Design Engineer Report

Sussex Regional Recharge
Facility
(SRRF) Wastewater Facility
Treatment Plant
Permit Amendment
(Phase 3)

PREPARED FOR:

Artesian Wastewater Management, Inc. 664 Churchmans Road Newark, DE 19701



Prepared by:

KCI Technologies, Inc. 614 N Dupont Highway Dover, DE 19901





EXECUTIVE SUMMARY

Purpose

§6.5.1.4.1.1.1

The goal of the project is to design and construct an expansion to the Southern Regional Recharge Facility (SRRF), previously referred to as Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF). SRRF serves as a regional facility to meet current and future wastewater needs within the Artesian Wastewater Management, Inc. (AWMI) service territories in Sussex County as well as neighboring utilities such as Sussex County through interconnections. The facility is owned and operated by AWMI.

Currently, SRRF operates under State Permit No. 359288-02. This permit authorizes a daily disposal volume of up to 3.75 million gallons per day (MGD). This disposal is spread across four different spray fields, delineated as Fields D, E, F and G, all of which are already permitted. The current SRRF wastewater treatment plant was authorized by Construction Permit No. 359288-03 which approved the construction of an initial treatment system rated for 625,000 gallons per day (gpd). (Note: for the purposes of this report, the components authorized under this construction permit will be referred to as "existing" even though they are still under construction)

This Design Engineer Report (DER) is being submitted to the Department of Natural Resources and Environmental Control (DNREC) in conjunction with design documents to secure a permit to construct additional treatment capacity to meet regional demands. No additional disposal capacity is being requested as part of this permit application.

Scope

§6.5.1.4.1.1.2

AWMI, as well as several other sources, intend to send additional wastewater loads to SRRF for treatment. These include, but are not limited to potential flow volumes from Georgetown, Sussex County, Milton, as well as current and future flows from customers throughout the extensive AWMI service area in Sussex County. Taken together these loads are well beyond the currently authorized 625,000 gpd capacity of the SRRF treatment plant.

The original phase (Phase 1) of construction was completed in 2019 and included a 92.6 MG treated effluent storage lagoon and pumping station associated with the spray irrigation reuse system. Since that time, the facility has received treated effluent from offsite facilities for beneficial reuse. Recently, AWMI received authorization to construct a 625,000 gpd treatment facility to allow receipt and treatment of raw wastewater at the SRRF facility (Phase 2). The effluent from the treatment facility will be discharged to the storage lagoon and discharged through the spray irrigation system. The existing treatment system is comprised of influent mechanical screening, influent pumping station, 4-stage Bardenpho biological treatment and clarification system, effluent filters, ultra-violet disinfection, and an effluent pumping station to discharge to the storage lagoon. Ancillary processes include aerated sludge holding tanks, an emergency diversion and equalization lagoon, and plant



drain pumping station to return side stream flows to the biological treatment system. The design and construction of this phase of work was developed with the anticipation of a future expansion.

This project (Phase 3) will consist of the expansion of the existing treatment facility with similar unit processes to reach a total treatment capacity of 1.875 MGD. No changes to the disposal capacity or operation are proposed and therefore will not be addressed in this DER. The new treatment systems will be limited to:

- a) New mechanical influent screen
- b) (4) additional hybrid Bardenpho treatment trains with integral clarifiers and aerated sludge holding
- c) New influent pumps (installed in existing wet well)
- d) New cloth media filtration system
- e) New UV system
- f) New Effluent pumps (installed in existing wet well)

Design Flows (peaks and average)

The existing SRRF facility has a design capacity of 625,000 gpd which is limited by the biological process. Wastewater treatment demand in this region is projected to exceed this capacity within the next 5 years, thus requiring the proposed expansion. AWMI seeks to provide affordable wastewater solutions and phase infrastructure improvements to match demand to the extent possible. As a result, AWMI is taking a master plan approach to the expansion of this regional facility. The site has sufficient area to expand the treatment systems when capacity is required. Similarly, AWMI is developing a master plan for expanding disposal capacity in the future when required. As noted above, this report is limited to expanding treatment capacity to 1.875 ADF which is 50% of the permitted disposal capacity of 3.75 MGD. An additional 1.5 MGD of disposal capacity is reserved for disposal of treated effluent from private industry leaving 375,000 gpd of excess disposal capacity.

§6.5.1.4.1.1.3 - 6.5.1.4.1.1.6, 6.5.1.4.1.5

An analysis of the historical influent daily flow volumes to AWMI Regional System (consisting of Beaver Creek WWTF, Heron Bay WWTF, and Stonewater Creek WWTF) was performed as described in \$6.3.1.6.1. The average of the top 10% Daily Flow/EDU was determined to be 113 gpd/EDU. This is about 10% greater than the highest average for a consecutive 30-day period and so represents a reasonable safety factor for the Peak Month for design purposes. For design purposes a maximum daily flow of 115 gpd/EDU is being used. Unless otherwise noted, the capacity flow rates in this report refer to Peak Month values. When measuring flow for permit compliance, this is calculated by averaging the daily flow rates across each calendar month and taking the highest in a given year. When predicting flow for design purposes, this is estimated by using a similar facility and averaging



the upper 10% of all daily readings across an extended period of historical data and dividing by the number of EDUs to get a design flow per EDU (as in **§6.3.1.6.1**).

As a result, Table 1-1 provides a summary of the design flows for this expansion.

Table 1-1:

	Existing	New	Total
Peak Daily Flow	0.625 MGD	1.25 MGD	1.87 MGD
Peak Hourly Flow (influent screening)	1.25 MGD	2.50 MGD	3.75 MGD
			(Peaking Factor = 2)
Equalized Peak Flow	0.8 MGD	1.6 MGD	2.4 MGD

Number of Equivalent Dwelling Units

The SRRF is a regional treatment facility that is intended to receive flows from multiple subdivisions, municipalities, and potentially contract users. The service area for the regional system consists of the properties described in current AWMI CPCNs, as well as any future CPCNs that may be granted by the PSC, contingent on applicable service agreements. These customers may include residential, commercial, municipal, industrial, and other users. Non-residential customers may be required to provide pre-treatment of wastewater, to be determined on a case-by-case basis. Each new subdivision or customer will be permitted and approved by DNREC as required by **\$6.5.10.3** prior to connection into the regional system. Additional conveyance infrastructure will be designed, permitted, and constructed as necessary to provide service to approved customers.

EDUs in different Sussex County subdivisions have been observed to produce significantly different volumetric and constituent contributions, and thus projections of limiting treatment factors for future growth are rough approximations. As growth occurs throughout the region, wastewater flow will be divided between the various treatment plants in the AWMI network on a dynamic basis to optimize plant operations. This growth will be monitored both in terms of flow rate and influent characteristics, and additional treatment and disposal capacity will be added to the regional system as needed to maintain compliance with the operations permits of each facility. Based on the flow analysis discussed above, the proposed 1.875 MGD of treatment capacity equates to approximately 16,304 EDUs (for planning purposes only).

Influent Characteristics

The design influent wastewater characteristics are based on actual concentrations from monitoring results for the AWMI Regional System for a three-year period. A factor of safety was added to the design BOD₅ and TSS values due to high variability over the observed three-year period. As the system grows, greater consistency is anticipated and may warrant lower design constituent concentrations in future capacity evaluations.



Table 1-2: Influent Design Wastewater Characteristics

Parameter	Three-Year Average ¹	Design Value
BOD ₅	311 mg/L	400 mg/L
TSS	298 mg/L	450 mg/L
Nitrate + Nitrite	2.4 mg/L	5 mg/L
Ammonia	51.1 mg/L	50 mg/L
TN	65.9 mg/L	70 mg/L
Phosphorus	7.8 mg/L	9 mg/L
рН	7.3	6.5 – 8.5

^{1.} BOD₅, TSS, and Phosphorus are based on AWMI Regional System averages. The remaining values are based on Stonewater Creek WWTF averages.

Design Effluent Wastewater Characteristics

SRRF has been classified by DNREC as an existing facility and has been designed for nutrient removal to the standards of PSN2 and PSP2. The design access level is Unlimited Public Access as per section **§6.5.1.4.1.1.6**. Accordingly, the proposed average effluent discharge wastewater characterization from the SRRF wastewater treatment plant, is as follows:

Table 1-3: Effluent Design Wastewater Characteristics

Parameter	Design Value	Units
BOD₅	10	mg/L
TSS	10	mg/L
Total Nitrogen ²	10	mg/L
Phosphorus	8	mg/L
рН	6.0 - 9.0	S.U.
Fecal Coliform	20	col/100 mL
Turbidity	5	NTU

- 1. Design is based on total nitrogen.
- 2. Shall be measured at the discharge of the wastewater treatment plant.

SUMMARY TABLE OF DESIGN PARAMETERS

Refer to Design Criteria Sheet in the attached KCI drawings.



FACILITY NAME

Southern Regional Recharge Facility (SRRF) Formerly: Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF)

Brief Description of Proposed Activity

§6.5.1.4.1.3.1

Design and construction of an expansion to the existing SRRF treatment processes to increase the treatment capacity to 1.875 MGD. Expansion will include new treatment equipment using the same technology as the existing treatment facilities. Consideration is given to future expansion needs which will be incorporated into the overall facility master plan.

Facility Location

Area by crossroads

§6.5.1.4.1.3.2

The existing SRRF wastewater treatment plant is located at 14291 Isaacs Road, Milton DE 19968 on parcel 235-6.00-28.00 comprising 127 acres. The entire site lies within Sussex County. The nearest crossroads are Route 231 and Milton Ellendale Highway. All improvements proposed to this permit amendment request will take place on this site.

All applicable tax map parcels

The SRRF treatment facility is located entirely within Tax Parcel 235-6.00-28.09.

The 12 digit Hydrologic Unit Code (HUC) Watershed(s) name(s)

020402070602 Broadkill River

County

Sussex County



Figure 1-1, below, provides an overview of the existing SRRF facility as well as the associated spray irrigation fields (for reference only).

Developer/owner

Name

Artesian Water Management Inc. David Spacht President of Wastewater

Mailing and email addresses

14701 Coastal Highway, Milton, DE 19968 dspacht@artesianwater.com 302-453-7319

Utility/operator

Utility/Operator Contact:

AWMI
Stanley Sigfried
Vice President of Wastewater
14701 Coastal Highway, Milton, DE 19968
ssiegfried@artesianwater.com
302-453-2387

Certificate of Public Conveyance and Necessity (CPCN)

AWMI is a public utility certified by the PSC in full compliance with Del. Admin. C., Title 26, 6001 and 6002. As such, the legal documents for operation are filed with the PSC, including the CPCNs. Lease agreements, and easement agreement requirements are already on file with DNREC.

Conditional Use Approval

§6.5.1.4.1.3.5 - 9

Sussex County Conditional Use#1724 and Ordinance No. 1922 most recently amended on April 13, 2021 approve the use of this site for the proposed purpose. A copy of this approval can be found in Appendix A1.

Lease Agreement(s)

Not Applicable for the SRRF treatment facility.

Easement Agreement(s)

Not Applicable for the SRRF treatment facility.



Legal Documents

Not Applicable for the SRRF treatment facility.

Site Map

Scaled Drawings with 1' Contour Elevations, excluding Spray Irrigation Fields, showing:

Layout of service area (development, strip mall, etc.)

§6.5.1.4.1.4.1.1

Figure 1-2 (below) provides a map of the proposed service areas as well as the other AWMI regional service systems. The proposed improvements will serve all of AWMI's interconnected system in cooperation with AWMI's other facilities and interconnections with Sussex County. The regional nature of the system allows for flows generated throughout the system to be routed to multiple facilities as needed by the operators.



Regional_Plan_SM_20190920.mxd Revised: 7/18/24

Woodfield Preserve 0 0.5 1 Miles EDUs: 280 SRRF WWTF Vincent Overlook EDUs:250 Interconnection with Sand Hill Valley Sussex County EDUs:395 **Beaver Creek** Windstone WWTF EDUs: 369 Shoreview EDUs: 97 Heron Bay **Beaver Creek** EDUs: 325 EDUs: 324 Oakwood Village EDUs: 115 Hawthrone EDUs:256 Allen Harim Woodgate Sanitary EDUs: 806 EDUs: 15 Spring Breeze EDUs: 343 Connection with Woodridge **Georgetown Airport** EDUs: 188 & Industrial Park Independence EDUs: 455 Stonewater Creek **WWTF** Liberty EDUs: 296 Pelican Point EDUs: 524 Stonewater Creek _

SUBDIVISION Sussex County FM

Existing FM

110 Artesian Wastewater Management, Inc.

Figure 1-2 Proposed Service Areas

EDUs: 545

Municipal Boundries

Wastewater Treatment Facility

§6.5.1.4.1.4.1.2

Refer to included KCI Construction Drawings

Disposal site(s) and spare disposal area(s)

§6.5.1.4.1.4.1.3-4

Not Applicable: No changes to the existing disposal or reuse systems are being requested.

Irrigation field including acreage of each pivot or zone with two (2) foot contour elevations

Not Applicable: No changes to the existing disposal or reuse systems are being requested

Access roads and utilities

The Site will be accessed through the existing entrance and access road.

Location of all monitoring and observation wells (existing and proposed)

§6.5.1.4.1.4.1.6

Not Applicable: No changes to the existing disposal or reuse systems are being requested

Buffers to property lines, watercourses and wetlands

§6.5.1.4.1.4.1.7

Buffers for the SRRF property were approved by Sussex County as part of the amended Conditional Use for the site. Refer to included KCI Construction Documents.

Location of any storm water control structures

§6.5.1.4.1.4.1.8**-**9

Existing stormwater control structures are shown on the KCI Construction Documents. Location of proposed storm water control structures will be designed and permitted in accordance with the requirements of Sussex County Conservation District.

Drainage structures

§6.5.1.4.1.4.1.8-9

Existing stormwater control structures are shown on the KCI Construction Documents. Location of proposed storm water control structures will be designed and permitted in accordance with the requirements of Sussex County Conservation District.



FEMA 100-year floodplain line

§6.5.1.4.1.4.1.10

None of the improvements proposed in this permit amendment request are located within a FEMA floodplain.

Location of any wetlands (see 2007 Statewide Mapping Project (SWMP) map, and State Tidal Wetlands maps

A search on the Delaware Statewide Wetlands Mapping site yielded no results for this site.

Watercourses within or contiguous the site

Ingram Branch is located along the southern border of the site. The proposed construction area is approximately 900 feet north of the branch and is not anticipated to have any adverse effects.

Residences and habitable structures within or contiguous to the site

§6.5.1.4.1.4.1.13

Several residences abut the SRRF property or are located directly across the road from it. These lots are all shown in the Conditional Use Site Plan included in Appendix A3.

Design Wastewater Characteristics

Influent to treatment facility

The following sections and tables describe the design parameters for the influent wastewaters that may be accepted by the proposed WWTF and the design effluent to disposal.

Table 1-2 Design Influent Parameters

Parameter	Three-Year Average ¹	Design Value
BOD ₅	311 mg/L	400 mg/L
TSS	298 mg/L	450 mg/L
Nitrate + Nitrite	2.4 mg/L	5 mg/L
Ammonia	51.1 mg/L	50 mg/L
TN	65.9 mg/L	70 mg/L
Phosphorus	7.8 mg/L	9 mg/L
рН	7.3	6.5 – 8.5

^{1.} BOD₅, TSS, and Phosphorus are based on AWMI Regional System averages. The remaining values are based on Stonewater Creek WWTF averages.



Effluent to treatment facility

Table 1-3 Design Effluent Parameters

Parameter	Design Value	Units
BOD₅	10	mg/L
TSS	10	mg/L
Total Nitrogen ²	10	mg/L
Phosphorus	8	mg/L
рН	6.0 - 9.0	S.U.
Fecal Coliform	20	col/100 mL
Turbidity	5	NTU

- 1. Design is based on total nitrogen.
- 2. Shall be measured at the discharge of the wastewater treatment plant.

Wastewater Treatment Facility Process Design

Overview

§6.5.1.4.1.6.1

The overall project approach is to supplement the previously approved influent headworks, biological treatment, tertiary treatment, and disinfection processes with additional treatment units using the same technologies. The proposed changes are documented in KCl's attached Construction Documents. As shown in the process flow diagram and design criteria, the existing 625,000 gpd biological treatment process, effluent filters, and UV disinfection system are intended to continue to operate as separate treatment process from the proposed expansion. The new biological treatment units, effluent filters, and UV disinfection system will provide an additional 1.25 MGD of independent treatment capacity. Interconnecting piping and valves will be installed to allow for crossover between the treatment trains to provide redundancy in the event of isolated equipment failure. To accommodate the larger treatment capacity, a second mechanical screen will be installed in the headworks to provide full redundancy without relying on the manual bar screen. In addition, the influent and effluent pumps will be replaced with larger pumps to convey higher flows. The existing equalization and emergency diversion lagoon provides 3.0 MG of storage (160% of peak daily flow) which is considered sufficient.

Process description

§6.5.1.4.1.6.2, §6.5.1.4.1.6.10

Raw influent is conveyed to SRRF through multiple forcemains which combine to a single 18" forcemain at the property line. Prior to entering the Headworks facility, the influent flow is metered and documented. The forcemain discharges to an open channel which will distribute the flow to both mechanical screens and the manual bypass screen in the event of a mechanical failure. The basis of design for the mechanical screens is the Envirocare capable



of a peak hydraulic loading of 4.5 MGD with screen opening size of 0.25 inches. The mechanical screens will separate materials from the influent flow and discharge the screening through a compactor/washer into a dumpster for periodic landfilling. Refer to the manufacturer's information section for additional information.

The screened effluent will be conveyed into the adjacent flow equalization basin to eliminate peak flows resulting from the forcemain conveyance system. The influent pump station will withdraw from the flow equalization basin and convey the screened influent to the biological process trains (BPTs) using a triplex pumping system. The station is designed to convey the peak hourly flow of 2.4 MGD with two pumps on duty and one full standby pump (2 pumps, 833.5gpm @ 133' TDH each, 60 HP). When operating in single pump mode, each pump has a design capacity of 1359 gpm @ 93' TDH. All pumps are equipped with VFDs to allow operators to optimize their operation based on flow conditions. The basis of design for the pumps is Flygt Model NP 3171 MT 3~ 435. Refer to the manufacturer's information section for additional information.

The biological process trains (BPTs) consist of a Hybrid Bardenpho biological nutrient removal process provided by Dutchland and designed by Basset Engineering, Inc. The process is identical to what was approved for construction in Phase 2 (BPT 1 & 2) and will add four new identical treatment trains (BPT 3, 4, 5, 6). A Process Design Report is included in Appendix __ and includes discussion of the biological treatmen system as well as the integral clarifiers and sludge holding tanks.

Note: The design of the facility includes interconnecting piping between unit processes to allow maximum operator flexibility. However, the intent is to operate the treatment train constructed in Phase 2 (BPTs, Clarifiers, Effluent Filters, and UV) independently from Phase 3 under normal conditions. This approach simplifies monitoring and troubleshooting required and will help isolate operational issues for more targeted corrective actions. Independent monitoring and controls including effluent sampling will be performed.

Following clarification, treated effluent is conveyed by gravity to the effluent cloth filters. In this phase, two new filter units (1 duty + 1 standby) will be installed in the new process building. Each filter unit will have 6 disks capable of treating the peak flow from BPTs 3-6. The filter backwash water will be diverted to the plant drain pump station for recycling for further treatment. The basis of design for the cloth media filters is the Aqua Aerobic AquaDisk. Refer to the manufacturer's information section for additional information.

The filtered effluent will flow by gravity to the UV disinfection system. The UV system consists of two banks of lights (1 duty + 1 standby) in a "u-shaped" cannel configuration. The UV system provides disinfection for the peak from from BPT 3-6 with integral redundancy. The basis of design for the UV disinfection system is Glasgo UV. Refer to the manufacturer's information section for additional information.

The disinfected effluent will be conveyed into the adjacent effluent pump station for conveyance to the effluent storage lagoon. The effluent pump station is similar to the influent pump station using a triplex pumping system and a peak flow of 2.4 MGD. The peak duty point for two pumps operating in parallel is 833.5gpm @ 72' TDH each. When operating in single pump mode, each pump has a design capacity of 1346 gpm @ 66 TDH. All pumps are equipped with VFDs to allow operators to optimize their operation based on flow conditions. The basis of design for the pumps is Flygt Model NP 3171 MT 3~ 435 25 HP. Refer to the manufacturer's information section for additional information.

As discussed in the Basset Engineering report, sludge produced in the biological treatment process will be stored in one of 3 aerated sludge holding tanks which are integrated into the BPT process tanks. Sludge will be thickened through decanting and then hauled from the site for offsite dewatering and disposal.

Process flow diagram

Refer to included KCI Construction Drawings.

Hydraulic profile

Refer to included KCI Construction Drawings.

Level of treatment

Refer to included KCI Construction Drawings.

Schematic of pump stations and unit processes

Refer to included KCI Construction Drawings.

Basis/tank volumes

Refer to Design Criteria Sheet.

Storage capacities

Refer to Design Criteria Sheet.

Capacity of pumps, blowers, and other mechanical equipment

Refer to Design Criteria Sheet and included Manufacturer's Information.

Determination of required storage volume

Not applicable; there are no proposed changes to the existing disposal and reuse systems.

Chemical Addition

A supplemental alkalinity addition system was constructed adjacent to the Headworks Building as part of Phase 2. No other chemical additional is anticipated.

Grit removal and/or screening process

Refer to Design Criteria Sheet.

Influent and effluent flow metering and recordation

§6.5.1.4.1.6.14

Influent flow is metered prior to entering the headworks. Screened flow will be metered after the Influent Pump Station and after the Treated Effluent Pump Station. Metering is automatically recorded by magnetic flow meters and SCADA.

Overview of mechanical control and alarm system(s)

§6.5.1.4.1.6.15

The mechanical controls, instrumentation, and alarms systems will be comprised of a combination of manufacturer supplied control panels, customized control panels, and overall SCADA system. The overall SCADA system will receive all alarms and critical operational data from the distributed unit process control panels and allow a centralized operator interface both at the facility and remotely. A backup autodialer alarm system will be installed to ensure critical alarm communication in the event that the SCADA system is offline for any reason. The following provides a brief summary of the existing and proposed control systems by unit process:

Headworks Building (Phase 2):

- 1. Influent Screen Manufacturer provided control panels for each screen.
- 2. Influent Pumping Station Custom control panel by AWMI also will receive alarms from Influent Screen for transmission to SCADA system.

Electrical/Control Building (Phase 2):

1. Biological Process Trains 1 & 2 (by Dutchland) – Custom control panel by AWMI which provides the operator with system status, alarm information, and the ability to modify system setpoints and parameters. Pumps and blowers are automatically cycled based on specified parameters, and standby pumps are activated as needed.

Filter/UV Building (Phase 2):

- 1. Effluent Cloth Filters manufacturer provided control panels for each screen, manual isolation valves for controlling flow to each unit.
- 2. UV Disinfection Manufacturer provided control panel
- 3. Effluent PS and Plant Drain PS Custom control panel by AWMI also will receive alarms from Effluent Filters, UV, and both pumping stations for transmission to SCADA system.



Office/Process Building (Phase 2):

- 1. Central Control Panel/SCADA Hub In the office/laboratory area, a central control panel allows the operator to view all data connected to the system network from the distributed control panels for each unit process. This hub also provides the central point of access for the SCADA system for onsite and offsite data access.
- 2. Autodialer An autodialer provides an emergency backup for critical system alarms including power failure and SCADA system failure to alert operators in the event that the primary SCADA system is offline for any reason.

Process Building (Phase 3):

- Biological Process Trains 3, 4, 5, & 6 (by Dutchland) Custom control panel by AWMI which
 provides the operator with system status, alarm information, and the ability to modify
 system setpoints and parameters. Pumps and blowers are automatically cycled based on
 specified parameters, and standby pumps are activated as needed. Custom control panel
 by AWMI also will receive alarms from Effluent Filters, UV, and both pumping stations for
 transmission to SCADA system
- 2. Effluent Cloth Filters manufacturer provided control panels for each screen, manual isolation valves for controlling flow to each unit.
- 3. UV Disinfection Manufacturer provided control panel

Calculations

See Appendix for Calculation and Manufacturer Information (cutsheets)

Process design calculations and equations

§6.5.1.4.1.6.16.1

Refer to the following documents for detailed calculations:

Influent Screen - EnviroCare

Biological Treatment Process (Trains 3-6) - Dutchland Incorporated (Basset Engineering)

Effluent Cloth Filters – Aqua Aerobic

UV Disinfection - Calgon

Pump Station Calculations (KCI)

Wastewater disposal sizing system

§6.5.1.4.1.6.16.2

Not Applicable; there are no proposed changes to the existing disposal system.

Dosing

§6.5.1.4.1.6.16.3

Not Applicable; there are no proposed changes to the existing disposal system.



Sludge production

§6.5.1.4.1.6.16.4

Refer to Dutchland Incorporated design documents.

Lift station(s)

§6.5.1.4.1.6.16.5

Refer to included pump station design calculation sheets.

Effluent Disposal System

Disposal system type

§6.5.1.4.1.7

As described previously, no changes or increases are being requested to the previously approved disposal system or the currently permitted Design Disposal Capacity of 3.75 MGD. Of that 3.75 MGD, 1.5 MGD must be reserved for disposal of treated effluent from the Allen Harim chicken processing facility in Harbeson, Delaware leaving an average volume of 2.25 MGD available for disposal of flows from the SRRF wastewater treatment plant. The proposed total treatment capacity of 1.875 MGD leaves an additional 0.375MGD of disposal capacity unallocated.

Effluent conveyance and distribution

§6.5.10.2.1.2

For existing conveyance system infrastructure, the applicable permits are on file with DNREC.

Flow metering and recordation

Effluent flow data will be documented in digital format through the plantwide SCADA system. A calibrated flow meter will be utilized on the effluent force main to capture totalized flow existing the treatment plant.

Disinfection

As noted above, UV disinfection is proposed as a proven, effective, and reliable method prior to conveyance of treated effluent to the storage lagoon.

Project phasing

Regional Facilities

§6.5.10.1.1

The expansion of SRRF is being performed as part of AWMI's continued development of an interconnected regional wastewater system. This system consists of a network of force mains and treatment plants that can be operated in a flexible manner to optimize individual treatment facility performance and adapt to the growing



wastewater needs of Sussex County. This network consists of four existing treatment facilities owned by AWMI (SRRF, Stonewater Creek WWTF, Beaver Creek WWTF, and Heron Bay WWTF). Thanks to this interconnected system, the target WWTF for any particular development can be adjusted as needed within the constraints of the pipe configuration to divide the load between the treatment plants in the most efficient manner. Part of that efficiency can include shutting plants down temporarily or quasi-permanently. Additionally, Artesian has interconnection agreements with Sussex County which can also be utilized to alleviate flow going to AWMI's wastewater treatment plants if needed.

The Stonewater Creek WWTF is currently operating under Operations permit # 202221-02. The facility is located at 24199 Indian Mission Road, Long Neck, DE, off of Route 5 on tax parcels 234-16.00-19.02 & 19.05. The facility is currently permitted to accept a max flow of 450,000 gallons per day, with disposal via RIBs.

The Beaver Creek WWTF is currently operating under operations permit #359014-06. The facility is located on the northeast corner of SR 5 & 9, in Sussex County DE in tax parcels 2-35-30.00-24.02 & 32.00. The facility is currently permitted to accept a max flow of 300,000 gallons per day, with disposal via RIBs.

The Heron Bay WWTF is not currently operating but is permitted under operations permit #359124-03. The facility is located northwest of the intersection of Route 23 and Road 286 in Sussex County Delaware in tax parcel number 234-5.00-536.00. Currently this system is approved to dispose of residential waste generated by 856 dwellings and a community center to be disposed of via RIBs.

As discussed above, the SRRF has been following a phased master plan.

Phase 1: Initial site permitting and development. Construction of effluent storage lagoon and spray irrigation systems. Completed 2019

Phase 2: Construction of initial 0.625 MGD treatment process (including BPTs 1 and 2). Currently under construction

Phase 3 (Current): Construction of additional 1.25 MGD of treatment (including BPTs 3, 4, 5, 6).

If regional demand continues to grow, the existing site has sufficient available lands to support additional liquid treatment, sludge dewatering and processing systems, and onsite disposal through rapid infiltration basins. This provides significant flexibility to AWMI to accommodate additional growth within the region, or changes in water use trends within the existing users.



Appendices



Appendix A1 –

Approved Conditional Use

JAMIE WHITEHOUSE, AICP
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DELAWARE sussexcountyde.gov

Appendix A1

April 16, 2021

Mr. Daniel W. Konstanski, P.E. 664 Churchmans Road Newark, DE 19702 By e-mail to: dkonstanski@artesianwater.com

RE: Notice of Decision Letter for Conditional Use (CU 2208) Artesian Wastewater Management Inc. to allow for the expansion of, and amendment of conditions of approvals for CU #1724. Tax Parcels: 235-6.00-28.00 & 28.09

Dear Mr. Konstanski,

At their meeting of April 13, 2021, the Sussex County Council approved the Conditional Use application to allow for the expansion of, and amendment of conditions of approval for CU #1724 subject to nine (9) conditions. The Conditional Use shall be substantially underway within three (3) years of the County Council approval otherwise the Conditional Use shall expire. A Site Plan showing the conditions of approval shall be reviewed and approved by the Planning Commission prior to commencement of the use on the parcel. The following are the conditions which amend and replace the conditions of approval of CU #1724 and Ordinance No. 1922:

- A. The regional Sewage Treatment Plant and its accompanying systems and facilities for the collection, storage, treatment and disposal of waste shall continue to operate with all changes or modifications to those systems and facilities being reviewed and approved by DNREC and they shall be operated, designed and constructed in accordance with all other applicable Federal, State and County requirements including those mandated by DNREC and other agencies having jurisdiction over same.
- B. The water treatment plan shall be subject to the conditions imposed on December 2, 2008 when Sussex County Council adopted Ordinance No. 2013 approving Conditional Use No. 1810.
- C. Any buildings constructed on the site shall be constructed with an agricultural appearance.
- D. There shall be a medium density landscaped buffer twenty feet (20') in width adjacent to the storage lagoons along Isaacs Road (Delaware Route 30) and along the back of the properties along the northern boundary of the property with the exception of where the structures are located too close to the northern boundary line for the location of the buffer (being within Tax Parcel No: 235-6.00-28.01). The density and location of these landscaped buffers shall be shown on the final site plan. These buffer areas and the plantings within them must be maintained by the property owner during the entire lifetime of this permitted use. For example, if a tree or shrub that is part of the landscaped buffer dies, it must be replanted with a similar tree or shrub in a timely manner.
- E. Any lagoons, Rapid Infiltration Basins or similar structures shall be located at least 100 feet from any dwellings.

- F. One lighted sign shall be permitted along Isaacs Road (Delaware Route 30) not to exceed 32 square feet in size per side.
- G. Any motorized, non-vehicular equipment utilized in the operation of the facility within 600 feet of a dwelling shall be located indoors.
- H. Any security lighting shall be screened so that it does not shine onto neighboring properties or County Roads.
- I. The Final Site Plan shall be subject to the review and approval of the Sussex County Planning and Zoning Commission.

The Final Site Plan shall be prepared by a licensed Delaware Surveyor or Engineer and shall contain the conditions of approval on the plan. The Final Site Plan shall be approved prior to the commencement of the use on the property. The Site Plan shall be reviewed and approved by the Planning Commission. Agency approvals include but are not limited to: DelDOT, the Sussex Conservation District and the Office of the State Fire Marshal.

Please submit a minimum of two (2) full size paper copies and an electronic copy (PDF) of the Preliminary Site Plan to the Planning and Zoning Office a minimum of twenty (20) days prior to a Planning Commission meeting.

An approved copy of the Ordinance granting approval of the Conditional Use will be sent to you from the Clerk of Council.

Please feel free to contact the Planning and Zoning Department with any questions during business hours 8:30 am to 4:30 pm, Monday through Friday, at (302)-855-7878.

Sincerely,

Ms. Lauren DeVore

Planner III

CC: Mr. Lester Shaffer, Chief Constable

Parm De Von

Ms. Susan Isaacs, Public Works

Mr. Andy Wright, Building Code

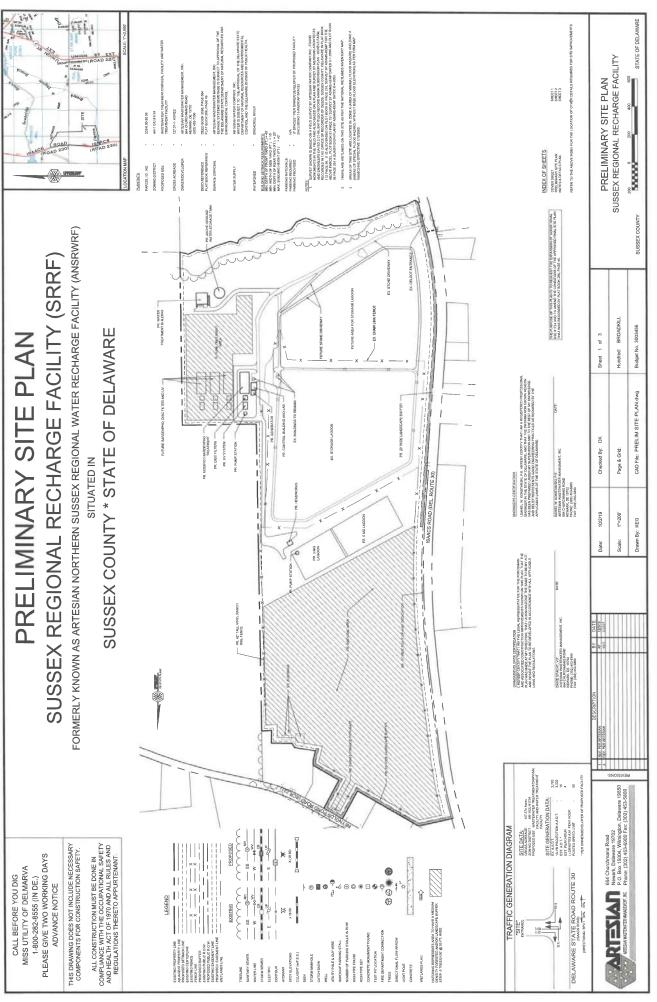
Mr. John Ashman, Engineering

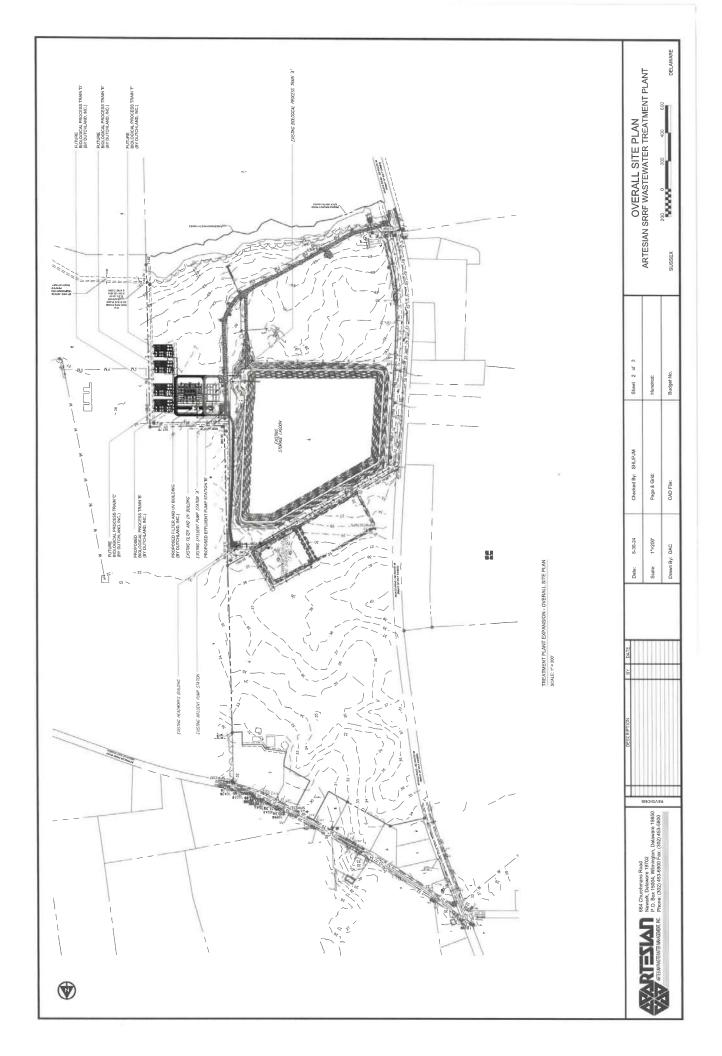
Mr. David Spacht, President, Artesian Wastewater Management, Inc.

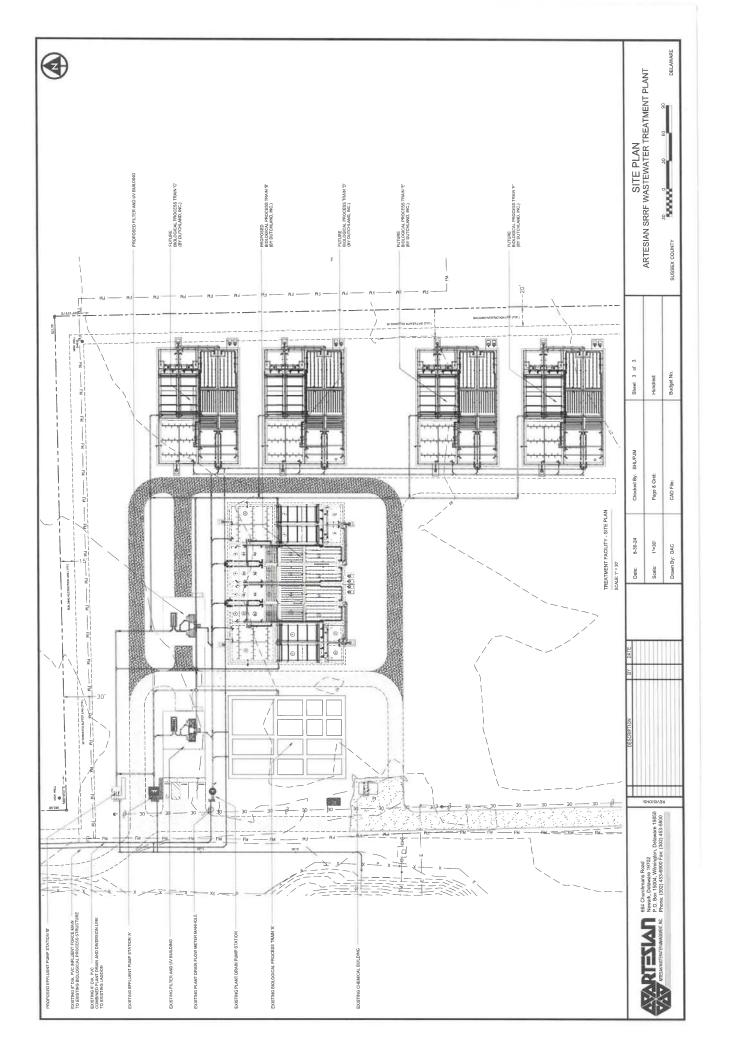
Mr. David Hutt, Partner, Morris James, LLP

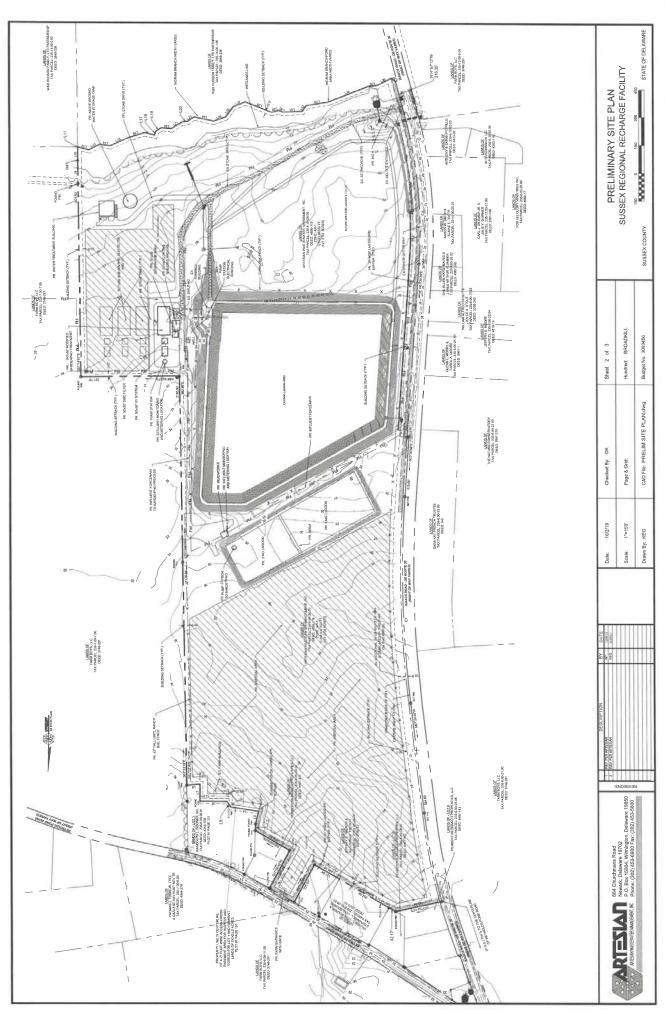


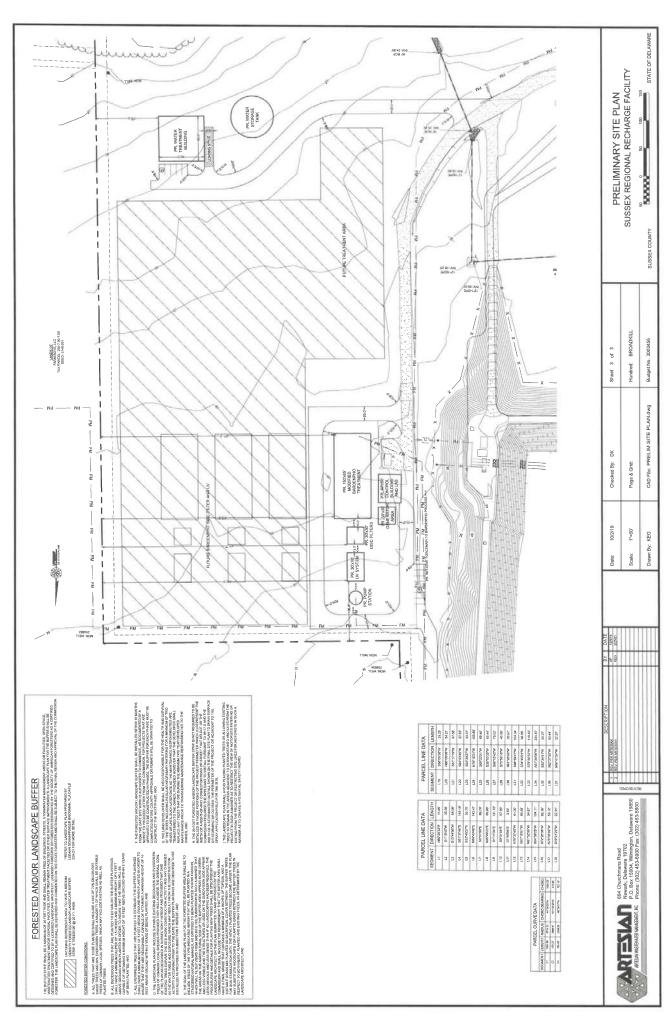
Appendix A2 – Site Plans













Appendix B1 –

Mechanical Screen - Envirocare

WEC220256AB Sussex County RRF

APPROVAL SUBMITTAL

PLEASE RETURN THE ORIGINAL DOCUMENT MARKED, SIGNED AND DATED

	APPROVED AS SUBMITTED		
BY: _		DATE:	
	APPROVED AS NOTED		
BY: _		DATE:	
NOT	ES:		
	REVISE AND RESUBMIT		
BY: _		DATE:	

ENVIRO-CARE COMPANY 1570 ST PAUL AVENUE GURNEE, IL 60031







Revision: -

Project No.: WEC220256AB

Project Name: Sussex County Regional Reclamation Facility

One (1) FSM MultiRake Bar Screen
HUR 700x3085/8
One (1) Flo-WashPress Washer Compactor
VWP2

A WAMGROUP® Company

Submittal

1570 St. Paul Avenue - Gurnee IL 60031 P: 815.636.8306 - www.enviro-care.com



For:

Sussex County Regional Reclamation Facility Newark, DE

Equipment:

One (1) FSM MultiRake Bar Screen, HUR 700x3085/8
One (1) SAVI Flo-WashPress Washer Compactor, VWP2

Customer:

Artesian Resources Corporation 664 Churchmans Road Newark, DE 19702-1934

Contact: Stanley Siegfried Phone: (302) 250-8364

Email: ssiegfried@artesianwater.com

Enviro-Care Agent:

Envirep, Inc. 254 Beacon Drive

Phoenixville, PA 19460-2065

Contact: Bill LaPorte Phone: (717) 433-7837

Email: wlaporte@envirep.com

Manufacturer:

Enviro-Care 1570 St. Paul Ave Gurnee IL 60031 Phone: (815) 636-8306

Fax: (847) 672-7968

Enviro-Care Contact:

Project Manager: Cory Reiser

Phone: (224) 302-0333

Email: creiser@enviro-care.com

Enviro-Care Project Number: WEC220256AB

October 2020



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Section One: Submittal Introduction





Submittal Introduction

PROPRIETARY AND CONFIDENTIAL

The information contained in this entire document is the sole property of Enviro-Care Company. Circulation, distribution or reproduction of this document in whole or in part without the written permission of Enviro-Care Company, is prohibited by law. Enviro-Care Company reserves the right to alter data or the design of its equipment at any time without prior notice and without any obligation whatsoever.

This submittal is being furnished for the approval of the mechanical and electrical equipment (if applicable) as outlined under the specification section and drawings referred to in the Letter of Clarification.

Scope of Supply: A complete outline of materials to be supplied is listed herein. This submittal package represents Enviro-Care's complete scope of supply. All other materials and services not specifically included on the drawings or within the body of this submittal are to be supplied by others.

Operation and Maintenance Manuals: Operation and Maintenance Manuals shall follow in a timely manner and with content to satisfy the specifications. Operation and Maintenance Manuals will be supplied with the equipment. The manuals will include, but are not limited to, the following information:

- Parts List for each type of equipment being provided.
- Recommended receiving and storage instructions.
- Recommended installation instructions.
- Pre-startup instructions.
- Operation and maintenance instructions.
- Recommended spare parts list.
- Trouble-shooting guides.
- Accessory equipment information.
- General Arrangement drawing and control panel drawing (if control panel provided).

Critical Dimensions: Dimensions which are critical to the design of the equipment, but were not clear and/or not provided in the specifications or Engineer's drawings, may appear on Enviro-Care drawing in this submittal package with a cloud around them. Approval to proceed will not be recognized by Enviro-Care, and production will remain on hold, until all clouded dimensions (if applicable) are confirmed or supplied in writing by the Contractor/ Engineer. Please note that the Enviro-Care submittal drawings contain dimensions with *'s denoted to identify variance from contract documents and should be particularly noted.

Re-submittals: The complete submittal will be sent if any changes are required.





Enviro-Care Company One-Year Warranty

Warranty Statement and Term:

Enviro-Care Company, Inc. warrants the supplied equipment to the original end user against defects in workmanship or material under normal use and service in compliance with the original design specifications and the maintenance requirements and instructions as found in the Operations & Maintenance Manual.

All Enviro-Care supplied equipment is warranted for twelve (12) months from date of start-up or eighteen (18) months from date of shipment, whichever occurs first.

Warranty Exclusions:

This warranty does not cover costs for labor, standard and/or scheduled maintenance performed, nor does it cover consumables and Enviro-Care parts that, by virtue of their operation, require replacement through normal wear (aka: Wear Parts), unless a defect in material or workmanship can be determined by Enviro-Care.

Wear parts are defined as brushes, rollers, spray nozzles, drum seals and other items specifically identified in the Operations & Maintenance Manual.

Warranty Coverage:

Enviro-Care's liability is limited to the supply or repair of defective parts returned, freight prepaid by buyer to a location specified by Enviro-Care. Repaired or replacement parts will be shipped to buyer prepaid via standard ground freight. Overnight express or expedited shipments will be at the expense of the buyer.

Exclusions and Exceptions:

This Warranty excludes damage or wear to equipment caused by misapplication of product, improper maintenance, accident, abuse, unauthorized alteration or repair, Acts of God, or installation or operation that is non-compliant with Enviro-Care installation and operations instructions.

Enviro-Care shall not under any circumstances be liable for any incidental or consequential damages arising from loss, damage to property, personal injury or other damage or losses owing to the failure of Enviro-Care's equipment. The liability of Enviro-Care Company, Inc. is limited as set forth above within the time period set forth above.

Enviro-Care
1570 St. Paul Ave
Gurnee, IL 60031
P: 815.636.8306 F:815.636.8302
Web: www.enviro-care.com
Email: service@enviro-care.com





Section Two: Scope of Supply





Scope of Supply

SECTION: N/A ADDENDA: N/A

See General Arrangement drawing WEC220256AB for Process Design Information

ITEM: "A" - One (1) FSM Multirake Bar Screen, Model HUR 700x3085/8 to include:

- Frame constructed from type 304 stainless steel.
- Barfield from type 304 stainless steel.
- Guide rails constructed from type 304 stainless steel.
- Rake assemblies entirely constructed from type 304 stainless steel.
- Dead plate constructed from type 304 stainless steel.
- Screen drive roller chain from type 304 stainless steel with Polyamide rollers. Each chain shall withstand a force of 20,000 pound-force.
- Stainless steel roller chain and screen rake elements driven by two (2) drive shaft mounted 304 stainless steel sprockets.
- Lower and mid-level rotating guides from type 304L stainless steel with ceramic collar bonded to the stub shaft with fiber reinforced PTFE self-lubricating bushing.
- Discharge chute constructed from type 304 stainless steel.
- Replaceable polyethylene wiper mounted to pivoting 304 stainless steel support arm.
- Screen electric drive motor 1.0 HP TEFC 1760 rpm suitable for 230/460/3/60 supplied with gear reducer mounted directly onto screen drive shaft.
- Neoprene side seals with type 304 stainless steel backing plates prevent bypass of material around the screen unit.
- Screen covers from type 304 stainless steel with handles.
- Shop surface preparation, stainless steel full dip passivation.

HARDWARE

- Assembly fasteners from type 304 stainless steel.
- Anchor rods from type 304 stainless steel.

CONTROL PANEL AND INSTRUMENTATION

- One (1) NEMA 4X type 304 stainless steel wall mount main control panel suitable for 480/3/60 electrical supply.
- One (1) NEMA 4X local Emergency Stop pushbutton control station complete.
- One (1) Ultrasonic Level Sensor Milltronics Pointek ULS200 ultrasonic sensor with discrete level outputs suitable for installation in a Class 1 Division 2 hazardous area with stainless steel mounting bracket.

SPARE PARTS (TOTAL)

None.

FIELD SERVICE (TOTAL)

• Site service of one (1) trip for a total of two (2) days for installation inspection, startup and operator training.



SECTION: N/A ADDENDA: N/A

See General Arrangement drawing WEC220256AB for Process Design Information

ITEM: "B" - One (1) SAVI Flo-WashPress Washer Compactor, Model VWP2 to include:

- Screenings washer and compactor from type 304 stainless steel.
- Discharge chute and inlet hopper from type 304 stainless steel.
- Torsion resistant, epoxy coated, decreasing pitch, shafted auger of high strength, alloy steel.
- Six (6) wear bars from stainless steel shall be located at the discharge end of the compaction auger.
- Washing/compacting zone to be equipped with spray nozzles to wash organic material from the screenings.
- A second set of spray nozzles to be located at the end of the compaction zone to maximize washing.
- The bottom of the washing/compaction zone shall be a 3 mm perforated screen to allow wash water to discharge to the drain housing.
- Two (2) NEMA 4X 120V stainless steel body solenoid valves for water spray functions.
- Drainage collection pan with 2.5-inch diameter outlet connection and 1/2-inch NPT flush water connection from type 304 stainless steel.
- Discharge piping from type 304 stainless steel.
- Washer/compactor electric drive motor 5.0 HP TEFC 1760 rpm suitable for 230/460/3/60 supply with gear reducer mounted directly onto auger drive shaft.
- Support legs, stand and frame 304 stainless steel.
- Anchor bolts 304 stainless steel.
- Fasteners 304 stainless steel.
- Shop surface preparation, stainless steel passivation and painting as required.

HARDWARE

- Assembly fasteners from type 304 stainless steel.
- Anchor rods from type 304 stainless steel.

CONTROL PANEL AND INSTRUMENTATION

• Controls for this equipment are included in control panel for A equipment.

SPARE PARTS (TOTAL)

None.

FIELD SERVICE (TOTAL)

· Provided with screen start up services.



Section Three: Letter of Clarification





Letter of Clarification

The given specification is for standard Enviro-Care equipment; minimal clarification needed, as follows:

General:

- 1. Please see Section Five Enclosures for Control Panel submittal comments.
- 2. Unit anchorage designed around various anchor systems. Where adhesive anchors are used, adhesive and applicator by others, not by Enviro-Care.
- 3. The enclosed Enviro-Care's submittal drawings may contain dimensions marked with <u>clouds</u>. This indicates information that needs to be confirmed or corrected by the Engineer and/or the Contractor at the time this submittal is returned. Submittal will not be considered as approved until all clouded dimensions have been confirmed and/or corrected.
- 4. If using non-potable water for wash, we recommend a strainer with a 20 mesh element or better to reduce clogging of solenoid valve(s).
- 5. In order to prevent rust on 304SS, chloride content in process water and wash water must be < 200 mg/L, and hydrogen sulfide (H₂S) content must be < 6ppm.

IMPORTANT: THE ANCILLARY ITEMS, HOPPER, DISCHARGE, MOUNTING BRACKETS ARE SCHEDULED FOR FABRICATION. IF ANY CHANGES ARE REQUIRED, THIS NEEDS IMMEDIATE RESPONSE TO ENVIRO-CARE.





Section Four: Accessory Equipment





Gearmotor -Screen Drive

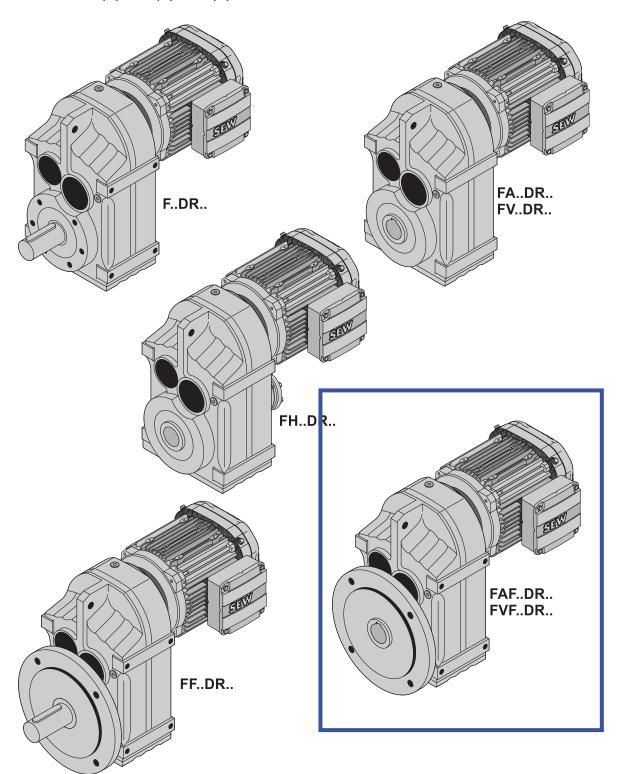


F..DRE/DRS

F..DRE/DRS

10

10.1 F, FA..(B), FV..(B), FH..(B), FT, FF, FAF, FVF, FHF, FAZ, FVZ..DR..



60404AXX





Product DescriptionCorrosion and surface protection

2.2 Corrosion and surface protection

General information

SEW-EURODRIVE offers various optional protective measures for operation of motors and gear units in excessive conditions.

- · Corrosion protection KS for motors
- · Industry option package

Corrosion protection KS

Corrosion protection KS for motors comprises the following measures:

- Stainless steel retaining screws.
- The nameplates are made from stainless steel or equivalent corrosion resistant material.
- · Interior motor components are protected with a corrosion resistant coating.
- · Additional sealing for brake motors.



Motors with a forced cooling fan and motors with a spreadshaft encoder (ES..) cannot be supplied with corrosion protection KS.

Industry Option Package

SEW-EURODRIVE provides options that provide protecton to the motor and reducer when operating in severe environments.

Contact SEW-EURODRIVE for additional information on available IOP's (Industry Option Packages).





3 Unit Designations and Variants

3.1 Gear unit and options – unit designations

Helical gear unit

Designation	
RX	Single-stage foot-mounted design
RXF	Single-stage B5 flange-mounted design
R	Foot-mounted design
RF	Foot and B5-flange mounted design
RF	B5 flange-mounted design
RZ	B14 flange-mounted design
RM	B5 flange-mounted design with extended bearing hub

Parallel-shaft helical gear unit

Designation										
F	Foot-mounted design									
FAB	Foot-mounted, hollow shaft									
FHB	Foot-mounted, hollow shaft with shrink disk									
FVB	Foot-mounted, hollow shaft with splined hollow shaft to DIN 5480									
FF	B5 flange-mounted design									
FAF	B5 flange-mounted design and hollow shaft									
FHF	5 flange-mounted and hollow shaft with shrink disk									
FVF	B5 flange-mounted design and hollow shaft with splined hollow shaft to DIN 5480									
FA	Hollow shaft									
FH	lollow shaft with shrink disk									
FT	Hollow shaft with TorqLOC® hollow shaft mounting system									
FTB	Foot-mounted hollow shaft with TorqLOC® hollow shaft mounting system									
FV	Hollow shaft with splining to DIN 5480									
FAZ	B14 flange-mounted design and hollow shaft									
FHZ	B14 flange-mounted and hollow shaft with shrink disk									
FVZ	B14 flange-mounted design and hollow shaft with splined hollow shaft to DIN 5480									



Unit Designations and VariantsUnit designations for AC motors and options



Unit designations for AC motors and options

AC motor series

Designation	
DRS	Standard efficiency motor
DRE	High efficiency motor
DKP	Premium efficiency motor
71 - 315	Sizes:
	71 / 80 / 90 / 100 / 112 / 132 / 160 / 180 / 200 / 225 / 315
K - L	Lengths:
	K= very short / S = short / M = medium / L = long
	MC/LC = Rotors with copper cage
2, 4, 6, 8/2, 8/4	Number of poles

Unit designation DR: Output variants

Designation	Option
/FI	IEC foot-mounted motor with specification of shaft height
/FG	7 Series integral motor, as stand-alone motor
/FF	IEC flange-mounted motor with bore holes
/FT	IEC flange motor with threads
/FL	General flange-mounted motor (other than IEC)
/FM	7 series integral gearmotor with IEC feet, with specification of shaft height if required
/FE	IEC flange-mounted motor with bore holes and IEC feet, with specification of shaft height
/FY	IEC flange-mounted motor with thread and IEC feet, with specification of shaft height if required
/FK	General flange-mounted motor (other than IEC) with feet, with specification of shaft height if required
/FC	C-face flange-mounted motor, dimensions in inch

Unit Designations and VariantsUnit designations for AC motors and options

Mechanical attachments

Designation	Option
BE	Spring-loaded brake with size specification
HR	Manual brake release of the brake, automatic disengaging function
HF	Manual brake release, lockable
/RS	Backstop
/MSW	MOVI-SWITCH®
/MI	Motor identification for MOVIMOT®
/MM03 - MM40	MOVIMOT®
/MO	MOVIMOT® option(s)

Temperature sensor/detection

Designation	Option
/TF	Temperature sensor (positive coefficient thermistor or PTC resistor)
/TH	Thermostat (bimetallic switch)
/KY	One KTY84 - 130 sensor
/PT	One / three PT100 sensor(s)

Encoder

Designation	Option
/ES7S /EG7S /EH7S /EV7S	Mounted speed sensor with sin/cos interface
/ES7R /EG7R /EH7R	Mounted speed sensor with TTL (RS-422) interface, V = 9 - 26 V
/EI7C	Mounted speed sensor with HTL interface
/EI76 /EI72 /EI71	Mounted speed sensor with HTL interface and 6 / 2 / 1 period(s)
/AS7W /AG7W	Mounted absolute encoder, RS-485 interface (multi-turn)
/AS7Y /AG7Y /AH7Y	Mounted absolute encoder, SSI interface (multi-turn)
/ES7A/EG7A	Mounting adapter for encoders from the SEW portfolio
/XV.A	Mounting adapter for non-SEW encoders
/XV	Mounted non-SEW encoders



Unit Designations and VariantsUnit designations for AC motors and options



Connection options

Designation	Option
/IS	Integrated plug connector
/ASB.	HAN 10ES plug connector on terminal box with two-clamp closure (cage clamps on motor end)
/ACB.	HAN 10E plug connector on terminal box with two-clamp closure (crimp contacts on motor end)
/AMB. /ABB.	HAN Modular 10B plug connector on terminal box with two-
/ADB. /AKB.	clamp closure (crimp contacts on motor end)
/ASE.	HAN 10ES plug connector on terminal box with single-clamp closure (cage clamps on motor end)
/ACE.	HAN 10ES plug connector on terminal box with single-clamp closure (crimp contacts on motor end)
/AME. /ABE.	HAN Modular 10B plug connector on terminal box with single-
/ADE. /AKE.	clamp closure (crimp contacts on motor end)
/KCC	Terminal strip with cage clamps (for DR.71 - DR.132)
/KC1	C1 profile compliant connection of the DR80 overhead trolley drive (VDI guideline 3643) (for DR71, 80)

Ventilation

Designation	Option								
N	Forced cooling fan								
/Z	Additional inertia (flywheel fan)								
/AL	al fan								
/U	n-ventilated (without fan) TENV								
/OL	on-ventilated (closed B side) TENV								
/C	Protection canopy for the fan guard								
/LF	Air filter								
/LN	Low-noise fan guard (for DR.71 – 132)								

Bearing

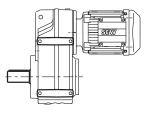
Designation	Option
/NS	Relubrication device (for DR.315 only)
/ERF	Reinforced bearing A-side with roller bearing (for DR.315 only)
/NIB	Insulated bearing B-side (for DR.315 only)

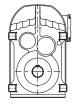


Unit Designations and Variants Gearmotor variants



Parallel-shaft helical gearmotors The following variants of parallel-shaft helical gearmotors can be supplied:

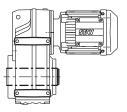


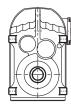


F..DR..

Foot-mounted parallel-shaft helical gearmotor





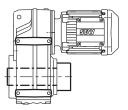


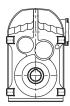
FA..B DR..

Foot-mounted parallel-shaft helical gearmotor with hollow shaft

FV.B DR

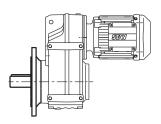
Foot-mounted parallel-shaft gearmotor with hollow shaft and splining according to DIN 5480

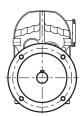




FH..B DR

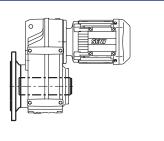
Foot-mounted parallel-shaft helical gearmotor with hollow shaft and shrink disk

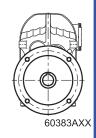




FF..DR.

B5 flange-mounted parallel-shaft helical gearmotor





FAF..DR..

Parallel-shaft helical gearmotor in B5 flange-mounted design with hollow shaft

FVF..DR..

Parallel-shaft helical gearmotor in B5 flange-mounted design with hollow shaft and splining according to DIN 5480



Important Information about Tables and Dimension SheetsSelection tables for gearmotors

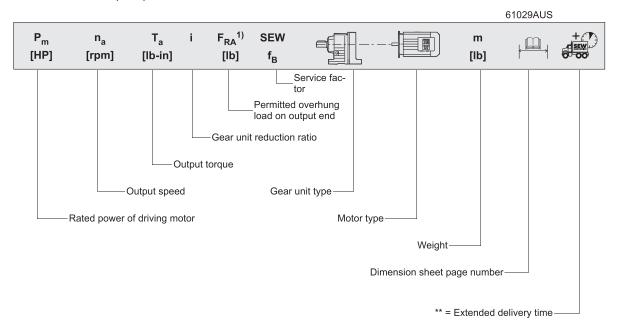
8.2 Selection tables for gearmotors

Structure of the selection tables

The two figures below illustrate the structure of the selection tables for gearmotors. There are two types of selection tables:

- 1. For standard output speeds, sorted according to the rated power P_m [HP] of the driving motor.
- 2. For particularly low output speeds, multi-stage gearmotors are always sorted according to the maximum permitted output torque T_{a max} [lb-in].

1. For standard output speeds:



Key

- * Finite gear unit reduction ratio
- Overhung load for foot-mounted gear units with solid shaft; overhung loads for other gear unit types upon request



Only applies to Spiroplan® (W) gearmotors:

• If a lubricant is used for the food industry (food grade), SEW $f_B \ge 1.2$ required.





6 Mounting Positions and Important Order Information

6.1 General information regarding the mounting positions

Designation of the mounting positions

SEW-EURODRIVE differentiates between six mounting positions M1 ... M6 for gear units, gearmotors and MOVIMOT® gearmotors . The following figure shows the position of the gear unit in mounting positions M1 M6

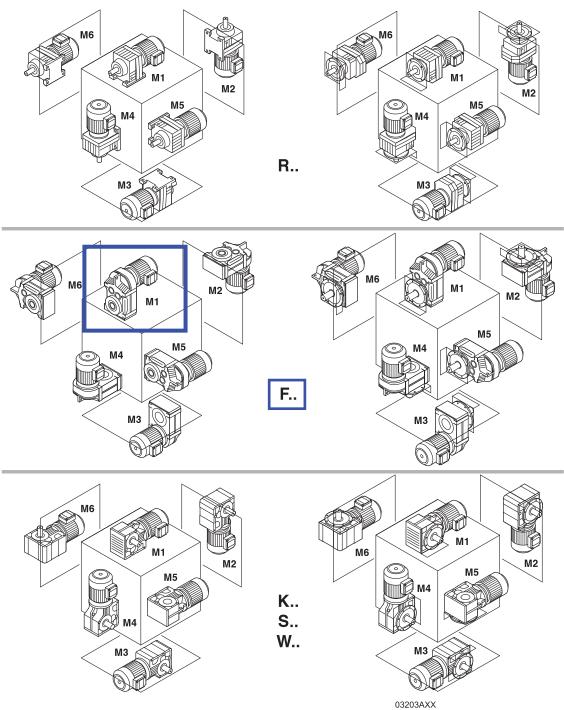
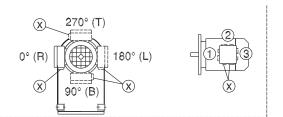
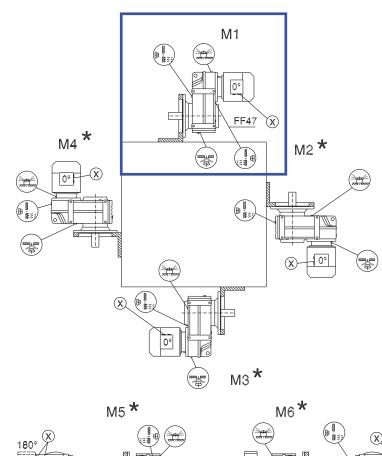


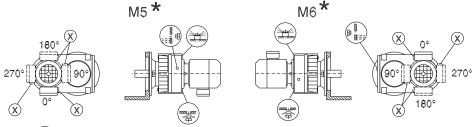
Figure 8: Depiction of mounting positions M1 ... M6

FF/FAF/FHF/FAZ/FHZ27-157, FVF/FVZ27-107



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F..27 M1, M3, M5, M6

F..27 M1 - M6

F..27 M1, M3, M5, M6

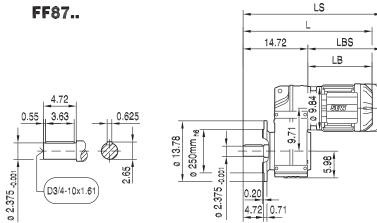
* → page 59

P _m [HP]	n _a [rpm]	T _a [lb-in]	i	F _{Ra} 1) [lb]	SEW f _B					m [lbs]	k [™] ≯	# (1)
2.0	1.8	62900	950	11500	1.10							
	2.1 2.4	55000 48300	834 736	12000 12400	1.25 1.40	FA	107R77	DRE	90L4	640	411	
	2.7	42500	640	12700	1.60	FAF	107R77	DRE	90L4 90L4	680	411	
	3.1	36700	560	13100	1.85	F	107R77	DRE	90L4	670	411	
	3.6	32000	180	13300	2.1	FF	107R77	DRE	90L4	730	411	
	4.0 4.7	28900 24500	436 370	13500 13700	2.4	4						
	2.7	43700	644	12700	1.60							
	3.0	40000	591	12900	1.75	FA	107R77	DRE	90L4	610	411	
	3.4	35000	518	13100	2.00	FAF	107R77	DRE	90L4	660	411	
	3.5	33100	491	13200	2.1	F	107R77	DRE	90L4	650	411	
	4.0 4.5	28900 25900	430 387	13500 13600	2.4 2.7	FF	107R77	DRE	90L4	710	411	
	3.3	35300	529	6920	1.10							
	3.7	31200	467	7200	1.20							
	4.3	26900	406	7460	1.40	FA	97R57	DRE	90L4	440	411	
	4.8	24100	363	7620	1.55	FAF	97R57	DRE	90L4	485	411	
	6.1 7.1	19000 16400	285 245	7890 8010	2.00	F	97R57 97R57	DRE DRE	90L4 90L4	455 530	411 411	
	8.4	13900	208	8120	2.7		311(31	DILL	30L4	330	411	
	8.9	12900	195	8160	2.9							
	3.4	34700	510	6960	1.10							
	3.7	32100	473	7140	1.20	FA	97R57	DRE	90L4	425	411	
	4.3 4.8	27200 24400	403 361	7440 7610	1.40 1.55	FAF	97R57	DRE	90L4	470	411	
	5.5	21300	317	7770	1.80	F	97R57	DRE	90L4	440	411	
	6.3	18700	275	7900	2.0	FF	97R57	DRE	90L4	510	411	
	7.2	16400	242	8010	2.3							
	5.0	22900	345	5500	1.15	FA	87R57	DRE	90L4	295	411	
	5.8 7.0	19900 16500	300 249	5760 6030	1.35 1.60	FAF F	87R57 87R57	DRE DRE	90L4 90L4	320 305	411 411	
					1.60	FF	87R57	DRE	90L4 90L4	340	411	
	5.0	23700	350	5420	1.10					225		
	5.5 6.2	21400 19000	315 281	5640 5840	1.25 1.40	FA FAF	87R57 87R57	DRE DRE	90L4 90L4	285 315	411 411	
	7.2	16300	240	6040	1.60	F	87R57	DRE	90L4	300	411	
	8.2	14300	211	6180	1.85	FF	87R57	DRE	90L4	335	411	
	9.0	13100	193	6260	2.0							
	6.3 6.9	20100 18400	276.77 253.41	7830 7920	1.90 2.1	FA	97	DRE	90L4	385	393	
	7.8	16300	223.88	8020	2.3	FAF	97	DRE	90L4	430	392	
	9.2	13800	189.92	8130	2.8	F	97 97	DRE DRE	90L4 90L4	400 475	391 392	
	10.0	12700	174.87	8170	3.0		31	DIXL	3024	473	332	
	6.4	19700	270.68	5780 5870	1.35							
	6.8 7.6	18600 16600	255.37 228.93	5870 6020	1.45 1.60	FA	87	DRE	90L4	245	388	
	8.8	14300	197.20	6180	1.85	FAF	87	DRE	90L4	270	387	
	9.7	13100	179.97	6260	2.0	F	87	DRE	90L4	255	386	
	11	11600	159.61	6350	2.3	FF	87	DRE	90L4	290	387	
	13 14	9770 8980	134.16 123.29	6460 6500	2.7 3.0							
	10	12100	166.47	3720	1.10							
	12	10300	142.27	3950	1.30							
	13	9500	130.42	4050	1.40							
	15 16	8330	114.45 108.46*	4160	1.60	FA	77 77	DRE	90L4	155 170	383	
	16 18	7900 6910	94.93	4200 4280	1.70 1.90	FAF F	77 77	DRE DRE	90L4 90L4	170 165	382 381	
	20	6220	85.52	4330	2.1	FF	77	DRE	90L4	190	382	
	23	5460	75.02	4370	2.4							
	24 26	5280 4840	72.50 66.46	4380 4410	2.5 2.7							
	20	4040	00.40	4410	۷.۱							

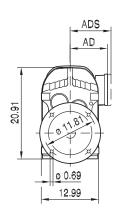




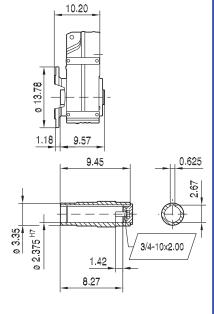




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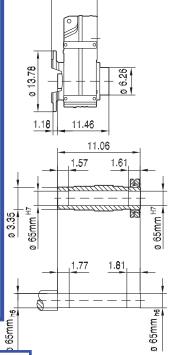






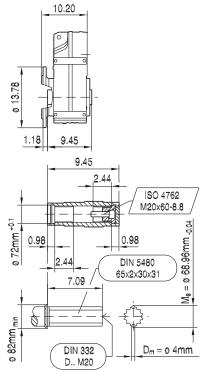


10.20



FVF87...

8



(→ []] 125)	DR80S	DR80M	DR90M	DR90L	DR100M	DR100L/LC	DR132S	DR132M/MC	DR160	DR180S/M	DR180L/LC
AC	6.14	6.14	7.05	7.05	7.76	7.76	8.70	8.70	10.63	12.44	12.44
AD	5.04	5.04	5.51	5.51	6.18	6.18	6.69	6.69	8.98	9.96	9.96
ADS	5.47	5.47	5.91	5.91	6.22	6.22	6.77	6.77	8.98	9.96	9.96
L	23.31	24.53	24.61	25.39	26.57	27.76	29.45	31.42	33.03	35.75	38.11
LS	26.50	27.72	28.27	29.06	30.24	31.42	33.86	35.83	38.43	43.19	45.55
LB	8.58	9.80	9.88	10.67	11.85	13.03	14.72	16.69	18.31	21.02	23.39
LBS	11.77	12.99	13.54	14.33	15.51	16.69	19.13	21.10	23.70	28.46	30.83

10



AC Brakemotors – Technical Data

Technical data of 4-pole high efficiency motors

14.4 Technical data of 4-pole high efficiency motors

1800 rpm - S1

Motor type	P _N T _N	n _N	230V	I _N 460V	575V	cosφ	η100%	I _A /I _N	T_A/T_N T_H/T_N	Code Letter	J _{Mot}	m
	[HP] [lb-in]	[rpm]	[A]			[%] ¹⁾				[10 ⁻³ lb-ft ²]	[lb] ²⁾	
DRS71S4 ³⁾	0.25 8.93	1700	0.9	0.45	0.36	0.69	72.0	4.2	1.9 1.9	G	11.6	17.2
DRS71S4 ³⁾	0.33 12.3	1700	1.24	0.62	0.49	0.69	72.0	4.2	1.9 1.9	G	11.6	17.2
DRS71S4 ³⁾	0.5 18.5	1700	1.84	0.92	0.74	0.69	72.0	4.2	1.9 1.9	G	11.6	17.2
DRS71M4 ³⁾	0.75 27.4	1690	2.5	1.25	1.0	0.71	74.0	4.3	2.2 2.1	G	16.8	20.1
DRE80M4	1 36.2	1740	2.9	1.44	1.15	0.78	82.5	7.1	3 2.1	K	51	31.5
DRE90M4	1.5 53.1	1740	4.5	2.25	1.8	0.73	84.0	7.7	3.6 2.9	L	84.3	40.6
DRE90L4	2 72.5	1740	5.7	2.85	2.3	0.77	85.5	7.5	3.4 3.0	К	103	47.4
DRE100L4	3 107	1735	8.0	4.0	3.2	0.79	87.5	8.1	4 3.3	К	161	63.9
DRE100LC4	5 177	1750	12.9	6.5	5.2	0.83	87.5	7.6	2.5 2.3	J	213	68.4
DRE132S4	5.4 190	1765	13.8	6.9	5.5	0.81	88.5	8.7	2.9 2.5	К	451	102
DRE132M4	7.5 265	1755	18	9	7.2	0.85	89.5	8.1	2.5 1.6	J	605	132
DRE132MC4	10 358	1770	24.5	12.3	9.8	0.82	89.5	8.7	2.1 1.6	К	807	138
DRE160M4	12.5 438	1770	31	15.4	12.3	0.82	91.0	8	3 2.2	J	1068	196
DRE160MC4	15 522	1780	36.5	18.3	14.6	0.82	91.7	8.2	2.9 2	J	1401	207
DRE180M4	20 716	1775	47.5	24	19	0.86	91.7	7.4	2.6 1.9	Н	2636	304
DRE180L4	25 885	1775	60	30	24	0.84	93.0	8.1	2.9 2.2	J	3087	335
DRE180LC4	30 1044	1780	71	35.5	28.5	0.84	93.0	7.6	2.4 1.8	J	3990	355
DRE200L4	40 1424	1780	99	49.5	39.5	0.82	93.0	7.4	2.6 2.1	J	5605	573
DRE225S4	50 1761	1775	119	59	47.5	0.84	93.0	7.2	2.7 2.0	Н	6958	650
DRE225M4	60 2124	1780	142	71	57	0.85	93.6	7.3	2.8 1.9	Н	8146	694

¹⁾ Efficiency levels according to IEC 60034-2-1 Ed. 1 (2007) / PLL from Residual Losses, NEMA MG1 and/or DoE

US DoE CC056A applies to DRE, DRP and DVE motors



²⁾ Applies for foot-mounted motor (DRS and DRE.../FL..)

³⁾ Standard efficiency motor





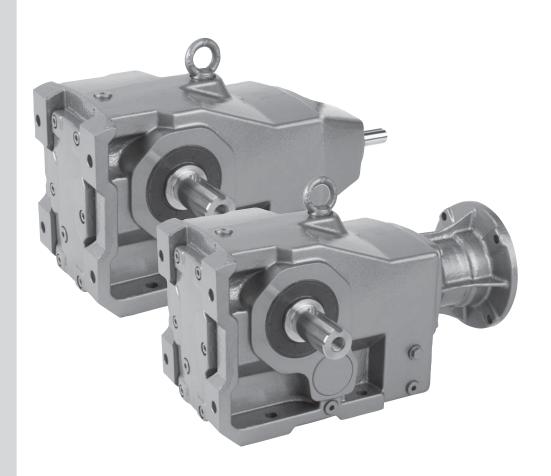
Gear Reducer – Screw Wash Press



Right-angle Helical-bevel Reducers Selection & Combinations

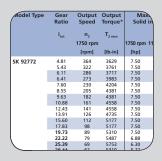
Selection

- SK 92072
- SK 92172
- SK 92372
- SK 92672
- SK 9012.1
- SK 9013.1
- SK 9016.1
- SK 9017.1
- SK 92772
- SK 9022.1
- SK 9023.1
- SK 9032.1
- SK 9033.1
- SK 9042.1
- SK 9043.1
- SK 9052.1
- SK 9053.1
- SK 9072.1
- SK 9072.1/32
- SK 9072.1/42
- SK 9082.1
- SK 9082.1/42
- SK 9082.1/52
- SK 9086.1
- SK 9086.1/52
- SK 9092.1
- SK 9092.1/52
- SK 9096.1
- SK 9096.1/62
- SK 9096.1/63





UNICASE™







Helical-bevel Ordering Guide







							dille					DRIVESYSTEN	
Gear Unit					Shaft/Mounting Reducer Op			ins	out M	otor Options			
K	o 9042.1				Q AF		8		_ [- 4			
N	•	7072.1			6 /	VI .	Ð			see page 6	500 60	e page 690	
						1				see page c	990 26	e page 690	
0	Gear Unit				2	Shaft/Mounting							
	92072 9012.1 9013.1 9072.1/32 92172 9016.1 9017.1 9072.1/42 92372 9022.1 9023.1 9082.1/42 92672 9032.1 9033.1 9082.1/52 92772 9042.1 9043.1 9086.1/52 9052.1 9053.1 9092.1/52				- Solid Shaft/Foot Mount VZ - Solid Shaft/Foot/B14 I VZ - Solid Shaft/B14 Flange VXF - Solid Shaft/Foot/B5 Fl.				9				
					VF - Solid Shaft/B5 Flange LXZ - Double Solid Shaft/Fi			9					
					LX - Double Solid Shaft/Foot				AXZ - Hollow Shaft/Footed/B14 Fla				
					AXF - Hollow Shaft/Footed/B5 Flang								
		9052.1 9072.1	9053.1	9096.1/62	8	Reducer Options							
		9082.1				☐ B - Fixing Element k	(it	□ VL - H	eavy Duty Output B	earings 🗖 VI	- Flouro-rubb	er Seals	
		9086.1				☐ H - Hollow Shaft Co	over	□ VL2 -	Spread Bearing Des	ign 🗆 0 9	SG - Oil Sight	Glass	
		9092.1 9096.1				☐ H66 - IP66 Hollow S	Shaft Cover	□ VL3 -	Oil Safe Spread Bea	rings 🗖 🔿	A - Oil Expans	ion Chamber	
		3030.1				□ D - Torque Arm		□ VL4 -	Drywell	□ 00	OC - Oil Cooler		
						□ K - Bottom Mount T	orque Arm	☐ SM5 -	Stainless Steel Sha	ft 🗆 w	C - Water Coo	ling Cover	
						☐ PR - Flange Pilot Removal ☐ SWA - Special Hollow Shaft ☐ LL - Long To					- Long Term S	Storage	
					☐ SH - Shrink Disc & Cover ☐ SWV - Special S			Special Solid Shaft	Shaft				
						☐ VSH - Heavy Duty Shrink	□ VSH - Heavy Duty Shrink Disc & Cover □ R - Backstop				P - Additiona	Additional Drain Plug	
4	Input NEMA IEC				Intea	ral Motors	Integr	ral Energy	Efficent Motors	Scoop	Motor	Servo Adap	
•	Shaft	Adapter	Adapter	636/4 0.1							Platform	(Keyed)	
	W	N56C N140TC	IEC 63 IEC 71	63S/4 - 0.1 63L/4 - 0.2		160L/4 - 20hp 180MX/4 - 25hp	80LH/4 - 90SH/4 -		200LH/4 - 40hp 225SH/4 - 50hp	S56 S140T	MKN056 MKN140	SEP 100 SEP 130	
		N180TC N210TC	IEC 80 IEC 90	715/4 - 0.3		180LX/4 - 30hp	90LH/4 -		2525MH/4 - 60hp	S180T S210T	MKN180 MKN210	SEP 165 SEP 215	
		N250TC	IEC 90	71L/4 - 0.5 80S/4 - 0.7		200L/4 - 40hp 225S/4 - 50hp	100LH/4 112MH/4		250MH/4 - 75hp 280SH/4 - 100hp	S250T	MKN250	SEP 213	
		N280TC N320TC	IEC 112 IEC 132	80L/4 - 1h	•	2525M/4 - 60hp	132SH/4		280MH/4 - 125hp	S280T S320T	MKN280	Servo Adap (Clamp)	
		N360TC	IEC 132	90S/4 - 1.5 90L/4 - 2h		250M/4 - 75hp 280S/4 - 100hp	132MH/4 160MH/4		315SH/4 - 150hp 315MH/4 - 175hp	S360T	MKN320 MKN360	SEK 100	
		N400TC	IEC 180	100L/4 - 3		280M/4 - 125hp	160LH/4		315MAH/4 - 200h	р S400T	MKN400	SEK 130	
			IEC 200 IEC 225	100LA/4 - 112M/4 - !		315S/4 - 150hp 315M/4 - 175hp	180MH/4 180LH/4		315LH/4 - 250hp			SEK 165 SEK 215	
			IEC 250	132S/4 - 7		315MA/4 - 200hp						SEK 300	
			IEC 280 IEC 315	132M/4 - 1 160M/4 -		315L/4 - 250hp Other Speeds Available			Other Speeds Available	e			
	duct C	pecific	ations	1	- 1	,		I	'		I.		
OC		pecific				M6 M1							
47	Ratio Mounting Position 7 79 .1 O M1				tion	B CONTRACTOR OF THE STATE OF TH				aint d Stainles Steel Paint C Standard			
17	7.79	:1	_	vi i √12				M2 O	NSD+ (gray)	s steet railit	_	ynthetic	
pa	ges 398 -	446		ЛЗ				0	NSD+W (white)		_	ood Grade	
	OR O M4 O M5							NSD-X3 (gray)					
υτ	put Spec	ea	_	И5 И6				0	NSD-X3W (whit	e)			
									C A SHILL I THINE II				
		rpm	_	special			мз	0	Special BLUE	_			
pa	ges 398 -		_				МЗ	0	Special BLUE	_			
iolic (if	d Shaft Sic f required)	446 de H	_	t B5 ired) (i	f requi		Diameter	Torq	ue Arm Side tion (if required)	Shrink Dis (if requi	red)	H66 Side (if required)	
olic (if Sha	d Shaft Sic frequired) aft Side A	446 de H	O S	t B5 (ired) O F	f requi lange	red) (if requi	Diameter	Torqu & Locat	ue Arm Side tion (if required)	Shrink Dis (if requi	red)	(if required) H66 Side A	
S olic (if Sha	d Shaft Sic f required) aft Side A aft Side B	446 H	O S	t B5 (ired) O F	f requi lange lange	red) (if requi Side A Side B	Diameter	Torq	ue Arm Side tion (if required)	Shrink Dis (if requi	red)	(if required)	
olic (if Sha Sha Sha	d Shaft Sic frequired) aft Side A	de H Diam	O S	t B5 (ired) (i	f requi lange lange	red) (if requi	Diameter	Torque & Locat O Side O Side	ue Arm Side tion (if required) A B Location	Shrink Dis (if requi	red)	(if required) H66 Side A	
Solic (if Sha Sha Sha see	I Shaft Side f required) aft Side A aft Side B aft Side A& e page 18	446 de H Diam &B see p	ollow Shafreter (if requ	t B5 (i O F F S S S S S S S S S S S S S S S S S	f requi lange lange lange !	red) (if requi	Diameter	Torque & Locat O Side O Side	ue Arm Side tion (if required)	Shrink Dis (if requi Side A Side B	red)	(if required) H66 Side A H66 Side B	
Solic (if Sha Sha Sha see	I Shaft Side f required) aft Side A aft Side B aft Side A& e page 18	446 de Hoiam &B see p	ollow Shafreter (if requ	t B5 (i O F F S S S S S S S S S S S S S S S S S	f requi lange lange lange :	red) (if requi	Diameter ired)	Torque & Locat O Side O Side	ue Arm Side tion (if required) A B Location	Shrink Dis (if requi • Side A • Side B see pag	red)	(if required) H66 Side A H66 Side B see page 18	
Solic (if Sha Sha see see ltag	I Shaft Side A aft Side B aft Side A aft Side A & e page 18 rmoto ge & Free 0/460V-60	446 de Hoiam &B see p	ollow Shafreter (if requared) ages 566 -	t B5 (ired) O F O F S	f requi lange lange lange ! e pag	red) (if requi	Diameter ired)	Torque Locati Side Side	Location e page 18 Conduit E	Shrink Dis (if requi Side A Side B see pag	e 18	(if required) H66 Side A H66 Side B see page 18	
Sha Sha Sha Sha see ea lltag 23 57	I Shaft Side A aft Side A aft Side B aft Side A& e page 18 rmot ge & Frec 0/460V-60 5V-60Hz	446 de Hoiam &B see p or Only quency	ollow Shafreter (if requared) ages 566 -	t B5 (ired) O F O F S	f requi lange lange lange re pag	red) (if requi	Diameter ired)	Torque & Locat O Side O Side	Location e page 18 Conduit E C CE I	Shrink Dis (if requi Side A Side B see pag	red) O e 18	(if required) H66 Side A H66 Side B see page 18	
Sha Sha Sha see eal lltag 23 57 20	d Shaft Sid f required) aft Side A aft Side B aft Side A& e page 18 rmoto ge & Frec 0/460V-60 5V-60Hz 8V-60Hz	446 de Hoiam &B see p or Only quency	ollow Shafreter (if requared) ages 566 -	t B5 (ired) O F O F S	f requi lange lange lange re pag	red) (if requi	Diameter ired)	Torque Locati Side Side	Location e page 18 Conduit E C CE II C CE III	Shrink Dis (if requi Side A Side B see pag	red) O e 18	(if required) H66 Side A H66 Side B see page 18	
Sha Sha Sha see ea lltag 23 57 20 40	d Shaft Sic f required) aft Side A aft Side B aft Side A& e page 18 rmoto ge & Frec 0/460V-60 5V-60Hz 8V-60Hz 0V-50Hz	446 de Hoiam &B see p or Only quency	ollow Shafreter (if requared) ages 566 -	t B5 (ired) O F O F S	f requi lange lange lange re pag	red) (if requi	Diameter ired)	Torque Locati Side Side	Location e page 18 Conduit E C CE I	Shrink Dis (if requi Side A Side B see pag	e 18	(if required) H66 Side A H66 Side B see page 18	









Selection Information

Gearbox Selection

A number of factors are considered when selecting a gear unit, including gearbox rating, service factor, speed and speed variation, horsepower, thermal capacity, ratio, physical size, ambient conditions and cost. Below are some guideline steps to help aid in the gear unit selection.

- 1. Determine the speed and/or gear ratio
- 2. Determine the required power or torque
- 3. Determine Service Factor
- 4. Select the basic gearbox type and input
- 5. Determine the required mounting position
- 6. Select options
- 7. Checks overhung load, thrust load, NEMA motor weight, thermal considerations, and other application considerations

1. Speed and Gear Ratio

The first step in selecting a gear unit is determining the final output speed or speeds you need. This speed is normally described in revolutions per minute (rpm). This output speed or speeds is determined by the input speed to the gear unit divided by its gear ratio. Their relationship is described by the following formulas.

i (gear ratio) =
$$\frac{\text{Input speed [rpm]}}{\text{Output speed [rpm]}}$$

Output speed [rpm] =
$$\frac{\text{Input speed [rpm]}}{\text{i (gear ratio)}}$$

To specify a gear unit, you can identify either gear ratio needed or the output speed (rpm) if the input speed is known.

2. Power and Torque

The second step for selecting a gear unit is the required power or torque needed to power the load. Torque in this catalog is normally expressed in pound-inches [lb-in].

Power [hp] =
$$\frac{\text{Torque [lb-in] x speed [rpm]}}{63025}$$

Torque [lb-in] =
$$\frac{\text{Power [hp] x 63025}}{\text{speed [rpm]}}$$

For a proper selection you must ensure that the motor or other prime mover can produce enough torque or power and that the gear unit has adequate torque or power capacity. You must also consider if the power or torque is specified at the input or output of the gear unit. The Helical-worm gear units have lower efficiency than in-line or bevel gear units, therefore helical-worm products efficiency may need to be considered in the selection.

To specify a gear unit you can identify torque or power.

3. Service Factor or Service Class

In addition to power or torque, service factor must also be considered. A service factor is essentially the ratio of extra capacity in a gear unit compared to the power or torque that is needed to run that application. The goal of selecting a gear unit with extra capacity (service factor) is to provide adequate service life in operation.

One reason to apply a larger service factor is if a unit operates more hours per day. If a unit runs 24 hours per day it should normally have a higher service factor than a unit that runs 8 hours per day if you expect the same calendar life.

A second reason for applying a larger service factor is to cope with a more difficult application. Even if it takes the same power and speed to operate a rock crusher as a fan, the rock crusher needs a stronger gearbox (higher service factor) to give the same operating life as the gear unit powering the fan.

The real question is how to determine the proper service factor for a gear unit in an application. Following are four possible methods.

Customer or User Specification

Many customers will have their own service factor guidelines or specifications.

AGMA Service Factoring

American Gear Manufacturers Association (AGMA) publishes lists of recommended service factors for different applications. These service factor recommendations have been determined form the experience of many gear manufactures and are in AGMA standard 6010. See page 68 for additional detail.

AGMA Service Classes

G1000 - Subject to Change Without Notice

American Gear Manufactures Association (AGMA) has another method for selecting gear units service factors. AGMA standard 6009 lists many applications by a service class (I, II, III) with class I being the simplest applications and class III being the hardest. These application service classes are associated with a range of service factors by the following table.

AGMA Service Class	Service Factor						
I	1.00 to 1.39						
II	1.40 to 1.99						
III	2.00 and above						

In the gearmotors selection table each unit is also classified by an AGMA service class. See page 64 for additional detail.

Selection Information











NORD Mass Acceleration Service Factoring

NORD often uses a calculation based system to properly assign a service factor. This system considers hours of operation per day, the severity of the application and the number of times the equipment is cycled. See page 72 for additional detail.

4. Gearbox Type & Input

NORD gear drives are available in a number of mechanical configurations including:

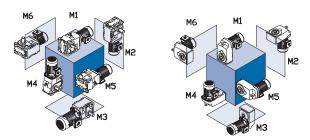
- Helical in-line
- Clincher™ shaft mount
- Right-angle helical-bevel
- Right-angle helical-worm

NORD's modular design allows for a number of different inputs to be added to NORD reducers including:

- Integral motor
- NEMA-C and IEC motor adapter
- Solid input shaft
- Servo motor adapter
- Sugar scoop mount
- Top motor mount platform NORDISC™ variable speed friction drives
- Titan[™] variable speed belt boxes

5. Mounting Position

The gearbox mounting position is an important and often overlooked specification. The mounting position determines how much oil the gear reducer reguires, in addition to determining the position of the oil drain, oil fill and vent on the gear drive. NORD offers six basic mounting positions. If your application requires a variation from the six basic mounting positions, please contact NORD.



Many gearbox and motor options require a location designation. For example a right-angle helical-bevel unit with a single solid shaft extension requires a shaft extension side location. Please see page 23 for additional options that require location designation.

6. Options

NORD offers a number of mechanical, protective, paint & lubrication options for gear reducers & motors. Please see page 25 for gear unit options & refer to the motor section (Section G) for motor options.

7. Checks

Overhung Load



An overhung or radial load exists when a force is applied at right-angles to a shaft beyond the shaft's outermost bearing. Pulleys, sheaves and sprockets will cause an overhung load when used as a power take-off. The amount of overhung load will vary, depending on the type of power take-off used and where it is located on the shaft.

Overhung load [FQ] can be found in the gearmotor rating tables and input shaft overhung load ratings [FQ1] can be found on pages 58 - 69. Overhung load capacities should not exceed the values in the table to ensure long bearing life. Overhung load capacities are to be applied at the midpoint of the shaft extension and without thrust loads.

To calculate overhung load see page 58.

Thrust Loads (Axial)

Loads that are directed towards or away from the gearbox along the axis of the shaft are called thrust or axial loads. Output shaft thrust capacity [FA] can be found in the gearmotor rating tables. Input shaft capacity [FA1] can be found on pages 68. Thrust load capacities should not exceed the values listed in the tables to ensure long bearing life. Thrust load capacities are listed for pure axial loads with no overhung load. Contact NORD for combination loads or a more exact examination of the application.

NEMA C-face Motor Weight Limits

When mounting a motor to a NORD NEMA C-face motor adapter it is important to consider the motor's weight. Following is a table that includes the maximum motor weight the NEMA adapter can support. If the motor exceeds the listed weight it must be externally supported. When a C-face mounted motor is externally supported care must be taken to ensure that the support system does not impose additional pre-loads on the NEMA motor adapter.

NEMA Weights

Motor FRAME	56C	143TC	145TC	182TC	184TC	210TC
Max Weight [lb]	66	88	110	130	175	220
Motor FRAME	250TC	280TC	324TC	326TC	365TC	
Max Weight [lb]	440	550	770	1100	1540	

Selection Information











Gear Reducer Ratings

The permissible continuous power limit of gear reducers is limited by both the mechanical rating and the thermal rating. The mechanical rating depends upon the material strength of the gear reducer's gears, bearings, housing, shafts, etc. The mechanical input power limit to the reducer is also a function of the mechanical power rating divided by the relevant reducer service factor.

The thermal rating or thermal limit depends upon the amount heat generated within the reducer and is influenced by a variety of factors including:

- Churning or splashing losses in the lubricant which depend upon reducer type, ratio, input style, mounting position or oil fill-level, and the circumferential travel velocities of the gear wheels.
- The actual speed and load conditions. These factors determine load-dependent losses in the gears and frictional losses in the gears, bearings and seal areas.
- Ambient Conditions:
 - Ambient Temperature.
 - Amount of free air circulation around the drive.
 - Possible near-by heat sources.
 - Heat dissipation or the ability of the reducer to transfer heat through the housing, shafts, and the mating sub-structure or mounting surface.

Observing the Reducer's Thermal Limit

When to Contact NORD

Through computer program analysis NORD can evaluate application conditions and the impact they have on a reducer's thermal capacity.

When applying helical in-line, Clincher™ shaft mount, & helical-bevel gear units of case sizes 6 & larger (SK62, SK6282 and SK9072.1 and larger), consult NORD if any two or more of the following conditions apply:

- Gear ratio, $i_{total} \le 24:1$ or $\le 48:1$ for helical-bevel units
- Input power, $P_1 \ge 60 \text{ hp } (45 \text{ kw})$
- Input speed, n₁ > 1800
- Vertical positioning (mounting position M2 or M4)
- Input configuration: NEMAC-face, IEC, servo adapter or solid-shaft input (Type-W)
- Elevated ambient temperature ≥ 86° F (30 °C)

When applying helical worm or worm gear units, please consult NORD if one of the following conditions applies:

- Input speed, n₁ > 1800
- Vertical positioning (mounting position M2 or M4)
- Inputconfiguration: NEMAC-face, IEC, servoadapter or solid-shaft input (Type-W)
- Elevated ambient temperature ≥ 86° F (30 °C)

Advise NORD of any special application considerations:

- Confined space or limited air circulation
- Exposure to other near-by radiant heat sources
- Dirty or dusty environments
- High altitude operation > 3,280 ft (1000 m) a.s.l.

Dangers of Reducer Overheating

The following problems may result when a reducer's thermal capacity or maximum oil sump temperatures are exceeded:

- Lubrication oxidation, breakdown & deterioration.
- A decrease in lubrication viscosity & film thickness.
- Loss of critical bearing and gear clearances required for proper lubrication.
- Increased contact pressures & increased operating temps. in the critical load zones of the gearing and bearings.
- An increased possibility for metal-to-metal contact and premature component wear.
- A significant reduction in the lubricant's ability to prevent scuffing, pitting, and in extreme cases galling or welding.

Maximum Oil Sump Temperature Limit

To prevent reducer overheating, the reducer's maximum oil sump temperature limit must not be exceeded for prolonged periods of operation (up to 3 hours continuous operation, depending upon reducer size).

Oil Type	Maximum Oil Ten	nperature Limit
	NORD	AGMA 9005-D94
Mineral	80-85 °C (176-185 °F)	95 °C (203 °F)
Synthetic	105 °C (220 ° F)	107 ° C (225 ° F)

Measures to Expand the Application Range

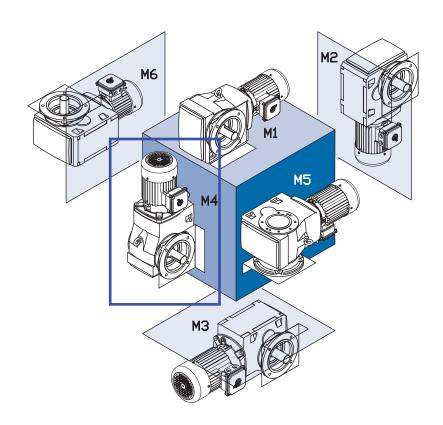
There are a variety of measures that may be taken in order to protect against thermal overload and expand the application range of the gear reducer. Common examples include the following:

- Recommending a change in lubrication viscosity and/or a specific synthetic lubricant type.
- Applying high-temperature seals.
- Increasing air flow around the gear unit.
- Protecting the reducer from high heat sources.
- Considering an integral motor instead of the bolt-on input assembly covers. In many cases the motor fan will substantially increase air-flow around the gear unit.
- Add an Oil Expansion/Overflow Chamber (Option "OA") or an Oil Reservoir (Option "OT").
- Oil Cooler (Option "OC").
- Water Cooling Cover (Option "WC")





Helical-Bevel Flange Mount Positions & Oil Fill Quantities



Mounting Position	M1		M2		M	M3		M4	M5		M6	
	Quarts	Liters										
SK92072	0.42	0.40	0.63	0.60	0.53	0.50	0.53	0.50	0.42	0.40	0.42	0.40
SK92172	0.53	0.50	0.97	0.92	0.92	0.87	1.11	1.05	0.79	0.75	0.69	0.65
SK92372	1.22	1.15	1.59	1.50	1.27	1.20	1.80	1.70	1.22	1.15	1.22	1.15
SK92672	1.64	1.55	2.96	2.80	2.64	2.50	3.49	3.30	2.54	2.40	2.54	2.40
SK92772	2.91	2.75	4.65	4.40	4.76	4.50	4.76	4.50	3.70	3.50	3.70	3.50
SK9012.1	0.74	0.70	2.01	1.90	2.01	1.90	2.54	2.40	1.27	1.20	1.80	1.70
SK9013.1	1.27	1.20	2.43	2.30	2.33	2.20	3.17	3.00	1.48	1.40	2.01	1.90
SK9016.1	0.74	0.70	2.01	1.90	2.01	1.90	2.54	2.40	1.27	1.20	1.80	1.70
SK9017.1	1.27	1.20	2.43	2.30	2.33	2.20	3.17	3.00	1.48	1.40	2.01	1.90
SK9022.1	1.37	1.30	2.75	2.60	3.70	3.50	4.44	4.20	2.11	2.00	2.96	2.80
SK9023.1	2.54	2.40	3.17	3.00	4.02	3.80	5.60	5.30	2.33	2.20	3.28	3.10
SK9032.1	2.01	1.90	5.50	5.20	6.76	6.40	7.72	7.30	3.49	3.30	5.39	5.10
SK9033.1	4.02	3.80	6.02	5.70	7.29	6.90	8.98	8.50	3.81	3.60	5.92	5.60
SK9042.1	3.81	3.60	10.30	9.70	12.0	11.4	12.2	11.5	6.87	6.50	8.67	8.20
SK9043.1	6.02	5.70	10.8	10.2	15.5	14.7	15.5	14.7	6.98	6.60	10.1	9.60
SK9052.1	7.93	7.50	17.4	16.5	21.1	20.0	23.8	22.5	12.2	11.5	19.0	18.0
SK9053.1	13.2	12.5	19.0	18.0	22.7	21.5	28.0	26.5	13.7	13.0	18.0	17.0
SK9072.1	12.7	12.0	29.1	27.5	34.9	33.0	40.7	38.5	20.1	19.0	27.5	26.0
SK9082.1	22.2	21.0	57.1	54.0	69.8	66.0	84.6	80.0	40.2	38.0	55.0	52.0
SK9086.1	38.1	36.0	82.4	78.0	96.2	91.0	107	101	56.0	53.0	80.3	76.0
SK9092.1	42.3	40.0	137	130	163	154	185	175	86.7	82.0	96.2	91.0
SK9096.1	74.0	70.0	198	187	204	193	272	257	119	113	165	156

Lubrication











Lubrication Types

Proper gearbox lubrication is essential in order to reduce friction, heat, and component wear. Lubricants reduce heat and wear by inserting a protective "fluid boundary" between mating parts and preventing direct metal to metal contact. Lubricants also help prevent corrosion and oxidation, minimize foam, improve heat transfer, optimize reducer efficiency, absorb shock loads and reduce noise.

Mounting position not only determines the proper fill-level but may also have some effect on final reducer assembly. If considering any mounting positions that are not shown as catalog-standard options, it is critical that the customer consult with NORD prior to ordering. Unless otherwise specified, NORD supplies most all gear units (*) factory-filled with the standard lubrication type and the appropriate amount of lubricating oil.

* Gear units SK10282, SK10382, SK11282, SK11382, SK12382, and SK9096.1 are supplied without oil.

Standard Oil Lubricants

Gear Unit Type	Ambient Temperature	Oil Type	ISO Viscosity	Manufacturer Brand / Type
Helical-Inline,	-4 to 104 °F (-20 to 40 °C)	MIN-EP	VG 220	Shell / Omala 220 ♦
Parallel-Shaft, &	-40 to 140 °F (-40 to 60 °C)	PAO	VG 220	Mobil SHC 630 ♦
Helical-Bevel	23 to 104 °F (-5 to 40 °C)	FG	VG 220	Shell / FM 220 ♦
Helical-Worm	-22 to 122 °F (-30 to 50 °C)	PAO	VG 680	Mobil SHC 636 ♦

Optional Oil Lubricants

Gear Unit Type	Ambient Temperature	Oil Type	ISO Viscosity	Manufacturer Brand / Type
Helical-Inline,	-31 to 176 °F (-35 to 80 °C)	PAO	VG 460	Mobil SHC 634
Parallel-Shaft, &	-40 to 77 °F (-40 to 25 °C)	PAO	VG 150	Mobil SHC 629
Helical-Bevel	-40 to 140 °F (-40 to 60 °C)	FG-PAO	VG 220	Shell / Cassida GL 220
Helical-Worm	-40 to 122 °F (-40 to 50 °C)	FG-PAO	VG 460	Shell / Cassida GL 460

Standard Bearing Grease Lubricants

Grease Type / Thickener	Ambient Temperature	NLGI Grade	Manufacturer Brand / Type
Standard (Li-Complex)	-22 to 140 °F (-30 to 60 °C)	NLGI 2	Shell Albida EP LC2 ♦
High Temp (Polyurea)	-13 to 176 °F (-25 to 80 °C)	NLGI 2	Mobil Polyrex EP 2 ♦
Food-Grade (Al-Complex)	-13 to 104 °F (-25 to 40 °C)	NLGI 2	Mobil Grease FM 222 ♦

Stocked Lubricant

Oil Formulation Codes

MIN-EP	Mineral Oil with EP Additive
PAO	Synthetic Polyalphaolefin Oil
PG	Synthetic Polyglycol Oil
FG	Food-Grade Oil
FG-PAO	Food-Grade, Synthetic Polyalphaolefin Oil

Important Notes

- In worm gears avoid using (EP) gear oils that contain sulfur-phosphorous chemistries, as these additives can react adversely with bronze worm gears and accelerate wear.
- Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacture for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not mix different oils with different additive packages or different base oil formulation types. Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral oil, or Polyalphaolefin (PAO) oil.
- Please Consult NORD if considering cold-temperature oils below an ISO Viscosity VG100 or Tower.







Helical-Bevel Weights - Reducer

INTRODUCTION

Approximate Weights [lb]

Туре	w	56C	140TC	180TC	210TC	250TC	280TC	320TC	360TC
SK 92072	15	24	24	_	-	_	-	_	_
SK 92172	26	35	35	-	-	-	-	-	-
SK 92372	40	49	49	60	_	_	_	_	_
SK 92672	79	86	86	97	112	-	-	-	-
SK 9012.1 SK 9013.1	75 86	86 90	86 -	101 –	-	- -		_ _	-
SK 9016.1 SK 9017.1	77 88	88 93	88 -	104 –	- 1	- -	1 1	_ _	- 1
SK 92772	99	101	101	112	128	128	_	_	_
SK 9022.1	93	104	104	119	-	-	-	-	-
SK 9023.1	104	108	–	–	-	-		-	-
SK 9032.1	150	154	154	163	183	-	-	_	-
SK 9033.1	154	165	165	–	-	-	-	_	-
SK 9042.1	276	265	265	280	311	333	-	_	-
SK 9043.1	287	291	291	300	–		-	_	-
SK 9052.1	441	430	430	445	476	498	498	_	-
SK 9053.1	459	463	463	472	-	-	-	_	-
SK 9072.1	794	-	–	767	796	851	851	882	915
SK 9072.1/32	803	807	807	816	836	-	-	-	-
SK 9072.1/42	862	-	851	897	919	942	-	-	-
SK 9082.1	1532	-	-	1338	1369	1424	1424	1455	1488
SK 9082.1/42	1435	1424	1424	1440	1471	1493	-	-	-
SK 9082.1//52	1491	-	-	1495	1526	1548	1548	-	-
SK 9086.1	2084	_	–	1890	1921	1976	1976	2007	2040
SK 9086.1/52	2042	2031	2031	2046	2077	2099	2099	–	–
SK 9092.1	3341	-	–	3147	3177	3233	3233	3263	3296
SK 9092.1/52	3299	3288	3288	3303	3334	3356	3356	–	–
SK 9096.1	4221	-	–	-	4057	4113	4113	4143	4176
SK 9096.1/62	4298	4287	4287	4302	4333	4355	4355	-	–
SK 9096.1/63	4315	4304	4304	4319	4350	4372	4372	-	–

Above weights are approximate. Depending upon ratio, oil quantity and optional equipment, reducer weights may be different than shown. Exact weights can be obtained after the unit is fully asembled.







SK 9042.1, SK 9043.1 NEMA-C + W Ratings & Combinations

Model Type	Gear Ratio	Output Speed	Output Torque*		imum in				ļ	NI Availal		C-Face		S	
		-	<u>.</u>		laanist (
	i _{tot}	n ₂	T _{2 max}	4750	Input S		F00								
		1750 rpm		1750 rpm	•	•	•					ı	I	l I	
		[rpm]	[lb-in]	[hp]	[hp]	[hp]	[hp]	56C	140TC	180TC	210TC	250TC	280TC	320TC	360TC
SK 9042.1	8.83	198	12390	20.00	13.20	10.00	6.60			k	Χ	Х			
	9.39	186	13275	20.00	13.20	10.00	6.60			K	X	X	Χ*		
	10.21 11.40	171 154	13275 13275	20.00 20.00	13.20 13.20	10.00 10.00	6.60 6.60	Х	Х	<u> </u>	X X	X	X*		
	13.40	131	17700	20.00	13.20	10.00	6.60	X	X	1	X	X	X*		
	15.66	112	17700	20.00	13.20	10.00	6.60	X	X	 k	X	X	X*		
	18.20	96	21683	20.00	13.20	10.00	6.60			X	Χ	Х			
	20.32	86	23010	20.00	13.20	10.00	6.60	Χ	Х	K K	Χ	Х	Χ*		
	23.89	73 63	23895	20.00	13.20	10.00	6.60	X	X	X X X X	X	X	X*		
	27.91 31.70	63 55	24780 24780	20.00	13.20 13.20	10.00 10.00	6.60 6.60	X	X		X	Х	Х*		
	34.39	55 51	24780	20.00	13.20	10.00	6.60	X	X	🗘	X	X*			
	40.54	43	24780	16.91	11.16	8.45	5.58	X	X	1	X	X*	Х*		
	47.67	37	24780	14.55	9.60	7.27	4.80	X	X	*	X	Χ*	X*		
	55.69	31	24780	12.19	8.04	6.09	4.02	Х	Х	X	Χ	Χ*	Χ*		
	63.25	28	24780	11.01	7.27	5.50	3.63	Χ	X	X	Χ				
	68.61	26	24780	10.22 9.04	6.75	5.11	3.37	X	X	🕻	X X*	Х*			
	76.18 86.43	23 20	24780 24780	7.86	5.97 5.19	4.52 3.93	2.98 2.59	X	X	X X X X	X*				
	95 56	18	24780	7.00	4.67	3.54	2.34	X	X	🕻	X*				
	117.79	15	21240	5.06	3.34	2.53	1.67	X	X	Х*					
	132.79	13	24780	5.11	3.37	2.56	1.69			X	Χ*				
	159.94	11	24780	4.32	2.85	2.16	1.43			X*	Χ*				
	165.24	11	13275	2.32	1.53	1.16	0.76	X	X						
	195.12 235.01	9.0 7.4	24780 24780	3.54 2.91	2.34 1.92	1.77 1.45	1.17 0.96	X X	X	X* X*					
	273.73	6.4	24780	2.51	1.66	1.45	0.96	X	X	X					
	329.69	5.3	24780	2.08	1.38	1.04	0.69	X	X						
-															
SK 9043.1	172.08	10	24780	3.00	1.98	1.50	0.99	Х	Х	X*					
	204.38 279.60	8.6 6.3	24780 24780	3.00 2.48	1.98 1.63	1.50 1.24	0.99 0.82	X	X	X* X*					
	350.72	5.0	24780	1.97	1.30	0.98	0.65	X X	X X*	X*					
	404.82	4.3	24780	1.69	1.12	0.85	0.56	X	X*	X*					
	568.04	3.1	24780	1.22	0.80	0.61	0.40	X	X*						
	645.18	2.7	24780	1.06	0.70	0.53	0.35	Х	Χ*						
	881.60	2.0	24780	0.79	0.52	0.39	0.26	Χ*	Χ*						
	1113.24	1.6	24780	0.63	0.42	0.31	0.21	X* X*	X* X*						
	1517.17 2128.35	1.2 0.82	24780 24780	0.47 0.32	0.31 0.21	0.24 0.16	0.16 0.11	X*	X*						
	2397.14	0.82	24780	0.32	0.21	0.16	0.11	X*	X*						
	3026.98	0.58	24780	0.23	0.15	0.11	0.08	X*	X*						
	3362.82	0.52	24780	0.20	0.13	0.10	0.07	Χ*	X*						
	4246.38	0.41	24780	0.16	0.11	0.08	0.05	Χ*	X*						

^{*} Caution - The motor power may exceed the gear unit's mechanical torque capacity

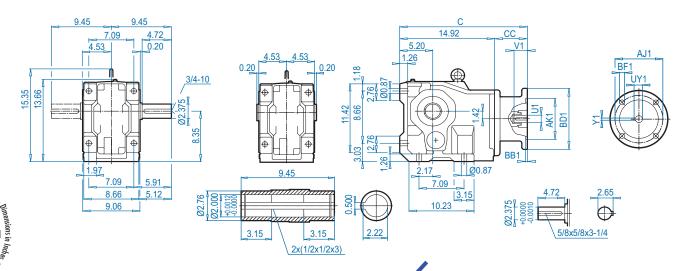
Ē	W	56C	140TC	180TC	210TC	250TC
SK 9042.1	276	265	265	280	311	333
SK 9043.1	287	291	291	300	-	-

The mechanical power limit of the solid input shaft type "W" may limit the reducer rating. All ratings are mechanical. See page 14 for thermal considerations.





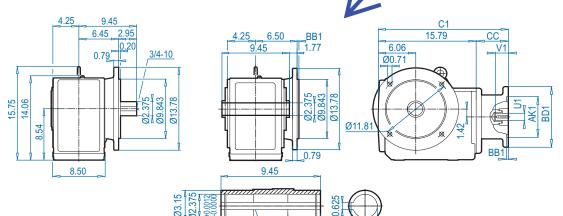
SK 9042.1 SK 9042.1AX NEMA Input





SK 9042.1AF

3.15

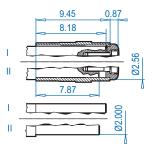


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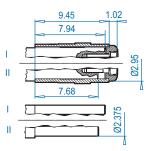
2x(5/8x7/16x3)

2.56





SK 9042.1AF**B** ⇒ □ 574



NEMA Dimensions

Туре	AJ1	AK1	BB1	BD1	BF1	U1	V1	UY1	Y1	С	C1	СС
56C	5.88	4.500	0.20	6.54	0.43	0.625	2.06	0.71	0.188	19.22	20.09	4.30
140TC	5.88	4.500	0.20	6.54	0.43	0.875	2.12	0.96	0.188	19.22	20.09	4.30
180TC	7.25	8.500	0.23	9.17	0.59	1.125	2.62	1.24	0.250	22.82	23.69	7.90
210TC	7.25	8.500	0.23	9.17	0.59	1.375	3.12	1.52	0.312	22.82	23.69	7.90
250TC	7.25	8.500	0.23	9.17	0.59	1.625	3.75	1.80	0.375	22.82	23.69	7.90

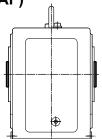
DIMENSIONS

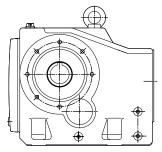
Hollow Shaft Dimensions

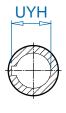


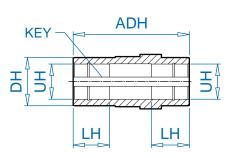


Hollow Shaft Dimensions (AZ-AF)











	ТҮРЕ	UH	DIAMETER TOLERANCE	ADH	LH	DH	UYH	KEY SIZE w x h x l	KEY QTY
ğ.	SK 9012.1 AZ/AF	1.375*	+0.0010 / -0.0000	5.83	1.97	1.97	1.52	5/16 x 5/16 x 2	2
2.	SK 9013.1 AZ/AF	1.4375	+0.0010 / -0.0000	5.83	1.97	1.97	1.61	3/8 x 3/8 x 2	2
		1.250	+0.0010 / -0.0000	5.83	1.97	1.97	1.37	1/4 x 1/4 x 2	2
		35mm	+0.025 / -0.000mm	148mm	50mm	50mm	38.3mm	10 x 8 x 60mm	2
	SK 9016.1 AZ/AF	1.375	+0.0010 / -0.0000	5.83	1.97	1.97	1.52	5/16 x 5/16 x 2	2
	SK 9017.1 AZ/AF	1.500*	+0.0010 / -0.0000	5.83	1.97	1.97	1.61	3/8 x 1/4 x 2	2
		1.4375	+0.0010 / -0.0000	5.83	1.97	1.97	1.61	3/8 x 3/8 x 2	2
		1.250	+0.0010 / -0.0000	5.83	1.97	1.97	1.37	1/4 x 1/4 x 2	2
		40mm	+0.025 / -0.000mm	148mm	50mm	50mm	42.2mm	12 x 7 x 60mm	2
	SK 9022.1 AZ/AF	1.500*	+0.0010 / -0.0000	7.09	2.36	2.17	1.67	3/8 x 3/8 x 2-1/4	2
	SK 9023.1 AZ/AF	1.4375	+0.0010 / -0.0000	7.09	2.36	2.17	1.61	3/8 x 3/8 x 2-1/4	2
		40mm	+0.025 / -0.000mm	180mm	60mm	55mm	43.3mm	12 x 8 x 60mm	2
	SK 9032.1 AZ/AF	2.000*	+0.0012 / -0.0000	8.27	2.76	2.76	2.22	1/2 x 1/2 x 2-3/4	2
	SK 9033.1 AZ/AF	1.9375	+0.0012 / -0.0000	8.27	2.76	2.76	2.16	1/2 x 1/2 x 2-3/4	2
		1.6875	+0.0012 / -0.0000	8.27	2.76	2.76	1.86	3/8 x 3/8 x 2-3/4	2
		50mm	+0.025 / -0.000mm	210mm	70mm	70mm	53.8mm	14 x 9 x 70mm	2
	SK 9042.1 AZ/AF	2.375*	+0.0012 / -0.0000	9.45	3.15	3.15	2.56	5/8 x 7/16 x 3	2
	SK 9043.1 AZ/AF	2.4375	+0.0012 / -0.0000	9.45	3.15	3.15	2.62	5/8 x 7/16 x 3	2
		2.1875	+0.0012 / -0.0000	9.45	3.15	3.15	2.41	1/2 x 1/2 x 3	2
L		60mm	+0.030 / -0.000mm	240mm	80mm	80mm	64.4mm	18 x 11 x 80mm	2
	SK 9052.1 AZ/AF	2.750*	+0.0012 / -0.0000	11.81	3.94	3.94	3.03	5/8 x 5/8 x 4	2
	SK 9053.1 AZ/AF	2.9375	+0.0012 / -0.0000	11.81	3.94	3.94	3.14	3/4 x 1/2 x 4-1/2	2
		70mm	+0.030 / -0.000mm	300mm	100mm	100mm	74.9mm	20 x 12 x 100mm	2
	SK 9072.1 AZ/AF	3.250*	+0.0012 / -0.0000	13.78	4.72	4.72	3.59	3/4 x 3/4 x 4-3/4	2
		2.9375	+0.0012 / -0.0000	13.78	4.72	4.72	3.14	3/4 x 1/2 x 4-1/2	2
		2.750	+0.0012 / -0.0000	13.78	4.72	4.72	3.03	5/8 x 5/8 x 4-1/2	2
		3.4375	+0.0014 / -0.0000	13.78	4.72	4.72	3.82	7/8 x 7/8 x 4-3/4	2
		3.625	+0.0014 / -0.0000	13.78	4.72	4.72	4.01	7/8 x 7/8 x 4-3/4	2
		80mm	+0.030 / -0.000mm	350mm	120mm	120mm	85.4mm	22 x 14 x 110mm	2
		90mm	+0.035 / -0.000mm	350mm	120mm	120mm	95.4mm	25 x 14 x 140mm	2
	SK 9082.1 AZ/AF	4.000*	+0.0014 / -0.0000	16.54	5.51	5.51	4.44	1 x 1 x 4-1/2	2
		3.9375	+0.0014 / -0.0000	16.54	5.51	5.51	4.38	1 x 1 x 4-1/2	2
		4.4375	+0.0014 / -0.0000	16.54	5.51	5.51	4.76	1 x 3/4 x 6	2
		110mm	+0.035 / -0.000mm	420mm	140mm	140mm	116.4mm	28 x 16 x 120mm	2
	SK 9086.1 AZ/AF	4.500	+0.0014 / -0.0000	19.69	6.30	6.30	4.95	1 x 1 x 6-1/2	2
		4.750*	+0.0014 / -0.0000	19.69	6.30	6.30	5.30	1-1/4 x 1-1/4 x 6-1/2	2
L		120mm	+0.035 / -0.000mm	500mm	160mm	160mm	127.4mm	32 x 18 x 150mm	2

^{*} standard size

[•] Dimensions are in inches unless otherwise noted.

[•] For shaft sizes not shown, consult NORD.





Motor -Screw Wash Press





BALDOR - RELIANCE I

Product Information Packet

VM7044T

5//3HP,1745//1450RPM,3PH,60//50HZ,184TC

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Part Detail							
Revision:	Н	Status:	PRD/A	Change #:		Proprietary:	No
Type:	AC	Prod. Type:	3634M	Elec. Spec:	36WGS543	CD Diagram:	CD0005
Enclosure:	XPFC	Mfg Plant:		Mech. Spec:	36E396	Layout:	36LYE396
Frame:	184TC	Mounting:	F1	Poles:	04	Created Date:	09-07-2010
Base:	Z	Rotation:	R	Insulation:	В	Eff. Date:	07-23-2015
Leads:	9#16					Replaced By:	
Literature:		Elec. Diagram:					

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Nameplate NP1426XPSLEV					
NO.		20	010A		
SER.					
SPEC.	36E396S543H1				
CAT.NO.	VM7044T				
НР	2//3	T. CODE	T3C		
VOLTS	230/460//190/380				
AMPS	13.6/6.8//11/5.5				
RPM	1745//1450				
Н	60//50	РН	3	CL	В
SER.F.	1.00	DES	А	CODE	ſ
RATING	40C AMB-CONT				
FRAME	184TC	NEMA-NOM-EFF	87.5		
USABLE AT 208V	14.2	PF	78		
BLANK					

Produ
BALDOR. RELIANCE

Parts List		
Part Number	Description	Quantity
SA202975	SA 36E396S543H1	1.000 EA
RA190238	RA 36E396S543H1	1.000 EA
36FN3000A01SP	EXFN, PLASTIC, 7.00 OD, .912 ID	1.000 EA
35CB3001A02SP	EXPL PROOF CONDUIT BOX, 3/4"PIPE TAP LEA	1.000 EA
11XW1032G06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	1.000 EA
HW3001B01	BRASS CUP WASHER, FOR #8 SCREW	1.000 EA
36EP1702A01	FR ENDPLATE, MACH	1.000 EA
HW4500A19	1/4-28X1/4 SLOTTED PLUG F/S	2.000 EA
HW5100A05	WVY WSHR F/205 & 304 BRGS	1.000 EA
36EP1703A01	PU ENDPLATE, MACH	1.000 EA
51XN1032A20	10-32 X 1 1/4 HX WS SL SR	2.000 EA
HW4001A01	1/4 HX SOC PIPE PLG (F/S) ALLOY STEEL W/	2.000 EA
60XN1032A07	10-32 X 1/2 TRUSS HEAD, TORX SERRATED ZN	2.000 EA
51XB1214A16	12-14X1.00 HXWSSLD SERTYB	1.000 EA
36FH2000A01	FAN COVER MACH	1.000 EA
12XN1032A10	10-32 X.625 HX WS SL ZN	4.000 EA
HW1001A10	WASHER, #10 SPLT LK, ZN X	4.000 EA
35CB3500A01SP	CONDUIT BOX LID, MACH	1.000 EA
51XN2520A16	SCREW, HEX WS SLT, ZN, 1/4-20 X 1.00	4.000 EA
HW2501E16	3KEY, 1/4 SQ X 1.750	1.000 EA
HA7000A02	KEY RETAINER RING, 1 1/8 DIA, 1 3/8 DIA	1.000 EA
85XU0407S04	4X1/4 U DRIVE PIN STAINLESS	6.000 EA
NP0018F	ALUM UL XP CONDUIT BOX NAMEPLATE	1.000 EA
MJ1000A75	GREASE, POLYREX EM EXXON (USe 4824-15A)	0.050 LB

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Parts List (continued)		
Part Number	Description	Quantity
HA3105A06	THRUBOLT- 3/8-16 X 10.500 X	4.000 EA
MG1025G29	MUNSELL 4.5Y 5.3/0.7 DARK CHARCOAL GREY	0.022 GA
LB1119N	WARNING LABEL	1.000 EA
LC0145B01	CONNECTION LABEL	1.000 EA
NP1426XPSLEV	SS XP UL CSA-EEV CC CL-I GP-D	1.000 EA
G0PA1000	PKG GRP, PRINT PK1026A06	1.000 EA
PK3082	STYROFOAM CRADLE	1.000 EA
MN416A01	TAG-INSTAL-MAINT no wire (1200/bx) 11/14	1.000 EA

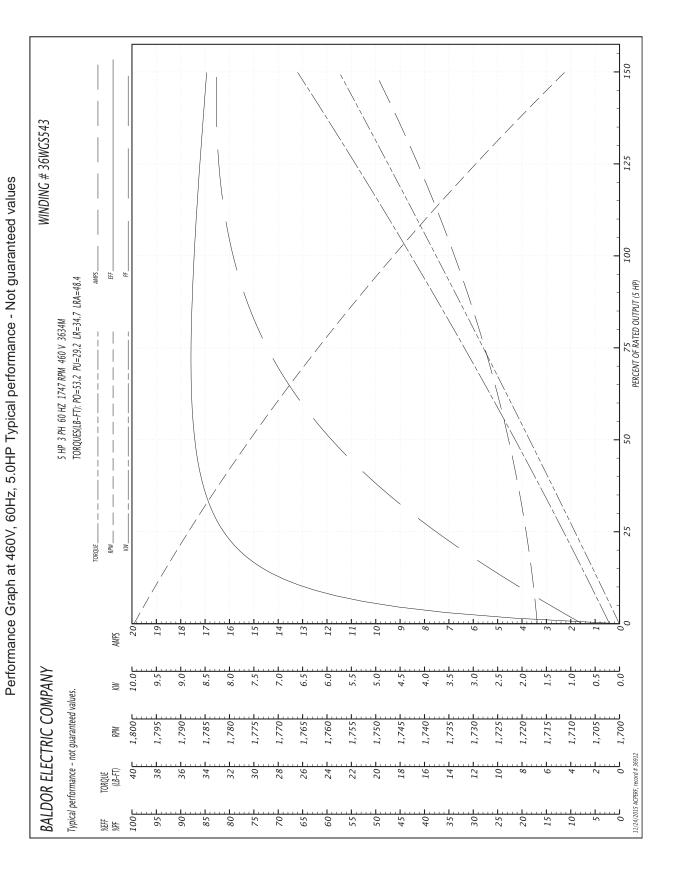
AC Induction Motor Performance Data Record # 36912 - Typical performance - not guaranteed values

Enclosure: XPFC	
Туре: 3634М	
Winding: 36WGS543-R003	

Name	Nameplate Data			460 V, 60 Hz: High Voltage Connection	
Rated Output (HP)		5//3		Full Load Torque	15 LB-FT
Volts	,	230/460//190/380		Start Configuration	direct on line
Full Load Amps		13.6/6.8//11/5.5		Breakdown Torque	53.2 LB-FT
R.P.M.		1745//1450		Pull-up Torque	29.2 LB-FT
和	09//09	Phase	3	Locked-rotor Torque	34.7 LB-FT
NEMA Design Code	٧	KVA Code	٦	Starting Current	48.4 A
Service Factor (S.F.)		1		No-load Current	3.42 A
NEMA Nom. Eff.	87.5	Power Factor	78	Line-line Res. @ 25°C	2.53 Ω
Rating - Duty		40C AMB-CONT		Temp. Rise @ Rated Load	78°C
				Rotor inertia	0.317 LB-FT2

Load Characteristics 460 V, 60 Hz, 5 HP

% of Rated Load	25	50	75	100	125	150
Power Factor	38	59	72	78	82	83
Efficiency	9.08	86.8	87.6	87.7	86.2	84.6
Speed	1788	1776	1762	1747	1730	1711
Line amperes	3.77	4.5	5.5	6.83	8.24	10



AC Induction Motor Performance Data Record # 36913 - Typical performance - not guaranteed values

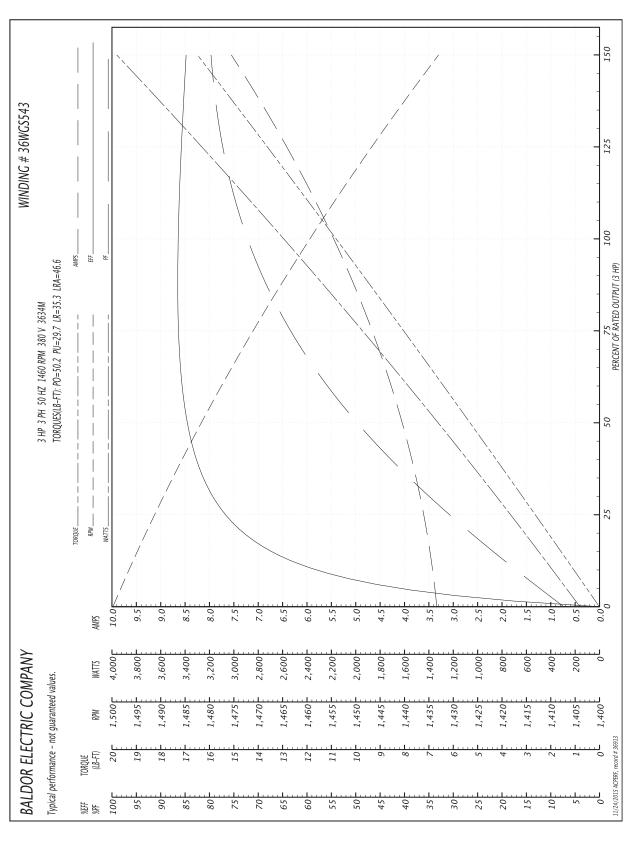
Enclosure: XPFC	
Type: 3634M	
Winding: 36WGS543-R003	

Name	Nameplate Data			380 V, 50 Hz: High Voltage Connection	
Rated Output (HP)		5//3		Full Load Torque	10.8 LB-FT
Volts	,	230/460//190/380		Start Configuration	direct on line
Full Load Amps		13.6/6.8//11/5.5		Breakdown Torque	50.2 LB-FT
R.P.M.		1745//1450		Pull-up Torque	29.7 LB-FT
和	09//09	Phase	3	Locked-rotor Torque	35.3 LB-FT
NEMA Design Code	٧	KVA Code	٦	Starting Current	46.6 A
Service Factor (S.F.)		1		No-load Current	3.36 A
NEMA Nom. Eff.	87.5	Power Factor	78	Line-line Res. @ 25°C	2.53 Ω
Rating - Duty		40C AMB-CONT		Temp. Rise @ Rated Load	26°C
				Rotor inertia	0.317 LB-FT2

Load Characteristics 380 V, 50 Hz, 3 HP

% of Rated Load	25	20	75	100	125	150
Power Factor	31	20	64	71	77	80
Efficiency	76.2	84.4	86	87.1	85.6	84.8
Speed	1491	1482	1471	1460	1447	1433
Line amperes	3.58	4.02	4.63	5.49	6:39	7.53

Performance Graph at 380V, 50Hz, 3.0HP Typical performance - Not guaranteed values







Level Sensor -Screen



SITRANS L Level instruments

Point level measurement

Pointek ULS 200

Overview



The Pointek ULS 200 is an ultrasonic non-contacting switch with two switch points for level detection of bulk solids, liquids and slurries in a wide variety of industries.

Benefits

- 2 switch outputs for high-high, high, low and low-low level alarms or pump up/pump down control
- Integral temperature compensation
- AC or DC power supply
- Electronics provided with fail-safe function
- Threaded process connections
- Polycarbonate or aluminum enclosures, Type 6/NEMA 6/IP67
- · Easy, two-button programming

Application

The measuring range for bulk solids is max. 3 m (9.8 ft) and 5 m (16.4 ft) for liquids and slurries. Unlike invasive contacting devices, there is no material buildup on the sensor.

The level switch has a rugged design, combining the transducer and electronics in one durable device. It has no moving parts and is virtually maintenance-free.

The transducer, available in PVDF copolymer, is inert to most chemicals. This means the device can be used in the chemical, petrochemical, water and wastewater industries. The Pointek ULS 200 delivers superior performance while reducing maintenance, downtime and equipment replacement costs.

 Key Applications: liquids, slurries, fluid materials, plugged chute detection, chemical industry

Design

Installation

The Pointek ULS 200 should be mounted in an area that is within the temperature range specified and that is suitable to the enclosure rating and materials of construction. The cover should be accessible to allow programming, wiring and display viewing.

It is advisable to keep the Pointek ULS 200 away from high voltage or current runs, contactors and SCR control drives.

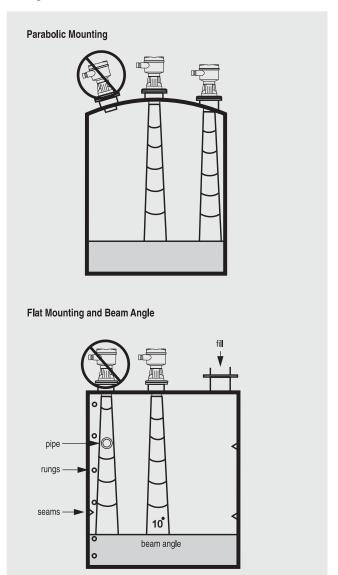
Locate the Pointek ULS 200 so that it has a clear sound path perpendicular to the material surface. The sound path should not intersect the fill path, rough walls, seams, rungs etc.

Mounting and Interconnection

The Pointek ULS 200 is available in three thread types: 2" NPT, 2" BSP or PF2 and can be fitted with the optional 75 mm (3") flange adapter for mating to 3" ANSI, DN 65, PN10 and JIS 10K 3B sized flanges.

Separate cables and conduit may be required to conform to standard instrumentation wiring or electrical codes.

Configuration



Pointek ULS 200 Mounting

SITRANS L Level instruments Point level measurement

Pointek ULS 200

Technical specifications		Selection and Ordering of
Mode of operation		Pointek ULS 200 Ultrasonic non-contacting swi
Measuring principle	Ultrasonic level switch	points for level detection of bu
Measuring range		slurries in a wide variety of inc
Measuring range in liquids	0.25 to 5 m (0.8 to 16.4 ft)	Power supply 24 V DC, relay output
Measuring range in bulk solids	0.25 to 3 m (0.8 to 9.8 ft)	24 V DC. transistor output
Output		100 to 230 V AC, relay output
AC Version (relay)	2 SPDT Form C contacts rated 5 A at 250 V AC, resistive load	Approvals CE, ATEX II 2G EEx md IIC T5
DC Version (relay)	2 SPDT Form C contacts rated 5 A at 48 V DC	CE, CSA Class I Div. 1, Class CE, FM Class I Div. 1, Class II
DC Version (transistor)	2 switches, rated max. 100 mA, 48 V DC	CE, CSANRTL/C, FM CE, CSA Class I Div. 2, Class
Accuracy		Process connection
AC/DC version		ETFE, 2" NPT (ANSI/ASME B1 EFTE, 2" BSPT (EN 10226-1)
- Resolution	3 mm (0.1")	EFTE, PF2 (JIS B 0202)
- Repeatibility	0.25 % of measuring range	PVDF copolymer, 2" NPT (ANS
Rated operation conditions		PVDF copolymer, 2" BSPT (EN
Installation conditions		PVDF copolymer, PF2 (JIS B (
- Location	Indoors/outdoors	Enclosure/cable inlet Polycarbonate
- Beam angle	12°	Cable inlet PG 13.5
Ambient conditions		Cable inlet ½" NPT
Ambient temperature	-40 to +60 °C (-40 to +140 °F)	Aluminum
- If mounted in metal threads	-20 to +60 °C (-5 to +140 °F)	 Cable inlet PG 13.5 Cable inlet ½" NPT
Medium conditions		Instruction manual
Process pressure	0.5 bar (7.25 psi) max.	English
Design		French
Material	Polycarbonate or epoxy-coated aluminum with gasket	Spanish German
Weight	Approx. 1.5 kg	Note: The instruction manual sa separate line item on the ord
Transducer material	PVDF copolymer	Accessories
Threaded mounting	2" NPT, 2" BSP or PF 2	Tag, stainless steel, 12 x 45 m
- Optional flange adapter	For 3" ANSI, DN 65, PN10 and JIS 10 K3B	text line, suitable for enclosure Universal Box Bracket Mountil
Power supply		3" ANSI, DN 65, PN10, JIS 10 adapter for 2" NPT
AC version	100 to 230 V AC, \pm 15%, 50/60 Hz, max. 12 VA, 5 W	3" ANSI, DN 65, PN10, JIS 10 adapter for 2" BSP
DC version	18 to 30 V DC, 3 W	2" BSP Locknut, plastic
Displays and controls	_	Available only with Enclosure
Display	LCD, three digits, 9 mm (0.35") high, for display of distance between sensor face and mate- rial, multisegment graphic for operating state	 Available only with Enclosure options A and E. Available only with Enclosure C) Subject to export regulations
Memory	EEPROM, non-volatile	, , , , , , , , , , , , , , , , , , , ,
Programming	2 keys	
Electronics/enclosure	Connection: terminal block, max. 2.5 mm² (14 AWG) solid/1.5 mm² (16 AWG) stranded	
Degree of protection	IP67/Type 6/NEMA 6	
Cable inlet	2 x ½" NPT or 2 x PG 13.5	
Certificates and approvals	CE (EMC certificate available on request), CSA _{NRTL/C} , FM CSA/FM Class I, Div. 1, Groups A, B, C, D; Class II; Groups E, F, G; Class III	

• ATEX II 2G EEx md II C T5

Selection and Ordering data	Order No.
Pointek ULS 200 C Ultrasonic non-contacting switch with two switch points for level detection of bulk solids, liquids and slurries in a wide variety of industries	7 M L 1 5 1 0 -
Power supply 24 V DC, relay output 24 V DC, transistor output	1
100 to 230 V AC, relay output	3
Approvals CE, ATEX II 2G EEx md IIC T5, SAA ¹⁾ CE, CSA Class I Div. 1, Class II Div. 1, Class III ²⁾ CE, FM Class I Div. 1, Class II Div. 1, Class III ²⁾ CE, CSANRILIC, FM	C F G H
CE, CSA Class I Div. 2, Class II Div. 2 ³⁾	J
Process connection ETFE, 2" NPT (ANSI/ASME B1.20.1) EFTE, 2" BSPT (EN 10226-1) EFTE, PF2 (JIS B 0202)	A B C
PVDF copolymer, 2" NPT (ANSI/ASME B1.20.1)	E
PVDF copolymer, 2" BSP1 (EN 10226-1) PVDF copolymer, PF2 (JIS B 0202)	F G
Enclosure/cable inlet Polycarbonate Cable inlet PG 13.5 Cable inlet ½" NPT	1 2
Aluminum • Cable inlet PG 13.5 • Cable inlet ½" NPT	3 4
French C) Spanish C) German C) Note: The instruction manual should be ordered as	7ML1998-1AS01 7ML1998-1AS11 7ML1998-1AS21 7ML1998-1AS31
a separate line item on the order.	
Accessories Tag, stainless steel, 12 x 45 mm (0.47 x 1.77*), one text line, suitable for enclosures Universal Box Bracket Mounting Kit	PBD-45000786 7ML1830-1BK
3" ANSI, DN 65, PN10, JIS 10K 3B ETFE Flange adapter for 2" NPT 3" ANSI, DN 65, PN10, JIS 10K 3B ETFE Flange adapter for 2" BSP	7ML1830-1BT 7ML1830-1BU
adapter for 2" BSP 2" BSP Locknut, plastic	7ML1830-1DQ

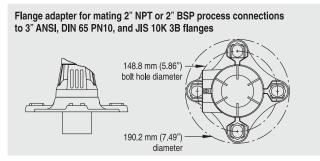
- ure/cable inlet 4.
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SITRANS L Level instruments

Point level measurement

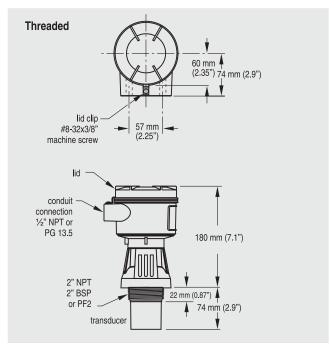
Pointek ULS 200

Options



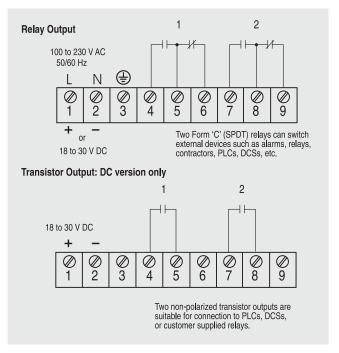
Pointek ULS 200 Optional Flange Adapter

Dimensional drawings



ULS 200 dimensions

Schematics



ULS 200 connections





Solenoid Valve ½" - Wash Press





General Service Solenoid Valves

Brass or Stainless Steel Bodies 3/8" to 2 1/2" NPT

Features

- Wide range of pressure ratings, sizes, and resilient materials provide long service life and low internal leakage
- High Flow Valves for liquid, corrosive, and air/inert gas service
- Industrial applications include:
 - Car wash
- Laundry equipment
 - Air compressors
- Industrial water control
- Pumps

Construction

Val	ve Parts in Contact with Flu	iids							
Body	Brass	304 Stainless Steel							
Seals and Discs	NBR o	r PTFE							
Disc-Holder	Р	Ά							
Core Tube	305 Stainless Steel								
Core and Plugnut	430F Stai	nless Steel							
Springs	302 Stair	nless Steel							
Shading Coil	Copper	Silver							

Electrical

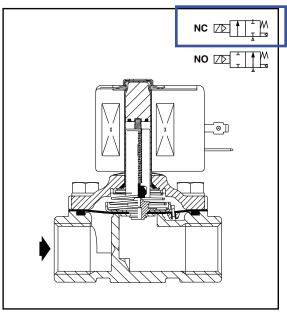
0444	Wa		g and Pou	wer	Spare Coil Part Number						
Standard Coil and			AC		General	Purpose	Explosi	onproof			
Class of Insulation	DC Watts	Watts	VA Holding	VA Inrush	AC	DC	AC	DC			
F	-	6.1	16	40	238210		238214				
F	11.6	10.1	25	70	238610	238710	238614	238714			
F	16.8	16.1	35	180	272610	97617	272614	97617			
F	-	17.1	40	93	238610	-	238614	-			
F	-	20	43	240	99257	-	99257	-			
F	-	20.1	48	240	272610	-	272614	-			
Н	30.6	-	-	-	-	74073	-	74073			
Н	40.6	-	-	-	-	238910	-	238914			

Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz). 6, 12, 24, 120, 240 volts DC. Must be specified when ordering. Other voltages available when required.

Solenoid Enclosures

Standard: RedHat II - Watertight, Types 1, 2, 3, 3S, 4, and 4X; RedHat - Type I. Optional: RedHat II - Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9; Red-Hat - Explosionproof and Watertight, Types 3, 4, 4X, 7, and 9. (To order, add prefix "EF" to catalog number, except Catalog Numbers 8210B057. 8210B058, and 8210B059, which are not available with Explosionproof enclosures.) See Optional Features Section for other available options.





Nominal Ambient Temp. Ranges

RedHat II/

RedHat AC: 32°F to 125°F (0°C to 52°C)

RedHat II DC: 32°F to 104°F (0°C to 40°C) DC: 32°F to 77°F (0°C to 25°C) RedHat

(104°F/40°C occasionally)

8210G227 AC: 32°F to 130°F (0°C to 54°C) DC: 32°F to 90°F (0°C to 32°C)

Refer to Engineering Section for details.

Approvals

UL listed as indicated, CSA certified. RedHat II meets applicable CE directives. Refer to Engineering Section for details.



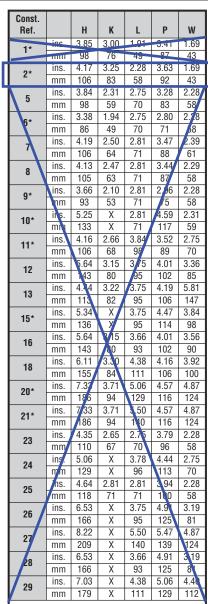
Specifications (English units)

		Operating Pressure I				ifferential (psi) Max. DC			Max. Fluid Temp. °F		Brass Body			Stainles	s Steel B	Body	Class	Rating/ of Coil ation ⑦	
Pipe Size (ins.)	Orifice Size (ins.)	Cv Flow Factor	Min.	Air- Inert Gas	Water	Light Oil @ 300 SSU	Air- Inert Gas	Water	Light Oil @ 300 SSU	AC	DC	Catalog Number	Constr. Ref. No. 4	UL ⑤ Listing	Catalog Number	Constr. Ref. No. 4	UL ⑤ Listing	AC	DC
NORMÁLL	Y CLOSE) (Closed	when	de-en	ergized)	, NBR or P		Seating	g										
3/0	3/8	1.5	1	150	125	-	40	40	-	180	150	8210G73 ③	1P	•	8210G36 ③	1P		6.1/F	11.6/F
3/8	5/8	3	0	150	150	-	40	40	-	180	150	8210G93	5D	-	-	-	-	10.1/F	11.6/F
3/8	5/8	3	5	200	150	135	125	100	100	180	150	8210G1	6D	0	-	-	-	6.1/F	11.6/F
3/8	5/8	3	5	300	300	300	-	-	-	175	-	821000	5D	0	-	-	-	17.1/F	-
1/2	7/16	2.2	U	150	125	-	40	40	-	180	150	8210G15 ③	2P	•	8210637 🍛	2P		6.1/F	11.6/F
1/2	5/8	1		150	150	-	40	40	-	120	150	821000/	5D	\cap	-		-	10 1/E	
1/2	5/8	4	0	150	150	125	40	40	-	175	150	-		-	8210G87	7D	•	17.1/F	11.6/F
1/2	3/0	4	o o	200	130	133	120	100	100	100	130	021002	מס)	-	-		0.1/Г	11.0/Г
1/2	5/8	4	5	300	300	300	-	-	-	175	-	8210G7	5D	0	-	-	-	17.1/F	
1/2	5/8	4	5	300	300	-	300	300	-	180	125	8210G227	5D	0	-	-	-	17.1/F	40.6/H
3/4	5/8	4.5	0	150	150	125	40	40	-	175	150	-	-	-	8210G88	7D	•	17 1/F	11.6/F
3/4	3/4	5	5	125	125	125	100	90	75	180	150	8210G9	9D	0	-	-	-	6.1/F	11.6/F
3/4	3/4	5	0	150	150	-	40	40	-	180	150	8210G95	8D	0	-	-		10.1/F	11.6/F
3/4	3/4	6.5	5	250	150	100	125	125	125	180	150	8210G3	11D	0	-	-	/ -	6.1/F	11.6/F
3/4	3/4	6	0	-	-	-	200	180	180	-	77	8210B26 ② ‡	10P	-	-	-/	-	-	30.6/H
3/4	3/4	6	0	350	300	200	-	-	-	200	-	8210G26 ② ‡	40P	•	-	-	-	16.1F	-
1	1	13	0		-	-	100	100	80	-	77	8210B54 ‡	31D	-	8210D89	15D	-	-	30.6/H
1	1	13	0	150	125	125	-	-	-	180	-	8210G54	41D	•	8210G89	45D	•	16.1/F	-
1	1	13	5	150	150	100	125	125	125	180	150	8210G4	12D	0	-	-	-	6.1/F	11.6/F
1	1	13.5	0	300	225	115	-	-	-	200	-	8210G27 ‡	42P	•/	-	-	-	20.1/F	-
1	1	13.5	10	300	300	300	-	-	-	175	-	8210G78 ②	13P		-	-	-	17.1/F	-
1 1/4	1 1/8	15	0	-	-	-	100	100	80	-	77	8210B55 ‡	32D	-	-	-	-	-	30.6/H
1 1/4	1 1/8	15	0	150	125	125	1	-	-	180	-	8210G55	420	•	-	-	-	16.1/F	-
1 1/4	1 1/8	15	5	150	150	100	125	125	125	180	150	8210G8	16D	0	-	-	-	6.1/F	11.6/F
1 1/2	1 1/4	22.5	0	-	-	-	100	100	80	-	77	8210B56 ±	33D	-	-	-	-	-	30.6/H
1 1/2	1 1/4	22.5	0	150	125	125	-	-	-	180	-	8210036 ‡	44D	•	-	-	-	16.1/F	-
1 1/2	1 1/4	22.5	5	150	150	100	125	125	125	180	150	8210G22	18D	•	-	-	-	6.1/F	11.6/F
2	1 3/4	43	5	150	125	90	50	50	50	180	150	8210G100	20P	•	-	-	-	6.1/F	11.6/F
2 1/2	1 3/4	45	5	150	125	90	50	50	50	180	150	8210G101	21P	•	-	-	-	6.1/F	11.6/F
NORMALL	Y OPEN (Open who	en de-c	energiz	zed), NE	R Seating	(PA Di	sc-Hold	er, except	as note	d	•							
3/8	5/8	3	0	150	150	125	125	125	80	180	150	8210G33	23D	•	-	-	-	10.1/F	11.6/F
3/8	5/8	3	5	250	200	200	250	200	200	180	180	8210G11 ® ⑨	39D	•	-	-	-	10.1/F	11.6/F
1/2	5/8	4	0	150	150	125	125	125	80	180	150	8210G34	23D	•	-	-	-	10.1/F	11.6/F
1/2	5/8	3	0	150	150	100	125	125	80	180	150	1-	-	-	8210G30	37D	•	10.1/F	11.6/F
1/2	5/8	4	5	250	200	200	250	200	200	180	180	8210G12 8 9	39D	•	-	-	-	10.1/F	11.6/F
3/4	3/4	5.5	0	150	150	125	125	125	80	180	150	8210G35	25D	•	-	-	-	10.1/F	11.6/F
3/4	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G38	38D	•	10.1/F	11.6/F
3/4	3/4	6.5	5	-	-	-	250	200	200	-	180	8210C13	240	•	-	-	-	-	16.8/F
3/4	3/4	6.5	5	250	200	200	-	-	-	180	-	8210G13	46D	•	-	-	-	16.1/F	-
1	1	13	0	125	125	125	-	-	-	180	-	8210B57 6 10	34D	6	-	-	-	20/F	-
1	1	13	5	-	-/	-	125	125	125	-	180	8210D14	26D	•	-	-	-	-	16.8/F
1	1	13	5	150	150	125	-	-	-	180	-	8210G14	47D	•	1	-	-	16.1/F	-
1 1/4	1 1/8	15	0	125	125	125	-	-	-	180	-	8210B58 @ 10	35D	•		-	-	20/F	
1 1/4	1 1/8	15	5	-	-	-	125	125	125	-	180	8210D18	28D	•	-	-	-	-	16.8/F
1 1/4	1 1/8	15	0	150	150	125	-	-	-	180	-	8210G18	48D	•	-	1	-	16.1/F	-
1 1/2	1 1/4	22.5	0	125	125	125	-	-	-	180	-	8210B59 @ 10	36D	•	-	-\	-	20/F	-
1 1/2	1 1/4	22.5	5	-	-	-	125	125	125	-	180	8210D32	29D	•	-	-	1.	-	16.8/F
1 1/2	1 1/4	22.5	5	150	150	125	-	-	-	180	-	8210G32	49D	•	-	-	-	16.1/F	-
2	1.5/4	43	5	-	-	-	125	125	125	-	150	8210103	30P	•	-	-	-	\-	16.8/F
2	1 3/4	43	5	125	125	125	-	-	-	180	-	8210G103	50P	•	-	-	-	16. KF	-
2 1/2	1 3/4	45	5	-	-	-	125	125	125	-	150	8210104	27P	•	-	-	-	-	16.8/F
2 1/2	1 3/4	45	5	125	125	125	-	-	-	180	-	8210G104	51P	•	-			16.1/F	1
Notes: ①	5 nsi on	Air 1 nsi	on Wa	iter								© Valves not av	vailahle w	ith Explos	ionproof enclo	osures			

- Notes: ① 5 psi on Air; 1 psi on Water.
 ② Valve provided with PTFE main disc.
 ③ Valve includes Ultem (G.E. trademark) piston.
 ④ Letter "D" denotes diaphragm construction; "P" denotes piston construction.
 ⑤ Safety Shutoff Valve; General Purpose Valve.
 Refer to Engineering Section (Approvals) for details.
- Valves not available with Explosionproof enclosures.
 On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.
 AC construction also has PA seating.
 No disc-holder.
 Stainless Steel disc-holder.
 Must have solenoid mounted vertical and upright.



Dimensions: inches (mm)

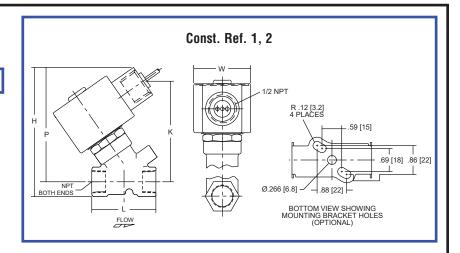


* DC dimensions slightly larger. **IMPORTANT:** Valves may be mounted in any position, except as noted in specifications table.

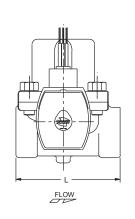
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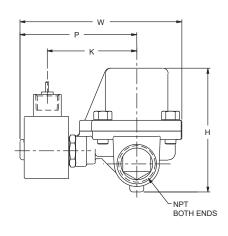
OPTIONAL MOUNTING BRACKET

HOLES

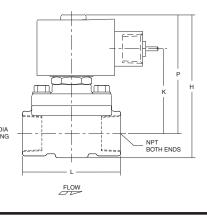


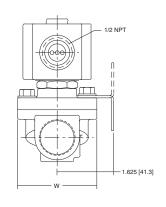
Const. Ref. 13





Const. Ref. 5-9, 11, 20, 21, 23, 25, 37,38









Anchor Bolts





Submittal Information

PERFORMANCE TABLE

A7 Average Ultimate Tension and Shear Loads 1,2,3 Acrylic Adhesive for Threaded Rod Installed in Solid Concrete

	THREADED ROD DIA.	DRILL HOLE DIAMETER	MAX. CLAMPING FORCE AFTER PROPER CURE	EMBEDMENT IN CONCRETE	2000 PSI (13.8 MPa) CONCRETE ULTIMATE TENSION ULTIMATE SHEAR	4000 PSI (27.6 MPa) CONCRETE ULTIMATE TENSION ULTIMATE SHEAR		
L	In. (mm)	In. (mm)	FtLbs. (Nm)	In. (mm)	Lbs. (kN) Lbs. (kN)	Lbs. (kN) Lbs (kN)		
ſ	3/8 (9.5)	7/16 (11.1)	13 - 18 (17-24)	1-1/2 (38.1)	N/A N/A	3,734 (16.6) 4,126 (18.3)		
				3-3/8 (85.7)	5,852 (26.0) 5,220 (23.2)	10,977 (48.8) 5,220 (23.2)		
				4-1/2 (114.3)	7,729 (34.4) 5,220 (23.2)	11,661 (51.9) 5,220 (23.2)		
١.	1/2 (12.7)	9/16 (14.3)	22 - 25 (29-33)	2 (50.8)	N/A N/A	6,022 (26.8) 8,029 (35.7)		
				4-1/2 (114.3)	10,798 (48.0) 8,029 (35.7)	17,162 (76.3) 8,029 (35.7)		
				6 (152.4)	14,210 (63.2) 8,029 (35.7)	17,372 (77.3) 8,029 (35.7)		
	5/8 (15.9)	11/16 (17.5)	55 - 80 (74-108)	2-1/2 (63.5)	N/A N/A	7,330 (32.6) 11,256 (50.1)		
		or		5-5/8 (142.9)	16,417 (73.0) 15,967 (71.0)	26,504 (117.9) 15,967 (71.0)		
		3/4 (19.1)		7-1/2 (190.5)	18,747 (83.4) 15,967 (71.0)	29,381 (130.7) 15,967 (71.0)		
	3/4 (19.1)	13/16 (20.6)	106 - 160 (143-216)	3 (76.2)	N/A N/A	8,634 (38.4) 20,126 (89.5)		
		or		6-3/4 (171.5)	18,618 (82.8) 20,126 (89.5)	29,727 (132.2) 20,126 (89.5)		
		7/8 (22.2)		9 (228.6)	23,934 (106.5) 20,126 (89.5)	37,728 (167.8) 20,126 (89.5)		
	7/8 (22.2)	15/16 (23.8)	185 - 250 (250-338)	3-1/2 (88.9)	N/A N/A	13,650 (60.7) 20,920 (92.9)		

This data is for reference only, adhesive selected (by contractor) may have different results.

A7 Allowable Tension Loads¹ for Threaded Rod Acrylic Adhesive Installed in Solid Concrete

THREADED ROD DIA.	DRILL HOLE DIAMETER	MIN. EMBEDMENT DEPTH		SION LOAD BASED SOND STRENGTH	ALI	ALLOWABLE TENSION LOAD BASED ON STEEL STRENGTH			
In. (mm)	In. (mm)		2000 PSI (13.8 MPa) CONCRETE	4000 PSI (27.6 MPa) CONCRETE	ASTM A307 (SAE 1018)	ASTM A193 GR. B7 (SAE 4140)	ASTM F593 AISI 304 SS		
			Lbs. (kN)	Lbs. (kN)	Lbs. (kN)	Lbs. (kN)	Lbs. (kN)		
3/8 (9.5)	7/16 (11.1)	1-1/2 (38.1) 3-3/8 (85.7) 4-1/2 (114.3)	N/A 1,460 (6.5) 1,930 (8.6)	934 (4.2) 2,740 (12.2) 2,915 (13.0)	2,080 (9.3) 2,080 (9.3) 2,080 (9.3)	4,340 (19.3) 4,340 (19.3) 4,340 (19.3)	3,995 (17.8) 3,995 (17.8) 3,995 (17.8)		
1/2 (12.7)	9/16 (14.3)	2 (50.8) 4-1/2 (114.3) 6 (152.4)	N/A 2,700 (12.0) 3,550 (15.8)	1,505 (6.7) 4,290 (19.1) 4,340 (19.3)	3,730 (16.6) 3,730 (16.6) 3,730 (16.6)	7,780 (34.6) 7,780 (34.6) 7,780 (34.6)	7,155 (31.8) 7,155 (31.8) 7,155 (31.8)		
5/8 (15.9)	11/16 (17.5) or 3/4 (19.1)	2-1/2 (63.5) 5-5/8 (142.9) 7-1/2 (190.5)	N/A 4,100 (18.3) 4,685 (20.8)	1,832 (8.2) 6,625 (29.5) 7,345 (32.7)	5,870 (26.1) 5,870 (26.1) 5,870 (26.1)	12,230 (54.4) 12,230 (54.4) 12,230 (54.4)	11,250 (50.0) 11,250 (50.0) 11,250 (50.0)		
3/4 (19.1)	13/16 (20.6) or 7/8 (22.2)	3 (76.2) 6-3/4 (171.5) 9 (228.6)	N/A 4,655 (20.7) 5,980 (26.6)	2,158 (9.6) 7,430 (33.1) 9,430 (42.0)	8,490 (37.8) 8,490 (37.8) 8,490 (37.8)	17,690 (78.7) 17,690 (78.7) 17,690 (78.7)	14,860 (66.1) 14,860 (66.1) 14,860 (66.1)		
7/8 (22.2)	15/16 (23.8) or 1 (25.4)	3-1/2 (88.9) 7-7/8 (200.0) 10-1/2 (266.7)	N/A N/A 9,220 (41.0)	3,413 (15.2) 11,230 (49.9) 12,080 (53.7)	11,600 (51.6) 11,600 (51.6) 11,600 (51.6)	25,510 (113.5) 25,510 (113.5) 25,510 (113.5)	20,835 (92.7) 20,835 (92.7) 20,834 (92.7)		
1 (25.4)	1-1/16 (27.0) or 1-1/8 (28.6)	4 (101.6) 9 (228.6) 12 (304.8)	N/A 8,050 (35.8) 11,515 (51.2)	4,067 (18.1) 12,050 (53.6) 15,985 (71.1)	15,180 (67.5) 15,180 (67.5) 15,180 (67.5)	31,620 (140.7) 31,620 (140.7) 31,620 (140.7)	26,560 (118.1) 26,560 (118.1) 26,560 (118.1)		
1-1/4 (31.8)	1-5/16 (33.3) or 1-3/8 (34.9)	5 (127.0) 11-1/4 (285.8) 15 (381.0)	N/A 11,490 (51.1) 15,550 (69.2)	5,460 (24.3) 14,175 (63.1) 21,095 (93.8)	23,800 (105.9) 23,800 (105.9) 23,800 (105.9)	49,580 (220.6) 49,580 (220.6) 49,580 (220.6)	34,670 (154.2) 34,670 (154.2) 34,670 (154.2)		

¹ Use lower value of either bond or steel strength for allowable tensile load.





GENERAL INFORMATION

DOMESTIC WEDGE ANCHOR

Carbon Steel and Stainless Steel Wedge Expansion Anchors

Anchor produced in the U.S.A., nut and washer made in Taiwan or China*

PRODUCT DESCRIPTION

The Domestic Wedge Anchor is a threaded, torque-controlled, carbon steel or stainless steel wedge expansion anchor which is designed for consistent performance in concrete. Suitable base materials are normal-weight and sand-lightweight concrete. The anchor is manufactured with carbon steel body and expansion clip or a stainless steel body and expansion clip. Nut and washer are included.

GENERAL APPLICATIONS AND USES

- Steel fixtures
- Support connections
- · Equipment and railing

FEATURES AND BENEFITS

- + Anchors made in the U.S.A., nut and washer made in Taiwan or China, domestic nut and washer available upon request.
- + Nominal drill bit size is the same as the anchor diameter
- + Anchor can be installed through standard fixture holes
- + Length ID code and identifying marking stamped on head of each anchor
- + Anchor design allows for follow-up expansion after setting under tensile loading
- + Corrosion resistant stainless steel anchors available

APPROVALS AND LISTINGS

• Tested to ASTM E 488

GUIDE SPECIFICATIONS

CSI Divisions: 031600-Concrete Anchors, 05090-Metal Fastenings and 050519 Post-installed Concrete Anchors. Expansion anchors shall be Domestic Wedge Anchor as supplied by Powers Fasteners, Inc., Brewster, NY. Anchors shall be installed in accordance with published instructions and the Authority Having Jurisdiction.

MATERIAL SPECIFICATIONS

Anchor component	Specification							
Anchor component	Carbon Steel ¹	Type 303	Type 316					
Anchor body	AISI C12L14	Type 303 Stainless Steel	Type 316 Stainless Steel					
Washer	AISI C1010-1018	300 Series Stainless Steel	Type 316 Stainless Steel					
Hex Nut	Low Carbon Steel, ASTM A563, Grade A	Type 18-8	Type 316 Stainless Steel					
Expansion wedge (clip)	AISI C1010-1018 1037	Type 18-8	Type 316 Stainless Steel					

^{1.} Plated with Commerical Bright Zinc and supplementary chromate treatment in accordance with ASTM B 633, SC1 Type III.

SECTION CONTENTS

General Information	1
Installation Instructions	2
Reference Performance Data	3
Ordering Information	5



DOMESTIC WEDGE ANCHOR ASSEMBLY

THREAD VERSION

UNC threaded stud

ANCHOR MATERIALS

 Carbon Steel Type 304 Stainless Steel, or Type 316 Stainless Steel

ANCHOR SIZE RANGE (TYP.)

• 1/4" diameter through 1-1/4" diameter

SUITABLE BASE MATERIALS

- Normal-weight concrete
- Sand-lightweight concrete

^{*} Domestic nut and washer available upon request.



REFERENCE PERFORMANCE DATA

Ultimate Load Capacities for Domestic Wedge Anchor in Normal-Weight Concrete^{1,2}

				Concrete Compre	ssive Strength, f'c			
Nominal Anchor	Minimum Embedment	2,00	0 psi	4,00	0 psi	6,00	O psi	
Diameter (in.)	Depth (in.)	Ultimate Tension Load Capacity (lbs.)	Ultimate Shear Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Ultimate Shear Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Ultimate Shear Load Capacity (lbs.)	
	1-1/8	1,170		1,770		2,775		
1/4	1-3/4	1,840	1,445	2,410	1,815	2,775	2,635	
	2-3/4	1,975		2,750		2,830		
	1-1/2	1,630		3,640		4,450		
3/8	3	3,230	4,320	5,655	5,120	5,975	6,235	
	5	4,075		6,330		6,360		
	2-1/4	4,000		6,715		9,615		
1/2	4	6,335	7,420	8,945	9,380	10,190	9,890	
	6	6,900		10,175		12,065		
	2-3/4	5,000	8,265	8,750		9,760		
5/8	5	8,855		15,590	12,930	16,800	16,375	
	7	9,380		16,710		17,735		
	3-1/4	6,640		11,315	17,050	16,230	22,965	
3/4	6	10,085	12,505	18,410		21,095		
	8	11,170		19,805		22,525		
7/8	3-7/8	8,395	18,250	16,355	20.225	16,800	23,980	
7/8	5-3/4	12,065	18,230	18,250	20,235	23,405	23,980	
	4-1/2	9,775		18,250		27,460		
1	7-1/2	11,890	23,620	26,725	27,605	34,960	28,910	
	10	15,590		30,490		37,840		
	5-1/2	17,550		22,970		32,370	55,565	
1-1/4	7	21,050	32,275	27,845	42,690	48,365		
	10	27,895		34,790		61,270		

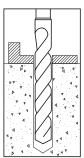
^{1.} Tabulated load values are for anchors installed in uncracked concrete with no edge or spacing considerations. Concrete compressive strength must be at the specified minimum at the time of installation.

^{2.} Ultimate load capacities must be reduced by a minimum safety factor of 4.0 or greater to determine allowable working loads.

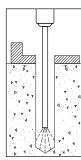


INSTALLATION INSTRUCTIONS

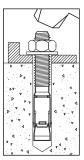
Installation Instructions for Domestic Wedge Anchor



Step 1 Using the proper drill bit size, drill a hole into the base material to the required depth. The tolerances of the drill bit used should meet the requirements of ANSI Standard B212.15.



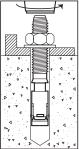
Step 2 Remove dust and debris from the hole, using a hand pump, compressed air or a vacuum to remove loose particles left from drilling.



Step 3 Position the washer on the anchor and thread on the nut. If installing through a fixture, drive the anchor through the fixture into the hole. Be sure the anchor is driven to the

minimum required

embedment depth.



Step 4 Tighten the anchor with a torque wrench by applying the required installation torque, Tinst.

Installation Table for Domestic Wedge Anchor

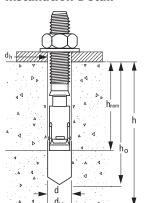
Anchor Property/	N-4-4'	11!4	Nominal Anchor Diameter (inch)								
Setting Information	Notation	Units	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/4	
Anchor outside diameter	d	in. (mm)	0.25 (6.4)	0.375 (9.5)	0.500 (12.7)	0.625 (15.9)	0.750 (19.1)	0.875 (22.2)	1.000 (25.4)	1.250 (31.8)	
Nominal drill bit diameter	dbit	in.	1/4 ANSI	3/8 ANSI	1/2 ANSI	5/8 ANSI	3/4 ANSI	7/8 ANSI	1 ANSI	1-1/4 ANSI	
Minimum diameter of hole clearance in fixture	dh	in. (mm)	5/16 (7.9)	7/16 (11.1)	9/16 (14.3)	11/16 (17.5)	13/16 (20.6)	15/16 (23.8)	1-1/8 (28.6)	1-3/8 (34.9)	
Minimum nominal embedment depth	h _{nom}	in. (mm)	1-1/8 (28.6)	1-1/2 (38.1)	2-1/4 (57.2)	2-3/4 (69.9)	3-1/4 (82.6)	3-7/8 (98.4)	4-1/2 (114.3)	5-1/2 (139.7)	
Minimum hole depth	h _o	in. (mm)	1-3/8 (34.9)	1-7/8 (47.6)	2-3/4 (69.9)	3-1/4 (82.6)	3-3/4 (95.3)	4-3/8 (111.1)	5 (127.0)	6 (152.4)	
Minimum member thickness	h _{min}	in. (mm)	3 (76.2)	3 (76.2)	3-3/8 (85.7)	4-1/8 (104.8)	4-7/8 (123.8)	5-13/16 (147.6)	6-3/4 (171.5)	8-1/4 (209.6)	
Installation torque	T _{inst}	ftlbf. (N-m)	5-10 (6.8-13.6)	25-30 (33.9-40.7)	50-60 (67.8-81.4)	75-90 (102-122)	150-175 (203-237)	200-250 (271-339)	250-300 (339-407)	400-450 (542-610)	
Torque wrench/socket size	-	in.	7/16	9/16	3/4	15/16	1-1/8	1-5/16	1-1/2	1-7/8	
Nut height	-	in.	7/32	21/64	7/16	35/64	41/64	3/4	55/64	1-1/16	

For SI: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m.

Length Identification

Mark	Α	В	С	D	E	F	G	Н	ı	J	K	L	M	N	0	Р	Q	R	S
From	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	4-1/2"	5"	5-1/2"	6"	6-1/2"	7"	7-1/2"	8"	8-1/2"	9"	9-1/2	10"	11"
Up to but not including	2"	2-1/2"	3"	3-1/2"	4"	4-1/2"	5"	5-1/2"	6"	6-1/2"	7"	7-1/2"	8"	8-1/2"	9"	9-1/2	10"	11"	12"
Length ider	ength identification mark indicates overall length of anchor.																		

Installation Detail



Nomenclature

h

Diameter of anchor Diameter of drill bit

Diameter of fixture clearance hole =

Base material thickness

The minimum value of h should be 1.5h_{nom} or 3" whichever is

greater

h_{nom} = Minimum embedment depth



Allowable Load Capacities for Carbon Steel and Stainless Steel Domestic Wedge Anchor in Normal-Weight Concrete^{1,2,3}

				Concrete Compres	sive Strength, f'c		
Nominal Anchor	Minimum Embedment	2,00	0 psi	4,000) psi	6,000) psi
Diameter (in.)	Depth (in.)	Allowable Tension Load Capacity (lbs.)	Allowable Shear Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Allowable Shear Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Allowable Shear Load Capacity (lbs.)
	1-1/8	295		445		695	
1/4	1-3/4	460	360	600	455	695	660
	2-3/4	495		690		710	
	1-1/2	410		910		1,115	
3/8	3	810	1,080	1,415	1,280	1,495	1,560
	5	1,020		1,580		1,590	
	2-1/4	1,000		1,680		2,405	
1/2	4	1,585	1,855	2,235	2,345	2,550	2,475
	6	1,725		2,545		3,015	
	2-3/4	1,250	2,065	2,190		2,440	
5/8	5	2,215		3,900	3,235	4,200	4,095
	7	2,345		4,180		4,435	
	3-1/4	1,660		2,830	4,265	4,060	5,740
3/4	6	2,520	3,125	4,600		5,275	
	8	2,795		4,950		5,630	
7/8	3-7/8	2,100	4,565	4,090	5,060	4,200	5,995
770	5-3/4	3,015	4,303	4,565	3,000	5,850	5,995
	4-1/2	2,445		4,565		6,865	
1	7-1/2	2,975	5,905	6,685	6,900	8,740	7,230
	10	3,900		7,625		9,460	
	5-1/2	4,390		5,745		8,095	
1-1/4	7	5,265	8,070	6,960	10,675	12,095	13,890
	10	6,975		8,700		15,320	

^{1.} Tabulated load values are for anchors installed in uncracked concrete. Concrete compressive strength must be at the specified minimum at the time of installation.

^{2.} Allowable load capacities listed are calculated using and applied safety factor of 4.0.

POWERS.

ORDERING INFORMATION



Domestic Wedge Anchor (Carbon Steel)

Domestic	estic Wedge Anchor (Carbon Steel)									
Cat. No.	Size	Min. Embed.	Thread Length	Std. Box	Std. Ctn.					
7400USA	1/4" x 1-3/4"	1-1/8"	3/4"	100	500					
7402USA	1/4" x 2-1/4"	1-1/8"	3/4"	100	500					
7404USA	1/4" x 3-1/4"	1-1/8"	3/4"	100	500					
7410USA	3/8" x 2-1/4"	1-1/2"	7/8"	50	250					
7412USA	3/8" x 2-3/4"	1-1/2"	1-1/8"	50	250					
7413USA	3/8" x 3"	1-1/2"	1-1/8"	50	250					
7414USA	3/8" x 3-1/2"	1-1/2"	1-1/8"	50	250					
7415USA	3/8" x 3-3/4"	1-1/2"	1-1/8"	50	250					
7416USA	3/8" x 5"	1-1/2"	1-1/8"	50	250					
7417USA	3/8" x 6-1/2"	1-1/2"	1-1/8"	50	200					
7420USA	1/2" x 2-3/4"	2-1/4"	1-1/4"	50	200					
7422USA	1/2" x 3-3/4"	2-1/4"	1-1/4"	50	200					
7423USA	1/2" x 4-1/2"	2-1/4"	1-1/4"	50	200					
7424USA	1/2" x 5-1/2"	2-1/4"	1-1/4"	50	150					
7426USA	1/2" x 7"	2-1/4"	1-1/4"	25	100					
7427USA	1/2" x 8-1/2"	2-1/4"	1-1/4"	25	100					
7428USA	1/2" x 10"	2-1/4"	1-1/4"	25	100					
7429USA	1/2" x 12"	2-1/4"	1-1/4"	25	100					
7430USA	5/8" x 3-1/2"	2-3/4"	2"	25	100					
7432USA	5/8" x 4-1/2"	2-3/4"	2"	25	100					
7433USA	5/8" x 5"	2-3/4"	2"	25	100					
7434USA	5/8" x 6"	2-3/4"	2"	25	75					
7436USA	5/8" x 7"	2-3/4"	2"	25	75					
7438USA	5/8" x 8-1/2"	2-3/4"	2"	25	75					
7439USA	5/8" x 10"	2-3/4"	2"	25	75					
7437USA	5/8" x 12"	2-3/4"	2"	25	75					
7440USA	3/4" x 4-1/4"	3-1/4"	2"	20	60					
7441USA	3/4" x 4-3/4"	3-1/4"	2"	20	60					
7442USA	3/4" x 5-1/2"	3-1/4"	2"	20	60					
7444USA	3/4" x 6-1/4"	3-1/4"	2"	20	60					
7446USA	3/4" x 7"	3-1/4"	2"	20	60					
7448USA	3/4" x 8-1/2"	3-1/4"	2"	10	40					
7449USA	3/4" x 10"	3-1/4"	2"	10	30					
7451USA	3/4" x 12"	3-1/4"	2"	10	30					
7461USA	1" x 6"	4-1/2"	2-1/4"	10	40					
7463USA	1" x 9"	4-1/2"	2-1/4"	10	30					
7465USA	1" x 12"	4-1/2"	2-1/4"	5	15					
7475USA	1-1/4" x 12"	5-1/2"	3-1/4"	5	15					

Installation Accessories

Cat. No.	Description				
08466	Adjustable torque wrench with 1/2" square drive (25 to 250 ftlbs.)	1			
08280	Hand pump / dust blower	1			

The published size includes the diameter and the overall length of the anchor. All anchors are packaged with nuts and washers.

Domestic Wedge Anchor (Type 303 Stainless Steel)

	1104907411	(
Cat. No.	Size	Min. Embed.	Thread Length	Std. Box	Std. Ctn.
7300USA	1/4" x 1-3/4"	1-1/8"	3/4"	100	500
7302USA	1/4" x 2-1/4"	1-1/8"	3/4"	100	500
7304USA	1/4" x 3-1/4"	1-1/8"	3/4"	100	500
7310USA	3/8" x 2-1/4"	1-1/2"	7/8"	50	250
7312USA	3/8" x 2-3/4"	1-1/2"	1-1/8"	50	250
7313USA	3/8" x 3"	1-1/2"	1-1/8"	50	250
7314USA	3/8" x 3-1/2"	1-1/2"	1-1/8"	50	250
7315USA	3/8" x 3-3/4"	1-1/2"	1-1/8"	50	250
7316USA	3/8" x 5"	1-1/2"	1-1/8"	50	250
7317USA	3/8" x 6"	1-1/2"	1-1/8"	50	200
7320USA	1/2" x 2-3/4"	2-1/4"	1-1/4"	50	200
7323USA	1/2" x 4-1/2"	2-1/4"	1-1/4"	50	200
7324USA	1/2" x 5-1/2"	2-1/4"	1-1/4"	50	150
7326USA	1/2" x 7"	2-1/4"	1-1/4"	25	100
7330USA	5/8" x 3-1/2"	2-3/4"	2"	25	100
7332USA	5/8" x 4-1/2"	2-3/4"	2"	25	100
7333USA	5/8" x 5"	2-3/4"	2"	25	100
7334USA	5/8" x 6"	2-3/4"	2"	25	75
7336USA	5/8" x 7"	2-3/4"	2"	25	75
7338USA	5/8" x 8-1/2"	2-3/4"	2"	25	75
7340USA	3/4" x 4-1/4"	3-1/4"	2"	20	60
7341USA	3/4" x 4-3/4"	3-1/4"	2"	20	60
7342USA	3/4" x 5-1/2"	3-1/4"	2"	20	60
7344USA	3/4" x 6-1/4"	3-1/4"	2"	20	60
7346USA	3/4" x 7"	3-1/4"	2"	20	60
7348USA	3/4" x 8-1/2"	3-1/4"	2"	10	40
7349USA	3/4" x 10"	3-1/4"	2"	10	30

Domestic Wedge Anchor (Type 316 Stainless Steel)

	· · · · · · · · · · · · · · · · · · ·				
Cat. No.	Size	Min. Embed.	Thread Length	Std. Box	Std. Ctn.
7600USA	1/4" x 1-3/4"	1-1/8"	3/4"	100	500
7602USA	1/4" x 2-1/4"	1-1/8"	3/4"	100	500
7604USA	1/4" x 3-1/4"	1-1/8"	3/4"	100	500
7610USA	3/8" x 2-1/4"	1-1/2"	7/8"	50	250
7612USA	3/8" x 2-3/4"	1-1/2"	1-1/8"	50	250
7613USA	3/8" x 3"	1-1/2"	1-1/8"	50	250
7614USA	3/8" x 3-1/2"	1-1/2"	1-1/8"	50	250
7615USA	3/8" x 3-3/4"	1-1/2"	1-1/8"	50	250
7616USA	3/8" x 5"	1-1/2"	1-1/8"	50	250
7620USA	1/2" x 2-3/4"	2-1/4"	1-1/4"	50	200
7622USA	1/2" x 3-3/4"	2-1/4"	1-1/4"	50	200
7623USA	1/2" x 4-1/2"	2-1/4"	1-1/4"	50	200
7624USA	1/2" x 5-1/2"	2-1/4"	1-1/4"	50	150
7626USA	1/2" x 7"	2-1/4"	1-1/4"	25	100
7630USA	5/8" x 3-1/2"	2-3/4"	2"	25	100
7632USA	5/8" x 4-1/2"	2-3/4"	2"	25	100
7633USA	5/8" x 5"	2-3/4"	2"	25	100
7634USA	5/8" x 6"	2-3/4"	2"	25	75
7636USA	5/8" x 7"	2-3/4"	2"	25	75
7638USA	5/8" x 8-1/2"	2-3/4"	2"	25	75
7640USA	3/4" x 4-1/4"	3-1/4"	2"	20	60
7641USA	3/4" x 4-3/4"	3-1/4"	2"	20	60
7642USA	3/4" x 5-1/2"	3-1/4"	2"	20	60
7644USA	3/4" x 6-1/4"	3-1/4"	2"	20	60
7646USA	3/4" x 7"	3-1/4"	2"	20	60
7648USA	3/4" x 8-1/2"	3-1/4"	2"	10	40
7652USA	7/8" x 8"	3-7/8"	2-1/4"	10	40
7663USA	1" x 9"	4-1/2"	2-1/4"	10	30



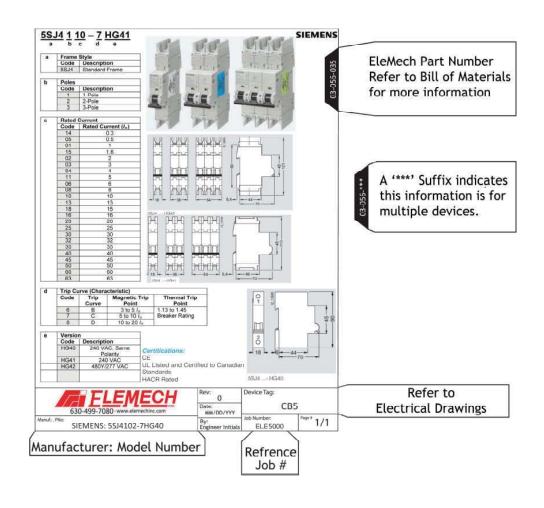


Control Panel Components



Catalog Cuts







C1.5WH6



PANDUIT

· Base and covers sold separately

- · Non-slip cover design incorporates integral high friction lining to inhibit cover movement
- · Cover flush with base provides greater wire capacity and improves aesthetics
- · Easy cover removal makes changes to wiring quick and easy
- · Available in various colors



 Part Number C1.5WH6 · RoHS Compliancy Status Compliant

· Part Description Covers duct to protect wires, improve aesthetics and provides greater wire capacity. Base

and covers sold separately.

 Product Type Type C Cover for Flush Cover Wiring Duct

Lead-Free PVC Material · Color White 6 · Length (ft.)

· Length (m) 1.82 CE Compliant Yes

 Pricing Description Duct Cover, PVC, 1.5"W X 6', White

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Rev: 0 Device Tag:

Date: 9/21/2020

SW

Job Number: By:

Page # 1/1 EVC8265

Manuf.: . PNo:

Panduit: C1.5WH6

PANDUIT[®]

- · Base and covers sold separately
- Non-slip cover design incorporates integral high friction lining to inhibit cover movement
- · Cover flush with base provides greater wire capacity and improves aesthetics
- · Easy cover removal makes changes to wiring quick and easy
- · Available in various colors



10-069-00

Part Number
 RoHS Compliancy Status
 Compliant

Part Description
 Covers duct to protect wires, improve aesthetics and provides greater wire capacity. Base

and covers sold separately.

Product Type
 Type C Cover for Flush Cover Wiring Duct

Material
 Lead-Free PVC

Color White
 Length (ft.) 6
 Length (m) 1.82
 CE Compliant Yes

Pricing Description
 Duct Cover, PVC, 1"W X 6', White

Panduit Wiring Duct Approvals and Compliances

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Rev:

9/21/2020

By: SW

Job Number:

EVC8265

Device Tag:

Page # 1/1

Manuf.: . PNo:

Panduit: C1WH6

F1.5X3WH6

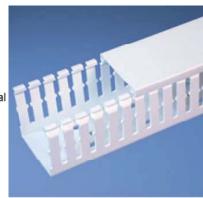


PANDUIT[®]

-005

Specifications

- · Made of lead-free PVC
- UL Recognized continuous use temperature: 122°F (50°C)
- UL94 Flammability Rating of V-0
- Conforms with NFPA 79-2002 section 14.3.1 requirement for flame retardant material
- Available in Light Gray and White
- · Provided with mounting holes



Part Number	F1.5X3WH6
 RoHS Compliancy Status 	Compliant
Part Description	Narrow finger, slotted wiring duct.
Material	Lead-Free PVC
• Color	White
 CSA Certified 	Yes
- Length (ft.)	6
■ CE Compliant	Yes
CE Marking	Yes
■ Duct Size W x H (In.)	1.75 x 3.12
• Duct Size W x H (mm)	44.5 × 79.2
Mounting Method	Standard Mounting Holes
Pricing Description	Slotted Duct,PVC,1.5"X3"X6',White

FLEMECH	Rev: 0	Device Tag:	
630-499-7080 · www.elemechinc.com	Date: 9/21/2020		
Manuf.:.PNo: Panduit: F1.5X3WH6	By:	Job Number: EVC8265	Page # 1/1

F1X3WH6



PANDUIT[®]

-007

Specifications

- · Made of lead-free PVC
- UL Recognized continuous use temperature: 122°F (50°C)
- UL94 Flammability Rating of V-0
- Conforms with NFPA 79-2002 section 14.3.1 requirement for flame retardant material
- · Available in Light Gray and White
- · Provided with mounting holes



◆ Part Number	F1X3WH6
- RoHS Compliancy Status	Compliant
Part Description	Narrow finger, slotted wiring duct.
■ Material	Lead-Free PVC
Color	White
■ CSA Certified	Yes
Length (ft.)	6
CE Compliant	Yes
CE Marking	Yes
■ Duct Size W x H (In.)	1.26 x 3.12
● Duct Size W x H (mm)	32.0 x 79.2
 Mounting Method 	Standard Mounting Holes
Pricing Description	Slotted Duct,PVC,1"X3"X6',White

Panduit Wiring Duct Approvals and Compliances

FLEMECH	Rev:	Device Tag:	
630-499-7080 · www.elemechinc.com	Date: 9/21/2020		
Manuf.: . PNo:	By:	Job Number:	Page # 1/1
Panduit: F1X3WH6	SW	EVC8265	'/'

DIN RAILS

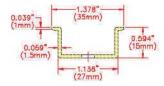




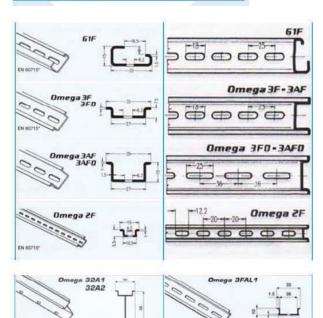
Catalog	Lengths
Number	per Pack
G1	12
G1F	12
G1F1	24
OMEGA 2F	20
OMEGA 2F1	40*
OMEGA 3	20
OMEGA 3F	20
OMEGA 3F1	40*
OMEGA 3FD	20
OMEGA 3A	10
OMEGA 3AF	10
OMEGA 3AF1	20*
OMEGA 3AFD	10
OMEGA 3B	10
OMEGA 3B1	10*
OMEGA 75	2

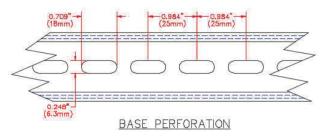
Treated with galvanic zinc plating and passivation (gal Zn 8c according to Din 50960)
Minimum thickness 6 microns
Standard length: 2 meters (6'63/4")





FRONT SECTION





FLEMECH	Rev: 0	Device Tag:	
630-499-7080 · www.elemechinc.com	Date: 9/21/2020		
Manuf.:.PNo: Iboco: Omega 3 AF	By: SW	Job Number: Page # 1	/1

Wire - MTW Type

CONDUCTORS: 22 AWG - 8AWG Stranded Tinned Copper per ASTM B-33

22 AWG - 10 AWG Solid Tinned Copper per ASTM M-

INSULATION: · Color-Coded Polyvinyl Chloride (PVC)

TEMPERATURE RANGE/

• UL 1011/1015/1028/BC-5W2: 105°C/600V

VOLTAGE RATING:

UL MTW: 90°C/600V
 CSA AWM I A/B & TEW: 105°C/600V

FLAME COMPLIANCES:

· CSA FT-1

INDUSTRY APPROVALS:

· UL Standard 758 - Styles

1011/1015/1028/1032/1230/1231/1335/1344

· UL Standard 1063 - MTW

• UL Standard 1426 - BC-5W2: 16 AWG - 8 AWG

· CSA AWM I A/B & TEW · UL THHW

· UL CT Tray Rated SAE J378

STANDARD COLORS:

Black, Orange, Blue, Violet, White, Yellow, Brown, Green/Yellow, Red, Green, Gray

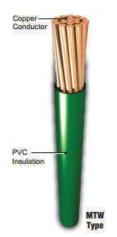
OPTIONS:

· Stripes available upon request (minimums may apply)

· Other copper constructions available upon request

(minimums may apply)

Catalog Number	er Description	
F22027	22 AWG (7/.0096) TC AWM 1015	
F20037	20 AWG (10/30) TC AWM 1015	
F18054	18 AWG (16/30) TC AWM 1015	
F16032	16 AWG (26/30) TC AWM 1015	
F14037	14 AWG (41/30) TC AWM 1015	
F12024	12 AWG (65/30) TC AWM 1015	
F10012	10 AWG (105/30) TC AWM 1015	
F08010	8 AWG (7X19/29) TC AWM 1028	



TEW/MTW Wire (Tinned Copper) Applications:

> This tinned copper hook up wire may be used for wiring of machine tools, appliances, and control cabinets.





Multi 9





UL 489 / CSA C22.2 No 5 / IEC/EN 60947-2 / GB 14048-2

C60se are multi-standard miniature circuit breakers and branch circuit protection as defined by UL 489. It combines following functions:

- circuit protection against short-circuit currents
 circuit protection against overload currents
- tripping and fault indication by the addition of auxiliaries.



Number of 18 mm (0.71 in.) poles		Breaking capacity (kA rms)								
	Voltage (Ue)	277 V ∿	240 V ∿	120 V ∿	60 V	440 V ∿	415 V ∿	240 V ∿	60 V	
1P	0.5 to 35	10	14	14	10		3	10	20	
	40 to 63	2	10	10	10	20	3	10	20	
	Voltage (Ue)	480Y/277	V √	240 V ∿	125 V	440 V ∼	415 V ∿	240 V ∼	125 V	
2P	1 to 25	10		14	10	6	10	20	-	
	30 to 35	10		14	200	6	10	20	-	
3P	1 to 35	10		14	8	6	10	20	-	
2P/3P	40 to 63	9		10	e	6	10	20	E:	



Electrical diagrams

1P	2P	3P	
80V::- 1 1 1 1 1 2 2 2	125V 1 3 1 3 † 2 4 2 4 1 10001	1 3 5 ± ± ± 2 4 6	

Catalogue numbers

Tunnel te	rminal conne	ection									
Туре	UL489 and CSA voltages	1P			2P			3P			
Auxiliaries		Remote inc	dication and	tripping, see	page 43	A.			*		
	1	Curve			Width in	Curve		Width in	Curve		Width in
Rating (In)		z	C	D (=K)	9 mm modules	С	D (=K)	9 mm modules	С	D (=K)	9 mm modules
C608P		di .	N.	9.		N.	W	100000000000000000000000000000000000000	8	2)	The sometimes
0.5		M9F44170	M9F42170	M9F43170	2	-	-	4		_	6
1	1	M9F44101	M9F42101	M9F43101	100	M9F42201	M9F43201	7.51	M9F42301	M9F43301	
2	1	M9F44102	M9F42102	M9F43102	1	M9F42202	M9F43202	1	M9F42302	M9F43302	1
3	>	M9F44103	M9F42103	M9F43103	1	M9F42203	M9F43203	1	M9F42303	M9F43303	1
1	8	M9F44104	M9F42104	M9F43104	1	M9F42204	M9F43204	1	M9F42304	M9F43304	1
5	g g	M9F44105	M9F42105	M9F43105	1	M9F42205	M9F43205	1	M9F42305	M9F43305	1
3	V and 240 V	M9F44106	M9F42106	M9F43106		M9F42206	M9F43206		M9F42306	M9F43306	
3		M9F44108	M9F42108	M9F43108		M9F42208	M9F43208		M9F42308	M9F43308	
10	480Y/277	M9F44110	M9F42110	M9F43110		M9F42210	M9F43210		M9F42310	M9F43310	
15	107	M9F44115	M9F42115	M9F43115		M9F42215	M9F43215		M9F42315	M9F43315	
20	84	M9F44120	M9F42120	M9F43120]	M9F42220	M9F43220		M9F42320	M9F43320]
25		M9F44125	M9F42125	M9F43125		M9F42225	M9F43225		M9F42325	M9F43325	
30	M9F44130 M9F42130 M9F43130		M9F42230	M9F43230		M9F42330	M9F43330				
35		M9F44135	M9F42135	M9F43135		M9F42235	M9F43235		M9F42335	M9F43335	
10	}	M9F44140	M9F42140	200	2	M9F42240	10000	4	M9F42340	M9F43340	6
15	M9F44150 N	M9F44145	M9F42145	M9F43145		M9F42245	M9F43245		M9F42345	M9F43345	
50		M9F42150	M9F43150	1	M9F42250	The Party of the Control of the Cont	1	M9F42350 M9F43			
33	22	M9F44163	M9F42163	M9F43163		M9F42263	M9F43263	1	M9F42363	M9F43363	1

FLEMECH	Rev:	Device Tag:	
630-499-7080 · www.elemechinc.com	Date: 9/21/2020	CB5	
Manuf.:.PNo:	By: SW/	Job Number:	Page # 1/2

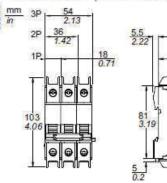
Schneider Electric

0.47

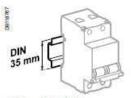
Weight (g / oz)

Circuit-breaker		
Туре	C60BP	
1P	130 g / 4.58 oz	
2P	260 g / 9.17 oz	
3P	390 g / 13.76 oz	45

Dimensions (mm / inches)



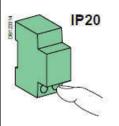


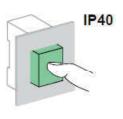


Clip on DIN rail 35 mm.



Indifferent position of installation.





Technical data

Insulation voltage (Ui)		500 V		
Service breaking co	apacity (Ics	In alternating current	75 % of Icu		
		In direct current	100 % of Icu		
Pollution degree		AND ALL OF THE PARTY OF THE PAR	3		
Rated impulse with	stand volta	ge (Uimp)	6 kV		
Thermal tripping	Reference	e temperature	25°C/77°F		
Magnetic tripping	Z curve	In alternating current	3 ln ± 20 %		
		In direct current	4.2 ln ± 20 %		
	C curve	In alternating current	8.5 ln ± 20 %		
		In direct current	12 In ± 20 %		
	D curve		12 In ± 20 %		
	(=K curve	In direct current	17 In ± 20 %		
Additional char					
Degree of protection	n Device or	nly	IP20		
(IEC 60529)	Device in	modular enclosure	IP40 Insulation class II		
Endurance (O-C)	Electrical	RI.	10,000 cycles		
	Mechanic	cal	20,000 cycles		
Operating tempera	ture		-30°C to +70°C / -22°F to 158°F		
Storage temperature			-40°C to +80°C / -40°F to 176°F		
Tropicalization (IEC	60068-1)		Treatment 2 (relative humidity 95 % at 55°C / 131°F)		
Dissipated power			See page 68		

FLEMECH	Rev:	Device Tag:	
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Manuf.:.PNo: Square D: M9F42102	By: SW	Job Number: EVC8265	^{Page #} 2/2

(I)(I)

Zelio[®] Plug-in Relays **RXM**



RXM Miniature Relays (page 4)

2 pole relays; 12 A, 1/2 hp (IEC rating = 12 A) 3 pole relays; 10 A, 1/3 hp (IEC rating = 10 A) 4 pole relays; 8 A, 1/3 hp (IEC rating = 6 A) 4 pole relays; 3 A (low level), 1/16 hp (IEC rating = 3 A)

- · Mechanical "relay status" indicator on all relays
- · Pilot light option available
- Manual operator optional for all relays
- Built-in marking area

Insulation characteristics

Rated insulation voltage (U	h)	250 V (IEC), 300 V (UL, CSA)
Rated impulse withstand v	oltage (Uimp)	3.6 kV (1.2/50 µs)
	Between coil and contact	2,500 Vac
Dielectric strength (rms voltage)	Between poles	2,500 Vac
(iiiia voitage)	Between contacts	1,500 Vac

Contact characteristics

Relay type			RXM2ABeee	RXM3AB •••	RXM4ABeee
,, , , , ,			DPDT	3PDT	4PDT
Contact materials			AgNi		
Conventional thermal current (Ith)	For ambient temperature ≤ 131 °F (55 °C)	12 A	10 A	6 A
	Conforming to IEC	N.O.	12 A	10 A	6 A
Rated operational current	in utilization category AC-1	N.C.	6 A	5 A	3 A
	Conforming to UL Resistive @277 Vac, h	p @ 120 Vac	12 A, 1/2 hp	10 A, 1/3 hp	8 A, 1/3 hp
Maximum operating rate	No load	*	18,000		
In operating cycles/hour	Under load		1,200		
Switching voltage	Maximum		250 Vac/Vdc		
Ouderland consolit.	Minimum		10 mA on 17 V		
Switching capacity	Maximum	*	3,000 VA	2,500 VA	1,500 VA
Utilization coefficient			20%		
Mechanical durability in millions of operating cycles		10			
Electrical durability in millions of operating cycles	Resistive load		0.1		

Coil characteristics

	UTANERO	AC	1.2 VA								
Average consum	ption	DC	0.9 W								
)		AC	≥ 0.15 Uc	į.							-
		DC	> 0.1 Uc								
Between coil energization and making of the N.O. contact	AC	20 ms									
Operating time		DC	20 ms								- 5
(response time) Between coil de-energization and	AC	20 ms									
	making of the N.C. contact	DC	20 ms								
Coil voltage Uc			12 V	24 V	48 V	110 V	120 V	125 V	220 V	230 V	240 V
Relay coil voltage	e codes		JD	BD	ED	FD	===	GD	MD	-	-
ii .	Average resistance at 68 "F (20 "C) ± 10%	160 Ω	650 Ω	2,600 Ω	11,000 Ω	-	11,000 Ω	14,000 Ω	8=1	-
DC	0	Min.	9.6 V	19.2 V	38.4 V	88 V		100 V	176 V	2-	
	Operating voltage limits	Max.	13.2 V	26.4 V	52.8 V	121 V	-	138 V	242 V	·	-
Relay coil voltage	e codes		-	B7	E7	-	F7	-	M7	P7	U7
	Average resistance at 68 °F (20 °C) ± 15%	-	180 Ω	770 Ω	-	4,430 Ω	-	15,000 Ω	15,000 Ω	15,500 Ω
AC		Min.	2=3	19.2 V	38.4 V		96 V	·	176 V	184 V	192 V
	Operating voltage limits	Max.	2=8	26.4 V	52.8 V	===	132 V	-	242 V	253 V	264 V

С.			-	nn		~	
	яΝ	ш		5 13	ш		т

Dielectric strength	2000 V AC (between poles) 2000 V AC (between coil and contact) 1300 V AC (between contacts)	
Product certifications	CSA GOST Lloyds UL	
Standards	EN/IEC 61810-1 UL 508 CSA C22.2 No 14	



630-499-7080 · www.elemechinc.com

Manuf.: . PNo: Square D: RXM3AB2F7 Rev: 0 Date:

Device Tag:

9/21/2020

Job Number:

EVC8265

Page # **1/2**

CR1-5

SW

Telemecanique

0.080 0.036

0.080 0.036

0.080 0.036

0.080 0.036

0.036

0.036

0.036

0.080

0.080

0.080

Miniature relays with lockable test button, without LED

RXM2AB2ED

RXM2AB2FD

RXM2AB2B7

RXM2AB2E7

RXM2AB2F7

RXM2AB2P7

0.082

0.082

0.082

0.082

0.082

0.037

0.037

0.037

0.037

0.037

0.082 0.037

Square D: RXM3AB2F7

48 Vdc

110 Vdc

125 Vdc

24 Vac

48 Vac

120 Vac

230 Vac

	Number and type	of cont	acts - Th	nermal current (Ith)					
	DPDT - 12 A		I	3PDT - 10 A		1	4PDT - 6 A		
		Weigh	nt		Weigh	nt		Weigh	ıt
Coil Voltage	Catalog Number	lb.	kg	Catalog Number	lb.	kg	Catalog Number	lb.	kg
12 Vdc	RXM2AB1JD	0.082	0.037	RXM3AB1JD	0.084	0.038	RXM4AB1JD	0.080	0.036
24 Vdc	RXM2AB1BD	0.082	0.037	RXM3AB1BD	0.084	0.038	RXM4AB1BD	0.080	0.036
48 Vdc	RXM2AB1ED	0.082	0.037	RXM3AB1ED	0.084	0.038	RXM4AB1ED	0.080	0.036
110 Vdc	RXM2AB1FD	0.082	0.037	RXM3AB1FD	0.084	0.038	RXM4AB1FD	0.080	0.036
220 Vdc	_	-10	-	-	-	 i	RXM4AB1MD	0.080	0.036
24 Vac	RXM2AB1B7	0.082	0.037	RXM3AB1B7	0.084	0.038	RXM4AB1B7	0.080	0.036
48 Vac	RXM2AB1E7	0.082	0.037	RXM3AB1E7	0.084	0.038	RXM4AB1E7	0.080	0.036
120 Vac	RXM2AB1F7	0.082	0.037	RXM3AB1F7	0.084	0.038	RXM4AB1F7	0.080	0.036
230 Vac	RXM2AB1P7	0.082	0.037	RXM3AB1P7	0.084	0.038	RXM4AB1P7	0.080	0.036
240 Vac	-		_	-		12.00	RXM4AB1U7	0.080	0.036
Miniature rela	ys with lockable te	st butto	n, with L	ED	*		3.00	•	-
12 Vdc	RXM2AB2JD	0.082	0.037	RXM3AB2JD	0.084	0.038	RXM4AB2JD	0.080	0.036
24 Vdc	RXM2AB2BD	0.082	0.037	RXM3AB2BD	0.084	0.038	RXM4AB2BD	0.080	0.036

RXM3AB2ED

RXM3AB2FD

RXM3AB2B7

RXM3AB2E7

RXM3AB2F7

RXM3AB2P7

0.084

0.084

0.084

0.084

0.038

0.038

0.038

0.038

0.084 0.038

0.084 0.038

RXM4AB2ED

RXM4AB2FD

RXM4AB2GD

RXM4AB2B7

RXM4AB2E7

RXM4AB2F7

RXM4AB2P7

Miniature relays	RXM3eeeee	RXM4eeee	Resistive load AC
= = = = = = = = = = = = = = = = = = =	21 21 21 28 28 28 28 28 28 28 28 28 28 28 28 28	=	S (8) 30/6 0 107
1 12 42 42 42 42 44 44 44 41 11 11 11 11 11 11 11 11 11	1 2 2 3 3 3 3 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5	12 22 32 42 5 6 7 48 14 24 34 44 8 10 10 11 12 11 13 41 13 14 14	Switching capacity (kVA)
RXM eeeeee Common view	RXM 2 Pin side view	RXM 3	RXM 4
0.16 (4) 0.26 (7) 0.24 (6.5) 0.2 (6.5)	0.83 (21) 0.10 (2.5) 0.53 0.10 (2.5) 0.53	0.10 (2.5) 0.53 (13.5) (2.5) 0.1 (2.5) 0.10	0,18 0,010 0,010 0,010 0,010 0,010 0,010 0,010 0,010 0,010 0,010 0,010 0,010
	LEMECH	Rev:	Device Tag:
630-499-7	7080 · www.elemechinc.com	Date: 9/21/202	CR1-5
Manuf.: . PNo:	D. DVM2AD2E7	By:	Job Number: Page # 1/2

SW

EVC8265

Schneider Belectric

RXZS2

bus jumper for Zelio Relay RXZ sockets with separate contacts



Main

Commercial Status	Commercialised	
Range of product	Zelio Relay	
Accessory / separate part type	Jumper	
Accessory / separate part designation	Bus jumper	
Sale per indivisible quantity	10	

Complementary

Product compatibility	Socket RXZ
Accessory / separate part destination	All RXZ sockets with separate contacts
[lth] conventional free air thermal current	5 A
Product weight	0.005 kg

Ordering and shipping details

Category	21128 - ZELIO ICE CUBE RELAY ACCESSORIES
Discount Schedule	CP2
GTIN	00785901924098
Nbr. of units in pkg.	10
Package weight(Lbs)	0.01
Stock Code	Stock - Normally stocked in distribution facility
Returnability	Υ
Country of origin	CN

FIFMECH	Rev:	Device Tag:		
630-499-7080 www.elemechinc.com	Date: 9/21/2020	CR1-	5	
Manuf.: . PNo:	By:	Job Number:	Page # 1 /1	
Square D: RXZ S2	SW	EVC8265	1/1	

Sockets Telemecanique Complementary [lth] conventional free air thermal current 12 A 5 A with bus jumper RXZE2S108M < 250 V [Ue] rated operational voltage Tightening torque <= 1 N.m (M3 screw(s)) Fixing mode By screw mounting on panel Clip on mounting on 35 mm symmetrical DIN rail Marking CE Width 27 mm

Product weight	0.058 kg 0.07 kg
Environment	
Standards	IEC 61984
Product certifications	CSA
	UL
Ambient air temperature for storage	-4085 °C
Ambient air temperature for operation	-4055 °C
IP degree of protection	IP20 conforming to EN/IEC 60529
Dielectric strength	2500 V
RoHS EUR status	Compliant
RoHS EUR conformity date	0801

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			1	10 10	000
			7	0, 0	0
1	an De	0	2	5 :	015
		0		-0-	
	(3) (2)		4	Sol	A PA
		FPC10		D.	9 .
2	- 23	0 29	- 2	27.5	-
1 2 3 5	Relay				
2	Protection Carriage				







RXZE2S111M

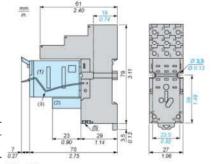


Complementary	
[Ith] conventional free air thermal current	10 A
	5 A with bus jumper
[Ue] rated operational voltage	< 250 V
Tightening torque	<= 1 N.m (M3 screw(s))
Fixing mode	By screw mounting on panel Clip-on mounting on 35 mm symmetrical DIN rail
Marking	CE
Width	27 mm
Product weight	0.000 kg

Environment

Standards	IEC 61984
Product certifications	CSA
	UL
Ambient air temperature for storage	-4085 °C
Ambient air temperature for operation	-4055 °C
IP degree of protection	IP20 conforming to EN/IEC 60529
Dielectric strength	2500 V
RoHS EUR status	Compliant
RoHS EUR conformity date	0801





- Relays Protection module
- Maintaining clamp
 2 elongated holes Ø 3.5 mm x 6.5 mm / Ø 0.13 in. x 0.25 in.
 2 bus jumpers
 provists for Sockets:











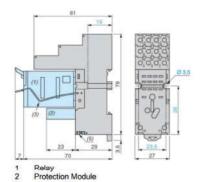
RXZE2S114M



Complementary	
[lth] conventional free air thermal current	10 A 5 A with bus jumper
[Ue] rated operational voltage	< 250 ∨
Tightening torque	<= 1 N.m (M3 screw(s))
Fixing mode	By screw mounting on panel Clip-on mounting on 35 mm symmetrical DIN rail
Marking	CE
Width	27 mm
Product weight	0.058 kg 0.07 kg

Environment

Standards	IEC 61984
Product certifications	CSA UL
Ambient air temperature for storage	-4005 °C
Ambient air temperature for operation	-4055 °C
IP degree of protection	IP20 conforming to EN/IEC 60529
Dielectric strength	2500 V
RoHS EUR status	Compliant
RoHS EUR conformity date	0801



Carriage Stirrup 2 Links connection

Approvals for Sockets:











Manuf.: . PNo:

Square D: RXZE2S111M

Rev: 0

Date: 9/21/2020

By: SW Device Tag:

CR1-5

Job Number: EVC8265 Page #

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General Data

Part No: 07.311.4053.1

Description: End Cover - Black

Type of end plate - Yes

Snap in - Yes

Inflammability Class of insulation material acc. With UL94 - V0



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Date:

Rev:

Device Tag:

9/21/2020

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DB1

Manuf.: . PNo:

Wieland: 07.311.4053.1

By:

SW

wieland

Cross connectors, (jumper bars) uninsulated





- уре	Part no. Sto	d. pack
NKM 4/15	6 mm spacing	Screw: M 3
2pole 9215 - 2	Z7.210.3227.0	50
3pole 9215 - 3	Z7.210.3327.0	50
4pole 9215 - 4	Z7.210.3427.0	50
5pole 9215 - 5	Z7.210.3527.0	50
6pole 9215 - 6	Z7.210.3627.0	50
70pole 9215 M-70	Z7.210.3027.0	10



General

Colour	Other
Type	Cross connector
Modular spacing	6 mm
Number of bridged clamps	4
Mounting method	Screwable
Insulated	No
Accessories	
Type	Cross connector
Mounting method	Screwable
Insulated	No
Colour	Other
Number of bridged clamps	4
Modular spacing	6 mm

FL	EMECH	
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Rev: Device Tag: 0

Date:

9/21/2020 By:

SW

Job Number: EVC8265 Page # 1/1

DB1

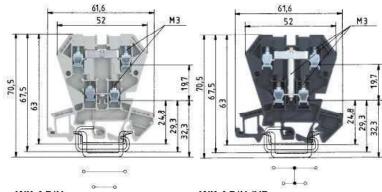
Manuf.: . PNo:

Wieland: Z7.210.3427



Multi-tier blocks with screw connection SEOS





			0-0						
0344 🚱 II 2GD IM2		WK 4 E/L	J			WK 4 E/U	/VB		
Exe I/II		fine-stranded	d solid	V	A	fine-stranded	solid	V	A
EN 60 947-7-1:2002 EN 60 947-7-2:2002		0.5-4mm ²	0.5 - 4 mm ²	400 V/6 kV/3	32	0.5-4mm ²	0.5-4 mm ²	400V/6kV/3	32
UL ratings	Field/factory wiring	No. 22-10 AV	NG	300V	20	No. 22-10 AW	/G	300V	20
CSA ratings		No. 20-12 AV	NG	300V	10	No. 20-12 AV	/G	300V	10
KEMA 02 ATEX 2114 U	EN 60 079-0/EN 60 079-7	0.5-4 mm ²	0.5-4mm ²	275 V	24/242	0.5-4mm ²	0.5-4mm ²	275 V	24
Width Approvals	Wire strip length	6 mm	x 🕮 us 91. @ @		9mm	6mm (10) 全人(10) 中心(10)	- 71@		9mm

Approvais		S North Constitution of	- March	2 C C C C C C C C C C C C C C C C C C C				
		Type	Part No.	5td. Pack	Type	Part No.	Std. Pack	
Multi-tier block	gray	WK 4 E/U	57.404.7055.0	100	W100			
Multi-tier block, vert. connected	black				WK 4 E/U/VB SCHWARZ	57.404.6955.1	100	
Multi-tier ground block green/	yellow							
Function block	red							
Function block	orange							
Accessories								
1. Mounting rail TS 35, DIN rail 7.5 mm high	L=2 m	35 x 27 x 7,5 EN 607 15	98.300.0000.0	1	35 x 27 x 7,5 EN 60715	98.300.0000.0	1	
Mounting rail TS 35, DIN rail, 15 mm high	L=2m	35 x 24 x 15 EN 60715	98.360.0000.0	1	35 x 24 x 15 EN 60715	98.360.0000.0	1	
Mounting rail TS 32, G rail*	L=2m	9006 EN 60715 G-32	98.190.0000.0	1	9006 EN 60715 G-32	98.190.0000.0	1	
2. End clamp with U-foot* 10mr	n wide	WE 1/U	Z5.523.5753.0	100	WE 1/U	Z5.523.5753.0	100	
End clamp TS 35, with screw 8mr	n wide	9708/2 S 35	Z5.522.8553.0	100	9708/2 S 35	Z5.522.8553.0	100	
End clamp TS 35, without screw 8mr	n wide	9708	Z5.522.7053.0	100	WEF 1/35	Z5.523.9353.0	100	
3. End plate	gray	AP4E	07.311.4055.0	10	AP 4 E	07.311.4055.0	10	
	blue							
4. Partition	gray	TW 4 E	07.311.5055.0	10	TW 4 E	07.311.5055.0	10	
	blue							
5. Cross connector with screws	2 pole	9215-2	Z7.210.3227.0	50	9215-2	07.210.3227.0	10	
for top tier	3 pole	9215-3	Z7.210.3327.0	50	9215-3	07.210.3327.0	1	
up to	6 pole	9215-6	Z7.210.3627.0	50	9215-6	07.210.3627.0	1	
Jumper comb for lower tier block	2 pole	IVBS WK 4 E-2	Z7.256.4227.0	10	IVBS WK 4 E-2	Z7.256.4227.0	10	
insulated, angled up to	6 pole	IVBS WK 4 E-6	Z7.256.4627.0	10	IVBS WK 4 E-6	Z7.256.4627.0	10	
Jumper comb for lower tier block	2 pole	IVB WK 4 E-2	Z7 255 2227,0	10	IVB WK 4 E-2	Z7.255.2227.0	10	
The state of the s	6 pole	IVB WK 4 E-6	Z7 255 2627,0	10	IVB WK 4 E-6	Z7.255.2627.0	10	
6. Partition plate with marking facility								
7. Single cover with marking facility		AD VB 4/15 GELB	04.326.2953.8	10	AD VB 4/15 GELB	04.326.2953.8	10	
Cover with warning symbol over 4 blocks								
		1. ***			2 1810-1-10-			
For more accessories see pages 60-77		Please note the mount With end plates 500 \ Ratings to adjacent fe	ed-through blacks a	the same series				
For marking systems see pages 70-75		14 For the current carrys	ng capability of the r	nounting rail see/	AT catalog section facts & DATA			

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wieland

Earth terminal WK 4 SL/ U /V0

Ground DIN rail terminal block with screw connection for mounting on TS 35 and TS 32, nominal cross section 4 mm², width 6 mm, color green/yellow





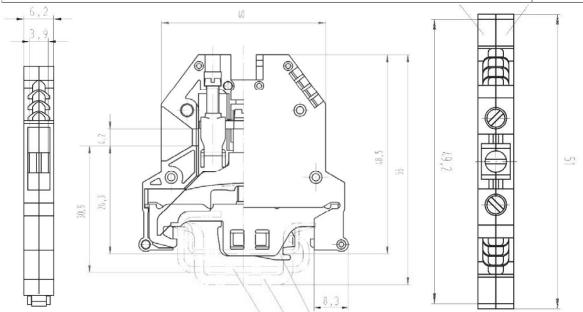






00-890-00

Rated impulse voltage	8 k\	/
Pollution degree	3	
Closing plate required	No	
Length	51 r	nm
Type of insulation material	The	rmoplastic
Cross section UL	2	2-10 AWG
Cross section CSA	2	0-10 AWG
Maximum cross section fine stranded	·	4 mm²
Wire strip length		9 mm
Torque conductor mounting		0.5 Nm
Torque rail mounting		0,5
6.0		/



FLEMECH	Rev: 0	Device Tag:	
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- = Not available

Non-fusible disconnect switches Compact, Heavy duty 16A – 2000A, 600V







09-001-A010

Catalog number	3 pole	OT16F3	OT25F3	OT40F3	OT63F3	OT80F3	OT30F3	OT60F3	OT100F3
General purpose amp rating	Α	20	30	40	60	80	30	60	100
Catalog reference	Page #	1.10	1.10	1,10	1.10	1.10	1.11	1.11	1.11
Approvals®									**
	2 pole 3 pole 4 pole	CSA C22.2 No.14 CSA C22.2 No.14	CSA C22.2 No.4 CSA C22.2 No.4	CSA C22.2 No.4 CSA C22.2 No.4	CSA C22.2 No.4 CSA C22.2 No.4				
Technical ratings CSA,UL®			(e (2)						10
Max operating voltage	V	600	600	600	600	600	600VAC / 250VDC	600VAC / 250VDC	600VAC / 250VD
Max horsepower rating Three phase									
208V 240V	HP	3 5	7.5 7.5	10 10	15 15	20 20	10	20 20	25 30
480V	HP	10	15	20	30	40	20	40	50
600V	HP	10	20	25	30	40	30	40	50
Single phase		200	gana	600	477,000,00	2402		Deposits of the second	400
120V	HP	1	1.5	2	2	2	2	3	5
240V	HP	2	3	5	7.5	10	5	7.5	15
Technical ratings IEC®									
Rated insulation and opera voltage. AC20 and DC203	V	750	750	750	750	750	750	750	750
Rated thermal current, Ith	0.000	25	32	40	63	80	40	63	115
AC 20/DC 20 open AC 20/DC 20 enclosed	A	25	32	40	63	80	40	63	115
AC 21A ≤ 500V	Α	16	25	40	63	80	40	63	100
690V	A	16	25	40	63	80	40	63	100
Rated operational power A									
400/415\ 690V	/ kW	7.5 7.5	9	11	22 15	37 18.5	15 15	18.5	37 37
Physical characteristics	KVV	7,5	9	10	15	18.5	15	15	3/
Weight @ 3 pole	Va	0.11	0.11	0.11	0.27	0.07	0.26	0.26	0.26
Here 95 Hz 55	Kg	0.11	0.11	0.11	0.27	0.27	0.36	0.36	0.36
Dimension 3 pole	H mm W mm	68 35	68 35	68 35	91 53	91 53	100 70	100 70	100 70
	D mm	56	56	56	72	72	75	75	75
Accessories									
Terminal lug kit		Integral	Integral	Integral	Integral	Integral	Integral	Integral	Integral
Terminal shroud		•	• 1	•	•	•	•	•	•
Auxiliary contact		•	•	•	•	•	•	•	•
Handle CSA/UL/NEMA typ Type 1, 3R, 12 Type 1, 3R, 4, 4X, 12	e					:		:	
Handle type									
Selector			•	•	•				
Pistol		•	•				•	•	
Conversion kits		1048	897	55	954	226		66.5	¥8
6 pole			•			:			
Transfer Bypass					18			7.	
Mechanical interlock			•	•	•	•		3 (•	
Electrical interlock									

CSA approved, UL listed, IEC rated, CE marked

① CSA 22.2 No.4 (UL98) —CSA File #LR58077, UL File # E101914 , CSA 22.2 No. 14 (UL508) —CSA File #LR58247, UL File # E63822

FLEMECH	Rev: 0	Device Tag:	
630-499-7080 · www.elemechinc.com	Date: 9/21/2020	DS1	
Manuf.: . PNo:	Bv:	Job Number:	Page # 1 /1
ABB: OT63F3 Assembly	SW	EVC8265	'/'

SUB-PANELS FOR ENCLOSURES

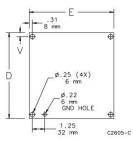
SUB-PANEL SUB-PANEL CATALOG NUMBER DIMENSIONS (IN.)

A-DPESS

<u>D</u> x <u>E</u>

NOTE:

- 6 indicates 316 Stainless Steel.
- 2. AL Indicates Aluminum
- 3. G indicates Conductive Steel





11-035-136

Catalog Nu A12P24 D x E (in.) DxE(n T (in.) or Thic Painted steel 9.00 x 21.00 229 x 533 12 ga. A12P24G 12 ga. Conductive stee 9.00 x 21.00 229 x 533 A16P12 Painted steel 330 x 229 12 ga. A16P12G A16P12SS6 Conductive steel 13.00 x 9.00 330 x 229 12 ga. Stainless Steel 13.00 x 9.00 12ga 330 x 229 A16P12AL Aluminum 13.00 x 9.00 330 x 229 0.10 in./3 mm A16P16 Painted steel 13.00 x 13.00 330 x 330 12 ga. A16P16G Conductive stee 13.00 x 13.00 330 x 330 12 ga. A16P16SS6 Stainless Steel 13 00 x 13 00 330 x 330 12 ga. A16P16AL 0.10 in./3 mm Aluminum 13.00 x 13.00 330 x 330 A18P18 A18P18G Painted steel 15.00 x 15.00 381 x 381 Conductive steel 15.00 x 15.00 381 x 381 12 ga A20P12 A20P12G Painted steel 17.00 x 9.00 12 ga. Conductive steel 17.00 x 9.00 432 x 229 12 ga. 12 ga. A20P16 17.00 x 13.00 432 x 330 Painted steel A20P16G Conductive stee 17.00 x 13.00 432 x 330 12 ga. 12 ga. 0.10 in./3 mm A20P16SS6 Stainless Steel 17.00 x 13.00 432 x 330 A20P16AL 17.00 x 13.00 Aluminum 432 x 330 A20P20 Painted steel 17,00 x 17,00 432 x 432 12 ga. A20P20G 17.00 x 17.00 432 x 432 Conductive stee 12 ga A20P20SS6 A20P20AL Stainless steel 17.00 x 17.00 432 x 432 12 ga. 0.10 in./3 mm Aluminum 17.00 x 17.00 432 x 432 A24P16 Painted steel 21.00 x 13.00 533 x 330 12 ga. A24P16G A24P16SS6 Conductive steel 21.00 x 13.00 533 x 330 12 ga Stainless Steel 21.00 x 13.00 533 x 330 12 ga. A24P20 Painted steel 21.00 x 17.00 533 x 432 0.75 12 ga. A24P20G A24P20SS6 Conductive steel Stainless Steel 21.00 x 17.00 533 x 432 12 ga. 12 ga. 0.75 0.75 19 19 21.00 x 17.00 533 x 432 A24P20AL Aluminum 21.00 x 17.00 533 x 432 0.10 in./3 mm 0.75 19 A24P24 Painted steel 21.00 x 21.00 533 x 533 12 ga. 0.75 19 A24P24G Conductive stee 21.00 x 21.00 533 x 533 12 ga. 0.75 19 A24P24SSE Stainless Steel 21.00 x 21.00 533 x 533 12 ga. 0.75 A24P24AL Aluminum 0.10 in./3 mm 21.00 x 21.00 533 x 533 0.75 19 A30P16 A30P16G Painted steel 27.00 x 13.00 686 x 330 12 ga. 0.75 Conductive stee 33,00 x 27.00 838 x 686 12 ga. 0.75 19 A30P20 Painted steel 27.00 x 17.00 686 x 432 0.75 12 ga 19 A30P20G A30P20SS6 Conductive steel 27.00 x 17.00 686 x 432 12 ga. 0.75 19 686 x 432 Stainless Steel 27.00 x 17.00 12 ga 0.75 A30P24 Painted steel 27.00 x 21.00 686 x 533 12 ga. 0.75 A30P24G Conductive steel 27.00 x 21.00 686 x 533 12 ga 0.75 0.75 19 19 Stainless Steel A30P24SS6 27.00 x 21.00 686 x 533 12 ga. 0.10 in./3 mm A30P24AL Alumi 27.00 x 21.00 686 x 533 0.75 A30P30 Painted steel 27.00 x 27.00 686 x 686 12 ga. 0.75 19 A30P30G Conductive ste 27.00 x 27.00 686 x 686 12 ga. 0.75 A30P30SS6 Stainless Steel 27 00 x 27 00 686 x 686 12 ga. 0.75 0.75 19 A36P16 Painted steel 33.00 X 13.00 838 X 330 12 ga. A36P16G A36P24 33.00 x 13.00 838 x 330 0.75 19 Conductive stee 12 ga. Painted steel 33 00 x 21 00 838 x 533 12 ga. 0.75 19 A36P24G Conductive steel 33.00 x 21.00 838 x 533 12 ga. 0.75 19 12 ga. 0.10 in./3 m A36P24SS6 Stainless Steel 33.00 x 21.00 838 x 533 0.75 19 A36P24AL Aluminum 33.00 x 21.00 838 x 533 0.75 19 A36P30 A36P30G 12ga Conductive stee 33.00 x 27.00 838 x 686 12 ga. 0.75 19 A36P30SS6 Stainless Steel 33.00 x 27.00 838 x 686 12 ga. 0.75 19 A36P30AL A36P36 33.00 x 27.00 Aluminum 838 x 686 0.10 in./3 mm Painted steel 0.75 33 00 x 33 00 838 x 838 12 ga. 19 A36P36G A36P36SS6 Conductive stee 33.00 x 33.00 838 x 838 0.75 12 ga. 19 Stainless Steel 33 00 x 33 00 838 x 838 12 ga. 0.75 A40P24 Painted steel 37.00 x 21.00 940 x 533 12 ga 0.75 19 A40P24G A40P30 37.00 x 21.00 940 x 533 12 ga. Painted steel 37.00 x 29.00 940 x 737 12 ga. 0.75 19 A40P30G Conductive steel 37.00 x 29.00 940 x 737 0.75 12 ga Painted steel A42P24 39.00 x 21.00 991 x 533 12 ga. 0.75 19 A42P24G Conductive stee 39.00 x 21.00 991 x 533 12 ga 0.75 A42P30 39.00 x 27.00 991 x 686

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Manuf.: . PNo:

Hoffman: A-36P24

Rev: 0 Date:

9/21/2020

By: SW

Device Tag:

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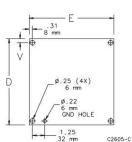
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SUB-PANELS FOR ENCLOSURES







NOTE:

- 1. 6 indicates 316 Stainless Steel.
- 2. AL Indicates Aluminum
- 3. G indicates Conductive Steel

Catalog Number	Material	Panel Size D x E (in.)	Panel Size D x E (mm)	Panel Gauge or Thickness	Edge Flanges	T (in.)	T (mm)	Number of Holes
A42P30G	Conductive steel	39.00 x 27.00	991 x 686	12 qa.	Flanges 4	0.75	19	6
A42P30SS6	Stainless Steel	39.00 x 27.00	991 x 686	12 qa.	7	0.75	19	6
A42P36	Painted steel	39.00 x 27.00	991 x 838	12 ga.	A	0.75	19	8
A42P36G	Conductive steel	39.00 x 33.00	991 x 838	12 ga.	7	0.75	19	8
A42P36SS6	Stainless Steel	39.00 x 33.00	991 x 838	12 ga.	, a	0.75	19	8
A42P42	Painted steel	39.00 x 39.00	991 x 991	12 ga.	4	0.75	19	R
A42P42G	Conductive steel	39.00 x 39.00	991 x 991	12 ga.	4	0.75	19	8
A48P24	Painted steel	45.00 x 21.00	1143 x 533	12 ga.	2	0.75	19	6
A48P24G	Conductive steel	45.00 x 21.00	1143 x 533	12 ga.	2	0.75	19	6
A48P30	Painted steel	45.00 x 27.00	1143 x 686	12 qa.	Ä	0.75	19	6
A48P30G	Conductive steel	45.00 x 27.00	1143 x 686	12 ga.	4	0.75	19	6
A48P36	Painted steel	45.00 x 27.00	1143 x 838	12 ga.	4	0.75	19	8
A48P36G	Conductive steel	45.00 x 33.00	1143 x 838	12 ya. 12 ya.	4	0.75	19	8
A48P36SS6	Stainless Steel	45.00 x 33.00	1143 x 838	12 ga.	4	0.75	19	8
A48P36AL	Aluminum	45.00 x 33.00	1143 x 838	0.10 in./3 mm	4	0.75	19	8
A48P42	Painted steel	45.00 x 39.00	1143 x 991	12 ga.	4	0.75	19	8
A48P42G	Conductive steel	45.00 x 39.00	1143 x 991	12 ga.	Ž.	0.75	19	8
A48P48	Painted steel	44.00 x 44.00	1118 x 1118	11 ga.	2	0.84		. 10
A48P48G	Conductive steel	44.00 x 44.00	1118 x 1118	11 ga.	7	0.84	21	10
A54P42	Painted steel	50.00 x 38.00	1270 x 965	11 ga.	- :	0.84	21	10
A54P42G	Conductive steel	50.00 x 38.00	1270 x 965	11 ga.	7	0.84	21	10
A60P24	Painted steel	57.00 x 21.00	1448 x 533	12 ga.	4	0.75	19	6
A60P24G	Conductive steel	57.00 x 21.00	1448 x 533	12 ga.	7	0.75	19	6
A60P30	Painted steel	57.00 x 27.00	1448 x 686	12 ga.	- 7	0.75	19	6
A60P30G	Conductive steel	57.00 x 27.00	1448 x 686	12 ga. 12 ga.	7	0.75	19	6
A60P36	Painted steel	57.00 x 33.00	1448 x 838	12 ga.	- 3	0.75	19	8
A60P36G	Conductive steel	57.00 x 33.00 57.00 x 33.00	1448 x 838		4	0.75	19	8
A60P36SS6	Stainless Steel	57.00 x 33.00	1448 x 838	12 ga. 12 ga.	7	0.75	19	8
A60P36AL	Aluminum		1448 x 838	0.10 in./3 mm	7	0.75		8
A60BFP42	Painted steel	57.00 x 33.00 56.00 x 38.00	1448 X 838		4	0.75	19 21	10
A60BFP42G	Conductive steel	56.00 x 38.00	1422 x 965	11 ga.	7	0.84	21	10
A60P48	Painted steel			11 ga.	4	0.84	21	10
		56.00 x 44.00	1422 x 1118	11 ga.	7			
A60P48G	Conductive steel	56.00 x 44.00	1422 x 1118	11 ga.	4	0.84	21	10
A60P60	Painted steel	56.00 x 56.00 56.00 x 56.00	1422 x 1422	11 ga.		0.84	21	10
A60P60G	Conductive steel		1422 x 1422	11 ga.	7	0.84	21 19	10
A72P36	Painted steel	69.00 x 33.00	1753 x 838	12 ga.	4			8
A72P36G	Conductive steel	69.00 x 33.00	1753 x 838	12 ga.	4	0.75	19	8 10
A72P60	Painted steel	68.00 x 56.00	1727 x 1422	11 ga.	4	0.84	21	1000
A72P60G	Conductive steel	68.00 x 56.00	1727 x 1422	11 ga.	4	0.84	21	10
A72P72	Painted steel	68.00 x 68.00	1727 x 1727	11 ga.	4	0.84	21	10
A72P72G	Conductive steel	68.00 x 68.00	1727 x 1727	11 ga.	4	0.84	21	10

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CONTINUOUS HINGE WITH CLAMPS TYPE 4X WALL-MOUNT ENCLOSURES PENTAIR





ENCLOSURE	ENCLOSURE	SUB-PANEL
CATALOG NUMBER	DIMENSIONS (IN.)	CATALOG NUMBER
A-AHBCSS6LP	<u>A</u> x <u>B</u> x <u>C</u>	A <u>A</u> P <u>B</u>

NOTE: 6 indicates 316 Stainless Steel.



INDUSTRY STANDARDS

UL 508A Listed; Type 3R, 4, 4X, 12; File No. E61997 cUL Listed per CSA C22.2 No 94; Type 3R, 4, 4X, 12; File No.

NEMA/EEMAC Type 3, 3R, 4, 4X, 12, 13 CSA File No. 42186: Type 4, 4X, 12 IEC 60529, IP66

APPLICATION

For use in indoor and outdoor corrosive environments that require a water-tight seal, this enclosure's seamless foam-in-place gasket and screw-down clamps provide a secure seal against

SPECIFICATIONS

- 14 gauge Type 304 or Type 316L staintess steel bodies and doors.
 Seams continuously welded and ground smooth
- Seamless foam-in-place gasket
- Rolled lip around three sides of door
- Stainless steel door clamp assembly
- Hasp and staple for padlocking
- Door removed by pulling stainless steel continuous hinge pin
- Data pocket is high-impact thermoplastic Collar studs provided for mounting optional panels
- Exterior hardware on Type 316L stainless steel enclosures matches enclosure material
- . Bonding provision on door, grounding stud on body

FINISH

Door, sides, top and bottom have smooth #4 brushed finish.

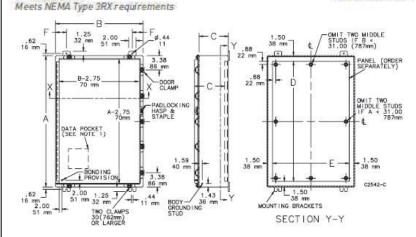
ACCESSORIES

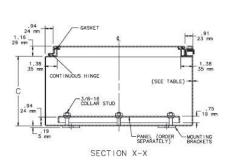
See also Accessories. Fast-Operating Clamp Assembly
Panels for Type 3R, 4, 4X, 12 and 13 Enclosures
Junction Box and Watt-Mount Enclosure Swing Out Panel Kit
Steel and Stainless Steel Window Kits
H2OMIT™ Vent Drains, Type 4X
H2OMIT™ Thermoelectric Dehumidifier

MODIFICATION AND CUSTOMIZATION

Hoffman excels at modifying and customizing products to your specifications. Contact your local Hoffman sales office or distributor for complete information.

BULLETIN: A45







Blackburn*





L70

78378613002

UPC Number: Status:

Active

Description:

Type L - Copper Single Conductor, One-Hole Mount for Conductor Range 14 Sol.-4 Str.

Features

Cold forged from pure electrolytic copper with 99 percent conductivity.

General Type L - Copper Single Conductor, One-Hole Style Mount Material Copper Wire Range 14 Sol.-4 Str. **Dimension Information** Length (inches) 1 1/8 Width (inches) 17/32 Height (inches) 35/64 D (inches) 9/32 E (inches) 9/32 3/32 F (inches) G (inches) 21/32 J (inches) 9/32 Packaging T&B Inner Pack 100 1000 Package in Units T&B Sold in UOM Each T&B Weight Per UOM 3.32 lbs. per 100

Available with screwdriver slot head screws only. UL 486A tested. Certifications Yes RoHS Compliance



Certifications

Notes



File Nbr: E9809

For further technical assistance, please contact us...

Thomas & Betts - USA 8155 T&B Blvd. Memphis, TN 38125 www.tnb.com

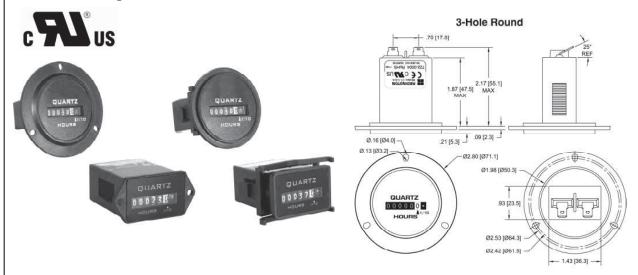
T&B Technical Support MS 3B-50 8155 T&B Blvd. Memphis, TN 38125

Hours: 7AM - 6PM CDT Monday-Friday Phone: (888) 862-3289 Fax: (901) 252-1321 Email:techsupport@tnb.com

FLEMECH	Rev: 0	Device Tag:	
630-499-7080 · www.elemechinc.com	Date: 9/21/2020	GND)
Manuf.: . PNo: Blackburn: L70	By: SW	Job Number: EVC8265	Page # 1/1

Totally Sealed Hour Meter

Redington



Panel Opening: 2.0" [50.6]

Models	Description			
722-0001	2-Hole Rectangular,	90-264VAC 50/60Hz,	1/4" [6.3mm] spade terminals,	hours & 1/10's
722-0002	Flush-Rectangular,	90-264VAC 50/60Hz,	1/4" [6.3mm] spade terminals,	hours & 1/10's
722-0003	Flush-Round,	90-264VAC 50/60Hz,	1/4" [6.3mm] spade terminals,	hours & 1/10's
722-0004	3-Hole Round,	90-264VAC 50/60Hz,	1/4" [6.3mm] spade terminals,	hours & 1/10's
5003-009	NEMA 4X, 12 Gaske	et for Model 722-0002		
5003-010	NEMA 4X, 12 Gaske	et for Model 722-0001		
5003-011	NEMA 4X, 12 Gaske	et for Model 722-0004		
5003-012	NEMA 4X, 12 Gaske	et for Model 722-0003		

Description

The Redington Model 722 provides an AC Hour Meter with an operating range of 90-264VAC 50/60 Hz. You no longer require two separate meters, one for 115VAC and one for 230VAC. Models are available in the standard industry housings, 2-Hole Rectangular, Flush-Rectangular, Flush-Round and 3-Hole Round. Its quartz time base insures accurate long-term time keeping. The Totally Sealed case protects against the environment and provides years of reliable service. All models are NEMA 4X,12 rated when mounted with optional gasket.

Specifications

6 - digits, 0.14" [3.6mm] 99999.9 Figures: Case Material: Black polymer Hours and idicator - white on black Lens Material: Polymer

Decimal - black on white Agency Approvals: UL/cUL Recognized, CE & RoHS Compliant,

Non-reset SAE & NEMA 4X, 12 Compliant Reset:

90-264VAC Voltage: Environmental: Totally Sealed 50/60Hz Frequency: Front Panel: NEMA 4X, 12 rated with optional gasket

Power: 1 watt max. -40°F to +185°F [-40°C to + 85°C] Temperature:

Mounting: Clip or mounting holes **Humidity:** 95% (SAE J1378)

10-80 Hz. 20g max. (SAE J1378) Termination: 1/4" [6.3mm] spade terminals Vibration: Weight: ~2 oz [57 g] Shock: 55g @ 9 - 13msec (SAE J1378) ± 0.02% over entire range Accuracy:

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Flexible Heaters

Flexible Heater Installation Methods

Flexible Heater Pressure Sensitive Adhesive (PSA)





For ease of attachment specify PSA. Installation is simple: just peel off the protective liner and apply. It will adhere to most clean smooth surfaces. Care must be taken when installing to attain a smooth, consistent, uniform bond to achieve maximum results.

Maximum Temperature:

Continuous - 300°F (149°C) Intermittent - 500°F (260°C)

Recommended Watt Density:

Under 5 W/in2 (0.78 W/cm2)

A layer of aluminum foil is vulcanized to the back of the heater for added heat dissipation prior to the application of PSA.

Tempco PN: SHS80707 SILICONE RUBBER HEATER 3.000" W x 5.000" L 12" Teflon® leads in location A Wire construction Pressure sensitive adhesive 75 watts, 120 volts

E Zu us (P

Tempco PN: SHS80708 SILICONE RUBBER HEATER 4.500" W x 6.500" L Wire construction Pressure sensitive adhesive 150 watts, 120 volts

UL Recognized: U.S. & Canada E65652

CSA Certified: 043099

12" Teflon® leads in location A E Su LPP 2



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HTR1

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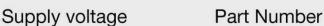
Tempco: SHS80707

Motor Load Monitors (Power Factor) CM-LWN

2 SPDT Relay Outputs

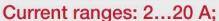






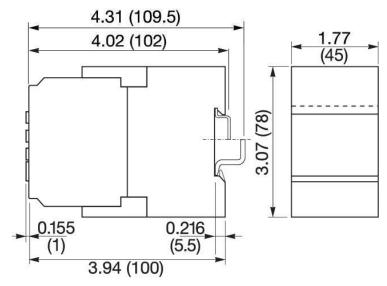
Current ranges: 0.5...5 A;

24...240 V AC/DC 1SVR 450 335 R 0000 110...130 V AC 1SVR 450 330 R 0000 220...240 V AC 1SVR 450 331 R 0000 380...440 V AC 1SVR 450 332 R 0000 480...500 V AC 1SVR 450 334 R 0000



1SVR 450 335 R 0100 24...240 V AC/DC 110...130 V AC 1SVR 450 330 R 0100 220...240 V AC 1SVR 450 331 R 0100 380...440 V AC 1SVR 450 332 R 0100 480...500 V AC 1SVR 450 334 R 0100

Mechanical View



Inches (Millimeters)



Manuf.: . PNo: ABB: 1SVR 450 330 R0000 Rev: 0

Date: 9/21/2020

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LM1

Job Number: EVC8265 Page # 1/2



Technical Data

Input

Supply voltage - power consumption A1-A2

Supply voltage frequency 24...240 V AC/DC version

A1-A2

110...130 V AC - 3.6 VA

24...240 V AC/DC - 8.4 VA

A1-A2

220...240 V AC - 3.6 VA 380...440 V AC - 3.6 VA

A1-A2

480...500 V AC - 3.6 VA

A1-A2

-15 % ... +10 %

50...60 Hz

15...400 Hz

Time Delay

Timing error over the supply voltage range Timing error over the temperature range

Supply voltage frequency AC versions

Starting time (Time S) and (response) time delay (Time R)

≤ 0.5 %

≤ 0.06 % / °C

Measuring Circuit

Measuring circuit inputs

Tolerance of supply voltage

Voltage range

Current range

Measuring current input - output

Possible overload current input

Hysteresis (referring to the j angle, in °)

L1, L2, L3

24...240 V AC/DC, 110...500 V AC in 5 ranges

L1/k - L1/l

2 relays, each with SPDT contacts

25 A for 3 s

100 A for 3 s

for cos φ min. and cos φ max., normally energized

Response time

≤300 ms

Display of Operating Status

Supply voltage $\cos \varphi$ min. $\cos \varphi$ max.

LED, green

LED, red

LED, red

Output

15-16/18, 25-26/28

Rated voltage VDE 0110, IEC 947-1

Rated switching voltage max.

Rated switching current AC 12 (resistive)

AC 15 (inductive) DC 12 (resistive) DC 13 (inductive) 400 V AC

400 V

4 A (at 230 V) 3 A (at 230 V)

4 A (at 24 V)

2 A (at 24 V)

30 x 10⁶ operations

1 x 10⁵ operations

5 A / fast acting

Short-circuit proof, max. fuse rating General Data

Mechanical life

Rated impulse withstand voltage Vimp

Electrical life (acc. to AC 12 / 230 V / 4 A)

Operating temperature Storage temperature

Mounting to DIN rail (EN 50022)

Wire size stranded with wire end ferrule

Weight

Manuf.: . PNo:

4 kV

-25°C ... +65°C -40°C ... +85°C

Snap-on mounting/Screw mounting using an adapter

2 x 14 AWG (2 x 2.5 mm²) Approx. 0.66 lb (300 g)

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ABB: 1SVR 450 330 R0000

By:

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Page # **2/2**

30.5 mm Push Buttons

Pilot Lights

Protection Rating			
Code	Description		
T	Metal, Type 4/13		
Н	Plastic, Type 4/4X/13		

	Power Module Type					
800T Type 4/13	Description	800H Type 4/4X/13				
Code		Code				
Р	Transformer (or dual input)	PR				
Q	Full voltage/ Universal	QR				

	Lamp Test Options
Code	Description
Blank	No test option
Т	Push-to-test
D	Dual input - diode+
DT	Dual input — transformer relay
	Push-to-test supplied with y jumpered contact block.

-	1	į,	ī		ě

-	
mination Options	
Description	
Incandescent	
LED*	
	Description Incandescent



	T
	Voltage
	Transformer
Code	Description
16	120V AC 50/60 Hz
26	240V AC 50/60 Hz
46	480V AC 50/60 Hz
56	600V AC 50/60 Hz
Full	Voltage — Incandescent
12	12V AC/DC
24	24V AC/DC
48	48V AC/DC
10	120V AC/DC
20	240V AC/DC
	Universal — LED
2	12130V AC/DC
	Dual Input
16	120V AC
24	24V AC/DC (Dual input diode only)

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	g	
	Lens Color	
Code	Color	Glass
Blank	No lens	Blank
A	Amber	D
В	Blue	E
С	Clear	F
G	Green	Н
R	Red	J
W	White	K

Specifications*

Manuf.: . PNo:

	MA.	Electrical Ratings		
Contact ratings		Refer to the contact ratings tables on page 10-4.		
Dielectric strength		2200V for one minute, 1300V for one minute (Logic Reed)		
Electrical design life cycles		1 000 000 at max, rated load, 200 000 at max, rated load (Logic Reed)		
	=	Mechanical Ratings		
Vibration		 102000 Hz, 1.52 mm displacement (peak-to-peak) max./ 10 G max. (except Logic Reed) 		
Shock		1/2 cycle sine wave for 11 ms ≥ 25 G (contact fragility) and no damage at 100 G		
Degree of protection		Type 1/4/12/13 (800T); Type 1/4/4X/12/13 (800H); EN/IEC 60529 IP66/65		
Mechanical design life cycles				
	(Momentary, non-illuminated)	10 000 000 min.		
Push buttons	(Momentary, illuminated)	250 000 min.		
	(Push-pull/twist-to-release)	250 000 min.		
A CANCEL CONTRACTOR	(Non-illuminated)	1 000 000 min.		
Selector switches	(Illuminated, key-operated)	200 000 min.		
Potentiometers		25 000 min.		
All other devices		200 000 min.		
Contact operation		Shallow, mini, and low-voltage contact blocks: Slow, double make and break Logic Reed and sealed switch contact blocks; Single break magnetic		
Wire gauge/Terminal screw tord	que	#1814 AWG (#1810 Max Duty) / 68 lb•in		
Typical operating forces Operators without contact bl	ocks	Flush, extended button, standard mushroom, jumbo plastic mushroom: 2 lbs max. Jumbo and extended aluminum mushroom head: 3.95 lbs max. Maintained selector switch: 3.6 in•lb max.		
Spring return selector switches		3.6 in∙lb to stop, 0.2 in∙lb to return		
Illuminated push buttons and	I push-to-test pilot lights	5 lb max.		
2-position push-pull		8.0 lb max. push or pull		
3-position push-pull		8 lb max. push to in position or pull to center position (15 lb max. pull to out position)		
Twist-to-release or push-pull		9 lbs max. push or pull 30 in•oz max. twist, 6 in•oz minimum return		
Potentiometer		Rotational torque 312 in oz; stopping torque 12 in lb (minimum)		
<u> </u>	Standard	1 lb		
	Logic Reed	1 lb max.		
	Sealed switch	3 lb max. at 0.205 in. plunger travel		
Contact blocks	Stackable sealed switch	1 lb max.		
	MaxDuty	1.4 lb max.		
	PenTUFF	1.4 lb max.		
	Self Monitoring	1.6 lb		
		Environment		
Tomporative range	Operating	-40+131 °F (-40+55 °C)		
Temperature range Storage		-40+185 °F (-40+85 °C)		
Rockwell Automation sal	below freezing are based on and liquids. Consult your local es office or Allen-Bradley er temperature applications.			
Humidity		5095% RH from 77140 °F (2560 °C) per Procedure IV of MIL-STD-810C. Method 507.1 cycling test		



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Allen-Bradley: 800H-PR16

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Allen-Bradley

Replacement Color Caps 30.5 mm Accessories







	800T/H Pilot Light Color Caps			
	Standard*	Push-to-Test∗	18 mm	
Color	Cat. No.	Cat. No.	Cat. No.	
Amber	800T-N26A	800T-N42	800T-N122A	
Blue	800T-N26B	800T-N43	800T-N122B	
Clear	800T-N26C	800T-N45	800T-N122C	
Green	800T-N26G	800T-N41	800T-N122G	
Red	800T-N26R	800T-N40	800T-N122R	
White	800T-N26W	800T-N44	800T-N122W	

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Manuf.: . PNo:	By:	Job Number:	Page # 1 / 1
Allen-Bradley: 800T-N26G	ŚW	EVC8265	'/'

Allen-Bradley

-010

Auxiliary Contacts





Auxiliary Contact Blocks for Front Mounting **●**

- 2- and 4-pole
- Quick and easy mounting without tools
- Electronic-compatible contacts down to 17V, 5 mA
- Mutual positive guidance to the main contactor poles (except for L types)
- Models with equal function with several terminal numbering choices
- L = Late break / Early make



Auxiliary contact blocks for front installation **⑤**

- 2 and 4 poles
- Quick and easy mounting without tools
- Contacts compatible with electronics
- Mutual positive quidance with the main contactor poles (except for L types)
- Models with equal function with several terminal numbering choises
- L = late break / early make

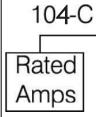
	 N.O.	N.C.	Connection Diagrams	For Use With	Cat. No.
200	0	2		100-C all C30⊗00C85⊗00	100-FA02 100-FB02
ē	1	1	51 61 11 21 53 61 12 152 154 62 174 175	100-C all C30⊗00…C85⊗00 C09⊗10…C23⊗10	100-FA11 100-FB11 100-FC11
	2	0	13 21 23 31 53 63 14 22 24 32 54 64	100-C all C30⊗00C85⊗00	100-FA20 100-FB20
	1L	1L	-FB11 -FC11 -FA20	100-C all C30⊗00C85⊗00	100-FAL11 100-FBL11
	0	4	14 24 158 66 118 26 -FB20 -FAL11 -FBL11	100-C all	100-FA04
	1	3		100-C all	100-FA13
ũ .	2	2		100-C all C30⊗00C85⊗00 C09⊗10C23⊗10	100-FA22 100-FB22 100-FC22
	3	1		100-C all C09⊗10C23⊗10	100-FA31 100-FC31
	4	0		100-C all	100-FA40
	1+1L	1+1L	23 31 43 53 53 63 73 83 53 61 75 87 54 52 75 87 54 54 54 54 54 54 54 54 54	100-C all	100-FAL22

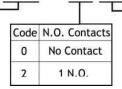
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630-499-7080 · www.elemechinc.com	Date: 9/21/2020	M1,2-F/R	
Manuf.:.PNo: Allen-Bradley: 100-FA31	By: SW	Job Number: EVC8265	Page # 1/1

Bulletin 100-C Contactors 領側



Allen-Bradley





Code	N.C. Contacts
0	No Contact
2	1 N.C.

V	120
Hz	0
60Hz	D



Reversing AC- and DC-Operated Contactors

		Auxiliary Installed pe			, AC-1	C-2, AC-3	otors — A	ing AC Me	or Switch	Ratings f	ji		7	
	١, ا				0 Hz)	Hp (6	10			(50 Hz)	3-Phase kW		[A]	$I_{\rm e}$
	7			nase	3-Ph		nase	1-Pi						
Cat. No.	N.C.*	N.O.	575V	460V	230V	200V	230V	115V	690V	500V	400V/415V	230V	AC-1	AC-3
104-C09⊗	1	1	7-1/2	5	2	2	1-1/2	1/2	4	4	4	3	32	9
104-C12®	1	1	10	7-1/2	3	3	2	1/2	5.5	5.5	5.5	4	32	12
104-C16⊗	1	1	15	10	5	5	3	1	7.5	7.5	7.5	5.5	32	16
104-C23®	1	1	15	15	7-1/2	5	3	2	10	13	11	7.5	32	23
104-C30®	1	0	25	20	10	7 4 10	5	2	15	15	15	10	65	30
104-C30®	1	1	25	20	10	7-1/2	5	2	15	15	15	10	65	30
104-C37⊗	1	0	30	25	10	10	5	3	18.5	20	10.5/00	11	65	37
104-C37⊗	1	1	30	25	10	10	5	3	18.5	20	18.5/20	11	00	3/
104-C43®	1	0	30	30	15	10	7.5	3	22	25	22	13	85	43
104-C43⊗	1	1	30	30	15	10	7.5	3	22	25	22	13	65	43
104-C60⊗	1	0	50	40	20	15	10	5	32	37	32	10.5	100	60
104-C60®	1	1	50	40	20	15	10	5	32	3/	32	18.5	100	60
104-C72⊗	1	0		50	nc	00	45	-	40	ve.	40	00	100	70
104-C72®	1	1	60	50	25	20	15	5	40	45	40	22	100	72
104-C85⊗	1	0	60	60	30	25	15	7.46	45	55	45	0.5	400	85
104-C85⊗	1	1	60	60	30	25	15	7-1/2	45	55	45	25	100	85
104-C97⊗	1	0	75	75	00	00	ave.	10			ee.	00	100	07
104-C97⊗	1	1	75	75	30	30	15	10	55	55	55	30	130	97

^{*} The N.C. auxiliary contact is supplied as part of the mechanical/electrical interlock.

⊗ Coil Voltage Code and Terminal Position

The Cat. No. as listed is incomplete. Select a coil voltage code from the table below to complete the Cat. No. Example: 120V, 60Hz: Cat. No. 100-C09⊗10 becomes Cat. No.100-C09D10.

[V]								100-					200-		208-	220-		230-					380-		400-					
Hz	12	24	32	36	42	48	100	110	110	120	127	200	220	208	240	230	230	240	240	277	347	380	400	400	415	440	480	500	550	600
50 Hz	R	K	٧	W	Х	Υ	KP	-	D	Р	S	KG	L	-	-	F	-	VA	Т	-	-	-	N	-	G	В	s==	M	С	-
60 Hz	Q	J	_	٧	_	X	_	KP	_	D	_	_	KG	Н	L	-	_	_	Α	Т	1	E	_ :	_	_	N	В	_	_	С
50/60 Hz	_	KJ	_	_	_	KY	KP	_	KD	_	-	KG	KL‡	_	_	KL‡	KF	-	KA	_	_	_	-0	KN	_	KB	-	-	_	-

‡ Not available on 100/104-C90 or -C97 contactors.

DC V	oltages [V]	9	12	24	36	48	48-72	60	64	72	80	110	110- 125	115	125	220	220- 250	230	250
	Standard	ZR	ZQ	ZJ	ZW	ZY	-	ZZ	ZB	ZG	ZE	ZD	-	ZP	ZS	ZA	-	ZF	ZT
100-C09C43	with Integrated Diode	-	2-2	DJ	-		-	=	1-0	12-1	-		2-	-	-	1-	=	1-0	-
	Electronic with Integrated Diode	-	EQ	EJ	-		EY	-		-	-		ED	-		-	EA	-	-
100-C60C97	with Integrated Diode	DR	DQ	DJ	DW	DY	-	DZ	DB	DG	DE	DD	_	DP	DS	DA	-	DF	DT

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Job Number:

M1-F/R Page #

Manuf.: . PNo:

Allen-Bradley: 104-C09D22

EVC8265

E100 Electronic Motor Overload Relay





28-005-08



Bulletin 193-1EF - Single- & Three-phase Devices

- Trip Class 10, 15, 20, 30
- Manual or Automatic Reset

Mounting Options	Current Range [A]	For Use With	Cat. No.
	0.10.5		193-1EFAB
	0.21.0		193-1EFBB
	1.05.0	100-C09C23	193-1EFCB
IFC Combination	3.216		193-1EFDB
EC Contactors	5.427		193-1EFEB
	5.427	300 CZO CEE	193-1EFED
	1155	100-C30C55	193-1EFFD
	20100	100-C60C97	193-1EFGE

Electrical Specifications

Control Relay Ratings

Attribute	Rating
Relay N.O. / N.C.	
Type of Contacts	Ag/Ni
Rated Thermal Current (I _{the})	B600: 5.0 A; C600: 2.5 A; R300: 1.0 A
Contact Reliability	17 V, 5 mA
Rated Insulation Voltage (U;)	690V AC
Rated Operating Voltage (U _e) IEC	690V AC
Rated Operating Voltage (U _o) UL	600V AC
	B600: 3 A (@120V AC), 1.5 A (@240V AC)
Rated Operating Current (I ₀)	C600: 1.5 A (@120V AC), 0.75 A (@240V AC)
	R300: 0.22 A (@125V DC), 0.11 A (@250V DC)
Minimum Operating Current	10 mA @ 5V DC
Rating Designation	N.O. C600 / N.C. B600 (AC) N.O. / N.C. R300 (DC)
Utilization Category	AC-15/DC-13
B600 VA Rating	3600VA make / 360VA break
C600 VA Rating	1800VA make / 180VA break
R300 VA Rating	28VA make / 28VA break

Overload Protection

Attribute		Rating
Attribute	Cat. No. 193-1EE	Cat. No. 193-1EF, 592-1EF
Type of Relay	Ambient Compensated Ti	me-Delay Phase Loss Sensitive
Nature of Relay	Sol	lid-state
FLA Setting	Ro	tary Dial
Trip Rating	12	0% FLA
Trip Class	10, 20	10, 15, 20, 30
Reset Mode	Manual	Automatic or Manual
Overload Reset Level	after 2 minutes Manual Reset can occur a rese	TCU when accessory powered, s when self powered. inytime by pressing the manual et button. () can only occur below 70% TCU

Motor/Load Ratings

Attribute	Rating
Terminals	1/L1, 3/L2, 5/L3, 2/T1, 4/T2, 6/T3
Terminal Style Devices	
Rated Insulation Voltage U	690V AC
Rated Operating Voltage U _e , IEC	690V AC
Rated Operating Voltage U _e , UL	600V AC
Pass-thru Style Devices	JEA
Rated Insulation Voltage Ui	1000V AC
Rated Operating Voltage U _{e,} IEC	1000V AC
Rated Operating Voltage U _{e.} UL	600V AC
Rated Impulse Voltage (U _{imp})	6 kV AC
Rated Operating Current I _e	See page 4
Rated Frequency	4565 Hz

Environmental Specifications

Attribute	Overload Rating	Accessory Rating
Ambient Temperature		
Storage	-40+85 °C	(-40+185 °F)
Operating (open) (1)	-20+65 °C	(-4+149 °F)
Operating (enclosed)	-20+50 °C (-4+122 °F)	-20+55 °C (-4+131 °F)
Humidity		
Operating	595% Non-condensir	ng; 92% relative humidity
Damp Heat - Steady State (per IEC 60068-2-78)	93% relative humidity	, 40 °C (104 °F), 56 days
Damp Heat - Cyclic (per IEC 60068-2-30)		5 °C/40 °C (77 °F/104 °F), 21 cles
Cooling Method	Natural o	convection
Vibration (per IEC 68-2-6), operating	Opera	ting 3 G
Shock (per IEC 68-2-27), operating	Operat	ting 30 G
Maximum Altitude	20	00 m
Pollution Environment	Pollution	n Degree 3
Degree of Protection	IP20 (front of panel)	IP20

Standards Compliance

- · CSA22.2, No. 60947-4-1
- EN 60947-4-1
- UL 60947-4-1
- · GB/T 14048.4-2010
- SJ/T 11364, GB/T 26572, SJ/Z 11388

Certifications

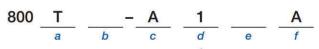
- cULus Listed File No. E14840
- CE Marked
- RCM (formerly C-tick)
- . AR
- RINA
- DNV/GL
- (((
- KC
 - EAC
- Environmental Protection Use Period 25 (China RoHS)
- · Morocco Regulatory Certification

630-499-7080 · www.elemechinc.com	Rev: 0 Date: 9/21/2020	Device Tag: OL1	
Manuf.: . PNo: Allen-Bradley: 193-1EFCB	By: SW	Job Number: EVC8265	Page # 1/1

30.5 mm Push Buttons



(I) Allen-Bradley



Protection Rating		
Code Description		
T	Metal, Type 4/13	
Н	Plastic, Type 4/4X/13	

Ь		
	Finger-Safe Guards	
Code	Description	
Blank	No guards	
С	Guards on terminals	

	Operator Type	
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
Α	Flush head	AR
В	Extended head	BR
D	Mushroom head	DR
DX	Mushroom head less color cap	DRX
-	Bootless guarded head	GR
_	Booted head	R*

	Color Cap	
Code	Description	
Blank	Used only when ordering Operator Type DX/DRX	
1	Green	
2	Black	
3	Orange*	
	Color Cap	
Code	Description	
4	Grey*	
5	White®	

Red Blue

Yellow

	е
S	pecial Mushroom Head
Code	Description
J§	Jumbo mushroom head — plastic
L§	Jumbo mushroom head — metal

Note: Special mushroom head options only apply to mushroom head operator type code D/DR (Table c).

Contact Block(s)		
Code Description		
Blank	No contacts	
	Standard	
D1	1 N.O.	
D2	1 N.C.	
D3	1 N.O.E.M.	
D4	1 N.C.L.B.	
D5	1 N.O. (Mini)	
D6	1 N.C. (Mini)	
A1	1 N.C.L.B 1 N.O.	
A2	2 N.O.‡	
A4	2 N C	
A7	1 N.C.L.B 1 N.C.	
Α	1 N.O 1 N.C.	
В	2 N.O 2 N.C.	



Certifications

UL Listed (File No. E14840, E10314 Guide No. NKCR, NOIV) CSA Certified (File No. LR1234, LR11924) CSA C22.2, No. 14

Specifications*

		Electrical Ratings	
Contact ratings		Refer to the contact ratings tables on page 10-4.	
Dielectric strength		2200V for one minute, 1300V for one minute (Logic Reed)	
Electrical design life cycles	s	1 000 000 at max. rated load, 200 000 at max. rated load (Logic Reed)	
		Mechanical Ratings	
Vibration		 102000 Hz, 1.52 mm displacement (peak-to-peak) max./ 10 G max. (except Logic Reed) 	
Shock		1/2 cycle sine wave for 11 ms ≥ 25 G (contact fragility) and no damage at 100 G	
Degree of protection	3	Type 1/4/12/13 (800T); Type 1/4/4X/12/13 (800H); EN/IEC 60529 IP66/65	
Mechanical design life cyc	eles	40	
	(Momentary, non-illuminated)	10 000 000 min.	
Push buttons	(Momentary, illuminated)	250 000 min.	
	(Push-pull/twist-to-release)	250 000 min.	
TOTAL STATES AND	(Non-illuminated)	1 000 000 min.	
Selector switches	(Illuminated, key-operated)	200 000 min.	
Potentiometers	***************************************	25 000 min.	
All other devices		200 000 min.	
Contact operation		Shallow, mini, and low-voltage contact blocks: Slow, double make and break Logic Reed and sealed switch contact blocks: Single break magnetic	
Wire gauge/Terminal screv	v torque	#1814 AWG (#1810 Max Duty) / 68 lb•in	
Operators without conta	MANUSCHIA PROGRAMMA CONTRACTOR CONTRACTOR CONTRACTOR CONTRACTOR CONTRACTOR CONTRACTOR CONTRACTOR CONTRACTOR CO	Flush, extended button, standard mushroom, jumbo plastic mushroom: 2 lbs max. Jumbo and extended aluminum mushroom head: 3,95 lbs max. Maintained selector switch: 3.6 in•lb max.	
Spring return selector s		3.6 in•lb to stop, 0.2 in•lb to return	
	s and push-to-test pilot lights	5 lb max.	
2-position push-pull		8.0 lb max. push or pull	
3-position push-pull		8 lb max. push to in position or pull to center position (15 lb max. pull to out position)	
Twist-to-release or push	i-pull	9 lbs max. push or pull 30 in•oz max. twist, 6 in•oz minimum return	
Potentiometer	Ta	Rotational torque 312 in•oz; stopping torque 12 in•lb (minimum)	
	Standard	1 lb	
	Logic Reed	1 lb max.	
Market Control of the	Sealed switch	3 lb max. at 0.205 in. plunger travel	
Contact blocks	Stackable sealed switch	1 lb max.	
	MaxDuty	1.4 lb max.	
	PenTUFF	1.4 lb max.	
Self Monitoring		1.6 lb	
		Environment	
Temperature range	Operating	-40+131 °F (-40+55 °C)	
	Storage	-40+185 °F (-40+85 °C)	
the absence of mois Rockwell Automatic	uree below freezing are based on sture and liquids. Consult your local on sales office or Allen-Bradley n lower temperature applications.		
Humidity		 5095% RH from 77140 °F (2560 °C) per Procedure IV of MIL-STD-810C, Method 507.1 cycling test 	

FIFMECH	Rev:	Device Tag:	
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Manuf.:.PNo: Allen-Bradley: 800H-AR2D2	By: SW	Job Number: EVC8265	Page # 1/1

Schneider Electric

RM22TR33

Modular 3-phase control relay, 8 A, 2 CO, 380...480 V AC

Main

Range of product	Zelio Control	
Product or component type	Modular measurement and control relays	
Relay type	Control relay	
Phase	3 phase	
Relay name	RM22TR	
Relay monitored parameters Overvoltage and undervoltage detection Phase sequence Phase failure detection		
Time delay type	Adjustable 0.130 s, +/- 10 % of the full scale value on crossing the threshold Tt	
Switching capacity in VA 2000 VA		
Measurement range	380480 V voltage AC	

Complementary

Complementary		
Reset time	1500 ms at maximum voltage	
Maximum switching voltage	250 V AC	
Minimum switching current	10 mA 5 V DC	
Maximum switching current	8 A AC	
[Us] rated supply voltage	380480 V AC	
Supply voltage limits	304576 V AC	
Operating limits	- 20 % + 20 % Un	
Power consumption in VA	15 VA 480 V AC 60 Hz	
Voltage detection threshold	< 100 V AC	
Supply voltage frequency	5060 Hz +/- 10 %	
Output contacts	2 C/O	
Nominal output current	8 A	
Setting accuracy of the switching threshold	+/- 10 % of the full scale	
Setting accuracy of time delay	10 P	
Time delay drift	<= 0.05 % per degree centigrade depending permissible ambient air temperatur <= 1 % within the supply voltage range	
Hysteresis	2 % fixed selectable	
Run-up delay at power-up	650 ms	
Maximum measuring cycle	150 ms measurement cycle as true rms value	
Threshold adjustment voltage	220 % of Un selected	
Voltage range	380480 V phase to phase	
Repeat accuracy	+/- 0.5 % input and measurement circuit +/- 3 % time delay	
Measurement error	< 1 % over the whole range with voltage variation < 0.05 %/°C with temperature variation	
Response time	<= 300 ms	
Overvoltage category	III IEC 60664-1 III UL 508	
Insulation resistance	> 100 MOhm 500 V DC IEC 60255-27	
Mounting position	Any position	
Connections - terminals	Screw terminals, 2 x 0.52 x 2.5 mm² AWG 20AWG 14) solid without cable end Screw terminals, 2 x 0.22 x 1.5 mm² AWG 24AWG 16) flexible with cable end Screw terminals, 1 x 0.51 x 3.3 mm² AWG 20AWG 12) solid without cable end Screw terminals, 1 x 0.21 x 2.5 mm² AWG 24AWG 14) flexible with cable end	
Tightening torque	5.318.85 lbf.in (0.61 N.m) IEC 60947-1	



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C20 400	7090	INC.

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Housing material	Self-extinguishing plastic
Status LED	Relay ON LED Yellow) Power ON LED Green)
Mounting support	35 mm DIN rail EN/IEC 60715
Electrical durability	100000 cycles
Mechanical durability	10000000 cycles
Utilisation category	AC-15 IEC 60947-5-1 DC-13 IEC 60947-5-1 AC-1 IEC 60947-4-1 DC-1 IEC 60947-4-1
Safety reliability data	MTTFd = 388.1 years B10d = 350000
Contacts material	Cadmium free
Maximum Width	0.89 in (22.5 mm)
Net Weight	0.20 lb(US) (0.09 kg)
Environment	
mmunity to microbreaks	10 ms
Electromagnetic compatibility	Immunity for residential, commercial and light-industrial environments EN/IEC 61000-6-1 Immunity for industrial environments EN/IEC 61000-6-2 Emission standard for residential, commercial and light-industrial environments EN/IEC 61000-6-3 Emission standard for industrial environments EN/IEC 61000-6-4 Electrostatic discharge 6 kV contact discharge)level 3 IEC 61000-4-2 Electrostatic discharge 8 kV air discharge)level 3 IEC 61000-4-2 Radiated radio-frequency electromagnetic field immunity test 10 V/mlevel 3 IEC 61000-4-3 Electrical fast transient/burst immunity test 4 kV direct)level 4 IEC 61000-4-4 Electrical fast transient/burst immunity test 2 kV capacitive coupling)level 4 IEC 61000-4-5 Surge immunity test 2 kV differential mode)level 4 IEC 61000-4-5 Conducted and radiated emissionsclass B group 1 CISPR 11 Conducted and radiated emissionsclass B CISPR 22
Standards	EN/IEC 60255-1
Product certifications	CSA CCC EAC China RoHS RCM CE GL UL
Ambient air temperature for storage	-40158 °F (-4070 °C)
Ambient air temperature for operation	-4122 °F (-2050 °C) 60 Hz -4140 °F (-2060 °C) 50 Hz AC/DC
Relative humidity	9397 % 77131 °F (2555 °C) IEC 60068-2-30
Vibration resistance	0.075 mm 1058.1 Hz) not in operation IEC 60068-2-6 1 gn 1058.1 Hz) not in operation IEC 60068-2-6 0.035 mm 58.1150 Hz) in operation IEC 60068-2-6 0.5 gn 58.1150 Hz) in operation IEC 60068-2-6
Shock resistance	15 gn 11 ms) not in operation IEC 60068-2-27 5 gn 11 ms) in operation IEC 60068-2-27
IP degree of protection	IP20 IEC 60529 terminals) IP40 IEC 60529 housing) IP50 IEC 60529 front panel)
Pollution degree	3 IEC 60664-1 3 UL 508

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Telemecanique

Zelio[®] Logic 2

Programmable Smart Relays

Compact smart relays with display

Number Discrete Including Relay Transistor Clock Reference inputs 0-10 V analog outputs outputs

I/O inputs

Supply \sim 100 to 240 V

SR2 B201FU 12 0 8 0 Yes



Product certifications			UL, CSA, GL (pending), C-Tick
Conformity with the	Conforming to 73/23/EEC		EN (IEC) 61131-2 (open equipment)
ow voltage directive	Comorning to 73/23/EEC		EN (IEC) 01131-2 (open equipment)
Conformity with the EMC directive	Conforming to 89/336/EEC		EN (IEC) 61131-2 (Zone B) EN (IEC) 61000-6-2, EN (IEC) 61000-6-3 (1) and EN (IEC) 61000-6-4
Degree of protection	Conforming to IEC/EN 60529		IP 20
Overvoltage category	Conforming to IEC/EN 60664-1		3
Degree of pollution	Conforming to IEC/EN 61131-2		2
Ambient air temperature around the device	Operation	°C (°F)	- 20 to + 55 (- 4 to + 131) + 40 (+ 104) in an enclosure, conforming to IEC 60068-2-and IEC 60068-2-2
	Storage	°C (°F)	- 40 to + 70 (- 40 to + 158)
Maximum relative humidity			95% without condensation or dripping water
Maximum operating altitude Operation		m (ft.)	2000 (6562)
	Transport	m (ft.)	3048 (10 000)
Mechanical resistance	Immunity to vibration		IEC/EN 60068-2-6, test Fc
	Immunity to mechanical shock		IEC/EN 60068-2-27, test Ea
Resistance to electrostatic discharge	Immunity to electrostatic discharge		IEC/EN 61000-4-2, level 3
Resistance to HF interference immunity)	Immunity to electromagnetic radiated fields		IEC/EN 61000-4-3, level 3
	Immunity to fast transients in bursts		IEC/EN 61000-4-4, level 3
	Immunity to shock waves		IEC/EN 61000-4-5
	Radio frequency in common mode		IEC/EN 61000-4-6, level 3
	Voltage dips and breaks (∼)		IEC/EN 61000-4-11
	Immunity to damped oscillation waves		IEC/EN 61000-4-12
Conducted and radiated emissions	Conforming to EN 55022/11 (Group 1)		Class B (1)
Screw terminals connection capacity	Flexible cable with cable end	mm ²	1 conductor: 0.25 to 2.5, cable: AWG 24 to AWG 14 2 conductors: 0.25 to 0.75, cable: AWG 24 to AWG 18
Tightening using	Semi-solid cable	mm²	1 conductor: 0.2 to 2.5 cable: AWG 25 to AWG 14
Ø 3.5 screwdriver)	Solid cable	mm²	1 conductor: 0.2 to 2.5, cable: AWG 25 to AWG 14 2 conductors: 0.2 to 1.5, cable: AWG 24 to AWG 16
	Tightening torque	N.m (lbf-in)	0.5 (4.4)
Processing character	ristics		
Number of control scheme lines	With LADDER programming		120
Number of function blocks	With FBD programming		Up to 200
Cycle time		ms	10 to 50
Response time		ms	20 minimum
Back-up time	Day/time		10 years (lithium battery) at 25 °C (77 °F)
(in the event of power failure)	Program and settings		10 years (EEPROM memory cartridge)
Program memory checking			On each power-up
Clock drift			12 min/year 0 to 55 °C (32 to 131 °F) 6 sec/month at 25 °C (77 °F) and calibration
Timer block accuracy			1% ± 2 cycle time



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By:

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Telemecanique: SR2B201FU

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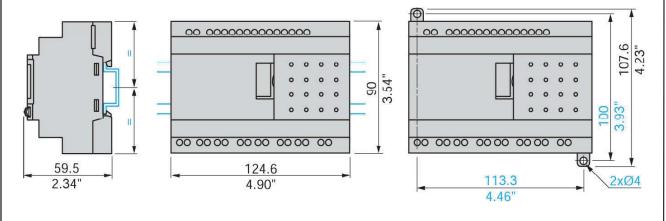
PR1

	cteristics				Telemecaniq
Smart relay type				SR2 eee/ SR3 B101ee/ SR3 XT61ee/ SR3 XT101ee	
Operating limit values			V	5 to 150	
in Institute and a second second second				\sim 24 to 250	
Contact type				N/O	
Thermal current			A	8	
Electrical durability	Utilization	DC-12	٧	24	
or 500 000 operating cycles	category		Α	1.5	
		DC-13	٧	24 (L/R = 10 ms)	
			Α	0.6	
		AC-12	V	230	
			Α	1.5	
		AC-15	V	230	
			Α	0.9	
Minimum switching capacity	At minimum v	oltage of 12 V	mA	10	
Low power switching				12 V - 10 mA	
eliability of contact	24-7-7-8				
Maximum operating rate	No-load		Hz	10	
Web 2010 to 1990 Web 2010	At le (operation		Hz	0.1	
Mechanical life		operating cycles		10	
Rated impulse		DIEC/EN 60947-1	kV	4	
withstand voltage (Uimp)	and IEC/EN 6	60664-1	1000		
Response time	Trip		ms	10	
	Reset		ms	5	
Built-in protection	Against short	The state of the s		None	
Against overvoltage				1000	
		roltage		None	
Transistor output of	and overload	<u> </u>		None	
Transistor output ch	and overload	<u> </u>			
Smart relay type	and overload	<u> </u>	, v	SRe Beezbu	
Smart relay type Operating limit values	and overload naracterist	tics	V	SRe Bee2BD 19.2 to 30	
Smart relay type	and overload naracteris	tics	V	SRe Bee2BD 19.2 to 30 24	
Smart relay type Operating limit values	naracteris Nominal volta Nominal curre	tics age ent	V A	SRe Bee2BD 19.2 to 30 24 0.5	
Smart relay type Operating limit values Load	Nominal volta Nominal curre Maximum cur	tics age ent	V A A	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V	
Smart relay type Operating limit values Load Drop-out voltage	Nominal volta Nominal curre Maximum cur At state 1	tics age ent	V A A V	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≈ 2 for I = 0.5 A	
Smart relay type Operating limit values Load	Nominal volta Nominal curre Maximum cur At state 1 Trip	tics age ent	V A A V ms	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≤ 2 for I = 0.5 A ≤ 1	
Smart relay type Operating limit values Load Drop-out voltage Response time	Nominal volta Nominal curre Maximum cur At state 1 Trip Reset	rics age ent rrent	V A A V ms	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≤ 2 for I = 0.5 A ≤ 1 ≤ 1	
Smart relay type Diperating limit values Load Drop-out voltage Response time	Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overload	ics ige ent rent ad and short-circuits	V A A V ms	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≤ 2 for I = 0.5 A ≤ 1 ≤ 1 Yes	
Smart relay type Diperating limit values Load Drop-out voltage Response time	Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo	ige ent rrent ad and short-circuits roltage (1)	V A A V ms ms	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≤ 2 for I = 0.5 A ≤ 1 ≤ 1 Yes Yes	
Smart relay type Diperating limit values Load Drop-out voltage Response time	Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo	ics ige ent rent ad and short-circuits	V A A V ms ms	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≤ 2 for I = 0.5 A ≤ 1 ≤ 1 Yes Yes Yes	
Smart relay type Operating limit values Load Orop-out voltage Response time Built-in protection	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against invers	ige ent rent ad and short-circuits roltage (1) ions of power supply	V A A V ms ms	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≤ 2 for I = 0.5 A ≤ 1 ≤ 1 Yes Yes	ay oı
Smart relay type Diperating limit values Load Drop-out voltage Response time Built-in protection Analog output chara	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against invers	ige ent rent ad and short-circuits roltage (1) ions of power supply	V A A V ms ms	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≤ 2 for I = 0.5 A ≤ 1 ≤ 1 Yes Yes Yes	ay o
Smart relay type Diperating limit values Load Drop-out voltage Response time Built-in protection Analog output chara	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against invers Output range	ige ent rent ad and short-circuits roltage (1) ions of power supply	V A A V ms ms	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≤ 2 for I = 0.5 A ≤ 1 ≤ 1 Yes Yes Yes	ау о
Smart relay type Diperating limit values Load Drop-out voltage Response time Built-in protection Analog output chara	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against invers	ige ent rent ad and short-circuits roltage (1) ions of power supply	V A A V ms ms	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≈ 2 for I = 0.5 A ≼ 1 ≼ 1 Yes Yes Yes Yes Yes Yes Yes	ау о
Smart relay type Diperating limit values Load Drop-out voltage Response time Built-in protection Analog output chara	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against invers Output range	ad and short-circuits voltage (1) ions of power supply (QB, QC)	V A A V ms ms	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≤ 2 for I = 0.5 A ≤ 1 < 1 Yes Yes Yes Yes Yes Yes The is no volt-free contact between the smart relationship in	ay oı
Smart relay type Deprating limit values Load Drop-out voltage Response time Built-in protection Analog output chara	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against invers Output range Type of load	ad and short-circuits voltage (1) ions of power supply (QB, QC)	V A A V ms ms (1) If their	SR● B●●2BD 19.2 to 30 24 0.5 0.625 at 30 V < 2 for I = 0.5 A < 1 Yes Yes Yes Yes Yes Yes Yes Ye	ay oi
Smart relay type Deprating limit values Load Drop-out voltage Response time Built-in protection Analog output chara Analog outputs	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against invers acteristics Output range Type of load Maximum load	ad and short-circuits voltage (1) ions of power supply (QB, QC)	V A A V ms ms (1) If their	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≤ 2 for I = 0.5 A ≤ 1 ≤ 1 Yes Yes Yes Yes Yes Yes The is no volt-free contact between the smart relationship in	ay oi
Smart relay type Deprating limit values Load Drop-out voltage Response time Built-in protection Analog output chara Analog outputs	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against overlo Against invers Output range Type of load Maximum load Value of LSB	ad and short-circuits voltage (1) ions of power supply (QB, QC)	V A A V ms ms (1) If their	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≤ 2 for I = 0.5 A ≤ 1 ≤ 1 Yes Yes Yes Yes Yes Yes The is no volt-free contact between the smart relationship in	ay oi
Smart relay type Deprating limit values Load Drop-out voltage Response time Built-in protection Analog output chara Analog outputs	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against overlo Against invers Output range Type of load Maximum load Value of LSB Resolution	ad and short-circuits voltage (1) ions of power supply (QB, QC)	V A A V ms ms (1) If then	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V ≪ 2 for I = 0.5 A ≪ 1 ≪ 1 Yes Yes Yes Yes Yes The is no volt-free contact between the smart relative to the second of the s	ay oi
Smart relay type Deprating limit values Load Drop-out voltage Response time Built-in protection Analog output chara Analog outputs	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against invers Output range Type of load Maximum load Value of LSB Resolution Conversion tir	ad and short-circuits roltage (1) ions of power supply (QB, QC)	V A A V ms ms V (1) If then	SRe Bee2BD 19.2 to 30 24 0.5 0.625 at 30 V	ay oi
Smart relay type Operating limit values Load Drop-out voltage	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against overlo Against invers acteristics Output range Type of load Maximum load Value of LSB Resolution Conversion tir Precision	ad and short-circuits roltage (1) ions of power supply (QB, QC) at 25 °C (77 °F) at 55 °C (131 °F	V A A V ms ms V (1) If then	SR● B●●2BD 19.2 to 30 24 0.5 0.625 at 30 V	ay oi
Smart relay type Operating limit values Load Drop-out voltage Response time Built-in protection Analog output chara Analog outputs	Nominal volta Nominal volta Nominal curre Maximum cur At state 1 Trip Reset Against overlo Against overlo Against invers acteristics Output range Type of load Maximum load Value of LSB Resolution Conversion tir Precision	ad and short-circuits roltage (1) ions of power supply (QB, QC) d at 25 °C (77 °F) at 55 °C (131 °F acy at 55 °C	V A A V ms ms V (1) If then	SR● B●●2BD 19.2 to 30 24 0.5 0.625 at 30 V < 2 for I = 0.5 A < 1 < 1 Yes Yes Yes Yes Yes 10 10 10 10 bits Smart relay cycle time ± 1% of the full scale value ± 1% of the full scale value	ay oi

FLEMECH	Rev: 0	Device Tag:	
630-499-7080 · www.elemechinc.com	Date: 9/21/2020	PR1	
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Smart relay type				SRe eeeeFU
			122	
Nominal value of inputs	Voltage		V	100 to 240
	Current		mA	0.6
	Frequency		Hz	47 to 63
Input switching limit values	At state 1	Voltage	V	≥ 79
		Current	mA	> 0.17
	At state 0	Voltage	V	≤ 40
		Current	mA	< 0.5
Input impedance at state 1			kΩ	350
Configurable response time	State 0 to 1	(50/60 Hz)	ms	50
	State 1 to 0	(50/60 Hz)	ms	50
Isolation	Between su	pply and inputs		None
	Between inp	outs		None
Protection	Reverse pol	arity protection		Control instructions not executed

Smart relay type			SR2 ●201FU
Primary	Nominal voltage	V	100 to 240
Voltage limits	<u> </u>	V	85 to 264
Nominal input current	Without extensions	mA	100/50
	With extensions	mA	_
Power dissipated	Without extensions	VA	11
	With extensions	VA	_
Micro-breaks	Permissible duration	ms	10
rms insulation voltage		V	1780





30.5 mm Push Buttons

Selector Switches

Specifications*

800



Allen-Bradley

	a		b	C	d	е	1	
	a					e (cont'd)	83	f (cont'd)
	Protection Ratin	a		d		Cam Option‡		Contact Blocks+
Code	Description	-	Kno	b/Lever Type Operators	Code	Description	Code	Description
T	Metal, Type	4000		Standard Knob	KC1	KC1 cam	Blank	No contacts
Н	Plastic, Type 4	Carlotte Commence	Code	Operator Function	KC7	KC7 cam		Class 1, Div. 2/Zone 2
11	riasiic, type 4	4N 10	2	Maintained	KD7	KD7 cam		Logic Reed
	b		4	Spring return from left	KE76	KE7 cam	AB	1 N.O 1 N.C.
	Finger-Safe Guard	ds	5	Spring return from right	KQ1	KQ1 cam	2007	1-800T-XAR on white side
Code	Description		91	Spring return from both	KQ7	KQ7 cam	986	2 N.O 2 N.C. 2-800T-XARs —
Blank	No quard			Knob Lever®	KR16	KR1 cam	BR	1 on white side/1 on black
C	Guards on terr		Code	Operator Function	KR7§	KR7 cam		side
-	Guardo on ten	Till tobo	17	Maintained	KT1§	KT1 cam		Sealed Switch
	C		18	Spring return from left	KT7§	KT7 cam	AP	1 N.O 1 N.C.
	Knob Insert Colo	rs	19	Spring return from right	KU7§	KU7 cam	- PAE	1-800T-XAP on white side
800T	800T 800H		20 Spring return from both			f		2 N.O 2 N.C. 2-800T-XAPs —
Type	Description			Metal Wing Lever®	Contact Blocks		BP	1 on white side/1 on black
4/13	Description	4/4X/13	Code	Operator Function	Code	Description		side
Code		Code	11	Maintained	Blank	No contacts on operator	S	tackable Sealed Switch
J	White	JR	15	Spring return from left	-	Standard	AY	1 N.O 1 N.C.
JX	Packet of	JRX	16	Spring return from right	1000	1 N.O 1 N.C.	ALT	1-800T-XAY on white side
U.A.	colored inserts*	UTIA	141	Spring return from both	A	1-800T-XA on white side		2 N.O 2 N.C.
Me	tal Wing Lever Co	lors®		Coin Slot®		2 N.O 2 N.C.	BY	2-800T-XAYs — 1 on white side/1 on black
Code	Color	Code	Code	Operator Function	В	2-800T-XAs — 1 on white side/1 on black		side
JA	Red		10	Spring return from both	1	side	• One	insert of each color (blue,
JG	Grey				P	PenTUFF (Low Voltage)	green	n, orange, red, and yellow).
		•		Cam Option±	AV	1 N.O 1 N.C.		available on Bul. 800T, Type operators.
			Code	Description		1-800T-XAV on white side		overlapping cam is required
			Blank	KB7 cam (std.)	-	2 N.O 2 N.C. 2-900T-XAVs	cons	ult your local distributor.
			L/A4	KD7 Cairi (std.)	BV	t on white eide/1 on black	§ Not a	available with wing levers.

	W.	Electrical Ratings				
Contact ratings	Ü	Refer to the contact ratings tables on page 10-4.				
Dielectric strength		2200V for one minute, 1300V for one minute (Logic Reed)				
Electrical design life cycle	s	1 000 000 at max. rated load, 200 000 at max. rated load (Logic Reed)				
		Mechanical Ratings				
Vibration		 102000 Hz, 1.52 mm displacement (peak-to-peak) max./ 10 G max. (except Logic Reed) 				
Shock	3	1/2 cycle sine wave for 11 ms ≥ 25 G (contact fragility) and no damage at 100 G				
Degree of protection	3	Type 1/4/12/13 (800T); Type 1/4/4X/12/13 (800H); EN/IEC 60529 IP66/65				
Mechanical design life cyc	cles					
	(Momentary, non-illuminated)	10 000 000 min.				
Push buttons	(Momentary, illuminated)	250 000 min.				
	(Push-pull/twist-to-release)	250 000 min.				
ALL PROPERTY AND A STATE OF	(Non-illuminated)	1 000 000 min.				
Selector switches	(Illuminated, key-operated)	200 000 min.				
Potentiometers		25 000 min.				
All other devices		200 000 min.				
Contact operation		Shallow, mini, and low-voltage contact blocks: Slow, double make and break Logic Reed and sealed switch contact blocks: Single break magnetic				
Wire gauge/Terminal screw torque		#1814 AWG (#1810 Max Duty) / 68 lb•in				
Typical operating forces Operators without contact blocks		Flush, extended button, standard mushroom, jumbo plastic mushroom: 2 lbs max. Jumbo and extended aluminum mushroom head: 3.95 lbs max. Maintained selector switch: 3.6 in•lb max.				
Spring return selector switches		3.6 in•lb to stop, 0.2 in•lb to return				
Illuminated push button	s and push-to-test pilot lights	5 lb max.				
2-position push-pull		8.0 lb max. push or pull				
3-position push-pull	- 1	8 lb max, push to in position or pull to center position (15 lb max, pull to out position)				
Twist to release or push	1-pull	9 lbs max. push or pull 30 in+oz max. twist, 6 in+oz minimum return				
Potentiometer		Rotational torque 3…12 in oz; stopping torque 12 in lb (minimum)				
	Standard	1 16				
	Logic Reed	1 lb max.				
	Sealed switch	3 lb max, at 0.205 in, plunger travel				
Contact blocks	Stackable sealed switch	1 lb max.				
	MaxDuty	1.4 lb max.				
	PenTUFF	1.4 lb max.				
	Self Monitoring	1.6 lb				
		Environment				
POWERS AND STREET, CITY FOR SAID	Operating	-40+131 °F (-40+55 °C)				
Temperature range	Storage	-40+185 °F (-40+85 °C)				
the absence of moi Rockwell Automatic	ures below freezing are based on sture and liquids. Consult your local on sales office or Allen-Bradley in lower temperature applications.					
Humidity	And the second s	5095% RH from 77140 °F (2560 °C) per Procedure IV of MIL-STD-810C, Method 507.1 cycling test				

Certifications

UL Listed (File No. E14840, E10314 Guide No. NKCR, NOIV) **CSA** Certified (File No. LR1234, LR11924) CSA C22.2, No. 14



630-499-7080 · www.elemechinc.com

Manuf.: . PNo: Allen-Bradley: 800H-JR2A Rev: 0 Date:

By:

Device Tag:

9/21/2020

SW

Job Number:

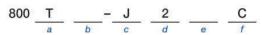
Page #

EVC8265

SS1,3,5,6

800T/H 30.5 mm

3-Position Selector Switch Devices, Non-Illuminated







a

Protection Rating					
Code	Description				
T	Metal, Type 4/13				
Н	Plastic, Type 4/4X/13				

b

F	Finger-Safe Guards
Code	Description
Blank	No guards
С	Guards on terminals

3	Knob Insert Color	rs
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
J	White	JR
JX	Packet of colored inserts★	JRX
Me	tal Wing Lever Co	lors‡
Code	Color	Code
JA	Red	-
JG	Grey	

Kno	ob/Lever Type Operators
	Standard Knob
Code	Operator Function
2	Maintained
4	Spring return from left
5	Spring return from right
91	Spring return from both
	Knob Lever‡
Code	Operator Function
17	Maintained
18	Spring return from left
19	Spring return from right
20	Spring return from both
	Metal Wing Lever‡
Code	Operator Function
11	Maintained
15	Spring return from left
16	Spring return from right
141	Spring return from both
	Coin Slot‡

Operator Function
Spring return from both

Code	Description
Blank	KB7 cam (std.)
KA1	KA1 cam
KA7	KA7 cam

MAI	NA7 Cam	
(Cam Option§∆	
Code	Description	
KC1	KC1 cam	
KC7	KC7 cam	
KD7	KD7 cam	
KE7#	KE7 cam	
KQ1	KQ1 cam	
KQ7	KQ7 cam	
KR1 .	KR1 cam	
KR7.	KR7 cam	
KT1=	KT1 cam	
KT7+	KT7 cam	
KU7.	KU7 cam	
KR1. KR7. KT1. KT7.	KR1 cam KR7 cam KT1 cam KT7 cam	_

	E
	Contact Blocks
Code	Description
Blank	No contacts on operator
	Standard
Α	1 N.O 1 N.C. 1-800T-XA on white side
В	2 N.O 2 N.C. 2-800T-XAs — 1 on white side/1 on black side
P	enTUFF (Low Voltage)
AV	1 N.O 1 N.C. 1-800T-XAV on white side
BV	2 N.O 2 N.C. 2-800T-XAVs — 1 on white side/1 on black side
Code	Description
Blank	No contacts
	Class 1, Div. 2
	Logic Reed
AR	1 N.O 1 N.C. 1-800T-XAR on white side
BR	2 N.O 2 N.C. 2-800T-XARs — 1 on white side/1 on black side
_	Sealed Switch
AP	1 N.O 1 N.C. 1-800T-XAP on white side
BP	2 N.O 2 N.C. 2-800T-XAPs — 1 on white side/1 on black side
S	tackable Sealed Switch
AY	1 N.O 1 N.C. 1- 800T-XAY on white side
BY	2 N.O 2 N.C. 2-800T-XAYs — 1 on white side/1 on black side



- CE Marked
- CSA Certified File Nos. LR1234, LR11924
- CSA C22.2 No. 14
- EN/IEC 60947-5-1
- EN/IEC 60947-5-5
- EN ISO 13850
- UL Listed File Nos. E14840, E10314; Guide Nos. NKCR, NOIV, NISD

Table 1. Cam and Contact Block Functionality Table

Contact	Contact	ts																			· (Ca	ım (Cod	les																			
Block Suffix Code	Block Side	Circuits		KB Std		2002	KA	1		KA	7	1	KC.		ŀ	(C)	7	1	(D7	7	,	KE	7	M	KQ:	1	1	(Q7	7	į.	(R1		1	(R7			KT [.]	1	3	KT:	7	1	KU	7
. A.	1870-9	Α	X	0	0	Х	0	0	0	0	Х	0	0	Х	Х	0	0	0	0	X	Х	0	0	Х	0	Х	Х	0	Х	Х	0	Х	Х	0	Х	0	0	Х	Х	0	0	Х	0	0
444	White	В	0	0	X	0	X	0	0	X	0	0	X	0	0	X	0	0	X	0	0	X	X	0	X	0	0	Х	0	0	Χ	0	0	Χ	0	X	0	0	0	0	X	0	X	0
B. B.	TWO CO.	Α	X	0	0	X	0	0	0	0	Х	0	0	Χ	X	0	0	X	0	0	0	0	X	0	0	Х	Χ	0	0	0	0	Χ	Χ	0	0	0	0	Х	X	0	0	0	0	X
] H_ '	Black	В	0	0	X	0	X	0	0	X	0	Χ	0	0	0	0	Χ	0	Χ	0	Х	Х	0	0	Х	0	0	Х	0	X	Χ	0	0	X	X	X	X	0	0	X	X	Х	X	0
	(AAROSOS S	Α	X	0	0	Χ	0	0	0	0	X	0	0	Х	X	0	0	0	0	Χ	Х	0	0	X	0	Х	X	0	Х	X	0	Χ	Χ	0	Χ	0	0	X	X	0	0	Х	0	0
	White	В	0	0	X	0	X	0	0	X	0	0	X	0	0	X	0	0	Х	0	0	X	X	0	X	0	0	Х	0	0	X	0	0	X	0	X	0	0	0	0	X	0	X	0
ļ —	Di I	A	Х	0	0	X	0	0	0	0	X	0	0	X	X	0	0	X	0	0	0	0	X	0	0	Х	X	0	0	0	0	Х	X	0	0	0	0	X	X	0	0	0	0	X
	Black	В	0	0	X	0	X	0	0	X	0	Х	0	0	0	0	Х	0	X	0	X	Χ	0	0	X	0	0	Х	0	Х	Х	0	0	Χ	Х	X	X	0	0	X	X	X	X	0

Note: X = Closed/O = Open



Cutler-Hammer Control Power Transformers









Technical Data

Epoxy encapsulated windings Type

50/60 Hz Frequency

Insulation Class 105, 55°C temperature rise

Terminals Pressure plate Standards ANSI/NEMA ST-1

UL 506

Approvals UL, file E46323

CSA, file LR27533

Primary: 240 x 480, 230 x 460, 220 x 440 with Jumpers Secondary: 120/115/110 with Fuse Clips for 13/32 x 1-1/2 Fuses

VA	Dimensio	ns (Inches)		Weight	Dimensio	ns (mm)		Weight	Wiring	Style	
	Height	Width	Depth	Lbs.	Height	Width	Depth	kg	Diagram ①	Number	
25	2-9/16	3	2-1/2	1.7	65	76	64	.8	1	C0025E2A	
50	2-9/16	3	3	2.6	65	76	76	1.2	1	C0050E2A	
75	2-9/16	3	3-1/2	3.5	65	76	89	1.6	1	C0075E2A	
100	2-7/8	3-3/8	3-3/8	4.2	73	86	86	1.9	1	C0100E2A	
150	3-3/16	3-3/4	4	6.7	81	95	102	3.0	1	C0150E2A	
200	3-13/16	4-1/2	4	8.5	97	114	102	3.9	1	C0200E2A	
250	3-13/16	4-1/2	4-3/8	10.0	97	114	111	4.5	1	C0250E2A	
300	3-13/16	4-1/2	4-3/4	11.3	97	114	121	5.1	1	C0300E2A	
350	3-13/16	4-1/2	5-1/4	13.6	97	114	133	6.2	1	C0350E2A	
500	4-3/4	5-1/4	5-1/2	19.2	121	133	140	8.7	1	C0500E2A	
750	4-3/4	5-1/4	7	28.1	121	133	178	12.8	1	C0750E2A	
1000	5-11/16	6-3/4	6-7/16	29.5	144	171	164	13.4	1	C1000E2A	
1500	6-3/8	7-1/2	7-3/8	40.0	162	191	187	18.1	1	C1500E2A	

Primary: 240 x 480 with Jumpers

Secondary: 24 with Fuse Clips for 13/32 x 1-1/2 Fuses (through 500 VA)

VA Dimen		ns (Inches)		Weight	Dimensio	ns (mm)		Weight	Wiring	Style
	Height	Width	Depth	Lbs.	Height	Width	Depth	kg	Diagram ①	Number
50	2-9/16	3	3	2.7	65	76	76	1.2	2	C0050E2B
75	2-9/16	3	3-1/2	3.5	65	76	89	1.6	2	C0075E2B
100	2-7/8	3-3/8	3-3/8	4.2	73	86	86	1.9	2	C0100E2B
150	3-3/16	3-3/4	4	6.7	81	95	102	3.0	2	C0150E2B
200	3-13/16	4-1/2	4	8.5	97	114	102	3.9	2	C0200E2B
250	3-13/16	4-1/2	4-3/8	10.1	97	114	111	4.6	2	C0250E2B
300	3-13/16	4-1/2	4-3/4	11.4	97	114	121	5.2	2	C0300E2B
350	3-13/16	4-1/2	5-1/4	13.4	97	114	133	6.1	2	C0350E2B
500	4-3/4	5-1/4	5-5/8	17.5	121	133	143	7.9	2	C0500E2B
750	4-3/4	5-1/4	7	28.1	121	133	178	12.8	2	C0750E2B

Primary: 240 x 480 with Jumpers

Secondary: 120 x 240 with Jumpers, Secondary Fuse Clips not Applicable

VA	Dimensio	ns (Inches)		Weight	Dimensio	ns (mm)		Weight	Wiring	Style	
	Height	Width	Depth	Lbs.	Height	Width	Depth	kg	Diagram ①	Number	
50	2-9/16	3	3	2.6	65	76	76	1.2	11	C0050E2CXX	
75	2-9/16	3	3-1/2	3.5	65	76	89	1.6	11	C0075E2CXX	
100	2-7/8	3-3/8	3-3/8	4.2	73	86	86	1.9	11	C0100E2CXX	
150	3-3/16	3-3/4	4	6.7	81	95	102	3.1	11	C0150E2CXX	
200	3-13/16	4-1/2	4	8.5	97	114	102	3.9	11	C0200E2CXX	
250	3-13/16	4-1/2	4-3/8	10.0	97	114	111	4.6	11	C0250E2CXX	
300	3-13/16	4-1/2	4-7/8	11.8	97	114	124	5.4	11	C0300E2CXX	
350	3-13/16	4-1/2	5-1/4	13.6	97	114	133	6.2	11	C0350E2CXX	
500	4-3/4	5-1/4	5-1/4	17.5	121	133	133	8.0	11	C0500E2CXX	
750	4-3/4	5-1/4	7	26.4	121	133	178	12.0	11	C0750E2CXX	



Manuf.: . PNo:

Cutler-Hammer: C0300E2A Assembly

Rev: 0 Date:

9/21/2020

By: SW Device Tag:

T1,CB3,4

Job Number:

EVC8265



Primary: 240 x 480, 230 x 460, 220 x 440 with Jumpers and Two-Pole Primary Fuse Block for Rejection Type Fuses Secondary: 120/115/110 with Fuse Clips for 13/32 x 1-1/2 Fuses

VA Dimen	Dimensio	ns (Inches)		Weight	Dimensio	ns (mm)		Weight	Wiring	Style	
	Height	Width	Depth	Lbs.	Height	Width	Depth	kg	Diagram ①	Number	
50	3-15/16	3	3	2.8	100	76	76	1.3	1	C0050E2AFB	
75	3-15/16	3	3-1/2	3.7	100	76	89	1.7	1	C0075E2AFB	
100	4-1/4	3-3/8	3-3/8	4.4	108	86	86	2.0	1	C0100E2AFB	
150	4-9/16	3-3/4	4	6.9	116	95	102	3.1	1	C0150E2AFB	
200	5-3/16	4-1/2	4	8.7	132	114	102	3.9	1	C0200E2AFB	
250	5-3/16	4-1/2	4-3/8	10.2	132	114	111	4.6	1	C0250E2AFB	
300	5-3/16	4-1/2	4-3/4	11.5	132	114	121	5.2	1	C0300E2AFB	
350	5-3/16	4-1/2	5-1/4	13.8	132	114	133	6.3	1	C0350E2AFB	
500	6-1/8	5-1/4	5-1/2	19.4	156	133	140	8.8	1	C0500E2AFB	
750	6-1/8	5-1/4	7	28.3	156	133	178	12.8	1	C0750E2AFB	
1000	7-1/16	6-3/4	6-7/16	29.7	179	171	164	13.4	1	C1000E2AFB	
1500	7-3/4	7-1/2	7-3/8	40.2	197	191	187	18.1	1	C1500E2AFB	

Primary: 240 \times 480 with Jumpers and Two-Pole Primary Fuse Block for Rejection Type Fuses Secondary: 24 with Fuse Clips for 13/32 \times 1-1/2 Fuses

VA	Dimensio	ns (Inches)		Weight	Dimensio	ns (mm)		Weight	Wiring	Style	
	Height	Width	Depth	Lbs.	Height	Width	Depth	kg	Diagram ①	Number	
50	3-15/16	3	3	2.8	100	76	76	1.3	2	C0050E2BFB	
75	3-15/16	3	3-1/2	3.8	100	76	89	1.7	2	C0075E2BFB	
100	4-1/4	3-3/8	3-3/8	4.4	108	86	86	2.1	2	C0100E2BFB	
150	4-9/16	3-3/4	4	6.9	116	95	102	3.1	2	C0150E2BFB	
200	5-3/16	4-1/2	4	8.7	132	114	102	3.9	2	C0200E2BFB	
250	5-3/16	4-1/2	4-3/8	10.3	132	114	111	4.7	2	C0250E2BFB	
300	5-3/16	4-1/2	4 3/4	11.6	132	114	121	5.3	2	C0300E2BFB	
350	5-3/16	4-1/2	5-1/4	13.6	132	114	133	6.2	2	C0350E2BFB	
500	6-1/8	5-1/4	5-5/8	17.7	156	133	143	8.0	2	C0500E2BFB	

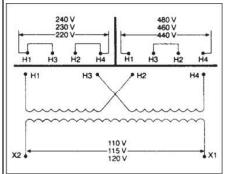
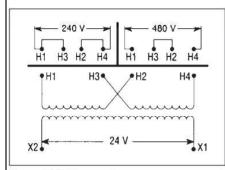


Figure 9-12. Diagram 1



480 V H1 H3 H2 H4 H1 H3 H2 H4 X2 • X4 X2 X3 X1 120 V

Figure 9-22. Diagram 11

Figure 9-13. Diagram 2



Device Tag: Rev: T1,CB3,4 Job Number:















2,5 mm²/5 mm Width

4 mm²/6 mm Width

10 mm²/10 mm Width 16 mm²/12 mm Width 35 mm²/16 mm Width

Туре		Part no. Std.	pack	Туре	Part no.	Std. pack	Туре	Part no. Std. pack
Marking str	ips, unm	arked		Marking strips, u	nmarked			
9705 //5/10		04.242.5053.0	25	9705 //6/10	04.242.6053	2.0 25	10 mm ² /10	mm Width
Marking str	ips, mark	ced		Marking strips, m	narked		marked for 5 blo	cks (every 2nd tag) *
9705 A/5/9 B	1-9	04.842.4953.0	25	9705 A/6/9 B 1 - 9	04.842.5953	3.0 25	9705 A/5/10/5 B	04.842.5553.0 25
9705 A/5/10 B*		04.842.5053.0	25	9705 A/6/10 B*	04.842.6053	3.0 25		
9705 A/5/10 B	1 - 10	04.845.0153.0	25	9705 A/6/10 B 1 - 10	04.846.0153	3.0 25		
1	1 - 20	04.845.0253.0	25	11 - 20	04.846.0253	3.0 25		
2	1 - 30	04.845.0353.0	25	21 - 30	04.846.0353	3.0 25	Name and the same of the same	
3	1 - 40	04.845.0453.0	25	31 - 40	04.846.0453	3.0 25	16 mm ² /12	mm Width
4	1 - 50	04.845.0553.0	25	41 - 50	04.846.0553	3.0 25		
5	1 - 60	04.845.0653.0	25	51 - 60	04.846.0653	3.0 25	marked for 5 blo	cks (every 2nd tag) *
6	1 - 70	04.845.0753.0	25	61 - 70	04.846.0753	3.0 25	9705 A/6/10/5 B	04.842.6553,0 25
7	1 - 80	04.845.0853.0	25	71 - 80	04.846.0853	3.0 25		
8	1 - 90	04.845.0953.0	25	81 - 90	04.846.0953	3.0 25		
9	1 - 100	04.845.1053.0	25	91 - 100	04.846.1053	0.0 25		
	⊕ (10 x)	04.855.0053.0	25	(10	0 x) 04.856.0053	3.0 25	35 mm ² /16	mm Width
	± (10 x)	04.855.0153.0	25	÷ (10	0 x) 04.856.0153	0.0 25		
	+ (10 x)	04.855.0253.0	25	+ (10	0 x) 04.856.0253	3.0 25	marked for 5 blo	cks (every 2nd tag) *
	- (10 x)	04.855.0353.0	25	- (10	0 x) 04.856.0353	3.0 25	9705 A/8/10/5 B	04.842.8553.0 25
Ĵ.	L1 (10 x)	04.855.0453.0	25	L1 (10	0 x) 04.856.0453	3.0 25		
9	L2 (10 x)	04.855.0553.0	25	L2 (10	0 x) 04.856.0553	3.0 25		
3	L3 (10 x)	04.855.0653.0	25	L3 (10	0 x) 04.856.0653	1.0 25		
F	PE (10 x)	04.855.0753.0	25	PE (10	0 x) 04.856.0753	3.0 25		
	SL (10 x)	04.855.3153.0	25	SL (10	0 x) 04.856.3153	3.0 25		
	N (10 x)	04.855.3253.0	25	N (10	0 x) 04.856.3253	3.0 25		
9	F1 (10 x)	04.855.0953.0	25	F1 (10	0 x) 04.856.0953	1.0 25		
3	F2 (10 x)	04.855.1053.0	25	F2 (10	0 x) 04.856.1053	1.0 25		
11, 12, 13, N,	PF (2 x)	04 855 0853 0	25	11,12,13, N, PF (3	2 x) 04 856 0853	0 25		
with enlarge	d marking	g area		with enlarged mar	king area			
9705 AL/5/10		04.242.5153.0	25	9705 AL/6/10	04.242.6353	0.0 25		
*Custom ma	rking upo	on request		*Custom marking	upon request		* indicate required	d marking with part no.

	EMECH
	ENECH
	INC.
630-499-708	O · www.elemechinc.com

Manuf.: . PNo:

Wieland: 04.242.6353-CUSTOM

Rev: 0 Date:

9/21/2020

By: SW Device Tag:

TB,DB

Job Number: EVC8265 Page # 1/1

42-063-00

wieland

(II) (II)

Item No. Z5.522.8553.0 End bracket 9708 / 2 S 35

End clamp for mounting rail TS 35

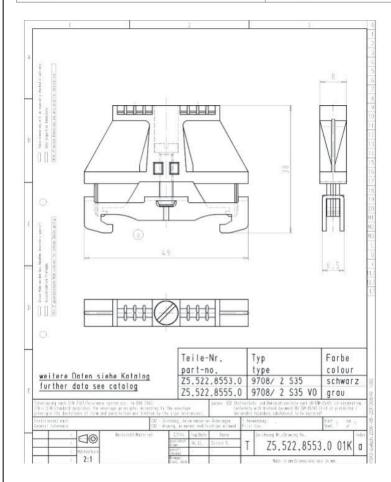
Item No.	Z5.522.8553.0
EAN	4015573141766
order unit	100 Piece(s)

as carnell

Technical data

Δ	c	c	Δ	2	9	n	rı	es

ArticlePrice	udp_no_price
Colour	Black
Inflammability class of insulation material acc. with UL94	V2
Width/grid dimension	8 mm
Latching	Screwable
Length	49 mm
Material	Metal
Mounting method	DIN rail (top hat rail) 35/7.5 mm



FLEMECH	Rev:	Device Tag:	
630-499-7080 · www.elemechinc.com	Date: 9/21/2020	TB,DB	
Manuf.: . PNo: Wieland: Z5.522.8553	By: SW	Job Number: Page # 1/	1

Item No. Z7.281.1227.0

Insulated jumper bar IVBWK 4 - 2

Cross connector, insulated for DIN rail terminal blocks type WK \dots , 2 -pole

Item No.	Z7.281.1227.0	
EAN	4015573156081	
order unit	10 Piece(s)	

🔊 wieland

(II) (II)

Technical data

Accessories

ArticlePrice		
Colour	Yellow	
Туре	Cross connector	
Modular spacing	5.95 mm	
Number of bridged clamps	2	
Mounting method	Screwable	
Insulated	Yes	



Гуре	Part no. S	Std. pack	Type	Part no.	Std. pack	Type		Part no. Str	f. pack
or terminal blocks type			WK 4/U	6 mm spacin	g Screw: M 3	WK 4/3	-6 SKO	6 mm spacing	Screw: M 3
WK 2,5/U	5 mm spacin	g Screw: M 2.5	WK 4TKS D/U			2pole	2072/2	Z7.220.0227.0	50
WK 2,5 - 4 KOI/U			WK 4 3 S 1 K/U			3pole	2072/3	Z7.220.0327.0	50
WK 2,5 U/8113 S/H			WK 4 3-6 S 1 K/U			4pole	2072/4	Z7.ZZ0.04Z7.0	50
WKN 2,5 E/U			WK 4 5 S 2,8 1 K/U			5pole	2072/5	Z7.220.0527.0	50
2pole VB WK 2,5-2	Z7.280.0227.0	10	WK 4 3 S 1 K/IW/U			6pole	2072/6	Z7.220.0627.0	50
3pole VB WK 2.5-3	Z7.280.0327.0	10	WK 4 3-6 S 1 K/IW/	U		70pole	2072/M	Z7.210.1027.0	10
4pole VB WK 2.5-4	Z7.280.0427.0	10	WK 4/U F1			93			
Spole VB WK 2,5 5	Z7.280.0527.0	10	WK 4/U F2			WK/5 S	/U	6 mm spacing	Screw: M 3
6pole VB WK 2,5-6	Z7.280.0627.0	10	2pole VB WK 4-2	Z7.281.0227.0	10	WK/5-1	0 S/U	TOWNS CO. S. C.	
BOpole VB WK 2.5 M-80	Z7.280.0027.0	10	3pole VB WK 4-3	Z7.281.0327.0	10	WK/3-6			
		a 1500	4pole VB WK 4-4	Z7.281.0427.0	10	WK/4 S			
WKM 2,5/15	5 mm spaci	ng Screw: M 2.5	5pole VB WK 4-5	Z7.281.0527.0	10	WK/4-8	Control of the Contro		
WKM 2,5 F1/15	- man aparon		Spole VB WK 4 6	Z7.281.0627.0	10	1000	9703/6 2	Z7.211.0227.0	50
WKM 2,5 F2/15			70pole VB WK 4 M-70	Z7.281.0027.0	10		9703/6-3	Z7.211.0327.0	50
WKM 2,5/2 S 2,8 1 K	/15		CONTROL DESCRIPTION OF THE PARTY OF THE PART		1500		9703/6-4	Z7.211.0427.0	50
WKM 2,5 TP1 O/15			WK 4/D 1/2 U	6 mm spacin	g Screw: M 3		9703/6-5	Z7.211.0527.0	50
WKM 2,5 TP2 O/15			WK 4/D 2/2 U	o min opasii		1,000,000,000,000	9703/6-6	Z7.211.0627.0	50
2pole VB WKM 2,5/15-	77 215 4227 0	50	2pole VB WK 4 D2	Z7.281.6227.0	10	12 10 10 10 10 10 10 10 10 10 10 10 10 10	9703/6 M-70	Z7.211.0027.0	10
3pole VB WKM 2.5/15-			3pole VB WK 4 D.,-3	Z7.281.6327.0	10	Market Co.			
4pole VB WKM 2.5/15-			4pole VB WK 4 D4	Z7.281.6427.0	10				
5pole VB WKM 2.5/15-			5pole VB WK 4 D5	Z7.281.6527.0	10				
6pole VB WKM 2,5/15-			6pole VB WK 4 D6	Z7.281.6627.0	10				
60pole VB WKM 2,5/15 M4			70pole VB WK 4 D. M-7		10				
WK/3 S/IW/U	6 mm spaci	ng Screw: M 3	WKM 4/15	6 mm spacin	g Screw: M 3				
			WK 4/D EU						
WK/3 - 6 S/IW/U			WK 4 E/U for upper						
WK/4 S/IW/U			WK 4 E/U GU ORAI	NGE					
WK/4-8 S/IW/U		e rraevi	WK 4 E/U GO						
2pole VB WK/S/IW/U			WK 4 E/U G2	0.000.00					
3pole VB WK/S/IW/U			WK 4 E/U G1 ORAN	IGE					
4pole VB WK/S/IW/U			WK 4 E/U G-URL						
5pole VB WK/S/IW/U			WK 4 E/U G-ULR	NAME OF TAXABLE PARTY.					
6pole VB WK/S/IW/U			WK 4 E/U VB SCHV						
20pole VBWK/S/IW/U-2	20 Z7.281.3027.0	10	2pole 9215 - 2	Z7.210.3227.0	50				
			3pole 9215 - 3	Z7.210.3327.0	50				
			4pole 9215 - 4	Z7.210.3427.0	50				
			5pole 9215 - 5	Z7.210.3527.0	50				
			6pole 9215 - 6	Z7.210.3627.0	50				
			70pole 9215 M-70	Z7.210.3027.0	10				

630-499-7080 · www.elemechinc.com	Rev: 0	Device Tag: TB1	
Manuf.:.PNo: Wieland: Z7.281.1227	9/21/2020 By: SW	Job Number: EVC8265	Page # 1/1

Datasheet

Art.No. 07.311.0155.0

End plate AP 2,5 -4 /V0

End plate for DIN rail terminal blocks type WK ..., color gray



Art.No.	07.311.0155.0	
EAN	4015573392663	
Order unit	10 pieces	

Approvals

Technical data

General

Grey
Yes
No
1.5 mm
Yes
V0

Accessories

Type of end plate	Yes
Type of partition Colour	No
Colour	Grey
Thickness	1.5 mm
Snap in	Yes
Inflammability class of insulation material acc. with UL94	VO



0 Date:

Rev:

Device Tag:

9/21/2020

TB1,2

Manuf.: . PNo:

Wieland: 07.311.0155.0

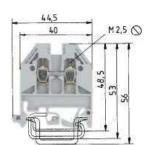
By: SW Job Number: EVC8265 Page # 1/1

Feed-through blocks with screw connection

* or 2x na. 14 sal/str AWG or 2x na. 16 sal/str AWG or 2x na. 18 sal/str AWG or 3x na. 20 sal/str AWG or 3x na. 22 sal/str AWG

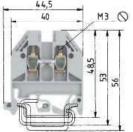
⁶ or 2x no. 12 sol/str AWG or 2x no. 16 sol/str AWG or 3x no. 18 sol/str AWG or 3x no. 22 sol/str AWG

" at 2x na . 12 sal/str AWG at 2x na . 14 sal/str AWG ar 3x na . 16 sal/str AWG









0344 W II 2GD IM2 Exe I/II EN 60 947-7-1:2002 UL ratings CSA ratings KEMA 02 ATEX 2114 U¹⁾ EN 60 079-0/EN 60 079-7 0.5-2.5 mm² 0.5-4 mm² Wire strip length 5 mm

WK 2,5/U fine-stranded solid Field/factory wiring No. 22-12 AWG 600V 2 No. 24-12 AWG 600V 690V

23 24 0.5-4 mm² 0.5-6 mm² 800 V/8 kV/3 20/30 No. 22-10 AWG⁴ 600 V 25 No. 20-10 AWG 600 V 25 No. 20-10 AWG 23 0.5-4 mm² 0.5-6 mm² 9mm 6mm

A fine-stranded solid

WK 4/U

30/35 600V 40 14/273 690V 9mm

pprovals	D D D BALEX A IS A PLAN A CO			A D D HALF UP THE WALE WAS ALL OF		
	Туре	Part No.	Std. Pack	Type	Part No.	Std. Pack
Feed-through block gray	WK 25/U	57.503.0055.0	100	WK 4/U	57.504.0055.0	100
Feed-through block Ex i blue	WK 2,5/U BLAU	57.503.0055.6	100	WK 4/U BLAU	57.504.0055.6	100
Accessories						
1. Mounting rail TS 35, DIN rail 7.5 mm high L=2 m	35 x 27 x 7,5 EN 607 15	98.300.0000.0	1	35 x 27 x 7,5 EN 607 15	98.300.0000.0	1
Mounting rail TS 35, DIN rail, 15 mm high L=2 m	35 x 24 x 15 EN 60715	98.360.0000.0	1	35 x 24 x 15 EN 60715	98,360,0000.0	1
Mounting rail TS 32. G rail ² L=2 m	9006 EN 60715 G-32	98.190.0000.0	1	9006 EN 60715 G-32	98.190.0000.0	1
End clamp with U-foot ^a 10mm wide	WE 1/U	Z5.523.5753.0	100	WE:1/U	Z5.523.5753.0	100
End clamp TS 35, with screw 8mm wide	9708/2 \$35	Z5.522.8553.0	100	9708/2 \$35	Z5.522.8553.0	100
End clamp TS 35, without screw 8mm wide	WEF 1/35	Z5.523.9353.0	100	WEF 1/35	Z5.523.9353.0	100
3. End plate gray	AP25-4	07.311.0155.0	10	AP 2.5 -4	07.311.0155.0	10
blue	AP 2,5 - 4 BLAU	07.311.0155.6	10	AP 2,5 -4 BLAU	07.311.0155.6	10
4. Partition gray	TW 2,5 - 4	07.311.1155.0	10	TW 2,5 - 4	07.311.1155.0	10
blue	TW 2,5 - 4 BLAU	07.311.1155.6	10	TW 2,5 - 4 BLAU	07.311.1155.6	10
5. Cross connector with screws 2 pale	IVB WK 2,5 -2	Z7.280.2227.0	10	IVB WK 4 - 2	Z7.281.1227.0	10
insulated 3 pole	IVB WK 2,5 -3	Z7.280.2327.0	10	IVB WK 4 - 3	Z7.281.1327.0	10
up to 12 pole	IVB WK 2,5 - 12	Z7.280.3227.0	10	IVB WK 4 - 12	Z7 281 2227.0	10
6. Partition plate with marking facility	TS 2,5 GELB	07.311.2053.8	10	TS 4 GELB	07.311.2153.8	10
7. Single cover with marking facility	AD VB 2,5 GELB	04.326.2053.8	10	AD VB 4 GELB	04.326.2153.8	10
8. Cover with warning symbol over 4 blocks	AD VB 5/4 GELB	04.343.4756.8	10	AD VB 6/4 GELB	04.343.4856.8	10
For more accessories see pages 60-77	*1 For maintaining the p		ices, the open side	e of a feed-through terminal bi	ock as well as both si	des af a jumpe
For marking systems see pages 70-75	II Please note the mour		the cover stade	# Do not use in Exervira	nments it With	n/without jump



Date: By:

Rev:

Device Tag:

9/21/2020

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Job Number:

EVC8265

TB1,2

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Manuf.: . PNo:

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Wieland: 57.504.0055.0

SW

SMALL COMPACT THERMOSTAT

KTO 011 / KTS 011

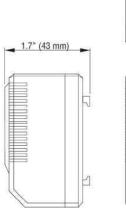


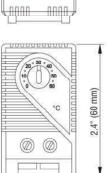




Technical Data KT 011

Part No. Contact		type	Scale on housing			
01140.9-00	normally closed		30 - 140°F			
01141.9-00	normally open	_0 0	30 - 140°F			
01146.9-00	normally closed		0 - 60°C			
01147.9-00	normally open	~~~	0 - 60°C			
Sensor element		Thermostatic b	oi-metal			
Maximum tolera	nce:	±7.2°F (4K)				
Switching differe	ence (hysteresis):	12.6°F ± 5.4°F (7°C ± 3K)				
Service life:		100.000 cycle	S			
Switching capac	city (max. load):	15A resistive/2A inductive @ 120 VAC				
***************************************		10A resistive/2 DC 30W	A inductive @ 250 VAC			
EMI/EMC comp	liance:	EN 55014-1-2	, EN 61000-3-2, EN 61000-3-3			
Connections:		2-pole termina	I for AWG 14 max. (2.5 mm ²)			
Mounting:		Clip for 35 mn	n DIN rail (EN 50022)			
Dimensions (H	x W x D):	2.4 x 1.3 x 1.7	" (60 x 33 x 43 mm)			
Housing:	252541V00031 3 254	Plastic, UL94V	/-0`			
Weight:		1.27 oz (36 g)				
Protection type:		IP 20				
Operating/storag		-49 to 158°F	(-45 to 70°C)			
Agency approva	ıls:	UL, CSA				





1.3" (33 mm)



Stego: 01140.9-00

Rev: 0

Date: 9/21/2020

By: SW Device Tag:

TS1

Job Number: EVC8265 Page # 1/1

Manuf.: . PNo:

CHNF SERIES CONTINUOUS HINGE WITH CLAMPS TYPE 4X JUNCTION BOXES



ENCLOSURE	ENCLOSURE	SUB-PANEL
CATALOG NUMBER	DIMENSIONS (IN.)	CATALOG NUMBER
A-ABCCHNFSS6	AxBxC	A APB

NOTE:

- 1. SS INDICATES 304 STAINLESS STEEL
- 2. 6 INDICATES 316 STAINLESS STEEL





INDUSTRY STANDARDS

UL 50, 50E Listed; Type 3R, 4, 4X, 12; File No. E27567 cUL Listed per CSA C22.2 No 94; Type 3R, 4, 4X, 12; File No. E27567 UII 508A Listed: Type 3R, 4, 4X, 12; File No. F61997

UL 508A Listed; Type 3R, 4, 4X, 12; File No. E61997 cUL Listed per CSA C22.2 No 94; Type 3R, 4, 4X, 12; File No. E61997

NEMA/EEMAC Type 3R, 4, 4X, 12, 13 CSA File No. 42184: Type 4, 4X, 12 IEC 60529, IP66 Meets NEMA Type 3RX requirements

APPLICATION

Used in either indoor or outdoor applications, these enclosures combine a rugged continuous hinge, seamless foam-in-place gasket and stainless steel screw-down clamps for a reliable seal that protects components from corrosive environments.

SPECIFICATIONS

- · 16 and 14 gauge Type 304 or 316L stainless steel
- · Seams continuously welded and ground smooth
- Seamless foam-in-place gasket
- · Stainless steel screws and clamps
- · Pull stainless steel continuous hinge pin to remove door
- Weldnuts provided for mounting optional panels and terminal block kits
- · Bonding provision on door and body

FINISH

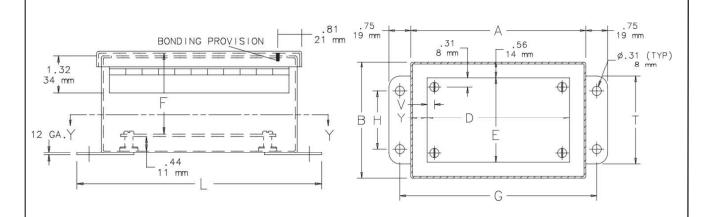
Cover and sides of body have smooth #4 brushed finish.

ACCESSORIES

Fast-Operating Clamp-Cover Junction Box Clamp Lock Kit for Clamp Cover Junction Boxes Panels for Junction Boxes Terminal Block Kit Assembly for Junction Boxes Overview

MODIFICATION AND CUSTOMIZATION

Hoffman excels at modifying and customizing products to your specifications. Contact your local Hoffman sales office or distributor for complete information.





Accessories

30.5 mm Push Buttons















Shallow Block

PenTUFF™ (Low Voltage)

Logic Reed Block

Sealed Switch Block

Stackable Sealed

Contact Type	Shallow Block∗®		PenTUFF (Low Voltage) Block**		Logic Reed Block‡		Sealed Switch Block‡		Stackable Sealed Switch Block‡	
	Cat. No.	Code	Cat. No.	Code	Cat. No.	Code	Cat. No.	Code	Cat. No.	Code
1 N.O.	800T-XD1	D	800T-XD1V	Н	800T-XD1R	V	800T-XD1P	R	800T-XD1Y	5
1 N.C.	800T-XD2	E	800T-XD2V	U	800T-XD2R	W	800T-XD2P	S	800T-XD2Y	6
1 N.O.E.M.	800T-XD3	G	800T-XD3V	1	-	-	_		<u></u> :	<u> </u>
1 N.C.L.B.	800T-XD4	J	800T-XD4V	Q	_		_	- 1	_	1
1 N.O N.C.	800T-XA	A	800T-XAV	F	800T-XAR	Т	800T-XAP	Р	800T-XAY	7
2 N.O.	800T-XA2§	М	_	-	800T-XA2R§	Y	_	_	800T-XA2Y	8
2 N.C.	800T-XA4	N	_		800T-XA4R	Z	_		800T-XA4Y	9
I N.C.L.B 1 N.O.	800T-XA1	В	_	-	-	-	 -	-	-	- 1
1 N.C.L.B 1 N.C.	800T-XA7	С	_	-	-	-	-	-	-	

Note: Modular suffix codes can be used when specifying selector switches with multiple contact blocks.

PenTUFF™ (Low Voltage) Contact Ratings

Minimum DC: 5V, 1 mA

Maximum thermal continuous current I_{th} 2.5 A AC/1.0 A DC. Bulletin 800T units with 800T-XAV contacts have ratings as follows: Maximum continuous current I_{th} 2.5 A. Bulletin 800T units have control circuit ratings with sealed switch contact blocks as follows:

Max. Opertnl.	Utilization	Category	Rated Operational Currents			
Volte Ue	IEC	NEMA	Volte U _e	Make	Break	
AC 300	AC-15	C300	120300 0120	1800VA 15 A	180VA 1.5 A	
DC 150	DC-13	R150	24150 024	28VA 1.0 A		

Stackable Sealed Switch Contact Ratings

Minimum: 5V, 10 mA (digital); 24V, 1 mA (analog)

Max. Opertnl.	Utilization	Category	Rated Operational Currents			
Volts U _e	IEC	NEMA	Volts U _e	Make	Break	
AC 300	AC-15	C300	120300 0120	1800VA 15 A	180VA 1.5 A	
DC 150	DC-13	Q150	24150 024	69VA 2.5 A		

MaxDuty Contact Rating

Maximum thermal continuous current Ith 24 A. Pilot Duty - 120V AC, 12 A; 24V DC, 10 A Motor Ratings - 120V AC, 1.5 Hp; 240V AC, 3 Hp; 24V DC, 10 A FLA/60 A LRA

Logic Reed Contact Ratings

Minimum - DC: 5V, 1 mA

Maximum - DC: 30V, 0.06 A, AC: 150V, 0.15 A Should only be used with resistive loads.

Product Certifications

Certifications	UR/UL, CSA, CCC, CE				
Standards Compliance — CE Marked	NEMA ICS-5; UL 508, EN ISO 13850, EN 60947-1, EN 60947-5-1, EN 60947-5-5				

FIENECH	Rev:	Device Tag:			
630-499-7080 · www.elemechinc.com	Date: 9/21/2020	PB			
Manuf.: . PNo:	Bv:	Job Number:	Page # 1/1		
Allen-Bradley: 800T-XAY	ŚW	EVC8265	1/1		

Bulletin 800T/H

30.5 mm Push Buttons

Emergency Stop Operators





2-Position Red Trigger Action Twist-to-Release, Non-Illuminated

- Tamper resistant front-of-panel mounting and non-removable operator head
- Compliant with global E-stop standards, including EN ISO 13850 and EN 60947-5-5









Cat. No. 800T-TFXLET6

	Operator	Position		Type 4/13			
			45 mm Plastic	63 mm Metal	Key Release	45 mm Plastic	
Contact Type	Out	In	Cat. No.+®‡	Cat. No.*§	Cat. No.**	Cat. No.∗⊕‡	
No contacts	700	<u></u>	800T-TFXT6	800T-TFXLT6	800T-TFXK6	800H-TFRXT6	
1 N.C.	X	0	800T-TFXT6D2	800T-TFXLTD2	800T-TFXK6D2	800H-TFRXT6D2	
1 N.O 1 N.C.	o x	X	800T-TFXT6A	800T-TFXLT6A	800T-TFXK6A	800H-TFRXT6A	
1 S.M.C.B.>	X	0	800TC-TFXT6D4S	800TC-TFXLT6D4S	800TC-TFXK6D4S	800HC-TFRXT6D45	

- * For finger-safe contact block terminals, add a C to the cat. no. Example: Cat. No. 800TC-TFXT6 or 800HC-TFRXT6.
- # To order a device with a jumbo (60 mm) plastic head add the letter J after X. Example: Cat. No. 800T-TFXJT6A or 800H-TFRXJT6A.
- † To order a jumbo head device with "E-STOP" printed on the cap add the letters JE after X. Example: Cat. No. 800T-TFXJET6 or 800H-TFRXJET6. § To order a device with "E-STOP" engraved on the cap add the letter E after L. Example: Cat. No. 800TC-TFXLET6D4S.

- Provided with two DO18 keys.
- Self-monitoring contact block.

800	T		- T	FX	T	6	D2
	a	b		C	d		е

Standards Compliance

UL 508 CCC

Certifications

UL Listed (File No. E14840, E10314 Guide No. NKCR, NOIV)

CSA Certified (File No. LR1234, LR11924) CSA C22.2, No. 14

EN/IEC: 60947-5-1

d					
Protection Rating					
Description					
Metal, Type 4/13					
Plastic, Type 4/4X/13					
	Description Metal, Type 4/13				

Finger-Safe Guards					
Description					
No guards					
Guards on terminals					
	Description No guards				

	Head Type‡	1111
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
FX	Standard (45 mm) mushroom head	FRX
FXJ	Jumbo (60 mm) mushroom head	FRXJ
FXJE	Jumbo (60 mm) mushroom head with "E-STOP"	FRXJE
FXK	45 mm mushroom head key release	-
FXL	63 mm anodized aluminum head	-
FXLE	63 mm anodized aluminum head with "E-STOP"	_

d

	Release Function	
Code	Color	
Blank	Key release¥	
T	Twise release	

Note: X = Closed/O = Open #Configurable only with FXK head type.

			Contact Block(s)
	Operator	Position	
Code	Out		Description
Blank	_	_	No contacts on operator
			Standard
D1	0	X	1 N.O.
D2	X	0	1 N.C.
D4	X	0	1 N.C.L.B.
Α	O X	X	1 N.O 1 N.C.
A1	O X	X	1 N.O 1 N.C.L.B.
A5	X	0	2 N.C.L.B.
	5 35	Pe	nTUFF (Low Voltage)
D1V	0	X	1 N.O.
D2V	X	0	1 N.C.
D4V	X	0	1 N.C.L.B.
AV	O X	X	1 N.O 1 N.C.
		CI	ass 1, Div. 2/Zone 2
			Logic Reed
D1R	0	X	1 N.O.
D2R	X	0	1 N.C.
AR	X	X O	1 N.O 1 N.C.
			Sealed Switch
D1P	0	X	1 N.O.
D2P	X	0	1 N.C.
AP	O X	X	1 N.O. 1 N.C.
	- 13	75.00	ckable Sealed Switch
D1Y	0	X	1 N.O.
D2Y	X	0	1 N.C.
AY	O X	X O	1 N.O 1 N.C.



630-499-7080 · www.elemechinc.com

Manuf.: . PNo: Allen-Bradley: 800H-TFRXT6

Rev:	Device Tag:		
Date: 9/21/2020		PB	

By:

Job Number: SW EVC8265



Section Five: Enclosures





Job Number: WEC220256A Job Name: Newark, DE

Revision: -Approval Date:

Apprvd By

Created By CR33

	1				11.51	10104084	
riue	Fart Number	Part Name	Kevision	Quantity	Onit	Material	Notes
101	WEC220256A	FSM HUR Multirake, Model 700x30/85/8		1	EA	304SS	
		SEW- Eurodrive SA87 DRE90L6 - M1B - 1145/4rpm					
102	SEW-Gearmotor	230/460 3.6/1.8amp		1	EA	O	Screen Drive
103	WEC220256-FRAME	Shaped frame support		2	SETS		
104	ANCR-1/2"-0750-304S	Anchor rod, 1/2" x 7-1/2" LG		10	EA	304SS	Epoxy and applicator by others, not by EC
							ONLY NEEDED IF ANCHOR RODS USED (DELETE
							THIS LINE if expansion anchors used), double
105	FW-1/2"-304S	Flat Washer, 1/2"		20	EA	304SS	quantity of anchor rods
							ONLY NEEDED IF ANCHOR RODS USED (DELETE
							THIS LINE if expansion anchors used), double
106	HNC-1/2"-304S	Hex Nut, 1/2"		20	EA	304SS	quantity of anchor rods
107	WEC220256-SEAL	Channel side seal		2	EA	buna	
108	WEC220256-BRAC	Side seal bracket and hardware		4	sets	304ss	
109	WEC220256-COVER	Covers		2		304ss	
110	LS-POINTEK 49-043-02	Pointek ULS 200	N/A	1	EA	-	Supplied w/ control panel
111	BRKT-LS.U-01	Bracket, Level Sensor, above channel, med	-	1	EA	304SS	1 anchor/bracket
112	EXANC-3/8"-0350-304S	Expansion Anchor, 3/8" x 3-1/2" LG		2	EA	304SS	each anchor includes one nut and one washer
113	LABEL-EC-4x12	Label EC 4 x 12		2	EA	Vinyl	need 2 per screen
114	LABEL-EC-2x5	Label EC 2 x 5		1	EA	Vinyl	for control panel
115	LABEL-FSM-16x16	Label FSM 16X16		1	EA	Vinyl	need 1 per screen
116	NAMEPLATE	Nameplate		2	EA	-	need 1 per screen
117	WEC220256A-CP01	Control Panel, 480/3/60, NEMA 4X		1	EA	304SS	
118	WEC220256A-LCS	Local Control Station NEMA 4x		1	EA	-	Supplied w/ control panel

10/2/2020





Job Number: WEC220256B Job Name: Newark, DE Revision: -

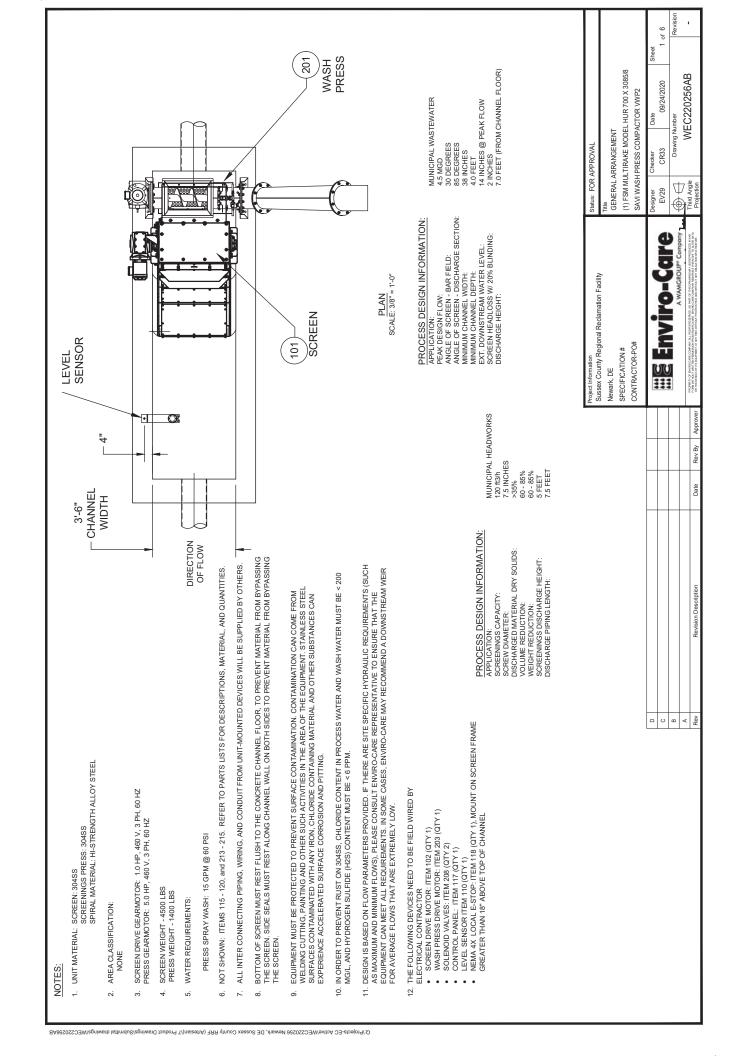
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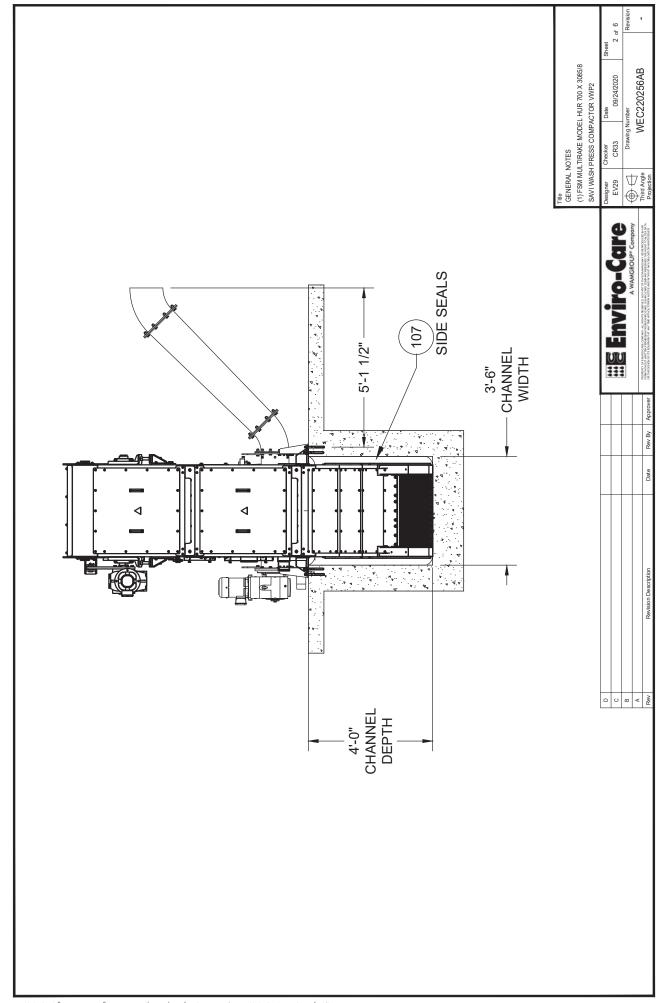
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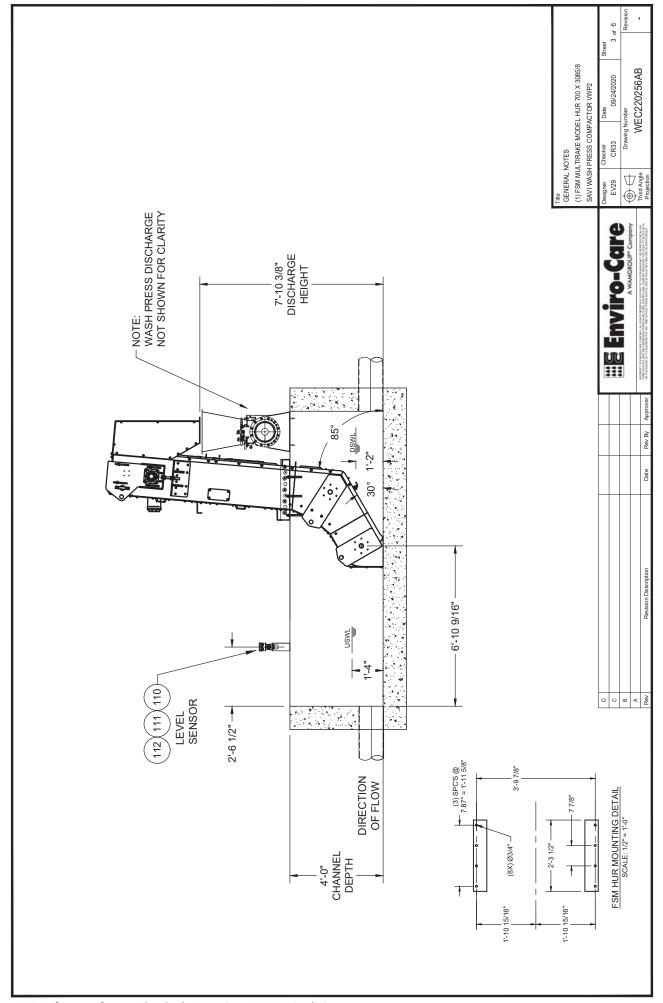
201 WEC220256B SAVI FLO-WASH PRESS VWP-1 202 RD-SK9042.1AF-180TC REDUCER - NORD, Ratio 117.79:1, M4 203 VM7044T Baldor VM7044T-184TC-5hp 204 HCSC-1/2"-0125-304S 1/2" Capscrew x 1-1/4" LG 205 ANCR-1/2"-0750-304S Anchor rod, 1/2" x 7 1/2" LG 206 FW-1/2"-304S Flat Washer, 1/2" 207 HNC-1/2"-304S Hex Nut, 1/2" 208 SOV-8210G87 Solenoid valve, ASCO, 1/2", 120VAC 209 WEC220256B-209 Inlet Hopper 210 WEC220256B-210 Discharge Pipe 211 LABEL-EC-4x12 Label EC 4 x 12 212 NAMEPLATE Nameplate	9:1, M4	1 1 1 4 8 4	EA EA EA	304SS CI #N/A 304SS	304SS Main Unit CI #N/A #N/A
RD-SK9042.1AF-180TC VM7044T HCSC-1/2"-0125-304S ANCR-1/2"-0750-304S FW-1/2"-304S HNC-1/2"-304S SOV-8210G87 WEC220256B-209 WEC220256B-210 LABEL-EC-4x12 NAMEPLATE	p p	1 1 4 8 9	EA EA	CI #N/A 304SS	W/N#
VM7044T HCSC-1/2"-0125-3045 ANCR-1/2"-0750-3045 FW-1/2"-3045 HNC-1/2"-3045 SOV-8210G87 WEC220256B-210 LABEL-EC-4x12 NAMEPLATE	d. 9	1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	EA EA	#N/A 304SS	W/N#
HCSC-1/2"-0125-304S ANCR-1/2"-0750-304S FW-1/2"-304S HNC-1/2"-304S SOV-8210G87 WEC220256B-210 LABEL-EC-4x12 NAMEPLATE	9	8 8 1	EA EA	304SS	
ANCR-1/2"-0750-304S FW-1/2"-304S HNC-1/2"-304S SOV-8210G87 WEC220256B-209 WEC220256B-210 LABEL-EC-4x12 NAMEPLATE		8 7	EA		Motor to reducer
FW-1/2"-3045 FW-1/2"-3045 HNC-1/2"-3045 SOV-8210G87 WEC220256B-209 WEC220256B-210 LABEL-EC-4x12 NAMEPLATE		0 1	1	33700	المسترافه والمسترافة و
HNC-1/2"-304S SOV-8210G87 WEC220256B-209 WEC220256B-210 LABEL-EC-4x12 NAMEPLATE			FA		Epoxy and applicator by others, not by EC
SOV-8210G87 WEC220256B-209 WEC220256B-210 LABEL-EC-4x12 NAMEPLATE		16	EA	30455	
WEC220256B-209 WEC220256B-210 LABEL-EC-4x12 NAMEPLATE	enoid valve, ASCO, 1/2", 120VAC	2	EA	304SS	SS body
WEC220256B-210 LABEL-EC-4x12 NAMEPLATE	t Hopper	1	EA	304SS	
LABEL-EC-4x12 I	harge Pipe	1	EA	304SS	
NAMEPLATE	el EC 4 x 12	2	EA	Vinyl	
	neplate	1	EA	MUJA	
					No spare parts required

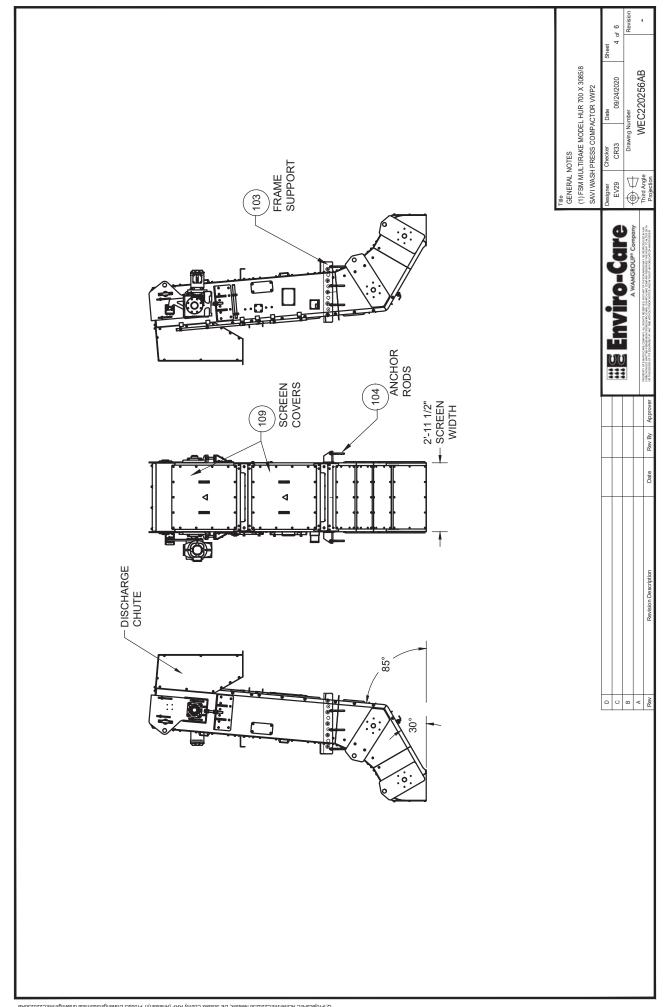
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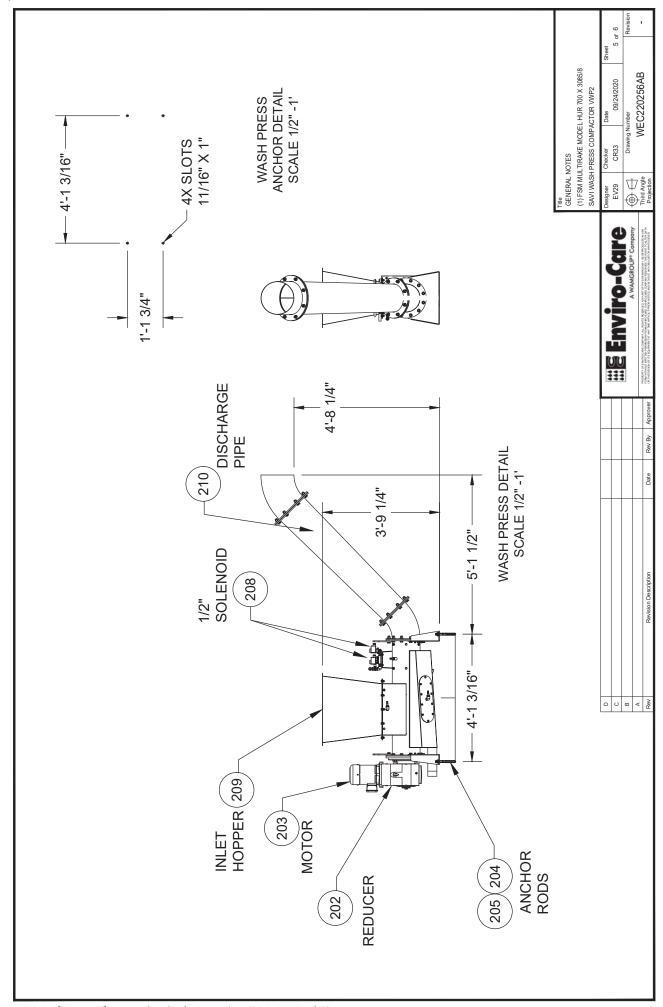












- ENVIRO-CARE RESERVES PROPRIETARY RIGHTS TO THIS DRAWING AND THE DATA SHOWN THEREON, WHICH IS SUBMITTED IN CONFIDENCE.
- IF APPLICABLE, A STAR DENOTES VARIANCE FROM CONTRACT DOCUMENTS AND SHOULD BE PARTICULARLY NOTED.
- 3. IF APPLICABLE, A CLOUD DENOTES DIMENSIONS WHICH ARE CRITICAL TO THE DESIGN OF THE EQUIPMENT, BUT NOT CLEAR AND/OR NOT PROVIDED IN THE CONTRACT DOCUMENTS.
- 4. THE FOLLOWING DEFINES THE RESPONSIBILITY OF ENVIRO-CARE WITH REGARD TO THE INFORMATION SHOWN ON THIS DRAWING.
- A. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION OR INSTALLATION PURPOSES UNTIL IT HAS BEEN APPROVED BY THE OWNER, THE ENGINEER OR AN AUTHORIZED REPRESENTATIVE.
- B. DIMENSIONS, WEIGHTS, AND OTHER INFORMATION ARE PROVIDED TO ACCOMMODATE THE STRUCTURE TO THE EQUIPMENT AS SHOWN.
- C. ENVIRO-CARE IS NOT RESPONSIBLE FOR ANY CONCRETE STRUCTURE DESIGN. THE ENGINEER IS TO DETERMINE SIZES TO SUIT LOCAL REQUIREMENTS.
- D. ENVIRO-CARE IS NOT RESPONSIBLE FOR DAMAGE, INJURY OR LOSS RESULTING FROM USE OF THE SUPPLIED EQUIPMENT.
- E. CHARGES FOR MODIFICATIONS OR ADDITIONS TO THE EQUIPMENT WILL NOT BE ACCEPTED BY ENVIRO-CARE, UNLESS PRIOR APPROVAL HAS BEEN OBTAINED IN WRITING FROM AN AUTHORIZED ENVIRO-CARE REPRESENTATIVE.

- ALL CONCRETE, GROUT, CONCRETE REINFORCING, SLIDE GATES, PIPING, VALVES, PIPE SUPPORTS OR FITTINGS, WALL BRACKETS, ELECTRICAL WIRING, CONDUIT, OR ELECTRICAL EQUIPMENT, ERECTION, FIELD PAINTING OR PAINT, FIELD WELDING OR WELD ROD, GREASE, OR LUBRICATING OIL, EXCEPT AS SPECIFICALLY NOTED IS TO BE BY OTHERS, NOT BY ENVIRO-CARE.
- 6. ALL ONSITE WELDING MUST CONFORM TO THE LATEST STANDARDS OF THE AMERICAN WELDING SOCIETY.
- 7. UNIT ANCHORAGE DESIGNED AROUND RED HEAD A7 / HILTI HIT-RE 500 ADHESIVE / HILTI EXPANSION ANCHOR SYSTEM. ANCHORS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
- 8. ANCHOR DIMENSIONS SHOWN ARE PROVIDED FOR REFERENCE ONLY. USE SUPPORTS & BRACKETS AS TEMPLATE TO LOCATE ANCHOR BOLT LOCATIONS.
- SEE PARTS LIST FOR ITEM IDENTIFICATION.

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Enviro-Care Flo-MultiRake / Compactor Control System Newark, DE

WEC220256A Rev. 0
Bill of Material
EleMech S.O. EVC8265

Item No	Item No Component	Description	Manufacturer Part Number	QTY Device	vice
Flo-Multi	Rake / Compact	Flo-MultiRake / Compactor Control System (Quantity: 1)			
1	1 00-000-000	Wire, Hardware, Wire labels, etc.	EleMech: Miscellaneous	1	
2	2 10-069-000	Wireway Duct Cover, 1.5"W, 6 Ft. Section, w/Panduit F Series	Panduit: C1.5WH6	4	
3	3 10-069-001	Wireway Duct Cover, 1"W, 6 Ft. Section, w/Panduit F Series	Panduit: C1WH6	3	
4	4 10-069-005	Wireway Duct, 1.5"Wx3"H, 6 Foot Section	Panduit: F1.5X3WH6	4	
5	5 10-069-007	Wireway Duct, 1"Wx3"H, 6 Foot Section	Panduit: F1X3WH6	3	
9	6 25-000-A001	Legendplate Assembly, Yellow E-Stop, Standard Encl.	EleMech: 25-000-A001 Assembly	1	
7	7 25-000-A002	Legendplate Assembly, White, Black Text, Standard Encl.	EleMech: 25-000-A002 Assembly	12	
8	8 25-000-A019	Nameplate Assembly, White: Power Supply - 3/60/480VAC	EleMech: 25-000-A019 Assembly	⊣	
6	9 42-063-007	Terminal Block, Din Rail, 35MM Wide, 15 High, 2 Meters Long	Iboco: Omega 3 AF	1	
10	10 51-000-062	Wire, MTW Type, 600V, 105°C, CSA/UL1015, Tinned Copper	EleMech: 51-000-062	1	
11	11 03-058-151	Circuit Breaker, 3 Pole, 480VAC, 5A, 10kA, UL489, Type D	Square D: M9F43305	1 CB1	
12	12 03-058-156	Circuit Breaker, 3 Pole, 480VAC, 20A, 10kA, UL489, Type D	Square D: M9F43320	1 CB2	2
13	13 03-058-119	Circuit Breaker, 1 Pole, 240VAC, 2A, 14kA, UL489, Type C	Square D: M9F42102	1 CB5	2
14	14 06-058-011	Control Relay, 3PDT,120VAC, 11Pin Spade, Indicator, Operator	Square D: RXM3AB2F7	5 CR1-5	1-5
15	15 06-058-012	Control Relay, Bus Jumper, 2-Pole, w/Telemec. RXM Relay	Square D: RXZ S2	4 CR1-5	1-5
16	38-058-003	Socket, 11 Pin Spade, Din, Screw Term., 3Tier, 250V w/3-Pole	Square D: RXZE2S111M	5 CR1-5	1-5
17	17 07-063-000	Distribution Block, End Cover, 4 Pole, 300V,10A, w/WK4E\U\VB	Wieland: 07.311.4053.1	1 DB1	1
18	18 07-063-001	Distribution Block, Jumper, 4 Pole, 300V,10A, w/WK4E\U\VB	Wieland: Z7.210.3427	3 DB1	1
19	19 07-063-002	Distribution Block, Single Pole, 10A, 300V, WK4E\U\VB	Wieland: 57.404.6955.1	10 DB1	1
20	20 42-063-004	Terminal Block, Ground, 30A, 600V, 6MM Wide, w/WK4/U	Wieland: 57.504.9055.0	1 DB1	1
21	21 09-001-A010	Disconnect Assembly, Non-Fused, 60 Amp, NEMA 4X, 8-10" Depth	ABB: OT63F3 Assembly	1 DS1	1
22	11-000-340	Enclosure Drip Shield, Stainless Steel, Per Inch	EleMech: 11-000-340	24 EN1	1
23	23 11-035-136	Sub-Panel, Painted Steel, w/36"Hx24"W C. Hinge Encl	Hoffman: A-36P24	1 EN1	1
24	24 11-035-226	Enclosure, Nema 4X, 304SS, 36"Hx24"Wx8"D, C. Hinge	Hoffman: A-36H2408SSLP	1 EN1	1
25	25 15-011-000	Ground Lug, 14AWG - 4AWG	Blackburn: L70	2 GND	D
26	26 16-052-005	Elapsed Time Meter, 6 Digit, Round, 3-Hole, NEMA 4X	Redington: 722-0004	2 HM1,2	11,2
27	27 16-052-006	Elapsed Time Meter, Gasket, NEMA 4X (Use w/722-0004)	Redington: 5003-011	2 HM1,2	11,2
28	17-451-000	Heater, Silicone, Flat, 120VAC, 75 Watts, w/12" Lead, UL/CSA	Tempco: SHS80707	1 HTR1	31
29	29 52-137-003	Label, Caution: Heater Element, 1.5"Wx0.75"H, White/Red	Nameplate Tech: 52-137-003	1 HTR1	31

Enviro-Care Flo-MultiRake / Compactor Control System Newark, DE

WEC220256A Rev. 0	ill of Material	EleMech S.O. EVC8265
\aleph	Bill	Ele

Item No Component	Description	Manufacturer Part Number	QTY Device
30 52-137-002	Label, Multiple Supply Sources, Warning, 2.5"Wx1.5"H, Yellow	Nameplate Tech: 52-137-002	1 LBL1
31 52-137-001	Label, High Voltage, Danger, 6.5"Wx3.5"H, White/Black/Red	Nameplate Tech: 52-137-001	1 LBL2
32 34-001-002	PM, 1/3PH, 110-500VAC, 0.5-5A, 2)SPDT, 120VAC	ABB: 1SVR 450 330 R0000	1 LM1
33 34-001-003	PM, 1/3PH, 110-500VAC, 2-20A, 2)SPDT, 120VAC	ABB: 1SVR 450 330 R0100	1 LM2
34 32-005-046	Lens, Pilot Light, White, NEMA 4X, Standard, w/A-B 800H	Allen-Bradley: 800T-N26W	1 LT1
35 32-005-048	Pilot light, NEMA 4X, 120VAC, Transformer, No Lens	Allen-Bradley: 800H-PR16	6 LT1-6
36 32-005-044	Lens, Pilot Light, Green, NEMA 4X, Standard, w/A-B 800H	Allen-Bradley: 800T-N26G	2 LT2,4
37 32-005-045	Lens, Pilot Light, Red, NEMA 4X, Standard, w/A-B 800H	Allen-Bradley: 800T-N26R	2 LT3,5
38 22-005-010	Aux. Contact, Top mounted, 3NO/1NC, w/A-B 100C/104C/300 Ser.	Allen-Bradley: 100-FA31	4 M1,2-F/R
39 22-005-012	Contactor, 3PH, Reversing, 9 Amp, 1NO Aux., 120VAC Coil	Allen-Bradley: 104-C09D22	1 M1-F/R
40 22-005-015	Contactor, 3PH, Reversing, 23 Amp, 1NO Aux., 120VAC Coil	Allen-Bradley: 104-C23D22	1 M2-F/R
41 25-000-A010	Nameplate Assembly, White, Black Text, 1"Hx3"W	EleMech: 25-000-A010 Assembly	3 NP1-3
42 28-005-081	Overload Relay, E100, Adj Class, 1.0-5.0A, w/100-C09 C23	Allen-Bradley: 193-1EFCB	1 OL1
43 28-005-082	Overload Relay, E100, Adj Class, 3.2-16A, w/100-C09 C23	Allen-Bradley: 193-1EFDB	1 OL2
44 29-005-117	Pushbutton, E-Stop, NEMA 4X, Oper+1NC, Twist Rel. Red Head	Allen-Bradley: 800H-TFRXT6D2	1 PB1
45 02-005-000	Contact Block, 1NO/1NC, w/A-B 800 Series	Allen-Bradley: 800T-XA	1 PB3
46 29-005-037	Pushbutton, NEMA 4X, Oper+1NC, Flush Head, Black	Allen-Bradley: 800H-AR2D2	1 PB3
47 30-183-000	Phase Failure, Voltage Monitoring Relay, 380-480VAC, 2 SPDT	Telemecanique: RM22TR33	1 PFR1
48 33-183-004	PR, Zelio, 120VAC, 12)120VAC In, 8)Relay Out	Telemecanique: SR2B201FU	1 PR1
49 EVC-274-P007	Program, PR, Zelio, SR2B201FU, Standard	EleMech: EVC-274-P007	1 PR1
50 13-000-A000	Spare Parts Box Assembly, Din Rail Mount	EleMech: 13-000-A000 Assembly	1 SP1
51 39-005-009	Selector Switch, NEMA 4X, 3 Pos. Maintained, 1NO-1NC	Allen-Bradley: 800H-JR2A	4 SS1,3,5,6
52 39-005-011	Selector Switch, Nema 4X, 3 Pos. Spring Fr. Right, 1NO-1NC	Allen-Bradley: 800H-JR5A	2 SS2,4
53 41-018-A100	Control Transformer Assembly, 480-120VAC, 300VA, w/C-Breaker	Cutler-Hammer: C0300E2A Assembly	1 T1,CB3,4
54 42-063-000	Terminal Block, Labels, Custom Printed, w/WK4/U	Wieland: 04.242.6353-CUSTOM	88 TB,DB
55 42-063-009	Terminal Block, End Clamp, w/WKN10/U	Wieland: Z5.522.8553	6 TB,DB
56 42-063-008	Terminal Block, Labels, Blank, w/WK4/U-(600 tags per box)	Wieland: Z4.242.6353	22 TB1
57 42-063-015	Terminal Block, Jumper, w/WK4/U, 02 pole, Insulated	Wieland: Z7.281.1227	2 TB1
58 42-063-001	Terminal Block, End Plate, Gray, w/WK4/U	Wieland: 07.311.0155.0	2 TB1,2
59 42-063-003	Terminal Block, Single Pole Gray, 30A, 600V, 6MM Wide, WK4/U	Wieland: 57.504.0055.0	43 TB1,2

Enviro-Care Flo-MultiRake / Compactor Control System Newark, DE

Bill of Material EleMech S.O. EVC8265

WEC220256A Rev. 0

Item No	Item No Component	Description	Manufacturer Part Number	QTY	QTY Device
09	60 46-034-000	Thermostat, for heater control, N.C.contact, 6 amp, 30-140 F.	Stego: 01140.9-00	1	1 TS1
LCS, 1 Hc	ile, NEMA 4X, 30	LCS, 1 Hole, NEMA 4X, 304SS, E-Stop, C1D2 (Quantity: 1)			
61	61 11-035-045	Enclosure, NEMA 4X, 304SS, 04"Hx04"Wx03"D, Clamp Jct. Box	Hoffman: A-404NFSS	1 1	1 LCS1
62	62 02-005-008	Contact Block Sealed, Stackable, 1NC - 1NO, w/A-B 800 Series	Allen-Bradley: 800T-XAY	1 PB	Bc Bc
63	63 25-000-A001	Legendplate Assembly, Yellow E-Stop, Standard Encl.	EleMech: 25-000-A001 Assembly	1 PB	В
64	64 29-005-118	Pushbutton, E-Stop, NEMA 4X, Oper. Only, Twist Rel. Red Head	Allen-Bradley: 800H-TFRXT6	1 PB	В
Spare Pa	rts / Ship Loose	Spare Parts / Ship Loose (Total Quantity Provided)			
9	65 49-043-025	ULC, Pointek, Polycarbonate, CSA Class I Div.II Zone 2	Siemens: 7ML15103JE02	1 (1 ULC
99	66 61-000-012	Labor, Engineering, Submittal, Schematics, BOM	EleMech: 61-000-012	1 (1 CRATE



SCREEN COMPACTOR WEC220256AB NEWARK, DE EVC8265 SPECIFICATION REFERENCE

TABLE OF CONTENTS	NTS
DESCRIPTION	DRAWING SHEET NO.
COVER PAGE	EVC8265A1
CONTROL PANEL SPECIFICATION	EVC8265A2
ELECTRICAL SCHEMATICS	EVC8265A3
FIELD WIRING DIAGRAM	EVC8265A7
PR 10 & DEVICE SETPOINTS	EVC8265A8
SEQUENCE OF OPERATION	EVC8265A9
ENCLOSURE LAYOUT	EVC8265A10

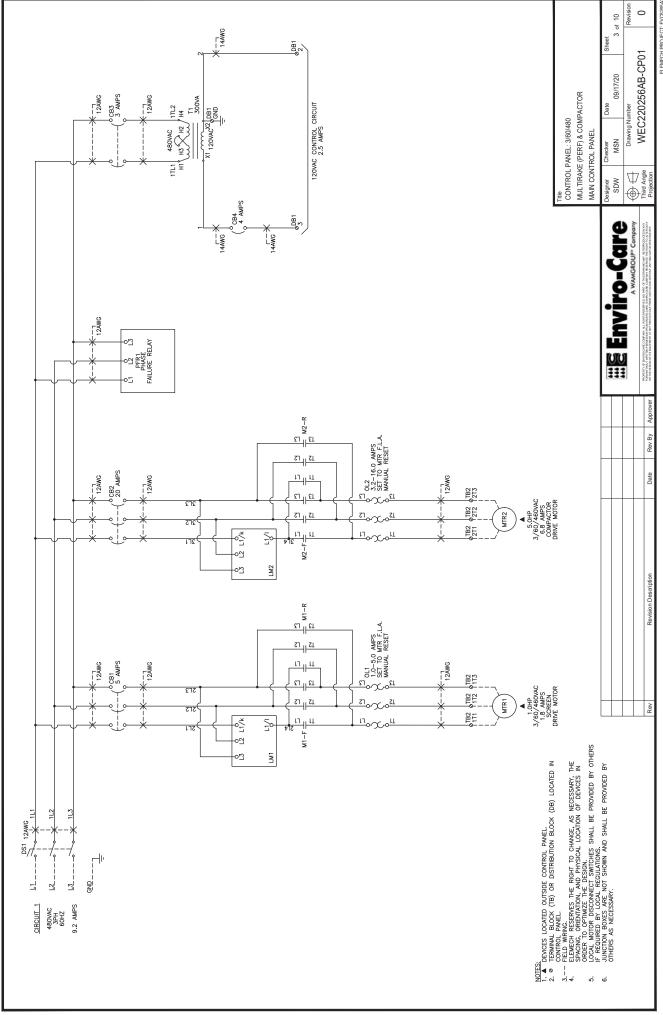
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☐ REJECTED ☐ REVISE AND RESUBMIT
BY:
DATE:

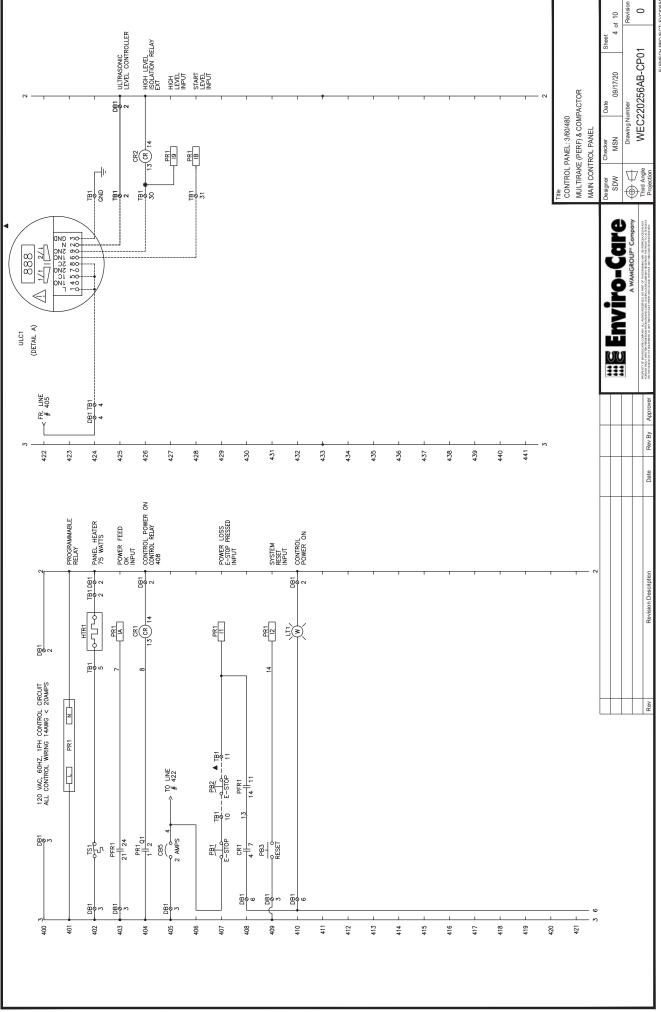
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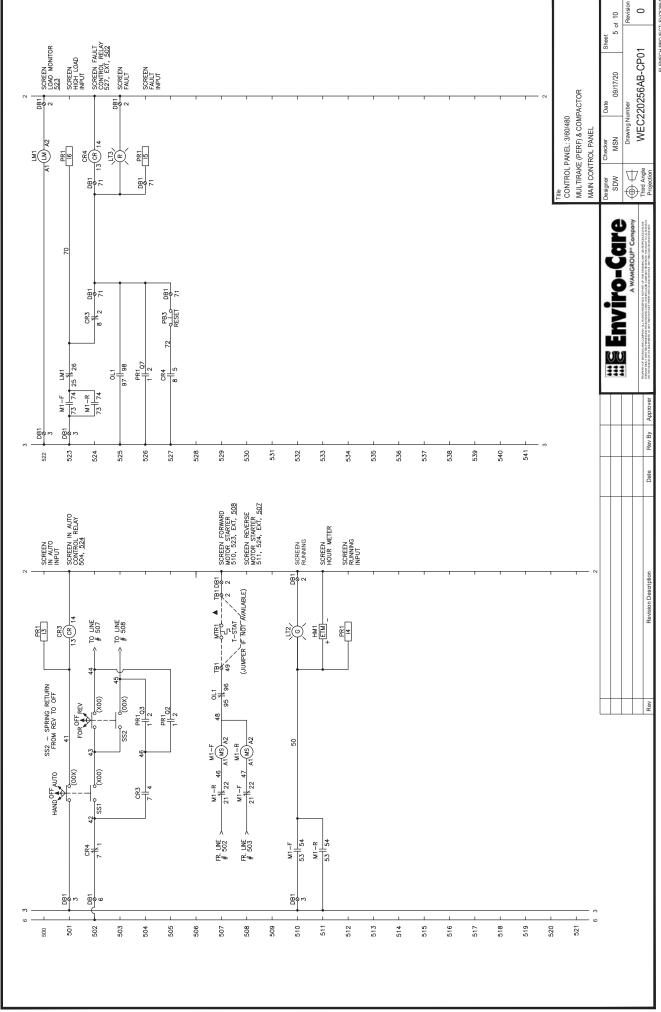
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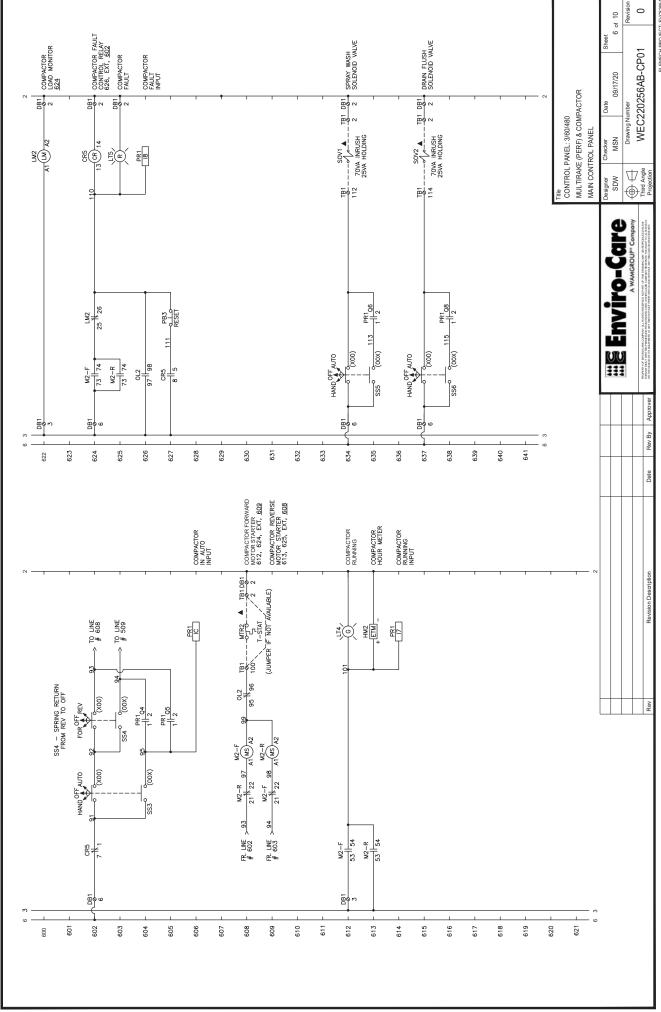
ELEMECH PROJECT: EVC8265A1	ELEMECH PRO.							
,			Projection	COMMINIOUT WITTON TOMASTANTON DIAZIOCAME, EMPROCAME CAMPONINGE MY TREETINGS THE MAINT TO ALTER DAY OR LOSS OF THE DESCRIPTION WHY TO SELVEN THE WITHOUT PROCENDICEAND WHY OLD MY TO GALGATION WHY TO SELVEN.	Approver	Rev By	Date	Revision Description
C	WFC220256AB-CP01		7 §	SOURCE OF THE STATE OF THE STAT				
Revision	umber	Drawing Number	#					
1 of 10	09/17/20	MSN	SDW					
+	Date Sheet	Checker	Designer	•				
		MAIN CONTROL PANEL	MAIN CON					
	MPACTOR	IULTIRAKE (PERF) & COMPACTOR	MULTIRAK					
	0	Title CONTROL PANEL: 3/60/480	Title CONTROL					
		Status: FOR APPROVAL	Status: FOF	Project Information				

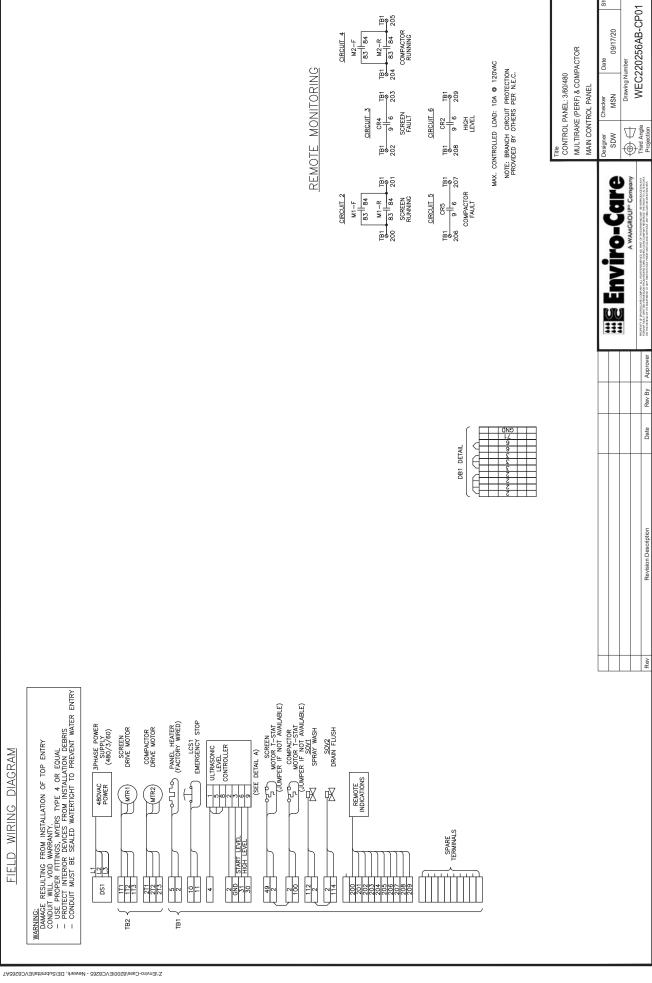
Control Panel Enlcosure			Local Enclosure				
Rating:		NEMA 4X	Tag: LCSI Rating:	NEMA 4X CID2	Material:	304 SS	
Material:		304 SS					
Disconnect Type:		Door Interlock - Non-Fused	Power and Motor				
X Condensation Heater			Power Feed:	97 EIA SCCB	EAIC	480	ZVA
Installation Conditions:			0001	LEA SCCN			2
☐ Indoor - Unconditioned	ditioned	☐ Indoor - Conditioned	Jata:	¥ 14		9	
Outdoor - Direct Sunlight	t Sunlight	X Outdoor - Shaded	1 : 480	FLA		FVK	
Environment Max Temperature Rating (°F):		110	Motor 2 : 480 VAC	6.8 FLA 5.0	HP Controller:	FVR	
Internal Device Max Temperature Rating (°F):		122	Networking				
Climate Control Type:		None Required	Communication Type:			N/A	
Panel Construction			Subnet: N/A	Gateway:	ay:	N/A	
Contiguotion		111 508 A	IP Address:				
Celulication:		AGT			Z	N/A	
Listing Serial Number:		TOTAL	Programming:				
Options: X Phase Failure Relay			PR1: Zelio SR2B201FU	Software: Ze	ZelioSoft	Version: La	Latest
			Notes: 1. PR shall be programmed with ladder type only.	dder type only.			
Nameplates and Legendplates:		SE SERVICIONES TRANS					
Material Type:		Thermal Printed					
Attachment Type:		Adhesive	Instrumentation				
Colors:	Background:	White Text: Black	Tag: ULC1	Cable Length:	ţth:	N/A	
Wire/ Cable Type: Wiring to be 14 AWG unless otherwise	Wire Color: Black - Power	Wire Labels: X Adhesive, Self-laminating X Adhesive, Self-laminating X X X X X X X X X	Rating: Non-Hazardous X Class I, Division;	☐ Intrinsically Safe Class 1 Division 1,2 ☐ Class 1 Division 1,2	lass 1 Division 1,2		
specified. 16 AWG minimum. Wire shall be MTW type, tinned copper, 600VAC, 105°C, UL1015/CSA.	Black - 120VAC Hot White - 120VAC Neutral Red - 120VAC Control Yellow - Foreign Voltage Green - Ground Blue - DC Positive White/Blue - DC Negative	☐ Heat Shrink					
	Note: Colors based on UL508A requirements.	98A					
					THE CONTROL PANEL: 3/60/480 MULTIFAKE (PERF) & COMPACTOR MAIN CONTROL PANEL	760/480 & COMPACTOR VEL	
					Designer Checker	Date	Shee
					Ξ	wing Number	2 0 2
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NGS	FACTORY FIELD 2 FITING 2 FITING 3 FITING 1 8.0FT 1 2 2 2 2 2 2 2 2 1 1 1 N THE FIELD.	Trie CONTROL PANEL: 3/80/480 MULTIRAKE (PERF) & COMPACTOR MAIN CONTROL PANEL	Designer Checker Date Sheet SDW MSN 09/17/20 8 of 10 Annual of the control of t	256AB-CP01	. ELEMECH PROJECT: EV C828548
DEVICE SETTINGS	NUCTION FUNCTION NUMBER DESCRIPTION NUMBER D		≣ Enviro-Care	А WAMGROUP® Company поставляется выпасоваться и в внесоздаться гороногости поравить по трановить ши в внесоздаться гороногости по трановить по трановить внесоздаться с поставляется в поставляется и в поставляется в	
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SEQUENCE OF OPERATION

FSM MutiRake Screen MODES OF OPERATION;
HAND.
Screen Selector is in the HAND position, the Screen will operate per Screen FOR-OFF-REV selector. The Screen Will spring return from REV to OFF.

When the Screen selector is in the AUTO position, the Screen will start to run when the fliquid level reaches the start level or high level set-point, as determined by the Ultrasoric Level Controller. The Screen will continue to run after the figuid level falls below the start level set-point, for the time set in the Screen Level Off-Deloy Timer. AUTO:

The Screen will also cycle ON and OFF per the settings of the Screen Repeat Cycle immer (adjustable). The Screen Repeat Cycle immer is provided for 3 possible reasons: 1) To keep the Screen operating periodically in low flow situations 2) in case there is a failure with the ULC. In one weather conditions, to keep the screen operating periodically to prevent the screenings from freezing.

Notes:

1. Any run of the Screen will reset the Screen Repeat Cycle Timer.

2. Perssing and holding the System Reset pushbutten for 3 seconds will initiate Screen Run cycle if the Screen selector is in the AUTO position.

Compactor Modes of Operation:
HAND.
HAND.
Compactor Selector is in the HAND position, the Compactor will operate per the
Compactor FRE-RFL selector. The Compactor will spring return from REV to OFF.

When the Compactor selector is in the AUTO position, the Press will operate per the MASH CYCLE AUTO SEQUENCE detailed below

Spray Wash Modes of Operation:

5 the Spray Wash selector is in the HAND position, the Sray Wash will When the Spray Wash selector is in the AUTO position, the Spray Wash will operate per the WASH CYCLE AUTO SEQUENCE detailed below.

Mash Cycle Auto Sequence:

A Compactor Wash Cycle will be initiated once the screen has run for an accumulated run time (adjustable-SCREIN ACCUMULATED RUN TIME). Once a Wash Cycle is initiated, the Compactor will run forward for the time rese in the Compactor will run forward for the time rese to the Compactor Initial Run Timer. Once the Compactor Initial Run Timer is complete, the Compactor will run forward for the time set in the Compactor Forward Run Timer, then dwell for the time set in the Compactor Forward—Dwell run completes one Compactor Wash Wash Repeat Cycle Timer (10 Vi time first). The Compactor will run per the Sproy Wash Repeat Oycle Timer (10 Vi time first). The Compactor will complete the number of Forward—Dwell cycles set in the Compactor Wash Cycle Counter.

Once the Compactor has completed the set number of cycles, the Compactor will run continuously forward for the time set in the Compactor Discharger Thren: Once the Compactor Discharger Thren: Compactor Discharger Thren: Fochies its set-point, the Drain Flush Solemid Volve will set for the time set in the Drain Flush Thren: Once the Drain Flush Solemid Volve closes; the Compactor/Veah Cycle will be complete.

Notes:

1. If the Spray Wash Repeat Cycle ON Timer setting is greater than the combined time of the Forward-Dwell cycle, the Spray Wash Solenia Valve will remain open.

Optional Reverse wash cycle. (for high fecal loads requiring extra washing):
If the Optional Reverse wash cycle is enabled, then the Compostor will run in reverse and refer the forward dwell for the time set in the Compactor Reverse Run Timer, and dwell for the time set in the Compactor Reverse Run Timer, and the count of the time set in the Compactor Reverse Thank of the the Compactor forward for the time set in the Compactor Forward Run Timer and dwell for the time set in the Compactor Forward Am Timer and dwell for the time set in the Compactor Forward -Dwell—Reverse—Dwell completes one Wash Cycle.

3. IMPORTANT: While running the Optional Reverse wash cycle, the Compactor Forward Dwell Timer should never be set to zero.

EMERGENCY STOP:

if the Emergency Stop (E-Stop) pushbutton is pressed, the Screen, Compactor, Sproy Wash, and Drain Flush will stop immediately. To reset, pull out the E-Stop pushbutton and press the System Reset pushbutton.

SEQUENCE OF OPERATION

ESM MultiRake Screen FAULTS/Resets;

1. A fault occurs when the Screen Load Monitor is tripped when the Screen is operating in HAND mode. The Screen will stop immediately, and the Screen Fault light will be illuminated.

Reset: Push the System Reset button.

A fault occurs when the Screen Motor Thermostat (if supplied) is tripped. The Screen will stop immediately.

Reset: Foult 2 resets automatically when the Screen Motor returns to a safe imperature. 5.

The

3. A fault occurs when the Screen Load Monitor detects high current while operating in the FORWARD or REVERSE direction in AUTO mode. The Screen will attend to clear the obstruction (cimn) automatically: the Screen will stop, dwell, and then run in REVERSE for the time set in the Screen Reverse Run Times. The Screen will then stop, dwell, and resume TORWARD operation. If high current is no longer detected, the Screen shall automatically reset and resume normal operation. If high current in FORWARD persists, the SIOP—DWELL—FORWARD process (Jam Cycle Will repeat. The Screen will attempt to clear the Jam by repeating the Jam Cycle for the number of intense set in the Jam Cycle Counter (Factory Detault Setting is 3). If high current in FORWARD direction persists, or if Motor Starfer Thermal Cherical and the Screen Foult light will be illuminated. m.

<u>Compactor FAULTS/Resets:</u>
1. A fault occurs when the Compactor Load Monitor is tripped. The Compactor will stop Reset. Push the System Reset button.

- A fault occurs when the Compactor Motor Starter Thermal Overload is tripped. The Compactor will stop be immediately, and the Compactor Audi light will be illuminated. Resett, Past the Reset pushbutton on the Compactor Motor Starter Thermal Overload located inside the control panel. Unless entry into the control panel is being performed by a qualified electrician, the control panel power should be shut off prior to entry.
- . A foult occurs when the Compactor Motor Thermostat (if supplied) is tripped. The Compactor will stop immediately.

 Resett Fould 3 resets automatically when the Compactor Motor returns to a safe traperfound.

MULTIRAKE (PERF) & COMPACTOR CONTROL PANEL: 3/60/480 MAIN CONTROL PANEL

Designer	Checker	Date	Sheet	
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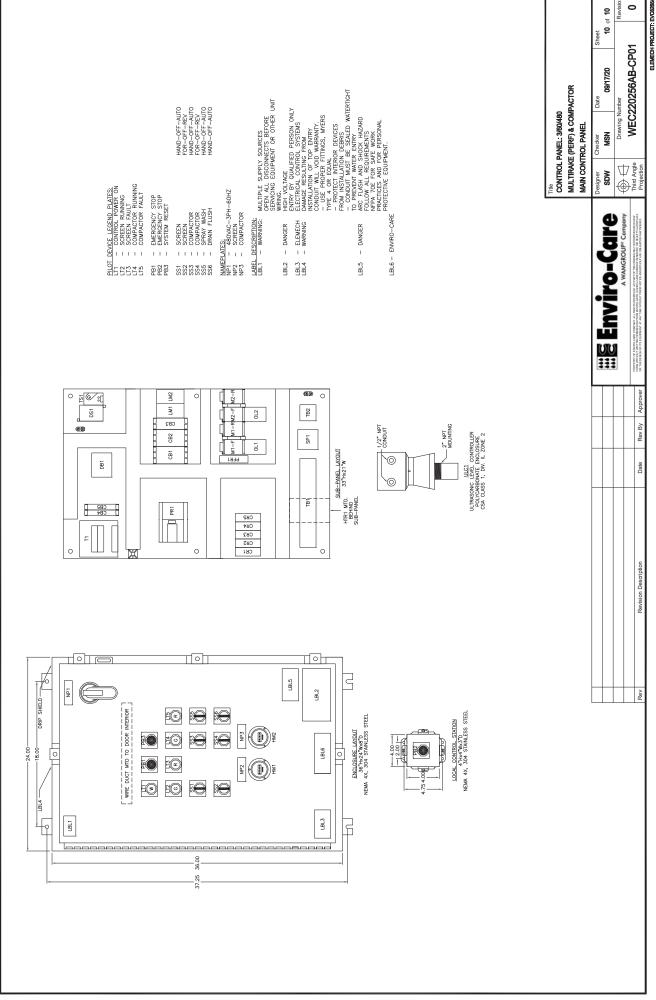
Enviro-Care

Rev By

Date

Revision Description

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Appendix B2 -

Biological Process

Trains 3-6

Dutchland Incorporated (Bassett)

PROCESS DESIGN REPORT

Artesian SRRF Phase 2 & 3

WASTEWATER TREATMENT PLANT

September 2024

MANUFACTURER



ENGINEER



Bassett Engineering Inc.

1440 Broad Street Montoursville, PA 17754-2510

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INTRODUCTION

The water reclamation facility has been designed to process a Design Flow of 1,250,000 gpd of domestic wastewater with peak flows of 1,600,000 gpd. The wastewater treatment process will be the Hybrid Bardenpho biological nutrient removal process with UV disinfection and aerated sludge holding. Dutchland, Inc. of Gap, PA, will manufacture the structures using precast 5,000-psi concrete with 10-inch thick walls and 16-inch thick bases. The wastewater treatment facility will consist of the following unit processes:

- Biological Reactor
- Clarifier
- UV Disinfection
- Sludge Holding

This Process Design Report is written as a continuation of Phase 1 which consisted of a two-train plant designed to process a design flow of 625,000 gpd of domestic wastewater. Phases 2 & 3 are each identical in design to Phase 1, the only exception being that Phase 3 is mirrored across an east-west axis from Phase 2. Each phase is referred to herein as a "train-pair" as it is two trains constructed common-wall.

ANTICIPATED INFLUENT WASTEWATER CHARACTERISTICS

gpd < or =	1,250,000 gpd = (1.25 MGD)
$BOD_5 < or =$	400 mg/l = 4,170 lbs/d
TSS < or =	450 mg/l = 4,692 lbs/d
TKN < or =	70 mg/l = 730 lbs/d
pH =	6.0 – 9.0 S.U.
TP < or =	9.0 mg/I = 93.8 lbs/d

Note: The gpd and influent wastewater characteristics are maximum monthly but are calculated as average daily.

ANTICIPATED EFFLUENT WASTEWATER CHARACTERISTICS (MONTHLY AVERAGE)

$BOD_5 < or =$	10 mg/l
TSS < or =	10 mg/l
Nitrogen < or =	10 mg/l
Phosphorus < or =	8 mg/l

REFERENCE TABLE

<u>Abbreviation</u>	Full Term	<u>Units</u>
TKN	Total Kjeldahl Nitrogen	mg/l or lbs/d
MGD	Million Gallons per Day	
TSS	Total Suspended Solids	mg/l or lbs/d
BOD₅	5-Day Biochemical Oxygen Demand	mg/l or lbs/d
TP	Total Phosphorus	mg/l or lbs/d
gpd	Gallons per Day	
mg/l	Milligrams per liter	
lbs/day or #/d	Pounds per Day	
mpn/100ml	Most Probable Number of bacteria per 100ml	
cf	Cubic Feet	
sf or sq. ft.	Square Feet	
CFM	Cubic Feet per Minute	
WAS	Waste Activated Sludge	
RAS	Return Activated Sludge	
TWAS	Thickened Waste Activated Sludge	
SRT	Solids Retention Time	Days
MLSS	Mixed Liquor Suspended Solids	mg/I or lbs/d
MLVSS	Mixed Liquor Volatile Suspended Solids	mg/I or lbs/d
HRT	Hydraulic Retention Time	Hours
SOR	Surface Overflow Rate	gpd/sf
psi	Pounds per Square Inch	
SWD	Side Water Depth	ft
SLR	Solids Loading Rate	lbs/d/sf

BIOLOGICAL REACTOR

The Biological Reactor's primary functions are to reduce biochemical oxygen demand (BOD), advance nitrification, the process by which Total Kjeldahl Nitrogen (TKN, the sum of organic nitrogen and ammonia) is oxidized into nitrite and then nitrate, and reduce phosphorus concentrations. The treatment process to be implemented is the Hybrid Bardenpho process.

The Hybrid Bardenpho is a plug-flow BNR process which is designed to remove phosphorus and nitrogen biologically. The Hybrid is an adaptation of the 5-stage Bardenpho process: both have, in series, an Anaerobic Zone, a First Anoxic Zone, an Oxic Zone, a Second Anoxic Zone, and a Reaeration Zone. The Bardenpho process incorporates Return Activated Sludge (RAS) pumping from the Secondary Clarifier underflow to the First Anoxic Zone in the reactor. It also includes Nitrate Recycle pumping from the end of the Oxic Zone to the First Anoxic Zone. The Hybrid adds a Mixed Liquor Recycle from the end of the First Anoxic Zone to the head of the Anaerobic Zone. This significantly enhances biological phosphorus removal. It also greatly improves sludge settleability and clarifier performance. The Hybrid Bardenpho is otherwise identical to the 5-Stage Bardenpho, including the high degree of flexibility to operate many other plug-flow BNR process configurations.

			Artesian	SRRF BNR R	eactor Volu	mes			
Hybrid Bardenpho	Min. HDT (hr)	Actual HDT (hr)	Total Volume (gal)	Effective Volume (gal)	Effective Vol/Train (gal)	Effective Vol/Train (cf)	Side Water Depth (ft)	Width (ft)	Length (ft)
Anaerobic	1.5	1.64	96,042	85,372	21,343	2,853	16	20	8.92
An	1.5	1.64	96,042	85,372	21,343	2,853	16	20	8.92
First Anoxic	4.5	4.58	268,382	238,562	59,640	7,973	16	20	24.92
Ax-1	1.5	1.53	89,760	79,786	19,947	2,667	16	20	8.33
Ax-2	3.0	3.05	178,622	158,776	39,694	5,307	16	20	16.58
Oxic	14.4	14.71	861,696	765,952	191,488	25,600	16	20	80.00
Ox-1	2.4	2.45	143,616	127,658	31,915	4,267	16	20	13.33
Ox-2	4.8	4.89	286,334	254,520	63,630	8,507	16	20	26.58
Ox-3	7.2	7.37	431,746	383,774	95,943	12,827	16	20	40.08
Second Anoxic	3.0	3.03	177,724	157,978	39,494	5,280	16	20	16.50
Ax2-1	3.0	3.03	177,724	157,978	39,494	5,280	16	20	16.50
Reaeration	0.25	0.29	17,166	15,260	3,815	510	15.48	4.5	7.08
RA	0.25	0.29	17,166	15,260	3,815	510	15.48	4.5	7.08
Total	23.7	24.2	1,421,010	1,263,125	315,780	42,220			130

Summary of Modeling Results:

<u>Parameter</u>	Permit Limit	Performance
TSS	10 mg/L	6.8 mg/L
CBOD ₅	10 mg/L	2.6 mg/L
TP	8 mg/L	1.3 mg/L
TN	10 mg/L	4.9 mg/L

^{*}See Appendix A for full BioWin Modeling results.

Calculations:

BOD Removal:

Pounds of BOD₅/1000 cf of effective aeration capacity:

 $\frac{102,400}{1,000}$ cubic feet in aeration = 102.4 x 1,000 cu. ft 1,000

4,170 lbs BOD₅ x
$$\frac{1}{102.4}$$
 = 40.7 lbs BOD/1,000 cf of aeration

Reactor Train-Pair Hydraulic Calculations Summary:

Port Size	Height (ft)	Width (ft)	Area (sf)	C =	Ideal Split
Α	1.00	1.50	1.50	0.60	50/50
Port Size	Height (ft)	Width (ft)	Area (sf)	C =	Ideal Split
В	0.50	0.50	0.25	0.60	90/10

Flow Scenario 625,000 gpd Reactors 2

		Baffle F	low Split			
	Flow (gpd)	Over (%)	Under (%)	H (ft)	WSE	TOW Elev.
AN-1	950,000	41%	59%		43.04	
Baffle				0.01453		42.98
AX-1	2,512,500	53%	47%		43.03	
Baffle				0.06421		42.92
AX-2	1,887,500	100%	0%		42.96	
Baffle				0.13085		42.83
OX-1	1,887,500	48%	52%		42.43	
Baffle				0.04360		42.35
OX-2	1,887,500	48%	52%		42.39	
Baffle				0.04360		42.30
OX-3	1,887,500	86%	14%		42.35	
Baffle				0.11777		42.19
DEOX (Pipe)	637,500	-	-	0.17500	42.23	
2nd AX	637,500	100%	0%		42.05	-
Baffle				0.05315		41.96
RA- Clar Pipe	637,500	-	-	0.07118	42.00	-

0.71389 1.11231

^{*}See Appendix C for full Clarifier Hydraulic Calculations.

Air Required (from BioWin):

		Su	mmary	- Artesian SRRF E	BNR Rea	ctor Air Deman	ıd	
<u>Zone</u>		per Zor tor, (SC		No. of Diffuse	ers	Diff. Density	Taper	Zone
	MAX	MIN	AVG	Per Reactor	Total	Dill. Delisity	Тарег	20116
0x-1	180	130	160	107	214	8.19%	27.6%	Ox-1
Ox-2	270	190	250	167	334	6.42%	43.1%	Ox-2
Ox-3	200	150	170	114	228	2.90%	29.4%	Ox-3
Totals	650	470	580	388	776		100.0%	Totals

Air Pressure Required: 16.0 ft. SWD x $\frac{1 \text{ psi}}{2.31 \text{ ft.}}$ = 6.9 psi Allow for pressure losses – use 8.0 psi 2.31 ft.

Total aeration = 1,300 CFM @ 8 psi $\frac{1,300 \text{ CFM}}{51.2} = \frac{25.4 \text{ CFM}}{1,000 \text{ cf}}$ <**OK>**

CLARIFIERS

Number of Clarifiers: 4

Dimensions of each chamber: 51 ft. 0 in. L x 20 ft. 0 in. W x 18 ft. 0 in. D

Surface Area = 1,000 sf. each = 4,000 sf total

Side Water Depth (SWD): 16 ft. 0 in. Freeboard: 2 ft. 0 in.

Total volume: 538,560 gallons Effective volume: 478,720 gallons

Mixed Liquor will flow through a 12-inch PVC transfer port to the clarifier, through a baffled inlet that will dissipate the inlet velocity and prevent short-circuiting of the mixed liquor. The concrete baffle stops below the working water level in the clarifier, and extends down close to the clarifier bottom. The total and effective volumes of the clarifier are slightly lower than the volumes calculated by the overall dimensions due to the volume occupied by the baffle wall. Additionally the functional surface area of the clarifier is slightly lower than the overall tank surface area due to the area occupied by the baffle wall.

Each clarifier chamber will contain two hoppers, each with a side slope of approximately 60°. Separation occurs within the clarifier, after which sludge will settle at the bottom and be scraped back to the hopper. Two 2-inch air lift WAS/RAS pumps will remove settled sludge from the clarifier and either return it to biological reactors or waste it to the sludge holding chamber. Clear supernatant will overflow from the top to the clarifier effluent pipe after the weir trough (launder).

One scum skimmer assembly will be provided for the chamber, which will consist of an 8-inch diameter stainless-steel pipe (as detailed), which is used to draw off scum. The skimmer assembly will be connected to a 3-inch air lift pump which will pump the skimmed water to the sludge holding chamber.

Each clarifier will be provided with mechanical chain-and-flight sludge and scum scrapers that will push scum downstream towards the scum skimmer pipe and will push sludge back to the sludge hoppers located at the influent end of the clarifier. Each clarifier will contain one adjustable stainless-steel effluent v-notch weir trough. The supernatant will flow over the weir into the trough. An integral stainless-steel scum baffle will be affixed to the weir trough to keep floating material from entering the weir trough before being skimmed off. The weir trough will be equipped with adjustable slide gates to adjust the liquid level in the clarifier and aeration. Each weir trough will have 19.67 linear feet of weir for liquid overflow on each side, for a total of 39.33 linear feet.

Calculations:

Surface Overflow Rate:

Design Average Surface Overflow Rate (SOR) = 300 gpd/sf

Desired Surface Area: $\underline{1 \text{ sf}}$ x $\underline{1,250,000 \text{ Gallons}} = 4,167 \text{ sf}$

300 gpd D

Provided Surface Area: = 4,000 sf <**OK>**

Actual Average Surface Overflow rate: $\frac{1,250,000 \text{ gpd}}{4,000 \text{ sf}} = 313 \frac{\text{gpd}}{\text{sf}} \approx 300 \frac{\text{gpd}}{\text{sf}}$ **<Within the margin** of error>

Design Peak Surface Overflow Rate (SOR) = 600 gpd/sf

Desired Surface Area: $\underline{1 \text{ sf}}$ x 1,600,000 $\underline{\text{Gallons}}$ = 2,667 sf

00 gpd Da

Provided Surface Area: = 4,000 sf **<OK>**

Actual Peak Surface Overflow rate: <u>1,600,000 apd</u> = 400 <u>apd</u> < 600 <u>apd</u> < **OK>**

4,000 sf sf s

Solids Loading Rate:

Design Factors:

MLSS design = 2,500 mg/l

Assume RAS Flow = 100% of design influent flow to clarifier

Combined flow = 1,250,000 MGD x (1.0+1.0) = 2,500,000 gpd = 2.5 MGD

SLR = 2,500,000 <u>Gallons</u> x <u>8.34 lbs</u> x <u>2,500 parts</u> x <u>1</u> = 13.03 lbs/day/sf **<OK>** Day Gal 10^6 parts 4,000 sf

Air Pressure Required: 16.0 ft. SWD x $\frac{1 \text{ psi}}{2.31}$ = 6.9 psi 2.31 ft.

Allow for pressure losses – use 8.0 psi

_..__

Air Required: 4 surface skimmer airlift pumps @ 10 CFM ea. = 40 CFM @ 8 psi

Total Air Required = 40 CFM @ 8 psi

Clarifier Weir Calculations:

*See Appendix C for full Clarifier Hydraulic Calculations.

Total How (cfs)
length (ft)
Spacing (ft)
Notches
Angle (Degrees)
How per Notch (cfs)
Headloss (ft)

Avg	Peak	Min
1.0056	1.2640	1.1990
39.3	39.3	39.3
0.33	0.33	0.33
118	118	118
90	90	90
0.00852	0.01071	0.01016
0.1022	0.1120	0.1097

SLUDGE HOLDING

Number of Sludge Holding Chambers: 2

Side Water Depth (SWD): 16 ft. 0 in. Freeboard: 2 ft. 0 in.

Total volume: 505,348 gallons Effective volume: 449,198 gallons = 60,052 cf

Sludge will enter the aerated sludge holding chamber when sludge is wasted from the clarifier. The operator will periodically remove sludge from the clarifier by closing the return sludge ball valve, and opening the waste sludge ball valve.

The sludge holding chamber will be aerated cyclically, with air being turned off to:

- Waste sludge,
- To settle and decant clear supernatant thickening the sludge,
- And to denitrify.

Cyclical aeration involves turning the air on and off, typically on for a few hours and off for about half that time. The sludge will turn anoxic and denitrify while air is off. Once the operator turns off the air in the sludge holding chamber, the solids will begin to settle and the supernatant will be left on top.

24" SS coarse bubble diffusers will provide air to the sludge and maintain residual dissolved oxygen. Each SS diffuser will be capable of providing 5 to 40 CFM.

Calculations

Days of Sludge Storage: Design Factors:

- a. Daily flow = 1,250,000 gallons per day = 1.25 MGD
- b. Biological Reactor Volume = 1,263,120 gallons
- c. Sludge tank volume with 30 day storage
- d. Influent $BOD_5 = 400 \text{ mg/l} = 4,170 \text{ lbs/days}$
- e . MCRT = 30 days
- f. MLSS = 2,500 mg/l
- g. MLVSS = 80% of MLSS (assumed) = 2,000 mg/l

h. Lbs. of MLVSS in aeration:

2,000 parts of MLVSS x 8.34 lbs x 1,263,125 gallons = 21,069 lbs.
$$10^6$$
 Parts gallon

Food/Microorganism ratio (lbs):

4,170 lbs of BOD x (1) =
$$0.198 \frac{\text{lbs BOD/day}}{\text{lbs MLVSS}}$$

Sludge Wasting required to maintain constant sludge, age of 30 days:

$$21,069 \underline{\text{lbs. MLVSS}} = 702 \text{ lbs/day WAS (of volatile solids)}$$
 30 day SRT

i. WAS wasted to SHT daily:

j . Thicken from 2,500 mg/l TSS in Aeration to 1.5% = 15,000 mg/l MLVSS in Sludge Holding Gallons of Thickened Sludge:

42,086 gallons x
$$2,500$$
 mg/l TSS WAS = 7,017 gpd TWAS Day 15,000 mg/l TSS TWAS

k. Volume required with 30 days of storage:

Volume provided = 449,198 gallons

I . Air Pressure Required: 16.0 ft. SWD x $\frac{1 \text{ psi}}{2.31 \text{ ft.}}$ = 6.9 psi 2.31 ft.

Allow for pressure losses – use 8.0 psi

Air required:
$$60,052 \text{ cf x } \underline{30 \text{ CFM}} = 1,800 \text{ CFM } @ 8 \text{ psi} \\ 1,000 \text{ cf}$$

AERATION BLOWER AND AIR (CFM) REQUIRED

Four aeration blowers will be utilized for each train-pair of this wastewater treatment plant.

- 1. Aerate the Oxic Zones and Reaeration Zone of the Biological Reactor.
- 2. Aerate Sludge Holding Tank.
- 3. Air lift return/waste activated sludge pumping from the Secondary Clarifier.
- 4. An installed spare large enough to serve the demands of the largest of the other blowers (oxic).

Proposed Equipment (List of Blowers/Motors)

		Airflow	Pressure	Variable
Process		SCFM	psi	(Y/N)
Blower 1				
Biological Reactor		1,300	8	Υ
	Subtotal Blower 1	1,300	8	MAX
Blower 2				
Biological Reactor		1,260	8	Υ
Clarifier		40	8	N
	Subtotal Blower 2	1,300	8	MAX
Blower 3				
Sludge Holding		1,800	8	Υ
	Subtotal Blower 3	1,800	8	MAX
	TOTAL Aeration Demand	4,400	8	MAX

FUNCTIONALITY DESCRIPTION OF BLOWER MOTOR CONTROLS

Electrical controls for the plant blower motors will be provided within one or more control panels. Controls will include: motor circuit breakers, across-the-line magnetic motor starters for constant-speed blowers, variable frequency drives (VFD's) for variable-speed blowers, and motor thermal overload protection. The panel(s) will control the operation of all plant blower motors, including starters, VFD(s), on-off breakers, indicator lights, and elapsed time meters. The control panel(s) will include multiple twenty-four hour time clock(s) adjustable to 15-minute time increments to permit automatic operation of each motor throughout the day. A three-position "hand-off-auto" (H-O-A) selector switch will be installed for each motor, to allow the motors to operate either on a continuous run basis or according to the cycle established by setting the time clock.

The aeration blower for the reactor will be powered by a variable frequency drive, allowing the air flow rate to be adjusted automatically. A dissolved oxygen probe will be provided and configured to control the VFD. The operator will input a DO setpoint, and the VFD will increase and decrease the blower speed as needed to maintain a constant DO concentration. A cycle time function will also be provided. At periods of very low oxygen demand, the blower capacity may exceed even the minimum oxygen demand. The timer will turn the VFD off for a time, which the operator will be able to adjust. If at the end of this variable time period DO has fallen below the setpoint, the controller will turn the aeration blower back on at the minimum speed.

SUSSEX REGIONAL RECHARGE FACILITY (SRRF) WASTEWATER TREATMENT PLANT MECHANICAL DRAWINGS FOR PHASE 2 & 3 1,250,000 GPD WWTP EXPANSION

SUSSEX COUNTY, DELAWARE

OWNER:

ARTESIAN WASTEWATER MANAGEMENT, INC.

664 CHURCHMANS ROAD NEWARK, DE 19702

ENGINEER:

BASSETT ENGINEERING, INC.

1440 BROAD ST.

MONTOURS VILLE, PA 17754



Engineered Concrete Environmental Solutions

160 Rt. 41 - Gap, PA 17527 Ph. 717-442-8282 Fax 717-442-9330 www.dutchlandinc.com

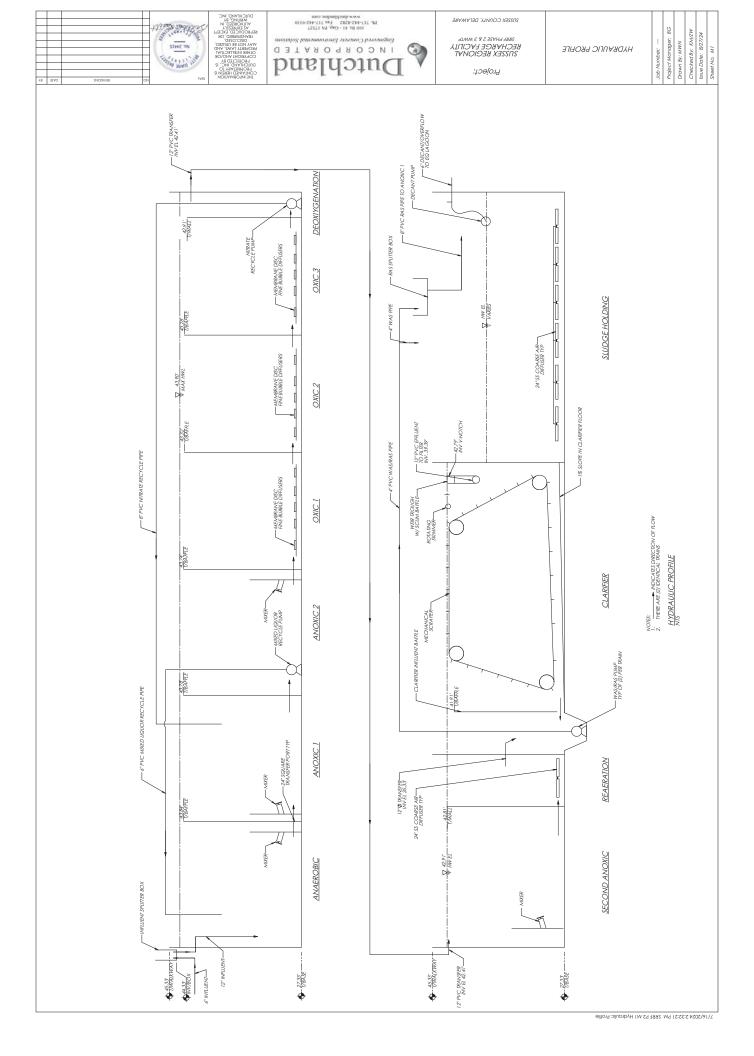
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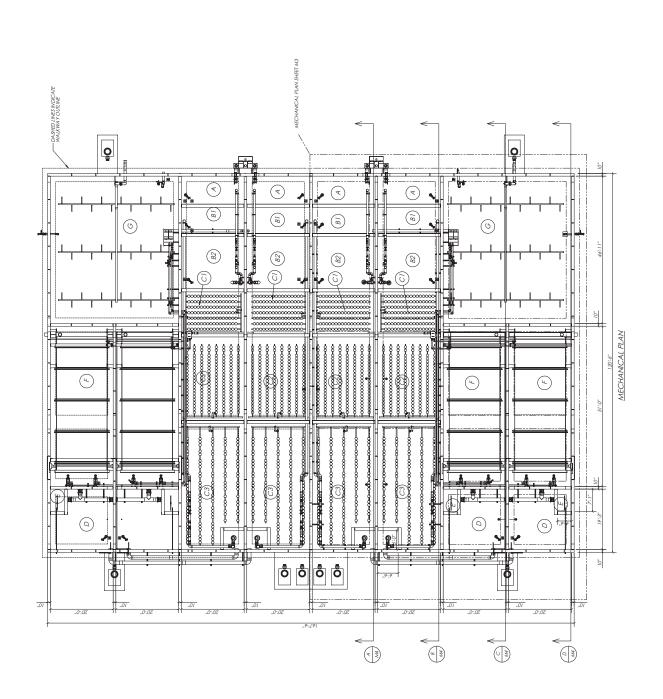
0	8/27/2024	MI	HYDRAULIC PROFILE
0	8/27/2024	W2	MECHANICAL TANK PLAN
0	8/27/2024	M3	MECHANICAL TANK PLAN
0	8/27/2024	M4	SECTIONS A & B
0	8/27/2024	MS	SECTIONS C & D
0	PCUC/LC/8	M	MECHANICAL DETAILS I

MECHANICAL DETAILS 2

M7

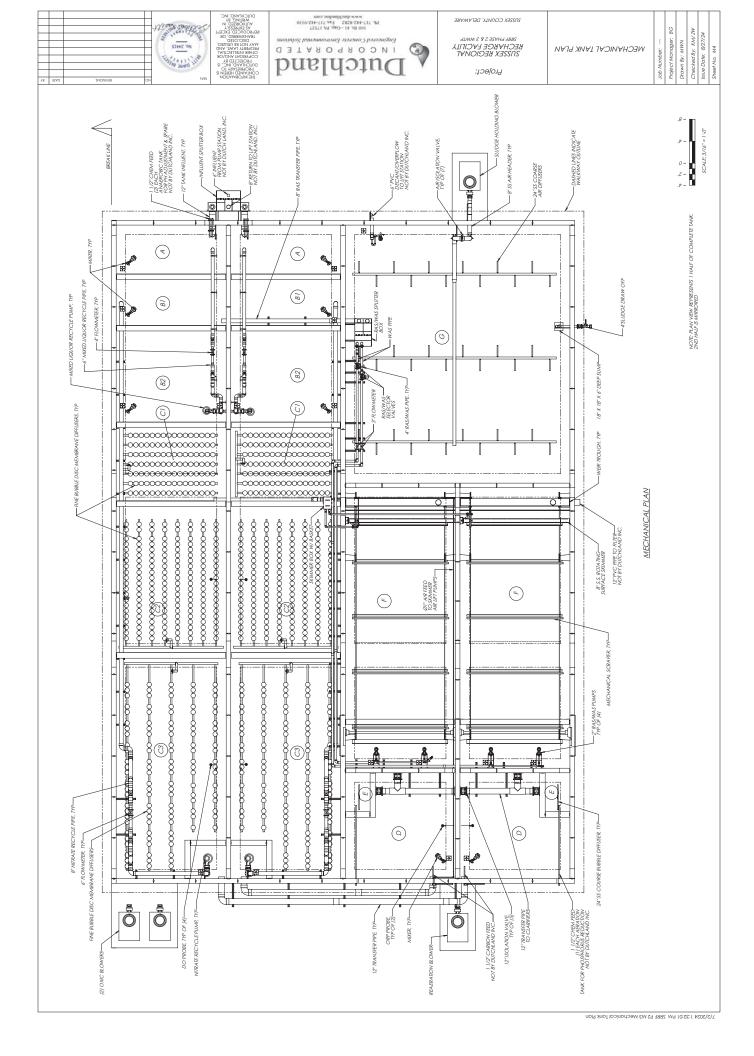


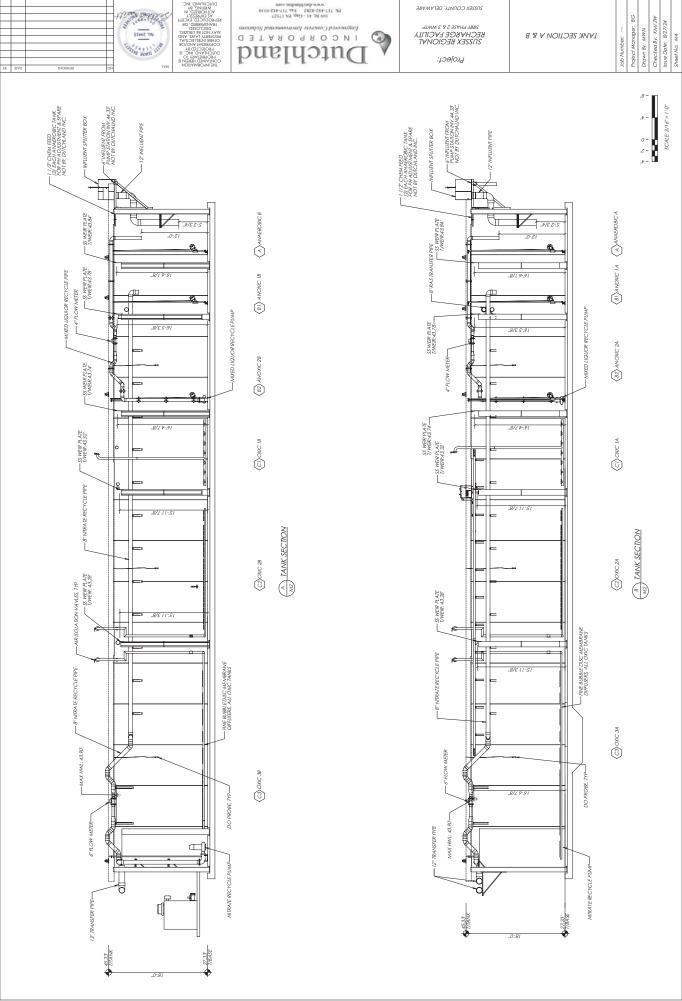


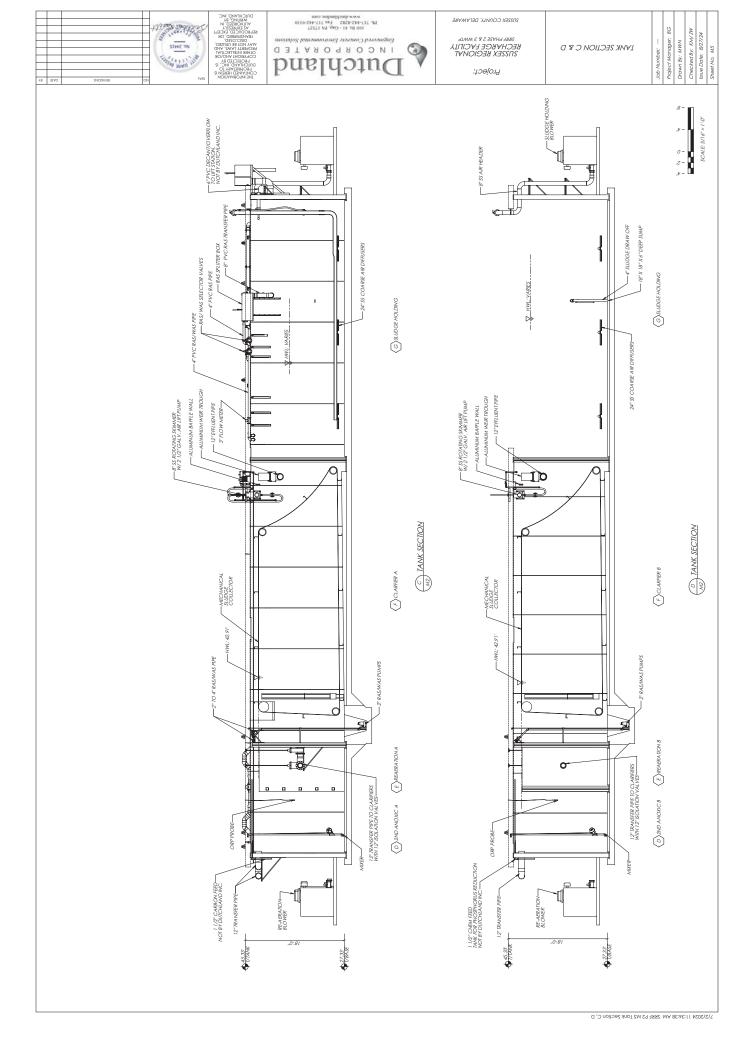


NO. 24415

į		TANK KEY TOTAL	EFECTIVE VOLUME
į,	COUNTE	VOLUME (GAL)	(GAU)
₹	ANAEROBIC	76,042	85,372
8)	ANOXIC 1	89,760	79,786
82	ANOXIC 2	178,622	158,776
C)	OXIC 1	143,616	127,658
C5	OXIC 2	286,334	254,520
S	OXIC 3	431,746	383,774
Q	2nd ANOXIC	177,724	157,978
ш	REAERATION	17,166	15,260
ı,	CLARIBER	538,560	478,720
O	SUDGE HOLDING	505,348	449,198



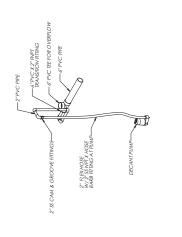




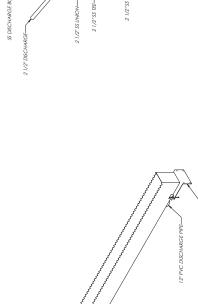
160 Rt. 41 - Clap, PA 17527 Ph. 717-442-8282 Fax 717-442-9330 Www.durchlandine.com SUSSEX COUNTY, DELAWARE Checked By: KM/ ZW Issue Date: 8/27/24 9 SKKE EHPSE 5 8 3 MMIE SOSSEX BECIONAL Dutchland

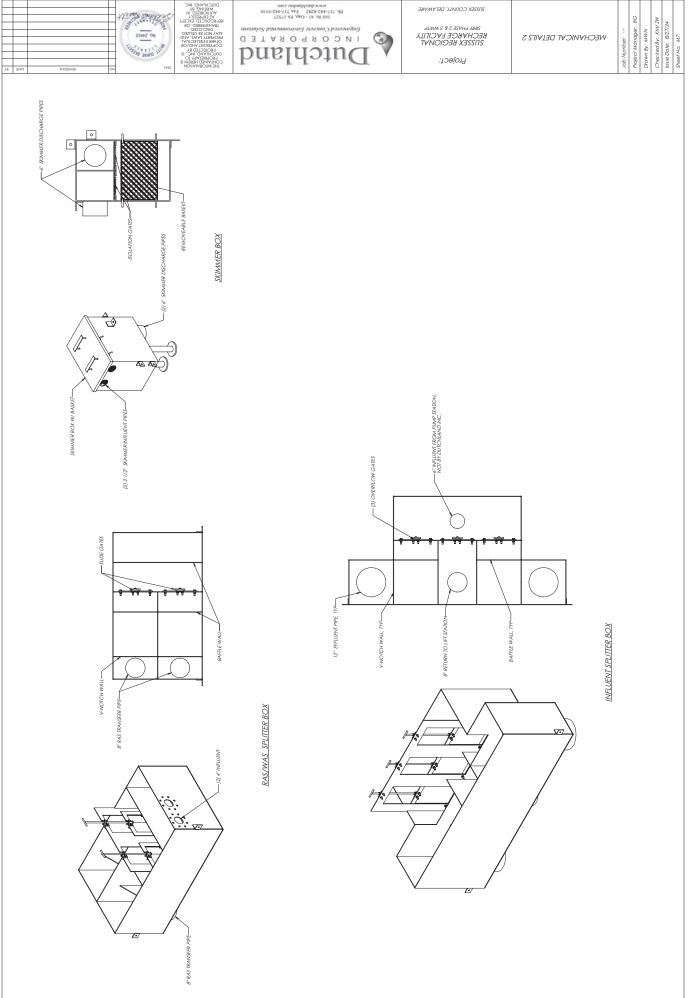
INCORPORATED

Engineered Control Environmental Solutions **MECHANICAL DETAILS 1** Project: SS ROTATING SKIMMER W/2 1/2" AIR LIFT PUMP REAERATION SS DISCHARGE BOX— 2 1/2"SS TEE-



DECANT/ OVERFLOW

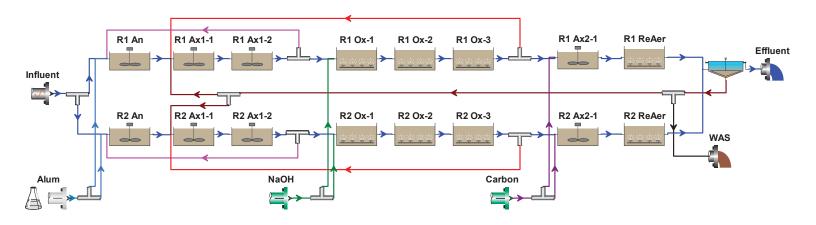




APPENDIX A BIOWIN MODELING RESULTS

BioWin Modeling Results

SRRF Hybrid Bardenpho Process (HBPHO)



Dry Weather Flow/Loading Influent Data

Element name	Value
Time (days)	245
Flow (MGD)	0.55
Total COD mgCOD/L	920
Total Kjeldahl Nitrogen mgN/L	70.0
Total P mgP/L	9.00
Nitrate N mgN/L	3.0
рН	7.0
Alkalinity mmol/L	5.0
Inorganic S.S. mgTSS/L	36
Calcium mg/L	80
Magnesium mg/L	15
Dissolved oxygen mg/L	1.0

High/Max Month Flow/Loading Influent Data

Element name	<u>Value</u>
Time (days)	90
Flow (MGD)	0.6875
Total COD mgCOD/L	736
Total Kjeldahl Nitrogen mgN/L	56.0
Total P mgP/L	7.20
Nitrate N mgN/L	2.4
рН	7.0
Alkalinity mmol/L	4.8
Inorganic S.S. mgTSS/L	36
Calcium mg/L	64
Magnesium mg/L	12
Dissolved oxygen mg/L	0.8

Max Week Flow/Loading Influent Data

Element name	<u>Value</u>
Time (days)	6
Flow (MGD)	0.800
Total COD mgCOD/L	613
Total Kjeldahl Nitrogen mgN/L	46.8
Total P mgP/L	6.00
Nitrate N mgN/L	2.0
рН	7.0
Alkalinity mmol/L	4.0
Inorganic S.S. mgTSS/L	30
Calcium mg/L	53
Magnesium mg/L	10
Dissolved oxygen mg/L	0.7

Max Day Flow/Loading Influent Data

Element name	<u>Value</u>
Time (days)	1
Flow (MGD)	0.800
Total COD mgCOD/L	405
Total Kjeldahl Nitrogen mgN/L	30.8
Total P mgP/L	3.96
Nitrate N mgN/L	1.3
рН	7.0
Alkalinity mmol/L	2.6
Inorganic S.S. mgTSS/L	20
Calcium mg/L	35
Magnesium mg/L	7
Dissolved oxygen mg/L	0.4

Influent Wastewater Fractions

Name	Default	Modeled
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.16	0.16
Fac - Acetate [gCOD/g of readily biodegradable COD]	0.15	0.15
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.75	0.75
Fus - Unbiodegradable soluble [gCOD/g of total COD]	0.050	0.050
Fup - Unbiodegradable particulate [gCOD/g of total COD]	0.13	0.13
Fna - Ammonia [gNH3-N/gTKN]	0.66	0.66
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.50	0.50
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.020	0.020
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.035	0.035
Fpo4 - Phosphate [gPO4-P/gTP]	0.50	0.50
FupP - P:COD ratio for influent unbiodegradable part. COD [gP/gCOD]	0.011	0.011

Reactor Physical Data

Zone	Volume [Gal]	% of Total Volume	HDT @ 0.625 MGD [hrs]	Depth [ft]	DO [mg/L]
An	42,000	6.7%	1.61	16	0
Ax1-1	40,000	6.4%	1.54	16	0
Ax1-2	80,000	12.7%	3.07	16	0
Ox-1	64,000	10.2%	2.46	16	2.0
Ox-2	128,000	20.4%	4.92	16	2.0
Ox-3	192,000	30.6%	7.37	16	1.0
Ax2-1	75,000	8.0%	1.92	16	0
ReAer	7,100	1.1%	0.27	16	2.0
TOTALS	628,100	100%	24.12		

Secondary Clarifier Physical Data (2 total)

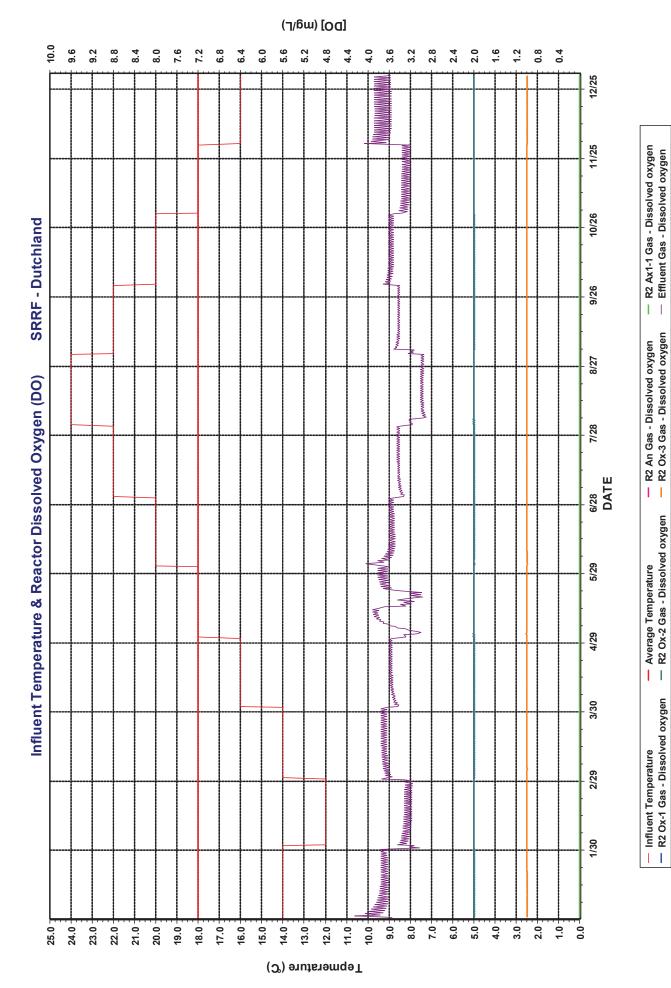
Volume [Gal]	Surf. Area [ft²]	Depth [ft]
197,956	2,000	13

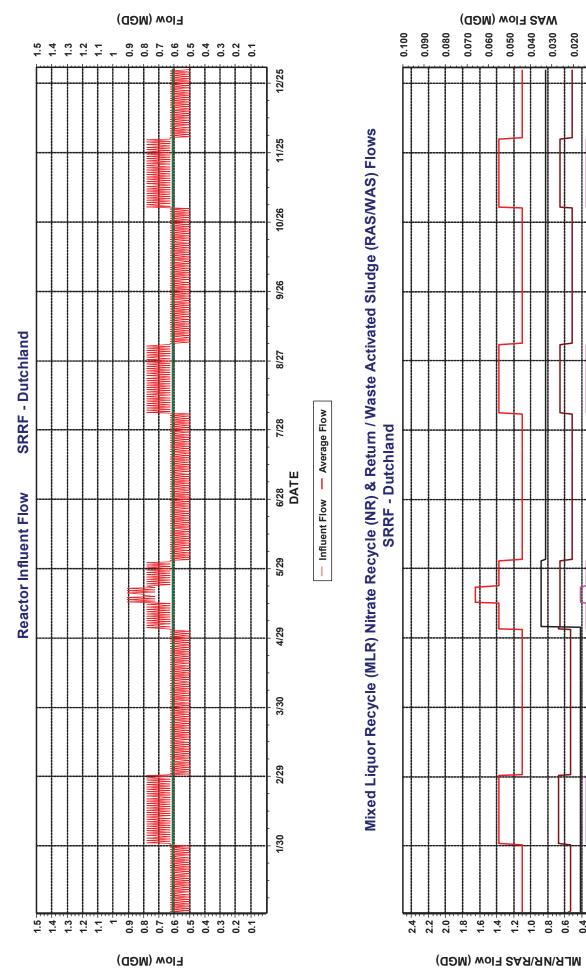
Flow Splits

Selector	Split
MLR	1*Q _{inf} (1.65 MGD max)
NR	4*Q _{inf} (3.30 MGD max)
RAS	(Varies, see charts)
WAS	(Varies, see charts)

Chemical Feeds

Feed	Flow	Modeled As
Alum	0 gpd	57,700 mg Al/L
Caustic	0 gpd	200,000 mg Ca/L, 2,000 meq/L strong bases
Carbon	0 gpd	MicroC (670,000 mg/L Readily Bio. COD)





0.010

12/25

11/25

9/26

8/27

7/28

5/29

4/29

3/30

2/29

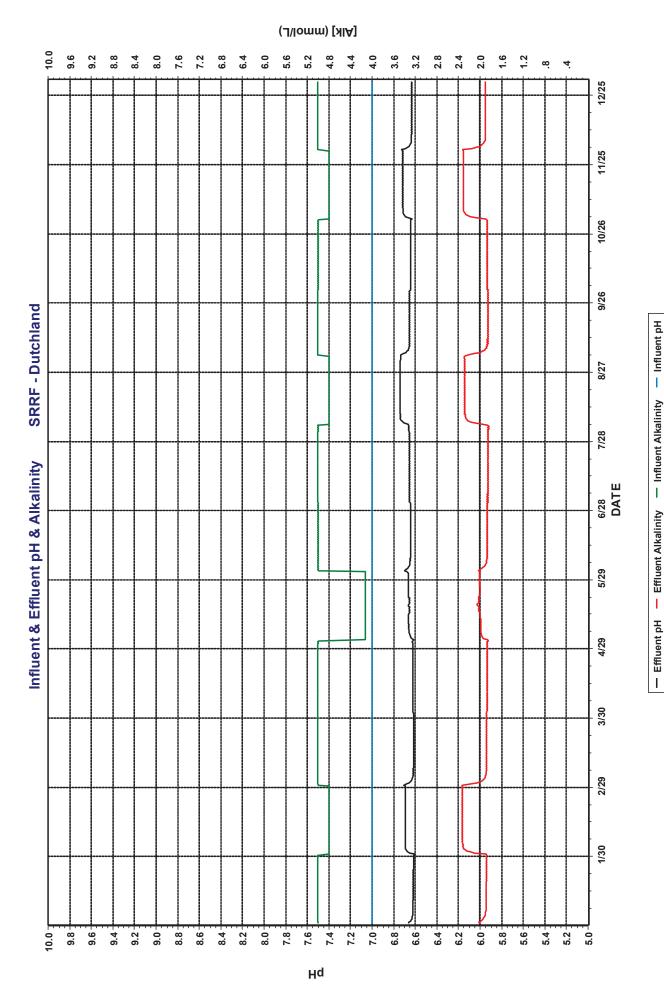
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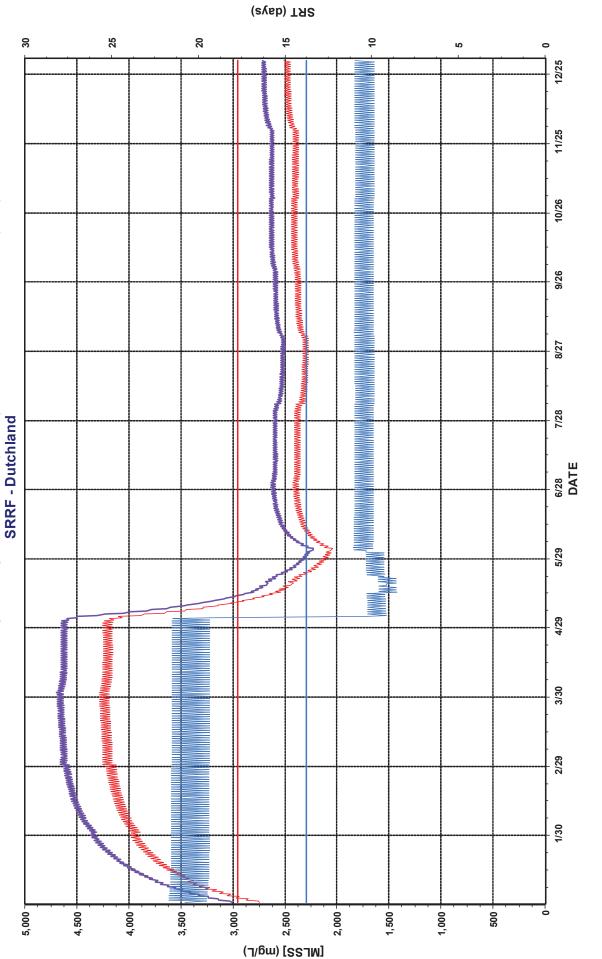
- RAS Flow - WAS Flow

— R1 MLR Flow

- R1 NR Flow







— Average SRT

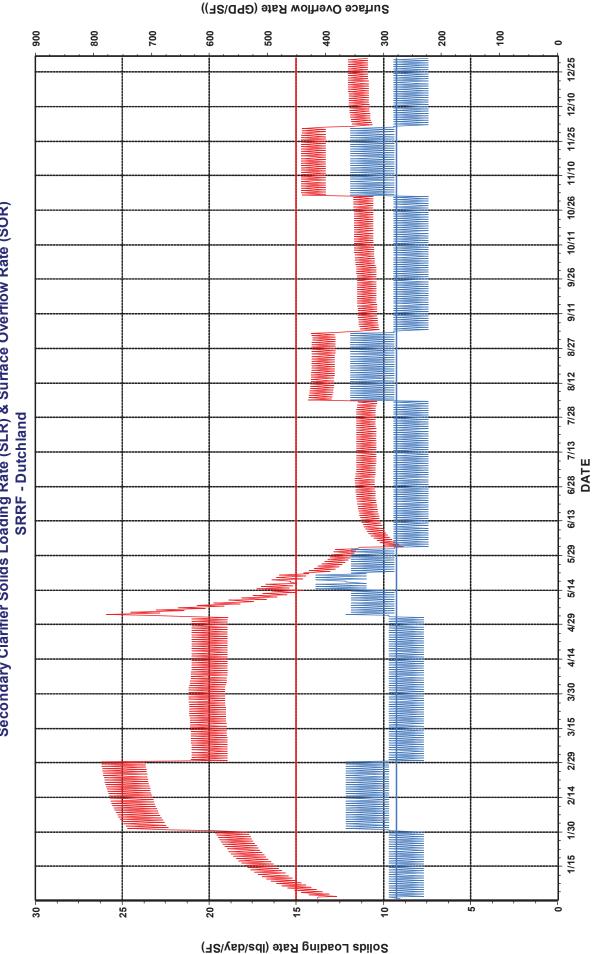
SRT

— Average MLSS

— Reactor MLSS

R2 Ox-2 Total suspended solids





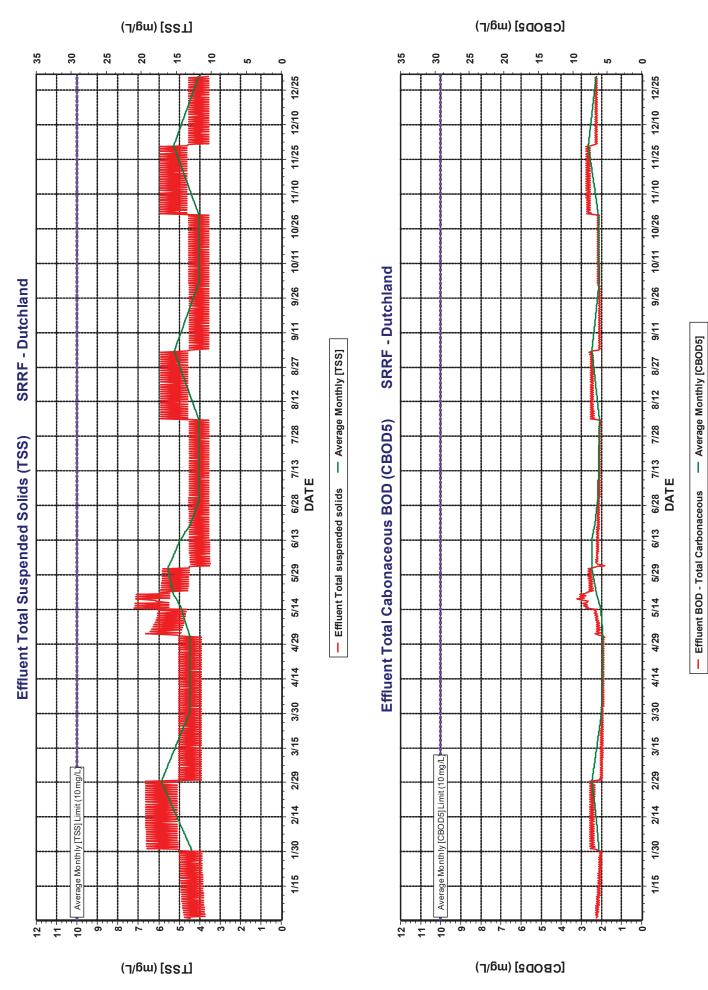
Average SOR

Sec. Clarifiers Surface overflow rate

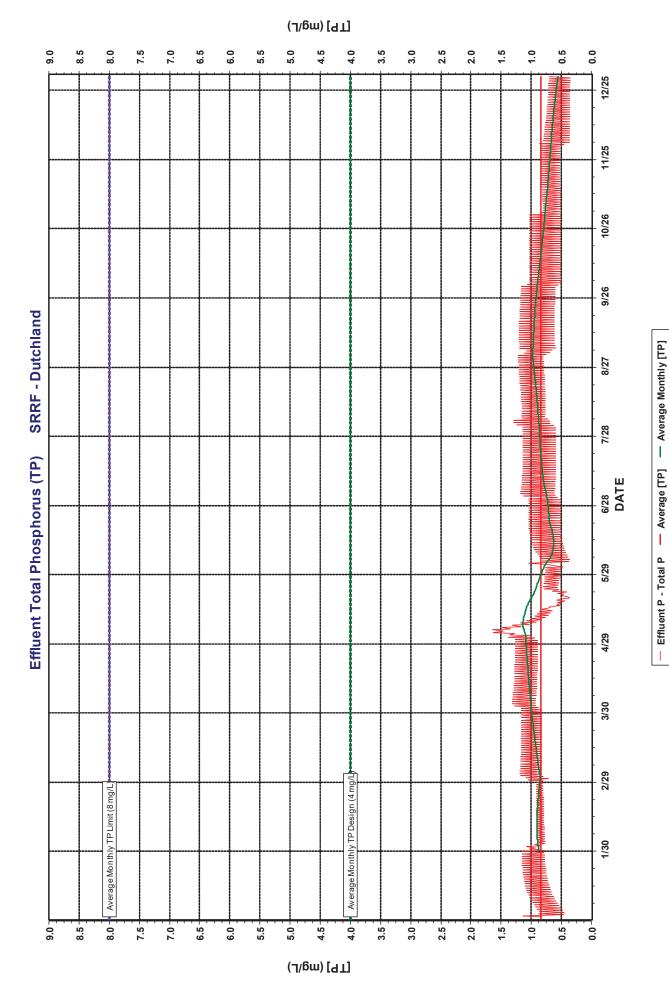
Average SLR

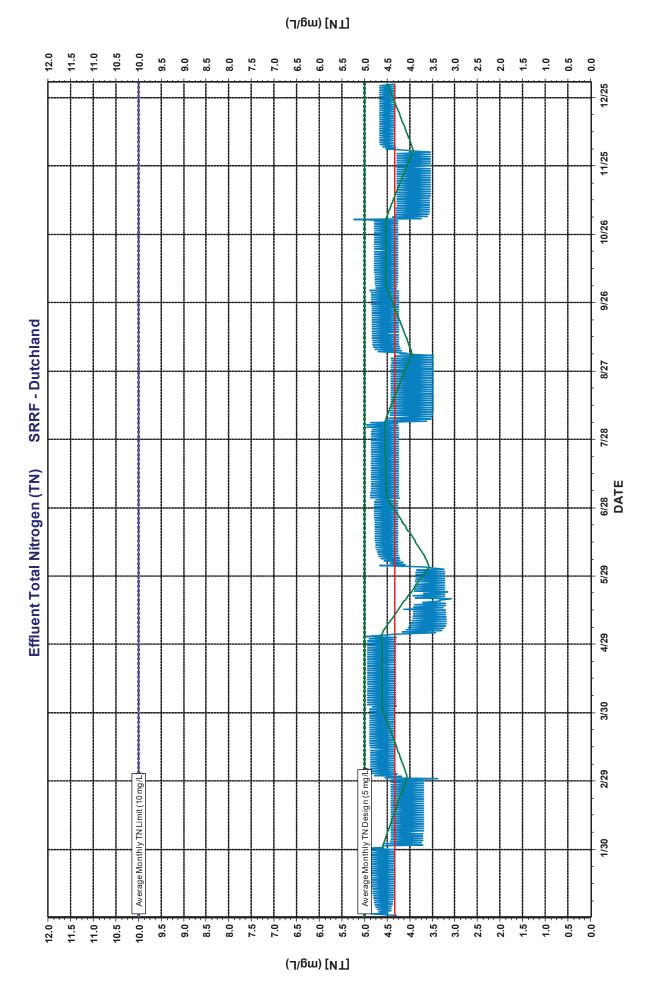
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Sec. Clarifiers Solids loading rate



SRRF BioWin PDR Final.docx



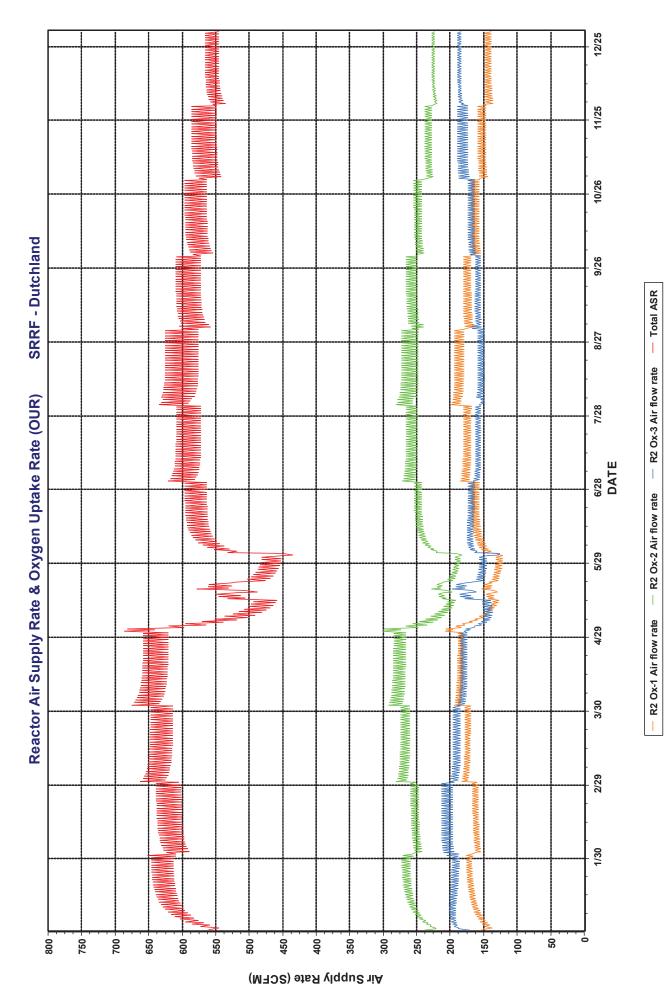


— Average Monthly [TN]

Average [TN]

Ī

— Effluent N - Total N



APPENDIX B

BIOLOGICAL REACTOR HYDRAULIC CALCULATION RESULTS

PROCESS- HBHPO							
Conditions: Startup,	Min Flow	Reactors in Service	1				
Minimum Flow, gpd	200,000						
Average Flow, gpd	625,000		%Qave	gpd	cfs	gpm	
Peak Flow, gpd	792,000	Plant Influent Flow =	20%	125,000	0.193	90	
		Nitrate Recycle=	80%	500,000	0.774	350	
		Mixed Liquor Recycle=	160%	1,000,000	1.547	690	
		Return Sludge=	100%	625,000	0.967	430	
		Potable Water =	4%	25,000	0.039	20	
	Flow from Seco	ondary Clarifier No. 2=	20%	125,000	0.193	90	
		•					
		lary Clarifier No. 2=	124%	775,000	1.199	540	(((: M P)
		r No.1 (Zone 1) =		1,150,000	1.779	800	(Inf+MLR)
		r No.1 (Zone 2,3) =		2,275,000	3.520	1580	(Inf+MLR+NR+Ras)
		r No.1 (Zone 4,5,6) =		1,275,000	1.973	890	(Inf+NR+Ras)
	Flow in Reactor	r No.1 (Zone 7,8,9) =	124%	775,000	1.199	540	(Inf+Ras)
	Flow in Reactor	r No.2 (Zone 1) =	0%	0	0.000	0	
	Flow in Reactor	r No.2 (Zone 2,3) =	0%	0	0.000	0	
	Flow in Reactor	r No.2 (Zone 4,5,6) =	0%	0	0.000	0	
	Flow in Reactor	r No.2 (Zone 7,8,9) =	0%	0	0.000	0	
		, , , , ,					
Conditions: Average	Flow	Reactors in Service	2				
Minimum Flow, gpd		iteactors in dervice	_				
	*		0/ 0010	and	ofo	anm	
Average Flow, gpd	625,000	Dient Influent Class -	%Qave	gpd	cfs	gpm	
Peak Flow, gpd	792,000	Plant Influent Flow =	100%	625,000	0.967	430	
		Nitrate Recycle=		2,500,000	3.868	1740	
		Mixed Liquor Recycle=		1,250,000	1.934	870	
		Return Sludge=	100%	625,000	0.967	430	
		Potable Water =	4%	25,000	0.039	20	
	Flow from Seco	ondary Clarifier No. 2=	100%	625,000	0.967	430	
	Flow to Second	lary Clarifier No. 2=	102%	637,500	0.986	440	
1	Flow in Reactor	r No.1 (Zone 1) =	152%	950,000	1.470	660	(Inf+MLR)
2	Flow in Reactor	r No.1 (Zone 2,3) =	402%	2,512,500	3.887	1740	(Inf+MLR+NR+Ras)
		r No.1 (Zone 4,5,6) =		1,887,500	2.920	1310	(Inf+NR+Ras)
		r No.1 (Zone 7,8,9) =	102%	637,500	0.986	440	(Inf+Ras)
		r No.2 (Zone 1) =	152%	950,000	1.470	660	(mirred)
		r No.2 (Zone 2,3) =		2,512,500	3.887	1740	
		, ,					
		No.2 (Zone 4,5,6) =		1,887,500	2.920	1310	
8	Flow in Reactor	r No.2 (Zone 7,8,9) =	102%	637,500	0.986	440	
Conditions: Peak Fl		Reactors in Service	1				
Minimum Flow, gpd	•						
Average Flow, gpd	625,000		%Qave	gpd	cfs	gpm	
Peak Flow, gpd	792,000	Plant Influent Flow =	127%	792,000	1.225	550	
	1.27	Nitrate Recycle=	400%	2,500,000	3.868	1740	
		Mixed Liquor Recycle=	200%	1,250,000	1.934	870	
		Return Sludge=	100%	625,000	0.967	430	
		Potable Water =	4%	25,000	0.039	20	
	Flow from Seco	ondary Clarifier No. 2=	127%	1,003,622	1.553	700	
		lary Clarifier No. 2=		1,442,000	2.231	1000	
		r No.1 (Zone 1) =		2,067,000	3.198	1440	(Inf+MLR)
		r No.1 (Zone 1) =		5,192,000	8.033	3610	(Inf+MLR+NR+Ras)
		No.1 (Zone 2,5) =					` '
		, , ,		3,942,000	6.099	2740	(Inf+NR+Ras)
		No.1 (Zone 7,8,9) =		1,442,000	2.231	1000	(Inf+Ras)
		No.2 (Zone 1) =	0%	0	0.000	0	
		r No.2 (Zone 2,3) =	0%	0	0.000	0	
		r No.2 (Zone 4,5,6) =	0%	0	0.000	0	
	Flow in Reactor	r No.2 (Zone 7,8,9) =	0%	0	0.000	0	

Reactor No.1 %Q to Reactors cfs gpd 625,000 Flow from Reactor No.1 = 100% 0.967

WSE downstream of Reactor Effluent Weir

Reactor Effluent Weir Elevation (ft) 100.00

Rectangular Weir w/ End Contractions

Weir Length(ft)= 2.0 Headloss Over Weir(ft)= 0.276

WSE In Zone 6 (OX4) (ft) 100.28

%Q to Reactors

cfs gpd

Length

100

Reactor Dimensions

Width

20.0

Headloss = Slope*Length

0.000 Negligble

Slope, s=(v*0.014/1.486/Rh^(2/3))^2

Depth

16

X-sectional

Area, sf

320

Flow in Reactor No.1 (Zone 6) = 100% 625,000 0.967

Friction Loss through Reactor rectangular channel flowing partially full

0.003 Flow velocity (fps) V-Q/A Hydraulic Radius(ft) Rh= A/(W+2 6.15 Slope = s, see formula 0.0000000007

Headloss through Reactor (ft) =

Losses at Walls Between Reactor Subzones

Top Baffle Wall = eff. weir +.03 0.50 in. freeboard - Qa

Width of Baffle Wall (ft) 20

> Flow in Zone DS WSE US WSE AN-1 950,000 43.027 43.041 0.01453 2.512.500 42.962 0.06421 AX-1 43.027 1.887.500 42.433 42.962 0.52927 AX-2 OX-1 1,887,500 42.390 42.433 0.04360 OX-2 1,887,500 42.346 42.390 0.04360 1,887,500 42.228 0.11777 OX-3 42.346 AN-2 637,500 42.000 42.053 0.05315 RA 637,500 42.000 42.053 0.05315 Actual Freeboard= 58.97 58.96 Total H 0.9193

> > 102.00

Flow Over/Under Flow Split-- AN-1 Baffle

Given: Q-total = Q-under + Q-over and h-over must = h-under Method: Assume h, calc. Q-over and Q-under, check Q-total

Flow Through Submerged Port: Q=C*a*(2*g*h)^.5 (Brater & King p.4-10)

Port

Total Flow Through	950,000	gpd or cfs:	1.470
Height (ft)	Width (ft)	Area (sf)	C =
1.00	1.50	1.50	0.60

Exterior Wall Ht.=

Headloss through port at Q: h=(Q/C*a)^2/64.4

> h (ft) 0.01453

Q-under (cfs) 0.871

102.00

Velocity thru Port (ft/s) 0.58

WSE downstream 43.027 Wall ht. below WSE-down (ave) 0.042 Top of Wall 42.985 WSE upstream 43.041 Width of Wall (ft)

Check by calculating Q-over to see if it fits Q-under assumption. Formula: Submerged Broad Crested Weir, Q=Q1*(1-(H2/H1)^1.5)^0.385 (B & K p.5-19) where Q1=3.33*L*H1^1.5, H1=height upstream and H2=height downstream

> Q-over (cfs) calculated 0.600

Q-actual 1.470 Q-total (cfs) calc. 1.470

check: Q-calc = 100.0% of Q-actual. H (ft) 0.0145 Flow % Over 0.600 40.8% Under 0.871 59.2% Total 1.470 100%

Summary

Match? yes

Flow Over/Under Flow Split-- AX-1 Baffle

Given: Q-total = Q-under + Q-over and h-over must = h-under Method: Assume h, calc. Q-over and Q-under, check Q-total

Flow Through Submerged Port: Q=C*a*(2*g*h)^.5 (Brater & King p.4-10)

Port

Total Flow Through	2,512,500	gpd or cfs:	3.887
Height (ft)	Width (ft)	Area (sf)	C =
1.00	1.50	1.50	0.60

Headloss through port at Q: $h=(Q/C*a)^2/64.4$

h (ft) **0.06421** Q-under (cfs) 1.830

Velocity thru Port (ft/s)

WSE downstream
Wall ht. below WSE-down (ave)
Top of Wall
WSE upstream
Width of Wall (ft)

1.22	
42.962	
0.042	
42.921	
43.027	
20	
. un de r es su mantien	_

1 22

 Summary

 H (ft)
 0.0642

 Flow
 %

 Over
 2.057
 52.9%

 Under
 1.830
 47.1%

 Total
 3.887
 100%

 Match?
 yes

Check by calculating Q-over to see if it fits Q-under assumption. Formula: Submerged Broad Crested Weir, Q=Q1*(1-(H2/H1)^1.5)^0.385 (B & K p.5-19) where Q1=3.33*L*H1^1.5, H1=height upstream and H2=height downstream

Q-over (cfs) calculated

2.057

Q-actual 3.887

Q-total (cfs) calc.

3.887

check: Q-calc = 100.0% of Q-actual.

Flow Over/Under Flow Split-- AX-2 Baffle

Given: Q-total = Q-under + Q-over and h-over must = h-under Method: Assume h, calc. Q-over and Q-under, check Q-total

Flow Through Submerged Port: Q=C*a*(2*g*h)^.5 (Brater & King p.4-10)

Port

Total Flow Through	1,887,500	gpd or cfs:	2.920
Height (ft)	Width (ft)	Area (sf)	C =
0.00	0.00	0.00	0.60

Headloss through port at \overline{Q} : h=(Q/C*a)^2/64.4

h (ft) DROP VALUE 0.13085 0.000

Total HL \(\)\tau-under (cfs)\\
0.1308 \(0.000\)

Velocity thru Port (ft/s)

Width of Wall (ft)

WSE downstream
Wall ht. below WSE-down (ave)
Top of Wall
WSE upstream

42.433
0.042
42.832
42.962
20

Check by calculating Q-over to see if it fits Q-under assumption. Formula: Submerged Broad Crested Weir, Q=Q1*(1-(H2/H1)^1.5)^0.385 (B & K p.5-19) where Q1=3.33*L*H1^1.5, H1=height upstream and H2=height downstream

Q-actual 2.920

Flow Over/Under Flow Split-- OX-1 Baffle

Given: Q-total = Q-under + Q-over and h-over must = h-under Method: Assume h, calc. Q-over and Q-under, check Q-total

Flow Through Submerged Port: Q=C*a*(2*g*h)^.5 (Brater & King p.4-10)

Port

Total Flow Through	1,887,500	gpd or cfs:	2.920
Height (ft)	Width (ft)	Area (sf)	C =
1.00	1.50	1.50	0.60

Headloss through port at Q: $h=(Q/C*a)^2/64.4$

> h (ft) 0.04360

Q-under (cfs) 1.508

Velocity thru Port (ft/s) 1.01

WSE downstream 42.390 Wall ht. below WSE-down (ave) 0.042 42.348 Top of Wall WSE upstream 42.433 Width of Wall (ft) 20

H (ft) 0.0436 Flow Over 1.412 48.4% Under 51.6% 1.508 Total 2.920 100% Match? yes

Summary

Check by calculating Q-over to see if it fits Q-under assumption. Formula: Submerged Broad Crested Weir, Q=Q1*(1-(H2/H1)^1.5)^0.385 (B & K p.5-19) where Q1=3.33*L*H1^1.5, H1=height upstream and H2=height downstream

> Q-over (cfs) calculated 1.412

2.920 Q-actual 2.920 Q-total (cfs) calc.

check: Q-calc = 100.0% of Q-actual.

Flow Over/Under Flow Split-- OX-2 Baffle

Given: Q-total = Q-under + Q-over and h-over must = h-under Method: Assume h, calc. Q-over and Q-under, check Q-total

Flow Through Submerged Port: Q=C*a*(2*g*h)^.5 (Brater & King p.4-10)

Port

Total Flow Through	1,887,500	gpd or cfs:	2.920
Height (ft)	Width (ft)	Area (sf)	C =
1.00	1.50	1.50	0.60

Headloss through port at Q: h=(Q/C*a)^2/64.4

> h (ft) 0.04360

Q-under (cfs) 1.508

1.01

Velocity thru Port (ft/s) 42.346 WSE downstream Wall ht. below WSE-down (ave) 0.042 Top of Wall 42.304 WSE upstream 42.390 Width of Wall (ft) 20

	Summary	
H (ft)	0.0436	
	Flow	%
Over	1.412	48.4%
Under	1.508	51.6%
Total	2.920	100%
Match?	yes	

Check by calculating Q-over to see if it fits Q-under assumption. Formula: Submerged Broad Crested Weir, Q=Q1*(1-(H2/H1)^1.5)^0.385 (B & K p.5-19) where Q1=3.33*L*H1^1.5, H1=height upstream and H2=height downstream

> Q-over (cfs) calculated 1.412

Q-actual 2.920 Q-total (cfs) calc. 2.920

check: Q-calc = 100.0% of Q-actual.

Flow Over/Under Flow Split--OX-3 Baffle + pipe from DEOX

Given: Q-total = Q-under + Q-over and h-over must = h-under Method: Assume h, calc. Q-over and Q-under, check Q-total

Flow Through Submerged Port: Q=C*a*(2*g*h)^.5 (Brater & King p.4-10)

Total Flow Through

Port	Height (ft)	Width (ft)
	0.50	0.50

Headloss through port at Q: h=(Q/C*a)^2/64.4

h (ft) Q-under (cfs)
0.11777 0.413

1,887,500

 Velocity thru Port (ft/s)
 1.65

 WSE downstream
 42.228

 Wall ht. below WSE-down (ave)
 0.042

 Top of Wall
 42.186

 WSE upstream
 42.346

 Width of Wall (ft)
 12.5 6x6.5

Check by calculating Q-over to see if it fits Q-under assumption. Formula: Submerged Broad Crested Weir, Q=Q1*(1-(H2/H1)^1.5)^0.385 (B & K p.5-19) where Q1=3.33*L*H1^1.5, H1=height upstream and H2=height downstream

2.920

Q-over (cfs) calculated 2.507 Q-total (cfs) calc. 2.921

gpd or cfs:

Area (sf) **0.25**

2.920 C =

0.60

check: Q-calc = 100.0% of Q-actual.

Q-actual

Summary 0.1178 H(ft) Flow % Over 2.507 85.9% Under 0.413 14.1% Total 2.921 100% Match? yes

PIPE FROM DEOX to 2nd ANOXIC

Partially Full Pipe Flow Calculations - U.S. Units

, ,				
Flow (cfs)	0.986			
Length, L (ft)	35			
Pipe Dia (ft)	1.0			
Area (ft^2)	0.39	Wetted area at 5.75		
Perimeter (ft)	1.6	Assumes 10.5 of 12 inch Pipe is fil	led	
Slope, S (ft/ft)	0.005	USED: https://www.e	ngineersed	ge.com/flu
Chezy Coef, C	100.00			
Velocity, v (ft/s)	3.491060011			
Friction Factor, <i>f</i>	0.02576	WSE downstream	42.053	
Hydraulic Radius, Rh	0.24375	Wall ht. below WSE-	-	
Gravity, g	32.2	Top of Wall	-	
		WSE upstream	42.228	
HL= f*(L/(4Rh))*(V^2/2g)	0.175	•		

Flow Over/Under Flow Split-- 2nd ANOXIC Baffle

Given: Q-total = Q-under + Q-over and h-over must = h-under Method: Assume h, calc. Q-over and Q-under, check Q-total

Flow Through Submerged Port: Q=C*a*(2*g*h)^.5 (Brater & King p.4-10)

Ρ	0	rt

Width of Wall (ft)

Total Flow Through	637,500	gpd or cfs:	0.986
Height (ft)	Width (ft)	Area (sf)	C =
0.00	0.00	0.00	0.60

Headloss through port at Q: h=(Q/C*a)^2/64.4

h (ft) **0.05315** Q-under (cfs) 0.000

Velocity thru Port (ft/s)
WSE downstream
Wall ht. below WSE-down (ave)
Top of Wall
WSE upstream

42.000 0.042 41.958 42.053 11.5833

#DIV/0!

Summary 0.0532 H (ft) Flow % Over 0.986 100.0% Under 0.000 0.0% 100% Total 0.986 Match? yes

Check by calculating Q-over to see if it fits Q-under assumption. Formula: Submerged Broad Crested Weir, Q=Q1*(1-(H2/H1)^1.5)^0.385 (B & K p.5-19) where Q1=3.33*L*H1^1.5, H1=height upstream and H2=height downstream

100.0%

Q-over (cfs) calculated

0.986 0.986

Q-actual 0.986

Q-total (cfs) calc.

of Q-actual.

Pipe Reaeration to Clar

Q-calc =

check:

Flow to zone	0.986					
Formula for friction loss	hf=L*(4.73*Q^1.85)/(100	0^1.85*D^4.87)				
Pipe dia.(ft) = D	1.00		Formula for minor loss	s hm=K*v^2/64.4	Qty	K
Flow velocity(fps) =Q	1.26		Minor Losses	Sum K	1	0.50
Total length(ft)	5.5		Entrance	0.50	1	0.30
Friction Loss	hf(ft)=	0.005	Tee (flow in line to bra	1.20	1	1.00
Velocity head (ft) = ✓	0.02		Exit	1.00		
Minor Losses	hm(ft)=	0.066	Total K=	2.70		
Total Headlos	s in Pipe (ft) =	0.071				

WSE downstream 41.929
Wall ht. below WSE
Top of Wall
WSE upstream 42.000

APPENDIX C CLARIFIER HYDRAULIC CALCUALTION RESULTS

		ı		
Startup-Min Clarifier Calculations		fiers	cts	
	Flow from Secondary Clarifier No. 1=	124% 775,00	775,000 1.199	
WSE @ DS end of secondary clarifier launder		100.00		
Invert of Secondary Clarifier effluent pipe		00.66		Set 1.00 ft. below WSE
Launder Bottom El.(ft)		99.18		Dimensior Width, b Length, L Depth of
Depth of flow.(ft) = $b^*(D/b)$		0.82		1.33 19.67 0.82
Flow velocity(fps) = $V = Q/A$		1.10		Calculate Flow Depth 1st calc. K' =Q*n/(b^(8/3)s^0.5) K'
Hydraulic Radius(ft) Rh= A/(W+2D)		0.37		assumed slope = 0.10% ref. Brater & King 0.275
Velocity head (ft) = $v^2/2g$		0.02		Given K', D/b= 0.618 Table 7-11
Slope = s, see formula		0.05%		Slope, $s=(v^*n/1.486/Rh^{(2/3)})^2$ where $n=0.015$
	Friction Loss $hf(ft) = slope \times length$	0.009	6(
	Minor Losses hm(ft)= Total Headloss in Launder (ft)=	0.028	& <u>L</u>	entrance channel (from DES) 1.50
WSE, upstream end of clarifier launder		100.86		
Clarifier Effluent Weir V-notch Inverts Elevation (ft)		101.11		Actual 3.0 inches of drop over weir
Losses over V-notch weirs: Calculate Number of V-notches	-notches			
Weir Length(ft)		39.33		
V-notch spacing(ft)		0.33		
Number per tank		118		Adjust Spacing to get Headloss close to 0.2 ft. @ Peak Flow
Weir Notch Angle		0 006		
q per v-notch(cfs)		0.010		
	Headloss Over Weir (ft) =	0.110	1.32 inches	S FINAL LAUNDER DIMENSIONS
WSE @ downstream end of Secondary Clarifier		101.22		l D M
		%Q to Clarifiers gpd	cfs	19.67 1.33 2.25
Q to Secondary Carifier No. 1=		124% 775,000	00 1.199	
Friction Loss through Secondary Clarifier rectangular channel flowing partially full	angular channel flowing partially full		,	Clarifier Dimensions (per train)
Flow velocity(fps) V=Q/A		0.004		Length Width Depth Area, sf
Hydraulic Radius(ft) Rh= A/(W+2D)		6.15		51 20 16 320
Slope = s, see formula		0.00000001%		Slope, s=(v*0.014/1.486/Rh^(2/3))^2
	Headloss through Clarifier (ft) =	0.000000000		Headloss = Slope*Length
WSE at influent end of Secondary Clarifier (ft)		101.22		Set min. 2.00 ft. below WSE
Invert of 12" Secondary Clarifier influent pipe		102.00		

Ava Clarifier Calculations		%O to Clarifiers and cfs	
	Flow from Secondary Clarifier No. 1=	650.000 1	
WSE @ DS end of secondary clarifier launder			
Invert of Secondary Clarifier effluent pipe		00.66	Set 1.00 ft. below WSE
Launder Bottom EI.(ft)		99.18	Qnty Width, b Length, L Depth of
Depth of flow.(ft) = $b^*(D/b)$		0.82	Lauriner 1 1.33 19.67 0.82
Flow velocity(fps) = $V = Q/A$		0.92	Calculate Flow Depth 1st calc. $K' = Q^*n/(b^{\prime}(8/3)s^{\prime}0.5)$ K'
Hydraulic Radius(ft) Rh= A/(W+2D)		0.37	assumed slope = 0.10% ref. Brater & King 0.226
Velocity head (ft) = $v^2/2g$		0.01	Given K', D/b= 0.618 Table 7-11
Slope = s, see formula		0.03%	Slope, $s=(v^*n/1.486/Rh^2(2/3))^2$ where $n=0.015$
	Friction Loss hf(ft) = slope x length	900.0	Minor losses,hm=K*v^2/64.4
	Minor Losses hm(ft)= Total Headloss in Launder (ft)=	0.020 0.026	entrance channel (from DES) 1.50 Total K 1.50
WSE, upstream end of clarifier launder		100.85 0.848 depth	
Clarifier Effluent Weir V-notch Inverts Elevation (ft)		101.11	Actual 3.2 inches of drop over weir
Losses over V-notch weirs: Calculate Number of V-notches	/-notches		
Weir Length(ft)			notch depth (if continuous)
V-notch spacing(ft)		0.33 4.00 2	
Number per tank		118	Adjust Spacing to get Headloss close to 0.2 ft. @ Peak Flow
Weir Notch Angle		90.0	
q per v-notch(cfs)		00.00	
	Headloss Over Weir (ft) =	0.102 1.23 inches	hes FINAL LAUNDER DIMENSIONS
WSE @ downstream end of Secondary Clarifier		101.22	L W D depth?
		%Q to Clarifiers gpd cfs	19.67 1.33 2.25 2.14
Q to Secondary Carifier No. 1=		102% 650,000 1.006	Check with peak
Friction Loss through Secondary Clarifier rectangular channel flowing partially full	angular channel flowing partially full		Clarifler Dimensions (per train)
Flow velocity(fps) V=Q/A		0.003	Length Width Depth Area, sf
Hydraulic Radius(ft) Rh= A/(W+2D)		6.15	51 20 16 320
Slope = s, see formula		0.00000001%	Slope, s=(v*0.014/1.486/Rh^(2/3))^2
	Headloss through Clarifier (ft) =	0.000000004	\overline{S}
WSE at influent end of Secondary Clarifier (ft)		101.22	Set min. 2.00 ft. below WSE
Invert of 12" Secondary Claritier Influent pipe		102.00	

Peak Clarifier Calculations		%O to Clarifiers of	apd cfs	
	Flow from Secondary Clarifier No. 1=		1	
WSE @ DS end of secondary clarifier launder	•	100.00		
Invert of Clarifier effluent pipe		98.67		Set 1.33 ft. below WSE
Launder Bottom EI.(ft)		99.18		Dimensior Width, b Length, L Depth of I
Depth of flow. (ft) = $b^*(D/b)$		0.82		1 1.33 19.67 0.82
Flow velocity(fps) = $V = Q/A$		1.16		Calculate Flow Depth 1st calc. $K' = Q^* n/(b^4/8/3) s^4 0.5$) K'
Hydraulic Radius(ft) Rh= A/(W+2D)		0.37		assumed slope = 0.10% ref. Brater & King 0.452
Velocity head (ft) = $v^2/2g$		0.02		Given K', D/b= 0.618 Table 7-11
Slope = s, see formula		0.05%		Slope, $s=(v^*n/1.486/Rh^4(2/3))^2$ where $n=0.015$
	Friction Loss $hf(ft) = slope \times length$		0.010	Minor losses,hm=K*v^2/64.4
	Minor Losses hm(ft)=		0.031	entrance channel (from DES) 1.50
	Total Headloss in Launder (ft)=		0.041	Total K 1.50
WSE, upstream end of clarifier launder		100.86	0.86 depth	
Clarifier Effluent Weir V-notch Inverts Elevation (ft)		101.11 10	101.11	Actual 3.0 inches of drop over weir into launder
Losses over V-notch weirs: Calculate Number of V-notches	'-notches			0.250 ft of drop over weir into launder
Weir Length(ft)		39.33		
V-notch spacing(ft)		0.33 Depth of no	th of nc 2 inches	es 2.4
Number per tank		118		Adjust Spacing to get Headloss close to 0.2 ft. @ Peak Flow
Weir Notch Angle		0.06		
q per v-notch(cfs)		0.011		-
	Headloss Over Weir (ft) =	0.112	1.34 inches	es FINAL LAUNDER DIMENSIONS Depth of Notch 0.17
WSE @ downstream end of Secondary Clarifier		101.23		Launder Bottom 99.18
			gpd cfs	
Q to Secondary Carifier No. 1=		204% 81	817,000 1.264	Use Depth 2.25
Friction Loss through Secondary Clarifier rectangular channel flowing partially full	angular channel flowing partially full			Clarifier Dimensions (per train)
Flow velocity(fps) V=Q/A		0.004		Length Width Depth Area, sf
Hydraulic Radius(ft) Rh= A/(W+2D)		6.15		51 20 16 320
Slope = s, see formula		0.00000001%		Slope, s=(v*0.014/1.486/Rh^(2/3))^2
	Headloss through Clarifier (ft) =	0.000000000		Headloss = Slope*Length
WSE at influent end of Secondary Clarifier (ft)		101.23		Set min. 2.00 ft. below WSE
Invert of 12" Secondary Clarifier influent pipe		102.00		



Appendix B3 – Effluent Cloth Filters Aqua Aerobic



Process Design Report

SRRF SUSSEX COUNTY, DE

Design# 178915

Option: Preliminary AquaDisk Design

AquaDisk®

Cloth Media Filter



Designed By: Kayla Stevens



Design Notes

Project: SRRF SUSSEX COUNTY, DE
Option: Preliminary AquaDisk Design

Designed by Kayla Stevens on Tuesday, April 1, 2025



Design#: 178915

Process/Site

- The average and maximum design flow and loading conditions, shown within the report, are based on maximum month average and maximum day conditions, respectively.

Filtration

- The cloth media filter recommendation and anticipated effluent quality are based upon influent water quality conditions as shown under "Design Parameters" of this Process Design Report.
- The filter influent should be free of algae and other solids that are not filterable through a nominal 10 micron pore size media. Provisions to treat algae and condition the solids to be filterable are the responsibility of others.
- Redundancy has not been considered in the cloth media filter design.

Equipment

- Scope of supply includes freight, installation supervision and start-up services.
- Equipment selection is based upon the use of Aqua-Aerobic Systems' standard materials of construction and electrical components, suitable for non-classified electrical environments.
- Aqua-Aerobic Systems, Inc. is familiar with various "Buy American" Acts (i.e. BABA, AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project's "Buy American" provisions.
- If the cloth media filter will be offline for extended periods of time, protection from sunlight is required.

Project ID: 114194D - SRRF SUSSEX COUNTY, DE / Design#: 178915

AquaDisk® Tertiary Filtration - Design Summary

Project: SRRF SUSSEX COUNTY, DE
Option: Preliminary AquaDisk Design

Designed by Kayla Stevens on Tuesday, April 1, 2025



Design#: 178915

DESIGN INFLUENT CONDITIONS

Pre-Filter Treatment: Secondary

 Avg. Design Flow
 = 1.25 MGD
 = 868.06 gpm
 = 4731.76 m³/day

 Max Design Flow
 = 3.13 MGD
 = 2173.61 gpm
 = 11848.34 m³/day

					Effluent	
DESIGN PARAMETERS	Influent	mg/l	Required	<= mg/l	Anticipated	<= mg/l
Avg. Total Suspended Solids:	TSSa	10	TSSa	5	TSSa	5
Max. Total Suspended Solids:	TSSm	15				
*Turbidity:			NTU	2	NTU	2

^{*}Note: Turbidity represented in Nephelometric Turbidity Units (NTU's) in lieu of mg/l.

AquaDisk FILTER RECOMMENDATION

Qty Of Filter Units Recommended = 2

Number Of Disks Per Unit = 6

Total Number Of Disks Recommended = 12

Total Filter Area Provided = $645.6 \text{ ft}^2 = (59.98 \text{ m}^2)$

Filter Model Recommended = AquaDisk Package: Model ADFSP-54 x 6E-PC

Filter Media Cloth Type = OptiFiber PES-13®

AquaDisk FILTER CALCULATIONS

Filter Type:

Vertically Mounted Cloth Media Disks featuring automatically operated vacuum backwash. Tank shall include a rounded bottom and solids removal system.

Average Flow Conditions:

Average Hydraulic Loading = Avg. Design Flow (gpm) / Recommended Filter Area (ft²)

= 868.1 / 645.6 ft²

= 1.34 gpm/ft² (3.29 m/hr) at Avg. Flow

Maximum Flow Conditions:

Maximum Hydraulic Loading = Max. Design Flow (gpm) / Recommended Filter Area (ft²)

= 2173.6 / 645.6 ft²

= 3.37 gpm/ft2 (8.23 m/hr) at Max. Flow

Solids Loading:

Solids Loading Rate = (lbs TSS/day at max flow and max TSS loading) / Recommended Filter Area (ft²)

= 391.6 lbs/day / 645.6 ft²

= 0.61 lbs. TSS /day/ft² (2.96 kg. TSS/day/m²)

Project ID: 114194D - SRRF SUSSEX COUNTY, DE / Design#: 178915

Equipment Summary

Project: SRRF SUSSEX COUNTY, DE
Option: Preliminary AquaDisk Design

Designed by Kayla Stevens on Tuesday, April 1, 2025



Design#: 178915

Cloth Media Filters

AquaDisk Tanks/Basins

2 AquaDisk Model # ADFSP-54x6E-PC Package Filter Painted Steel Tank(s) consisting of:

- 6 Disk painted steel tank(s).
- 3" ball valve(s).

AquaDisk Centertube Assemblies

2 Centertube(s) consisting of:

- 304 stainless steel centertube weldment(s).
- Centertube driven sprocket(s).
- Dual wheel assembly(ies).
- Rider wheel bracket assembly(ies).
- Effluent seal plate weldment.
- Centertube bearing kit(s).
- Effluent centertube lip seal(s).
- Pile cloth media and non-corrosive support frame assemblies.
- Disk segment 304 stainless steel support rods.
- Media sealing gaskets.

2 Cloth set(s) will have the following feature:

- Cloth will be chlorine resistant.

AquaDisk Drive Assemblies

2 Drive System(s) consisting of:

- Gearbox with motor.
- Drive sprocket(s).
- Drive chain(s) with pins.
- Stationary drive bracket weldment(s).
- Adjustable drive bracket weldment(s).
- Chain guard weldment(s).
- Warning label(s).

AquaDisk Backwash/Sludge Assemblies

2 Backwash System(s) consisting of:

- Backwash shoe assemblies.
- Includes enhanced backwash shoe design.
- Backwash shoe support weldment(s).
- 1 1/2" flexible hose.
- Stainless steel backwash shoe springs.
- Hose clamps.

2 Backwash/Solids Waste Pump(s) consisting of:

- Backwash/waste pump(s).
- Stainless steel anchors.
- 0 to 15 psi pressure gauge(s).
- 0 to 30 inches mercury vacuum gauge(s).
- Throttling gate valve(s).
- 2" bronze 3 way ball valve(s).

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Equipment Summary

Project: SRRF SUSSEX COUNTY, DE
Option: Preliminary AquaDisk Design

Designed by Kayla Stevens on Tuesday, April 1, 2025



Design#: 178915

AquaDisk Instrumentation

- 2 Pressure Transmitter(s) consisting of:
 - Level transmitter(s).
- 2 Float Switch(es) consisting of:
 - Float switch(es).
- 2 Vacuum Transmitter(s) consisting of:
 - Vacuum transmitter(s).

AguaDisk Valves

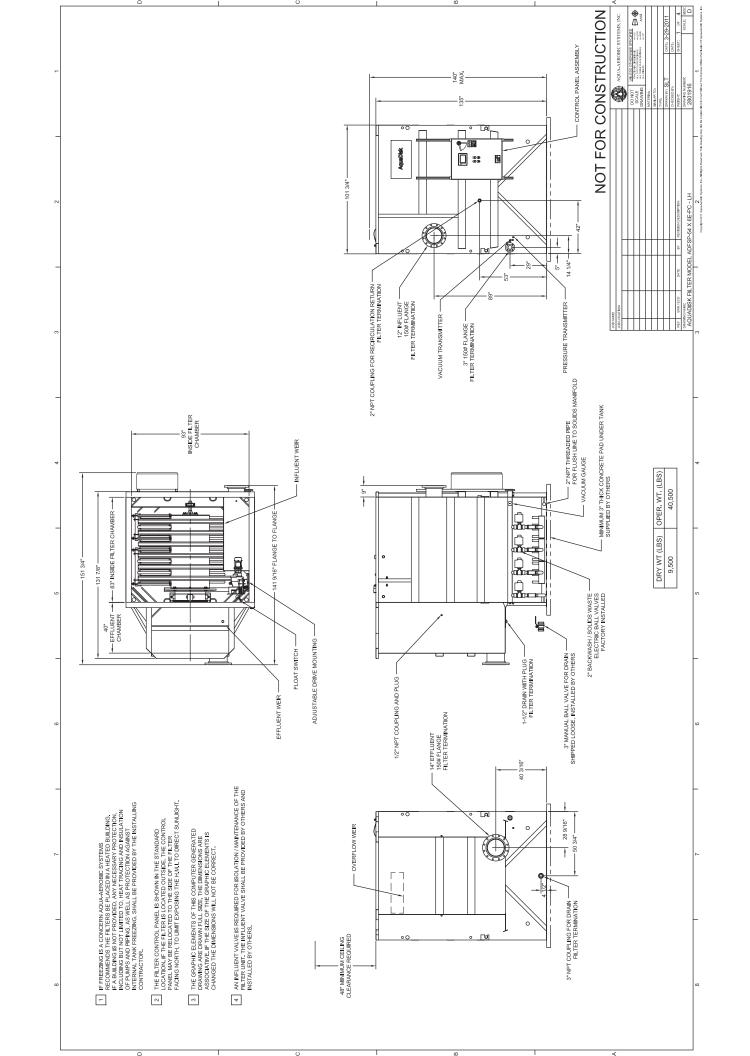
- 2 Set(s) of Backwash Valves consisting of:
 - 2" full port, three piece, stainless steel body ball valve(s), grooved end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork).
 - 2" flexible hose.
 - Victaulic coupler(s).
- 2 Solids Waste Valve(s) consisting of:
 - 2" full port, three piece, stainless steel body ball valve(s), grooved end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork).
 - 2" flexible hose.
 - Victaulic coupler(s).

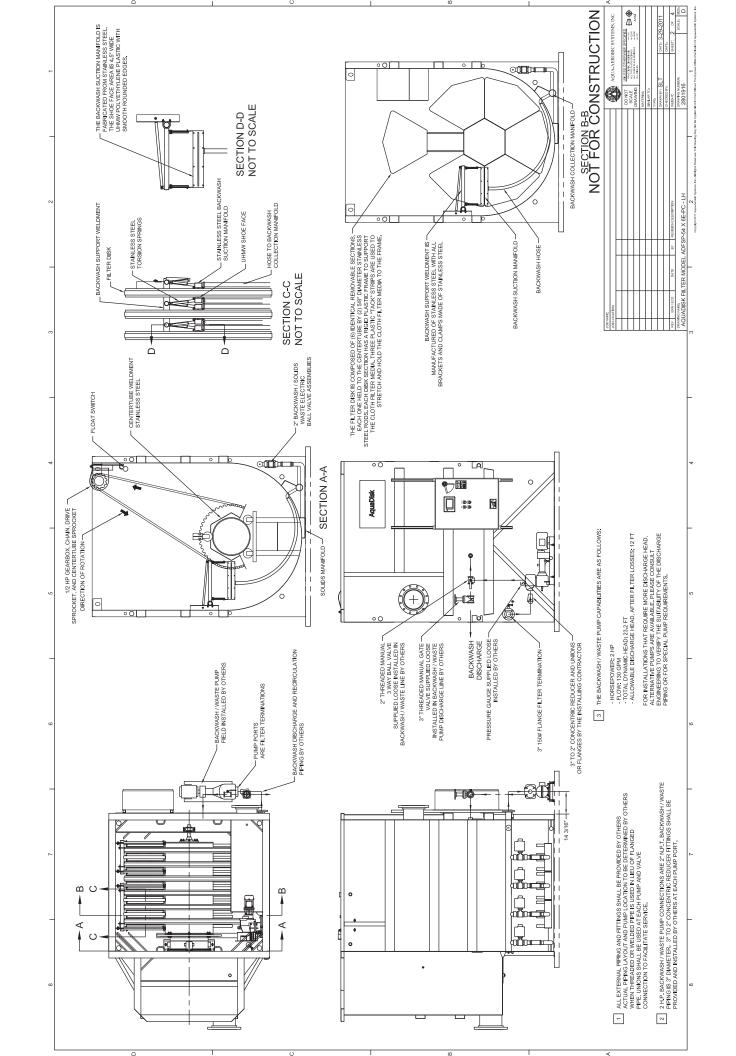
AquaDisk Controls w/Starters

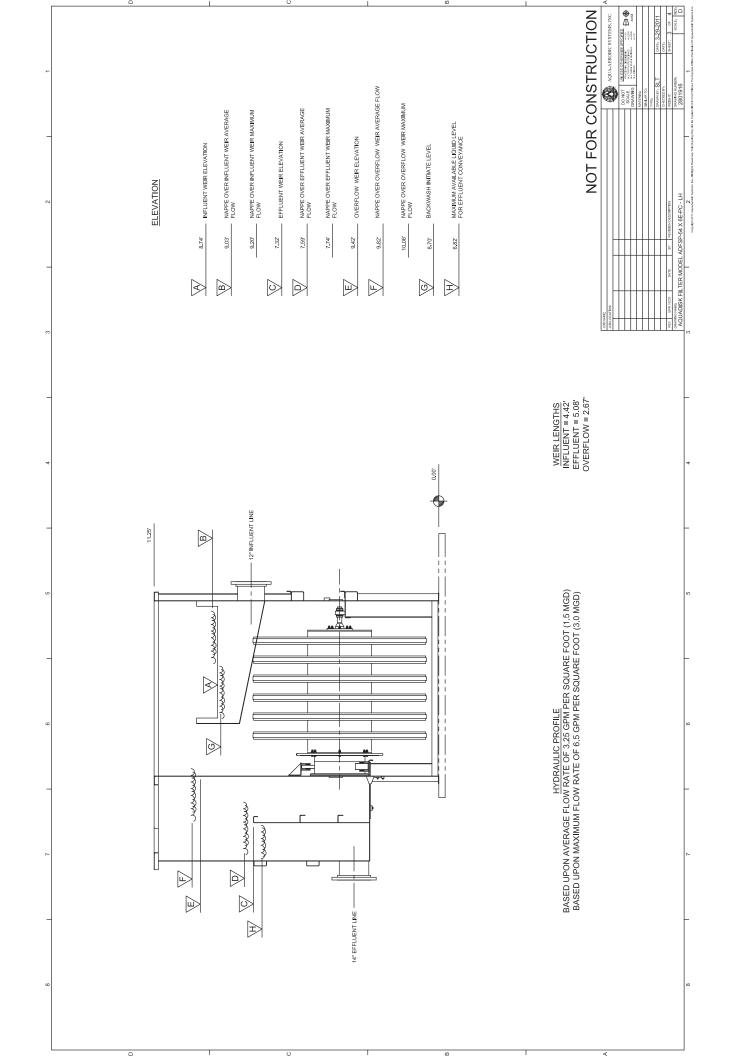
- 2 Conduit Installation(s) consisting of:
 - PVC conduit and fittings.
- 2 Control Panel(s) consisting of:
 - NEMA 4X fiberglass enclosure(s).
 - Circuit breaker with handle.
 - Transformer(s).
 - Fuses and fuse blocks.
 - Line filter(s).
 - GFI convenience outlet(s).
 - Control relay(s).
 - Selector switch(es).
 - Indicating pilot light(s).
 - Compactlogix Processor.
 - Power supply(s).
 - Input card(s)
 - Output card(s).
 - Analog input card(s).
 - Ethernet switch(es).
 - Operator interface(s).
 - Power supply(ies).
 - Motor starter(s).Terminal blocks.
 - · · · · · · · · ·

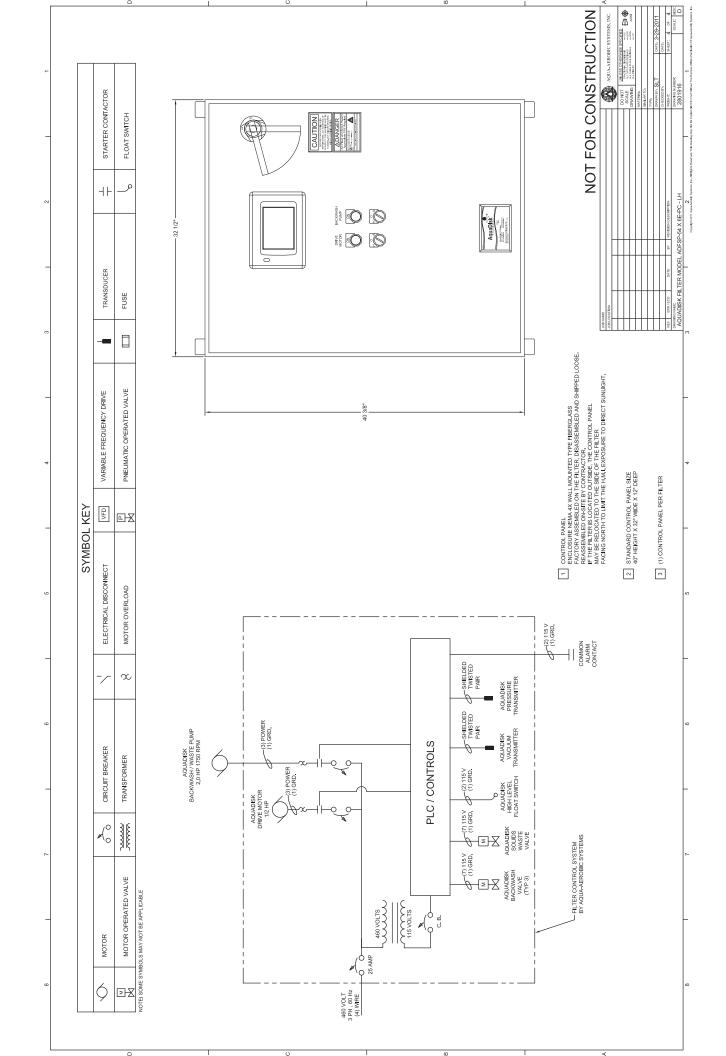
- UL label(s).

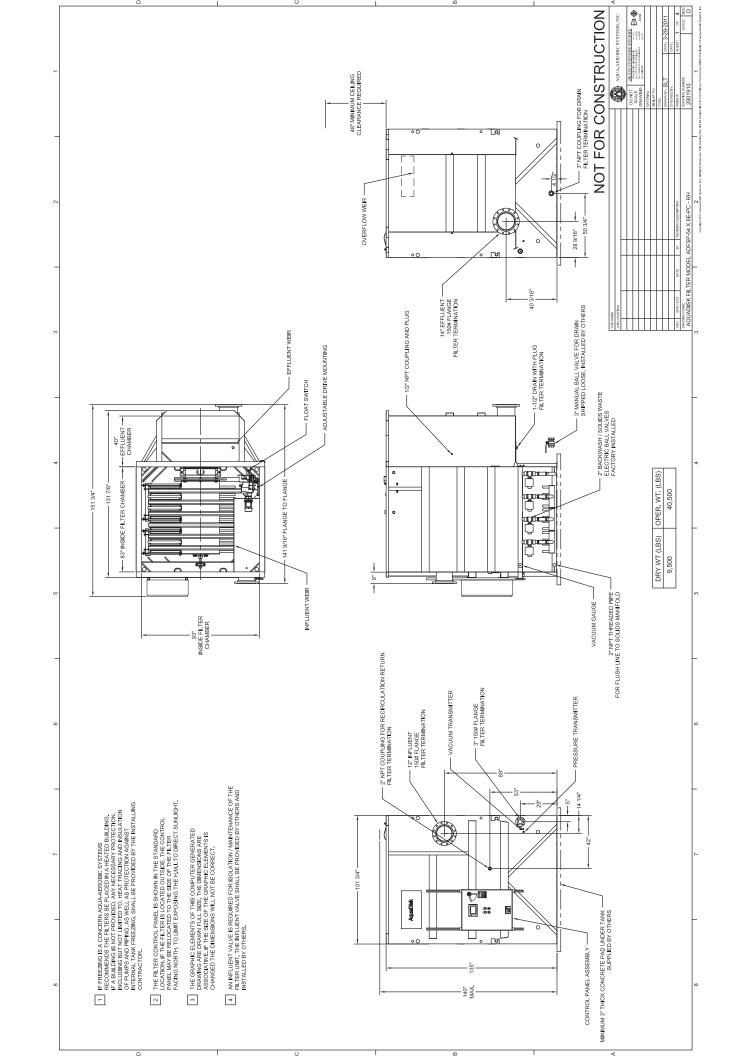
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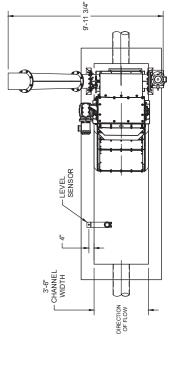






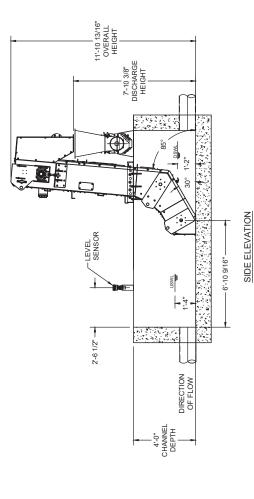
PROCESS DESIGN INFORMATION (SCREEN):
APPLICATION:
APPLICATION:
AF MGD
SCREEN BACK FOW:
ANGLE OF SCREEN:
ANGLE OF SCREEN:
CHANNEL MDTH:
CHANNEL MDTH:
DOWNSTREAM WATER LEVEL:
14 O INCHES @ PEAK FLOW
HEADLOSS:
C.S. INCHES @ PEAK FLOW WITH 30% BLINDING
6.3 INCHES @ PEAK FLOW WITH 30% BLINDING
6.3 INCHES @ PEAK FLOW WITH 30% BLINDING
5.5 INCHES @ PEAK FLOW WITH 30% BLINDING
6.3 INCHES @ PEAK FLOW WITH 50% BL

PROCESS DESIGN INFORMATION (PRESS):
APPLICATION:
MUNICIPAL HEADWORKS
SCREEWINGS CAPACITY:
SCREWINGS DISCHARGE HEIGHT:
BISCHARGE PIPING LENGTH:
TS FEET
SPRAY WASH WATER:
15 GPM AT 60 PSI



NOTES:
1. CONCRETE, GROUT, INTERCONNECTING PIPING
NOT BY SAVECO
2. ALL INTERCONNECTING PIPING TO BE SELF SUPPORTING
3. DRAWING NOT FOR CONSTRUCTION

PLAN



4'-0" CHANNEL DEPTH

-5'-1 1/2"

-

3'-6" - CHANNEL WIDTH

FRONT ELEVATION

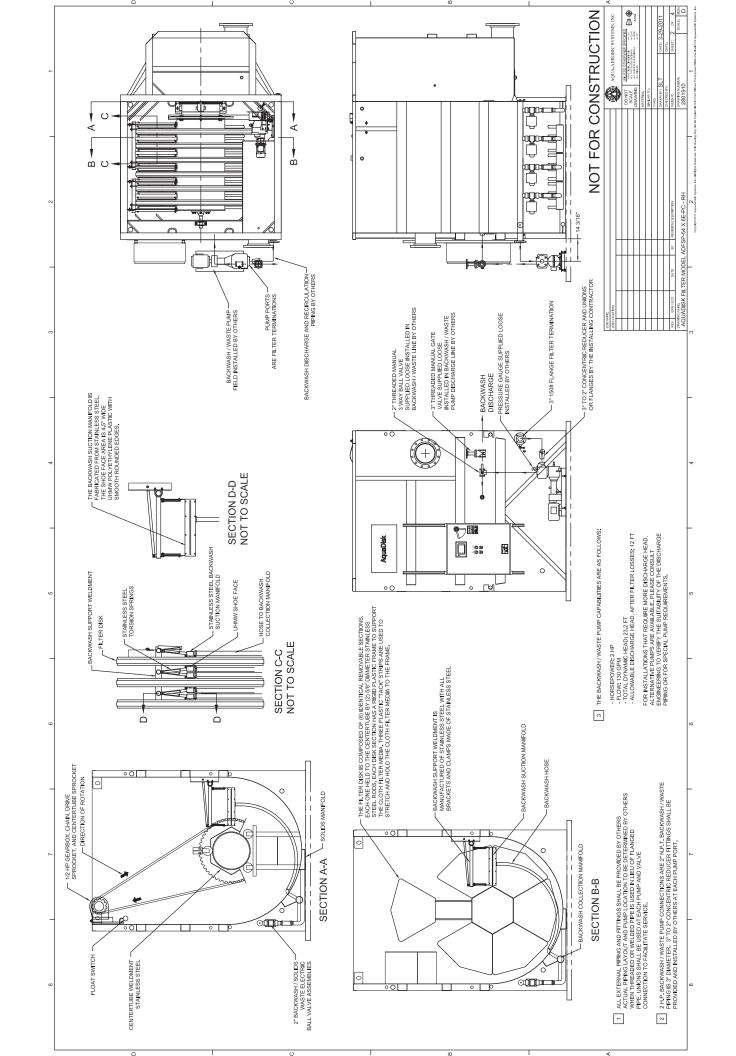


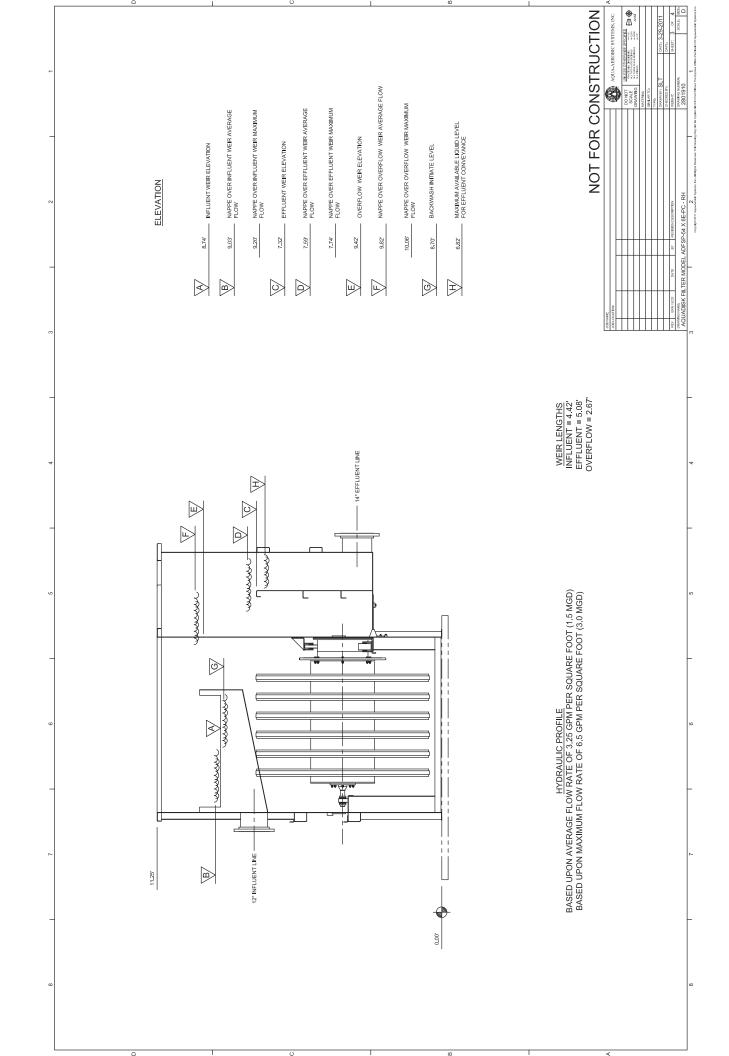
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RECLAMTION FACILITY	₩ ₩	Title HUR7-AB712x3085/8 FSM MULTIRAKE BAR SCREEN
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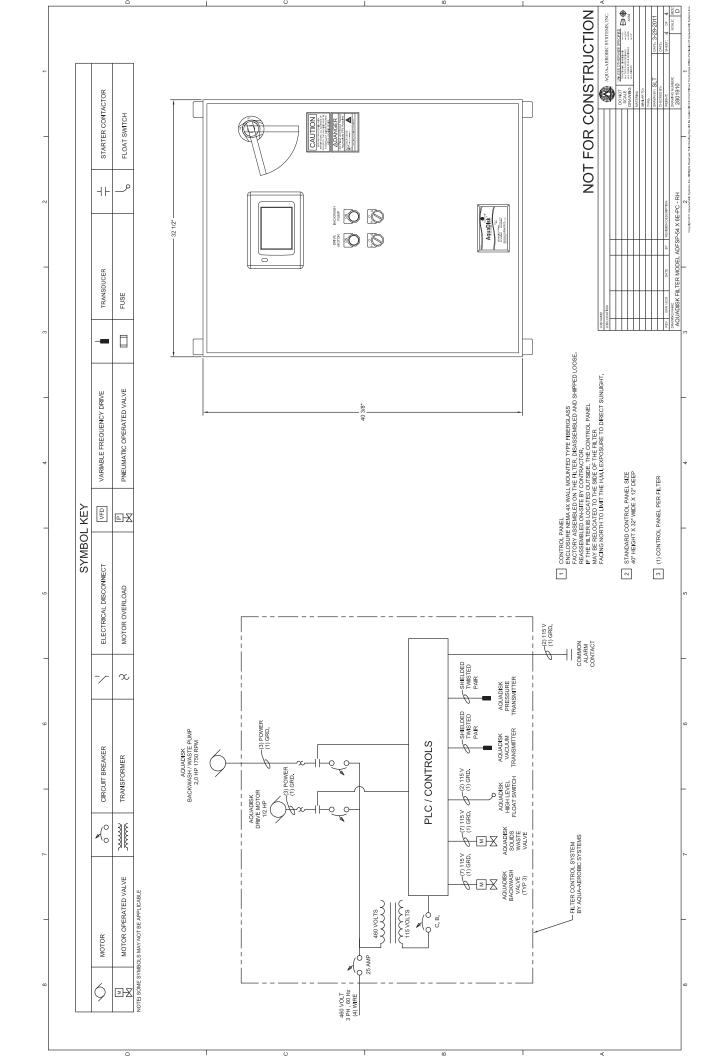
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1 OF 1 WEC225085-AB 1-1-0₄









Appendix B4 – UV Disinfection Glasgo

SRRF WWTP Milton DE GLOW-6000-4-8X-AUTO- U TURN SUBMITTAL V1.0 February 24, 2022 GLASCO UV PART 1 GENERAL

- 1.1 DESCRIPTION GLOW-6000-4-8X-AUTO-U TURN UV Disinfection
 - A. Glasco UV will furnish all materials, equipment and appurtenances required to provide an amalgam based horizontal UV disinfection system with automatic cleaning provided with accessories as described in this document and in keeping with the specification.
 - B. Glasco UV will supply the following:
 - 1. One (1) concrete channel provided by Dutchland
 - 2. Two (2) banks of self-cleaning modules
 - 3. One (1) Ballast Control Center
 - 4. One (1) Allen Bradley PLC Center
 - 5. Two (2) UV monitoring systems
 - 6. One (1) automatic quartz cleaning center
 - 7. One (1) Thern hoist
 - 8. One (1) low level sensor
 - 9. One (1) set of spares
 - C. The CONTRACTOR will furnish all labor, materials, equipment, and appurtenances required to install, test and place into satisfactory operation the UV SYSTEM furnished by Glasco. These services include but are not limited to:
 - 1. Mechanical installation of the system including anchor bolts, air piping, supports, fittings and valves.
 - 2. Electrical installation. Placement and delivery of protected power to the enclosures.

1.2 QUALITY ASSURANCE

- A. Design Criteria:
 - 1. The equipment has been designed to disinfect effluent with the following characteristics:

a. Peak Flow:

b. Minimum Flow:

c. Total Suspended Solids:

d. Biological Oxygen Demand:

e. Effluent Temperature Range:

f. Ultraviolet Transmission:

2.50 MGD

<10 mg/l

<10 mg/l

33 to 90 F

65%

g. Max mean particle size: 30 Microns
h. Effluent standards: 200/100 ml fecal

i. Dosage: 90 mJ

- 2. The UV system will fit into the channel having the approximate dimensions:
 - a. Length
 - b. Width 32"
 - **c. Depth** 48"
- 3. The effluent depth will be 32" as by the weir as furnished by Glasco.
- 4. System Configuration
 - a. The UV system will fit in the channel as shown on the attached drawings.
 - b. The UV system will be configured as follows:

1.	Number of channels:	1
2.	Number of banks per channel:	2
3.	Number of modules per bank:	4
4.	Number of lamps per module:	16
5.	Total number of lamps system:	64+64=128
6.	Number of System Control (SCC):	1
7.	Number of Ballast Control Centers (BCC):	1
8.	UV Sensors:	1
9.	Weir:	1

- c. Performance Requirements:
 - 1. The UV disinfection system will provide a discharge permit of 200/100 ml
 - 2. The UV system will be a multi-bank UV system with automatic cleaning, PLC controls, Level Control as shown.
 - The UV system has been designed to provide a bioassay dosage of 90 mJ (90,000 uWs/cm2) with a UVT of 65% at end lamp life and with fouling.
 - 4. The multibank approach allows for service while system is still disinfecting.
 - 5. The system has been designed for complete outdoor installation.

1.3 SUBMITTALS

- A. Glasco UV has submitted information as it relates to the UV Specification. Ultraviolet (UV) disinfection system will be complete and operational with controls and accessories as shown and as specified. The UV equipment will be capable of treating the wastewater with the characteristics outlined to meet the permitted discharge limitations.
 - 1. The system is described in this document as it relates to the specification.
 - 2. Dimensional drawings are attached for both the structure and devices like the Level control Weir.
 - 3. Catalog cut and data sheets are attached.
 - 4. Power drawings and layout wiring diagrams are attached.

- 5. UV dosage is based on bioassay data (see attached)
- 6. The UV system is being provided with a performance guarantee.

1.4 GUARANTEE

A. Equipment

1. The UV system will be free from defects for a period of 1 year after final acceptance by owner.

B. UV Lamps

- 1. The UV lamps are warranted for 16,000 hours when operated in automatic mode and will be prorated after 9,000 hours. On/Off cycles are limited to 4 times per day.
- C. Ballasts are warranted for five (5) years and prorated after one (1) year.

System Warranty

- A. The warranty period is 18 months from date of delivery and 12 months from date of the Certification of Substantial Completion whichever comes first. It covers all failures due to defects in material and/or workmanship excluding consumables (see separate lamp and ballast warranties below).
- B. Spare parts will be available at the indicated pricing for at least 10 years.
- C. Performance and Parts

This warranty shall not apply to any failure or defect which results from the Equipment not being operated and maintained in strict accordance with instructions specified in Glasco UV's Instructions Manual or which results from mishandling, misuse, neglect, improper storage, improper operation of the Equipment with other equipment furnished by the Customer or by other third parties or from defects in designs or specifications furnished by or on behalf of the Customer by a person other than Glasco UV. In addition, this warranty shall not apply to Equipment that has been altered or repaired after start-up by anyone except:

- Authorized representatives of Glasco UV, or
- · Customer acting under specific instructions from Glasco UV.

Customer must notify Glasco UV in writing within 5 days of the date of any Equipment failure. This notification shall include a description of the problem, a copy of the operator's log, a copy of the Customer's maintenance record and any analytical results detailing the problem. If Customer has not maintained the operator's log and maintenance record in the manner directed in the Operation and Maintenance manual or does not notify Glasco UV of the problem as specified above, this warranty may, in Glasco UV's discretion, be invalid.

Customer will fully cooperate with Glasco UV, in the manner requested by Glasco UV, in attempting to diagnose and resolve the problem by way of telephone support. If the problem can be diagnosed by telephone support and a replacement part is required, Glasco UV will either, at Glasco UV's expense, ship a repaired, reworked, or new part to the Customer who will install such part as directed by Glasco UV or will direct Customer to acquire, at Glasco UV's expense, such part from a third party and then install such part as directed by Glasco UV.

This warranty is the exclusive remedy of the Customer for all claims based on a failure of or defect in the Equipment, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or fitness for a particular purpose shall apply to the Equipment.

D. Lamp Warranty

Each low pressure, lamp is guaranteed for 16,000 hours operating time under normal operating conditions. Normal operating conditions include:

On/off cycles max. 4 per 24 operating hours,

Voltage fluctuations according to DIN IEC 38.

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In case of premature lamp failure, the client is requested to send the lamp back to Glasco UV together with the information of UV unit serial number, hours run and on/off cycles. Glasco UV then offers the following:

Lamp failure before 16,000 h: Glasco UV will send a replacement lamp free of charge,

Upon return to our facilities in Mahwah, NJ, we will dispose/recycle all used and failed lamps at no charge to the client.

Period of Coverage: Where a Lamp has been stored, handled and installed as specified in the Operation and Maintenance manual, and the relevant UV equipment has been operated and maintained in accordance with instructions specified in the Operation and Maintenance manual, and:

Regardless of actual Lamp operating hours, the Lamp warranty is void if the date of Lamp failure occurs more than thirty-six

(36) calendar months after the Lamp shipment date from Glasco. The above operating conditions of Lamps are based on 4 On/Off cycles, on average per 24-hour period, when operated in automatic mode.

Limitations: This limited warranty does not cover:

Lamps that have been used with parts not supplied or approved by Glasco

Lamps that have been physically damaged or fail due to corrosion, exposure to contaminants (e.g. effluent), incorrect installation or operation,

Costs related to removal, installation, or troubleshooting

Damage caused by improper return packaging

Taxes, duties or brokerage fees (if any)

The above warranty is the exclusive remedy for all claims based on a failure of or defect in a Lamp, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or of fitness for a particular purpose shall apply to a Lamp.

Glasco does not assume any liability for personal injury or property damage caused by use or misuse of a Lamp. Glasco shall not in any case be liable for special, incidental, indirect or consequential damages, even if it has been advised of the possibility thereof. Glasco's liability shall not, in any case, exceed the cost of replacement of a defective Lamp.

E. Ballast Warranty

The warranty is only valid with respect to a new Ballast that is part of the original unit, spare parts that shipped with unit or a factory replacement component, and that is properly stored, handled and installed as specified in the Operation and Maintenance manual supplied with the system. Without limiting the generality of the foregoing, any excess vibration or improper operation of the Ballast shall void this warranty.

Glasco shall not be liable for any Ballast failure which results from UV equipment not being operated and maintained in strict accordance with the instructions set out in the Operation and Maintenance manual.

In order to assess and process any Ballast warranty claim, Glasco requires the customer to notify within one (1) month of the failure and submit a written document otherwise the warranty shall be void.

Glasco reserves the right to require the Customer to return failed Ballasts facilities for inspection along with the operator's log and maintenance records. Failure to return the Ballast or provide logs or records when requested shall void the warranty. Glasco will cover the return shipping expense.

Period of Coverage: Where a Ballast has been stored, handled and installed as specified in the Operation and Maintenance manual, and the relevant UV equipment has been operated and maintained in accordance with instructions specified in the Operation and Maintenance manual:

- 1. the Ballast fails within one (1) calendar year after the Warranty Start Date, GLASCO shall provide the Customer with a replacement Ballast free of charge.
- 2. the Ballast fails after the first (1st), and before the fifth (5th), anniversary of the Warranty Start Date, Glasco will provide the Customer with a replacement Ballast at a discounted price. The following formula is used to determine the discounted price for replacement Ballasts:

Replacement Ballast Price= ((Number of Elapsed Months)/ 60 x Ballast List Price)

The "Warranty Start Date" is, in the case of a Ballast forming part of a new system installation or shipped as a spare part with a new system, the commissioning date of the new system and, in the case of a Ballast purchased as a replacement component, the shipment date of the Ballast. One "Elapsed Month" shall be deemed to have passed at the beginning of the day in each subsequent month that is the same calendar day as the day on which the Warranty Start Date falls, or the first day of the next following month if the Warranty Start Date falls on a day not present in any particular month.

Limitations: This limited warranty does not cover:

Ballasts that have been used with parts not supplied or approved by Glasco UV

Ballasts that have been physically damaged or fail due to corrosion, improper installation, exposure to moisture or

abnormal stresses

Costs related to removal, installation, or troubleshooting

Damage caused by improper return packaging or damage caused by power quality disturbances falling outside the

acceptable voltage tolerances. Taxes, duties or brokerage fees, if any

The above warranty is the exclusive remedy for all claims based on a failure of or defect in a Ballast, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or of fitness for a particular purpose shall apply to a Ballast.

Glasco does not assume any liability for personal inquiry or property damage caused by use or misuse of a Ballast. Glasco shall not in any case be liable for special, incidental, indirect or consequential damages, even if it has been advised of the possibility thereof. GLASCO's liability shall not, in any case, exceed the cost of the ballast.

2 PART- PRODUCTS

2.1 DESIGN, CONSTRUCTION AND MATERIALS

A. General

- 1. All metal contacted by liquid or in close proximity to liquid will be: Type 316L stainless steel
 - i. Type 316L stainless steel for metal requiring welding.
- 2. All metal above the water will be: Type 304 stainless steel
- 3. All wiring will be Teflon coated.
- 4. All material exposed to UV radiation will be from the following:

Type 316 stainless steel

Type 214 clear fused quartz

- i. 99.9 percent silicon dioxide
- ii. Circular tubing
- iii. FEP
- iv. Teflon coated wiring is rated for 15 years.

B. Lamp Array Configuration:

- 1. The lamp array is uniform in a horizontal array with all lamps evenly spaced.
- 2. The UV module is designed for full immersion of the lamp's electrodes.

C. UV Module

- 1. Each module will hold the UV lamps in the channel and will be designed to have 4" centerline spacing. This will maximize disinfection.
- 2. Each UV module houses UV lamps. In the event of lamp breakage, the system is designed so no other lamps will be damaged by the water. This allows each lamp to be electrically isolated.
- 3. UV modules are constructed from 316L stainless steel.
- 4. Modules are constructed in a manner, which will prevent light from emanating. Light will not emanate when modules and covers are put on the UV unit.
- 5. Modules will connect to the Ballast Control Center in watertight outdoor rated IP65 cables.
- 6. The UV modules are removable from the channel.
- 7. The open end of the quartz sleeve will be compressed by a Viton o-ring.
 - a. The ends of the lamps do not extend beyond the frame.
 - b. The modules have lifting lugs and handles.

- c. The UV module is capable of being submerged. All electronics are remotely located.
- d. No tools are required to make compression seals. These are hand tightened.



GLOW-6000-SX Module as shown will be provided.

D. UV Lamps

- 1. The UV lamps are low pressure high intensity amalgam.
- 2. Lamps have the following characteristics:

Low pressure high intensity four pin at one end. Lamps are considered GXA64T6L and are 320 watts.

- 3. Lamps have all electrical connections at one end. They have 4 pins that are designed of ceramic ends. The design prevents arcing. The lamp material (quartz) is designed to be 94% transmissible.
- 4. UV Lamps have a 16,000-hour warranty as described.
- 5. Lamps are designed to produce 254nm and are manufactured from a material that does not produce ozone (ozone is produced in the 185 nm range).
- 6. Lamps have been designed to vary output.

E. Lamp End Seal and Lamp Holder

- 1. The open end of the quartz sleeve (one end is closed aka domed) is fire polished for smoothness. This sleeve is sealed with a Viton O-ring and a hand tightened knurled compression fitting.
- 2. The compression nut does not require any tools.
- 3. The UV lamp is held in place by a two sealed molded lamp connector. The holder prevents fracturing and water damage.

- 4. Seals are designed to prevent water damage in the event of a breakage.
- 5. The UV seal is designed to prevent moisture from entering.
- 6. The lamp holder is designed to prevent the UV lamp from touching metal cup.

F. UV Lamp Quartz Sleeves

- 1. Sleeves will be clear fused quartz circular tubing as by GE Type 214. Sleeves will be rated for transmittance of 94 percent or more and sleeve will not be subject to solarization over its life. Sleeve will be 25 mm X 28 mm X 1626 mm and shall be fire polished and domed.
- 2. One end of each sleeve will be closed, and the other end sealed by a lamp end seal and compressed O-ring. The closed end of the sleeve will be held in place by means of a retaining O-ring. The sleeve will not come in contact with any steel in the frame.

G. UV Module Support Rackk

- 304L stainless steel modular support racks will be provided to be embedded into the concrete by the contractor. Modular support racks will be placed in a proper position to hold the UV modules.
- H. An Automatic Level Control stainless steel level control weir with drain will be provided.
- I. Low Level Water Sensor
 - 1. A low-level float sensor (data sheets attached) will be provided.
 - 2. During operation, if the float falls below an acceptable level, the UV lamps will be extinguished.
 - 3. The Low-Level Sensor will connect directly to the System Control Center. No power is required.

J. Electrical

- 1. Each module will be powered by the Ballast Control Center (BCC).
- 2. Each module has a pre-conduited, pre-wired cable, which will connect to the Junction Box, which in turn is attached to the Ballast Control Center (BCC).
- 3. Majority of the equipment is pre-wired and pre-terminated. There is little to no terminations required. Any terminations related to the UV system will be addressed.
- 4. The UV ballast has been designed to operate two (2) UV lamps.
- 5. The Power Factor on ballast is 98% (See attached with ballast data).
- 6. Power supply to the Ballast Control center will be 480V, 3 Phase, 40 Amps.
- 7. Power supply to the System Control Center PLC will be 120V, 10 Amps.

8. Electrical supply is not required for low level. The low level will connect directly to the SCC.

K. Ballast Control Center (BCC)

- A single freestanding NEMA 4x modified stainless steel enclosure will be provided for each bank. The BCC will provide power and controls to the UV modules. BCC will be wired to a junction box. The junction box will have connections for power, data and air for the automatic cleaning system.
- 2. Data will be collected from the electronic ballasts and will be displayed on Operator User Interface.
- 3. Each module will have a dedicated circuit breaker. Each bank will have breakers.
- 4. The enclosure, by Hoffman, will be stainless steel 304L and has a factory rating of **NEMA4x.**
- 5. The enclosure is designed for outdoor use and is provided with an Air Conditioner (by Hoffman). It is designed to be sealed from the environment and for harsh work environments.
- 6. The Hoffman enclosures are supplied with a NEMA 4X rating on the free standing stainless steel enclosure.
- 7. One (1) BCC for project.

L. Control and Instrumentation

- 1. System Control Center (SCC) aka PLC Center:
 - a. The SCC will be an Allen Bradley CompactLogix PLC with color touch screen Operator User Interface.
 - b. The SCC will be the central command center and will provide alarms and alerts to the operators. These following alarms (not limited to) will be the primary:
 - 1. Lamp Failure in the form of LEDs
 - 2. Low UV intensity
 - 3. Communication loss
 - 4. Flow signal loss
 - c. Each bank can be placed in Hand or Auto Mode (OFF).
 - d. Elapsed time per bank will be recorded as a way to notify to change lamps at 16,000 hours.
 - e. I/O's will be provided to remotely indicate alarms such as:
 - 1. Major alarms
 - 2. Bank status

M. UV Detection System

- 1. A UV sensor will be provided in each bank. The sensor will be cleaned as part of the automatic quartz cleaning process.
- 2. The UV sensor reads true UVC light and provides a 0-100% readout. The sensor is a digital validated sensor.

MI. Bank Pacing

- 1. A signal from the plant flow meter will be integrated into the UV SCC integrator. This flow signal, in combination with other data, will help modulate the lamps in relationship to flow to save electricity.
- 2. The system will ramp up and down (dim) to meet the required flow rate to save energy.
- 3. The banks will be swapped for even wear and will manage the on/off cycling.

MII. Automatic Quartz Cleaning Center

- 1. A single automatic quartz cleaning center will be provided with cover for outdoor use.
- 2. The enclosure is an engineered Fiberglass to hold a compressor. While it indicates stainless, the Fiberglass is better for this application and lowers the head load.
- 3. The center provides air regulator and air dryer.

MIII. Cleaning System

- The system is provided with a proven automatic quartz cleaning system using pneumatics. The system cleans on a user definable basis and can be manually overridden to wipe on demand.
- 2. The wiping system operates during the disinfection phase. The wiper does not interfere with disinfection.
- 3. The cleaning duration and period is user definable.
- 4. The SCC can control the wiper as well as an override in the junction box.
- 5. All equipment will be provided for a fully operational center.

MIV. Module Lifting Device (Them Ensign 5PA10)

- 1. One Davit crane (with 1 base) will be supplied to lift modules from channel.
- 2. The crane will have a hand winch and an adjustable boom to insure reach and height.
- 3. The device has a swivel.
- 4. One (1) base will be provided to the contractor.

MV. Spare Parts

- 1. 4 UV lamps
- 2. 4 Quartz sleeves
- 3. 2 Wiper rings
- 4. 2 O-rings
- 5. 1 Ballast
- 6. 2 Operators kits.

PART 3 EXECUTION

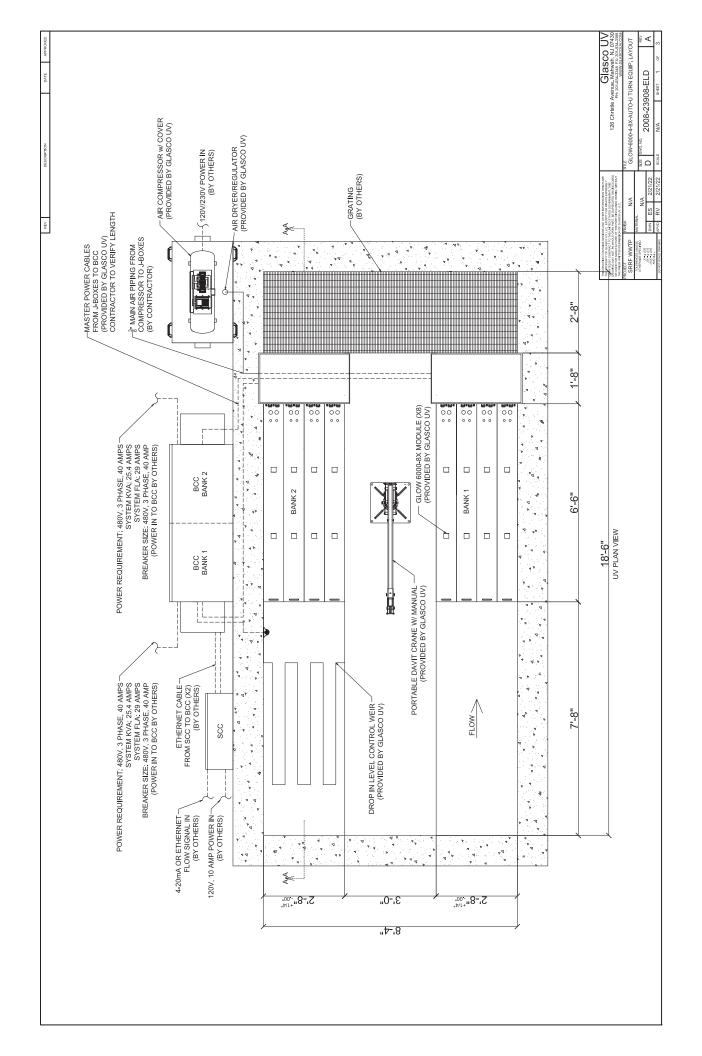
3.1 START UP SERVICES AND TRAINING

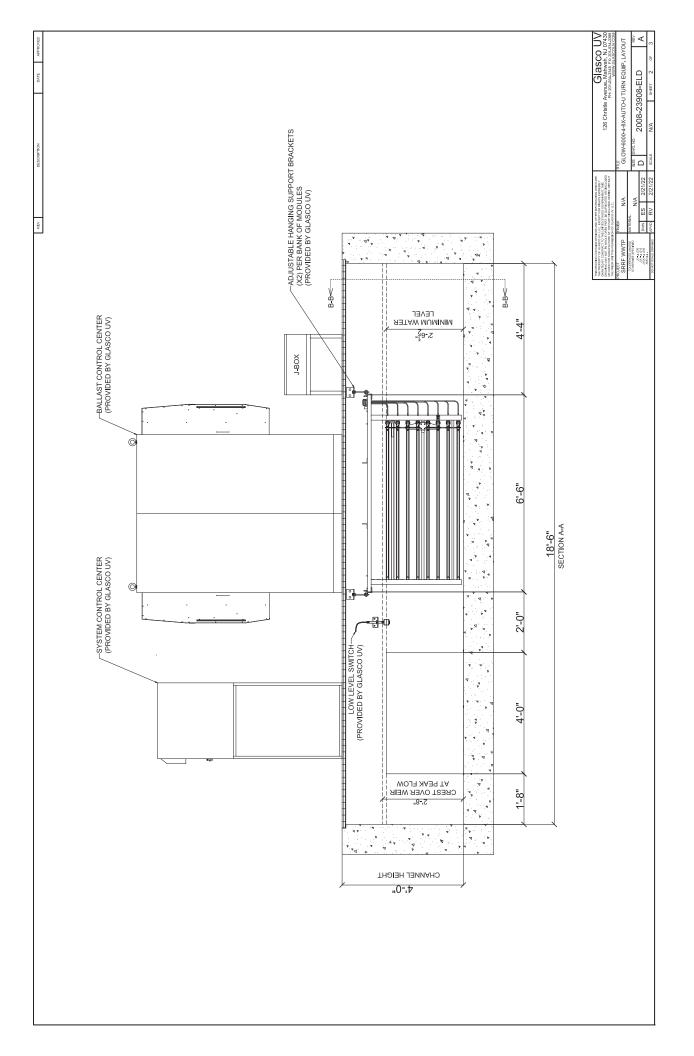
- a) The UV manufacturer will ensure that all material and accessories are delivered to the job site in a timely manner. The UV equipment supplier will verify that all components of the UV system are inspected, and factory tested prior to shipment.
- b) Equipment will be packaged to prevent damage during shipment and will be stored in a dry, temperature-controlled indoor environment prior to installation.
- c) Equipment will be installed in accordance with manufacturer's instruction and recommendations. Exercise care when handling equipment to avoid damage to finish, materials and components of the system.
- d) Manufacturer will provide the services of a qualified manufacturer's representative or a factory technician to oversee installation, start-up and final test of the UV system and controls for three (3) days.
 - The UV manufacturer *may* provide additional training on a per diem basis to plant operators as necessary on the operation of the equipment. Training will include system cleaning, O&M review, replacement of lamps, quartz sleeves, ballasts, and other maintenance items.
 - Additional days of training will be made available to plant personnel as request on a per diem basis.

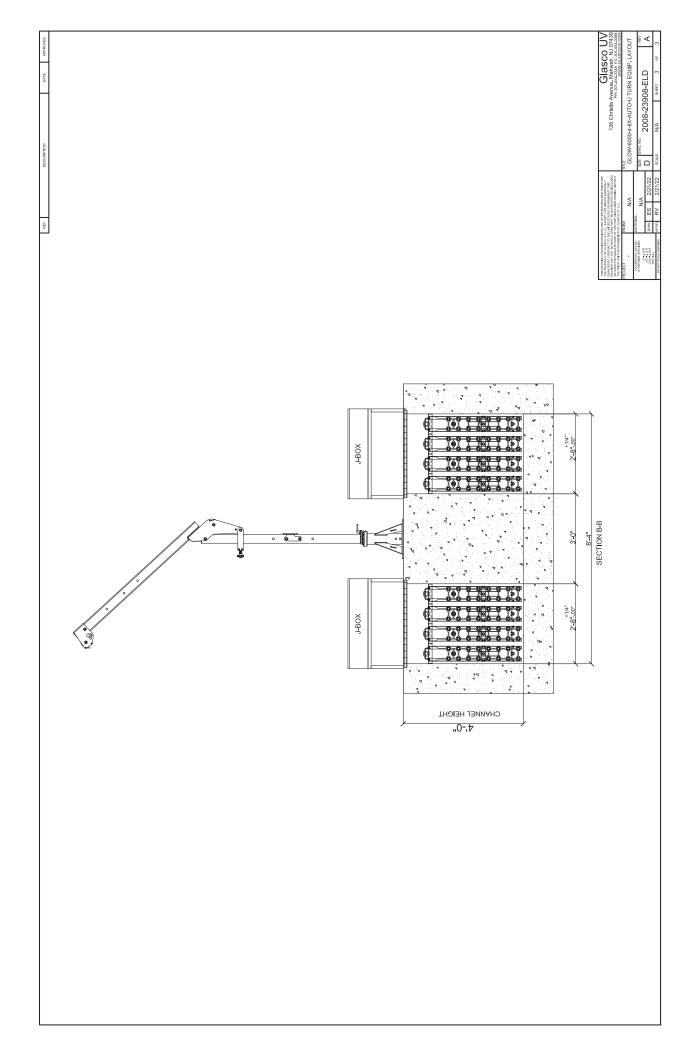
3.2 MANUFACTURERS SERVICES

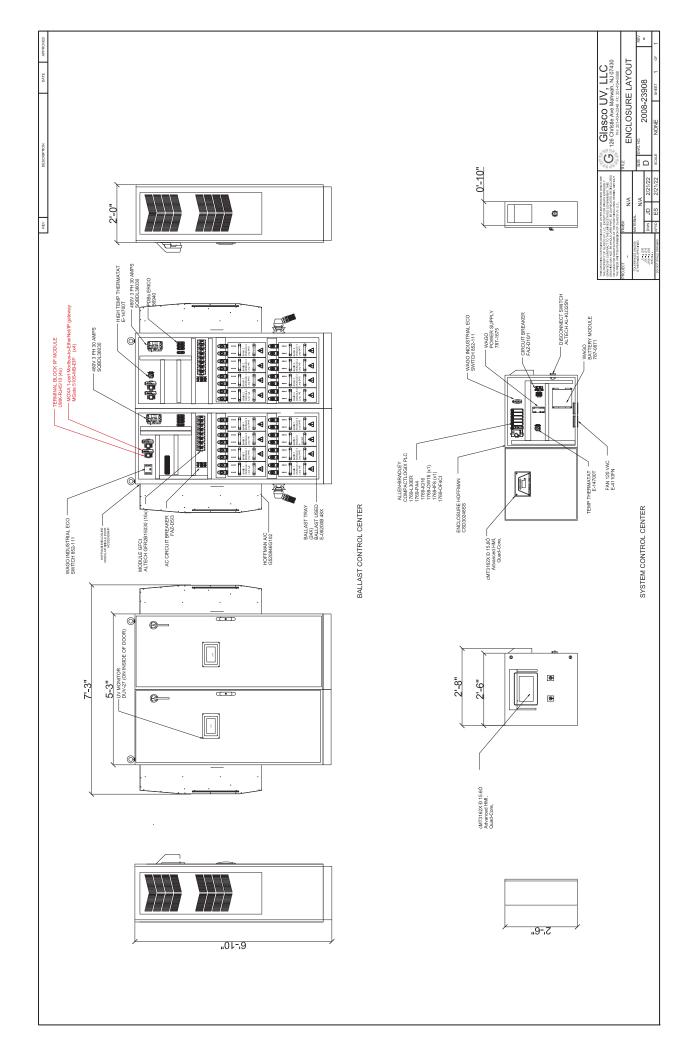
- A. Equipment start-up will be coordinated with the manufacturer's technical representative. The manufacturer's representative will inspect the complete installation and calibrate and adjust equipment as necessary and correct or supervise correction of defects or malfunctions.
- B. A manufacturer's technical representative will instruct Owner personnel in the proper operation and maintenance procedures for the entire UV system.
- C. The Contractor shall coordinate the services of electrician, systems integrator, electrical distribution manufacturer's field technician and all other personnel required for system start-up.

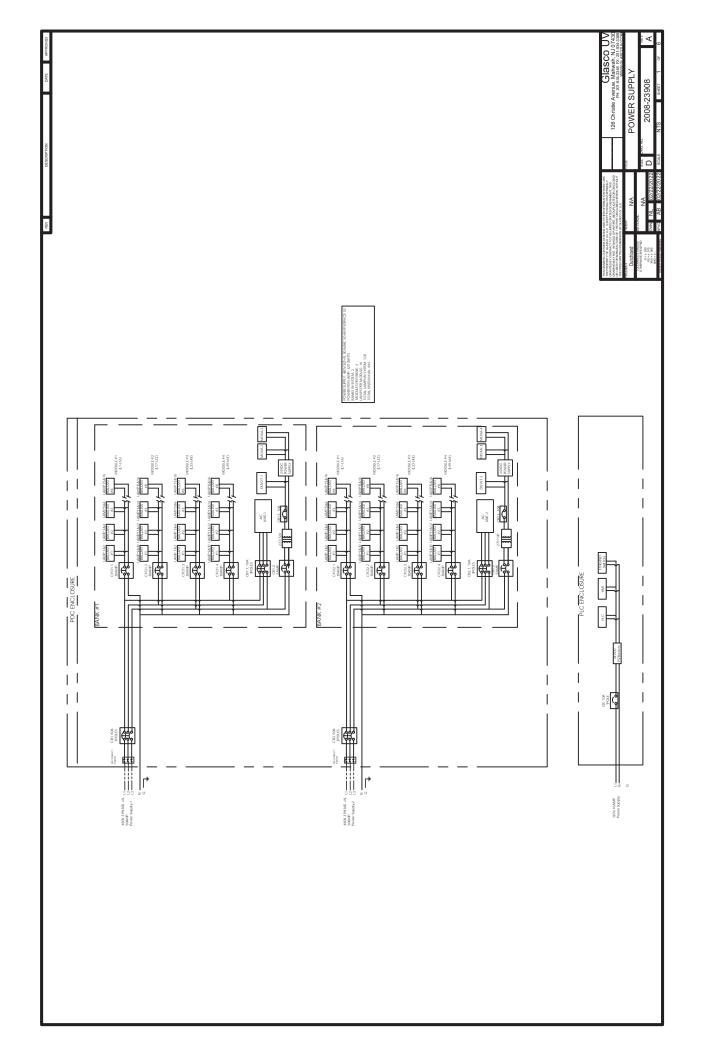
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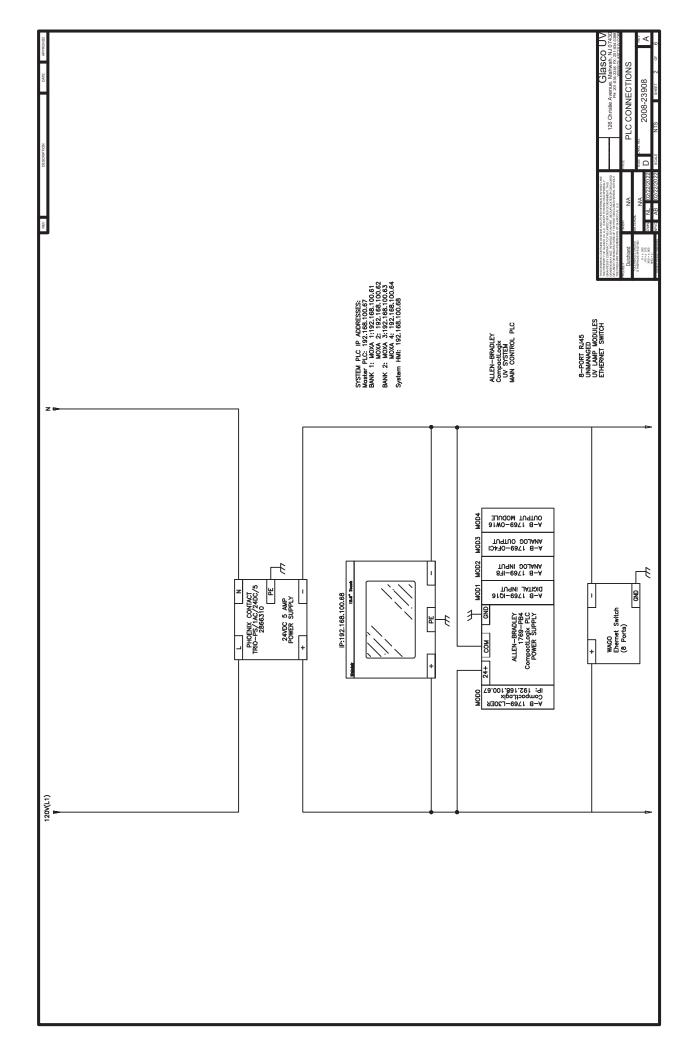


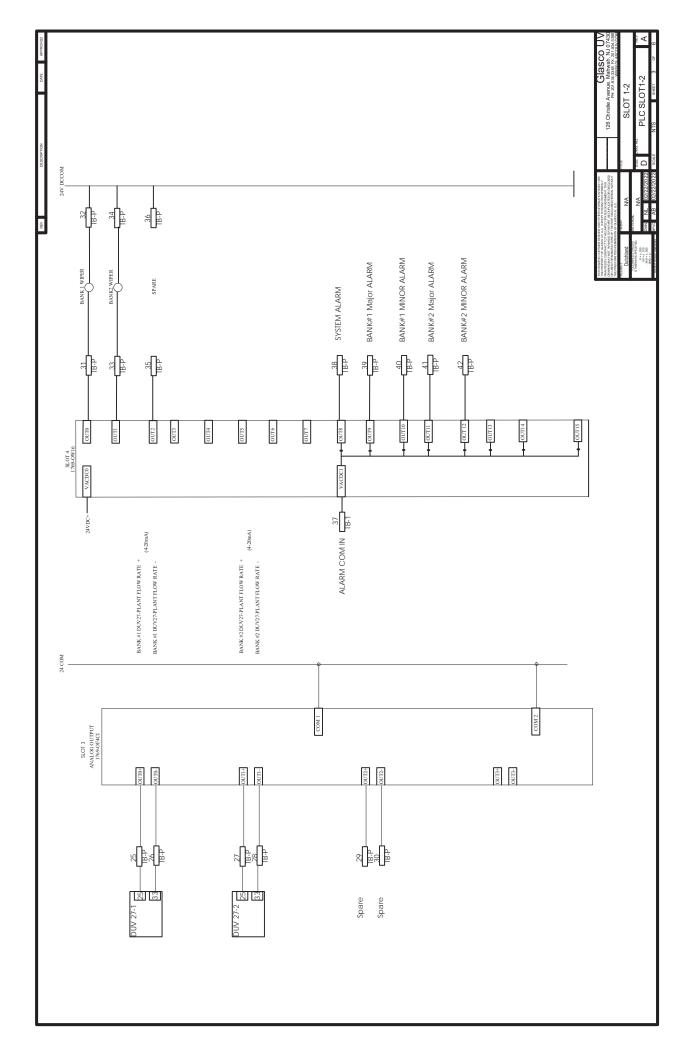


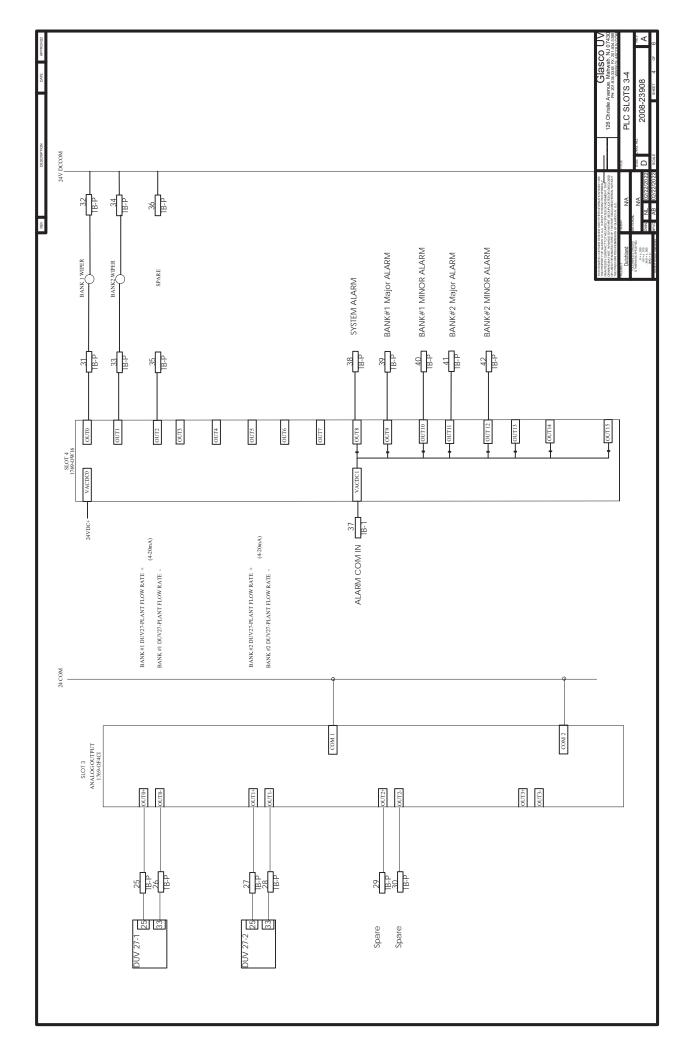


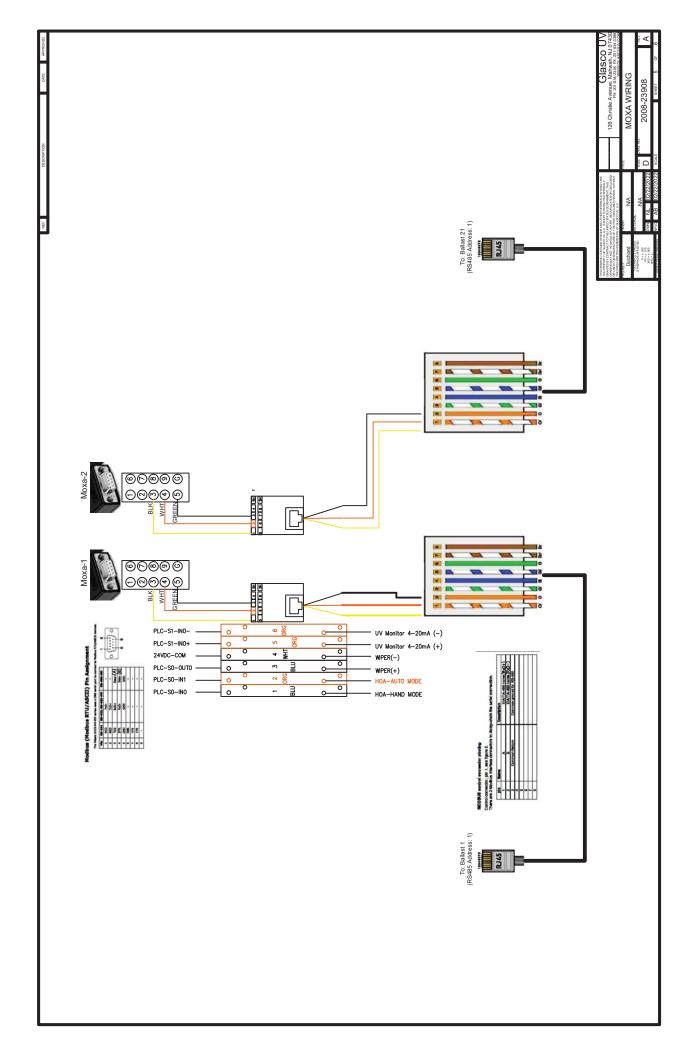


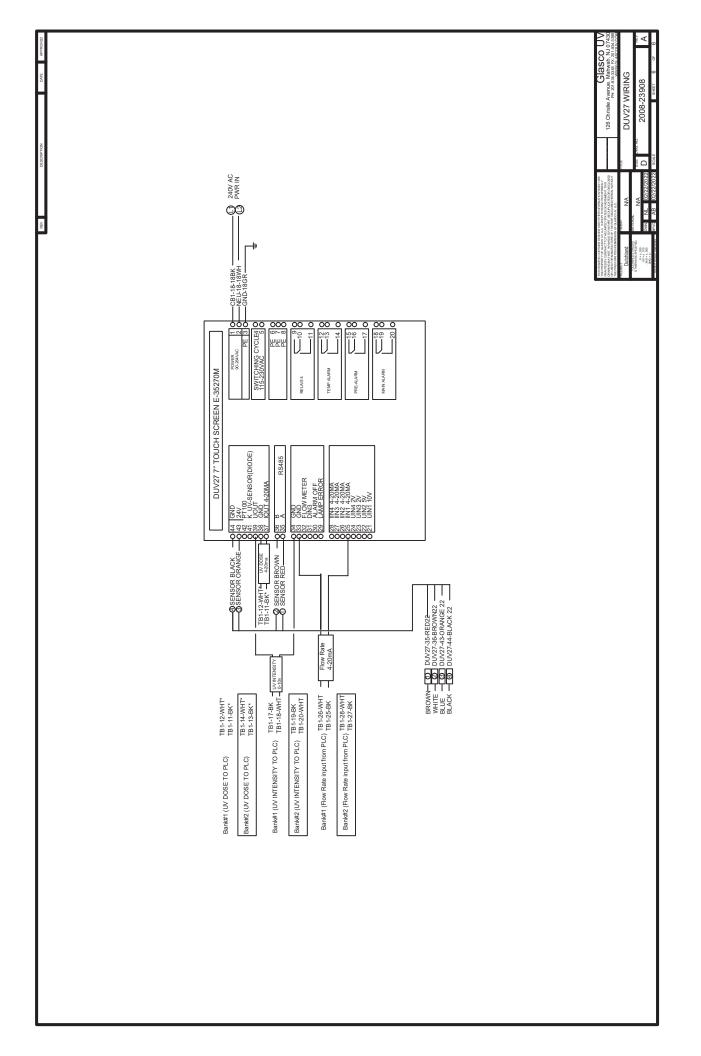












DATA SHEET

AMALGAM LAMPS

Since 2003, Glasco has utilized high-quality spot amalgam and pellet amalgam lamps in both our standard and custom configurations. Our low pressure pellet amalgam lamps function with equal efficiency in both horizontal and vertical operations.

Amalgam lamps yield up to three times the UVC output over standard lamps of the same length. We have applied our proprietary LongLife+™ process to the amalgam line. The proprietary internal coating eliminates the common problem of accelerated depreciation so often associated with higher intensity lamps.

Our lamps have an operating life of up to 16,000 hours, maintaining an end-of-life UVC output of 85%. Degredation at 12,000 hours is 90%.

Pellet amalgam technology has a major benefit over spot amalgam technology. Pellet amalgam lamps are designed to produce higher UVC at full power, but also provide higher UV output under dimming conditions as compared to spot -



amalgam technology. This difference allows for increased output with reduced costs. Other benefits of our pellet amalgam technology include greater efficiency in any mounting orientation (horizontal or vertical) and stable operation in more extreme ambient environments.

Features of Amalgam Lamps

- * Stable UVC output performance over a broad water temperature range $(4 40^{\circ}\text{C})$
- * Higher wattage lamps = fewer lamps required = reduced capital and maintenance cost

Features of Spot Amalgam Lamps

- * Higher UVC outputs down to 50% dimming* range compared to "Spot"technology Universal mounting (horizontal, vertical and diagonal)
- * Stable output performance in very high glass wall temperature application where lamp is mounted vertically or diagonally.

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8-2018

LAMP DATA L-713560

Part #	L-713560
Lamp type	GXA64T6L
Lamp watts (nominal)	320 (input 350W)
Tube diameter	19 mm
Length	62"
Arc length	58"
Current	2.1 Amps
Lamp voltage	157
Lamp life	12,000 hours (16,000)
UVC watts	110
End material	Ceramic
Tube temperature	<150 C
Туре	Pre heat
Wires	Teflon coated
Wavelength	254 nm
Mains voltage (running lamp)	230 Volts
Country origin	USA

for further information please contact us at info@glascouv.com glascouv.com Data is subject to change



The quartz material used for UV disinfection is generically referred to as GE Type 214.

This is considered the worldwide standard for clear fused quartz lamp tubing. GE 214 is high purity, high transmittance, high temperature material with a low hydroxyl (OH)-content and is suitable for a broad range of mercury and other quartz lamp applications.

The industry standard clear fused quartz material. Available in a full range of sizes (lengths, diameters and end seals). Quartz has excellent visual, thermal and mechanical properties with low hydroxyl content and tight dimensional tolerances. The sleeves are 99.9% silicon dioxide in construction.

PROPERTY	TYPICAL VALUES	PROPERTY	TYPICAL VALUES
Density	2.2 x 10 ³ kg/m ³	Dielectric Properties (20°C, 1 MHz)	
Hardness	5.5-6.5 Mohs' Scale	Constant	3.75
	570 KHN ₁₀₀	Strength	5 x 10 ⁷ V/m
Design Tensile Strength	$4.8 \times 10^7 \text{Pa} (\text{N/m}^2) (7,000 \text{psi})$	Loss Factor	< 4 x 10 ⁻⁴
Design Compressive Strength	> 1.1 x 10° Pa (160,000 psi)	Dissipation Factor	< 1 x 10 ⁻⁴
Bulk Modulus	3.7 x 10 ¹⁰ Pa (5.3 x 10 ⁶ psi)		
Rigidity Modulus	3.1 10 ¹⁰ Pa (4.5 x 10 ⁶ psi)	Index of Refraction	1.4585
Young's Modulus	7.2 x 10 ¹⁰ Pa (10.5 x 10 ⁶ psi)	Constringence (Nu value)	67.56
Poisson's Ratio	0.17		
Coefficient of Thermal	5.5 x 10 ⁷ cm/cm °C	Velocity of Sound-Shear Wave	3.75 x 10 ³ m/s
Expansion		Velocity of Sound/	5.90 x 10 ³ m/s
(20°C – 320°C)		Compressional Wave	
		Sonic Attenuation	< 11 dB/m MHz
Thermal Conductivity (20°C)	1.4 W/m °C		
Specific Heat (20°)	670 J/kg °C	Permeability Constants (700°C)	(cm³ mm/cm² sec cm Hg)
Softening Point	1683°C	Helium	210 x 10 ⁻¹⁰
Annealing Point	1215°C	Hydrogen	21 x 10 ⁻¹⁰
Strain Point	1120°C	Deutrium	17 x 10 ⁻¹⁰
Electrical Resistivity (350°C)	7 x 10 ⁷ ohm cm	Neon	9. 5 x 10 ⁻¹⁰

1



OPTICAL PROPERTIES

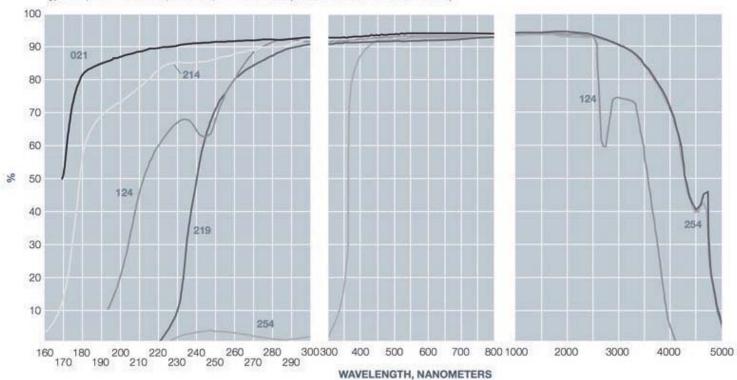
UV Cutoff: As the transmission curve in below illustrates, **Type 214** fused quartz has a UV cutoff (1 mm thickness) at < 160 nm, a small absorption at 245 nm and no appreciable absorption due to hydroxyl ions.

Type 219, which contains approximately 100 ppm Ti, has a UV cutoff at ~230 nm for a 1 mm thick sample. The IR edge falls between 4.5 and 5.0 um for a 1 mm thick sample.

The chart details the percent transmittance for Types 214, 124 and 219 fused quartz, including the losses caused by reflections at both surfaces. Values represent a 1 mm thick Type 214 sample and a 10 mm thick Type 124 sample. Type 124 fused quartz is a very efficient material for the transmission of infrared radiation. Its infrared transmission extends out to about 4 micrometers with little absorption in the "water band" at 2.73 um.

Fused Quartz Average Transmittance Curves

Type 124, 10mm thickness; all others, 1mm thickness (Includes Surface Reflection Losses)



Quartz sleeves are fire polished at the ends. As shown, "domes" or "test tube" ends are shaped and polished. Sleeves come in various lengths, diameters and end confgurations.





The E-10624M UV monitor can be used with a variety of sensors. The UV meter is designed to work in conjunction with a UV sensor to provide operational status of a UV lamp. Depending on the sensor and the requirements, the E-10624M can display UV lamp output UV-values displayed in "W/m²", "mW/cm²" or "%".

The monitor can reduce maintenance costs by determining exactly when lamps need to be serviced. The continuously monitors relative lamp output from 0% to 100%. It provides a method of determining exactly when lamps need to be cleaned or replacement.

As the lamps age, the monitor tracks the lamp output through the display. A warning threshold can be set to turn on a warning indicator and activate a relay for external control.

Thresholds are programmable from 0% to 100% levels. In addition to the display and alarms, the monitor has a 4 to 20ma output which represents the 0% to 100% on the display. This output can be used for remote monitoring or sent to a data collection systems/



The system is "calibrated" after initial installation of the lamp bank and readjusted after after 100 hour burn in. The monitor is adjusted to indicate 100% for new/clean lamps. Then appropriate operator alert levels are set for the specified decrease in intensity.



Part #	E-10624M	
Meter type	Digital for 254 nm	
Supply voltage	24 v	
Lamp monitored	1 to array	
Operation temperature	113F	
Ambient temperature	32 to 104 F	
Size	3" x 3" x 2"	
Hour counter	Resettable	
Display	Multicolor 2 line LCD backlight	
UV alarm	Potential free relay	
UV value	Forwarded via 4-20 mA	
Country of origin	Germany	



The **P-6555SP** is an UV sensor probe used in open channel wastewater applications and is designed to provide the relative UV output of lamps.

The system is comprised of a UV Monitor and a UV Sensor. The system provides a representative overview of how the lamps are performing from the time they were brought on line. Low readings may indicate that the lamp is coming to the end of life, that the quartz sleeve are dirty or that there has been a change to the transmission of the wastewater.

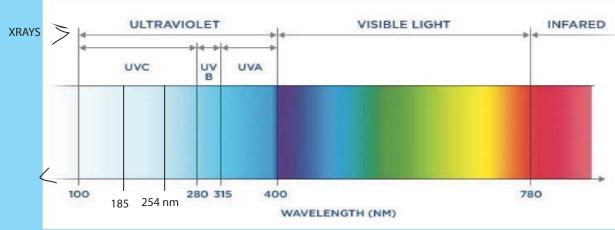
The UV monitor is a true ultraviolet (UV) sensing system. It senses only the germicidal energy spectrum as shown on the chart. Unlike light sensors, which register any wavelength including daylight, the sensor reads UVC light.

Low-pressure lamps produce close to 95% of its light in the 254-nanometer range. The sensor head contains a quartz-filtering device that blocks all wavelengths except those required for the destruction of microorganisms.



E-4025SM (sensor)

The sensor looks at an array of lamps. The specific monitor for your project will be detailed in the attached documentation. The sensor is inserted through the top of the module and resides in its own quartz sleeve. This sleeve is cleaned as part of the automatic quartz cleaning system. This helps maintain the true UV reading.





Part #	P-6555SP (E-4025SM)	
Sensitive element	Silicon Carbide Dioxide (SiC)	
Spectral range	210-380 nm	
Aperture angle	110 Degrees (laterally round)	
IP Code	IP40	
Operation temperature	32-104 F (0-40c)	
Max pressure	10 bar	
Body material	Stainless steel / Teflon	
Cable length	Max 30 meters	
Country of origin	Germany	



Product overview electronic lamp drivers



UVineo - 800W Electronic Lamp Driver

for LP Lamps 240 - 800W

Features

- Small size / low weight
- Autorange input
- 0 10V control of output power
- Power Factor Correction included
- Long lamp cable length (up to 30m)
- High efficiency
- · Low inrush current
- 4x LED status indication
- · Opto-isolated control outputs
- Lamp on
- System status
- Lamp driver status
- Lamp status
- Serial communication (MODBUS)
- Without Modbus communication: settings are fixed

Applications

- UV Disinfection
- UV Curing

Input

Input line voltage 180 - 305 V_{rms}
Input line frequency 47 - 63 Hz
Input line current 4.5 A max.

Power Factor > 0.98 at 100% power

Current THD < 5% typ.

Output

Lamp power 240 - 800W 90 - 160 V_{rms} typ. Lamp voltage Lamp current 2 - 10 A Ignition voltage 1200 Vp Dimming down to 30% Adjustable filament heating at dimming Filament power 2 x 0 - 30 W Preheat adjustable 8 A max Power up to 2 x 80W

adjustable duration

300 x 200 x 70 mm

Wago type 257 / RJ45

Miscellaneous

Dimensions

Connector input

Efficiency > 94% typ. Protections open / short output ground fault lamp leakage temperature input under / overvoltage EOL rectification Cooling Field replaceable fan Lamp cable 30m max. 0° to +50° C Operating temperature -40° to +85° C Storage Approvals CE / cUL

CE c TU'us

Rev.09092013/TTOK

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GLASCO UV - NEDAP POWER SUPPLY

IUVA World conference Sydney 2019

Ultra Violet (UV) low- and medium pressure lamps and LED's are well known and widely accepted UV sources for disinfection applications for water and other fluids, air and surface. Improving efficiency of UV lamps has reached physical limits and UV LEDs still have a long way to go. Unfortunately the overall efficiency of the energy supply systems for the UV sources are in most cases not getting the right amount of attention and short term costs for initial investment are prevailing over the total cost of ownership.

Most ballasts/lamp drivers act as non-linear loads on power grids, drawing a distorted waveform that contains harmonics and results in electromagnetic compatibility (EMC) problems, including Power Quality issues. When electronic lamp drivers consume power in a pulsed manner, it leads to a lower Power Factor (PF). Remind that our "conventional" power grid was designed for linear loads.

Repeating peak currents at the mains input will contain harmonics and the summation of all harmonics is known as total harmonic distortion (THD) of the current. This again leads to distortion of the voltage, depending on the power line impedance.

The impacts of lower Power Factor and harmonic current and voltage distortion are increased losses in transformers, power lines and overheating and degradation of conductors and insulating material. Last but not least, it could reduce lifetime of components.

Another Power Quality problem for UV systems can be mains surges and transient peak voltages (several kilovolts) at the input of the ballast/lamp driver. With insufficient surge suppression in the ballast, the surges can lead to damage of the driver and also overvoltage can reach the lamp, possibly leading to premature lamp failures.

The impact of Power Factor and THD of electronic lamp drivers was investigated by benchmarking 4 topologies available in the market. A comparison was made with regard to overall efficiency and Power Quality, costs and CO₂ footprint impact.

Power Factor and Harmonics.

The ratio of real power and apparent power defines the Power Factor (optimum PF=1) in an AC electrical power system. The Power Factor is determined by the amount of phase shift between voltage and current and by the amount of harmonic current in relation to the fundamental current. Higher apparent power causes higher currents in the power grid and causes additional copper losses (I2*R). In addition, distortion of the input current caused by a device like an electronic lamp driver/ballast will lead to more harmonic currents. In this case the copper losses (I2*R) will increase due to higher currents (I) and the skin effect, where higher frequency currents flow primarily in the outer layer of a conductor, will cause an increase in resistance (R). Also Eddy Currents will add some additional losses as stray electromagnetic fields induce circulating currents in nearby wires and windings of transformers.



The increase in total current (I_{rms}) due to the harmonics can be calculated by multiplying the basic current I_1 (at line frequency 50Hz or 60Hz) by a factor determined by the Total Harmonic Distortion THD_(i)

$$I_{rms} = I_1 * \sqrt{(1+THD^2)}$$

and is shown in the following graph:

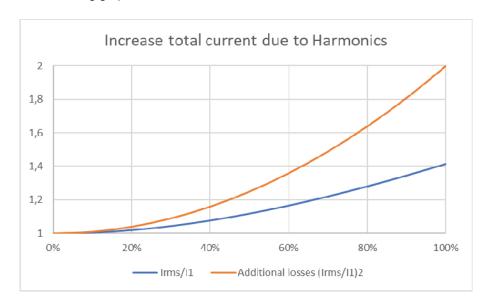


Fig. 1

Devices that cause severe THD_(i) levels of 60%, will show an increase of total current of 16% leading to additional power losses of **36%.** This is excluding the additional losses due to the skin effect.

Impact of high mains voltage/current distortion (THD):

* More Energy losses	Harmonics cause additional losses in conductors and equipment.
★ Higher subscription costs	Harmonic currents can cause higher subscribed power level and consequently higher costs. Utilities will be charging customers.
☆ Oversizing of equipment	Conductors/equipment must be (over)sized taking into account the flow of harmonic currents. Due to skin effect, resistance increases with frequency. So even more oversizing needed for harmonics. Also neutral conductor needs to be oversized as well.
Reduced service life equipment	At THD _u >10%, service life of equipment is significantly reduced. Reduction estimated at: - 32.5% for single-phase machines - 18% for three-phase machines - 5% for transformers To maintain the service lives, equipment must be oversized.
☆ Overload, tripping and shutdown	Circuit-breakers are subjected to current peaks caused by harmonics and nuisance tripping could occur resulting in down-time.

Disturbance of sensitive devices

equipment.

Transients can cause failures or damage to sensitive

In our quest to more reliable and more energy efficient systems it is also important to look into the losses in our power grids, heating up our power cables and transformers. Minimizing these losses will reduce overall costs and will reduce the CO₂ footprint.

On average the power line losses are around 8% but are heavily depending per country, see Fig.2 - Electric power transmission and distribution losses (% of output).



Electric power transmission & distribution losses (% of output).

Fig. 2

Benchmark Electronic Lamp Drivers.

To investigate the performance on Power Quality, 4 lamp driver types available in the market were evaluated. As there is a wide range of applicable power levels and type of lamps, 4 drivers for medium pressure lamps were tested and results were normalized to 100% power level. All units were tested with lamps in an air cooled test chamber and at 21°C ambient temperature. Following set-up was used, see Fig. 3.

Test set up

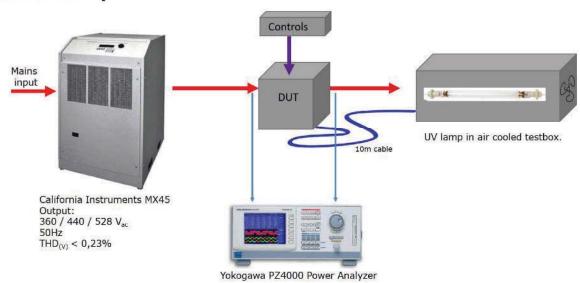


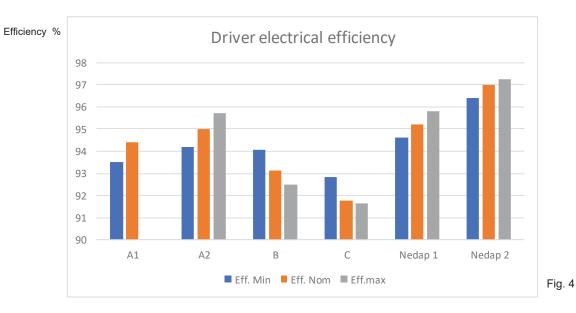
Fig. 3

Besides the Nedap drivers, 3 other topologies were tested, 2 European designs ("A1+A2""and "B") and 1 Asian design ("C"). A1+A2 are drivers from the same manufacturer but different power levels. Design B is made available in the market at several brands.



Efficiency.

Efficiency of the driver was measured with the Yokogawa PZ4000 Power analyzer at minimum, nominal and maximal specified input voltage and at 100% output power.



Note: A1 measurement at Vin max. was not possible due to shut down of driver

It should be noted that for drivers A + B additional power to the cooling fans is not included. In cases C and Nedap the power for the cooling fans and auxiliary voltage for the drivers are included. With state of the art components and designs, an overall efficiency of >95% should be achievable. Be aware that in order to fulfill EMC requirements additional filters are required for A,B and C drivers. This will lower the overall efficiency results.

Power Factor.

Again at 3 input voltage settings the Power Factor was measured, see fig.5.

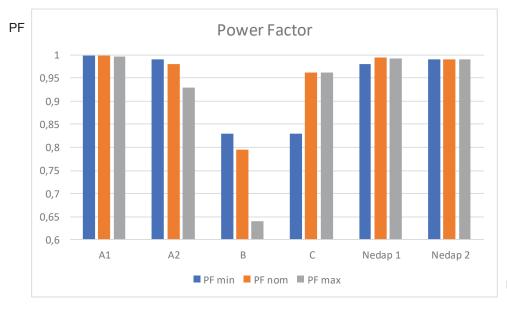


Fig. 5



As indicated the target here is to be close to PF=1. In several cases a good Power factor of well above 0,98 was noticed. In one case (B) a very poor Power Factor (<0.65) was measured at 100% output power and maximal input voltage.

Designs A2 + B showed instability depending on impedance of the power line. In these cases extra attention is needed for additional power line filters to protect the driver for overvoltage, functional instability and to lower the EMC levels, produced by the driver.

Design A showed also a weak point at input line under voltage situations. Output power of the driver in these cases was not automatically dimmed, causing the input current reaching the input fuse rating. This could lead to overheating of components and/or nuisance failures in the field.

During powering up the driver C a current peak of 185A at V_{in} =460V was measured. Nominal value of the input current at 100% output power is around 34A.

Total Harmonic Distortion.

Last but not least the values for the THD_(i) were determined at 3 input voltage levels.

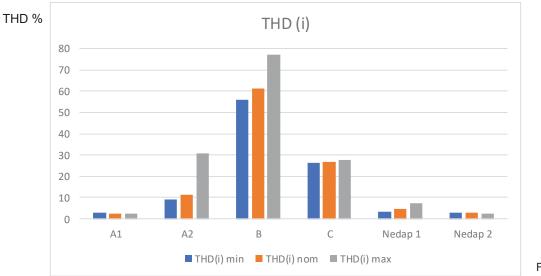


Fig. 6

The target is to be well below 10%. Both Nedap and design A1 show excellent performance here. Design B shows a very high level, even at nominal input voltage, of THD_(i)=61% leading to a **37%** increase in power losses in the power grid.

In many cases additional filters and protection devices are recommended by the manufacturer in order to fulfill regulations and required performance of the driver. Costs for these additional devices can go up to USD 150,- per lamp driver.

Some lamp driver designs do not offer a hold-up time of 20mses. This means that at a missing input voltage cycle or brown-out, the lamp will extinguish and it requires cool down time before restart is possible. In most cases these designs also show a weak input voltage immunity performance and voltage transients can reach the UV lamp resulting in lower lamp lifetime.



Skin effect.

We de see a trend towards higher power low pressure HO lamps, where currents can go up to 10A at frequencies of up to 60kHz. Besides cable capacitance, inductance and dielectric losses, the skin effect needs to be taken into consideration when designing the lamp cables in order to minimize series resistance

of these cables. Specially in some applications where long distances (>50m) are required. See also our publication in IUVA News, Vol. 14, No. 3.

Also connectors and terminals need this attention.

Following picture (Fig.7) shows lamps that have failed after only 300 hrs. of operation with 60-70 on/off cycles. Very often, initially the lamps and/or drivers are blamed, but in this case this premature lamp failure was caused by wrong ferrules and crimping tool, resulting in excessive additional resistance. This led to too low filament temperatures and excessive wear of the electrodes.



Fig. 7

Conclusion.

Energizing our UV sources can be done more energy efficient. This will save costs over the lifetime of the product, reduce carbon footprint and will improve reliability. Initial low cost systems with limited features with regard to Power Factor, THD, EMC and efficiency will lead to higher operational cost during the lifetime of systems. Looking at the total costs of ownership will help in making the right decision for selecting electronic lamp drivers.

Electronic lamp drivers nowadays are available with excellent performances. For choosing the right solution we advise to select drivers with an efficiency of > 95%, a Power Factor of > 0,98 and THD levels below 5%.



PO Box 101, 7140 AC Groenlo, The Netherlands info@nedap-uv.com www.nedap-uv.com



MCSS-HP

Stainless steel combinable version, single door enclosure



CONNECT AND PROTECT



IP 66 | TYPE 4X, 12, 13 | IK 10



The stainless steel single door combinable floor standing enclosure range, MCSS-HP, with a IP 66 protection degree offers a higher protection level for equipment and components which will help extend their lifetime and reduce maintenance costs when the enclosure is installed for rough environments with severe conditions. These new enclosures are rated as IP66 even if they are bayed between them using the standard baying brackets.

Material: AISI 304L pre-grained stainless steel / AISI 316L. Frame: 1.5 mm. Door: 2 mm. Rear, roof and side panels: 1.5 mm. Bottom plates: 1.5 mm stainless steel. Mounting plate: 3 mm galvanized steel.

Frame: Seam welded reversed open profiles with 25 mm hole pattern, according to DIN 43660. Including integrated external hole pattern.

Door: Mounted with four hinges, allowing left or right hand opening. Including door frame with 25 mm hole pattern.

Rear panel: Fitted by M6 torx screws. Standard facilities for rear door mounting.

3

Side panels: Supplied as an accessory.

Roof panel: Removable.

Lock: Espagnolette 4-point locking system. Does not interfere with the enclosure inner space. Standard double-bit lock with 3 mm insert. Standard inserts, cylinders, lift handles and T-handles are available as accessories.

Bottom plates: One piece bottom plate, with injected polyurethane gasket to ensure maximum sealing.

Mounting plate: Double folded and slides into position. Adjustable in depth by steps of 25 mm, with the MPD02 accessory. Mounting plate is supplied, attached on the outside of the enclosure packaging.

Earthing: All panels are earthed through their fittings and are equipped with a separate earthing stud.

Finish: 400s pre-grained stainless steel (0.5 microns average).

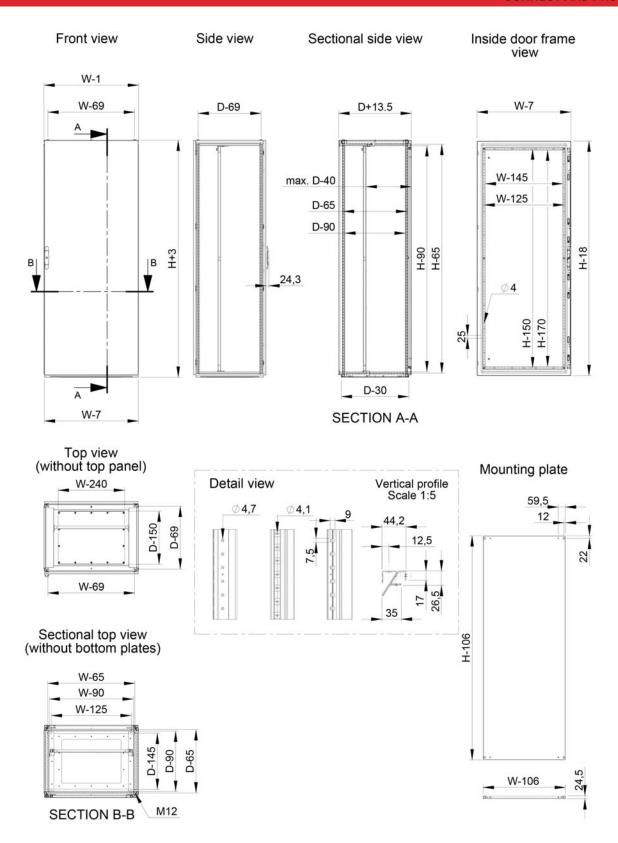
Protection: Complies with IP 66 | TYPE 4X, 12, 13 | IK 10.

Mounting requirements: For stand-alone installation, add side panels. For combined installation, HPPG01 and baying brackets, CCI and CCM are required.

Delivery: Frame with fitted door, rear panel, roof panel, bottom plate, mounting plate and door frame. Delivery also includes earthing bolts. Delivered on a pallet which is identical to the width of the enclosure to allow baying without removal. All packing material is recyclable.



CONNECT AND PROTECT



MCSS-HP

Stainless steel combinable version, single door enclosure



CONNECT AND PROTECT

	Mounting plat	e dimensions	Usable depth			
Н	W	D	h	w	d	Item no.
2000	800	600	1894	694	559	MCSS20086HP

^{*}Other dimensions available on request. Special side panel is required if depth is greater than 700 mm.

MCSS-HP

Stainless steel combinable version, single door enclosure



CONNECT AND PROTECT



CONCEPT, TYPE 4X



INDUSTRY STANDARDS

Mounting brackets required to meet UL/CSA external mounting requirements.

UL 508A Listed; Type 3R, 4, 4X, 12; File No. E61997 cUL Listed per CSA C22.2 No 94; Type 3R, 4, 4X, 12; File No.

NEMA/EEMAC Type 3R, 4, 4X, 12, 13 CSA File No. 42186: Type 4, 4X, 12 VDE IP66 IEC 60529, IP66 Meets NEMA Type 3RX requirements

APPLICATION

For indoor or outdoor applications that require corrosion protection from chemicals and water. CONCEPT Enclosures feature streamlined styling with an attractive stroked finish and flush quarter-turn latches for secure closure. Available in solid- and window-door models.

SPECIFICATIONS

- Manufactured from Type 304 or Type 316L stainless steel
 Minimum-width body flange provides maximum body opening
 External formed 90-degree body flange

- Panel mounting studs fit optional CONCEPT panels and other accessories
- Mounting holes in back of body for direct mounting or for optional external mounting brackets
- Type 316 stainless steel hidden hinges promote clean aesthetic appearance
- Corner formed doors are interchangeable and easily removed by pulling clip-style hinge pins
- Provision on door (except window-door style and when B = 12 in.) for thermoplastic data pocket
- Provision on door (except window-door style and when B = 12 in.) for optional doorstop kit
- Quarter-turn latches furnished with flush slotted insert
- Seamless foam-in-place gasket
- Self-grounding latch system with double seal
- Bonding provision on door; grounding stud on body
- Furnished hardware kit consists of panel-mounting nuts, panelgrounding hardware and sealing washers for wall-mounting
- Installation instructions
- · Window doors have a clear polycarbonate window

Door and body have smooth #4 brushed finish.

ACCESSORIES

Type 316 Stainless Steel Door Stop Kit CONCEPT panels H20MIT Vent Drains, Type 4X H20MIT Thermoelectric Dehumidifier Handles Lock Inserts HF Side-Mount Filter Fans Steel, Stainless Steel and Non-Metallic Window Kits PANÉLITE Enclosure Lights Hol-Sealers Hole Seals

MODIFICATION AND CUSTOMIZATION

Hoffman excels at modifying and customizing products to your specifications. Contact your local Hoffman sales office or distributor for complete information.

BULLETIN: CWS

Standard Product One-Door

			Door	Body		Conductive	Panel Size	Panel Size	Mounting	Mounting	Latches	o		., ,
Catalog Number	AxBxC in.	AxBxC mm	Gauge	Gauge	Panel	Panel	D x E (in.)	D x E (mm)	G x H (in.)	G x H (mm)	Qty.	Style	J (in.)	J (mm)
CSD12126SS	12.00 x 12.00 x 6.00	305 x 305 x 152	16	16	CP1212	CP1212G	10.20 x 10.20	259 x 259	10.50 x 10.50	267 x 267	1	Quarter-turn	6.00	152
CSD12126SS6	12.00 x 12.00 x 6.00	305 x 305 x 152	16	16	CP1212	CP1212G	10.20 x 10.20	259 x 259	10.50 x 10.50	267 x 267	1	Quarter-turn	6.00	152
CSD12246SS	12.00 x 24.00 x 6.00	305 x 610 x 152	16	16	CP2412	CP2412G	22.20 x 10.20	564 x 259	10.50 x 22.50	268 x 572	1	Quarter-turn	6.00	152
CSD12246SS6	12.00 x 24.00 x 6.00	305 x 610 x 152	16	16	CP2412	CP2412G	22.20 x 10.20	564 x 259	10.50 x 22.50	268 x 572	1	Quarter-turn	6.00	152
CSD16126SS	16.00 x 12.00 x 6.00	406 x 305 x 152	16	16	CP1612	CP1612G	14.20 x 10.20	361 x 259	14.50 x 10.50	368 x 267	1	Quarter-turn	8.00	203
CSD16126SS6	16.00 x 12.00 x 6.00	406 x 305 x 152	16	16	CP1612	CP1612G	14.20 x 10.20	361 x 259	14.50 x 10.50	368 x 267	1	Quarter-turn	8.00	203
CSD16166SS	16.00 x 16.00 x 6.00	406 x 406 x 152	16	16	CP1616	CP1616G	14.20 x 14.20	361 x 361	14.50 x 14.50	368 x 368	1	Quarter-turn	8.00	203
CSD16166SS6	16.00 x 16.00 x 6.00	406 x 406 x 152	16	16	CP1616	CP1616G	14.20 x 14.20	361 x 361	14.50 x 14.50	368 x 368	1	Quarter-turn	8.00	203
CSD20166SS	20.00 x 16.00 x 6.00	508 x 406 x 152	16	16	CP2016	CP2016G	18.20 x 14.20	462 x 361	18.50 x 14.50	470 x 368	1	Quarter-turn	10.00	254
CSD20166SS6	20.00 x 16.00 x 6.00	508 x 406 x 152	16	16	CP2016	CP2016G	18.20 x 14.20	462 x 361	18.50 x 14.50	470 x 368	1	Quarter-turn	10.00	254
CSD20206SS	20.00 x 20.00 x 6.00	508 x 508 x 152	16	16	CP2020	CP2020G	18.20 x 18.20	462 x 462	18.50 x 18.50	470 x 470	1	Quarter-turn	10.00	254
CSD20206SS6	20.00 x 20.00 x 6.00	508 x 508 x 152	16	16	CP2020	CP2020G	18.20 x 18.20	462 x 462	18.50 x 18.50	470 x 470	1	Quarter-turn	10.00	254
CSD24206SS	24.00 x 20.00 x 6.00	610 x 508 x 152	16	16	CP2420	CP2420G	22.20 x 18.20	564 x 462	22.50 X 18.50	572 x 470	1	Quarter-turn	12.00	305
CSD24206SS6	24.00 x 20.00 x 6.00	610 x 508 x 152	16	16	CP2420	CP2420G	22.20 x 18.20	564 x 462	22.50 X 18.50	572 x 470	1	Quarter-turn	12.00	305
CSD30166SS	30.00 x 16.00 x 6.00	762 x 406 x 152	16	16	CP3016	CP3016G	28.20 x 14.20	716 x 361	28.50 x 14.50	724 x 368	2	Quarter-turn	5.00	127
CSD30166SS6	30.00 x 16.00 x 6.00	762 x 406 x 152	16	16	CP3016	CP3016G	28.20 x 14.20	716 x 361	28.50 x 14.50	724 x 368	2	Quarter-turn	5.00	127
CSD16128SS	16.00 x 12.00 x 8.00	406 x 305 x 203	16	16	CP1612	CP1612G	14.20 x 10.20	361 x 259	14.50 x 10.50	368 x 267	1	Quarter-turn	8.00	203
CSD16128SS6	16.00 x 12.00 x 8.00	406 x 305 x 203	16	16	CP1612	CP1612G	14.20 x 10.20	361 x 259	14.50 x 10.50	368 x 267	1	Quarter-turn	8.00	203
CSD16168SS	16.00 x 16.00 x 8.00	406 x 406 x 203	16	16	CP1616	CP1616G	14.20 x 14.20	361 x 361	14.50 x 14.50	368 x 368	1	Quarter-turn	8.00	203
CSD16168SS6	16.00 x 16.00 x 8.00	406 x 406 x 203	16	16	CP1616	CP1616G	14.20 x 14.20	361 x 361	14.50 x 14.50	368 x 368	1	Quarter-turn	8.00	203
CSD16208SS	16.00 x 20.00 x 8.00	406 x 508 x 203	16	16	CP2016	CP2016G	18.20 x 14.20	462 x 361	14.50 x 18.50	368 x 470	1	Quarter-turn	8.00	203
CSD16208SS6	16.00 x 20.00 x 8.00	406 x 508 x 203	16	16	CP2016	CP2016G	18.20 x 14.20	462 x 361	14.50 x 18.50	368 x 470	1	Quarter-turn	8.00	203
CSD20168SS	20.00 x 16.00 x 8.00	508 x 406 x 203	16	16	CP2016	CP2016G	18.20 x 14.20	462 x 361	18.50 x 14.50	470 x 368	1	Quarter-turn	10.00	254
CSD20168SS6	20.00 x 16.00 x 8.00	508 x 406 x 203	16	16	CP2016	CP2016G	18.20 x 14.20	462 x 361	18.50 x 14.50	470 x 368	1	Quarter-turn	10.00	254
CSD20208SS	20.00 x 20.00 x 8.00	508 x 508 x 203	16	16	CP2020	CP2020G	18.20 x 18.20	462 x 462	18.50 x 18.50	470 x 470	1	Quarter-turn	10.00	254
CSD20208SS6	20.00 x 20.00 x 8.00	508 x 508 x 203	16	16	CP2020	CP2020G	18.20 x 18.20	462 x 462	18.50 x 18.50	470 x 470	1	Quarter-turn	10.00	254



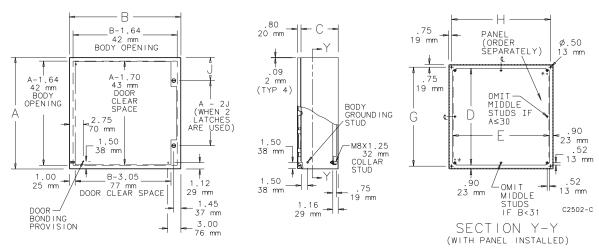
CREATIVATES 70 70 70 70 70 70 70 7				Door	Body		Conductive	Panel Size	Panel Size	Mounting	Mounting	Latches	.		., .
CROSTACRESS 2011 2.010 101 501 501 501 501 502	Catalog Number	AxBxC in.	AxBxC mm	Gauge	Gauge	Panel	Panel	D x E (in.)	D x E (mm)	G x H (in.)	G x H (mm)	Qty.	Style	J (in.)	J (mm)
CREATIONS 2.00 1.												1			
CREATERINGS												1			305
CRIDICATES												1			305
CRIDICATES 2.0 pt 2.0 pt 50 pt 50 pt 20 pt 10 pt 50 pt 20 pt 10 pt 50 pt 20 pt 50 pt 5															305
CONDICATIONS CONDICATION															305
CROSCO-1985 2,40 7,40 12 10 12 14 16 0 0 17 17 15 17 17										22.50 x 22.50					127
CROSCORESS 24.00 2.00 1.00 510 776 720 14 16 PCPUID CROSCORESS 10.00 72.00 11.00 72.20 72.00 72.00 11.00 72.20 72.00	CSD24248SS6			14	16	CP2424	CP2424G							5.00	127
CONDININESS 1000 2000 1200	CSD24308SS	24.00 x 30.00 x 8.00	610 x 762 x 203	14	16	CP3024	CP30240G	28.20 x 22.20	716 x 564	28.50 x 22.50	724 x 572	2	Quarter-turn	5.00	127
CROSSIPATIONS CROSSIPATION CRO	CSD24308SS6	24.00 x 30.00 x 8.00	610 x 762 x 203	14	16	CP3024	CP3024G	28.20 x 22.20	716 x 564	28.50 x 22.50	724 x 572	2	Quarter-turn	5.00	127
CSD0242555 0.00 2 2.00 2 2.00		30.00 x 20.00 x 8.00											Quarter-turn		127
CSD020081855 30.00 2 0.0		30.00 x 20.00 x 8.00	762 x 508 x 203										Quarter-turn		127
CROSS-00000855 30.00 2.0															127
CRISTIANNESS SOLD 7.00 0.00 7.00															127
CROSSIACRESS 30.0 2 km 2 km 2 km 2 km 2 km 1 km 2 km 1 km 2 km															127
CRISTACTIVES S. O. N. Y. A. D. N. E. D. Flat S. O. S. O. D. N. E. D. Flat S. O. S. O. D. N. E. D. Flat Flat S. O. S. O. D. N. E. D. S. O. D. N. E. D. S. O. S. O. D. N. E. D. S. O. D. S. O. D. N. E. D. S. O. D. S. O. D. N. E. D. S. O. D. S. O. D. D. S. O. D. S. O. D. N. E. D. S. O. D. S. O. D. S. O. D. D. S. O. D.															127
CROSS-0808555 0.00 x 0.0															127
CRISTIANNESS 18,00 7,20 7,20 7,2															127
CSD142110SS 1.00 17.00 11.00 16.9 11.00 16.9															127
SSD14181SS 1.00 1.70 1.0															127
CSD141610SS 1.00 1.40 1.10 1.00															203
SSD14210SS 1.00 1.0															203
CSD142011SSS 1.00 2.20 2.10 2.00															
SSD1410SS 1.60 y 2.00 y 1.10 40 x 50 x 50 16 16 PCP016 PCP0166 18.20 x 1.20 46.27 x 50 1 x 50 x 1.50 30 x 70 x 1.00 10.00 20 x 1.00 x 1.00 x 1.00 50 x 40 x 25 x 16 16 PCP016 PCP0166 18.20 x 1.20 46.27 x 50 1 x 50 x 1.50 40 x 40 x 50 10 coarter-turn 1.00 x 25 x 50 x 50 x 50 x 50 x 50 x 50 x												1			203
SSD2014 SSS 20.00 x 6.00 x 0.00 x 0.												1			
SSD201819SS 20.00 x 10.00 500 x 20.00 x 10.00 500 x 20.00 x 20.00 x 10.00 500 x 20.00 x 20.0															254
SS020210SS 20.00 x 20.00 x 10.00 50.85 kB x 254 6 16 CP2200 CP2200 12.20 x 18.20 45x x 46z 18.50 x 18.50 470 x x 70 1 0.00 x 10.00 x															
CSD202410SS 20.00 x 20.00 x 10.00 50.8 x 10 x 25 x 10 10.0															254
CSD02410SS 20.00 x 2.000 x 10.00 60 x 8 10 x 54 6 16 CP2470 C															254
SSD02410RSS 20.00 x 2.00 x 1.00 x 1.00 500 x 610 x 254 16 6 CP240 CP2406 22.00 x 14.00 544 x 255 27.00 x 17.00 20 CS2410RS 2.00 x 1.00 x 1.00 610 x 640 x 254 16 6 CP2416 CP24166 22.00 x 14.00 543 2.50 x 14.50 572 x 368 1 0ustret-tum 12.00 30 CS2410RSS 2.00 x 2.00 x 1.00 610 x 640 x 525 16 16 CP2416 CP24166 22.00 x 14.00 543 2.50 x 14.50 572 x 368 1 0ustret-tum 12.00 30 CS2410RSS 2.00 x 2.00 x 1.00 610 x 640 x 525 16 16 CP2410 CP24100 22.00 x 18.00 544 x 462 22.50 x 18.50 572 x 572 3.00 10 0ustret-tum 12.00 30 CS242410RSS 2.00 x 2.00 x 10.00 610 x 640 x 525 16 16 CP2410 CP24100 CP24100 22.00 x 18.00 544 x 642 22.50 x 18.50 572 x 572 2 0ustret-tum 12.00 30 CS242410RSS 2.00 x 2.00 x 10.00 610 x 640 x 54 16 CP2410 CP24100 CP24100 22.00 x 18.00 544 x 642 22.50 x 18.50 572 x 572 2 0ustret-tum 12.00 30 CS242410RSS 2.00 x 2.00 x 10.00 610 x 640 x 54 16 CP2410 CP24100 CP24															254
CSD2441BISS															254
CSD242010SS 24.00 x 2.00 x 1.00 x 1.00 610 x 505 x 54 16 CP2416 CP24.00 CP24.00 22.00 x 1.00 x 1.00 510 x 505 x 54 10 20.00 x 1.00 x 1.00 610 x 505 x 54 16 CP24.00 CP												1			305
SSP42011SS 2.0 m x 20.0 m x 10.00 610 x 692 x 54. 14 6 CP2/20 CP2/2016 22.0 m x 12.00 54. 462 22.5 m x 18.00 572 x 7/0 1 Outstre-turn 12.00 32.												1			305
SSP4241BSS 2-0 N x 2.0 N x 1.0 N x 1.0 N x 1.0 N x 1.0 x 1.0 N x 1.0 x 1.0 N x 1.0												1			305
CSD242410SS												1			305
CSD243010SS															127
SSD424010SS 24,00 x 30,00 x 10,00 610 x 762 x 254 14 16 CP3024 CP30246 28,20 x 22,20 716 x 564 22,50 x 28,50 572 x 724 2 Quarter-turn 5,00 12 CSD302010SS 30,00 x 10,00 762 x 505 x 254 14 16 CP3020 CP302106 22,20 x 18,20 716 x 462 28,50 x 18,50 724 x 470 2 Quarter-turn 5,00 12 CSD302010SS 30,00 x 20,00 x 10,00 762 x 505 x 254 14 16 CP3020 CP302106 22,20 x 18,20 716 x 462 28,50 x 18,50 724 x 470 2 Quarter-turn 5,00 12 CSD30210SS 30,00 x 20,00 x 10,00 762 x 505 x 254 14 16 CP3020 CP302106 22,20 x 18,20 716 x 462 28,50 x 18,50 724 x 470 2 Quarter-turn 5,00 12 CSD302410SS 30,00 x 20,00 x 10,00 762 x 505 x 254 14 16 CP3020 CP302106 22,00 x 18,20 716 x 462 28,50 x 18,50 724 x 470 2 Quarter-turn 5,00 12 CSD302410SS 30,00 x 20,00 x 10,00 762 x 505 x 254 14 16 CP3020 CP302106 28,20 x 22,20 716 x 564 28,50 x 25,50 724 x 572 2 Quarter-turn 5,00 12 CSD303010SS 30,00 x 30,00 x 10,00 762 x 505 x 254 14 16 CP3020 CP302106 28,20 x 22,20 716 x 564 28,50 x 25,50 724 x 572 2 Quarter-turn 5,00 12 CSD303010SS 30,00 x 30,00 x 10,00 742 x 505 x 254 14 16 CP3020 CP30210 28,20 x 22,20 716 x 564 28,50 x 25,50 724 x 572 2 Quarter-turn 5,00 12 CSD303010SS 30,00 x 30,00 x 10,00 74 x 76 x 254 14 16 CP3020 CP30210 28,20 x 22,20 716 x 564 28,50 x 25,50 724 x 572 2 Quarter-turn 5,00 12 CSD303010SS 30,00 x 30,00 x 10,00 74 x 76 x 254 14 16 CP3020 CP3020 728 x 500 724 x 724 2 Quarter-turn 5,00 17 CSD303010SS 30,00 x 10,00 74 x 76 x 254 14 16 CP3020 CP3020 728 x 500 724 x 724 2 Quarter-turn 5,00 17 CSD303010SS 30,00 x 10,00 74 x 76 x 254 14 16 CP3020 CP30300 32,00 x 10,00 x 10,00 74 x 76 x 254 14 16 CP3020 CP30300 32,00 x 10,00 x 10,00 74 x 76 x 254 14 16 CP3020 CP30300 32,00 x 10,00 x 10,00															127
CSD302110SS 24,00 x 30,00 x 10,00 762 x 508 x 254 14 16 CP3024 CP30246 22 20 x 18.20 716 x 564 22 50 x 28.50 572 x 724 2 Quarter-turn 5,00 12 CSD302110SS 30,00 x 2,00 x 10,00 762 x 508 x 254 14 16 CP3024 CP30246 22 20 x 18.20 716 x 462 22.50 x 18.50 724 x 470 2 Quarter-turn 5,00 12 CSD302110SS 30,00 x 2,00 x 10,00 762 x 508 x 254 14 16 CP3024 CP30246 22.00 x 18.20 716 x 462 22.50 x 18.50 724 x 470 2 Quarter-turn 5,00 12 CSD302110SS 30,00 x 2,00 x 10,00 762 x 508 x 254 14 16 CP3024 CP30246 22.00 x 22.00 x 12.00 762 x 508 x 254 14 16 CP3024 CP30246 22.00 x 22.00 72.00 x 72 x 572 2 Quarter-turn 5,00 12 CSD302110SS 30,00 x 2,00 x 10,00 762 x 508 x 254 14 16 CP3024 CP30246 22.00 x 22.00 x 22.00 72.00 x 72 x 572 2 Quarter-turn 5,00 12 CSD303010SS 30,00 x 2,00 x 10,00 762 x 508 x 256 14 16 CP3030 CP30246 22.00 x 22.00 x 22.00 74.00 x 72 x 22 2 Quarter-turn 5,00 12 CSD303010SS 30,00 x 2,00 x 10,00 x 10,00 762 x 508 x 256 14 16 CP3034 CP30246 22.00 x 22.00 x 22.00 74.00 x 72 x 22 Quarter-turn 5,00 12 CSD303010SS 36,00 x 30.00 x 10,00 x 10,00 762 x 508 x 256 14 16 CP3034 CP30246 22.00 x 22.00 x 22.00 74.00 x 72 x 22 Quarter-turn 5,00 12 CSD303010SS 36,00 x 30.00 x 10,00 x 10,00 762 x 508 x 256 14 16 CP3034 CP30246 22.00 x 22															127
CSB032010SS 30.00 x 20.00 x 10.00 x 20.00 x 20.00 x 10.00 x 20.00												2			127
CSD302410SS 30,00 x 20,00 x 10,00 76x x 508 x 254 14 16 CP3020 CP30246 28.20 x 12.20 716 x 442 28.50 x 12.50 724 x 572 2 Quarter-turn 5,00 12 CSD302410SS 30,00 x 24,00 x 10.00 76x x 54 x 10x 254 14 16 CP3024 CP30246 28.20 x 22.20 716 x 564 28.50 x 22.50 724 x 572 2 Quarter-turn 5,00 17 CSD303010SS 30,00 x 30,00 x 10.00 76x x 76x x 254 14 16 CP3020 CP30246 28.20 x 22.20 716 x 564 28.50 x 22.50 724 x 572 2 Quarter-turn 5,00 17 CSD303010SS 30,00 x 30,00 x 10.00 76x x 76x x 254 14 16 CP3030 CP30306			762 x 508 x 254	14	16	CP3020	CP3020G	28.20 x 18.20	716 x 462		724 x 470			5.00	127
CSD30301USS 30.00 x 2.00 x 1.00.0	CSD302010SS6		762 x 508 x 254	14	16	CP3020	CP3020G	28.20 x 18.20	716 x 462	28.50 x 18.50	724 x 470	2	Quarter-turn	5.00	127
CSD303010SS6 00.00 x 3.0.00 x 1.0.00 762 x 762 x 254 14 16 CP3030 CP30306 28.20 x 28.20 716 x 716 28.50 x 28.50 724 x 724 2 0uarter-turn 5.00 17 CSD303010SS6 30.00 x 3.0.00 x 1.0.00 914 x 610 x 254 14 16 CP3030 CP36746 CP3	CSD302410SS	30.00 x 24.00 x 10.00	762 x 610 x 254	14	16	CP3024	CP3024G	28.20 x 22.20	716 x 564	28.50 x 22.50	724 x 572	2	Quarter-turn	5.00	127
CSD304210SS6 30.00 x 30.00 x 10.00 762 x 762 x 254 14 16 CP3020 CP30306 28.20 x 28.20 716 x 716 28.50 x 28.50 724 x 724 2 Quarter-turn 5.00 17 CSD304210SS6 36.00 x 74.00 x 10.00 914 x 610 x 254 14 16 CP3624 CP36246 34.20 x 28.20 869 x 716 34.50 x 28.50 876 x 724 2 Quarter-turn 5.00 17 CSD3043010SS6 36.00 x 30.00 x 10.00 914 x 762 x 254 14 14 CP3630 CP36306 34.20 x 28.20 869 x 716 34.50 x 28.50 876 x 724 2 Quarter-turn 5.00 17 CSD3043010SS6 36.00 x 30.00 x 10.00 914 x 762 x 254 14 14 CP2442 CP24426 22.20 x 4.00 54.50 x 28.50 876 x 724 2 Quarter-turn 5.00 17 CSD3043010SS6 42.00 x 24.00 x 10.00 1067 x 610 x 254 14 14 CP2442 CP24426 22.20 x 4.00 54.50 x 28.50 876 x 724 2 Quarter-turn 5.00 17 CSD3043010SS6 42.00 x 24.00 x 10.00 1067 x 610 x 254 14 14 CP2430 CP24306 40.20 x 28.20 1021 x 716 40.50 x 28.50 1029 x 724 1 3-point 21.00 53 CSD423010SS6 42.00 x 30.00 x 10.00 1067 x 762 x 254 14 14 CP2430 CP24306 40.20 x 28.20 1021 x 716 40.50 x 28.50 1029 x 724 1 3-point 21.00 53 CSD423010SS6 42.00 x 30.00 x 10.00 1219 x 610 x 254 14 14 CP2430 CP24306 40.20 x 28.20 1021 x 716 40.50 x 28.50 1029 x 724 1 3-point 21.00 53 CSD423010SS6 42.00 x 30.00 x 10.00 1219 x 610 x 254 14 14 CP2430 CP24306 40.20 x 28.20 1021 x 716 40.50 x 28.50 1029 x 724 1 3-point 21.00 53 CSD423010SS6 40.00 x 24.00 x 10.00 1219 x 610 x 254 14 14 CP2430 CP24306 40.20 x 28.20 1021 x 716 40.50 x 28.50 1029 x 724 1 3-point 21.00 53 40.50 x 24.50 40.5	CSD302410SS6	30.00 x 24.00 x 10.00	762 x 610 x 254	14	16	CP3024	CP3024G	28.20 x 22.20	716 x 564	28.50 x 22.50	724 x 572	2	Quarter-turn	5.00	127
CSD36410SS6	CSD303010SS	30.00 x 30.00 x 10.00	762 x 762 x 254	14	16	CP3030	CP3030G	28.20 x 28.20	716 x 716	28.50 x 28.50	724 x 724	2	Quarter-turn	5.00	127
CSD33610SS 6 36.00 x 20.00 x 10.00 914 x 610 x 254 14 16 CP3630 CP36346 34.20 x 22.20 869 x 564 34.50 x 22.50 876 x 572 2 Quarter-turn 5.00 17 CSD33610SS 6 0.00 x 30.00 x 10.00 914 x 762 x 254 14 16 CP3630 CP36366 34.20 x 28.20 869 x 716 34.50 x 28.50 876 x 774 2 Quarter-turn 5.00 17 CSD33610SS 6 0.00 x 30.00 x 10.00 914 x 762 x 254 14 14 CP2442 CP24426 22.20 x 40.20 564 x 1021 40.50 x 22.50 1029 x 577 1 3.00 x 21.00 50 x 20.00 x 20.0	CSD303010SS6		762 x 762 x 254	14	16	CP3030	CP3030G	28.20 x 28.20	716 x 716	28.50 x 28.50		2	Quarter-turn	5.00	127
CS0363010SS 36.00 x 30.00 x 10.00 914 x 762 x 254	CCD3/3/1000	27 00 × 27 00 × 10 00	914 x 610 x 254	14	16	CP3624	CP362/G	2/.00	007 x 504	2/ 50 22 50	974 v 572	າ	Ouarter-turn	5.00	127
\$\begin{array}{c} \text{CSD363010SS} & \text{3} & \text{0} & \text{v} & \text{1} & \text{1} & \text{CP24426} & \text{CP24426} & \text{2} & \text{2} & \text{d} & \text{3} & \text{3} & \text{2} & \text{2} & \text{0} & \text{2} & \text{1} & \text{1} & \text{1} & \text{CP24426} & \text{CP24426} & \text{2} & \text{v} & \text{d} & \text{5} & \text{1} & \text{2} & \text{1} & \text{1} & \text{CP24426} & \text{2} & \text{v} & \text{d} & \text{0} & \text{5} & \text{1} & \text{2} & \text{1} & \text{1} & \text{CP24426} & \text{2} & \text{v} & \text{d} & \text{0} & \text{5} & \text{1} & \text{2} & \text{1} & \text{1} & \text{CP24426} & \text{2} & \text{v} & \text{d} & \text{0} & \text{5} & \text{1} & \text{1} & \text{1} & \text{CP24426} & \text{2} & \text{2} & \text{d} & \text{0} & \text{5} & \text{2} & \text{1} & \text{1} & \text{0} & \text{CP24266} & \text{2} & \text{2} & \text{d} & \text{0} & \text{0} & \text{5} & \text{1} & \text{1} & \text{CP24230} & \text{CP24306} & \text{4} & \text{0} & \text{2} & \text{2} & \text{0} & \text{2} & \text{1} & \text{3} & \text{1} & \text{1} & \text{CP42306} & \text{4} & \text{0} & \text{2} & \text{2} & \text{0} & \text{1} & \text{3} & \text{5} & \text{1} & \text{1} & \text{CP42306} & \text{4} & \text{0} & \text{2} & \text{2} & \text{0} & \text{1} & \text{1} & \text{0} & \text{CP42306} & \text{4} & \text{0} & \text{2} & \text{2} & \text{0} & \text{1} & \text{1} & \text{0} & \text{CP42306} & \text{4} & \text{0} & \text{2} & \text{2} & \text{0} & \text{1} & \text{1} & \text{0} & \text{2} & \text{1} & \text{1} & \text{0} & \text{2} & \text{0} & \text{2} & \text{1} & \text{1} & \text{0} & \text{2} & \text{0} & \text{1} & \text{1} & \text{0} & \text{0} & \text{2} & \text{0} & \text{1} & \text{1} & \text{0} & \text{0} & \text{2} & \text{0} & \text{2} & \text{0} & \text{1} & \text{1} & \text{1} & \text{0} & \text{CP24266} & \text{0} & \text{2} & \text{0} & \text{0} & \text{1} & \text{0} & \text{0} & \text{0}	CSD362410SS6	36.00 x 24.00 x 10.00	914 x 610 x 254	14	<u> 16</u>	CP3624	CP3624G	34.20 x 22.20	869 x 564	34.50 x 22.50	876 x 572	2	Quarter-turn	5.00	127
\$\frac{\text{C}}{\text{C}}\$\frac{\text{C}}{\	CSD363010SS	36.00 x 30.00 x 10.00	914 x 762 x 254	14	16	CP3630	CP3630G	34.20 x 28.20	869 x 716	34.50 x 28.50	876 x 724	<mark>2</mark>	Q <mark>uarter-turn</mark>	5.00	127
CSD423410SS		36.00 x 30.00 x 10.00										2		5.00	127
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Catalon numbers ending in 6 are Type 3161 stainless steel				1-7	17	0. 0000	31 00000	JT.LU A LU.LU	007 A 7 10	54.00 A £0.00	010 N 124	-	additor turil	0.00	127

Catalog numbers ending in 6 are Type 316L stainless steel.

Purchase panels separately. Optional stainless steel, composite and aluminum panels are also available for most sizes.

 ${\tt Optional\ NEMA\ style\ steel\ and\ stainless\ steel\ panels\ require\ conversion\ kit\ catalog\ number\ CCPM4.}$





Standard Product One-Door with Window

			Door	Body		Panel Size	Panel Size	Mounting	Mounting	Window Size	Window Size	Latch			
Catalog Number	AxBxC in.	AxBxC mm	Ga.	Ga.	Panel	D x E (in.)	D x E (mm)	G x H (in.)	G x H (mm)	M x N (in.)	M x N (mm)	Qty.	Style	J (in.)	J (mm)
CSD12126WSS	12.00 x 12.00 x 6.00	305 x 305 x 152	16	16	CP1212	10.20 x 10.20	259 x 259	10.50 x 10.50	267 x 267	8.74 x 7.10	222 x 180	1	Quarter-turn	6.00	152
CSD16126WSS	16.00 x 12.00 x 6.00	406 x 305 x 152	16	16	CP1612	14.20 x 10.20	361 x 259	14.50 x 10.50	368 x 267	12.74 x 7.10	324 x 180	1	Quarter-turn	8.00	203
CSD20166WSS	20.00 x 16.00 x 6.00	508 x 406 x 152	16	16	CP2016	18.20 x 14.20	462 x 361	18.50 x 14.50	470 x 368	16.74 x 11.10	425 x 282	1	Quarter-turn	10.00	254
CSD20206WSS	20.00 x 20.00 x 6.00	508 x 508 x 152	16	16	CP2020	18.20 x 18.20	462 x 462	18.50 x 18.50	470 x 470	16.74 x 15.10	425 x 384	1	Quarter-turn	10.00	254
CSD20168WSS	20.00 x 16.00 x 8.00	508 x 406 x 203	16	16	CP2016	18.20 x 14.20	462 x 361	18.50 x 14.50	470 x 368	16.74 x 11.10	425 x 282	1	Quarter-turn	10.00	254
CSD20208WSS	20.00 x 20.00 x 8.00	508 x 508 x 203	16	16	CP2020	18.20 x 18.20	462 x 462	18.50 x 18.50	470 x 470	16.74 x 15.10	425 x 384	1	Quarter-turn	10.00	254
CSD24208WSS	24.00 x 20.00 x 8.00	610 x 508 x 203	16	16	CP2420	22.20 x 18.20	564 x 462	22.50 x 18.50	572 x 470	20.74 x 15.10	527 x 384	1	Quarter-turn	12.00	305
CSD24248WSS	24.00 x 24.00 x 8.00	610 x 610 x 203	14	16	CP2424	22.20 x 22.20	564 x 564	22.50 x 22.50	572 x 572	20.74 x 17.68	527 x 449	2	Quarter-turn	5.00	127
CSD30248WSS	30.00 x 24.00 x 8.00	762 x 610 x 203	14	16	CP3024	28.20 x 22.20	716 x 564	28.50 x 22.50	724 x 572	26.74 x 17.68	679 x 449	2	Quarter-turn	5.00	127
CSD161210WSS	16.00 x 12.00 x 10.00	406 x 305 x 254	16	16	CP1612	14.20 x 10.20	361 x 259	14.50 x 10.50	368 x 267	12.74 x 7.10	324 x 180	1	Quarter-turn	8.00	203
CSD201610WSS	20.00 x 16.00 x 10.00	508 x 406 x 254	16	16	CP2016	18.20 x 14.20	462 x 361	18.50 x 14.50	470 x 368	16.74 x 11.10	425 x 282	1	Quarter-turn	10.00	254
CSD202010WSS	20.00 x 20.00 x 10.00	508 x 508 x 254	16	16	CP2020	18.20 x 18.20	462 x 462	18.50 x 18.50	470 x 470	16.74 x 15.10	425 x 384	1	Quarter-turn	10.00	254
CSD242010WSS	24.00 x 20.00 x 10.00	610 x 508 x 254	16	16	CP2420	22.20 x 18.20	564 x 462	22.50 x 18.50	572 x 470	20.74 x 15.10	527 x 384	1	Quarter-turn	12.00	305
CSD242410WSS	24.00 x 24.00 x 10.00	610 x 610 x 254	14	16	CP2424	22.20 x 22.20	564 x 564	22.50 x 22.50	572 x 572	20.74 x 17.68	527 x 449	2	Quarter-turn	5.00	127
CSD302410WSS	30.00 x 24.00 x 10.00	762 x 610 x 254	14	16	CP3024	28.20 x 22.20	716 x 564	28.50 x 22.50	724 x 572	26.74 x 17.68	679 x 449	2	Quarter-turn	5.00	127
CSD202012WSS	20.00 x 20.00 x 12.00	508 x 508 x 305	14	16	CP2020	18.20 x 18.20	462 x 462	18.50 x 18.50	470 x 470	16.74 x 15.10	425 x 384	1	Quarter-turn	10.00	254
CSD302412WSS	30.00 x 24.00 x 12.00	762 x 610 x 305	14	16	CP3024	28.20 x 22.20	716 x 564	28.50 x 22.50	724 x 572	26.74 x 17.68	679 x 449	2	Quarter-turn	5.00	127

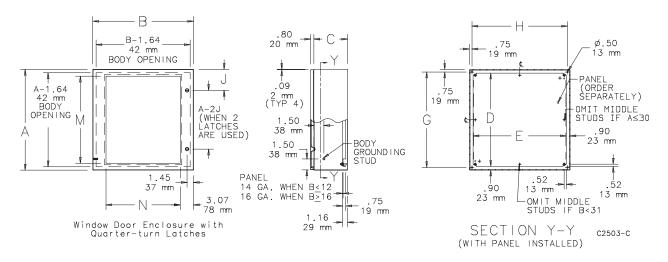
Purchase panels separately.

Optional NEMA style steel and stainless steel panels require conversion kit catalog number CCPM4.

Material is stainless steel Type 304.

For Conductive Panels, add a "G" to the panel catalog number.

CONCEPT Single-Door Wall-Mounted Enclosures with Windows





CompactLogix System

1769-L33ERMS, 1769-L36ERM, 1769-L36ERMS





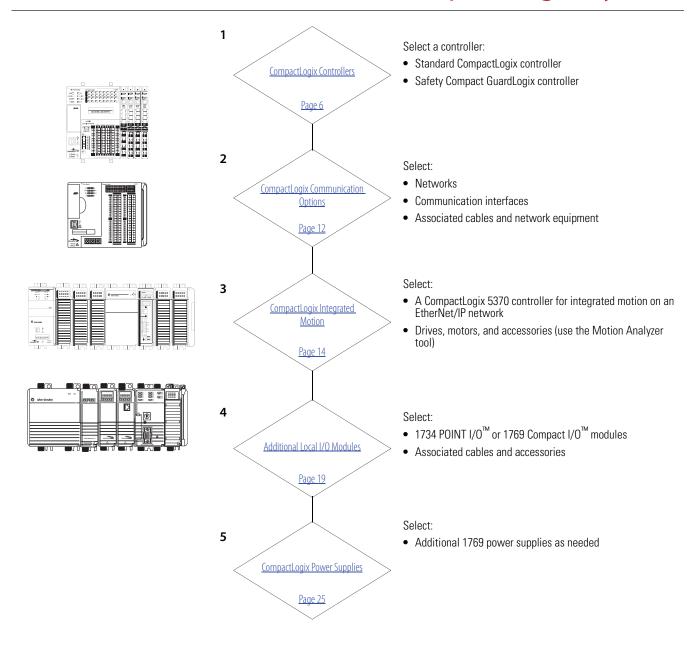




Logix Controllers Comparison

Characteristic	ControlLogix® 1756-L83E, 1756-L85E	ControlLogix 1756-71, 1756-L72, 1756-L73, 1756-L73XT, 1756-L74, 1756-L75 GuardLogix® 1756-L72S, 1756-L73S, 1756-L73S	Armor™ ControlLogix 1756-L71EROM, 1756-L72EROM Armor™ GuardLogix® 1756-L71EROMS, 1756-L72EROMS	CompactLogix™ 1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L33ER, 1769-L33ERM, 1769-L36ERM Compact GuardLogix 1769-L30ERMS, 1769-L33ERMS, 1769-L33ERMS,	CompactLogix 1769-L24ER-BB1B, 1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B	CompactLogix 1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B 1769-L19ER-BB1B
Controller tasks: Continuous Periodic Event	• 32 • 1000 programs/task	32 100 programs/task	• 32 • 100 programs/task	• 32 • 100 programs/task	• 32 • 100 programs/task	• 32 • 100 programs/ task
Event tasks	Consumed tag, EVENT instruction triggers, Module Input Data changes, and motion events	Consumed tag, EVENT instruction triggers, Module Input Data changes, and motion events	Consumed tag, EVENT instruction triggers, Module Input Data changes, and motion events	Consumed tag, EVENT instruction triggers and motion events	Consumed tag, EVENT instruction triggers and motion events	Consumed tag, EVENT instruction triggers and motion events
User memory	• 1756-L83E: 10 MB • 1756-L85E: 40 MB	1756-L71: 2 MB 1756-L72: 4 MB 1756-L73: 8 MB 1756-L73: 8 MB 1756-L74: 16 MB 1756-L75: 32 MB 1756-L715: 2 MB + 1 MB safety 1756-L725: 4 MB + 2 MB safety 1756-L735: 8 MB + 4 MB safety	1756-L71EROM: 2 MB 1756-L71EROMS: 2 MB + 1 MB safety 1756-L72EROM: 4 MB 1756-L72EROMS: 4 MB + 2 MB safety	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM: 1 MB 1769-L33ER, 1769-L33ERM: 2 MB 1769-L33ERM: 3 MB 1769-L30ERMS: 1 MB + 0.5 MB safety 1769-L33ERMS: 2 MB + 1 MB safety 1769-L36ERMS: 3 MB + 1 MB safety	• 1769-L24ER: 750 KB • 1769-L27ERM: 1 MB	• 1769-L16ER: 384 KB • 1769-L18ER, 1769-L18ERM: 512 KB • 1769- L19ER-BB1B: 1 MB
Built-in ports	Dual-port EtherNet/IP™ 1 port USB client	1 port USB Client	Dual-port EtherNet/IP 1 port USB client	Dual-port EtherNet/IP 1 port USB Client	Dual-port EtherNet/IP 1 port USB Client	Dual-port EtherNet/IP 1 port USB Client
Communication options	EtherNet/IP ControlNet™ DeviceNet™ Data Highway Plus™ Remote I/O SynchLink™ USB Client	EtherNet/IP ControlNet DeviceNet Data Highway Plus Remote I/O SynchLink USB Client	EtherNet/IP ControlNet DeviceNet Data Highway Plus Remote I/O SynchLink USB Client	EtherNet/IP Embedded switch Single IP address DeviceNet USB Client	EtherNet/IP Embedded switch Single IP address DeviceNet USB Client	EtherNet/IP Embedded switch Single IP address USB Client
Controller resources	• 1756-L83E: 100 EtherNet/IP nodes • 1756-L85E: 300 EtherNet/IP nodes	500 connections	500 connections	256 connections	256 connections	256 connections
Controller redundancy	None	Full support	None	Backup via DeviceNet	Backup via DeviceNet	None
Integrated motion	EtherNet/IP	EtherNet/IP	EtherNet/IP	EtherNet/IP	EtherNet/IP	EtherNet/IP

Select a CompactLogix System

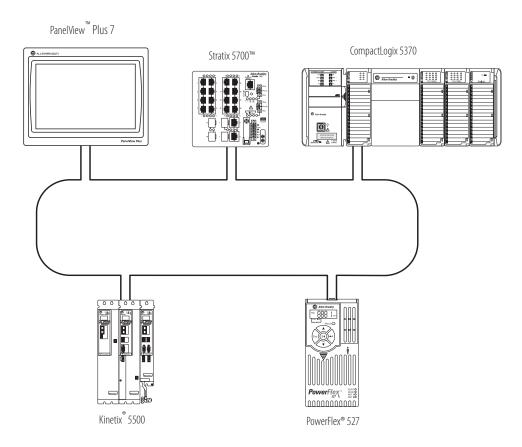


CompactLogix Controllers Overview

The CompactLogix system is designed to provide a Logix solution for small and mid-size applications. Typically, these applications are machine-level control applications. A simple system can consist of a standalone controller with one bank of I/O modules and DeviceNet communication. In a more complex system, add other networks, motion control, and safety control. As part of the Integrated Architecture system, the CompactLogix controllers use the same programming software, network protocol, and information capabilities as all Logix controllers, providing a common development environment for all control disciplines.

- The CompactLogix 5370 L3 controllers deliver scalable, affordable control ideal for applications from small standalone equipment to high-performance indexing tables, process skids, case packers and erectors, and packaging. The CompactLogix 5370 L3 controllers also provide a truly integrated motion solution.
- The CompactLogix 5370 L2 controllers combine the power of the Logix architecture with the flexibility of Compact I/O modules. From small standalone equipment to higher performance applications, these controllers are ideal for assembly machines, hoisting systems, process skids, indexing tables, and packaging.
- The CompactLogix 5370 L1 controllers combine the power of the Logix architecture with the flexibility of POINT I/O. Ideal for small to mid-size machines, these controllers offer value to customers looking for the benefits of Integrated Architecture in a lower-cost system.

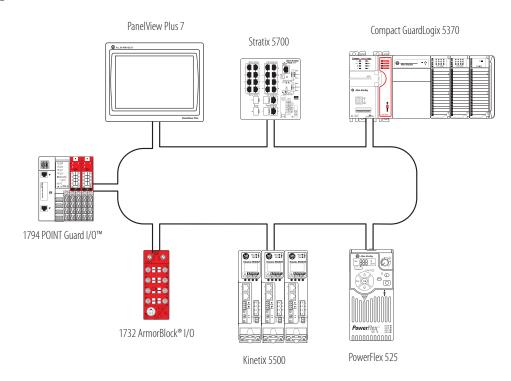
CompactLogix 5370 System on an EtherNet/IP Network



The CompactLogix 5370 L2 and L3 controllers support DeviceNet connectivity.

Compact GuardLogix Controllers Overview

The Compact GuardLogix controller provides safety control to achieve SIL CL3 according to EN62061 / EN 61511-1 / IEC 61508 and PLe according to EN ISO 13849-1.



CompactLogix Controllers

The CompactLogix platform brings together the benefits of the Logix platform— common programming environment, common networks, common control engine—in a small footprint with high performance. Combined with Compact I/O modules, the CompactLogix platform is perfect for tackling smaller, machine-level control applications, with or without simple motion, with unprecedented power and scalability. A CompactLogix platform is ideal for systems that require standalone and system-connected control over EtherNet/IP, ControlNet, or DeviceNet networks.



For detailed specifications, see CompactLogix Controllers Specifications Technical Data, publication <u>1769-TD005</u>.

Characteristic	CompactLogix 5370 L1 Controllers	CompactLogix 5370 L2 Controllers	CompactLogix 5370 L3 Controllers		
Controller application	Small applications Embedded 1734 I/O modules	Small applications Embedded 1769 I/O modules	General purpose		
Controller tasks	32; 100 programs/task	32; 100 programs/task	32; 100 programs/task		
Event tasks	Consumed tag, EVENT instruction, embedded inputs, remote I/O, axis, and motion event triggers	Consumed tag, EVENT instruction, remote I/O, axis, and motion event triggers	Consumed tag, EVENT instruction, remote I/O, axis, and motion event triggers		
User memory	1769-L16ER-BB1B: 384 KB 1769-L18ER-BB1B, 1769-L18ERM-BB1B: 512 KB 1769-L19ER-BB1B: 1 MB	 1769-L24ER-QB1B, 1769-L24ER-QBFC1B: 750 KB 1769-L27ERM-QBFC1B: 1 MB 	 1769-L30ER, 1769-L30ERM, 1769-L30ER-NSE: 1MB 1769-L33ER, 1769-L33ERM: 2 MB 1769-L36ERM: 3 MB 1769-L30ERMS: 1 MB + 0.5 MB safety 1769-L33ERMS: 2 MB + 1 MB safety 1769-L36ERMS: 3 MB + 1.5 MB safety 		
Built-in ports	• 2 EtherNet/IP ⁽¹⁾ • 1 USB	• 2 EtherNet/IP ⁽¹⁾ • 1 USB	• 2 EtherNet/IP ⁽¹⁾ • 1 USB		
Communication options • Dual-port EtherNet/IP		Dual-port EtherNet/IP DeviceNet	Dual-port EtherNet/IP (standard and safety) DeviceNet (standard)		

⁽¹⁾ CompactLogix 5370 controllers have two EtherNet/IP ports to connect to an EtherNet/IP network. The ports carry the same network traffic as part of the embedded switch of the controller. The controller uses only one IP address.

CompactLogix 5370 L1 Controllers with Embedded I/O

The CompactLogix 5370 L1 controller comes with:

- A built-in, 24V DC nonisolated power supply. (1)
- Dual EtherNet/IP ports for linear and ring topologies.
- USB port for firmware download and programming.
- Embedded digital I/O (16 DC inputs, 16 DC outputs).
- Support for 1734 POINT I/O.



Characteristic	1769-L16ER-BB1B	1769-L18ER-BB1B	1769-L18ERM-BB1B	1769-L19ER-BB1B	
Available user memory	384 KB	512 KB	512 KB	1 MB	
Memory card	• 1784–SD1 (1 GB), shipped with 1784–SD2 (2 GB)	h controller		•	
Communication ports	2 EtherNet/IP 1 USB				
Embedded I/O	16 sinking 24V DC digital inpu 16 sourcing 24V DC digital out				
EtherNet/IP connections	256 EtherNet/IP 120 TCP	256 EtherNet/IP120 TCP	• 256 EtherNet/IP • 120 TCP		
EtherNet/IP nodes in one Studio 5000 Logix Designer® application, max	4	8			
Integrated motion on an EtherNet/IP network	_		Supports up to 2 axes	_	
Module expansion capacity	6 POINT I/O modules	8 POINT I/O modules	8 POINT I/O modules		
Battery	None		<u>.</u>		
Embedded power supply	1028.8V DC 24V DC nominal				
Programming software support	 Version 20 - For controllers that use firmware revision 20. Version 21 or later - For controllers that use firmware revision 21 or later. 				

⁽¹⁾ For more information on how to connect a 24V DC power source to the 24V DC nonisolated power supply of the CompactLogix 5370 L1 controller, see the CompactLogix 5370 Controllers User Manual, publication 1769-UM021.

CompactLogix 5370 L2 Controllers with Embedded I/O

The CompactLogix 5370 L2 controller comes with:

- A built-in, 24V DC power supply.
- Dual EtherNet/IP ports for linear and ring topologies.
- USB port for firmware download and programming.
- A combination of embedded digital, analog, and high-speed counter I/O.
- A 1769-ECR right-end cap.
- Support for 1769 Compact I/O.



Characteristic	1769-L24ER-QB1B	1769-L24ER-QBFC1B	1769-L27ERM-QBFC1B			
Available user memory	0.75 MB	0.75 MB	1 MB			
Memory card	• 1784-SD1 (1 GB), shipped with controller • 1784-SD2 (2 GB)					
Communication ports	• 2 EtherNet/IP • 1 USB					
Embedded I/O	16 sinking/sourcing 24V DC digital input points 16 sourcing 24V DC digital output points	 16 sinking/sourcing 24V DC digital input points 16 sourcing 24V DC digital output points 4 universal analog input points 2 analog output points 4 high-speed counters 				
EtherNet/IP connections	• 256 EtherNet/IP • 120 TCP	• 256 EtherNet/IP • 120 TCP	• 256 EtherNet/IP • 120 TCP			
EtherNet/IP nodes in one Logix Designer application, max	8		16			
Integrated motion on an EtherNet/IP network	_	_	Supports up to 4 axes			
Module expansion capacity	4 1769 modules	•				
Battery	None	None				
Embedded power supply	24V DC	24V DC				
Programming software support	Version 20 - For controllers that use firmware Version 21 or later - For controllers that use firmware					

These controllers replace previous catalog numbers.

New Controller	Replaces Previous Controller	Differences
1769-L24ER-QBFC1B	1769-L23-QBFC1B 1769-L23E-QBFC1B	Additional memory Integrated motion on EtherNet/IP support (1769-L27ERM-QBFC1B) USB port instead of RS-232 port
1769-L24ER-QB1B	1769-L23E-QB1B	Dual-port EtherNet/IP support
1769-L27ERM-QBFC1B	1769-L23E-QBFC1B	SD card support addition Support for additional expansion I/O modules

CompactLogix 5370 L3 Controllers

In a CompactLogix 5370 L3 controller system, the 1769 I/O modules can be placed to the left and the right of the power supply. As many as eight modules can be placed on each side of the power supply. The CompactLogix 5370 L3 controller comes with:



- Dual EtherNet/IP ports for linear and ring topologies.
- USB port for firmware download and programming.
- Support for 1769 Compact I/O.

Characteristic	1769-L30ER	1769-L30ERM	1769-L30ER-NSE	1769-L33ER	1769-L33ERM	1769-L36ERM		
Available user memory	1 MB	1 MB	1 MB No capacitor	2 MB	2 MB	3 MB		
Memory card	1784-SD1 (1 GB), shippe 1784-SD2 (2 GB)	ed with controller			•			
Communication ports	• 2 EtherNet/IP • 1 USB							
EtherNet/IP connections	• 256 EtherNet/IP • 120 TCP	• 256 EtherNet/IP • 120 TCP	• 256 EtherNet/IP • 120 TCP	• 256 EtherNet/IP • 120 TCP	 256 EtherNet/IP 120 TCP	• 256 EtherNet/IP • 120 TCP		
EtherNet/IP nodes in one Logix Designer application, max	16			32	48			
Integrated motion on an EtherNet/IP network	_	Supports up to 4 axes	_	_	Supports up to 8 axes	Supports up to 16 axes		
Module expansion capacity	8 1769 modules 1 bank of modules			16 1769 modules 2 banks of modules	•	30 1769 modules 3 banks of modules		
Battery	None	one						
Power supply distance rating	4 modules	4 modules 4 modules 4 modules						
Programming software support		rollers that use firmware re For controllers that use firm		•		•		

These controllers replace previous catalog numbers.

New Controller ⁽¹⁾	Replaces Previous Controller	Differences
1769-L30ER 1769-L30ERM 1769-L30ER-NSE	1769-L31 1769-L32C ⁽²⁾ 1769-L32E	Additional memory Integrated motion on EtherNet/IP support (1769-L30ERM, 1769-L33ERM, 1769-L36ERM) USB port instead of RS-232 port
1769-L33ER 1769-L33ERM	1769-L35CR ⁽²⁾ 1769-L35E	Dual-port EtherNet/IP support SD card instead of CompactFlash card
1769-L36ERM	Any previous 1769-L3x controller	

⁽¹⁾ IMPORTANT: Typically, you can use any of the new controllers that are listed in each row as replacements for any of the previous controllers that are listed in the corresponding cell to the right. For example, you can replace a 1769–132E with a 1769–130ER, 1769–130ERM, or 1769–130ERM, or 1769–130ERM.

Use the 1769-L30ER-NSE controller for mining applications. You can deplete the residual stored energy of the 1769-L30ER-NSE controller to 200 μ J or less before you transport it into or out of a mine. The 1769-L30ER-NSE controller does not maintain the real-time clock on power cycle.

In some rare cases, system configuration prevents controller replacement as shown in the previous table. For example, if your system uses a 1769-L32E controller with 12 expansion modules, you cannot replace that controller with a 1769-L30ER, 1769-L30ERM, or 1769-L30ERM, or 1769-L30ERM, or 1769-L30ERM controller. Those controllers support no more than 8 expansion modules. You must replace the 1769-L32E controller with a 1769-L33ERM, or 1769-L33ERM controller.

We recommend that before you upgrade your controllers, consider your application requirements to verify that the replacements listed previously apply.

⁽²⁾ Requires converting from ControlNet connections to EtherNet/IP connections.

Compact GuardLogix 5370 Controllers

In a Compact GuardLogix 5370 controller system, the 1769 I/O modules can be placed to the left and the right of the power supply. As many as eight modules can be placed on each side of the power supply. The CompactLogix 5370 L3S controller comes with:

- Dual EtherNet/IP ports for ring topologies.
- USB port for firmware download and programming.
- Safety control to achieve SIL 3/PLe according to ISO 13849.
- Support for 1769 Compact I/O.



Characteristic	1769-L30ERMS	1769-L33ERMS	1769-L36ERMS			
Available user memory	1 MB (standard) 0.5 MB (safety)	2 MB (standard) 1 MB (safety)	3 MB (standard) 1.5 MB (safety)			
Memory card	• 1784-SD1 (1 GB), shipped with controller • 1784-SD2 (2 GB)					
Communication ports	2 EtherNet/IP 1 USB					
EtherNet/IP connections	• 256 EtherNet/IP • 120 TCP					
EtherNet/IP nodes in one Logix Designer application, max	16	32	48			
Integrated motion on an EtherNet/IP network	Supports up to 4 axes	Supports up to 8 axes	Supports up to 16 axes			
Module expansion capacity	8 1769 modules	16 1769 modules	30 1769 modules			
	1 bank of modules	2 banks of modules	3 banks of modules			
Battery	None					
Power supply distance rating	4 modules					
Programming software support	Version 28 or later – For controllers that use firmwa	re revision 28 or later.				

Controller Memory Use

These equations provide an estimate of the memory that is needed for a CompactLogix controller. These numbers are rough estimates.

Controller tasks	* 4000	=	bytes (minimum 1 task)
Digital I/O points	* 400	=	bytes
Analog I/O points	* 2600	=	bytes
DeviceNet modules ⁽¹⁾	* 7400	=	bytes
Other communication modules (2)	* 2000	=	bytes
Motion axes	* 8000	=	bytes
FactoryTalk® alarm instruction	* 1000	=	bytes (per alarm)
FactoryTalk subscriber	* 10000	=	bytes

⁽¹⁾ The first DeviceNet module is 7400 bytes. Additional DeviceNet modules are 5800 bytes each.

Reserve 20...30% of the controller memory for future expansion.

⁽²⁾ Count the communication modules in the system, not just those modules in the local chassis. This total includes device connection modules, adapters, and ports on PanelView terminals.

CompactLogix Communication Options

You can configure your system for information exchange between a range of devices and computing platforms and operating systems. Select a CompactLogix controller with integrated communication or the appropriate communication module.

For detailed specifications, see:

- CompactLogix Controllers Specifications Technical Data, publication <u>1769-TD005</u>.
- CompactLogix Communication Modules Specifications Technical Data, publication <u>1769-TD007</u>.

EtherNet/IP Communication Options

The Ethernet Industrial network protocol (EtherNet/IP) is an open industrial-networking standard that supports real time I/O messaging and message exchange. The EtherNet/IP network uses off-the-shelf Ethernet communication chips and physical media.

Dual-port EtherNet/IP support embeds switch technology directly in the controller to so the controller can operate on star, linear, or ring EtherNet/IP topologies.

Cat. No.	Description	Communication Rate	Logix Resources ⁽¹⁾	TCP/IP Connections
1769-L16ER-BB1B,	CompactLogix 5370 L1 controller with integrated EtherNet/IP dual-port, POINT I/O form factor	10/100 Mbps	4 nodes 256 EtherNet/IP connections	120
1769-L18ER-BB1B, 1769-L18ERM-BB1B			8 nodes 256 EtherNet/IP connections	
1769-L19ER-BB1B				
1769-L24ER-BB1B, 1769-L24ER-QBFC1B	CompactLogix 5370 L2 controller with integrated EtherNet/IP dual-port, Compact I/O form factor	10/100 Mbps	8 nodes 256 EtherNet/IP connections	120
1769-L27ERM-QBFC1B		10/100 Mbps	16 nodes 256 EtherNet/IP connections	
1769-L30ER, 1769-L30ERM, 1769-L30ERMS	CompactLogix 5370 L3 controller with integrated EtherNet/IP dual-port	10/100 Mbps	16 nodes 256 EtherNet/IP connections	120
1769-L33ER, 1769-L33ERM, 1769-L33ERMS			32 nodes 256 EtherNet/IP connections	
1769-L36ERM, 1769-L36ERMS			48 nodes 256 EtherNet/IP connections	
1769-AENTR	1769 EtherNet/IP adapter	10/100 Mbps	128 EtherNet/IP connections	96

⁽¹⁾ The number of nodes that are listed for CompactLogix 5370 controllers represents the maximum number of EtherNet/IP nodes you can include in a controller project for those controllers. For example, in a controller project that uses a 1769-L18ERM-BB1B controller, you can add as many as eight EtherNet/IP nodes to the project.

DeviceNet Communication Options

The DeviceNet network is an open, low-level network that provides connections between simple industrial devices (such as sensors and actuators) and higher-level devices (such as controllers and computers).

Cat. No.	Description	Communication Rate	Number of Nodes
1769-SDN	Compact I/O DeviceNet scanner	125 Kbps (500 m max)	64
1769-ADN	Compact I/O DeviceNet adapter	250 Kbps (250 m max) 500 Kbps (100 m max)	

Serial Communication Options

These CompactLogix controllers support serial communication.

Cat. No.	Serial Options
1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ERM-BB1B	1734–232ASC module for an RS-232 serial interface 1734–485 ASC module for an RS-422 and RS-485 serial device
1769-L24ER-BB1B, 1769-L24ER-QBFC1B	1769-ASCII module for an ASCII interface to RS-232, RS-422, and RS-485 devices
1769-L27ERM-QBFC1B	1769-SM2 module for a Modbus RTU interface
1769-L30ER, 1769-L30ERM, 1769-L30ERMS	
1769-L33ER, 1769-L33ERM, 1769-L33ERMS	
1769-L36ERM, 1769-L36ERMS	

Modbus Support

To access a Modbus TCP network, connect through the embedded Ethernet port of the CompactLogix 5370 controllers and execute a ladder-logic routine. For more information, see Knowledgebase document 470365 at http://www.rockwellautomation.com/knowledgebase/.

To access a Modbus RTU network, connect through the serial port (if available) and execute a ladder-logic routine. For more information, see Using Logix5000™ Controllers as Masters or Slaves on Modbus Application Solution, publication <u>CIG-AP129</u>.

CompactLogix Integrated Motion

The Logix architecture supports motion control components that work in a wide variety of machine architectures.

- Integrated motion on EtherNet/IP supports a connection to Ethernet drives.
- The Kinetix integrated-motion solution uses a SERCOS interface module to perform multi-axis, synchronized motion.
- Logix integrated motion supports the analog family of servo modules for controlling drives/actuators.
- Networked motion provides the ability to connect via the DeviceNet network to one axis drive to perform point-to-point indexing.

Motion Feature	1769-L30ERM, 1769-L30ERMS, 1769-L33ERM, 1769-L33ERMS, 1769-L36ERM, 1769-L36ERMS	1769-L27ERM-QBFC1B	1769-L18ERM-BB1B
EtherNet/IP sequence of events for software registration	Yes	Yes	Yes
Kinematics	Yes	Yes	Yes
Integrated motion on an EtherNet/IP network	Yes	Yes	Yes
Indexing	Yes with AMCI 1769–3602 pulse-train output module	Yes with AMCI 1769–3602 pulse-train output module	Yes with one of these pulse-train output modules: • AMCI 1734-3401 • AMCI 1734-3401L
Load observer (with only Kinetix 6500 drives)	Yes	Yes	Yes
Total axis count	100	100	100
Virtual axis, max.	100	100	100
EtherNet/IP axis, max.	16	4	2
EtherNet/IP feedback, VHz, torque, or velocity axis, max.	48	16	8

For more information, see the:

- Motion Analyzer CD to size your motion application and to make final component selection. Download the software from http://www.ab.com/motion/software/analyzer.html.
- Kinetix Motion Control Selection Guide, publication <u>GMC-SG001</u>, to verify drive, motor, and accessory specifications.

Some CompactLogix 5370 controllers support integrated motion on an EtherNet/IP network. Select the controller with sufficient axis-support for your application.

Compact GuardLogix Integrated Safety

The Compact GuardLogix controller provides safety control to achieve SIL 3/PLe according to ISO 13849. A major benefit of this system is that it is still one project, safety and standard together.

Application	Description
SIL 1, 2, 3	The Compact GuardLogix controller system is type-approved and certified for use in safety applications up to and including SIL 3 according to IEC 61508, and applications up to and including PLe/Cat.4 according to ISO 13849-1. For more information, see: GuardLogix Controllers User Manual, publication 1769-UM022. GuardLogix 5570 and Compact GuardLogix 5370 Controller Safety Systems Safety Reference Manual, publication 1756-RM099. Compact GuardLogix Controllers User Manual, publication 1768-UM002. GuardLogix Safety Application Instruction Set Reference Manual, publication 1756-RM095.

During development, safety and standard have the same rules, multiple programmers, online editing, and forcing are all possible. Once the project is tested and ready for final validation, you apply the safety application signature and safety-lock the application to set the safety task to a SIL 3 integrity level, which the GuardLogix controller enforces. When safety memory is locked and protected, the safety logic cannot be modified and all safety functions operate with SIL 3 integrity. On the standard side of the GuardLogix controller, all functions operate like a regular Logix controller. Thus online editing, forcing, and other activities are all possible.

With this level of integration, standard logic and external devices, like HMIs or other controllers, can read safety memory, eliminating the need to condition safety memory for use elsewhere. The result is easy system-wide integration and the ability to display safety status on displays or marquees. Use Guard I/O modules for field device connectivity. For safety interlocking between GuardLogix controllers use Ethernet or ControlNet networks. Multiple GuardLogix controllers can share safety data for zone to zone interlocking, or one GuardLogix controller can use remote distributed safety I/O between cells/areas.

The Compact GuardLogix controller has these safety-related features and the standard features of a CompactLogix controller.

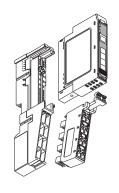
Characteristic	1769-L30ERMS	1769-L33ERMS	1769-L36ERMS	1768-L43S	1768-L45S
Available user memory	1 MB standard 0.5 MB safety	2 MB standard 1 MB safety	3 MB standard 1.5 MB safety	2 MB standard 0.5 MB safety	3 MB standard 1 MB safety
Communication options	Dual-port EtherNet/IP DeviceNet (standard)	 Dual-port EtherNet/IP (standard and safety) DeviceNet (standard) 		EtherNet/IP (standard and safety) ControlNet (standard and safety) DeviceNet (standard)	EtherNet/IP (standard and safety) ControlNet (standard and safety) DeviceNet (standard)
Programming languages	Standard task: all langu Safety task: relay ladde	uages er, safety application instruction	ons	•	•

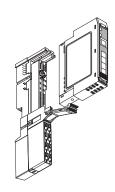
Additional Local I/O Modules

1734 POINT I/O Modules

Additional 1734 POINT I/O modules can be installed on a CompactLogix 5370 L1 controller. The POINT I/O family is ideal for applications where flexibility and low cost of ownership are key for successful control system design and operation.

The base (A) mounts onto the DIN rail and provides the backplane. The POINT I/O module (B) snaps into the base. The removable terminal block (C) also snaps into the base and provides the wiring and terminations for field-side connections, and system power for the backplane.





1734 AC Digital Modules

Cat. No.	Inputs/Outputs	Voltage Category	Wiring Base	POINTBus™ Current @ 5V DC
1734-IA2	2 inputs, nonisolated, sink	120V AC	1734-TB, 1734-TBS, 1734-TOP, 1734-TOPS	75 mA
1734-IA4	4 inputs, nonisolated, sink			
1734-IM2	2 inputs, nonisolated, sink	220V AC	1734-TB, 1734-TBS, 1734-TOP, 1734-TOPS	75 mA
1734-IM4	4 inputs, nonisolated, sink			
1734-0A2	2 outputs, nonisolated, source	120/220V AC	1734-TB, 1734-TBS, 1734-TOP, 1734-TOPS	75 mA
1734-0A4	4 outputs, nonisolated, source			

1734 DC Digital Modules

Cat. No.	Inputs/Outputs	Voltage Category	Wiring Base	POINTBus Current @ 5V DC
1743-IB2	2 inputs, sink	24V DC	1734-TB, 1734-TBS	75 mA
1734-IB4	4 inputs, sink			
1734-IB4D	4 inputs, sink, diagnostic	24V DC	1734-TB, 1734-TBS, 1734-TOP, 1734-TOPS	50 mA
1734-IB8	8 inputs, sink	24V DC	1734-TB, 1734-TBS	75 mA
1734-IB8S	8 inputs, sink, safety	24V DC	1734-TB,1734-TOP	175 mA
1734-IV2	2 inputs, source	24V DC	1734-TB,1734-TBS	75 mA
1734-IV4	4 inputs, source			
1734-IV8	8 inputs, source			

Cat. No.	Inputs/Outputs	Voltage Category	Wiring Base	POINTBus Current @ 5V DC
1734-0B2	2 outputs, nonisolated, source	12/24V DC	1734-TB, 1734-TBS	75 mA
1734-0B2E	2 outputs, nonisolated protected, source			
1734-0B4	4 outputs, nonisolated, source			
1734-0B4E	4 outputs, nonisolated protected, source			
1734-0B8	8 outputs, nonisolated, source			
1734-0B8E	8 outputs, nonisolated protected, source			
1734-0B8S	8 outputs, safety	24V DC	1734-TB,1734-TOP	190 mA
1734-0V2E	2 outputs, nonisolated protected, sink	12/24V DC	1734-TB, 1734-TBS	75 mA
1734-0V4E	4 outputs, nonisolated protected, sink			
1734-0V8E	8 outputs, nonisolated protected, sink			

1734 Relay Contact Output Modules

Cat. No.	Inputs/Outputs	Voltage Range	Wiring Base	POINTBus Current @ 5V DC
1734-0W2	2 Form A (normally open) relays	528.8V DC @ 2.0 A	1734-TB,1734-TBS	80 mA
1734-0W4	4 Form A (normally open) relays	48V DC @ 0.5 A 125V DC @ 0.25 A		
1734-0X2	2 Form C isolated (normally open; normally closed) electromechanical relays	125V DC @ 0.23 A 125V DC @ 2.0 A 240V AC @ 2.0 A		100 mA

1734 Analog and Temperature Modules

Cat. No.	Inputs/Outputs	Range	Resolution	Wiring Base	POINTBus Current @ 5V DC
1734-IE2C	2 single-ended, nonisolated, current	420 mA 020 mA	16 bits over 021 mA 0.32 μA/cnt	1734-TB, 1734-TBS	75 mA
1734-IE2V	2 single-ended, nonisolated, voltage	010V (-0.0V under, +0.5V over) ±10V (-0.5V under, +0.5V over)	15 bits plus sign 320 μV/cnt in unipolar or bipolar mode		
1734-IE4C	4 single-ended, nonisolated, current	420 mA 020 mA	16 bits - over 021 mA 0.32 μA/cnt		
1734-IE4S	4 inputs, single-ended, safety rated	020 mA, 420 mA ±5V, 05V, ±10V, 010V	12 bits	1734-TB, 1734-TBS, 1734-TOP, 1734-TOPS, 1734-TOP3, 1734-TOP3S	110 mA
1734-IE8C	8 single-ended, nonisolated, current	420 mA 020 mA	16 bits - over 021 mA 0.32 μA/cnt	1734-TB, 1734-TBS	75 mA
1734-IR2	2 single-ended, nonisolated	0600 Ω	16 bits 9.5 mΩ/cnt 0.03 °C/cnt (Pt385 @ 25 °C) [0.05 °F/cnt (Pt385 @ 77 °F)]	1734-TB, 1734-TBS, 1734-TOP, 1734-TOPS	220 mA
1734-IR2E	2 single-ended, nonisolated, protected	0220 Ω	16 bits 2.4 mΩ/cnt 0.006 °C/cnt (Pt385 @ 25 °C) [0.0114 °F/cnt (Pt385 @ 77 °F)]		

Cat. No.	Inputs/Outputs	Range	Resolution	Wiring Base	POINTBus Current @ 5V DC
1734-IT2I	2 differential, individually isolated	Sensors B, C, E, J, K, N, R, S, T	15 bits plus sign 2.5 μV/cnt	1734-TBCJC	175 mA
1734-0E2C	2 single-ended, nonisolated, current	420 mA 020 mA	13 bits over 021mA 2.5 μA/cnt (average) 32.7 μA/cnt (typical range)	1734-TB, 1734-TBS, 1734-TB3, 1734-TB3S	75 mA
1734-0E2V	2 single-ended, nonisolated, voltage	010V (-0.0V under, +0.5V over) ±10V (-0.5V under, +0.5V over)	14 bits (13 plus sign) 1.28 mV/cnt in unipolar or bipolar mode		
1734-0E4C	4 single-ended, nonisolated, current	420 mA 020 mA	16 bits over 021 mA 0.32 μA/cnt)		

1734 Counter Modules

Cat. No.	Inputs/Outputs	Range	Frequency	Wiring Base	POINTBus Current @ 5V DC
1734-IJ	1 - 1 group of A/Areturn, B/Breturn and Z/Zreturn	5V DC	1.0 MHz counter and encoder X1 500 kHz encoder X2 (no filter	1734-TB, 1734-TBS, 1734-TB3, 1734-TB3S	160 mA
1734-IK	1 - 1 group of A/Areturn, B/Breturn and Z/Zreturn	1524V DC	250 kHz encoder X4 (no filter)		160 mA
1734-VHSC24	1 - 1 group of A/Areturn, B/Breturn and Z/Zreturn	1524V DC			180 mA
1734-VHSC5	1 – 1 group of A/Areturn, B/Breturn and Z/Zreturn	5V DC			180 mA

1734 Self-configurable Modules

Cat. No.	Inputs/Outputs	Voltage Category	Wiring Base	POINTBus Current @ 5V DC
1734-8CFG	8 self-configurable	24V DC	1734-TB, 1734-TBS, 1734-TOP, 1734-TOPS	100 mA

1734 Communication and Specialty Modules

Cat. No.	Description	Wiring Base	POINTBus Current
1734-AENT	The single port adapter connects POINT I/O modules to the Ethernet network.	N/A	
1734-AENTR	The adapter connects POINT I/O modules to a linear or DLR network and uses two copper network ports to connect to the network.	N/A	
1734-232ASC	The 1734–232ASC and 1734–485ASC serial interface modules offer a serial-link communication interface	1734-TB, 1734-TBS 75 r	75 mA
1734-485ASC	solution for peripheral products with RS-232 (only 1734-232ASC), RS-485, and RS-422 ports (only 1734-485ASC.)		
1734-ARM	The 1734-ARM address reserve module reserves address and slot numbers to maintain a numbering scheme of a system. The 1734-ARM has no module configuration and does not communicate I/O data.	1734-TB, 1734-TBS	75 mA
1734-CTM	The common terminal module (1734-CTM) and voltage terminal module (1734-VTM) expand the termination		75 mA
1734-VTM	capabilities of POINT I/O modules. Install the modules to support higher density (8 channel) POINT I/O modules.	1734-TOP, 1734-TOPS	
1734-SSI	The 1734-SSI module collects serial data from absolute-position, encoding sensors that use standard Synchronous Serial Interface (SSI) protocol.	1734-TB, 1734-TBS	110 mA

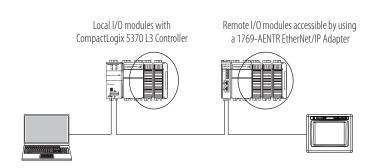
1769 Compact I/O Modules

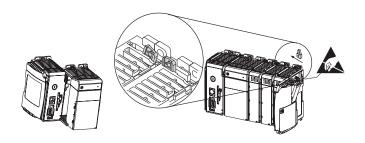
The 1769 Compact I/O modules can be used with the CompactLogix 5370 L2 and L3 controllers and 1768 CompactLogix controllers as follows:

- Local I/O modules
- Remote I/O modules accessible by using a 1769-AENTR EtherNet/IP adapter

The modules mechanically lock together with a tongueand-groove design and have an integrated communication bus that is connected from module to module by a moveable bus connector.

Each I/O module includes a built-in removable terminal block with fingersafe cover for connections to I/O sensors and actuators. The terminal block is behind a door at the front of the module. I/O wiring can be routed from beneath the module to the I/O terminals.





For detailed specifications, see 1769 Compact I/O Modules Specifications Technical Data, publication <u>1769-TD006</u>.

Power Supply Distance Ratings

Check the specification table of each module for the power supply distance rating. This rating indicates how many slot positions the module can be from the power supply.

1769 AC Digital Modules

Cat. No.	Inputs/Outputs	Voltage Category	Operating Voltage Range	Backplane Current	Power Supply Distance Rating
1769-IA8I	8 inputs, individually isolated	100/120V AC	79132V AC, 4763 Hz	90 mA @ 5.1V ⁽¹⁾	8
1769-IA16	16 inputs	100/120V AC	79132V AC, 4763 Hz	115 mA @ 5.1V	8
1769-IM12	12 inputs	200/240V AC	159265V AC, 4763 Hz	100 mA @ 5.1V	8
1769-0A8	8 outputs	100/240V AC	85265V AC 4763 Hz	145 mA @ 5.1V	8
1769-0A16	16 outputs	100/240V AC	85265V AC 4763 Hz	225 mA @ 5.1V	8

⁽¹⁾ Maximum is 190 mA.

1769 DC Digital Modules

Cat. No.	Inputs/Outputs	Voltage Category	Operating Voltage Range	Backplane Current	Power Supply Distance Rating
1769-IG16	16 inputs	5V DC TTL	4.55.5V DC	120 mA @ 5.1V	8
1769-IQ16	16 inputs	24V DC sink/source	1030V DC @ 30 °C (86 °F) 1026.4V DC @ 60 °C (140 °F)	115 mA @ 5.1V	8
1769-IQ16F	16 inputs, high speed	24V DC sink/source	1030V DC @ 30 °C (86 °F) 1026.4V DC @ 60 °C (140 °F)	100 mA @ 5.1V	8
1769-IQ32	32 inputs	24V DC sink/source	1030V DC @ 30 °C (86 °F) 1026.4V DC @ 60 °C (140 °F)	170 mA @ 5.1V	8
1769-IQ32T	32 inputs	24V DC sink/source	20.426.4V DC @ 60 °C (140 °F)	170 mA @ 5.1V	8
1769-IQ6X0W4	6 inputs 4 outputs	24V DC sink/source input AC/DC normally open relay contact outputs	1030V DC@30°C (86°F) 1026.4V DC@60°C (140°F)	105 mA @ 5.1V 50 mA @ 24V	8
1769-0B8	8 outputs	24V DC source	20.426.4V DC	145 mA @ 5.1V	8
1769-0B16	16 outputs	24V DC source	20.426.4V DC	200 mA @ 5.1V	8
1769-0B16P	16 outputs, protected	24V DC source	20.426.4V DC	160 mA @ 5.1V	8
1769-0B32	32 outputs	24V DC source	20.426.4V DC	300 mA @ 5.1V	6
1769-0B32T	32 outputs	24V DC source	10.226.4V DC	220 mA @ 5.1V	8
1769-0G16	16 outputs	5V DC TTL	4.55.5V DC	200 mA @ 5.1V	8
1769-0V16	16 outputs	24V DC sink	20.426.4V DC	200 mA @ 5.1V	8
1769-0V32T	32 outputs	24V DC sink	10.226.4V DC	300 mA @ 5.1V	8

1769 Contact Output Modules

Cat. No.	Inputs/Outputs	Operating Voltage Range	Backplane Current	Power Supply Distance Rating
1769-0W8	8 outputs	5265V AC 5125V DC	125 mA @ 5.1V 100 mA @ 24V	8
1769-0W8I	8 outputs, individually isolated	5265V AC 5125V DC	125 mA @ 5.1V 100 mA @ 24V	8
1769-0W16	16 outputs	5265V AC 5125V DC	205 mA @ 5.1V 180 mA @ 24V	8

1769 Analog Modules

Cat. No.	Inputs/Outputs	Range	Resolution	Backplane Current	Power Supply Distance Rating
1769-IF4	4 inputs, differential or single–ended	±10V 010V 05V 15V 020 mA 420 mA	14 bits (unipolar) 14 bits plus sign (bipolar)	120 mA @ 5.1V 60 mA @ 24V	8
1769-IF4I	4 inputs, differential or single-ended, individually isolated	±10V 010V 05V 15V 020 mA 420 mA	16 bits (unipolar) 15 bits plus sign (bipolar)	145 mA @ 5.1V 125 mA @ 24V	8
1769-IF8	8 inputs, differential or single-ended	±10V 010V 05V 15V 020 mA 420 mA	16 bits (unipolar) 15 bits plus sign (bipolar)	120 mA @ 5.1V 70 mA @ 24V	8
1769-IF16C	16 inputs, single-ended	020 mA 420 mA	16 bits (unipolar) 15 bits plus sign (bipolar)	190 mA @ 5.1V 70 mA @ 24V	8
1769-IF16V	16 inputs, single-ended	±10V 010V 05V 15V	16 bits (unipolar) 15 bits plus sign (bipolar)	190 mA @ 5.1V 70 mA @ 24V	8
1769-IF4X0F2	4 inputs, differential or single-ended 2 outputs, single-ended	010V 020 mA	Input: 8 bits plus sign Output: 8 bits plus sign	120 mA @ 5.1V 160 mA @ 24V	8
1769-IF4FX0F2F	4 inputs, fast differential or single-ended 2 outputs, fast single-ended	±10V 010V 05V 15V 020 mA 420 mA	Input: 14 bits (unipolar) 14 bits plus sign (bipolar) Output: 13 bits (unipolar) 13 bits plus sign (bipolar)	220 mA @ 5.1V 120 mA @ 24V	8
1769-0F2	2 outputs, single-ended	±10V 010V 05V 15V 020 mA 420 mA	14 bits (unipolar) 14 bits plus sign (bipolar)	120 mA @ 5.1V 120 mA @ 24V	8
1769-0F4	4 outputs, single-ended	±10V 010V 05V 15V 020 mA 420 mA	15 bits plus sign unipolar and bipolar	120 mA @ 5.1V 170 mA @ 24V	8
1769-0F4CI	4 outputs, differential, individually isolated	020 mA 420 mA	16 bits (unipolar)	165 mA @ 5V 110 mA @ 24V	8

Cat. No.	Inputs/Outputs	Range	Resolution	Backplane Current	Power Supply Distance Rating
1769-0F4VI	4 outputs, differential, individually isolated	±10V 010V 05V 15V	15 bits plus sign (bipolar)	145 mA @ 5.1V 75 mA @ 24V	8
1769-0F8C	8 outputs, single-ended	020 mA 420 mA	16 bits (unipolar)	140 mA @ 5.1V 145 mA @ 24V	8
1769-0F8V	8 outputs, single-ended	±10V 010V 05V 15V	16 bits plus sign (bipolar)	145 mA @ 5.1V 125 mA @ 24V	8

1769 Analog RTD and Thermocouple Modules

Cat. No.	Inputs/Outputs	Sensors Supported	Backplane Current	Power Supply Distance Rating
1769-IR6	6 RTD inputs	100, 200, 500, 1000 Ω Platinum 385 100, 200, 500, 1000 Ω Platinum 3916 120 Ω Nickel 618 120 Ω Nickel 672 10 Ω Nickel-iron 518 0150 Ω 0500 Ω 01000 Ω	100 mA @ 5.1V 45 mA @ 24V	8
1769-IT6	6 thermocouple inputs	Thermocouple types B, C, E, J, K, N, R, S, T ±50V ±100V	100 mA @ 5.1V 45 mA @ 24V	8 ⁽¹⁾

⁽¹⁾ To reduce the effects of electrical noise, install the 1769-IT6 module at least two slots away from the AC power supplies.

1769 Communication and Specialty Modules

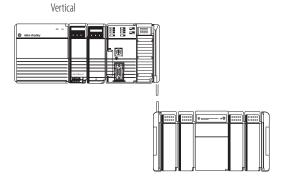
Cat. No.	Description	Backplane Current	Power Supply Distance Rating
1769-AENTR	The adapter connects 1769 I/O modules to a linear or DLR network and uses two copper network ports to connect to the network.	500 mA @ 5V	5
1769-ARM	Use a 1769-ARM address reserve module to reserve module slots. After creating an I/O configuration and user program, you can remove and replace any I/O module in the system with a 1769-ARM module once you inhibit the removed module in the Logix Designer application.	60 mA @ 5.1V	8
1769-ASCII	The 1769-ASCII module, a general-purpose two-channel ASCII interface, provides a flexible network interface to a wide variety of RS-232, RS-485, and RS-422 ASCII devices. The module provides the communication connections to the ASCII device.	425 mA @ 5.1V	4
1769-BOOLEAN	Use the 1769-BOOLEAN module in applications that require repeatability, such as material handling and packaging, when there is a requirement to activate an output that is based on the transition of an input. If the Boolean expression is true, the output is directed to the ON state. If the Boolean expression is false, the output channel is directed to the OFF state. There are four operators that you can configure as OR, AND, XOR, or none.	220 mA @ 5.1V	8

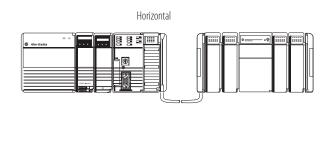
Cat. No.	Description	Backplane Current	Power Supply Distance Rating
1769-HSC	Use the 1769-HSC when you need: a counter module that can react to high-speed input signals. to generate rate and time-between-pulses (pulse interval) data. as many as two channels of quadrature or four channels of pulse/count inputs. 	245 mA @ 5.1V	4
1769-SM1	The Compact I/O to DPI or SCANport™ module connects to PowerFlex 7-class drives, other DPI-based host devices, and SCANport-based host devices such as 1305 and 1336 PLUS™ II drives.	280 mA @ 5.1V	6
1769-SM2	The Compact I/O to DSI/Modbus module connects to PowerFlex 4-class drives and to other Modbus RTU slave devices, such as PowerFlex 7-class drives with 20-COMM-H RS485 HVAC adapters.	350 mA @ 5.1V	4

1769 Expansion Cables

If you divide 1769 modules into multiple banks, make sure:

- Each bank needs its own power supply.
- To use expansion cables to connect the banks.
- The last I/O bank requires an end cap.





How you orient I/O banks determines the expansion cables that you must connect the I/O banks.

If you add a	And connect the chassis	Use this cable ⁽¹⁾
Second bank	Right to left	1769-CRLx
	Right to right	1769-CRRx
Third bank	Right to left	1769-CRLx
	Right to right	1769-CRRx
	Left to left	1769-CLL <i>x</i>

⁽¹⁾ Where x = 1 for 1 ft (305 mm) or 3 for 3.28 ft (1 m).

1769 End Caps

The final 1769 Compact I/O bank requires an end cap on the end without the expansion cable. The CompactLogix 5370 L2 controller comes with a right-end cap, so you do not need to order one separately.

- Right end cap, catalog number 1769-ECR
- Left end cap, catalog number 1769-ECL

1769 Wiring Systems

As an alternative to buying removable terminal blocks (RTBs) and connecting the wires yourself, you can buy a wiring system of:

- Interface modules (IFMs) that provide the output terminal blocks for digital I/O modules. Use the pre-wired cables that match the I/O module to the IFM.
- Analog interface modules (AIFMs) that provide the output terminal blocks for analog I/O modules. Use the pre-wired cables that match the I/O module to the AIFM.
- I/O module-ready cables. One end of the cable assembly is an RTB that plugs into the front of the I/O module. The other end has individually color-coded conductors that connect to a standard terminal block.

Removable Terminal Kits

You can order removable terminal kits with the CompactLogix 5370 L1 and L2 controllers separately. The kits are used to connect wiring to the controllers. The following table describes the kits.

Cat. Nos.	Controllers Supported	Description
1769-RTB45	CompactLogix 5370 L1	 Four 10-pin connectors that are used to connect wiring to the embedded digital I/O module of the controller. One 5-pin connector that is used to connect an external 24V DC power source to the controller.
1769-RTB40DIO	CompactLogix 5370 L2	Four 10-pin connectors that are used to connect wiring to the embedded digital I/O module of the controller.
1769-RTB40AIO	1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B	Four 10-pin connectors that are used to connect wiring to the embedded analog I/O module of the controller.

CompactLogix Power Supplies

Select power supplies based on the controller and the number of additional I/O banks.

For a	Select	
CompactLogix 5370 L3 controller	One 1769 power supply for the controller and local I/O modules One 1769 power supply for each additional bank of I/O modules	
CompactLogix 5370 L2 controller	No power supply as it is integral to the controller package	
CompactLogix 5370 L1 controller	No power supply as it is integral to the controller package	

Power Supplies

Cat. No.	Description	Voltage Category	Operating Voltage Range
1769-PA2	1769 Compact I/O expansion power supply	120V/220V AC	85265V AC
1769-PB2		24V DC	19.231.2V DC
1769-PA4		120V/220V AC	85265V AC or 170265V AC (switch selectable) 4763 Hz
1769-PB4		24V DC	19.231.2V DC

For detailed specifications, see Compact Power Supplies Specifications Technical Data, publication <u>1769-TD008</u>.

Select a	Compact	Loaix S	vstem
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Notes:



cMT3162X

HMI with 15.6" FHD IPS Display

Feature

- The oTP integrated touch solution offers an edge-to-edge design, high-resolution and high-transmittance. 15.6" 1920 x 1080 FHD IPS LCD

- Supports Vibration Alerting
 Quad-core Cortex-A17 CPU with High Performance dedicated 3D Processor
 Fan-less Cooling System
 Built- in 4GB Flash Memory and RTC

- COM1 / COM3 RS-485 2W Supports MPI 187.5K, please use one at a time.
- Built-in Power Isolator
- NEMA4/IP66 Compliant Front Panel

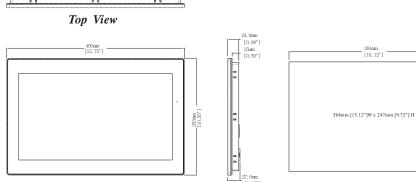
		Display	15.6" IPS
	Display	Resolution	1920 x 1080
		Brightness (cd/m²)	300
		Contrast Ratio	800:1
		Backlight Type	LED
		Backlight Life Time	>30,000 hrs.
		Colors	16.2M
		LCD Viewing Angle (T/B/R/L)	89/89/89
		Pixel Pitch (mm)	0.17925(H) x 0.17925(V)
		Type	Tempered Glass, Capacitive Type
	Touch Panel	Hardness Scale	7H
		Flash	4 GB
	Memory	RAM	1 GB
	Processor		Quad-core RISC
		SD Card Slot	N/A
		USB Host	USB 2.0 x 1
		USB Client	N/A
			LAN 1: 10/100/1000 Base-T x 1
		Ethernet	LAN 2: 10/100 Base-T x 1
	I/O Port	COM Port	Con.A: COM1 RS-485 2W/4W, COM3 RS-485 2W, CAN Bus Con.B: COM1 RS-232 4W, COM3 RS-232 2W*
		RS-485 Isolation	N/A
		CAN Bus	Yes
		HDMI	N/A
		Audio Output	Built-in Mono Speaker
H	RTC	radio Odipat	Built-in
	KIO	Input Power	24±20%VDC
		Power Isolation	Built-in
	Power	Power Consumption	1.3A@24VDC
	1 04101	Voltage Resistance	500VAC (1 min.)
		Isolation Resistance	Exceed 50MΩ @ 500VDC
		PCB Coating	Yes
		Enclosure	Front bezel: Plastic, Rear Enclosure: Aluminum
		Dimensions WxHxD	400 x 263 x 27.6 mm
	Specification	Panel Cutout	384 x 247 mm
		Weight	Approx. 1.6 kg
		Mount	Panel mount, VESA mount 100 x 100 mm
		Protection Structure	NEMA4 / IP66 Compliant Front Panel
		Storage Temperature	-20° ~ 60°C (-4° ~ 140°F)
	Environment	Operating Temperature	0° ~ 50°C (32° ~ 122°F)
		Relative Humidity	10% ~ 90% (non-condensing)
		Vibration Endurance	10 to 25Hz (X, Y, Z direction 2G 30 minutes)
		CE	CE marked
	Certificate	UL	cULus Listed
		EasyBuilder Pro	V6.04.01 or later versions
	Software	Weincloud	EasyAccess 2.0 (Optional), Dashboard* (Optional)
		CODESYS®	
	+ O + T + O D + (- DTO/2-2)	CODESTS	Optional

^{*} Only Tx & Rx (no RTS/CTS) may be used for COM1 RS-232 when COM3 RS-232 is also used.

^{*} Dashboard requires EasyBuilder Pro V6.06.01 or later versions.

^{*} CODESYS® is a trademark of 3S-Smart Software Solutions GmbH.

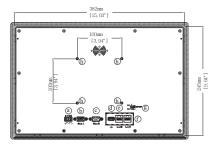
Dimensions



Front View

Side View

Cutout Dimensions



Rear View



Bottom View

а	Power Connector	Ф	LAN2
b	COM1 RS-485, COM3 RS-485, CAN Bus (Con.A)	f	LAN1
С	COM1 RS-232, COM3 RS-232 (Con.B)	g	DIP SW
d	USB Host	h	VESA 100mm Screw Holes

Ordering Information

□ cMT3162X:

15.6" IPS LCD HMI, 4GB flash memory, 1GB RAM on board

Optional:

□ RZ0CDS000: CODESYS activation card & license sticker

□ RZACEA020: EasyAccess 2.0 Activation Card

Pin Assignment:

Con. B: COM1 / COM3 [RS232] 9 Pin, Male, D-sub

PIN#	COM1 [RS232]4W	COM3 [RS232]2W
1		
2	RxD	
3	TxD	
4		
5	G	ND
6		
7	RTS	TxD
8	CTS	RxD
9	G	ND

Con. A: COM1 / COM3 [RS485]/ CAN Bus 9 Pin, Female, D-sub

PIN#	COM1 [RS485]2W	COM1 [RS485]4W	COM3 [RS485]2W	CAN Bus
1	Data-	Rx-		
2	Data+	Rx+		
3		Tx-		
4		Tx+		
5		GN	ND	
6			Data-	
7				CAN_L
8				CAN_H
9			Data+	

Altech Corp.®

Certified System

Serving the Automation & Control Industry Since 1984

ISO 900



LINE Largosa and







Alterh TEST

UL 489
Branch Circuit Breaker
with Ground Fault Relay

UL 1053
Ground Fault Sensing
and Relaying Device





Rated current m

UL Ground Fault Equipment Protectors



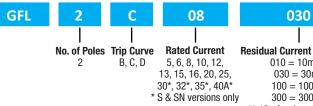
Altech Corp.

GFL Series (5A - 40A)

10kA UL489 Listed Branch Circuit Breaker with Equipment Ground Fault Protection (RCBO)

The GFL Series range is a combined Branch Circuit Breaker and Equipment Ground Fault Protector, featuring dual pole switching (live and neutral disconnect) and designed to provide protection against short circuits, overloads, AC ground faults (residual current faults) as well as pulsating DC ground faults.

GFL Series RCBO Ordering Scheme



Residual Current Sensitivity
010 = 10mA**
030 = 30mA
100 = 100mA
100 = 100mA
300 = 300mA
** 10mA only available on

EXAMPLE: GFL2C080302

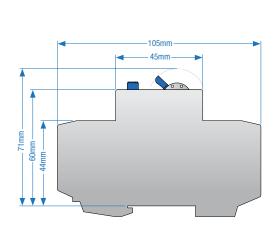
current ratings up to 25A

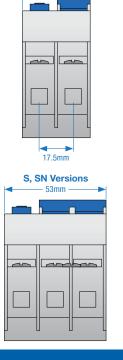
NOTE:

2=240V Single Phase System with neutral connection. S=120/240V Split Phase System with no neutral connection. SN=120/240V Split Phase System with neutral connection.

Technical Specification

Number of Poles	1+N (2)	2 (S), 2+N (SN)
Rated Voltage (U _n)	240V AC	120/240V AC
Rated Current	5, 6, 8, 10, 12, 13, 15, 16, 20, 25A	5, 6, 8, 10, 12, 13, 15, 16, 20, 25, 30, 32, 35, 40A
Rated Residual Operating Co	ırrent (I _n) 10)**, 30, 100, 300mA
Rated Short Circuit Capacity	(Inc)	10kA
Rated Frequency		50/60Hz
Overload Tripping		B, C and D
Cable Size & Tightening Toro	que 14 - 3 AWG (2mr	n2 - 25mm2) @ 17.5lb-in (2.0Nm)
	18 - 16 AWG (1m	m2 - 1.5mm2) @ 25lb-in (2.8Nm)
Electrical Life	6000	Switching Operations
Mechanical Life	1000	O Switching Operations

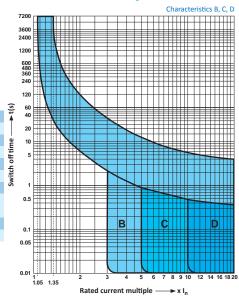




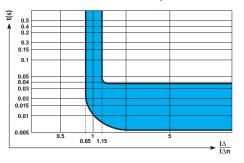
2 Version



GFL Series RCBO Overload Trip Curves



GFL Series RCBO Ground Fault Trip Curve



Altech Corp.

GF Series (up to 63A)

480Y/277V AC Ground Fault Sensing and Relaying Device (RCCB)

The GF Series of Equipment Ground Fault Protection Relays (Earth Leakage Protection) is the latest addition to Altech's UL Listed product range, providing ground fault (residual current) protection for circuits with loads up to 63A. Short Circuit Withstand rating is 10kA.

LINE LINE





GF Series RCCB Ordering Scheme

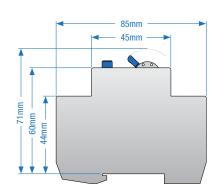
GF	2	25	030
	No. of Poles	Rated Current	Residual Current Sensitivity
	2, 4	25, 40, 63A	010 = 10 mA*
			030 = 30 mA
EXAMPLI	E.		100 = 100 mA
			300 = 300 mA
GF225030	J		500 = 500 mA
		*(01)	NLY 2 pole, 25A - Cat. No. GF225010)

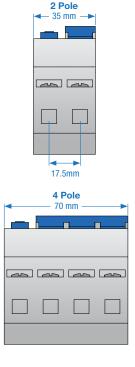
Technical Specification

Number of Poles	2	4
Rated Voltage (U _n)	277V AC	480Y/277V AC
Rated Current		25, 40, 63A
Rated Residual Operating Current (In)		10*, 30, 100, 300, 500mA
Rated Frequency		50/60Hz
Cable Size & Tightening Torque	Solid wire sized 16 -	6 - 3 AWG (1.5mm² - 25mm²) @ 17.5lb-in (2.0Nm) 10 AWG (1.5mm² - 5.5mm²) @ 17.5lb-in (2.0Nm) - 16 AWG (1mm² - 1.5mm²) @ 25lb-in (2.8Nm)
Electrical Life		6000 Switching Operations
Mechanical Life		10000 Switching Operations

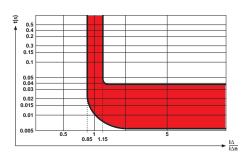
GF Series RCCB Short Circuit Withstand Rating

V	IR	Backup
2 Pole	10kA	Class J Fuse 250A or lower
277V AC		Altech L Series Branch Circuit Breaker
		Altech R Series Supplementary Protector
4 Pole		Class J Fuse 250A or lower
480Y/277V AC	10kA	Altech L Series Branch Circuit Breaker
		Altech R Series Supplementary Protector





GF Series RCCB Ground Fault Trip Curve



Altech Corp.

GFR Series (5A - 40A)

480Y/277V AC Ground Fault Relay with Overload Protection (RCBO)

The GFR Series is a combined Equipment Ground Fault Relay and Supplementary Protector (RCBO), featuring dual pole switching (live and neutral) and designed to provide protection against overloads and AC ground faults (residual current faults) as well as pulsating DC ground faults. Short Circuit Withstand rating is 10kA.

GFR Series RCBO Ordering Scheme







Ground Fault Sensing & Relaying Equipment E483493

GFR 06 No. of Poles Trip Curve **Rated Current** 2, 4 B, C, D 5, 6, 8, 10, 12, 13, 15. 16. 20. 25. 30. 32, 35, 40A **EXAMPLE:**

GFR2B06030

Technical Specification

Residual Current Sensitivity $010 = 10 \text{mA}^*$

030

030 = 30 mA100 = 100 mA300 = 300 mA

500 = 500 mA* 10mA only available on

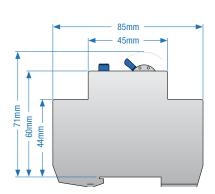
current ratings up to 25A, 2 pole only

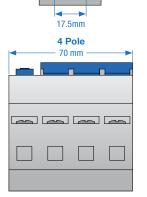
2 Pole 35 mm

Number of Poles	2
Rated Voltage (Un)	277V AC 480Y/277V AC
Rated Current	5, 6, 8, 10, 12, 13, 15, 16, 20, 25, 30, 32, 35, 40A
Rated Residual Operating Current (In)	10*, 30, 100, 300, 500mA
Rated Frequency	50/60Hz
Overload Tripping	B, C and D
Cable Size & Tightening Torque	Stranded wire sized 16 - 3 AWG (1.5mm2 - 25mm2) @ 17.5lb-in (2.0Nm)
	Solid wire sized 16 - 10 AWG (1.5mm2 - 5.5mm2) @ 17.5lb-in (2.0Nm)
	Solid wire sized 18 - 16 AWG (1mm2 - 1.5mm2) @ 25lb-in (2.8Nm)
Electrical Life	6000 Switching Operations
Mechanical Life	10000 Switching Operations

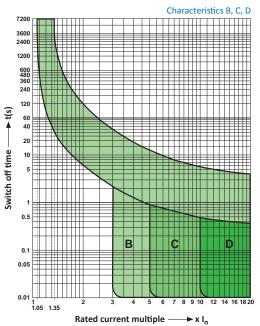
GFR Series RCBO Short Circuit Withstand Rating

V	ı	IR	Backup
	≤20A	10kA	None
2 Pole			Class J Fuse 250A or lower
277V AC	>20A	10kA	Altech L Series Branch Circuit Breaker
			Altech R Series Supplementary Protector
	≤20A	10kA	None
4 Pole			Class J Fuse 250A or lower
480Y/277V AC	>20A	10kA	Altech L Series Branch Circuit Breaker
			Altech R Series Supplementary Protector

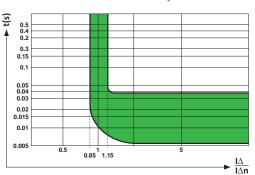




GFR Series RCBO Overload Trip Curves



GFR Series RCBO Ground Fault Trip Curve





Group G

Primary Voltage: 277 Secondary Voltage: 120







VA	CE VA	A Catalog Mto	Mtg.	Output Amps	Overall Dimensions			Mounting Centers		Mounting Slot	Height with	Height with	Approx. Ship
Rating	Rating	Number	Fig.		A	В	ပ	D	E	GXH	Finger Guard	Fuse Block Adapter	Weight Lbs.
50	50	SP50NJ	А	0.42	2.60	3.35	2.60	2.13	2.17	0.22 x 0.44	2.98	2.79	1.6
100	100	SP100NJ	Α	0.83	2.99	3.54	2.85	2.52	2.40	0.22 x 0.44	3.23	3.04	3.2
150	150	SP150NJ	А	1.25	2.99	4.29	2.85	2.52	3.15	0.22 x 0.44	3.23	3.04	4.3
250	160	SP250NJ	Α	2.08	3.78	4.09	3.40	3.31	2.99	0.22 x 0.44	3.78	3.59	6.4
350	250	SP350NJ	А	2.92	3.78	4.69	3.40	3.31	3.58	0.22 x 0.44	3.78	3.59	8.1
500	300	SP500NJ	Α	4.17	4.49	4.69	3.78	3.78	3.66	0.31 x 0.81	4.16	3.97	11
750	500	SP750NJ	A	6.25	5.25	5.08 ¹	4.37	4.50	4.06	0.31 x 0.81	4.75	4.56	18
1000	650	SP1000NJ	Α	8.33	5.25	5.47 ¹	4.37	4.50	4.45	0.31 x 0.81	4.75	4.56	20
1500	1000	SP1500NJ	А	12.50	5.25	6.85 ¹	4.37	4.50	5.83	0.31 x 0.81	4.75	4.56	29

Primary and Secondary voltage links/jumpers supplied standard with all transformers. Special voltages and VA sizes available upon request.

¹ Note: For 750 through 1500 VA units actual overall depth is 0.24" plus the value in column B.

* See page 10 for dimensional drawings.

All dimensions in inches

Group H

Primary Voltage: Secondary Voltage: 12 x 24

VA	CE VA	Catalog	Mtg.	Output		Overall mensio			nting ters	Mounting Slot	Height with	Height with	Approx. Ship
Rating	Rating	Number	Fig.		A	В	С	D	E	GXH	Finger Guard	Fuse Block Adapter	Weight Lbs.
50	50	SP50PR	Α	4.17/2.08	2.60	3.35	2.60	2.13	2.17	0.22 x 0.44	2.98	2.79	1.7
100	100	SP100PR	Α	8.33/4.17	2.99	3.74	2.85	2.52	2.60	0.22 x 0.44	3.23	3.04	3
150	150	SP150PR	Α	12.5/6.25	2.99	4.29	2.85	2.52	3.15	0.22 x 0.44	3.23	3.04	4.3
250	160	SP250PR	Α	20.8/10.4	3.78	3.90	3.40	3.31	2.80	0.22 x 0.44	3.78	3.59	5.9
350	250	SP350PR	Α	29.2/14.6	3.78	4.69	3.40	3.31	3.58	0.22 x 0.44	3.78	3.59	8.2
500	300	SP500PR	В	41.7/20.8	4.49	5.47	3.78	3.78	3.66	0.31 x 0.81	4.16	3.97	11

Primary and Secondary voltage links/jumpers supplied standard with all transformers. Special voltages and VA sizes available upon request.

* See page 10 for dimensional drawings.

All dimensions in inches



Product data sheet Characteristics

LC1D40ABD

TeSys D contactor - 3P(3 NO) - AC-3 - <= 440 V 40 A - 24 V DC standard coil

Product availability: Stock - Normally stocked in distribution facility



Price*: 275.00 USD



Main

Range	TeSys	
Product name	TeSys D	
Product or component type	Contactor	
Device short name	LC1D	
Contactor application	Resistive load Motor control	
Utilisation category	AC-1 AC-4 AC-3	
Poles description	3P	
Pole contact composition	3 NO	
System Voltage	<= 300 V DC power circuit <= 690 V AC 25400 Hz power circuit	2
[le] rated operational current	40 A (<= 140 °F (60 °C)) at <= 440 V AC AC-3 power circuit 60 A (<= 140 °F (60 °C)) at <= 440 V AC AC-1 power circuit	
Motor power kW	18.5 kW at 380400 V AC 50/60 Hz AC-3 22 kW at 500 V AC 50/60 Hz AC-3 30 kW at 660690 V AC 50/60 Hz AC-3 11 kW at 220230 V AC 50/60 Hz AC-3 9 kW at 400 V AC 50/60 Hz AC-4 22 kW at 415440 V AC 50/60 Hz AC-3	or and otherwise of the order
Motor power hp	5 hp at 230/240 V AC 50/60 Hz 1 phase motors 10 hp at 230/240 V AC 50/60 Hz 3 phases motors 30 hp at 575/600 V AC 50/60 Hz 3 phases motors 3 hp at 115 V AC 50/60 Hz 1 phase motors 10 hp at 200/208 V AC 50/60 Hz 3 phases motors 30 hp at 460/480 V AC 50/60 Hz 3 phases motors	ierdajmar Thie droumantairn is not intended as a cubetifute for and is not to be used for determining suitability of these produc
Control circuit type	DC standard	
[Uc] control circuit voltage	24 V DC	
Auxiliary contact composition	1 NO + 1 NC	
[Uimp] rated impulse withstand voltage	Conforming to IEC 60947	

Overvoltage category	III
[lth] conventional free air thermal current	60 A at <= 140 °F (60 °C) power circuit 10 A at <= 140 °F (60 °C) signalling circuit
Irms rated making capacity	800 A at 440 V power circuit conforming to IEC 60947 140 A AC signalling circuit conforming to IEC 60947-5-1 250 A DC signalling circuit conforming to IEC 60947-5-1
Rated breaking capacity	800 A at 440 V power circuit conforming to IEC 60947
[lcw] rated short-time withstand current	100 A 1 s signalling circuit 120 A 500 ms signalling circuit 140 A 100 ms signalling circuit 320 A <= 104 °F (40 °C) 10 s power circuit 720 A <= 104 °F (40 °C) 1 s power circuit 72 A <= 104 °F (40 °C) 10 min power circuit 165 A <= 104 °F (40 °C) 1 min power circuit
Associated fuse rating	80 A gG at <= 690 V coordination type 1 power circuit 80 A gG at <= 690 V coordination type 2 power circuit 10 A gG signalling circuit conforming to IEC 60947-5-1
Average impedance	1.5 mOhm at 50 Hz - Ith 60 A power circuit
[Ui] rated insulation voltage	600 V power circuit certifications CSA 600 V power circuit certifications UL 690 V power circuit conforming to IEC 60947-4-1 690 V signalling circuit conforming to IEC 60947-1 600 V signalling circuit certifications CSA 600 V signalling circuit certifications UL
Electrical durability	1.5 Mcycles 40 A AC-3 at Ue <= 440 V 1.4 Mcycles 60 A AC-1 at Ue <= 440 V
Power dissipation per pole	5.4 W AC-1 2.4 W AC-3
Protective cover	With
Mounting support	Plate Rail
Standards	CSA C22.2 No 14 EN 60947-4-1 EN 60947-5-1 IEC 60947-4-1 IEC 60947-5-1 UL 508
Product certifications	CCC CSA GOST UL
Connections - terminals	Control circuit: screw clamp terminals 2 cable(s) 00 in² (12.5 mm²) - cable stiffness: flexible - with cable end Control circuit: screw clamp terminals 1 cable(s) 00.01 in² (14 mm²) - cable stiffness: flexible - without cable end Control circuit: screw clamp terminals 2 cable(s) 00.01 in² (14 mm²) - cable stiffness: flexible - without cable end Control circuit: screw clamp terminals 1 cable(s) 00.01 in² (14 mm²) - cable stiffness: flexible - with cable end Control circuit: screw clamp terminals 1 cable(s) 00.01 in² (14 mm²) - cable stiffness: solid - without cable end Control circuit: screw clamp terminals 2 cable(s) 00.01 in² (14 mm²) - cable stiffness: solid - without cable end Power circuit: screw connection 2 cable(s) 125 mm² - cable stiffness: flexible - with cable end Power circuit: screw connection 2 cable(s) 125 mm² - cable stiffness: solid - without cable end Power circuit: screw connection 2 cable(s) 125 mm² - cable stiffness: flexible - without cable end Power circuit: screw connection 1 cable(s) 135 mm² - cable stiffness: flexible - without cable end Power circuit: screw connection 1 cable(s) 135 mm² - cable stiffness: flexible - without cable end Power circuit: screw connection 1 cable(s) 135 mm² - cable stiffness: flexible - without cable end Power circuit: screw connection 1 cable(s) 135 mm² - cable stiffness: flexible - without cable end
Tightening torque	Control circuit: 15.04 lbf.in (1.7 N.m) - on screw clamp terminals - with screwdriver flat Ø 6 mm Control circuit: 15.04 lbf.in (1.7 N.m) - on screw clamp terminals - with screwdriver Philips No 2 Power circuit: 70.8 lbf.in (8 N.m) - on EverLink BTR screw connectors - cable 0.040.05 in² (2535 mm²) hexagonal 0.16 in (4 mm) Power circuit: 5 N.m - on EverLink BTR screw connectors - cable 125 mm² hexagonal 4 mm
Operating time	1624 ms opening 42.557.5 ms closing
Safety reliability level	B10d = 1369863 cycles contactor with nominal load conforming to EN/ISO 13849-1 B10d = 20000000 cycles contactor with mechanical load conforming to EN/ISO 13849-1

2 Schneider

Mechanical durability	10 Mcycles
Operating rate	3600 cyc/h at <= 140 °F (60 °C)

Complementary

Built-in bidirectional peak limiting diode suppressor	
0.10.3 Uc drop-out at 140 °F (60 °C), DC 0.751.25 Uc operational at 60 °C, DC	
34 ms	
19 W at 68 °F (20 °C)	
7.4 W at 68 °F (20 °C)	
Type mechanically linked (1 NO + 1 NC) conforming to IEC 60947-5-1 Type mirror contact (1 NC) conforming to IEC 60947-4-1	
25400 Hz	
5 mA signalling circuit	
17 V signalling circuit	
1.5 ms on de-energisation (between NC and NO contact) 1.5 ms on energisation (between NC and NO contact)	
> 10 MOhm signalling circuit	
	0.10.3 Uc drop-out at 140 °F (60 °C), DC 0.751.25 Uc operational at 60 °C, DC 34 ms 19 W at 68 °F (20 °C) 7.4 W at 68 °F (20 °C) Type mechanically linked (1 NO + 1 NC) conforming to IEC 60947-5-1 Type mirror contact (1 NC) conforming to IEC 60947-4-1 25400 Hz 5 mA signalling circuit 17 V signalling circuit 1.5 ms on de-energisation (between NC and NO contact) 1.5 ms on energisation (between NC and NO contact)

Environment

IP degree of protection	IP20 front face conforming to IEC 60529
Protective treatment	TH conforming to IEC 60068-2-30
Pollution degree	3
Ambient air temperature for operation	23140 °F (-560 °C)
Ambient air temperature for storage	-76176 °F (-6080 °C)
Permissible ambient air temperature around the device	-40158 °F (-4070 °C) at Uc
Operating altitude	9842.52 ft (3000 m) without derating in temperature
Fire resistance	1562 °F (850 °C) conforming to IEC 60695-2-1
Flame retardance	V1 conforming to UL 94
Mechanical robustness	Vibrations contactor open 2 Gn, 5300 Hz Vibrations contactor closed 4 Gn, 5300 Hz Shocks contactor open 10 Gn for 11 ms Shocks contactor closed 15 Gn for 11 ms
Height	4.8 in (122 mm)
Width	2.17 in (55 mm)
Depth	4.72 in (120 mm)
Product weight	2.04 lb(US) (0.925 kg)

Ordering and shipping details

Category	22345 - CTR,D-LINE,OPEN,NONREV-NEW
Discount Schedule	112
GTIN	00785901929826
Nbr. of units in pkg.	1
Package weight(Lbs)	2.200000000000002
Returnability	Υ
Country of origin	FR

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 0001 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold

Reference not containing SVHC above the threshold

Product environmental profile	Available
Product end of life instructions	Available
California proposition 65	WARNING: This product can expose you to chemicals including:
Substance 1	Antimony oxide & Antimony trioxide, which is known to the State of California to cause cancer.
More information	For more information go to www.p65warnings.ca.gov

Contractual warranty

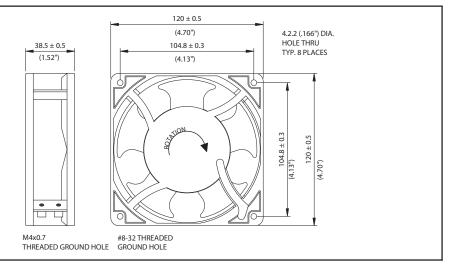
Warranty period	18 months	

OA109 Series



AC Fan - 115V, 230V 120x38mm (4.7"x 1.5")





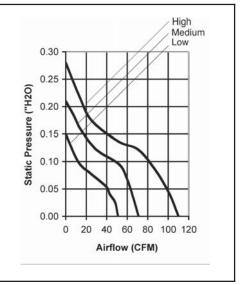
	i	
Frame	Diecast Aluminum	
Impeller	PBT, UL94V-0 plastic	
Connection	2x 300mm Lead wires (22AWG) or terminals	
Motor	AC shaded pole, impedance protected	
Bearing System	Dual ball or Sleeve	
Insulation Resistance	>100M ohm between leadwire and frame (500VDC)	
Dielectric Strength	1 min at 1500 VAC, 50/60Hz	

Operating Temperature
Ball Bearing
-20C ~ +80C
Sleeve Bearing
-10C ~ +50C
Storage Temp
-40C ~ +100C

Life Expectancy
Ball Bearing
60,000 hours (L10 at 40C)
Sleeve Bearing
30,000 hours (L10 at 40C)

Weight: \sim 1.12 lbs.

m0



Model Number	Speed (RPM)	Airflow (CFM)	Noise (dB)	Volts AC	Voltage Range	Watts	Max. Static Pressure ("H ₂ O)
OA109AP-11-1 *	3000	110	42	115	80~130	15	.28
OA109AP-11-2 *	2300	71	35	115	80~130	11	.24
OA109AP-11-3 *	1600	51	25	115	80~130	8	.15
OA109AP-22-1 *	3000	110	42	230	160~260	15	.28
OA109AP-22-2 *	2300	71	35	230	160~260	11	.24
OA109AP-22-3 *	1600	51	25	230	160~260	8	.15

^{*} Indicate "TB" (Terminal Ball Bearing), "WB" (12" Wire Leads, Ball Bearing), "TS" (Terminal, Sleeve Bearing), "WS" (12" Wire Leads, Sleeve Bearing)



Thermostat NC 301110



Product Features

SoliTherm	
301110	
Grey (RAL 7011)	
PC plastic	
IP 20	
Hyst. 7±3K / Sw.Pt.tol ±4K	
CE, cURus, RoHS	
E358385	
90321089	



Technical data 301110

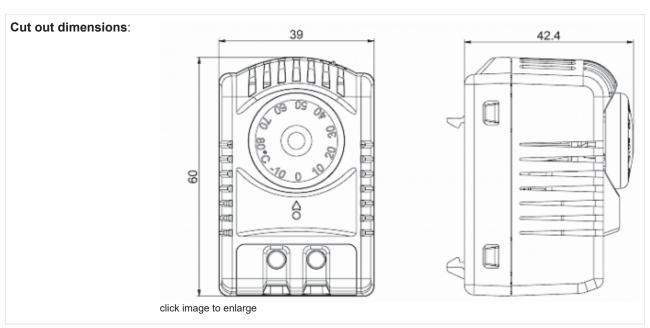
Temperature range:	-45°C - 120°C
Setting range:	-10°C - 80°C
Mounting:	Clips for DIN rail 35 mm
Dimension HxWxD:	60 x 39 x 42.4 mm
Weight:	~ 65 g
Voltage / Frequency:	max 250 V AC 16 A(res)/ 10 A(ind) max 72 V DC max 30 W
Lifetime:	100,000 hrs.
Connection:	2-pole terminal, clamping torque 0.5 Nm max. solid wire - 2.5 mm² max., stranded wire - 1.5 mm² max.

Please click on the graphics to download.

More CAD drawings can be found under Product Download.

> Overview product group Thermal controls / Accessories

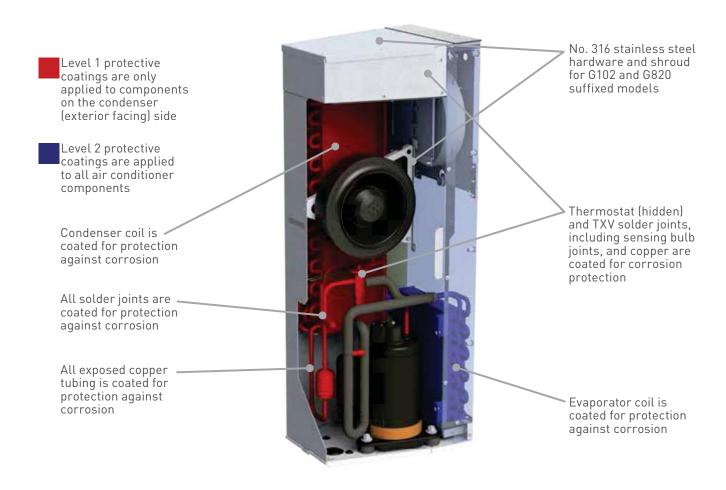






SPECTRACOOL NARROW WITH ADVANCED CORROSION PROTECTION OVERVIEW

SPECTRACOOL Corrosion Protection Solutions provide the industry leading corrosion protection to components critical to the performance of the air conditioner. For applications where air conditioners are exposed to harsh, corrosive, chemical elements. Hoffman utilizes advanced coatings to protect the critical components, extending their life and optimizing the extended performance level of the product.



THERMAL MANAGEMENT Spec-01229 C SUBJECTTO CHANGEWITHOUT NOTICE NVENT.COM/HOFFMAN





SPECTRACOOL

AIR CONDITIONER

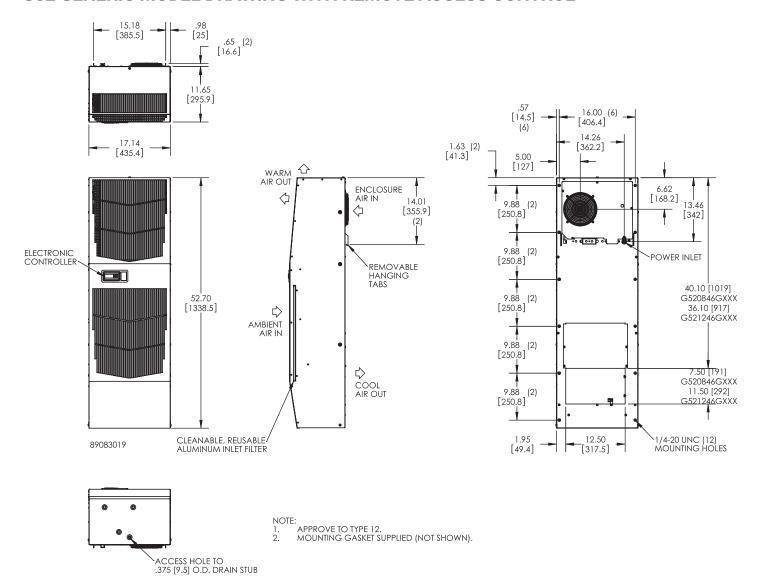
G52 MODEL

INSTRUCTION MANUAL

Rev. I © 2018 nVent P/N 89101400 89101404

DIMENSIONAL DRAWINGS

G52 GENERIC MODEL DRAWING WITH REMOTE ACCESS CONTROL



- 24 - © 2018 nVent 89101404

Data sheet | Item number: 852-111

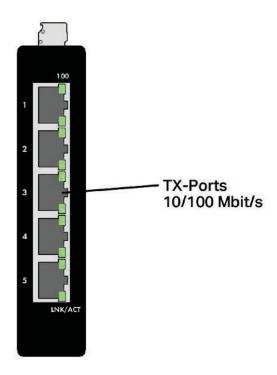
Industrial unmanaged ECO switch; 5-port 100Base-TX

www.wago.com/852-111









Item description

The 852-111 is a 5-port 10/100Base-TX industrial ETHERNET switch supporting Auto-Negotiation and Auto-MDI-/MDI-X detection for each port.

Using the switch's 5 ports, several segments can be created to reduce the network load, while providing a dedicated bandwidth to each user node. The 852-111 switch is a cost-effect solution to keep up with the constant demands of IP-based, industrial communication needs.

The switch is easy to configure and install and is best suited for small to medium-sized networks.

Features:

- 5 ETHERNET ports, 10/100 Mbps autonegotiation
- Front-panel diagnostic LEDs
- Supports Auto-MDI/MDI-X functions
- Full/half-duplex transfer modes for each port
- Store-and-forward switching method
- Integrated address look-up table, supports 2000 absolute MAC addresses
- Overvoltage protection
- IEEE 802.3x flow control in full-duplex mode
- DIN-35 rail mounting

Data sheet | Item number: 852-111

www.wago.com/852-111



Data

Technical Data

Switching mode	Store-and-forward, non-blocking	
Number of 100Base-TX ports	5	
Communication standards	IEEE 802.3 10BASE-T	
	IEEE 802.3u 100BASE-TX	
	IEEE 802.3x Flow Control	
MAC table (large)	2000 addresses	
Jumbo Frame Size	1536 Byte	
Supply voltage	DC 18 30 V	
Energy consumption max.	3 W	
Baud rate	Copper cable: 10/100Mbit/s	
Transmission medium (communication/fieldbus)	Copper cable: Cat. 5 or higher, 100 m maximum cable length	
Topology	Star	
Indicators	Device: LED (PWR) green: Power supply; per port: LED (100, LNK	
	/ACT) green: Status 100 Mbps, LNK/ACT port 1 5	

Connection data

Connection technology: communication/fieldbus	Copper cable: 5 x RJ-45
Connection technology: supply	1 x im Gerät verbaute Stiftleiste: 231-433/001-000; mitgelieferte Federleiste (Steckverbinder MCS): 231-103/026-000

Geometrical Data

Width	23.4 mm / 0.921 inch	
Height from upper-edge of DIN-35 rail	81 mm / 3.189 inch	
Depth	109.2 mm / 4.299 inch	

Mechanical data

Weight	352 g
Color	black
Housing material	Sheet steel

Environmental Requirements

Surrounding air (operating) temperature	-40 70 °C
Surrounding air (storage) temperature	-40 80 °C
Degree of protection	IP30
Relative air humidity (no condensation)	95%
Type of mounting	DIN-35 rail
Vibration resistance	acc. to IEC 60068-2-6
Shock resistance	acc. to IEC 60068-2-27
Fire load	5.28 MJ

Data sheet | Item number: 852-111

www.wago.com/852-111



Commercial data

Country of Origin	TW
GTIN	4045454847593
Product Group	27 (Special components I/O)

Ship Approvals

Logo	Approval	Certificate name
POWED AND THE PROPERTY OF THE	DNV DNV Germany GmbH	A-14050

Subject to changes.

WAGO Corporation Germantown, WI 53022 32423 Minden

Phone: +49571 887-0 | Fax: (262) 255-6222 Email: info.us@wago.com | Web: www.wago.com Do you have any questions about our products? We are always happy to take your call at {0}.



Overview

Model Name	APC Power-Saving Back-UPS Pro 700
Includes	USB cable , User Manual
Standard Lead Time	Usually in Stock
Product Distribution	Anguilla , Aruba , Bahamas , Barbados , Belize , Bermuda , Canada , Cayman Islands , Colombia , Costa Rica , Cuba , Dominican Republic , Ecuador , El Salvador , Guatemala , Guyana , Haiti , Honduras , Jamaica , Mexico , Nicaragua , Panama , Puerto Rico , Trinidad And Tobago , Turks And Caicos Islands , United States , Venezuela , VIRGIN ISLANDS (UNITED STATES)

Output

Model Name	APC Power-Saving Back-UPS Pro 700	
Includes	USB cable , User Manual	
Standard Lead Time	Usually in Stock	
Product Distribution	APC Power-Saving Back-UPS Pro 700 USB cable , User Manual Usually in Stock Anguilla , Aruba , Bahamas , Barbados , Belize , Bermuda , Canada , Cayman Islands , Colombia , Costa Rica , Cuba , Dominican Republic , Ecuador , El Salvador , Guatemala , Guyana , Haiti , Honduras , Jamaica , Mexico , Nicaragua , Panama , Puerto Rico , Trinidad And Tobago , Turks And Caicos Islands , United States , Venezuela , VIRGIN ISLANDS (UNITED STATES) 420 Watts / 700 VA 420 Watts / 700 VA 120V 50/60Hz +/- 3 Hz Line Interactive Stepped approximation to a sinewave (3) NEMA 5-15R (Battery Backup) , (3) NEMA 5-15R (Surge Protection)	
Output		
Output Power Capacity	420 Watts / 700 VA	
Max Configurable Power (Watts)	420 Watts / 700 VA	
Nominal Output Voltage	120V	
Output Frequency (sync to mains)	50/60Hz +/- 3 Hz	
Output Frequency (sync to mains)	Line Interactive	
Waveform Type	Stepped approximation to a sinewave	
Output Connections	(3) NEMA 5-15R (Battery Backup) , (3) NEMA 5-15R (Surge Protection)	
Input		
Nominal Input Voltage	120V	
Input Frequency	50/60 Hz +/- 3 Hz (auto sensing)	
Cord Length	6 feet (1.83 meters)	
Input voltage range for main operations	88 - 143 V	
Maximum Input Current	12 A	
Input Breaker Capacity	15 A	

Input

•		
Nominal Input Voltage	120V	2.
Input Frequency	50/60 Hz +/- 3 Hz (auto sensing)	
Cord Length	6 feet (1.83 meters)	
Input voltage range for main operations	88 - 143 V	
Maximum Input Current	12 A	7
Input Breaker Capacity	15 A	7

Batteries & Runtime

Included Battery Modules	1	
Battery Slots Empty	0	Jocan
Typical recharge time	12 hour(s)	
Replacement Battery	RBC17	
RBC Quantity	1	SCI

Communications & Management

Interface Port(s)	USB
Available SmartSlot™ Interface Quantity	0

Surge Protection and Filtering

Surge energy rating	354 Joules
Filtering	Full time multi-pole noise filtering :5% of IEEE surge let-through : zero clamping response time: instantaneous
Data Line Protection	Coaxial cable for CATV/SATV/modem/Audio-Video (coax connector) , Network line - 10/100/1000 Base-T Ethernet (RJ-45 connector)

Physical

Tityologi	
Maximum Height	7.48 inches (190.0 mm)
Maximum Width	3.58 inches (91.0 mm)
Maximum Depth	12.2 inches (310.0 mm)
Rack Height	0 U
Net Weight	15.73 lbs (7.15 kg)
Shipping Weight	17.61 lbs (8.0 kg)
Shipping Height	9.92 inches (252.0 mm)
Shipping Width	5.43 inches (138.0 mm)
Shipping Depth	17.4 inches (442.0 mm)
Master Carton Units	2.0
Master Carton Dimensions (Length x Width x Height)	18.0 inches
Master Carton Weight	16.53 kg
Color	Black
SCC Codes	1073130426679 9
Units per Pallet	48.0

Environmental

Operating Environment	32 - 104 °F (0 - 40 °C)
Operating Relative Humidity	0 - 95 %
Operating Elevation	0-10000 feet (0-3000 meters)
Storage Temperature	5 - 113 °F (-15 - 45 °C)
Storage Relative Humidity	0 - 95 %
Storage Elevation	0-50000 feet (0-15000 meters)
Audible noise at 1 meter from surface of unit	45.000 dB
Online Thermal Dissipation	48.500 BTU/hr
	·

Conformance

Approvals	ENERGY STAR V1.0 (USA), FCC Part 15 Class B, NOM, TUV, UL 1778
Standard warranty	3 years repair or replace
Equipment protection policy	Lifetime: \$150000

Sustainable Offer Status

RoHS	Compliant
REACH	REACH: Contains No SVHCs

4184 NXH

DC axial compact fan



ebm-papst St. Georgen GmbH & Co. KG

Hermann-Papst-Str. 1 D-78112 St. Georgen Phone +49 (0) 7724 81-0 Fax +49 (0) 7724 81-1309 info2@de.ebmpapst.com www.ebmpapst.com

Nominal data

Туре	4184 NXH		
Nominal voltage		VDC	24
Nominal voltage range		VDC	12 28
Speed (rpm)		min-1	4400
Power consumption		W	11.0
Min. ambient temperature		°C	-30
Max. ambient temperature		°C	70
Air flow		m ³ /h	237
Sound power level		В	6.5
Sound pressure level		dB(A)	57

ml = Max. load \cdot me = Max. efficiency \cdot fa = Free air \cdot cs = Customer specification \cdot ce = Customer equipment Subject to change





DC axial compact fan

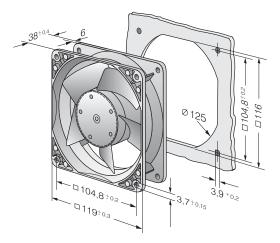
Technical description

Impeller material	Glass-fiber reinforced PA plastic
Weight	0.390 kg
Dimensions	119 x 119 x 38 mm
Housing material	Die-cast aluminum
Airflow direction	Intake over struts
Direction of rotation	Clockwise, viewed toward rotor
Storage	Ball bearing
Service life L10 at 40 °C	70000 h
Service life L10 at maximum	35000 h
temperature	
Cable	Flat plug 2.8 x 0.5 mm. Optionally also with wires.
Motor protection	Protection against reverse polarity and blocked rotor.
Approval	VDE, CSA, UL
Option	Speed signal





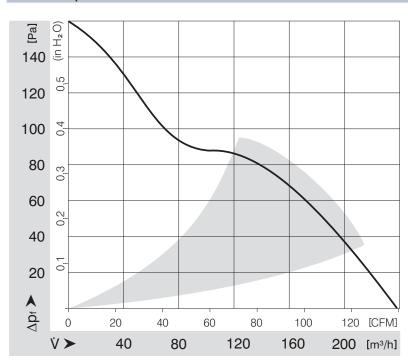
Product drawing







Curves: Air performance

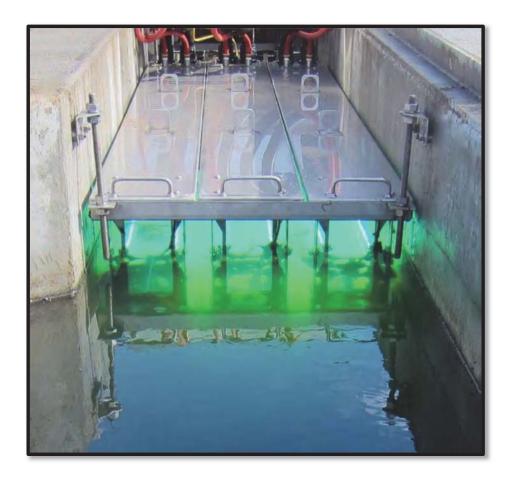






INSTALLATION, OPERATION AND MAINTENANCE MANUAL GLOW-6000 SERIES

Horizontal Ultraviolet Disinfection Systems DRAFT MILTON DE GLOW-6000-2-8X DRAFT



Manufactured by:
Glasco Ultraviolet
126 Christie Street
Mahwah, NJ 07430
(201) 934-3348 Fax (201) 934-3388 www.glascouv.com

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I. Safety Instructions

In order to protect end users and operators from injury, safety precautions must be followed. This Installation, Operation and Maintenance Manual outlines important safety issues. The following WARNING SYMBOLS will be found throughout the manual to alert the end users to take important precautions:



INFORMATION. This symbol signifies helpful information.



CAUTION This symbol indicates a potentially dangerous situation. Failure to adhere to this warning may lead to serious injury and or death.



ELECTRIC SHOCK. This symbol signifies helpful information and indicates a potentially dangerous situation. Failure to adhere to this warning may lead to serious injury and or death.

EYE PROTECTION. This symbol indicates that UV resistant eye protection must be worn to protect from UV light as well as debris.

HAND PROTECTION. This symbol signifies that hand protection must be worn to protect the lamps from skin oils as well as protect the operator from UV light and sharp materials caused by a broken lamp/quartz.

II. General Information

Please read this manual prior to installing, starting up and operating the equipment. The equipment uses sophisticated technology, but has been designed to make operation and maintenance easy. If you have questions or feel uncomfortable performing any of the required tasks, please contact GLASCO UV. Do not attempt any service if you are untrained in electrical and mechanical operations of industrial equipment.

All local safety codes and regulations should be followed. As with servicing all wastewater plant equipment, ensure that your safety clothing and your tools are in good working order. In addition and a helpful reminder: be careful of slip, fall, overhead and trip hazards around the plant.

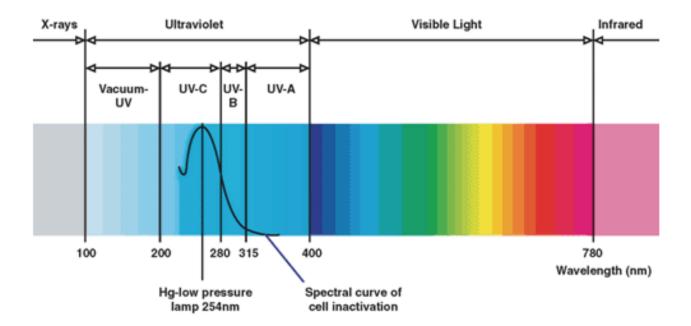


The UV system needs to be maintained and does require YEARLY replacement parts. GLASCO UV recommends that key spare and replacement parts be kept on hand. In order for the system to operate properly, please only use genuine factory parts. Failure to use genuine parts will void the warranty and may damage the system.

A. About Ultraviolet (UV) Disinfection

The technology uses UV light to target and disable disease-causing microorganisms (pathogens).

Over 100 years ago, scientists discovered that if you exposed pathogens to UV light, their reproduction was limited. The UV light source that they used, resided in the UVC range of the light spectrum. Specifically, they discovered that light in the 254 nanometer (nm) range was the most effective wavelength. Today, specialized UV lamps are used for a variety of disinfection applications.



When wastewater pathogens are exposed to UV light, their cells become damaged and this damage inhibits reproduction. The UV light, produced by a special UV lamp, damages the cell's DNA and RNA and once damaged, they are unable to replicate. This physical process renders them harmless.

The amount of damage is a result of the intensity of the UVC output multiplied by the time the water is exposed to the light. The applied dosage is expressed as milliwatt seconds per square centimeter (mW.s/cm2) or millijoules per square centimeter (mJ/cm2). Dosages of 30,000 uW.s/cm2 (30 mJ cm2) are common for meeting a typical 200/100 ml discharge permit. Dosage will be inline with permit requirements.

Using UV for disinfection is a practical and acceptable technology, but do not confuse disinfection with sterilization. Sterilization means the complete and total inactivation of microorganisms.

1. Why are plants and operators selecting UV technology?

- To move away from chlorine processes
- UV is considered a green technology
- No chemicals are added, so there is no need for chemical removal
- No chemical storage
- UV works instantly without requiring a residence time
- Easy maintenance

2. What are limitations of UV technology?

The quality of the effluent entering UV system needs to be monitored. Effluent that is outside of the design parameters may cause permit violations.

Primary concerns relate to the UV transmittance (UVT) of the water and the Total Suspended Solids (TSS). While turbidity can impact UV system efficiency, UVT and TSS are the primary measurements.

UVT is the measurement of UV absorbing materials in the water. The levels are determined by using a 254 nm spectrophotometer to compare distilled water (100%) to an effluent sample through a 1 cm path. Many plants average 65%, but higher and lower values are not uncommon. The UVT% measurement is one of the primary numbers used to design a system so it is of great importance to ensure that the plant operates within design parameters.

Changes in wastewater UVT can be due to industrial wastes, breakdown in upstream processes or high mineral content (iron).

TSS is the measurement of solids in the water that will interfere with the delivery of UV light. Most plants have to meet a certain permit level (i.e. 30 mg/l) in order to satisfy the discharge permit. The solids, which vary in size, not only prevent proper UV light transmission, but actually house pathogens. The TSS number is impacted by the upstream processes (filter, membrane, clarifiers, etc.).

In addition to the above issues, the UV system needs to be cleaned on a periodic basis based on effluent conditions.

B. Preparation for Installing UV System

The following information is meant to be used by engineers, contractors, operators and owners to help better understand the technology, it benefits and potential hazards.



1. Important Safety Information

UV light is extremely harmful to eyes and skin and will cause burns. Do not look directly or indirectly at the UV light. Do not expose your skin for any prolonged time. Use protective - clothing and eyewear (make sure it is UV resistant) when servicing equipment.

If accidentally exposed to UV light for an extended period, immediately seek medical attention. Symptoms for eye exposure include burning, itching and redness. Symptoms for skin exposure are similar to sun burn.

Use gloves when handling lamps and quartz. The reason is that skin oils will adhere to the lamps and sleeves and prevent UV light from properly emanating. If the sleeves become dirty, wipe them with a lint free cloth with denatured alcohol.

UV lamps and their quartz sleeves can become razor sharp if broken. Take care when installing and removing the quartz sleeves. Only hand-tighten compression fittings.

2. Optimizing System Performance

The UV lamps and their corresponding quartz sleeves need to be maintained. As a general rule, the lamps need to be changed after a year of usage (9,000-12,000 hours). Quartz sleeves should be changed every five (5) years or when they show wear.

Quartz sleeves also need to be cleaned on a periodic basis based on real world plant conditions. GLASCO UV recommends using a ScotchBrite $^{\text{TM}}$ pad and a commercially available cleaning product like LimeAway $^{\text{TM}}$ or CLR $^{\text{TM}}$. In addition to cleaning, please remember to wear gloves when handling lamps and sleeves.

3. Plant Design

Your UV system has been designed on a set of parameters. These parameters are described below and are based on the entire plant operating properly. Ensure that preprocesses are providing good effluent that meets the design parameters. If you have concerns, please test the effluent's UV transmission (UVT%) and compare it to the design parameters.

Peak instant:
 Average flow:
 Minimum flow:
 UV Transmittance at 254 nm:
 Dosage:
 Total Suspended Solids:
 Effluent temperature range:
 1.5 MGD
 66%
 10 mJ
 33 to 85 F

Effluent standard to be achieved < effluent limit of 20 fecal/100 ml based on a 30-day geometric mean of daily samples and sampling location immediately downstream of the UV reactor. Dosage > 90 mJ (90,000 uWs/cm2)

4. Environmental Issues Relating to UV Lamps

UV lamps need to be recycled like fluorescent lamps because they contain mercury. Please follow your local recycling laws. Please visit www.lamprecycle.org to find a recycler in your area. In the event that you are unable to find a disposal location, please contact GLASCO.

5. Receiving UV Equipment and Spare Parts

It is important to compare the shipment's contents to the actual packing list. Any deviations must be brought to the factory's attention. Additionally, lamps and quartz sleeves need to be inspected for damage. If shipment or parts are damaged,

Immediately contact factory and hold broken contents and their containers for inspection by shipping company.

6. Electrical Configuration and Maintenance

The UV disinfection system uses sophisticated electronics and specialty lamps. Unlike other equipment in the wastewater plant, the UV system's electronics require clean power. The system has been designed to use a certain specified voltage. UV equipment must be protected from surges. If the plant is susceptible to brown outs, please contact factory. If factory is using a back up generator, ensure that the UV system is isolated during the start up and operation.

III. Components, Assembly and Operation

A. Components

The UV disinfection system will come with a number of components. The following list highlights the main ones.

Two (2) modular support stainless steel bracketing systems

Stainless Steel Level Control System with drain

Ballast Control Center (BCC) – houses electronics, controls, displays

PLC – Allen Bradley

UV Modules

Ultraviolet lamps

Quartz sleeves

UV monitoring probe

Automatic cleaning system

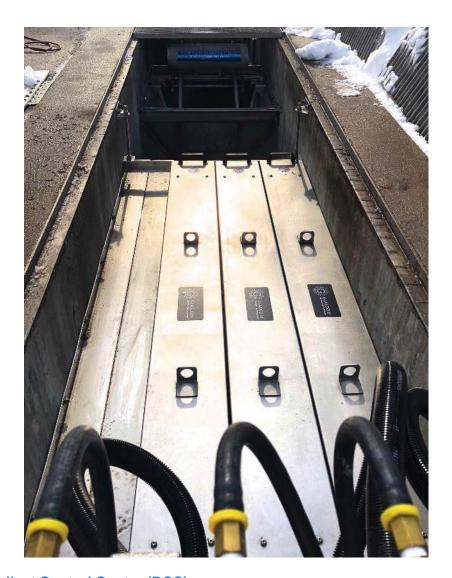
Spare parts

Safety and cleaning supplies

☐ Warranty information

1. CONCRETE 2 bank -

A channel will have been provided for the UV disinfection system.



2. Ballast Control Center (BCC)

The BCC will need to be mounted near the channel. Prior to final placement on a wall or unistruts, insure that the cables from the module reach the BCC. Factory standard is 8' (feet) from the modules to the BCC. Check this distance before final placement.

The BCC requires clean power. Information on voltage and cycle will be on the nameplate. Power surges and fluctuations may damage the electronics of the system and thus void the warranty.

The BCC will contain the ballasts and other electrical controls. Fans have been integrated to cool the electrical components. The BCC will display operation status (individual lamp status, run time and UV output with the UV monitor.



EXAMPLE ONLY

A combination Ballast Control Center and System Control Center (BCC/SCC) Layout



EXAMPLE OF THE INSIDE OF A BCC houses ballasts, UV meters, Disconnect Switches, Breakers, PLC, Lighting Contactors and other controls.

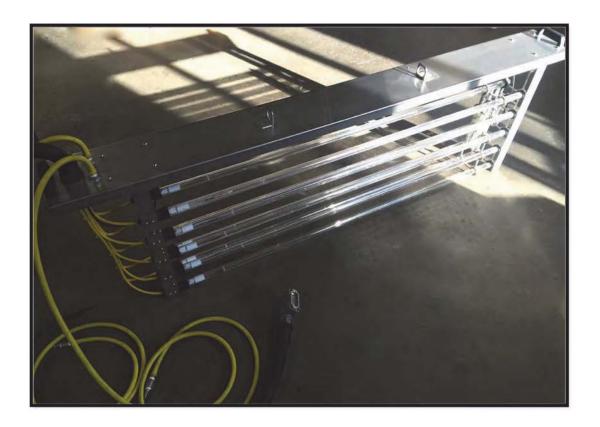
3. Disinfection Modules

The disinfection modules are designed to hold the UV lamps in the UV channel. They are constructed of stainless steel and hold the lamps via underwater compression seals.

The modules are pre-wired to be connected directly to the BCC. The only tasks that need to be completed are the installation of the lamps and quartz sleeves.

Take your time when setting the system up. Leave yourself room and make sure you have the proper supports.

To connect or remove the module cable to the Ballast Control Center, simply plug the cable into the receptacle.



4. Lamps and Quartz Sleeves Inspection and Installation



Insure that lamps and quartz have not been broken. We recommend that you use gloves when handling lamps and quartz sleeves to prevent them from becoming dirty. If lamps or quartz have broken, take extra care to prevent yourself from becoming injured.

Take the module and place it on a clean work surface or hang in on a factory supplied optional wall rack. You will need to install a lamp and quartz sleeve into each lamp holder.

The module has a side where the lamp connects and a side that supports the closed quartz sleeve. In between the two there is a wiper mechanism. This not only cleans, but supports the quartz sleeves.





Remove the compression nut. Check to see if the O-ring is inside. Once loosened, take the lamp and slide the end into the quartz sleeve. Make sure that the 4-pin connection remains outside.

Moisten the domed end (closed end) of the quartz sleeve as well as the rubber grommet in the quartz holder with water. Slide the dome end through the wiper mechanism and quartz holder grommet.

Connect the lamp to the socket. Push the open end of the quartz sleeve into the compression nut. Gently push in, feel the sleeve stop and then withdraw the sleeve 1/8". You need to leave some room because when you tighten the nut, it will push the quartz further in. Hand-tighten the compression nut. Once you have hand tightened the nut, gently pull the quartz sleeve to see if it disengages from the nut. If it does not, then you have a secure fit.



Insert oring into compression nuts



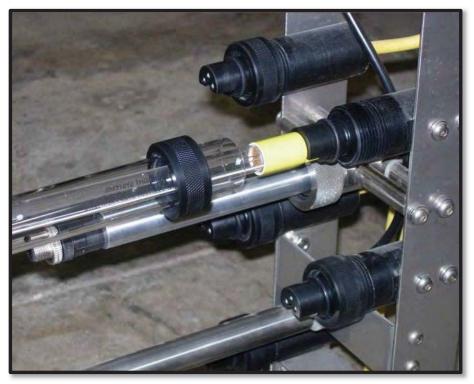
Moisten quartz and oring with water



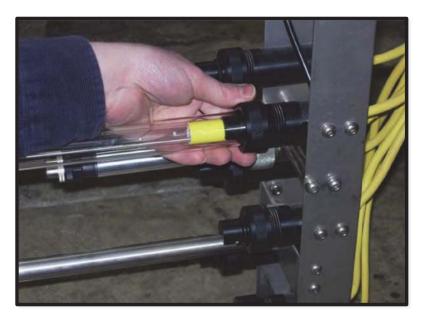
Slide lamp into quartz



Push lamp into the socket



Once dome end is inserted through the grommet, pull lamp out of quartz and insert into socket. Pull quartz into lamp holder and twist over the internal oring.



Hand-tighten compression nut



Domed end is supported in grommet

a) Quartz Sleeve Maintenance



In order to insure proper disinfection, the quartz sleeves need to be maintained. Since the lamps produce heat and since the effluent has solids, the quartz sleeves can become fouled. This necessitates a cleaning regime that will be determined by plant operating conditions.

There are various methods for cleaning the quartz sleeves.

(1) Automatic Mechanical Cleaning

The system may have come with an automatic mechanical cleaning system. The pneumatically (air) driven system requires compressed dry air. Based on a timer (PLC or other), the system will wipe the quartz sleeve in a quick fashion.

The frequency and duration of the cleaning cycle is user definable (see attached O&M for PLC or Automatic Cleaning).

Air compressors need to provide dry clean air that is regulated.

A piston resides on the module. The piston technology uses rare earth magnets and a break away cleaning frame.

Contained within the wiping mechanism, free-floating EPDM rings are used to form a tight cleaning surface. This material does not have a memory and wipes back and forth without forming wear spots.

(2) Manual Cleaning

Plant operators can remove a module and clean by hand. A mild citric acid or a lime removal product and a ScotchBrite pad should be used to hand-clean the sleeves. If this is the method of choice, a cleaning rack can be provided. This can be a wall mounted or free standing stainless steel support.

(3) Automated Cleaning

Plant operators can remove the module and place it in a stainless steel tank for cleaning. The tank would hold a mild citric acid that would be agitated by a pump. The tanks come with wheels, an air connection from a compressor and a drain. In cases

where this is the preferred method, an additional spare module should be kept on site to replace the removed module to insure continual disinfection.

(4) Removal of Module for Cleaning

Disconnect power to the module that will be cleaned. To do this, disconnect power to the Ballast Control Center. Remove the cable from the receptacle by unscrewing cap (unlocking clasp) and pulling it out of the connection.

Use safety glasses or a face shield that is UV resistant. Even though you are removing one module, the system can still operate and UV light may come from the channel.

Remove the module from the channel.

Install spare module or leave empty and then Power system "On."

Use a solution like Lime Away or a citric acid with a ScotchBrite pad. Brush quartz until all sediment is removed. You may want to use a cleaning rack or a washing tank to perform this duty. If your unit did not come with a rack or tank, you can order one. This device can be made to your exact specifications.

After cleaning, check compression nuts to make sure that the sleeves were not loosened during cleaning.

Lamps need to be changed on a yearly basis or if they become ineffective. Even though a lamp is still glowing after a year, it will have lost efficiency and will still need to be replaced. Lamps can glow for up to three years or more and be completely ineffective.

5. Ballast Control Center (BCC)



The plant electrician will need to bring protected power to the BCC. Your UV system has been designed to work on a constant power supply. The electronic ballasts are susceptible to power fluctuations. Low voltage will cause ballast failures. The ballasts have been labeled with the voltage and cycle. It is imperative that the appropriate voltage range is maintained. If you have questions, call factory. Failure to provide adequate power will void the warranty.

This configuration incorporates a remote modified stainless steel NEMA style enclosure with window kit or PLC operator user interface. The enclosure will have been designed for indoor or outdoor use. If used in an outdoor environment, consult factory for recommendations. Glasco recommends protecting the enclosure from high heat and extreme environmental conditions. If this information was not taken into consideration during the design phase, the BCC may need to be modified.

The BCC is generally provided with analog displays: Lamp on/off indicators (LEDs), running time meter and UV intensity meter. The BCC will have an On/Off or a H/O/A switch. PLC is optional.

The BCC contains ballasts. The ballasts drive the UV lamps. In order to keep the ballasts running at optimum performance, it is necessary to cool the ballasts. As ballasts heat up, they become exponentially less efficient.

The BCC will come with a fan cooling system. Insure that the fans are operational and filters are checked and cleaned on a periodic basis.

a) BCC Displays

1) Lamp-out Indicators

The Power Centers display lamp status indicators (LEDs). The LED indictors show a green light when the lamp is on. This provides the operator with a quick overview of system status. As noted before, lamps can operate for years without producing any UV light. This is why it is essential to track lamp replacements.

If the LED goes off, then it may mean that a lamp is no longer functioning. However, it may indicate a problem with the LED, the lamp's corresponding ballast or a problem located within the lamp holder. SEE TROUBLE SHOOTING.

2) Running Time Meter

This non-resettable time meter will allow you to see how long the system or bank has been running. It will also be instrumental in establishing a cleaning schedule. As noted, lamps

need to be replaced sometime after 9,000 hours.

3) Ultraviolet Monitor

After 100-hour burn-in, the UV display is procedurally set to Full-Scale (100%). This is done during nominal operating and water quality conditions. Lower UV readings may indicate:

- fouling quartz sleeves
- fouling UV probe face
- lamp aging
- water quality (% UV Transmission)
- UV detector aging
- eroding electrical connections.

The UV sensor is located in its own quartz sleeve. The sleeve is wiped as part of the automatic cleaning system.



b) BCC Electrical

(1) Over-Current and Ground Fault Protection

The system features Over-current protection via Circuit Breakers, as well as Ground Fault Protection via GFCI devices. These are housed in the BCC.

Circuit Breakers CBs are provided to protect a single channel Module or groups of channel Modules. Some systems are wired with multiple CBs, for example, so neighboring Modules remain operating if one CB trips. One CB handles Odd numbered Modules, while one CB protects Even numbered Modules. Your system will be clearly labeled inside. The state of the CBs may be optionally detected for an Alarm system.

A GFCI is provided, within the Ballast Control Center, and is dedicated for each individual channel Module. So a fault in any single Module does not affect the disinfection performance of any other Module. A GFCI trip may optionally* be detected and fed to an Alarm system.

Testing the GFCI requires some understanding of the dynamics of the intelligent electronic ballasts cascaded with this device. After tripping, via "Test" button (or actual Ground Fault) wait 10 seconds to 2 minutes before pressing the "Reset" button. If the GFCI immediately trips, discontinue power to this section by turning the related Circuit Breaker Off for 2 minutes. This breaker may control power to other Modules. With power Off, "Reset" the tripped GFCI. Return power to the section by flipping the Circuit Breaker back On. See the appendix on TROUBLESHOOTING if problems persist.

The functions of Over-current and Ground Fault protection may be combined in a single device. These are wired for dedicated individual Module protection like the GFCI discussion above, when used.

(2) Electronic Ballast

The provided electronic ballast is specially designed for germicidal performance in challenging water treatment conditions. The ballast controls the start-up and maintenance of the conductive arc in the mercury vapor lamp under conditions of varying temperature.

The ballasts will need to be replaced if found defective. To replace the ballast, simply disconnect the wires, loosen holding screws and insert new ballast. Send defective ballast back to for warranty work or out of warranty service.



To Power Off (follow local codes and use caution)

- 1. Turn off breaker from main control panel by others and use log out. If plant does not have a lock out procedure then following all power down instructions and leave note at breaker stating time and date shut off and a message not to power up.
- 2. Turn off UV external On/Off Switch
- 3. Turn off Internal Breaker
- 4. Disconnect module cable from BCC

(3) BCC Utilities

Protected power is brought to the BCC and landed. The BCC has built in electrical protection. Proper shut down procedures are required.

In addition to the power connection, the BCC will have ports for other connections. These include receptacle for the modules, connections for air to operate the automatic cleaning system, receptacle for UV sensor and additional connectors based on the project. All connections can be made at the Junction Box.



Example Air, Power and UV monitor connectors

IV. Troubleshooting UV Horizontal Channel System

This guide provides information and recommendations on how to correct basic operational problems. When performing any of these tasks, be sure to wear protective clothing and eyewear. In addition, protect yourself from shock hazards.

Symptom:	Check:		
Power Center			
UV lamp LED(s) Off	Power Off, wait, power On, observe LED(s). The "intelligent"		
	ballasts will keep a lamp Off for various causes, in some		
	cases this may be a false trip. If the LED(s) come On and then flicker Off, it means that the ballast is good and that the problem is past the ballast. If problem recurs, see "LED stays Off"		
UV lamp LED(s) stays Off.	Power Off and remove cable from Ballast Control Center receptacle. Remove cable from a known good module and connect known bad module into the receptacle. If the problem is fixed, then it is most likely bad ballast. If the problem follows, it is most likely associated with module.		
	If suspected to be the module, lift module out. Examine for damage, water infiltration and really blackened lamp ends. If none, power On, and observe through your UV face shield, at safe distance, if lamp actually lights. If Lamp lights and LED is On, suspect loose electrical connection. If Lamp lights and LED is still Off, call Authorized Service for Ballast Control Center repair.		
	If lamps are still Off, suspect bad ballast and replace.		
GFCI Breaker Off (All lamp LEDs for a module off)	Ground Fault occurred. May be a false trip. Power the effected module Off (if not already powered by GFCI On/Off Breaker combination). Examine cable connectors for tightness. If suspicious, loosen, disconnect, clean, dry and re- connect. Lift module out of channel and examine for water infiltration. If so see "Water Infiltration". Reset GFCI, and Power On, (or Power On and reset GFCI). If problem recurs, refer to Authorized Service for Power Control Center repair.		

Hydraulic		
Water in Sleeve Water in	Check compression nut for tightness. Notice how tight it is. It may	
Gland Water in Quartz Water Infiltration	simply need to be tighter when reassembled later. Disassemble and dry related parts (Sleeve, O-ring, Lamp). The inside of a Sleeve may be cleaned with Citric acid, if a mild detergent fails to remove all scale. The inside of a	
	Sleeve may be rinsed with Alcohol. It may be dried by poking a dry lint-free cloth (tethered on a string for retrieval) to the end, with a thin	
Mechanical		
Broken Sleeve Broken	Carefully Loosen and dismantle effected parts (compression nut, O-	
Gland Broken Quartz Broken Glass	ring). Remove broken shards and debris. Dry the area including lamp base connector. May use a water	
	displacement spray for electrical parts (eg.: WD-40, or petroleum distillate with silicone lubricant). Do NOT contaminate any Quartz Sleeve or Lamp with this spray. Complete the installation with a fresh O-ring and Quartz Sleeve. Hand-tighten the compression nut.	

V. Maintenance Schedule

The time and frequency of maintenance has a lot to do with the specific wastewater plant and the quality of the actual water. Due to the nature of wastewater, some plants will have to do more maintenance than others.

The primary maintenance task is keeping the quartz sleeves clean. This can be an every day task (worst case scenario) or more infrequently (quarterly). This schedule will be determined after start up.

ITEM FREQUENCY DESCRIPTION

UV Lamps Operation	Weekly to monthly	Check LEDs to see if lamps are operating
UV Lamp Change	1x every 12-14 months or	Replace all lamps
	after 9,000 hours	
Quartz Sleeves	Weekly to Quarterly	Check UV monitor for low readings. Periodically
		remove module from channel (after powering
Overta Cleave Change	Deplete every 2 to 5 veers	off) and visually inspect.
Quartz Sleeve Change	Replace every 3 to 5 years	Quartz sleeves will become etched and foggy
		after years of operation. They need to be replaced based on visual inspection.
		replaced based on visual inspection.
O-rings, wiper rings and	Replace every 3 to 5 years	The orings and grommets will eventually need
Grommets		to be replaced.
Ballast Control Center	Monthly	Check for moisture in enclosure. Ensure that
		seals are functional.
Ballast Control Center	Bi Yearly	Clean BCC with water and or stainless steel
		polish. No not hose clean, as water will get into fans and vents.
Fan Operation	Monthly	Check to see if working
Fan Filter	Monthly	Clean periodically to allow for cooling.
	· · · ·	and processing the same of the
UV Sensor	Weekly to monthly	Check for low readings. If low, check for debris
		on sensor, dirty sleeves or bad lamps
Modules	2x a year	Remove modules for visual inspection.
Modules Seasonal	Yearly	If disinfection is seasonal, do not leave modules
		in the channel as they may be damaged by
		environment.
Module Storage	Yearly	When storing the UV modules over winter,
		insure that they are not damaged. Replace
		orings as they may dry out. Do not leave
		modules to freeze in channel

VI. Attachments

If your unit came with optional equipment, instructions will be attached to this manual. This includes informational material on the following:

UV Monitoring System

PLC

UPS

Wiring Diagrams

Automatic cleaning system Air Compressor

Ultraviolet (UV) Monitoring System UVM-1624

Type: Digital 0-100%
Applications: Water / Wastewater

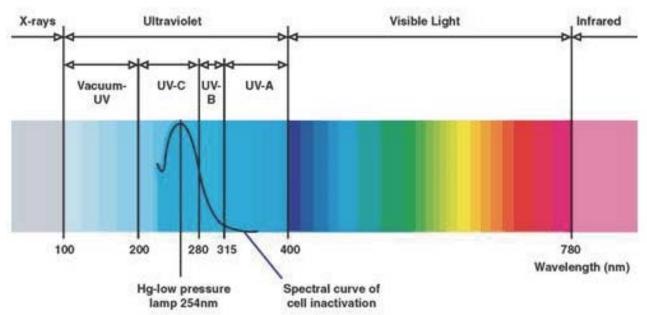
Components: UV Meter

Sensors: Various available

Theory of Operation

A UV monitoring system is designed to provide the relative UV output of a lamp. The system provides a representative overview of how the lamps are performing. Low readings may indicate that the lamp is coming to the end of life, that the quartz sleeve is dirty, that the sensor window is dirty or that there has been a change to the transmission of the wastewater.

The monitoring package is a true ultraviolet (UV) sensing system. It senses only the germicidal energy spectrum as shown on the following chart. Unlike light sensors, which register any wavelength including daylight, this is a precision instrument designed to work on a particular wavelength.



Standard low-pressure lamps produce close to 95% of its light in the 254-nanometer range. The sensor head contains a quartz-filtering device that blocks all wavelengths except those required for the destruction of microorganisms.

Alarming Capabilities

The UV monitoring system provides a 4-20 mA output.

September 2014

Operation



ELECTRIC SHOCK. Indicates risk of electrical shock, which may cause serious injury and or death. While the UV monitor is a 24 Volt device, you will be working with UV lamps and water and we recommend being careful.

- 1. The meter face provides an "ENTER" button as well as an "UP ARROW" and a "DOWN ARROW". The UVM-1624 is a 24 volt UV monitor. It can displays relative UV output (0-100%) or absolute UV output (W/m2). It also will display run time.
- 2. The UVM-1624 UV monitoring system has been factory calibrated. You will find, however, that it is necessary to Re-Calibrate it once the system is in use.
- 3. Factory Presets (editable):
 - a. Low UV warning at 70%
 - b. Low UV alarm at 50%
 - c. End value 110% (limits the percentage that the UV monitor can display)

4. Recalibration *must* occur whenever a lamp change is performed (new lamp) and with the water in the system.



- a. Press and hold ENTER to enter settings menus.
- b. Press ENTER repeatedly to see a list of user definable fields.
- c. The re-calibration function focuses on finding the sensor input screen. By pressing the enter button, you will cycle through the various functions.
- d. Hit enter until "sensor input signal" is shown to be DIGITAL is confirmed to be set. If it is not, use UP and DOWN to select DIGITAL. (depending of the type of unit you have purchased) Your unit is equipped with a DIGITAL sensor your monitor will have a label on its face indicating which of the two you have to select at this stage.
- e. Press ENTER and you will see the end value (%). We recommend setting to 100%. To adjust, use the up and down arrows. Once selected, hit enter.
- f. You will be brought to another function screen. The Adjust screen also you to confirm your changed settings. Toggle to Yes or No and hit Enter.
- g. The UV meter will read "scanning" and it will confirm the new settings. Once scanned, hit enter to get to the next function.
- h. The next functions will allow the user to select Alarm and Pre Alarms at certain %. Once entered, you will be brought to another screen "CONFIG".
- i. Simply allow it to run and it will set the system.

The UV Monitor can be a standalone product or can be located in a Ballast Control Center. When performing re-calibration or other trouble shooting operations, please be careful as UV system operates at 120 volts or 230 volts.

Programmable Functions

There are many settings that can be programmed into your UVM-1624.

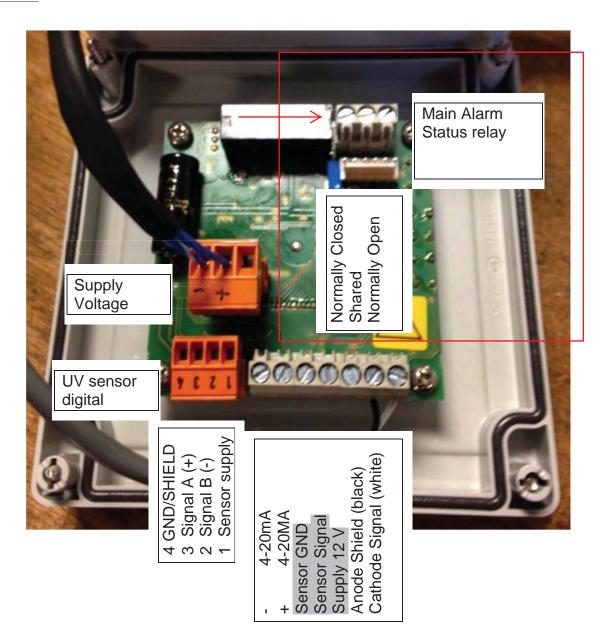
Basic settings: language, date, time, lock code and display contrast.

Operation settings: start up delay, lamp replacement time.

Settings: sensor type, measurement unit, reference value, alarm setpoints

Statistics: on/off cycles, lamp hours and total monitor operation hours

Utilities



The UV monitor allows the end user to use various sensors. It also allows for the end user to take a signal (4-20mA) or dry contacts for remote monitoring.

TECHNICAL

Supply Voltage
Operating Temperature
Ambient Temperature
Running time of clock battery
Operating Status
Status LCD Colors
Languages available

24V DC, 1 W max 45C (113F) 0-40 C (32-104F) 8 years LCD – 2 line alpha numeric Green, Yellow, Red English, Germany, French



UV sensor is enclosed in its own quartz sleeve





Operator Interface User Manual

PROJECT: MILTO N DE

SYSTEM: DRAFT

USER NAME: GLOW-6000-4-8x

PASSWORD:

System Overview

The UV disinfection system consists of three (3) banks of UV lamps. Each bank contains three (3) modules each with six (6) UV lamps. The Ballast Control Center houses lamp-ballasts, power distribution equipment, system controller, operator interface, and instrumentation (UV intensity meters, lamp status, hour meters). The system is controlled by an Allen Bradley PLCs.

Modes of Operation

The system control cabinet contains one three position selector switch for each bank which determines the operating mode of the bank. The description of each position is as follows:

HAND places the bank in manual mode. In this mode, the PLC logic is bypassed and the UV bank is turned on immediately. The system ignores the water level switches and always keeps the lamps on.

OFF turns the UV bank off.

AUTO places the system in auto mode. In auto mode, the PLC will control the UV bank operation. Unlike HAND mode, the system monitors the channel water level switch; the lamps will not turn on if the water level is low, and they will be turned off if a low water level alarm occurs while they are in operation. The system waits for a remote start request to put a bank into service. The system determines which bank to operate based on the operator's selection and the availability of the selected bank. If both banks are in auto mode, an automatic sequencing cycle is used to swap banks based upon an operator adjustable timer. The system uses bank pacing logic which will turn on both banks if the system flow exceeds an operator adjustable setpoint. Hysteresis values and timers are used to prevent unnecessary bank cycling due to unstable flow conditions.

Operator Interface Overview

The operator interface are Weintek Color Touch HMI. It communicates with the PLC over an Ethernet connection using TCP/IP. There are ten screens for the monitoring and adjustment of the UV system operation. A description of each screen is provided in the following sections.

Main Screen

The Main screen provides an overview of the system.



The descriptions of the controls and objects on this screen are as follows:

- 1. Displays the flow through the system.
- 2. Displays the mode selector switch position for the UV bank.
- 3. Displays the UV intensity of the bank.
- 4. Pushbutton to navigate to the Menu.
- 5. Pushbutton to change the Forward/Reverse sequencing mode.
- 6. Module Alarm in alarm condition.
- 7. System Alarm in alarm condition
- 8. Wiper status when wiper actives.
- 9. Bank status either ON or OFF
- 10. Module Plug status

Lamp Hours (Display) Screen

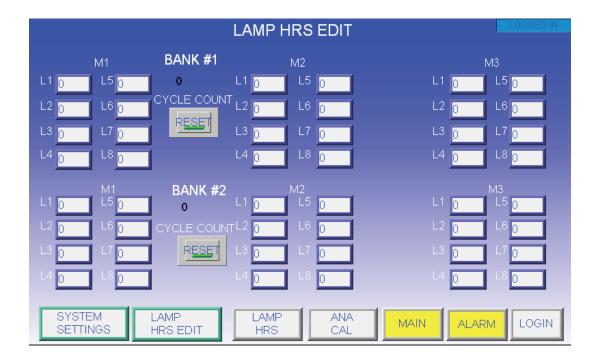
This screen displays the cumulative ON time of each UV lamp. This is a display only screen. It gives an indication of the usage of each lamp in both UV bank. Bank power cycle counts are also displayed in this screen.



Lamp Hours (Edit) Screen

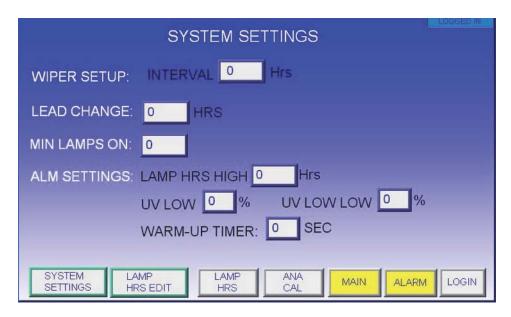
This password-protected screen allows the user to change the run-time hours for each individual lamp in both banks. Bank power cycle counts are also can be reset in this screen.

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Operational Setpoints Screen

This screen contains the operator configurable operational setpoints.

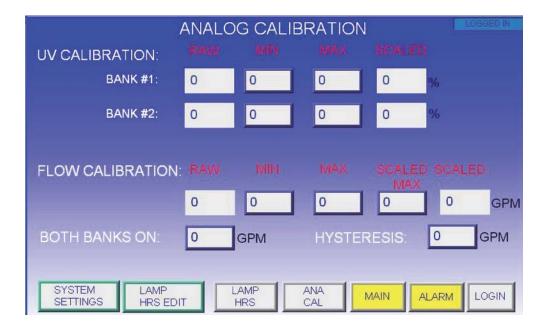


Descriptions of the objects on this screen are as follows:

- The Wiper Setup: INTERVAL numeric entry field is used to enter the desired number of hours between automatic wipe sequences.
- LEAD CHANGE specifies the time (in hours) for the automatic changeover of the forward and reverse sequencing. For this feature to work automatically, both banks must be set to auto mode.
- Min Lamps ON: Specifies the number of minim lamps on in the system for each bank.
- The LAMP HRS HIGH is the setpoint in hours at which the bank "HIGH LAMP HOURS" alarm will be generated if any lamp within a bank reaches this cumulative number of hours in operation.
- The UV LOW is the setpoint at which a bank "UV Level Low" alarm will be generated if the UV intensity falls to this level after the warm-up time.
- The UV LOW-LOW is the setpoint at which a bank "UV Level Low-Low" alarm will be generated if the UV intensity falls to this level after the warm-up time.
- Warm-Up timer is the delay timer when system starts. It will disable some of the alarm checking during the warm-up time like UV intensity and minimum lamps on.
- Press the MENU button to go to the MENU Screen.

Analog Calibration Screen

This screen is used to calibrate the analog signals in the system. These signals include the UV intensity of each bank and the system flow rate. A description of the values in each column is given below.

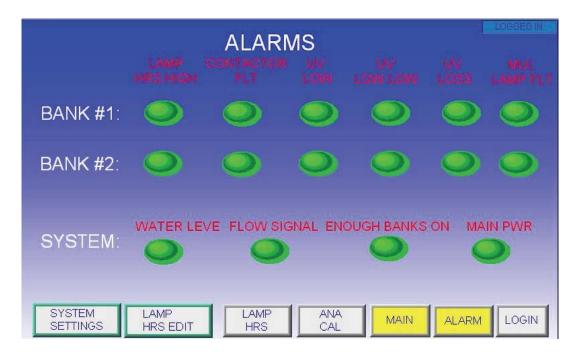


- The RAW column is an integer value representing the 4-20 mA analog signal converted to the range specified in the analog input module configuration. For a 1762-NI4 module with channels configured for current inputs, a 4 mA signal has a value of 6240 counts and a 20 mA signal has a value of 31200 counts.
- The MIN column is a number representing the minimum input scaling value. This is the 4 mA signal raw value (6240 for the input module described above). It is assumed that the transmitter 4 mA signal corresponds to a scaled value of zero.
- The MAX column is a number representing the maximum input scaling value. This is the 20 mA signal raw value (31200 for the input module described above).
- The SCALED MAX column is a number representing the maximum scaled value of the signal in engineering units. This number corresponds to the 20 mA signal from the transmitter.
- The SCALED column is the value of the input signal in engineering units based on the scaling parameters.
- BOTH BANKS ON specifies the flow setpoint in gallons per Minute(GPM) for the bank pacing logic. When the system flow exceeds this value, the PLC turns on both UV banks. Both banks will remain on until the flow has decreased below the twobank setpoint by the hysteresis amount for approximately one minute.

 HYSTERESIS specifies the dead-band value for the bank pacing logic. Once the PLC turns on two banks, it will keep both of them on until the flow has fallen below the two-bank setpoint by this hysteresis amount.

Note: The numbers used in the example are for the module described above. A different input module, or the same module with a different input range or configuration, may require different scaling parameters.

ALARMS



Bank Alarms: Lamp Hours High

Contact Fault
Bank UV LOW
Bank UV LOW LOW
Bank UV LOSS
Multiple Lamps Fault

System alarm display active alarms for :

Water Level Low FLOW SIGNAL FAULT NOT ENOUGH BANKS ON MAIN POWER LOSS



LOW / HIGH LEVEL FLOAT SWITCH PART # LLS-1



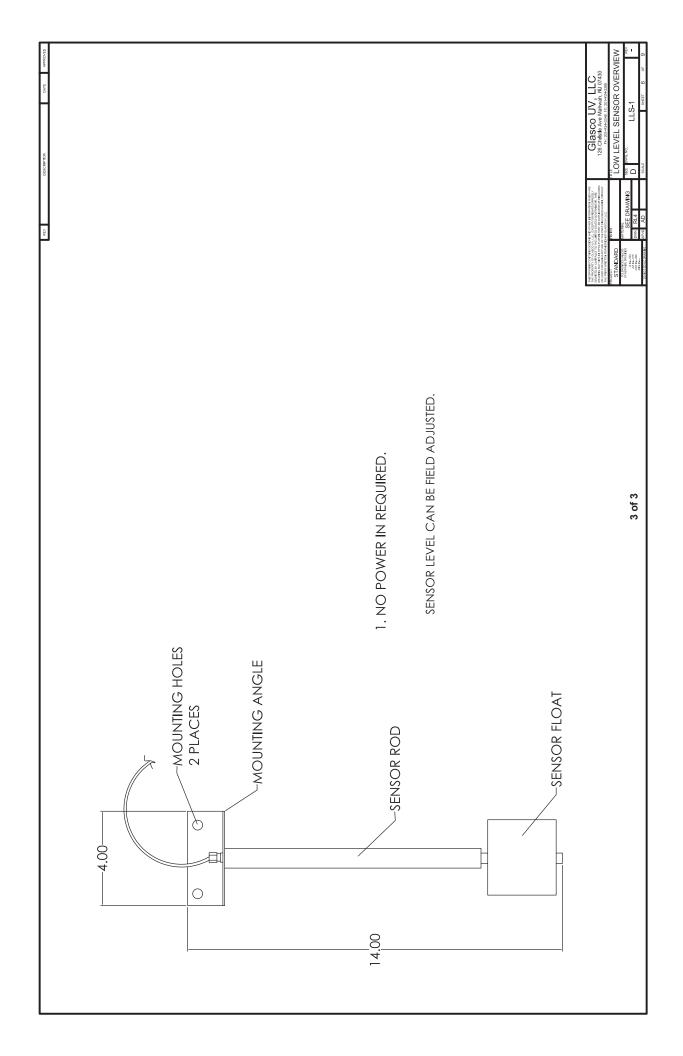
Item	Liquid Level Shut Off Switch
Mounting	Vertical
Mounting Brackets	316L stainless adjustable
Tank Connection Size	1/4" NPT
VA Rating	60
Operating Temp. Range	392 Degrees F Max.
Max. Pressure	200 psi
Switch Function	Selectable
Overall Length	3.38"
Float Material	316 SS
Float Length	2.00"
Float Dia.	2.13"
Stem Material	316 SS
Stem Length	2.63"
Height	3.52"
Width	2.13"
Contact Form	SPST
Max. Voltage	240
Body Material	316 Stainless Steel
Standards	ABS, UL, CE, CSA, NSF, Explosion Proof
Electrical Connections	22 ga. PTFE Coated 24" Leads
Float Specific Gravity	0.55

Unit does not require power and can be installed at various places in the channel. It is designed to extinguish UV lamps in the event of flow variations. You do no want lamps burning in the air as it will cause fouling or lamp damage.

The LLS-1 connects directly the Enclosure via a 2 wire waterproof cable and is used for both low level and high level.



When float falls or rises at a certain level, the lamps will be extinguished. Float is adjustable.



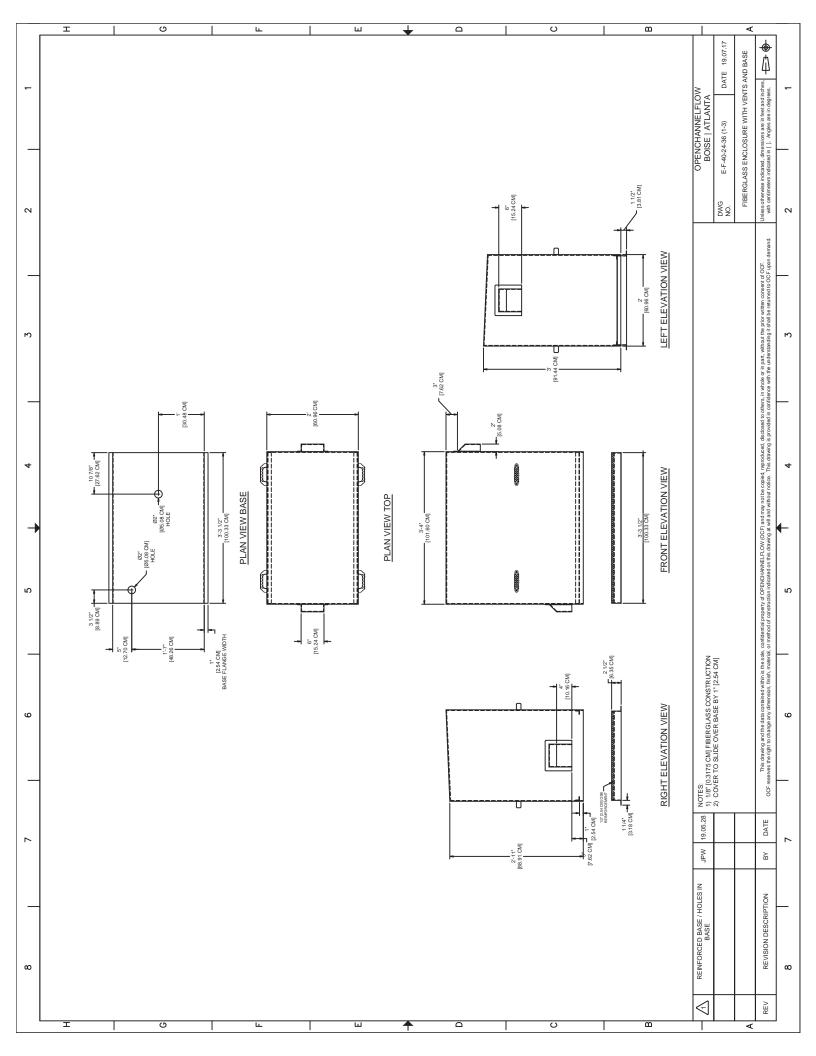


Air Compressor Package with Cover (automatic quartz cleaning)

This package is provided with a 15 gallon compressor, dryer, regulator and fiberglass vented cover. The unit needs minimal maintenance (oil and keeping the air supply dry). The cover protects the equipment from the environment and needs to be removed for general maintenance.



225 lbs (2' 9" H x 2' W x 3' L)





15, 20, and 30 Gallon Horizontal Portable Air Compressors

Operating Instructions and Parts Manual



Models: VX4002, VX4011, VT6290, VT6182, VT6183, VT6104, and VT6271





Please read and save these instructions. Read care assemble, install, operate or maintain the product	
Protect yourself and others by observing all safety with instructions could result in personal injury an instructions for future reference.	
REMINDER: Keep your dated proof of purchase for this manual or file it for safekeeping.	warranty purposes! Attach it to
Model #:	or parts, product & service information visit www.campbellhausfeld.com
Serial #: Purchase Date:	Campbell Hausfeld 100 Production Drive Harrison, Ohio 45030

BEFORE YOU BEGIN

Introduction

Air compressor units are intended to provide compressed air to power pneumatic tools, operate spray guns and supply air for pneumatic valves and actuators. The pumps supplied with these units have oil lubricated bearings. A small amount of oil carryover is present in the compressed air stream. Applications requiring air free of oil vapor should have the appropriate filters installed. The air compressor units are to be mounted per the instructions provided on a solid floor. Any other use of these units will void the warranty and the manufacturer will not be responsible for problems or damages resulting from such misuse.

QUICK REFERENCE

Recommended Oil (2 Options)

Single viscosity SAE30 ISO100 nondetergent compressor oil. Part number ST125303AV (0.5 qt) or ST126701AV (4 qt).

10W30 synthetic oil such as Mobile 1 or CE0032 (1 qt).

Oil Capacity

Approximately 8.5 oz.

UNPACKING

A CAUTIONDo not lift or move unit without appropriately rated equipment. Be sure the unit is securely attached to lifting device used. Do not lift unit by holding onto tubes or coolers. Do not use unit to lift other attached equipment.

After unpacking the unit, inspect carefully for any damage that may have occurred during transit. Check for loose, missing or damaged parts. Check to be sure all supplied accessories are enclosed with the unit. In case of questions, damaged or missing parts, please visit www.campbellhausfeld.com for customer assistance.

A WARNING

Do not operate unit if damaged during shipping, handling or use. Damage may result in bursting and cause injury or property damage.

GENERAL SAFETY INSTRUCTIONS

Safety Guidelines

This manual contains information that is very important to know and understand. This information is provided for SAFETY and to PREVENT EQUIPMENT PROBLEMS. To help recognize this information, observe the following symbols.

▲ DANGER

Danger indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.

A WARNING

Warning indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

A CAUTION

Caution indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.

NOTICE

Notice indicates important information, that if not followed, may cause damage to equipment.

IMPORTANT: Information that requires special attention.

Safety Symbols

The following Safety Symbols appear throughout this manual to alert you to important safety hazards and precautions.



Wear Eye and Mask Protection



Read Manual First



Risk of Fire



Risk of Moving Parts



Risk of Hot Parts



Risk of Explosion



Risk of



Risk of Pressure



California Proposition 65

A WARNING

This product or its power cord may contain chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after

handling.



A WARNINGYou can create dust when you cut, sand, drill or grind materials such as wood, paint, metal, concrete, cement, or other masonry. This dust often contains chemicals known to cause cancer, birth defects, or other reproductive harm. Wear protective gear.

Important Safety Information

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

This manual contains important safety, operational and maintenance information. If you have any questions, please visit www.campbellhausfeld.com for customer assistance.

Since the air compressor and other components (material pump, spray guns, filters, lubricators, hoses, etc.) used make up a high pressure pumping system, the following safety precautions must be observed at all times:

Important Safety Information (Continued)

A DANGER

BREATHABLE AIR WARNING

This compressor/pump is not equipped and should not be used "as is" to supply breathing quality air. For any application of air for human consumption, the air compressor/pump will need to be fitted with suitable in-line safety and alarm equipment. This additional equipment is necessary to properly filter and purify the air to meet minimal specifications for Grade D breathing as described in Compressed Gas Association Commodity Specification G 7.1, OSHA 29 CFR 1910. 134, and/or Canadian Standards Associations (CSA).

DISCLAIMER OF WARRANTIES

In the event the compressor is used for the purpose of breathing air application and proper in-line safety and alarm equipment is not simultaneously used, existing warranties shall be voided, and the manufacturer disclaims any liability whatsoever for any loss, personal injury or damage.

General Safety



- Read all manuals included with this product carefully. Be thoroughly familiar with the controls and the proper use of the equipment.
- Follow all local electrical and safety codes as well as the United States National Electrical Codes (NEC) and Occupational Safety and Health Act (OSHA).
- Only persons well acquainted with these rules of safe operation should be allowed to use the
- Keep visitors away and NEVER allow children in the work area.
- Wear safety glasses and use hearing protection when operating the unit.
- Do not stand on or use the unit as a handhold.
- Before each use, inspect compressed air system and electrical components for signs of damage, deterioration, weakness or leakage. Repair or replace defective items before using.
- Check all fasteners at frequent intervals for proper tightness.



Motors, electrical equipment and controls can cause electrical arcs that will ignite a flammable A WARNING gas or vapor. Never operate or repair in or near a flammable gas or vapor. Never store flammable liquids or gases in the vicinity of the compressor.



Never operate compressor without a beltguard. This unit can start automatically without warning. Personal injury or property damage could occur from contact with moving parts.

Do not wear loose clothing or jewelry that will get caught in the moving parts of the unit.



A CAUTION Compressor parts may be hot even if the unit is stopped.

- Keep fingers away from a running compressor; fast moving and hot parts will cause injury and/or burns.
- If the equipment should start to vibrate abnormally, STOP the engine/motor and check immediately for the cause. Vibration is generally an indication of trouble.
- To reduce fire hazard, keep engine/motor exterior free of oil, solvent, or excessive grease.

A WARNING

A WARNING

An ASME code safety relief valve with a setting no higher than 150 psi MUST be installed in the tank for this compressor. The ASME safety valve must have sufficient flow and pressure ratings to protect the pressurized components from bursting.



See compressor specification decal for maximum operating pressure. Do not operate with pressure switch or pilot valves set higher than the maximum operating pressure.

Important Safety Information (Continued)

A WARNING

Maximum operating pressure is 135 psi for single stage compressors. Do not operate with pressure switch or pilot valves set higher than 135 psi (single stage).

Never attempt to adjust ASME safety valve. Keep safety valve free from paint and other accumulations.



A WARNING or damaged tanks.

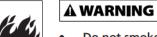
Never attempt to repair or modify a tank! Welding, drilling or any other modification will weaken the tank resulting in damage from rupture or explosion. Always replace worn, cracked

NOTICE

Drain liquid from tank daily.

- Tanks rust from moisture build-up, which weakens the tank. Make sure to drain tank regularly and inspect periodically for unsafe conditions such as rust formation and corrosion.
- Fast moving air will stir up dust and debris which may be harmful. Release air slowly when draining moisture or depressurizing the compressor system.

Spraying Precautions



Do not spray flammable materials in vicinity of open flame or near ignition sources including the compressor unit

- Do not smoke when spraying paint, insecticides, or other flammable substances.
- Use a face mask/respirator when spraying and spray in a well ventilated area to prevent health and fire hazards.
- Do not direct paint or other sprayed material at the compressor. Locate compressor as far away from the spraying area as possible to minimize overspray accumulation on the compressor.
- When spraying or cleaning with solvents or toxic chemicals, follow the instructions provided by the chemical manufacturer.

Save These Instructions Do Not Discard

The DANGER, WARNING, CAUTION, and NOTICE notifications and instructions in this manual cannot cover all possible conditions and situations that may occur. It must be understood by the operator that caution is a factor which cannot be built into this product, but must be supplied by the operator.

Getting To Know Your Compressor

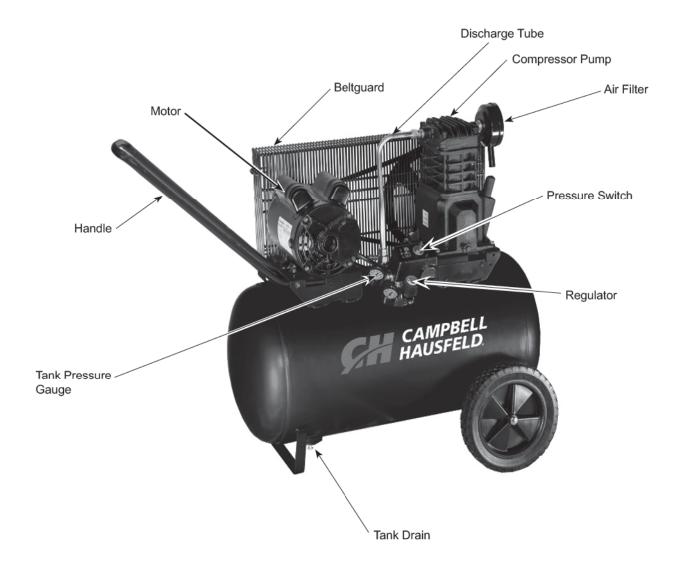


Figure 1 - Horizontal Unit Identification

SPECIFICATIONS

	VX4002 / VX4011	VT6290 / VT6183	VT6182	VT6104 / VT6271
Motor HP	2	2	3.7	3.7
Power	120V/240V	120V/240V	240V	240V
Phase	1 (single)	1 (single)	1 (single)	1 (single)
Displacement CFM	7.2	7.2	12.2	12.2
Air Delivery CFM @ 90 PSI	5.5	5.5	10.2	10.2
Air Delivery CFM @ 135 PSI	4.9	4.9	9.8	9.8
Max PSI	135	135	135	135
Pump RPM	1020	1020	1020	1020
Tank Capacity	15 gallons	20 gallons	20 gallons	30 gallons
Unit Weight	136 lbs	148 lbs	155 lbs	174 lbs
Amp Draw	15A / 7.5A	15A / 7.5A	15.7A	15.7A
Max Duty Cycle	75%	75%	75%	75%
Tank Outlet	1/4 inch NPT	1/4 inch NPT	1/4 inch NPT	1/4 inch NPT

DIMENSIONS

	VX4002 / VX4011	VT6290 / VT6183	VT6182	VT6104 / VT6271
Length	28 in.	37 in.	37 in.	52 in.
Width	18 in.	21 in.	21 in.	24 in.
Height	26.5 in.	30.5 in.	30.5 in.	38.5 in.

INSTALLATION INSTRUCTIONS

Grounding

This product must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current. This product is equipped with a cord having a grounding wire with an appropriate grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances. Do not use grounding adapter.

AWARNINGRisk of electric shock. Improper use of grounding plug can result in a risk of electrical shock. Plug must be plugged into an outlet that is properly installed and grounded in accordance with local codes and ordinances by a qualified electrician.

This product comes from the factory ready for use on a nominal 120 volt circuit and has a grounding plug similar to the plug illustrated in Figure 2. If the listed conditions cannot be met or if nuisance tripping of the current protection device occurs, it may be possible to operate the compressor from a 120 volt 20 amp circuit. See Figure 2.

Check motor data plate for 240 volt compatibility. A 240 volt unit must be operated on a 240 volt circuit. The cord must only plug into a 240 volt grounded outlet and may require a new cord and plug. See Figure 3. This product may be modified to operate at 240V. To do so, a 240V power cord needs to be purchased and installed on the unit and wired into the pressure switch just like the 120V cord. The panel on the back of the motor needs to be opened and the flag terminals need to be moved so that the brown wire that is on terminal #1 is on terminal #7 and the white wire that is on terminal #3 needs to be moved to terminal #1 (where the brown wire was originally). See Figure 4.

AWARNINGAll wiring and electrical connections should be performed by a qualified electrician. Installation must be in accordance with local codes and national electrical codes. If not properly grounded, this tool can cause an electrical shock, particularly when used in damp locations, in proximity of plumbing, outdoors.

Installation of grounding plug can result in electric shock. When repair or replacement of the cord or plug is required, do not connect the grounding wire to either flat blade terminal. The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire. Never connect green (or green and yellow) wire to a live terminal.

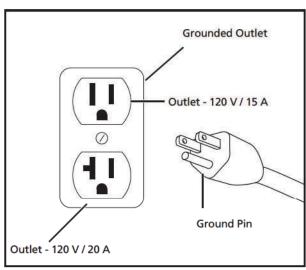


Figure 2 - 120V

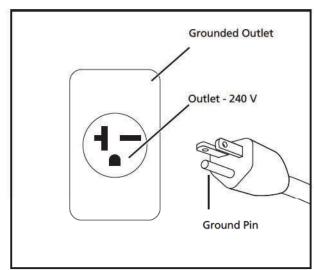


Figure 3 - 240V

INSTALLATION INSTRUCTIONS (CONTINUED)

Use only a 3-wire extension cord that has a 3-blade grounding plug and a 3-slot receptacle that accepts the plug on the product. Make sure your extension cord is not damaged. When using an extension cord, be sure to use one heavy enough to carry the current your product draws. For lengths less than 25 ft. 16-3 AWG extension cords shall be used. An undersized cord results in a drop in the voltage and loss of power and overheating. (NOTICE: Table below shows the correct size to use depending on cord length. When in doubt, use the next heavier gauge. The smaller the gauge number, the heavier the cord.)

Use of an extension cord may cause excess heat to motor. This could lead to tripped breaker (at electrical panel) or tripped thermal overload (on compressor motor). If this occurs, eliminate extension cord and plug compressor directly into electrical outlet. Avoid using extension cords; use longer air hose(s) instead.

Check with a qualified electrician or serviceman when the grounding instructions are not completely understood, or when in doubt as to whether the product is properly grounded. Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician. Only connect the product to an outlet having the same configuration as the plug. Do not use an adapter with this product.

Amp	Voltage	Cord Length in Feet								
Rating	120V	25 ft.	50 ft.	100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	400 ft.	500 ft.
Range	240V	50 ft.	100 ft.	200 ft.	300 ft.	400 ft.	500 ft.	600 ft.	800 ft.	500 ft.
8 -	10	14	10	8	6	6	6	4	4	2
10	- 12	12	10	8	6	6	4	4	2	2
12	- 14	12	8	8	6	6	4	4	2	0
14	- 16	12	8	8	4	4	4	2	2	0

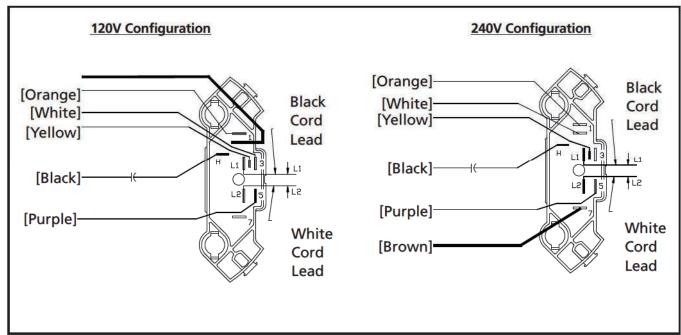


Figure 4 - 120V and 240 Configuration

INSTALLATION INSTRUCTIONS (CONTINUED)

Lubrication

A CAUTION

Before operating compressor, ensure oil is filled to the center of the sight gauge (See Figure 5).

A CAUTION

Using any other type of oil may shorten pump life and damage valves.

Recommended Oil (2 Options)

Single viscosity SAE30 ISO100 nondetergent compressor oil. Part number ST125303AV (0.5 gt) or ST126701AV (4 qt).

10W30 synthetic oil such as Mobile 1 or CE0032 (1 qt).

Oil Capacity

Approximately 8.5 oz.

Remove cap from oil fill opening. Install breather (found in parts bag with this manual). Check oil level. See specification label on compressor pump for the proper oil capacity and oil type. All lubricated compressor pumps discharge some condensed water and oil with the compressed air. Install appropriate water/oil removal equipment and controls as necessary for the intended application.

Do not use regular automotive oil. Additives in regular motor oil can cause valve deposits and reduce pump life. For maximum pump life, drain and replace oil after the first fifty (50) hours of operation. Then perform oil changes every three (3) months.

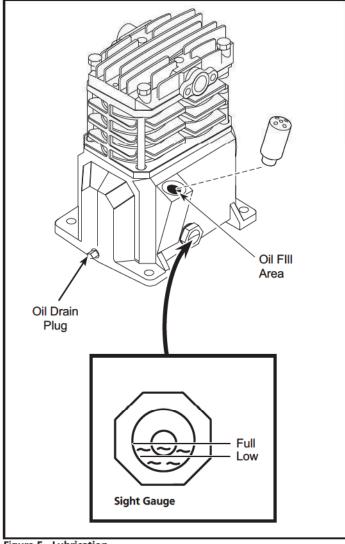


Figure 5 - Lubrication

OPERATING INSTRUCTIONS

All lubricated compressor pumps discharge some condensed water and oil with the compressed air. Install appropriate water/oil removal equipment and controls as necessary for the intended application.

NOTICE

Failure to install appropriate water/oil removal equipment may result in damage to machinery or workpiece.

Start-up/Break-in Procedure

▲ WARNING

Risk of Personal Injury. Do not attach air tools to open end of the hose until startup is completed and the unit checks okay.

▲ WARNING

Risk of Personal Injury. Never disconnect threaded joints with pressure in tank!

- Check oil level per the Lubrication Section of this manual.
- Open the bottom tank drain valve (see Figure 6).
 - Turn outlet valve to open air flow.
- 3. Plug unit in.
- 4. Move pressure switch to the **AUTO** position to run the unit (see Figure 7).
- 5. Run the unit for thirty (30) minutes at zero (0) psi (under no load) to break in pump parts.
- Move the pressure switch lever or knob to OFF and turn tank drain valve to shut off air flow. The compressor is now ready for use.
- Change oil after first fifty (50) hours of operation. Then perform oil changes every three (3) months or two hundred (200) hours of run time, whichever comes first.

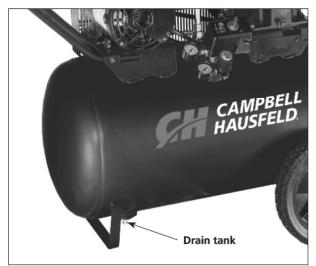


Figure 6

Compressor Use

It is extremely important to operate the compressor in a clean, well-ventilated area where the surrounding air temperature will not be more than 100°F. Do not locate the compressor air inlet near steam, paint spray, sandblast areas or any other source of contamination.

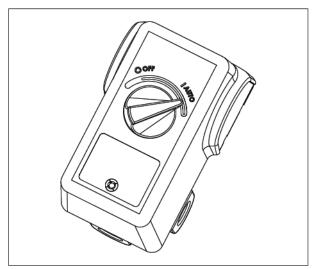


Figure 7

OPERATING INSTRUCTIONS

On/Off Cycling of Compressor

WARNING

Risk of Bursting. Drain tank every day to prevent corrosion and possible injury due to tank damage. Do not operate drain with more than 40 psi in tank or drain valve may be damaged. Drain tank of moisture daily using the drain valve in the bottom of the tank.

NOTICE

Unit care and maintenance. Drain liquid from tank daily.

In the **AUTO** position, the compressor pumps air into the tank. When a shut-off (preset "cut-out") pressure is reached, the compressor automatically shuts off.

If the compressor is left in the **AUTO** position and air is depleted from the tank by use of a tire chuck, tool, etc., the compressor will restart automatically at its preset "cut-in" pressure. When a tool is being used continuously, the compressor will cycle on and off automatically.

In the **OFF** position, the compressor will not operate.

Drain Tank. Disconnect, tag, unplug and lock out power source; release pressure. Drain moisture from tank by opening drain valve underneath tank (See Figure 8).



Figure 8

MOISTURE IN COMPRESSED AIR

Moisture in compressed air will form into droplets as it comes from an air compressor pump. When humidity is high or when a compressor is in continuous use for an extended period of time, this moisture will collect in the tank. When using a paint spray or sandblast gun, this water will be carried from the tank through the hose, and out of the gun as droplets mixed with the spray material.

IMPORTANT: This condensation will cause water spots in a paint job, especially when spraying other than water based paints. If sandblasting, it will cause the sand to cake and clog the gun, rendering it ineffective. A filter in the air line, located as near to the gun as possible, will help eliminate this moisture.

MAINTENANCE / REPAIR

TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Low discharge pressure	1. Air demand exceeds pump capacity	 Reduce air demand or use a compressor with more capacity.
	2. Restricted air intake	2. Clean or replace the air filter element.
	 Air leaks (fittings, tubing on compressor, or plumbing outside of system) 	 Listen for escaping air. Apply soap solution to all fittings and connections. Bubbles will appear at points of leakage. Tighten or replace leaking fittings or connections. Use pipe thread sealant.
	4. Blown gaskets	4. Replace any gaskets proven faulty on inspection.
	5. Leaking or damaged valves	 Remove head and inspect for valve breakage, misaligned valves, damaged valve seats, etc. Replace defective parts and reassemble.
		▲ CAUTION Unit care and maintenance. Install a new head gasket each
		time the head is removed.
Excessive noise (knocking)	Loose motor pulley or flywheel	1. Tighten pulley/flywheel clamp bolts and set-screws
	2. Loose fasteners on pump or motor	2. Tighten fasteners.
	3. Lack of oil in crankcase	Check for proper oil level; if low, check for possible damage to bearings. Dirty oil can cause excessive wear.
	4. Worn connecting rod	 Replace connecting rod. Maintain oil level and change oil more frequently.
	5. Worn piston pin bores	 Remove piston assemblies from the compressor and inspect for excess wear. Replace excessively worn piston pin or pistons, as required. Maintain oil leve and change oil more frequently.
	6. Piston hitting the valve plate	 Remove the compressor head and valve plate and inspect for carbon deposits or other foreign matter on top of piston. Replace head and valve plate using new gasket. See Lubrication section for recommended oil.
	7. Noisy check valve in compressor	7. Replace check valve.
	system	A DANGER Risk of Explosion. Do not disassemble check valve with a
argo guantity of oil in the	B SENTENCE OF SECURE SECURE	pressure in tank.
arge quantity of oil in the lischarge air NOTE: In an oil-lubed	Worn piston rings	 Replace with new rings. Maintain oil level and change oil more frequently.
compressor there will always be a small amount of oil in the	Compressor air intake restricted	Clean or replace filter. Check for other restrictions in the intake system.
air stream.	3. Excessive oil in compressor	3. Drain down to full level.
	4. Wrong oil viscosity	4. Use Mobil 1 [®] 10W-30 or full synthetic.
Water in discharge air/tank	Normal operation. The amount of water	1. Drain tank more often. At least daily.
	increases with humid weather	2. Add a filter to reduce the amount of water in the air line.
Motor hums and runs slowly or not at all	1. Low voltage	 Check incoming voltage. It should be approximate 230 volts. Motor will not run properly on 208 volts Low voltage could be due to wires (from electrical source to compressor) being too small in diameter and / or too long. Have a qualified electrician chec these conditions and make repairs as needed.
	2. Use of extension cord	2. Do not use an extension cord. Use longer air hose with larger diameter.
	3. Too many devices on same circuit	3. Limit the circuit to the use of compressor only
	4. Loose electrical connections	4. Check all electrical connections.
	 Malfunctioning pressure switch - contacts will not close 	5. Replace pressure switch.
	6. Malfunctioning check valve	6. Replace check valve.
	-	A DANGER Risk of Explosion. Do not disassemble check valve with
		air pressure in tank

air pressure in tank.

TROUBLESHOOTING GUIDE (CONTINUED)

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Motor hums and runs slowly or not at all (Continued)	 Defective unloader valve on pressure switch 	7. Replace unloader valve.
	8. Defective motor capacitor(s)	8. Replace capacitor(s).
	9. Defective motor	9. Replace motor.
Reset mechanism cuts out repeatedly or circuit breaker trips repeatedly	Lack of proper ventilation/room temperature too high	Move compressor to well-ventilated area.
	2. Too many devices on same circuit	Limit the circuit to the use of only the air compressor.
	3. Restricted air intake	3. Clean or replace filter element.
	4. Loose electrical connection	4. Check all electrical connections.
	5. Pressure switch shut-off pressure set too high	5. Replace pressure switch.
	6. Malfunctioning check valve	6. Replace check valve.
		A DANGER Risk of Explosion. Do not disassemble check valve with
	7. Defective unloader valve on pressure switch	7. Replace unloader valve.
	8. Defective motor capacitor(s)	8.Replace capacitor(s).
	9. Malfunctioning motor	9. Replace motor.
Tank does not hold pressure when compressor is off and the shut off valve is closed	Air leaks (fittings, tubing on compressor, or plumbing outside system)	 Check all connections with soap and water solution. Tighten; or remove and apply sealant to threads, then reassemble.
	2. Worn check valve	2. Replace check valve.
		Risk of Explosion. Do not disassemble check valve with air pressure in tank.
	3. Check tank for cracks or pin holes	3. Replace tank. Never repair a damaged tank.
Pressure switch continuously blows air out the unloader valve	Malfunctioning check valve	Replace the check valve if the unloader valve on the pressure switch bleeds off constantly when unit shuts off.
		A DANGER Risk of Explosion. Do not disassemble check valve with air pressure in tank.
Excessive vibration	1. Loose fasteners on pump or motor	1. Tighten fasteners.
	2. Belt needs replaced	2. Replace with correct size.
	3. Belt alignment	3. Align flywheel and pulley.
Pressure switch does not release air when the unit shuts off	Malfunctioning unloader valve on pressure switch	Replace the unloader valve if it does not release the pressure for a short period of time when the unit shuts off.
		A DANGER Risk of Explosion. Do not disassemble unloader valve with air pressure in tank.

MAINTENANCE AND INSPECTION INSTRUCTIONS



A WARNING

Disconnect, tag and lock out power source then release all pressure from the system before attempting to install, service, relocate or perform any maintenance.

In order to maintain efficient operation of the compressor system, check the air filter and oil level before each use. The ASME safety valve should also be checked daily (see Figure 9). Pull ring on safety valve and allow the ring to snap back to normal position. This valve automatically releases air if the tank pressure exceeds the preset maximum. If air leaks after the ring has been released, or the valve is stuck and cannot be actuated by the ring, the ASME safety valve must be replaced.

A WARNING

Do not tamper with the ASME safety valve.

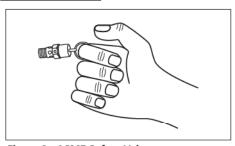


Figure 9 - ASME Safety Valve

<u>Tank</u>



Never attempt to repair or modify a tank! Welding, drilling or any other modification will weaken the tank resulting in damage from rupture or explosion. Always replace worn, cracked

NOTICE

A WARNING

or damaged tanks.

Drain liquid from tank daily.

The tank should be carefully inspected at a minimum of once a year. Look for cracks forming near the welds. If a crack is detected, remove pressure from tank immediately and replace.

Compressor Lubrication

See Installation. Add oil as required. The oil should be changed every three months or after every 200 hours of operation; whichever comes first.

If the compressor is run under humid conditions for short periods of time, the humidity will condense in the crankcase and cause the oil to look creamy. Oil contaminated by condensed water will not provide adequate lubrication and must be changed immediately. Using contaminated oil will damage bearings, pistons, cylinders and rings and is not covered under warranty. To avoid water condensation in the oil, periodically run the compressor with tank pressure near 120 psi for single stage compressors by opening the drain cock or an air valve connected to the tank or hose. Run the pump for an hour at a time at least once a week or more often if the condensation reoccurs.

IMPORTANT: Change oil after first 50 hours of operation.

Air Filter

Never run the compressor pump without an intake air filter or with a clogged intake air filter. The air filter element should be checked monthly (see Figure 10). Operating compressor with a dirty filter can cause high oil consumption and increase oil contamination in the discharge air. If the air filter is dirty it must be replaced.

Components

Turn off all power and clean the cylinder head, motor, fan blades, air lines, aftercooler and tank on a monthly basis.



Figure 10 - Air Filter Element

MAINTENANCE AND INSPECTION INSTRUCTIONS (CONTINUED)

Belts

A WARNING

Lock out and tag the power then release all pressure from the tank to prevent unexpected movement of the unit.

Check belt tension every 3 months. Adjust belt tension to allow 3/8 inch to 1/2 inch deflection with normal thumb pressure. Also, align belts using a straight edge against the face of the flywheel and touching the rim on both sides of the face. The belts should be parallel to this straight edge (see Figure 11). Dimension A should be the same as B and C to ensure proper alignment of the belts.

Slots in the bed-plate allow for sliding the motor back and forth to adjust belt tension.

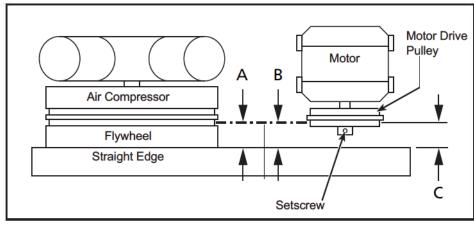


Figure 11 - Top View

Removing Belt Guard

When removing belt guard front to inspect or replace belts, inspect plastic retaining clips and replace if damaged or if clip can be removed without a tool.

Removing Retaining Clips

- 1. Using crescent wrench on pliers, rotate clip 90°.
- 2. Pull clip out and away from beltguard.
- Reverse process to reinstall after inspecting the clip.

Figure 12

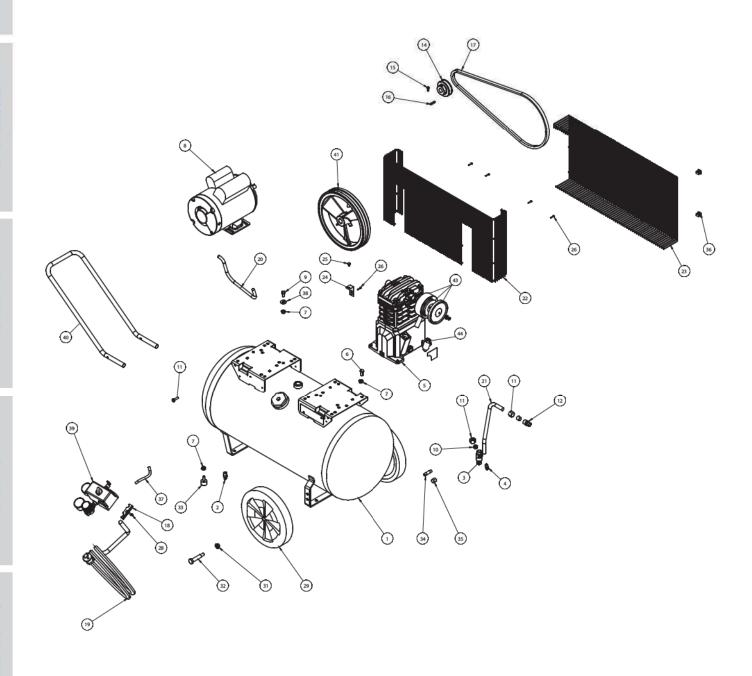
Storage

If compressor is to be stored for a short period of time, make sure that it is stored in a normal position and in a cool protected area.

Maintenance Schedule

OPERATION	DAILY	MONTHLY	3 MONTHS
Check Safety Valve	•		
Drain Tank (see Figure 6)	•		
Check Oil Level	•		
Clean or Change Air Filter		•	
Check Intercooler		•	
Clean Unit Components		•	
Check Belt Tightness			•
Change Oil (see Figure 5)			•

REPAIR PARTS ILLUSTRATION FOR VX400200, VX401100, VT618305, VT618205, VT629004, VT610408, AND VT627103



For Repair Parts, visit www.campbellhausfeld.com to find your local distributor

24 hours a day – 365 days a year Please provide following information:

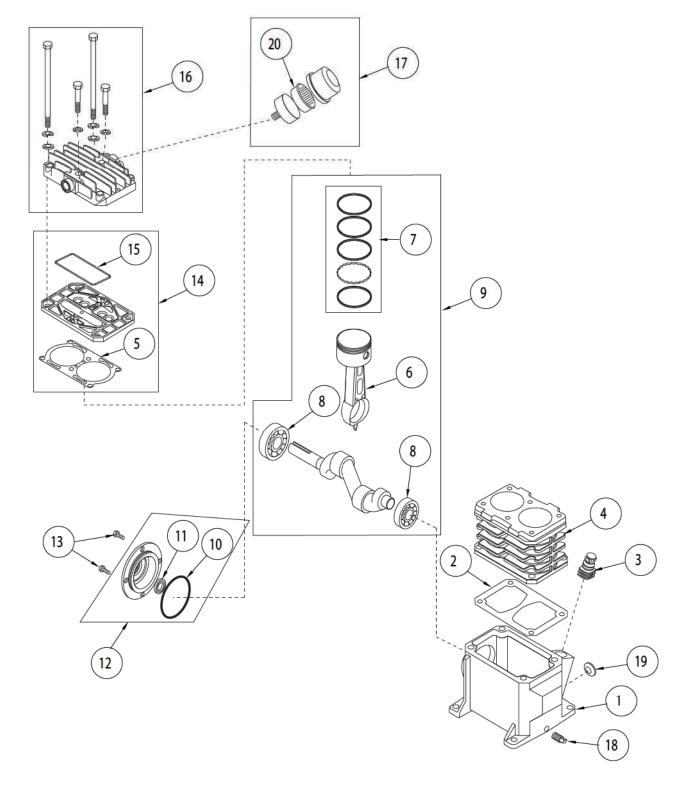
- Model number
- Serial number (if any)
- Part description and number as shown in parts list

REPAIR PARTS LIST FOR VX400200, VX401100, VT618305, VT618205, VT629004, VT610408, AND VT627103

AITE	V1027105		
Ref No	Description	Part Number	Qty
1	TANK, 13 GALLONS	AR053500CG	1
	TANK, 20 GALLONS TANK, 30 GALLONS	AR040700CG AR040400CG	1
2	DRAINCOCK, 1/4 IN.	D-1403	1
2	CHECK VALVE	CV221500SJ	1
4	QUICK CONNECT	CV2213003J	1
7	FITTING, 1/4 IN. TUBE X 1/8 IN. NPT		
5	PUMP, 2 HP PUMP 3.7 HP	VT480000SJ VT490000SJ	1 1
6	SELF TAPPING SCREW, 5/16 IN12	ST016500AV	4
7	SPINLOCK NUT, 5/16 IN18	ST146001AV	10
8	MOTOR, 2 HP 120/240V MOTOR, 3.7 HP 240V	MC019800SJ MC019700SJ	1 1
9	HEX HEAD BOLT, 5/16 IN18 X 3/4 IN.	ST016000AV	4
10	RUBBER FERRULE, 1/2 IN. TUBE	ST085200AV	1
11	COMPRESSION NUT, 1/2 IN.	ST033001AV	2
12	COMPRESSION FITTING	ST159001AV	1
13	BRASS FERRULE, 1/2 IN. TUBE	ST032900AV	1
14	MOTOR PULLEY	PU015200AV	1
15	1/4 IN. SET SCREW	ST012200AV	1
16	MOTOR KEY	KE000900AV	1
17	BELT, AX48	BT020401AV	1
18	PRESSURE SWITCH CORD GRIP	CW209500AV	1
19	POWER CORD, 120V	EC012601AV	1
20	MOTOR POWER CORD	EC012800AV	1
21	EXHAUST TUBE , 1/2 IN.	VT035900AP	1
22	BELT GUARD BACK	BG313200AV ●	1
23	BELT GUARD FRONT	BG313300AV ●	1
24	BELT GUARD BRACKET	BG220400AV	1
25	SELF TAPPING SCREW, #10-3/8 IN.	ST073278AV	1
26	SELF TAPPING SCREW, #5-5/8 IN.	ST073277AV ●	5
27	HEX HEAD SELF TAPPIN SCREW 1/4 IN. X 7/8 IN.	ST074407AV	2
28	STRAIN RELIEF SCREW	ST209800AV	1

Ref			
No	Description	Part Number	Qty
29	WHEEL, 10 IN. WHEEL 6 IN. (15 GALLON UNIT)	WA004000AV WA003900AV	2
30	HEX HEAD SELF TAPPING SCREW, #8 X 3/8 IN.	ST074407AV	1
31	FLANGE NUT, 3/8 IN16	ST033500AV	2
32	AXLE BOLT, 1/2 IN18 X 1-7/8 IN.	ST084700AV	2
33	RUBBER FOOT	ST162602AV	2
34	2 IN. X 1/8 IN. NPT PIPE NIPPLE		1
35	1/8 IN. NPT PIPE CAP		1
36	PLASTIC RETAINING CLIP	ST199700AV ●	4
37	PTFE TUBE, 1/4 IN. X 13 IN.	ST117802AV	1
38	WASHER, 5/16 IN.	ST011200AV	4
39	PRESSURE SWITCH ASSEMBLY	MY000500AJ	1
	REDUCING BUSHING, 1/2 IN. X 1/4 IN. NPT	ST071428AV	1
	REDUCING BUSHING, 1/4 IN. X 1/8 IN. NPT	ST071407AV	1
	PIPE NIPPLE, 1/4 IN. NPT		1
	HEX PIPE NIPPLE, 1/4 IN. NPT	HF002401AV	1
	ASME SAFETY VALVE, 150 PSI	V-215105AV	1
	PRESSURE GAUGE, 300 PSI	GA016306AV	2
	PRESSURE SWITCH	CW209000AV	1
10	REGULATOR	RE206202AV	1
40	HANDLE	HL043700AV	1
41	PUMP FLYWHEEL	PU015901AV	1
42	AIR FILTER HOUSING	VH901700AV	1
43	AIR FILTER ELEMENTS	VH901800AV	1
44	CRANK CASE BREATHER	VH901100AV	1
Repa	air Parts Kits	V/TEE40E0 11 /	
•	BELT GUARD KIT	VT551953AV	
	NOT AVAILABLE		

REPAIR PARTS ILLUSTRATION FOR VT4800 (2HP) AND VT4900 (3.7HP)



For Repair Parts, visit www.campbellhausfeld.com to find your local distributor

24 hours a day - 365 days a year

Please provide following information:

- Model number
- Serial number (if any)
- Part description and number as shown in parts list

REPAIR PARTS ILLUSTRATION FOR VT4800 (2HP) AND VT4900 (3.7HP)

Ref. No.	Description	Part Number:	Qty.
1	CRANKCASE	175	1
2	CRANKCASE GASKET	•	1
3	BREATHER	VH901100AV	1
4	CYLINDER		1
5	CYLINDER GASKET	•	1
6	CONNECTING ROD AND PISTON ASSEMBLY (MODEL VT4800) CONNECTING ROD AND PISTON ASSEMBLY (MODEL VT4900)	VT020500AV TQ010901AJ	2 2
7	PISTON RING SET		2
8	BALL BEARING	1 777	2
9	CRANKSHAFT, BEARINGS, RODS, PISTON ASSEMBLY		1
10	O-RING	•	1
11	OIL SEAL		1
12	BEARING CAP ASSEMBLY	S SS	1
13	M6 X 10 MM SCREW	t	4
14	VALVE PLATE ASSEMBLY	VT491100AJ	1
15	VALVE PLATE MOLDED SEAL	•	1
16	CYLINDER HEAD AND FASTENERS	S oci	1
17	AIR FILTER ASSEMBLY	VH901700AV	1
18	1/8 IN27 OIL DRAIN PLUG	<u>1922</u>	1
19	SIGHT GLASS	ST191700AV	1
20	AIR FILTER ELEMENT	VH901800AV	1
EPAIR F	PARTS KITS		
•	GASKET KIT	VT470900AV	
	NOTAVAILABLE		
t	AVAILABLE AT LOCAL HARDWARE STORE		



Reminder: Keep your dated proof of purchase for warranty purposes! Attach it to this manual or file it for safekeeping.

LIMITED WARRANTY

- 1. DURATION: From the date of purchase by the original purchaser as follows: One Year.
- WHO GIVES THIS WARRANTY (WARRANTOR): Campbell Hausfeld a Marmon/Berkshire Hathaway Company, 100 Production Drive, Harrison, Ohio, 45030. Visit www.campbellhausfeld.com
- WHO RECEIVES THIS WARRANTY (PURCHASER): The original purchaser (other than for purposes of resale) of the Campbell Hausfeld compressor.
- 4. WHAT PRODUCTS ARE COVERED BY THIS WARRANTY: Any Campbell Hausfeld air compressor.
- WHAT IS COVERED UNDER THIS WARRANTY: Substantial defects due to material and workmanship with the exceptions noted below.
- 6. WHAT IS NOT COVERED UNDER THIS WARRANTY:
 - A. Implied warranties, including those of merchantability and FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED FROM THE DATE OF ORIGINAL PURCHASE AS STATED IN THE DURATION. If this compressor is used for commercial, industrial or rental purposes, the warranty will apply for ninety (90) days from the date of purchase. Extreme Duty Contractor Compressors are not limited to a ninety (90) day warranty when used in contractor applications. Four cylinder single-stage and two-stage compressors are not limited to a ninety (90) day warranty when used in commercial or industrial applications. Some States do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you.
 - B. ANY INCIDENTAL, INDIRECT, OR CONSEQUENTIAL LOSS, DAMAGE, OR EXPENSE THAT MAY RESULT FROM ANY DEFECT, FAILURE, OR MALFUNCTION OF THE CAMPBELL HAUSFELD PRODUCT. Some States do not allow the exclusion or limitations of incidental or consequential damages, so the above limitation or exclusion may not apply to you.
 - C. Any failure that results from an accident, purchaser's abuse, neglect or failure to operate products in accordance with instructions provided in the owner's manual(s) supplied with compressor.
 - D. Pre-delivery service, i.e. assembly, oil or lubricants, and adjustment.
 - E. Items or service that are normally required to maintain the product, i.e. lubricants, filters and gaskets, etc.
 - F. Gasoline engines and components are expressly excluded from coverage under this limited warranty. The Purchaser must comply with the warranty given by the engine manufacturer which is supplied with the product.
 - G. Additional items not covered under this warranty:
 - All Compressors
 - a. Any component damaged in shipment or any failure caused by installing or operating unit under conditions not in accordance with installation and operation guidelines or damaged by contact with tools or surroundings.
 - b. Pump or valve failure caused by rain, excessive humidity, corrosive environments or other contaminants.
 - c. Cosmetic defects that do not interfere with compressor functionality.
 - d. Rusted tanks, including but not limited to rust due to improper drainage or corrosive environments.
 - e. Electric motors, check valves and pressure switches after the first year of ownership.
 - f. Drain cocks.
 - g. Damage due to incorrect voltage or improper wiring.
 - h. Other items not listed but considered general wear parts.
 - i. Pressure switches, air governors and safety valves modified from factory settings.
 - 2. Lubricated Compressors
 - a. Pump wear or valve damage caused by using oil not specified.
 - Pump wear or valve damage caused by any oil contamination or by failure to follow proper oil maintenance guidelines.
 - 3. Belt Drive / Direct Drive / Gas Driven Compressors
 - a. Belts.
 - b. Ring wear or valve damage from inadequate filter maintenance.
 - c. Manually adjusted load/unload and throttle control devices.
- RESPONSIBILITIES OF WARRANTOR UNDER THIS WARRANTY: Repair or replace, at Warrantor's option, compressor or component which is defective, has malfunctioned and/or failed to conform within duration of the warranty period.
- 8. RESPONSIBILITIES OF PURCHASER UNDER THIS WARRANTY:
 - A. Provide dated proof of purchase and maintenance records.
 - B. Portable compressors or components must be delivered or shipped to the nearest Campbell Hausfeld Authorized Service Center. Freight costs, if any, must be borne by the purchaser.
 - C. Use reasonable care in the operation and maintenance of the products as described in the owner's manual(s).
- WHEN WARRANTOR WILL PERFORM REPAIR OR REPLACEMENT UNDER THIS WARRANTY: Repair or replacement will be scheduled and serviced according to the normal work flow at the servicing location, and depending on the availability of replacement parts.

This Limited Warranty applies in the U.S., Canada and Mexico only and gives you specific legal rights. You may also have other rights which vary from State to State or country to country.

Operating Instructions

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Portable **Air Compressors**

Description

Air compressor units are intended to provide compressed air to power pneumatic tools and operate spray guns. The pumps on these units are oil lubricated. A small amount of oil carryover is present in the compressed air stream. Applications requiring air free of oil or water should have the appropriate filter installed. The air compressor unit must be mounted on a solid floor or solid ground. Any other use of these units will void the warranty and the manufacturer will not be responsible for problems or damages resulting from such misuse.

Safety Guidelines

This manual contains information that is very important to know and understand. This information is provided for SAFETY and to PREVENT **EQUIPMENT PROBLEMS.** To help recognize this information, observe the following symbols.

ADANGER

Danger indicates an imminently

hazardous situation which, if not avoided, will result in death or serious injury.

AWARNING a potentially Warning indicates

hazardous situation which, if not avoided, could result in death or serious injury.

ACAUTION

Caution indicates a potentially

hazardous situation which, if not avoided, MAY result in minor or moderate injury.



Notice indicates important

information, that if not followed, may cause damage to equipment.

Unpacking

After unpacking the unit, inspect carefully for any damage that may have occurred during transit. Make sure to tighten fittings, bolts, etc., before putting unit into service.

AWARNING unit if damaged Do not operate

during shipping, handling or use. Damage may result in bursting and cause injury or property damage.

General Safety Information

Since the air compressor and other components (material pump, spray guns, filters, lubricators, hoses, etc.) used, make up a high pressure pumping system, the following safety precautions must be observed at all times:

1 Read all manuals included with this product carefully. Be thoroughly familiar with the controls and the proper use of the

equipment.

- 2. Follow all local electrical and safety codes as well as in the United States, the National Electrical Codes (NEC) and Occupational Safety and Health Act (OSHA).
- 3. Only persons well acquainted with these rules of safe operation should be allowed to use the compressor.
- 4. Keep visitors away and NEVER allow children in the work area.
- 5. Wear safety glasses and use hearing protection when operating
- 6. Do not stand on or use the unit as a handhold.

ADANGER

Breathable Air Warning

This compressor/pump is NOT equipped and should NOT be used "as is" to supply breathing quality air. For any application of air for human consumption, you must fit the air compressor/pump with suitable in-line safety and alarm equipment. This additional equipment is necessary to properly filter and purify the air to meet minimal specifications for Grade D breathing as described in Compressed Gas Association Commodity Specification G 7.1 -1966, OSHA 29 CFR 1910. 134, and/or Canadian Standards Associations (CSA).

DISCLAIMER OF WARRANTIES In the event the compressor is used for the purpose of breathing air application and proper in-line safety and alarm equipment is not simultaneously used, existing warranties are void, and Campbell Hausfeld disclaims any liability whatsoever for any loss, personal injury or damage.

- 7. Before each use, inspect compressed air system and electrical components for signs of damage, deterioration, weakness or leakage. Repair or replace defective items before using.
- 8. Check all fasteners at frequent intervals for proper tightness.

AWARNING

Motors, electrical equipment and controls can cause electrical arcs



that will ignite a flammable gas or vapor. Never operate or repair in or near a flammable gas or vapor. Never

REMINDER: Keep your dated proof of purchase for warranty purposes! Attach it to this manual or file it for safekeeping.

General Safety Information (Continued)

store flammable liquids or gases in the vicinity of the compressor.

AWARNING

Never operate compressor without a beltguard. This unit can start automatically without warning.



Personal injury or property damage could occur from contact with moving parts.

9. Do not wear loose clothing or jewelry that will get caught in the moving parts of the unit.

ACAUTION

Compressor parts may be hot even if the unit is stopped.



- 10. Keep fingers away from a running compressor; fast moving and hot parts will cause injury and/or burns.
- 11. If the equipment should start to vibrate abnormally, STOP the engine/motor and check immediately for the cause. Vibration is generally a warning of trouble.
- 12. To reduce fire hazard, keep engine/motor exterior free of oil, solvent, or excessive grease.

An ASME code safe-AWARNING ty relief valve with a setting no higher than the pressure vessel's maximum allowable working pressure (M.A.W. P.) MUST be installed in the tank for this compressor. The ASME safety valve must have sufficient flow and pressure ratings to protect the pressurized components from bursting.

ACAUTION See compressor specification decai for maximum operating pressure. Do not operate with pressure switch or pilot valves set higher than the maximum operating pressure.

13. Never attempt to adjust ASME safety valve. Keep safety valve free from paint and other accumulations.

ADANGER

Never attempt to repair or modify a tank! Welding, drilling or any other modification will weaken the tank



resulting in damage from rupture or explosion. Always replace worn, cracked or damaged tanks.

NOTICE

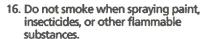
Drain liquid from tank daily.

- 14. Tanks rust from moisture build-up. which weakens the tank. Make sure to drain tank regularly and inspect periodically for unsafe conditions such as rust formation and corrosion.
- 15. Fast moving air will stir up dust and debris which may be harmful. Release air slowly when draining moisture or depressurizing the compressor system.

SPRAYING PRECAUTIONS

AWARNING

Do not spray flammable materials in vicinity of open flame or near ignition sources including the compressor



17. Use a face mask/respirator when spraying and spray in a well ventilated area to prevent health and fire hazards.



- 18. Do not direct paint or other sprayed material at the compressor. Locate compressor as far away from the spraying area as possible to minimize overspray accumulation on the compressor.
- 19. When spraying or cleaning with solvents or toxic chemicals, follow the instructions provided by the chemical manufacturer

AWARNING Disconnect, tag and lock out power source, then

release all pressure from the system before attempting to install, service, relocate or perform any maintenance.



Introduction

Refer to Figure 1 to locate the following items.

Pressure switch - Auto/Off Switch - In the "AUTO" position, the compressor shuts off automatically when tank pressure reaches the maximum preset pressure. In the "off" position, the compressor will not operate. This switch should be in the "OFF" position when connecting or disconnecting the power cord from the electrical outlet or when changing air tools. (See Figure 8.)

When the pressure switch turns the motor off you will hear air leaking out of the Pressure Switch Unloader Valve for a short time. This releases the air pressure from the discharge tube and allows the compressor to restart easier.

Regulator - The regulator controls the amount of air pressure in the air hose. The air hose is attached at the outlet of the regulator.

ASME Safety Valve - This valve automatically releases air if the tank pressure exceeds the preset maximum.

Discharge tube - This tube carries compressed air from the pump to the check valve. This tube becomes very hot during use.

To avoid the risk of AWARNING

severe burns, never touch the discharge tube.

Check valve - One-way valve that allows air to enter the tank, but

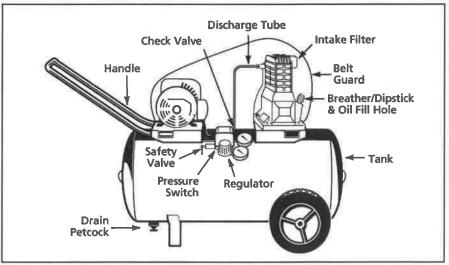


Figure 1 (Vertical unit not shown)

Introduction (Continued)

prevents air in the tank from flowing back into the compressor pump. Handle - Designed to move the

compressor.

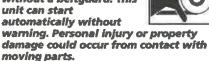
AWARNING

Never use the handle to lift the unit completely off the ground.

Belt Guard - Covers the belt, motor pulley and flywheel.

AWARNING Never

operate compressor without a beltguard. This unit can start



Tank Drain Valve - This valve is located on the bottom of the tank. Use this valve to drain moisture from the tank daily to reduce the risk of corrosion

Reduce tank pressure below 10 psi, then drain moisture from tank daily to avoid tank corrosion. Drain moisture from tank(s) by opening the drain valve located underneath the tank.

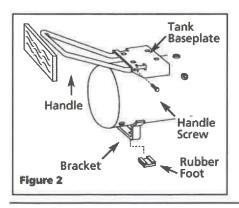
Tank Pressure Gauge - Indicates amount of air pressure stored in tank.

Hose Pressure Gauge - Indicates amount of air pressure in hose used to operate tools. This pressure is increased or decreased by the regulator.

Assembly

HORIZONTAL TANK UNITS ONLY HANDLE

- 1. Remove the handle screw from the tank baseplate, if preinstalled.
- 2. Insert handle into both sides of tank baseplate. Squeeze handle to fit into special openings in baseplate (See Figure 2).



- 3. Place a short piece of wood against end of handle and tap with a mallet or hammer until the hole in the handle lines up with the hole in the baseplate.
- 4. Insert and tighten the handle screw into the hole in the baseplate and through the handle. Make sure the screw goes through the handle.

WHEEL ASSEMBLY

The items marked with an asterisk (*) in Figure 3 were shipped loose with the unit. Assemble as follows:

- 1. Insert shoulder bolt through wheel hub with the bolt head on the opposite side of the protruding hub section.
- 2. For the 8 inch diameter wheels. insert the shoulder bolt in the lowest hole of the tank axle iron and tightly secure with locknut.
- For the 10 inch diameter wheels. insert the shoulder bolt in the upper hole in the tank axle iron and tightly secure with the locknut. Repeat this step on the opposite side.

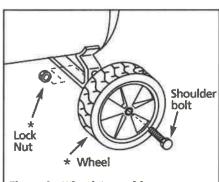


Figure 3 - Wheel Assembly

When assembled, the tank must sit level or slope slightly towards the tank drain valve to allow tank to drain properly.

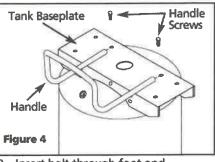
VERTICAL TANK UNITS ONLY HANDLE ASSEMBLY

insert four handle screws through holes in handle and tighten to tank baseplate (See Figure 4).

FOOT ASSEMBLY

The items marked with an asterisk (*) were shipped loose with the unit (See Figure 5).

1. Tilt unit to allow access to front foot and secure properly to ensure unit does not tip over.



- Insert bolt through foot and bracket. The foot should be on the lower side of bracket.
- 3. Tightly secure with the lock nut. Repeat on opposite side.

WHEEL ASSEMBLY

The items marked with an asterisk (*) were shipped loose with the unit (See Figure 5).

- 1. Insert shoulder bolt through wheel hub. The bolt hex head should be on the opposite side of protruding hub center.
- 2. Feed the shoulder bolt through the hole on the tank axle iron and tightly secure with the locknut. Repeat on the opposite side.

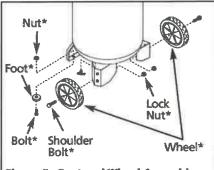


Figure 5 - Foot and Wheel Assembly

LUBRICATION

THIS UNIT IS ACAUTION SHIPPED WITHOUT Off.! Follow lubrication instructions before operating compressor.

Ensure oil drain extension and cap has been installed (if included) then remove the dipstick breather (See Figure 6) and fill pump oil according to Chart 1.

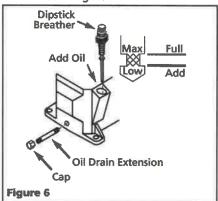
OIL DRAIN EXTENSION

Some models include an oil drain extension and cap (found with the owner's manual). Install the oil drain extension and cap before adding oil to the pump. To avoid oil leaks, it is highly recommended to apply PTFE thread sealant tape or paste type sealant to the threads on each end of the oil drain extension. Screw the cap onto

one end of Assembly (Continued)

the extension. Remove the oil drain plug from the base of the pump and install the oil drain extension (See Figure 6).

See specification label on air tank for pump model number and refer to Chart 1 for the proper oil capacity. Use SAE 30 industrial grade air compressor oil or full synthetic motor oil like Mobil 1 10W-30. Do not use regular automotive oil such as 10W-30. Additives in regular motor oil can cause valve deposits and reduce pump life. For maximum pump life, drain and replace oil after the first hour of run time. Proper oil fill level is illustrated in Figure 6.



Pump Model A	pprox. Oil Capacity
VS260000KB	6 oz
VT470000KB	12 oz
VT470200KB	11.5 oz
TC100000KB	12 oz

Chart 1

WIRING

Local electrical wiring codes differ from area to area. Source wiring, plug and protector must be rated for at least the amperage and voltage indicated on your motor nameplate, and meet all electrical codes for this minimum. Use a slow blow fuse type T or a circuit breaker.

ACAUTION

Overheating, short circuiting and fire damage will result from inadequate wiring.



NOTE: 120 volt, 15 amp units can be operated on a 120 volt 15 amp circuit under the following conditions:

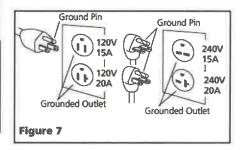
1. No other electrical appliances or

- lights are connected to the same branch circuit.
- 2. Voltage supply is normal.
- Circuit is equipped with a 15 amp circuit breaker or a 15 amp slow blow fuse type T (For Canada use Type D).

If the above conditions cannot be met or if nuisance tripping of the current protection device occurs, it may be necessary to operate the compressor from a 120 volt 20 amp circuit. Some models convert to 240 volt operation, see DUAL VOLTAGE MOTOR.

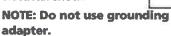
GROUNDING INSTRUCTIONS

 This product must be grounded. In the event of an electric short circuit, grounding reduces the risk of electrical shock by providing an escape wire for the electric current. Unit is equipped with a cord that has a grounding prong. It will fit one of the common outlet types shown in Figure 7. If plug will not fit in the desired outlet, have the plug or the outlet replaced by a qualified electrician.



ADANGER

Improper use of grounding plug can result in a risk of electrical shock.



- 2. If repair or replacement of the cord or plug is necessary, do not connect the grounding wire to either flat blade terminal. The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.
- Check with a qualified electrician or serviceman if the grounding instructions are not completely understood, or if in doubt as to whether the product is properly

grounded. Do not modify the plug provided; if it will not fit the outlet, have the proper outlet installed by a qualified electrician.

PLUGS AND RECEPTACLES

- If the plug on the electrical cord of the unit is unfamiliar to you or will not fit your particular receptacle, Figure 7 will help you understand why by illustrating the different plugs and the voltages they are to be used with.
- Make sure that the product is connected to an outlet having the same configuration as the plug.
- The receptacles must be connected to circuits rated to carry at least the voltage and amperages shown.
- 4. NEVER have a receptacle replaced with one of a higher amperage before determining the change can be made according to all electrical codes affecting your particular area. The installation should be made by a qualified electrician. If the products must be reconnected for use on different types of circuits, the reconnection should be made by qualified personnel.

DUAL VOLTAGE MOTORS (SOME MODELS)

Dual voltage motors may be connected for either 120 volts or 240 volts. By comparing the plug on the cord with the receptacles shown in Figure 7, you can determine for which voltage your compressor is factory wired. Also check motor decal to change from low voltage to high voltage.

AWARNING qualified electrician.

All wiring must be performed by a

To change connections for alternate voltage:

- 1. Disconnect cord from power source
- 2. Remove motor terminal cover.
- 3. Find connection diagram on back side of the cover or on motor nameplate and reconnect to desired voltage as indicated on diagram.

AWARNING If you do not understand this wiring diagram you must find a qualified electrician that does understand wiring diagrams.

Change plug to match voltage and current requirements.

Assembly (Continued)

When converting AWARNING

to an alternate voltage, be sure the green ground wire of the cord connects to the ground pin of the plug and to the metal body of the pressure switch.

Operation

START-UP

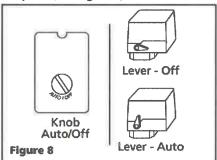
NOTICE

lubrication section.

This compressor pump must be filled with oil before startup. See

ACAUTION Do not attach air tools to open end of the hose until start-up is completed and the unit checks OK.

- 1. Remove the dipstick breather and fill pump to the proper oil level. See Lubrication Section.
- 2. Open tank drain valve.
- 3. Turn pressure switch lever or knob to OFF position and plug in power
- 4. Turn pressure switch lever or knob to AUTO position and run unit for 30 minutes to break in the pump parts (See Figure 8).



- 5. Turn regulator knob fully counterclockwise. Compressor will build to maximum preset pressure and shut off.
- 6. Turn regulator knob clockwise to cause air to bleed off. Compressor will restart at preset pressure.
- 7. Turn pressure switch lever or knob to OFF position and unplug powercord. Slowly turn regulator knob clockwise to allow all air pressure to be released. Do not proceed to the next step until the tank pressure reaches zero (0).
- 8. Attach hose, then add chuck or other tool to open end of hose. Plug in powercord. Turn pressure switch lever to AUTO position. When full pressure is reached turn

- regulator knob clockwise until desired outlet pressure is achieved.
- 9. After use, turn pressure switch lever or knob to the OFF position.
- 10. If compressor is not used for a long time period, bleed air from line and use drain valve to drain water from the tank. Then, follow the maintenance schedule.

NOTE: Electric models are equipped with a pressure switch that automatically turns the motor OFF when the tank pressure reaches a preset level. After air is used from the tank and drops to a preset low level, the pressure switch automatically turns the motor back on.

Maintenance

AWARNING

Disconnect, tag and lock out power source, then release all pressure from the system before



attempting to install, service, relocate or perform any maintenance.

All repairs should be performed by an authorized service representative.

FOR EFFICIENT OPERATION:

Perform the following test to verify free operation of the safety valve weekly and follow maintenance schedule below.

1. Pull ring on safety valve and allow the ring to snap back to normal position (See Figure 9). This valve automatically releases air if the tank pressure exceeds the preset maximum.

ACAUTION A large amount of fast moving air will be release if the safety valve is actuated with air pressure in the tank.

ADANGER Do not attempt to tamper with this valve. This valve should be checked occasionally. If air leaks after the ring has been released, or the valve is stuck and cannot be actuated by the ring, the safety valve must be replaced.

With motor OFF and unplugged, clean debris from motor, flywheel, tank, air lines and pump cooling fins.

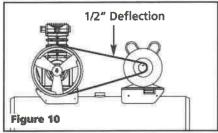


MOISTURE IN COMPRESSED AIR

Moisture in compressed air will form into droplets as it comes from an air compressor pump. When humidity is high or when a compressor is in continuous use for an extended period of time, this moisture will collect in the tank. When using a paint spray or sandblast gun, this water will be carried from the tank through the hose, and out of the gun as droplets mixed with the spray material.

Important: This condensation will cause water spots in a paint job. especially when spraying other than water based paints. If sandblasting, it will cause the sand to cake and clog the gun, rendering it ineffective.

A filter or air dryer in the air line, located as near to the gun as possible, will help eliminate moisture.



DRIVE BELT

Belts will stretch in normal use. Properly adjusted, a 5-pound pressure applied to the belt between the motor pulley and the pump will deflect the belt about 1/2" (See Figure 10).

TO ADJUST DRIVE BELT:

- 1. Remove belt quard.
- 2. Loosen the four fasteners holding the motor to the baseplate.
- 3. Shift the motor in the proper direction. The belt must be properly aligned when adjustment is made.
- 4. Adjust flywheel or motor pulley so that the belt runs straight.
- 5. If necessary, use a gear puller to move the pulley on the motor shaft. Tighten setscrew after pulley is positioned.
- 6. Attach belt guard.

STORAGE

 When not in use, hose and compressor should be stored in a cool dry place.

Portable Air Compressors

- Tanks should be drained of moisture and hose should be disconnected and hung with open ends down to allow any moisture to drain.
- Protect the electrical cord from possible damage by winding the cord loosely around the handle of the unit or coiling the cord up.

TORQUE R	EQUIREMENTS Compressor Head Bolts	Bearing
VS	100-125	50-120
VT	225-300	50-120
TC	225-300	50-120
Chart 3		

Technical Support

For technical support regarding operation or repair of this product, please call 1-800-543-6400.

MAINTENANCE SCHEDULE

Operation	Daily	Weekly	Monthly	3 Months
Check Oil Level				
Drain Tank	•			
Check Air Filter		•		
Check Safety Valve				
Clean Unit				
Check Belt Tightness				0
Change Oil				

Chart 2

Troubleshooting Chart

Symptom	Possible Cause(s)	Corrective Action
Low discharge pressure	 Air demand exceeds pump capacity Air leaks Restricted air intake Blown gaskets Leaking or damaged valves 	 Reduce air demand or use a compressor with more capacity. Listen for escaping air. Apply soap solution to all fittings and connections. Bubbles will appear at points of leakage. Tighten or replace leaking fittings or connections. Clean the air filter element. Replace any gaskets proven faulty on inspection. Remove head and inspect for valve breakage, misaligned valves, damaged valve seats, etc. Replace defective parts and reassemble. ACAUTION Install a new head gasket each time the head is removed
Pump overheating causes air filter to melt	Insulating gasket between filter and head is missing	1. Install gasket.
	2. Broken valves/blown gasket	Replace valves or install new gasket.
Excessive noise (knocking)	Loose motor or compressor pulley	 Loose motor or compressor pulleys are a very common cause of compressors knocking. Tighten pulley clamp bolts and set- screws.
	2. Lack of oil in crankcase	Check for proper oil level; if low, check for possible damage to bearings. Dirty oil can cause excessive wear.
	3. Worn connecting rod	Replace connecting rod. Maintain oil level and change oil
	4. Worn piston pin bores	more frequently. 4. Remove piston assemblies from the compressor and inspect for excess wear. Replace excessively worn piston pin or pistons, as required. Maintain oil level and change oil more frequently.
	5. Piston hitting the valve plate	Remove the compressor head and valve plate and inspect for carbon deposits or other foreign matter on top of piston.

Troubleshooting Chart

Symptom	Possible Cause(s)	Corrective Action
	rossible Cause(s)	
Excessive noise (knocking) Continued	Noisy check valve in compressor system	Replace head and valve plate using new gasket. See Lubrication section for recommended oil. 6. Replace. Do not disassemble check valve with air pressure in tank
Large quantity of oil in the discharge air NOTE: In an oil lubricated compressor there will always be a small amount of oil in the air stream. Water in discharge air/tank	Worn piston rings Compressor air intake restricted Excessive oil in compressor Wrong oil viscosity Normal operation. The amount of water increases with humid weather	 Replace with new rings. Maintain oil level and change oil more frequently. Clean filter. Check for other restrictions in the intake system. Drain down to full level. Use Mobil 1* 10W-30 Drain tank more often. At least daily. Add a filter to reduce the amount of water in the air line.
Motor hums and runs slowly or not at all	Use of extension cord Malfunctioning check valve or unloader valve Low voltage Malfunctioning pressure switch - contacts will not close	 Do not use an extension cord. Use longer air hose with larger diameter. Replace check valve, unloader valve or pressure switch. ADANGER Do not disassemble check valve with air pressure in tank Check with voltmeter, check reset switch on motor. If reset switch trips repeatedly, find and correct the cause. See next item. Repair or replace pressure switch.
Reset mechanism cuts out repeatedly or fuses blow repeatedly	Too many devices on same circuit Incorrect fuse size or circuit breaker Malfunctioning check valve Pressure switch set too high Loose wiring Malfunctioning motor	 Limit the circuit to the use of only the air compressor. Be sure that fuses or circuit breakers are rated properly. Replace check valve. ADANGER Do not disassemble check valve with air pressure in tank Adjust or replace. Check all electrical connections. Replace motor.
Tank does not hold pressure when compressors off and the shut off valve is closed Pressure switch continuously blows air	Worn check valve Check all connections and fittings for leaks Check tank for cracks or pin holes Malfunctioning check valve	 Replace check valve. ADANGER Do not disassemble check valve with air pressure in tank Tighten. Replace tank. Never repair a damaged tank. Replace the check valve if the unloader valve bleeds off constantly.
Out the unloader valve Pressure switch does not release air when the unit shuts off	Malfunctioning unloader valve on pressure switch	ADANGER Do not disassemble check valve with air pressure in tank 1. Replace the pressure switch if it does not release the pressure for a short period of time when the unit shuts off. ADANGER Do not disassemble pressure switch with air pressure in tank
Excessive vibration	 Loose fasteners Belt needs replaced Belt alignment 	 Tighten. Replace with correct size. Align flywheel and pulley.

Portable Air Compressors

Limited Warranty

- 1. DURATION: From the date of purchase by the original purchaser as follows: One Year, Two Years, Three Years, Four Years, or Five Years as indicated on product specification label.
- WHO GIVES THIS WARRANTY (WARRANTOR):
 - Campbell Hausfeld / Scott Fetzer Company, 100 Production Drive, Harrison, Ohio, 45030, Telephone: (800) 543-6400
- WHO RECEIVES THIS WARRANTY (PURCHASER): The original purchaser (other than for purposes of resale) of the Campbell Hausfeld
- WHAT PRODUCTS ARE COVERED BY THIS WARRANTY: Any Campbell Hausfeld air compressor.
- WHAT IS COVERED UNDER THIS WARRANTY: Parts and Labor to remedy substantial defects due to material and workmanship during the first year of ownership with the exceptions noted below. Parts only to remedy substantial defects due to material and workmanship during remaining term of coverage with exceptions noted below.
- WHAT IS NOT COVERED UNDER THIS WARRANTY:
 - A. Implied warranties, including those of merchantability and FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED FROM THE DATE OF ORIGINAL PURCHASE AS STATED IN THE DURATION. If the compressor is used for commercial, industrial or rental purposes, the warranty will apply for ninety (90) days from the date of purchase. Two-stage compressors are not limited to a ninety (90) day warranty when used in commercial or industrial applications. Some States do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you
 - B. ANY INCIDENTAL, INDIRECT, OR CONSEQUENTIAL LOSS, DAMAGE, OR EXPENSE THAT MAY RESULT FROM ANY DEFECT, FAILURE, OR MALFUNCTION OF THE CAMPBELL HAUSFELD PRODUCT. Some States do not allow the exclusion or limitations of incidental or consequential damages, so the above limitation or exclusion may not apply to you.
 - C. Any failure that results from an accident, purchaser's abuse, neglect or failure to operate products in accordance with instructions provided in the owner's manual(s) supplied with compressor.

 - D. Pre-delivery service, i.e. assembly, oil or lubricants, and adjustment.

 E. Items or service that is normally required to maintain the product, i.e. lubricants, filters and gaskets, etc.
 - F. Gasoline engines and components are expressly excluded from coverage under this limited warranty. The Purchaser must comply with the warranty given by the engine manufacturer which is supplied with the product
 - G. Additional items not covered under this warranty:
 - 1. Excluded items pertaining to All Compressors
 - Any component damaged in shipment or any failure caused by installing or operating unit under conditions not in accordance with installation and operation guidelines or damaged by contact with tools or surroundings.
 - Pump or valve failure caused by rain, excessive humidity, corrosive environments or other contaminants.
 - Cosmetic defects that do not interfere with compressor functionality.
 - d. Rusted tanks, including but not limited to rust due to improper drainage or corrosive environments.
 - The following components are considered normal wear items and are not covered after the first year of ownership. Electric motor, check valve, pressure switch, regulator, pressure gauges, hose, tubing, pipe, fittings and couplers, screws, nuts, hardware items, belts, pulleys, flywheel, air filter and housing, gaskets, seals, oil leaks, air leaks, oil consumption or usage, piston rings.
 - Tank drain valves.
 - Damage due to incorrect voltage or improper wiring.
 - Other items not listed but considered general wear parts.
 - Pressure switches, air governors, load/unload devices, throttle control devices and safety valves modified from factory settings.
 - Damage from inadequate filter maintenance.
 - j. Damage from inadequate titler maintenance.
 k. Induction motors operated with electricity produced by a generator.
 - 2. Excluded items specific to Lubricated Compressors:
 - a. Pump wear or valve damage caused by using oil not specified.
 - b. Pump wear or damage caused by any oil contamination.
 - Pump wear or damage caused by failure to follow proper oil maintenance guidelines, operation below proper oil level or operation without oil.
- H. Labor, service call, or transportation charges after the first year of ownership of stationary compressors. Stationary compressors are defined as not including a handle or wheels.
- 7. RESPONSIBILITIES OF WARRANTOR UNDER THIS WARRANTY: Repair or replace, at Warrantor's option, compressor or component which is defective, has malfunctioned and/or failed to conform within duration of the warranty period.
- RESPONSIBILITIES OF PURCHASER UNDER THIS WARRANTY:
 - A. Provide dated proof of purchase and maintenance records.
 - B. Portable compressors or components must be delivered or shipped to the nearest Campbell Hausfeld Authorized Service Center. Freight costs, if any, must be borne by the purchaser.
 - C. Use reasonable care in the operation and maintenance of the products as described in the owner's manual(s).
 - D. Repairs requiring overtime, weekend rates, or anything beyond the standard manufacturer warranty repair labor reimbursement
 - Time required for any security checks, safety training, or similar for service personnel to gain access to facility.
 - Location of unit must have adequate clearance for service personnel to perform repairs and easily accessible.
- WHEN WARRANTOR WILL PERFORM REPAIR OR REPLACEMENT UNDER THIS WARRANTY: Repair or replacement will be scheduled and serviced according to the normal work flow at the servicing location, and depending on the availability of replacement parts.

This Limited Warranty applies in the U.S., Canada and Mexico only and gives you specific legal rights. You may also have other rights which vary from State to State or country to country.



ARO-FLO SERIES

FILTERS, REGULATORS AND LUBRICATORS





ARO-Flo Series

For more than 100 years, Ingersoll Rand ARO® has been an industry leader in the design and manufacture of compressors, pneumatic tools, and

air preparation equipment. Clean air is a key ingredient that enables effective and efficient operation of tools, equipment, and machinery in almost every industry. As such, the use of air preparation devices, such as filters, regulators, and lubricators (FRLs) is an excellent means of keeping your air supply in top condition, as well as enabling your tools and equipment to operate at their peak performance. The ARO-Flo Series FRLs continue the tradition of offering premium products for your operation, and also raises the bar in the industry for safety, flow performance, and modularity.

Safety:

Providing safe tools and equipment is our top priority. ARO-Flo Series FRLs are designed with integrated safety features such as locking bowls and clear multilingual markings. Accessories such as lockout valves, check valves, and soft-start valves allow the air supply to be safely managed and controlled.

Ingersoll Rand attests that ARO-Flo Series of filters, regulators, lubricators (1000, 1500, 2000, 3000 Series) and select accessories are out of scope for ATEX Directive 94/9/EEC or 2014/34/EU. The products listed in the form IRITS-1215-197 certificate can be used in group II, category 2 environment; Gas and Dust with temperature a T6 (Ex II 2GD T6) if all conditions set up in the Instruction Manual are meet.

be found at AROZONE.COM

Performance: ARO-Flo Series FRLs set the standard for flow performance. Simply put, air flows better through ARO-Flo filters, regulators, and lubricators than almost any other other air filtration device. This means less air is choked during the air preparation process, and your equipment can perform at its peak performance.

Instruction Manuals and certificate regarding ATEX Declaration can

Modularity:

All ARO-Flo accessories are designed to integrate with each other within each size range. From pipe adapters to T-brackets, your complete FRL assembly and its individual components can be easily, safely, and quickly assembled or disassembled with a minimum of tools — no fuss or complications, even with fixed piping.

Best in class

The following regulators were put through head-to-head tests to determine how they compare with the new ARO-Flo Series.

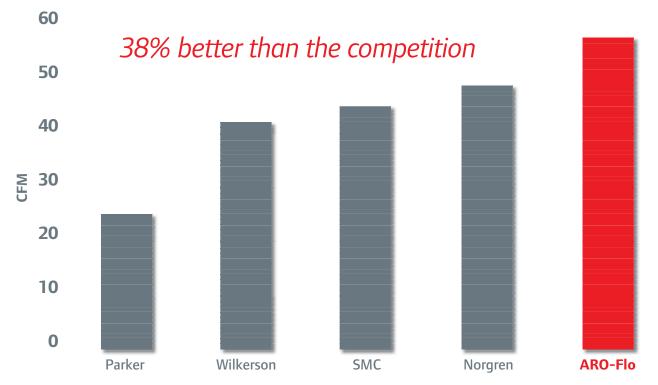
Manufacturer	Model Number	Flow Rate
Parker	14R118F	27 cfm
Wilkerson®	R08-02-F0G0	44 cfm
SMC®	AR20-N02E-Z	48 cfm
Norgren	R72G-2AK-RMG	51 cfm
ARO-Flo	R37121-620	59 cfm

How did we do? On average, the ARO-Flo 1/4" 1000 Series regulator flowed 38 percent better than the competition. All regulators were tested under the same conditions, and all units were new - right out of the box.



R37121-620

1/4" Regulator — Flow Test



Test parameters: 100 psi inlet pressure, 90 psi set pressure, and 33 psi drop

This is not the largest 1/4" regulator in the ARO-Flo Series, but rather the smallest. How did we do it? We designed the ARO-Flo Series from the ground up to allow air to pass through the units with a minimum of flow loss. The bottom line: If you want superior flow in your application, you can't miss with the new ARO-Flo Series.

Features and benefits



Spares and Accessories

See our accessories catalog or go to our Web site for the complete selection of accessories for your application.



Refurb kits 104302



Mounting brackets 104409



Replacement parts 104338



Pressure switch 104415







1000 Series

1000 Series

1/8" and 1/4" Ports

Max flow: 59 scfm **Series size:** Miniature

Page: 8



1500 Series

1/4" and 3/8" Ports

Max flow: 113 scfm **Series size:** Compact

Page: 18



2000 Series

3000 Series

Super-Duty Series

Specialty Items

2000 Series

3/8", 1/2", and 3/4" Ports

Max flow: 222 scfm Series size: Standard

Page: 28



3000 Series

3/4" and 1" Ports

Max flow: 368 scfm **Series size:** Heavy-Duty

Page: 38



Super-Duty Series

1", 1-1/4", 1-1/2", 2" and 3" Ports

Max flow: 1,770 scfm **Series size:** Super-Duty

Page: 48



Specialty Items

1/8", 1/4", 3/8", 1/2", and 3/4" Ports

Specialty line **Page:** 56

1500 Series piggyback filters / regulators

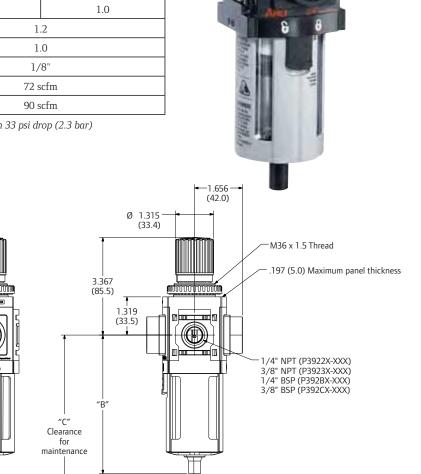
1/4" and 3/8" Ports

Technical data		
	POLYCARBONATE BOWL	METAL / METAL W/ SIGHT GLASS
Max inlet pressure (psi)	150	250
Temperature range (F)	23 – 125	23 – 175
	0 -	30
Spring range options (psi)	0 -	60
	0 –	140
Bowl cap — manual drain (oz)	1.3	1.3
Bowl cap — auto drain (oz)	1.0	1.0
Bowl cap — coal manual drain	1	.2
Bowl cap — coal auto drain	1	.0
Gauge port	1/	8"
Flow capacity — 1/4" port*	72 s	scfm
Flow capacity — 3/8" port*	90 s	scfm

^{*}Inlet pressure 100 psi (6.9 bar), 90 psi set (6.2 bar), with 33 psi drop (2.3 bar)

1/8" NPT gauge port-(No gauge option)

(84.1)



Panel nut comes standard on all individual piggyback units

MODEL	A (MM)	B (MM)	C (MM)	DRAIN
P392XX-XX0	8.150 (207.0)	4.783 (121.5)	6.783 (172.3)	MANUAL
P392XX-XX4	9.016 (229.0)	5.650 (143.5)	7.650 (194.3)	AUTOMATIC

2.205 (56.0)

Warranty

Ingersoll Rand Company warrants to the original use purchaser of the Ingersoll Rand Air Systems Components depicted in this catalog that Ingersoll Rand will repair or replace, free of charges, including return shipping costs within the continental United States of America, any such product which under normal use and service proves defective in material or workmanship, as determined by Ingersoll Rand inspection, twenty-four months from date of purchase, provided the claimed defective product, or part thereof, is promptly returned to the Ingersoll Rand Service Repair Center or a factory-authorized service repair center, with transportation charges prepaid.

If Ingersoll Rand inspection discloses no defect in material or workmanship, repair or replacement and return will be made at customary

THE FOREGOING WARRANTY SUPERSEDES, VOIDS AND IS IN LIEU OF ALL OR ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND NO WARRANTY OR MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE IS INTENDED OR MADE. The sole obligation of Ingersoll Rand and the original use purchaser's sole remedy is as stated above and in no event shall Ingersoll Rand be liable for any special, direct, indirect, incidental, consequential, or other damages or expenses of any nature including, without limitation, loss of profits or production time incurred by the original use purchaser or any other party.

Compatible Lubricants

Although air line lubrication is not required for most ARO® valves, other mechanisms in the system may need such lubrication. When a lubricator is used it should be supplied only with oils which are compatible with the materials used in the valves for seals and poppets. Generally speaking, these are petroleum base oils with oxidation inhibitors, and aniline point between 180°F (82°C) and 220°F (104°C) and an ISO 32, or lighter, viscosity. Oils with phosphate type additives, such as zinc dithiophosphate, must be avoided because they can harm polyurethane valve components. The best oils to use in pneumatic systems are those specifically compounded for air line lubricator service. We recommend ARO® Lubricative Oil P/N 29665, it is specially formulated for use with pneumatic power tools, motors, valves, cylinders and hoists.

Cautions of the Use of Polycarbonate Plastic Bowls

Use Only with Compressed Air. Filters and lubricators with polycarbonate plastic bowls are specifically designed for compressed air service, and their use with any other fluid (liquid or gas) is a misapplication. The use with or injection of certain hazardous fluids in the system (e.g., alcohol or liquefied petroleum gas) could be harmful to the plastic bowl or result in a combustible condition or hazardous leakage. Before using with a fluid other than air, or for non-industrial applications, or for life support systems. Consult the factory. Use Metal Bowl Guard When Supplied. A metal bowl guard is supplied with all but the smallest bowls, and must always be used to minimize danger from fragmentation in the event of failure of a plastic bowl. Avoid Harmful Substances. Some compressor oils, chemical cleaners, solvents, paints, and fumes will attack plastic bowls and can cause bowl failure. Do not use with or near these materials. When a bowl becomes dirty, replace the bowl or wipe it with a clean dry cloth. Immediately replace any plastic bowl which is crazed, cracked, or deteriorated.

SUBTANCES HARMFUL TO POLYCARBONATE PLASTIC BOWLS

Acetaldehyde	Benzoic acid	Cresol	Ethylene glycol	Milk of lime (CaOH)	Styrene
Acetic acid	Benzyl alcohol	Cyclohexanol	Formic acid	Nitric acid	Sulfuric acid
Acetone	Brake fluids	Cyclohexanone	Freon (refrigerant	Nitrobenzene	Sulfuryl chloride
Acrylonitrile	Bromobenzene	Cyclohexene	& propellant)	Nirocellulose lacquer	Tetrahydronaphthalene
Ammonia	Butyric acid	Dimethyl formamide	Gasoline (high aromatic)	Phenol	Thiophene
Ammonium fluoride	Carbolic acid	Dioxane	Hydrazine	Phosphorous hydroxyl	Toluene
Ammonium hydroxide	Carbon disulfide	Ethane tetrachloride	Hydrocarbons	chloride	Turpentine
Ammonium sulfide	Carbon tetrachloride	Ethyl acetate	Hydrochloric acid	Phosphorous trichloride	Xylene
Anaerobic adhesives	Caustic potash solution	Ethyl ether	Lacquer thinner	Propionic acid	Perchlorethylene
& sealants	Caustic soda solution	Ethylamine	Methyl alcohol	Pyridine	
Antifreeze	Chlorobenzene	Ethylene chlorohydrin	Methylene chloride	Sodium hydroxide	
Benzene	Chloroform	Ethylene dichloride	Methylene salicylate	Sodium sulfide	

Trade Names of Stustances HARMFUL to Polycarbonate Plastic Bowls

· Atlas Perma-Guard · Buna N · Cellulube #150 & #220 · Crylex #5 cement · Eastman 910 · Garlock 98403 (polyurethane) · Haskel 568-023 • Hilgard Company's hil phene • Houghton & Co. oil 1120, 1130, 1055 • Houstsafe 1000 • Kano Kroil • Keystone penetrating oil #2 • Loctite 271, 290, 601 · Loctite Teflon sealant · Marvel Mystery Oil · Minn. Rubber 366Y · National Compound N11 Nylock VC-3 · Parco 1306 Neoprene · Permabond 910 · Petron PD287 · Prestone · Pydraul AC · Sears Regular Motor Oil · Sinclair oil "Lily White" · Stauffer Chemical FYROUEL 150 · Stillman SR 269-75 (polyurethane) · Stillman SR 513-70 (neoprene) · Tannergas · Telar · Tenneco and Erol 495 & 500 oils · Titon · Vibra-tite · Zerex

Progress in motion

For more than 85 years, ARO® pumps and fluid products have helped drive innovation and create new standards for how the world gets work done. Over the years, we have applied our knowledge of our customers' industries and the demands placed on productivity and quality to consistently deliver products that increase productivity and minimize the costs associated with transferring, extruding, and applying a wide range of fluids, from low- to high-viscosity.

When you purchase an ARO® product, you can be confident that you are getting industry-proven dependability, versatility, and value. No matter what your product, process, or location, we offer the products, accessories, and a worldwide distribution and service network prepared to keep your process in motion.

After all, we've been doing it for more than 85 years.



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ARO°

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5PA5 / 5PA10

Winona, MN USA I www.thern.com



ENSIGN SERIES

SERIES FEATURES

II ENSIGN

ADJUSTABLE SHEAVE BLOCK

Sheave easily adjusts without tools to 4 different positions allowing for a wide range of height and reach combinations.

ADJUSTABLE BOOM ANGLE

Convenient stainless steel adjustment screw, with comfortable turning knob, allows for easy, one-hand boom adjustment when not under load.

QUICK-MOUNT WINCH BRACKET

A variety of Thern winches can be attached to the bracket. After a winch is attached to the bracket, the bracket is easily mounted (without tools) to any of three convenient/ ergonomic positions on the mast via quick-connect pins.

NYLATRON FLANGE BEARING

The Ensign 500 features a nylatron bearing that supports the mast at the top of the base to assist with the crane's 360° smooth rotation.

TAPERED ROLLER BEARING

A tapered roller bearing, pinned to the bottom of the mast, allows the crane to rotate 360° under load. Standard only on the Ensign 500.

ROLLER/BALL BEARING*

Standard on Ensign 1000, the specially designed roller/ball bearing at top of base requires no tools for installation. Allows smooth, easy 360° crane rotation under load.

STAINLESS STEEL LOCK*

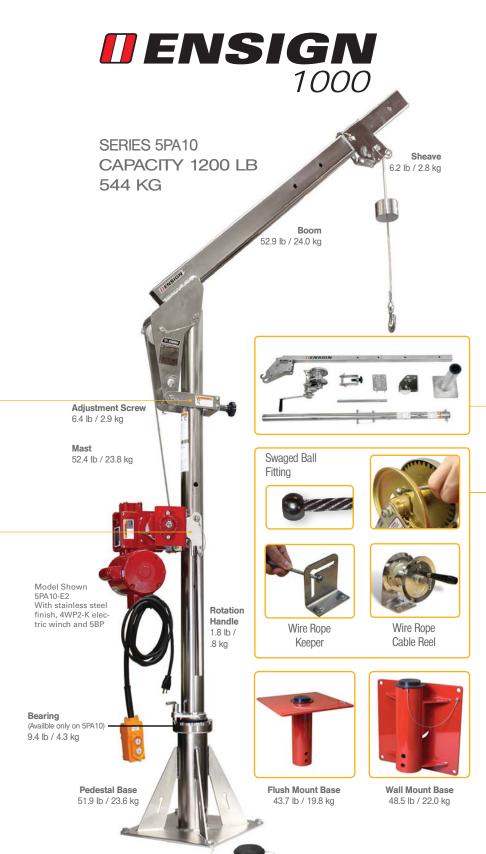
Stainless steel lock assembly keeps crane in position during winch operation and when not in use. Included with roller/ball bearing.





*Not available on the Ensign 500

FEATURES AND BENEFITS



TRADITIONAL FEATURES

MANUAL OR POWER OPERATION

Thern davit cranes can be configured with a manual winch for short, infrequent lifts or a power winch for longer lifts or heavier loads. Choose from Thern's spur or worm gear hand winches or power winches with 115/1/60 as standard. Other voltages available as well as pneumatic, hydraulic or DC Volt power operation.

CORROSION RESISTANT FINISH

Electrostatic powder coated crane and stainless steel fasteners combine to resist corrosion in harsh environments. Other options available include: galvanized, stainless steel and epoxy finishes.

EASY ASSEMBLY/DISASSEMBLY

Quick-release stainless steel pins allow for easy assembly and quick disassembly for transport or storage. No tools required.

OUICK DISCONNECT ANCHOR

For quickly attaching or removing wire rope equipped with a swaged ball fitting - Allows the operator to leave the wire rope attached to the load at all times and simply remove the rope from the winch and attached to the optional wire rope keeper or cable reel.

VARIETY OF BASES

Pedestal, flush and wall mount bases allow for a variety of mounting solutions and are easily installed to a variety of solid surfaces with anchor bolts or other fastening methods. Bases sold separately. Base cap included with lanyard keeps water and debris out of base when crane is removed.

2 -YEAR WARRANTY

Industry-leading two-year limited warranty on all our products.







CRANES AND WINCHES

FINISHES



Crane Finishes for Ensign Series

All cranes come standard with Electrostatic Powder Coat red finish. Four optional finishes also offered are Galvanized, 304 or 316 Stainless Steel, and corrosion-resistant Epoxy. Custom colors are available per customer request - Please contact factory.

RED	GAL	304	316 SS	EPX
		SS	SS	

Finish	Code	Model ENSIGN 500	Number ENSIGN 1000	Options	Description
Powder Coat (Red)	RED	5PA5	5PA10	Standard N/C	Red electrostatic powder coating applied to all cranes - Good
Galvanized	GAL	5PA5G	5PA10G	Optional/Extra	An economical choice that provides extra protection - Better
304 Stainless Steel	304SS	5PA5S	5PA10S	Optional/Extra	Electro-polished for added protection - Best
316 Stainless Steel	316SS	5PA5S316	5PA10S316	Optional/Extra	A higher level of corrosion protection - Premium
Epoxy (Gray)	EPX	5PA5X	5PA10X	Optional/Extra	3-part epoxy is impact, fire, water, and slip-resistant - Premium

WINCHES

For Ensign Series







Hand Winches

Winch	Winch Model No.	Description	Finish	Approx. Ship Weight
M1	M4022PB-K	(5PA5) Spur gear hand winch with brake	Zinc Plated	17 lbs 7.7 kg
IVII	M4312PB-K	(5PA10) Spur gear hand winch with brake	ZITIC Flateu	17 IDS 7.7 Ng
M2	4WM2V-K	Worm gear hand winch with brake	Red Enamel	42 lbs 19.1 kg
M2X	4WM2VEGRA-K	Worm gear hand winch with brake	Epoxy Paint (Gray)	42 lbs 19.1 kg
МЗ	M4042PBSS-K M4312PBSS-K	(5PA5) Stainless steel spur gear hand winch with brake (5PA10) Stainless steel spur gear hand winch with brake	Stainless Steel	24 lbs 10.9 kg

All hand winches include disc brake for load control and steel gear covers to protect gears and help prevent injuries. NOTE: Worm gear requires more turns with less effort than a spur gear winch.

Electric Winches

										EZ/
Electric	Model No.	Line	Speed	Finish	Power	Control	Арр		E2	
Winch	Model No.	1st Layer	Full Drum	Filliali	rowei	(Pendant)	Ship W	/eight		
E2	4WP2V-K	8 fpm	13 fpm	Enamel Paint	115 Volt, AC, Single Phase	6 ft	85 lbs	39 kg		
E2X	4WP2VEGRA-K	8 fpm	13 fpm	Epoxy Paint	115 Volt, AC, Single Phase	6 ft	85 lbs	39 kg	E4	K
E4	4777-K	13 fpm	22 fpm	Enamel Paint	115 Volt, AC Single Phase	6 ft	110 lbs	50 kg	2	2
E4X	4777EGRA-K	13 fpm	22 fpm	Epoxy Paint	115 Volt, AC Single Phase	6 ft	110 lbs	50 🚾		
E4DC	4777DC-K	13 fpm	22 fpm	Enamel Paint	12 Volt, DC	10 ft	124 lbs	57 kg	E4DC	E4XD
E4XDC	4777DCEGRA-K	13 fpm	22 fpm	Epoxy Paint	12 Volt, DC	10 ft	124 lbs	57 kg		
A 11 1 1 1									The second secon	-

All electric winches mount on boom via quick mount bracket and are equipped with internal break for load control.



BASES AND WIRE ROPE



BASES (sold separately) **For Ensign Series**

Select the appropriate base(s) for your application from the chart below. Matching your crane with multiple bases provides optimal worksite flexibility and an economical solution for servicing multiple lift stations.











Finish	Pede	estal	Flu	ısh	Wa	all
rinisii	5PA5	5PA10	5PA5	5PA10	5PA5	5PA10
Powder Coat Paint	5BP5	5BP10	5BF5	5BF10	5BW5	5BW10
Galvanized	5BP5G	5BP10G	5BF5G	5BF10G	5BW5G	5BW10G
304 Stainless Steel	5BP5S	5BP10S	5BF5S	5BF10S	5BW5S	5BW10S
316 Stainless Steel	5BP5S316	5BP10S316	5BF5S316	5BF10S316	5BW5S316	5BW10S316
Epoxy Paint	5BP5X	5BP10X	5BF5X	5BF10X	5BW5X	5BW10X
Approximate Ship Weight	21 lbs (9.5 kg)	56 lbs (25.4 kg)	21 lbs (9.5 kg)	47 lbs (21.3 kg)	23 lbs (10.4 kg)	52 lbs (23.6 kg)

WIRE ROPE Assembly (sold separately) **For Ensign Series**





Wire Rope	Galvanized A	ircraft Cable	304 Stainles	s Steel Rope	316 Stainles	s Steel Rope
Length	3/16" Dia	1/4" Dia.	3/16" Dia.	1/4" Dia.	3/16" Dia.	1/4" Dia.
Wire Rope Ratings*	1200 lbs (544 kg)	2000 lbs (907 kg)	1000 lbs (454 kg)	1800 lbs (816 kg)	800 lbs (363 kg)	1400 lbs (635 kg)
20 ft - 6 m	WA19-20NS	WA25-20NS	WS19-20NS	WS25-20NS	WSS19-20NS	WSS25-20NS
28 ft - 8.5 m	WA19-28NS	WA25-28NS	WS19-28NS	WS25-28NS	WSS19-28NS	WSS25-28NS
36 ft - 10.9 m	WA19-36NS	WA25-36NS	WS19-36NS	WS25-36NS	WSS19-36NS	WSS25-36NS
45 ft - 13.7 m	WA19-45NS	WA25-45NS	WS19-45NS	WS25-45NS	WSS19-45NS	WSS25-45NS
60 ft - 18.2 m	WA19-60NS	WA25-60NS	WS19-60NS	WS25-60NS	WSS19-60NS	WSS25-60NS
75 ft - 22.8 m	WA19-75NS	WA25-75NS	WS19-75NS	WS25-75NS	WSS19-75NS	WSS25-75NS
90 ft - 27.4 m	WA19-90NS	-	WS19-90NS	-	WSS19-90NS	-

Thern winches and cranes are sold without wire rope. However, we carry top quality wire rope assemblies optimally designed for use with our winches and cranes. The assemblies above are equipped with a swaged ball fitting and swivel hook (Enamel w/Galvanized rope or Stainless Steel with SS rope)

*Based on 3.5:1 design factor NOTE: 1/8" wire rope is available with a reduced load rating. Please contact the factory.

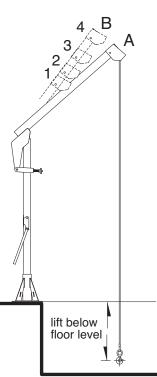




II ENSIGN



		elow ¹ oor			Rope eteter		Rope gth ³		Co	Winch nfigurati	ons	
Minimu	ım (B4)	Maximu	ım (B1)					M1	M2	М3	E2	E4
(ft)	(m)	(ft)	(m)	(in)	(mm)	(ft)	(m)					
0	0	5	1.5	3/16	5	20	6.0	Х	-	Х	-	Х
8	2.4	13	3.9	3/16	5	28	8.5	Х	-	Х	-	Х
16	4.8	21	6.4	3/16	5	36	10.9	Х	-	Х	-	Х
25	7.6	30	9.1	3/16	5	45	13.7	Х	-	Х	-	Х
40	12.1	45	13.7	3/16	5	60	18.2	-	-	Х	-	Х
55	16.7	60	18.2	3/16	5	75	22.8	-	-	Х	-	Х
70	21.3	75	22.8	3/16	5	90	27.4	-	-	-	-	Х
For lo	ong lifts (L	Jp to 240'	(73.1m))	please co	ontact fac	tory						
0	0	5	1.5	1/4	6	20	6.0	-	Х	Х	Х	Х
8	2.4	13	3.9	1/4	6	28	8.5	-	Х	Х	Х	Х
16	4.8	21	6.4	1/4	6	36	10.9	-	Х	Х	Х	Х
25	7.6	30	9.1	1/4	6	45	13.7	-	Х	Х	Х	Х
40	12.1	45	13.7	1/4	6	60	18.2	-	-	-	-	Х



IMPORTANT:

It is the owner or operator's responsibility to determine the suitability of the equipment to its intended use. Study all applicable codes, manuals and regulations. Be sure to read the Owner's Manual supplied with the equipment before operating it.



¹ Lift below floor level varies depending on boom position and base configuration. For longer lifts, please contact factory.

² Performance Characteristics are for standard products referred to in this manual. Non-standard products may vary from the original design. Contact Thern, Inc. for this information.

³ Wire rope assemblies include a hood and a swaged ball fitting to work with quick disconnect anchor on winches, cable spooler and wire rope keeper. 316SS wire rope is also available. Please contact the factory.

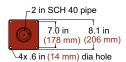
II ENSIGN 500

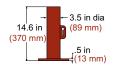
Ensign 500 on Pedestal Base Performance Ratings²

Boom Position	Load Rating		Hook	Hook Reach		Height
	(lb)	(kg)	(in)	(mm)	(in)	(mm)
A-1	500	226	17	431	74	1879
A-2	400	181	22	558	79	2006
A-3	300	136	28	711	87	2209
A-4	250	113	36	914	96	2438
B-1	500	226	14	355	76	1930
B-2	400	181	17	431	83	2108
B-3	300	136	22	558	91	2311
B-4	250	113	28	711	101	2565

¹ Lift below floor level varies depending on boom position and base configuration. For longer lifts, please contact factory.

Pedestal Base 5BP5



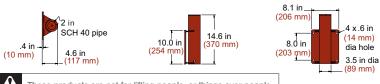


Flush/Wall Mount Performance Ratings²

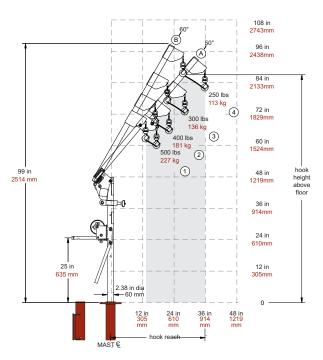
Boom Position	Load Rating		Hook Reach		Hook Height	
	(lb)	(kg)	(in)	(mm)	(in)	(mm)
A-1	500	226	17	431	60	1524
A-2	400	181	22	558	65	1651
A-3	300	136	28	711	73	1854
A-4	250	113	36	914	82	2082
B-1	500	226	14	355	62	1574
B-2	400	181	17	431	69	1752
B-3	300	136	22	558	77	1955
B-4	250	113	28	711	87	2209

¹ Lift below floor level varies depending on boom position and base configuration. For longer lifts, please contact factory.

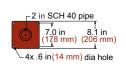
Wall-Mount Base 5BW5



120 in 3048mm 108 in 2743mm 96 in 2438mm 84 in 72 in 1829mm 60 in 1524mm 114 in 2896 mm height 48 in 1219mm above floor 36 in 914mm 24 in 2.38 in dia MASTÇ 12 in 305 mm 36 in 914 mm



Flush-Mount Base 5BF5







² Performance Characteristics are for standard products. Non-standard products may vary from the original design. Contact Thern, Inc. for this information.

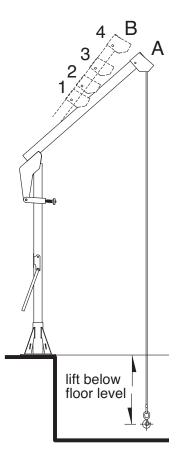
² Performance Characteristics are for standard products. Non-standard products may vary from the original design. Contact Thern, Inc. for this information.

II ENSIGN



Ensign 1000
Lift Below Floor ² Level
Lift Bolow 1

	Lift B Flo	elow ' oor			Rope eteter		Rope gth ³		Co	Winch nfiguration	ons	
Minimu	ım (B4)	Maxim	um (B1)					M1	M2	МЗ	E2	E4
(ft)	(m)	(ft)	(m)	(in)	(mm)	(ft)	(m)					
5	1.5	9	2.7	3/16	5	28	8.5	Х	-	Х	-	Х
13	3.9	17	5.1	3/16	5	36	10.9	Х	-	Х	-	Х
22	6.7	26	7.9	3/16	5	45	13.7	Х	-	Х	-	Х
37	11.2	41	12.4	3/16	5	60	18.2	Х	-	Х	-	Х
52	15.8	56	17.0	3/16	5	75	22.8	Х	-	Х	-	Х
67	20.4	71	21.6	3/16	5	90	27.4	Х	-	Х	-	Х
97	29.5	101	30.7	3/16	5	120	36.5	-	-	-	-	Х
For Io	ong lifts (L	Jp to 240'	(73.1m))	please co	ontact fact	tory						
5	1.5	9	2.7	1/4	6	28	8.5	-	Х	Х	Х	Х
13	3.9	17	5.1	1/4	6	36	10.9	-	Х	Х	Х	Х
22	6.7	26	7.9	1/4	6	45	13.7	-	Х	Х	Х	Х
37	11.2	41	12.4	1/4	6	60	18.2	-	Х	Х	Х	Х
52	15.8	56	17.0	1/4	6	75	22.8	-	-	-	_	Х
5	1.5	9	2.7	5/16	8	28	8.5	Х	-	Х	-	Х
13	3.9	17	5.1	5/16	8	36	10.9	Х	-	Х	-	Х
22	6.7	26	7.9	5/16	8	45	13.7	-	-	-	-	Х
1 Lift bolow	u floor lovel	varios dona	ndina on ho	om nocition	and base or	nfiguration	For longer	lifta placas	contact for	lon.		



IMPORTANT:

It is the owner or operator's responsibility to determine the suitability of the equipment to its intended use. Study all applicable codes, manuals and regulations. Be sure to read the Owner's Manual supplied with the equipment before operating it.





¹ Lift below floor level varies depending on boom position and base configuration. For longer lifts, please contact factory.

² Performance Characteristics are for standard products referred to in this manual. Non-standard products may vary from the original design. Contact Thern, Inc. for this information.

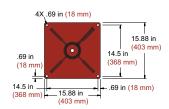
³ Wire rope assemblies include a hood and a swaged ball fitting to work with quick disconnect anchor on winches, cable spooler and wire rope keeper. 316SS wire rope is also available. Please contact the factory.

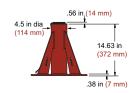
Ensign 1000 on Pedestal Base Performance Ratings²

Boom Position	Load Rating		Hook	Reach	Hook Height	
	(lb)	(kg)	(in)	(mm)	(in)	(mm)
A-1	1200	544	26	660	93	2362
A-2	1000	453	32	812	98	2489
A-3	800	362	39	990	104	2641
A-4	650	294	48	1219	112	2844
B-1	1200	544	22	558	97	2463
B-2	1000	453	26	660	103	2616
B-3	800	362	32	812	110	2794
B-4	650	294	39	990	120	3048

¹ Lift below floor level varies depending on boom position and base configuration. For longer lifts, please contact factory.

Pedestal Base 5BP10



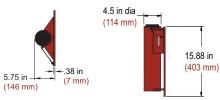


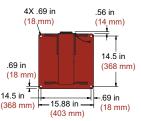
Flush/Wall Mount Performance Ratings²

Boom Position	Load Rating		Hook	Hook Reach		Height
	(lb)	(kg)	(in)	(mm)	(in)	(mm)
A-1	1200	544	26	660	79	2007
A-2	1000	453	32	812	84	2134
A-3	800	362	39	990	90	2286
A-4	650	294	48	1219	98	2489
B-1	1200	544	22	558	83	2108
B-2	1000	453	26	660	89	2261
B-3	800	362	32	812	96	2438
B-4	650	294	39	990	106	2692

¹ Lift below floor level varies depending on boom position and base configuration. For longer lifts, please contact factory.

Wall-Mount Base 5BW10

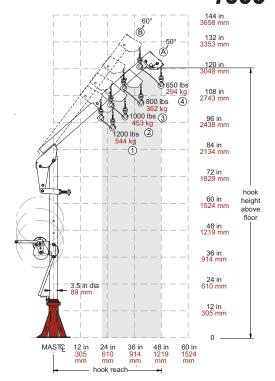


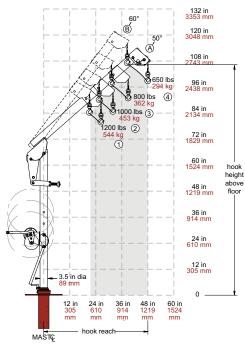




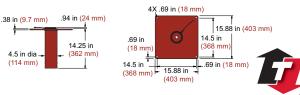
These products are not for lifting people, or things over people

II ENSIGN





Flush-Mount Base 5BF10



² Performance Characteristics are for standard products. Non-standard products may vary from the original design. Contact Thern, Inc. for this information.

² Performance Characteristics are for standard products. Non-standard products may vary from the original design. Contact Thern, Inc. for this information.

ACCESSORIES

ACCESSORIES FOR ENSIGN SERIES

	ACCE	330HIL3 F	OR ENGIGIN SERIES
ļ	Item	Part Number	Description
	Roller/Ball Bearing Comes Standard on 5PA10 (Not available on 5PA5)	5PT10BRG 5PT10BRG-S 5PT10BRG-S316 5PT10BRG-SS 5PT10BRG-SS316 5PT10BRG-X	Red electrostatic powder coat paint finish - Good 304 Stainless steel electro-polished finish for added protection - Better 316 Stainless steel electro-polished finish for a higher level of protection - Best 304 Stainless steel - For use with stainless steel base only 316 Stainless steel - For use with stainless steel base only 3-part epoxy paint (gray) finish for higher level of protection - Premium
	5PA5 Series Rotational Lock	5PA5LCK-S 5PA5LCK-S316 5PQ5LCKF-S 5PA5LCKF-S316	Optional 5PA5 rotation lock holds crane position at 30° increments For pedestal and wall mount bases - 304 Stainless Steel For pedestal and wall mount bases - 316 Stainless Steel For flush mount base - 304 Stainless Steel For flush mount base - 316 Stainless Steel
	Base Anchor	AN50A-5 AN50A-5S AN50A-5S316	4 Hilti® Zinc Plated Steel fasteners 1/2 X 5.50 STL KB-TZ 4 Hilti® 304 Stainless Steel fasteners 1/2 X 5.50 SST304 KB-TZ 4 Hilti® 316 Stainless Steel fasteners 1/2 X 5.50 SST316 KB-TZ
	Kit	AN62A-6 AN62A-6S AN62A-6S316	4 Hilti® Zinc Plated Steel fasteners 5/8 X 6.00 STL KB-TZ 4 Hilti® 304 Stainless Steel fasteners 5/8 X 6.00 SST304 KB-TZ 4 Hilti® 316 Stainless Steel fasteners 5/8 X 6.00 SST316 KB-TZ
	Drill-Drive	ED300-DW11	120 VAC, 11.5 amp, 300rpm drill-motor to power drive the hand winch. Only available for cranes configured with the M2 winch option. Includes 1-1/8" hex drive socket.
	KitS	ED300-DW06	CORDLESS KIT: 60 V Brushless Motor, 300rpm drill-motor to power drive the M2 hand winch option. Includes 1-1/8" hex drive socket.
	Cable Spooler	RW50	316 stainless steel reel winds up wire rope when detached from crane.
	Headache	HB10-12-25 HB10-25-38	Red Painted 10lb fits 3/16" to 1/4" Rope Red Painted 10lb fits 1/4" to 3/8" Rope
	Ball	HB10S-12-25 HB10S-25-38	Stainless Steel 10lb fits 3/16" to 1/4" Rope Stainless Steel 10lb fits 1/4" to 3/8" Rope
	Wire Rope Keeper	RK19-25S RK19-25S316	Stainless steel bracket attaches to base or other structure to hold free end of the wire rope when detached from the crane.

IMPORTANT:

It is the owner or operator's responsibility to determine the suitability of the equipment to its intended use. Study all applicable codes, manuals and regulations. Be sure to read the Owner's Manual supplied with the equipment before operating it.





OPTIONS

ADDITIONAL OPTIONS FOR ENSIGN SERIES

Thern offers a variety of additional options you can choose to enhance your davit crane.

FACTORY LOAD TEST

Upon request, Thern can test your crane prior to shipping, up to 125% of rated load.

EXTENDED 5-YEAR WARRANTY

Extend our standard 2-year warranty to 5 years.

• PE STAMP - PROFESSIONAL ENGINEER STAMP

Available upon request at time of order.

CE MARK

Available upon request at time of order, CE mark for products sold into the European union.

ATEX CLASSIFICATION

Specially rated for use in explosive settings. Available upon request at time of order.

POWER WINCH OPERATION

AC electric in any voltage. DC electric, hydrualic and pneumatic power winches available.

CUSTOM ELECTRIC CONTROLS

Thern can build the high quality controls you need to operate your equipment.

DRILL-DRIVEABLE WINCH

A worm gear hand winch is also available for operation with a 400 rpm max drill motor option.

LIMIT SWITCH

Add an emergency safety shut-off to ensure safe operation.

CUSTOMIZATION

Customization is available for almost all Them products and should always be performed by our engineers to assure the changes meet our stringent quality standards. Below are some of our more common customization requests. Only factory modifications are covered under warranty.

LONGER LIFT DISTANCES

Customized winch and crane configurations to accommodate longer lifts.

CUSTOM COLORS & FINISHES

Custom colors and finishes are available to match your unique application

EXTENDED BOOM AND MASTS

Thern can extend mast heights and boom lengths to fit your needs

RELOCATE THE WINCH

The winch can be relocated to fit confined spaces or height restrictions

SPECIAL BASES

Custom bases or mounting requirements can be manufactured to meet your unique situation



























Thern, Incorporated

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5712 Industrial Park Road Winona, MN USA
TF: 1-800-843-7648
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www.thern.com

Thern Europe

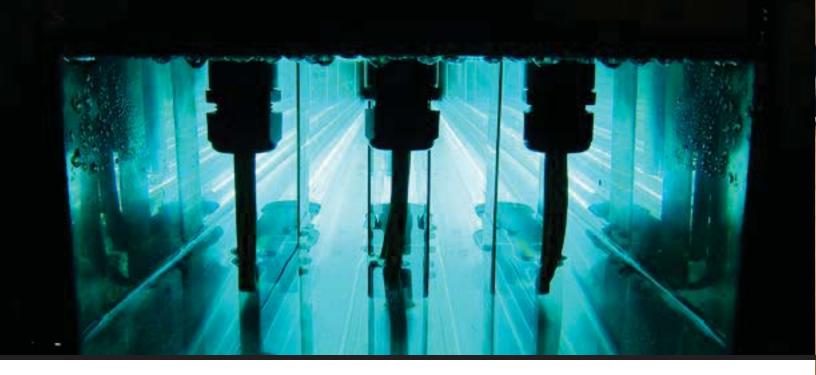
Bedrijvenpark Twente 454e 7602 KM Almelo The Netherlands Phone: +31-546-898-380 europe@thern.com

GLOW Series Wastewater



Horizontal Open Channel Ultraviolet Disinfection





GLOW Series

Our Company

Glasco has been manufacturing UV disinfection systems for over 50 years. Equipment is manufactured for a variety of markets, industries and applications in our NJ (USA) facility.

Founded in 1922, Glasco began as a New York City based metal equipment fabricator for the food and beverage industries. In the 1940's, the company was committed to supporting other manufacturers during the war effort. Our stated mission was to "build and design any handling equipment made of metal that will enable you to process or fabricate more expeditiously or more efficiently".

In the 1960's, Glasco introduced their first chambered UV system for an industrial application. Since then, we have manufactured tens of thousands of UV systems. The UV business developed in the industrial markets and grew into the municipal market in the 1980s.

Today, Glasco manufactures a wide range of UV systems for treating both clean and wastewater for residential, commercial, industrial and municipal market-places.

Systems integrate UV light to provide environmentally friendly disinfection. UVC light, defined as light emitted at wavelengths between 200 and 300 (254 is peak) nanometers (nm), is used as a means of disinfection by inactivating microorganisms, including waterborne diseases (pathogens). UV irradiation has been proven to be a fast, reliable, effective, economical, and green disinfection method and has been successfully applied worldwide for decades.

UVC lights targets the microorganisms' DNA. Exposure to UVC light prevents the microorganism from reproducing and cells that cannot reproduce cannot infect and are therefore harmless.



1. UV Disinfection

When wastewater pathogens are exposed to UV light, their cells become damaged and this damage inhibits reproduction. The UV light, produced by a special UV lamp, damages the cell's DNA and RNA and once damaged, they are unable to replicate. This physical process renders them harmless.

2. The Kill

The amount of damage is a result of the lamp's UVC intensity multiplied by residence time. The dosage is commonly referred to as microwatts and is often expressed as mJ/cm2. Dosages of 30,000 uWs/cm2 (30 mJ) are common for meeting a 200/100 ml discharge permit.

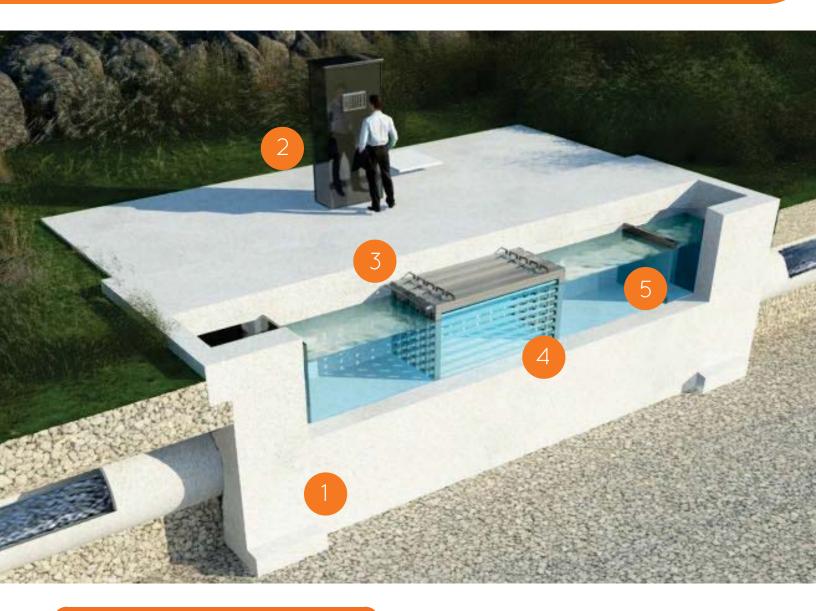
3. Calculating Dose

The two primary methods to calculate dose are biological testing (bioassay) and mathematical calculations using light physics (Point Source Summation Method aka UVDIS). Both offer end-users with information that is important in system sizing. Each method takes into account flow rate, water transmission, lamp type and # of lamps.

4. Why use UV?

UV disinfection is a well accepted method for treating wastewater. The main benefits: a green technology (no chemicals), short residence time and the technology has matured over the last 40 years. UV disinfection produces no harmful by-products and will work on a wide range of effluent quality.

Horizontal Plant Overview



UV channel layout and level control devices

Horizontal open channel UV systems will be installed in a pre-packaged stainless steel or pre-poured concrete channel. Systems need to be designed with level control systems. Level control is necessary to keep the UV lamps submerged regardless of flow (from 0 to peak). There are three (3) types of level control systems: finger weir, counter-balanced level gate and downward opening gate.

There are pros and cons for the three (3) options. The most common and economical is a fixed serpentine finger weir. For higher flow rates, a counter-balanced gate can be considered for its smaller footprint and lower headloss. A downward opening gate requires a level sensing system and is the more complicated of the control systems.

- 1 Concrete Channel
- 2 BCC / SCC
- 3 Junction Box
- 4 Modules
- 5 Level Control

Horizontal Operation

Modules are lowered into a stainless steel support system. Once in place, the module's utilities (power, data and air) are connected to the Ballast Control Center (BCC) and System Control Center (SCC) directly or through a junction box.

As wastewater enters the channel, banks of modules will turn ON in relation to a flow signal. To aid in lamp life and energy savings, the system can be designed to dim the UV lamps based on a flow signal.

The quartz sleeves and UV sensor are automatically cleaned on a periodic basis. The sleeves are wiped to prevent build-up from adhering to the quartz.

Throughout the year, operators inspect the system to ensure that the lamps are functioning and that they are still producing actual UV light. Lamp Out and Low UV output indicators and alarms will direct operators to the service issue.

Modules are removed for service, cleaning or for seasonal storage.

Ballast Control Center (BCC)

Modules are connected to a Ballast Control Center (BCC). This remote enclosure houses the ballasts, electronics, electrical devices and controls in a modified NEMA 4x housing.

BCC's come in many configurations and are designed for harsh wastewater environments. These range from smaller thermoplastic with Lexan window kits to free standing stainless steel with air conditioners, PLC controls and touchscreen interface.

All BCCs can be located up and away from the channel. Depending on the requirements, the BCC can be located up to 90 feet from the channel.



Automatic Quartz Cleaning System

Modules may come with an automatic quartz cleaning system. The pneumatically driven piston uses a quick stroke approach to remove materials from the sleeves before they have the ability to build up and foul. System can use a standalone air compressor or plant supplied air.

Ultraviolet Monitoring

Modules incorporate a UV light sensor and monitoring system. The sensor is placed in its own dedicated quartz sleeve, which is cleaned as part of the automatic quartz wiping system. The sensor reads 360 degrees of UVC light and provides an output from 0-100% or uW/cm2.



Lamp and System Maintenance

In order to perform preventive and yearly maintenance, the horizontal module needs to be removed from the channel. Once removed, operators need to undo the quartz o-ring seal, remove the quartz sleeve, remove and then replace the lamp and then re-quartz for return to operation.

Controls and Displays

At a minimum, each horizontal system will display lamp operating status, run time and UV output. PLCs can be integrated for remote monitoring on a lamp by lamp basis, lamp dimming, flow pacing based on a 4-20 mA signal from plant flow meter and automatic operation.

1 GLOW-300 (30" - 80 Watts)

Treats wastewater flows up to **150,000 GPD.** Called packaged plants, systems comes with stainless steel channel, transition boxes and built in weir. Electronics are remote in a NEMA 4x enclosure. Lamp: Low pressure **high output 80 watts**.

SUNLIGHT4XHO (60" - 155 Watts)

Treats wastewater flows up to **2.0 MGD**. System is biologically validated. Lamp technology: Low pressure **high output 155** watts.

Validated under US EPA ETV
Environmental Tech Verification

2 GLOW-5000 (60" - 155 Watts)

Treats wastewater flows up to **2.0 MGD**. System is biologically validated. Lamp technology: Low pressure **high output 155 watts**.

4 GLOW-6000 (60" - 320 Watts)

Treats wastewater flows up to **10 MGD**. Using state of the art amalgam UV lamp technology, the system has a 15 year track record and has been biologically tested. Lamp technology: Low pressure high intensity **amalgam 320 watts**.

Horizontal Models

Horizontal UV disinfection systems have been the most widely installed type of UV system in the world.

While wastewater plants have many available configurations (vertical open channel, chambered or Telfon tube (FEP), horizontal systems have been our most widely installed product.

While designed for unlimted flows, we believe that larger flows are better suited for vertical amalgam systems.

Glasco has installed hundreds of horizontal systems and continues to be a major supplier for plants < 1 MGD.

Typical Set Up

- Stainless steel or pre poured concrete channel
- · Horizontal modules
- Remote NEMA 4x enclosures
- Level control (weir, flap gate or downward gate)
- · Optional automatic air driven quartz cleaning
- UV monitoring
- · PLC control
- Select models bioassayed at UV Validation and Research Center - Johnstown, NY
- Hydraulically tested and profiled
- Environmental Technology Verification (ETV) test performed for NSF International (NSF) and the US Environmental Protection Agency (US-EPA)



GLOW 300	
Flow rate range	up to 150,000 GPD
Channel	Stainless (optional concrete)
Level Control	Stainless weir with drain
Lamps	Low Pressure HO
Watts per lamp	85
Voltage	120-277 50/60 Hz
Electrical enclosures	Remote NEMA 4x Fiberglass
Ballasts	Electronic
UV Monitoring	0-100% (optional 4-20 mA)
Quartz sleeve cleaning	Optional Automatic

The **GLOW 300** is our offering for lower flow rates (<150,000 US GPD) and is designed to treat a 6" water level. The system has been designed for smaller packaged wastewater treatment plants.

Systems are good for smaller towns, industries, mobile home parks and new developments.

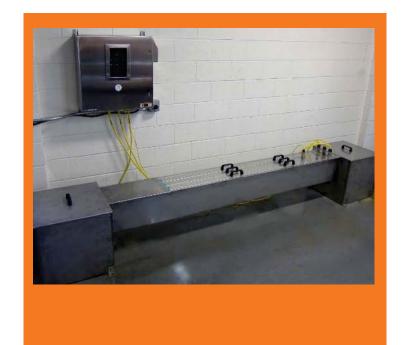
The **GLOW 5000** is our offering for mid sized waste water plants exceeding 150,000 GPD. The system has 15 production years and hundreds of world wide installations.

Systems can be provided with pre-packaged stainless steel channel, but can also be installed in pre-poured concrete channels.

GLOW 5000	
Flow rate range	Up to 2 MGD
Channel	Stainless (optional concrete)
Level Control	Stainless weir with drain
Lamps	Low Pressure HO
Watts per lamp	155
Voltage	120-240 50/60 Hz
Electrical enclosures	Remote NEMA 4x Stainless
Ballasts	Electronic
UV Monitoring	0-100% (optional 4-20 mA)
Quartz sleeve cleaning	Optional Automatic



SUNLIGHT H-4XE-HO (typical 200/100 ml plant)					
Flow rate range	1.0 MGD / Bank				
Channel	Stainless steel or concrete				
Level Control	Stainless weir with drain				
Lamps	Low Pressure HO				
Watts per lamp	155				
Voltage	120-240 50/60 Hz				
Electrical enclosures	Remote NEMA 4x Stainless				
Ballasts	Electronic				
UV Monitoring	0 - 100% with 4-20 mA				
Quartz sleeve cleaning	Optional Automatic				



The **SUNLIGHT H-4XE-HO** is a sixteen (16) lamp biologically validated low pressure high output UV disinfection channel system that treats 1 MGD (for a 200/100 ml) and is designed to treat a 12" water level.

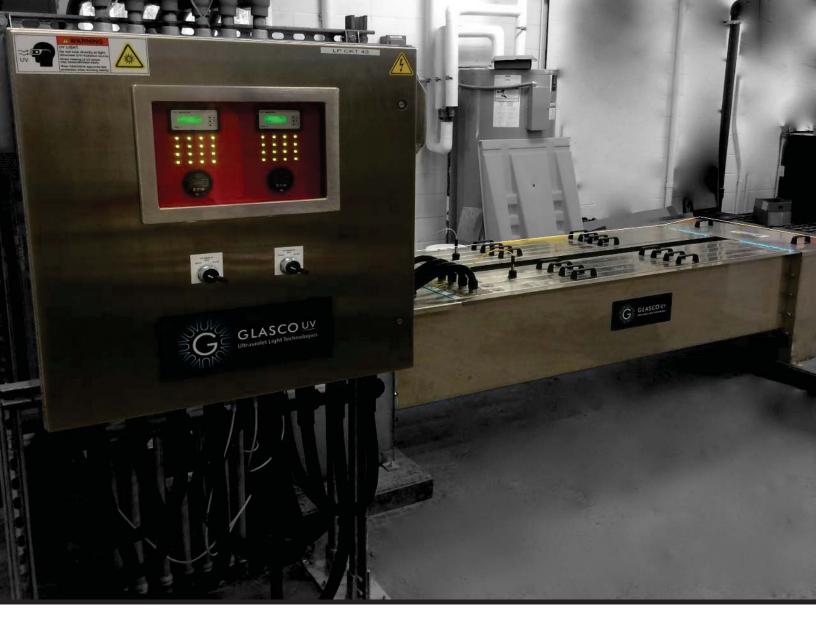
The system has been validated in cooperation with the NSF and US EPA's Environmental Technology Verification Program (ETV). The **GLOW 6000** large flow horizontal amalgam UV disinfection system is designed for large plants.

Using state of the art lamp, ballast and monitoring equipment, the GLOW 6000 is a high tech UV disinfection system.

The system uses various plant parameters to dim the lamps in relationship to the flow. This allows for energy and lamp conservation.



GLOW 6000	
Flow rate range	Up to 10 MGD
Channel	Concrete
Level Control	Weir, Flap Gates, Gate
Lamps	Low Pressure Amalgam
Watts per lamp	320
Voltage	208-240 V 50/60 Hz
Electrical enclosures	Remote NEMA 4x Stainless
Ballasts	Electronic
UV Monitoring	0 - 100% with 4-20 mA
Quartz sleeve cleaning	Automatic



Installations

Depending on the Horizontal model, the ballasts and other electronics will be remotely located in a stainless steel or thermoplastic electrical enclosure.

For the higher powered 320 watt amalgam systems, the sophisticated electronics are maintained in remote stainless steel air-conditioned enclosures. For projects that are concerned about flooding, remote ballasts can be beneficial.

A dedicated air compressor may be provided to run the automatic quartz cleaning. A hoist may be incorporated to remove the modules for seasonal disinfection or for servicing.

Experience

- 1999 installed first low pressure high output system.
- 2001 installed first 320 watt horizontal amalgam
- 2004 installed 36 MGD amalgam system.
- 2005 installed 100th wastewater system
- 2007 installed first 450 watt horizontal amalgam.
- 2009 NSF EPA ETV Bioassays conducted.
- Worldwide installation base with horizontal systems installed in North and South America, Europe and Asia.





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info@glascouv.com glascouv.com







Operator Training

www.glascouv.com

MILTON DE TRAINING

System: GLOW-6000-2-8X x 2 Banks

System is a low pressure high intensity amalgam horizontal UV system with automatic quartz sleeve cleaning and PLC control.

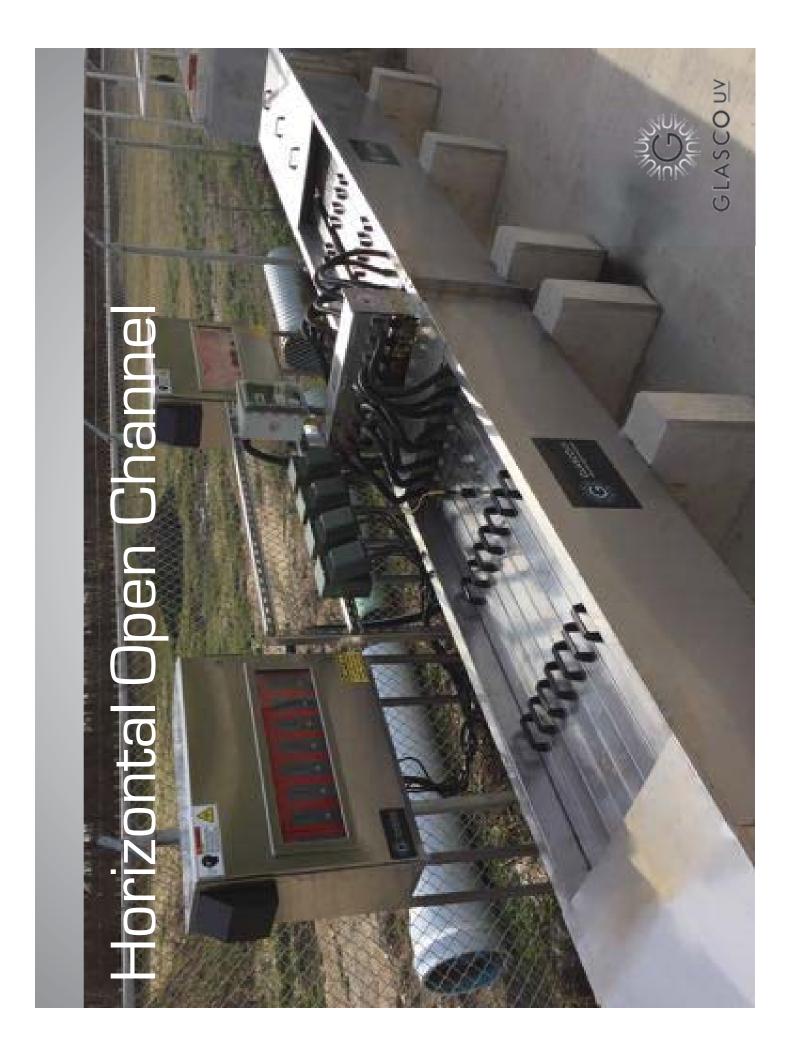
16 lamps 32 lamps per bank Low pressure amalgam Automatic air driven <20/100 ml 1.5 MGD 65% **UV Transmission of water** UV lamps per module **UV Lamp technology** Modules per bank Discharge permit Quartz cleaning Average day Channels Max day Banks

Safety // /



- and in the channel. Always power off and lock out Electricity is present in the Ballast Control Center system. Serious injury or death.
- Lamps and quartz if broken can be sharp. Wear gloves.







Example of a similar but Concrete Channel By Others



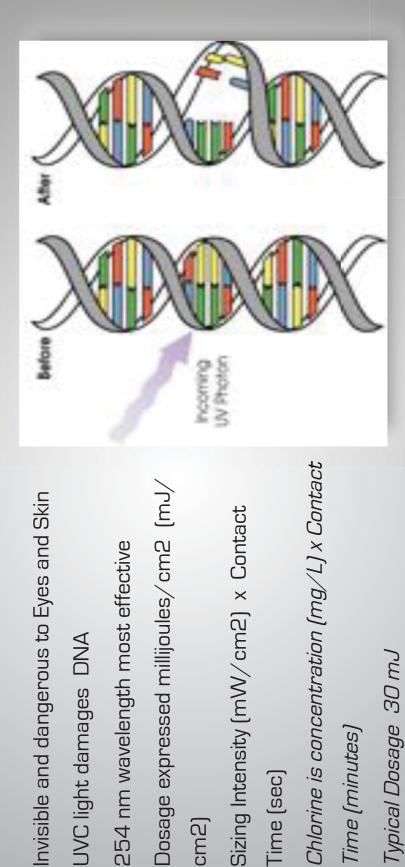


"Examples of another site

"Mounting Brackets and Weir are mounted in channel

About UV Light Disinfection

- Invisible and dangerous to Eyes and Skin
- UVC light damages DNA
- 254 nm wavelength most effective
- Dosage expressed millijoules/cm2 [mJ/ cm2)
- Sizing Intensity [mW/cm2] x Contact Time (sec)
- Typical Dosage 30 mJ Time (minutes)





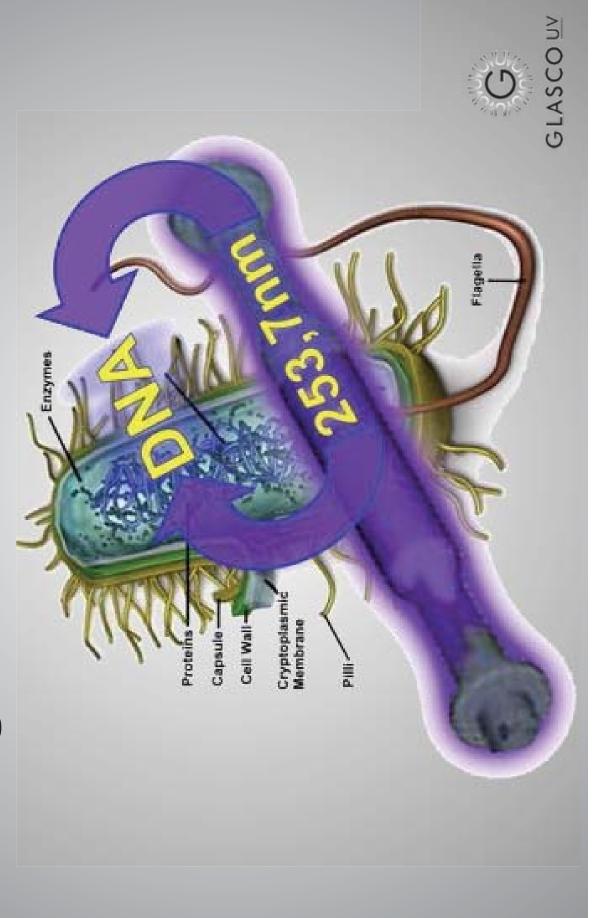
Safety // /



- UV light is dangerous and you must protect your eyes and skin
- and in the channel. Always power off and lock out Electricity is present in the Ballast Control Center system.
- Lamps and quartz if broken can be sharp. Wear gloves.



UV Light Disinfection



Microorganisms



- Hepatitis Poliovirus
 - Coxsackie
- Rotavirus

Legionella Virbrio Cholerae

Salmonella

E-Coli

Fecal Coliform

- Giardia Cryptosporidium



What Comprises System?

- Major Components
- Channel brackets and level control
- Horizontal Modules holding UV lamps
- Quartz sleeves to protect lamps
- Remote electronics that power/control UV lamps
- UV monitoring sensor
- Automatic quartz cleaning system (air driven) G



UV Lamps

- Low pressure
- High Intensity Amalgam -320watts
- 90%+ output in 254 nm
- 12,000 hours
- Rated in watts
- Converts to UVC watts (35%)
- Solarizes (darkens) end of life



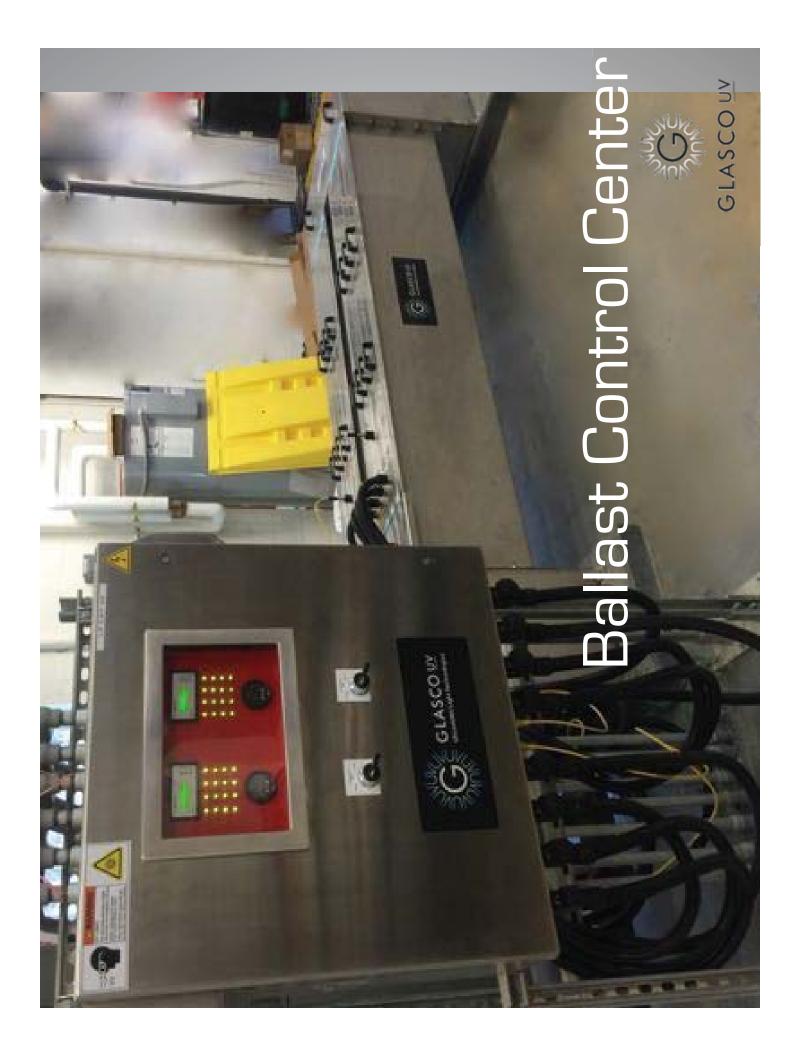
Quartz Sleeves

- GE Type 214 material
- Protects lamp
- Allows UVC light to pass through
- Can foul with minerals









Ballasts

- Mercury (Hg) Vapor Lamps require a ballast to operate
- Converts line current into the proper voltage, amperage and waveform
- Provides proper warm up and cool down
- Built in protection and controls (input power quality correction, end of lamp life, dimming)
- Needs to be kept cool and dry
- Life >10 years
- Ballast Control Centers house ballasts
- Lamps are dimmed by a controller





UV Monitoring

- A UV Sensor monitors output of a lamp offer lifetime (new 100%)
- Put in its own quartz sleeve
- Sensors are auto cleaned
- Low UV reading may mean
 (lamps aging, fouled quartz or changes in wastewater quality)





E-Coli (bacteria) dosages

90% [1 log]

1.5 mJ

99% (2 log)

2.4 mJ

99.9% (3 log)

4.1 mJ

99.99% [4 log]

5.6 mJ

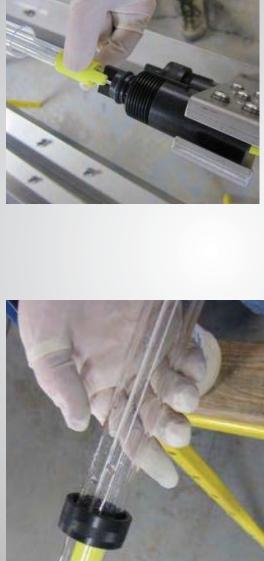
MOST Systems Sized at 30 mJ aka microwatts aka

Millijoules





Quartz Installation









UV Sensor Installation







Ballast Control Center





Start Up Checklist

- Prior to Start Up:
- Verification that components have been received
- Verify that lamps and quartz sleeves are not damaged
- Install UV lamps and Quartz sleeves
- Install UV sensor
- Verify that Ballast Control Center power is accurate and Transformer installed properly
- Power On UV System
- Operate system breakers for individual modules
- Check air flow in BCC



Start Up Checklist (2)

- Check to see if all lamps are working via PLC or lamp indicators
- Check to see that system is recording hours
- Check to see UV monitors output
- Calibrate with new lamps in the wastewater to 100%
- Operate the automatic cleaning system
- Calibrate with new lamps in the actual wastewater to 100



Training Checklist

- Training:
- How to install lamps and sleeves
- Preventing seal failures
- How to Power On/Off system as well as other breakers and disconnects
- How to check the fans or air handling system
- Check compressor for oil and maintenance
- How to operate the wiper (proper pressure and air cleaning)
- How to re-calibrate the UV sensor



How UV Systems are Sized

Basic information required:

Peak Flow

Peak instant flow rate (avg and min)

UVT%

UV % transmission of effluent (typ 70-99%)

TSS

Total Suspended Solids (<30 mg/l)

Biological Oxygen Demand (<30 mg/l)

BODS

Iron Level (<0.3 mg/)

Count in (???,??? mpn/100 ml) - Usually unknown

E

Influent

??/100 ml

Discharge Permit

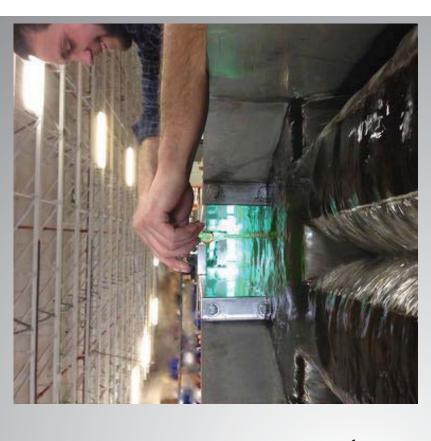
Location

(indoor or outdoor)



How To Size

- Methods for sizing
- Bioassay (biology)
- Systems biologically tested
- Always used for municipal drinking water



- EPA Point Source Summation Method UV DIS (light physics)
- Uses flow rate, UVT, lamp spacing, lamp output, end of lamp life, fouling
- CON: UV manufacturer's can overstate their lamp output and the lamp life. This makes it harder for engineers to design specifications





For further information

info@glascouv.com www.glascouv.com

DATA SHEET

(Part # P-2000FS) FACE-SHIELD

UV light is harmful to your eyes and skin. Exposure to UV light can cause blindness or other permanent damage.

If you work safely, you will not encounter problems. We REQUIRE operators to use protective eyeware and faceshields when performing work on the system.

The faceshield described below are good for UV systems. This particular model has a brand name of ELVEX, but others are commercially available.

Color: Clear

Material: Lexan Polycarbonate

Thickness: 0.07 inches

Heat Tolerance: up to 265 F

UV Protection: 99.9%

Standard: ANSI Z87.1-2003

requires protective glass

es under face shields.



Safety Data Sheet	revised: 05.08.2011
,	Rev. Nr.: 2
trade name:	Ident Nr.:
Ultraviolet wave emitter	
filled with mercury lesser 2.5 %	

Informations about manufacturer/supplier

Heraeus Holding GmbH Reinhard-Heraeus-Ring, D-63801 Kleinostheim D – 63801 Kleinostheim

contact person: Mr. Köhler phone: +49-(0)6181-355607

Composition/information on ingredients

Chemical characterization (substance)

Emitter consistent of quartz glass filled with small amounts of mercury (< 2.5 %).

CAS-No.	Compo	Content [%]
7439-97-6/	Mercury	< 2.5

Hazard identification

Hazard information

The emitter is not dangerous under regular conditions.

Overexposition of radiation to skin or eyes causes burns.

Mechanical destruction may cause danger by splinter of glass and liberation of mercury. Mercury is harmful to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

Liberated mercury may cause chronic toxic effects to human (see chap. "Toxilogical information").

First-aid measures

General information

Burns caused by overexposition of radiation or severe injuries caused by splinter of glass should be treated by a physician.

revised: 05.08.2011
Rev. Nr.: 2
Ident Nr.:

Accidental release measures

Personal precautions:

If the emitter is mechanical destroyed amounts of mercury can be liberated. In this case provide sufficient air exchange and/or ventilation in working rooms.

Avoid any contact with mercury.

Balls of mercury take up with a special mercury tongs and put it in a closable containment out of plastic material.

Very small balls which can not take up with the tongs grit with zinc powder or a special mercury absorber to bind the mercury. These materials eliminate very accurately from the surfaces and put it in a closable containment as described before.

Mercury and the materials with the fixed mercury forward to disposal in accordance with locally valid waste-disposal-regulations.

(For the danger caused by vapours of mercury see chap. "Toxilogical information".)

Environmental precautions:

Mercury do not allow to enter surface and ground water, the sewage system or soil.

Methods for cleaning up/taking up:

Clean up the decontaminated surfaces with wet cleaning rags. The rags forward to disposal as described before.

Further information:

Handling and storage

Handling

Advice on safe handling

Avoid mechanical stress (danger of broken glass). Ensure adequate ventilation at the working place.

Storage

Requirements for storage rooms and vessels

Storage must be made according to legal regulations.

Safety Data Sheet	revised: 05.08.2011
,	Rev. Nr.: 2
trade name:	Ident Nr.:
Ultraviolet wave emitter	
filled with mercury lesser 2.5 %	
•	

Exposure controls / Personal protection

Advice on limits

Japan: OEL: 0.05 mg/m³ (Mercury) mg/m³ (Mercury) TWA: 0.1 Australia: mg/m³ (Mercury) 0.005 Russia: TWA: mg/m³ (Mercury) France: VME: 0.05 MAK: 0.1 mg/m3 (Mercury) Germany: USA: REL: 0.05 mg/m³ (Mercury) mg/m³ (Mercury) Mexico: TWA: 0.05

Personal protective equipment

Respiratory protection: If mercury is liberated and ventilation of the working

place is not sufficient use filter with

combination Hg-P3.

Hand protection: If glass is broken use cut resistance gloves.

Eye protection: If glass is broken use eye protection.

Body protection: ---

Protective and hygiene measures: Skin contaminated with mercury wash immediately

with soap and plenty of water.

Contaminated clothes change immediately.

Physical and chemical properties

<u>Appearance</u>

Form : Solid
Colour: Colourless
Odour : Odourless

Aspects relevant for security

Test method

Melting point : appr. 2000 °C (quartz glass)

Boiling point : not applicable Flash point : not applicable solubility in water : insoluble

Toxicological information

Safety Data Sheet	revised: 05.08.2011
	Rev. Nr.: 2
trade name:	Ident Nr.:
Ultraviolet wave emitter	
filled with mercury lesser 2.5 %	

Acute toxicity

No acute toxicity is caused by mercury.

Chronic toxcicity

Inhalation of mercury vapour for a longer period of time can damage the central nerve system. Symptoms are: trembling of muscles, degeneration of muscles, emotional instability, lack of concentration, impaired vision.

(Important! Liberated mercury remove completely as described in chap. "Accidental release measures" .)

Ecological information

Mercury is harmful to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

Advice on disposal

Disposal

Dispose the product according to legal regulations.

Diposal of the materials which are generated in the case of a broken emitter (see chap. "Accidental release measures") must also be done according to legal regulations.

Disposal of packing

Packages which are not contaminated with mercury should be recycled.

Transport information

Contact the manufacturer/ supplier for the mercury content of the emitter.

Land transport

Transportation must be done according to the legal regulations of the concerned countries.

Marine transport (IMDG)

No dangerous good in the sense of IMDG if mass of Hg is lesser 1 Kg per emitter (chap. 3.3.1; special provision: 941).

Air transport (IATA/ICAO)

No dangerous good in the sense of IATA if mass of Hg is lesser 100 mg per emitter and additionally the quantity of mercury per package is 1 g or less (chap. 4.4; special provision: A69).

Safety Data Sheet	revised: 05.08.2011
	Rev. Nr.: 2
trade name:	Ident Nr.:
Ultraviolet wave emitter	
filled with mercury lesser 2.5 %	

Otherwise following classification is correct:

UN-No.: UN 2809

Proper Shipping Name: MERCURY CONTAINED IN MANUFACTERED ARTICLES)

Main risk: 8

Subsidiary risk: --Packing group: ||||
Label: 8

Further information

The data given here is based on today's stand of our knowledge and experience. The purpose of this Safety Data Sheet is to describe the product in terms of their safety requirements. The data does not signify any warranty with regard to the products properties.

Updated Education Program Plan for Massachusetts Consumers and Municipalities For the Proper Use and Disposal of Mercury-added Lamps

Submitted By

National Electrical Manufacturers Association



On Behalf Of Participating Manufacturers of Mercury-Containing Lamps

PURSUANT TO

An Act Relative to Mercury Management
The Commonwealth of Massachusetts
Chapter 190 of the Acts of 2006, Section 6J

Updated January 25, 2012

Program Participants

This Lamp Recycling Education Program Plan is developed and supported by members of the National Electrical Manufacturers Association (NEMA) Lamp Section and non-Lamp Section companies who manufacture or import mercury-containing lamps that are sold in Massachusetts and who have agreed to participate in supporting the Program ("Program Participants"). Other manufacturers of mercury-added lamps that are not members of NEMA have been invited to participate as well.

The following companies are the current Program Participants in this Lamp Recycling Education Program:

- AAAA World Import Export, Inc.
- Advanced Lighting Technologies, Inc./Venture Lighting
- Bulbrite Industries, Inc.
- Casio, Inc.
- Do It Best Corp.
- Earthtronics
- Eiko Limited
- Energetic Lighting, Inc.
- EYE Lighting International of N.A., Inc.
- Fanlight Corporation, Inc.
- Feit Electric Company, Inc.
- GE Consumer & Industrial Lighting
- Globe Electric Company, Inc.
- Greenlite Lighting Corp.
- Halco Lighting Technologies
- Light Sources, Inc.
- Lights of America, Inc.
- Litetronics International, Inc.

- Lumiram
- Maxlite, Inc.
- OSRAM SYLVANIA, Inc.
- OttLite Technologies, Inc.
- Overdrive Lighting/Global Consumer Products
- Panasonic Corporation of North America
- Philips Electronics N.A. Corp.
- P.Q.L., Inc.
- Ruud Lighting, Inc., a subsidiary of Cree Inc.
- Satco Products, Inc.
- SLi Lighting
- Sunshine Lighting
- Technical Consumer Products, Inc.
- Ushio America, Inc.
- Verilux, Inc.
- Westinghouse Lighting Corp.

This Lamp Recycling Education Program ("the Program") remains open to other mercury-added lamp manufacturers who desire to participate.

I. Overview of Updated Lamp Recycling Education Program

The overall goals of the Updated Lamp Recycling Education Program continue to be:

- Increase the number of mercury containing lamps recycled in Massachusetts
- Comply with applicable Massachusetts regulations
- Build on prior years' efforts
- Expand public awareness of the legal obligation to properly dispose mercury containing lamps

To date, the Program has produced educational materials in the form of posters, brochures, web pages, articles for publication, and other items aimed at informing business owners, facility managers, state and local government offices, lamp distribution channel partners (wholesale and retail), lighting installers, the solid waste industry, lighting specifiers, and households and consumers. Specifically, the program has supplied information concerning:

- The economic and environmental benefits of mercury-added lamps
- The hazards mercury can pose to human health and the environment
- Proper disposal and recycling methods for mercury-added lamps
- Where and how to recycle mercury-added lamps

These educational materials will continue to be deployed as part of the Program.

Entering the fifth year of this effort, manufacturers are building on lessons learned in previous years. The majority of growth in collections in previous years has come from commercial and industrial generators of waste lamps. However, as the installed base of fluorescent lamps ages in homes, targeting retail consumers will become more important.

II. Updated Lamp Recycling Education Program Plan Activities

A. Update of <u>www.lamprecycle.org</u>

1. Activity Description

The web site www.lamprecycle.org is an important element of manufacturers' national and state specific outreach efforts. The site already generates significant traffic. NEMA member companies, as well as virtually all other lamp manufacturers, print the URL www.lamprecycle.org on the packaging of every mercury-containing lamp they sell, which leads to a significant portion of site visits. More than 60% of visitors go directly to the site, as opposed to using search engine or clicking on a link found at another web address.

Updates for the site in 2012 will be based on continued monitoring of information for further improvements of recycling.

2. Schedule

Upgrades to the web site will be on a rolling basis throughout 2012. Marketing and promotion of the site will continue to be an ongoing activity.

B. Advertising Campaign

1. Activity Description

The Program plan for 2012 includes web display, pay per click, outdoor, local, event, and social advertising. The advertising campaign will focus on raising consumer awareness of the need to properly dispose mercury-added lamps and provide direction to more information (*e.g.* www.lamprecycle.org) for information on free or low-cost options for disposing waste mercury lamps.

• Web

Pay Per Click

Using Pay Per Click (PPC) in an education/awareness campaign such as this a unique benefit. PPC advertising is traditionally used to drive web visits to a particular site. While we will allot money for click-through's to lamprecycle.org, more impressions will be generated due to the message being visible to the general public, without them clicking on the ad.

These efforts will be geographically focused to drive the message to the largest percentage of the population.

Display

The program will again use display advertising as part of the campaign. The approach is to blitz a media outlet for approximately 30 days. (this advertising is based on number of impressions; the campaign would run for 30 days or longer if the minimum number of impressions was not reached in 30 days).

Advertisements will be placed in the www.boston.com, www.telegram.com and www.wickedlocal.com. This campaign will cover the Boston designated market area (DMA) and central Massachusetts (Worcester County).

This method is used to remind readers who have become aware through ads of past years, as well as introducing new readership to the message, over a focused 30 days.

Radio

The Program will develop a public service announcement (PSA) for radio to promote the availability of lamp recycling locations throughout the state. Radio PSAs can geographically target Massachusetts residents and quickly inform them about their legal

obligation to recycle mercury-containing lamps and where they can locate additional information (e.g. www.lamprecycle.org).

NEMA will request a letter of support for the PSA from the Governor or another state official or agency as this will increase the likelihood of the PSA garnering airtime.

Outdoor

The Program again plans to utilize the Commuter Rail Platform Advertising. This large (46"x60" poster), colorful media form draws the attention of daily commuters. NEMA has been advised that this form of advertising will put the recycling message in front of an estimated 3.4 million Commuter Rail riders over a four week period.

2. Schedule

NEMA plans to arrange for the placement of rail platform, web-based, and radio ads in the 2nd quarter 2012.

C. Local Media/Community/Business Outreach

1. Activity Description

The Center for EcoTechnology (CET), a non-profit organization based in Pittsfield, MA, will be contracted by NEMA on behalf of the Program Participants to aid in providing media outreach and linkages to local business sectors to promote lamp recycling, primarily in Western, MA. The CET activities that the Program plans to support include:

- Identify and promote existing hardware store recycling programs, while creating press releases and attending local community events to make public aware of these opportunities. Work with existing municipal outreach mechanisms to include the retail take-back option This also includes promoting use of the retail collateral available on the lamprecyle.org website (Sec. F below).
- Follow-up with participants of "Green Business" workshops previously conducted by CET to disseminate recycling message and provide technical assistance on establishing a recycling program.
- Identify media opportunities including inserts in local papers and/or America Recycles Day.
- Coordinate with Covanta Energy to engage partnerships at their facilities across the Commonwealth.
- Work with Municipal Health and Building Departments.

- Work with local colleges and universities to engage the student population and identity collaborative methods for encouraging lamp recycling.
- Give technical assistance to local businesses, smaller hauling companies, and their customers.

The Program plans to continue its ongoing efforts to work with counterparts in other trade associations such as the Associated Industries of Massachusetts to spread the message to their respective memberships.

2. Schedule

The timing or certainty of these earned media placements and engagements with third-parties is not readily predictable and outside of CET's control. CET was retained in early 2012 and the planned program will be rolled out on a schedule mutually agreeable to both CET and NEMA over the course of 2012.

D. Local Events

1. Activity Description

The Program plans to participate in public events in Massachusetts. The objective is to raise awareness among various groups of the legal obligation to recycle mercury-containing lamps and various mechanisms available in Massachusetts to comply with law. The contract with CET will add much support to the local effort of the event listed below.

Where applicable, the NEMA recycling brochure and poster (developed in 2008) will be distributed.

2. List of Potential Events/Venues

Event	Audience	Location	Date
EarthFest	Consumers	Boston	May, 2012



Appendix B5 -

Forcemain and Lift Station Sizing

PUMPING STATION & FORCE MAIN CALCULATION SHEET					0				* chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://ww						lps
AIN CALC					* Ductile iron pipe			hL (ft/100ft)		15.532	4.1/0	0.662	0.323	1667	10.69
FORCE M					and Age			Velocity (fps)	38.05	18.36	7.10	5.02	3.74	Design Flow (gpm)	Velocity (V) =
ATION &	pdfi pdfi	pd6 pd6		Flow is	Pipe Material			riow Kate (cfs)	3.71	3.71	3.71	3.71	3.71		for a
C NING ST/	.5,000 302	2,400,000	1.28		pendent upon			A - Sectional Area (sqft)	0.10	0.20	0.52	0.74	0.99	!	7.98
	A. Calculate Peak Design Flow: Qavg = 1,87	Qpeak =	Peak Factor	Flow Rate (gpm) Flow Rate (cfs)	C-Factor * Dependent upon Pipe Material and Age	e Diameters:	Actual Inside	(in) Area (sqft)	4.23	6.09	9.79	11.65	13.50		Choose Pipe Diameter (in)
INFLUENT	A. Calculate			1667 3.71	140	Analyze Pipe Di		Diameter (in)	4.00	0.00	10.00	12.00	14.00		Choose Pipe
- 0		8 6 7 7 7	13 13 15	16	18 19 20 21			24	25	26	28	29	31	33	35 36 37 38

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39	Pump Station Friction Losses	iction Los	ses					*Normally use 4 in FM	
40	ď	otomoio lo	r of Division	Actual Diamater of Dining within Dumn Station (inches)	(aodod) doit	*			
42	,	מופפ))	(6011011)				
43	43 Fittings		Size (inch)	Leq (ft)	Qty.	Leg (ft)			
44	44 Reducer 2/3		9	5	1	2			
45	45 Plug Valve		9	3.2	1	3.2	two lines, x		
46	46 Entrance Losses	•	9	0	0	0	1		
47	90 deg. Elbow		9	16.7	2	33.4	ı		
48	Check valve		9	50.5	-	50.5	one line		
49	Tee (branch)	•	9	32.7	2	65.4	1		
20	50 45 deg bends	•	9	7.7	0	0	1		
51	T (flow thru)		9	0	0	0			
52	52 Pipe Length	•	9	-	35	35	length		
53		•			Total Leq (ft)	192.5	1		
24							1		
55	Force Main Fricti	ion Losses	Ø						
26	56								
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29									
9	60 Fittings	•	Size (inch)	Leg (ft)	Qty.	Leg (ft)			
61	61 Reducer 2/3		7.98	0	0	0			
62	Gate Valve		7.98	5.3	2	10.6			
63	63 Entrance Losses		7.98	0	0	0			
64	90 deg. Elbow		7.98	21	2	42			
65	Check valve		7.98	15	0	0			
99	Tee (branch)		7.98	0	0	0			
67	45 deg bends		7.98	10.6	4	42.4			
68	68 Wye (flow thru)		7.98	0	0	0			
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71									
72	Static Head Loss:	اة:							
73									
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76	67	"Pump Off" Elevation (ft)	vation (rt)	low point					
77	14	Static Head							
78									
70	70 Calaulata Tatal Punamia Haad	Lunamin L	·ben						

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ტ																			
ш																			
Ш				Total	14.00	16.35	22.47	31.93	44.52	60.12	78.62	99.95	124.03	150.82	180.27	212.33	246.96	284.15	323.84
Ο			Loss in FM	Pipe (ft)	0.00	1.71	6.17	13.07	22.25	33.63	47.12	62.66	80.22	92.66	121.22	144.60	169.85	196.96	225.91
O			Loss in PS	Pipe (ft)	0.00	0.64	2.29	4.86	8.27	12.49	17.51	23.28	29.81	37.06	45.04	53.73	63.11	73.18	83.93
В		RVE:		Static Loss	14	14	41	14	14	14	14	14	41	14	14	14	14	14	14
A		90 SYSTEM CURVE:		GPM	0	200	400	009	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800
	83	90		91	92	93	94	92	96	6	86	66	100	101	102	103	104	105	106



NP 3202 HT 3~ 458

Created On: 5/15/25

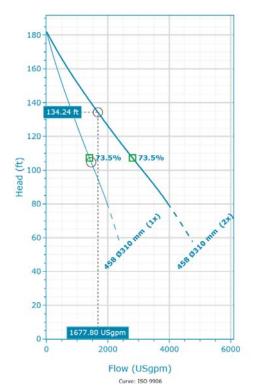




NP 3202 HT 3~ 458 | Configuration Summary



Flygt's self-cleaning non-clog N-pumps feature innovative designs and functions that deliver high sustained efficiency and the most reliable operation. This makes them the most reliable choice available for a broad range of wastewater applications for tough applications such as unscreened sewage, wastewater and sludge up to an 8 percent solids concentration. Impeller material available in Hardened cast Iron, Hard Iron and Stainless Steel to fit any wastewater application.



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for performance guarantees.

Installation

Installation Type

P - Semi-Permanent, Wet

Motor

Rated Voltage	Motor Efficiency Class
460 V	Standard
Coupling	Rated Power
D	60 Hp

Materials

Impeller Material Hard-Iron Volute Material Grey Cast Iron

Performance

Explosion Proof Impeller Diameter
No 310 mm

Max. Pumped Media Temp.

104 °F

 Project:
 Created By:
 Created On:
 Last Update:

 NP 3202 HT 3~ 458
 5/15/25





NP 3202 HT 3~ 458 | Product Details

Description

N 3202

The Flygt N-series are equipped with the Flygt invented N-technology with its innovative self-cleaning impeller. Solid objects entering the pump will pass through the impeller between the impeller vanes. If an object gets caught on the leading edge of one of the vanes, it will slide along the backswept shape towards the perimeter of the inlet where it will be guided by a relief groove through the pump housing. This ensures a high sustained total efficiency over time. Due to the mechanical self-cleaning design, a sludge concentration of solids up to 8% can easily be pumped. The pump can easily be installed in either permanently or temporary submerged, or horizontally or vertically dry installations.

Flexible and Modular Design

The modular hydraulic design enables customization of the hydraulics to meet the requirements of many applications.

- o Replaceable wear ring in two materials, gray iron or Hard Iron, for different operation conditions
- o Hardened gray iron impeller for typical wastewater applications
- Hard-Iron impeller for heavy duty wastewater applications containing abrasive and corrosive content
 Chopper ring intended for tough wastewater applications where cutting is required due to long fibres and solid concentrations up to 10-12%
- o Stainless steel impeller for special applications that require duplex stainless steel

Robust and Reliable

- o Short shaft overhang reduces shaft deflection and increases seal and bearing life
- o Class H Motor designed for submersible use. Heat is concentrated to the stator core for improved cooling properties.
- o The Plug-in seal with Active Seal system eliminates the risk associated with incorrect installation and careless handling. All in one unit. Available in Tungsten carbide (WCCR) or Silicone carbide (SiC) depending on pumped media.
- Motor cable SUBCAB* specially developed for submersible use
- Offers flexible cooling systems, e.g. closed-loop cooling system, media cooled or external cooling that allows full motor potential in dry installations.
 Premium brand bearings, greased for life, ensures a minimum of 50 000 hours of duty
- Leakage sensor and motor temperature sensor as standard

The N 3202 is available with the following options

- o ATEx, FM, CSA-approvals
- o Premium efficiency motors o Hard Iron hydraulic design
- o Stainless Steel hydraulic design
- o Vibration-sensor, extended motor temperature sensors, additional leakage-sensor, current-sensor and pump memory
- o Compatible with SmartRun® Wastewater pump controller
- o Compatible with MAS 801 monitoring system

Product Features

- o State-of-the-art wastewater pump with N-technology
- o Sustained high efficiency pumping with energy savings up to 25%
- o Flexible and modular design
- o Robust and reliable

Construction Materials

Impeller Material Volute Material Stator Cover Material Hard-Iron Grey Cast Iron

Motor

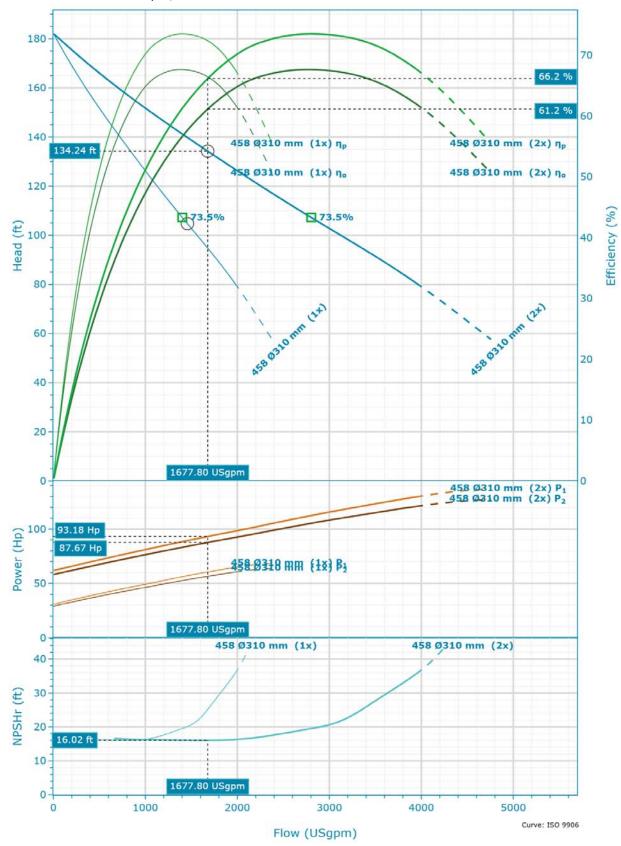
Rated Power	Number Of Phases	Start Current Ratio	Motor Issue
60 Hp	3	6.3	11
Motor Denomination	Rated Motor Speed	Insulation Class	Locked Rotor Code
30-24-4AA	1,780 RPM	Н	G
Motor Efficiency Class	Rated Voltage	Approval	Max starts per hour
Standard	460 V	Standard	30
Version Code	Rated Current	Total moment of inertia	Power Factor 100%
185	68 A	8.9384 ft²lbf	0.91
Frequency	Start Current	Type of duty	Power Factor 75%
60 Hz	425 A	S1	0.88
Max P2 (1x)	Starting Current, Direct Starting	Stator Variant	Power Factor 50%
63.65 Hp	425 A	1	0.82
Number Of Poles	Starting Current, Star Delta	Motor Module	Efficiency 100%
4	141.67 A	130	91.5 %
			Efficiency 75%
			92 %
			Efficiency 50%
			92.5 %

Created By: Created On: Last Update: NP 3202 HT 3~ 458 5/15/25





NP 3202 HT 3~ 458 | Hydraulic Data & Performance Curve



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for performance guarantees.

Project: Created By: NP 3202 HT 3∼ 458 -

Created On: 5/15/25

Last Update:





Selection

Series System Type N 3000 Parallel Pumps Name **Operating Pumps** NP 3202 HT 3~ 458

Frequency Standby Pumps 60 Hz +1 Standby Pump **Total Flow** Curve Code

1,667.00 USgpm 458

Total Head Impeller Diameter 132.70 ft 310 mm Pump Flow Inlet Diameter 833.50 USgpm 200 mm

Pump Head Outlet Diameter

132.70 ft 6 in

Number Of Vanes

2

Design Point - Single Pump

Flow (1x) Input Power (P1) (1x) 838.9 USgpm 46.59 Hp

Head (1x) Shaft power (P2) (1x) 134.24 ft 43.83 Hp

Overall Efficiency (1x) NPSHr (1x) 61.15 % 16.03 ft Pump Efficiency (1x) Static Head 66.16 % 14.00 ft

Flow To BEP Ratio (1x)

59.9 %

Design Curve - Single Pump

Rated Speed BEP Flow (1x) 60 Hz 1,401.64 USgpm BEP Head (1x) Max Flow (1x) 2,379.39 USgpm 107.25 ft H@QMin (1x) Max P2 (1x) 182 ft 63.65 Hp

H@QMax (1x) 57.58 ft BEP (1x) 73.5 %

Fluid

Fluid Type Density 63.567 lb/ft3 Sewage Fluid Temperature Dynamic Viscosity 1.069871 cP 62.33 °F Specific Gravity Fluid Vapor Pressure

0.279 psi 1.018

Design Point - System

Input Power (P1) 1,677.8 USgpm 93.18 Hp Head Shaft power (P2) 134.24 ft 87.67 Hp Overall Efficiency (ηο) **NPSHR** 16.03 ft 61.15 %

Pump Efficiency (ηp) Static Head 14.00 ft 66.16 %

> Flow To BEP Ratio 59.9 %

Design Curve - System

Rated Speed **BEP Flow** 60 Hz 2,803.29 USgpm Max Flow **BEP Head** 4,758.79 USgpm 107.25 ft H@QMin Max P2 182 ft 127.3 Hp H@QMax Specific Energy 690 kWh/mGal 57.58 ft

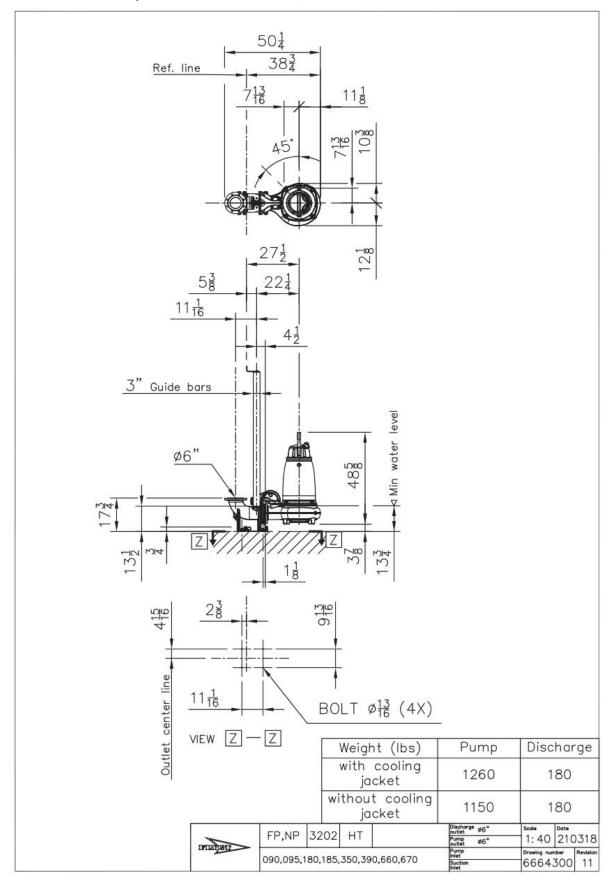
BEP 73.5 %

Created By: Created On: Last Update: NP 3202 HT 3~ 458 5/15/25





NP 3202 HT 3~ 458 | Dimensional Data & Drawing



 Project:
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 Created On:
 Last Update:

 NP 3202 HT 3~ 458
 5/15/25

Company

Contact

Phone No.

Email



	Α	В	O	O	Ш	ш	- н	J
~	띪	ENT PUM	PING ST	ATION &	FORCE 	MAIN CAL	F PUMPING STATION & FORCE MAIN CALCULATION SHEET	
7			Ī					
ე 4	₹	Calculate Peak Design Flow:	MOIL					
2		(
9		Cavg =	1,875,000	gbd gpm				
ω σ								
19		Qpeak =	2,400,000	pdb				
12	-la:							
13	اما	Peak Factor	1.28					
15	<u> </u>							
16	1666.67	Flow Rate (gpm)	n)					
17	3.71	Flow Rate (cfs)						
18	3		•					
19	140	C -Factor * De	C -Factor * Dependent upon Pipe Material and Age	Pipe Material	and Age	*PVC		
20								
22	Analyze Pip	e Diameters:						
23		23						
	Pipe	Actual Inside	;	i				
24	Diameter (in)	Pipe Diameter	(in) Area (soft)	Flow Rate	Velocity (fps)	hl (#/100ft)		
25		4.23	0.10	3.71	38.05	91.480		
26		60.9	0.20	3.71	18.36	15.532		
27		7.98	0.35	3.71	10.69	4.170		
28		9.79	0.52	3.71	7.10	1.542		
29	12.00	11.65	0.74	3.71	5.02	0.662		
31								
32	-la:							
33	<u></u>			Des	Design Flow (gpm)	1667		
34	I.		100	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(()	7000		
38	Choose Pip(35 Choose Pipe Diameter (in)	7.98	10 B	Velocity (V) =	10.69	rps	
37	<u> </u>							
38								

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⋖	В	O	Q	Ш	Ц	9	I	_			¥
Pum	.2							_	_	_	
	١										
41 6	Actual Diamet	er of Piping w	Actual Diameter of Piping within Pump Station (inches)	tion (inches)							
47											
43				Ċ	3						
44 Fittings		Size (Inch)	Leg (ft)	Qťý.	Leg (ft)						
45 Reducer 2/3	2/3	9	2	_	5						
46 Plug Valve	Je	9	3.2	2	6.4	two lines, x					
47 Entrance Losses	Losses	9	0	0	0						
48 90 deg. Elbow	Elbow	9	16.7	2	33.4						
49 Check valve	alve	9	50.5	-	50.5	one line, /					
50 Tee (branch)	nch)	9	32.7	0	0						
51 45 deg bends	ends	9	7.7	2	15.4						
52 Tee (flow	, thru)	9	0	0	0						
53 Pipe Len	gth	9	1	35	35	length					
54				Total Leq (ft)	145.7						
22											
56 Force Ma	ain Friction Losse	Se									
22	57										
28											
26.7 69	Diameter of Force Main Piping (inches)	orce Main Pipi	ing (inches)								
09	Ī										
61 Fittings	!	Size (inch)	Leg (ft)	Qt⁄.	Leq (ft)						
62 Reducer	2/3	7.98	0	0	0						
63 Gate Valve	ve	7.98	5.3	1	5.3						
64 Entrance	Losses	7.98	0	0	0						
65 90 deg. E	:Ibow	7.98	21	2	105						
66 Check va	alve	7.98	0	0	0						
67 45 deg be	ends	7.98	10.6	2	21.2						
68 Tee (flow	/ thru)	7.98	32.7	0	0						
69 Pipe Len	gth	7.98	1	490	490						
70				Total Leq (ft)	621.5						
77 642410 110	Ctatic Hood occ.										
72	sau Loss.										
7.7	High Doint in System (ff)	3/ctom (ft)		High Water evel at Storage	of Officials	9000					
	"Pump Off" Elevation (ft)	system (it) evation (ft)	low point	iigii watei Lev	מו טוטומטט במ	1000					
92		(-)	_								
77 22	Static Head										
78	1										
79 Calculate	79 Calculate Total Dynamic Head	Hoad.									

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A	В	ပ		O		ш	ட	O		I		_	7	\prec
_	237 Calculate Total Dynamic Head:	c Head:												
\overline{c}	n of PS Friction	on Losses,	Force №	238 * Summation of PS Friction Losses, Force Main Friction Losses, and Static Head	osses,	and Static	Head							
	24.33 Pump Station Fricton Losses (ft)	on Fricton L	osses (1	ft)										
	25.91 Force Main Friction Losses (ft)	Friction Los	sses (ft)											
	1													
243 esign Point:														
72.24	TDH (ft)							Min HP Req'd	p,k	36	36.5 HP			
7	1666.67 Design Flow Rate (gpm)	v Rate (gpm		* This Flow and TDH is the desired design	A TDH	is the desi	red design	Flygt Model	NP 312	7 MT-3 93	30 460V	10 hp Pr	Flygt Model NP 3127 MT-3 930 460V 10 hp Premium Efficiency	>
	ı			point						•	60 Hz			

	<	۵	C	c	Ц	L	C		-		۷
	∢	ם	٥	ח	П	L	פ	С		7	<
88								09	60 Hz		
91	SYSTEM CURVE:	IRVE:									
			Loss in PS	Loss in FM	H						
92	GP.M	Static Loss	Pipe (π)	Pipe (rt)	l otal		PUMP CURVE IN PARALLEL: PUMP CURVE INDIVIDUAL:	N PARALLEL:	PUMP CURVI	E INDIVIDUAL:	
93		22	0.00	0.00	22.00		GPM	Head (ft)	GPM	Head (ft)	
94	200	22	0.48	0.51	22.99		14	103	14	103	
92	400	22	1.74	1.85	25.58		335.74	94.08	168	92	
96	009	22	3.68	3.91	29.59		657	86.9	248	91	
26	800	22	6.26	6.67	34.92		818	83.5	489	80	
86	1000	22	9.46	10.07	41.53		1139	7.77	891	89	
66	1200	22	13.25	14.11	49.36		1309	74	972	99	
100	1400	22	17.62	18.77	58.39		1636.55	70.38	1346	55	
101		22	22.56	24.03	68.59		1943	65.94	1534	49	
102	1800	22	28.05	29.88	79.93		2104	63.6	1775	41	
103	2000	22	34.09	36.31	92.40		2586	56.4	2258	27	
104		22	40.66	43.31	105.97						
105	2400	22	47.77	50.87	120.64						
106		22	55.39	58.99	136.38						
107	2800	22	63.53	99.79	153.19						
108	ac '										
109											
110	B. Wet Well Volu	Volume									
111											
112	112 General Guidelir	deline Equatio	n: Vmin = (Tr	min X Qp) / 4; l	ne Equation: Vmin = (Tmin X Qp) / 4; Use Tmin = 10 minutes	ninutes					
113	2					A	9				
114	Note: Actua	ar Pump Manut.	acturer's reco	ommedations	гог оп/оп сусте	times snould	114 <u>Note:</u> Actual Pump Manufacturer's recommedations for on/orf cycle times should be used to confirm sizing	ırm sızıng			
116		10									
117	å	1667									
118			-								
119	Vmin =	416	gallons								
120		557.00	cuft								
121	-										
122	;				=		-	9			
123	123 Alternate Wet We	et Well Volume Calc's:	Calc's:	* change to siz	e wetwell for mir	imum pump ru	* change to size wetwell for minimum pump run time -> when Qi = 1/2 Qo	Ji = 1/2 Qo			
125	T	α									
126	Ö	l m	* Qin is Qout	(Qpeak) divide	d by 2, simulatin	q best conditio	Qin is Qout (Qpeak) divided by 2, simulating best conditions for minimum time	ime			
127	Qout	1666.67	* Qout is Qpe	eak because Q	* Qout is Opeak because Opeak is output of wastewater at peak conditions	wastewater at	peak conditions				
128	00.										
Ĺ	т		-								

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NP 3171 MT 3~ 435

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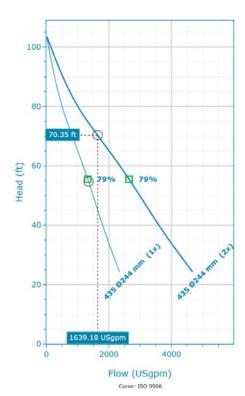




NP 3171 MT 3~ 435 | Configuration Summary



Flygt's self-cleaning non-clog N-pumps feature innovative designs and functions that deliver high sustained efficiency and the most reliable operation. This makes them the most reliable choice available for a broad range of wastewater applications for tough applications such as unscreened sewage, wastewater and sludge up to an 8 percent solids concentration. Impeller material available in Hardened cast Iron, Hard Iron and Stainless Steel to fit any wastewater application.



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for performance guarantees.

Installation

Installation Type

P - Semi-Permanent, Wet

Motor

Rated Voltage	Motor Efficiency Class
460 V	Standard
Coupling	Rated Power
D	25 Hp

Materials

Impeller Material Hard-Iron Volute Material Grey Cast Iron

Performance

Explosion Proof Impeller Diameter
No 244 mm
Max. Pumped Media Temp.

104 °F

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NP 3171 MT 3~ 435 | Product Details

Description

N 3171

The Flygt N-series are equipped with the Flygt invented N-technology with its innovative self-cleaning impeller. Solid objects entering the pump will pass through the impeller between the impeller vanes. If an object gets caught on the leading edge of one of the vanes, it will slide along the backswept shape towards the perimeter of the inlet where it will be guided by a relief groove through the pump housing. This ensures a high sustained total efficiency over time. Due to the mechanical self-cleaning design, a sludge concentration of solids up to 8% can easily be pumped. The pump can easily be installed in either permanently or temporary submerged, or horizontally or vertically dry installations.

Flexible and Modular Design

The modular hydraulic design enables customization of the hydraulics to meet the requirements of many applications.

- o Replaceable wear ring in two materials, gray iron or Hard Iron, for different operation conditions
- o Hardened gray iron impeller for typical wastewater applications
- Hard-Iron impeller for heavy duty wastewater applications containing abrasive and corrosive content
 Chopper ring intended for tough wastewater applications where cutting is required due to long fibres and solid concentrations up to 10-12%
- o Stainless steel impeller for special applications that require duplex stainless steel

Robust and Reliable

- o Short shaft overhang reduces shaft deflection and increases seal and bearing life
- o Class H Motor designed for submersible use. Heat is concentrated to the stator core for improved cooling properties.
- o The Plug-in seal with Active Seal system eliminates the risk associated with incorrect installation and careless handling. All in one unit. Available in Tungsten carbide (WCCR) or Silicone carbide (SiC) depending on pumped media.
- Motor cable SUBCAB* specially developed for submersible use
- Offers flexible cooling systems, e.g. closed-loop cooling system, media cooled or external cooling that allows full motor potential in dry installations.
 Premium brand bearings, greased for life, ensures a minimum of 50 000 hours of duty
- Leakage sensor and motor temperature sensor as standard

The N 3171 is available with the following options:

- o ATEx, FM, CSA-approvals
- o Premium efficiency motors
- o Hard Iron hydraulic design
- o Stainless Steel hydraulic design
- o Vibration-sensor, extended motor temperature sensors, additional leakage-sensor, current-sensor and pump memory
- o Compatible with SmartRun® Wastewater pump controller
- o Compatible with MAS 801 monitoring system

Product Features

- o State-of-the-art wastewater pump with N-technology
- o Sustained high efficiency pumping with energy savings up to 25%
- o Flexible and modular design
- o Robust and reliable

Construction Materials

Impeller Material Volute Material Stator Cover Material Hard-Iron Grev Cast Iron

Motor

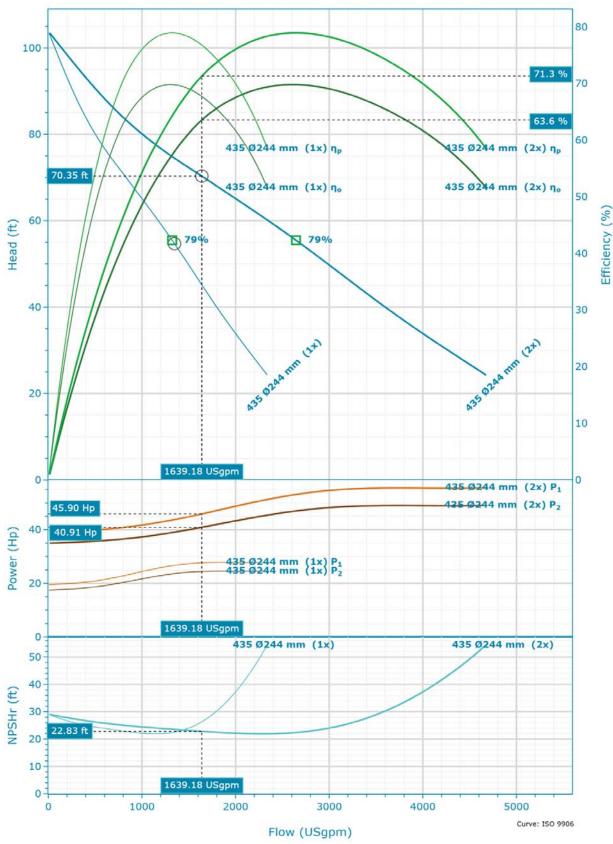
Rated Power	Number Of Phases	Start Current Ratio	Motor Issue
25 Hp	3	6.13	12
Motor Denomination	Rated Motor Speed	Insulation Class	Locked Rotor Code
25-14-4AA	1,770 RPM	Н	G
Motor Efficiency Class	Rated Voltage	Approval	Max starts per hour
Standard	460 V	Standard	30
Version Code	Rated Current	Total moment of inertia	Power Factor 100%
185	30 A	3.2777 ft ² lbf	0.89
Frequency	Start Current	Type of duty	Power Factor 75%
60 Hz	183 A	S1	0.86
Max P2 (1x)	Starting Current, Direct Starting	Stator Variant	Power Factor 50%
24.53 Hp	183 A	1	0.78
Number Of Poles	Starting Current, Star Delta	Motor Module	Efficiency 100%
4	61 A	130	88 %
			Efficiency 75%
			89.5 %
			Efficiency 50%
			89.5 %

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NP 3171 MT 3~ 435 | Hydraulic Data & Performance Curve



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for performance guarantees.

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Selection

Series System Type Parallel Pumps N 3000 Name **Operating Pumps**

NP 3171 MT 3~ 435

Frequency Standby Pumps 60 Hz No Standby Pump **Total Flow** Curve Code

1,667.00 USgpm 435

Total Head Impeller Diameter 72.00 ft 244 mm Pump Flow Inlet Diameter 833.50 USgpm 200 mm

Pump Head Outlet Diameter 72.00 ft

6 in

Number Of Vanes

2

Design Point - Single Pump

Flow (1x) Input Power (P1) (1x) 819.59 USgpm 22.95 Hp

Head (1x) Shaft power (P2) (1x)

70.35 ft 20.46 Hp Overall Efficiency (1x) NPSHr (1x) 63.56 % 22.83 ft Pump Efficiency (1x) Static Head 71.30 % 22.00 ft

Flow To BEP Ratio (1x)

62 %

Design Curve - Single Pump

Rated Speed BEP Flow (1x) 60 Hz 1,322.57 USgpm BEP Head (1x) Max Flow (1x) 2,338.1 USgpm 55.48 ft H@QMin (1x) Max P2 (1x) 103.49 ft 24.53 Hp

H@QMax (1x) 24.28 ft BEP (1x) 79 %

Fluid

Fluid Type Density Water 62.428 lb/ft³ Fluid Temperature Dynamic Viscosity 39.2 °F 1.567212 cP Specific Gravity Fluid Vapor Pressure

0.118 psi

Design Point - System

Input Power (P1)

1,639.18 USgpm 45.9 Hp Head Shaft power (P2) 70.35 ft 40.91 Hp Overall Efficiency (ηο) **NPSHR**

22.83 ft 63.56 % Pump Efficiency (ηp) Static Head 71.30 % 22.00 ft

Flow To BEP Ratio

62 %

Design Curve - System

Rated Speed **BEP Flow** 60 Hz 2,645.14 USgpm Max Flow BEP Head 4,676.21 USgpm 55.48 ft H@QMin Max P2 103.49 ft 49.07 Hp H@QMax Specific Energy 348 kWh/mGal 24.28 ft

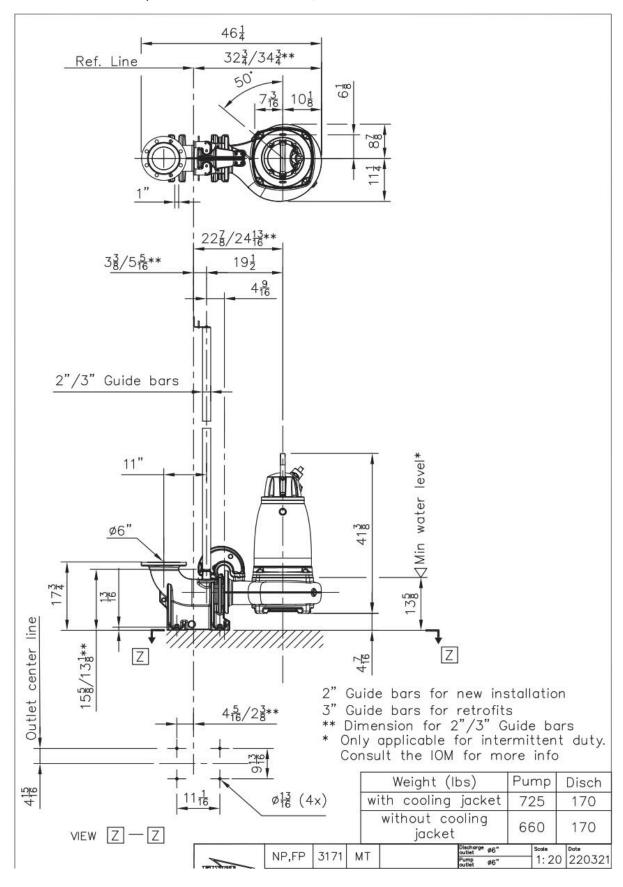
BEP 79 %

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NP 3171 MT 3~ 435 | Dimensional Data & Drawing



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Company

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