The Country Life Community

WasteWater Operation and Maintenance Plan
O and M, Manual

For

Country Life Community
On-site Wastewater Treatment & Disposal Facility
6939 Hickman Road
Greenwood, Delaware 19950

Part I

The Country Life Community On-site Wastewater Treatment and Disposal System (OWTDS) is designed to receive and treat sanitary wastewater from 35 two-bedroom cottage units and a 42,000 sf building containing 24 assisted living beds, 20 one-bedroom and 6 two-bedroom units. The influent flows to the OWTDS shall not exceed a daily average of 13,305 gallons per day(GPD). The sanitary wastewater is treated by a Premier Tech Ecoprocess Moving Bed Biofilm Reactor (MBBR) and then the wastewater is discharged to a micro-irrigation “drip” dispersal system for final disposal.

Influent Limitations

1. The daily average of influent flow shall not exceed 13,305 gpd.

Effluent Limitations

1. The daily average of effluent discharged to the micro-irrigation system shall not exceed 13,305 gpd.
2. Total Nitrogen annual average concentration shall not exceed 10 mg/l.
3. The 5-day Biochemical Oxygen Demand (BOD_5) monthly average concentration shall not exceed 30 mg/l.
4. The Total Suspended Solids (TSS) monthly average concentration shall not exceed 30 mg/l.

The operation of this wastewater treatment and disposal facility requires a Class II operator. The operator is responsible for operation, maintenance, and sampling of the facility. The operator shall perform site checks at a minimum of one every two weeks or as needed to adequately operate the facility.

An operator log shall always be kept onsite along with all facility records and copies of monitoring reports. This log shall, at a minimum, include the following:

a. Time spent at the treatment facility on any date;
b. Details of the operation and maintenance performed on the system on any date;
c. The volume of wastewater treated and discharged;
d. Identification of and description of any portions of the disposal system the were underperforming;
e. Record of any deviations from the operation and maintenance manual;
f. General daily weather conditions;
g. Record of all actions taken to correct violations of this Permit and the Department's regulations;
h. Record of all site management activities undertaken; and
i. Record the date and volumes, and destination of biosolids removed from the facility.

Meter Calibration

The Permittee shall calibrate all flow meters in accordance with the Manufacturer's recommendations. Calibration shall include, but not be limited to influent, effluent, continuous online turbidity and chlorine residual monitors. The calibration documentation shall be submitted with the Annual Report in accordance with this Permit.

Environmental Release of Pollutants

The Permittee shall also notify the GWDS regarding any environmental release of pollutants (i.e., spill) into surface water or groundwater or on land, within 24-hours from the time the Permittee becomes aware of the release and activate their emergency site plan. In addition, the following information shall be reported to the GWDS within five days.

a. The facility name and location of release;
b. The chemical name or identity of any substance involved in the release;
c. An indication of whether the substance is an extremely hazardous substance;
d. An estimate of the quantity of any substance that was released into the environment;

e. The time and duration of the release;
f. The medium or media into which the release occurred;
g. Any known or anticipated acute or chronic health risks associated with the emergency and, where appropriate, advice regarding medical attention necessary for exposed individuals;
h. Proper precautions to take as a result of the release, including evacuation;
i. The names and telephone number of the person or persons to be contacted for further information; and
j. Such other information as the GWDS may require.

Right of Entry

The permittee shall allow, at reasonable times, the Secretary of the Department, or their authorized representatives, upon the presentation of credentials and such other documents as may be required by law:

a. To enter upon the permittee's premises where the on-site wastewater treatment and disposal system is located or where any records are required to be kept under the terms and conditions of this permit;
b. To have access to and copy any records required to be kept under the terms and conditions of this permit;
c. To inspect any facility, equipment, monitoring method, monitoring equipment, practice or operation permitted or required under this permit;
d. To sample or monitor for the purpose of assuring permit compliance with any condition of this permit, the regulations or 7 Del C., Chapter 60.

Reapplication for a Permit

At least 180 days prior to the expiration date of the Permit, the Permittee shall apply for renewal, or notify the Department of the intent to no longer construct the OWTDS by the expiration date.

Records Retention

All records and information resulting from the monitoring activities required by this Permit including all records of analyses performed and calibration and maintenance of instrumentation and recording from continuous monitoring instrumentation shall be retained for five (5) years.

Groundwater Requirements

The operation of the wastewater treatment facility shall not cause the quality of Delaware's groundwater resources to be in violation of applicable Federal or State Drinking Water Standards.

Facilities Operations

The Permittee shall properly maintain and operate all structures, pipelines, systems and equipment for collection, treatment control and monitoring which are used by the permittee to achieve compliance with the terms and conditions of the Permit.

Site Checks (2 week minimum)

Enter the community via Magnolia Avenue heading towards Facility, check and monitor the Lift Stations for high level alarms.

1. A Red light on the control panel, near Lift Station, indicates the high level or problems within that station.
2. At this time there are only two (2) stations in operation. In future expansion, another station will be required.
3. Upon arrival at the wastewater building, located at the north end of the property, enter a key code to unlock and gain access to the entrance of the building.
4. Go to the labeled main PLC Control Panel. On the home screen will be the operation of the system. Go through system check to the Alarm Screen to see if any have been activated. If any show activation, locate that part of the system to check that Alarm: Floats, Pumps and Solenoid.

a. Floats
   Floats control stopping and starting of pumps.

   1. Floats could be just stuck in wrong position
   2. If floats are not in working order, it could be electrical issues; if electrical malfunctions, you might need to seek professional electrical help; Emergency numbers will be posted on panel.

b. Pumps
   Pumps move the wastewater fluid through the system.

   1. If pumps do not start or continue to run without stopping, usually due to float or signal input malfunction;
   2. If you cannot resolve the issue, seek professional electrical help.

c. Solenoids
   Solenoids are located at different Zones in drain fields. (Zone locations will be displayed on a Map in records at desk) There are also Solenoids located within the system in the building.

   1. If you cannot resolve the issue, seek professional help.

Drain Fields Site Evaluation

The fields are to be visually checked every two (2) weeks as part of site check for any wet areas of the drain fields. None of the areas should have any surface water present unless heavy rainfall was recent. Drain fields are laid out in different zone areas, which each have their own manual hand valve that should be closed if any zone areas are showing signs of surface water. They should remain closed till that solenoid valve can be repaired.

If all systems are operating properly proceed to Log Book to complete daily site visits.

Log Book - Documentation

An operator log shall always be kept onsite along with all facility records and copies of monitoring reports. This log shall, at a minimum, include the following:

a. Time spent at the treatment facility on any date;
b. Details of the operation and maintenance performed on the system on any date;
c. The volume of wastewater treated and discharged;
d. Identification of and description of any portions of the disposal system that were underperforming;
e. Record of any deviations from the operation and maintenance manual;
f. General daily weather conditions;
g. Record of all actions taken to correct violations of the Permit and the Department's regulations;
h. Record of all site management activities undertaken; and
i. Record the date and volumes, and destination of biosolids removed from the facility.

Yearly Preventive Maintenance

All pumps will be checked for amperage draw (on motor nameplate); if above normal operating range, further checks should be performed to see if they need to be replaced. If PSI on gauges or GPS on flow meters are not in normal range could also indicate the pump is about to fail, may need to be replaced.

Waste water traitement

Operation & Maintenance Manuel

Nº P-6658



Ecoprocess™ MBBR
Réacteur Biologique
à garnissage en suspension

Ecoflo®
Biofiltres en îlots

Projet : COUNTRY REST HOME INC

12046 Sunset Lane
Greenwood
Delaware 19950

Date : June 2022

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Septic Tank and Sludge Management Reservoir

Operation and Maintenance Guide

Premier Tech Aqua (PTA) *congratulates you for your purchase. By making this choice you contribute to the protection of the environment and the water sources of your community.*

This guide contains the necessary information regarding the operation, usage and maintenance of ***Septic Tanks and Sludge Management Reservoirs****. For more information, please do not hesitate to contact our Customer Service at* ***1 800 632-6356 or visit us at PREMIERTECHAQUA.COM****.*

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1 Operation

1.1 Model

Septic tanks and sludge management reservoirs are offered in various models and materials, including concrete, fibreglass and polyethylene. Premier Tech Aqua tanks and reservoirs are made of polyethylene and are offered in different models. They range from a PST-960 tank to larger capacity tanks (PST-1500 to PST-5000). For more information about the various models and capacities of your septic tanks and/or sludge management reservoirs, please consult the « Data Sheet » inside this manual.

1.2 Functioning

The purpose of septic tanks and sludge management reservoirs is to settle and store sludge before it can be disposed of by regular pump outs.

Inside the septic tank, the primary type of sludge originating from the raw sewage is settled. The retention time inside the septic tank provides a minimal amount of time sufficient for the liquid-solid separation to occur, as required by the regulation.

When a sludge management reservoir is integrated in a treatment chain, its purpose is to allow the settling and accumulation of secondary sludge produced by the biological treatment. The secondary clarifier, which separates the biological sludge of the treatment chain, then pumps it directly into the sludge management reservoir. The supernatant of this reservoir is directed toward the beginning of the treatment chain, the septic tank.

2 Maintenance and Servicing

A septic tank must be inspected regularly (measurement of sludge and scum levels) and pumped out when required. The design of the treatment chain serves as a tool to assess the autonomy of the septic tank on a theoretical basis. However, this autonomy must be validated under real conditions. Various factors, inherent to the specific operation conditions of an installation can influence the production of primary sludge, making it difficult to evaluate theoretical designs with precision.

The sludge management reservoir must also be inspected periodically (measurement of sludge and scum levels) and pumped out when required. The design of the treatment chain serves as a tool to assess the autonomy of the septic tank on a theoretical basis. However, this autonomy must be validated under real conditions. Various factors, inherent to the specific operation conditions of an installation can influence the production of secondary sludge, making it difficult to evaluate theoretical designs with precision. In certain cases, the sludge from the secondary treatment is returned to the septic tank. In those cases, the septic tank is oversized so it can receive the sludge produced by the secondary treatment.

A regular follow-up of sludge levels in each of these reservoirs must be ensured to evaluate the frequency of sludge pump outs under real conditions.

2.1 Monthly Maintenance

2.1.1 Inspection and sludge level measurement

- If the primary treatment is a septic tank, measure the sludge and scum levels and make sure the septic tank is pumped out when required. Please refer to the local regulation for maximum levels at which the tank must be pumped out.
- If a secondary sludge reservoir is integrated, measure the height of the sludge and scum and make sure the septic tank is pumped out when required. Please refer to your local regulation for maximal levels at which the reservoir must be pumped out.
- It is good practice to verify if there is an accumulation of sludge and scum in the equalization tank, to have it pumped out when required or anytime a preceding reservoir is being pumped out.

3 Start-Up and Seasonal Shutdown

No specific action is required on the system, either at start-up or for a seasonal shutdown.

For seasonal shutdowns where frost is to be expected, it is not recommended to empty reservoirs. The water level can be lowered below the inlet and outlet descending pipes to prevent frost damage. When an effluent filter is installed, we recommend removing the filtering cartridge during the shutdown period.

For summer shutdowns or when the weather is warmer, it may be preferable to empty reservoirs to avoid the generation of foul odours during the shutdown period.

4 Troubleshooting

4.1 Increase in the Level of the Septic Tank

Possible Causes	Explanations and Repairs
The effluent filter of the septic tank is blocked	• Using protective gloves, open the septic tank. To remove the effluent filter, pull on the cartridge. Clean the cartridge. Make sure you place the effluent filter back properly.
The conduits are obstructed	• Check if anything is obstructing the conduits. Clean if necessary.
The daily flow is greater than the design flow	• If the daily flow is greater than the design flow, the operation times of the pumps will need to be adjusted to meet the system's demands, without being fed on a continuous basis. To ensure an efficient treatment, it is essential that the treatment chain be set on dose feed mode; not in continuous feed.

4.2 High TSS Concentrations at the Outlet of the Septic Tank

Possible Causes	Explanations and Repairs
High sludge level in the septic tank	• If TSS concentrations are high at the outlet of the septic tank, the tank may need to be pumped out. • If this is a recurring problem, it is possible that the septic tank is undersized and that solid particles do not have enough time as expected to settle in the septic tank.

For any issue, question or comments, please do not hesitate to contact Premier Tech Aqua at 1 800 632-6356.

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Ecoprocess MBBR™

Operation and Maintenance Guide

Premier Tech Aqua (PTA) *congratulates you for your purchase of an* ***ECOPROCESS™ MBBR Wastewater Treatment System****. By making this choice you contribute to the protection of the environment and the water sources of your community.*

This guide contains the necessary information regarding the operation, usage and maintenance of the ***ECOPROCESS™ MBBR Technology****. For more information, please do not hesitate to contact our Customer Service at* ***1 800 632-6356 or visit us at PREMIERTECHAQUA.COM****.*

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1 Operation of the Treatment Chain

1.1 Introduction

The treatment chain of the **ECOPROCESS™ MBBR** is comprised minimally of an MBBR reactor and a secondary decanter. The MBBR reactor is an aerated reservoir which contains a moving bed biofilm that ensures the biological treatment. The purpose of the secondary decanter is to separate solids produced by the MBBR and discharge treated water at the effluent. Different treatment chain configurations are offered to meet the specific needs of clients.

The wastewater treatment process of the **ECOPROCESS™ MBBR** is entirely managed by one or more than one control panels. The purpose of the control panel(s) is to apply power or disconnect the equipment of the treatment chain. The control panel(s) can manage:

- The feed pumps of the MBBR reactor.
- The blowers ensuing the aeration inside the MBBR reactor.
- The sludge and scum pumps of the decanter.
- The phosphorus removal pumps (please consult the Phosphorus Removal Section of this document for more information on their operation and maintenance).
- The pumps of the pumping stations (please consult the Pumping Station Sections of this document for more information on their operation and maintenance).

1.2 Feeding of the MBBR with an Equalization Tank

In most cases, an equalization tank is integrated in the treatment chain to regularize the feed to the MBBR. The water contained in the equalization tank is directed to the **ECOPROCESS™ MBBR** using submersible feed pumps.

Feeding of the bioreactor(s) is performed on an on-demand basis and depends on the activation of the floats in the equalization tank. In certain cases, feeding the MBBR can be done by gravity directly at the outlet of the septic tank. In that specific case, feed does not need to be managed, but the operation guidelines of the MBBR must be taken into consideration. For example, no aeration will be required in economy mode.

Figure 1 indicates schematically the position of the various floats in the equalization tank of the **ECOPROCESS™ MBBR** treatment chain.

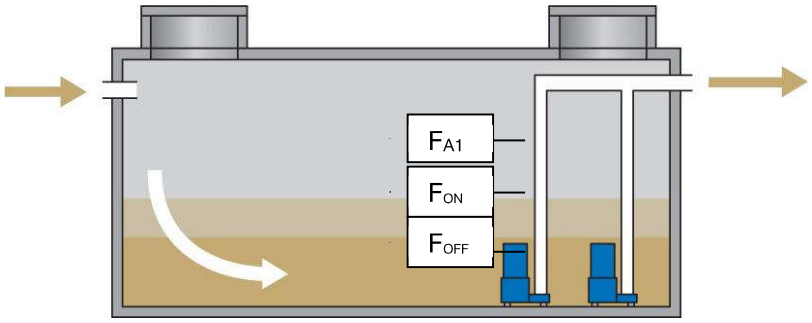


Figure 1: Schematic representation of the position of the floats in the Equalization Tank of the ECOPROCESS™ MBBR treatment chain.

Three (3) level floats are required to control the water level in the equalization tank. The lowest float (F_{OFF}) deactivates the control sequence and feed system. The middle float (F_{ON}) activates the automatic control sequence. The highest float (F_A) activates the continuous operation of the pumps as well as the alarm to notify the client of a high level of water in the equalization tank.

Please consult the « Technical Sheet » Section of this document for more information on the operation and components of the equalization tank.

The purpose of the PTA control panels is to operate the feed pumps of the MBBR in automatic, manual or stop mode depending on the position of the activation button of each pump.

1.2.1 Automatic Operation Mode

The automatic operation mode is the one prioritized under normal operations of the treatment chain. This operation mode allows the treatment chain to treat 100% of the design flow over a 20-hour period. During the start-up of the equipment, operation times of the pumps in automatic mode should be adjusted to make sure the treatment chain meets the needs of the client.

Please note that in all these cases, when a pump is operating:

- The power switch of the pump's motor is activated.
- If the pump is overloaded, a message will appear on the operator interface.
- It is possible to know the actual operating times of the pump via the control panel.

1.2.1.1 Case #1: The water level rises

This is the control sequence when the water level rises:

- Initially, the water lever is located under the first float (F_{OFF}). The MBBR is in economy mode (C1). The water lever rises and activates this float. No action is undertaken by the control system. The MBBR stays in economy mode (C1).
- The water level rises again and activates the second float (F_{ON}). The control system activates the pump of the equalization tank that operates as per a pre-established cycle. The MBBR is also activated in normal mode (C2).
- In the event of a peak flow, the level of water will continue to rise and will activate the high float (F_A), which serves as an alarm float. The control system will activate the pumps of the equalization tank so that they operate continuously to deactivate the alarm float. The pumps will operate alternatively depending on a predetermined « ON » time in normal mode, without any pause. The MBBR continues to operate in normal mode (C2). A visual alarm will appear on the control panel. **This situation is not normal.**

1.2.1.2 Case #2: The Water Level Goes Down

- Initially, the level of liquid in the reservoir will be under the alarm float (F_A). This means that all three (3) floats are activated (high position) and that the pumps operate continuously. The level goes down and deactivates the alarm float (F_A), the pump's operation mode returns to the normal, pre-established cycle. The MBBR continues to operate in normal mode (C2).
- The water level goes down and deactivates the second float (F_{ON}). No action is undertaken by the control panel and the pumps continue to operate as per normal sequences. The MBBR continues to operate in normal mode (C2).
- The water level goes down and deactivates the first float (F_{OFF}). The control system will stop the pumps, the MBBR is no longer fed. The MBBR activates its economy mode (C1).
- Under normal operating conditions, the water level should not reach the alarm float (F_A). When normal activities are taking place in the serviced building, the water level should be between the F_{OFF} float and F_A float.

1.2.2 Manual Operation Mode

The feed pumps are operating without stoppage regardless of the level of the liquid. The operation and stop sequences are short-circuited.

Note: Avoid operating the pumps when dry.

1.2.3 Operation Mode: Stop

In this position, no power is sent to the motors of the different pumps.

1.3 Operation Mode of the Aeration of the ECOPROCESS™ MBBR System

Two operation modes are possible for the blowers of the MBBR reactor, namely the economy mode (C1) and the normal mode (C2).

1.3.1 Normal Operation Mode (C2)

- Activates itself when the F_{OFF} and F_{ON} floats are activated (high position).
- **ECOPROCESS™ MBBR** reactor receives a constant level of influent doses at a set frequency.
- The aeration inside the reactor is frequent because of the regular arrival of water to be treated (pre-established sequence).
- Deactivates itself when the F_{OFF} is deactivated (low position).

This operation mode varies depending on the age of the system. In fact, during the first weeks of operation, the biological load inside the reactor must construct itself. That is why the aeration time must be modified to prevent the accumulation of foam inside the reactor.

1.3.1.1 Start-Up Mode

At the time of the start-up, the aeration must be kept to a minimum to begin the biological activity and avoid the accumulation of foam on the surface of the reactor. The operation time of the blowers must be set to 2 minutes and the stop time at 6 minutes.

1.3.1.2 Intermediary Mode

A few weeks after the start-up, it is possible to increase the aeration to optimize the consumption of the organic load in the reactor and the mixing of the media. The operation time of the blowers must be set at 5 minutes and the stop time at 5 minutes.

1.3.1.3 Full Operation Mode

When the system has reached an equilibrium and if the reactor is deprived of oxygen, the aeration must be adjusted for the reactor to reach its maximum performance in terms of organic and nitrogen load removal, if applicable. The operation time of the blowers must be set at 30 minutes and the stop time at 5 minutes.

1.3.2 Economy Mode

- Activates itself when the F_{OFF} float is deactivated (low position).
- The MBBR reactor has not received any influent for a certain time.
- The aeration is less frequent because there is no new flow of wastewater (pre-established sequence)
- Deactivates itself when the F_{ON} float activates itself (high position).

1.3.3 Summary of the Operation Modes of the Blowers

Table 1: Summary of the operation and stop times of blowers depending on the operation mode

OPERATION MODE	OPERATION TIME (MIN)	STOP TIME (MIN)
ECONOMY	5	55
START-UP	2	6
INTERMEDIARY	5	5
FULL OPERATION	55	5

1.4 High Level Alarm in the MBBR Biological Reactor

A high-level float is installed inside the reactor. It is activated if the water level is higher than the height of the outlet. The control panel will indicate an alarm to inform the client of the situation. The likely cause of a high level in the reactor is:

- The holding grid of the media is clogged and the water cannot flow freely to the subsequent treatment step.

1.5 Operation Mode of the Secondary Decanter

The secondary decanter is, in most cases, gravity fed. It is located downstream of the MBBR biological reactor. When the water level in the reactor has reached the invert of the outlet of the MBBR reservoir, the water flows toward the decanter. A scum pump and, at the minimum, a sludge pump is integrated in each decanter. The purpose of the

scum pump is to remove the sludge floating on the surface of the decanter. The purpose of the sludge pump or pumps it to remove the sludge which has settled at the bottom of the tank.

Under normal condition, the pumps both activate themselves two (2) times a day in alternation (depending on pre-established sequences). The pumps operate independently of the operation mode of the MBBR (economy or normal mode). The operation and stop times of each type of pumps can be adjusted in the control panel. The operation and stop times should be adjusted at the start-up of the treatment chain. Depending on the actual operation (real loads), it will be possible to increase the frequency of sludge removal based on the speed at which the sludge and scum accumulate in the decanter. However, it is important to consider the volume of the supernatant recirculated at the beginning of the treatment chain by the sludge removal. Please consult the technical sheet of the decanter in the « Technical Sheet of the Internal Components » Section of this document for more information about the capacity of the sludge removal pumps.

If required, please contact **Premier Tech Aqua** to determine the optimal operation and stop times of the scum and sludge pumps.

1.6 Low Level Control of the Secondary Decanter

A low-level float is integrated in the secondary decanter. When it is deactivated (low position), the sludge and scum pumps will not start to avoid operating dry and then emptying the reservoir without any reason until the float is activated again. This condition indicates there has not been any inflow of water for a certain time.

Table 2: Summary of the operation and stop times of the sludge and scum removal pumps

NUMBER OF REMOVAL PER DAY PER PUMP	OPERATION TIME (MIN)	STOP TIME (H)
1	1	12
2	1	6
3	1	4
4	1	3

Depending on the specific configuration of the installation, please note that the operation time of the pumps could be greater than what is indicated in the above table. These times are nonetheless generally sufficient.

1.7 Operator Interface and Alarm Management

The operator interface located in the control panels allows you to consult and modify the operation parameters of the electro-technical components of the treatment system, namely of the pumps and blowers for the MBBR reactor and scum and sludge pumps of the decanter. The screen of the interface also indicates all the alarms that occurred. When the panel indicates an alarm on the screen of the interface, make sure you note it in the monthly log book and see that the situation which generated the alarm is corrected. Please consult the Troubleshooting Section at the end of this document to identify the issue. If the problem persists, please contact **Premier Tech Aqua.** To cancel an alarm, press the Reset button. A persisting alarm indicates that the problem is still occurring. If the alarm disappears by pressing the Reset button, the problematic condition is no longer in effect. However, it is good practice to investigate further to identify and understand what caused the alarm.

The operation guide of the control panel(s) in this document provides more details on how to navigate into the user interface.

2 Process Control – Biology

2.1 Biological Operation Parameters

2.1.1 Dissolved Oxygen in the MBBR

To ensure an adequate treatment by the microorganisms and prevent an excessive proliferation of filamentous bacteria, a minimal dissolved oxygen concentration of 4 mg/L should be maintained in the bioreactors.

The lack of oxygenation can lead to a dark coloration of the contents of the MBBR, an unpleasant odour characteristic of a « septic condition » an accumulation of biomass on the media and diminished treatment performances. Various potential solutions can be considered:

- Increase the aeration time while in normal operating mode (C2) to increase the quantity of oxygen supplied to the bioreactor. However, special attention must be paid not to aerate excessively to limit the destruction of the biofilm flocs suspended by the movement of the media pieces.
- Reduce the duration of the non-aerated periods while in normal operation mode (C2) to increase the number of aeration sequences.
- Reduce the volume of each feed dose applied to the bioreactor.
- Reduce the frequency of the feed periods (be careful with these last two adjustments. You must make sure that you will be able to respect the daily flow of wastewater to be treated).

2.1.2 Nutriments

The organic matter, the nitrogen and the phosphorus constitute a source of food and are essential nutriments for the microorganisms responsible for the treatment. Their activity will be maximal when all their needs are met. Nitrogen and/or phosphorus deficiency can favour the growth of filamentous organisms and impair treatment performances. A balanced mass ratio (BOD_5/N/P) of 100/5/1 must be present for the biological activity. In the event of a deficiency, the situation can be corrected by adding nitrogen and/or phosphorus to obtain a more balanced mass ratio.

2.1.3 pH and Alkalinity Variations

pH will vary if acid or basic wastewater is discharged into the system or if the alkalinity of the water is insufficient in the raw sewage. A drop in the pH can impair treatment performances. Usually, the occasional addition of small quantities of acid or alkaline products in the wastewater will not impair the treatment due to the dilution rate inside the reactor. However, an important spillage of acid or alkaline products could impair or even inhibit the treatment.

A lack of alkalinity ($CaCO_3$) in the wastewater (buffering capacity) can lead to a decrease in pH. Typically, the alkalinity is consumed by the nitrification process during the biological treatment under aerated conditions. While mostly used by the nitrifiers, the chemical removal of the phosphorus can also consume a fraction. A residual alkalinity at the effluent of 50 mg/L is generally recommended to ensure the stability of the pH during the treatment.

Significant pH variations in the system on a regular basis may make it necessary to add an automatic pH control equipment or some alkalinity.

2.1.4 Biofilm Control

The efficiency of the biological treatment is based on the activity of the microorganisms stuck on the media pieces. A sufficient quantity of such microorganisms must thus be found in the biofilm covering the media surface. However,

an excessive quantity of biofilm can impair the process treatment. Under normal conditions, the thickness of the biofilm should be barely visible up to 1 mm.

To reduce the clogging of the media pieces and optimize the thickness of the biofilm, the operator must make sure aeration is sufficient. The purpose of the aeration is twofold: it cleans the media by stirring and abrasion, and ensures sufficient input of dissolved oxygen for the biological treatment. The operation of the blowers, if it respects minimal mixing criteria, will usually allow for the adequately recurring of the surface of the media. An optimal thickness of biofilm will thus be maintained.



Figure 2: Media with little colonization



Figure 3: Very colonized media

In certain cases, where the applied load is much lower than the design loads, it may be necessary to reduce the duration of the aeration times to limit the excessive abrasion of the suspended pieces of biofilm. In fact, a very elevated retention time can lead to suspended biomass flocs breakage and impair the separation of solids by the decanter. To limit the flocs from breaking, the agitation must be controlled. Be careful not to lower the aeration too much to maintain a sufficient biological activity for the treatment.

2.2 Environmental Follow-Ups

The operation of an **ECOPROCESS™ MBBR** is done automatically. However, it is necessary to perform periodical follow-ups of its performances to ensure that the control parameters are always properly adjusted. To do so, it is generally appropriate to perform a sampling of the effluent of the treatment chain. Certain precautions must be taken during the sampling procedures to avoid contaminating the samples collected and skew the obtained results. As such, it is essential that the instruments and materials used for the sampling (sampler, sampling points, bottles, etc.) be carefully cleaned and disinfected. Moreover, it is strongly recommended, when more than one sampling points are concerned, to begin with the least contaminated point and move back up the treatment chain. This will limit the risks of cross contamination.

The following parameters are generally analyzed:

- Total carbonaceous biochemical oxygen demand after 5 days (BOD_5C_{tot}).
- Chemical Oxygen Demand (COD).
- Total Suspended Solids (TSS).
- Total Phosphorus (when required by the regulation or for a system diagnostic).
- All forms of Nitrogen (when required by the regulation or for a system diagnostic).
- Fecal Coliforms (when required by the regulation or for a system diagnostic).

- Soluble Carbonaceous Biochemical Oxygen Demand after 5 days ($CBOD_{5\ sol}$) (system diagnostic).
- Other parameters can be required as per the local regulation as well as discharge requirements specific to your installation.

3 Maintenance and Servicing of the System

3.1 Weekly Inspection and Maintenance

The operation principle of the **ECOPROCESS™ MBBR** treatment process is simple, but the system does require regular, preventive inspection and maintenance. A minimal weekly follow-up is recommended as a preventive measure to be able to react swiftly in the event of an electro-technical operation failure. It is not required that this follow-up be performed by a person trained by Premier Tech Aqua. Here are the actions to be undertaken during these visits:

3.1.1 Weekly Inspections

- Visual inspection of the proper operation of the electromechanical components, pumps and blowers.
- Visual and olfactive inspection around the **ECOPROCESS™ MBBR** treatment chain (equalization tank, bioreactor, decanter, pumping stations, etc.).
- Note down any failure or other particularities related to the operation of the system.
- If possible, note the operation time of every equipment.

3.2 Periodical Operation and Maintenance Follow-ups

The maintenance of the **ECOPROCESS™ MBBR** system should be performed by a person trained by Premier Tech Aqua. Premier Tech Aqua service partners inspect and maintain the mechanical components and perform the follow-up required for the proper functioning of the treatment process.

Table 3: Principal operation points of the ECOPROCESS™ MBBR System

Activities
Operation of the treatment chain
Inspection of the primary treatment and sludge measurement
Reading of key operational parameters
Inspection and maintenance of the **MBBR** system
Inspection and maintenance of the secondary decanter

3.2.1 Operation of the Treatment Chain

- Verification of the general operation condition of the treatment chain.
- Verification of the operation of the pumps.
- Verification of the operation of the control panel(s) and alarm system.
- Perform the maintenance of the pumps and blowers as per the recommendations of the manufacturer (please consult the « Technical Data Sheet of the Internal Components » Section of this document.

3.2.2 Reading of Key Operation Parameters

- Note the operation times of the various pumps and blowers.
- Note the total number of operation hours of the electrotechnical components.

- Note any failure or particularities related to the operation of the system.
- Make the required adjustments based on the observations made.

3.2.3 Inspection and Maintenance of the ECOPROCESS™ MBBR System

- Evaluate the correct feed rate of the **ECOPROCESS™ MBBR** system.
- Verify the proper operation of the blowers and the homogeneity of the mixture in the tank.
- Note the pressure indicated on the manometer while the blowers are operating.
- Note the adjustment of the relief valve. It should open when the pressure is 25% greater than the operational pressure.
- Verify if the clogging indicator of the blower's filter has indicated any clogging. Clean the filter, if required. Following the maintenance of the filter reinitialize the clogging indicator by pressing the yellow button on top.



3.2.4 Inspection and Maintenance of the Decanter

- Verify the operation of the pumps and make sure the sludge is properly directed to the storage tank (septic or sludge management tank).
- Note the accumulation of scum on the surface of the decanter (inlet, middle and outlet section).
    - If there is scum, increase the frequency of the scum removal.
    - If there is scum in the inlet and outlet sections, it will need to be removed manually with a Shop-Vac®.
- Measure the sludge accumulation at the bottom of the decanter (inlet and outlet section). There should not be any sludge there.
    - If there is an accumulation of sludge at the bottom of the decanter, increase the frequency of the sludge removal.

3.3 Environmental Follow-Ups

To validate the treatment performance of the treatment system, a sample and analysis of the physical and physicochemical parameters may be required.

Moreover, for all types of treatment chains designed for community, commercial and institutional establishments, local authorities may require environmental follow-ups of the treatment performances of the treatment chain while in operation.

Premier Tech Aqua can provide technical services for such follow-up programs. Premier Tech Aqua offers different service packages depending on the specific needs of clients and maintenance contracts are renewable on an annual basis. Depending on the type of service selected by the client (Bronze, Silver or Gold), the frequency of the visits of the sampling site may vary. Our Bronze service contracts include two maintenance visits and an instantaneous type

of sampling per visit. Silver contracts include four maintenance visits and a sampling. Gold contracts include the annual follow-up required by local Environmental Authorities (depending on the type of effluent and design flow).

4 Intermittent Operation and Seasonal Fluctuations

A prolong no flow period (one week) could lead to the death of a fraction of the microorganisms present on the media. The restart of the alimentation of the MBBR is performed automatically, without the need for any human intervention. Depending on the duration of the no flow period, a few days to a few weeks could be required for the complete reestablishment of the treatment performances. Moreover, it is possible that such a situation generates foam. This foam will be controllable by the addition of an anti-foam agent available from any speciality supplier and by reducing the duration of the aeration (please consult Section 1.2).

In certain applications, it is possible that loads vary depending on the period of the year the system is in operation. For example, a restaurant may only operate in the summer.

In terms of the flow variation, the treatment system will adjust itself automatically. During periods when flow will be less. When the flow is less, the MBBR technology will be in economy mode for longer periods of time.

A significant variation in the $BODC_5$ concentration at the influent could have a negative impact on the treatment. As such, and in certain cases, it may be necessary to adjust the aeration. Premier Tech Aqua recommends adjusting the duration of the aeration proportionally to the difference of the mass loading to be treated. For example, based on the following table:

Table 4: design criteria of the treatment system (occasional loads)

Parameters	Pressing waters	Maple waters	Average of the water generated yearly
Type of operation	3 months/year	2 months/year	Year
$CBOD_{5\ soluble}$ concentration (mg/L)	2,000	1,500	665
Daily flow (L/day)	7,000	500	11,735
Daily charge to treat (g/d)	**14,000**	**750**	**7,809**

- The variation in the mass load brought about by the maple waters is lower than 10%, which represent a typical variation the MBBR can absorb. No modification in the aeration times is required.
- The variation mass loading brought about by the pressing waters is, on the other hand, significant and requires an adjustment. Considering the aeration will be operating for 60 minutes (« ON ») and 5 minutes of stop time (« OFF ») under normal operation conditions, this means that the blowers are operating 92% of the time and aerate the reactor, which corresponds to a full capacity operation (yearly waters and pressing waters). The aeration will need to be adjusted when pressing waters are no longer directed to the treatment chain.

$$\%\ of\ the\ aeration\ time\ = \frac{real\ charge}{total\ design\ load}\ x\ design\ operation\ time$$

$$\%\ of\ the\ aeration\ time = \frac{7\ 809\ g/day}{21809\ g/day}\ x\ 92\%$$

$$\%\ of\ aeratino\ time\ =\ 33\%$$

- Under these conditions, the blower should be adjusted to aerate for 5 minutes and pause for 10 minutes to aerate the reactor 33% of the time.

5 Start-Up and Seasonal Shutdown

When the treatment chain is not operating in the winter, certain actions must be undertaken to prevent any equipment breakage:

- Drain the feed pipes of the reactor by completely opening the drain valves on the 2" (50 mm) outlet pipe of the equalization tank.
- Drain any other pipes that may freeze in the winter.
- Make sure that pumps are not located at a level where the water could freeze and lead to breaks. For the decanter, it is preferable to lower the pumps to the bottom of the reservoir for the winter period. At start-up, the pumps should be placed back in their original position.

During start-up, following a temporary $CBOD_5$ shutdown of the treatment chain, it is important to open the lids of the reactor and secondary decanter to verify if any component may have broken during the stoppage period.

For more information about the shutdown of a treatment chain in the winter, please consult the « Seasonal Shutdown » Section of this document.

6 Troubleshooting

IMPORTANT: certain operations can only be executed by a qualified electrician or technician.

6.1 Mechanical Features

6.1.1 High-float alarm – Equalization Tank

Turn off the fee pumps. Keep the water consumption to a minimum until the issue is resolved.

Possible Causes	Explanations and Repairs
Mechanical problem leading to a high level	• Reset the circuit breaker of the pumps, if required. • Reset the overload relay of the pumps, if required. • Verify the operation of the pumps manually. • Verify if a high-level float is stuck in the equalization tank. • Verify the operation of the level floats in the equalization tank. • Proceeded with the necessary verification, repairs or part replacements if the problem continues.
Air lock in the pump's conduit	• Activate the pump and wait a few minutes for movement in the conduit to begin. • Activate the pump and, if possible, move the pump and its conduit vertically to let the air out. • With the pump deactivated, dissemble the pipes (cam coupler) to purge the air and reconnect the pipe.
Calibration of the pumps	• Verify if anything is obstructing the pumps or feed conduits. • Validate the flow of the feed pumps. • Based on the flow of the feed pumps and their pre-established operation sequences, evaluate their daily treatment capacity. • Evaluate the daily flow to be treated based on the flow of the feed pumps and the daily operation time totalizators. • Adjust the flow or the operating times if the treatment capacity is lower than the daily flow to be treated.
Obstruction of the holding grid of the MBBR media	• Clean the holding grids inside the MBBR.
Runoff water flowing to the treatment chain	• Inspect all the elements of the treatment chain and verify if any runoff water is flowing to the installation. • Correct what may be required to address the issue.
Real flow is greater than the design flow	• Revise the design of the **ECOPROCESS™ MBBR** treatment chain.

6.1.2 Problem with the feed pump of the ECOPROCESS™ MBBR System

Turn off the feed pumps. Keep water consumption to a minimum until the issue is resolved.

Possible Causes	Explications et Repairs
Defective pump(s)	• Identify the defective pump with the error message on the operator interface. • Reset the circuit breaker of the defective pump, if required. • Reset the overload relay of the defective pump, if required. • Test the operation of the pumps manually. • Proceed with the necessary verification, repairs or part replacements if the problem continues.
Obstructed Valve adjustments	• Verify that water flows freely in the valve when it is in the open position. • If the valve seemed obstructed, use a push rod to unblock it.

6.1.3 Presence of an important amount of foam in the MBBR

The presence of controlled foam inside the reservoir is not necessarily problematic. Foam becomes an issue when it is so abundant that it begins to seep out of the tank.

Possible Causes	Explanations and Repairs
At Start-Up • Initial Start-up • Seasonal Start-up • Start-up after a long period of no flow	• At the initial start-up, reduce the aeration times as per the times listed in Section 1.2.3. Set the operational times to normal when the foam is well controlled. • If the adjustment of the aeration is insufficient, add an anti-foam product during the start-up period as per the recommendations of the manufacturer.
Under normal operations	• Investigate how the system is used by the occupants of the serviced building. Verify if certain products rejected into the wastewater may cause an accumulation of foam. • Measure the concentration of the dissolved oxygen of the water inside the MBBR while in normal operation mode. If the water is saturated, the mixing could be excessive and produce foam. Reduce the aeration rate all the while making sure to maintain a minimum of 4 mg/L in dissolved oxygen. • If the adjustment of the aeration is insufficient, add an anti-foam product as per the recommendations of the manufacturer.

6.1.4 Problem: the treatment chain does not function, even if the main switch is in the « ON » position

Possible Causes	Explanations and Repairs
Defective electrical and phase connections	• Verify the various phases with a voltmeter. • Reset the main circuit breaker or replace any burnt fuse.
Defective electrical connections	• Verify if all electrical connections were performed concord with the electrical plans.
Defective control unit	• Verify if the voltage before and after the main switch concord with the electrical plans.
System in manual mode	• Verify if every equipment is in « AUTO » mode.
Problem with the floats inside the equalization tank	• Verify if you can visually confirm that the low float of the equalization tank is activated (on the control panel and inside the tank). Verify the electrical connections, if necessary.

6.1.5 Problem: Defective blower

The blower refuses to start or stop.

Possible Causes	Explanations and Repairs
Temporary loss of communication	• If the equipment is operational, ignore this error.
Burnt out feed fuse	• Verify the feed fuses. • Replace any fuses, if required.

Blower surcharge

Possible Causes	Explanations and Repairs
Closed valve or obstructed conduit	• Verify if the valves before and after the blower are open. • Verify that the conduits before and after the blower are not obstructed.
Defective motor	• Use an ammeter to verify the current used by the motor. • Verify the condition of the winding of the motor. An electrical resistance. should be present at each phase of the grounding. • Replace the motor, if required.
Defective blower	• Verify the general condition of the blower (leaks, temperature and colour). • Reassemble or replace the blower, if required.
Incorrect adjustment of the maximum current in the frequency inverter	• Verify that the adjustment maximal current of the frequency inverter corresponds to the motor (FLA).

6.1.6 High-level alarm – MBBR

Possible Causes	Explanations and Repairs
Clogging of the holding grid of the media	• Clean the holding grid inside the MBBR.

6.1.7 Problem: Decanter

Possible Causes	Explanations and Repairs
Scum accumulation on the surface	• The frequency of scum removal is insufficient. Increase the frequency of scum removals depending on the site's needs as specified in Section 1.5. • The loading time of the conduits is elevated and not enough water is directed to the sludge holding tank. Increase the « ON » time of the scum removals to make sure the sludge is directed to the scum storage tank adequately. • Clean the surface at the inlet and outlet of the decanter with a « Shop-Vac® ».
Sludge accumulation at the bottom of the tank	• The frequency of the scum removal is insufficient. Increase the frequency of the scum removals depending on the site's needs as specified in Section 1.5. • The loading time of the conduits is elevated and not enough water is directed to the sludge holding tank. Increase the « ON » time of the scum removals to make sure the sludge is directed to the holding tank properly.

6.1.8 Problem: Odours

Identify the source of the odour carefully. Air can circulate between reservoirs and on the site. Sometimes, an odour detected near an equipment may be triggered by another equipment.

Possible Causes	Explanations and Repairs
Not enough aeration	• Septic type of odour from the MBBR. Measure the level of aeration and increase the aeration frequency while in normal operation mode if the dissolved oxygen is below 4 mg/L.
Location of the treatment chain near human activity	• Perform a smoke test inside the reservoirs to validate the presence of leaks and the source of the odour. • Install an air vent further away from where human activities takes place. • Waterproof the reservoirs' access point, if they are leaking. • Install a carbon filter to treat odours.

6.1.9 Problem: The treatment performances overage

Possible Causes	Explanation and Repairs
Total $CBOD_5$	• Verify if the real loads are higher than the design loads. If so, revise the design of the treatment chain. • Measure the soluble $CBOD_5$. • If the soluble $CBOD_5$ is 50% lower than the discharge objective in total $CBOD_5$, refer to the section below about TSS. • If the soluble $CBOD_5$ is greater than the discharge objective in total $CBOD_5$, increase the aeration inside the MBBR while in normal operation mode. • Then, if the soluble $CBOD_5$ is greater than the discharge objective in total $CBOD_5$ total, lower the volume of water dosed to the MBBR by dose.
TSS	• Refer to Section 6.1.7 of this document if there is an accumulation of sludge and scum. • Verify that the design of the surface loading rate is respected. • Reduce the volume of water dosed at each dose. • Reduce the aeration inside the MBBR, if the oxygenation is excessive.

6.1.10 Power Outages

In the event of a power outage, the program with restart by itself and will store any previously entered data. If you have any questions about the functioning of the **ECOPROCESS™ MBBR** treatment system, please do not hesitate to contact Premier Tech Aqua Customer Service at 1 800 632-6356.

For any issue, question or comment, please do not hesitate to

contact Premier Tech Aqua at 1 800 632-6356.

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Septic tank

Technical Data Sheet

*This is the technical data sheet of the polyethylene **septic tanks** from **Premier Tech Aqua**. If you have any questions or comments, please contact the customer service at **1 800 632-6356** or visit our website at **PREMIERTECHAQUA.COM.***

1 Specifications

1.1 PST-1500 to PST-5000 tanks

Specifications	PST-1500	PST-2000	PST-2500	PST-3000	PST-3500	PST-4000	PST-4500	PST-5000
Nominal capacity	4 000 gal US (15 m³)	5 200 USgal (20 m³)	6 600 USgal (25 m³)	7 900 USgal (30 m³)	9 250 USgal (35 m³)	10 600 USgal (40 m³)	11 900 USgal (45 m³)	13 200 USgal (50 m³)
Effective capacity	3 700 gal US (14 m³)	4 750 gal US (18 m³)	5 600 gal US (21.3 m³)	6 800 gal US (25.8 m³)	8 000 gal US (30.3 m³)	9 200 gal US (34.8 m³)	10 400 gal US (39.3 m³)	11 600 gal US (43.8 m³)
Tank height (A)	190" (4,29 m)	222" (5,63 m)	273" (6,93 m)	324" (8,22 m)	375" (9,52 m)	426" (10,81 m)	477" (12,11 m)	528" (13,41 m)
Tank length (B)	108 ½" (2,76 m), including one riser of 12" (300 mm)							
Maximum height (additional riser added)	120 ½" (3,06 m)							
Tank width (C)	91 ½" (2,33 m)							
Inlet invert height (D)	76 ¾" (1,95 m)							
Outlet invert height (E)	74 ½" (1,895 m)							
Inlet pipe diameter	6" (150 mm) SDR-35							
Outlet pipe diameter	4" (100 mm) SDR-35							
Opening diameter	24" (610 mm)							
Number of openings	2			3		4		5
Weight of empty tank[1]	1 620 lb (735 kg)	1 843 lb (836 kg)	2 533 lb (1 149 kg)	2 881 lb (1 307 kg)	3 474 lb (1 576 kg)	3 825 lb (1 735 kg)	4 418 lb (2 004 kg)	4 768 lb (2 163 kg)
Tank material	Medium density polyethylene (MDPE)							

1. Weights indicated are approximate and not binding. For handling and lifting purposes only.

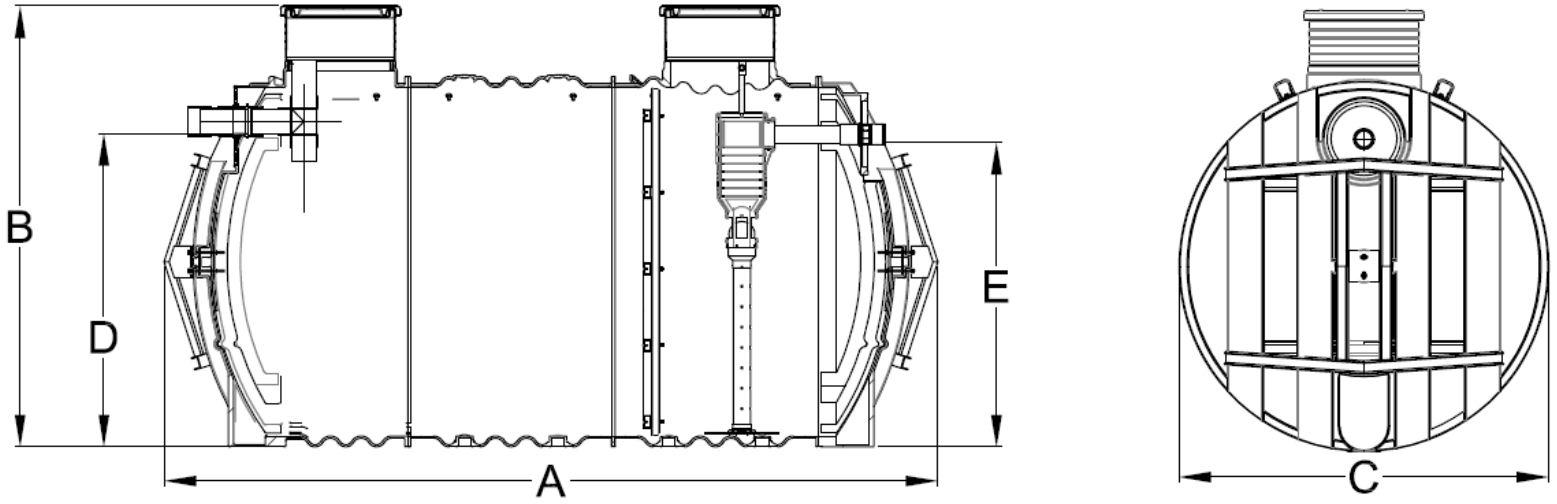


Figure 1 - Septic tank (PST-1500 to PST-5000) and its dimensions

1.2 PST-6000 and PST-7500 tanks

Caractéristiques	PST-6000 Tank #2	PST-6000 Tank #1	PST-7500 Tank #1	PST-7500 Tank #2
Nominal capacity	10 600 USgal (40 m³)	5 200 USgal (20 m³)	13 200 USgal (50 m³)	6 600 USgal (25 m³)
Effective capacity	9 200 gal US (34.8 m³)	4 750 gal US (18 m³)	11 600 gal US (43.8 m³)	5 600 gal US (21.3 m³)
Tank height (A)	426" (10,81 m)	222" (5,63 m)	528" (13,41 m)	273" (6,93 m)
Tank length (B)	108 ½" (2,76 m), including one riser of 12" (300 mm)			
Maximum height (additional riser added)	120 ½" (3,06 m)			
Tank width (C)	91 ½" (2,33 m)			
Inlet invert height (D)	76 ¾" (1,95 m)			
Outlet invert height (E)	74 ½" (1,895 m)			
Inlet pipe diameter	6" (150 mm) SDR-35			
Outlet pipe diameter	6" (150 mm) SDR-35	4" (100 mm) SDR-35	6" (150 mm) SDR-35	4" (100 mm) SDR-35
Opening diameter	24" (610 mm)			
Number of openings	4	2	5	2
Weight of empty tank[1]	3 825 lb (1 735 kg)	1 843 lb (836 kg)	4 768 lb (2 163 kg)	2 533 lb (1 149 kg)
Tank material	Medium density polyethylene (MDPE)			

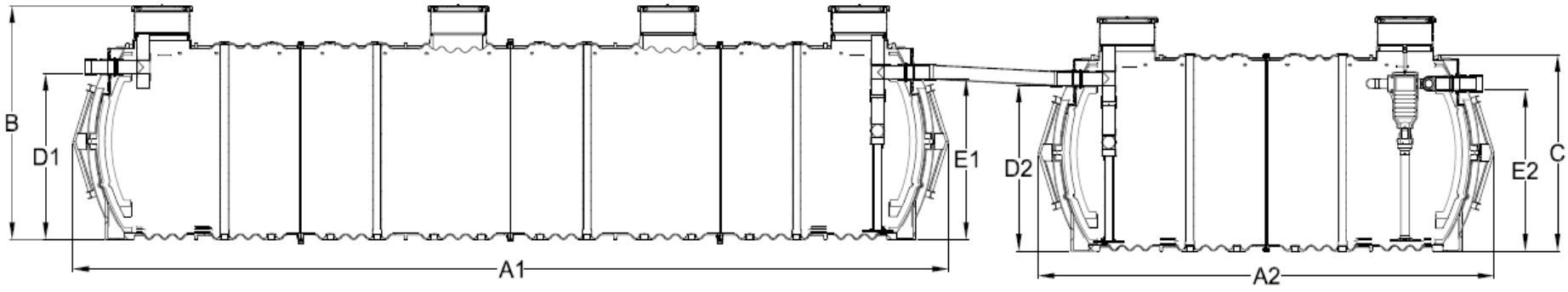


Figure 2 - Septic tank (PST-6000 and PST-7500) and its dimensions

2 Internal components

A. Septic tank affluent
B. Tank reinforcement
C. Polyethylene tank
D. Polyethylene lids
E. Polyethylene risers
F. Wall
G. Prefilter PL-525
H. Septic tank effluent

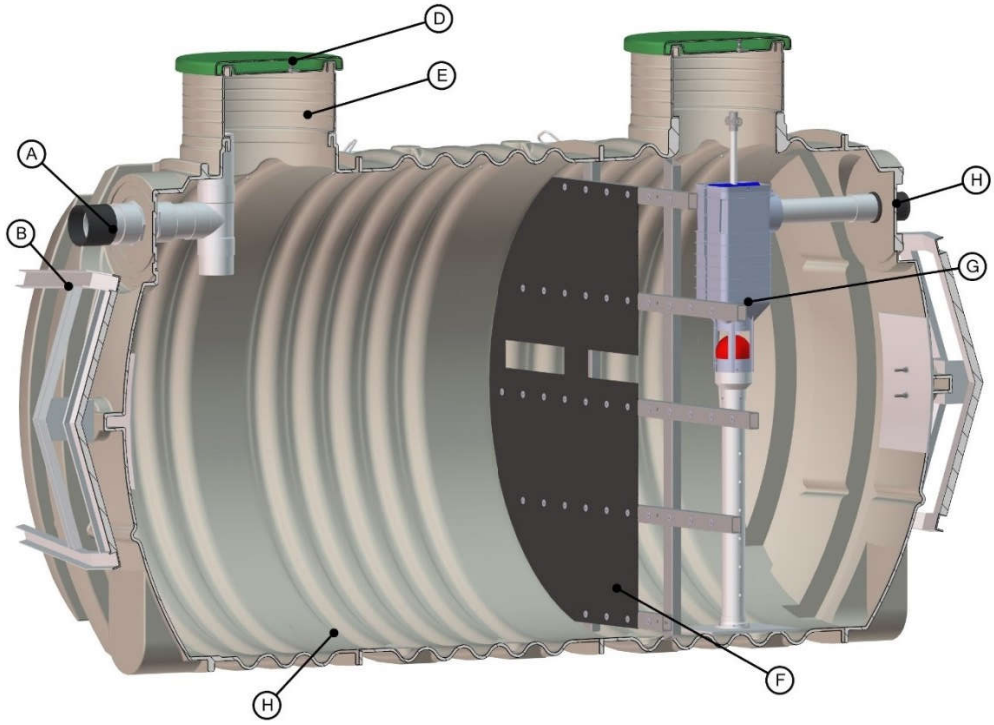


Figure 3 - Internal components of the septic tank (PST-1500 as an example)

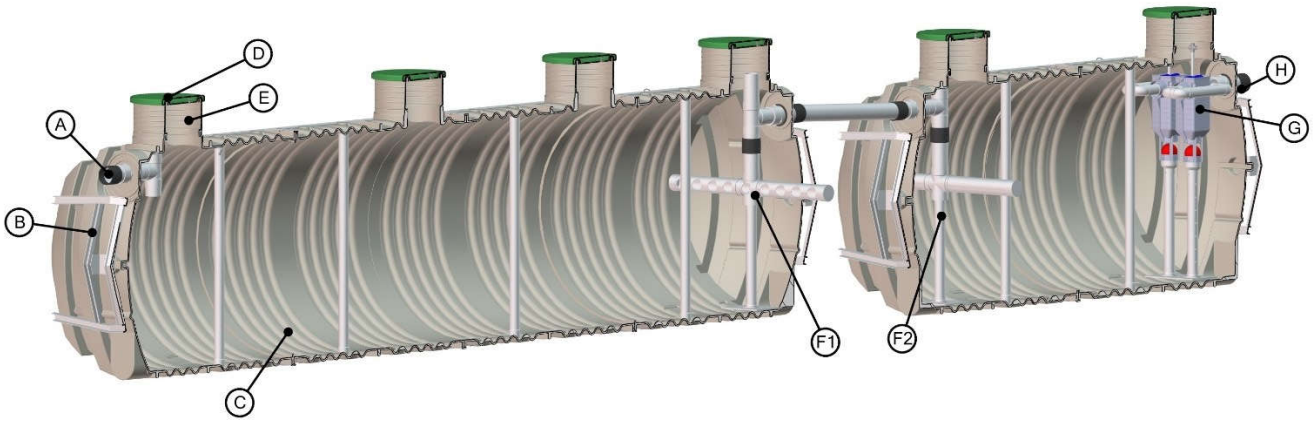


Figure 4 - Internal components of the septic tank (PST-6000 as an example)

Pumping station

Technical Data Sheet

*This is the technical data sheet of the polyethylene **pumping stations** from **Premier Tech Aqua**. If you have any questions or comments, please contact the customer service at **1 800 632-6356** or visit our website at **PREMIERTECHAQUA.COM.***

1 Specifications

1.1 PSA-660 to PSA-2500 tanks

Specifications	PSA-390	PSA-660	PSA-1000	PSA-1500	PSA-2000	PSA-2500
Nominal capacity	1 000 gal US (3.9 m^3)	1 760 gal US (6.65 m^3)	2 650 gal US (10 m^3)	4 000 gal US (15 m^3)	5 200 USgal (20 m^3)	6 600 USgal (25 m^3)
Effective capacity	900 gal US (3.45 m^3)	1 550 gal US (5.9 m^3)	2 500 gal US (9.6 m^3)	3 800 gal US (14.4 m^3)	4 850 gal US (18.4 m^3)	5 750 gal US (21.8 m^3)
Tank length (A)	128" (3,20 m)	155" (3,93 m)	3,54 m (139")	190" (4,29 m)	222" (5,63 m)	273" (6,93 m)
Tank height (B)	68" (1,72 m)	84" (2,13 m)	108 ½" (2,76 m), including one riser of 12" (300 mm)			
Maximum height (additional riser)	88" (2,23 m)	104" (2,64 m)	120 ½" (3,06 m)			
Tank width (C)	49" (1,24 m)	49" (1,33 m)	91 ½" (2,33 m)			
Inlet invert height (D)	42" (1,08 m)	57" (1,45 m)	76 ¾" (1,95 m)			
Outlet invert height (E)	43" (1,09 m)	55" (1,40 m)	76 ¾" (1,95 m)			
Inlet pipe diameter	4" (100 mm) SDR-35					
Outlet pipe diameter	2" (50 mm) PVC SC80					
Opening diameter	24" (610 mm)					
Number of openings	2					
Weight of empty tank[1]	463 lb (210 kg)	772 lb (350 kg)	1 433 lb (650 kg)	1 620 lb (735 kg)	1 843 lb (836 kg)	2 533 lb (1 149 kg)
Tank material	Medium density polyethylene (MDPE)					
Feeding pumps	2 X 0,5 HP					
Level floats	3 X 30MANCPNO MILLIAMP					
PHOSPHORUS REMOVAL OPTION (FOR EQUALIZATION TANK)						
Recirculating pump	1 X 0.5 hp					

1. Weights indicated are approximate and not binding. For handling and lifting purposes only.

1.2 PSA-3000 to PSA-5000 tanks

Caractéristiques	PSA-3000	PSA-3500	PSA-4000	PSA-4500	PSA-5000
Nominal capacity	7 900 USgal (30 m³)	9 250 USgal (35 m³)	10 600 USgal (40 m³)	11 900 USgal (45 m³)	13 200 USgal (50 m³)
Effective capacity	7 000 gal US (26.5 m³)	8 200 gal US (31.1 m³)	9 400 gal US (35.7 m³)	10 650 gal US (40.3 m³)	11 850 gal US (44.9 m³)
Tank length (A)	324" (8,22 m)	375" (9,52 m)	426" (10,81 m)	477" (12,11 m)	528" (13,41 m)
Tank height (B)	108 ½" (2,76 m), including one riser of 12" (300 mm)				
Maximum height (additional riser added)	120 ½" (3,06 m)				
Tank width (C)	91 ½" (2,33 m)				
Inlet invert height (D)	76 ¾" (1,95 m)				
Outlet invert height (E)	76 ¾" (1,95 m)				
Inlet pipe diameter	4" (100 mm) SDR-35				
Outlet pipe diameter	2" (50 mm) PVC SC80				
Opening diameter	24" (610 mm)				
Number of openings	3		4		5
Weight of empty tank[1]	2 881 lb (1 307 kg)	3 474 lb (1 576 kg)	3 825 lb (1 735 kg)	4 418 lb (2 004 kg)	4 768 lb (2 163 kg)
Tank material	Medium density polyethylene (MDPE)				

1. Weights indicated are approximate and not binding. For handling and lifting purposes only.

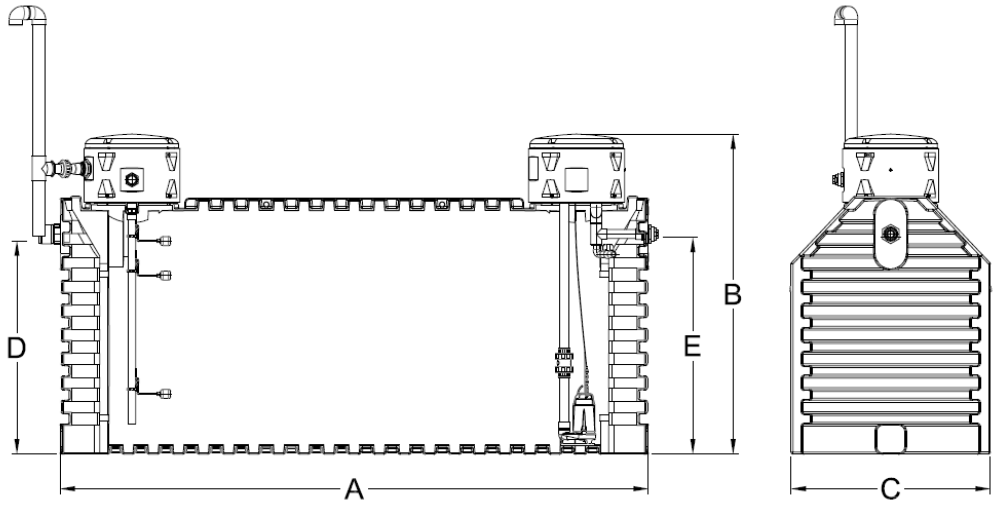


Figure 1 - Pumping station (PSA-390 and PSA-660) and its dimensions

2 Internal components

A.	Pumping station affluent	G.	Drain valve
B.	Vent	H.	Outlet pipe
C.	Float tree	I.	Control valve
D.	Check valve	J.	Level float
E.	Pump	K.	Polyethylene lids
F.	Polyethylene tank	L.	Polyethylene risers PSR-140

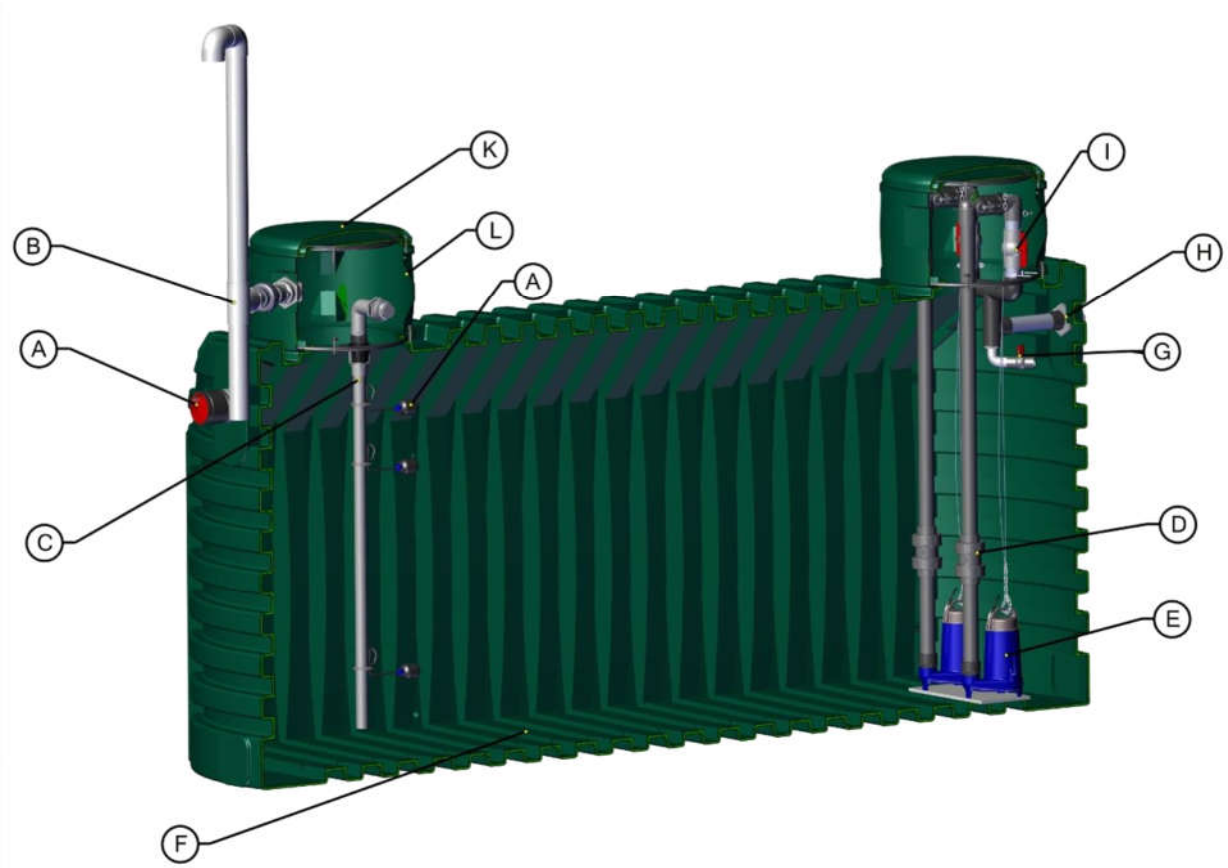


Figure 2 - Internal components of pumping station

3 Internal components function

3.1 Drain valve

The drain valve allows us to drain the piping between the pumping station and the equipment downstream. Usually, this valve is slighty open to allow the water drainage inside the pumping station in between each pumping event. A slight negative slop is necessary between the pumping station and the downstream equipment to ensure a complete drainage of the pipes.

3.2 Control valve

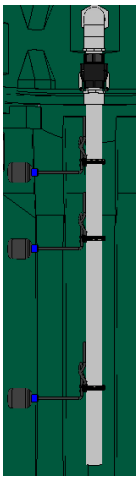
Control valves allows us to control the flow of each pumps. By reducing the valve opening, it is possible to reduce the flow to respect the specifications of the downstream equipment.

3.3 Check valve

Check valves installed on each pump piping allow us to avoid the pumps to pump one in the other as they are installed in parallel

4 Level control

Level control inside the tank is achieve by three* (3) level float. Regarding the position of each of the float, pumps stop, start based on a predetermined sequence or start in override.



Float	Function
#3 (Top)	This float activates the override mode and the high level alarm. If this float is activated (high position), the pump will work at all times and the high-level alarm (noise and light) will be activated up until when the float is desactivated (low position). The alarm needs to be desativated by the owner at the control panel.
#2 (Middle)	This float activates the predetermined sequence of the pumps. When the float is activated (high position), the pumps are in the sequence mode, using the data entered to the control panel. When the float is desativated, no action is taken by the control panel.
#1 (Bottom)	This float stops the predetermined pumping sequence. When the float is activated (high position), no action is taken by the control panel. When the float is desactivated (low position), the pumps stop.

* It is possible to have a 4th float to control the level. In that case, the floats #1 and #2 have the same functions while float #3 is the override float and float #4 the alarm float.

Moving Bed Biofilm Reactor

Technical Data Sheet

*This is the technical data sheet of the polyethylene **Moving Bed Biolfim Reactors** from **Premier Tech Aqua**. If you have any questions or comments, please contact the customer service at **1 800 632-6356** or visit our website at **PREMIERTECHAQUA.COM.***

1 Specifications

Specifications	MBBR-660	MBBR-2000	MBBR-2500	MBBR-3000	MBBR-3500	MBBR-4000	MBBR-4500	MBBR-5000
Nominal capacity	1750 USgal (6,65 m³)	5200 USgal (20 m³)	6 600 USgal (25 m³)	7 900 USgal (30 m³)	9 250 USgal (35 m³)	10 600 USgal (40 m³)	11 900 USgal (45 m³)	13 200 USgal (50 m³)
Effective capacity	1 550 USgal (5,9 m³)	4 300 USgal (16.2 m³)	5 400 USgal (20.4 m³)	6 700 USgal (25.5 m³)	7 800 USgal (29.5 m³)	9 000 USgal (34.1 m³)	10 170 USgal (38.5 m³)	11 400 USgal (43.1 m³)
Tank height (A)	155" (3,93 m)	222" (5,63 m)	273" (6,93 m)	324" (8,22 m)	375" (9,52 m)	426" (10,81 m)	477" (12,11 m)	528" (13,41 m)
Tank length (B)	84" (2,13 m)	108 ½" (2,76 m), including one riser of 12" (300 mm)						
Maximum height (additional riser added)	104" (2.64 m)	120 ½" (3,06 m)						
Tank width (C)	52 ⅜" (1,33 m)	91 ½" (2,33 m)						
Inlet invert height (D)	57" (1,45 m)	79 $\frac{5}{8}$" (2,02 m)						
Outlet invert height (E)	55" (1,40 m)	74" (1,88 m)						
Inlet pipe diameter	4" (100 mm) SDR-35							
Outlet pipe diameter	4" (100 mm) SDR-35							
Opening diameter	24" (610 mm)							
Number of openings	2			3		4		5
Weight of empty tank[1]	772 lb (350 kg)	1 843 lb (836 kg)	2 533 lb (1 149 kg)	2 881 lb (1 307 kg)	3 474 lb (1 576 kg)	3 825 lb (1 735 kg)	4 418 lb (2 004 kg)	4 768 lb (2 163 kg)
Bulk density [2]	9.36 lb/ft³ (150 kg/m³)							
Tank material	Medium density polyethylene (MDPE)							
AirOmega (diffusors)	2 X 4' (1,22 m)	2 X 8' (2,44 m)	3 X 8' (2,44 m)	3 X 8' (2,44 m)	4 X 8' (2,44 m)	4 X 8' (2,44 m)	6 X 8' (2,44 m)	6 X 8' (2,44 m)

1. The weight indicated in the table is approximate and is not binding (for handling and lifting purposes only.
2. The media quantity inside the tank depends of the daily flow and the organic load to be treated.

1.1 Tank MBBR-660

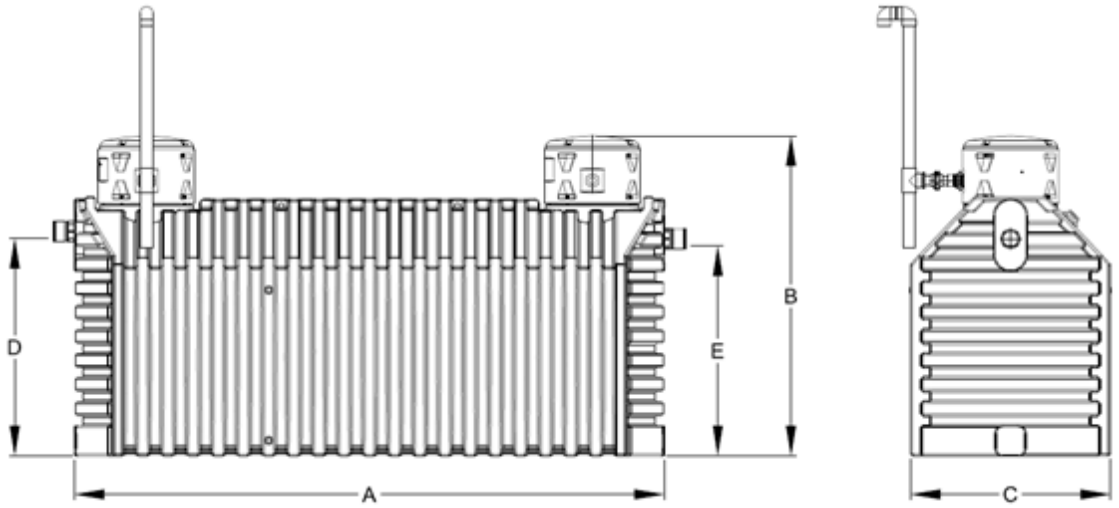


Figure 1: Tank dimensions (MBBR-660)

1.2 Large capacity tanks (2000 to 5000)

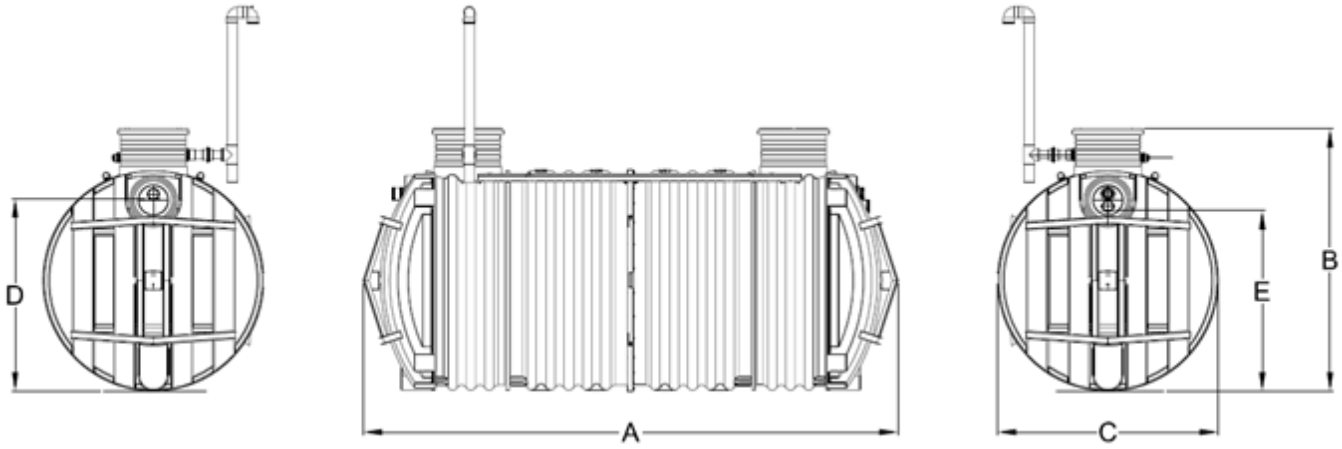


Figure 2: Large capacity tank dimensions

2 Internal components

2.1 Tank MBBR-660

A. MBBR affluent
B. Media retention screen
C. AirOmega (diffusors)
D. Vent
E. Internal air distribution pipe
F. Float tree
G. MBBR effluent
H. PSR-140 risers
I. Polyethylene lids

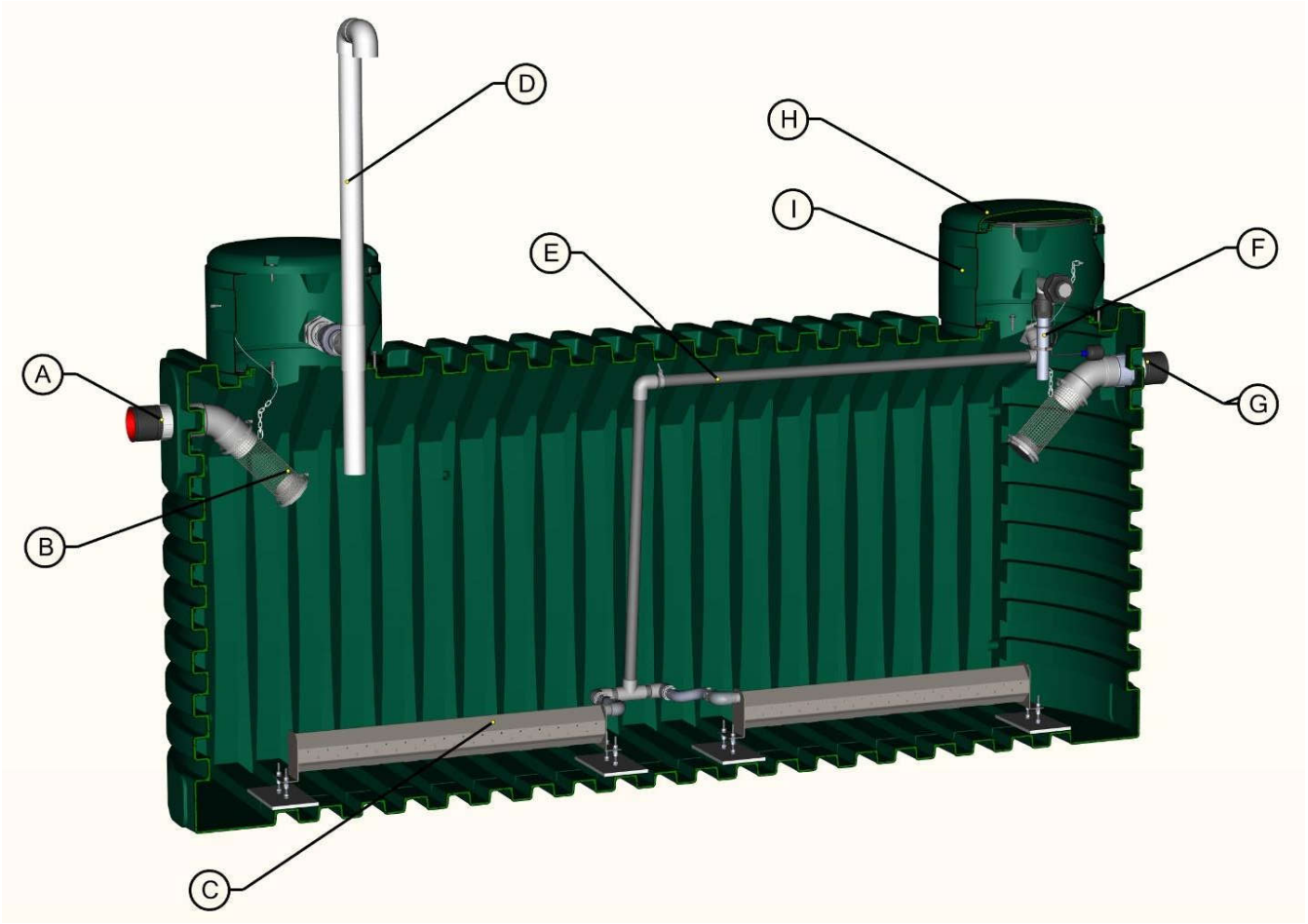


Figure 3: Internal components of the MBBR reactor

2.2 Large capacity tank (2000 to 5000)

A. MBBR affluent
B. Media retention screen
C. Tank reinforcement
D. AirOméga (diffusors)
E. Polyethylene tank
F. Vent
G. Polyethylene lids
H. 12'' (300 mm) polyethylene risers
I. Float tree
J. Internal air distribution pipe
K. MBBR effluent

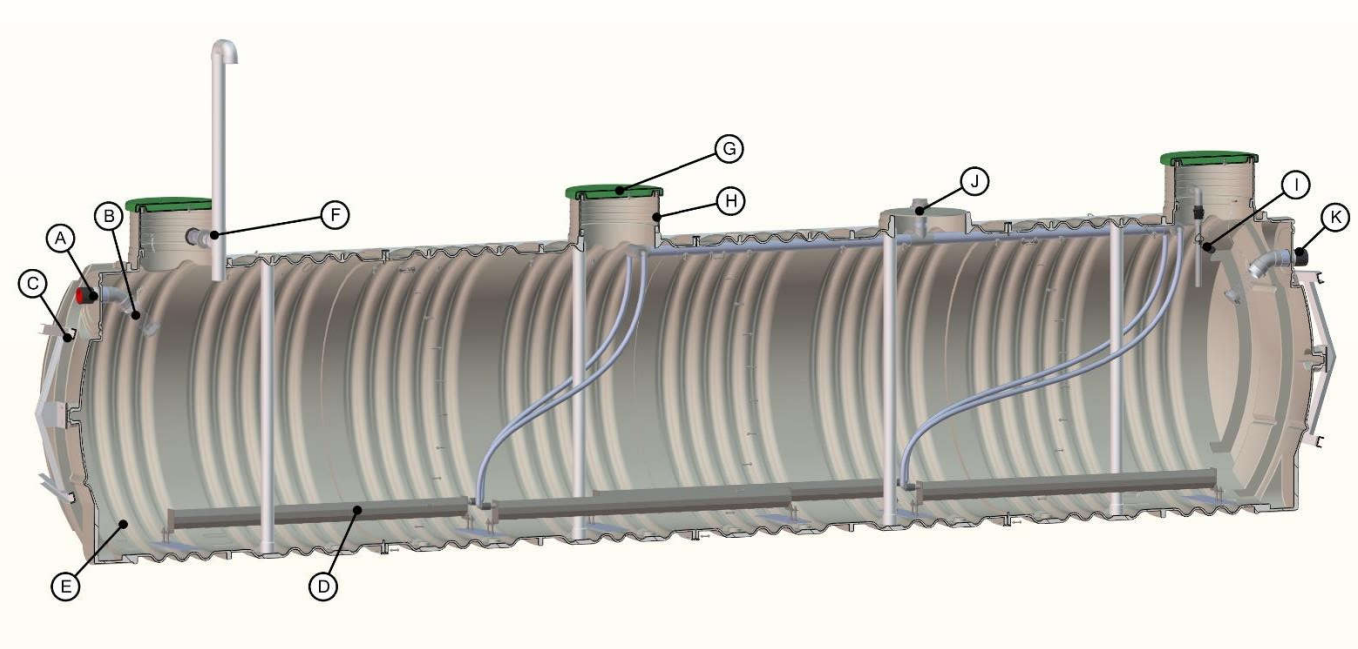


Figure 4: Internal components of the MBBR reactor (MBBR-4000 as an exemple)

3 Operation mode

The microorganisms within the MBBR use the organic matter, nitrogen and phosphorus as food, resulting in their multiplication and biofilm growth. The movement created by the aeration system inside the bioreactor allows the scouring of the media and the detachment of excessive biofilm, contributing to keep a low biofilm thickness and thus promoting high transfer rate of nutriments and oxygen into the biofilm. On the other hand, the suspended biomass and the detached biofilm are discharged from the MBBR and must be separated from the treated water to reach the required quality standard. This excess biomass is settled in the secondary clarifier located downstream of the MBBR system.

3.1 Level float

The level float inside the MBBR reactor is used to alarm the owner if the level inside the reactor is unreasonably high. When the level float is activated (high position), an alarm is activated inside the control panel and need to be deactivated by the owner.

3.2 Aeration

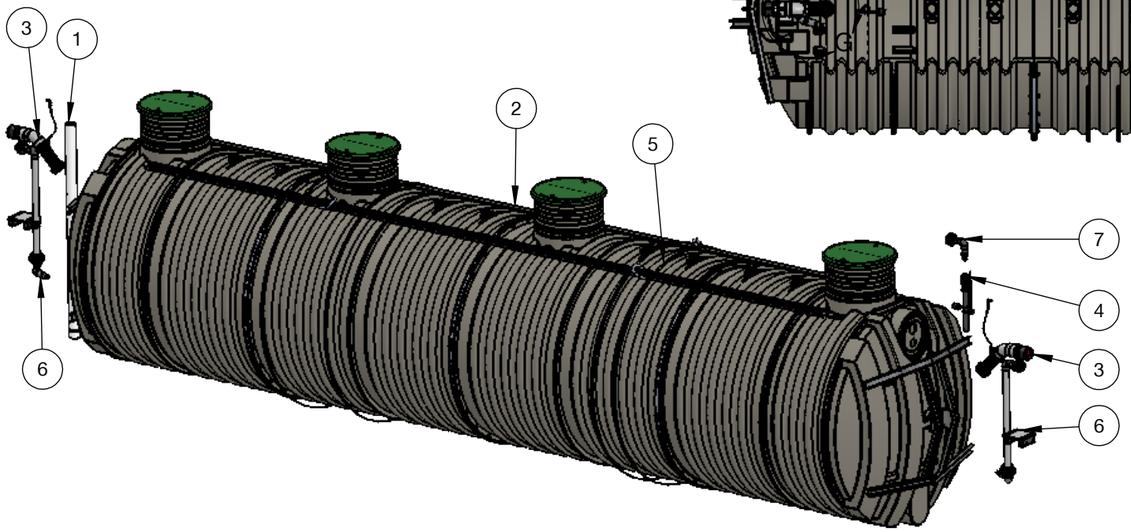
A blower installed inside a shelter blows air inside the MBBR reactor. Coarse bubbles are formed by the AirOmega, Premier Tech coarse bubble diffusors. Air is essential for the degradation of the organic load contain in the wastewater.

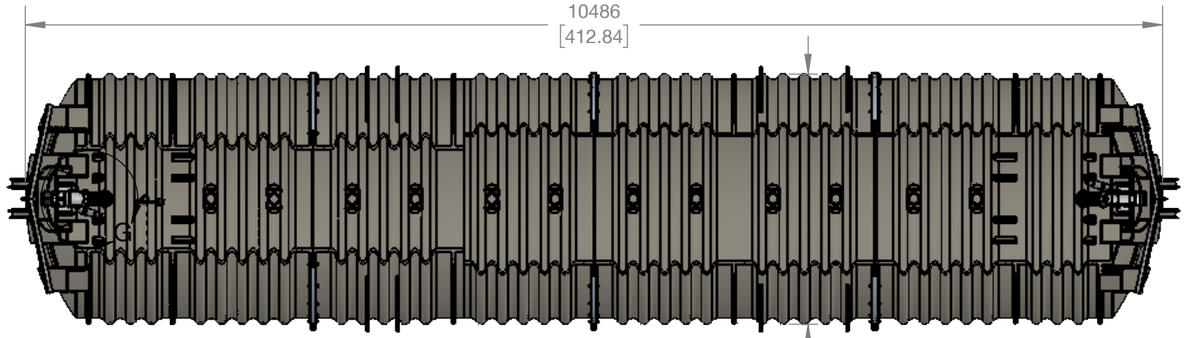
3.3 Retention media screen

Retention media screen at the inlet and the outlet of the MBBR reactor maintain the media inside the tank.

3.4 Media

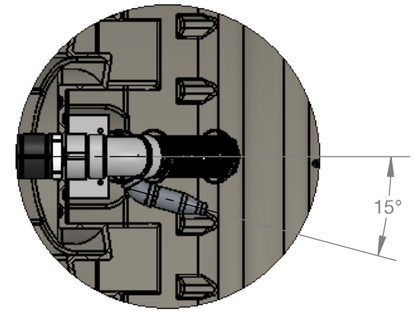
Media inside the reactor is used by the biomass to grow.



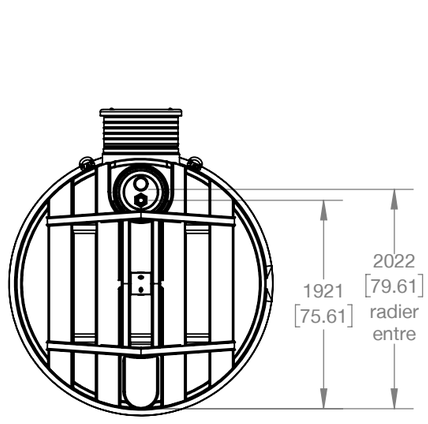


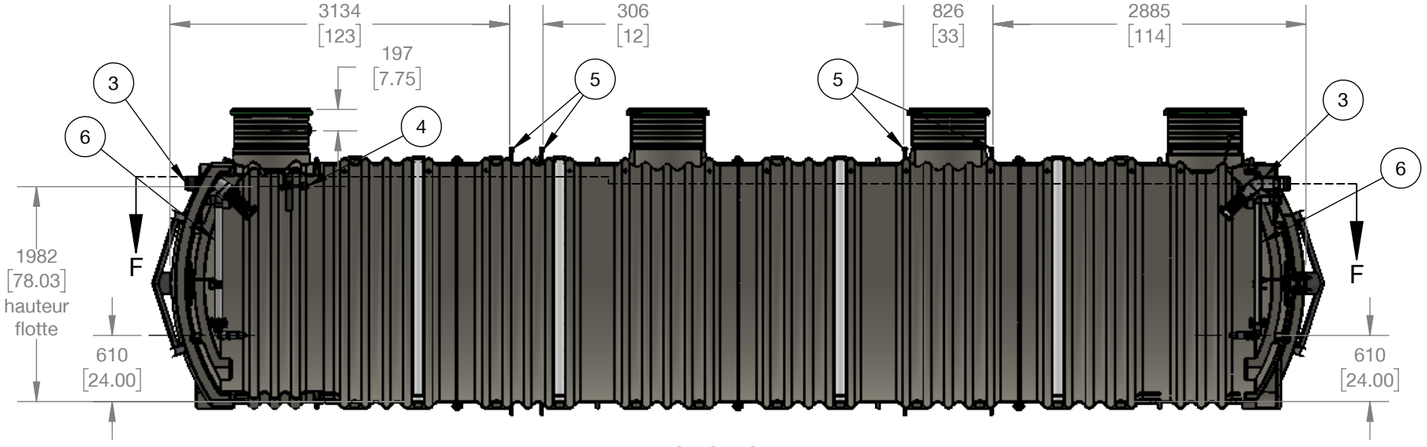
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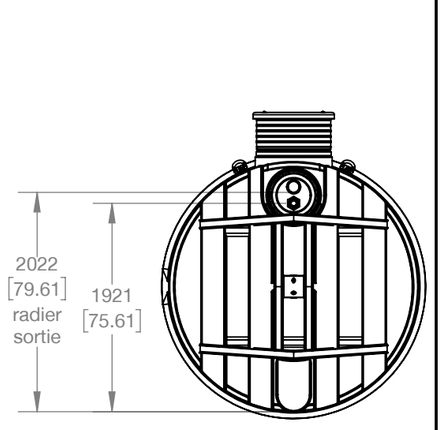
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2	200427	PLT-4000	1
3	322513-NA	GRILLE MBBR 45 DEG PVC	2
4	337644-NA	ARBRE À FLOTTES RÉACTEUR PLT	1
5	337756	SANGLE À CLIQUET	4
6	401341	ANOXIC 45 deg - 2" PST	2
7	406042	ARBRE A FLOTTE FIXE ET COMMUNE	1



DETAIL G







SECTION E-E

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REACTEUR MBBR 4000 ANOXIC

PROJET / PROJECT

STANDARD

TOLERANCE METRIQUE / IMPERIAL
X. ± 3 mm X/X ± 1/8
X.X ± 1.5 mm .X ± .060''
X.XX ± 0.5 mm .XX ± .030''
X.XXX ± 0.25 mm .XXX ± .010''

POUR FABRICATION

ÉCH. / SCALE: NTS

FORMAT / SIZE: B

POID / WEIGHT: LBS

MATÉRIEL / MATERIAL: Material <not specified>

No PROJET / PROJECT No.

REV.: 0

DESSINÉ / DRAWN: LECP2 — DATE: 2022-03-29

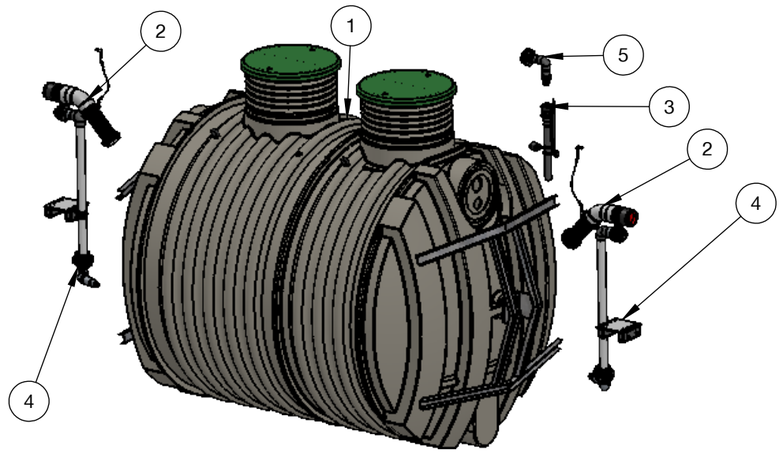
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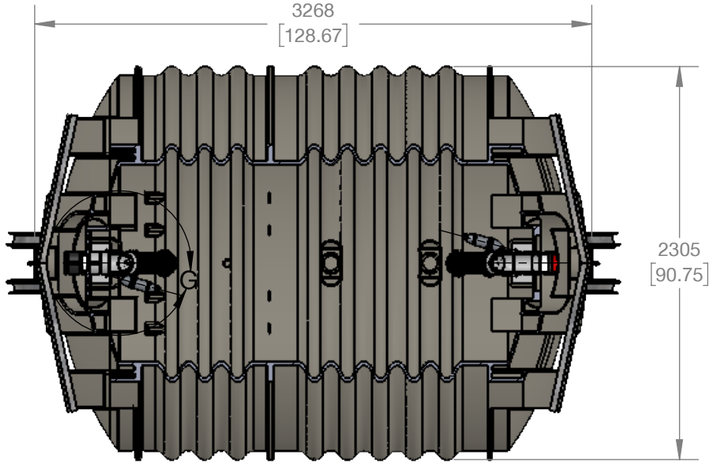
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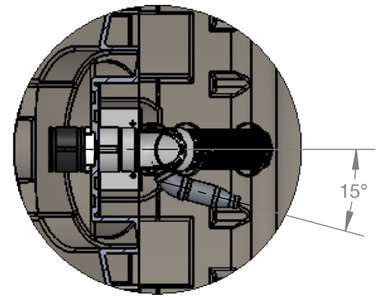
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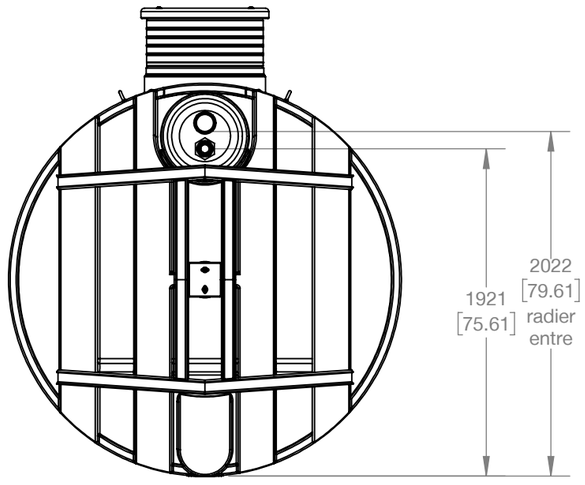


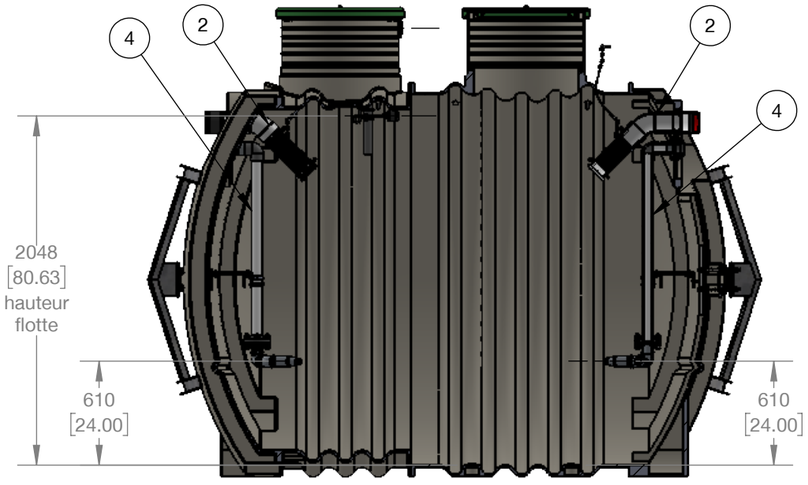
SECTION F-F

ITEM	PART NUMBER	DESCRIPTION	QTY.
1	312307	PLT-1000	1
2	322513-NA	GRILLE MBBR 45 DEG PVC	2
3	337644-NA	ARBRE À FLOTTES RÉACTEUR PLT	1
4	401341	ANOXIC 45 deg - 2" PST	2
5	406042	ARBRE A FLOTTE FIXE ET COMMUNE	1

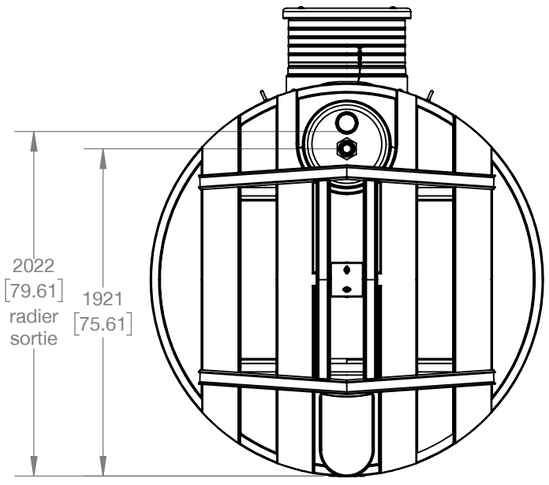


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REACTEUR MBBR 1000 ANOXIC

PROJET / PROJECT

STANDARD

TOLERANCE METRIQUE / IMPERIAL
X. ± 3 mm X/X ± 1/8
X.X ± 1.5 mm .X ± .060''
X.XX ± 0.5 mm .XX ± .030''
X.XXX ± 0.25 mm .XXX ± .010''

POID / WEIGHT 625.28 kg

DESSINÉ / DRAWN LECP2 — DATE 2022-03-29

APPROUVÉ / APPROVED - — DATE -

POUR FABRICATION

MATÉRIEL / MATERIAL <not specified>

VÉRIFIÉ/VERIFIED MEHA — DATE 2021-08-31

UNITÉS / UNITS mm (po)

ÉCH. / SCALE NTS

FORMAT / SIZE B

No PROJET / PROJECT No.

REV. 0

NUMÉRO DE DESSIN / DRAWING NUMBER 401083-NA

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Ecoprocess™ MBBR

O&M Manual

2023

PREMIER TECH

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Premier Tech Water and Environment welcomes you to have acquired an Ecoprocess™ MBBR wastewater treatment plant. By choosing this method of treatment, you are helping to protect your health and your environment.

This guide contains the necessary information concerning the operation, instructions, maintaining your Ecoprocess™ MBBR technology. For more information, do not hesitate to contact our customer service at 1 800 632-6356.

A DESCRIPTION AND FUNCTIONING OF MBBR TECHNOLOGY

This **M**oving **B**ed **B**iofilm **R**eactor (MBBR) system is designed for the treatment of wastewater. The wastewater is pumped to the treatment site. The operation of the biological system is based on a principle of filling and discharging continuously.

The MBBR system, a modification of the conventional activated sludge system, operates on the principle by which the micro-organisms present in the wastewater agglomerate on a plastic medium (media) to form a bacterial community (biofilm) which feeds soluble and particulate substrates. The substrates mainly composed of carbon, nitrogen and phosphorus, represent an energy source (food) for the biomass. The use of these substrates by the biomass results in meeting the effluent standards.

Media used is neutrally buoyant HDPE material with carbon black added for UV protection. It has a nominal density of 0.96, and measures 18 mm diameter by 14 mm thick. The specific surface of the media is 590 m² / m³ of packing.

Aeration is performed using coarse bubble Ecoprocess™ AirOmega diffusers for oxygenation of biomass and to ensure the continued suspension of media.

The media retention screens retain the carrier elements within each basin while allowing mixed liquor to pass freely. Flow out of each basin shall be distributed uniformly among the basin media retention screens. A media retention device having a mesh with openings of 10 mm maximum, ensuring minimum head loss is used.

The process does not require sludge recirculation and, consequently, it does not require controlling F / M ratio (CBOD5 / volatile suspended solids) and sludge age (SRT).

When compared with a conventional activated sludge system, the MBBR provides improved effluent quality, a greater ease of operation, a greater flexibility of process economy and a piping, equipment and civil works.

Working with a Premier Tech Water and Environment technology ensures peace of mind as your treatment process will be supported by our impressive decentralized sanitation service network.

B TREATMENT CHAIN DESCRIPTION

B.1 PRINCIPLE CHARACTERISTICS OF ECOPROCESS™ MBBR TECHNOLOGY

The MBBR system is a modification of conventional activated sludge system. It operates on the principle that the microorganisms present in the wastewater are growing on a solid support to form fixed film to feed on particulate and soluble substrates, and the media is retained in the bioreactor. The substrates mainly composed of carbon, nitrogen and phosphorus, are growth factors (food) for the biomass. The use of these substrates by the biomass eventually helps in meeting effluent standards.

A well sized reactor allows a balanced growth of the biomass, which in turn will help in maintaining good flocculating and agglomerating biomass. This will facilitate the separation of liquid / solid mixture. Otherwise, an improperly sized reactor causes a poorly settled sludge, and thereby increasing suspended solids in the effluent.

The design of the reactor is determined by mass balance that requires a complete characterization of the wastewater using its specific kinetic coefficients.

The following corresponds to the proposed treatment system:

- Primary Tank / clarifier;
- Equalization tank;
- Ecoprocess™ MBBR – Anoxic step 1;
- Ecoprocess™ MBBR – Aerobic step 1;
- Ecoprocess™ MBBR – Aerobic step 2;
- Pumping station to recirculate towards anoxic tank step 1;
- Ecoprocess™ MBBR – Anoxic step 2;
- Ecoprocess™ MBBR – Aerobic step 3;
- Pumping station to recirculate towards anoxic tank step 2;
- Secondary clarifier.

B.2 PRIMARY TREATMENT

B.2.1 OIL AND GREASE TRAP (BY CLIENT)

A grease trap must be provided upstream of the septic tank for commercial projects with high organic load wastewater (e.g. Establishment where food is prepared). The grease trap serves to retain the fats and oils that may be present in raw water before they are routed to the septic tank.

B.2.2 PRIMARY TREATMENT

A primary clarifier is installed and play the role of a fine screen as pre-filters are installed at the outlet of the primary settler. The primary clarifier helps to reduce suspended solids and part of the particulate CBOD5. Easily floating oils and fats will also be retained. It also protects the treatment system with organic load fluctuations and, to a certain extent, variations in temperature, pH and toxicity.

B.3 EQUALIZATION TANK

The equalization tank accumulates the wastewater during the daily peaks, which allows regulating the flow supplied to the Ecoprocess™ MBBR system. The volume of the basin is determined as a function of different applications. This basin is generally equipped with two submersible pumps which are controlled by the Ecoprocess™ MBBR system control panel. This basin generally include additional submersible pump for water recirculation to the primary settling tank if the primary phosphate removal is present.

B.4 MOVING BED BIOFILM REACTOR TECHNOLOGY (MBBR)

The microorganisms within the MBBR use the organic matter, nitrogen and phosphorus as food, resulting in their multiplication and biofilm growth. The movement created by the mixing/aeration system inside the bioreactor allows the scouring of the media and the detachment of excessive biofilm, contributing to keep a low biofilm thickness and thus promoting high transfer rate of nutriments and/or oxygen into the biofilm. The MBBR system is commonly used in decentralized wastewater treatment systems for their ease of operation. The Ecoprocess™ MBBR allows for nutrient (i.e. BOD and Nitrogen) removal with minimal footprint. Besides a complete oxidation of organic matter (i.e. BOD), a proposed multi-stage configuration can assure an advanced total nitrogen removal through Nitrification followed by Denitrification processes using if needed an external carbon source (i.e. MicroC™).
This post Denitrification step will allow to manage high level of nitrogen at the inlet.
To give more strength to the design a Pre-denitrification is introduced through a recirculation loop (back to Anoxic Tank – Step1) that will further reduce Nitrate concentrations using incoming organic matter. This will result in significant saving on operating cost associated with carbon source usage during post denitrification and operating cost associated with energy consumption used for oxidation of BOD.

Anoxic – Step 1: This step is equipped with media and mixing jets. It is designed to reduce Nitrates produced from the aerobic Step 2 recirculation loop. It is assumed the ratio in Total $CBOD_5$:N is lower than 6, in which case additional carbon source is required in this step.
Nitrate probe in anoxic tank helps to regulate the external carbon source dosing (MicroC).
Aerobic – Step 1: This step is equipped with media and coarse bubble air diffusers. It is designed to remove soluble BOD_5. It is possible to combine Aerobic - Step 1 in the same tank as Aerobic - Step 2, in which case a baffle wall is installed between the 2 steps. For this project, 2 separate tanks were used.

Aerobic – Step 2: This step is equipped with media and coarse bubble air diffusers. It is designed to oxidize Ammonia Nitrogen (i.e. Nitrification) into nitrite/nitrate. After this step, a certain amount of water is recirculated back to the Anoxic – Step 1 tank via a pumping station installed between Aerobic – Step 2 and Anoxic – Step 2. The design considers a 3Q recirculation rate for a 78% TN removal.
Anoxic – Step 2: This step is equipped with mixing jets and designed to reduce Nitrates formed in the previous step (due to nitrification) using an additional carbon source. This step is added in order to remove the high concentration of nitrogen from the incoming wastewater.
Nitrate probe in anoxic tank helps to regulate the external carbon source dosing (MicroC).
Aerobic – Step 3: This step will be executed by the EcoProcess™ MBBR and is used mainly to oxidize excess BOD_5, finalize the nitrification process and ensure a stability of the treatment process effluent. After this step, a certain amount of water is recirculated back to the Anoxic – Step 2 tank via a pumping station installed between Aerobic – Step 3 and Secondary Clarifier.

B.5 SECONDARY CLARIFIER

A clarifier is installed downstream of the Aerobic MBBR – Step 3 to remove the particles from the treated water. Because the aeration system is also used to promote movement inside the bioreactor, the MBBR effluent is highly oxygenated resulting in non-negligible quantity of particles carried to the water surface of the clarifier by oxygen microbubbles. Baffles inside the clarifier help concentrate the scum at the surface whereas a skimmer device collects the scum periodically and return it into the primary treatment. Residual sludge settles at the bottom of the clarifier. A sludge collecting device, installed at the bottom of the clarifier and mainly composed of perforated pipes connected to a pump, collects the sludge periodically and return it into the primary treatment.

Skimmer and sludge collecting pumps are efficiently controlled by floats and timers. Operating time and frequency are adjusted based on the specifications of the project.

C DETAILLED DESCRIPTION OF ELECTRO-MECHANICAL COMPONENTS

C.1 PRE-FILTER

- Polylok PL-525 - Hold suspended solids of dimension greater than the openings of the filter

C.2 EQUALIZATION TANK PUMPS

- Two (2) submersible pumps of 0.5 HP (4.3 A @ 230 V) to be installed in the equalization tank to feed the treatment system;
- Three (3) level detection floats with tree installed in the equalization tank;
- They are controlled by the Ecoprocess™ MBBR system control panel.

C.3 MBBR – ANOXIC STEP-1

- One (1) polyethylene tank model MBBR-4000/Anoxic (effective volume of ± 9750 US gallons);
- 353 ft³ of HDPE MBBR media;
- Two (2) media retention screens (inlet /outlet);
- One (1) level detection floats with tree;
- Mixing jet system installed inside the tank;
- One (1) Nitrate probe for denitrification step, c/w support.

C.4 MBBR – AEROBIC STEP-1

- One (1) polyethylene tank model MBBR-2000/Aerobic (effective volume of ± 4275 US gallons);
- 282 ft³ of HDPE MBBR media;
- Two (2) media retention screens (inlet / outlet);
- One (1) level detection float with tree;
- Coarse bubble diffusers with internal tank piping;

C.5 MBBR – AEROBIC STEP-2

- One (1) polyethylene tank model MBBR-2000/Aerobic (effective volume of ± 4275 US gallons);
- 282 ft³ of HDPE MBBR media;
- Two (2) media retention screens (inlet / outlet);
- One (1) level detection float with tree;
- Coarse bubble diffusers with internal tank piping;

- One (1) pH probe for pH control.

C.6 PUMPING STATION (RECIRCULATION-1)

- One (1) polyethylene tank model PSA-660 modified (effective volume of ± 1500 US gallons);
- Two (2) submersible pumps of 0.5 HP (4.3 A @ 230 V) for mixing of Anoxic – Step 1 and to recirculate part of the effluent of Aerobic – Step 2 back to the Anoxic – Step 1;
- One (1) submersible pump of 0.5 HP (4.3 A @ 230 V) is to pump the liquid to mechanical shelter for chemical addition and contents are sent back.
- One (1) level detection float with tree.
- Coarse bubble diffusers with internal tank piping.

C.7 MBBR – ANOXIC STEP-2

- One (1) polyethylene tank model MBBR-1000/Anoxic (effective volume of ± 2450 US gallons);
- 105 ft³ of HDPE MBBR media;
- Two (2) media retention screens (inlet and outlet);
- One (1) level detection float with tree;
- One (1) mixing jet installed inside the tank;
- One (1) Nitrate probe for denitrification step, c/w support.

C.8 MBBR – AEROBIC STEP-3

- One (1) polyethylene tank model MBBR-660/Aerobic (effective volume of 1,550 US gallons);
- 70 ft³ of HDPE MBBR media;
- Two (2) media retention screens (inlet and outlet);
- One (1) level detection float with tree;
- Coarse bubble diffusers with internal tank piping;

C.9 PUMPING STATION (RECIRCULATION-2)

- One (1) polyethylene tank model PSA-660 modified (effective volume of ± 1500 US gallons);
- Two (2) submersible pumps of 0.5 HP (4.3 A @ 230 V) for mixing of Anoxic – Step 2 and to recirculate part of the effluent of Aerobic – Step 3 back to the Anoxic – Step 2;
- One (1) submersible pump of 0.5 HP (4.3 A @ 230 V) is to pump the liquid to mechanical shelter for chemical addition and contents are sent back.
- One (1) level detection float with tree.
- Coarse bubble diffusers with internal tank piping.

C.10 SECONDARY CLARIFIER

- One (1) polyethylene tank model DEC-3000 (effective surface area of 109 ft²);
- One (1) submersible pump of 0.5 HP (4.3 A @ 230 V) for sludge removal;
- One (1) submersible pump of 0.5 HP (4.3 A @ 230 V) for scum removal;
- One (1) level detection float with tree;

C.11 ECOPROCESS™ MBBR MEDIA

MBBR Media	
Type of material	High density polyethylene (HDPE)
Density	0.96
Specific surface area	590 m²/m³
Media fill rate	35 à 70 %
Type of aeration	Ecoprocess™ Air Omega coarse bubble

C.12 ANOXIC TANKS MIXING

- Equipped with mixing jet using submersible pumps installed in recirculation tanks.

C.13 MECHANICAL SHELTER

- One (1) blower, model FPZ K05-MS (3HP, 16 A @ 230 V) to be installed inside a heated mechanical room/shelter (mechanical room/shelter to be supplied and sited by others).
- Two (2) blowers, model FPZ K04-MS (2HP, 12 A @ 230 V) to be installed inside a heated mechanical room/shelter (mechanical room/shelter to be supplied and sited by others).

C.14 DENITRIFICATION EQUIPMENT

- Nitrate probe controls the carbon addition
- A dosing pump provides external carbon source to the biomass to improve nitrogen removal

C.15 ALKALINITY DOSING

- pH probe controls the alkalinity addition
- A dosing pump to dose alkalinity source to control pH.

C.16 CONTROL PANEL

- Enables automatic pump control, adjustment of dosing cycles and alarm management.
- Pump operating time totalizer.
- Selecting the mode of operation of the pumps (Manual / Stop / Auto).
- Visual alarm.

D INSTALLATION

D.1 GENERAL HANDLING RULES

- Engineering practices and safe work practices must be observed at all times, especially when handling the equipment during installation and start-up.
- All codes (local, provincial, national) must be observed and followed.
- Upon receipt of the equipment on site, the contractor must be particularly careful not to damage the equipment.
- All civil engineering structures and mechanical engineering should be carefully inspected to ensure their compatibility with equipment installed.
- Any anchorage must be set up as required on assembly drawings. Good alignments and elevations must be obtained. Anchor bolts should hold the pieces in place and not force them into position.
- All movable parts must be free to rotate such as pumps, blowers.
- Communication / control cables must be kept away from power cables. Connections, terminals, junction boxes must meet the standards and cable sizes used help to minimize voltage loss. Consult a qualified electrician if necessary.
- The lifting system on all equipment, prefabricated mechanical room and tank must be appropriately designed and should properly distribute the load equally on all available lifting points.

E SYSTEM START-UP

E.1 BEFORE SYSTEM START-UP

To avoid personal injury and damage to the treatment system, the following instructions must be observed at the time of start-up of Ecoprocess™ MBBR treatment process:

- Before start-up, check that the tools and other unnecessary items were removed from the site;
- Tanks must be free of debris and trash;
- Check all connections between each of the basins and associated equipment (pumps, blowers, driving the effluent discharge, electrical connections, control floats, etc.);
- Follow all safety rules listed in this manual.

The person responsible for the start-up of Ecoprocess™ MBBR system shall, prior to any intervention, be familiar with the following:

- The operating principle of the Ecoprocess™ MBBR system treatment process;
- Control and operating parameters of Ecoprocess™ MBBR treatment process;
- All equipment of the Ecoprocess™ MBBR treatment process;
- The safety precautions associated with Ecoprocess™ MBBR treatment process;
- What to do in case of an emergency?

The operation of a Ecoprocess™ MBBR treatment system must be done only in optimal conditions. It is the responsibility of the person completing the start-up that all unit processes in chain of treatment has been inspected and that each defect noted during the inspection has been corrected or reported to a member of Premier Tech Water and Environment customer service.

E.2 DRY TESTS

A) Cleaning of all tanks (does not apply to pre-assembled units)

- Ensure that no particles of more than 2mm are present in the tank at the time of filling. Use a shop vacuum if required.

B) Turning control panel in ON position

- Measure the voltage directly on the panel to make sure it is within the operating range.
- Ensure that no equipment will start automatically when power the panel.
- Start the control panel power.
- Put all the equipment through the interface to MANUAL before triggering the emergency stop.

C) Adjustment and functioning of floats

- Adjust each of the floats of the equalization basin at the prescribed height.
- Switch manually each float and check the status change in the control panel.

E.3 TESTING WITH CLEAR WATER

Inspection of the coarse bubble diffusers and blower operation - Note that these tests are required when the installation is completed on site and must be made prior to the addition of the MBBR media.

- Fill the bioreactor with service water approximately fifteen (15) cm above the coarse bubble diffuser level.
- Start the blower
- Check the consistency of the bubbles in the basin.
- Check for leaks in the non-submerged pipelines.
- Stop the blower.

E.4 ADDING MBBR MEDIA IN THE REACTOR

IMPORTANT - MBBR MEDIA IS INITIALLY HYDROPHOBIC AND HAS THE PROPENSITY TO FLOAT. MBBR MEDIA REQUIRES WETTING PROCESS. THE INITIAL MEDIA FILLING PROCEDURE SHOULD BE PERFORMED WITH A PARTIALLY FILLED BASIN. THEREFORE, IT IS STRONGLY RECOMMENDED THAT THE INITIAL FILL BE PERFORMED WELL BELOW NORMAL OPERATING LEVEL, TYPICALLY 4 TO 5 FEET ABOVE DIFFUSER LEVEL. MEDIA IS TO BE ADDED SLOWLY IN THE REACTOR.
NOTE – MBBR MEDIA SHOULD NOT BE ADDED ALL AT ONCE.

E.5 TESTS WITH WASTEWATER

Tests submerged pumps

- Fill equalization tank with service water to the operation level.
- Start the pumps one by one
- Measure amperage and make sure it is under the FLA (Full load amps specified on the equipment plate)
- Calculate the flow rate of each pump.

IMPORTANT – PREVENT DRY RUNNING OF PUMPS.

E.6 SEEDING OF ECOPROCESS™ MBBR SYSTEM

The addition of commercial organic seed products (organic growth), in liquid or solid form, may also be required for the development of active biomass and accelerate the process of biomass development. Biological biofilm begins to form after 2-3 weeks of operation.

E.6.1 STARTING THE TREATMENT SYSTEM

Put all equipment in automatic mode. In the event that the primary treatment and the equalization tank are not filled with wastewater, the Ecoprocess™ MBBR system will simply wait till the tanks are filled up with wastewater.

Please fill in the logbook of the Ecoprocess™ MBBR treatment process that it meets all operation parameters.

F TREATMENT SYSTEM

F.1 INTRODUCTION

The process of the wastewater treatment system Ecoprocess™ MBBR is fully managed by a control panel. It also contains the components for switching on and off of Ecoprocess™ MBBR system treatment chain equipment, namely:

- Ecoprocess™ MBBR feed pumps (if required);
- MicroC dosing pumps for nitrogen removal;
- Alkalinity dosing pumps for pH control;

F.2 ECOPROCESS™ MBBR SUPPLY AND MANAGEMENT SYSTEM

The water in the equalization tank is sent to the EcoProcess™ MBBR treatment unit using submersible feed pumps. The programmable controller activates the pump cycle to distribute the flow over a maximum amount of time, thereby reducing the number of hydraulic and organic surges that might occur during the day.

Figure 1 shows schematically the positioning of the various floats in the equalization tank of the Ecoprocess™ MBBR treatment process.

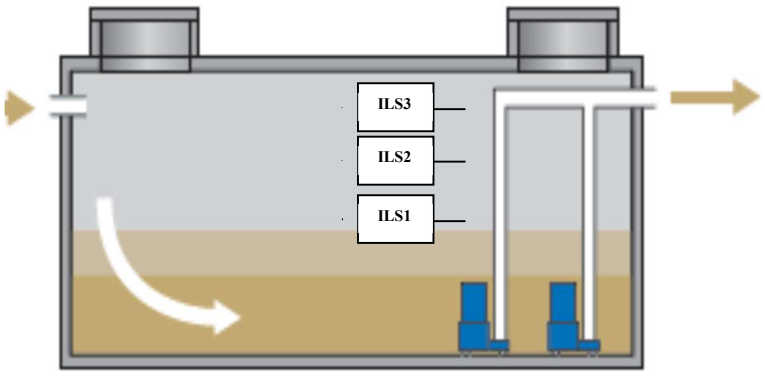


Figure 1

The setting selected on the manual/off/automatic selector influences the pump's operating mode as follows:

Mode selector set to *automatic*:

Case 1: liquid located under the normal cycle float (cycle 1)
The pump(s) are on standby.

Case 2: liquid activates the normal cycle float (cycle 1)
The normal pumping cycle is activated. As such, a cyclic pump and stop sequence takes place over a 20 to 24-hour period, assuming 100% of the design flow.

Case 3: liquid activates the high-level float (cycle 2)
An accelerated pumping cycle is activated. This cycle operates in the same way as the regular cycle, but for different operating time periods.

Case 4: liquid activates the override float
The two pumping cycles are short circuited. In such a case, pumping is continuous alternating among the different pumps, until the level of the liquid in the equalization tank is below the override float. At this level, the alarm is activated.

Mode selector set to *manual*:

The selected pump operates continuously regardless of the level of the liquid in the equalization tank. The pump/stop sequence is short circuited.

IMPORTANT – PREVENT DRY RUNNING OF PUMPS.

In all cases, when a pump is operating:

- The pump's motor contactor is activated;
- If the pump is overloaded, a message in displayed on the operator interface.

Mode selector set to *off* (*stop*:)

At this setting, there is no power to motor of the pump. The human machine interface indicates that the feed pumps are stopped.

F.3 HUMAN MACHINE INTERFACE

The human machine interface (HMI) allows you to view and modify the operating parameters of electromechanical components of the treatment system. The interface screen also displays the alarms. When an alarm is displayed on the interface screen, make sure to add a note in the log book and contact Premier Tech Water and Environment staff. To cancel the message of the alarm, press the "Reset" button.

WARNING - IT IS HIGHLY RECOMMENDED THAT YOU CONTACT A PREMIER TECH WATER AND ENVIRONMENT REPRESENTATIVE BEFORE MAKING ANY CHANGES TO THE PROGRAMMING OR THE CONTROL INSTRUCTIONS.

G BIOLOGICAL PROCESS CONTROL

G.1 BIOLOGICAL OPERATION PARAMETERS

A. Dissolved oxygen level in the MBBR during aeration

- To prevent the proliferation of filamentous bacteria, the concentration of dissolved oxygen in the aeration periods should be adjusted by increasing the amount of air. The minimum concentration of dissolved oxygen in the reactor should be 4 mg/L.
- During the initial weeks of operation it is recommended to operate at DO levels around 4 mg/l. This will facilitate the biological acclimation period. After sufficient time has passed, the DO may be lowered to 2-3 mg/l so long as the system continues to show carbonaceous oxidation. The DO should be measured both at the influent and effluent of the basin.

B. Nutrient deficiency

- During the synthesis of the cells, an ammonia or phosphorus deficiency promotes the growth of filamentous organisms. The situation can be corrected by adding nitrogen and / or phosphorus to obtain a mass ratio of BOD5 / N / P 100/5/1.

C. pH Changes

- The pH will vary significantly if acidic or basic wastewater is released into the system, or if all the alkalinity of the influent is consumed during the nitrification reaction. A change in the color of the contents of MBBR or a fungal growth is indicators of pH variations. Usually, the one-time addition of acid or alkaline products in the influent will be sufficiently diluted in the reactor due to the high hydraulic retention time. However, a large spill of acidic or alkaline product would be to the detriment of MBBR process.

A residual alkalinity of 80 mg / l is necessary to prevent significant reductions in pH caused by nitrification.

If significant pH changes occur in the system on a regular basis, it may be necessary to add automatic pH control equipment.

D. Biofilm detachment: Biofilm detachment is a phenomenon caused by several factors:

- Nutrient deficiency

If nutrient availability is a problem, then the operator should add the appropriate nutrients as described above.

- thick biofilm

To reduce the clogging of media and optimize the thickness of the biofilm, the operator must ensure that aeration is adequate and meets the minimum mixing criteria.

- Excess mixing

To reduce the loss of biofilm, and to avoid detachment of biofilm, mixing must be controlled so that the collision between the media is not too high.

E. Septic Conditions

- A dark color of the MBBR content as well as an unpleasant odor characterizes a septic condition. This condition will develop if the oxygenation of the biomass is insufficient for a prolonged period of time (i.e. when the organic load is higher than the design value).
- Increase dissolved oxygen values and / or duration of aeration time (by reducing the duration of non-aerated periods to increase the aeration of the biomass).

G.2 ENVIRONMENTAL MONITORING

Some preventive measures must be taken into consideration, when sampling procedures are performed to avoid contamination. It is important to thoroughly clean and disinfect instruments used for sampling (sampler, sampling valve, bottles, etc.).

The following parameters are generally sampled:

- CBOD5
- COD
- TSS
- Total phosphorus
- Fecal coliforms
- Other parameters may be required, refer to local regulations and the standards of your own waste facility.

H SYSTEM MAINTENANCE

WARNING: Working in close contact with wastewater carries a health risk. You are advised to obtain the necessary vaccinations and always wear adequate protective gear (gloves, safety glasses, etc.) before undertaking any maintenance work on the equipment.

H.1 PERIODICAL FOLLOW-UP AND MAINTENANCE TO BE PERFORMED BY OWNER

Despite its simplicity, the EcoProcess™ MBBR treatment process must be inspected and maintained on a periodical basis. The inspection and the maintenance should be performed by a qualified person (wastewater treatment operator, technician, etc.). He has to perform different tasks. Here are what to look for and what to do during these visits:

WEEKLY CHECK

- Visual inspection of the proper functioning of electromechanical components.
- Visual and olfactory inspection of the Ecoprocess™ MBBR treatment process (Eq tank, MBBR tank).
- Record all faults and operating features.

H.2 OPERATION AND MAINTENANCE PERIODICAL FOLLOW-UP OFFERED BY PREMIER TECH WATER AND ENVIRONMENT

Premier Tech Water and Environment recommends that maintenance of Ecoprocess™ MBBR system is performed by a trained and qualified by Premier Tech Water and Environment. It conducts the inspection and maintenance of mechanical components as well as to monitor the behavior of the treatment process.

The maintenance contract is renewable annually. Monitoring and recommended maintenance include a tour of the facilities. The cost for this service varies depending on the area, the type of connected institution and its mode of operation (seasonal or annual). Here are the details the monitoring and maintenance performed by the technician during his annual visit.

Table 1 – Principle attributes of operation of Ecoprocess™ MBBR system

Activities
A- Operation of the treatment system
B- Reading of the key operating parameters
C- Visual inspection of Ecoprocess™ **MBBR** system's effluent
D- Inspection and maintenance of Ecoprocess™ **MBBR** bioreactor

E- Inspection of sludge management tanks (primary and secondary)

A. Operation of the treatment system

- Check general operating status of the treatment system
- Check the operation of pumps and disinfection unit (if present).
- Check the operation of the control panel and alarm system.
- Maintains pumps and blowers, as recommended by the manufacturer.

B. Reading key operation parameters

- Note the operating time of the various pumps and blowers.
- Record the total number of hours of operation of the electro-mechanical components.
- Record all faults and operating characteristics.

C. Ecoprocess™ MBBR system media

- Bacterial colonization on the media is a good indicator of the performance of the reactor Ecoprocess™ MBBR. A thin layer of biomass should be visible on the inner surface of the media. The thickness of this layer may vary according to the loads, temperature or other. See Figure 2 below:

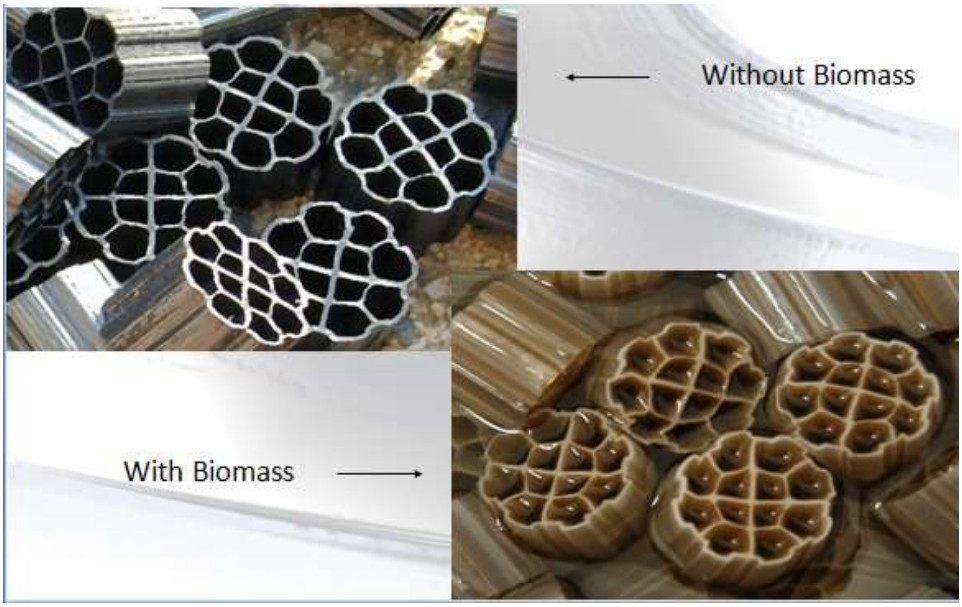


Figure 2 – Photo showing biofilm formation on media

D. Inspection and Maintenance Ecoprocess™ MBBR

- Measure the dissolved oxygen concentration in the bioreactor.
- Check the feed rates of Ecoprocess™ MBBR system.
- Check the operation of the dosing pumps when present (chemical coagulant for phosphorus removal)
- Check the operation of the fans and the homogeneity of the mixture

- Check the operation of the skimmer and pump sludge from the settler. Ensure that there is no significant accumulation of scum and sludge in the secondary clarifier of MBBR

E. Inspection of primary treatment

- If the primary treatment is a septic tank, measure the height of sludge and scum and haul away, if required.

H.3 ENVIRONMENTAL MONITORING

To validate the performance of your treatment system, it may be essential to take a sample for analysis of physical and chemical parameters.

In addition, for all types of sanitation sector developed for community facilities, commercial and institutional, local authorities may require environmental monitoring of the treatment process.

Premier Tech Water and Environment provides technical services to carry out this monitoring program and, therefore, will provide on request a very competitive bid with the costs related to visits, sampling and analysis.

I TROUBLESHOOTING

***IMPORTANT*: Certain tasks must be executed by an electrician or a specialized technician.**

I.1 HIGH LEVEL ALARM – EQUALIZATION TANK

Turn the power off at the pumps. Minimize water consumption during the duration of the problem.

Possible causes	Explanations and repairs
High level:	• Reset electrical disconnect switch of pump, if necessary. • Reset overload relay of pump, if necessary. • Check pump's manual operation. • Check whether the level floats are obstructed in the equalization tank. • Check the operation of the level floats in the equalization tank. • Check whether water flows through the static mixer when pump is activated. • Undertake any necessary repairs or replacements.
Water infiltrates through the treatment system:	• Inspect the whole treatment system and check whether unwanted water infiltrates through the system. • Rectify the situation if required.
The real flow is greater than the design flow:	• Reconsider Ecoprocess™ MBR treatment system's design.

I.2 PROBLEM: ECOPROCESS™ MBBR SYSTEM FEED PUMPS

Turn the power off at the pumps. Minimize water consumption during the duration of the problem.

Possible causes	Explanations and repairs
Faulty pump:	• Identify the faulty pump by reading the error message on the operator interface. • Reset the faulty pump's electrical disconnect switch, if necessary. • Reset the faulty pump's overload relay, if necessary. • Check pump's manual operation. • If the problem persists, undertake any necessary verifications, repairs or replacements.
Clogged adjustment valve:	• Make sure the water circulates freely through the valve when it is in the open position. • Make sure the water circulates freely through the static mixer.

	• If the valve seems to be clogged, clean it with the appropriate material.

I.3 PROBLEM: ANOXIC TANK MIXING

Turn the power off at the pumps (recirculation tank pumps).

Possible causes	Explanations and repairs
Faulty pump:	• Identify the faulty pump by reading the error message on the operator interface. • Reset the faulty pump's electrical disconnect switch, if necessary. • Reset the faulty pump's overload relay, if necessary. • Check pump's manual operation. • If the problem persists, undertake any necessary verifications, repairs or replacements.

I.4 PROBLEM : THE TREATMENT CHAIN IS NOT FUNCTIONING EVEN IF THE MAIN SWITCH IS « ON »

Possible causes	Explanations and repairs
Electrical wiring, wrong phases:	• Check the different phases with a voltmeter. • Reset the main disconnect switch or replace the blown fuses.
Incorrect electrical wiring:	• Check whether the electrical wiring concords with the wiring diagrams.
Faulty electrical control unit:	• Check the voltage before and after the main disconnect switch in concordance with the wiring diagrams.
System in manual mode:	• Check whether all the components are in «AUTO» mode.
Float problem in the equalization tank:	• Check whether the equalization tank's low level float is visually activated (on control panel and in the tank). Check the electrical wiring if necessary.

I.5 PROBLEM : HIGH LEVEL IN THE BIOREACTORS

Possible cause	Explanations and repairs
Faulty Float	• Check the operation of control floats. When in the elevated position, the incoming water float should stop pumping from the equalization tank to bioreactors.
Float Position	• If required, reposition the high level floats (consult P&ID diagram). • If required, reposition the incoming water floats (consult P&ID diagram). • Check the position of the floats from one bioreactor to the other.
System in Manual mode	• Verify that all equipment in AUTO mode

Tank configuration	• Check whether the valves of the active bioreactors are open (air valve, feeding valve).

I.6 PROBLEM : BLOWER

The blower refuses to start or stop:

Possible Causes	Explanations and repairs
Faulty blower:	• Measure the amperage consumed by the faulty blower's motor. • Check the state of the motor's winding (if necessary, consult the blower's manual). • If required, replace the blower.
Blown feeding fuse:	• Check the feeding fuses. • If required, replace.

I.7 PROBLEM: LOW PH

Possible causes	Explanations and repairs
Alkalinity dosing	• Check if the Alkalinity dosing pump is okay and feeding properly; • Adjust the alkalinity dosing;

I.8 PROBLEM: NITRATE PROBE

Possible causes	Explanations and repairs
Nitrate probe giving wrong values	• Check if the Nitrate probe is functioning okay; • Take steps as per Nitrate probe manual.

I.9 PROBLEM: PH PROBE

Possible causes	Explanations and repairs
pH probe giving wrong values	• Check if the pH probe is functioning okay; • Take steps as per pH probe manual.

I.10 PROBLEM: INSUFFICIENT NITRIFICATION

INSUFFICIENT NITRIFICATION

Possible Causes	Explanations and Repairs
Lack of aeration	• The dissolved oxygen rate is insufficient in the bioreactor. ➢ Insufficient adjustment within the control panel. ➢ Air leak within the aeration pipe.

	➢ Carbonated load to be treated is higher resulting in a higher oxygen demand. ➢ Real daily flow is higher than the design criteria.
Insufficient alkalinity	• Insufficient alkalinity for complete nitrification. A pH drop could also be observed in this case. An alkalinity/Nitrogen mass ratio of 7/1 is necessary for complete nitrification. ➢ Increase alkalinity dosing in the treatment system.
Influent loads superior to the design criteria	• Contact Premier Tech Aqua to properly identify the problem.
Toxicity of the influent	• Identify the source and reduce toxicity by pretreatment, equalization, etc.

I.11 PROBLEM: INSUFFICIENT DENITRIFICATION

INSUFFICIENT DENITRIFICATION (FOR SYSTEM DESIGN WITH DENITRIFICATION)

Possible Causes	Explanations and Repairs
Not enough carbon source readily available	• Increase carbon source dosing.
Presence of high residual oxygen concentration	• Readjust the recirculation rate; • Add carbon during anoxic periods;
Reaction time too short	• Increase duration of anoxic periods.

I.12 POWER FAILURE

Following a power failure, the program will restart itself and retain the data entered previously. For questions about the functioning of the components of Ecoprocess™ MBBR treatment process do not hesitate to contact the customer service Premier Tech Water and Environment at 1 800 632-6356.

J OPERATING GUIDELINES

It is NOT RECOMMENDED to discharge any of the following substances into the septic system:

- Industrial wastewater (not intended to be sent to the treatment system) unless it has been validated by Premier Tech Water and Environment;
- Any kind of silicone product;
- Water softener or pool backwash;
- Oil and grease (motor oil, cooking oil, etc.);
- Wax and resins;
- Paints and solvents;
- Petroleum products;
- Acids, bases (caustic soda);
- Any kind of pesticide;
- Any kind of septic tank additive;
- Automatic toilet bowl cleaners;
- Toxic substances;
- Anything not easily biodegradable (for example, coffee beans, cigarette butts, sanitary napkins, tampons, condoms, cotton swab, etc.).



AND

IT IS RECOMMENDED:

- Never connect a drain pipe, roof gutter, sump pump or sump or drain air conditioning at treatment process;
- Use phosphate-free detergents to significantly reduce the amount of chemical coagulant required for phosphorus removal when the level of treatment is required;
- Communicate with a representative of Premier Tech Water and Environment before making any changes to programming or control instructions;
- Call a person qualified by Premier Tech Water and Environment to perform or support you for the maintenance and operation of your technology Ecoprocess™ MBBR.

K HEALTH AND SAFETY

Wastewater contains innumerable microorganisms like bacteria, viruses, fungi and parasites from many sources. This water also contains organic matter, of which a large part consists of dissolved or colloidal impurities, and numerous other pollutants that must be removed completely or partially by the treatment system.

K.1 WORKING NEAR ECOPROCESS™ MBBR SYSTEM

Equipment must be maintained by a competent and qualified technician. As well, and without any exception, you must ensure that all electrical equipment is turned off before any action is carried out.

K.2 RISK ASSESSMENT

Falling and drowning risk
Working on top of opened maintenance holes and concrete tanks (septic tank, equalization tank, sludge management tank and **Ecoprocess™ MBBR** system) may cause a worker to fall or drown.

Injury risk
There is a risk of cuts and/or bruises when maintenance tasks are being done on moving parts of Ecoprocess™ **MBBR** system, when samples are being collected or during a routine inspection.

Electrocution risk
There is a risk of electrocution if electrical component maintenance is done without cutting off the power to equipment being worked on. Turn off the main switch of control panel before opening it.

Infection risk
There is always a risk of being infected by microorganisms through direct contact with wastewater or sludge.

K.3 PREVENTIVE MEASURES

- All circulation areas around the treatment system must be designed to reduce the risk of slipping and/or falling;
- All structures must be checked often and kept in proper working order;
- If work has to be done inside one of the tanks, each section must be emptied. Pumps and valves controlling the water intake must be set to *STOP (Offline)* and padlocked. The safety procedures to enter a confined space must be followed. Using a safety belt, independent respirator and gas detector may be necessary;
- When the work requires the use of electrical tools, these tools must be double insulated. It's wise to use compressed air tools;

- The worker must wear the protective clothing required to work in places that are contaminated by wastewater.

K.4 PERSONNEL'S RESPONSIBILITY

Employees must observe all safety rules established to protect them and the treatment system. All personnel must follow the instructions below:

- Observe all written and verbal safety rules and be aware of the danger related to the various tasks;
- Do not undertake any task until you have received and understood the appropriate instructions;
- Immediately report any dangerous equipment, condition or work method;
- Report any accident or injury to your immediate supervisor;
- Consider the water in the treatment station as contaminated and not drinkable;
- Avoid operating any equipment that is not equipped with safety and protective devices;
- Keep all tools clean and in proper working order and correctly use the right tool for the job;
- Use appropriate protective gear for each task;
- Observe personal hygiene rules in an effort to prevent infections;
- Never put speed of execution before safety;
- Never consider a job done before making sure that the next person using equipment or facility is completely safe.

K.5 PERSONNEL'S HYGIENE

Wastewater and its by-products present dangers for the personnel working in the treatment facilities, namely diseases transmitted through water, like typhoid fever, parathyroid fever, dysentery, viral hepatitis, hepatitis and tetanus. Personal hygiene is the best defense against infections. Anyone working near wastewater must observe the following guidelines:

- Avoid touching/putting your hands on your face (nose, mouth, eyes, ears, etc.)
- Wear rubber or latex gloves to carry out any work requiring direct contact with treatment equipment, wastewater or raw/organic sludge;
- Wear gloves when your hands are chapped, burnt or damaged;
- Wash your hands thoroughly with soap and warm water before eating, before and after going to the washroom, before and after smoking a cigarette, etc.;
- Keep your fingernails short and remove any foreign object using soap and a stiff-bristle scrubbing brush;
- Avoid putting clean clothing in contact with work clothing;
- Report any cut or scratch and administer appropriate first aid;
- Take a shower after every work day.

K.6 SECURITY EQUIPMENT AND PERSONAL PROTECTION

The types of safety/protective equipment used in purification facilities vary according to the situation and the tasks. In all cases, notices/signs pertaining to safety must be read and respected. The treatment station's safety rules must include detailed instructions on how to use the safety equipment. Specific needs for safety equipment must be determined after studying the conditions in each establishment. The following list of safety/protective equipment, although not exhaustive, does provide useful information:

- Large diameter portable and flexible fan to ventilate openings, sewers, suction pits, wells and confined spaces;
- Equipment used to detect a lack of oxygen and/or the presence of explosive, toxic and combustible gases in the air;
- Hydrogen sulfide and carbon monoxide detectors;
- Self-contained breathing apparatus for every person working underground or in a confined space;
- Inhaler or resuscitator;
- First aid kit;
- Barricades, markers, specific caution/warning signs and flashing lights, as needed;
- Fire-fighting equipment, including dry chemical fire extinguishers and carbon-dioxide snow fire extinguishers;
- Portable explosion-proof lights;
- Safety harness and life line;
- Safety vests or ring buoys and life line;
- Personal protective clothing and gear, including glasses, face mask, safety helmet, and rubber boots with protective steel caps, safety shoes and rainwear.

K.7 USING ELECTRICAL TOOLS AND/OR EQUIPMENT

Wastewater treatment plant equipment is powered by electricity. If safety rules are not strictly observed, undertaking maintenance tasks may cause electric shocks, very serious injuries and even result in death. The following general guidelines should be considered as the minimum measures when using electrical equipment in the treatment station:

- Maintenance tasks on electrical equipment should always be done by competent and authorized technicians;
- Plan for and use safety switches and identification labels in all isolated places or when starter switches are located away from equipment they control;
- Consider electrical equipment and wires as being live unless you are absolutely sure they are not and are properly grounded;
- It is forbidden to use metal ladders or metal measuring tapes near electrical equipment;
- Employees who work on live electrical equipment must work in teams of two;
- Use approved rubber gloves when the voltage exceeds 300V;
- Electrical panels must always be closed unless work requires them to be opened;
- Before working on live equipment, equipment must first be turned off, unplugged and properly grounded;
- Never check whether or not a circuit is live by touching it;
- The personnel working on electrical equipment or wiring must avoid touching water, pipes, drains, metal objects, etc.;
- Avoid unplugging or shunting any electrical safety device;

- Before working in a confined space, cover all live circuits with insulating blankets;
- All tools must have insulated handles and shafts;
- Avoid using flashlights with metal casing;
- Avoid wearing jewellery while working on or near electrical circuits;
- All electrical tools must be grounded or doubly insulated;
- Use rubber mats in control centers and near electrical control panels;
- Any electrical motor, switch and case must always be kept clean.

K.8 ACCIDENT REPORTS

Any work-related accident and any illness that might be work-related must be reported to the supervisor. The same applies to any minor injury that requires proper treatment. Very often, applying these rules immediately can reduce the severity of the injury or the illness, as well as the time off work. All accident reports must include the following details: name of the injured or sick individual; place, date time and cause(s) of accident; part of the body affected and severity of the injury or illness.

K.9 ACCIDENTS INVESTIGATION

The supervisor must carry out an in-depth investigation of any accident causing an injury that incapacitates a worker. The main objectives of the investigation are the following:

- Determine cause of accident in an effort to prevent a similar situation from taking place;
- Determine any improvements to be made in terms of equipment, supervision or training;
- Make personnel aware of specific dangers;
- Establish facts regarding legal liability.





Ecoprocess™ MBBR

Moving Bed Biofilm Reactor

Process Narrative

Project name:	6658-Country Life Community Wastewater Treatment Plant
Contact person:	
Date:	Feb 09, 2023
Revision:	0
Prepared by:	Ashish Mehna, M.Eng. P.Eng. 450 916 8244, Email – meha@premiertech.com

CONFIDENTIAL

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A USE OF LEVEL FLOATS

A.1 EQ TANK

Level switch low ILS1	« OFF »	Stops Eq tank pump (IP1 and IP2);
Level switch normal ILS2	« ON »	Starts Eq Tank pump (IP1 or IP2); **Note** - IP1 and IP2 should start alternatively one by one; It should be ON/OFF timer with alternative pump.
Level switch high ILS3	« ON »	Starts Eq Tank pump alternatively (IP1 or IP2); Send an alarm for high level; **Note** - IP1 or IP2 should work continuously. And stop IP1 or IP2 when ILS3 is deactivated.

A.2 MBBR (ANOXIC#1)

Very high level (MBLS1): High level alarm

MBLS1 « OFF »: Permission to start IP1 and IP2;

MBLS1 « ON »: Prevent IP1 and IP2 from starting and
High alarm activation

A.3 MBBR (AEROBIC#1)

Very high level (MBLS2): High level alarm

MBLS2 « OFF »: Permission to start IP1 and IP2;

MBLS2 « ON »: Prevent IP1 and IP2 from starting and
High alarm activation

A.4 MBBR (AEROBIC#2)

Very high level (MBLS3): High level alarm
MBLS3 « OFF »: Permission to start IP1 and IP2;

MBLS3 « ON »: Prevent IP1 and IP2 from starting and
High alarm activation

A.5 RECIRCULATION TANK #1

Very low level (RTLS1): Low level alarm
RTLS1 « OFF »: Prevent RP1, RP2, and RP3 from starting And
Generate Low level alarm;

RTLS1 « ON »: Permission to start RP1, RP2, and RP3;

Very high level (RTHS1): High level alarm

A.6 MBBR (ANOXIC#2)

Very high level (MBLS4): High level alarm
MBLS4 « OFF »: Permission to start IP1 and IP2;

MBLS4 « ON »: Prevent IP1 and IP2 from starting and
High alarm activation

A.7 MBBR (AEROBIC#3)

Very high level (MBLS5): High level alarm
MBLS5 « OFF »: Permission to start IP1 and IP2;

MBLS5 « ON »: Prevent IP1 and IP2 from starting and
High alarm activation

A.8 RECIRCULATION TANK #2

Very low level (RTLS2): Low level alarm
RTLS2 « OFF »: Prevent RP4, RP5 and RP6 from starting And
Generate Low level alarm;

RTLS2 « ON »: Permission to start RP4, RP5 and RP6;

A.9 CLARIFIER

Low level float (SCLS1): Scum pump and WAS pump protection.
SCLS1 « ON »: Permission to start WAS pump (WP1) and
Permission to start Scum pump (SP1)

SCLS1 « OFF»: Prevent WAS pump (WP1) from starting and
Prevent Scum pump (SP1) from starting;

A.10 ALKALINITY SOURCE

Low level float (DLS1): DP1 dosing pump protection.
DLS2 « ON »: Permission to start DP1;

DLS2 « OFF»: Prevent DP1 from starting;

A.11 MICROC

Low level float (DLS2): DP2 and DP3 dosing pumps protection.
DLS2 « ON »: Permission to start DP2 and / or DP3

DLS2 « OFF»: Prevent DP2 or DP3 from starting;

B EQUIPMENT

B.1 BLOWERS AB1, AB2 AND AB3 (MBBR AERATION)

Start:

Blower in automatic mode	and
(MBBR Blower time ON counter activated)	or

Stop:

Blower in manual mode	or
(MBBR Blower time OFF counter activated)	and

Note - Blower operation is in two modes – Normal mode and Economy mode.

B.2 RECIRCULATION PUMPS RP1, RP2, AND RP3

Start:
RTLS1 float activated

Stop:
RTLS1 float deactivated

B.3 RECIRCULATION PUMPS RP4, RP5 AND RP6

Start:
RTLS2 float activated

Stop:
RTLS2 float deactivated

B.4 SCUM PUMP SP1

Start:

SCLS1 float activated	and
Scum extraction time ON counter activated	

Stop:

SCLS1 float deactivated	or

Scum extraction time OFF counter activated

B.5 WAS PUMP WP1

Start:

SCLS1 float activated	and
WAS extraction time ON counter activated	

Stop:

SCLS1 float deactivated	or
WAS extraction time OFF counter activated	

C USE OF DOSING PUMPS

C.1 DOSING PUMPS: MICROC

C.1.1 MICROC DOSING PUMP (DP2) - NITRATE PROBE (AIT1) MODE

Start condition in Nitrate probe mode
Nitrate read value is ≥ ***nitrate set point*** AND RP1 is in operation Nitrate maximum value set point = 1.5 mg/L
Stop condition in Nitrate probe mode
Nitrate read value is ≤ ***nitrate set point***; Nitrate minimum value set point = 1.0 mg/L

Please add maximum timer value at the interface (adjustable)

C.1.2 MICROC DOSING PUMP (DP2) - TIMER MODE

Start condition in Timer mode
Dosing timer ON is enabled AND RP1 is in operation Dosing Pump Timer ON = 2 minutes
Stop condition in Timer mode
Dosing timer OFF is enabled; Dosing Pump Timer OFF = 2 minutes

Important – dosing pump timer ON – OFF to be field adjusted.

C.2 DOSING PUMP: ALKALI

C.2.1 ALKALI DOSING PUMP (DP1) - PH PROBE MODE

Start condition
MBBR Aerobic#2 pH less than 6 AND RP1 is in operation
Stop condition
MBBR Aerobic#2 pH more than 7.5;

Please add maximum timer value at the interface (adjustable)

C.2.2 ALKALI DOSING PUMP-TIMER MODE

Start condition
Dosing timer ON is enabled AND RP1 is in operation; Dosing Pump Timer ON = 2 minutes
Stop condition
Dosing timer OFF is enabled; Dosing Pump Timer OFF = 2 minutes

Important – dosing pump timer ON – OFF to be field adjusted.

C.2.3 MICROC DOSING PUMP (DP3) - NITRATE PROBE (AIT3) MODE

Start condition in Nitrate probe mode
Nitrate read value is ≥ ***nitrate set point*** AND RP4 is in operation Nitrate maximum value set point = 1.5 mg/L
Stop condition in Nitrate probe mode
Nitrate read value is ≤ ***nitrate set point***; Nitrate minimum value set point = 1.0 mg/L

Please add maximum timer value at the interface (adjustable)

C.2.4 MICROC DOSING PUMP (DP3) - TIMER MODE

Start condition in Timer mode
Dosing timer ON is enabled AND RP4 is in operation Dosing Pump Timer ON = 2 minutes
Stop condition in Timer mode
Dosing timer OFF is enabled; Dosing Pump Timer OFF = 2 minutes

Important – dosing pump timer ON – OFF to be field adjusted.

Secondary clarifier

Technical Data Sheet

*This is the technical data sheet of the polyethylene **secondary clarifiers** from **Premier Tech Aqua**. If you have any questions or comments, please contact the customer service at **1 800 632-6356** or visit our website at **PREMIERTECHAQUA.COM.***

1 Specifications

Specifications	DEC-660	DEC-2000	DEC-2500	DEC-3000	DEC-3500	DEC-4000	DEC-4500	DEC-5000
Nominal capacity	1 750 USgal (6,65 m³)	5 200 USgal (20 m³)	6 600 USgal (25 m³)	7 900 USgal (30 m³)	9 250 USgal (35 m³)	10 600 USgal (40 m³)	11 900 USgal (45 m³)	13 200 USgal (50 m³)
Effective capacity	1 550 USgal (5,9 m³)	4 300 USgal (16.3 m³)	5 500 USgal (20.7 m³)	6 700 USgal (25.4 m³)	7 900 USgal (29.7 m³)	9 100 USgal (34.4 m³)	10 200 USgal (38.7 m³)	11 500 USgal (43.4 m³)
Tank height (A)	155" (3,93 m)	222" (5,63 m)	273" (6,93 m)	324" (8,22 m)	375" (9,52 m)	426" (10,81 m)	477" (12,11 m)	528" (13,41 m)
Tank length (B)	84" (2,13 m)	108 ½" (2,76 m), including one riser of 12" (300 mm)						
Maximum height (additional riser added)	104" (2.64 m)	120 ½" (3,06 m)						
Tank width (C)	52 ⅜" (1,33 m)	91 ½" (2,33 m)						
Inlet invert height (D)	54 $\frac{5}{8}$" (1,39 m)	74 ¼" (1,88 m)						
Inlet pipe diameter	4" (100 mm) SDR-35							
Outlet invert height (E)	54 $\frac{5}{8}$" (1,39 m)	74 ¼" (1,88 m)						
Outlet pipe diameter	4" (100 mm) SDR-35							
Scum/sludge height (F)	63" (1,60 m)	81" (2,06 m)						
Scum/sludge diameter	2" (50 mm) PVC SC80							
Opening diameter	24" (610 mm)							
Number of openings	2			3		4		5
Weight of empty tank[1]	772 lb (350 kg)	1 843 lb (836 kg)	2 533 lb (1 149 kg)	2 881 lb (1 307 kg)	3 474 lb (1 576 kg)	3 825 lb (1 735 kg)	4 418 lb (2 004 kg)	4 768 lb (2 163 kg)
Tank material	Medium density polyethylene (MDPE)							
Scum pump	1 X 0.5 hp							
Sludge pump	1 X 0.5 hp			2 x 0.5 hp				3 X 0.5 hp

[1] The weight indicated in the table is approximate and is not binding (for handling and lifting purposes only.

1.1 Tank DEC-660

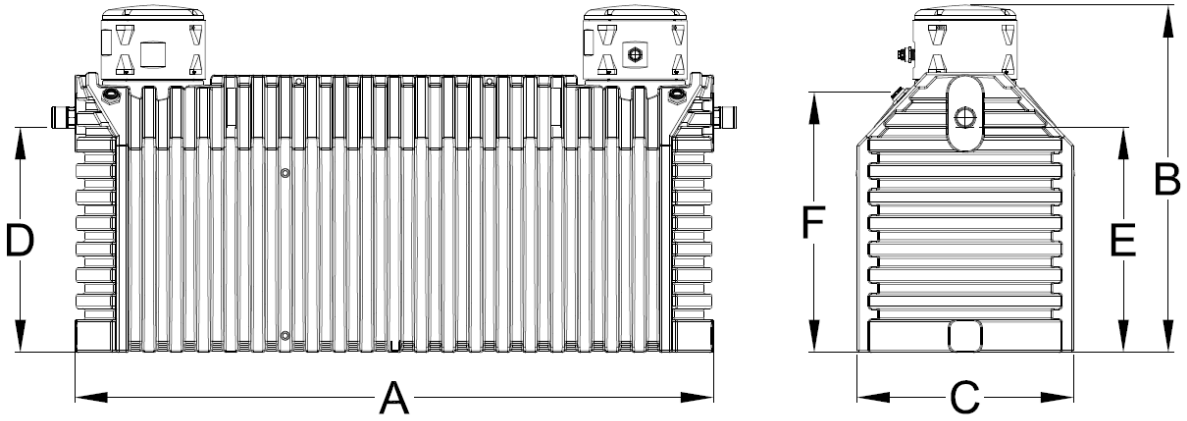


Figure 1 - Tank dimensions (DEC-660)

1.2 Large capacity tanks (2000 to 5000)

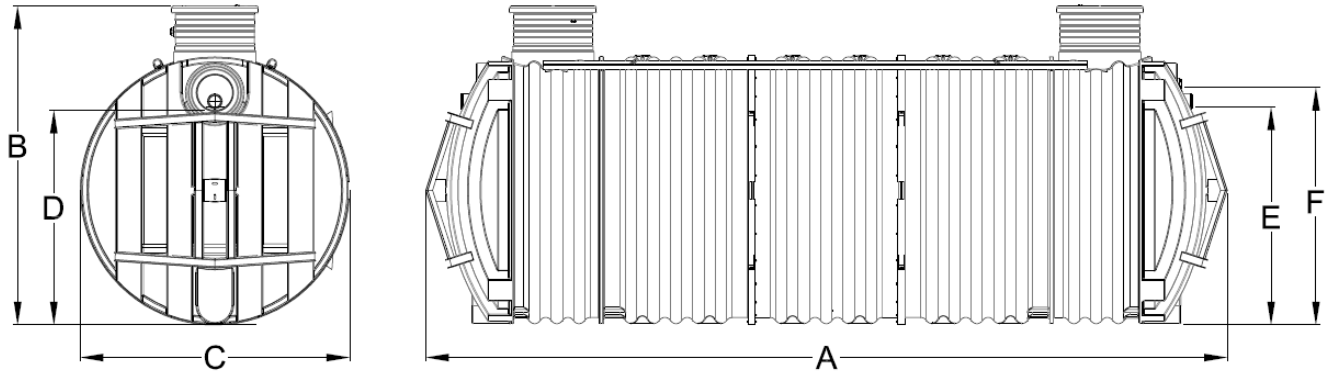


Figure 2 - Large capacity tank dimensions

2 Internal components

2.1 Tank MBBR-660

A. Secondary clarifier influent
B. Outlet sludge removal piping
C. Sludge pump
D. Sludge removal piping
E. Baffles
F. Skimmer
G. Polyethylene lids
H. PSR-140 polyethylene risers
I. PHT-660 polyethylene tank
J. Low level float
K. Outlet scum removal piping
L. Scum pump
M. Secondary clarifier effluent

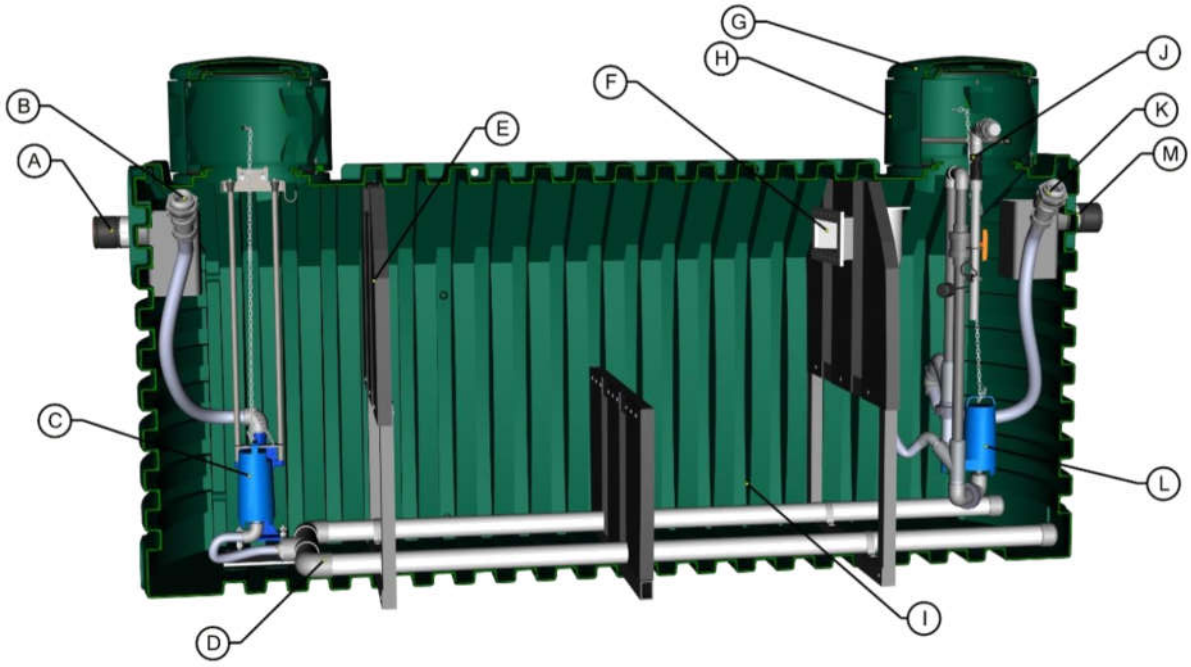


Figure 3 - Internal components of the secondary clarifier

2.2 Large capacity tank (2000 to 5000)

A. Secondary clarifier influent
B. Outlet sludge removal piping
C. Sludge pump
D. Sludge removal piping
E. Baffles
F. Skimmer
G. Polyethylene lids
H. Polyethylene risers (12''/300 mm)
I. Polyethylene tank
J. Low level float
K. Scum and sludge outlet
L. Scum pump
M. Secondary clarifier effluent
N. Check valve
O. Tank reinforcement

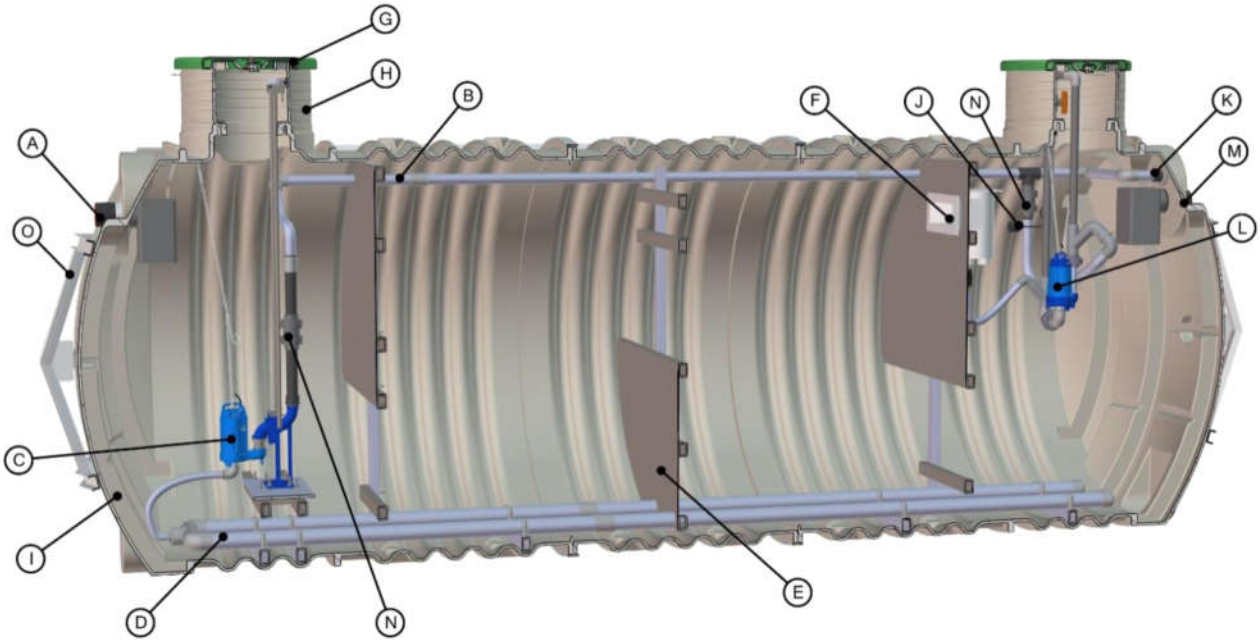


Figure 4 - Internal components of the secondary clarifier (DEC-2500 as an example)

3 Operation mode

A clarifier is installed downstream of the MBBR to remove the particles from the treated water. Because the aeration system is also used to promote movement inside the bioreactor, the MBBR effluent is highly oxygenated resulting in non-negligible quantity of particles carried to the water surface of the clarifier by oxygen microbubbles. Baffles inside the clarifier help concentrate the scum at the surface where a skimmer device collects the scum periodically and returns it to the primary treatment tank or the sludge storage tank. Residual sludge settles at the bottom of the clarifier. A sludge collecting device, installed at the bottom of the clarifier, mainly composed of perforated pipes connected to a pump, collects the sludge periodically and returns it to the primary treatment tank or the sludge storage tank. Skimmer and sludge collecting pumps are controlled by floats and timers. Operating time and frequency are adjusted based on the specifications of the project.

3.1 Baffles

The baffles force the effluent of the Ecoprocess™ MBBR effluent to flow alternatively up and down to have a good separation between the water and the sludge inside the tank.

3.2 Skimmer

Skimmer collects the scum on the surface of the water. Scum is constituted with sludge produced by the MBBR reactor upstream.

3.3 Sludge removal pipes

Sludge removal pipes remove all the decant sludge coming from the MBBR by the holes under the pipes. The pipes are installed all tank long to ensure a good sludge removal.

3.4 Scum and sludge pump

The pumps used to remove scum and sludge only work couple of minutes per day, ensuring an effective and regulated removal. It also allows few movements inside the tank, ensuring a better separation.

3.5 Level float

The level float inside the clarifier only shut down the pumps when deactivated (low level). The pump cannot start when the float is down to prevent emptying the tank.

Pumping station

Technical Data Sheet

*This is the technical data sheet of the polyethylene **pumping stations** from **Premier Tech Aqua**. If you have any questions or comments, please contact the customer service at **1 800 632-6356** or visit our website at **PREMIERTECHAQUA.COM**.*

1 Specifications

1.1 PSA-660 to PSA-2500 tanks

Specifications	PSA-390	PSA-660	PSA-1000	PSA-1500	PSA-2000	PSA-2500
Nominal capacity	1 000 gal US (3,9 m³)	1 760 gal US (6,65 m³)	2 650 gal US (10 m³)	4 000 gal US (15 m³)	5 200 USgal (20 m³)	6 600 USgal (25 m³)
Effective capacity	900 gal US (3.45 m³)	1 550 gal US (5,9 m³)	2 500 gal US (9.4 m³)	3 600 gal US (13.7 m³)	4 400 gal US (16.5 m³)	5 500 gal US (20.9 m³)
Tank height (A)	128" (3,20 m)	155" (3,93 m)	3,54 m (139")	190" (4,29 m)	222" (5,63 m)	273" (6,93 m)
Tank length (B)	68" (1,72 m)	84" (2,13 m)	108 ½" (2,76 m), including one riser of 12" (300 mm)			
Maximum height (additional riser)	88" (2,23 m)	104" (2,64 m)	120 ½" (3,06 m)			
Tank width (C)	49" (1,24 m)	49" (1,33 m)	91 ½" (2,33 m)			
Inlet invert height (D)	42" (1,08 m)	57" (1,45 m)	76 ¾" (1,95 m)			
Outlet invert height (E)	43" (1,09 m)	55" (1,40 m)	76 ¾" (1,95 m)			
Inlet pipe diameter	4" (100 mm) SDR-35					
Outlet pipe diameter	2" (50 mm) PVC SC80					
Opening diameter	24" (610 mm)					
Number of openings	2					
Weight of empty tank[1]	463 lb (210 kg)	772 lb (350 kg)	1 433 lb (650 kg)	1 620 lb (735 kg)	1 843 lb (836 kg)	2 533 lb (1 149 kg)
Tank material	Medium density polyethylene (MDPE)					
Feeding pumps	2 X 0,5 HP					
Level floats	3 X 30MANCPNO MILLIAMP					
PHOSPHORUS REMOVAL OPTION (FOR EQUALIZATION TANK)						
Recirculating pump	1 X 0.5 hp					

1. Weights indicated are approximate and not binding. For handling and lifting purposes only.

1.2 PSA-3000 to PSA-5000 tanks

Caractéristiques	PSA-3000	PSA-3500	PSA-4000	PSA-4500	PSA-5000
Nominal capacity	7 900 USgal (30 m³)	9 250 USgal (35 m³)	10 600 USgal (40 m³)	11 900 USgal (45 m³)	13 200 USgal (50 m³)
Effective capacity	6 800 gal US (25.6 m³)	7 900 gal US (30 m³)	9 200 gal US (34.7 m³)	10 300 gal US (39.1 m³)	11 600 gal US (43.8 m³)
Tank height (A)	324" (8,22 m)	375" (9,52 m)	426" (10,81 m)	477" (12,11 m)	528" (13,41 m)
Tank length (B)	108 ½" (2,76 m), including one riser of 12" (300 mm)				
Maximum height (additional riser added)	120 ½" (3,06 m)				
Tank width (C)	91 ½" (2,33 m)				
Inlet invert height (D)	76 ¾" (1,95 m)				
Outlet invert height (E)	76 ¾" (1,95 m)				
Inlet pipe diameter	4" (100 mm) SDR-35				
Outlet pipe diameter	2" (50 mm) PVC SC80				
Opening diameter	24" (610 mm)				
Number of openings	3		4		5
Weight of empty tank[1]	2 881 lb (1 307 kg)	3 474 lb (1 576 kg)	3 825 lb (1 735 kg)	4 418 lb (2 004 kg)	4 768 lb (2 163 kg)
Tank material	Medium density polyethylene (MDPE)				

1. Weights indicated are approximate and not binding. For handling and lifting purposes only.

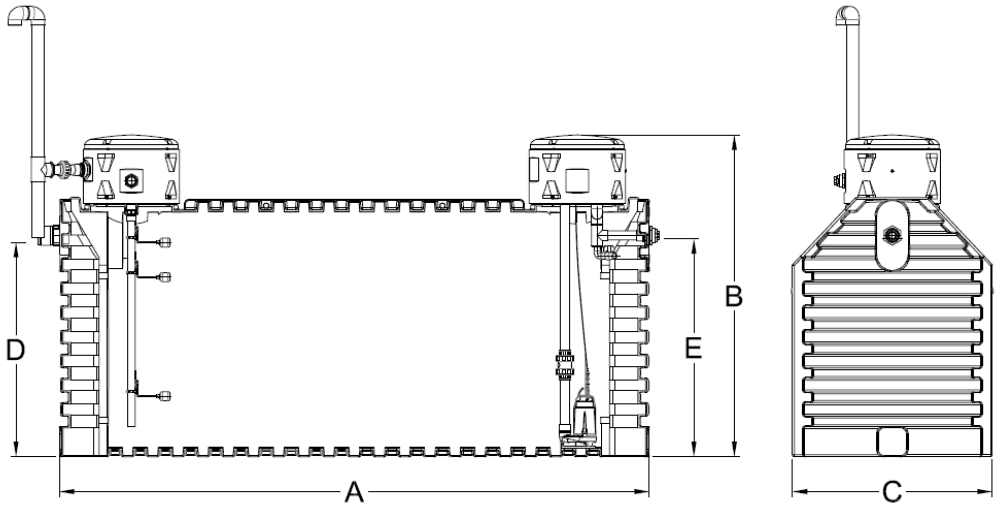


Figure 1 - Pumping station (PSA-390 and PSA-660) and its dimensions

2 Internal components

A.	Pumping station affluent	G.	Drain valve
B.	Vent	H.	Outlet pipe
C.	Float tree	I.	Control valve
D.	Check valve	J.	Level float
E.	Pump	K.	Polyethylene lids
F.	Polyethylene tank	L.	Polyethylene risers PSR-140

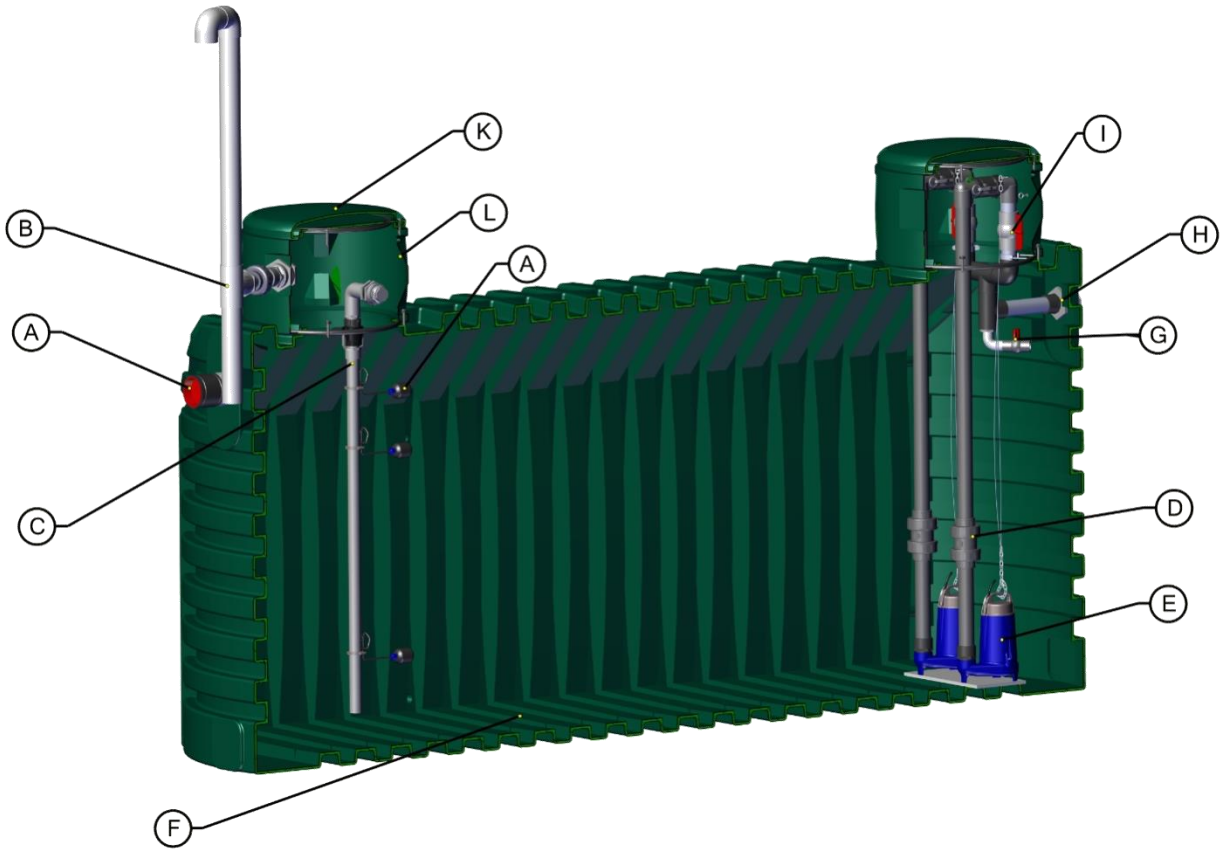


Figure 2 - Internal components of pumping station

3 Internal components function

3.1 Drain valve

The drain valve allows us to drain the piping between the pumping station and the equipment downstream. Usually, this valve is slighty open to allow the water drainage inside the pumping station in between each pumping event. A slight negative slop is necessary between the pumping station and the downstream equipment to ensure a complete drainage of the pipes.

3.2 Control valve

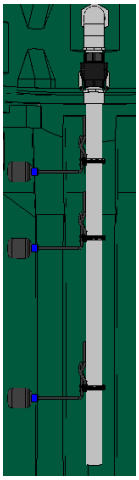
Control valves allows us to control the flow of each pumps. By reducing the valve opening, it is possible to reduce the flow to respect the specifications of the downstream equipment.

3.3 Check valve

Check valves installed on each pump piping allow us to avoid the pumps to pump one in the other as they are installed in parallel

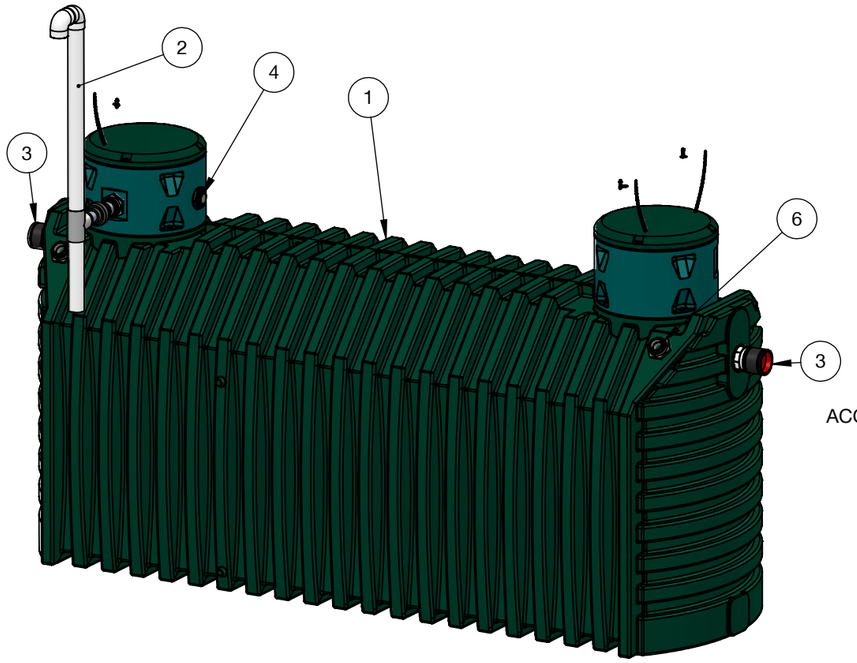
4 Level control

Level control inside the tank is achieve by three* (3) level float. Regarding the position of each of the float, pumps stop, start based on a predetermined sequence or start in override.

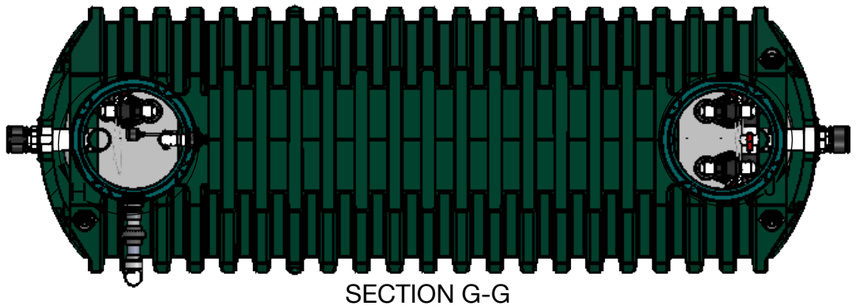


Float	Function
#3 (Top)	This float activates the override mode and the high level alarm. If this float is activated (high position), the pump will work at all times and the high-level alarm (noise and light) will be activated up until when the float is desactivated (low position). The alarm needs to be desativated by the owner at the control panel.
#2 (Middle)	This float activates the predetermined sequence of the pumps. When the float is activated (high position), the pumps are in the sequence mode, using the data entered to the control panel. When the float is desativated, no action is taken by the control panel.
#1 (Bottom)	This float stops the predetermined pumping sequence. When the float is activated (high position), no action is taken by the control panel. When the float is desactivated (low position), the pumps stop.

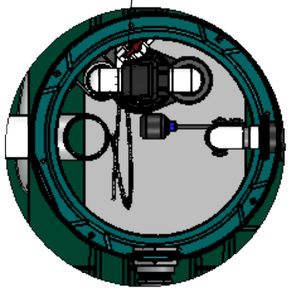
* It is possible to have a 4th float to control the level. In that case, the floats #1 and #2 have the same functions while float #3 is the override float and float #4 the alarm float.



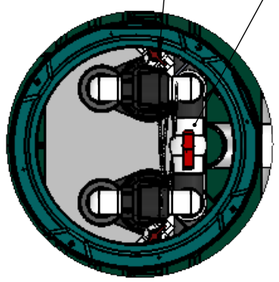
ITEM	PART NUMBER	DESCRIPTION	QTY.
1	316537	CUVE PRT-660 POLYETHYLÈNE	1
2	322915	ÉVENT 3" PVC	1
3	322954	TUYAUTERIE ENTRÉE SORTIE	2
4	6790-ARBRE A 2 FLOTTES	ARBRE À FLOTTE MBBR-660	1
5	6790-pompe dedie	1 POMPE DÉDIÉE PST-660	1
6	6790-2 pompes dedies	2 POMPE DÉDIÉE PST-660	1



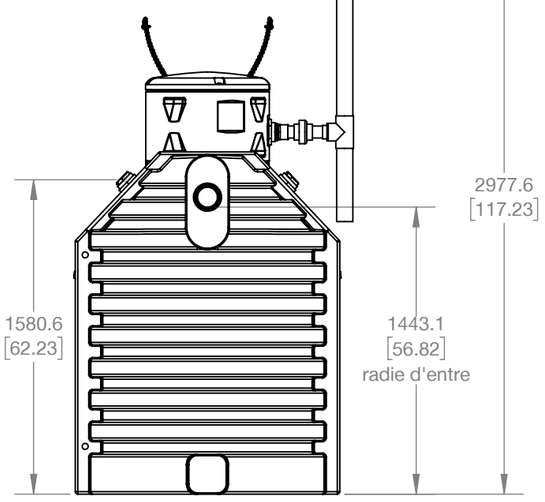
SECTION G-G

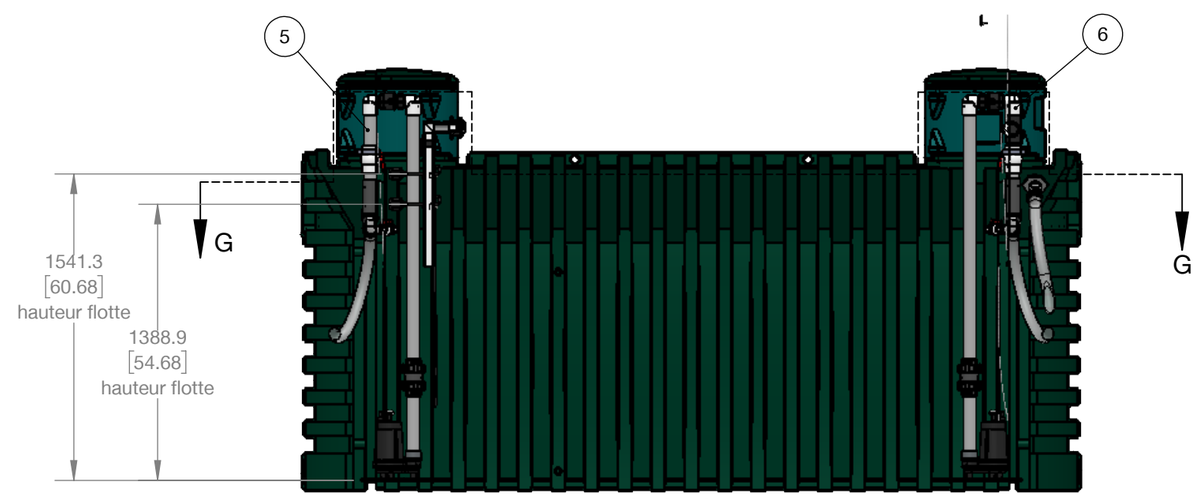


DETAIL H

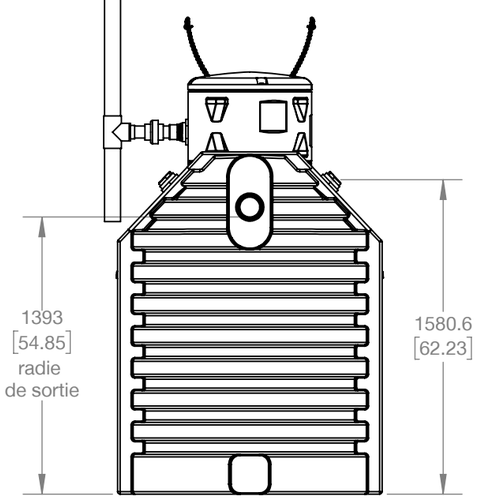


DETAIL J





SECTION D-D



No	DATE	RÉVISION / REVISION	PAR / BY
-	-	-	-
-	-	-	-
-	-	-	-
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-	-	-	-

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Ecoprocess MBBR
RESERVOIR DE RECIRCULATION #1

PROJET / PROJECT
STANDARD

TOLERANCE
METRIQUE / IMPERIAL
X. ± 3 mm X/X ± 1/8
X.X ± 1.5 mm .X ± .060''
X.XX ± 0.5 mm .XX ± .030''
X.XXX ± 0.25 mm .XXX ± .010''

POUR FABRICATION

ÉCH. / SCALE: NTS
FORMAT / SIZE: B

POID / WEIGHT: 1914.25 kg
MATÉRIEL / MATERIAL: <not specified>
No PROJET / PROJECT No.:
REV.: 0

DESSINÉ / DRAWN: LECP2
DATE: 2021-09-24
VÉRIFIÉ/VERIFIED: MICR
DATE: 2021-08-19
APPROUVÉ / APPROVED: -
DATE: -
UNITÉS / UNITS: mm (po)

NUMÉRO DE DESSIN / DRAWING NUMBER: 6790-RESERVOIR DE RECIRCULATION #1
PAGE 1 DE / OF 1

Phosphorus removal

Technical data sheet

*This technical data sheet gives information about the **phosphorus removal of Premier Tech Aqua**. For more information, do not hesitate to contact our customer service at **1 800 632-6356** or to visit our website at **PREMIERTECHAQUA.COM.***

1 Technical data

Components	Specifications
Dosing pump	1. Walchem EZ-C21-D1-VC/VE 2. Walchem EZ-B11-D1-VC/VE 3. Walchem EZ-C36-D1-VC/VE
Maximum flow	1. 38 ml/min 2. 130 ml/min 3. 400 ml/min
System height (A)	1,08 m (43")
System width (B)	1,30 m (51")
Area on the wall	1,40 m² (15,2 pi²)
Inlet pipe diameter	50 mm (2") PVC SCH80
Outlet pipe diameter	100 mm (4") PVC SCH40
Proposed chemical agent for phosphorus removal	MP2 ou PASS10

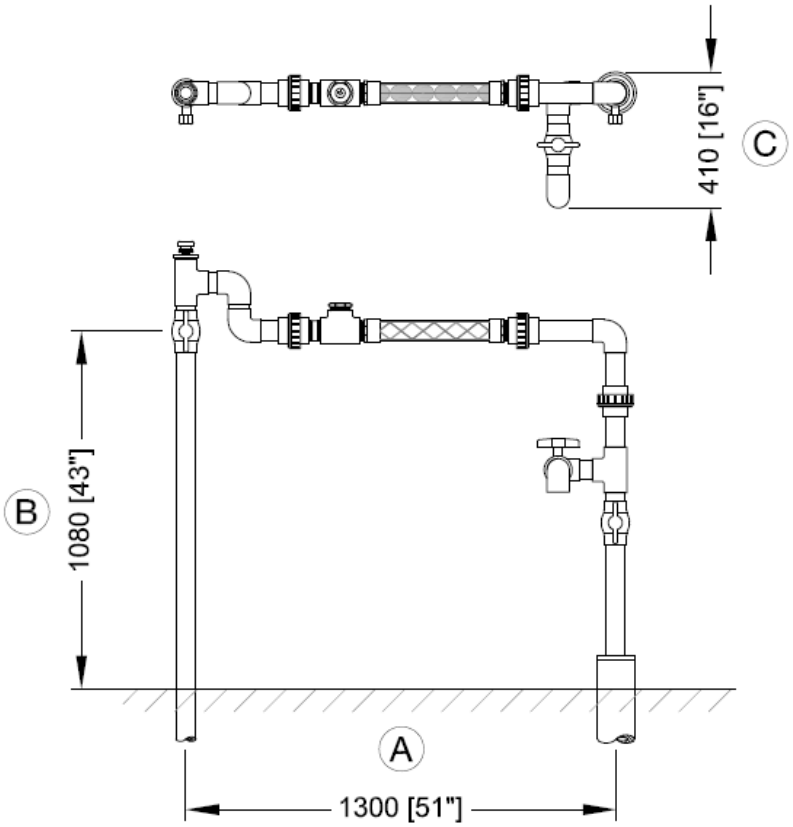
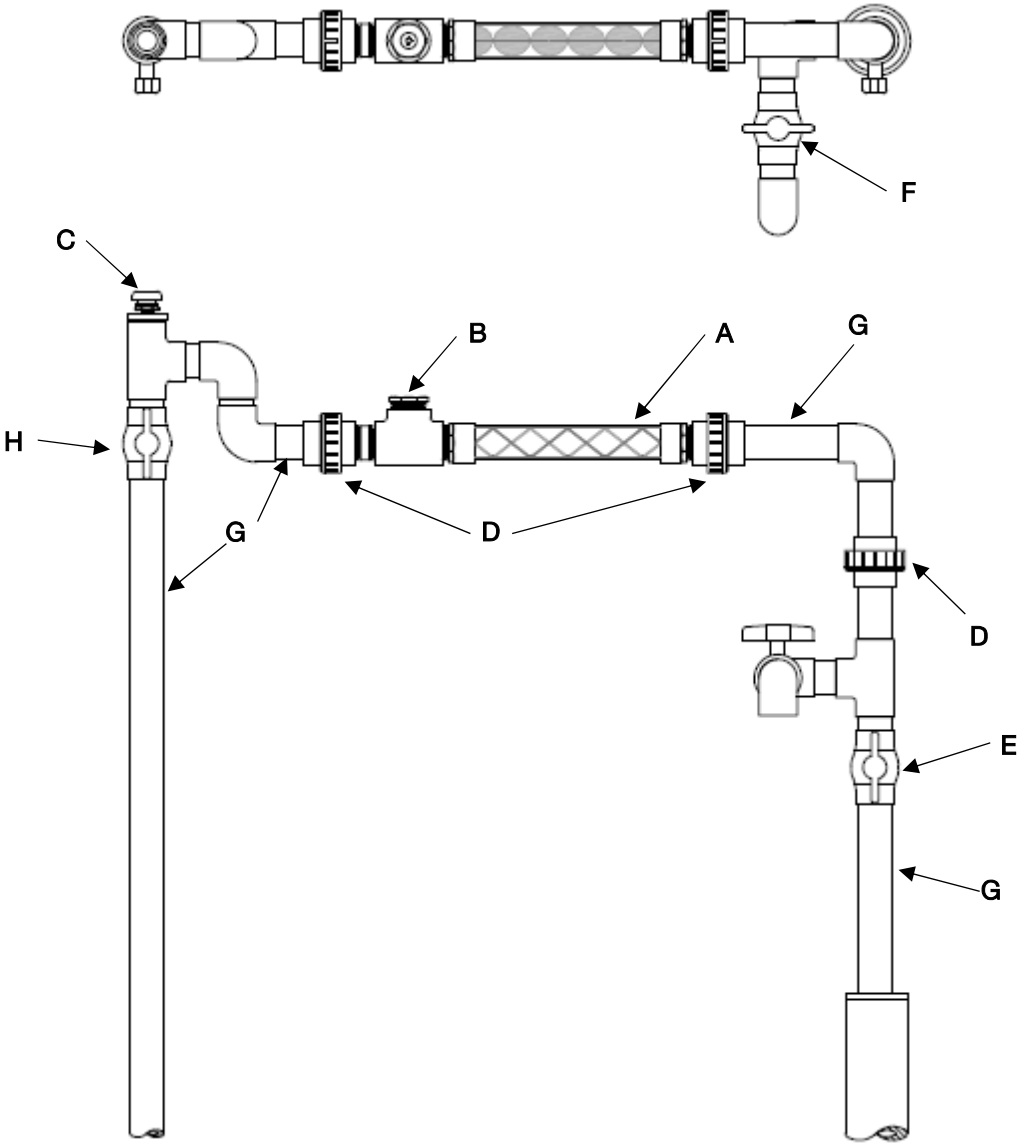


Figure 1 - Phosphorus removal system

2 Internal components

A. Static mixer
B. Dogin pump injection site
C. Anti-syphon
D. Threaded union
E. Outlet valve
F. Sampling valve
G. PVC pipes
H. Inlet valve



3 Components function

3.1 Recirculation pump

Located in the equalization tank (primary phosphorus removal) or in the flash mix tank (secondary phosphorus removal), it brings water to be threated to the phosphorus removal system inside the heated shelter.

3.2 Static mixer

It allows a good mixing of the injected chemical agent inside the recirculated water pipe.

3.3 Dosing pump

This pump is used to moved the coagulant from the drum to the static mixer. Depending of the concentration and the daily flow to threat, the chosen pump differs in order to inject the right amont of coagulant.

3.4 Anti-syphon

The anti-syphon allows to empty the pipe. When the recirculation pump stops, pipes empty themselves because of its presence.

3.5 Threaded unions

Three threaded unions are installed in the unit. Two are located before and after the static mixer. They allow to remove the static mixer so that it can be washed if it clogs. It is important to close the inlet valve when the static mixer is not installed.

3.6 Outlet and sampling valve

When it is necessary to grab a sample, the sampling valve has to be open and the outlet valve close so that the flow is going to the sampling point.

3.7 Inlet valve

The inlet valve allows to isolate the system during maintenance.

3.8 PVC pipe

These four PVC pipes needs no be provided by the customer because the length of these pipe change depending of the site specifications.

PHT tanks CCI

Installation guide

*This guide provides information regarding the installation, operation, maintenance and warranty of the **PHT tanks** from **Premier Tech Aqua**. For additional information, contact our customer service at **1 800 632-6356**.*

Table of content

1. Technical Data 1
2. Components of the holding tank 2
3. Installation procedure 2

1. Technical Data

The holding tanks are made of medium density polyethylene (MPDE).

Table 1 - Characteristics of PHT tanks

Models	PHT-390	PHT-660
Nominal total capacity	3,9 m³ / 3 900 L 1 030 gal. US	6,65 m³ / 6 650 L 1 760 gal. US
Liquid capacity		
Total length (A)	3 320 mm 130 ½"	3 965 mm 156"
Total width (B)	1 250 mm 49 ¼"	1 330 mm 52 ⅜"
Total height (C)	1 330 mm 52 ⅜"	1 720 mm 67 ¾"
Inlet height (D)	Depend of the tank function	
Outlet height (E)		
Opening diameter (F)	470 mm 18 ½"	470 mm 18 ½"
Approximate weight **	210 kg 463 lb	350 kg 772 lb

* Pipe invert.
** Weights indicated are approximate and not binding (for handling and lifting purposes only).
Note: The characteristics can be modified at any time.

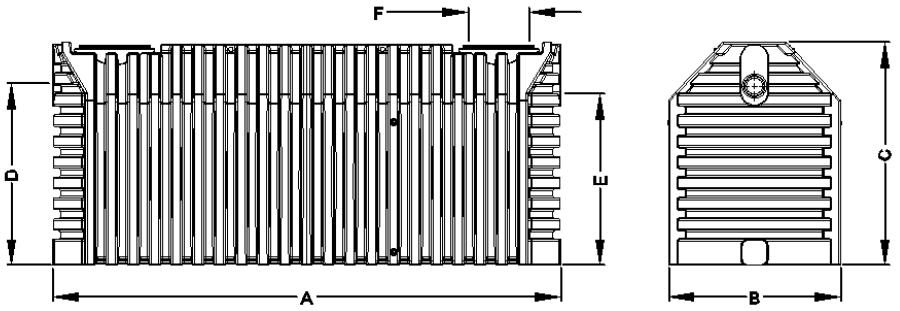


Figure 1 - PHT tank

2. Components of the holding tank

2.1. Internal components

Internal components are not the same depending of the tank function. The internal components of each function are listed below. General rules, all pumps and floats are not installed inside the tank. They must be install on site.

2.1.1. MBBR

- Float (1) tree to install;
- 2 media retaining screens;
- Media inside the tank;
- AirOmega install on the bottom of the tank to aerate the tank;
- Inside piping for aeration;
- Vent to install.

2.1.2. Clarifier

- Was pump to install;
- Scum pump to install;
- Piping to remove was;
- Flexible pipe to connect to was and scum pump;
- Skimmer to help remove the scum.

2.1.3. Pumping station

- Two (2) dosing pump to install;
- Floats (3) tree.

2.1.4. Equalization tank with phosphorus removal

- Two (2) dosing pump to install;
- Floats (3) tree;
- One (1) recirculation pump for phosphorus removal (if necessary).

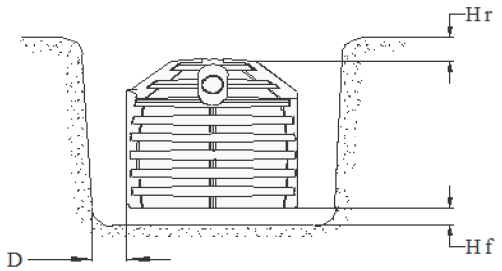
For more information about the installation of internal components of all these tanks (MBBR, clarifier, pumping station, etc.), refer yourself to the installation guide of internal components of the desired tank.

3. Installation procedure

3.1. Step 1 – Excavation

Specific Requirements

- Soil backfill thickness covering the tank:
  Hr ≥ 30 cm (12") and Hr ≤ 90 cm (36").
- Clearance between the excavation and the tank:
  D ≥ 30 cm (12") on all sides.
- Minimum thickness of the bedding (Hf) :
  Minimum 15 cm (6") in loose soil or Minimum 30 cm (12") in bedrock.



Note regarding the bedding: Use 0-20 mm (0-¾") Ø gravel or sand well compacted and levelled.

3.2. Step 2a – Installing with an anchoring system (optional)

An anchoring system can be installed to prevent problems should the water table temporarily and exceptionally rise above the base of the tank. This option is strongly recommended, but is limited as a preventive measure. The water table level should never rise above the first third of the tank's height.

- Level and compact the material used for the base.
- Put the concrete counterweight in place (not included). See table below for required weight.
- Add a 20 cm (8") layer of backfill material.
- Level and compact the backfill material.
- Manoeuvre the tank using the rope on top.
- Put the tank in place.
- Install the retainer straps as shown (not included).

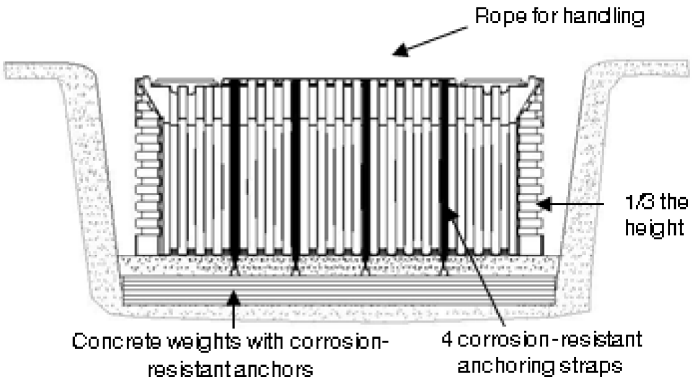


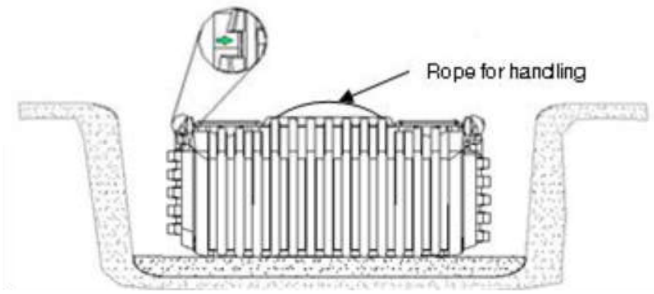
Table 2 - Table showing the load of the tank's anchoring system

Tank model	Resistance/strap	Total weight of concrete
PHT-390	1 000 kg	3 400 kg
PHT-660	1 000 kg	5 700 kg

Note: Use only non-corrosive materials.

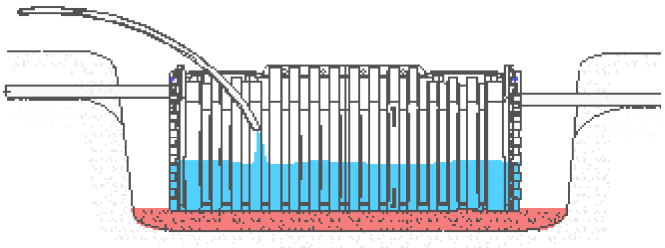
3.3. Step 2b – Bedding preparation and tank placing

- Level and compact the material used for the base.
- Handle the tank using the rope on the top.
- Put the tank in place.



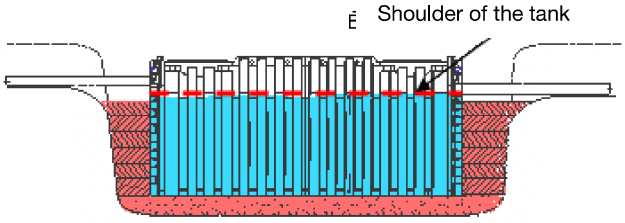
3.4. Step 3 – Connecting the tank

- Hook up the plumbing connections at the inlet of the tank while filling the tank with water.
- MBBR, pumping station and equalization tanks must be ventilated using a pipe that is at least 100 mm (4") in diameter or that is connected to the dwelling's ventilation pipe.



3.5. Step 4 – Initial backfill

- Backfill up to the shoulder of the tank.
- Note that the backfill material must be deposited and not dumped. As such, a bulldozer should not be used.
- The backfill material must not contain any organic matter or impervious soil, stones, debris or particles larger than 20 mm (¾") or any object that could damage the tank

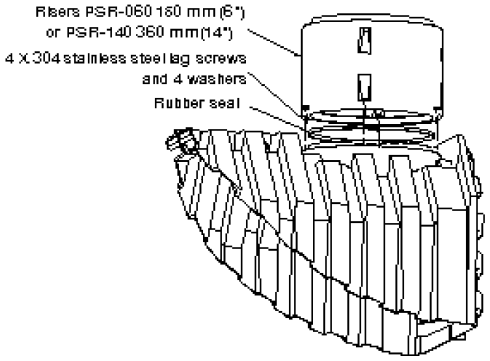


Note: It is essential to backfill evenly each side of the tank.

3.6. Step 5 – Riser installation

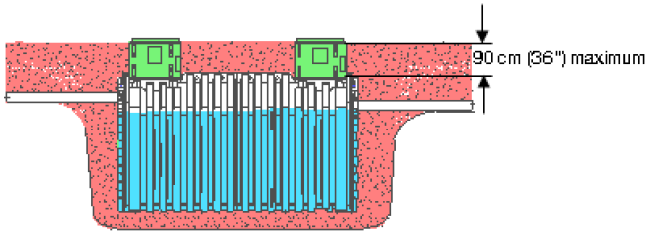
When risers are required, proceed as follows:

- Clean the rim of the tank access (where the 4 holes are located for the lag screws).
- Place the rubber seal on the access rim.
- Put the riser in place, aligning the holes in the base of the riser with the holes of the access rim.
- Tighten the riser in place by using the 4 lag screws and washers provided for this purpose.



3.7. Step 6 – Final backfill

- Before the final backfill, it is strongly recommended that the tank and the access be insulated to prevent freezing. Insulating panels should be used for this purpose.
- Backfill up to the desired level.
- The thickness of the backfill over the tank **must not** exceed 90 cm (36").
- If necessary, use PSR-060 or PSR-140 risers.
- Secure the lid onto the tank or onto the riser using the supplied lag screws



If you have any question or comments, do not hesitate to contact Premier Tech Aqua at 1 800 632-6356.

PREMIER TECH AQUA

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Large capacity polyethylene tank (PLT)

Installation guide

*This guide provides the information required to plan and execute the installation of a **Premier Tech Aqua large-capacity polyethylene tank** for commercial, institutional or community use. Please read this guide in full before beginning the installation process. This installation guide is generic in nature and does not replace the detailed instructions and specifications stipulated in your engineering plans. Any inconsistency found between your engineering plans and the instructions provided in this guide must be brought to the attention of your engineer. For further information, please contact our technical support department: **1 800 632-6356.***

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2 Cautionary remarks....3

3 Handling....3

4 Installation in dry zones....4

5 Installation in humid zones (flood-prone areas, water tables, runoff areas, etc.) and difficult soils (clayey, etc.)....4

6 Deep installations....10

7 Vehicle crossings and high load sites....10



SAFETY FIRST!

- Read this guide in full before beginning the installation. In particular, review the installation conditions, the installation sequence as well as the post-installation conditions that must be met before beginning any installation work whatsoever. For further information, contact Premier Tech Aqua.
- Take all necessary precautions to avoid damaging the system.
- The installer is responsible for ensuring safety from the beginning to the end of the installation process. Refer to the most recent version of the Safety Code for the construction industry (S-2.1, r.6), published by the CSST, for detailed safety information

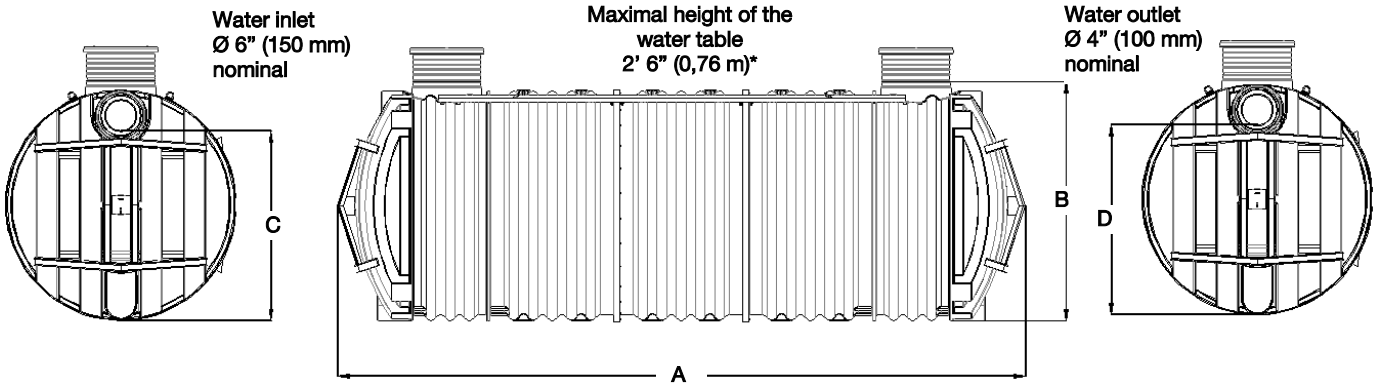
1 Specifications

Table 1 - Technical data of PLT tank used as septic tank of holding tank

Models	PLT-1000[3]	PLT-1500	PLT-2000	PLT-2500	PLT-3000	PLT-3500	PLT-4000	PLT-4500	PLT-5000
Nominal capacity	2 642 gal US (10 m³)	3 963 gal US (15 m³)	5 200 gal US 20 m³)	6 604 gal US (25 m³)	7 925 gal US (30 m³)	9 246 gal US (35 m³)	10 567 gal US (40 m³)	11 888 gal US (45 m³)	13 209 gal US (50 m³)
Effective capacity (septic tank) [1,3]	N/A	3 698 gal US (14,0 m³)	4 755 gal US (18,0 m³)	5 627 gal US (21,3 m³)	6 816 gal US (25,8 m³)	8 004 gal US (30,3 m³)	9 193 gal US (34,8 m³)	10 382 gal US (39,3 m³)	11 571 gal US (43,8 m³)
Length including lining (A)	11’ 7” (3,54 m)	15’ 10” (4,82 m)	18’ 6” (5,63 m)	22’ 9” (6,93 m)	27’ 0” (8,22 m)	31’ 3” (9,52 m)	35’ 6” (10,81 m)	39’ 9” (12,11 m)	44’ (13,41 m)
Width	7’ 8” (2,340 m)								
Height (B)	With one (1) riser (mandatory): 8’ 10” (2,700 m) minimum With two (2) risers: 9’ 10” (3,000 m) maximum								
Inlet height (C) [2]	76 3/4” (1,950 m)								
Outlet height (D)*	74 1/2” (1,895 m)								
Weight[4]	1 433 lb (650 kg)	1 620 lb (735 kg)	1 843 lb (836 kg)	2 533 lb (1149 kg)	881 lb (1 307 kg)	3 474 lb (1 576 kg)	3 825 lb (1 735 kg)	4 418 lb (2 004 kg)	4 768 lb (2 163 kg)
Number of manholes 24” (600 mm)	2	2	2	3	3	4	4	4	5

Note: Specifications are subject to change at any time. Integrated PL-525 effluent filter in all septic tanks.

1. Valid only for septic tanks. For other type of tanks (equalization tank, MBBR, clarifier, etc.) refer yourself to the data sheet of each product.
2. Valid for septic tanks and holding tanks. For other type of tanks (equalization tank, MBBR, clarifier, etc.) refer yourself to the data sheet of each product.
3. PLT-1000 tank is not available in septic tank.
4. Weights indicated are approximate and not binding (for handling and lifting purposes only)



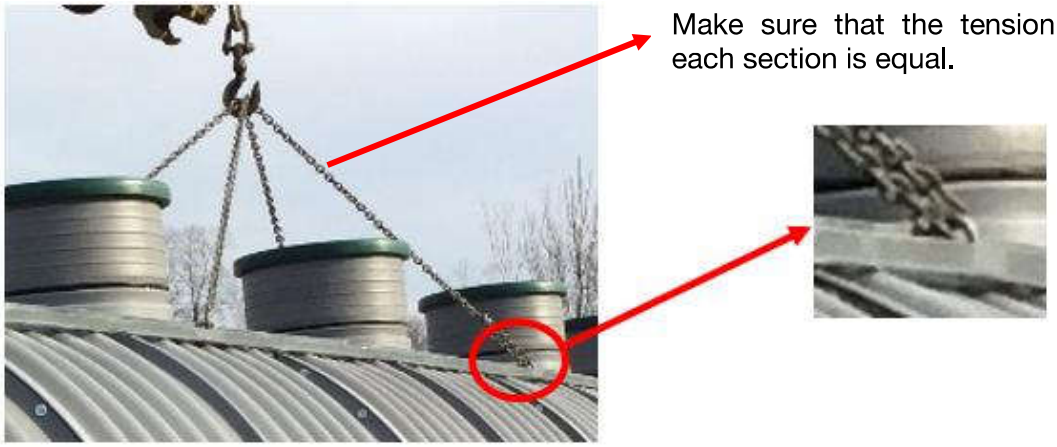
* For installation in the water table, the maximum allowable height should be occasional. In some case, their use could be forbid. For every installation in the water table or in a flood-prone area, please contact Premier Tech Aqua for more information.

2 Cautionary remarks

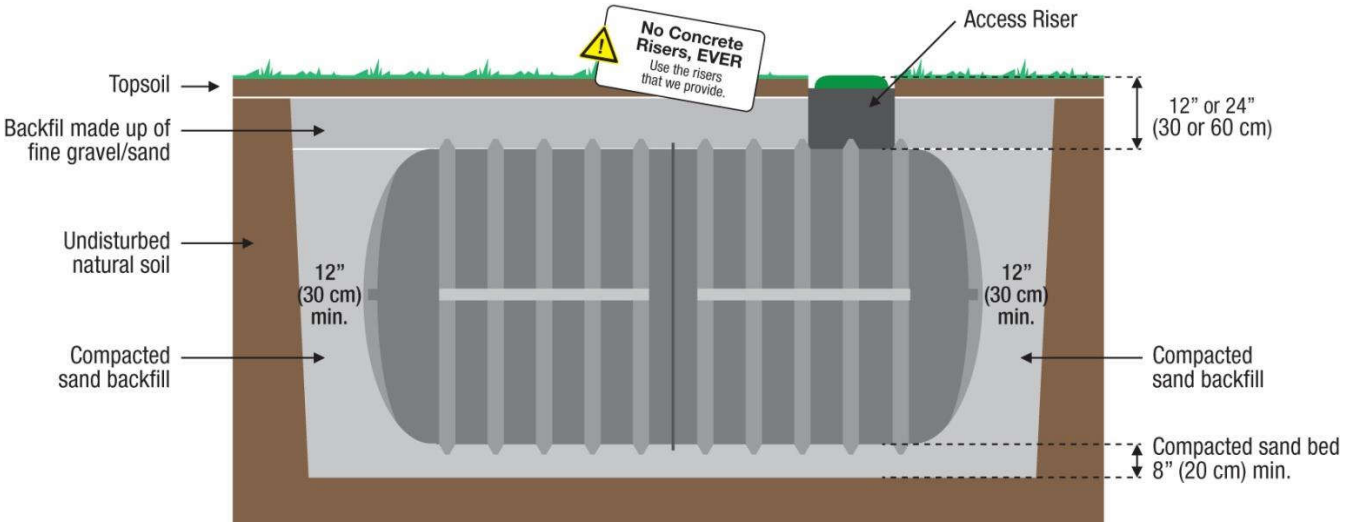
- In the case of certain large-capacity polyethylene (PE) tanks, given they are sometimes unusually long (up to 40’ feet), measures must be taken to **make sure the site will be accessible before passing the order.**
- Before backfilling, verify the overall condition of the tank and verify that all internal tubes/rods have been installed correctly.
- Use only Premier Tech Aqua branded accessories (extensions, covers, tethers, etc.).
- The tank must be filled with water during the backfill operation to balance the stresses exerted on the tank’s walls.
- The tank must be backfilled with class A sand. This sand must be compacted and the backfilling is done in successive (approximately 12’’, 300 mm) with a vibrating plate of 24” (600 mm) width or less. A vibrating plate weighing less than 330 lb (150 kg) is recommended.
- The tank may be covered by a mix containing 80 % of fine gravel/sand (granul. 0-3/4’’ (0/10mm)) and topsoil.
- The depth of the backfill material covering the tank **must not exceed 24 inches (60 cm).** If the coverage is more than 24 inches (60 cm) deep, the “deep installation” instructions must be followed and the appropriate analyses must be done.
- In no case may **the level of the water table rise higher than the bottom third of the height** of the tank, 30'' (760 mm).
- The tank must be fully supported on a soft and firm surface.

3 Handling

- It is essential to use the anchor points to move of lift the tank. The tank must not be move by a fork-lift by the bottom of the tank.
- The anchor points use to lift the tank are installed directly on the tank for PLT-1000 model. For all the other models, the anchor points are installed on the lifting support.
- Use a chain system with hooks attached to the anchor points to handle the tank.
- Given the large dimensions of certain tanks, the use of a crane of an appropriate lifting capacity may be required.

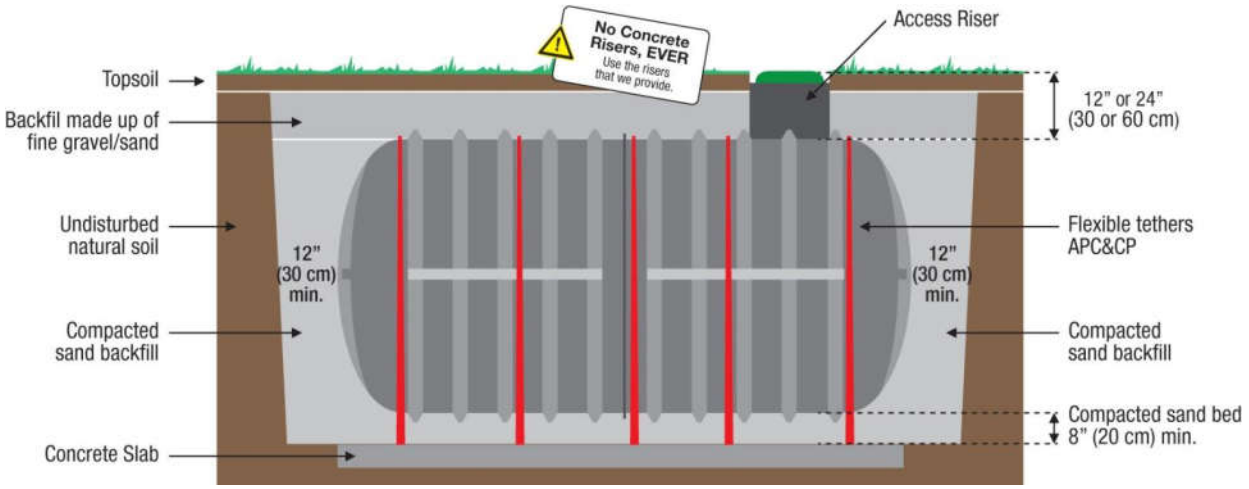


4 Installation in dry zones



- The entire length of the tank must absolutely **rest on a bed of sand or 0-½" inch (0/10 mm) gravel** that is at least 8" (20 cm) deep.
- A space of **12" (30 cm) between the tank and the walls of the excavation site around the tank's perimeter** must be backfilled with this same material in successive highly compacted layers of 30 cm.
- The upper portion of the backfill is made up of fine gravel/sand. Backfilling is done in successive layers and may be completed by a thin layer of topsoil (4" (10 cm) maximum).
- The total depth of the **coverage cannot exceed 24" (60 cm)**. If the coverage is **deeper than 24" (60 cm)**, follow the "deep installation" instructions.
- It is important to fill the tank with clear water while backfilling to equilibrate the strength on each side of the tank wall. The maximum differential accepted is 12" (300 mm).
- The tank must be backfilled with class A sand. The sand must be compacted by layers of 12" maximum (300 mm) with a vibrating plate of 24" (600 mm) or less. A maximum weight of 300 lb for the vibrating plate is recommended.

5 Installation in humid zones (flood-prone areas, water tables, runoff areas, etc.) and difficult soils (clayey, etc.)



- The entire length of the tank must absolutely **rest on a bed of sand or 0-½" inch (0/10 mm) gravel** that is well compacted and at least 8" (20 cm) deep. It must also be tethered (using the anchor points and tether straps provided by PTA) to a concrete slab at the bottom of the excavation site. This concrete slab must weigh at least as much as the tank filled with water.
    - An appropriate analysis conducted by a specialized firm will determine the weight of the concrete slab as well as the number of straps required. If no studies were realized, the following table may be use as a reference.

Table 2 - Tether straps and concrete slab for each tank

Models	PLT-1000	PLT-1500	PLT-2000	PLT-2500	PLT-3000	PLT-3500	PLT-4000	PLT-4500	PLT-5000
Tether straps number	2	3	4	5	6	8	8	10	10
Weight of concrete slab	10 t	15 t	20 t	25 t	30 t	35 t	40 t	45 t	50 t

- A space of **12" (30 cm) between the tank and the walls of the excavation site around the tank's perimeter** must be backfilled with this same material in successive highly compacted layers of 30 cm.
- In no case may **the level of the water table rise higher than the bottom third of the height** of the tank.
- According to trade practices, measures must be taken to provide for a drainage system (water drainage collection system at the bottom of the excavation site and pump to evacuate the drained water) or the tank must be installed less deep in the ground.
- If the water table rises to the level of the tank without however exceeding the allowable maximum, the use of a concrete slab and tethering straps is mandatory. The tethers must be connected to corrosion-resistant reinforcing steel rods forming one piece with the slab.
- The upper portion of the backfill is made up of fine gravel/sand. Backfilling is done in successive layers and may be completed by a thin layer of topsoil (4" (10 cm) maximum).
- It is important to fill the tank with clear water while backfilling to equilibrate the strength on each side of the tank wall. The maximum differential accepted is 12" (300 mm).
- The total depth of the **coverage cannot exceed 24" (60 cm).** If the coverage is **deeper than 24" (60 cm)**, follow the "deep installation" instructions.
- It is important to fill the tank with clear water while backfilling to equilibrate the strength on each side of the tank wall. The maximum differential accepted is 12" (300 mm).
- The tank must be backfilled with class A sand. The sand must be compacted by layers of 12" maximum (300 mm) with a vibrating plate of 24" (600 mm) or less. A maximum weight of 300 lb for the vibrating plate is recommended.
- The tether straps must be installed over the lifting support and fixed each side of the tank.

Figure 1 - Examples of an inappropriate installation of tether straps

Wrong: Tether strap directly on the tank



Wrong: Tether strap installed on the lifting support



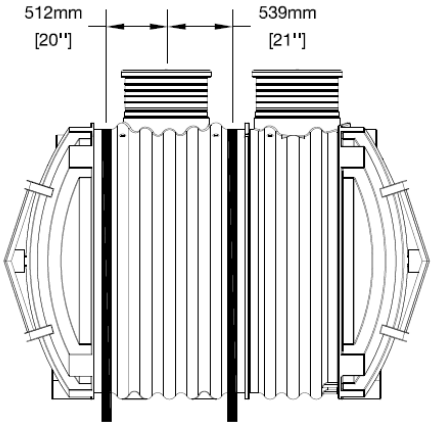
Figure 2 - Example of how to install tether straps correctly on large capacity tanks

Tether straps are correctly installed because they are passing over the lifting support.

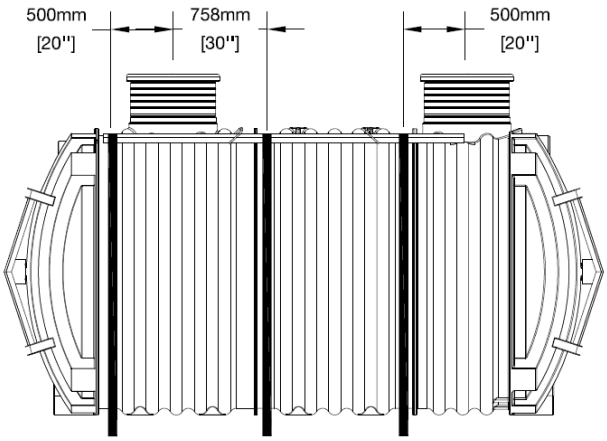


Table 3 - Where to install the tether straps on each tank

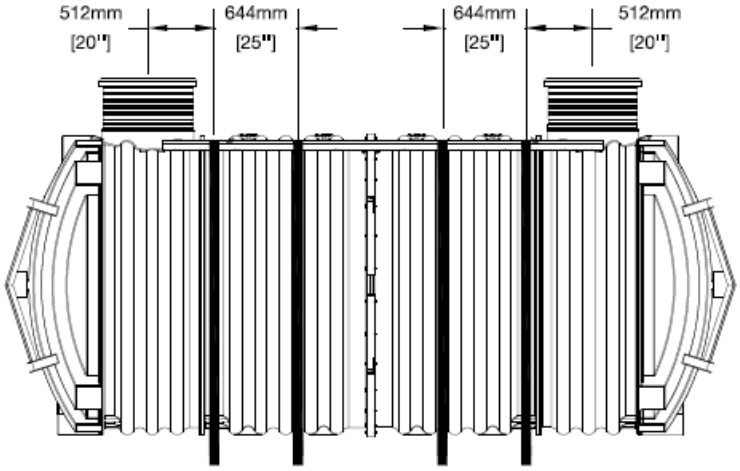
PLT-1000



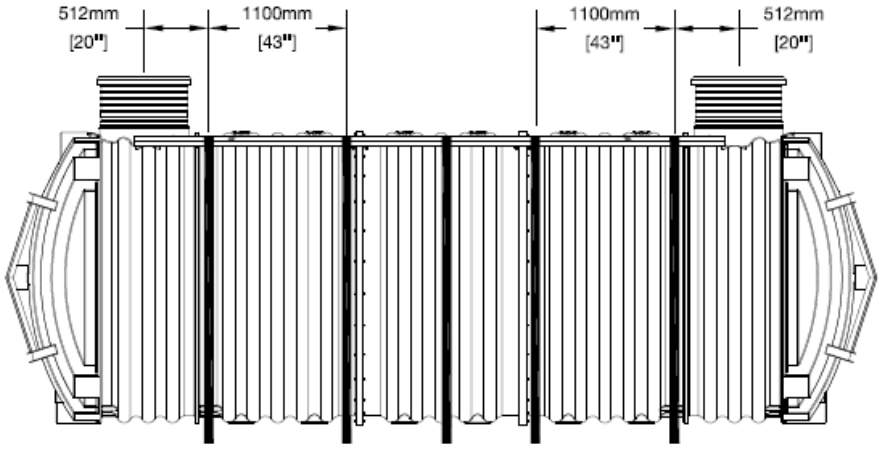
PLT-1500



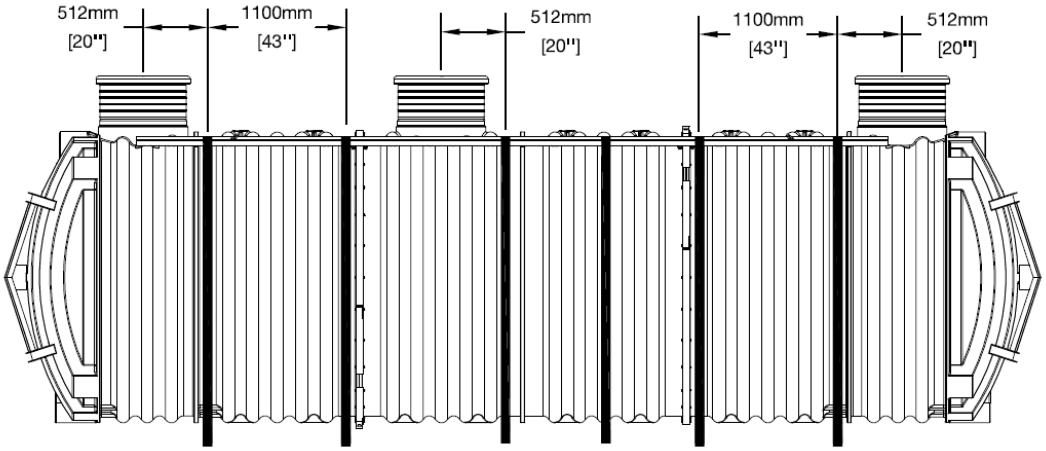
PLT-2000



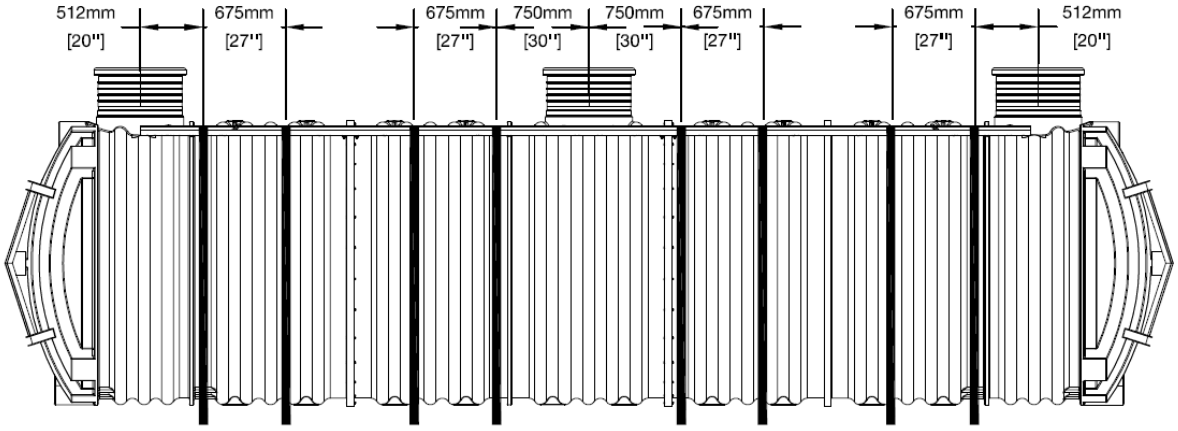
PLT-2500



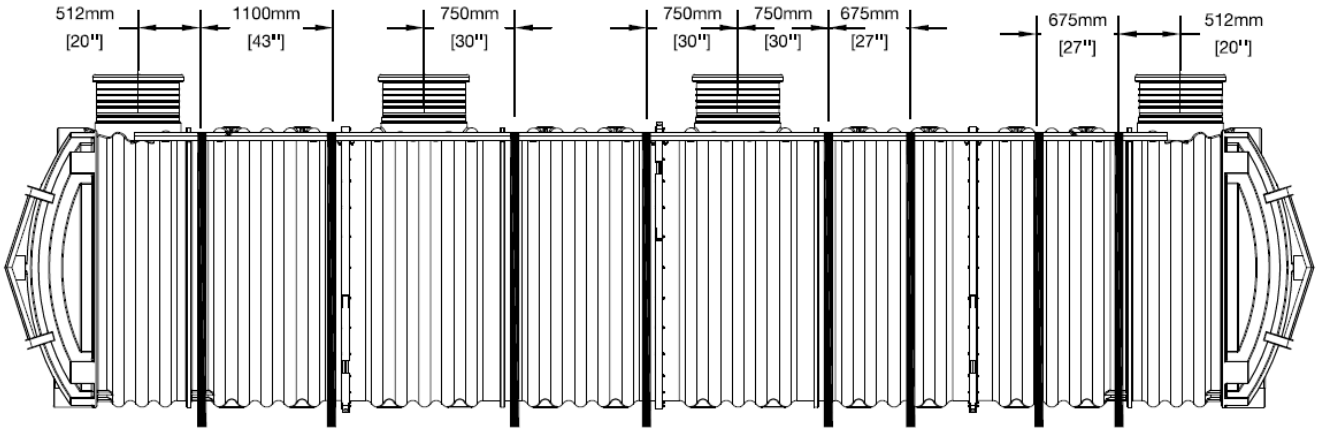
PLT-3000



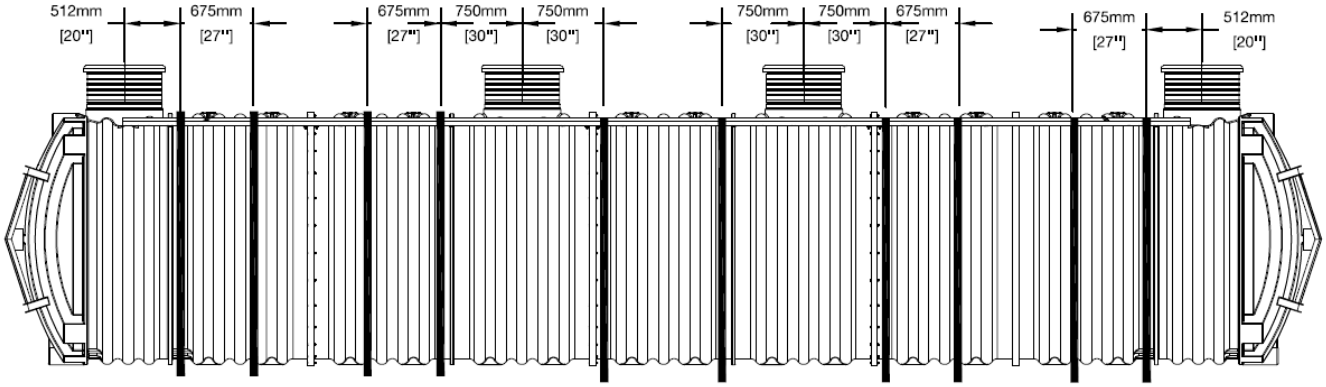
PLT-3500



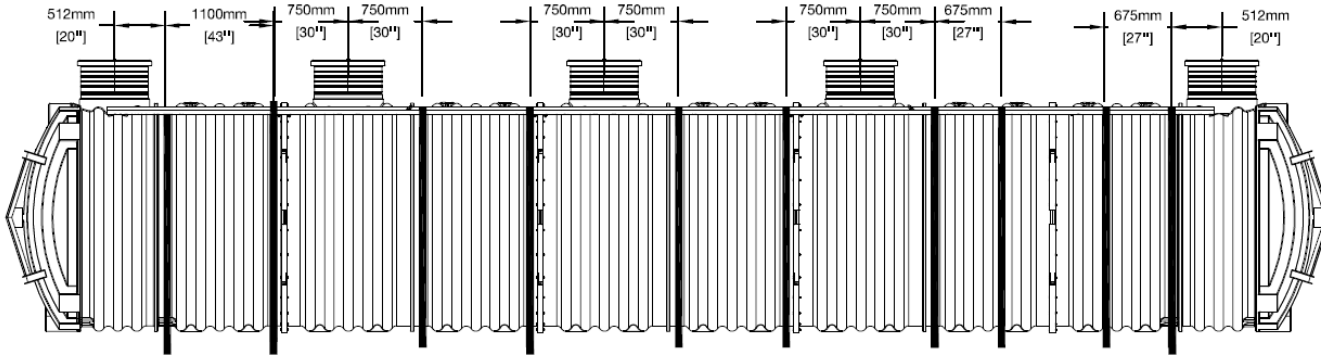
PLT-4000



PLT-4500



PLT-5000



6 Deep installations

- The depth of the backfill material covering the tank **must not exceed 20” (50 cm).** If the coverage is more than 20” (50 cm) deep, an appropriate study must be conducted by an engineer.
- Never use concrete extensions unless a self-supporting load distribution slab is installed without direct contact with the tank (this analysis must be conducted by a specialized firm).
- In both cases, contact Premier Tech Aqua to have the approach validated in accordance with the tank’s specifications.

7 Vehicle crossings and high load sites

- Never drive vehicles or place objects weighing over 450 lb (200 kg) within 10’ (3 m) of the lids.

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MBBR 660– Internal components

Installation guide

This guide provides the information required to plan and execute the installation of a ***Premier Tech Aqua MBBR 660 internal components*** *for commercial, institutional or community use.* Please read this guide in full before beginning the installation process. This installation guide is generic in nature and does not replace the detailed instructions and specifications stipulated in your engineering plans. Any inconsistency found between your engineering plans and the instructions provided in this guide must be brought to the attention of your engineer. *For further information, please contact our technical support department:* ***1 800 632-6356.***

1 Equipments to install on site

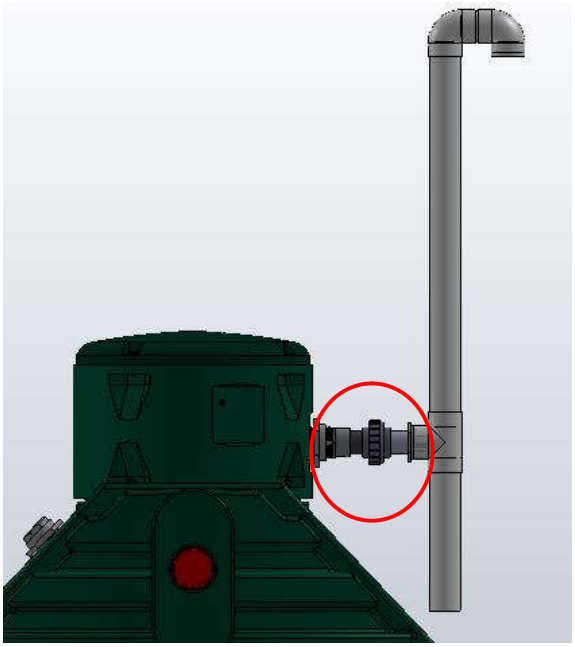
Some components of the MBBR are shipped on a pallet and must be installed on site by the installer. The components are not already installed inside the tank to avoid damaging the components and the tank during transportation. The components must be installed before backfilling and before adding fresh water in the tank.

- Vent
- Float tree

Also, the blower(s) and the MBBR(s) air inlet piping must be fabricated with galvanized steel.

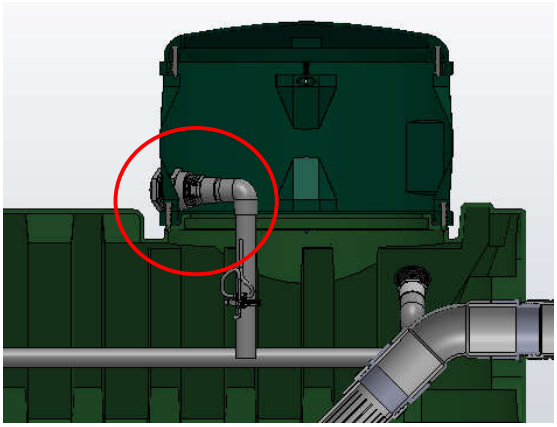
2 Vent installation

The vent must be connected to the 3" threaded union located on the MBBR inlet manhole riser. The female threaded union end must be threaded to the male threaded union end coming from the riser. The threaded union is circled in the picture below.



3 Float tree installation

The float tree must be installed inside the manhole located at the MBBR inlet. A cam coupler 1½'' is used to connect the tree to the riser. Find the cam coupler male part inside the inlet riser and connect the cam coupler female part of the float tree.

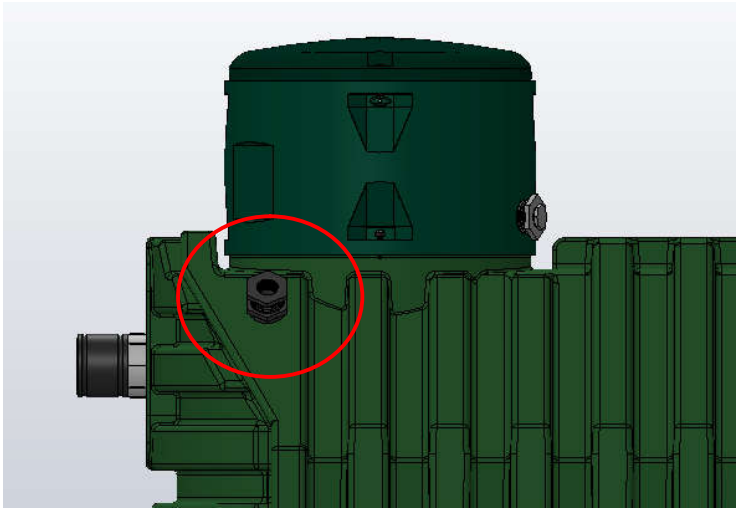




Do not adjust the float position. It has already been adjusted during the fabrication.

4 Aeration piping

Galvanized steel must be use to connect the blowers to the MBBR tank. Connect the galvanized pipe to the tank fitting located on the tank near the MBBR outlet access. A 2" male NPT needs to be used to connect the aeration piping to the 2" female NPT exiting of the tank. The connection site is circle in the picture below.



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MBBR PLT– Internal components

Installation guide

*This guide provides the information required to plan and execute the installation of a **Premier Tech Aqua MBBR PLT internal components** for commercial, institutional or community use.* Please read this guide in full before beginning the installation process. This installation guide is generic in nature and does not replace the detailed instructions and specifications stipulated in your engineering plans. Any inconsistency found between your engineering plans and the instructions provided in this guide must be brought to the attention of your engineer. *For further information, please contact our technical support department: **1 800 632-6356.***

1 Equipment to install on site

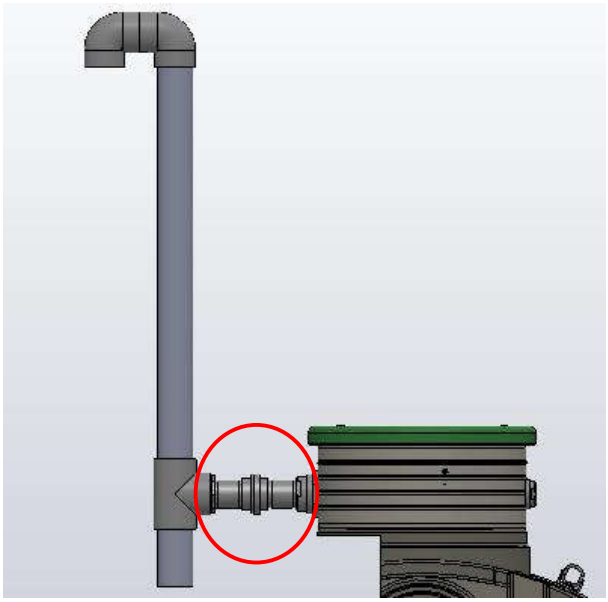
Some components of the MBBR are shipped on a pallet and must be installed on site by the installer. The components are not already installed inside the tank to avoid damaging the components and the tank during transportation. The components must be installed before backfilling and before adding fresh water in the tank.

- Vent
- Float tree

Also, the blower(s) and the MBBR(s) air inlet piping must be fabricated with galvanized steel.

2 Vent installation

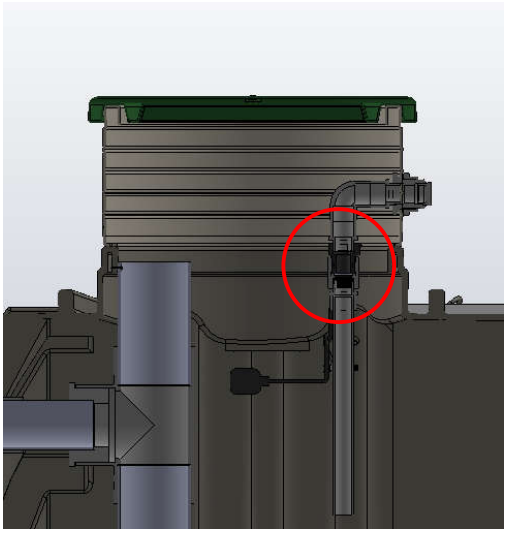
The vent must be connected to the 3” threaded union located on the MBBR inlet manhole riser. The female threaded union end must be threaded to the male threaded union end coming from the riser. The threaded union is circled in the picture below.



3 Float tree installation

The float tree must be installed inside the manhole located at the MBBR inlet. A cam coupler 1½'' is used to connect the tree to the riser. Find the cam coupler male part inside the inlet riser and connect the cam coupler female part of the float tree.

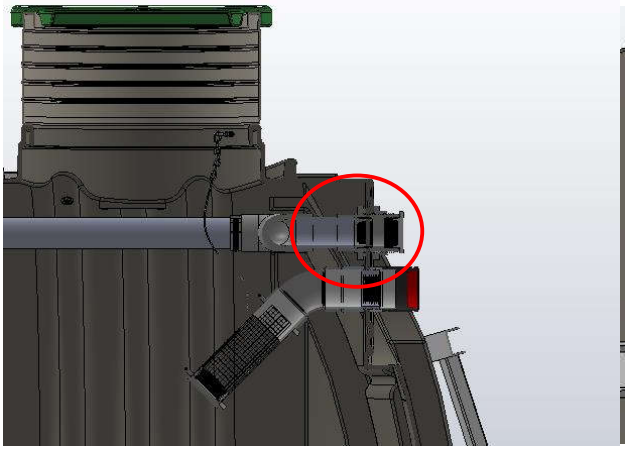


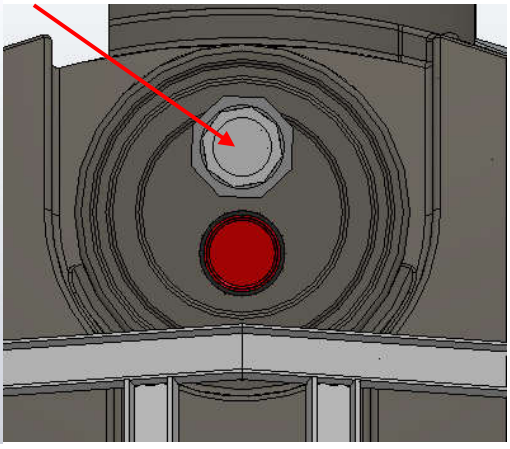


Do not adjust the float position. It has already been adjusted during the fabrication.

4 Aeration piping

Galvanized steel must be use to connect the blowers to the MBBR tank. The location of the air inlet varies with the tank sizes. This location can be found on the MBBR fabrication plan. A 2", 3'' or 4'' male NPT needs to be used to connect the aeration piping to the 2", 3'' or 4'' female NPT getting out of exiting the tank. The most frequent connection site is circled in the picture below (over the water outlet).





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Clarifier 660– Internal components

Installation guide

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1 Internal components to install on site

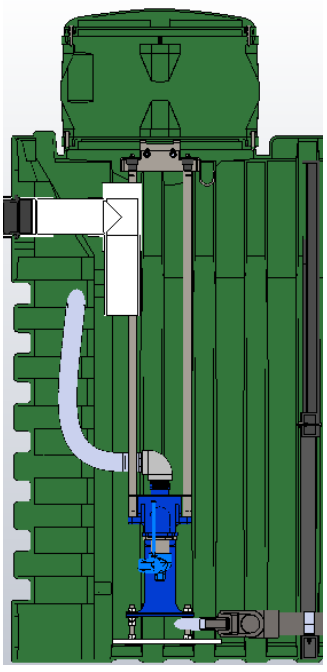
Some components of the clarifier are shipped on a pallet and must be installed on site by the installer. The components are not already installed inside the tank to avoid damaging the components and the tank during transportation. The components must be installed before backfilling and before adding fresh water in the tank.

- Sludge pumps
- Scum pump
- Float tree

All pumps need to be connected to their own flexible pipe inside the tank.

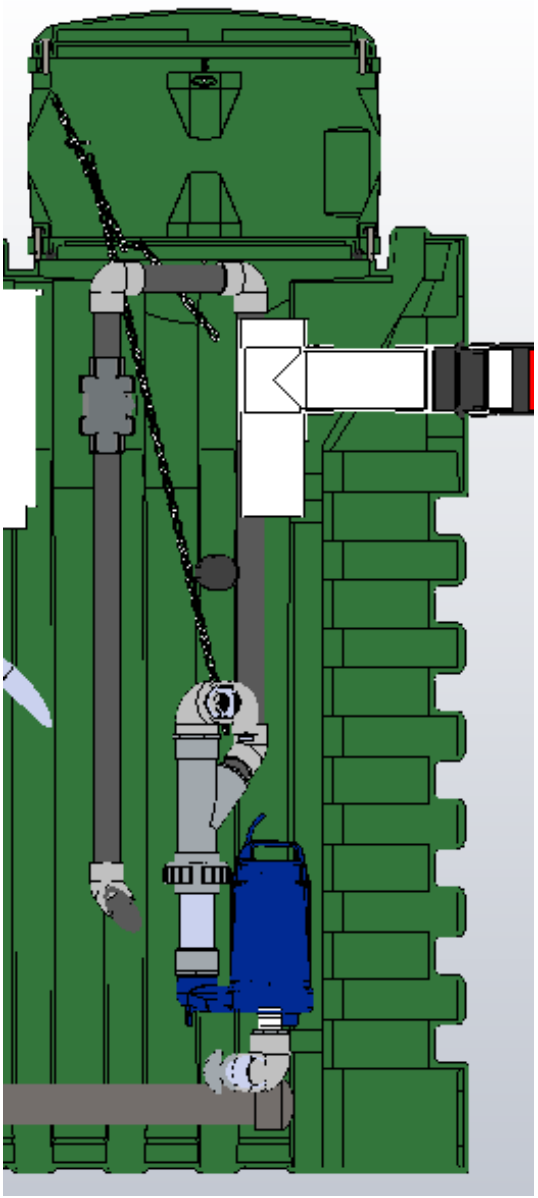
2 Sludge pump installation

The sludge pumps must be installed inside the access where the guide bars are, normally inside the access located near the clarifier water inlet. A chain is installed on every pump. It will help to get the pump out of the tank if problems occur during the operation. All chains must be fixed to the quick link installed inside the access riser once the pump installation is completed. Before fixing the pumps to the guide bars, it is important to connect the 2" flexible pipe to the pump inlet and fix the pipe with two clamps. The flexible piping to connect to the pump is normally attached to the guide rails. Insert the pump fixations inside the guide rails and let the pump slowly slide down the rails.



3 Scum pump installation

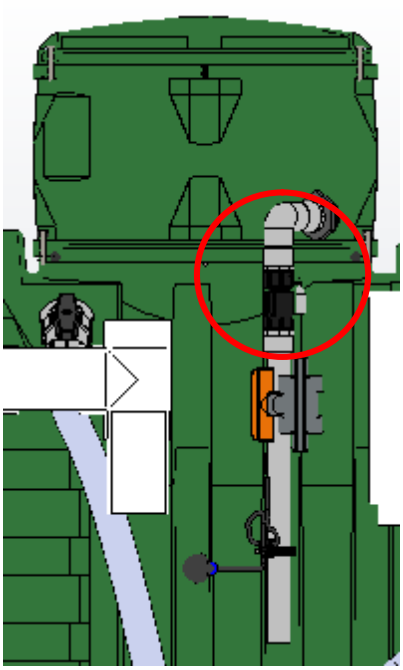
The scum pump must be installed inside the access located at the outlet of the clarifier. This pump is hanging by a chain and a rod inside the clarifier. The rod is sitting inside the riser. The chain and the rod help to remove the pump from the tank. The chain is attached to the pump and to the rod.



Also, it is important to connect the 1-1/4" flexible pipe coming from the skimmer to the 1-1/4" barbed fitting and to fix it with two clamps. The 2" flexible pipe coming from the discharge needs to be connected to the 2" barbed fitting as shown on the picture above.

4 Float tree installation

The float tree must be installed inside the manhole located at the clarifier inlet. A cam coupler 1½" is used to connect the tree to the riser. Find the cam coupler male end inside the inlet riser and connect the cam coupler female end of the float tree.



Do not adjust the float position. It has already been adjusted during the fabrication.

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Clarifier PLT– Internal components

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1 Internal components to install on site

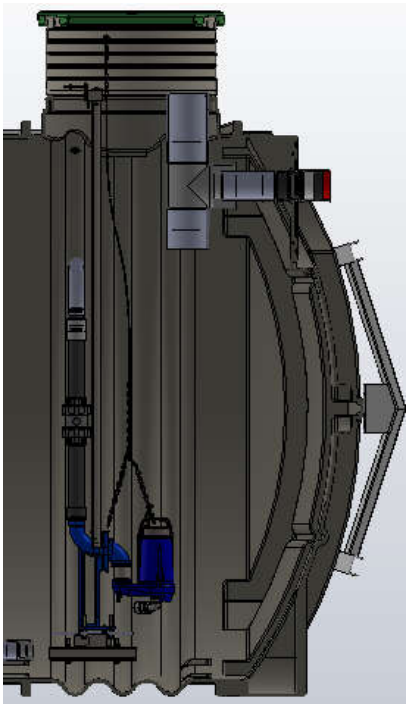
Some components of the clarifier are shipped on a pallet and must be installed on site by the installer. The components are not already installed inside the tank to avoid damaging the components and the tank during transportation. The components must be installed before backfilling and before adding fresh water in the tank.

- WAS pumps
- Scum pump
- Float tree

All pumps need to be connected to their own flexible pipe inside the tank.

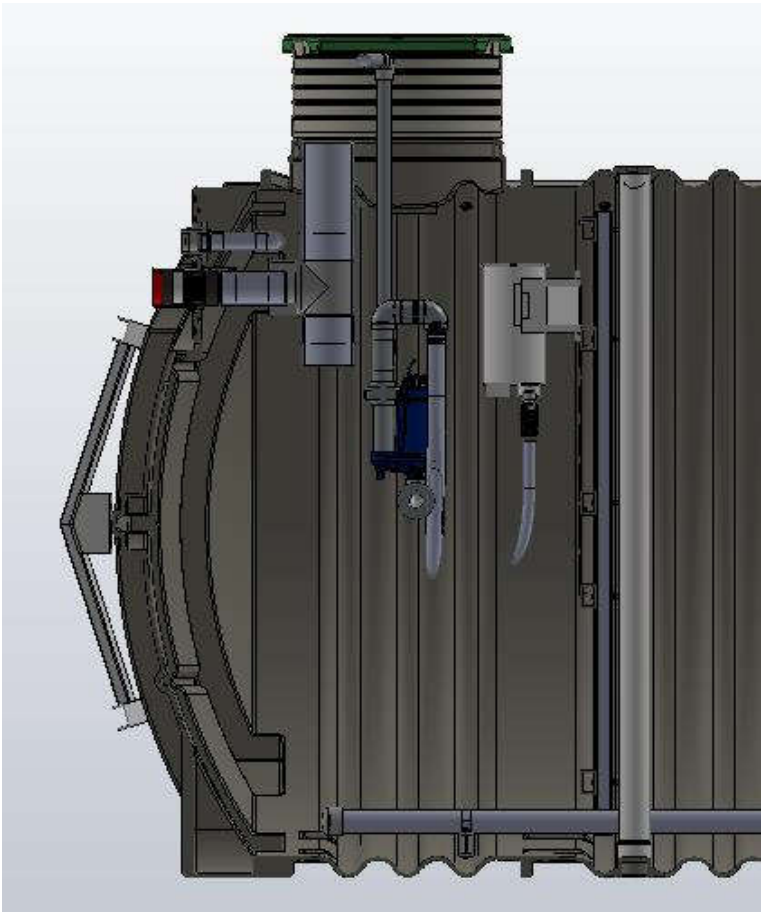
2 WAS pump installation

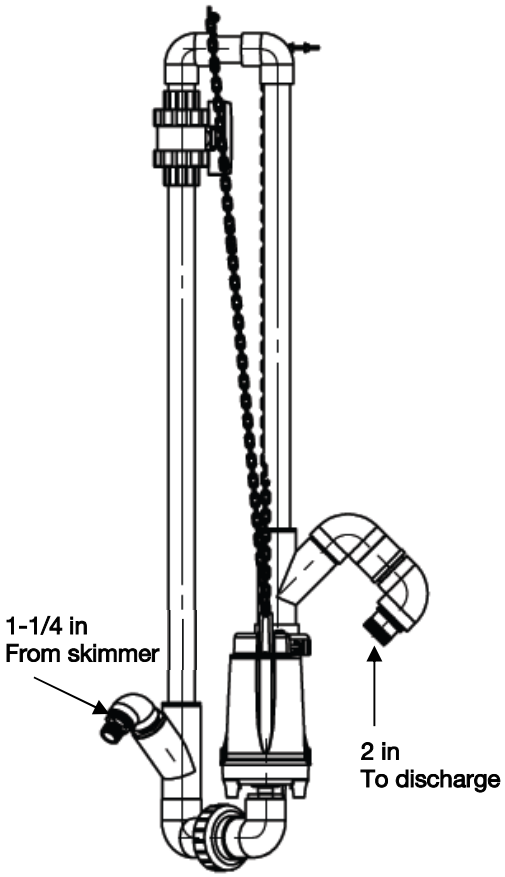
The WAS pumps must be installed inside the access where the guide bars are, normally inside the access located near the clarifier water inlet. A chain is installed on every pump. It will help to get the pump out of the tank if problems occur during the operation. All chains must be fixed to the quick link installed inside the access riser once the pump installation is completed. Before fixing the pumps to the guide bars, it is important to connect the 2" flexible pipe to the pump inlet and fix the pipe with two clamps. The flexible piping to connect to the pump is normally attached to the guide rails. Insert the pump fixations inside the guide rails and let the pump slowly slide down the rails.



3 Scum pump installation

The scum pump must be installed inside the access located at the outlet of the clarifier. This pump is hanging by a chain and a rod inside the clarifier. The rod is sitting inside the riser. The chain and the rod help to remove the pump from the tank. The chain is attached to the pump and to the rod.

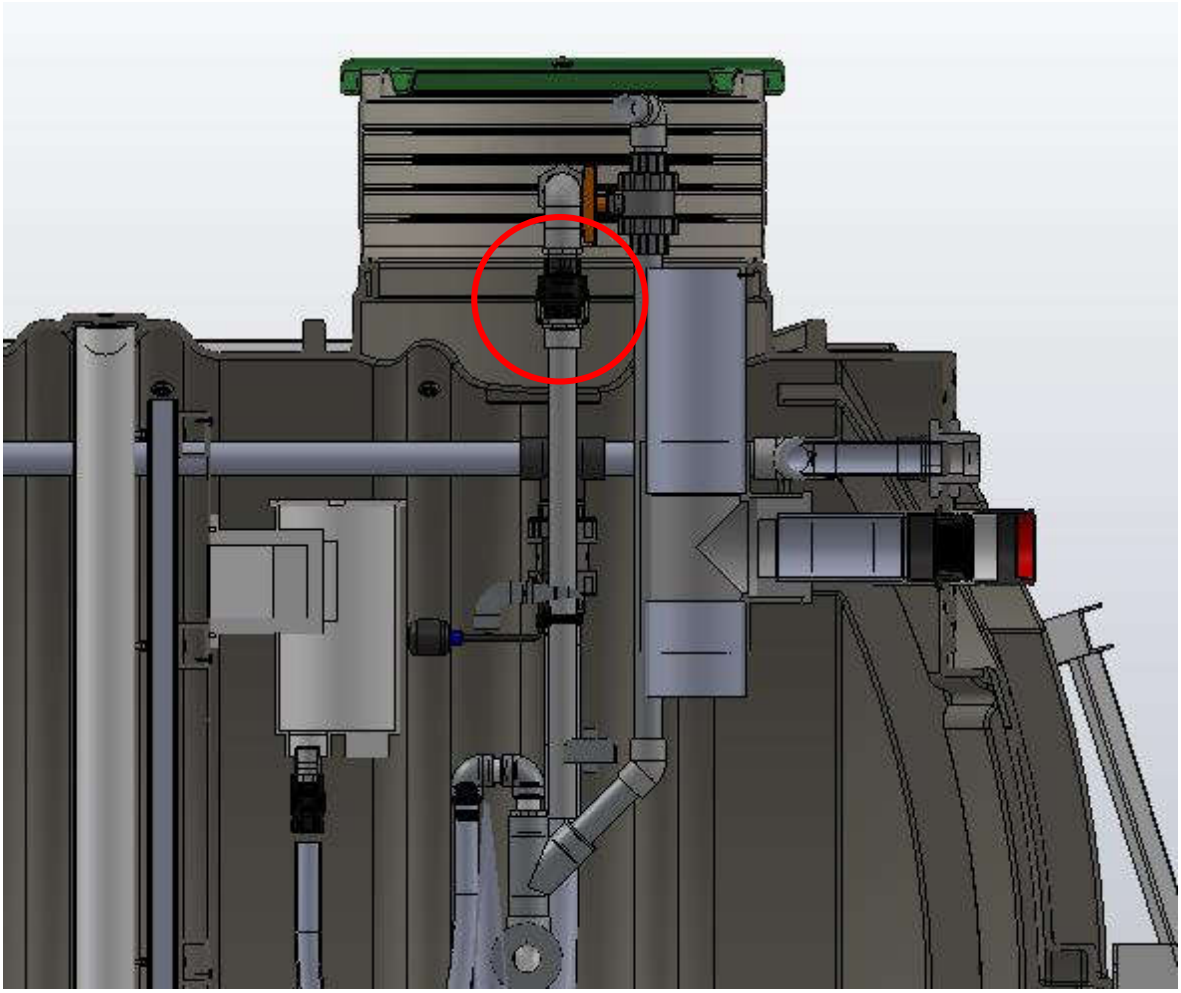




Also, it is important to connect the 1-1/4” flexible pipe coming from the skimmer to the 1-1/4” barbed fitting and to fix it with two clamps. The 2” flexible pipe coming from the discharge needs to be connected to the 2” barbed fitting as shown on the picture above.

4 Float tree installation

The float tree must be installed inside the manhole located at the clarifier inlet. A cam coupler 1½’’ is used to connect the tree to the riser. Find the cam coupler male end inside the inlet riser and connect the cam coupler female end of the float tree



Do not adjust the float position. It has already been adjusted during the fabrication.

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NOTE

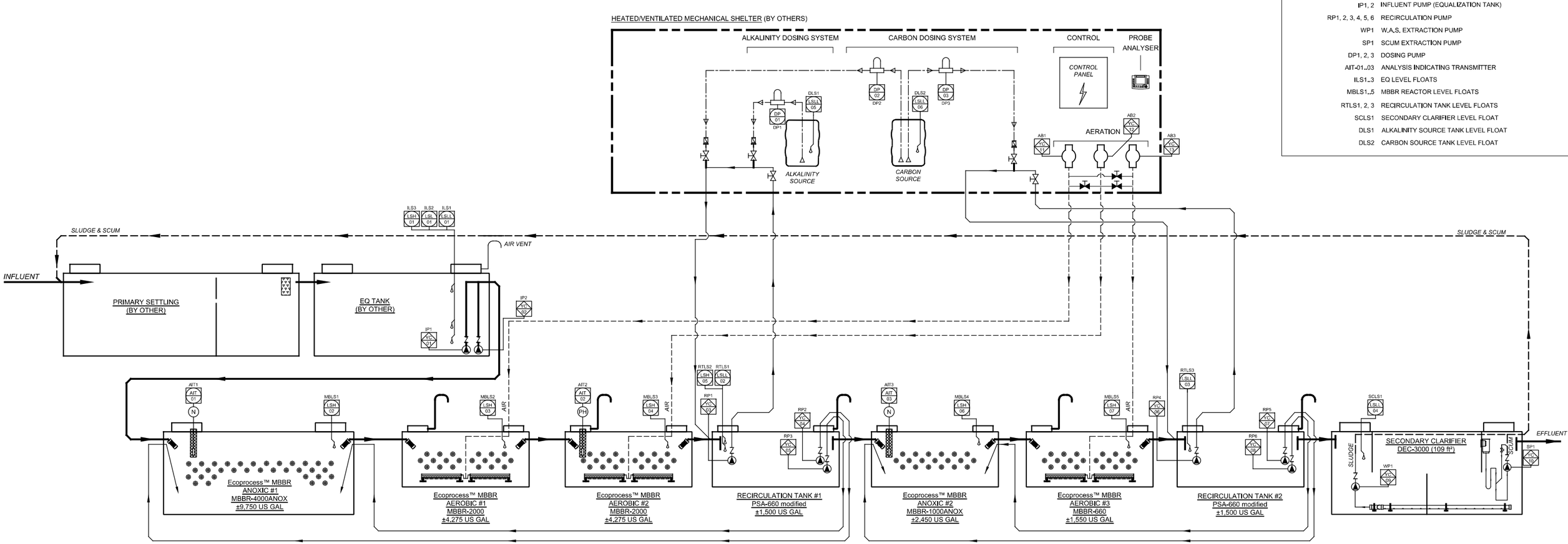
1. INTERCONNECTING PIPING & FITTINGS BY OTHERS

LEGEND

- CHECKVALVE
- ANOXIC MBBR DIFFUSER
- AirOmega™ DIFFUSER
- FLOAT SWITCH
- SUBMERSIBLE PUMP
- BLOWER
- MANUAL VALVE
- PH PROBE
- NITRATE (NO3) PROBE
- DOSING PUMP

EQUIPMENT SEQUENTIAL COMMAND — EQUIPMENT COMMAND

LSH	HIGH LEVEL ALARM FLOAT (HIGH LEVEL SWITCH)
LSL	LOW LEVEL FLOAT (LOW LEVEL SWITCH)
LSLL	LOW LEVEL ALARM FLOAT (LOW LOW LEVEL SWITCH)
AB1, 2, 3	AIR BLOWER
IP1, 2	INFLUENT PUMP (EQUALIZATION TANK)
RP1, 2, 3, 4, 5, 6	RECIRCULATION PUMP
WP1	W.A.S. EXTRACTION PUMP
SP1	SCUM EXTRACTION PUMP
DP1, 2, 3	DOSING PUMP
AIT-01..03	ANALYSIS INDICATING TRANSMITTER
ILS1..3	EQ LEVEL FLOATS
MBLS1..5	MBBR REACTOR LEVEL FLOATS
RTLS1, 2, 3	RECIRCULATION TANK LEVEL FLOATS
SCLS1	SECONDARY CLARIFIER LEVEL FLOAT
DLS1	ALKALINITY SOURCE TANK LEVEL FLOAT
DLS2	CARBON SOURCE TANK LEVEL FLOAT



No	DATE	REVISION	BY
01	2022-03-23	ADD 2 MBBR 2000	

PREMIER TECH AQUA

1-800-632-6356 PREMIERTECHAQUA.COM

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TITLE

Ecoprocess™ MBBR (N-DN)

Process & Instrumentation Diagram

PROJECT

Country life Community

TOL. X. ± 0.1875" .X ± 0.0625" .XX ± 0.0156"

PROJ.

FOR INFORMATION

SCALE N.T.S.

PAPER SIZE B

DRAFTER	DATE	MATERIAL	PROJECT No.	REV.
BLAG3	2022-03-21		P-66598	1

VERIFIED BY	DATE	UNITS	DRAWING NUMBER	PAGE 1 OF 1
M. SEGUIN			P-6658-P&ID	

APPROVED BY	DATE	CERTIFICATION
A. MEHNA		

POLYLOK™ Inc.
Innovations in Precast, Drainage & Wastewater Products
Zabel® A Division of Polylok Inc.

PL-525, PL-625 Effluent Filters & Grease Traps

1/16" Filtration Slots

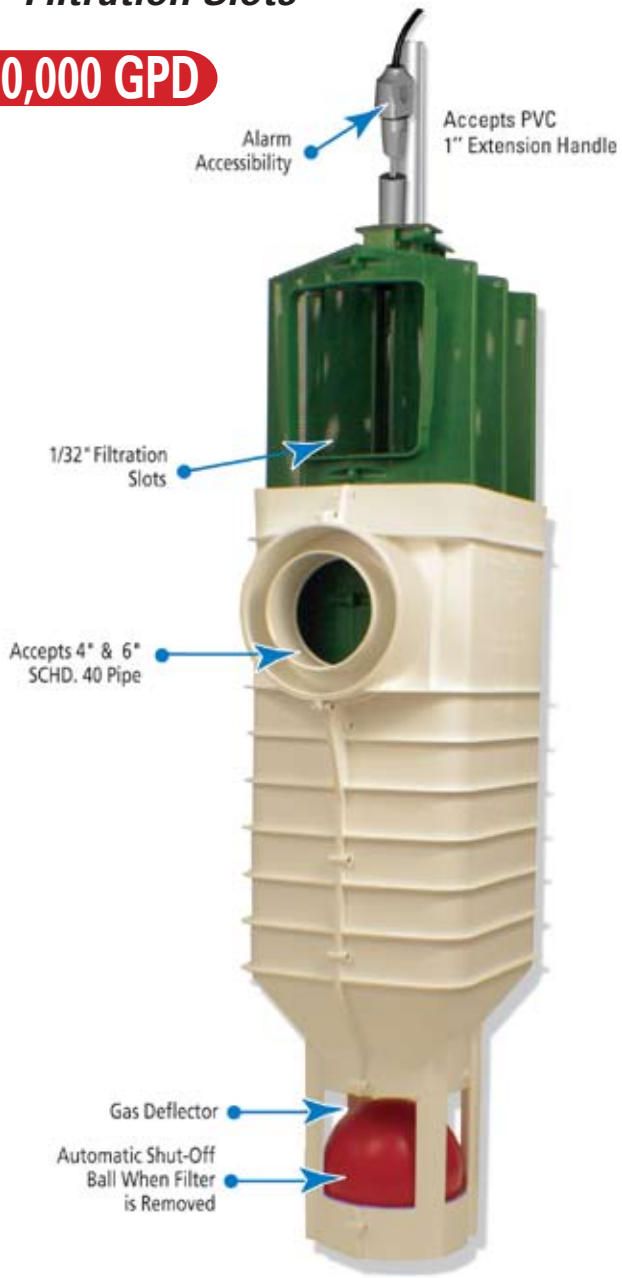
10,000 GPD



PL-525

1/32" Filtration Slots

10,000 GPD



PL-625



Outdoor Smart Filter Alarm

All Polylok/Zabel filters accept the SmartFilter® switch and alarm.

PL-525 Filter

The PL-525 Filter is rated for over 10,000 GPD (gallons per day) making it one of the largest filters in its class. It has 525 linear feet of 1/16" filtration slots. Like the Polylok PL-122, the Polylok PL-525 has an automatic shut off ball installed with every filter. When the filter is removed for cleaning, the ball will float up and temporarily shut off the system so the effluent won't leave the tank.

Features:

- Rated for 10,000 GPD (Gallons Per Day)
- 525 linear feet of 1/16" filtration
- Accepts 4" and 6" SCHD. 40 pipe
- Built in Gas Deflector
- Automatic shut-off ball when filter is removed
- Alarm accessibility
- Accepts PVC extension handle
- Lightweight



PL-525 & PL-625 Installation:

Ideal for residential and commercial waste flows up to 10,000 Gallons Per Day (GPD).

1. Locate the outlet of the septic tank.
2. Remove the tank cover and pump tank if necessary.
3. Glue the filter housing to the 4" or 6" outlet pipe. If the filter is not centered under the access opening use a Polylok Extend & Lok or piece of pipe to center filter.
4. Insert the PL-525 or PL-625 filter into its housing.
5. Replace and secure the septic tank cover.

PL-625 Effluent Filter

The PL-625 filter is ideal for grease trap applications. The 1/32" filtration has been shown to reduce fats, oils, and grease (FOG) by as much as 60% to 98%! The filter may be used in onsite wastewater systems that require a finer level of TSS removal. Whatever the application, Polylok has the filter for you!

Ideal for:

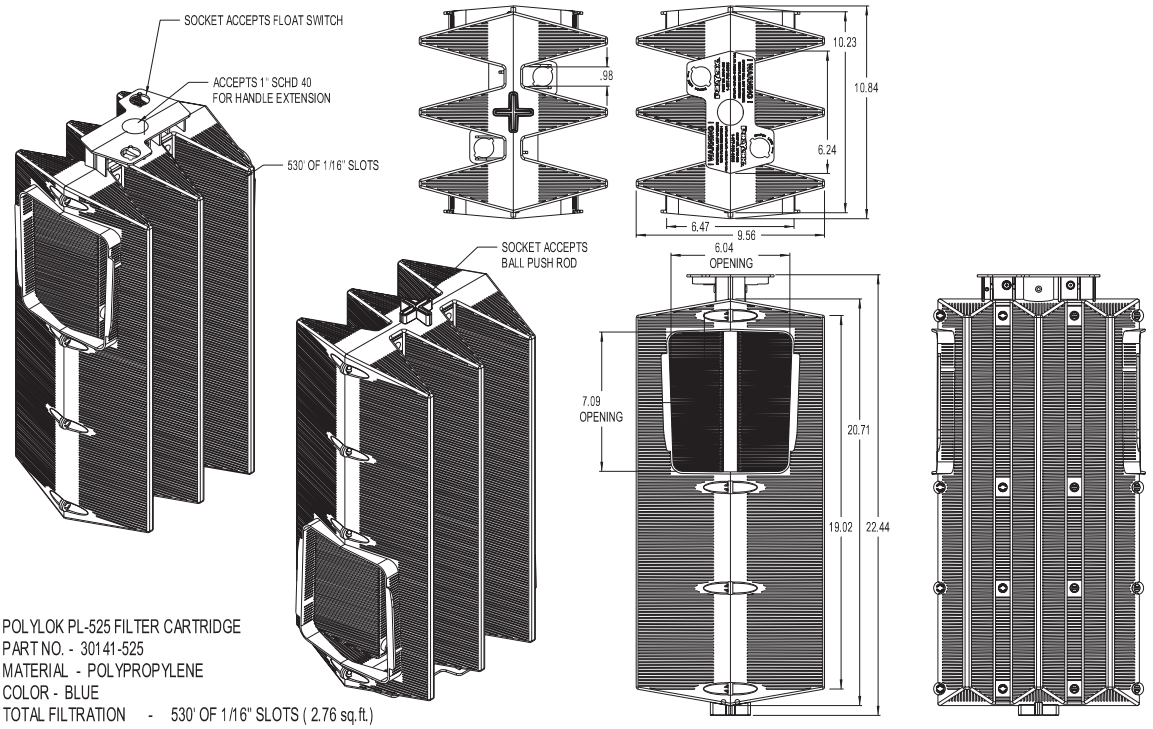
- Grease Traps
- Laundromats
- Dog Kennels

PL-525 & PL-625 Maintenance:

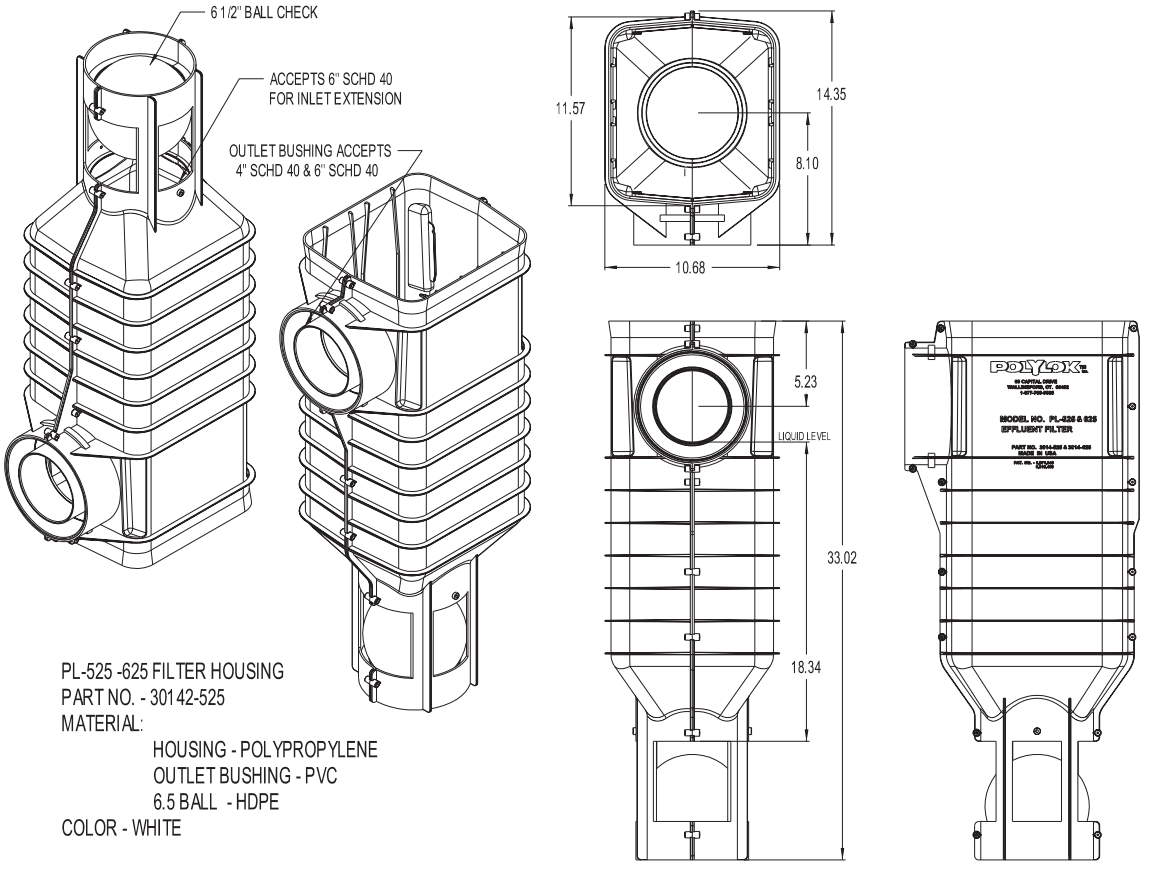
The PL-525 & PL-625 Effluent Filters will operate efficiently for several years under normal conditions before requiring cleaning. It is recommended that the filter be cleaned every time the tank is pumped or at least every three years. If the installed filter contains an optional alarm, the owner will be notified by an alarm when the filter needs servicing. Servicing should be done by a certified septic tank pumper or installer.

1. Locate the outlet of the septic tank.
2. Remove tank cover and pump tank if necessary.
3. Do not use plumbing when filter is removed.
4. Pull PL-525 or PL-625 out of the housing.
5. Hose off filter over the septic tank. Make sure all solids fall back into septic tank.
6. Insert the filter cartridge back into the housing making sure the filter is properly aligned and completely inserted.
7. Replace and secure septic tank cover.

PL-525 EFFLUENT FILTER

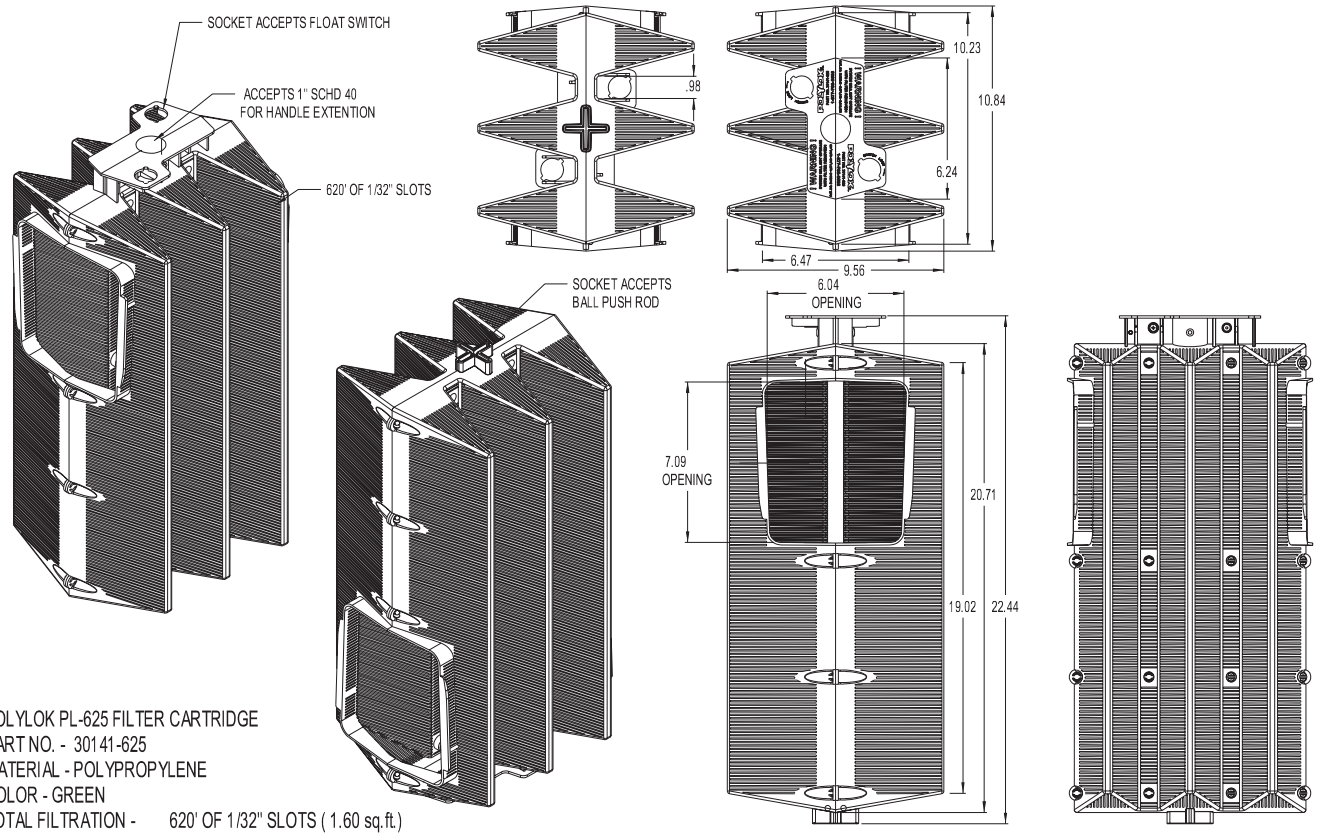


POLYLOK PL-525 FILTER CARTRIDGE
PART NO. - 30141-525
MATERIAL - POLYPROPYLENE
COLOR - BLUE
TOTAL FILTRATION - 530' OF 1/16" SLOTS (2.76 sq.ft.)
TOTAL FILTER SURFACE - 1,380 SQ. IN.

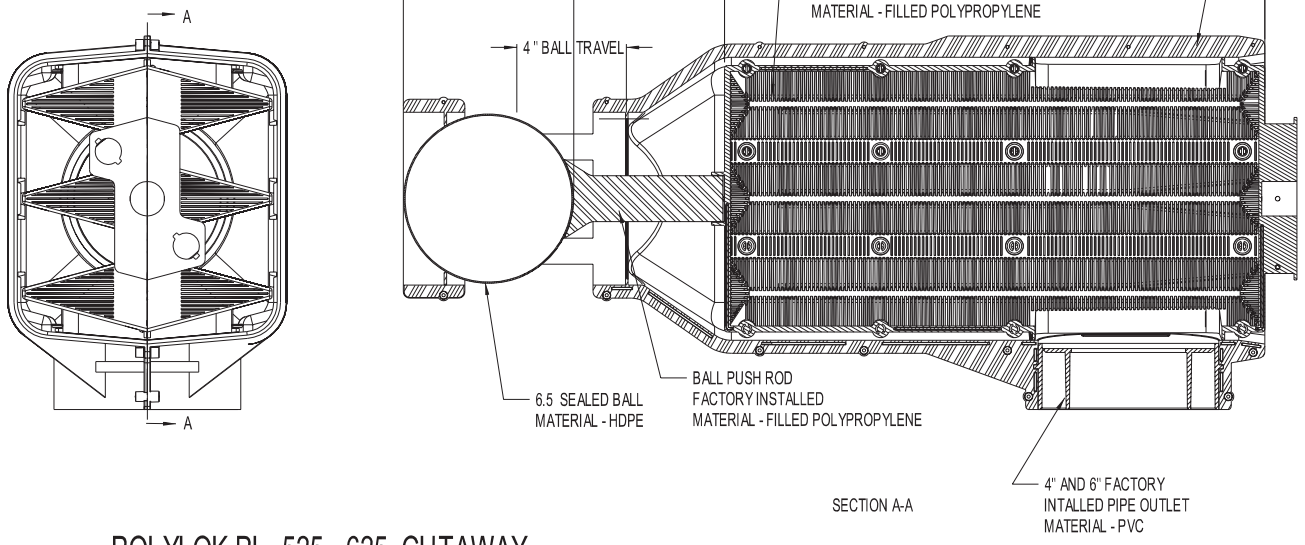


PL-525 -625 FILTER HOUSING
PART NO. - 30142-525
MATERIAL:
HOUSING - POLYPROPYLENE
OUTLET BUSHING - PVC
6.5 BALL - HDPE
COLOR - WHITE

PL-625 EFFLUENT FILTER



POLYLOK PL-625 FILTER CARTRIDGE
PART NO. - 30141-625
MATERIAL - POLYPROPYLENE
COLOR - GREEN
TOTAL FILTRATION - 620' OF 1/32" SLOTS (1.60 sq.ft.)
TOTAL FILTER SURFACE - 1,380 SQ. IN.



POLYLOK PL- 525 - 625 CUTAWAY

Champion Pump

CPE

4/10 - 1/2HP
EFFLUENT

Every pump tested in water to ensure pump meets peformance curve.

SSPMA CERTIFIED

FEATURES/BENEFITS

PERFORMANCE
Heads up to 65' TDH
Flows up to 86 GPM

MOTOR
High efficient, 115v or 230v, oil filled, permanent split capacitor motor with upper and lower ball bearings and thermal overload protection
- Constant bearing lubrication
- Maximum motor cooling
- Runs cooler and lasts longer
- Internal overload protection
- Quiet operation
- Fasteners and shaft made from rugged, corrosion resistant stainless steel

SEAL DESIGN
Type 21 inboard seal design with secondary exclusion seal
- Rotating components of seal are in the motor housing, being lubricated by the motor oil preventing foreign matter from wrapping around the seal components
- Seal will last longer if the pump runs dry
- Secondary exclusion seal keeps debris from entering the seal cavity

IMPELLER DESIGN
Non-clog style, cast-iron vortex impeller (CPEH Thermoplastic Vortex)
- Designed to help reduce clogging by foreign material

POWER CORD
Sealed entry quick disconnect power cords
- Prevents water from entering the motor housing through a cut cord
- Easy to replace in the field
- Available in lengths up to 100'

SWITCH
Piggy-back switch design
- Defective switches can be diagnosed over the phone
- Pump can be operated manually or supplied with other piggy-back switches
- Switch can be replaced without having to replace the pump

APPLICATIONS
Dewatering, septic systems, residential and commercial developments, elevator pits and STEP systems





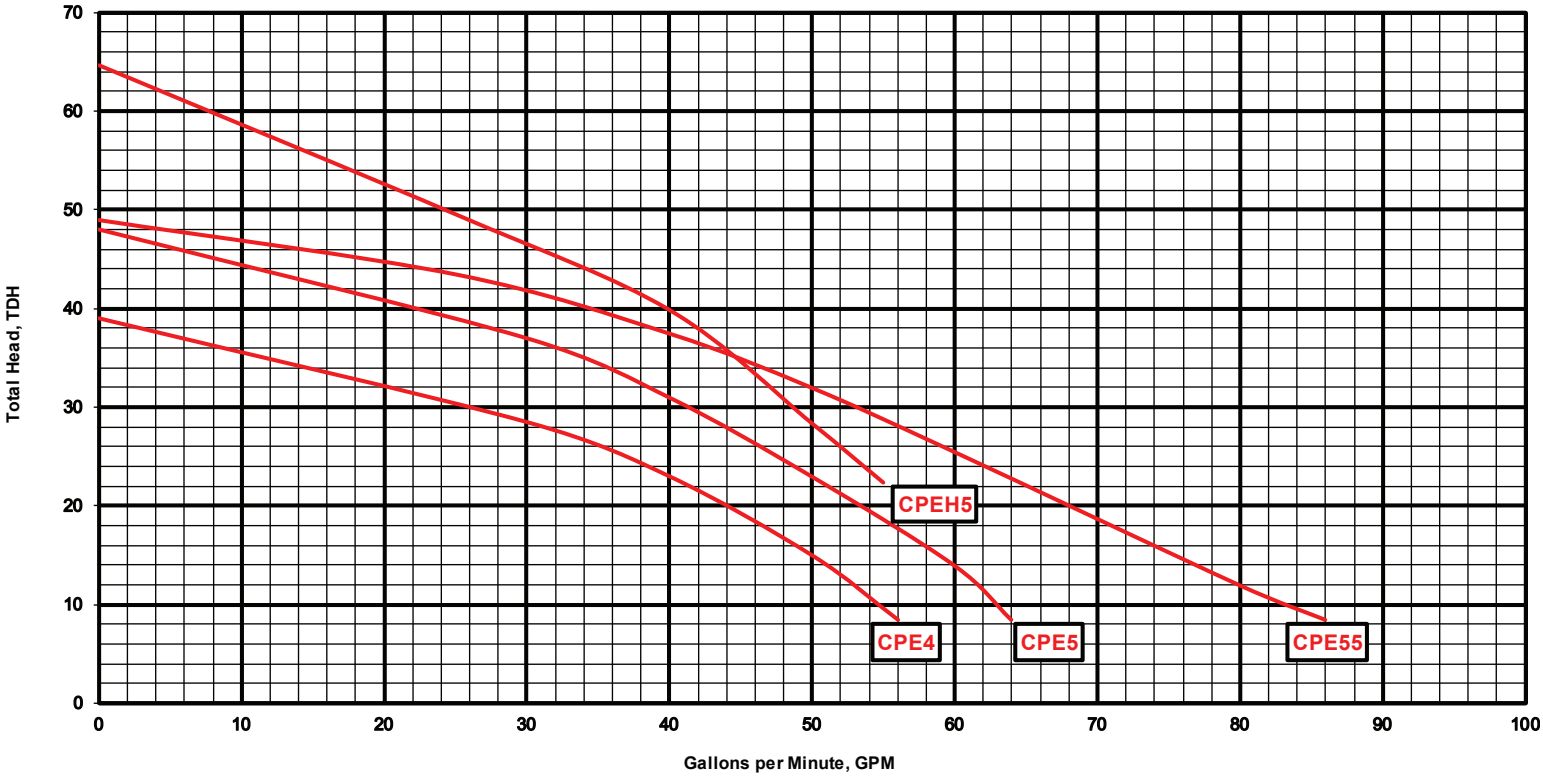
Vertical Float



Wide-Angle Float

4/10-1/2 HP submersible pumps that handle up to 3/4" solids with 2" discharge

PERFORMANCE CURVE

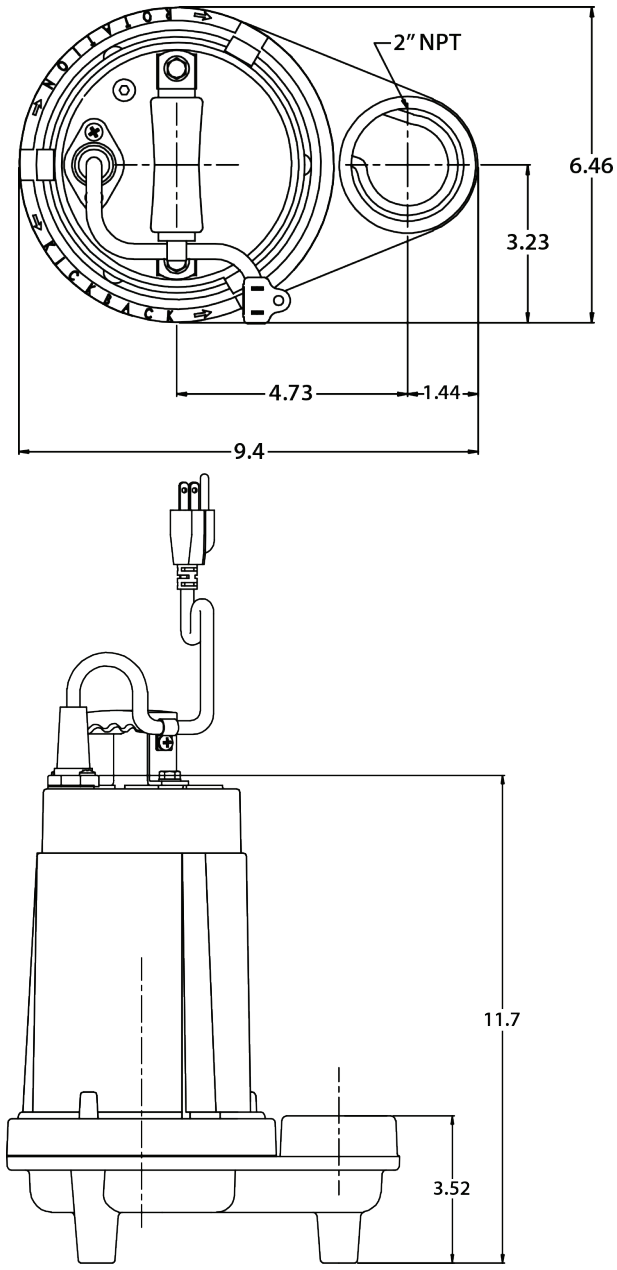


Champion Pump Company, Inc • P.O. Box 528 • Ashland, OH 44805
Phone 419-281-4500 • Fax 419-616-1100 • www.championpump.com

REV 1017

TECHNICAL DATA

DISCHARGE	2" NPT. vertical standard
LIQUID TEMPERATURE	140 Degrees F. (Intermittent)
MOTOR HOUSING	Cast Iron
VOLUTE	Cast Iron
SEAL PLATE	Cast Iron
IMPELLER	Cast Iron / Vortex (CPEH thermoplastic vortex)
SOLIDS HANDLING	3/4"
SHAFT	Stainless Steel
SHAFT SEAL (SINGLE SEAL)	Inboard mechanical with secondary exclusion V-Seal, carbon rotating face, ceramic stationary face, Buna-N elastomer, 300 series stainless steel hardware
BEARINGS (UPPER & LOWER)	Single row, ball, oil lubricated
HARDWARE	300 Series stainless steel
O-RINGS	Buna-N
CORD	20' Length standard. Up to 100' available. (UL/CUL) Listed 16 AWG, Type SJTW
MOTOR (SINGLE PHASE)	4/10-1/2 HP 3450 RPM, 60 Hz, NEMA L Includes Overload Protection in the motor, oil filled, class B permanent split capacitor
WEIGHT	37 lbs. (Manual)



MODEL(S) INFORMATION

MODEL	HP	VOLTS	PHASE	AMPS	CORD LENGTH	SWITCH
CPE4-12 / CPE5-12 / CPE55-12 /CPEH5-12	4/10 - 1/2	115	1	6.6 / 8.5 / 10.5 / 11.5	20'	Manual
CPE4-13 / CPE5-13 / CPE55-13 / CPEH5-13	4/10 - 1/2	115	1	6.6 / 8.5 / 10.5 / 11.5	30'	Manual
CPE4-15 / CPE5-15 / CPE55-15 / CPEH5-15	4/10 - 1/2	115	1	6.6 / 8.5 / 10.5 / 11.5	50'	Manual
CPE4A-12 / CPE5A-12 / CPE55A-12 / CPEH5A-12	4/10 - 1/2	115	1	6.6 / 8.5 / 10.5 / 11.5	20'	Wide-Angle Float
CPE4A-13 / CPE5A-13 / CPE55A-13 / CPEH5A-13	4/10 - 1/2	115	1	6.6 / 8.5 / 10.5 / 11.5	30'	Wide-Angle Float
CPE4V-12 / CPE5V-12 / CPE55V-12 / CPEH5V-12	4/10 - 1/2	115	1	6.6 / 8.5 / 10.5 / 11.5	20'	Vertical Float
CPE4V-13 / CPE5V-13 / CPE55V-13 / CPEH5V-13	4/10 - 1/2	115	1	6.6 / 8.5 / 10.5 / 11.5	30'	Vertical Float
CPE4-22 / CPE5-22 / CPE55-22 / CPEH5-22	4/10 - 1/2	230	1	3.3 / 4.3 / 5.75 / 5.75	20'	Manual
CPE4A-22 / CPE5A-22 / CPE55A-22 / CPEH5A-22	4/10 - 1/2	230	1	3.3 / 4.3 / 5.75 / 5.75	20'	Wide-Angle Float
CPE4V-22 / CPE5V-22 / CPE55V-22 / CPEH5V-22	4/10 - 1/2	230	1	3.3 / 4.3 / 5.75 / 5.75	20'	Vertical Float

Champion Pump Company, Inc • P.O. Box 528 • Ashland, OH 44805
Phone 419-281-4500 • Fax 419-616-1100 • www.championpump.com

SJE MILLIAMPMASTER™ Control Switch

Mechanically-activated control switch designed to activate low current control panels and alarms.



This wide-angle or narrow-angle control switch offers reliable low current control for AC and DC applications in water, wastewater, and sewage. The internal switching mechanism has sealed gold cross-point contacts for reliable low current operation. Common applications include PLC (programmable logic controller) panels, IS panels with intrinsically safe barriers, low current solar applications, and other low current control panels and alarms applications.

The wide-angle version activates/deactivates approximately 4" (10.16 cm) above and below horizontal with a 3.5" (9 cm) tether. The narrow angle version activates/deactivates at approximately 1.5" (3.81 cm) above and below horizontal with a 3.5" (9 cm) tether. It is not sensitive to rotation.

Normally Open Model (high level)
The control switch turns on (closes) when the switch tips **above** horizontal signaling a high level, and turns off (opens) when the switch drops below horizontal.

Normally Closed Model (low level)
The control switch turns on (closes) when the switch drops **below** horizontal signaling a low level, and turns off (opens) when the switch tips above horizontal.

FEATURES

- Low current, non-arching applications down to 0.160 mA at 125 VAC.
- Mechanically-activated, snap action contacts.
- High impact, corrosion resistant polypropylene float housing.
- Not sensitive to rotation.
- Blue colored cap for easy identification of SJE MilliAmpMaster™ control switch.
- UL Listed for use in non-potable water and sewage.
- CSA Certified.
- Five-year limited warranty.

SSPMA MEMBER · LR54245 · LISTED 83N2 · Member of Hydraulic Institute

SPECIFICATIONS

CABLE: flexible 18 gauge, 2 conductor (UL,CSA) SJOW, water-resistant (CPE)

FLOAT: 2.74 inch diameter x 4.83 inch long (7.0 cm x 12.3 cm), high-impact, corrosion resistant, polypropylene housing for use in sewage and water up to 140°F (60°C)

MAXIMUM WATER DEPTH: 30 feet (9 meters), 13 PSI (90kPa)

ELECTRICAL:
125 VAC
Maximum Electrical Load: 1 amp
Minimum Electrical Load: 0.160 milliamps
30 VDC
Maximum Electrical Load: 0.1 amps
Minimum Electrical Load: 0.160 milliamps
5 VDC
Minimum Electrical Load: 1 milliamps

OPTIONS

This switch is available:

- for normally open (high level) applications or normally closed (low level) applications.
- with narrow or wide-angle pumping ranges.
- in standard cable lengths of 10, 15, 20, or 30 feet and 3, 5, 6, or 10 meters (longer lengths available).
- with two mounting options that allow for flexibility in installation:

  Mounting Clamp: for applications where the switch can be attached to a discharge pipe or similar mounting device.

  Externally Weighted: for applications where the switch can be suspended from above.

California Prop 65 requires the following: ⚠ WARNING Cancer and Reproductive Harm - www.P65Warnings.ca.gov

SEE REVERSE SIDE FOR ORDERING INFORMATION.
SEE PRICE BOOK FOR LIST PRICE.

SJE RHOMBUS
1-888-DIAL-SJE • 1-218-847-1317
1-218-847-4617 Fax
email: customer.service@sjeinc.com
www.sjerhombus.com

SJE MILLIAMPMASTER™ Control Switch

Mechanically-activated control switch designed to activate low current control panels and alarms.

ORDERING INFORMATION

Narrow-Angle Versions

Normally Open		Normally Closed		Shipping Weight
Part #	Description	Part #	Description	
1018838	10MANPCNO	**1018839**	10MANPCNC	1.04 lbs.
1018840	10MANWENO	**1018841**	10MANWENC	2.16 lbs.
1018842	15MANPCNO	**1018843**	15MANPCNC	1.37 lbs.
1018844	15MANWENO	**1018845**	15MANWENC	2.45 lbs.
1018846	20MANPCNO	**1018847**	20MANPCNC	1.69 lbs.
1018848	20MANWENO	**1018849**	20MANWENC	2.70 lbs.
1018850	30MANPCNO	**1018851**	30MANPCNC	2.34 lbs.
1018852	30MANWENO	**1018853**	30MANWENC	3.43 lbs.

Wide-Angle Versions

Normally Open		Normally Closed		Shipping Weight
Part #	Description	Part #	Description	
1015725	10MAPCNO	**1016180**	10MAPCNC	1.04 lbs.
1016181	10MAWENO	**1016182**	10MAWENC	2.16 lbs.
1016184	15MAPCNO	**1016185**	15MAPCNC	1.37 lbs.
1016186	15MAWENO	**1016187**	15MAWENC	2.45 lbs.
1016211	20MAPCNO	**1016212**	20MAPCNC	1.69 lbs.
1016213	20MAWENO	**1016214**	20MAWENC	2.70 lbs.
1016215	30MAPCNO	**1016216**	30MAPCNC	2.34 lbs.
1016217	30MAWENO	**1016218**	30MAWENC	3.43 lbs.

PC = **P**ipe **C**lamp **WE** = **W**eighted **E**xternally **NO** = **N**ormally **O**pen **NC** = **N**ormally **C**losed
NOTE: Descriptions are grouped by cable length measured in feet (10, 15, 20, 30).
SEE PRICE BOOK FOR LIST PRICE.

OPTIONS

PACKAGING
Bagged - standard
Boxed - optional
Bulk - optional; must be ordered in master carton quantities.

Please contact customer service for details/pricing.

ADDITIONAL CABLE
Longer cable lengths available. Please call for details.

UL Listed for Water & Sewage

LISTED 83N2 LR54245

SSPMA MEMBER

SPECIFICATIONS

CABLE: flexible 18 gauge, 2 conductor (UL, CSA) SJOW, water-resistant (CPE) jacket

FLOAT: 2.74 inch diameter x 4.83 inch long (7.0 cm x 12.3 cm), high impact, corrosion resistant, polypropylene housing for use in sewage and water up to 140°F (60°C)

MAXIMUM WATER DEPTH: 30 feet (9 meters), 13 psi

ELECTRICAL:
125 VAC
Maximum Electrical Load:
1 amp
Minimum Electrical Load:
0.160 milliamps
30 VDC
Maximum Electrical Load:
0.1 amps
Minimum Electrical Load:
0.160 milliamps
5 VDC
Minimum Electrical Load:
1 milliamps

OTHER INFORMATION

NORMALLY OPEN (HIGH LEVEL) OPERATION
The control switch closes (turns on) when the float tips **above** horizontal signaling a high level, and opens (turns off) when the float drops **below** normal.

NORMALLY CLOSED (LOW LEVEL) OPERATION
The control switch closes (turns on) when the float drops **below** horizontal signaling a low level, and opens (turns off) when the float tips **above** horizontal.

Call or fax your order!
1-888-DIAL-SJE (1-888-342-5753) • Fax 218-847-4617

SJE RHOMBUS

www.sjerhombus.com
customer.service@sjeinc.com

Product offering and pricing are subject to change without notice.
*Please visit **www.sjerhombus.com** for the most current information.*

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FPZ BLOWER TECHNOLOGY

REGENERATIVE BLOWERS - VACUUM

SCL K03 / K04 / K05 / K06 MS SERIES

SN 1879-9 1/2

TECHNICAL CHARACTERISTICS

- Aluminium alloy construction
- Smooth operation
- High efficiency impeller
- Maintenance free
- Mountable in any position
- Recognized TEFC - cURus motor

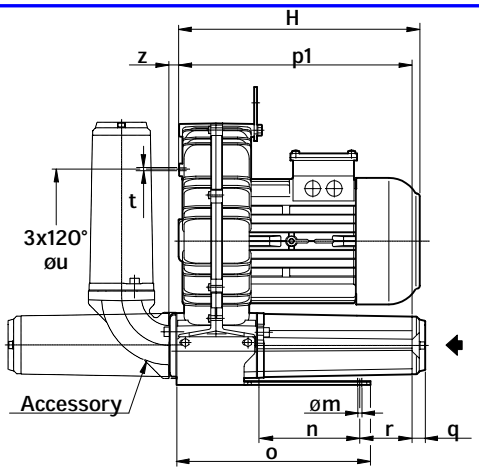
OPTIONS

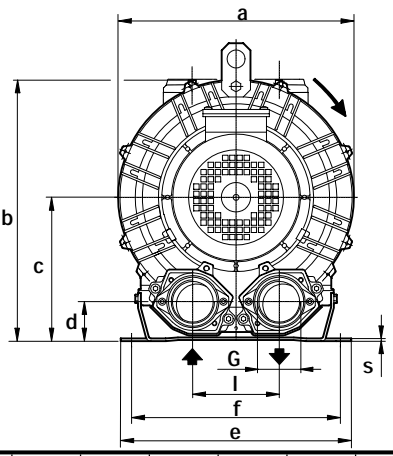
- Special voltages (IEC 38)
- Surface treatments

ACCESSORIES

- Inlet and/or inline filters
- Additional inlet/outlet silencers
- Safety valves
- Flow converting device
- Optional connectors

Dimensions in inches.
Dimension for reference only.





Model	a	b	c	d	e	f	G	l	m	n	o	p1	q	r	s	t	u	z
K03-MS	9.49	10.55	5.79	1.69	9.06	8.07	1" ¼ NPT	3.39	0.39	3.27	5.59	8.07	0.71	2.95	0.16	M6	5.51	0.47
K04-MS	11.22	12.40	6.77	1.93	10.04	8.86	1"1/2 NPT	4.02	0.47	3.74	6.73	8.74	0.71	2.76	0.16	M6	6.89	0.71
K05-MS	12.87	14.37	7.87	2.13	12.60	10.24	2" NPT	4.72	0.59	4.53	10.43	12.60	0.71	3.86	0.16	M8	7.87	0.75
K06-MS	14.80	15.47	8.07	2.13	12.80	11.42	2" NPT	4.92	0.59	5.51	10.71	13.15	0.71	3.35	0.16	M8	9.45	0.75

Model	Maximum flow cfm		Installed power Hp		Maximum differential pressure Δp (In Hg)		Noise level Lp dB (A) (1)		Overall dimensions H	Weight
	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	Inches	Lbs
K03-MS	52	43	3/4	3/4	4.7	3.7	61.0	59.0	10.43	24.30
			1	1	5.9	4.9	61.3	59.3	11.97	26.50
K04-MS	98	81	1 ½	1 ½	4.3	5.9	63.8	61.8	11.65	36.40
			2	2	6.3	6.6	64.0	62.0	13.78	43.00
			3	-	7.4	-	64.2	-	13.78	49.60
K05-MS	156	129	2	2	3.8	5.1	69.5	67.5	13.20	51.80
			3	3	6.6	7.1	69.8	67.8	13.20	58.40
			4	-	8.1	-	70.1	-	14.40	67.20
K06-MS	216	179	3	3	3.7	4.8	72.0	70.0	13.54	68.70
			4	4	5.5	7.0	72.3	70.3	14.17	71.65
			5 ½	5 ½	8.1	8.1	72.6	70.6	14.17	77.60
			6 1/5 (2)	-	9.6	-	72.9	-	14.45	77.60

(1) Noise measured at 1 m distance with inlet and outlet ports piped, in accordance to ISO 3744.
(2) No cURus motor

- For proper use, the blower should be equipped with inlet filter and safety valve; other accessories available on request.
- Ambient temperature from +5° to +104°F.
- Specifications subject to change without notice.

FPZ, Inc. 150 N. Progress Drive Saukville, WI 53080 USA Tel. (262) 268-0180 usa@fpz.com www.fpz.com

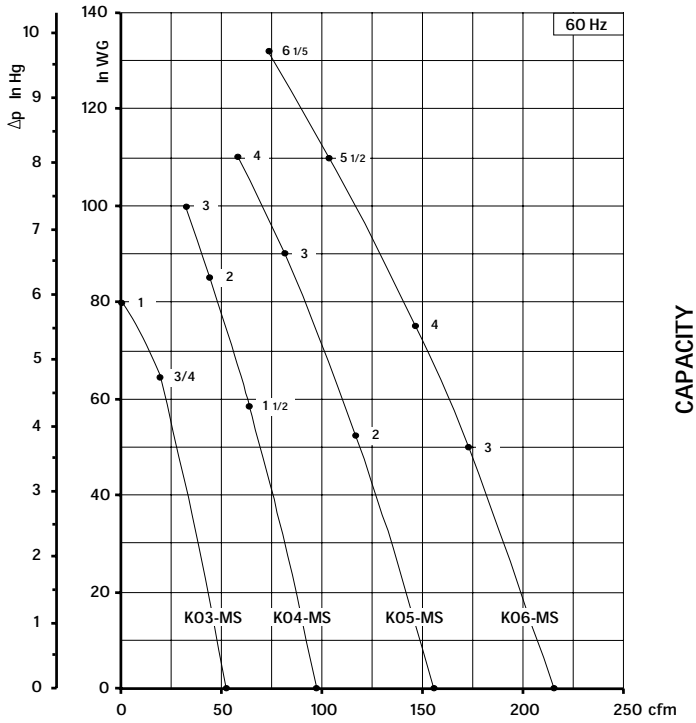
FPZ BLOWER TECHNOLOGY

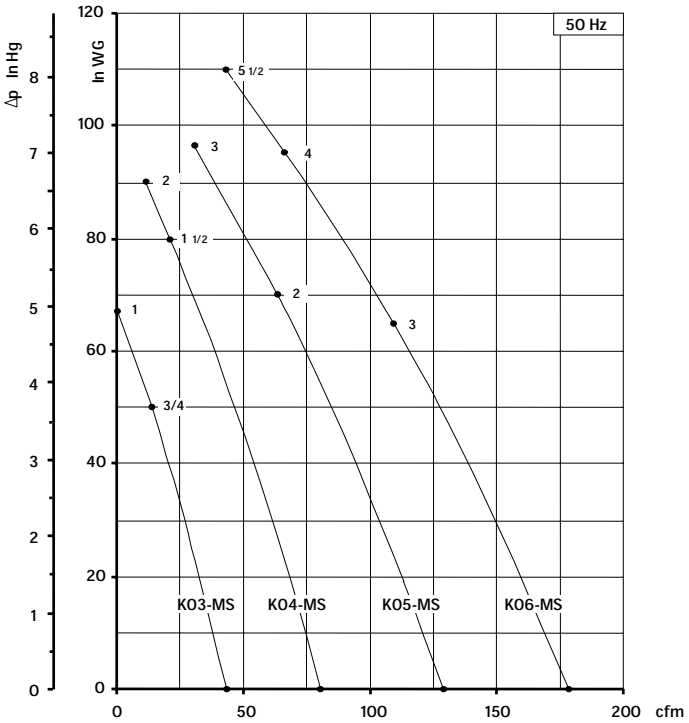
REGENERATIVE BLOWERS - VACUUM

SCL KO3 / KO4 / KO5 / KO6 MS SERIES

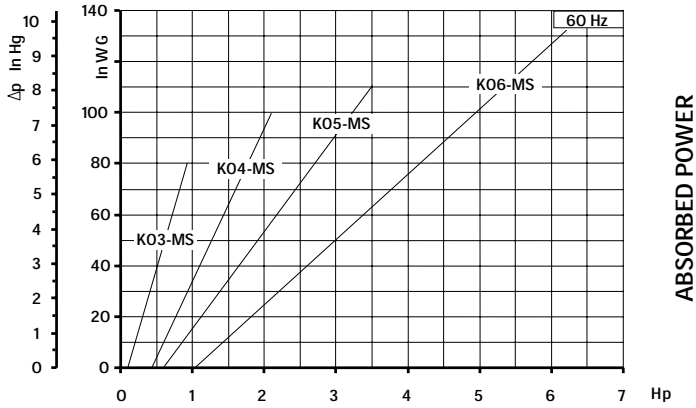
SN 1879-9 2/2

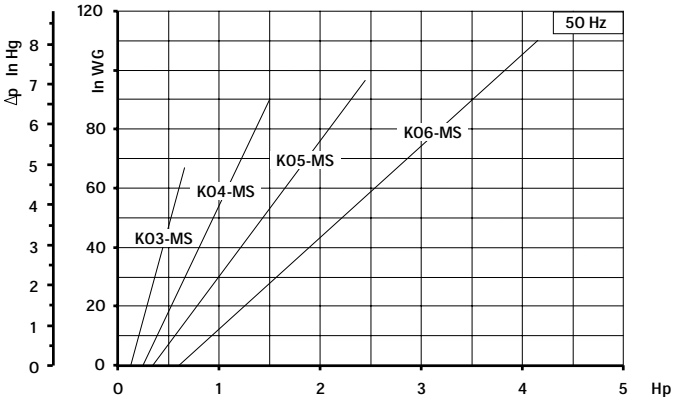
CAPACITY



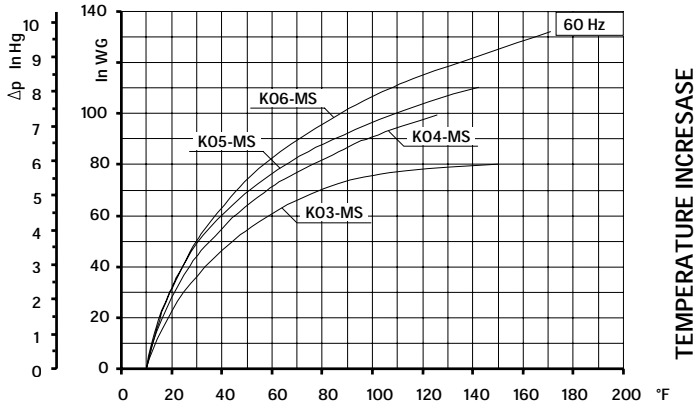


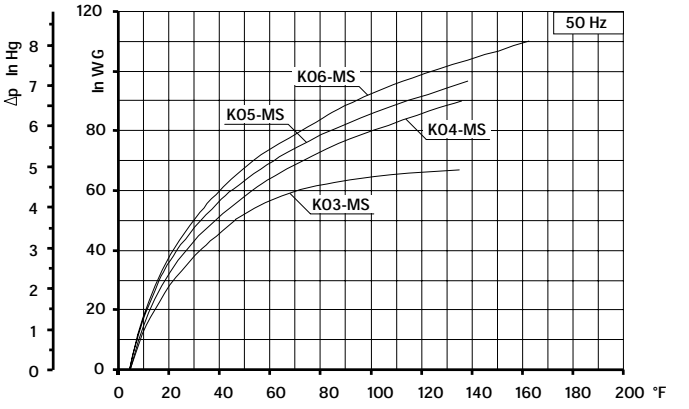
ABSORBED POWER





TEMPERATURE INCRESASE





Curves refer to air at 68° F temperature, measured at inlet port and 29.92 In Hg atmospheric backpressure (abs).
Values for flow, power consumption and temperature rise: +/-10% tolerance.
Data subject to change without notice.

FPZ, Inc. 150 N. Progress Drive Saukville, WI 53080 USA Tel. (262) 268-0180 usa@fpz.com www.fpz.com

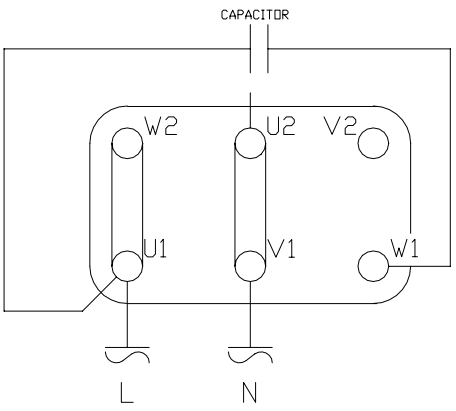
SINGLE PHASE DUAL VOLTAGE

GENERAL SPECIFICATIONS:

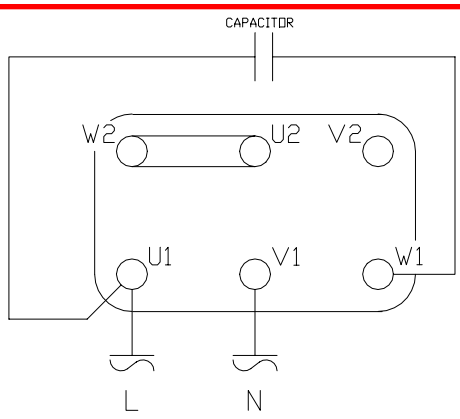
1-	Type:	Single phase AC MOTOR - IEC 60034
2-	Marks:	cURus, CE
3-	Poles:	2
4-	Frequency:	60 Hz
5-	Insulation Class:	F
6-	Enclosure:	TEFC
7-	Protection:	IP 55
8-	Thermal Protector:	KLIXON 140 °C
9-	Service Factor:	1. 0
10-	Max. Ambient:	40°C
11-	Duty:	Cont.
12-	Construction:	Aluminium frame

POWER Hp	VOLTAGE V	SPEED min $^{-1}$	FLA A	STARTING CURRENT A	POWER FACTOR cos φ	CAPACITOR µF
1/3	115-208/230	3330	3.5 / 1.7	12.3 / 6.0	0.97	16.0 - 400 V
1/2	115-208/230	3360	4.8 / 2.6	16.8 / 9.1	0.96	16.0 - 400 V
3/4	115-208/230	3450	9.8 / 4.9	46.1/ 23.0	0.95	20.0 - 400 V
1	115-208/230	3450	13.0 / 7.2	49.4 / 24.7	0.66	31.5 - 400 V
1 ½	115-208/230	3330	13.6 / 7.3	54.4 / 29.2	0.97	50.0 - 400 V
2	115-208/230	3440	24.0 / 12.0	79.2 / 39.6	0.90	70.0 - 400 V
3	115-208/230	3425	31.5 / 16.0	154.4 / 78.4	0.85	60.0 - 400 V

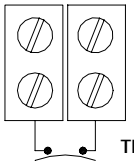
LOW VOLTAGE 115 V - 60 Hz



HIGH VOLTAGE 208-230 V - 60 Hz



THERMAL PROTECTION NORMALLY CLOSED



Specifications subject to change without notice. Alternate motor suppliers may be used.

FPZ BLOWER TECHNOLOGY

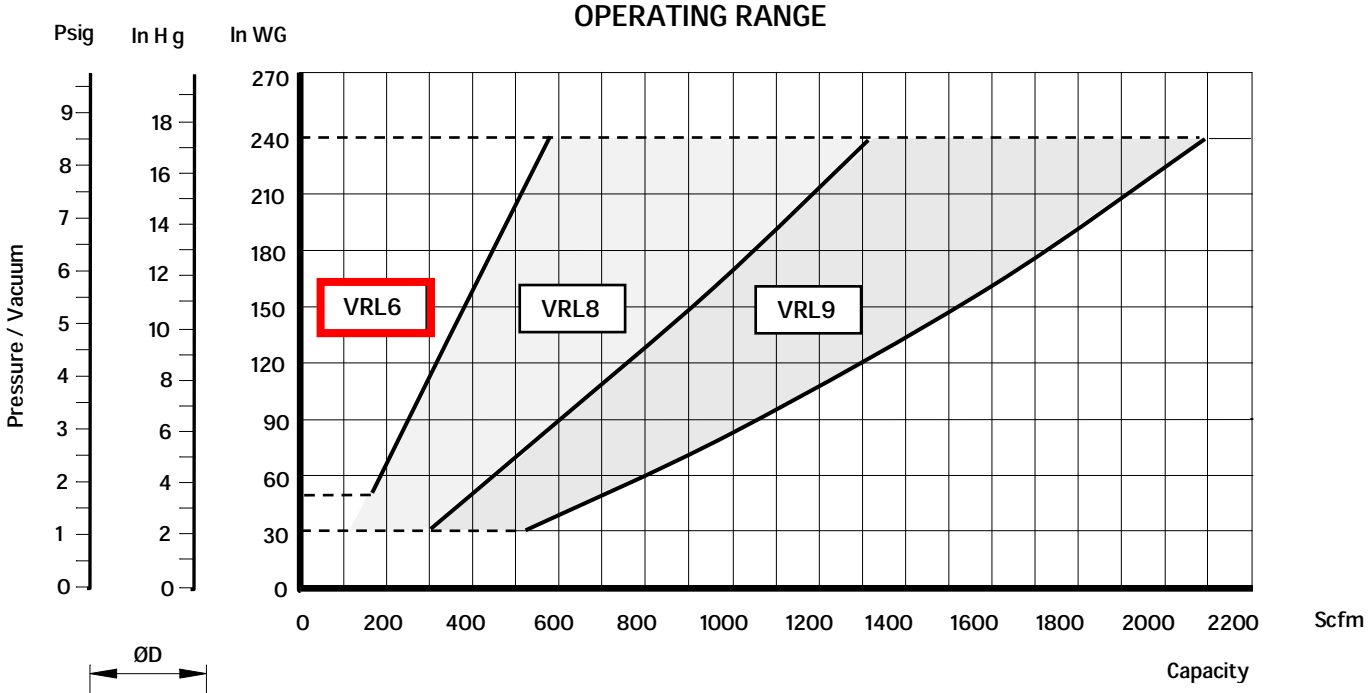
Safety Valves

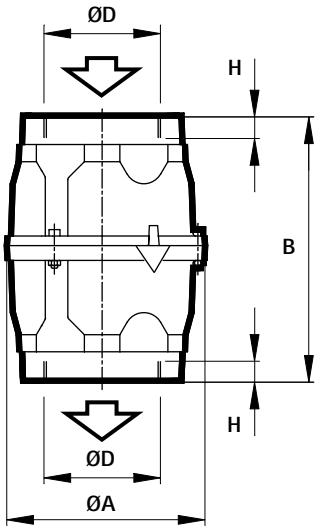
SN 1733 -5 1/1

The VRL valves are designed to protect blowers and / or motors from over pressurization or excess vacuum. When there is over pressurization, the valve opens and discharges to the outside. When there is excess in vacuum, the valve opens and takes flow from outside.
The valves have been designed for low pressure / low vacuum, with minimal difference between the initial value at which the valve begins to open and its fully opened position. The valves are supplied with 2 different springs to maximize their efficiency.
These compact valves, made of aluminum alloy, are both easy to install and calibrate. The valves are designed to operate in a wide range of capacities. The VRL can be plumbed to divert excess primary flow through a secondary external outlet when working in pressure conditions or to pipe in a secondary flow when working in vacuum.
Maximum efficiency is achieved by keeping operating values (flow versus pressure or vacuum) within the operating range (shaded area on graph). Capacity refers to air having a density equal to 0.075 lbs./cu.ft .



OPERATING RANGE





OVERALL DIMENSIONS

TYPE	ND	D	A	B	H	WEIGHT (Lbs)
VRL6	2"	2" NPT	4.02	6.90	0.47	1.9
VRL8	3"	3" NPT	5.31	7.48	0.59	4.2
VRL9	4"	4" NPT	6.30	8.11	0.71	5.7

- Dimensions in inches.
- Specifications subject to change without prior notice.

FPZ BLOWER TECHNOLOGY

Dirty Filter Indicator

SS1401 1/1

FEATURES

- Monitors FilterContinuously
- Easy Filter Maintenance
- Filter Element LifeMaximized
- Downtime Reduced
- Graduated Restriction Readings



Part No: VG-020-013

SPECIFICATIONS

The dirty filter indicator shows the amount of filter element restriction and how much life the element has left. This is a convenient and inexpensive solution to receiving the maximum usage from every element.

The yellow indicator in the filter monitor gauge drops as the dirt accumulates on the filter element. The element is ready for change out or servicing when the yellow indicator reaches the red zone. This allows you to determine the condition of the filter element even after the equipment has been shut down.

The element should be serviced or replaced at the maximum pressure drop of 10-15 inches of water. If the blower is operating at its maximum rated pressure, contact the factory for recommended setting.





GAUGE IN ACTION



Normal Clean Filter



Gauge shows how much capacity remains

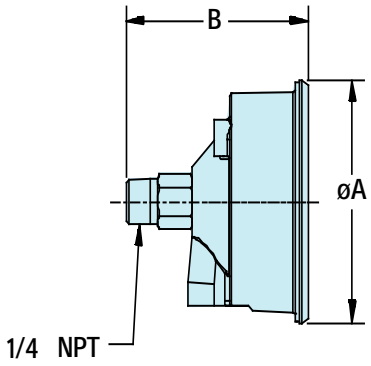


Gauge shows filter element capacity used. Filter requires service

Note: The monitor gauge has a 1/8" MPT connection. It is mounted either on the weatherhood or on the outlet pipe depending on the filter assembly. Used for pressure applications only.

Gauges, Check Valves, Silencers, Enclosures

Gauges

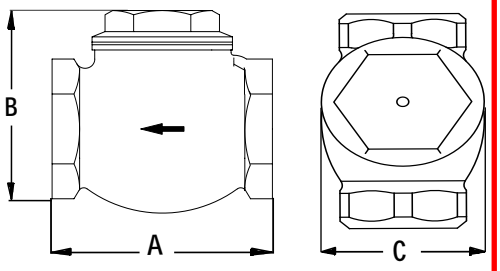


Gauges are important for monitoring the operating pressure or vacuum of the blower. Gauges should be positioned as close to the blower as possible.

Part number	Duty	Scale	A	B
VG25-60	Vacuum	0-60" H_2O	2.88	2.59
VG25-200	Vacuum	0-200" H_2O		
VG25-300	Vacuum	0-300" H_2O		
PG25-60	Pressure	0-60" H_2O		
PG25-200	Pressure	0-200" H_2O		
PG25-300	Pressure	0-300" H_2O		
PG20-15	Pressure	0-15 psi	2.25	1.9

Dimensions in inches. Tolerance on given values ± 10% - unbinding and can be changed without prior notice.

Check Valves

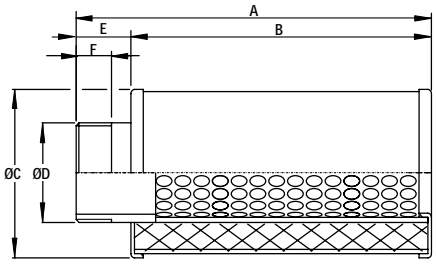


Swing check valves allow air to flow in one direction. These valves prevent backflow into the blower and are supplied in bronze or brass.

Part Number	NPT	A	B	C
CV075	0.75"	2.4		
CV10	1"	2.8	1.9	2.7
CV125	1.25"	3.2	2.2	3.2
CV15	1.5"	3.6	2.5	3.5
CV20	2"	4.3	3.1	4.2
CV30	3"	5.8	4.2	6.1
CV40	4"	6.9	5.5	7.1

Dimensions in inches. Tolerance on given values ± 10% - unbinding and can be changed without prior notice.

Silencers



Silencers provide additional sound attenuation.

TYPE	D	A	B	C	E	F	lbs
SS 4	1" 1/4	7.5	5.5	2.8	2	0.6	0.8
SS 5	1" 1/2	7.9	6.7	3.1	1.2	0.8	1.1
SS 6	2"	9.1	7.9	3.5	1.2	0.8	1.3
SS 8	3"	19.1	15.7	6.0	3.3	0.8	4.8
SS 9	4"	18.3	16.9	6.7	1.1	0.8	9.9

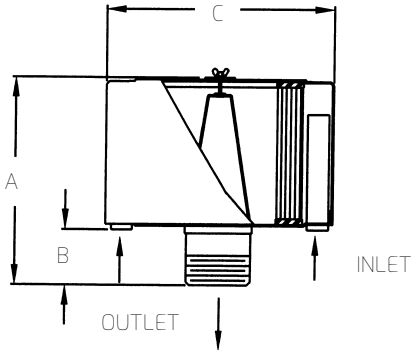
Steel manufactured (apart from SI 9 / SS 9 - entirely in aluminium) with sound absorbing polyurethane element.

Dimensions in inches. Tolerance on given values ± 10% - unbinding and can be changed without prior notice.

Inlet Filters

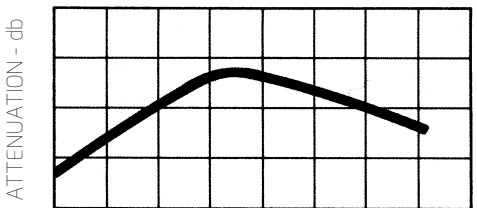
SS1401

FPZ inlet filters are used for pressure applications. The inlet filters combine filtration and sound attenuation into a compact package. Inlet filters consist of a filter cartridge enclosed by a carbon steel weather hood. Elements are easily serviceable by simply removing the weather hood.



Dimension tolerance ± 1/8"

TYPICAL NOISE ATTENUATION – FS SERIES



Noise attenuation may vary due to application

FEATURES & SPECIFICATIONS

- Polyester: 99%+ removal efficiency standard to 5 micron
- Fully drawn weather hood - no welds to rust or vibrate apart
- Tubular silencing design - tube is positioned to maximize attenuation and air flow while minimizing pressure drop
- Durable carbon steel construction with baked enamel finish
- and powder coated weather hood
- Interchangeable elements: Polyester, Paper
- Low pressure drop center bracket and outlet pipe design
- Filter change out differential: 10"-15" H_2O Over Initial Delta P

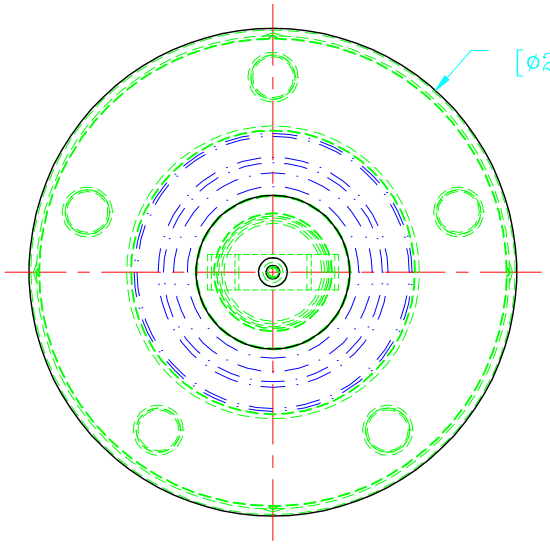
OPTIONS (Inquiries Encouraged)

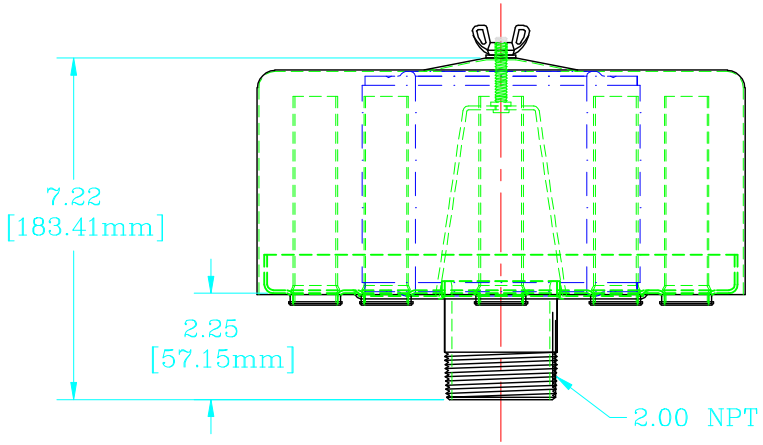
- Various media available
- 1/8" & 1/4" tap holes
- Pressure Drop Indicator
- Available in Stainless Steel
- Epoxy coated housings
- Hot dipped galvanized housings
- Special connections, NPT

Polyester Element	NPT	Dimensions (Inches) A	B	C	Used on Models	Approx Wt. Lbs
FS-15-050	½"	4	1 ½	6	10DL	2
FS-15-075	¾"	4	1 ½	6	15DH	2
FS-15-100	1"	4	1 ½	6	06	2
FS-19P-125	1 ¼"	6 5/8"	1 5/8"	6	K03-MS, R20-MD	3
FS-19P-150	1 ½"	6 5/8"	1 5/8"	6	K04-MS, K04-TD, 30DH, 40DH	4
FS-31P-200	2"	7 ¼"	2 ¼"	10	K05-MS, K05-TD	8
FS-231P-200	2"	12 ¼"	2 ¼"	10	K06-MS, K06-TD, K07R-MD, K08R-MD	14
FS-231P-300	3"	13"	3"	10"	K07-MS, K05-TS, K07-TD	15
FS-235P-300	3"	13"	3"	16"	K08-MS, K06-TS, K08-TD	29
FS-235P-400	4"	14"	4"	16"	K09-MS, K10-MS, K09-MD, K10-MD, K11-MD, K12-MD, K09-TD, K10-TD	30
FS-245P-400	4"	14"	4"	16"	K07-TS, K08-TS, K11-MS, K12-MS, K11-TD, K12TD	31
FL10*	NA	14 3/8"	1 3/8"	16 3/16"	K09-TS, K10-TS, K11-TS, K12-TS,	18

*FL 10 utilizes 15 micron paper element and does not include tubular silencers

REVISIONS						
ZONE	REV.	DESCRIPTION	CDR #	CHG BY	DATE	APP'D





REPLACEMENT ELEMENT#	31P
MATERIAL	POLYESTER
CFM FLOW	195
SURFACE AREA	2.3 SQ. FT.
I.D.	3.63
O.D.	5.75
HEIGHT	4.75

MODEL#	HOUSING MATERIAL	FINISH
FS-31P-200	CARBON STEEL	BAKED ENAMEL GREY

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS: ±1/4
DECIMALS: .XX ±.125
.XXX ±.063
ANGLES ±2

CUSTOMER APPROVAL:

DATE:

SOLBERG MANUFACTURING INC.
1151 W. ARDMORE AVE.
ITASCA, IL 60143
630/773-1363

SALES REP.: R.KULPA

APPROVALS	DATE
DRAWN: CRW	01/11/02
ENGINEER:	
APPROVED:	

DESCRIPTION: FS-31P-200
SCALE: 1:2
SHEET: 1 of 1
WT. MAX.:
SIZE: C
MATERIAL: SEE TABLE
FINISH: SEE TABLE
DRAWING NUMBER: SD10561

WALCHEM
An Iwaki America Company

Metering Pumps
EZ Series

OVERVIEW

EZ Series electronic metering pumps offer precise chemical injection at a low cost. The compact size and simple control make them ideal for water treatment and OEM applications.

EZ Series have outputs to 6.3 GPH (24 l/h) and a maximum pressure of 150 PSI (10 bar). Advanced microprocessor control and a turndown ratio of 360:1 make this series an exceptional value. The pumps are simple to operate with only three pushbutton keys and the unmatched turndown ratio provides both versatility and high resolution chemical feed which eliminates slug-feeding effects.



SUMMARY OF KEY BENEFITS

High Speed Performance
E-Class pumps operate at 360 strokes-per-minute, providing high resolution chemical feed. Most competitive products operate at slower speeds, resulting in slug feeding, accelerated diaphragm wear and poor feed control.

Engineered Longevity
All E-Class pumps feature dual bearing support. The armature and shaft are supported with a bearing on each end, which ensures proper axial movement, enabling the E-Class to operate at 360 SPM while extending the life of the diaphragm.

Superior Check Valve Performance
Dual Check Valve Assemblies in both suction and discharge fittings feature precision ball guides and tapered seats. Precise machining and molding of parts limit valve ball travel, ensuring that balls fully seat and seal with every stroke. This superior check valve design guarantees fast priming and reliable performance.

High Compression Ratio
The compression ratio of a metering pump is important because it affects the pump's ability to prime and vent. The compression ratio is raised when you reduce the dead volume of the pump head during operation. All E-Class pumps feature a very high compression ratio that ensures proper feed especially with off-gassing products (i.e. Sodium Hypochlorite).

Innovative Timer Control
The EZ-Timer module integrates Walchem's EZB pump technology with a versatile programmable timer. Timed feed control can be programmed in daily or weekly cycles.

Walchem and Iwaki have over 100 years of combined pump experience. This partnership has led to the design of the most innovative and comprehensive metering pump product line in the world, the E-Class Metering Pumps. E-Class features five great series: EZ, EW, EK, EHE and EHF. The wide range of capabilities within the E-Class ensures that there's a model to fit any water treatment, food & beverage, agriculture, water conditioning, car wash, or other industrial chemical feed applications.

EZ pumps have outputs to 6.3 GPH (24 l/h) and pressure capabilites to 150 PSI (10 bar). The compact size and simple control make it ideal for OEM applications. Effective, reliable performance is achieved through sophisticated engineering. Designed with a turndown ratio of 360:1, the EZ is an exceptional value.



Simply stated - the EZ packs all of the 360spm performance of the bigger pumps into the compact chassis of the industry's easiest pump to operate. The EZ is the best on/off pump on the market. Built to prime, hold prime and to last, the EZ Series metering pump offers precise chemical injection at an economical cost.

Features include double ball check valves, long lasting diaphragm, an optional automatic air vent valve and the ability to remotely mount the control unit.

Digital Speed Control

The EZ is simple to operate with three pushbutton keys. The 360:1 turndown ratio provides unmatched versatility.



Timer Control Module Option

The EZ-Timer module integrates Walchem's EZB technology with a versatile programmable timer. Timed feed control can be programmed in daily or weekly cycles. The weekly schedules can be programmed in either 1 or 2-week cycles with a daily on-time. The daily timer can be set for multiple daily on-times. On-times are set in minutes (0-999).

The EZ-Timer pump is a simple and effective way to automate additions in small systems. With capacities up to 3.2 GPH and pressure ratings up to 150 psi, the EZ-Timer pump is perfect for many applications, including accurate, consistent addition of biocides into your cooling tower system.



2-YEAR WARRANTY
'Bumper-to-Bumper' on all E-Class Pumps including Wetted Parts

Electrical Specifications

EZ	EZB	EZC
50/60 Hz, single phase	20 Watt avg.	22 Watt avg.
115 VAC ±10%	0.8 Amp max.	1.2 Amp max.
230 VAC ±10%	0.4 Amp max.	0.6 Amp max.

Shipping Weight

	6 lbs. (2.7kg) (approximate)	8 lbs. (3.6 kg) (approximate)

Safety Certifications

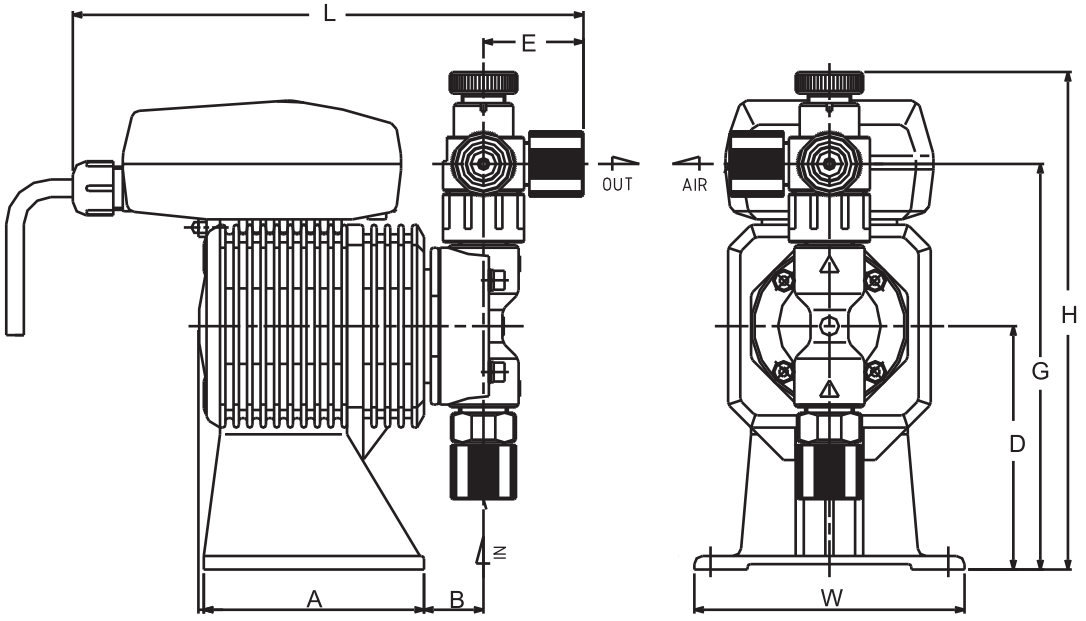
The EZ series metering pumps are WQA tested and certified to NSF/ANSI Standard 61.

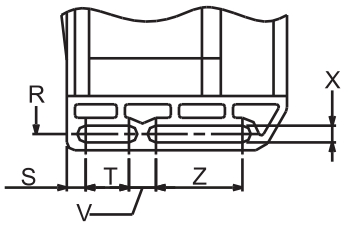
The EZ series metering pumps are tested by Intertek to UL and CSA standards.

Operating Conditions

Ambient Temperature: 32 to 122°F (0 to 50°C)
Relative Humidity: 30% to 90% non-condensing
Liquid Temperature: PVC liquid ends: 32 to 104°F (0 to 40°C)
PP, PVDF, SS liquid ends: 32 to 140°F (0 to 60°C)
Below 32°F (0°C), pump is limited to 70% of maximum pressure. Liquid cannot freeze.

Dimensions





Mounting Dimensions

Model	R	S	T	X	V	Z
EZB	3.46”	0.28”	0.63”	0.24”	0.39”	1.26”
EZC	3.94”	0.59”	1.18”	0.28”	0.59”	1.18”

approximate dimensions for larger size pump

Model	A	B	E	D	G	H	L	W
EZB	3.2	1.0	1.5[1]	3.5	6.8[2]	8.0	7.5	3.9[3]
EZC	4.1	1.1	1.5[1]	3.9	7.1[2]	8.4	8.2	4.6[3]

Notes for EZ11, 16, 21:
1. Addition of a Multifunction valve increases overall length by 0.37”. Addition of an Auto Air Vent Valve increases overall length by 1.59”
2. Addition of a Multifunction Valve increases discharge height by 0.22”. No change for the Auto Air Vent Valve.
3. Addition of a Multifunction Valve increases overall liquid end height by 1.16”. No change for the Auto Air Vent Valve.

ORDER INFORMATION

EZ	B16	D	1	—	VC	A
Pump series	Capacity/ Pressure	Control Module	Voltage		Liquid End	Options

PUMP SERIES
EZ = Electronic metering pump with manual speed control (adjustable to 360 strokes per minute)

CAPACITY/PRESSURE RATING
See chart on this page

CONTROL MODULE
D = Manual speed adjustment from 1-360 spm
T = Timer control module (available on 115V EZB pumps only)

VOLTAGE
1 = 115VAC, 50/60 Hz
2 = 230VAC, 50/60 Hz

LIQUID END
See chart on this page

OPTIONS
Blank = Standard manual air vent valve included, except with liquid end code -FC.

A = Automatic air vent valve installed. For VC liquid ends on B11, B16, C16 & C21 size pumps only. Pressure rating is reduced by 35 psi with valve installed.

M = Multi-function back pressure/anti-syphon valve installed. For PC, PE, VC and VE liquid ends on 11, 16 and 21 size pumps only. Not available with the AAVV feature.

All pumps also include a manual air vent valve with the exception of FC liquid ends. All pumps include one foot valve, one injection valve, 20 feet of polyethylene tubing and one ceramic weight.

Capacity/Pressure Rating

Size	Max Output Capacity		Max output per stroke	Max Pressure[1]		Connection Size (in) Tubing O.D.
	GPH	mL/min	mL	PSI	MPa	
B11	0.6	38	0.11	150	1.0	3/8
B16	1.0	65	0.18	105	0.7	3/8
B21	1.5	95	0.26	60	0.4	3/8
B31	3.2	200	0.56	30	0.2	1/2
C16	1.3	80	0.22	150	1.0	3/8
C21	2.0	130	0.36	105	0.7	3/8
C31	4.3	270	0.75	50	0.35	1/2
C36	6.3	400	1.17	30	0.2	1/2

1 Auto Air vent valve reduces maximum pressure approx. 35 PSI (0.2 MPa)

Liquid End Materials

Liquid End	Pump Head & Fittings	Diaphragm	Valve Balls	Valve Seat	Valve Seals	Gasket	Tubing
FC	PVDF	PTFE (bonded to EPDM)	CE	PCTFE	PTFE	PTFE	PE
PC	GFRPP		CE	FKM	FKM		
PE	GFRPP		CE	EPDM	EPDM		
VC	PVC		CE	FKM	FKM		
VE	PVC		CE	EPDM	EPDM		
TC	PVDF		CE	FKM	FKM		

CE	Alumina ceramic	EPDM	Ethylene propylene diene monomer
FKM	Fluoroelastomer	GFRPP	Glass fiber reinforced polypropylene
PE	Polyethylene	PTFE	Polytetrafluoroethylene
PCTFE	Polychlorotrifluoroethylene	PVC	Polyvinylchloride (translucent)
PVDF	Polyvinylidenefluoride	HC	Hastelloy C276

ABOUT US

Walchem integrates its advanced sensing, instrumentation, fluid pumping and communications technologies to deliver reliable and innovative solutions to the global water treatment market.

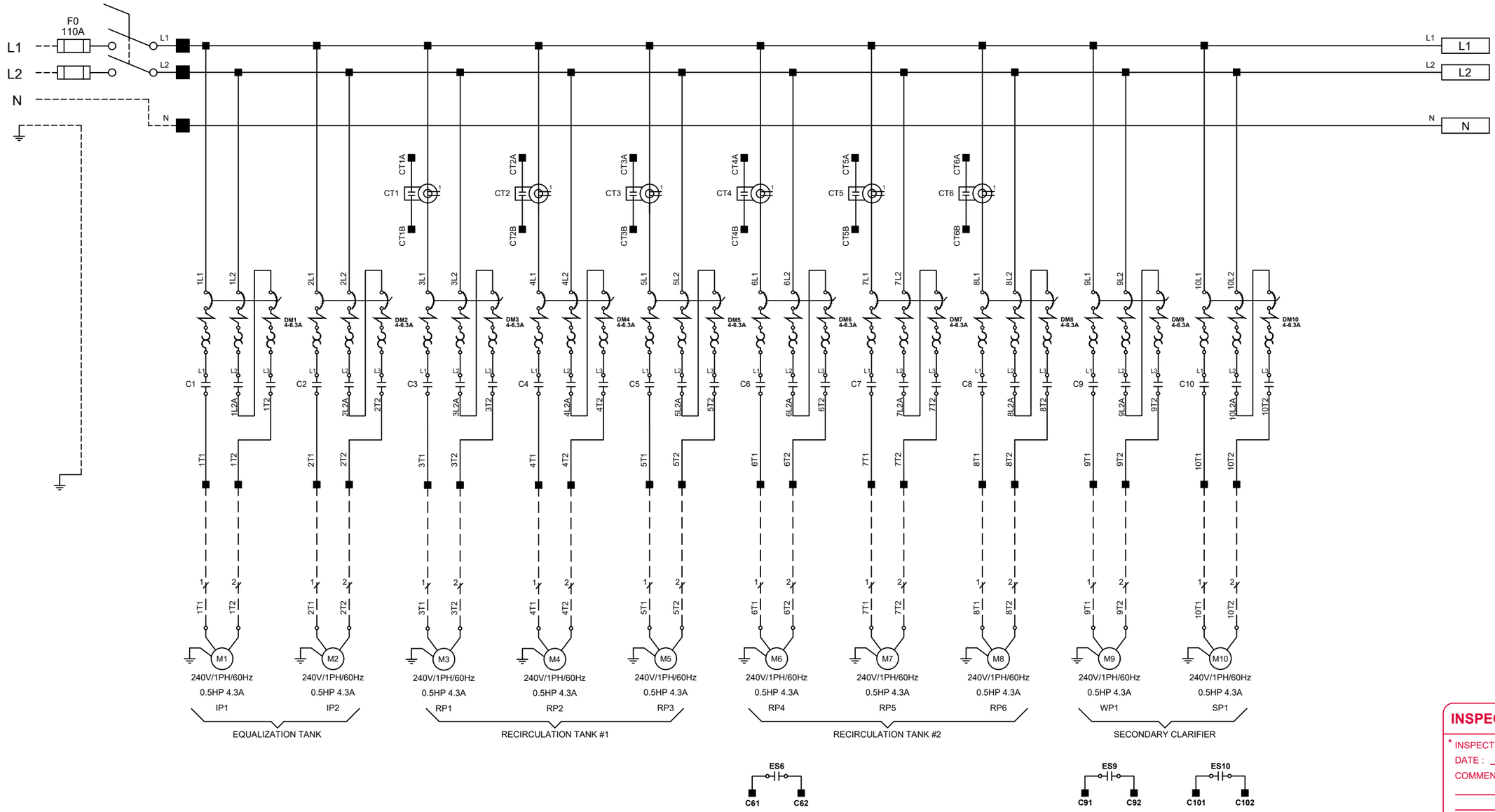
Our in-house engineering is driven by quality, technology and innovation. For more information on the entire Walchem product line, visit: www.walchem.com

WALCHEM
An Iwaki America Company

Walchem, An Iwaki America Incorporated Company
Five Boynton Road Hopping Brook Park
Holliston, MA 01746 USA
Phone: 508-429-1110
Fax: 508-429-7433
www.walchem.com

180165.K Sept 2011

POWER SUPPLY
BY OTHERS
120/240V, 1 PHASE, 60 Hz, 110 A



LEGEND

LIST OF EQUIPEMENTS

AB1 : AIR BLOWER 1
AB2 : AIR BLOWER 2
AB3 : AIR BLOWER 3

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(Equalization tank)
IP2 : INFLUENT PUMP 2
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F0 : FUSE
DMX : MANUAL STARTER
PLT-3 : POWER ON INDICATOR
RX : RELAY

MANUAL SWITCH

WIRING BY OTHERS

INSPECTION

* INSPECTÉ PAR / INSPECTED BY : _____
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TITRE / TITLE
Ecoprocess™ MBBR
Schéma électrique (Puissance)

PROJET / PROJECT
Warehouse & Distribution facility in PA

TOL. X. ± 5 mm
.X ± 2 mm
.XX ± 0.25 mm

PROJ.

POUR AVIS

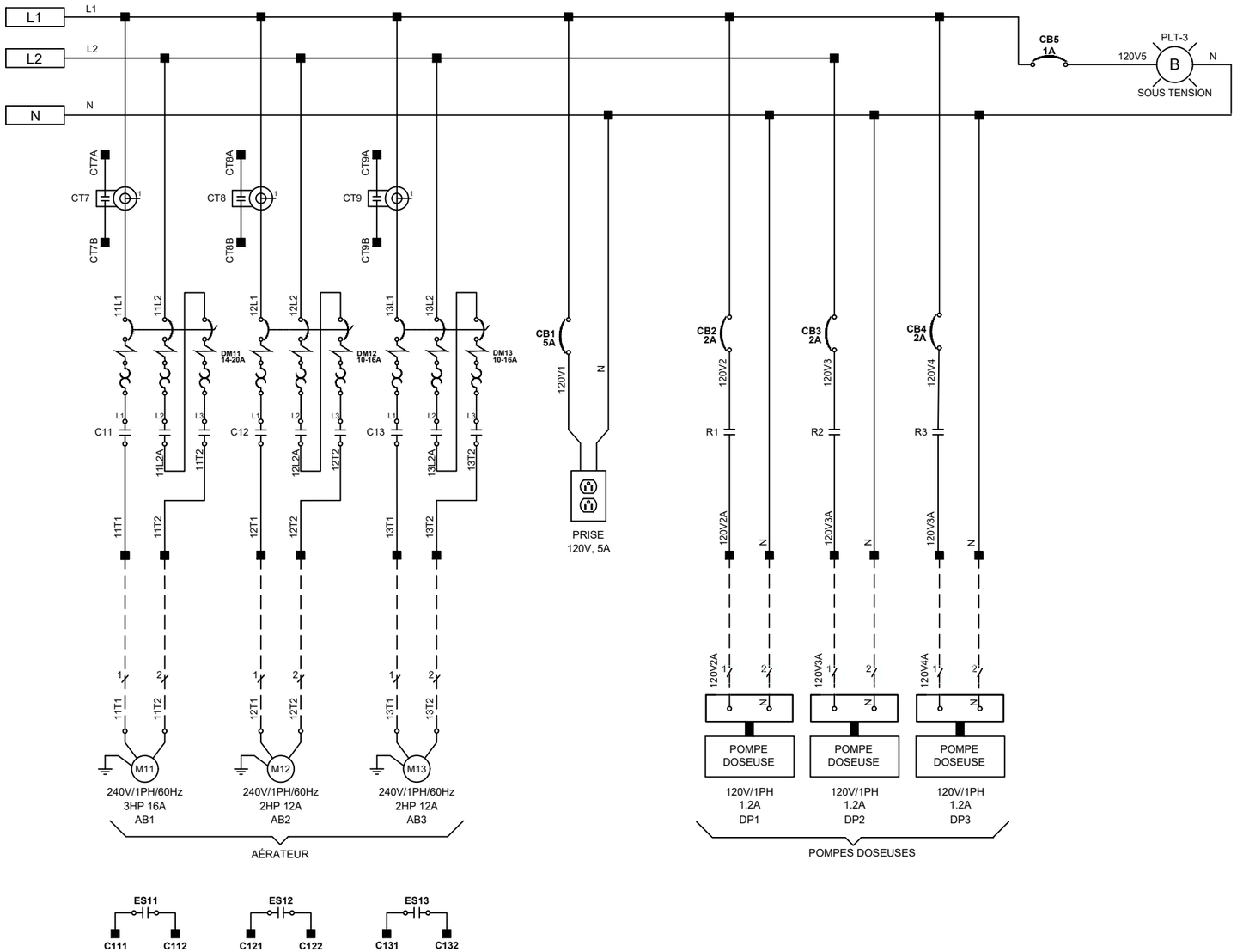
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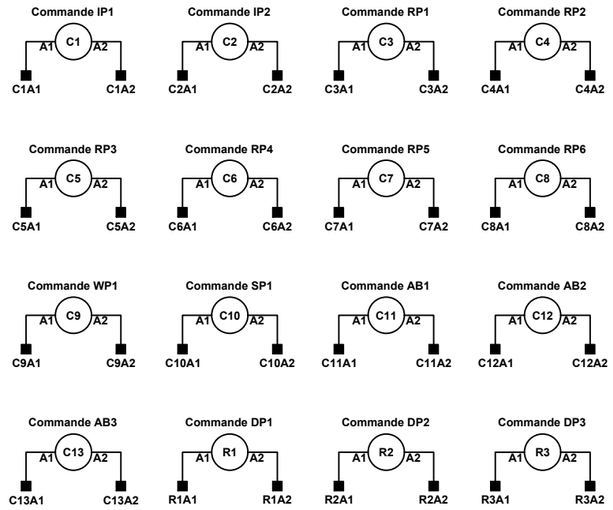
DESSINÉ / DRAWN	DATE	MATÉRIEL / MATERIAL	No PROJET / PROJECT No.	REV.
E. PAQUIN	2021-10-07		P-6790	3
VÉRIFIÉ / VERIFIED	DATE	UNITÉS / UNITS		
APPROUVÉ / APPROVED	DATE	CERTIFICATION: cUL		

NUMÉRO DE DESSIN / DRAWING NUMBER: **6790-E01**

PAGE 1 DE / OF 2



BOBINES DE CONTACTEURS & RELAIS 120VAC



LEGEND

LIST OF EQUIPEMENTS

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MANUAL SWITCH

WIRING BY OTHERS

INSPECTION

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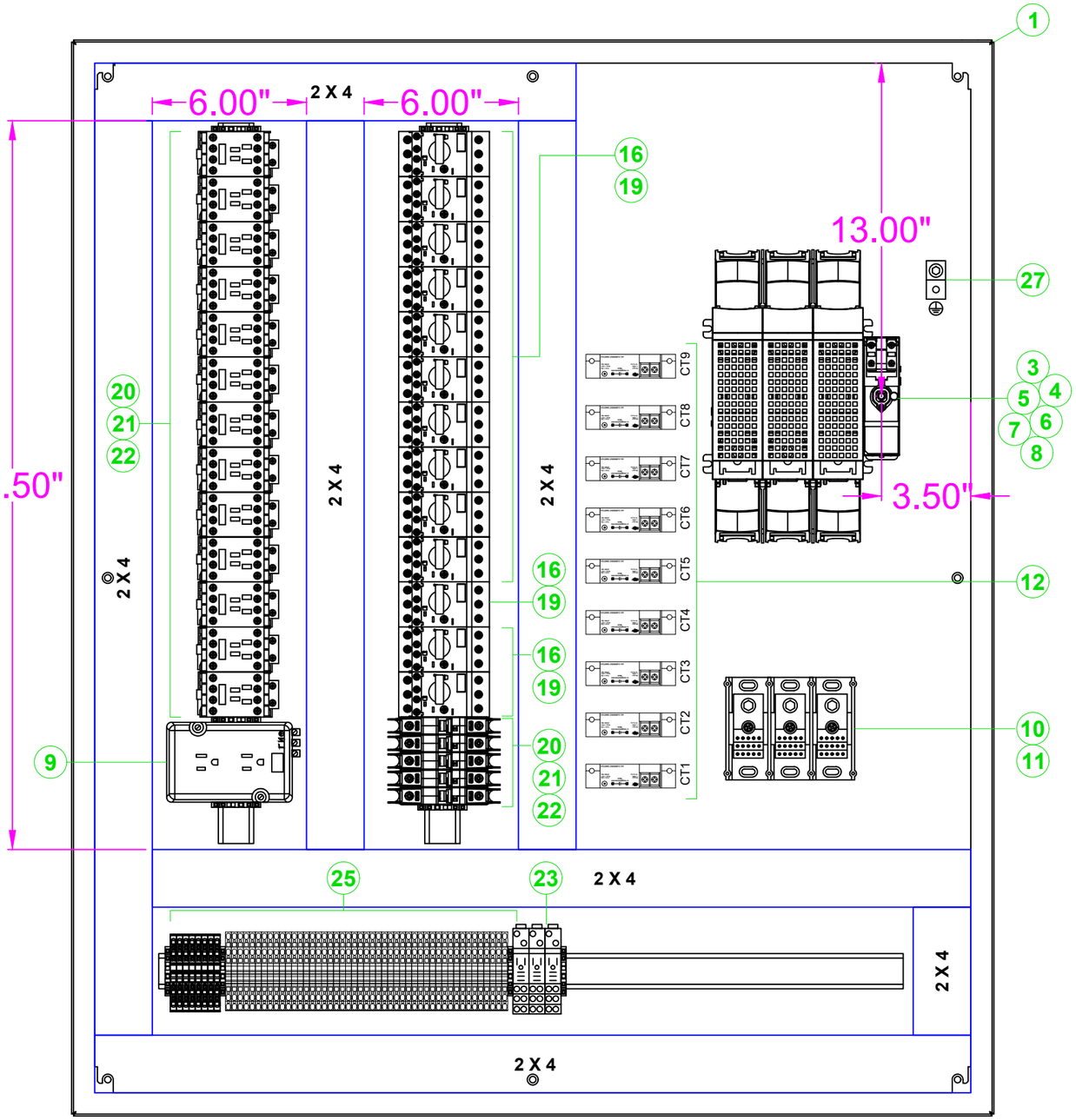
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PROJ.

POUR AVIS

ÉCH. / SCALE: AUCUNE
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#	QTÉ	DESCRIPTION	RÉFÉRENCE	MANUFAC.	# DE PIÈCE
1	1 1	BOITIER NEMA4-12 42*36*12 PLAQUE DE MONTAGE		HAMMOND	EN4SD423612GY EP4236
2	1	KIT DE MONTAGE POUR "SWING PANEL"		HAMMOND	ESP4236
3	1	DISCONNECT SWITCH, Open, J FUSE, 200 A, 3 POLE	F0	EATON	R9L3200FJ
4	1	POIGNÉE POUR DISCONNECT (NOIRE ET BLEUE)		EATON	PHB2N4XF
5	1	SHAFT POUR DISCONNECT		EATON	SF500PH10X10
6	2	KIT DE LUG POUR DISCONNECT		EATON	LK3R9DL
7	2	KIT DE PROTECTION "FINGER SAFE" POUR DISCONNECT		EATON	TSR9L3
8	3	FUSIBLE TYPE "J" 110A	F0	MERSEN	AJT110
9	1	RECEPTACLE DIN RAIL 15A, DUPLEX		ALLEN-BRADLEY	1492-REC15
10	1	BLOC DE DISTRIBUTION 1 IN 10 OUT		MERSEN	MPDB67653
11	3	COUVERCLE DE BLOC DE DISTRIBUTION		MERSEN	MPDBC6667
12	9	TRANSFORMATEUR DE COURANT AVEC CONTACT NORMALEMENT OUVERT	CT1....9	EATON	ECSNOASC
13	10	CONTACTEUR 9A, COMMANDE 120VAC	C1...C10	ALLEN-BRADLEY	100-C09D10
14	2	CONTACTEUR 16A, COMMANDE 120VAC	C12...C13	ALLEN-BRADLEY	100-C16D10
15	1	CONTACTEUR 9A, COMMANDE 120VAC	C11	ALLEN-BRADLEY	100-C23D10
16	10	DÉMARREUR MANUEL 4 @ 6.3A FRAME C	DM1...DM10	ALLEN-BRADLEY	140M-C2E-B63
17	2	DÉMARREUR MANUEL 10 @ 16A FRAME C	DM12...DM13	ALLEN-BRADLEY	140M-C2E-C16
18	1	DÉMARREUR MANUEL 14 @ 20A FRAME C	DM11	ALLEN-BRADLEY	140M-C2E-C20
19	13	POIGNÉE AVEC SERRURE DÉMARREUR MANUEL		ALLEN-BRADLEY	140M-C-KN1
20	1	DISJONCTEUR 1 POLE, 5A	CB1	ALLEN-BRADLEY	1489-M1C050
21	3	DISJONCTEUR 1 POLE, 2A	CB2...CB4	ALLEN-BRADLEY	1489-M1C020
22	1	DISJONCTEUR 1 POLE, 1A	CB5	ALLEN-BRADLEY	1489-M1C010
23	3 3	BASE DE RELAIS TYPE 700HK RELAIS BASE CARRÉE, 1N.O., 1N.C.	R1...R3	ALLEN-BRADLEY	700HN121 700HK36A1
24	1 1 1	BASE EN PLASTIQUE 22mm LUMIÈRE LED BLANCHE, 120VAC CAPUCHON LUMIÈRE BLEU	PLT-3	ALLEN-BRADLEY	800F-ALP 800F-N5W 800FP-P6
25	47 8	BORNES 2 ÉTAGES SPRING CAGE, 30A LD4 BORNES 2 ÉTAGES, M.A.L.T. PT4-QUATTRO-PE		ALLEN-BRADLEY PHOENIX CONTACT	1492-LD4 3211854
26	2	BARRE DE MISE À LA TERRE		ILSCO	N8020A104T
27	1	LUG DE MISE À LA TERRE		ILSCO	TA-250

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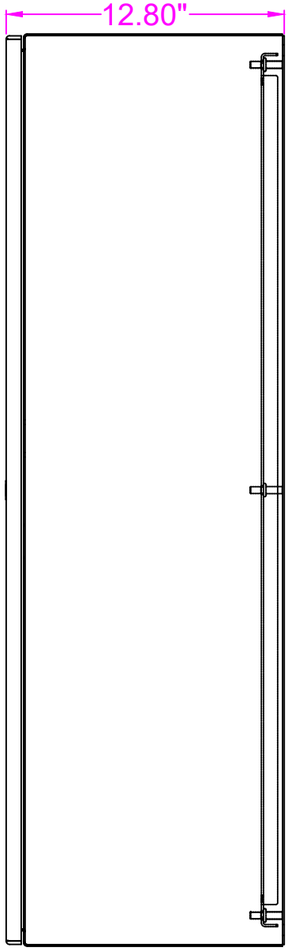
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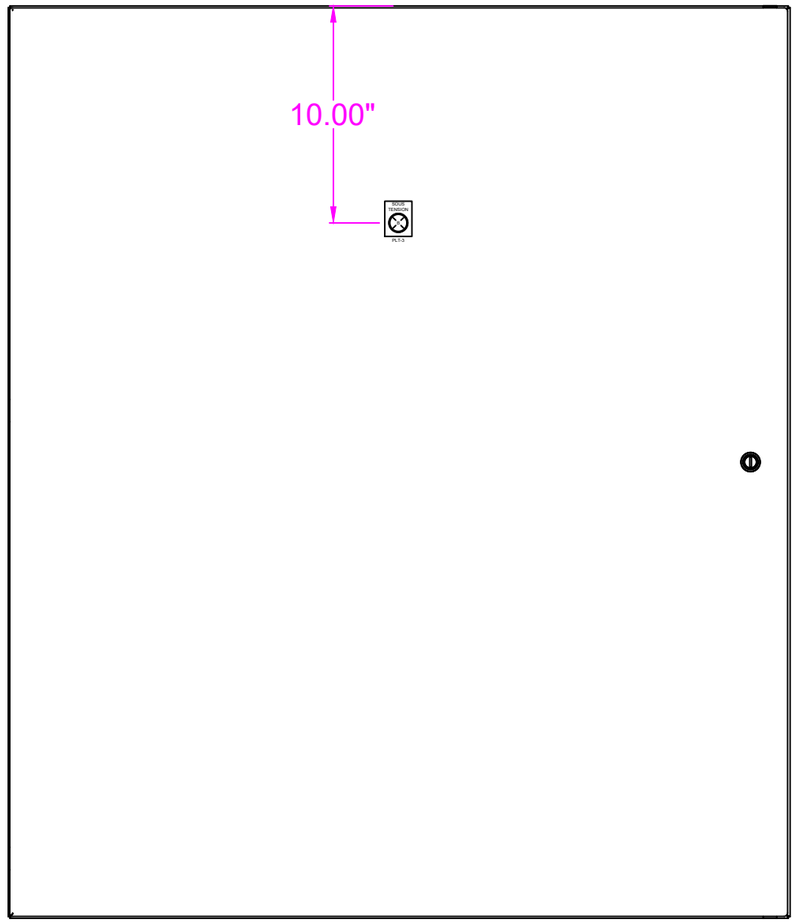
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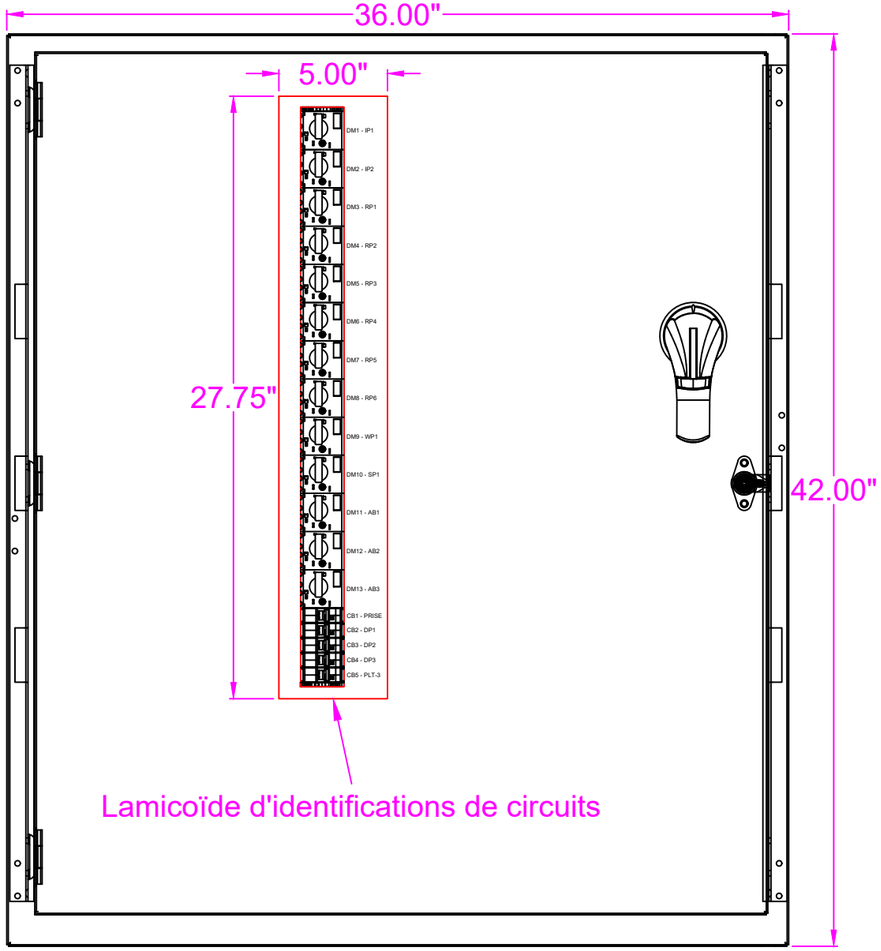
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Vue de côté



Vue extérieure



Vue intérieure "Swing Panel"

LEGEND

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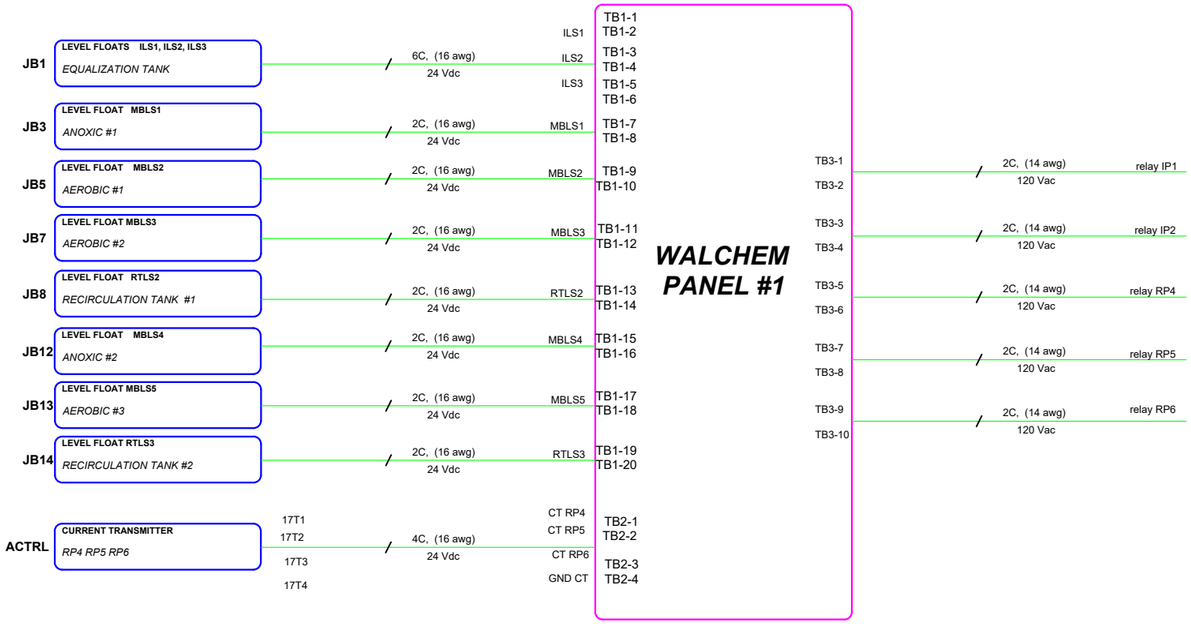
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POUR AVIS

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APPROUVÉ / APPROVED	DATE	CERTIFICATION: cUL	**6790-E03A**	



Include internet connection for remote access

LEGEND

24vdc / 120 Vac : CONTROL

120 / 240 Vdc : POWER

NOTE

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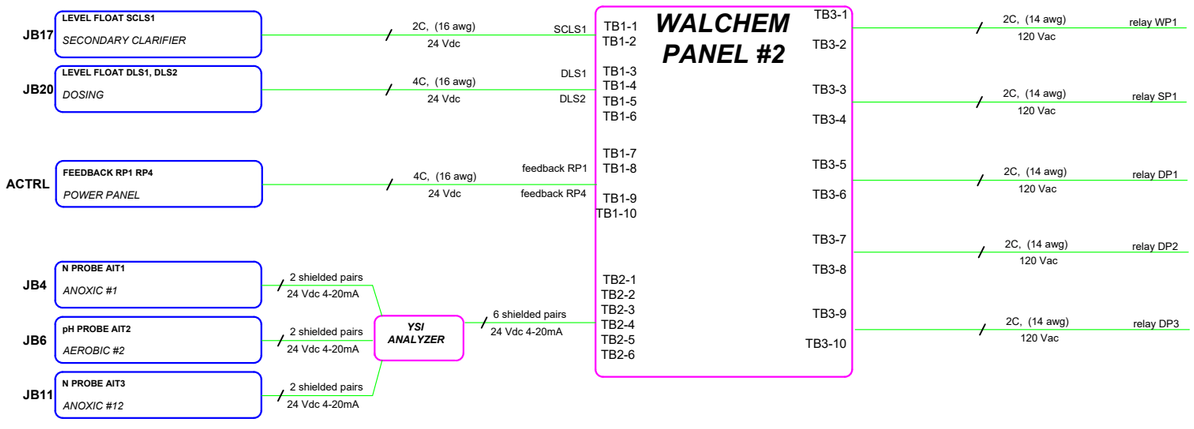
ECOPROCESS™ MBBR

Electrical Distribution

PROJET / PROJECT

Warehouse & Distribution facility in PA

TOL.	PROJ.	FOR INFORMATION	ÉCH. / SCALE: N.T.S.
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			NUMÉRO DE DESSIN / DRAWING NUMBER: 6790-WALCHEM 1
			PAGE DE / OF



Cartes d'entrées supplémentaires

A (1) carte dual sensor - (1) entrée pour la sonde de pH - (1) de spare
B (1) carte avec (2) entrées 4-20 mA - pour les deux sonde de Nitrate

Inclure connexion via internet pour accès à distance

LEGEND

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120 / 240 Vdc : POWER

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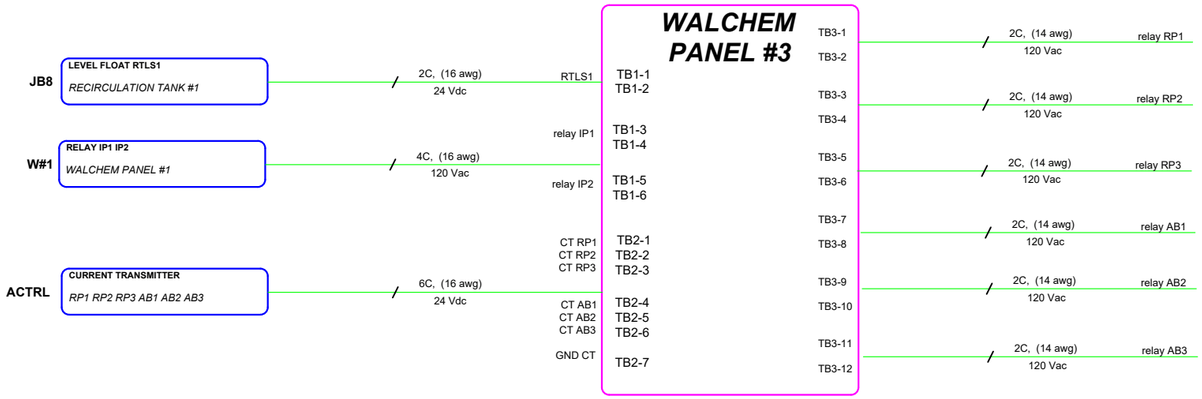
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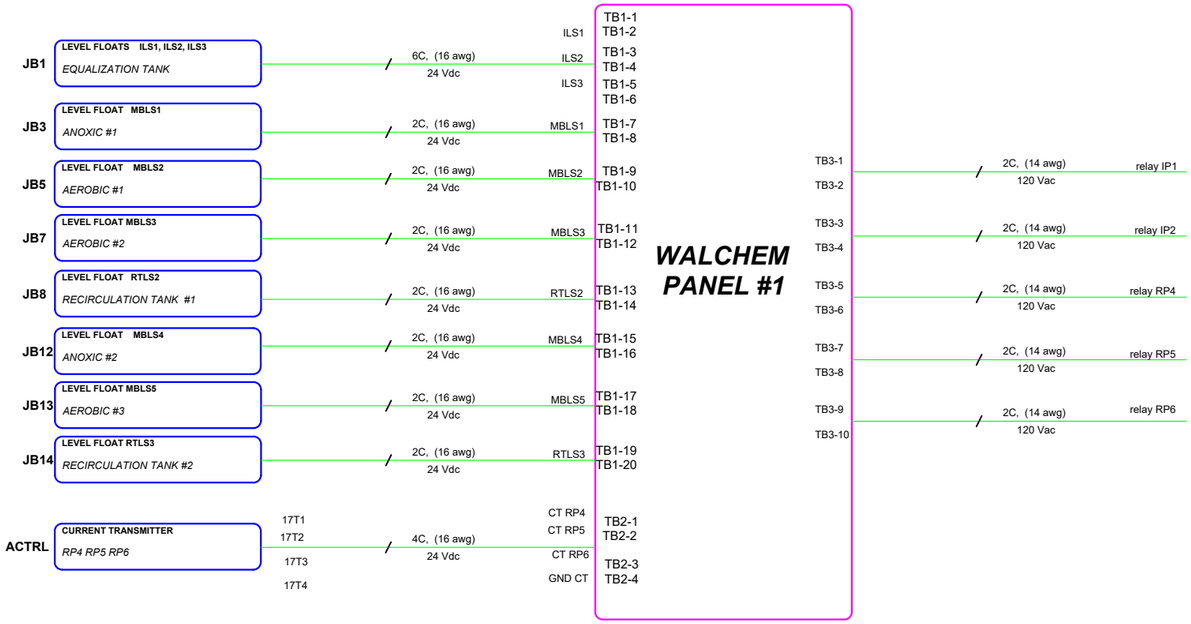
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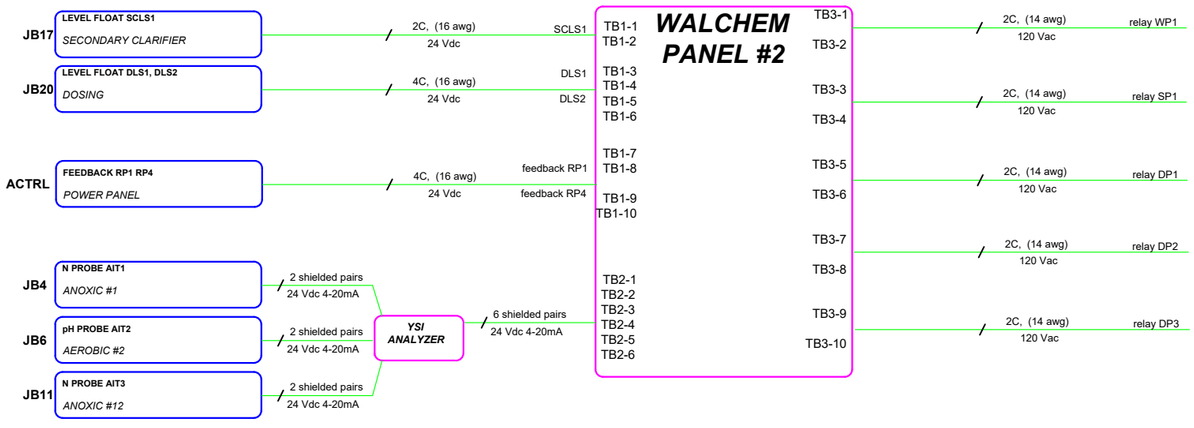
ECOPROCESS™ MBBR

Electrical Distribution

PROJET / PROJECT

Warehouse & Distribution facility in PA

TOL.	PROJ.	FOR INFORMATION	ÉCH. / SCALE: N.T.S.
DESSINÉ / DRAWN	DATE	MATÉRIEL / MATERIAL	No PROJET / PROJECT No.: P-6790
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			PAGE DE / OF



Additional entry cards

A (1) dual sensor card - (1) input for the pH probe - (1) spare
B (1) card with (2) 4-20 mA inputs - for both Nitrate probes

Include internet connection for remote access

LEGEND

24vdc / 120 Vac : CONTROL

120 / 240 Vdc : POWER

NOTE

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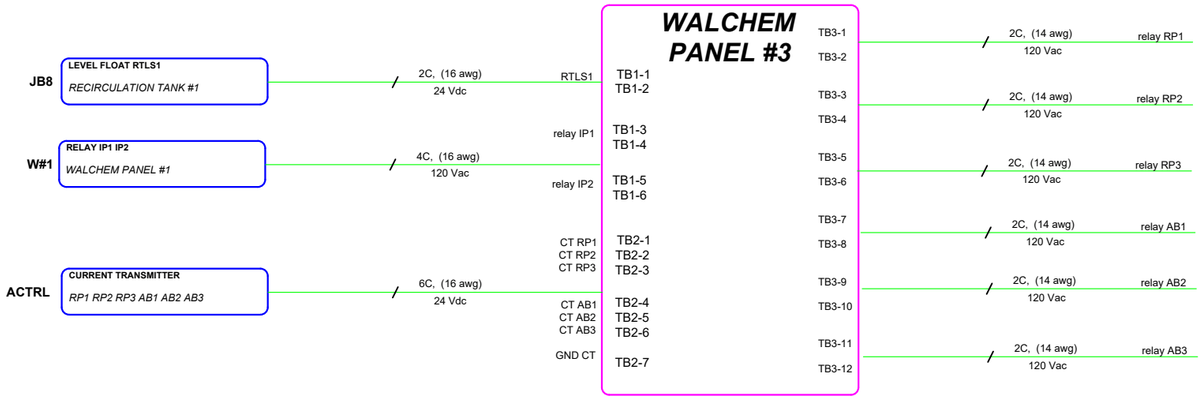
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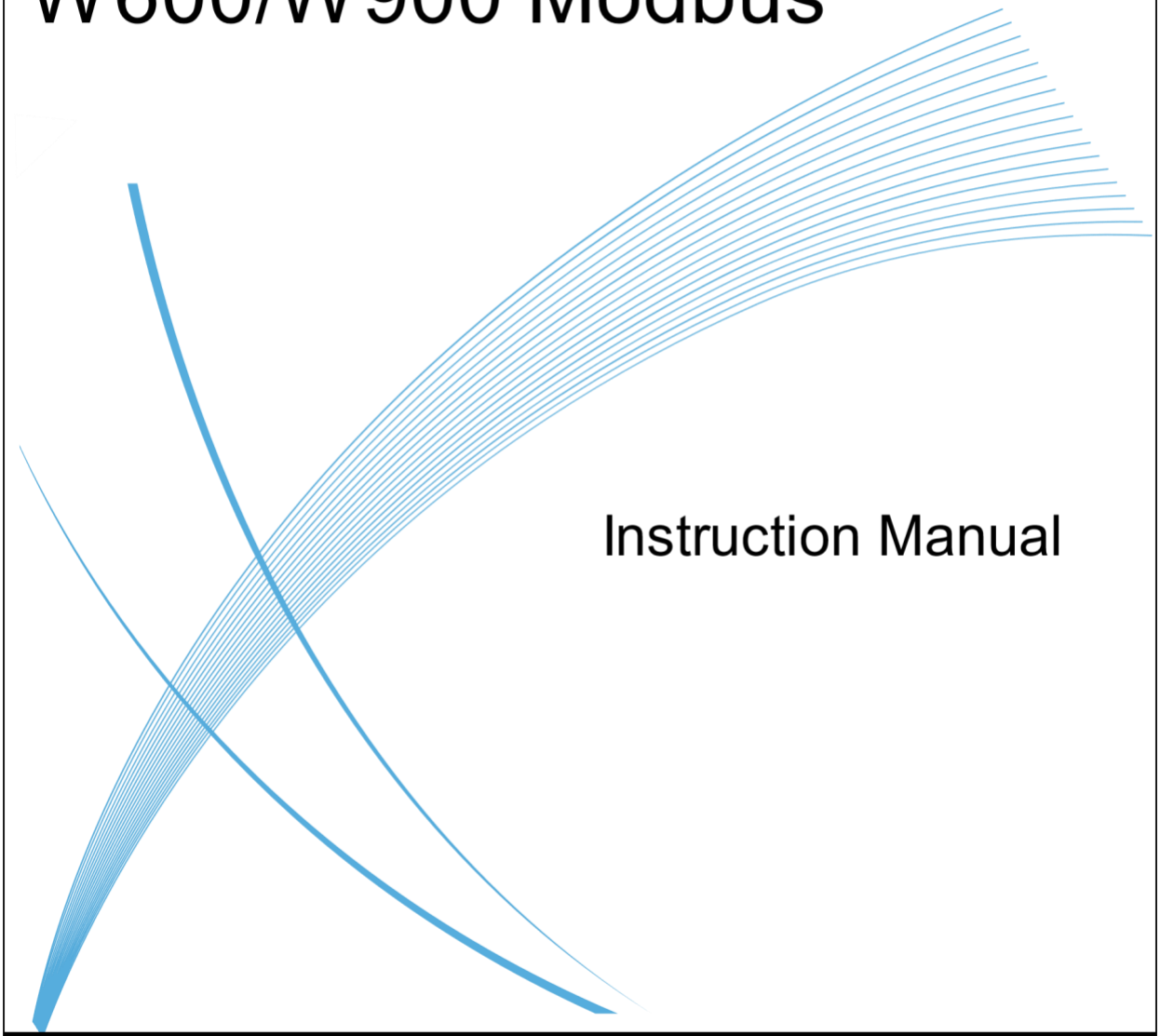
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WALCHEM

IWAKI America Inc.

W600/W900 Modbus



Instruction Manual

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180676 Rev G
April 2020

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1.0 SCOPE

This document is a User Interface Specification for the Walchem Modbus/TCP product feature for W600 and W900 Controllers. It contains mapping of the various dynamic variables to their Modbus/TCP address locations.

This document supports the Modbus/TCP feature on controller software versions 3.01 and higher.

2.0 INTRODUCTION

The Modbus/TCP feature allows the Walchem controller to communicate with PC-based applications such as WonderWare and Intellution HMI/SCADA programs, Building Energy Management systems, Distributed Control Systems (DCS), as well as stand-alone HMI devices.

The controller is a Modbus Server, meaning that it can respond to requests from the HMI device. The controller cannot initiate the flow of information. For example, it will not immediately send a new alarm message. It will wait until the HMI device requests the current data contained in specific address locations.

If the HMI device does not directly support the Modbus/TCP protocol, then a protocol translation gateway may be required to convert from Modbus/TCP to a protocol that the device supports. Please note that Modbus/RTU requires a serial interface, not Ethernet, and therefore is not directly compatible with the Walchem controller.

3.0 OVERVIEW

Modbus/TCP, also known as Modbus TCP/IP, is a form of Modbus that uses the TCP/IP layers as a base for controlling the communications between different devices. This is not to be confused with Modbus *over* TCP/IP, which Walchem controllers do not support.

The Modbus/TCP protocol supports multiple types of data transactions, from reading single bits per transaction, to advanced object-oriented operations. However, to ensure the most compatible system available, only a basic subset of these functions is supported in the controller.

The official Modbus/TCP protocol supports data addresses 5 digits in length. A *de facto* extended standard exists which supports data addresses 6 digits in length. However, to ensure compatibility, the Modbus/TCP feature supports only 5-digit data address system.

The Modbus/TCP feature supports reading and writing of single-bit Coils and 16-bit Holding Registers, as well as read-only single-bit Discrete Inputs and 16-bit Input Registers. These data formats allow the controller to establish blocks that contain all the process variables, set points, alarms, and input/output status values that are made public to a Modbus/TCP client. These blocks of data are packaged so that it can be read in 8-bit chunks (for a group of up to 8 Coils or Discrete Inputs) or 16-bit chunks (for a single Holding Register or Input Register), regardless of the type of data within it. In the following sections, the formatting, storing, and reading of this data are described.

3.1 Modbus Settings

Settings relating to the Modbus/TCP feature can be configured in the Remote Communication Configuration Menu.

The 'Verbose Logging' setting is used to generate an Event log entry for every Modbus message into and out of the controller. The information may be used in conjunction with an HMI log when troubleshooting communications during commissioning. However, the additional logging adds a significant load on the controller's systems. Therefore, this feature should only be enabled temporarily while actively troubleshooting communications. The setting automatically reverts to Disabled when the controller is restarted.

Detailed information on the Remote Communication Configuration Menu can be found in the controller Instruction Manual.

4.0 MODBUS/TCP DRIVER

4.1 Modbus/TCP Protocol

The Modbus protocol, as well as the Modbus/TCP variant, is well documented in the specifications which are available at http://www.modbus.org, a website established by the Modbus Organization for supporting and organizing the Modbus protocol.

The Modbus/TCP Application Data Unit (ADU) consists of 2 distinct sections:



The total size of the ADU is between 9 and 263 bytes, depending on the function code and number of data addresses requested.

4.1.1 MBAP Header

The Modbus/TCP extension adds 7 additional bytes to the original Modbus protocol, which allows for the transport over the TCP/IP layers. These 7 bytes make up the MBAP Header:

Modbus Application Protocol (MBAP) Header		
Name	**Size**	**Description**
Transaction Identifier	2 bytes	Identification of Request/Response transaction. Copied from request to response
Protocol Identifier	2 bytes	0 = Modbus protocol.
Length	2 bytes	Number of following bytes (includes the Unit Identifier and PDU)
Unit Identifier	1 byte	Identification of Remote Device. Can be used for broadcasting (unsupported).

The Unit Identifier has a special consideration in the Modbus/TCP implementation. If the value is 0, then the request is a broadcast message and the packet will be processed, but no response will be generated. If the value is non-zero, the packet will be processed and a response will be returned.

Normally the Slave ID, which is not present in the Modbus/TCP protocol, will be set in the HMI client software to 1. The broadcast Unit Identifier address is not supported by the controller; all supported function codes require a response message at all times.

4.1.2 Protocol Data Unit

The Protocol Data Unit (PDU) is made up of between 2 and 256 bytes, depending on the function and number of data addresses requested:

Protocol Data Unit (PDU)		
Name	**Size**	**Description**
Function Code	1 byte	Function Code identifier. Can be any of the hexadecimal codes listed in the Function Code table.
Data Payload	1 – 255 byte(s)	Payload for request/response transactions. Varies depending on function code and number of addresses requested.

4.1.3 Modbus/TCP Function Codes

The Modbus/TCP Server feature supports the following function codes:

Supported Function Codes			
Function Code	**Name**	**Description**	**Data Address Range**
FC1 (0x01)	Read Coils	Read up to 2000 consecutive 1-bit Coils within a single request/response cycle.	0xxxx
FC2 (0x02)	Read Discrete Inputs	Read up to 2000 consecutive 1-bit Discrete Inputs within a single request/response cycle.	1xxxx
FC3 (0x03)	Read Holding Registers	Read up to 125 consecutive 16-bit Holding Registers within a single request/response cycle.	4xxxx
FC4 (0x04)	Read Input Registers	Read up to 125 consecutive 16-bit Input Registers within a single request/response cycle.	3xxxx
FC5 (0x05)	Write Single Coil	Write a single 1-bit Coil within a single request/response cycle.	0xxxx
FC6 (0x06)	Write Single Holding Register	Write a single 16-bit Holding Register within a single request/response cycle.	4xxxx
FC16 (0x10)	Write Multiple Holding Registers	Write up to 125 consecutive 16-bit Holding Registers within a single request/response cycle.	4xxxx

The consecutive address limitations of the Coils, Discrete Inputs, Holding Registers, and Input Registers were established for the Modbus/TCP standard to maintain consistency with the original Modbus protocol standard, even though a TCP/IP packet can contain a larger payload.

The Modbus/TCP feature allows for Function Codes 1 and 2 to be used interchangeably for read requests. For example, a read coils (FC1) request for data addresses 00605 through 00610 will always return the same result as a read discrete inputs (FC2) request for data addresses 10605 through 10610.

Likewise, the Modbus/TCP feature allows for Function Codes 3 and 4 to also be used interchangeably for read requests. For example, a read holding registers (FC3) request for data addresses 40587 through 40590 will always return the same result as a read input registers (FC4) request for data addresses 30587 through 30590. All addresses accessible as a Coil or Discrete Input may also be accessed as a Holding Register or Input Register.

Only the 4 least significant digits of the data address are explicitly stated in the Modbus message, with the most significant (5^{th}) digit being derived from the function code. However, generally the entire 5-digit data address must be specified in the Tag Database of an HMI.

4.1.3.1 Function Code 1, Read Coils

Read Coils Request PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x01).
Starting Address	2 Bytes	The data address of the first Coil to read.
Quantity of Coils	2 Bytes	The number of Coils requested, maximum of 2000 per message.

Read Coils Response PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x01).
Byte Count	1 Byte	The number of data bytes to follow.
Coil Status	1-125 Bytes	8 Coils per byte, up to 2000 Coils per message.

Read Coils Exception PDU		
Name	**Size**	**Description**
Error Code	1 Byte	0x80 plus Function Code Identifier (0x81).
Exception Code	1 Byte	See 4.1.4 Modbus/TCP Exception Error Codes

4.1.3.2 Function Code 2, Read Discrete Inputs

Read Discrete Inputs Request PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x02).
Starting Address	2 Bytes	The data address of the first Discrete Input to read.
Quantity of Discrete Inputs	2 Bytes	The number of Discrete Inputs requested, maximum of 2000 per message.

Read Discrete Inputs Response PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x02).
Byte Count	1 Byte	The number of data bytes to follow.
Discrete Input Status	1-125 Bytes	8 Discrete Inputs per byte, up to 2000 Discrete Inputs per message.

Read Discrete Inputs Exception PDU		
Name	**Size**	**Description**
Error Code	1 Byte	0x80 plus Function Code Identifier (0x82).
Exception Code	1 Byte	See 4.1.4 Modbus/TCP Exception Error Codes

4.1.3.3 Function Code 3, Read Holding Registers

Read Holding Registers Request PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x03).
Starting Address	2 Bytes	The data address of the first Holding Register to read.
Quantity of Holding Registers	2 Bytes	The total number of Holding Registers requested, maximum of 125 per message.

Read Holding Registers Response PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x03).
Byte Count	1 Byte	The number of data bytes to follow.
Holding Register Values	2-250 Bytes	1 Holding Register for every 2 bytes, maximum of 125 Holding Registers per message.

Read Holding Registers Exception PDU		
Name	**Size**	**Description**
Error Code	1 Byte	0x80 plus Function Code Identifier (0x83).
Exception Code	1 Byte	See 4.1.4 Modbus/TCP Exception Error Codes

4.1.3.4 Function Code 4, Read Input Registers

Read Input Registers Request PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x04).
Starting Address	2 Bytes	The data address of the first Input Register to read.
Quantity of Input Registers	2 Bytes	The total number of Input Registers requested, maximum of 125 per message.

Read Input Registers Response PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x04).
Byte Count	1 Byte	The number of data bytes to follow.
Input Register Values	2-250 Bytes	1 Input Register for every 2 bytes, maximum of 125 Input Registers per message.

Read Input Registers Exception PDU		
Name	**Size**	**Description**
Error Code	1 Byte	0x80 plus Function Code Identifier (0x84).
Exception Code	1 Byte	See 4.1.4 Modbus/TCP Exception Error Codes

4.1.3.5 Function Code 5, Write Single Coil

Write Single Coil Request PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x05).
Coil Address	2 Bytes	The data address of the Coil to which to write.
Coil Value	2 Bytes	The value to write to the Coil (0xFF00 = On, 0x0000 = Off).

Write Single Coil Response PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x05).
Coil Address	2 Bytes	The data address of the Coil written.
Coil Value	2 Bytes	The value written to the Coil (0xFF00 = On, 0x0000 = Off).

Write Single Coil Exception PDU		
Name	**Size**	**Description**
Error Code	1 Byte	0x80 plus Function Code Identifier (0x85).
Exception Code	1 Byte	See 4.1.4 Modbus/TCP Exception Error Codes

4.1.3.6 Function Code 6, Write Single Holding Register

Write Single Holding Register Request PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x06).
Holding Register Address	2 Bytes	The data address of the Holding Register to which to write.
Holding Register Value	2 Bytes	The value to write to the Holding Register.

Write Single Holding Register Response PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x06).
Holding Register Address	2 Bytes	The data address of the Holding Register written.
Holding Register Value	2 Bytes	The value written to the Holding Register.

Write Single Holding Register Exception PDU		
Name	**Size**	**Description**
Error Code	1 Byte	0x80 plus Function Code Identifier (0x86).
Exception Code	1 Byte	See 4.1.4 Modbus/TCP Exception Error Codes

4.1.3.7 Function Code 16, Write Multiple Holding Registers

Write Multiple Holding Registers Request PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x10).
Starting Address	2 Bytes	The data address of the first Holding Register to which to write.
Quantity of Holding Registers	2 Bytes	Number of Holding Registers to write.
Byte Count	1 Byte	The number of data bytes to follow.
Holding Register Values	1-250 Bytes	2 bytes for every Holding Register, maximum of 125 Holding Registers per message.

Write Multiple Holding Registers Response PDU		
Name	**Size**	**Description**
Function Code	1 Byte	Function Code Identifier (0x10).
Starting Address	2 Bytes	The data address of the Holding Register written.
Quantity of Holding Registers	2 Bytes	Number of Holding Registers written.

Write Multiple Holding Registers Exception PDU		
Name	**Size**	**Description**
Error Code	1 Byte	0x80 plus Function Code Identifier (0x90).
Exception Code	1 Byte	See 4.1.4 Modbus/TCP Exception Error Codes

4.1.4 Modbus/TCP Exception Error Codes

The Modbus/TCP feature supports the following Exception (Error) Codes:

Supported Exception Codes		
Exception Code	**Name**	**Description**
0x01	Illegal Function	The function code received is not supported in the controller.
0x02	Illegal Data Address	The data address received is not an allowable address within the controller. This error will only be generated if the first register requested is not valid for the function.
0x03	Illegal Data Value	A value contained in the query data field for a *Write* command is not an allowable value for field. This error will only be generated if the first register requested is not valid for the function.
0x04	Slave Device Failure	An unrecoverable error occurred while the controller was attempting to perform the requested action. This is a general exception code indicating that the request was valid, but the controller could provide a response.

When an exception occurs, the Response PDU contains a Function Code of 0x80 plus the original hexadecimal Function Code.

4.2 TCP/IP Interface

The Modbus/TCP interface is attached to the TCP/IP stack that is implemented within the Walchem controller. When the Modbus feature is *Enabled*, the controller will listen to all communications that come in on the Modbus/TCP registered port 502. This port can be changed in the Remote Communications Menu.

4.3 Data Refresh

To ensure continued connectivity, the Modbus/TCP client should not request data more frequently than once every 5000 msec. Faster refresh rates are unsupported and may result in unexpected behavior.

4.4 Data Encoding

Modbus uses a 'big-endian' representation for addresses and data items. This means that within each register, when a numerical quantity larger than a single byte is transmitted, the MOST significant byte is sent first. The following topics describe the different types of encoding and show how the data is encoded within the Modbus/TCP packet. Most client drivers will extract the data from the packet in the correct format for use/display within the client environment.

4.4.1 Coils and Discrete Inputs

4.4.1.1 Boolean

Coils and Discrete Inputs can be used for digital input states, relay states, alarm states, and reset buttons that are representable as a 1 or a 0. All binary data is packed from least significant bit to most significant bit into a byte containing up to 8 Coils or Discrete Inputs. Bits not containing the value of a Coil or Discrete Input are space holders and have a value of 0.

Byte Value	Coil 1	Coil 2	6 unused bits
0x02 (00000010)	0	1	000000

Reset buttons may also be packed as a 16-bit word when using the Write Single Coil function code. (0xFF00 = On, 0x0000 = Off)

Word Value	Coil Value	Most Significant Byte	Least Significant Byte
0xFF00 (1111111100000000)	1	0xFF (11111111)	0x00 (00000000)

4.4.2 Holding Register and Input Registers

4.4.2.1 16-Bit Word (Boolean)

Holding Registers and Input Registers can be used for digital input states, relay states, alarm states, and reset buttons that are representable as a 1 or a 0. All binary data can be packed into a 16-Bit register, with the least significant bit of the least significant byte being occupied by the 1-bit value. This is functionally identical to a 16-bit integer.

Word Value	Bit Value	Most Significant Byte	Least Significant Byte
0x0001 (0000000000000001)	1	0x00 (00000000)	0x01 (00000001)

4.4.2.2 16-Bit Word (Bitfield)

Holding Registers and Input Registers can be used for Alarm Bitfields. An 8-Bit Alarm bitfield is packed into the least significant byte of a 16-bit register. This is offered as a single-register alternative to accessing alarm states individually. Bitfields can be decoded in section 5.5 Alarm Bitfields.

Word Value	Alarm Bitfield Value	Most Significant Byte	Least Significant Byte
0x00AA (0000000010101010)	0xAA	0x00 (00000000)	0xAA (10101010)

4.4.2.3 16-Bit Word (Status)

Holding Registers and Input Registers can be used for enumerated values such as status codes. An 8-Bit status code is packed into the least significant byte of a 16-bit register. This is functionally identical to the 16-bit integer. Status codes are defined in section 5.4 Status Register Codes.

Word Value	Alarm Bitfield Value	Most Significant Byte	Least Significant Byte
0x00AA (0000000010101010)	0xAA	0x00 (00000000)	0xAA (10101010)

4.4.2.4 16-Bit Word (Integer)

Holding Registers and Input Registers can be used for 16-bit integers containing HOA settings, and time data that don't require 32-bit integers. All 16-bit integers are unsigned.

Word Value	Most Significant Byte	Least Significant Byte
0x1234	0x12	0x34

4.4.2.5 32-Bit Value (Integer)

Holding Registers and Input Registers can be used for 32-bit integer data containing elapsed time values and timestamps. The system clock register and all registers containing timestamps use the Unix Time format, that counts the seconds passed since 12:00:00 am, January 1st, 1970. Registers are only 16 bits wide; therefore, a request message must include 2 consecutive registers to read or write a 32-bit integer. The 32-bit value is transmitted with the least significant word first, then the most significant word. All 32-bit integers are unsigned.

Word Value	Register 1		Register 2	
	Most Significant	Least Significant	Most Significant	Least Significant
	Least Significant Word		Most Significant Word	
0x12345678	0x56	0x78	0x12	0x34

4.4.2.6 32-Bit Value (Float)

Holding Registers and Input Registers can be used for 32-bit floating point data containing set points, sensor readings, percentages, deadbands, etc. Registers are only 16 bits wide; therefore, a request message must include 2 consecutive registers to read or write a 32-bit float. The 32-bit value is transmitted with the least significant word first, then the most significant word.

Word Value	Register 1		Register 2	
	Most Significant	Least Significant	Most Significant	Least Significant
	Least Significant Word		Most Significant Word	
0x12345678	0x56	0x78	0x12	0x34

4.4.2.7 32-Bit Inverse Data Format (Integer or Float)

32-bit integers and floats can use an inverse data format, where the contents of registers 1 and 2 are switched. When inverse data format is selected, the 32-bit value is transmitted with the most significant word first, then the least significant word. The data format setting can be modified in the Remote Communications Settings Menu.

Word Value	Register 1		Register 2	
	Most Significant	Least Significant	Most Significant	Least Significant
	Most Significant Word		Least Significant Word	
0x12345678	0x12	0x34	0x56	0x78

5.0 DATA DICTIONARY

5.1 Addressing (0- or 1-Based)

The addressing within the Modbus/TCP protocol (that is, the data within the physical packet) is 0-based, meaning the first element/item to be accessed is referenced by address 0. The Modbus standard for handling and displaying data is 1-based, meaning the first element/data item to be accessed is referenced by address 1.

For most client applications, users enter the 1-based number which is converted to 0-based addressing at the protocol level. The addresses defined in the following address maps below are 1-based, as most of the client applications work with this method. Register addresses for individual elements are derived by adding the address offset in the appropriate Type-Specific Address Map to the starting address in the I/O Channel Address Map below.

5.2 Address Maps

The address map is a function code-agnostic map that contains all data values that can be accessed as Coils (0xxxx), Discrete Inputs (1xxxx), Holding Registers (4xxxx), and Input Registers (3xxxx).

The Address Map of the Modbus/TCP feature is modular; valid addresses are determined by the add-on card configuration of the controller and the task being performed by each Input or Output. Each object has a block of 36 addresses.

The Modbus/TCP feature allows all addresses to be accessed as registers. On the following address map tables, values in **BOLD** can also be accessed as a Coil or Discrete Input.

As examples, to read the 'Controller Firmware Version' from the System Address Map (starting address x0037) as an Input Register (FC4), the address indices 2 and 3 must be requested together: Addresses 30039 and 30040.

To read the 'Low Alarm' status for Sensor 2-1 in a W600 Controller as a Coil (FC1), the Sensor Input Address Map indicates the starting address is x0865. Address index 28 must be requested: Address 00893. For the W900 Controller, the 'Low Alarm' status for Sensor 2-1 is x1729 + 28 = Address 01757.

To write the 'Setpoint' for Relay 3 (set to On/Off control mode) in the Relay On/Off Control Mode Address Map (staring address x9001) as a Holding Register (FC6), the address indices 6 and 7 must be used together: Addresses 49007 and 49008.

5.2.1 W600 Controller – I/O Channel Address Maps

The address ranges for each input/output channel in the W600 controller are as follows:

W600 Controller – I/O Channel Address Map			
Object	**Starting Address**	**Ending Address**	**Type-Specific Address Maps**
System	x0037	x0072	See 5.3.1 System Address Map
Network	x0145	x0180	See 5.3.2 Network Address Map
Sensor Input 1-1	x0577	x0612	See 5.3.3 Sensor Input Address Maps
Sensor Input 1-2	x0613	x0648	
Sensor Input 1-3	x0649	x0684	
Sensor Input 2-1	x0865	x0900	
Sensor Input 2-2	x0901	x0936	
Sensor Input 2-3	x0937	x0972	
Digital Input 1	x0289	x0324	See 5.3.4 Digital Input Address Maps
Digital Input 2	x0325	x0360	
Digital Input 3	x0361	x0396	
Digital Input 4	x0397	x0432	
Digital Input 5	x0433	x0468	
Digital Input 6	x0469	x0504	
Virtual Input 1	x5761	x5796	See 5.3.5 Virtual Input Address Maps
Virtual Input 2	x5797	x5832	
Relay Output 1	x8929	x8964	See 5.3.6 Relay Output Address Maps Or 5.3.7 Pulse Relay Output Address Maps
Relay Output 2	x8965	x9000	
Relay Output 3	x9001	x9036	
Relay Output 4	x9037	x9072	
Relay Output 5	x9073	x9108	
Relay Output 6	x9109	x9144	
Analog Output 1	x1153	x1188	See 5.3.8 Analog Output Address Maps
Analog Output 2	x1189	x1224	

5.2.2 W900 Controller – I/O Channel Address Maps

The address ranges for each input/output channel in the W900 controller are as follows:

<table>
<tr><th colspan="4">W900 Controller – I/O Channel Address Map</th></tr>
<tr><th>Object</th><th>Starting Address</th><th>Ending Address</th><th>Type-Specific Address Maps</th></tr>
<tr><td>System</td><td>x0037</td><td>x0072</td><td>See 5.3.1 System Address Map</td></tr>
<tr><td>Network</td><td>x0145</td><td>x0180</td><td>See 5.3.2 Network Address Map</td></tr>
<tr><td>Sensor Input 1-1</td><td>x1153</td><td>x1188</td><td rowspan="24">See 5.3.3 Sensor Input Address Maps

Note: When using P/N 191918 I/O card with 2 Analog Input + 4 Analog Output channels, the two (4-20 mA) Sensor Inputs are mapped from channels 1 and 2 into channels 5 and 6.

For example, if the card is installed in the third I/O slot, the register address mapping is:

Analog Output 3-1: x2305 to x2340
Analog Output 3-2: x2341 to x2376
Analog Output 3-3: x2377 to x2412
Analog Output 3-4: x2413 to x2448
Sensor Input 3-1: x2449 to x2484
Sensor Input 3-2: x2485 to x2520</td></tr>
<tr><td>Sensor Input 1-2</td><td>x1189</td><td>x1224</td></tr>
<tr><td>Sensor Input 1-3</td><td>x1225</td><td>x1260</td></tr>
<tr><td>Sensor Input 1-4</td><td>x1261</td><td>x1296</td></tr>
<tr><td>Sensor Input 1-5</td><td>x1297</td><td>x1332</td></tr>
<tr><td>Sensor Input 1-6</td><td>x1333</td><td>x1368</td></tr>
<tr><td>Sensor Input 2-1</td><td>x1729</td><td>x1764</td></tr>
<tr><td>Sensor Input 2-2</td><td>x1765</td><td>x1800</td></tr>
<tr><td>Sensor Input 2-3</td><td>x1801</td><td>x1836</td></tr>
<tr><td>Sensor Input 2-4</td><td>x1837</td><td>x1872</td></tr>
<tr><td>Sensor Input 2-5</td><td>x1873</td><td>x1908</td></tr>
<tr><td>Sensor Input 2-6</td><td>x1909</td><td>x1944</td></tr>
<tr><td>Sensor Input 3-1</td><td>x2305</td><td>x2340</td></tr>
<tr><td>Sensor Input 3-2</td><td>x2341</td><td>x2376</td></tr>
<tr><td>Sensor Input 3-3</td><td>x2377</td><td>x2412</td></tr>
<tr><td>Sensor Input 3-4</td><td>x2413</td><td>x2448</td></tr>
<tr><td>Sensor Input 3-5</td><td>x2449</td><td>x2484</td></tr>
<tr><td>Sensor Input 3-6</td><td>x2485</td><td>x2520</td></tr>
<tr><td>Sensor Input 4-1</td><td>x2881</td><td>x2916</td></tr>
<tr><td>Sensor Input 4-2</td><td>x2917</td><td>x2952</td></tr>
<tr><td>Sensor Input 4-3</td><td>x2953</td><td>x2988</td></tr>
<tr><td>Sensor Input 4-4</td><td>x2989</td><td>x3024</td></tr>
<tr><td>Sensor Input 4-5</td><td>x3025</td><td>x3060</td></tr>
<tr><td>Sensor Input 4-6</td><td>x3061</td><td>x3096</td></tr>
<tr><td>Digital Input 1</td><td>x0577</td><td>x0612</td><td rowspan="12">See 5.3.4 Digital Input Address Maps</td></tr>
<tr><td>Digital Input 2</td><td>x0613</td><td>x0648</td></tr>
<tr><td>Digital Input 3</td><td>x0649</td><td>x0684</td></tr>
<tr><td>Digital Input 4</td><td>x0685</td><td>x0720</td></tr>
<tr><td>Digital Input 5</td><td>x0721</td><td>x0756</td></tr>
<tr><td>Digital Input 6</td><td>x0757</td><td>x0792</td></tr>
<tr><td>Digital Input 7</td><td>x0793</td><td>x0828</td></tr>
<tr><td>Digital Input 8</td><td>x0829</td><td>x0864</td></tr>
<tr><td>Digital Input 9</td><td>x0865</td><td>x0900</td></tr>
<tr><td>Digital Input 10</td><td>x0901</td><td>x0936</td></tr>
<tr><td>Digital Input 11</td><td>x0937</td><td>x0972</td></tr>
<tr><td>Digital Input 12</td><td>x0973</td><td>x1008</td></tr>
</table>

W900 Controller – I/O Channel Address Map			
Object	**Starting Address**	**Ending Address**	**Type-Specific Address Maps**
Virtual Input 1	x5761	x5796	See 5.3.5 Virtual Input Address Maps
Virtual Input 2	x5797	x5832	
Virtual Input 3	x5833	x5868	
Virtual Input 4	x5869	x5904	
Virtual Input 5	x5905	x5940	
Virtual Input 6	x5941	x5976	
Virtual Input 7	x5977	x6012	
Virtual Input 8	x6013	x6048	
Relay Output 1	x8929	x8964	See 5.3.6 Relay Output Address Maps Or 5.3.7 Pulse Relay Output Address Maps
Relay Output 2	x8965	x9000	
Relay Output 3	x9001	x9036	
Relay Output 4	x9037	x9072	
Relay Output 5	x9073	x9108	
Relay Output 6	x9109	x9144	
Relay Output 7	x9145	x9180	
Relay Output 8	x9181	x9144	
Analog Output 1-1	x1153	x1188	See 5.3.8 Analog Output Address Maps
Analog Output 1-2	x1189	x1224	
Analog Output 1-3	x1225	x1260	
Analog Output 1-4	x1261	x1296	
Analog Output 2-1	x1729	x1764	
Analog Output 2-2	x1765	x1800	
Analog Output 2-3	x1801	x1836	
Analog Output 2-4	x1837	x1872	
Analog Output 3-1	x2305	x2340	
Analog Output 3-2	x2341	x2376	
Analog Output 3-3	x2377	x2412	
Analog Output 3-4	x2413	x2448	
Analog Output 4-1	x2881	x2916	
Analog Output 4-2	x2917	x2952	
Analog Output 4-3	x2953	x2988	
Analog Output 4-4	x2989	x3024	
Control Output 1	x6913	x6948	See 5.3.6 Relay Output Address Maps Or 5.3.7 Pulse Relay Output Address Maps Note: Control Outputs share address maps and alarm bitfields with Relay control modes
Control Output 2	x6949	x6984	
Control Output 3	x6985	x7020	
Control Output 4	x7021	x7056	
Control Output 5	x7057	x7092	
Control Output 6	x7093	x7128	
Control Output 7	x7129	x7164	
Control Output 8	x7165	x7200	

5.2.3 Alternate Address Maps

The I/O Address Maps in the previous sections are based on the hardware position/slot within the controller. Alternate Address Maps use software-based, dynamic addressing to provide a more efficient way to access similar data from different objects. Using these address tables, the same field type is accessible using consecutive addresses. For example, the primary values for all sensors installed in the controller can be accessed in a single Modbus FC4 request/response cycle starting at address 39217.

I/O Type	Available Objects	Type-Specific Alternate Address Map
Sensor Inputs	Primary Value; Status Alarm Bitfield Low, High Alarms LoLo, HiHi Alarms Calibration Required	See 5.3.9.1 Alternate Sensor Input / Temperature Input / Analog Input Address Map
Digital Inputs	DI State; Interlock State Total Time Flowrate; Flow Total Alarm Bitfield Low, High Alarms	See 5.3.9.2 Alternate Digital Input Address Map
Virtual Inputs	Primary Value; Status Alarm Bitfield	See 5.3.9.3 Alternate Virtual Input Address Map
Relay Outputs	Relay State Pulse Output Percent Time On; Status Alarm Bitfield	See 5.3.9.4 Alternate Relay Output Address Map
Analog Outputs	Output Percent Time On; Status Alarm Bitfield	See 5.3.9.5 Alternate Analog Output Address Map
Control Outputs	Output State Output Percent Time On; Status Alarm Bitfield	See 5.3.9.6 Alternate Control Output Address Map

Note that changing I/O card locations can affect the address used to access individual objects. For example, if a W900 is configured with a Dual SI card in slot 1 and a Dual AI card in slot 3, the alternate address mappings for the primary values are different if a Single SI card is inserted into slot 2:

Scenario #1: I/O Slot 2 Not Populated				**Scenario #2: I/O Slot 2 Populated**			
Channel	**Address**	**Alternate**	**Address**	**Channel**	**Address**	**Alternate**	**Address**
I/O Slot 1: Dual Sensor Input Card				**I/O Slot 1: Dual Sensor Input Card**			
Sensor Input 1-1	x1153	Sensor 1	x9217	Sensor Input 1-1	x1153	Sensor 1	x9217
Sensor Input 1-2	x1189	Sensor 2	x9219	Sensor Input 1-2	x1189	Sensor 2	x9219
Sensor Input 1-3	x1225	Sensor 3	x9221	Sensor Input 1-3	x1225	Sensor 3	x9221
Sensor Input 1-4	x1261	Sensor 4	x9223	Sensor Input 1-4	x1261	Sensor 4	x9223
I/O Slot 2: Not Populated				**I/O Slot 2: Single Sensor Input Card**			
				Sensor Input 2-1	x1729	Sensor 5	x9225
				Sensor Input 2-2	x1765	Sensor 6	x9227
I/O Slot 3: Dual Analog Input Card				**I/O Slot 3: Dual Analog Input Card**			
Sensor Input 3-1	x2305	**Sensor 5**	**x9225**	Sensor Input 3-1	x2305	**Sensor 7**	**x9229**
Sensor Input 3-2	x2341	**Sensor 6**	**x9227**	Sensor Input 3-2	x2341	**Sensor 8**	**x9231**

5.3 Type-Specific Address Maps

5.3.1 System Address Map

System Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Controller Time	32-Bit Integer	Read	Unix Time
1				
2	Controller Firmware Version	32-Bit Float	Read	
3				
4	Date of Last Data Log	32-Bit Integer	Read	Unix Time
5				
6	Controller Processor Temperature	32-Bit Float	Read	°C
7				
8	Network Card Temperature	32-Bit Float	Read	°C
9				
10	Digital Input Card Temperature (W900 Only)	32-Bit Float	Read	°C
11				
12	I/O Card 1 Temperature	32-Bit Float	Read	°C
13				
14	I/O Card 2 Temperature	32-Bit Float	Read	°C
15				
16	I/O Card 3 Temperature (W900 Only)	32-Bit Float	Read	°C
17				
18	I/O Card 4 Temperature (W900 Only)	32-Bit Float	Read	°C
19				
20				
21				
22				
23				
24				
25				
26	Battery Power	32-Bit Float	Read	Volt
27				
28	+3.3 V Supply	32-Bit Float	Read	Volt
29				
30	+5 V Supply	32-Bit Float	Read	Volt
31				
32	+12 V Supply (W900 Only)	32-Bit Float	Read	Volt
33				
34				
35	Alarm Bitfield	16-Bit Bitfield	Read	See 5.5.1 System Alarm Bitfield

5.3.2 Network Address Map

Network Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Fluent Last Data Time	32-Bit Integer	Read	Unix Time
1				
2	Fluent Last Configuration Time	32-Bit Integer	Read	Unix Time
3				
4	Fluent Refresh Rate	32-Bit Float	Read/Write	1 – 1440 Minutes
5				
6	Fluent LiveConnect Status	16-Bit Status	Read	See 5.4 Status Register Codes
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	WiFi Signal Strength (W900 Only)	32-Bit Float	Read	-30 – -100 dBm
19				
20	WiFi RSSI (W900 Only)	32-Bit Float	Read	0 – 100%
21				
22	WiFi Channel (W900 Only)	32-Bit Float	Read	1 – 14
23				
24	WiFi Security (W900 Only)	16-Bit Status	Read	See 5.4 Status Register Codes
25	WiFi Status (W900 Only)	16-Bit Status	Read	See 5.4 Status Register Codes
26	Begin Temporary Ad-Hoc Mode Session (W900 Only)	**Boolean**	**Read/Write**	**Write 1 to Begin Temporary Ad-Hoc Mode Session**
27	End Temporary Ad-Hoc Mode Session (W900 Only)	**Boolean**	**Read/Write**	**Write 1 to End Temporary Ad-Hoc Mode Session**
28	Ad-Hoc Mode Time Limit (W900 Only)	32-Bit Float	Read/Write	1 – 1440 minutes
29				
30				
31				
32				
33				
34				
35	Alarm Bitfield	16-Bit Bitfield	Read	See 5.5.2 Network Alarm Bitfield

5.3.3 Sensor Input Address Maps

5.3.3.1 Sensor Input (all types except Analog Input Flowmeter) Address Map

Sensor Input (all types except Analog Input Flowmeter) Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Primary Value	32-Bit Float	Read	Sensor Units
1				
2	Primary Raw Value	32-Bit Float	Read	Conductivity: µS/cm before ATC Active, Cu/Ni: mV 4-20 mA Input: mA Temperature: Ω Corrosion Rate: Mild Steel mpy Imbalance: Corr/Imb
3				
4	Last Calibration Date	32-Bit Integer	Read	Unix Time
5				
6				
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Sensor Units
11				
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14	LoLo Alarm Setpoint	32-Bit Float	Read/Write	Sensor Units
15				
16	Low Alarm Setpoint	32-Bit Float	Read/Write	Sensor Units
17				
18	High Alarm Setpoint	32-Bit Float	Read/Write	Sensor Units
19				
20	HiHi Alarm Setpoint	32-Bit Float	Read/Write	Sensor Units
21				
22	24-Hour Minimum †	32-Bit Float	Read	Sensor Units
23				
24	24-Hour Maximum †	32-Bit Float	Read	Sensor Units
25				
26	24-Hour Average †	32-Bit Float	Read	Sensor Units
27				
28	**Low Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
29	**High Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
30	**LoLo Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
31	**HiHi Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
32	**Cal Required**	**Boolean**	**Read**	**1 = Alarm Active**
33	**Input Failure**	**Boolean**	**Read**	**1 = Alarm Active**
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	Alarm Bitfield	16-Bit Bitfield	Read	See 5.5.3 Sensor Input Alarm Bitfield

† Field is only available for W900 Controllers.

5.3.3.2 Analog Input Flowmeter Address Map

Analog Input Flowmeter Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Primary Flowrate	32-Bit Float	Read	Flow Units
1				Rate Units
2	Primary Raw Value	32-Bit Float	Read	mA
3				
4	Last Calibration Date	32-Bit Integer	Read	Unix Time
5				
6	Flow Total	32-Bit Float	Read	Flow Units
7				
8	Input Filter	32-Bit Float	Read/Write	mA
9				
10	Deadband	32-Bit Float	Read/Write	Flow Units
11				Rate Units
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14	LoLo Alarm Setpoint	32-Bit Float	Read/Write	Flow Units
15				Rate Units
16	Low Alarm Setpoint	32-Bit Float	Read/Write	Flow Units
17				Rate Units
18	High Alarm Setpoint	32-Bit Float	Read/Write	Flow Units
19				Rate Units
20	HiHi Alarm Setpoint	32-Bit Float	Read/Write	Flow Units
21				Rate Units
22	24-Hour Flow Total	32-Bit Float	Read	Flow Units
23				
24				
25	**Reset Total Flow**	**Boolean**	**Read/Write**	**Write 1 to Reset Flow Total**
26	24-Hour Average Flowrate	32-Bit Float	Read	Flow Units
27				Rate Units
28	**Low Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
29	**High Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
30	**LoLo Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
31	**HiHi Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
32	**Cal Required**	**Boolean**	**Read**	**1 = Alarm Active**
33	**Input Failure**	**Boolean**	**Read**	**1 = Alarm Active**
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	Alarm Bitfield	16-Bit Bitfield	Read	See 5.5.3 Sensor Input Alarm Bitfield

5.3.4 Digital Input Address Maps

5.3.4.1 Digital Input / DI State Type Address Map

Digital Input / DI State Type Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Last Reset Date	32-Bit Integer	Read	Unix Time
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22	24-Hour Time On †	32-Bit Integer	Read	Seconds
23				
24				
25				
26				
27				
28				
29				
30				
31				
32	**Reset Total Time**	**Boolean**	**Read/Write**	**Write 1 to Reset Time**
33	**DI State**	**Boolean**	**Read**	**0 = Open, 1 = Closed**
34	**Interlock State**	**Boolean**	**Read**	**0 = Inactive 1 = Active Interlock**
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.4 Digital Input Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.4.2 Digital Input / Contacting Flow Meter Type Address Map

Digital Input / Contacting Flow Meter Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Last Reset Date	32-Bit Integer	Read	Unix Time
1				
2	Total Flow	32-Bit Float	Read	Flow Units
3				
4				
5				
6	Total Flow Alarm Setpoint	32-Bit Float	Read/Write	0 – 1,000,000,000 Flow Units
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22	24-Hour Flow Total †	32-Bit Float	Read	Flow Units
23				
24				
25				
26				
27				
28				
29				
30				
31				
32	**Reset Total Flow**	**Boolean**	**Read/Write**	**Write 1 to Reset Flow Total**
33				
34				
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.4 Digital Input Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.4.3 Digital Input / Paddlewheel Flow Meter Type Address Map

Digital Input / Paddlewheel Flow Meter Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Last Reset Date	32-Bit Integer	Read	Unix Time
1				
2	Total Flow	32-Bit Float	Read	Flow Units
3				
4	Current Flowrate	32-Bit Float	Read	Flow Units Rate Units
5				
6	Total Flow Alarm Setpoint	32-Bit Float	Read/Write	0 – 1,000,000,000 Flow Units
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Flow Units Rate Units
11				
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14				
15				
16	Low Alarm Setpoint	32-Bit Float	Read/Write	Flow Units Rate Units
17				
18	High Alarm Setpoint	32-Bit Float	Read/Write	Flow Units Rate Units
19				
20				
21				
22	24-Hour Flow Total †	32-Bit Float	Read	Flow Units
23				
24	24-Hour Minimum Flowrate †	32-Bit Float	Read	Flow Units Rate Units
25				
26	24-Hour Maximum Flowrate †	32-Bit Float	Read	Flow Units Rate Units
27				
28	24-Hour Average Flowrate †	32-Bit Float	Read	Flow Units Rate Units
29				
30				
31				
32	**Reset Total Flow**	**Boolean**	**Read/Write**	**Write 1 to Reset Flow Total**
33				
34				
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.4 Digital Input Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.4.4 Digital Input / DI Counter Type Address Map

Digital Input / DI Counter Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Last Reset Date	32-Bit Integer	Read	Unix Time
1				
2	Total	32-Bit Float	Read	Units
3				
4	Current Rate	32-Bit Float	Read	Units Rate Units
5				
6	Total Alarm Setpoint	32-Bit Float	Read/Write	0 – 1,000,000,000 Units
7				
8				
9				
10				
11				
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14				
15				
16				
17				
18				
19				
20				
21				
22	24-Hour Total †	32-Bit Float	Read	Units
23				
24	24-Hour Minimum Rate †	32-Bit Float	Read	Units Rate Units
25				
26	24-Hour Maximum Rate †	32-Bit Float	Read	Units Rate Units
27				
28	24-Hour Average Rate †	32-Bit Float	Read	Units Rate Units
29				
30				
31				
32	**Reset Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Total**
33				
34				
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.4 Digital Input Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.4.5 Digital Input / Flow Monitor Type Address Map

Digital Input / Flow Monitor Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Last Reset Date	32-Bit Integer	Read	Unix Time
1				
2	Total Feed	32-Bit Float	Read	Flow Units
3				
4	Current Flowrate	32-Bit Float	Read	Flow Units / Rate Units
5				
6	Totalizer Alarm Setpoint	32-Bit Float	Read/Write	0 – 1,000,000 Flow Units
7				
8	Volume/Contact	32-Bit Float	Read/Write	0.001 – 1000.000 Flow Units / Pulse
9				
10				
11				
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14	Reprime Time	16-Bit Integer	Read/Write	0 – 3599 Seconds
15	Flow Alarm Delay	16-Bit Integer	Read/Write	10 – 3599 Seconds
16	Flow Alarm Clear	32-Bit Float	Read/Write	1 – 100,000 Pulses
17				
18				
19				
20				
21				
22	24-Hour Flow Total †	32-Bit Float	Read	Flow Units
23				
24	24-Hour Minimum Flowrate †	32-Bit Float	Read	Flow Units / Rate Units
25				
26	24-Hour Maximum Flowrate †	32-Bit Float	Read	Flow Units / Rate Units
27				
28	24-Hour Average Flowrate †	32-Bit Float	Read	Flow Units / Rate Units
29				
30				
31				
32	**Reset Total Flow**	**Boolean**	**Read/Write**	**Write 1 to Reset Flow Total**
33				
34				
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.4 Digital Input Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.4.6 Digital Input / Remote Modbus Type Address Map

Digital Input / Remote Modbus Type Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Last Reset Date	32-Bit Integer	Read	Unix Time
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22	24-Hour Time On	32-Bit Integer	Read	Seconds
23				
24				
25				
26				
27				
28				
29				
30				
31				
32	**Reset Total Time**	**Boolean**	**Read/Write**	**Write 1 to Reset Time**
33	**DI State**	**Boolean**	**Read/Write**	**0 = Open, 1 = Closed**
34	**Interlock State**	**Boolean**	**Read**	**0 = Inactive 1 = Active Interlock**
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.4 Digital Input Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

5.3.5 Virtual Input Address Maps

5.3.5.1 Virtual Input / Calculation Type Address Map

Virtual Input / Calculation Type Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Primary Value	32-Bit Float	Read	Virtual Input Units
1				
2				
3				
4				
5				
6				
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Virtual Input Units
11				
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14	LoLo Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
15				
16	Low Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
17				
18	High Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
19				
20	HiHi Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
21				
22	24-Hour Minimum †	32-Bit Float	Read	Virtual Input Units
23				
24	24-Hour Maximum †	32-Bit Float	Read	Virtual Input Units
25				
26	24-Hour Average †	32-Bit Float	Read	Virtual Input Units
27				
28	**Low Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
29	**High Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
30	**LoLo Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
31	**HiHi Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
32				
33	**Misc. Alarm**	**Boolean**	**Read**	**1 = Out-Of-Range or Input Failure Alarm Active**
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	Alarm Bitfield	16-Bit Bitfield	Read	See 5.5.5 Virtual Input Alarm Bitfield

† Field is only available for W900 Controllers.

5.3.5.2 Virtual Input / Raw Value Type Address Map

Virtual Input / Raw Value Type Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Primary Value	32-Bit Float	Read	Virtual Input Units
1				
2				
3				
4				
5				
6				
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Virtual Input Units
11				
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14	LoLo Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
15				
16	Low Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
17				
18	High Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
19				
20	HiHi Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
21				
22	24-Hour Minimum †	32-Bit Float	Read	Virtual Input Units
23				
24	24-Hour Maximum †	32-Bit Float	Read	Virtual Input Units
25				
26	24-Hour Average †	32-Bit Float	Read	Virtual Input Units
27				
28	**Low Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
29	**High Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
30	**LoLo Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
31	**HiHi Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
32				
33	**Misc. Alarm**	**Boolean**	**Read**	**1 = Out-Of-Range or Input Failure Alarm Active**
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	Alarm Bitfield	16-Bit Bitfield	Read	See 5.5.5 Virtual Input Alarm Bitfield

† Field is only available for W900 Controllers.

5.3.5.3 Virtual Input / Redundant Sensor Type Address Map

Virtual Input / Redundant Sensor Type Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Primary Value	32-Bit Float	Read	Virtual Input Units
1				
2				
3				
4				
5				
6				
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Virtual Input Units
11				
12				
13				
14				
15				
16				
17				
18	Deviation Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
19				
20				
21				
22	24-Hour Minimum	32-Bit Float	Read	Virtual Input Units
23				
24	24-Hour Maximum	32-Bit Float	Read	Virtual Input Units
25				
26	24-Hour Average	32-Bit Float	Read	Virtual Input Units
27				
28				
29				
30				
31				
32	**Deviation Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
33	**Misc. Alarm**	**Boolean**	**Read**	**1 = Input Failure Alarm Active**
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	Alarm Bitfield	16-Bit Bitfield	Read	See 5.5.5 Virtual Input Alarm Bitfield

5.3.5.4 Virtual Input / Disturbance Type Address Map

Virtual Input / Disturbance Type Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Primary Value	32-Bit Float	Read	Unitless
1				
2				
3				
4				
5				
6	Value at Minimum Disturbance	32-Bit Float	Read/Write	Unitless
7				
8	Value at Maximum Disturbance	32-Bit Float	Read/Write	Unitless
9				
10				
11				
12	Smoothing Factor	32-Bit Float	Read/Write	0 – 90%
13				
14				
15				
16				
17				
18				
19				
20				
21				
22	Minimum Disturbance	32-Bit Float	Read/Write	Disturbance Input Units
23				
24	Maximum Disturbance	32-Bit Float	Read/Write	Disturbance Input Units
25				
26	24-Hour Minimum	32-Bit Float	Read	Unitless
27				
28	24-Hour Maximum	32-Bit Float	Read	Unitless
29				
30	24-Hour Average	32-Bit Float	Read	Unitless
31				
32				
33				
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	Alarm Bitfield	16-Bit Bitfield	Read	See 5.5.5 Virtual Input Alarm Bitfield

5.3.5.5 Virtual Input / Remote Modbus Type Address Map

Virtual Input / Remote Modbus Type Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Primary Value	32-Bit Float	Read/Write	Virtual Input Units
1				
2				
3				
4				
5				
6				
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Virtual Input Units
11				
12				
13				
14	LoLo Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
15				
16	Low Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
17				
18	High Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
19				
20	HiHi Alarm Setpoint	32-Bit Float	Read/Write	Virtual Input Units
21				
22	24-Hour Minimum	32-Bit Float	Read	Virtual Input Units
23				
24	24-Hour Maximum	32-Bit Float	Read	Virtual Input Units
25				
26	24-Hour Average	32-Bit Float	Read	Virtual Input Units
27				
28	**Low Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
29	**High Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
30	**LoLo Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
31	**HiHi Alarm**	**Boolean**	**Read**	**1 = Alarm Active**
32				
33	**Misc. Alarm**	**Boolean**	**Read**	**1 = Out-Of-Range or Message Error or Update Timeout or Input Failure Alarm Active**
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	Alarm Bitfield	16-Bit Bitfield	Read	See 5.5.5 Virtual Input Alarm Bitfield

5.3.6 Relay Output Address Maps

5.3.6.1 Relay Output / Manual Control Mode Address Map

Relay Output / Manual Control Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22				
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30				
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.2 Relay Output / On/Off Control Mode Address Map

Relay Output / On/Off Control Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Duty Cycle	32-Bit Float	Read/Write	0 – 100%
13				
14	Duty Cycle Period	16-Bit Integer	Read/Write	0 – 3599 Seconds
15				
16				
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26	Daily Maximum Time Limit †	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.3 Relay Output / On/Off Disturbance Control Mode Address Map

Relay Output / On/Off Disturbance Control Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Duty Cycle	32-Bit Float	Read/Write	0 – 100%
13				
14	Duty Cycle Period	16-Bit Integer	Read/Write	0 – 3599 Seconds
15				
16				
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On	32-Bit Integer	Read	Seconds
25				
26	Daily Maximum Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

5.3.6.4 Relay Output / Dual Setpoint Control Mode Address Map

Relay Output / Dual Setpoint Control Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6	Setpoint 1	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Setpoint 2	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Deadband	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Duty Cycle	32-Bit Float	Read/Write	0 – 100%
13				
14	Duty Cycle Period	16-Bit Integer	Read/Write	0 – 3599 Seconds
15				
16				
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26	Daily Maximum Time Limit †	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.5 Relay Output / Time Proportional Control Mode Address Map

Relay Output / Time Proportional Control Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10	Proportional Band	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Current Cycle	32-Bit Float	Read	Seconds
13				
14	Sample Period	32-Bit Integer	Read/Write	10 – 86,399 Seconds
15				
16				
17				
18				
19				
20				
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26	Daily Maximum Time Limit †	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.6 Relay Output / Intermittent Sampling Control Mode Address Map

Relay Output / Intermittent Sampling Control Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10	Proportional Band	32-Bit Float	Read/Write	Input Sensor Units
11				
12				
13				
14	Sample Time	16-Bit Integer	Read/Write	10 – 3599 Seconds
15	Hold Time	16-Bit Integer	Read/Write	10 – 3599 Seconds
16	Max Blowdown	32-Bit Integer	Read/Write	0 – 86,399 Seconds
17				
18	Wait Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20				
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.7 Relay Output / Bleed And Feed Control Mode Address Map

Relay Output / Bleed And Feed Control Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	Daily Maximum Time Limit †	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20				
21				
22	Feed Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Feed Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Feed Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.8 Relay Output / Bleed Then Feed Control Mode Address Map

Relay Output / Bleed Then Feed Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Feed Time	32-Bit Integer	Read	Seconds
5				
6	Bleed Time	32-Bit Integer	Read	Seconds
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	Daily Maximum Time Limit †	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Feed Percentage	32-Bit Float	Read/Write	0 – 100%
21				
22	Feed Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26				
27	**Reset Timer**	**Boolean**	**Read/Write**	**Write 1 to Reset Feed Timer**
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Feed Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Feed Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.9 Relay Output / Flow Timer Control Mode Address Map

Relay Output / Flow Timer Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Feed Time	32-Bit Integer	Read	Seconds
5				
6	Accumulator Volume Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Volume Units
7				
8	Accumulator Total	32-Bit Float	Read	Volume Units
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	Daily Maximum Time Limit †	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Feed Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26				
27	**Reset Timer**	**Boolean**	**Read/Write**	**Write 1 to Reset Feed Timer**
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.10 Relay Output / Counter Timer Control Mode Address Map

Relay Output / Counter Timer Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Feed Time	32-Bit Integer	Read	Seconds
5				
6	Accumulator Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Units
7				
8	Accumulator Total	32-Bit Float	Read	Units
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	Daily Maximum Time Limit †	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Feed Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26				
27	**Reset Timer**	**Boolean**	**Read/Write**	**Write 1 to Reset Feed Timer**
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.11 Relay Output / Target PPM Control Mode Address Map

Relay Output / Target PPM Control Mode Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Feed Time	32-Bit Integer	Read	Seconds
5				
6	Accumulator Volume Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Volume Units
7				
8	Accumulator Total	32-Bit Float	Read	Volume Units
9				
10	Target PPM	32-Bit Float	Read/Write	1 – 1,000,000 ppm
11				
12	Daily Maximum Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
13				
14	24-Hour Time On	32-Bit Integer	Read	Seconds
15				
16	Specific Gravity Of Product	32-Bit Float	Read/Write	0 – 9.999 mg/l
17				
18	Pump Capacity	32-Bit Float	Read/Write	0 – 10,000 Volume Units / Hour
19				
20	Pump Setting	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Low Cycles Limit	32-Bit Float	Read/Write	0.00 – 100.00
25				
26				
27	**Reset Timer**	**Boolean**	**Read/Write**	**Write 1 to Reset Feed Timer**
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

5.3.6.12 Relay Output / PPM By Volume Control Mode Address Map

Relay Output / PPM By Volume Control Mode Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Feed Volume	32-Bit Float	Read	Volume Units
5				
6	Accumulator Volume Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Volume Units
7				
8	Accumulator Total	32-Bit Float	Read	Volume Units
9				
10	Target PPM	32-Bit Float	Read/Write	1 – 1,000,000 ppm
11				
12	Daily Maximum Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
13				
14				
15				
16	Specific Gravity Of Product	32-Bit Float	Read/Write	0 – 9.999 mg/l
17				
18				
19				
20	24-Hour Time On	32-Bit Integer	Read	Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Low Cycles Limit	32-Bit Float	Read/Write	0.00 – 100.00
25				
26				
27	**Reset Timer**	**Boolean**	**Read/Write**	**Write 1 to Reset Feed Timer**
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

5.3.6.13 Relay Output / Flow Meter Ratio Control Mode Address Map

Relay Output / Flow Meter Ratio Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Volume	32-Bit Float	Read	Flow Units
5				
6	Accumulator Volume Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Flow Units
7				
8	Accumulator Total	32-Bit Float	Read	Flow Units
9				
10	Bleed Volume Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Flow Units
11				
12	Bleed Cycle Volume	32-Bit Float	Read	Flow Units
13				
14				
15				
16				
17				
18				
19				
20	Daily Maximum Time Limit †	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26				
27	**Reset Timer**	**Boolean**	**Read/Write**	**Write 1 to Reset Feed Timer**
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.14 Relay Output / Volumetric Blend Control Mode Address Map

Relay Output / Volumetric Blend Control Mode Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Remaining Volume	32-Bit Float	Read	Flow Units
5				
6	Accumulator Volume Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Flow Units
7				
8	Cycle Volume	32-Bit Float	Read	Flow Units
9				
10	Bleed Volume Setpoint	32-Bit Float	Read/Write	1 – 1,000,000 Flow Units
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	Daily Maximum Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On	32-Bit Integer	Read	Seconds
25				
26				
27	**Reset Timer**	**Boolean**	**Read/Write**	**Write 1 to Reset Feed Timer**
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

5.3.6.15 Relay Output / Dual Switch Control Mode Address Map

Relay Output / Dual Switch Control Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26	Daily Maximum Time Limit †	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.16 Relay Output / Boolean Logic Control Mode Address Map

Relay Output / Boolean Logic Control Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On	32-Bit Integer	Read	Seconds
25				
26	Daily Maximum Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

5.3.6.17 Relay Output / Percent Timer Control Mode Address Map

Relay Output / Percent Timer Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	Feed Percentage	32-Bit Float	Read/Write	0 – 100%
21				
22	Feed Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30				
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.6.18 Relay Output / Event Timer Control Mode Address Map

Relay Output / Event Timer Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6				
7				
8	Event 5 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
9				
10	Event 5 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
11				
12	Event 4 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
13				
14	Event 4 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
15				
16	Event 3 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
17				
18	Event 3 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Event 2 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
21				
22	Event 2 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Event 1 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
25				
26	Event 1 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	Active Timer Event	16-Bit Integer	Read	Event Number
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

5.3.6.19 Relay Output / Biocide Timer Control Mode Address Map

Relay Output / Biocide Timer Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6	Bleed Lockout	32-Bit Integer	Read/Write	0 – 86,399 Seconds
7				
8	Prebleed To Setpoint	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Prebleed Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds
11				
12	Event 4 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
13				
14	Event 4 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
15				
16	Event 3 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
17				
18	Event 3 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Event 2 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
21				
22	Event 2 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Event 1 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
25				
26	Event 1 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	Active Timer Event	16-Bit Integer	Read	Event Number
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

5.3.6.20 Relay Output / Spike Control Mode Address Map

Relay Output / Spike Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Spike Event Time	32-Bit Integer	Read	Seconds
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Spike Setpoint	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Deadband	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Duty Cycle	32-Bit Float	Read/Write	0 – 100%
13				
14	Duty Cycle Period	16-Bit Integer	Read/Write	0 – 3599 Seconds
15				
16	Event 3 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
17				
18	Event 3 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Event 2 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
21				
22	Event 2 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Event 1 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
25				
26	Event 1 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	Active Timer Event	16-Bit Integer	Read	Event Number
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

5.3.6.21 Relay Output / Probe Wash Control Mode Address Map

Relay Output / Probe Wash Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Cycle Time	32-Bit Integer	Read	Seconds
5				
6	Hold Time Limit	32-Bit Integer	Read/Write	0 – 3599 Seconds
7				
8	Event 5 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
9				
10	Event 5 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
11				
12	Event 4 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
13				
14	Event 4 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
15				
16	Event 3 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
17				
18	Event 3 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Event 2 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
21				
22	Event 2 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Event 1 Start Time	32-Bit Integer	Read/Write	0 – 86,399 Seconds Since Midnight
25				
26	Event 1 Duration	32-Bit Integer	Read/Write	0 – 86,399 Seconds
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	Active Timer Event	16-Bit Integer	Read	Event Number
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

5.3.6.22 Relay Output / Plating Control Mode Address Map

Relay Output / Plating Control Address Map (W600 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Total Feed Volume	32-Bit Float	Read	Volume Units
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10	Deadband	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Duty Cycle	32-Bit Float	Read/Write	0 – 100%
13				
14	Duty Cycle Period	16-Bit Integer	Read/Write	0 – 3599 Seconds
15				
16	Pump Setting	32-Bit Float	Read/Write	0 – 100%
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Total Turns	32-Bit Float	Read	Turns
25				
26	Turnover Limit	32-Bit Float	Read/Write	0 – 100 Turns
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

5.3.6.23 Relay Output / Plating Follow Control Mode Address Map

Relay Output / Plating Follow Control Address Map (W600 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Total Feed Volume	32-Bit Float	Read	Volume Units
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16	Pump Setting	32-Bit Float	Read/Write	0 – 100%
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30				
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

5.3.6.24 Relay Output / Lag Output Control Mode Address Map

Relay Output / Lag Output Address Map				
Address	**Field**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6	Setpoint 1 §	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Setpoint 2 §	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Deadband §	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Activation Delay Time ‡§	32-Bit Integer	Read/Write	0 – 86,399 Seconds
13				
14	Wear Level Cycle Time ‡§	32-Bit Integer	Read/Write	10 – 86,399 Seconds
15				
16	Current Activation Time ‡§	32-Bit Integer	Read	Seconds
17				
18	Current Wear Level Cycle Time ‡§	32-Bit Integer	Read	Seconds
19				
20	No. of Activated Outputs ‡§	16-Bit Integer	Read	Count
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26	24-Hour Time On †	32-Bit Integer	Read	Seconds
27				
28				
29				
30	**Reset Output TO**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31	**Relay State**	**Boolean**	**Read**	**1 = Relay On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.
‡ Field is only defined for Lag Outputs configured as the “Last Lag” in the chain.
§ Field is only meaningful for certain configurations of Lead-Lag chains.

5.3.6.25 Relay Output / Alarm Control Mode Address Map

Relay Output / Alarm Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22				
23				
24	24-Hour Time On †	32-Bit Integer	Read	Seconds
25				
26				
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30				
31	**Relay State**	**Boolean**	**Read**	**0 = Off, 1 = On**
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Integer	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.7 Pulse Relay Output Address Maps

5.3.7.1 Pulse Relay Output / Manual Control Mode Address Map

Pulse Relay Output / Manual Control Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	On Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
19				
20	Off Time Delay	32-Bit Integer	Read/Write	0 – 86,399 Seconds
21				
22				
23				
24	24-Hour Average Output †	32-Bit Float	Read	Percent
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30				
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.7.2 *Pulse Relay Output / Pulse Proportional Control Mode Address Map*

Pulse Relay Output / Pulse Proportional Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10	Proportional Band	32-Bit Float	Read/Write	Input Sensor Units
11				
12				
13				
14				
15				
16	24-Hour Average Output †	32-Bit Float	Read	Percent
17				
18	Minimum Output	32-Bit Float	Read/Write	0 – 100%
19				
20	Maximum Output	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.7.3 *Pulse Relay Output / Flow Proportional Control Mode Address Map*

Pulse Relay Output / Flow Proportional Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Target PPM	32-Bit Float	Read/Write	1 – 1,000,000 ppm
7				
8				
9				
10				
11				
12				
13				
14	24-Hour Average Output †	32-Bit Float	Read	Percent
15				
16	Specific Gravity Of Product	32-Bit Float	Read/Write	0 – 9.999 mg/l
17				
18	Pump Capacity	32-Bit Float	Read/Write	0 – 10,000 Volume Units / Hour
19				
20	Pump Setting	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Low Cycles Limit	32-Bit Float	Read/Write	0.00 – 100.00
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.7.4 Pulse Relay Output / Pulse PID Control Mode Address Map

Pulse Relay Output / Pulse PID Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Current Integral	32-Bit Float	Read	Seconds
9				
10	Gain or Proportional Gain ‡	32-Bit Float	Read/Write	0.001 – 1000
11				
12	Integral Time or Integral Gain ‡	32-Bit Float	Read/Write	0.001 – 1000
13				
14	Derivative Time or Derivative Gain ‡	32-Bit Float	Read/Write	0 – 1000
15				
16	24-Hour Average Output †	32-Bit Float	Read	Percent
17				
18	Minimum Output	32-Bit Float	Read/Write	0 – 100%
19				
20	Maximum Output	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 seconds
23				
24				
25	**Reset PID Integral**	**Boolean**	**Read/Write**	**Write 1 to Reset PID Integral**
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.
‡ Setting is dependent on current selection for “PID Gain Form” (see Controller Instruction Manual)

5.3.7.5 *Pulse Relay Output / Pulse Disturbance Control Mode Address Map*

Pulse Relay Output / Pulse Disturbance Control Mode Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16	24-Hour Average Output	32-Bit Float	Read	Percent
17				
18	Minimum Output	32-Bit Float	Read/Write	0 – 100%
19				
20	Maximum Output	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

5.3.7.6 Pulse Relay Output / Lag Output Control Mode Address Map

Pulse Relay Output / Lag Output Control Mode Address Map				
Address	**Field**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Percent Output	32-Bit Float	Read	Percent
5				
6	Setpoint 1 §	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Setpoint 2 §	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Deadband §	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Activation Delay Time ‡§	32-Bit Integer	Read/Write	0 – 86,399 Seconds
13				
14	Wear Level Cycle Time ‡§	32-Bit Integer	Read/Write	10 – 86,399 Seconds
15				
16	Current Activation Time ‡§	32-Bit Integer	Read	Seconds
17				
18	Current Wear Level Cycle Time ‡§	32-Bit Integer	Read	Seconds
19				
20	No. of Activated Outputs ‡§	16-Bit Integer	Read	Count
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Average Output †	32-Bit Float	Read	Percent
25				
26				
27				
28				
29				
30	**Reset Output TO**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.6 Relay Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.
‡ Field is only defined for Lag Outputs configured as the “Last Lag” in the chain.
§ Field is only meaningful for certain configurations of Lead-Lag chains.

5.3.8 Analog Output Address Maps

5.3.8.1 Analog Output / Manual Control Mode Address Map

Analog Output / Manual Control Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16	24-Hour Average Output †	32-Bit Float	Read	Percent
17				
18				
19				
20				
21				
22				
23				
24				
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30				
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.7 Analog Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.8.2 Analog Output / Retransmit Mode Address Map

Analog Output / Retransmit Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16	24-Hour Average Output †	32-Bit Float	Read	Percent
17				
18				
19				
20				
21				
22				
23				
24				
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28				
29				
30				
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.7 Analog Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.8.3 Analog Output / Proportional Control Mode Address Map

Analog Output / Proportional Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8				
9				
10	Proportional Band	32-Bit Float	Read/Write	Input Sensor Units
11				
12				
13				
14				
15				
16	24-Hour Average Output †	32-Bit Float	Read	Percent
17				
18	Minimum Output	32-Bit Float	Read/Write	0 – 100%
19				
20	Maximum Output	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.7 Analog Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.8.4 Analog Output / Flow Proportional Control Mode Address Map

Analog Output / Flow Proportional Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Target PPM	32-Bit Float	Read/Write	1 – 1,000,000 ppm
7				
8				
9				
10				
11				
12				
13				
14	24-Hour Average Output †	32-Bit Float	Read	Percent
15				
16	Specific Gravity Of Product	32-Bit Float	Read/Write	0 – 9.999 mg/l
17				
18	Pump Capacity	32-Bit Float	Read/Write	0 – 10,000 Volume Units / Hour
19				
20	Pump Setting	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	Low Cycles Limit	32-Bit Float	Read/Write	0.00 – 100.00
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.7 Analog Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

5.3.8.5 Analog Output / PID Control Mode Address Map

Analog Output / PID Control Mode Address Map				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Setpoint	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Current Integral	32-Bit Float	Read	Seconds
9				
10	Gain or Proportional Gain ‡	32-Bit Float	Read/Write	0.001 – 1000
11				
12	Integral Time or Integral Gain ‡	32-Bit Float	Read/Write	0.001 – 1000
13				
14	Derivative Time or Derivative Gain ‡	32-Bit Float	Read/Write	0 – 1000
15				
16	24-Hour Average Output †	32-Bit Float	Read	Percent
17				
18	Minimum Output	32-Bit Float	Read/Write	0 – 100%
19				
20	Maximum Output	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 seconds
23				
24				
25	**Reset PID Integral**	**Boolean**	**Read/Write**	**Write 1 to Reset PID Integral**
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.7 Analog Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.

‡ Setting is dependent on current selection for “PID Gain Form” (see Controller Instruction Manual)

5.3.8.6 Analog Output / Disturbance Control Mode Address Map

Analog Output / Disturbance Control Mode Address Map (W900 Controller Only)				
Address	**Name**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16	24-Hour Average Output	32-Bit Float	Read	Percent
17				
18	Minimum Output	32-Bit Float	Read/Write	0 – 100%
19				
20	Maximum Output	32-Bit Float	Read/Write	0 – 100%
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24				
25				
26	Hand Output	32-Bit Float	Read/Write	0 – 100%
27				
28	Hand Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
29				
30	**Reset Output Timeout**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.7 Analog Output Alarm Bitfield** **When accessed as a Coil,** **Returns 1 if any alarm is active**

5.3.8.7 Analog Output / Lag Output Control Mode Address Map

Analog Output / Lag Output Control Mode Address Map				
Address	**Field**	**Data Encoding**	**Permissions**	**Value**
0	Time On	32-Bit Integer	Read	Seconds
1				
2	Total Time	32-Bit Integer	Read	Seconds
3				
4	Output	32-Bit Float	Read	Percent
5				
6	Setpoint 1 §	32-Bit Float	Read/Write	Input Sensor Units
7				
8	Setpoint 2 §	32-Bit Float	Read/Write	Input Sensor Units
9				
10	Deadband §	32-Bit Float	Read/Write	Input Sensor Units
11				
12	Activation Delay Time ‡§	32-Bit Integer	Read/Write	0 – 86,399 Seconds
13				
14	Wear Level Cycle Time ‡§	32-Bit Integer	Read/Write	10 – 86,399 Seconds
15				
16	Current Activation Time ‡§	32-Bit Integer	Read	Seconds
17				
18	Current Wear Level Cycle Time ‡§	32-Bit Integer	Read	Seconds
19				
20	No. of Activated Outputs ‡§	16-Bit Integer	Read	Count
21				
22	Output Time Limit	32-Bit Integer	Read/Write	0 – 86,399 Seconds
23				
24	24-Hour Average Output †	32-Bit Float	Read	Percent
25				
26				
27				
28				
29				
30	**Reset Output TO**	**Boolean**	**Read/Write**	**Write 1 to Reset Output Timeout**
31				
32	**Reset Time Total**	**Boolean**	**Read/Write**	**Write 1 to Reset Time Total**
33	HOA Setting	16-Bit Integer	Read/Write	0 = Hand, 1 = Off, 2 = Auto Mode
34	Status	16-Bit Status	Read	See 5.4 Status Register Codes
35	**Alarm Bitfield**	**16-Bit Bitfield**	**Read**	**See 5.5.7 Analog Output Alarm Bitfield When accessed as a Coil, Returns 1 if any alarm is active**

† Field is only available for W900 Controllers.
‡ Field is only defined for Lag Outputs configured as the “Last Lag” in the chain.
§ Field is only meaningful for certain configurations of Lead-Lag chains.

5.3.9 Alternate Address Maps

5.3.9.1 Alternate Sensor Input Address Map

Alternate Sensor Input Address Map								
Object	**Primary Value**	**Status**	**Alarm Bitfield**	**Low Alarm**	**High Alarm**	**LoLo Alarm**	**HiHi Alarm**	**Cal Required**
Data Encoding	**32-Bit Float**	**16-Bit Status**	**16-Bit Bitfield**	**Boolean**	**Boolean**	**Boolean**	**Boolean**	**Boolean**
Permissions	**Read**	**Read**	**Read**	**Read**	**Read**	**Read**	**Read**	**Read**
Value	**Sensor Units**	**See 5.4 Status Register Codes**	**See 5.5.3 Sensor Input Alarm Bitfield**	**1 = Alarm Active**	**1 = Alarm Active**	**1 = Alarm Active**	**1 = Alarm Active**	**1 = Alarm Active**
Sensor Number	**Address**	**Address**	**Address**	**Address**	**Address**	**Address**	**Address**	**Address**
Sensor 1	x9217	x9281	**x9313**	**x9345**	**x9377**	**x9409**	**x9441**	**x9473**
Sensor 2	x9219	x9282	**x9314**	**x9346**	**x9378**	**x9410**	**x9442**	**x9474**
Sensor 3	x9221	x9283	**x9315**	**x9347**	**x9379**	**x9411**	**x9443**	**x9475**
Sensor 4	x9223	x9284	**x9316**	**x9348**	**x9380**	**x9412**	**x9444**	**x9476**
Sensor 5	x9225	x9285	**x9317**	**x9349**	**x9381**	**x9413**	**x9445**	**x9477**
Sensor 6	x9227	x9286	**x9318**	**x9350**	**x9382**	**x9414**	**x9446**	**x9478**
Sensor 7	x9229	x9287	**x9319**	**x9351**	**x9383**	**x9415**	**x9447**	**x9479**
Sensor 8	x9231	x9288	**x9320**	**x9352**	**x9384**	**x9416**	**x9448**	**x9480**
Sensor 9	x9233	x9289	**x9321**	**x9353**	**x9385**	**x9417**	**x9449**	**x9481**
Sensor 10	x9235	x9290	**x9322**	**x9354**	**x9386**	**x9418**	**x9450**	**x9482**
Sensor 11	x9237	x9291	**x9323**	**x9355**	**x9387**	**x9419**	**x9451**	**x9483**
Sensor 12	x9239	x9292	**x9324**	**x9356**	**x9388**	**x9420**	**x9452**	**x9484**
Sensor 13	x9241	x9293	**x9325**	**x9357**	**x9389**	**x9421**	**x9453**	**x9485**
Sensor 14	x9243	x9294	**x9326**	**x9358**	**x9390**	**x9422**	**x9454**	**x9486**
Sensor 15	x9245	x9295	**x9327**	**x9359**	**x9391**	**x9423**	**x9455**	**x9487**
Sensor 16	x9247	x9296	**x9328**	**x9360**	**x9392**	**x9424**	**x9456**	**x9488**
Sensor 17	x9249	x9297	**x9329**	**x9361**	**x9393**	**x9425**	**x9457**	**x9489**
Sensor 18	x9251	x9298	**x9330**	**x9362**	**x9394**	**x9426**	**x9458**	**x9490**
Sensor 19	x9253	x9299	**x9331**	**x9363**	**x9395**	**x9427**	**x9459**	**x9491**
Sensor 20	x9255	x9300	**x9332**	**x9364**	**x9396**	**x9428**	**x9460**	**x9492**
Sensor 21	x9257	x9301	**x9333**	**x9365**	**x9397**	**x9429**	**x9461**	**x9493**
Sensor 22	x9259	x9302	**x9334**	**x9366**	**x9398**	**x9430**	**x9462**	**x9494**
Sensor 23	x9261	x9303	**x9335**	**x9367**	**x9399**	**x9431**	**x9463**	**x9495**
Sensor 24	x9263	x9304	**x9336**	**x9368**	**x9400**	**x9432**	**x9464**	**x9496**

5.3.9.2 *Alternate Digital Input Address Map*

Object	DI State	Interlock State	Total Time	Flowrate	Flow Total	Alarm Bitfield
Data Encoding	**Boolean**	**Boolean**	**32-Bit Integer**	**32-Bit Float**	**32-Bit Float**	**16-Bit Bitfield**
Permissions	**Read**	**Read**	**Read**	**Read**	**Read**	**Read**
Control Modes	**DI State**	**DI State**	**DI State**	**Paddlewheel FM Feed Monitor**	**Contacting FM Paddlewheel FM Feed Monitor**	**All**
Value	**0 = Open 1 = Closed**	**0 = Inactive 1 = Active Interlock**	**Seconds**	**Flow Units Rate Units**	**Flow Units**	**See 5.5.4 Digital Input Alarm Bitfield**
Digital Input Number	**Address**	**Address**	**Address**	**Address**	**Address**	**Address**
Digital Input 1	**x9681**	**x9697**	x9649	x9617	x9649	**x9713**
Digital Input 2	**x9682**	**x9698**	x9651	x9619	x9651	**x9714**
Digital Input 3	**x9683**	**x9699**	x9653	x9621	x9653	**x9715**
Digital Input 4	**x9684**	**x9700**	x9655	x9623	x9655	**x9716**
Digital Input 5	**x9685**	**x9701**	x9657	x9625	x9657	**x9717**
Digital Input 6	**x9686**	**x9702**	x9659	x9627	x9659	**x9718**
Digital Input 7	**x9687**	**x9703**	x9661	x9629	x9661	**x9719**
Digital Input 8	**x9688**	**x9704**	x9663	x9631	x9663	**x9720**
Digital Input 9	**x9689**	**x9705**	x9665	x9633	x9665	**x9721**
Digital Input 10	**x9690**	**x9706**	x9667	x9635	x9667	**x9722**
Digital Input 11	**x9691**	**x9707**	x9669	x9637	x9669	**x9723**
Digital Input 12	**x9692**	**x9708**	x9671	x9639	x9671	**x9724**

5.3.9.3 *Alternate Virtual Input Address Map*

Alternate Virtual Input Address Map			
Object	**Primary Value**	**Status**	**Alarm Bitfield**
Data Encoding	**32-Bit Float**	**16-Bit Status**	**16-Bit Bitfield**
Permissions	**Read**	**Read**	**Read**
Value	**Virtual Input Units**	**See** 5.4 Status Register Codes	**See** 5.5.5 Virtual Input Alarm Bitfield
Virtual Input Number	**Address**	**Address**	**Address**
Virtual Input 1	x9505	x9537	**x9553**
Virtual Input 2	x9507	x9538	**x9554**
Virtual Input 3	x9509	x9539	**x9555**
Virtual Input 4	x9511	x9540	**x9556**
Virtual Input 5	x9513	x9541	**x9557**
Virtual Input 6	x9515	x9542	**x9558**
Virtual Input 7	x9517	x9543	**x9559**
Virtual Input 8	x9519	x9544	**x9560**

5.3.9.4 *Alternate Relay Output Address Map*

Object	Relay State	Pulse Output	Time On	Status	Alarm Bitfield
Data Encoding	**Boolean**	**32-Bit Float**	**32-Bit Integer**	**16-Bit Status**	**16-Bit Bitfield**
Permissions	**Read**	**Read**	**Read**	**Read**	**Read**
Control Modes	**All except Pulse Outputs**	**Only Pulse Outputs**	**All**	**All**	**All**
Value	**0 = Off 1 = On**	**%**	**Seconds**	**See** 5.4 Status Register Codes	**See** 5.5.6 Relay Alarm Bitfield
Relay Number	**Address**	**Address**	**Address**	**Address**	**Address**
Relay 1	**x9601**	x9793	x9729	x9761	x9777
Relay 2	**x9602**	x9795	x9731	x9762	x9778
Relay 3	**x9603**	x9797	x9733	x9763	x9779
Relay 4	**x9604**	x9799	x9735	x9764	x9780
Relay 5	**x9605**	x9801	x9737	x9765	x9781
Relay 6	**x9606**	x9803	x9739	x9766	x9782
Relay 7	**x9607**	x9805	x9741	x9767	x9783
Relay 8	**x9608**	x9807	x9743	x9768	x9784

5.3.9.5 *Alternate Analog Output Address Map*

Object	Analog Output	Time On	Status	Alarm Bitfield
Data Encoding	**32-Bit Float**	**32-Bit Integer**	**16-Bit Status**	**16-Bit Bitfield**
Permissions	**Read**	**Read**	**Read**	**Read**
Value	**%**	**Seconds**	**See** 5.4 Status Register Codes	**See** 5.5.7 Analog Output Alarm Bitfield
Analog Output Number	**Address**	**Address**	**Address**	**Address**
Analog Output 1	x9825	x9857	x9921	**x9953**
Analog Output 2	x9827	x9859	x9922	**x9954**
Analog Output 3	x9829	x9861	x9923	**x9955**
Analog Output 4	x9831	x9863	x9924	**x9956**
Analog Output 5	x9833	x9865	x9925	**x9957**
Analog Output 6	x9835	x9867	x9926	**x9958**
Analog Output 7	x9837	x9869	x9927	**x9959**
Analog Output 8	x9839	x9871	x9928	**x9960**
Analog Output 9	x9841	x9873	x9929	**x9961**
Analog Output 10	x9843	x9875	x9930	**x9962**
Analog Output 11	x9845	x9877	x9931	**x9963**
Analog Output 12	x9847	x9879	x9932	**x9964**
Analog Output 13	x9849	x9881	x9933	**x9965**
Analog Output 14	x9851	x9883	x9934	**x9966**
Analog Output 15	x9853	x9885	x9935	**x9967**
Analog Output 16	x9855	x9887	x9936	**x9968**

5.3.9.6 *Alternate Control Output Address Map*

Object	Output State	Percent Output	Time On	Status	Alarm Bitfield
Data Encoding	**Boolean**	**32-Bit Float**	**32-Bit Integer**	**16-Bit Status**	**16-Bit Bitfield**
Permissions	**Read**	**Read**	**Read**	**Read**	**Read**
Control Modes	**All except Percent Outputs**	**Only Percent Outputs**	**All**	**All**	**All**
Value	**0 = Off 1 = On**	**%**	**Seconds**	**See 5.4 Status Register Codes**	**See 5.5.6 Relay Alarm Bitfield**
Control Output Number	**Address**	**Address**	**Address**	**Address**	**Address**
Control Output 1	**x9889**	x9569	x9969	x9905	x9937
Control Output 2	**x9890**	x9571	x9971	x9906	x9938
Control Output 3	**x9891**	x9573	x9973	x9907	x9939
Control Output 4	**x9892**	x9575	x9975	x9908	x9940
Control Output 5	**x9893**	x9577	x9977	x9909	x9941
Control Output 6	**x9894**	x9579	x9979	x9910	x9942
Control Output 7	**x9895**	x9581	x9981	x9911	x9943
Control Output 8	**x9896**	x9583	x9983	x9912	x9944

5.4 Status Register Codes

Status Code	Name	Description
0	Error	Generic Error.
1	None	No status to report.
2	Sensor Auto Cal	Sensor Circuit Auto-Calibration in progress.
3	Sensor User Cal	Sensor User-Calibration in progress.
4	DI State: Open	DI State is open.
5	DI State: Closed	DI State is closed.
6	DI Interlock: Active	DI Interlock State is active
7	DI Interlock: Inactive	DI Interlock State is inactive
8	Relay: On	Relay is energized.
9	Relay: Off	Relay is not energized.
10	Unused	Unused.
11	Output Interlocked	Output is interlocked by a DI or another output.
12	Output Forced On	Output is forced on by a DI or by another output.
13	Output Timeout	Output timeout limit exceeded.
14	Output Input Error	No valid measurement could be retrieved from the input.
15	Output Error	Error occurred attempting to set the output.
16	Output Hold	Output control on hold due to calibration.
17	Output HOA: Auto On	Output control in Auto Mode, output on.
18	Output HOA: Auto Off	Output control in Auto Mode, output off.
19	Output HOA: Hand	Output control in Hand Mode.
20	Output HOA: Off	Output control in Off Mode.
21	Output Deadband	Output is on and within the deadband area.
22	Relay Timeout	Timeout alarm: output off.
23	Relay OK	Relay reports it is on.
24	Daily Max Timeout	Daily maximum feed time limit exceeded.
25	Biocide: Prebleed	Pre-Bleed active before timed biocide feed.
26	Biocide: Hold	Bio feed bleed lockout in progress.
27	Biocide: Add	Bio feed in progress.
28	Time Proportional: Off	Off period within a time proportional cycle.
29	Bleed & Feed: Bleeding	Bleed valve activated, feed time accumulating.
30	Bleed & Feed: Timeout	Feed time exceeding user-entered feed time limit.
31	Intermittent Sampling: Wait	Wait cycle between readings.
32	Intermittent Sampling: Sample	Sample cycle before new reading.
33	Intermittent Sampling: Hold	Hold cycle before new reading.
34	Intermittent Sampling: Bleed	Bleed cycle after reading.
35	Probe Wash: On	Probe Wash in progress.
36	Probe Wash: Hold	Hold Cycle after probe wash.
37	Unused	Unused.
38	Unused	Unused.
39	Unused	Unused.

Status Code	Name	Description
40	Off-Line	Network connection status disabled.
41	N/A	Requested information is undefined in the current context.
42	Success	Fluent LiveConnect available
43	Failure	Fluent LiveConnect unavailable
44	Sensor Input Failure	Sensor input failure or sensor board alarm.
45	Sensor Fault Error	Sensor value outside of fault limits.
46	Sensor Range Alarm	Sensor value outside of range limits.
47	Relay Cycle Delay	Relay state change delayed by minimum cycle time setting.
48	Sensor Normal	Sensor is running in normal operation.
49	Sensor Initializing	Sensor input is initializing.
50	Sensor Default Temp	Sensor using default temperature instead of sensor value.
51	Alarm Relay: Open	Alarm Output relay closes on an alarm.
52	Alarm Relay: Closed	Alarm Output relay opens on an alarm.
53	Probe Wash: Relay Off	Probe Wash in progress for input sensor.
54	Disabled	Feature is disabled.
55	Duty Cycle: Off	Relay is off due to duty cycle settings.
56	VI Calculation Error	Calculation error while evaluating a virtual input.
57	Output On Delay	Relay is off waiting for on delay to expire.
58	Output Off Delay	Relay is on waiting for off delay to expire.
59	DI Flow Verify: Off	DI Flow Monitor reports an error, output is forced off.
60	DI Flow Verify: Auto	DI Flow Monitor reports an error, output is in auto mode.
61	Output PID Saturated: High	PID integral hold due to output saturated at 100%.
62	Output PID Saturated: Low	PID integral hold due to output saturated at 0%.
63	Output Lead Lag	Lag is controlling (or being controlled) in automatic mode.
64	DI Flow Verify: Reprime	DI Flow Monitor reports an error, output is forced on.
65	Spike Onset	Spike onset climb active before reaching spike setpoint.
66	Spike Event: On	Spike onset value achieved, event in progress, output on.
67	Spike Event: Off	Spike onset value achieved, event in progress, output off.
68	Stabilizing	Sensor input is in a stabilization delay.
69	Circuit Test	Corrosion Sensor circuit self-test in progress.
70	Cable Test	Corrosion Sensor cable test in progress.
71	Circuit Cal	Corrosion Sensor circuit calibration in progress.
72	Polarization	Corrosion Sensor polarization measurement in progress.
73	Imbalance	Corrosion Sensor imbalance measurement in progress.
74	Resistance	Corrosion Sensor solution resistance measurement.

Status Code	Name	Description
75	Enabled	Ethernet or WiFi communications enabled.
76	Invalid Config	WiFi infrastructure mode configuration settings invalid.
77	Connecting	WiFi infrastructure mode connection in progress.
78	Network Not Found	WiFi infrastructure network not available.
79	Invalid Key	WiFi security key for infrastructure network invalid.
80	Unable To Connect	WiFi unable to connect to infrastructure network.
81	Connected	WiFi infrastructure mode network connection successful.
82	Ad-Hoc Mode	WiFi ad-hoc access point is available.
83	Unused	Unused.
84	Invalid Config	WiFi ad-hoc mode configuration settings invalid.
85	WPA Personal	WiFi security mode WPA Personal (PSK).
86	WPA Enterprise	WiFi security mode WPA Enterprise (Radius).
87	WPA2 Personal	WiFi security mode WPA2 Personal (PSK).
88	WPA2 Enterprise	WiFi security mode WPA2 Enterprise (Radius).
89	WEP	WiFi security mode WEP.
90	Alarm Suppressed	Alarm is suppressed due to selected DI or output condition.
91	Sensor Dry	Corrosion Sensor not submerged in water.
92	Data Log Suppressed	Data Logging is suppressed due to selected condition.

5.5 Alarm Bitfields

Alarm bitfields are comprised of an 8-bit field encapsulated in a 16-bit word. Bit 1 is the least significant bit, bit 8 is the most significant bit. See 4.4.2.2 16-Bit Word (Bitfield) for details. Some alarms have multiple causes, consult the Controller Instruction Manual for a comprehensive list of possible alarm causes.

5.5.1 System Alarm Bitfield

System Alarm Bitfield		
Bit Name	**Bit No.**	**Description**
Temperature Alarm	1	Controller internal temperatures fall below -10°C or exceed 75°C.
Battery Low	2	The button-cell battery voltage falls below 2.4VDC.
Invalid Setting	3	A hardware change creates invalid settings.
Software Version	4	The firmware of an add-on card needs to be updated.
Board Failure	5	An internal controller component has failed.
Internal Voltage	6	One or more internal (3.3V, 5V, 12V) voltage signal is out of range.
Unused	7	
Unused	8	

5.5.2 Network Alarm Bitfield

Network Alarm Bitfield		
Bit Name	**Bit No.**	**Description**
Web Server Failure	1	Internal error when the web server on the Ethernet card fails.
Fluent Data Comm	2	Controller cannot send data to Fluent.
Fluent LiveConnect	3	Controller cannot create a VPN connection to the Fluent server.
WiFi Error	4	Unable to connect to (or create) WiFi network.
Unused	5	
Unused	6	
Unused	7	
Unused	8	

5.5.3 Sensor Input Alarm Bitfield

Sensor Input Alarm Bitfield			
Bit Name	**Bit No.**	**Description**	**SI Types**
Low	1	The sensor reading drops below the Low Alarm setpoint.	All sensor types
High	2	The sensor reading rises above the High Alarm setpoint.	All sensor types
Low Low	3	The sensor reading drops below the Low Low Alarm setpoint.	All sensor types
High High	4	The sensor reading rises above the High High Alarm setpoint.	All sensor types
Replace Electrode †	**5**	Electrode in service longer than alarm time setpoint.	**Corrosion sensors only**
Total †	**5**	The flowmeter total exceeds the limit.	**AI Flowmeter only**
Unused †	6		
Input Failure †	7	The sensor reading is invalid (out of range, sensor fault, wiring incorrect, sample error, or I/O card failure). This alarm will stop the control for any output using the sensor.	All sensor types
Calibration Required	8	The sensor requires calibration.	All sensor types

† Compatibility Note: In controller software versions 3.09 and earlier, Bit 5 was used for "Out of Range" errors and Bit 6 was used for "Sensor Fault" alarms. In software versions 3.11 and later, these alarms are combined with other types of sensor "Input Failures" reported using Bit 7.

5.5.4 Digital Input Alarm Bitfield

Digital Input Alarm Bitfield			
Bit Name	**Bit No.**	**Description**	**DI Types**
DI State	1	The input is in the state selected to generate an alarm.	DI State & Remote Modbus only
Total	2	The meter total exceeds the limit.	All Digital Meters
Total Range	3	The range of the totalizer is exceeded.	
Input Failure	4	This digital input circuit is no longer functioning.	All DI Types
Flow Verify	**5**	Feed Monitor unable to verify chemical feed.	**Flow Monitor only**
Modbus Alarm	**5**	Modbus message error or update timeout.	**Remote Modbus only**
Low	6	Flowrate below the Low Alarm setpoint.	Paddlewheel & DI Counter only
High	7	Flowrate above the High Alarm setpoint.	
Unused	8		

5.5.5 Virtual Input Alarm Bitfield

Virtual Input Alarm Bitfield			
Bit Name	**Bit No.**	**Description**	**VI Types**
Low	1	The value drops below the Low Alarm setpoint.	Calculation, Raw Value & Remote Modbus only
High	2	The value rises above the High Alarm setpoint.	
Low Low	3	The value drops below the Low Low Alarm setpoint.	
High High	4	The value rises above the High High Alarm setpoint.	
Out of Range	**5**	The value is outside of the acceptable range. This alarm will stop the control for any output using the sensor.	**Calculation & Remote Modbus only**
Deviation	**5**	The difference between the two inputs exceeds the Deviation Alarm setpoint.	**Redundant only**
Modbus Alarm	6	Modbus message error or update timeout.	Remote Modbus only
Unused	7		
Input Failure	8	A value required for a virtual calculation is not available. This alarm will stop the control for any output using the sensor.	All VI Types

5.5.6 Relay & Control Output Alarm Bitfield

Relay & Control Output Alarm Bitfield			
Bit Name	**Bit No.**	**Description**	**Control Modes**
Output Timeout	1	The output has been activated for longer than the configured time limit. Control is stopped while the alarm is active.	All modes with *Output Time Limit* setting
Relay Event Skipped	**2**	A timer event was not able to be initiated.	**All modes with *Event Timer* settings**
Turnover Limit	**2**	Number of Turns exceeds Turnover Limit setpoint.	**Plating Control mode only**
Control Failure	3	The output control circuit is no longer functioning.	All Control Modes
State Alarm	4	The output is in the state selected to generate an alarm.	Boolean Logic mode only
Daily Max Timeout	5	The output has been activated during the current day for longer than the configured daily time limit. Control is stopped while the alarm is active.	All modes with *Daily Max Time* setting
Unused	6		
Unused	7		
Unused	8		

5.5.7 Analog Output Alarm Bitfield

Analog Output Alarm Bitfield			
Bit Name	**Bit No.**	**Description**	**Control Modes**
Output Timeout	1	The output has been activated for longer than the configured time limit. Control is stopped while the alarm is active.	All modes with *Output Time Limit* setting
Control Failure	2	The analog control circuit is no longer functioning.	All Control Modes
Unused	3		
Unused	4		
Unused	5		
Unused	6		
Unused	7		
Unused	8		

WALCHEM

IWAKI America Inc.

W900 Series
Water Treatment Controller

Instruction Manual

Five Boynton Road Hopping Brook Park Holliston, MA 01746 USA

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Notice

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180686 Rev. F June 2020

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1.0 INTRODUCTION

The Walchem W900 Series controllers offer a high level of flexibility in controlling water treatment applications.

- There are four slots that accept a variety of Input/Output Modules, which provides unparalleled versatility. Dual sensor input modules are available that are compatible with a variety of sensors (two sensors per module):
  - » Contacting conductivity
  - » Electrodeless conductivity
  - » pH
  - » ORP
  - » Any Walchem disinfection sensor
  - » Generic sensor (Ion Selective Electrodes or any type of sensor with a linear voltage output between -2 VDC and 2 VDC)
- Three analog (4-20 mA) input modules with two, four or six input circuits is also available for use with 2,3 or 4-wire transmitters.
- Two other modules feature two or four isolated analog outputs that may be installed to retransmit sensor input signals to a chart recorder, datalogger, PLC or other device. They may also be connected to valves, actuators or metering pumps for linear proportional control or PID control.
- Another module combines two analog (4-20 mA) inputs and four analog outputs.
- Eight Virtual Inputs are configurable in the software, to either allow for calculations based on two real inputs, or to allow to compare values from two sensors to provide redundancy.
- Eight relay outputs may be set to a variety of control modes:
  - » On/Off set point control
  - » Time Proportional control
  - » Pulse Proportional control (when purchased with Pulse solid state opto outputs)
  - » Flow Proportional
  - » PID control (when purchased with Pulse solid state opto outputs)
  - » Lead/Lag control of up to 6 relays
  - » Dual set point
  - » Timer
  - » Bleed or Feed based on a Water Contactor or Paddlewheel flow meter input
  - » Feed and Bleed
  - » Feed and Bleed with Lockout
  - » Feed as a percent of Bleed
  - » Feed as a percent of elapsed time
  - » Daily, Weekly, 2-week or 4-week Biocide timers with pre-bleed and post-add lockout of bleed
  - » Intermittent sampling for boilers with proportional blowdown, controlling on a trapped sample
  - » Always on unless interlocked
  - » Probe Wash timer
  - » Spike to alternate set point on timed basis
  - » Target PPM
  - » PPM Volume
  - » Dual Switch
  - » Boolean Logic
  - » Diagnostic Alarm triggered by:
    - High or Low sensor reading
    - No Flow
    - Relay output timeout
    - Sensor error

Relays are available in several combinations of powered relays, dry contact relays, and pulse solid state opto relays.

Eight Virtual Outputs are configurable in the software, using most of the possible relay or analog output control algorithms, that may be used to interlock or activate actual control outputs.

The standard Ethernet feature provides remote access to the controller's programming via a PC connected directly, via a local area network, or via Walchem's Fluent account management server. It also allows emailing of datalog files (in CSV format, compatible with spreadsheets like Excel) and alarms, to up to eight email addresses. The Modbus TCP and BACnet remote communications options allow communication with PC-based applications, HMI/SCADA programs, Building Energy Management systems, Distributed Control Systems (DCS), as well as stand-alone HMI devices.

Two optional WiFi cards are available, one which allows simultaneous Ethernet and WiFi communications, and one that increases security by disabling Ethernet when WiFi is enabled. The WiFi can be set to Infrastructure Mode to provide all the Ethernet functions above, or Ad-Hoc Mode to allow access to the programming wirelessly.

Our USB features provide the ability to upgrade the software in the controller to the latest version. The Config file feature allows you to save all the set points from a controller onto a USB flash disk, and then import them into another controller, making the programming of multiple controllers fast and easy. The data logging feature allows you to save the sensor readings and relay activation events to a USB flash disk.

2.0 SPECIFICATIONS

2.1 Measurement Performance

pH	**ORP/ISE**
Range -2 to 16 pH units Resolution 0.01 pH units Accuracy ± 0.01% of reading	Range -1500 to 1500 mV Resolution 0.1 mV Accuracy ± 1 mV
Disinfection Sensors	
Range (mV) -2000 to 1500 mV	Range (ppm) 0-2 ppm to 0-20,000 ppm
Resolution (mV) 0.1 mV	Resolution (ppm) Varies with range and slope
Accuracy (mV) ± 1 mV	Accuracy (ppm) Varies with range and slope
Temperature	**Analog (4-20 mA)**
Range -4 to 500°F (-20 to 260°C)	Range 0 to 22 mA
Resolution 0.1°F (0.1°C)	Resolution 0.01 mA
Accuracy ± 1% of reading	Accuracy ± 0.5% of reading
Corrosion	
Range	**Resolution**
0-2 mpy or mm/year	0.001 mpy or mm/year
0-20 mpy or mm/year	0.01 mpy or mm/year
0-200 mpy or mm/year	0.1 mpy or mm/year
0.01 Cell Contacting Conductivity	
Range	0-300 µS/cm
Resolution	0.01 µS/cm, 0.0001 mS/cm, 0.001 mS/m, 0.0001 S/m, 0.01 ppm
Accuracy	± 1% of reading
0.1 Cell Contacting Conductivity	
Range	0-3,000 µS/cm

Resolution	0.1 µS/cm, 0.0001 mS/cm, 0.01 mS/m, 0.0001 S/m, 0.1 ppm
Accuracy	± 1% of reading
1.0 Cell Contacting Conductivity	
Range	0-30,000 µS/cm
Resolution	1 µS/cm, 0.001 mS/cm, 0.1 mS/m, 0.0001 S/m, 1 ppm
Accuracy	± 1% of reading
10.0 Cell Contacting Conductivity	
Range	0-300,000 µS/cm
Resolution	10 µS/cm, 0.01 mS/cm, 1 mS/m, 0.001 S/m, 10 ppm
Accuracy	± 1% of reading

Electrodeless Conductivity

Range	Resolution	Accuracy
500-12,000 µS/cm	1 µS/cm, 0.01 mS/cm, 0.1 mS/m, 0.001 S/m, 1 ppm	1% of reading
3,000-40,000 µS/cm	1 µS/cm, 0.01 mS/cm, 0.1 mS/m, 0.001 S/m, 1 ppm	1% of reading
10,000-150,000 µS/cm	10 µS/cm, 0.1 mS/cm, 1 mS/m, 0.01 S/m, 10 ppm	1% of reading
50,000-500,000 µS/cm	10 µS/cm, 0.1 mS/cm, 1 mS/m, 0.01 S/m, 10 ppm	1% of reading
200,000-2,000,000 µS/cm	100 µS/cm, 0.1 mS/cm, 1 mS/m, 0.1 S/m, 100 ppm	1% of reading

Temperature °C	Range Multiplier
0	181.3
10	139.9
15	124.2
20	111.1
25	100.0
30	90.6
35	82.5
40	75.5
50	64.3
60	55.6
70	48.9

Temperature °C	Range Multiplier
80	43.5
90	39.2
100	35.7
110	32.8
120	30.4
130	28.5
140	26.9
150	25.5
160	24.4
170	23.6
180	22.9

Note: Conductivity ranges on page 2 apply at 25°C. At higher temperatures, the range is reduced per the range multiplier chart.

2.2 Electrical: Input/Output

Input Power	100 to 240 VAC, 50 or 60 Hz, 13 A maximum
Inputs	
Sensor Input Signals (0 to 8 depending on model code):	
Contacting Conductivity	0.01, 0.1, 1.0, or 10.0 cell constant OR
Electrodeless Conductivity	OR
Disinfection	OR

Amplified pH, ORP or ISE	Requires a preamplified signal. Walchem WEL or WDS series recommended. ±5VDC power available for external preamps.
Each sensor input card contains a temperature input	
Temperature	100 or 1000 ohm RTD, 10K or 100K Thermistor
Analog (4-20 mA) Sensor Input (0 to 24 depending on model code):	2-wire loop powered or self-powered transmitters supported 3 or 4 –wire transmitters supported Two to Six channels per board, depending on model Channel 1, 130 ohm input resistance Channel 2-6, 280 ohm input resistance All channels fully isolated, input and power Available Power: One independent isolated 24 VDC ± 15% supply per channel 1.5 W maximum for each channel
Digital Input Signals (12 standard):	
State-Type Digital Inputs	Electrical: Optically isolated and providing an electrically isolated 12VDC power with a nominal 2.3mA current when the digital input switch is closed Typical response time: < 2 seconds Devices supported: Any isolated dry contact (i.e. relay, reed switch) Types: DI State
Low Speed Counter-Type Digital Inputs	Electrical: Optically isolated and providing an electrically isolated 12VDC power with a nominal 2.3mA current when the digital input switch is closed 0-20 Hz, 25 msec minimum width Devices supported: Any device with isolated open drain, open collector, transistor or reed switch Types: Contacting Flowmeter, Flow Verify
High Speed Counter-Type Digital Inputs	Electrical: Optically isolated and providing an electrically isolated 12VDC power with a nominal 2.3mA current when the digital input switch is closed, 0-500 Hz, 1.00 msec minimum width Devices supported: Any device with isolated open drain, open collector, transistor or reed switch Types: Paddlewheel Flowmeter, DI Counter
Outputs	
Powered mechanical relays (0 to 8 depending on model code):	Pre-powered on circuit board switching line voltage. Two, three or four relays are fused together (depending on model code) as one group, total current for this group must not exceed 6 A (resistive), 1/8 HP (93 W)
Dry contact mechanical relays (0 to 8 depending on model code):	6 A (resistive), 1/8 HP (93 W) Dry contact relays are not fuse protected
Pulse Outputs (0, 2 or4 depending on model code):	Opto-isolated, Solid State Relay 200mA, 40 VDC Max. VLOWMAX = 0.05V @ 18 mA
4 - 20 mA (0 to 16 depending on model code)	Internally powered, 15 VDC, Fully isolated 600 Ohm max resistive load Resolution 0.0015% of span Accuracy ± 0.5% of reading
Ethernet	10/100 802.3-2005 Auto MDIX support Auto Negotiation

Wi-Fi	Radio Protocol: IEEE 802.11 b/g/n Security Protocols (Ad-Hoc Mode): WPA2-Personal Security Protocols (Infrastructure Mode): WPA/WPA2-Personal, WEP Certifications and Compliance: FCC, IC TELEC, CE/ETSI, RoHS, Wi-Fi Certified
NOTE on Wi-Fi: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.	
Agency Approvals:	
Safety	UL 61010-1:2012 3rd Ed. CSA C22.2 No. 61010-1:2012 3rd Ed. IEC 61010-1:2010 3rd Ed. EN 61010-1:2010 3rd Ed.
EMC	IEC 61326-1:2012 EN 61326-1:2013
Note: For EN61000-4-6, EN61000-4-3 the controller met performance criteria B. *Class A equipment: Equipment suitable for use in establishments other than domestic, and those directly connected to a low voltage (100-240 VAC) power supply network which supplies buildings used for domestic purposes.	

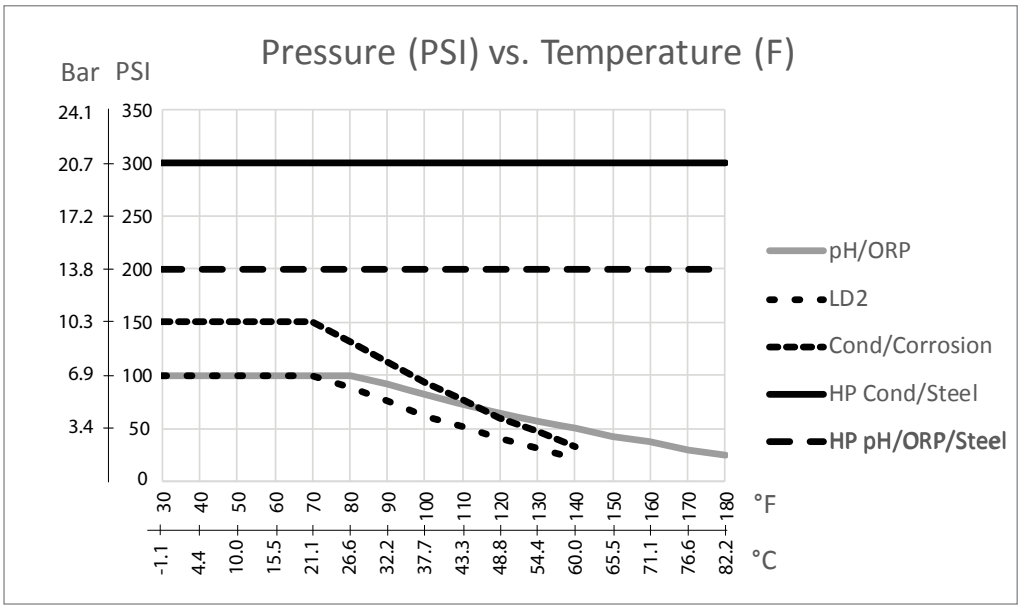
2.3 Mechanical

Enclosure Material	Polycarbonate
Enclosure Rating	NEMA 4X (IP65)
Dimensions	12.2” W x 13.8” H x 5.4” D (310 mm x 351 mm x 137 mm)
Display	320 x 240 pixel monochrome backlit display with touchscreen
Operating Ambient Temp	-4 to 122 °F (-20 to 50 °C)
Storage Temperature	-4 – 176°F (-20 – 80°C)
Humidity	10 to 90% non-condensing

Mechanical (Sensors) (*see graph)

Sensor	Pressure	Temperature	Materials	Process Connections
Electrodeless conductivity	0-150 psi (0-10 bar)*	CPVC: 32-158°F (0 to 70°C)* PEEK: 32-190°F (0 to 88°C)	CPVC, FKM in-line o-ring PEEK, 316 SS in-line adapter	1” NPTM submersion 2” NPTM in-line adapter
pH	0-100 psi (0-7 bar)*	50-158°F (10-70°C)*	CPVC, Glass, FKM o-rings, HDPE, Titanium rod, glass-filled PP tee	1” NPTM submersion 3/4” NPTF in-line tee
ORP	0-100 psi (0-7bar)*	32-158°F (0-70°C)*		
Contacting conductivity (Condensate)	0-200 psi (0-14 bar)	32-248°F (0-120°C)	316SS, PEEK	3/4” NPTM
Contacting conductivity Graphite (Cooling Tower)	0-150 psi (0-10 bar)*	32-158°F (0-70°C)*	Graphite, Glass-filled PP, FKM o-ring	3/4” NPTM
Contacting conductivity SS (Cooling Tower)	0-150 psi (0-10 bar)*	32-158°F (0-70°C)*	316SS, Glass-filled PP, FKM o-ring	3/4” NPTM
Contacting conductivity (Boiler)	0-250 psi (0-17 bar)	32-401°F (0-205°C)	316SS, PEEK	3/4” NPTM
Contacting conductivity (High Pressure Tower)	0-300 psi (0-21 bar)*	32-158°F (0-70°C)*	316SS, PEEK	3/4” NPTM

pH (High Pressure)	0-300 psi (0-21 bar)*	32-275°F (0-135°C)*	Glass, Polymer, PTFE, 316SS, FKM	1/2" NPTM gland
ORP (High Pressure)	0-300 psi (0-21 bar)*	32-275°F (0-135°C)*	Platinum, Polymer, PTFE, 316SS, FKM	1/2" NPTM gland
Free Chlorine/Bromine	0-14.7 psi (0-1 bar)	32-113°F (0-45°C)	PVC, Polycarbonate, silicone rubber, SS, PEEK, FKM, Isoplast	1/4" NPTF Inlet 3/4" NPTF Outlet
Extended pH Range Free Chlorine/Bromine	0-14.7 psi (0-1 bar)	32-113°F (0-45°C)		
Total Chlorine	0-14.7 psi (0-1 bar)	32-113°F (0-45°C)		
Chlorine Dioxide	0-14.7 psi (0-1 bar)	32-131°F (0-55°C)		
Ozone	0-14.7 psi (0-1 bar)	32-131°F (0-55°C)		
Peracetic Acid	0-14.7 psi (0-1 bar)	32-131°F (0-55°C)		
Hydrogen Peroxide	0-14.7 psi (0-1 bar)	32-113°F (0-45°C)		
Corrosion	0-150 psi (0-10 bar)	32-158°F (0-70°C)*	Glass-filled PP, FKM o-ring	3/4" NPTM
Flow switch manifold	0-150 psi (0-10 bar) up to 100°F (38°C)* 0-50 psi (0-3 bar) at 140°F (60°C)	32-140°F (0-60°C)	GFRPP, PVC, FKM, Isoplast	3/4" NPTF
Flow switch manifold (High Pressure)	0-300 psi (0-21 bar)*	32-158°F (0-70°C)*	Carbon steel, Brass, 316SS, FKM	3/4" NPTF



2.4 Variables and their Limits

Sensor Input Settings	Low Limit	High Limit
Alarm limits	Low end of sensor range	High end of sensor range
Input alarm dead band	Low end of sensor range	High end of sensor range
Cell constant (conductivity only)	0.01	10
Smoothing Factor	0%	90%
Temp Comp Factor (conductivity linear ATC only)	0%	20.000%
Installation Factor (Electrodeless conductivity only)	0.5	1.5
Cable length	0.1	3,000
PPM conversion factor (only if units = PPM)	0.001	10.000
Default temperature	-20	500
Deadband	Low end of sensor range	High end of sensor range
Calibration Required Alarm	0 days	365 days
Sensor Slope (Generic sensor only)	-1,000,000	1,000,000
Sensor Offset (Generic sensor only)	-1,000,000	1,000,000

Low Range (Generic sensor, Virtual Input)	-1,000,000	1,000,000
High Range (Generic sensor, Virtual Input)	-1,000,000	1,000,000
Constant (Virtual Input only)	10% below Low Range setting	10% above High Range setting
Deviation Alarm (Virtual Input)	10% below Low Range setting	10% above High Range setting
4 mA value (Transmitter, AI Monitor analog input only)	0	100
20 mA value (Transmitter, AI Monitor analog input only)	0	100
Max Sensor Range (Fluorometer analog input only)	0 ppb	100,000 ppb
Dye/Product Ratio (Fluorometer analog input only)	0 ppb/ppm	100 ppb/ppm
Set Flow Total (Flowmeter analog input only)	0	1,000,000,000
Flowmeter Max (Flowmeter analog input only)	0	1,000,000
Input Filter (Flowmeter analog input only)	1 mA	21 mA
Totalizer Alarm (Flowmeter analog input only)	0	2,000,000,000
Min Disturbance (Disturbance Virtual Input only)	Low end of sensor range	High end of sensor range
Max Disturbance (Disturbance Virtual Input only)	Low end of sensor range	High end of sensor range
Value at Min Disturbance (Disturbance Virtual Input only)	0	100
Value at Max Disturbance (Disturbance Virtual Input only)	0	100
Stabilization Time (Corrosion only)	0 hours	999 hours
Electrode Alarm (Corrosion only)	0 days	365 days
Alloy Multiplier (Corrosion only)	0.2	5.0
Tank Capacity	0	1,000,000
Empty At	0 mA	21 mA
Full At	0 mA	21 mA
Digital flow meter input settings	**Low Limit**	**High Limit**
Totalizer alarm	0	2,000,000,000
Volume/contact for units of Gallons or Liters	1	100,000
Volume/contact for units of m^3	0.001	1,000
K Factor for units of Gallons or Liters	0.01	100,000
K Factor for units of m^3	1	1,000,000
Paddlewheel rate alarm limits	0	High end of sensor range
Paddlewheel rate alarm deadband	0	High end of sensor range
Smoothing Factor	0%	90%
Set Flow Total	0	1,000,000,000
Feed Monitor Input Settings	**Low Limit**	**High Limit**
Totalizer Alarm	0 vol. units	1,000,000 vol. units
Set Flow Total	0 vol. units	1,000,000,000 vol. units
Flow Alarm Delay	00:10 Minutes	59:59 Minutes
Flow Alarm Clear	1 Contact	100,000 Contacts
Dead Band	0%	90%
Reprime Time	00:00 Minutes	59:59 Minutes
Volume/Contact	0.001 ml	1,000.000 ml
Smoothing Factor	0%	90%
Counter Input Settings	**Low Limit**	**High Limit**
DI Counter Rate Alarms	0	30,000
DI Counter Rate Deadband	0	30,000
Totalizer Alarm	0	2,000,000,000
Set Total	0	2,000,000,000

Units per Pulse	0.001	1,000
Smoothing Factor	0%	90%
Remote Modbus Input Settings	**Low Limit**	**High Limit**
Alarm Limits	Low end of defined range	High end of defined range
Deadband	Low end of defined range	High end of defined range
Low Range	-1,000,000	1,000,000
High Range	-1,000,000	1,000,000
Reply Timeout	1 second	15 seconds
Remote Register	0	65535
Update Period	00:01 MM:SS	59:59 MM:SS
Timeout Alarm Delay	00:10 MM:SS	59:59 MM:SS
Relay output settings	**Low Limit**	**High Limit**
Output Limit Time	1 second	86,400 seconds (0 = unlimited)
Hand Time Limit	1 second	86,400 seconds (0 = unlimited)
Daily Max Time	00:01 MM:SS	23:59 MM:SS (0 = unlimited)
Min Relay Cycle	0 seconds	300 seconds
Set Point	Low end of sensor range	High end of sensor range
Spike Set Point (Spike mode)	Low end of sensor range	High end of sensor range
Onset Time (Spike mode)	0 seconds	23:59:59 HH:MM:SS
Duty Cycle Period (On/Off, Spike, Dual Setpoint modes)	0:00 minutes	59:59 minutes
Duty Cycle (On/Off, Spike, Dual Setpoint modes)	0%	100%
On Delay Time (Manual, On/Off, Dual Setpoint modes, Dual Switch, Alarm modes, Boolean Logic)	0 seconds	23:59:59 HH:MM:SS
Off Delay Time (Manual, On/Off, Dual Setpoint modes, Dual Switch, Alarm modes, Boolean Logic)	0 seconds	23:59:59 HH:MM:SS
Dead Band	Low end of sensor range	High end of sensor range
Feed duration (Flow Timer, Counter Timer mode)	0 seconds	86,400 seconds
Accumulator Volume (Flow Timer, Target PPM, PPM Volume, Volumetric Blend, Flow Meter Ratio modes)	1	1,000,000
Accumulator Setpoint (Counter Timer mode)	1	1,000,000
Feed Percentage (Bleed then Feed mode)	0%	100%
Feed Lockout Time Limit (Bleed & Feed, Bleed then Feed modes)	0 seconds	86,400 seconds
Prebleed To Conductivity (Biocide mode)	1 (0 = no prebleed)	High end of sensor range
Prebleed Time (Biocide mode)	0 seconds	86,400 seconds
Bleed Lockout (Biocide mode)	0 seconds	86,400 seconds
Event duration (Biocide, Timer modes)	0	30,000
Proportional band (Time/Pulse Proportional mode, Intermittent Sampling)	Low end of sensor range	High end of sensor range
Sample period (Time Proportional mode)	0 seconds	3600 seconds
Sample Time (Intermittent Sampling mode)	0 seconds	3600 seconds
Hold Time (Probe Wash, Intermittent Sampling modes)	0 seconds	3600 seconds
Maximum Blowdown (Intermittent Sampling mode)	0 seconds	86,400 seconds
Wait Time (Intermittent Sampling mode)	10 pulses/minute	480 pulses/minute
Max Rate (Pulse Proportional, Pulse PID modes, Flow Prop Modes)	0%	100%
Minimum Output (Pulse Proportional, Pulse PID modes)	0%	100%
Maximum Output (Pulse Proportional, Pulse PID modes)	0%	100%

Gain (Pulse PID Standard mode)	0.001	1000.000
Integral Time (Pulse PID Standard mode)	0.001 seconds	1000.000 seconds
Derivative Time (Pulse PID Standard mode)us	0 seconds	1000.000 seconds
Proportional Gain (Pulse PID Parallel mode)	0.001	1000.000
Integral Gain (Pulse PID Parallel mode)	0.001 /second	1000.000 /second
Derivative Gain (Pulse PID Parallel mode)	0 seconds	1000.000 seconds
Input Minimum (Pulse PID modes)	Low end of sensor range	High end of sensor range
Input Maximum (Pulse PID modes)	Low end of sensor range	High end of sensor range
Wear Cycle Time (Lag mode)	10 seconds	23:59:59 HH:MM:SS
Delay Time (Lag mode)	0 seconds	23:59:59 HH:MM:SS
Target (Target PPM, PPM Volume modes)	0 ppm	1,000,000 ppm
Pump Capacity (Target PPM, PPM Volume modes)	0 gal/hour or l/hour	10,000 gal/hour or l/hour
Pump Setting (Target PPM, PPM Volume modes)	0%	100%
Specific Gravity (Target PPM, PPM Volume modes)	0 g/ml	9.999 g/ml
Blend Volume (Volumetric Blend mode)	1	1,000,000
Low Cycles Limit (Target PPM, PPM Volume mode)	0 cycles of concentration	100 cycles of concentration
Bleed Volume (Flow Meter Ratio mode)	1	1,000,000
Pump Capacity (Flow Prop mode)	0 gal/hour or l/hour	10,000 gal/hour or l/hour
Pump Setting (Flow Prop mode)	0%	100%
Specific Gravity (Flow Prop mode)	0 g/ml	9.999 g/ml
Target (Flow Prop mode)	0 ppm	1,000,000 ppm
Analog (4-20 mA) Output Settings	**Low Limit**	**High Limit**
4 mA Value (Retransmit mode)	Low end of sensor range	High end of sensor range
20 mA Value (Retransmit mode)	Low end of sensor range	High end of sensor range
Hand Output	0%	100%
Set Point (Proportional, PID modes)	Low end of sensor range	High end of sensor range
Proportional Band (Proportional mode)	Low end of sensor range	High end of sensor range
Minimum Output (Proportional, PID, Disturbance modes)	0%	100%
Maximum Output (Proportional, PID, Disturbance modes)	0%	100%
Off Mode Output (Proportional, PID, Flow Prop, Disturbance modes)	0 mA	21 mA
Error Output (not in Manual mode)	0 mA	21 mA
Hand Time Limit (not in Retransmit mode)	1 second	86,400 seconds (0 = unlimited)
Output Time Limit (Proportional, PID, Disturbance modes)	1 second	86,400 seconds (0 = unlimited)
Gain (PID, Standard mode)	0.001	1000.000
Integral Time (PID Standard mode)	0.001 seconds	1000.000 seconds
Derivative Time (PID Standard mode)	0 seconds	1000.000 seconds
Proportional Gain (PID Parallel mode)	0.001	1000.000
Integral Gain (PID Parallel mode)	0.001 /second	1000.000 /second
Derivative Gain (PID Parallel mode)	0 seconds	1000.000 seconds
Input Minimum (PID modes)	Low end of sensor range	High end of sensor range
Input Maximum (PID modes)	Low end of sensor range	High end of sensor range
Pump Capacity (Flow Prop mode)	0 gal/hour or l/hour	10,000 gal/hour or l/hour
Pump Setting (Flow Prop mode)	0%	100%
Specific Gravity (Flow Prop mode)	0 g/ml	9.999 g/ml
Target (Flow Prop mode)	0 ppm	1,000,000 pm
Low Cycles Limit (Flow Proportional mode)	0 cycles of concentration	100 cycles of concentration

Configuration settings	Low Limit	High Limit
Local Password	0000	9999
Log in Timeout	10 minutes	1440 minutes
Fluent update period	1 minute	1440 minutes
Fluent reply timeout	10 seconds	60 seconds
Alarm Delay	0:00 minutes	59:59 minutes
SMTP Port	0	65535
TCP Timeout	1 second	240 seconds
Auto Dim Time	0 seconds	23:59:59 HH:MM:SS
Device ID (BACnet)	1	4194302
Data Port (Modbus, BACnet)	1	65535
Ad-Hoc Time Limit	1 min.	1440 min.
Graph settings	**Low Limit**	**High Limit**
Low axis limit	Low end of sensor range	High end of sensor range
High axis limit	Low end of sensor range	High end of sensor range

3.0 UNPACKING & INSTALLATION

3.1 Unpacking the unit

Inspect the contents of the carton. Please notify the carrier immediately if there are any signs of damage to the controller or its parts. Contact your distributor if any of the parts are missing. The carton should contain a W900 series controller and an instruction manual. Any options or accessories will be incorporated as ordered.

3.2 Mounting the electronic enclosure

The controller is supplied with mounting holes on the enclosure. It should be wall mounted with the display at eye level, on a vibration-free surface, utilizing all four mounting holes for maximum stability. Use M6 (1/4" diameter) fasteners that are appropriate for the substrate material of the wall. The enclosure is NEMA 4X (IP65) rated. The maximum operating ambient temperature is 122°F (50°C); this should be considered if installation is in a high temperature location. The enclosure requires the following clearances:

Top:	2" (50 mm)
Left:	10" (254 mm)
Right:	4" (102 mm)
Bottom:	7" (178 mm)

3.3 Sensor Installation

Refer to the specific instructions supplied with the sensor being used, for detailed installation instructions.

General Guidelines

Locate the sensors where an active sample of water is available and where the sensors can easily be removed for cleaning. Position the sensor such that air bubbles will not be trapped within the sensing area. Position the sensor where sediment or oil will not accumulate within the sensing area.

In-Line Sensor Mounting

In-line mounted sensors must be situated so that the tee is always full and the sensors are never subjected to a drop in water level resulting in dryness. Refer to Figure 2 for typical installation.

Tap off the discharge side of the recirculation pump to provide a minimum flow of 1 gallon per minute through the flow switch manifold. The sample must flow into the bottom of the manifold in order to close the flow switch, and return to a point of lower pressure in order to ensure flow. Install an isolation valve on both sides of the manifold to stop flow for sensor maintenance.

IMPORTANT: To avoid cracking the female pipe threads on the supplied plumbing parts, use no more than 3 wraps of Teflon tape and thread in the pipe FINGER tight plus 1/2 turn! Do not use pipe dope to seal the threads of the flow switch because the clear plastic will crack!

Submersion Sensor Mounting

If the sensors are to be submersed in the process, mount them firmly to the tank, and protect the cable with plastic pipe, sealed at the top with a cable gland, to prevent premature failure. Place the sensors in an area of good solution movement.

Sensors should be located such that they respond rapidly to a well-mixed sample of the process water and the treatment chemicals. If they are too close to the chemical injection point, they will see spikes in concentration and cycle on and off too frequently. If they are too far away from the chemical injection point, they will respond too slowly to the concentration changes, and you will overshoot the set point.

The **contacting conductivity sensor** should be placed as close to the controller as possible, to a maximum distance of 250 ft. (76 m). Less than 25 ft. (8 m) is recommended. The cable must be shielded from background electrical noise. Always route low voltage (sensor) signals with at least a 6" (15 cm) separation from AC voltage wiring.

The **electrodeless conductivity sensor** should be placed as close to the controller as possible, to a maximum distance of 120 ft. (37 m). Less than 20 ft. (6 m) is recommended. The cable must be shielded from background electrical noise. Always route low voltage (sensor) signals with at least a 6" (15 cm) separation from AC voltage wiring. These sensors are affected by the geometry and conductivity of their surroundings, so either maintain 6 inches (15 cm) of sample around the sensor or ensure that any nearby conductive or non-conductive items are consistently positioned. Do not install the sensor in the path of any electrical current that may be flowing in the solution, as this will shift the conductivity reading.

The **amplified pH/ORP/ISE electrode** should be placed as close to the controller as possible, to a maximum distance of 1000 feet (305 m) from the controller. A junction box and shielded cable are available to extend the standard 20 foot (6 m) length. pH and ORP electrodes must be installed such that the measuring surfaces will always remain wet. A U-trap provided in the manifold design should achieve this, even if the sample flow stops. These electrodes also must be installed with the measuring surfaces pointing down; that is 5 degrees above the horizontal, at a minimum.

The **disinfection sensor** should be placed as close to the controller as possible, to a maximum distance of 100 feet (30 m) from the controller. A junction box and shielded cable are available to extend the standard 20 foot (6 m) length. The sensor should be mounted such that the measuring surfaces will always stay wet. If the membrane dries out, it will respond slowly to changing disinfectant values for 24 hours, and if dried out repeatedly, will fail prematurely. The flow cell should be placed on the discharge side of a circulation pump or downhill from a gravity feed. Flow into the cell must come from the bottom side that has the ¾" x ¼" NPT reducing bushing installed. The reducing bushing provides the flow velocity required for accurate readings and must not be removed! A "U" trap should be installed so that if the flow stops, the sensor is still immersed in the water. The outlet of the flow cell must be plumbed to open atmosphere unless the system pressure is at or below 1 atmosphere. If the flow through the line cannot be stopped to allow for cleaning and calibration of the sensor, then it should be placed in a by-pass line with isolation valves to allow for sensor removal. Install the sensor vertically, with the measuring surface pointing down, at least 5 degrees above horizontal. Flow rate regulation must be done upstream from the sensor, because any flow restriction downstream can increase the pressure above atmospheric and damage the membrane cap!

The **corrosion sensor** should be placed as close to the controller as possible, to a maximum distance of 100 feet (30 m) from the controller. A junction box and shielded cable (p/n 100084) are available to extend the standard 6 foot (3 m) or 20 foot (6 m) length. The sensor should not be installed unless the o-rings/electrodes that match the metallurgy to be examined are attached to the steel threaded rods. Standard corrosion electrodes are 5 cm2 surface area. Do not touch the metal electrodes; they should be clean and free of any scratches, oils or contamination to accurately measure the corrosion. The sensor should be mounted horizontally, such that the measuring surfaces will always stay completely wet. The sensor should ideally be installed in the side branch of a 1" or ¾" tee, with the flow entering the tee through the top branch and flowing away from the base of the sensor, towards the tips of the electrodes. A constant flow rate is required, at a minimum of 1.5 gpm (5.7 lpm) with an ideal flow rate of 5 gpm (19 lpm). If more than one metal is to be used, the most noble metal should be first.

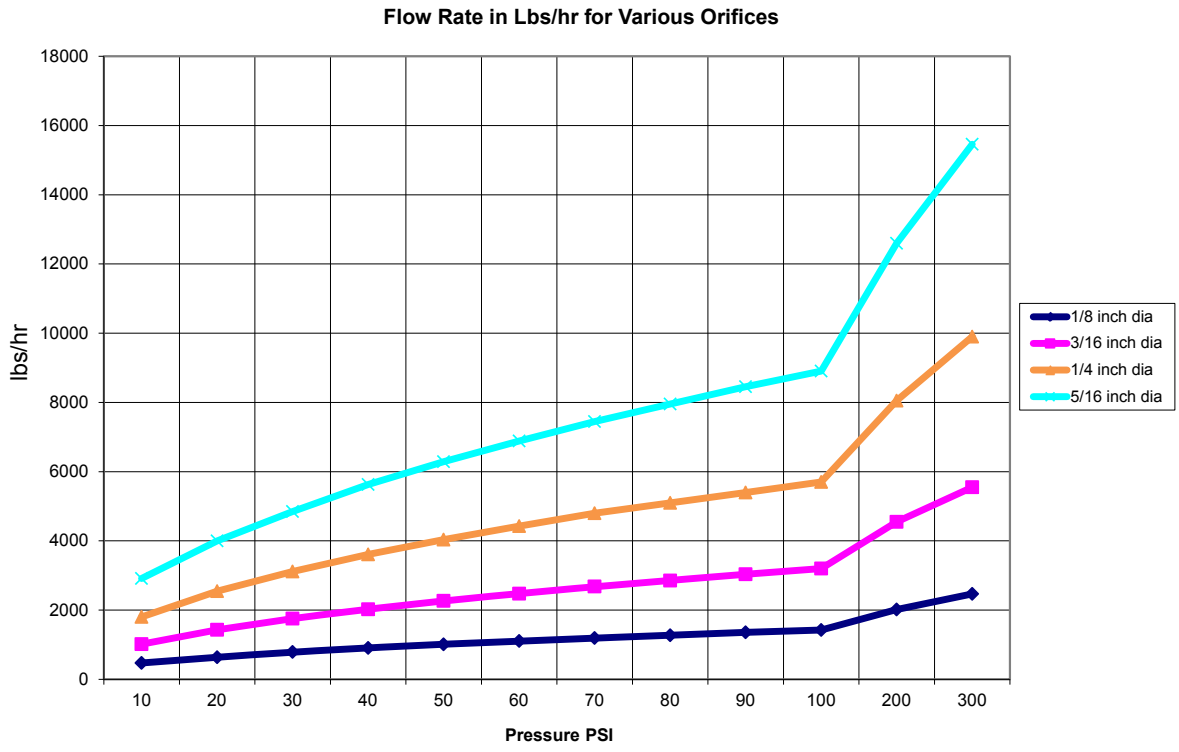
Important Boiler Sensor Installation Notes: (refer to typical installation drawing)

1. Make sure the minimum water level in the boiler is at least 4-6 inches above the skimmer blowdown line. If the skimmer line is closer to the surface, it is likely that steam will be drawn into the line instead of boiler water. The skimmer line must also be installed above the highest tube.
2. Maintain a 3/4 inch minimum pipe ID with no flow restrictions from the tap for the boiler skimmer blow-down line to the electrode. If the ID is reduced below 3/4 inch, then flashing will occur beyond that point and the conductivity reading will be low and erratic. Minimize the usage of tees, valves, elbows or unions between the boiler and the electrode.
3. A manual shut off valve should be installed so that the electrode can be removed and cleaned. This valve must be a full port valve in order to avoid a flow restriction.
4. Keep the distance between the tap for the boiler skimmer line to the electrode as short as possible, to a maxi-mum of 10 feet.
5. Mount the electrode in the side branch of a cross in a horizontal run of pipe. This will minimize entrapment of steam around the electrode and will allow any solids to pass through.
6. There MUST be a flow restriction after the electrode and/or control valve in order to provide back pressure. This flow restriction will be either a flow control valve or an orifice union. The amount of the flow restric-tion will affect the blowdown rate as well, and should be sized accordingly.
7. Install the motorized ball valve or solenoid valve per the manufacturer's instructions.

For best results, align the hole in the conductivity electrode such that the direction of water flow is through the hole.

Guide to Sizing Blowdown Valves and Orifice Plates

1. **Determine the Rate of Steam Production in Pounds per Hour:**
   Either read off the boiler name plate (water-tube boilers) or Calculate from horsepower rating (fire-tube boilers): HP x 34.5 = lbs/hr. Example: 100 HP = 3450 lbs/hr.
2. **Determine the Concentration Ratio (BASED ON FEEDWATER)**
   A water treatment chemical specialist should determine the desired number of cycles of concentration. This is the ratio of TDS in the boiler water to TDS in the feedwater. Note that feedwater means the water that is



fed to the boiler from the deaerator and includes makeup water plus condensate return. Example: 10 cycles of concentration has been recommended

3. **Determine the Required Blowdown Rate in Pounds Per Hour**
   Blowdown Rate = Steam Production / (Concentration Ratio –1) Example: 3450/(10-1) = 383.33 lbs./hr

4. **Determine if Continuous or Intermittent Sampling is Required**
   Use intermittent sampling when the boiler operation or loading is intermittent, or on boilers where the required blowdown rate is less than 25% of the smallest available flow control valve or less than the flow through the smallest orifice. See the graphs on the next page.

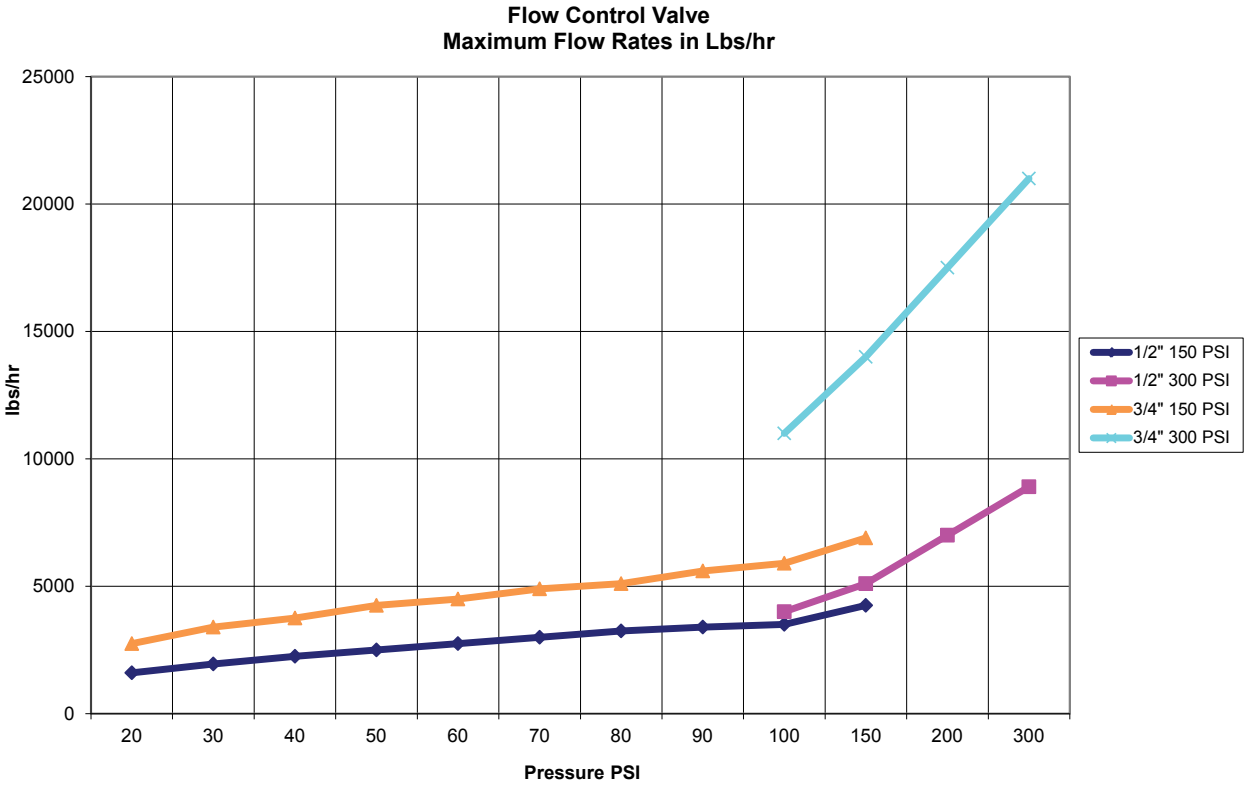
   Use continuous sampling when the boiler is operating 24 hours per day and the required blowdown rate is more than 25% of the smallest applicable flow control valve or orifice. See the graphs on the next page.

   Use of a flow control valve will give you the best control of the process, since the flow rate can be easily adjusted. The dial on the valve also gives you a visual indication if the flow rate has been changed. If the valve clogs, it can be opened to clear the obstruction, and closed to the previous position.

   If an orifice plate is used, you must install a valve downstream from the orifice in order to fine tune the flow rate and provide additional back pressure in many applications.

   Example: An 80 psi boiler has a Required Blowdown Rate of 383.33 lbs./hr. The maximum flow rate of the smallest flow control valve is 3250 lbs./hr. 3250 x 0.25 = 812.5 which is too high for continuous sampling. Using an orifice, the flow rate through the smallest diameter plate is 1275 lbs./hr. This is too high for continuous sampling.

5. **Determine the Orifice or Flow Control Valve Size for this Blowdown Rate**
   Use the following graphs to select a flow control device:



3.4 Icon Definitions

Symbol	Publication	Description

	IEC 417, No.5019	Protective Conductor Terminal
|	IEC 417, No. 5007	On (Supply)
O	IEC 417, No. 5008	Off (Supply)
	ISO 3864, No. B.3.6	Caution, risk of electric shock
	ISO 3864, No. B.3.1	Caution

3.5 Electrical installation

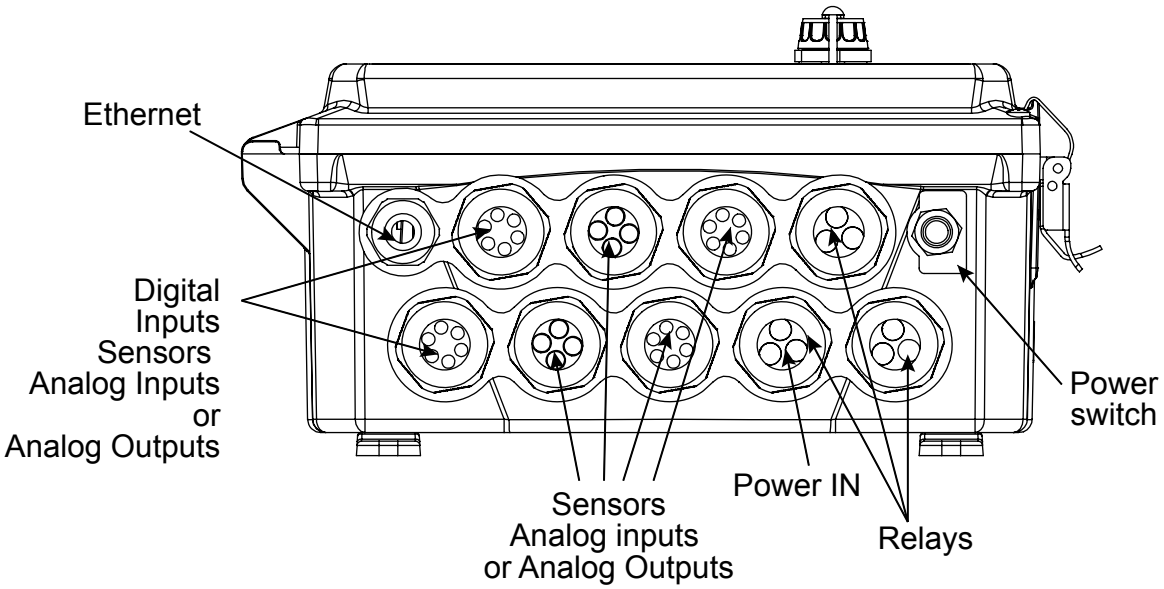
The various standard wiring options are shown in figure 1, below. Your controller will arrive from the factory pre-wired or ready for hardwiring. Depending on your configuration of controller options, you may be required to hard-wire some or all of the input/output devices. Refer to figures 6 through 18 for circuit board layout and wiring.

Note: when wiring the optional flow meter contactor input, the 4-20 mA outputs or a remote flow switch, it is advisable to use stranded, twisted, shielded pair wire between 22-26 AWG. Shield should be terminated at the controller at the most convenient shield terminal.

 **CAUTION** 

1.	There are live circuits inside the controller even when the power switch on the front panel is in the OFF position! The front panel must never be opened before power to the controller is REMOVED! If your controller is prewired, it is supplied with an 8 foot, 14 AWG power cord with NEMA 5-15P USA style plug. A tool (#2 Phillips driver) is required to open the front panel.
2.	When mounting the controller, make sure there is clear access to the disconnecting device!
3.	The electrical installation of the controller must be done by trained personnel only and conform to all applicable National, State and Local codes!
4.	Proper grounding of this product is required. Any attempt to bypass the grounding will compromise the safety of persons and property.
5.	Operating this product in a manner not specified by Walchem may impair the protection provided by the equipment.

Figure 1 Conduit Wiring



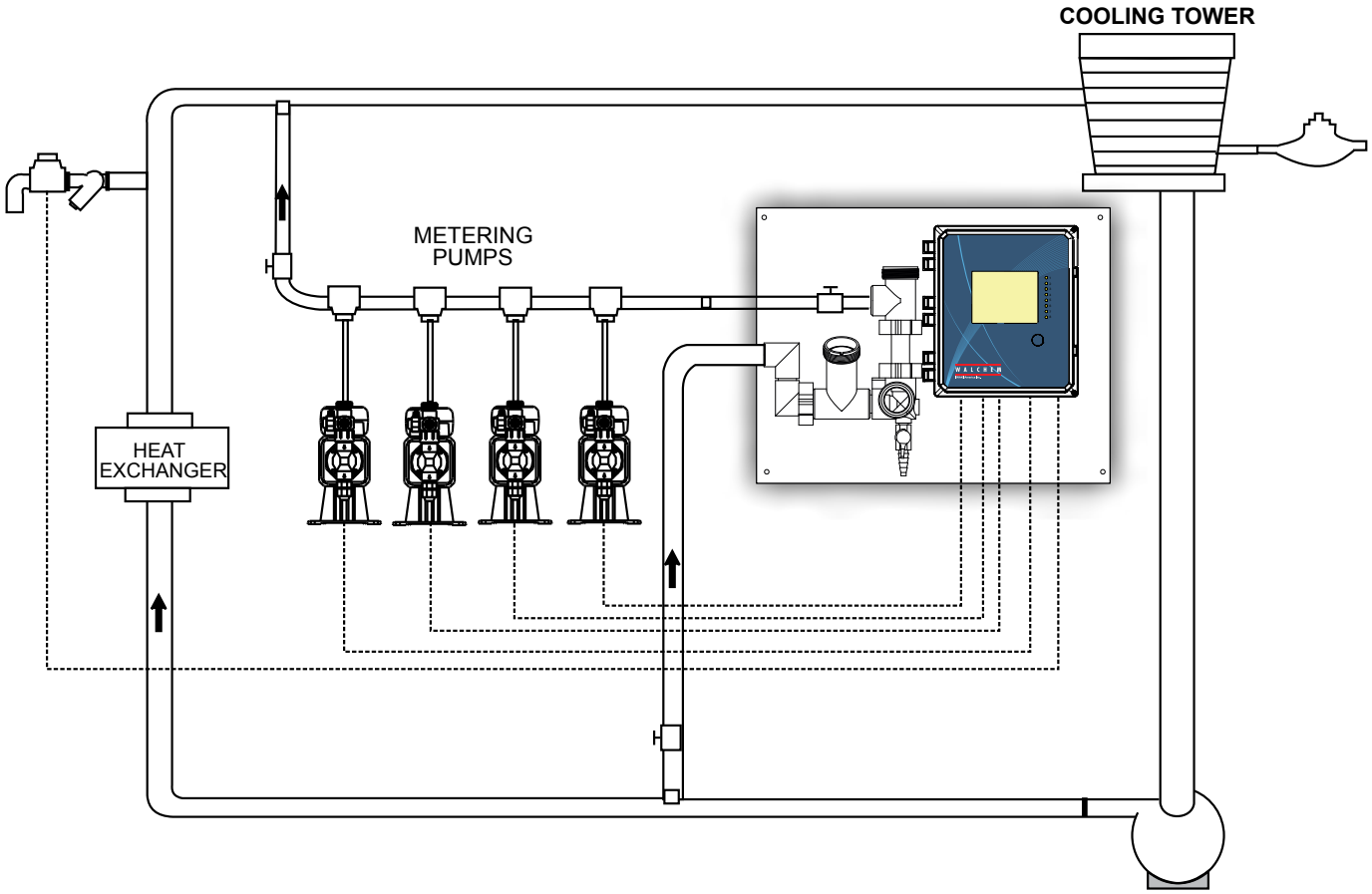


Figure 2 Typical Installation – Cooling Tower

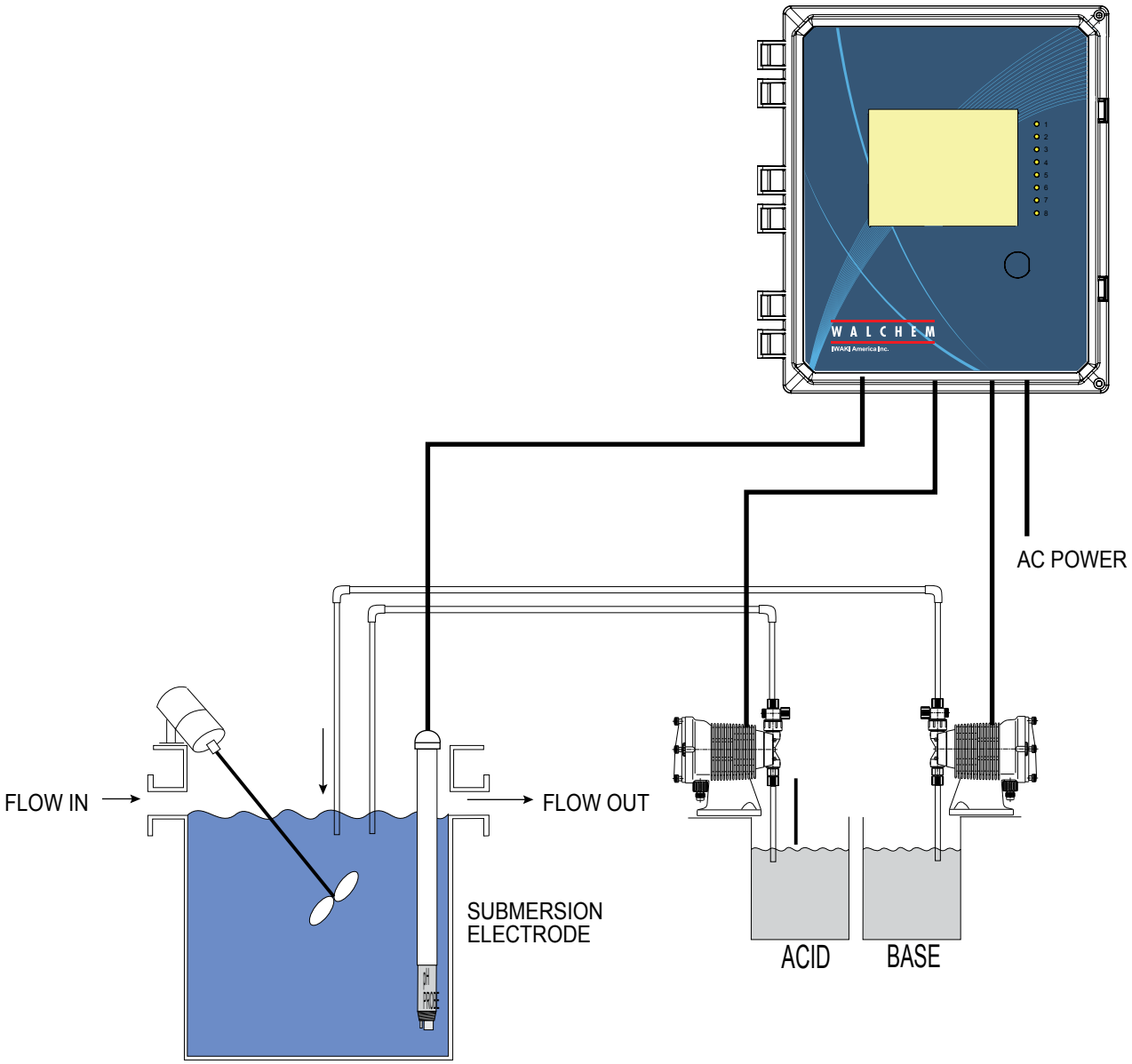


Figure 3 Typical Installation – Submersion

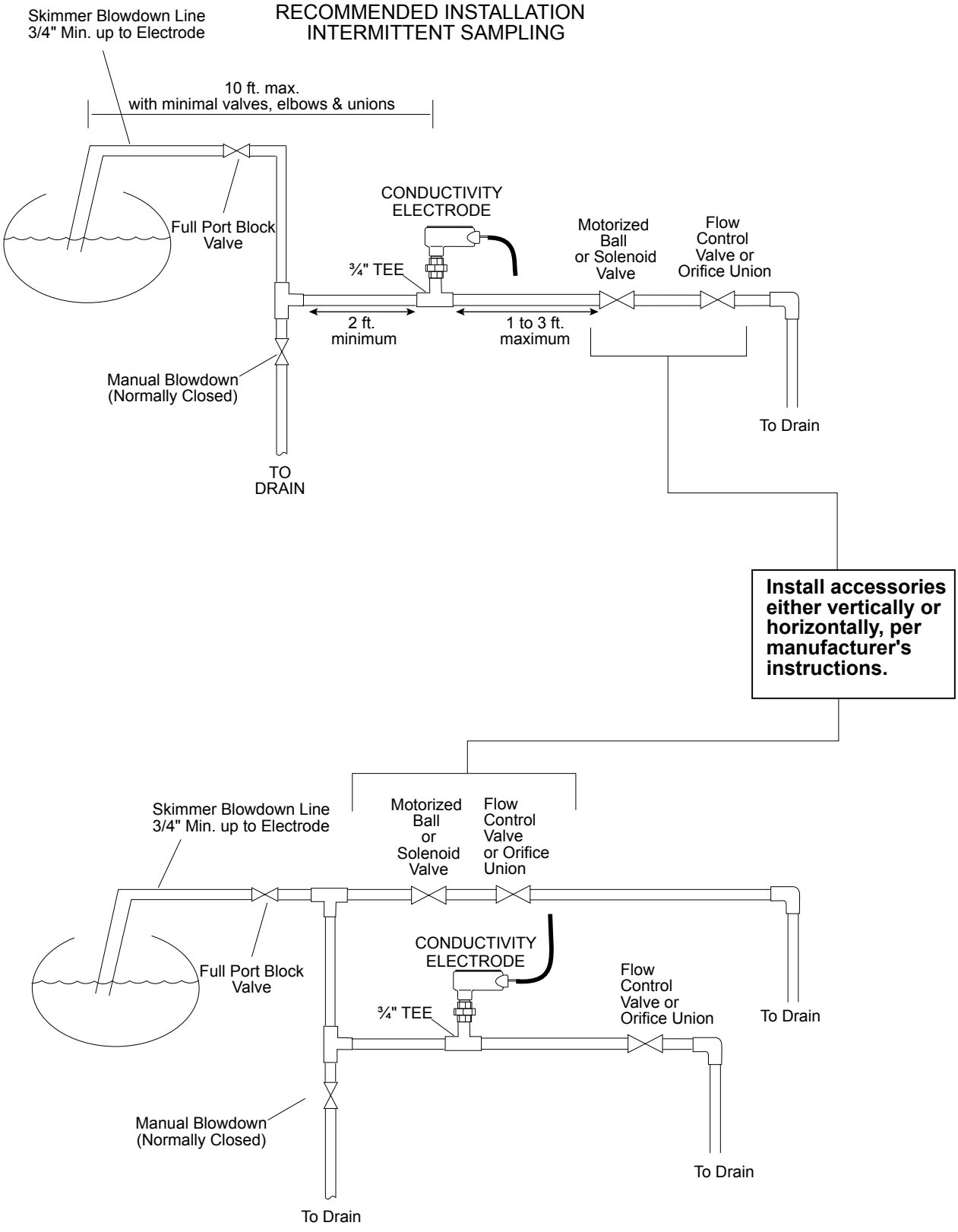


Figure 4 Typical Installation – Boiler

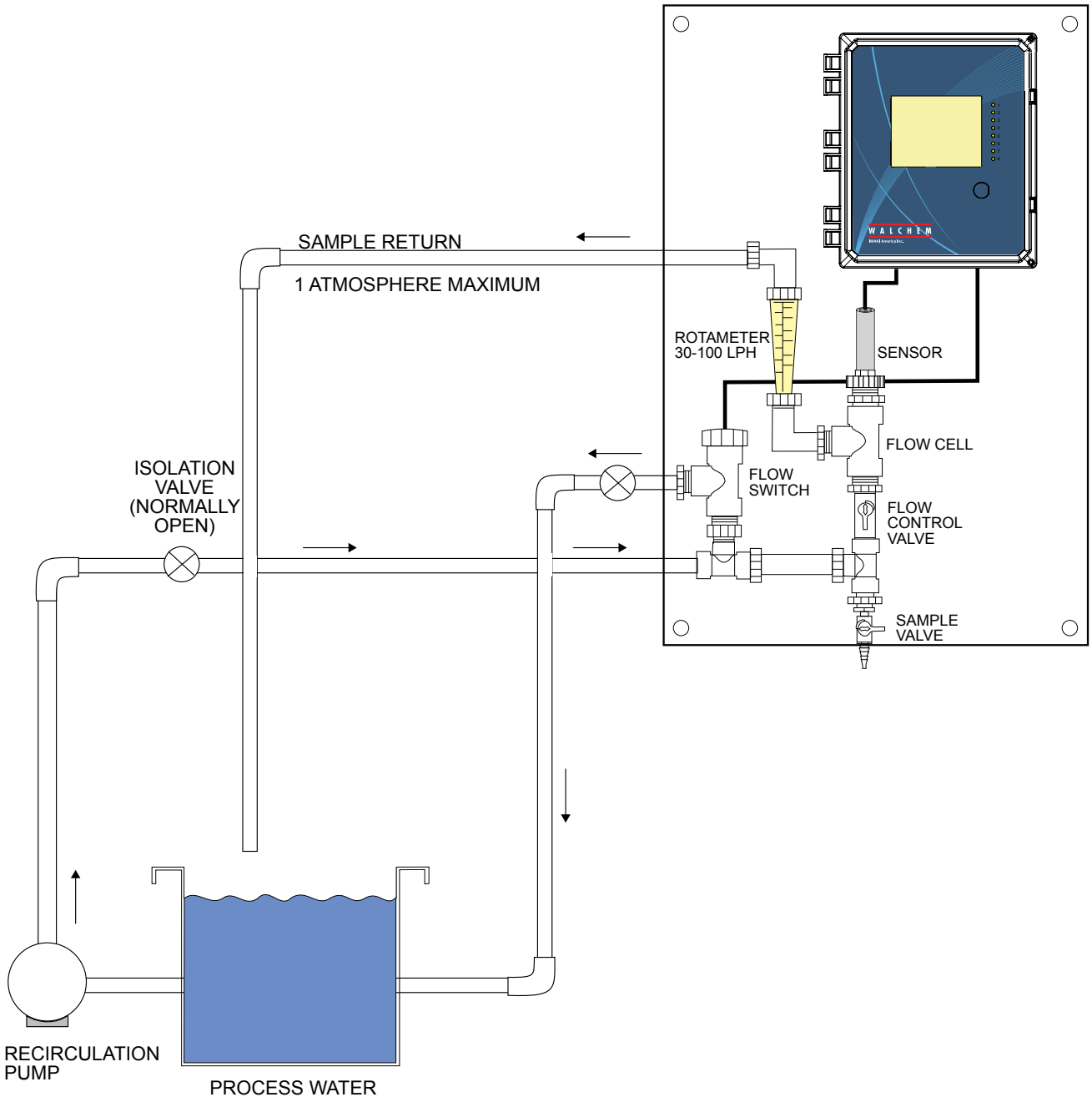


Figure 5 Typical Installation – Disinfection Sensor

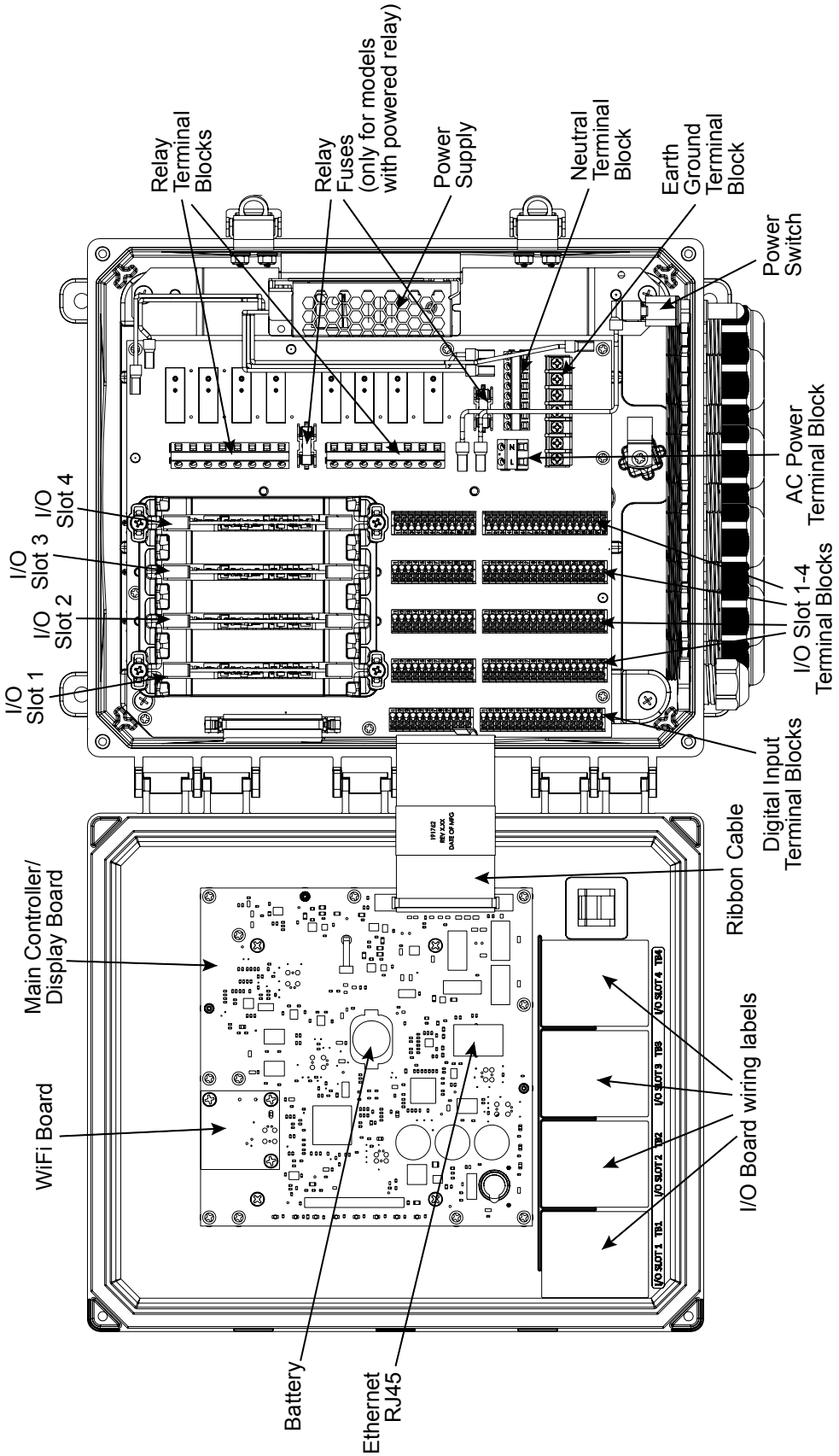


Figure 6 Parts Identification

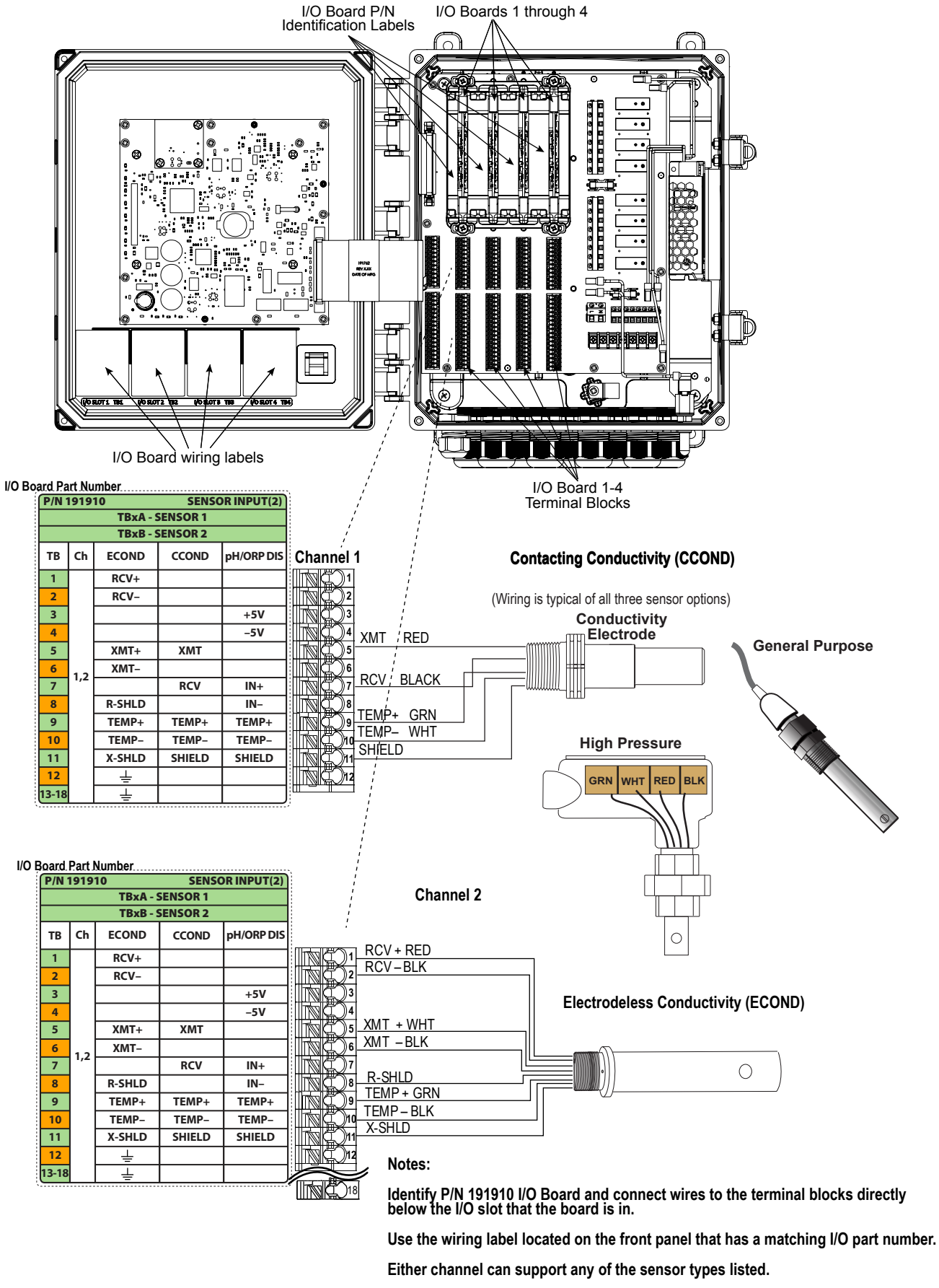


Figure 7 Part Number 191910 Dual Sensor Board wiring - Conductivity

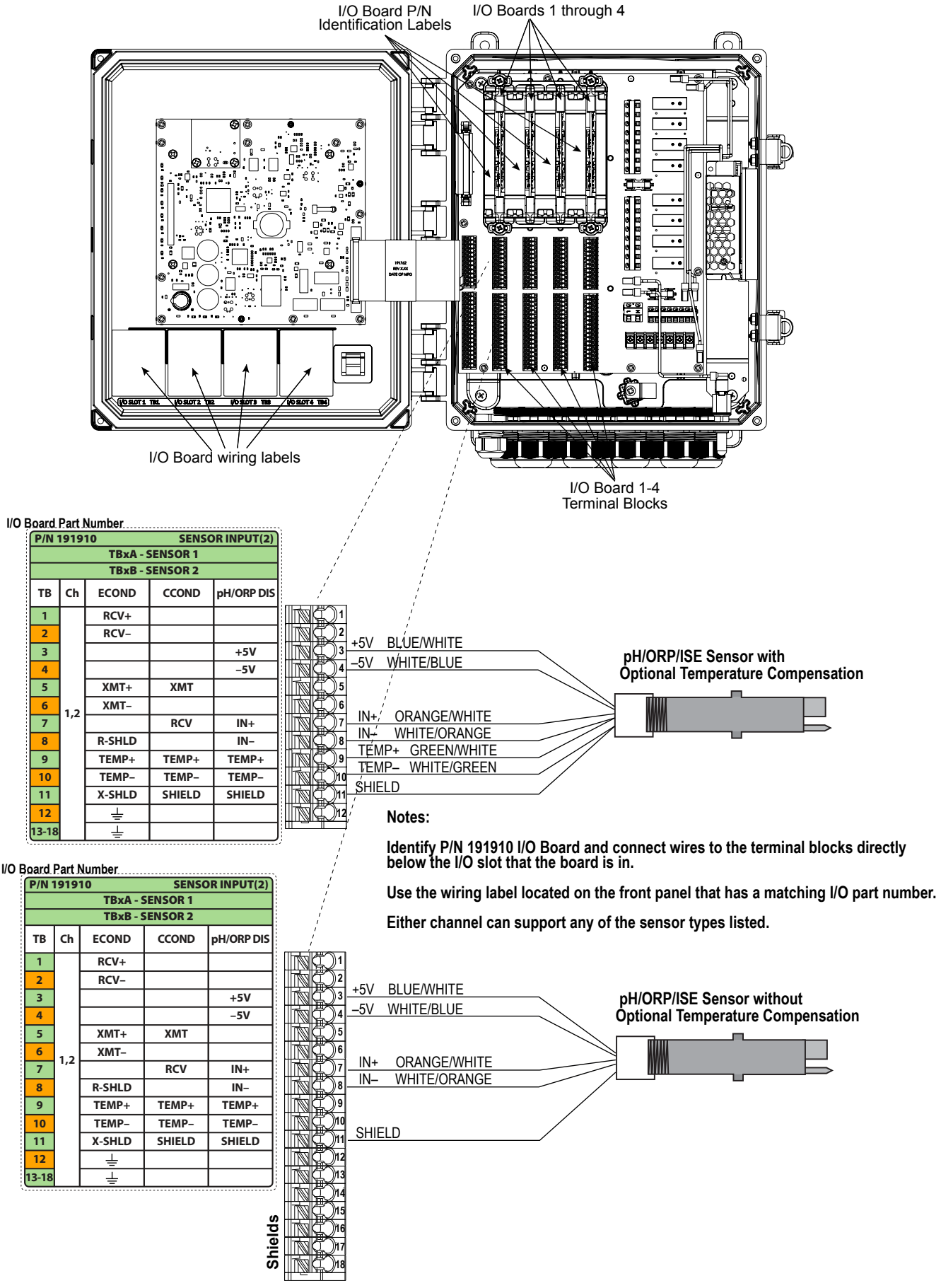


Figure 8 Part Number 191910 Dual Sensor Board Wiring - pH/ORP/ISE

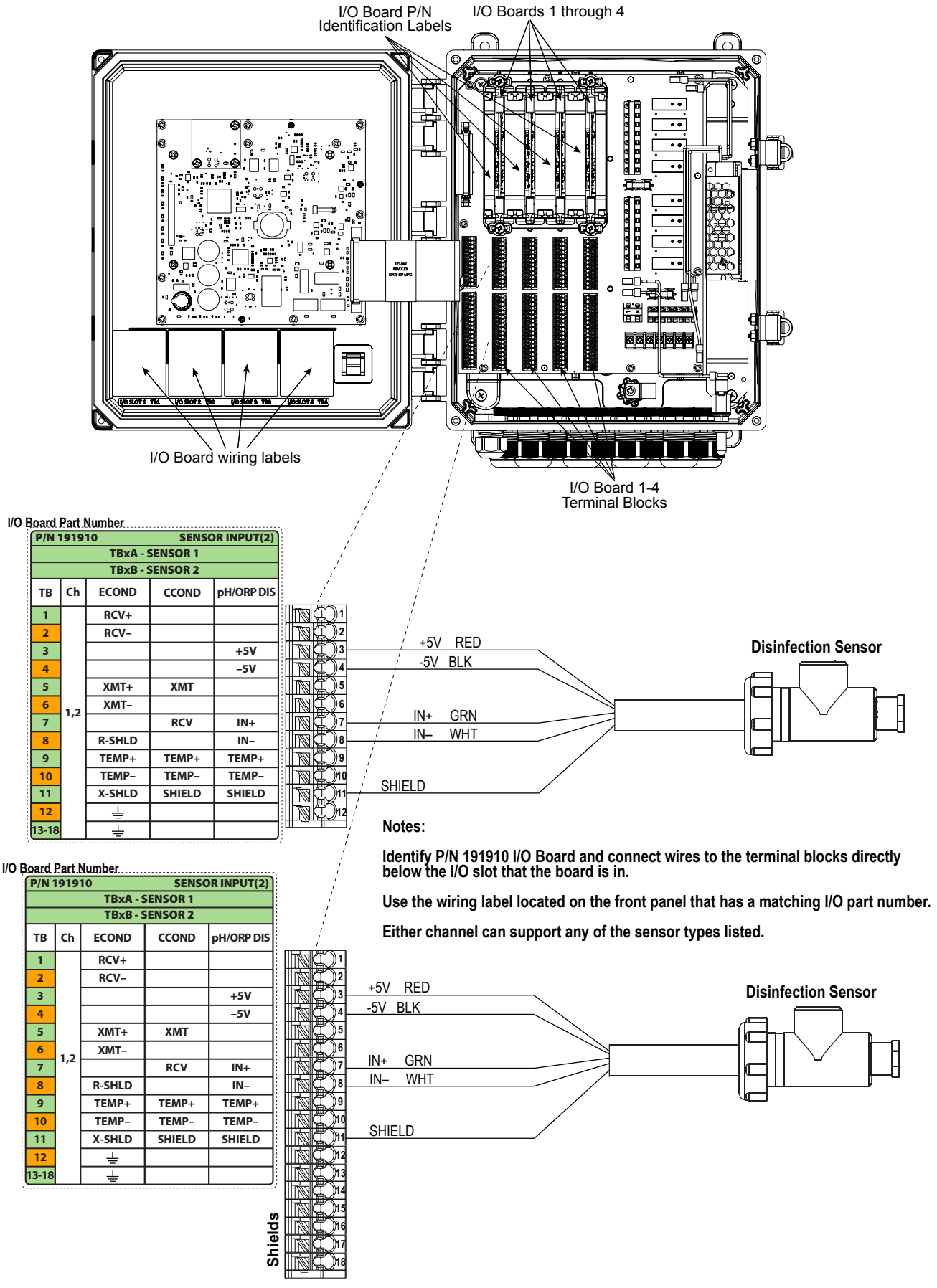
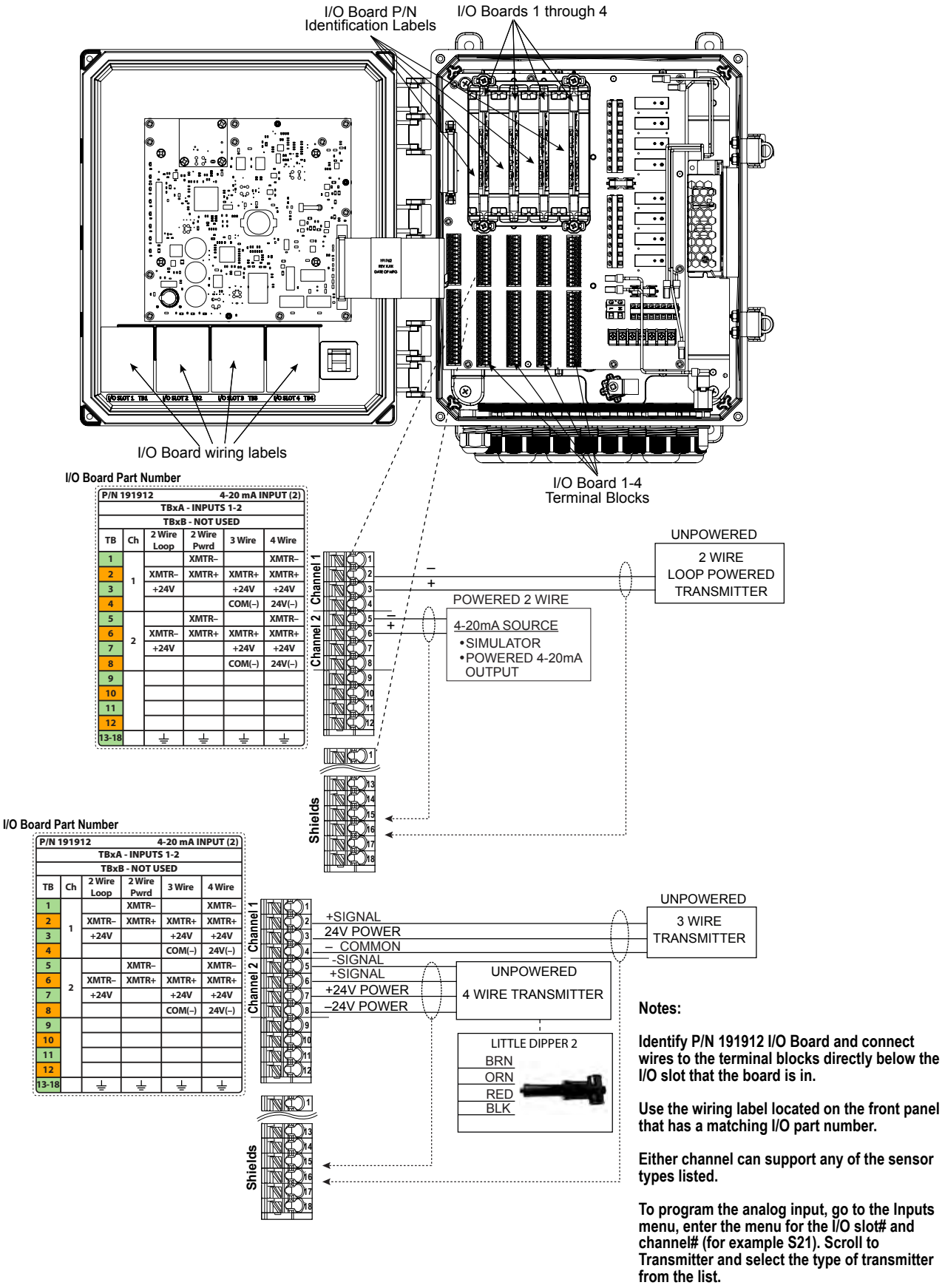


Figure 9 Part Number 191910 Dual Sensor Board Wiring - Disinfection



Notes:

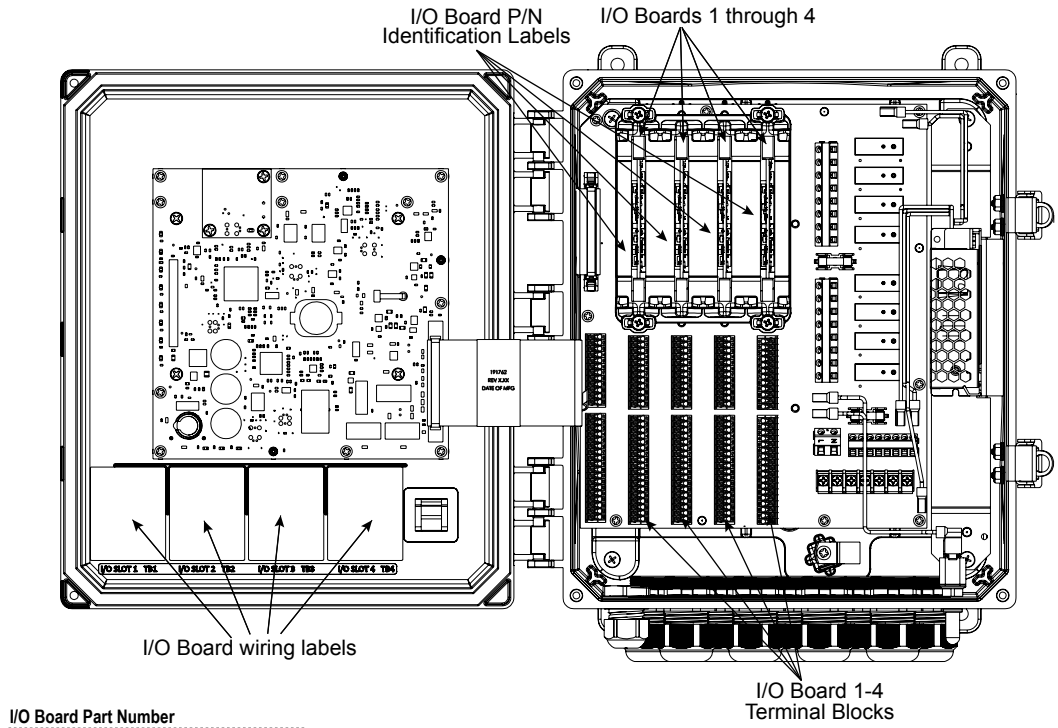
Identify P/N 191912 I/O Board and connect wires to the terminal blocks directly below the I/O slot that the board is in.

Use the wiring label located on the front panel that has a matching I/O part number.

Either channel can support any of the sensor types listed.

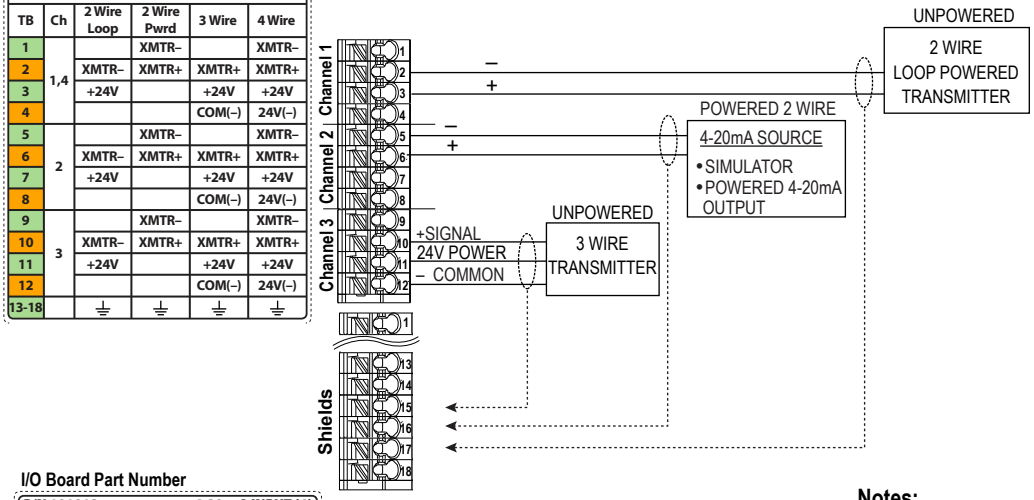
To program the analog input, go to the Inputs menu, enter the menu for the I/O slot# and channel# (for example S21). Scroll to Transmitter and select the type of transmitter from the list.

Figure 10 Part Number 191912 Dual Analog (4-20mA) Sensor Input Board Wiring



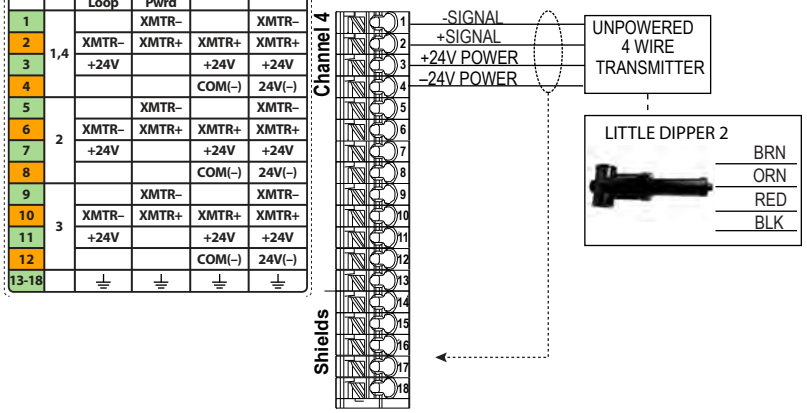
I/O Board Part Number

P/N 191913		4-20 mA INPUT (4)			
TBxA - INPUTS 1-3					
TBxB - INPUT 4					
TB	Ch	2 Wire Loop	2 Wire Pwrd	3 Wire	4 Wire
1	1,4		XMTR–		XMTR–
2		XMTR–	XMTR+	XMTR+	XMTR+
3		+24V		+24V	+24V
4				COM(–)	24V(–)
5	2		XMTR–		XMTR–
6		XMTR–	XMTR+	XMTR+	XMTR+
7		+24V		+24V	+24V
8				COM(–)	24V(–)
9	3		XMTR–		XMTR–
10		XMTR–	XMTR+	XMTR+	XMTR+
11		+24V		+24V	+24V
12				COM(–)	24V(–)
13-18		⏚	⏚	⏚	⏚



I/O Board Part Number

P/N 191913		4-20 mA INPUT (4)			
TBxA - INPUTS 1-3					
TBxB - INPUT 4					
TB	Ch	2 Wire Loop	2 Wire Pwrd	3 Wire	4 Wire
1	1,4		XMTR–		XMTR–
2		XMTR–	XMTR+	XMTR+	XMTR+
3		+24V		+24V	+24V
4				COM(–)	24V(–)
5	2		XMTR–		XMTR–
6		XMTR–	XMTR+	XMTR+	XMTR+
7		+24V		+24V	+24V
8				COM(–)	24V(–)
9	3		XMTR–		XMTR–
10		XMTR–	XMTR+	XMTR+	XMTR+
11		+24V		+24V	+24V
12				COM(–)	24V(–)
13-18		⏚	⏚	⏚	⏚



Notes:

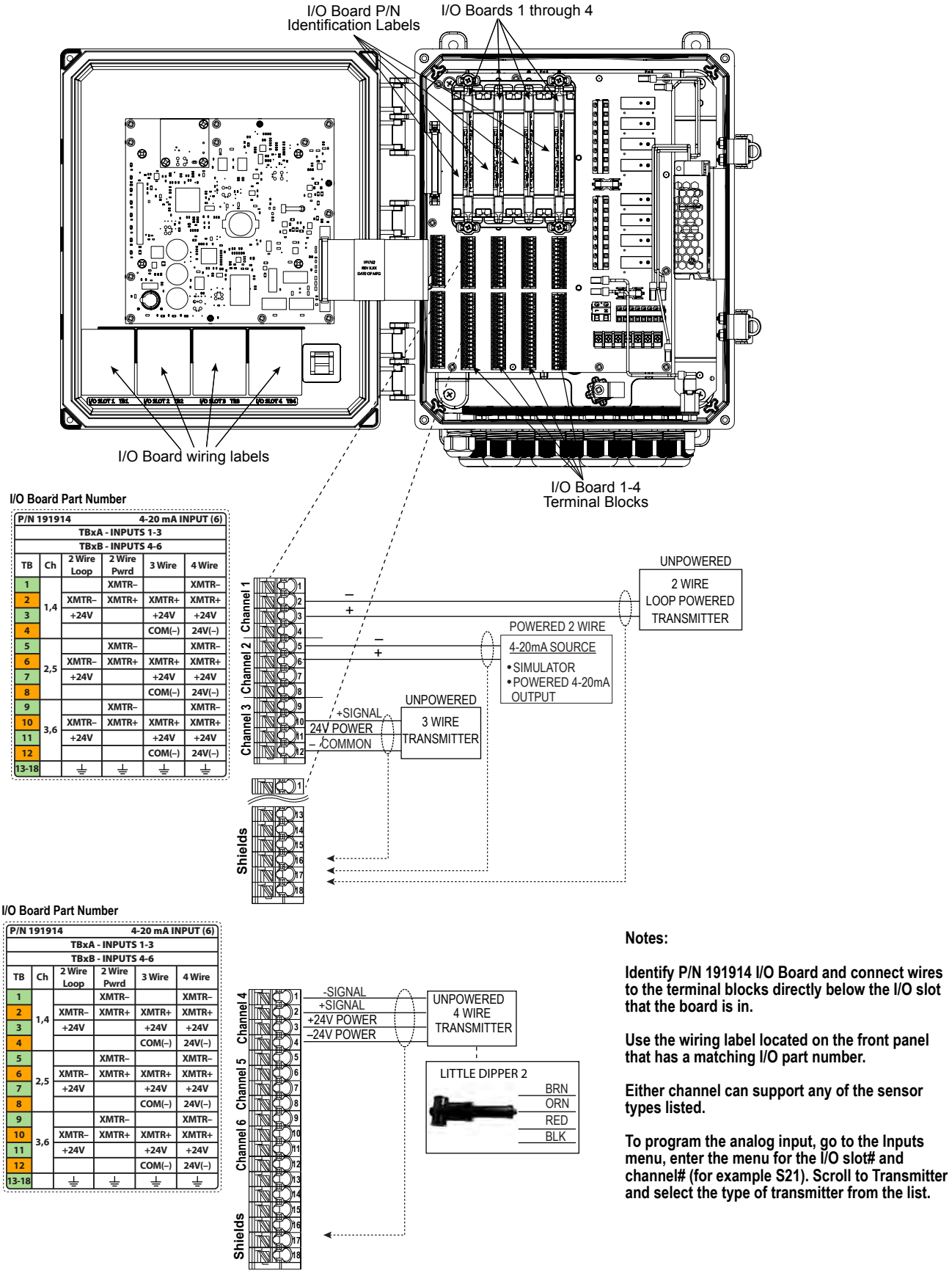
Identify P/N 191913 I/O Board and connect wires to the terminal blocks directly below the I/O slot that the board is in.

Use the wiring label located on the front panel that has a matching I/O part number.

Either channel can support any of the sensor types listed.

To program the analog input, go to the Inputs menu, enter the menu for the I/O slot# and channel# (for example S21). Scroll to Transmitter and select the type of transmitter from the list.

Figure 11 Part Number 191913 Four Analog (4-20mA) Sensor Input Board Wiring



Notes:

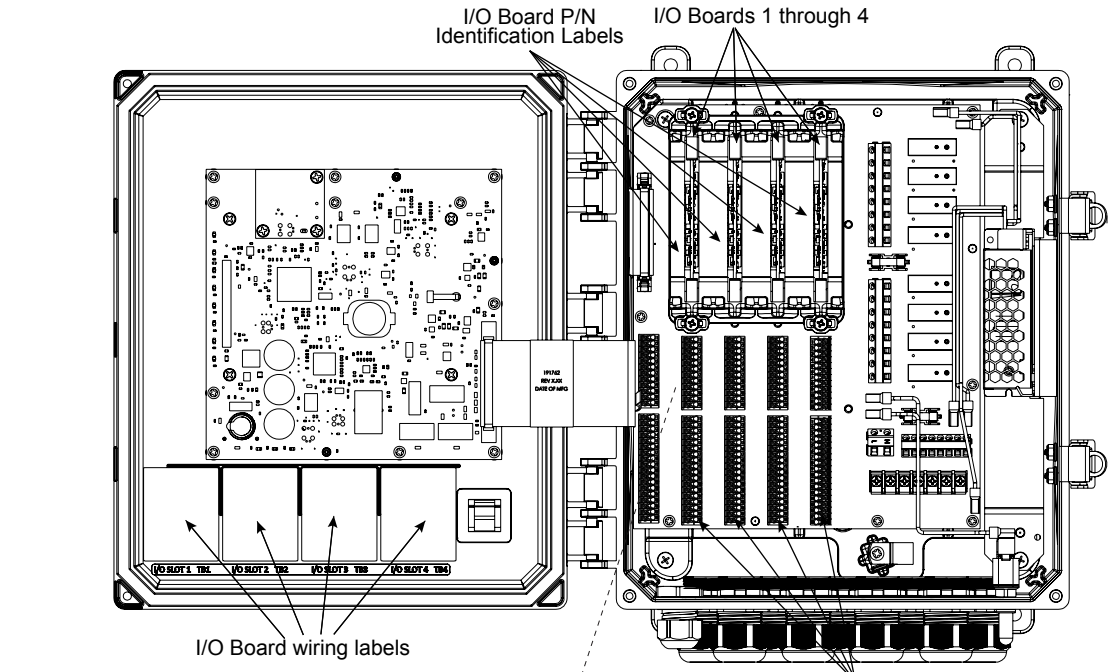
Identify P/N 191914 I/O Board and connect wires to the terminal blocks directly below the I/O slot that the board is in.

Use the wiring label located on the front panel that has a matching I/O part number.

Either channel can support any of the sensor types listed.

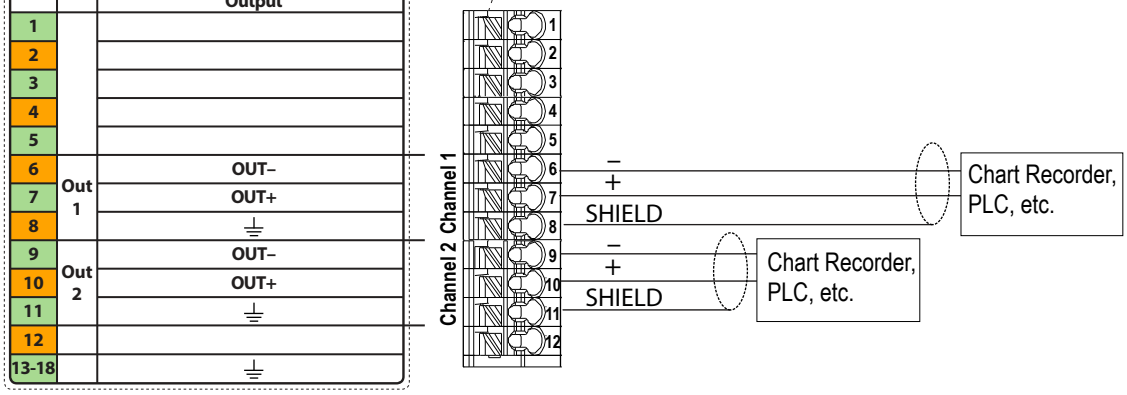
To program the analog input, go to the Inputs menu, enter the menu for the I/O slot# and channel# (for example S21). Scroll to Transmitter and select the type of transmitter from the list.

Figure 12 Part Number 191914 Six Analog (4-20mA) Sensor Input Board Wiring



I/O Board Part Number

P/N 191915		4-20 mA OUTPUT (2)
TBxA - OUTPUTS 1-2		
TBxB - NOT USED		
TB	Ch	4-20 mA Output
1		
2		
3		
4		
5		
6	Out 1	OUT–
7		OUT+
8		⏚
9	Out 2	OUT–
10		OUT+
11		⏚
12		
13-18		⏚



Notes:

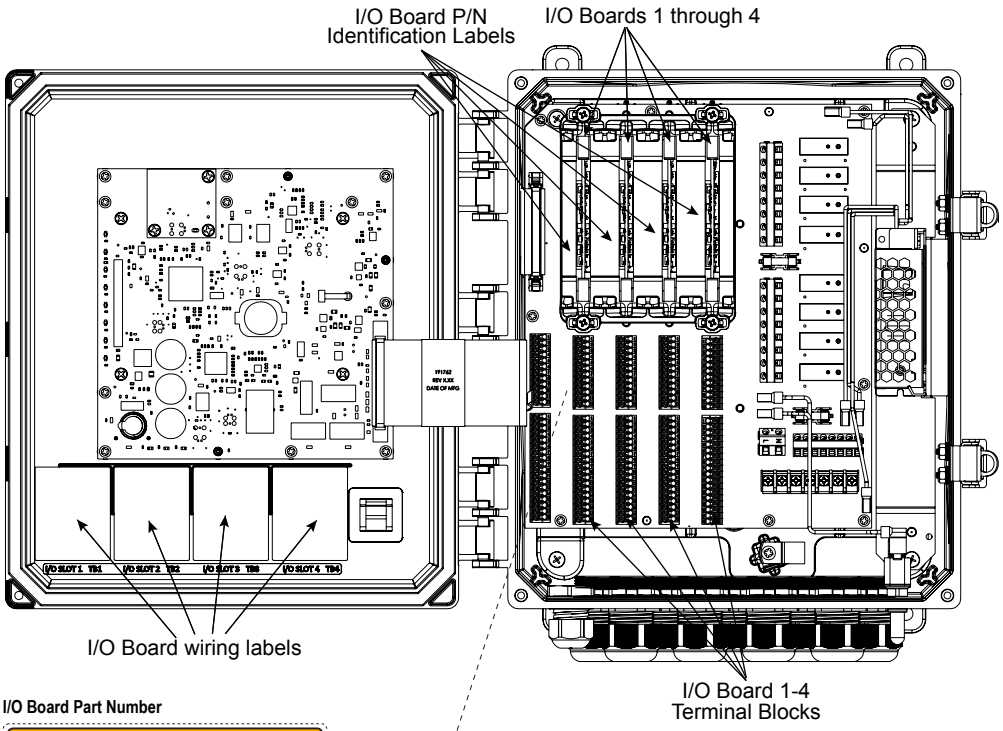
Identify P/N 191915 I/O Board and connect wires to the terminal blocks directly below the I/O slot that the board is in.

Use the wiring label located on the front panel that has a matching I/O part number.

Either channel can support any of the sensor types listed.

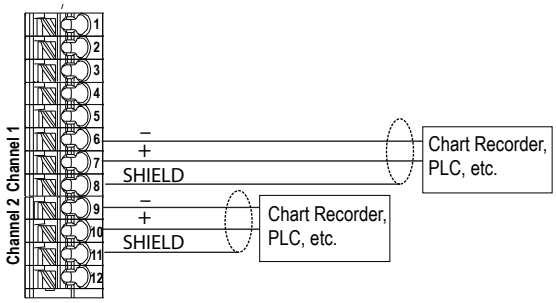
Each analog output is internally powered, 15 VDC, fully isolated.

Figure 13 Part Number 191915 Dual Analog (4-20mA) Output Wiring



I/O Board Part Number

P/N 191916		4-20 mA OUTPUT (4)
TBxA - OUTPUTS 1-2		
TBxB - OUTPUTS 3-4		
TB	Ch	4-20 mA Output
1		
2		
3		
4		
5		
6	Out 1,3	OUT–
7		OUT+
8		⏚
9	Out 2,4	OUT–
10		OUT+
11		⏚
12		
13-18		⏚



Notes:

Identify P/N 191916 I/O Board and connect wires to the terminal blocks directly below the I/O slot that the board is in.

Use the wiring label located on the front panel that has a matching I/O part number.

Either channel can support any of the sensor types listed.

Each analog output is internally powered, 15 VDC, fully isolated.

I/O Board Part Number

P/N 191916		4-20 mA OUTPUT (4)
TBxA - OUTPUTS 1-2		
TBxB - OUTPUTS 3-4		
TB	Ch	4-20 mA Output
1		
2		
3		
4		
5		
6	Out 1,3	OUT–
7		OUT+
8		⏚
9	Out 2,4	OUT–
10		OUT+
11		⏚
12		
13-18		⏚

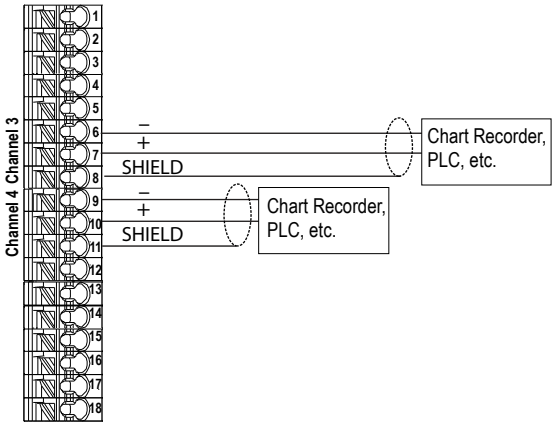
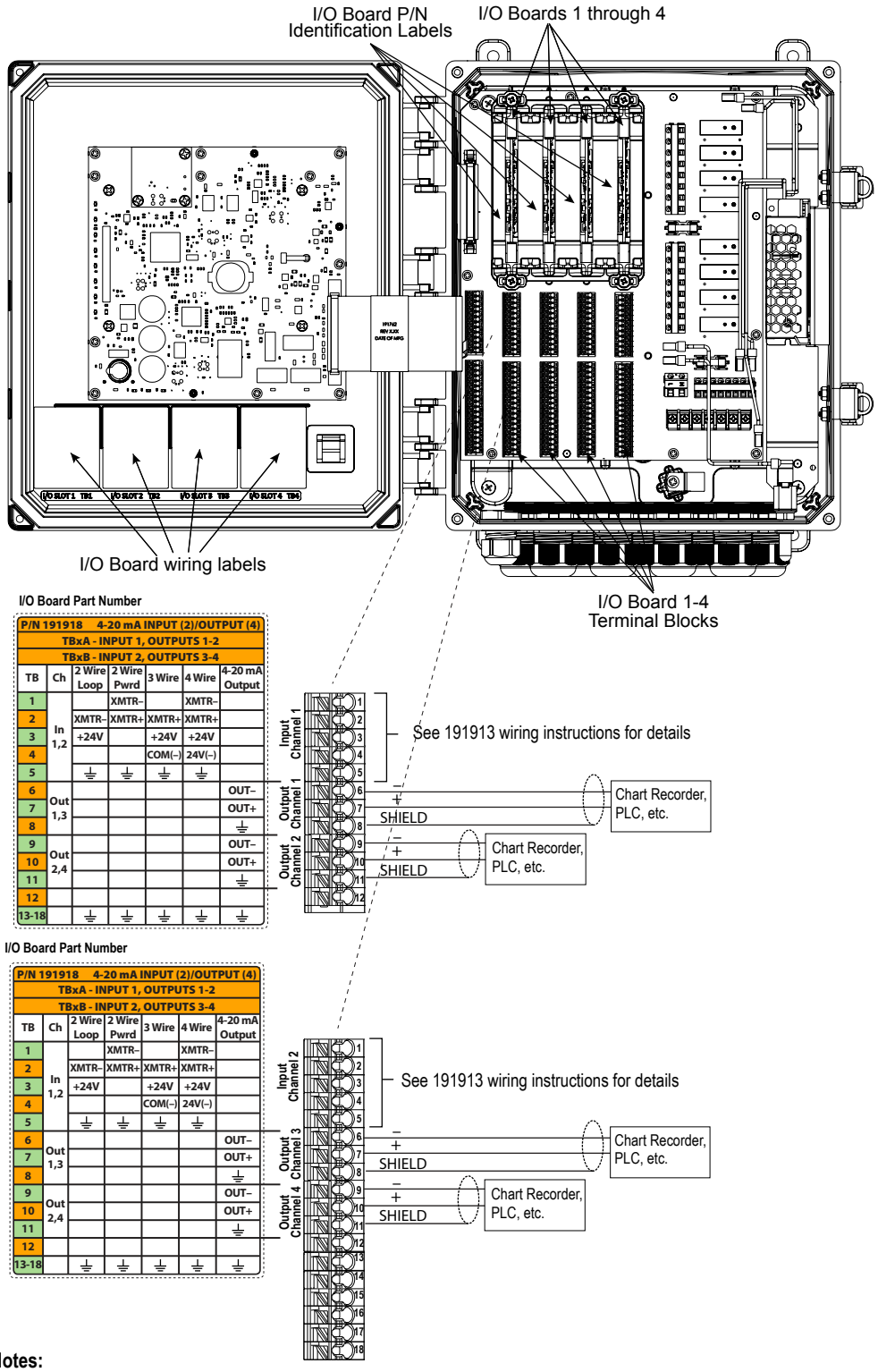


Figure 14 Part Number 191916 Four Analog (4-20mA) Output Wiring



Notes:

Identify P/N 191918 I/O Board and connect wires to the terminal blocks directly below the I/O slot that the board is in.

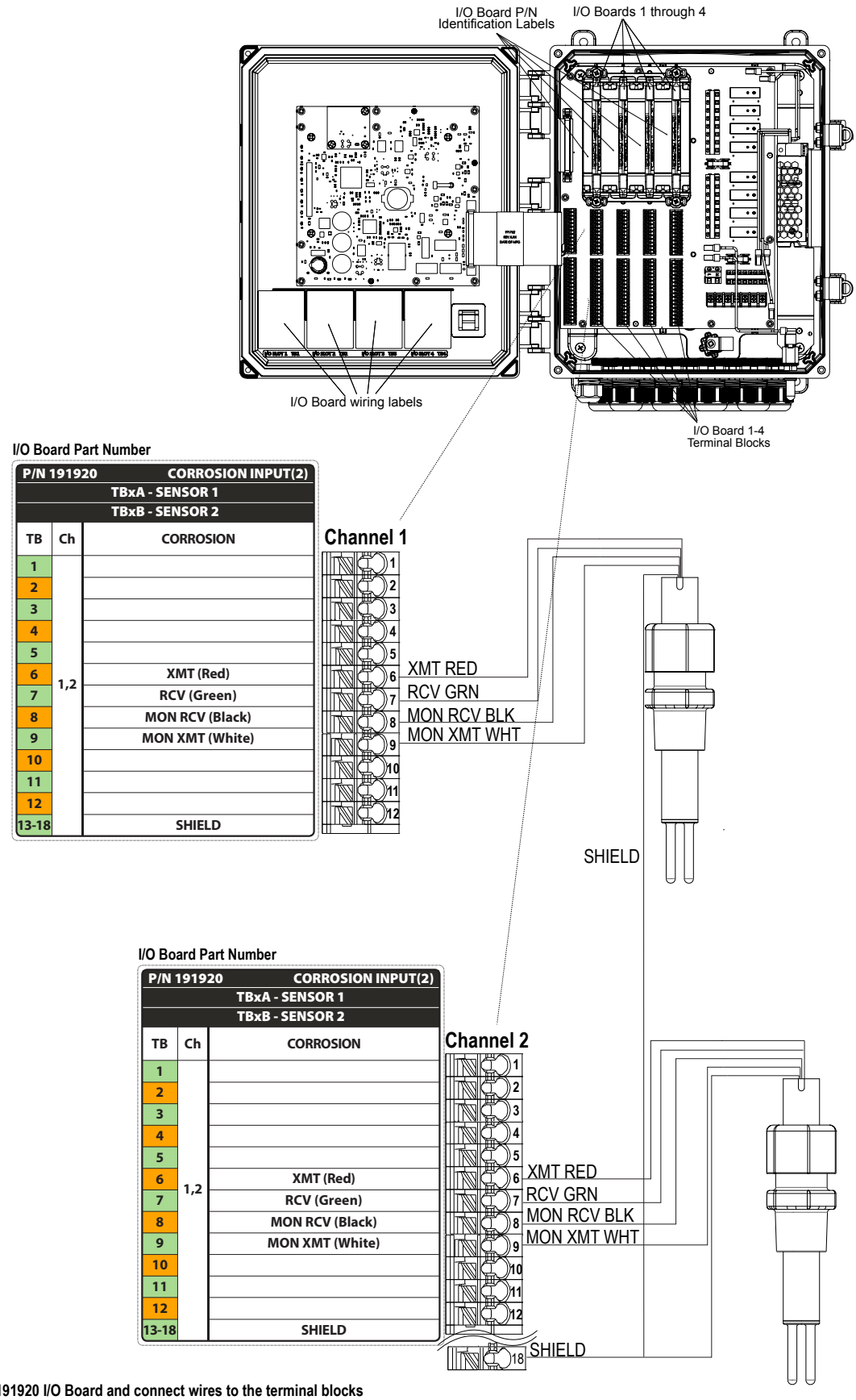
Use the wiring label located on the front panel that has a matching I/O part number.

Either channel can support any of the sensor types listed.

Each analog output is internally powered, 15 VDC, fully isolated.

To program the analog input, go to the Inputs menu, enter the menu for the I/O slot# and channel# (for example S21). Scroll to Transmitter and select the type of transmitter from the list.

Figure 15 Part Number 191918 Dual Analog (4-20mA) Input + Four Analog (4-20mA) Output Wiring



Notes:
Identify P/N 191920 I/O Board and connect wires to the terminal blocks directly below the I/O slot that the board is in.
Use the wiring label located on the front panel that has a matching I/O part number.
Either channel can support any of the sensor types listed.

Figure 16 Part Number 191920 Dual Corrosion Sensor Input Board Wiring

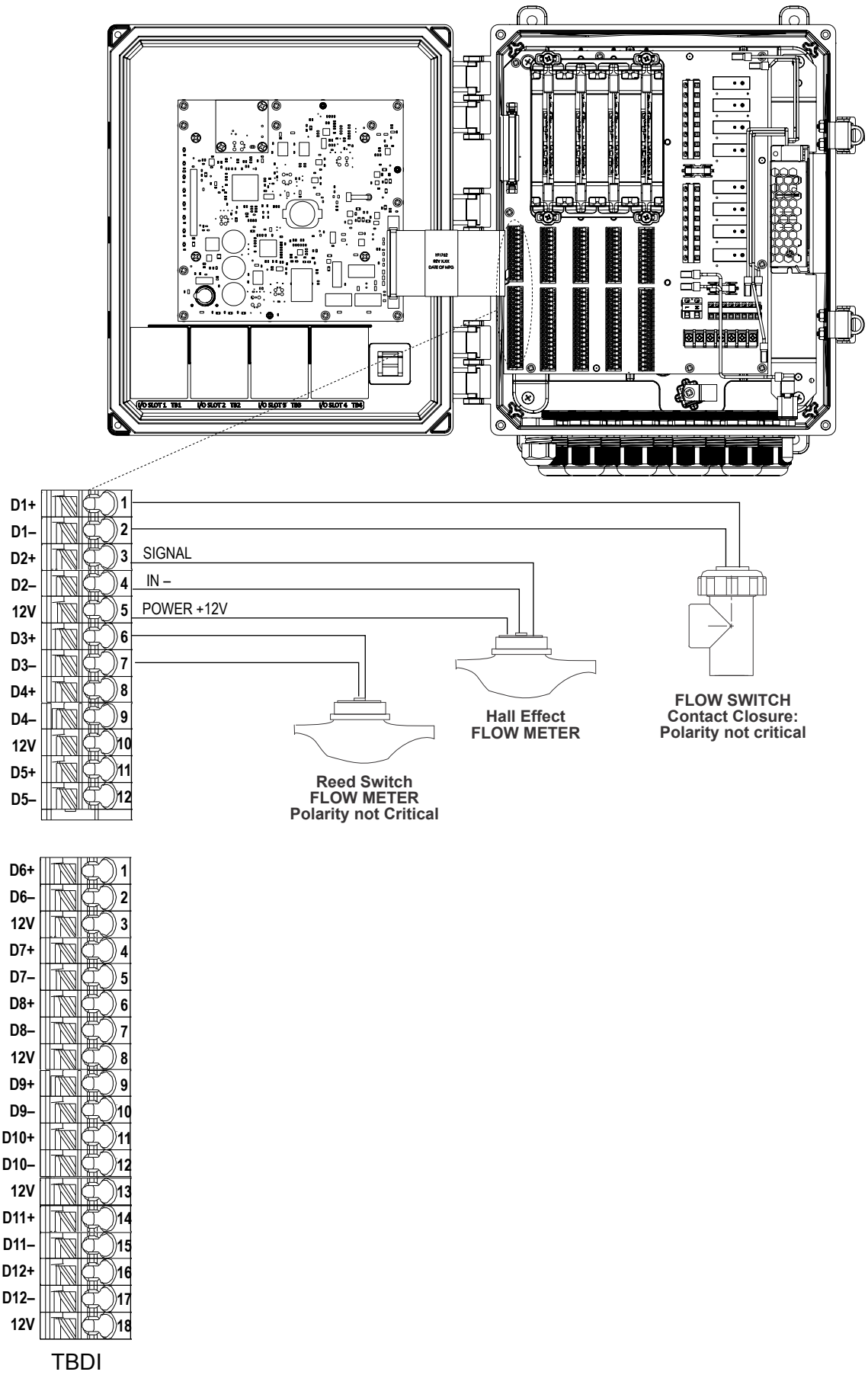
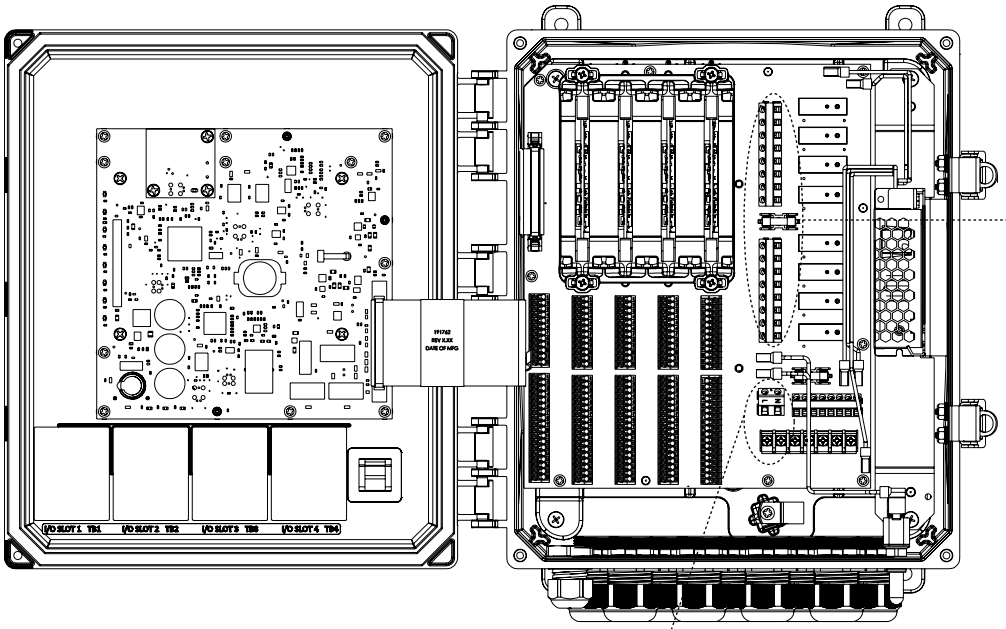


Figure 17 Digital Input Wiring



Relay Model Code	R1	R2	R3	R4	R5	R6	R7	R8
900	Powered	Powered	Powered	Powered	Powered	Powered	Powered	Powered
910	Powered	Powered	Powered	Powered	Powered	Powered	Powered	Dry
920	Dry	Dry	Dry	Dry	Dry	Dry	Pulse	Pulse
930	Powered	Powered	Dry	Dry	Powered	Powered	Dry	Dry
940	Dry	Dry	Pulse	Pulse	Dry	Dry	Pulse	Pulse
950	Powered	Powered	Pulse	Pulse	Powered	Powered	Pulse	Pulse
960	Powered	Powered	Powered	Powered	Powered	Powered	Pulse	Pulse
970	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry

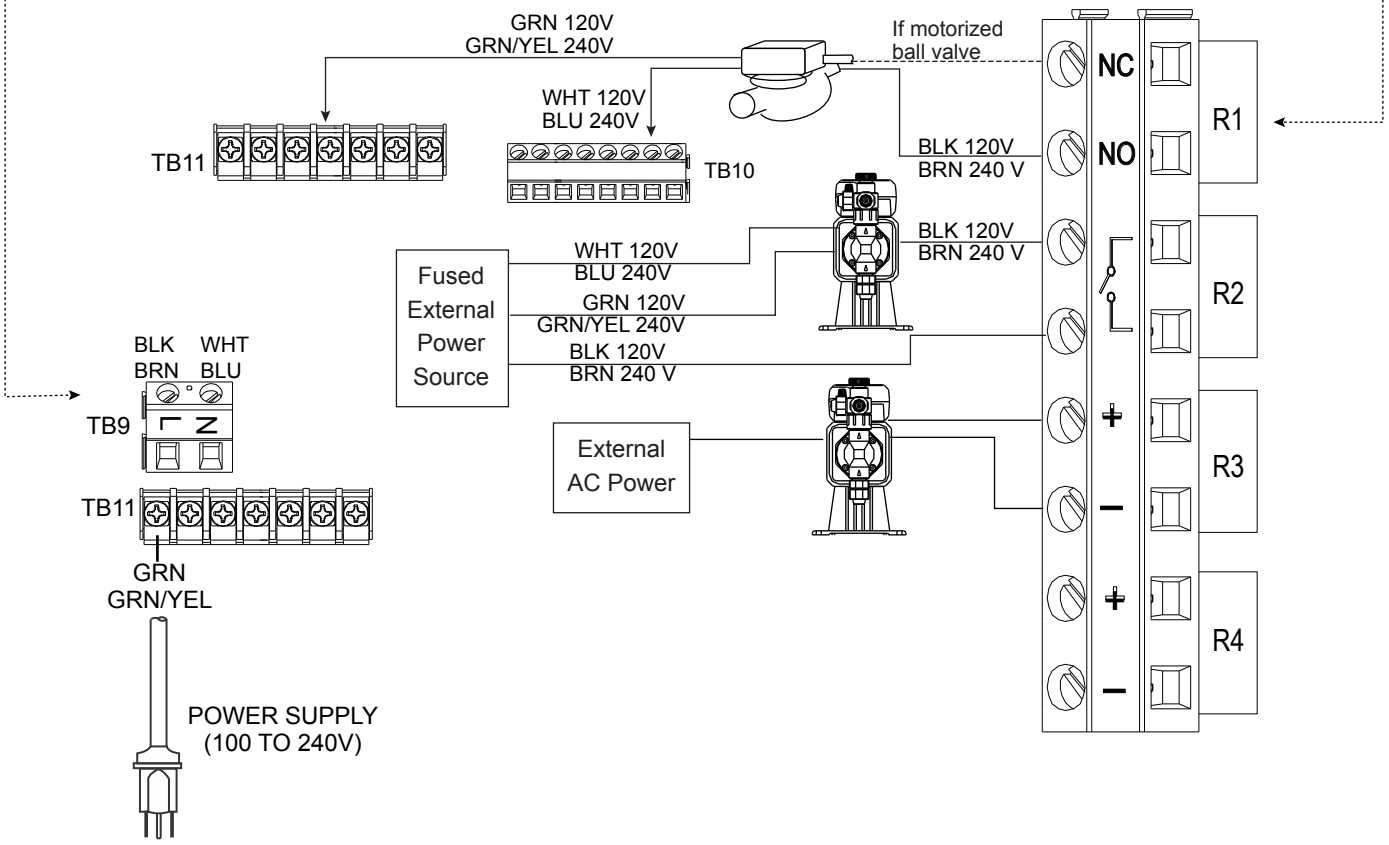


Figure 18 AC Power & Relay Output Wiring

4.0 FUNCTION OVERVIEW

4.1 Front Panel

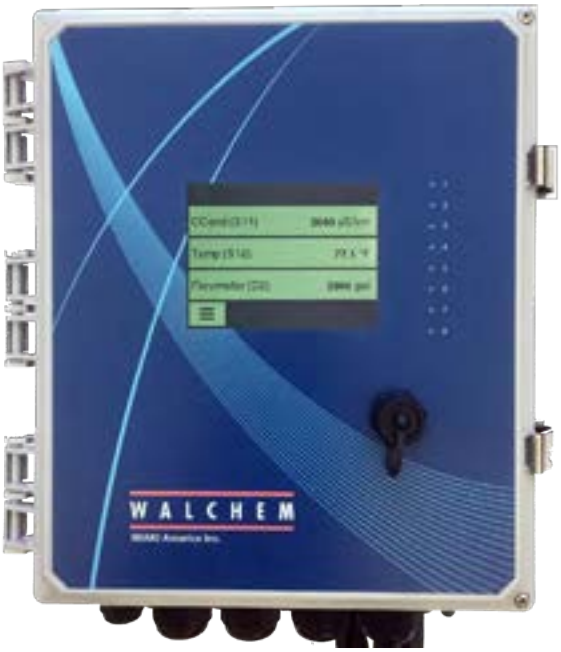


Figure 19 Front Panel

4.2 Touchscreen

A Home screen is displayed while the controller is on. This display shows a user-defined list of input readings or status of outputs. Touching any of the items on the Home Screen will bring up the item's Details Screen, where you can access calibration and setting menus. If more than four items have been selected to be displayed on the Home screen, the display will toggle between the first group of up to four and the next group. A "pause button" icon, when touched, stops the automatic toggling. Touching the down arrow icon allows for manual toggling. Touching the "play button" icon enables automatic toggling again. Touching the Menu icon brings up the Main Menu screen.

4.3 Icons

The following icons appear on the Home screen.



The Main Menu icon brings you to the list of menu options listed below.

The following icons appear on the Main Menu screen. Touch the icon to get to the menu selections.



Alarm Menu



Inputs Menu



Outputs Menu



Configuration Menu



HOA Menu



Graph Menu



Home Page

Other icons may appear in the menu screens.



Calibration icon appears in sensor input menus and brings up the calibration menu



Cancel icon aborts a calibration or setting change



The Page Down icon scrolls down to a new page in a list of options.



The Page Up icon scrolls up to a new page in a list of options.



The Back/Return icon returns the display to the previous screen



The Make Character Higher icon is used when making an alphanumeric entry



The Make Character Lower icon is used when making an alphanumeric entry



The Move Cursor icon is used to scroll left to right within an alphanumeric entry



The Confirm icon accepts a choice, finishes entering data, or advances to the next calibration step



Settings Menu



The Character Delete icon deletes part of an alphanumeric entry



The Shift icon switches between upper and lower case alpha entry screens



The Next Screen icon moves to the next step in a calibration sequence. In a Graph it shifts the graph forward in time.



The Previous Screen icon moves back a step in a calibration sequence. In a Graph it shifts the graph backwards in time.

Overview of the use of icons

Changing Numeric Values

To change a number, use the Character Delete icon to the digit to be changed. If the new number will be negative, start with touching the minus sign, then use the numeric touchpad and decimal point to type the number (some entries must be integers and the decimal will be ignored and the setting rounded to the nearest integer). Once the value of the number is correct touch the Confirm icon to store the new value into memory, or touch the Cancel icon to leave the number at its previous value and go back.

Changing Names

To change the name used to identify an input or output, use the Move Cursor icon to the character to be changed and change it using either the Make Character Higher or Lower icons. Upper case and lower case letter, numbers, a blank space, period, plus and minus symbols are available. Move the cursor to the right and modify each character. Once the word is correct, use the Enter icon to store the new value into memory, or use the Cancel icon to leave the word at its previous value and go back.

Choosing from a List

Selecting the type of sensor, the units of measure of an input, or the control mode used for an output, the selection is picked from a list of available options. Touch the Page Up or Down icons if necessary to find the desired option, and then touch the option to highlight it. Touch the Confirm icon to store the new option into memory, or touch the Cancel icon to leave the selection at its previous value and go back.

Hand-Off-Auto Relay Mode

Touch the desired relay mode. In Hand mode the relay is forced on for a specified amount of time and when that time is up the relay returns to its previous mode, in Off mode the relay is always off until taken out of Off mode, and in Auto mode the relay is responding to control set points. Touch the Return icon to go back to the relay settings.

Interlock and Activate with Channels Menus

To select which digital inputs or relays will interlock this relay (Interlock Channels), or which digital inputs or relays will force this relay on (Activate with Channels), touch the input or relay number(s). The background of the selected item will turn dark. When finished selecting as many as needed, touch the Confirm icon to accept the changes or the Cancel icon to leave the selections at the previous settings and go back.

4.4 Startup

Initial Startup

After having mounted the enclosure and wired the unit, the controller is ready to be started. Plug in the controller and turn on the power switch to supply power to the unit. The display will briefly show the model number and then revert to the normal summary (Home) display. Refer to section 5 below for more details on each of the settings.

To return to the summary display, touch the Main Menu icon  and then touch the Home icon.

Config Menu (see section 5.4)

Choose language

Touch the Configuration Settings icon. Touch Global Settings. Touch the Scroll Down icon until the English word “Language” is displayed and then touch it. Touch the Scroll Down icon until your language is displayed and touch it. Touch the Confirm icon to change all menus to your language.

Set date (if necessary)

Touch the Scroll Up or Down icon until Date is displayed, and then touch it. Touch the Move Cursor icon to highlight the Day, and then use the numeric touchpad to change the date. Touch the Confirm icon to accept the change.

Set time (if necessary)

Touch the Scroll Up or Down icon until Time is displayed and then touch it. Touch the Move Cursor icon to highlight the digit to change, then use the numeric touchpad to change the time. Touch the Confirm icon to accept the change.

Set global units of measure
Touch the Scroll Up or Down icon until Global Units is displayed and then touch it. Touch the desired units. Touch the Confirm icon to accept the change.

Set temperature units of measure
Touch the Scroll Up or Down icon until Temp Units is displayed and then touch it. Touch the desired units. Touch the Confirm icon to accept the change.

Touch the Main Menu icon. Touch the Inputs icon.

Inputs (see section 5.2)

Program the settings for each input
The S11 sensor input will be displayed. Touch it to get to the Details screen. Touch the Settings icon. If the name of the sensor does not describe the type of sensor connected, touch the Scroll Down icon until Type is displayed. Touch the Type field. Touch the Scroll Down icon until the correct type of sensor is displayed, then touch it to highlight it. Touch the Confirm icon to accept the change. This will bring you back to the Settings screen. Finish the rest of the S1 settings. For disinfections sensors, choose the exact sensor in the Sensor menu. For contacting conductivity sensors, enter the cell constant. Select the units of measure. Enter the alarm set points and alarm deadband. Set the default temperature that will be used for automatic temperature compensation if the temperature signal becomes invalid.

When finished with S11, touch the Return icon until the list of inputs is displayed. Touch the Scroll Down icon and repeat the process for each input.

The S12 temperature input Element should be set correctly once the S11 sensor type has been set. If not, select the correct temperature element and set the alarm set points and alarm deadband. Generic, ORP and disinfection sensors do not have temperature signals and are preset to Unassigned.

To calibrate the temperature, return to the S12 Details screen, touch the Calibrate icon, and touch the Enter icon to perform a calibration. If either input card is a Dual Analog Input card (4-20mA signal), then select the type of sensor that will be connected. Select Fluorometer if a Little Dipper 2 will be connected. Select AI Monitor if the device can be calibrated on its own and the W900 calibration will only be in units of mA. Select Transmitter if the device connected cannot be calibrated on its own and the W900 will need to be used to calibrate in engineering units of measure.

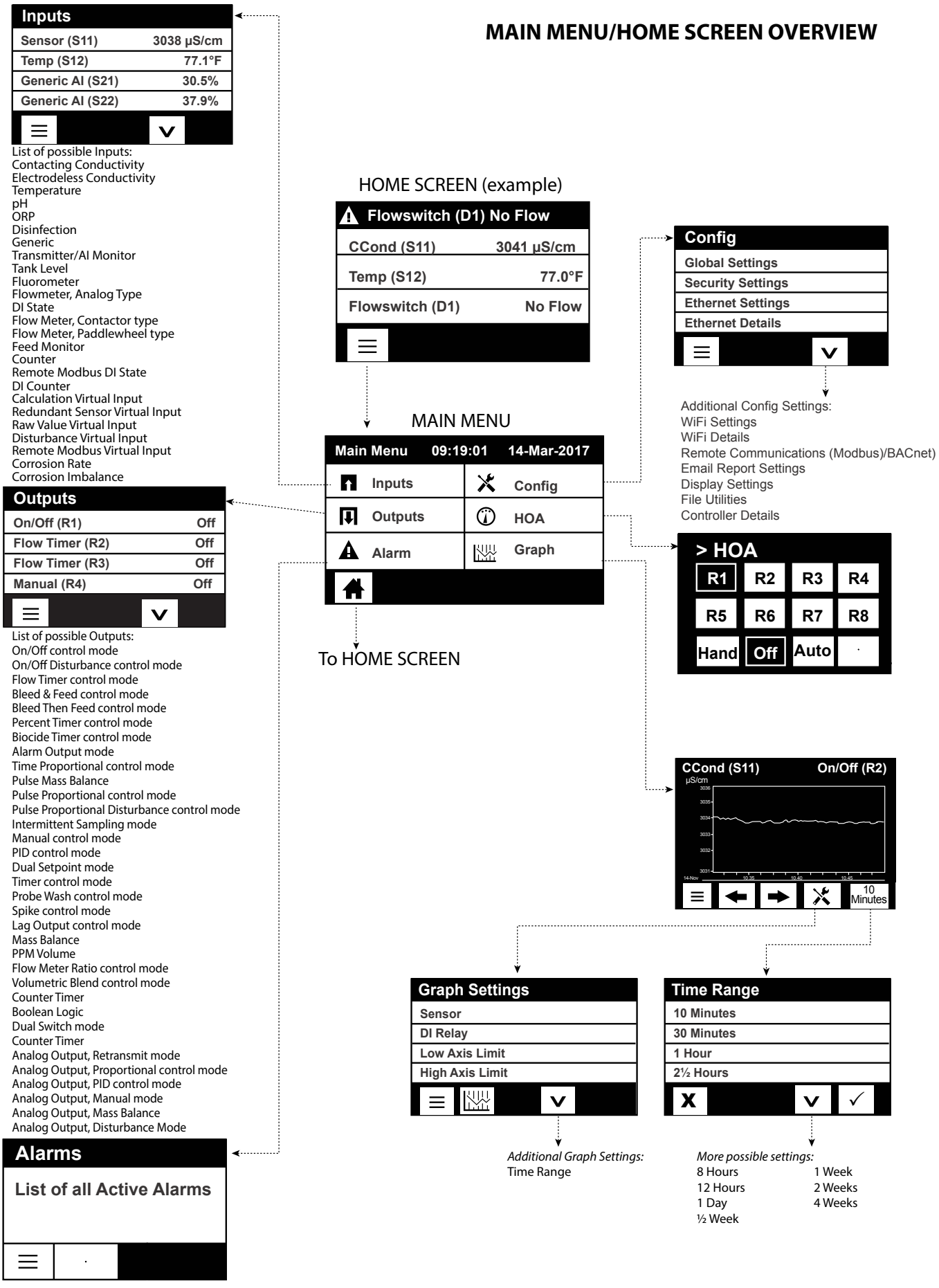
If a flow switch or liquid level switch is connected, D1 through D12 (whichever one has the device connected to it) should be set to DI State type (if no switch is connected, select No Sensor). Set the state that will possibly interlock control outputs (refer to the Outputs settings to program which outputs, if any, will be interlocked by the switch). Set the state, if any, that will result in an alarm.

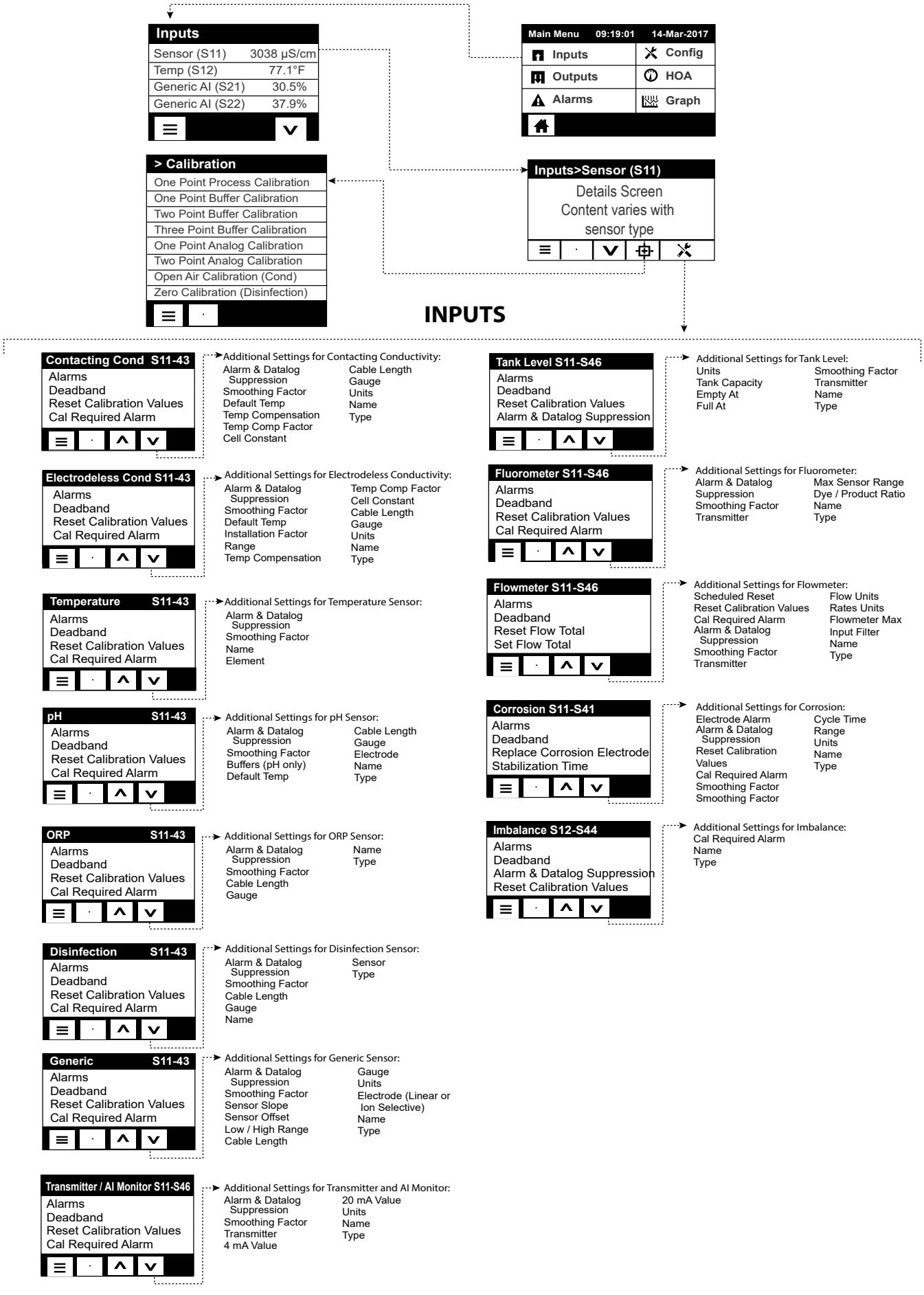
If a contacting head or paddlewheel flow meter is connected, D1 through D12 (whichever one has the device connected to it) should be set to that type (if no flow meter is connected, select No Sensor). Set the units of measure, volume/contact or K factor, etc.

Calibrate the sensor
To calibrate the sensor, return to the list of inputs, touch the sensor to calibrate, touch the Calibrate icon, and select one of the calibration routines. For disinfection and Generic sensors, start with the Zero Calibration. For electrodeless conductivity, start with the Air Calibration. Refer to section 5.2.

Touch the Main Menu icon. Touch the Outputs icon.

MAIN MENU/HOME SCREEN OVERVIEW




Inputs
Sensor (S11) 3038 µS/cm
Temp (S12) 77.1°F
Generic AI (S21) 30.5%
Generic AI (S22) 37.9%
Main Menu 09:19:01 14-Mar-2017
Inputs
Config
Outputs
HOA
Alarms
Graph
> Calibration
One Point Process Calibration
One Point Buffer Calibration
Two Point Buffer Calibration
Three Point Buffer Calibration
One Point Analog Calibration
Two Point Analog Calibration
Open Air Calibration (Cond)
Zero Calibration (Disinfection)
Inputs>Sensor (S11)
Details Screen
Content varies with
sensor type
INPUTS
Contacting Cond S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Contacting Conductivity:
Alarm & Datalog Suppression
Smoothing Factor
Default Temp
Temp Compensation
Temp Comp Factor
Cell Constant
Cable Length
Gauge
Units
Name
Type
Electrodeless Cond S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Electrodeless Conductivity:
Alarm & Datalog Suppression
Smoothing Factor
Default Temp
Installation Factor
Range
Temp Compensation
Temp Comp Factor
Cell Constant
Cable Length
Gauge
Units
Name
Type
Temperature S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Temperature Sensor:
Alarm & Datalog Suppression
Smoothing Factor
Name
Element
pH S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for pH Sensor:
Alarm & Datalog Suppression
Smoothing Factor
Buffers (pH only)
Default Temp
Cable Length
Gauge
Electrode
Name
Type
ORP S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for ORP Sensor:
Alarm & Datalog Suppression
Smoothing Factor
Cable Length
Gauge
Name
Type
Disinfection S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Disinfection Sensor:
Alarm & Datalog Suppression
Smoothing Factor
Cable Length
Gauge
Name
Sensor
Type
Generic S11-43
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Generic Sensor:
Alarm & Datalog Suppression
Smoothing Factor
Sensor Slope
Sensor Offset
Low / High Range
Cable Length
Gauge
Units
Electrode (Linear or Ion Selective)
Name
Type
Transmitter / AI Monitor S11-S46
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Transmitter and AI Monitor:
Alarm & Datalog Suppression
Smoothing Factor
Transmitter
4 mA Value
20 mA Value
Units
Name
Type
Tank Level S11-S46
Alarms
Deadband
Reset Calibration Values
Alarm & Datalog Suppression
Additional Settings for Tank Level:
Units
Tank Capacity
Empty At
Full At
Smoothing Factor
Transmitter
Name
Type
Fluorometer S11-S46
Alarms
Deadband
Reset Calibration Values
Cal Required Alarm
Additional Settings for Fluorometer:
Alarm & Datalog Suppression
Smoothing Factor
Transmitter
Max Sensor Range
Dye / Product Ratio
Name
Type
Flowmeter S11-S46
Alarms
Deadband
Reset Flow Total
Set Flow Total
Additional Settings for Flowmeter:
Scheduled Reset
Reset Calibration Values
Cal Required Alarm
Alarm & Datalog Suppression
Smoothing Factor
Transmitter
Flow Units
Rates Units
Flowmeter Max
Input Filter
Name
Type
Corrosion S11-S41
Alarms
Deadband
Replace Corrosion Electrode
Stabilization Time
Additional Settings for Corrosion:
Electrode Alarm
Alarm & Datalog Suppression
Reset Calibration Values
Cal Required Alarm
Smoothing Factor
Smoothing Factor
Cycle Time
Range
Units
Name
Type
Imbalance S12-S44
Alarms
Deadband
Alarm & Datalog Suppression
Reset Calibration Values
Additional Settings for Imbalance:
Cal Required Alarm
Name
Type

INPUTS

DIGITAL INPUTS

DI State (D1-D12)
Open Message
Closed Message
Interlock
Alarm

Additional Settings for DI State:
Alarm & Datalog Suppression
Total Time
Reset Time Total
Name
Type

Contactor Type

Flowmeter (D1-D12)
Totalizer Alarm
Reset Flow Total
Set Flow Total
Scheduled Reset

Additional Settings for Contactor, Flowmeter:
Alarm & Datalog Suppression
Volume/Contact
Flow Units
Name
Type

Paddlewheel Type

Flowmeter (D1-D12)
Alarms
Deadband
Alarm & Datalog Suppression
Set Flow Total

Additional Settings for Paddlewheel, Flowmeter:
Alarm & Datalog Suppression
Totalizer Alarm
Reset Flow Total
K Factor
Flow Units
Rate Units
Smoothing Factor
Name
Type

Feed Monitor (D1-D12)
Totalizer Alarm
Reset Flow Total
Set Flow Total
Scheduled Reset

Additional Settings for Feed Monitor:
Total Alarm Mode
Flow Alarm Mode
Flow Alarm Delay
Flow Alarm Clear
Deadband
Reprime Time
Volume/Contact
Flow Units
Rate Units
Smoothing Factor
Output
Name
Type

Only if HVAC mode is disabled

DI Counter (D1-D12)
Alarms
Deadband
Alarm & Datalog Suppression
Totalizer Alarm

Additional Settings for DI Counter
Reset Total
Set Total
Scheduled Reset
Units
Rate Units
Units per Pulse
Smoothing Factor
Name
Type

Remote Modbus (D1-D12)
Open Message
Closed Message
Interlock
Alarm

Additional Settings for Remote Modbus
Modbus Mode
Remote Device IP
Data Port
Reply Timeout
Function
Remote Register
Data Type
Update Period
Timeout Alarm Delay
Total Time
Reset Time Total
Alarm Suppression
Name
Type

VIRTUAL INPUTS

Calculation (V1-V8)
Alarms
Deadband
Input
Constant

Additional Settings for Calculation:
Input 2
Constant 2
Calculation Mode
Alarm & Datalog Suppression
Low Range
High Range
Smoothing Factor
Name
Type

Redundant (V1-V8)
Deviation Alarm
Deadband
Alarm & Datalog Suppression
Mode

Additional Settings for Redundant:
Input
Input 2
Name
Type

Raw Value (V1-V8)
Alarms
Deadband
Alarm & Datalog Suppression
Input

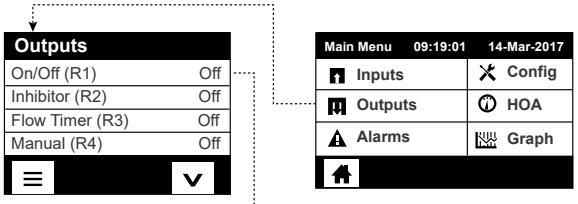
Additional Settings for Raw Value:
Smoothing Factor
Name
Type

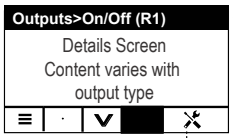
Disturbance Input (V1-V8)
Min Disturbance
Max Disturbance
Value at Min Disturbance
Value at Max Disturbance

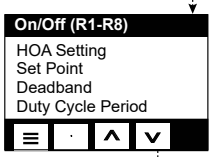
Additional Settings for Disturbance:
Smoothing Factor
Disable Disturbance
Channels
Disturbance Input
Name
Type

Remote ModBus (V1-V8)
Alarms
Deadband
Alarm & Datalog Suppression
Low Range

Additional Settings for Disturbance:
High Range
Modbus Mode
Remote Device IP
Data Port
Reply Timeout
Function
Remote Register
Data Type
Update Period
Timeout Alarm Delay
Name
Units
Type

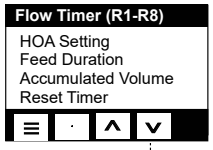






Additional Settings for On/OFF Mode:

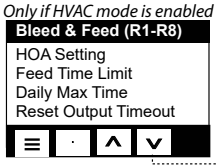
Duty Cycle	Minimum Relay Cycle
On Delay Time	Hand Time Limit
Off Delay Time	Reset Time Total
Daily Max Time	Input
Output Time Limit	Direction
Reset Output Timeout	Name
Interlock Channels	Mode
Activate with Channels	



Additional Settings for Flow Timer Mode:

Daily Max Time	Hand Time Limit
Output Time Limit	Reset Time Total
Reset Output Timeout	Flow Input
Interlock Channels	Flow Input 2
Activate with Channels	Name
Minimum Relay Cycle	Mode

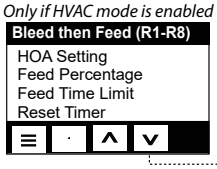
Only if HVAC mode is enabled



Additional Settings for Bleed & Feed Mode:

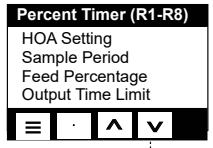
Interlock Channels	Bleed
Activate with Channels	Name
Minimum Relay Cycle	Mode
Hand Time Limit	
Reset Time Total	

Only if HVAC mode is enabled



Additional Settings for Bleed then Feed Mode:

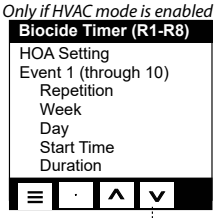
Daily Max Time	Hand Time Limit
Output Time Limit	Reset Time Total
Reset Output Timeout	Bleed
Interlock Channels	Name
Activate with Channels	Mode
Minimum Relay Cycle	



Additional Settings for Percent Timer Mode:

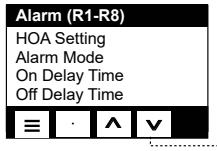
Reset Output Timeout	Name
Interlock Channels	Mode
Activate with Channels	
Minimum Relay Cycle	
Hand Time Limit	
Reset Time Total	

Only if HVAC mode is enabled



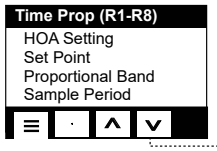
Additional Settings for Biocide Timer Mode:

Bleed	Activate with Channels
Prebleed Time	Minimum Relay Cycle
Prebleed To	Hand Time Limit
Cond Input	Reset Time Total
Bleed Lockout	Name
Add Last Missed	Mode
Interlock Channels	



Additional Settings for Alarm Mode:

Select Alarms	Hand Time Limit
Output	Reset Time Total
Interlock Channels	Name
Activate with Channels	Mode
Minimum Relay Cycle	



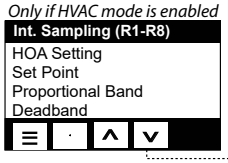
Additional Settings for Time Prop Mode:

Daily Max Time	Reset Time Total
Output Time Limit	Input
Reset Output Timeout	Direction
Interlock Channels	Name
Activate with Channels	Mode
Minimum Relay Cycle	
Hand Time Limit	

RELAY OUTPUTS (R1-R8) and VIRTUAL OUTPUTS (C1-C8)

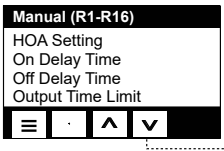
(CONTINUED ON NEXT PAGE)

Only if HVAC mode is enabled



Additional Settings for Intermittent Sampling Mode:

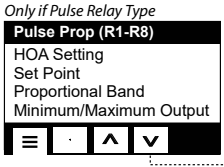
Sample Time	Min Relay Cycle
Hold Time	Hand Time Limit
Maximum Blowdown	Reset Time Total
Wait Time	Cond Input
Output Time Limit	Trap Sample
Reset Output Timeout	Name
Interlock Channels	Mode
Activate with Channels	



Additional Settings for Manual Mode:

Reset Output Timeout	Name
Interlock Channels	Mode
Minimum Relay Cycle	
Hand Time Limit	
Reset Time Total	

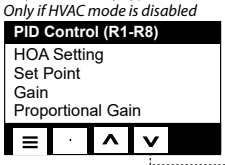
Only if Pulse Relay Type



Additional Settings for Pulse Prop Mode:

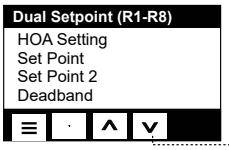
Maximum Rate	Input
Interlock Channels	Direction
Activate with Channels	Name
Minimum Relay Cycle	Mode
Hand Time Limit	
Reset Time Total	

Only if Pulse Relay Type
Only if HVAC mode is disabled



Additional Settings for PID Control Mode:

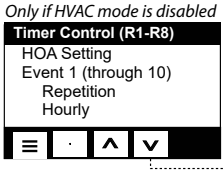
Integral Time	Input Maximum
Integral Gain	Gain Form
Derivative Time	Output Time Limit
Derivative Gain	Reset Output Timeout
Reset PID Integral	Interlock Channels
Minimum Output	Activate with Channels
Maximum Output	Minimum Relay Cycle
Maximum Rate	Hand Time Limit
Input	Reset Time Total
Direction	Name
Input Minimum	Mode



Additional Settings for Dual Setpoint Mode:

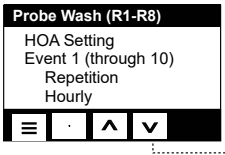
Duty Cycle Period	Minimum Relay Cycle
Duty Cycle	Hand Time Limit
On Delay Time	Reset Time Total
Off Delay Time	Input
Output Time Limit	Direction
Reset Output Timeout	Name
Interlock Channels	Mode
Activate with Channels	

Only if HVAC mode is disabled



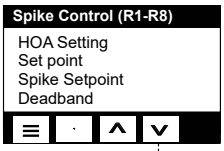
Additional Settings for Timer Control Mode:

Week	Interlock Channels
Day	Activate with Channels
Events Per Day	Minimum Relay Cycle
Start Time	Hand Time Limit
Duration	Reset Time Total
Add Last Missed	Name
Output Time Limit	Mode
Reset Output Timeout	



Additional Settings for Probe Wash Mode:

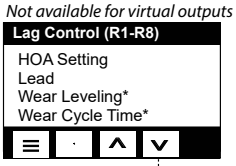
Week	Hold Time
Day	Interlock Channels
Events Per Day	Activate with Channels
Start Time	Minimum Relay Cycle
Duration	Hand Time Limit
Input	Reset Time Total
Input 2	Name
Sensor Mode	Mode



Additional Settings for Spike Control Mode:

Onset Time	Reset Output Timeout
Duty Cycle Period	Interlock Channels
Duty Cycle	Activate With Channels
Event 1 (through 6)	Min Relay Cycle
Repetition	Hand Time Limit
Week	Reset Time Total
Day	Input
Start Time	Direction
Duration	Name
Daily Max Time	Mode
Output Time Limit	

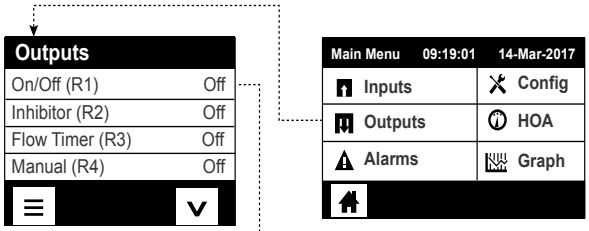
Not available for virtual outputs



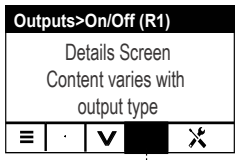
Additional Settings for Lag Control Mode:

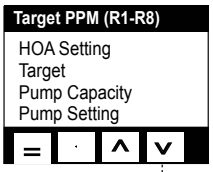
Activation Mode*	Activate with Channels
Set Point	Min Relay Cycle
Set Point 2	Hand Time Limit
Deadband	Reset Time Total
Delay Time*	Name
Output Time Limit	Mode
Reset Output Timeout	
Interlock Channels	

* See section 5.3.18



RELAY OUTPUTS (R1-R8) and VIRTUAL OUTPUTS (C1-C8)
Continued

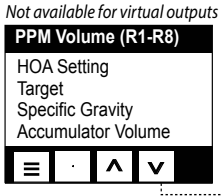




Additional Settings for Target PPM Control Mode:

Specific Gravity	Reset Time Total
Accumulator Volume	Flow Input
Reset Timer	Flow Input 2
Daily Max Time	Cycles Input
Output Time Limit	Low Cycles Limit
Reset Output Timeout	Name
Interlock Channels	Mode
Activate with Channels	
Min Relay Cycle	
Hand Time Limit	

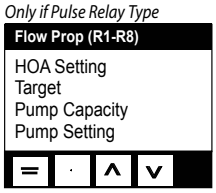
Not available for virtual outputs



Additional Settings for PPM Volume Control Mode:

Reset Timer	Reset Time Total
Daily Max Time	Flow Input
Output Time Limit	Flow Input 2
Reset Output Timeout	Cycles Input
Interlock Channels	Low Cycles Limit
Activate with Channels	Name
Minimum Relay Cycle	Mode
Hand Time Limit	

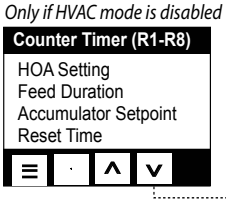
Only if Pulse Relay Type



Additional Settings for Flow Prop Control Mode:

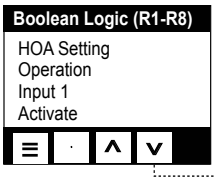
Specific Gravity	Reset Time Total
Maximum Rate	Flow Input
Output Time Limit	Cycles Input
Reset Output Timeout	Low Cycles Limit
Interlock Channels	Name
Activate with Channels	Mode
Hand Time Limit	

Only if HVAC mode is disabled



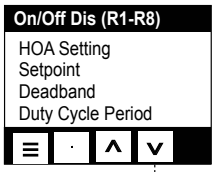
Additional Settings for Flow Timer Mode:

Daily Max Time	Hand Time Limit
Output Time Limit	Reset Time Total
Reset Output Timeout	Input
Interlock Channels	Name
Activate with Channels	Mode
Minimum Relay Cycle	



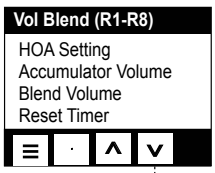
Additional Settings for Boolean Logic:

Input 2	Interlock Channels
Activate	Activate with Channels
On Delay Time	Hand Time Limit
Off Delay Time	Min Relay Cycle
Daily Max Time	Reset Time Total
Output Time Limit	Name
Reset Output Timeout	Mode
Alarm	



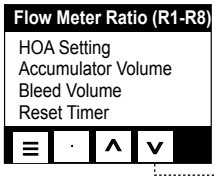
Additional Settings for On/Off Dis:

Duty Cycle	Minimum Relay Cycle
On Delay Time	Hand Time Limit
Off Delay Time	Reset Time Total
Daily Max Time	Input
Output Time Limit	Direction
Reset Output Timeout	Disturbance Input
Interlock Channels	Name
Activate with Channels	Mode



Additional Settings for Vol Blend:

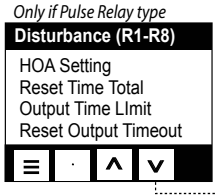
Daily Max TimeOutput	Reset Time Total
Time Limit	Flow Input
Reset Output Timeout	Disturbance Input
Interlock Channels	Name
Activate with Channels	Mode
Minimum Relay Cycle	
Hand Time Limit	



Additional Settings for Flow Meter Ratio:

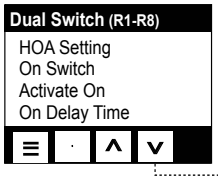
Daily Max Time	Makeup Meter
Output Time Limit	Makeup Meter 2
Reset Output Timeout	Bleed Meter
Interlock Channels	Bleed Meter 2
Activate with Channels	Disturbance Input
Minimum Relay Cycle	Name
Hand Time Limit	Mode
Reset Time Total	

Only if Pulse Relay type



Additional Settings for Disturbance:

Min Output	Primary Output
Max Output	Disturbance Input
Interlock Channels	Trigger Input
Activate with	Activated
Channels	Trigger Mode
Hand Output	Name
Hand Time Limit	Mode
Max Rate	



Additional Settings for Dual Switch Mode:

Off Switch	Interlock Channels
Activate Off	Activate with Channels
Off Delay Time	Min Relay Cycle
Hand Time Limit	Reset Time Total
Daily Max Time	Name
Output Time Limit	Mode
Reset Output Timeout	

ANALOG OUTPUTS (A11-A44) and VIRTUAL OUTPUTS (C1-C8)

Retransmit (A11-A44)
HOA Setting
4 mA Value
20 mA Value
Hand Output

Additional settings for Retransmit Mode:
Error Output
Reset Time Total
Input
Name
Mode

Prop Control (A11-A44)
HOA Setting
Set Point
Proportional Band
Min Output

Additional Settings for Proportional Control Mode:
Max Output
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Hand Output
Hand Time Limit
Reset Time Total
Off Mode Output
Error Output
Input
Direction
Name
Mode

Only if HVAC mode is disabled

PID Control (A11-A44)
HOA Setting
Set Point
Gain
Proportional Gain

Additional Settings for PID Control Mode:
Integral Time
Integral Gain
Derivative Time
Derivative Gain
Reset PID Integral
Min Output
Max Output
Max Rate
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Hand Output
Hand Time Limit
Off Mode Output
Error Output
Reset Time Total
Input
Direction
Input Minimum
Input Maximum
Gain Form
Name
Mode

Disturbance (A11-A44)
HOA Setting
Reset Time Total
Output Time Limit
Reset Output Timeout

Additional Settings for Disturbance:
Min Output
Max Output
Interlock Channels
Activate with Channels
Hand Output
Hand Time Limit
Off Mode Output
Error Output
Primary Output
Disturbance Input
Trigger Input
Activated
Trigger Mode
Name
Mode

Manual Control (A11-A44)
HOA Setting
Interlock Channels
Activate with Channels
Minimum Relay Cycle

Additional Settings for Manual Control Mode:
Hand Time Limit
Reset Time Total
Name
Mode

Flow Prop (A11-A44)
HOA Setting
Target
Pump Rating
Pump Setting

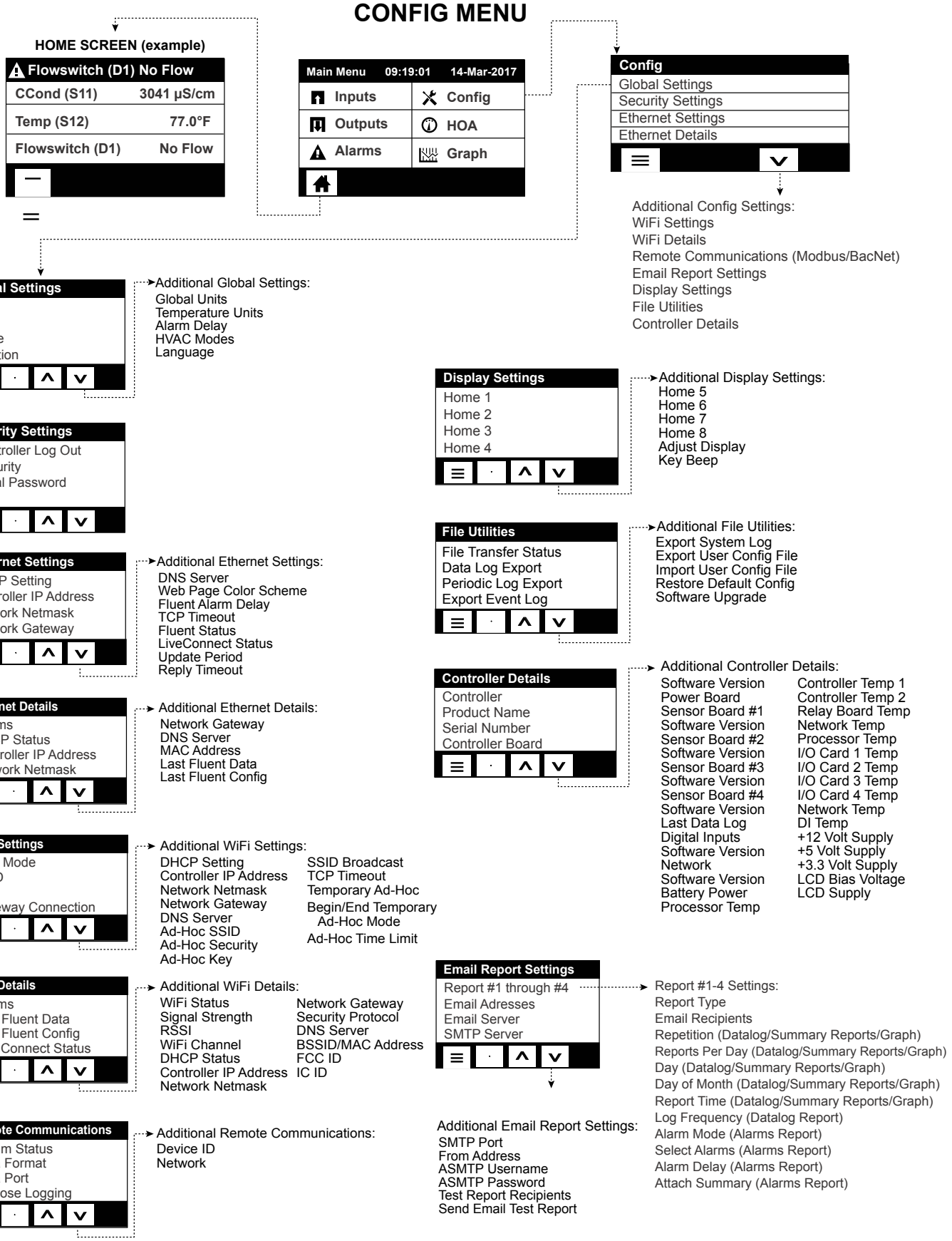
Additional Settings for Flow Prop Control Mode:
Specific Gravity
Output Time Limit
Reset Output Timeout
Interlock Channels
Activate with Channels
Hand Output
Hand Time Limit
Off Mode Output
Error Output
Reset Time Total
Flow Input
Cycles Input
Low Cycles Limit
Name
Mode

Not available for virtual outputs

Lag Output (A11-A44)
HOA Setting
Lead
Reset Time Total
Output Time Limit

Additional settings for Lag Output Mode:
Reset Output Timeout
Wear Leveling
Wear Cycle Time
Name
Mode

CONFIG MENU


HOME SCREEN (example)
Flowswitch (D1) No Flow
CCond (S11) 3041 µS/cm
Temp (S12) 77.0°F
Flowswitch (D1) No Flow
Main Menu 09:19:01 14-Mar-2017
Inputs
Config
Outputs
HOA
Alarms
Graph
Config
Global Settings
Security Settings
Ethernet Settings
Ethernet Details
Additional Config Settings:
WiFi Settings
WiFi Details
Remote Communications (Modbus/BacNet)
Email Report Settings
Display Settings
File Utilities
Controller Details
Global Settings
Date
Time
Name
Location
Additional Global Settings:
Global Units
Temperature Units
Alarm Delay
HVAC Modes
Language
Display Settings
Home 1
Home 2
Home 3
Home 4
Additional Display Settings:
Home 5
Home 6
Home 7
Home 8
Adjust Display
Key Beep
Security Settings
Controller Log Out
Security
Local Password
File Utilities
File Transfer Status
Data Log Export
Periodic Log Export
Export Event Log
Additional File Utilities:
Export System Log
Export User Config File
Import User Config File
Restore Default Config
Software Upgrade
Ethernet Settings
DHCP Setting
Controller IP Address
Network Netmask
Network Gateway
Additional Ethernet Settings:
DNS Server
Web Page Color Scheme
Fluent Alarm Delay
TCP Timeout
Fluent Status
LiveConnect Status
Update Period
Reply Timeout
Controller Details
Controller
Product Name
Serial Number
Controller Board
Additional Controller Details:
Software Version
Power Board
Sensor Board #1
Software Version
Sensor Board #2
Software Version
Sensor Board #3
Software Version
Sensor Board #4
Software Version
Last Data Log
Digital Inputs
Software Version
Network
Software Version
Battery Power
Processor Temp
Controller Temp 1
Controller Temp 2
Relay Board Temp
Network Temp
Processor Temp
I/O Card 1 Temp
I/O Card 2 Temp
I/O Card 3 Temp
I/O Card 4 Temp
Network Temp
DI Temp
+12 Volt Supply
+5 Volt Supply
+3.3 Volt Supply
LCD Bias Voltage
LCD Supply
Ethernet Details
Alarms
DHCP Status
Controller IP Address
Network Netmask
Additional Ethernet Details:
Network Gateway
DNS Server
MAC Address
Last Fluent Data
Last Fluent Config
WiFi Settings
WiFi Mode
SSID
Key
Gateway Connection
Additional WiFi Settings:
DHCP Setting
Controller IP Address
Network Netmask
Network Gateway
DNS Server
Ad-Hoc SSID
Ad-Hoc Security
Ad-Hoc Key
SSID Broadcast
TCP Timeout
Temporary Ad-Hoc
Begin/End Temporary Ad-Hoc Mode
Ad-Hoc Time Limit
Email Report Settings
Report #1 through #4
Email Adresses
Email Server
SMTP Server
Report #1-4 Settings:
Report Type
Email Recipients
Repetition (Datalog/Summary Reports/Graph)
Reports Per Day (Datalog/Summary Reports/Graph)
Day (Datalog/Summary Reports/Graph)
Day of Month (Datalog/Summary Reports/Graph)
Report Time (Datalog/Summary Reports/Graph)
Log Frequency (Datalog Report)
Alarm Mode (Alarms Report)
Select Alarms (Alarms Report)
Alarm Delay (Alarms Report)
Attach Summary (Alarms Report)
WiFi Details
Alarms
Last Fluent Data
Last Fluent Config
Live Connect Status
Additional WiFi Details:
WiFi Status
Signal Strength
RSSI
WiFi Channel
DHCP Status
Controller IP Address
Network Netmask
Network Gateway
Security Protocol
DNS Server
BSSID/MAC Address
FCC ID
IC ID
Additional Email Report Settings:
SMTP Port
From Address
ASMTP Username
ASMTP Password
Test Report Recipients
Send Email Test Report
Remote Communications
Comm Status
Data Format
Data Port
Verbose Logging
Additional Remote Communications:
Device ID
Network

Outputs (see section 5.3)

Program the settings for each output

The R1 relay output will be displayed. Touch the relay field to get to the Details screen. Touch the Settings icon. If the name of the relay does not describe the control mode desired, touch the Scroll Down icon until Mode field is displayed. Touch the Mode field. Touch the Scroll Down icon until the correct control mode is displayed, then touch the Confirm icon to accept the change. This will bring you back to the Settings screen. Finish the rest of the R1 settings.

If you want the output to be interlocked by a flow switch or by another output being active, enter the Interlock Channels menu and select the input or output channel that will interlock this output.
The default is for the output to be in Off mode, where the output does not react to the settings. Once all settings for that output are complete, enter the HOA Setting menu and change it to Auto.
Repeat for each output.

Normal Startup

Startup is a simple process once your set points are in memory. Simply check your supply of chemicals, turn on the controller, calibrate it if necessary and it will start controlling.

4.5 Shut Down

To shut the controller down, simply turn off the power. Programming remains in memory. It is important that the pH/ORP electrode remains wet. If the shutdown is expected for any longer than a day, and it is possible for the electrode to dry out, remove the electrode from the tee and store it in pH 4 buffer or cooling tower water. Take care to avoid freezing temperatures when storing the pH/ORP electrodes to avoid breakage of the glass.

5.0 OPERATION using the touchscreen

These units control continuously while power is applied. Programming is accomplished either via the touchscreen or the optional Ethernet connection. See section 6.0 for Ethernet instructions.

To view the readings of each sensor, or whatever user-defined list of parameters that has been set, touch the Home icon if not already there. The menus for each of these parameters may be accessed directly by touching the parameter.

Keep in mind that even while browsing through menus, the unit is still controlling.

Touch the Main Menu icon  from the home page to access all settings. The menu structure is grouped by alarms, inputs and outputs. Under the Configuration menu will be general settings such as the clock, the language, etc. that do not have an input or output associated with it. Each input has its own menu for calibration and unit selection as needed. Each output has its own setup menu including set points, timer values and operating modes as needed.

5.1 Alarms Menu 

Touch the Alarms icon to view a list of active alarms. If there are more than six active alarms, the Page Down icon will be shown; touch this icon to bring up the next page of alarms.

Touch the Main Menu icon to go back to the previous screen.

5.2 Inputs Menu 

Touch the Inputs icon to view a list of all sensor and digital inputs. The Page Down icon pages down the list of inputs, the Page Up icon pages up the list of inputs, the Main Menu icon brings back the previous screen.

Touch the input to access that input's details, calibration (if applicable) and settings.

Sensor Input Details

The details for any type of sensor input include the current value read, alarms, the raw (uncalibrated) signal, the sensor type, and the calibration gain and offset. If the sensor has automatic temperature compensation, then the sensor's temperature value and alarms, the temperature resistance value read, and the type of temperature element required are also displayed under a separate sensor input menu.

Calibration

Touch the Calibration icon to calibrate the sensor. Select the calibration to perform: One Point Process, One Point Buffer or Two Point Buffer Calibration. Not all calibration options are available for all types of sensor.

One Point Process Calibration

New Value
Enter the actual value of the process as determined by another meter or laboratory analysis and touch Confirm.

Cal Successful or Failed
If successful, touch Confirm to put the new calibration in memory.
If failed, you may retry the calibration or cancel. Refer to Section 8 to troubleshoot a calibration failure.

One Point Buffer Calibration, Disinfection/Generic Sensor Zero Cal, Conductivity Air Cal

Cal Disables Control
Touch Confirm to continue or Cancel to abort

Buffer Temperature (only appears if no temperature sensor is detected for sensor types that use automatic temperature compensation)
Enter the temperature of the buffer and touch Confirm.

Buffer Value (only appears for One Point Calibration except when automatic buffer recognition is used))
Enter the value of the buffer being used

Rinse Sensor
Remove the sensor from the process, rinse it off, and place it in the buffer solution (or oxidizer-free water for Zero Cal, or air for the conductivity open air cal). Touch Confirm when ready.

Stabilization
When the temperature (if applicable) and signal from the sensor is stable, the controller will automatically move to the next step. If they don't stabilize you may manually go to the next step by pressing Confirm.

Cal Successful or Failed
If successful, touch Confirm to put the new calibration in memory.
If failed, you may retry the calibration or cancel. Refer to Section 8 to troubleshoot a calibration failure.

Resume Control
Replace the sensor in the process and touch Confirm when ready to resume control.

Two Point Buffer Calibration

Cal Disables Control
Touch Confirm to continue or Cancel to abort

Buffer Temperature (only appears if no temperature sensor is detected for sensor types that use automatic temperature compensation)
Enter the temperature of the buffer and touch Confirm.

First Buffer Value (does not appear if automatic buffer recognition is used)
Enter the value of the buffer being used

Rinse Sensor

Remove the sensor from the process, rinse it off, and place it in the buffer solution. Touch Confirm when ready.

Stabilization
When the temperature (if applicable) and signal from the sensor is stable, the controller will automatically move to the next step. If they don't stabilize you may manually go to the next step by touching Confirm.

Second Buffer Temperature (only appears if no temperature sensor is detected for sensor types that use automatic temperature compensation)
Enter the temperature of the buffer and press Confirm.

Second Buffer Value (does not appear if automatic buffer recognition is used)
Enter the value of the buffer being used

Rinse Electrode
Remove the sensor from the process, rinse it off, and place it in the buffer solution. Touch Confirm when ready.

Stabilization
When the temperature (if applicable) and signal from the sensor is stable, the controller will automatically move to the next step. If they don't stabilize you may manually go to the next step by touching Confirm.

Cal Successful or Failed
If successful, touch Confirm to put the new calibration in memory. The calibration adjusts the offset and the gain (slope) and displays the new values. If failed, you may retry the calibration or cancel. Refer to Section 8 to troubleshoot a calibration failure.

Resume Control
Replace the sensor in the process and touch Confirm when ready to resume control.

Three Point Buffer Calibration (pH sensors only)

Cal Disables Control
Touch Confirm to continue or Cancel to abort

Buffer Temperature (only appears if no temperature sensor is detected)
Enter the temperature of the buffer and touch Confirm.

First Buffer Value (does not appear if automatic buffer recognition is used)
Enter the value of the buffer being used

Rinse Sensor
Remove the sensor from the process, rinse it off, and place it in the buffer solution. Touch Confirm when ready.

Stabilization
When the temperature (if applicable) and signal from the sensor is stable, the controller will automatically move to the next step. If they don't stabilize you may manually go to the next step by touching Confirm.

Second Buffer Temperature (only appears if no temperature sensor is detected)
Enter the temperature of the buffer and touch Confirm.

Second Buffer Value (does not appear if automatic buffer recognition is used)
Enter the value of the buffer being used

Rinse Electrode
Remove the sensor from the process, rinse it off, and place it in the buffer solution. Touch Confirm when ready.

Stabilization
When the temperature (if applicable) and signal from the sensor is stable, the controller will automatically move to the next step. If they don't stabilize you may manually go to the next step by touching Confirm.
Third Buffer Temperature (only appears if no temperature sensor is detected)
Enter the temperature of the buffer and touch Confirm.

Third Buffer Value (does not appear if automatic buffer recognition is used)
Enter the value of the buffer being used

Rinse Electrode
Remove the sensor from the process, rinse it off, and place it in the buffer solution. Touch Confirm when ready.

Stabilization
When the temperature (if applicable) and signal from the sensor is stable, the controller will automatically move to the next step.

Cal Successful or Failed
If successful, touch Confirm to put the new calibration in memory. The calibration adjusts the offset, gain (slope) and calibration midpoint and displays the new values. If failed, you may retry the calibration or cancel. Refer to Section 7 to troubleshoot a calibration failure.

Resume Control
Replace the sensor in the process and touch Confirm when ready to resume control.

One Point Analog Calibration

OK to disable control? Touch Confirm to continue or Cancel to abort.

Input Value
Enter the mA value that the transmitter will be sending. Touch Confirm to continue or Cancel to abort.

Please set input signal to specified value
Make sure that the transmitter is sending the desired mA signal. Touch Confirm to continue or Cancel to abort.
Automatic circuit calibration in progress

Cal Successful or Failed
If successful, touch Confirm to save calibration results. The calculated offset will be displayed.
If failed, you may retry the calibration or cancel. You may also restore calibration to the factory defaults. The calibration will fail if the measured mA is more than 2 mA away from the Input Value entered.

Please restore input signal to process value
Put the transmitter back into normal measurement mode if necessary and touch Confirm when ready to resume control.

Two Point Analog Calibration

OK to disable control? Touch Confirm to continue or Cancel to abort.

Input Value
Enter the mA value that the transmitter will be sending. Touch Confirm to continue or Cancel to abort.

Please set input signal to specified value
Make sure that the transmitter is sending the desired mA signal. Touch Confirm to continue or Cancel to abort.
Automatic circuit calibration in progress

Second Input Value
Enter the mA value that the transmitter will be sending. Touch Confirm to continue or Cancel to abort.

Please set input signal to specified value
Make sure that the transmitter is sending the desired mA signal. Touch Confirm to continue or Cancel to abort.
Automatic circuit calibration in progress

Cal Successful or Failed
If successful, touch Confirm to save calibration results. The calculated offset and gain will be displayed.
If failed, you may retry the calibration or cancel. You may also restore calibration to the factory defaults. The calibration will fail if the offset is more than 2 mA or the gain is not between 0.5 and 2.0.
Please restore input signal to process value
Put the transmitter back into normal measurement mode if necessary and touch Confirm when ready to resume control.

5.2.1 Contacting Conductivity

Settings

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 3000, and the deadband is 10, the alarm will activate at 3001 and deactivate at 2990.
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Default Temp	If the temperature signal is lost at any time, then the controller will use the Default Temp setting for temperature compensation.
Cable Length	The controller automatically compensates for errors in the reading caused by varying the length of the cable.
Gauge	The cable length compensation depends upon the gauge of wire used to extend the cable
Cell Constant	Enter the cell constant of the sensor that is connected to the input.
Temp Compensation	Select between the standard NaCl temperature compensation method or a linear %/degree C method.
Temp Comp Factor	This menu only appears if Linear Temp Comp is selected. Change the %/degree C to match the chemistry being measured. Standard water is 2%.
Units	Select the units of measure for the conductivity.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

5.2.2 Electrodeless Conductivity

Settings

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 3000, and the deadband is 10, the alarm will activate at 3000 and deactivate at 2990.
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Default Temp	If the temperature signal is lost at any time, then the controller will use the Default Temp setting for temperature compensation.

Installation Factor	Do not change unless instructed by the factory.
Cable Length	The controller automatically compensates for errors in the reading caused by varying the length of the cable.
Gauge	The cable length compensation depends upon the gauge of wire used to extend the cable
Cell Constant	Do not change unless instructed by the factory. The Walchem sensor is 6.286. Sensors made by others are not supported.
Range	Select the range of conductivity that best matches the conditions the sensor will see.
Temp Compensation	Select between the standard NaCl temperature compensation method or a linear %/ degree C method.
Temp Comp Factor	This menu only appears if Linear Temp Comp is selected. Change the %/degree C to match the chemistry being measured. Standard water is 2%.
Units	Select the units of measure for the conductivity.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

5.2.3 Temperature

Settings 

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 100, and the deadband is 1, the alarm will activate at 100 and deactivate at 99.
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Name	The name used to identify the sensor may be changed.
Element	Select the specific type of temperature sensor to be connected.

5.2.4 pH

Settings 

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 9.50, and the deadband is 0.05, the alarm will activate at 9.51 and deactivate at 9.45.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.

Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.
Buffers	Select if calibration buffers will be manually entered, or if they will be automatically detected, and if so, which set of buffers will be used. The choices are Manual Entry, JIS/NIST Standard, DIN Technical, or Traceable 4/7/10.
Default Temp	If the temperature signal is lost at any time, then the controller will use the Default Temp setting for temperature compensation.
Cable Length	The controller automatically compensates for errors in the reading caused by varying the length of the cable.
Gauge	The cable length compensation depends upon the gauge of wire used to extend the cable
Electrode	Select Glass for a standard pH electrode, or Antimony. Antimony pH electrodes have a default slope of 49 mV/pH and an offset of -320 mV at pH 7.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

5.2.5 ORP

Settings 

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 800, and the deadband is 10, the alarm will activate at 801 and deactivate at 790.
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Cable Length	The controller automatically compensates for errors in the reading caused by varying the length of the cable.
Gauge	The cable length compensation depends upon the gauge of wire used to extend the cable
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

5.2.6 Disinfection

Settings 

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 7.00, and the deadband is 0.1, the alarm will activate at 7.01 and deactivate at 6.90.
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.

Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Cable Length	The controller automatically compensates for errors in the reading caused by varying the length of the cable.
Gauge	The cable length compensation depends upon the gauge of wire used to extend the cable
Name	The name used to identify the sensor may be changed.
Sensor	Select the specific type and range of disinfection sensor to be connected.
Type	Select the type of sensor to be connected.

5.2.7 Generic Sensor

Settings 

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 7.00, and the deadband is 0.1, the alarm will activate at 7.01 and deactivate at 6.90.
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Sensor Slope	Enter the slope of sensor in mV/Units (if Electrode selection is Linear) or mV/Decade (if Electrode selection is Ion Selective).
Sensor Offset	Only appears if the Electrode selection is Linear. Enter the offset of the sensor in mV if 0 mV is not equal to 0 units. **For Ion Selective Electrodes, the Sensor Offset is not calculated until the first calibration is performed, and the sensor will read Zero until a calibration has been successfully completed!**
Low Range	Enter the low end of the range of the sensor
High Range	Enter the high end of the range of the sensor
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Cable Length	The controller automatically compensates for errors in the reading caused by varying the length of the cable.
Gauge	The cable length compensation depends upon the gauge of wire used to extend the cable
Units	Type in the units of measure for the input, for example, ppm.
Electrode	Select the type of electrode to be connected. Select Linear if the sensor slope is a linear voltage per Units. Select Ion Selective if the electrode voltage output is logarithmic, defined as “mV/decade”.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

5.2.8 Corrosion Input

ONLY AVAILABLE IF A CORROSION INPUT BOARD IS INSTALLED

Input Details

The details for this type of input include the current corrosion rate, alarms, status, current stage in the measurement cycle, the elapsed time in the current cycle, the raw (uncalibrated) corrosion rate, the number of days in service of the electrodes, the calibration offset, the date of last calibration, and the type of input.

Settings

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 10, and the deadband is 0.1, the alarm will activate at 10.01 and deactivate at 9.9.
Replace Corrosion Electrode	Used to reset the timers for both the “Electrode Alarm” and the “Stabilization Time”.
Stabilization time	Provides a control lock-out during the initial period of high readings when the electrode is changed. Set to 0 hours to disable.
Electrode Alarm	Set a reminder, in days, for when to replace the electrode tips.
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Alloy Multiplier	Enter the multiplier that matches the metallurgy of the electrodes connected to the sensor. Refer to the chart below.
Cycle Time	Select the length of the cycle time to be used. The longer cycle times provide more accurate readings but decrease the speed of response.
Range	Select the expected range of the corrosion rate.
Units	Select the units of measure for the corrosion.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

Alloy Multipliers

These values are based on using standard corrosion electrodes with 5 cm2 surface area.

Material	Multiplier	UNS Code
Carbon Steel	1.00	K03005
Copper 110 ETP	2.00	C11000
Admiralty Brass	1.67	C44300
Aluminum 1100	0.94	A91100
Aluminum 2024	0.88	A92024
Phosphorized Admiralty Brass	1.68	C44500
Aluminum Silicon Bronze	1.48	C64200

Aluminum Brass	1.62	C68700
Copper/Nickel 90/10	1.80	C70610
Copper/Nickel 70/30	1.50	C71500
AISI 4130 Alloy Steel	1.00	G41300
Lead	2.57	L50045
Monel 400 Nickel	1.13	N04400
Monel K500 Nickel	1.04	N05500
Hastelloy C22	0.85	N06022
Inconel 600 Nickel	0.95	N06600
Incoloy Alloy 20	0.98	N08020
Incoloy Alloy 800	0.89	N08800
Incoloy Alloy 825	0.88	N08825
Hastelloy C276	0.86	N10276
Titanium Grade 2	0.75	R50400
304 Stainless Steel	0.89	S30400
316 Stainless Steel	0.90	S31600
2205 Duplex Stainless Steel	0.89	S31803
2507 Super Duplex Stainless Steel	0.88	S32750
Zinc	1.29	Z17001

5.2.9 Corrosion Imbalance Input

ONLY AVAILABLE IF A CORROSION INPUT BOARD IS INSTALLED

Input Details

The details for this type of input include the current corrosion imbalance value, alarms, status, current stage in the measurement cycle, the elapsed time in the current cycle, the ratio of the current imbalance value to the current corrosion rate, the calibration offset, the date of last calibration, and the type of input.

Settings 

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 10, and the deadband is 0.1, the alarm will activate at 10.01 and deactivate at 9.9.
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

5.2.10 Transmitter Input and AI Monitor Input

Select AI monitor if the device connected can be calibrated on its own and the W900 calibration will only be in units of mA. Select Transmitter if the device connected cannot be calibrated on its own and the W900 will be used to calibrate in engineering units of measure.

Settings

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 7.00, and the deadband is 0.1, the alarm will activate at 7.01 and deactivate at 6.90.
Transmitter	Select the type of transmitter connected (2-wire loop powered, 2-wire self-powered, 3-wire, or 4-wire).
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
4 mA Value	Enter the value that corresponds to a 4 mA output signal from the transmitter.
20 mA Value	Enter the value that corresponds to a 20 mA output signal from the transmitter.
Units	Select the units of measure for the transmitter.
Name	The name used to identify the transmitter may be changed.
Type	Select the type of sensor to be connected. The choice of AI Monitor and Transmitter is only available if a 4-20mA type sensor card is installed.

5.2.11 Fluorometer Input

Settings

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 7.00, and the deadband is 0.1, the alarm will activate at 7.01 and deactivate at 6.90.
Transmitter	Select the type of transmitter connected (2-wire loop powered, 2-wire self-powered, 3-wire, or 4-wire).
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Max Sensor Range	Enter the value of the ppb of dye at which the sensor transmits 20 mA.

Dye/Product Ratio	Enter the value for the ratio of ppb of dye to ppm of inhibitor that is in the inhibitor product being fed.
Name	The name used to identify the transmitter may be changed.
Type	Select the type of sensor to be connected. The choice of Analog Input is only available if that type of sensor card is installed.

5.2.12 Analog Flowmeter Input

Settings

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 7.00, and the deadband is 0.1, the alarm will activate at 7.01 and deactivate at 6.90.
Totalizer Alarm	Enter the high limit on the total volume of water accumulated above which an alarm will be activated.
Reset Flow Total	Enter this menu to reset the accumulated flow total to 0. Touch Confirm to accept, Cancel to leave the total at the previous value and go back.
Set Flow Total	This menu is used to set the total volume stored in the controller to match the register on the flow meter. Enter the desired value.
Scheduled Reset	Choose to automatically reset the flow total, and if so, Daily, Monthly or Annually.
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.
Cal Required Alarm	To get an alarm message as a reminder to calibrate the sensor on a regular schedule, enter the number of days between calibrations. Set it to 0 if no reminders are necessary.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Transmitter	Select the type of transmitter connected (2-wire loop powered, 2-wire self-powered, 3-wire, or 4-wire).
Flow Units	Select the units of measure for the water volume, between gallons, liters, cubic meters and million of gallons (MG).
Rate Units	Select the units of measure for the flow rate time base.
Flowmeter Max	Enter the flow rate at which the meter outputs a 20 mA signal.
Input Filter	Enter the mA below which the flow rate will considered 0. Typically any meter output below 4.02 mA is actually 0 flow.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected.

5.2.13 Analog Tank Level Input

Settings

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 7.00, and the deadband is 0.1, the alarm will activate at 7.01 and deactivate at 6.90.
Reset Calibration Values	Enter this menu to reset the sensor calibration back to factory defaults.

Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Units	Enter the units of measure for the transmitter.
Tank Capacity	Enter the capacity of the tank when full in the units of measure entered above.
Empty At	Enter the mA output of the level sensor when the tank is empty.
Full At	Enter the mA output of the level sensor when the tank is full.
Smoothing Factor	Increase the smoothing factor percentage to dampen the re-sponse to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Transmitter	Select the type of transmitter connected (2-wire loop powered, 2-wire self-powered, 3-wire, or 4-wire.
Name	The name used to identify the transmitter may be changed.
Type	Select the type of sensor to be connected.

5.2.14 DI State

Input Details

The details for this type of input include the current state with a custom message for open versus closed, alarms, the status of the interlock, and the current type of input setting.

Settings 

Touch the Settings icon to view or change the settings related to the sensor.

Open Message	The words used to describe the switch state may be customized.
Closed Message	The words used to describe the switch state may be customized.
Interlock	Choose whether the input should be in the interlocked state when the switch is either open or closed.
Alarm	Choose if an alarm should be generated when the switch is open, or closed, or if no alarm should ever be generated.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Total Time	Choose to totalize the amount of time that the switch has been open or closed. This will be displayed on the input details screen.
Reset Total Time	Enter this menu to reset the accumulated time to zero. Touch Confirm to accept, Cancel to leave the total at the previous value and go back.
Name	The name used to identify the switch may be changed.
Type	Select the type of sensor to be connected to the digital input channel.

5.2.15 Flow Meter, Contactor Type

Input Details

The details for this type of input include the total volume accumulated through the flow meter, alarms, and the current type of input setting.

Settings 

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low and High Alarm limits may be set.

Deadband	This is the Alarm Deadband. For example, if the High Alarm is 100, and the deadband is 1, the alarm will activate at 100 and deactivate at 99
Totalizer Alarm	Enter the high limit on the total volume of water accumulated above which an alarm will be activated.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Reset Flow Total	Enter this menu to reset the accumulated flow total to 0. Touch Confirm to accept, Cancel to leave the total at the previous value and go back.
Set Flow Total	This menu is used to set the total volume stored in the controller to match the register on the flow meter. Enter the desired value.
Scheduled Reset	Choose to automatically reset the flow total, and if so, Daily, Monthly or Annually.
Volume/Contact	Enter the volume of water that needs to go through the flow meter in order to generate a contact closure.
Flow Units	Select the units of measure for the water volume.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected to the digital input channel.

5.2.16 Flow Meter, Paddlewheel Type

Input Details

The details for this type of input include the current flow rate, total volume accumulated through the flow meter, alarms, and the current type of input setting.

Settings 

Touch the Settings icon to view or change the settings related to the sensor.

Alarms	Low and High Alarm limits may be set.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 100, and the deadband is 1, the alarm will activate at 100 and deactivate at 99.
Totalizer Alarm	Enter the high limit on the total volume of water accumulated above which an alarm will be activated.
Reset Flow Total	Enter this menu to reset the accumulated flow total to 0. Touch Confirm to accept, Cancel to leave the total at the previous value and go back.
Set Flow Total	This menu is used to set the total volume stored in the controller to match the register on the flow meter. Enter the desired value.
Scheduled Reset	Choose to automatically reset the flow total, and if so, Daily, Monthly or Annually.
K Factor	Enter the pulses generated by the paddlewheel per unit volume of water.
Flow Units	Select the units of measure for the water volume.
Rate Units	Select the units of measure for the flow rate time base.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected to the digital input channel.

5.2.17 Feed Monitor

The Feed Monitor Digital Input type performs the following functions:

- Monitors a pulse signal from a pump (Iwaki PosiFlow, Tacmina Flow Checker, LMI Digital Pulse, etc)
- Totalizes the chemical feed and calculates the current flow rate
- Activates a Total Alarm if the feed exceeds a specified limit
- Activates a Flow verify alarm if the control output is ON and the feed monitor does not record any pulses within a specified period of time.

Each Feed Monitor input can be linked to any type of output channel (powered relay, dry contact relay, solid state relay, or analog 4-20 mA) to validate chemical feed from any type of pump.

Total Alarm

The W900 monitors the total feed and activates a Total Alarm if the value exceeds the Totalizer Alarm set point. When used in conjunction with Scheduled Reset selections (Daily, Monthly, or Annually), this alarm can be used to alert users to situations where excess chemical product is used and/or to discontinue chemical feed if the amount exceeds the set point during the specified time period.

While a Total Alarm is active, the linked pump will be controlled based on the Total Alarm Mode setting:

Interlock	The output will be OFF while the alarm is active.
Maintain	The alarm condition has no effect on output control.

Flow Verify Alarm

The W900 monitors the status or current percent output of the channel linked to the feed monitor to determine if a Flow Verify alarm should be activated.

The *Flow Alarm Delay* setting (MM:SS) contains the time to trigger the alarm if the output is activated and no pulses are registered. To avoid nuisance alarms at very low flow rates, if the linked output is a solid state relay (set with a pulse proportional or PID control mode) or an analog 4-20 mA output, the alarm will only be activated if no input pulses are monitored while the output is set to greater than a specified Dead Band (%).

The *Flow Alarm Clear* setting is the number of pulses that must be registered to verify that pump operation is restored and clear the Flow Verify alarm. During Flow Verify alarm conditions, the count of pulses registered will be reset to zero if no single pulses occur during the Flow Alarm Delay time period. In this manner, random single pulses spread over a long time period will not accumulate and result in a Flow Verify alarm being cleared before product feed is actually restored.

If desired, a user can configure the feed monitor to attempt to reprime the pump when a Flow Verify alarm first is activated.

The *Reprime Time* (MM:SS) specifies the amount of time that the output should be energized after the initiation of a Flow Verify alarm. If the linked output is a solid state relay (set to a pulse proportional or PID control mode) or an analog 4-20 mA output, the output will be set to the Max Output percent during the reprime event. If the Flow Verify alarm is cleared during the reprime event (because the specified number of pulses was registered), the reprime event will be immediately ended and normal control of the output channel will be restored.

While a Flow Verify alarm is active, the linked pump will be controlled based on the Flow Alarm Mode setting:

Disabled	*Flow Verify* alarms are not monitored, no change in output control.
Interlock	The output will be forced OFF while the alarm is active.(except during the reprime event)
Maintain	The alarm condition has no effect on output control. (except during the reprime event)

If a *Flow Verify* alarm is active and *Interlock* is selected, the output to the pump will be turned off after the specified Reprime Time and only operator actions can restore normal control operations. In most cases, action will be taken to manually reprime the pump, refill the chemical tank, etc. and the output will be put into Hand mode to confirm proper operation of the pump. When the Feed Monitor registers sufficient pulses, the Flow Verify alarm will clear and the pump output can be put back into Auto Mode.

If both *Total Alarm* and *Flow Verify* alarms are active simultaneously, an Interlock selection for either mode setting will take precedence for pump control. Automatic output control will continue despite the alarm conditions only if Maintain is selected for both mode settings.

Interlocking or Activating any Control Output with a Feed Monitor Input
Digital Input channels are available for selection as Interlock Channels or Activate With Channels by any output. If a Feed Monitor is selected in this manner, the Digital Input will trigger that action if any alarm (Flow Verify, Total Alarm, or Range Alarm) is currently active.

Input Details
The details for this type of input include the current flow rate of chemical feed, the total volume fed since the last reset, alarms, the status of the output linked to the input, the date and time of the last total reset, and the current type of input setting.

Settings
Touch the Settings icon to view or change the settings related to the sensor.

Totalizer Alarm	A high limit on the total accumulated volume of chemical fed may be set, to trigger a Total Alarm.
Reset Flow Total	Enter this menu to reset the accumulated flow total to 0. Touch Confirm to accept, Cancel to leave the total at the previous value and go back.
Set Flow Total	This menu is used to set the total accumulated volume stored in the controller to match a specified volume.
Scheduled Reset	Choose to automatically reset the flow total, and if so, Daily, Monthly or Annually
Total Alarm Mode	Choose to Interlock or Maintain the control of the linked pump while the Total Alarm is active.
Flow Alarm Mode	Choose to Interlock or Maintain the control of the linked pump while a Flow Verify alarm is active. Choose Disable to monitor flow rate and accumulate total without any flow alarms.
Flow Alarm Delay	Time (MM:SS) that will trigger a Flow Verify alarm if the output is activated and no pulses are registered.
Flow Alarm Clear	Enter the number of contacts that must be registered to clear a Flow Verify alarm.
Dead band	Enter the percent output above which the pump is considered On for monitoring of Flow Verify alarms. This setting is only available if the linked Output is a solid state (pulsing) relay or analog (4-20 mA) output.
Reprime Time	Time (MM:SS) that the output should be energized for the reprime event.
Volume/Contact	Enter the volume, in ml, of chemical delivered for each pulse of the feed monitoring device.
Flow Units	Select the units of measure for the accumulated feed total.
Rate Units	Select the units of measure for the feed flow rate time base.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes in the flowrate. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Output	Select the relay or analog (4-20 mA) output channel controlling the pump which will be monitored by this feed monitor input.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected to the digital input channel

5.2.18 DI Counter Input

ONLY AVAILABLE IF HVAC MODES ARE DISABLED IN CONFIG MENU – GLOBAL SETTINGS

A digital input counter input is used to count contacts from a digital input, totalize the number of contacts, and monitor or control on the rate of contacts.

Input Details
The details for this type of input include the current rate, total contacts counted (in user defined units), date and

time of last total reset, alarms, and the current type of input setting.

Settings

Touch the Settings icon to view or change the settings related to the virtual input.

Alarms	Low and High Alarm limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 100, and the deadband is 1, the alarm will activate at 100 and deactivate at 99
Totalizer Alarm	A high limit on the total number of contact closures accumulated may be set.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Reset Total	Enter this menu to reset the accumulated total to 0. Touch Confirm to accept, or Cancel to leave the total at the previous value and go back.
Set Total	This menu is used to set the total number of contact closures stored in the controller a certain value.
Scheduled Reset	Choose to automatically reset the flow total, and if so, Daily, Monthly or Annually.
Units	Type in the units of measure for the what the contacts represent (widgets, etc.)
Rate Units	Select the units of measure for the rate time base (widgets per second, minute, hour, day).
Units per Pulse	Enter the number of units represented by one pulse.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next rate reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Name	The name used to identify the sensor may be changed.
Type	Select the type of sensor to be connected to the digital input channel.

5.2.19 Remote Modbus DI State

ONLY AVAILABLE IF A MODBUS KEY FILE HAS BEEN IMPORTED AND THE COMM STATUS IN THE REMOTE COMMUNICATIONS MENU HAS BEEN SET TO MODBUS

The Remote Modbus DI State input is used to simulate a switch closure by obtaining the open or closed state information from a Modbus application via Modbus TCP. This information can be used to Interlock or activate a control output in exactly the same way as a physical switch. This virtual input type however uses up an actual input channel.

Input Details

The details for this type of input include the current state with a custom message for open versus closed, alarms, the status of the interlock, date/time of the last update, cycle time, 24-hour time, total time, date/time of last total time reset and the current type of input setting.

Settings

Touch the Settings icon to view or change the settings related to the sensor.

Open Message	The words used to describe the virtual switch-open state may be customized.
Closed Message	The words used to describe the virtual switch-closed state may be customized.
Interlock	Choose whether the input should be in the interlocked state when the virtual switch is either open or closed.

Alarm	Choose if an alarm should be generated when the virtual switch is open, or closed, or if no alarm should ever be generated.
Modbus Mode	Select Server Mode is the Modbus application will write the value to the input on its own schedule. Select Client if the controller will ask the Modbus application for the latest value.
Remote Device IP	Client mode only. Enter the IP address of the device that will provide the Modbus data.
Data Port	Client mode only. Enter the data port to be used by the Modbus TCP connection.
Reply Timeout	Client mode only. Enter the number of seconds to wait before retrying if no data is received.
Function	Client mode only. Select the Modbus function that the controller will use to read data.
Remote Register	Client mode only. Enter the register that contains the desired data.
Update Period	Client mode only. Enter the frequency that the controller will request new data.
Timeout Alarm Delay	Enter the time that will trigger an Update Timeout alarm if no new data has been received from the Modbus application.
Total Time	Choose to totalize the amount of time that the virtual switch has been open or closed. This will be displayed on the input details screen.
Reset Time Total	Enter this menu to reset the accumulated time to zero. Touch Confirm to accept, Cancel to leave the total at the previous value and go back.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Name	The name used to identify the virtual switch may be changed.
Type	Select the type of sensor to be connected to the digital input channel.

5.2.20 Virtual Input – Calculation

A Calculation type Virtual Input is not a physical sensor; it is a value that is calculated from two physical sensor inputs. The analog values that can be used for each type of calculation are selected from a List of all defined sensor inputs, analog inputs, flowmeter rates, the other virtual input, solid state relay %, and analog output %.

Calculation modes are:

- **Difference** (Input - Input 2)
- **Ratio** (Input / Input 2)
    - This selection could be used to calculate Cycles of Concentration in HVAC applications, for example
- **Total** (Input + Input 2)
- **% Difference** [(Input - Input 2) / Input]
    - This selection could be used to calculate % Rejection in RO applications, for example

Virtual Input Details

The details for any type of virtual input include the current value calculated, alarms, the status, and the input type.

Settings 

Touch the Settings icon to view or change the settings related to the virtual input.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 7.00, and the deadband is 0.1, the alarm will activate at 7.01 and deactivate at 6.90.
Input	Select the physical input or select Constant, whose value will be used in the calculation shown above as the Input in the formula.

Constant	Only appears if the Input selection is Constant. Enter the value.
Input 2	Select the physical input or select Constant, whose value will be used in the calculation shown above as the Input 2 in the formula.
Constant 2	Only appears if the Input 2 selection is Constant. Enter the value.
Calculation Mode	Select a calculation mode from the list.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Low Range	Set the low end of the normal range for the calculated value. A value below this will trigger a Range Alarm and deactivate any control output using the virtual input.
High Range	Set the high end of the normal range for the calculated value. A value above this will trigger a Range Alarm and deactivate any control output using the virtual input.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Name	The name used to identify the input may be changed.
Type	Select the type of input; either Calculation, Redundant, Raw Value, Disturbance, or Not Used.

5.2.21 Virtual Input – Redundant

A Redundant type Virtual Input is not a physical sensor; it is a value that is calculated from two physical sensor inputs. The redundant sensor algorithm compares the readings from two sensors, and chooses which sensor to use. The value of the virtual input is the value of the sensor chosen by this comparison.

If the difference between the two exceeds a programmable amount, a deviation alarm is set, but control continues. If one of the sensors goes into a range error or a fault alarm, the other sensor will take over. If both sensors give invalid readings, an input alarm is set and any outputs using the virtual input for control are disabled.

The analog values that can be used for each type of calculation are selected from a List of all defined sensor inputs and analog inputs.

There are three modes:

- Primary/Backup – The primary sensor (selected as the Input) value, as opposed to the backup sensor (selected as Input 2) value, is chosen as the virtual input value, assuming it has a valid reading.
- Minimum Value – The sensor that has the lower reading of the two sensors is chosen as the virtual input value. This makes sense if a failing sensor normally drifts high.
- Maximum Value – The sensor that has the higher reading of the two sensors is chosen as the virtual input value. This makes sense if a failing sensor normally drifts low.

Virtual Input Details

The details for a virtual input include the current difference calculated, the current values of the inputs used in the calculation, alarms, the status, and the input type.

Settings 

Touch the Settings icon to view or change the settings related to the virtual input.

Deviation Alarm	Enter the value for the difference between the two input readings above which the deviation alarm will trigger.

Deadband	This is the Alarm Deadband. For example, if the Deviation Alarm is 1.00, and the deadband is 0.1, the alarm will activate if the sensor readings are 1.01 units apart, and deactivate at 0.89 units apart.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Mode	Select which mode for determining the value for the virtual sensor input.
Input	Select the physical input for the primary sensor.
Input 2	Select the physical input for the backup sensor.
Name	The name used to identify the input may be changed.
Type	Select the type of input; either Calculation, Redundant, Raw Value, Disturbance, or Not Used.

5.2.22 Virtual Input – Raw Value

A Raw Value type Virtual Input is not a physical input. The value of the virtual input comes from the unmanipulated signal from a real sensor.

- non-temperature compensated µS/cm
- mV for pH, ORP, Disinfection, Generic
- mA for analog inputs
- ohms for temperature

Virtual Input Details
The details for a virtual input include the current raw value of the real input used, alarms, the status, and the input type.

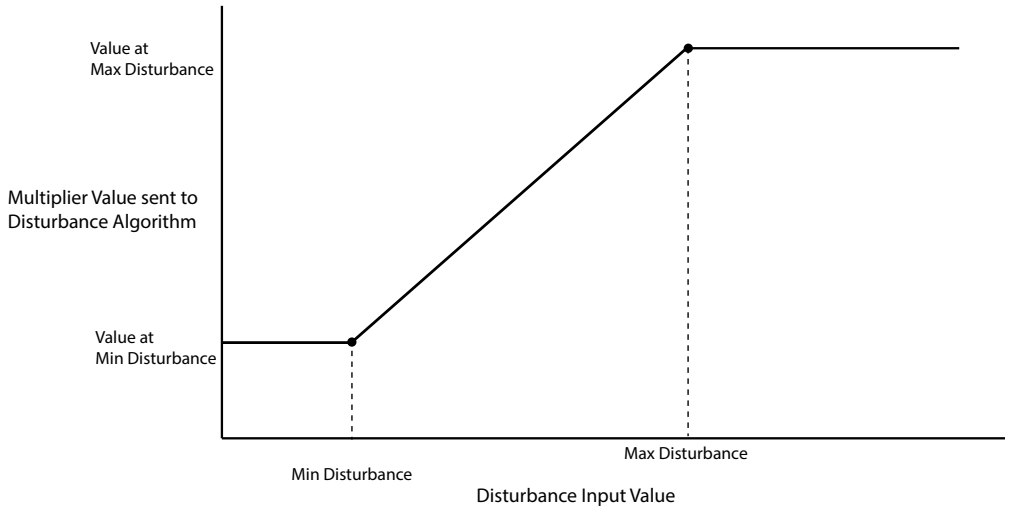
Settings
Touch the Settings icon to view or change the settings related to the virtual input.

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 7.00, and the deadband is 0.10, the alarm will activate at 7.01 and deactivate at 6.90.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Input	Select the physical input whose raw value will be used as this virtual input.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Name	The name used to identify the input may be changed.
Type	Select the type of input; either Calculation, Redundant, Raw Value, Disturbance, or Not Used.

5.2.23 Virtual Input - Disturbance

A Disturbance type Virtual Input is not a physical input. The value of the virtual input is calculated from a real sensor input plus an equation that defines the real sensor's impact on a control output that is using a different real sensor. A common example is controlling pH based upon a pH input signal, but modifying control based upon the

flow rate, with a Disturbance Type Virtual Input defining the impact of the flow rate on the control output. Based on the disturbance input channel selection, minimum and maximum disturbance input readings, and defined multiplier values at the min and max disturbance readings, this Virtual Input generates a value that is used to multiply to a primary control value. Disturbance input channel values that result in a multiplier output of 1.0 have no impact on the final control output. The output value is restricted between low and high limits to allow more complete control over the impact of disturbance inputs. The value of the multiplier at min disturbance can be either higher or lower than its value at max disturbance, depending upon what effect is desired on the control setpoint.



Virtual Input Details

The details for a virtual input include the current multiplier value calculated, the current values of the inputs used in the calculation, alarms, the status, and the input type.

Settings

Touch the Settings icon to view or change the settings related to the virtual input.

Min Disturbance	Enter the value of the disturbance input where the value of the calculated multiplier will be the Value at Min Disturbance value (set below).
Max Disturbance	Enter the value of the disturbance input where the value of the calculated multiplier will be the Value at Max Disturbance (set below).
Value at Min Disturbance	Enter the value of the multiplier that will occur when the disturbance input is at the Min Disturbance value.
Value at Max Disturbance	Enter the value of the multiplier that will occur when the disturbance input is at the Max Disturbance value.
Smoothing Factor	Increase the smoothing factor percentage to dampen the response to changes. For example, with a 10% smoothing factor, the next reading shown will consist of an average of 10% of the previous value and 90% of the current value.
Disable Disturbance Channels	If any of the relays or digital inputs are selected, the multiplier value of the disturbance input is set to 1.0. if the selected relay or digital input is active. Typically this is used to stop using the disturbance function in case of an upset condition.
Disturbance Input	Select the real sensor input that will be used to modify the control output.
Name	The name used to identify the input may be changed.
Type	Select the type of input; either Calculation, Redundant, Raw Value, Disturbance, or Not Used.

5.2.24 Remote Modbus Sensor Virtual Input

ONLY AVAILABLE IF A MODBUS KEY FILE HAS BEEN IMPORTED AND THE COMM STATUS IN THE REMOTE COMMUNICATIONS MENU HAS BEEN SET TO MODBUS

The Remote Modbus sensor virtual input is used to simulate a sensor by obtaining the sensor value from a Modbus application via Modbus TCP. This information can be used to activate a control output, be logged or graphed in exactly the same way as a physical sensor.

Input Details

The details for this type of input include the current value, alarms, the minimum, maximum and average values over the past 24 hours, the status of the input, date/time of the last update, cycle time, 24-hour time, total time, date/time of last total time reset and the current type of input setting.

Settings

Alarms	Low-Low, Low, High and High-High Alarms limits may be set.
Deadband	This is the Alarm Deadband. For example, if the High Alarm is 7.00, and the deadband is 0.1, the alarm will activate at 7.01 and deactivate at 6.90.
Alarm & Datalog Suppression	If any of the relays or digital inputs are selected, any alarms related to this input will be suppressed if the selected relay or digital input is active. At the same time, all datalogs and graphs containing the input will show no data for the duration of the activation.
Low Range	Enter the low end of the range of the sensor.
High Range	Enter the high end of the range of the sensor.
Modbus Mode	Select Server Mode is the Modbus application will write the value to the input on its own schedule. Select Client if the controller will ask the Modbus application for the latest value.
Remote Device IP	Client mode only. Enter the IP address of the de-vice that will provide the Modbus data.
Data Port	Client mode only. Enter the data port to be used by the Modbus TCP connection.
Reply Timeout	Client mode only. Enter the number of seconds to wait before retrying if no data is received.
Function	Client mode only. Select the Modbus function that the controller will use to read data.
Remote Register	Client mode only. Enter the register that contains the desired data.
Update Period	Client mode only. Enter the frequency that the con-troller will request new data.
Timeout Alarm Delay	Enter the time that will trigger an Update Timeout alarm if no new data has been received from the Modbus application.
Name	The name used to identify the virtual switch may be changed.
Units	Type in the units of measure for the input.
Type	Select the type of sensor to be connected to the digital input channel.

5.3 Outputs Menu

Touch the Outputs icon from the Main Menu to view a list of all relay and analog outputs. The Page Down icon pages down the list of outputs, the Page Up icon pages up the list of outputs, the Main Menu icon brings back the previous screen. Touch an output to access that output's details and settings.
NOTE: When the output control mode or the input assigned to that output is changed, the output reverts to OFF mode. Once you have changed all settings to match the new mode or sensor, you must put the output into AUTO mode to start control.

5.3.1 Relay, Any Control Mode

Settings

Touch the Settings icon to view or change the settings related to the relay. Settings that are available for any control mode include:

HOA Setting	Select Hand, Off or Auto mode by touching the desired mode.
Output Time Limit	Enter the maximum amount of time that the relay can be continuously activated. Once the time limit is reached, the relay will deactivate until the Reset Output Timeout menu is entered.
Reset Output Timeout	Enter this menu to clear an Output Timeout alarm and allow the relay to control the process again.
Interlock Channels	Select the relays and digital inputs that will interlock this relay, when those other relays are activated in Auto mode. Using Hand or Off to activate relays bypasses the Interlock logic.
Activate With Channels	Select the relays and digital inputs that will activate this relay, when those other relays are activated in Auto mode. Using Hand or Off to activate relays bypasses the Activate With logic.
Minimum Relay Cycle	Enter the number of seconds that will be minimum amount of time that the relay will be in the active or inactive state. Normally this will be set to 0, but if using a motorized ball valve that takes time to open and close, set this high enough that the valve has time to complete its movement.
Hand Time Limit	Enter the amount of time that the relay will activate for when it is in Hand mode.
Reset Time Total	Press the Confirm icon to reset the total accumulated on-time stored for the output back to 0.
Name	The name used to identify the relay may be changed.
Mode	Select the desired control mode for the output.

5.3.2 Relay, On/Off Control Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the sensor process value at which the relay will activate.
Deadband	Enter the sensor process value away from the set point at which the relay will deactivate.
Duty Cycle Period	Using a duty cycle helps to prevent overshooting the set point in applications where the response of the sensor to chemical additions is slow. Specify the amount of time for the cycle, and the percentage of that cycle time that the relay will be active. The relay will be off for the rest of the cycle, even if the set point has not been satisfied. Enter the length of the duty cycle in minutes:seconds in this menu. Set the time to 00:00 if use of a duty cycle is not required.
Duty Cycle	Enter the percentage of the cycle period that the relay will be active. Set the percentage to 100 if use of a duty cycle is not required.
On Delay Time	Enter the delay time for relay activation in hours:minutes:seconds. Set the time to 00:00:00 to immediately activate the relay.
Off Delay Time	Enter the delay time for relay deactivation in hours:minutes:seconds. Set the time to 00:00:00 to immediately deactivate the relay.

Input	Select the sensor to be used by this relay.
Direction	Select the control direction.
Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.3 Relay, Flow Timer Control Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, remaining feed time, accumulated flow total, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings 

Touch the Settings icon to view or change the settings related to the relay.

Feed Duration	Enter the amount of time for the relay to activate for once the accumulated volume through the water meter has been reached.
Accumulated Volume	Enter the volume of water to pass through the water meter required to trigger the chemical feed.
Flow Input	Select the input to be used to control this output.
Flow Input #2	Select the second flowmeter input to be used to control this output if applicable. The sum of the two flow total volumes will be used to trigger the chemical feed.
Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.4 Relay, Bleed and Feed Control Mode

ONLY AVAILABLE IF HVAC MODES ARE ENABLED IN CONFIG MENU – GLOBAL SETTINGS

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings 

Touch the Settings icon to view or change the settings related to the relay.

Feed Time Limit	Enter the maximum amount of feed time per bleed event
Bleed	Select the relay to be used for Bleed/Blowdown

Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.5 Relay, Bleed then Feed Control Mode

ONLY AVAILABLE IF HVAC MODES ARE ENABLED IN CONFIG MENU – GLOBAL SETTINGS

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, remaining feed time, the accumulated bleed time, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Feed Percentage	Enter the % of bleed relay activation time to use for the feed relay activation time
Feed Time Limit	Enter the maximum amount of feed time per bleed event
Reset Timer	Use this menu to cancel the current feed cycle
Bleed	Select the relay to be used for Bleed/Blowdown
Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.6 Relay, Percent Timer Control Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, cycle time, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Sample Period	Enter the duration of the sample period.
Feed Percentage	Enter the % of the sample period time to use for the feed relay activation time

5.3.7 Relay, Biocide Timer Control Mode

ONLY AVAILABLE IF HVAC MODES ARE ENABLED IN CONFIG MENU – GLOBAL SETTINGS

Basic Timer Operation

This algorithm is typically used to provide a baseline amount of chlorine for disinfection, and periodically shocking the system with a larger dose. During normal operation, the relay will be reacting to the sensor to maintain a set point within a programmable Deadband, as described in On/Off Control Mode above. When a Spike event triggers, the algorithm will change from the normal set point to the Spike Set Point, for the programmed time. Once the time expires, control to the normal set point resumes.

Basic Biocide Operation

When a biocide event triggers, the algorithm will first prebleed (if a prebleed is programmed) for the set amount of prebleed time or down to the set prebleed conductivity. Then the biocide relay is turned on for the set duration. This is followed by a post-bio add lockout that blocks the bleed relay from turning on for a set amount of bleed lockout time.

Special Condition Handling

Prebleed

If both a time limit and a conductivity limit are set, the time limit takes precedence. The bleed relay will turn off once the time limit is reached or when the prebleed conductivity limit is reached (whichever occurs first). If the prebleed has a conductivity limit set, then the time limit can't be set to zero, as this would allow the prebleed to last forever if the conductivity limit is never reached.

Overlapping biocide events

If a second biocide event occurs while the first one is still active (in prebleed, biocide add or lockout), the second event will be ignored. An Event Skipped alarm will be set.

Interlock Conditions

Interlocks override the relay control, but do not change the operation of the timers or related bleed control.

A no-flow (or other interlock) condition does not delay a biocide add. The biocide add duration timer will continue even if the relay is locked out due to a no-flow or other interlock condition. This will prevent delayed biocide adds which can potentially cause higher than expected biocide concentrations in the system when two biocides adds occur close to the same time. Not allowing delayed biocide adds will also prevent incompatible biocides getting added at close to the same time.

"Activate With" Conditions

"Activate with channels" settings override the relay control, but do not change the operation of the timers or related bleed control. The biocide timer continues counting biocide add time when the biocide relay is forced on, and ends at the expected time (biocide event start time plus duration). If the "activate with" condition continues after the end of the biocide feed time, the relay remains activated.

Alarms

An Event Skipped alarm is set when a second biocide event occurs while one event is still running (either in prebleed, biocide add or post-biocide add lockout).

An Event Skipped alarm is also set when the biocide add relay never turns on during a biocide add because of an interlock condition.

The alarm is cleared when the relay is next activated for any reason (the next timer event or HAND mode or "activate with" force on condition).

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting. The current week number and day of the week is displayed (even if there is no multi-week repetition event programmed). Cycle Time shows the time counting down of the currently active part of the biocide cycle (pre-bleed, biocide feed, or post biocide feed lockout of the bleed).

Settings 

Touch the Settings icon to view or change the settings related to the relay.

Event 1 (through 10)	Enter these menus to program timer events via the menus below:
Repetition	Select the time cycle to repeat the event: Daily, 1 Week, 2 Week, 4 Week, or None. An event means that the output is turned on at the same time of day, for the same amount of time, and except for the Daily cycle, on the same day of the week.

Week	Only appears if Repetition is longer than 1 Week. Select the week during which the event will occur.
Day	Only appears if Repetition is longer than Daily. Select the day of the week during which the event will occur.
Start Time	Enter the time of day to start the event.
Duration	Enter the amount of time that the relay will be on.
Bleed	Select the relay to be used for Bleed/Blowdown
Prebleed Time	If lowering the conductivity prior to feeding biocide is desired using a fixed time instead of a specific conductivity setting, enter the amount of time for the prebleed. Also may be used to apply a time limit on a conductivity based prebleed.
Prebleed To	If lowering the conductivity prior to feeding biocide is desired, enter the conductivity value. If no prebleed is required, or if a time-based prebleed is preferred, set the conductivity value to 0.
Cond Input	Select the sensor to be used to control the prebleed relay selected above.
Bleed Lockout	Enter the amount of time to lockout bleed after the biocide feed is complete.
Add Last Missed	Select Enabled if the controller should delay start the most recent Biocide cycle until immediately after an Interlock clears, or Disabled if all Biocide feed should be skipped if there is an Interlock condition at the time the add was due to start.

5.3.8 Relay, Alarm Output Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings 

Touch the Settings icon to view or change the settings related to the relay.

Alarm Mode	Select the alarm conditions that will put the relay into the alarm state: All Alarms Selected Alarms
On Delay Time	Enter the delay time for relay activation in hours:minutes:seconds. Set the time to 00:00:00 to immediately activate the relay.
Off Delay Time	Enter the delay time for relay deactivation in hours:minutes:seconds. Set the time to 00:00:00 to immediately deactivate the relay.
Select Alarms	Scroll through the list of all inputs and outputs, as well as System Alarms and Network (Ethernet) alarms. Touch the parameter to select alarms related to that parameter, then scroll through the list of alarms. Touch each alarm to check the box indicating the alarm is selected. Touch the Confirm icon when finished with that parameter to save the changes. Repeat for each input and output.
Output	Select if the relay will be active when in the alarm state (Normally Open) or if the relay will be active when not in the alarm state (Normally Closed).

5.3.9 Relay, Time Proportional Control Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, the current % on time calculated for the cycle, the current point in the cycle time, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the sensor process value at which the relay will be off for the entire Sample Period.
Proportional Band	Enter the distance that the sensor process value is away from the set point at which the relay will be on for the entire Sample Period.
Sample Period	Enter the duration of the sample period.
Input	Select the sensor to be used by this relay.
Direction	Select the control direction.
Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.10 Relay, Intermittent Sampling Control Mode

ONLY AVAILABLE IF HVAC MODES ARE ENABLED IN CONFIG MENU – GLOBAL SETTINGS

In an Intermittent Sampling with Proportional Blowdown control mode, the controller reads an analog input on a timed schedule, and the relay responds to maintain the conductivity value at the set point by activating for a programmable amount of time that varies with the deviation from the set point.

The relay goes through a sequence of activation/deactivation as described below. The intended purpose of this algorithm is boiler blowdown. A sample cannot be supplied to the sensor continuously in many boilers because a recirculating loop is not possible, and it would be a waste of hot water to constantly run a sample to a drain. A valve is opened intermittently to supply a sample to the sensor.

Where a non-ideal installation of the sensor can cause the sample to flash to steam, and give a false low reading, this can be corrected by taking the reading with the sample held in the pipe with the sampling valve closed, so the sample is at boiler pressure and therefore back in the liquid state. Enable Trap Sample if this is the case. Because the conductivity reading cannot be trusted while the valve is open, the blowdown is timed rather than in direct response to a sensor reading. Rather than relying upon a fixed time, where the blowdown could be much longer than necessary if the reading is just barely off the set point value, proportional blowdown adjusts the time appropriately.

If Trap Sample is Disabled, then the blowdown is not timed, and the Hold Time and Maximum Blowdown time are not used. The blowdown valve will stay open until the conductivity is below set point. In this case the Output Time Limit menu is available to stop the blowdown if the sensor is unresponsive.

Note that the software will not allow two relays using Intermittent Sampling to be assigned to the same sensor input; the previous relay set up will change to Off mode.

Output Details

The details for this type of output include the relay on/off state, relay status (HOA mode, Interlock status, Intermittent Sampling cycle step, etc.), time remaining for the active Intermittent Sampling cycle step, alarms related to this output, current cycle on time, relay type, the live reading of the conductivity, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the conductivity value below which the controller will not start a blowdown cycle.

Proportional Band	(only shown if trap sample is enabled) Enter the conductivity value above the set point at which the maximum blowdown time will occur. For example, if the Set point is 2000 uS/cm, and the Proportional Band is 200 uS/cm, then if the conductivity is above 2200 uS/cm the blowdown valve will open for the Maximum Blowdown time described below. If the conductivity of the trapped sample is 2100 uS/cm, the blowdown valve will open for half the Maximum Blowdown time.
Deadband	(only shown if trap sample is disabled) Enter the sensor process value away from the set point at which the relay will deactivate.
Sample Time	Enter the length of time the blowdown valve will be open in order to capture a fresh sample of boiler water.
Hold Time	(only shown if trap sample is enabled) Enter the length of time the blowdown valve will be closed in order to ensure that the captured sample is at boiler pressure.
Maximum Blowdown	(only shown if trap sample is enabled) Enter the maximum length of time that the blowdown valve will be open, when the conductivity of the captured sample is above the set point plus the proportional band.
Wait Time	Enter the time to wait to sample the water again once the captured sample is below set point.
Trap Sample	Enable or disable trapping of the sample.
Cond Input	Select the sensor to be used by this relay.

5.3.11 Relay, Manual Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings

A Manual relay will activate if the HOA mode is Hand, or if it is Activated With another channel.

On Delay Time	Enter the delay time for relay activation in hours:minutes:seconds. Set the time to 00:00:00 to immediately activate the relay.
Off Delay Time	Enter the delay time for relay deactivation in hours:minutes:seconds. Set the time to 00:00:00 to immediately deactivate the relay.

5.3.12 Relay, Pulse Proportional Control Mode

ONLY AVAILABLE IF CONTROLLER INCLUDES PULSE OUTPUT HARDWARE

Output Details

The details for this type of output include the relay pulse rate, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the sensor process value at which the output will pulse at the Minimum Output % set below.
Proportional Band	Enter the distance that the sensor process value is away from the set point beyond which the output will be pulsing at the Maximum Output % set below.
Minimum Output	Enter the lowest possible pulse rate as a percentage of the Maximum Stroke Rate set below (normally 0%).
Maximum Output	Enter the highest possible pulse rate as a percentage of the Maximum Stroke Rate set below.
Maximum Rate	Enter the maximum pulse rate that the metering pump is designed to accept (10 - 360 pulse/minute range).
Input	Select the sensor to be used by this relay.

Direction	Set the control direction.

5.3.13 Relay, PID Control Mode

ONLY AVAILABLE IF CONTROLLER INCLUDES PULSE OUTPUT HARDWARE & HVAC MODE IS DISABLED

The PID algorithm controls a solid state relay using standard Proportional-Integral-Derivative control logic. The algorithm provides feedback control based on an error value continuously calculated as the difference between a measured process variable and a desired set point. Tuning settings specify the response for proportional (the size of the error), integral (the time that the error has been present), and derivative (the rate of change for the error) parameters. With proper tuning, the PID control algorithm can hold the process value close the set point while minimizing overshoot and undershoot.

Normalized Error

The error value versus set point that is calculated by the controller is normalized and represented as percent of full scale. As a result, tuning parameters entered by the user are not dependent upon the scale of the process variable and the PID response with similar settings will be more consistent even when using different types of sensor inputs.

The scale used to normalize the error is dependent upon the type of sensor selected. By default, the full nominal range of the sensor is used. This range is editable by the user if tighter control is desired.

PID Equation Formats

The controller supports two different forms of the PID equation as specified by the Gain Form setting. The two forms require different units for entry of the PID tuning parameters.

Standard

The standard form is more commonly used in industry because its time-based settings for the integral and derivative coefficients are more meaningful. This form is selected by default.

Parameter	Description	Units
K_p	Gain	unitless
T_i	Integral Time	seconds or seconds/repeat
T_d	Derivative Time	seconds

$$Output\ (\%) = K_p \left[e(t) + \frac{1}{T_i} \int e(t)dt + T_d \frac{de(t)}{dt} \right]$$

Parameter	Description	Units
e(t)	Current Error	% of full scale
dt	Delta Time Between Readings	seconds
de(t)	Difference Between Current Error & Previous Error	% of full scale

Parallel

The parallel form allows the user to enter all parameters as Gains. In all cases, larger gain values result in faster output response.

Parameter	Description	Units
K_p	Proportional Gain	unitless
K_i	Integral Gain	1/seconds
K_d	Derivative Gain	seconds

$$Output\ (\%) = K_p\ e(t)\ +\ K_i \int e(t)dt\ +K_d \frac{de(t)}{dt}$$

Integral Value Management

To determine the integral component of the PID calculation, the controller software must maintain a running total of the accumulated area under the error curve (Current Integral). The sign of the value added to the accumulated Current Integral during each cycle may be positive or negative based on the current Direction setting as well as the relative values of the current process reading and the set point.

Override Control

The Current Integral accumulates when the output is set to Auto mode. If the controller is switched to Off mode, the value no longer accumulates, but it is not cleared. Therefore, PID control will resume where it left off if the controller is switched from Off back to Auto. Similarly, accumulation of the Control Integral will be suspended if the output is interlocked and resume after the lock-out is removed.

Bumpless Transfer

When the output is switched from Hand to Auto mode, the controller calculates a value for the Current Integral using the current error to generate the same output percent as the Hand Output setting. This calculation does not use the Derivative tuning setting to minimize errors from momentary fluctuations in the input signal. This feature ensures a smooth transition from manual to automatic control with minimal overshoot or undershoot as long as the user sets the Hand Output percentage close to the value that the process is expected to require for optimal control in Auto mode.

Wind-up Suppression

The Current Integral value that is accumulating while the output is set to Auto can become very large or very small if the process value remains on the same side of the set point for a prolonged period of time. However, the controller may not be able to continue to respond if its output is already set to the minimum or maximum limits (0-100% by default). This condition is referred to as Control Wind-Up and can result severe overshoot or undershoot after a prolonged upset has ended.

For example, if the process value remains far below the set point despite a control output being pinned at 100%, the Current Integral will continue to accumulate errors (wind-up). When the process value finally rises to above the set point, negative errors will begin to decrease the Current Integral value. However, the value may remain large enough to keep the output at 100% long after the set point is satisfied. The controller will overshoot the set point and the process value will continue to rise.

To optimize system recovery after wind-up situations, the controller suppresses updates to the Current Integral that would drive the output beyond its minimum or maximum limit. Ideally, the PID parameters will be tuned and the control elements (pump, valves, etc.) will be sized properly so that the output never reaches its minimum or maximum limit during normal control operations. But with this wind-up suppression feature, overshoot will be minimized should that situation occur.

Output Details

The details for this type of output include the pulse rate in %, HOA mode or Interlock status, input value, current integral, current and accumulated on-times, alarms related to this output, relay type, and the current control mode setting.

Set Point	Numeric entry of a process value used as a target for PID control. The default value, units and display format (number of decimal places) used during data entry are defined based on the Input channel setting selected.
Gain	When the Gain Form setting is Standard, this unitless value is multiplied by the total of the proportional, integral, and derivative terms to determine the calculated output percent.

Proportional Gain	When the Gain Form setting is Parallel, this unitless value is multiplied by the normalized error (current process value versus set point) to determine the proportional component of the calculated output percent.
Integral Time	When the Gain Form setting is Standard, this value is divided into the integral of the normalized error (area under the error curve), then multiplied by the Gain to determine the integral component of the calculated output percent.
Integral Gain	When the Gain Form setting is Parallel, this value is multiplied by the integral of the normalized error (area under the error curve) to determine the integral component of the calculated output percent.
Derivative Time	When the Gain Form setting is Standard, this value is multiplied by the change in error between the current reading and the previous reading, then multiplied by the Gain to determine the derivative component of the calculated output percent.
Derivative Gain	When the Gain Form setting is Parallel, this value is multiplied by the change in error between the current reading and the previous reading to determine the derivative component of the calculated output percent.
Reset PID Integral	The PID Integral Value is a running total of the accumulated area under the error curve (Current Integral). When this menu option is selected, this total is set to zero and the PID algorithm is reset to its initial state.
Minimum Output	Enter the lowest possible pulse rate as a percentage of the Maximum Stroke Rate set below (normally 0%).
Maximum Output	Enter the highest possible pulse rate as a percentage of the Maximum Stroke Rate set below.
Maximum Rate	Enter the maximum pulse rate that the metering pump is designed to accept (10 – 480 pulse/minute range).
Input	Select the sensor to be used by this relay
Direction	Set the control direction. This setting is used to determine the sign of the calculated error (current process value versus set point) and allows flexible control with only positive values for all PID tuning parameters.
Input Minimum	The low end of the sensor input range, used to normalize errors into percent of full scale units. These values are set to the nominal range of the selected input sensor by default.
Input Maximum	The high end of the sensor input range, used to normalize errors into percent of full scale units. These values are set to the nominal range of the selected input sensor by default.
Gain Form	Select the PID Equation Format used to enter tuning parameters.

5.3.14 Relay, Dual Set Point Mode

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings 

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the first sensor process value at which the relay will activate.
Set point 2	Enter the second sensor process value at which the relay will activate.
Deadband	Enter the sensor process value away from the set point at which the relay will deactivate.
Duty Cycle Period	Using a duty cycle helps to prevent overshooting the set point in applications where the response of the sensor to chemical additions is slow. Specify the amount of time for the cycle, and the percentage of that cycle time that the relay will be active. The relay will be off for the rest of the cycle, even if the set point has not been satisfied. Enter the length of the duty cycle in minutes:seconds in this menu. Set the time to 00:00 if use of a duty cycle is not required.

Duty Cycle	Enter the percentage of the cycle period that the relay will be active. Set the percentage to 100 if use of a duty cycle is not required.
On Delay Time	Enter the delay time for relay activation in hours:minutes:seconds. Set the time to 00:00:00 to immediately activate the relay.
Off Delay Time	Enter the delay time for relay deactivation in hours:minutes:seconds. Set the time to 00:00:00 to immediately deactivate the relay.
Input	Select the sensor to be used by this relay.
Direction	Select the control direction. In Range will activate the relay when the input reading is between the two set points. Out of Range will activate the relay when the input reading is outside the two set points.
Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.15 Relay, Timer Control Mode

ONLY AVAILABLE IF HVAC MODES ARE DISABLED IN CONFIG MENU – GLOBAL SETTINGS

Basic Timer Operation

When a timer event triggers the algorithm will activate the relay for the programmed time.

Special Condition Handling

Overlapping timer events

If a second timer event occurs while the first one is still active, the second event will be ignored. An Event Skipped alarm will be set.

Interlock Conditions

Interlocks override the relay control, but do not change the operation of the timer control.

A digital input or output interlock condition does not delay the relay activation. The relay activation duration timer will continue even if the relay is deactivated due to an interlock condition. This will prevent delayed events which can potentially cause problems in they do not occur at the correct time.

"Activate With" Conditions

"Activate with channels" settings override the relay control, but do not change the operation of the timer control. The relay activation duration timer continues counting when the timer relay is forced on, and ends at the expected time (event start time plus duration). If the "activate with" condition continues after the end of the event time, the relay remains activated.

Alarms

An Event Skipped alarm is set when a second timer event occurs while one event is still running.

An Event Skipped alarm is also set when the timer relay never turns on during an event because of an interlock condition.

The alarm is cleared when the relay is next activated for any reason (the next timer event or HAND mode or "activate with" force on condition).

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting. The current week number and day of the week is displayed (even if there is no multi-week repetition event programmed). Cycle Time shows the time counting down of the currently active part of the timer cycle.

Settings 

Touch the Settings icon to view or change the settings related to the relay.

Event 1 (through 10)	Enter these menus to program timer events via the menus below:
Repetition	Select the time cycle to repeat the event: Hourly, Daily, 1 Week, 2 Week, 4 Week, or None. An event means that the output is turned on at the same time of day, for the same amount of time, and except for the Daily cycle, on the same day of the week.
Week	Only appears if Repetition is longer than 1 Week. Select the week during which the event will occur.
Day	Only appears if Repetition is longer than Daily. Select the day of the week during which the event will occur.
Events Per Day	Only appears if Repetition is Hourly. Select the number of events per day. The events occur on the Start Time and then evenly spaced throughout the day.
Start Time	Enter the time of day to start the event.
Duration	Enter the amount of time that the relay will be on.
Add Last Missed	Select Enabled if the controller should delay start the most recent Biocide cycle until immediately after an Interlock clears, or Disabled if all Biocide feed should be skipped if there is an Interlock condition at the time the add was due to start.

5.3.16 Relay, Probe Wash Control Mode

Basic Timer Operation

When a Probe Wash event triggers, the algorithm will activate the relay for the programmed time. The relay will activate a pump or valve to supply a cleaning solution to the sensor or sensors. The output of the selected sensors will either be held or disabled during the cleaning cycle, and for a programmable hold time after the cleaning cycle.

Special Condition Handling

Overlapping timer events

If a second timer event occurs while the first one is still active, the second event will be ignored. An Event Skipped alarm will be set.

Interlock Conditions

Interlocks override the relay control, but do not change the operation of the timer control.

A digital input or output interlock condition does not delay the relay activation. The relay activation duration timer will continue even if the relay is deactivated due to an interlock condition. This will prevent delayed events which can potentially cause problems in they do not occur at the correct time.

"Activate With" Conditions

"Activate with channels" settings override the relay control, but do not change the operation of the timer control. The relay activation duration timer continues counting when the timer relay is forced on, and ends at the expected time (event start time plus duration). If the "activate with" condition continues after the end of the event time, the relay remains activated.

Alarms

An Event Skipped alarm is set when a second timer event occurs while one event is still running.

An Event Skipped alarm is also set when the timer relay never turns on during an event because of an interlock condition.

The alarm is cleared when the relay is next activated for any reason (the next timer event or HAND mode or "activate with" force on condition).

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting. The current week number and day of the week is displayed (even if there is no multi-week repetition event programmed). Cycle Time shows the time counting down of the currently active part of the timer cycle.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Event 1 (through 10)	Enter these menus to program timer events via the menus below:
Repetition	Select the time cycle to repeat the event: Hourly, Daily, 1 Week, 2 Week, 4 Week, or None. An event means that the output is turned on at the same time of day, for the same amount of time, and except for the Daily cycle, on the same day of the week.
Week	Only appears if Repetition is longer than 1 Week. Select the week during which the event will occur.
Day	Only appears if Repetition is longer than Daily. Select the day of the week during which the event will occur.
Events Per Day	Only appears if Repetition is Hourly. Select the number of events per day. The events occur on the Start Time and then evenly spaced throughout the day.
Start Time	Enter the time of day to start the event.
Duration	Enter the amount of time that the relay will be on.
Input	Select the sensor that will be washed.
Input 2	Select the second sensor, if applicable, that will be washed.
Sensor Mode	Select the effect that the probe wash event will have on any control outputs that use the sensor(s) being washed. The options are to either Disable the sensor readings (turn the control output off) or Hold the sensor reading at the last valid sensor reading prior to the start of the probe wash event.
Hold Time	Enter the amount of time needed to hold the sensor reading after the event has finished, in order for the wash solution to be replaced by process solution.

5.3.17 Relay, Spike Control Mode

Basic Timer Operation

This algorithm is typically used to provide a baseline amount of chlorine for disinfection, and periodically shocking the system with a larger dose. During normal operation, the relay will be reacting to the sensor to maintain a set point within a programmable Deadband, as described in On/Off Control Mode above. When a Spike event triggers, the algorithm will change from the normal set point to the Spike Set Point, for the programmed time. Once the time expires, control to the normal set point resumes. The Onset Time setting allows the user to decide if the programmed spike duration time starts counting down immediately, or if the controller will wait until the higher set point is achieved
(or the onset time expires, whichever comes first) before starting the spike Duration timer.

Special Condition Handling

Overlapping timer events

If a second timer event occurs while the first one is still active, the second event will be ignored. An Event Skipped alarm will be set.

Interlock Conditions

Interlocks override the relay control, but do not change the operation of the timer control.
A digital input or output interlock condition does not delay the relay activation. The relay activation duration timer will continue even if the relay is deactivated due to an interlock condition. This will prevent delayed events which can potentially cause problems in they do not occur at the correct time.

“Activate With” Conditions

“Activate with channels” settings override the relay control, but do not change the operation of the timer control.

The relay activation duration timer continues counting when the timer relay is forced on, and ends at the expected time (event start time plus duration). If the “activate with” condition continues after the end of the event time, the relay remains activated.

Alarms

An Event Skipped alarm is set when a second timer event occurs while one event is still running.

An Event Skipped alarm is also set when the timer relay never turns on during an event because of an interlock condition.

The alarm is cleared when the relay is next activated for any reason (the next timer event or HAND mode or “activate with” force on condition).

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, current cycle on time, relay type and alarms. The current week number and day of the week is displayed (even if there is no multi-week repetition event programmed). Cycle Time shows the time counting down of the currently active part of the cycle.

Settings 

Press the Settings key view or change the settings related to the relay.

Set point	Enter the sensor process value at which the relay will activate.
Spike Set point	Enter the sensor process value at which the relay will activate during the Spike Event time.
Deadband	Enter the sensor process value away from the set point at which the relay will deactivate. The same Deadband is used for the normal Set Point and the Spike Set Point.
Onset Time	The onset time determines when the duration timer starts. If set to zero, the duration time starts immediately. If set higher than that, the controller will not start the duration timer until the spike set point is achieved, or until the onset time is over, whichever comes first.
Duty Cycle Period	Using a duty cycle helps to prevent overshooting the set point in applications where the response of the sensor to chemical additions is slow. Specify the amount of time for the cycle, and the percentage of that cycle time that the relay will be active. The relay will be off for the rest of the cycle, even if the set point has not been satisfied. Enter the length of the Duty Cycle Period in minutes:seconds in this menu. Set the time to 00:00 if use of a duty cycle is not required.
Duty Cycle	Enter the percentage of the cycle period that the relay will be active. Set the percentage to 100 if use of a duty cycle is not required.
Event 1 (through 8)	Enter these menus to program spike events via the menus below:
Repetition	Select the time cycle to repeat the event: Daily, 1 Week, 2 Week, 4 Week, or None. An event means that the output is turned on at the same time of day, for the same amount of time, and except for the Daily cycle, on the same day of the week.
Week	Only appears if Repetition is longer than 1 Week. Select the week during which the event will occur.
Day	Only appears if Repetition is longer than Daily. Select the day of the week during which the event will occur.
Start Time	Enter the time of day to start the event.
Duration	Enter the amount of time that the relay will be on.
Input	Select the sensor to be used by this relay.
Direction	Select the control direction.

Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.18 Relay Output, Flow Proportional Mode

ONLY AVAILABLE IF CONTROLLER INCLUDES PULSE OUTPUT HARDWARE

Overview

In Flow Proportional control mode, the controller monitors the rate of flow through an analog or digital flow meter, and continuously adjusts the proportional band to achieve a target PPM level.

The user enters the target PPM and the data necessary to calculate the proportional band (the water flow rate at which the maximum pulse rate will occur) required to maintain the target PPM with that flow rate of water.

$$\%\ output = \frac{Target\ PPM \times Water\ Flow\ Rate\ (liter/min\ or\ gal/min)}{Cycles \times Pump\ Rating\ (liter\ or\ gal/hr) \times Pump\ Setting\ (\%) \times Specific\ Gravity \times 166.67}$$

$$\%\ output = \frac{Target\ PPM \times Water\ Flow\ Rate\ (m^3/min)}{Cycles \times Pump\ Rating\ (liter/hr) \times Pump\ Setting\ (\%) \times Specific\ Gravity \times 0.16667}$$

Control Operation

If the output is continuously on for longer than the Output Time Limit, then output will deactivate.

Output Details

The details for this type of output include the output %, HOA mode or Interlock status, alarms related to this output, flow input value, current cycle on time, total accumulated on-time, raw pulse rate output, and the current control mode setting.

Settings 

Touch the Settings icon to view or change the settings related to the relay.

Target	Enter the desired PPM set point for the product.
Pump Capacity	Enter the maximum flow rate for the metering pump
Pump Setting	Enter the stroke length setting for the metering pump, in percent
Specific Gravity	Enter the specific gravity of the product to be added.
Maximum Rate	Enter the maximum pulse rate that the metering pump is designed to accept (10 - 360 pulse/minute range).
Hand Output	Enter the output % desired when the output is in Hand mode
Flow Input	Select the flow meter to be used as an input for this control relay

5.3.19 Relay, Target PPM Control Mode

ONLY AVAILABLE IF HVAC MODE IS ENABLED

Overview

In Target PPM control mode, the controller monitors the total volume of flow through up to two analog or digital flow meters, and after a programmable volume has been accumulated, the relay activates for a calculated time to achieve a target PPM level.

The user enters the target PPM, the volume of water to trigger the chemical feed, and the data necessary to calculate the pump on-time required to maintain the target PPM in that volume of water.

$$\text{Pump On-Time (sec.)} = \frac{\text{Accumulator Setpoint (gal or l) x Product Level x 0.0036}}{\text{Cycles x Pump Rating (gal or l/hr.) x Pump Setting (\%) x Specific Gravity (g/cm}^3\text{)}}$$

$$\text{Pump On-Time (sec.)} = \frac{\text{Accumulator Setpoint (m}^3\text{) x Product Level x 3.6}}{\text{Cycles x Pump Rating (l/hr) x Pump Setting (\%) x Specific Gravity (g/cm}^3\text{)}}$$

Control Operation

As flow accumulates, the controller updates a field called Accumulator Total. When this value is greater than or equal to the value set for the Accumulator Volume, the relay activates for the calculated number of seconds, and the accumulated total is reduced by the accumulator volume amount.

If the trigger volume is achieved again before the activation time has expired, the newly calculated on-time per unit volume is added to the remaining on-time. If the relay state is continuously on for longer than the Output Time Limit, then relay will deactivate.

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, total accumulated on-time, alarms related to this output, current cycle on time, remaining on-time, accumulator total, disturbance input value (if used) and adjusted target setpoint (if disturbance input is used), cycles of concentration, relay type and the current control mode setting.

Settings 

Touch the Settings icon to view or change the settings related to the relay

Target	Enter the desired PPM set point for the product.
Pump Capacity	Enter the maximum flow rate for the metering pump.
Pump Setting	Enter the stroke length setting for the metering pump, in percent.
Specific Gravity	Enter the specific gravity of the product to be added.
Accumulator Volume	Enter the volume of water passing through the water meter to trigger the chemical feed.
Flow Input	Select the flow meter to be used as an input for this control relay.
Flow Input 2	Select the second flow meter, if any, to be used as an input for this control relay.
Cycles Input	Select the virtual input that is programmed as a Ratio calculation of the system conductivity/makeup conductivity, or select None.
Low Cycles Limit	Enter the lower limit for cycles of concentration, if used. The calculated on-time is limited to a maximum value if the cycles of concentration gets too low.
Disturbance Input	Select the virtual input or control output that will multiplied by the control setpoint (Target ppm setpoint). A typical application for this is to use a corrosion sensor as the disturbance input to adjust the PPM setpoint.

Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.20 Relay, PPM by Volume Control Mode

ONLY AVAILABLE IF HVAC MODE IS ENABLED. NOT AVAILABLE FOR VIRTUAL OUTPUTS.

Overview

In PPM by Volume control mode, the controller monitors the total volume of flow through up to two analog or digital flow meters, and after a programmable volume has been accumulated, the relay activates until the calculated number of pulses from a flow monitoring device to achieve a target PPM level are received.

The user enters the target PPM, the volume of water to trigger the chemical feed, and the data necessary to calculate the volume of chemical required to maintain the target PPM in that volume of water. The Feed Monitoring device programming (volume/pulse, assignment of the device to a relay output) is entered in the Feed Monitor digital input menus.

$$\textit{Volume to Feed (gal or l)} = \frac{\textit{Accumulated Volume (gal or l) x Target PPM}}{\textit{Cycles x Specific Gravity x } 10^6}$$

$$\textit{Volume to Feed (l)} = \frac{\textit{Accumulated Volume } (m^3) \textit{ x Target PPM}}{(\textit{Cycles x Specific Gravity x } 10^6) \textit{ x } 1000}$$

Control Operation

As flow accumulates, the controller updates a field called Accumulator Total. When this value is greater than or equal to the value set for the Accumulator Volume, the relay activates for the calculated number of pulses from the feed monitor, and the accumulated total is reduced by the accumulator volume amount.

If the trigger volume is achieved again before the activation time has expired, the newly calculated feed monitor pulses per unit volume are added to the remaining number. If the relay state is continuously on for longer than the Output Time Limit, then relay will deactivate.

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, total accumulated on-time, alarms related to this output, current cycle on time, remaining feed volume, accumulator total, cycles of concentration, relay type and the current control mode setting.

Settings 

Touch the Settings icon to view or change the settings related to the relay

Target	Enter the desired PPM set point for the product.
Specific Gravity	Enter the specific gravity of the product to be added.
Accumulator Volume	Enter the volume of water passing through the water meter to trigger the chemical feed.
Flow Input	Select the flow meter to be used as an input for this control relay.
Flow Input 2	Select the second flow meter, if any, to be used as an input for this control relay.

Cycles Input	Select the virtual input that is programmed as a Ratio calculation of the system conductivity/makeup conductivity, or select None.
Low Cycles Limit	Enter the lower limit for cycles of concentration, if used. The calculated on-time is limited to a maximum value if the cycles of concentration gets too low.
Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.21 Relay, Flow Proportional Mode

ONLY AVAILABLE IF CONTROLLER INCLUDES PULSE OUTPUT HARDWARE

Overview

In Flow Proportional control mode, the controller monitors the rate of flow through an analog or digital flow meter, and continuously adjusts the pulse proportional output proportional band to achieve a target PPM level.

The user enters the target PPM and the data necessary to calculate the proportional band (the water flow rate at which the maximum pulse rate will occur) required to maintain the target PPM with that flow rate of water.

$$\%\ output = \frac{Target\ PPM \times Water\ Flow\ Rate\ (liter/min\ or\ gal/min)}{Cycles \times Pump\ Rating\ (liter\ or\ gal/hr) \times Pump\ Setting\ (\%) \times Specific\ Gravity \times 166.67}$$

$$\%\ output = \frac{Target\ PPM \times Water\ Flow\ Rate\ (m^3/min)}{Cycles \times Pump\ Rating\ (liter/hr) \times Pump\ Setting\ (\%) \times Specific\ Gravity \times 0.16667}$$

Control Operation

If the output is continuously on for longer than the Output Time Limit, then output will deactivate.

Output Details

The details for this type of output include the output %, HOA mode or Interlock status, alarms related to this output, current cycle on time, total accumulated on-time, cycles of concentration, pulse rate, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Target	Enter the desired PPM set point for the product.
Pump Capacity	Enter the maximum flow rate for the metering pump.
Pump Setting	Enter the stroke length setting for the metering pump, in percent.
Specific Gravity	Enter the specific gravity of the product to be added.
Hand Output	Enter the output % desired when the output is in Hand mode.
Flow Input	Select the flow meter to be used as an input for this control relay.

Cycles Input	Select the virtual input that is programmed as a Ratio calculation of the system conductivity/makeup conductivity, or select None.
Low Cycles Limit	Enter the lower limit for cycles of concentration, if used. The calculated on-time is limited to a maximum value if the cycles of concentration gets too low.

5.3.22 Relay, Counter Timer Control Mode

ONLY AVAILABLE IF HVAC MODES ARE DISABLED IN CONFIG MENU – GLOBAL SETTINGS

The Counter Timer algorithm activates the relay for a programmable amount of time, triggered by the accumulation of a programmable number of contact closures from a Digital Counter type input.

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, time on, remaining on-time, accumulator total, total relay activation time, alarms related to this output, relay type and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Feed Duration	Enter the amount of time for the relay to activate for once the accumulated setpoint number of contact closures has been reached.
Accumulated Setpoint	Enter the number of contact closures required to trigger the relay activation.
Input	Select the input to be used to control this output.
Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.23 Relay Output, On/Off Disturbance Control Mode

On/Off control mode is enhanced to add a disturbance input that is multiplied by the user-entered setpoint. An example of this might be the control of a corrosion inhibitor containing PTSA based upon a fluorometer sensor input, with the setpoint modified based upon a corrosion sensor Disturbance Input, so a higher corrosion reading results in more corrosion inhibitor being fed. Another example might be cooling tower conductivity control on cycles of concentration, with the cycles setpoint modified by a Disturbance Input of Makeup Conductivity.

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, input value, current setpoint, disturbance input value, relay type, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the sensor process value at which the relay will activate.
Deadband	Enter the sensor process value away from the set point at which the relay will deactivate.

Duty Cycle Period	Using a duty cycle helps to prevent overshooting the set point in applications where the response of the sensor to chemical additions is slow. Specify the amount of time for the cycle, and the percentage of that cycle time that the relay will be active. The relay will be off for the rest of the cycle, even if the set point has not been satisfied. Enter the length of the duty cycle in minutes:seconds in this menu. Set the time to 00:00 if use of a duty cycle is not required.
Duty Cycle	Enter the percentage of the cycle period that the relay will be active. Set the percentage to 100 if use of a duty cycle is not required.
On Delay Time	Enter the delay time for relay activation in hours:minutes:seconds. Set the time to 00:00:00 to immediately activate the relay
Off Delay Time	Enter the delay time for relay deactivation in hours:minutes:seconds. Set the time to 00:00:00 to immediately deactivate the relay
Input	Select the sensor to be used by this relay.
Direction	Select the control direction.
Disturbance Input	Select the virtual input or analog output to be multiplied by the control setpoint.
Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.24 Relay Output, Volumetric Blending Control Mode

Volumetric Blending is used to mix two liquid streams together at a fixed ratio. The relay controls a diverter valve that alternates between two sources, metering in a programmable accumulator volume when the relay is deactivated, and then switches to a programmable blend volume when the relay is activated.

This control mode includes an optional disturbance input that is multiplied by the user-entered blend volume. A common example is to mix two cooling tower makeup water sources, and then to use the makeup conductivity as a disturbance input to adjust the ratio.

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, accumulated on-time, alarms related to this output, relay type, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Accumulator Volume	Enter the volume through the flow meter with the relay deactivated.
Blend Volume	Enter the volume through the flow meter with the relay activated.
Flow Input	Select the flowmeter input to be used to control this output.
Disturbance Input	Select the virtual input or analog output to be used to multiplied by the control setpoint (Blend Volume).

Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.25 Relay, Dual Switch Control Mode

Dual Switch mode is typically used to fill or empty a tank, using a level switch contact closure to activate the relay when the liquid level is at one extreme and deactivate the relay at the other extreme. It is more versatile than that; the on and off triggers may be any digital input or relay output state.

Note that the Dual Switch control relay will only respond to trigger relay state changes that occur when that relay is in Auto mode, not if the trigger is activated manually using Hand or Off modes.

Output Details

The details for this type of output include the relay on/off state, HOA mode Interlock or delay status, current cycle on time, time on over the past 24 hours, the total accumulated on-time since the last reset, alarms related to this output, relay type, and the current control mode setting.

Settings 

Touch the Settings icon to view or change the settings related to the relay.

On Switch	Select the digital input or output that will trigger the relay to activate.
Activate On	Select the state of the digital input or output that will trigger the relay to activate.
On Delay Time	Enter the delay time for relay activation in hours:minutes:seconds. Set the time to 00:00:00 to immediately activate the relay.
Off Switch	Select the digital input or output that will trigger the relay to de-activate.
Activate Off	Select the state of the digital input or output that will trigger the relay to deactivate.
Off Delay Time	Enter the delay time for relay deactivation in hours:minutes:seconds. Set the time to 00:00:00 to immediately deactivate the relay.
Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.26 Relay, Boolean Logic Control Mode

In Boolean Logic control mode, the output is activated based on the state of two inputs, using AND, OR, or Inverse operators. The inputs to the algorithm can be the state of relay or virtual outputs, as well as the state of digital or remote Modbus digital inputs. If more than two state inputs are necessary, a virtual Boolean output can be used as an input to another Boolean control relay.

Output Details

The details for this type of output include the relay on/off state, HOA mode Interlock or delay status, current cycle on time, time on over the past 24 hours, the total accumulated on-time since the last reset, alarms related to this output, relay type, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Operation	Select the operation to use to activate the relay. Choices are Input 1 AND Input 2, Input 1 OR Input 2, and Inverse Input.
Input 1	Select the digital input or output that will be used as Input 1 in the Operation used to trigger the relay to activate.
Activate	Select the state of the digital input (open or closed) or output (on or off) that will be used as Input 1 in the Operation used to trigger the relay to activate.
Input 2	Not available for Inverse Operation. Select the digital input or output that will be used as Input 2 in the Operation used to trigger the relay to activate.
Activate	Not available for Inverse Operation. Select the state of the digital input (open or closed) or output (on or off) that will be used as Input 2 in the Operation used to trigger the relay to activate.
On Delay Time	Enter the delay time for relay activation in hours:minutes:seconds. Set the time to 00:00:00 to immediately activate the relay.
Off Delay Time	Enter the delay time for relay deactivation in hours:minutes:seconds. Set the time to 00:00:00 to immediately deactivate the relay.
Alarm	Select if activation or deactivation of the Boolean Logic output should produce an alarm or not.
Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.27 Relay or Analog Output, Lag Control Mode

NOT AVAILABLE FOR VIRTUAL OUTPUTS

Overview

The Lead Lag control mode allows a group of outputs to be controlled by a single control algorithm using a variety of configurations. The control mode support backup pumps operation, alternate pump with wear leveling, and the activation of additional outputs after a time delay, or based on alternate set points, or based on digital state changes.

A Lead Lag group consists of a single Lead output and one or more Lag outputs. The Lead output can be set to any control mode. The new Lag control mode can be selected for any number of additional outputs (limited only by the number of outputs available within the controller). A setting for each Lag output allows selection of a Lead output that is used to create an ordered group of Lead Lag relays.

Example: R1 is an On/Off relay, R2 is set for Lag mode with a Lead output of R1. R3 is set as an additional Lag mode relay with a Lead output of R2, thus creating an ordered chain of three relays in the Lead Lag group (R1←R2←R3). After the group is defined, the Lead output (R1) operates with the standard On/Off Control func-

tionality. The last Lag mode relay in the chain (R3) offers various settings that are used to define the desired control operations for the entire Lead Lag group. Selectable Lead Lag control options include backup, wear leveling, and/or activating additional outputs based on various criteria.

Backup Pump Control
By default, Lead Lag groups always provide backup operation if the Lead control mode determines that its output should be energized but it is disabled due to a Flow Verify alarm and/or because the Lead output HOA setting is Off or Hand (not in Auto mode).

Wear Leveling Modes
The order of Lead and Lag output activation can be changed based on configurable wear leveling modes. This option is intended to allow users to manage the usage of primary and secondary pumps within a system. One wear leveling mode selects a different output each time the group is activated. Additional modes vary the activation of the pumps within the group based on the time-on for each output, with the intent to either balance the usage of each pump or to energize the primary output most often and periodically exercise auxiliary pumps to insure proper operation when they are needed.

Output Activation Modes
Depending on the control mode selected for the Lead output, Lag output(s) can be configured for activation of additional outputs based on one or more of the following criteria:
On-time (for example, energize a second relay 10 minutes after the primary relay is turned on)
Control set points (for example, energize a second relay if the pH continues to rise)
Switch change (for example, energize a second pump to maintain a tank level when the low-low level switch opens

Control Operation

Backup Pump Control
The default control operation for the Lead Lag group is that if a condition exists that prevents one relay from being activated, it is skipped and the next output in the group is turned on instead. This situation may occur if the output is experiencing an active Flow Verify alarm or the output is not in Auto mode. Backup control using a Lag output does not require any additional settings and could be used to create an output for a backup pump to be activated only if the main pump loses prime and/or is taken out of service for maintenance.

Example: A Lead Lag group consisting of R1, R2 & R3 is configured (R1←R2←R3). All three pumps have PosiFlow monitors wired to inputs D1, D2 & D3, respectively. R1 uses On/Off mode to control caustic feed to maintain a pH set point above 7.0. R1 and R3 pumps are in Auto mode, R2 pump has been taken out of service for maintenance and is currently in HOA Off mode. The process pH falls below 7.0 and R1 is energized. Before the pH rises to satisfy the dead band, the D1 PosiFlow input monitors an error condition and activates a Flow Verify alarm for the R1 pump. The Lead Lag system de-energizes R1 and checks the status of R2. Because R2 is not is service, R3 is energized to maintain caustic feed.

Each digital input channel set up as a Feed Monitor type has a Flow Alarm Mode setting used to specify how the pump output is handled when Flow Verify alarms are identified. Based on this setting, the Lead Lag group responds as follows:

Disabled	The Flow Verify alarm is never activated and the Lead Lag group is not affected by the status of the PosiFlow input.
Interlock	When a Flow Verify alarm is activated, the related output is immediately turned off; if available, other outputs in the Lead Lag group are activated instead.
Maintain	When a Flow Verify alarm is activated, other outputs in the Lead Lag group are activated instead if they are available; if no other outputs are available, or if additional outputs are required due to Output Activation Mode settings, output(s) reporting a Flow Verify alarm may still be activated as a last resort.

Wear Leveling Modes

After the Lead Lag group is defined, additional parameters can be configured within the settings list of the last output in the group. These options optimize the behavior of the Lead Lag functionality. Several different wear leveling options can be selected to control the order in which outputs are activated.

Disabled

The order in which the Lead and Lag outputs turn on does not change automatically. They are always energized in the same order.

Duty Based

The order in which outputs are activated changes every time the Lead output is activated. How long each individual pump has been running is not considered.

Example: When the Lead output, set for On/Off control, drops below the setpoint, R1 is activated. R1 turns off after its deadband is satisfied. The next time the measurement goes below the setpoint, R2 is activated and R1 remains off. After all outputs in the group have been exercised for one feed cycle, the process begins again with the first output (R1).

Time Balanced

Time balanced mode alternates outputs in a manner that equalizes the runtime of all connected pumps. This mode takes into account how long each output in the Lead Lag group has been running (since a manual reset) and selects the output that has the lowest on-time during each cycle. If the output remains energized longer than the specified cycle time, the time-on for each output is recalculated and a different output may be activated to balance the usage of each.

Example: In a two-pump Lead Lag group, time balanced wear leveling is selected with a cycle time of 2 hours. When the Lead control mode (R1) determines the output should be activated, R2 turns on because it has the lowest accumulated on-time. After 2 hours, if the output remains activated, the on-times are re evaluated and R2 turns off and R1 turns on because it now has the least accumulated total on time. The cycle continues until the Lead control mode determines the feed is complete.

Time Unbalanced

This wear leveling mode improves fault-tolerance of the group by varying the wear on each pump by activating each pump for a different percentage of time. In this mode, a primary output is activated most of the time and secondary (auxiliary) output(s) are activated for a smaller percentage of the total output on-time. This strategy can be useful to ensure that a backup pump is exercised sufficiently so that it will be functional when needed, but does not wear at the same rate as the primary pump to minimize the chances of both pumps failing at the same time. When one Lag pump is defined within the Lead Lag group, the Lead pump runs 60% of the time and the Lag pump runs 40%. If more than two (2) pumps are defined for the group, fixed ratios are used to insure all pumps are exercised periodically and wear at different rates, as shown in the chart.

Percent On	Number of Relays				
Relay	2	3	4	5	6
1	60.0%	47.4%	41.5%	38.4%	36.5%
2	40.0%	31.6%	27.7%	25.6%	24.4%
3		21.1%	18.5%	17.1%	16.2%
4			12.3%	11.4%	10.8%
5				7.6%	7.2%
6					4.8%

Output Activation Modes

Depending on the current control mode selection for the Lead output, additional settings may be available within the settings list of the last output in the group to provide additional option(s) to optimize the behavior of the Lead Lag functionality. Several different activation modes can be selected to control the status of additional output(s) based on either elapsed time, alternate setpoints, and/or alternate switch inputs.

Disabled
No action is taken to activate more than one output within the Lead Lag group of outputs. This mode is used when a group of Lead Lag outputs exists only to provide backup in case of a Flow Verify failure on one of the pumps, or if a pump is taken out of service, and/or if only wear leveling is desired.

Time Based
Lag outputs are activated following the Lead output after a user-settable delay. The same delay value is used for all outputs. This menu selection is available only when the Lead output is using On/Off, Dual Setpoint, Spike or Manual control modes.

Example: If the Lead output is set to Manual, this control option could be used to force on the output based on a digital input signal (e.g., level switch). If the level switch remains open for more than the specified delay time, the second output in the Lead Lag group is energized. If another delay time elapses, a third output (if available) is also turned on.

In On/Off, Dual Setpoint, or Spike control modes, additional pump(s) are energized if the process value remains outside the setpoint range for more than the specified delay time.
Example: In a two-output Lead Lag group (R1←R2), the Lead (R1) output, set for Dual Setpoint control, is programmed to energize its output when the D.O. reading is outside the 4.0-4.5 ppb control range with a deadband of 0.1 ppb. Time based output activation is selected with a delay time of 15 minutes. When the D.O. value falls below 4.0 ppb, R1 is activated. After 15 minutes, if the D.O. has not risen to 4.1 ppb or higher, R2 will also be activated. When the process value reaches 4.1 ppb, both outputs are turned off.

Setpoint Based
Each Lag output has its own setpoint(s) and deadband when this option is selected. The setpoints for each output in the Lead Lag group are evaluated individually and outputs are added as needed based on the current process value. Setpoint based activation mode also incorporates time based activation and can also be configured to trigger an additional pump (if available) after a specified delay time. This menu selection is available only when the Lead output is using On/Off or Dual Setpoint control modes.

Example 1: The Lead output (R1) is set for On/Off control of pH with a setpoint of 8.50, a deadband of 0.20 and a "force lower" control direction. The first Lag output (R2) has a setpoint of 9.00 and a deadband of 0.20. The second Lag output (R3) has a setpoint of 9.50 and a deadband of 0.20. The delay time is disabled (set for 0:00 minutes). Wear leveling is disabled. When the pH goes above 8.50, R1 energizes. If the pH proceeds to exceed 9.00, R2 energizes. And if the pH rises above 9.50, R3 energizes. When the pH decreases to below 9.30, R3 goes off. When the pH falls to below 8.80, R2 goes off. And finally, when the pH decreases to below 8.30, R1 is turned off.

Example 2: The same three-pump configuration (R1←R2←R3) as in Example 1 except the delay time is set for 30 minutes. When the pH goes above 8.50, R1 energizes. If 30 minutes passes before the pH exceeds 9.00 or drops below 8.30, R1 remains on and R2 is energized. If the pH then rises above 9.00, the next output in the group, R3, is energized. If the pH continues to rise and exceeds 9.50, no additional action is possible. When the pH decreases to below 8.80, R3 goes off. When the pH falls to below 8.30, both R1 and R2 are turned off.

This control is very similar to the operation if three (3) separate On/Off control outputs are configured all with the pH as Input and using the setpoints listed above. However, the Lead Lag option improves on this control by incorporating backup pump controls and optional time based activation. If the pH rises above 8.50 when pump R1 has an active Flow Verify alarm or is in HOA Off mode, pump R2 immediately energizes. R3 energizes when the pH goes above 9.00. Although no third pump is available to activate if the pH continues to rise above 9.50, this control system is more fault tolerant than the currently available options.

Switch Based
When using switch based activation mode, each Lag output has an Activate With Channels setting that is used to specify one or more digital input or relay output channels that activates an additional output. Switch based activation mode incorporates time based activation and can also be configured to trigger an additional output (if available) after a specified delay time. This menu selection is available only when the Lead output is using Manual control mode.

Example 1: A lift station includes a tank with a high level switch (D1) and a high-high level switch (D2). Three pumps are configured as a Lead Lag group (R1←R2←R3). The Lead output (R1) is set for Manual control mode with an Activate With Channels selection of D1 (high level switch), R1 will be energized if D1 closes. The first Lag output (R2) has an Activate With Channels selection of D2 (high-high level switch). The last Lag output (R3) has no Activate With Channels selected. All pumps are in HOA Auto mode. The delay time is disabled (set for 0:00 minutes). Wear leveling is disabled. When the high level switch closes, the R1 pump is activated. If the high-high level switch closes, the R2 pump is also activated. When D2 opens, R2 is turned off. When D1 opens, R1 is turned off. In this configuration, the R3 pump serves only as a backup in case one of the pumps is down for maintenance (in HOA Off mode).

Example 2: The same lift station, two-level switches, three-pump configuration (R1←R2←R3) as in Example 1 except the delay time is set for 1 hour. When the high level switch closes, the R1 pump is activated. If the high-high level switch closes, the R2 pump is also activated. If the tank level remains above the high-high level switch for another 1 hour, the R3 pump is activated. When D2 opens, R3 is turned off. When D1 opens, both R2 and R1 are turned off. In this configuration, the R3 pump serves not only as a backup in case one of the pumps is down for maintenance, but also provides additional capacity should it be needed.

Advanced Functionality

The examples listed above detail the control behavior if wear leveling or output activation modes are enabled. The features are implemented independently. Wear Leveling modes are used to determine which output(s) are activated. Output Activation modes determine how many output(s) are activated at one time. More advanced output control strategies can be implemented when these features are used in combination.

Example: In a two-pump scenario, the Lead output (R1) is set for On/Off control of pH with a setpoint of 8.50, deadband of 0.20 and a "force lower" control direction. The Lag output (R2) has a setpoint of 9.00 and a deadband of 0.20. Time unbalanced (60/40) wear leveling is selected with a cycle time of 15 minutes. When the pH goes above 8.50, the on-times for each pump are evaluated. If R1 has been on less than 80% of the total time for the two pumps, it is energized. Otherwise, R2 has been on for less than 20% of the total time, so it is energized. If the pH remains above the deadband and does not exceed the second setpoint (8.30 < pH < 9.00), the pump selection is re-evaluated every 15 minutes and, if warranted, the pump in operation is switched. If the pH proceeds to exceed 9.00, both pumps are energized and wear leveling is no longer a consideration. When the pH fails to below 8.80, the pump on-times are again evaluated and the appropriate pump is turned off.

Note that while this control is quite powerful, it might cause confusion with users because the setpoints entered for a specific pump within the Lead Lag group may not coincide with the setpoints used to activate that particular pump during operation. The information shown on the Details pages for each pump should be sufficient to minimize this ambiguity.

Control Mode Conflicts

Some control modes are incompatible with Lag output functionality because of an interactive relationship between the output and one or more linked inputs:

- Intermittent Sampling – This control mode places a linked sensor into a Hold state during most of its operational cycle
- Probe Wash – This control mode places one or two linked sensors into a Hold state when a wash cycle is in progress and for a specified Hold period afterward

The link between the output and the sensor input(s) cannot be easily transferred to other outputs, so these types of control modes cannot be designated as Lead output for a Lead Lag group. Outputs configured with these types of control modes are not included on the selection list presented for Lead output. Also, the control mode of an output that is the Lead output for a Lead Lag group cannot be changed to one of these types. If selected, the controller will be unable to save the change and an error message will be added to system log.

Output Details

The details for this type of output include the relay on/off state, relay status (HOA mode, Interlock from sensor calibration, probe wash, or other condition), the current cycle and the total on-times, alarms related to this output, the output defined as the Lead of the group, the output that is the Last Lag output of the group, the number of outputs

currently energized within the group, the elapsed time since the last change in the number of outputs energized, the elapsed time since the last wear leveling evaluation, the type of output, and the current control mode setting.

Settings 

Touch the Settings icon to view or change the settings related to the relay.
The Lag control mode output defined as the Last Lag within the Lead Lag group offers settings to define the parameters controlling operation of the entire group.

All Lag mode outputs that are not the Last Lag output in the Lead Lag group (those that are selected as a Lead output from another Lag mode output) offer a more limited list of settings.
Lag Settings (Menus with * are shown only in the Last Lag output settings)

HOA Setting	Select Hand, Off or Auto mode by touching the desired mode
Lead	Select the output that will be the lead output for this relay
Wear Leveling*	Select the wear leveling scheme to use. Refer to the detailed description above.
Wear Cycle Time*	This setting only appears if Time Balanced or Time Unbalanced Wear Leveling has been selected above. Enter the amount of elapsed time before time on totals for each output are reevaluated for wear leveling.
Activation Mode*	This entry is only appears if the control mode of the Lead output is On/Off, Dual Setpoint, Spike or Manual. Select one of the options that will determine if and when an additional output will be activated if the primary output is unable to reach the setpoint.
Set point	This setting only appears if the control mode of the Lead output is On/Off or Dual Setpoint and the Activation Mode above is Setpoint Based. Enter the process value for the input assigned to the Lead output that will trigger an additional output to activate.
Set point 2	This setting only appears if the control mode of the Lead output is Dual Setpoint and the Activation Mode above is Setpoint Based. Enter the process value for the input assigned to the Lead output that will trigger an additional output to activate.
Deadband	This setting only appears if the control mode of the Lead output is On/Off or Dual Setpointand the Activation Mode above is Setpoint Based. Enter the sensor process value away from the set point(s) at which the relay will deactivate.
Delay Time*	This setting only appears if the control mode of the Lead output is On/Off, Dual Setpoint, Spike or Manual. Enter the amount of time, if any, to delay the activation of the output.
Activate With Channels	This setting only appears if the control mode of the Lead output is Manual and the activation mode is Switch Based. Select one or more digital input and/or relay output channels that, if activated, will also activate the Lag output
Reset Time Total	Enter this menu to clear the accumulated time that the output has been activated. This value is used for Time Balanced or Time Unbalanced wear leveling.
Output Time Limit	Enter the maximum amount of time that the relay can be continuously activated. Once the time limit is reached, the relay will deactivate until the Reset Output Timeout menu is entered.
Reset Output Timeout	Enter this menu to clear an Output Timeout alarm and allow the relay to control the process again.
Name	The name used to identify the relay may be changed.
Mode	Select the desired control mode for the output.

Several standard settings that are available for most control modes are not available for Lag outputs. These features affect the entire Lead Lag group and can be specified only within the Lead output's settings. The settings for these fields are propagated down through the entire Lead Lag group when changed for the Lead output. Although the settings for these fields are identical for all outputs in the Lead Lag group, the handling by each Lag output may be independent or group-managed.

Below are the settings that are in the Lead Relay settings that will affect the Lead Lag group:

Interlock Channels	Select the relays and digital inputs that will interlock this relay and all others in the group.
Min Relay Cycle	Enter the number of seconds that will be minimum amount of time that each relay in the group will be in the active or inactive state. Normally this will be set to 0, but if using a motorized ball valve that takes time to open and close, set this high enough that the valve has time to complete its movement.
Hand Time Limit	Enter the amount of time that each relay in the group will activate for when it is in Hand mode.
Hand Output	This menu only appears for pulse relay or analog output Lead outputs. Enter the output % desired for each output in the group when the output is in Hand mode.
Off Mode Output	This menu only appears for analog output Lead outputs.Enter the output mA value desired for each output in the group when the output is in Off mode, or being Interlocked, or during a calibration of the sensor being used as an input. The acceptable range is 0 to 21 mA.
Error Output	This menu only appears for analog output Lead outputs.Enter the output mA desired for each output in the group when the sensor is not giving the controller a valid signal. The acceptable range is 0 to 21 mA.

The ***Activate With Channels*** setting, normally available for all outputs, is **not** propagated through the Lead Lag group. This field can be entered independently for each Lag Output when the control mode of the Lead output is Manual and the activation mode is Switch Based.

Most other settings for the various types of Lead control modes are managed independently from other outputs within a Lead Lag group. In most cases, no ***Activation Mode*** settings are available, so the Lead output determines the status for the entire group based on its settings and the current controller parameters. However, when an Activation Mode is enabled, the handling of some settings may require some additional explanation. For example,

- Duty Cycle - If a Lead output with a control mode of On/Off or Dual Setpoint has a Duty Cycle setting of less that 100%, this cycle will be managed for the Lead output only. The Duty Cycle will drive other Lag
- outputs for Backup or Wear Leveling purposes. However, if additional Lag Output(s) are energized due to
- Setpoint-Based or Time-Based Activation Mode settings, the additional outputs will operate independently of the Duty Cycle setting. The Lead output will continue to cycle On and Off, however, the additional outputs
- will remain activated with 100% duty cycle until the setpoint deadband is satisfied.
- On Delay / Off Delay - If the Lead output with a control mode of On/Off, Dual Setpoint, or Manual has either an On or Off Delay Time setting specified, the delay will be managed for the Lead output only. If one or more Lag outputs provide Backup or Wear Leveling support, the Delay Times would also effect these outputs. However, if additional Lag Output(s) are energized due to Activation Mode settings, the additional outputs will operate independently of the On or Off Delay Time setting(s) and will energize and de-energize without delay when needed.

5.3.28 Relay Output, Flow Meter Ratio Control Mode

Flow Meter Ratio Control Mode is typically used in cooling water applications to control the conductivity of the water using volumetric cycles of concentration. The controller measures the volume of makeup water going through one or two water meters, and after a programmable amount, activates the relay to control a programmable

volume out through one or two bleed water meters.

Output Details

The details for this type of output include the relay on/off state, HOA mode or Interlock status, Accumulated make-up water total, bleed cycle volume, remaining volume, relay on-time for this cycle, accumulated on-time, alarms related to this output, relay type, and the current control mode setting.

Settings 

Touch the Settings icon to view or change the settings related to the relay.

Accumulator Volume	Enter the volume through the makeup water meters that will activate the relay.
Bleed Volume	Enter the volume through the bleed water meters that will deactivate the relay.
Makeup Meter	Select the makeup water meter from the pulldown list.
Makeup Meter 2	Select the makeup water meter from the pulldown list, if applicable, or leave at None.
Bleed Meter	Select the bleed water meter from the pulldown list.
Bleed Meter 2	Select the bleed water meter from the pulldown list, if applicable, or leave at None.
Daily Max Time	Enter the maximum amount of accumulated on-time, in Hand or Auto modes, that the relay can have between midnight and midnight the next day. If the time is exceeded, the relay will deactivate, and a Daily Max Timeout alarm will be triggered. The alarm will clear, and relay allowed to reactivate at midnight the next day. If the relay was in Hand mode when the alarm was triggered, it will revert to whichever HOA state it was in prior to being set to Hand. To override the Daily Max Limit for the rest of the day, press Reset Output Timeout.

5.3.29 Relay or Analog Output, Disturbance Variable Control Mode

Only available for 4-20 mA and pulse relay output channels.

These control modes generate an output by combining contributions from a Primary control output, a Disturbance Input, and a Trigger Input in a variety of ways. When the disturbance trigger discrete input is active, the disturbance input is multiplied by the primary output to determine the control percent output. An alternate calculation trigger mode selection (Use Disturbance) is available to simply switch to the disturbance output when the trigger is active (rather than combine the two values).

Some Example Applications

In-Line pH Control Adjusted for Flow

Direct feedback pH control in a pipe using a Primary Output of PID or Proportional control mode, with the Disturbance Input using flow rate to provide a multiplier to adjust the output. This is primary feedback control with a feedforward trim. No Trigger is required.

Chemical feed in proportion to Flow Adjusted for pH

If the incoming flow is variable but the pH of the water is relatively constant, feed the chemical using Flow Proportional control mode, with the Disturbance Input using the pH reading to provide a multiplier to adjust the output. This is primary feedforward control with a feedback trim. No Trigger is required.

Alternate Control During Upset Condition

Some disturbance applications require switching from one control mode to a different control mode (or a similar mode with different control settings) during an upset condition. The Primary Output could be set to Proportional control of pH, with the Disturbance Input selected as a Flow Proportional control algorithm. A Trigger Input could be selected as a relay output that activates if the flow rate is either too high or too low. These conditions would

trigger a switch from pH control to flow based control.

Output Details

The details for this type of output include the % output, HOA mode or Interlock status, alarms related to this output, Primary Output %, Disturbance Input value, current cycle on-time, accumulated on-time, raw output (in mA or pulses/min.), relay type, and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Minimum Output	Enter the lowest output %. If the output should be off at the set point, this will be 0%.
Maximum Output	Enter the highest output %.
Hand Output	Enter the output % desired when the output is in Hand mode.
Off Mode Output	Only for analog outputs. Enter the output mA value desired when the output is in Off mode, or being Interlocked, or during a calibration of the sensor being used as an input. The acceptable range is 0 to 21 mA.
Maximum Rate	Only for pulse outputs. Enter the maximum pulse rate that the metering pump is designed to accept (10 - 360 pulse/minute range).
Error Output	Only for analog outputs. Enter the output mA desired when the sensor is not giving the controller a valid signal. The acceptable range is 0 to 21 mA.
Primary Output	Select the control output that will be used along with the disturbance input to calculate the control signal for the disturbance output.
Disturbance Input	Select the virtual input or analog output that will be used along with the Primary Output to calculate the control signal for the disturbance output.
Trigger Input	Select a state-type digital input or relay output that will be used to initiate the disturbance control, or select None if the disturbance control will be active all the time.
Activated	Only appears if the Trigger Input is other than None. If a digital input is the Trigger Input, select between When Open or When Closed. If a relay output is the Trigger Input, select between When On or When Off.
Trigger Mode	Only appears if the Trigger Input is other than None. Select the action to take when the disturbance control algorithm has been activated. Multiply is used to calculate the control signal by multiplying the Disturbance Input value by the primary control output value. Use Disturbance is used when the Disturbance Input selected is a control output, and the action desired is to use this different control algorithm when in the disturbance state.

5.3.30 Analog Output, Proportional Control Mode

Output Details

The details for this type of output include the output %, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

Set point	Enter the sensor process value at which the output % will be the programmed minimum %.
Proportional Band	Enter the sensor process value away from the set point at which the output % will be the programmed maximum %.
Minimum Output	Enter the lowest output %. If the output should be off at the set point, this will be 0%.
Maximum Output	Enter the highest output %.
Hand Output	Enter the output % desired when the output is in Hand mode.
Off Mode Output	Enter the output mA value desired when the output is in Off mode, or being Interlocked, or during a calibration of the sensor being used as an input. The acceptable range is 0 to 21 mA.

Error Output	Enter the output mA desired when the sensor is not giving the controller a valid signal. The acceptable range is 0 to 21 mA.
Input	Select the sensor input to use for proportional control.
Direction	Select the control direction.

5.3.31 Analog Output, Flow Proportional Mode

Overview

In Flow Proportional control mode, the controller monitors the rate of flow through an analog or digital flow meter, and continuously adjusts the analog (4-20 mA) output proportional band to achieve a target PPM level.

The user enters the target PPM and the data necessary to calculate the proportional band (the water flow rate at which the maximum pulse rate will occur) required to maintain the target PPM with that flow rate of water.

$$\%\ output = \frac{Target\ PPM \times Water\ Flow\ Rate\ (liter/min\ or\ gal/min)}{Cycles \times Pump\ Rating\ (liter\ or\ gal/hr) \times Pump\ Setting\ (\%) \times Specific\ Gravity \times 166.67}$$

$$\%\ output = \frac{Target\ PPM \times Water\ Flow\ Rate\ (m^3/min)}{Cycles \times Pump\ Rating\ (liter/hr) \times Pump\ Setting\ (\%) \times Specific\ Gravity \times 0.16667}$$

Control Operation

If the output is continuously on for longer than the Output Time Limit, then output will deactivate.

Output Details

The details for this type of output include the output %, HOA mode or Interlock status, alarms related to this output, current cycle on time, total accumulated on-time, cycles of concentration, mA output, and the current control mode setting.

Settings 

Touch the Settings icon to view or change the settings related to the relay.

Target	Enter the desired PPM set point for the product.
Pump Capacity	Enter the maximum flow rate for the metering pump.
Pump Setting	Enter the stroke length setting for the metering pump, in percent.
Specific Gravity	Enter the specific gravity of the product to be added.
Hand Output	Enter the output % desired when the output is in Hand mode.
Off Mode Output	Enter the output mA value desired when the output is in Off mode, or being Interlocked, or during a calibration of the sensor being used as an input. The acceptable range is 0 to 21 mA.
Error Output	Enter the output mA desired when the sensor is not giving the controller a valid signal. The acceptable range is 0 to 21 mA.
Flow Input	Select the flow meter to be used as an input for this control relay.
Cycles Input	Select the virtual input that is programmed as a Ratio calculation of the system conductivity/makeup conductivity, or select None.
Low Cycles Limit	Enter the lower limit for cycles of concentration, if used. The calculated on-time is limited to a maximum value if the cycles of concentration gets too low.

5.3.32 Analog Output, PID Control Mode

ONLY AVAILABLE IF CONTROLLER INCLUDES ANALOG OUTPUT HARDWARE & HVAC MODE IS DISABLED

The PID algorithm controls an analog (4-20 mA) output using standard Proportional-Integral-Derivative control logic. The algorithm provides feedback control based on an error value continuously calculated as the difference between a measured process variable and a desired set point. Tuning settings specify the response for proportional (the size of the error), integral (the time that the error has been present), and derivative (the rate of change for the error) parameters. With proper tuning, the PID control algorithm can hold the process value close the set point while minimizing overshoot and undershoot.

Normalized Error

The error value versus set point that is calculated by the controller is normalized and represented as percent of full scale. As a result, tuning parameters entered by the user are not dependent upon the scale of the process variable and the PID response with similar settings will be more consistent even when using different types of sensor inputs.

The scale used to normalize the error is dependent upon the type of sensor selected. By default, the full nominal range of the sensor is used. This range is editable by the user if tighter control is desired.

PID Equation Formats

The controller supports two different forms of the PID equation as specified by the Gain Form setting. The two forms require different units for entry of the PID tuning parameters.

Standard

The standard form is more commonly used in industry because its time-based settings for the integral and derivative coefficients are more meaningful. This form is selected by default.

Parameter	Description	Units
K_p	Gain	unitless
T_i	Integral Time	seconds or seconds/repeat
T_d	Derivative Gain	seconds

$$Output\ (\%) = K_p \left[e(t) + \frac{1}{T_i} \int e(t)dt + T_d \frac{de(t)}{dt} \right]$$

Parameter	Description	Units
e(t)	Current Error	% of full scale
dt	Delta Time Between Readings	seconds
de(t)	Difference Between Current Error & Previous Error	% of full scale

Parallel

The parallel form allows the user to enter all parameters as Gains. In all cases, larger gain values result in faster output response. This form is used in the WebMaster controller and is used internally by the Control Module.

Parameter	Description	Units
K_p	Proportional Gain	unitless
K_i	Integral Gain	1/ seconds
K_d	Derivative Gain	seconds

$$Output\ (\%) = K_p\ e(t) + K_i \int e(t)dt + K_d \frac{de(t)}{dt}$$

Integral Value Management

To determine the integral component of the PID calculation, the controller software must maintain a running total of the accumulated area under the error curve (Current Integral). The sign of the value added to the accumulated Current Integral during each cycle may be positive or negative based on the current Direction setting as well as the relative values of the current process reading and the set point.

Override Control

The Current Integral accumulates when the output is set to Auto mode. If the controller is switched to Off mode, the value no longer accumulates, but it is not cleared. Therefore, PID control will resume where it left off if the controller is switched from Off back to Auto. Similarly, accumulation of the Control Integral will be suspended if the output is interlocked and resume after the lock-out is removed.

Bumpless Transfer

When the output is switched from Hand to Auto mode, the controller calculates a value for the Current Integral using the current error to generate the same output percent as the Hand Output setting. This calculation does not use the Derivative tuning setting to minimize errors from momentary fluctuations in the input signal. This feature ensures a smooth transition from manual to automatic control with minimal overshoot or undershoot as long as the user sets the Hand Output percentage close to the value that the process is expected to require for optimal control in Auto mode.

Wind-up Suppression

The Current Integral value that is accumulating while the output is set to Auto can become very large or very small if the process value remains on the same side of the set point for a prolonged period of time. However, the controller may not be able to continue to respond if its output is already set to the minimum or maximum limits (0-100% by default). This condition is referred to as Control Wind-Up and can result severe overshoot or undershoot after a prolonged upset has ended.

For example, if the process value remains far below the set point despite a control output being pinned at 100%, the Current Integral will continue to accumulate errors (wind-up). When the process value finally rises to above the set point, negative errors will begin to decrease the Current Integral value. However, the value may remain large enough to keep the output at 100% long after the set point is satisfied. The controller will overshoot the set point and the process value will continue to rise.

To optimize system recovery after wind-up situations, the controller suppresses updates to the Current Integral that would drive the output beyond its minimum or maximum limit. Ideally, the PID parameters will be tuned and the control elements (pump, valves, etc.) will be sized properly so that the output never reaches its minimum or maximum limit during normal control operations. But with this wind-up suppression feature, overshoot will be minimized should that situation occur.

Output Details

The details for this type of output include the analog output value in %, HOA mode or Interlock status, input value, current integral, current and accumulated on-times, alarms related to this output, and the current control mode setting.

Set Point	Numeric entry of a process value used as a target for PID control. The default value, units and display format (number of decimal places) used during data entry are defined based on the Input channel setting selected.
Gain	When the Gain Form setting is Standard, this unitless value is multiplied by the total of the proportional, integral, and derivative terms to determine the calculated output percent.
Proportional Gain	When the Gain Form setting is Parallel, this unitless value is multiplied by the normalized error (current process value versus set point) to determine the proportional component of the calculated output percent.
Integral Time	When the Gain Form setting is Standard, this value is divided into the integral of the normalized error (area under the error curve), then multiplied by the Gain to determine the integral component of the calculated output percent.
Integral Gain	When the Gain Form setting is Parallel, this value is multiplied by the integral of the normalized error (area under the error curve) to determine the integral component of the calculated output percent.

Derivative Time	When the Gain Form setting is Standard, this value is multiplied by the change in error between the current reading and the previous reading, then multiplied by the Gain to determine the derivative component of the calculated output percent.
Derivative Gain	When the Gain Form setting is Parallel, this value is multiplied by the change in error between the current reading and the previous reading to determine the derivative component of the calculated output percent.
Reset PID Integral	The PID Integral Value is a running total of the accumulated area under the error curve (Current Integral). When this menu option is selected, this total is set to zero and the PID algorithm is reset to its initial state.
Minimum Output	Enter the lowest possible output value (normally 0%).
Maximum Output	Enter the highest possible output value as a percentage.
Off Mode Output	Enter the output mA value desired when the output is in Off mode, or being Interlocked, or if the Output Time Limit has expired, or during a calibration of the sensor being used as an input. Also if there is a Probe Wash programmed for the sensor, and the Sensor Mode option is set to Disable the output during the Wash cycle (if the Sensor Mode option is set to Hold the output holds its last setting and the Integral is not updated during the Wash). The acceptable range is 0 to 21 mA.
Error Output	Enter the output mA desired when the sensor is not giving the controller a valid signal. The acceptable range is 0 to 21 mA.
Input	Select the sensor to be used by this output.
Direction	Set the control direction. This setting is used to determine the sign of the calculated error (current process value versus set point) and allows flexible control with only positive values for all PID tuning parameters.
Input Minimum	The low end of the sensor input range, used to normalize errors into percent of full scale units. These values are set to the nominal range of the selected input sensor by default.
Input Maximum	The high end of the sensor input range, used to normalize errors into percent of full scale units. These values are set to the nominal range of the selected input sensor by default.
Gain Form	Select the PID Equation Format used to enter tuning parameters.

5.3.33 Analog Output, Manual Mode

Output Details

The details for this type of output include the analog output %, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, and the current control mode setting.

Settings

A Manual analog output will activate if the HOA mode is Hand, or if it is Activated With another channel. There are no additional programmable parameters

5.3.34 Analog Output, Retransmit Mode

Output Details

The details for this type of output include the output %, HOA mode or Interlock status, accumulated on-time, alarms related to this output, current cycle on time, relay type and the current control mode setting.

Settings

Touch the Settings icon to view or change the settings related to the relay.

4 mA Value	Enter the process value to correspond to a 4 mA output signal.
20 mA Value	Enter the process value to correspond to a 20 mA output signal.

Hand Output	Enter the output % desired when the output is in Hand mode.
Error Output	Enter the output % desired when the input signal is invalid (Error mode).
Input	Select the sensor input to retransmit.

5.4 Configuration Menu 

The configuration Settings Menu is used for settings and activities that are not tied to Inputs or Outputs.

5.4.1 Global Settings

Date	Enter the current year, month and day.
Time	Enter the current hour (military time), minute, and second.
Name	Enter the name to help identify the controller when it connects to Fluent.
Location	Enter the location to help identify the controller when it connects to Fluent.
Global Units	Select the units to be used for cable length and wire gauge settings, metric or Imperial.
Temperature Units	Select between Fahrenheit and Celsius.
Alarm Delay	Enter how much time to wait after powering up the controller before alarm conditions are considered valid.
HVAC Modes	Enable HVAC Modes for cooling tower and boiler applications where the relay control modes for Biocide timer, Bleed and Feed, Bleed then Feed, and Intermittent Sampling are required. Disable HVAC Modes if these control modes are not necessary and a more generic timer control mode will replace the Biocide timer.
Language	Select the language the software will use.

5.4.2 Security Settings

Controller Log Out	When Security is Enabled, and after the password has been entered, the controller requires immediate use of a password to calibrate or change settings. Once finished making changes, log out to prevent unauthorized changes by someone else. If not manually logged out, the controller will automatically log out after 10 minutes of inactivity.
Security	Select Enable to require a password in order to calibrate or change settings, or Disable to allow calibration and set point changes without a password. In order to enable security, the default password must be entered first, then touch Enabled, then touch the Confirm icon.
Local Password	Used to change the touchscreen password needed for full configuration capability if security has been enabled. The default local password is 5555. This can and should be changed using this menu if Security is enabled.

5.4.3 Ethernet Settings

Will not appear if a WiFi-Only type WiFi card is installed.

DHCP Setting	Select Enabled to get an IP address from the LAN or Disabled to use a fixed IP address.
Controller IP Address	Enter the default IP address to use if a network is not available or if DHCP is disabled.
Network Netmask	Enter the default netmask to use if a network is not available or if DHCP is disabled.
Network Gateway	Enter the default gateway address to use if a network is not available or if DHCP is disabled.
DNS Server	Enter the default DNS server IP address to use if DHCP is disabled.
Web Page Color Scheme	Select between the Light color background and the Dark color background

Fluent Alarm Delay	Enter the number of minutes to delay in sending out a Fluent Comms Error message if a data packet is not successfully sent. In order to delay at all, the time must exceed the Update Period time.
TCP Timeout	Do not change from the default of 1 second unless directed to by techical service. The TCP Timeout should only be increased if the Fluent live connection is being Reset due to slow cellular connection speed.
Fluent Status	Select Enabled to activate a connection to Fluent, or Disabled to stop sending data and alarms to Fluent.
LiveConnect Status	Select Enabled to allow the ability to access the controller programming and log files remotely using Fluent, or Disabled to prevent remote connection to the controller using Fluent. The controller can still send data and alarms to Fluent, but the LiveConnect icon will not appear on the Fluent webpages.
Update Period	Enter the time between data updates being sent to Fluent.
Reply Timeout	Enter the maximum time allowed for Fluent to respond.

5.4.4 Ethernet Details

The Ethernet Details are for information only and display the Ethernet settings currently in use, and the recent history of the Fluent connection. Will not appear if a WiFi-Only type WiFi card is installed.

Alarms	Displays any active Ethernet-related alarms
DHCP Status	Displays if the connection to the LAN using DHCP was successful or not.
Controller IP Address	Displays the IP address that the controller is currently using.
Network Netmask	Displays the netmask address that the controller is currently using.
Network Gateway	Displays the gateway address that the controller is currently using.
DNS Server	Displays the DNS server address that the controller is currently using.
MAC Address	Displays the MAC address of the Ethernet card.
Last Fluent Config	Displays the date and time of the last attempt to send configuration data to the Fluent server.
Last Fluent Data	Displays the date and time of the last attempt to send a data to the Fluent server.

5.4.5 WiFi Settings

Will only appear if a WiFi option board is installed.

There are two types of WiFi board that are available.

The WiFi-only type of board will disable the controller's wired Ethernet connection when it is attached to the controller. The controller will either be able to connect to a Local Area Network (LAN) via Infrastructure Mode, or it will be able to connect to a PC, tablet, or cell phone via Ad-Hoc Mode. It will not be able to have a wired Ethernet connection to a LAN or cellular gateway device and also connect to a tablet via Ad-Hoc Mode. This configuration is inherently more secure.

The dual connection type WiFi cards do not disable the controller's wired Ethernet connection when it is attached to the controller. This allows simultaneous connection to a cellular gateway (Ethernet) and a LAN (WiFi, using Infrastructure mode), or to a LAN (Ethernet) and a nearby PC, tablet or cell phone (WiFi, using Ad-Hoc mode). This configuration is inherently less secure, since it cannot be guaranteed to be impossible to bridge between the two connections.

WiFi Mode	Select between Infrastructure Mode, Ad-Hoc Mode, or Disabled.
SSID	Infrastructure Mode. Enter the SSID of the LAN's wireless network connection.
Key	Infrastructure Mode. Enter the key needed to connect to the LAN's wireless network connection.

Gateway Connection	Infrastructure Mode. Only appears if a Dual WiFi/Ethernet type WiFi card is installed. Select which connection, Ethernet or WiFi, will provide the Gateway function. This means that all external Internet connections such as Fluent or emails will default to using this connection. Note that If the selected connection is no longer available, the controller will switch to using the other connection. Regardless of the connection being used , the menus to enable or disable Fluent or Live Connect will be available only in the selected connection's menu.
DHCP Setting	Infrastructure Mode. Enable to allow the controller to obtain its IP address and other network settings from the LAN or disable to enter this information manually.
Controller IP Address	Infrastructure Mode. Only appears if a Dual WiFi/Ethernet type WiFi card is installed, and the DHCP Setting is set to Disabled. Manually enter the IP address for the |con-troller.
Network Netmask	Infrastructure Mode. Only appears if a Dual WiFi/Ethernet type WiFi card is installed and the DHCP Setting is set to Disabled. Manually enter the network netmask address for the controller.
Network Gateway	Infrastructure Mode. Only appears if a Dual WiFi/Ethernet type WiFi card is installed and the Gateway Connection is selected as WiFi, and the DHCP Setting is set to | Disabled. Manually enter the gateway address to be used by the controller when connected to the LAN.
DNS Server	Infrastructure Mode. Only appears if a Dual WiFi/Ethernet type WiFi card is installed and the Gateway Connection is selected as WiFi, and the DHCP Setting is set to Disabled. Manually enter the address for the DNS server that the controller will use.
Ad-Hoc SSID	Ad-Hoc Mode. Enter the SSID that the controller may broadcast as an available wireless network connection. The default setting is "ControllerModel_SerialNumber"
Ad-Hoc Security	Ad-Hoc Mode. Select the security protocol used by the controller's wireless network connection.
Ad-Hoc Key	Ad-Hoc Mode. Enter the key needed to connect to the controller's wireless network connection. Between 8 and 64 characters are required.
SSID Broadcast	Ad-Hoc Mode. Select whether the controller's wireless network card will broadcast its SSID or not.
TCP Timeout	Do not change from the default of 1 second unless directed to by technical service. The TCP Timeout should only be increased if the Fluent live connection is being Reset due to slow cellular connection speed.
Temporary Ad-Hoc	Infrastructure Mode. Enable if it is desirable to allow the controller to disconnect from Infrastructure Mode and switch to a time-limited Ad-Hoc mode, to give a user temporary access to the controller without allowing that user access to the network.
Begin/End Temporary Ad-Hoc Mode	Infrastructure Mode. Only appears if Temporary Ad-Hoc is Enabled. Press this to start the temporary Ad-Hoc mode connection and timer. The menu will change to End Temporary Ad-Hoc Mode while the timer is running. Pressing the menu again will end the Ad-Hoc connection immediately. Otherwise the connection will end when it times out.
Ad-Hoc Time Limit	Infrastructure Mode. Only appears if Temporary Ad-Hoc is Enabled. Enter the time limit for the temporary ad-hoc mode connection.

5.4.6 WiFi Details

Will only appear if a WiFi option board is installed.

The WiFi Details are for information only and display the network settings currently in use.

WiFi Status	Displays if the WiFi is enabled or disabled.
Signal Strength	Displays the signal strength in the range of -100 to -30 dBm
RSSI	Displays the Relative Signal Strength In percent (0% = -100 dBm and 100% is greater than -49 dBm).
WiFi Channel	Displays the WiFi channel that the controller is currently using.
Alarms	Displays any active WiFi-related alarms.
DHCP Status	Displays if the connection to the device using DHCP was successful or not.
Controller IP Address	Displays the IP address that the controller is currently using.
Network Netmask	Displays the netmask address that the controller is currently using.
Network Gateway	Displays the gateway address that the controller is currently using.
Security Protocol	Displays the security protocol that the controller is currently using.
DNS Server	Displays the DNS server address that the controller is currently using
BSSID/MAC Address	Displays the BSSID/MAC address of the WiFi board.
FCC ID	Displays the FCC ID code, if applicable (USA).
IC ID	Displays the IC ID code, if applicable (Canada).
Last Fluent Config	Displays the date and time of the last attempt to send configuration data to the Fluent server.
Last Fluent Data	Displays the date and time of the last attempt to send a data to the Fluent server.
Live Connect Status	Displays the status of the Live Connect tunnel.

5.4.7 Remote Communications (Modbus and BACnet)

This menu will appear only if one of the optional Remote Communications activation keys has been imported into the controller, either by the factory at the time of ordering, or later using a field activation file.

To add the Remote Communications feature in the field, purchase the activation key file and save it to an USB drive, as the only file stored on the root directory of the stick. Insert the stick into the USB port of the controller. Go to the Configuration Menu, then File Utilities, then Import User Config File. Press the Confirm icon to start the activation process.

The display will report whether the import was successful or not. The activation key file is only valid for the serial number of the controller for which it was purchased.

For a complete description of the Modbus feature and register map, refer to the separate Modbus instruction manual. For a complete description of the BACnet feature and list of object instances, refer to the separate BACnet instruction manual.

Comm Status	Select Modbus or BACnet to enable one of the protocols, or Disabled.
Data Format	Modbus Only. Select to receive Modbus data in Standard (Float) format or Float Inverse format
Device ID	BACnet Only. Enter the device ID for the controller. The default will be based on the controller serial number.
Network	BACnet only, if the dual connection WiFi card is installed. Select the connection that will be used for BACnet communications; Ethernet or WiFi.
Data Port	The standard port for Modbus data is port 502, and for BACnet is 47808. Enter the port used if it is non-standard.

Verbose Logging	If logging is Enabled, all Modbus or BACnet requests will be logged in the Event Log (any errors, the function called, starting register, number of registers, value of the first register, get object requests). This is useful when first setting up the HMI, but it will quickly fill the Event Log if it is not Disabled during normal operation. The Verbose Logging function will be automatically disabled after power to the controller is cycled.

5.4.8 Email Report Settings

NOTE: To set up the content of the Graph report, connect using a browser via Ethernet or WiFi and go to the Graph webpage. See section 6.

Report #1 (through 4)	Enter this menu to activate and set up a report to email, via the menus below:
Report Type	Select the type of report to email: None, Alarm, Datalog, Graph, or Summary (the Home webpage showing a Summary of current conditions).
Email Recipients	Select up to 8 email addresses that reports may be sent to by touching the check box. The addresses are entered in the Email Addresses menu described below.
Repetition	Only appears if Report Type is Datalog, Graph or Summary. Select how frequently to repeat sending the report: None, Hourly, Daily, Weekly or Monthly.
Reports Per Day	Only appears if Report Type is Datalog, Graph or Summary. Only appears if the repetition is set to Hourly. Select the number of reports per day: 2, 3, 4, 6, 8, 12 or 24. The report is sent on the Report Time and then evenly spaced throughout the day.
Day	Only appears if Report Type is Datalog, Graph or Summary. Only appears if the repetition is set to Weekly. Choose the day of the week on which the report will be sent.
Day of Month	Only appears if Report Type is Datalog, Graph or Summary. Only appears if the repetition is set to Monthly. Choose the day of the month on which the report will be sent. If the current month has less days than the number entered, the report will be sent on the last day of the month.
Report Time	Only appears if Report Type is Datalog, Graph or Summary. Only appears if the repetition is set to Daily, Weekly or Monthly. Enter the time of day for the report to be sent.
Log Frequency	Only appears if the Report Type is Datalog. Select the amount of time between data points. The amount of time allowed varies with the repetition of the report.
Alarm Mode	Only appears if Report Type is Alarm. Choose to send emails on All Alarms or only Selected Alarms.
Attach Summary	Only appears if Report Type is Alarm. Select Enabled to receive alarm emails that include the Main Menu webpage as an attachment or Disabled to receive a text-only alarm report email.
Select Alarms	Only appears if Rerport Type is Alarm. Only appears if the Alarm Mode is set to Selected Alarms. Select an Input or Output channel, System Alarm or Network Alarm, then touch the check box for individual alarms that will trigger an email to the list of recipients. Repeat for as many as desired.
Alarm Delay	Only appears if Report Type is Alarm. Enter how much time to wait after the alarm has been triggered before alarm conditions are considered valid and the email is sent.
Email Addresses	Enter up to 8 email addresses that reports may be sent to.
Email Server	Select the type of email server to be used: SMTP, ASMTP, or TLS/SSL
SMTP Server	Enter the SMTP server address, either numeric or its name.
SMTP Port	Enter the port to be used by email server. The default is port 25 for SMTP, port 587 for ASMTP, and port 465 for TLS/SSL.

From Address	Enter the controller's email address.
ASMTP Username	Enter the username required for authentication. Only appears if the email server type is ASMTP or TLS/SSL.
ASMTP Password	Enter the password required for authentication. Only appears if the email server type is ASMTP or TLS/SSL.
Test Report Recipients	Select the email addresses from the list that should receive the test report. If there are none, enter them in the Email Addresses menu described above.
Send Email Test Report	Enter this menu and confirm to send the test Summary report to the selected test report recipients.

5.4.9 Display Settings

Home 1	Select the input or output to display on the 1st line of the display Home screen.
Home 2	Select the input or output to display on the 2nd line of the display Home screen.
Home 3	Select the input or output to display on the 3rd line of the display Home screen.
Home 4	Select the input or output to display on the 4th line of the display Home screen.
Home 5	Select the input or output to display on the 5th line of the display Home screen.
Home 6	Select the input or output to display on the 6th line of the display Home screen.
Home 7	Select the input or output to display on the 7th line of the display Home screen.
Home 8	Select the input or output to display on the 8th line of the display Home screen.
Adjust Display	Change the contrast and the brightness by touching the arrow keys. If the display becomes unreadable, it is possible to reset the defaults by powering down and pressing the bottom right corner of the touchscreen while powering back on.
Auto Dim Time	If this is set to a non-zero time, the display backlight will dim if the touchscreen is not touched for that amount of time. Touching the screen will turn the back to normal brightness.
Key Beep	Select enable to hear a beep when an icon is pressed, or disable for silence

5.4.10 File Utilities

The File Utilities menu is used to transfer log files, user settings files and software upgrade files, using the local and a USB flash drive stick or using a network connection and browser.

If using a USB drive, it is necessary to choose a quality product, less than 16 MB capacity, with FAT file system.

Files may be renamed, but Configuration and Software Upgrade file extensions must NOT be changed. The USB drive must contain only one copy of these type of files. If more than one is available, the first one alphabetically will be imported by the controller.

File Transfer Status	Displays the status of the last attempt to export a file
Data Log Export	The data log contains data from every input and output. Enter this menu set up a data log file to export:
Data Log Range	Select how far back in time for data to be downloaded: Since Previous download, past 6 hours, all the way up to the past 3 months.
Log Frequency	Select the amount of time between data points. The amount of time allowed varies with the Data Log Range. If the Data Log Range is selected as Since Previous download, the choices for frequency of data points will be limited by how far back in time the last download occurred.
Export Data Log File	Save the Data Log file, as defined by the Data Log Range and Log Frequency settings above, to a USB stick.

Periodic Log Export	The periodic log contains data that is calculated hourly rather than analog in nature, such as hourly Minimum Maximum and Average sensor calculations, relay virtual output or digital input hourly on times, flow total volumes for the hour, and analog output average output % for the hour. Enter this menu set up a periodic data log file to export:
Periodic Log Range	Select how far back in time for data to be downloaded: Since Previous download, past 6 hours, all the way up to the past 3 months.
Log Frequency	Select the amount of time between data points. The amount of time allowed varies with the Periodic Log Range. If the Periodic Log Range is selected as Since Previous download, the choices for frequency of data points will be limited by how far back in time the last download occurred.
Export Periodic Log File	Save the Periodic Log file, as defined by the Periodic Log Range and Log Frequency settings above, to a USB stick.
Export Event Log	Save the Event Log file to a USB stick. This records set point changes, user calibrations, alarms, relay state changes, file exports, etc.
Export System Log	Save the System Log file to a USB stick. This records hardware changes, software upgrades, automatic calibrations, power loss, system-level issues, etc.
Export User Config File	The User Configuration file contains all settings for the controller. Enter this menu to save the controller's settings to a USB stick (or download the file to a computer if using the web interface) for using later to restore settings to this controller, or to program additional controllers with the same settings as this one. It may take several minutes to create the file and transfer it.
Import User Config File	The User Configuration file contains all settings for the controller. Insert a USB stick (if using the local interface) containing the desired Configuration file. Enter this menu to import the file from the stick onto the controller. If using the web interface, click Upload and select the file to upload.
Restore Default Config	Enter this menu to restore all of the settings to the factory default values. Any changes to settings that were previously made will be lost!
Software Upgrade	Insert a USB stick that has the upgrade file stored in the root directory into the USB connector under the watertight cap on the outside of the front panel (see figure 19). Touch the Confirm icon, and then touch the Confirm icon to start the upgrade.

NOTE: To maintain the IP65 rating, always remove the stick and replace the cap securely over the USB connector when not in use.

5.4.11 Controller Details

Controller	Displays the name for the group of default settings used as built
Product Name	Displays the model of the controller as built
Serial Number	Displays the serial number of the controller
Controller Board	Displays the part number and revision of the front panel circuit board
Software Version	Displays the software version on the controller board
Power Board	Displays the part number and revision of the power/relay board
Sensor Board #1 - #4	Displays the part number and revision of the I/O boards (One entry for each board installed, up to 4)
Software Version	Displays the software version on each I/O board (One entry for each board installed, up to 4)
Last Data Log	Displays the date and time of the last data log download
Digital Inputs	Displays the part number and revision of the digital inputs

Software Version	Displays the software version of the digital inputs
Network	Displays the part number and revision of the network circuit
Software Version	Displays the software version on the network circuit
Battery Power	Displays the VDC output of the battery that is used to hold the date and time. The acceptable range is 2.4-3.3 VDC.
Controller Temp 1	Displays the temperature of the first controller thermistor. The acceptable range is -10 to 75 C.
Controller Temp 2	Displays the temperature of the second controller thermistor. The ac-ceptable range is -10 to 75 C.
Relay Board Temp	Displays the temperature of the relay board thermistor. The acceptable range is -10 to 75 C.
Processor Temp	Displays the temperature of the controller board processor. The acceptable range is -10 to 75 C.
DI Temp	Displays the temperature of the digital input processor. The acceptable range is -10 to 75 C.
I/O Card 1-4 Temp	Displays the temperature of each I/O module processor. The acceptable range is -10 to 75 C.
Network Temp	Displays the temperature of the network circuit processor. The acceptable range is -10 to 85 C.
+12 Volt Supply	The normal range is 11.28 to 12.72 VDC. The 12 V supply is the main DC power from which all lower voltages are generated.
+5 Volt Supply	The normal range is 4.7 to 5.3 VDC. The 5 V supply is used for powering all the I/O.
+3.3 Volt Supply	The normal range is 2.8 to 3.5 VDC. The 3V supply is used to run the system.
LCD Bias Voltage	The normal range is -25 to -20 VDC. This is the touchscreen voltage after contrast adjustment.
LCD Supply	The normal range is -25 to -20 VDC. This is the touchscreen voltage before contrast adjustment.

5.5 HOA Menu

The HOA (Hand-Off-Automatic) Menu is used to quickly and easily test all relay outputs, and to stop or enable automatic control.

Touch the relay number in order to change the HOA state of that relay. The relay number will be shaded dark, and its current HOA state will be shaded dark. Then touch the desired state. The change happens immediately unless that relay has a Minimum Relay Cycle programmed that is above 0 seconds.

5.6 Graph Menu

The Graph Menu is used to display a graph containing one sensor or analog input value plus one digital input or relay state. Touch the Graph icon and the controller will display “Generating Graph Please Stand By” for a few seconds then show the graph. The default is to show the value of sensor input S11 and the state of relay output R1 over the past 10 minutes.

Touching any point on either line on the graphs displays a vertical line plus the details for that data point: date and time, value of the sensor, and an arrow showing if the state or the digital input/relay was high or low at that time.

Touching the  or the  icons will redraw the graph forward or backwards in time, in increments of one time range. It can only go back in time to the point where the data log file used to generate the graph starts. Changing the time frame while in the graph view, after moving back in time, shows data from that past time. Exiting the graph menu and returning to the graph menu moves back to the current time.

Settings

Sensor	Enter this menu to select the sensor, analog input, flowmeter type digital input (total flow and/or flow rate if applicable), or analog output value to show on the graph
DI/Relay	Enter this menu to select digital input, or analog output value to show on the graph
Low Axis Limit	The graph auto-scales based on the sensor value if both Low and High Axis Limit are set to 0. To manually adjust the Y axis scale, enter the low limit here.
High Axis Limit	The graph auto-scales based on the sensor value if both Low and High Axis Limit are set to 0. To manually adjust the Y axis scale, enter the high limit here.
Time Range	Select the time range for the X axis of the graph. The time range may also be accessed from the graph view by touching the time range icon in the lower right corner.

The resolution of the screen only allows for 84 data points per graph, so not all data points in each time range can be shown. For finer resolution, download the data log CSV file from the Config – File Utilities menu and graph the data in Excel or equivalent spreadsheet application.

Time Range	Time between data points	Datalog file used
10 minutes	10 seconds	Daily
30 minutes	30 seconds	Daily
1 hour	1 minute	Daily
2½ hours	2 minutes	Weekly
8 hours	6 minutes	Weekly
½ day	10 minutes	Weekly
1 day	20 minutes	Weekly
½ week	1 hour	Monthly
1 week	2 hours	Monthly
2 weeks	4 hours	Monthly
4 week	8 hours	Monthly

6.0 OPERATION using Ethernet

All of the same settings that are available using the touchscreen are also available using a browser that is connected to the controller's Ethernet IP address. The controller may be connected to a Local Area Network (LAN), directly to the Ethernet port of a computer, or to the Fluent account management system server.

6.1 Connecting to a LAN

Connect the controller's network card to the LAN using a CAT5 cable with RJ45 connector.

6.1.1 Using DHCP

Using the touchscreen, from the Main menu, touch Config, then touch Ethernet Settings, then touch DHCP Setting. Touch Enabled, then the Confirm icon.

After a power cycle of the controller, return to Config, then Ethernet Details to view the Controller IP Address that has been assigned to the controller by the network.

6.1.2 Using a fixed IP Address

Using the touchscreen, from the Main menu, touch Config, then touch Ethernet Settings, then touch DHCP Setting. Touch Disabled, then the Confirm icon. Cycle power to the controller. If DHCP is already Disabled then you can skip this step.

Using the touchscreen, from the Main menu, touch Config, then touch Ethernet Settings, then touch Controller IP Address. Enter the IP address provided by the administrator of the LAN then touch the Confirm icon. Repeat for the Network Netmask and Network Gateway settings. Cycle power to the controller.

6.2 Connecting Directly to a Computer

Connect the controller's network card to the computer using a CAT5 cable with RJ45 connector.
Follow the instructions above to give the controller a fixed IP address that is compatible with the network settings of the computer. On the Security webpage there is also a setting for the Log in Timeout, which is the time limit for the web connection to be idle before requiring the user to log in again. Having this setting short is the best protection against unauthorized access.

Open a browser and type the numeric Controller IP address in the web page address field. The login screen should quickly appear. Once logged in, the Home page will appear.

The default username is admin and the default password is the 10-digit serial number for the controller. The serial number can be found printed on the label on the side of the controller, or by using the local touchscreen and going to the Config menu, then Controller Details.

Once logged in with the default password, a prompt will appear to change to new credentials. The option to close the prompt window and continue using the existing credentials exists, however the Admin and View-Only level usernames and passwords can and should be changed by browsing to the Config menu, Security Settings webpage. Log into the page using the current Admin level username and password, then change to new ones.

6.3 Navigating the web pages

From any computer that is directly connected to the controller, or is on the same network as the controller, open a browser and type the numeric Controller IP address in the web page address field. The login screen should quickly appear.

The default username is admin and the default password is the 10-digit serial number for the controller. The serial number can be found printed on the label on the side of the controller, or by using the local touchscreen and going to the Config menu, then Controller Details.

Once logged in with the default password, a prompt will appear to change to new credentials. The option to close the prompt window and continue using the existing credentials exists, however the Admin and View-Only level usernames and passwords can and should be changed by browsing to the Config menu, Security Settings webpage. Log into the page using the current Admin level username and password, then change to new ones.

After logging in, the Home page will appear. This will display the date and time, any active alarms, and the current readings or status of all of the Inputs and Outputs. On the left side of the page you will see links to the Main Menu selections: Alarms, Inputs, Outputs, Graphs, Config, Notepad and Software Upgrade if available. Click each menu to see the submenus, and click on the submenu to access all of the details and settings associated with it. At the bottom, there is a manual logout.

Below the Main Menu links there may be links to the instruction manual, Walchem website, and Walchem Fluent website, that are useful if the controller is connected to the Internet.

6.4 Graphs Webpage

The graphs page can display up to 8 parameters at a time. All possible parameters available based upon the controller programming are listed in one column. Click the right arrow to add the highlighted parameter to the Selected column, or the left arrow to move a selected parameter back out. Use the up and down arrows to move the highlighted selected parameter up and down the list to set the order of the graphs on the page.

Click the Refresh Graph button  to display the changes.

Select the Time Range for the X-Axis of the graph from the pulldown list, from 1 Hour to 4 Weeks.

If you are setting up a Graph Report email, click Save For Report to set the current page settings as the ones to be used for the report. You will want to make sure that the selected Time Range is at least as long as the Report Frequency set in the Email Report menu.

You can then change the settings on the graphs webpage without changing the report settings, by clicking the refresh button without clicking the Save For Report button. The graph page will be greyed out until the refresh button has been clicked.

In order to see what the report settings are, click the Load Report Settings button.
The graph email will contain an html attachment showing the graphs. The Export Graph button can be used to save the graphs as an image that can be copied to a document. The same button is also available directly from the Graphs web-page.

The graphs will display the parameter's data in 360 data points, equally spread over the time range, in a blue line. For analog inputs and outputs, the minimum value, maximum value, and average value over that same time range are also displayed and graphed in a yellow line. The Y-axis will auto-scale to fit the data.

To change the Y-axis scale to a custom range, click anywhere on the axis, enter the desired minimum and maximum values, click Save, and then click the refresh graph button. To return to auto-ranging, click the Y-axis, click Set Defaults, and refresh.

6.5 Software Upgrade

The software upgrade link will appear only to users with Admin login, and only if the controller has access to the Internet and the controller software is currently at version 3.31 or higher, and the software is not at the latest version available.

An Upgrade Description link to a webpage that supplies more details on the content of the upgrade is also available.

Click on Start Upgrade to begin the upgrade process.

The Upgrade Status will be displayed, with a button that may be used to Cancel the upgrade. Upon confirmation to cancel the upgrade, a Resume button will appear.

The status messages include:
Preparing controller for upgrade
    Then if successful: Complete
    Or not successful: Failed
Downloading upgrade file (showing number of bytes downloaded of total number of bytes)
    Then if successful: Complete
    Or not successful: Failed
Validating upgrade file
    Then if successful: Complete
    Or not successful: Failed
Upgrade in progress (showing each individual step in the upgrade installation)

When the upgrade installation is complete, the login webpage will appear. Status or error messages will be recorded in the System Log.

6.6 Notepad Menu

The Notepad Menu is used to store up to 10,240 bytes of notes (approximately one byte per character for English language). This is typically used to communicate or store important process changes or events. A byte counter in the lower right-hand corner displays how much space remains.

Click Save Notes and do not navigate away from the webpage until the popup screen indicates that changes have been accepted. If the size is too large, you can click Clear Notes, which is noted in the Event Log, or delete some text and then save.

6.7 Remote Sensor Calibration

For each sensor input, a Sensor Calibration is available on the input's webpage. To initiate a sensor calibration, click on the One-Point Process Calibration button.

A popup will open that displays the current value for that input and allow entry of the new value. Type the value of that parameter as determined by another meter or laboratory analysis and click Begin Calibration. Click Cancel to abort the calibration and retain the previous calibration.

For input types using automatic temperature compensation, the temperature reading will be displayed until the reading is stable and then move to the next step without any action required.

If successful, the calibration gain or offset will be displayed. Click Save to accept the new value or Cancel to retain the previous calibration.

If the new value results in a gain or offset that is out of the allowable range for the input, Calibration Failed will be displayed. Click OK to end the calibration and retain the previous calibration settings. Refer to section 8.1 Calibration Failure for help troubleshooting each type of sensor.

7.0 MAINTENANCE

The controller itself requires very little maintenance. Wipe with a damp cloth. Do not spray down the controller unless the enclosure door is closed and latched.

7.1 Electrode Cleaning

NOTE: The controller must be recalibrated after cleaning the electrode.

Frequency

The electrode should be cleaned periodically. The frequency required will vary by installation. In a new installa tion, it is recommended that the electrode be cleaned after two weeks of service. To determine how often the elec trode must be cleaned, follow the procedure below.

1. Read and record the conductivity.
2. Remove, clean and replace the conductivity electrode.
3. Read conductivity and compare with the reading in step 1 above.

If the variance in readings is greater than 5%, increase the frequency of electrode cleaning. If there is less than 5% change in the reading, the electrode was not dirty and can be cleaned less often.

Cleaning Procedure

The electrode can normally be cleaned using a cloth or paper towel and a mild detergent. If coated with scale, clean with a dilute (5%) solution of hydrochloric acid solution. Occasionally an electrode may become coated with various substances that require a more vigorous cleaning procedure. Usually the coating will be visible, but not always. To clean a coated electrode, use fine grit abrasive, such as emery paper. Lay the paper on a flat surface

and move the electrode in a back and forth motion. The electrode should be cleaned parallel to the carbon elec trodes, not perpendicular.

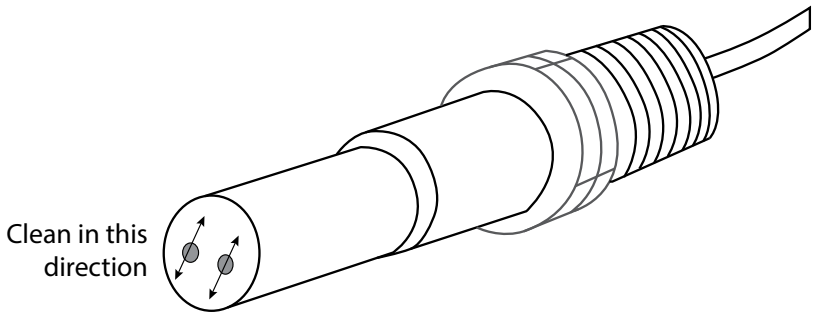


Figure 20 Cleaning the Electrode

7.2 Replacing the Fuse Protecting Powered Relays

CAUTION: Disconnect power to the controller before opening front panel!

Locate the fuse on the circuit board at the back of the controller enclosure under the plastic safety cover. Gently remove the old fuse from its retaining clip and discard. Press the new fuse into the clip, secure the front panel of the controller and return power to the unit.

Warning: Use of non-approved fuses can affect product safety approvals. Specifications are shown below. To insure product safety certifications are maintained, it is recommended that a Walchem fuse be used.

Fuse 5 x 20 mm, 6A, 250V	**Walchem P/N** 102834

8.0 TROUBLESHOOTING

CAUTION: Disconnect power to the controller before opening front panel!

Troubleshooting and repair of a malfunctioning controller should only be attempted by qualified personnel using caution to ensure safety and limit unnecessary further damage. Contact the factory.

8.1 Calibration Failure

Calibrations will fail if the adjustments to the reading are outside of the normal range for a properly functioning system. Refer to the instruction manual for the specific sensor being used for further information.

8.1.1 Contacting Conductivity Sensors

The calibration will fail if the adjustment to the gain is outside of 0.5 to 2.0.

Possible Cause	**Corrective Action**
Dirty electrode	Clean electrode
Improper wiring of sensor to controller	Correct wiring
Wrong cell constant entered	Program the controller cell constant setting at the value that matches the electrode being used
Incorrect temperature reading or setting	Ensure that the temperature is accurate
Incorrect cable length or wire gauge setting	Set to the correct values
Faulty electrode	Replace electrode

8.1.2 Electrodeless Conductivity Sensors

The calibration will fail if the adjustment to the gain is outside of 0.2 to 10, or the offset is outside of -10,000 to 10,000.

Possible Cause	Corrective Action
Dirty sensor	Clean sensor
Improper wiring of sensor to controller	Correct wiring
Sensor placed too close to container walls	Relocate sensor
Sensor placed in the direct path of electrical current flow	Relocate sensor
Incorrect temperature reading or setting	Ensure that the temperature is accurate
Incorrect cable length or wire gauge setting	Set to the correct values
Faulty sensor	Replace sensor

8.1.3 pH Sensors

The calibration will fail if the adjustment to the gain is outside of 0.2 to 1.2, or if the calculated offset is outside of -140 to 140.

Possible Cause	Corrective Action
Dirty electrode	Clean electrode
Improper wiring of sensor to controller	Correct wiring
Incorrect temperature reading or setting	Ensure that the temperature is accurate
Incorrect cable length or wire gauge setting	Set to the correct values
Faulty electrode	Replace electrode
Faulty preamplifier	Replace preamplifier

8.1.4 ORP Sensors

The calibration will fail if the adjustment to the gain is outside of 0.5 to 1.5, or if the calculated offset is outside of -300 to 300.

Possible Cause	Corrective Action
Dirty electrode	Clean electrode
Improper wiring of sensor to controller	Correct wiring
Faulty electrode	Replace electrode
Faulty preamplifier	Replace preamplifier

8.1.5 Disinfection Sensors

The calibration will fail if the adjustment to the gain is outside of 0.2 to 10.0, or if the calculated offset is outside of -40 to 40.

Possible Cause	Corrective Action
Insufficient conditioning	Wait for the appropriate amount of time before attempting a calibration.
Insufficient sample flow	Increase flow rate to between 30 and 100 liter per hour.
Air bubbles on membrane	Dislodge bubbles. Adjust flow rate higher if necessary.
Air bubbles in electrolyte	Refill membrane cap with electrolyte.
Dirty membrane	Clean membrane
Loose membrane cap	Tighten membrane cap.
Faulty membrane	Replace membrane cap.
High Pressure	Reduce pressure to below 1 atmosphere and refill cap with electrolyte
No electrolyte fill solution in membrane cap	Fill membrane cap with electrolyte. Replace membrane cap if it will not hold solution.

Improper wiring of sensor to controller	Correct wiring
Faulty sensor	Replace sensor
Faulty analysis equipment or reagents	Consult test equipment instructions
Sample contaminated with interfering molecule refer to Sensitivity specification in sensor instructions)	Remove source of contamination

8.1.6 Analog Inputs

The calibration will fail if the adjustment to the gain is outside of 0.5 to 2.0, or if the calculated offset is outside of -2 to 2 mA.

Possible Cause	**Corrective Action**
Improper wiring of sensor to controller	Correct wiring
Faulty sensor	Replace sensor

8.1.7 Temperature Sensors

The calibration will fail if the calculated offset is outside of -10 to 10.

Possible Cause	**Corrective Action**
Improper wiring of sensor to controller	Correct wiring
Temperature input is set to the incorrect element	Reprogram to match the connected temperature element
Faulty sensor	Replace sensor

8.1.8 Corrosion Inputs

The calibration will fail if the corrosion rate or imbalance value entered is outside the range of 0 to 5 times the corrosion rate Range setting.

Possible Cause	**Corrective Action**
Improper wiring of sensor to controller	Correct wiring
Range settings is too low	Increase the Range setting
Electrode tips have not conditioned long enough	Allow time for electrodes to condition
Old electrodes	Replace electrodes and consider setting an Electrode Alarm reminder
Electrodes not tight	Tighten electrodes
Electrodes are not completely submerged	Install sensor in the side branch of a tee, not the top

8.2 Alarm Messages

HIGH or HIGH-HIGH ALARM **Occurs if the sensor reading rises above the high alarm set points. If your unit is programmed for an alarm relay output, the alarm relay will activate. The controller will continue to check the sensor reading, and any outputs using the sensor will remain active.**	
Possible Cause	**Corrective Action**
The process went further out of control than normal.	May have to increase chemical flow rate.
The chemical supply has run out.	Replenish the chemical supply.
The pump or valve or supply line is faulty.	Repair or replace the control device.
Wrong chemical is being controlled.	Replace with correct chemical.
The sensor is not responding to changes.	Repair or replace sensor. Evaluate mixing or recirculation.
The pump is siphoning, valve leaking.	Repair or replace the control device or re-route tubing.
Control output has been left in “HAND” mode.	Switch back to “AUTO”.
It may be a normal part of the process.	None required.
LOW or LOW-LOW ALARM **Occurs if the sensor reading drops below the low alarm set points. If your unit is programmed for an alarm relay output, the alarm relay will activate. The controller will continue to check the sensor reading, and any outputs using the sensor will remain active.**	

Possible Cause	Corrective Action
The process went further out of control than normal.	May have to increase chemical flow rate.
The chemical supply has run out.	Replenish the chemical supply.
The pump or valve or supply line is faulty.	Repair or replace the control device.
Wrong chemical is being controlled.	Replace with correct chemical.
The sensor is not responding to changes.	Repair or replace sensor. Evaluate mixing or recirculation.
The pump is siphoning, valve leaking.	Repair or replace the control device or re-route tubing.
Control output has been left in “HAND” mode.	Switch back to “AUTO”.
It may be a normal part of the process.	None required.

DEVIATION ALARM
Occurs if there is a redundant sensor virtual input, and the two sensors assigned are reading too far apart.

Possible Cause	Corrective Action
The deviation alarm setting may be too low	Adjust setting
One or both of the sensors may need cleaning and calibration	Clean and calibrate
One of the sensors may be faulty	Replace sensor

DI STATE CUSTOM MESSAGE
A digital input that is a DI State type can be set such that either the open or closed state generates an alarm. The alarm message may be customized. The most common use for this will be a Flow Switch.

Possible Cause	Corrective Action
No flow	Check piping for closed valves, blockage, etc. Check recirculation pump.
Faulty flow switch/cable	Check with ohmmeter.
Faulty controller	Check by shorting digital input in controller.

TOTAL ALARM
Occurs if the flow meter or feed monitor totalizer alarm limit is exceeded.

Possible Cause	Corrective Action
Normal operation	Reset the total to clear alarm, or wait for the automatic total reset to occur.
AC coupled onto flow meter cable	Route cable at least 6 inches (150 mm) away from any AC voltage
Noise coupled onto flow meter cable	Shield cable

RANGE ALARM (for flow meter or feed monitor type digital inputs)
Occurs if the flow meter or feed monitor accumulated total is too large. The maximum total is 1 trillion times the increment of the device. For example, if the increment is one gallon per pulse the maximum total is 1 trillion gallons.

Possible Cause	Corrective Action
Normal operation	Reset the total to clear alarm, or wait for the automatic total reset to occur.

FLOW VERIFY
Occurs if the feed monitor digital input does not register any contacts while the control output for that pump has been active for longer than the Flow Alarm Delay time.

Possible Cause	Corrective Action
Metering pump has lost prime	Re-prime metering pump
Faulty metering pump	Repair or replace metering pump
Incorrect feed monitoring device wiring	Correct wiring. Make sure that digital input that the feed monitoring device is connected to has been assigned to the correct relay
Faulty feed monitoring sensor	Replace feed monitoring sensor
Blown fuse	Verify the pump is getting power. Replace fuse
Faulty output relay	Replace relay board
Faulty digital input	Verify that feed monitoring device is making contact closures using an ohmmeter. If OK, and connected properly, replace the controller circuit board.

OUTPUT TIMEOUT
This error condition will stop control. It is caused by the output (either relay or analog) being activated for longer than the programmed Time Limit.

Possible Cause	Corrective Action
The process went further out of control than normal.	Increase time limit or reset timer.
The chemical supply has run out.	Replenish the chemical supply.
The pump or valve or supply line is faulty.	Repair or replace the control device.
Wrong chemical is being controlled.	Replace with correct chemical.
The sensor is not responding to changes.	Replace sensor. Evaluate mixing or recirculation.

RANGE ALARM (for sensor inputs)
It indicates that the signal from the sensor is out of the normal range. This error condition will stop control of any output using the sensor. This prevents controlling based upon a false sensor reading. If the temperature sensor goes into range alarm, then the controller will go into manual temperature compensation using the Default Temperature setting.

Possible Cause	Corrective Action
Sensor wires shorted	Disconnect short
Faulty sensor	Replace sensor
Faulty controller	Replace or repair controller

EVENT SKIPPED ALARM
An event skipped alarm is set when a second biocide or timer event occurs while one event is still running (either in prebleed, biocide-add or post-biocide add lockout in the case of the biocide timer mode). An event skipped alarm is also set when the timer relay never turns on during an event because of an interlock condition. The alarm is cleared when the relay is next activated for any reason (the next timer event or HAND mode or "activate with" force on condition).

Possible Cause	Corrective Action
Incorrect programming	Reprogram to eliminate overlapping events
Long duration interlock condition	Normal operation
Long duration prebleed	Decrease prebleed time Increase bleed flow rate Reprogram to eliminate overlapping events

SENSOR FAULT
This error indicates that the signal from the sensor is no longer valid at all. This error condition will stop control of any output using the sensor.

Possible Cause	Correction Action
Sensor wires shorted	Disconnect short
Faulty sensor	Replace sensor
Faulty controller	Replace or repair controller

INPUT FAILURE
This alarm indicates that the sensor input circuit is no longer working, or that one of the inputs used to calculate a virtual input is in a Sensor Fault condition. This error condition will stop control of any output using the input.

Possible Cause	Correction Action
Faulty controller	Replace or repair controller
If using virtual inputs, sensor fault of one of the inputs	See Sensor Fault troubleshooting above

BATTERY POWER LOW
This alarm indicates that the battery which holds the date and time in memory is below 2.4 VDC.

Possible Cause	Correction Action
Faulty battery	Replace battery

SYSTEM TEMP LOW
This alarm indicates that the temperature inside the controller is below -10 °C.

Possible Cause	Correction Action
Low ambient temperatures	Provide heat for the controller

SYSTEM TEMP HIGH
This alarm indicates that the temperature of the controller or sensor processor IC is above 75 °C, or that the temperature of the Ethernet card processor IC is above 85 °C.

Possible Cause	Correction Action
High ambient temperatures	Provide cooling for the controller
High power draw	Do not use the controller's 24VDC to power more than 1.5W total

DISPLAY ERROR **This alarm occurs if the user interface gets lost**	
Possible Cause	**Correction Action**
Pressing icons very quickly	Exit out of the screen and continue programming
ETHERNET CARD FAILURE **This alarm occurs if the Ethernet circuit board fails**	
Possible Cause	**Correction Action**
Ethernet card locked up	Try a power cycle to reset it
Faulty Ethernet circuit	Replace Controller Board
WEB SERVER FAILURE **This alarm occurs if the web server on the Ethernet circuit board fails**	
Possible Cause	**Correction Action**
Web server locked up	Try a power cycle to reset it
Faulty Ethernet card	Replace Ethernet card
Fluent DATA COMM ERROR **This alarm occurs if the controller attempts to send data to Fluent and Fluent fails to acknowledge receipt of the data**	
Possible Cause	**Correction Action**
No connection to LAN	Connect Ethernet cable to LAN
Wrong IP, subnet and/or gateway address	Program valid settings for LAN in the controller or use DHCP if supported by the LAN
LAN is blocking outside access	Program LAN's router to open access
Network card failure	See above
SENSOR CAL REQUIRED **This alarm occurs if the sensor's Cal Reminder Alarm has been set to more than 0 days and if the sensor has not been calibrated within that number of days**	
Possible Cause	**Correction Action**
Time to calibrate	Calibrate the sensor
Reminder set in error	Set the Cal Reminder Alarm to 0
CALCULATION ERROR **This alarm occurs if a virtual input calculation cannot be completed, for example if it has to divide by zero.**	
Possible Cause	**Correction Action**
Zero value for the input used as the denominator	Calibrate or evaluate that input
FLOW VERIFY Occurs if the feed monitor digital input does not register any contacts while the control output for that pump has been active for longer than the Flow Alarm Delay time.	
Possible Cause	**Correction Action**
Metering pump has lost prime	Re-prime metering pump
Faulty metering pump	Repair or replace pump
Faulty verification device wiring	Correct wiring
Wrong digital input assigned to the output	Correct programming error
Faulty verification device	Repair or replace device
Faulty wiring of output to pump	Correct wiring
Faulty output board	Repair or replace board
Faulty digital input	Replace board
CONTROLLER, POWER, DISPLAY, OR SENSOR BOARD ERROR **This alarm occurs if the board listed is not recognized**	
Possible Cause	**Correction Action**
Poor ribbon cable connection	Remove and reseat ribbon cable, cycle power
Poor option card connection	Remove and reseat the board, cycle power

Faulty board	Return the controller for repair
CONTROLLER, POWER, SENSOR, DISPLAY, NETWORK OR ANALOG OUTPUT BOARD VARIANT **This alarm occurs if the type of board that is detected is not a valid type**	
Possible Cause	**Correction Action**
Poor ribbon cable connection	Reseat ribbon cable
Faulty ribbon cable	Replace ribbon cable
Faulty Board	Replace the board listed in the error message
SENSOR SOFTWARE VERSION **This alarm occurs if a sensor input card with software v2.11 or lower is installed onto a controller board running software v2.13 or higher**	
Possible Cause	**Correction Action**
Software is not compatible between boards	Perform a Software Upgrade
INVALID SENSOR TYPE **This alarm occurs if the programmed sensor type is not possible for the installed sensor board**	
Possible Cause	**Correction Action**
The sensor board has been removed and replaced with a different type	Reinstall the correct board or reprogram the input to a valid type for the board installed
INVALID CONTROL MODE **This alarm occurs if the programmed control mode is not possible for the installed power relay board**	
Possible Cause	**Correction Action**
The power relay board has been removed and replaced with an incorrect model	Reinstall the correct board or reprogram the output to a valid type for the board installed
Fluent LIVE CONNECT ERROR **This alarm occurs if the controller is unable to establish an encrypted connection to the Fluent server. If there is also a Fluent Data Comm Error, fix that first.**	
Possible Cause	**Correction Action**
No UDP support on Port 9012 or TCP support on Port 44965	Open ports/protocols on router
DISABLED (SENSOR, DIGITAL OR VIRTUAL INPUT; RELAY OR ANALOG OUTPUT) **This alarm occurs if software for that input or output did not start correctly**	
Possible Cause	**Correction Action**
The software is not functioning	If the error message clears on its own, no action is required. If the error message persists, cycle power. If the error message still persists, return the controller for repair.
RELAY OR ANALOG OUTPUT CONTROL FAILURE **This alarm occurs if software for that output did not run correctly**	
Possible Cause	**Correction Action**
The software is not functioning	If the error message clears on its own, no action is required. If the error message persists, cycle power. If the error message still persists, return the controller for repair.
FRAM FILE SYSTEM ERROR **This alarm occurs if the FRAM is not detected at power up**	
Possible Cause	**Correction Action**
The FRAM was or is not functioning	If the error message clears on its own, no action is required. If the error message persists, cycle power. If the error message still persists, replace the controller board.
REPLACE ELECTRODES **Occurs if the user has set an Electrode Alarm and the number of days selected since the last time “Replace Corrosion Electrode” has been confirmed has passed.**	
Possible Cause	**Corrective Action**
The Electrode Alarm timer has expired	Replace the electrodes and then confirm in the Replace Corrosion Electrode menu

WiFi MODULE FAILURE **The WiFi module is not responding**	
Possible Cause	**Corrective Action**
WiFi board not connected properly	Power down, reseat WiFi board, power up
Faulty WiFi board	Replace WiFi board
WiFi CONNECTION ERROR The WiFi module is unable to connect to the specified Infrastructure access point	
Possible Cause	**Corrective Action**
Missing settings	WiFi Status will be “Invalid Config”. Enter the missing settings.
Incorrect settings	Check with the LAN admin for the correct settings
Invalid key	WiFi Status will be “Invalid Key”. Check with the LAN admin for the correct settings.
Poor signal	WiFi status will be “Network Not Found” or “Unable to Connect”. Improve signal.
Access point is not working	WiFi status will be “Network Not Found” or “Unable to Connect”. Have LAN admin check access point functionality.
Faulty WiFi board	Replace WiFi board
UPDATE TIMEOUT This alarm occurs if a Remote Modbus Input does not receive the requested data within the programmed Timeout Alarm Delay time	
Possible Cause	**Corrective action**
No Ethernet connection to the Modbus application	Check wiring
Invalid Modbus communications settings	Check settings
Timeout Alarm Delay time is too short	Increase delay time
MESSAGE ERROR This alarm occurs if the Remote Modbus Input receives an error message from the Modbus application instead of the requested data	
Possible Cause	**Corrective action**
Invalid Modbus communications settings	Check settings. Enable Verbose Logging to see the exact error.
BOOLEAN ALARM This alarm occurs if a Boolean Logic output is in the state in which it is programmed to alarm.	
Possible Cause	**Corrective action**
Improperly programmed	Program correctly
Normal operation	Respond to the cause of the relay being in the alarm state
DAILY MAX TIMEOUT This alarm occurs if an output has been activated for longer than the programmed Daily Max Time Limit.	
Possible Cause	**Corrective Action**
Improperly programmed	Program correctly
Normal operation	Respond to the cause of the relay being activated for too long

8.3 Procedure for Evaluation of Conductivity Electrode

Try cleaning the electrode first (refer to Sect. 7.1). To check the electrode, check the electrode connections to the terminal strip (refer to Figure 7). Make sure that the correct colors go to the correct terminals, and that the connections are tight. Restore power and see if the conductivity is back to normal. If not, replace the electrode.

8.4 Procedure for Evaluation of the pH/ORP Electrode

The most common cause of a calibration failure is an electrode problem. First try cleaning the electrode, then retry the calibration. If this fails again, replace the electrode and retry the calibration.

The next most common problem is wet or poor connections. Check the connection of the electrode to the cable for moisture. Check the connections between the cable and the terminal strip. Make sure that they are tight, that the terminal is not clamped to the plastic jacket, and that the wires are routed to the correct terminal. If there is a junction

box installed between the electrode and the controller, check the wiring there as well.
You should be able to measure the +5VDC ±5% and -5VDC ±5% vs IN- at the terminal strip. If not, the controller is faulty. You should be able to measure the IN+ vs IN- (DC scale) and get the appropriate values for the buffer solutions used. If not, the preamplifier or its wiring is faulty.

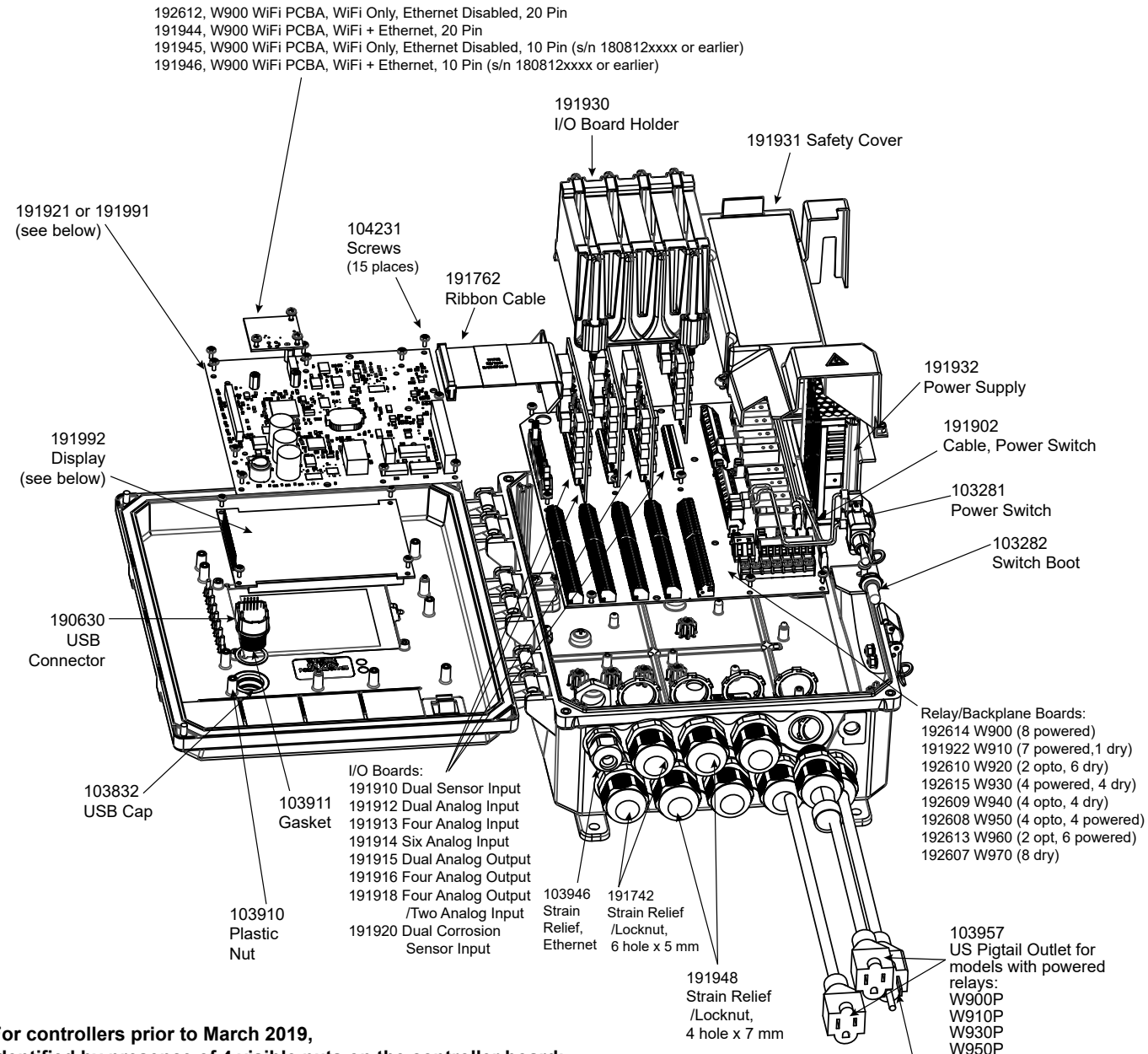
The last possibility is to try replacing the preamplifier.

8.5 Diagnostic Lights

Some of the circuit boards inside the controller have diagnostic lights.

CONTROLLER BOARD D12 LED **Indicates status of the software application. Normal operation is that 5 seconds after power-up, it does one long blink on, two short blinks, on long blink off. If it is not doing this:**	
Possible Cause	**Correction Action**
Controller software is not running	Try a power cycle to reset it
Faulty controller board	Replace controller board
CONTROLLER BOARD D14 LED **Indicates the status of the Ethernet software. Normal operation is that 5 seconds after power-up, it does 5 seconds on, 5 seconds off. If it is not doing this:**	
Possible Cause	**Correction Action**
Ethernet software is not running	Try a power cycle to reset it
Faulty controller board	Replace controller board
CONTROLLER BOARD D15 LED **Indicates the status of the digital input software. Blinks slowly for a few seconds during power-up. Normal operation is OFF. If not behaving this way:**	
Possible Cause	**Correction Action**
Digital input software locked up	Try a power cycle to reset it
Faulty controller board	Replace controller board
CONTROLLER BOARD D13 LED **Indicates the status of the 12VDC power supply. Normal operation is ON. If not on:**	
Possible Cause	**Correction Action**
Faulty ribbon cable	Replace ribbon cable
Faulty power supply	Replace power supply
CONTROLLER BOARD D11 LED **Indicates the status of the 5VDC power supply. Normal operation is ON. If not on:**	
Possible Cause	**Correction Action**
Faulty ribbon cable	Replace ribbon cable
Faulty power supply	Replace power supply
CONTROLLER BOARD D10 LED **Indicates the status of the 3.3VDC power supply. Normal operation is ON. If not on:**	
Possible Cause	**Correction Action**
Faulty ribbon cable	Replace ribbon cable
Faulty power supply	Replace power supply
I/O BOARD LEDs **Indicates the status of the sensor board. Blinks slowly for several seconds during power-up. Normal operation is OFF. If not behaving this way:**	
Possible Cause	**Corrective Action**
Sensor card locked up	Try a power cycle to reset it
Sensor card not seated correctly	Unplug the card and plug it back in
Ribbon cable not seated correctly	Unplug the ribbon cable at each end and plug it back in
Faulty ribbon cable	Replace ribbon cable
Faulty sensor card	Replace sensor card

9.0 Spare Parts Identification



For controllers prior to March 2019,
identified by presence of 4 visible nuts on the controller board:

Order 191921 Controller Board + Display. If also using WiFi, order a new 20-pin WiFi card.

191921-WA-CT-N Cooling tower

191921-WA-BL-N Boiler

191921-WA-IN-N Industrial

Change -N to -M for Modbus or BACnet

For controllers after to March 2019,
identified by absence of 4 visible nuts on the controller board:

191992 Display may be ordered separately from the controller board.

Order 191991 Controller Board. If also using WiFi, that card may be re-used.

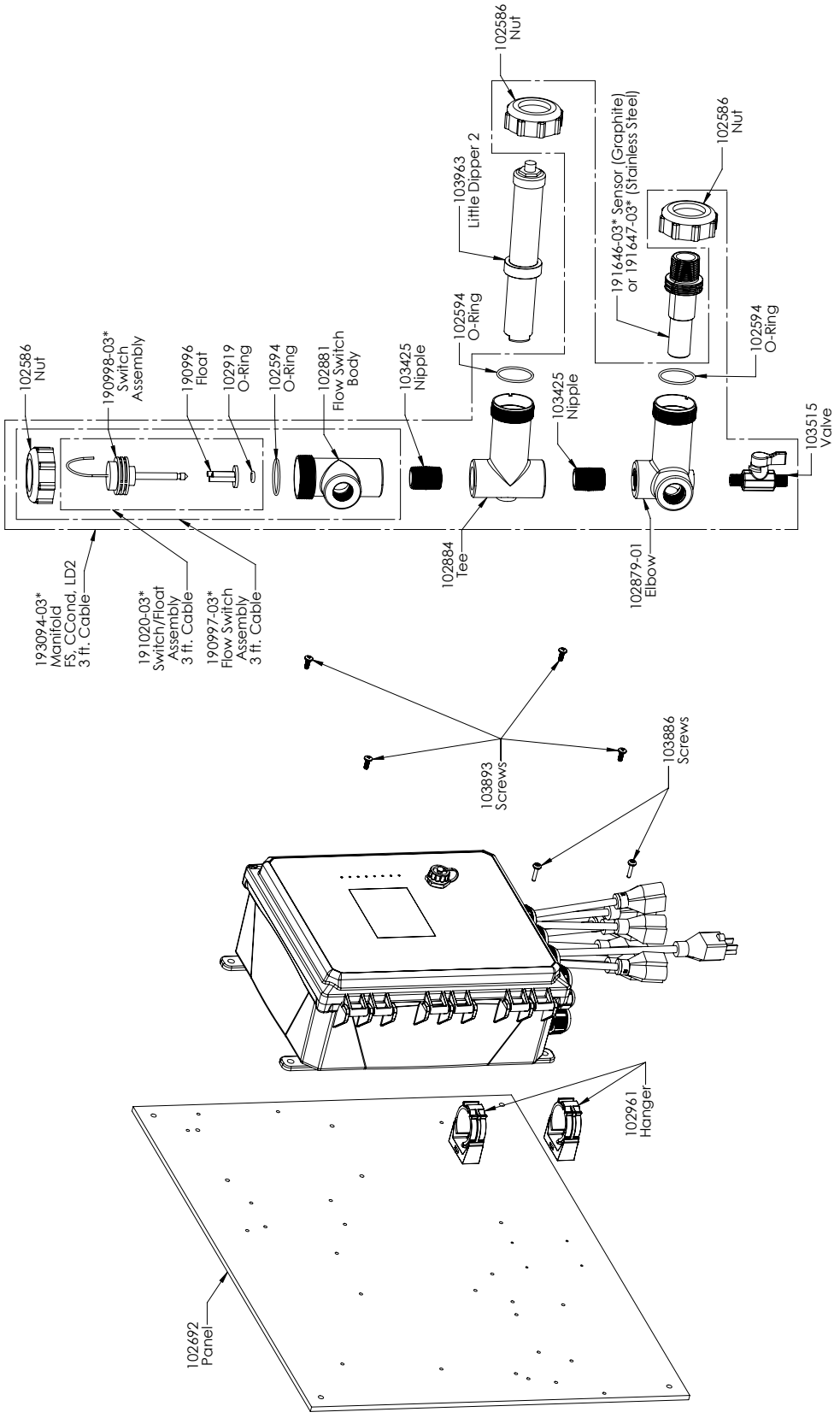
191991-WA-CT-N Cooling tower

191991-WA-BL-N Boiler

191991-WA-IN-N Industrial

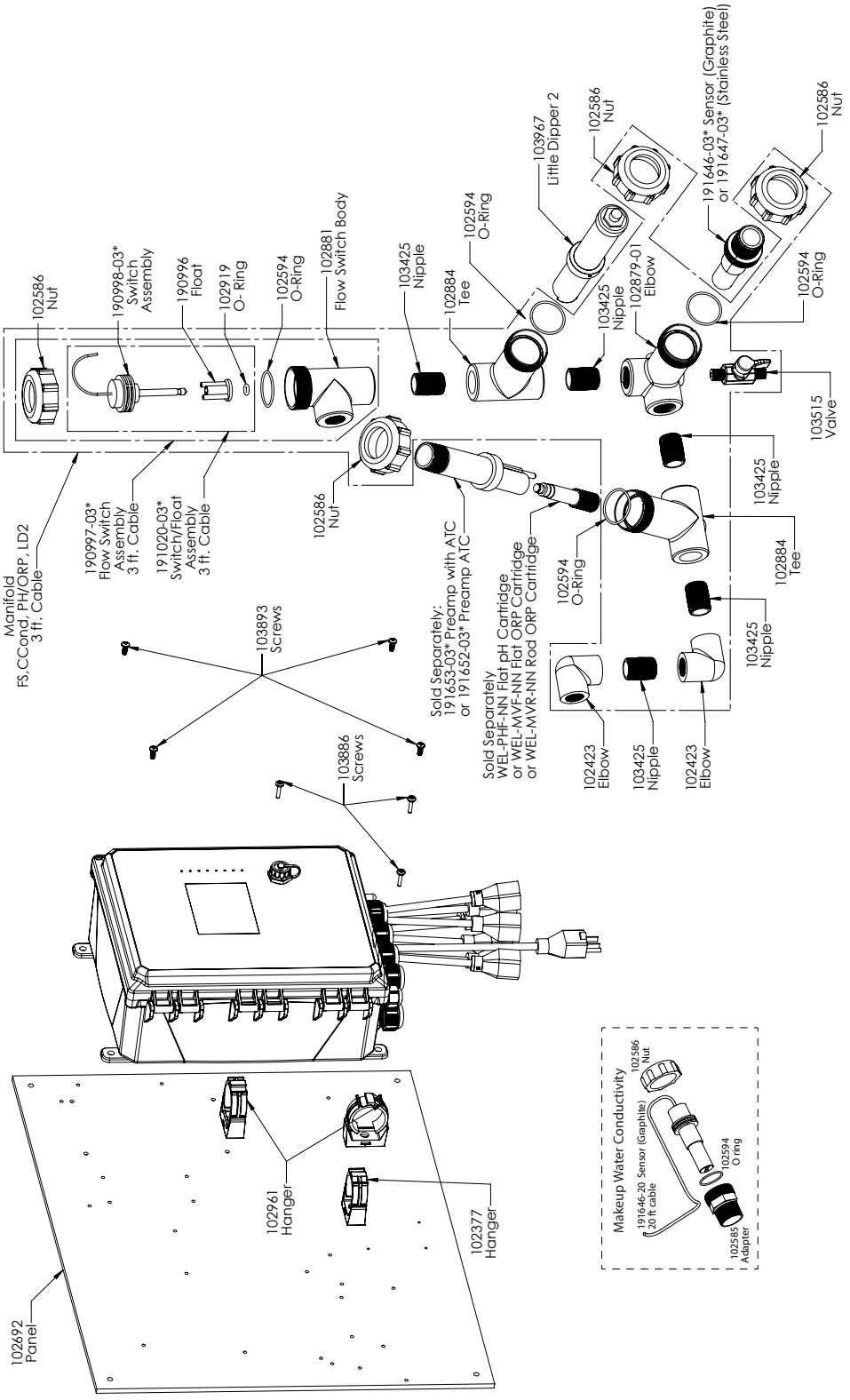
Change -N to -M for Modbus or BACnet

Controller Parts



WCT900 Sensor Options PAFMNN, PBFMNN, PAHMNN, PBHMNN, PAIMNN, PBIMNN

PAFMNN: Graphite contacting conductivity + Flow Switch manifold on panel + WEL-PHF no ATC + LD2
PAHMNN: + WEL-MVR + LD2 **PAIMNN:** + WEL-MVF + LD2
PBFMNN: 316SS contacting conductivity + Flow Switch manifold on panel + WEL-PHF no ATC + LD2
PBHMNN: + WEL-MVR + LD2 **PBIMNN:** + WEL-MVF + LD2



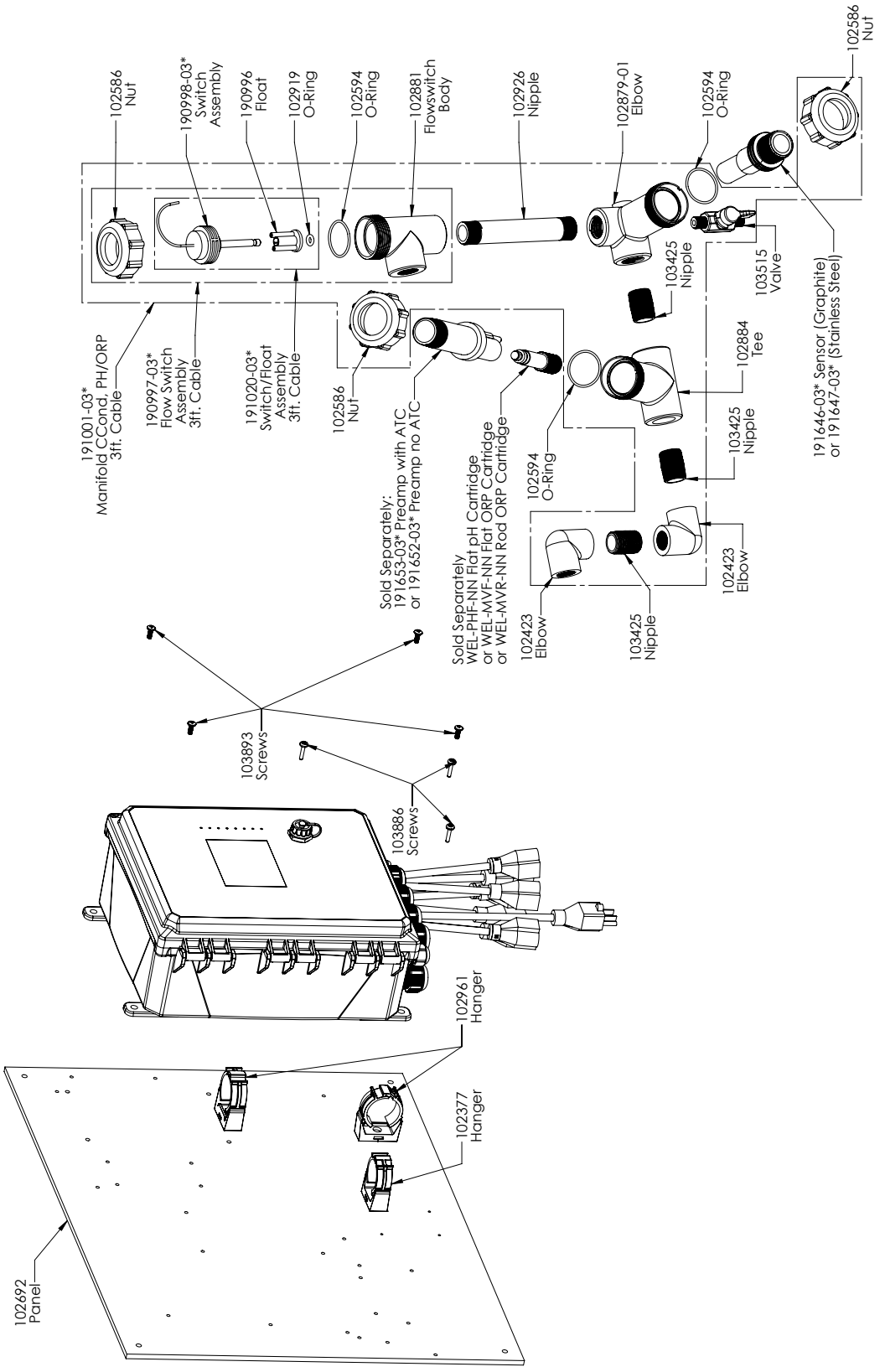
WCT900 Sensor Options PAEFMN, PBEFMN, PAEHMN, PBEHMN, PAEIMN, PBEIMN

PAEFMN: Graphite contacting conductivity + Flow Switch manifold on panel
+ Makeup Conductivity + WEL-PHF no ATC + LD2

PAEHMN: + WEL-MVR + LD2 **PAEIMN:** + WEL-MVF + LD2

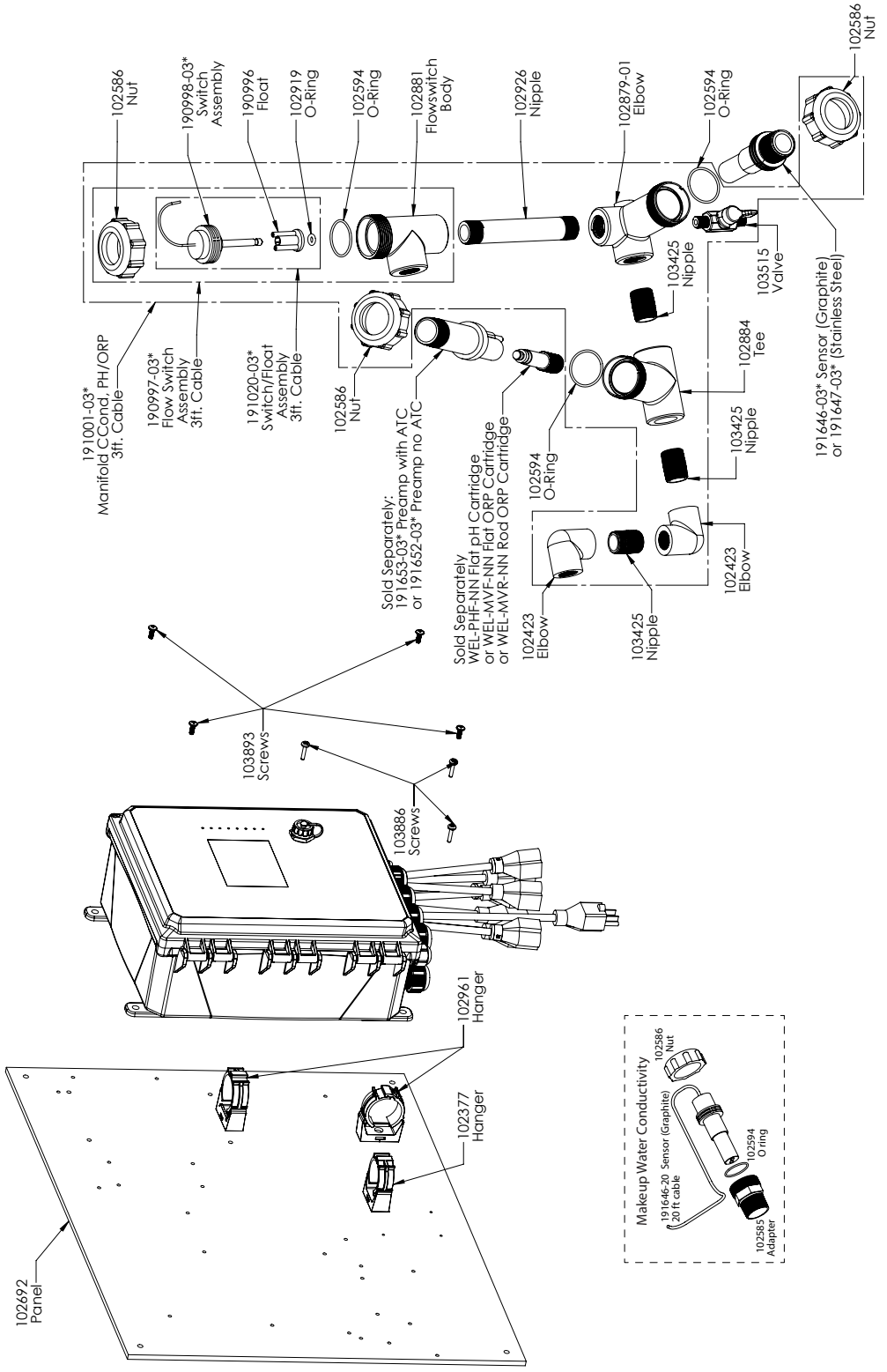
PBEFMN: 316SS contacting conductivity + Flow Switch manifold on panel
+ Makeup Conductivity + WEL-PHF no ATC + LD2

PBEHMN: + WEL-MVR + LD2 **PBEIMN:** + WEL-MVF + LD2



WCT900 Sensor Options PAFNNN, PBFNNN, PAHNNN, PBHNNN, PAINNN, PBINNN

PAFNNN: Graphite contacting conductivity + Flow Switch manifold on panel + WEL-PHF no ATC
PAHNNN: + WEL-MVR **PAINNN:** + WEL-MVF
PBFNNN: 316SS contacting conductivity + Flow Switch manifold on panel + WEL-PHF no ATC
PBHNNN: + WEL-MVR **PBINNN:** + WEL-MVF



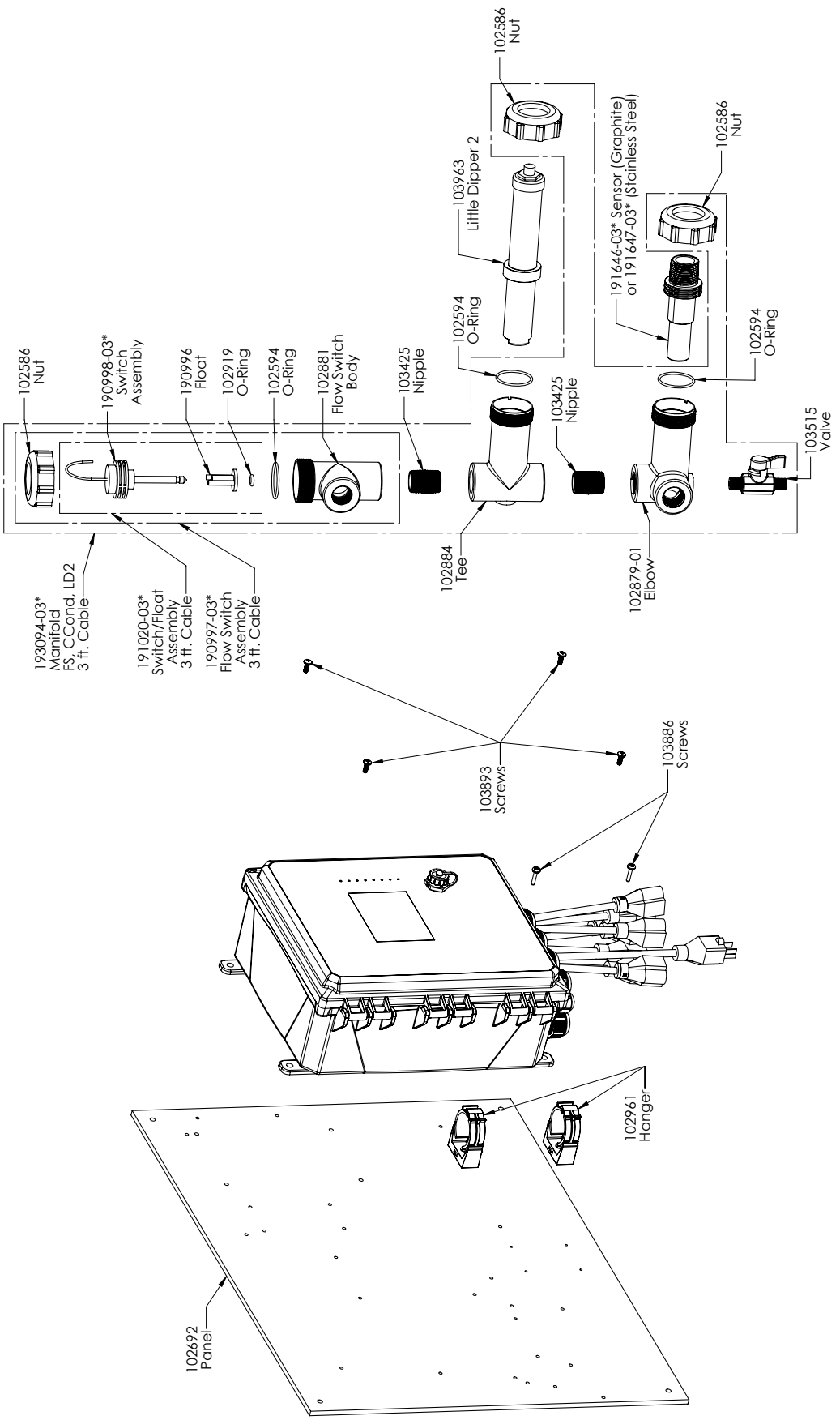
WCT900 Sensor Options PAEFNN, PBEFNN, PAEHNN, PBEHNN, PAEINN, PBEINN

PAEFNN: Graphite contacting conductivity + Flow Switch manifold on panel
+ Makeup Conductivity+ WEL-PHF no ATC

PAEHNN: + WEL-MVR **PAEINN:** + WEL-MVF

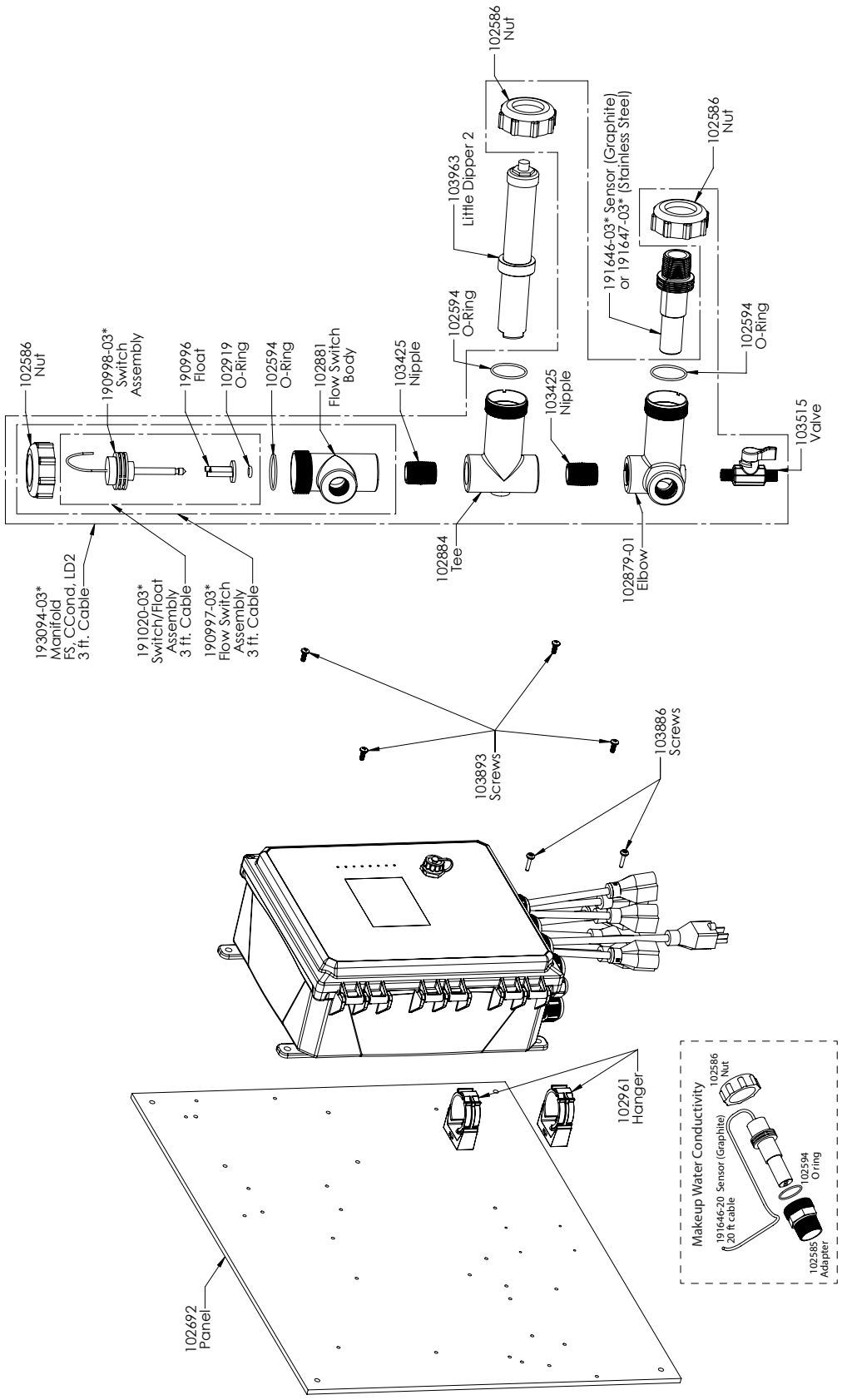
PBEFNN: 316SS contacting conductivity + Flow Switch manifold on panel
+ Makeup Conductivity + WEL-PHF no ATC

PBEHNN: + WEL-MVR **PBEINN:** + WEL-MVF



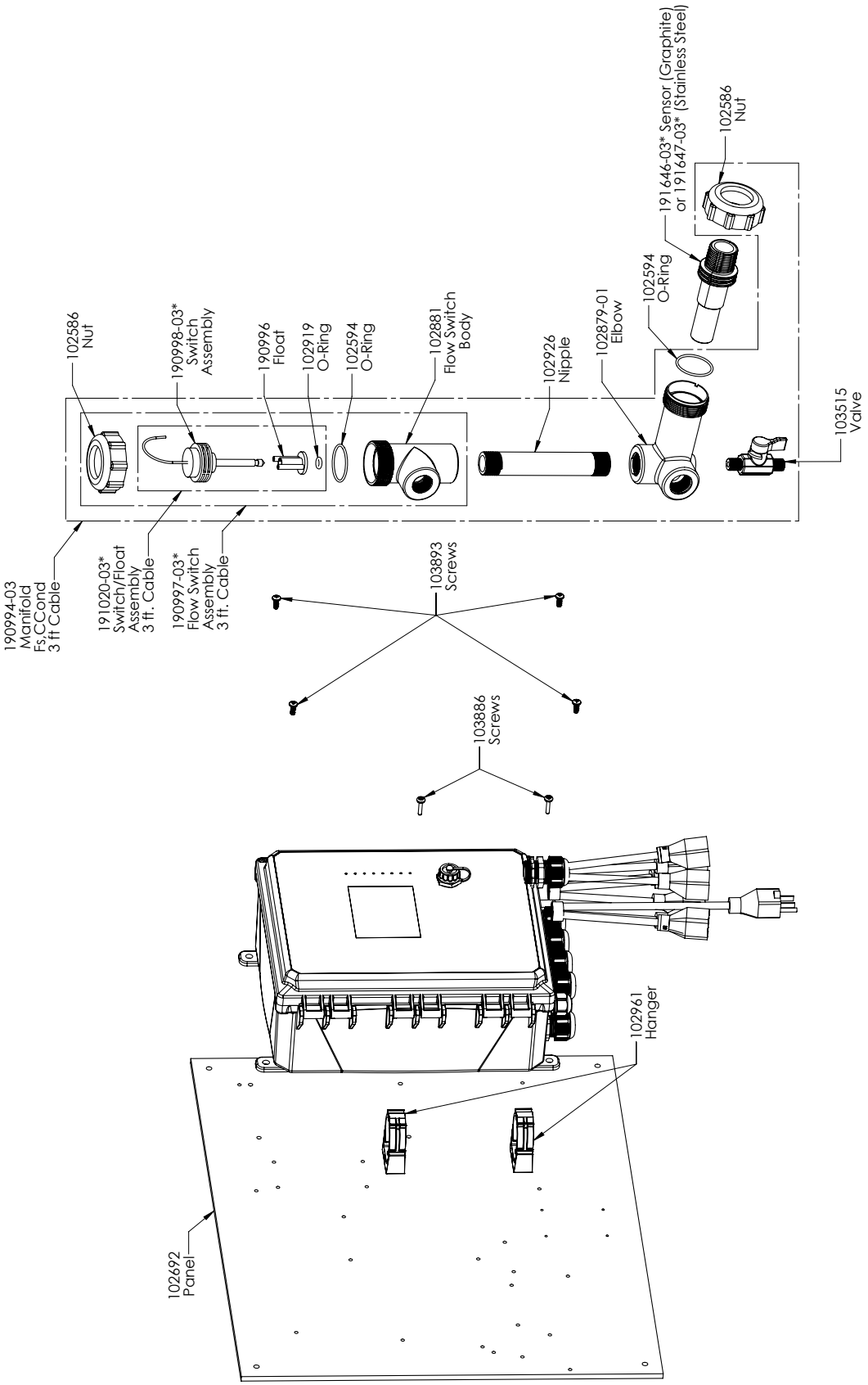
WCT900 Sensor Options PAMNNN, PBMNNN

PAMNNN: Graphite contacting conductivity + Flow Switch manifold on panel + LD2
PBMNNN: 316SS contacting conductivity + Flow Switch manifold on panel + LD2



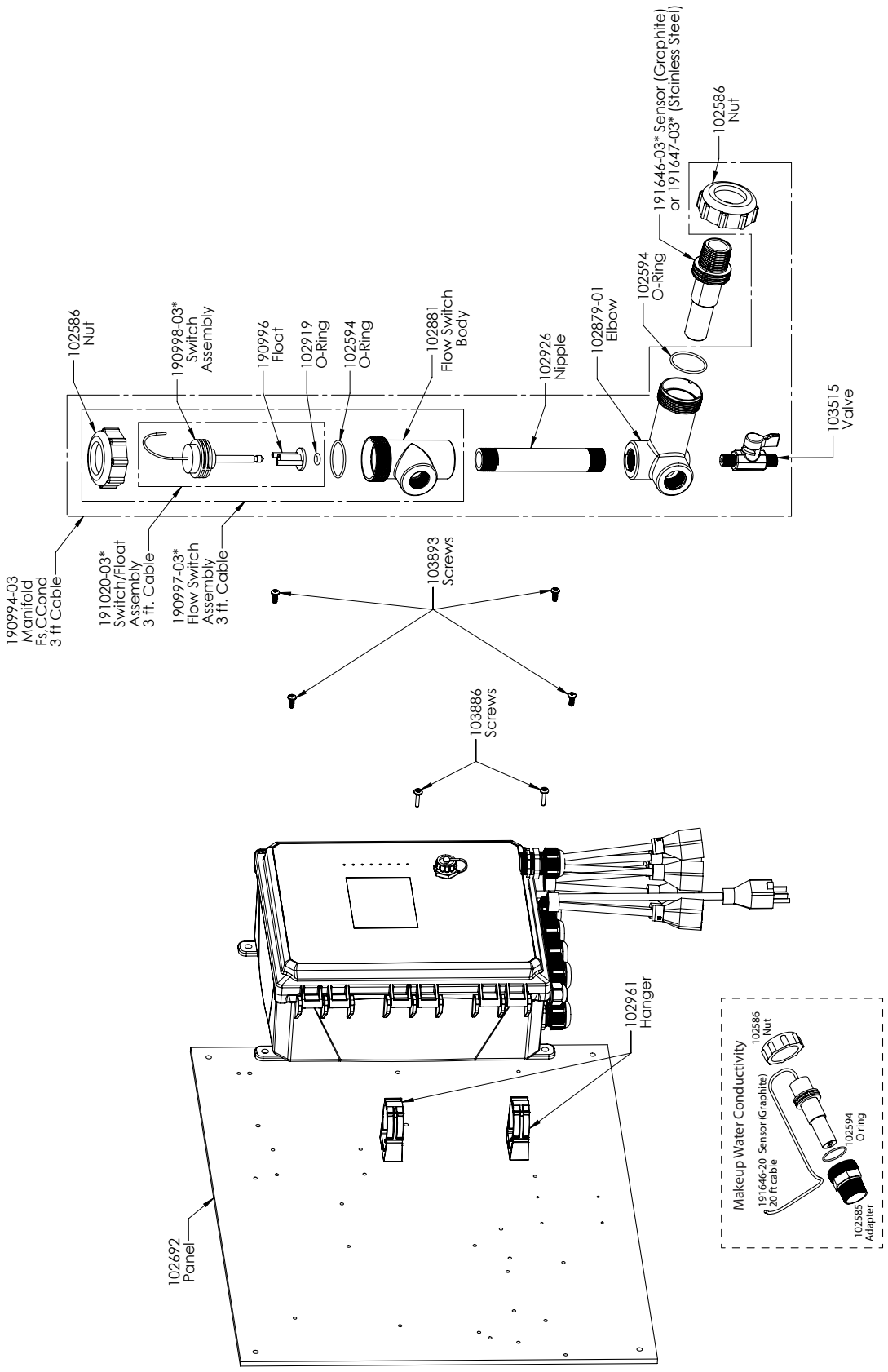
WCT900 Sensor Options PAEMNN, PBEMNN

PAEMNN: Graphite contacting conductivity + Flow Switch manifold on panel+ makeup sensor + LD2
PBMNNN: 316SS contacting conductivity + Flow Switch manifold on panel + makeup sensor + LD2



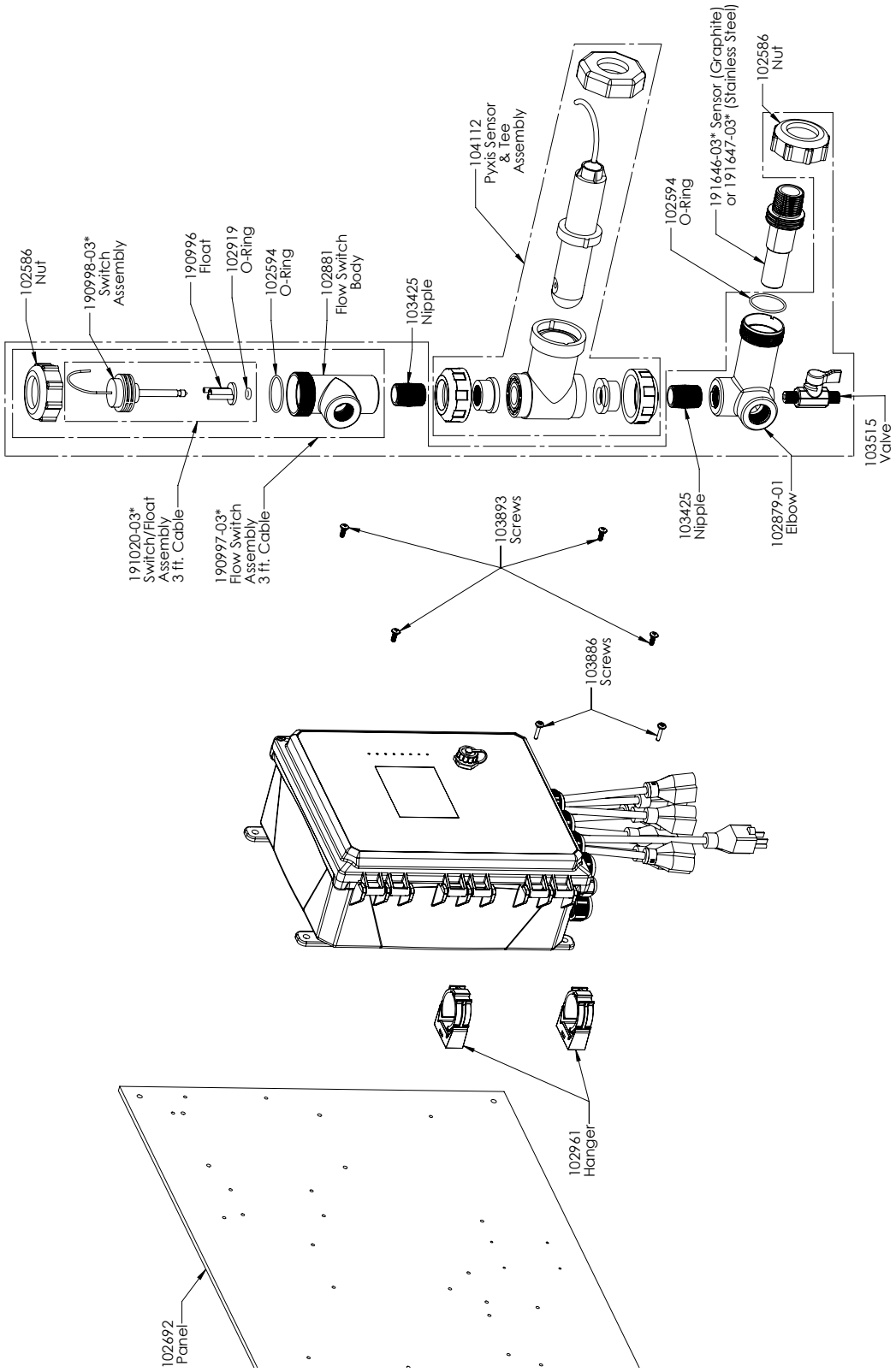
WCT900 Sensor Options PANNNN, PBNNNN

PANNNN: Graphite contacting conductivity + Flow Switch manifold on panel
PBNNNN: 316SS contacting conductivity + Flow Switch manifold on panel



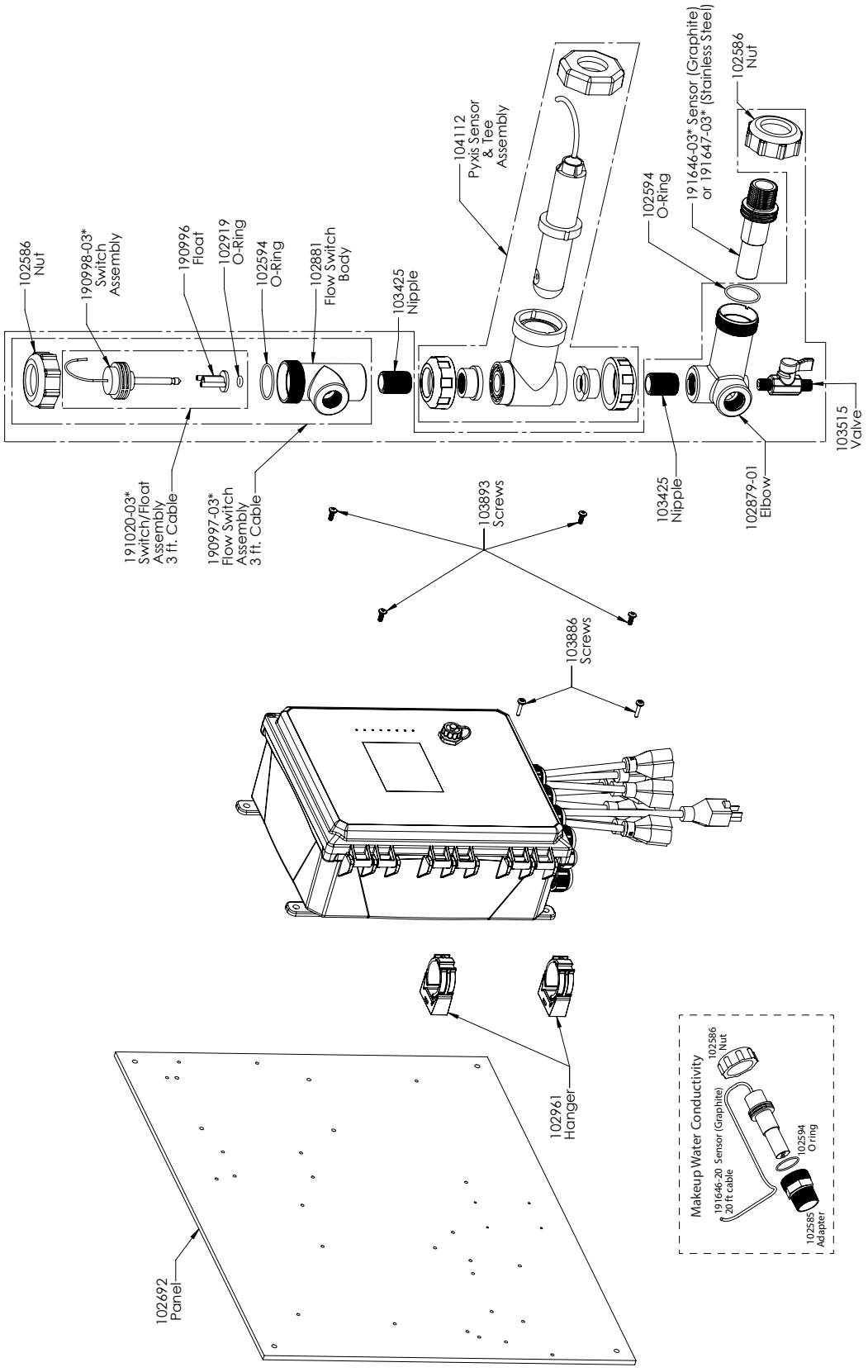
WCT900 Sensor Options PAENNN, PBENNN

PAENNN: Graphite contacting conductivity + Flow Switch manifold on panel + makeup sensor
PBENNN: 316SS contacting conductivity + Flow Switch manifold on panel + makeup sensor



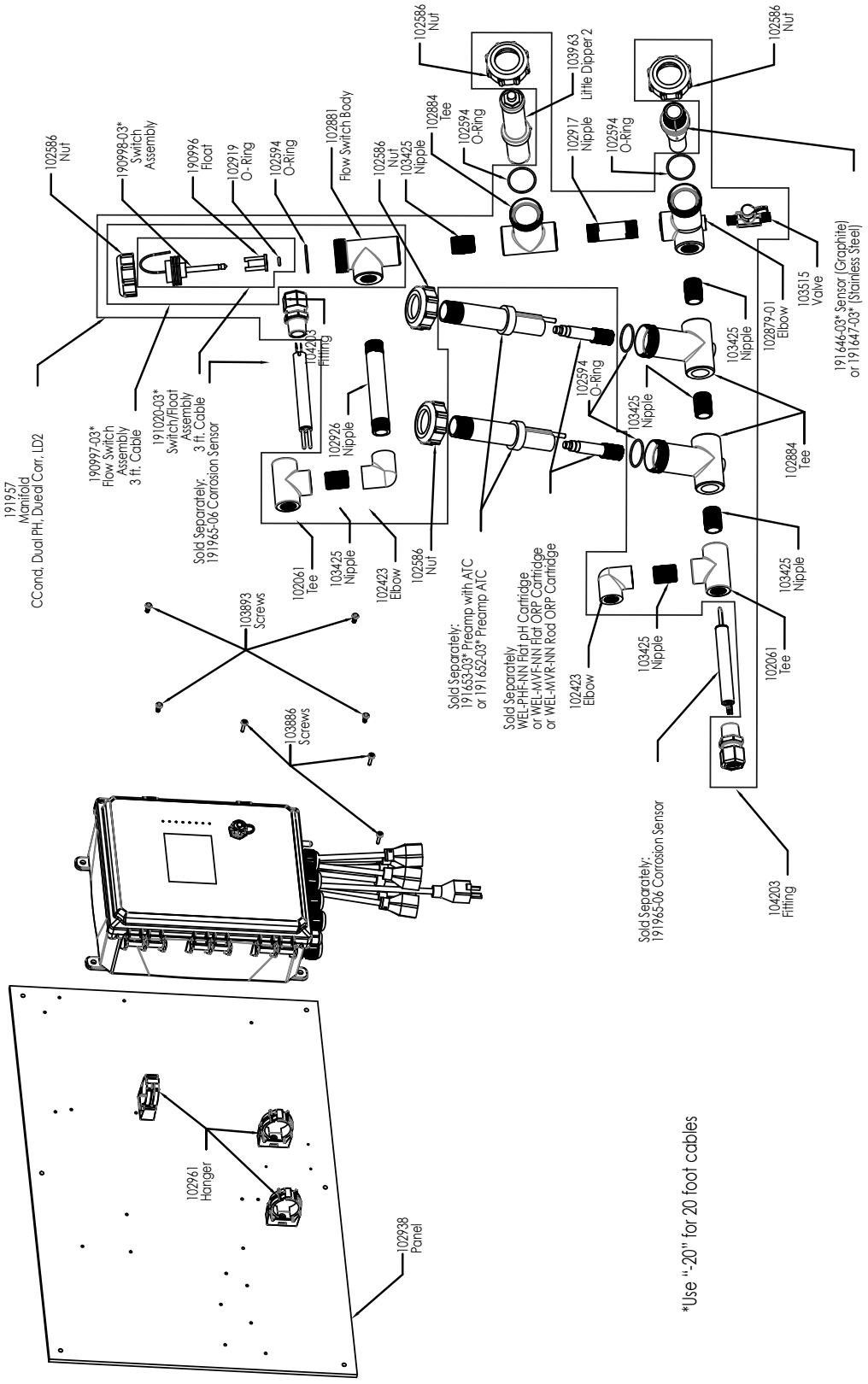
WCT900 Sensor Options PAPNNN, PBPNNN

PAPNNN: Graphite contacting conductivity + Flow Switch manifold on panel + Pyxis
PBPNNN: 316SS contacting conductivity + Flow Switch manifold on panel + Pyxis



WCT900 Sensor Options PAEPNN, PBEPNN

PAEPNN: Graphite contacting conductivity + Flow Switch manifold on panel + Pyxis + makeup sensor
PBEPNN: 316SS contacting conductivity + Flow Switch manifold on panel + Pyxis + makeup sensor



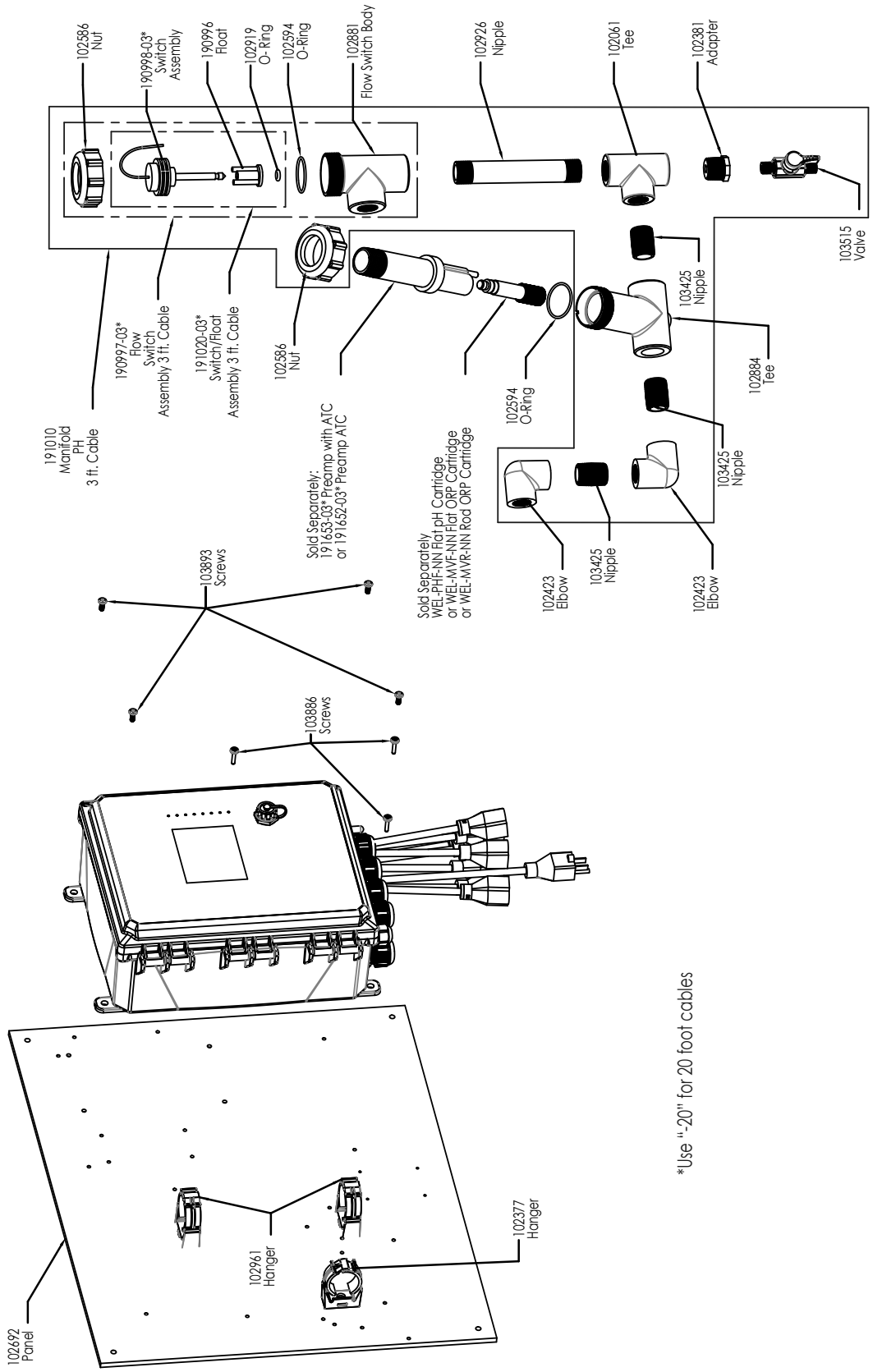
WCT900 Sensor Options PAFHMR, PBFHMR, PAFIMR, PBFIMR

PAFHMR: Graphite contacting conductivity + Flow Switch manifold on panel + WEL-PHF no ATC + Little Dipper 2 +Dual Corrosion + WEL-MVR

PAFIMR: + WEL-MVF

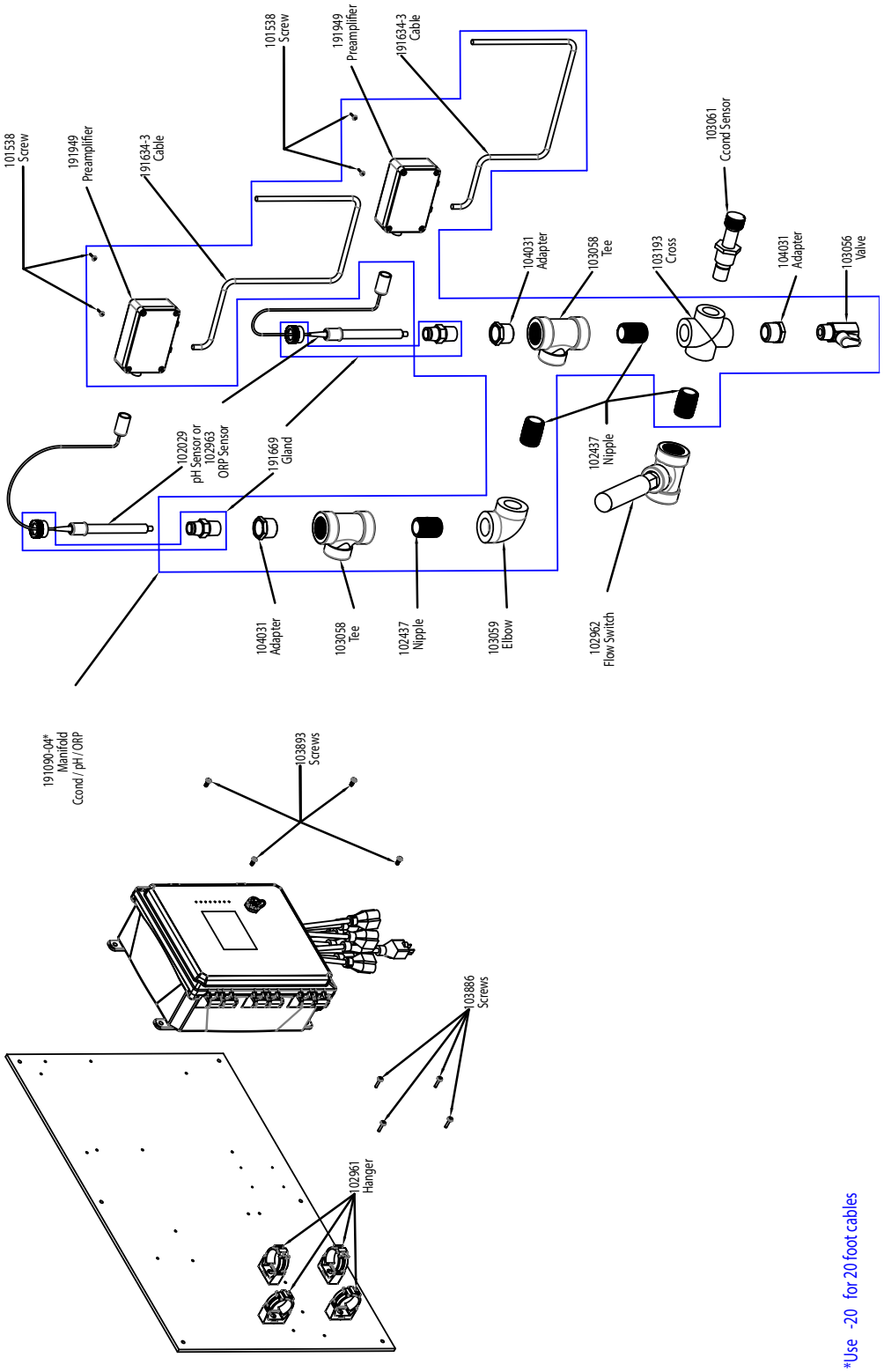
PBFHMR: 316SS contacting conductivity + Flow Switch manifold on panel+ WEL-PHF no ATC + Little Dipper 2 + Dual Corrosion + WEL-MVR

PBFIMR: + WEL-MVF



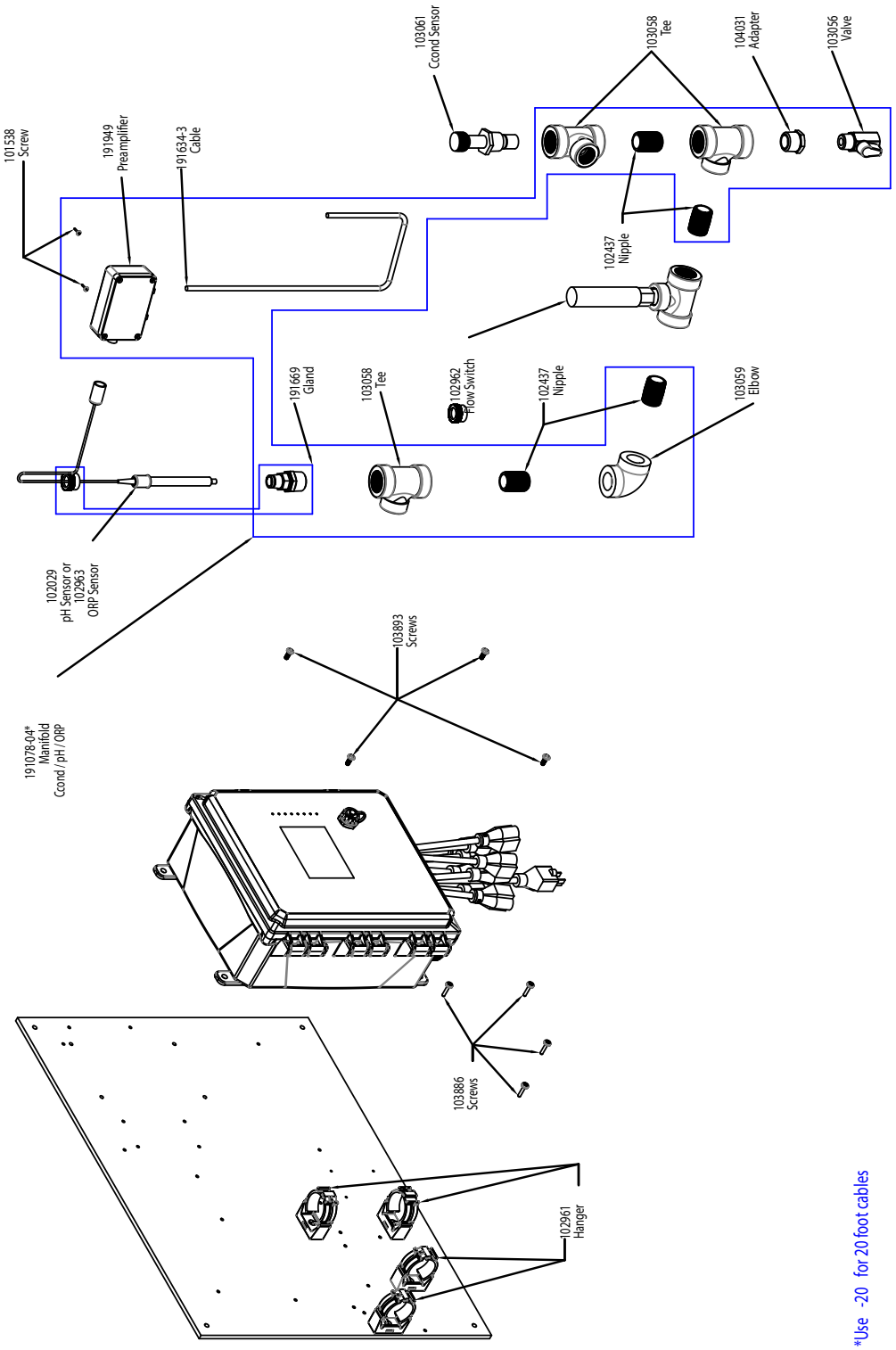
WCT900 Sensor Options PFNNNN, PHNNNN, PINNNN and WIN900 Sensor Option PBNNNN

W900-CT-PFNNNN: Flow Switch manifold on panel + WEL-PHF no ATC
PHNNNN: + WEL-MVR
PINNNN: + WEL-MVF
W900-IN-PBNNNN: Flow Switch manifold on panel + WEL-PHF with ATC



WCT900 Sensor Option HDGJNN

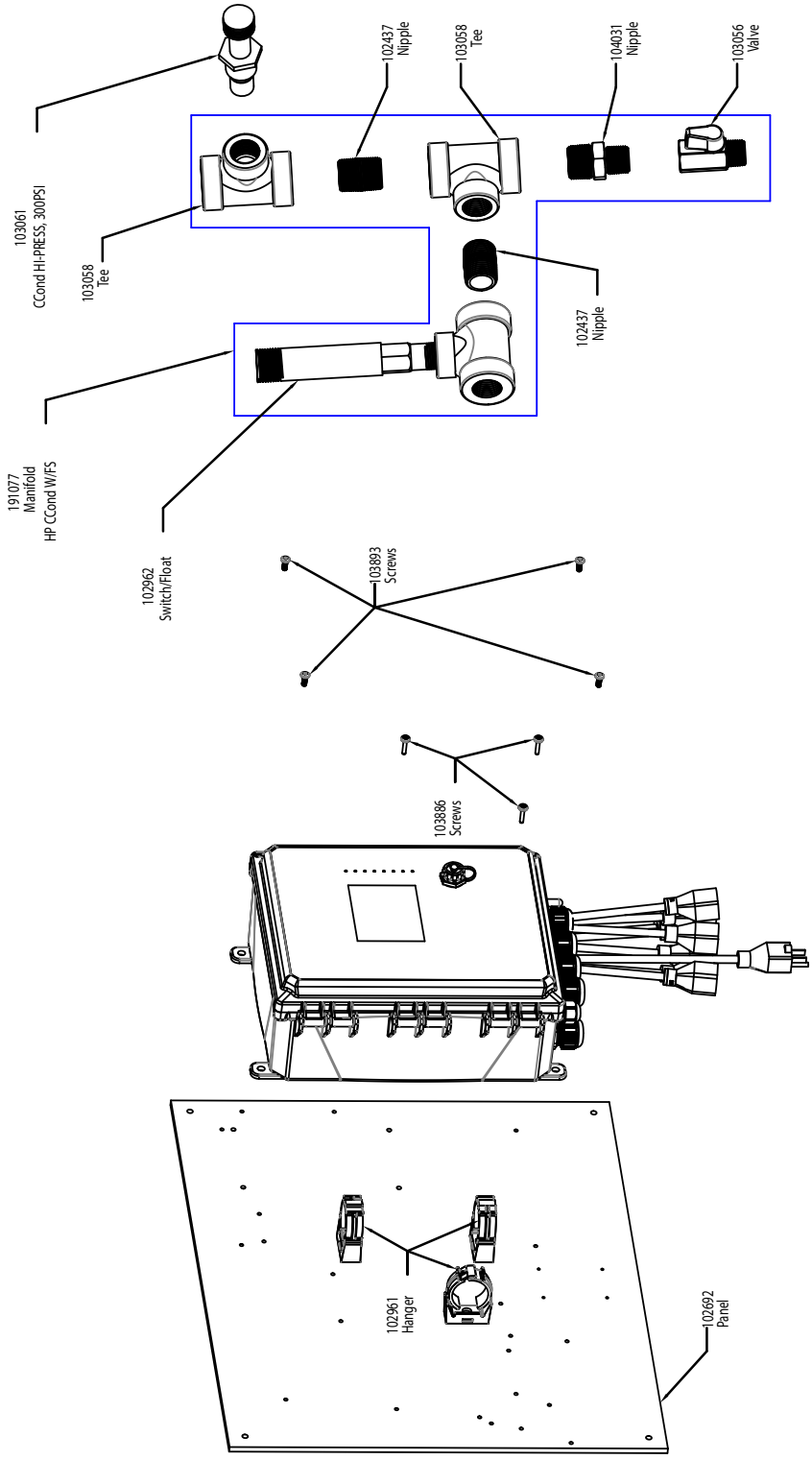
HDGJNN: High Pressure conductivity + pH + ORP + Flow Switch manifold on panel



WCT900 Sensor Options HDGNNN, HDJNNN

HDGNNN: High Pressure Conductivity + pH + Flow Switch manifold on panel

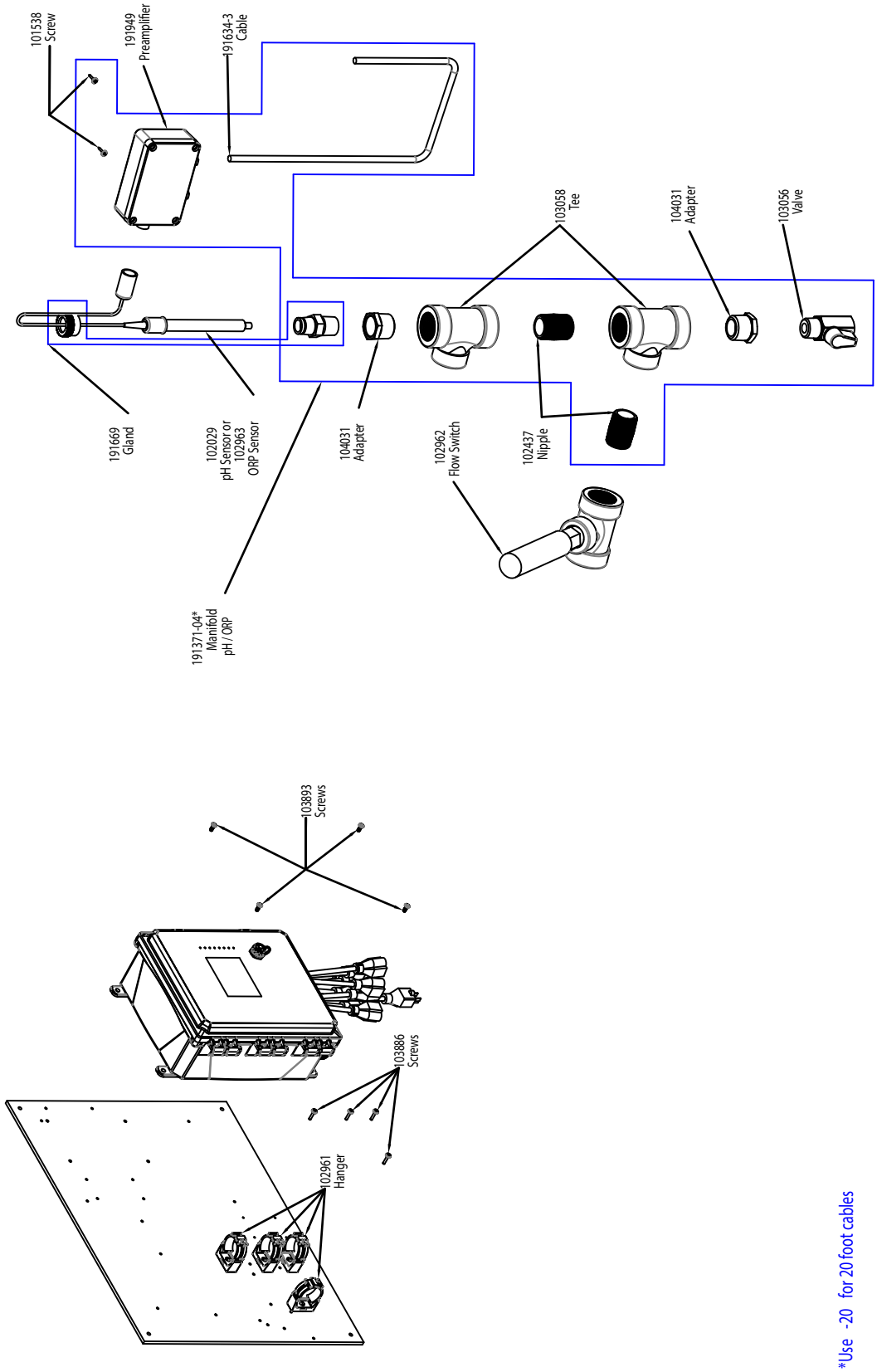
HDJNNN: High Pressure Conductivity + ORP + Flow Switch manifold on panel



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For Instructional Use Only.

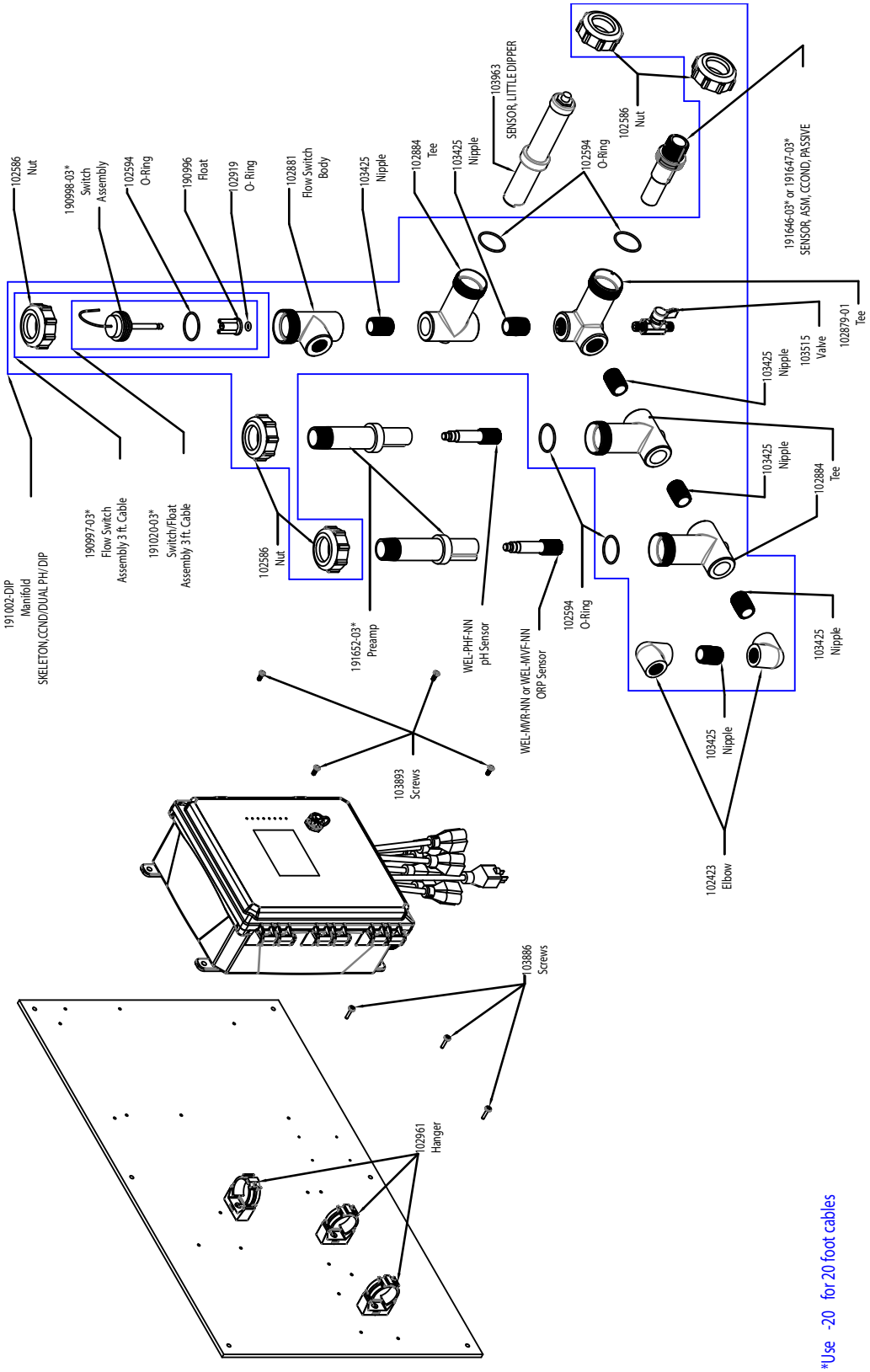
WCT900 Sensor Option HDNNNN

HDNNNN: High Pressure conductivity + Flow Switch manifold on panel



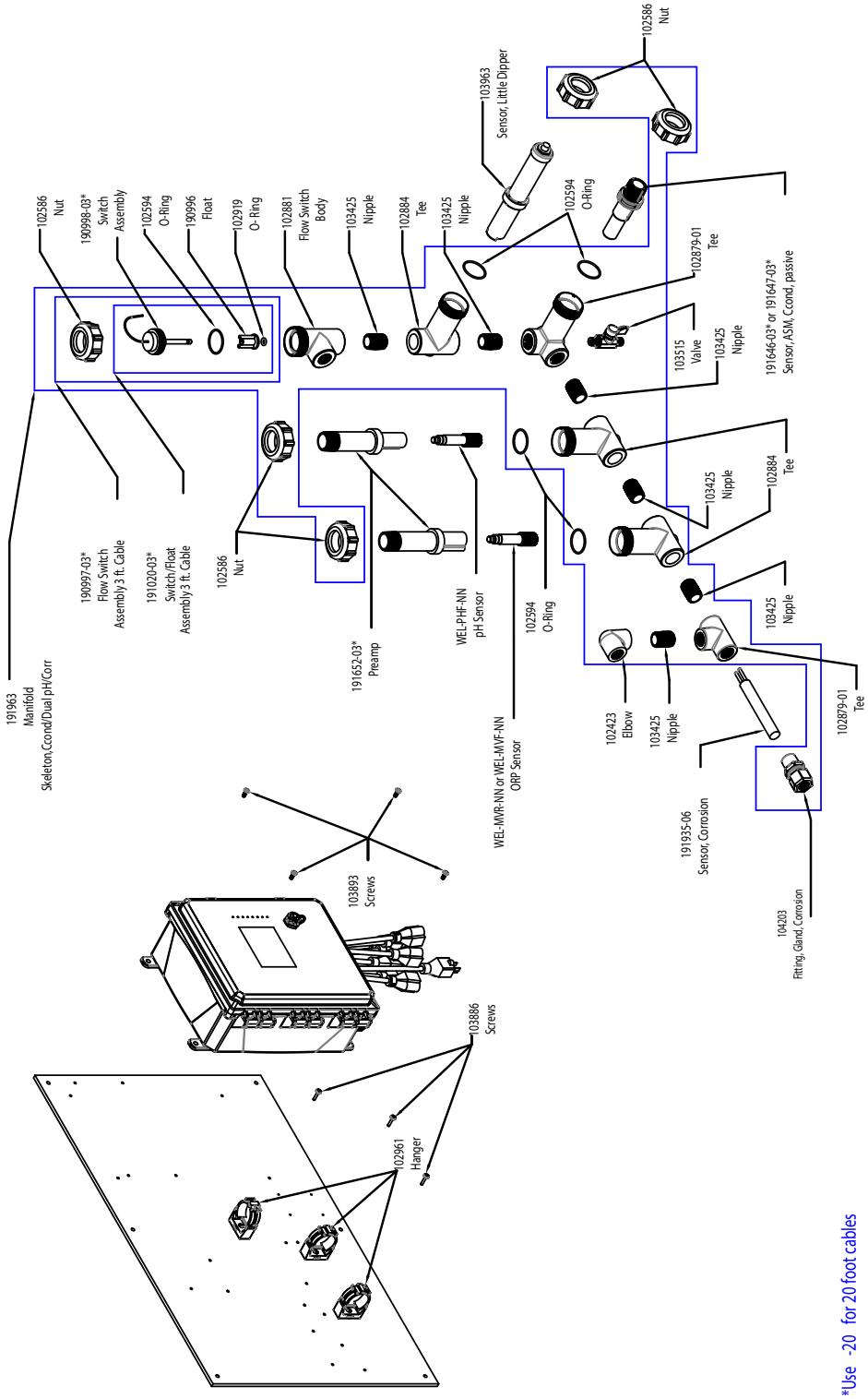
WCT900 Sensor Options HGNNNN, HJNNNN

HGNNNN: High Pressure pH + Flow Switch manifold on panel
HJNNNN: High Pressure ORP + Flow Switch manifold on panel



WCT900 Sensor Options PAFHMN, PBFHMN, PAFIMN, PBFIMN

PAFHMN: Graphite contacting conductivity + pH + LD2 + Flow Switch manifold on panel + Rod ORP
PAFIMN: + Flat ORP
PBFIMN: 316SS contacting conductivity + pH + LD2 + Flow Switch manifold on panel + Flat ORP
PBFHMN: + Rod ORP



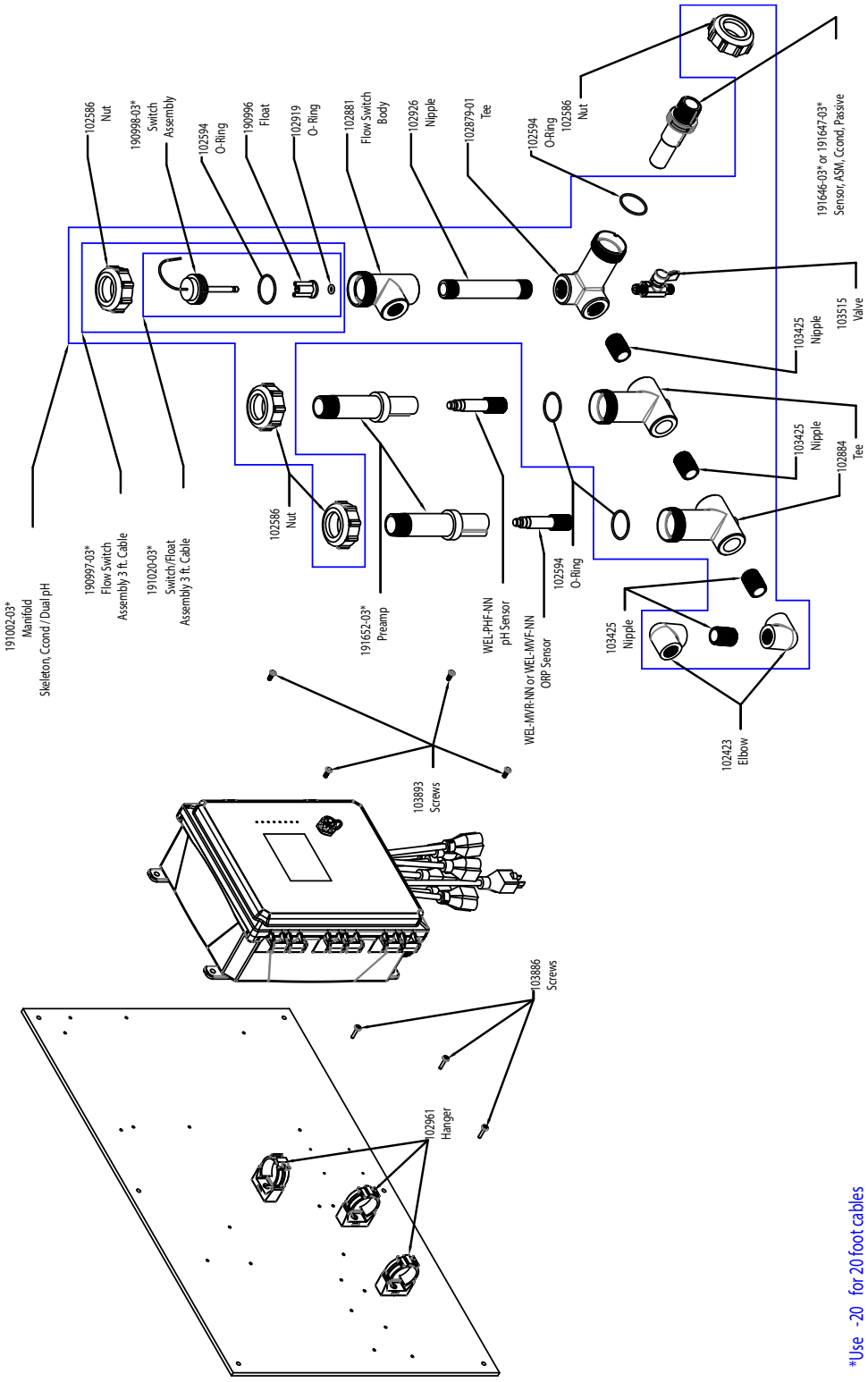
WCT900 Sensor Options PAFHMO, PBFHMO, PAFIMO, PBFIMO

PAFHMO: Graphite contacting conductivity + pH + LD2 + Corrosion + Flow Switch manifold on panel + Rod ORP

PAFIMO: + Flat ORP

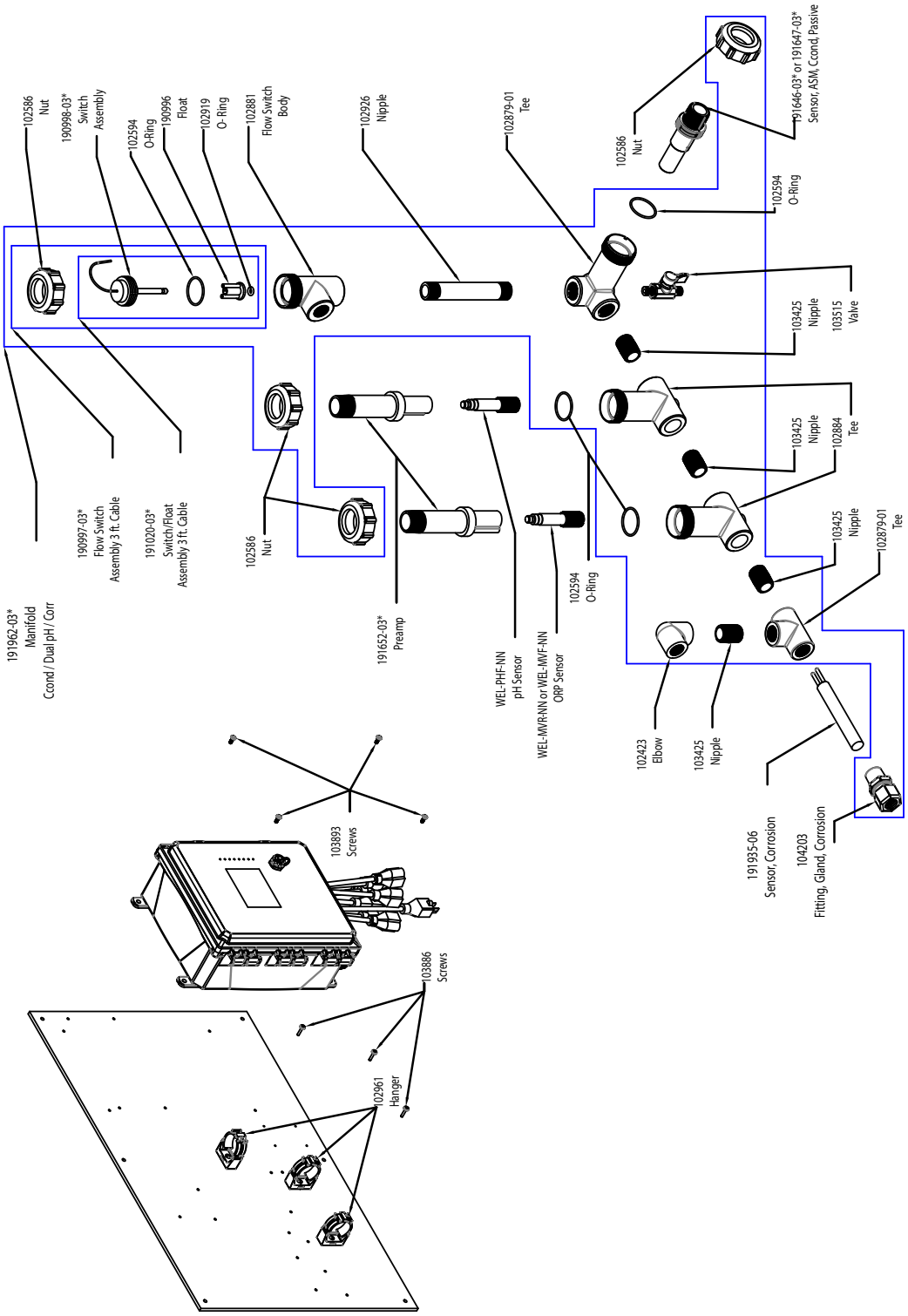
PBFHMO: 316SS contacting conductivity + pH + LD2 + Corrosion + Flow Switch manifold on panel + Rod ORP

PBFIMO: + Flat ORP



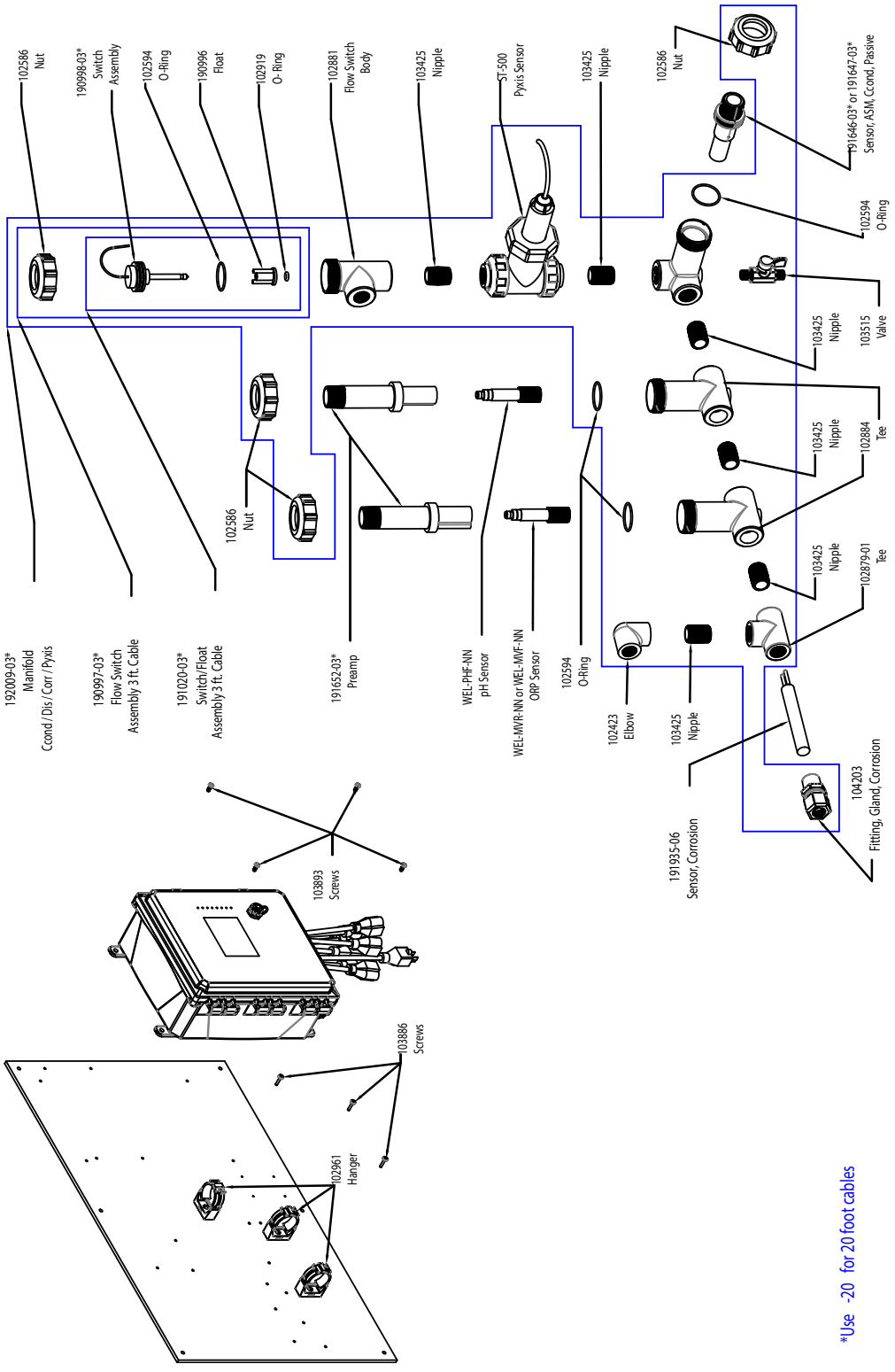
WCT900 Sensor Options PAFHNN, PBFHNN, PAFINN, PBFINN

PAFHNN: Graphite contacting conductivity + pH + Flow Switch manifold on panel + Rod ORP
PAFINN: + Flat ORP
PBFHNN: 316SS contacting conductivity + pH + Flow Switch manifold on panel + Rod ORP
PBFINN: + Flat ORP



WCT900 Sensor Options PAFHON, PBFHON, PAFION, PBFION

PAFHON: Graphite contacting conductivity + pH + Corrosion + Flow Switch manifold on panel + Rod ORP
PAFION: + Flat ORP
PBFHON: 316SS contacting conductivity + pH + Corrosion + Flow Switch manifold on panel + Rod ORP
PBFION: + Flat ORP



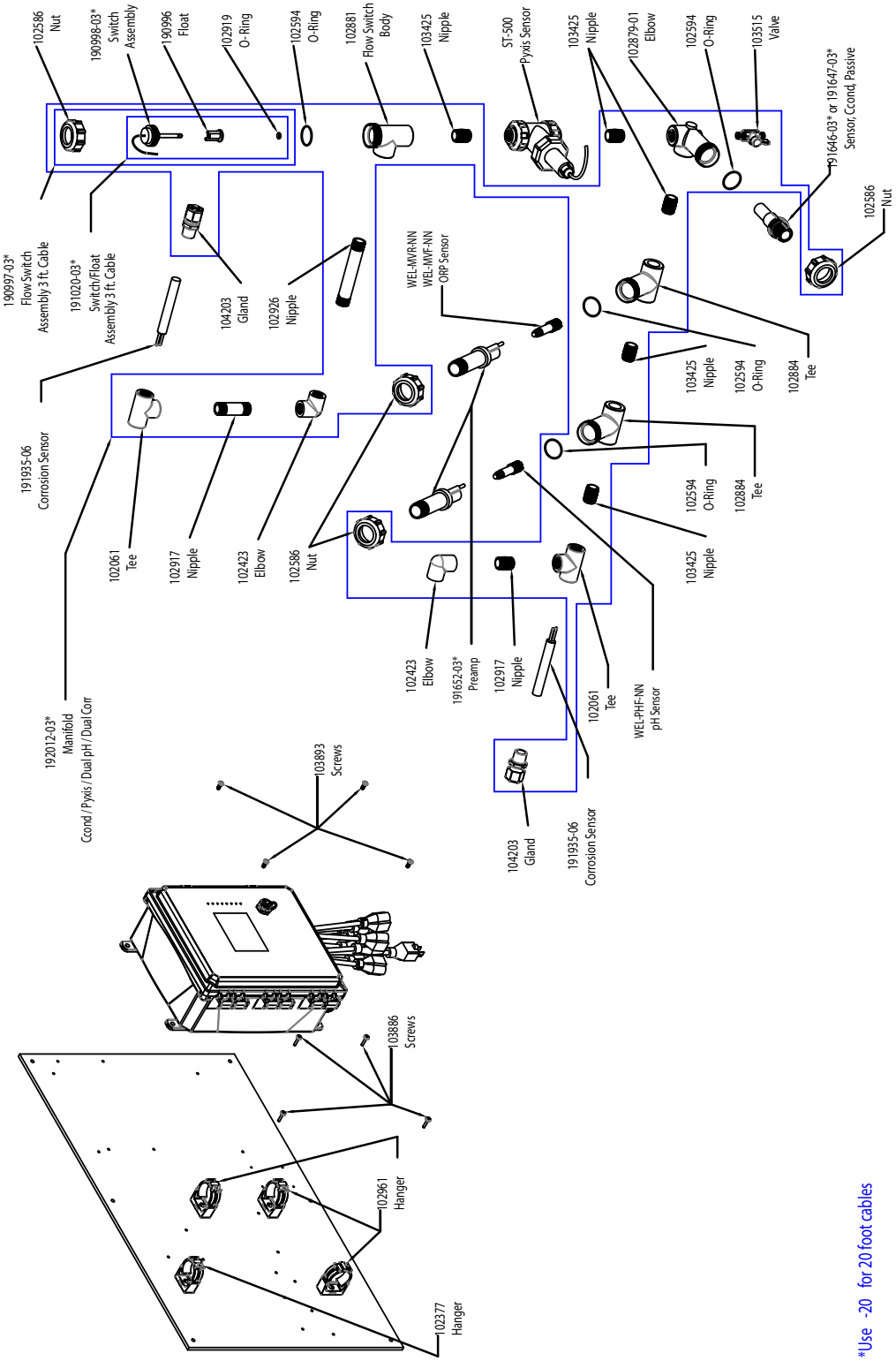
WCT900 Sensor Options PAFHOP, PBFHOP, PAFIOP, PBFIOP

PAFHOP: Graphite contacting conductivity + pH + Corrosion + Pyxis + Flow Switch manifold on panel + Rod ORP

PAFIOP: + Flat ORP

PBFHOP: 316SS contacting conductivity + pH + Corrosion + Pyxis + Flow Switch manifold on panel + Rod ORP

PBFIOP: + Flat ORP



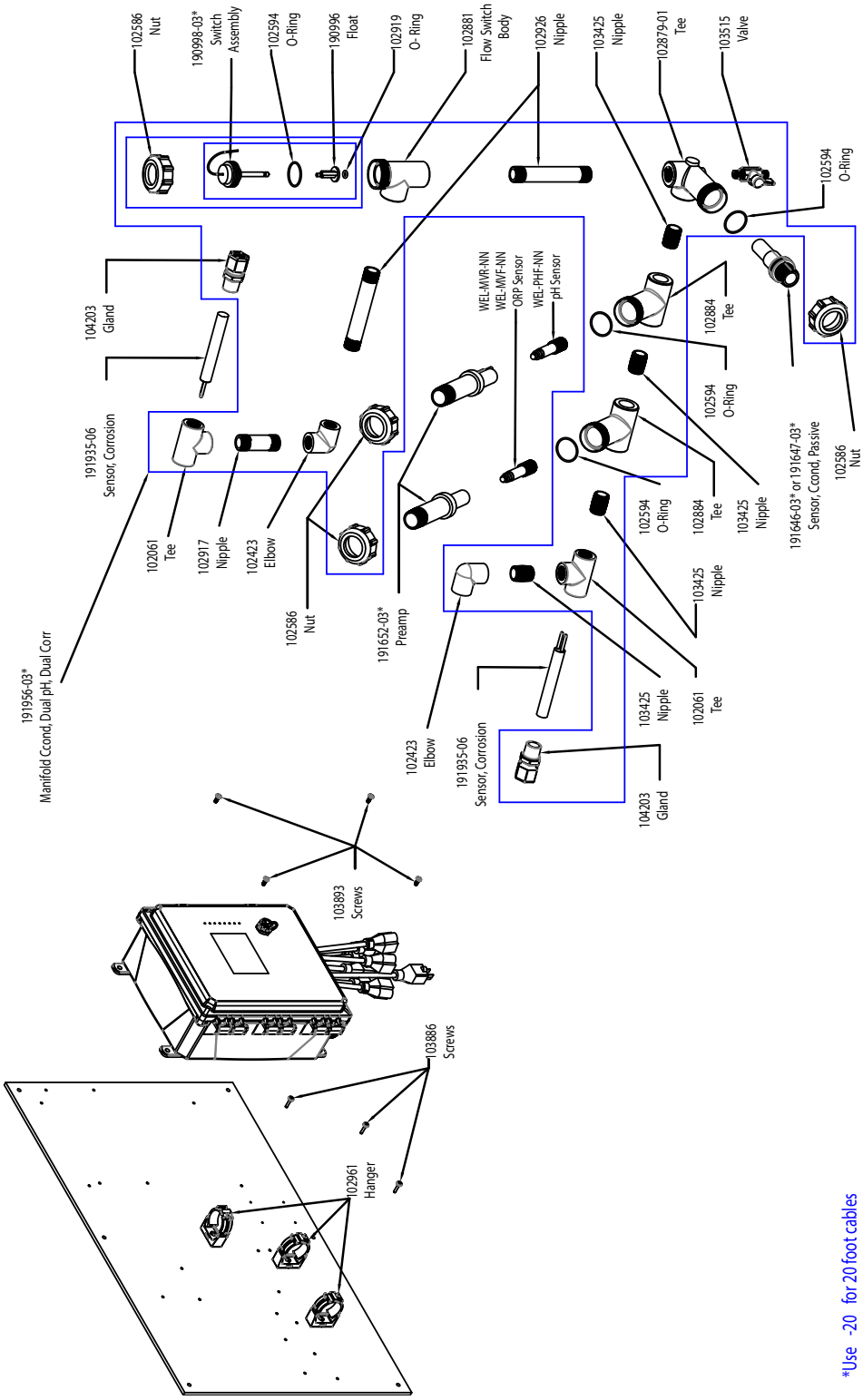
WCT900 Sensor Options PAFHPR, PBFHPR, PAFIPR, PBFIPR

PAFHPR: Graphite contacting conductivity + pH + Dual Corrosion + Pyxis + Flow Switch manifold on panel + Rod ORP

PAFIPR: + Flat ORP

PBFHPR: 316SS contacting conductivity + pH + Dual Corrosion + Pyxis + Flow Switch manifold on panel + Rod ORP

PBFIPR: + Flat ORP



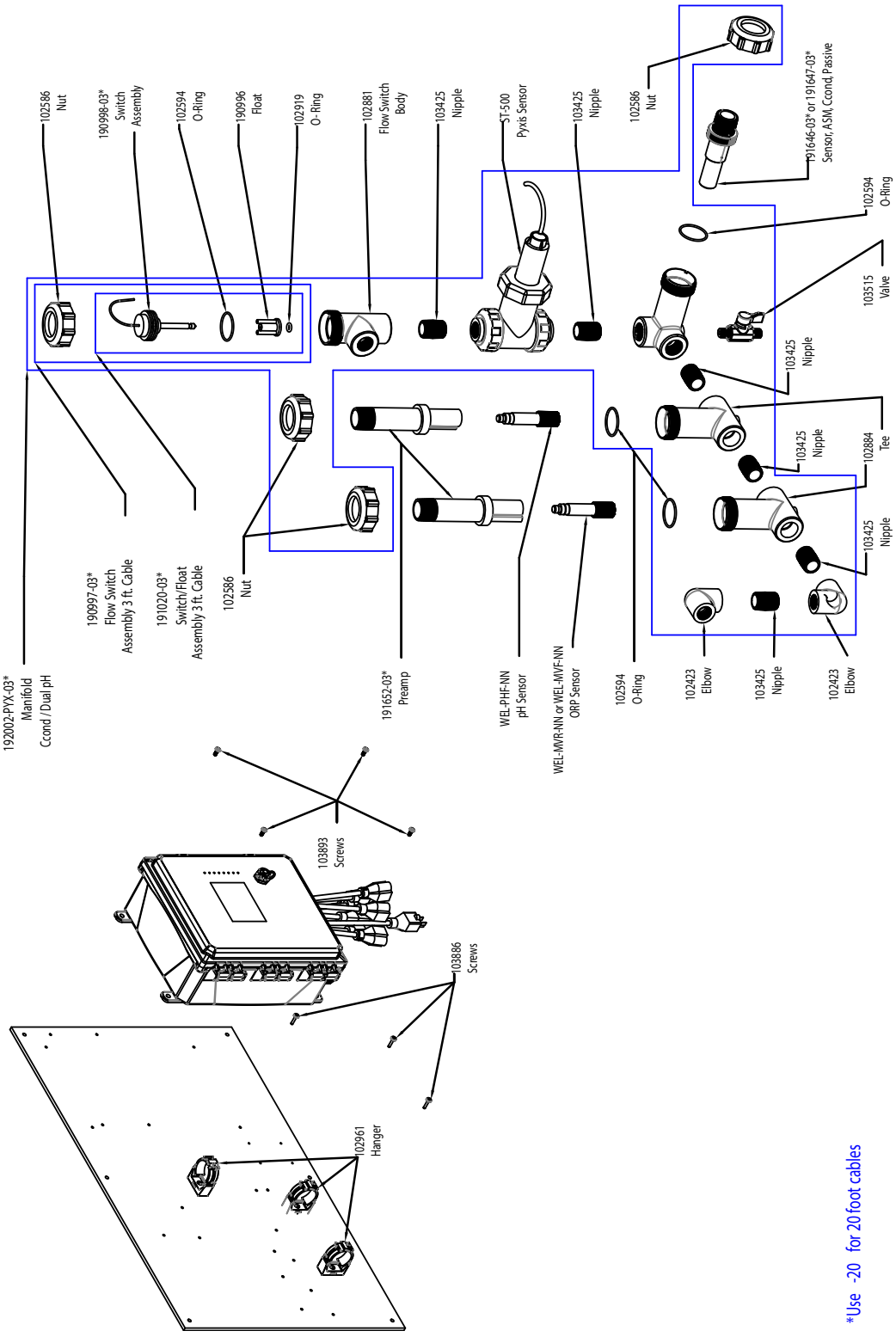
WCT900 Sensor Options PAFHRN, PBFHRN, PAFIRN, PBFIRN

PAFHRN: Graphite contacting conductivity + pH + Dual Corrosion + Flow Switch manifold on panel + Rod ORP

PAFIRN: + Flat ORP

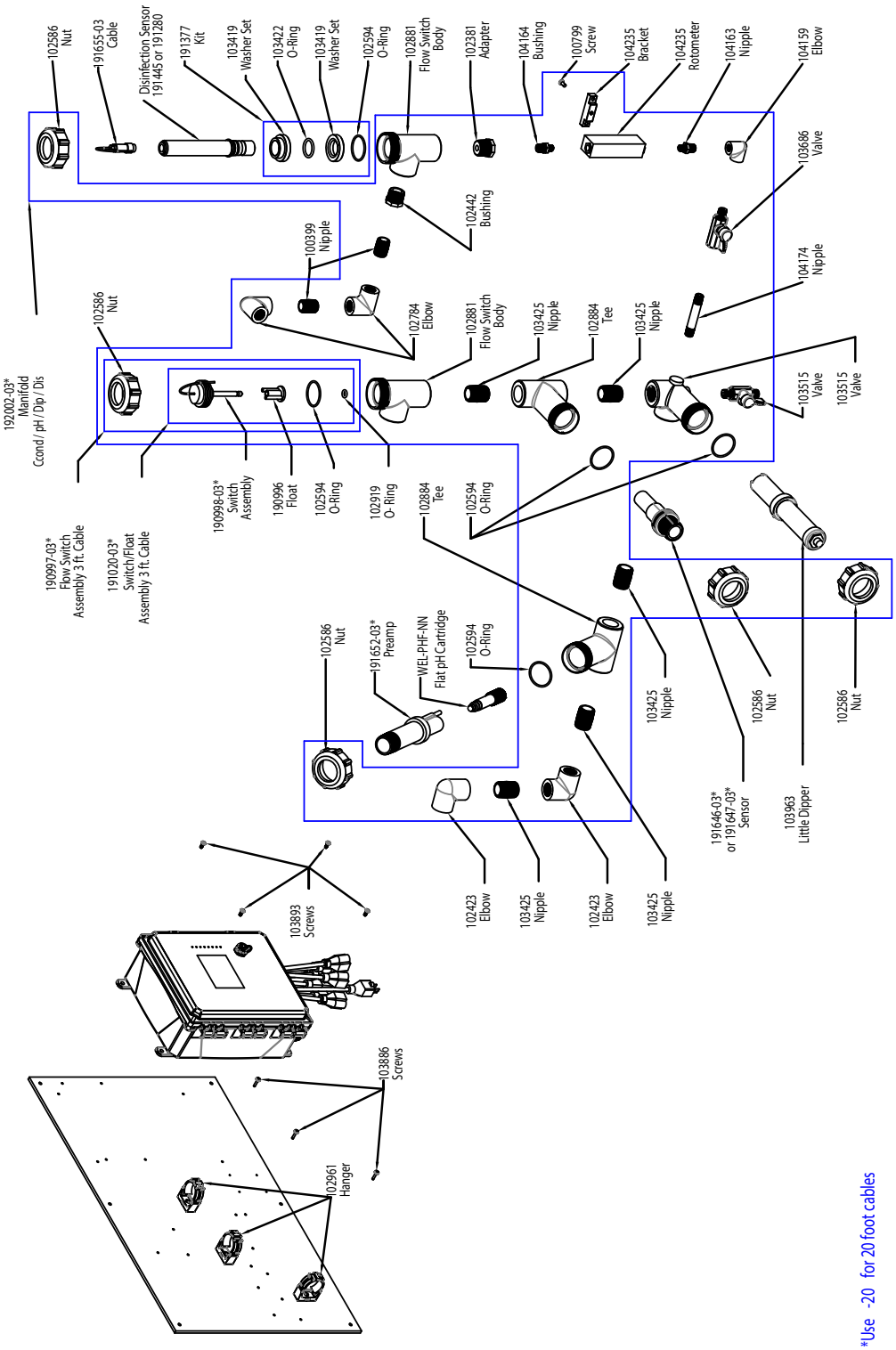
PBFHRN: 316SS contacting conductivity + pH + Dual Corrosion + Flow Switch manifold on panel + Rod ORP

PBFIRN: + Flat ORP



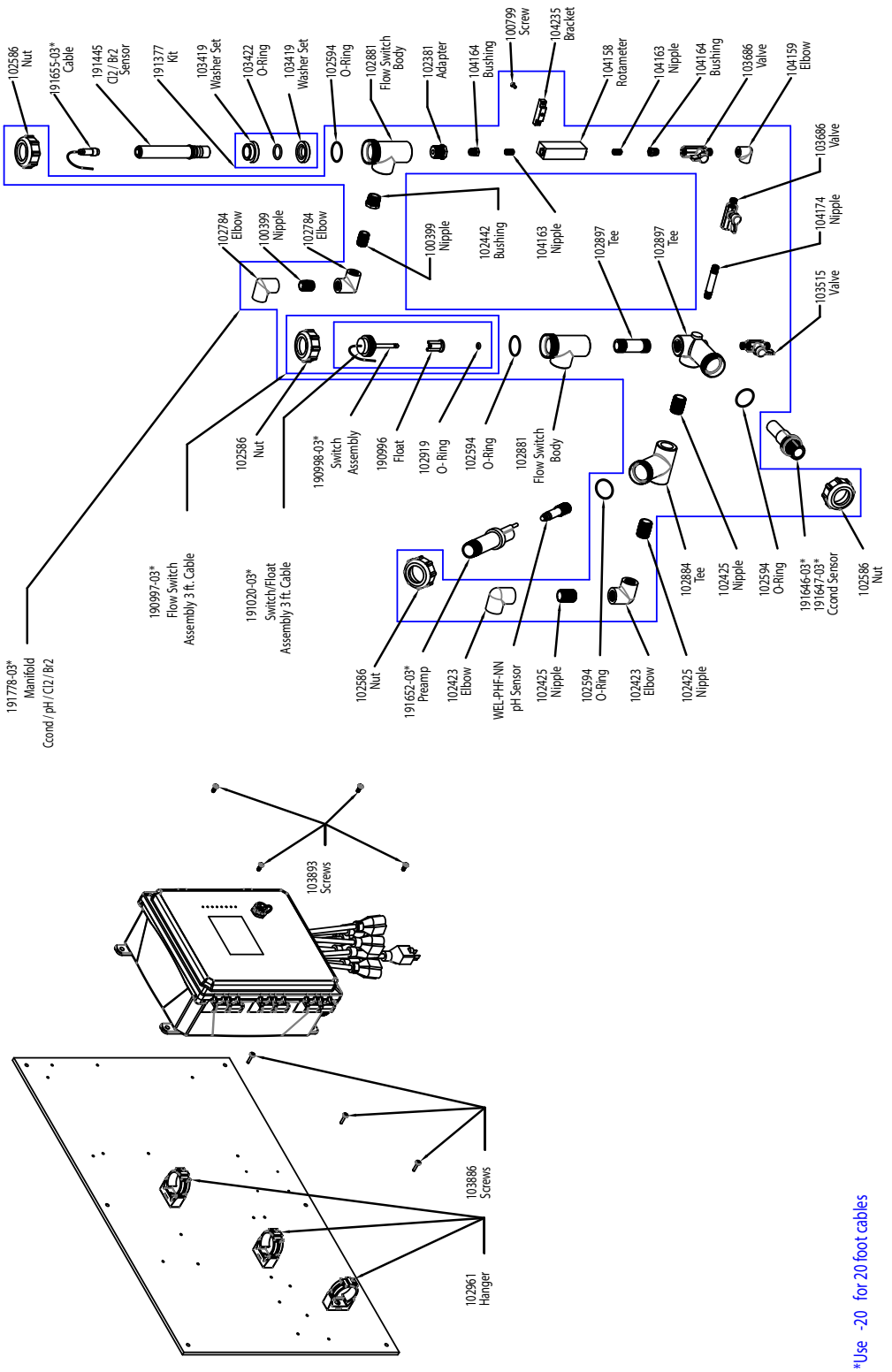
WCT900 Sensor Options PAFHPN, PBFHPN, PAFIPN, PBFIPN

PAFHPN: Graphite contacting conductivity + pH + Pyxis + Flow Switch manifold on panel + Rod ORP
PAFIPN: + Flat ORP
PBFHPN: 316SS contacting conductivity + pH + Pyxis + Flow Switch manifold on panel + Rod ORP
PBFIPN: + Flat ORP



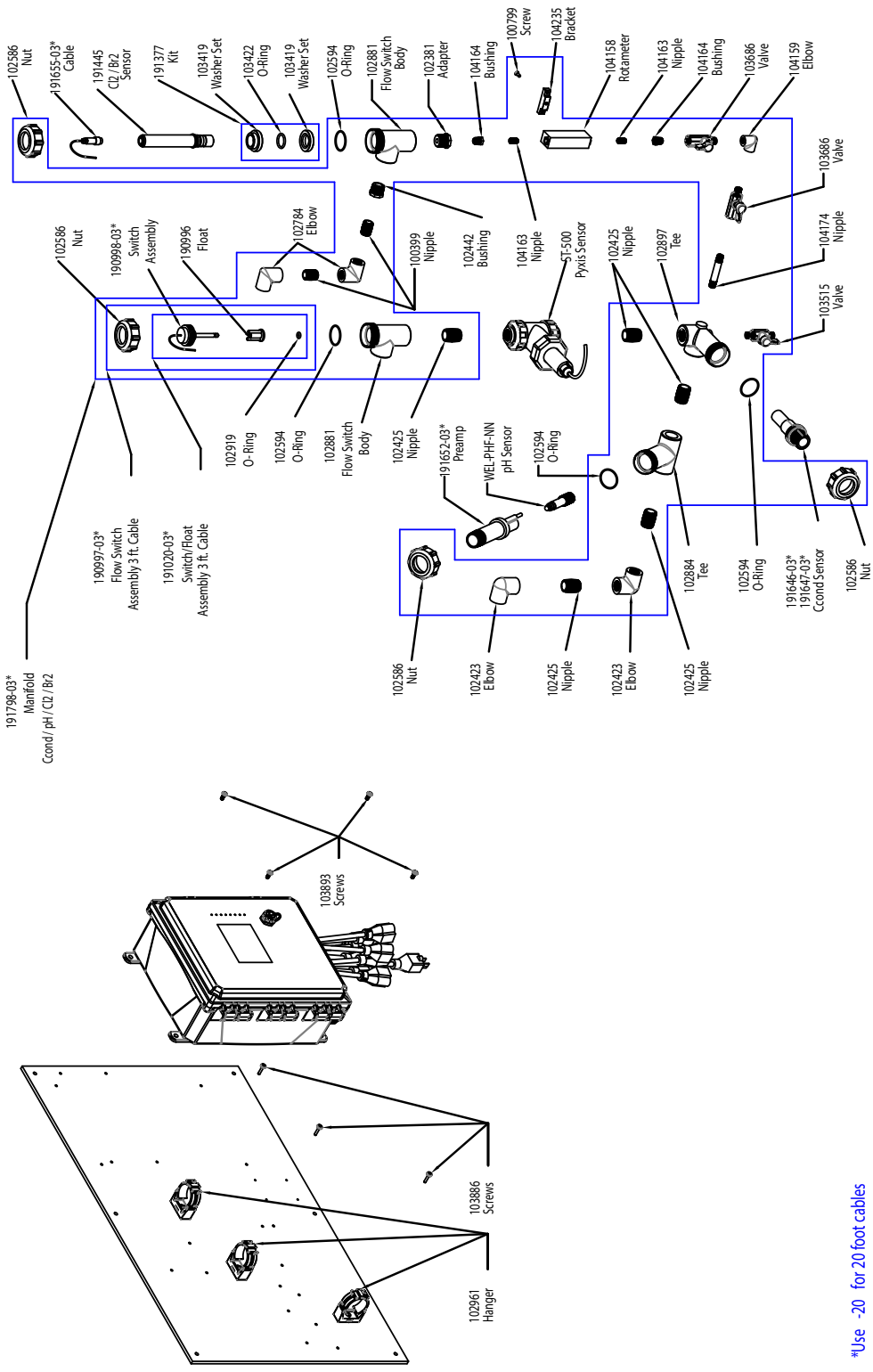
WCT900 Sensor Options PAFKMN, PBFKMN, PAFLMN, PBFLMN

PAFKMN: Graphite contacting conductivity + pH + LD2 + Flow Switch manifold on panel + Chlorine
PAFLMN: + Chlorine Dioxide
PBFKMN: 316SS contacting conductivity + pH + LD2 + Flow Switch manifold on panel + Chlorine
PBFLMN: + Chlorine Dioxide



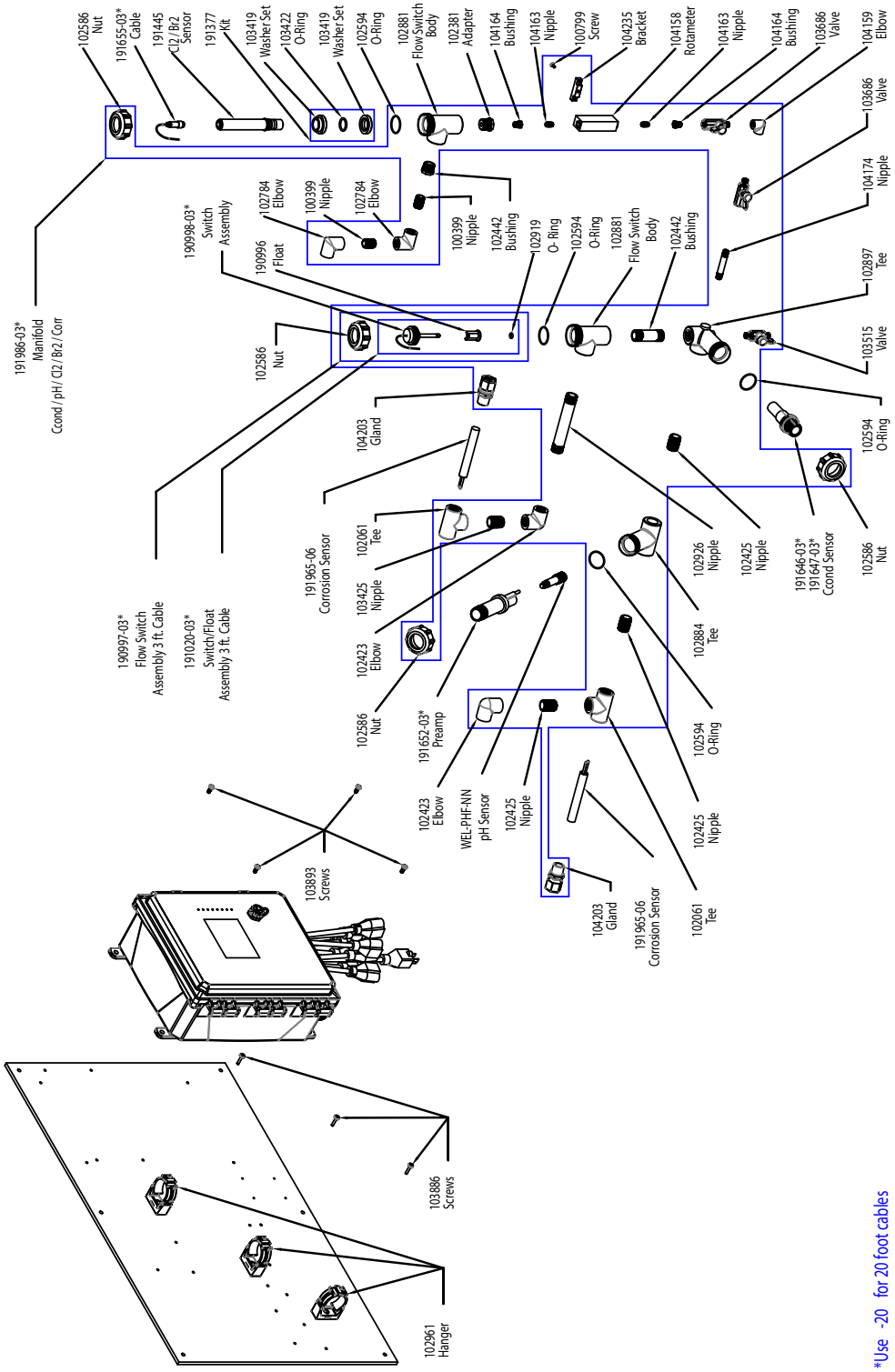
WCT900 Sensor Options PAFKNN, PBFKNN, PAFLNN, PBFLNN

PAFKNN: Graphite contacting conductivity + pH + Flow Switch manifold on panel + Chlorine
PAFLNN: + Chlorine Dioxide
PBFKNN: 316SS contacting conductivity + pH + Flow Switch manifold on panel + Chlorine
PBFLNN: + Chlorine Dioxide



WCT900 Sensor Options PAFKPN, PBFKPN, PAFLPN, PBFLPN

PAFKPN: Graphite contacting conductivity + pH + Pyxis + Flow Switch manifold on panel + Chlorine
PAFLPN: + Chlorine Dioxide
PBFKPN: 316SS contacting conductivity + pH + Pyxis + Flow Switch manifold on panel + Chlorine
PBFLPN: + Chlorine Dioxide



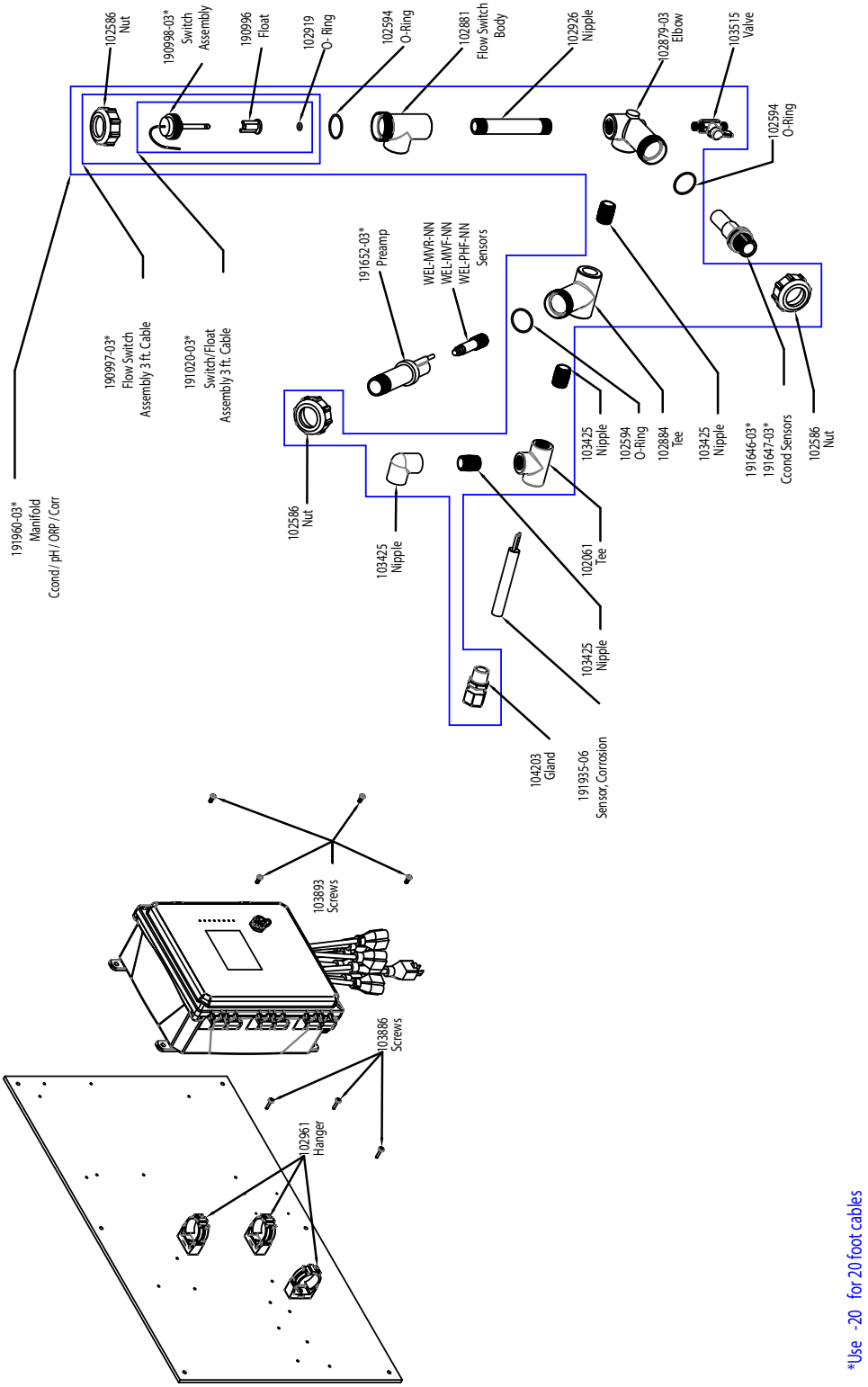
WCT900 Sensor Options PAFKRN, PBFKRN, PAFLRN, PBFLRN

PAFKRN: Graphite contacting conductivity + pH + Dual Corrosion + Flow Switch manifold on panel + Chlorine

PAFLRN: + Chlorine Dioxide

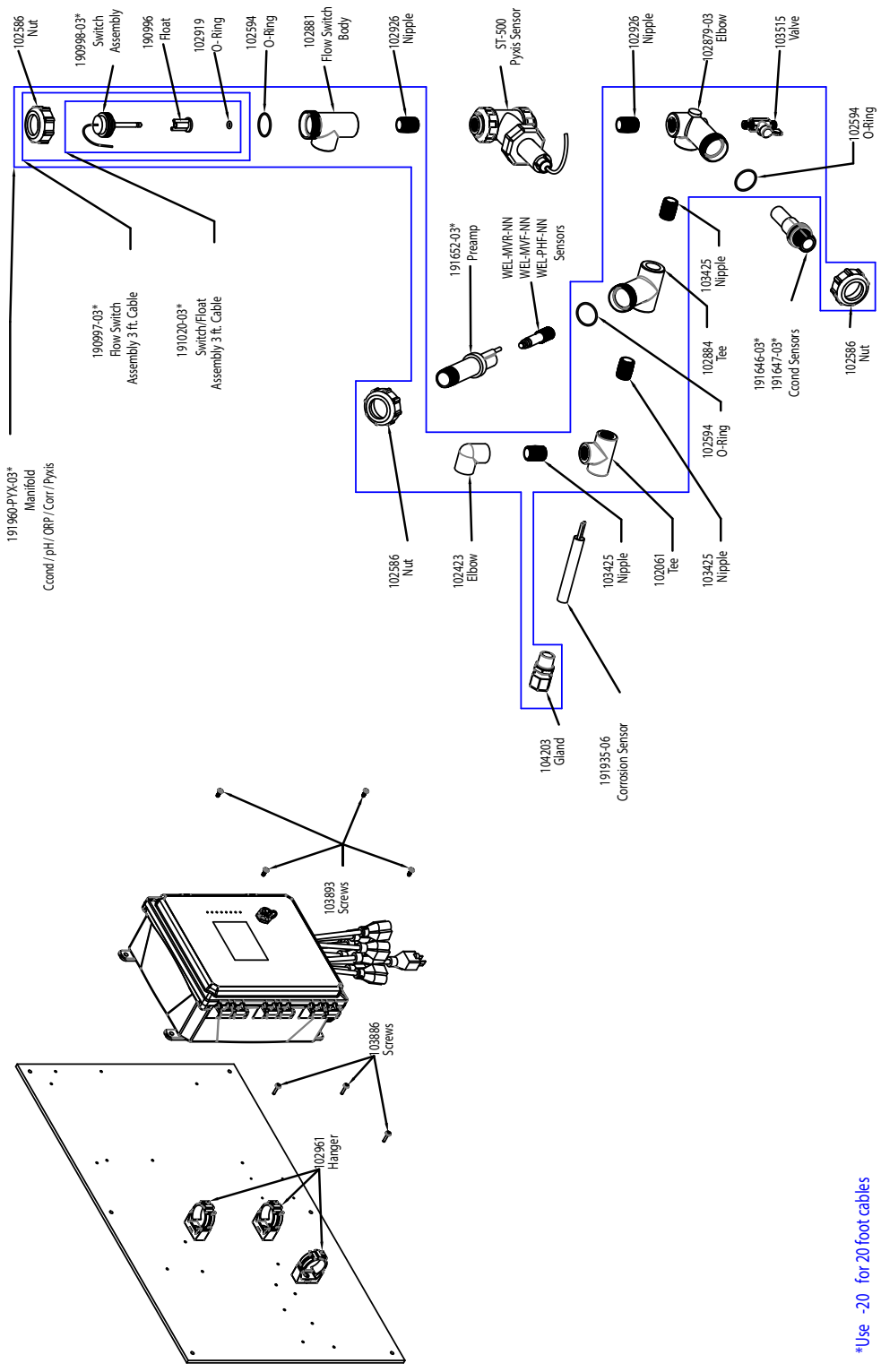
PBFKRN: 316SS contacting conductivity + pH + Dual Corrosion + Flow Switch manifold on panel + Chlorine

PBFLRN: + Chlorine Dioxide



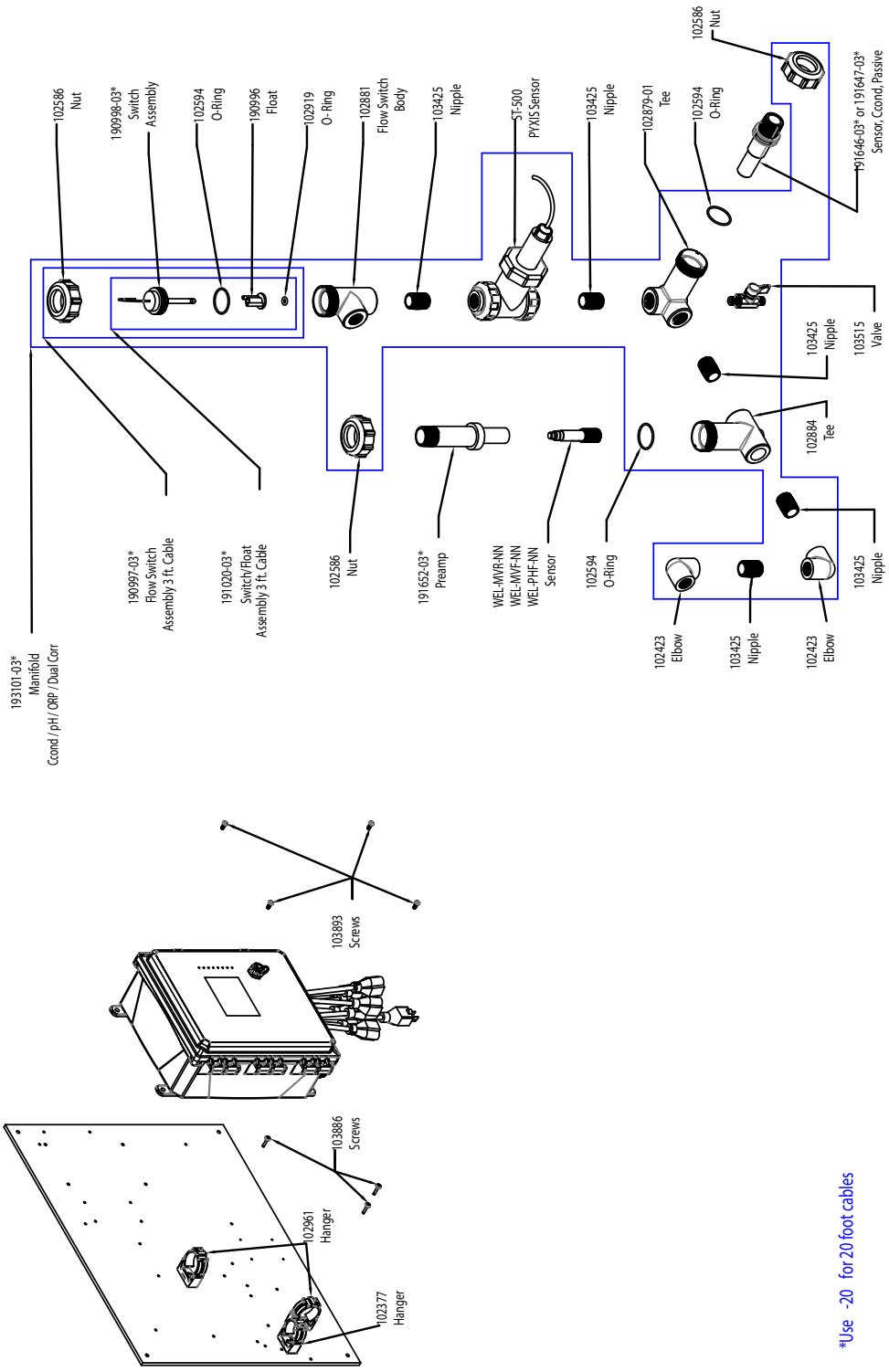
WCT900 Sensor Options PAFONN, PBFONN, PAHONN, PBHONN, PAIONN, PBIONN

PAFONN: Graphite contacting conductivity + Corrosion + Flow Switch manifold on panel + pH
PAHONN: + Rod ORP
PAIONN: + Flat ORP
PBFONN: 316SS contacting conductivity + Corrosion + Flow Switch manifold on panel + pH
PBHONN: + Rod ORP
PBIONN: + Flat ORP



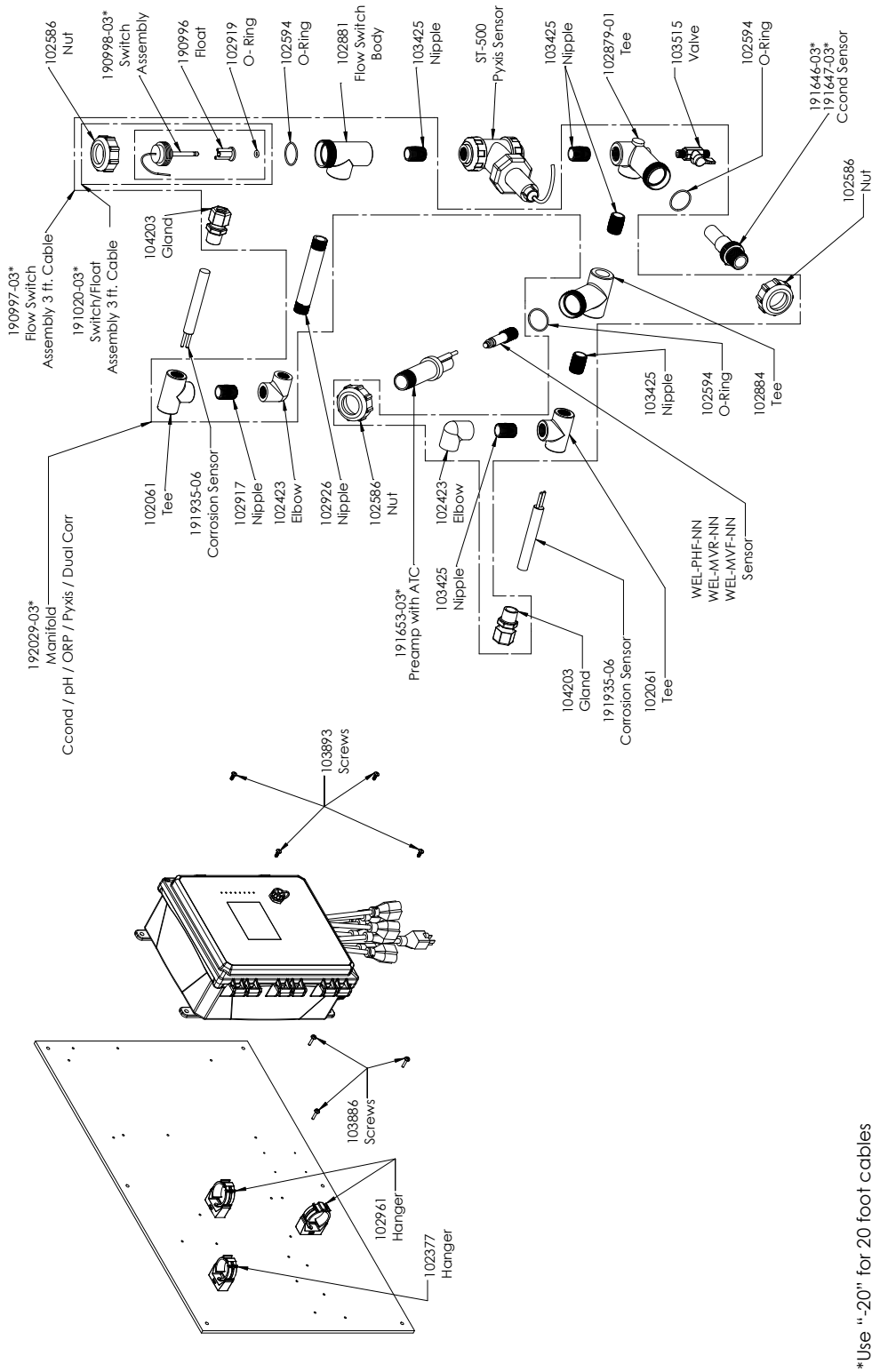
WCT900 Sensor Options PAFOPN, PBFOPN, PAHOPN, PBHOPN, PAIOPN, PBIOPN

PAFOPN: Graphite contacting conductivity + Corrosion + Pyxis + Flow Switch manifold on panel + pH
PAHOPN: + Rod ORP
PAIOPN: + Flat ORP
PBFOPN: 316SS contacting conductivity + Corrosion + Pyxis + Flow Switch manifold on panel + pH
PBHOPN: + Rod ORP
PBIOPN: + Flat ORP



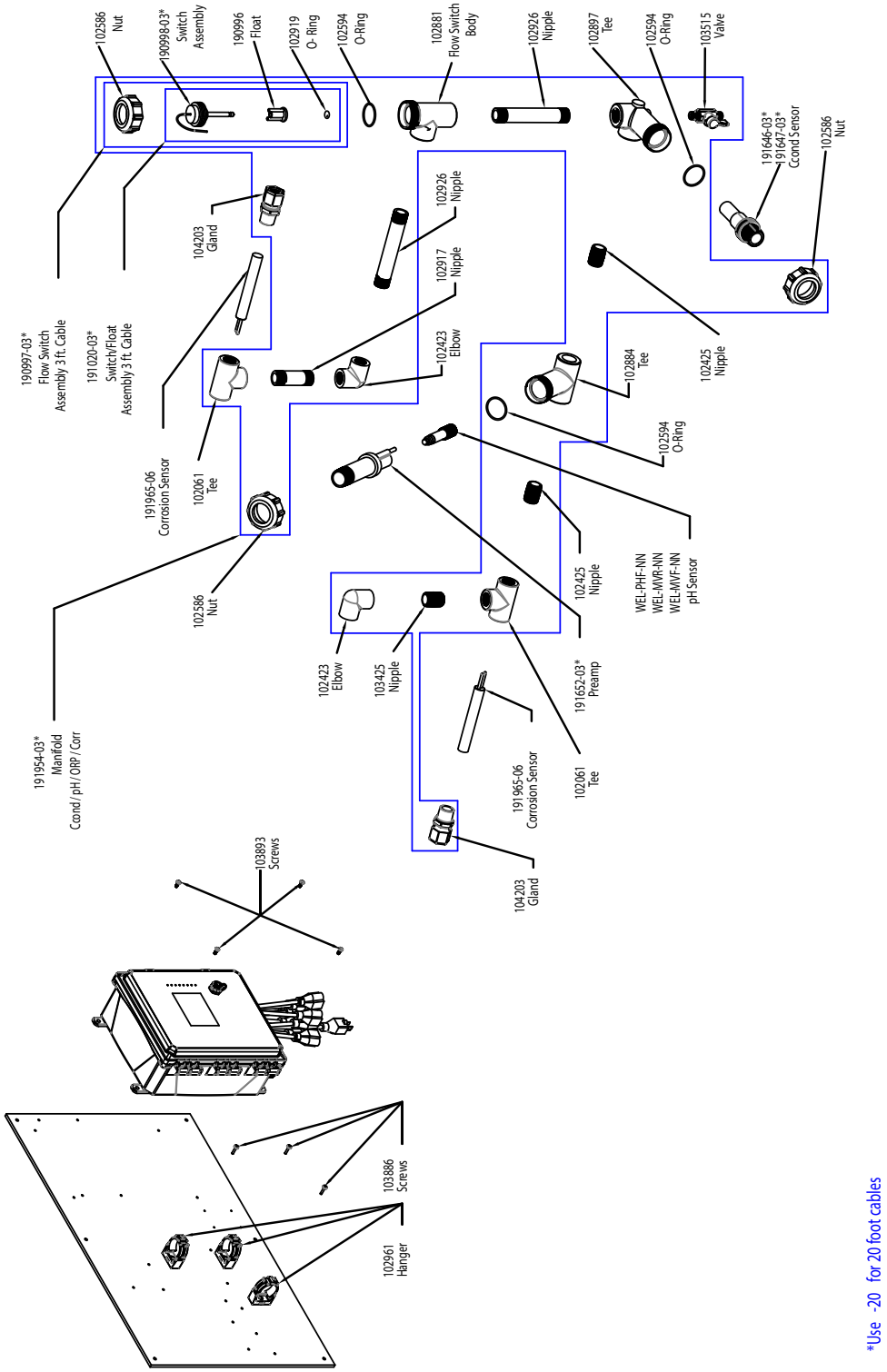
WCT900 Sensor Options PAFPNN, PBFPNN, PAHPNN, PBHPNN, PAIPNN, PBIPNN

PAFPNN: Graphite contacting conductivity + Pyxis + Flow Switch manifold on panel + pH
PAHPNN: + Rod ORP
PAIPNN: + Flat ORP
PBFPNN: 316SS contacting conductivity + Pyxis + Flow Switch manifold on panel + pH
PBHPNN: + Rod ORP
PBIPNN: + Flat ORP



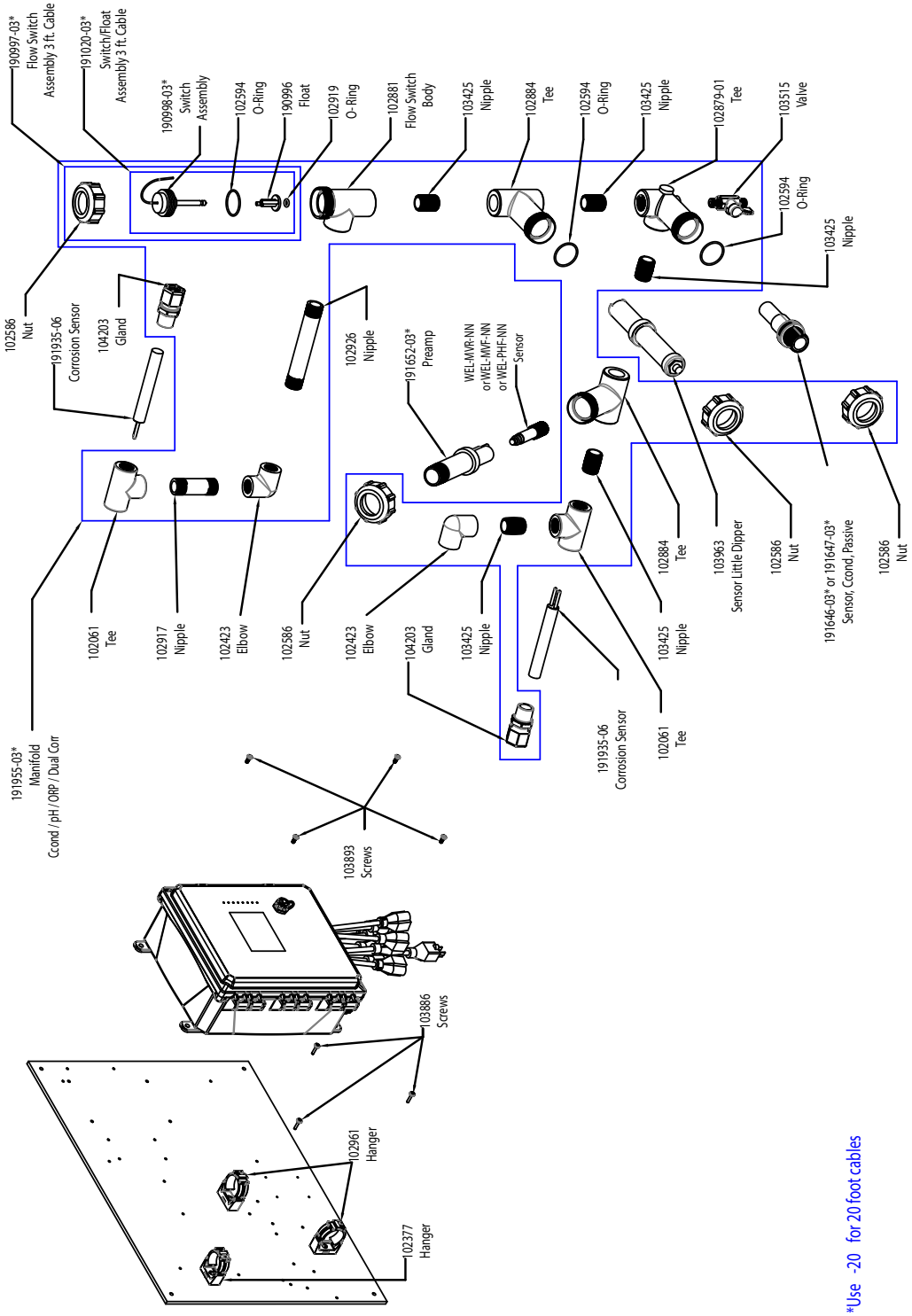
WCT900 Sensor Options PAFPRN, PBFPRN, PAHPRN, PBHPRN, PAIPRN, PBIPRN

PAFPRN: Graphite contacting conductivity + Dual Corrosion + Pyxis + Flow Switch manifold on panel + pH
PAHPRN: + Rod ORP
PAIPRN: + Flat ORP
PBFPRN: 316SS contacting conductivity + Dual Corrosion + Pyxis + Flow Switch manifold on panel + pH
PBHPRN: + Rod ORP
PBIPRN: + Flat ORP



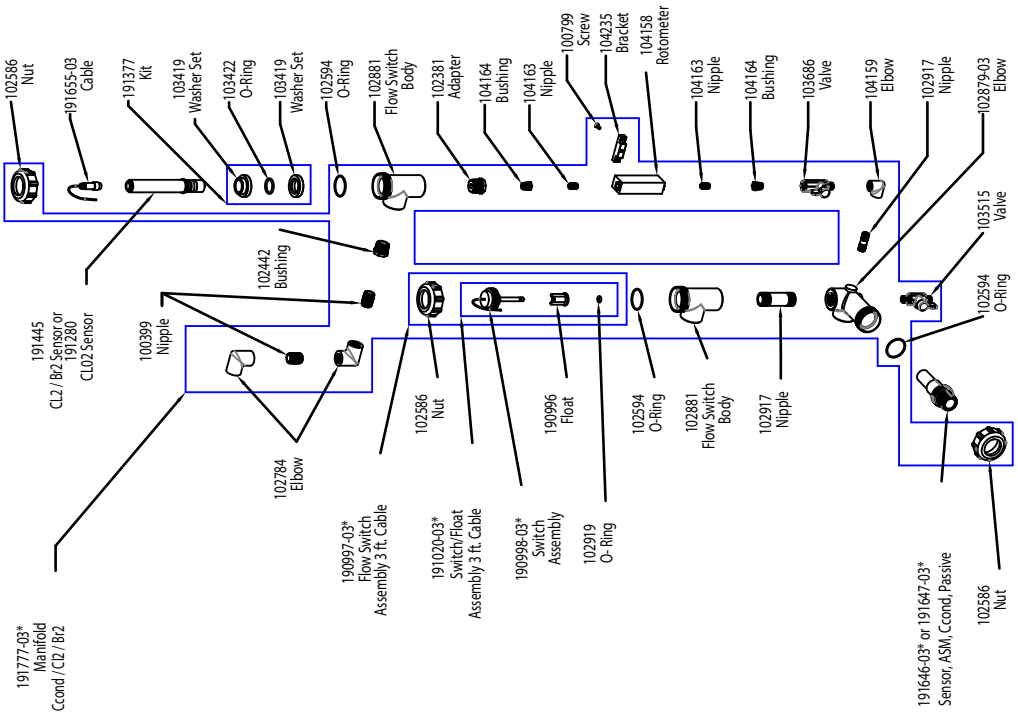
WCT900 Sensor Options PAFRNN, PBFRNN, PAHRNN, PBHRNN, PAIRNN, PBIRNN

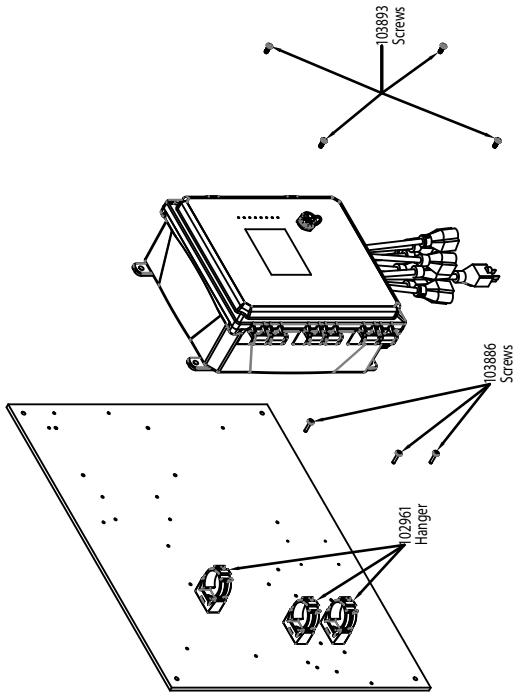
PAFRNN: Graphite contacting conductivity + Dual Corrosion + Flow Switch manifold on panel + pH
PAHRNN: + Rod ORP
PAIRNN: + Flat ORP
PBFRNN: 316SS contacting conductivity + Dual Corrosion + Flow Switch manifold on panel + pH
PBHRNN: + Rod ORP
PBIRNN: + Flat ORP



WCT900 Sensor Options PAFMRN, PBFMRN, PAHMRN, PBHMRN, PAIMRN, PBIMRN

PAFMRN: Graphite contacting conductivity + LD2 + Dual Corrosion + Flow Switch manifold on panel + pH
PAHMRN: + Rod ORP
PAIMRN: + Flat ORP
PBFMRN: 316SS contacting conductivity + LD2 + Dual Corrosion + Flow Switch manifold on panel + pH
PBHMRN: + Rod ORP
PBIMRN: + Flat ORP

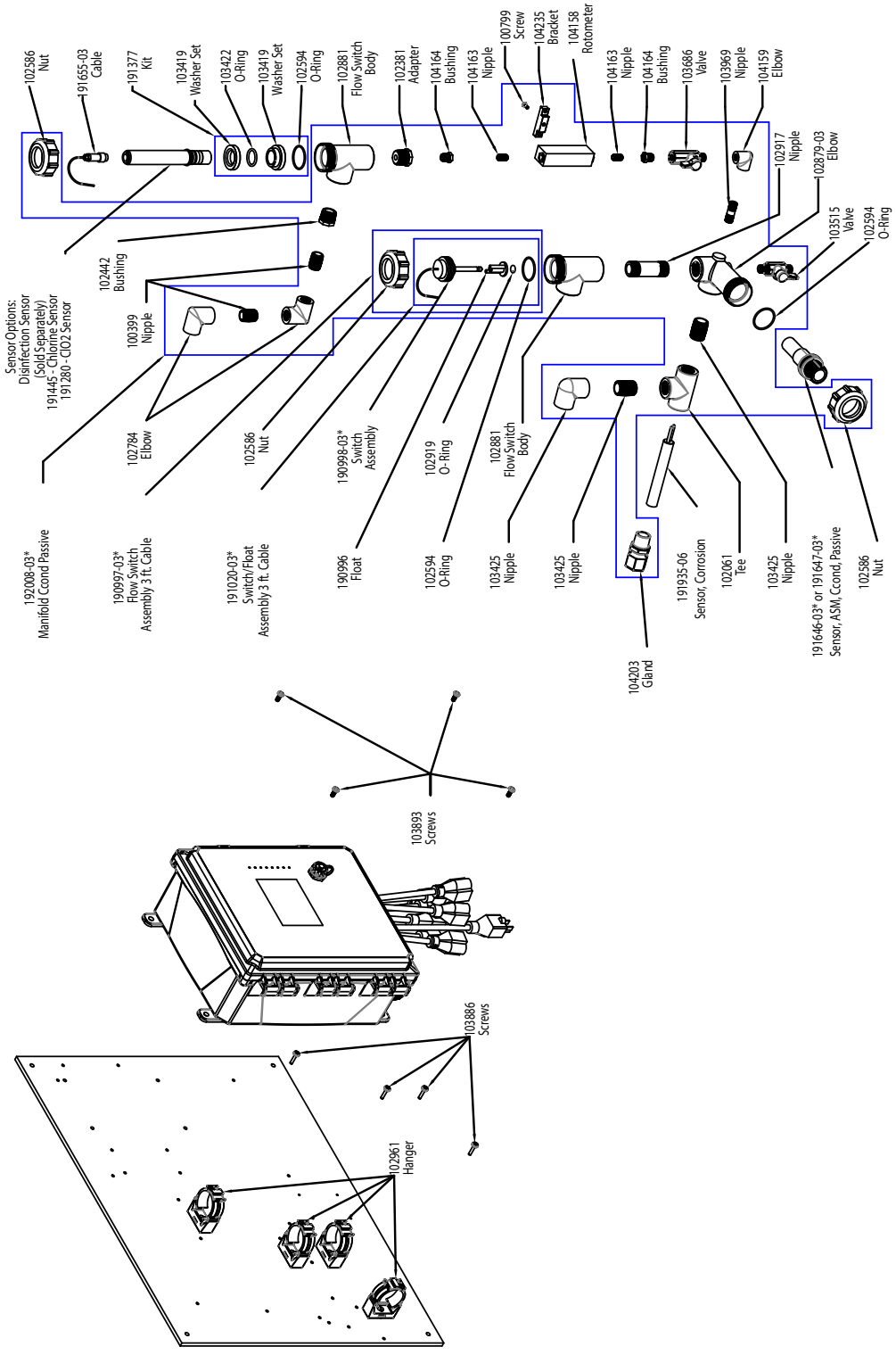




*Use -20 for 20 foot cables

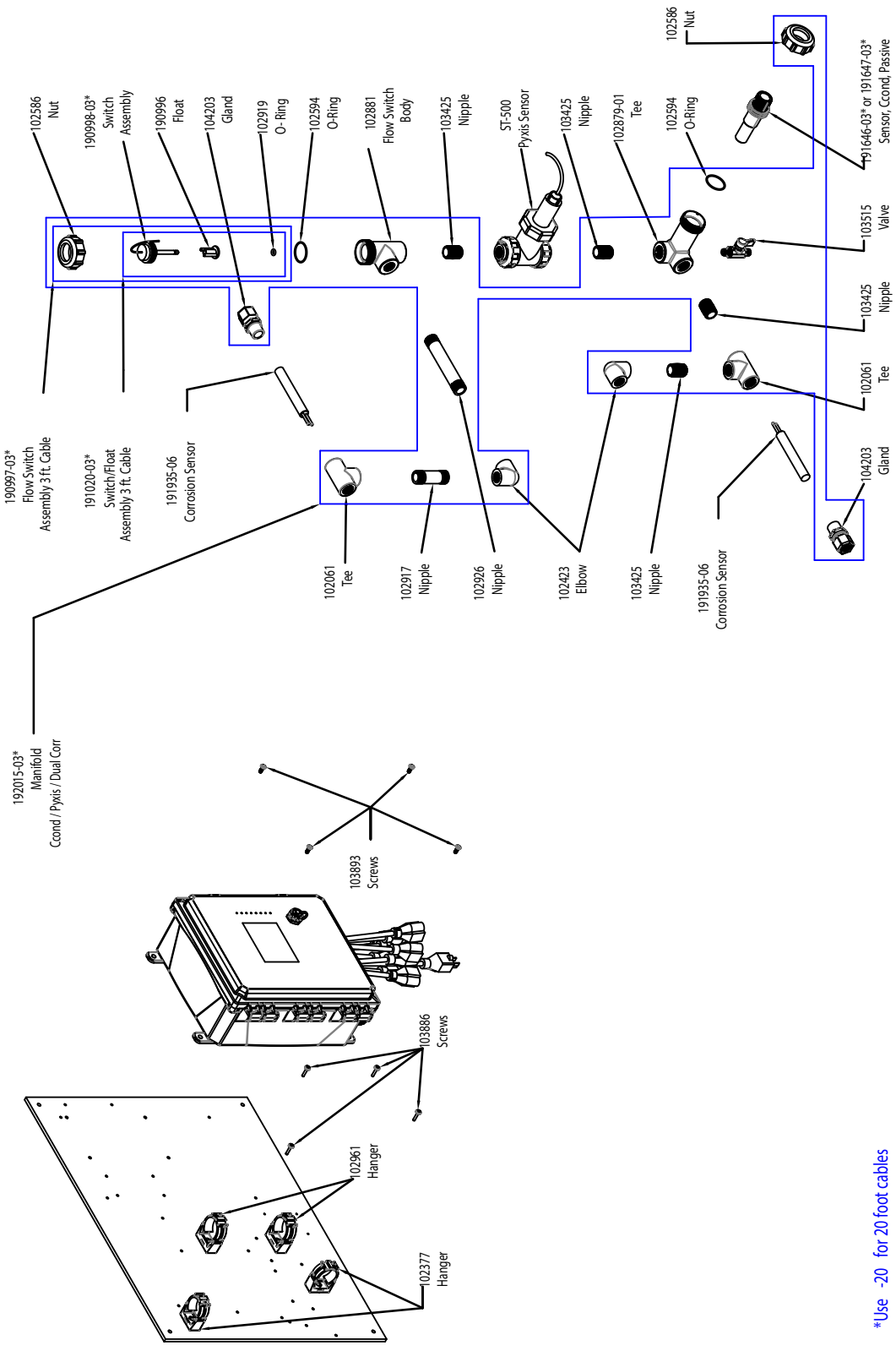
WCT900 Sensor Options PAKNNN, PBKNNN, PALNNN, PBLNNN

PAKNNN: Graphite contacting conductivity + Flow Switch manifold on panel + Chlorine
PALNNN: + Chlorine Dioxide
PBKNNN: 316SS contacting conductivity + Flow Switch manifold on panel + Chlorine
PBLNNN: + Chlorine Dioxide



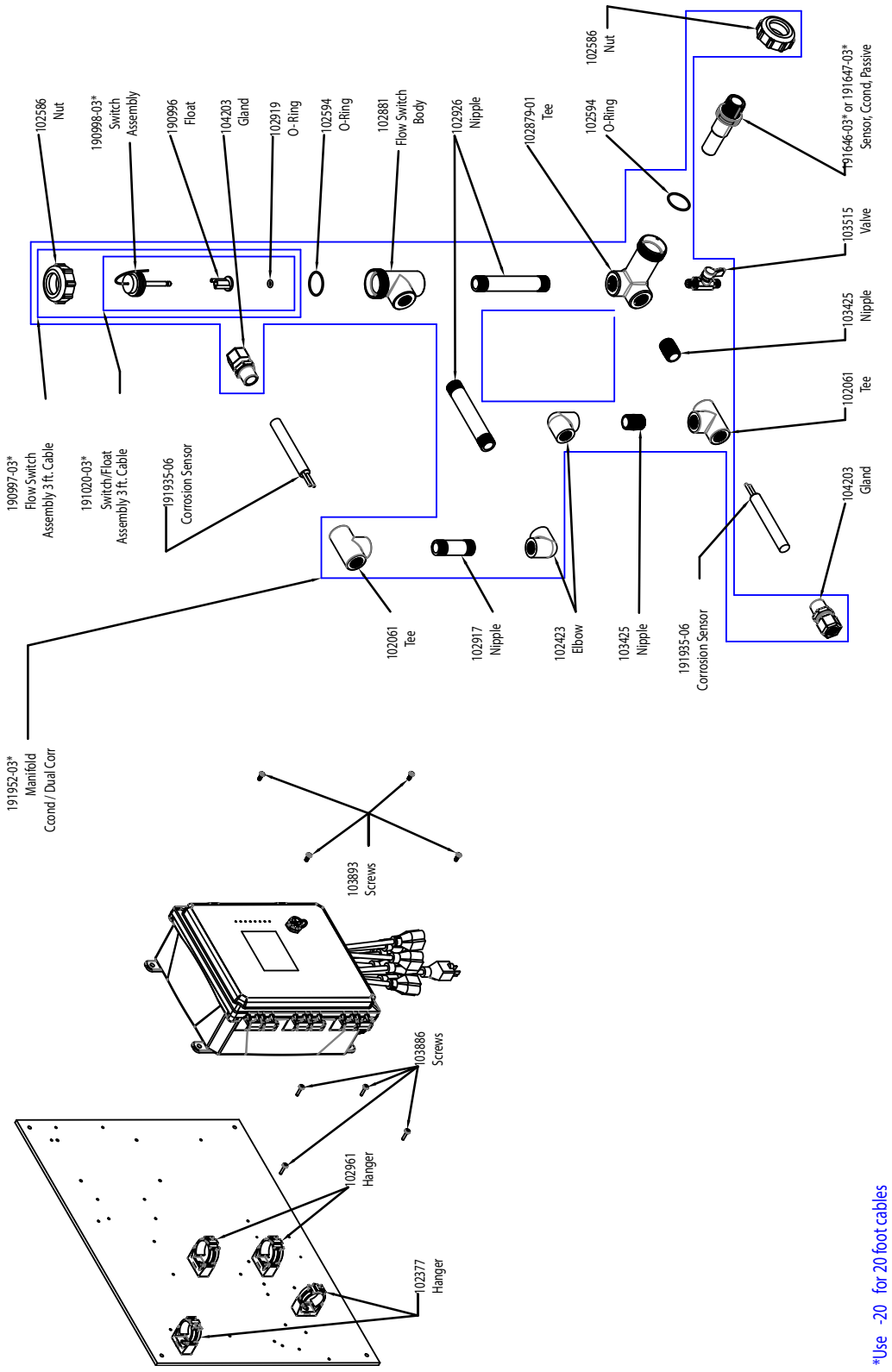
WCT900 Sensor Options PAKONN, PBKONN, PALONN, PBLONN, PAOSNN

PAKONN: Graphite contacting conductivity + Flow Switch manifold on panel + Chlorine + Corrosion
PBKONN: 316SS contacting conductivity + Flow Switch manifold on panel + Chlorine + Corrosion
PALONN: Graphite contacting conductivity + Flow Switch manifold on panel + ClO2 + Corrosion
PBLONN: 316SS contacting conductivity + Flow Switch manifold on panel + ClO2 + Corrosion
PASONN: Graphite contacting conductivity + Flow Switch manifold on panel + Disinfection (no sensor) + Corrosion



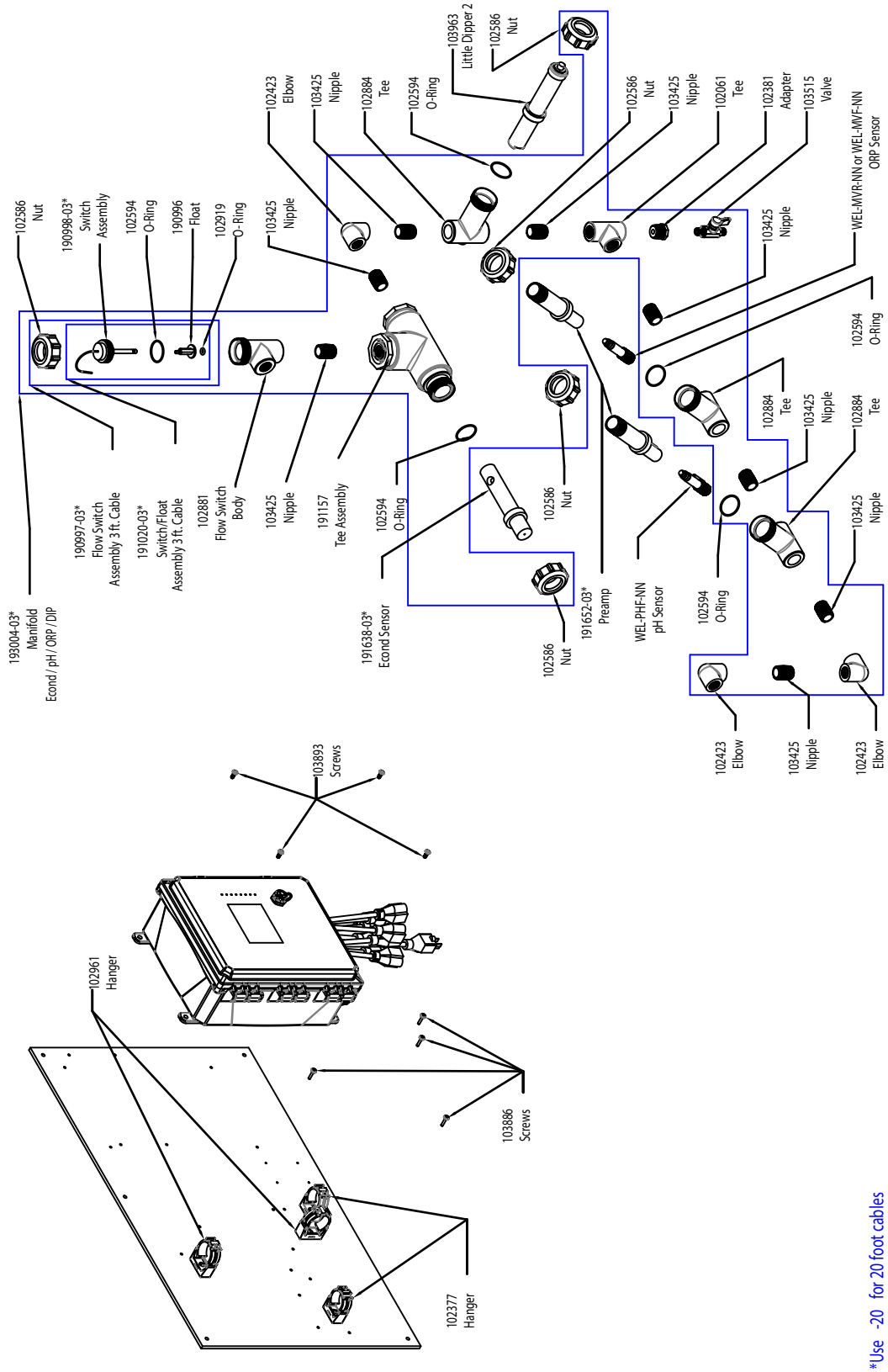
WCT900 Sensor Options PAPRNN, PBPRNN

PAPRNN: Graphite contacting conductivity + Dual Corrosion + Pyxis + Flow Switch manifold on panel
PBPRNN: 316SS contacting conductivity + Dual Corrosion + Pyxis + Flow Switch manifold on panel



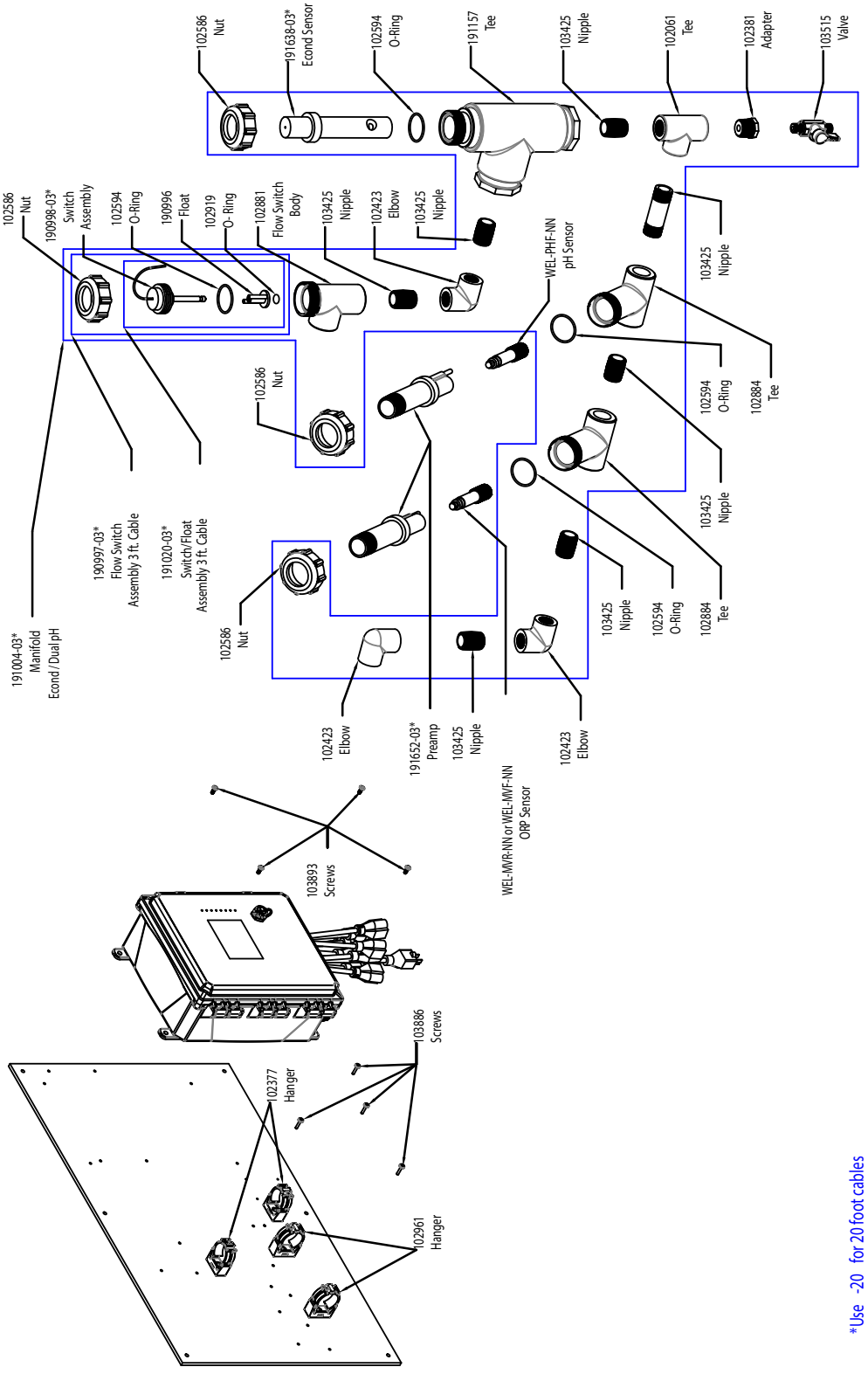
WCT900 Sensor Options PARNNN, PBRNNN

PARNNN: Graphite contacting conductivity + Dual Corrosion + Flow Switch manifold on panel
PBRNNN: 316SS contacting conductivity + Dual Corrosion + Flow Switch manifold on panel



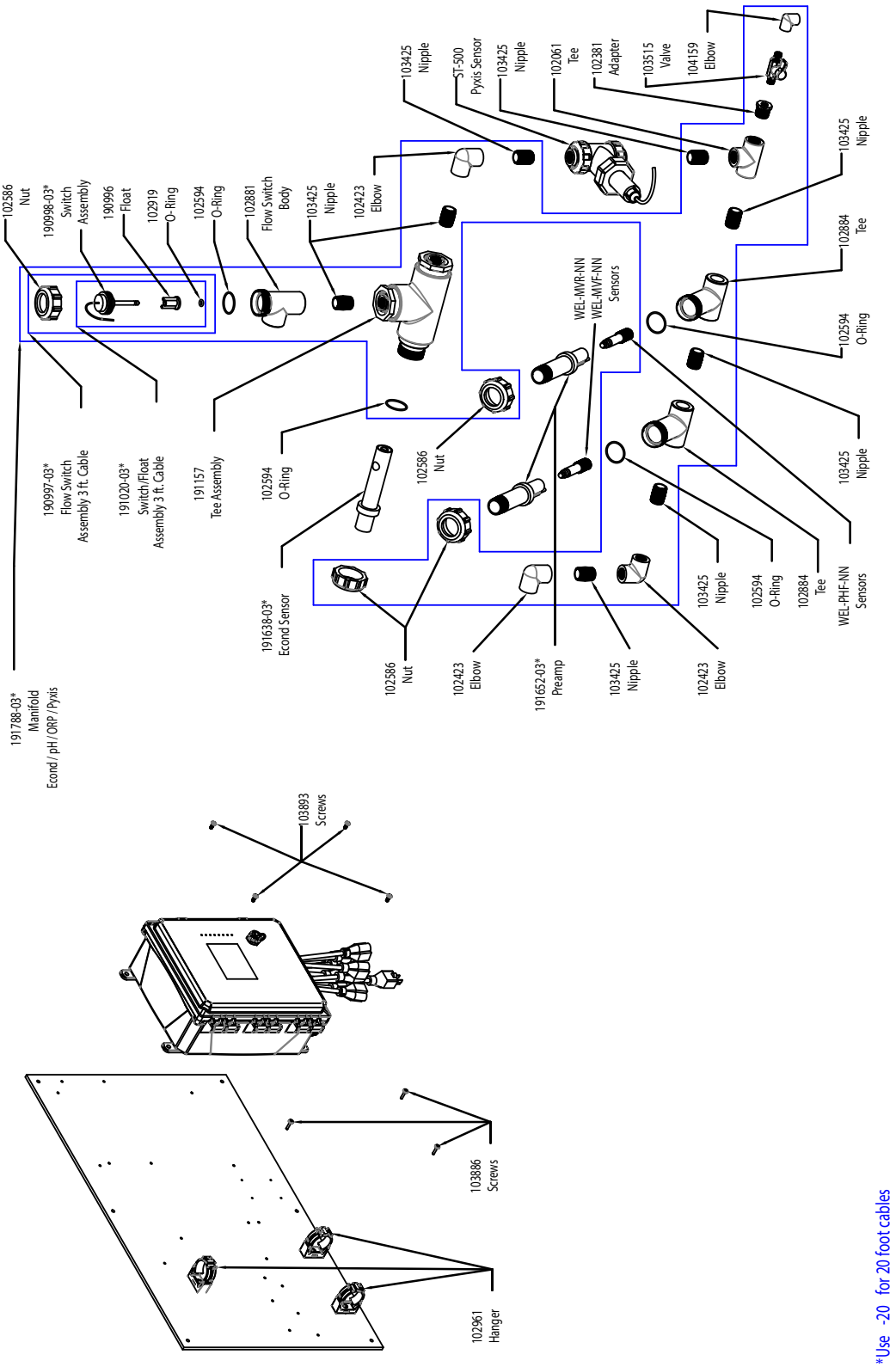
WCT900 Sensor Options PCFHMN, PCFIMN

PCFHMN: Electrodeless conductivity + pH + LD2 + Flow Switch manifold on panel + Rod ORP
PCFIMN: + Flat ORP



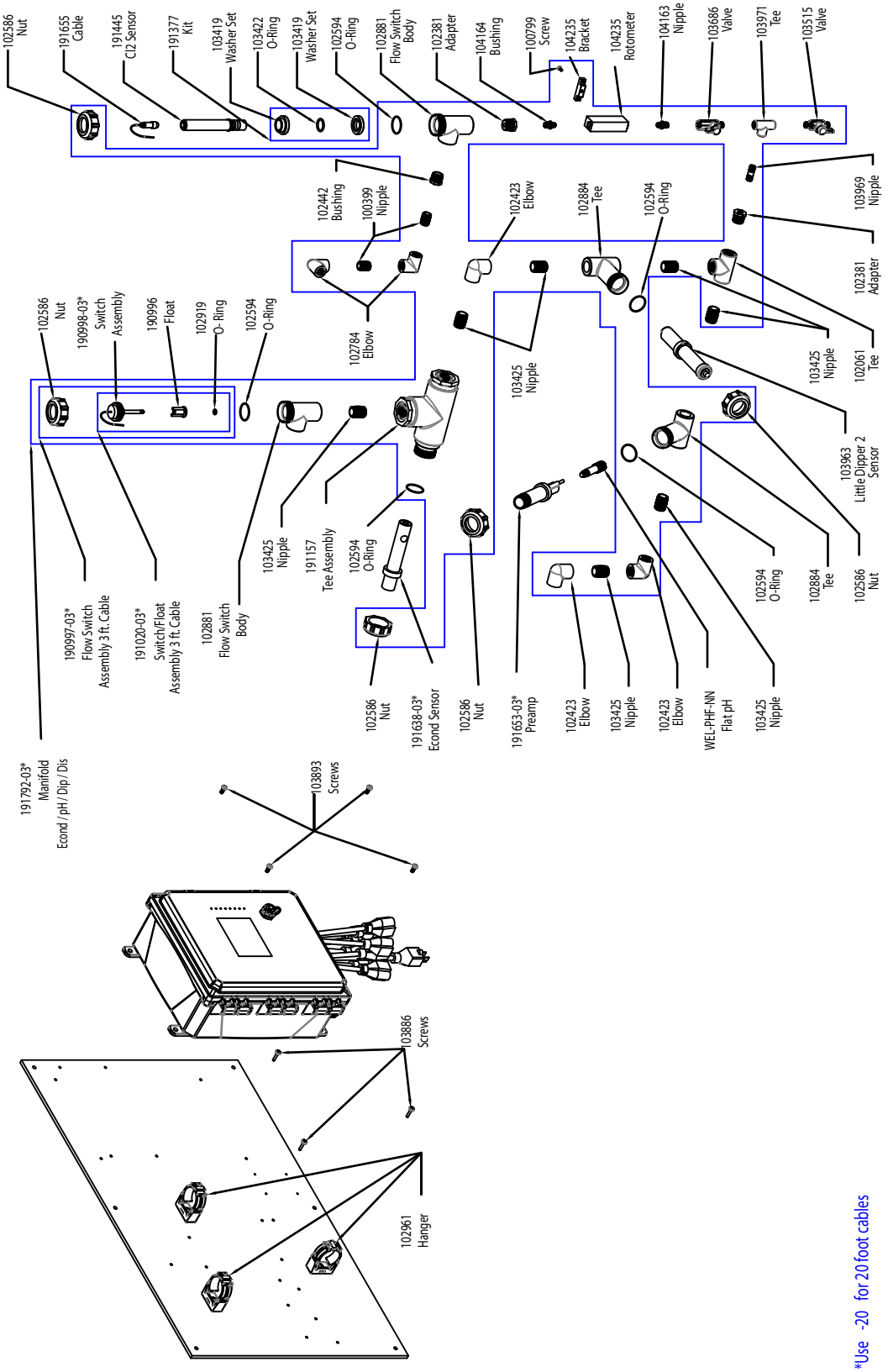
WCT900 Sensor Options PCFHNN, PCFINN

PCFHNN: Electrodeless conductivity + pH + Flow Switch manifold on panel + Rod ORP
PCFINN: + Flat ORP



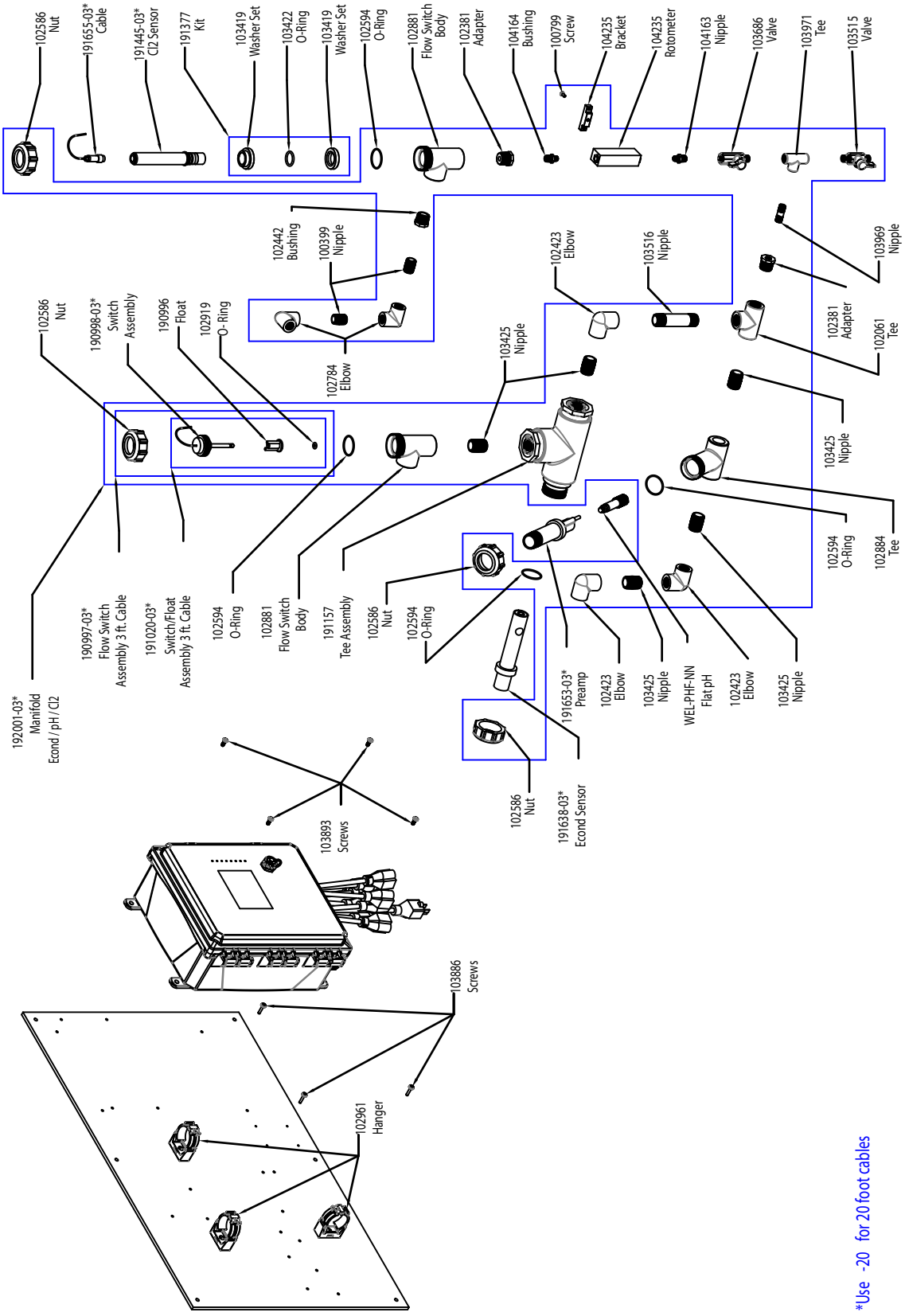
WCT900 Sensor Options PCFHPN, PCFIPN

PCFHPN: Electrodeless conductivity + pH + Pyxis + Flow Switch manifold on panel + Rod ORP
PCFIPN: + Flat ORP



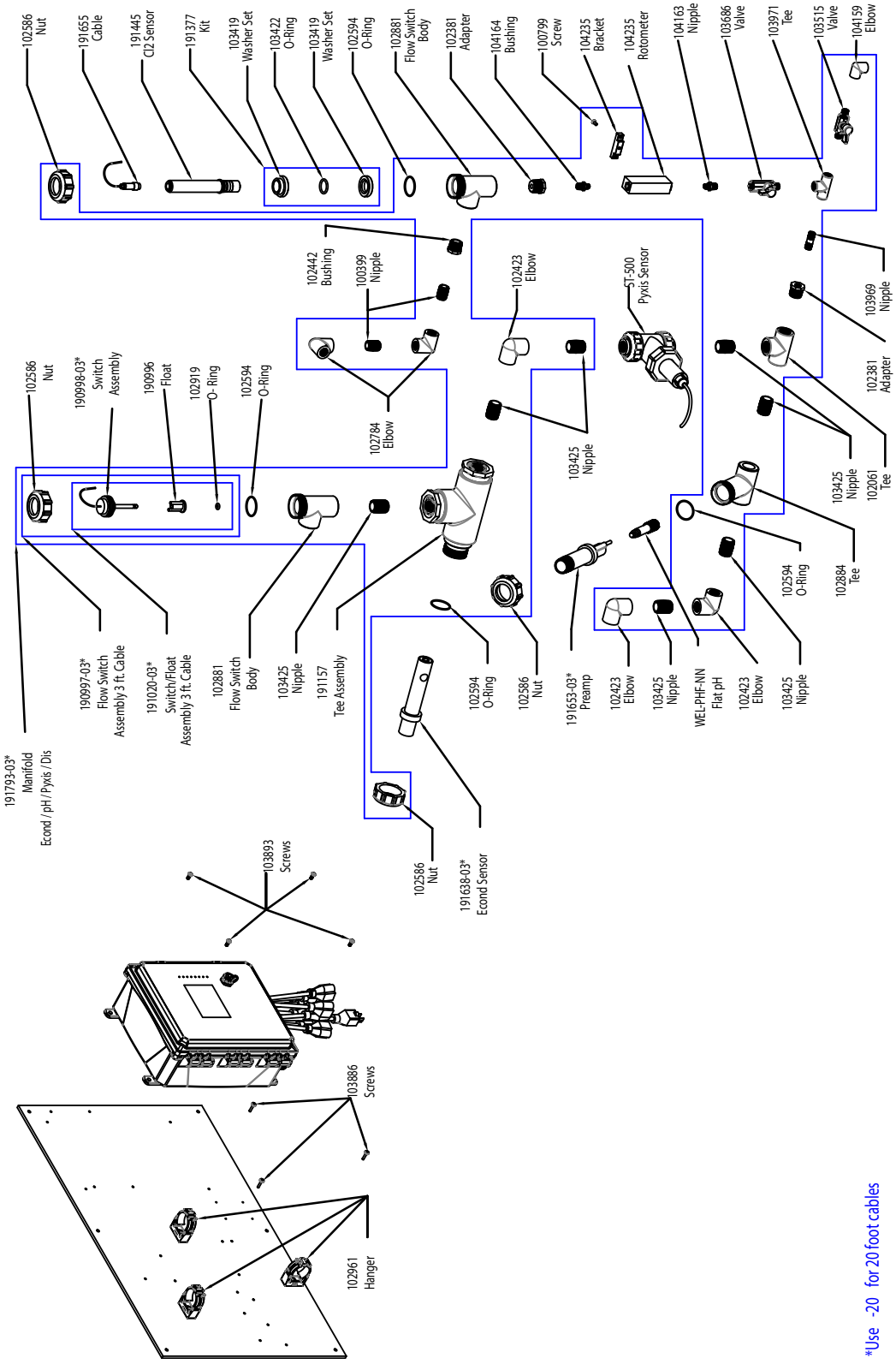
WCT900 Sensor Options PCFKMN, PCFLMN, PCFMSN

PCFKMN: Electrodeless conductivity + pH + LD2 + Flow Switch manifold on panel + Chlorine
PCFLMN: + Chlorine Dioxide
PCFMSN: + Disinfection (no sensor)



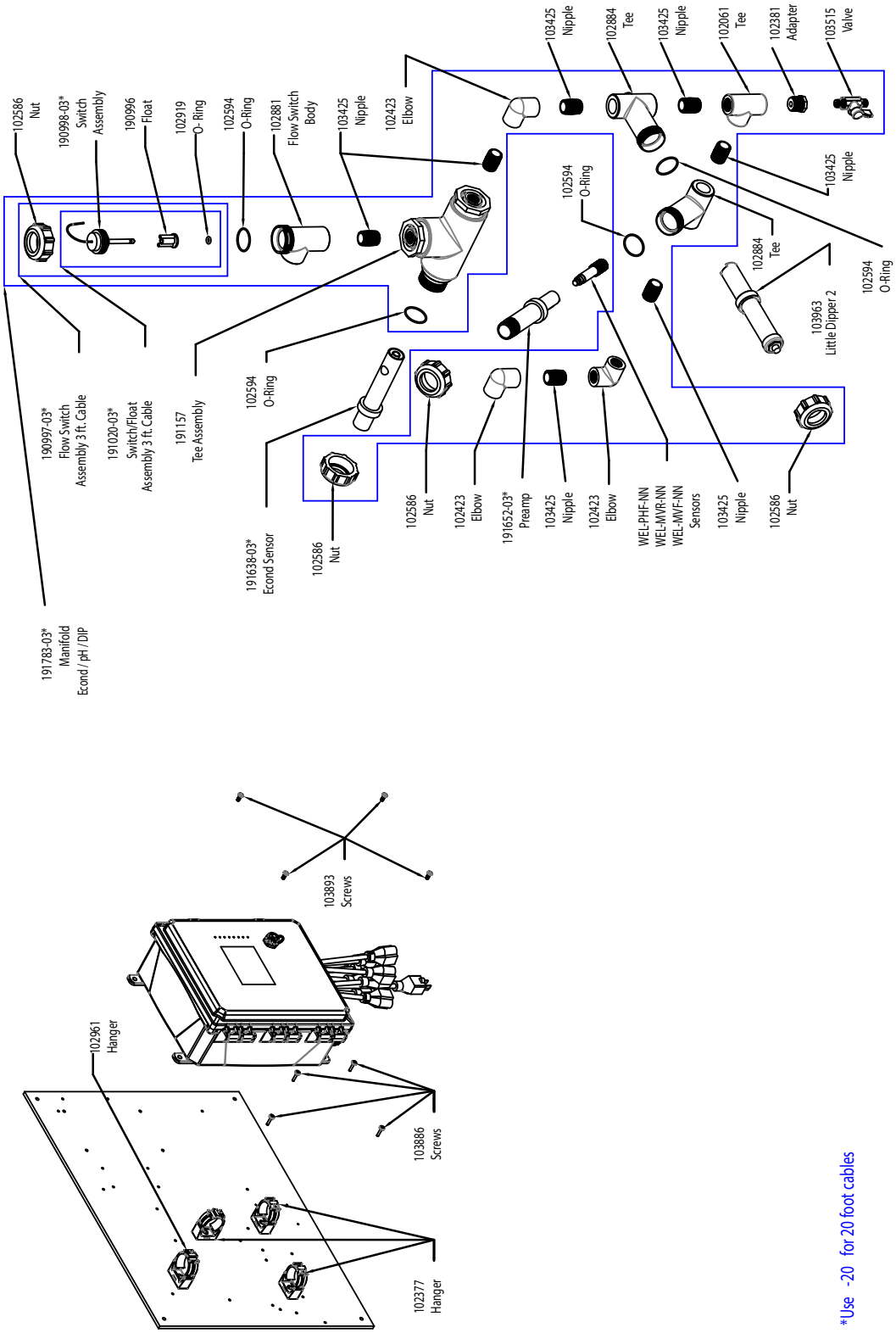
WCT900 Sensor Options PCFKNN, PCFLNN, PCFSNN

PCFKPN: Electrodeless conductivity + pH + Pyxis + Flow Switch manifold on panel + Chlorine
PCFLPN: + Chlorine Dioxide
PCFPSN: + Disinfection (no sensor)



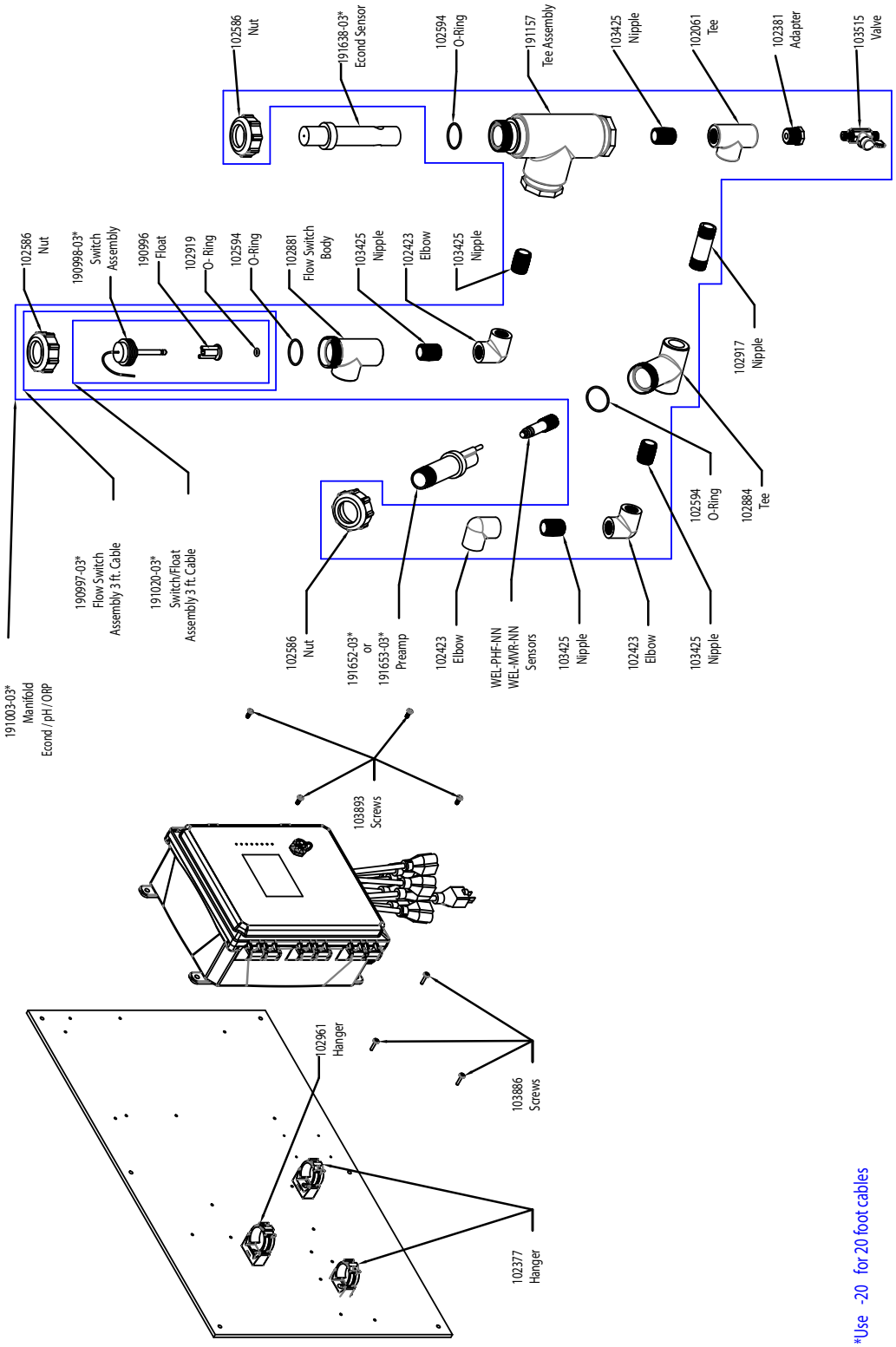
WCT900 Sensor Options PCFKPN, PCFLPN, PCFPSN

PCFKPN: Electrodeless conductivity + pH + Pyxis + Flow Switch manifold on panel + Chlorine
PCFLPN: + Chlorine Dioxide
PCFPSN: + Disinfection (no sensor)



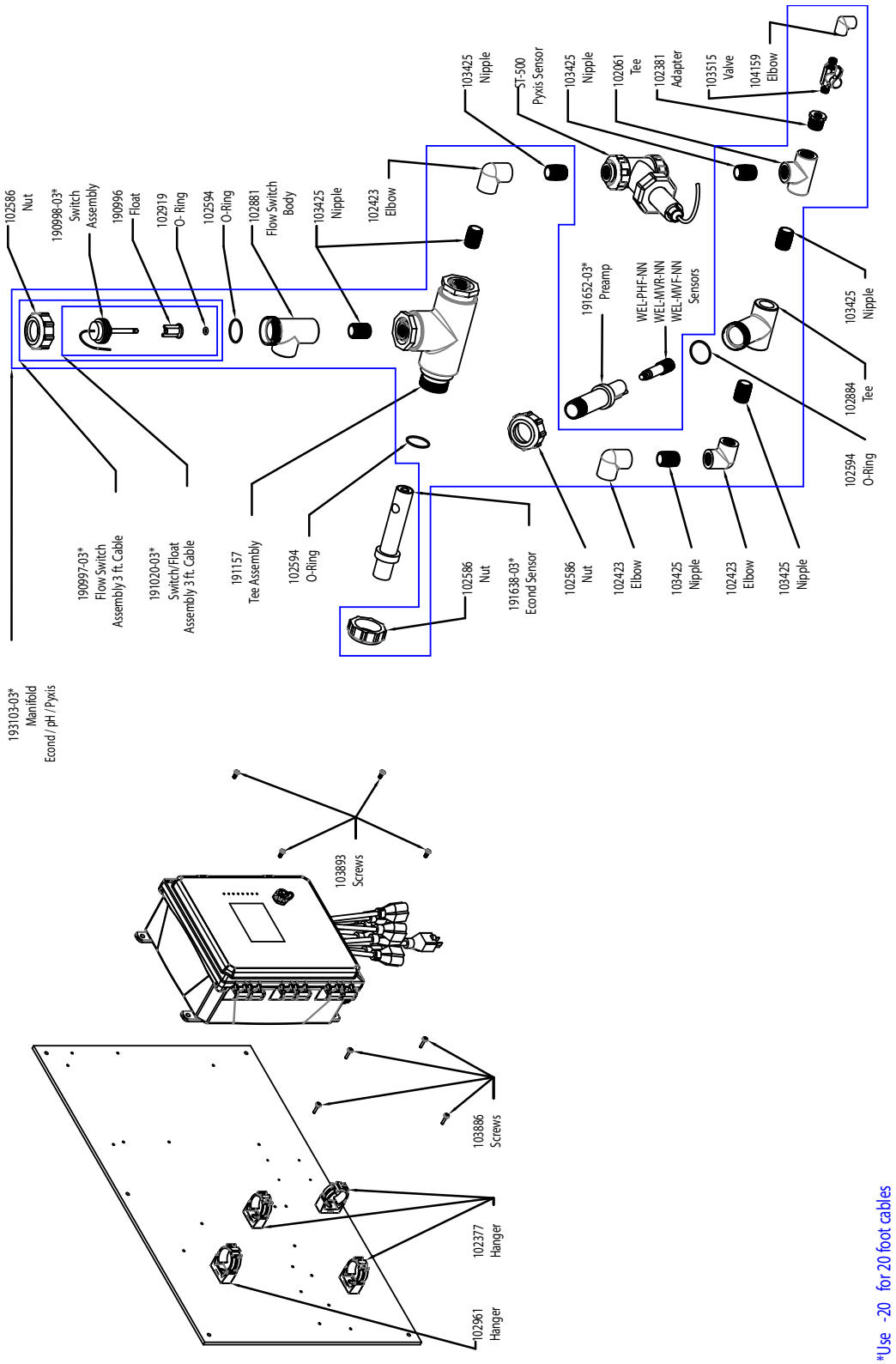
WCT900 Sensor Options PCFMNN, PCHMNN, PCIMNN

PCFMNN: Electrodeless conductivity + LD2 + Flow Switch manifold on panel + pH
PCHMNN: + Rod ORP
PCIMNN: + Flat ORP



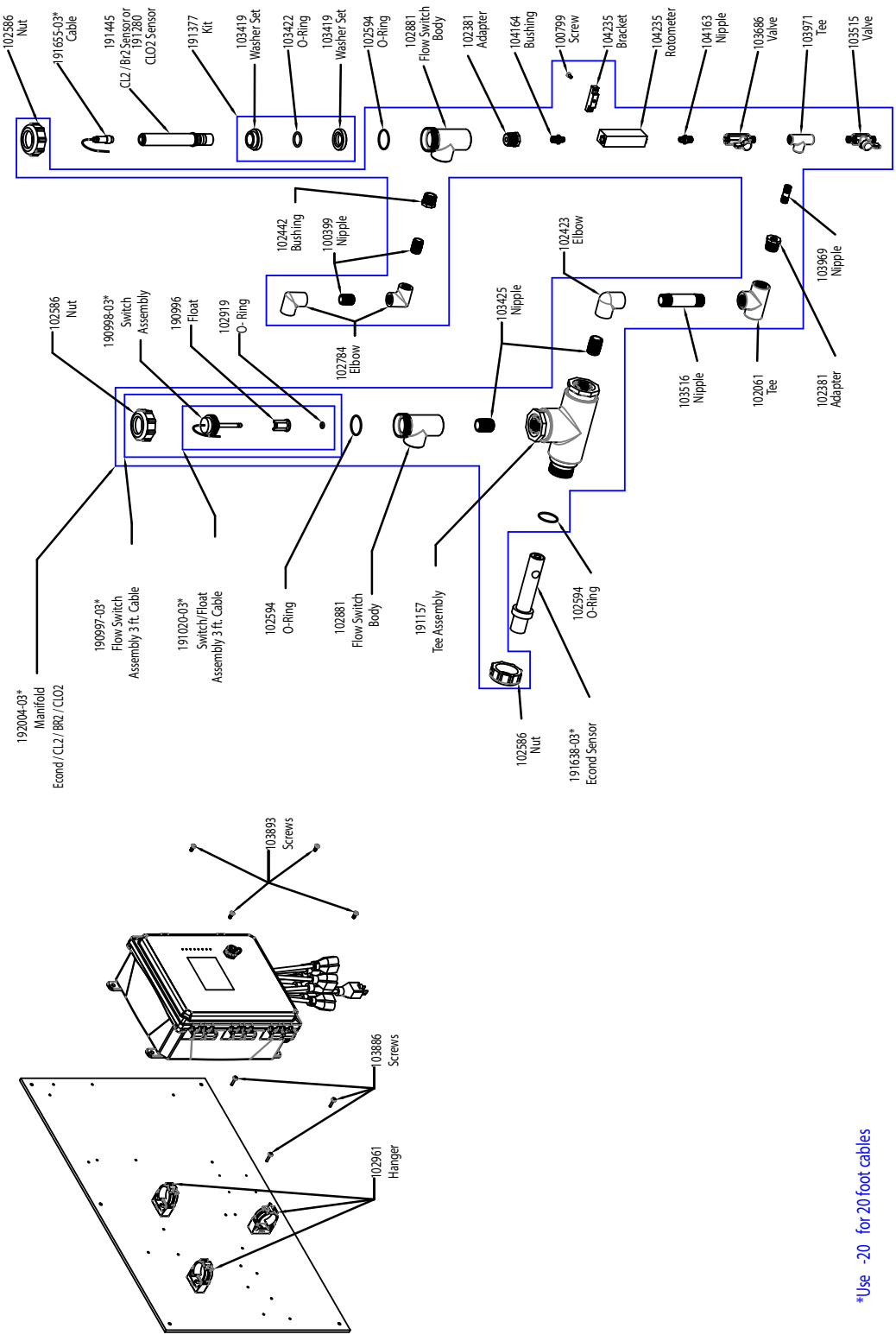
WCT900 Sensor Options PCFNNN, PCHNNN, PCINNN, WIN900 Sensor Option PBENNN

PCFNNN: Electrodeless conductivity + Flow Switch manifold on panel + pH
PCHNNN: + Rod ORP
PCINNN: + Flat ORP
PBENNN: Electrodeless conductivity + Flow Switch manifold on panel + pH with ATC



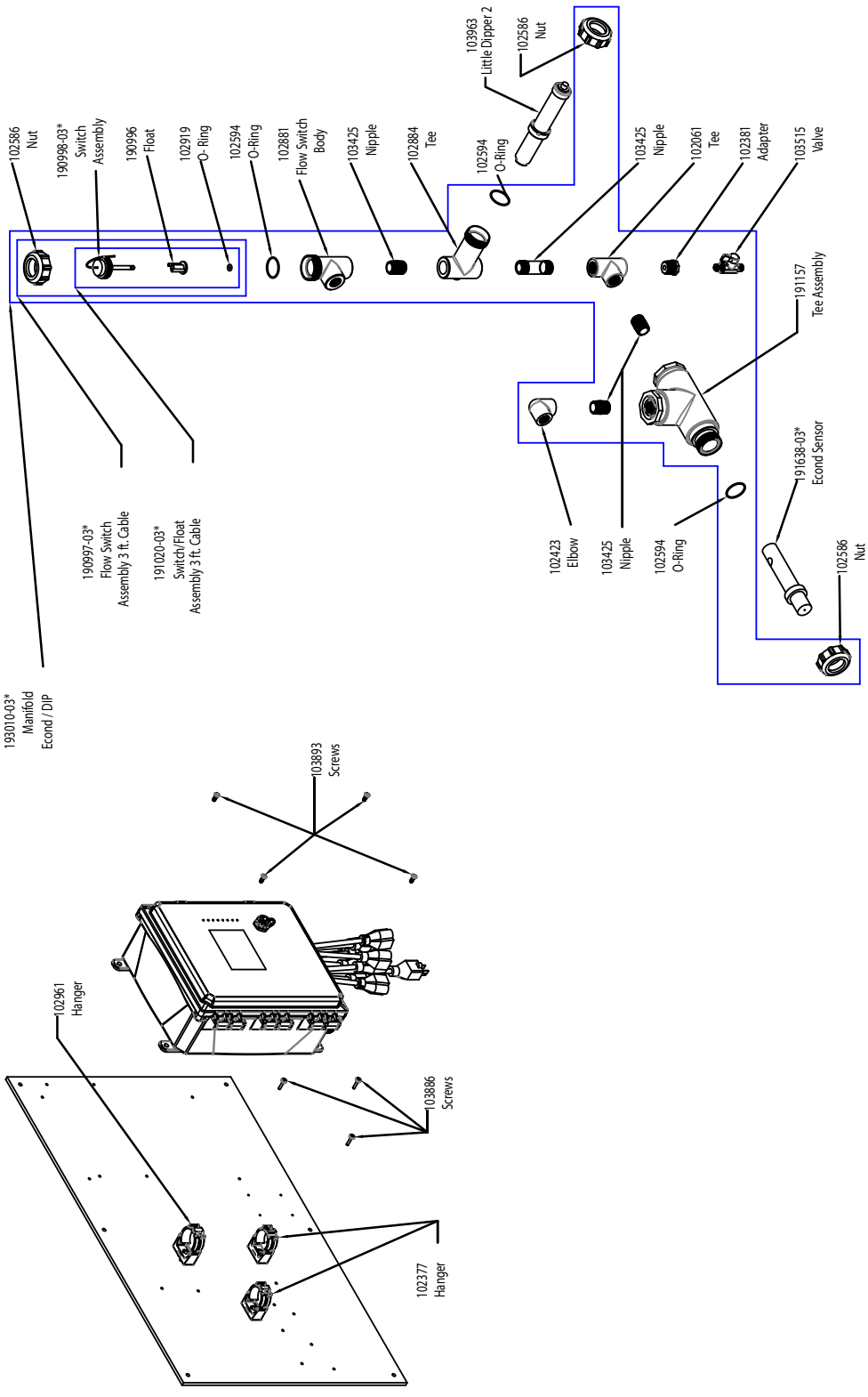
WCT900 Sensor Options PCFPNN, PCHPNN, PCIPNN

PCFPNN: Electrodeless conductivity + Pyxis + Flow Switch manifold on panel + pH
PCHPNN: + Rod ORP
PCIPNN: + Flat ORP



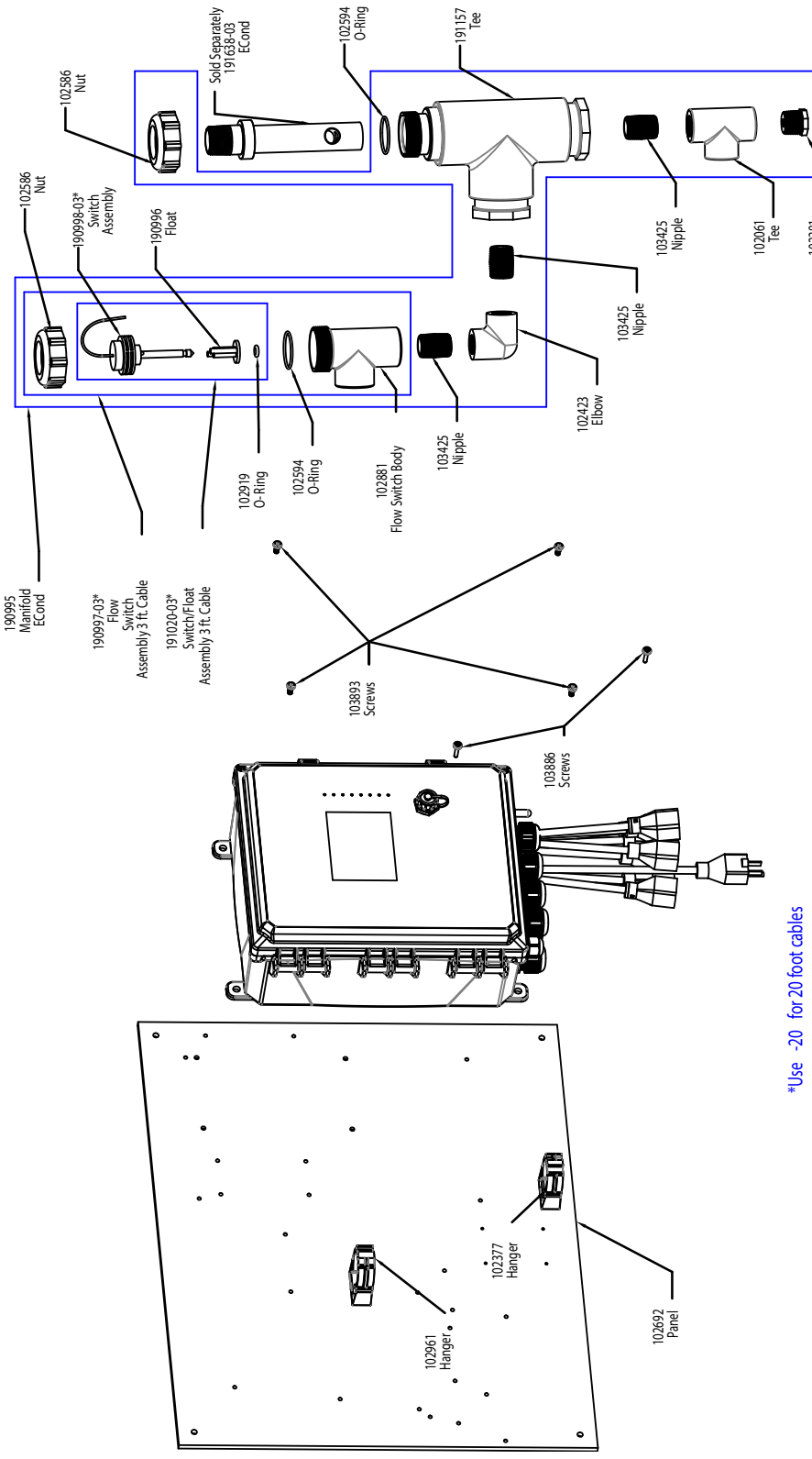
WCT900 Sensor Options PCKNNN, PCLNNN, PCSNNN

PCKNNN: Electrodeless conductivity + Flow Switch manifold on panel + Chlorine
PCLNNN: + Chlorine Dioxide
PCSNNN: + Disinfection (no sensor)



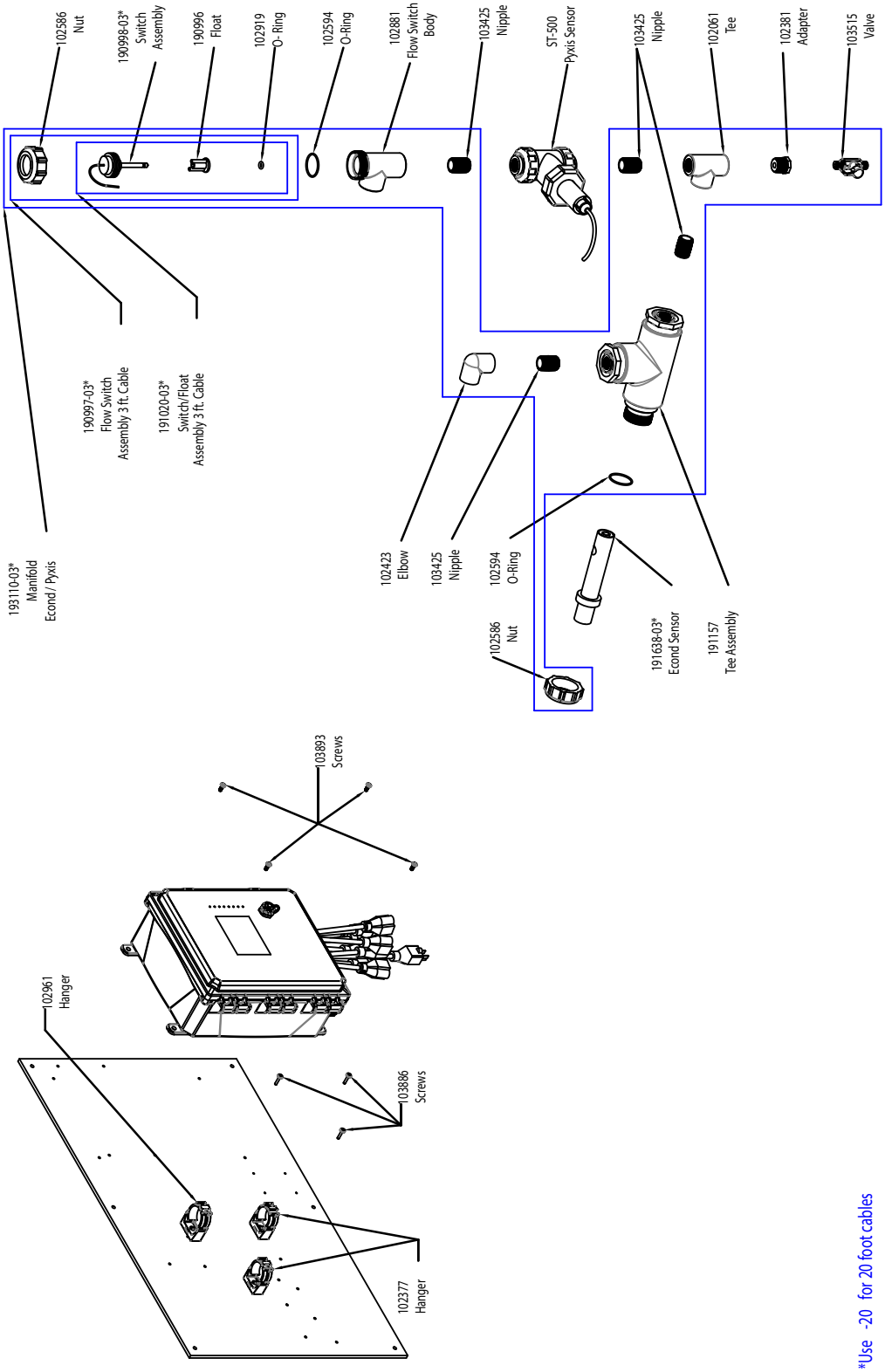
WCT900 Sensor Option PCMNNN

PCMNNN: Electrodeless conductivity + LD2 + Flow Switch manifold on panel



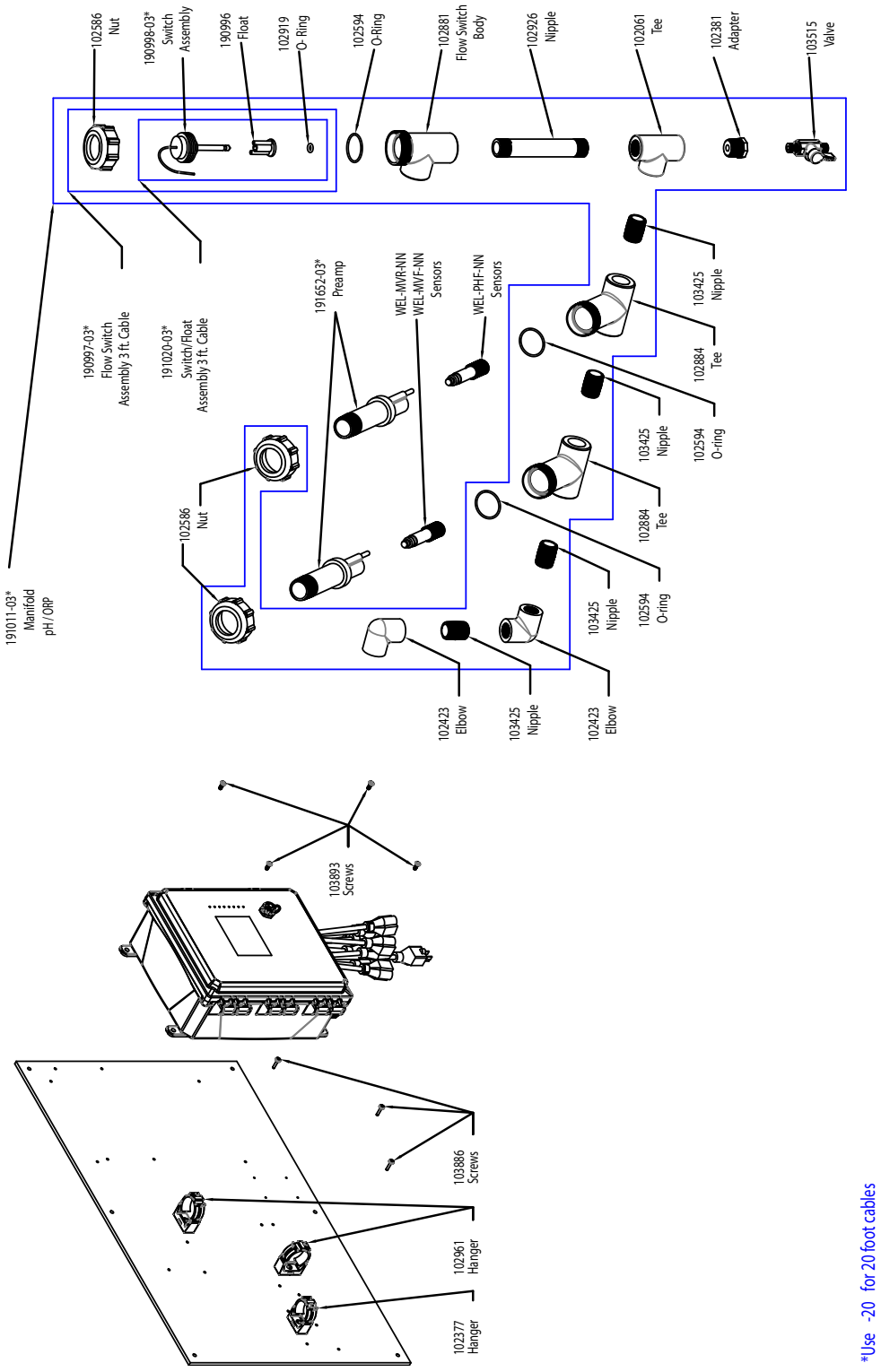
WCT900 Sensor Option PCNNNN

PCNNNN: CPVC electrodeless conductivity + Flow Switch manifold on panel



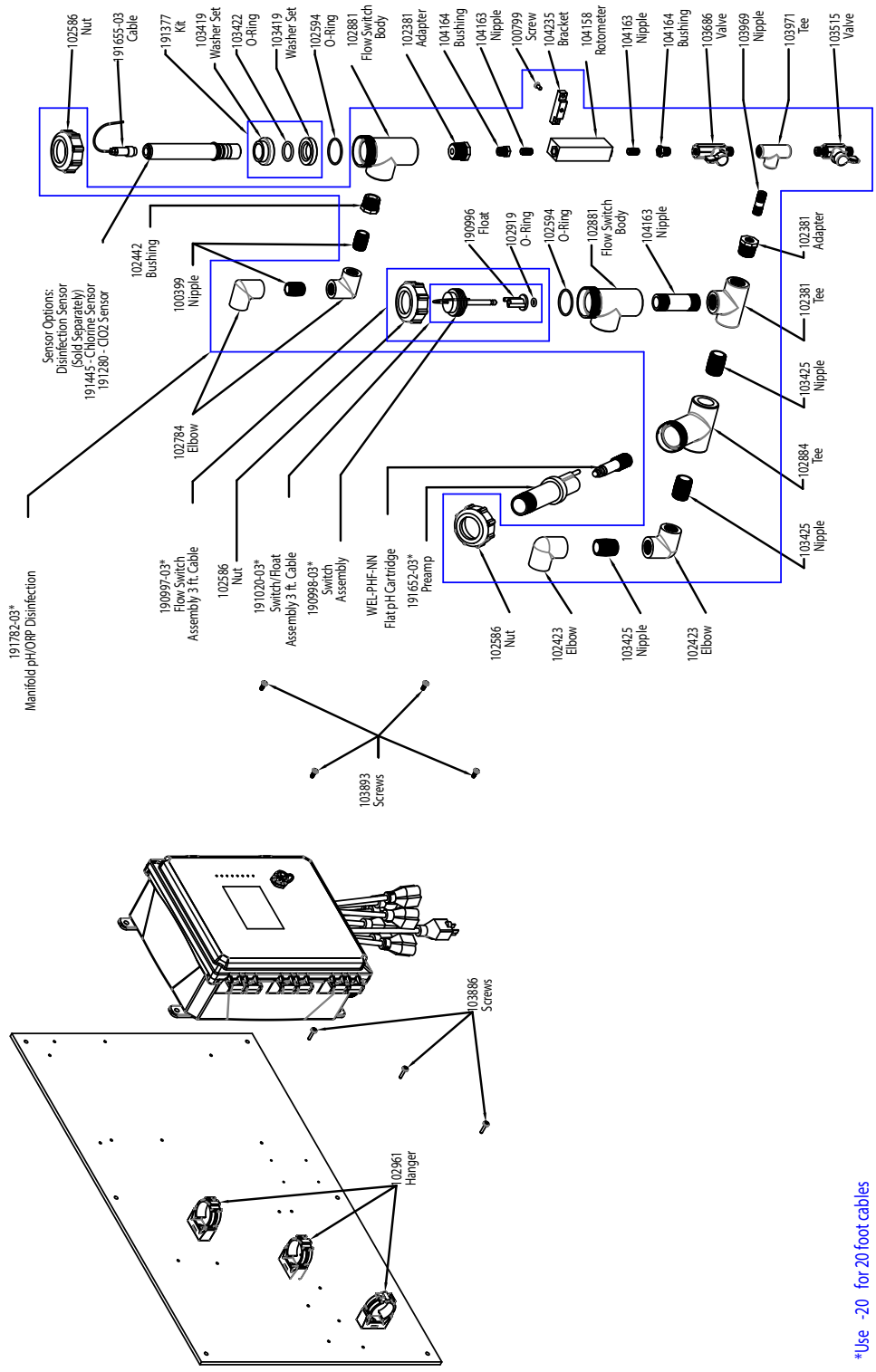
WCT900 Sensor Option PCPNNN

PCPNNN: Electrodeless conductivity + Pyxis + Flow Switch manifold on panel



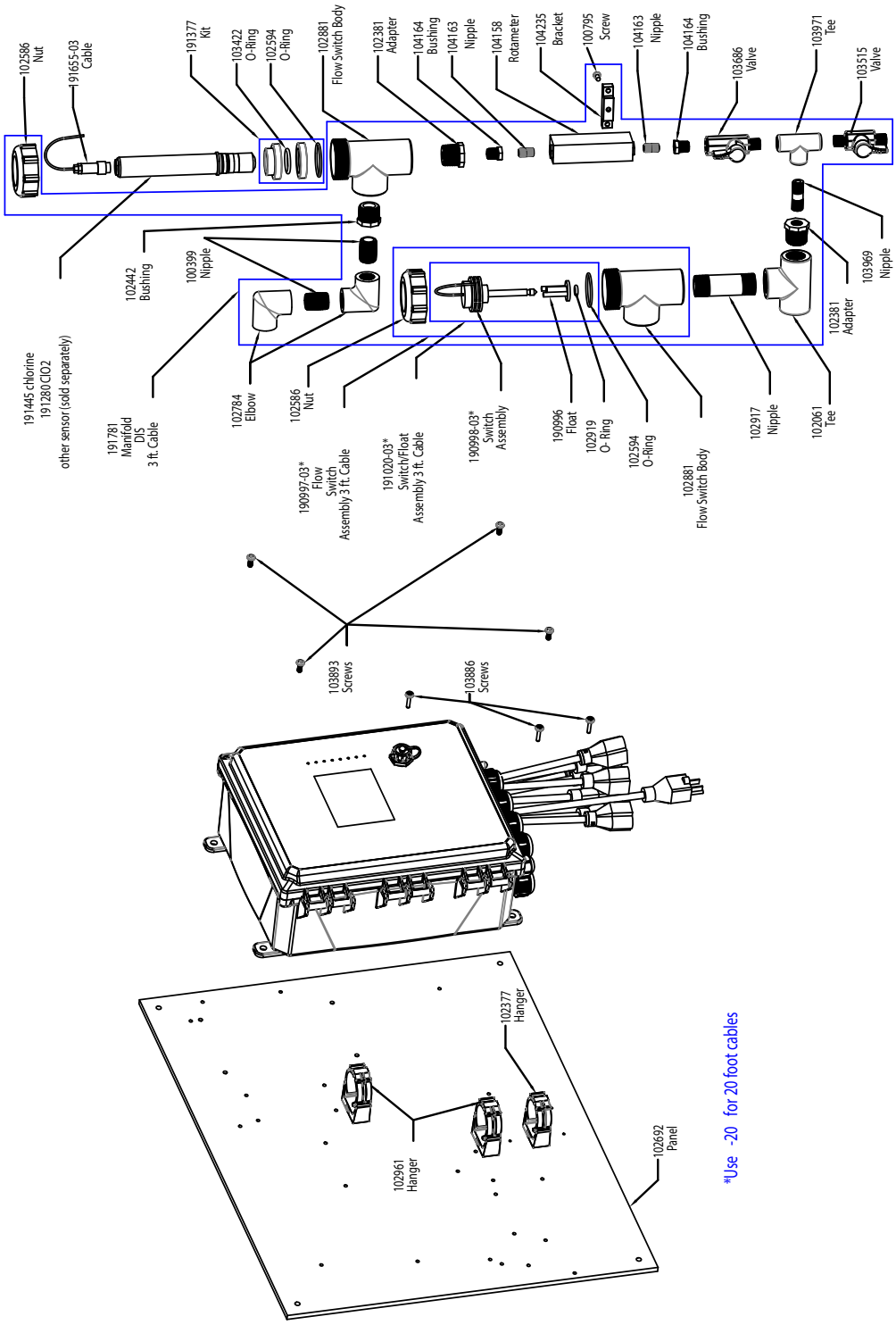
WCT900 Sensor Options PFHNNN, PFINNN

PFHNNN: pH + Flow Switch manifold on panel + Rod ORP
PFINNN: + Flat ORP



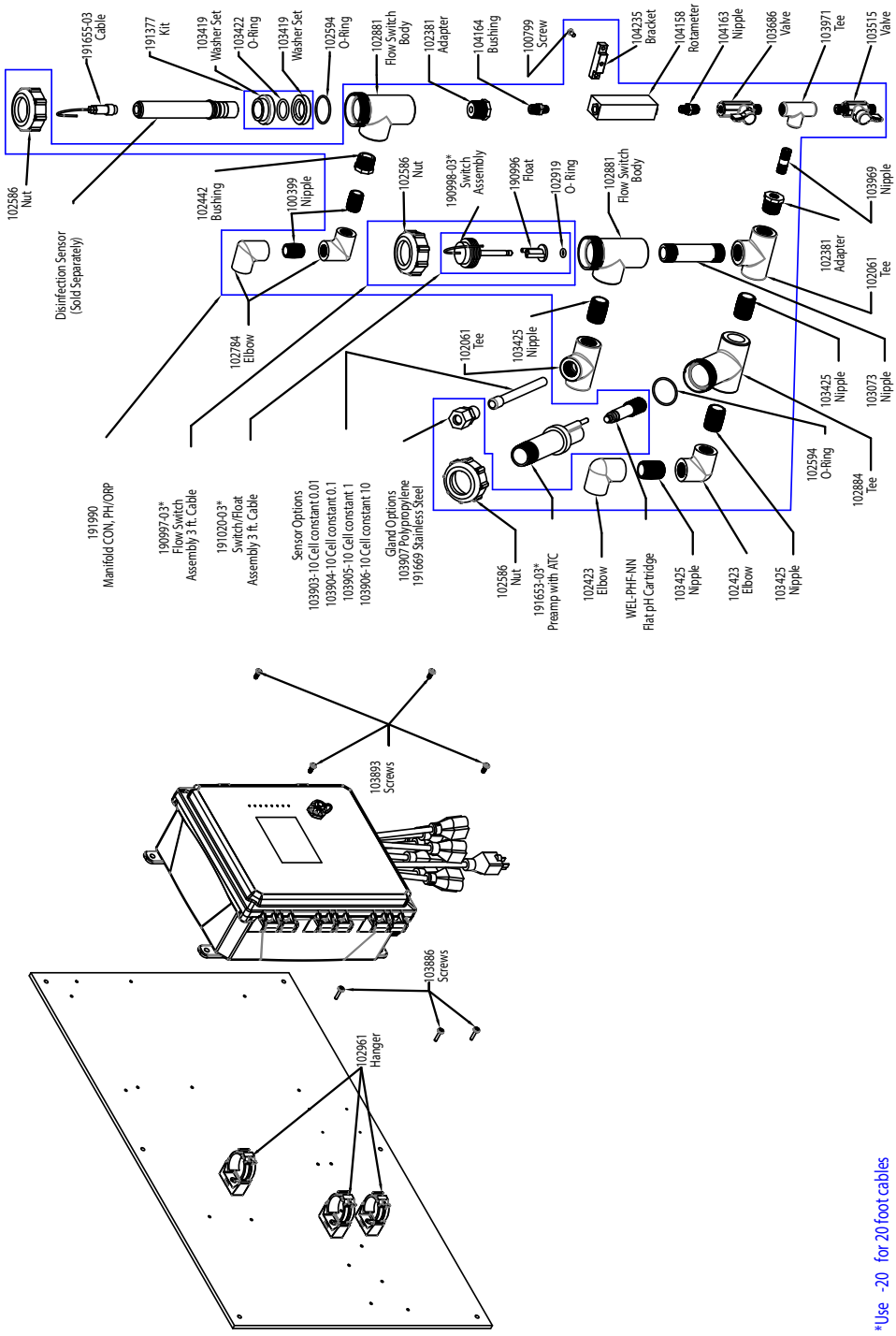
WCT900 Sensor Options PFKNNN, PFLNNN, PFSNNN

PFKNNN: pH + Flow Switch manifold on panel + Chlorine
PFLNNN: + Chlorine Dioxide
PFSNNN: + Disinfection (no sensor)



WCT900 Sensor Options PKNNNN, PLNNNN. WIN900 Sensor Option PCNNNN

PKNNNN: Extended pH Chlorine + Flow Switch manifold on panel
PLNNNN: Chlorine Dioxide + Flow Switch manifold on panel
PCNNNN: Disinfection (No Sensor) + Flow Switch manifold on panel



WIN900 Sensor Options PBCFNN, PBCGNN, PBCHNN, PBCINN, PBCJNN, PBCKNN, PBCLNN, PBCMNN

PBCFNN: Flat pH with ATC + Disinfection (No Sensor) + Flow Switch manifold on panel + Cell Constant 1.0 Low Pressure Generic conductivity
PBCGNN: + Cell Constant 0.1 Low Pressure Generic conductivity
PBCHNN: + Cell Constant 10 Low Pressure Generic conductivity
PBCINN: + Cell Constant 0.01 Low Pressure Generic conductivity
PBCJNN: + Cell Constant 1.0 High Pressure Generic conductivity
PBCKNN: + Cell Constant 0.1 High Pressure Generic conductivity
PBCLNN: + Cell Constant 10 High Pressure Generic conductivity
PBCMNN: + Cell Constant 0.01 High Pressure Generic conductivity

10.0 Service Policy

Walchem controllers have a 2-year warranty on electronic components and a 1-year warranty on mechanical parts and electrodes. See Statement of Limited Warranty in front of manual for details.

Walchem controllers are supported by a worldwide network of authorized master distributors. Contact your authorized Walchem distributor for troubleshooting support, replacement parts, and service. If a controller is not functioning properly, circuit boards may be available for exchange after the problem has been isolated. Authorized distributors will provide a Return Material Authorization (RMA) number for any products being returned to the factory for repair. Repairs are generally completed in less than one week. Repairs that are returned to the factory by next-day-air freight will receive priority service. Out-of-warranty repairs are charged on a time and material basis.

FIVE BOYNTON ROAD **HOPPING BROOK PARK** **HOLLISTON, MA 01746 USA**
TEL: 508-429-1110 **Web: www.walchem.com**

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IQ SensorNet Extension Module





SKU480008Y

The MIQ/JBR module is a repeater module for longer cable distances

The MIQ/JB module has 4 connections for sensor or module cables for the 2020 3G and 282/284 terminals.

Power consumption is 0 watts (non-active module).

Equipment used with	282/284 and 2020 3G

Integrated Lightning Protection	Yes
Languages	German, English
Operating Temperature	-4 to 131 °F (-20 to 55 °C)
Smart Sensors / Ports	Yes
Storage Temperature	-13 to 149 °F (-25 to 65 °C)
Warranty	Enclosure: 3 years

Visit YSI.com/IQ for additional information on the entire IQ SensorNet system

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IQ Sensor Net

D'une grande flexibilité grâce à la technologie numérique – l'IQ Sensor Net de WTW

IQ Sensor Net

- **Un** système de mesure **pour** tous les paramètres
- Composition libre des paramètres
- Raccordement possible de **20** sondes
- Extension simple du système possible à tout moment
- Installation simple grâce à la technique à deux fils
- Transmission numérique des signaux
- Protection antifoudre intégrée

>10 ans d'expérience
IQ SENSOR NET
1.000 fois vendus

Avec son IQ Sensor Net à structure modulaire, WTW est précurseur dans le domaine de la mesure continue en ligne : l'histoire d'une réussite depuis plus de 10 ans maintenant et des milliers de systèmes et de sondes vendus. Le système est en constante évolution, avec de plus en plus de paramètres et notamment les toutes dernières technologies de communication. Fondé sur la technologie largement éprouvée des appareils et des sondes, IQ Sensor Net se démarque par ses grandes performances et sa flexibilité uniques sous cette forme.

Le système peut ainsi être adapté de manière optimale à tous les travaux de mesure imaginables même dans des conditions locales particulières. La communication IQ Sensor Net utilisée permet de réduire nettement les coûts grâce à l'intégration simple de plusieurs postes de mesure sans que cela nuise à la fonctionnalité.

Wissenschaftlich-Technische Werkstätten GmbH · Dr.-Karl-Slevogt-Straße 1 · 82362 Weilheim · Allemagne · Tél.: +49 881 183-0 · Fax: +49 881 183-420

Philosophie du système IQ Sensor Net





IQ Sensor Net – Le système de mesure multiparamètres

Le système 2020 XT – la solution flexible pour aujourd'hui et demain. Sa construction modulaire lui permet d'« évoluer » au fur et à mesure que les exigences augmentent ! Cette flexibilité rend le système attrayant pour les stations d'épuration de petite taille, de taille moyenne mais aussi de grande taille. De la mesure de rejets avec les paramètres turbidité, pH, conductivité et température à l'analyse complète de la station d'épuration à l'aide d'un système unique en passant par la commande ou la régulation de la nitrification/dénitrification, toutes les applications imaginables peuvent être menées à bien – et ce à raison de frais d'investissement particulièrement réduits pour un fonctionnement extrêmement rentable – avec un système facile à manier.

Composition libre des paramètres

Les sondes spécifiques aux paramètres sont dotées d'une interface unique servant à la communication avec tous les composants situés en amont. Le raccordement de diverses sondes ou divers paramètres au système est ainsi possible. L'utilisateur peut choisir librement les paramètres. Seul le nombre de sondes est limité.

Ainsi, des tâches telles que la mesure à l'entrée et à la sortie sur des installations d'épuration ou la mesure parallèle dans plusieurs bassins sont ainsi possibles de manière simple et rentable à l'aide d'un seul système.

Raccordement possible de 20 sondes à un système de mesure

WTW propose des sondes IQ pour 15 paramètres différents dont de nouvelles sondes pour les paramètres carbone, nitrate, nitrite avec système de nettoyage unique et mesure du niveau de boues. Parmi les différents paramètres, de nombreuses sondes spéciales pour des applications précises sont disponibles. Au total, WTW propose actuellement plus de 30 differentes sondes IQ pouvant être associées librement. Si une sonde est connectée à l'IQ Sensor Net, le système la détecte automatiquement et la valeur mesurée s'affiche immédiatement. Le logiciel est conçu de telle sorte que même les nouveaux paramètres à venir pourront être intégrés dans les systèmes existants. Grâce à cette technique intelligente, le système peut être étendu à 20 sondes ou modifié très facilement.

Parce que des données de calibration peuvent être déposées dans les sondes, leur calibration peut être effectuée en laboratoire.



Numérique et modulaire

Les unités fonctionnelles figurant à l'origine dans un transmetteur conventionnel telles que, par exemple, le transformateur, les sorties, les relais, etc. sont modularisées en conséquence, tant sur le plan fonctionnel que mécanique. La communication entre les différents composants se fait de manière numérique comme sur les sondes.

La technique numérique de transmission autorise sans problème des distances importantes entre les différents composants du système. Ces derniers peuvent ainsi être placés quasiment n'importe où dans le système.

Le dispositif de raccordement est une ligne gainée à deux fils transportant les informations numériques mais assurant aussi l'alimentation basse tension des différents composants. Cela permet de satisfaire à des exigences du système telles que

- **Flexibilité locale extrême** (les postes de mesure peuvent être installés à distance)
- **Affectation dans l'espace de la fonction** (module à l'endroit ou la fonction est nécessaire) **et**
- **Installation ou extension simple**



Extrêmement flexible et rentable

L'emplacement quasiment libre des sondes ou des unités du système dans la station d'épuration en combinaison avec une technique de raccordement simple et sûre permet d'atteindre une flexibilité unique de l'IQ Sensor Net. Le système se caractérise également par sa haute rentabilité due à cette technique intelligente:

- Frais réduits à mesure que le nombre de postes de mesure augmente car il ne faut ajouter qu'une sonde par paramètre supplémentaire
- Pas de câblage point par point des différents postes de mesure – réalisation d'économies importantes sur les frais de câblage et d'installation
- Extension ultérieure simple et peu onéreuse du système possible à tout moment



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Caractéristiques et fonctions

du système IQ Sensor Net



Alimentation électrique et communication de l'IQ Sensor Net

Tant l'alimentation électrique que la communication à l'intérieur du système se font par le biais d'une ligne à 2 brins spéciale avec écran: le câble SENSOR NET SNCIQ. Les couleurs servent à différencier les brins afin de les raccorder correctement. En cas d'erreur, la fonction est entièrement garantie. La tension d'alimentation à l'intérieur du système est de 24 VDC environ de sorte à exclure tout risque dû à des tensions dangereuses en cas de contact.

Transmission numérique des signaux

La communication complète du système se fait sous forme numérique. Cela permet de garantir une grande précision de mesure même en cas de distance importante entre les composants du système. La transmission numérique des signaux est insensible aux parasites extérieurs CEM.

Protection antifoudre intégrée/compatibilité CEM élevée

Tous les composants IQ Sensor Net sont équipés en série d'une protection antifoudre intégrée d'une qualité WTW éprouvée. L'utilisation de dispositifs de protection supplémentaires externes est alors inutile. L'extrême compatibilité CEM de chaque composant contribue à la sécurité de fonctionnement maximale et à la grande disponibilité du système.

Extension des composants du système

Lorsque de nouveaux composants sont ajoutés à l'IQ Sensor Net, ce dernier les détecte automatiquement et les intègre immédiatement.





Changement de sonde

Les sondes peuvent être changées pendant le fonctionnement sans devoir descendre le système. Tous les réglages peuvent être repris très simplement de l'ancienne à la nouvelle sonde.

Affectation au choix des entrées et des sorties

Des sorties (mA/relais) peuvent être affectées à volonté à chaque composant d'entrée du système (sonde). Les affectations multiples sont également possibles.

Diagnostic d'erreur

Tous les états du système et les événements en présence sont enregistrés dans le registre interne. L'afficheur fournit à l'utilisateur toutes les indications relatives au diagnostic et à la suppression des erreurs.

Montage

Les sondes du système IQ Sensor Net peuvent être installées directement dans la rigole ou le bassin à l'aide d'accessoires éprouvés. Pour les mesures en circulation continue, il existe diverses cuves. Pour le montage des modules, des jeux spéciaux pour le montage du boîtier encastrable, pour l'installation sur des profilés chapeaux, pour le montage mural et la fixation sur des rampes sont disponibles. Pour l'installation à l'extérieur, le nouveau toit de protection SSH/IQ peut être utilisé en association avec toutes les colonnes WTW habituelles.

Caractéristiques et fonctions

des modules

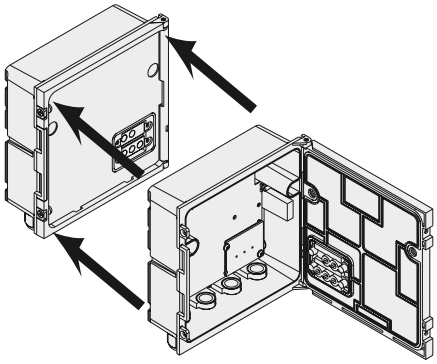


Raccordement mécanique d'un contrôleur

Un terminal TC 2020 XT peut être raccordé à chaque module. Le contact électrique pour l'alimentation électrique et la communication des données est établi en même temps que la connexion mécanique.

Empilement de modules

Jusqu'à 3 modules peuvent être empilés et raccordés mécaniquement. En même temps que la jonction mécanique s'établit aussi le contact électrique pour le transfert de données et d'énergie. Les différents modules de la pile sont accessibles à tout moment sans qu'il soit nécessaire de démonter la pile (il suffit de desserrer deux vis latérales).



Répartition des modules

Tous les modules peuvent être répartis séparément ou en piles dans tout le système. S'ils ne sont pas empilés, les composants du système sont raccordés par le câble gainé Sensor Net SNCIQ à 2 conducteurs. Chaque raccord Sensor Net des composants du système peut être utilisé pour faire passer le câble IQ Sensor Net. Les sondes IQ peuvent également être raccordées directement aux bornes Sensor Net.

Fonction terminator des modules

Chaque module dispose d'une fonction terminator. Il s'agit d'une résistance terminale pouvant être désactivée selon les besoins. Cette fonction est importante lorsque le module se trouve en dernier dans le système Sensor Net.



Fonction identité locale

La fonction identité locale est intégrée dans chaque module sous la forme d'un élément de mémoire. Des informations, telles que le lieu et le nom du poste de mesure ainsi que les sondes raccordées, peuvent être enregistrées dans cette mémoire lors de la configuration du système. Lors de l'installation d'un terminal, cette information est éditée, ce qui permet de trouver rapidement les sondes à des fins de calibrage.

Diagnostic sur les DEL

Deux DEL (jaune/rouge) se situent sur chaque module (sur le côté et bien visibles en permanence) à des fins de diagnostic. Elles indiquent si le module correspondant est prêt à fonctionner (alimentation électrique/communication des données).

Technique du système IQ Sensor Net

Coffret IQ Sensor Net

Le système IQ Sensor Net se compose d'un nombre variable de composants aux fonctions différentes.

Différents composants et fonctions principales:		
Contrôleur et terminal	Contrôleur	Se charge de la communication dans le système
	Terminal	Affichage des valeurs mesurées, utilisation et configuration du système ("interface homme-machine")
Modules	Modules transformateur	Alimentation électrique des composants du système
	Module de sortie combiné	Transmission des valeurs mesurées ou des fonctions d'indication/alarme (mA/relais)
	Modules de dérivation	Dérivation du système et raccordement des sondes
Sondes	Sondes IQ et modules de raccordement pour sondes passives	Saisie de variables de mesure
Câble	Câble de raccordement de sonde	Câble pour le raccordement de sondes à des modules
	Câble de connexion de module	Câble pour la connexion de modules à des sites de mesure distants
	Câble de connexion de module, pose en terre	Câble pour la connexion de modules à des sites de mesure distants spécialement conçu pour être mis sous la terre



Installation simple au bord du bassin

Les variantes du système IQ

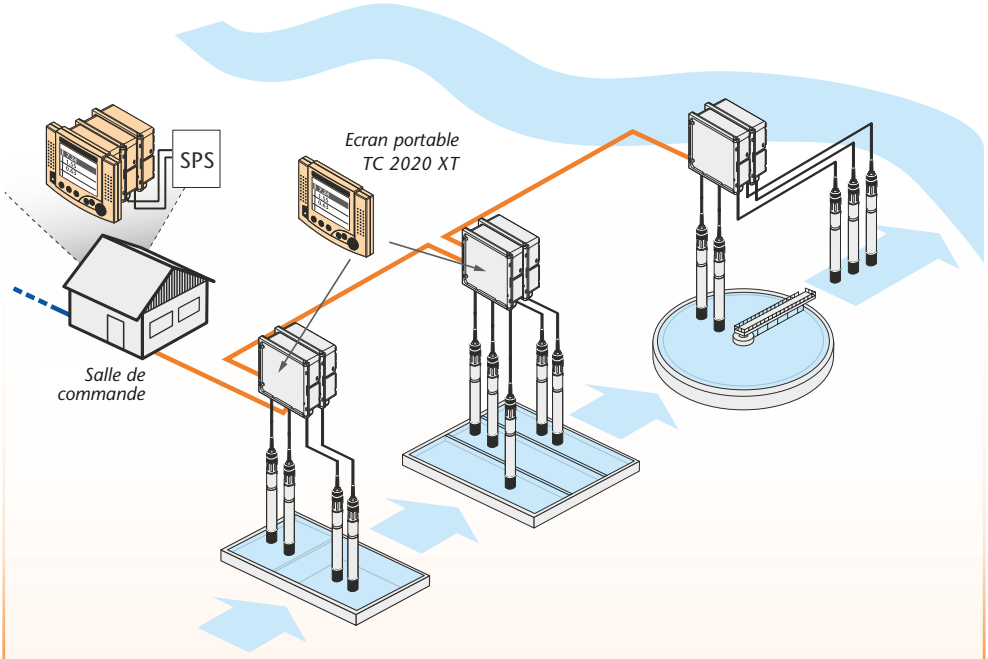
Système de sondes en réseau ou point de mesure individuel – un choix facile …

Lors de l'installation, il convient toujours de choisir entre ces deux possibilités

Système de sondes en réseau : système 2020 XT (jusqu'à 20 sondes)



- Réalisation possible d'un système centralisé (réseau) et décentralisé avec jusqu'à 20 sondes – extensible jusqu'à 3 unités terminal/contrôleur pour un montage au sein du réseau
- Sorties numériques et / ou analogiques combinables et extensibles à volonté par le rajout de modules supplémentaires



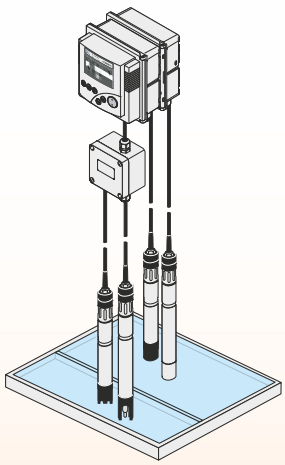
Exemple : réseau centralisé avec le système 2020 XT à 14 sondes

voir pages 94 et suiv

Point de mesure individuel : système 182 (1 à 4 sondes)



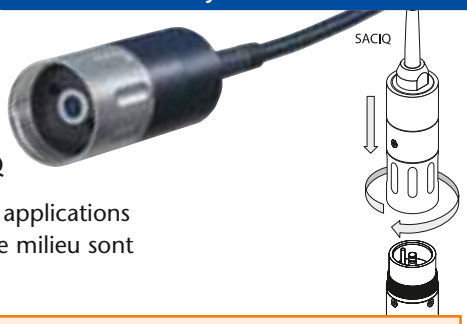
- Système décentralisé pour 1 à 4 sondes avec terminal intégré
- Installation possible de versions avec sorties analogiques ou numériques intégrées (par ex. RS-485/ bus de terrain PROFIBUS ou MODBUS)



Exemple : point de mesure individuel avec 4 sondes

voir pages 82 et suiv

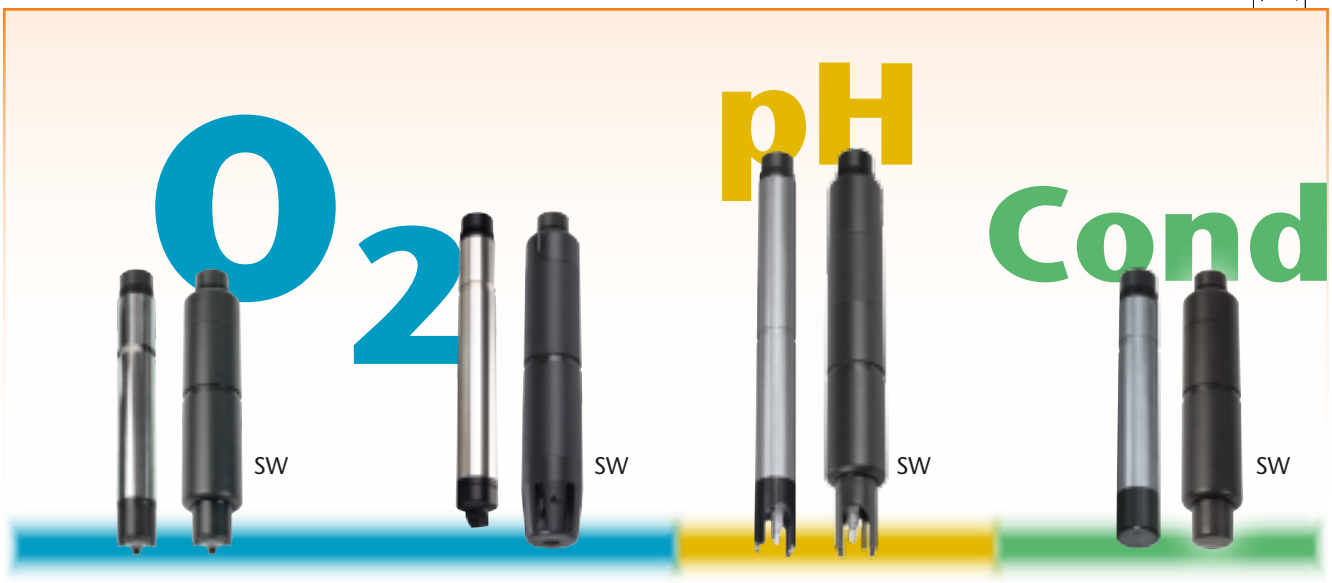
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Sondes IQ

Une connexion pour tous des sondes IQ – avec le câble de sonde universel SACIQ

Le modèle standard en inox de grande qualité convient pour les processus et les applications industrielles. Toutes les parties des versions eau de mer entrant en contact avec le milieu sont en titane et en matière plastique et donc extrêmement résistants à la corrosion.



Oxygène dissous

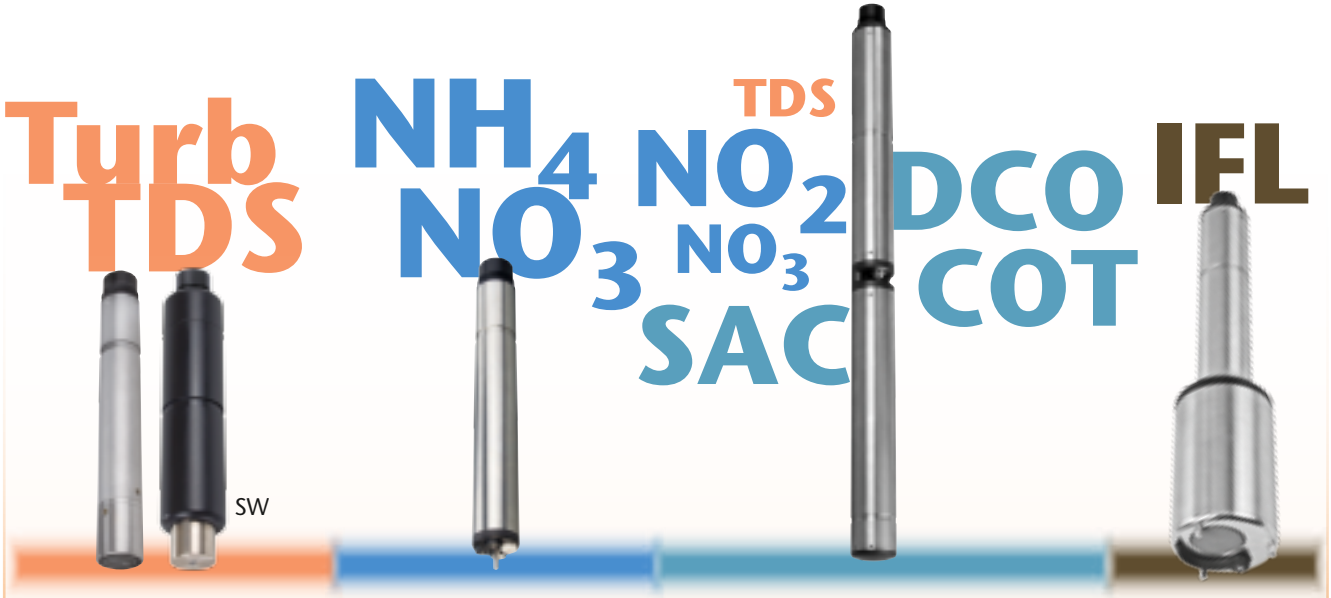
Pages 8–16

pH / Redox

Pages 19–22

Conductivité

Pages 28–31



Turbidité et matières en suspension

Pages 34–37

Ammonium et nitrate

Pages 44–50

Nitrite, nitrate, DCO/COT/ COD/DBO/SAC

Pages 51 & 60/61

Niveau de boues

Page 70

Le système 2020 XT – la solution modulaire pour aujourd'hui et demain

Vous planifiez un réseau à plusieurs sondes – et envisagez éventuellement de l'agrandir progressivement ?

Le système 2020 XT est la solution idéale pour de telles exigences :

Sa construction modulaire lui permet d'«évoluer» au fur et à mesure que les exigences augmentent ! Cette flexibilité rend le système attrayant pour les stations d'épuration de petite taille, de taille moyenne mais aussi de grande taille. De la mesure de rejets avec les paramètres turbidité, pH, conductivité et température à l'analyse complète de la station d'épuration à l'aide d'un système unique en passant par la commande ou la régulation de la nitrification/dénitrification, toutes les applications imaginables peuvent être menées à bien – et ce à raison de frais d'investissement particulièrement réduits pour un fonctionnement extrêmement rentable – avec un système facile à manier.

Les principales particularités du système :

- Possibilité de raccord de **20** sondes IQ numériques au choix
- **Extension du système** très simple et sans connaissance préalable possible
- Alimentation en courant centrale par des blocs d'alimentation à grande portée (100 - 240 VAC) ou 24 V
- Relais et sorties analogiques (0/4-20 mA) pratiquement à volonté au choix
- Sorties numériques **PROFIBUS DP** ou **MODBUS RTU**
- Connexion modem optionnelle via un **modem analogique ou GSM**
- **Liaison sans fil** par radio
- **Intégration simple** également des zones de mesure d'autres marques déjà existantes via des entrées mA

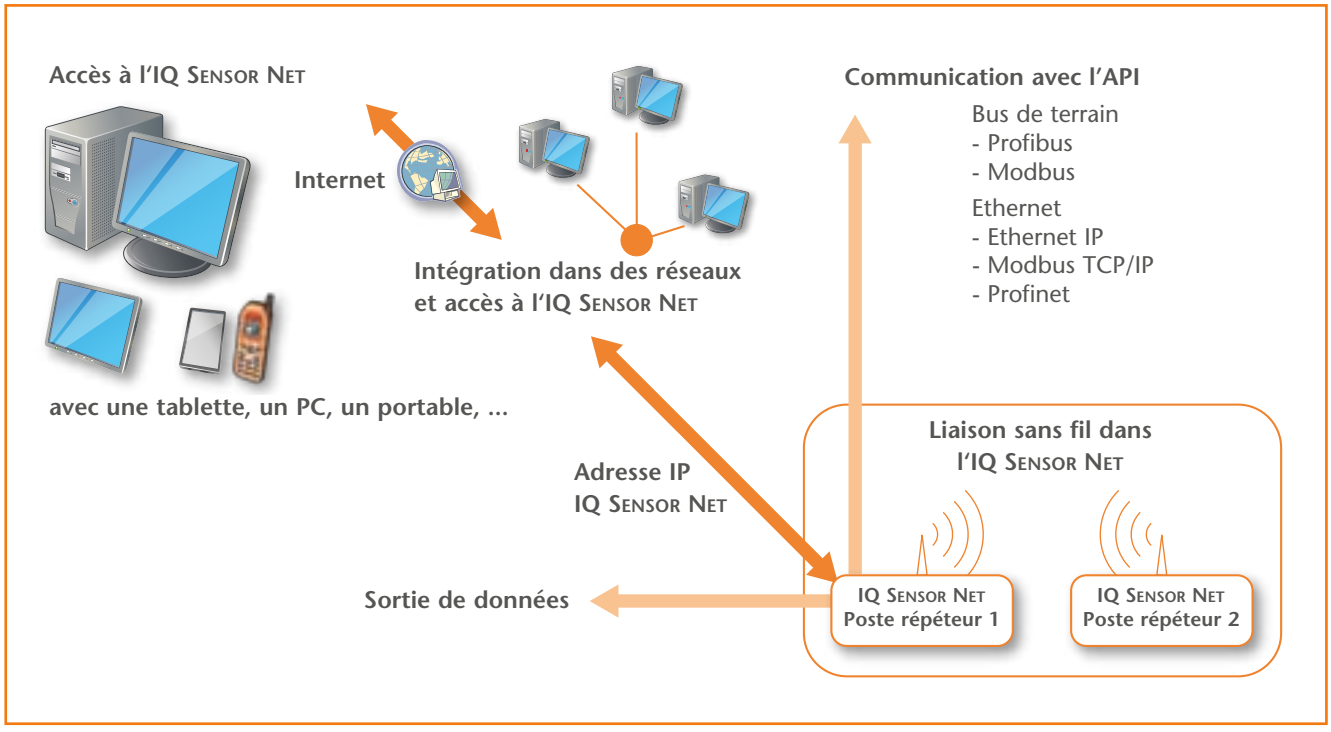
Communication numérique avec l'IQ Net

MIQ/2-PR
Module IQ avec raccord PROFIBUS-DP

MIQ/2-MOD
Module IQ avec raccord MODBUS RTU/RS 485

MIQ/Blue PS
pour la connexion sans fil et la ramification au sein du système IQ Sensor Net

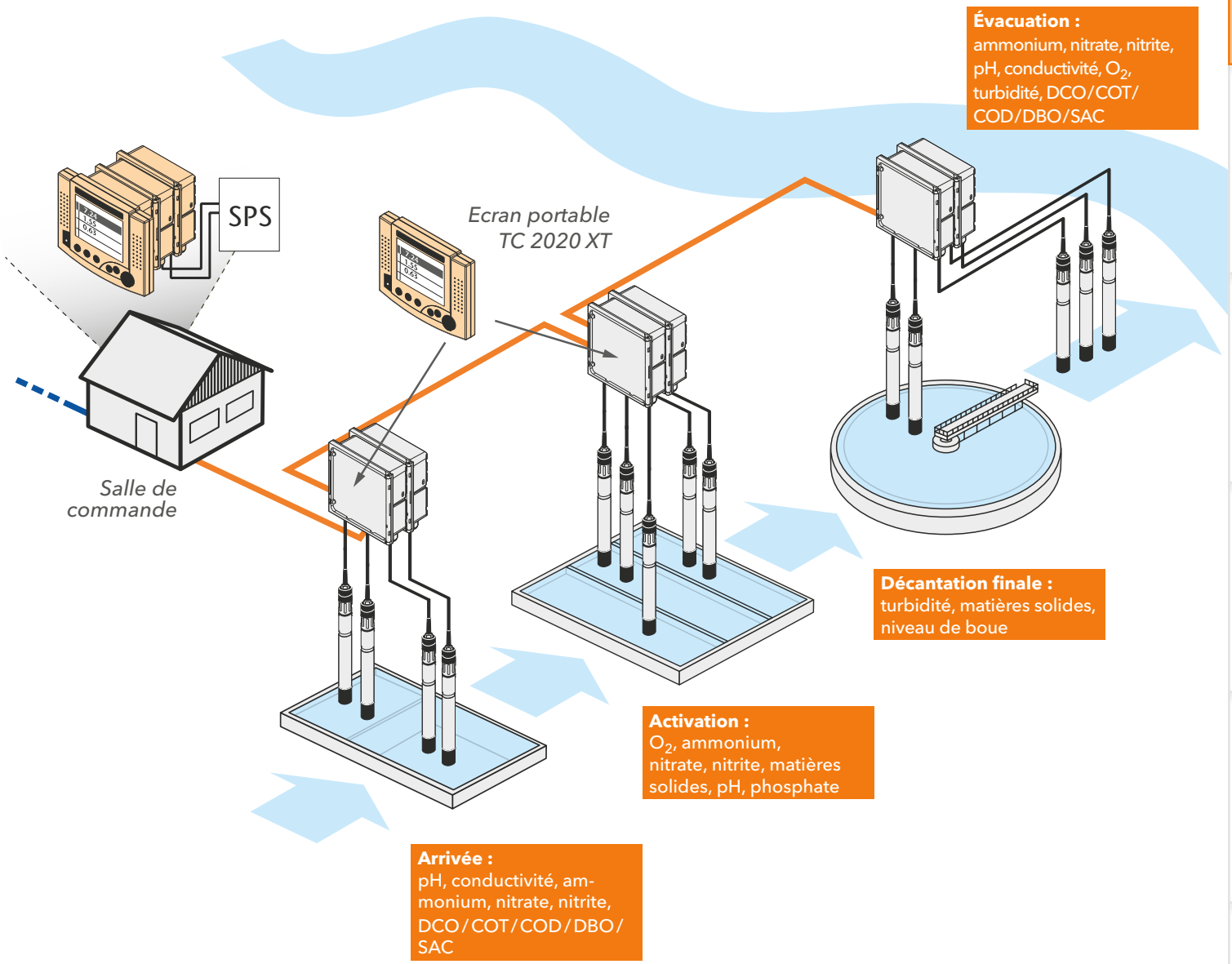
Autres postes IQ Sensor Net possibles.



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Architecture du système 2020 XT

Le **terminal/contrôleur MIQ/TC-2020 XT** peut aussi bien servir de contrôleur installé à demeure dans le système que de terminal mobile. C'est à l'utilisateur qu'il revient de configurer cette fonction dans le logiciel. Le voyant d'état signale la fonction choisie et informe sur d'éventuels évènements.



Système 2020 XT (USB)

- Port USB
- Fonction Electronic-Key
- Fonction IQ-LabLink

Système 2020 XT (Connect)

- Ports LAN et USB
- Serveur web intégré
- Divers protocoles de communication TCP/IP
- Versions Profibus et Modbus





Pages 85 et suiv

Page 88/89

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Terminal/contrôleur MIQ/TC 2020 XT

Le **terminal/contrôleur MIQ/TC 2020 XT** est la pièce maîtresse de chaque système 2020 IQ Sensor Net. Son processeur performant coordonne toutes les tâches au sein du réseau. Un échange de données extrêmement rapide est possible via le port USB à l'aide d'une clé USB ou directement avec des systèmes externes. Le voyant d'état du système renseigne vite et de manière fiable sur le fonctionnement et l'état du système.



En cas d'intégration de deux MIQ/TC 2020 XT dans le système, la sécurité et avec elle la disponibilité de l'ensemble du système seront optimisées du fait du fonctionnement à double processeur.
Utilisable universellement comme terminal et contrôleur (à demeure) ou bien en tant que terminal mobile.

- Port USB multifonctionnel
- Sécurité du système accrue par le fonctionnement à double processeur

Intégration dans des réseaux
- Télécommunication
- Télémaintenance

Voyant d'état
Chaque terminal/contrôleur MIQ/TC 2020 XT est équipé sur la face avant d'une DEL comme voyant d'état à des fins de diagnostic. Il suffit d'un coup d'œil sur cette DEL pour savoir si le système fonctionne normalement ou s'il y a une perturbation.

Port USB multifonctionnel :
- Fonction IQ-LabLink
- Fonction Electronic-Key (clé électronique)
- Mémorisation de la configuration
- Mémorisation des données de calibration
- Mémorisation du journal de bord
- Mémorisation de données enregistrées (fonction d'enregistreur de données)
- Téléchargement de logiciels

Dual Processor Technology

- En cas de dysfonctionnement de l'unité centrale (fonction terminal/contrôleur), la deuxième unité prend automatiquement la relève et assume les deux fonctions (passe automatiquement du fonctionnement en terminal au fonctionnement en terminal/contrôleur)
- Le voyant d'état signale le dysfonctionnement

IQ-LabLink – la liaison avec le monde du laboratoire

IQ-LabLink permet un échange de données sécurisé entre l'IQ SENSOR NET et un appareil de laboratoire. L'échange est effectué moyennant une clé USB vendue dans le commerce qui sert de support de données entre le système en ligne et l'appareil de laboratoire. La condition requise est que les appareils soient tous deux équipés de cette fonction et disposent d'un port USB. Les premiers appareils WTW qui disposent de cette nouvelle fonctionnalité sont les deux nouveaux photomètres spectraux **photoLab® 6100 VIS et photoLab® 6600 UV-VIS** (appareils de laboratoire) et le **terminal/contrôleur MIQ/TC 2020 XT** comme accès à l'IQ SENSOR NET.



Exemple d'application : ajustement de la matrice pour VARiON®*Plus*

La sonde multiparamètre VARiON®*Plus* mesure simultanément l'ammonium et le nitrate. La mesure de l'ammonium est compensée dynamiquement par une mesure indépendante du potassium. Comme toutes les eaux usées disposent d'une matrice spécifique, un ajustage d'appoint est réalisé de temps à autre pour ledit alignement de la matrice. Les valeurs pour l'alignement de la matrice sont déterminées avec un photomètre et mises à la disposition de la sonde. La saisie des valeurs était jusqu'à présent réalisée manuellement.

Ajustement de la matrice à l'aide de l'IQ-LabLink

Étape 1 sur le terminal IQ :

Génération automatique d'un fichier « Job » sur la clé USB avec les valeurs actuelles de la sonde, les paramètres, la désignation des points de mesure et l'attribution automatique d'un numéro de référence de job pour une identification sans équivoque.

Étape 2 sur le photomètre :

L'appareil identifie le fichier « Job » une fois la clé USB enfichée, demande de passer à la mesure des paramètres requis, donne des indications appropriées pour l'exécution correcte de la procédure, remémorise les données déterminées sur le fichier « Job » et en vérifie l'intégralité.

Étape 3 sur le terminal IQ :

Lecture complète de toutes les données nécessaires pour l'ajustement de la matrice par simple appui sur une touche sans interruption de la mesure en ligne.

IQ-LabLink

Les avantages en un coup d'œil :

- Des routines menées par le biais du logiciel pour un transfert sécurisé des données du laboratoire vers les systèmes en ligne
- Assignation fiable et simple de mesures en ligne et en laboratoire via des fichiers « Job » et des fonctions
- Fonctions d'aides intégrées pour une exécution correcte de la procédure
- Contrôle de l'intégralité et de la plausibilité
- Lecture complète de toutes les données par simple appui sur une touche sans interruption de la mesure en ligne

Fonction Electronic-Key avec autorisation d'accès programmable



Fonction Electronic-Key (clé USB)

- Protection contre l'accès non autorisé
- Autorisation d'accès individuelle

Principe de fonctionnement :

Si la fonction Electronic-Key est activée sur le système IQ Sensor Net, la clé USB sert de clé électronique avec laquelle on peut accéder au système. Pour ce faire, il y a un fichier crypté sur la clé USB. Le système est rendu accessible après la lecture de ce fichier. Le cryptage permet d'accorder l'accès à seulement certaines fonctions de manière à ce que l'accès à certains paramétrages soit limité aux personnes autorisées.



NOUVEAU

Système 2020 XT (Connect)



La nouvelle gamme de contrôleurs MIQ/MC2 de WTW

Port Ethernet – Serveur web et plus encore

Connexions réseau simples – réseau local et Internet

Des résultats de mesure toujours disponibles, partout dans le monde

La possibilité de consulter les résultats des mesures en ligne – à tout moment et partout dans le monde – à l'aide d'un ordinateur ou d'un smartphone compatible gagne de plus en plus en importance dans le secteur industriel et dans les stations d'épuration. C'est la raison pour laquelle l'équipement technique de mesure en ligne moderne doit permettre une intégration simple et peu onéreuse dans les réseaux locaux et bien sûr la connexion à Internet.

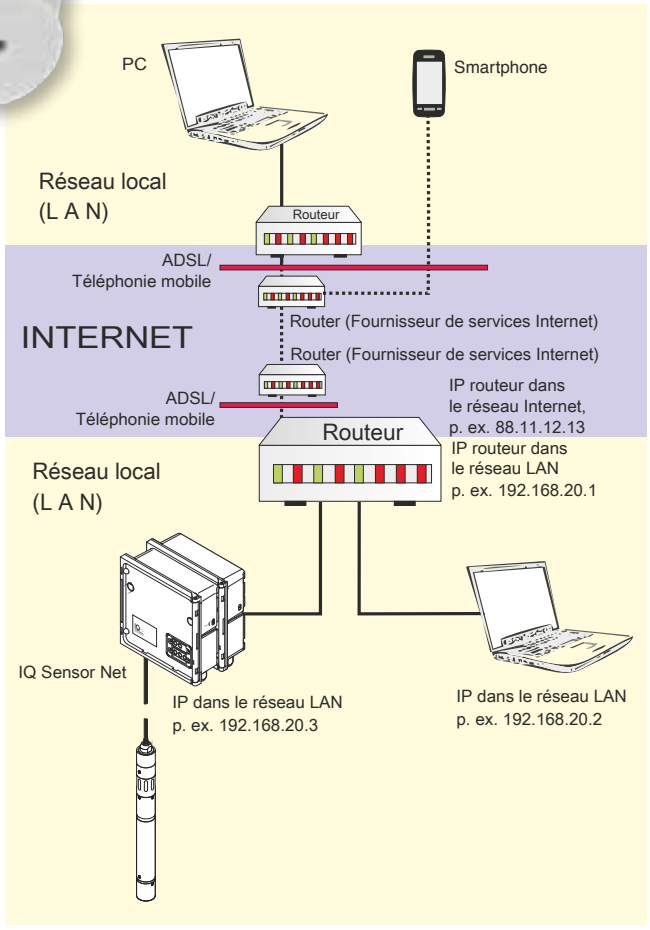


Résultats de mesure obtenus avec l'IQ Sensor Net

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Boîtier des nouveaux MIQ/MC2 à ports Ethernet/LAN et USB intégrés



Intégration du système IQ Sensor Net dans un réseau local par Ethernet/LAN et routeur ou un second réseau local par Internet

Port Ethernet/LAN et serveur web inclus – Prêts à l'emploi

Une fois encore, WTW est précurseur avec sa nouvelle gamme de contrôleurs MIQ/MC2, équipés de série d'un port Ethernet/LAN. L'intégration dans les systèmes réseaux et Internet par le biais des routeurs disponibles est simple et peu onéreux, et ne nécessite pas de matériel supplémentaire. Grâce au serveur web intégré, les données sont consultables à tout moment avec un logiciel de navigation sur un appareil pouvant se connecter à Internet, comme un PC, une tablette numérique ou un smartphone.

Spécifications techniques générales système 2020 XT

Système		
Homologation	ETL, cETL (conforme aux standards UL et canadiens importants), CE	
Compatibilité magnétique	EN 61326, classe B; FCC classe A, Résistance aux parasites pour un fonctionnement garanti (instruments indispensables)	
Protection intégrée contre la foudre	Protection contre la surcharge étendue à l'ensemble des composants du système par rapport aux exigences de la norme EN 61326, réalisée dans chacun des composants	
Liaison par câble	IQ Sensor Net câble SNCIQ ou SNCIQ/UG (pour mise à la terre, avec gaine PVC supplémentaire) : 2 brins avec protection; 2 x 0,75 mm²; cordon distinctif pour bonding aisé de la protection 0,75 mm²; tenant la pression jusque 10 bar	
Propriétés	Transmission commune d'énergie et des données sur ces deux lignes; irréversibilité sûre pour substitution de protection et conducteur intérieur (pas de destruction); contrôle de blindage permanent (Garantie CEM); topologie au choix de la pose des câbles au sein du système IQ Sensor Net, en forme de ligne, arbre, étoile, étoile multiple; Longueur totale de câble : 1000 m max. (sans amplification de signaux) ; en cas d'utilisation d'un module amplificateur de signaux MIQ/JBR, 1000 m supplémentaires	
Liaison sans fil	Transmission radio avec portée de 100 m (max. 300 m) ; avec postes répéteurs radio, distance quasi illimitée	
Propriétés	Transfert de données, alimentation séparée nécessaire pour chaque poste	
Contrôleurs	**Contrôleur/Terminal MIQ/TC 2020 XT**	**Contrôleur MIQ/MC2**
Dispositif d'accouplement des modules MIQ à l'arrière	Jonction mécano-électrique combinée, pour accouplement rapide à modules MIQ	
Port USB	USB-A (Host)	USB-A
Port Ethernet	–	Possibilité d'utiliser un connecteur RJ45 ou une barrette de connexion LSA
Afficheur	Écran de visualisation graphique ; résolution : 320 x 240 pixels ; champ visible : 114 x 86 mm, noir/blanc, éclairage arrière	–
Éléments de réglage/touches de fonction	5 touches de réglage: 3 passe-partout pour fonctions de mesurer (M), calibrer (C), réglages du set/système (S), 2 touches pour confirmation/ changement de menu O.K. (OK), escape (ESC) Bouton de commande à 4 directions pour la sélection rapide des fonctions logiciel et l'entrée de valeurs alphanumériques	–
Datalogger	Capacité de mémoire jusqu'à 525 600 groupes de données	
Alimentation électrique	Directe par l'IQ Sensor Net si accouplement à module MIQ	
Conditions ambiantes	Température de service: 20 °C… +55 °C; température de stockage: –25 °C … +65 °C	
Matériau du boîtier	ASA (Acrylnitril-Styrol-Acrylesterpolymère)	
Type de protection	IP 66/correspond à NEMA 4X (ne convient pas pour Conduit Connection)	
Dimensions	210 x 170 x 40 mm (L x H x P)	144 x 173 x 52 mm (L x H x P)
Poids	Environ 0,7 kg	
Garantie	3 ans contre vice matériel conformément à l'art. 13 de nos conditions générales de vente	
Module		
Accouplement module MIQ à l'avant	Jonction mécano-électrique combinée pour accouplement et retrait rapides du terminal MIQ/TC 2020 XT et du contrôleur MIQ/C184 XT, ainsi que pour brancher d'autres modules	
Accouplement module MIQ à l'arrière	Jonction mécano-électrique combinée pour accouplement d'autres modules, au total 3 unités comme unités de montage par empilage	
Amenées de câbles	4 passe-câbles à vis M 16 x 1,5	
Connexions serrées	Réglettes de bornes à vis Zone de serrage pour brins massifs: 0,2 … 4,0 mm² Zone de serrage pour brins souples: 0,2 … 2,5 mm² accessibles en soulevant le couvercle	
IQ Sensor Net	Connexions serrées pour l'IQ Sensor Net sont disponibles dans chaque module et utilisables au choix pour - le raccordement de sondes - comme entrée/sortie ou bouclage/distribution du câble IQ Sensor Net	
Autres fonctions	Deux DEL, jaune et rouge, pour la surveillance de la tension de régime de l' IQ Sensor Net; raccordement IQ Sensor Net irréversible; fonction d'identité locale intégrée; charge commutable (SN terminator) intégrée	
Alimentation électrique	Directe par l'IQ Sensor Net	
Conditions ambiantes	Température de service: –20 °C … +55 °C; température de stockage: –25 °C … +65 °C	
Matériau du boîtier	PC – 20% GF (Polycarbonate avec 20% fibre de verre)	
Type de protection	IP 66/correspond à NEMA 4X (ne convient pas pour Conduit Connection)	
Dimensions	144 x 144 x 52 mm (L x H x P)	
Poids	Environ 0,5 kg	
Garantie	3 ans contre vice matériel conformément à l'art. 13 de nos conditions générales de vente	
Sondes		
Raccords mécaniques pour accessoires	Rainure de logement; filetage d'assemblage G 1"	
Câble de raccordement sondes IQ	Jonction mécano-électrique combinée pour accouplement et retrait rapides de sondes. Constituée d'un connecteur à jack et raccord à vis tenant la pression. Longueurs de câble: disponibles en 1,5 m – 7,0 m – 15,0 (20 m – 50 m – 100 m pour le modèle pour l'eau de mer) Température de stockage: –25°C … +65°C Température de service : –20 °C … +55 °C	

Composants du système et fonctions correspondantes

Terminal/Contrôleur

	Modèle	Fonction	Référence
Unité de commande centrale	TC 2020 XT (Fonctionnement en mode : terminal/contrôleur)*	Unité centrale terminal/contrôleur : nécessaire au pilotage du système, doit rester dans le système ; ne peut pas être enlevée. L'état de fonctionnement est signalé par une DEL	470 000
	MIQ/TC 2020 XT-H3	Transmetteur de mesure multiparamètre constitué des composants MIQ/TC 2020 XT + MIQ/CR3 + MIQ/PS ; alimentation électrique 100 – 240 VAC ; 3 sorties analogiques (0/4-20 mA) et 3 sorties relais ; jusqu'à 20 sondes IQ quelconques peuvent être connectées	470 016
	MIQ/TC 2020 XT-H3 C6	Transmetteur de mesure multiparamètre constitué des composants MIQ/ TC 2020 XT + MIQ/C6 + MIQ/PS ; alimentation électrique 100 – 240 VAC ; 6 sorties analogiques (0/4 – 20 mA) ; jusqu'à 20 sondes IQ quelconques peuvent être connectées	470 017

Contrôleurs

	MIQ/MC2	Module IQ/Micro Controller ; nécessaire au système (un appareil, emplacement au choix) ; avec compensation entièrement automatique de la pression d'air et ports USB + LAN	471 015
	MIQ/MC2-MOD	Module IQ/Micro Controller avec compensation entièrement automatique de la pression d'air, raccord MODBUS RTU/RS 485 et ports USB + LAN	471 016
	MIQ/MC2-PR	Module IQ/Micro Controller avec compensation entièrement automatique de la pression d'air, raccord PROFIBUS-DP et ports USB + LAN	471 017

Modules MIQ

	Modèle	Fonction	Référence
Alimentation en énergie	MIQ/PS pour 100 – 240 VAC	Suivant les besoins en énergie, jusqu'à 6 modules peuvent être installés dans un système	480 004
	MIQ/24V pour 24 VAC/24 VDC		480 006
Modules de sortie (Analogique)	MIQ/CR3 avec 3 sorties courant et 3 sorties relais	Combinables à volonté	480 014
	MIQ/C6 avec 6 sorties courant		480 015
	MIQ/R6 avec 6 sorties relais		480 013
Modules de sortie (Numérique)	MIQ/2-MOD	Module IQ avec compensation entièrement automatique de la pression d'air et raccord MODBUS RTU/RS 485	471 018
	MIQ/2-PR	Module IQ avec compensation entièrement automatique de la pression d'air et raccord PROFIBUS-DP	471 019
Module vanne magnétique	MIQ/CHV PLUS	Module vanne magnétique pour le nettoyage à commande automatique des sondes avec de l'air comprimé	480 018
Module d'embranchements	MIQ/JB	MIQ/JB avec 4 raccords (pour IQ Net ou sondes IQ)	480 008
	MIQ/JBR	MIQ/JBR, comme MIQ/JB, avec en plus une amplification du signal pour l'utilisation avec des câbles longues distances (>1 km de longueur totale)	480 010
Module de connexion Entrée de courant	MIQ/IC2	MIQ/IC2 avec 2 entrées pour signaux 0/4-20 mA. Permet l'intégration dans l'IQ Net de transmetteurs de mesure et analyseurs séparés	480 016
Module de connexion pour sondes spectrales	MIQ/VIS	Pour la connexion des sondes CarboVis, NitraVis et NiCaVis	481 029
Module radio	MIQ/Blue PS	Pour la liaison sans fil et la ramification au sein du système IQ Sensor Net	480 021

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Toutes les sondes IQ sont raccordables, informations pour commande voir dans chaque chapitre de paramètre de mesure. Le tarif comprend un aperçu de tous les sondes pouvant être raccordées ainsi que des câbles de raccordement.

**Réglable par l'utilisateur via le logiciel*

Données de performances de l'IQ Sensor Net

Toutes les ressources se trouvant dans le système ont besoin pour fonctionner d'une puissance électrique déterminée. Grâce à la grande souplesse du système, de nombreuses variantes sont envisageables. C'est pourquoi il est nécessaire, après sélection de tous les composants, de dresser un bilan de puissance. Ceci est très simple à réaliser dans la mesure où l'on additionne la puissance absorbée de chacun des composants et vérifie si la somme dépasse la puissance livrée par un bloc d'alimentation. Si c'est le cas, la puissance disponible peut être augmentée en utilisant des blocs d'alimentation auxiliaires ou plus puissants.

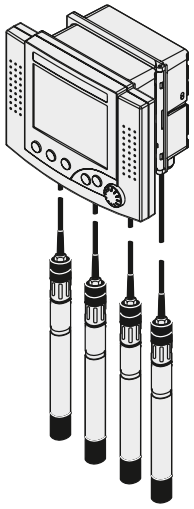
Puissance absorbée en watt MIQ/PS	Nombre de blocs d'alimentation
≤18 watts	1 bloc d'alimentation
18 - 36 watts	2 blocs d'alimentation
36 - 54 watts	3 blocs d'alimentation
55 - 72 watts	4 blocs d'alimentation
73 - 90 watts	5 blocs d'alimentation
91 - 108 watts	6 blocs d'alimentation

Si l'on dispose le bloc d'alimentation à proximité (<150 m) du grand consommateur principal et pour une longueur totale de câble allant jusqu'à 400 m, il ne faut normalement tenir compte d'aucune perte supplémentaire de puissance par le câble.
Pour des systèmes à câbles beaucoup plus longs, il apparaît une perte de puissance d'environ 1 watt par section de 100 m de câble. Ces valeurs indicatives sont valables pour l'emploi du câble SNCIQ spécifié pour l'IQ Sensor Net.

Exemple

Mesure du flux avec les paramètres turbidité, pH, oxygène, conductivité et température	Composants:	Puissance absorbée ou débitée	Pour ce système complet avec quatre sondes connectés, il suffit donc d'un bloc d'alimentation MIQ/PS. Le système dispose d'une réserve d'env. 9 watts. Il est possible de le compléter en conséquence en rajoutant des sondes et autres composants.
	MIQ/PS	+18,0 watts	
	MIQ/TC 2020 XT	–3,0 watts	
	MIQ/C6	–3,0 watts	
	VisoTurb® 700 IQ	–1,5 watts	
	SensoLyt® 700 IQ	–0,2 watts	
	TriOxmatic® 700 IQ	–0,2 watts	
	TetraCon® 700 IQ	–0,2 watts	
	Bilan Σ:	**+9,4 watts**	

MIQ/TC2020 XT
+ MIQ/PS
+ MIQ/C6 (6 x mA)
+ 4 sondes IQ



Transmetteur de mesure multiparamètres pour 4 paramètres au choix avec 6 sorties analogiques

Données de configuration et de puissance

Sondes IQ

Type	Description	Puissance absorbée/ W
SensoLyt® 700 IQ (SW)	Armature pH-/ Redox	➠ 0,2
TriOxmatic® 700 IQ (SW)	Sonde O_2	➠ 0,2
TriOxmatic® 701 IQ	Sonde O_2	➠ 0,2
TriOxmatic® 702 IQ	Sonde O_2	➠ 0,2
FDO® 700 IQ (SW)	Sonde optique O_2	➠ 0,7
TetraCon® 700 IQ (SW)	Sonde conductivité	➠ 0,2
VisoTurb® 700 IQ (SW)	Sonde turbidité	➠ 1,5
ViSolid® 700 IQ (SW)	Sonde MES	➠ 1,5
VARiON®*Plus* 700 IQ	Capteur combiné ammonium et nitrate (ISE)	➠ 0,2
AmmoLyt®*Plus* 700 IQ	Armature ammonium (ISE)	➠ 0,2
NitraLyt®*Plus* 700 IQ	Armature nitrate (ISE)	➠ 0,2
NitraVis® 70X IQ (TS)	Sonde optique nitrate avec module périphérique MIQ/VIS	➠ 8,0
CarboVis® 70X IQ (TS)	DCO/COT/COD/DBO/SAC-Sonde optique avec module MIQ/VIS	➠ 8,0
NiCaVis® 705 IQ	Sonde optique pour mesure de nitrate et DCO/COT/COD/DBO/SAC avec module périphérique MIQ/VIS	➠ 8,0
NiCaVis® 70X IQ NI	Sonde optique pour la mesure de nitrate, nitrite et DCO/COT/COD/DBO/SAC/TUV_{254}	➠ 8,0
P 700 IQ	Analyseur d'orthophosphate	➠ 0,5
IFL 700 IQ	Sonde de niveau de boues à racleur intégré	➠ 5,5**
IFL 701 IQ	Sonde de niveau de boues sans racleur	➠ 3,0

Modules de sortie analogique

Type	Description	48 canaux de sortie par système sont en tout disponibles	Puissance absorbée/ W
	Chaque sortie mA, chaque relais au sein du module compte comme 1 canal	**Nombre de canaux de sortie occupés**	
MIQ/CR3	Module IQ/Current Relais 3, avec chacun 3 sorties courant et 3 sorties relais	6	➠ 3,0
MIQ/C6	Module IQ/Current 6, avec 6 sorties courant 0/4 - 20-mA	6	➠ 3,0
MIQ/R6	Module IQ/Relais 6 avec 6 sorties relais	6	➠ 1,5
MIQ/CHV PLUS	Module IQ/Cleaning Head Valve pour nettoyage à commande automatique	1	➠ 1,0

Modules de sortie numérique

Type	Description	Puissance absorbée/ W
MIQ/2 PR	Module IQ avec raccord PROFIBUS-DP	➠ 2,0
MIQ/2 MOD	Module IQ avec raccord MODBUS RTU / RS 485	➠ 1,6
MIQ/Blue PS	Module IQ/Transmission radio pour la liaison sans fil dans le système IQ Sensor Net	➠ 0,6
MIQ/IF232	Module IQ/Terminal logiciel	➠ 0,2

Module d'entrée mA

Type	Description	Puissance absorbée/ W
MIQ/IC2**	Module IQ/Input Current 2 avec 2 entrées pour signaux 0/4 - 20 mA **chaque entrée de courant	➠ 0,2*
MIQ/JB	Module IQ/boîte de dérivation	➠ 0,0 (passives Modul)
MIQ/JBR	Module IQ/boîte de dérivation Repeater	➠ 0,2

Contrôleur/Terminal

Type	Description		Puissance absorbée/ W
MIQ/TC 2020 XT	Terminal / contrôleur pour le système 2020 XT	En tout 3 unités possibles par système parmi lesquelles 1 est stationnaire (fonction terminal/contrôleur) et 2 sont amovibles et déplaçables à volonté (fonction terminal)	➠ 3,0

Contrôleurs

Type	Description	Puissance absorbée/ W
MIQ/MC2	Module IQ/Micro Controller	➠ 1,6
MIQ/MC2-PR	Module IQ/Micro Controller avec raccord PROFIBUS-DP	➠ 2,0
MIQ/MC2-MOD	Module IQ/Micro Controller avec raccord MODBUS RTU / RS 485	➠ 1,6

Modules blocs d'alimentation électrique

Type	Description	Puissance débitée/ W
MIQ/PS	Module IQ/Power Supply pour alimentation èlectrique avec bloc d'alimentation à longue portée pour tension à l'entrée de 100 - 240 VAC	18 ➠
MIQ/24V	Module IQ/24 V pour alimentation en courant avec tension à l'entrée de 24 VAC ou 24 VDC	18 ➠

Attention : puissance absorbée du câble SNCIQ : 1 W/100 m (en tenir compte pour des câbles à partir d'une longueur de 400 m)

**(+2,2 W par interrupteur-sectionneur d'alimentation connecté)*

***avec MIQ/Blue PS : 3,0 W*

Système 182

Jusqu'à 4 sondes numériques peuvent être connectées à ce système – le système 182 est alors prédestiné pour remplacer ou compléter des points de mesure individuels sur des stations d'épuration existantes :

Système 182

- 1 à 4 sondes
- Sorties numériques
- Toutes les sondes IQ sont connectables

- Possibilité de connexion de jusqu'à 4 sondes quelconques à choisir parmi 19 sondes numériques disponibles
- Les paramètres pH, redox, oxygène, conductivité, température et turbidité/matières solides ainsi que les éléments nutritifs ammonium, nitrate et DCO sont ainsi mesurables directement in situ
- Alimentation électrique avec bloc d'alimentation à longue portée (100-240 VAC) ou variante 24 V
- Sorties numériques PROFIBUS DP ou MODBUS RTU
- Version analogique avec jusqu'à 5 sorties analogiques et 6 relais

Module	DIQ/S 182	DIQ/S 182 XT	DIQ/S 182 XT-4
			
Nombre maximal de sondes	2	2	4
Raccord enfichable pour bus	Raccord enfichable pour bus 2 x mA (0) 4 – 20 mA 3 x relais	DIQ /S 182 XT 4 x mA (0) 4 – 20 mA 5 x relais	DIQ/ S 182 XT-4 5 x mA (0) 4 – 20 mA 6 x relais
Version avec sortie numérique PROFIBUS	DIQ/S 182 PR Raccord enfichable pour bus 3 x relais	—	DIQ/S 182XT-4/ PR Raccord enfichable pour bus 3 x relais
Version avec sortie numérique MODBUS	DIQ/S 182 PR Raccord enfichable pour bus 3 x relais	—	DIQ/S 182XT-4/ PR Raccord enfichable pour bus 3 x relais

Module d'embranchements pour sondes et module vanne magnétique pour le nettoyage par air comprimé

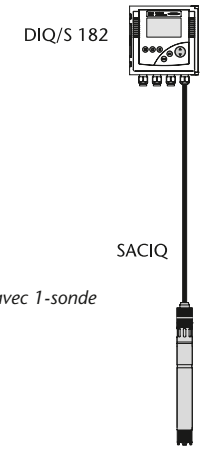


- (DIQ/JB) : raccordement d'une deuxième sonde IQ ou d'une sonde IQ plus éloignée
- (DIQ/CHV) : la vanne magnétique intégrée est directement pilotée par un relais du convertisseur de mesure.

Exemples de configuration Système 182

Exemple 1

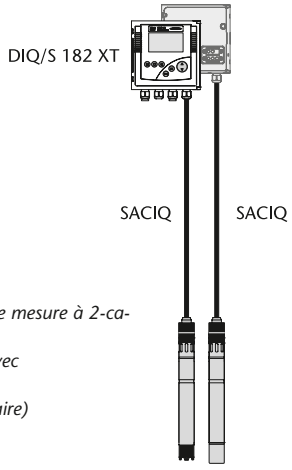
Exemple de configuration	Référence
DIQ/S 182	472 000
SACIQ-7,0	480 042
Sonde IQ	au choix



Convertisseur de mesure avec 1-sonde IQ directement raccordé

Exemple 2

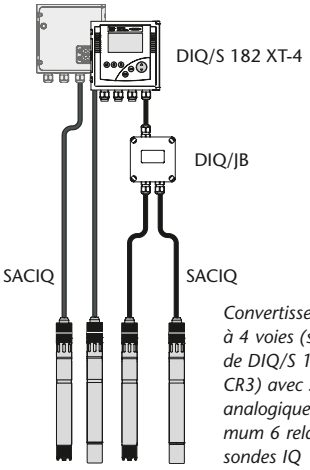
Exemple de configuration	Référence
DIQ/S 182 XT	472 001
2 x SACIQ-7,0	480 042
2 Sondes IQ	au choix



Convertisseur de mesure à 2-canaux (sorties analogiques) avec 2 sondes IQ (DIQ/JB nécessaire)

Exemple 3

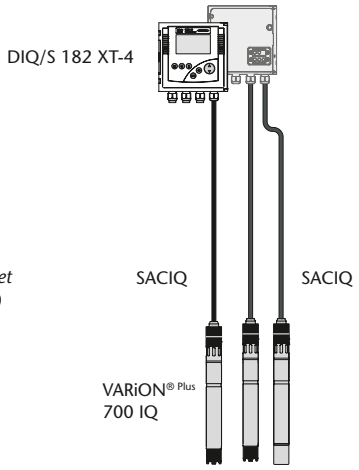
Exemple de configuration	Référence
DIQ/S 182 XT-4	472 015
4 x SACIQ-7,0	480 042
DIQ/JB	472 005
4 Sondes IQ	au choix



Convertisseur de mesure à 4 voies (set constitué de DIQ/S 182 et DIQ/CR3) avec 5 sorties analogiques et maximum 6 relais avec 4 sondes IQ

Point de mesure individuel avec sorties analogiques

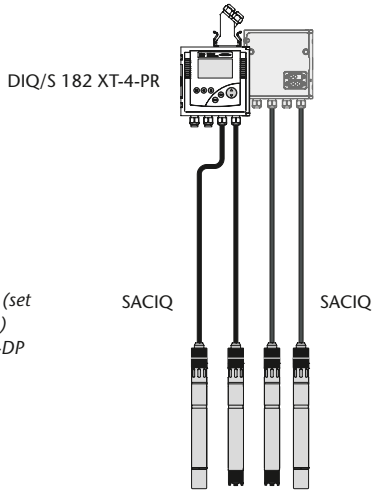
Exemple de configuration	Référence
DIQ/S 182 XT-4	472 015
3 x SACIQ-7,0	480 042
VARiON®*Plus* 700 IQ	107 066
2 Sondes IQ	au choix



Convertisseur de mesure à 4 voies (set constitué de DIQ/S 182 et DIQ/CR3) avec 5 sorties analogiques et maximum 6 relais avec 3 sondes IQ

Point de mesure individuel avec Profibus ou Modbus

Exemple de configuration	Référence
DIQ/S 182 XT-4-PR	472 017
4 x SACIQ-7,0	480 042
4 Sondes IQ	au choix



Convertisseur de mesure à 4 voies (set constitué de DIQ/S 182 et MIQ/JB) avec 3 relais et raccord PROFIBUS-DP avec 4 sondes IQ

Spécifications techniques générales de système 182

Système

Homologation	ETL, cETL (conforme aux standards UL et canadiens importants), CE
Compatibilité magnétique	EN 61326, émission: classe B, résistance aux parasites pour un fonctionnement indispensable, FCC classe A
Protection intégrée contre la foudre	Protection contre la surcharge étendue à l'ensemble des composants du système par rapport aux exigences de la norme EN 61326
Liaison par câble	IQ SENSOR NET câble SNCIQ ou SNCIQ/UG (pour mise à la terre, avec gaine PVC supplémentaire) : 2 brins avec protection; 2 x 0,75 mm^2; cordon distinctif pour bonding aisé de la protection 0,75 mm^2; tenant la pression jusque 10 bar
Propriétés	Transmission commune d'énergie et des données par une technique à deux brins; irréversibilité sûre pour substitution de protection et conducteur intérieur (pas de destruction); contrôle de blindage permanent (Garantie CEM); topologie au choix de la pose des câbles au sein du système IQ SENSOR NET, en forme de ligne, arbre, étoile, Longueur de câble total : max. 250 m
Liaison sans fil	Transmission radio avec portée de 100 m (max. 300 m) ; avec postes répéteurs radio, distance quasi illimitée
Propriétés	Transfert de données, alimentation séparée nécessaire pour chaque poste

Convertisseur

Afficheur	Écran de visualisation graphique; résolution: 128 x 64 pixels; champ visible: 72 x 40 mm, noir/blanc, éclairage arrière
Éléments de réglage/touches de fonction	5 touches de réglage: 3 passe-partout pour fonctions de mesurer (M), calibrer (C), réglages du set/système (S), 2 touches pour confirmation/changement de menu O.K. (OK), escape (ESC) Touche à bascule pour sélection rapide de fonctions de logiciel et entrée de valeurs alpha-numériques (up), (down)
Alimentation électrique	100 … 240 VAC (50/60 Hz), 24 V AC/DC
Accouplement module MIQ à l'arrière	Jonction mécano-électrique combinée pour accouplement d'autres modules, au total 2 unités comme unités de montage par empilage
Amenées de câbles	4 passe-câbles à vis M 16 x 1,5
Connexions serrées	Réglettes de bornes à vis Zone de serrage pour brins massifs: 0,2 … 4,0 mm^2 Zone de serrage pour brins souples: 0,2 … 2,5 mm^2 accessibles en soulevant le couvercle
IQ SENSOR NET	Connexions serrées pour l'IQ SENSOR NET pour le raccordement de sondes
Conditions ambiantes	Température de service: –20 °C … +55 °C; température de stockage: –25 °C … +65 °C
Matériau du boîtier	PC – 20 % GF (Polycarbonate avec 20 % fibre de verre)
Type de protection	IP 66/correspond à NEMA 4X (ne convient pas pour Conduit Connection)
Dimensions (L x H x P)	144 x 144 x 95 mm (DIQ/S 182 XT: 144 x 144 x 143 mm; DIQ modules 95 x 95 x 58 mm)
Poids	DIQ 182: environ 1 kg DIQ/S 182 XT et DIQ/S 182 XT-4: environ 1,5 kg
Garantie	3 ans contre vice matériel conformément à l'art. 13 de nos conditions générales de vente

Sondes

Raccords mécaniques pour accessoires	Rainure de logement; filetage d'assemblage G 1"
Câble de raccordement sondes IQ	Jonction mécano-électrique combinée pour accouplement et retrait rapides de sondes. Constituée d'un connecteur à jack et raccord à vis tenant la pression. Longueurs de câble: disponibles en 1,5 m – 7,0 m – 15,0 (20 m – 50 m – 100 m pour le modèle pour l'eau de mer) Température de stockage : –25 °C … +65°C Température de service : –20 °C … +55 °C

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Références Système 182

Convertisseur		Référence
DIQ/S 182	Dual IQ/Système 182, convertisseur de mesure universel pour le raccordement de 2 sondes IQ numériques, avec 2 sorties analogiques (0/4-20 mA) et 3 relais	472 000
DIQ/S 182 XT	Dual IQ/Système 182 pour le raccordement de 2 sondes IQ numériques, avec 4 sorties analogiques (0/4-20 mA) et 5 relais	472 001
DIQ/S 182-PR	Dual IQ/système 182, convertisseur de mesure universel pour le raccordement de 2 sondes IQ numériques, avec 3 relais et un raccord PROFIBUS-DP	472 002
DIQ/S 182-MOD	Dual IQ/système 182, convertisseur de mesure universel pour le raccordement de 2 sondes IQ numériques, avec 3 relais et un raccord MODBUS RTU/RS 485	472 003
DIQ/S 182/24V	Dual IQ/Système 182, convertisseur de mesure universel pour le raccordement de 2 sondes IQ numériques, avec 2 sorties analogiques (0/4-20 mA) et 3 relais, pour une alimentation en tension 24 V AC/DC	472 010
DIQ/S 182 XT/24V	Dual IQ/Système 182 pour le raccordement de 2 sondes IQ numériques, avec 4 sorties analogiques (0/4-20 mA) et 5 relais, pour une alimentation en tension 24 V AC/DC	472 011
DIQ/S 182-PR/24V	Dual IQ/système 182, convertisseur de mesure universel pour le raccordement de 2 sondes IQ numériques, avec 3 relais et un raccord PROFIBUS-DP, pour une alimentation en tension 24 V AC/DC	472 012
DIQ/S 182-MOD/24V	Dual IQ/système 182, convertisseur de mesure universel pour le raccordement de 2 sondes IQ numériques, avec 3 relais et un raccord MODBUS RTU/RS 485 , pour une alimentation en tension 24 V AC/DC	472 013
DIQ/S 182 XT-4	Dual 182 XT-4 – système pour la connexion de 4 sondes numériques avec 5 sorties analogiques (0/4-20 mA) et maximum 6 sorties relais. Matériel livré : DIQ/S 182 avec DIQ/CR3	472 015
DIQ/S 182 XT-4 - PR	Dual 182 XT-4 – système pour la connexion de 4 sondes numériques avec 3 relais et un raccord PROFIBUS-DP. Matériel livré : DIQ/S 182 avec MIQ/JB	472 017
DIQ/S 182 XT-4 - MOD	Dual 182 XT-4 – système pour la connexion de 4 sondes numériques avec 3 relais et un raccord MODBUS RTU/RS 485. Matériel livré : DIQ/S 182 avec MIQ/JB	472 019
DIQ/S 182 XT-4/24V	Dual 182 XT-4 – système pour la connexion de 4 sondes numériques avec 5 sorties analogiques (0/4-20 mA) et maximum 6 relais pour une alimentation électrique de 24 V AC/DC. Matériel livré : DIQ/S 182/24V avec DIQ/CR3	472 021
DIQ/S 182 XT-4 - PR/24V	Dual 182 XT-4 – système pour la connexion de 4 sondes numériques avec 3 relais et un raccord PROFIBUS-DP pour une alimentation électrique de 24 V AC/DC. Matériel livré : DIQ/S 182/24V avec MIQ/JB	472 023
DIQ/S 182 XT-4 - MOD/24V	Dual 182 XT-4 – système pour la connexion de 4 sondes numériques avec 3 sorties relais et un raccord MODBUS RTU / RS 485 pour une alimentation électrique de 24 V AC/DC. Matériel livré : DIQ/S 182/24V mit MIQ/JB	472 024
Modules DIQ		**Référence**
DIQ/JB	Dual IQ/Junction Box pour le raccordement d'un deuxième sonde IQ ou d'une sonde IQ plus éloigné sur le convertisseur de mesure universel DIQ/S 182 (système 182)	472 005
DIQ/CHV	Dual IQ/Cleaning Head Valve, pour un nettoyage automatique activé par relais dans le système 182 (relais et alimentation en air comprimé en externe)	472 007
MS/DIQ	Plaque de montage pour 2 modules DIQ max. (DIQ/CHV et DIQ/JB)	472 009
Modules MIQ et câble pour compléter le système		**Référence**
MIQ/Blue PS SET	Module Transmission radio, pour la liaison sans fil dans le système IQ Sensor Net ; paire de modules préconfigurée	480 021
MIQ/CR3	**Module de sortie (Analogique)** à 3 sorties courant et 3 sorties relais, combinable à volonté	480 014
MIQ/C6	**Module de sortie (Analogique)** à 6 sorties courant, combinable à volonté	480 015
MIQ/R6	**Module de sortie (Analogique)** à 6 sorties relais, combinable à volonté	480 013
MIQ/IC2	MIQ/IC2 à 2 entrées pour signaux 0/4-20 mA. Permet l'intégration dans l'IQ Net d'autres convertisseurs de mesure et analyseurs	480 016
MIQ/JB	**Module de connexions** à 4 raccords (pour IQ Net ou sondes IQ)	480 008
MIQ/CHV PLUS	Module vanne magnétique pour le nettoyage des sondes avec de l'air comprimé (commande automatique)	480 018
MIQ/PS	Module IQ/Power Supply, bloc d'alimentation à grande portée pour système 182, 2020 XT et 184 XT, puissance de sortie au maximum 18 Watt	480 004
MIQ/24V	Module IQ/24V, bloc d'alimentation pour une tension d'entrée 24 VAC / 24 VDC, pour système 182, 2020 XT et 184 XT, puissance de sortie max. 18 Watt	480 006
SNCIQ	Câble spécial bipolaire IQ Sensor Net avec blindage pour transférer sûrement l'énergie et les données au sein du système IQ Sensor Net. En cas de commande, indiquer la longueur en m (unité : m)	480 046
SNCIQ/UG	Câble bipolaire IQ Sensor Net avec blindage pour transférer sûrement l'énergie et les données au sein du système IQ Sensor Net, spécialement pour la mise à la terre. En cas de commande, indiquer la longueur en m (unité : m)	480 047

IP 66 CE cETLus **3 ans de garantie**

Matériel de montage pour convertisseurs de mesure sur demande, voir tarif.

Cable



SACIQ connecting cable, a cable for all sensors. For data transfer and power supply. In combination with sensor waterproof up to 100 m

- One cable for data transfer and power supply
- One connector for all sensors
- Available as regular or sea water edition

The IQ SENSOR NET sensor connecting cable SACIQ is used for power supply and data transfer. Another cable is redundant. The uniform connector makes only one cable necessary for all sensors. The sensor can be installed or removed via an easy screw connection. The connection is waterproof up to 100 m when connected to the sensor. Another plus is the integrated lightning protection of the IQ SENSOR NET, which the cable is part of.

Model	Description	Order no.
SACIQ-1,5	Sensor connecting cable for all IQ sensors, with waterproof plug/screw sensor connection (IP 68), 1.5 m	480040
SACIQ-SO	Sensor connecting cable, length freely selectable up to max. 100 m	480041V
SACIQ-7,0	Sensor connecting cable, 7 m	480042

Model	Description	Order no.
SACIQ-15,0	Sensor connecting cable 15 m	480044
SACIQ-20,0 SW	Sensor connecting cable for all IQ sensor, as sea water model, with waterproof plug/screw sensor connection IP 68, 20 m	480045
SACIQ-50,0 SW	Sensor connecting cable as sea water model, 50 m	480060
SACIQ-SO SW	Sensor connecting cable as sea water model, length freely selectable up to max. 100 m	480064V
SACIQ-25,0 SW	Sensor connecting cable as sea water model, 25 m	480066

Technical Data

Temperatur range	- 35 °C ... + 80 °C
Pressure range	106 Pa (10 bar) (cable connected to sensor)
Cable lengths	1.5 m, 7 m, 15 m, 20 m, 25 m, 50 m, 75 m, 100 m, special lengths
Material connector	Normal model: Stainless steel 1.4571, POM Sea water model: Titanium Grade 2

a xylem brand

SPECIFICATIONS

DOCUMENT #W118-02

YSI Digital SensoLyt® pH/ ORP Sensor for the IQ SensorNet System



The SensoLyt® is a rugged, online probe for measuring pH and ORP concentrations using a combination electrode for the most accurate wastewater process monitoring.

The SensoLyt® probe is used within the IQ SensorNet system and can therefore be networked with other probes and parameters for a complete process monitoring and control system. It can measure and display pH or ORP. A built-in pre-amplifier and temperature sensor with SensCheck function helps to monitor the sensor.

The SensoLyt® is the ideal probe for quantitative measurement of pH/ ORP in a wastewater treatment plant. Various SensoLyt® electrodes (SEA/DWA/ECA/PtA) meet the needs of different applications.

Parameters:

pH
ORP

- SensCheck function monitors sensors
- Electrodes are protected
- Electrodes can be removed and calibrated in the lab or in the field
- Provides pre-amplification of the electrode signal
- Digital sensor stores calibration value
- Automatic temperature compensation
- Electrodes can easily be replaced without tools
- 2-year warranty on the probe, 6 months on electrodes



The SensoLyt® sensor provides continuous data to help with operational improvement decisions.

SensoLyt® 700 IQ Technical Specifications

Electrode Type	Measuring Range	Accuracy	Application
ECA	2 to 12 pH units	+/- 0.2 pH	standard wastewater
SEA	2 to 12 pH units	+/- 0.2 pH	seawater
SEA-HP	4 to 12 pH units	+/- 0.2 pH	seawater/ high pressure
DWA	0 to 14 pH units	+/- 0.2 pH	drinking water
PtA	+/-2000 mV	+/- 20mV	
Temperature	Integrated NTC -5 to 60 °C (23 to 140 °F)	+/- 0.5° K	

Operating & Compensation Range Temperature	0 to 60 °C (32 to 140 °F)
Warranty	2 years on probe, 6 months on electrode
Dimensions	508 L x 40 D mm (20 L x 1.57 D in); SW design: 515 L x 59.5 D mm (20.78 L x 2.34 D in)
Certifications	CE, cETLus
Protection Class	Sensor with SACIQ cable connected: IP68
Operating Conditions	Overpressure/ Temperature
ECA	6 bar (87 psi)/ 68 °F (20 °C); 1 bar (14.5 psi)/ 140 °F (60 °C)
SEA	10 bar (145 psi)/ 68 °F (20 °C); 1 bar (14.5 psi)/ 140 °F (60 °C)
SEA-HP	10 bar (145 psi)/ 140 °F (60 °C)
DWA	6 bar (87 psi)/ 68 °F (20 °C); 1 bar (14.5 psi)/ 140 °F (60 °C)
PtA	10 bar (145 psi)/ 68 °F (20 °C); 1 bar (14.5 psi)/ 140 °F (60 °C)
Lightning/Voltage Protection	Yes
Electrical	Power Consumption: 0.2 W, Two wire shielded IQ cable provides power and communication
Materials	Housing: V4A Stainless Steel 1.4571 (SW version POM (Polyoxmethylene)), protection cap PVC; sensor holder POM (for electrode material see product manual)

SensoLyt® Plus 700 IQ Sensor Ordering Information

Name	Item #	Description
SensoLyt 700 IQ	109 170Y	Robust digital pH/ ORP probe for combination electrodes, SensoLyt® SEA, SEA-HP, DWA, ECA, PtA. Order pH or ORP electrodes and SACIQ cable separately
SensoLyt 700 IQ SW	109 171Y	Robust digital pH/ ORP probe with amplifier for use in salt water applications. Order pH or ORP electrodes separately
SensoLyt SEA	109 115Y	pH electrode ideal for highly polluted wastewater, emulsions and suspensions, media containing sulfides and proteins for use with the IQ SensorNet system
SensoLyt SEA-HP	109 118Y	pH electrode ideal for high pressure and temperature conditions for use with the IQ SensorNet system
SensoLyt DWA	109 119Y	pH electrode with built in reference, SensoLyt 700 IQ, ideal for drinking water or low conductivity applications
SensoLyt ECA	109 117Y	pH electrode ideal for general wastewater applications
SensoLyt PtA	109 125Y	ORP electrode ideal for municipal and industrial wastewater, emulsions and suspensions, media containing sulfides and proteins
SACIQ-1.5	480 040Y	Sensor cable for all IQ SensorNet sensors, IP-68 waterproof connection; cable length 4.9 ft (1.5 m)
SACIQ-7.0	480 042Y	Sensor cable for all IQ SensorNet sensors, IP-68 waterproof connection; cable length 23 ft (7 m)
SACIQ-15.0	480 044Y	Sensor cable for all IQ SensorNet sensors, IP-68 waterproof connection; cable length 49 ft (15 m)
SACIQ-SO	480 041VY	Sensor cable for all IQ SensorNet sensors, IP-68 waterproof connection; cable length special order up to 330 ft (100 m)
SACIQ-20.0 SW	480 045Y	Sensor cable for all IQ SensorNet sensors, IP-68 waterproof connection; cable length 65 ft (20 m) with screwable SACIQ-Plug
SACIQ-25.0 SW	480 066Y	Sensor cable for all IQ SensorNet sensors, IP-68 waterproof connection; cable length 82 ft (25 m) with screwable SACIQ-Plug
SACIQ-50.0 SW	480 060Y	Sensor cable for all IQ SensorNet sensors, IP-68 waterproof connection; cable length 162 ft (50 m) with screwable SACIQ-Plug
SACIQ-75.0 SW	480 067Y	Sensor cable for all IQ SensorNet sensors, IP-68 waterproof connection; cable length 243 ft (75 m) with screwable SACIQ-Plug
SACIQ-100.0 SW	480 062Y	Sensor cable for all IQ SensorNet sensors, IP-68 waterproof connection; cable length 330 ft (100 m) with screwable SACIQ-Plug
SACIQ-SO SW	480 064VY	Sensor cable for all IQ SensorNet sensors, IP-68 waterproof connection; cable length special order up to 330 ft (100 m) with screwable SACIQ-Plug
SACIQ-Plug	480 065Y	Screwable plug for all SACIQ sensor cables for IQ sensors

Visit YSI.com/IQ for additional information on the entire IQ SensorNet system

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Printed in the USA. W118-02 August, 2015

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Nitrogen Measurements: Ammonium · Nitrate · Nitrite

Wastewater treatment processes are concerned with controlling the energy efficient removal of pollutants in the smallest possible space in the shortest possible time.

Required are:

- detailed knowledge of the underlying process
- highest possible transparency of the process steps through corresponding measuring methods

The efficient control of Nitrogen in wastewater systems is possible by making those measurements directly in the wastewater process. This not only ensures purification but above all guarantees economic operation of the entire plant.

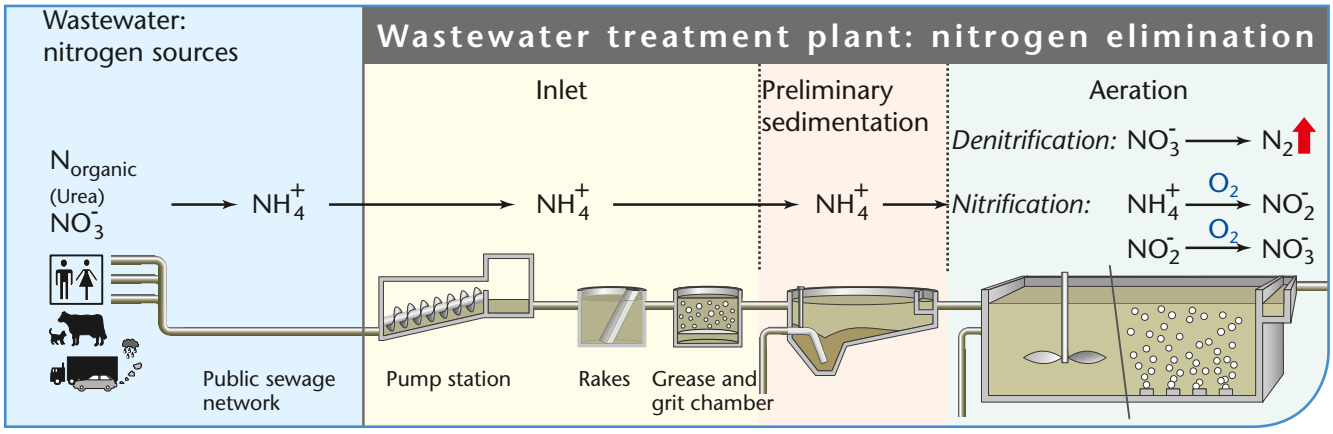
Purification processes for the removal of nitrogen from wastewater

Nitrogen is found in a large variety of compounds and forms and is considered to be the ultimate "quick-change artist". In municipal wastewater it is mainly encountered as a waste product in the form of urea, which is already converted in part to ammonium nitrogen by ammonification.

In the aeration basin, the initial step of nitrification consists in oxidizing the nitrogen present in wastewater via nitrite to nitrate, for which oxygen is required. During subsequent denitrification the nitrate (NO_3^-) is further converted to elemental nitrogen N_2 under the absence of oxygen. This nitrogen in gas form is harmlessly released into the environment.

Due to the various framework conditions and different biologically active groups of microorganisms, both methods are conducted in two fundamentally separate processes. The temporal and spatial sequence can be adapted to local conditions.

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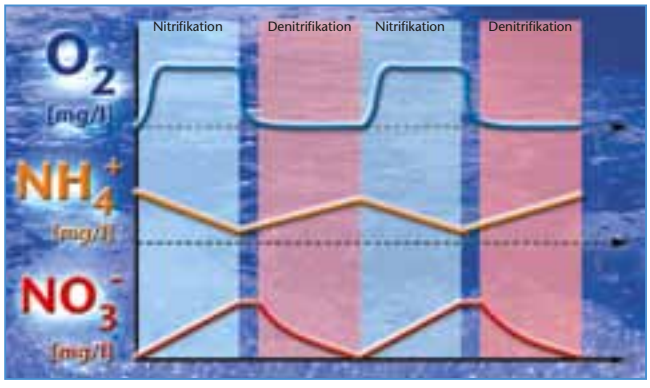


Measuring method for tracing nitrogen elimination

In addition to oxygen, measurements of ammonium and nitrate relevant for the nitrification and denitrification are determined in modern wastewater treatment plants. The immediately available parameters allow the control to be directly optimized. This guarantees efficient wastewater purifications. This results in reduced energy costs. Since nitrite is only present in very low concentrations under normal nitrification (about 0.1 mg/L), it is usually regarded as a minor measurement parameter in wastewater treatment plants. However, the nitrite-oxidizing organisms are inhibited by unfavorable conditions or toxic substances, which can cause elevated nitrite concentrations in the effluent. Since nitrite acts as a powerful fish poison, higher nitrite concentrations may not be discharged into natural waters. The measurement of nitrite as monitoring parameter using an appropriate online measurement technology is therefore also useful in treatment plants.

The following example of intermittent procedure illustrates the advantage of direct measurement of selected parameters.

Nitrification and denitrification are conducted in succession in the same basin. In the nitrification phase ammonium is oxidized using oxygen to form nitrate. The nitrate content increases accordingly. In the denitrification phase nitrate is reduced to form gaseous nitrogen; ammonium is formed from residual organic nitrogen. Ammonium and nitrate curves display opposite behavior.



Example: intermittent nitrification/denitrification

Correlation between the individual procedure measurements of dissolved oxygen, ammonium and nitrate

In order to minimize energy consumption in the aeration basin, a preferably efficient and low O_2 input should be targeted for complete nitrogen oxidation. Furthermore, the optimum efficiency of denitrification stages with anaerobic or anoxic conditions must be ensured. For optimum growth of nitric bacteria, higher concentrations of dissolved oxygen are generally required than for the pure decomposition of organic carbon compounds. The online measurement of the selected parameter of ammonium, which provides the possibility of NH_4-N controlled operation, makes the nitrification process transparent and offers significantly higher potential for energy saving of certainty than in pure O_2 controlled operation. A combined measurement of NH_4-N and O_2 is suitable for plant operation, as this prevents the formation of bulking sludge in the lower range and limits the oxygen input should interferences occur in NH_4-N decomposition (e.g. caused by a disturbed nutrient ratio of carbon : nitrogen : phosphate). This can create significant savings potentials.

Direct measuring procedures for determining ammonium and nitrate

The dynamics of the controlable process and the used measuring system are of great importance for the measuring and control technology. Here applies: the faster the control process and disturbance variables, the shorter recognition times are expected from the measuring system.



See page 43 for various measuring systems and applications.

In-situ ISE sensors

These control engineering demands led to the development of in-situ ISE (ion-selective) measuring techniques, which are capable of directly recording the respective selected parameter ammonium and nitrate during the process both quickly and without sample preparation.

In-situ UV-VIS and UV sensors

In-situ UV-VIS spectrometric sensors represent a precise measuring technique with long-term stability, which permit quasi-continuous recording of the selected parameter NO_3 and NO_2 in the smallest measuring cycles of minutes. The disturbance variables for optical measuring, such as turbidity/suspended solids, are eliminated by spectral recording. Thanks to integrated ultrasonic cleaning, a very long maintenance-free operation is possible.

Analyzers

Depending on measurements and applications, analyzer systems require standard and reagent solutions as well as sample preparation. Measuring intervals and automatic cleaning cycles are adjustable. These instruments automatically and recurrently compare measurements against reference standards and deliver high precision measurement values.

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WTW Measuring Systems for Nitrogen

● recommended by WTW ◑ suitable ❍ conditionally applicable *Measurement in aeration basin

System	Ammonium		Ammonium and Nitrate	Nitrate		Nitrate and Nitrite
						NEW 
Sensor/Module	IQ Sensor Net AmmoLyt® *Plus* 700 IQ	TresCon® Module OA 110	IQ Sensor Net VARiON® *Plus* 700 IQ	IQ Sensor Net NitraLyt® *Plus* 700 IQ	TresCon® Module ON 210/OS 210	IQ Sensor Net NitraVis® 700 IQ (NI)
		for mounting in TresCon® system			*for mounting in TresCon® system*	
Measured Variable	NH_4	NH_4	NH_4 and NO_3	NO_3	NO_X	NO_2 and NO_3
Inlet (determination of load)	◑	❍	◑	◑	❍	●
Aeration (regulation and control)	●	●	●	●	●	●
Effluent (monitoring)	❍	●	❍	❍	●	●
Autom. Cleaning	compressed air	cleaning solution	compressed air	compressed air	cleaning solution	Ultrasonic (compressed air)
Cleaning Cycles	variable	automatic 6/12/24 h	variable	variable	automatic 6/12/24 h	prior to each measurement
Measuring	in-situ	after sample preparation*	in-situ	in-situ	after sample preparation*	in-situ
Sample Preparation	none	PurCon®/PurCon® Insitu*	none	none	PurCon®/PurCon® Insitu*	none
Measuring Interval	continuous	adjustable	continuous	continuous	adjustable	adjustable
Response Time	quick	medium	quick	quick	medium	quick
Measuring Method	ISE (ion-selective)	gas-sensitive	ISE (ion-selective)	ISE (ion-selective)	photometric	UV-VIS and UV spectrometric
Accuracy	good	high	good	good	high	high
Cross Sensitivity	yes/potassium, compensation	none	yes, automatic compensation	yes/chloride, compensation	low	autom. compensated (spectrum)
Calibration	factory calibration	automatic 6/12/24 h	factory calibration	factory calibration	automatic 6/12/24 h	not necessary
Investment Costs	low	medium	low	low	medium	medium
Additional Costs	—	sample preparation/pump may be required	—	—	sample preparation/pump may be required	—
Operational Costs	low	medium	low	low	low	none
Consumables	electrodes	calibration standard/reagent cleaning solution/E pack	electrodes	electrodes	calibration standard cleaning solution/E pack	none

Improve your plant process values – invest and save

WTW ISE sensors

- As easy as measuring pH
- The original – reliable results through established technology
- No chemicals used



Measurement methods of ISE sensors

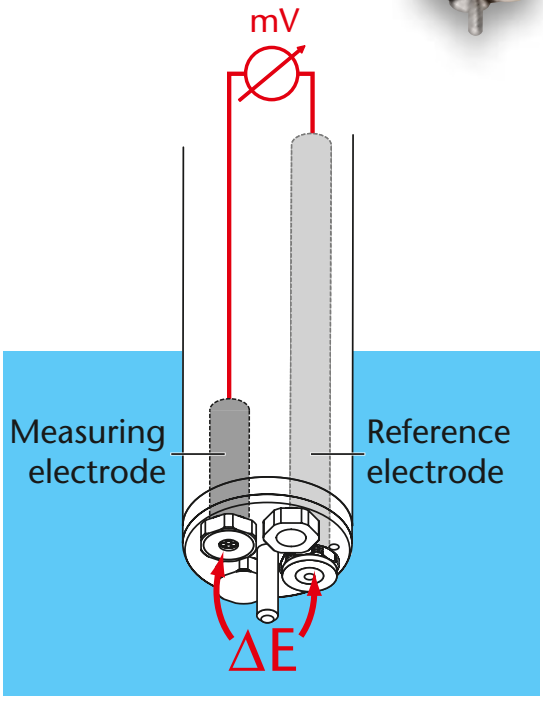
Ion-selective (ISE) on-line measurements of ammonium and nitrate have been applied for several years in the analytics of modern sewage systems.

WTW has provided ISE measurements of ammonium and nitrate in addition to the traditional wet chemical measurement using analyzers for more than the past 10 years.

Same as the pH measuring, the ISE measuring is based on the selectivity of membranes towards special material and is accordingly easy with the handling.

A tension ΔE is caused due to the selectivity between the work and reference electrode. This tension can be read as measuring value by using a transformer.

WTW ISE electrodes are characterized by highest stability. When used in typical applications they are calibration-free for their entire lifetime. The continuous measurement of ammonium and nitrate that works without sample preparations using ISE electrodes enables an optimization of the plant in respect to the cleaning performance and energy consumption.



$$\Delta E = E_{(ISE)} - E_{(Ref)}$$

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NEW

WTW Spectral sensors

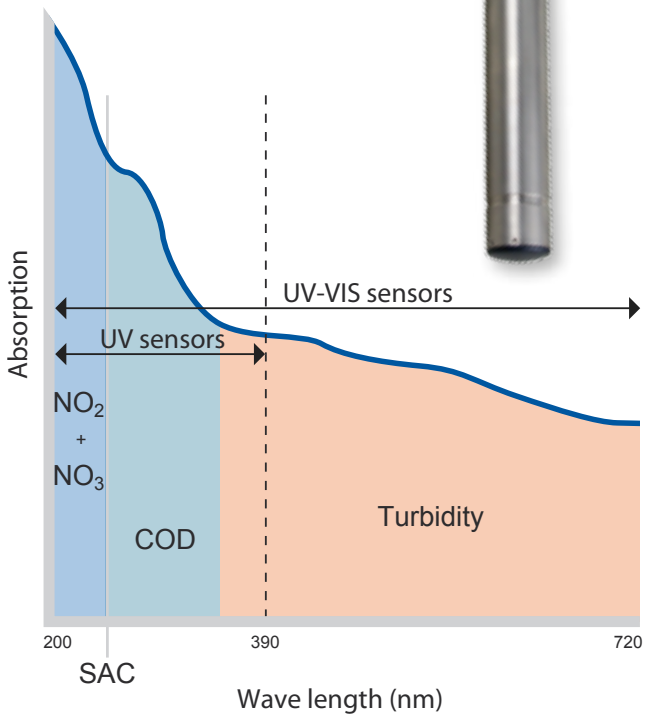
- In-situ sensors
- Precise optical measurement
- No chemicals or consumables



Measuring principle of the spectral on-line sensors for nitrate, nitrite and COD

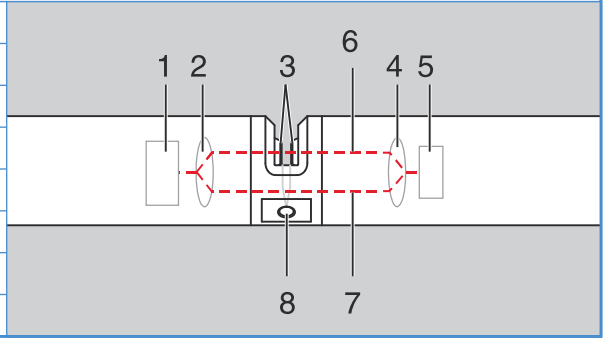
The spectral measurement of nitrate and nitrite by WTW is based on the principle of an absorption measurement; nitrate and nitrite ions absorb light in the UV range. The absorption measurement of 256 wavelengths over a wide wavelength range is the so-called absorption spectrum. From the high information content of the measured spectrum, the measured values are calculated using evaluation models. The evaluation models are based on methods and characteristics, which were obtained from a variety of measurements and long-term analyses. By using the entire information content of the spectrum, it is possible to determine the parameters, several parameters at a time and simultaneously eliminate cross-sensitivities of individual parameters and interference effects such as turbidity.

- By using UV-VIS sensors (wavelength range of 200 - 720 nm), nitrate and carbon parameters (COD, BOD, TOC, SAC) and TSS can be measured.
- In order to distinguish nitrate and nitrite, UV sensors (wavelength range of 200-390 nm) are required. These sensors can also determine carbon parameters (COD, BOD, TOC, SAC).



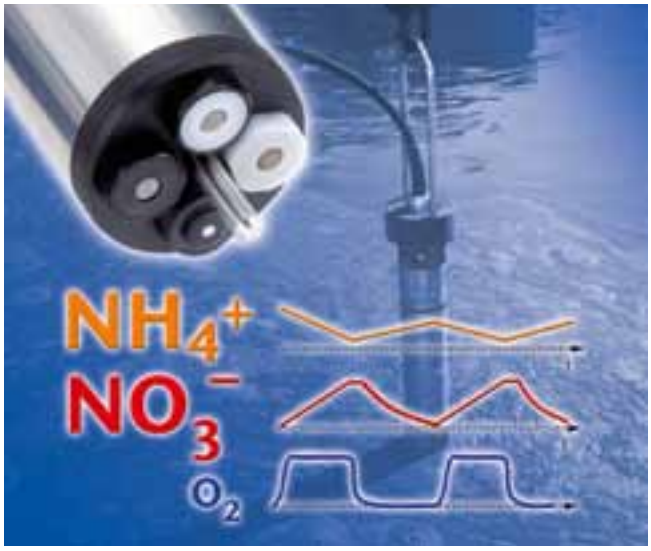
Measuring principle UV-V I S

1	Light source
2	Sender of the optical system
3	Measuring gap between the measurement windows
4	Receiver of the optical system
5	Detector
6	Measuring beam
7	Reference beam
8	Connector for the optional compressed air cleaning system



VARiON®*Plus* 700 IQ

- In-situ combination sensor for ammonium and nitrate
- 2 compensated parameters simultaneous
- Economic, cost-effective
- Calibration-free, long stability



Ammonium and Nitrate ion-selective with automatic compensation of interferences

Ion-selective measurements directly in process – reliable 24 hours a day

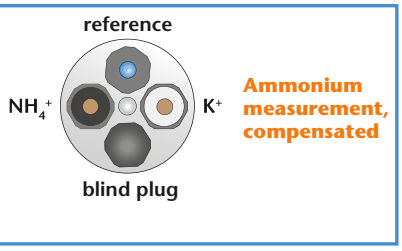
The highly variable ionic sensor VARiON®*Plus* allows:

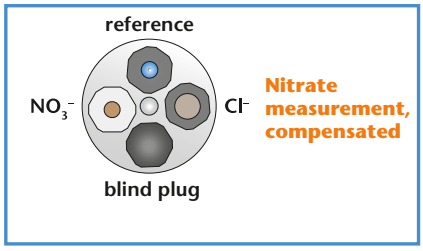
- The continuous measurement of ammonium – with online compensation of potassium ion interference by using potassium ISE.
- The new electrode VARiON®*Plus* NO_3 enables the measuring of nitrate without chloride compensation electrode.
- You can measure ammonium and nitrate using one sensor with perfect gradient display.

For measurement, simply insert the suitable electrode into the sensor, everything else is working automatically. The display shows the already compensated values. The potassium measuring value can be displayed optionally. These values are available via the 0/4–20 mA analog outputs or via the digital output PROFIBUS or Modbus.



Possible configurations





IQ-LabLink

With the initial installation of VARiON®*Plus* the dependency of the used electrode reference values for ammonium, nitrate, chloride and potassium is determined by a photometric system and can be adapted with VARiON®*Plus*.

The measurement data is required for ensuring a precise matrix adjustment.

For enhancing the data transfer between the laboratory spectrophotometers photoLab® 6100 / 6600 and VARiON®*Plus*, a USB memory stick in combination with the IQ-LabLink function can be used for the MIQ/TC 2020 XT to automatically read the data and store it on the VARiON®*Plus*.

- Safe, simple and fast data transfer
- Automatic verification check of data

Technical Data VARiON®*Plus*

Maximum Configuration	Common reference electrode, two measuring electrodes, one compensation electrode	
	Ammonium Measurement	**Nitrate Measurement**
Integrable Electrodes:		
Reference Electrode	VARiON®*Plus* Ref	
Measuring Electrode	VARiON®*Plus* NH_4	VARiON®*Plus* NO_3
Compensation Electrode	VARiON®*Plus* K	VARiON®*Plus* Cl
Measuring Ranges / Resolution	NH_4-N: 1 … 1,000 mg/l / 1 mg/l; 0.1 … 100 mg/l / 0.1 mg/l	NO_3-N: 1 … 1,000 mg/l / 1 mg/l; 0.1 … 100 mg/l / 0.1 mg/l
	NH_4^+: 1 … 1,290 mg/l / 1 mg/l; 0.1 … 129.0 mg/l / 0.1 mg/l	NO_3^-: 5 … 4,500 mg/l / 1 mg/l; 0.5 … 450.0 mg/l / 0.1 mg/l
Compensation Ranges	K^+: 1 … 1,000 mg/l / 1 mg/l	Cl^-: 1 … 1,000 mg/l / 1 mg/l
Temperature Measurement and Compensation	Integrated NTC thermistor, Range 32 °F … 104 °F (0 °C … +40 °C), Accuracy ±0.5 K, Resolution 0.1 K, t_{95} <20 s	
Calibration Procedures	2-point-calibration with multiple standard solutions, calibration against any reference value	
Ambient Conditions	Operating temperature: 32 °F … 104 °F (0 °C … +40 °C), storing temperature: 32 °F … 104 °F (0 °C … +40 °C)	
pH Range	pH 4 … pH 8.5	pH 4 … pH 11
Measuring Accuracy in laboratory standard solutions	±5% of measured value ±0.2 mg/l in standard solutions	
Working Life (typically)	All electrodes: 18 months (in typical application - sewage plants)	
Mechanical	Sensor body: V4A stainless steel 1.4571 Protective cup: POM Temperature sensor: V4A stainless steel 1.4571 Protection rating: IP 68 (0.2 bar, with installed electrodes) Electrode connector: POM	
Max. Pressure	Maximum 0.2 bar (incl. SACIQ sensor connection cable, with installed electrodes)	
Power Consumption	0.2 watts	
Dimensions	14.45 x 1.57 in. (367 x 40 mm, length x diameter), incl. SACIQ sensor connection cable	
Weight	Approx. 1.76 lb (800 g, without electrodes, without SACIQ sensor connection cable	
Guaranty	VARiON®*Plus* 700 IQ: 2 years for defects of quality	

Ordering Information

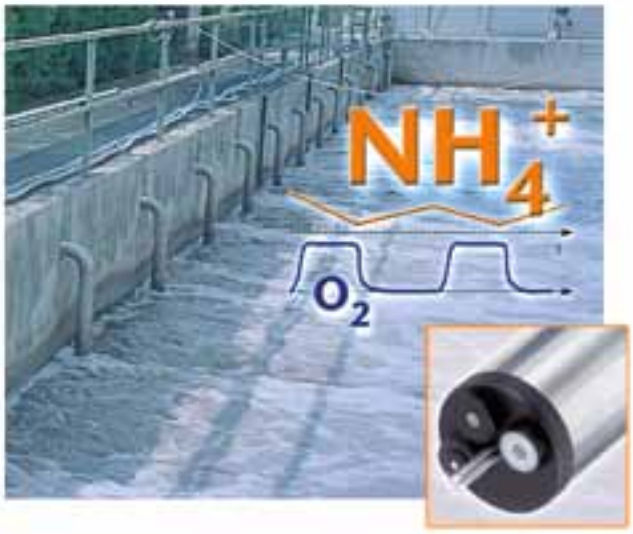
VARiON®*Plus* SETs	**Consisting of probe, reference electrode, measurement and compensation electrodes**	**Order No.**
VARiON®*Plus* A comp SET	Ammonium measurement, compensated	107 060
VARiON®*Plus* N comp SET	Nitrate measurement, compensated	107 062
VARiON®*Plus* AN/A comp SET	Ammonium measurement, compensated, plus nitrate measurement	107 066
VARiON®*Plus* AN/N comp SET	Nitrate measurement, compensated, plus ammonium measurement	107 068
Standard Solutions	**for VARiON®*Plus*, AmmoLyt®*Plus*, NitaLyt®*Plus***	**Order No.**
VARiON®*Plus*/ES-1	Combined standard 1 (low concentration), 1000 ml	107 050
VARiON®*Plus*/ES-2	Combined standard 2 (high concentration), 1000 ml	107 052
Accessories	**For automatic cleaning. Recommended for permanent operation.**	**Order No.**
MIQ/CHV PLUS	Valve module for automatic cleaning by compressed air controlled directly via the IQ Sensor Net bus	480 018
DIQ/CHV	Valve module for automatic compressed air cleaning for System 182; accessible by means of an DIQ/S 182 relay	472 007
CH	Cleaning head	900 107

IP 68 · CE · cETLus · 2 *Year Guaranty

* on armature

AmmoLyt® *Plus*

- In-situ ammonium sensor with potassium compensation
- Economic, cost-effective
- Calibration-free, long term stable
- Short response time



Ammonium Measurement directly in the Medium – without Sample Preparation

The continuous measuring of O_2 and NH_4 can result in significant savings through:

- energy-optimized operation due to demand-oriented regulation of aerator aggregates,
- adherence to critical values or reduction of wastewater charges.
- The potassium measuring value can be displayed optionally.

The low investment costs for the system can thus be amortized after a short period.



For information visit **www.WTW.com** for a customer care center near you

IQ-LabLink

With the initial installation of AmmoLyt®*Plus* the dependency of the used electrode reference values for ammonium or potassium is determined by a photometric system and can be adapted with AmmoLyt®*Plus*.

The measurement data is required for ensuring a precise matrix adjustment.

For enhancing the data transfer between the laboratory spectrophotometers photoLab® 6100/6600 and AmmoLyt®*Plus*, a USB memory stick in combination with the IQ-LabLink function can be used for the MIQ/TC 2020 XT to automatically read the data and store it on AmmoLyt®*Plus*.

- Safe, simple and fast data transfer
- Automatic verification check of data



Technical Data AmmoLyt®*Plus*

Appropriate Electrode	Reference electrode VARiON®*Plus* Ref, Measuring electrode VARiON®*Plus* NO_3, Compensation electrode VARiON®Plus Cl
Measuring Ranges/Resolution	NH_4-N: 1 … 1000 mg/l / 1 mg/l; 0.1 … 100 mg/l / 0.1 mg/l
	NH_4^+: 1 … 1290 mg/l / 1 mg/l; 0.1 … 129.0 mg/l / 0.1 mg/l
Compensation Range:	K^+: 1 … 1000 mg/l / 1 mg/l
Temp. Measurement and Compensation	Integrated NTC thermistor Range: 32 … 104 °F (0 … +40 °C), Accuracy ±0.5 K, resolution 0.1 K, t_{95} <20 s
Calibration Procedures	Matrix adjustment against any reference value, 2-point-calibration possible with multiple standard solution
Ambient Conditions	Integrated NTC thermistor Range: 32 … 104 °F (0 … +40 °C), Accuracy ±0.5 K, resolution 0.1 K
pH Range	pH 4 … pH 8.5
Measuring Accuracy in laboratory standard solutions	±5 % of measured value ±0.2 mg/l in standard solutions
Working Life (typically)	All electrodes: 18 months (in typical application - sewage plants)
Mechanical	Sensor body: V4A Stainless Steel 1.4571 Protective cap: POM, Temp. sensor: V4A Stainless Steel 1.4571 Protection rating: IP 68 (0.2 bar, with installed electrodes) Electrode connector: POM
Max. Pressure	Maximum 0.2 bar (incl. SACIQ sensor connection cable; with installed electrodes)
Power Consumption	0.2 watts
Dimensions	15.43 x 1.57 in. (392 x 40 mm, length x diameter), incl. sensor connection cable SACIQ
Weight	Approx. 1.48 lb (670 g, without electrode, without sensor connection cable)
Guaranty	AmmoLyt®*Plus* 700 IQ: 2 years for defects of quality

Ordering Information

AmmoLyt®*Plus*-System		Order No.
AmmoLyt®*Plus* 700 IQ	Robust digital armature for ion-selective electrodes (VARiON®*Plus* Ref/VARiON®*Plus* NH_4/VARiON®*Plus* K; not included in the delivery set)	107 080
VARiON®*Plus* Ref	Reference electrode for VARiON®*Plus* 700 IQ/AmmoLyt®*Plus* 700 IQ/NitraLyt®*Plus* 700 IQ	107 042
VARiON®*Plus* NH_4	Ammonium electrode	107 044
VARiON®*Plus* K	Electrode for dynamic potassium compensation with ammonium measuring	107 046
CH	Cleaning head	900 107
MIQ/CHV PLUS	Valve module for automatic cleaning by compressed air controlled directly via the IQ Sensor Net bus	480 018
DIQ/CHV	Valve module for automatic compressed air cleaning for System 182; accessible by means of an DIQ/S 182 relay	472 007

IP 68 CE cETLus **2 *Year Guaranty**

** on armature*

Standard Solutions see brochure "Product Details"

TresCon® OA 110

- Continuous measurements
- Automatic calibration
- Short response time

Online ammonium measurement

- Continuous ammonium value monitoring in sewage plant effluent
- Analysis of the ammonium-nitrogen pollution in surface waters
- Monitoring water treatment plants



Measuring Principle

The continuous determination of ammonium in the OA 110 module is carried out according to the potentiometric measuring principle with a gas-sensitive NH_3 electrode. Sodium hydroxide is added to the thermostatted sample to convert the ammonium dissolved in the medium into undissociated ammonia gas. The gaseous ammonia alters the pH registered by the measuring electrode; the alteration is a direct measure of the ammonium concentration in the sample.

Technical Data OA 110

	Standard 1	Standard 2*
Measuring Ranges	NH_4-N: 0.1 … 1000 mg/l; 0.01 … 71.00 mmol/l	NH_4-N: 0.05 … 10 mg/l; 0.005 … 0.71 mmol/l*
	NH_4+: 0.1 … 1280 mg/l; 0.01 … 71.00 mmol/l	NH_4+: 0.05 … 12.8 mg/l; 0.005 … 0.71 mmol/l*
Resolution (Display)	Range: 0.10 … 10 mg/l: 0.01 mg/l 10.0 … 100 mg/l: 0.1 mg/l 100 … 1000/1280 mg/l: 1 mg/l	Range: 0.05 … 10 mg/l: 0.01 mg/l*
Accuracy	±5 % of the measured value ±0.2 mg/l at <1 mg/l NH_4-N ±5 % of the measured value ±0.1 mg/l at 1.0 … 100 mg/l NH_4-N	±5% of the measured value ±0.05 mg/l at <1 mg/l NH_4-N* ±5% of the measured value ±0.1 mg/l at 1.0 … 10 mg/l NH_4-N*
Coefficient of Variation of Method	Range: 0.10 … 10 mg/l: 3 % 10.0 … 100 mg/l: 4 % 100 … 1000/1280 mg/l: 5 % (values for calibration with suitable standard solutions)	
Response time	<3 min (after alternation in concentration at module input)	
Measuring Interval	Continuous Mode and 10, 15, 20, 25, 30 min interval selectable, AutoAdapt, Interval-Program	
Calibration	Automatic 2-point calibration (AutoCal) with two standard solutions	
Sample input	Approx. 0.3 l/h, solids content <50 mg/l	
Consumption	Reagent, 10 l: 14/30/50 days at measuring intervals cont./20/30 min Standard solutions A/B, 1.5 l: 60 days with 24 Std. calibration interval Cleaning solution 1.5 l: 60 days with 24 Std. cleaning interval	
Maintenance Interval	Every 6 months	
Guaranty	2 years for defects of quality	

Ordering Information

		Order No.
OA 110	Separate TresCon® analyzer module for ammonium-nitrogen for extension of an existing TresCon® system (requires 1 measuring place)	820 008
TresCon® A 111	TresCon®-basic instrument with analysis module OA 110 for ammonium-nitrogen (wall mounting, space for 2 further modules)	8A-10030
TCU/A111	TresCon® Uno ammonium: single parameter system ammonium with analysis module OA 110 for ammonium-nitrogen	820 101

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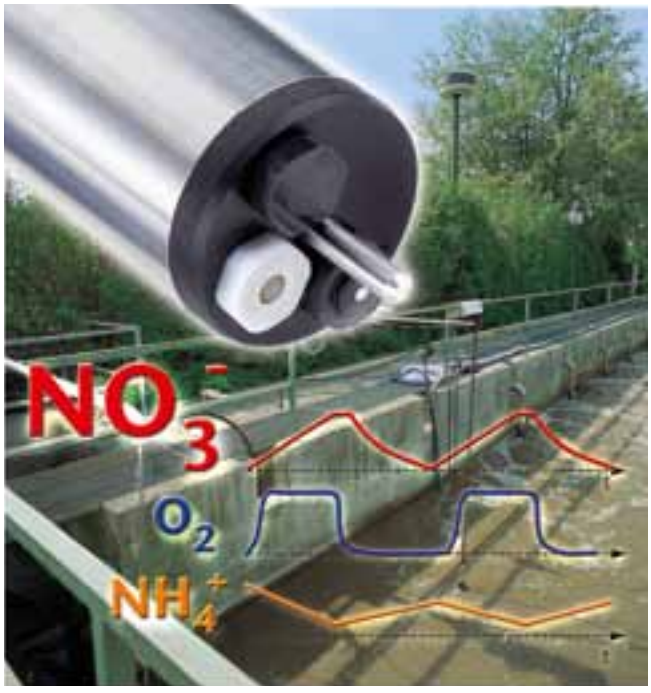
Accessories and consumables see brochure "Product Details"

** around calibration standard*

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NitraLyt®*Plus*

- In-situ nitrate sensor with optional chloride compensation
- Economic, cost-effective
- Calibration-free, long term stable
- Short response time



Nitrogen Elimination Process – monitored, optimized, cost effective

The optimization of nitrification/denitrification during wastewater treatment is simplified even further by the new NitraLyt®*Plus* system:

- Nitrate is also directly measurable during the process in addition to oxygen and ammonium.
- Measured values are promptly available and can be used directly to control the process.
- Low investment and maintenance costs (automatic compressed air cleaning system).



IQ-LabLink

With the initial installation of NitraLyt®*Plus* the dependency of the used electrode reference values for nitrate and chloride is determined by a photometric system and can be adapted with NitraLyt®*Plus*.

The measurement data is required for ensuring a precise matrix adjustment.

For enhancing the data transfer between the laboratory spectrophotometers photoLab® 6100 / 6600 and NitraLyt®*Plus*, a USB memory stick in combination with the IQ-LabLink function can be used for the MIQ/TC 2020 XT to automatically read the data and store it on NitraLyt®*Plus*.

- Safe, simple and fast data transfer
- Automatic verification check of data



Technical Data NitraLyt®*Plus*	
Appropriate Electrodes	Reference electrode VARiON®*Plus* Ref, Measuring electrode VARiON®*Plus* NO_3, Compensation electrode VARiON®*Plus* Cl
Measuring Ranges/ Resolution	NO_3-N: 1 … 1000 mg/l / 1 mg/l; 0.1 … 100.0 mg/l / 0.1 mg/l
	NO_3^-: 5 … 4500 mg/l / 5 mg/l; 0.5 … 450.0 mg/l / 0.5 mg/l
	Cl^-: 1 … 1000 mg/l / 1 mg/l
Temp. Measurement and Compensation	Integrated NTC thermistor Range: 32 … 104 °F (0 °C … +40 °C), Accuracy ±0.5 K, resolution 0.1 K, t_{95} <20 s
Calibration Procedures	Matrix adjustment against any reference value, 2-point-calibration possible with multiple standard solution
Ambient Conditions	Operating temperature: 32 °F … 104 °F (0 °C … +40 °C), storing temperature: 32 °F … 104 °F (0 °C … +40 °C)
pH Range	pH 4 … pH 11
Measuring Accuracy in laboratory standard solutions	±5% of measured value ±0.2 mg/l in standard solutions
Working Life (typically)	All electrodes: 18 months (in typical application - sewage plants)
Mechanical	Sensor body: V4A Stainless Steel 1.4571 Protective cap: POM, Temp. sensor: V4A Stainless Steel 1.4571 Protection rating: IP 68 (0.2 bar, with installed electrodes) Electrode connector: POM
Max. Pressure	Maximum 0.2 bar (incl. SACIQ sensor connection cable; with installed electrodes)
Power Consumption	0.2 watts
Dimensions	15.43 x 1.57 in. (392 x 40 mm, length x diameter), incl. sensor connection cable SACIQ
Weight	Approx. 1.48 lb (670 g, without electrode, without sensor connection cable)
Guaranty	NitraLyt®*Plus* 700 IQ: 2 years for defects of quality

Ordering Information

NitraLyt®*Plus*-System		Order No.
NitraLyt®*Plus* 700 IQ	Robust digital armature for ionselective electrodes (VARiON®*Plus* Ref/VARiON®*Plus* NO_3/VARiON®*Plus* Cl; not included in the delivery set)	107 080
VARiON®*Plus* Ref	Reference electrode for VARiON®*Plus* 700 IQ/AmmoLyt®*Plus* 700 IQ/NitraLyt®*Plus* 700 IQ	107 042
VARiON®*Plus* NO_3	Nitrate electrode for measuring nitrate with dynamic Cl compensation	107 045
VARiON®*Plus* Cl	Electrode for dynamic Cl compensation of the nitrate measurement	107 047
CH	Cleaning head	900 107
MIQ/CHV PLUS	Valve module for automatic cleaning by compressed air controlled directly via the IQ Sensor Net bus	480 018
DIQ/CHV	Valve module for automatic compressed air cleaning for System 182; accessible by means of an DIQ/S 182 relay	472 007

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* on armatures

Standard solutions see brochure "Product Details"

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NEW

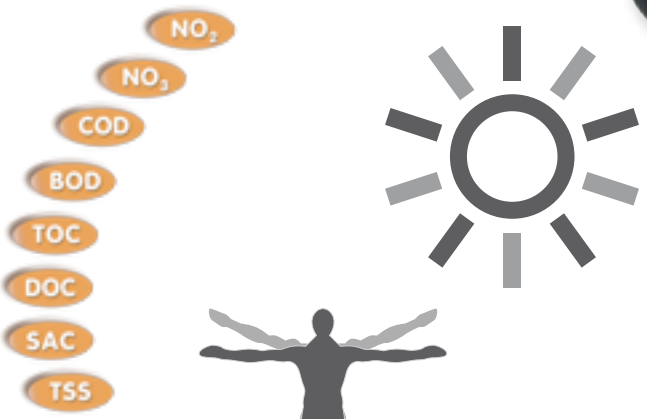
NitraVis®/NiCaVis®

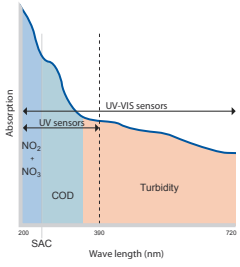
- High measurement reliability
- Low operating costs
- Simple handling
- Maximum durability



Optical in-situ measurement of nitrate, nitrite, carbon parameters and suspended solids (optional)

The chemical-free spectral measurement allows a precise determination of the measurement parameters for nitrate, nitrite, carbon parameters (COD, BOD, TOC, SAC) and TSS.





Two spectral types of sensors for different measurement parameters:

- UV-VIS sensors (Wavelength range 200-720 nm):
  - Nitrate
  - Carbon parameters
  - **TSS**
- UV sensors (Wavelength range 200-390 nm):
  - Nitrate
  - **Nitrite**
  - Carbon parameters

High measuring reliability

- Wide dynamic range and high measurement accuracy. Automatic adjustment of the number of flashes to the current sample matrix, similar to an exposure measurement in cameras, ensure optimized recording level of the detector.
- Excellent measurement repeatability and zero point and long-term stability. 100 % symmetrical optics, measurement and reference channel are identical in design, which enables optimal referencing.
- Evaluating the entire measured spectrum from 200 to provide recognition of interferences; calculate these automatically or apply these for compensation.

Simple to use

- Due to the built-in ultrasonic cleaning system, a very long maintenance-free operation is possible. Accumulation of dirt and biofilm formation is gently but very effectively prevented.

Maximum durability

- High-tech materials such as titanium and peek ensure an easy use in almost all media, even corrosive media.

Technical Data NitraVis®/NiCaVis®

Measuring Principle	Spectral Measurement in the UV-VIS Range (200 - 720 nm) / UV range of 200 - 390 nm					
Applications	Municipal wastewater: inlet, aeration, outlet					
Measuring Range Nitrate Standard		**NitraVis® 701 IQ**	**NitraVis® 705 IQ**		**NiCaVis® 705 IQ**	**NiCaVis® 701 IQ NI**	**NiCaVis® 705 IQ NI**
	NO_3-N:	0.1 … 100.0 mg/l inlet, aeration	0.01 … 25.00 mg/l outlet	NO_3-N: NO_2-N: COD	0.01 … 25.00 mg/l — 0.1 … 800.00 mg/l Municipal wastewater: outlet	0.1 … 100 mg/l 0.1 … 25 mg/l 0.5 … 4000.0 mg/l inlet, aeration, outlet	0.01 … 25 mg/l 0.01 … 5 mg/l 0.1 … 800 mg/l outlet
Measuring Range Suspended Solids (Option)	TSS:	0 … 10.00 g/l inlet, aeration	0 … 900.0 mg/l outlet	TSS:	—	—	—
Materials	Housing: Titan 3.7035, PEEK Window: Sapphire glass						
Pressure Resistance	≤1 bar						
Ambient Conditions	Operating Temperature: 32 °F … 113 °F (0 °C … +45 °C) Storage temperature: 14 °F … 122 °F (-10 °C … +50 °C)						
Flow velocity	≤3 m/s						
pH range	pH 4 … pH 12						
Dimensions	31.57 x 2.36 in. (802 x 59.9 mm; length x diameter)						
Weight	Approx. 8.82 lb (4 kg)						
Guaranty	2 years for defects of quality						

Ordering Information

UV-VIS sensors NitraVis®	**Supplied with multifunctional slide and Shock-Absorption-Rings, without connection cable (SACIQ order separately)**	**Order No.**
NitraVis® 701 IQ	Optical nitrate sensor, with spectral processing of the UV-VIS range, for in-situ measurement in inlet / BNR part of municipal wastewater treatment plants, with integrated ultrasonic cleaning.	481 044
NitraVis® 701 IQ TS Double sensor	Optical nitrate/TSS sensor, with spectral processing of the UV-VIS range, for in-situ measurement in inlet / BNR part of municipal wastewater treatment plants, with integrated ultrasonic cleaning.	481 045
NitraVis® 705 IQ	Optical nitrate, with spectral processing of the UV-VIS range, for in-situ measurement in the effluent of municipal wastewater treatment plants, with integrated ultrasonic cleaning.	481 046
NitraVis® 705 IQ TS Double sensor	Optical nitrate/TSS , with spectral processing of the UV-VIS range, for in-situ measurement in the effluent of municipal wastewater treatment plants, with integrated ultrasonic cleaning.	481 047
UV-VIS sensors NiCaVis®	Supplied with multifunctional slide and Shock-Absorption-Rings, without connection cable (SACIQ order separately)	**Order No.**
NiCaVis® 705 IQ Double sensor	Optical nitrate and COD/TOC/DOC/BOD/SAC probe, with spectral processing of the UV/VIS range, for in-situ measurement in effluent of municipal wastewater treatment plants, with integrated ultrasonic cleaning.	481 052
UV sensors NiCaVis®	**Delivery set: sensor, shock-absorption-rings, calibration feed, manual**	**Order No.**
NiCaVis 701 IQ NI	UV sensor for the measurement of nitrate, nitrite, CODtotal, CODsoluble, TOC, BOD, DOC, SACtotal, SACsoluble and UVT254 in inlet, BNR part and effluent of municipal wastewater treatment plants.	481 054
NiCaVis 705 IQ NI	UV sensor for the measurement of nitrate, nitrite, CODtotal, CODsoluble, TOC, BOD, DOC, SACtotal, SACsoluble and UVT254 in the effluent of municipal wastewater treatment plants.	481 055
Accessories	**for additional compressed air cleaning system (optional)**	**Order No.**
Cleaning Air Box	Cleaning air box with compressor, 230 VAC with air-filter	480 019
MIQ/CHV PLUS	Valve module for automatic cleaning by compressed air; controlled directly via the IQ Sensor Net Bus	480 018
DIQ/CHV	Valve module for the automatic compressed air cleaning for System 182; accessible by means of an DIQ/S 182 relay	472 007
SET/AP	Compressed air cleaning set: 15 m compressed air tubing incl. fittings, additional modules and components, must be ordered separately	481 075

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TresCon® ON 210/OS 210

- Reagent-free measuring method
- 4-beam measuring method for optimal background compensation
- Simultaneous nitrate and SAC determination (OS 210)

Nitrate/SAC measurement

- Regulating nitrate degradation in denitrification
- Continuous monitoring of nitrate effluent values
- Organic pollution SAC (OS 210)



Measuring Principle Nitrate

The ability of nitrate ions to absorb UV light of certain wavelengths is used for measuring the nitrate. The ultraviolet light from a pulsed photoflash lamp passes through a flow-thru measuring cuvette where it is partially absorbed by the nitrate ions present in the sample flow. The intensity of the attenuated light is measured at a measuring wavelength and at a reference wavelength and evaluated electronically. The 4-beam measuring method used ensures a high degree of long-term stability and absolute accuracy; interfering background influences are efficiently compensated.

SAC measuring principle

Absorption measurement of aqueous sample in UV range. The SAC (spectral absorption coefficient), measured with a wavelength of 254 nm, represents the organic water pollution.

Technical Data ON 210/OS 210

Measuring Range	NO_3-N: 0.1 - 60 mg/l	0 - 4000 mmol/l
	NO_3: 0.1 - 250 mg/l	0 - 4000 mmol/l
	SAC: 0.1 - 200m^{-1}	
Resolution (Display)	Nitrate: Range: 0.1 … 100 mg/l : 0.1 mg/l 100 … 250 mg/l : 1 mg/l SAC: 0.1 m^{-1} (only OS 210)	
Accuracy	±2% of the measured value ±0.4 mg/l	
Coefficient of variation for method	2%	
Response Time	30 s (after alteration in concentration at module input)	
Measuring interval	Continuous mode and 5, 10, 15, 20, 25, 30 min intervals selectable, AutoAdapt, Interval-Program	
Calibration	Automatic zero balance, works calibration	
Sample Flow Rate	0.5 l/hr approx., suspended solids content <50 mg/L	
Consumption	Distilled water, 10 l: 130 days with 24 h interval for zero balance Cleaning solution, 1.5 l: 120 days with 24 h cleaning interval	
Maintenance Interval	Every 6 months	
Guaranty	2 years for defects of quality	

Ordering Information

Separate TresCon® analyzer module for nitrate (+ SAC) for extension of an existing TresCon® system (requires 1 measuring place)		**Order No.**
ON 210	Nitrate	820 007
OS 210	Nitrate + SAC	820 010
TresCon® basic instrument with analysis module ON 210 (nitrate) or OS 210 (nitrate + SAC) (wall mounting, space for 2 further modules)		**Order No.**
TresCon® N 211	Nitrate	8A-20030
TresCon® S 211	Nitrate + SAC	8A-70030
TresCon® Uno single parameter system nitrate or nitrate + SAC with analysis module ON 210 or OS 210		**Order No.**
TCU/N211	TresCon® Uno nitrate	820 102
TCU/S211	TresCon® Uno nitrate + SAC	820 107

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Accessories and consumables see brochure "Product Details"

TresCon® ON 510

- Continuous background compensation
- Reliable and accurate – 2-beam reference photometer
- Can be used in weakly polluted water without sample preparation

Measuring Principle

The measuring principle of the NO_2 analyzer module is based on the azo dye method. A reagent reacts with nitrite to color the sample solution pink. The intensity of the pink color is proportional to the nitrite concentration in the sample and is measured by a double-beam reference photometer. An additional manual correction facility allows the system to be adapted to plant-specific characteristics so that a high degree of measuring accuracy can be achieved even with strongly colored samples.

On-line nitrite measurement

- Observation of the nitrification process
- Monitoring nitrite effluent values
- Measurement checks in drinking water treatment
- Monitoring nitrite pollution in natural waters
- Monitoring of critical values in fish farming



Technical Data ON 510

Measuring Range	NO_2-N: 0.005 - 1.200 mg/l 0.40 - 90 µmol/l
	NO_2: 0.020 - 4.000 mg/l 0.40 - 90 µmol/l
Resolution (Display)	Range: 0.005 … 1.200 mg/l : 0.001 mg/l 0.020 … 4.000 mg/l : 0.001 mg/l 0.40 … 90.00 µmol/l : 0.1 µmol/l
Accuracy	±2% of the measured value ±0.05 mg/l NO_2-N
Coefficient of variation for method	1%
Response Time	<5 min to measured value (after alteration in concentration at module input)
Measuring interval	5, 10, 15, and 20 min intervals selectable, AutoAdapt, Interval-Program
Calibration	Automatic 2-point calibration, time and interval selectable
Background Correction	Continuous background compensation based on new WTW algorithm
Sample input	Approx. 0.06 l/h, solid content <50 mg/l
Consumption	Reagent, 1 l: 20/40/80 days with 5/10/20 min measuring interval Standard B, 1 l: 80 days with 24 h calibration interval Cleaning solution, 1.5 l: 45 days with 24 h cleaning interval
Maintenance Interval	Every 6 months
Guaranty	2 years for defects of quality

Ordering Information

Model		Order No.
ON 510	Separate TresCon® analyzer module for nitrite for extension of an existing TresCon® system (requires 1 measuring place)	820 009
TresCon® N 511	TresCon® basic instrument with analysis module ON 510 for nitrite (wall mounting, space for 2 further modules)	8A-30030
TCU/N511	TresCon® Uno single parameter system nitrite with analysis module ON 510	820 103

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Accessories and consumables see brochure "Product Details"

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Mesure de pH/Redox on-line

Mesurer · Surveiller · Réguler

La mesure du pH est l'une des plus fréquentes en analyse des eaux, eaux usées et eaux industrielles; le pH joue en effet un rôle important dans de nombreux process: s'il est trop bas ou trop élevé, l'efficacité de l'épuration lors du traitement biologique des eaux usées peut s'en trouver fortement diminuée. En outre, la mesure et la surveillance continuelles du pH avec des systèmes de mesure au fonctionnement fiable sont indispensables pour l'épuration chimique des eaux ou dans de nombreux procédés chimiques industriels.

Dès les premières années de sa création, l'entreprise WTW s'est attachée à développer et réaliser des systèmes précis de mesure du pH. Grâce aux longues années d'expérience dans ce domaine, les systèmes de mesure de pH on-line de WTW sont aujourd'hui appréciés dans le monde entier pour leur précision, leurs performances et leur fiabilité.

Mesure de pH/Redox on-line

- Installations d'épuration des eaux
- Traitement et surveillance des eaux
- Installations de neutralisation
- Eaux souterraines et de surface
- Chimie des process industriels
- Industrie alimentaire
- Pharmacie

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Neutralisation/Précipitation/Détoxication

La valeur du pH est d'une grande importance pratique, aussi bien dans le traitement des eaux et eaux usées que dans les process industriels. Le caractère acide ou alcalin du milieu joue un rôle essentiel dans de nombreux processus biologiques et chimiques, mais aussi mécaniques/physiques. Toute une série de réactions – par ex. lors de la précipitation ou de la détoxication – n'ont lieu qu'en présence d'un pH approprié. Les conséquences d'un pH «inadéquat» peuvent être multiples et variées, la corrosion étant l'une des plus graves. Si le pH est trop faible ou trop élevé, il est souvent nécessaire de neutraliser le milieu.



Dans l'épuration des eaux usées industrielles et communales, les conséquences négatives ci-dessous peuvent s'ensuivre de valeurs pH extrêmes:

- Les micro-organismes actifs dans l'épuration biologique des eaux usées sont sensibles aux bases et aux acides; la valeur du pH devrait donc se trouver si possible en zone neutre, aux environs de 7. Si le pH est inférieur à 5 ou supérieur à 10, le processus d'épuration s'en trouve pour ainsi dire paralysé.
- Un pH de 6,5 ou inférieur provoque la destruction progressive des matériaux et pièces de construction métalliques, et même d'éventuels dommages dans les canalisations.
- La solubilité de nombreuses substances se modifie en fonction du pH et de la température, ce qui peut provoquer des précipitations indésirables et des dépôts gênants.

Les dispositions et décrets légaux exigent déjà que seules des eaux usées d'un pH situé entre 6,5 et 8,5 soient rejetées dans le réseau public de canalisations. Les resets industriels indirects d'eaux usées, par ex. laiteries ou brasseries, doivent donc éventuellement procéder à un prétraitement de leurs eaux usées dans une installation de neutralisation.

Régulation du pH

Neutralisation, précipitation ou même détoxication exigent non seulement une mesure en continu du pH, mais aussi une régulation efficace du pH. Dans le cas d'applications simples, par ex. pour des processus à modification lente, une simple régulation à deux points peut suffire. Dans de nombreux cas, les appareils avec **une régulation PID (Proportionnelle, Intégrale, Dérivée)** (IQ Sensor Net) sont nettement plus efficaces et de surcroît plus économiques pour le dosage des agents de neutralisations et floculants.

Technique de mesure du pH de WTW

La technique de mesure de pH de WTW comprend des sondes, des armatures et des transmetteurs pour les tâches industrielles pratiques les plus diverses. Outre les sondes de mesure SensoLyt® qui ont fait leurs preuves et s'utilisent surtout dans les stations d'épuration, la gamme de produits disponibles comprend aussi des armatures robustes interchangeables à flux continu pour utilisations industrielles.

Les transmetteurs éprouvés des séries 170 et 296 sont équipés d'un algorithme de régulation (PI/PF). Le modèle pH Ex est conçu pour être utilisé en zones antidéflagrantes. Pour l'utilisation en zone antidéflagrantes, un transmetteur de mesure spécial ainsi que des sondes et accessoires sont disponibles (voir tarif).

Avec l'IQ Sensor Net et les sondes IQ, on propose une technique entièrement nouvelle qui offre non seulement une très grande flexibilité mais aussi des qualités dont on parle beaucoup, comme les «sondes préétalonnables en laboratoire».

SensoLyt® sondes de mesure de pH/Redox

- Fonction Sensor Check pour l'identification des bris de l'électrode
- Mécanique robuste
- Changement simple de l'électrode de pH
- La sonde peut être préétalonnée (SensoLyt® 700 IQ)

Technique de mesure de pH SensoLyt®

En mesure de pH continue – notamment dans les conditions souvent difficiles en eaux usées – les systèmes de mesure doivent être extrêmement fiables et sûrs.

Les sondes de mesure SensoLyt® sont compatibles entre elles dans un système composé d'une armature et de la sonde correspondante de mesure Redox ou pH. Associées aux transmetteurs performants WTW, ces sondes forment des systèmes de mesure de pH intégrés et robustes, représentatifs du standard actuellement le plus élevé en technique de mesure on-line sur le plan de la fiabilité de mesure, de la résistance au brouillage électromagnétique et du rendement.

La technique numérique des sondes IQ, qui stockent directement les valeurs de calibration, présente des avantages tout particuliers. Il est ainsi possible d'étalonner une sonde en laboratoire et de la replacer ensuite à l'endroit de son utilisation. Il en résulte une certaine autonomie et confort – notamment en hiver ou lors de mauvaises conditions météo. Le raccordement à la sonde étant rapide et direct, on peut réintégrer cette dernière sans problème dans le système.



SensoLyt® 700 *SensoLyt® 700 IQ*

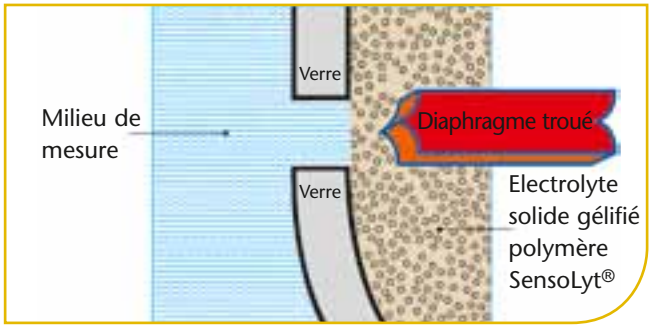


Connexion/Sonde IQ

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Sondes combinées SensoLyt®

- Fiables
- Insensibles aux brouillages
- Faciles à entretenir



La fiabilité d'une mesure de pH est déterminée principalement par la qualité de la sonde de mesure du pH/Redox, la plupart du temps soumise en continu à une sollicitation extrême lors de l'utilisation pratique dans l'exploitation.

Le système de référence utilisé est décisif pour le fonctionnement d'une sonde. Dans les sondes combinées SensoLyt®, l'électrode de référence est une électrode classique Ag/AgCl, entièrement logée dans un électrolyte solide polymère résistant à la pression.

Dans cet électrolyte pour ainsi dire gélifié, les modifications de concentration sont très lentes, les propriétés électrochimiques des phases déterminant le potentiel restent inchangées sur une longue période. Sur ce type d'électrodes, la surface limite matrice polymère/milieu de mesure se compose d'un diaphragme troué, c'est-à- dire que la liaison électrique se fait par deux petits trous situés dans la paroi du système de référence. Un diaphragme de cette sorte se distingue par sa grande résistance à l'encrassement.

Les sondes combinées SensoLyt® sont en outre très aisées à entretenir, car l'électrolyte n'a pas besoin d'être renouvelé.



SensoLyt® SEA-HP

SensoLyt® SEA / SE*

L'électrode combinée de pH fonctionne avec un diaphragme troué double et un électrolyte solide gélifié polymère, sans AgCl et donc résistant aux sulfures.

Plage de mesure: pH 2 ... 12

- Eaux usées fortement polluées
- Emulsions, suspensions
- Milieux contenant protéines et sulfures

SensoLyt® SEA-HP

Réalisation analogue au SensoLyt® SEA, avec armature optimalisée pour l'utilisation sous pression/température plus élevées.

Plage de mesure: pH 4 ... 12

- Mesure en ligne en conduite

SensoLyt® DWA / DW*

Notamment dans le domaine des eaux potables à faible conductivité, elle se distingue par une longue durée de vie et une mesure précise.

Plage de mesure: pH 0 ... 14

- Eau potable

SensoLyt® ECA / EC*

L'électrode combinée de pH fonctionne avec un diaphragme troué simple et un électrolyte gélifié. Elle constitue une solution stable sur une longue période et rentable notamment pour les eaux usées collectives.

Plage de mesure: pH 2 ... 12

- Eaux usées moyennement polluées

SensoLyt® PtA / Pt*

La sonde de potentiel redox, comparable à la SEA SensoLyt® quant à ses caractéristiques électrochimiques et ses qualités de construction. Elle comporte de même un diaphragme troué et convient particulièrement aux mesures en eaux usées très chargées.

Plage de mesure: ± 2000 mV

- Eaux usées collectives et industrielles
- Emulsions, suspensions
- Milieux contenant des protéines et sulfures

** Sonde sans armature pour montage direct dans les cuves à circulation continue*

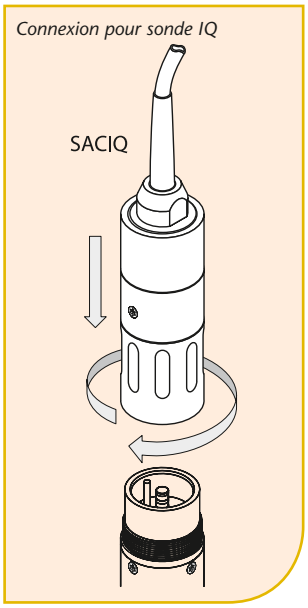
Armatures SensoLyt®

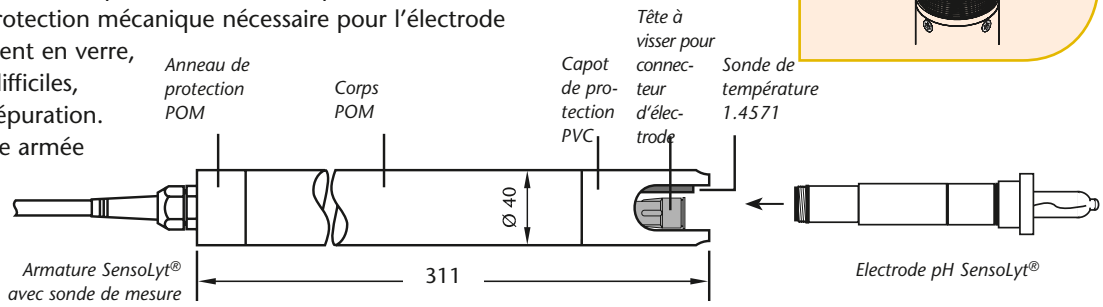
Dans le cadre du système WTW, les armatures immersibles SensoLyt® sont dotées d'une fonction polyvalente:

- **Préamplification** du signal de sonde
- Réception d'une sonde NTC de **mesure de température**
- **Protection mécanique** pour l'électrode pH
- Traitement des signaux numérique avec enregistrement des valeurs de calibration (sondes IQ)

Le faible signal de tension délivré par la sonde de pH est très sensible au brouillage et ne doit donc pas être transmis sur de longues distances sans être amplifié. Pour cette raison, WTW a intégré le préamplificateur à l'armature, car la transformation d'adaptation d'impédance permet une transmission à basse impédance et donc sûre du signal, même sur de longues distances. Pour la compensation automatique de température ou la mesure de température, les armatures SensoLyt® ont une sonde NTC intégrée qui permet de saisir avec un dispositif de mesure simultanément les paramètres pH ou Redox et température.

L'armature offre la protection mécanique nécessaire pour l'électrode sensible, le plus souvent en verre, dans les conditions difficiles, surtout en station d'épuration. D'autre part, la sonde armée peut être remplacée aisément sans outil supplémentaire lors de la maintenance.





Numérique

SensoLyt® 700 IQ

Armature pH/Redox numérique avec préamplificateur intégré et protection contre la foudre ainsi que traitement numérique des signaux et une sonde de température intégrée à connecter à l'IQ SENSOR NET. Une technique spéciale de commutation permet la surveillance de bris de verre. Avec l'unité de mémoire intégrée des valeurs de calibration, on peut produire une «mesure pH précalibrée» en laboratoire dont la valeur est déposée dans la sonde. Grâce à la fermeture rapide de la sonde, on peut l'enlever facilement du lieu d'utilisation et l'y replacer avec le calibration en laboratoire. On s'évite ainsi des calibrations pénibles et dans des conditions difficiles sur le terrain – à condition de disposer d'une connexion IQ en laboratoire.

Analogique

SensoLyt® 700

L'armature standard SensoLyt® 700 comprend un préamplificateur et une sonde de température intégrés. Une technique spéciale de commutation permet de surveiller si le verre de la sonde de pH est intact. En outre, l'armature est dotée en série d'une protection efficace contre la foudre. L'armature SensoLyt® 700 peut être équipée d'électrodes de la série SensoLyt® et est compatible avec tous les transmetteurs WTW des séries EcoLine et QuadroLine®.

SensoLyt® 690

Comme SensoLyt® 700, mais sans fonction SensCheck.

SensoLyt® 650

Le nouveau modèle SensoLyt® 650 est une armature passive sans préamplificateur, c'est-à-dire conçue pour les mesures à haute impédance. L'armature est reliée directement à l'entrée haute impédance des transmetteurs WTW pH 170 et pH 296 ou Stratos 2211 X pH.

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Caractéristiques techniques Armatures SensoLyt® numériques

Modèles	**SensoLyt® 700 IQ (SW*)**
Préamplificateur intégré	Oui
Sortie de signaux	Numérique
Fonction SensCheck	Oui
Mémoire dans sonde pour stockage des données de calibration	Oui
Puissance absorbée	0,2 Watt
Mesure de la température	NTC intégré, -5 °C ... +60 °C
Conditions ambiantes	Température d'utilisation: 0 °C ... +60 °C
Raccordement électrique	Câble blindé à 2 conducteurs, avec fermeture rapide sur la sonde
Protection intégrée contre la foudre	Oui
Compatibilité électromagnétique	EN 61326 Classe B FCC Classe A, Résistance aux parasites pour un fonctionnement indispensable
Marques de conformité	CE, cETL, ETL
Mécanique	Bâti: acier spécial V4A 1.4571 Cage protectrice: PVC Logement chaîne de mesure: POM Type de protection: IP 68
Dimensions (longueur x diamètre)	508 x 40 mm SW: 515 x 59,5 mm
Poids (sans câble)	Env. 970 g SW: env. 1.800 g
Garantie	2 ans contre vice matériel conformément à l'art. 13 de nos conditions générales de vente

Références Sondes de mesure pH/Redox numériques

Sondes SensoLyt® numériques		**Références**
SensoLyt® 700 IQ	Armature pH-/Redox pour chaînes de mesure SensoLyt® SEA, DWA, ECA, PtA	109 170
SACIQ-7,0	Câble de raccordement de sondes pour toutes les sondes IQ, longueur câble 7,0 m	480 042

IP 68 CE cETLus 2 *ans de garantie

*sur l'armature

Autres longueurs de câbles, et modèles spéciaux par ex. pour eau de mer / eau saumâtre et solutions tamponnées, voir tarif

** SW : Sonde pour eau de mer (avec cage plastique (POM))*

Caractéristiques techniques Armatures SensoLyt® analogiques

Modèles	SensoLyt® 700 (SW*)	SensoLyt® 690	SensoLyt® 650
Préamplificateur intégré	Oui	Oui	Non
Sortie de signaux	De basse impédance, analogique		À haute impédance, analogique
Fonction SensCheck	Oui	Non	Non
Mémoire dans sonde pour stockage des données de calibration	—		
Puissance absorbée	—		
Mesure de la température	NTC intégré, 0 °C ... +60 °C		
Conditions ambiantes	Température d'utilisation: 0 °C ... +60 °C		
Raccordement électrique	Câble de raccordement PU intégré avec fiche vissable à 7 pôles, (IP 65)		Câble de raccordement PU à extrémités ouvertes
Protection intégrée contre la foudre	Oui		
Compatibilité électromagnétique	EN 61326 Classe B FCC Classe A		
Marques de conformité	CE		
Mécanique	Bâti: POM Cage protectrice: PVC Type de protection: IP 68		
Dimensions (longueur x diamètre)	311 x 40 mm SW: 318 x 59,5 mm		
Poids (sans câble)	Env. 320 g SW: env. 880 g		
Garantie	2 ans contre vice matériel conformément à l'art. 13 de nos conditions générales de vente		

Caractéristiques techniques Electrodes combinées SensoLyt®

Modèles	SEA/SE**	SEA-HP	DWA/DW**	ECA/EC**	PtA/Pt**
Type d'électrode	Électrolyte solide gélifié polymère, diaphragme troué double		Électrolyte modifié gélifié diaphragme céramique	Électrolyte gélifié, diaphragme troué 1fois	Électrolyte solide gélifié polymère, diaphragme troué double
Conditions de service (surpression/ température)	10 bar / 20 °C 1 bar / 60 °C 0 ... 60 °C	10 bar / 60 °C 0 ... 60 °C	6 bar / 20 °C 1 bar / 60 °C 0 ... 60 °C	6 bar / 20 °C 1 bar / 60 °C 0 ... 60 °C	10 bar / 20 °C 1 bar / 60 °C 0 ... 60 °C
Plage de mesure	2 ... 12 pH	4 ... 12 pH	0 ... 14 pH	2 ... 12 pH	±2000 mV***
Mécanique	Membrane de verre cylindre, versions avec armature de protection en PVC (SEA-HP: POM), 2 joints toriques d'étanchéité glissants à monter dans armatures SensoLyt®				
Dimensions	Longueur 120 mm (sans tête à enficher)				
Raccordement électrique	Tête des électrodes à enficher étanches à l'immersion				
Garantie	6 mois contre vice matériel conformément à l'art. 13 de nos conditions générales de vente				

Références Sondes de mesure pH/Redox analogiques

Sondes SensoLyt® analogiques		Références
SensoLyt® 700-7	Armature pH avec préamplificateur intégré, longueur câble 7 m	109 191
SensoLyt® 690-7	Comme modèle 700-7, mais sans fonction SensCheck	109 180
SensoLyt® 650-7	Armature pH avec sortie de signaux haute impédance, longueur câble 7 m (pour SensoLyt® SEA, DWA, ECA, PtA)	109 195
Sondes combinées SensoLyt®		**Références**
SensoLyt® SEA	Electrode combinée de pH, plage de mesure 2 ... 12 pH, pour montage dans armatures SensoLyt®	109 115
SensoLyt® SEA-HP	Electrode combinée de pH, plage de mesure 4 ... 12 pH, pour montage dans armatures SensoLyt®	109 118
SensoLyt® DWA	Electrode combinée de pH, plage de mesure 0 ... 14 pH, pour montage dans armatures SensoLyt®	109 119
SensoLyt® ECA	Electrode combinée de pH, plage de mesure 2 ... 12 pH, pour montage dans armatures SensoLyt®	109 117
SensoLyt® PtA	Electrode combinée Redox, plage de mesure ± 2000 mV, pour montage dans armatures SensoLyt®	109 125
SensoLyt® SE	Comme modèle SEA, mais sans armature, pour montage dans récipients à écoulement libre p.ex.	109 100
SensoLyt® DW	Comme modèle DWA, mais sans armature, pour montage dans récipients à écoulement libre p.ex	109 103
SensoLyt® EC	Comme modèle ECA, mais sans armature, pour montage dans récipients à écoulement libre p.ex.	109 102
SensoLyt® Pt	Comme modèle PtA, mais sans armature, pour montage dans récipients à écoulement libre p.ex.	105 412

IP 68 CE 2 *ans de garantie

*sur l'armature

Autres longueurs de câbles, et modèles spéciaux par ex. pour eau de mer / eau saumâtre et solutions tamponnées, voir tarif

** SW : Sonde pour eau de mer (avec cage plastique (POM))*
*** Électrodes sans armure, p. ex. pour montage dans récipients à écoulement libre*
**** en fonction du convertisseur de mesure*

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CHEMtrac Armature amovible

Depuis de nombreuses années, les armatures interchangeables CHEMtrac prouvent leur excellence pour la mesure en ligne des valeurs pH et redox dans des processus continus. Elles permettent de rentrer et sortir la sonde pendant le fonctionnement, sans interrompre celui-ci. Elles supportent très bien les surpressions élevées, et assurent les mesures de pH dans des réservoirs sous pression.



CHEMtrac 830M

- Utilisation sécurisée en cas de surpression
- Maniement simple et rapide
- Utilisable jusqu'à 16 bars et 140° C

L'armature **CHEMtrac 830M** est une armature amovible performante qui satisfait les exigences croissantes de la pratique industrielle. Elle satisfait en particulier les critères élevés de sécurité définis aujourd'hui envers les armatures de procédé et est caractérisée par une technologie tournée vers l'avenir. Combinée aux convertisseurs de mesure WTW, l'armature amovible CHEMtrac forme un système de mesure du pH intégré et flexible pour une multitude d'applications industrielles.

L'armature CHEMtrac 830M convient pour les situations suivantes :

- Montage en conduites rigides ou réservoirs sous pression
- Milieu de mesure entièrement isolé de l'environnement
- Electrode résistant à la pression avec électrolyte polymère

L'armature amovible manuelle CHEMtrac 830M est disponible en acier fin robuste : toutes les parties en contact avec les milieux sont en acier inoxydable 1.4404/316 L. Cette armature peut ainsi être utilisée jusqu'à 16 bar de pression et 140 °C de température.

Électrodes combinées de pH/Redox ProcessLine



L'armature amovible CHEMtrac 830 M est prévue pour des électrodes combinées à une tige ProcessLine. La structure particulière de ces électrodes leur confère une précision, une stabilité, une rapidité et une durabilité remarquables, très proches de celles des électrodes à électrolyte liquide :

- Entretien minimal : pas de remplissage répété d'électrolyte ni d'installation de régulations de pression en cascade compliquées.
- Diaphragmes troués évitant l'encrassement et le blocage de l'électrode de référence.
- Électrolyte Duralid à haute teneur en KCl et aux caractéristiques spéciales : le garant d'une grande durabilité et de résultats de mesure rapides et stables.
- Verre de membrane éprouvé (verre H) à très faible erreur alcaline et forme sphérique optimisée.
- Large champ d'applications dans des milieux présentant une force ionique extrêmement élevée, des propriétés très oxydantes ou une forte teneur en base ou en acide, ou dans des solvants.

Les électrodes ProcessLine requièrent ainsi moins d'entretien et permettent des économies substantielles. Ces qualités en font les électrodes de choix pour les processus les plus rudes, notamment dans l'industrie chimique.

Compatibilité de système

À l'aide des câbles appropriés, les électrodes combinées de pH peuvent être directement connectées à l'entrée haute impédance des transmetteurs pH 170 et pH 296 ainsi que de l'IQ Sensor Net. On a besoin de l'adaptateur ADA/pH 171 pour le raccordement au transmetteur pH 171 (pas avec InPro 4200). Lorsque la distance qui sépare le point de mesure et le transmetteur est plutôt grande, il convient alors d'intercaler le boîtier KI/pH 170 ou KI/pH-MIQ/S à préamplificateur intégré. On garantit ainsi la transmission à basse impédance et sans brouillage du signal au transmetteur (sauf en combinaison avec InPro 4200).

Le boîtier permet aussi de brancher une sonde de température dans le cas où une compensation automatique de la température est nécessaire.

Caractéristiques techniques Electrode combinée de pH/Redox ProcessLine

	PL 80-225pH	PL 81-225pHT VP	PL 82-225pHT VP	PL 89-225Pt
Plage de mesure	pH 0 ... 14	pH 0 ... 14	pH 0 ... 14	pH 0 ... 14
Plage de température	0 °C ... 130 °C	0 °C ... 130 °C	0 °C ... 130 °C	0 °C ... 130 °C
Système de référence	Électrolyte polymère Duralid, entretien minimal, système Ag/AgCl			
Résistance à la pression	12 bar dans toute la plage de température			
Diaphragme	Diaphragme troué double			
Diamètre du corps	12 mm			
Longueur utile du corps	225 mm			
Sonde de température	–	Pt 1000	Pt 100	–
Connexion	Tête enfichable S7, PG 13.5	Fiche VP	Fiche VP	Tête enfichable S7, PG 13.5
Garantie	6 mois contre vice matériel conformément à l'art. 13 de nos conditions générales de vente			

Caractéristiques techniques armature amovible CHEMtrac 830 M

Description	Armature manuelle amovible, matériau : acier inoxydable (1.4404/316L), adaptée à tous les types de sonde de Ø12/225 mm à filetage PG 13.5
Profondeur d'immersion	107 mm max.
Résistance	12 bar, 140 °C
Raccordements à la chambre de rinçage	G 1/8"
Garantie	1 an contre vice matériel conformément à l'art. 13 de nos conditions générales de vente

Références

Armature interchangeable CHEMtrac		**Références**
CHEMtrac 830 M	Armature manuelle amovible en inox (1.4404/316L) pour le montage/le remplacement/l'entretien des électrodes combinées de pH/Redox sans interruption de service	109 237
Électrodes combinées de pH/Redox		**Références**
PL 80-225pH	Électrode combinée de pH pour CHEMtrac 830 M, tête enfichable S7	109 234
PL 81-225pHT VP	Électrode combinée de pH pour CHEMtrac 830 M, fiche VP, Pt 1000	109 236
PL 82-225pHT VP	Électrode combinée de pH pour CHEMtrac 830 M, fiche VP, Pt 100	109 239
PL 89-225Pt	Électrode combinée de Redox pour CHEMtrac 830 M, tête enfichable S7	109 235

Câbles de raccordement et accessoires, voir tarif

Aperçu de la configuration mesure numérique de pH/Redox

			IQ Sensor Net **Système 2020 XT/182**
Numérique	**SensoLyt® 700 IQ** avec préamplificateur intégré, mesure de la température intégrée 0 … 60 °C, SensorCheck et mémoire des valeurs de calibration	Electrodes intégrables: SEA: 2 … 12 pH SEA-HP: 4 … 12 pH DWA: 0 … 14 pH ECA: 2 … 12 pH PtA: ±2000 mV 0 … 60 °C	• transmission numérique des signaux • SensCheck • mesure pH/Redox dans eaux usées très polluées (collectivités / industrielles) (SEA) • mesure pH dans eaux usées normalement polluées (collectivités / industrielles) (ECA) • mesure pH dans eau potable (DWA) • mesure Redox dans eaux usées très polluées (collectivités / industrielles) (PtA) • installation en ligne (SEA ou SEA-HP)
Analogique			Boîtier de connexion pour le raccordement de l'armature analogique ChemTrac 830 M à l'IQ Sensor Net :
	CHEMtrac 830 M pH/Redox armature pH interchangeable avec connexion pour épuration et calibration; réalisation VA 1.4404/316L: 16 bars / 140 °C	Electrodes intégrables: PL 80-225pH 0 … 14 pH, 0 … 130 °C PL 81-225pHT VP 0 … 14 pH, 0 … 130 °C PL 82-225pHT VP 0 … 14 pH, 0 … 130 °C PL 89-225pt 0 … 14 pH, 0 … 130 °C	KI/pH-MIQ/S 505 544

— Configuration impossible

Mesure analogique de pH/Redox



Guide de configuration des sondes analogiques de pH/Redox voir **page 99**

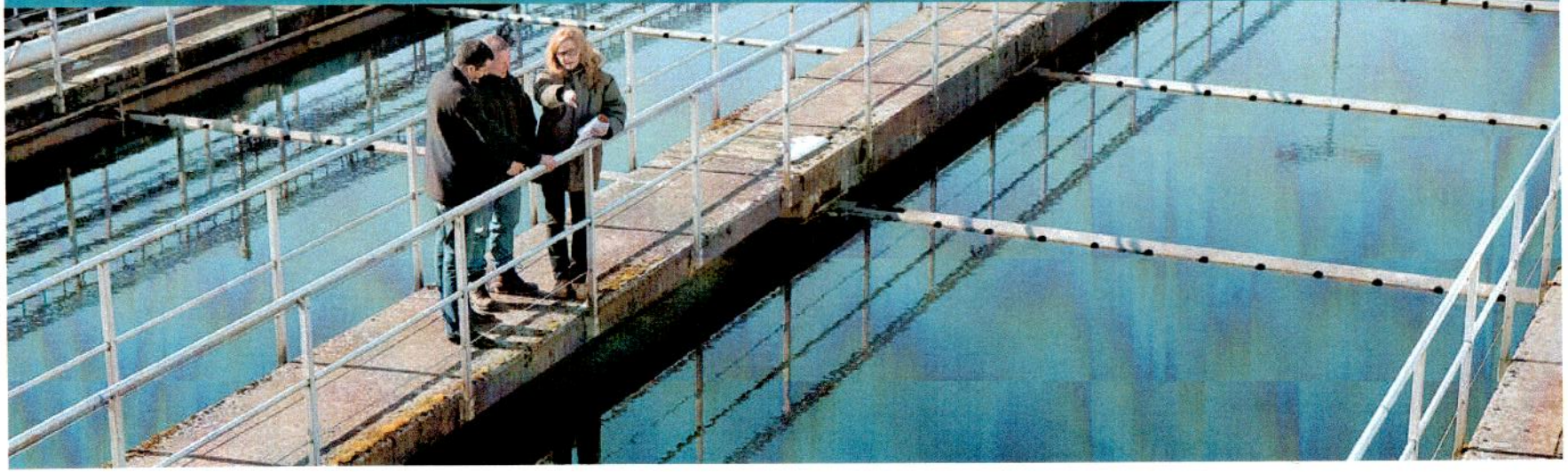
April 18, 2012

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IQ SensorNet

Mounting Options

Mark Vuksan – Regional Sales Manager

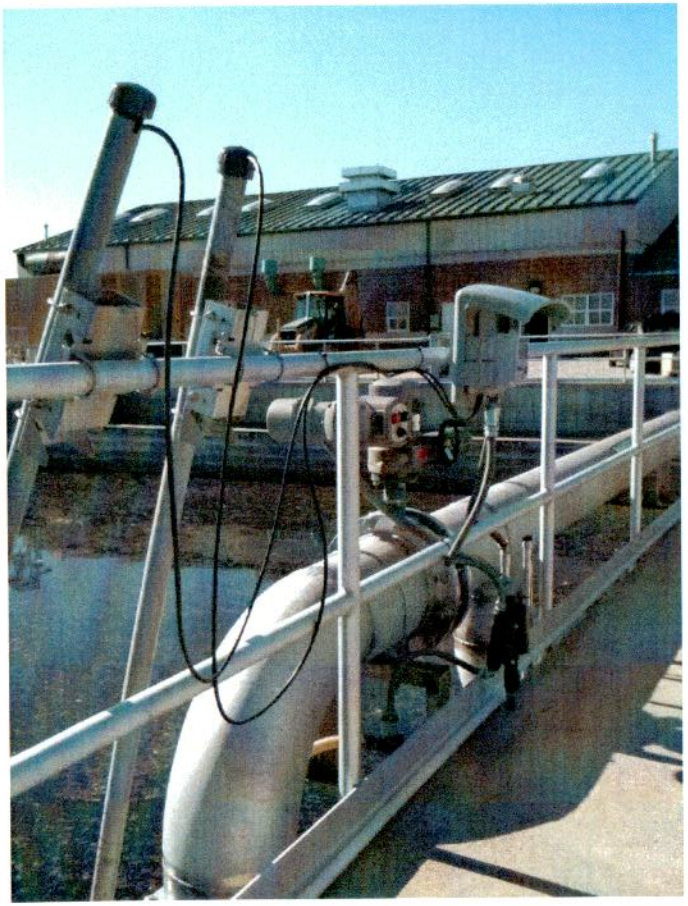


Module Mounting Options



109295Y	SSH/IQ	IQ Sun Shield, Plastic, For 182 & 2020 installations
109286Y	MR/SD 170	Pipe mounting kit for SD/M 170 sun shields(dia. 25-60 mm)

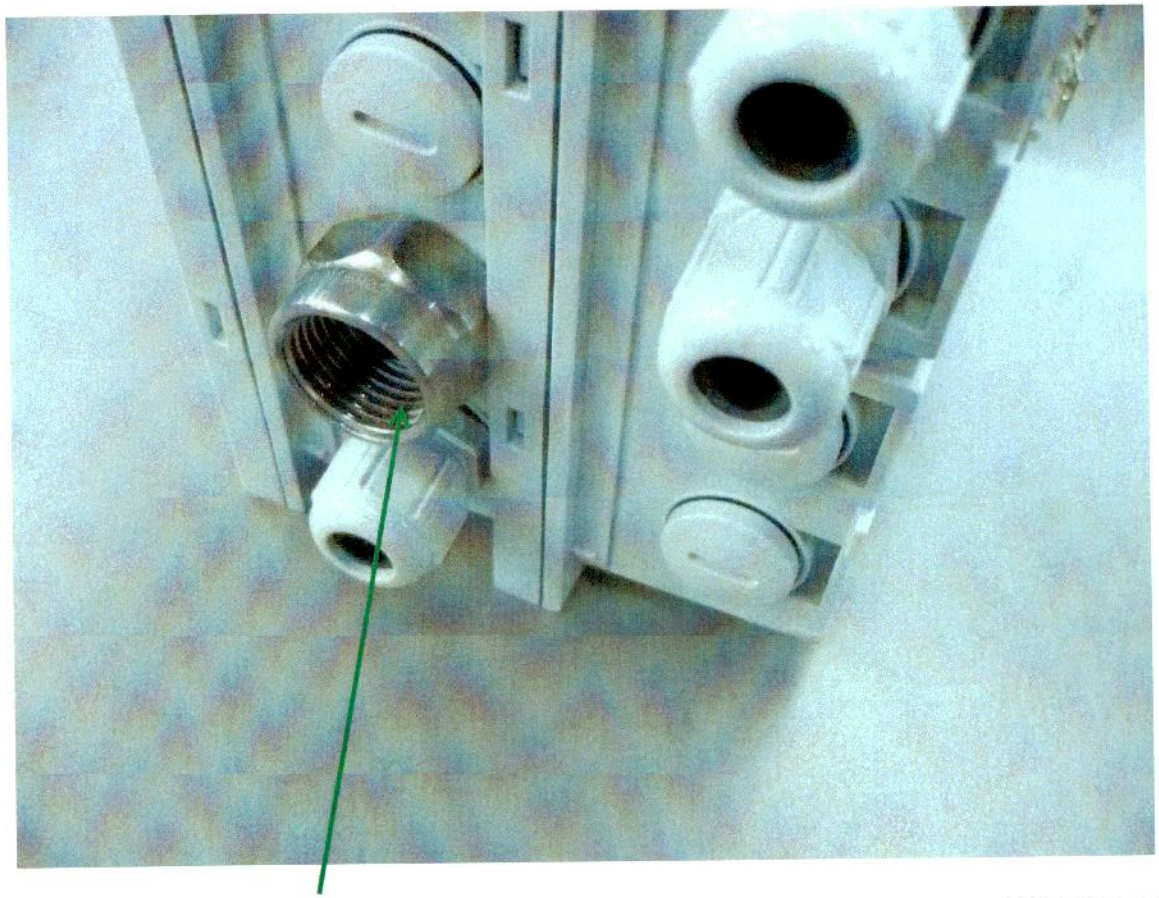
Module Mounting Options





109295Y	SSH/IQ	IQ Sun Shield, Plastic, For 182 & 2020 installations
109286Y	MR/SD 170	Pipe mounting kit for SD/M 170 sun shields(dia. 25-60 mm)

Stainless Steel Conduit Adaptor



480053USY Adapter, Conduit, Stainless Steel Metric M16 male to 1/2" NPT female

Module Mounting Options

Tools

- 4 mm set screw wrench
- Phillips screw driver.

Mounting the sun shield on a mounting stand

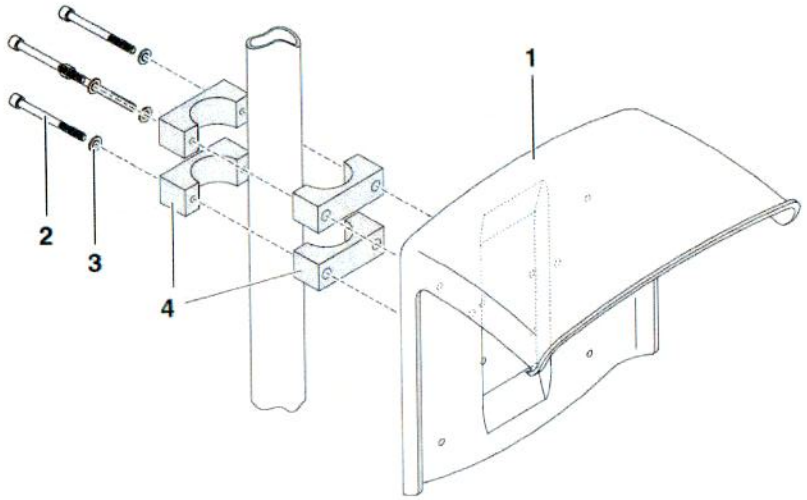


Fig. 3-17 Mounting the SSH/IQ sun shield on a mounting stand

1	Screw the sun shield (pos. 1 in Fig. 3-17) with the four hexsoket head screws (pos. 2), the washers (pos. 3) and the clamps (pos. 4) at the required height on the mounting stand from the back.

109295Y	SSH/IQ	IQ Sun Shield, Plastic, For 182 & 2020 installations
109286Y	MR/SD 170	Pipe mounting kit for SD/M 170 sun shields(dia. 25-60 mm)

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Module Mounting Options



109284Y	SD/K 170	Sun shield for outdoor installation of junction boxes
109286Y	MR/SD 170	Pipe mounting kit for SD/M 170 sun shields(dia. 25-60 mm)

Module Mounting Options

Mounting the MIQ module on a panel

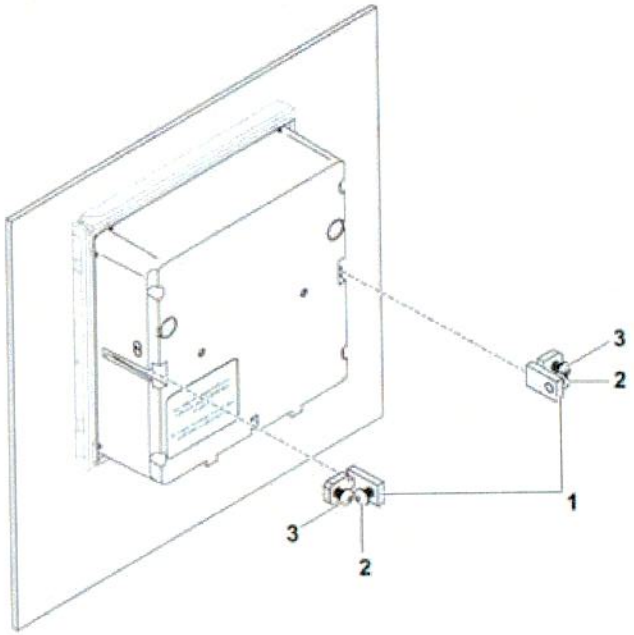


Fig 3-23 Mounting the MIQ module on a panel



480048Y PMS/IQ Panel Mount Kit for IQ Modules

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Module Mounting Options

Mounting the MIQ module on a top hat rail

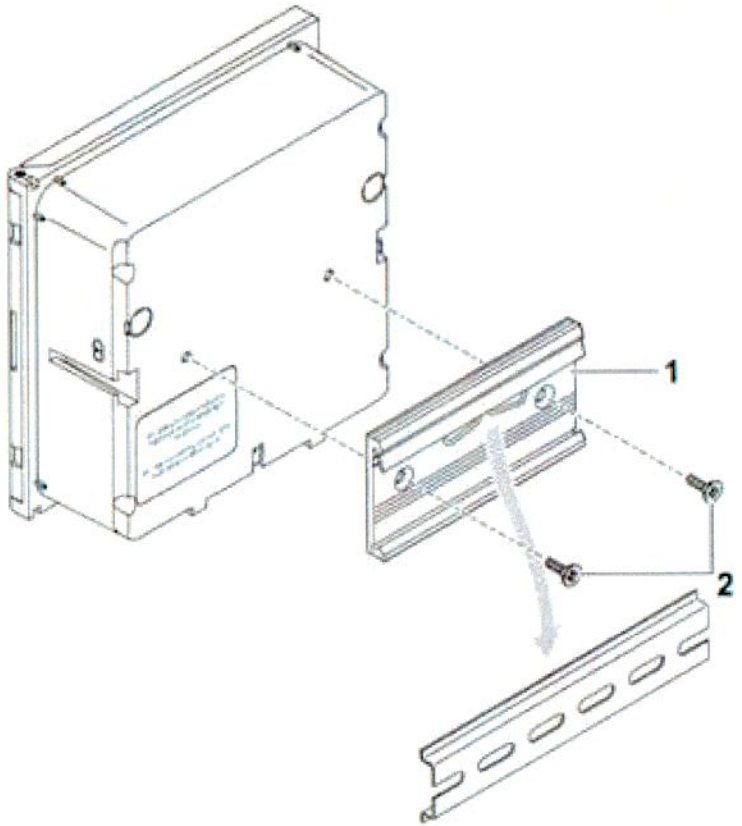
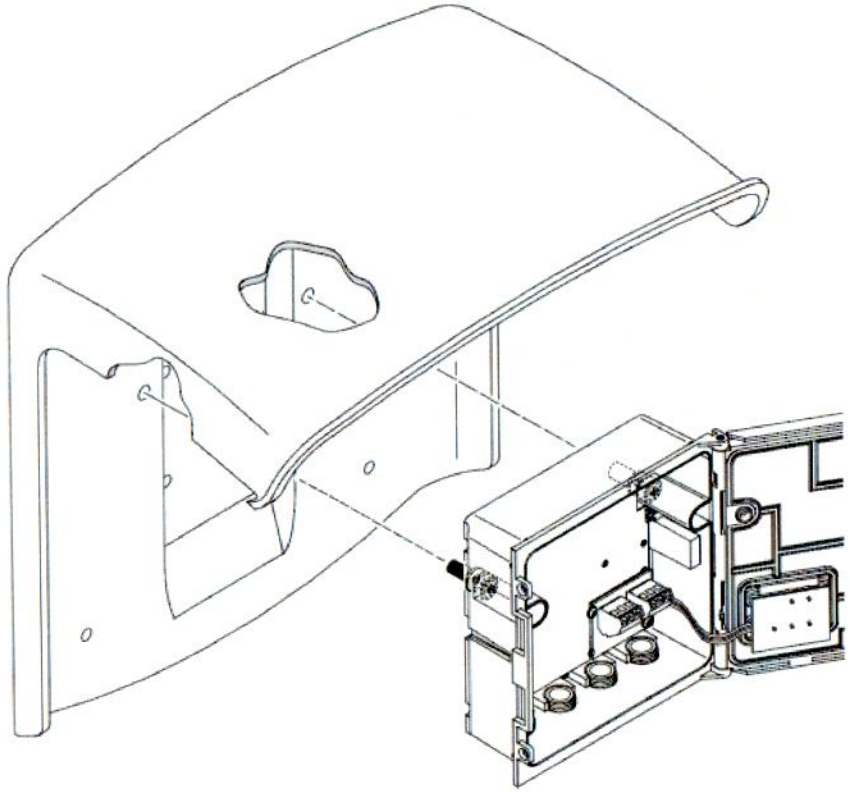


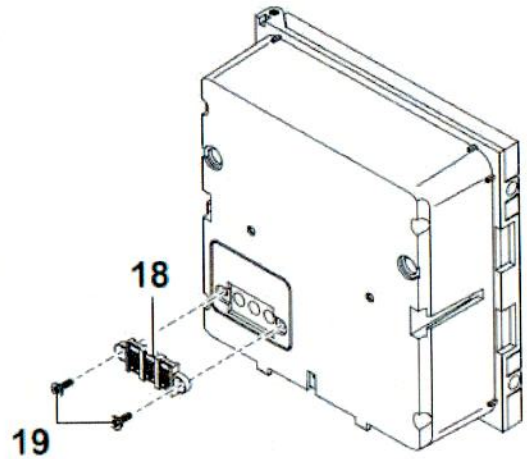
Fig. 3-24 Mounting the MIQ module on a top hat rail

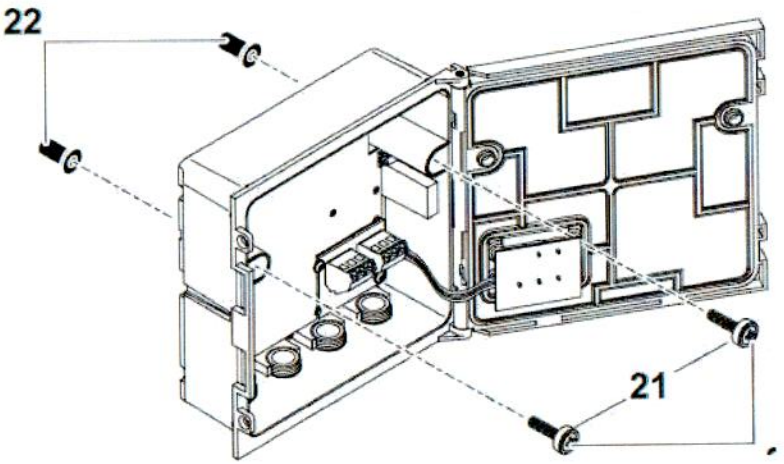
480050Y THS/IQ Top Hat Rail Mounting for IQ Modules (Din Rail Mounting System)

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How To Stack Modules

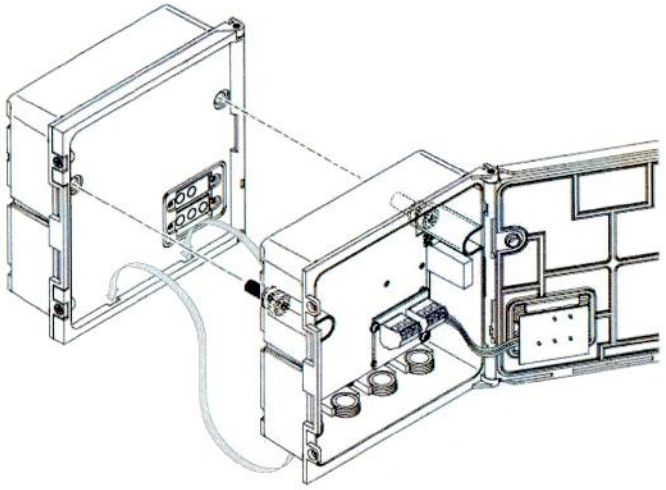


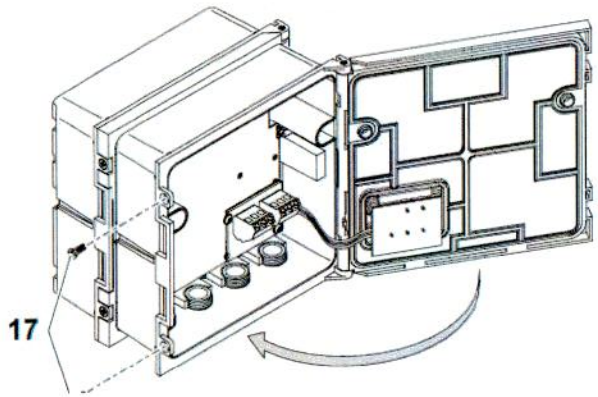


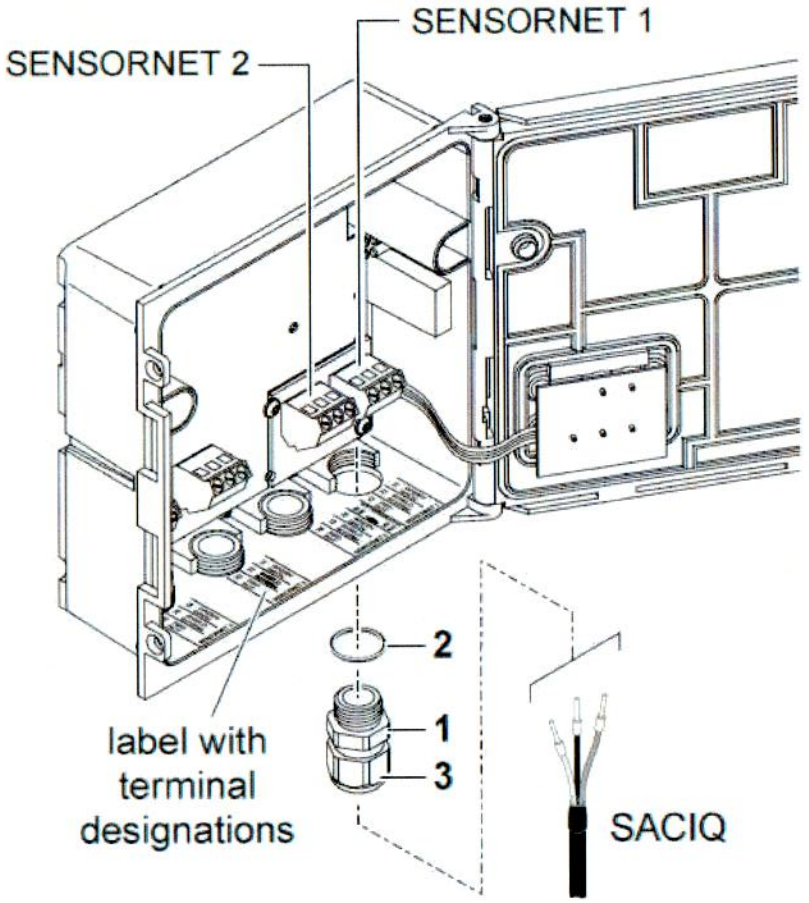


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How To Stack Modules







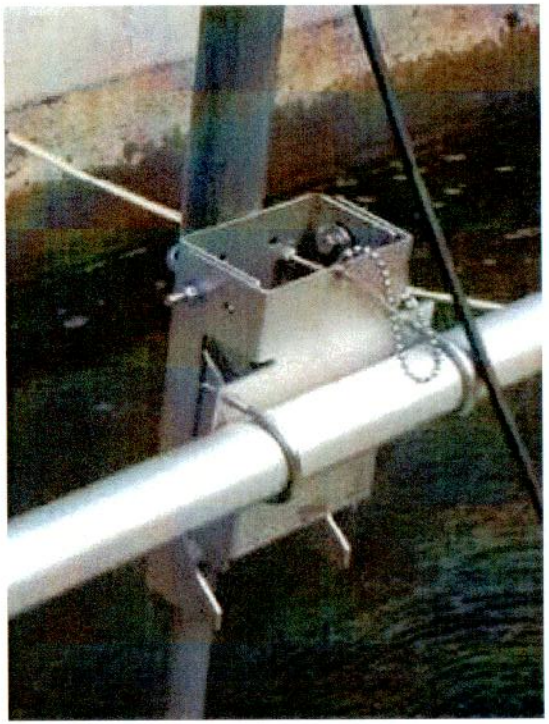
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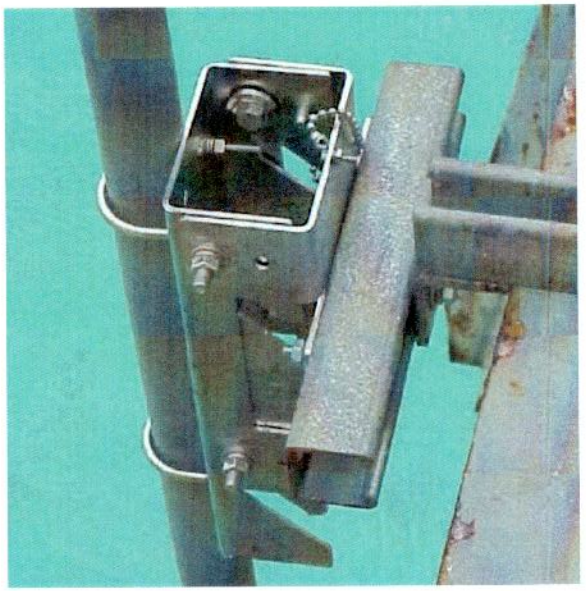
Sensor Mounting Options



Sensor Mounting Options



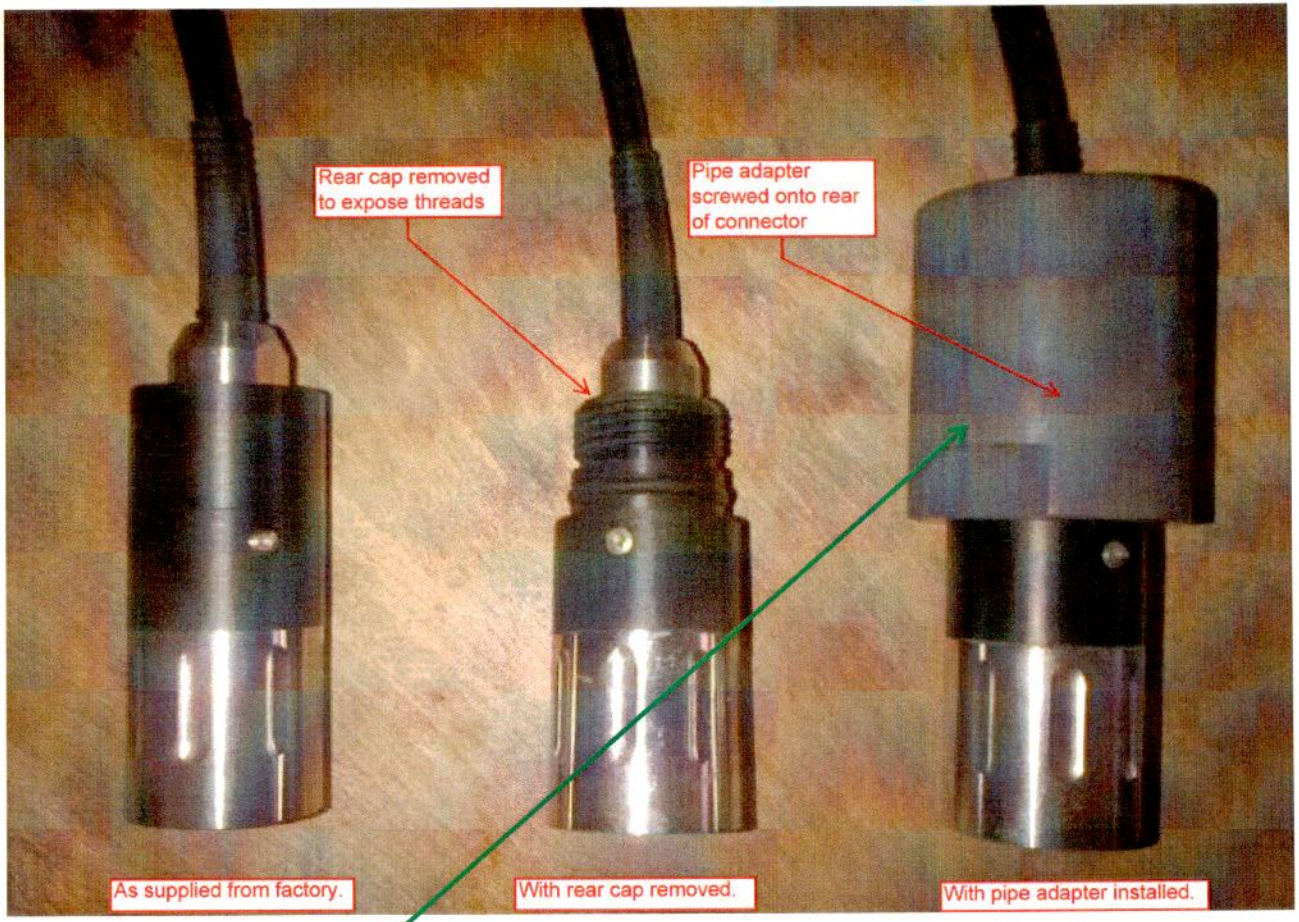




2458000Y SMK Quick Release Stainless Steel Handrail Mounting Bracket & 1 1/2" Sensor Adaptor

Customer supplies 1-1/2" PVC pipe

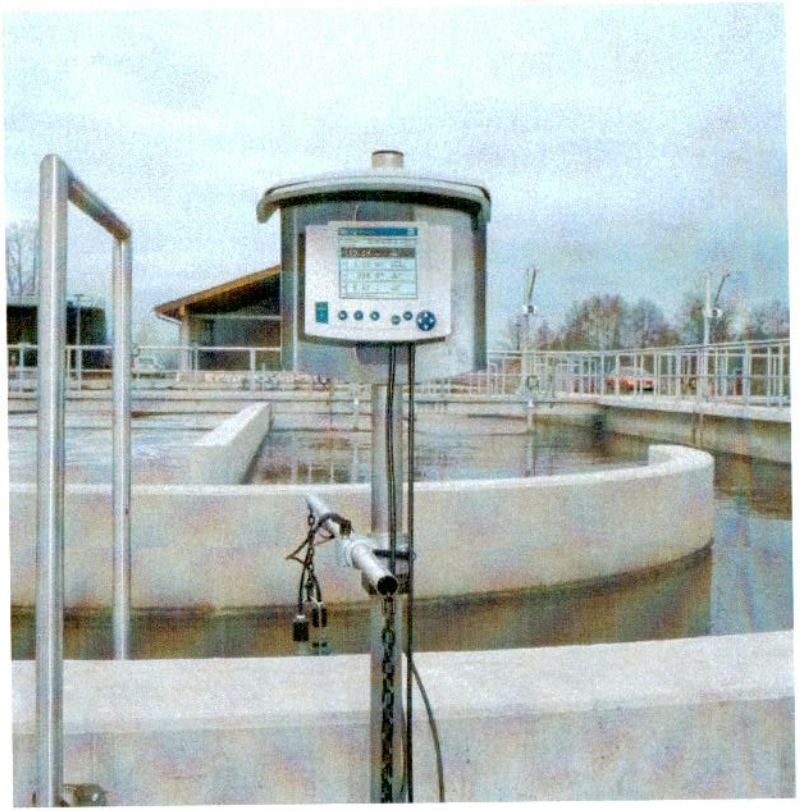
Sensor Coupling



559327-2Y Sensor coupling for SACIQ sensor cable to 1 1/2" SCH 80 PVC pipe

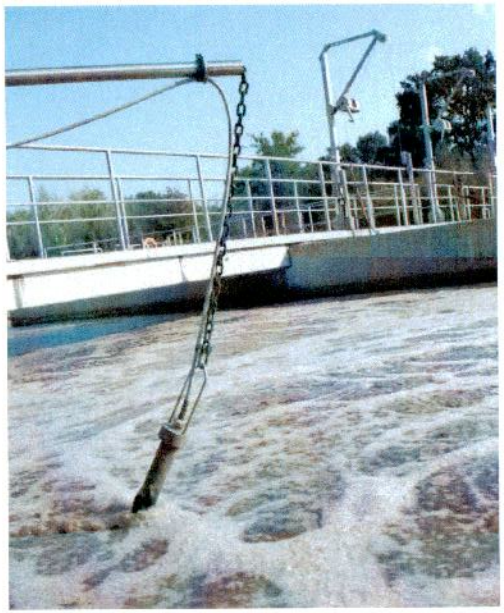
This component is part of SMK kit (prior page)

Combo Mounting Options



109304Y	IN/SET1	Installation set for mounting of one on-line sensor. Supplied with: Single sensor holder EH/U 170; SensoClean swing mounting EH/F 170-1,5; Vario floor mounting BE/ST 170; Sun shield SSH/IQ
109305Y	IN/SET2	Installation set for mounting of two on-line sensors. Supplied with: Single sensor holder EH/U 170;Se...an swing mounting EH/F 170-1,5; Vario floor mounting BE/ST 170; Sun shield SSH/IQ
109306Y	IN/SET3	Installation set for mounting of three on-line sensors. Supplied w/: Single sensor holder EH/U 170;SensoClean swing mounting EH/F 170-1,5; Vario floor mounting BE/ST 170; Sun shield SSH/IQ

Sensor Mounting Options



You need:

109320Y EH/U 170 Single sensor holder (European Style Mounting)

Plus choose one of these:

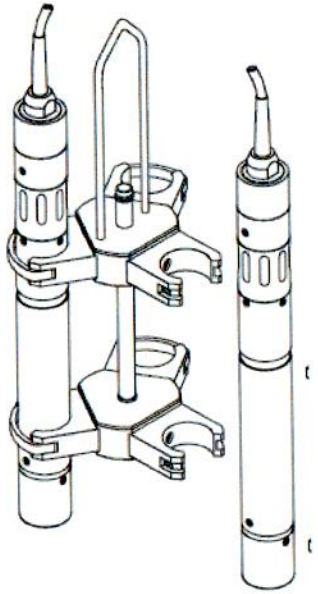
109272Y EH/F 170-1,5 SensoClean Swing mounting assembly, boom length 1.5 m
109273Y EH/F 170-2,5 SensoClean Swing mounting assembly, boom length 2.5 m

Plus choose one of these:

109 278Y BE/R 170 Pipe mounting of boom or pendulum, no pivot
109 279Y BE/R 170-D Pipe mounting of boom or pendulum, with pivot

Sensor Mounting Options





Choose one of the following:

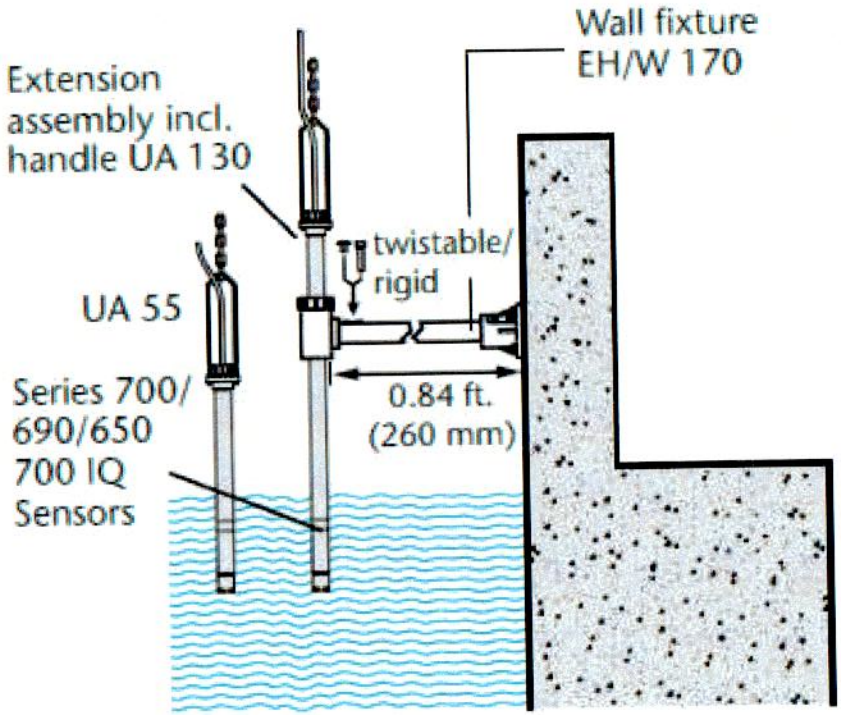
109323Y EH2/U 170	Twin sensor holder (European Style Mounting)
109325Y EH3/U 170	Triple sensor holder (European Style Mounting)

Plus the mounting Assembly:

109281Y BE/ST 170-R	Vario pipe mounting stand, complete set

Measurements in Basins or in Open Channels

Wall mounting
for universal extension assemblies UA 55/ UA 130

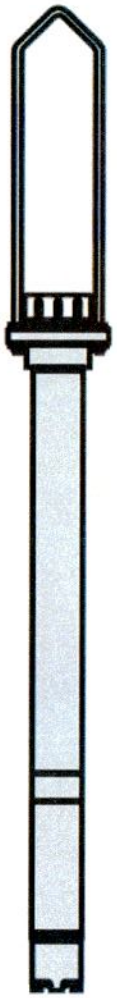


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Installation Accessories

EH/U 170
Artikel-Nr. 109 320

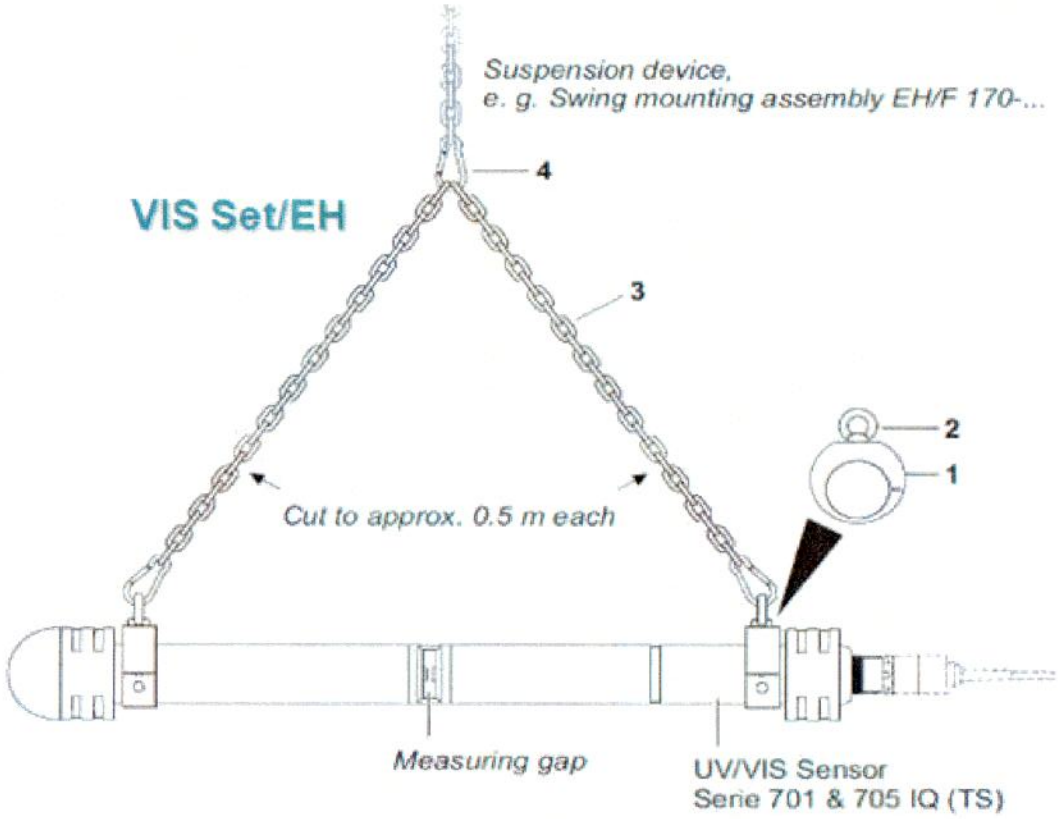




UA 55
UA 1
UA-S

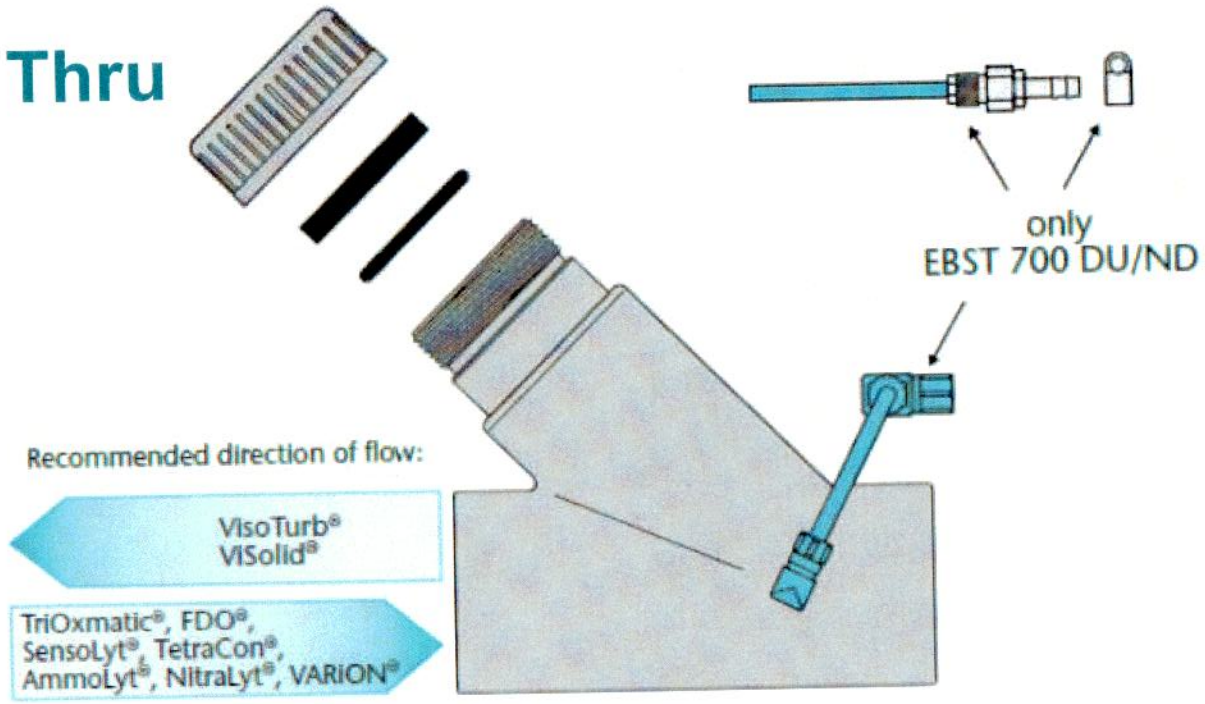
Description	Model	Order no.
Mounting set for horizontal installation with EH/F 170 swing mounting assembly	VIS Set/EH	481 073

VIS Set/EH



2" PVC Flow Thru

Requires 2 components



Cell

Pressure	Self Clean	Model
0.2 bar @ 50C	Yes	EBST 700-DU/ND-US
3 bar @ 50C	No	EBST 700-DU/N-US

Sensor Adapter

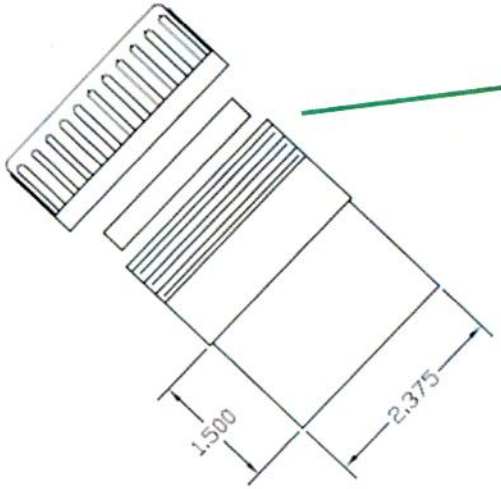
Sensor	Flow Thru Vessels	
	EBST 700-DU/N	EBST 700-DU/ND
FDO	ADA-DF15	x
SensoLyt	ADA-DF9	x
TetraCon	ADA-DF9	x
TriOxmatic 700 701	ADA-DF9	x
VARiON	ADA-DF9	ADA-DF9
ViSolid	ADA-DF9	ADA-DF9
VisoTurb	ADA-DF9	ADA-DF9

	Recommended
	Check Sensor Specs
x	Not intended

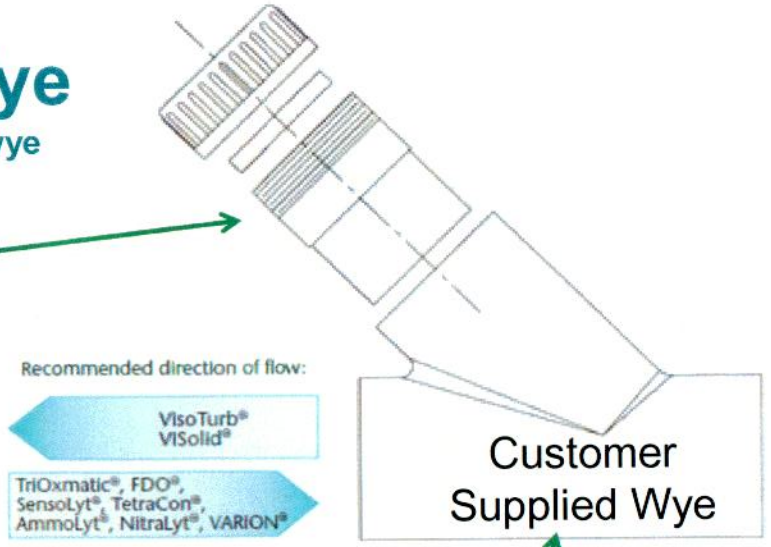
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Flow Thru Bushing for Wye

Requires 2 components and one customer supplied wye



2" Bushing



Pressure	Self Clean	Model
3 bar @ 50C	No	EBS 700-DU/N-US

Sensor Adapter

Sensor	Flow Thru Vessels	
	EBST 700-DU/N	EBST 700-DU/ND
FDO	ADA-DF15	x
SensoLyt	ADA-DF9	x
TetraCon	ADA-DF9	x
TriOxmatic 700 701	ADA-DF9	x
VARiON	ADA-DF9	ADA-DF9
ViSolid	ADA-DF9	ADA-DF9
VisoTurb	ADA-DF9	ADA-DF9

Spears p/n Schd 40	Spears p/n Schd 80	Wye Size
475-020	875-020	**2X2**
475-338[1]	875-338[1]	**3X2**
475-420	875-420F*	**4X2**
475-528[1]	875-528F*	**6X2**
475-578F*	875-578F*	**8X2**
475-621F*	875-621F*	**10X2**
475-661F*	875-661F*	**12X2**

[1] Sized with Bushing

* Fiberglass reinforced

Above data from SpearsMfg.com

	Recommended
	Check Sensor Specs
x	Not intended

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Retractable

Requires 3 components

Pressure	Self Clean	Model
2 bar @ 60C	No	WA 700/2
10 bar @ 60C	No	WA 700/10

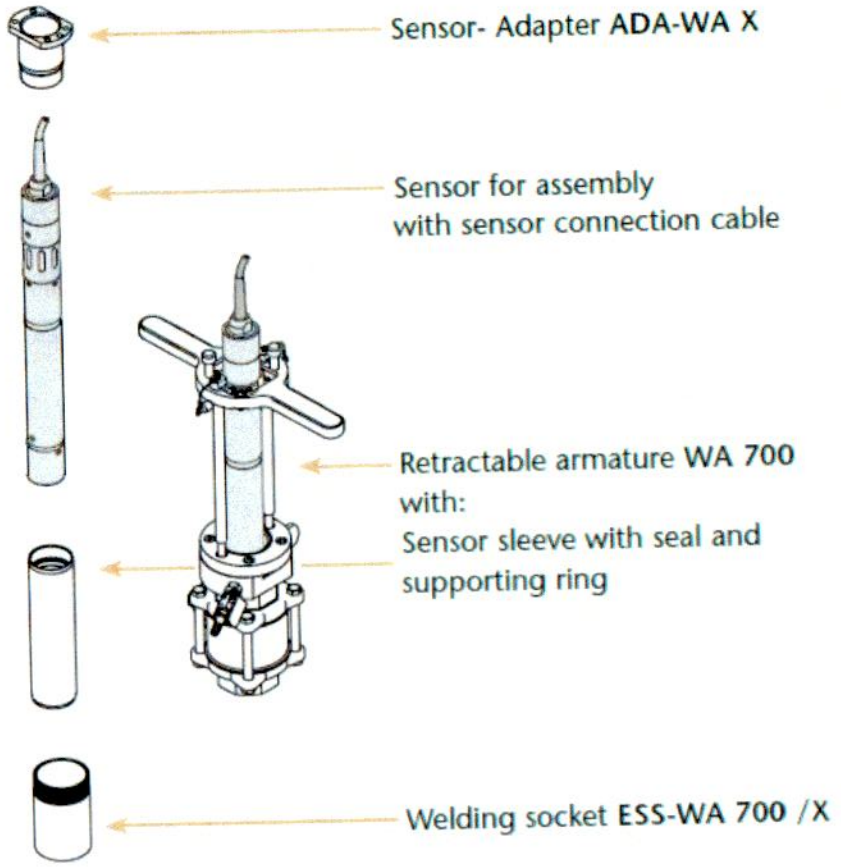
Cell

Sensor	Flow Thru Vessels	
	WA 700/2	WA 700/10
FDO	ADA-WA4	ADA-WA4
SensoLyt	ADA-WA1	ADA-WA1
TetraCon	ADA-WA1	ADA-WA1
TriOxmatic 700 701	ADA-WA1	ADA-WA1
VARiON	x	x
ViSolid	ADA-WA1	ADA-WA1
VisoTurb	ADA-WA1	ADA-WA1

Sensor Adapter

ESS-WA 700/ST	Steel welding socket
ESS-WA 700/VA	Stainless steel welding socket

Socket

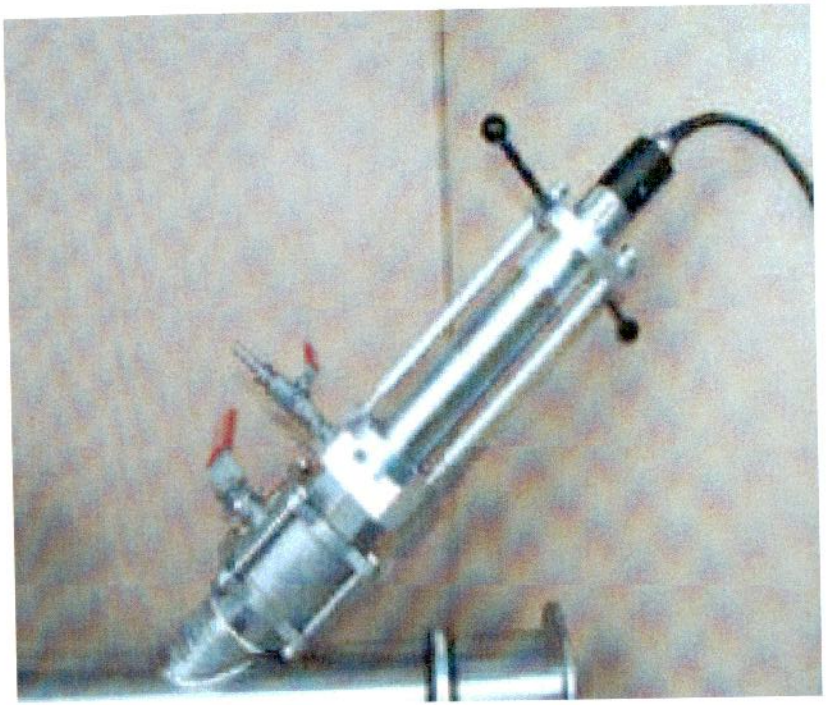


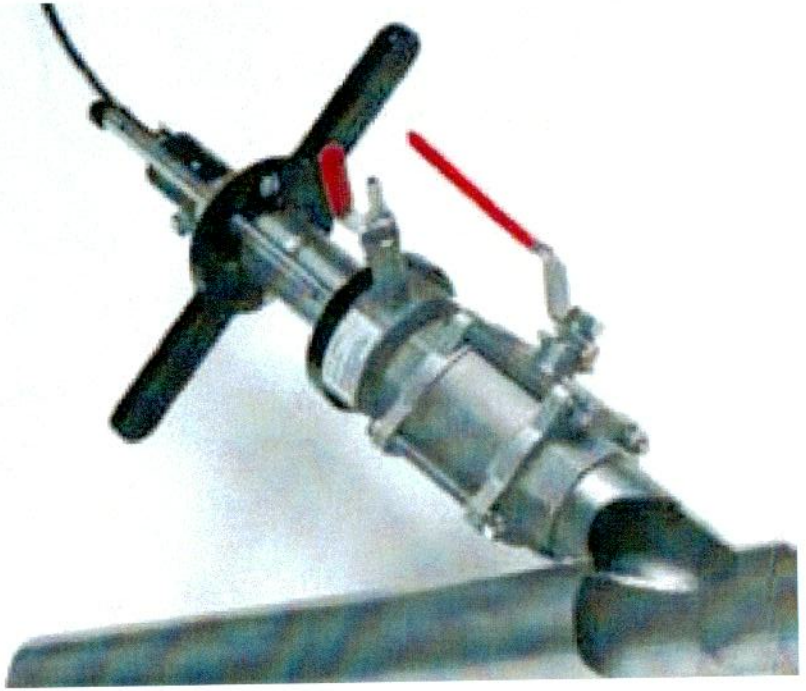


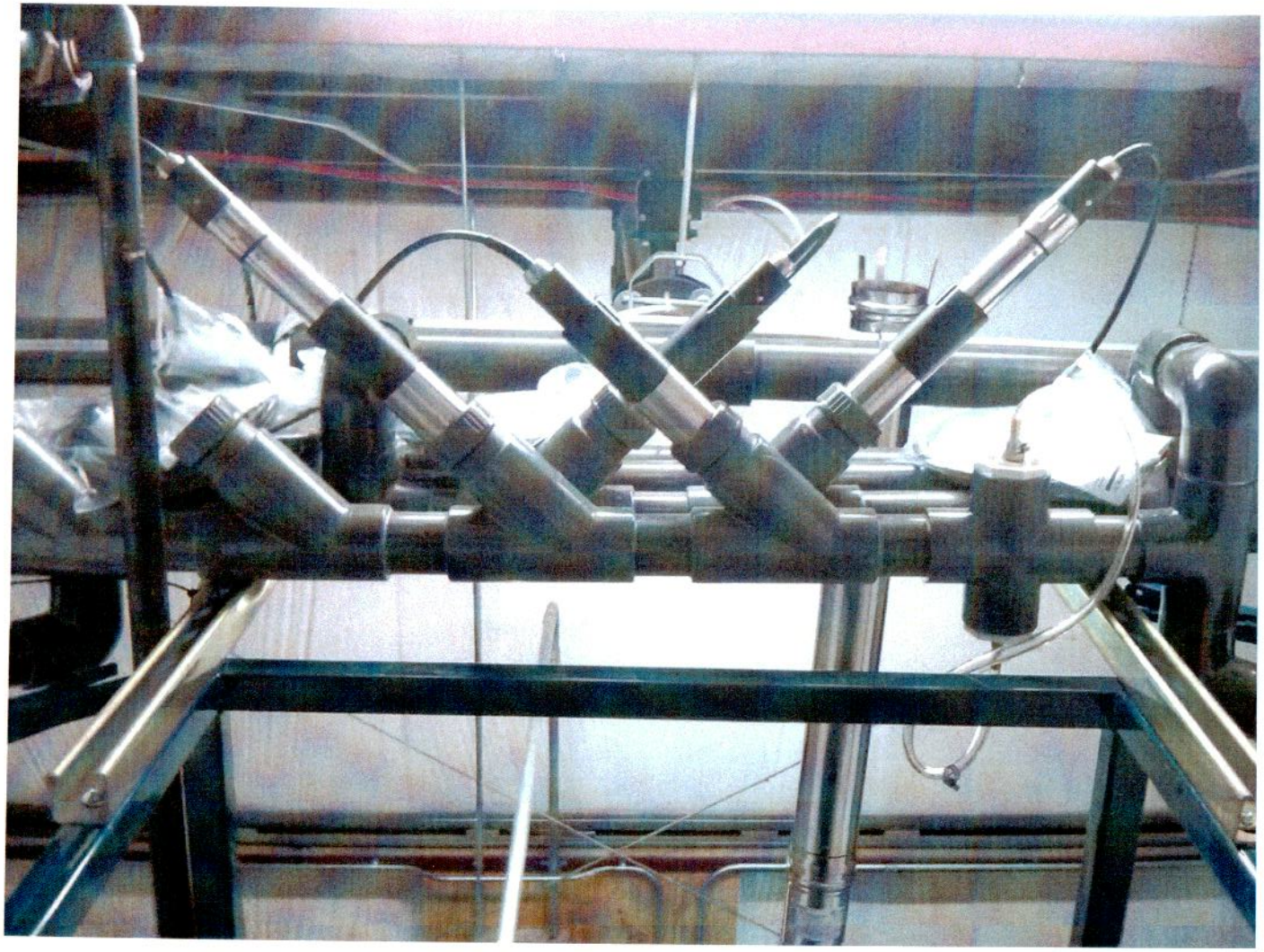
	Recommended
	Check Sensor Specs
x	Not intended

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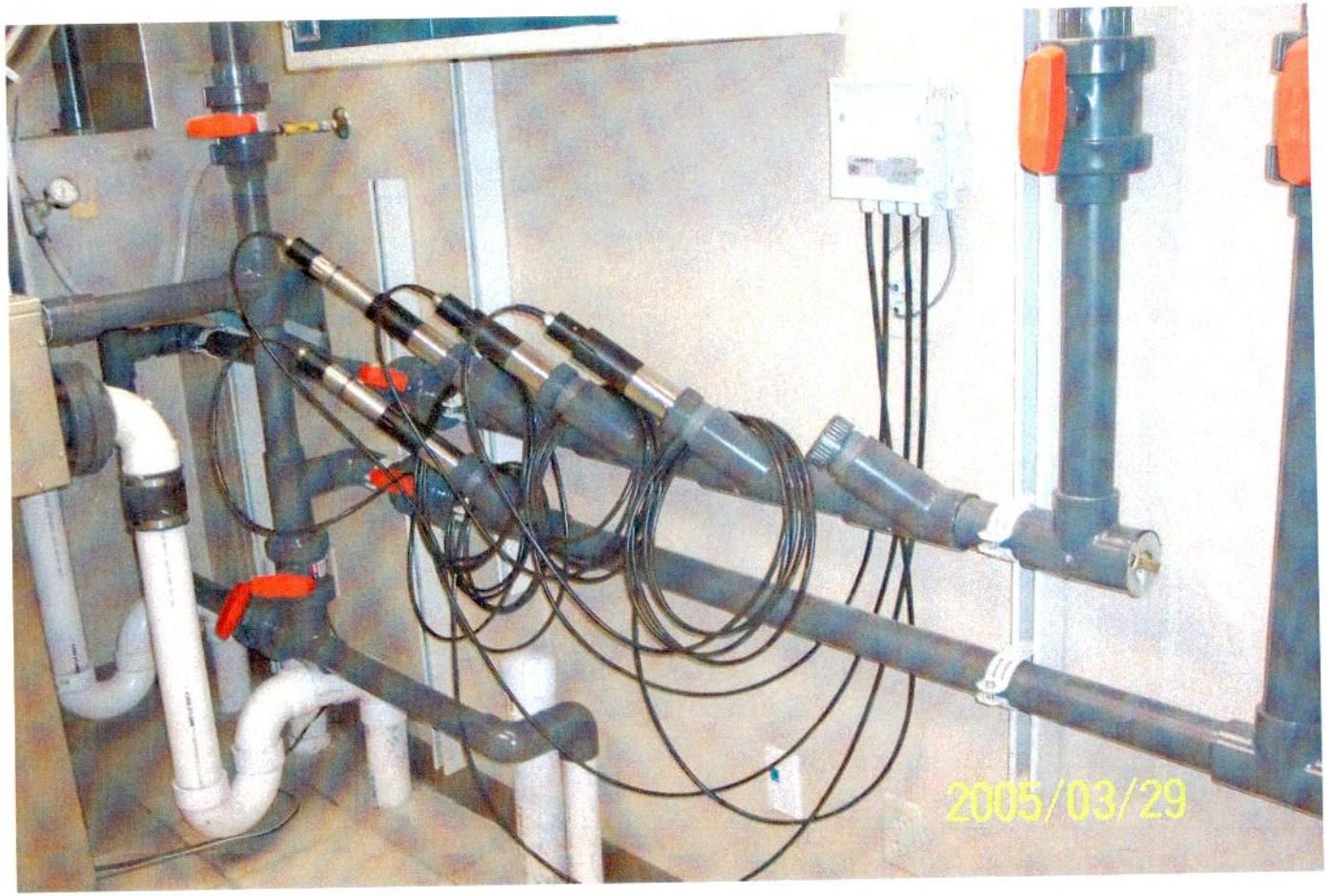
Pipe Insertion Mounting Options







Sensor Mounting Options



Weld In

Requires 2 components

Cell

Pressure	Self Clean	Model
3 bar @ 50C	No	ESS 700-VA/N
10 bar @ 60C	No	ESS 700-VA/10

Sensor Adapter

Sensor	Flow Thru Vessels	
	ESS 700 VA/N	ESS 700 VA/10
FDO	ADA-DF15	ADA-DF11
SensoLyt	ADA-DF9	ADA-DF11
TetraCon	ADA-DF9	ADA-DF11
TriOxmatic 700 701	ADA-DF9	ADA-DF11
VARiON	x	x
ViSolid	ADA-DF9	ADA-DF11
VisoTurb	ADA-DF9	ADA-DF11



ESS 700 VA/10

	Recommended
	Check Sensor Specs
x	Not intended

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Flow Cell, Single Sensor

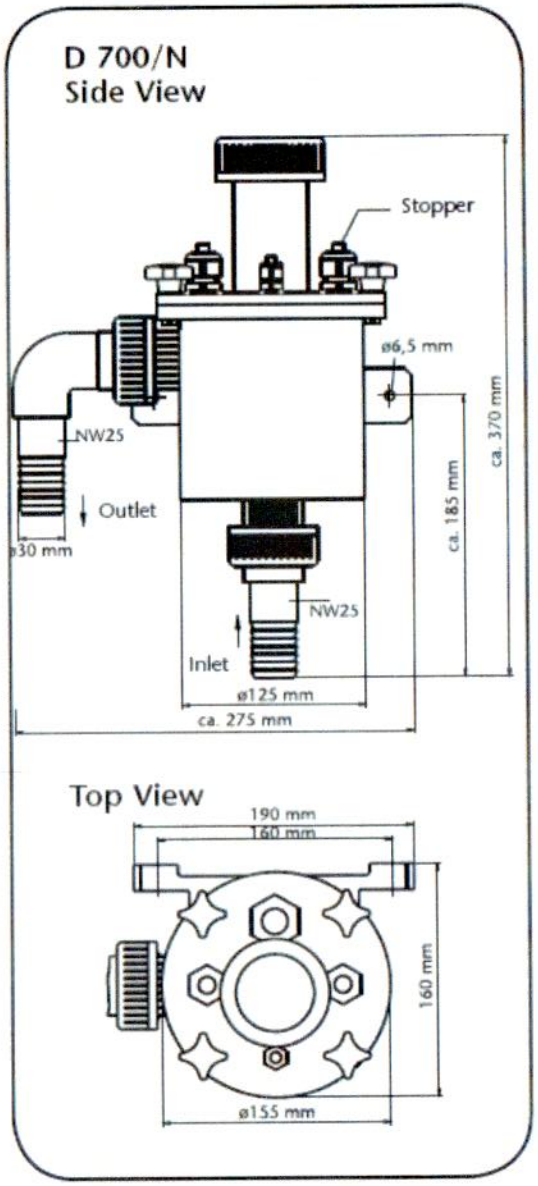
Requires 2 Components

Pressure	Self Clean	Model
1 bar @ 50C	No	D 700/N

Cell

Sensor	Flow Thru Vessels D 700/N
FDO	ADA-DF14
SensoLyt	ADA-DF1
TetraCon	ADA-DF1
TriOxmatic 700 701	ADA-DF1
VARiON	ADA-DF1
ViSolid	x
VisoTurb	x

Sensor Adapter



	Recommended
	Check Sensor Specs
x	Not intended

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Flow Cell, Quad Sensor

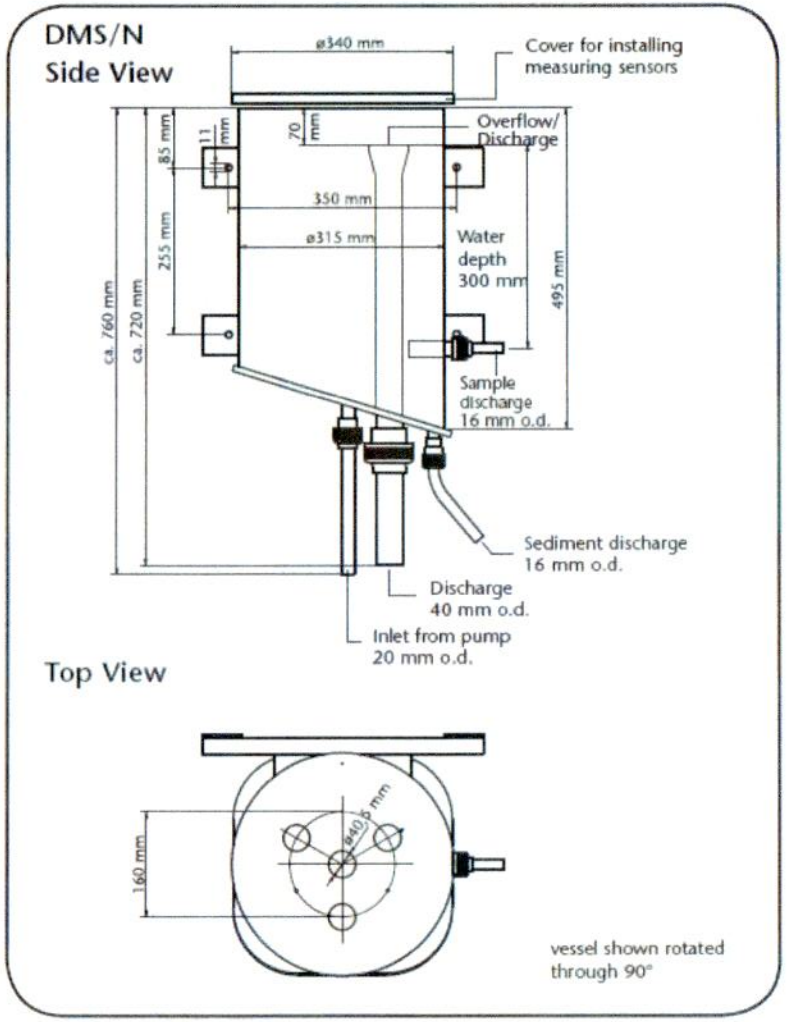
Requires 2 Components

Pressure	Self Clean	Model
1 bar @ 50C	No	DMS/N

Cell

Sensor	Flow Thru Vessels DMS/N
FDO	ADA-DF1
SensoLyt	ADA-DF1
TetraCon	ADA-DF1
TriOxmatic 700 701	ADA-DF1
VARiON	ADA-DF1
ViSolid	ADA-DF7
VisoTurb	ADA-DF7

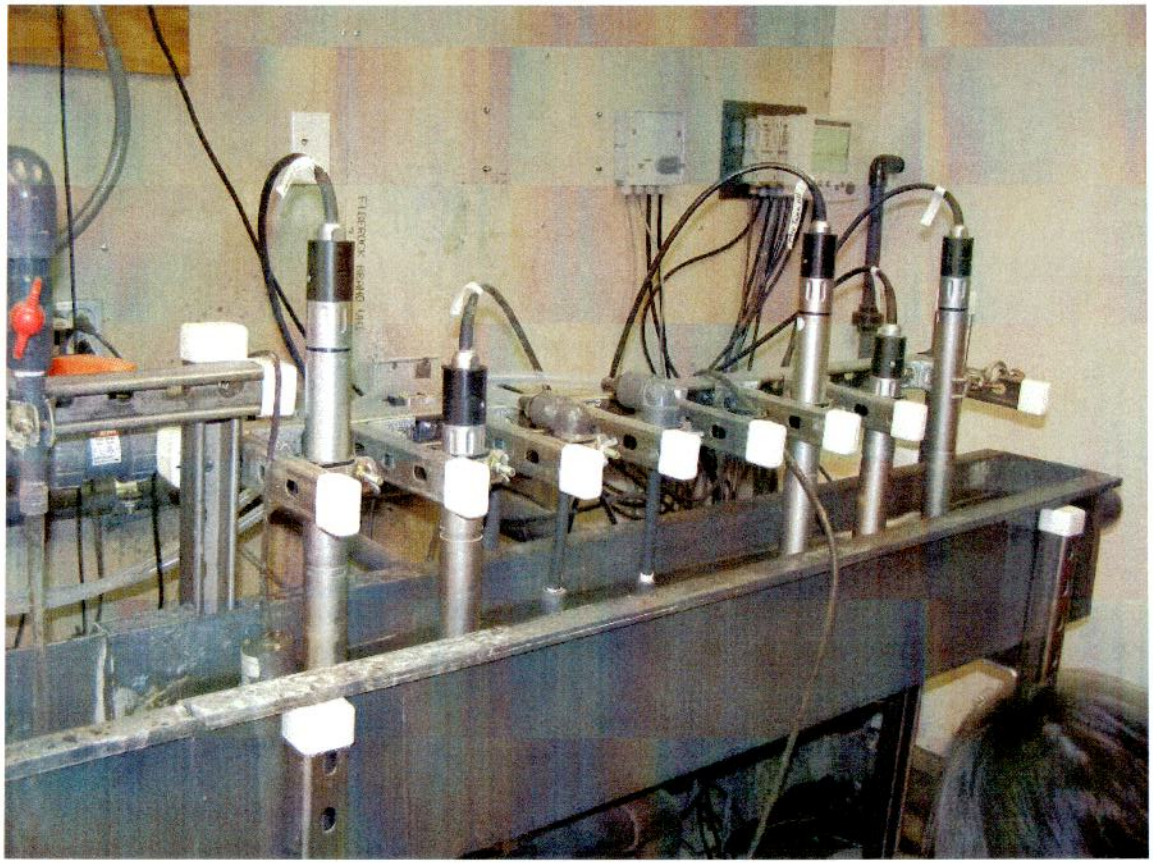
Sensor Adapter



	Recommended
	Check Sensor Specs
x	Not intended

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Sensor Mounting Options

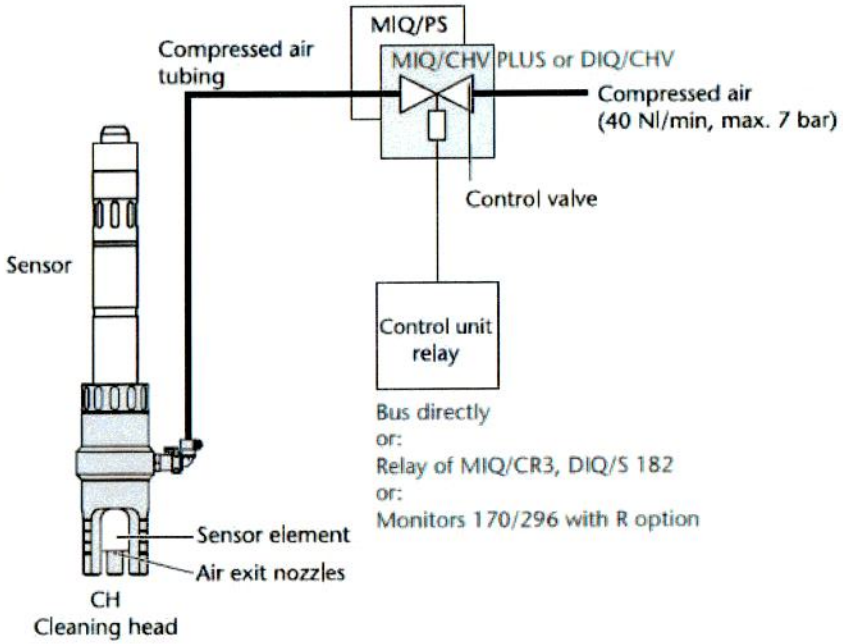


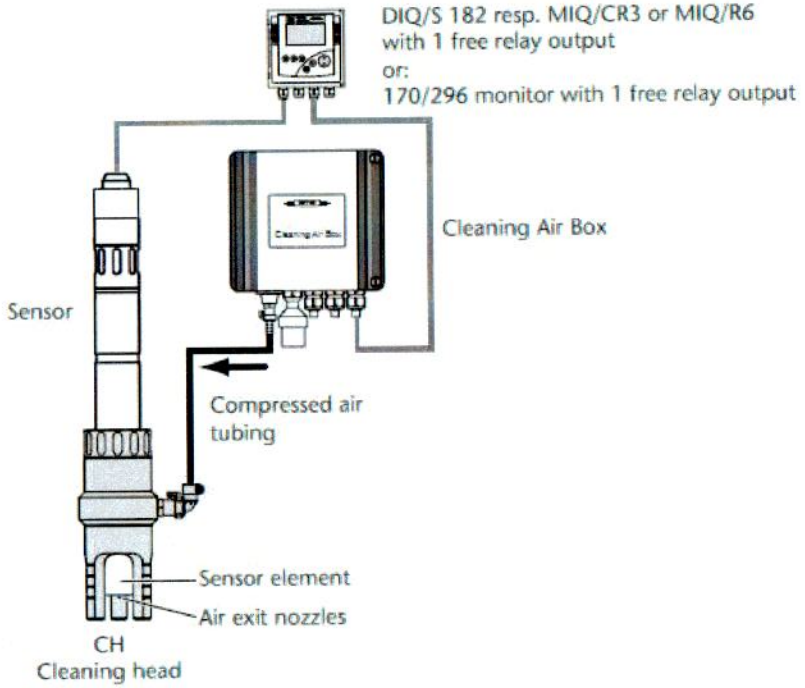
Cleaning Air Box Mounting



109295Y	SSH/IQ	IQ Sun Shield, Plastic, For 182 & 2020 installations
109286Y	MR/SD 170	Pipe mounting kit for SD/M 170 sun shields(dia. 25-60 mm)

Cleaning Air Box Options





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QUESTIONS



Thank you for your time



The system 282/284

THE NEW CONTROLLER FOR THE IQ SENSORNET

YSI

a xylem brand

The new controller for all IQ SensorNet sensors

System 282/284 for small and mid-sized wastewater treatment plants

- Up to 4 sensors and 20 parameters with one controller
- USB interface and data logger
- Access data anytime via the internet





Why choose the 282/284?



Up to 20 parameters at once

Monitor up to 20 parameters at once, including Orthophosphate and sludge level. The intuitive software and a large graphic display make it easy to use.



USB interface and data logger ensures your system is up-to-date and secure

USB interface and data logger enables simple updates and data downloads you can do yourself.



Convenient and available at anytime via the internet

Connection to the internet enables access to the IQ SensorNet and your data at anytime and any place. Monitoring remotely saves time and money.

Application examples

Monitoring of COD

- Reagent-free measurement of COD
- Up to 5 parameters simultaneously
- Low maintenance with integrated ultrasonic cleaning
- Precise optical measurement



Up to 5 parameters with one sensor with the 282/284

Sludge level measurement with IFL 700 IQ

- Optimized measurement location
- Easy installation
- Plotting of echo profile
- Wireless connection available via MIQ/WL PS SET



Optimal sludge level measurement with system 282/284 and wireless connection

Efficient phosphorus removal with P700 IQ

- Efficient phosphate removal
- 2 measurement ranges in one unit
- Integrated pump
- Low reagent consumption
- Automated calibration with standards



System 282/284 with Orthophosphate analyzer P700 IQ

Technical data

Sensor Options	All IQ sensors, DIQ/S 282: 2 sensors, DIQ/S 284: 4 sensors
Parameters	pH/ORP, O_2, Cond, Turbidity, TSS, NH_4^+, NO_2^-, NO_3^-, NO_x, PO_4, COD, BOD, TOC, DOC, SAC, UVT, sludge level
Interfaces	USB and data logger (as standard); as option: PROFIBUS (RS 485) or MODBUS (RS 485) or Ethernet/IP, MODBUS TCP, PROFINET (RJ45) or RJ45 for remote control
Overall cable length	250 m (820 ft.)
Power supply	Wide range power supply (100 - 240 VAC) or 24 V
Enclosure	IP67 rating
Display	Graphic color display, backlit
Warranty	3 years

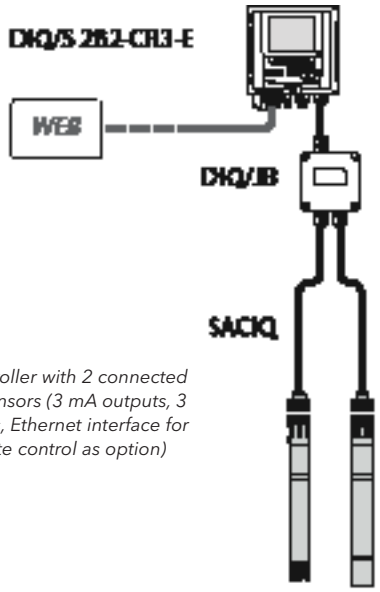
Order information

Model	Description	Order No.
Controller for up to 2 sensors		
DIQ/S 282-CR3	Controller for 2 IQ sensors, with 3 analog outputs, 3 relays	472 110Y
DIQ/S 282-PR	Controller for 2 IQ sensors, with PROFIBUS connection, 3 relays	472 111Y
DIQ/S 282-MOD	Controller for 2 IQ sensors, with MODBUS connection, 3 relays	472 112Y
DIQ/S 282-CR3-E	Controller for 2 IQ sensors, with 3 analog outputs, 3 relays, with RJ45 interface for internet access and remote control	472 113Y
DIQ/S 282-EF	Controller for 2 IQ sensors, with Ethernet fieldbuses, internet access and remote control, 3 relays	472 114Y
Controller for up to 4 sensors		
DIQ/S 284-CR6	Controller for 4 IQ sensors, with 6 analog outputs, 3 relays	472 130Y
DIQ/S 284-PR	Controller for 4 IQ sensors, with PROFIBUS connection, 3 relays	472 131Y
DIQ/S 284-MOD	Controller for 4 IQ sensors, with MODBUS connection, 3 relays	472 132Y
DIQ/S 284-CR6-E	Controller for 4 IQ sensors, with 6 analog outputs, 6 relays, with RJ45 interface for internet access and remote control	472 133Y
DIQ/S 284-EF	Controller for 4 IQ sensors, with Ethernet fieldbuses, internet access and remote control, 3 relays	472 134Y
Sensor Options		
FDO® 700 IQ	Calibration free, optical sensor for O_2	201 650Y
VARiON®*Plus* AN/A	Electrochemical ISE sensor for NH_4, NO_3 and K	107 066Y
VisoTurb® 700 IQ	Optical sensor for turbidity with ultrasonic cleaning	600 010Y
ViSolid® 700 IQ	Optical sensor for suspended solids with ultrasonic cleaning	600 012Y
SensoLyt 700 IQ	pH/ORP sensor with amplifier	109 170Y
CarboVis® 705 IQ	Spectral sensor with ultrasonic cleaning for COD, BOD, TOC, DOC, SAC and UVT	481 050Y
NiCaVis® 701 IQ NI	Spectral sensor with ultrasonic cleaning for COD, BOD, TOC, DOC, NO_3 and NO_2	481 054Y
UV 701 IQ SAC	Single wavelength sensor with ultrasonic cleaning for SAC and UVT	481 036Y
P 700 IQ-I115	Wet chemistry analyzer for Orthophosphate	8P-111Y
IFL 700 IQ	Ultrasonic sensor for sludge level	481 200Y

Configuration examples digital systems
IQ Sensor Net System 282/284

Example 1

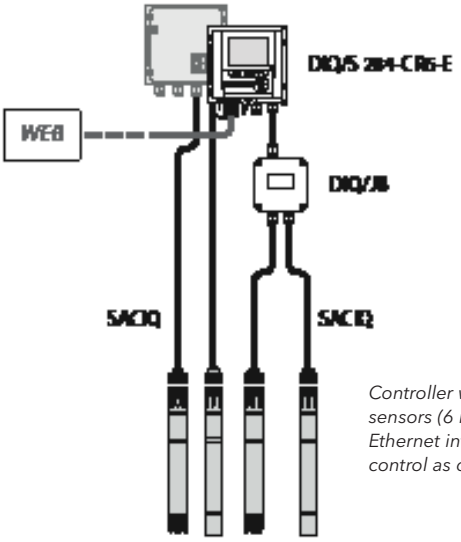
Example with 2 IQ sensors	Order no.
DIQ/S 282-CR3-E	472 113Y
2 x SACIQ-7,0	480 042Y
DIQ/JB	472 005Y
2 x IQ sensors	user selected



Controller with 2 connected IQ sensors (3 mA outputs, 3 relays, Ethernet interface for remote control as option)

Example 2

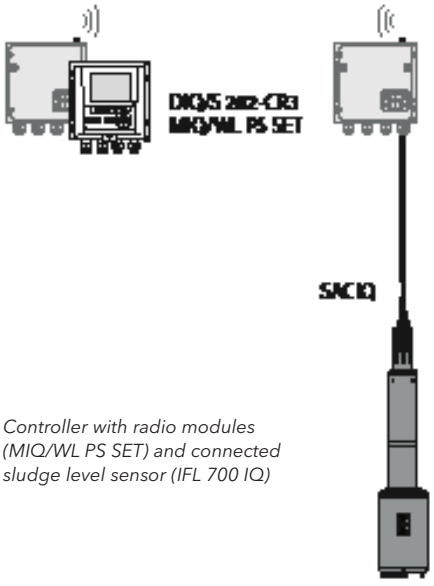
Example with 4 IQ sensors	Order no.
DIQ/S 284-CR6-E	472 133Y
4 x SACIQ-7,0	480 042Y
DIQ/JB	472 005Y
4 x IQ sensors	user selected



Controller with 4 connected IQ sensors (6 mA outputs, 6 relays, Ethernet interface for remote control as option)

Example 3

Sludge level measurement	Order no.
DIQ/S 282-CR3	472 110Y
1 x MIQ/WL PS SET	480 025Y
1 x SACIQ-7,0	472 042Y
IFL 700 IQ	481 200Y



Controller with radio modules (MIQ/WL PS SET) and connected sludge level sensor (IFL 700 IQ)

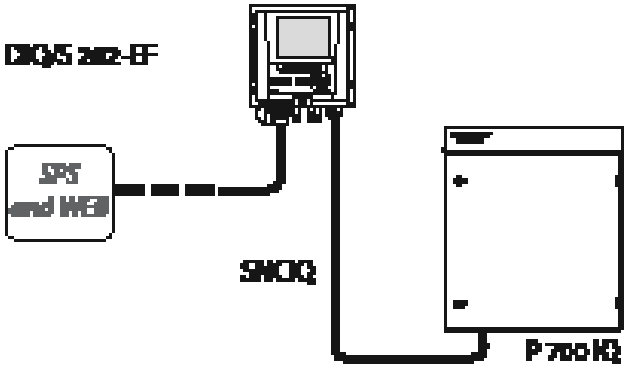
Installation accessories (selection)

For mounting of sensors, transmitters and modules we recommend our installation accessories.

For example 1	Description	Order No.
Installation set for 2 sensors and 1 controller	IN/SET2	109 305Y
For example 2		
Installation set for 2 sensors and 1 controller	IN/SET2	109 305Y
Junction clamp for mounting 2nd boom	MS/KK 170	109 290Y
Boom for sensor mounting	EH/F 170-1,5	109 272Y
Twin sensor holder	EH2/U 170	109 323Y
For example 3		
Installation set for 1 sensor and 1 controller	IN/SET1	109 304Y
Sun shield for 1 controller	SSH/IQ	109 295Y
Mounting set for sun shield	MR/SD 170	109 286Y

Example 4

Phosphate measurement and Ethernet	Order no.
DIQ/S 282-EF	472 114Y
1 x P 700 IQ-I115	8P-000Y
SNCIQ	480 046



Controller with connected P 700 IQ (3 relays, Ethernet interface for remote control and equipped with fieldbusses to transfer data to a PLC)

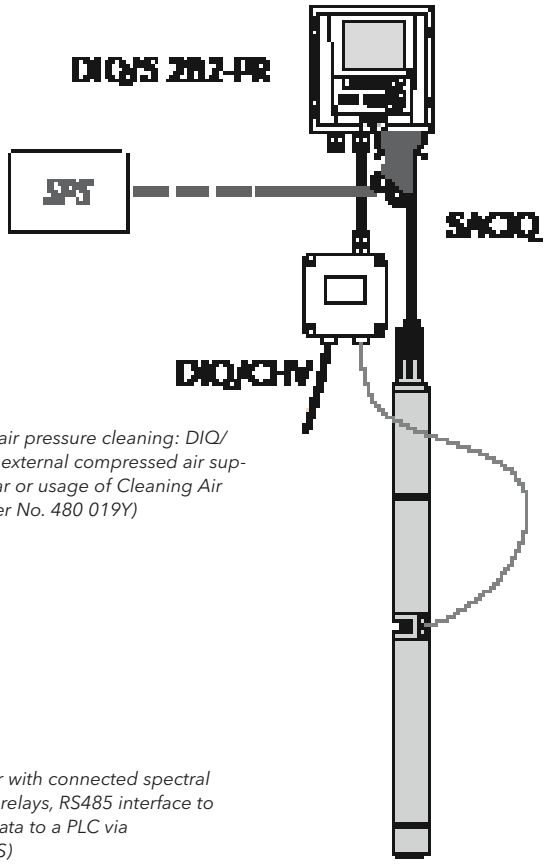
Installation accessories (selection)

For mounting of sensors, transmitters and modules we recommend our installation accessories.

For example 4	Description	Order No.
Sun shield for 1 controller	SSH/IQ	109 295Y
Mounting set for sun shield	MR/SD 170	109 286Y
Clamp for rail mounting	RM	821 988Y

Example 5

Spectral sensor and PROFIBUS	Order no.
DIQ/S 282-PR	472 111Y
1 x SACIQ-7,0	480 042Y
1 spectral sensor	user selected



Optional air pressure cleaning: DIQ/CHV with external compressed air supply 3-5 bar or usage of Cleaning Air Box (Order No. 480 019Y)

Controller with connected spectral sensor (3 relays, RS485 interface to transfer data to a PLC via PROFIBUS)

For example 5	Description	Order No.
Installation set for 1 sensor and 1 controller	IN/SET1	109 304Y

IQ SENSOR NET XT

IQ Sensor Net Accessories*

*For additional accessories, visit our website:
www.YSI.com/IQSN

Xylem |'zīl m|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're a global team unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to
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Let's Solve Water

a xylem brand

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