



EQUIPMENT SUBMITTAL

CENTURYLINK CIB 750 TON

June 3, 2015

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EQUIPMENT DESCRIPTION

SCOPE OF SUPPLY



JOB DATA FORM (JDF)

I. General

Job Information

Name: CenturyLink CIB

Number: 2015-*

Location: *

Date: 3/22/15

Engineer:

Revision: 1

Customer: CenturyLink

Application: 750 Ton CIB

Environment: Outdoor

Application engineer: Bob Overbey

Representative: Specialty AC

Model number: RCO1W075001200VI0CI08PFX1

*Project Site Schedule

Job Number	2015-139	2015-142	2015-141	2015-143	2015-144	2015-145	2015-146
Site	DN3	CL1	NJ3	CH3b	CH3b	TP1	BR1
Tonnage	750	750	1000	1000	1000	750	750

Service

Start-up by: Systecon

Warranty: 5 year (60 months, not to exceed 66 months from shipment)

Type of warranty: Parts and Labor

Spare Parts:

- One VFD per size
- One Ethernet Switch

Process Cooling System

Chiller

Tag: CH-1

Type: Centrifugal

Manufacturer: Trane

Model: CVHF0570

Tons: 750

Evaporator

Design flow: 1200 GPM

Pressure drop: 14.9'

Minimum flow: 328 GPM

Pressure drop: 1'

Maximum flow: 2340 GPM

Pressure drop: 55'

Entering temperature: 70°F

Leaving temperature: 55°F

Condenser

Design flow: 1365 GPM
 Minimum flow: 681 GPM
 Maximum flow: 2498 GPM
 Entering temperature: 78°F

Pressure drop: 16.9'
 Pressure drop: 4.8'
 Pressure drop: 49.9'
 Leaving temperature: 92°F

Cooling Tower

Tag: CT-1

Type: Open, Crossflow, Induced draft
 Manufacturer: Marley
 Design Flow: 1200 GPM
 Entering temperature: 100°F
 Wetbulb temperature: 82°F
 Cooling Tower Fans: Qty: 1
 Motor Control: Variable speed
 Vibration Switch for Fan Failure
 Stainless Steel Hot/Cold Basin
 Galvanized Steel Casing and Structure
 Low Sound Fan
 Access Ladder with Cage to top of Tower

Number of Cells: 1
 Model: NC8412UAS1
 Leaving temperature: 85°F
 Horsepower: 50 HP

System

Chilled Water Flow: 1200 GPM
 Tower Water Flow: 1365 GPM
 Fluid: Water

Flow Test

Non-witnessed (Witnessed for DN3 only)
 Test Points: 25, 50, 75, 100%
 Pressure measured at: System Connections

II. Installer Responsibility

Install all supplied loose package transmitters including:
 Set Enclosure
 Assemble Cooling Tower Support Structure
 Set Cooling Tower
 Install Cooling Tower piping
 Install Cooling Tower make-up water, drain and overflow piping
 Install required Cooling Tower electrical components

III. Equipment Enclosure

- Manufacturer: Space Fabrication
- Material: Firestone Panel
- Dimensions: 480"L x 168"W x 120"H
- Color: River Rock
- Double door (Plant Access): 1
- Maintenance double doors: 3
- Maintenance single door: 2
- Floor drains: 4
- Line size: 3
- Indoor light: 4
- Outdoor light: 1
- Indoor GFI duplex outlet: 2
- Chiller refrigerant relief exhaust fan
- Chiller refrigerant relief intake motorized damper
- Unit Heater as required by Location
 - 7.5 kW heater Sites: DN3, NJ3, CL1, CH3a, CH3b.
 - No heater, Sites: TP1 & BR1
- Fan Coil as required by Location
 - All Sites: qty (2) Larkin LCA6-G-1300 with circulator pump & circuit setter

IV. Mechanical

Cooling Tower Structural Steel Platform

- Erection of cooling tower platform to be by the installation contractor.
- Platform to include the following options:
 - Tower Piping supports.
 - Certified structural drawings and calculations.
 - Galvanized steel construction.

Base

- Main base
 - Type: Structural steel
 - Concrete fill: No
 - Decking: 1/4" with 2" lip
 - Heat Exchanger 2" containment lip.

Piping

Tower piping

<u>Size</u>	<u>Class</u>	<u>Material</u>	<u>Fittings</u>
8"	125/150	Steel	Welded fab
Tower Inlet/Outlet		Connections: 1	
Pipe size: 8"			

Chiller piping

<u>Size</u>	<u>Class</u>	<u>Material</u>	<u>Fittings</u>
8"	125/150	Steel	Welded fab

Evaporator Inlet/Outlet
 Pipe size: 8" Connections: 1
 Bypass
 Pipe size: 8" Quantity: 1

Condenser Inlet/Outlet
 Pipe size: 8" Connections: 1
 Bypass
 Pipe size: 8" Quantity: 1

Chiller Relief Piping - PVC

Heat Exchanger piping

<u>Size</u>	<u>Class</u>	<u>Material</u>	<u>Fittings</u>
8"	125/150	Steel	Welded fab

Hot Side Inlet/Outlet (Chilled Water)
 Pipe size: 8" Connections: 1
 Bypass
 Pipe size: 8" Quantity: 1

Cold Side Inlet/Outlet (Tower Water)
 Pipe size: 8" Connections: 1
 Bypass
 Pipe size: 8" Quantity: 1

Tower Pump piping

<u>Size</u>	<u>Class</u>	<u>Material</u>	<u>Fittings</u>
2 to 6"	125/150	Steel	Welded fab

Suction
 Header size: 8" Connections: 1
 Branch size: 8" Quantity: 2

Discharge
 Header size: 8" Connections: 1
 Branch size: 8" Quantity: 2

Pumps

Manufacturer: Patterson
 Furnished by: Systecon

Tag No.	GPM	TDH	HP	RPM	NPSHR	Model No.
P-1	1365	101'	50	1785	12.5'	V8A13A-RC
P-2	1365	101'	50	1785	12.5'	V8A13A-RC

Motor

Manufacturer: WEG
 Type: TEFC
 Duty: Inverter capable
 Efficiency: Premium

Valves**Non-Actuated**

Type: Butterfly
 Location/Function: Tower Inlet/Outlet
 Location/Function: Chiller Inlet
 Location/Function: Heat Exchanger Inlet/Outlet
 Location/Function: Pump Suction/Discharge
 Location/Function: Filter Inlet/Outlet
 Size: 8"
 Manufacturer: ProValve
 Model: Series 500
 Operator: Lever

Type: Check Valve
 Location/Function: Pump discharge
 Size: 8"
 Manufacturer: ProValve
 Model: CL

Actuated

Tag: CV-01
 Type: Butterfly
 Location/Function: Chiller Condenser Head Pressure Control
 Qty: 1
 Size: 8"
 Manufacturer: ValveTeck
 Mounting: Package
 Actuator Manufacturer: Electra
 Configuration: 2-way
 Actuator: Electric
 Controls: Modulating

Tag: CV-02
 Type: Butterfly
 Location/Function: Chiller Condenser Isolation
 Qty: 1
 Size: 8"
 Manufacturer: ValveTeck
 Mounting: Package
 Actuator Manufacturer: Electra
 Configuration: 2-way
 Actuator: Electric
 Controls: 2-Position

Tag: CV-03
Type: Butterfly
Location/Function: Chiller Evaporator Isolation
Qty: 1
Size: 8"
Manufacturer: ValveTeck
Mounting: Package
Actuator Manufacturer: Electra
Configuration: 2-way
Actuator: Electric
Controls: 2-Position

Tag: CV-04
Type: Butterfly
Location/Function: Chiller Evaporator Bypass
Qty: 1
Size: 8"
Manufacturer: ValveTeck
Mounting: Package
Actuator Manufacturer: Electra
Configuration: 2-way
Actuator: Electric
Controls: 2-Position

Tag: CV-05
Type: Butterfly
Location/Function: Heat Exchanger Cold Side Bypass
Qty: 1
Size: 8"
Manufacturer: ValveTeck
Mounting: Package
Actuator Manufacturer: Electra
Configuration: 2-way
Actuator: Electric
Controls: 2-Position

Tag: CV-06
Type: Butterfly
Location/Function: Heat Exchanger Hot Side Bypass
Qty: 1
Size: 8"
Manufacturer: ValveTeck
Mounting: Package
Actuator Manufacturer: Electra
Configuration: 2-way
Actuator: Electric
Controls: 2-Position

Tag: CV-07
 Type: Butterfly
 Location/Function: Filter Bypass
 Qty: 1
 Size: 8"
 Manufacturer: ValveTeck
 Mounting: Package
 Actuator Manufacturer: Electra
 Configuration: 2-way
 Actuator: Electric
 Controls: 2-Position via Tekleen Controller

Water Treatment – Automatic Filter

Qty: 1
 Model: LFP-8LP
 Inlet Piping size: 8"
 Outlet Piping size: 8"
 Actuated Bypass Valve: 8".
 Bypass Piping
 Material: SST 304
 Design flow: 1365 GPM
 Electronic Backwash Controller w/ Piston Solenoid

Manufacturer: Tekleen
 Application: Full Steam

Plate & Frame Heat Exchanger

Qty: 1
 Manufacturer: Sondex
 Model: S86-IS10-348-TMTL33-LIQUID
 Pressure: 150PSIG ASME stamped
 Hot Side Flow: 1200 GPM
 Hot Side Entering Temperature: 70°F
 Cold Side Flow: 1365 GPM
 Cold Side Entering Temperature: 53°F
 Plate Material: 304 SS

Hot Side Pressure Drop: 7.47 PSIG
 Hot Side Leaving Temperature: 55°F
 Cold Side Pressure Drop: 9.56 PSIG
 Cold Side Leaving Temperature: 66°F
 Gasket Material: Nitrile

Make-up Water Connection

Size: 1" w/ Solenoid Valve

Paint

Type: Systecon standard
 Color: Systecon standard

Insulation

Chilled Water Piping Interior: Armaflex – ¾" Painted White
 Installation: Factory

V. Electrical

Power Distribution – Multi Feed

Power Feed #1

Voltage: 460 /Phase: 3 /Hertz: 60

Equipment powered: Chiller

Power Feed #2

Voltage: 460 /Phase: 3 /Hertz: 60

Equipment powered: Pumps, CT Fans, Basin Heaters and Enclosure Utilities

Power Feed #3 (UPS Power)

Voltage: 208 /Phase: 3 /Hertz: 60

Equipment powered: Controls

Line Disconnecting Means

Pump VFD's: Fused Disconnect

Tower Fan VFD's: Circuit Breaker

Controls: Circuit Breaker

Motor Control

Variable Frequency Drives

Type: PWM

Manufacturer: ABB ACH550

NEMA: 1

Equipment controlled: Pumps, 50 HP

Equipment controlled: CT Fan, 50 HP

Options: Electronic Bypass

Control Enclosure

cULus listed.

NEMA: 1

VI. Instrumentation

Refrigerant monitoring system

Manufacturer: Honeywell Vulcain chiller refrigerant monitoring system.

Model: VA301EM-RFSA-20 controller

Sensors: (1) VA301RFSR123 refrigerant gas sensor (under chiller)

Options: (1) Horn and strobe lights

Flow Meter

Manufacturer: Onicon
Model: S1210

Transmitter set: 1
Tag: FM-01
Pipe size: 8"
Flow range: 1,600 GPM
Mounting: Package – Chilled Water Supply

Differential Pressure Transmitter

Manufacturer: Rosemount
Model: S2051

Transmitter set: 1
Tag: DPT-01
Qty: 1
Function: Heat Exchanger Differential Pressure
Range: 0 to 100' DP
Mounting: Package

Transmitter set: 2
Tag: DPT-02
Qty: 1
Function: Chiller Evaporator Differential Pressure
Range: 0 to 100' DP
Mounting: Package

Pressure Transmitter

Manufacturer: Systecon standard
Model: PT 626

Transmitter set: 1
Quantity: 2
Tag: PT-01, 03
Function: CDW Pump Suction pressure
Range: 0 to 100 PSIA
Mounting: Package

Transmitter set: 2
Quantity: 2
Tag: PT-02, 04
Function: CDW Pump Discharge pressure
Range: 0 to 200 PSIG
Mounting: Package

Transmitter set: 3
Quantity: 2
Tag: PT-05, 06
Function: Filter Inlet/Outlet Pressure

Range: 0 to 200 PSIG
Mounting: Package

Pressure Gauge

Manufacturer: Systecon standard
Model: P-5105
Size: 4 1/2"
Range: 0 to 200 PSIG
Sensing lines: Stainless Braid / Pipe mounted

Pressure gauge set: 1
Quantity: 4
Tag: PI-01, 02, 03, 04
Function: Chiller Inlet/Outlet pressure

Pressure gauge set: 2
Quantity: 4
Tag: PI-05, 06, 07, 08
Function: Heat Exchanger Inlet/Outlet pressure

Temperature Transmitter

Manufacturer: Rosemount
Model: 248
Transmitter set: 1
Quantity: 1
Tag: TT-01
Function: Tower Water Supply Temp
Pipe size: 8" with 4.5" probe length
Range: 32 to 122 °F
Mounting: Package

Transmitter set: 2
Quantity: 1
Tag: TT-02
Function: Tower Water Return Temp
Pipe size: 8" with 4.5" probe length
Range: 32 to 122 °F
Mounting: Package

Transmitter set: 3
Quantity: 1
Tag: TT-03
Function: Chilled Water Supply Temp
Pipe size: 8" with 4.5" probe length
Range: 32 to 122 °F
Mounting: Package

Transmitter set: 4
 Quantity: 1
 Tag: TT-04
 Function: Chilled Water Return Temp
 Pipe size: 8" with 4.5" probe length
 Range: 32 to 122 °F
 Mounting: Package

Thermometer

Manufacturer: Weiss
 Model: DVU-35
 Thermowell length: 4 1/2"

Quantity: 4
 Tag: TI-01, 02, 03, 04
 Function: Chiller Inlet/Outlet temp
 Range: -50 to 300°F
 Mounting: Pipe mount
 Quantity: 4
 Tag: TI-05, 06, 07, 08
 Function: Heat Exchanger Inlet/Outlet temp
 Range: -50 to 300°F
 Mounting: Pipe mount

VII. Controls

Pump Sequencing

Alternation: Automatic
 Pumps controlled: P-1, P-2
 Sequencing type: Standard
 System initialized indication
 Pump run indication
 Elapsed time indication
 Pump failure alarm w/cut off/ auto sequence
 VFD failure alarm w/cut off/ auto sequence

Chiller Sequencing

Sequencing by: Systecon
 Chillers controlled: CH-1
 Chiller start/stop based upon: Mode (On in Pre and Mechanical Cooling)
 Chiller failure alarm w/cut off

Tower Sequencing

Sequencing by: Systecon
 Cooling Towers controlled: CT-1 Fan
 Tower fan start/stop based upon: Tower Supply Temperature
 VFD failure alarm w/cut off

Controller

Type: Script

Screen size: 10"

PID Applications

Pump PID Controlling Process: Heat Exchanger DPT-01

Run at Constant Speed in Mechanical Cooling Mode

CT Fan PID Controlling Process: Constant Speed in Mechanical and Pre-Cooling Modes

Chilled Water Supply Temp TT-03 for Free Cooling Mode

CV-01 Head Pressure Control Valve: Modulate based on Chiller Signal in Mechanical and Pre-Cooling; Fully Open in Free Cooling

Mode Sequencing

Mechanical Cooling above adjustable Chilled Water Supply Setpoint

Chiller On

CV-01 – Modulating

CV-02 – Open

CV-03 – Open

CV-04 – Closed

CV-05 – Open

CV-06 – Open

Pre-Cooling below adjustable Chilled Water Supply Setpoint

Chiller On

CV-01 – Modulating

CV-02 – Open

CV-03 – Open

CV-04 – Closed

CV-05 – Closed

CV-07 – Closed

Free Cooling below adjustable Chilled Water Supply Setpoint

Chiller Off

CV-01 – 100% Open

CV-02 – Closed

CV-03 – Closed

CV-04 – Open

CV-05 – Closed

CV-07 – Closed

Chiller Interface

Protocol: BACnet Type: MSTP

From Chiller

Description

All available point

Protocol: Hardwire

To Chiller

Description

Chiller enable/disable

Qty

1

Type

Digital

CHW Setpoint

1

Analog

From Chiller

Description

Chiller Status

Qty

1

Type

Digital

BAS Interface

Protocol: BACnet Type: MSTP

Input points received from BAS Interface

Description

System enable/disable

Qty

1

Type

Digital

CHW Setpoint

1

Analog

Output points sent to BAS Interface

Description

Pump Run

Qty

2

Type

Digital

Pump Fail

2

Digital

Pump VFD Fail

2

Digital

Tower Fan Run

1

Digital

Tower Fan VFD Fail

1

Digital

Control Valve Failure

6

Digital

Control Valve Fully Open

6

Digital

Control Valve Fully Closed

6

Digital

Filter Alarm

1

Digital

Tower Level High

1

Digital

Tower Level Low

1

Digital

Filter Inlet Pressure

1

Analog

Filter Outlet Pressure

1

Analog

Pump Suction Pressure

2

Analog

Pump Discharge Pressure

2

Analog

Chilled Water Supply Temp

1

Analog

Chilled Water Temp

1

Analog

Tower Supply Temp

1

Analog

Tower Return Temp

1

Analog

Heat Exchanger Differential Pressure

1

Analog

Chiller Evaporator Differential Pressure

1

Analog

Filter Flush Count

1

Analog

Pump kW

2

Analog

Pump Speed	2	Analog
Pumping kW	1	Analog
Chiller kW	1	Analog
Plant kW	1	Analog
Plant Tons	1	Analog
Plant kW / Ton	1	Analog

CONTRACTOR INSTALLATION RESPONSIBILITIES



ASSEMBLY REQUIREMENTS AND CONTRACTOR INSTALLATION RESPONSIBILITIES

The general list below is not meant to be all inclusive. There may be additional responsibilities for the installation contractor not detailed below. Full assembly instructions will be provided prior to shipment.

- Receiving and inspection of equipment interior and exterior (report damage accordingly).
- Hoisting and rigging of all equipment sections into final locations.
- Leveling and shimming as needed per manufacturers recommendations.
- Tightening and checking all mechanically fastened connections that may have vibrated loose during shipment.
- Installing of equipment accessories that are shipped loose from the factory.
 - Cooling Tower Support Platform and Ladder
 - Cooling Tower Piping
 - Cooling Tower
 - Fan Reassembly if provided with Ultra Quiet Fan
 - Heat Trace on Cooling Tower piping if provided.
- Providing temporary protection of the enclosure and equipment from the elements before roofing and final section connections can be finalized.
- Flushing and filling each system.
- Installing all life safety equipment as needed.
- Installing all field connections to the unit including piping, electrical and drainage.
- Installing all utilities needed for the mechanical system including tower make-up water, drainage and electrical power.
- Installing all hydronic connections (leading to and away from) the chiller plant.
- Installing all outdoor cooling tower water piping (provided loose in sections by Systecon) between the chiller plant and the cooling towers. Note that contractor to be responsible for all piping modifications that may be required in order to connect the piping.
- Touching up and painting scratches and minor dents that may occur during hoisting and rigging.
- Obtaining all pertinent permits and inspections needed to start-up equipment.
- Starting up of system with supervision of manufacturer technician.
- Reassembly of tower cells and installation of all related items such as externally mounted motors, davit arms, access ladders, safety rails, access platforms, and any other devices provided for the cooling towers.

Systecon Standard Construction

The following is a list of standards from which Systecon designs and builds water management systems:

Pipe	- ANSI Standard 120/53 for Steel Pipe
Steel Flange Fittings	- ANSI Standard B16.5 Class 150 and 300
Steel Butt-Weld Fittings	- ANSI Standard B16.9
Cast Iron Threaded Fittings	- ANSI Standard B16.4 Class 125 and 250
Cast Iron Flange Fittings	- ANSI Standard B16.1 Class 125 and 250
Welds for Pipe	- ASME Standard 31.1
Flange Bolts	- ASTM Standard 307 Grade B
Valves	- ANSI Standards B16.1, B16.18, B16.24, B16.34
Pumps	- Hydraulic Institute Standard
Base	- American Institute of Steel Construction
Isolation	- Uniform Building Code Section 2312; 1 G or less Minimum Restraint Capability
Pressure Vessel	- ASME Standard Section 8
Electrical Panels	- U.L. Standard 508

FACTORY TESTING OVERVIEW

FACTORY FLOW TEST DESCRIPTION



WITNESSED FLOW TEST

CIB Testing

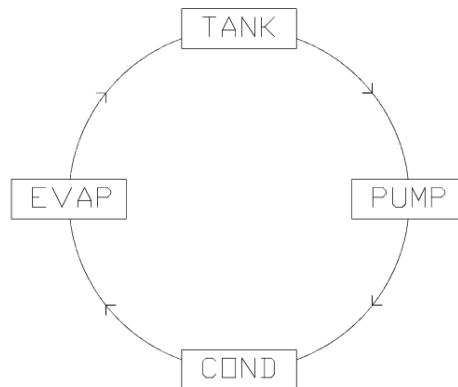
A simulated sequencing test of the CIB including operation of chillers, valves and pumps. The controls for the entire system will be tested simultaneously to perform the necessary mode switchover and failure sequences to ensure proper plant operation. The Storage Tank will be used in lieu of the Cooling Tower for testing purposes.

Chiller will be run tested at ambient water temperatures to verify operation and functionality. Actual water temps will limit run time and run capacity of the chiller.

A report will be generated detailing the results of the entire flow test.

CIB Test Setup:

- The Flow Test Stand storage tank outlet will be piped to the Condenser Water Pump Suction connection.
- The Condenser Water Outlet will be piped into the Evaporator Inlet
- The Evaporator Outlet will be piped to the Flow Test Stand storage tank.



Pump Performance Testing:

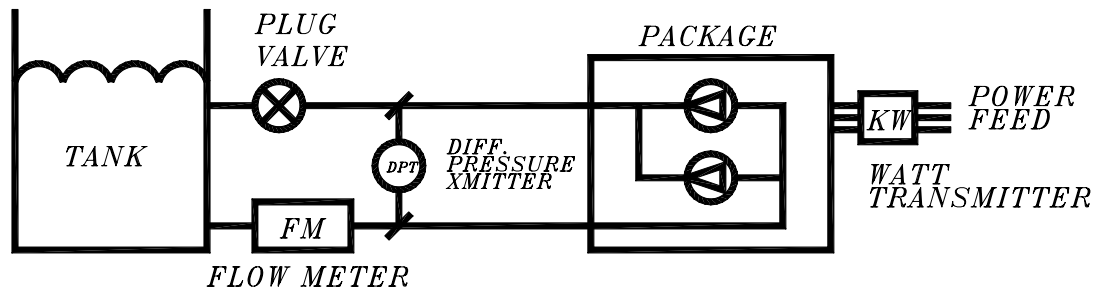
- The Condenser Water pump set to be Wire to Water tested in flow test stand at 25, 50, 75, and 100% system design flow.
- This test will utilize the Flow Test Stand described on the next page.

CIB Sequence Testing:

- Valve operation verification
- Sequence Verification
 - Mechanical Cooling
 - Pre Cooling w/ Mechanical Cooling
 - Free Cooling
- Equipment Failure Sequences
- Chiller Run Test



Flow Test Stand



Systecon follows the Hydraulic Institute's HI 6.6 standards for the calibration of test instrumentation. These test procedures are now being recognized by ASHRAE and should become an ANSI Test Standard. Our calibration results for each piece of equipment are on file and are made available upon request.

Following are the procedures used for calibrating and certifying Systecon's various test instruments:

Flow Meter:

Systecon has two full-throated magnetic meters for measuring flows from 5 GPM to 1200 GPM, and from 300 GPM to 25000 GPM. Systecon uses a third party that specializes in the testing of flow measuring devices. Systecon's flow meters are tested and calibrated once a year. The flow meter accuracy is within the allowable test accuracy of 5% of rate by the test equipment. These tests are conducted with Systecon's test stand piping, not with special piping for meter calibration.

Tank:

Systecon utilizes A 21,000 gallon tank. The tank is designed to absorb the heat generated by running the pumps, since water temperature rise will effect the accuracy of the test. The test is conducted to limit the temperature rise to no more than 10°F over the duration of the test.

Watt Transmitter:

The test watt transmitter has an accuracy of 1%; this accuracy is certified annually by E.I.L., an independent testing laboratory and traceable to NIST.

Pressure Transmitters:

Pressure transmitters have an accuracy of +-1% and traceable to NIST.

Flow Control Valve:

The flow control valve used for the system flow is fully automated and utilizes a 16,000 step digital positioner.



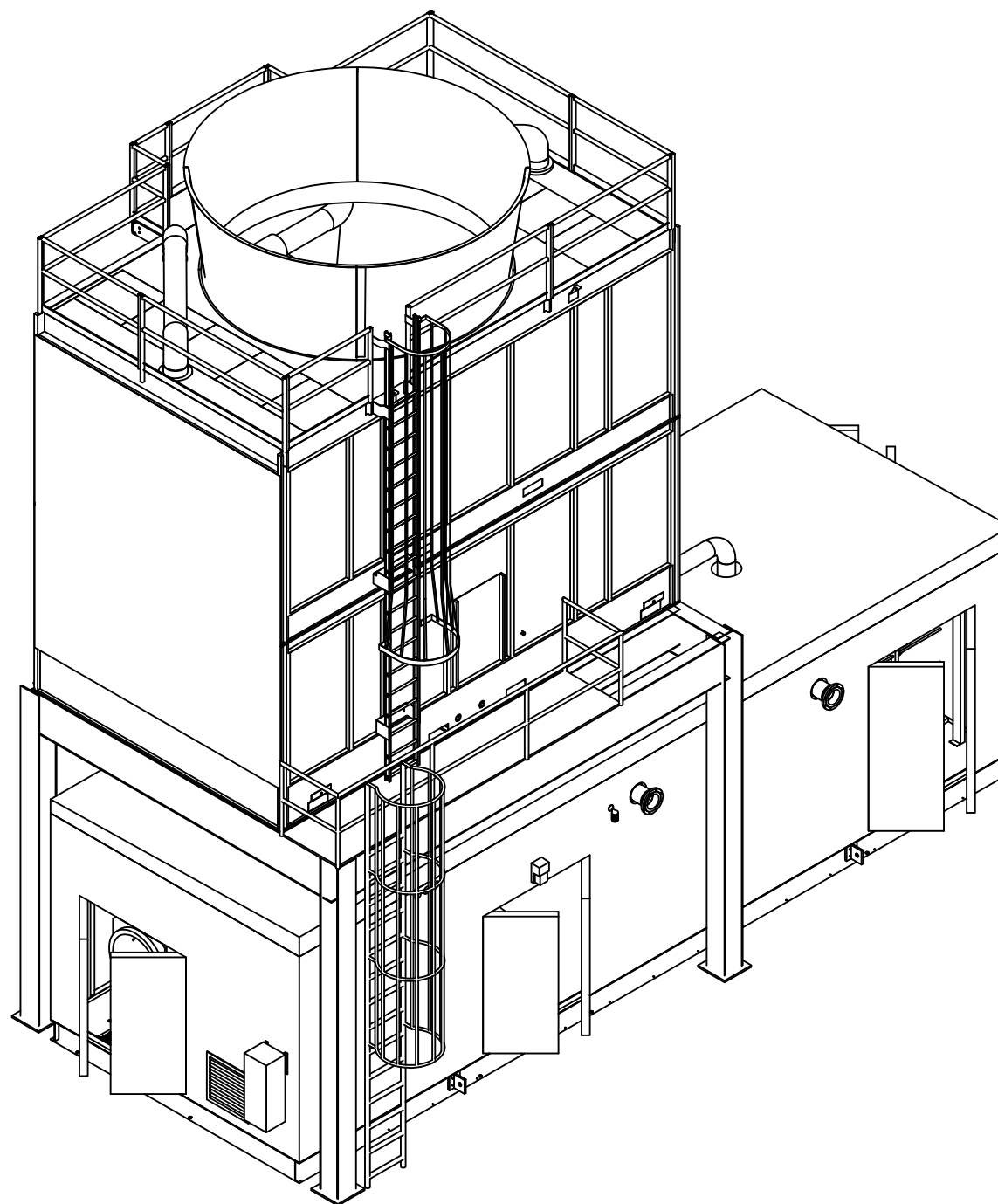
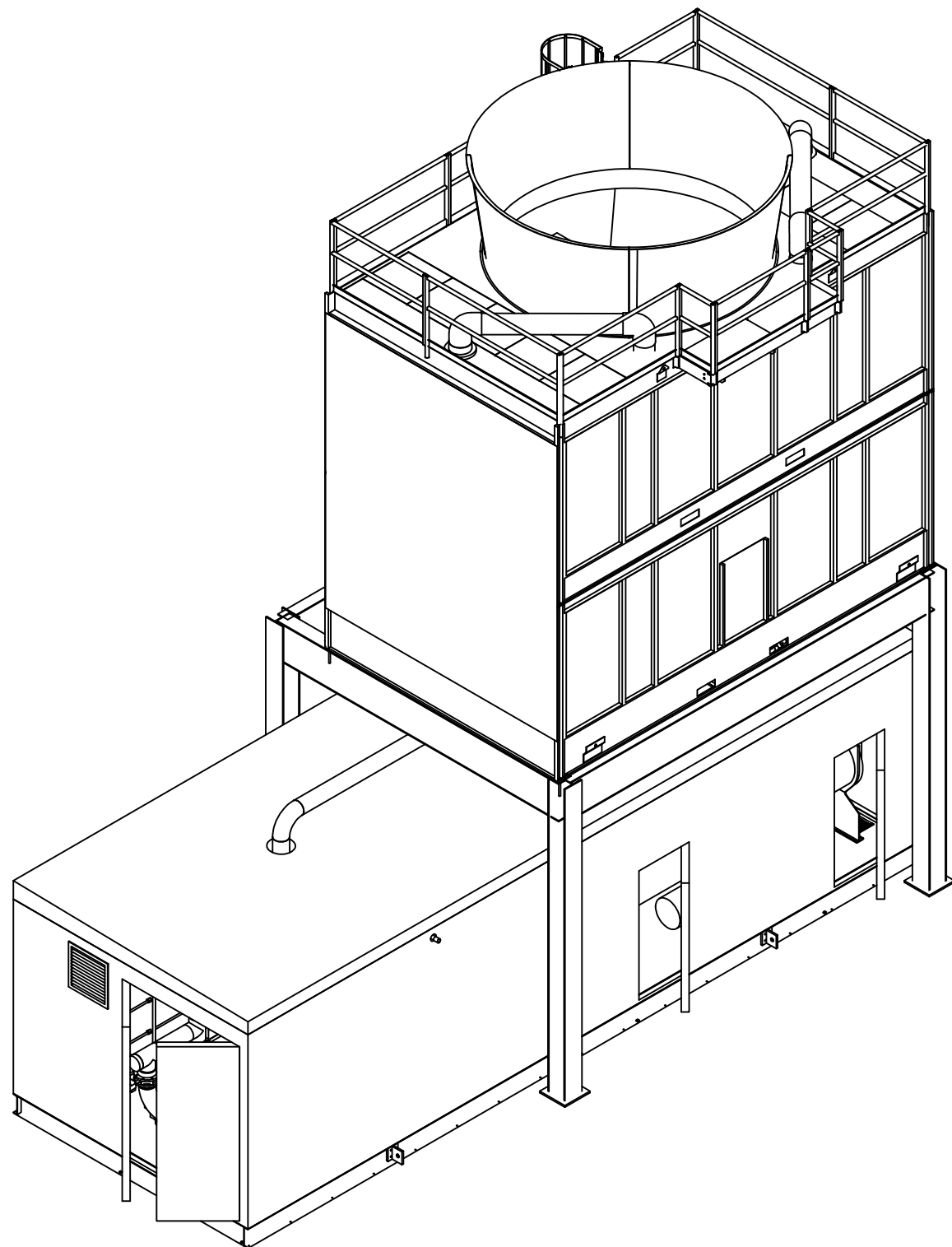
Hydrostatic Test

All piping will be subjected to a hydro test. The components are tested unpainted. The piping is filled with clean water. A hydrostatic pump then pressurizes the system 150 psig. The pressure is maintained for 30 minutes. The gauge on the test pump is checked to make sure the pressure is maintained. The piping is then inspected and checked for leaks or damage. If leaks are detected, the leaks are repaired and the test is redone. The system is drained and the check valves are tested to make sure they are closing. A certified report is filled out and kept in the job file and is available for review.

MECHANICAL SYSTEMS DESIGN

MECHANICAL LAYOUT DRAWINGS

ISOMETRIC VIEWS



IMPORTANT NOTICE:

1. PIPING DIMENSIONS ARE APPROXIMATE. FINAL DIMENSIONS MAY VARY DUE TO MANUFACTURING TOLERANCES. DO NOT COMPLETE FIELD PIPING UNTIL SYSTEM IS PROPERLY INSTALLED. SYSTECON ACCEPTS NO LIABILITY DUE TO DIMENSION VARIANCES.
2. DO NOT RIG FROM SYSTEM PIPING.
3. LEVEL AND SHIM BASE BEFORE ANCHORING.
4. DO NOT BIND SYSTEM CONNECTIONS.
5. FIELD PIPING MUST BE SUPPORTED INDEPENDENT OF SYSTEM CONNECTIONS.
6. ALLOW 48" CLEARANCE IN FRONT OF ELECTRICAL ENCLOSURES.
7. IF APPLICABLE, INTERNAL DRAINS ARE NOT TRAPPED CONTINUE DRAIN PIPING IN COMPLIANCE WITH LOCAL CODE(S).
8. IF APPLICABLE, BASE MUST BE GROUTED (3000 PSI CONCRETE)
9. INTERNAL PIPE SIZE IS: 8"

ETL THIS SYSTECON PACKAGED SYSTEM COMPLIES WITH ANSI/UL-778 AND UL-508 AND BEARS THE LABEL OF CERTIFICATION.

125 PSIG MAXIMUM SUCTION DESIGN
 175 PSIG MAXIMUM DISCHARGE DESIGN
 PUMPING SYSTEM TYPE:
 SYSTEM FLOW: _____ GPM _____ PSIG
 USE: _____

PUMP	MODEL	FLOW	HEAD	HP
P-1.2	V8A13A-RC	1365	101	50

POWER: 460_V_3_PH_60_HZ

SYSTEM WEIGHTS
 (DOES NOT INCLUDE CT & CT STRUCTURE)

SHIPPING WT. = 70,000 LBS
 _____ CU. FT OF BASE FILL WT. =
 WATER WT. = 10,000 LBS
 OPERATIONAL WT. = 80,000 LBS

REVISION HISTORY

REV	DESC.	DATE	DRN. BY	CHK. BY:
1	PER C.O. #1	6/23/2015	JWC	



DRN. BY: JWC 5/27/2015

CHK. BY: TWF 6/1/2015

ENGINEER:

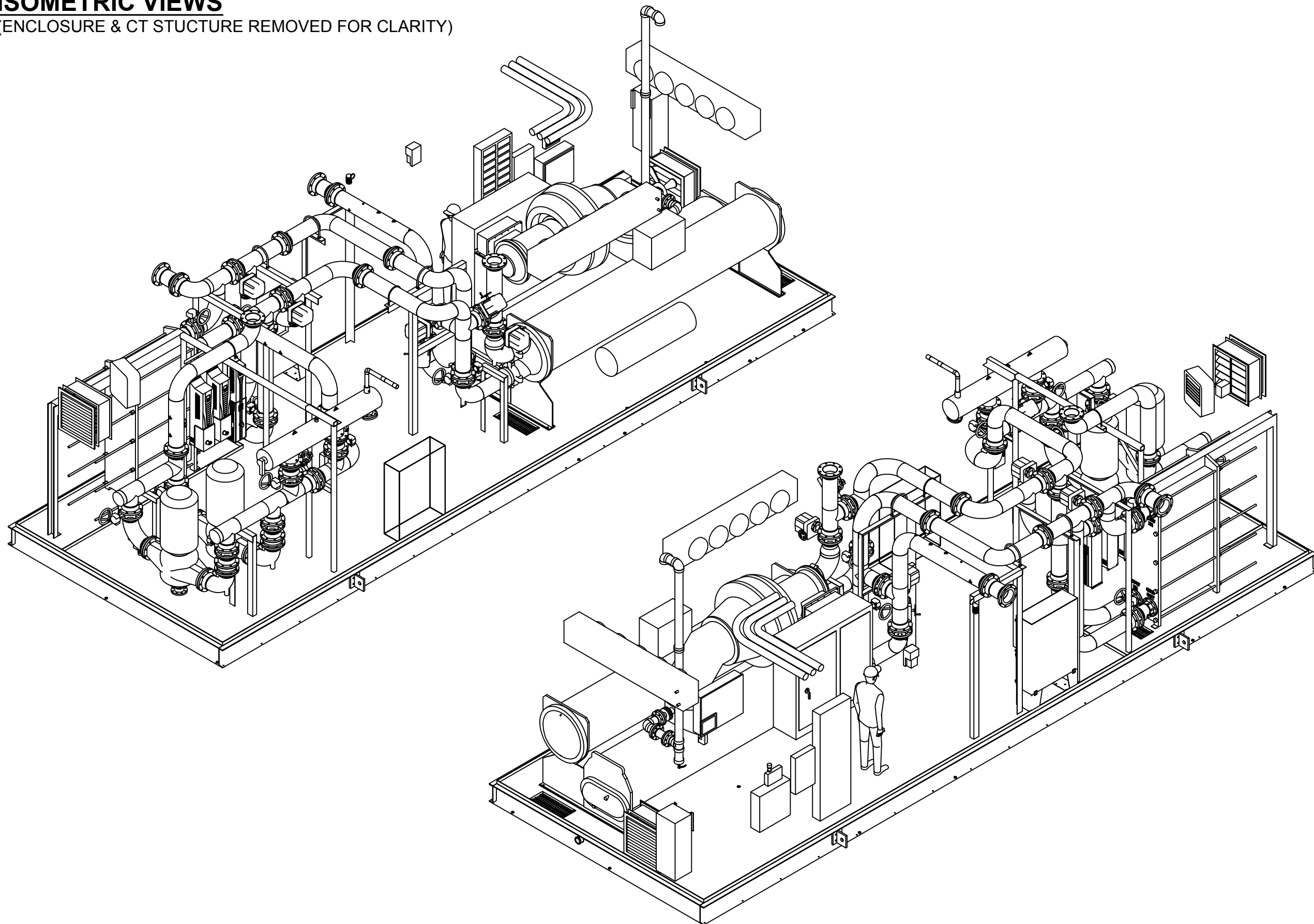
TITLE: MECHANICAL SYSTEM LAYOUT (750 TON)

JOB NAME: CENTURYLINK CIB - 750 TON

DRAWING NO.: 20151XXM1 SHEET 1 OF 6

ISOMETRIC VIEWS

(ENCLOSURE & CT STRUCTURE REMOVED FOR CLARITY)



IMPORTANT NOTICE:

1. PIPING DIMENSIONS ARE APPROXIMATE. FINAL DIMENSIONS MAY VARY DUE TO MANUFACTURING TOLERANCES. DO NOT COMPLETE FIELD PIPING UNTIL SYSTEM IS PROPERLY INSTALLED. SYSTECON ACCEPTS NO LIABILITY DUE TO DIMENSION VARIANCES.
2. DO NOT RIG FROM SYSTEM PIPING.
3. LEVEL AND SHIM BASE BEFORE ANCHORING.
4. DO NOT BIND SYSTEM CONNECTIONS.
5. FIELD PIPING MUST BE SUPPORTED INDEPENDENT OF SYSTEM CONNECTIONS.
6. ALLOW 48" CLEARANCE IN FRONT OF ELECTRICAL ENCLOSURES.
7. IF APPLICABLE, INTERNAL DRAINS ARE NOT TRAPPED CONTINUE DRAIN PIPING IN COMPLIANCE WITH LOCAL CODE(S).
8. IF APPLICABLE, BASE MUST BE GROUTED (3000 PSI CONCRETE)
9. INTERNAL PIPE SIZE IS: 8"



THIS SYSTECON PACKAGED SYSTEM COMPLIES WITH ANSI/UL-778 AND UL-508 AND BEARS THE LABEL OF CERTIFICATION.

125 PSIG MAXIMUM SUCTION DESIGN
 175 PSIG MAXIMUM DISCHARGE DESIGN
 PUMPING SYSTEM TYPE:
 SYSTEM FLOW: _____ GPM _____ PSIG
 USE: _____

PUMP	MODEL	FLOW	HEAD	HP
P-1.2	V8A13A-RC	1365	101	50

POWER: 460_V_3_PH_60_HZ

SYSTEM WEIGHTS

(DOES NOT INCLUDE CT & CT STRUCTURE)

SHIPPING WT. = 70,000 LBS
 _____ CU. FT OF BASE FILL WT. = _____
 WATER WT. = 10,000 LBS
 OPERATIONAL WT. = 80,000 LBS

REVISION HISTORY

REV	DESC.	DATE	DRN. BY	CHK. BY:
1	PER C.O. #1	6/23/2015	JWC	



DRN. BY: JWC 5/27/2015

CHK. BY: TWF 6/1/2015

ENGINEER:

TITLE: MECHANICAL SYSTEM LAYOUT (750 TON)

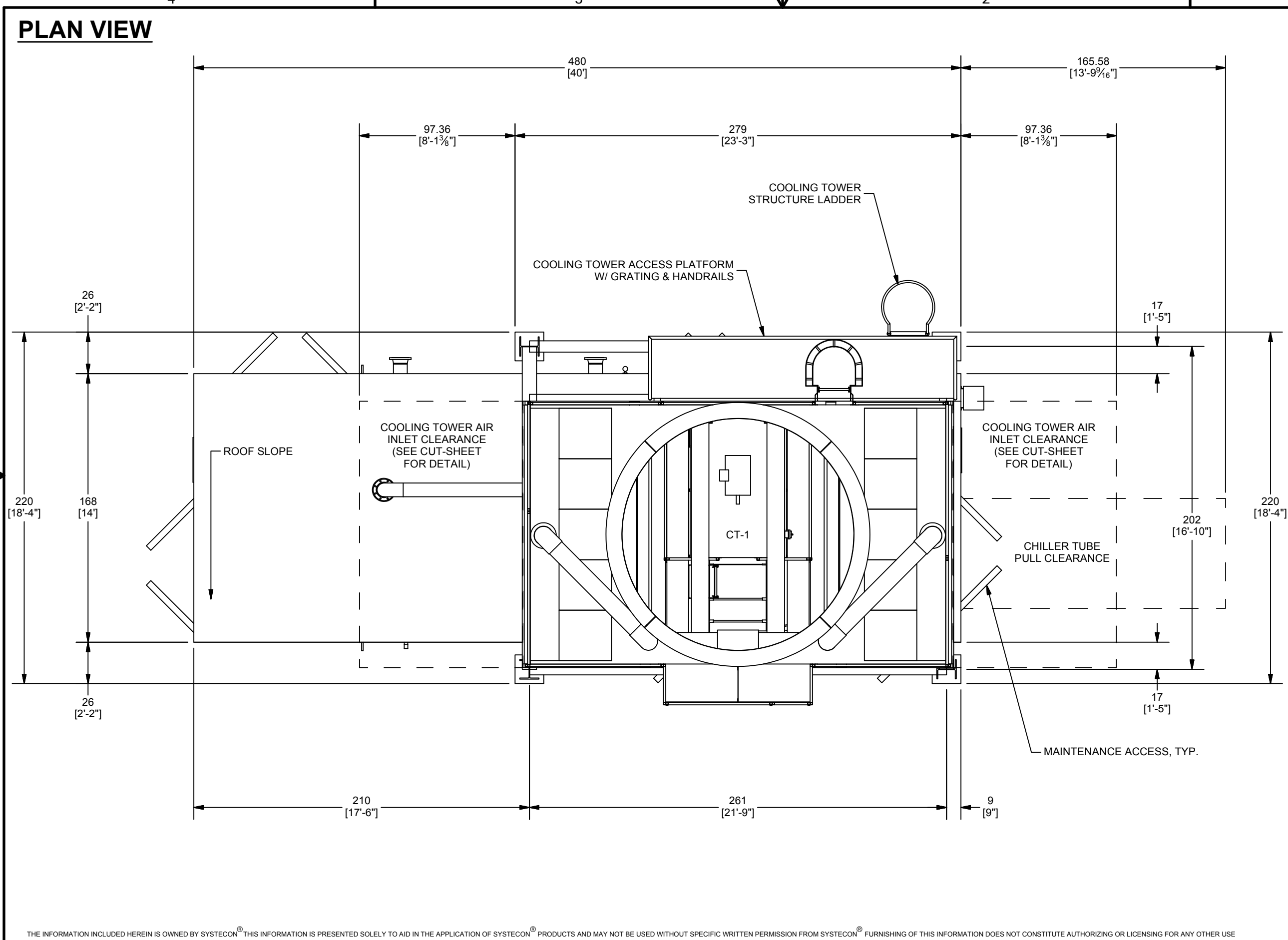
JOB NAME: CENTURYLINK CIB - 750 TON

DRAWING NO.: 20151XXM1 SHEET 2 OF 6

PLAN VIEW

B

A



IMPORTANT NOTICE:

1. PIPING DIMENSIONS ARE APPROXIMATE. FINAL DIMENSIONS MAY VARY DUE TO MANUFACTURING TOLERANCES. DO NOT COMPLETE FIELD PIPING UNTIL SYSTEM IS PROPERLY INSTALLED. SYSTECON ACCEPTS NO LIABILITY DUE TO DIMENSION VARIANCES.
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125 PSIG MAXIMUM SUCTION DESIGN
175 PSIG MAXIMUM DISCHARGE DESIGN
PUMPING SYSTEM TYPE:
SYSTEM FLOW: _____ GPM _____ PSIG
USE: _____

PUMP	MODEL	FLOW	HEAD	HP
P-1.2	V8A13A-RC	1365	101	50

POWER: 460_V_3_PH_60_HZ

SYSTEM WEIGHTS
(DOES NOT INCLUDE CT & CT STRUCTURE)

SHIPPING WT. = 70,000 LBS
_____ CU. FT OF BASE FILL WT. = _____
WATER WT. = 10,000 LBS
OPERATIONAL WT. = 80,000 LBS

REVISION HISTORY

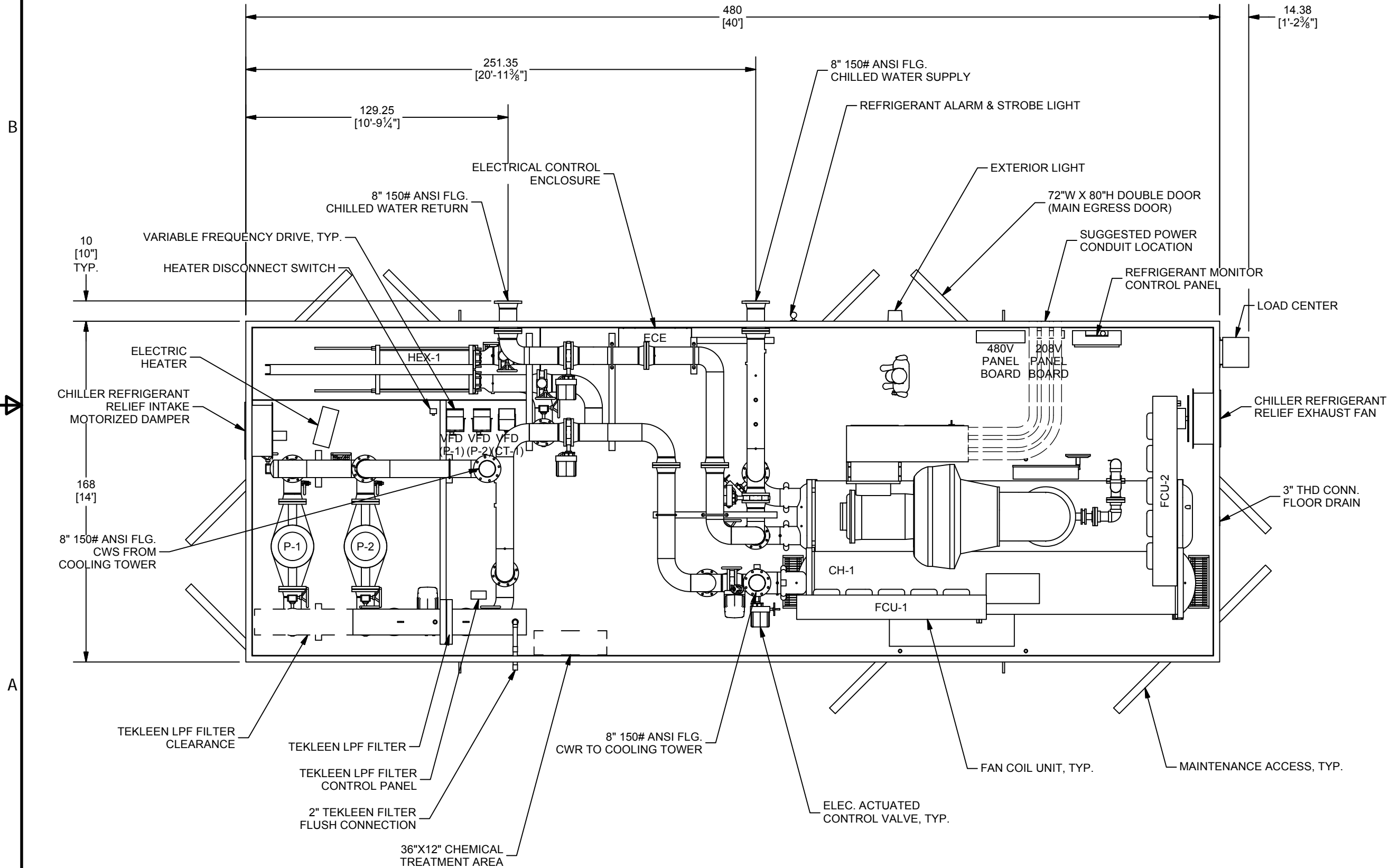
REV	DESC.	DATE	DRN. BY	CHK. BY:
1	PER C.O. #1	6/23/2015	JWC	

Systemcon®

DRN. BY: JWC 5/27/2015
CHK. BY: TWF 6/1/2015
ENGINEER:
TITLE: MECHANICAL SYSTEM LAYOUT (750 TON)
JOB NAME: CENTURYLINK CIB - 750 TON
DRAWING NO.: 20151XXM1 SHEET 3 OF 6

PLAN VIEW

(CT EQUIP. & ROOF REMOVED FOR CLARITY)



IMPORTANT NOTICE:

1. PIPING DIMENSIONS ARE APPROXIMATE. FINAL DIMENSIONS MAY VARY DUE TO MANUFACTURING TOLERANCES. DO NOT COMPLETE FIELD PIPING UNTIL SYSTEM IS PROPERLY INSTALLED. SYSTECON ACCEPTS NO LIABILITY DUE TO DIMENSION VARIANCES.
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125 PSIG MAXIMUM SUCTION DESIGN
175 PSIG MAXIMUM DISCHARGE DESIGN
PUMPING SYSTEM TYPE:
SYSTEM FLOW: _____ GPM _____ PSIG
USE: _____

PUMP	MODEL	FLOW	HEAD	HP
P-1,2	V8A13A-RC	1365	101	50

POWER: 460_V_3_PH_60_HZ

SYSTEM WEIGHTS

(DOES NOT INCLUDE CT & CT STRUCTURE)

SHIPPING WT. = 70,000 LBS
 _____ CU. FT OF BASE FILL WT. = _____
 WATER WT. = 10,000 LBS
 OPERATIONAL WT. = 80,000 LBS

REVISION HISTORY				
REV	DESC.	DATE	DRN. BY	CHK. BY
1	PER C.O. #1	6/23/2015	JWC	

DRN. BY: JWC 5/27/2015
 CHK. BY: TWF 6/1/2015
 ENGINEER:
 TITLE: MECHANICAL SYSTEM LAYOUT (750 TON)
 JOB NAME: CENTURYLINK CIB - 750 TON
 DRAWING NO.: 20151XXM1 SHEET 4 OF 6

ELEVATION VIEWS

(WALLS & DOORS REMOVED FOR CLARITY)

IMPORTANT NOTICE:

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USE: _____

PUMP	MODEL	FLOW	HEAD	HP
P-1.2	V8A13A-RC	1365	101	50
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

POWER: 460_V_3_PH_60_HZ

SYSTEM WEIGHTS (DOES NOT INCLUDE CT & CT STRUCTURE)

SHIPPING WT.= 70,000 LBS
_____ CU. FT OF BASE FILL WT.=
WATER WT.= 10,000 LBS
OPERATIONAL WT.= 80,000 LBS

REVISION HISTORY

REV	DESC.	DATE	DRN. BY	CHK. BY
1	PER C.O. #1	6/23/2015	JWC	



DRN. BY: JWC 5/27/2015

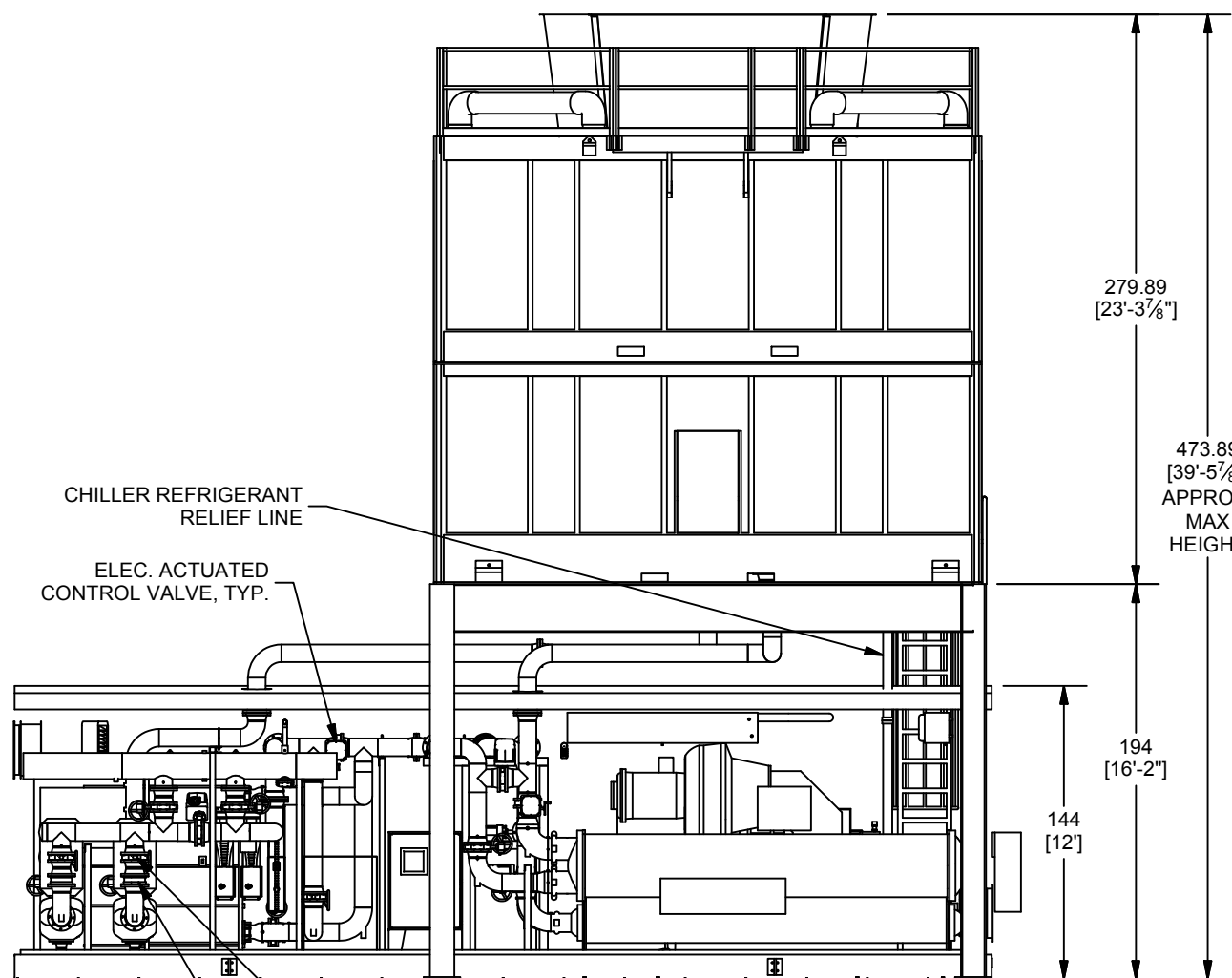
CHK. BY: TWF 6/1/2015

ENGINEER:

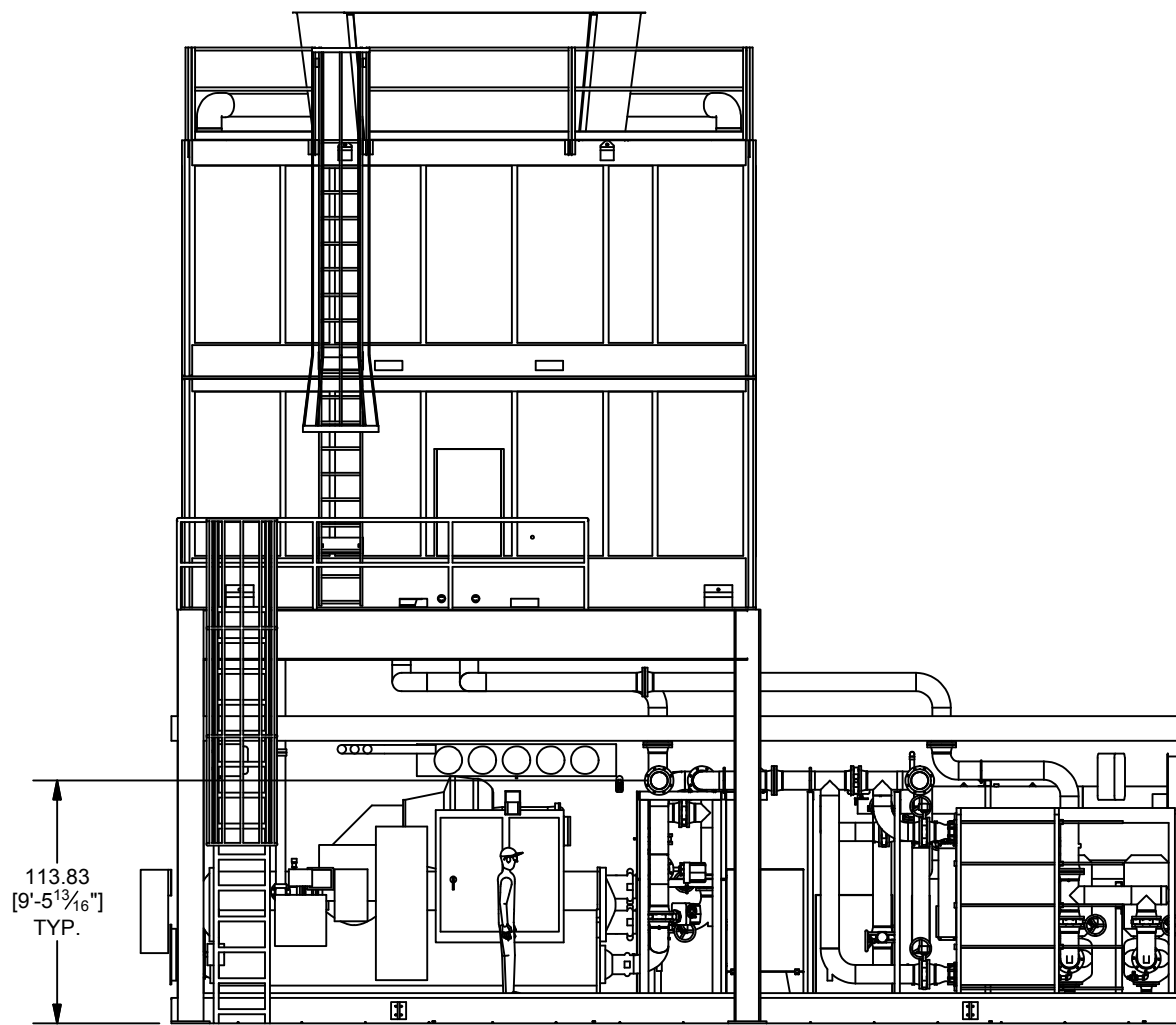
TITLE: MECHANICAL SYSTEM LAYOUT (750 TON)

JOB NAME: CENTURYLINK CIB - 750 TON

DRAWING NO.: 20151XXM1 SHEET 5 OF 6



FRONT VIEW



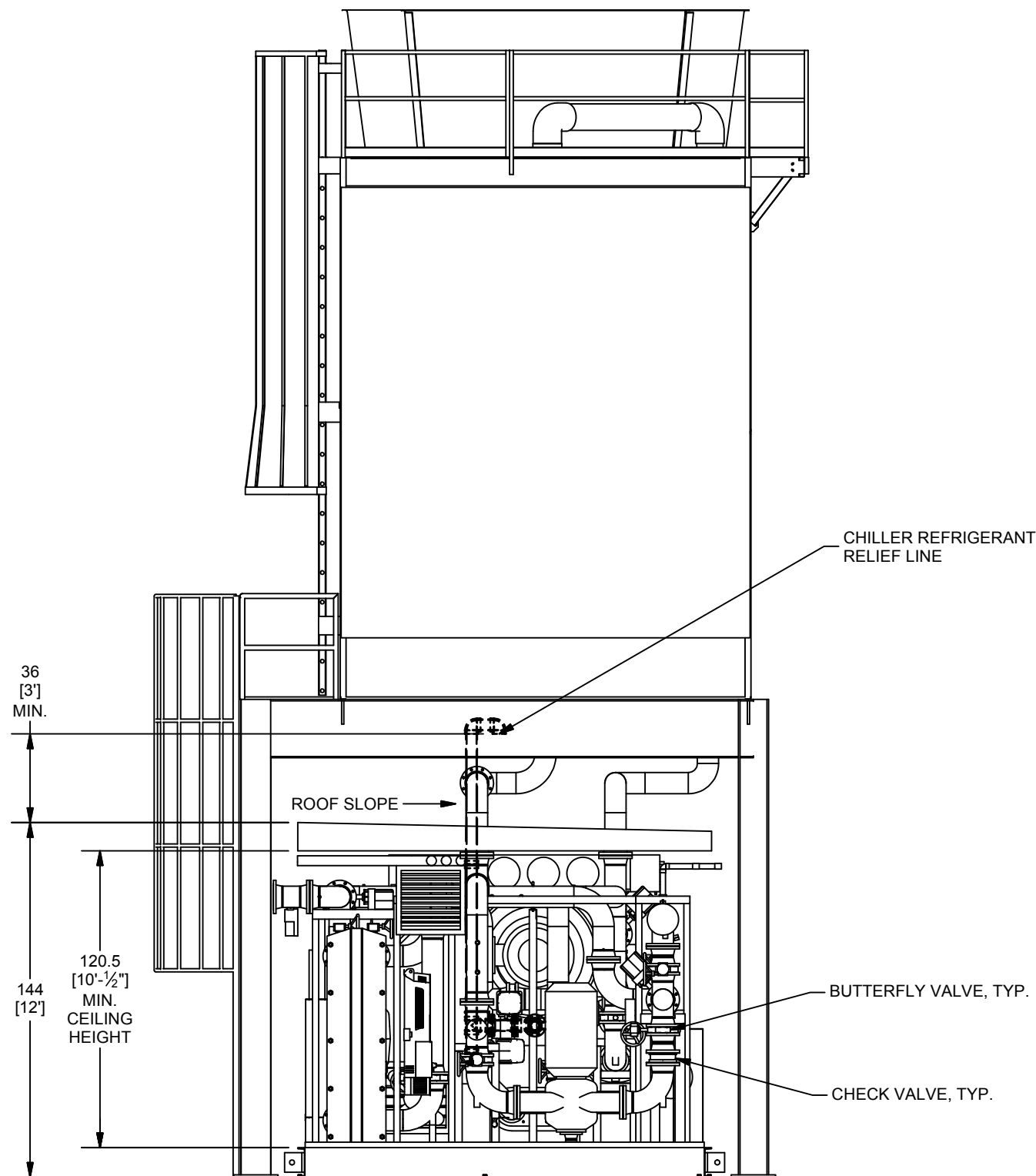
REAR VIEW

ELEVATION VIEWS

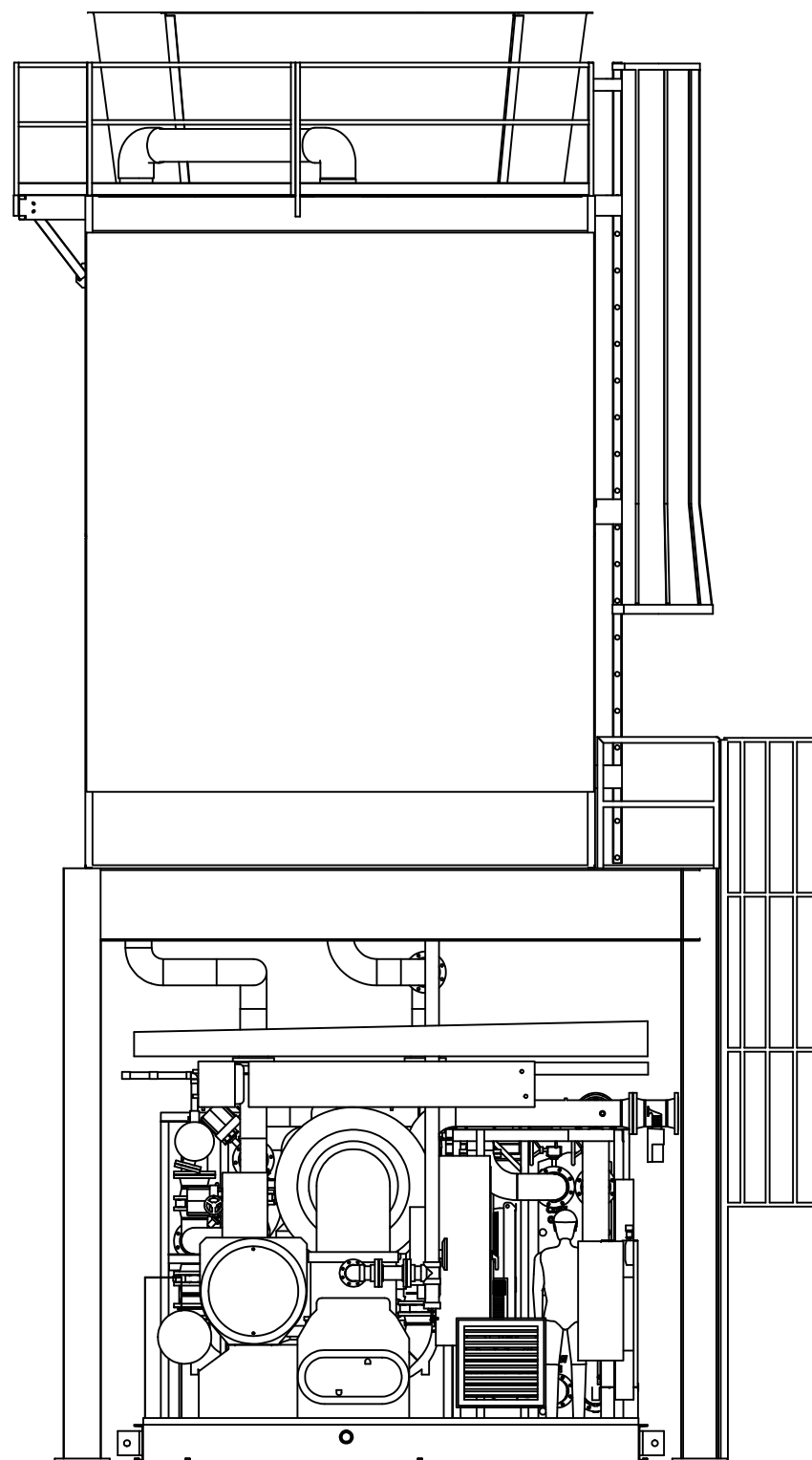
(WALLS & DOORS REMOVED FOR CLARITY)

B

A



LEFT SIDE VIEW



RIGHT SIDE VIEW

IMPORTANT NOTICE:

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125 PSIG MAXIMUM SUCTION DESIGN
 175 PSIG MAXIMUM DISCHARGE DESIGN
 PUMPING SYSTEM TYPE:
 SYSTEM FLOW: _____ GPM _____ PSIG
 USE: _____

PUMP	MODEL	FLOW	HEAD	HP
P-1.2	V8A13A-RC	1365	101	50

POWER: 460_V_3_PH_60_HZ

SYSTEM WEIGHTS

(DOES NOT INCLUDE CT & CT STRUCTURE)

SHIPPING WT.= 70,000 LBS
 _____ CU. FT OF BASE FILL WT.=
 WATER WT.= 10,000 LBS
 OPERATIONAL WT.= 80,000 LBS

REVISION HISTORY

REV	DESC.	DATE	DRN. BY	CHK. BY:
1	PER C.O. #1	6/23/2015	JWC	



DRN. BY: JWC 5/27/2015

CHK. BY: TWF 6/1/2015

ENGINEER:

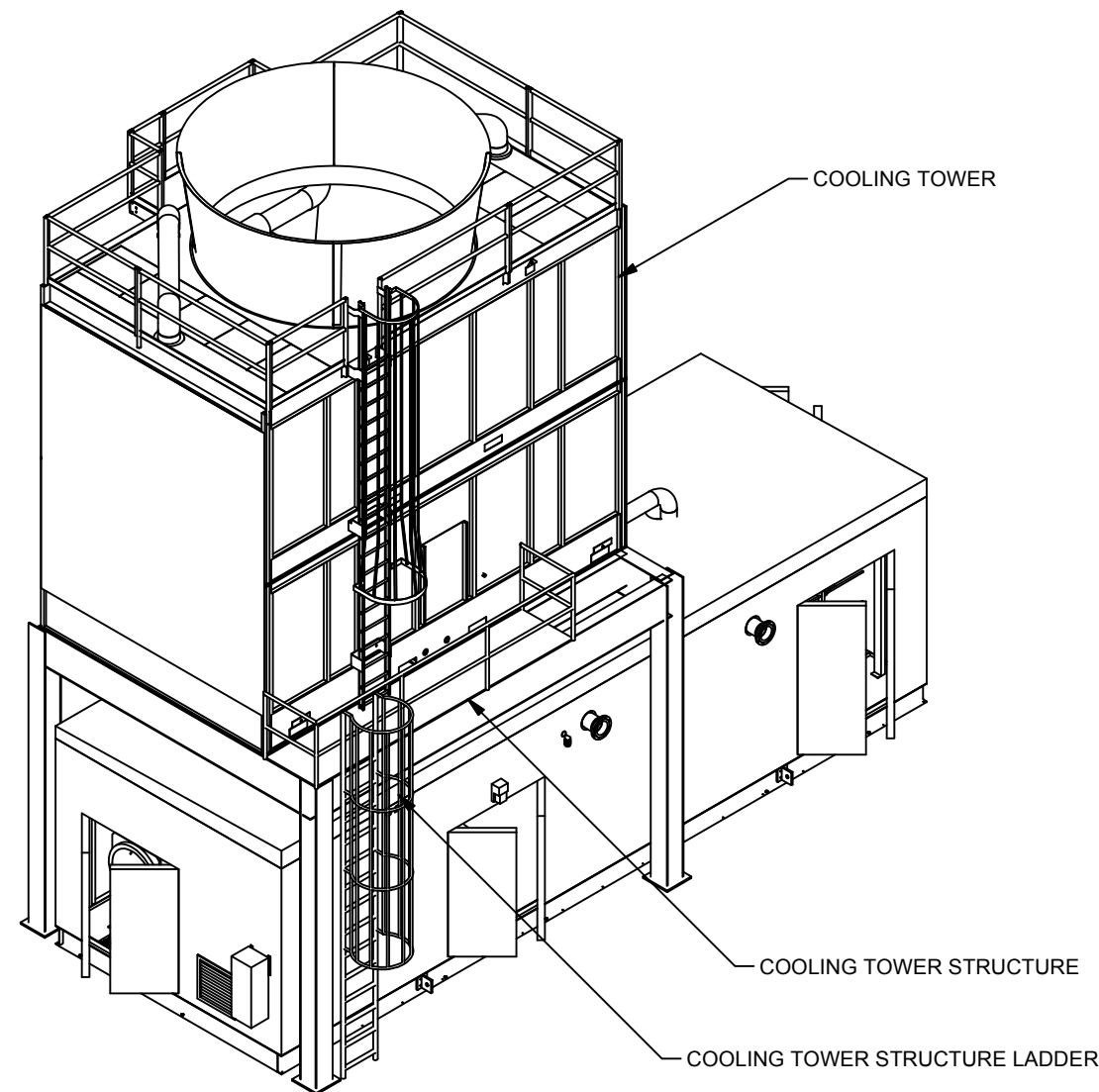
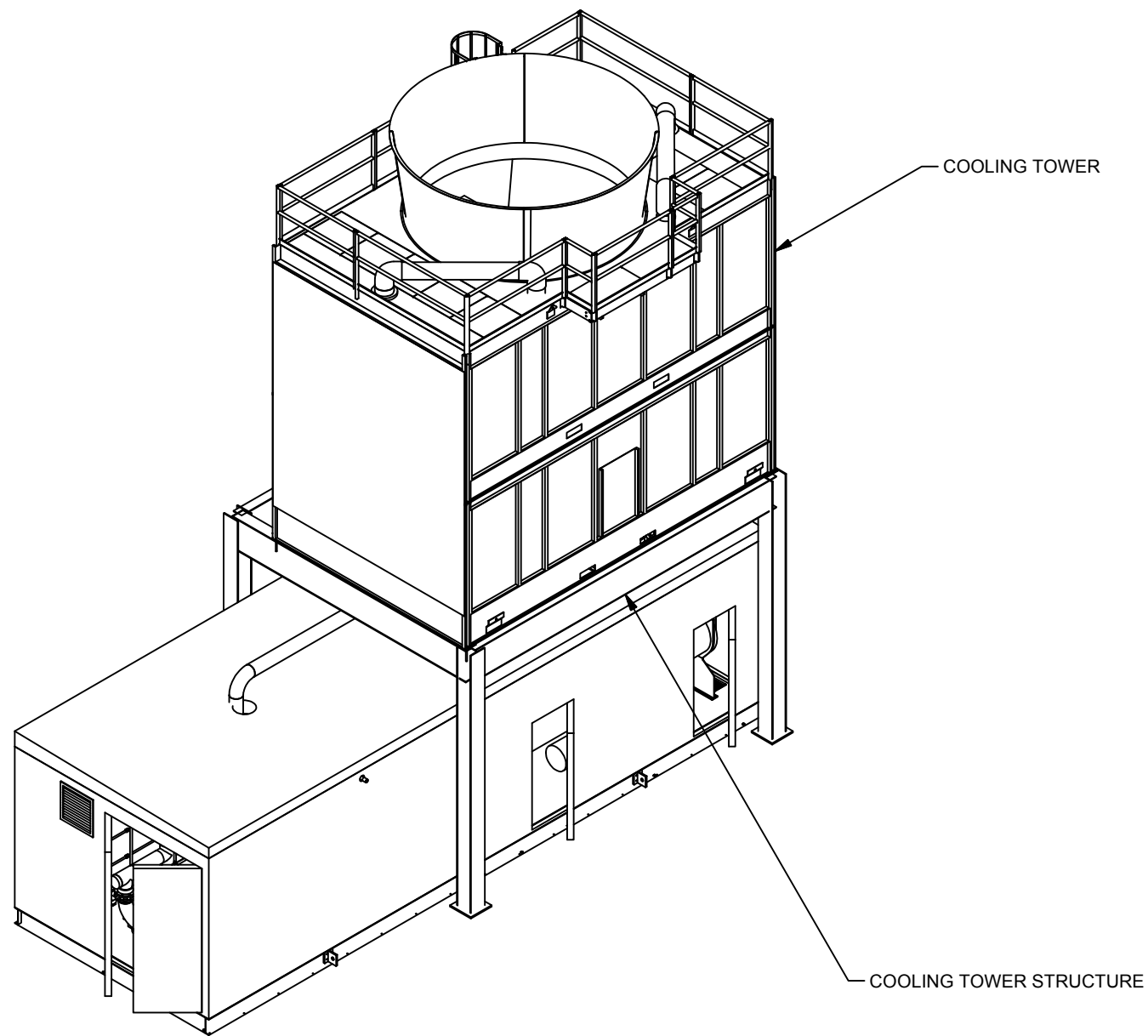
TITLE: MECHANICAL SYSTEM LAYOUT (750 TON)

JOB NAME: CENTURYLINK CIB - 750 TON

DRAWING NO.: 20151XXM1 SHEET 6 OF 6

ENTIRE PLANT ISOMETRIC VIEWS

COOLING TOWER OPERATING WEIGHT: 48,378 LBS



REVISION HISTORY				
REV	DESC.	DATE	DRN. BY	CHK. BY:
1	PER ENG. COMMENTS	6/3/2015	JWC	
2	PER ENG. COMMENTS	6/18/2015	JWC	

Systecon[®]

DRN. BY: JJB 5/27/2015

CHK. BY: JWC 5/28/2015

LOCATION:

TITLE: COOLING TOWER STRUCTURE

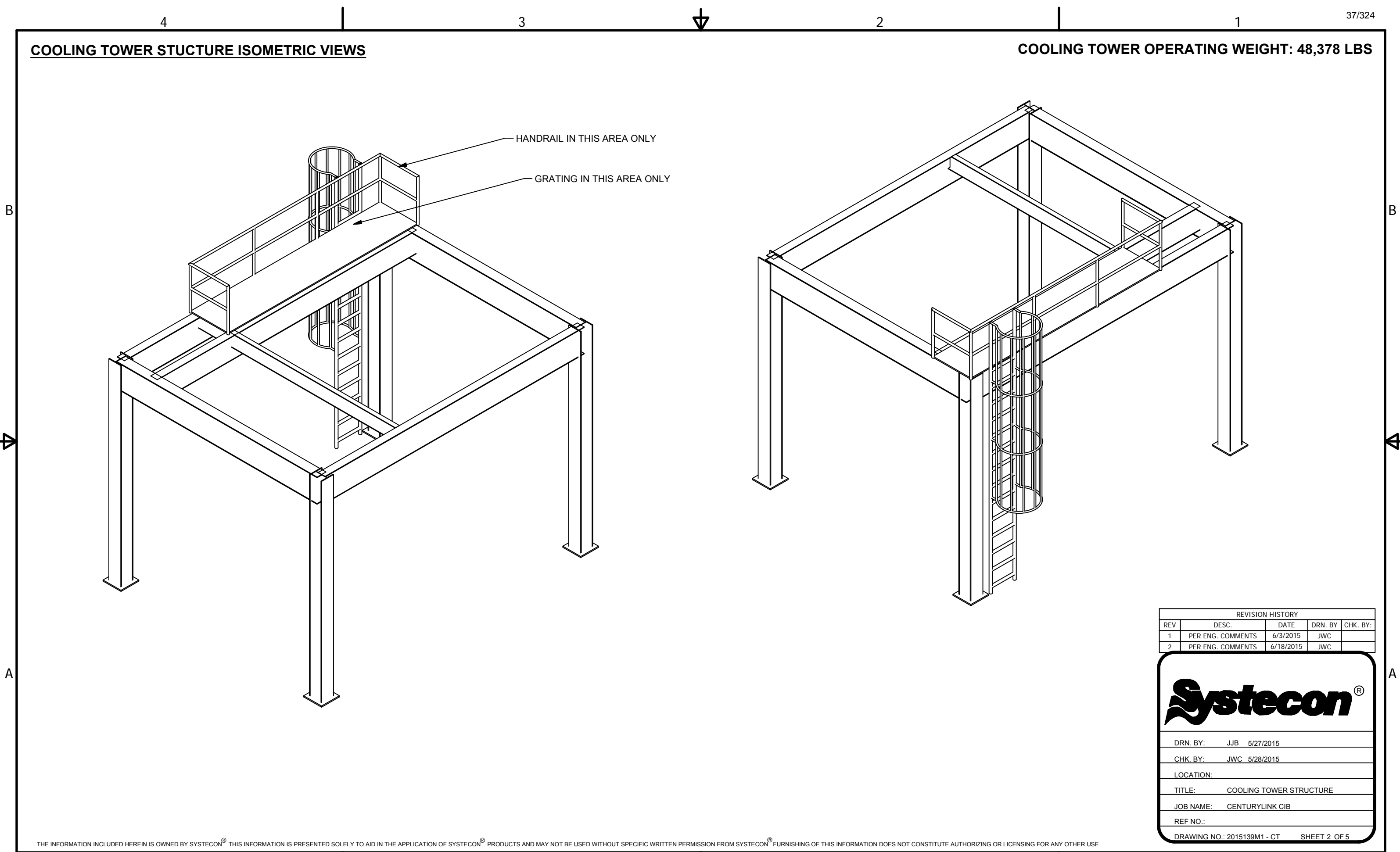
JOB NAME: CENTURYLINK CIB

REF NO.:

DRAWING NO.: 2015139M1 - CT SHEET 1 OF 5

COOLING TOWER STRUCTURE ISOMETRIC VIEWS

COOLING TOWER OPERATING WEIGHT: 48,378 LBS



REVISION HISTORY				
REV	DESC.	DATE	DRN. BY	CHK. BY:
1	PER ENG. COMMENTS	6/3/2015	JWC	
2	PER ENG. COMMENTS	6/18/2015	JWC	

Systecon[®]

DRN. BY: JJB 5/27/2015

CHK. BY: JWC 5/28/2015

LOCATION:

TITLE: COOLING TOWER STRUCTURE

JOB NAME: CENTURYLINK CIB

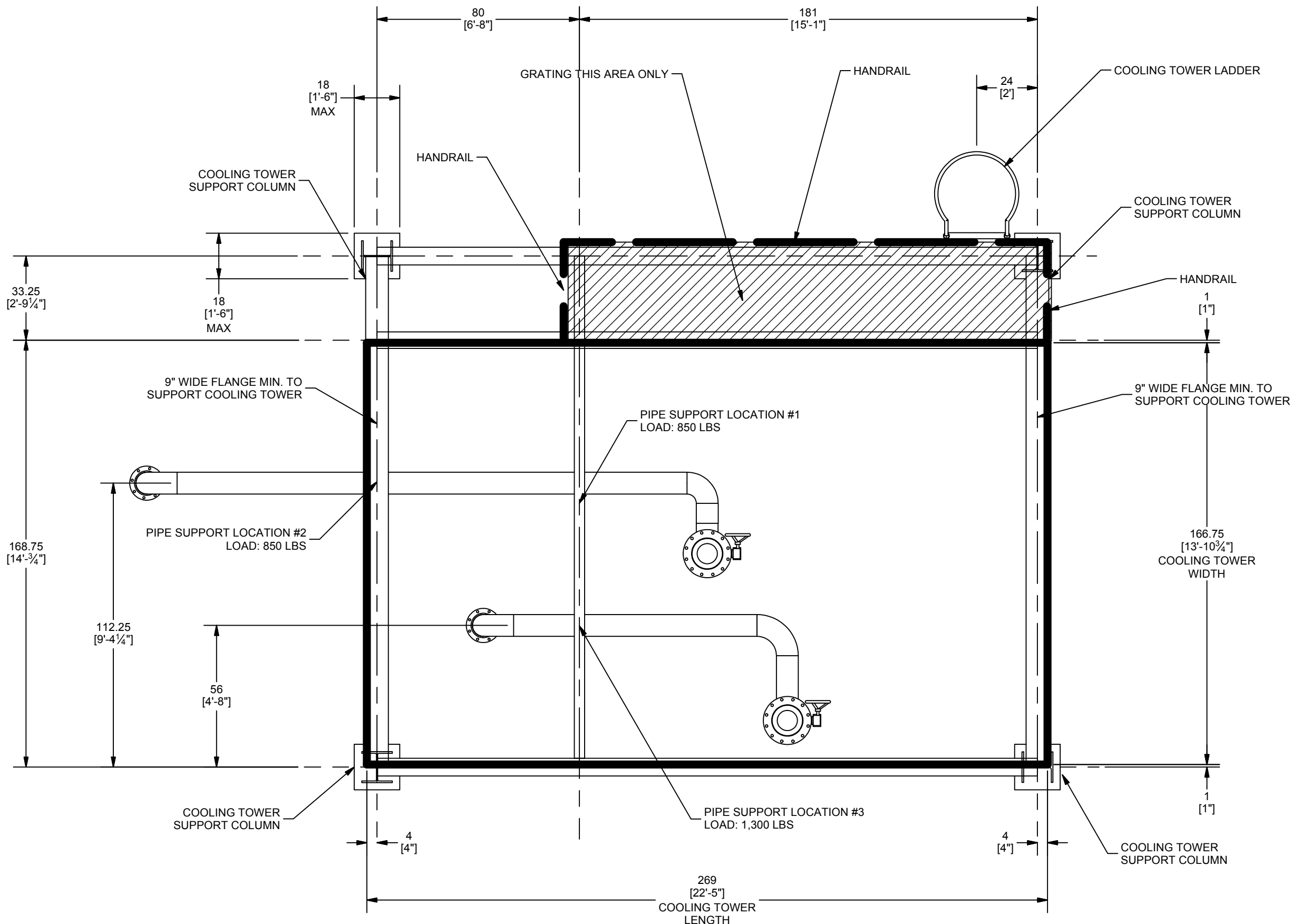
REF NO.:

DRAWING NO.: 2015139M1 - CT SHEET 2 OF 5

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COOLING TOWER STUCTURE PLAN VIEW

COOLING TOWER OPERATING WEIGHT: 48,378 LBS



REVISION HISTORY				
REV	DESC.	DATE	DRN. BY	CHK. BY:
1	PER ENG. COMMENTS	6/3/2015	JWC	
2	PER ENG. COMMENTS	6/18/2015	JWC	

Systecon®

DRN. BY: JJB 5/27/2015

CHK. BY: JWC 5/28/2015

LOCATION:

TITLE: COOLING TOWER STRUCTURE

JOB NAME: CENTURYLINK CIB

REF NO.:

DRAWING NO.: 2015139M1 - CT SHEET 3 OF 5

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COOLING TOWER STUCTURE ELEVATION VIEWS

COOLING TOWER OPERATING WEIGHT: 48,378 LBS

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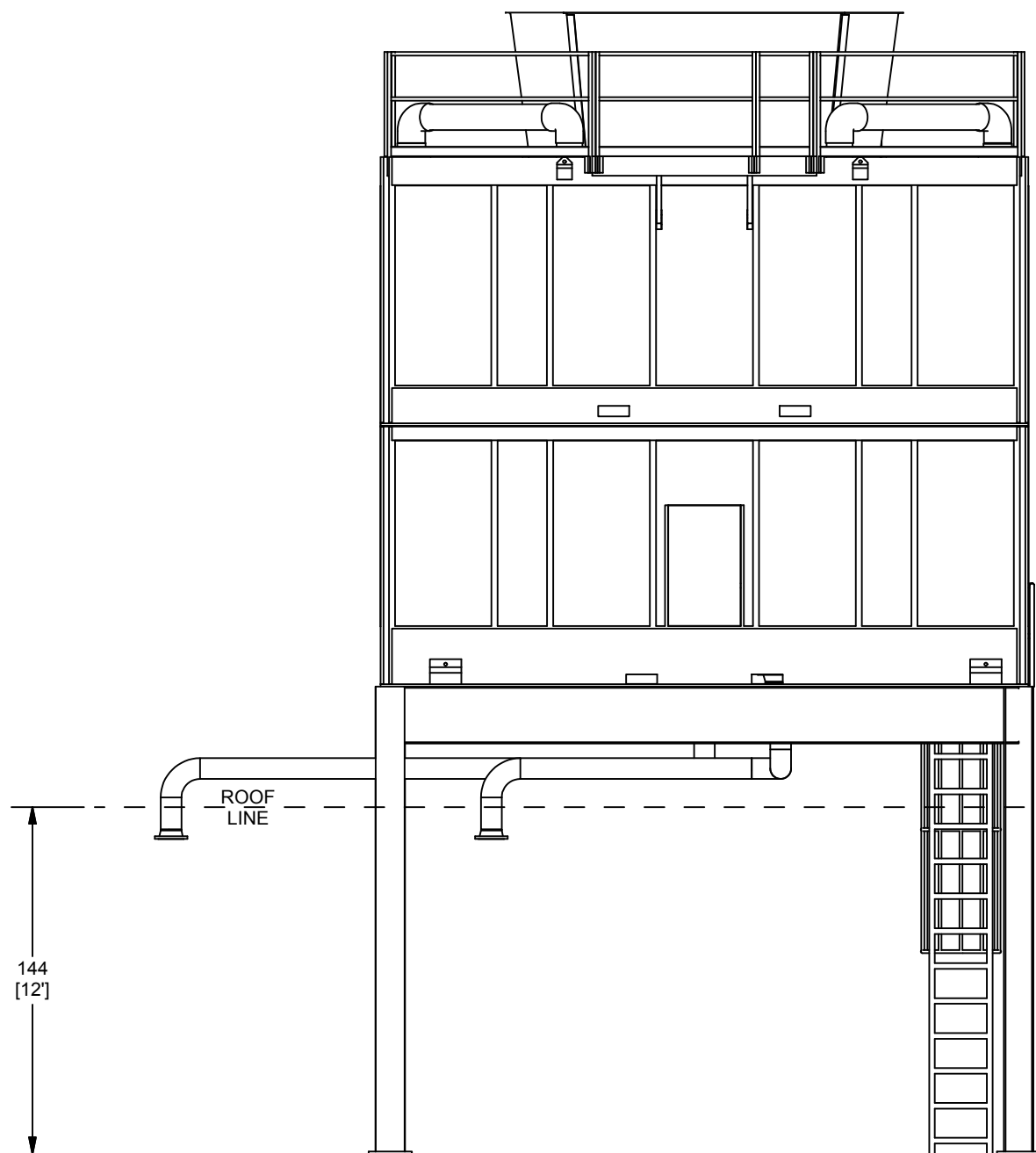
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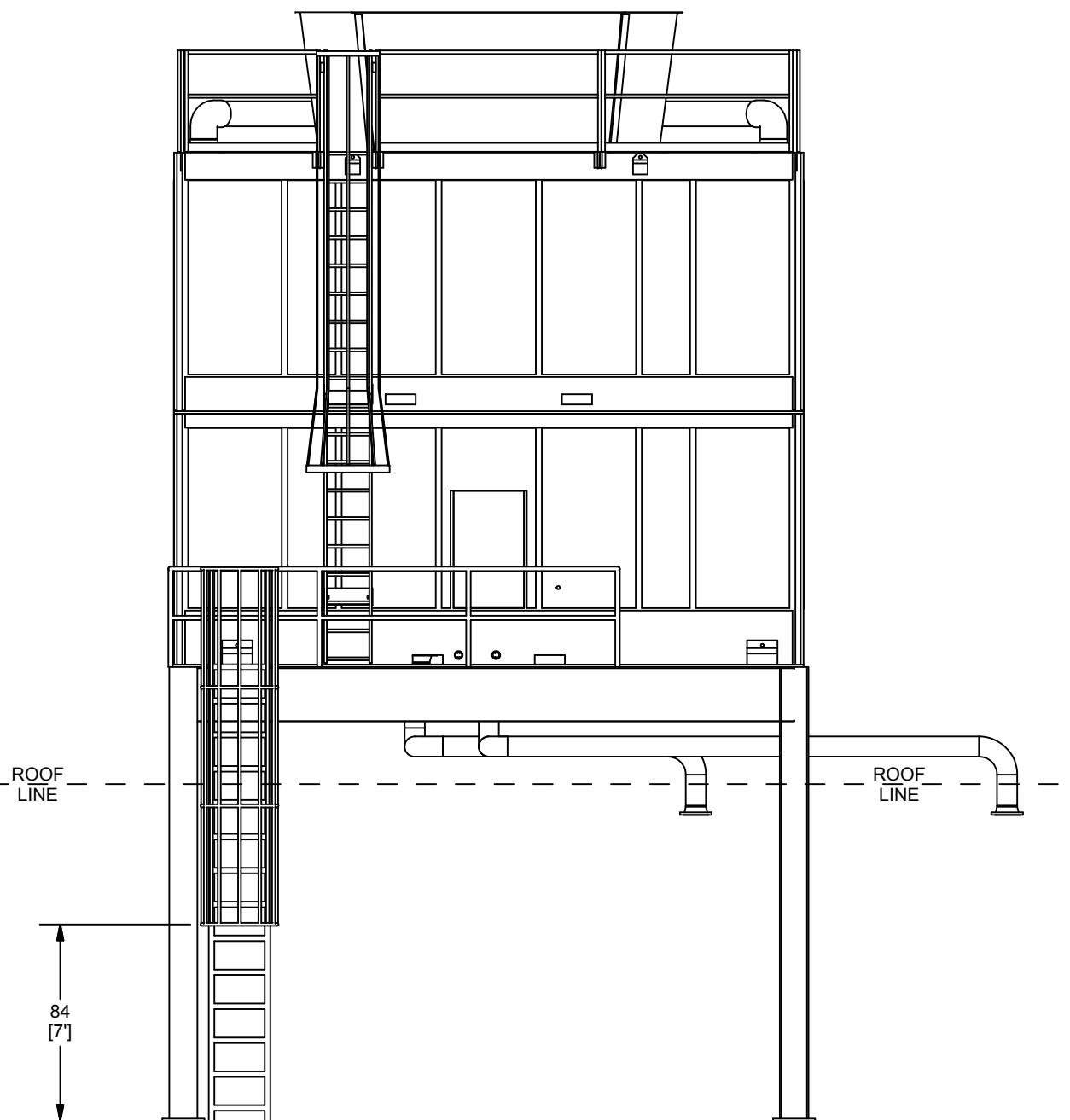
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2

1



FRONT VIEW



REAR VIEW

REVISION HISTORY				
REV	DESC.	DATE	DRN. BY	CHK. BY:
1	PER ENG. COMMENTS	6/3/2015	JWC	
2	PER ENG. COMMENTS	6/18/2015	JWC	

Systecon[®]

DRN. BY: JJB 5/27/2015

CHK. BY: JWC 5/28/2015

LOCATION:

TITLE: COOLING TOWER STRUCTURE

JOB NAME: CENTURYLINK CIB

REF NO.:

DRAWING NO.: 2015139M1 - CT SHEET 4 OF 5

THE INFORMATION INCLUDED HEREIN IS OWNED BY SYSTECON[®] THIS INFORMATION IS PRESENTED SOLELY TO AID IN THE APPLICATION OF SYSTECON[®] PRODUCTS AND MAY NOT BE USED WITHOUT SPECIFIC WRITTEN PERMISSION FROM SYSTECON[®] FURNISHING OF THIS INFORMATION DOES NOT CONSTITUTE AUTHORIZING OR LICENSING FOR ANY OTHER USE

4

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1

COOLING TOWER STUCTURE ELEVATION VIEWS

COOLING TOWER OPERATING WEIGHT: 48,378 LBS

B

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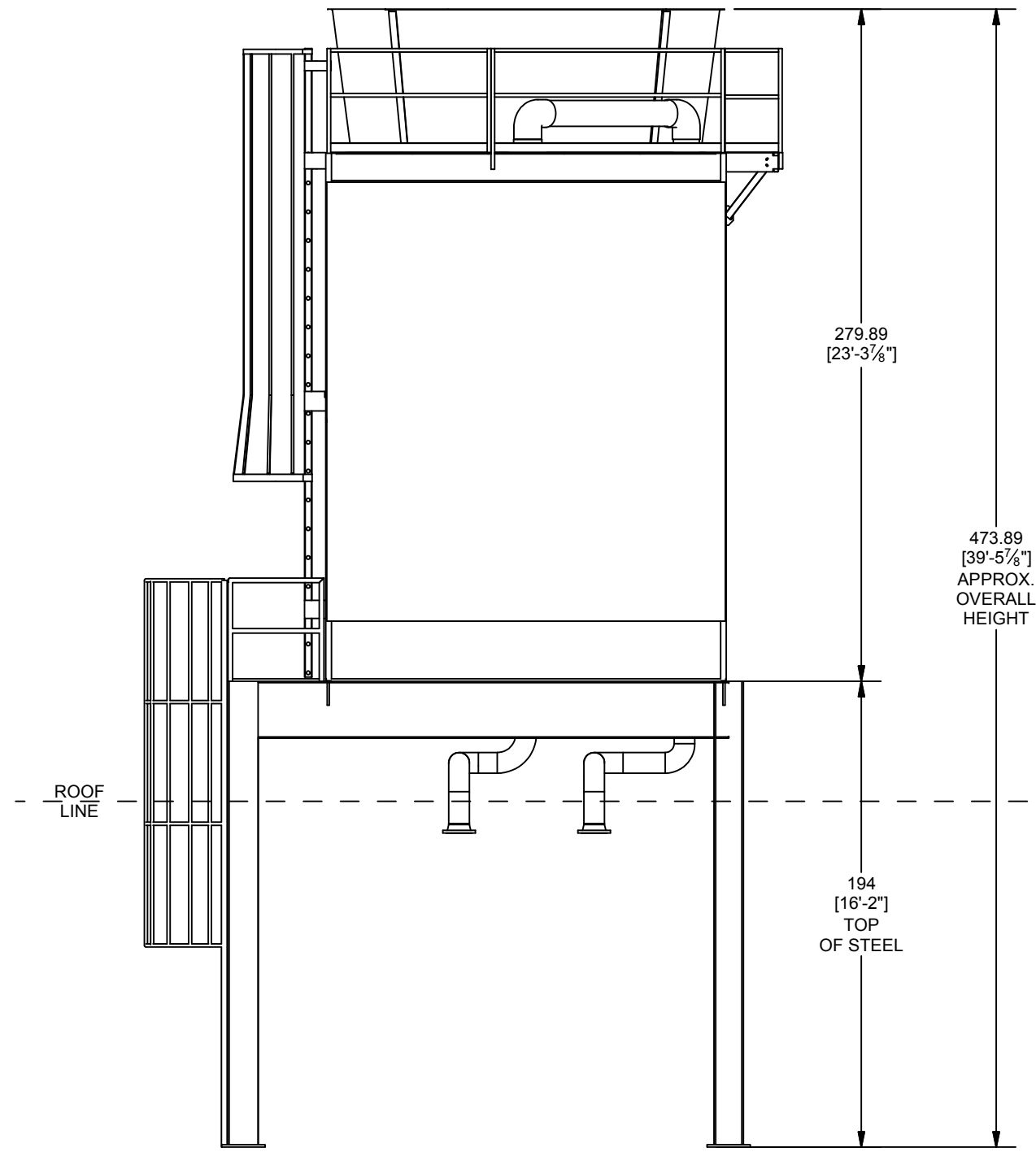
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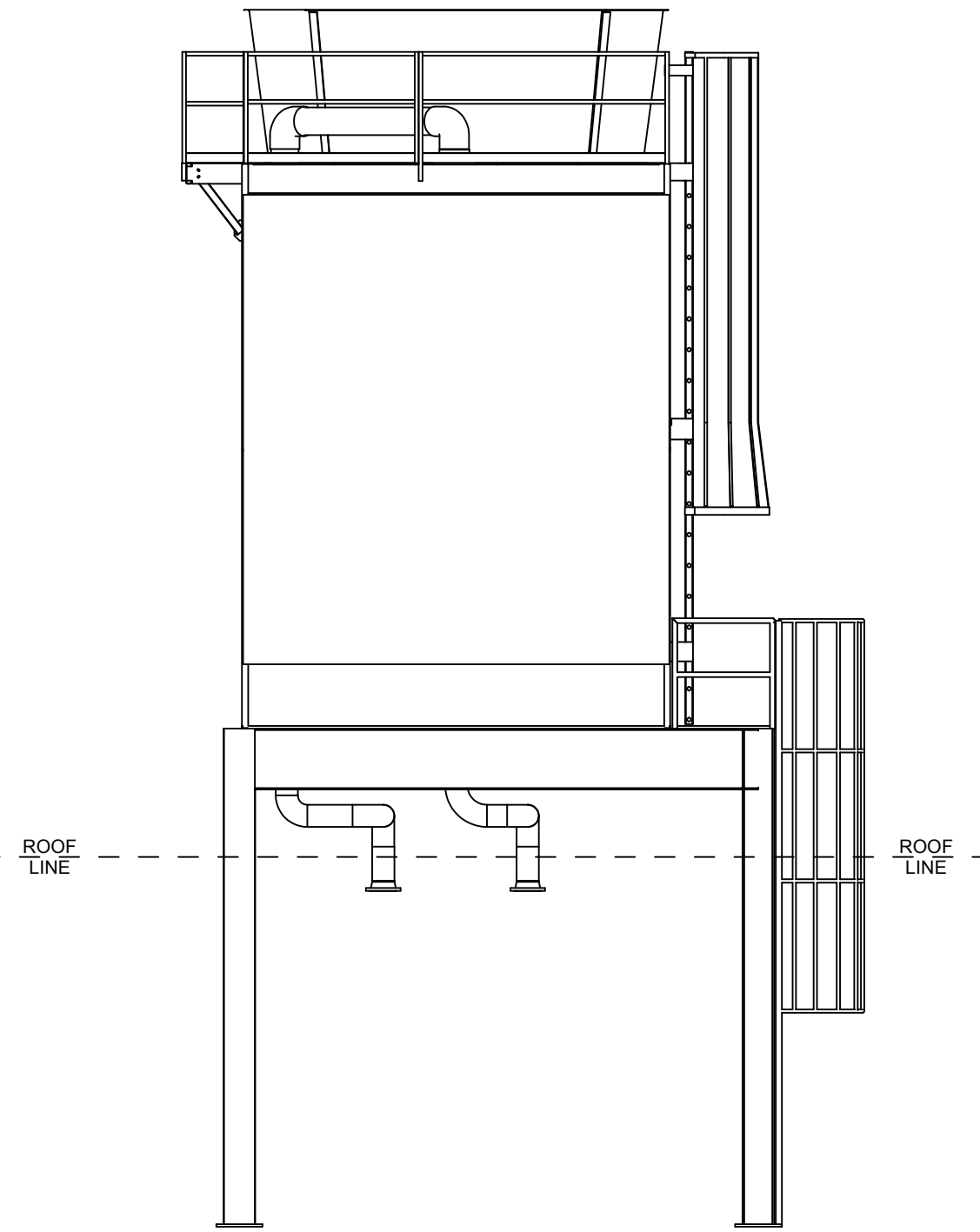
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2

1



LEFT SIDE VIEW



RIGHT SIDE VIEW

REVISION HISTORY				
REV	DESC.	DATE	DRN. BY	CHK. BY:
1	PER ENG. COMMENTS	6/3/2015	JWC	
2	PER ENG. COMMENTS	6/18/2015	JWC	

Systemcon®

DRN. BY: JJB 5/27/2015

CHK. BY: JWC 5/28/2015

LOCATION:

TITLE: COOLING TOWER STRUCTURE

JOB NAME: CENTURYLINK CIB

REF NO.:

DRAWING NO.: 2015139M1 - CT SHEET 5 OF 5

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4

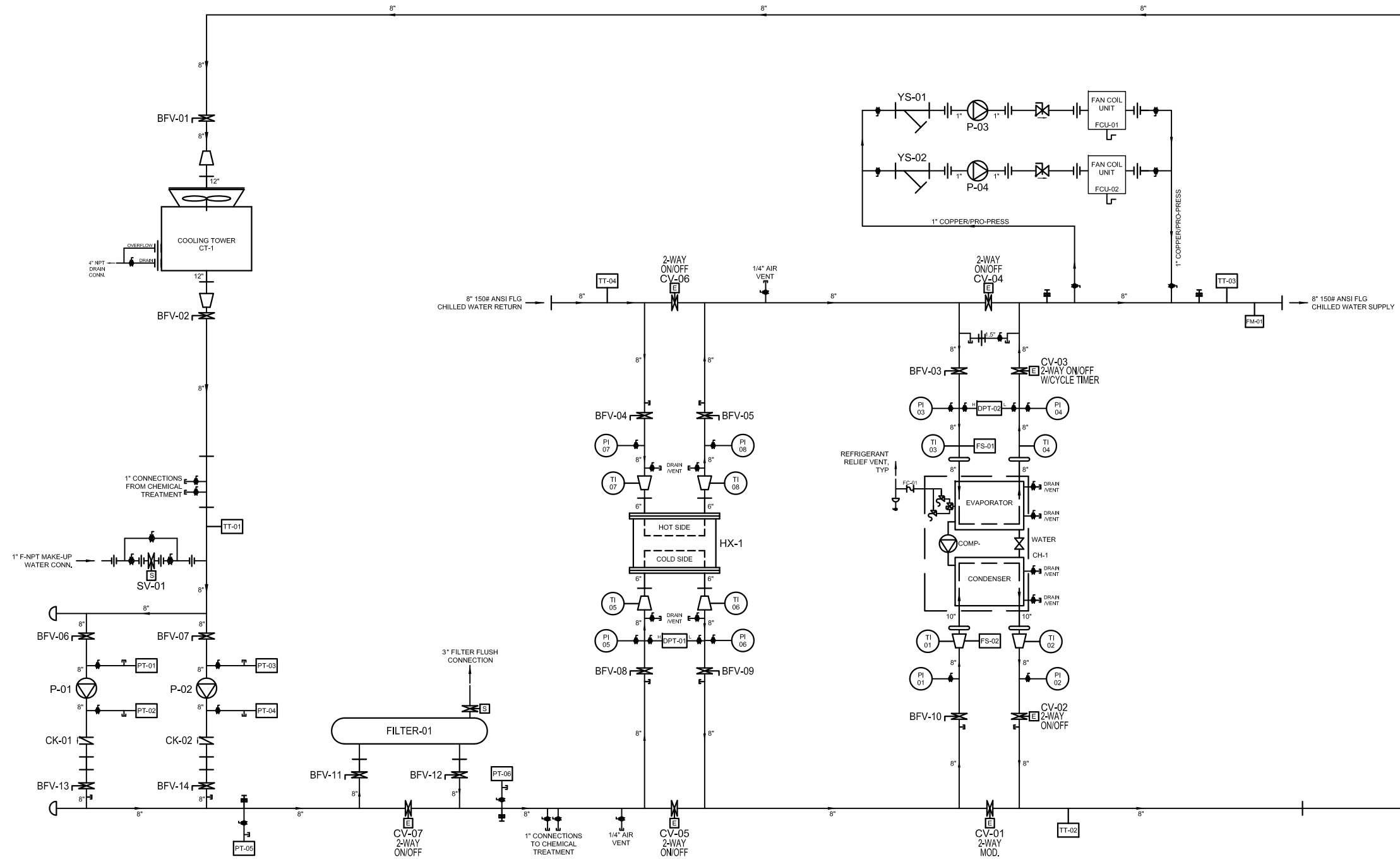
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2

1

MECHANICAL FLOW SCHEMATIC DRAWING

REVISION HISTORY				
DATE	REV	DESC	DRN BY	CHK BY
6/23/2015	1	PER C.O. #1	JWC	



PRINTED DRAWING SIZE: 24"x36" (D SIZE)




DRN. BY:	JWC	05/27/2015
CHK. BY:	TWF	06/01/2015
ENGINEER:		
TITLE:	MECHANICAL SYSTEM SCHEMATIC	
JOB NAME:	CENTURYLINK (750 TON CIB)	
DRAWING NO.:	20151XXM2-750TON	SHEET 1 OF 3

REVISION HISTORY			
DATE	REV	DESC	DRN BY / CHK BY
6/23/2015	1	PER C.O. #1	JWC

INSTRUMENTATION SCHEDULE						
TAG	CATALOG	MANUFACTURER	MFG MODEL NO.	DESCRIPTION	RATING	FUNCTION
DPT-01	10000764	ROSEMOUNT	2051CD4A52A1AB4	DIFFERENTIAL PRESSURE TRANSMITTER	0 - 100' DP	HEAT EXCHANGER HEX-1 DIFFERENTIAL PRESSURE
DPT-02	10000764	ROSEMOUNT	2051CD4A52A1AB4	DIFFERENTIAL PRESSURE TRANSMITTER	0 - 100' DP	HEAT EXCHANGER HEX-1 DIFFERENTIAL PRESSURE
FM-01	10001119	ONICON	F-1210	FLOW METER - 8" PIPE	0 - 1800 GPM	CHILLED WATER SYSTEM FLOW
FS-01	N/A	N/A	N/A	FLOW SWITCH ON CHILLER BY CHILLER MFG		CH-01 EVAP FLOW INDICATION
FS-02	N/A	N/A	N/A	FLOW SWITCH ON CHILLER BY CHILLER MFG		CH-01 COND FLOW INDICATION
PI-01	10001324	AMETEK	160813A	PRESSURE GAUGE	0 - 200 PSIG	CH-01 COND INLET PRESSURE GAUGE
PI-02	10001324	AMETEK	160813A	PRESSURE GAUGE	0 - 200 PSIG	CH-01 COND OUTLET PRESSURE GAUGE
PI-03	10001324	AMETEK	160813A	PRESSURE GAUGE	0 - 200 PSIG	CH-01 EVAP INLET PRESSURE GAUGE
PI-04	10001324	AMETEK	160813A	PRESSURE GAUGE	0 - 200 PSIG	CH-01 EVAP OUTLET PRESSURE GAUGE
PI-05	10001324	AMETEK	160813A	PRESSURE GAUGE	0 - 200 PSIG	HX-1 COLD SIDE INLET PRESSURE GAUGE
PI-06	10001324	AMETEK	160813A	PRESSURE GAUGE	0 - 200 PSIG	HX-1 COLD SIDE OUTLET PRESSURE GAUGE
PI-07	10001324	AMETEK	160813A	PRESSURE GAUGE	0 - 200 PSIG	HX-1 HOT SIDE INLET PRESSURE GAUGE
PI-08	10001324	AMETEK	160813A	PRESSURE GAUGE	0 - 200 PSIG	HX-1 HOT SIDE OUTLET PRESSURE GAUGE
PT-01	10003654	DWYER	626-03-GH-P1-E4-S1	PRESSURE TRANSMITTER NEMA 1	0 - 100 PSIA	PUMP P-1 SUCTION PRESSURE
PT-02	10003653	DWYER	626-12-GH-P1-E4-S1	PRESSURE TRANSMITTER NEMA 1	0 - 200 PSIG	PUMP P-1 DISCHARGE PRESSURE
PT-03	10003654	DWYER	626-03-GH-P1-E4-S1	PRESSURE TRANSMITTER NEMA 1	0 - 100 PSIA	PUMP P-2 SUCTION PRESSURE
PT-04	10003653	DWYER	626-12-GH-P1-E4-S1	PRESSURE TRANSMITTER NEMA 1	0 - 200 PSIG	PUMP P-2 DISCHARGE PRESSURE
PT-05	10003653	DWYER	626-12-GH-P1-E4-S1	PRESSURE TRANSMITTER NEMA 1	0 - 200 PSIG	FILTER UNIT INLET PRESSURE
PT-06	10003653	DWYER	626-12-GH-P1-E4-S1	PRESSURE TRANSMITTER NEMA 1	0 - 200 PSIG	FILTER UNIT OUTLET PRESSURE
TI-01	38000026	WEISS	DVU35	WEISS THERMOMETER DVU35 W/WELL	-50 TO 300°F	CH-01 COND INLET THERMOMETER
TI-02	38000026	WEISS	DVU35	WEISS THERMOMETER DVU35 W/WELL	-50 TO 300°F	CH-01 COND OUTLET THERMOMETER
TI-03	38000026	WEISS	DVU35	WEISS THERMOMETER DVU35 W/WELL	-50 TO 300°F	CH-01 EVAP INLET THERMOMETER
TI-04	38000026	WEISS	DVU35	WEISS THERMOMETER DVU35 W/WELL	-50 TO 300°F	CH-01 EVAP OUTLET THERMOMETER
TI-05	38000026	WEISS	DVU35	WEISS THERMOMETER DVU35 W/WELL	-50 TO 300°F	HX-1 COLD SIDE INLET THERMOMETER
TI-06	38000026	WEISS	DVU35	WEISS THERMOMETER DVU35 W/WELL	-50 TO 300°F	HX-1 COLD SIDE OUTLET THERMOMETER
TI-07	38000026	WEISS	DVU35	WEISS THERMOMETER DVU35 W/WELL	-50 TO 300°F	HX-1 HOT SIDE INLET THERMOMETER
TI-08	38000026	WEISS	DVU35	WEISS THERMOMETER DVU35 W/WELL	-50 TO 300°F	HX-1 HOT SIDE OUTLET THERMOMETER
TT-01	10005300	ROSEMOUNT	248HANAB2XAF6	TEMPERATURE TRANSMITTER 4.5" PROBE (6-10" PIPE) COLD WATER	32 - 122°F	COOLING TOWER SUPPLY TEMPERATURE
TT-02	10005300	ROSEMOUNT	248HANAB2XAF6	TEMPERATURE TRANSMITTER 4.5" PROBE (6-10" PIPE) COLD WATER	32 - 122°F	COOLING TOWER RETURN TEMPERATURE
TT-03	10005300	ROSEMOUNT	248HANAB2XAF6	TEMPERATURE TRANSMITTER 4.5" PROBE (6-10" PIPE) COLD WATER	32 - 122°F	CHILLED WATER SUPPLY TEMPERATURE
TT-04	10005300	ROSEMOUNT	248HANAB2XAF6	TEMPERATURE TRANSMITTER 4.5" PROBE (6-10" PIPE) COLD WATER	32 - 122°F	CHILLED WATER RETURN TEMPERATURE

PRINTED DRAWING SIZE: 24"x36" (D SIZE)



DRN. BY: JWC 05/27/2015

CHK. BY: TWF 06/01/2015

ENGINEER:

TITLE: MECHANICAL SYSTEM SCHEMATIC

JOB NAME: CENTURYLINK (750 TON CIB)


DRAWING NO.: 20151XXM2-750TON SHEET 2 OF 3

REVISION HISTORY			
DATE	REV	DESC	DRN BY / CHK BY
6/23/2015	1	PER C.O. #1	JWC

MECHANICAL EQUIPMENT SCHEDULE					
TAG	QTY	CATALOG	MANUFACTURER	MFG MODEL NO	DESCRIPTION
BFV-01 BFV-02 BFV-03 BFV-04 BFV-05 BFV-06 BFV-07 BFV-08 BFV-09 BFV-10 BFV-11 BFV-12 BFV-13 BFV-14	14	10000452	PROVALVE	PV08L204435G	8" MANUAL BUTTERFLY SERIES 500
BV-01 BV-02 BV-03 BV-04 BV-06 BV-07 BV-18 BV-19 BV-21 BV-22 BV-23 BV-37 BV-38	13	10000295	WATTS	547104 FBV-3C	1" BALL VALVE
BV-16 BV-17 BV-24 BV-25	4	10000296	WATTS	547102 FBV-3C	1/2" BALL VALVE
BV-08 BV-10 BV-11 BV-12 BV-13 BV-14 BV-15 BV-20 BV-26 BV-27 BV-28 BV-29 BV-30 BV-31 BV-32 BV-33 BV-34 BV-35 BV-36 BV-39 BV-40	21	10000297	WATTS	547100 FBV-3C	1/4" BALL VALVE
BV-09	1	10000298	WATTS	547106 FBV-3C	1-1/2" BALL VALVE
BV-05	1	10009139	WATTS	546845 FBV-3C	4" BALL VALVE
CK-01 CK-02	2	10000525	PROVALVE	PVCL08125CSESF	8" SERIES CL CHECK VALVE
CV-02 CV-04 CV-05 CV-06 CV-07	5	10000023	PROVALVE ELECTRA	BF208FA41O-A	8" 2-WAY ON/OFF
CV-03	1	10000024	PROVALVE ELECTRA	BF208FA41O-A-C	8" 2-WAY ON/OFF W/ CYCLE TIMER
CV-01	1	10000054	PROVALVE ELECTRA	BF208FA41E-S	8" 2-WAY MODULATING
FC-01	1	10002726	METRAFLEX	N/A	4" SS METRA-MINI FLEX CONNECTOR
GC-03 GC-04	2	10001391	VICTAULIC	77	10" VICTAULIC PIPE COUPLING STYLE 77 WITH "E" GASKET
GC-01 GC-02	2	10001410	VICTAULIC	77	8" VICTAULIC PIPE COUPLING STYLE 77 WITH "E" GASKET
BAV-01 BAV-02	2	10000245	B&G	CB-1	BALANCE VALVE CB-1 CIRCUIT SETTER
FCU-01 FCU-02	2	10004735	LARKIN	LK-LCA6-G-1300AB 115/1/60 PSC STD EFF MOTORS	FAN COIL UNIT LCA6-G-1300
SV-01	1	10002155	ASCO	8210G27	SOLENOID VALVE 1 IN. 8210G27 N.C.
YS-01 YS-02	2	10004046	WATTS	LF777SI	1" THD BRASS Y-STRAINER

MAJOR EQUIPMENT SCHEDULE					
TAG	QTY	CATALOG	MANUFACTURER	MFG MODEL NO	DESCRIPTION
CH-1	1	CENLINK-750T	TRANE	CVHF0570	750 TON CENTRIFUGAL LIQUID CHILLER WATER COOLED CHILLER EVAP EWT / LWT = 70°F / 55°F COND EWT / LWT = 85°F / 100°F EVAP FLOW=1200 GPM COND FLOW=1365 GPM 750 TONS
CT-1	1	CENLINK-750T	MARLEY	NC8412UAS	COOLING TOWER 1 CELL FAN MTR = 50 HP FLOW = 1365 GPM IN TEMP = 92.8°F OUT TEMP = 78.0°F
HX-1	1	CENLINK-750T	SONDEX	S86-IS10	HEAT EXCHANGER PLATE & FRAME COLD SIDE FLOW = 1365 GPM COLD SIDE IN/OUT TEMP = 53°F / 50°F HOT SIDE FLOW = 1200 GPM HOT SIDE IN/OUT TEMP = 70°F / 55&DF
P-01 P-02	2	CENTURYLINK-750T	PATTERSON	MTR MFG= WEG	V8A13A-RC VERTICAL FLOW=1365 GPM HEAD=101 FT MTR HP=50 HP
P-03 P-04	2	CENTURYLINK-750T	BELL & GOSSETT	MTR MFG= ??	NRF-22 CIRCULATING PUMP FLOW=5 GPM HEAD=10 FT MTR HP=1/8 HP

PRINTED DRAWING SIZE: 24"x36" (D SIZE)



DRN. BY: JWC 05/27/2015

CHK. BY: TWF 06/01/2015

ENGINEER:

TITLE: MECHANICAL SYSTEM SCHEMATIC

JOB NAME: CENTURYLINK (750 TON CIB)

DRAWING NO.: 20151XXM2-750TON SHEET 3 OF 3

SYSTEM FLOW SCHEMATIC SYMBOLS

BALL VALVE	BUTTERFLY VALVE	BUTTERFLY VALVE WITH PNEUMATIC ACTUATOR	BUTTERFLY VALVE WITH ELECTRIC ACTUATOR	BUTTERFLY VALVE W / LIMIT SWITCH	CHECK VALVE	PLUG VALVE	GATE VALVE	GLOBE VALVE
TRIPLE-DUTY VALVE	BALANCE VALVE	NEEDLE VALVE	CONTROL VALVE P-PRESSURE	CONTROL VALVE F-FLOW	RELIEF VALVE	AIR RELEASE VALVE	AIR VENT	AIR CHARGING VALVE
VACUUM BREAKER	BACKFLOW PREVENTER VALVE	FLOAT VALVE	THREE-WAY CONTROL VALVE	MANUAL THREE-WAY VALVE	ACTUATED THREE-WAY TEE ASSEMBLY	VERTICAL SIGHT GLASS	REDUCING SUCTION DIFFUSER	SUCTION DIFFUSER
FLOW SWITCH	THERMOMETER	TEMPERATURE TRANSMITTER	INLINE SIGHT GLASS	PRESSURE GAUGE	PRESSURE SWITCH	FLOW METER	PRESSURE TRANSMITTER	TRIDICATOR
CENTRIFUGAL PUMP	WYE STRAINER	BASKET STRAINER	FLEXIBLE CONNECTOR	LEVEL SWITCH	LEVEL TRANSMITTER	T-0-L WITH PIPE PLUG	FUNNEL	TEST PORT
GROOVED CONNECTION	GROOVED COUPLING	AIR SEPARATOR	EXPANSION TANK (BLADDER TYPE)	CHEMICAL SHOT FEEDER	FLOAT & THERM. STREAM TRAP	SHELL & TUBE HEAT EXCHANGER	PLATE & FRAME HEAT EXCHANGER	SOLIDS SEPARATOR
THREADED UNION	CONCENTRIC REDUCER	ECCENTRIC REDUCER	REDUCING FLEXIBLE CONNECTOR	SOLENOID VALVE	<p style="text-align: center;">FLOW SCHEMATIC LINE TYPES</p> <p>———— = PRIMARY EQUIPMENT</p> <p>———— = SENSING LINES</p> <p>----- = FUTURE / FIELD</p>			

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AJP
DG
TB
JC

DRN. TLA 11/10/93
CHK. MH 11/10/93
ARCH./ENG.
TITLE SYSTEM FLOW SCHEMATIC SYMBOLS
JOB NAME



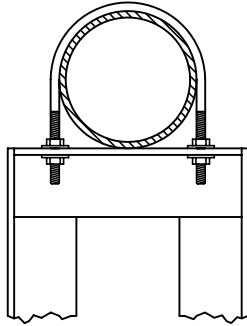
DRAWING NO. LEGEND 1

SHT. 1 OF 1

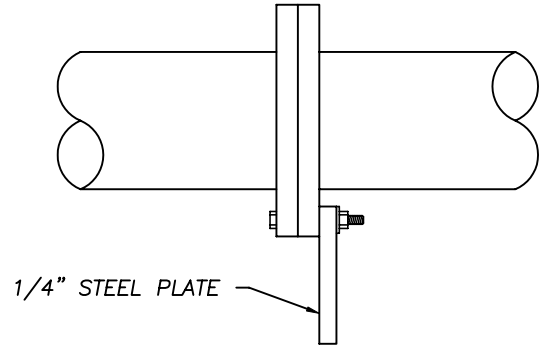
STANDARD PIPE SUPPORTS

SYSTECON STANDARD PIPE SUPPORTS

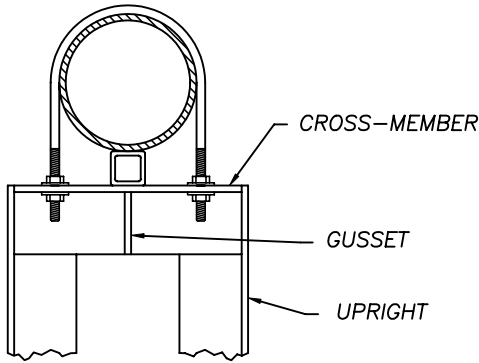
TYPICAL U-BOLT PIPE SUPPORT



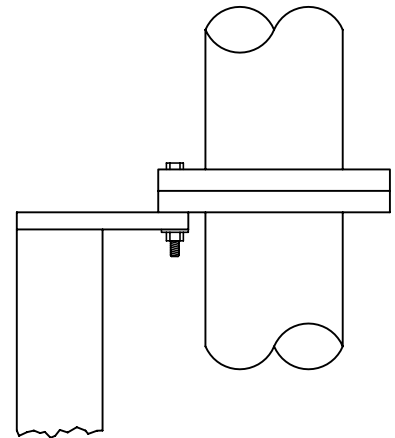
TYPICAL FLANGE BRACKET



TYPICAL U-BOLT HVAC PIPE SUPPORT SUITABLE FOR INSULATION



TYPICAL BENCH BRACKET



STANDARD PIPE BRACKETS

24" PIPE & LARGER

- 4"x4"x3/16" TUBE UPRIGHTS
- 4"x4"x3/8" ANGLE CROSS-MEMBERS
- GUSSET REQUIRED UNDER SADDLE & OPEN END ANGLES
- SADDLES ARE 1"x2" BAR

12"-20" PIPE

- 4"x4"x1/4" ANGLE UPRIGHTS
- 4"x4"x3/8" ANGLE CROSS-MEMBERS
- GUSSET REQUIRED UNDER SADDLE
- SADDLES ARE 1-1/2" TUBE

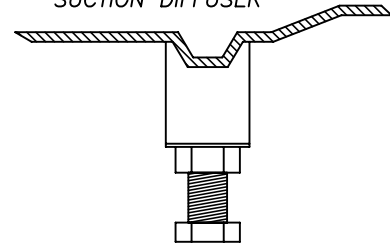
6"-10" PIPE

- 4"x3"x1/4" ANGLE UPRIGHTS
- 4"x3"x1/4" ANGLE CROSS-MEMBERS
- GUSSET NOT REQUIRED
- SADDLES ARE 1-1/2" TUBE

1"-4" PIPE

- 2-1/2" ANGLE UPRIGHTS
- 2-1/2" CROSS-MEMBERS
- SADDLES ARE 1" TUBE

SUCTION DIFFUSER



TYPICAL PIPE STAND SUPPORT FOR SUCTION DIFFUSER

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					DRN. BY: DW 3/22/94	
					CHK. BY:	
					ENGINEER:	
					TITLE: STANDARD PIPE SUPPORTS	
DATE	REVISION	DRN. BY	CHK. BY	DRAWING NO.: SUPPORTS	SHT. 1 OF 1	

ELECTRICAL SYSTEMS DESIGN

ELECTRICAL DRAWINGS

MECHANICAL COMPONENT DATA SHEETS

CHILLERS



Submittal

73/324

Prepared For:
Bob Overbey @ Systecon

Date: May 20, 2015

Customer P.O. Number:
Customer Project Number:

Sold To:

Job Number:
Job Name:
CTL - Chiller in a Box Rev 9

Trane U.S. Inc. is pleased to provide the enclosed submittal for your review and approval.

Product Summary

Qty	Product
1	Centrifugal Water Chillers

The attached information describes the equipment we propose to furnish for this project, and is submitted for your approval. This is Generic and not site specific.

Gary L Rich
Trane
310 Soquel Way
Sunnyvale, CA 94085-4101
Phone: (408) 481-3600
Cell: (415) 317-2822
Fax: (408) 481-3666

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 Centrifugal Water Chillers 26

Tag Data - Centrifugal Water Chillers (Qty: 1)

Item	Tag(s)	Qty	Description	Model Number
A1	750T	1	Centrifugal Chiller (CTV)	CVHF0570

Product Data - Centrifugal Water Chillers`

Item: A1 Qty: 1 Tag(s): 750T

Standard ship cycle CVHE, CVHF & CVHG
 North America region
 Centrifugal liquid chiller with 2 stage compressor R-123 refrigerant
 Compressor size: 570 nominal tons
 Adaptiview controls
 Without enhanced electrical package
 Incoming line hertz: 60
 Compressor motor hertz: 60
 Incoming line voltage: 480 volt
 Compressor motor voltage: 480 volt 3 phase
 Compressor motor power: 362 kW
 Compressor impeller cutback: 255
 Standard cooling
 Evaporator shell size: 050 long
 Evaporator bundle size: 860 nominal tons
 Evaporator tubes: 1.00 inch (25.4 mm) dia. micro internally enhanced copper
 Evaporator tube wall: .025 inch (0.6 mm) thick
 Evaporator fluid type: Water
 With evaporator variable flow
 Evaporator waterbox type: Non-marine
 Evaporator waterbox construction: Standard
 Evaporator water box passes: Two pass
 Evaporator waterbox pressure: 150 psig (1034 kPa)
 Evaporator waterbox connection: Victaulic
 Evaporator waterbox arrangement: in RH end - out RH end
 Thermal dispersion flow switch (IFM) - Field Installed (Fld)
 Condenser shell size: 080 long
 Condenser bundle size: 710 nominal tons
 Condenser tube: 0.75 inch (19.1 mm) internally enhanced copper
 Condenser tube wall: .025 inch (0.6 mm) thick
 Condenser shell construction: Standard
 Condenser fluid type: Water
 Without condenser variable flow
 Condenser waterbox type: non-marine
 Condenser waterbox construction: Standard
 Condenser water box passes: Two pass
 Condenser waterbox pressure: 150 psig (1034 kPa)
 Condenser waterbox connection: Victaulic
 Condenser waterbox arrangement: in RH end - out RH end
 Standard tube sheet construction
 Thermal dispersion flow switch (IFM) - Field Installed (Fld)
 Orifice size: 880 nominal tons
 Agency listing: U.L. listed unit (United States requirement)
 Factory performance test: Standard air run and vibration test
 Factory tolerance test: Standard air run and vibration test
 Brass logo with customer specified engraving
 Factory testable - yes
 Don't apply special ton tolerance
 Don't apply special kW/ton tolerance
 Without China Energy Efficiency
 Unit option: Insulation package
 Green Seal certified
 Out of scope for ASHRAE 90.1-1999
 Out of scope for ASHRAE 90.1 - 2007
 Out of scope for ASHRAE 90.1 - 2007 Addendum M
 Complies with ASHRAE 90.1 - 2010

ASHRAE 90.1-2010
Complies with ASHRAE 90.1-2013
Operating Status
Generic BAS
Extended Operation
BACnet
Without enhanced protection
Accessory line item 1
Accessory line item 2
Accessory line item 3
Trane Supplied Refrigerant
Refrigerant Cooled AFD
Unit mounted adaptive frequency drive
Adaptive frequency drive maximum RLA: 608 amps
Starter power connection: Circuit breaker
Standard enclosure - Nema 1
Startup Included - Trane Service must start equipment for warranty to be honored

Leak Tight Refrigerant Warranty that includes:

- ✓ **5-year refrigerant leak tight warranty. Trane will provide the refrigerant at NO charge if chiller leaks within the first 5-year of operation.**
- ✓ **Lifetime refrigerant leak tight warranty if Trane service provides a continuous, uninterrupted service contract.**

Terms:

- **Refrigerant is included. Labor is not included.**
- **This is in addition to the extended warranties described below which includes parts AND labor.**

Extended Warranties:

2nd thru 5th Year Parts Warranty (1st year is standard)
1st thru 5th Year labor warranty
1st thru 5th Year Refrigerant Quality and Labor Warranty

Performance Data - Centrifugal Water Chillers

Tags	750T
Primary cooling capacity (tons)	750.00
Primary power (kW)	300.70
Primary RLA (Incoming line) (A)	382.00
Minimum circuit ampacity (A)	476.00
Maximum overcurrent protection (A)	800.00
Compressor motor RLA (A)	419.30
Motor locked rotor amps (A)	2947.00
Actual motor voltage full load (V)	458.8
Actual motor frequency (Hz)	57
Primary efficiency (kW/ton)	0.401
Minimum 90.1 full load efficiency (kW/ton)	0.453
NPLV (kW/ton)	0.216
Minimum 90.1 IPLV/NPLV efficiency (kW/ton)	0.307
Evaporator entering fluid temp (F)	70.00
Evaporator leaving fluid temp (F)	55.00
Evaporator fluid flow rate (gpm)	1198.40
Evaporator pressure drop (ft H2O)	14.92
Evaporator fouling factor (hr-sq ft-deg F/Btu)	0.00010
Evaporator fluid concentration (%)	0.00
Condenser entering fluid temp (F)	78.00
Condenser leaving fluid temp (F)	92.79
Condenser fluid flow rate (gpm)	1365.00
Condenser pressure drop (ft H2O)	16.88
Condenser fouling factor (hr-sq ft-deg F/Btu)	0.00025
Condenser fluid concentration (%)	0.00
HCFC 123 refrigerant charge (lb)	1050.0
Shipping weight (lb)	21523.0
Operating weight (lb)	24872.0
Unit center of gravity X (in)	22.000
Unit center of gravity Y (in)	48.000
Unit center of gravity Z (in)	74.000
Left Front isolator load (lb)	7372.0
Left Rear isolator load (lb)	3155.0
Right Front isolator load (lb)	9633.0
Right Rear isolator load (lb)	4712.0
Chiller heat rejected to ambient (MBh)	5.13
AFD heat rejected to ambient (MBh)	10.55
Evaporator maximum fluid flow rate (gpm)	2340.90
Evaporator pressure drop maximum flow (ft H2O)	55.07
Evaporator minimum fluid flow rate (gpm)	327.90
Evaporator pressure drop minimum flow (ft H2O)	1.09
Condenser maximum fluid flow rate (gpm)	2497.90
Condenser pressure drop maximum flow (ft H2O)	49.88
Condenser minimum fluid flow rate (gpm)	681.20
Condenser pressure drop minimum flow (ft H2O)	4.86
Compressor Weight (lb)	4628.0
Motor Weight (lb)	2239.0
Starter Weight (lb)	1680.0
Suction Elbow Weight (lb)	280.0
Economizer Weight (lb)	420.0
Evaporator Weight (lb)	4698.0
Evaporator Waterboxes Weight (lb)	630.0
Condenser Weight (lb)	4903.0
Condenser Waterboxes Weight (lb)	1032.0
Miscellaneous Weight (lb)	1013.0

CenTraVac Chiller 750t CVH-0010

Single Point Part Load Calculator

Row #	% Load	Capacity	Evap LWT	Evap FR	Evap EWT	Evap PD	Cond EWT	Cond FR	Cond LWT	Cond PD	kW	Amps	Efficiency
1	39.9	299.0	55.00	1198.4	60.97	15.00	85.00	1365.0	91.00	16.77	131.2	175.1	0.439
2	39.9	299.0	55.00	1198.4	60.97	15.00	83.00	1365.0	88.95	16.86	121.3	163.3	0.406
3	39.9	299.0	55.00	1198.4	60.97	15.00	81.00	1365.0	86.90	16.95	111.7	151.8	0.374
4	39.9	299.0	55.00	1198.4	60.97	15.00	79.00	1365.0	84.85	17.03	102.4	140.7	0.343
5	39.9	299.0	55.00	1198.4	60.97	15.00	77.00	1365.0	82.80	17.12	93.5	129.7	0.313
6	39.9	299.0	55.00	1198.4	60.97	15.00	75.00	1365.0	80.76	17.22	85.1	119.2	0.285
7	39.9	299.0	55.00	1198.4	60.97	15.00	74.00	1365.0	79.74	17.26	81.0	114.1	0.271
8	39.9	299.0	55.00	1198.4	60.97	15.00	73.00	1365.0	78.71	17.31	77.1	109.1	0.258
9	39.9	299.0	55.00	1198.4	60.97	15.00	71.00	1365.0	76.67	17.41	70.6	99.6	0.236

FCLT-LAX	MODL-CVHF	NTON-570	CNIF-ADPV
INDP-NO	IHRZ-60	HRTZ-60	SRTY-UAFD
IVLT-480	ENCL-STD	VOLT-480	CPKW-362
CPIM-255	EVSZ-050L	EVBS-860	EVTM-IMCU
EVTH-25	EVVF-YES	EVWP-2	EVWN-8
EVFP-NONE	CDSZ-080L	CDBS-710	CDTM-TECU
CDTH-25	CDVF-NO	CDWP-2	CDWN-10
TSTY-STD	CDFP-NONE	ORSZ-880	TEST-CWT1
TTOL-STD	TPUL-CNST	FTST-YES	ASTT-NO
OPMM-KWTN	INSL-YES	GBAS-YES	EXOP-YES
TRMM-BCNT			

CenTraVac Centrifugal Chiller, Version 31.08, REVL 55161

CenTraVac Chiller 750t CVH-0010

Single Point Part Load Calculator

Row #	% Load	Capacity	Evap LWT	Evap FR	Evap EWT	Evap PD	Cond EWT	Cond FR	Cond LWT	Cond PD	kW	Amps	Efficiency
1	37.2	279.0	55.00	1198.4	60.57	15.00	69.00	1365.0	74.26	17.51	60.2	85.1	0.216
2	34.5	259.0	55.00	1198.4	60.17	15.01	68.00	1365.0	72.87	17.57	53.4	75.7	0.206
3	29.3	220.0	55.00	1198.4	59.39	15.01	68.00	1365.0	72.14	17.59	46.8	67.0	0.213
4	24.0	180.0	55.00	1198.4	58.59	15.02	68.00	1365.0	71.40	17.61	40.4	58.3	0.224
5	18.7	140.0	55.00	1198.4	57.80	15.03	68.00	1365.0	70.67	17.63	34.4	49.8	0.246
6	13.3	100.0	55.00	1198.4	57.00	15.03	68.00	1365.0	69.93	17.65	28.1	40.8	0.281
7	10.7	80.0	55.00	1198.4	56.60	15.04	68.00	1365.0	69.56	17.66	25.2	37.0	0.315
8	6.0	45.0	55.00	1198.4	55.90	15.04	68.00	1365.0	68.92	17.67	21.0	32.3	0.468

FCLT-LAX MODL-CVHF NTON-570 CNIF-ADPV
 INDP-NO IHRZ-60 HRTZ-60 SRTY-UAFD
 IVLT-480 ENCL-STD VOLT-480 CPKW-362
 CPIM-255 EVSZ-050L EVBS-860 EVTM-IMCU
 EVTH-25 EVVF-YES EVWP-2 EVWN-8
 EVFP-NONE CDSZ-080L CDBS-710 CDTM-TECU
 CDTH-25 CDVF-NO CDWP-2 CDWN-10
 TSTY-STD CDFP-NONE ORSZ-880 TEST-CWT1
 TTOL-STD TPUL-CNST FTST-YES ASTT-NO
 OPMM-KWTN INSL-YES GBAS-YES EXOP-YES
 TRMM-BCNT

CenTraVac Centrifugal Chiller, Version 31.08, REVL 55161

CTL - Chiller in a Box Rev 9 – Generic and Not Site Specific**Mechanical Specifications - Centrifugal Water Chillers****Item: A1 Qty: 1 Tag(s): 750T****Compressor-Motor**

Direct drive multiple-stage compressor, multi-stage capacity control guide vanes. Shrouded aluminum alloy impellers dynamically balanced. Motor-compressor assembly balanced to .15 in./sec (.0038m/sec) maximum vibration measured on motor and bearing housings. Refrigerant cooled, hermetically sealed, two-pole, squirrel cage induction motor. Two pressure lubricated bearings support the rotating assembly. A direct drive submerged oil pump motor, 3/4 hp (.560 kW) 115V/50/60/1 provides filtered and temperature controlled oil to compressor bearings.

Evaporator-Condenser

Shells are carbon steel plate. Evaporator includes rupture disk per BSR/ASHRAE 15 Safety Code. Carbon steel tube sheets are drilled, reamed and grooved to accommodate tubes. Tubes are individually replaceable externally finned seamless copper. Tubes are mechanically expanded into tube sheets. Eliminators are installed over entire length of the evaporator tube bundle. A multiple orifice control system maintains proper refrigerant flow. Condenser baffle prevents direct impingement of compressor discharge gas upon the tubes. Refrigerant side of the assembled unit is tested at both pressure (30.00 psi leak test) and vacuum. Water side is hydrostatically tested at one and one-half times design working pressure, but not less than 225.00 psi.

Trane reserves the right to implement chiller technology enhancements that will reduce the chiller's refrigerant charge, with no impact on chiller performance. Changes may be reflected in the chiller's nameplate refrigerant charge and the quantity of refrigerant charge shipped to the jobsite, depending upon the final date of equipment manufacture.

Water Boxes

Drains and vents - All water boxes have 3/4-inch NPTI vents and drain connections provided. Evaporators have 2 vents and 2 drains, condensers have 1 vent and 1 drain. If grooved connections are offered, the design is based on Style 77.

Non-marine water boxes have water connections that extend out from the end.

Economizer

A flash economizer with no moving parts provides power saving capability.

Purge System

The EarthWise(TM) purge includes a 1/4 hp 115V/60/1, 100V/50/1 air cooled condensing unit, purge tank, drier elements, a 1/20 hp (.037 kW) 115V/60/1, 110V/50/1 pump-out compressor, a carbon tank, and a heater. The purge is designed with an activated carbon filtration system that includes an autoregeneration feature which results in automatic high-efficiency removal of noncondensibles from the chiller without manual carbon maintenance. The purge is rated in accordance with AHRI Standard 580.

AdaptiView Control Panel:

The Tracer(tm) AdaptiView is a microprocessor-based chiller control system that provides complete stand alone system control and monitoring for the water cooled CenTraVac (TM). It is a factory mounted package including a full complement of controls to safely and efficiently operate the CenTraVac chiller, including oil management, purge operation, interface to the starter, and comprehensive motor protection including three phase solid state motor overload. Inlet and outlet water (fluid) temperature sensors are located in the evaporator and condenser waterbox connections as standard.

The display is a touch sensitive 12 1/8" diagonal color liquid crystal display (LCD) that uses color graphics and animation to ensure ease of use. The touch sensitive interface allows the operator to view the chiller graphically and receive a status indication via subsystem animations. The operator can navigate easily between the primary chiller subsystems including: compressor, evaporator, condenser, and motor. For each subsystem, you can view status and detailed operating parameters. In addition, alarms, reports, trending, and settings can all be accessed quickly from the main screen. The display is mounted on a flexible "arm" that allows extensive height and viewing angle variations.

The panel supports an extensive list of Languages including the default English. The data can be set to be viewed in inch pounds IP or metric units SI. For remote starters - Class 1 control panel voltage (30-115 V) are clearly labeled in the control panel. Class 2 input voltage (30V max) is also labeled in the control panel.

Operating Data including:

*operating hours

- *number of starts
- *chilled water setpoint
- *evaporator and condenser water flow status
- *evaporator entering and leaving water temperatures
- *evaporator saturated refrigerant temperatures
- *evaporator approach temperature
- *evaporator refrigerant pressure
- *condenser entering and leaving water temperatures
- *condenser saturated refrigerant temperatures
- *condenser approach temperature
- *condenser refrigerant pressure
- *oil differential pressure
- *oil tank temperature
- *purge mode
- *purge average daily pump-out time
- *% RLA per phase for motor
- *RLA per phase
- *volts per phase
- *power factor
- *kw
- *kwh
- *frequency

The AdaptiView also contains the following dedicated reports:

Evaporator, Condenser, Compressor, Motor, Purge, and ASHRAE. Each report is comprised of a detailed listing of operational data relative to that chiller subsystem.

Control functions including:

- *leaving chilled water temperature
- *percent demand limit
- *chiller water reset (based on return water temperature)
- *front panel control type
- *setpoint source
- *differential to start
- *differential to stop

Status data including:

- *waiting to start
- *running
- *run limit
- *run inhibit (adaptive)
- *auto
- *free cooling (option)
- *preparing to shutdown
- *shutting down (post lube)
- *stopped

Safeties including:

Automatic safety shutdown for:

- *Low chilled water temperature,
- *low evaporator refrigerant temperature
- *high condenser refrigerant pressure
- *evaporator and condenser flow status
- *low evaporator/condenser differential refrigerant pressure
- *low oil pressure
- *oil pressure overdue
- *high or low oil temperature
- *high bearing oil temperature (requires enhanced protection option)
- *high motor current
- *high motor temperature
- *starter function faults

*critical temperature and pressure sensor faults

The devices are of a latching trip out type requiring manual reset. Non-latching safety trip outs for operating conditions external to the chiller automatically permits unit to resume normal operation when condition is corrected.

Advanced motor protection monitors 3-phase current to provide latching trip out protection from adverse effects of phase loss, phase unbalance, phase reversal, loss of phase reversal protection, and electrical distribution faults (momentary power loss) by instantaneous trip out of motor.

Surge protection - Detects surge and limits chiller loading through inlet vane modulation. Head relief through lowering cooling tower water temperature can be requested. If not corrected within 7 minutes, chiller is shut down.

Enhanced Adaptive Control(TM) - Built in intelligence to keep the chiller on line (safely making maximum tons) while simultaneously preventing chiller damage/failure. During any chiller limiting mode of operation, the control panel enunciates the condition via a relay output.

Trending:

The controller provides 10 standard graphs for trending multiple parameters. The operator can add an additional 6 custom graphs if desired. On any one custom graph, the operator can choose to trend up to 10 unique parameters from a more comprehensive list. Two Y axes are available for any graph to facilitate readability.

Diagnostics:

AdaptiView includes comprehensive diagnostic monitoring. All active diagnostics are available, and up to 20 historic diagnostics are communicated to the operator via the 12 1/8" LCD display with graphic navigation system. Each diagnostic is time and date stamped.

Service Tool:

A PC-based service tool called Tracer TU, connected to the chiller via USB port, is available for additional cost and displays the last 100 diagnostics, indicating the time, date of occurrence, and system parameters at the time of the diagnostic. The service tool provides advanced troubleshooting and access to sophisticated configuration settings not needed during operation of the chiller.

Security:

The AdaptiView can be set to prevent unauthorized access to the chiller settings. The operator can choose to secure the operating settings with a password. Data and reports can still be accessed once the settings are locked out.

The memory for the AdaptiView is non-volatile type, so if power is lost, operating settings are retained. A life time battery is standard, which is used only to support the clock function for the chiller.

Chilled and Condenser water pump relays:

Chilled water and condenser water pump relays are provided and it is recommended that they be used for pump control.

BACnet(MSTP) Direct Points List:

The following points are available directly from the chiller. Recognize that some of these points require chiller options or configurations.

Inputs Including

Chiller Auto/Stop
Chiller Mode (e.g. cool)
External Base Loading Enable/Disable (requires Extended Operation option)
External Base Loading Setpoint (requires Extended Operation option)
Chilled Water Setpoint
Current Limit Setpoint
Heating Setpoint (requires Extended Operation option)
Wall Mounted Refrigerant Specific Monitor (requires Extended Operation option)
Clear Diagnostics

Outputs Including

Evaporator Pump relay
Condenser Pump relay
Chilled Water Flow Status
Condenser Water Flow Status

Evaporator Water Flow Rate (requires Flow Compensation option)
Condenser Water Flow Rate (requires Flow Compensation option)
Chiller capacity (requires Flow Compensation option)
Leaving Chilled Water Temperature
Entering Chilled Water Temperature
Entering Condenser Water Temperature
Leaving Condenser Water Temperature
Second Condenser Entering Water Temperature (requires HR or Aux condenser bundle)
Second Condenser Leaving Water Temperature (requires HR or Aux condenser bundle)
Active Chilled/Hot Water Setpoint
Active Current Limit Setpoint
Active Base Loading Setpoint (requires Extended Operation option)
Head Relief Request relay
Compressor Running relay
Chiller On/Off
Limit Warning relay
Maximum Capacity relay
Alarms Description1
 Manual Reset Alarm relay
 Auto Reset Alarm relay
 Purge Alarm relay

Alarm Reset
Condenser Refrigerant Pressure
Condenser Refrigerant Temperature
Evaporator Refrigerant Pressure
Evaporator Refrigerant Temperature
Compressor Discharge Refrigerant Temperature (requires Enhanced Protection option)
Differential refrigerant pressure (not for head pressure control)
Operating Status (Alarm, Run Enabled, Local Control, Limited)
Chiller Modes (i.e. Off, Starting, Running, Shutting Down)
Base Loading Active (requires Extended Operation option)
Hot Gas Bypass Active (requires Hot Gas Bypass option)
Operating Mode (e.g. Cool)
Current Per Line
Voltage Per Phase
Unit Power Consumption (kW)
Motor winding temperature
Motor power factor (uncorrected)
Oil Temperature
Oil Pressure Differential
 High Side Oil Pressure
 Low Side Oil Pressure

Compressor Starts
Compressor Run Time
Inlet guide vane position
Inboard bearing oil temperature (requires Enhanced Protection option)
Outboard bearing oil temperature (requires Enhanced Protection option)
Purge Status2
Purge Pumpout Average (24 hour)
Purge pump-out
Purge regeneration
Purge carbon tank temperature
Purge liquid temperature
Purge suction temperature
Purge time to next purge run
Purge pump-out chiller on-7 days
Purge pump-out chiller off-7 days
Purge pump-out life
Purge regeneration life
Refrigerant Monitor
AFD output frequency

AFD transistor temperature

Hardwire BAS Interface provides:

Chilled Water Setpoint input - Provides for setpoint adjustment of control point from multiple sources

Current Limit Setpoint input - provides for setpoint adjustment of control point from multiple sources

Percent RLA Output - provides % RLA output

Condenser Pressure Output - A hardwire output signal of condenser pressure, or differential pressure between the evaporator and condenser is provided.

Operating Status:

The following hardwire binary outputs are available:

Compressor running relay

Alarm relay - manual reset

Alarm relay - auto reset

Limit warning relay

Purge alarm relay

Head relief request relay

Maximum capacity relay

Evaporator Proof of Flow - Thermal Dispersion

A factory provided, field installed thermal dispersion type proof of flow switch is provided. The thermal dispersion controller is mounted in the chiller control panel, the piping probe and wiring is shipped loose for field installation. Follow the installation instructions in the chiller installation manual.

Condenser Proof of Flow - Thermal Dispersion

A factory provided, field installed thermal dispersion type proof of flow switch is provided. The thermal dispersion controller is mounted in the chiller control panel, the piping probe and wiring is shipped loose for field installation. Follow the installation instructions in the chiller installation manual.

Paint

All CenTraVac(TM) painted surfaces are coated with a primer and an air-dry beige primer-finisher prior to shipment.

Isolation

All units ship with neoprene isolator pads as standard. Enough pads are provided to cover the area under the chiller supports.

Shipment

All units are of hermetic design, leak tested, charged to 5.00 psi and shipped as a single factory assembled package. Full oil charge shipped in oil sump. Refrigerant shipped to jobsite from refrigerant manufacturer. The entire chiller is shrink wrapped for protection.

Insulation

Factory applied insulation. All low temperature surfaces are covered with 3/4" Armaflex II or equal (thermal conductivity=0.28 BTU/hr-ft sq.) (1.59 W/m2-K), including the evaporator, water boxes and suction elbow. The economizer is insulated with 3/8" insulation. The chiller feet are not insulated.

TRANE Adaptive Frequency Drive (AFD)

The Trane AFD is a closed-loop, liquid refrigerant cooled, microprocessor based pulsed width modulation design. The AFD is both voltage and current regulated. Output power devices: IGBT transistors.

The AFD is factory mounted on the chiller and ships completely assembled, wired and tested. Patented Trane AFD control logic is specifically designed to interface with the centrifugal water chiller controls. AFD control adapts to the operating ranges and specific characteristics of the chiller, and chiller efficiency is optimized by coordinating compressor motor speed and compressor inlet guide vane position. Chilled water control and AFD control work together to maintain the chilled water setpoint, improve efficiency and avoid surge. If a surge is detected, AFD surge avoidance logic will make adjustments to move away from and avoid surge at similar conditions in the future. Use only copper conductors for terminal connections. Failure to do so may cause corrosion or overheating, and starter damage.

AFD Design Features

* NEMA 1 ventilated enclosure with a hinged, locking door is tested to a short circuit rating of 65,000 amps. It includes a padlockable door-mounted circuit breaker/shunt trip with AIC rating of 65,000 amps. The circuit breaker is interlocked

with the enclosure door. The entire package is UL/CUL listed.

- * Simple modular construction.
- * The drive is rated for maximum 480/60/3 input power, +/-10%.
- * Displacement power factor of .98 at full load, minimum of .96 at all other part loads.
- * Minimum efficiency of 97% at rated load and 60 hertz.
- * Full motor voltage is applied regardless of the input voltage.
- * Soft-start; linear acceleration; coast to stop.
- * Adjustable output frequency from 38 to 60 hertz.
- * All control circuit voltages are physically and electrically isolated from power circuit voltage.
- * 150% instantaneous torque available for improved surge control.
- * Output line-to-line and line-to-ground short circuit protection.

* Harmonic attenuation- integrated active rectification control of the building AC power assures low line-generated harmonics back to the users power grid. The AFD has less than or equal to 5% current total demand distortion (TDD) as measured at the AFD. This is based on an electrical system with voltage distortion less than 1.5 %.

Chiller Unit Control Features for AFD

Chiller Unit Control Features for AFD

The chiller unit control panel capabilities provide for the control/configuration interface to, and the retrieval/display of, AFD-related data. AFD standard design features controlled through AdaptiView include:

- * Current limited to 100%
- * Motor overload protection.
- * Motor overtemperature protection.
- * Phase loss, reversal, imbalance protection.
- * Overvoltage/undervoltage protection.

Digitally displayed on the AdaptiView panel: output speed in hertz, input frequency, output speed in rpm, input line voltage, output voltage, input line kw, output kw, input line amps per phase, average input line amps, output/motor amps average current in % RLA, load power factor, fault, AFD transistor temperature.

Environmental Ratings:

- * 32F to 104 (0C to 40) operating ambient temperature
- * Altitude to 3300 feet (1000m), amperage derate of 1% per every 300 feet above 3300 feet
- * Humidity, 95% non-condensing

Required Installer Responsibilities

The following are considered functions normally required of the equipment installer./n

Install unit on a foundation with flat support surfaces level within 1/16" and of sufficient length to support concentrated loading. (Spring isolators should be considered whenever chiller installation is planned for an upper story location.)

Place isolation pads or optional spring type isolators provided by the chiller manufacturer under the unit. When isolators are chosen, no pads are provided.

Install unit per applicable Trane Installation Manual.

Complete all water and electrical connections.

Where specified, provide and install valves in water piping upstream and downstream of the evaporator and condenser water boxes as means of isolating shells for maintenance and to balance and trim system.

Furnish and install a flow switch with timer or equivalent device in both the chilled water and condenser water piping properly interlocked to insure that unit can operate only when water flow is established.

Furnish and install taps for thermometers and pressure gauges in water piping adjacent to inlet and outlet connections of both evaporator and condenser.

Furnish and install drain valves to each water box.

Install vent cocks on each water box.

Furnish and install strainers upstream of chiller evaporator and condenser bundles to protect tubes from potential damage caused by debris in the circulating water. Note: Failure to install strainers in all water piping entering the chiller could result in tube plugging conditions that could damage unit components. If the circulating pumps are immediately upstream of the chiller bundles, then the strainer can be installed immediately ahead of the pumps. If the circulating pumps are downstream of the chiller bundles, then the strainers should be installed immediately ahead of the chiller bundles.

Furnish sufficient refrigerant 25.0 lb per machine and dry nitrogen 50.0 lb per machine for pressure testing under manufacturer's supervision.

Start-up unit under supervision of a qualified Trane field engineer.

Where specified, insulate evaporator and any other portions of machine required to prevent sweating under normal operating conditions.

Water connection piping must not transfer forces to the chiller. Because of cumulative tolerances in manufacture and field installation, prepiping of water connections closer than 36" is not recommended. Any problems associated with prepiping of water connections closer than 36" to the chiller are the responsibility of the installing contractor.

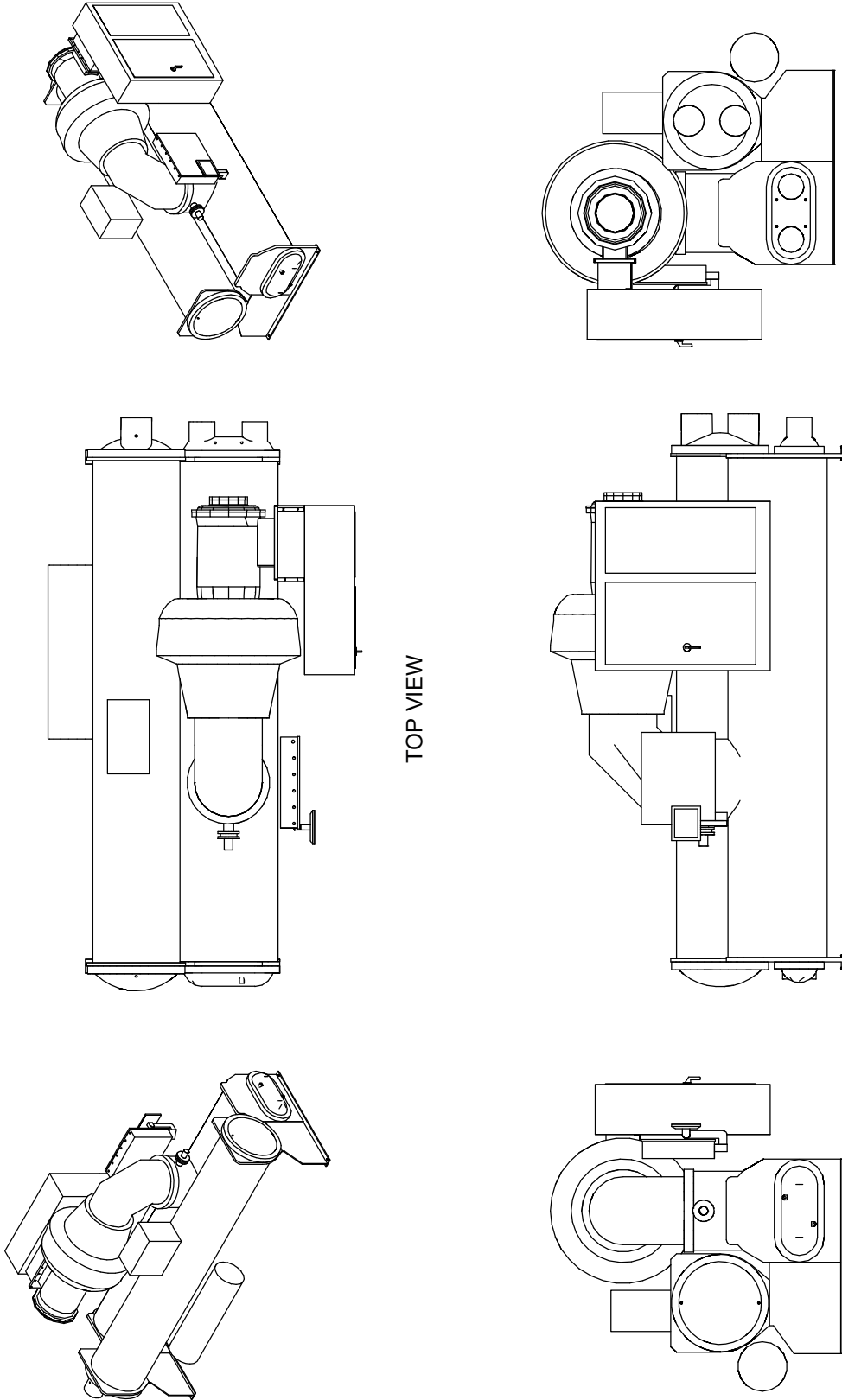
Furnish and install vent lines for rupture disk and purge venting to atmosphere per ASHRAE 15 and unit installation manual. If RuptureGuard-Relief Valve option is ordered, remove factory rupture disk and install RuptureGuard-Relief Valve per the IOM manual.

Leak-Tight Warranty

The CenTraVac chiller features a 5-year limited Leak-Tight Warranty which is valid for the lesser of 60 months from initial start-up or 66 months from date of shipment. The limited Leak-Tight Warranty covers models CVHE/F/L, CVHS and CDHF chillers installed in the United States or Canada. The Company's obligations and liabilities under this warranty are limited to furnishing replacement refrigerant; no other parts or labor are covered under this limited warranty. No liability whatever shall attach to the Company until appropriate actions have been taken (acceptable to Company) to eliminate the source of the leak, and then said liability shall be limited to furnishing the replacement refrigerant.

If the chiller is placed under a comprehensive Trane service and maintenance agreement (Trane Select Agreement or better) prior to the expiration of the standard Leak-Tight Warranty, the protection against refrigerant loss shall continue under the Trane Select Agreement for as long as an active Trane Select Agreement remains in effect without interruption.

If a 10-Year Parts, Labor and Refrigerant Warranty was purchased for the chiller and the chiller is placed under a Trane Select Agreement (or better) prior to the expiration of the 10-Year Parts, Labor and Refrigerant Warranty, the protection against refrigerant loss shall continue under the Trane Select Agreement for as long as an active Trane Select Agreement remains in effect without interruption.



TOP VIEW

RIGHT SIDE VIEW

FRONT VIEW

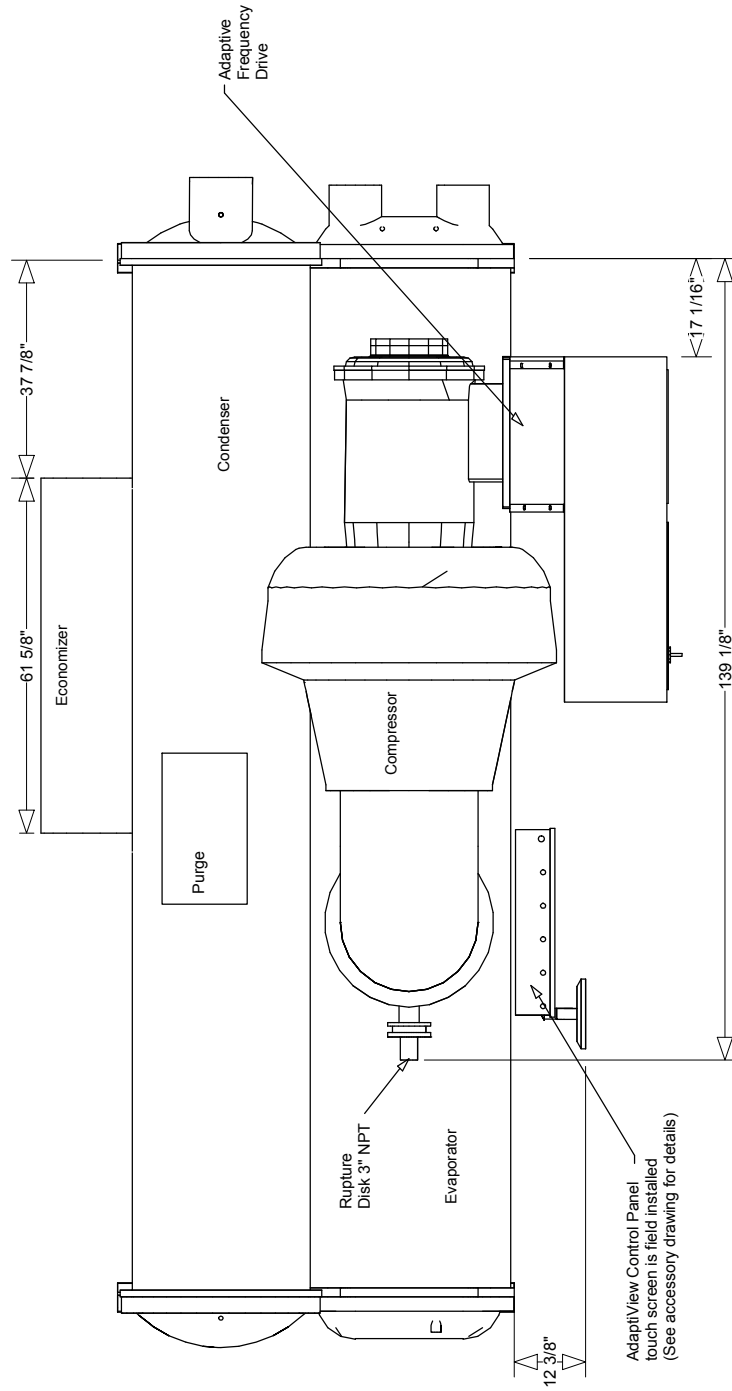
LEFT SIDE VIEW

SHELL TYPE	CONN DIA	CONN TYPE	FLOW DIRECTION
EVAPORATOR COOLING COND	8" 10"	VICTAULIC VICTAULIC	IN REAR OUT FRONT IN BOTTOM OUT TOP

CUSTOMER NOTES:
 UNLESS OTHERWISE SPECIFIED DIMENSIONAL TOLERANCE $\pm 1/12"$
 COOLING COND CONNS ARE STRAIGHT OUT THE END OF THE WATER BOX.
 WATER BOX DRAIN AND VENT LOCATIONS ARE SHOWN ON THE WATER BOX END PLATES.

Unit Dimensions - Centrifugal Water Chillers

Item: A1 Qty: 1 Tag(s): 750T

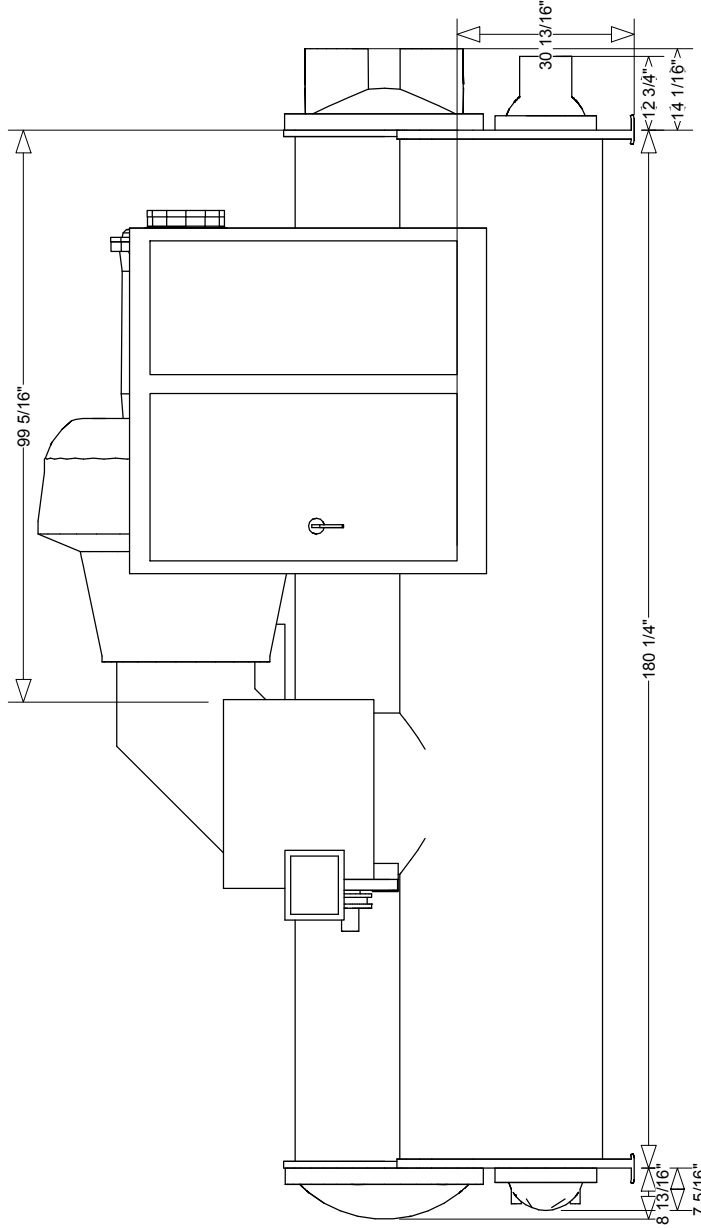


TOP VIEW

CUSTOMER NOTES:
UNLESS OTHERWISE SPECIFIED DIMENSIONAL TOLERANCE $\pm 1/16"$
COOLING COND CONNS ARE STRAIGHT OUT THE END OF THE WATER BOX.
WATER BOX DRAIN AND VENT LOCATIONS ARE SHOWN ON THE WATER BOX END PLATES.

SHELL TYPE	CONN DIA	CONN TYPE	FLOW DIRECTION
EVAPORATOR COOLING COND	8" 10"	VICTAULIC VICTAULIC	IN REAR OUT FRONT IN BOTTOM OUT TOP

CV/HF 570 Nominal tons
500 Ton long shell evap.
800 Ton long shell cond.
Without additional condenser



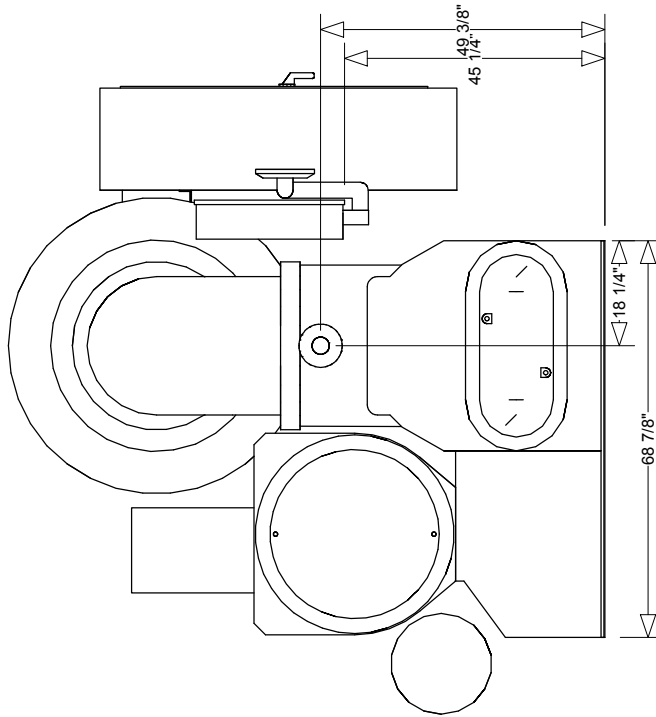
FRONT VIEW

CUSTOMER NOTES:
UNLESS OTHERWISE SPECIFIED DIMENSIONAL TOLERANCE +/- 1/2"
COOLING COND CONNS ARE STRAIGHT OUT THE END OF THE WATER BOX.
WATER BOX DRAIN AND VENT LOCATIONS ARE SHOWN ON THE WATER BOX END PLATES.

SHELL TYPE	CONN DIA	CONN TYPE	FLOW DIRECTION
EVAPORATOR	8"	VICTAULIC	IN REAR OUT FRONT
COOLING COND	10"	VICTAULIC	IN BOTTOM OUT TOP

CV/HF 570 Nominal tons
500 Ton long shell evap.
800 Ton long shell cond.
Without additional condenser

CV/HF 570 Nominal tons
500 Ton long shell evap.
800 Ton long shell cond.
Without additional condenser



LEFT SIDE VIEW

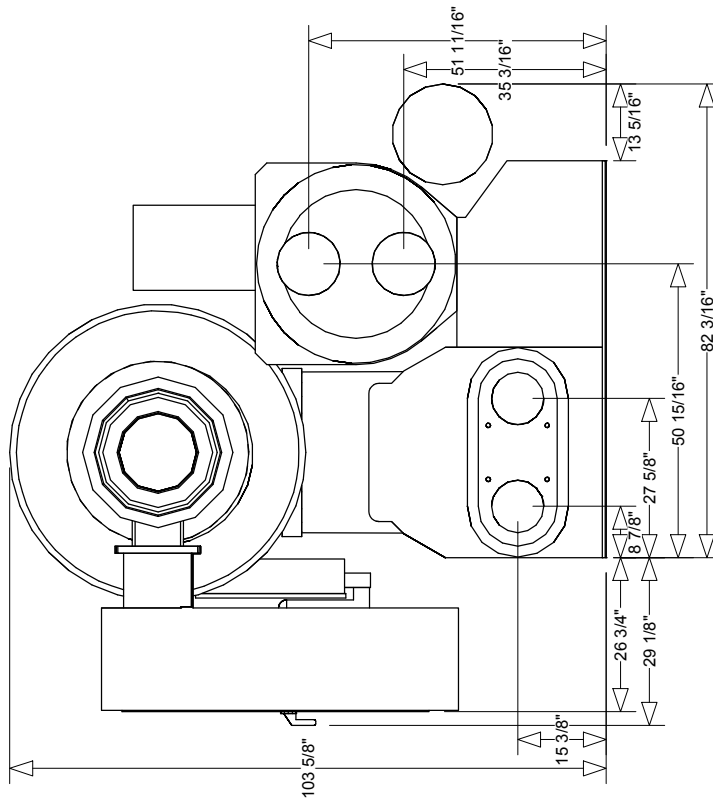
CUSTOMER NOTES:
UNLESS OTHERWISE SPECIFIED DIMENSIONAL TOLERANCE $\pm 1/16"$
COOLING COND CONNS ARE STRAIGHT OUT THE END OF THE WATER BOX.
WATER BOX DRAIN AND VENT LOCATIONS ARE SHOWN ON THE WATER BOX END PLATES.

SHELL TYPE	CONN DIA	CONN TYPE	FLOW DIRECTION
EVAPORATOR COOLING COND	8"	VICTAULIC VICTAULIC	IN REAR OUT FRONT IN BOTTOM OUT TOP

Unit Dimensions - Centrifugal Water Chillers

Item: A1 Qty: 1 Tag(s): 750T

CV/HF 570 Nominal tons
500 Ton long shell evap.
800 Ton long shell cond.
Without additional condenser

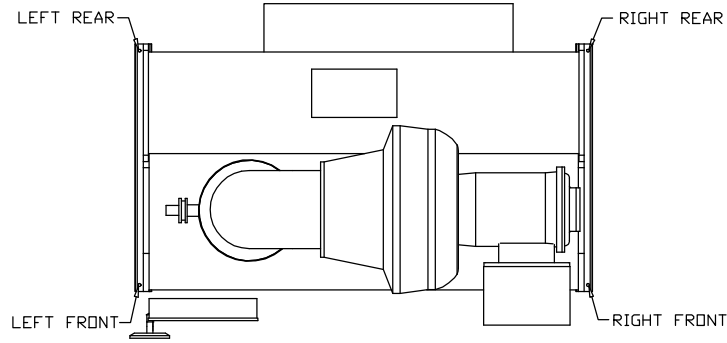


RIGHT SIDE VIEW

CUSTOMER NOTES:
UNLESS OTHERWISE SPECIFIED DIMENSIONAL TOLERANCE $\pm 1/12"$
COOLING COND CONNS ARE STRAIGHT OUT THE END OF THE WATER BOX.
WATER BOX DRAIN AND VENT LOCATIONS ARE SHOWN ON THE WATER BOX END PLATES.

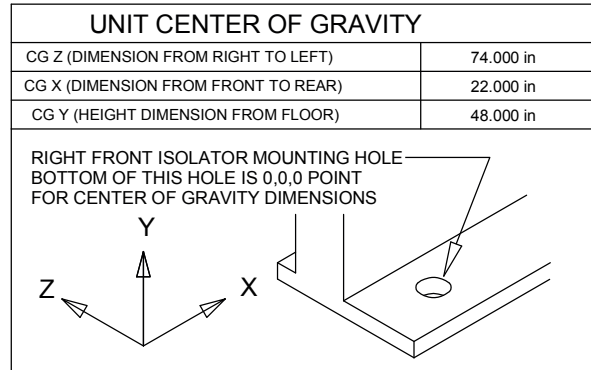
SHELL TYPE	CONN DIA	CONN TYPE	FLOW DIRECTION
EVAPORATOR COOLING COND	8" 10"	VICTAULIC VICTAULIC	IN REAR OUT FRONT IN BOTTOM OUT TOP

WEIGHTS AND CENTER OF GRAVITY



SPRING ISOLATOR SELECTION				
LOCATION	ISOLATOR LOAD*	VENDOR P/N	TRANE P/N	ISOLATOR COLOR
LEFT FRONT	7372.0 lb			
LEFT REAR	3155.0 lb			
RIGHT FRONT	9633.0 lb			
RIGHT REAR	4712.0 lb			
LEFT MIDDLE	N/A			
RIGHT MIDDLE	N/A			

COMPONENT	WEIGHT*
COMPRESSOR WEIGHT	4628.0 lb
MOTOR WEIGHT	2239.0 lb
STARTER WEIGHT	1680.0 lb
SUCTION ELBOW WEIGHT	280.0 lb
ECONOMIZER WEIGHT	420.0 lb
EVAPORATOR WEIGHT	4698.0 lb
EVAPORATOR WATERBOXES WEIGHT	630.0 lb
CONDENSER WEIGHT	4903.0 lb
CONDENSER WATERBOXES WEIGHT	1032.0 lb
HEAT RECOVERY CONDENSER WEIGHT	N/A
HEAT RECOVERY CONDENSER WATERBOXES WEIGHT	N/A
AUXILIARY CONDENSER WEIGHT	N/A
AUXILIARY CONDENSER WATERBOXES WEIGHT	N/A
MISCELLANEOUS WEIGHT	1013.0 lb



WEIGHTS	
SHIPPING	OPERATING
21523.0 lb	24872.0 lb

NAMEPLATE PRODUCT DESCRIPTION:

MODL	CVHF	VOLT	480	PTON	750.00 tons	NTON	570
EVTM	IMCU	CDTM	TECU	CPKW	362	CPIM	255
CDBS	710			EVSZ	050L	EVBS	860
				ORSZ	880	CDSZ	080L

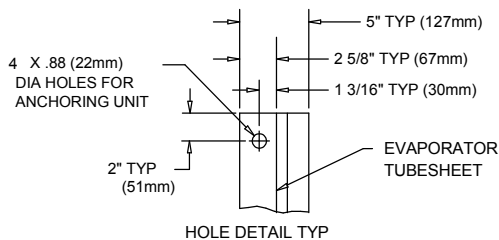
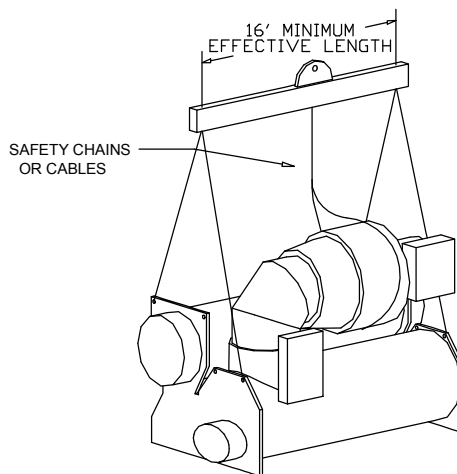
*ALL PUBLISHED WEIGHTS ACCURATE TO +/- 10 %

Weight, Clearance & Rigging Diagram - Centrifugal Water Chillers

Item: A1 Qty: 1 Tag(s): 750T

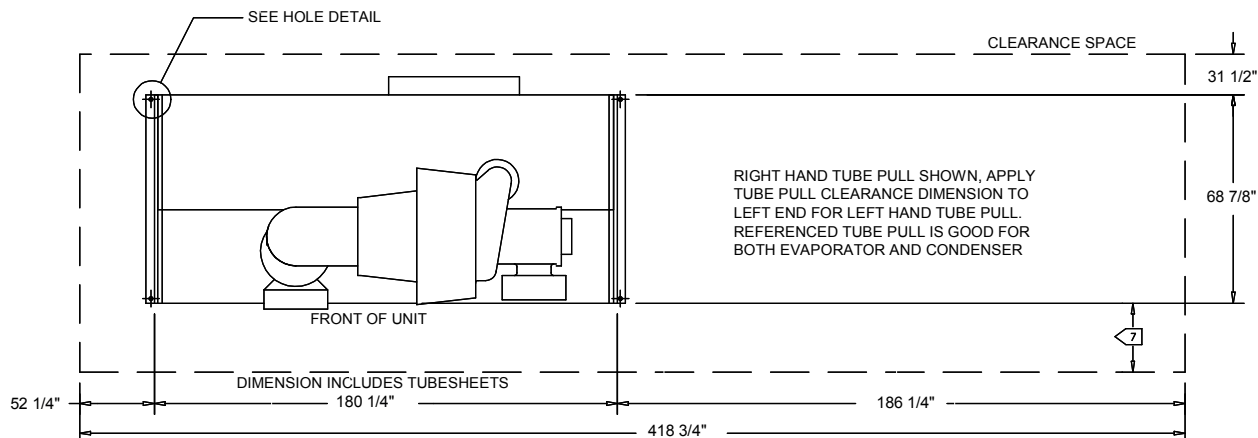
⚠ WARNING

1. HEAVY OBJECTS!
DO NOT USE CABLES (CHAINS OR SLINGS) EXCEPT AS SHOWN. EACH OF THE CABLES (CHAINS OR SLINGS) USED TO LIFT THE UNIT MUST BE CAPABLE OF SUPPORTING THE ENTIRE WEIGHT OF THE UNIT. LIFTING CABLES (CHAINS OR SLINGS) MAY NOT BE OF THE SAME LENGTH. ADJUST AS NECESSARY FOR EVEN UNIT LIFT. OTHER LIFTING ARRANGEMENTS MAY CAUSE EQUIPMENT OR PROPERTY-ONLY DAMAGE. FAILURE TO PROPERLY LIFT UNIT MAY RESULT IN DEATH OR SERIOUS INJURY. SEE DETAILS BELOW.
2. IMPROPER UNIT LIFT!
TEST LIFT UNIT APPROXIMATELY 24 INCHES TO VERIFY PROPER CENTER OF GRAVITY LIFT POINT. TO AVOID DROPPING OF UNIT, REPOSITION LIFTING POINT IF UNIT IS NOT LEVEL. FAILURE TO PROPERLY LIFT UNIT COULD RESULT IN DEATH OR SERIOUS INJURY OR POSSIBLE EQUIPMENT OR PROPERTY-ONLY DAMAGE.
3. ATTACH SAFETY CHAIN OR CABLE AS SHOWN WITHOUT TENSION, NOT AS A LIFTING CHAIN OR CABLE, BUT TO PREVENT THE UNIT FROM ROLLING.
4. DO NOT FORKLIFT THE UNIT TO MOVE OR LIFT.
5. LIFTING HOLES PROVIDED ON CHILLER TO ATTACH CABLES (CHAINS OR SLINGS).
6. 36" (900 MM) RECOMMENDED CLEARANCE ABOVE HIGHEST POINT OF COMPRESSOR.
7. FOLLOW NEC SECTION 110 AND OTHER APPLICABLE LOCAL CODES FOR CLEARANCES IN FRONT OF ELECTRICAL ENCLOSURES.
8. SPECIFIC SHIPPING AND OPERATING WEIGHTS OF THE SUBMITTED CHILLER ARE PROVIDED IF THE CENTRIFUGAL CHILLER SELECTION WAS ENTERED IN TOPSS. DETAILED LOAD POINT AND SPRING ISOLATOR APPLICATION WEIGHTS ARE AVAILABLE FROM "CENTRAVAC ISOLATOR SELECTION REPORT" AVAILABLE FROM THE REPORT GENERATOR OF THE TRANE TOPSS CHILLER SELECTION PROGRAM. CONTACT YOUR LOCAL TRANE SALES ENGINEER IF THIS DATA IS REQUIRED.



(SEE NOTE 8 ABOVE)

MAXIMUM SHIPPING	21523.0 lb
MAXIMUM OPERATING	24872.0 lb

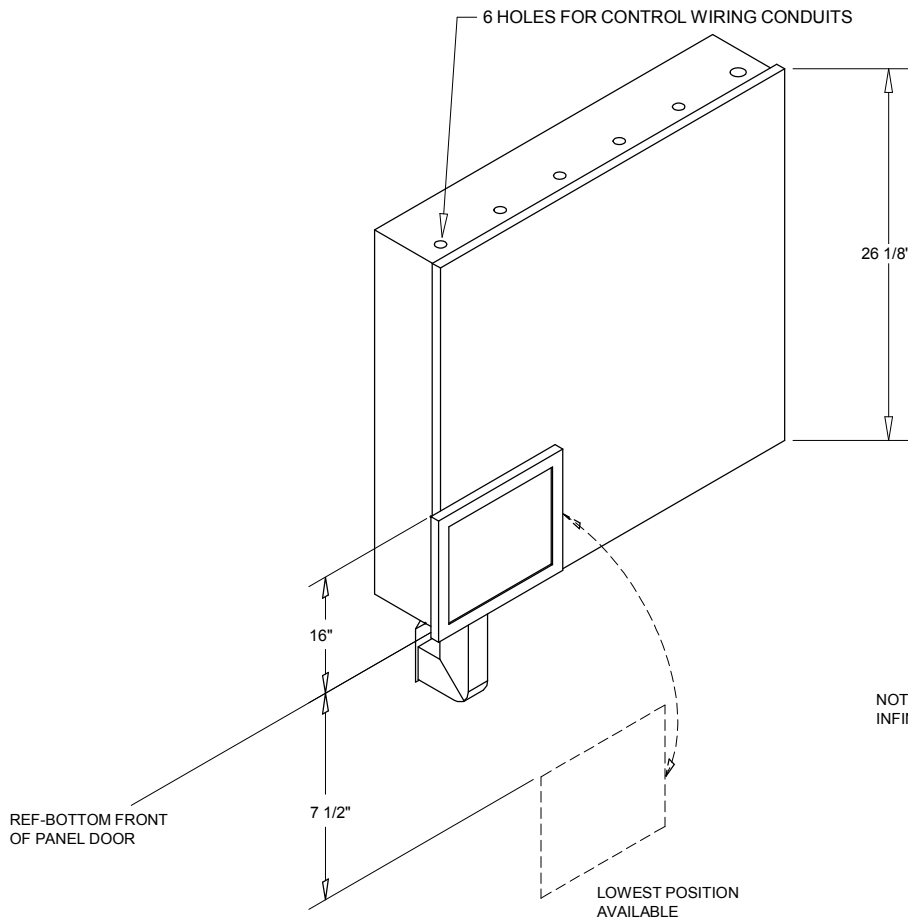
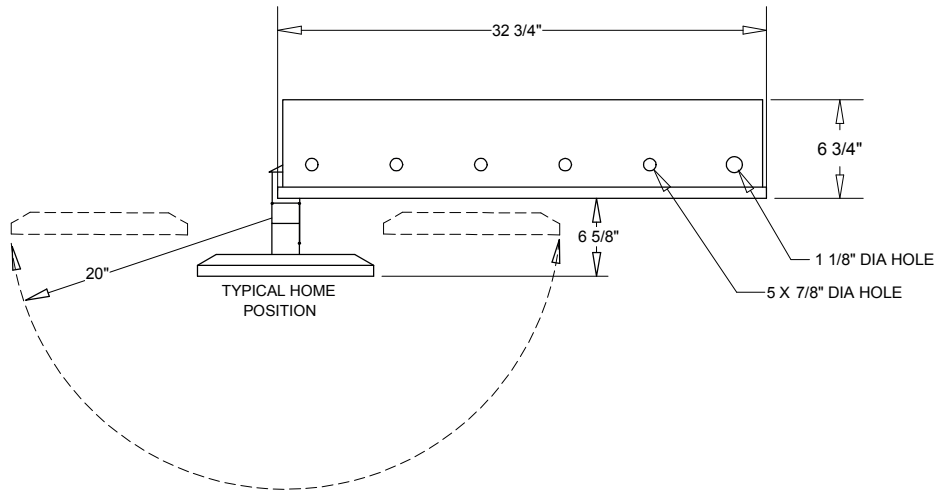


Accessory - Centrifugal Water Chillers

Item: A1 Qty: 1 Tag(s): 750T

ADAPTIVIEW CONTROL PANEL

TOP VIEW



NOTE: DISPLAY CAN MOVE TO AN INFINITE NUMBER OF POSITIONS.

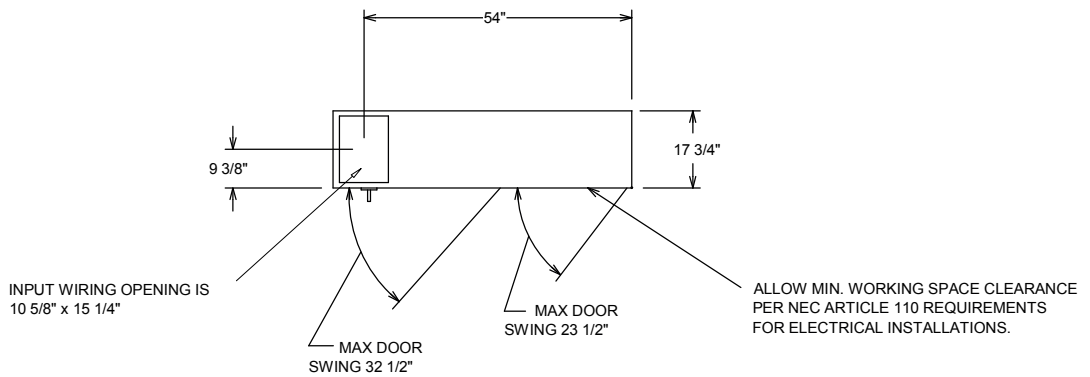
Accessory - Centrifugal Water Chillers

Item: A1 Qty: 1 Tag(s): 750T

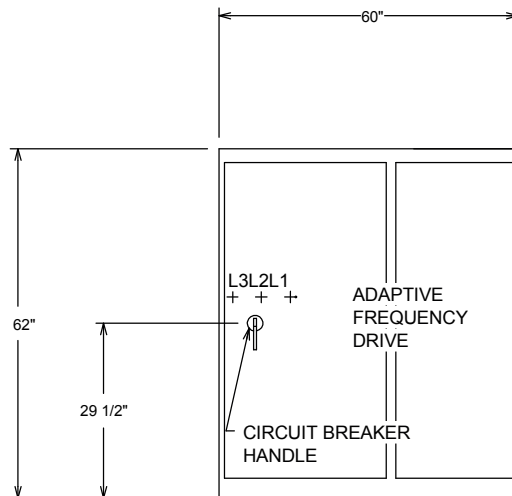
ADAPTIVE FREQUENCY DRIVE

MAX RLA	BREAKER AIC AMPS	SHORT CIRCUIT WITHSTAND RATINGS (RMS SYMMETRICAL AMPS)	LINE CONNECTION LUGS ADAPTIVE FREQUENCY DRIVE	PANEL CONNECTION	INTERNAL WIRE LENGTH
608	65,000	65,000	(3)2/0-400 MCM	CB	30

CB = CIRCUIT BREAKER



TOP VIEW



FRONT VIEW

Field Wiring - Centrifugal Water Chillers

Item: A1 Qty: 1 Tag(s): 750T

<p>⚠ WARNING HAZARDOUS VOLTAGE! DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT AND TAG PROCEDURES BEFORE SERVICING. INSURE THAT ALL MOTOR CAPACITORS HAVE DISCHARGED STORED VOLTAGE. UNITS WITH VARIABLE SPEED DRIVE, REFER TO DRIVE INSTRUCTIONS FOR CAPACITOR DISCHARGE. FAILURE TO DO THE ABOVE BEFORE SERVICING COULD RESULT IN DEATH OR SERIOUS INJURY.</p>	<p>⚠ AVERTISSEMENT TENSION DANGEREUSE! COUPER TOUTES LES TENSIONS ET OUVRIRE LES SECTIONNEURS A DISTANCE, PUIS SUIVRE LES PROCEDURES DE VERROUILLAGE ET DES ETIQUETTES AVANT TOUTE INTERVENTION. VERIFIER QUE TOUTS LES CONDENSATEURS DES MOTEURS SONT DECHARGES. DANS LE CAS D'UNITS COMPORTANT DES ENTRAÎNEMENTS A VITESSE VARIABLE, SE REPORTER AUX INSTRUCTIONS DE L'ENTRAÎNEMENT POUR DECHARGER LES CONDENSATEURS. NE PAS RESPECTER CES MESURES DE PRECAUTION PEUT ENTRAÎNER DES BLESSURES GRAVES POUVANT ETRE MORTELLES.</p>	<p>⚠ ADVERTENCIA ¡VOLTAJE PELIGROSO! DESCONECTE TODA LA ENERGIA ELECTRICA, INCLUSIVE LAS DESCONECCIONES REMITAS Y SIGA LOS PROCEDIMIENTOS DE CIERRE Y ETIQUETADO ANTES DE PROCEDER AL SERVICIO. ASEGURESE DE QUE TODOS LOS CAPACITORES DEL MOTOR HAYAN DESCARGADO EL VOLTAJE ALMACENADO. PARA LAS UNIDADES CON E.C. DE DIRECCION DE VELOCIDAD VARIABLE, CONSULTE LAS INSTRUCCIONES PARA LA DESCARGA DEL CONDENSADOR. EL NO REALIZAR LO ANTERIORMENTE INDICADO, PODRIA OCASIONAR LA MUERTE O SERIAS LESIONES PERSONALES.</p>
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<p>CAUTION USE COPPER CONDUCTORS ONLY! UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS. FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.</p>	<p>ATTENTION N'UTILISER QUE DES CONDUCTEURS EN CUIVRE! LES BORNES DE L'UNITE NE SONT PAS CONÇUES POUR RECEVOIR D'AUTRES TYPES DE CONDUCTEURS. L'UTILISATION DE TOUT AUTRE CONDUCTEUR PEUT ENDOMMAGER L'EQUIPEMENT.</p>	<p>PRECAUCIÓN UTILICE ÚNICAMENTE CONDUCTORES DE COBRE! LAS TERMINALES DE LA UNIDAD NO ESTÁN DISEÑADAS PARA ACEPTAR OTROS TIPOS DE CONDUCTORES. SI NO LO HACE, PUEDE OCASIONAR DAÑO AL EQUIPO.</p>
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* CONNECTION DIAGRAMS ARE AVAILABLE AT THE WEBPAGE SHOWN IN THE MECHANICAL SPECIFICATIONS SECTION OF THIS SUBMITTAL.

NOTES:

1. DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. CHECK SALES ORDER TO DETERMINE IF WIRING IS REQUIRED FOR SPECIFIC OPTIONS.
2. CAUTION - DO NOT ENERGIZE UNIT UNTIL CHECK-OUT AND START-UP PROCEDURES HAVE BEEN COMPLETED.

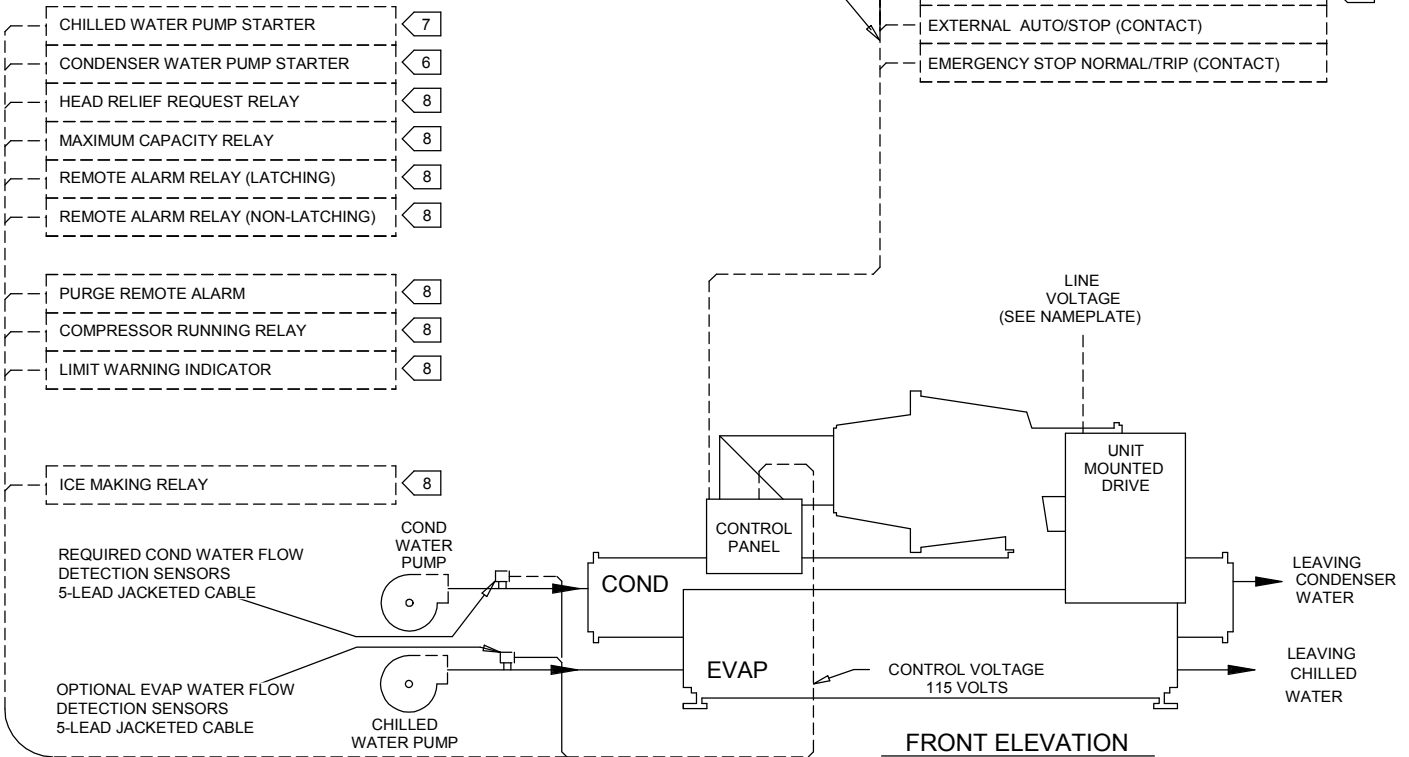
REQUIRED

3. ALL CUSTOMER CONTROL CIRCUIT WIRING MUST HAVE A MINIMUM RATING OF 150 VOLTS.
4. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC), STATE AND LOCAL REQUIREMENTS. OUTSIDE THE UNITED STATES, OTHER COUNTRIES APPLICABLE NATIONAL AND/OR LOCAL REQUIREMENTS SHALL APPLY.
5. EVAPORATOR AND CONDENSER FLOW SWITCHES ARE REQUIRED. THEY MUST BE INSTALLED AND WIRED TO THE TRANE PANEL BY THE INSTALLING CONTRACTOR. PURCHASE OF SWITCHES FROM TRANE IS OPTIONAL.

- 6 2 WIRES, 115 VAC CIRCUIT, SEPARATE POWER SUPPLY IS REQUIRED. MINIMUM CONTACT RATING AT 115 VAC - 2.88 INDUCTIVE 1/3 H.P. (.25 kW) AT 115 VAC REQUIRED.
- 7 2 WIRES, 115 VAC CIRCUIT, SEPARATE POWER SUPPLY IS REQUIRED. CONTACTS ARE N.O. CONTACT RATING - 2.88 INDUCTIVE 1/3 H.P. (.25 kW) AT 115 VAC OPTIONAL.
- 8 2 OR 3 WIRES (N.O. &/OR N.C.), 115 VAC CIRCUIT, SEPARATE 115 VAC POWER SUPPLY IS REQUIRED. CONTACTS ARE NO/NC RATINGS - 2.88 INDUCTIVE 1/3 H.P. (.25 kW) AT 115 VAC.
- 9 2-10V INPUT (2 WIRES)
- 10 2-10V OUTPUT (2 WIRES)
- 11 CUSTOMER SUPPLIED SILVER CONTACTS MUST BE COMPATIBLE WITH DRY CIRCUIT 24 VDC, 12ma RESISTIVE LOAD.
- 12 SHIELDED PAIR, 30 VOLT OR LESS CIRCUIT. MAX LENGTH 1500 FT. BELDON TYPE 8760 RECOMMENDED. (2 WIRES)

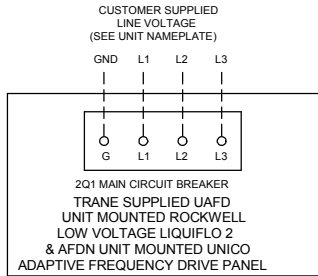
THE UNIT CONTROL PANEL (ADAPTIVIEW) SUPPLIES A CONTACT OUTPUT TO CONTROL THE CUSTOMER SUPPLIED DEVICES SHOWN BELOW. MAXIMUM FUSE SIZE PER DEVICE - 15 AMPS.

LOW VOLTAGE (30V MAX)
DO NOT RUN WITH HIGHER VOLTAGE CIRCUITS



Field Wiring - Centrifugal Water Chillers

Item: A1 Qty: 1 Tag(s): 750T



WARNING
HAZARDOUS VOLTAGE!
DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT AND TAG PROCEDURES BEFORE SERVICING. INSURE THAT ALL MOTOR CAPACITORS HAVE DISCHARGED STORED VOLTAGE. UNITS WITH VARIABLE SPEED DRIVE, REFER TO DRIVE INSTRUCTIONS FOR CAPACITOR DISCHARGE. FAILURE TO DO THE ABOVE BEFORE SERVICING COULD RESULT IN DEATH OR SERIOUS INJURY.

AVERTISSEMENT
TENSION DANGEREUSE!
COUPER TOUTES LES TENSIONS ET OUVRIRE LES SECTIONNEURS A DISTANCE, PUIS SUIVRE LES PROCEDURES DE VERRILLAGE ET DES ETIQUETTES AVANT TOUTE INTERVENTION. VERIFIER QUE TOUTS LES CONDENSATEURS DES MOTEURS SONT DECHARGES. DANS LE CAS D'UNITES COMPORTANT DES ENTRAÎNEMENTS A VITESSE VARIABLE, SE REPORTER AUX INSTRUCTIONS DE L'ENTRAÎNEMENT POUR DECHARGER LES CONDENSATEURS. NE PAS RESPECTER CES MESURES DE PRECAUTION PEUT ENTRAÎNER DES BLESSURES GRAVES POUVANT ETRE MORTELLES.

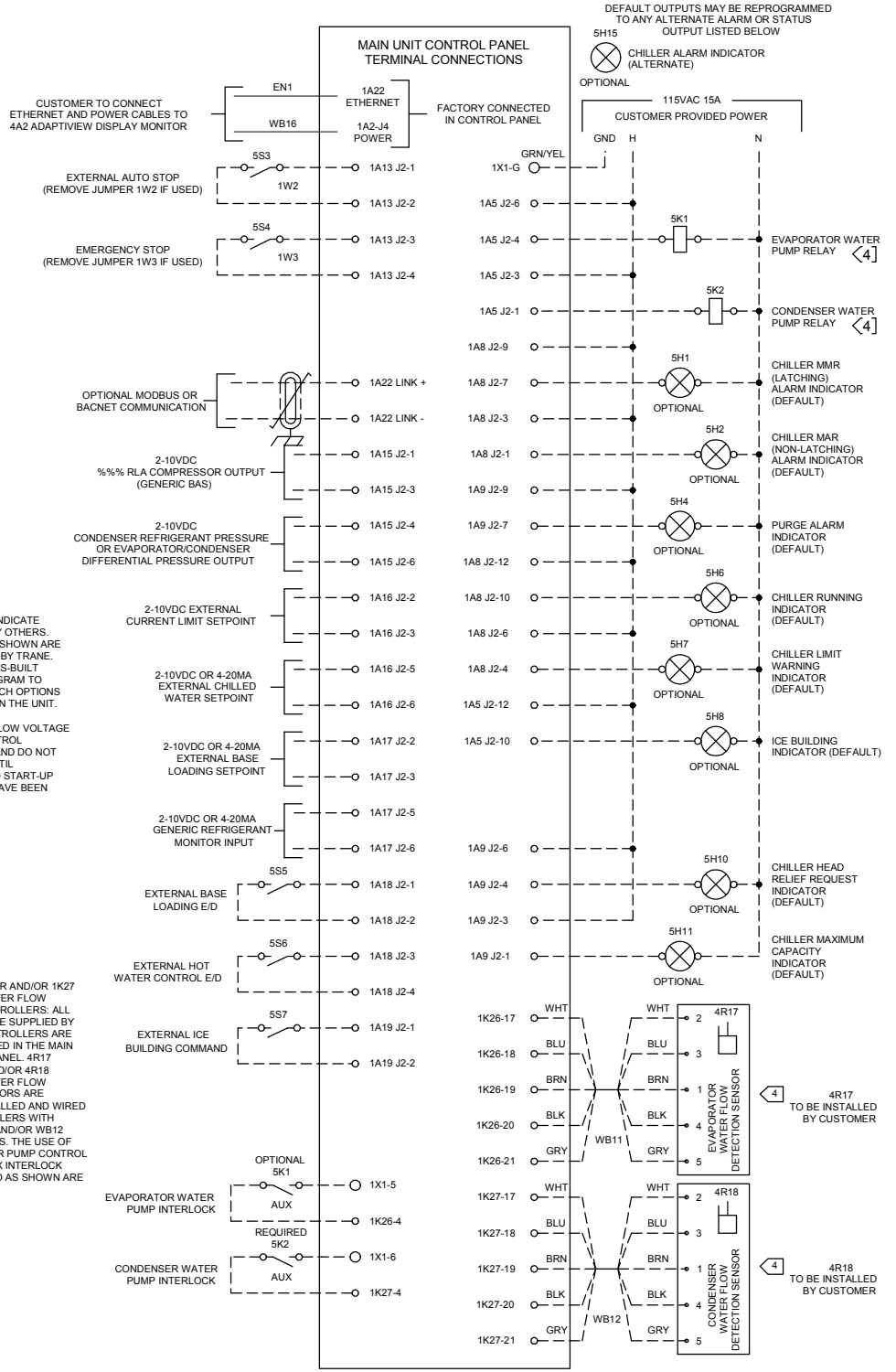
ADVERTENCIA
¡VOLTAJE PELIGROSO!
DESCONECTE TODA LA ENERGIA ELECTRICA, INCLUIDO LAS DESCONEJIONES REMITAS Y SIGA LOS PROCEDIMIENTOS DE CIERRE Y ETIQUETADO ANTES DE PROCEDER AL SERVICIO. ASEGURESE DE QUE TODOS LOS CAPACITORES DEL MOTOR HAYAN DESCARGADO EL VOLTAJE ALMACENADO. PARA LAS UNIDADES CON EJE DE DIRECCION DE VELOCIDAD VARIABLE, CONSULTE LAS INSTRUCCIONES PARA LA DESCARGA DEL CONDENSADOR. EL NO REALIZAR LO ANTERIORMENTE INDICADO, PODRIA OCASIONAR LA MUERTE O SERIAS LESIONES PERSONALES.

CAUTION
USE COPPER CONDUCTORS ONLY!
UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS. FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

ATTENTION
N'UTILISER QUE DES CONDUCTEURS EN CUIVRE!
LES BORNES DE L'UNITÉ NE SONT PAS CONÇUES POUR RECEVOIR D'AUTRES TYPES DE CONDUCTEURS. L'UTILISATION DE TOUT AUTRE CONDUCTEUR PEUT ENDOMMAGER L'EQUIPEMENT.

PRECAUCIÓN
UTILICE ÚNICAMENTE CONDUCTORES DE COBRE!
LAS TERMINALES DE LA UNIDAD NO ESTÁN DISEÑADAS PARA ACEPTAR OTROS TIPOS DE CONDUCTORES. SI NO LO HACE, PUEDE OCASIONAR DAÑO AL EQUIPO.

- NOTES:**
- DASHED LINES INDICATE FIELD WIRING BY OTHERS. WIRE NUMBERS SHOWN ARE RECOMMENDED BY TRANE. REFER TO THE AS-BUILT SCHEMATIC DIAGRAM TO DETERMINE WHICH OPTIONS ARE PRESENT ON THE UNIT.
 - DO NOT ROUTE LOW VOLTAGE (30V) WITH CONTROL VOLTAGE (115V) AND DO NOT POWER UNIT UNTIL CHECK-OUT AND START-UP PROCEDURES HAVE BEEN COMPLETED.
- 4 1K26 EVAPORATOR AND/OR 1K27 CONDENSER WATER FLOW DETECTION CONTROLLERS: ALL COMPONENTS ARE SUPPLIED BY TRANE. THE CONTROLLERS ARE FACTORY INSALLED IN THE MAIN UNIT CONTROL PANEL. 4R17 EVAPORATOR AND/OR 4R18 CONDENSER WATER FLOW DETECTION SENSORS ARE CUSTOMER INSTALLED AND WIRED TO THE CONTROLLERS WITH SUPPLIED WB11 AND/OR WB12 JACKETED CABLES. THE USE OF SEPARATE WATER PUMP CONTROL RELAYS WITH AUX INTERLOCK CONTACTS WIRED AS SHOWN ARE REQUIRED.



WIRE NO OR DEVICE	FIELD WIRING CIRCUIT SELECTION INFORMATION
SUPPLY AND MOTOR LEADS	SEE NAMEPLATE; MINIMUM CIRCUIT AMPACITY
5S1*, 5S2*	CIRCUIT PROTECTED AT 20A, 115VAC 1PH, 10 AWG MAX WIRE SIZE
5S3 THRU 5S8	24VDC, 12MA RESISTIVE LOAD, 14 AWG MAX WIRE SIZE
ALL REMAINING LLID TERMINALS	CONTACT RATING; 2.88A INDUCTIVE, 1/3 HP, 0.25KW AT 115VAC. 14 AWG MAX WIRE SIZE.

Field Installed Options - Part/Order Number Summary
 This is a report to help you locate field installed options that arrive at the jobsite. This report provides part or order numbers for each field installed option, and references it to a specific product tag. It is NOT intended as a bill of material for the job.

Product Family - Centrifugal Water Chillers

Item	Tag(s)	Qty	Description	Model Number
A1	750T	1	Centrifugal Chiller (CTV)	CVHF0570

Field Installed Option Description	Part/Ordering Number
Thermal dispersion flow switch (IFM) - Field Installed	
Thermal dispersion flow switch (IFM) - Field Installed	

COOLING TOWER

Submittal to:
Mr. Bob Overbey
 Systecon Inc
 6121 Schumacher Park Drive
 West Chester, OH 45069

Project:
 Century Link –
 750 Ton Englewood CO

Engineer:

Opportunity / Quote No. (Ver): BRIAN BRIDGEFORD_150522_142754709 / BRIAN BRIDGEFORD_150608_145814156 (1)
 Rep Quote No.: 12552 Submittal Rev II

June 23, 2015

Marley NC8400 Tower

TOWER MODEL	PERFORMANCE CONDITIONS	MOTOR DATA	TOWER DIMENSIONS	WEIGHTS
Quantity of (1) Marley NC Class model NC8412UAS factory assembled 1-Cell crossflow cooling tower	Per 1-cell tower: 1,365 gpm 92.8 °F Hot Water 78.0 °F Cold Water 75.0 °F Entering WB	NEMA 50 HP 1 speed / 1 wind 3 phase / 60 Hz / 230/460v 1.15sf / TEFC 1800 RPM Premium Efficiency Inverter duty nameplated	Each cell: (without options) Length 13' - 10 3/4" Width 22' - 5" Height 23' - 4 1/8" Per 1-cell tower: (with options) Length 19' - 0 13/16" Width 22' - 5" Height 23' - 4 1/8"	Per cell: Shipping: 24,716 lb Operating: 47,873 lb Per 1-cell tower: Shipping: 24,716 lb Operating: 47,873 lb Heaviest Lift: 12,944 lb

Quantities shown below are per tower.

Base Tower Construction/Equipment:

Galvanized Steel casing. Galvanized Steel structure.
 Stainless Steel collection basin. Stainless Steel distribution basin.
 All stainless steel is series 300.
 Low Sound fan with aluminum blades.
 Marley designed Geareducer® with 5-year warranty.
 PVC film fill with integral louvers and drift eliminators designed and manufactured by Marley.
 Drift rate guaranteed to be no greater than .005% of the design flow rate.
 Factory Mutual Approval, including fill pack partition.
 Fiberglass fan stack.

Collection Basin Connections and Accessories:

All flanges are to Class 125 ANSI B16.1 standard.
 All threads are to American Standard Pipe Taper Thread.
 (1) 12 in diameter bottom outlet(s) with trash screen(s) and anti-vortex plate(s).
 4 in diameter combination drain and overflow in each cell
 Probe type electronic water level sensor with the following events: make-up, low-alarm, high-alarm
 30 kW per cell 480/3 volt/phase electric immersion heater for freeze protection of the collection basin during cold weather system shutdown, Includes heater elements, water temperature sensor probe, control box and Heater system disconnect switch

Distribution Basin Inlet and Accessories:

(1) self-balancing 12 in diameter PVC bottom inlet connection per cell.
 All internal piping is PVC. External piping is PVC.
 Variable flow nozzles @ 30% design flow. (410 gpm)

Maintenance & Maintenance Access Features:

Tower is designed in accordance with OSHA safety standards.
 This quotation includes features that will allow safe access on the fan deck while the fan is still operating.
 External lube line with dipstick
 Full face horizontally mounted air inlet screens for easy access to collection basin
 Convenient access to the collection basin and plenum area is provided via a large access door located on each endwall
 Stainless Steel plenum walkway and Internal mechanical equipment access platform in each cell
 Fan deck extension
 Easy fitting perimeter guardrail, kneerail & toeboard w/ (1) Cased face ladder
 Easy fitting ladder safety cage(s) and Self closing safety gate(s) included at the top of the access ladder(s)

Control Systems:

No starters
 Marley M-5 121-010 DPDT Manual Reset (For use with building Automation Systems) vibration cutoff switch

Tower Specials:

Start up / Owner Training

Field Installed Equipment:

The field installed portion of the equipment will require approximately 39.5 man-hours of installation time after the tower arrives at the jobsite (based on USA experienced crew). The price to install these components is NOT included in the total price.

COOLING TOWER SUBMITTAL

Drawings & Data

<i>Transmittal Code</i>	<i>Approval Code</i>	<i>No. of Copies</i>	<i>Drawing Number /Rev/Date</i>	<i>Description</i>
E	SFA	1	5/21/2015	Tower data sheet
E	SFA	1	BB563765S	Schematic Plan and Louver Elevation
E	SFA	1	BB563765M	Schematic Cased Elevation and Notes
E	SFA	1	BB564154P	Piping Plan Revised 6-12-2015
E	SFA	1	BB563765G	Supporting Steel Plan and Details
E	SFA	1	09-14 / A	Support Bearing Details
E	SFA	1	09-119A	Bottom Inlet Connection Details
E	SFA	1	2011-1419	Standard Bottom Outlet Piping Details
E	SFA	1	09-117 / A	Ladder Details
E	SFA	1	00-4885 / B	Electric Basin Heater Details
E	SFA	1	L874N1:c24341-A-O	Basin Heater Wiring Diagram
E	SFA	1	08-24233	Water Level Control Wiring MU + LA + HA
E	SFA	1	2011-1417	Collection Basin Water Level Details
E	SFA	1	09-167	Recommended Conduit Installation
E	SFA	1	09-136	Hoisting Details
E	SFA	1	00-161E	The SPX Cooling Technologies Certification of Limited Warranty ("Warranty Certificate") shall include an extended material warranty covering 5 years from date of shipment. All other terms of the Warranty Certificate remain unchanged and in effect.

Transmittal Codes:

E = Enclosed Herewith
S = Sent Separately
F = Sent via Fax
O = Other

Other Codes:

P = Print
R = Reproducible
D = Reduced Copy

Approval Codes:

SFA = Approval Document. Equipment is held for Approval and Release.
AFC = Certified Document. Equipment has been Approved for Construction.
Changes made after this point may result in price adds and/or delays.
INF = Information Document. Submitted for Information only.
RFA = Corrected Document. Re-submitted for Approval and Release
OTH = Other

Shipment Lead-Time After Drawing Approval: 30 business days

June 23, 2015

For: SPX Cooling Technologies

By: Stoermer-Anderson Inc

BRIAN BRIDGEFORD

Job Information

Selected By

Systecon Inc
 6121 Schumacher Park Dr
 6121 Schumacher Park Dr
 bill.bell@systecon.com

Bill Bell
 Tel 513-777-7722

SPX Cooling Technologies Contact

SPX Cooling Technologies
 7401 W 129th
 Overland Park, KS 66213
 andrew.matz@ct.spx.com

Tel 913-664-7604

Cooling Tower Definition

Manufacturer	Marley	Fan Motor Speed	1800 rpm
Product	NC Steel	Fan Motor Capacity per cell	50.00 BHp
Model	NC8412UAS1	Fan Motor Output per cell	50.00 BHp
Cells	1	Fan Motor Output total	50.00 BHp
CTI Certified	No	Air Flow per cell	262900 cfm
Fan	12.00 ft, 5 Blades	Air Flow total	262900 cfm
Fan Speed	290 rpm, 10933 fpm	Static Lift	19.19 ft
Fans per cell	1	Distribution Head Loss	0.00 ft
		ASHRAE 90.1 Performance	72.5 gpm/Hp

Model Group Standard Low Sound (A)
 Sound Pressure Level 79 dBA (Single Cell), 5.00 ft from Air Inlet Face. See sound report for details.

Conditions

Tower Water Flow	1365 gpm	Air Density In	0.07148 lb/ft ³
Hot Water Temperature	92.79 °F	Air Density Out	0.07189 lb/ft ³
Range	14.79 °F	Humidity Ratio In	0.01525
Cold Water Temperature	78.00 °F	Humidity Ratio Out	0.02540
Approach	3.00 °F	Wet-Bulb Temp. Out	83.82 °F
Wet-Bulb Temperature	75.00 °F	Estimated Evaporation	22 gpm
Relative Humidity	50.0 %	Total Heat Rejection	10067000 Btu/h
Capacity	109.4 %		

- This selection satisfies your design conditions.
- The performance for this selection is not guaranteed because the approach is less than 5 °F.
- This selection is not CTI Certified because: the approach is less than 5 °F.

Weights & Dimensions

	Per Cell	Total
Shipping Weight	18760 lb	18760 lb
Heaviest Section	10560 lb	
Max Operating Weight	43040 lb	43040 lb
Width	22.42 ft	22.42 ft
Length	13.90 ft	13.90 ft
Height	23.34 ft	

Minimum Enclosure Clearance

Clearance required on air inlet sides of tower without altering performance. Assumes no air from below tower.

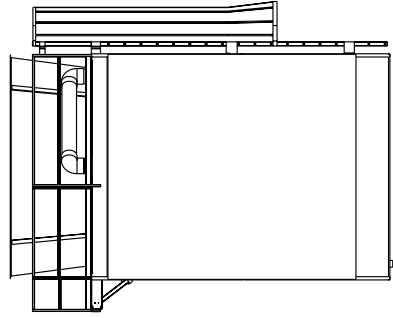
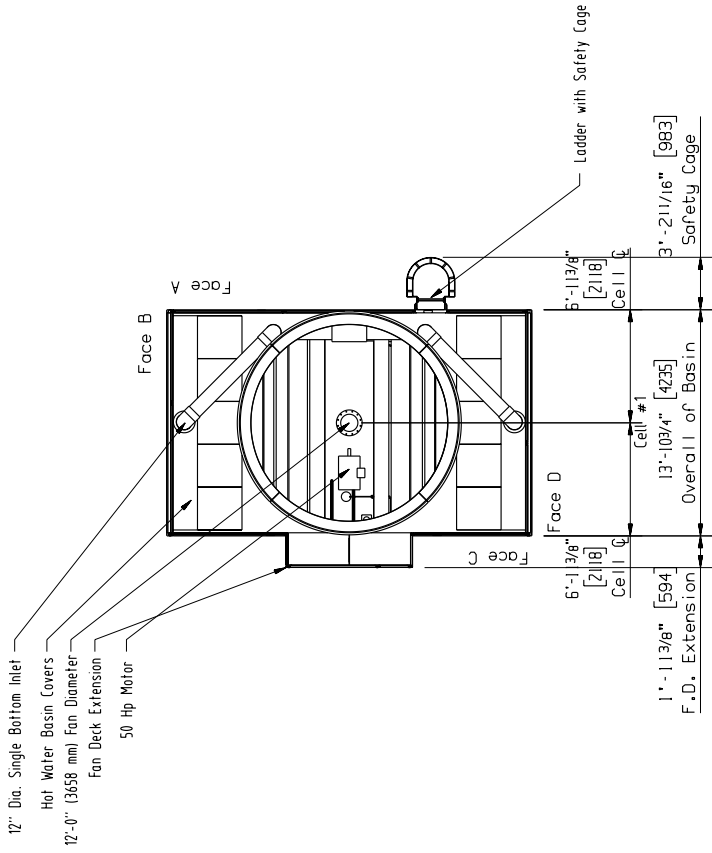
Solid Wall	8.53 ft
50 % Open Wall	6.09 ft

Weights and dimensions do not include options; refer to sales drawings. For CAD layouts refer to file 8412_ALS.dxf

Cold Weather Operation

Heater Sizing (to prevent freezing in the collection basin during periods of shutdown)

Heater kW/Cell	30.0	24.0	18.0	15.0	12.0	9.0	7.5
Ambient Temperature °F	-19.70	-6.98	5.75	12.11	18.47	24.83	28.01



NOTES

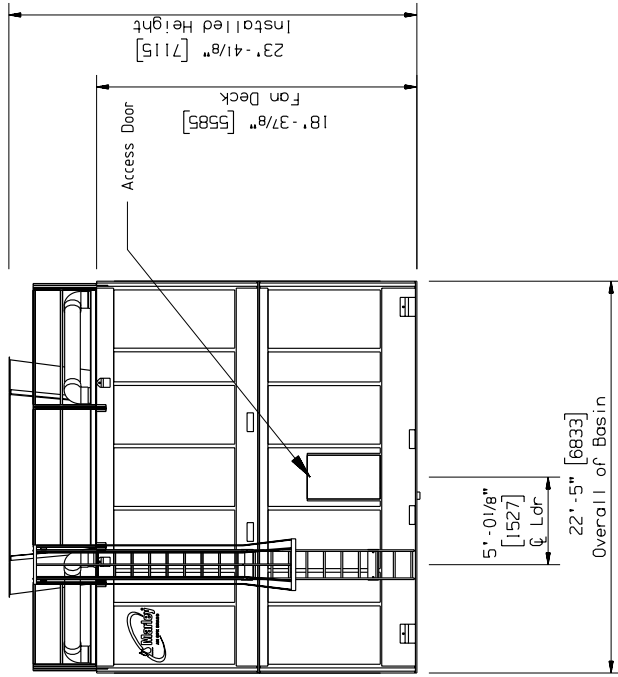
1. The tower assembly tolerance applicable to all dimensions is + or - 1/8" (3 mm). Consult suppliers of supporting structure for construction tolerances.
2. The units of measure are in IP (SI) units unless otherwise noted.
3. See Schematic Cased Elevation and Notes drawing for additional notes.

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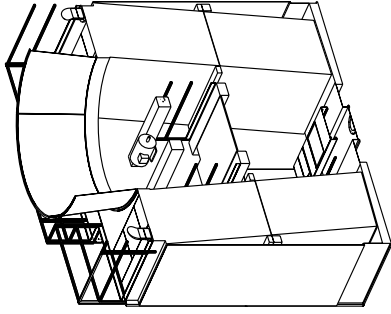
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REV. BY	CHECKED
REV. DATE	

NC842UAS1BGF - Schematic Plan and Louver Elevation		DATE	CHECKED	APPROVED	ORDER NUMBER	PLOT	DRAWING NUMBER
750 Ton Englewood CO Order 6-8-2015		06/08/15	QTC	SYS	0	1=1	BB563765S
Englewood, CO, United States							
DRAWN BY		BRIAN BRIDGEFORD_150608_145814156_V1					

104/32



Cased Face A

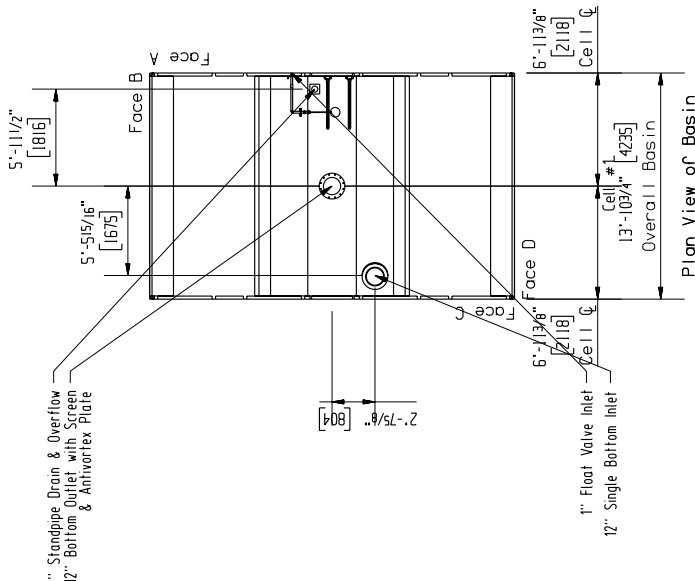


Interior View

NOTES


1. The fan motor must be locked out and inoperable before entering the tower. This warning has been placed on the access door.
2. The internal inlet piping, including flat face flange gaskets, which starts at the face of the inlet connection is provided by SPX CT. The piping external to the tower and its supports are provided by others. The external piping may not be supported from the tower.
3. The external inlet piping at the top of the tower is provided by SPX CT and installed in the field by others. This piping can be an obstacle to personnel on top of the tower. The installation detail drawings are included in the Literature Package shipped with the tower.
4. The internal vertical riser will apply an additional vertical operating load of 1050 lb (476 kg) at the bottom inlet flange attachment to the external piping which is supported by others.
5. To insure maximum thermal performance the cooling tower must be installed level and plumb. Both of the air inlet faces must have adequate air supply. If obstructions exist, consult your SPX CT representative.
6. Contact your SPX CT sales engineer for the required pump head for this inlet arrangement.
7. Hoisting clips are provided for ease of unloading and positioning. For overhead lifts or where additional safety precautions are prudent, add slings beneath the tower. See Hoisting Details drawing.
8. Flanged connections conform to Class 125 ANSI B16.1 specification. The bolt holes straddle the centerlines.
9. Construction of the ladder and guardrail: The guardrail is fabricated from galvanized structural tubing. Top rail, middle rail and posts are 1 1/2" (38 mm) square tube 1/8" (3 mm) thick. Toeboards are 12 gauge heavy mill galvanized steel. The ladder is aluminum 3" (76 mm) x 1 1/8" (29 mm) I-beam side rails and 1 1/4" (32 mm) serrated rungs.
10. The ladder and guardrail are field installed by others. The tower is shop modified to accept this option. The clips and hardware are provided by SPX CT for the field installation. The installation detail drawings are included in the literature package shipped with the tower.
11. OSHA standards recommend the use of a Safety Cage when the length of a single ladder exceeds 20'-0" (6096 mm).
12. The Fan Deck Extension is field assembled by others. The tower is shop modified and all attaching clips and fasteners are provided by SPX CT. Assembly details are included in the Literature Package shipped with the tower.
13. The Plenum Walkway consists of 11 gauge steel supports and 16 gauge steel walkway panels. The elevation of the Plenum Walkway is above the overflow water level of the collection basin. The distance from the top of the Plenum Walkway to the fan is 14'-9 11/16" (4514 mm).
14. The Interior Mechanical Equipment Platform consists of the Plenum Walkway plus an elevated platform for access to the mechanical equipment. A ladder is provided from the Plenum Walkway to the elevated platform along with a handrail system for the elevated platform.
15. The distance from the elevated platform to the fan exceeds 7'-1 3/4" (2178 mm).
16. Single inlet options (side or bottom inlet) - This piping can be an obstacle to personnel on top of the tower.
17. The tower assembly tolerance applicable to all dimensions is + or - 1/8" (3 mm). Consult suppliers of supporting structure for construction tolerances.
18. The units of measure are in IP (SI) units unless otherwise noted.

ECCO NUMBER		NC84-12UAS1BGF - Schematic Cased Elevation and Notes				105/32	
REV. BY	CHECKED	DATE	CHECKED	APPROVED	ORDER NUMBER	PLOT	DRAWING NUMBER
BRIAN BRIDGEFORD		06/08/15	QTC	SYS	0	1=1	BB563765M
REV. DATE	DRAWN BY		750 Ton Englewood CO Order 6-8-2015		REV.		
	BRIAN BRIDGEFORD		Englewood, CO, United States		105/32		

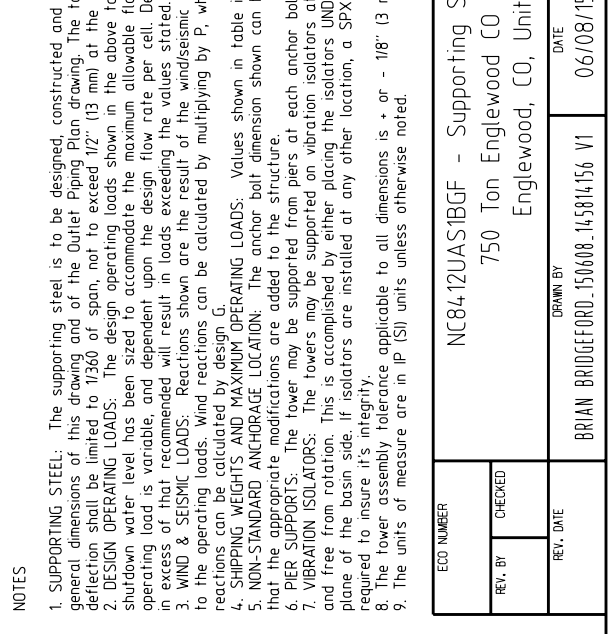
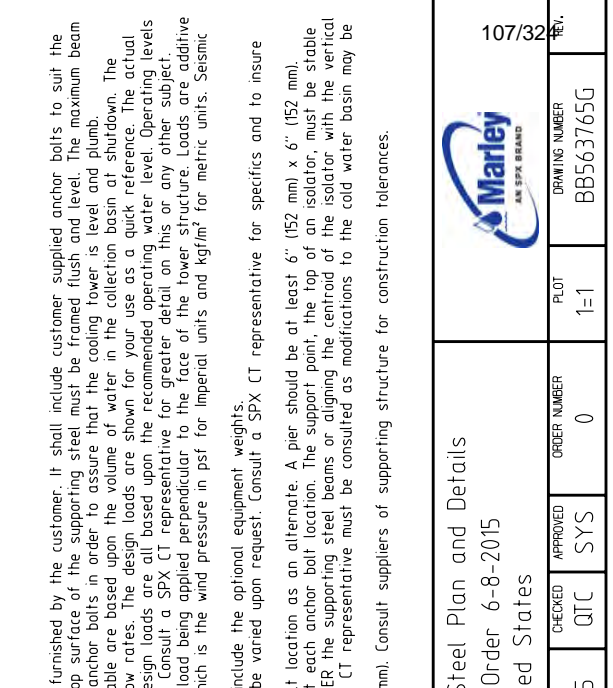
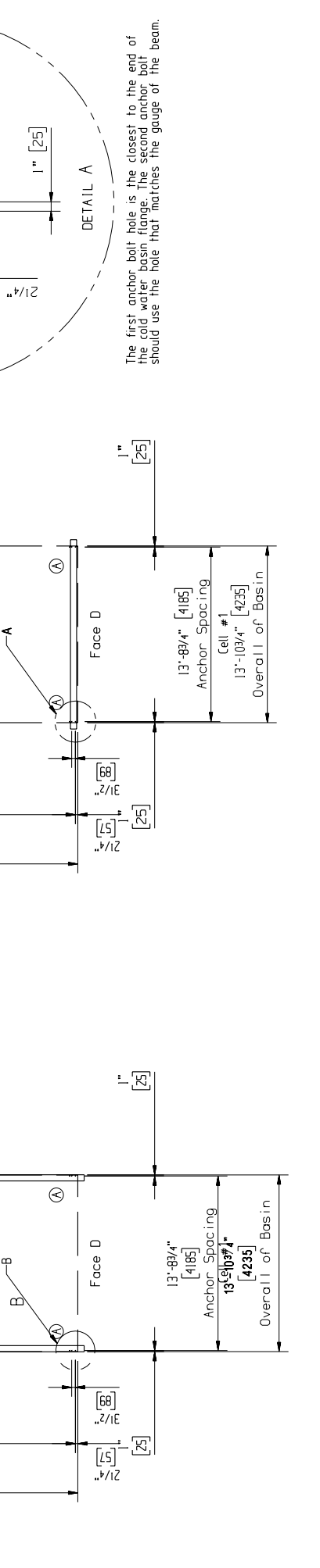
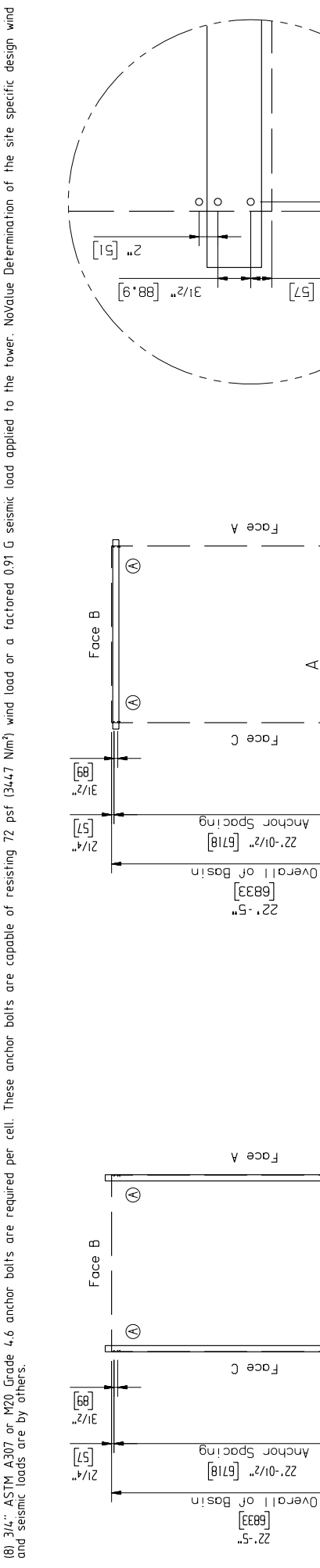


NOTES

1. All piping supports are by others. Do NOT support outlet piping from the tower.
2. The collection basin piping accessories shown on this drawing are furnished by SPX CT. This includes a full faced gasket. Flat faced flange, fasteners and seal washers attachment to the outlet are supplied by others. The use of a flange other than a flat faced flange will damage the collection basin floor.
3. The standpipe overflow is to be field installed by others.
4. The design operating loads shown in the table on the Grillage Details drawing are based upon the volume of water in the collection basin at shutdown. The shutdown water level has been sized to accommodate the maximum allowable flow rates. The actual operating load is variable, and is dependent upon the design flow rate per cell. Design loads are all based upon the recommended operating water level. Operating levels in excess of that recommended can result in loads exceeding values stated. Consult a SPX CT representative for greater detail on this or any other subject.
5. Refer to basin heater detail drawings for heater details.
6. The tower assembly tolerance applicable to all dimensions is + or - .118" (3 mm). Consult suppliers of supporting structure for construction tolerances.
7. The units of measure are in IP (SI) units unless otherwise noted.

		106/32 REV.
NC8412UAS1BGF - Piping Plan 750 Ton Englewood CO Order 6-8-2015 Englewood, CO, United States		ORDER NUMBER 10106693 C01
DRAWN BY BRIAN BRIDGEFORD.150608.14.5814.156 V2		APPROVED SYS
DATE 06/12/15		CHECKED QTC
PLOT 1=1		DRAWING NUMBER BB564.154.P

Shipping Weight		Design Operating Loads		Wind Load		Seismic Load	
per Tower	Heaviest Lift	per Tower	per Cell	at A	Vert. Reaction at A	Horiz. Reaction at A	Horiz. Reaction at A
24716 lb (11211 kg)	12944 lb (5871 kg)	47873 lb (21715 kg)	47873 lb (21715 kg)	13204 lb (5989 kg)	159.83 x P lb (14.85 x P kgf)	110.19 x P lb (10.24 x P kgf)	14573 x G lb (6610 x G kgf)
(8) 3/4" ASTM A307 or M20 Grade 4.6 anchor bolts are required per cell. These anchor bolts are capable of resisting 72 psf (344.7 Nim ²) wind load or a factored 0.91 G seismic load applied to the tower. No Value Determination of the site specific design wind and seismic loads are by others.							



NOTES

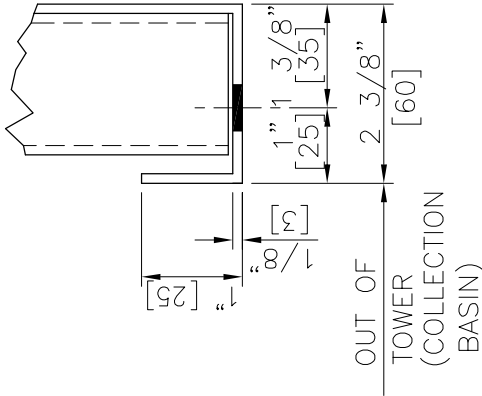
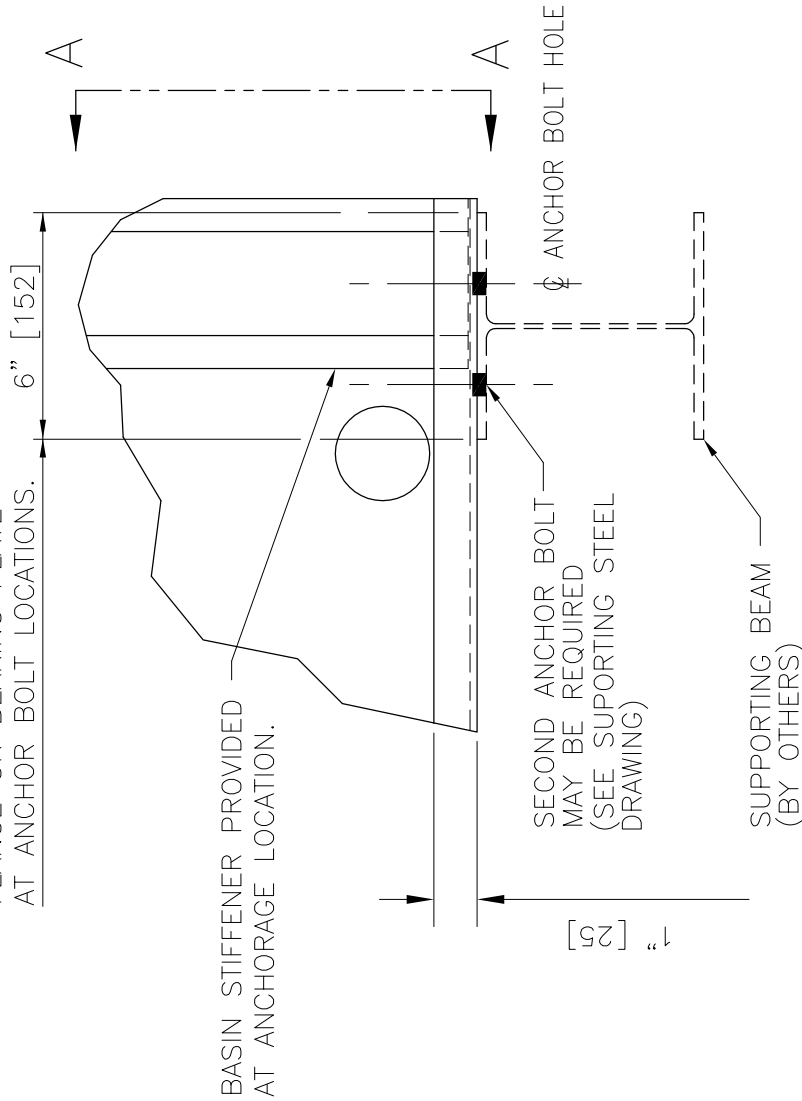
- SUPPORTING STEEL:** The supporting steel is to be designed, constructed and furnished by the customer. It shall include customer supplied anchor bolts to suit the general dimensions of this drawing and of the Outlet Piping Plan drawing. The top surface of the supporting steel must be framed flush and level. The maximum beam deflection shall be limited to 1/360 of span, not to exceed 1/2" (13 mm) at the anchor bolts in order to assure that the cooling tower is level and plumb.
- DESIGN OPERATING LOADS:** The design operating loads shown in the above table are based upon the volume of water in the collection basin at shutdown. The shutdown water level has been sized to accommodate the maximum allowable flow rates. The design loads are shown for your use as a quick reference. The actual operating load is variable, and dependent upon the design flow rate per cell. Design loads are all based upon the recommended operating water level. Operating levels in excess of that recommended will result in loads exceeding the values stated. Consult a SPX CT representative for greater detail on this or any other subject.
- WIND & SEISMIC LOADS:** Reactions shown are the result of the wind/seismic load being applied perpendicular to the face of the tower structure. Loads are additive to the operating loads. Wind reactions can be calculated by multiplying by P, which is the wind pressure in psf for Imperial units and kgf/m² for metric units. Seismic reactions can be calculated by design G.
- SHIPPING WEIGHTS AND MAXIMUM OPERATING LOADS:** Values shown in table include the optional equipment weights.
- NON-STANDARD ANCHORAGE LOCATION:** The anchor bolt dimension shown can be varied upon request. Consult a SPX CT representative for specifics and to insure that the appropriate modifications are added to the structure.
- PIER SUPPORTS:** The tower may be supported from piers at each anchor bolt location as an alternate. A pier should be at least 6" (152 mm) x 6" (152 mm).
- VIBRATION ISOLATORS:** The towers may be supported on vibration isolators at each anchor bolt location. The support point, the top of an isolator, must be stable and free from rotation. This is accomplished by either placing the isolators UNDER the supporting steel beams or aligning the centroid of the isolator with the vertical plane of the basin side. If isolators are installed at any other location, a SPX CT representative must be consulted as modifications to the cold water basin may be required to insure it's integrity.
- The tower assembly tolerance applicable to all dimensions is + or - .10" (3 mm). Consult suppliers of supporting structure for construction tolerances.
- The units of measure are in IP (SI) units unless otherwise noted.

ECO NUMBER: NC8412UAS1BGF - Supporting Steel Plan and Details
 750 Ton Englewood CO Order 6-8-2015
 Englewood, CO, United States

107/32

REV. BY	CHECKED	DATE	CHECKED	APPROVED	ORDER NUMBER	PLOT	DRAWING NUMBER
BRIAN BRIDGEMAN		06/08/15	QTC	SYS	0	1=1	BB563765G

MINIMUM BEARING WIDTH
MAY BE PROVIDED BY BEAM
FLANGE OR BEARING PLATE
AT ANCHOR BOLT LOCATIONS.



SECTION A-A

(LOUVER FACE B OR D)

SUPPORT BEARING DETAILS

(PARTIAL CASED FACE A OR C ELEVATION)

GENERAL NOTES

1. TOLERANCE APPLICABLE TO DIMENSIONS SHOWN ARE DEPENDENT UPON FABRICATION, ASSEMBLY AND CONSTRUCTION TOLERANCES. FABRICATION TOLERANCE IS $\pm 1/16"$ [2] & ASSEMBLY TOLERANCE IS $\pm 1/8"$ [3]. CONSULT SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THE DIMENSIONS SHOWN ARE IN INCHES UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS SHOWN INSIDE OF BRACKETS [] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

I-P [SI] UNITS

ECO NUMBER	QTC-CHK
REV. BY	CHECKED
BCC	MN
REV. DATE	02/04/09

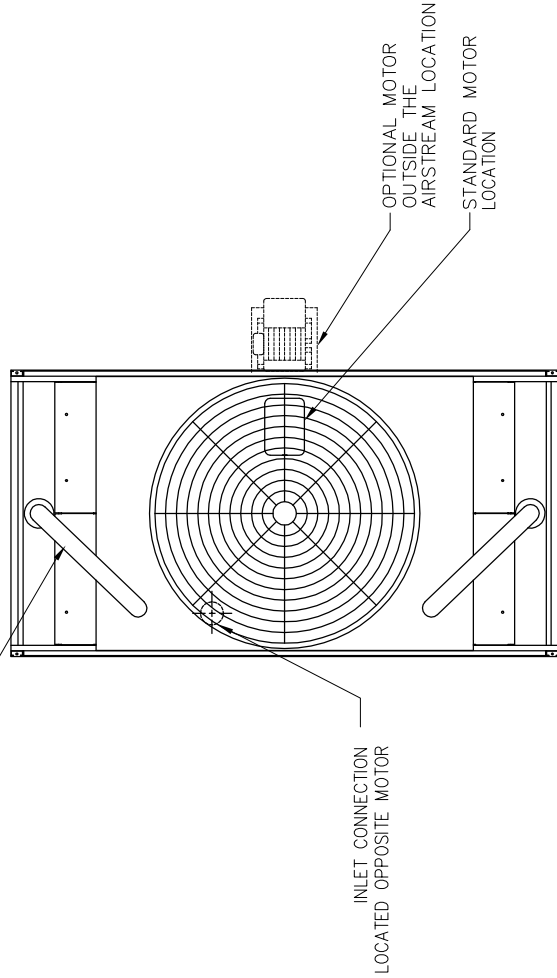
SUPPORT BEARING DETAILS
8401 THRU 8414 TOWERS

DRAWN BY	DATE	CHECKED	APPROVED
B. GOODING	01/16/2009	MN	MN

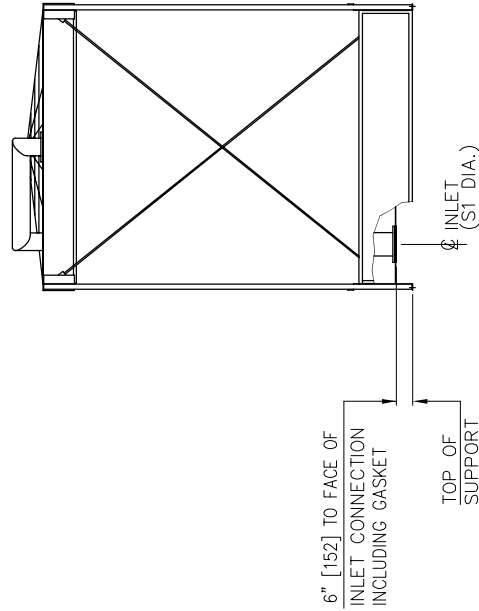
ORDER NUMBER	1=1	PLOT	DRAWING NUMBER	09-14	REV.	A
			108/324			

SPX.
COOLING TECHNOLOGIES

EXTERNAL INLET PIPING PROVIDED WITH THE COOLING TOWER AND FIELD INSTALLED BY OTHERS



PLAN



AIR INLET ELEVATION

TOWER MODEL	DIMENSIONS	
8401	S1	
8402	N/A	
8403	8"	
8405	8"	
8407	10"	
8409	10"	
8411	12"	
8412	12"	
8413	12"	
8414	12"	

SEE "OUTLET PIPING PLAN" DRAWING FOR DIMENSIONAL LOCATION OF INTERNAL INLET PIPING.

NOTES

1. ALL INTERNAL INLET PIPING TO THE FACE OF THE INLET CONNECTION, INCLUDING RUBBER SLEEVE IS SUPPLIED WITH THE COOLING TOWER. EXTERNAL PIPING AND SUPPORTS BEYOND THE INLET CONNECTION IS BY OTHERS. EXTERNAL PIPING MAY NOT BE SUPPORTED FROM THE TOWER.
2. ASSEMBLY TOLERANCE IS $\pm 1/8"$ [3]. CONSULT SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THE DIMENSIONS SHOWN ARE IN I-P (INCH-POUND) UNITS UNLESS OTHERWISE NOTED.
3. S1 DIAMETER INLET CONNECTION CONFORMS TO CLASS 125 ANSI B16.1 SPECIFICATIONS. BOLT HOLES STRADDLE CENTERLINES. FLAT FACE FLANGE GASKETS ARE SUPPLIED WITH THE COOLING TOWER. USE THIS DRAWING IN CONJUNCTION WITH THE SCHEMATIC DETAIL DRAWINGS.
4. MULTI-CELL TOWERS SHOULD INCLUDE PROVISIONS TO BALANCE FLOW BETWEEN CELLS.
5. CONTACT YOUR SALES ENGINEER FOR THE REQUIRED PUMP HEAD FOR THIS ARRANGEMENT.
6. ALL DIMENSIONS SHOWN INSIDE OF BRACKETS[] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

I-P [SI] UNITS

ECO NUMBER	QTC-CHK
REV. BY	CHECKED
BCC	MN
REV. DATE	02/02/09

BOTTOM INLET CONNECTION DETAILS
8401 THRU 8414 TOWERS

DRAWN BY
B. GOODING

DATE
01/16/09

CHECKED
MN

APPROVED
MN

ORDER NUMBER
1=1

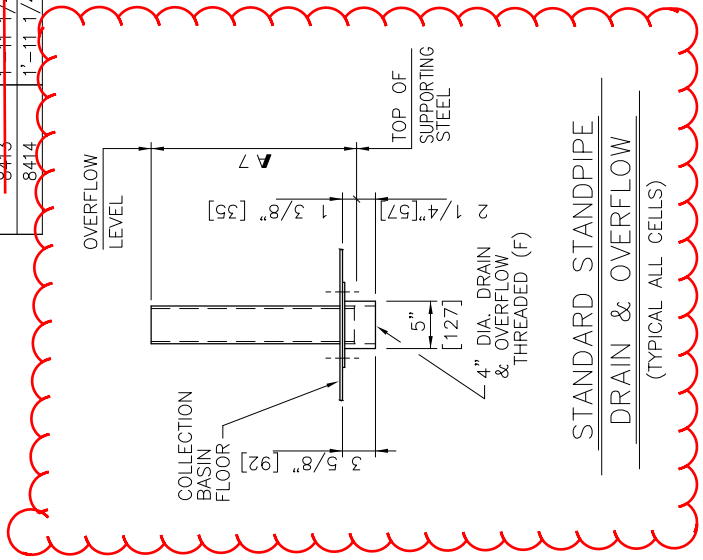
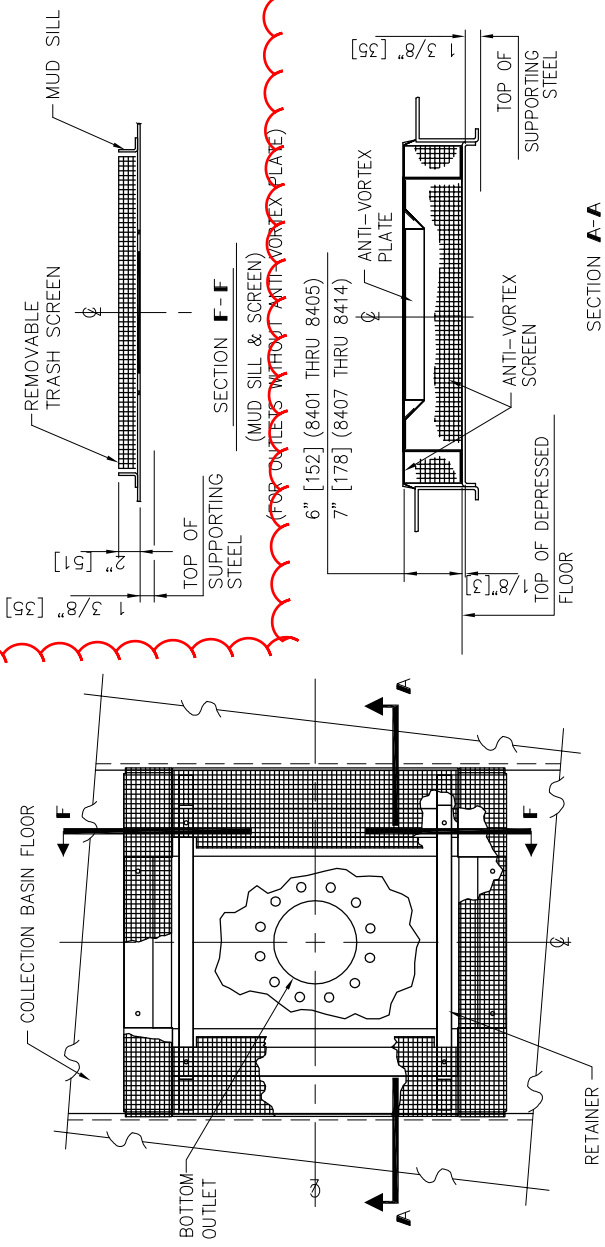
PLOT
DRAWING NUMBER
09-119

REV.
A

109/324

SPX.
COOLING TECHNOLOGIES

TOWER MODEL	DIMENSIONS
8401	1'-3" [381]
8402	1'-3" [381]
8403	1'-5 1/4" [438]
8405	1'-5 1/4" [438]
8407	1'-5 1/4" [438]
8409	1'-5 1/4" [438]
8411	1'-9 1/4" [540]
8412	1'-9 1/4" [540]
8413	1'-11 1/4" [591]
8414	1'-11 1/4" [591]



STANDARD STANDPIPE
DRAIN & OVERFLOW
(TYPICAL ALL CELLS)

GENERAL NOTES

1. ALL ACCESSORIES SHOWN ARE PROVIDED WITH THE COOLING TOWER.
2. ALL PIPING SUPPORTS ARE BY OTHERS. DO NOT SUPPORT PIPING FROM TOWER.
3. FLANGE DRILLING SHOWN CONFORMS TO CLASS 125 ANSI B16.1. BOLT HOLES WILL STRADDLE CENTERLINE OF AN OUTLET. THE OUTLET PIPING ATTACHMENT REQUIRES USE OF A FLAT FACED FLANGE, FASTENERS AND SEAL WASHERS(SUPPLIED BY OTHERS) AND A FULL FACED GASKET (PROVIDED WITH THE COOLING TOWER).
4. TOLERANCE APPLICABLE TO DIMENSIONS SHOWN ARE DEPENDENT UPON FABRICATION, ASSEMBLY AND CONSTRUCTION TOLERANCES. FABRICATION TOLERANCE IS ±1/16" [2] AND ASSEMBLY TOLERANCE IS ±1/8" [3]. CONSULT SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THE DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.
5. ALL DIMENSIONS SHOWN INSIDE OF BRACKETS [] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

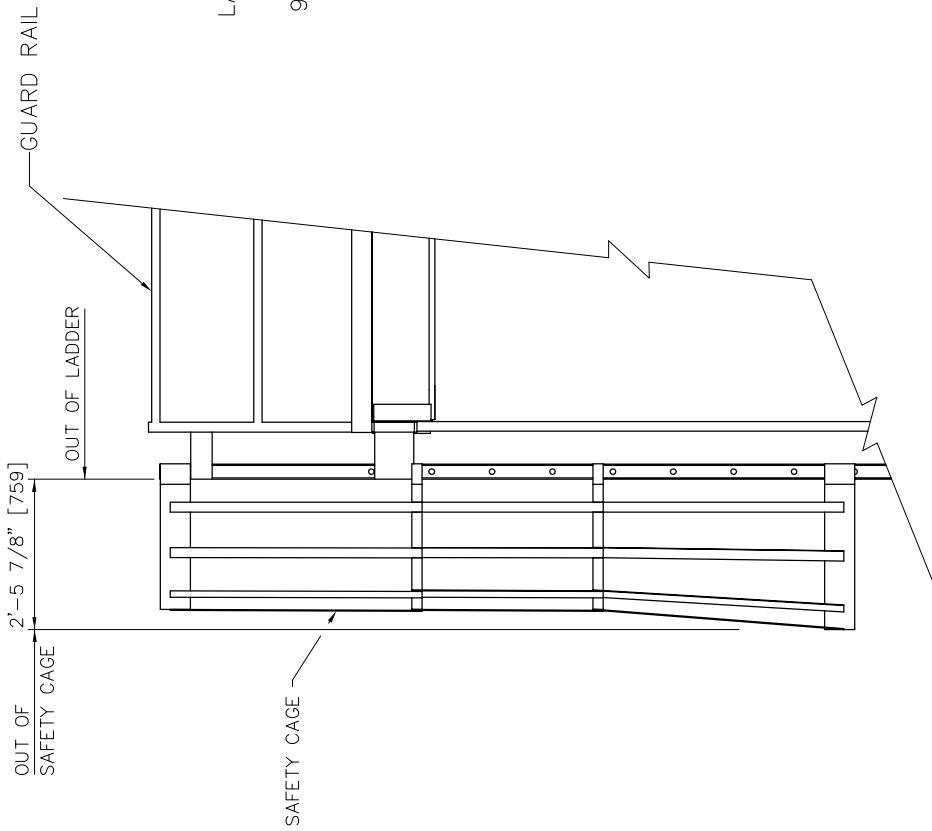
- BOTTOM OUTLET WITH ANTI-VORTEX PLATE AND SCREEN
- ~~BOTTOM OUTLET WITH MUD SILL AND SCREEN~~
- ~~BOTTOM OUTLET WITHOUT SCREEN~~
- ~~BOTTOM OUTLET EQUALIZER~~

NOTE: ANTI-VORTEX PLATE AND SCREEN ARE NOT PROVIDED FOR BOTTOM OUTLET EQUALIZER.

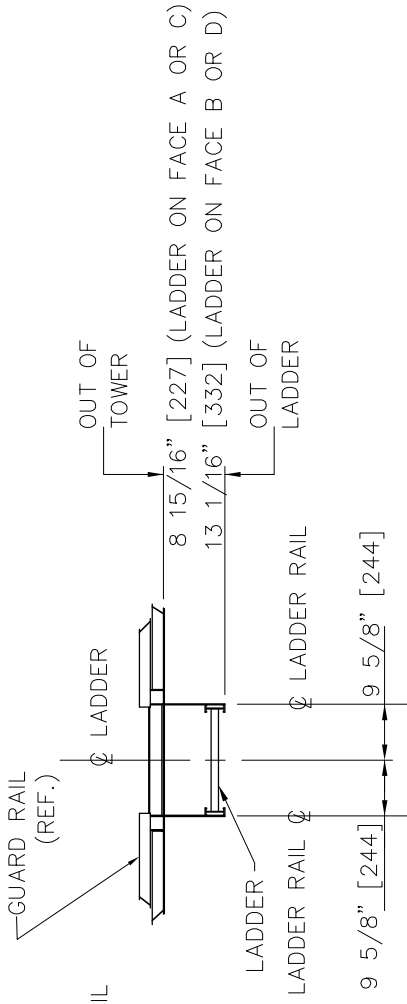
SEE "OUTLET PIPING PLAN" DRAWING FOR OUTLET DIAMETER

I-P [SI] UNITS

ECO NUMBER	STANDARD BOTTOM OUTLET PIPING DETAILS				110/324					
REV. BY	CHECKED	8401 THRU 8414 TOWERS				COOLING TECHNOLOGIES				
REV. DATE	M. Nation				DATE	12/20/2011	ORDER NUMBER	1=1	DRAWING NUMBER	2011-1419
		CHECKED	APPROVED	MM	MM	PLOT	1=1	REV.		



LADDER WITH CAGE ELEVATION

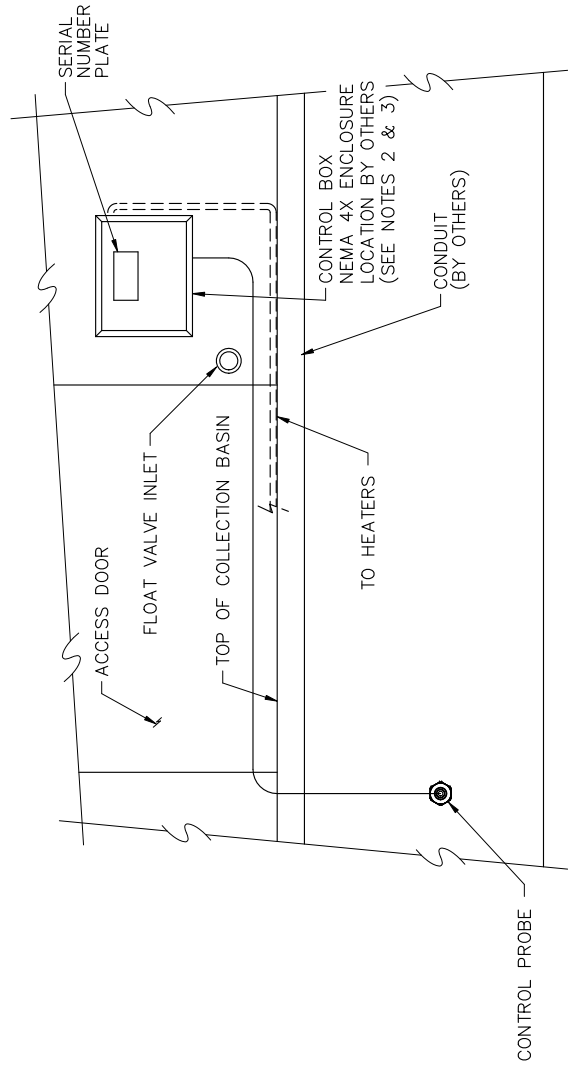


LADDER DETAIL
(PLAN VIEW)

NOTES

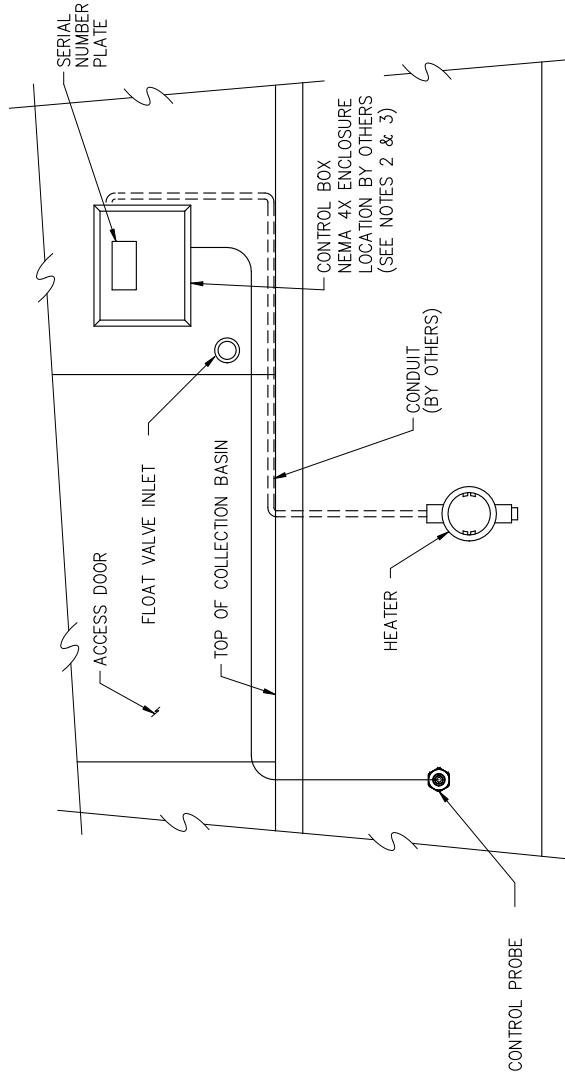
1. THE COOLING TOWER FAN DECK IS NOT CONSIDERED AN ELEVATED WORKING PLATFORM SINCE NORMAL RECOMMENDED MAINTENANCE PROCEDURES ARE LESS THAN THE FREQUENCY OF MAN-HOURS THAT OSHA DEFINES FOR SUCH A PLATFORM, PER OSHA'S 1984 INTERPRETATION OF THEIR REGULATIONS. THIS OPTION AND OTHERS ARE AVAILABLE FOR THOSE CUSTOMERS WHO PREFER THE EXTRA DEGREE OF PROTECTION IT PROVIDES.
2. NORMAL TOWER MAINTENANCE DOES NOT REQUIRE PERSONNEL TO BE ON TOP OF THE TOWER. IF ACCESS TO TOP OF THE TOWER IS NEEDED, THEN LADDER AND HANDRAIL OPTION IS RECOMMENDED.
3. LADDER IS ALL ALUMINUM CONSTRUCTION CONSISTING OF 3" [76] X 1 1/8" [29] I-BEAM SIDE RAILS AND 1 1/4" [32] DIAMETER SERRATED RUNGS.
4. TOWER IS MODIFIED FOR LADDER AND HANDRAIL WITH ALL ATTACHING CLIPS AND HARDWARE PROVIDED WITH THE COOLING TOWER. LADDER AND HANDRAIL ARE ASSEMBLED AND INSTALLED IN THE FIELD BY OTHERS. INSTALLATION DETAILS ARE SHIPPED WITH THE TOWER.
5. TOLERANCE APPLICABLE TO DIMENSIONS SHOWN ARE DEPENDENT UPON FABRICATION, ASSEMBLY AND CONSTRUCTION TOLERANCES. FABRICATION TOLERANCE IS $\pm 1/16"$ [2] & ASSEMBLY TOLERANCE IS $\pm 1/8"$ [3]. CONSULT SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THE DIMENSIONS SHOWN ARE IN INCHES UNLESS OTHERWISE NOTED.
6. PER O.S.H.A. STANDARDS, SAFETY CAGE IS RECOMMENDED WHEN THE DIFFERENCE IN ELEVATION BETWEEN TOWER FAN DECK AND GRADE EXCEEDS 20' [6096].
7. OPTIONAL LADDER EXTENSIONS ARE PROVIDED IN NOMINAL LENGTHS OF 5' [1524] AND 11' [3353] ONLY. FIELD MODIFICATION, BY OTHERS, OTHERS, IS REQUIRED FOR EXTENSIONS OF DIFFERENT LENGTHS. PER O.S.H.A. STANDARDS, AN ACCESS DOOR PLATFORM IS RECOMMENDED IF TOWER IS ELEVATED.
8. IF LADDER EXTENSION WITH SAFETY CAGE IS PURCHASED, THE ACTUAL LADDER EXTENSION LENGTH MUST BE SPECIFIED TO ASSURE THE PROPER BOTTOM ELEVATION OF SAFETY CAGE.
9. ALL DIMENSIONS SHOWN INSIDE OF BRACKETS[] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

ECO NUMBER QTC-CHK		LADDER DETAILS WITH SAFETY CAGE		I-P [S] UNITS	
REV. BY BCC	CHECKED MN	DRAWN BY B. GOODING	DATE 01/16/09	CHECKED MN	APPROVED
REV. DATE 02/04/09	ORDER NUMBER 1=1		DRAWING NUMBER 09-117		REV. A
SPX		COOLING TECHNOLOGIES		111/324	



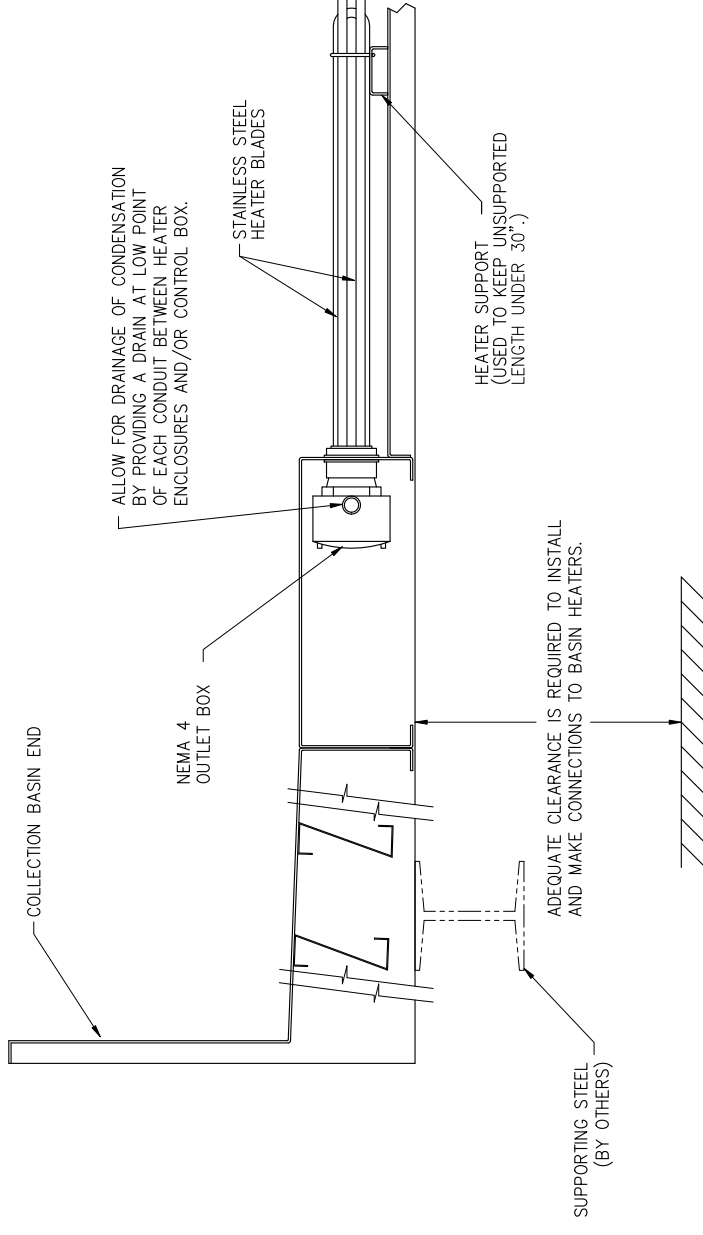
VIEW WITH HEATER IN SIDE OF DEPRESSED SECTION

SINGLE & MULTI-CELL TOWERS



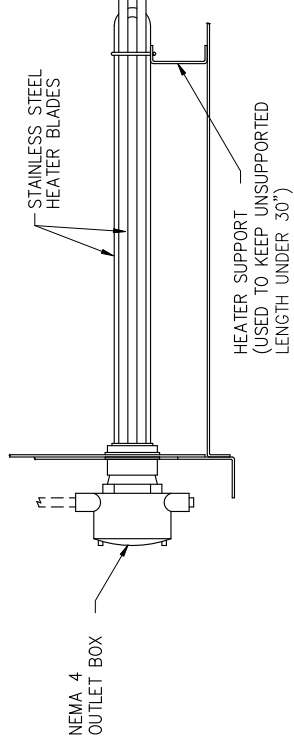
VIEW WITH HEATER IN BASIN SIDE AT END OF DEPRESSED SECTION

SINGLE OR 2 CELL TOWERS



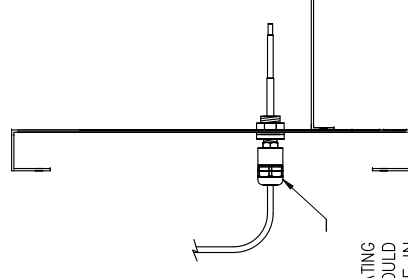
SECTION WITH HEATER IN SIDE OF DEPRESSED SECTION

SINGLE & MULTI-CELL TOWERS



SECTION WITH HEATER IN BASIN SIDE AT END OF DEPRESSED SECTION

SINGLE OR 2 CELL TOWERS



STAINLESS STEEL CONTROL PROBE TO MONITOR WATER TEMPERATURE AND PREVENT HEATERS FROM OPERATING OUT OF WATER. THE HEATERS WOULD OPERATE IN EXCESS OF 1500° F IN THE AIR AND WOULD BE A POTENTIAL FIRE HAZARD.

SECTION SHOWING CONTROL PROBE

SINGLE & MULTI-CELL TOWERS

GENERAL NOTES

1. ALL BASIN HEATER COMPONENTS ARE FIELD INSTALLED AND WIRED BY OTHERS. CUSTOMER'S INSTALLATION MUST MEET REQUIREMENTS OF LATEST NATIONAL ELECTRICAL CODE AND LOCAL CODES.
2. ONE HEATER PACKAGE FOR CONTROL OF THE HEATERS IS LIMITED TO A MAXIMUM OF TWO CELLS. MULTI-CELL TOWERS WITH MORE THAN TWO CELLS MUST HAVE A HEATER PACKAGE FOR EVERY TWO CELLS.
3. CONTROL BOX COMPONENTS:
 - TRANSFORMER – STEP DOWN LINE VOLTAGE TO 24 VOLTS FOR CONTROL CIRCUIT.
 - MAGNETIC CONTACTOR – CONTROLS POWER TO HEATER. CONTACTS ARE RATED FOR LINE VOLTAGE. COIL IS RATED FOR A 24 VOLT CIRCUIT.
 - CIRCUIT BOARD / CONTROL PROBE – SENSES WATER TEMPERATURE AND CONTROLS THE CONTACTOR TO MAINTAIN THE SET WATER TEMPERATURE. PREVENTS THE CONTACTOR FROM CLOSING WHEN THE CONTROL PROBE SENSES THE WATER LEVEL DROPPING TOO LOW FOR SAFE OPERATION OF THE HEATERS.
 - OPTIONAL FEATURES AS SELECTED.
4. ALL STANDARD HEATER PACKAGES WITH NEMA 4 CONTROL BOXES ARE U.L. LISTED. (U.L. LISTING NOT AVAILABLE ON EXPLOSION PROOF CONTROL BOXES).
5. CONTROL PROBE CORD LENGTH OF 12'-0" MAY LIMIT CONTROL BOX LOCATION.
6. SINGLE AND DUAL HEATERS WILL BE PLACED IN EITHER THE SIDE AND/OR END OF THE DEPRESSED SECTION OF THE COLDWATER BASIN. LOCATION WILL DEPEND ON OPTIONS SELECTED WITH LOCATION SHOWN ON THE CONTRACT OUTLET PIPING DETAILS DRAWING.
7. THE ENCLOSURE RATING FOR THE INDEECO CONTROL BOX OR PANEL IS NEMA 4X. THIS IS STANDARD. THE HEATER CONTROL PANEL CARRIES A NEMA RATING OF 4X, BUT THE UL RATING IS TYPE 4. UL DOES NOT RATE COMPONENTS ACCORDING TO NEMA STANDARDS, BUT INSTEAD THEY HAVE TO BE TESTED TO UL STANDARDS.

ECD NUMBER

15408

REV. BY

BEJ DMJ

CHECKED

DATE

09/15/2000

DRAWN BY

J.MALONE

CHECKED

APPROVED

ORDER NUMBER

MPC

PLOT

I-P UNITS

2/2

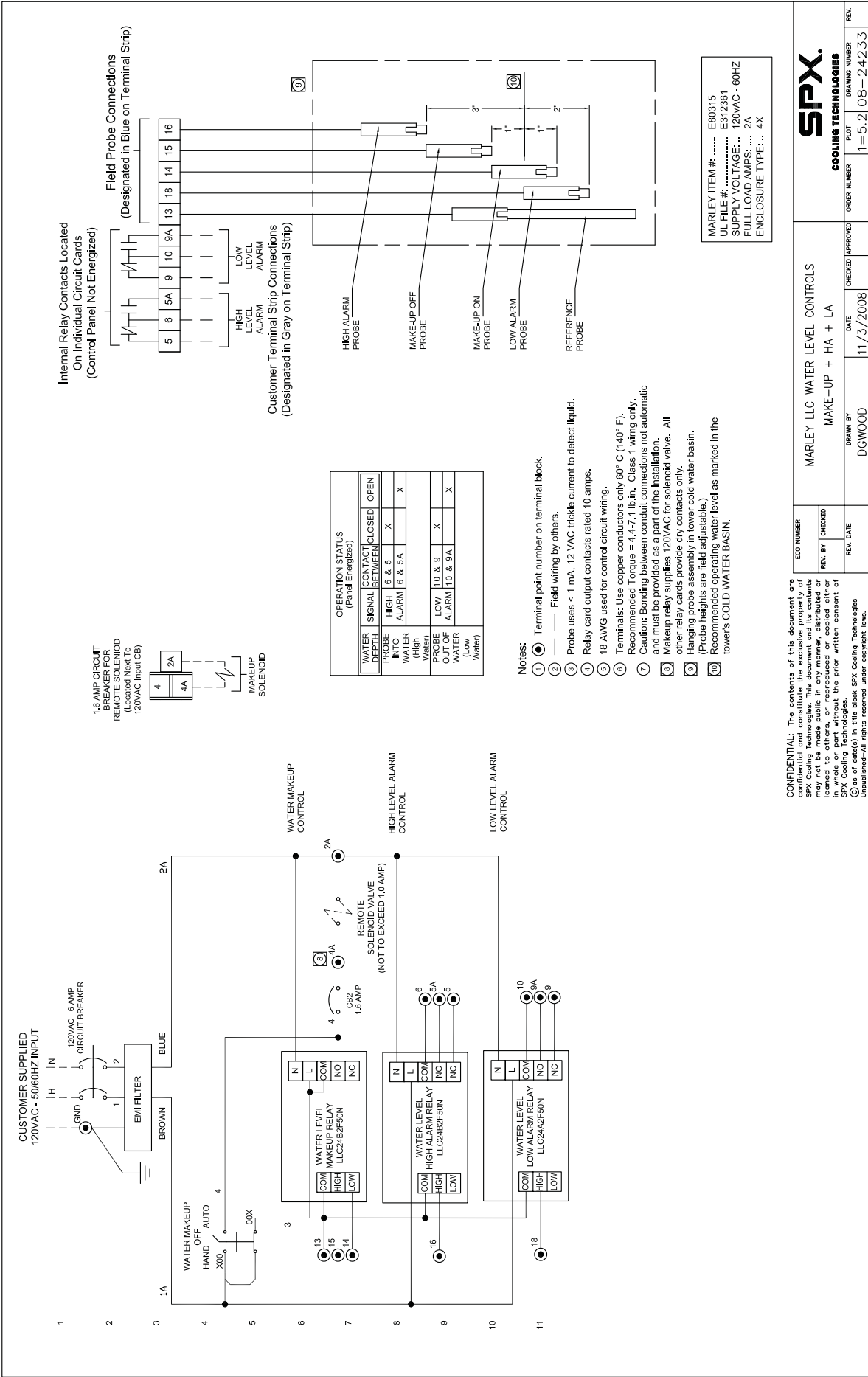
Marley

1=1

DRAWING NUMBER

00-4885

REV. B



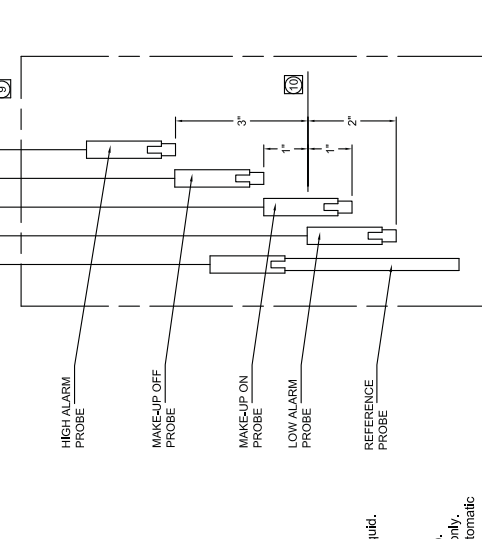
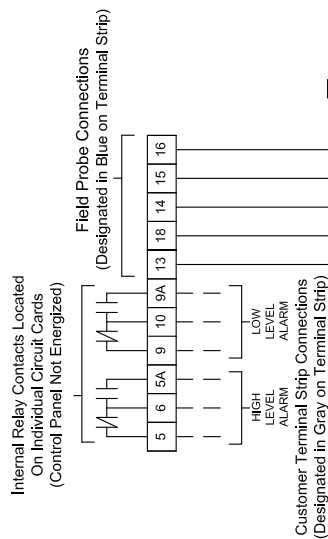
1.6 AMP CIRCUIT BREAKER OF REMOTE END (Located Next To 120VAC Input CB)



WATER MAKEUP CONTROL
 HIGH LEVEL ALARM CONTROL
 LOW LEVEL ALARM CONTROL

OPERATION STATUS (Panel Energized)			
WATER DEPTH PROBE	SIGNAL HIGH ALARM	CONTACT BETWEEN 16 & 5	CLOSED OPEN
WATER INTO (High Water)	16 & 5	X	X
PROBE OUT OF WATER (Low Water)	10 & 9	X	X

- Notes:
- Terminal point number on terminal block.
 - Field wiring by others.
 - Probe uses < 1 mA, 12 VAC trickle current to detect liquid.
 - Relay card output contacts rated 10 amps.
 - 18 AWG used for control circuit wiring.
 - Terminals: Use copper conductors only 60° C (140° F). Recommended Torque = 4.4-7.1 lb.in. Class 1 wiring only.
 - Caution: Bonding between conduit connections not automatic and must be provided as a part of the installation.
 - Makeup relay supplies 120VAC for solenoid valve. All other relay cards provide dry contacts only.
 - Hanging probe assembly in lower cold water basin. (Probe heights are field adjustable.)
 - Recommended operating water level as marked in the lower's COLD WATER BASIN.



MARLEY ITEM #: E80315
 UL FILE #: E312361
 SUPPLY VOLTAGE: .. 120VAC - 60HZ
 FULL LOAD AMPS: ... 2A
 ENCLOSURE TYPE: ... 4X

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SPX.
COOLING TECHNOLOGIES

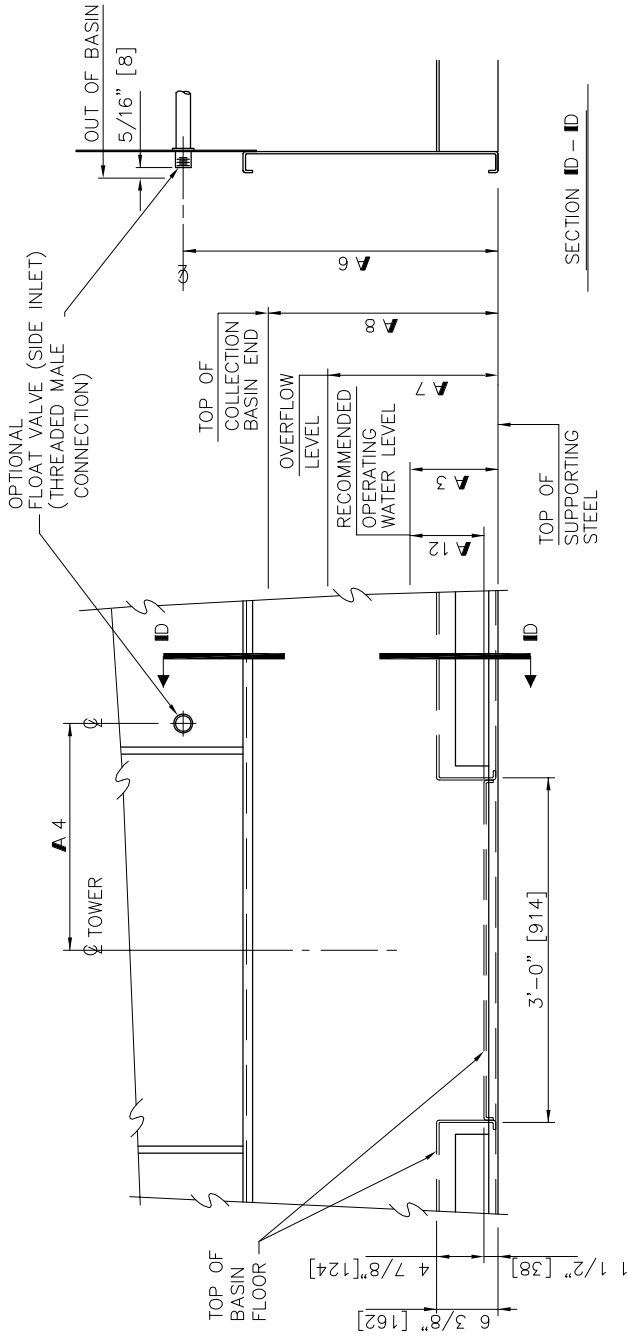
MARLEY LLC WATER LEVEL CONTROLS
 MAKE-UP + HA + LA

ECO NUMBER
 REV. BY CHECKED

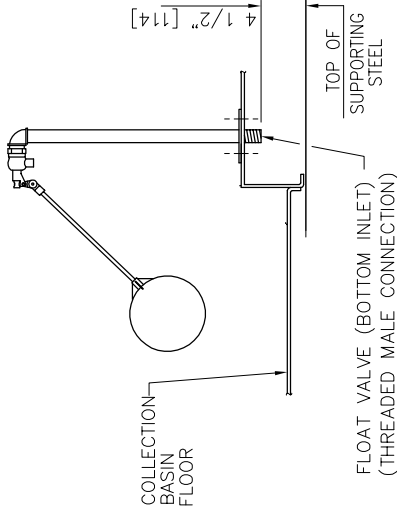
DATE 11/3/2008
 DRAWN BY DGMWOOD

ORDER NUMBER
 REV. DATE

1=5.2 08-24233
 REV.



EXTERIOR CELL ELEVATION
(FACES "A" OR "C")



OPTIONAL FLOAT VALVE
(BOTTOM INLET)

SEE "OUTLET PIPING PLAN" DRAWING FOR FLOAT VALVE LOCATION, SIZE & TYPE

DIMENSIONS

TOWER MODEL	A3	A4	A6		A7	A8	A12
			1" DIAMETER	2" DIAMETER			
8401	8 1/2" [216]	1'-6 3/16" [462]	2'-3 11/16" [703]	2'-4 3/16" [716]	1'-3" [381]	1'-8" [508]	7" [178]
8402	8 1/2" [216]	1'-10 1/2" [572]	2'-3 11/16" [703]	2'-4 3/16" [716]	1'-3" [381]	1'-8" [508]	7" [178]
8403	8 1/2" [216]	2'-4 3/8" [721]	2'-6 7/8" [784]	2'-7 3/8" [797]	* 1'-5 1/4" [438]	1'-10 1/4" [565]	7" [178]
8405	8 1/2" [216]	1'-11 7/8" [606]	2'-6 7/8" [784]	2'-7 3/8" [797]	* 1'-5 1/4" [438]	1'-10 1/4" [565]	7" [178]
8407	9 1/2" [241]	2'-2 3/8" [670]	2'-6 7/8" [784]	2'-7 3/8" [797]	* 1'-5 1/4" [438]	1'-10 1/4" [565]	8" [203]
8409	9 1/2" [241]	2'-2 3/8" [670]	2'-6 7/8" [784]	2'-7 3/8" [797]	* 1'-5 1/4" [438]	1'-10 1/4" [565]	8" [203]
8411	9 1/2" [241]	2'-5 3/4" [755]	2'-9 15/16" [862]	2'-10 7/16" [875]	1'-9 1/4" [540]	2'-2 1/4" [667]	8" [203]
8412	9 1/2" [241]	2'-5 3/4" [755]	2'-9 15/16" [862]	2'-10 7/16" [875]	1'-9 1/4" [540]	2'-2 1/4" [667]	8" [203]
8413	9 1/2" [241]	2'-5 3/4" [755]	2'-9 15/16" [862]	2'-10 7/16" [875]	1'-11 1/4" [591]	2'-2 1/4" [667]	8" [203]
8414	9 1/2" [241]	2'-5 3/4" [755]	2'-9 15/16" [862]	2'-10 7/16" [875]	1'-11 1/4" [591]	2'-2 1/4" [667]	8" [203]

* 1'-6 1/2" [470] ON TOWERS WITH 12" OR 14" DIA. SIDE SUCTION OUTLET

GENERAL NOTES

- FOR FLOAT VALVE INLET DIAMETER SIZING INFORMATION, SEE DWG. 98-22969 [98-22970].
- TOLERANCE APPLICABLE TO DIMENSIONS SHOWN ARE DEPENDENT UPON FABRICATION, ASSEMBLY AND CONSTRUCTION TOLERANCES. FABRICATION TOLERANCE IS ±1/16" [2] AND ASSEMBLY TOLERANCE IS ±1/8" [3]. CONSULT SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THE DIMENSIONS SHOWN ARE IN INCHES UNLESS OTHERWISE NOTED.
- ON THE 8401, IF A SUMP OR BOTTOM OUTLET OPTION IS SUPPLIED WITH AN ANTI-VORTEX PLATE, A FLOAT VALVE MAY NOT BE IN THE SAME CELL.
- ALL DIMENSIONS SHOWN INSIDE OF BRACKETS [] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
- REFER TO SUPPORTING STEEL DRAWING FOR DESIGN OPERATING LOADS.
- THE RECOMMENDED WATER LEVEL IS FOR CELLS WITH OUTLETS. THE OPERATING WATER LEVEL IN ADJACENT CELLS MAY BE GREATER DEPENDING ON THE GPM, NUMBER OF OUTLES AND FLUME ARRANGEMENT.

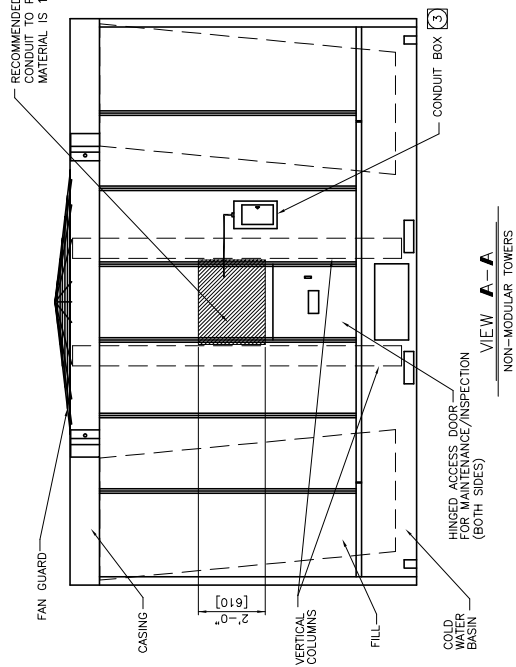
I-P [SI] UNITS

ECO NUMBER		COLLECTION BASIN WATER LEVEL DETAILS				115/324	
REV. BY	CHECKED	8401 THRU 8414 TOWERS				ORDER NUMBER	REV.
		DRAWN BY M. Nation				1=1	2011-1417
REV. DATE		DATE	CHECKED	APPROVED	PLOT	DRAWING NUMBER	
		12/20/2011	MM	MM	1=1	2011-1417	

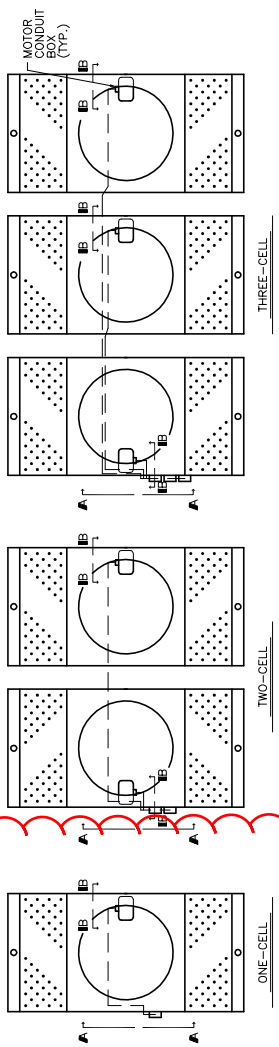
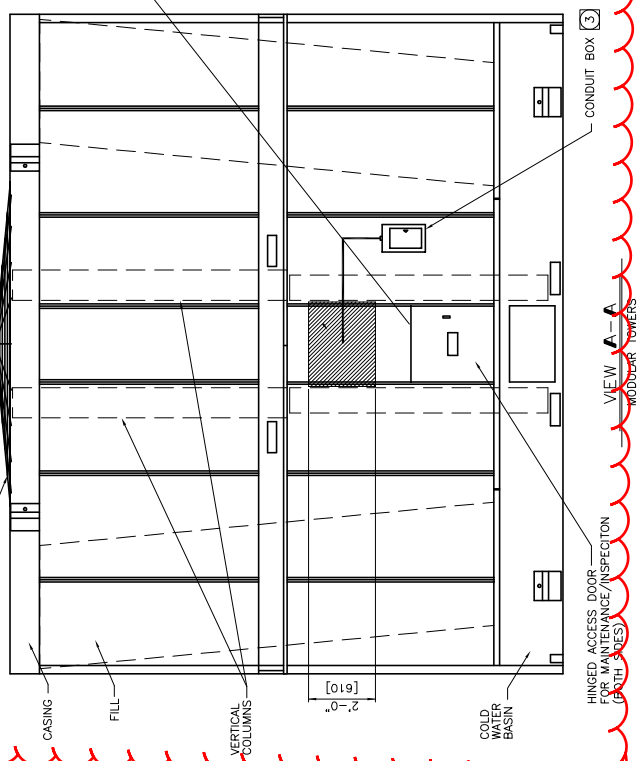
SPFX.

COOLING TECHNOLOGIES

RECOMMENDED LOCATION FOR CONDUIT TO PASS THROUGH CASING. MATERIAL IS 1/16" (2) THICK.



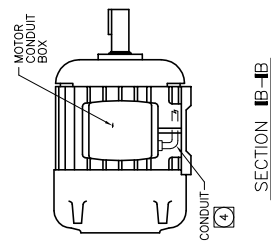
RECOMMENDED LOCATION FOR CONDUIT TO PASS THROUGH CASING. MATERIAL IS 1/16" (2) THICK.



CONDUIT INSTALLATION KEY PLANS

GENERAL NOTES

- ALL CONDUIT, CONNECTIONS, SUPPORTING CLIPS, HANGERS, AND SAFETY SWITCHES ARE SUPPLIED BY OTHERS.
- ALL WIRING MUST CONFORM TO LOCAL AND NATIONAL CODES.
- NON-FUSED SAFETY DISCONNECT SWITCHES ARE RECOMMENDED. THESE SWITCHES SHOULD BE LOCATED ON THE EXTERIOR OF THE TOWER. MOTORS WITH 3 OR 4 WEATHERPROOF ENCLASURES SHOULD BE LOCATED IN A NEMA 3 OR 4 WEATHERPROOF ENCLOSURE. ATTACH ENCLOSURE TO EXTERIOR OF TOWER USING VERTICAL FLANGES OF CASING. CONDUIT BOX MUST BE LOCATED AT A LOWER ELEVATION THAN MOTOR.
- CONDUIT SHOULD BE SUPPORTED APPROXIMATELY EVERY TEN FEET [3048], EXCEPT WHERE NOTED BELOW. IMPORTANT: CONDUIT MUST BE PITCHED DOWN TO ALLOW CONDENSATION TO DRAIN AWAY FROM MOTOR AND OUT OF CONDUIT. CONDUIT MUST BE WATERTIGHT. CONDUIT SHOULD BE RIGID EXCEPT AS NOTED BELOW.
 - APPROXIMATELY 2 FEET [610] OF FLEXIBLE STEEL CONDUIT (SEALTIGHT OR EQUIVALENT) SHOULD BE USED AT THE MOTOR CONDUIT BOX OF ALL CONDUIT BOXES.
 - A CONDUIT SUPPORT SHOULD BE LOCATED WITHIN 3 FEET [914] OF ALL CONDUIT BOXES.
 - IF MOISTURE CANNOT DRAIN OUT OF MOTOR CONDUIT BOX, A SHAPE OF 1/4" [6.35] DRAIN HOLE MUST BE DRILLED IN BOTTOM OF CONDUIT BOX.
- CONDUIT MAY BE SUPPORTED ON THE SIDE OF THE INTERIOR BOX BEAMS OR SUSPENDED FROM BOTTOM OF THE BEAM. SEE KEY PLANS AND VIEW A-A FOR LOCATION AT WHICH TO RUN CONDUIT THROUGH TOWER CASING. HOLE(S) CUT IN CASING FOR CONDUIT SHOULD NOT BE FLAME CUT, AND SHOULD NOT BE LARGER THAN NECESSARY TO ACCOMMODATE CONDUIT FITTINGS. SEAL HOLES WITH WATERPROOF CAULKING.
- TOWERS WITH NO LADDER AND HANDRAIL:
 - ONE CELL TOWERS MAY HAVE DISCONNECT SWITCH LOCATED ON MOTOR FACE OR TOWER.
 - MULTI-CELL TOWERS SHOULD HAVE DISCONNECT SWITCHES LOCATED TOGETHER WITH CONDUIT FITTINGS AND TOWER BEAMS ADJACENT CELLS AS SHOWN ON INSTALLATION KEY PLAN.
- TOWERS WITH LADDER AND HANDRAIL:
 - DISCONNECT SWITCHES SHOULD BE LOCATED ON LADDER SIDE OF TOWER FOR EASE OF ACCESSIBILITY. SEPARATE CONDUIT IS REQUIRED FOR EACH MOTOR. ROUTE CONDUIT THROUGH CASING AND ACROSS ADJACENT CELLS AS SHOWN IN INSTALLATION KEY PLAN.
- ALL OF THE DIMENSIONS SHOWN INSIDE BRACKETS [] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.



ECO NUMBER	REVISIONS
REV. BY	CHECKED
REV. DATE	DATE

RECOMMENDED CONDUIT INSTALLATION

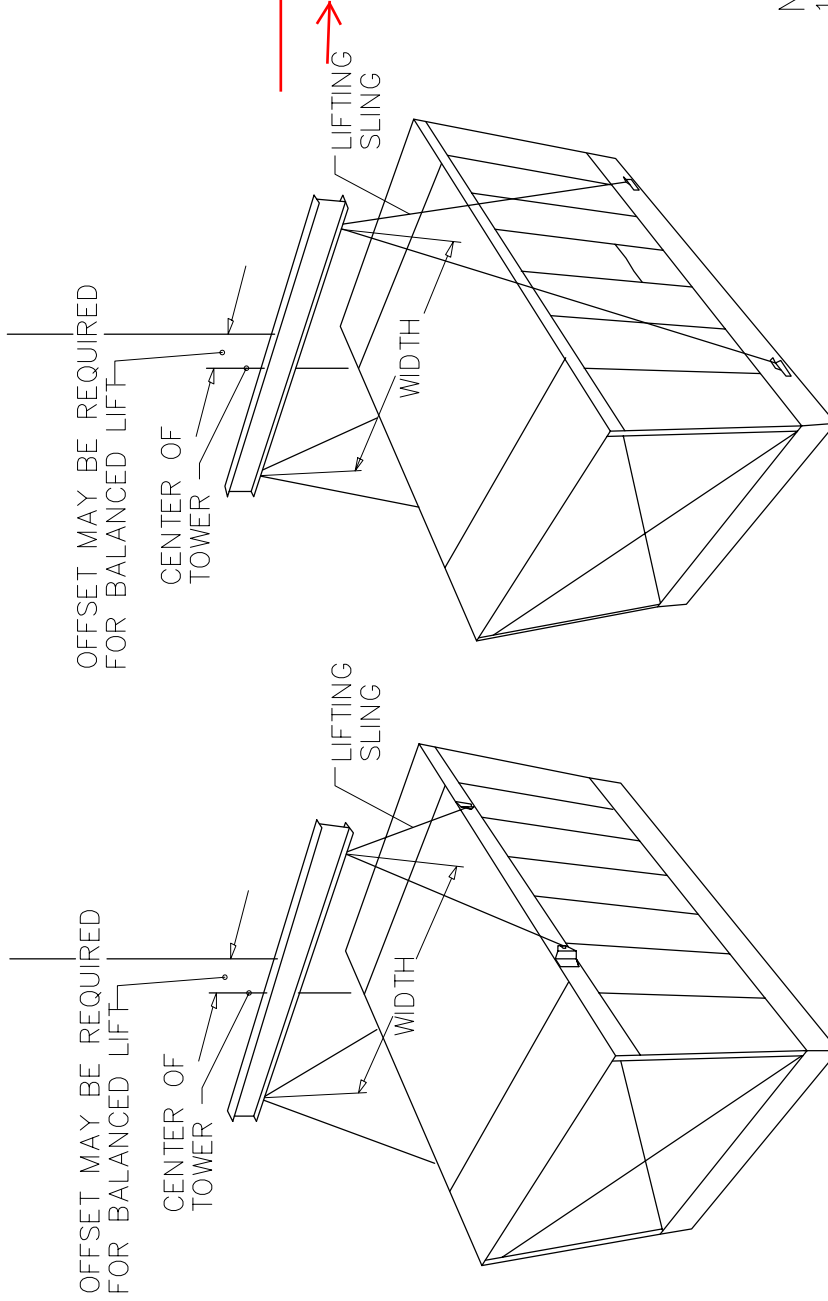
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116/324	REV.
COOLING TECHNOLOGIES	DRAWING NUMBER
1=109-167	PLOT
ORDER NUMBER	1=109-167
APPROVED	MIN
CHECKED	DATE
02/05/2009	DATE
B. GOODING	DRAWN BY
1=109-167	REV.

I-P [S] UNITS



TOWER MODEL	TOWER WIDTH	MINIMUM SLING LENGTH
8401	6'-7" [2007]	5'-6" [1676]
8402	8'-6" [2591]	6'-0" [1829]
8403	8'-6" [2591]	8'-0" [2438]
8405	10'-0" [3048]	8'-0" [2438]
8407	12'-0" [3658]	8'-6" [2591]
8409	14'-0" [4267]	17'-6" [5334]
8411 TOP	12'-0" [3658]	9'-0" [2743]
8411 BOTTOM	12'-0" [3658]	16'-6" [5029]
8412 TOP	14'-0" [4267]	9'-0" [2743]
8412 BOTTOM	14'-0" [4267]	16'-6" [5029]
8413 TOP	12'-0" [3658]	9'-0" [2743]
8413 BOTTOM	12'-0" [3658]	16'-6" [5029]
8414 TOP	14'-0" [4267]	9'-0" [2743]
8414 BOTTOM	14'-0" [4267]	16'-6" [5029]



NOTES:

1. ALL HOISTING CLIP HOLES ARE 1 1/4" [32].
2. OVERALL LENGTH OF SHACKLE PIN SHOULD NOT EXCEED 5 1/4" [133].
3. FOR OVERHEAD LIFTS OR WHERE ADDITIONAL SAFETY IS REQUIRED, ADD SLINGS BENEATH THE TOWER UNIT.
4. ALL DIMENSIONS SHOWN INSIDE OF BRACKETS [] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

TOWER UNITS WITH
HOISTING CLIPS AT THE TOP
8401 THRU 8407
TOP MODULE OF 8411, 8412, 8413 & 8414

TOWER UNITS WITH
HOISTING CLIPS AT THE BOTTOM
8409
BOTTOM MODULE OF 8411, 8412, 8413 & 8414

I-P [S] Units

ECO NUMBER		HOISTING DETAILS				117/324	
REV. BY	CHECKED	8401 THRU 8414 TOWERS				ORDER NUMBER	DRAWING NUMBER
REV. DATE	DRAWN BY	DATE	CHECKED	APPROVED	1=1	09-136	REV.
	B. GOODING	01/23/2009	MIN				

SPX

COOLING TECHNOLOGIES

SPX Cooling Technologies Certification of Limited Warranty

SPX Cooling Technologies, Inc. ("SPX Cooling") hereby warrants the standard galvanized Marley NC® Class cooling tower as follows:

1. This standard galvanized NC tower will be free from all defects in material and workmanship for a period of (18) eighteen months from date of shipment by SPX Cooling to the original installation
2. SPX Cooling warrants that the mechanical equipment, which is limited to the fan(s), gearbox(es), driveshaft(s), coupling(s), sheaves (if applicable), premium efficiency motor(s) and mechanical equipment support(s), [but excluding spact and standard efficiency motors and all motor components, which are warranted by its manufacturer and bearing assemblies and V-belts (if applicable) which are warranted for 18 months] will be free from defects in material and workmanship for a period of (5) five years from the date of shipment by SPX Cooling to the original installation. To obtain the expected life of the Geareducer® and warranty coverage, scheduled maintenance, in accordance with the Marley User Manuals, is required to check oil level, check for leaks in oil plugs, lube line connections, seals and correct as necessary during that time. All other nonstandard purchased equipment, such as electrical equipment, consisting of motor controls, Marley VFD, basin heaters, low water makeup valves, etc. are excluded from this five year warranty and will carry the standard warranty provided by its manufacturer or in accordance with an SPX Cooling warranty certificate for that product. The majority of all nonstandard purchased equipment is shipped either loose or in plastic containers in the basin of the tower. These components must be stored in a dry and secured environment until actual installation. Reported issues stemming from moisture in the components or loss of components will not be warranted. To obtain the expected life of the motor and warranty coverage, motors must be installed and operated following the Marley *Electric Motor User Manual* 92-1475.
3. SPX Cooling further warrants that the standard galvanized NC tower meets the performance standards set forth in CTI Standard STD-201 Certification Standard for Water Cooling Towers. Performance altering operations such as reduced horsepower or fan speed changes voids CTI Certification.

The obligation under this warranty is limited to the repair or the replacement of defective materials, at SPX Cooling's option, F.O.B. original shipping point or EXWORKS plant. Warranty on repaired or replaced equipment will be for the time remaining under the terms of the original warranty. This warranty is non transferable.

This warranty does not obligate SPX Cooling to bear the cost of labor, transportation charges, or other costs incurred in connection with the repair or replacement of defective parts; nor does this warranty apply to normal wear and tear nor to damage resulting from operations not conforming with the NC's operation and maintenance instructions, accident, alteration, misuse or an abnormally corrosive or abrasive use environment.

SPX Cooling's total liability for damages related to the performance of or failure to perform shall be limited to the amount of the contract price and in no event shall either party hereto be responsible or held liable to the other for any special, punitive, indirect, incidental, or consequential damages.

The above warranties are in lieu of all other warranties expressed or implied, and all implied warranties of merchantability and fitness for a particular purpose are hereby disclaimed and excluded from this agreement.

SPX®

COOLING TECHNOLOGIES

SPX Cooling Technologies, Inc.

7401 W 129 Street | Overland Park, KS 66213

913 664 7400 | spxcooling.com

WARRANTY 00-161E

PLATE AND FRAME HEAT EXCHANGERS



PHE-Type	S86-IS10-348-TMTL33-LIQUII	Hot side	Cold side
Flowrate	(g.p.m.)	1200.00	1365.00
Inlet temperature	(°F)	70.00	53.00
Outlet temperature	(°F)	55.00	66.18
Pressure drop	(PSI)	7.47	9.56
Heat exchanged	(Btu/h)	9006625	
Thermodynamic properties:		Water	Water
Density	(Lb/Ft ³)	62.30	62.31
Specific heat	(Btu/Lb*F)	1.00	1.00
Thermal conductivity	(Btu/h*Ft*F)	0.34	0.34
Mean viscosity	(cP)	1.09	1.14
Wall viscosity	(cP)	1.14	1.09
Fouling factors	(Ft ² *h*F/kBtu)		
Dimensioning factor	(%)	0.0	
Inlet branch		F1	F3
Outlet branch		F4	F2
Design of Frame / Plates:			
Plate arrangement (passes*channel)		1 × 173 + 0 × 0	
Plate arrangement (passes*channel)		1 × 174 + 0 × 0	
Number of plates		348	
Effective heat surface	(Ft ²)	3,351.93	
Overall K-value Duty/Clean	(Btu/Ft ² *h*F)	955 / 955	
Plate material		0.0157 inch AISI 304	
Gasket material / Max. temp.	(°F)	NITRIL HT SONDER LOCK (S) / 284	
Max. design temperature	(°F)	88.00	
Max. Working/test pressure	(PSI)	150,00 / 195,00	
Max. Differential pressure	(PSI)	150.00	
Frame type / Paint Specification		IS No 6 / Category C2L BLUE RAL 5010	
Connections HOT side	(F1->F4)	6 INCH Flange Mild steel ANSI B16.5 #150	
Connections COLD side	(F3->F2)	6 INCH Flange Mild steel ANSI B16.5 #150	
Liquid volume	(Ft ³)	33.07	
Frame length	(Ft)	8.53	Max. No. of Plates 393
Net weight	(Lb)	5349	
Contact Sondex for packaging.			
Accessories:			
	NNN		0

PUMPS

Duttonson

A Gorman-Rupp Company

Energy Efficient Solutions in HVAC Pumping



ENVIROFLO

HYDRONIC PUMPING SOLUTIONS



ENVIROFLO
HYDRONIC PUMPING SOLUTIONS

Cost-effective quality.
Flexibility. Interchangeability.
Expert applications support. The
fastest delivery in the marketplace
for standard units. And **GREEN.**

That's EnviroFlo™ Hydronic
Pumping Solutions from Patterson.

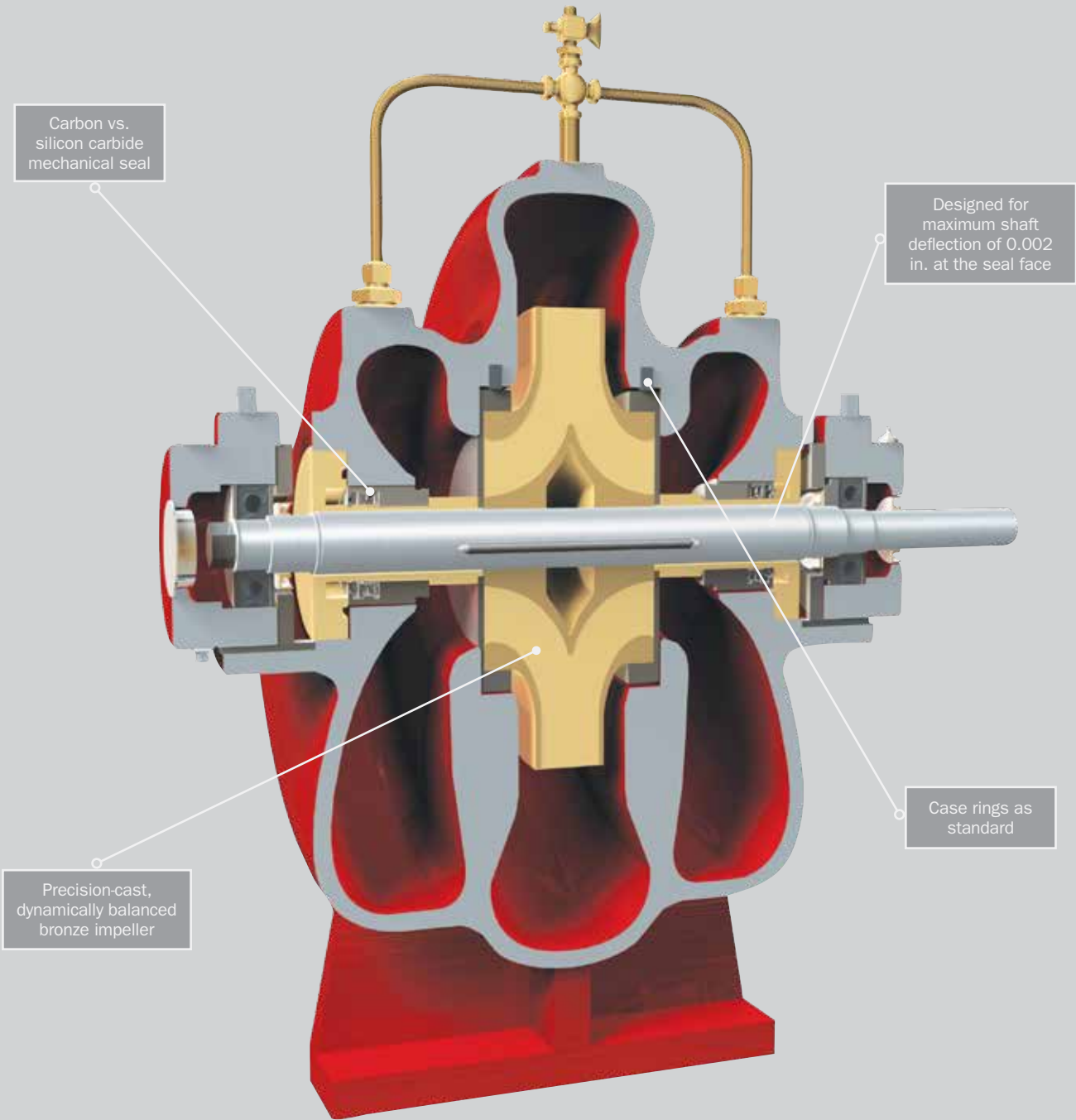


Lifecycle support...testing, training and service...

Our highly engineered pumps are thoroughly tested, including hydrostatic pressure-testing, in our fully equipped laboratory. This enables our engineers to verify design and performance specifications and ensures reliable service for you year after year.

Also, we are one of the few worldwide pump manufacturers who offer coordinated factory training in the proper operation and maintenance of our pumping products. And our teams of field and factory experts always stand ready to provide our customers with dedicated personal service, whether it's a complete pump rebuild, a single part or the answer to a simple question.





East Hartford High School—EnviroFlo Horizontal Split Case Pumps met critical construction schedule demands with easy, groutless base installation. Now they're providing high efficiency primary/secondary chilled water and condenser water movement for reliable student/teacher comfort.



Vertical In-Line HVAC Pumps

Supporting energy sustainability with efficient performance.

With a legacy of quality and durability, EnviroFlo Vertical In-Line Pumps offer reliability and full flexibility to overcome constraints and serve all types of HVAC applications. Both split-coupled and close-coupled configurations are available in a high-efficiency design that minimizes energy consumption and prolongs service life.

A precision-cast, dynamically balanced bronze impeller minimizes vibration while maximizing bearing life. A case wear ring, flush seal lines, grease-lubricated bearings and a variable speed rated coupling are standard.

EnviroFlo Vertical In-Line Pumps are designed for easy maintenance. A back pullout configuration provides easy access to interior areas without disturbing piping connections. The split coupling design is available in 5 hp or larger, and a double suction impeller is available on largest sizes (12 in. and 14 in.).

The bearing housing mounts directly to the pump volute to save space and provide proper alignment. An optional, heavy structural steel channel base is available for floor-mounted versions. While it does not require grouting, it is recommended. Flush seal lines are standard.

Flows to 10,000 gpm with heads to 400 ft tdh are offered. Case working pressure is 175 psi with 250 psi available on select models.



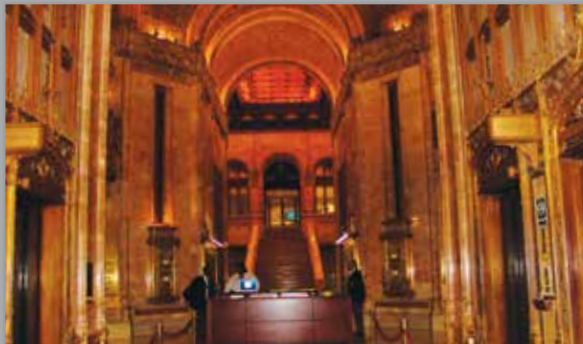
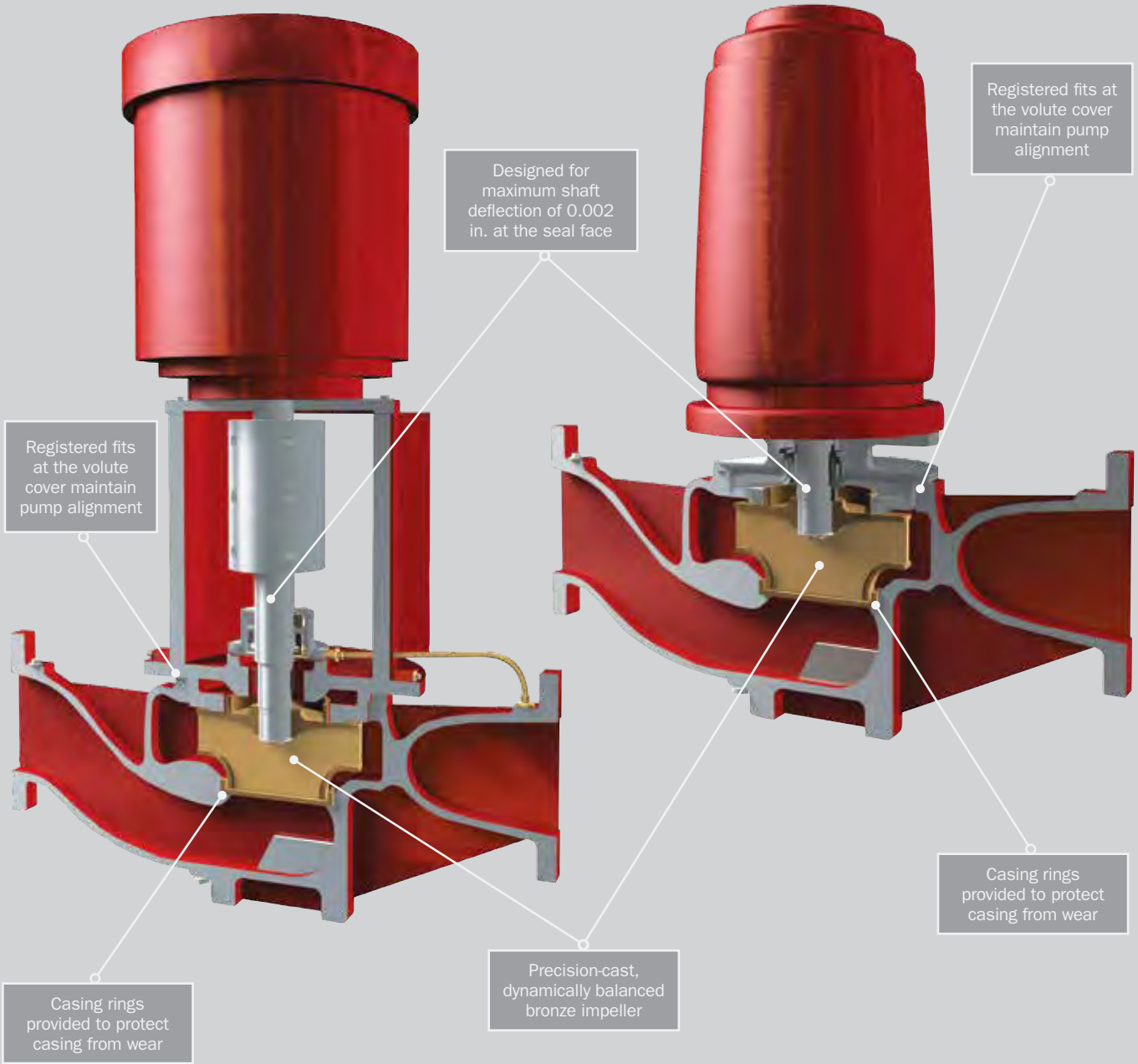
EnviroFlo Split-Coupled Vertical In-Line Configuration



EnviroFlo Close-Coupled Vertical In-Line Configuration

Split-Coupled Configuration

Close-Coupled Configuration



Woolworth Building—EnviroFlo Close-Coupled Vertical In-Line Pumps are providing world-class quality and reliability as they circulate condenser water to 18 units on three floors of this world-renowned structure in NYC.

FRACTIONAL HP

GENERAL PURPOSE

NEMA PREMIUM EFFICIENCY

CRUSHER® DUTY

IEC TRU-METRIC™

PUMP MOTORS

DEFINITE PURPOSE

ADD-ON™ MODIFICATIONS

MOTOR TECHNICAL DATA

DRIVES & SOFT STARTERS

CONTROLS



ODP – THREE PHASE – FOOT MOUNT

WEG Premium Efficiency motors meet or exceed all NEMA Premium and CEE requirements for energy efficiency. These Open Drip Proof (ODP) motors are designed for environments where dirt and moisture are minimal. Design B torque and high efficiency design from 143T through 444/5T frames. These motors are specifically designed to provide maximum ventilation and heat dissipation. 'C' and 'D' flange available.



APPLICATIONS

- Pumps
- Fans
- Kneader and mixer machines
- Cutter and sawing machines
- Pressing machines
- Industrial equipment
- Conveyors
- Blowers
- Compressors
- Machinery
- Cranes
- Packaging equipment

STANDARD FEATURES

- Three-phase, II and IV pole, 60Hz
- Voltage: 208-230/460V, 200V, 460V or 575V
- Open Drip Proof (ODP)
- NEMA dimensions
- NEMA Design 'B'
- Service factor: 1.15
- Continuous Duty (S1)
- 104°F (40°C) ambient temperature
- Ball bearings are supplied as standard
- 1045 Carbon Steel Shaft for frames up to 365T
- 4140 steel shaft for motors 404T and above (3600 RPM motors supplied with 1045)
- Class 'F' insulation for all frames
- Class 'H' impregnation resin
- F1 mount (also available flanged motors)
- Paint: Synthetic enamel alkyd resin base
- Color: RAL 6002 – Green
- Stainless steel nameplate – laser etched
- MGI Part 31 rating for use with VFD - 4:1 constant torque speed range.
- 50/60Hz rated up to 250 HP (50Hz at 1.0 Service Factor)
- For 50Hz at 1.15 SF a higher HP should be selected

OPTIONAL FEATURES

- Cable glands
- Special voltages
- Cast iron NEMA 'C' flange available for all frames or 'D' flange ('D' flange only for frames 254T and up)
- Specially designed shaft
- Second shaft end
- Thermistors, Thermostats or RTD's (PT100)
- Roller Bearings

FRAME – SPECIFIC FEATURES

FOR FRAME 143T/5T ONLY

- Welded steel plate frames (welded feet)
- Cast iron endshields with through bolt construction
- 'ZZ' bearings (double shielded)
- Degree of protection: IP21

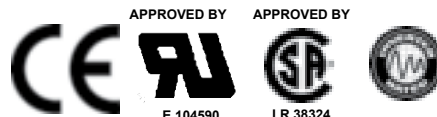
FOR 182/4T AND 213/5T FRAMES ONLY

- Aluminum endshields and terminal box
- Cooling system with finned rotor
- ZZ Bearings (double shielded)
- Degree of protection : IP21

FOR FRAMES 254/6T UP TO 444/5T

- Cast iron frames
- Cast iron endshields and terminal box
- Cooling system with finned rotor
- Steel shaft 4140 for 404T & up

- Regreasable bearings positive pressure lubrication system (frame 254T and up)
- Degree of protection: IP23



PUMP CURVES



Company:
Name:
Date: 5/22/2015

Pump:

Model: V8A13A-RC
Type: VIL
Synch speed: 1800 rpm
Size: 8x8x13.5
Specific Speeds:
Dimensions:
Speed: 1785 rpm
Dia: 11.625 in
Impeller: D05-89866
Ns: 1809
Nss: 10821
Suction: 8 in
Discharge: 8 in

Search Criteria:

Flow: 1600 US gpm Head: 101 ft

Fluid:

Water
SG: 1
Viscosity: 1.105 cP
NPSHa: ---
Temperature: 60 °F
Vapor pressure: 0.2563 psi a
Atm pressure: 14.7 psi a

Motor:

Standard: NEMA
Enclosure: ODP
Sizing criteria: Max Power on Design Curve
Size: 50 hp
Speed: 1800
Frame: See Chart

Pump Limits:

Temperature: ---
Pressure: ---
Sphere size: ---
Power: ---
Eye area: ---

---- Data Point ----

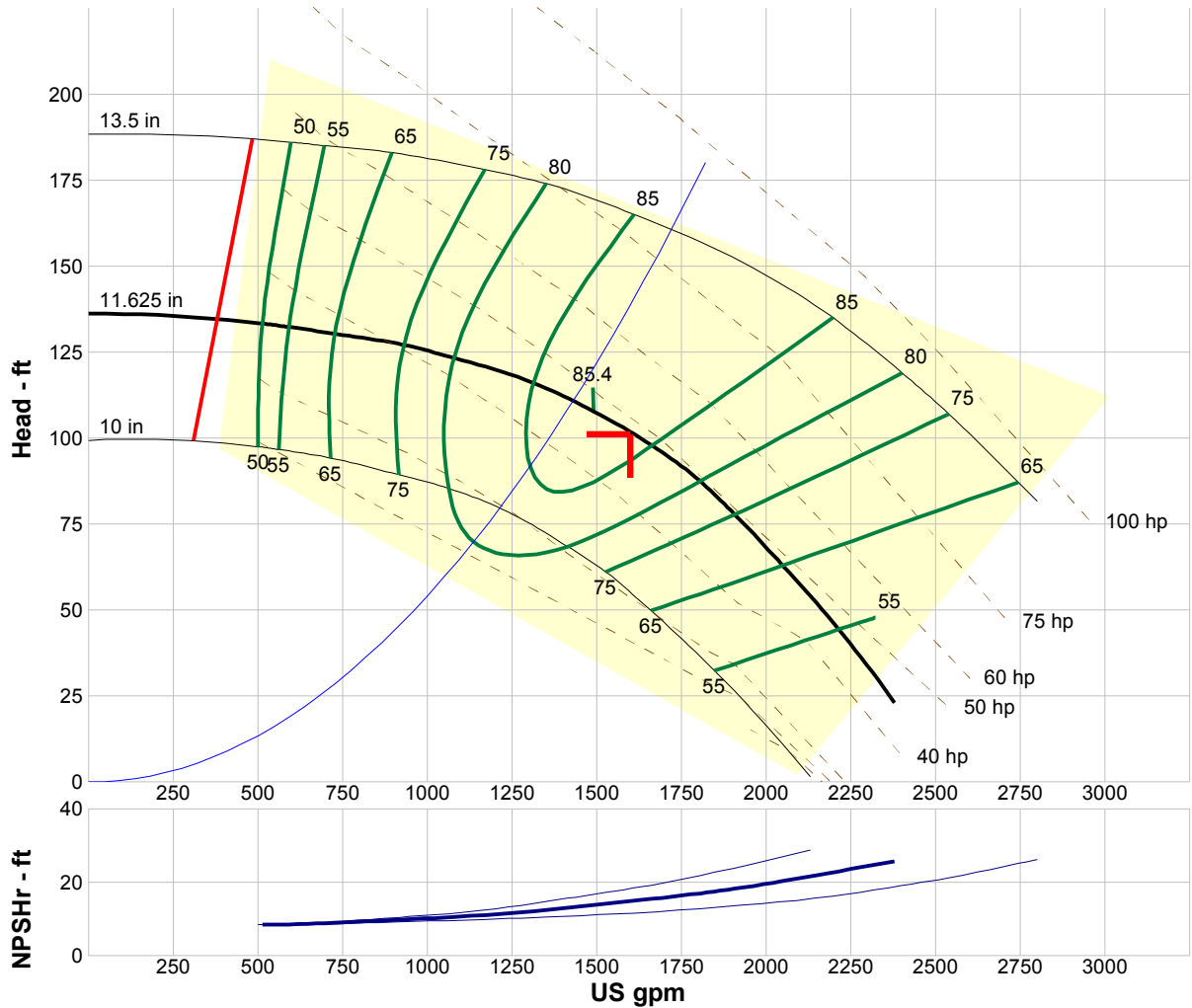
Flow: 1600 US gpm
Head: 101 ft
Eff: 85.2%
Power: 48 hp
NPSHr: 14.9 ft

---- Design Curve ----

Shutoff head: 136 ft
Shutoff dP: 59 psi
Min flow: 373 US gpm
BEP: 85.4% @ 1491 US gpm
NOL power:
50.1 hp @ 2048 US gpm

-- Max Curve --

Max power:
93.2 hp @ 2800 US gpm

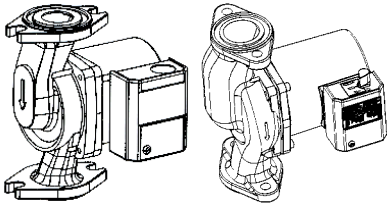


Refer to Working Pressure vs. Temperature chart for maximum rated working pressure. All data are subject to change. Consult factory for certified data.

Performance Evaluation:

Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
1920	1785	76.3	74	49.9	18.5
1600	1785	101	85.2	48	14.9
1280	1785	117	84.3	44.8	12
960	1785	126	76	40.2	10.1
640	1785	132	58.6	36.2	8.74

JOB:	REPRESENTATIVE:	
UNIT TAG:	ORDER NO.	DATE:
ENGINEER:	SUBMITTED BY:	DATE:
CONTRACTOR:	APPROVED BY:	DATE:



NRF - System Lubricated Iron Body Circulators

DESCRIPTION

A flanged in-line system lubricated circulating pump designed specifically for quiet operation in a closed hydronic heating system.

CONSTRUCTION MATERIALS

Pump Body: Cast Iron
Impeller: Noryl
Shaft: Ceramic
Bearings: Carbon

OPERATING DATA

Maximum Working Pressure: 150 psi (10.3Bar)
Minimum Operating Temperature: 40°F (5°C)
Maximum Operating Temperature
NRF-22 & NRF-9F/LW: 240°F (115°C)
NRF-25, NRF-33, NRF-36 & NRF-45: 225°F (107°C)

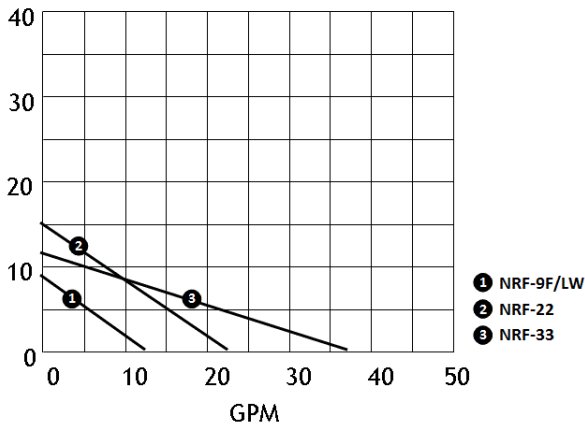
SCHEDULE

MODEL NUMBER	PART NUMBER	STANDARD 60 CYCLE SINGLE PHASE MOTOR CHARACTERISTICS				TAGGING INFORMATION	QUANTITY
		WATTS	VOLTAGE	F.L. AMPS	RPM		
NRF-9F/LW	103267	41	115	.40	2800		
NRF-22	103251	92	115	.80	2940		
NRF-25*	103417	125	115	1.1	2950		
NRF-33	103350	125	115	1.1	2950		
NRF-36*	103400	270	115	2.1	3300		
NRF-45*	103404	270	115	2.1	3300		

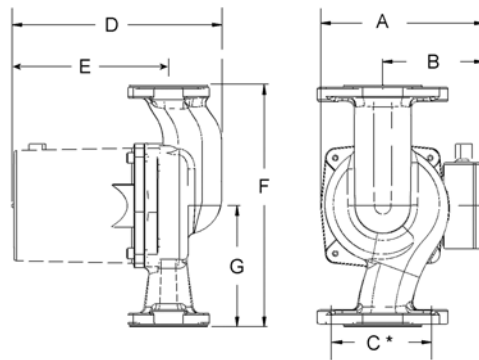
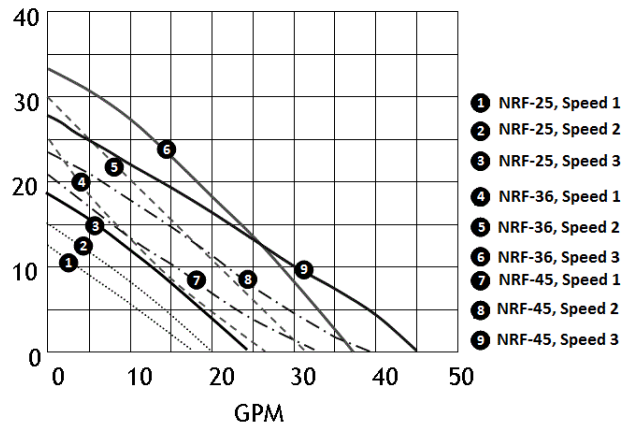
*Three-speed pump

PUMP PERFORMANCE CURVE

(FT) SINGLE SPEED PUMPS



(FT) 3 - SPEED PUMPS



* C is center-to-center dimension of bolt holes. Flange orientation varies.

TYPICAL SPECIFICATIONS

- The contractor shall furnish and install in-line circulating pumps as illustrated on the plans and in accordance with the following specifications:
1. The pumps shall be of the horizontal, system lubricated type specifically designed and guaranteed for quiet operation.
 2. Pumps to be suitable for _____°F (_____°C) [Select one: 240°F (115°C) for NRF-22 and NRF-9F/LW; 225°F (107°C) for NRF-25, NRF-33, NRF-36 and NRF-45] operation at 150 psig (10.3 Bar) working pressure.
 3. The pumps shall have a ceramic shaft supported by carbon bearings. Bearings are to be lubricated by the circulating fluid.
 4. Motor stator to be isolated from circulating fluid through use of stainless steel can. Rotor to be sheathed in stainless steel.
 5. Motors shall be non-overloading at any point on the pump curve. (Select one: NRF-9F/LW, NRF-22, NRF-25, NRF-33) motors to have built-in impedance protection. (Select one: NRF-36, NRF-45) motors to have built-in thermal protection.
 6. [Select one: NRF-25, NRF-36 or NRF-45] is available with 3-speed, thermally protected motor covering a wide range of hydraulic capabilities.
 7. The pump manufacturer shall be ISO-9001 certified.

Pumps to have a capacity of _____ GPM at _____ foot head when powered by 115 volt, 60 cycle, single phase electrical supply. All pumps are to be Bell and Gossett Model NRF-_____.

MODEL	PART NUMBER	A in (mm)	B in (mm)	C in (mm)	D in (mm)	E in (mm)	F in (mm)	G in (mm)	Weight (lb)
NRF-9F/LW	103267	5-1/8 (130)	3-3/16 (81)	3-3/16 (81)	6-3/16 (157)	4-5/16 (110)	6-3/8 (162)	3-3/16 (81)	9.3
NRF-22	103251	5-1/8 (130)	3-3/16 (81)	3-3/16 (81)	6-3/16 (157)	4-5/16 (110)	6-3/8 (162)	3-3/16 (81)	9.3
NRF-25*	103417	5-1/8 (130)	3-3/16 (81)	3-3/16 (81)	6-3/16 (157)	4-7/8 (124)	6-3/8 (162)	3-7/8 (98)	10.4
NRF-33	103350	5-1/8 (130)	3-3/16 (81)	3-3/16 (81)	6-3/16 (157)	3-11/16 (94)	6-3/8 (162)	3-3/16 (81)	10.4
NRF-36	103400	5-3/4 (146)	3-9/16 (91)	3-3/16 (81)	6-7/8 (175)	5-3/8 (137)	6-3/8 (162)	3-3/16 (81)	13.1
NRF-45*	103404	5-3/4 (146)	3-9/16 (91)	3-7/16 (87)	7-3/8 (187)	5-1/2 (140)	8-1/2 (216)	4-1/4 (108)	14.5

Dimensions are subject to change. Not to be used for construction purposes unless certified.

Companion Flanges Available in Sizes: 3/4", 1", 1-1/4" and 1-1/2"

Xylem Inc.
 8200 N. Austin Avenue
 Morton Grove, IL 60053
 Phone: (847)966-3700
 Fax: (847)965-8379
 www.bellgossett.com



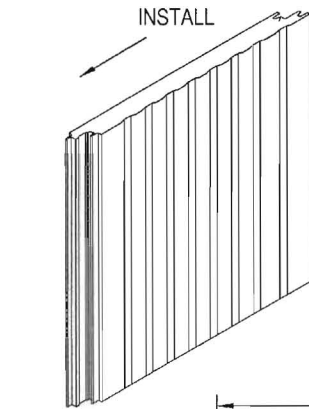
EQUIPMENT ENCLOSURE

Sonoma Series

Profile

SN-V0.1

UNA-FOAM WALL PANEL SYSTEM



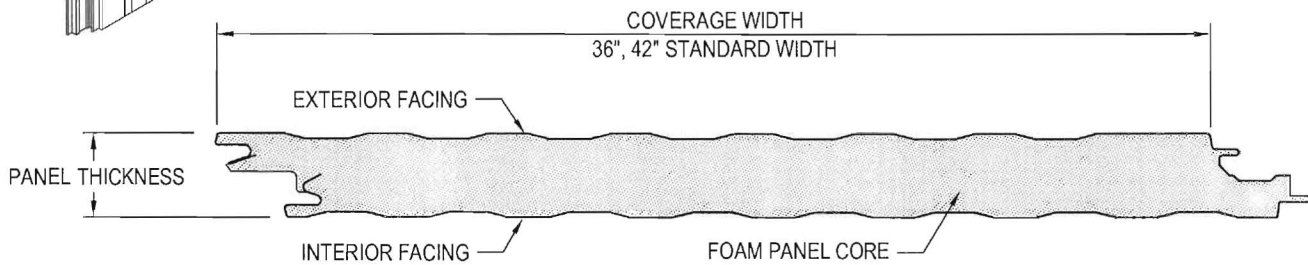
ITEM NUMBER: SONOMA PANEL

MODULE WIDTH: 36" & 42"

PANEL LENGTHS: STANDARD 8'-0" to 53'-0"

PANEL THICKNESS: 2", 2-1/2", 3", 4", 5" & 6"

(2-3/4" THICKNESS ALSO AVAILABLE FOR LIGHT SONOMA)



EXTERIOR PROFILE: SONOMA NOMINAL 1/8" DEEP AND LIGHT SONOMA NOMINAL 1/16" DEEP WITH FLUSH SIDE JOINTS FOR HIGH PROFILE PROJECTS.

INTERIOR PROFILE: SONOMA NOMINAL 1/8" DEEP LIGHT SONOMA NOMINAL 1/16" DEEP

PANEL CORE: FOAMED-IN-PLACE, NON-CFC & ZERO ODP POLYURETHANE, FACTORY MUTUAL CLASS I APPROVAL

THERMAL VALUES: K-FACTOR Btu in/ft² hr. °F @ 75°F (24°C)
MEAN CORE TEMPERATURE = 0.140. K-FACTOR, Btu in/ft² hr. °F @ 40°F (4°C) MEAN CORE TEMPERATURE = 0.126.

FINISHES & COLORS: A FULL RANGE OF EXTERIOR COLORS & COATINGS ARE AVAILABLE FOR THE ARCHITECTURAL MARKET. FOR SPECIFIC INFORMATION ABOUT AVAILABLE COLORS AND COATINGS, VISIT THE ONLINE COMPREHENSIVE SELECTION.

EXTERIOR FACING: STUCCO EMBOSSED, G-90 GALVANIZED AND OR AZ-50 ALUMINUM-ZINC COATED STEEL IN 22 GA.

INTERIOR FACING: STUCCO EMBOSSED, G-90 GALVANIZED AND OR AZ-50 ALUMINUM-ZINC COATED STEEL IN 26 GA., 24 GA. AND 22 GA.

PANEL JOINT: OFFSET DOUBLE TONGUE AND GROOVE WITH EXTENDED METAL SHELF FOR POSITIVE FACE FASTENING. REVEAL JOINT POSSIBLE.

FASTENING: FASTENER AND CLIP CONCEALED IN THE SIDE JOINT.

NOTES:

- HEAVIER GAUGES MINIMIZE "OIL CANNING"
- OIL CANNING IS NOT A CAUSE FOR REJECTION.
- AN EXTENSIVE SELECTION OF ASSOCIATED PANEL FLASHING AND TRIMS ARE AVAILABLE.
- CONTACT FSMP FOR UP TO DATE TECHNICAL INFORMATION AND MATERIAL LIMITATIONS.
- ALL SYSTEMS WITH TESTING MUST BE INSTALLED IN ACCORDANCE WITH THE ASSEMBLY AS TESTED.

V0.1

INSULATED METAL PANEL SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The drawings and provisions of the General Conditions, Supplementary Conditions and the sections included under Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Pre-insulated architectural metal panel cladding where indicated on the drawings. Also included are all necessary trims, fasteners, sealants and gaskets as required for a weathertight installation. Panels shall be secured to the structure with concealed clips and fasteners in the side joints.
 - 1. Steel faced factory foamed-in-place flat panels with integral reveals with compatible joinery. Panels shall be designed to permit installation in either vertical or horizontal orientations.
 - 2. Extruded aluminum trim related to the walls and its intersection with adjacent materials.
 - 3. Sealants and gaskets between panels and their intersection.

1.3 RELATED SECTIONS

- A. Section 07 62 00 – Sheet Metal Flashing and Trim
- B. Section 07 92 00 – Joint Sealants

1.4 REFERENCES

- A. AAMA 501.1 – Standard Test Method for Exterior Windows, Curtain Walls and Doors for Water Penetration Using Dynamic Pressure.
- B. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- C. ASTM A 792 – Standard Specification for Steel Sheet, Aluminum-Zinc Alloy Coated Steel by the Hot-Dip Process.
- D. ASTM C 518 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- E. ASTM E 72 – Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- F. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. ASTM E 283 – Standard Method for Determining the Rate of Air Leakage Through Exterior Window, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

- H. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Wall by Uniform Static Air Pressure Difference.
- I. CAN/ULC S102 – Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.5 PERFORMANCE REQUIREMENTS

- A. Structural Tests: The design load/deflection criteria shall be verified from tests per ASTM E 72 "Air Bag Method" using a 20 psf (.96 kPa) simulated wind load. A deflection limit of L/180 shall apply to wall panel.
- B. Thermal Transmission: Testing in accordance with ASTM C 518, "measurement of steady state thermal transmission", the panels shall provide a K-factor of .140 btu/sf/hr/deg. F at 75° F (24° C) mean temperature (air films are not included).
- C. Vapor Barrier
 - 1. Air Infiltration: Air infiltration shall not exceed .06 cfm per square foot of wall area when tested per ASTM E 283 at a static pressure of 12.0 psf (.576 kPa).
 - 2. Static Water Penetration: There shall be no uncontrolled water penetration through the panel joints at a static pressure of 20.0 psf (.96 kPa) when tested per ASTM E 331.
 - 3. Dynamic Water Penetration: There shall be no uncontrolled water penetration through the panel joints when subjected to a 95 mph (153 kph) slipstream airflow and application of water for a 15 minute period in accordance with AAMA 501.1.
- D. Fire
 - 1. Surface Burning Characteristics: The insulated core shall have been tested in accordance with ASTM E 84 and CAN/ULC S102 for surface burning characteristics. The core shall have a maximum flame spread of 25 and a maximum smoke developed rating of 450.
 - 2. Factory Mutual Research Corporation (FMRC) Standard 4880, 50' (15.24 m) High Corner Test for Unlimited Height Structures: The panel assembly shall not support a self-propagating fire which reaches any of the limits of the 50'(15.24 m) high corner test structure as evidenced by flaming or material damage of the ceiling of the assembly. Note: Approval is applicable to structures of unlimited height.
 - 3. Factory Mutual Research Corporation (FMRC) Standard 4881, Standard for Class 1 Exterior Wall Systems.
 - a. Note: Panels to be installed per Factory Mutual guidelines for required listings.
- E. Bond Strength
 - 1. Fatigue Test: The panel shall withstand deflection cycling at L/180 to two (2) million alternate cycles with no evidence of delamination, core cracking or permanent bowing.

2. Freeze/Heat Cycling: The panel shall exhibit no delamination, surface blistering or permanent bowing when subjected to cyclic temperature extremes of -20°F (-28°C) to $+180^{\circ}\text{F}$ ($+82^{\circ}\text{C}$) for twenty-one (21) eight hour cycles.
 3. Humidity Test: The panel shall exhibit no delamination or metal corrosion at interface when subjected to a $+140^{\circ}\text{F}$ ($+60^{\circ}\text{C}$) temperature and 100% relative humidity for a total of 1200 hours.
 4. Autoclave Test: The panel shall exhibit no delamination of the foam core from metal skins when exposed to 2 psi (.122 kg/sq. cm) pressure at a temperature of $+212^{\circ}\text{F}$ ($+100^{\circ}\text{C}$) for a total of 2½ hours.
- F. State of Florida Building Code Product Approved Panel System.
- G. System shall be Large Missile Impact tested and approved by Miami-Dade per the following tests: TAS 201-94, 202-94, 203-94.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Material type, metal thickness and finish.
 4. Installation methods.
- C. Shop Drawings: Including elevations, fastening patterns, sections of each condition and details as required.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Panel Sample: Submit 1' (305 mm) high by full width sample panel for each profile specified indicating the metal, texture and finish.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing factory fabricated metal panels with a minimum documented experience of ten (10) years.
- B. Installer Qualifications: Company specializing in installation of the products specified for projects of similar size and scope with minimum five (5) years documented experience.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the project is located and who is experienced in providing engineering services of kind indicated.

1.8 SUBSTITUTIONS

- A. Materials, accessories and testing specified shall establish the minimum level of quality, performance, dimension and appearance required of any substitution.
- B. No substitution will be considered unless a written request to the specifying architect is received for approval at least ten (10) days prior to the established bid date. Evidence shall be submitted to demonstrate equivalency to the products and performance levels specified. Laminated panels shall not be considered acceptable substitutes for the specified foamed-in-place panels.
 - 1. A complete description of the substitution including details referenced to the wall panel shown on the contract drawings.
 - 2. Independent test reports verifying compliance with specified performance requirements.
 - 3. A detailed listing of each specification item with which the substitution does not fully comply.
- C. The manufacturer or wall panel contractor proposing the substitution shall pay the costs of any other subcontractor affected by the proposed substitution.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products off the ground, with panels sloped for drainage and covered to protect factory finishes from damage.

1.10 WARRANTY

- A. Project warranty refers to Conditions of the Contract for project warranty provisions. Manufacturer's warranty: submit, for Owner's acceptance, manufacturer's standard warranty documents executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights owner may have under Contract Documents.
- B. The Contractor shall warrant the materials to be free of faults and defects in accordance with the General Conditions, except that the warranty shall be extended by paint manufacturer's standard multi-year warranty. The warranty shall be in writing and shall be signed by the manufacturer.
- C. Materials Manufacturers: Repair or replace defective materials for a period of two (2) years.
- D. Panel System Manufacturer: Repair or replace fabricated products which fail due to faulty workmanship for a period of five (5) years.
- E. Panel System Installer: Repair or replace products or components which fail due to faulty workmanship for a period of two (2) years.

- F. Painted Finish: Coatings Manufacturer and applicator to warrant paint for a period of twenty (20) years after the Effective Date, the factory applied finish applied by the applicator.
- a) WILL NOT chip, crack or peel (lose adhesion) but does not include minute fracturing which may occur in proper fabrication of building parts.
 - b) WILL NOT chalk in excess of ASTM D-4214-89 number eight (8) rating, determined by the procedure outlined in ASTM D-4214-89 specification test.
 - c) WILL NOT change color more than five (5) Delta-E Hunter units (square root of the sum of square Delta L, Delta a, and Delta b) as determined by ASTM method D-2244. It is acknowledged that fading or color changes may not be uniform if the surfaces are not equally exposed to the sun and elements.
 - d) No warranty is offered for the interior painted surface of the panel.

1.11 SPECIAL WEATHER RESISTANT WARRANTY

- A. The owner shall receive a single source warranty from the wall panel system fabricator including all of the following criteria. Multiple warranties to owner are not acceptable.
- a. Warranty coverage: No Dollar Limit (NDL) weather resistant warranty for a term 10-years covering panel system material and labor.
 - b. Warranty coverage to include the following: all system panels, underlayment, sealants and other system components and accessories manufactured or used in the manufacturing process and installed by warranty applicator. The warranty covers leak repair, materials, labor and workmanship.
 - c. All warranted materials must be installed in accordance with metal wall panel manufacturer's shop drawings and published installation guides.
 - d. All materials must be installed by a qualified, approved and trained contractor or manufacturer's representative.
 - e. Throughout construction, wall system is subject to periodic inspection by an approved contractor or manufacturer's representative.
 - f. Warranty shall commence on the date of Substantial Completion of panel work.
- B. Warranty site inspection meetings: Conduct on-site inspections throughout the installation of wall panels and accessories to verify accuracy of product installation and compliance to manufacturer's written installation instructions. Site inspections to include verification of all system panels, underlayment, sealants and other system components and accessories as manufactured or approved by manufacturer and installed by warranty applicator.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer: Architectural metal insulated wall panels to be assigned per architectural drawings and specifications in color, finish and length described in accompanied documents. Raw material substitutions shall be approved in writing.
- B. Alternate systems by other manufacturers/fabricators are to be submitted to the architect not less than 7 working days prior bid.

2.2 PANEL DESIGN

- A. Panel – General Requirements: Flat Insulated stucco embossed Architectural Metal Wall Panel - Roll-formed exterior and interior steel sheet faces chemically bonded to continuously foamed-in-place polyurethane core; laminated panels are not acceptable.
 1. Exterior Face: G-90 galvanized stucco embossed painted steel, minimum Grade 33 and/or AZ-50 Aluminum-Zinc stucco embossed painted steel, minimum Grade 33 in 22ga (0.0312").
 2. Interior Face: G-90 galvanized unembossed painted steel, minimum Grade 33 and/or AZ-50 Aluminum-Zinc unembossed painted steel, minimum Grade 33 in 26ga (0.0187"), 24ga (0.0250") & 22ga (0.0312") unless otherwise indicated.
 3. Longitudinal Joint Sealants: Field applied.
 4. Foam Core: Non-CFC, Class I, polyurethane.
 5. Exterior Finish: Exterior face sheet shall be treated with a nominal 0.2 mil (5 microns) base primer, followed by a nominal 0.7 mil (17.5 microns) finish coat of full strength PVF2 fluoropolymer in manufacturer's standard colors.
Note: Thick mil coatings for aggressive environments are available at extra cost. Siliconized Polyester is also available. Consult the factory for complete information.
 6. Interior Finish: The interior face sheet shall be a nominal 0.2 mil (5 microns) primer followed by a nominal 0.7 mil (17.5 microns) polyester coating in USDA compliant Blizzard White.
- B. Flat Architectural Metal Wall Panel: Concealed fastener wall panels with offset double tongue and groove joinery and an extended metal shelf allowing fasteners to penetrate both metal faces with clips concealed in the side joint.
 1. Exterior Face Profile: Flat, stucco embossed.
 2. Interior Face Profile: Light Sonora Pattern, 1/16" deep
 3. Module Width: 24", 30" or 36" in horizontal or vertical application.
 4. Thickness: 2", 2.5", 3" or 4".

5. Joint Reveal Options: ¼", ½", ¾", 1", 1½", 2", 2½", or 3" horizontal joint reveal.
6. Trimless ends provided at panel ends if required.
- C. Foam core shall be continuously foamed-in-place, Non-CFC polyurethane.
- D. Flashing and trim shall be brake-formed sheet metal in the same thickness and finish to match the panels.
- E. Manufacturer's standard extruded aluminum trim painted to match the panel is available.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Panel installer shall examine all structural steel before beginning installation to ensure that all supporting members are straight, level, plumb, properly braced and satisfactory for panel installation.
- B. Do not begin installation until unsatisfactory conditions are corrected.
- C. Start of installation shall signify structure and adjacent conditions as being proper and acceptable.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations including approved shop drawings, installation guidebook and manufacturer's handbook of construction details.
- B. Install panel as indicated on drawings, accurate in size, square, and free from distortion or defects.
- C. Install flashing and trim true and in proper alignment.
- D. Install sealants where indicated to clean dry surfaces only without skips or voids, to ensure weather tightness and integrity of the vapor barrier.

3.3 DAMAGED MATERIAL

- A. Damage caused by the manufacturer or wall panel contractor shall be replaced or repaired to as new construction.
- B. The panel installer shall inspect and approve each completed wall area and shall be responsible for protection of completed work from damage by other trades.

3.4 CLEANING

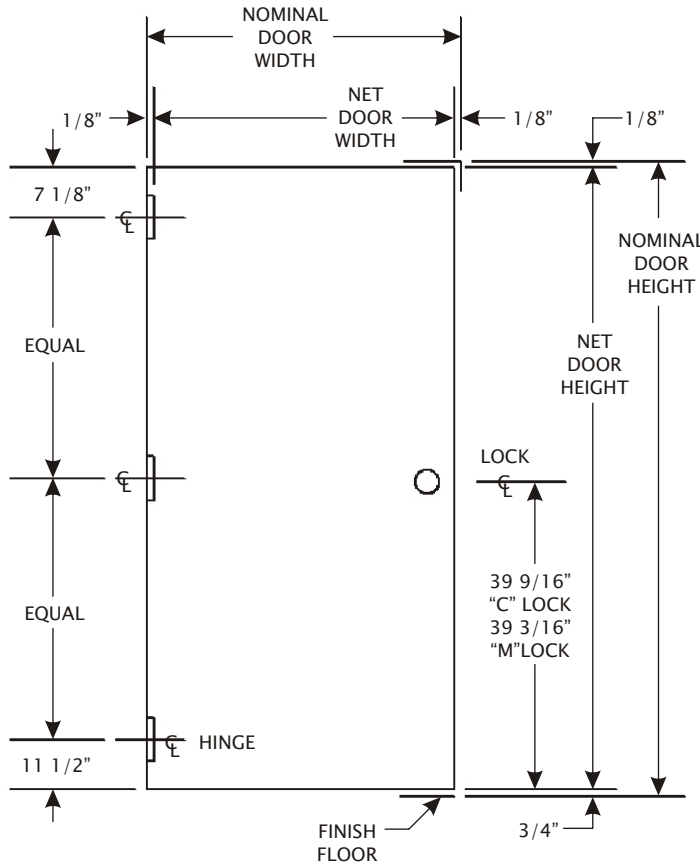
- A. Replace damaged panels and other components of work, which cannot be repaired by finish touch-up or similar minor repair.

- B. Wipe finished surfaces clean of any filings caused by drilling or cutting to prevent rust staining.

TECHNICAL DATA SHEET

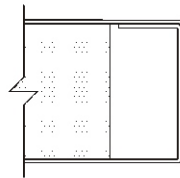
DS-103

14 GAUGE DOOR



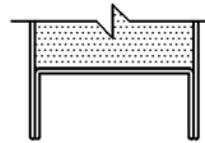
STANDARD DOOR WIDTHS	
NOMINAL DOOR WIDTHS	NET DOOR WIDTHS
2'-0"	23 3/4"
2'-4"	27 3/4"
2'-6"	29 3/4"
2'-8"	31 3/4"
3'-0"	35 3/4"
3'-4"	39 3/4"
3'-6"	41 3/4"
3'-8"	43 3/4"
3'-10"	45 3/4"
4'-0"	47 3/4"

STANDARD DOOR HEIGHTS	
NOMINAL DOOR HEIGHTS	NET DOOR HEIGHTS
6-8"	79 1/8"
7'-0"	83 1/8"
7'-2"	85 1/8"
7'-10"	93 1/8"
8'-0"	95 1/8"



SECTION A-A

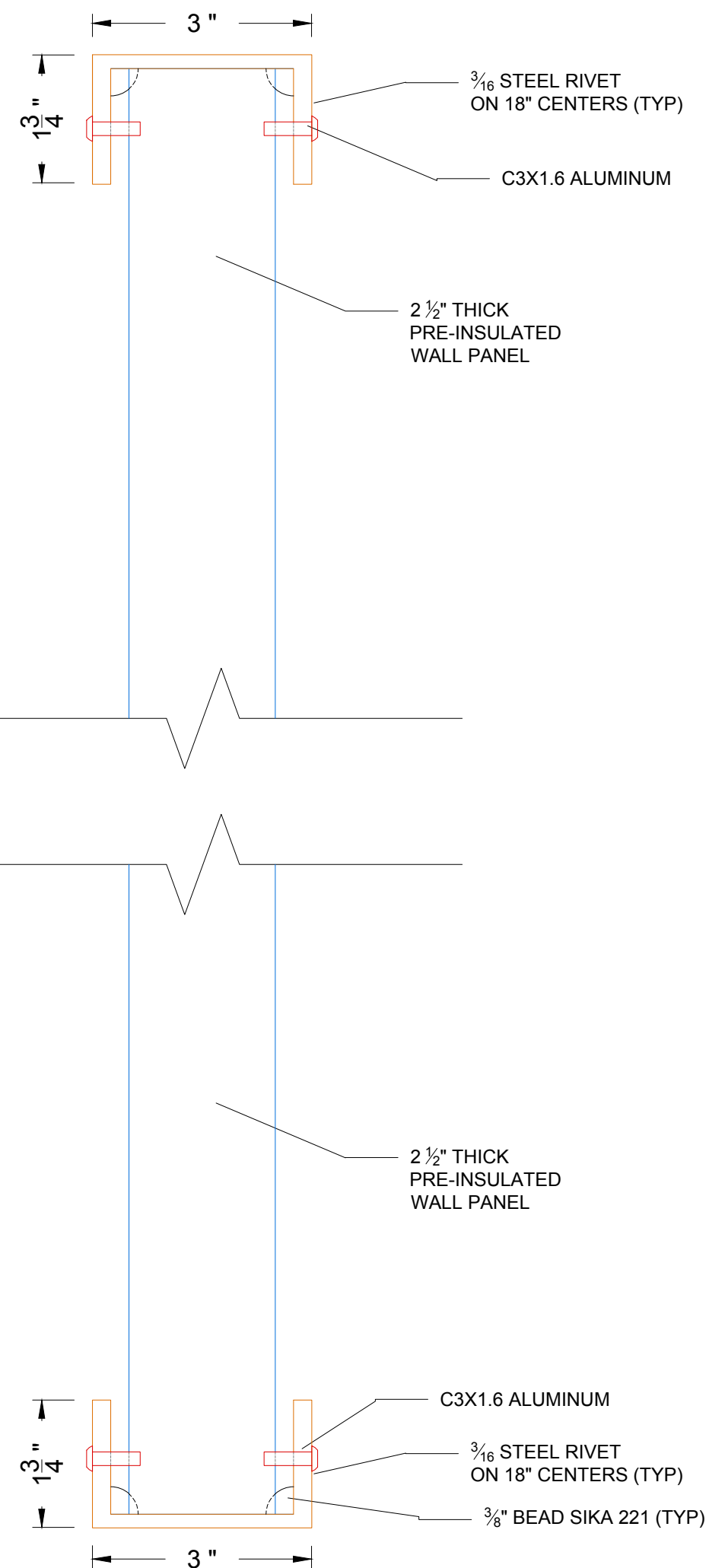
MECHANICALLY INTERLOCKED SQUARE EDGE



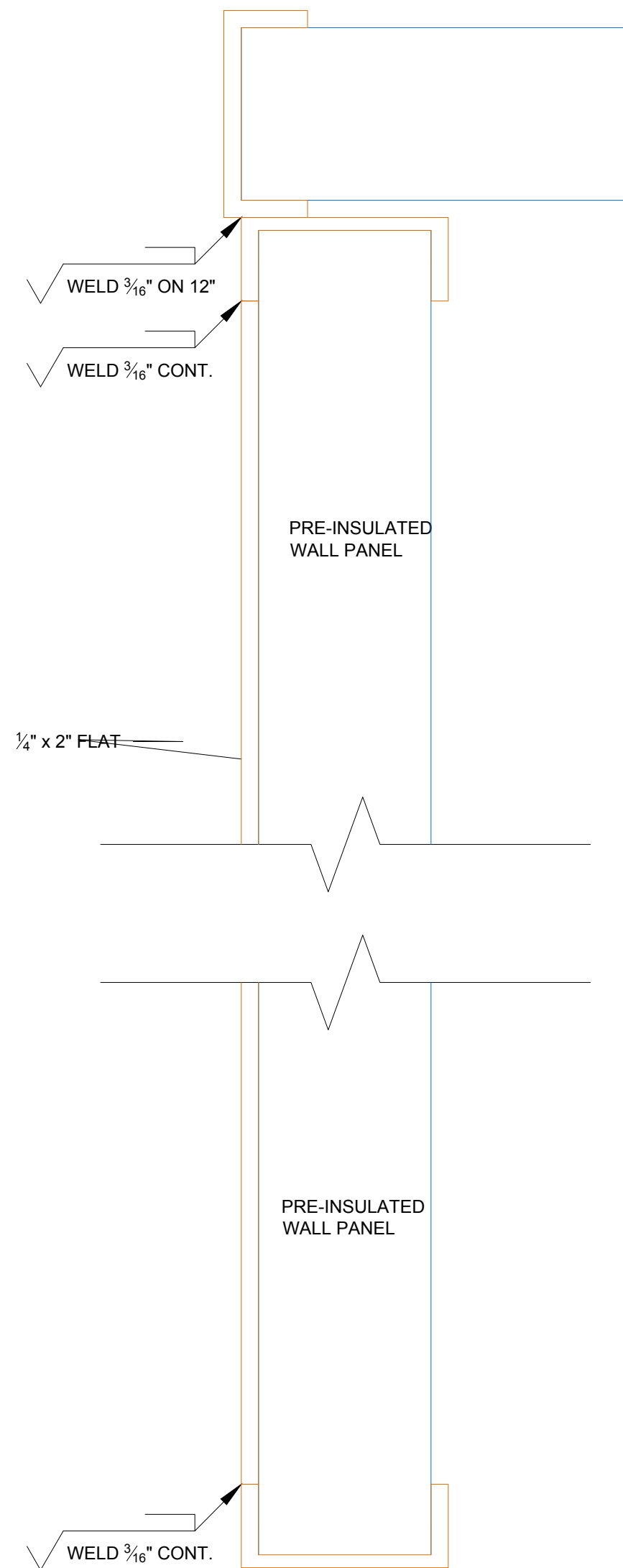
SECTION B-B

16 GAUGE TOP AND BOTTOM CHANNEL

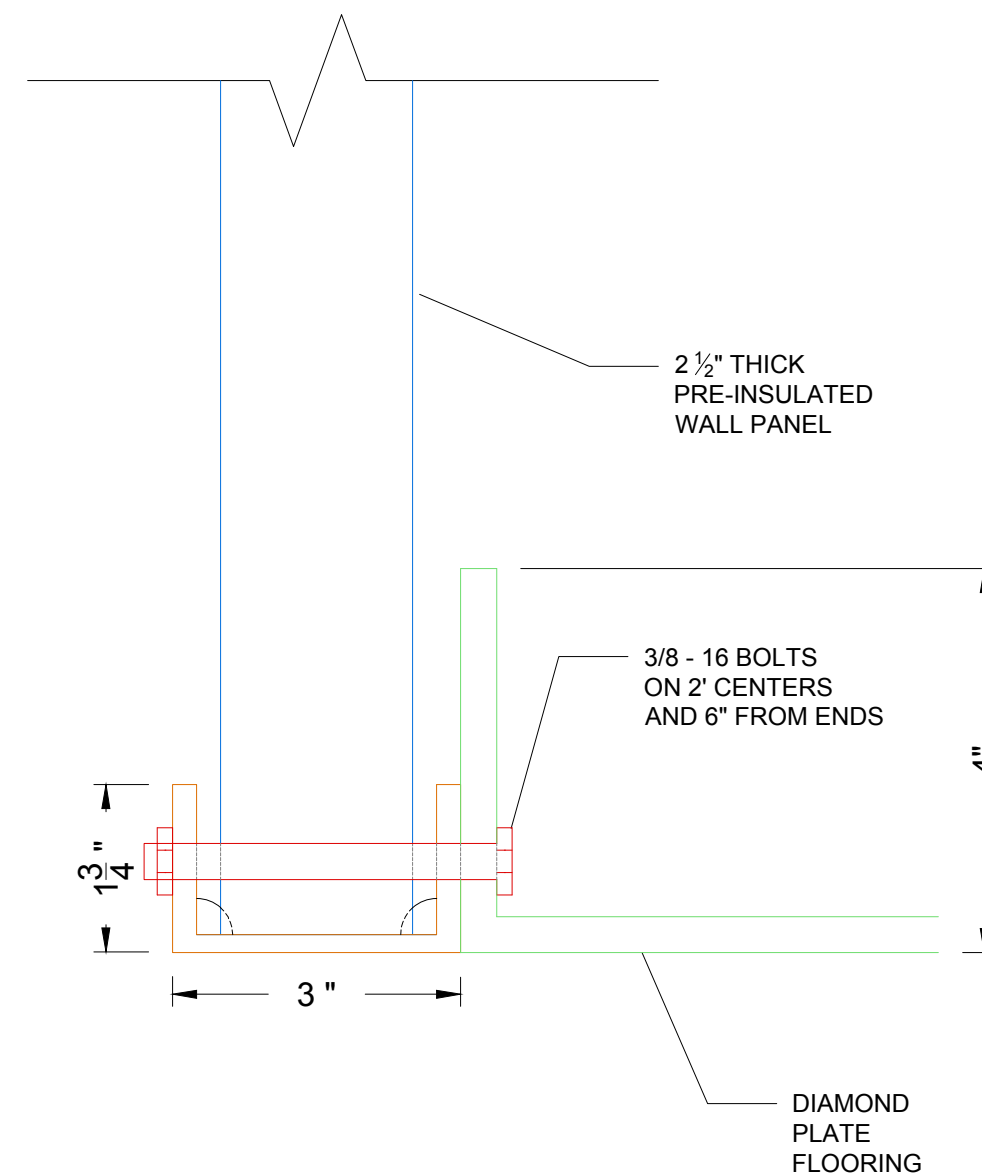




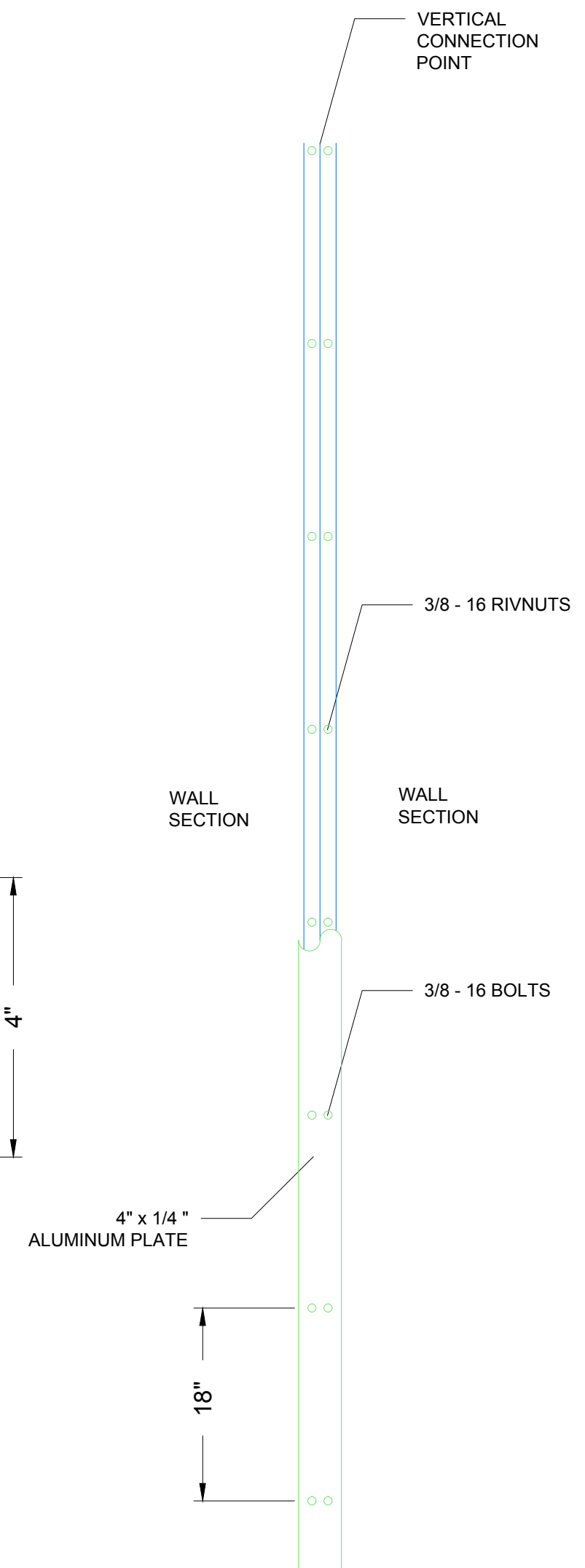
PANEL FRAMING DETAIL
NOT TO SCALE



ENCLOSURE ATTACHMENT DETAIL
NOT TO SCALE



FLOOR ATTACHMENT DETAIL
NOT TO SCALE



VERTICAL WALL CONNECTION DETAIL
NOT TO SCALE

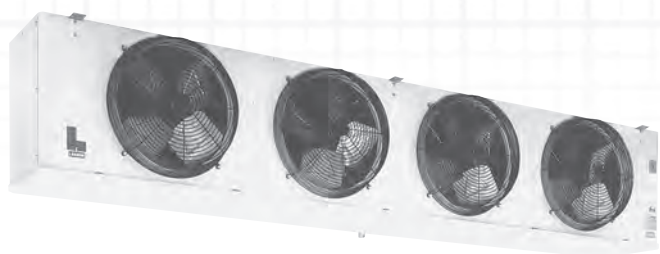
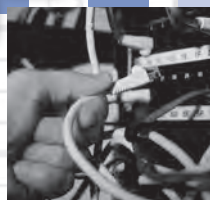
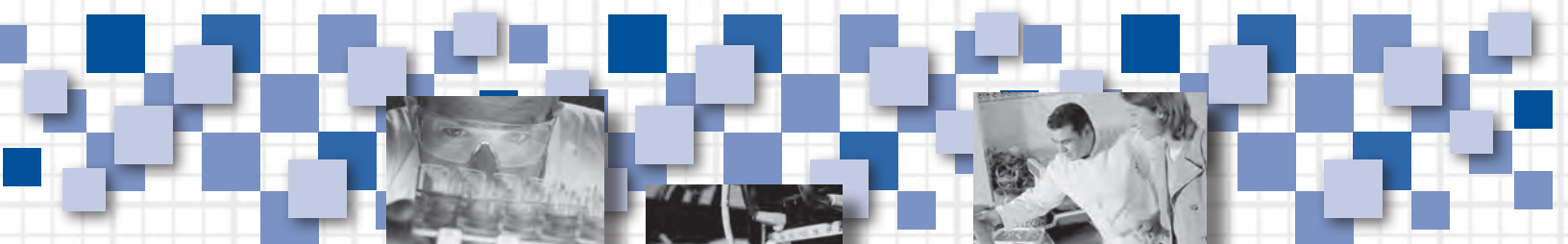
DATE	REV.	DESCRIPTION

SPACE FABRICATION
2880 CRESCENTVILLE ROAD
WEST CHESTER, OHIO 45069

SYSTECON ENCLOSURE

PROJ. MGR.	
DRAWN BY	
CHECKED BY	MP
DATE:	03/20/13
JOB No.	
TITLE	PANEL FRAMING DETAILS
REV No.	0
SHEET No.	PF-01

FAN COIL UNITS



Glycol Unit Coolers For Secondary Loop Systems

Technical Guide

Low Velocity Center Mount • Low Profile • Medium Profile • Center Mount



FEATURES & BENEFITS

The models featured here are specifically designed for use with propylene glycol mixtures, which are environmentally-friendly. They are UL-listed for the US and Canada and meet NSF standards.

LOW VELOCITY CENTER MOUNT	LOW PROFILE	MEDIUM PROFILE	CENTER MOUNT
CABINET			
Low air velocity helps to maintain high humidities and prevent product drying and weight loss; low sound makes a comfortable working environment	Minimal height of the low profile series makes it ideal for low ceiling coolers, allowing for maximum headroom and more product storage	Heavy-duty design is ideal for larger walk-in coolers and freezers	Compact center-ceiling mount design allows for shelving and storage of product around walls.
Painted aluminum cabinet for maximum durability	Painted aluminum cabinet design features front access panels on each side for easy access to electrical and refrigeration components	Painted aluminum cabinet for maximum durability	Textured aluminum cabinet for maximum durability
All electrical components factory wired to terminal board and identified, making it easy to field wire the unit.			
Internal panels are "isolated" which provides for quiet unit operation			
HEATERS AND COIL			
All warm-fluid defrost models have electric drain pan heaters			
Heater/fan control is factory set and wired			
Coils are dehydrated and sealed at the factory			
Sweat connections to reduce potential for leaks			
Vent and drain fittings for proper charging of system			
GUARDS AND MOTORS			
Wire fan guards with PVC coating are standard and provide added durability	Motor mount design is optimized to minimize vibration	Wire fan guards with PVC coating are standard and provide added durability (optional molded guards for ext. air throw)	Wire fan guards with PVC coating are standard and provide added durability
Motors plug into wiring harness for easier servicing			

LOW VELOCITY CENTER MOUNT	LOW PROFILE	MEDIUM PROFILE	CENTER MOUNT
DRAIN PAN			
Double drain pan prevents drain pan sweating	Optimized drain fitting position	Front hinged drain pan for easy access	Double drain pan prevents drain pan sweating
OPTIONS			
Energy-efficient PSC motors (115/1/60 or 208-230/1/60)	Energy-efficient PSC motors (115/1/60, 208-230/1/60) (TEAO motors are standard on 115V and special order on 230V and 460V)	PSC motors are standard (TEAO motors are special order on 230V and 460V)	Energy-efficient PSC motors (115/1/60 or 208-230/1/60)
Optional Energy-efficient EC Motors (115/1/60 or 208-230/1/60)			
575 volt units are not available	575 volt units are not available	575 volt units are available	575 volt units are not available
Available in stainless steel cabinets and/or drain pan			
Copper fin or oil coatings			
Shipped loose shut-off and balance valves			

NOMENCLATURE

NOMENCLATURE				
<p>Model Series:</p> <p>LCA6 = Low Profile Air Defrost LCH6 = Low Profile Warm Fluid Defrost LCE6 = Low Profile Electric Defrost MMT = Medium Profile Air Defrost LWA = Low Velocity Air Defrost LWG = Low Velocity Warm Fluid Defrost LTE = Low Velocity Electric Defrost ACM = Center Mount Air Defrost</p> <p style="text-align: right;">Glycol</p>	LCA6	G	0400	B
			B	B
			Electrical Code: A = 115/1/60 B = 208-230/1/60 M = 460/1/60 L = 575/1/60*	Design Revision (Varies depending on model series)
			BTUH/ITD	

NOTE:

ITD = Room air temperature - Entering fluid temperature
 * = Only available for MMT6G models (available mid-July)



LOW PROFILE CAPACITIES CONTINUED

LCA6G/LCH6G/LCE6G Models with PSC Motors

Model	Capacity BTUH/ °ITD*	Fan Data		Fan Motor Data (Total Amps/Watts)				Defrost Heaters			
		No.	CFM	PSC Motor Data+			Watts	115/1/60 Amps	208-230/1/60 Amps	460/1/60 Amps	
				HP	115/1/60 A, W	208-230/1/60 A, W					460/1/60 A, W
LCA6G0400	400	2	1400	1/15	2.0, 164	1.0, 182	0.8, 234	---	---	---	---
LCA6G0475	475	2	1300	1/15	2.0, 164	1.0, 182	0.8, 234	---	---	---	---
LCA6G0525	525	2	1300	1/15	2.0, 164	1.0, 182	0.8, 234	---	---	---	---
LCA6G0725	725	3	1950	1/15	3.0, 246	1.5, 273	1.2, 351	---	---	---	---
LCA6G0900	900	4	2600	1/15	4.0, 328	2.0, 364	1.6, 468	---	---	---	---
LCA6G1000	1000	5	3250	1/15	5.0, 410	2.5, 455	2.0, 585	---	---	---	---
LCA6G1300	1300	5	3125	1/15	5.0, 410	2.5, 455	2.0, 585	---	---	---	---
LCA6G1475	1475	6	3750	1/15	6.0, 492	3.0, 546	2.4, 702	---	---	---	---
LCH6G0475	475	2	1300	1/15	2.0, 164	1.0, 182	0.8, 234	600	5.2	2.6	1.3
LCH6G0525	525	2	1300	1/15	2.0, 164	1.0, 182	0.8, 234	600	5.2	2.6	1.3
LCH6G0725	725	3	1950	1/15	3.0, 246	1.5, 273	1.2, 351	900	7.8	3.9	2.0
LCH6G0900	900	4	2600	1/15	4.0, 328	2.0, 364	1.6, 468	1200	10.4	5.2	2.6
LCH6G1300	1300	5	3125	1/15	5.0, 410	2.5, 455	2.0, 585	1500	13.0	6.5	3.3
LCH6G1475	1475	6	3750	1/15	6.0, 492	3.0, 546	2.4, 702	1800	15.7	7.8	3.9
LCE6G0400	400	2	1400	1/15	---	1.0, 182	0.8, 234	1800	---	7.8	3.9
LCE6G0475	475	2	1300	1/15	---	1.0, 182	0.8, 234	1800	---	7.8	3.9
LCE6G0525	525	2	1300	1/15	---	1.0, 182	0.8, 234	1800	---	7.8	3.9
LCE6G0725	725	3	1950	1/15	---	1.5, 273	1.0, 351	2700	---	11.7	5.9
LCE6G0900	900	4	2600	1/15	---	2.0, 364	2.0, 468	3600	---	15.7	7.8
LCE6G1000	1000	5	3250	1/15	---	2.5, 455	2.0, 585	4500	---	19.6	9.8
LCE6G1300	1300	5	3125	1/15	---	2.5, 455	2.0, 585	4500	---	19.6	9.8
LCE6G1475	1475	6	3750	1/15	---	3.0, 546	2.0, 702	5400	---	23.5	11.7

* Initial temperature difference (ITD) is (Room air temperature - Entering fluid temperature)

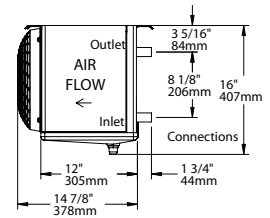
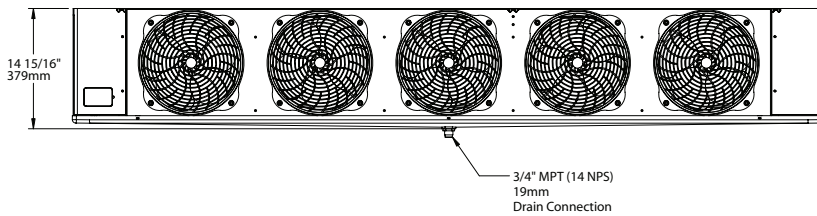
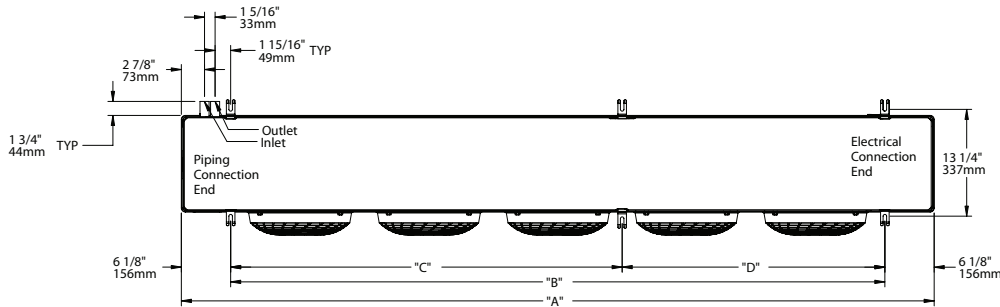
Multiply the reference capacity by the ITD to get the reference capacity

+ Includes open drip-proof (ODP) and totally-enclosed (TEAO) motors (TEAO motors are standard on 115V and special order on 230V and 460V)

LOW PROFILE PHYSICAL DATA

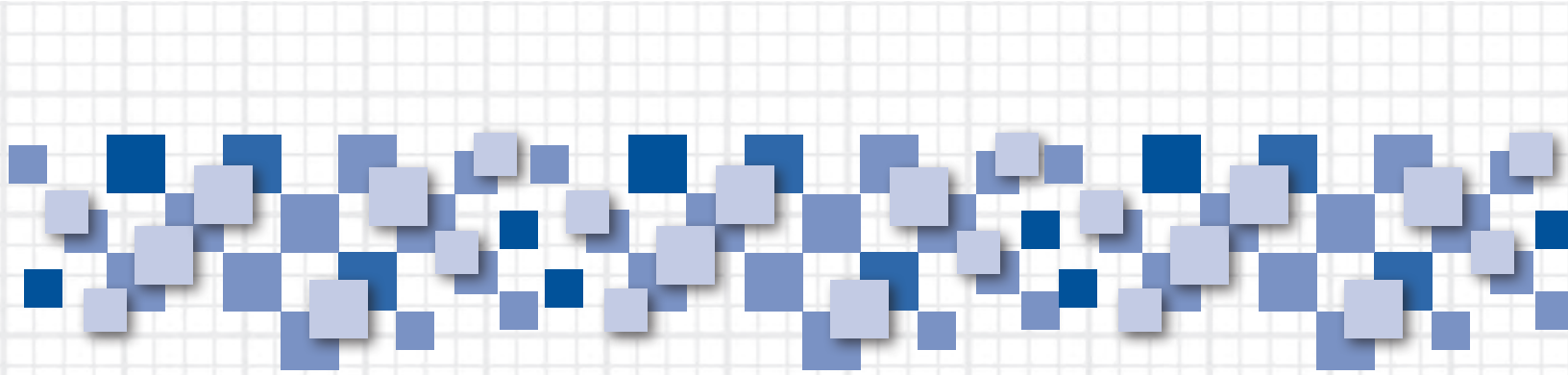
Model	No. of Fans	Coil Data					Condensate Drain	Defrost Type	Approx. Net Wt. Lbs.
		FPI	Tube OD	# Circuits	Connections OD	Finned Length			
LCA6G0400	2	6	3/8	4	7/8	32	3/4 MPT	Air	50
LCA6G0475	2	6	3/8	5	7/8	32	3/4 MPT	Air	52
LCA6G0525	2	6	3/8	6	7/8	32	3/4 MPT	Air	55
LCA6G0725	3	6	3/8	10	7/8	48	3/4 MPT	Air	70
LCA6G0900	4	6	3/8	10	1-1/8	64	3/4 MPT	Air	83
LCA6G1000	5	6	3/8	10	1-1/8	80	3/4 MPT	Air	104
LCA6G1300	5	6	1/2	10	1-1/8	80	3/4 MPT	Air	109
LCA6G1475	6	6	1/2	10	1-1/8	96	3/4 MPT	Air	134
LCH6G0475	2	6	3/8	5	7/8	32	3/4 MPT	Warm Fluid	55
LCH6G0525	2	6	3/8	6	7/8	32	3/4 MPT	Warm Fluid	58
LCH6G0725	3	6	3/8	10	7/8	48	3/4 MPT	Warm Fluid	73
LCH6G0900	4	6	3/8	10	1-1/8	64	3/4 MPT	Warm Fluid	86
LCH6G1300	5	6	1/2	10	1-1/8	80	3/4 MPT	Warm Fluid	113
LCH6G1475	6	6	1/2	10	1-1/8	96	3/4 MPT	Warm Fluid	139
LCE6G0400	2	6	3/8	4	7/8	32	3/4 MPT	Electric	50
LCE6G0475	2	6	3/8	5	7/8	32	3/4 MPT	Electric	52
LCE6G0525	2	6	3/8	6	7/8	32	3/4 MPT	Electric	55
LCE6G0725	3	6	3/8	10	7/8	48	3/4 MPT	Electric	70
LCE6G0900	4	6	3/8	10	1-1/8	64	3/4 MPT	Electric	83
LCE6G1000	5	6	3/8	10	1-1/8	80	3/4 MPT	Electric	104
LCE6G1300	5	6	1/2	10	1-1/8	80	3/4 MPT	Electric	109
LCE6G1475	6	6	1/2	10	1-1/8	96	3/4 MPT	Electric	134

LOW PROFILE DIMENSIONAL DATA



Model	No. of Fans	Dimensions (inches/mm)			
		A	B	C	D
LCA6G/LCE6G0400	2	45-1/2 1,156	33-1/4 845	---	---
LCA6G/LCE6G0475	2	45-1/2 1,156	33-1/4 845	---	---
LCA6G/LCE6G0525	2	45-1/2 1,156	33-1/4 845	---	---
LCA6G/LCE6G0725	3	61-1/2 1,562	49-1/4 1,251	---	---
LCA6G/LCE6G0900	4	77-1/2 1,969	65-1/4 1,657	---	---
LCA6G/LCE6G1000	5	93-1/2 2,375	81-1/4 2,064	48-5/8 1,235	32-5/8 829
LCA6G/LCE6G1300	5	93-1/2 2,375	81-1/4 2,064	48-5/8 1,235	32-5/8 829
LCA6G/LCE6G1475	6	109-1/2 2,781	97-1/4 2,470	48-5/8 1,235	48-5/8 1,235
LCH6G0475	2	45-1/2 1,156	33-1/4 845	---	---
LCH6G0525	2	45-1/2 1,156	33-1/4 845	---	---
LCH6G0725	3	61-1/2 1,562	49-1/4 1,251	---	---
LCH6G0900	4	77-1/2 1,969	65-1/4 1,657	---	---
LCH6G1300	5	93-1/2 2,375	81-1/4 2,064	48-5/8 1,235	32-5/8 829
LCHG61475	6	109-1/2 2,781	97-1/4 2,470	48-5/8 1,235	48-5/8 1,235

NOTE: Hanger brackets will accept 3/8" / 10 mm hanger rods



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or visit us at www.larkinproducts.com



Mastering the Art of Cold



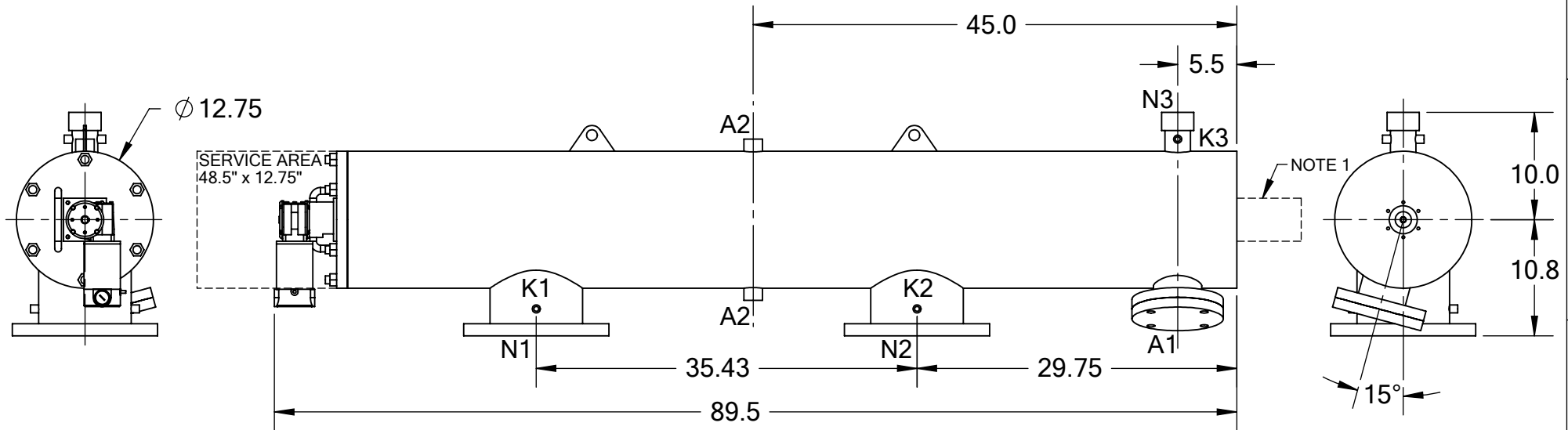
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Since product improvement is a continuing effort, we reserve the right to make changes in specifications without notice.

SIDE STREAM FILTER

REVISIONS				
REV.	ZONE	DESCRIPTION	DATE	INITIAL
1	7D	ADDED NOTE 1.	04/16/15	M.S.




TECHNICAL DATA

FLOW RATE	MAX. 1,500 GPM (341 m ³ /hr)
SCREEN SIZE	____ MICRON
SCREEN AREA	8.0 SQ. FEET
DESIGN TEMPERATURE	160 °F
DESIGN PRESSURE	150 PSI
EMPTY WEIGHT	~360 LBS.
FULL WEIGHT	~660 LBS.

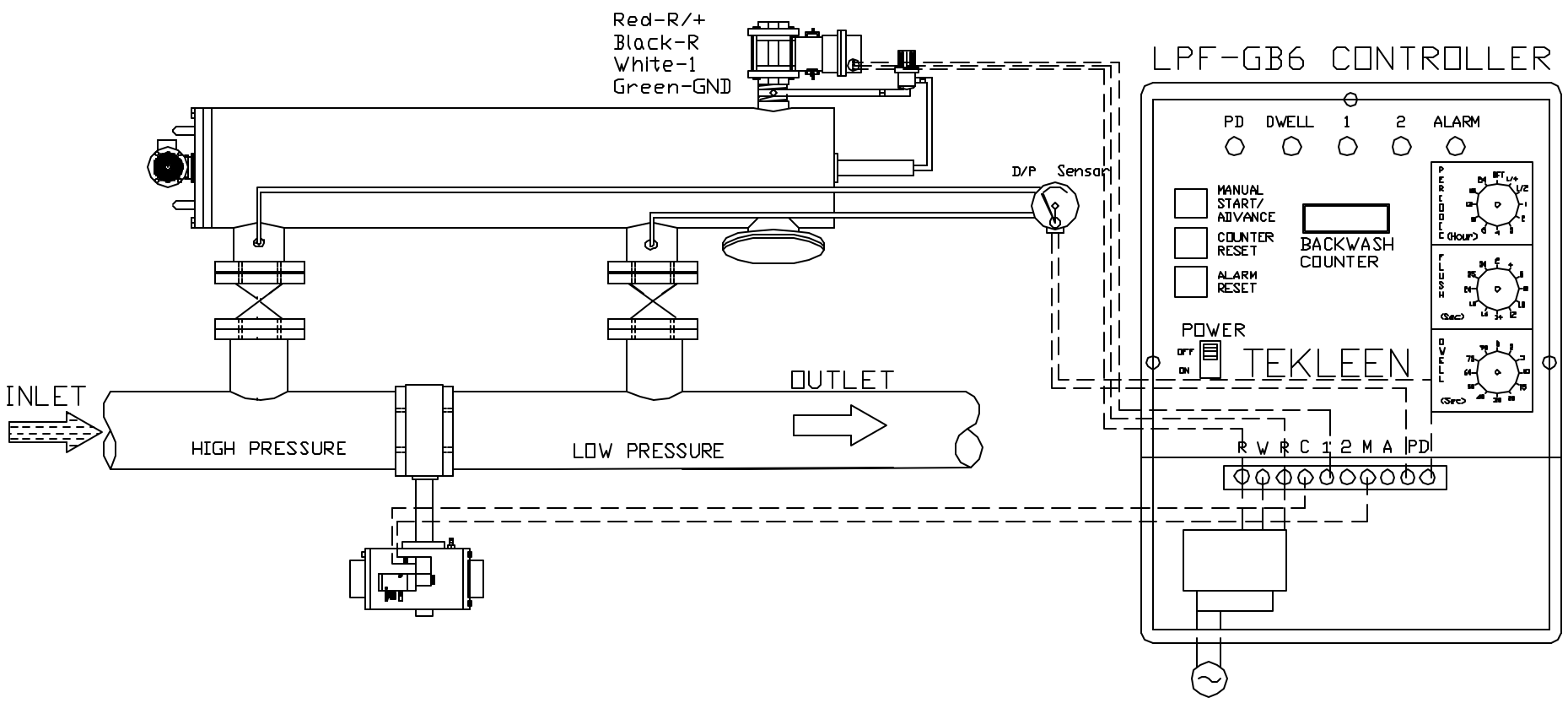
NOTES:

- PLEASE ALLOW ~20" ADDITIONAL TO INSTALL AND REMOVE THE PISTON ASSEMBLY TO THE BACKSIDE OF THE FILTER.

NOZZLE	CONNECTION	TYPE	SIZE	RATING	TOLERANCES (UNLESS OTHERWISE SPECIFIED)		 TEKLEEN <i>Automatic Filters Inc.</i> 2672 S. LA CIENEGA BLVD. LOS ANGELES, CA 90034 MAIN: (310) 839-2828 FAX: (310) 839-6878
A1	SERVICE PORT	FLANGED	3.5" ASA	CL. #150 F.F. w/ Blind	FRAC. ±1/16	ANGLE ±1°	
A2	PRESSURE RELEASE	THREADED	1" NPT(2)		.X ±.1		
K1	HIGH PRESSURE CONN.	THREADED	1/4" NPT(2)		.XX ±.05		MATERIAL: SST
K2	LOW PRESSURE CONN.	THREADED	1/4" NPT(2)		.XXX ±.010		
K3	HYDRAULIC CONN.	THREADED	1/4" NPT(2)				TITLE: LPF8-LP FILTER, CUT DRAWING
N1	INLET	FLANGED	8" ASA	CLASS #150 F.F.S.O.			
N2	OUTLET	FLANGED	8" ASA	CLASS #150 F.F.S.O.			DRAWN BY: S. PERKINSON
N3	FLUSH OUTLET	THREADED	2" NPT				
					DATE: 04/19/12	DRAWING NUMBER	
					SCALE: 1:14	SHEET: 1 OF 1	LPF-8LP-CUT-01
							REV 1

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
------	-----	-------------	------	----------



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES		AUTOMATIC FILTERS, INC.		
DECIMALS ANGULAR .XX ± .05 ± 0.5 DEG. XXX ± .01		TITLE LPF Filter Emergency Bypass Valve		
DRAWN Daniel Sternberg	DATE 7-10-09	SIZE A	DWG NO. LPF GB6 BPV	REV 0
CHECKED		NOT TO SCALE	SHEET	OF

AUTOMATIC FILTERS, INC.

2672 S. LA CIENEGA BLVD.
LOS ANGELES, CA 90034
310 839 2828 800 336 1942
FAX 310 839 6878
www.Tekleen.com
info@Tekleen.com

LPF
USERS'
MANUAL

Tekleen

Check List for Optimal Filter Performance

- There should be no back-pressure on the flush line. A 1" valve should have a 2" waste line, and 2" valve should have a 3" waste line. Do not use rubber hosing or flexible tubing for the waste line.
- The differential pressure gauge should be mounted within 3 feet of the filter. Long tubing lines will result in faulty gauge readings.
- The water supply line to the piston should be connected to the neck of the flush outlet and filtered by a 1/4" mini filter.
- The fitting on the side of all pistons is for venting only. It should be open to atmospheric pressure and pointing toward the ground.
- Sealant should be applied on the contact points on the backside of the d/p gauge to protect it from water. The d/p gauge should be mounted up-side down to prevent shorting of the contact points in the event of a water leak.
- If the filter outlet discharges to a tank, or to open atmosphere, a valve should be installed at the filter outlet to maintain a minimum working pressure of 15 PSI during the cleaning cycle.
- If the flush valve fails to open or close, verify the connections to the controller are wired correctly (see diagram on pg. 17).
- A surge protector should be installed before the electronic controller.
- It is recommended that a pressure gauge be installed on the inlet of the filter.

To ensure proper installation, email digital pictures with contact information to info@tekleen.com before startup.

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SECTION I INTRODUCTION

1.1 Description

The LPF series models (Low Pressure Filter) are automatic, self cleaning screen type water filters. The filtration system consists of a tank body with a coarse screen, fine screen, electric motor, single flush valve and an electronic controller.

1.2 Theory of Operation

Pressurized water enters the filter inlet and travels through the coarse screen from the outside in. The water then travels through the fine screen from the inside out where small contaminants (down to 25 microns) are filtered. The clean water then exits the outlet.

When the fine screen becomes contaminated, a pressure differential is sensed causing the automatic controller to open the flushing valve and start the electric motor. When the flushing valve opens, the pressure in the hydraulic motor chamber is reduced causing the clean water to reverse flow at the nozzles through the filter element pushing contaminants off the screen, through the dirt collector and out the flush valve.

As the electric motor rotates the dirt collector, water passes through the nozzles, thus vacuuming the entire surface area of the filter element.

When the screen is clean, the unit automatically closes the electric valve, returning the filter to normal operation.

The entire cleaning cycle takes approximately 10-15 seconds. It should be noted that even during the cleaning cycle, the filtration process continues uninterrupted.

1.3 Recommended Applications

Tekleen filters are ideal for filtering out silt, scale, sand, rust, dirt and organic material like algae, zebra mussels, and clams from virtually all types of water sources.

1.4 Design Features

Among the many features of the LPF models is the avoidance of the danger of forcing contaminated water back into the system, which often happens with a sand filter. Tekleen filters will deliver clean water or no water at all.

The most predominant feature is its ability to remove organics such as algae and other suspended particles.

All filter internal elements can be removed and disassembled from the filter body without disruption of the plumbing.

The backwash cycle, Tekrinse, uses 90% less rinse water than other filters on the market today.

For special constructions and applications, see Appendix I, page 12.

1.5 Filter Specifications Chart

Model	Flange Size	Screen Area	Max. Flow	Empty Weight	Service Area
	Inch	Sq. Ft.	GPM	Lbs.	Inch
LPF2-L	2	0.5	130	120	7
LPF2-LP	2	0.5	130	120	7
LPF2-S	2	1.4	200	150	13
LPF2-SP	2	1.4	200	150	13
LPF3	3	0.5	150	125	7
LPF3-S	3	1.4	200	150	13
LPF3-SP	3	1.4	200	150	13
LPF3-LP	3	2.5	300	180	20
LPF4	4	1.4	300	170	13
LPF4-P	4	1.4	300	170	13
LPF4-LPE	4	2.5	400	180	20
LPF4-L	4	5	500	230	35
LPF4-LP	4	5	500	230	35
LPF4-XLP	4	8	800	400	51
LPF4-SP	4	7	1,000	500	62
LPF6-P	6	2.5	600	180	20
LPF6-L	6	5	800	280	35
LPF6-LP	6	5	800	280	35
LPF6-XLP	6	8	800	400	51
LPF6-TXLP	6	16	1,500	900	51
LPF6-SP	6	7	1,750	400	62
LPF8	8	5	1,320	400	35
LPF8-P	8	5	1,320	300	35
LPF8-LP	8	8	1,500	450	51
LPF8-SP	8	7	1,750	500	62
LPF8-TLP	8	16	2,500	1,000	51
LPF10	10	7	1,750	500	62
LPF10-P	10	7	1,750	500	62
LPF10-LP	10	11	2,630	650	91
LPF12	12	11	2,630	700	91
LPF12-P	12	11	2,630	700	91
LPF12-LP	12	12.5	4,000	800	91
LPF14	14	12.5	4,000	800	91
LPF14-P	14	12.5	4,000	800	91
LPF14-LP	14	16	6,000	1,000	91
LPF16-P	16	12.5	5,000	900	91
LPF16-LP	16	16	6,000	1,000	91
LPF16-L	16	16	6,000	1,000	91
LPF16-SP	16	24	10,000	1,400	91
LPF18-TP	18	25	8,000	1,600	91
LPF18-SP	18	24	10,000	1,800	91
LPF20-TP	20	25	8,500	2,000	91
LPF20-SP	20	24	10,000	2,500	91
LPF20-TLP	20	32	10,000	1,800	91
LPF24-SP	24	24	10,000	2,500	91
LPF24-TLP	24	32	12,000	2,000	91
LPF30-TSP	30	48	10,000	2,500	91
LPF36-TSP	36	48	20,000	2,800	91

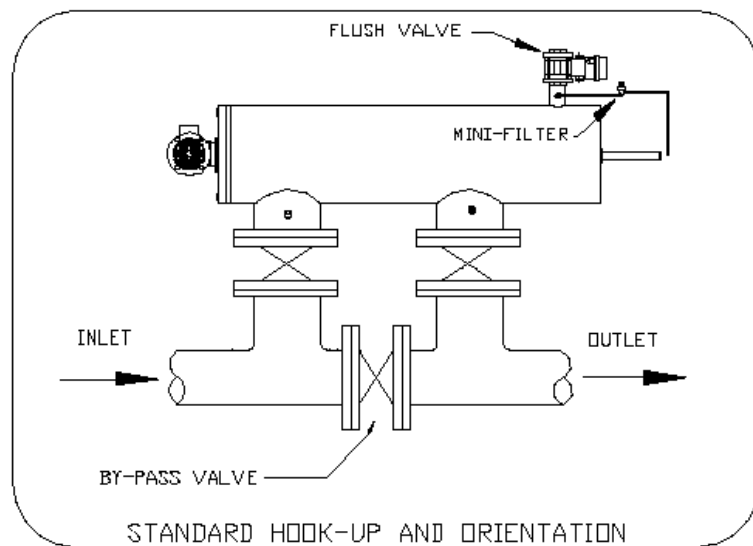
SECTION II INSTALLATION AND HOOK-UP

2.1 Mechanical Hook-Up and Orientation

The positioning of the filter tank should be determined by the disposal of waste water and to allow easy access and removal of filter element (see Filter Specifications Chart for the required service area). The Tekleen filter can rest on the inlet and outlet flanges or can be mounted on a stand if desired. **In fact, the filter can be mounted in any position (vertical, upside down, etc.). The electronic controller should be mounted in close proximity to the filter housing.**

2.2 Plumbing Hook-Up

The waste discharge pipe should be at least one inch larger in diameter than the size of the flush valve (1" valve to 2" pipe & 2" valve to 3" pipe). The waste pipe should be kept as short as possible with no more than one elbow. This will minimize back pressure on the flush line.



Flush lines should not be elevated. This will affect the pressure difference required for the cleaning cycle. If it is necessary to run flush lines uphill, please consult with the manufacturer.

Flush line pipe must be ridged. It should not be made out of flexible tube or rubber hosing. Any restrictions in the flush line will reduce the cleaning ability of the filter.

A block valve should be installed at the inlet of the filter. During start-up, the block valve should be only slightly open to prevent a surge of pressure across the filter when the pump is started. Once the pump is on-line, slowly open the block valve. This will prevent any possible damage to the filter due to a pressure surge.

2.3 GB6, DP Gauge, and Electric Ball Valve Connection

Before power is applied to the electronic controller, make all connections between the controller, DP Gauge, and electric ball valve (see page 15-16).

1. **BALL VALVE:** Plug controller into appropriate power source. Connect the ball valve to the controller as shown in the wiring diagram (page 15-16). Activate the manual start switch on the GB6 controller and visually inspect the open and close movement of the ball valve.

2. **FLUSHING TIME ADJUSTMENT:** The flush time is normally set to 10 seconds. Flush time should be adjusted to allow the piston indicator pin to reach the end of the slot during one backwash cycle. **NOTE:** Excessive flush time will not improve cleaning, and may lead to unnecessary wear and tear on filter equipment.

3. **PRESSURE DIFFERENTIAL ADJUSTMENT:** The differential switch is preset for 7 PSI. It can be changed to different set points (see your electronic controller manual).

USING 1/4 INCH DIAMETER TUBING

1. Attach tubing to the low pressure 1/4" fitting (on the outlet flange). Attach the other end of the tubing to the fitting on the DP switch marked "low" pressure.

2. Attach tubing to the high pressure 1/4" fitting (on the inlet flange). Attach the other end of the tubing to the fitting on the DP switch marked "high" pressure.

Notes: Do not run tubing more than three feet in length (preferably two feet or less). Due to the pressure drop across the tubing, the electronic controller may not operate properly if tubing is too long.

3. Attach tubing to the end of the piston. Attach the other end to the fitting on the neck of the flush outlet (before the flush valve). The mini-filter should be added to this 1/4" line to prevent larger debris particles from plugging the piston. The fitting on the side of the piston should point downward and be used to vent the piston.

SECTION III OPERATION AND ADJUSTMENTS

3.1 Start-Up

During start-up, the block valve at the filter inlet should be only partially open to prevent a surge of pressure across the filter when the pump is started. Once the pump is on-line, slowly open the block valve. This will prevent any possible damage to the filter due to a pressure surge.

During the initial filling of the main pipeline, there may not be enough back-pressure downstream from the filter to allow the cleaning cycle to function properly. Therefore, it is necessary to install a valve at the outlet to be partially closed (i.e., gate valve, ball valve or butterfly valve).

If a downstream main line valve is partially closed, enough to provide 15 PSI at the filter inlet pressure gauge, the self cleaning cycle will operate properly. Once the total system is fully charged, the downstream valve can be adjusted, as long as 15 PSI is maintained at the filter inlet during the cleaning cycle.

In applications where the main flow to the filter is intentionally interrupted and the line is drained, it is advisable to install a flow control or pressure sustaining valve downstream from the filter. This will create back pressure on the filter in order to enable proper flushing while main line pressurizes.

Once the system is fully pressurized, push the manual flush button on the electronic controller and verify that the piston is moving. For pistons with non-metal casings, a flashlight can be held up to the case, where the bottom cap of the piston can be seen, and a visual check performed to verify the piston is completing the full stroke. For metal pistons, an indicating pin is located underneath the piston cover sleeve and can be checked to verify the full stroke of the piston is obtained. Also during this manual flush, verify that the flush valve is opening all the way. During the first cleaning cycle, air in the system will be expelled, so it may require more than one cycle to achieve proper cleaning.

3.2 Cleaning Cycle Requirements

WORKING PRESSURE

The filter requires a minimum pressure of 15 PSI at the inlet during the cleaning cycle for effective cleaning.

Maintaining the necessary minimum working pressure during the cleaning cycle requires a pump with sufficient capacity. Pump selection will depend on three key parameters: the required working pressure (15 PSI), the process flow of the system, and the flush flow of the filter.

PROCESS FLOW

Process flow is the volumetric rate of water that will pass through the filter during normal operation (when the filter is not in a cleaning cycle).

FLUSH FLOW

The flush flow is the volumetric rate of water that will be used during a cleaning cycle. This rate depends on the size of the flush valve used.

FLUSH VALVE SIZE		FLUSH FLOW	
inch	mm	gpm	m ³ /hr
1"	DN25	60-80	14-18
1.5"	DN40	120-160	27-36
2"	DN50	240-320	55-73

To determine if a pump will satisfy the performance needs of your system, add the process flow of the system to the flush flow of the filter to find the total flow.

Process Flow + Flush Flow = Total Flow

Consult the pump curve provided by the pump manufacturer to determine if it meets the performance requirements. The pump curve describes the performance of the pump in terms of flow and pressure. Locate your total flow on the graph to determine what pressure will be maintained at that flow. If the pressure is greater than 15 PSI, then the pump satisfies the requirements.

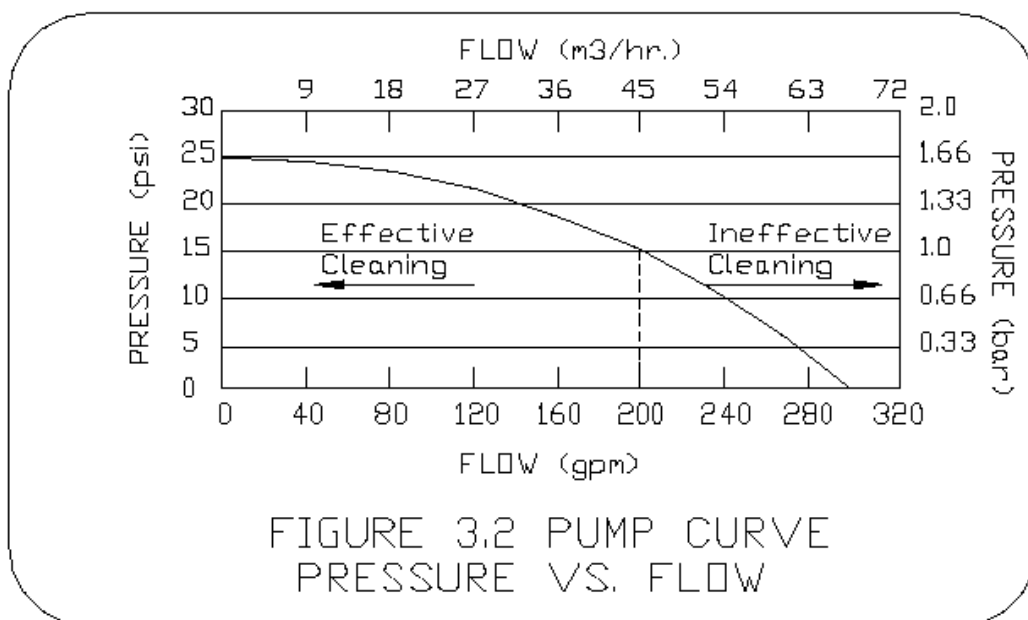


Figure 3.2 shows an example of a pump curve. Since a minimum of 15 PSI must be maintained, the critical point for this pump is at 200 gpm. Any flow greater than this will not yield effective cleaning during the backwash cycle.

If, for example, the process flow were to be 190 gpm and the flush flow 40 gpm, the total flow would be 230 gpm. This would produce an inlet pressure less than the required 15 PSI and as a result the filter would not be able to perform an effective cleaning cycle.

If the process flow were to be 150 gpm with a flush flow of 40 gpm, the total flow would be 190 gpm. This would produce an inlet pressure greater than the required 15 PSI and result in an effective cleaning cycle.

SECTION IV MAINTENANCE

4.1 Shutdown Procedure

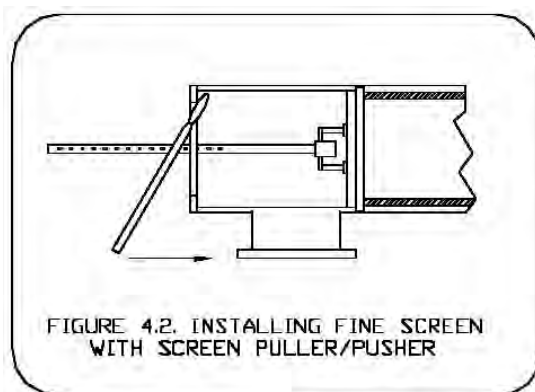
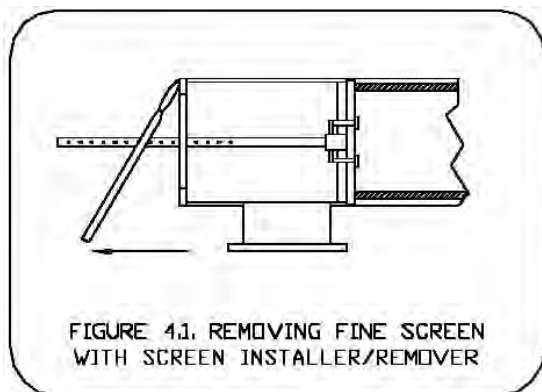
When shutting down the filter, steps must be taken to ensure that there will be no reverse flow across the screen that may damage components. The proper shutdown sequence is as follows:

1. Open the bypass valve.
2. Close the outlet valve completely.
3. Close the inlet valve completely. The filter is now isolated and the system flow is bypassed.
4. Relieve any residual pressure in the filter housing by detaching the 1/4" plastic tubing from any fitting.
5. Drain the remaining water from the filter body by either:
 - a. Unscrewing the 1" NPT pressure release plug (located on the top and bottom of the filter).
 - b. Loosen the cover nuts and slightly open the cover.

4.2 Filter Cleaning

The coarse screen is not part of the self cleaning mechanism. Therefore periodic cleaning and inspection of the coarse screen, if supplied, is necessary for removal of large particles trapped in the chamber. To do this, simply follow the shutdown procedure, and then remove the filter cover.

It is also recommended that the fine screen be inspected during coarse screen cleaning. For models with line sizes of 2"-8", remove fine screen using screen installer/remover tool.



4.3 Dirt Collector Replacement

If the dirt collector should ever need replacing, follow steps 1 through 5 in section 4.1 (Shutdown Procedure) and proceed as follows:

1. Open the service port flange.
2. Unscrew the lower bearing.
3. Remove the hydraulic motor.
4. Remove the dirt collector.

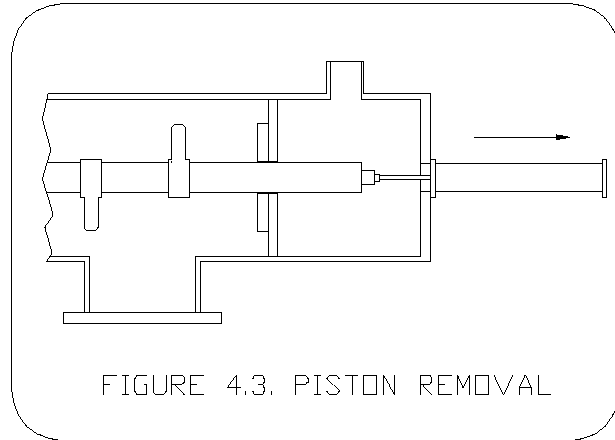


FIGURE 4.3. PISTON REMOVAL

4.4 Piston Removal/Replacement

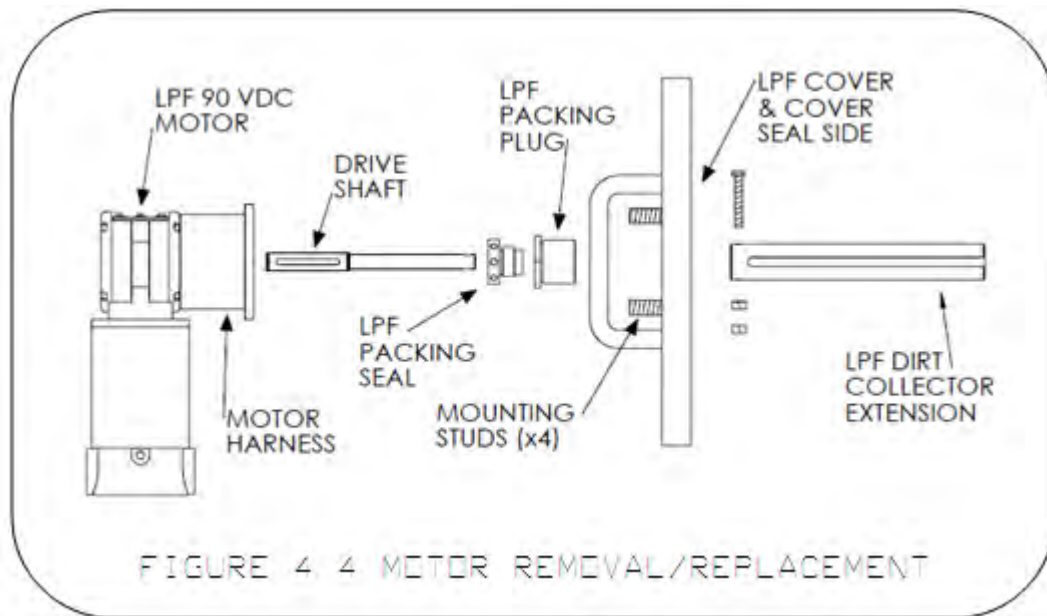
If the piston needs to be removed or replaced, follow the steps outlined and refer to Fig. 4.3:

1. Follow steps 1-5, section 4.1
2. Unscrew all connection nuts.
3. Remove piston from the filter housing.
4. Re-assemble unit (reverse procedure).

4.5 Motor Removal/Replacement

If the motor needs to be removed or replaced, follow steps outlined as follows and refer to Fig. 4.4:

1. Follow steps 1-5, section 4.1
2. Remove the LPF cover from the filter.
3. Remove the bolt securing the drive shaft to the LPF dirt collector extension.
4. Remove the drive shaft from the motor. Use a hammer and screwdriver to hammer the shaft from the side of the LPF cover with the cover seal.
5. Remove the 8 nuts on the mounting studs, and separate the motor/bracket from the cover.
6. Remove the 4 screws securing the motor to the motor bracket.
7. Re-assemble unit (reverse procedure).



4.6 Periodic Inspection

The following parts should be inspected annually for wear and tear and should be replaced if necessary:

- Cover Seal
- Fine Screen
- Piston
- Dirt Collector
- Lower Bearing
- Coarse Screen
- O-rings
- Electric Motor Packing
- Upper Bearing
- Air/Water Connections

SECTION V TROUBLESHOOTING GUIDE

5.1 Problem: Excessive pressure drop through filter without flushing.

POSSIBLE CAUSES

1. Controller is not turned on.
2. Flush valve is wired incorrectly.
3. Filter is installed backwards.
4. D/P switch is malfunctioning.

SOLUTIONS

1. Turn the power switch to "on".
2. Consult the wiring diagram, and verify that the valve is connected correctly.
3. Verify correct flow through filter.
4. Check set point on D/P switch. Make sure ¼" black tubing is less than 3 feet in length and unobstructed. Verify that the D/P switch is connected to the appropriate fittings on the filter.

5.2 Problem: Frequent or continuous flushing while filling main pipeline.

POSSIBLE CAUSES

1. Downstream pressure is not available to provide effective cleaning cycle.
2. High flow rate exceeds the D/P switch's preset differential.
3. Filter may have been shut down while the screen is dirty, resulting in a layer of contaminant on the screen that has caked on.

SOLUTIONS

- 1&2. Partially close downstream mainline valve. Filter inlet gauge should read at least 15 PSI.
3. A "super flush" must be performed as follows: Close the outlet valve and initiate a cleaning cycle. Open the outlet valve and check the filter differential. If the differential does not return to zero, repeat the process.

5.3 Problem: Frequent flushing during normal operation.

POSSIBLE CAUSE

1. Very dirty water.
2. Marginal working pressure results in poor cleaning cycle.
3. Screen may be partially plugged.
4. Dirt collector may be jammed which results in only cleaning the screen directly in front of the nozzles.

SOLUTION

1. Screen opening size may be too small for the given application. Consult manufacturer.
2. Verify the inlet pressure is at least 15 PSI during the cleaning cycle. If not, partially close the outlet valve to increase inlet pressure.
3. Perform super flush as described in section 5.2.
4. Open filter and verify the dirt collector rotates freely.

5.4 Problem: Screen will not clean properly.

POSSIBLE CAUSE

1. The flush cycle duration is too short.
2. Filter was shut down dirty with contaminants caked on the screen.
3. Flush line is causing back pressure on the flush valve.
4. Piston is not operating properly.

SOLUTION

1. Increase flush duration on controller panel.
2. Perform super flush as described in section 5.2.
3. Make sure the flush line is 1" larger than the flush valve (See section 2.2).
4. Verify that the indicator pin is moving during the cleaning cycle. Make sure that the inlet pressure is at least 15 PSI during the cleaning cycle.

SECTION VI SPARE PARTS

6.1 Recommended Spare Parts

The following are recommended spare parts to keep in stock:

- Fine Screen (4)
- Cover Seal (10)
- Upper Bearing (11)
- D/P Switch (34)
- Piston Repair Kit (29)
- Mini-Filter (18)
- Set of O-rings (16)
- Dirt Collector (5)
- Lower Bearing (12)
- Controller Board
- Dirt Collector Nozzles (6)

6.2 Spare Parts List

See filter cutaway on page 15.

APPENDICES

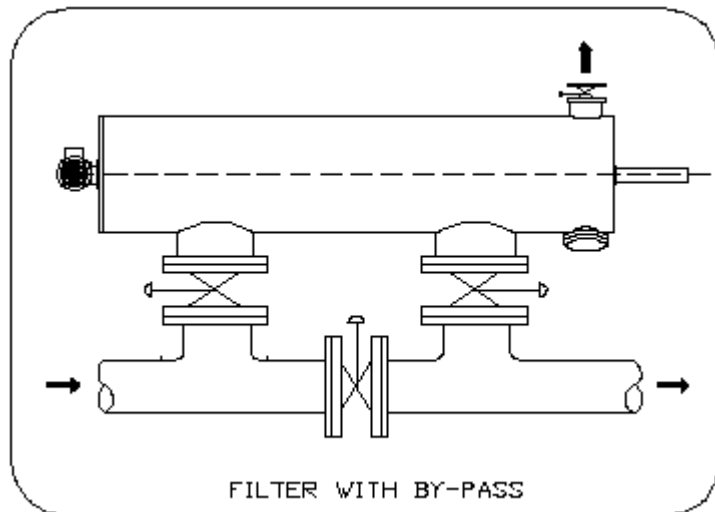
Appendix I Special Installation

I. AUTOMATIC BY-PASS

Sometimes it is necessary to have flow even when the filter is out of service for periodic maintenance. In this situation, it is recommended to create a by-pass.

FILTER BY-PASS

It is very simple to create a by-pass, especially for the on-line models. To do so, add a block valve on both the inlet and outlet and a bypass with another block valve (see drawing).

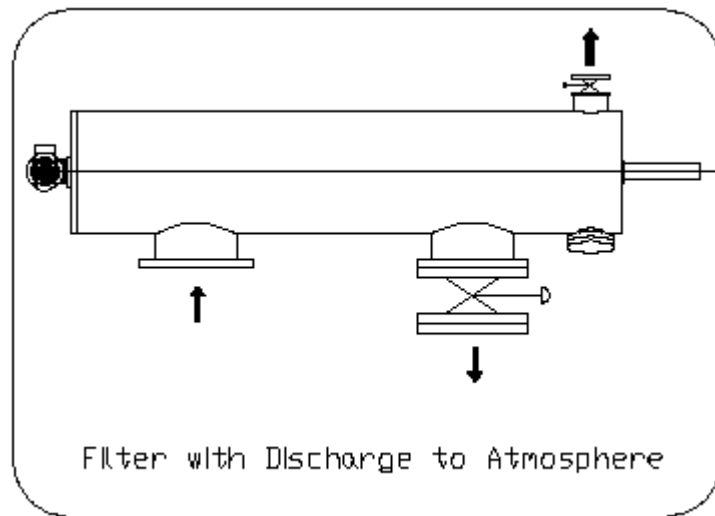


If the by-pass valves are provided with actuators, it can be converted into an automatic by-pass system by wiring them to the controller (see controller manual).

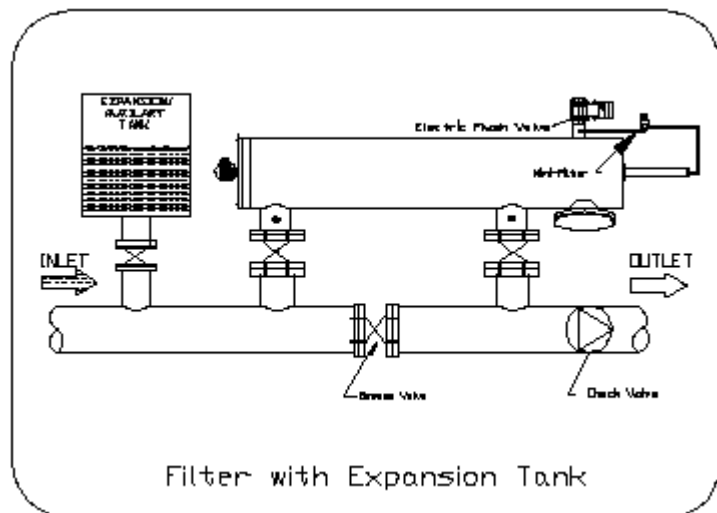
Appendix II Alternate Flushing Methods

There are several possible solutions if there is not enough pressure and/or flow to successfully achieve a backwash. For low flow installations with pressure greater than 15 PSI, proceed as follows:

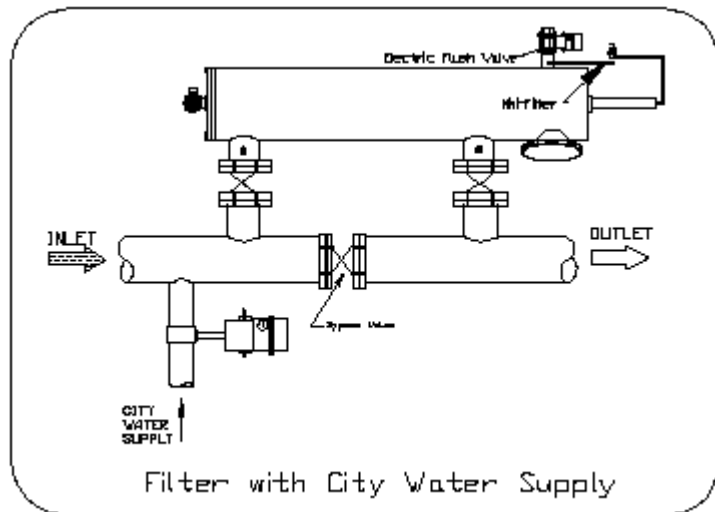
1. The easiest method is to place an automatic valve (pressure sustaining valve) at the filter outlet. The valve will close when the filter is flushing. During the cleaning cycle, there would be no water available to the system and the full pump capacity will be used for the backwash filter.



2. The required extra flow can be obtained by means of an expansion tank installed directly upstream of the filter inlet. The expansion tank would contain water at operating pressure to supply to the filter during the cleaning cycle.



3. Another way to obtain supplemental flow is to add a water source to the inlet of the filter. The water source would be controlled with an actuated valve, opening during the cleaning cycle (see controller manual for wiring).

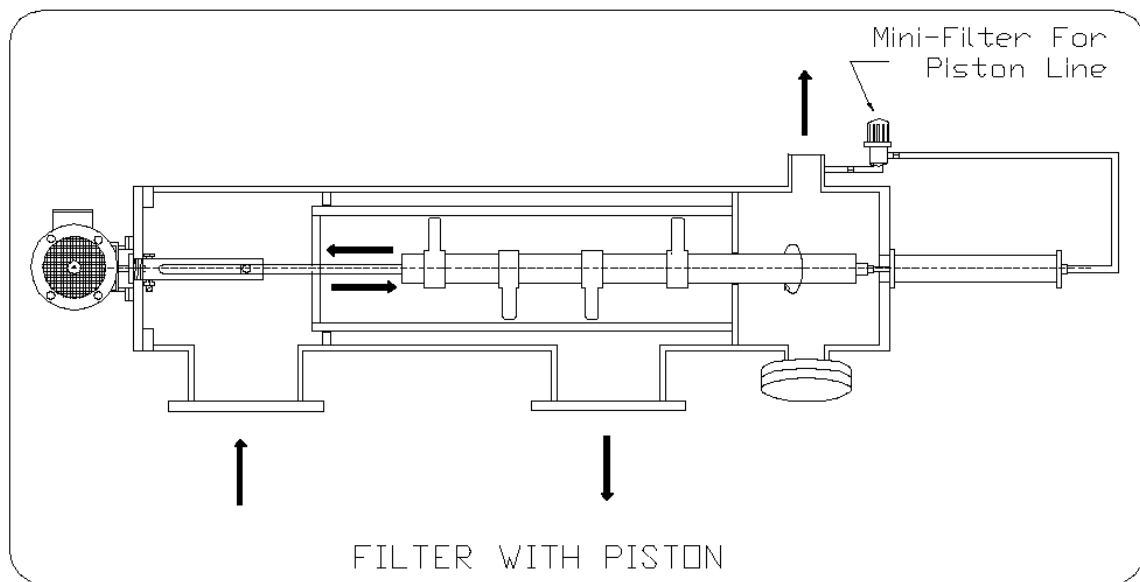


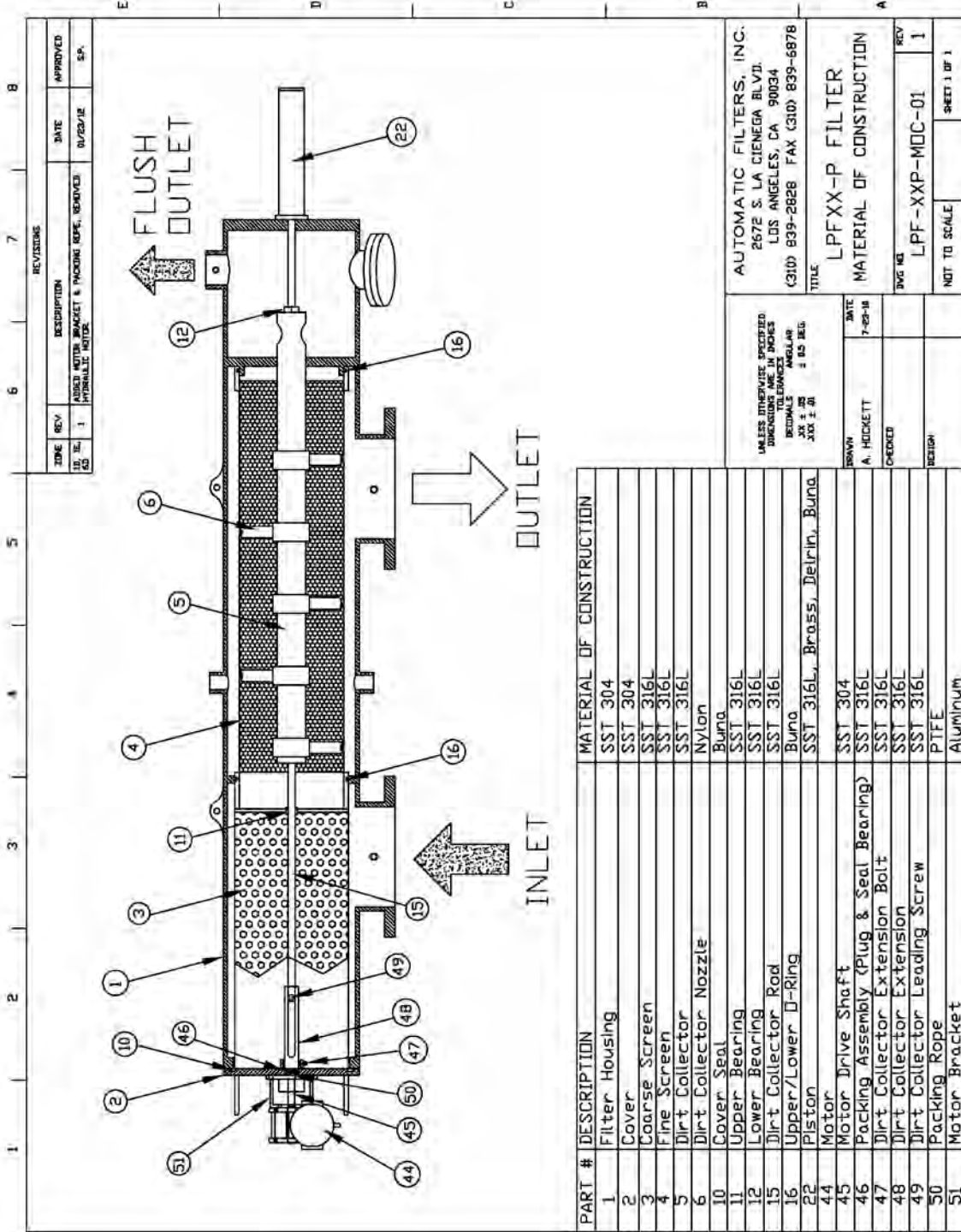
Appendix III Piston

Due to longer screens on larger filters, it is necessary to employ a piston for the cleaning mechanism. The piston is used to control the linear movement of the dirt collector during cleaning cycles. This enables the dirt collector to clean the entire surface area of the screen in a spiral-downward movement. At the end of the cleaning cycle, the flush valve closes and the normal filtration process resumes. At the same time, the piston is pressurized, which pushes the dirt collector back into its original position, ready for the next cleaning cycle.

Upon initial installation of the system, all seals within the piston may not be set in place. This may lead to water leaking from the piston, which is normal. In addition to protecting the piston, the PVC cover sleeve allows water leakage to be drained to a single location. After the system has been running for some time, the seals within the piston will set and the leakage will decrease or stop completely. The cover sleeve can also be slid back to expose the bolt holes and piston indicating pin.

Note: Some LPF models come with a different piston than what is pictured below.





REV		DESCRIPTION	DATE	APPROVED
1	1	ASST MOTOR BRACKET & PACKING REFE. REWORKED HYDRAULIC NOTICES	01/23/12	SA

AUTOMATIC FILTERS, INC.
 2672 S. LA CIENEGA BLVD.
 LOS ANGELES, CA 90034
 (310) 839-2828 FAX (310) 839-6878

TITLE
LPFXX-P FILTER
 MATERIAL OF CONSTRUCTION

DWG NO
 LPF-XXP-MOC-01

REV
 1

NOT TO SCALE

SHEET 1 OF 1

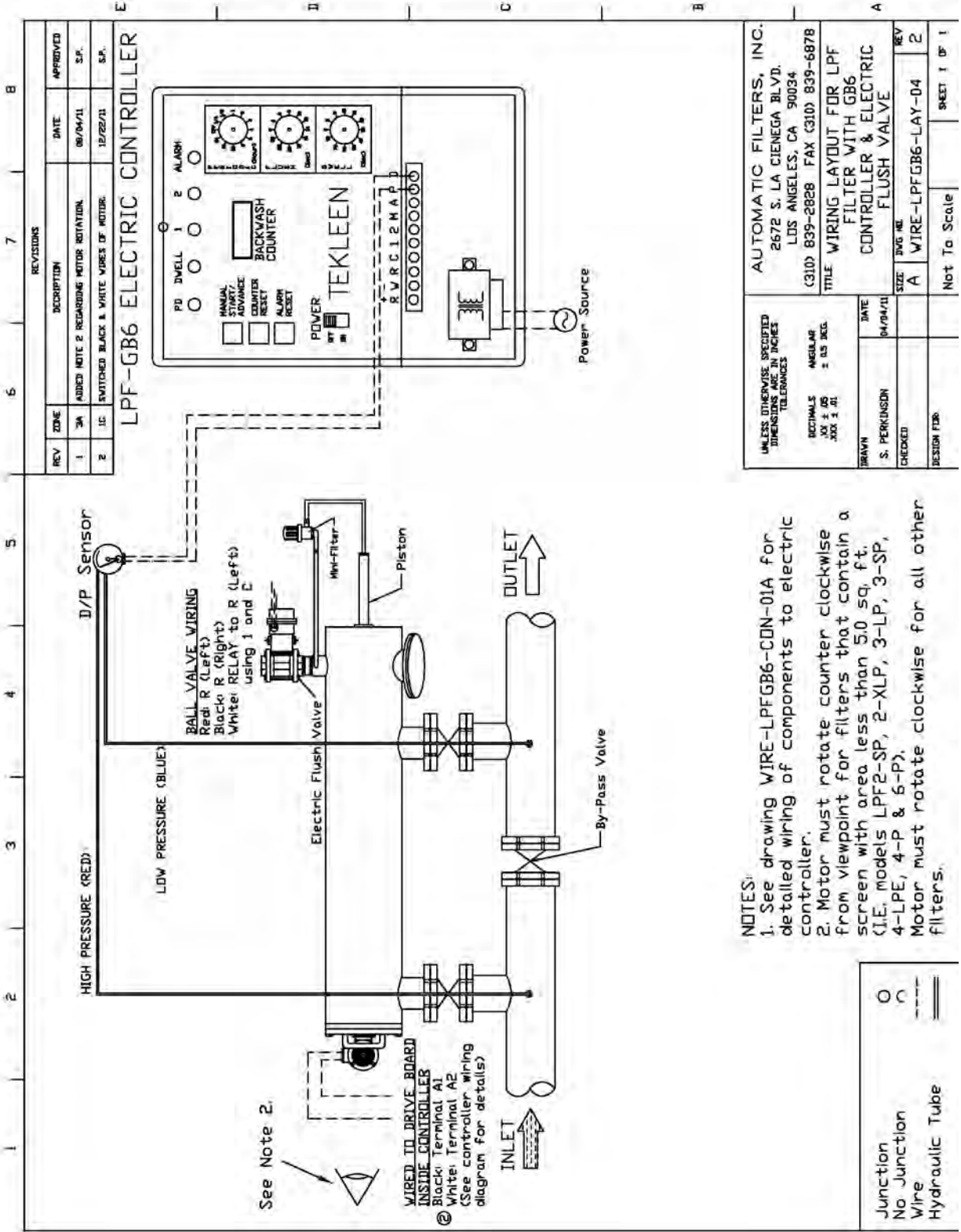
ALL DIMENSIONS ARE IN INCHES
 DECIMALS ANGULAR
 XXX ± .05

DATE
 7-23-10

A. HOCKETT
 CHECKED

DESIGN

PART #	DESCRIPTION	MATERIAL OF CONSTRUCTION
1	Filter Housing	SST 304
2	Cover	SST 304
3	Coarse Screen	SST 316L
4	Fine Screen	SST 316L
5	Dirt Collector	SST 316L
6	Dirt Collector Nozzle	Nylon
10	Cover Seal	Buna
11	Upper Bearing	SST 316L
12	Lower Bearing	SST 316L
15	Dirt Collector Rod	SST 316L
16	Upper/Lower O-Ring	Buna
22	Piston	SST 316L, Brass, Delrin, Buna
44	Motor	
45	Motor Drive Shaft	SST 304
46	Packing Assembly (Plug & Seal Bearing)	SST 316L
47	Dirt Collector Extension Bolt	SST 316L
48	Dirt Collector Extension	SST 316L
49	Dirt Collector Leading Screw	SST 316L
50	Packing Rope	PTFE
51	Motor Bracket	Aluminum



REV	ZONE	DESCRIPTION	DATE	APPROVED
1	3A	ADDED NOTE 2 REGARDING MOTOR ROTATION.	06/04/11	SF.
2	1C	SWITCHED BLACK & WHITE WIRES OF MOTOR.	12/22/11	SA.

LPF-GB6 ELECTRIC CONTROLLER

REVISIONS		TITLE		DATE	
REV	ZONE	DESCRIPTION	DATE	APPROVED	
1	3A	ADDED NOTE 2 REGARDING MOTOR ROTATION.	06/04/11	SF.	
2	1C	SWITCHED BLACK & WHITE WIRES OF MOTOR.	12/22/11	SA.	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES

DECIMALS ANGULAR
 .001 ± .005 ± 1/2 DEG.
 .005 ± .01

DATE 04/04/11

DESIGNED BY S. PERKUNSON

CHECKED

DESIGN FIRM

NOT TO SCALE

SHEET 1 OF 1

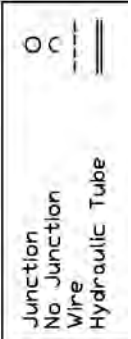
AUTOMATIC FILTERS, INC.
 2672 S. LA CIENEGA BLVD.
 LOS ANGELES, CA 90034
 (310) 839-2828 FAX (310) 839-6878

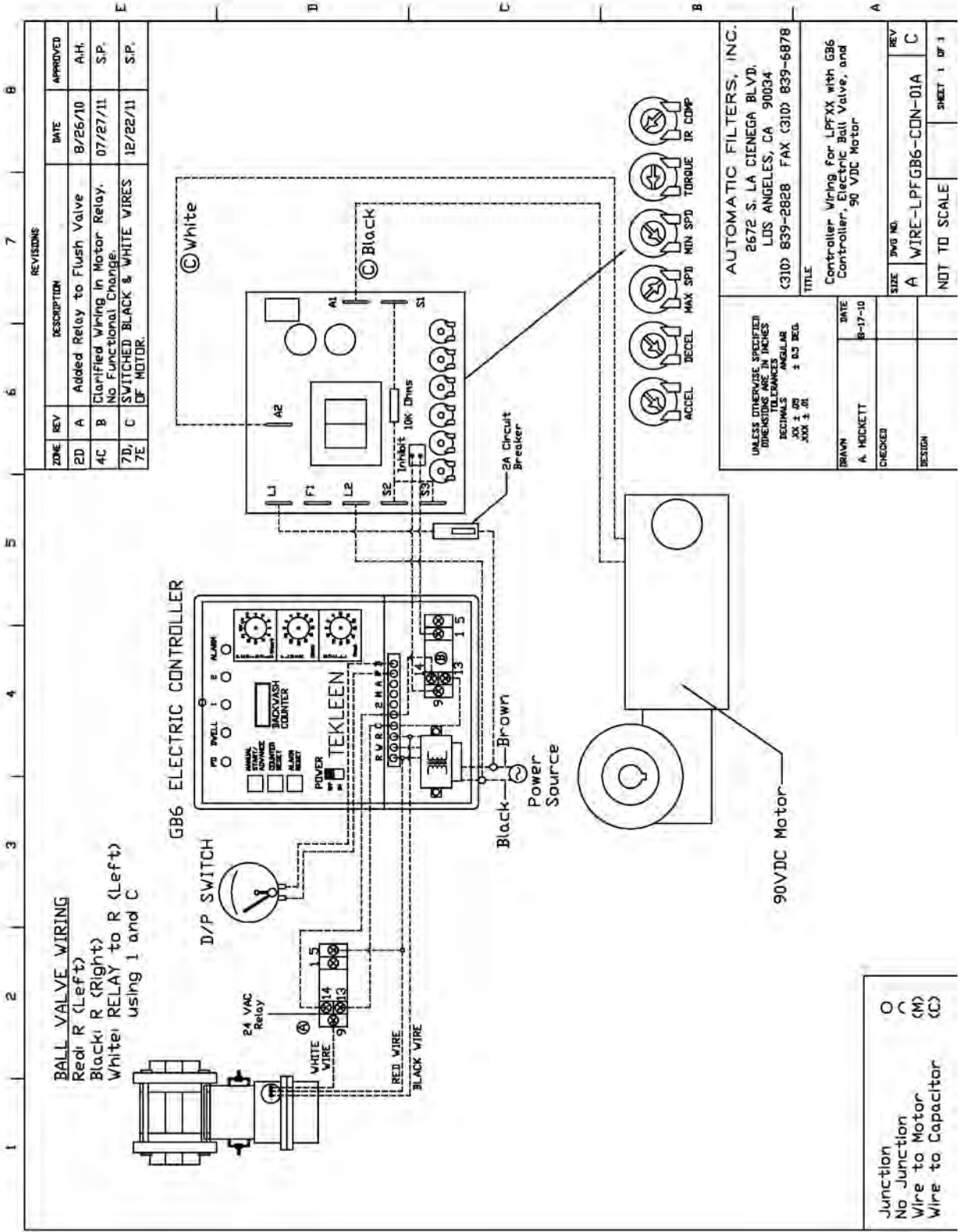
TITLE WIRING LAYOUT FOR LPF FILTER WITH GB6 CONTROLLER & ELECTRIC FLUSH VALVE

SIZE DWG. NO. A WIRE-LPFG6-LAY-04

REV 2

- NOTES:**
- See drawing WIRE-LPFG6-CON-01A for detailed wiring of components to electric controller.
 - Motor must rotate counter clockwise from viewpoint for filters that contain a screen with area less than 50 sq. ft. (I.E. models LPF2-SP, 2-XLP, 3-LP, 3-SP, 4-LPE, 4-P & 6-P). Motor must rotate clockwise for all other filters.





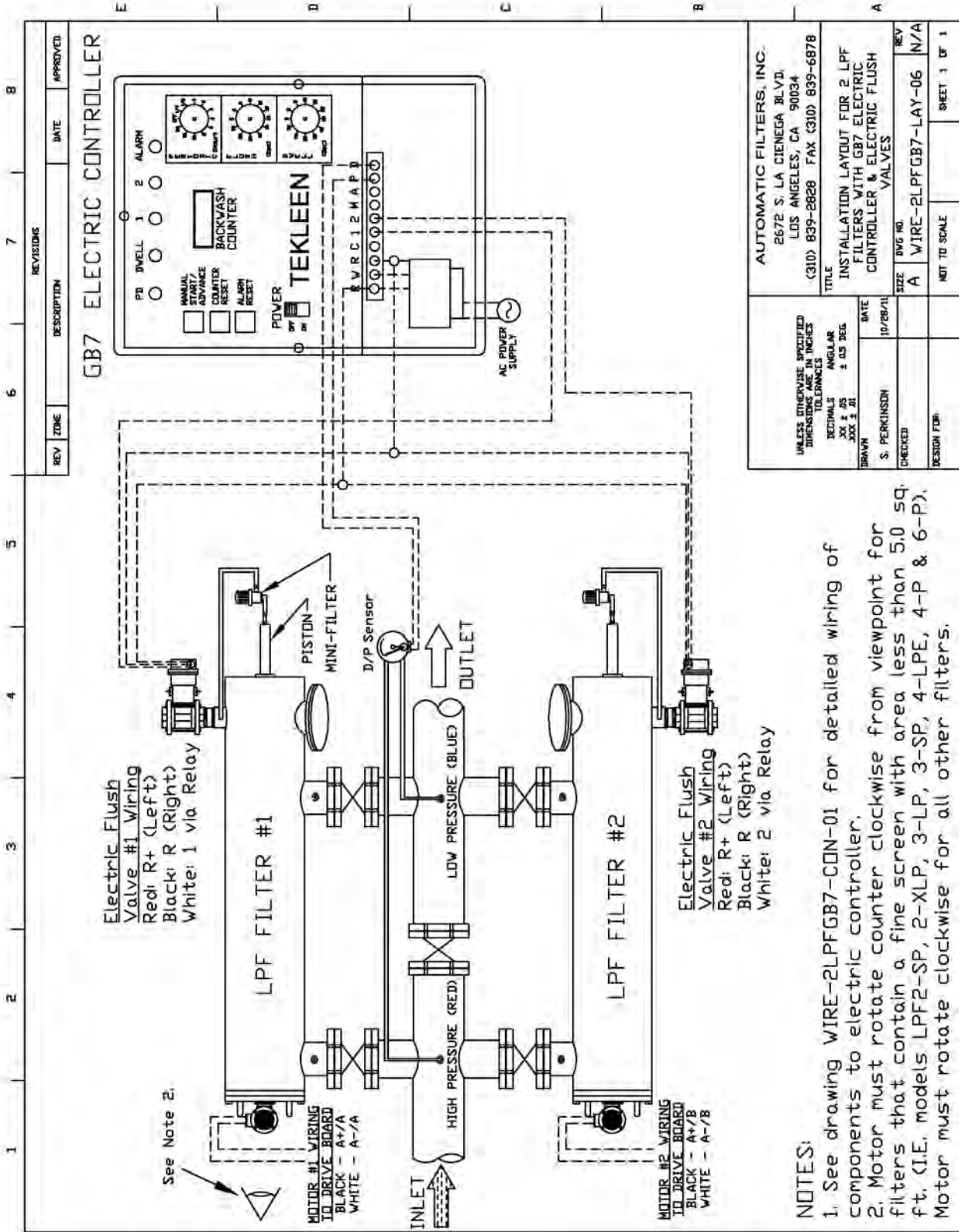
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
2D	A	Added Relay to Flush Valve	8/26/10	A.H.
4C	B	Clarified Wiring in Motor Relay. No Functional Change.	07/27/11	S.P.
7D	C	SWITCHED BLACK & WHITE WIRES OF MOTOR.	12/22/11	S.P.

UNLESS OTHERWISE SPECIFIED
 DIMENSIONS IN INCHES
 DECIMALS ANGULAR
 .001 ± .001 ± .03 DEG.
 .005 ± .01

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 LOS ANGELES, CA 90034
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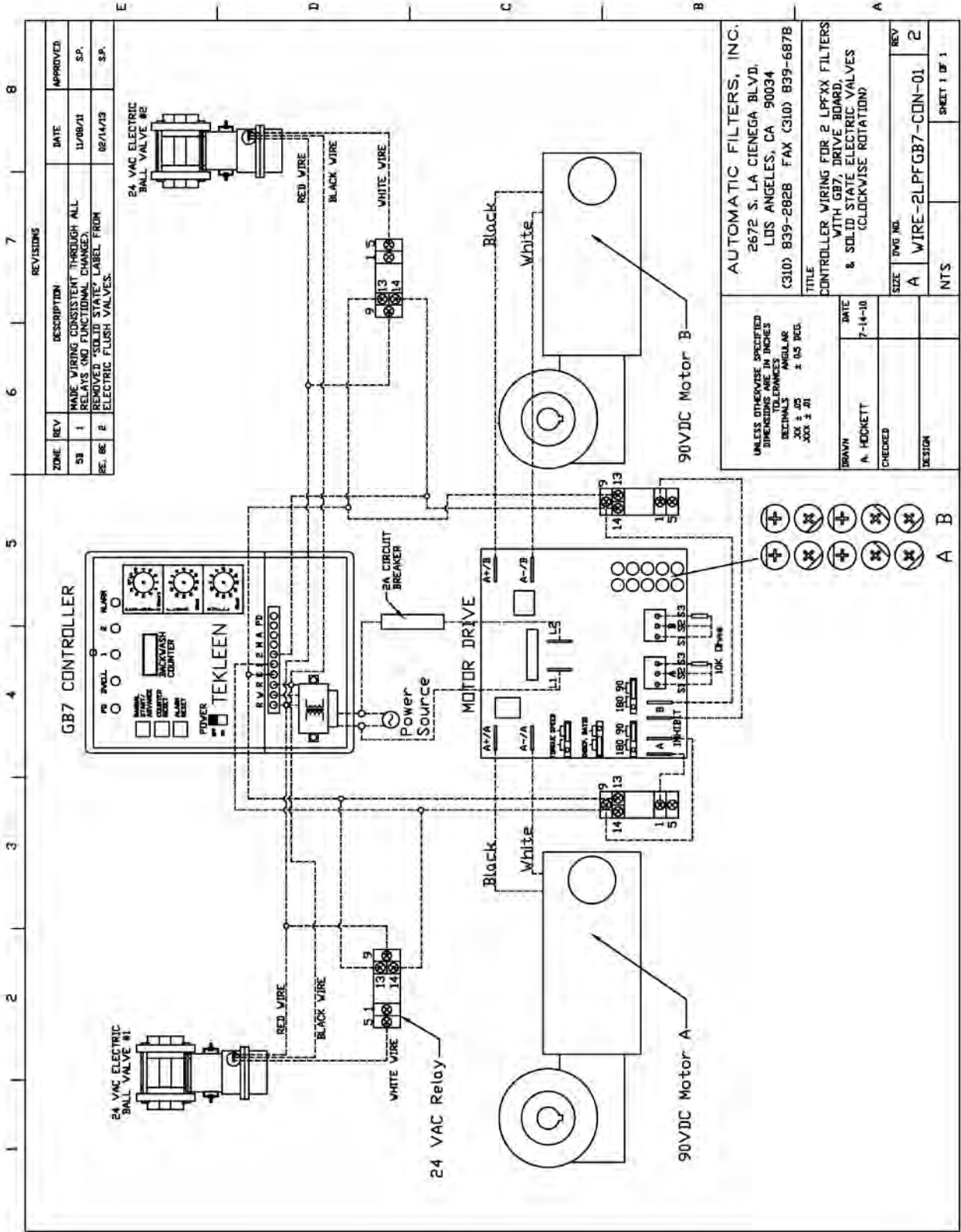
TITLE
 Controller Wiring for LPFX with GB6 Controller, Electric Ball Valve, and 90 VDC Motor

DESIGN	DATE	SIZE	REV
A. HICKETT	8-17-10	A	C
CHECKED		WIRE NO.	
		WIRE-LPFG6-CON-01A	
		NOT TO SCALE	SHEET 1 OF 1



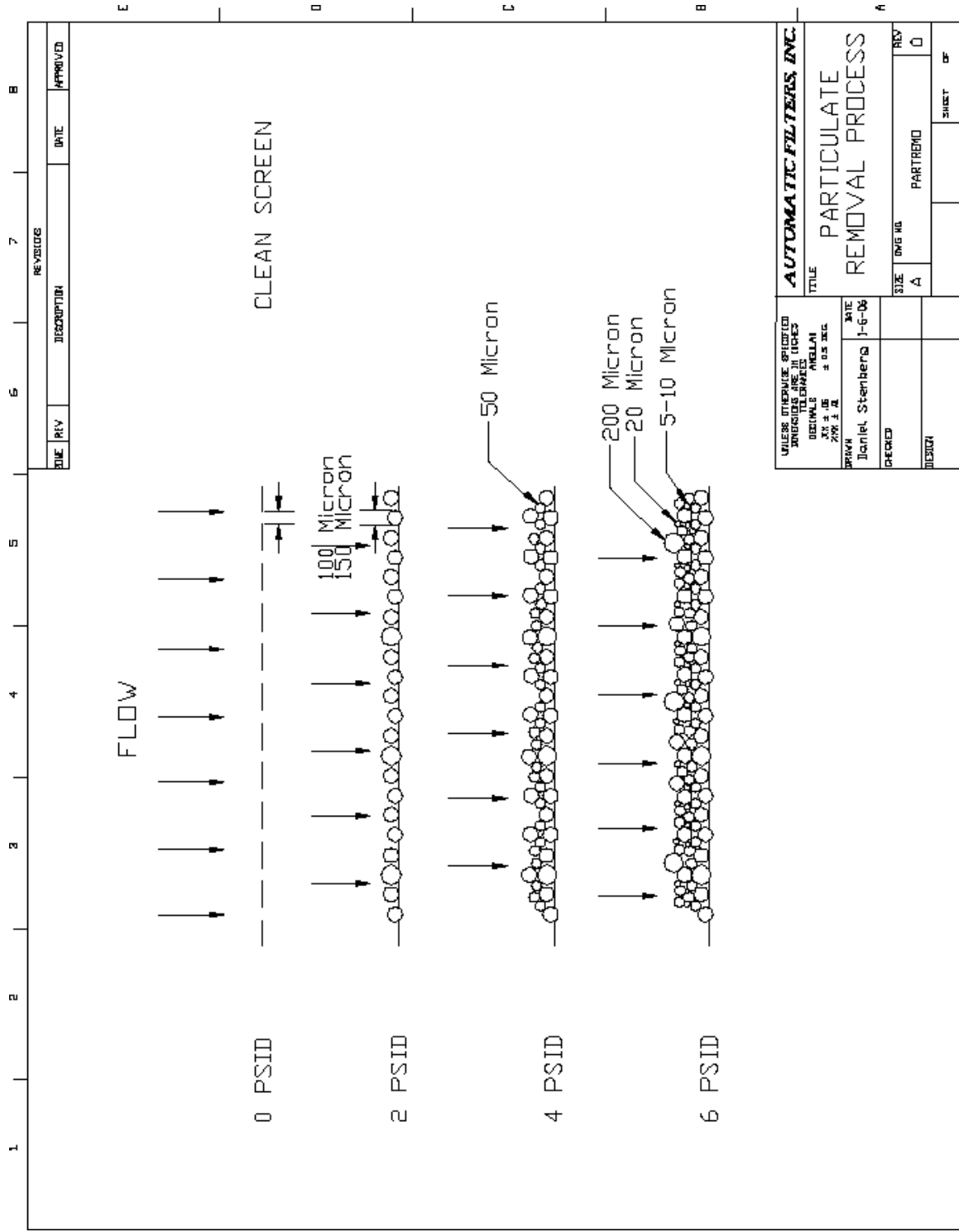
NOTES:

1. See drawing WIRE-2LPFG87-CON-01 for detailed wiring of components to electric controller.
2. Motor must rotate counter clockwise from viewpoint for filters that contain a fine screen with area less than 5.0 sq. ft. (I.E. models LPF2-SP, 2-XLP, 3-LP, 3-SP, 4-LPE, 4-P & 6-P). Motor must rotate clockwise for all other filters.



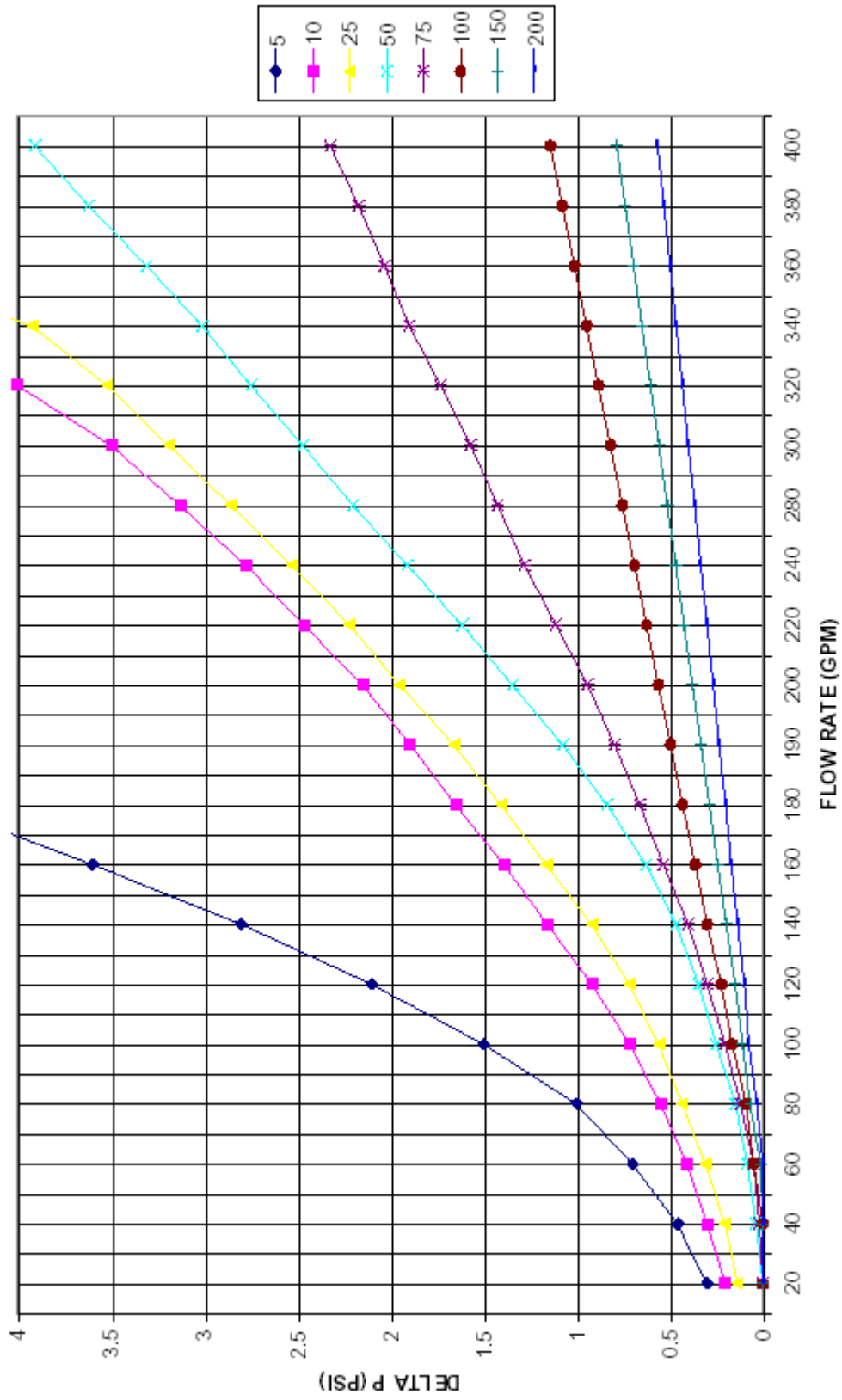
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
SB	1	MADE WIRING CONSISTENT THROUGH ALL RELAYS (NO FUNCTIONAL CHANGE)	11/08/11	S.P.
SE, BE, P	2	REMOVED "SOLID STATE" LABEL FROM ELECTRIC FLUSH VALVES	02/14/13	S.P.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMALS TOLERANCES ANGULAR .XX ± .01 .XXX ± .01		AUTOMATIC FILTERS, INC. 2672 S. LA CIENEGA BLVD. LOS ANGELES, CA 90034 (310) 839-2828 FAX (310) 839-6878	
TITLE CONTROLLER WIRING FOR 2 LPFXX FILTERS WITH GB7 DRIVE BOARD & SOLID STATE ELECTRIC VALVES (CLOCKWISE ROTATION)		DATE 7-14-10	
DRAWN A. HOCKETT		SIZE DWG NO. A WIRE-2LPFGB7-CON-01	
CHECKED		NTS	
DESIGN		REV 2	
		SHEET 1 OF 1	



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		AUTOMATIC FILTERS, INC.	
DESIGNER JAN ± '06 200 ± 1/8	DRAWN Daniel Stenberga 1-6-06	TITLE PARTICULATE REMOVAL PROCESS	
CHECKED	DATE 1-6-06	SIZE A	REV 0
DESIGN		PARTNO	SHEET OF

PRESSURE DROP DATA 1SQ FT.



WARRANTY

Automatic Filters, Inc. (AFI) warrants its filters and controllers to be free from original defects for one year from the date of original sale. The manufacturer will replace, free of charge, any part found defective under normal use and service within the guarantee period, provided the product is installed, used, and maintained in accordance with good engineering practice and all applicable instructions or limitations issued by AFI. The manufacturer assumes no liability for incidental or consequential damage sustained in the adoption or use of our engineering data, service, or products. Liability is limited to the repair or replacement of the products. No agent or representative of AFI has the authority to waive or add to this agreement. Altered products or use of products in a manner not intended shall void this warranty. All warranty claims must be sent along with the defective product, freight prepaid to AFI at its business address. All warranty shipments are for the account of the buyer. The warranty period shall be 12 months from the date of shipment to the client.

ACTUATED CONTROL VALVES

BF**Series 41****Butterfly Valve****Electric 120 VAC - NEMA 4****Description**

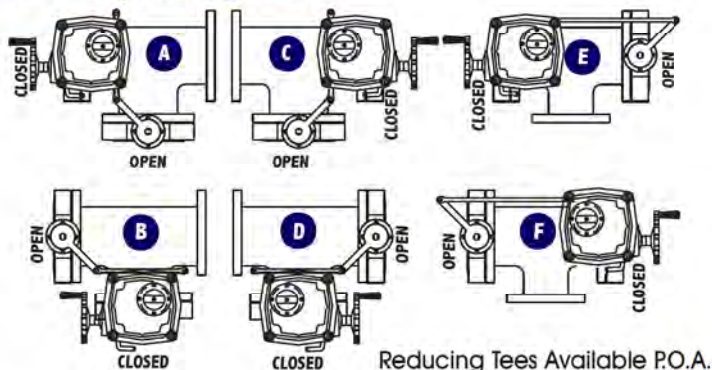
The BF Series 41 electric actuated valve assemblies are rated NEMA 4 for outdoor use. These assemblies are available in 2-way and 3-way configurations 2"-36", in a non-spring return type. Two way assemblies are complete with full lugged bodies, 304 stainless disc (2"-24"), EPDM seat, and direct mounted to an electric actuator. Three way assemblies are complete with (2) lugged valves mounted on a cast iron tee with linkage kit to an electric actuator for use in either mixing or diverting applications.

Operation

Valve assemblies with NEMA 4 electric actuators are powered by 120 VAC voltage. Each actuator is controlled by either on/off or modulating commands. All actuators contain reversible type, high torque output motors. These motors are protected with torque switches. The limit switches are independently operated by adjustable cams in each direction of operation. Light indication with (2) auxiliary switches are standard. Factory mounted, tested, and calibrated, these assemblies provide accurate and automatic valve positioning for temperature control.

Actuator Performance

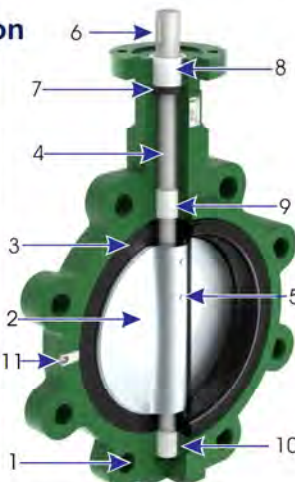
- Housing NEMA 4 (indoor or outdoor applications) protects against wind blown dust, rain, splashes and hose water
- Agency approved listings: CE, ETL Listed to UL 508
- Power supply 120 VAC 50/60 Hz
- Controls available are on/off or mod. (4-20 MA, 0-10 VDC)
- Manual handwheel override standard on each actuator
- Visual position indicator that confirms valve travel
- Noise level: 50 DB maximum
- Operating temperature: -40°F to +140°F
- Self-locking, permanently lubricated, worm gear train that prevents backdrive and the need for a mechanical brake
- Heater, thermostat standard to minimize condensation
- Auxiliary switches standard
- Mechanical stops standard
- Baked on epoxy coating for superior protection

Assembly Configurations**Valve Performance**

- 2-way and 3-way assemblies 2" through 36"
- Valves comply with MSS SP-67 specifications, for industry standard face to face requirements
- Lug bodies compatible with ANSI 125/150# flanges
- Extended 2" neck for insulation clearance
- 304 stainless steel disc for corrosion resistance
- Phenolic backed cartridge style seat which is non-collapsible, stretch resistant and blow out proof
- Maximum seat temperature EPDM -30°F to +275°F
- Maximum valve rating is 200 psi
- Bi-directional, bubble tight close off
- Maximum steam rating 15 psi (EPDM only)
- Valve seat does not require gaskets
- Valve rated for dead end service

Standard Valve Construction

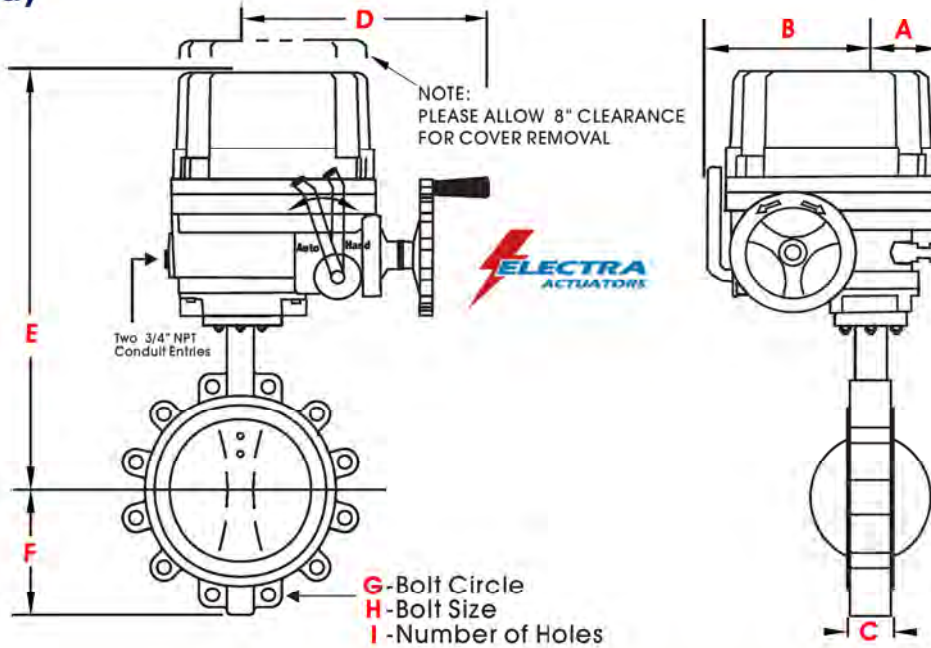
Item	Description	Materials
1	BODY	DUCTILE IRON
2	DISC	304 SS
3	SEAT	EPDM
4	SHAFT	416 SS
5	TAPER PINS	316 SS
6	KEY	416 SS
7	U-Cup Seal	BUNA-N
8	BUSHING	PTFE
9	BUSHING	PTFE
10	BUSHING	PTFE
11	SET SCREW	CARBON



BF Series 41 / Non-Spring



2-Way



Standard Assembly: Ductile Iron Body, 304 Stainless Disc, EPDM Seat, On/Off, 120 VAC, with Heater, Manual Override, 2-SPDT Switches Modulating Service Change Last O to E in Model Number, For Accessories See page 4, Wiring under "Electrical Section" Series 41

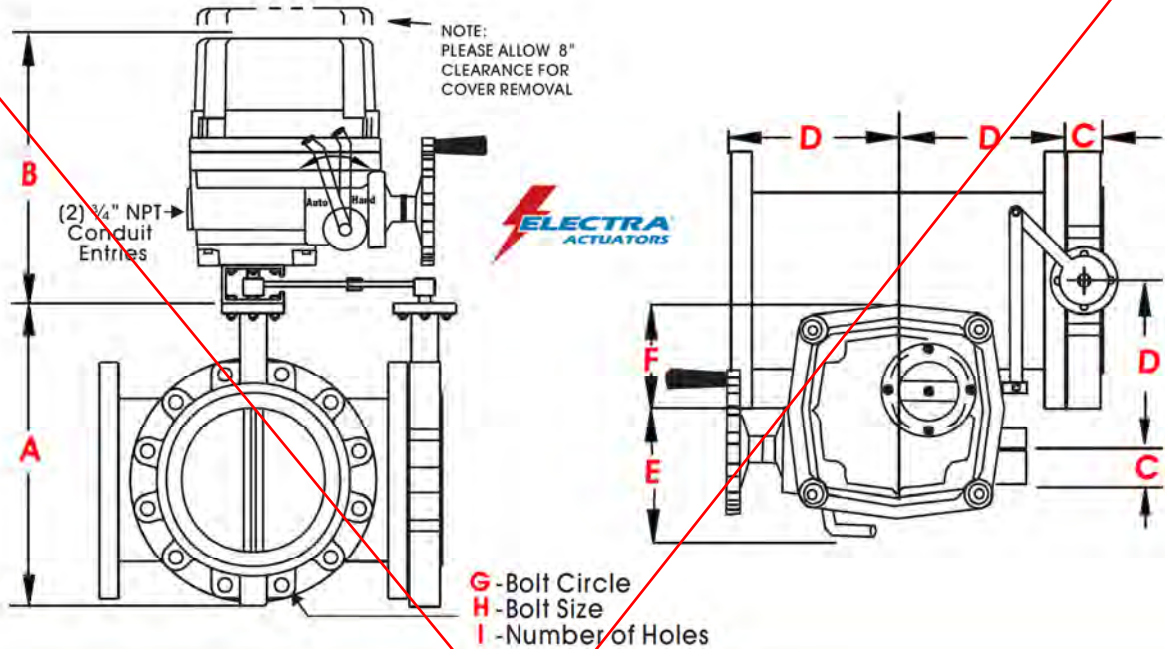
Assembly Specification				Speed 90°		Amp draw	41 Series operator		Assembly Dimensions								
Size	Model Number	Close off	Wt.	On/Off	Mod.	On/Off	On/off	Mod.	A	B	C	D	E	F	G	H	I
in DN		Psi Bar	lb Kg	(sec.)	(sec.)	Mod.			inch mm								
2 50	BF202FA410	200 14	37 17	22	75	2.38	700-00	700-01	3 1/2 89.0	5 1/2 140.0	1 3/4 44.5	10 1/2 267.0	16 5/8 422.3	3 1/4 82.6	4 3/4 120.7	5/8 - 11 UNC	4
2 1/2 65	BF225FA410	200 14	38 17	22	75	2.38	700-00	700-01	3 1/2 89.0	5 1/2 140.0	1 7/8 47.6	10 1/2 267.0	17 1/8 434.9	3 3/4 95.2	5 1/2 139.7	5/8 - 11 UNC	4
3 80	BF203FA410	200 14	44 20	22	75	2.38	700-00	700-01	3 1/2 89.0	5 1/2 140.0	1 7/8 47.6	10 1/2 267.0	17 7/8 441.3	4.0 101.6	6.0 152.4	5/8 - 11 UNC	4
4 100	BF204FA410	200 14	56 25	22	75	2.38	700-00	700-01	3 1/2 89.0	5 1/2 140.0	2 1/8 53.9	10 1/2 267.0	18 1/8 460.4	4 7/8 123.8	7 1/2 190.5	5/8 - 11 UNC	8
5 125	BF205FA410	200 14	58 26	22	75	2.38	700-01	700-01	3 1/2 89.0	5 1/2 140.0	2 1/4 57.2	10 1/2 267.0	20 5/8 523.9	5 3/8 136.5	8 1/2 215.9	3/4 - 10 UNC	8
6 150	BF206FA410	200 14	70 32	22	75	2.38	700-01	700-01	3 1/2 89.0	5 1/2 140.0	2 1/4 57.2	10 1/2 267.0	21 1/8 536.6	5 7/8 149.2	9 1/2 241.3	3/4 - 10 UNC	8
8 200	BF208FA410	200 14	100 45	22	75	2.87	700-02	700-02	3 1/2 89.0	5 1/2 140.0	2 1/2 63.5	10 1/2 267.0	21 3/4 550.4	7 1/8 180.9	11 3/4 298.5	3/4 - 10 UNC	8
8-U 200	BF208UA410	100 7	100 45	22	75	2.38	700-01	700-01	3 1/2 89.0	5 1/2 140.0	2 1/2 63.5	10 1/2 267.0	21 3/4 550.4	7 1/8 180.9	11 3/4 298.5	3/4 - 10 UNC	8
10 250	BF210FA410	200 14	124 56	26	75	3.38	700-03	700-03	4.0 102.0	5 1/2 140.0	2 3/4 69.9	11 1/4 286.0	23.0 582.1	8 1/4 209.6	14 1/4 361.9	7/8 - 9 UNC	12
10-U 250	BF210UA410	100 7	124 56	26	75	3.38	700-03	700-03	4.0 102.0	5 1/2 140.0	2 3/4 69.9	11 1/4 286.0	23.0 582.1	8 1/4 209.6	14 1/4 361.9	7/8 - 9 UNC	12
12 300	BF212FA410	200 14	159 72	32	75	4.55	700-06	700-06	4.0 102.0	6 3/8 162.0	3 3/8 79.4	11 1/4 286.0	24 3/4 626.6	9 3/4 247.7	17.0 431.8	7/8 - 9 UNC	12
12-U 300	BF212UA410	100 7	159 72	26	75	3.38	700-03	700-03	4.0 102.0	6 3/8 162.0	3 3/8 79.4	11 1/4 286.0	24 3/4 626.6	9 3/4 247.7	17.0 431.8	7/8 - 9 UNC	12
14 350	BF214RA410	150 10	214 97	32	75	4.55	700-06	700-06	4.0 102.0	6 3/8 162.0	3 3/8 79.4	11 1/4 286.0	26.0 658.3	11.0 279.4	18 3/4 476.3	1 - 8 UNC	12
16 400	BF216RA410	150 10	260 118	32	75	7.20	700-12	700-12	4 3/8 111.1	7 3/8 186.0	3 1/2 88.9	12 1/8 307.0	28 1/8 715.10	12.0 304.8	21 1/4 539.8	1 - 8 UNC	16
18 450	BF218RA410	150 10	294 133	97	97	7.20	700-30	700-30	5 1/4 133.0	7 3/8 186.0	4 1/4 113.4	12 1/8 307.0	46 3/4 1187.5	14 3/8 365.2	22 3/4 577.9	1 1/8 - 7 UNC	16
20 500	BF220RA410	150 10	568 258	97	97	7.20	700-30	700-30	5 1/4 133.0	7 3/8 186.0	5 1/4 133.4	12 1/8 307.0	46 3/4 1187.5	14 5/8 371.5	25.0 635.0	1 1/8 - 7 UNC	20
24 600	BF224RA410	150 10	783 355	97	97	7.20	700-30	700-30	5 1/4 133.0	7 3/8 186.0	6 1/8 155.6	12 1/8 307.0	46 3/4 1187.5	18.0 457.2	29 1/2 749.3	1 1/4 - 7 UNC	20

NOTE: Wiring Diagrams Located Under "Electrical Section" Series 41, Tagged With Operator Number

BF Series 41 / Non-Spring



3-Way



Standard Assembly: Ductile Iron Body, 304 Stainless Disc, EPDM Seat, On/Off, 120 VAC, with Heater, Manual Override, 2-SPDT Switches Modulating Service Change Last O to E in Model Number, For Accessories See page 4, Wiring under "Electrical Section" Series 41

Assembly Specification				Speed 90°		Amp draw	41 Series operator		Assembly Dimensions								
Size in DN	Model Number	Close off Psi Bar	Wt. lb Kg	On/Off (sec.)	Mod. (sec.)	On/Off Mod.	On/off	Mod.	A	B	C	D	E	F	G	H	I
2 50	BF302FA410	200 14	62 28	22	75	2.38	700-00	700-01	9 5/8 244.5	13 1/4 336.6	1 3/4 44.5	4 1/2 114.3	5 1/2 140.0	3 1/2 89.0	4 3/4 120.7	5/8 - 11 UNC	4
2 1/2 65	BF325FA410	200 14	73 33	22	75	2.38	700-00	700-01	10 5/8 269.9	13 1/4 336.6	1 7/8 47.6	5.0 127.0	5 1/2 140.0	3 1/2 89.0	5 1/2 139.7	5/8 - 11 UNC	4
3 80	BF303FA410	200 14	92 42	22	75	2.38	700-00	700-01	11 7/8 282.6	13 1/4 336.6	1 7/8 47.6	5 1/2 139.7	5 1/2 140.0	3 1/2 89.0	6.0 152.4	5/8 - 11 UNC	4
4 100	BF304FA410	200 14	143 65	22	75	2.38	700-01	700-01	12 3/4 323.9	13 1/4 336.6	2 1/8 53.9	6 1/2 165.1	5 1/2 140.0	3 1/2 89.0	7 1/2 190.5	5/8 - 11 UNC	8
5 125	BF305FA410	200 14	165 75	22	75	2.38	700-01	700-01	13 3/4 349.3	13 1/4 336.6	2 1/4 57.2	7 1/2 190.5	5 1/2 140.0	3 1/2 89.0	8 1/2 215.9	3/4 - 10 UNC	8
6 150	BF306FA410	200 14	195 89	22	75	2.87	700-02	700-02	14 3/4 374.7	13 1/4 336.6	2 1/4 57.2	8.0 203.2	5 1/2 140.0	3 1/2 89.0	9 1/2 241.3	3/4 - 10 UNC	8
8 200	BF308FA410	200 14	350 159	26	75	3.38	700-03	700-03	17 3/8 441.3	14 1/2 366.0	2 1/2 63.5	9.0 228.6	6 3/8 162.0	4.0 102.0	11 3/4 298.5	3/4 - 10 UNC	8
8-U 200	BF308UA410	100 7	295 134	22	75	2.87	700-02	700-02	17 3/8 441.3	13 1/4 336.6	2 1/2 63.5	9.0 228.6	5 1/2 140.0	3 1/2 89.0	11 3/4 298.5	3/4 - 10 UNC	8
10 250	BF310FA410	200 14	500 227	32	75	4.55	700-06	700-06	19 3/4 501.7	14 1/2 366.0	2 3/4 69.9	11.0 279.4	6 3/8 162.0	4.0 102.0	14 1/4 361.9	7/8 - 9 UNC	12
10-U 250	BF310UA410	100 7	445 202	26	75	3.38	700-03	700-03	19 3/4 501.7	14 1/2 366.0	2 3/4 69.9	11.0 279.4	6 3/8 162.0	4.0 102.0	14 1/4 361.9	7/8 - 9 UNC	12
12 300	BF312FA410	200 14	680 309	32	75	4.55	700-06	700-06	21.0 533.4	14 1/2 366.0	3 3/8 79.4	12.0 304.8	6 3/8 162.0	4.0 102.0	17.0 431.8	7/8 - 9 UNC	12
12-U 300	BF312UA410	100 7	680 309	26	75	3.38	700-03	700-03	21.0 533.4	14 1/2 366.0	3 3/8 79.4	12.0 304.8	6 3/8 162.0	4.0 102.0	17.0 431.8	7/8 - 9 UNC	12
14 350	BF314RA410	150 10	925 420	32	75	7.20	700-08	700-08	25 1/2 647.7	15 1/2 391.0	3 3/8 79.4	14.0 355.6	7 3/8 186.0	4 3/8 111.1	18 3/4 476.3	1 - 8 UNC	12
16 400	BF316RA410	150 10	1190 541	32	75	7.20	700-12	700-12	27 3/4 704.9	15 1/2 391.0	3 1/2 88.9	15.0 381.0	7 3/8 186.0	4 3/8 111.1	21 1/4 539.8	1 - 8 UNC	16
18 450	BF318RA410	150 10	1350 614	97	97	7.20	700-30	700-30	31.0 787.4	33 1/4 844.5	4 1/4 107.9	16 1/2 419.1	7 3/8 186.0	5 1/4 133.0	22 3/4 539.8	1 1/8 - 7 UNC	16
20 500	BF320RA410	150 10	1900 864	97	97	7.20	700-30	700-30	33 1/2 850.9	33 1/4 844.5	5 1/4 133.4	18.0 457.2	7 3/8 186.0	5 1/4 133.0	25.0 635.0	1 1/8 - 7 UNC	20
24 600	BF324RA410	150 10	2800 1273	97	97	7.20	700-30	700-30	40 7/8 1019.2	33 1/4 844.5	6 1/8 155.6	22.0 558.8	7 3/8 186.0	5 1/4 133.0	29 1/2 539.8	1 1/4 - 7 UNC	20

NOTE: Wiring Diagrams Located Under "Electrical Section" Series 41, Tagged With Operator Number

Flow Coefficients (C_v) Degrees represent angle of disc opening

2-Way Valve Assembly

Size	10°	20°	30°	40°	50°	60°	70°	80°	90°
2"	0.06	3	7	15	27	44	70	105	115
2 1/2"	0.10	6	12	25	45	75	119	278	196
3"	0.20	9	18	39	70	116	183	275	302
4"	0.30	17	36	78	139	230	364	546	600
5"	0.50	29	61	133	237	392	620	930	1022
6"	0.80	45	95	205	366	605	958	1437	1579
8"	2	89	188	408	727	1202	1903	2854	3136
10"	3	151	320	694	1237	2047	3240	4859	5340
12"	4	234	495	1072	1911	3162	5005	7507	8250
14"	6	338	715	1549	2761	4568	7230	10844	11917
16"	8	464	983	2130	3797	6282	9942	14913	16388
18"	11	615	1302	2822	5028	8320	13168	19752	21705
20"	14	791	1674	3628	6450	10698	16931	25396	27908
24"	22	1222	2587	5605	9989	16528	26157	39236	43116

3-Way Valve Assembly

Size	10°	20°	30°	40°	45°	50°	60°	70°	80°	90°
2"	105	73	51	42	42	42	51	73	105	115
2 1/2"	178	125	87	70	70	70	87	125	178	196
3"	275	192	134	109	109	109	134	192	275	302
4"	546	381	266	217	217	217	266	381	546	600
5"	931	649	453	370	370	370	453	649	931	1022
6"	1438	1003	700	571	571	571	700	1003	1438	1579
8"	2856	1992	1390	1135	1135	1135	1390	1992	2856	3136
10"	4862	3391	2367	1931	1931	1931	2367	3391	4862	5340
12"	7511	5239	3657	2983	2983	2983	3657	5239	7511	8250
14"	10850	7568	5283	4310	4310	4310	5283	7568	10850	11917
16"	14921	10406	7265	5927	5927	5927	7265	10406	14921	16388
18"	19763	13783	9622	7850	7850	7850	9622	13783	19763	21705
20"	25410	17722	12372	10093	10093	10093	12372	17722	25410	27907
24"	39258	27379	19115	11210	11210	11210	19115	27379	39258	43116

Note: The flow characteristic of a valve is described as the C_v value. C_v is defined as the max flow of 60°F water expressed in GPM (Gallons per minute) which produces a 1 psi pressure drop across the valve.

Assembly Number

Series	Config	Size	Close Off	Disc/Seat	Actuator	Controls	Accessories
BF	2	04	F	A	41	E	
1	2	3	4	5	6	7	8

1. Series
BF = BF Butterfly Valve

2. Configuration
2 = 2-way
3 = 3-way

3. Size
02 = 2.0"
25 = 2.5"
03 = 3.0"
04 = 4.0"
to
36 = 36.0"

4. Close Off
F = Full Rated / 200 PSI
U = Under Cut / 100 PSI (8", 10", 12")
R = Reduced Rated / 150 PSI (14" and Above)

5. Construction
A = 304 Stainless Disc / EPDM Seat

6. Actuator
41 = Non-Spring / 120 VAC

7. Controls
Q = On/Off
E = Modulating 0-10 VDC / 4-20 MA

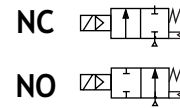
8. Accessories
C = Cycle Timer
D = Digital Board 0-10 VDC / 4-20 MA
F = Feedback (specify 0-10 or 4-20 out)
J = Manual Override Kill Box
T = Local Control Station

Please specify 3-Way Configuration Located on Front of Brochure
Gold Seal Warranty: 2 Years Limited Warranty

SOLENOID VALVE



Pilot Operated
General Service Solenoid Valves
 Brass or Stainless Steel Bodies
 3/8" to 2 1/2" NPT



288/324
2/2
 SERIES
8210

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

Valve Parts in Contact with Fluids		
Body	Brass	304 Stainless Steel
Seals and Discs	NBR or PTFE	
Disc-Holder	PA	
Core Tube	305 Stainless Steel	
Core and Plugnut	430F Stainless Steel	
Springs	302 Stainless Steel	
Shading Coil	Copper	Silver

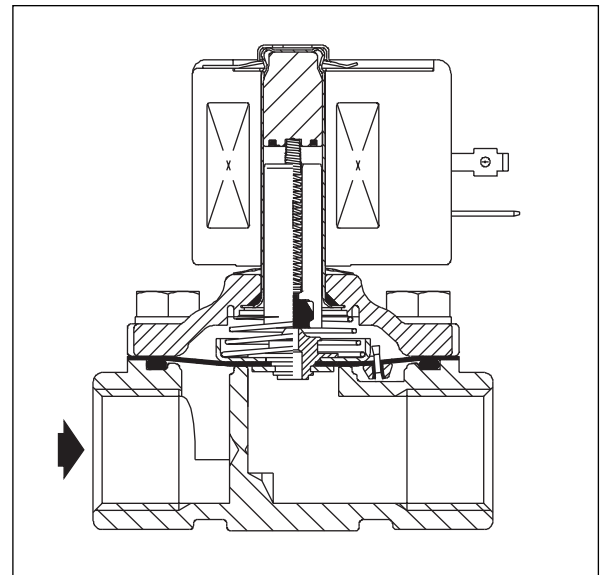
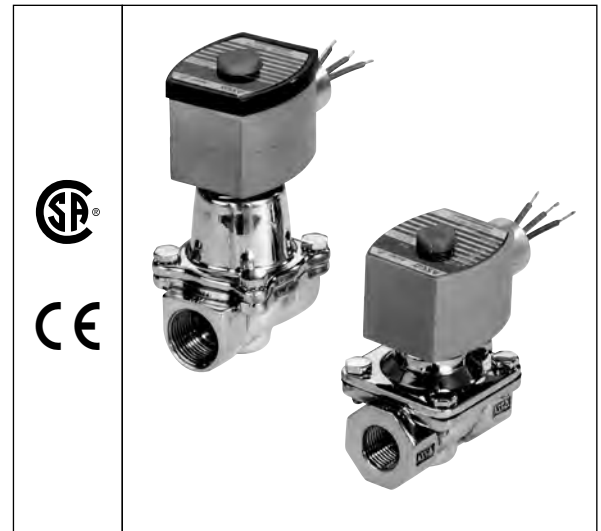
Electrical

Standard Coil and Class of Insulation	Watt Rating and Power Consumption				Spare Coil Part Number			
	DC Watts	AC			General Purpose		Explosionproof	
		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	-
H	30.6	-	-	-	-	74073	-	74073
F	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: Red-Hat II - Watertight, Types 1, 2, 3, 3S, 4, and 4X; Red-Hat - Type I.
Optional: Red-Hat 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 8210B57, 8210B58, and 8210B59. Valves not available with Explosionproof enclosures.)
 See *Optional Features Section* for other available options.



Nominal Ambient Temperature Ranges:

- Red-Hat II/
- Red-Hat AC: 32°F to 125°F (0°C to 52°C)
- Red-Hat II DC: 32°F to 104°F (0°C to 40°C)
- Red-Hat DC: 32°F to 77°F (0°C to 25°C)
 (104°F/40°C occasionally)

Refer to *Engineering Section* for details.

Approvals:

CSA certified. Red-Hat II meets applicable CE directives.
 Refer to *Engineering Section* for details.

Specifications (English units)

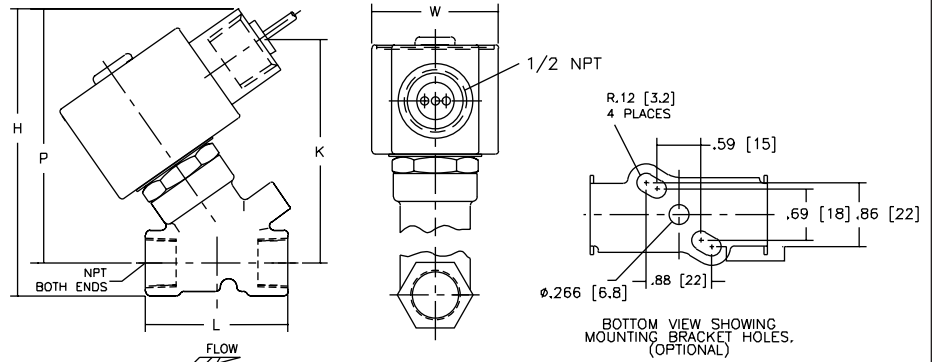
Pipe Size (ins.)	Orifice Size (ins.)	Cv Flow Factor	Min.	Operating Pressure Differential (psi)						Max. Fluid Temp. °F		Brass Body			Stainless Steel Body			Watt Rating/Class of Coil Insulation ⑦	
				Max. AC			Max. DC			AC	DC	Catalog Number	Constr. Ref. No. ④	UL ⑤ Listing	Catalog Number	Constr. Ref. No. ④	UL ⑤ Listing	AC	DC
				Air-Inert Gas	Water	Light Oil @ 300 SSU	Air-Inert Gas	Water	Light Oil @ 300 SSU										
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																			
3/8	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	○	-	-	-	6.1/F	11.6/F
3/8	5/8	3	5	300	300	300	-	-	-	175	-	8210G6	5D	○	-	-	-	17.1/F	-
1/2	7/16	2.2	①	150	125	-	40	40	-	180	150	8210G15 ③	2P	●	8210G37 ③	2P	●	6.1/F	11.6/F
1/2	5/8	4	0	150	150	-	40	40	-	180	150	8210G94	5D	○	-	-	-	10.1/F	11.6/F
1/2	5/8	4	0	150	150	125	40	40	-	175	150	-	-	-	8210G87	7D	●	17.1/F	11.6/F
1/2	5/8	4	5	200	150	135	125	100	100	180	150	8210G2	6D	○	-	-	-	6.1/F	11.6/F
1/2	5/8	4	5	300	300	300	-	-	-	175	-	8210G7	5D	○	-	-	-	17.1/F	-
1/2	3/4	4	5	-	300	-	-	300	-	180	125	8210G227	5D	○	-	-	-	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	○	-	-	-	6.1/F	11.6/F
3/4	3/4	5	0	150	150	-	40	40	-	180	150	8210G95	8D	○	-	-	-	10.1/F	11.6/F
3/4	3/4	6.5	5	250	150	100	125	125	125	180	150	8210G3	11D	○	-	-	-	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	○	-	-	-	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	-	-	-	180	-	8210G55	43D	●	-	-	-	16.1/F	-
1 1/4	1 1/8	15	5	150	150	100	125	125	125	180	150	8210G8	16D	○	-	-	-	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	-	8210G56 ‡	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
NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)																			
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 ⑧ 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	-	-	-	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	24D	●	-	-	-	-	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	●	-	-	-	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	●	-	-	-	16.1/F	-
1 1/4	1 1/8	15	0	125	125	125	-	-	-	180	-	8210B58 ⑥ 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	5	150	150	125	-	-	-	180	-	8210G18	48D	●	-	-	-	16.1/F	-
1 1/2	1 1/4	22.5	0	125	125	125	-	-	-	180	-	8210B59 ⑥ ⑩	36D	●	-	-	-	20/F	-
1 1/2	1 1/4	22.5	5	-	-	-	125	125	125	-	180	8210D32	29D	●	-	-	-	-	16.8/F
1 1/2	1 1/4	22.5	5	150	150	125	-	-	-	180	-	8210G32	49D	●	-	-	-	16.1/F	-
2	1 3/4	43	5	-	-	-	125	125	125	-	150	8210I03	30P	●	-	-	-	-	16.8/F
2	1 3/4	43	5	125	125	125	-	-	-	180	-	8210G103	50P	●	-	-	-	16.1/F	-
2 1/2	1 3/4	45	5	-	-	-	125	125	125	-	150	8210I04	27P	●	-	-	-	-	16.8/F
2 1/2	1 3/4	45	5	125	125	125	-	-	-	180	-	8210G104	51P	●	-	-	-	16.1/F	-
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.											⑥ Valves not available with Explosionproof enclosures. ⑦ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts. ⑧ AC construction also has PA seating. ⑨ No disc-holder. ⑩ Stainless Steel disc-holder. ‡ Must have solenoid mounted vertical and upright.								

Dimensions: inches (mm)

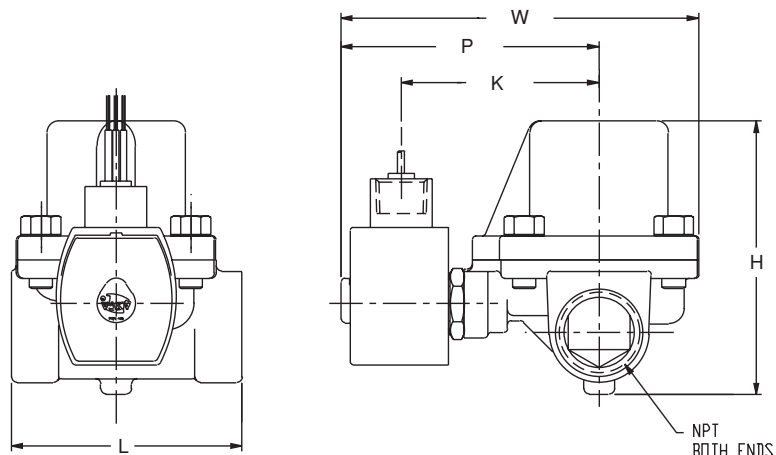
Constr. Ref. No.		H	K	L	P	W
1*	ins.	3.85	3.00	1.91	3.41	1.69
	mm	98	76	49	87	43
2*	ins.	4.17	3.25	2.28	3.63	1.69
	mm	106	83	58	92	43
13	ins.	4.44	3.22	3.75	4.19	5.81
	mm	113	82	95	106	147
5	ins.	3.84	2.31	2.75	3.28	2.28
	mm	98	59	70	83	58
6*	ins.	3.38	1.94	2.75	2.80	2.28
	mm	86	49	70	71	58
7	ins.	4.19	2.50	2.81	3.47	2.39
	mm	106	64	71	88	61
8	ins.	4.13	2.47	2.81	3.44	2.29
	mm	105	63	71	87	58
9*	ins.	3.66	2.10	2.81	2.96	2.28
	mm	93	53	71	75	58
10* ^①	ins.	5.25	X	2.81	4.59	2.31
	mm	133	X	71	117	59
11*	ins.	4.16	2.66	3.84	3.52	2.75
	mm	106	68	98	89	70
12	ins.	5.64	3.15	3.75	4.01	3.36
	mm	143	80	95	102	85
15*	ins.	5.34	X	3.75	4.47	3.84
	mm	136	X	95	114	98
16	ins.	5.64	3.15	3.66	4.01	3.56
	mm	143	80	93	102	90
18	ins.	6.11	3.30	4.38	4.16	3.92
	mm	155	84	111	106	100
20*	ins.	7.33	3.71	5.06	4.57	4.87
	mm	186	94	129	116	124
21*	ins.	7.33	3.71	5.50	4.57	4.87
	mm	186	94	140	116	124
23	ins.	4.35	2.65	2.75	3.79	2.28
	mm	110	67	70	96	58
24	ins.	5.06	X	3.78	4.44	2.75
	mm	129	X	96	113	70
25	ins.	4.64	2.81	2.81	3.94	2.28
	mm	118	71	71	100	58
26	ins.	6.53	X	3.75	4.91	3.19
	mm	166	X	95	125	81
27	ins.	8.22	X	5.50	5.47	4.87
	mm	209	X	140	139	124
28	ins.	6.53	X	3.66	4.91	3.19
	mm	166	X	93	125	81
29	ins.	7.03	X	4.38	5.06	4.40
	mm	179	X	111	129	112

① Valves must be mounted with solenoid vertical and upright.
* DC dimensions slightly larger.

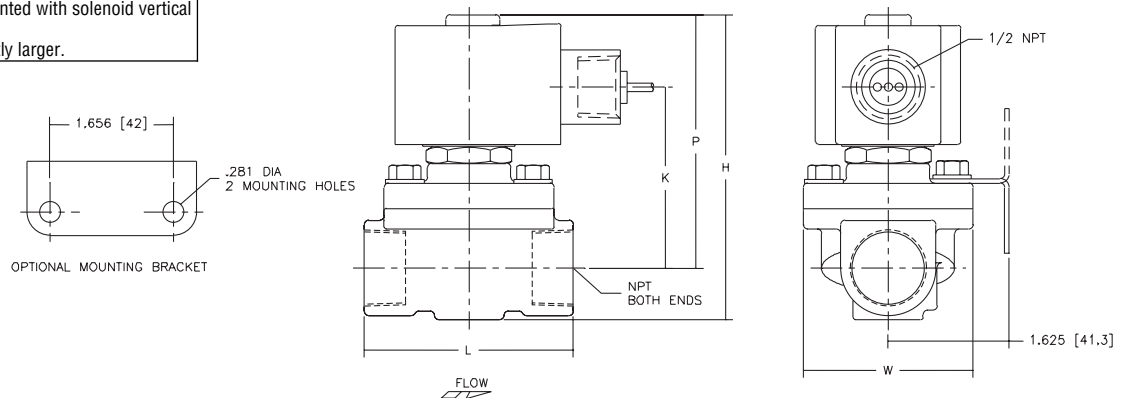
Constr. Refs. 1, 2



Constr. Ref. 13



Constr. Refs. 5-9, 11, 20, 21, 23, 25, 37, 38

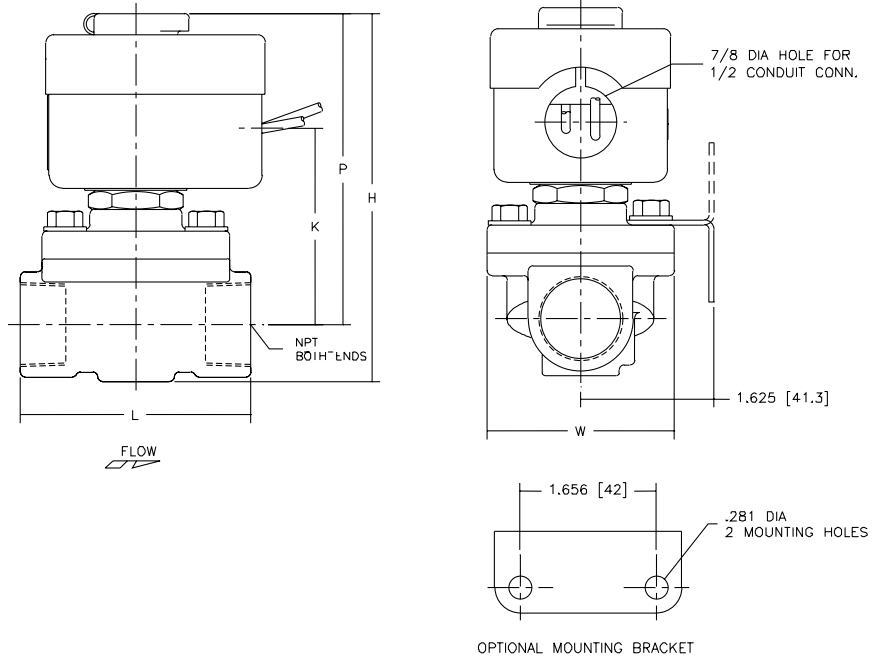


Dimensions: inches (mm)

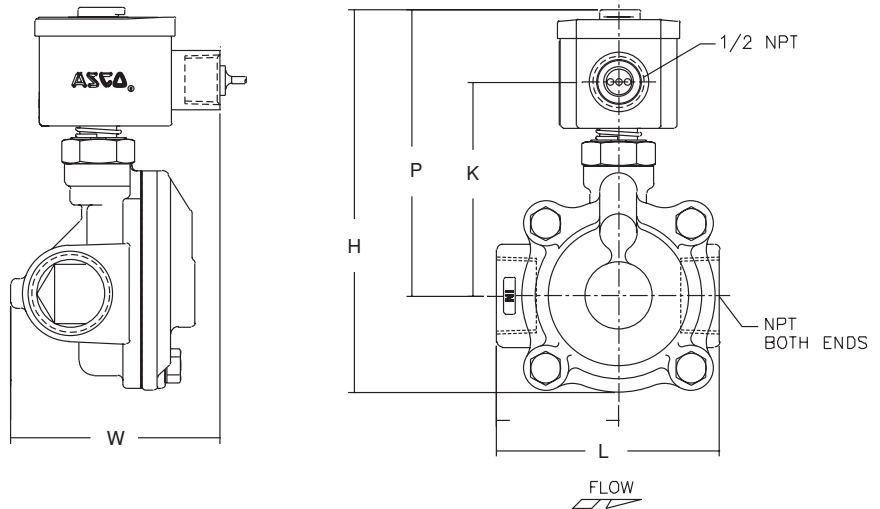
Constr. Ref. No.		H	K	L	P	W
30	ins.	8.22	X	5.06	5.47	4.87
	mm	209	X	129	139	124
31	ins.	5.25	X	3.75	4.44	3.25
	mm	133	X	95	113	83
32	ins.	5.69	X	3.66	4.69	3.25
	mm	145	X	93	119	83
33	ins.	6.06	X	4.38	4.94	3.91
	mm	154	X	111	125	99
34	ins.	6.91	X	3.75	6.09	3.25
	mm	176	X	95	155	83
35	ins.	7.34	X	3.66	6.34	3.25
	mm	186	X	93	161	83
36	ins.	7.66	X	4.38	6.56	3.91
	mm	195	X	111	167	99
37	ins.	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
38	ins.	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
39	ins.	5.42	2.31	2.75	4.86	3.80
	mm	138	59	70	123	97
40	ins.	5.20	3.29	2.81	4.50	2.28
	mm	132	83	71	114	58
41	ins.	5.13	3.10	3.75	4.32	3.25
	mm	130	79	95	110	83
42	ins.	6.43	4.40	3.93	5.62	3.25
	mm	163	112	100	143	83
43	ins.	5.57	3.35	3.66	4.57	3.25
	mm	142	85	93	116	83
44	ins.	5.90	3.57	4.38	4.79	3.91
	mm	150	91	111	122	99
45	ins.	5.26	3.17	3.75	4.38	3.84
	mm	134	81	95	111	98
46	ins.	4.95	3.10	3.84	4.31	2.75
	mm	126	79	98	110	70
47	ins.	6.43	3.59	3.75	4.81	3.52
	mm	163	91	95	122	90
48	ins.	6.43	3.59	3.66	4.81	3.73
	mm	163	91	93	122	95
49	ins.	6.91	3.75	4.38	4.96	4.40
	mm	176	95	111	126	112
50	ins.	8.13	4.15	5.06	5.37	4.87
	mm	207	105	129	136	124
51	ins.	8.13	4.15	5.50	5.37	5.18
	mm	207	105	140	136	132

IMPORTANT: Valves may be mounted in any position, except as noted in specifications table.

Constr. Refs. 10, 15, 24, 26-36



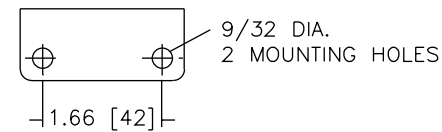
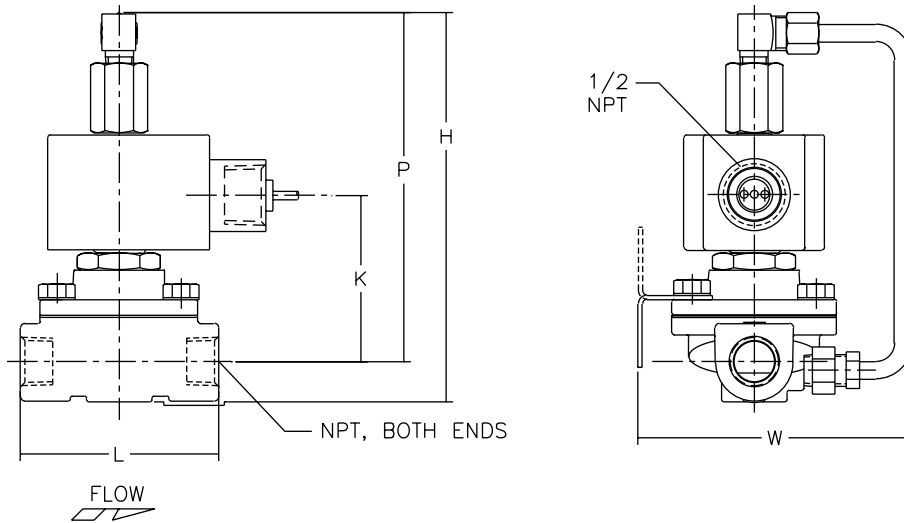
Constr. Refs. 12, 16, 18



Note: Valve must be mounted with solenoid vertical and upright.

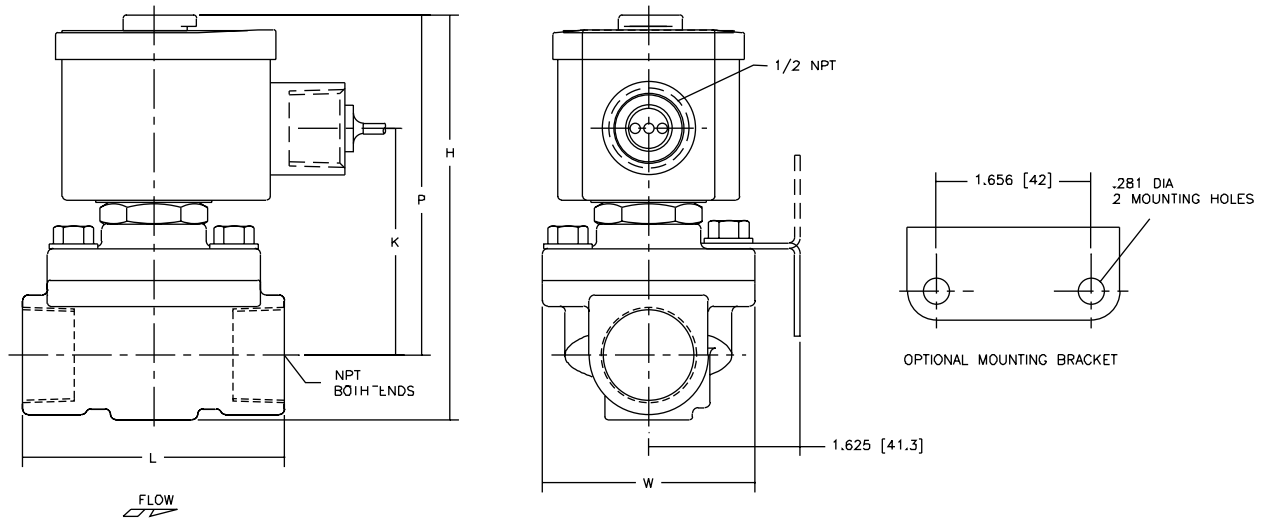
Dimensions: inches (mm)

Constr. Refs. 39



SHOWING MOUNTING
BRACKET ONLY

Constr. Refs. 40-51



MANUAL BUTTERFLY VALVES

PRO VALVE™

Butterfly Catalog Manual & Automated

SERIES 500



BUTTERFLY VALVES - Series 500

PRO VALVE


SERIES 500 Features and Benefits

- Resilient seat provides bi-directional bubble tight close off ANSI Class VI.
- Phenolic backed seat provides a positive seal against standard ANSI flanges. Seat serves as a flange seal eliminating the need for a gasket.
- Primary stem seal, formed by preloaded contact of disc hub with flattened seat surface, completely isolates stem and body parts from the line media.
- Secondary stem seal formed by an engineered interference fit of the stem through the seat.
- Superior one piece shaft design, provides high strength and positive disc control.
- PTFE corrosion resistant upper and lower bushings ensure long service life with low operating torques.
- Solid stainless steel disc has polished disc edge for lower seating and unseating torques. Disc is low profile for minimum flow restriction and low pressure loss.
- Heavy duty one piece ductile iron body with extended neck allows for insulation clearance. Body is epoxy coated for excellent chemical resistance.
- Dead end service set screws lock the seat to the body to ensure disc does not blow out in dead in service.
- Stainless steel taper pins are driven into the disc and lock the disc in place for Maximum strength against vibration loads.
- Designed to comply with MSS SP-67 and API 609 specifications.

MARKETS SERVED

HVAC / ATC

Chemical

Petrochemical Processing

Power and Utilities

Food and Beverage

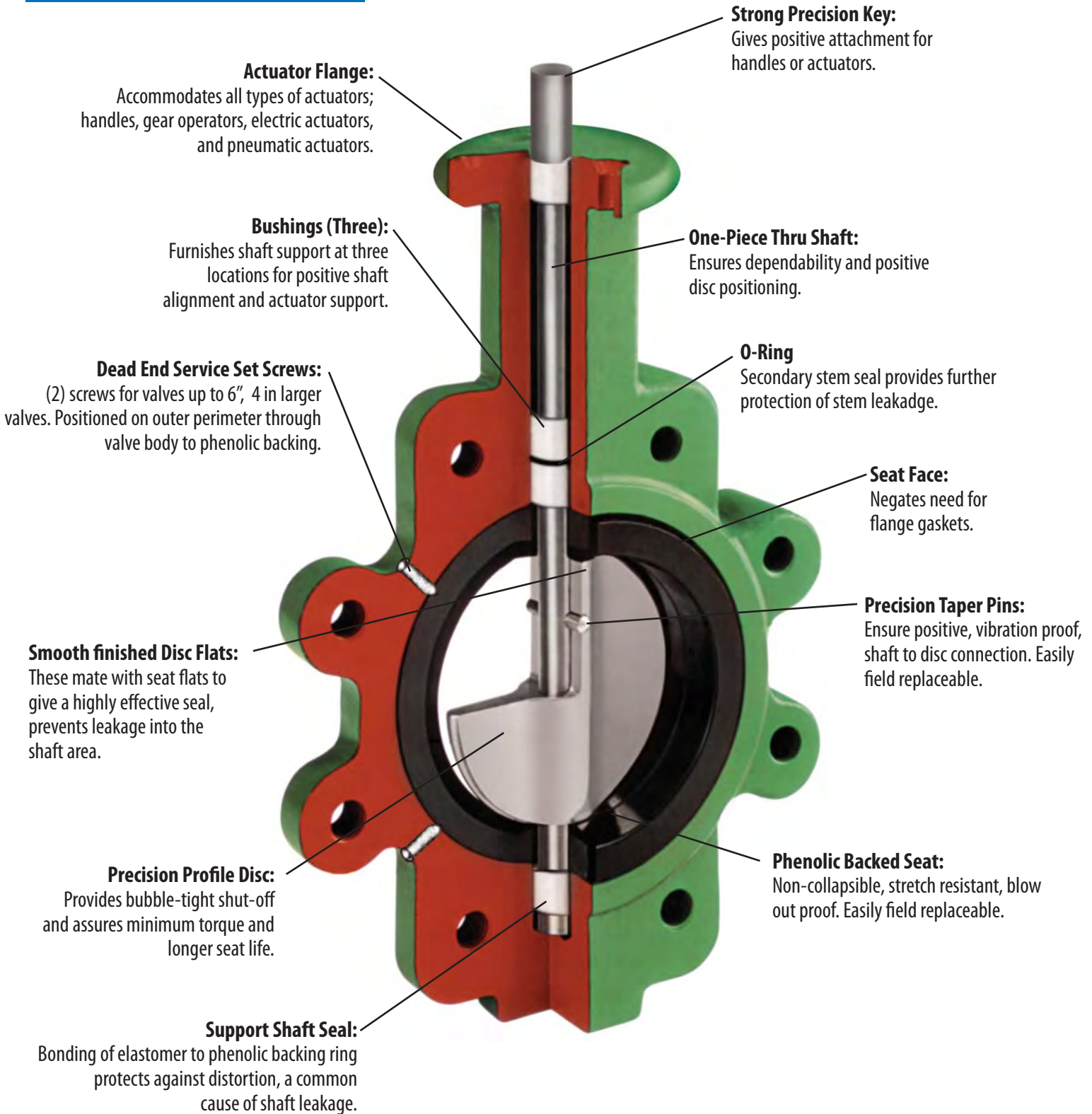
Pulp & Paper Industry

Steel Processing

BUTTERFLY VALVES - Series 500

PRO VALVE

Sectional View



BUTTERFLY VALVES - Series 500



C_v Values — Valve Sizing Coefficients (US-GPM @1ΔP)

Size	10°	20°	30°	40°	50°	60°	70°	80°	90°
2"	0.06	3	7	15	27	44	70	105	115
2 ½"	0.10	6	12	25	45	75	119	178	196
3"	0.20	9	18	39	70	116	183	275	302
4"	0.30	17	36	78	139	230	364	546	600
5"	0.50	29	61	133	237	392	620	930	1022
6"	0.80	45	95	205	366	605	958	1437	1579
8"	2	89	188	408	727	1202	1903	2854	3136
10"	3	151	320	694	1237	2047	3240	4859	5340
12"	4	234	495	1072	1911	3162	5005	7507	8250
14"	6	338	715	1549	2761	4568	7230	10844	11917
16"	8	464	983	2130	3797	6282	9942	14913	16388
18"	11	615	1302	2822	5028	8320	13168	19752	21705
20"	14	791	1674	3628	6465	10698	16931	25396	27908
24"	22	1222	2587	5605	9989	16528	26157	39236	43116
30"	37	2080	4406	9546	17010	28147	44545	66818	73426

Valve Seating Torques (In-Lbs.)

Valve Size	Standard Disc Differential Pressure				Undercut Diff. Press.
	50 PSI ΔP Bushing	100 PSI ΔP Bushing	150 PSI ΔP Bushing	200 PSI ΔP Bushing	75 PSI ΔP Bushing
	PTFE	PTFE	PTFE	PTFE	PTFE
2"	100	106	111	115	—
2 ½"	151	163	176	186	—
3"	207	220	232	248	—
4"	290	323	357	389	—
5"	423	481	540	601	—
6"	599	691	783	796	—
8"	1,060	1,183	1,307	1,371	819
10"	1,671	1,872	2,074	2,175	903
12"	2,568	2,795	3,023	3,150	1,443
14"	2,640	3,070	3,500	—	2,301
16"	4,260	4,880	5,500	—	—
18"	6,287	7,243	8,200	—	—
20"	8,360	9,180	10,000	—	—
24"	15,427	16,813	18,200	—	—
30"	27,313	29,407	31,500	—	—

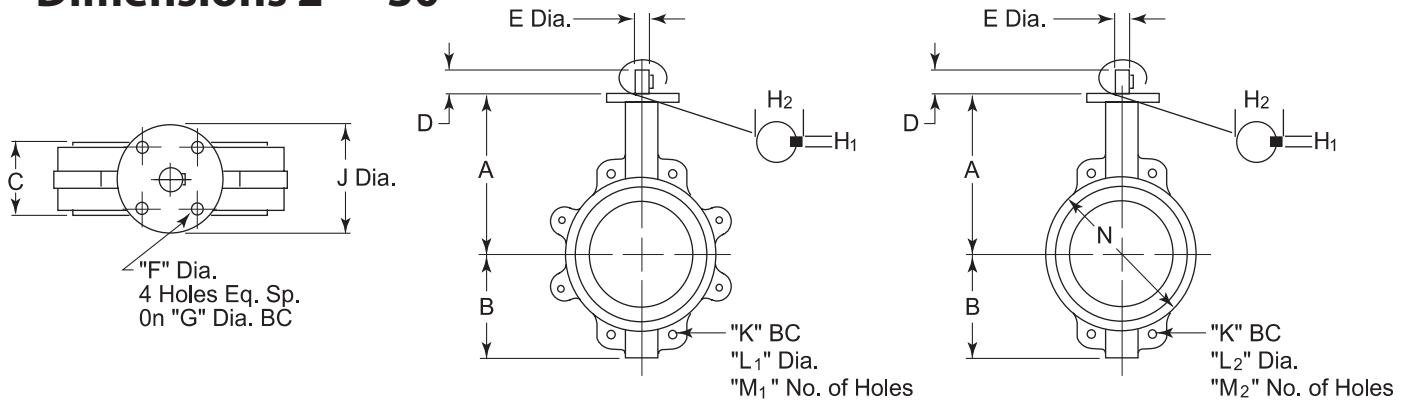
Seat Ratings

Material	Temperature Ratings °F
Buna-N	+10 to 180
EPDM	-30 to 275
Viton High Temperature	+10 to 400

BUTTERFLY VALVES - Series 500



Dimensions 2" - 30"

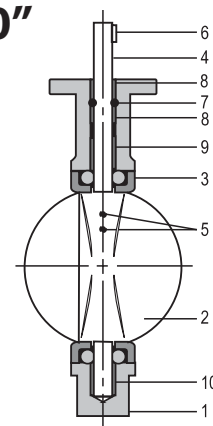


Inches MM	Lug Wt. Lbs	Wafer Wt. Lbs	A	B	C	D	E	F	G	H ₁	H ₂	J	K	L ₁ *	L ₂ *	M ₁ *	M ₂ *	N
2" 50	7	6	6 3/8 161.93	3 3/4 82.50	1 3/4 44.45	1 1/4 31.75	1/2 12.70	3/8 9.53	2.76 70	1/8	9/16	3 1/2 90	4 3/4 120.65	5/8-11 17.46	11/16 17.46	4	4	4 101.6
2 1/2" 65	8	7	6 7/8 174.63	3 1/2 88.90	1 7/8 47.63	1 1/4 31.75	1/2 12.70	3/8 9.53	2.76 70	1/8	9/16	3 1/2 90	5 1/2 139.70	5/8-11 17.46	11/16 17.46	4	4	4 3/4 120.65
3" 80	14	10	7 1/8 180.98	3 7/8 98.40	1 7/8 47.63	1 1/4 31.75	1/2 12.70	3/8 9.53	2.76 70	1/8	9/16	3 1/2 90	6 152.40	5/8-11 17.46	11/16 17.46	4	4	5 1/8 130.18
4" 100	26	13	7 7/8 200.03	4 1/2 114.30	2 1/8 53.98	1 1/4 31.75	5/8 15.88	3/8 9.53	2.76 70	5/32	11/16	3 1/2 90	7 1/2 190.50	5/8-11 17.46	11/16 17.46	8	4	6 3/4 171.45
5" 125	28	18	8 3/8 212.73	5 127	2 1/4 57.15	1 1/4 31.75	3/4 19.05	3/8 9.53	2.76 70	3/16	27/32	3 1/2 90	8 1/2 215.90	3/4-10 20.64	13/16 20.64	8	4	7 3/4 196.85
6" 150	31	20	8 7/8 225.43	5 1/2 139.70	2 1/4 57.15	1 1/4 31.75	3/4 19.05	3/8 9.53	2.76 70	3/16	27/32	3 1/2 90	9 1/2 241.30	3/4-10 20.64	13/16 20.64	8	4	8 5/8 219.08
8" 200	49	32	10 1/4 260.35	7 177.80	2 1/2 63.50	1 3/4 44.45	7/8 22.23	7/16 11.11	4.02 102	3/16	1	6 150	11 3/4 298.45	3/4-10 20.64	13/16 20.64	8	4	10 9/16 268.29
10" 250	72	42	11 1/2 292.10	8 203.20	2 3/4 69.85	1 3/4 44.45	1 1/8 28.58	7/16 11.11	4.02 102	5/16	1 1/4	6 150	14 1/4 361.95	7/8-9 23.81	15/16 23.81	12	4	13 1/16 331.79
12" 300	105	70	13 1/4 336.55	9 1/2 241.30	3 1/8 79.38	1 3/4 44.45	1 1/4 31.75	7/16 11.11	4.02 102	5/16	1 3/8	6 150	17 431.80	7/8-9 23.81	15/16 23.81	12	4	16 1/8 409.58
14" 350	155	95	14 1/2 368.30	10 1/2 266.70	3 1/8 79.38	1 3/4 44.45	1 1/4 31.75	1/2 12.70	4.92 125	13/32	1 3/8	6 150	18 3/4 476.25	1-8 26.99	1 1/16 26.99	12	4	17 1/8 434.98
16" 400	195	117	15 3/4 400.05	12 3/4 323.80	3 1/2 88.90	2 50.80	1 5/16 33.34	1/2 12.70	4.92 125	13/32	1 7/16	6 150	21 1/4 539.75	1-8 26.99	1 1/16 26.99	16	4	20 508.00
18" 450	230	165	16 5/8 422.28	14 3/8 365.10	4 1/4 107.95	2 50.80	1 1/2 38.10	11/16 17.50	5.51 140	13/32	1 5/8	8 1/4 210	22 3/4 577.85	1 1/8-7 31.75	1 1/4 31.75	16	4	21 3/8 542.93
20" 500	396	275	18 7/8 479.43	14 355.60	5 1/4 133.35	2 1/2 63.50	1 5/8 41.28	11/16 17.50	5.51 140	31/64	1 3/4	8 1/4 210	25 635.00	1 1/8-7 31.76	1 1/4 31.76	20	4	23 5/16 592.14
24" 600	610	440	22 1/8 561.98	16 7/8 428.60	6 1/8 155.58	2 3/4 69.85	2 50.80	7/8 22.20	6.50 165	5/8	2 3/16	8 1/4 210	29 1/2 749.30	1 1/4-7 31.75	1 1/4 31.75	20	4	27 7/8 708.03
30" 800	1050	740	26 660	21 1/4 539.80	6 3/4 171.45	2 5/8 66.70	2 3/16 55.60	11/16 17.50	10 254	5/8	2 1/2	11 7/8 300	36 914.40	1 1/4-7 31.75	1 1/4 31.75	28	4	34 3/8 873.13

L1 and M1 refer to Lug valves, L2 and M2 refer to Wafer Style. "C" dimension is listed with elastomer in the relaxed condition. Approximately 1/8" total compression is required for proper sealing with pipe flanges. Valves are designed for installation between ANSI B16.1 Class 125 (Iron) and B16.5 Class 150 (Steel) flanges. Gaskets are not needed, and should not be used since the seat face seals against the mating flange.

Standard Bill of Materials Dimensions 2" - 30"

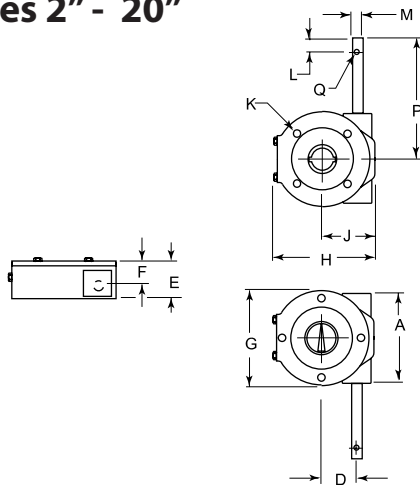
Item	Description	Materials
1	Body	Ductile Iron
2	Disc	304 Stainless Steel
3	Seat	EPDM or BUNA-N
4	Shaft	416 Stainless Steel
5	Taper Pin	316 Stainless Steel
6	Key	Carbon Steel
7	O-Ring	Buna-N
8	Bushing	PTFE
9	Bushing	PTFEPTFE
10	Bushing	



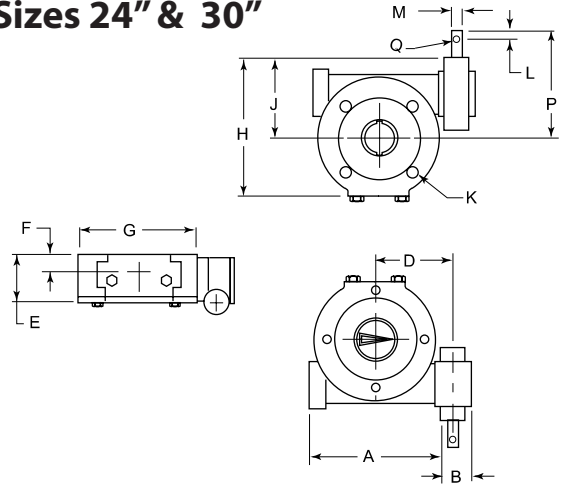
BUTTERFLY VALVES - Series 500



Gear Operator Sizes 2" - 20"

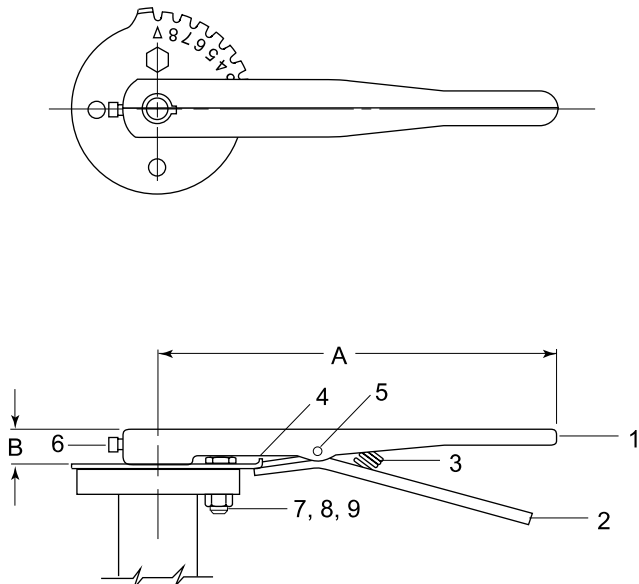


Sizes 24" & 30"



Size	Wt.	A	B	D	E	F	G	H	J	K	L	M	P	Q
2" & 3"	18	4.69	—	2.48	2.92	1.63	6.06	7.00	4.00	M6-.50 2.25 BC	1.31	0.75	8.31	0.25
4" - 6"	18	4.69	—	2.48	2.92	1.63	6.06	7.00	4.00	M8-.59 2.75 BC	1.31	0.75	8.31	0.25
8" & 10"	23	5.39	—	3.07	3.00	1.50	6.31	7.80	4.56	M12-.71 3.50 BC	1.31	0.75	7.80	0.25
12" & 14"	23	5.39	—	3.07	3.00	1.50	6.31	7.80	4.46	M12-.71 2.75 BC	1.31	0.75	7.80	0.25
16" & 18"	60	8.15	—	4.50	4.18	1.43	7.86	11.50	6.25	M18-1.0 6.25 BC	1.31	1.00	9.63	0.31
20"	98	11.08	4.10	6.81	4.63	4.81	8.00	13.13	6.50	M18-1.2 .50 BC	—	0.98	10.75	.23
24"	98	11.08	4.10	6.81	4.63	4.81	8.00	13.13	6.50	M20-1.2 .50 BC	—	0.98	10.75	.23
30"	85	8.75	3.93	4.66	5.60	4.14	10.00	13.75	6.75	M20-.85 .50 BC	1.37	1.00	13.17	0.38

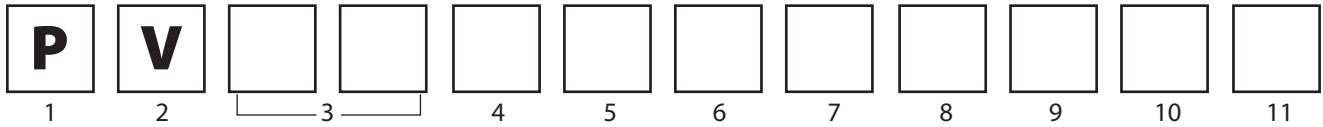
10 Position Lever



Item	Description
1	Handle
2	Latch
3	Spring
4	Indicator Plate
5	Pin
6	Set Screw
7	Cap Screw
8	Lock Washer
9	Nut

Handle Weights									
2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"	
2 Lb.	2 Lb.	2 Lb.	2 Lb.	2 Lb.	2 Lb.	4 Lb.	4 Lb.	4 Lb.	

BUTTERFLY VALVES - Series 500



3. Size	Code
2"	02
2.5"	25
3"	03
To	
30"	30

6. Pressure	Code
200 psi (2"-12")	0
75 psi undercut	3
150 psi (14"-30")	6

9. Bushings	Code
PTFE (2" - 30")	3

4. Series / Style	Code
Lug Body	L
Wafer Body	W

7. Disc	Code
304 Stainless	4

10. Seat/Liner	Code
EPDM	5
BUNA-N	1
Viton (400°)	6

5. Body	Code
Ductile Iron	2

8. Shaft	Code
416 Stainless	4

11. Actuator	Code
Handle (10 position)	2
Lockable Handle	4
Gear Operator	G
No operator	X

CHECK VALVES



Series CL Check Valves

Cast Iron Body
Elastomer Seat



Bubble Tight
Close Off



Features and Benefits

• W~ÑÉé=ÄÜÉÄá=î~äiÉë=êÉ=eiÄei~áiá~ääó=

• Ribs around the side wall support the

• W~ÑÉé=ÄÜÉÄá=î~äiÉë=êÉ=äçãJëä~ã=

• Long spring legs ensure closing tension

• Shaft supports with large bearings act as

• Resilient seats allows for bubble tight

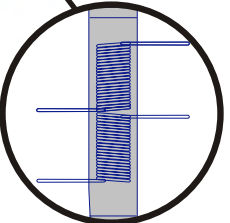
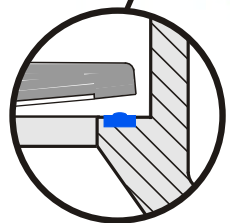
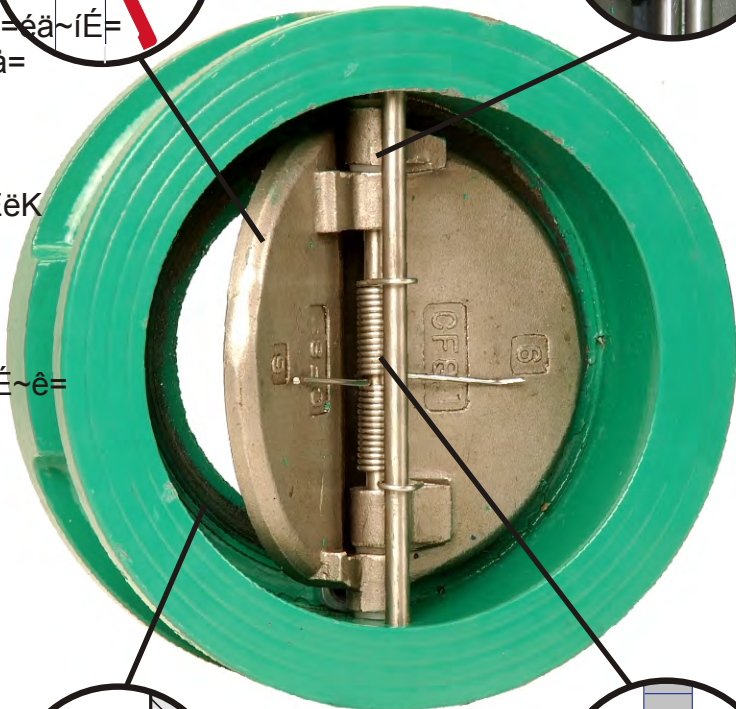
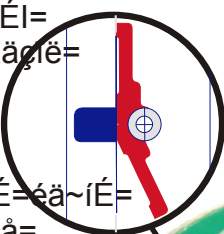
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Dual Plates

• Dual plates provide a soft seat design

Thrust Washers

• Thrust washers support the shaft



Soft Seat Design

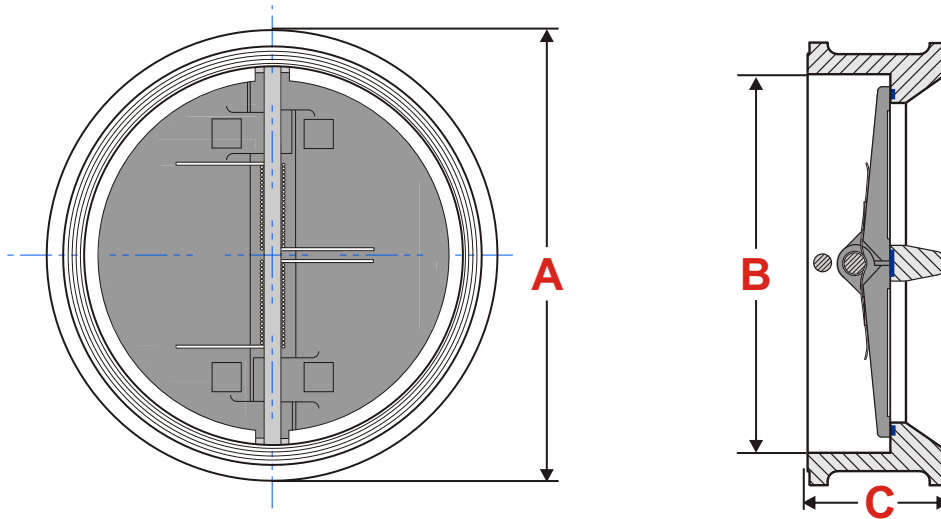
• Soft seat design ensures bubble tight

Long Leg Springs

• Long leg springs ensure closing tension

Markets Served

- HVAC
- Chemical
- Power and Utilities
- Food and Beverage
- Pulp & Paper Industry
- Steel Processing



Dimensions

Valve Size	in. mm	Cv	A	B	C	Weight lbs Kg
2"	50	75	4 1/8	2 3/4	2 1/8	4 1.80
2 1/2"	65	95	4 7/8	3 1/4	2 1/8	6 2.40
3"	80	191	5 3/8	3 1/2	2 1/4	8 3.60
4"	100	377	6 3/8	4 1/2	2 1/2	13 5.90
5"	125	483	7 11/16	5 3/4	2 3/4	16 7.30
6"	150	821	8 3/4	6 5/8	3.0	20 9.0
8"	200	1,590	11	8 5/8	3 3/4	38 17
10"	250	2,920	13 3/8	10 3/4	4 1/4	58 26
12"	300	4,470	16	12 3/4	5 5/8	93 42
14"	350	5,870	16 5/8	14	7 1/4	122 55
16"	400	8,690	19 3/4	16	7 1/2	185 84
18"	450	10,940	21 5/8	18 3/8	8.0	220 100
20"	500	14,290	23 3/8	20 1/4	8 3/8	245 111
24"	600	23,000	28 1/4	24 1/4	8 3/4	380 172

Seat Temp Ratings

Material	Temperature Ratings °F
bmaj=Epi-âÇ-êÇF	JPM=iç=OTR

Pressure Rating

====Ov=J=NOv=====OMM=mpf
====NQv=J=OQv=====NRM=mpf

Connections

ÜÉÁa=î~aiÉe=~éÉ=Áçæ~íaÁaÉ=kapÉ=NSKN=
â~ëë=NOR=EfêçâF=çê=_NSKR=â~ëë=NRM=EëiÉÉäF
Nâ~âÖÉëK

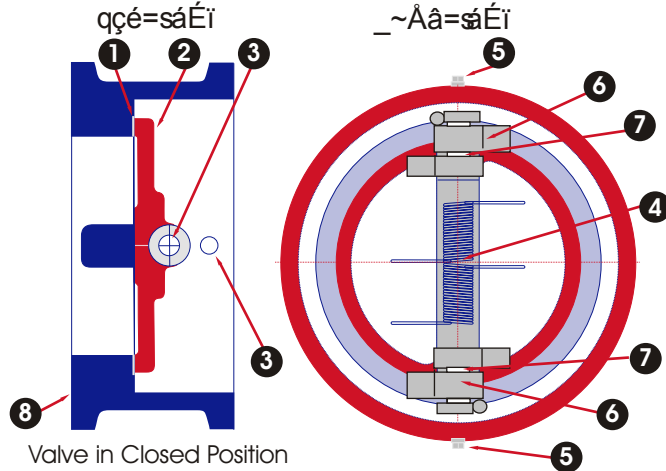
k çİVwâEñEÇâ çİ aİaOçNAUEA#~a ÈeçN=aoâ~ai NAli ÈeabueêEçâ a ÈEeççİ aèiÈ~a Nçâ ÷UE=ei a eçâAU=êEçeeêÈEÇâİ KNUEa=çâçİ ÈE=eaEi=UE#~a ÈE=Uçİ çEÈ ã çİ aİEÇççİ aèiÈ~a =eNè=èeçeeâEÇçUâEÇâ ã ÈâÇ=İçâ=çâçİ ÈNâ eâ Èççmçç~a ÈAUÉAâ#~a ÈEiAİ iAçâ ã çâèè=AlE=â#~a È=âçEââOÈâÇEÈâÇKÈeİ èççÈE=çç= ÈEQ AE=UE=âE=UçççN#~aİ dçâİ ççİ #Uççİ ÇU=UE#~a Èi# UâU=çİ çEççEâ#~a È=âEççİ Èçç=çâ ççâEai#~a È=İçâK

3 Series CL

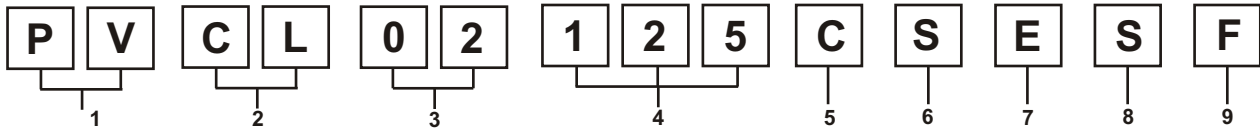


Bill of Materials

kçK	aÉëÄëáéíáçá	j~íÉëá~ä
N	pÉ~íLpÉ~ä	bmaj
O	aáëÄë	`cUj=EPMQ=pKpKF
P	pÜ~Ñí	PNS=πί~áääÉëë
Q	qçéëáçá=péëáá	ÖMQ=πί~áääÉëë
R	máìÖ	`~ëÄçá=πίÉÉä
S	eááÖÉ=páÉÉí	EPMQ=πί~áääÉëë
T	qÜëíëí=_É~éáá	Ömqcb
U	_çÇó	`~ëí=féçá



Part Number



1. Type Code	2. Series Code	3. Size Code	4. Class Code	5. Body Code
mêç=sáíÉ=====	st.~ÑÉë=====	íOv=====	AKM@NOR@=====	NOR-éí=féçá=====
	ÜÉÁá=====	OKRv=====	==OR	

Pv=====MP
Qv=====MQ
Rv=====MR
Sv=====MS
Uv=====MU
NMv=====NM
NOv=====NO

6. Disc Code	7. Seat Code	8. Spring Code	9. Connection Code
PMQ=πί~áääÉëë=====	pmaj=====	PNS=πί~áääÉëë=====	pá~í=c~ÁÉ=====
			=====c

MANUAL BALL VALVES

For Commercial and Industrial Applications

Job Name _____

Contractor _____

Job Location _____

Approval _____

Engineer _____

Contractor's P.O. No. _____

Approval _____

Representative _____

Series FBV-3C, FBVS-3C

2-Piece, Full Port, Brass Ball Valves

Sizes: 1/4" – 4" (8 – 100mm)

Series FBV-3C 2-piece, full port, brass ball valves are used in commercial and industrial applications for a full range of liquids and gases. They feature a bottom-loaded blowout proof stem, virgin PTFE seats, thrust washer, and adjustable stem packing gland, stem packing nut, chrome plated brass ball, brass adapter, and steel handle.

Features

- Certified to NSF/ANSI standard 61/8
- CSA approved threaded valves only 1/4" – 3" (15 – 80mm)
- UL/FM approved threaded valves 1/2" – 2" (15 – 50mm)
- UL Listed solder valves 1/2" – 2" (15 – 50mm)
- Fluorocarbon elastomer stem O-ring prevents stem leaks
- Adjustable stem packing gland
- PTFE stem packing seal, thrust washer, and seats
- Bottom loaded blowout proof stem
- Machined chrome plated brass ball
- Valves comply to MSS-SP-110 standard

Models

FBV-3C: 1/4" – 4" (8 – 100mm) with threaded connections

FBVS-3C: 1/2" – 3" (15 – 80mm) with solder connections

Pressure – Temperature

Temperature Range: -40°F to 400°F (-40°C to 204°C)

Pressure Ratings

FBV-3C: 1/4" – 2" (8 – 50mm)

600psi (41 bar) WOG, non-shock
150psi (10.3 bar) WSP

2 1/2" – 4" (65 – 100mm)

400psi (27.5 bar) WOG, non-shock
125psi (8.6 bar) WSP

FBVS-3C: 1/2" – 2" (15 – 50mm)

600psi (41 bar) WOG, non-shock
150psi (10.3 bar) WSP

2 1/2" – 3" (65 – 80mm)

400psi (27.5 bar) WOG, non-shock
125psi (8.6 bar) WSP

*This valve is designed to be soft soldered into lines without disassembly, using a low temperature solder to 420°F (216°C). Higher temperature solders may damage the seat material.

NOTE: Apply heat with the flame directed **AWAY** from the center of the valve body. Excessive heat can harm the seats. After soldering, the packing nut may have to be tightened.



Approvals

1/4" – 3" (8 – 80mm) FBV-3C

Certified to NSF/ANSI standard 61/8*



1/2" – 3" (15 – 80mm) FBVS-3C

Certified to NSF/ANSI standard 61/8*



*Domestic cold water at 73°F (23°C)

1/2" – 2" (15 – 50mm) FBV-3C UL/FM approved



1/2" – 2" (15 – 50mm) FBVS-3C UL Listed



approved

Gas Approvals (Threaded Valves Only)

1/4" – 3/8" (8 – 10mm)

ASME B16.33, CSA 

1/2 psig, 5psig, (14, 34 kPa)

@ -40°F to 125°F (-40°C to 52°C)


1/2" – 2" (15 – 50mm) ASME B16.33, CSA



1/2 psig, 5psig, and 125psig (14, 34 and 862 kPa)

@ -40°F to 125°F (-40°C to 52°C)

2 1/2" – 3" (65 – 80mm)

ASME B16.38, CSA 

1/2 psig, 5psig, and 125psig (14, 34 and 862 kPa)

@ -40°F to 125°F (-40°C to 52°C)

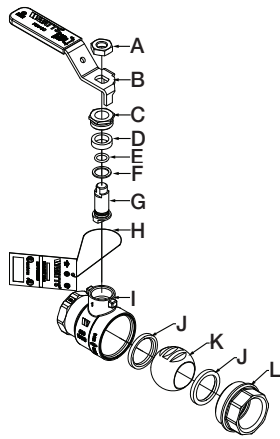
Specifications

Approved valves shall be 2-piece full port design constructed of a forged brass body and end adapter. Seats and stem packing shall be virgin PTFE. Stem shall be bottom loaded, blowout proof design with fluorocarbon elastomer O-ring to prevent stem leaks. Valve shall have chrome plated brass ball and adjustable packing gland. Threaded valves 1/2" – 3" (shall be CSA approved to 1/2, 5, and 125psig (14, 34 and 862 kPa), UL/FM approved and certified to NSF/ANSI standard 61/8. Solder valves to be UL listed and certified to NSF/ANSI standard 61/8. Valve sizes 1/4" – 2" (8 – 80mm) shall be rated to 600psi (41 bar) WOG non-shock and 150psi (10.3 bar) WSP. Valve sizes 2 1/2" – 4" (65 – 100mm) threaded, shall be rated to 400psi (27.5 bar) WOG non-shock and 125psi (8.6 bar) WSP. Valve sizes 2 1/2" – 3" (65 – 88mm) solder shall be rated to 400psi (27.5 bar) WOG non-shock and 125psi (8.6 bar) WSP. Valve shall be a Watts Regulator Company Series FBV-3C (threaded) or FBVS-3C (solder).

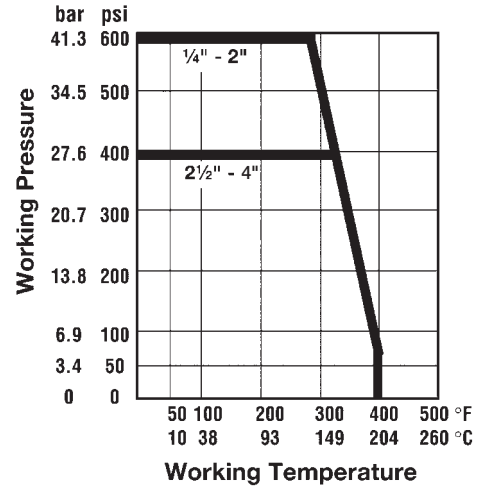
Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

Materials

Temperature – Pressure

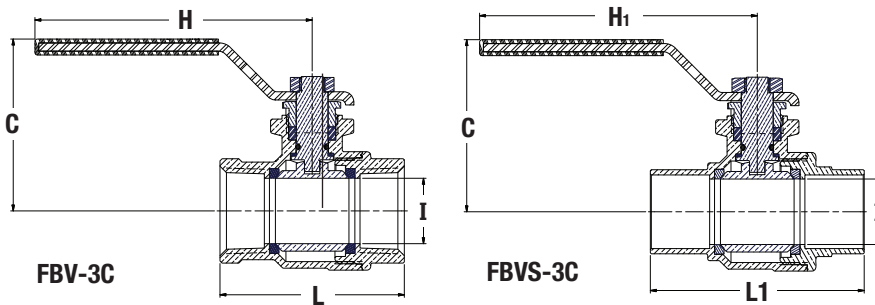


- A. Handle Nut Zinc plated carbon steel
- B. Handle Assembly Zinc plated carbon steel with vinyl insulator
- C. Packing Nut Brass
- D. Stem Packing Virgin PTFE
- E. O-ring Fluorocarbon elastomer (FKM)
- F. Thrust Washer Virgin PTFE
- G. Stem Machined Brass
- H. Tag Cardboard, Mylar coated both sides
- I. Body Forged Brass
- J. Seats Virgin PTFE
- K. Ball Chrome plated brass
- L. Adapter Forged Brass



*See applicable note on reverse side for solder end valves with regards to pressure/temperature rating.

Dimensions – Weights



SIZE (DN)		DIMENSIONS										WEIGHT			
in.	mm	C		H		H ₁		I		L		L ₁		lbs.	kg.
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm		
1/4	8	1 ¹³ / ₁₆	46	3 ⁷ / ₁₆	87	-	-	1/2	12.9	1 ³ / ₄	45	-	-	0.4	0.2
3/8	10	1 ¹³ / ₁₆	46	3 ⁷ / ₁₆	87	-	-	1/2	12.9	1 ³ / ₄	45	-	-	0.4	0.2
1/2	15	1 ¹³ / ₁₆	46	3 ⁷ / ₁₆	87	3 ⁷ / ₁₆	87	1/2	12.9	1 ¹⁵ / ₁₆	50	2 ¹ / ₁₆	52	0.4	0.2
3/4	20	2 ¹ / ₄	57	4	101	4	101	3/4	19.2	2 ⁵ / ₁₆	59	2 ¹¹ / ₁₆	68	0.8	0.3
1	25	2 ⁵ / ₈	67	4 ¹ / ₄	108	4 ¹ / ₄	108	1	25.5	2 ¹³ / ₁₆	72	3 ¹ / ₄	83	1.2	0.5
1 1/4	32	2 ¹³ / ₁₆	71	4 ¹ / ₄	108	4 ¹ / ₄	108	1 1/4	31.9	3 ³ / ₁₆	81	3 ¹¹ / ₁₆	94	1.8	0.8
1 1/2	40	3 ³ / ₁₆	80	5 ¹ / ₄	134	5 ⁵ / ₁₆	135	1 1/4	38.0	3 ¹ / ₂	88	4 ¹ / ₄	108	2.6	1.2
2	50	3 ¹ / ₂	89	6	153	6	153	2	50.9	4 ¹ / ₈	105	5 ⁵ / ₁₆	135	3.7	1.7
2 1/2	65	4 ¹ / ₁₆	104	7 ³ / ₈	187	7 ³ / ₈	188	2 1/2	63.6	5 ⁵ / ₁₆	134	6 ¹ / ₄	158	7.1	3.2
3	80	4 ¹ / ₂	114	7 ³ / ₄	197	7 ³ / ₄	197	3	76.3	6 ¹ / ₁₆	154	7 ³ / ₈	185	11.3	4.7
4	100	5 ³ / ₈	136	9 ⁵ / ₈	245	-	-	4	101.6	7 ⁷ / ₁₆	189	-	-	17.7	8.0



Water Safety & Flow Control Products



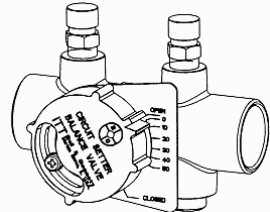
ISO 9001-2000 CERTIFIED

USA: 815 Chestnut St., No. Andover, MA 01845-6098; www.watts.com

Canada: 5435 North Service Rd., Burlington, ONT. L7L 5H7; www.wattscanada.ca

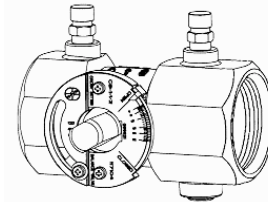
BALANCE VALVES

JOB:	REPRESENTATIVE:	
UNIT TAG:	ORDER NO.	DATE:
ENGINEER:	SUBMITTED BY:	DATE:
CONTRACTOR:	APPROVED BY:	DATE:



Circuit Setter® Plus

Calibrated Balance Valves
with NPT and Solder Connections



DESCRIPTION

The Bell & Gossett CIRCUIT SETTER PLUS calibrated balance valve is a precision machined ball type triple purpose balancing instrument. It is precisely calibrated for use as a presettable balance valve, variable orifice flow meter and positive shut-off service valve. Valves are furnished with a calibrated nameplate and memory stop indicator which permits the valve to be preset to a fixed open position and then closed for service without disturbing valve setting. Valves are equipped with capped readout valves fitted with internal check valves and 1/4" NPT tapped and plugged drain port.

CONSTRUCTION

Body: Bronze
 Ball: Brass
 Seat Rings: Glass and Carbon filled TFE
 Readout Valves: Brass with EPT check valves
 Stern "O" Ring: EPDM

MAXIMUM WORKING PRESSURE

NPT Models: 300 psig (2069 kPa)
 Sweat Models: 200 psig* (1379 kPa)

MAXIMUM OPERATING TEMPERATURE

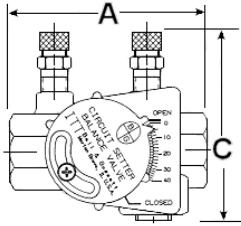
250°F (121°C)

*See Instruction Sheet G95873

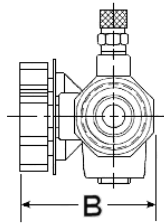
SCHEDULE

MODEL NO.	PART NUMBER	TAGGING INFORMATION	QUANTITY
CB-1/2S	117412		
CB-3/4S	117413		
CB-1S	117401		
CB-1-1/4S	117402		
CB-1-1/2S	117403		
CB-2S	117404		
CB-1/2	117414		
CB-3/4	117415		
CB-1	117416		
CB-1-1/4	117103		
CB-1-1/2	117104		
CB-2	117105		
CB-2-1/2	117106		
CB-3	117107		

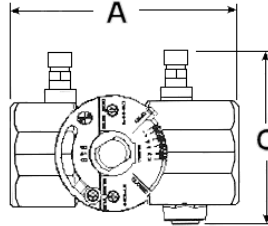
CIRCUIT SETTER PLUS Calibrated Balance Valves



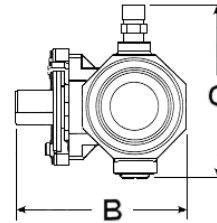
TOP VIEW 1/2"-1"



END VIEW 1/2"-1"



TOP VIEW 1 1/4"-3"



END VIEW 1 1/4"-3"

DIMENSIONS AND WEIGHTS

MODEL NUMBER	DIMENSIONS IN INCHES (MM)					WEIGHT IN LBS. (KG)
	SIZE	CONNS.	A	B	C	
CB-1/2S	1/2	SWEAT	2-15/16 (74.6)	2-1/8 (54)	2-9/16 (65.1)	1 (0.5)
CB-3/4S	3/4	SWEAT	3-1/2 (88.9)	2-1/4 (57.2)	2-3/4 (69.9)	1-1/4 (0.6)
CB-1S	1	SWEAT	4-9/32 (108.7)	2-3/8 (60.3)	3-11/32 (84.9)	2 (.9)
CB-1-1/4S	1-1/4	SWEAT	4-29/32 (124.6)	3-3/16 (81)	3-3/8 (85.7)	3 (1.4)
CB-1-1/2S	1-1/2	SWEAT	5-7/32 (132.6)	3-9/32 (83.3)	4 (101.6)	3-1/2 (1.6)
CB-2S	2	SWEAT	6-5/16 (160.3)	3-29/32 (99.2)	4-15/32 (113.5)	5-1/2 (2.5)
CB-1/2	1/2	NPT	2-15/16 (74.6)	2-3/16 (55.6)	2-3/4 (69.9)	1-1/4 (0.6)
CB-3/4	3/4	NPT	3-1/16 (77.8)	2-3/8 (60.3)	2-15/16 (74.6)	1-1/2 (0.7)
CB-1	1	NPT	3-13/16 (96.8)	2-11/16 (68.3)	3-3/16 (81)	2 (0.9)
CB-1-1/4	1-1/4	NPT	4-3/8 (111.1)	3-9/32 (83.3)	3-1/2 (88.9)	3-1/4 (1.5)
CB-1-1/2	1-1/2	NPT	4-7/16 (112.7)	3-15/32 (88.1)	3-13/16 (96.8)	3-3/4 (1.7)
CB-2	2	NPT	5-1/8 (130.2)	4-1/32 (102.4)	4-1/4 (108)	5-1/2 (2.5)
CB-2-1/2	2-1/2	NPT	6 (152.4)	4-17/32 (115.1)	4-11/16 (119.1)	8-3/4 (4.0)
CB-3	3	NPT	6-1/2 (165.1)	5-7/32 (132.6)	5-5/16 (134.9)	12-3/4 (5.8)

Dimensions are subject to change. Not to be used for construction purposes unless certified.

TYPICAL SPECIFICATION

Furnish and install as shown on plans with manufacturer recommendations Model CB calibrated balance valves.

PRE-SET BALANCE FEATURE

Valves to be designed to allow installing contractor to pre-set balance points for proportional system balance prior to system start-up in accordance with pre-set balance schedule.

VALVE DESIGN AND CONSTRUCTION

All valves 1/2" to 3" pipe size to be of bronze body/brass ball construction with glass and carbon filled TFE seat rings. Valves to have differential pressure read-out ports across valve seat area. Read-out ports to be fitted with internal EPT inserts and check valves. Valve bodies to have 1/4" NPT tapped drain/purge port. Valves to have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves to have calibrated nameplates to assure specific valve settings. Valves shall be designed for positive shut-off.

DESIGN PRESSURE/TEMPERATURE

- A. 1/2" - 3" NPT connections 300 psig (2069 kPa) at 250°F (121°C)
- B. 1/2" - 2" Sweat connections 200 psig (1379 kPa) at 250°F (121°C)

All balance valves to be ITT Bell & Gossett Model No. CB-_____ (note sizes).

IMPORTANT:

When monitoring system flow, care must be exercised to avoid direct skin or eye contact with liquids that may escape. Liquids with temperatures in excess of 120°F (49°C) may cause burns.

Bell & Gossett Circuit Setter Balance Valves are not recommended for use with meter connections pointing downward.



Bell & Gossett

Bell & Gossett
8200 N. Austin Avenue, Morton Grove, IL 60053
Phone (847)966-3700
Facsimile (847)966-9052
www.bellgossett.com



SUCTION DIFFUSERS

Style PSD

Suction Diffuser

Cast Iron (ASTM A 126, Class B)

125 lb. Flanged



Suction Diffuser

APPLICATIONS

The Keckley Style PSD mounts to the suction side of a pump in either a horizontal or vertical position. It is designed to remove any foreign matter that may be hazardous to the pump or other system components, while providing the proper flow conditions to the pump. Where space is limited, the Keckley Style PSD can be used as an elbow (in some cases a reducing elbow) with a built in strainer for easy maintenance and system performance.

CONSTRUCTION

The Keckley Style PSD Suction Diffusers are constructed from rugged cast iron castings that are machined to exacting specifications. These bodies have drilled flanges that are in accordance with ASME B16.1.

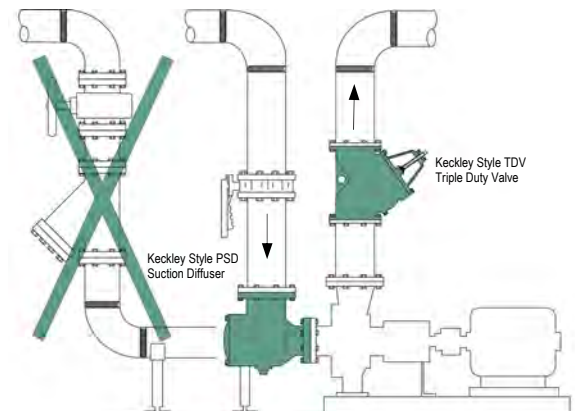
FEATURES

- Reduces installation costs by replacing the strainer, elbow, and entry pipe on the suction side of the pump.
- Integral straightening vanes ensure uniform flow to the suction inlet of the pump.
- Minimal pressure drop (Oversized body & screen).
- Perforated stainless steel screen with a 20 mesh stainless steel removable start-up sleeve to help promote a cleaner more trouble free system.
- Bolted cover plate with O-ring seal – standard. (Knobs available upon request).
- Cast supporting pads on the diffuser body offer easy mounting of standard I.D. support foot.
- Tapping for inlet and outlet differential connections – Optional.
- Drain connection with plug – standard.

WORKING PRESSURES – NON SHOCK

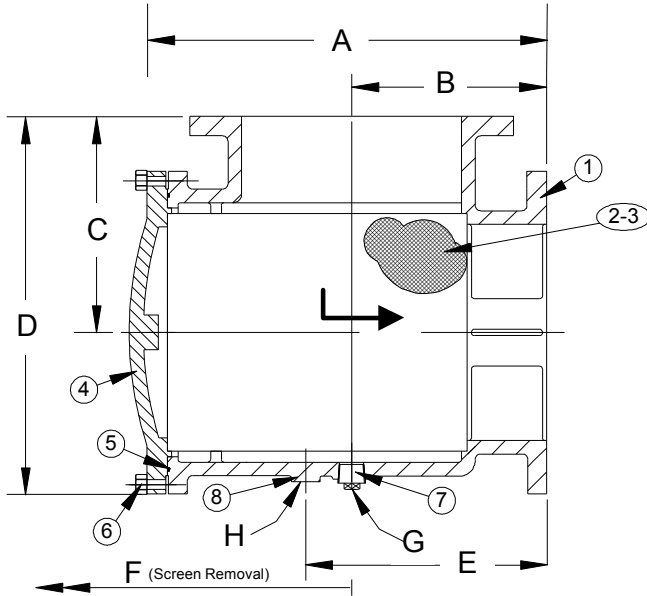
NOM. RATING	MEDIA	2" to 12"	14" and Larger
125# (FLANGED)	W.O.G.	200 PSI @ 150°F	150 PSI @ 150°F

TYPICAL INSTALLATION



Style PSD

Suction Diffuser, 125 lb. Flanged
Cast Iron (ASTM A 126, Class B)


PARTS LIST

ITEM	DESCRIPTION	MATERIAL
1	BODY	CAST IRON (ASTM A 126, CLASS B)
2	SCREEN	STAINLESS STEEL (304)
3	MESH SLEEVE*	STAINLESS STEEL (304)
4	COVER	CAST IRON (ASTM A 126, CLASS B)
5	O-RING	BUNA-N
6	HEX HEAD BOLT†	STEEL
7	PLUG	CAST CARBON STEEL
8	STUB	CAST IRON (ASTM A 126, CLASS B)

†Ductile Iron Knobs are available upon request.

SIZE	SCREEN PERFORATION	OPEN AREA
2" to 20"	1/18"	43%

*20 mesh stainless steel sleeves are provided with all Suction Diffusers for start up applications.

Other meshes or screen perforations available upon request, consult factory.

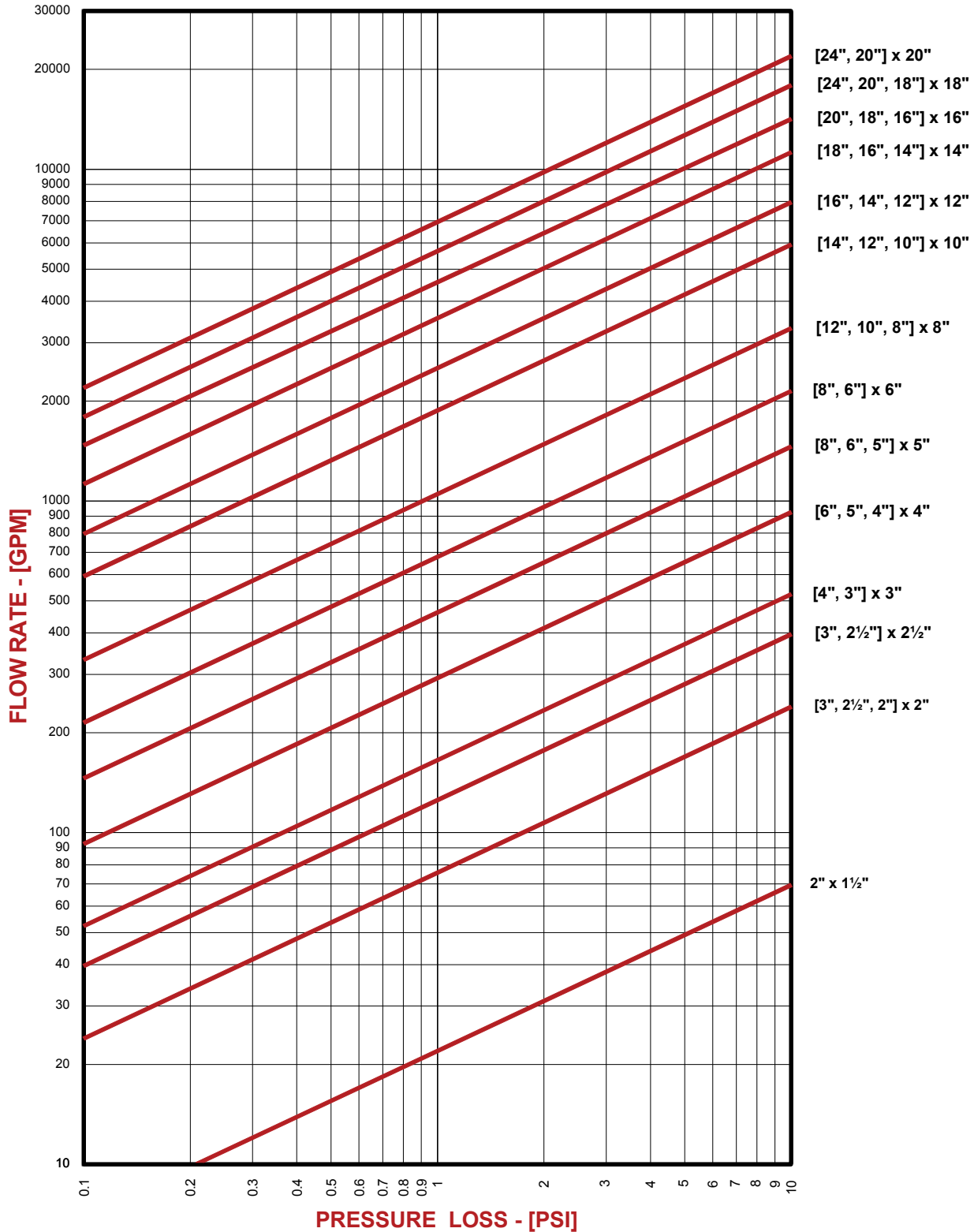
SIZE Inlet x Outlet	A	B	C	D	E	F	G	H	WEIGHTS LBS.
						Screen Removal	Blow Down Connection	Pipe Support I.D.	
2 X 1-1/2	10	4-1/2	4-1/2	7	6	8-13/16	3/4	1.02	24
2 X 2	10	4-1/2	4-1/2	7	6	8-13/16	3/4	1.02	24
2-1/2 X 2	10-5/8	5	5	7-13/16	6-9/16	9-1/8	3/4	1.02	27
2-1/2 X 2-1/2	10-5/8	5	5	7-13/16	6-9/16	9-1/8	3/4	1.02	37
3 X 2	10	4-1/2	5-1/2	8-1/8	6	9-5/8	3/4	1.30	42
3 X 2-1/2	11-3/16	5-1/2	5-1/2	9	7	9-5/8	3/4	1.30	46
3 X 3	11-3/16	5-1/2	5-1/2	9	7	9-5/8	3/4	1.30	51
4 X 3	13-1/8	6-1/2	6-1/2	11	8-3/4	11-1/2	1	1.30	74
4 X 4	13	6-1/2	6-1/2	11	8-1/4	11-1/2	1	1.30	76
5 X 4	15-1/2	7-1/2	7-1/2	13	10	14-7/8	1	1.30	106
5 X 5	15-1/2	7-1/2	7-1/2	13-3/4	10	14-7/8	1	1.30	111
6 X 4	13-1/8	6-1/2	8	12-3/16	8-3/4	16-9/16	1	1.30	93
6 X 5	16-5/8	8	8	14-7/16	10-11/16	16-9/16	1	1.30	128
6 X 6	16-5/8	8	8	14-1/2	10-11/16	16-9/16	1	1.30	149
8 X 5	19-3/16	9	7-9/16	13-1/8	13	16-7/8	1	1.30	178
8 X 6	16-7/8	8	9	15-1/2	10-11/16	16-7/8	1	1.30	178
8 X 8	21-3/8	9	9	17-1/4	11-5/8	22-7/8	1-1/4	2.05	267
10 X 8	21-3/16	9	11	19-1/4	11-5/8	22-7/8	1-1/4	2.05	353
10 X 10	26-11/16	11	11	20-3/4	14-3/16	30-1/4	1-1/4	2.05	388
12 X 8	21-11/16	11	11	19-1/4	13-5/8	22-7/8	1-1/4	2.05	492
12 X 10	26-11/16	11	12	21-3/4	14-3/16	33	1-1/4	2.05	492
12 X 12	26-11/16	12	12	21-3/4	15-3/8	28-3/4	1-1/4	2.05	529
14 x 10	26-11/16	12-15/16	12-9/16	22-3/16	17-3/16	33	1-1/4	2.05	507
14 x 12	26-11/16	12-15/16	12-9/16	22-3/16	17-3/16	31	1-1/4	2.05	601
14 x 14	26-11/16	12-15/16	12-9/16	22-3/16	17-3/16	33-1/8	1-1/4	2.05	620
16 x 12	29-5/16	14-5/16	13-3/16	23-3/4	18-5/8	28-3/4	1-1/4	2.05	725
16 x 14	29-5/16	14-5/16	13-3/16	23-3/4	18-5/8	31	1-1/2	2.05	750
16 x 16	29-5/16	14-5/16	13-3/16	23-3/4	18-5/8	33-1/8	1-1/2	2.05	820
18 x 18	30-15/16	15-5/16	14-9/16	26-5/16	18-13/16	-	2	2.05	-
20 x 20	33-7/16	16-7/8	16	28-3/4	20-5/16	-	2	2.05	-

Larger sizes available upon request.

Certified dimensional drawings and metric drawings available upon request.

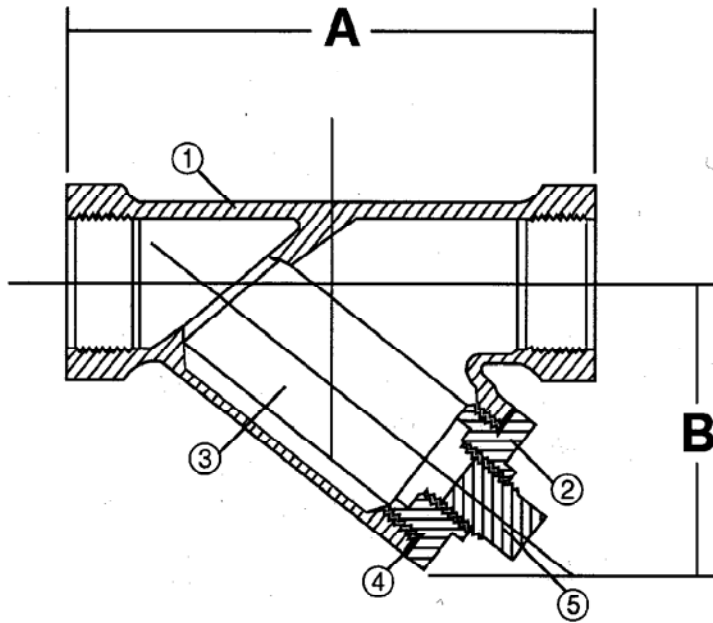
PRESSURE DROP CHART

Suction Diffuser (Style PSD)



Y-STRAINERS

**STYLE BSJ
Y-TYPE 150#
BRONZE SCREWED STRAINER**



LIST OF MATERIALS		
ITEM	PART NAME	MATERIAL
1	BODY	BRONZE C84400
2	CAP	BRONZE
3	SCREEN	TYPE 304 S.S.
4	GASKET	NON-ASBESTOS
5	PLUG	BRASS

OPERATING TEMPERATURE & PRESSURE:
 Steam 150 psi at 350° F
 Water, Oil, Gas 200 psi at 150° F

STANDARD SCREENS			
SERVICE	SIZES	SCREEN OPENINGS	SCREEN MATERIAL
STEAM	1/4" - 2" 2-1/2" & 3"	20 MESH .045 PERF.	STAINLESS STEEL
LIQUID	1/4" - 2" 2-1/2" & 3"	20 MESH .045 PERF.	STAINLESS STEEL

DIMENSIONAL DATA (INCHES)							
Qty.	Size		A Threaded Ends	B Height	Lbs. Weight	Size of Blowoff (NPT)	Notes
	Inch	MM					
	1/2"	15	3-3/16"	2-3/16"	.75	3/8"	
	3/4	20	4	2-3/4	1.25	3/8	
	1	25	4-1/2	3	1.75	1/2	
	1-1/4	32	5-5/16	3-1/2	2.75	1/2	
	1-1/2	40	6-1/4	3-7/8	3.50	1/2	
	2	50	7-1/2	5-7/16	5.75	1/2	
	2-1/2	65	9	5-7/8	9	1/2	
	3	80	10-3/16	6-5/16	13.25	1/2	

CUSTOMER _____
 PROJECT _____
 ENGINEER _____
 ARCHITECT _____
 PRO OR P.O. NO. _____

the Metraflex® company
 CHICAGO ILLINOIS

DESCRIPTION:
150# BRONZE SCREWED STRAINER
 STYLE BSJ

DRAWN BY: JRR	DATE: 1-97	DRAWING: BSJ-1
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GROOVED PIPE COUPLING

Standard Flexible Coupling



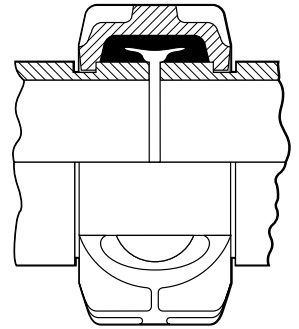
STYLE 77

Style 77 couplings are designed with cross-ribbed construction to provide a strong component for pressure piping systems. Sizes 3/4 – 12”/20 – 300 mm are two-piece housings. For 14 – 24”/350 – 600 mm sizes, Victaulic offers the Advanced Groove System (AGS) line of products. Request publication 20.03 for information on the flexible Style W77 AGS coupling.

All sizes are provided with plated bolts and nuts. Galvanized and stainless steel housings are also available.

Independent testing has shown the Style 77 coupling to be an effective stress relief and vibration attenuation device providing performance superior to braided steel and elastomeric arch-type connectors when used in close proximity to the source of vibration. Refer to 26.04 for vibration information.

Independent testing has shown that Victaulic Style 77 flexible couplings provide exceptional functionality during and after earthquake conditions. Refer to 26.12 for further information.



Exaggerated for clarity

MATERIAL SPECIFICATIONS

Housing: Ductile iron conforming to ASTM A-536, grade 65-45-12. Ductile iron conforming to ASTM A-395, grade 65-45-15, is available upon special request.

Housing Coating: Orange enamel.
 • **Optional:** Hot dipped galvanized and others.

Coupling Gasket: (specify choice*)†

- **Grade “E” EPDM (All other sizes)**
 EPDM (Green color code). Temperature range –30°F to +230°F/–34°C to +110°C. Recommended for hot water service within the specified temperature range plus a variety of dilute acids, oil-free air and many chemical services. UL classified in accordance with ANSI/NSF 61 for cold +86°F/+30°C and hot +180°F/+82°C potable water service. NOT RECOMMENDED FOR PETROLEUM SERVICES.
- **Grade “T” nitrile**
 Nitrile (Orange color code). Temperature range –20°F to +180°F/–29°C to +82°C. Recommended for petroleum products, air with oil vapors, vegetable and mineral oils within the specified temperature range. Not recommended for hot water services over +150°F/+66°C or for hot dry air over +140°F/+60°C.

* Services listed are General Service Recommendations only. It should be noted that there are services for which these gaskets are not recommended. Reference should always be made to the latest Victaulic Gasket Selection Guide for specific gasket service recommendations and for a listing of services which are not recommended.

Bolts/Nuts: Heat-treated plated carbon steel, trackhead meeting the physical and chemical requirements of ASTM A-449 and physical requirements of ASTM A-183.

- **Optional:** Type 316 stainless steel, Grade B-8M, Class 2.

† Supplemental lubricant is recommended for services installed at or continuously operating below 0°F/–18°C.

JOB/OWNER	CONTRACTOR	ENGINEER
System No. _____	Submitted By _____	Spec Sect _____ Para _____
Location _____	Date _____	Approved _____
		Date _____

Standard Flexible Coupling

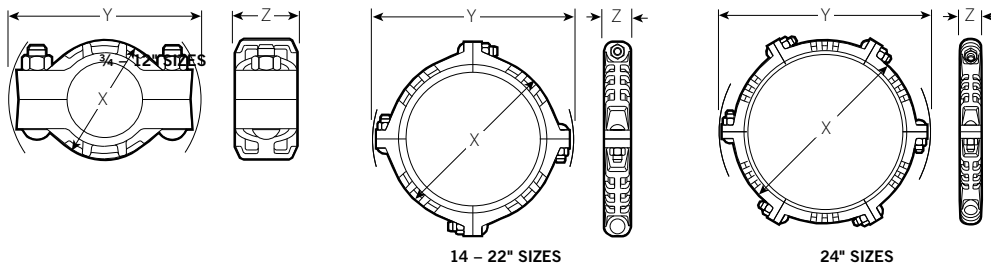
STYLE 77

DIMENSIONS

Size		Max. Work Pressure *	Max. End Load *	Allow. Pipe End Sep. †	Deflect. Fr. C, †		Bolt/Nut@ No - Size	Dimensions – Inches/mm			Approx. Wgt. Each
Nominal Size Inches mm	Actual Outside Diameter Inches mm	psi kPa	Lbs. N	Inches mm	Per Cplg. Deg.	Pipe In./Ft. mm/m	Inches mm	X	Y	Z	Lbs. kg
¾ 20	1.050 26.7	1,000 6900	865 3850	0 – 0.06 0 – 1.6	3° – 24'	0.72 60	2 – ¾ x 2	2.13 54	4.00 102	1.75 44	1.1 0.5
1 25	1.315 33.4	1,000 6900	1,360 6050	0 – 0.06 0 – 1.6	2° – 43'	0.57 48	2 – ¾ x 2	2.38 61	4.12 105	1.75 44	1.2 0.5
1¼ 32	1.660 42.2	1,000 6900	2,160 9610	0 – 0.06 0 – 1.6	2° – 10'	0.45 38	2 – ½ x 2½	2.65 67	5.00 127	1.88 48	2.0 0.9
1½ 40	1.900 48.3	1,000 6900	2,835 12615	0 – 0.06 0 – 1.6	1° – 56'	0.40 33	2 – ½ x 2½	3.13 79	5.38 137	1.88 48	2.1 1.0
2 50	2.375 60.3	1,000 6900	4,430 19715	0 – 0.06 0 – 1.6	1° – 31'	0.32 26	2 – ½ x 2½	3.63 92	5.88 149	1.88 48	2.6 1.2
57.0mm	2.664 57.0	1,000 6900	3955 17592	0 – 0.16 0 – 1.6	1° – 34'	0.33 27	2 – ½ x 2½	3.43 87	5.73 146	1.9 48	3.0 1.4
2½ 65	2.875 73.0	1,000 6900	6,490 28880	0 – 0.06 0 – 1.6	1° – 15'	0.26 22	2 – ½ x 2¾	4.25 108	6.50 165	1.88 48	3.1 1.4
76.1 mm	3.000 76.1	1,000 6900	7,070 31460	0 – 0.06 0 – 1.6	1° – 12'	0.26 22	2 – ½ x 2¾	4.38 111	6.63 168	1.88 48	3.2 1.5
3 80	3.500 88.9	1,000 6900	9,620 46810	0 – 0.06 0 – 1.6	1° – 2'	0.22 18	2 – ½ x 2¾	5.00 127	7.13 181	1.88 48	3.7 1.7
3½ 90	4.000 101.6	1,000 6900	12,565 55915	0 – 0.06 0 – 1.6	0° – 54'	0.19 16	2 – ¾ x 3¼	5.63 143	8.25 210	1.88 48	5.6 2.5
4 100	4.500 114.3	1,000 6900	15,900 70755	0 – 0.13 0 – 3.2	1° – 36'	0.34 28	2 – ¾ x 3¼	6.13 156	8.88 226	2.13 54	6.7 3.0
108.0mm	4.250 108.0	1,000 6900	14,180 63100	0 – 0.13 0 – 3.2	1° – 41'	0.35 29	2 – 16 x 82.5	6.00 152	8.63 219	2.13 54	11.0 5.0
5 125	5.563 141.3	1,000 6900	24,300 108135	0 – 0.13 0 – 3.2	1° – 18'	0.27 23	2 – ¾ x 4¼	7.75 197	10.65 270	2.13 54	10.6 4.8
133.0mm	5.250 133.0	1,000 6900	21,635 96275	0 – 0.13 0 – 3.2	1° – 21'	0.28 24	2 – 20 x 108	7.63 194	10.38 264	2.13 54	10.0 4.5
139.7mm	5.500 139.7	1,000 6900	23,745 105665	0 – 0.13 0 – 3.2	1° – 18'	0.28 24	2 – 20 x 108	8.63 219	10.65 270	2.13 54	10.0 4.5
6 150	6.625 168.3	1,000 6900	34,470 153390	0 – 0.13 0 – 3.2	1° – 5'	0.23 18	2 – ¾ x 4¼	8.63 219	11.88 302	2.13 54	12.0 5.4
159.0mm	6.250 159.0	1,000 6900	30,665 136460	0 – 0.13 0 – 3.2	1° – 9'	0.24 20	2 – 20 x 108	8.63 219	11.50 292	2.13 54	13.2 6.0
165.1 mm	6.500 165.1	1,000 6900	33,185 147660	0 – 0.13 0 – 3.2	1° – 6'	0.23 19	2 – ¾ x 4¼	8.88 226	11.63 295	2.13 54	13.2 6.0

Table continued on page 3.

See notes on page 3.



Standard Flexible Coupling

STYLE 77

DIMENSIONS

Size		Max. Work Pressure *	Max. End Load *	Allow. Pipe End Sep. †	Deflect. Fr. C ₁ †		Bolt/Nut@ No - Size	Dimensions - Inches/mm			Approx. Wgt. Each
Nominal Size Inches mm	Actual Outside Diameter Inches mm	psi kPa	Lbs. N	Inches mm	Per Cplg. Deg.	Pipe In./Ft. mm/m	Inches mm	X	Y	Z	Lbs. kg
8 § 200	8.625 219.1	800 5500	46,740 207995	0 - 0.13 0 - 3.2	0° - 50'	0.18 14	2 - 7/8 x 5	11.00 279	14.75 375	2.50 63	20.8 9.4
10 § 250	10.750 273.0	800 5500	73,280 326100	0 - 0.13 0 - 3.2	0° - 40'	0.14 12	2 - 1 x 6	13.63 346	17.13 435	2.63 67	31.1 14.1
12 § 300	12.750 323.9	800 5500	102,000 453900	0 - 0.13 0 - 3.2	0° - 34'	0.12 9	2 - 1 x 6 1/2	15.63 397	19.25 489	2.63 67	27.8 12.6
14 ‡ 350	14.000 355.6	300 2065	46,180 205500	0 - 0.13 0 - 3.2	0° - 31'	0.11 9	4 - 1 x 3 1/2	16.63 422	19.88 505	2.88 73	35.6 16.1
377.0mm μ	14.842 377.0	300 2065	51,875 230,845	0 - 0.13 0 - 3.2	0° - 31'	0.11 9	4 - 1 x 3 1/2	17.39 442	20.96 531	2.8 71	48.8 22.1
16 ‡ 400	16.000 406.4	300 2065	60,320 268425	0 - 0.13 0 - 3.2	0° - 27'	0.10 9	4 - 1 x 3 1/2	19.00 482	22.13 562	3.00 76	51.1 23.2
426.0mm μ	16.772 426	300 2065	66,245 294,795	0 - 0.13 0 - 3.2	0° - 27'	0.10 9	4 - 1 x 3 1/2	19.69 500	22.92 581	2.92 74	56.7 25.7
18 ‡ 450	18.000 457.2	300 2065	76,340 339710	0 - 0.13 0 - 3.2	0° - 24'	0.08 7	4 - 1 x 3 1/2	21.38 543	24.50 622	3.13 80	64.4 29.2
480.0mm μ	18.898 48	300 2065	84,105 374,265	0 - 0.13 0 - 3.2	0° - 24'	0.08 7	4 - 1 x 3 1/2	22.38 569	25.86 655	3.04 77	77.2 35
20 ‡ 500	20.000 508.0	300 2065	94,000 418300	0 - 0.13 0 - 3.2	0° - 22'	0.08 7	4 - 1 1/2 x 4	23.63 600	27.25 692	3.13 80	91.2 41.4
530.0mm μ	20.866 530	300 2065	102,535 456,280	0 - 0.13 0 - 3.2	0° - 22'	0.08 7	4 - 1 1/2 x 4	24.29 617	27.8 704	3.07 77	91.7 41.6
22 ‡ 550	22.000 559.0	300 2065	114,000 507300	0 - 0.13 0 - 3.2	0° - 19'	0.07 6	4 - 1 1/2 x 4	25.75 654	29.50 749	3.13 80	92.0 41.7
580.0mm μ	22.835 580	300 2065	102,380 455,591	0 - 0.13 0 - 3.2	0° - 19'	0.07 6	4 - 1 1/2 x 4	26.76 680	30.01 762	3.12 79	92.8 42.2
24 ‡ 600	24.000 609.6	250 1725	113,000 502850	0 - 0.13 0 - 3.2	0° - 18'	0.07 6	6 - 1 1/2 x 4	27.75 704	31.25 794	3.13 80	94.0 42.6
630.0mm μ	24.803 630	250 1725	102,790 457,416	0 - 0.13 0 - 3.2	0° - 18'	0.07 6	6 - 1 1/2 x 4	28.42 722	32.16 817	3.12 79	96.8 44
14 - 24 350 - 600	AGS See Style W77, Publication 20.03										

§ Couplings 8, 10, 12/200, 250, 300 mm sizes available to JIS standards. Refer to Section 06.17 for details.

* Working Pressure and End Load are total, from all internal and external loads, based on standard weight (ANSI) steel pipe, standard **roll** or **cut** grooved in accordance with Victaulic specifications. Contact Victaulic for performance on other pipe.

WARNING: FOR ONE TIME FIELD TEST ONLY, the Maximum Joint Working Pressure may be increased to 1 1/2 times the figures shown.

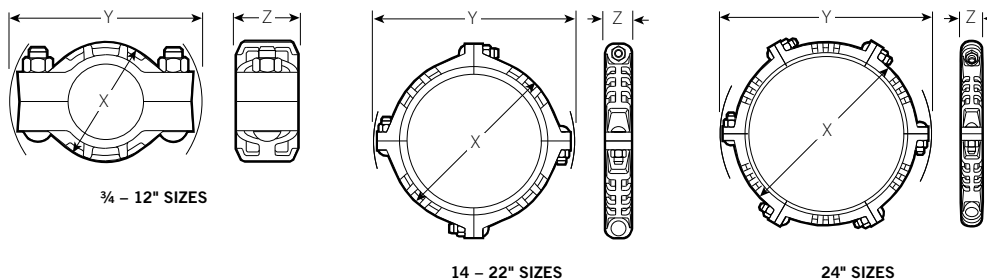
† Allowable Pipe End Separation and Deflection figures show the maximum nominal range of movement available at each joint for standard **roll** grooved pipe. Figures for standard **cut** grooved pipe may be doubled. These figures are maximums; for design and installation purposes these figures should be reduced by: 50% for 3/4 - 3 1/2"/20 - 90mm; 25% for 4"/100mm and larger.

@ Number of bolts required equals number of housing segments.

Metric thread size bolts are available (color coded gold) for all coupling sizes upon request. Contact Victaulic for details.

‡ For cut groove systems only. For 14 - 24"/350 - 600 mm Roll Groove systems Victaulic offers the Advanced Groove System (AGS) line of products. Request publication 20.03 for information on the Style W77 flexible AGS coupling.

μ CIS size product is designed with two housings and requires two bolts.



Standard Flexible Coupling

STYLE 77

INSTALLATION

Reference should always be made to the I-100 Victaulic Field Installation Handbook for the product you are installing. Handbooks are included with each shipment of Victaulic products for complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

WARRANTY

Refer to the Warranty section of the current Price List or contact Victaulic for details.

NOTE

This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.



For complete contact information, visit www.victaulic.com

06.04 1469 REV J UPDATED 1/2008

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06.04



PRO-PRESS SYSTEM



System Data Sheet

System Description

ProPress®, ProPress XL™ and ProPress XLC are safe, reliable, and economical copper pipe installation systems that use modern cold press connection technology for a wide assortment of more than 500 fittings in dimensions ranging from 1/2" to 4".

Applications

Tubing: K, L, and M hard copper tubing from 1/2" to 4" and soft copper tubing in 1/2" to 1-1/4" diameters. All tubing must comply with the ASTM B88 standard. ProPress fittings are approved for installations in both above and below ground applications. Per code, local inspector approval must be obtained prior to installation below ground.

Operating Parameters:

Operating Pressure 200 PSI Max.
Test Pressure 600 PSI Max.
Low Pressure Steam 15 PSI Max.
Vacuum 29.2" Mercury Max. @ 68°F
Operating Temperature 0°F - 250°F

Approved Applications:

- Potable water
- Hydronic heating (w/ Glycol)
- Chilled water
- Compressed Air (200 PSI Max.)
- Non Medical Gases (140 PSI Max.)
- Fire Sprinkler (175 PSI Max.)
- Low Pressure Steam (15 PSI Max.)
- Vacuum (29.2" Mercury Max. @ 68°F)

System Benefits

- Fast and Easy to Use
- Flameless
- Permanent Connections
- Wide Capacity from 1/2" to 4"
- Large Selection of Fittings
- Consistent Professional Appearance
- Less Equipment Required
- Environmentally Friendly Connection System
- Versatility of Fittings and Tools for Variety of Applications

Fittings

Viega ProPress fittings are offered in 500+ configurations including: Elbows, Couplings, Reducers, Tees, Reducing Tees, Threaded Adapters, Unions, Caps, and Flanges. All Threaded 1/2"- 2" fittings are bronze.

Smart Connect™ (SC Feature)

In ProPress 1/2"- 4" dimensions, the Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an **unpressed** connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

RIDGID Pressing Tools			
Model	CT-400	320-E	100-B
Volts	120v	14.4v Battery	14.4v Battery
Amps	5.2A	24A	24A
Weight (w/ out jaw)	15.6 lbs.	10.5 lbs	7.5 lbs

Tools

RIDGID offers three pressing tools for connecting ProPress fittings.

- CT-400 Corded Tool (1/2" to 4")
- 320-E Battery powered Tool (1/2" to 4")
- 100-B Battery powered Tool (1/2" to 1")
- 1/2" to 4" fittings are pressed in 4-7 sec.

History

ProPress has been used in Europe since the late 1980s and in the U.S. since the late 1990s for a variety of applications. Backed by two plumbing leaders with over 175 years of combined excellence.

Warranty

Viega ProPress products carry a 50-year warranty against defects in material and workmanship. The RIDGID Lifetime Warranty applies to tools, jaws and crimp rings from Ridge Tool Company.

Approvals and Certificates NSF International

www.nsf.org/business/search_listings/index.asp#mname (enter "Viega")

IAPMO

<http://pld.iapmo.org/> (enter "Viega")

UL

<http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/gfilebr.html> (enter "ex6157")

ABS

(American Bureau of Shipping)
<http://www.eagle.org/typeapproval/contents.html> (enter "Viega")

CSA International

<http://www.csa-international.org/product/> (enter "Viega")

INTERNATIONAL APPROVALS

- Deutsch Verein des Gas-und Wasserfachese.V. (DVGW)
- Lloyd's Register (LLOYD'S)
- Det Norske Veritas (DNV)
- Registro Italiano Navale (RINA)
- Bureau Veritas (BV)
- KIWA

Compliant with

- ICC International Plumbing Code
- UPC Uniform Plumbing Code
- PHCC National standard plumbing code
- Florida Building Code, Volume II Plumbing Code
- NFPA 13,13D, and 13R

Contact your local Viega or RIDGID representative for details on local approvals

For more information on RIDGID products contact:

Ridge Tool Company
400 Clark Street, Elyria, Ohio 44036
Demos, Literature: 800-769-7743
Technical inquiries: 800-519-3456
Availability: 888-743-4333
Web: www.ridgid.com

VIEGA • One Company... One Partner... Delivering System Solutions.

301 N. Main, Floor 9 • Wichita, KS 67202 • Ph: 877-Viega-NA • Fax: 800-976-9817 • E-Mail: service@viega.com • www.viega-na.com

EXHAUST FAN



Shutter-Mount Exhaust Fans



- Mount: vertical only
- Motors: totally enclosed, 115V, 60 Hz, thermally protected
- Max. inlet/ambient temp.: 104°F
- 7" through 24" dia. propellers are aluminum; 30" and 36" propellers are galvanized steel
- OSHA-compliant gray polyester powder-coated wire guards

Fans come fully assembled with shutters and pre-punched mounting holes; simply frame an opening and mount. UL and C-UL Listed.

INSULATED FAN COVERS

Fit snugly over fan guard using high strength magnets to provide wind, draft, and weather insulation. Interior installation; covers store compactly when not in use.

Propeller Dia. (in.)	CFM @ 0.000" SP	CFM @ 0.125" SP	Motor RPM	Motor HP	Full Load Amps	Bearing Type	Sones @ 0.000" SP @ 5 ft.	Speed Control	H (in.)	W (in.)	Max. Depth (in.)	Sq. Opening Req. (in.)	No. of Blades	EXHAUST FANS		INSULATED FAN COVERS	
														Item No.	✓	Item No.	✓
Speed Controllable																	
7	140	—	1550	1/25	1.5	Sleeve	4.8	1DG1	11 1/2	11 1/2	10 1/16	8 1/2	5	1HKL9	✓	6HKV6	✓
10	585	285	1550	1/25	1.5	Sleeve	6.6	1DG1	13 1/2	13 1/2	10 1/16	10 1/2	5	1HLA1	✓	6HKV7	✓
12	800	470	1550	1/25	1.5	Sleeve	7.6	1DG1	15 1/2	15 1/2	12 1/2	13	3	1HLA2	✓	6HKV8	✓
16	1095	720	1550	1/20	1.0	Sleeve	8	1DG1	19 1/2	19 1/2	14 1/2	17	3	1HLA3	✓	6HKV9	✓
18	1860	850	1075	1/4	1.3	Sleeve	8.4	1DG1	21 1/2	21 1/2	14 1/2	19	3	1HLA4	✓	6HKW0	✓
20	2830	2255	1100	1/4	5	Sleeve	11.3	1DG2	23 1/2	23 1/2	17 1/2	21	3	1HLA9	✓	6HKW1	✓
24	3240	2485	1075	1/4	4	Ball	11.7	1DG2	27 1/2	27 1/2	19 1/2	25	3	1HLB3	✓	6HKW2	✓
Single-Speed																	
18	2590	2190	1725	1/4	4.5	Ball	14.3	—	21 1/2	21 1/2	18 1/4	19	3	1HLA5	✓	6HKW0	✓
20	2955	2450	1725	1/4	4.5	Ball	14.4	—	23 1/2	23 1/2	17 1/2	21	3	1HLA8	✓	6HKW1	✓
20	3635	3115	1725	1/2	4.8	Ball	16.9	—	23 1/2	23 1/2	17 1/2	21	3	1HLA7	✓	6HKW1	✓
24	3270	2515	1075	1/4	4.1	Sleeve	10.7	—	27 1/2	27 1/2	18 1/2	25	3	1HLB2	✓	6HKW2	✓
24	3970	3240	1075	1/2	5.3	Sleeve	12.1	—	27 1/2	27 1/2	17 1/2	25	3	1HLB4	✓	6HKW2	✓
30	6075	4195	825	1/2	4.5	Ball	13.5	—	33 1/2	33 1/2	18 1/2	31	3	1HLB5	✓	6HKW3	✓
36	8225	6480	825	1/2	6.4	Ball	14.7	—	39 1/2	39 1/2	18 1/2	37	3	1HLB6	✓	6HKW4	✓
Two-Speed																	
24	3985/3760	3255/2995	1075	1/4	5.3	Sleeve	11.8/11.3	1DG29	27 1/2	27 1/2	18 1/2	25	3	1HLB1	✓	6HKW2	✓
Single-Speed																	
20	2985	2445	1725	1/4	4.3	Ball	14.3	—	23 1/2	23 1/2	17 1/2	21	3	—	—	6HKW1	✓



2-Speed Fan Switch

For use with No. 1HLB1 and other 2-speed fans. Mounts on standard 4" x 2" single gang box. SPDT (center off).

Voltage	Max. Amps	Item No.
120	15	1DG29



Corrosion-Resistant Shutter-Mount Exhaust Fans



- Mount: vertical only
- Motors: totally enclosed, 115V, 60 Hz, thermally protected
- Max. inlet/ambient temp.: 104°F
- Fiberglass-reinforced polypropylene propellers
- OSHA-compliant epoxy-coated wire guards

Constructed with fiberglass shutter and frame and stainless steel hardware, for superior resistance to corrosive gases and vapors. UL and C-UL Listed.

Note: Not designed for laboratory hood exhaust or explosive atmospheres.

Propeller Dia. (in.)	CFM @ 0.000" SP	CFM @ 0.125" SP	Motor RPM	Motor HP	Full Load Amps	Bearing Type	Sones @ 0.000" SP @ 5 ft.	H (in.)	W (in.)	Max. Depth (in.)	Sq. Opening Req. (in.)	No. of Blades	Item No.	✓
10	524	379	1550	1/25	1.9	Sealed Ball	12.3	13	13	14 1/2	10 1/2	4	1BLH6	✓
12	1100	799	1625	1/8	1.9	Sealed Ball	13.1	15	15	15	13	4	1BLH8	✓
16	2005	1678	1625	1/8	2.1	Sealed Ball	15.7	19	19	15	17	4	1BLJ1	✓
18	2790	1961	1075	1/4	4.1	Sealed Ball	12.5	21	21	18 1/2	19	8	1BLJ3	✓
20	3642	2838	1075	1/2	4.9	Sealed Ball	13.7	23	23	17 1/2	21	8	1BLJ5	✓
24	4876	4197	1075	1/2	6.7	Sealed Ball	17.4	27	27	18	25	8	1BLJ7	✓



Guard- and Ring-Mount Exhaust Fans

- Mount: vertical or horizontal
- Motors: totally enclosed, 115V, 60 Hz, thermally protected
- Max. inlet/ambient temp.: 104°F

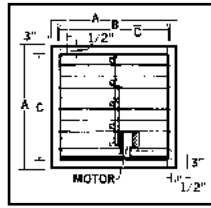
Designed for low-pressure exhausting and cooling applications. Automatic shutter is recommended; see Index under "Shutters, Fan". UL and C-UL Listed.

Propeller Dia. (in.)	CFM @ 0.000" SP	CFM @ 0.125" SP	Motor RPM	Motor HP	Operating Amps	Bearing Type	Max. Depth (in.)	Outside Dia. (in.)	Mounting Holes O.C. (in.)	No. of Blades	Item No.	✓
Guard-Mount Fans with OSHA-Compliant Gray Polyester-Coated Guards												
7	230	—	1550	1/25	1.5	Sleeve	4 1/2	9 1/2	7 1/2	5	1HKL2	✓
10	595	405	1550	1/25	1.5	Sleeve	5 1/2	11 1/2	8 3/4	5	1HKL3	✓
12	820	535	1550	1/25	1.5	Sleeve	5 1/2	13 1/2	10 3/4	3	1HKL4	✓
16	1060	585	1550	1/20	1.0	Sleeve	6 1/2	17 1/2	12 1/2	3	1HKL5	✓
18	2515	1780	1725	1/4	4.4	Ball	12 1/2	20 1/2	15 1/2	3	1HKL6	✓
20	2600	1685	1725	1/4	4.0	Ball	11 1/2	22 1/2	16 1/2	3	1HKL7	✓
24	3840	2690	1075	1/2	3.6	Sleeve	10 1/2	26 1/2	19 1/2	3	1HKL8	✓
Ring-Mount Fans with Galvanized Steel Frame*												
6	119	—	1550	1/65	0.72	Ball	5	7	11 3/8	5	12U117	✓
9	305	—	1550	1/45	0.74	Ball	5	9 1/2	11 1/4	5	12U118	✓
12	665	—	1550	1/30	1.40	Ball	6 1/2	12 1/2	13 1/2	5	12U119	✓
12	889	—	1550	1/20	1.50	Ball	7 1/2	16 1/2	14 1/2	3	12U120	✓

* OSHA complying guards are required when a fan is installed within 8 ft. of floor, working level, or within reach of personnel. Review OSHA codes and UL standards. See Index under Guards, Fan.

MOTORIZED DAMPER

Motorized Dampers



- Exhaust or supply
- Mount: horizontal or vertical
- Max. velocity: 3500 fpm

Stainless steel jamb seals keep out light, air, and moisture. Feature center-pivoting louvers for a full 90° opening. Welded-corner construction and factory-installed motors. Mill-finish extruded aluminum models have 0.125"-thick frames, and 0.08"-thick louvers. G-90 galvanized steel models have 14-ga. frames, 16-ga. louvers.

Single-Panel Motorized Damper, Rear View
No. 4C560

Single-Panel Motorized Damper, Front View
No. 3C725

For Fan Dia. (in.)	Volts, 60 Hz	Overall Square (in.) A	Sq. Opening Req. (in.)	Frame Less Flange (sq. in.)	Free Area (sq. ft.)	Motor Bracket Extension (in.)*	Extruded Aluminum Dampers	G90 Galvanized Steel Dampers
Single Panel, Power Open, Spring Return								
12	120/240	15	13	12	0.835	6 7/8	3HHP4 ✓	3HHP3 ✓
16	120/240	19	17	16	1.750	6 7/8	4C560 ✓	3C725 ✓
20	120/240	23	21	20	2.053	6 7/8	4C561 ✓	3C726 ✓
24	120/240	27	25	24	3.585	6 7/8	3C315 ✓	3C727 ✓
30	120/240	33	31	30	5.679	10 1/4	3C234 ✓	3C728 ✓
36	100-240	39	37	36	8.252	10 1/4	3C131 ✓	3C729 ✓
42	100-240	45	43	42	11.305	10 1/4	3C235 ✓	3C730 ✓
48	100-240	51	49	48	14.836	10 1/4	3C132 ✓	3C731 ✓
Double Panel, Power Open, Spring Return								
54	24-240	57	55	54	18.827	10 1/4	3C188 ✓	3C732 ✓
60	24-240	63	61	60	23.314	10 1/4	3C189 ✓	3C733 ✓

* From damper frame to end of bracket.

Motorized Volume-Control Channel-Style Dampers



Volume-Control Channel-Style Damper
No. 5NKK1

- 100 to 240V
- Exhaust or supply
- Mount: horizontal or vertical
- Max. velocity: 3500 fpm

Regulate airflow in medium- and low-pressure commercial applications. TPV louver seals and stainless steel jamb seals minimize leakage. Actuator is internally installed. Mill-finish extruded aluminum frame (5" deep x 0.1" thick) and louvers (0.08" thick). Plated steel linkage and pivot pins.

Overall Square (in.)	Sq. Opening Req. (in.)	Free Area (sq. ft.)	Motor Bracket Extension (in.)*	Item No.
Single Panel, Power Open, Spring Return				
11 3/4	12	0.372	1 1/2	5NKK1 ✓
15 3/4	16	1.05	1 1/2	5NKK2 ✓
19 3/4	20	2.126	1 1/2	5NKK3 ✓
23 3/4	24	3.172	1 1/2	5NKK4 ✓
29 3/4	30	5.107	1 1/2	5NKK5 ✓
35 3/4	36	7.559	1 1/2	5NKK6 ✓
41 3/4	42	10.49	1 1/2	5NKK7 ✓
47 3/4	48	13.9	1 1/2	5NKK8 ✓

* From damper frame to end of bracket.

Backdraft Dampers

For belt-drive centrifugal roof and wall ventilators. Max. velocity: 2000 fpm for models up to 19" and no-flange, 2250 fpm for 23" and larger.

WARNING: Not for use with kitchen exhaust applications.

ROOF-MOUNT

G-90 galvanized steel frame, 2" deep with 1" flange. Aluminum louvers, stainless steel pivot pins, nylon bushings, and felted edge. Prepunched conduit hole knockout.

WALL-MOUNT

16-ga. mill-finish extruded aluminum frame, 1 1/2" deep with 1 3/8" flange. Mill-finish aluminum louvers have galvanized steel reinforcement strip. Spring close for positive seal.

NO-FLANGE HORIZONTAL/VERTICAL MOUNT

For use in roof curbs, ductwork, and wall collars when using a fan or power roof ventilator. G-90 galvanized frame is 2" deep. Mill-finish aluminum louvers. Stainless steel pivot pins and rivets, and nylon bushings. Prepunched conduit knockout.

OPTIONAL SHUTTER MOTORS

Motor packs expand options where standard 120/240 line voltage is not available. 60 Hz, 1-phase motors simplify installation by eliminating the need for transformers or other adaptations. Each includes motor, bracket, linkage kit, and 6" leads with junction box. 8 1/2" overall installed height. Not for use with 8" roof curbs. UL Recognized.

Damper Size (in.)	Overall Size (in.)	Item No.
Roof Mount, Exhaust Backdraft Dampers		
9 1/2 x 9 1/2	11 1/2 x 11 1/2	3TZ50
12 x 12	14 x 14	4HX64
15 x 15	17 x 17	4HX65
19 x 19	21 x 21	4HX66
23 x 23	25 x 25	4HX67
27 x 27	29 x 29	4HX68
35 x 35	37 x 37	4HX69
39 x 39	41 x 41	4HX70
50 x 50	52 x 52	4HX71
Wall Mount, Supply Backdraft Dampers		
8 x 8	10 3/4 x 10 3/4	4HX72
10 x 10	12 3/4 x 12 3/4	4HX73
11 x 11	13 3/4 x 13 3/4	4HX33
12 x 12	14 3/4 x 14 3/4	4HX74
13 x 13	15 3/4 x 15 3/4	4HX75
14 x 14	16 3/4 x 16 3/4	4HX76
15 x 15	17 3/4 x 17 3/4	4HX77
17 x 17	19 3/4 x 19 3/4	5NKN4
20 x 20	22 3/4 x 22 3/4	5NKN5
25 x 25	27 3/4 x 27 3/4	5NKN6
No Flange, Horizontal or Vertical Mount Backdraft Exhaust Dampers		
7 3/4 x 7 3/4	7 3/4 x 7 3/4	3HHL4
9 3/4 x 9 3/4	9 3/4 x 9 3/4	2FTW8
11 3/4 x 11 3/4	11 3/4 x 11 3/4	2FTX4
13 3/4 x 13 3/4	13 3/4 x 13 3/4	2FTX5
15 3/4 x 15 3/4	15 3/4 x 15 3/4	3HHL5
17 3/4 x 17 3/4	17 3/4 x 17 3/4	2FTU9
19 3/4 x 19 3/4	19 3/4 x 19 3/4	3HHL6
23 3/4 x 23 3/4	23 3/4 x 23 3/4	2FTV7
27 3/4 x 27 3/4	27 3/4 x 27 3/4	3HHL7
29 3/4 x 29 3/4	29 3/4 x 29 3/4	3HHL8
33 3/4 x 33 3/4	33 3/4 x 33 3/4	3HHL9
35 3/4 x 35 3/4	35 3/4 x 35 3/4	3HHN1
39 3/4 x 39 3/4	39 3/4 x 39 3/4	3HHN2
41 3/4 x 41 3/4	41 3/4 x 41 3/4	6WRK7
47 3/4 x 47 3/4	47 3/4 x 47 3/4	3HHN3
49 3/4 x 49 3/4	49 3/4 x 49 3/4	6WRK8
55 3/4 x 55 3/4	55 3/4 x 55 3/4	5NKN7
59 3/4 x 59 3/4	59 3/4 x 59 3/4	5NKN8
61 3/4 x 61 3/4	61 3/4 x 61 3/4	6WRK9
63 3/4 x 63 3/4	63 3/4 x 63 3/4	5NKN9

Voltage	Amps	H (in.)	W (in.)	D (in.)	Item No.
Optional Shutter Motors					
24	1.02	8 1/2 (Installed)	4 1/2	7 1/4	2FTX6 ✓
120/240	0.20/0.14	8 1/2 (Installed)	4 1/2	7 1/4	2C904 ✓
208	0.11	8 1/2 (Installed)	4 1/2	7 1/4	2FTV1 ✓
277	0.12	8 1/2 (Installed)	4 1/2	7 1/4	2FTV3 ✓
460	0.11	8 1/2 (Installed)	4 1/2	7 1/4	2FTW4 ✓



Roof-Mount Backdraft Damper
No. 4HX64



Wall-Mount Backdraft Damper
No. 4HX74



No-Flange Backdraft Damper
No. 2FTW8



Shutter Motor
No. 2C904

HEATER

Electric Unit Heaters



No. **2YU61**

- Adjustable outlet louvers
- Fan forced, 60 Hz
- Ceiling or wall mount

Advanced pull-through airflow design provides even air distribution and cooler element operation. Automatic reset linear thermal protector provides protection over entire length of element area to disconnect heater if normal operating temperatures are exceeded. Heavy-duty, totally enclosed motors. Aluminum-finned, copper-clad steel sheath heating element. 20-gauge steel neutral gray die-formed housing. Can be mounted vertically or horizontally. Four top and four back threaded reinforced holes for ceiling mounting with 5/16"-18 threaded rods (not included); 30"H units require 3/8"-16 rods (see page 2836).

24V low voltage control circuit standard on all models except 3 and 5 kW single-voltage units, which are wired for direct line voltage control. 3-phase models are phase balanced. 3-phase 30 and 50 kW units are wired for single- or two-stage low voltage control and contain two-speed motor for Hi/Low fan selection. UL and C-UL Listed (E154218). Meet NEC and OSHA requirements.

Uses: Can be used as auxiliary, supplemental, or primary heat source in large exposed areas or additions.

Note: Wall-mounted or unit-mounted thermostat (not included) must be used with these heaters. See page 3891.

kW	Output BtuH (x1000)	Volts	Phase	Amps* AC	CFM‡	Temp. Rise (°F)	Dimensions (In.)			Max. Mounting Height (Ft.)	Horizontal Air Throw (Ft.)	Item No.	Shpg. Wt.	
							H	W	D					
3.0	10.2	208	1	14.5	350	27	16	14	8½	8	12	2YU61	✓	24.2
3.0/2.2	10.2/7.5	240/208	1	12.5/11.0	350	27	16	14	8½	8	12	2YU58	✓	24.0
3.0	10.2	277	1	11	350	27	16	14	8½	8	12	2YU60	✓	23.8
3.0	10.2	480	3	3.6	350	27	16	14	8½	8	12	2YU59	✓	28.1
5.0	17	208	1 or 3	24	350	45	16	14	8½	8	12	2YU65	✓	24.7
5.0/3.7	17.0/12.6	240/208	1 or 3	21.0/18.0	350	45	16	14	8½	8	12	2YU62	✓	25.2
5.0	17	277	1	18	350	45	16	14	8½	8	12	2YU64	✓	24.2
5.0	17	480	3	6	350	45	16	14	8½	8	12	2YU63	✓	27.4
7.5	25.6	208	1 or 3	36	650	37	21¾	19	8½	9	18	2YU68	✓	37.5
7.5/5.6	25.6/19.1	240/208	1 or 3	31.3/27.0	650	37	21¾	19	8½	9	18	2YU66	✓	37.6
7.5	25.6	480	3	9	650	37	21¾	19	8½	9	18	2YU67	✓	38.4
10.0	34.1	208	1 or 3	48	650	49	21¾	19	8½	9	18	2YU71	✓	38.8
10.0/7.5	34.1/25.6	240/208	1 or 3	42.0/36.0	650	49	21¾	19	8½	9	18	2YU69	✓	38.0
10.0	34.1	480	3	12	650	49	21¾	19	8½	9	18	2YU70	✓	39.2
15.0	51.2	208	1 or 3	72	910	52	21¾	19	13¾	11	35	2YU74	✓	56.0
15.0/11.2	51.2/38.2	240/208	3	36.1/31.3	910	52	21¾	19	13¾	11	35	2YU72	✓	53.8
15.0	51.2	480	3	18	910	52	21¾	19	13¾	11	35	2YU73	✓	54.0
20.0/15.0	68.2/51.2	240/208	3	48.0/41.2	1320	48	21¾	19	13¾	12	41	2YU75	✓	56.0
20.0	68.2	480	3	24	1320	48	21¾	19	13¾	12	41	2YU76	✓	56.0
30.0	102.3	208	3	84	2100/1800	45/53	30	26¾	13¾	12	50	2YU79	✓	97.0
30/22.5	102/77	240/208	3	72.3/63.0	2100/1800	45/53	30	26¾	13¾	12	50	2YU77	✓	95.0
30.0	102.3	480	3	36	2100/1800	45/53	30	26¾	13¾	12	50	2YU78	✓	93.0
50.0 / 37.5	170/127	240/208	3	120.4/104.2	3000/2600	53/61	30	26¾	18¾	15	60	2YU80	✓	128.0
50.0	170.5	480	3	60.2	3000/2600	53/61	30	26¾	18¾	15	60	2YU81	✓	124.0

(* Maximum amp rating reflects single phase on combination single/three phase units. To obtain amperage draw on three-phase power supply, divide single-phase rating by 1.73. (‡) Air delivery data on dual voltage units reflects high voltage.

Electric Heat Line Voltage Thermostats

Thermostat Type	Switch Type	Sensor Type	Resistive Contact Ratings at		Control Range (°F)	Differential (Deg. F)	Color	Dimensions (In.)			Brand	Mfr. Model	Item No.	\$ Each	Shpg. Wt.	
			120V (A)	240V (A)				H	W	D						
Bimetal Operated	SPST	Bimetal	22	22	50 to 90	3	White	4¾	2¾	2¾	Dayton	—	4PU49	20.01	0.7	
Digital Programmable	DPST	Thermistor	—	15	40 to 86	+/- 1	White	4¾	2¾	7/8	Honeywell	TL8230A1003	6WY24	✓	59.80	0.8
Electric Heat, Slide Action	DPST*	Bimetal	22	22	40 to 85	+/- 3	Brushed Gold	4½	2¾	1½	Honeywell	T498B1512	2E832	36.65	0.5	
Electric Heat, Slide Action	DPST*	Bimetal	22	22	40 to 85	+/- 1	Beige	4½	2¾	1¼	White-Rodgers	1A66-641	4E037	39.20	0.6	

(* Double pole disconnect with "Off" position which mechanically breaks both sides of line.

ELECTRICAL COMPONENT DATA SHEETS

VARIABLE FREQUENCY DRIVES

Adjustable Frequency Drives

Product Bulletin

ACH550-US-02



The ACH550 is an adjustable frequency AC drive designed specifically for the HVAC market that achieves the ultimate in flexible motor control performance. Offering two modes of motor control: Scalar (V/Hz) and Sensorless Vector, the ACH550 provides accurate speed control for any standard squirrel cage motor.

With drives ranging from 1 to 550 HP, the ACH550 series features an 'intuitively obvious' multi-lingual, graphic display panel that also provides an assistant to aid users in start-up. The control panel can be mounted on the cover of the drive, or remotely, and can upload, store, and download parameters.

The ACH550 comes equipped with an extensive library of preprogrammed HVAC application macros that, at

the touch of a button, allow rapid configuration of inputs, outputs, and parameters for specific HVAC applications to maximize convenience and minimize start-up time.

The ACH550 can be used for the simplest to the most demanding HVAC applications. Two internal option slots can be configured with additional relay outputs as well as a host of different communication bus adapters.

The ACH550 has a 110% short term overload rating for one (1) minute out of ten (10) and is capable of >130% short-term overload rating for 2 seconds out of each minute.



FEATURES

Standard Features

UL, cUL labeled, CE marked & BTL listed (BACnet Testing Lab)
 EMI/RFI Filter (1st Environment, Restricted Distribution)
 Start-Up Assistants
 Maintenance Assistants
 Diagnostic Assistants
 Real Time Clock
 Includes Day, Date and Time
 Operator Panel Parameter Backup (read/write)
 Full Graphic and Multilingual Display
 for Operator Control, Parameter Set-Up and Operating
 Data Display:
 Output Frequency (Hz)
 Speed (RPM)
 Motor Current
 Calculated % Motor Torque
 Calculated Motor Power (kW)
 DC Bus Voltage
 Output Voltage
 Heatsink Temperature
 Elapsed Time Meter (resettable)
 KWh (reset-able)
 Input / Output Terminal Monitor
 PID Actual Value (Feedback) & Error
 Fault Text
 Warning Text
 Three (3) Scalable Process Variable Displays
 User Definable Engineering Units
 Two (2) Programmable Analog Inputs
 Six (6) Programmable Digital Inputs
 Two (2) Programmable Analog Outputs
 Up to six (6) Programmable Relay Outputs (Three (3) Standard)
 Adjustable Filters on Analog Inputs and Outputs
 Mathematical Functions on Analog Reference Signals
 All Control Inputs Isolated from Ground and Power
 Three (3) Resident Serial Communication Protocols
 Johnson Controls N2
 Siemens Buildings Technologies FLN (P1)
 Modbus RTU
 Input Speed Signals
 Current 0 (4) to 20 mA
 Voltage 0 (2) to 10 VDC
 Increase/Decrease Reference Contacts (Floating Point)
 Serial Communications
 Start/Stop
 2 Wire (Dry Contact Closure)
 3 Wire (Momentary Contact)
 Application of Input Power
 Application of Reference Signal (PID Sleep/Wake-Up)
 Serial Communications
 Start Functions
 Ramp
 Flying Start
 Premagnetization (DC brake) on Start
 Automatic Torque Boost
 Automatic Torque Boost with Flying Start
 Auto Restart (Reset) – Customer Selectable and Adjustable
 Stop Functions
 Ramp or Coast to Stop
 Emergency Stop
 DC Braking / Hold at Stop
 Flux Braking
 Accel/Decel
 Two (2) sets of Independently Adjustable Ramps
 Linear or Adjustable 'S' Curve Accel/Decel Ramps

HVAC Specific Application Macros
 Separate Safeties (2) and Run Permissive Inputs
 Damper Control
 Override Input (Fire Mode)
 Timer Functions
 Four (4) Daily Start/Stop Time Periods
 Four (4) Weekly Start/Stop Time Periods
 Four Timers for Collecting Time Periods and Overrides
 Seven (7) Preset Speeds
 Supervision Functions
 Adjustable Current Limit
 Electronic Reverse
 Automatic Extended Power Loss Ride Through (Selectable)
 Programmable Maximum Frequency to 500 Hz
 PID Control
 Two (2) Integral Independent Programmable PID
 Setpoint Controllers (Process and External)
 External Selection between Two (2) Sets of Process
 PID Controller Parameters
 PID Sleep/Wake-Up
 Motor Control Features
 Scalar (V/Hz) and Vector Modes of Motor Control
 V/Hz Shapes
 Linear
 Squared
 Energy Optimization
 IR Compensation
 Slip Compensation
 Three (3) Critical Frequency Lockout Bands
 Preprogrammed Protection Circuits
 Overcurrent
 Short Circuit
 Ground Fault
 Overvoltage
 Undervoltage
 Input Phase Loss
 Output Device (IGBT) Overtemperature
 Adjustable Current Limit Regulator
 UL508C approved Electronic Motor Overload (I₂T)
 Programmable Fault Functions for Protection Include
 Loss of Analog Input
 Panel Loss
 External Fault
 Motor Thermal Protection
 Stall
 Underload
 Motor Phase Loss
 Ground Fault
 5% Input Impedance
 5% Impedance with Internal Reactor(s)
 Patented Swinging Choke Design for Superior Harmonic
 Mitigation in frame sizes (R1 to R4)

Available Options

3 Relay Extension Module (OREL-01)
 115/230 V Digital input Interface Card (OHDI-01)
 Embedded Fieldbus Protocols
 BACnet (MS/TP)
 Fieldbus Adapter Modules
 LonWorks
 Profibus
 DeviceNet
 DriveWindow Light Start-up, Operation, Programming and Diagnostic
 Tool
 Computer Based Training (CBT) Tool
 Fan Replacement Kit

SPECIFICATIONS

Input Connection

Input Voltage (U ₁)	208/220/230/240 VAC 3-phase +/-10%
	208/220/230/240 VAC 1-phase +/-10%
	380/400/415/440/460/480 VAC 3-phase +/-10%
	500/575/600 VAC 3-phase +/- 10%
Frequency:	48 - 63 Hz
Line Limitations:	Max +/-3% of nominal phase to phase input voltage
Fundamental Power Factor (cosφ):	0.98 at nominal load
Connection:	U ₁ , V ₁ , W ₁ (U ₁ , V ₁ , 1-phase)

Output (Motor) Connection

Output Voltage:	0 to U ₁ , 3-phase symmetrical, U ₂ at the field weakening point
Output Frequency:	-500 to 500 Hz
Frequency Resolution:	0.01 Hz
Continuous Output Current:	
Variable Torque:	1.0 * I _{2N} (Nominal rated output current, Variable Torque)
Short Term Overload Capacity:	
Variable Torque:	1.1 * I _{2N} , (1 min/10 min)
Peak Overload Capacity:	
Variable Torque:	1.35 * I _{2N} , (2 sec/1 min)
Base Motor Frequency Range:	10 to 500 Hz
Switching Frequency:	1, 4, 8 or 12 kHz
Acceleration Time:	0.1 to 1800 s
Deceleration Time:	0.1 to 1800 s
Efficiency:	0.98 at nominal power level
Short Circuit Withstand Rating:	100,000 AIC (UL) w/o fuses
Connection:	U ₂ , V ₂ , W ₂

Enclosure

Style:	UL (NEMA) Type 1, Type 12, or Type 3R
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Agency Approval

Listing and Compliance:	UL, cUL, CE, BTL (BACnet Testing Laboratory)
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Ambient Conditions, Operation

Air Temperature:	-15° to 40°C (5° to 104°F), above 40°C the maximum output current is de-rated 1% for every additional 1°C (up to 50°C (122°F) maximum limit.
Relative Humidity:	5 to 95%, no condensation allowed, maximum relative humidity is 60% in the presence of corrosive gasses
Contamination Levels:	
IEC:	60721-3-1, 60721-3-2 and 60721-3-3
Chemical Gasses:	3C1 and 3C2
Solid Particles:	3S2
Installation Site Altitude:	0 to 1000 m (3300 ft) above sea level. At sites over 1000 m (3300 ft) above sea level, the maximum power is de-rated 1% for every additional 100 m (330 ft). If the installation site is higher than 2000 m (6600 ft) above sea level, please contact your local ABB distributor or representative for further information
Vibration:	Max 3.0 mm (0.12 in) 2 to 9 Hz, Max 10 m/s ² (33 ft/s ²) 9 to 200 Hz sinusoidal

Ambient Conditions, Storage (in Protective Shipping Package)

Air Temperature:	-40° to 70°C (-40° to 158°F)
Relative Humidity:	Less than 95%, no condensation allowed
Vibration:	In accordance with ISTA 1A and 1B specifications
Shock (IEC 60086-2-29):	Max 100 m/s ² (330 ft/s ²) 11 ms

Ambient Conditions, Transportation (in Protective Shipping Package)

Air Temperature:	-40° to 70°C (-40° to 158°F)
Relative Humidity:	Less than 95%, no condensation allowed
Atmospheric Pressure:	60 to 106 kPa (8.7 to 15.4 PSI)
Vibration:	Max 3.5 mm (0.14 in) 2 to 9 Hz, Max 15 m/s ² (49 ft/s ²) 9 to 200 Hz sinusoidal
Shock (IEC 60086-2-29):	Max 100 m/s ² (330 ft/s ²) 11 ms
Free Fall:	R1: 76 cm (30 in)
	R2: 61 cm (24 in)
	R3: 46 cm (18 in)
	R4: 31 cm (12 in)
	R5 & 6: 25 cm (10 in)

Cooling Information

Cooling Method:	Integral fan(s)
Power Loss:	Approximately 3% of rated power

SPECIFICATIONS (Continued)

Analog Inputs

Quantity	Two (2) programmable
Voltage Reference:.....	0 (2) to 10 V, 250kOhm, single ended
Current Reference:.....	0 (4) to 20 mA, 100Ohm, single ended
Potentiometer:.....	10 VDC, 10 mA (1K to 10KOhms)
Input Updating Time.....	8 ms
Terminal Block Size.....	2.3mm ² / 14AWG

Reference Power Supply

Reference Voltage.....	+10 VDC, 1% at 25°C (77°F)
Maximum Load.....	10 mA
Applicable Potentiometer	1 kOhm to 10 kOhm
Terminal Block Size.....	2.3mm ² / 14AWG

Analog Outputs

Quantity	Two (2) programmable current outputs
Signal Level.....	0 (4) to 20 mA
Accuracy	+/- 1% full scale range at 25°C (77°F)
Maximum Load Impedance.....	500 Ohms
Output Updating Time	2 ms
Terminal Block Size.....	2.3mm ² / 14AWG

Digital Inputs

Quantity	Six (6) programmable digital inputs
Isolation	Isolated as one group
Signal Level.....	24 VDC, (10V Logic 0)
Input Current	15 mA at 24 VDC
Input Updating Time:.....	4 ms
Terminal Block Size.....	2.3mm ² / 14AWG

Internal Power Supply

Primary Use	Internal supply for digital inputs
Voltage:	+24 VDC, max 250 mA
Maximum Current:.....	250 mA
Protection:.....	Short circuit protected

Relay Outputs

Quantity	Three (3) programmable relay (Form C) outputs
Switching Capacity:.....	8 A at 24 VDC or 250 VAC, 0.4 A at 120 VDC
Max Continuous Current:	2A RMS
Contact Material:.....	Silver Cadmium Oxide (AgCdO)
Isolation Test Voltage	4 kVAC, 1 minute
Output Updating Time	12 ms
Terminal Block Size.....	2.3mm ² / 14AWG

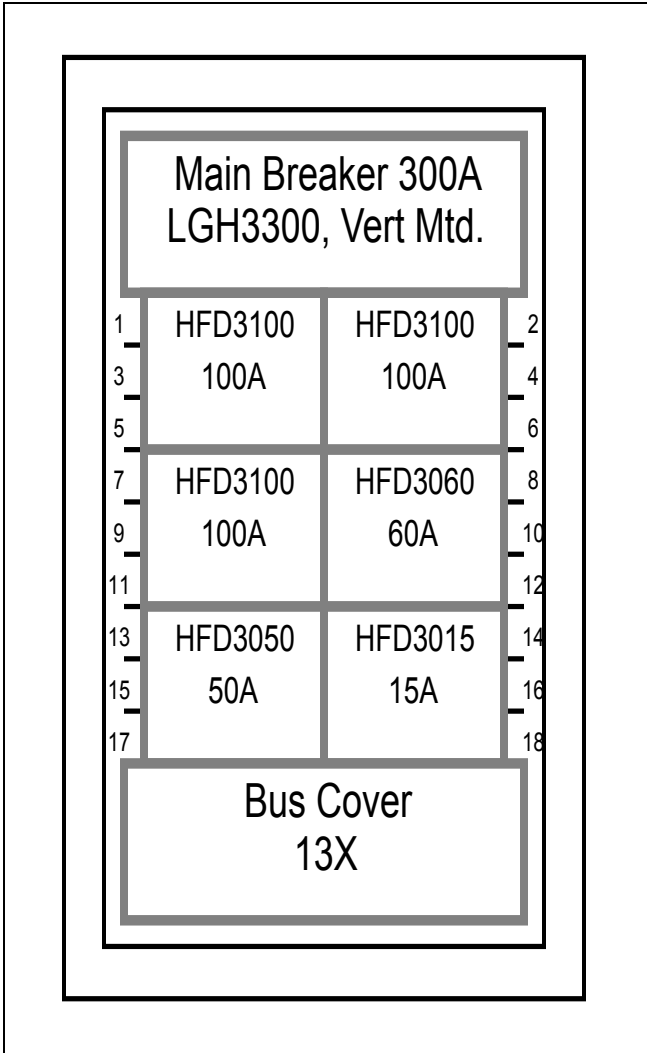
Protections

Single Phase.....	Protected (input & output)
Overcurrent Trip Limit:.....	3.5 x I _{2N} instantaneous
Adjustable Current Regulation Limit:.....	1.1 x I _{2N} (RMS) max.
Overvoltage Trip Limit:	1.30 x U _N
Undervoltage Trip Limit:	0.65 x U _N
Overtemperature (Heatsink):.....	+115°C (+239°F)
Auxiliary Voltage:.....	Short Circuit Protected
Ground Fault:	Protected
Short Circuit:	Protected
Microprocessor fault:.....	Protected
Motor Stall Protection:	Protected
Motor Overtemperature Protection (I _{2t}):.....	Protected
Input Power Loss of Phase:	Protected
Loss of Reference:.....	Protected
Short Circuit Current Rating:.....	100,000 RMS symmetrical Amperes
Input Line Impedance:.....	5% impedance with standard internal choke(s) Swinging Choke (R1 to R4)

Notes

- U1 = Input Voltage
- U2 = Output Voltage
- U_N = Nominal Motor Voltage
- f_N = Nominal Motor Frequency
- P_N = Power – Normal Duty (HP)
- I_{2N} = Nominal Motor Current
Normal Duty

PANELBOARD



General Information

(Section 1 of 1)

Service Voltage: 480V 3Ph 3W **Enclosure:** Type 1
Bus Rating & Type: 600A Aluminum **Neutral Rating:** None
Ground Bar: Std. Bolted Aluminum, Al or Cu cable
S.C. Rating: 65k A.I.C. Fully Rated

Main Device Type: Main Breaker - Top Cable Entry
Main Terminals: Mechanical - (1) #2-500 kcmil (Cu/Al)
Neutral Terminals: None
Box Catalog No.: EZB2072R
Trim: EZ Trim, Door in Door, Concealed Hardware (EZTV2072S)

Surface Mounted

Box Dimensions: 72.00" [1828.8mm]H x 20.00" [508.0mm]W x 5.75" [146.1mm]D
Min. Gutter Size: Top = 5.5" [139.7mm] Bottom = 5.5" [139.7mm]
 Left = 4" [101.6mm] Right = 4" [101.6mm]

Panel ID Nameplate: (1) Panelboard 1
Type: Plastic, adhesive-backed (2) 480V 3Ph 3W
Color: White with Black Letters (3)

UL

Trim Lock: Standard Lock & Key (Keyed WEM2)
 Circuit Directory: Plastic Sleeve with Card
 Main Circuit Breaker Trip Type: Thermal-Magnetic.

Device Modifications:

Ref #	Description
PLK1	Padlockable Hasp Lockoff
Ckt #: 1, 2, 7, 8, 13, 14	
Main Device Mods:	
LPHL	Padlockable Hasp Lockoff Device

Branch Devices

Qty	Poles	Trip	Frame	Amps	kAIC
1	3	15	HFD	100	65
3	3	100	HFD	100	65
1	3	50	HFD	100	65
1	3	60	HFD	100	65

Notes:

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PREPARED BY KAL HARRINGTON	DATE 6/2/2015	Eaton			
APPROVED BY	DATE	JOB NAME Systecon Bob Overbey	DESIGNATION Panelboard 1		
VERSION 1.0.0.4	TYPE PRL3a	DRAWING TYPE Customer Approval			
NEG-ALT Number CN440520X5K1-0001	REVISION 0	DWG SIZE A	G.O.	ITEM	SHEET 1 of 1

TRANSFORMERS

Dry Type Transformers Servicenter Mini-Unit Substations Integral Transformer and Distribution Center Single-Phase and Three-Phase TP-1



Single-Phase Servicenter

Single-Phase Indoor/Outdoor 60 Hz

Input Voltage	Output Voltage	kVA	Max. Branch Spaces 1 THQL, 1-pole	Max. Branch Spaces 1 THQL, 2-pole	Max. Branch Spaces 1/2 THQP, 1-pole	Max. Branch Spaces 1/2 THQP, 2-pole	Total 1-pole Spaces	Breaker Rating-Primary Main	Breaker Rating-Secondary Main	Product Number
480 Volts	120/240 Volts	5	6	3	12	4	12	25A	30A	9T21S1050
480 Volts	120/240 Volts	7.5	6	3	12	4	12	35A	40A	9T21S1070
480 Volts	120/240 Volts	10	8	4	16	6	16	50A	50A	9T21S1100
480 Volts	120/240 Volts	15	12	6	24	10	24	60A	70A	9T21S1150
480 Volts	120/240 Volts	25	20	10	8	2	24	100A	150A	9T21S1250

Three-Phase Indoor/Outdoor 60 Hz¹ TP-1

Input Voltage	Output Voltage	kVA	Max. Branch Spaces, 1-pole	Max. Branch Spaces 3-pole	Total 1-pole Spaces	Breaker Rating-Primary Main	Breaker Rating-Secondary Main	Product Number
240 Volts	208V/120 Volts	15	12	4	12	100A	50A	9T83B0001
240 Volts	208V/120 Volts	22.5	18	6	18	100A	70A	9T83B0002
240 Volts	208V/120 Volts	30	24	8	24	100A	100A	9T83B0003
480 Volts	208V/120 Volts	15	12	4	12	40A	50A	9T83B0011
480 Volts	208V/120 Volts	22.5	18	6	18	70A	70A	9T83B0012
480 Volts	208V/120 Volts	30	24	8	24	90A	100A	9T83B0013
600 Volts	208V/120 Volts	15	12	4	12	40A	50A	9T83B0021
600 Volts	208V/120 Volts	22.5	18	6	18	40A	70A	9T83B0022
600 Volts	208V/120 Volts	30	24	8	24	40A	100A	9T83B0023

¹(3) 5% taps 1 above and 2 below rated primary volts.

Three-Phase Indoor/Outdoor 60 Hz¹ TP-1 Copper Transformer Windings

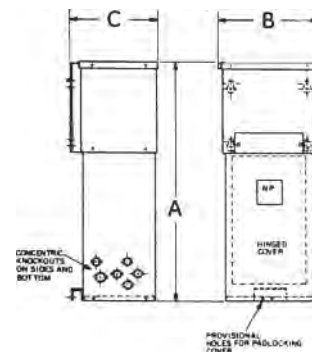
Input Voltage	Output Voltage	kVA	Max. Branch Spaces, 1-pole	Max. Branch Spaces 3-pole	Total 1-pole Spaces	Breaker Rating-Primary Main	Breaker Rating-Secondary Main	Product Number
240 Volts	208V/120 Volts	15	12	4	12	100A	50A	9T83C0001
240 Volts	208V/120 Volts	22.5	18	6	18	100A	70A	9T83C0002
240 Volts	208V/120 Volts	30	24	8	24	100A	100A	9T83C0003
480 Volts	208V/120 Volts	15	12	4	12	40A	50A	9T83C0011
480 Volts	208V/120 Volts	22.5	18	6	18	70A	70A	9T83C0012
480 Volts	208V/120 Volts	30	24	8	24	90A	100A	9T83C0013
600 Volts	208V/120 Volts	15	12	4	12	40A	50A	9T83C0021
600 Volts	208V/120 Volts	22.5	18	6	18	40A	70A	9T83C0022
600 Volts	208V/120 Volts	30	24	8	24	40A	100A	9T83C0023



Dry Type Transformers Servicenter Mini-Unit Substations Integral Transformer and Distribution Center Outlines, Dimensions and Wiring Diagrams

Single-Phase

kVA	Product Number	Approx. Net Weight (Lbs.)	"A" Height (in.)	"B" Width (in.)	"C" Depth (in.)	Frame Size
5	9T21S1050	103	32.5	10.75	11.12	16350
7.5	9T21S1070	147	32.5	10.75	11.12	16600
10	9T21S1100	198	35	12.62	12.62	19400
15	9T21S1150	220	35	12.62	12.62	19500
25	9T21S1250	388	44.75	16.75	16	50500



Dimensions Single-Phase

Three-Phase TP-1 Aluminum

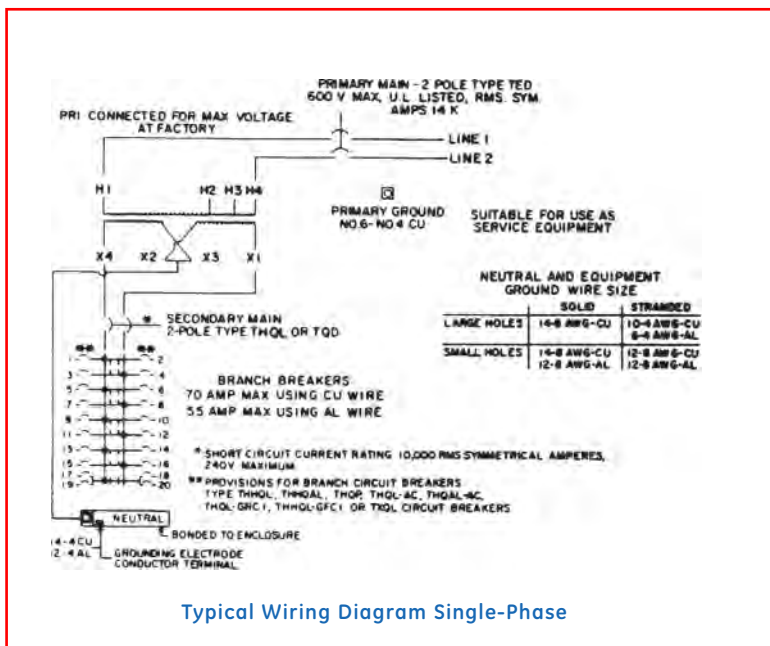
kVA	Product Number	Approx. Net Weight (Lbs.)	"B" Height (in.)	"A" Width (in.)	Depth (in.)	Frame Size
15	9T83B0001	280	27.3	27.4	16.9	XV371
22.5	9T83B0002	450	32.2	34.5	24	XV372
30	9T83B0003	450	32.2	34.5	24	XV372
15	9T83B0011	280	27.3	27.4	16.9	XV371
22.5	9T83B0012	450	32.2	34.5	24	XV372
30	9T83B0013	450	32.2	34.5	24	XV372
15	9T83B0021	280	27.3	27.4	16.9	XV371
22.5	9T83B0022	450	32.2	34.5	24	XV372
30	9T83B0023	450	32.2	34.5	24	XV372



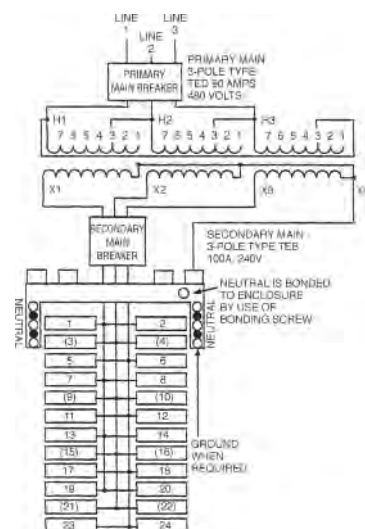
Dimensions Three-Phase

Three-Phase TP-1 Copper

kVA	Product Number	Approx Net Weight (Lbs)	"A" Height (in.)	"B" Height (in.)	"C" Height (in.)	Frame Size
15	9T83C0001	290	27.3	27.4	16.9	XV371
22.5	9T83C0002	460	32.2	34.5	24	XV372
30	9T83C0003	460	32.2	34.5	24	XV372
15	9T83C0011	290	27.3	27.4	16.9	Y371C
22.5	9T83C0012	460	32.2	34.5	24	Y372C
30	9T83C0013	460	32.2	34.5	24	Y372C
15	9T83C0021	290	27.3	27.4	16.9	XV371
22.5	9T83C0022	460	32.2	34.5	24	XV372
30	9T83C0023	460	32.2	34.5	24	XV372



Typical Wiring Diagram Single-Phase



Typical Wiring Diagram Three-Phase¹

¹For 22.5 and 15 kVA three-phase Servicers, secondary main breaker is a backfed plug-in type with positive retainers.



Load Centers and Circuit Breakers

PowerMark Plus™ Load Centers

Three-Phase, Four-Wire, 208Y/120Vac¹

Main Circuit Breaker or Main Lugs Factory Installed

242/324
Section 1
 Load Center
 3PH
 Main Lugs
 Outdoor NEMA 3R



TM24420CB

Main Lugs Factory Installed Outdoor (NEMA 3R) Enclosure

Main Ampere Rating	1 Pole, 1" Spaces	2 Pole, 1" Spaces	3 Pole, 1" Spaces	Total 1-pole Spaces	Feed Type	Box Number	Main Wire Size (AWG/kcmil) Cu-Al	Equipment Ground Kit	Product Number
125	12	6	4	12	Top	R3	6-2/0	TGK12 (order separately) TGK24 (order separately)	TL12412R ^{2,4}
150	18	8	6	18	Top	R4	1-3/0 (Cu), 2/0-3/0 (Al)	TGK24 (order separately) TGK32 (order separately)	TL18415R ^{2,4}
150	24	12	8	24	Top	R4	1-3/0 (Cu), 2/0-3/0 (Al)	TGK24 (order separately) TGK32 (order separately)	TL24415R ^{2,4}
200	18	8	6	18	Top	R4	1-250 (Cu), 2/0-250 (Al)	TGK32 (order separately)	TL18420R ^{2,4}
200	30	14	10	30	Top	R6	1-250 (Cu), 2/0-250 (Al)	TGK32 (order separately)	TL30420R ^{2,4}
200	42	20	14	42	Top	R8	1-250 (Cu), 2/0-250 (Al)	TGK42 (order separately)	TL42420R ^{2,3}
225	42	20	14	42	Top	R8	1-300 (Cu), 2/0-300 (Al)	TGK42 (order separately)	TL42422R ^{2,3}

¹Also UL Listed for three-phase, four-wire 240/120 Volts ac delta and three-phase, three-wire 240 Volts ac branch breakers installed.

²100-200 Amp three-phase devices have removable closing cap. Larger Ampere devices require field cut openings. Order hubs separately. See page 1-27.

³Not suitable for use as service entrance equipment.

⁴Alternate main breaker: 100 Amp max. THQL three-pole, use retainer THQLRK. See page 1-28.

Load Center
 3PH
 Main Breaker
 Indoor NEMA 1

Main Breaker Factory Installed Indoor (NEMA 1) Enclosure

Main Ampere Rating	1 Pole, 1" Spaces	2 Pole, 1" Spaces	3 Pole, 1" Spaces	Total 1-pole Spaces	Front Type	Feed ² Type	Box Number	Main Wire Size (AWG/kcmil) Cu-Al	Equipment Ground Kit	Product Number
100	12	6	4	12	Combination Flush/Surface Front	Top Bottom	6	6-1/0 (Cu), 4-1/0 (Al)	TGK12 (order separately) TGK24 (order separately)	TM12410C ⁶
100	18	8	6	18	Combination Flush/Surface Front	Top Bottom	6	6-1/0 (Cu), 4-1/0 (Al)	TGK24 (order separately) TGK32 (order separately)	TM18410C ⁶
125	30	14	10	30	Combination Flush/Surface Front	Top	11	1-3/0 (Cu), 2/0-3/0 (Al)	TGK32 (order separately)	TM30412C
125	30	14	10	30	Combination Flush/Surface Front	Bottom	11	1-3/0 (Cu), 2/0-3/0 (Al)	TGK32 (order separately)	TM30412CB
150	24	12	8	24	Combination Flush/Surface Front	Top	11	1-3/0 (Cu), 2/0-3/0 (Al)	TGL1, TGL2, TGL20, TNG3, TGN6 (order separately)	TM24415C
150	24	12	8	24	Combination Flush/Surface Front	Bottom	11	1-3/0 (Cu), 2/0-3/0 (Al)	TGK32 (order separately)	TM24415CB
150	30	14	10	30	Combination Flush/Surface Front	Top	11	1-3/0 (Cu), 2/0-3/0 (Al)	TGK32 (order separately)	TM30415C
150	30	14	10	30	Combination Flush/Surface Front	Bottom	11	1-3/0 (Cu), 2/0-3/0 (Al)	TGK32 (order separately)	TM30415CB
150	42	20	14	42	Combination Flush/Surface Front	Top	13	1-3/0 (Cu), 2/0-3/0 (Al)	TGK42 (order separately)	TM42415C
150	42	20	14	42	Combination Flush/Surface Front	Bottom	13	1-3/0 (Cu), 2/0-3/0 (Al)	TGK42 (order separately)	TM42415CB
200	24	12	8	24	Combination Flush/Surface Front	Top	11	1-300 (Cu), 2/0-300 (Al)	TGK32 (order separately)	TM24420C
200	24	12	8	24	Combination Flush/Surface Front	Bottom	11	1-300 (Cu), 2/0-300 (Al)	TGK32 (order separately)	TM24420CB

⁵Also UL Listed for three-phase, four-wire 240/120 Volts ac delta and three-phase, three-wire 240 Volts ac branch breakers installed.

⁶100 Amp indoor devices UL listed for bottom-feed by installing complete unit upside-down.

Note: See page 11-4, AL Series Lighting Panelboards as replacements for 300-600A load centers.

This table continued on next page



Load Centers and Circuit Breakers

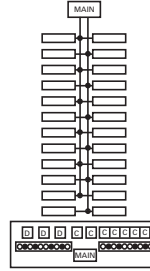
PowerMark Gold and Plus Load Centers

Circuit Breakers

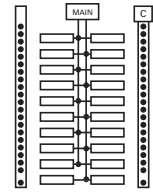
Wiring Diagrams

Breaker Symbol	Breaker Fill	
	1" THQL	1/2" THQP
	1	—
	1	2

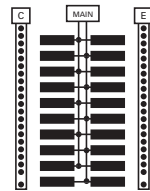
Terminal Symbol	Wire Range (AWG/kcmil)	
	Cu	Al
o	14-8	12-8
•	14-4	12-4
A	6-2	6-2
B	14-1/0	12-1/0
C	6-2/0	6-2/0
D	1-300	2/0-300
E	1-300	1-300
F	6-1	6-1
G	6-3	6-3



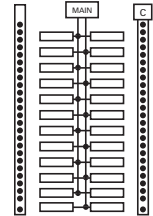
TL2440, TM2440



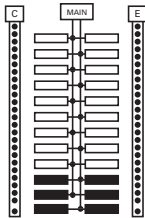
TM2010CCU, TM2010RCU



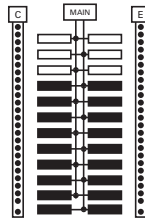
TM2020CCU, TM2020RCU
TLM2020CCU, TLM2020RCU



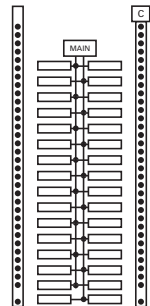
TM2410CCU, TM2412CCU
TM2412RCU, TLM2412CCU, TLM2412RCU



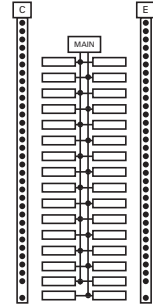
TM2415RCU, TLM2415RCU



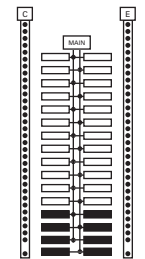
TLM2420C42, TM2415C42



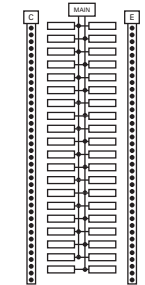
TM3210CCU



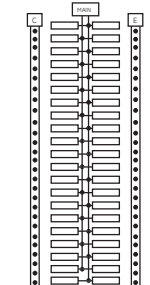
TM3215CCU, TM3215RCU



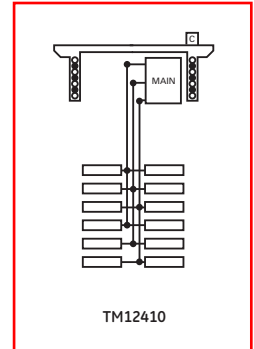
TM3220CCU, TM3220RCU, TLM3220CCU



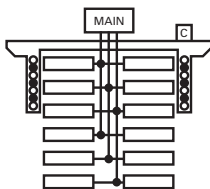
TM4020CCU, TM4020RCU
TLM4020CCU, TLM4020RCU



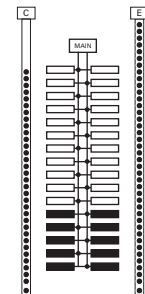
TM4222RCU, TLM4222CCU
TLM4222RCU, TM4222CCU



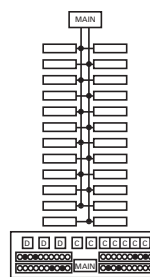
TM12410



TL12412



TM3215C42, TLM3220C42, TM3220C42



TL2460



INTERIOR LIGHTING

Catalog Number	245/324
Notes	
Type	

FEATURES & SPECIFICATIONS

INTENDED USE — SBL LED wraparound provides a digital lighting platform to deliver general ambient lighting for surface-mount applications. The SBL provides a similar look to that of an existing fluorescent wrap with all of the excellent benefits of LED: energy savings, long life, and maintenance savings. Ideal for closets, storage rooms, and offices.

CONSTRUCTION — Linear side prisms control brightness, pyramidal bottom prisms minimize lamp image. Continuous side flanges on fixture body provide light trap and continuous diffuser support to prevent accidental opening and simplify maintenance. Full depth, white enamel end plates.

Die-formed from code gauge cold-rolled steel. Channel cover snaps into place without the use of tools. Full end cap factory installed to reduce job site labor.

OPTICS — The translucent white diffuser reduces glare and pixilation without impacting performance.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior quantity and quality of illumination for extended service life. 90% LED lumen maintenance at 60,000 hours (L90/60,000). The LEDs have a CRI of 82.

eldoLED driver options deliver choice of dimming range and choices for control, while assuring flicker-free, low-current inrush, 89% efficiency and low EMI.

Pair the SBL with the fixture mount Sensor Switch LSXR sensor for additional energy savings when the space is unoccupied. The LSXRHL sensor dims the fixture down to a low-level setting when there is no occupancy. This option is ideal for stairwells, back rooms, and closets due to the low occupancy level in those spaces.

Optional nLight® embedded controls continuously monitor system performance, allow for constant lumen management / compensation function, facilitate simple "plug-and-play" network and controls upgrading via Cat-5 cable. Ballast disconnect provided where required to comply with US and Canadian codes.

LISTINGS — CSA certified to meet U.S. and Canadian standards. DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

Damp listed.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

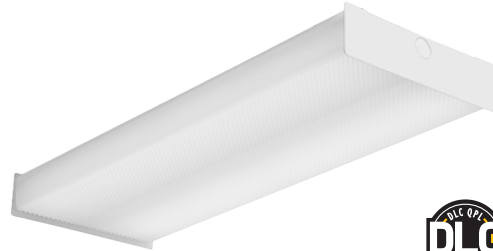
Note: Actual performance may differ as a result of end-user environment and application.

All values are design or typical values, measured under laboratory conditions at 25 °C.

Specifications subject to change without notice.

Square-basket LED Wraparound

SBL2



2'
LED



eldoLED

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

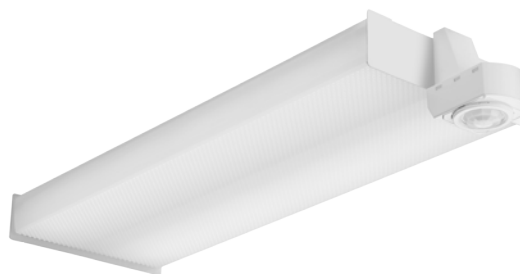
Example: SBL2 20L EZ1 LP840

SBL2										
Series	Lumens ¹	Voltage	Driver	Color temperature	Control	Finish				
SBL2 2' LED wrap	20L	(blank) MVOLT 347 347V ²	EZ1 eldoLED dims to 1%, 0-10V SLD Step-level dimming ³ EOHN eldoLED non-dimming, on/off ³	LP830 3000 K LP835 3500 K LP840 4000 K LP850 5000 K	(blank) No controls N80 nLight with 80% (L80) lumen management N80EMG nLight with 80% (L80) lumen management for use with generator supply EM power N100 nLight without lumen management N100EMG nLight without lumen management for use with generator supply EM power LSXRHL Sensor Switch® fixture mount sensor with High/Low occupancy operation ⁴ LSXR10 Sensor Switch fixture mount sensor with on/off occupancy operation	(blank) White				

Notes

- 1 Approximate lumen output.
- 2 Not available with SLD driver.
- 3 Not available with control options.
- 4 Dims to approximately 10% light output when unoccupied. See sensor details on next page.

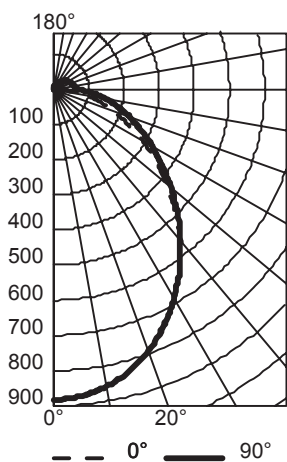
Performance Data				
Lumen	Package	Lumens	Input Watts	LPW
20L	LP830	2,360.6	23	102.6
20L	LP835	2,409.4	23	104.8
20L	LP840	2,428.8	23	105.6
20L	LP850	2,459.7	23	106.9



Sensor Switch LSXRHL Sensor	
Lens type:	10 - Low Mount 360° coverage
Dimming:	HL - High/Low Occupancy operation
Min Dim Level:	3V - approximately 10% light output when unoccupied
Time Delay:	5M - 5 minutes

PHOTOMETRICS

SBL2 20L EZ1 LP840, 2428.8 delivered lumens, test no. LTL27400P2, tested in accordance to IESNA LM-79.



CP Summary

	0°	90
0°	883	883
5°	878	877
15°	832	830
25°	744	741
35°	624	626
45°	488	498
55°	352	377
65°	232	274
75°	134	188
85°	45	107
90	2	68

Coefficients of Utilization

pc	pw	Coefficients of Utilization											
		80%			70%			50%			20%		
		70%	50%	30%	50%	30%	10%	50%	30%	10%	50%	30%	10%
0	118	118	118	114	114	114	108	108	108				
1	107	102	97	99	95	91	93	90	87				
2	97	89	82	86	80	74	82	76	72				
3	89	78	70	76	68	62	72	66	60				
4	81	69	61	67	59	53	64	57	52				
5	75	62	53	61	52	46	58	50	45				
6	69	56	47	55	46	40	52	45	39				
7	64	51	42	50	42	36	48	40	35				
8	60	47	38	46	38	32	44	37	31				
9	56	43	35	42	34	29	40	33	28				
10	53	40	32	39	31	26	37	31	26				

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	658	27.1	27.1
0° - 40°	1048	43.2	43.2
0° - 60°	1756	72.3	72.3
0° - 90°	2271	93.5	93.5
90° - 120°	104	4.3	4.3
90° - 130°	127	5.2	5.2
90° - 150°	152	6.2	6.2
90° - 180°	157	6.5	6.5
0° - 180°	2429	100.0	100.0

MOUNTING DATA

Suspension Kit Ceiling Types: F1 for use with most T-bar and screw slot grid ceiling applications. Designed for on-grid and off-grid installations.

F2 for use with recessed or surface-mount horizontal J-box applications.

For unit or row installation; surface or suspend mounting.

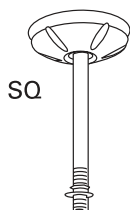
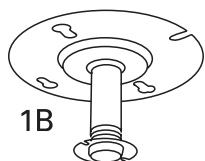
Individual installation — One double-stem or two single-stem hangers required.

For aircraft cable, one STACG_, STACGF_, or STACGE_ required for each suspension point.

Row installation — Order one (1) STCR accessory per fixture for continuous row applications. Not required for last fixture in row. One hanger per fixture plus one per row required.

Note: 2' configurations with emergency option cannot be stem mounted.

See ACCESSORIES below for hanging devices.



DIMENSIONS

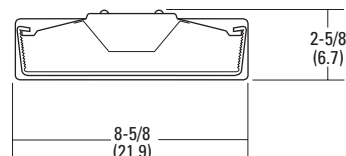
All dimensions are inches (centimeters) unless otherwise noted.

Specifications

Length: 24 (61.0)

Width: 8-5/8 (21.9)

Depth: 2-5/8 (6.7)



All dimensions are inches (centimeters) unless otherwise indicated.

Catalog Number	247/324
Notes	
Type	

FEATURES & SPECIFICATIONS

INTENDED USE

Combination emergency lighting unit and exit. Suitable for illuminating the path of egress and for marking the means of egress in accordance with Life Safety Code NFPA 101.

CONSTRUCTION

Injection-molded, flame-retardant, high-impact, thermoplastic housing with snap-fit design components for easy installation. Universal J-box pattern. Universal chevrons are easily removed for directional indication. Fully assembled single face with extra faceplate for easy field-conversion to double face. Track and swivel arrangement permits full range of lamp adjustment.

Letters 6" high with 3/4" stroke, with 100 ft viewing distance rating, based on UL924 standards.

OPTICS

The typical life of the LED lamp is 10 years. Two 1.8W LED lamps for emergency light.

ELECTRICAL

Dual-voltage input 120V or 277V AC; 9.6V output. Emergency combo provided with test switch, status indicator and rechargeable battery. Maintenance-free nickel-cadmium battery provides 90 minutes of emergency power. High output (HO) option powers up to 2 LED remote lamps.

LISTINGS

UL Listed. Meets UL 924, NFPA 101, NFPA 70-NEC and OSHA illumination standards. Indoor damp location 32°F to 122°F (0°C to 50°C) listed standard.

WARRANTY

Fixtures are covered by Lithonia Lighting 24-month warranty against mechanical defects in manufacture.

All life safety equipment, including emergency lighting for path of egress must be maintained, serviced, and tested in accordance with all National Fire Protection Association (NFPA) and local codes. Failure to perform the required maintenance, service, or testing could jeopardize the safety of occupants and will void all warranties.

Note: Specifications subject to change without notice.

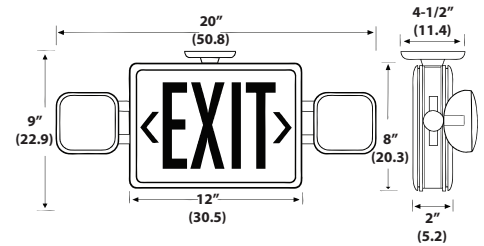
Actual performance may differ as a result of end-user environment and application.

Contractor Select

LED Exit/Unit Combos



ECR LED



All dimensions are inches (centimeters).
Shipping weight: 3.6 lbs. (1.6 kgs.).

ORDERING INFORMATION

Catalog Number	UPC	Description	Supply Voltage	Input Wattage	Pallet Qty.	Standard Carton Qty.
ECR LED M6	784231874516	Red	120/277	3.8	108	6
ECG LED M6	784231874592	Green	120/277	3.2	108	6
ECR LED HO M6	784231874561	Red, high output	120/277	3.8	108	6
ECG LED HO M6	784231874615	Green, high output	120/277	3.2	108	6

Accessories: Order as separate catalog number.	
ELA WG3	Wireguard (back mount only) ¹
ELA LED M12	Single remote lamp ^{2,3}
ELA LED T M12	Double remote lamp ^{2,3}
ELA LED WP M12	Single, weather-proof remote lamp ^{2,3}
ELA LED T WP M12	Double, weather-proof remote lamp ^{2,3}

Notes

- See spec sheet [ELA-WG](#).
- See spec sheet [LED-Remote Lamps](#).
- Only available with HO option.

EXTERIOR LIGHTING



TWS LED

LED Wall Luminaire

Catalog
Number

249/324

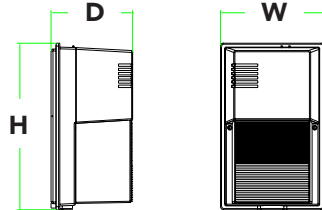
Notes

Type

Hit the Tab key or mouse over the page to see all interactive elements.

Specifications

Width:	6-3/4" (17.2 cm)
Height:	10-7/8" (27.7 cm)
Depth:	5-5/16" (13.5 cm)
Weight:	3.19 lbs (1.45 kg)



Introduction

The popular TWS luminaire is now available with long-lasting, energy-efficient LED technology. Featuring a classic dayform, the TWS LED offers a traditional appearance and is powered by advanced LEDs.

The TWS LED luminaire is powerful yet energy efficient, capable of replacing up to a 70W HPS wall pack while saving up to 78% in energy costs. With long-life LEDs, the TWS LED eliminates frequent lamp and ballast replacements associated with traditional technologies.

Ordering Information

EXAMPLE: TWS LED 1 50K 120 PE

TWS LED	Performance Package		Color Temperature		Voltage		Control Options		Finish	
Series										
TWS LED	1	1017 lumens	50K	5000K ¹	120	120V ²	PE	Photoelectric cell, button type	(blank)	Dark bronze

Accessories

Ordered and shipped separately.

TWSWG Wire Guard

NOTES

- Corrected color temperature (CCT) shown is nominal per ANSI C78, 377-2008.
- 120V driver operates on 120V.

FEATURES & SPECIFICATIONS

INTENDED USE

The TWS LED combines traditional wall pack design with high-output LEDs to provide an energy-efficient, low maintenance LED wall pack suitable for replacing up to 70W HPS fixtures. The traditional shape helps maintain building aesthetics when replacing only a portion of your building's wall packs. TWS LED is for outdoor applications such as personnel doors, loading areas, driveways and parking areas.

CONSTRUCTION

Back plate is die-cast aluminum. Front cover is impact-resistant polycarbonate which is fully gasketed. All electronics are protected in the upper housing. Housing is sealed against moisture and environmental contaminants.

FINISH

UV stabilized polycarbonate front cover has dark bronze color which provides superior resistance to corrosion and weathering and that can withstand extreme climate changes without cracking or peeling.

OPTICS

Protective polycarbonate lens covers the LEDs. Prismatic front cover and precision-molded reflector for superior uniformity and fixture spacing. Light engine is available in 5000K (69 min. CRI).

ELECTRICAL

Light engine consists of two high-powered, long-life, high-efficacy LEDs mounted on an internal aluminum heat sink to maximize heat dissipation and promote long life (L95/100,000 hours at 40°C). Driver and integral photocell operate at 120V and are fully enclosed in the upper housing. There are no user serviceable parts.

INSTALLATION

Back housing easily mounts to any recessed junction box. With all electronics in upper housing the open lower section makes wiring easy. Mount on any vertical surface. Not recommended in applications where a sprayed stream of water can come in direct contact with polycarbonate lens.

LISTINGS

UL Certified to US and Canadian safety standards for wet-location mounting higher than 4 feet off the ground.

Rated for -40°C to 40°C ambient temperature.

WARRANTY

Five-year limited warranty. Full warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx.

Note: Specifications are subject to change without notice. Actual performance may differ as a result of end-user environment and application



Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts. Actual performance may differ as a result of end-user environment and application.

Performance Package	Drive Current (mA)	CCT	System Watts	50K (5000K, 67 CRI)				
				Lumens	B	U	G	LPW
1	900	5000K	19W	1,017	1	3	1	54

Lumen Ambient Temperature (LAT) Multipliers

Use these factors to determine relative lumen output for average ambient temperatures from 0-40°C (32-104°F).

Ambient		Lumen Multiplier
0°C	32°F	1.03
10°C	50°F	1.02
20°C	68°F	1.01
25°C	77°F	1.00
30°C	86°F	0.99
40°C	104°F	0.98

Electrical Load

LED Package	Drive Current (mA)	System Watts	Current (A)			
			120	208	240	277
1	1000	19W	0.20	0.12	0.10	0.09

Projected LED Lumen Maintenance

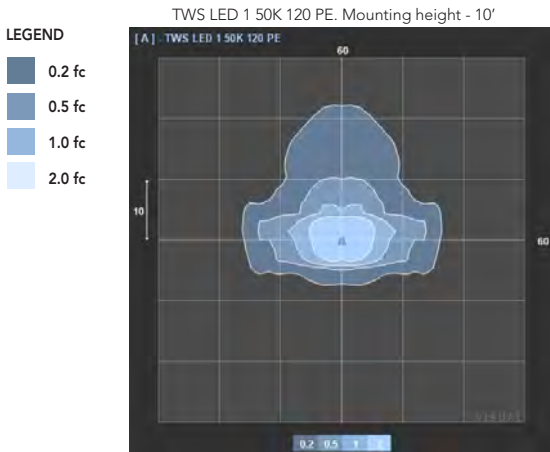
Data references the extrapolated performance projections in a **40°C ambient**, based on 10,000 hours of LED testing (tested per IESNA LM-80-08 and projected per IESNA TM-21-11).

To calculate LLF, use the lumen maintenance factor that corresponds to the desired number of operating hours below. For other lumen maintenance values, contact factory.

Operating Hours	0	25,000	50,000	55,000	100,000
Lumen Maintenance Factor	1.0	0.98	0.97	0.97	0.95

Photometric Diagrams

To see complete photometric reports or download .ies files for this product, visit the Lithonia Lighting TWS LED homepage. Tested in accordance with IESNA LM-79 and LM-80 standards



Lighting Facts Labels

Lithonia Lighting

LED lighting facts
A Program of the U.S. DOE

Light Output (Lumens) **1017**
Watts **18.79**
Lumens per Watt (Efficacy) **54**

Color Accuracy
Color Rendering Index (CRI) **69**

Light Color
Correlated Color Temperature (CCT) **5054 (Daylight)**

Warm White 2700K 3000K Bright White 4500K Daylight 6500K

All results are according to IESNA LM-79-2008: Approved Method for the Electrical and Photometric Testing of Solid-State Lighting. The U.S. Department of Energy (DOE) verifies product test data and results.

Visit www.lightingfacts.com for the Label Reference Guide.

Registration Number: NJSM-SAWRYQ (11/21/2012)
Model Number: TWS LED 1 50K 120 PE
Type: Outdoor wall pack.



RECEPTACLES

Ground Fault Products Heavy Duty Commercial & Hospital Grade GFCI Receptacles Tamper-Resistant and Weather Resistant with Auto Grounding



GFTR201

10kA Short Circuit Current Rating

- Limits improper access to energized contacts
 - Patented shutter design for tamper-resistant protection
- No power at face if reverse wired
 - Open circuit condition eliminates false assumption of protection at face
- Ground fault EOL indicator
 - Flashing **RED** indicates device has lost capability to provide protection
- Accepts fork terminals
 - Open terminal design
- Installation ease
 - Internal back wiring
 - Automatic self-grounding staple
 - Captive mounting screws

Circuit Guard® GFCI Receptacles Tamper-Resistant and Weather Resistant

Description	Rating	Color	Catalog Number	
Flush, nylon face, back and side wired, multiple drive screws, self-grounding staple.	15 and 20A 125V AC	Black	GFTR15BK	GFTR20BK
		Brown	GFTR15	GFTR20
		Gray	GFTR15GY	GFTR20GY
		Ivory	GFTR15I	GFTR20I
		Light Almond	GFTR15LA	GFTR20LA
		Red	GFTR15R	GFTR20R
		White	GFTR15W	GFTR20W



GFTR15AL

Circuit Guard® GFCI Receptacles - 3 Pack Tamper-Resistant and Weather Resistant

Description	Rating	Color	Catalog Number	
3 Pack, flush, nylon face, back and side wired, multiple drive screws, self-grounding staple.	15 and 20A 125V AC	Ivory	GFTR15I3	GFTR20I3
		Light Almond	GFTR15LA3	GFTR20LA3
		White	GFTR15W3	GFTR20W3

Note: Consult factory for availability of other colors.



GFTR20W3

Circuit Guard® GFCI Receptacles Tamper-Resistant and Weather Resistant

Description	Rating	Color	Catalog Number	
Hospital Grade ● Flush, nylon face, back and side wired, multiple drive screws, self-grounding staple.	15 and 20A 125V AC	Black	GFR8200HBKTR	GFR8300HBKTR
		Brown	GFR8200HTR	GFR8300HTR
		Gray	GFR8200HGYTR	GFR8300HGYTR
		Ivory	GFR8200HITR	GFR8300HITR
		Light Almond	GFR8200HLATR	GFR8300HLATR
		Red	GFR8200HRTR	GFR8300HRTR
		White	GFR8200HWTR	GFR8300HWTR

Note: GFCI type receptacles should not be used in critical care patient areas or for electrical life support equipment applications because of the possibility of power interruption. All GFCI receptacles listed above are furnished with a matching color nylon wallplate. 20 amp feed-through capability. See page Tech-10 for Tamper-Resistant and Weather Resistant descriptions.



GFR8300HRTR

REFRIGERANT MONITOR



Division of BW Technologies

1 800 563-2967



Expansion Module

VA301EM

Vulcain's innovative VA301EM Expansion Module incorporates all of the features and characteristics needed to meet the broadest range of customer requirements. Offering the ultimate in stability and gas detection accuracy, the VA301EM is also unsurpassed in its ability to be configured for easy compliance to ASHRAE 15, B-52 and international mechanical codes.

Specifically designed for larger-scale mechanical and chiller rooms and environments where refrigerant gases may be present, the VA301EM features Vulcain's award-winning IR sensing technology and can be connected to up to four remote sensors at a time installed at distances of up to 200 feet (60m) away.

Given this added degree of flexibility, end-users can now enjoy the cost and safety advantages of being able to effectively detect multiple gases in locations with a single unit. Moreover, the VA301EM is designed for both new and retrofit applications and can be custom-configured to comply with the most rigorous norms and standards.

Key Features and Benefits

- Industry-leading sensing technologies
- Able to operate with up to four remote sensors at a time
- Various sensors available to simultaneously detect a range of different gases, including:
 - Refrigerants
 - Combustibles
 - Toxic gases
- Robust and reliable RS-485 MODBUS communication
- Four fully programmable relays
- Three 24 Vdc alarm outputs
- Up to four 4-20 mA outputs
- Three alarm levels with built-in visual indicators and audible alarm
- Easy to read LCD display
- Auto-diagnostic capabilities
- Convenient stand-alone or network operation
- Cost-effective solution for installation in hazardous locations

Ordering Information

VA301EM	Expansion Module, 24 Vdc alarm outputs (3), relays (4), 4-20 mA outputs (4), network
VA301EM-RFS	Expansion Module, 24 Vdc alarm outputs (3), relays (4), 4-20 mA outputs (4), network, strobe light
VA301EM-RFSA	Expansion Module, 24 Vdc alarm outputs (3), relays (4), 4-20 mA outputs (4), network, strobe light & horn

Sensors

VA301IRFS-xxx*	Refrigerant gas sensor
S301D2-xxx**	Explosion-proof sensor assembly
(xxx*)	Gases detected: R123, R134a, R125, R11, R12, R22
(xxx**)	Gases detected: CO, NO ₂ , NO, Cl ₂ , Combustibles (LEL), H ₂ S, O ₂ , SO ₂ , HCN, HCl, F ₂ , O ₃ , HF, SiH ₄

Options

EMBG	Breakglass manual switch
IRFSENSORGUARD	Metal guard (sensor only)

Annunciator Panel

VA301EMRP	Expansion Module Remote Panel, 24 Vdc alarm outputs (3), relays (4)
VA301EMRP-RFS	Expansion Module Remote Panel, 24 Vdc alarm outputs (3), relays (4), strobe light
VA301EMRP-RFSA	Expansion Module Remote Panel, 24 Vdc alarm outputs (3), relays (4), strobe light & horn

ISO 9001:2000



Intertek

Protecting your health and your environment.

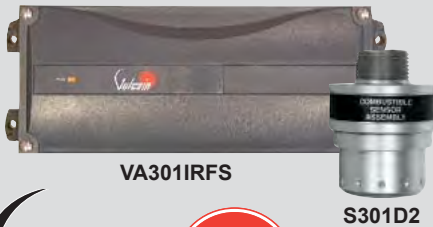
VA301EM

FULL ARRAY OF COMPATIBLE SENSORS

The VA301EM can be interfaced with various sensor assemblies providing a wide variety of toxic and explosives gases to be detected.

Gases	Range
R123	0-1000 ppm
R125	0-1000 ppm
R11	0-1000 ppm
R12	0-1000 ppm
R22	0-1000 ppm
R134a	0-1000 ppm
CO	0-250 ppm
NO ₂	0-10 ppm
NO	0-50 ppm
Cl ₂	0-15 ppm
Combustibles	0-100% LEL
H ₂ S	0-50 ppm
O ₂	0-25 %
SO ₂	0-10 ppm
HCN	0-50 ppm
HCl	0-25 ppm
F ₂	0-1 ppm
O ₃	0-2.5 ppm
HF	0-10 ppm
SiH ₄	0-5 ppm

Accuracy within 3%



VA301IRFS

S301D2



For further information:

USA
1971 Western Avenue, Unit 1122
Albany, NY
USA 12203

Tel: 1-800-563-2967
Fax: 1-888-967-9938

TORONTO
344 Edgeley Boulevard, Unit 13
Vaughan, ON
L4K 4B7

Tel: 1-905-660-6544
Fax: 1-905-660-7362

MONTREAL
4005 Matte Boulevard, Unit G
Brossard, QC
J4Y 2P4

Tel: 1-800-563-2967
Fax: 1-888-967-9938

E-mail: sales@vulcaininc.com
www.vulcaininc.com

VN1090-01-01-00-8.25x11-20050221-5725-4



VA301EM SPECIFICATIONS

255/324

VISUAL INDICATORS:

Normal Operation: Green LED
Alarm Level 1: Red LED
Alarm Level 2: Red LED
Alarm Level 3: Red LED
Signal Tx: Blinking amber LED
Failure Indication: Yellow LED

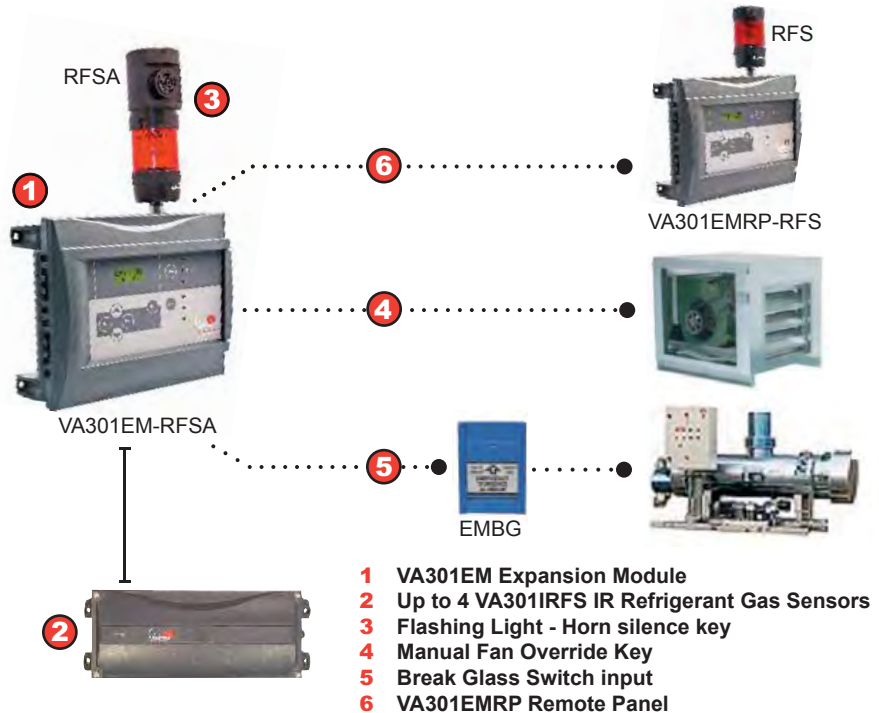
User Interface: Alphanumeric display and keypad
Distance Between Controller and Sensor: Up to 200 feet for VA301IRFS and 500 feet for S301D₂
Relay Output Rating: 5 A, 30 VDC or 250 VAC (resistive load)
Alarm Levels: 3 with high and low setpoints
Outputs: 4 DPDT relays (alarms and/or fault), buzzer
Three 24 Vdc, 250 mA (per output)
Four 4-20 mA outputs
RFS option: 24 Vdc red strobe
RFS option: 24 Vdc red strobe & 105 dBA horn
Operating Humidity Range: 0-95% RH, non-condensing
Operating Temperature Range: Refrigerant: 32 °F to 100 °F (0 °C to 40 °C)
Toxic: -40 °F to 100 °F (-40 °C to 40 °C)
Combustible: -40 °F to 122 °F (-40 °C to 50 °C)

GENERAL SPECIFICATIONS

Size: 11.02 x 7.99 x 2.73 inches
28 x 20.3 x 7 cm
Weight: 2.6 lbs. (1.2 kg)
Power Requirement: 22-27 VAC, 29-38 VDC, 1.5A max.

Certified to UL and CSA standards

DUE TO ON-GOING RESEARCH AND PRODUCT IMPROVEMENT, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.



Up to 10 VA301EMRP Remote Panels can be connected to the VA301EM providing audible and visual warnings at entrances to potentially dangerous areas. The Remote Panel includes relays (4), 24 Vdc alarm outputs (3), a 65 dBA buzzer and backlit display. Optional strobe (RFS) and horn/strobe combination (RFSA) are available.

ASHRAE No 15-2001 Mechanical Standard and B-52 Code Compliance

The ASHRAE and B-52 security standards have been established to minimize risk and protect the safety of mechanical room personnel and the environment at large. Available in a special configuration, the VA301EM Expansion Module has been carefully designed to meet and even exceed these rigorous standards. The VA301EM can be configured to offer:

- automatic fan, horn and strobe activation
- manual fan activation
- non-latching relay for manual alarm recognition
- silence key for manual horn deactivation
- built-in 24 Vdc outputs for horn operation
- 2 breakglass switch accessories for manual alarm activation

Locally Distributed by:



101 Series AdaptaLight® Stackable Beacon

The 101 Series AdaptaLight Stackable Beacon is a unique audible-visual signaling device that can contain up to 5 light modules and a pulsating horn in a single "stack." It is for heavy-duty use in locations where visibility over longer distances is required. All modules are gasketed. The base of the AdaptaLight Stackable Beacon contains a pulsating horn rated at 85 dB at 10 feet. The horn can be operated as a sixth independent signal or in conjunction with any one of the light modules. The steady-on modules provide a constant visual signal. They are ideal for start/stop functions, on/off process or continuous duty visual signaling applications.

The flashing modules command immediate attention, while the steady-on module is ideal for indicating a normal status. Applications include signaling of equipment malfunction.

The strobe modules are ideal for high ambient light areas. They can effectively signal urgent status changes when used in conjunction with the incandescent or LED light modules. The LED modules are best for applications where long life is a requirement.

The 101XBRM (XTRA-BRITE™) LED beacons are supplied in steady-on mode, and offer field-selectable flash patterns that include Ultra-Flash (random flash pattern) or 65 flashes per minute modes.

The AdaptaLight can be direct or ½" NPT conduit pipe mounted in non-hazardous dust and weatherproof applications. For indoor applications, it may be vertically mounted with lenses facing either up or down. For weatherproof installation, the unit must be mounted vertically with lenses facing up. They may also be corner mounted using the Cat. No. CBR, corner mount bracket, or wall mounted, using the Cat. No. WBR, wall mount bracket.

101 Series AdaptaLight® Features

- Available in 12V DC*, 24V DC or 120V AC
- Option for panel or conduit mounting
- PLC Compatible
- Six gasketed modules:
 - steady-on or flashing incandescent
 - steady-on or flashing halogen
 - dual-mode steady-on/Ultra-Flash (random) or flashing LED
 - strobe
- Stackable in any combination or color
- Base unit comes with 85 dB pulsating horn
- LED modules immune to shock and vibration
- Module rearrangement requires no wiring; screw terminals in base for field wiring
- Electrical interconnection between modules is through solid copper busses

*Incandescent and strobe modules only

101 Series AdaptaLight® Stackable Beacon

Description	Module Type	Cat. No.	Operating		Lens/LED Colors	Projected LED Life (L70) [†]	Flash Rate	Replacement	
			Voltage	Current				Horns	Lamps
101 Series AdaptaLight Stackable Beacon	Base Unit with Horn (85 dB @ 10 ft.)	101BS-E1	12V DC	0.05 A	—	—	—	P-047570-0743	—
		101BS-G1	24V DC	0.05 A	—	—	—	P-047570-0743	—
		101BS-N5	120V AC 50/60 Hz	0.05 A	—	—	—	123A-N5	—
	Steady-On Incandescent	101SIN*-E1	12V DC	1.0 A	Red, Green, Amber, Blue, Magenta, Clear	—	—	—	Industry Std. No. 94
	Steady-On Halogen	101SINH*-G1	24V DC	0.32 A	Red, Green, Amber, Blue, Magenta, Clear	—	—	—	50LMP-9WH-D
		101SINH*-N5	120V AC 50/60 Hz	0.11 A	Red, Green, Amber, Blue, Magenta, Clear	—	—	—	50LMP-12WH-D
	Flashing Incandescent	101FIN*-E1	12V DC	1.0 A	Red, Green, Amber, Blue, Magenta, Clear	—	65 fpm	—	Industry Std. No. 94
	Flashing Halogen	101FINH*-G1	24V DC	0.32 A	Red, Green, Amber, Blue, Magenta, Clear	—	65 fpm	—	50LMP-9WH-D
		101FINH*-N5	120V AC 50/60 Hz	0.11 A	Red, Green, Amber, Blue, Magenta, Clear	—	65 fpm	—	50LMP-12WH-D
	Strobe	101ST*-E1	12V DC	0.5 A	Red, Green, Amber, Blue, Magenta, Clear	—	—	—	91B-ST
		101ST*-G1	24V DC	0.3 A	Red, Green, Amber, Blue, Magenta, Clear	—	—	—	91B-ST
		101ST*-N5	120V AC 50/60 Hz	0.12 A	Red, Green, Amber, Blue, Magenta, Clear	—	—	—	91B-ST
	Dual-Mode XBR LED	101XBRM**24D	24V DC	0.220 A	Red, Green, Amber, Blue, White	148,000 hours	65 fpm	—	—
		101XBRM**120A	120V AC 50/60 Hz	0.115 A	Red, Green, Amber, Blue, White	148,000 hours	65 fpm	—	—

*Letter in this position designates lens color: A - amber, B - blue, G - green, R - red, C - Clear, or M - Magenta

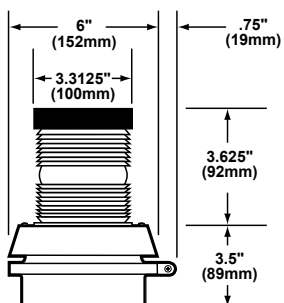
**Letter in this position designates lens/LED color: A - amber, B - blue, G - green, R - red, or W - White

[†]LED Manufacturer's Median Projected LED Life for LUXEON Rebel LEDs (L70 at 85°C and T_{junction} 98°C). Actual LED life will vary inversely with ambient temperature, voltage, driver current, junction temperature and duty-cycle at which the signaling device is operated. Please refer to <http://www.philipsumileds.com/pdfs/WP15.pdf>.

PLC Output to Meet Input Parameter Specifications

Cat. No.	Operating Voltage	Max. Off State Leakage Current (mA)	Continuous On Current (mA)	Surge (inrush / duration)
101BS-G1	24V DC	1.2	20	2 A / 1 millisecond
101BS-N5	120V AC 50/60 Hz	25	50	2 A / 1 millisecond
101SINH*-G1	24V DC	25	320	.36 A / 1 nSecond
101SINH*-N5	120V AC 50/60 Hz	25	110	.5 A / 8 nSecond
101FINH*-G1	24V DC	25	320	1.2 A / 100 nSeconds
101FINH*-N5	120V AC 50/60 Hz	25	110	1.15 A / 8 nSeconds
101ST*-G1	24V DC	1.5	300	.33 A / 1 nSecond
101ST*-N5	120V AC 50/60 Hz	5	120	2.1 A / 1 nSecond
101XBRM**24D	24V DC	10	215	10 A / 85 microseconds
101XBRM**120A	120V AC 50/60 Hz	10	108	10 A / 170 microseconds

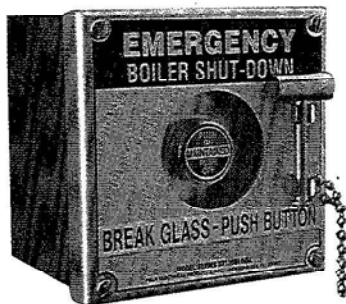
Dimensional Drawings



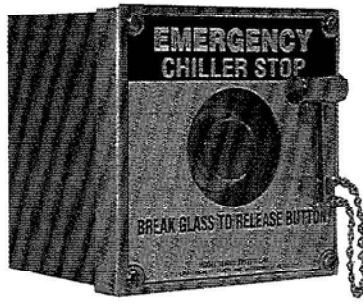
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Data Sheet ES001-0111 Issue 1
Not to be used for installation purposes.
Page 2 of 2



ST120SN1BP2SL
BOILER SHUT-DOWN



ST120SN1SL
CHILLER STOP



ST120FN1 with
Accessory PILCLHCOV5
ELECTRICAL DISCONNECT



ST120SN1BP2SL
HVAC SHUT-DOWN



ST120SN4XS304



ST120SN3RSL fitted with
Accessory PILCLHCOV5A
GENERATOR STOP

STANDARD MODEL NUMBERS

DESCRIPTION

CONTACT BLOCK CAPACITY (Standard) *

ST120SN3R	Surface mount, NEMA 3R Rainproof,	All-metal, 1/2-3/4" knockout on bottom and back,	1-6 per station
ST120SN1	Surface mount, NEMA 1,	All-metal, 1/2-3/4" knockout on bottom and back	1-6 per station
ST120FN1	Flush mount, NEMA 1,	All-metal, 1/2-3/4" knockout on bottom and back,	1-6 per station
ST120SN4	Surface mount, NEMA 4 and 12,	All-metal, 1/2-3/4" knockout on back,	1-6 per station
ST120FN4	Flush mount, NEMA 4 and 12,	All-metal, 1/2-3/4" knockout on back,	1-6 per station
ST120SN4XS304	Surface mount, NEMA 4X, 304 Stainless Steel, 1/2" conduit provision on back,		1-6 per station



OPTIONS AVAILABLE

TO ORDER: The above Standard Models may be ordered as-is or may include optional features listed below. Add desired optional suffix(s) to the indicated Standard Model number chosen from above

- Add suffix BP1 "Break Glass - Push Button" model, round flush momentary (standard) operator (Note 1)
- >Add suffix BP2 "Break Glass - Push Button" model, round flush maintained operator (Note 1)
- Add suffix TG Two position toggle switch behind glass, maintained both positions (Notes 2, 3)
- >Add suffix P1 Two position Selector Switch, maintained both positions, short lever (Note 2)
- >Add suffix P2 Two position Selector Switch, maintained left, momentary right, short lever (Note 2)
- >Add suffix P3 Three position Selector Switch, maintained all positions, short lever (Note 2)
- >Add suffix P4 Three position Selector Switch, maintained center, momentary left/right, short lever (Note 2)
- >Add suffix P5 Three position Selector Switch, maintained right/center, momentary left, short lever (Note 2)
- >Add suffix P6 Three position Selector Switch, maintained left/center, momentary right, short lever (Note 2)
- >Add suffix K1 Two position Keyed Selector behind glass, maintained both positions, key removal left (Notes 2, 3)
- >Add suffix K2 Two position Keyed Selector behind glass, maintained both positions, key removal left/right (Notes 2, 3)
- >Add suffix K3 Two position Keyed Selector behind glass, maintained left, momentary right, key removal left (Notes 2, 3)
- >Add suffix K4 Three position Keyed Selector behind glass, maintained all positions, key removal center (Notes 2, 3)
- >Add suffix K5 Three position Keyed Selector behind glass, maintained all positions, key removal left/right (Notes 2, 3)
- >Add suffix K6 Three position Keyed Selector behind glass, maintained all positions, key removal left (Notes 2, 3)
- >Add suffix K7 Three position Keyed Selector behind glass, maintained all positions, key removal all positions (Notes 2, 3)
- >Add suffix K8 Three position Keyed Selector behind glass, momentary left/right, maintained center, key removal center (Notes 2, 3)
- >Add suffix K9 Three position Keyed Selector behind glass, momentary left, maintained right/center, key removal right (Notes 2, 3)
- >Add suffix K10 Three position Keyed Selector behind glass, momentary right, maintained left/center, key removal center (Notes 2, 3)
- >Add suffix K11 Three position Keyed Selector behind glass, momentary right, maintained left/center, key removal left (Notes 2, 3)
- Add suffix IL Illuminated operator model, available with standard and suffix BP1/BP2/P1-P6 devices (Notes 4, 5)
- Add suffix XD Extra Depth model for twelve contact block capacity
- Add suffix SL Specific Legend (specify text)
- >Add suffix BL Inscription Plate Carrier for toggle/selector switch/keyed selector, small blank lettering plate for 2/3 positions
- >Add suffix CL Inscription Plate Carrier for toggle/selector switch/keyed selector, same as above but with custom lettering (specify)

> DENOTES NEW ITEM

CONTACTOR

NEMA Full Voltage Power Devices

NEMA Rated Full Voltage Contactors

CR305, CR385 Magnetic Contactors

1600 Hp Maximum

NEMA Sizes 00-9

600V Maximum 50/60 Hertz

2500 Amperes Maximum

Application

GE's magnetic contactor is designed for use on today's modern equipment. Especially suitable for handling the switching of resistance heating and capacitor circuit loads, their compact size also fits the needs of the panel building industry. In addition, they may be used for controlling ac motors where overload protection is provided separately.

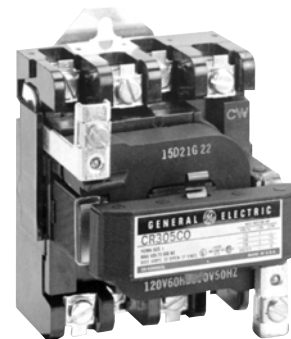
Features

- Easy disassembly for maintenance and inspection of contacts.
- Auxiliary contacts with vertical contact surfaces enclosed to prevent accumulation of dust and dirt.
- Attractive, modern squared-off design enclosure.
- Magnet faces specially treated to resist rust.
- Provision for ring terminals may be specified as a special feature, if required. No price addition applies for this optional feature.

Product Number Selection Instructions

1. Specify contactor by product number.
Example: CR305B103 at _____ is a Size 0, 18-Ampere, three-pole contactor (extra pole to be used as an auxiliary), with 230-240 Volt 60 Hertz coil. Contactor is in Type 1 enclosure.
2. Order forms not listed or with special features by complete description.
3. The final letter of the product number denotes extra auxiliary contacts (sometimes referred to as auxiliary interlocks). Order the desired extra auxiliary contacts by replacing the final letter from first column of auxiliary interlock table (see page 1-132).
Example: CR305C102AAB _____ is Size 1 contactor with one extra auxiliary contact, normally open.
4. Contactors are available with coils of other ratings (at same price) than those shown on pages 1-196 to 1-198. Refer to coil suffix table on page 1-8 for information. To order contactor forms with these other coil ratings, insert suffix from table in place of fifth and sixth numbers of contactor product number shown on pages 1-196 to 1-198.
Example: A CR305C123 NEMA Size 1, three-pole contactor in Type 1 enclosure, except with 24 Volt, 60 Hertz coil, becomes a CR305C124 product number.

For NEMA Size 7-9 contactors with other control circuit voltages, contact your nearest GE Consumer & Industrial Representative.



Typical CR305 Open-Type Magnetic Contactor

5. Holding Contacts

Each CR305 contactor is furnished with a normally open auxiliary contact for use as a holding interlock in three-wire control circuits. This auxiliary contact has the same rating as a main pole (contact) for Sizes 00, 0, and 1. If this contact is not required on these sizes, specify contactor with one less pole.

6. 50 Hertz Contactors

Pricing of contactors for use on 50 Hertz is the same as in table for 60 Hertz. See three-phase horsepower ratings for 380-415 Volts, 50 Hertz on page 1-6.

7. Product Notes

Motor full-load current should not exceed continuous ampere rating of contactor.

NEMA Types 4/4X and 12 contactors are UL listed to include Class II Groups F and G, Div. 2 only, and Class III Hazardous Locations.

Reference Publications

Instructions	Publication Number
NEMA Size	
00, 0, 1	GEH-5190
2	GEH-4774
3	GEH-4806
4	GEH-4807
5	GEH-4839
6	GEH-5198
7-9	GEH-5108

Magnetic Nonreversing Contactors (CR305, CR385) – Contents

Application Information and Selection Instructions (CR305, CR385)	1-195
NEMA Sizes 00-9, One- and Two-Pole (CR305, CR385)	1-196
NEMA Sizes 00-9, Three-Pole (CR305, CR385)	1-197
NEMA Sizes 00-9, Four-Pole (CR305, CR385)	1-198
Factory Installed Modifications (CR305, CR385)	1-199
Outlines and Dimensions (CR305, CR385)	1-210



Publications and Reference: See Section 17 for a complete list of additional product-related publications

Other Coil Voltages: See page 1-8

Factory Installed Modifications: See pages 1-199 to 1-203

Field Installed Modifications: See pages 1-204 to 1-209

AIR PRESSURE SENSING SWITCH



AIR PRESSURE SENSING SWITCH WITH ADJUSTABLE SET POINT RANGE

APPLICATION

Model AFS-222 Air Pressure Sensing Switch is a general purpose proving switch designed for HVAC and Energy Management applications. It may be used to sense positive, negative, or differential air pressure.

GENERAL DESCRIPTION & OPERATION

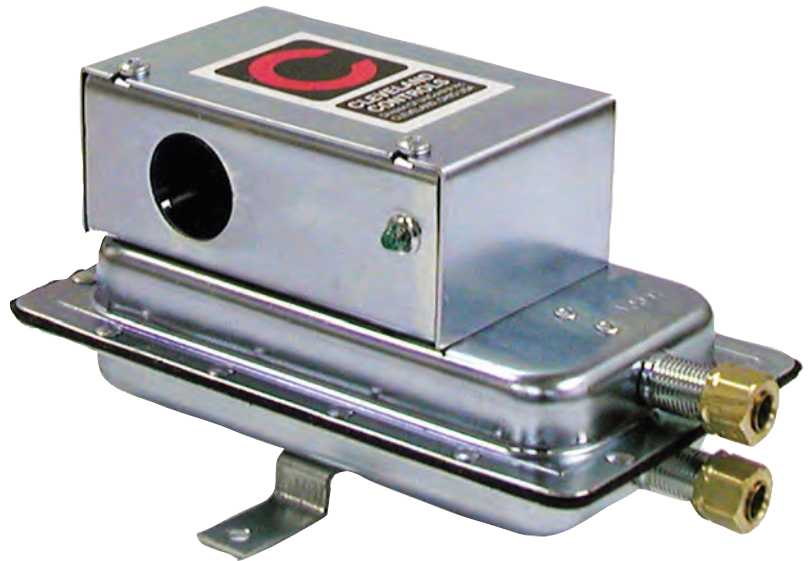
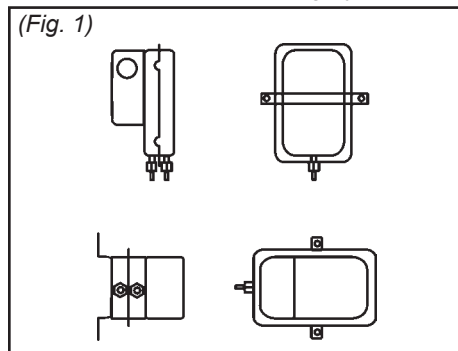
The plated housing contains a diaphragm, a calibration spring and a snap-acting SPDT switch. The sample connections located on each side of the diaphragm accept 1/4" OD metallic tubing via the integral compression ferrule and nut.

An enclosure cover guards against accidental contact with the live switch terminal screws and the set point adjusting screw. The enclosure cover will accept a 1/2" conduit connection.

MOUNTING (SEE FIGURE 1)

Select a mounting location which is free from vibration. The **AFS-222** must be mounted with the diaphragm in any vertical plane in order to obtain the lowest specified operating set point. Avoid mounting with the sample line connections in the "up" position. Surface mount via the two 3/16" diameter holes in the integral mounting bracket. The mounting holes are 3-7/8" apart.

The **AFS-222** is designed to accept firm-wall sample lines of 1/4" OD tubing by means of



AIR SAMPLING CONNECTION (SEE FIGURE 2)

ferrule and nut compression connections. For sample lines of up to 10 feet, 1/4" OD tubing is acceptable. For lines up to 20 feet, use 1/4" ID tubing. For lines up to 60 feet, use 1/2" ID tubing. A 1/4" OD adapter, suitable for slip-on flexible tubing is available: order part number 18311.

Locate the sampling probe a minimum of 1.5 duct diameters downstream from the air source. Install the sampling probe as close to the center of the airstream as possible. Refer to Figure 2 to identify the high pressure inlet (H) and the low pressure inlet (L). Select one of the five application options listed below, and connect the sample lines as recommended.

POSITIVE PRESSURE ONLY: Connect the sample line to inlet H; inlet L remains open to the atmosphere.

NEGATIVE PRESSURE ONLY: Connect the sample line to inlet L; inlet H remains open to the atmosphere.

TWO NEGATIVE SAMPLES: Connect the higher negative sample to inlet L. Connect the lower negative sample to inlet H.

TWO POSITIVE SAMPLES: Connect the higher positive sample to inlet H. Connect the lower positive sample to inlet L.

ONE POSITIVE AND ONE NEGATIVE SAMPLE: Connect the positive sample to inlet H. Connect the negative sample to inlet L.



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DIVISION OF UNICONTROL INC.
1111 Brookpark Rd
Cleveland OH 44109

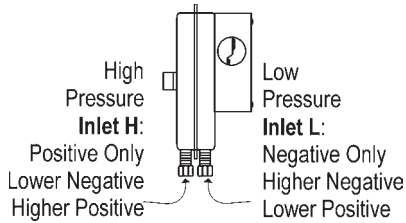
Tel: 216-398-0330
Fax: 216-398-8558

Email: salesvac@unicontrolinc.com

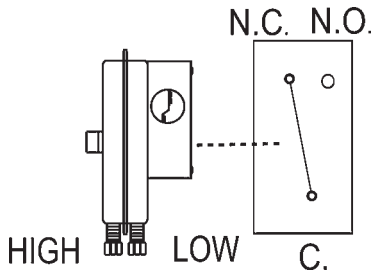
Web page: <http://www.clevelandcontrols.com>



(Figure 2)

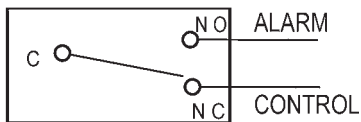


(Figure 3)

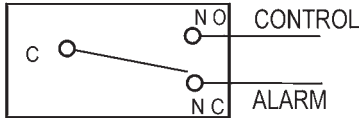


(Figure 4)

To prove excessive air flow or pressure:



To prove insufficient air flow or pressure:



ELECTRICAL CONNECTIONS (SEE FIGURE 3)

Before pressure is applied to the diaphragm, the switch contacts will be in the normally closed (NC) position. The snap switch has screw top terminals with cup washers. Wire alarm and control applications as shown in Figure 4.

FIELD ADJUSTMENT

The adjustment range of an **AFS-222** Air Switch is 0.05 ± 0.02 " w.c. to 12.0" w.c. To adjust the set point, turn the adjusting screw counterclockwise until motion has stopped. Next, turn the adjusting screw 4 complete turns in a clockwise direction to engage the spring. From this point, the next ten turns will be used for the actual calibration. **Each full turn represents approximately 1.2" w.c.**

Please note: To properly calibrate an air switch, a digital manometer or other measuring device should be used to confirm the actual set point.

SPECIFICATIONS

MODEL AFS-222 AIR PRESSURE SENSING SWITCH WITH ADJUSTABLE SET POINT RANGE

Mounting Position:

Mount with the diaphragm in any vertical plane.

Set Point Range:

0.05 ± 0.02 " w.c. to 12.0" w.c.

Field Adjustable "Operate Range":

0.07" w.c. to 12.0" w.c.

Field Adjustable "Release Range":

0.04" w.c. to 11.2" w.c.

Approximate Switching Differential:

Progressive, increasing from 0.02 \pm 0.01" w.c. at minimum set point to approximately 0.8" w.c. at maximum set point.

Measured Media:

Air, or combustion by-products that will not degrade silicone.

Maximum Pressure:

1/2 psi (0.03 bar).

Operating Temperature Range:

-40F to 180F (-40 to 82C).

Life:

100,000 cycles minimum at 1/2 psi maximum pressure each cycle and at maximum rated electrical load.

Electrical Rating:

300 VA pilot duty at 115 to 277 VAC, 15 amps noninductive to 277 VAC, 60Hz.

Contact Arrangement: SPDT.

Electrical Connections:

Screw-type terminals with cup washers.

Conduit Opening:

7/8" diameter opening accepts 1/2" conduit.

Sample Line Connectors:

Male, externally threaded 7/16" 24 UNS 2A thread, complete with nuts and self-aligning ferrules.

Sample Line Connections:

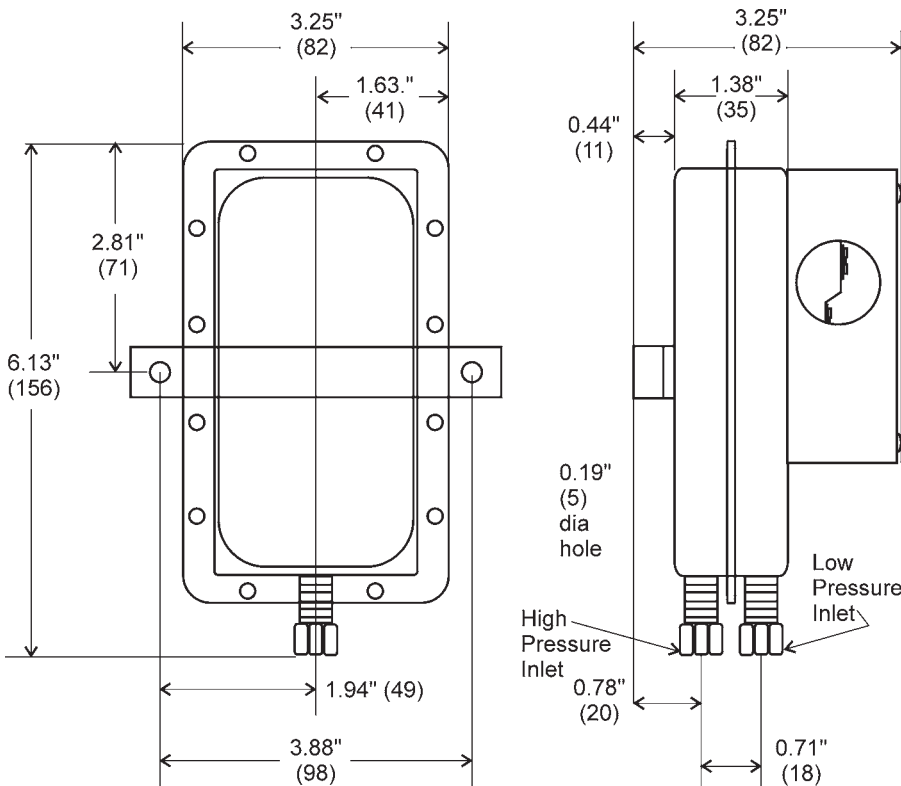
Connectors will accept 1/4" OD rigid or semi-rigid tubing.

Approvals: UL, FM, CSA.

Shipping Weight: 1.2 lbs.

Accessories:

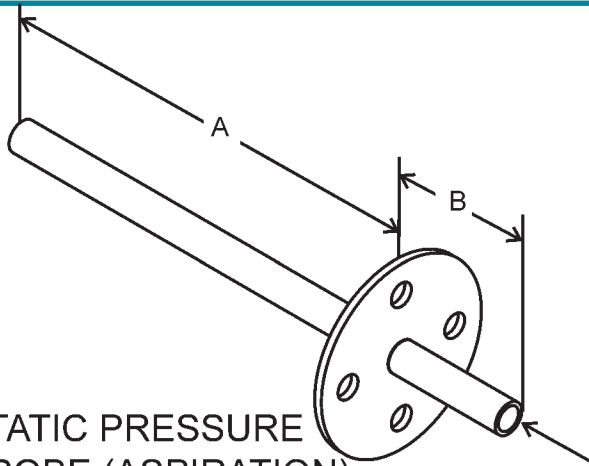
- P/N 18311 Slip-on 1/4" OD Tubing Adapter, suitable for slipping on flexible plastic tubing.
- Sample line probes.
- Orifice plugs (pulsation dampers).



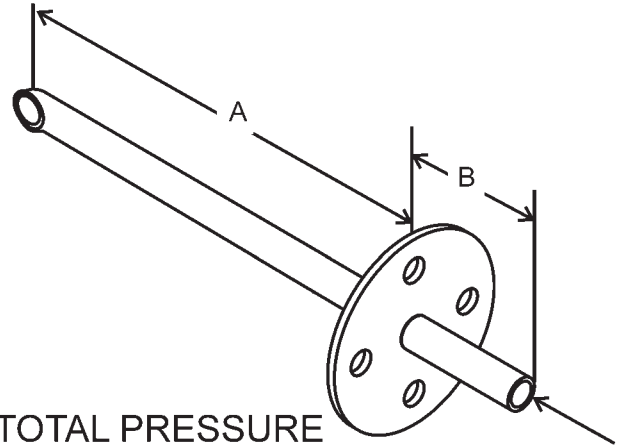
Nominal Dimensions in Inches (Millimeters)



FOR AIR PRESSURE SENSING SWITCHES



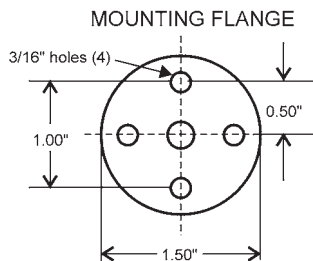
STATIC PRESSURE PROBE (ASPIRATION) 0.25" max. OD



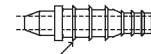
TOTAL PRESSURE PROBE (IMPACT) 0.25" max. OD

Static Pressure (Aspiration) Probes				
Dimension A	Smooth OD Dimension B	Part Number	Barbed End Dimension B	Part Number
1.5	1.0	21397	1.75	21397-112
2.0	.5	21116	1.25	21116-112
3.5	1.0	21398	1.75	21398-112
4.0	.5	21117	1.25	21117-112
5.5	1.0	21399	1.75	21399-112
6.0	.5	21118	1.25	21118-112
7.5	1.0	21400	1.75	21400-112
8.0	.5	21119	1.25	21119-112

Total Pressure (Impact) Probes				
Dimension A	Smooth OD Dimension B	Part Number	Barbed End Dimension B	Part Number
1.5	1.0	21401	1.75	21401-112
2.0	.5	21120	1.25	21120-112
3.5	1.0	21402	1.75	21402-112
4.0	.5	21121	1.25	21121-112
5.5	1.0	21403	1.75	21403-112
6.0	.5	21122	1.25	21122-112
7.5	1.0	21404	1.75	21404-112
8.0	.5	21123	1.25	21123-112
10.0	.5	28527	1.25	28527-112
12.0	.5	28528	1.25	28528-112



FACTORY-INSTALLED
BARBED ADAPTER
FOR HOSE CONNECTION



45° BARB TYP. 6 PLACES
BARBED END WILL ACCEPT
1/8" THRU 1/4" ID
FLEXIBLE PLASTIC TUBING.



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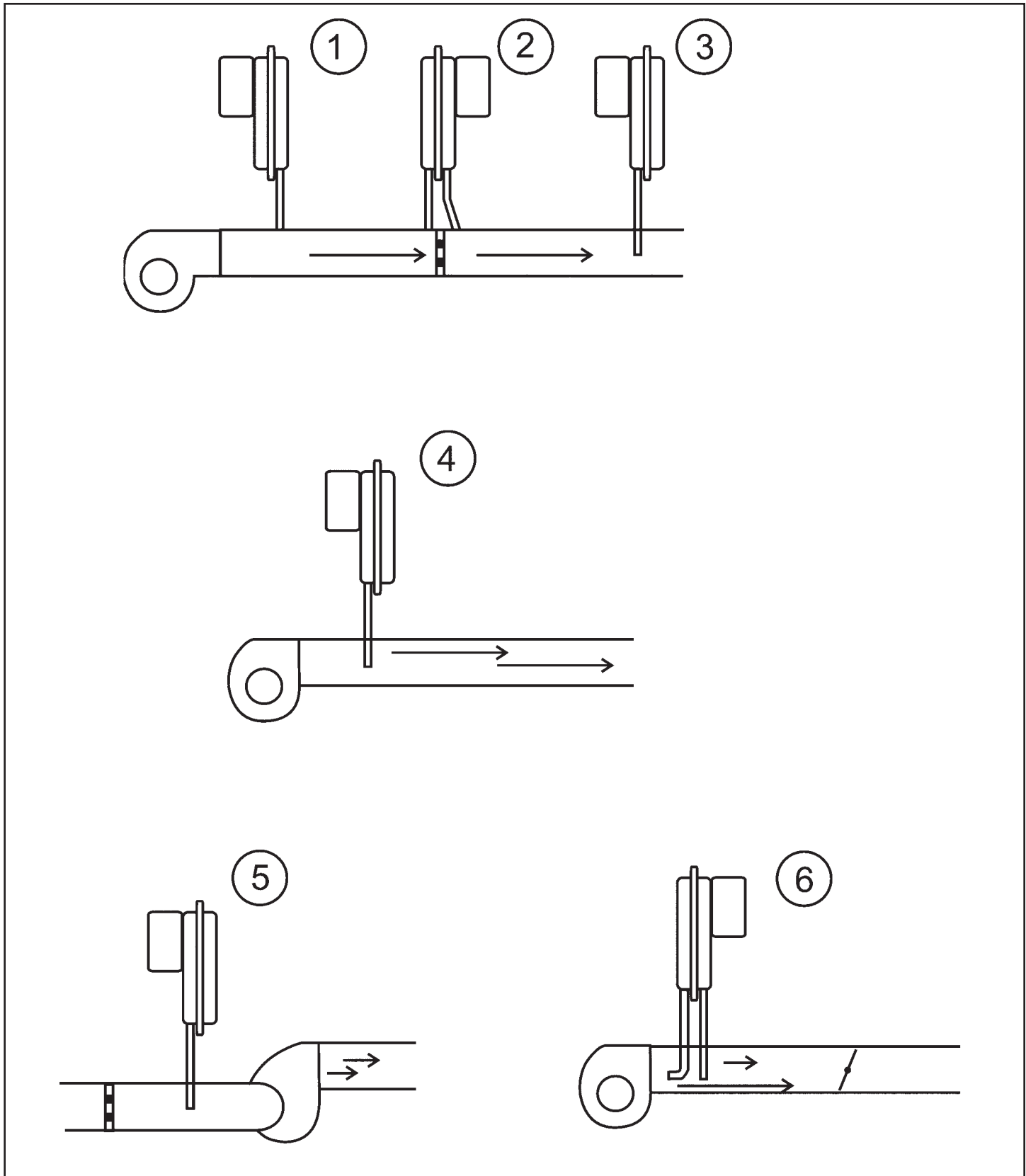
RECOMMENDED PROBE LOCATIONS:

1. Position 5 to 8 diameters downstream from elbows, obstructions, or significant change in duct area.
2. Insert probe into duct perpendicular to airstream so that:
 - **Aspiration** (static) probe tip opens parallel with airstream.
 - **Impact** (total pressure) probe tip opens directly into the airstream.

TYPICAL APPLICATIONS (SEE FIGS. 1-6):

265/324

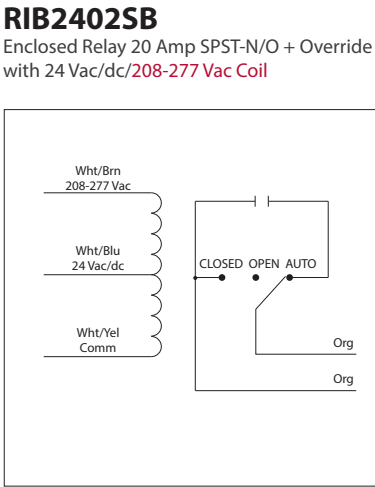
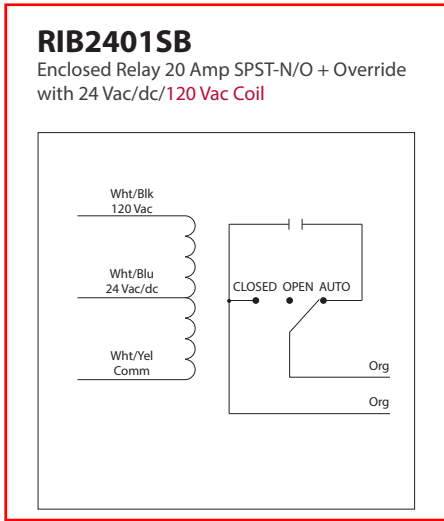
1. Positive static pressure increases as the filter gets dirty.
2. Differential across filter changes as filter gets dirty.
3. Flow is reduced as filter gets dirty.
4. Fan operation **or** true air flow with little or no static pressure.
5. Negative pressure increases as the filter gets dirty.
6. Fan operation **and** true air flow: varying amounts of static pressure. Probes must be perpendicular to air flow.



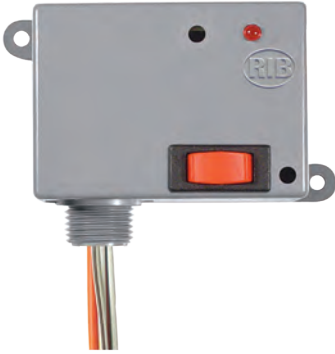
RELAY



Functional Devices, Inc. • p: 800.888.5538 • f: 765.883.7505 • www.functionaldevices.com • sales@functionaldevices.com



20 Amp Power Control Relays



Specifications

Relays & Contact Type: One (1) SPST Continuous Duty Coil
Expected Relay Life: 10 million cycles minimum mechanical
Operating Temperature: -30 to 140° F
Humidity Range: 5 to 95% (noncondensing)
Operate Time: 18mS
Relay Status: LED On = Activated
Dimensions: 2.30" x 3.20" x 1.80" with .50" NPT Nipple
Wires: 16", 600V Rated
Approvals: UL Listed, UL916, UL864, C-UL California State Fire Marshal, CE, RoHS
Housing Rating: UL Accepted for Use in Plenum, NEMA 1
Gold Flash: No
Override Switch: Yes

Contact Ratings:
 20 Amp Resistive @ 277 Vac
 20 Amp Ballast N/O @ 277 Vac
 10 Amp Ballast N/C @ 277 Vac
 10 Amp Tungsten N/O @ 120 Vac
 770 VA Pilot Duty @ 120 Vac
 1,110 VA Pilot Duty @ 277 Vac
 2 HP @ 277 Vac
 1 HP @ 120 Vac

Coil Voltage Input:
 24 Vac/dc ; 120 Vac ; 50-60 Hz (RIB2401SB)
 24 Vac/dc ; 208-277 Vac ; 50-60 Hz (RIB2402SB)
 Drop Out = 2.1 Vac / 3.8 Vdc
 Pull In = 18 Vac / 22 Vdc

Coil Current:

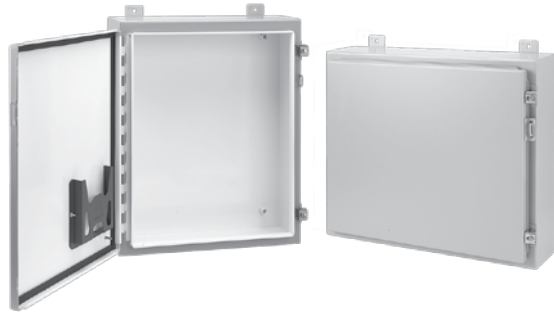
50 mA @ 18 Vac	33 mA @ 22 Vdc
83 mA @ 24 Vac	35 mA @ 24 Vdc
47 mA @ 120 Vac (RIB2401SB)	47 mA @ 30 Vdc
69 mA @ 208-277 Vac (RIB2402SB)	

Notes:

- Order Normally Closed by adding "-NC" to end of model number
- Order with Momentary Override Switch by adding "-MNO" to end of model number

CONTROLS ENCLOSURE

CONTINUOUS HINGE WITH CLAMPS, TYPE 12



INDUSTRY STANDARDS

UL 508A Listed; Type 12, 13; File No. E61997
cUL Listed per CSA C22.2 No. 94; Type 12, 13; File No. E61997

NEMA/EEMAC Type 12 and 13
CSA, File No. 42186: Type 12
IEC 60529, IP65

APPLICATION

For applications requiring a bright white interior to increase control visibility, this enclosure includes a padlocking hasp and staple for security and screw-down clamps for secure closure.

SPECIFICATIONS

- Enclosure bodies are 14 or 16 gauge steel. Doors are 14 gauge steel.
- Seams continuously welded and ground smooth
- External wall-mounting brackets
- Formed external return flanges around all sides of enclosure opening
- Screw-down door clamps
- Removable heavy-gauge continuous hinge pin
- Hasp and staple for padlocking
- Data pocket is high-impact thermoplastic
- Collar studs provided for mounting optional panels
- Bonding provision on door

FINISH

White inside with ANSI 61 gray finish outside.

ACCESSORIES

See also *Accessories*.

Drip Shield Kit for Type 12 Enclosures

Electric Heater

Fast-Operating Clamp Assembly

Compact Cooling Fans

Steel and Stainless Steel Window Kits

See also the *Popular Cooling and Accessories tables following the Standard Product table*.

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: A12

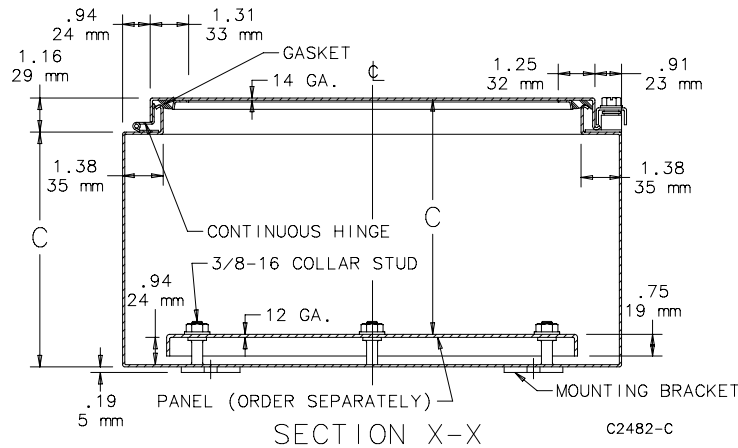
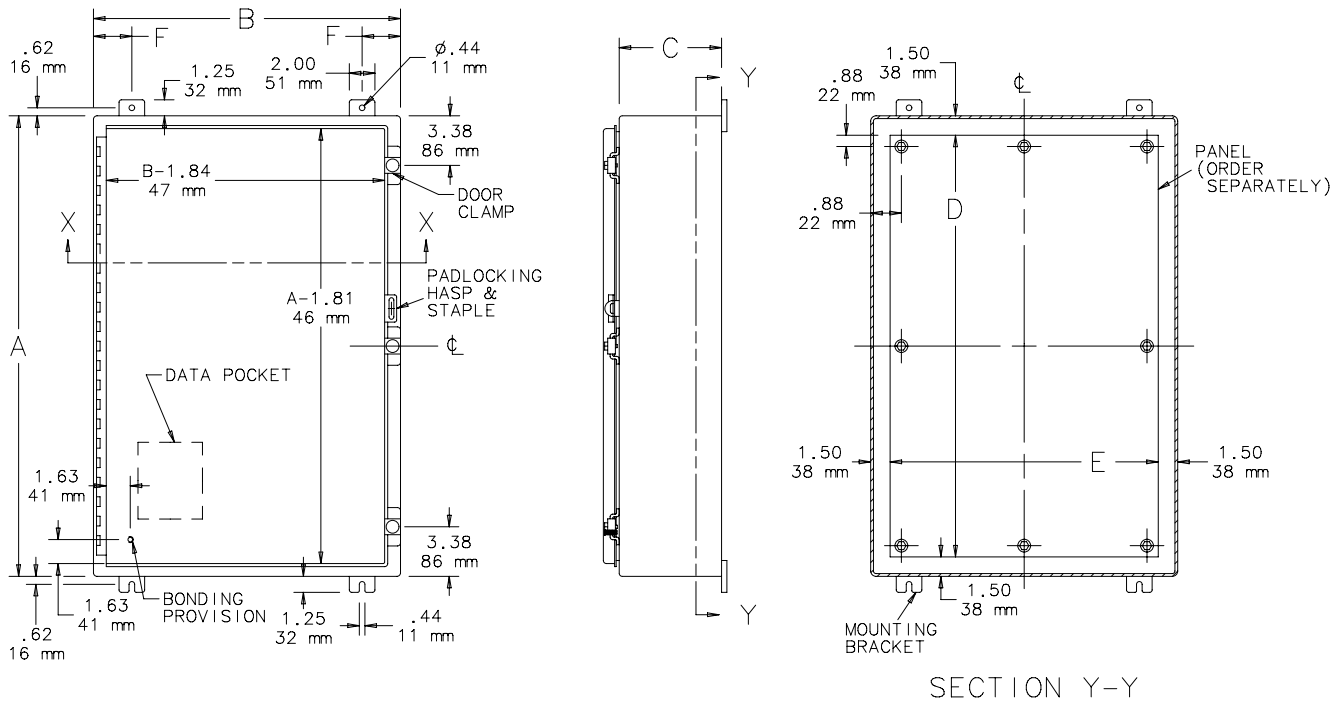
Standard Product

Catalog Number	AxBxC in./mm	Body Gauge	Panel	Conductive Panel	Panel Size D x E in./mm	F in./mm	Number of Clamps	Data Pocket
A122406LP	12.00 x 24.00 x 6.00 305 x 610 x 152	16	A12P24	A12P24G	9.00 x 21.00 229 x 533	3.00 76	2	Small
A161206LP	16.00 x 12.00 x 6.00 406 x 305 x 152	16	A16P12	A16P12G	13.00 x 9.00 330 x 229	1.25 32	2	Small
A161606LP	16.00 x 16.00 x 6.00 406 x 406 x 152	16	A16P16	A16P16G	13.00 x 13.00 330 x 330	3.00 76	2	Small
A162006LP	16.00 x 20.00 x 6.00 406 x 508 x 152	16	A20P16	A20P16G	17.00 x 13.00 432 x 330	3.00 76	2	Small
A201206LP	20.00 x 12.00 x 6.00 508 x 305 x 152	16	A20P12	A20P12G	17.00 x 9.00 432 x 229	1.25 32	2	Small
A201606LP	20.00 x 16.00 x 6.00 508 x 406 x 152	16	A20P16	A20P16G	17.00 x 13.00 432 x 330	3.00 76	2	Small
A202006LP	20.00 x 20.00 x 6.00 508 x 508 x 152	16	A20P20	A20P20G	17.00 x 17.00 432 x 432	3.00 76	2	Small
A202406LP	20.00 x 24.00 x 6.00 508 x 610 x 152	16	A24P20	A24P20G	21.00 x 17.00 533 x 432	3.00 76	2	Small
A241206LP	24.00 x 12.00 x 6.00 610 x 305 x 152	16	A12P24	A12P24G	9.00 x 21.00 229 x 533	1.25 32	2	Small
A241606LP	24.00 x 16.00 x 6.00 610 x 406 x 152	16	A24P16	A24P16G	21.00 x 13.00 533 x 330	3.00 76	2	Small
A242006LP	24.00 x 20.00 x 6.00 610 x 508 x 152	16	A24P20	A24P20G	21.00 x 17.00 533 x 432	3.00 76	2	Small
A242406LP	24.00 x 24.00 x 6.00 610 x 610 x 152	16	A24P24	A24P24G	21.00 x 21.00 533 x 533	3.00 76	2	Small
A301606LP	30.00 x 16.00 x 6.00 762 x 406 x 152	14	A30P16	A30P16G	27.00 x 13.00 686 x 330	3.00 76	2	Small
A302006LP	30.00 x 20.00 x 6.00 762 x 508 x 152	14	A30P20	A30P20G	27.00 x 17.00 686 x 432	3.00 76	2	Small
A302406LP	30.00 x 24.00 x 6.00 762 x 610 x 152	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large
A362406LP	36.00 x 24.00 x 6.00 914 x 610 x 152	14	A36P24	A36P24G	33.00 x 21.00 838 x 533	3.00 76	2	Large
A363006LP	36.00 x 30.00 x 6.00 914 x 762 x 152	14	A36P30	A36P30G	33.00 x 27.00 838 x 686	3.00 76	2	Large
A122408LP	12.00 x 24.00 x 8.00 305 x 610 x 203	16	A12P24	A12P24G	9.00 x 21.00 229 x 533	3.00 76	2	Small
A161208LP	16.00 x 12.00 x 8.00 406 x 305 x 203	16	A16P12	A16P12G	13.00 x 9.00 330 x 229	1.25 32	2	Small
A161608LP	16.00 x 16.00 x 8.00 406 x 406 x 203	16	A16P16	A16P16G	13.00 x 13.00 330 x 330	3.00 76	2	Small

Catalog Number	AxBxC in./mm	Body Gauge	Panel	Conductive Panel	Panel Size D x E in./mm	F in./mm	Number of Clamps	Data Pocket
A201612LP	20.00 x 16.00 x 12.00 508 x 406 x 305	14	A20P16	A20P16G	17.00 x 13.00 432 x 330	3.00 76	2	Small
A242012LP	24.00 x 20.00 x 12.00 610 x 508 x 305	14	A24P20	A24P20G	21.00 x 17.00 533 x 432	3.00 76	2	Small
A242412LP	24.00 x 24.00 x 12.00 610 x 610 x 305	14	A24P24	A24P24G	21.00 x 21.00 533 x 533	3.00 76	2	Small
A302412LP	30.00 x 24.00 x 12.00 762 x 610 x 305	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large
A303012LP	30.00 x 30.00 x 12.00 762 x 762 x 305	14	A30P30	A30P30G	27.00 x 27.00 686 x 686	3.00 76	2	Large
A362412LP	36.00 x 24.00 x 12.00 914 x 610 x 305	14	A36P24	A36P24G	33.00 x 21.00 838 x 533	3.00 76	2	Large
A363012LP	36.00 x 30.00 x 12.00 914 x 762 x 305	14	A36P30	A36P30G	33.00 x 27.00 838 x 686	3.00 76	2	Large
A363612LP	36.00 x 36.00 x 12.00 914 x 914 x 305	14	A36P36	A36P36G	33.00 x 33.00 838 x 838	3.00 76	2	Large
A423012LP	42.00 x 30.00 x 12.00 1067 x 762 x 305	14	A42P30	A42P30G	39.00 x 27.00 991 x 686	3.00 76	2	Small
A423612LP	42.00 x 36.00 x 12.00 1067 x 914 x 305	14	A42P36	A42P36G	39.00 x 33.00 991 x 838	3.00 76	2	Large
A483612LP	48.00 x 36.00 x 12.00 1219 x 914 x 305	14	A48P36	A48P36G	45.00 x 33.00 1143 x 838	3.00 76	3	Large
A603612LP	60.00 x 36.00 x 12.00 1524 x 914 x 305	14	A60P36	A60P36G	57.00 x 33.00 1448 x 838	3.00 76	3	Large
A723612LP	72.00 x 36.00 x 12.00 1829 x 914 x 305	14	A72P36	A72P36G	69.00 x 33.00 1753 x 838	3.00 76	3	Large
A242016LP	24.00 x 20.00 x 16.00 610 x 508 x 406	14	A24P20	A24P20G	21.00 x 17.00 533 x 432	3.00 76	2	Small
A242416LP	24.00 x 24.00 x 16.00 610 x 610 x 406	14	A24P24	A24P24G	21.00 x 21.00 533 x 533	3.00 76	2	Small
A302416LP	30.00 x 24.00 x 16.00 762 x 610 x 406	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large
A363016LP	36.00 x 30.00 x 16.00 914 x 762 x 406	14	A36P30	A36P30G	33.00 x 27.00 838 x 686	3.00 76	2	Large
A423616LP	42.00 x 36.00 x 16.00 1067 x 914 x 406	14	A42P36	A42P36G	39.00 x 33.00 991 x 838	3.00 76	2	Large
A483616LP	48.00 x 36.00 x 16.00 1219 x 914 x 406	14	A48P36	A48P36G	45.00 x 33.00 1143 x 838	3.00 76	3	Large
A603616LP	60.00 x 36.00 x 16.00 1524 x 914 x 406	14	A60P36	A60P36G	57.00 x 33.00 1448 x 838	3.00 76	3	Large
A302420LP	30.00 x 24.00 x 20.00 762 x 610 x 508	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large
A363020LP	36.00 x 30.00 x 20.00 914 x 762 x 508	14	A36P30	A36P30G	33.00 x 27.00 838 x 686	3.00 76	2	Large
A483620LP	48.00 x 36.00 x 20.00 1219 x 914 x 508	14	A48P36	A48P36G	45.00 x 33.00 1143 x 838	3.00 76	3	Large
A603620LP	60.00 x 36.00 x 20.00 1524 x 914 x 508	14	A60P36	A60P36G	57.00 x 33.00 1448 x 838	3.00 76	3	Large
A302424LP	30.00 x 24.00 x 24.00 762 x 610 x 610	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large

Purchase panels separately. Optional stainless steel, conductive, composite and aluminum panels are available for most sizes.

Small Data Pocket is 6.00 in. x 6.00 in. Large Data Pocket is 12.00 in. x 12.00 in.



Popular Cooling Products

Enclosure Depth (C Dimension)	Thermoelectric Cooler*
6 in. (152 mm)	SF0416414
8 in. (203 mm)	SF0516414
10 in. (254 mm)	SF0916414
12 in. (305 mm)	SF1016414
16 in. (406 mm)	SF1316414
20 in. (508 mm)	SF1316414
24 in. (610 mm)	SF1316414

*Important: Visit tools.hoffmanonline.com/attachments to access our **Cooling Selection Tool** to determine the appropriate cooling solution for your application.

Popular Accessories

Enclosure Width (B Dimension)	Light	Hole Seals	Window Kits
12 in. (305 mm)	LEDPUCK	AS050	APWK53NF
16 in. (406 mm)	LEDA2M35	AS050	APWK53NF
20 in. (508 mm)	LED24V15	AS050	APWK53NF
24 in. (610 mm)	LED24V15	AS050	APWK53NF
30 in. (762 mm)	LED24V15	AS050	APWK53NF
36 in. (914 mm)	LED24V15	AS050	APWK53NF

SCRIPT CONTROLLER (HMI)

Systecon's controls combine high speed, high reliable industrial grade programmable logic controllers (PLCs), a dedicated interface screen, and remote interface devices. This system architecture allows Systecon to provide guaranteed performance for all pumps and optimize plant operation with interfaces to chillers, boilers, and cooling towers. And, with the new SCRIPT™ system, Systecon can offer hundreds of points over standard communication drivers such as Bacnet, ModBus, N2 and LonWorks.

SCRIPT™ OFFERS:

- High Speed Direct Digital PID controls
- Text or Graphics Available on HMI for Monitoring and Changes to All Internal Values
- Serial Interfaces Available to Chillers, Towers and VFD's to Provide Direct Information Exchange
- Interfaces to Monitor Pump Pressures, System Pressures, Zone Setpoints, VFD Values, Chiller Valves and More
- Remote Access to Monitor and Change All Setpoints as well as Manually Start Equipment from a Remote Location

Systecon provides all the control algorithms required for:

- Wire to Water Efficiency control for pumps
- Total Variprime™ system controls for chillers, towers and valves
- Multiple package controls for distributed and profile pumping schemes
- Many other types of water and industrial process systems

Components

The PLC has long been the staple of the Systecon controls. It's reliability and high speed analog interfaces make it the perfect platform for pumping systems. The need for rapid response to system changes and integration to other devices such as chillers, valves, and transmitters, can only be performed with this type of high speed processing unit. The PLC's dedicated I/O processor does not get locked up performing reads or writes to peripheral devices common to other control systems. You are guaranteed that the PLC will operate and perform all functions even if the HMI screen goes down. Also, the dedicated PID loops allow the end user all the high speed logic needed for total plant management and precise closed loop control. Finally, with a failure rate of less than 1 in 100,000 the PLC is the best choice for a stand alone unit controller for every type of water management system.



1963

Systecon Founded
Relays and Timers for logic

1967

First Variable Volume Job
Used Hydro-constants on Pumps
Single Loop Analog Controller
Birth of S9401

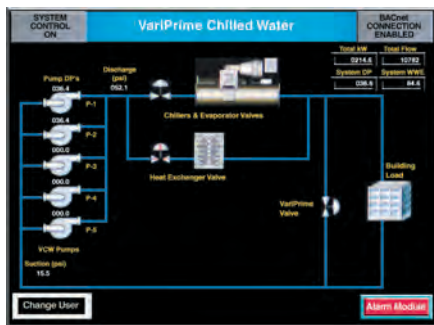
1981

First Job with VFD'S
Continued Use of Analog Controllers for
PID Loops and Relay ~ Timer Logic
Hard Wired Displays

1985

Developed WWE
S9501 & S9670 Series Controllers
Also Developed (included PID Loops,
WWE, BTU Monitor, and
Chiller Sequencer)

The *SCRIPT*™ system allows the end user to choose their interface and manual operation platform. The operator may choose a color screen only for changing of setpoints, time and sequencing delays, and status and failure indication functions. Optional hard wired operators on the front panel door allow for stand alone emergency operation that many plant operators prefer. For remote plants with limited access to an operator, the Systecon *SCRIPT*™ system will allow pumps and ancillary equipment in the plant to be manually started in event of an emergency. As always, the operator chooses his platform, and all systems



will employ the PLC for guaranteed performance and NO shutdowns or CPU failures. Furthermore, the PLC programming language employed does not require continual upgrades or proprietary software licenses. All programs and programming software is provided as part of the package when needed.

Remote Interface Devices

Systecon now offers a full line of serial interfaces with *SCRIPT*™ to communicate with most Building Automation Systems. Systecon supports ModBus, BACnet, LonWorks and N2. The following signals can be obtained from Systecon as a standard:

Typical Pump Information

- Component Status
- Component Failure
- Pump Pressures
- Pump Speed
- Strainer Pressure Drop
- Volts, Amps, kW



Typical System Information

- System flow
- Suction Pressure
- Discharge Pressure
- Zone Pressures
- Pump system WWE
- System kW/GPM

1987

PLC Based Controls

Replaced Relay/Timer Logic with PLC's ~ First use of Color Screen HMI for Larger Chiller Plant Control Systems

1991

S9511 Developed

Combined S9501 and S9670 into one Universal Controller ~ Began using ModBus and Modem Control Interfaces

2001

BACnet Interface

First Job with Certified BACnet Interface Controls

2002

SCRIPT™ System Developed

Provides BACnet, ModBus, LonWorks, and Ethernet as Standard Interfaces ~ Uses Full Color Graphics HMI for Seamless Remote Monitoring of all Points by BAS or Factory



No Matter where you view your *SCRIPT*[™] system, the graphics and data are always the same.

The Plant operator can view any point on the *SCRIPT*[™] system and make the needed adjustments via the package mounted HMI, or through a serial communications link at the operator workstation.



Systecon's Engineering Staff can monitor your *SCRIPT*[™] system at our facility to provide system analysis, real time diagnostics, and then provide changes to fine tune your system over it's entire lifetime.

IPC/IPX PowerStations

High-Performance Industrial Workstations

Industrial hardened workstations offer more for less!

IPC/IPX PowerStations offer more processing power, more memory, more storage, more reliability, and less thermal dissipation than ever before. And, the IPC/IPX gives you all this while offering lower configured price points.

IPC/IPX PowerStations are designed and tested to the extremes that can satisfy the most demanding applications. All models are NEMA-rated. The 15" display is optionally equipped with a stainless steel bezel for clean room/sanitary work environments.

And all PowerStations now come with an industry-leading, 24-month warranty!

Contact Information:

Parker Hannifin Corporation
Electromechanical Automation Division
 5500 Business Park Drive
 Rohnert Park, CA 94928

phone: 800.358.9068 / 707.584.7558

fax: 707.584.8015

email: emn_support@parker.com

www.parkermotion.com



Parker's industrial PC products include 10", 15", and 17" panel-mount color touchscreen systems and a machine-mount, PC-only system.

The IPX PowerStations come with InteractX runtime preloaded and enabled, reducing the time it takes to get a project running.

The IPC PowerStations are configured to run third-party or custom Windows applications and do not include an InteractX runtime license.

- Celeron M 550 at 2.0 GHz or Core2Duo T7500 at 2.2 GHz
- 2 or 4 GB memory
- Intel Express graphics
- 80 GB SSD standard on IPX (optional on IPC)
- 160 GB HDD standard on IPC (optional on IPX)
- 4 USB 2.0 ports (2) RS-232, (1) RS-232/422/485
- 2 1000 BaseT Ethernet ports
- HD audio

Pre-configured IPX Packaged Systems

Performance Features		Standard Performance Package	Premium Performance Package
CPU		2.0 GHz Celeron M 550	2.2 Ghz T7500 Core2Duo
DRAM		2 GB	4 GB
Operating System		Windows XP	Windows XP
Hard Drive		80 GB Intel SSD	80 GB Intel SSD
Optical Drive		None	DVD-RW
Display Size	Resolution	Model Number	Model Number
No Display	—	IPX00N-D	IPX00N-E
10" Display	800 x 600	IPX10S-D	IPX10S-E
15" Display	1024 x 768	IPX15T-D	IPX15T-E
15" Display with SS Bezel	1024 x 768	IPX15A-D	IPX15A-E
17" Display	1280 x 1024	IPX17T-D	IPX17T-E

ENGINEERING YOUR SUCCESS.

IPC/IPX PowerStations

IPC/IPX Common Specifications and Features

		IPC/IPX10	IPC/IPX15	IPC/IPX17	IPC/IPX00
Color TFT Display	Diagonal Size	10.4" (264 mm)	15.1" (380 mm)	17.0" (432 mm)	No display
	Resolution	SVGA (800 x 600)	XGA (1024 x 768)	SXGA (1280 x 1024)	2048 x 1536 monitor resolution
	Brightness	350 NIT	260 NIT	260 NIT	—
	Viewing Angle	U/D = 50/60° L/R = 70/70°	U/D = 80/60° L/R = 80/80°	U/D = 80/60° L/R = 80/80°	—
Touchscreen Interface		Analog resistive touchscreen			
Operating System		Windows XP Professional			
HMI Software		InteractX Unlimited Tag HMI Runtime software and license (IPX)			
Processor Support		2.0GHz Celeron M 550 or 2.2 GHz Core2Duo T7500			
Chipset		<ul style="list-style-type: none"> Intel GME965/ICH8M Chipset 533MHz/667MHz FSB Integrated Intel Graphics 			
Memory, System		2GB(Std.) 4GB(Max) (2) 200 Pin DDRII SODIMM Slots			
Storage Options	Hard Drive	(1) 2.5" 80 GB SSD (IPX) or 160 GB HDD (IPC), RAID (Optional)			
	Optical Drive	DVD/RW supports CD, CDR, CDRW, DVD-ROM and DVD-RW (Optional)			
Ports	Keyboard	(1) PS/2, with over current protection			
	Mouse	(1) PS/2, with over current protection			
	USB	(4) 2.0/1.1 ports Type-A, with over current protection			
	Serial	(2) RS232 9-Pin D-sub and (1) RS232/422/485 selectable 9-pin D-sub			
	Ethernet	(2) 1000Base-T w/ RJ45			
	External Video	(1) Analog 15-Pin D-sub connector (max. resolution 2048 x 1536), (1) DVI-I Digital Output			
	Audio	(1) Amplified Output, (1) Line Input, (1) Microphone, AC97, HD 5.1 Audio Output			
Expansion Slots		None Standard, Optional PCI Slots: (2) 3/4 Length or (1) 3/4 Length PCI and (1) PCI Express (X4) (coming soon)			
BIOS Options		Plug-n-Play Configurable Boot Devices: <ul style="list-style-type: none"> Hard Drive CD ROM CompactFlash LAN USB 			
Environmental	Temperature	0 – 50°C			
	Rel. Humidity	5 – 95% (non-condensing)			
	Vibration	10 – 500 Hz 0.5 g rms (random operational-HD)			
	Shock	10 G, 11 msec (operating) 30 G, 11 msec (non-operating)			
Power Requirement		100 – 240 VAC; 50/60 Hz			
Agency Approval		UL/CUL/CE; Class 1 Division 2 (optional); NEMA 4X			

IPC/IPX Ordering Information

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

Order Example:

IPC 00N – 1 C – X 2 H – N A 1

Select an option from each numbered field to create a complete model order code.

① Series

IPC Industrial PC
IPX Industrial PC with added InteractX runtime key

② Display

00N No display
10S 10" TFT (800x600 pixels)
15T 15" TFT (1024x768 pixels)
15A 15" TFT (1024x768 pixels) with stainless steel bezel
17T 17" TFT (1280x1024 pixels)

③ Form Factor

1 No expansion bus
2 3/4 PCI expansion (2 slots)

④ Processor

C 2.0 GHz Celeron M550
D 2.2 GHz Core2Duo T7500

⑤ Operating System

X Windows XP Pro

⑥ DRAM

2 2 GB
4 4 GB

⑦ Operating System Storage

H Hard drive (160 GB)
S Solid state drive (80 GB)

⑧ Optical Drive Option

N No optical drive
D DVD-RW

⑨ Input Voltage

A 100 – 240 VAC

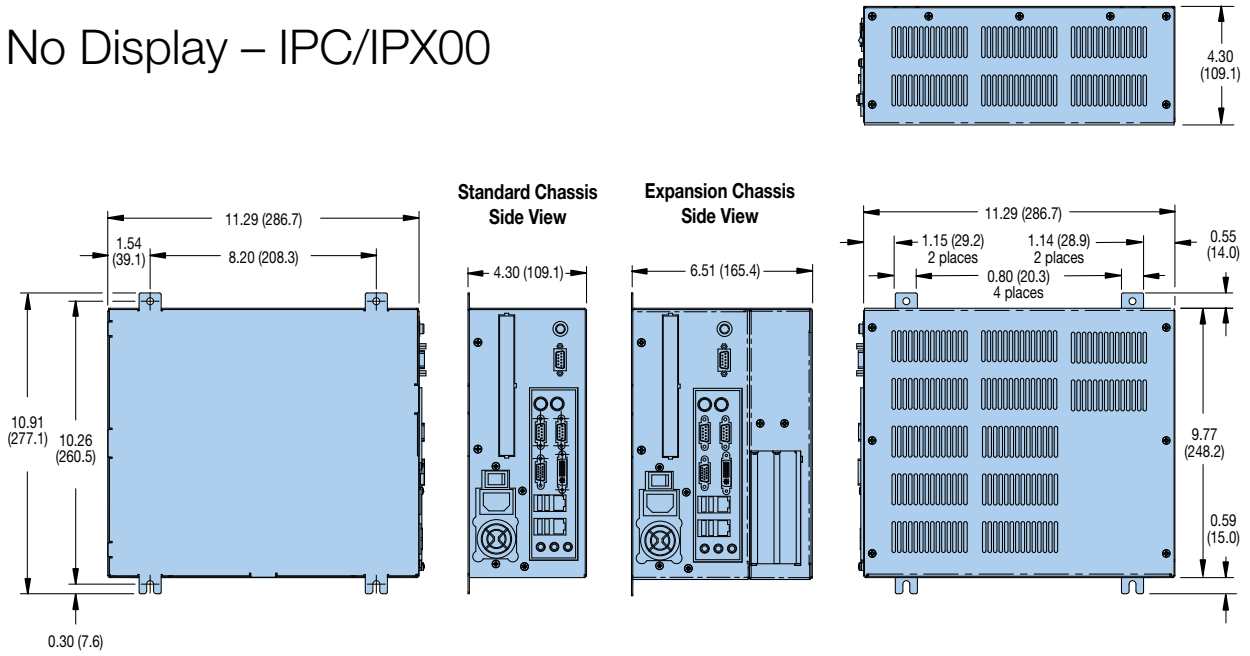
⑩ Agency Approval

1 No approvals
3 UL/CUL/CE
5 UL/CUL/CE Class 1 Div 2

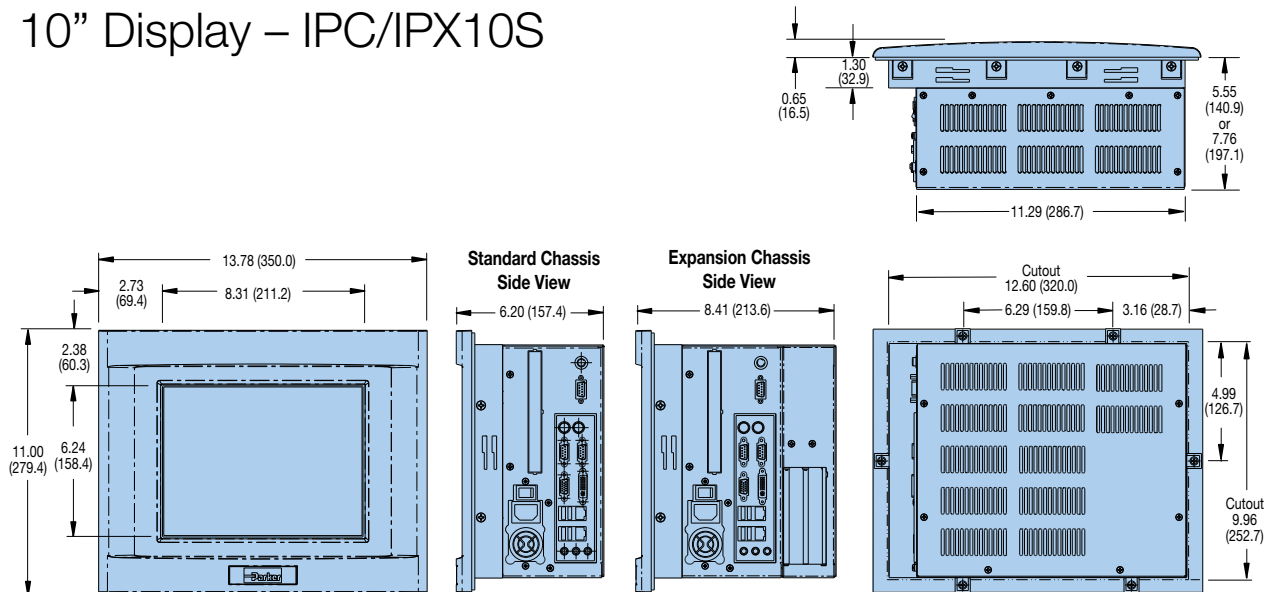
IPC/IPX Dimensions

Dimensions – in (mm)

No Display – IPC/IPX00



10" Display – IPC/IPX10S



PROGRAMMABLE LOGIC CONTROLLER

CompactLogix™ 5370 L3 Programmable Automation Controllers



1769-L30ER, -L30ERM, -L30ER-NSE, -L33ER, -L33ERM, -L36ERM

Features and Benefits

The CompactLogix 5370 L3 controllers deliver scalable, affordable control ideal for applications from small stand-alone equipment to high performance indexing tables, process skids, case packers and erectors, and packaging.

Machine builders and end users can take advantage of the cost-saving features of these controllers:

- Support for Integrated Motion on EtherNet/IP
- Support for Device Level Ring (DLR) network topologies
- Built-in energy storage eliminates the need for lithium batteries
- Support reuse of existing 1769 I/O
- Removable 1GB secure digital (SD) card improves data integrity
- Flexible memory options up to 3MB
- Added features for hazardous environments (NSE version)
- Support for Kinematics eliminates the need for additional robot controllers and software
- Open socket capability allows support for Modbus TCP as well as devices such as printers, barcode readers and servers

Reduce cost and time to market with CompactLogix 5370 L3 Programmable Automation Controllers.



Expanding on the scalability of the Logix family of controllers, the CompactLogix 5370 L3 programmable automation controllers (PAC) are designed to meet the growing need for a higher performance controller in a compact and affordable package.

As part of the Integrated Architecture system, the CompactLogix 5370 L3 controllers use the same programming software, network protocol, and information capabilities as all Logix controllers, providing a common development environment for all control disciplines.

Integrated Motion on EtherNet/IP

The CompactLogix 5370 L3 controller provides a strong motion solution for customers looking for performance and cost competitiveness.

- Supports up to 16 axes of integrated motion
- Together with the Kinetix 350, offers cost-effective, scalable motion solution

Network Capabilities

With dual Ethernet ports and an integrated Ethernet switch, these controllers now support Device Level Ring (DLR) network topologies, simplifying integration of components in your control system and reducing system cost:

- Provides resiliency from loss of one network connection
- Allows replacement of devices one at a time without stopping production
- Reduces the number of Ethernet switches in the control system

Features for Hazardous Environments

The No Stored Energy (NSE) version of the CompactLogix 5370 L3 offers additional features for hazardous environments found in industries such as mining and oil and gas.

- Allows safe transport of controller in and out of mining areas
- Powered down controller has less than 200uJ of residual energy stored in each component
- No consequences of arc or spark to cause an explosion in gaseous environment

LISTEN.
THINK.
SOLVE.™

CompactLogix 5370 L3 Controller Product Specifications

	1769-L30ER	1769-L30ERM	1769-L30ER-NSE	1769-L33ER	1769-L33ERM	1769-L36ERM
User memory	1 MB	1 MB	1 MB	2 MB	2 MB	3 MB
Controller tasks	32 tasks	32 tasks	32 tasks	32 tasks	32 tasks	32 tasks
Programs per task	100 tasks	100 tasks	100 tasks	100 tasks	100 tasks	100 tasks
Integrated Motion	--	4 axis CIP motion position loop axis	--	--	8 axis CIP motion position loop axis	16 axis CIP motion position loop axis
Package Size	55mm wide x 118mm high x 105mm deep					
Certifications	cULH (Class I Division 2), KCC / UL (UL 508), ULH (Class I & II, Division 2 and Class III, Divisions 1 & 2) / ATEX, CE, C-Tick / Marine and GOST certifications in 2012					
Local Expansion Modules	8	8	8	16	16	30
Local Expansion I/O Points	128	128	128	256	256	480
Communication Module Additions	DeviceNet with 1769-SDN or 3rd party					
Flash Memory Card	Industrially rated and certified Secure Digital (SD) memory card (1 and 2 GB options); all controllers shipped with 1 GB card					
Servo Drives (Position Loop CIP)	--	4	--	--	8	16
Ethernet I/O IP nodes	16	16	16	32	32	64
Virtual axes	100	100	100	100	100	100
Feedback only, torque, velocity, Vhz (max CIP motion drives)	--	16	--	--	32	64
Axes/ms	--	2	--	--	2	2
Kinematics support	--	yes	--	--	yes	yes
Software / Firmware	RSLogix 5000 V20 and RSLinx Classic V2.58 Firmware v20.1x or later					

CompactLogix, Integrated Architecture, Kinetix, RSLogix, Integrated Motion on EtherNet/IP are trademarks of Rockwell Automation, inc. Trademarks not belonging to Rockwell Automation are property of their respective companies.

www.rockwellautomation.com

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Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

COMMUNICATIONS

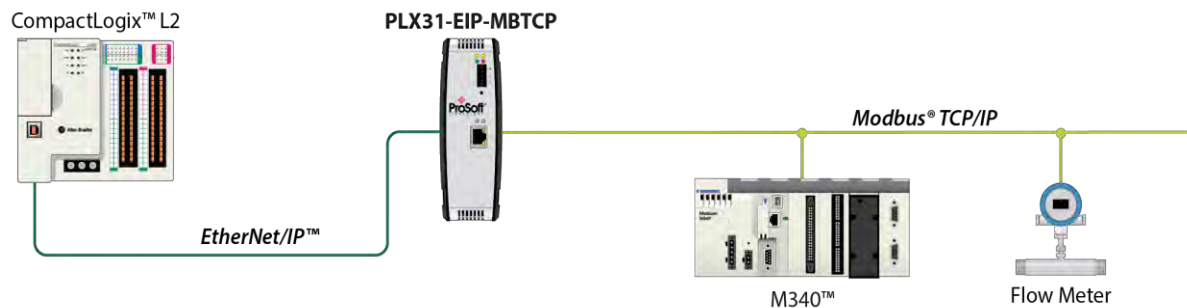


DATASHEET

EtherNet/IP™ to Modbus® TCP/IP Communication Gateway PLX31-EIP-MBTCP

ProSoft Technology's EtherNet/IP™ to Modbus® TCP/IP communication gateway allows high-speed bi-directional data transfers between EtherNet/IP™ enabled controllers or devices and Modbus® TCP/IP controllers or devices. Our Modbus® TCP/IP driver features multiple client and server functionality, for faster data transmission.

In addition, the gateway includes several features, including data prioritization, that allow for simplified integration, reduced commissioning time and optimized performance.



Features

- ◆ Data prioritization: Multiple I/O connections allow you to set RPIs for status and/or control data, optimizing Ethernet bandwidth.
- ◆ Includes an embedded EDS Add-On Profile, allowing for simplified integration and reduced commissioning time.
- ◆ Includes a SD card slot (SD card optional) for storing configuration files. This can be used for disaster recovery.
- ◆ ProSoft Discovery Service: This utility allows your PC to see the gateway and change its default IP address without being on the same subnet.

Specifications

EtherNet/IP™ Specifications

Specification	Description
Number of Class 3 Server Connections	5
Supported PLC Types	PLC2, PLC5, SLC, CLX, CMLX
Supported Message Types	PCCC and CIP
Class 3 Client Connections	Connected - 2 Unconnected - 1
Number of Class 1 I/O Connections	2
I/O connection sizes	248/248
Max RPI time	5 ms per connection
CIP Services Supported	0x4C - CIP Data Table Read 0x4D - CIP Data Table Write
Command List	Support for 100 commands per Client, each configurable for command type, IP address, register to/from addressing and word/bit count.
Command Sets	PLC-2/PLC-3/PLC5 Basic Command Set PLC5 Binary Command Set PLC5 ASCII Command Set SLC500 Command Set

Modbus® TCP/IP Specifications

Specification	Description												
Supported Modbus Function Codes	<table border="0"> <tr> <td>1: Read Coil Status</td> <td>15: Force (Write) Multiple Coils</td> </tr> <tr> <td>2: Read Input Status</td> <td>16: Preset (Write) Multiple Holding Registers</td> </tr> <tr> <td>3: Read Holding Registers</td> <td>22: Mask Write Holding Register (Slave Only)</td> </tr> <tr> <td>4: Read Input Registers</td> <td>23: Read/Write Holding Registers (Slave Only)</td> </tr> <tr> <td>5: Force (Write) Single Coil</td> <td></td> </tr> <tr> <td>6: Preset (Write) Single Holding Register</td> <td></td> </tr> </table>	1: Read Coil Status	15: Force (Write) Multiple Coils	2: Read Input Status	16: Preset (Write) Multiple Holding Registers	3: Read Holding Registers	22: Mask Write Holding Register (Slave Only)	4: Read Input Registers	23: Read/Write Holding Registers (Slave Only)	5: Force (Write) Single Coil		6: Preset (Write) Single Holding Register	
1: Read Coil Status	15: Force (Write) Multiple Coils												
2: Read Input Status	16: Preset (Write) Multiple Holding Registers												
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4: Read Input Registers	23: Read/Write Holding Registers (Slave Only)												
5: Force (Write) Single Coil													
6: Preset (Write) Single Holding Register													
Supported Clients	10												
Supported Servers	MBAP - 5 Encapsulated - 5												
Command List	Up to 160 fully configurable Client commands												
Status Data	Error codes reported individually for each command												
Command List Polling	Each command can be individually enabled or disabled; write-only-on-data-change is available												



Where Automation Connects™

Global Distribution

ProSoft Technology® products are distributed and supported worldwide through a network of over 500 distributors in over 50 countries. Our knowledgeable distributors are familiar with your application needs. For a complete list of distributors, go to our web site at:

www.prosoft-technology.com

Global Support

We are there for you

All ProSoft Technology products are backed with free technical support. Contact our worldwide Technical Support team directly by phone or email.

Global Offices

We are where you are

ProSoft Technology has regional offices worldwide available to help you with all your industrial application needs. If you need help choosing a ProSoft Technology solution for your particular application check out our contact information under distributor sales on the web site at:

www.prosoft-technology.com

Whether your application is large or small, our technical professionals are there to help you choose the right communication solution.

Hardware Specifications

Specification	Description
Power Supply	24 VDC nominal 10 to 36 VDC allowed Positive, Negative, GND Terminals
Current Load	24 VDC nominal @ 300 mA 10 to 36 VDC @ 610 mA maximum
Operating Temperature	-25°C to 70°C (-13°F to 158°F)
Storage Temperature	-40°C to 80°C (-40°F to 176°F)
Shock	IEC 60068-2-27; 15G @ 11ms, 3-Axis (Operational) IEC 60068-2-27; 30G @ 18ms, 3-Axis (Non-Operational)
Vibration	IEC 60068-2-6; 5G @ 10 to 150 Hz
Relative Humidity	5% to 95% RH with no condensation
Dimensions (H x W x D)	5.38 x 1.99 x 4.38 in 13.67 x 5.05 x 11.13 cm
LED Indicators	Configuration (CFG), Error (ERR), Power (PWR), Hardware Fault (FLT), Network Status (NS), EtherNet/IP™ Class I or Class III Connection Status (EtherNet/IP Only) Module Status (MS), Module Configuration Status (EtherNet/IP Only) Ethernet Communication Port Link/Activity, and 100 mbit
Ethernet Port	10/100Mbit half-duplex RJ45 Connector Electrical Isolation 1500 Vrms at 50 to 60 Hz for 60 seconds, applied as specified in section 5.3.2 of IEC 60950: 1991 Ethernet Broadcast Storm Resiliency is less than or equal to 5000 [ARP] frames-per-second and less than or equal to 5 minutes duration
Shipped With Each Unit	2.5 mm screwdriver ProSoft Solutions DVD J180 Power Connector 5' straight-through Ethernet cable

Agency Approvals and Certifications

ATEX Zone 2
 CB Safety
 CE Mark
 UL/cUL Class 1 Div 2



Additional Products

ProSoft Technology® offers a full complement of hardware and software solutions for a wide variety of industrial communication platforms. For a complete list of products, visit our web site at: www.prosoft-technology.com

Ordering Information

To order this product, please use the following:

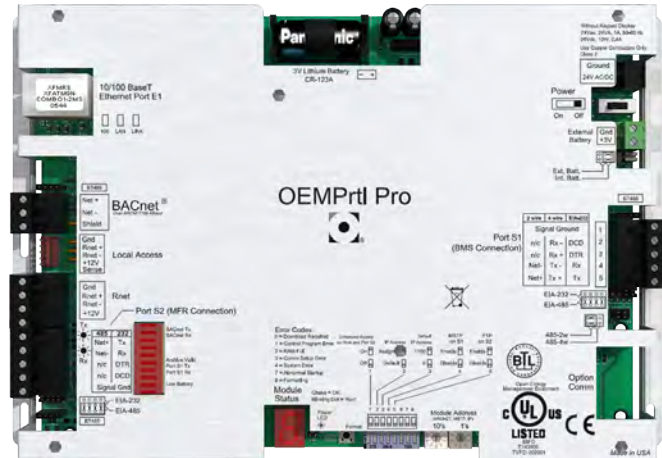
EtherNet/IP™ to Modbus® TCP/IP Communication Gateway

PLX31-EIP-MBTCP

To place an order, please contact your local ProSoft Technology distributor. For a list of ProSoft Technology distributors near you, go to: www.prosoft-technology.com and select *Where to Buy* from the menu.

OEMPrtl Pro - Router | Protocol Translator

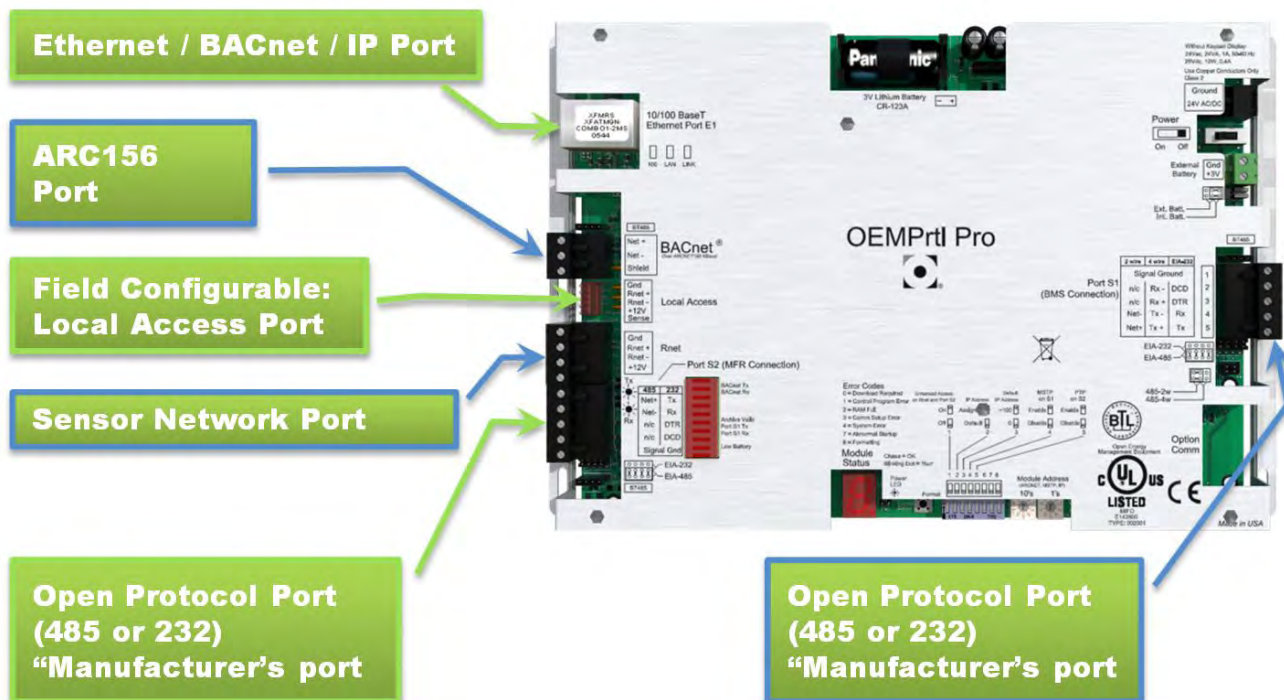
The OEMPrtl Pro sets a new standard for multiple equipment protocol conversion. An extremely powerful, high-speed device router & gateway, the OEMPrtl Pro can connect hundreds of control modules to a BACnet/IP backbone. Support for BACnet/IP, BACnet-over-Ethernet, ARC156, MS/TP, BACnet PTP, Modbus, N2, and LonWorks* communications are standard. A wide range of open and proprietary protocol translator drivers allow the OEMPrtl Pro to also serve as a gateway to other manufacturers' equipment. Fully programmable, the OEMPrtl Pro can also execute complex control strategies for high-level system integration and is easily configured using the industry's leading graphical programming tool, EIKON Logic Builder. It can convert between multiple open protocols like; Modbus to BACnet, or from a proprietary protocol to an open protocol to allow for integration with virtually any Building Management System. The OEMPrtl Pro also offers the ability to plug in an optional backlit LCD display/keypad to allow for viewing any of the points in your system.



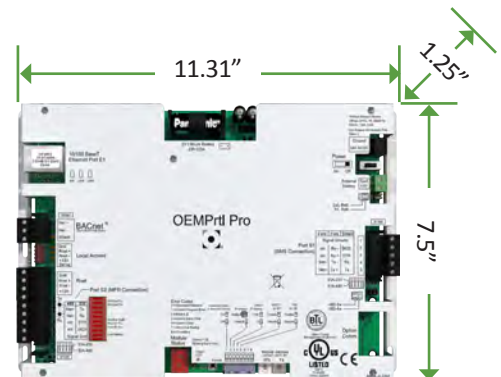
Key Features and Benefits

- Built-in protocol support: BACnet (ARC156, MS/TP, and PTP), Modbus (RTU and ASCII), N2, and LonWorks*.
- Custom programmable using our powerful EIKON graphic programming tool. Eikon allows you to create graphic logic sequences for your application, which can be fully simulated off-line (with Eikon's simulation tool), and graphically viewable live on your equipment - the ultimate diagnostic tool.
- Built-in support for OEMCtrl's custom configurable keypad/display unit - BACview6 (4-line by 40 character per line display) or BACview5 (2-line by 16 character per line display). Up to 2 Keypad/display units can be mounted remotely.
- Local laptop computer access port provided diagnostics and configuration.

Communication Flexibility



Power	24VAC ± 15% (20.4VAC to 27.6VAC), 50 to 60Hz, 10VA power consumption (single Class 2 source only, 20VA or less).
Physical	Rugged Aluminum Housing
Operating Range	-0° to 130°F (-18.5° to 54.4°C); 10 to 90% relative humidity, non-condensing
Communication Ports	<p>BACnet Port : ARC156 communication.</p> <p>Port S1: (BMS Connection) Normally configured for the Building Management System. It is configurable for EIA-485 mode or EIA-232 and supports communications protocols BACnet MS/TP, BACnet PTP, Modbus (RTU or ASCII), N2, or LonWorks (through an SLTA).</p> <p>Port S2: (MFR Connection) Connection to the Manufacturer's equipment. It is jumper configurable for EIA-485 mode or EIA-232. It supports communications protocols BACnet MS/TP, BACnet PTP, Modbus (RTU or ASCII), N2, or LonWorks (through an SLTA).</p> <p>Rnet: Local laptop and/or BACview access port.</p>
BACnet	    <p>Conforms to the BACnet Building Controllers (B-BC) Standard Device as defined in BACnet 135-2001 Annex L. BTL (BACnet Test Labs) listed device</p>
	 <p>LonWorks requires an SLTA</p>
Status Indication	Visual (LED) status of serial communication, running, errors, power, and all digital outputs
Battery	Battery CR123A has a life of 10 years with 720 hours of cumulative power outage
Protection	Built-in surge transient protection circuitry. Module protected by internal solid state Polyswitches on incoming power and network connections. Polyswitches do not need to be replaced as they will reset themselves once the condition that caused them to "trip" returns to normal.
Listed by	FCC, UL, cUL, and CE listed. BTL (BACnet Test Labs)



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CIRCUIT BREAKERS

UL 489

DIN rail miniature circuit breakers



EATON

Powering Business Worldwide

UL 489 DIN rail branch circuit breakers

FAZ-NA circuit breakers

PRODUCT OVERVIEW

Optimum and efficient protection



Optimum product quality, tested reliability and safety stand for best protection of personnel, installations and plant. Eaton's FAZ-NA DIN rail mountable circuit breaker is designed for use in branch service applications.

Powerful offering for machine and system builders

The FAZ-NA is available with B, C and D characteristics in accordance with UL® 489, CSA® C22.2 No.5; UL 1077, CSA C22.2 No.235 and IEC 60947-2. These devices are CE marked.

Typical applications

Feeder and branch circuit protection

- Convenience receptacle circuits (internal/external)
- Motor control circuits
- Load circuits leaving the equipment (external)
- HACR equipment (heating, air conditioning, refrigeration) (internal/external)
- PLC I/O points
- Computers
- Power supplies
- Control instrumentation
- Relays
- UPS
- Power conditioners

Features

- Complete range of UL 489 listed DIN rail mounted miniature circuit breakers up to 40A current rating
- Standard ratings of 10 kAIC up to 277/480 Vac
- Select amperages available at 14 kAIC up to 277/480 Vac and 10 kAIC up to 125 Vdc per pole
- Current limiting design provides fast short-circuit interruption that reduces the let-through energy, which can damage the circuit

- Suitable for branch circuit device protection
- Thermal-magnetic overcurrent protection
 - Three levels of short-circuit protection, categorized by B, C and D curves
- Trip-free design—breaker can not be defeated by holding the handle in the ON position
- Captive screws cannot be lost
- SWD (switching duty)—suitable for switching fluorescent lighting loads ($I_n \leq 20A$)
- Fulfill UL 489, CSA C22.2 No.5 and also IEC 60947-2 Standard
- For use in applications for which UL 1077 or CSA C22.2 No.235 are also allowed
- Field installable shunt trip and auxiliary switch subsequent mounting
- Separate version for ring-tongue connection (Type FAZ-RT), terminal screws can be removed (on both sides)
- Module width of only 17.7 mm (per pole)
- Contact Position Indicator (red/green)
- Easy installation on DIN rail
- Possibility for sealing the toggle in ON or OFF position

FAZ-NA complies with the latest national and international standards

Standards—Feeder and Branch Circuit Protection

UL 489

Standard for molded case circuit breakers (MCCB) for feeder and branch circuit protection.

Products meet the requirements of the National Electrical Code® (NEC®).



CSA C22.2 No.5

Standard for molded case circuit breakers (MCCB) for feeder and branch circuit protection (corresponds closely to UL 489 Standard).

Products meet the requirements of the Canadian Electrical Code (CEC).



RoHS

These devices are RoHS compliant.



VDE

These devices are VDE compliant.



ABS

These devices are ABS compliant.



Tripping curves to choose from

Eaton FAZ-NA branch circuit breakers are available with “B,” “C” and “D” tripping characteristics. B-curve devices are suitable for applications where low levels of inrush current are expected.

C-curve devices are suitable for applications where medium levels of inrush current are expected. Applications include small transformers, lighting, pilot devices, control circuits and coils. C-curve devices provide a medium magnetic trip point.

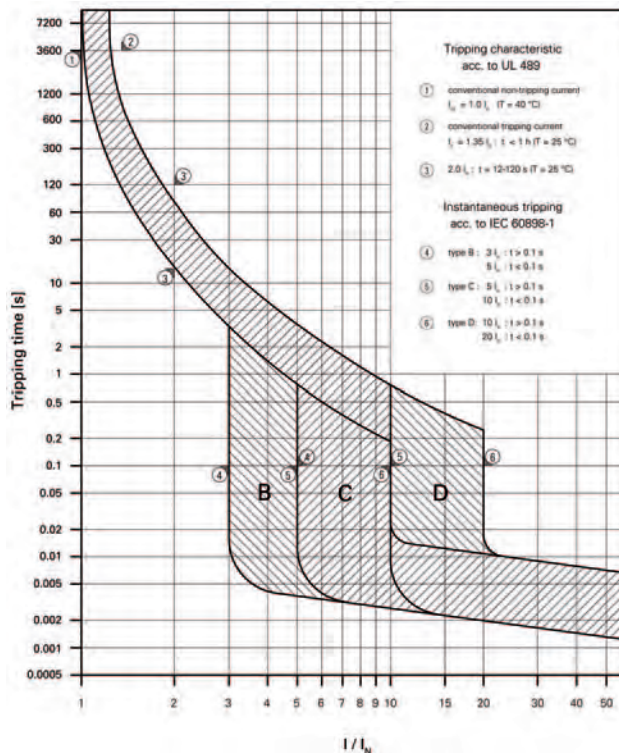
D-curve devices are suitable for applications where high levels of inrush current are expected. The high magnetic trip point prevents nuisance tripping in high inductive applications such as motors, transformers and power supplies.

Eaton FAZ-NA devices are current limiting, which means they interrupt fault currents within one half cycle of the fault. Current limiting devices offer superior protection by reducing peak let-through current and energy.

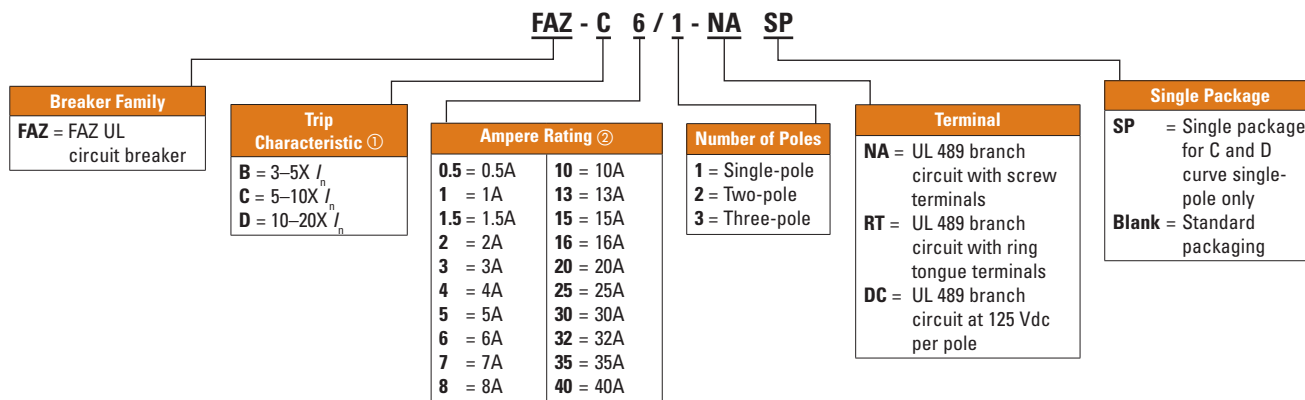
Device printing on front and side

Installation options

These branch circuit breakers are available in two terminal configurations: standard box terminals that accept multiple conductors and ring-tongue terminals, ideally suited to demanding requirements of the semi-conductor industry. All breakers mount on standard 35 mm DIN rail. Bus connectors and feeder terminal facilitate mounting and wiring of multiple miniature circuit breaker arrays in control panel assemblies. These circuit breakers can also be reverse feed.



Catalog Numbering System



① I_n = Rated current for instantaneous trip characteristics.

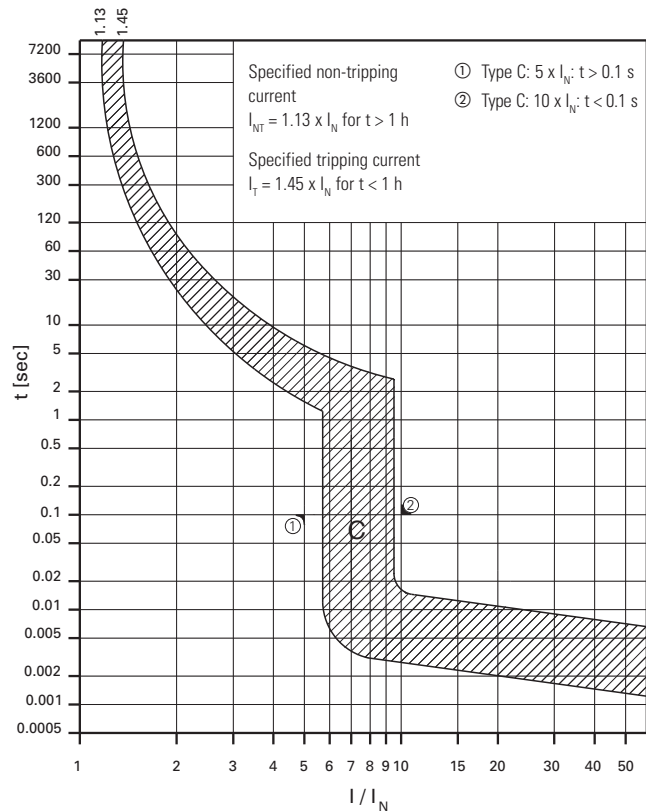
② B curve starts at 1 ampere.

FAZ-NA circuit breakers

PRODUCT SELECTION

FAZ-NA product selection

- UL approved (UL 489) and CSA Certified (CSA C22.2 No.5-02) as branch circuit breakers
- Interrupting capacity: 10 kA UL/CSA; 15 kA IEC 60947-2
- Current limiting device
- UL file number E235139



FAZ-NA UL 489 Circuit Breakers—10 kAIC, 14 kAIC C Curve (15–25A)



	Single-pole ①	Two-pole	Three-pole
Amperes	Catalog Number	Catalog Number	Catalog Number
C Curve (5–10X I_n Current Rating)			
0.5	FAZ-C0.5/1-NA-SP	FAZ-C0.5/2-NA	FAZ-C0.5/3-NA
1	FAZ-C1/1-NA-SP	FAZ-C1/2-NA	FAZ-C1/3-NA
1.5	FAZ-C1.5/1-NA-SP	FAZ-C1.5/2-NA	FAZ-C1.5/3-NA
2	FAZ-C2/1-NA-SP	FAZ-C2/2-NA	FAZ-C2/3-NA
3	FAZ-C3/1-NA-SP	FAZ-C3/2-NA	FAZ-C3/3-NA
4	FAZ-C4/1-NA-SP	FAZ-C4/2-NA	FAZ-C4/3-NA
5	FAZ-C5/1-NA-SP	FAZ-C5/2-NA	FAZ-C5/3-NA
6	FAZ-C6/1-NA-SP	FAZ-C6/2-NA	FAZ-C6/3-NA
7	FAZ-C7/1-NA-SP	FAZ-C7/2-NA	FAZ-C7/3-NA
8	FAZ-C8/1-NA-SP	FAZ-C8/2-NA	FAZ-C8/3-NA
10	FAZ-C10/1-NA-SP	FAZ-C10/2-NA	FAZ-C10/3-NA
13	FAZ-C13/1-NA-SP	FAZ-C13/2-NA	FAZ-C13/3-NA
15	FAZ-C15/1-NA-SP	FAZ-C15/2-NA	FAZ-C15/3-NA
16	FAZ-C16/1-NA-SP	FAZ-C16/2-NA	FAZ-C16/3-NA
20	FAZ-C20/1-NA-SP	FAZ-C20/2-NA	FAZ-C20/3-NA
25	FAZ-C25/1-NA-SP	FAZ-C25/2-NA	FAZ-C25/3-NA
30	FAZ-C30/1-NA-SP	FAZ-C30/2-NA	FAZ-C30/3-NA
32	FAZ-C32/1-NA-SP	FAZ-C32/2-NA	FAZ-C32/3-NA
35 ②	FAZ-C35/1-NA-SP	FAZ-C35/2-NA	FAZ-C35/3-NA
40 ②	FAZ-C40/1-NA-SP	FAZ-C40/2-NA	FAZ-C40/3-NA

① Option for single packaging on single-pole C and D curves only; add suffix SP when ordering.

② 240 Vac rated only.

FAZ-RT UL 489 Circuit Breakers with Ring-Tongue Terminals—10 kAIC, 14 kAIC C Curve (15–25A)



	Single-pole	Two-pole	Three-pole
Amperes	Catalog Number	Catalog Number	Catalog Number
C Curve with Ring-Tongue Terminals (5–10X I_n Current Rating)			
0.5	FAZ-C0.5/1-RT-SP	FAZ-C0.5/2-RT	FAZ-C0.5/3-RT
1	FAZ-C1/1-RT-SP	FAZ-C1/2-RT	FAZ-C1/3-RT
1.5	FAZ-C1.5/1-RT-SP	FAZ-C1.5/2-RT	FAZ-C1.5/3-RT
2	FAZ-C2/1-RT-SP	FAZ-C2/2-RT	FAZ-C2/3-RT
3	FAZ-C3/1-RT-SP	FAZ-C3/2-RT	FAZ-C3/3-RT
4	FAZ-C4/1-RT-SP	FAZ-C4/2-RT	FAZ-C4/3-RT
5	FAZ-C5/1-RT-SP	FAZ-C5/2-RT	FAZ-C5/3-RT
6	FAZ-C6/1-RT-SP	FAZ-C6/2-RT	FAZ-C6/3-RT
7	FAZ-C7/1-RT-SP	FAZ-C7/2-RT	FAZ-C7/3-RT
8	FAZ-C8/1-RT-SP	FAZ-C8/2-RT	FAZ-C8/3-RT
10	FAZ-C10/1-RT-SP	FAZ-C10/2-RT	FAZ-C10/3-RT
13	FAZ-C13/1-RT-SP	FAZ-C13/2-RT	FAZ-C13/3-RT
15	FAZ-C15/1-RT-SP	FAZ-C15/2-RT	FAZ-C15/3-RT
16	FAZ-C16/1-RT-SP	FAZ-C16/2-RT	FAZ-C16/3-RT
20	FAZ-C20/1-RT-SP	FAZ-C20/2-RT	FAZ-C20/3-RT
25	FAZ-C25/1-RT-SP	FAZ-C25/2-RT	FAZ-C25/3-RT
30	FAZ-C30/1-RT-SP	FAZ-C30/2-RT	FAZ-C30/3-RT
32	FAZ-C32/1-RT-SP	FAZ-C32/2-RT	FAZ-C32/3-RT
35 ②	FAZ-C35/1-RT-SP	FAZ-C35/2-RT	FAZ-C35/3-RT
40 ②	FAZ-C40/1-RT-SP	FAZ-C40/2-RT	FAZ-C40/3-RT

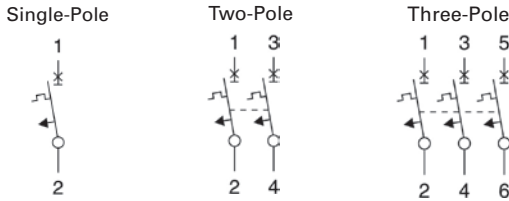
UL 489 DIN rail branch circuit breakers

FAZ-NA circuit breakers

TECHNICAL DATA

Miniature circuit breakers FAZ-NA

Connection Diagrams



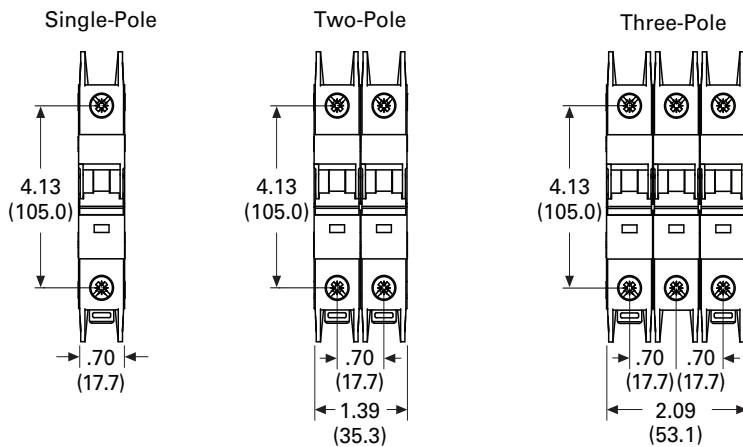
Miniature Circuit Breakers FAZ-NA

Description	
Electrical	
Design according to	UL 489, CSA C22.2 No.5, IEC 60947-2
Rated voltage FAZ-NA UL/CSA	10 kAIC at 277/480V from 0.5A to 32A 14 kAIC at select amperages B and C Curves (15–25A), D Curve (13–20A)
UL/CSA UL/CSA IEC 947-2	10 kAIC at 240 Vac for 35A and 40A 10 kAIC at 48 Vdc per pole 15 kAIC at 240/415 Vac
Rated voltage FAZ-NA-DC UL/CSA	10 kAIC at 125 Vdc per pole (two poles maximum) 10 kAIC at 250 Vdc with two poles connected in series
Rated frequency	50/60 Hz
Characteristic	B, C, D
Endurance	≥ 20,000 Operations
Line voltage connection	Suitable for reverse feed
Mechanical	
Frame size	45 mm
Device height	105 mm
Device width	17.7 mm per pole
Terminal protection	Finger and hand touch safe according to BGV A3, OVE-EN 6
Mounting	Quick fastening with two lock-in positions on IEC/EN 60715
Upper and lower terminals	Open mouth/lift terminals
Terminal capacity	One wire AWG 18–6 Two wires AWG 18–10
Terminal fastening torque	AWG 18-21: 21 lb-in AWG 10-8: 25 lb-in AWG 6: 36 lb-in
Mounting	Independent of position
Calibration temperature	
UL 489, CSA C22.2 No.5	40°C
IEC 60947-2	30°C

Dimensions

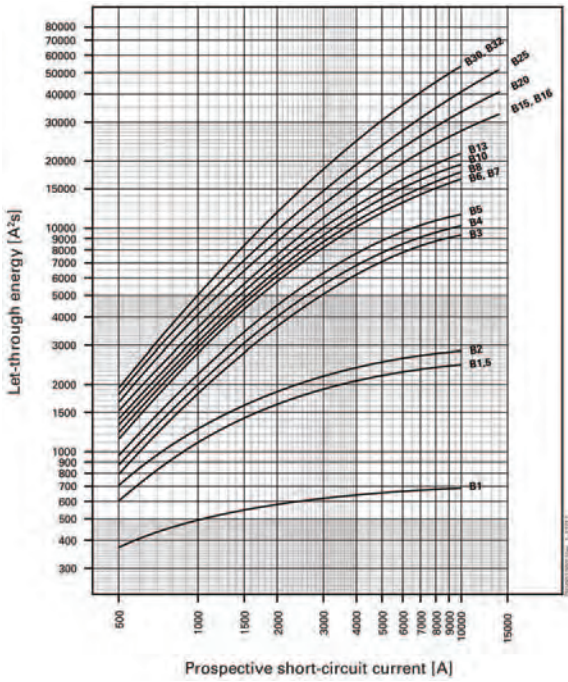
Miniature Circuit Breakers

FAZ-NA

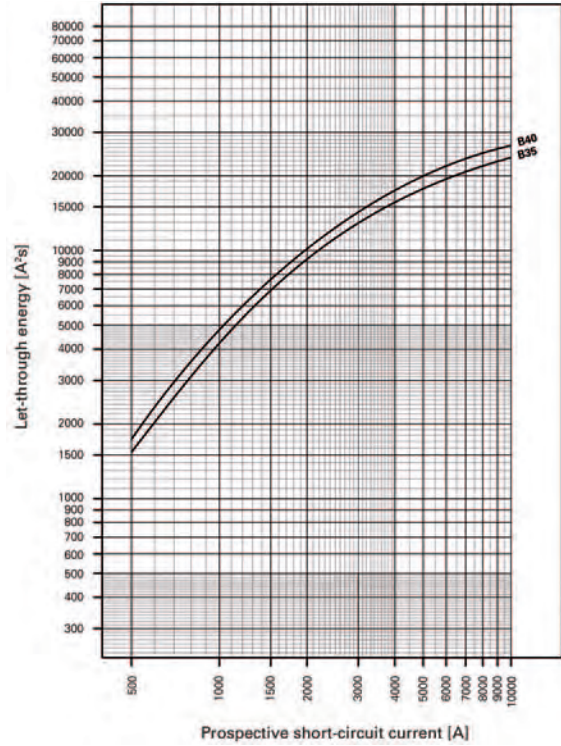


Let-through energy

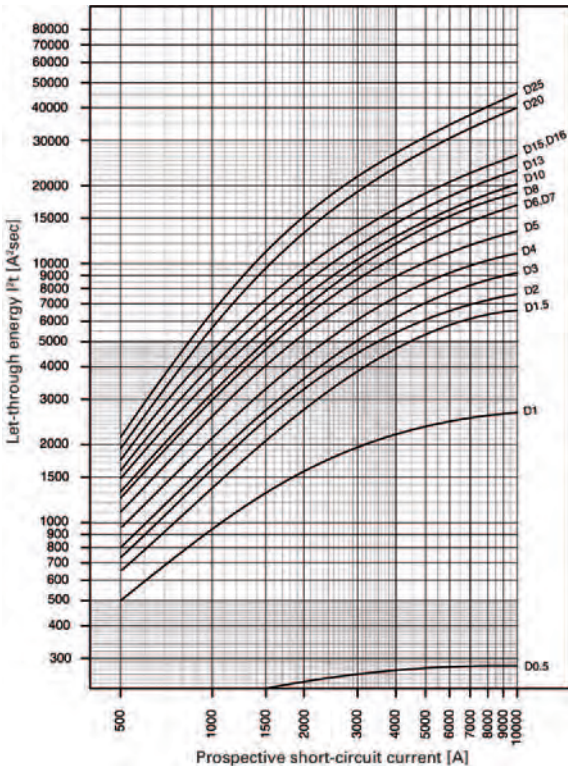
Characteristic B (1–32A), 277V



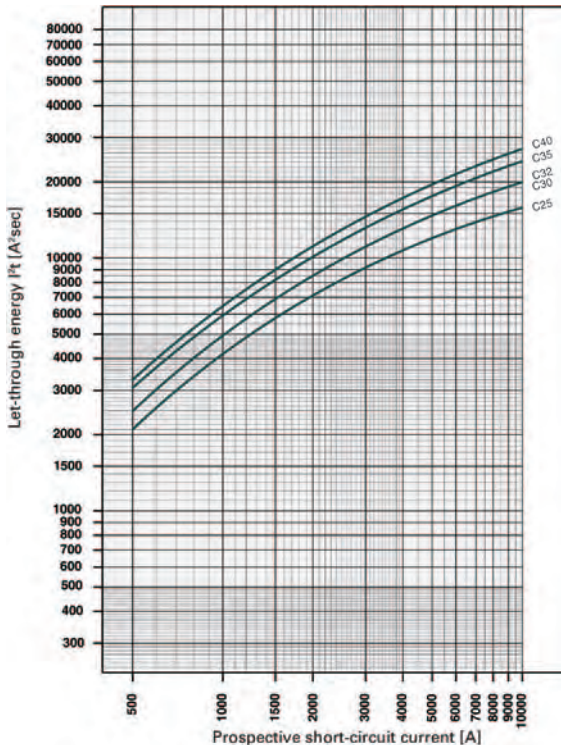
Characteristic B (35–40A), 240V



Characteristic C (0.5–32A), 277V

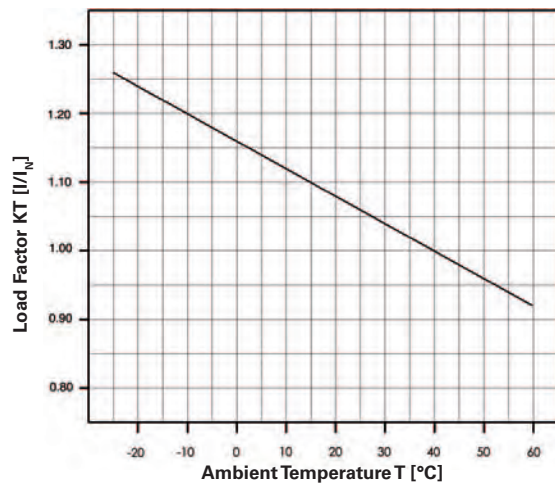


Characteristic C (40A), 240V



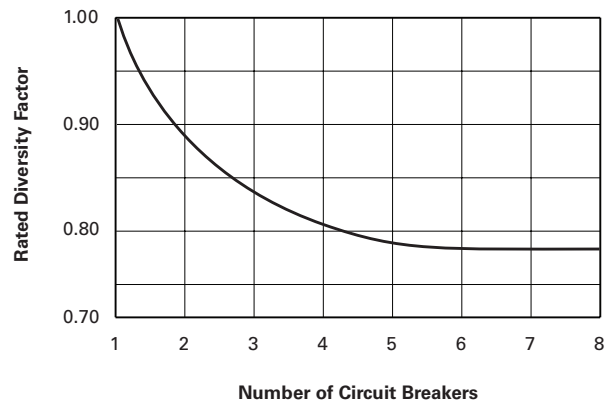
Influence of Ambient Temperature T on Load Carrying Capacity

Device Market Current Rating I_n (A) at 40°C	I_n (A) at Higher Ambient Temperature								
	15°C	20°C	25°C	30°C	40°C	50°C	55°C	60°C	
0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
1.0	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	
1.5	1.7	1.6	1.6	1.6	1.5	1.4	1.4	1.4	
2.0	2.2	2.2	2.1	2.1	2.0	1.9	1.9	1.8	
3.0	3.3	3.2	3.2	3.1	3.0	2.9	2.9	2.8	
4.0	4.4	4.3	4.2	4.2	4.0	3.8	3.8	3.7	
5.0	5.5	5.4	5.3	5.2	5.0	4.8	4.7	4.6	
6.0	6.6	6.5	6.4	6.2	6.0	5.8	5.6	5.5	
7.0	7.7	7.6	7.4	7.3	7.0	6.7	6.6	6.4	
8.0	8.8	8.6	8.5	8.3	8.0	7.7	7.5	7.4	
10.0	11.0	10.8	10.6	10.4	10.0	9.6	9.4	9.2	
13.0	14.3	14.0	13.8	13.5	13.0	12.5	12.5	12.0	
15.0	16.5	16.2	15.9	15.6	15.0	14.4	14.1	13.8	
16.0	17.6	17.3	17.0	16.6	16.0	15.4	15.0	14.7	
20.0	22.0	21.6	21.2	20.8	20.0	19.2	18.8	18.4	
25.0	27.5	27.0	26.5	26.0	25.0	24.0	23.3	23.0	
30.0	33.0	32.4	31.8	31.2	30.0	28.8	28.2	27.6	
32.0	35.2	34.6	33.9	33.3	32.0	30.7	30.1	29.4	
40.0	44.0	43.2	42.4	41.6	40.0	38.4	37.6	36.8	



Maximum Load I_L at ambient temperature T: $I_L(T) = I_N K_T(T)$

Load Carrying Capacity of Adjoining Miniature Circuit Breakers



Power Loss at I_n

I_n [A]	Characteristic B			Characteristic C			Characteristic D		
	Single-pole	Two-pole	Three-pole	Single-pole	Two-pole	Three-pole	Single-pole	Two-pole	Three-pole
	P [W]	P [W]	P [W]	P [W]	P [W]	P [W]	P [W]	P [W]	P [W]
0.5	—	—	—	1.6	3.2	4.7	1.6	3.2	4.8
1	1.1	2.2	3.4	1.1	2.2	3.4	0.8	1.5	2.3
1.5	2.2	4.4	6.6	1.3	2.6	3.9	1.0	2.1	3.1
2	1.4	2.8	4.3	1.4	2.8	4.3	1.0	2.1	3.1
3	2.1	4.2	6.4	1.2	2.4	3.6	1.2	2.4	3.6
4	1.4	2.9	4.3	1.4	2.9	4.3	1.4	2.9	4.3
5	1.8	3.7	5.5	1.9	3.7	5.6	1.5	2.9	4.4
6	1.7	3.5	5.2	1.2	2.3	3.5	1.2	2.3	3.5
7	2.0	4.0	6.0	1.4	2.8	4.3	1.4	2.8	4.3
8	2.0	3.9	5.9	1.4	2.8	4.2	1.2	2.4	3.7
10	1.8	3.6	5.3	1.8	3.6	5.3	1.5	3.0	4.5
13	2.4	4.7	7.1	2.4	4.7	7.1	2.0	4.1	6.1
15	1.9	3.8	5.6	1.9	3.8	5.6	1.5	3.1	4.6
16	2.1	4.3	6.4	2.1	4.3	6.4	1.7	3.5	5.2
20	2.9	5.8	8.7	2.9	5.8	8.7	1.8	3.7	5.5
25	3.1	6.2	9.3	3.1	6.2	9.3	2.6	5.1	7.7
30	3.0	6.0	9.0	3.0	6.0	9.0	2.7	5.4	8.1
32	3.4	6.8	10.2	3.4	6.8	10.2	3.1	6.2	9.3
35	4.0	8.1	12.1	3.7	7.4	11.0	3.8	7.6	11.3
40	4.0	8.1	12.1	4.0	8.1	12.1	3.9	7.8	11.6

TCP

Thermal Circuit Breaker

CLIPLINE

Data Sheet
100212_04_en

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Description

The thermal circuit breaker can be switched back on again, has a compact design and is available in nine finely graded steps for nominal currents from 0.25 A to 10 A. The integrated ON/OFF switching function makes it possible to switch the circuit breaker back on immediately after triggering thus increasing the availability of the system.

The thermal circuit breaker **TCP** can be plugged into UK 6-FSI/C fuse base terminal blocks with screw connection technology and into ST 4-FSI/C terminals with spring-cage connection technology. For both types of terminal blocks, the potential distribution can be conveniently implemented using bridges.



Make sure you always use the latest documentation.
It can be downloaded at www.download.phoenixcontact.com.
A conversion table is available on the Internet at
www.download.phoenixcontact.com/general/7000_en_00.pdf.



This data sheet is valid for all products listed on the following page:

Ordering Data

Thermal Circuit Breaker

Description	Type	Order No.	Pcs./Pck.
Thermal miniature circuit breaker, can be plugged onto UK 6-FSI/C... or ST 4-FSI/C... base terminal block			
Nominal current 0.25 A	TCP 0,25A	0712123	20
Nominal current 0.5 A	TCP 0,5A	0712152	20
Nominal current 1 A	TCP 1A	0712194	20
Nominal current 2 A	TCP 2A	0712217	20
Nominal current 3 A	TCP 3A	0712233	20
Nominal current 4 A	TCP 4A	0712259	20
Nominal current 6 A	TCP 6A	0712275	20
Nominal current 8 A	TCP 8A	0712291	20
Nominal current 10 A	TCP 10A	0712314	20

Accessories

Description	Type	Order No.	Pcs./Pck.
Zack strip, 10-section, white	ZBF 5 (ordering data see CLIPLINE catalog)		

Technical Data

Technical Data in Accordance With IEC/DIN VDE

Nominal voltage	250 V AC / 65 V DC
Nominal current	0.25 A ... 10 A
Ambient temperature	-20°C ... +60°C

Interrupting Capacity I_{CN}

For nominal currents of 0.25 A ... 4 A	6 x I_N
For nominal currents of 6 A ... 10 A	8 x I_N


Interrupting Capacity (UL 1077)

AC 250 V	2000 A
DC 65 V	200 A

Service Life

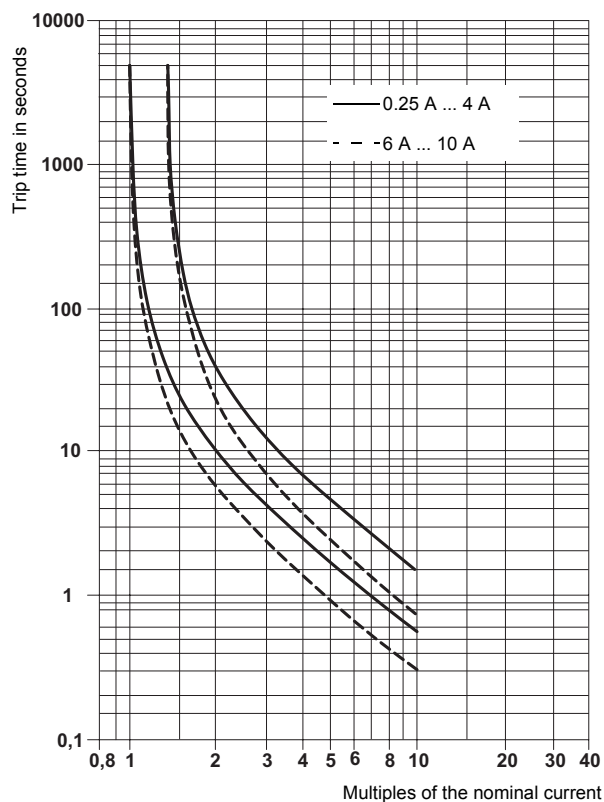
Cycles with 1 x I_N (inductive)	3000
Cycles with 2 x I_N (inductive)	500

General Data

Rated surge voltage	2.5 kV
Contamination class	2
Surge voltage category	III
Insulating material group	I
Insulating material	PA
Inflammability class in accordance with UL 94	V0
Connection data	250 V AC / 65 V DC
Approvals	

Time/Current Characteristic Curve

Total interruption period for nominal current, ambient temperature 23°C



The time/current characteristic curve depends on the ambient temperatures. To avoid a premature or late switch-off, the nominal current of the circuit breaker must be multiplied with a temperature factor.

Ambient Temperature [°C]	-20	-10	0	23	40	50	60
Temperature Factor	0.76	0.84	0.92	1	1.08	0.16	1.24

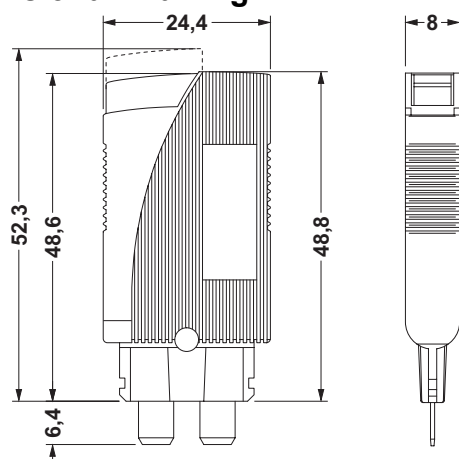


When aligned in a row, the nominal current of the devices can either be transmitted at only 80% or must be oversized accordingly.

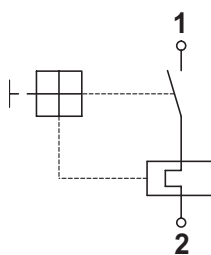
Nominal Currents and Characteristic Internal Resistances

Nominal Current [A]	Internal Resistance [Ω]
0.25	14
0.5	3.4
1	0.9
2	0.25
3	0.11
4	0.07
6	≤ 0.05
8	≤ 0.05
10	≤ 0.05

Dimensional Drawing



Circuit Diagram



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POWER SUPPLY

Slim Line Power Supplies PS5R-S

- Features**
- Lightweight and Compact in size
 - Wide Power Range: 15W – 240W
 - Universal Input:
 - 15W to 90W: 85-264V AC/100-370V DC
 - 120W and 240W: 85-264V AC/100-350V DC
 - Power Factor Correction (EN61000-3-2) for 60W to 240W
 - Meets SEMI F47 Sag Immunity (120W & 240W)
 - NEC Class 2 rated (15W, 30W & 60W)
 - Approved for Class 1, Div. 2 Hazardous Locations
 - Fused input
 - Overcurrent protection, auto-reset
 - Overvoltage protection, shut down
 - Spring-up Screw Terminal type, IP20
 - DIN rail or Panel Surface Mount
 - Approvals:
 - CE Marked, TÜV, c-UL, UL 508, UL 1310 (PS5R-SB, -SC, -SD), UL 1604, EN 50178:1997, LVD: EN60950:2000, EMC: Directive, EN61204-3:2000 (EMI: Class B, EMS: Industrial)



For more information on these and other IDEC power supplies, visit:

www.idec.com/powersupply

Specifications

Part Numbers	5V DC output	PS5R-SB05	–	–	–	–	–	
	12V DC output	PS5R-SB12	PS5R-SC12	–	–	–	–	
	24V DC output	PS5R-SB24	PS5R-SC24	PS5R-SD24	PS5R-SE24	PS5R-SF24	PS5R-SG24	
Output Capacity		15W (5V Model is 10W)	30W	60W	90W	120W	240W	
Input	Input Voltage (single-phase, 2-wire)	85 to 264 VAC, 100 to 370 VDC					85 to 264V AC, 100 to 350V DC	
	Input Current (maximum)	100VAC	0.45A	0.9A	1.7A	2.3A	1.8A	3.5A
		200VAC	0.3A	0.6A	1.0A	1.4A	1.0A	1.7A
	Internal Fuse Rating	2A	3.15A	3.15A	4A	4A	4A	6.3A
	Inrush Current (cold start)	50A maximum (at 200V AC)						
	Leakage Current (at no load)	132V AC: 0.38 mA maximum 264V AC: 0.75 mA maximum		0.75mA maximum			1mA maximum	
Typical Efficiency	5V DC	69%	–	–	–	–	–	
	12V DC	75%	78%	–	–	–	–	
	24V DC	79%	80%	83%	82%	84%	–	
Output Current Ratings	5V DC	2.0A	–	–	–	–	–	
	12V DC	1.2A	2.5A	–	–	–	–	
	24V DC	0.65A	1.3A	2.5A	3.75A	5A	10A	
Voltage Adjustment	±10% (V. ADJ control on front)							
Output Holding Time	20ms minimum (at rated input and output)							
Starting Time	200ms maximum	–	–	–	–	650ms maximum	500ms maximum	
Rise Time	100ms maximum (at rated input and output)					200ms maximum		
Line Regulation	0.4% maximum							
Load Regulation	1.5% maximum						0.8% max	
Temperature Regulation	0.05% degree C maximum							
Ripple Voltage	2% peak to peak maximum (including noise)					1% peak to peak maximum (including noise)		
Overcurrent Protection	105% or more, auto reset				105 to 130%, auto reset		103 to 110%, auto reset	
Overvoltage Protection	120% min. SHUTDOWN							
Operation Indicator	LED (green)							
Voltage Low Indication	LED (amber)	–	–	–	–	–	LED (amber)	

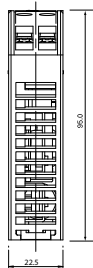
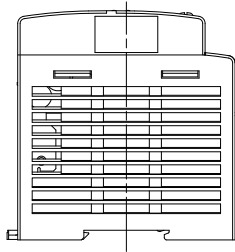
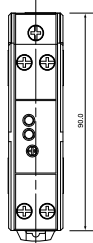
Specifications Con't

	PS5R-SB	PS5R-SC	PS5R-SD	PS5R-SE	PS5R-SF	PS5R-SG	
Parallel Operation	No						
Dielectric Strength	Between Input and Ground: 2000 VAC, 1 minute*						
Insulation Resistance	Between Input & Output Terminals: 100 MΩ Min						
Operating Temperature	-10 to +65°C (14 to 149°F)					-10 to 60°C (14 to 140°F)	
Storage Temperature	-25 to 75°C (-13 to +167°F)						
Operating Humidity	20 to 90% relative humidity (no condensation)						
Vibration Resistance	Frequency 10 to 55Hz, Amplitude 0.375mm						
Shock Resistance	300m/s ² (30G) 3 times each in 6 axes						
Approvals	EMC: EN61204-3 (EMI: Class B, EMS: Industrial), c-UL (CSA 22.2 No. 14), UL 1604, UL 508, LVD: EN60950, EN50178						
	UL1310 Class 2, c-UL (CSA 22.2 No. 213 and 223)			-		SEMI F47	
Harmonic Directive	N/A			EN61000-3-2 A14 class A			
Weight (approx.)	160g	250g	285g	440g	630g	1000g	
Terminal Screw	M3.5 slotted-Phillips head screw (screw terminal type)						
IP protection	IP20 fingersafe						
Dimensions H x W x D (mm)	90 x 22.5 x 95	95 x 36 x 108		115 x 46 x 121	115 x 50 x 129	125 x 80 x 149.5	
Dimensions H x W x D (inches)	3.54 x 0.89 x 3.74	3.74 x 1.42 x 4.25		4.53 x 1.81 x 4.76	4.53 x 1.97 x 5.08	4.92 x 3.15 x 5.89	

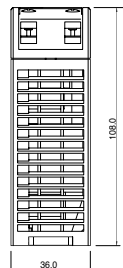
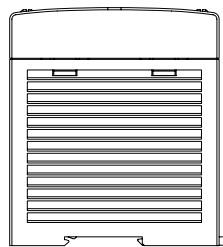
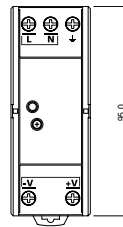
* Between input and output: 3000VAC, 1 minute; Between output and ground: 500VAC, 1 minute

Dimensions

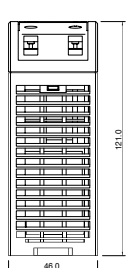
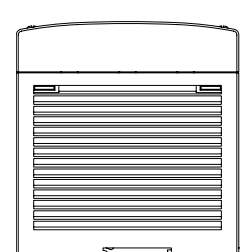
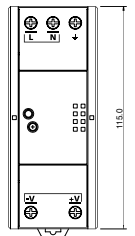
PS5R-SB



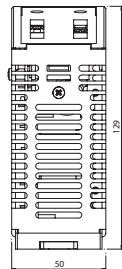
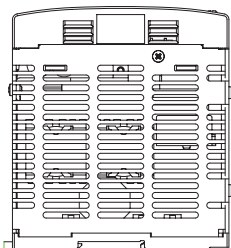
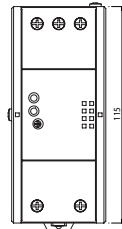
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PS5R-SD



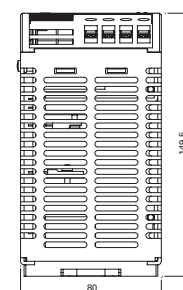
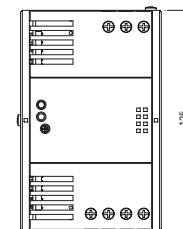
PS5R-SE



PS5R-SF



PS5R-SG



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www.idec.com

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 Catalog No. PS9V-DS100-0 04/07 10K

RELAYS

Miniature Power Relays: MY2



Refer to the standards certifications and compliance section of your OMRON website for the latest information on certified models.

Ordering Information

Classification	Model	Rated voltage (V)	
		Standard products	Made-to-order items
Standard models	MY2	12, 24, 100/110, or 200/220 VAC	110/120 or 220/240 VAC
		12, 24, 48, or 100/110 VDC	
Models with built-in operation indicators	MY2N	12, 24, 100/110, 110/120, 200/220, or 220/240 VAC	
		12, 24, 48, or 100/110 VDC	
Models with built-in diodes	MY2-D	12, 24, or 100/110 VDC	48 VDC
Models with built-in diodes and operation indicators	MY2N-D2	12, 24, 48, or 100/110 VDC	
Models with built-in CR circuits	MY2-CR	100/110 or 200/220 VAC	110/120 or 220/240 VAC
Models with built-in CR circuits and operation indicators	MY2N-CR	100/110 or 200/220 VAC	110/120 or 220/240 VAC

- Note:**
1. Ask your OMRON representative for details on the time required to deliver made-to-order products.
 2. Ask your OMRON representative for details on product specifications and the ability to manufacture products with voltages other than the above coil specifications.
 3. The above models and specifications are new versions in the MY Series.
 4. Except for MY2(N)-CR Relays with the above voltage specifications, all Relays have a height of 53 mm or less. If Mounting Brackets are required, refer to page 33 for selection information.

Ratings and Specifications

Ratings

Operating Coils (Standard Models)

Rated voltage (V)	Item	Rated current (mA)		Coil resistance (Ω)	Coil inductance (H)		Must-operate voltage (V)	Must-release voltage (V)	Maximum voltage (V)	Power consumption (VA, W)
		50 Hz	60 Hz		Armature OFF	Armature ON				
AC	12	106.5	91	46	0.17	0.33	80% max. *1	30% min. *2	110% of rated voltage	Approx. 1.0 to 1.2 (at 60 Hz)
	24	53.8	46	180	0.69	1.3				
	100/110	11.7/12.9	10/11	3,750	14.54	24.6				
	110/120	9.9/10.8	8.4/9.2	4,430	19.2	32.1				
	200/220	6.2/6.8	5.3/5.8	12,950	54.75	94.07				
	220/240	4.8/5.3	4.2/4.6	18,790	83.5	136.4				
DC	12	72.7		165	0.73	1.37	10% min. *2			Approx. 0.9
	24	36.3		662	3.2	5.72				
	48	17.6		2,725	10.6	21.0				
	100/110	8.7/9.6		11,440	45.6	86.2				

- Note:**
1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/–20% for the AC rated current and ±15% for the DC coil resistance.
 2. The AC coil resistance and inductance values are reference values only (at 60 Hz).
 3. Operating characteristics were measured at a coil temperature of 23°C.
 4. The maximum voltage capacity was measured at an ambient temperature of 23°C.
- *1. There is variation between products, but actual values are 80% max. To ensure operation, apply at least 80% of the rated value (at a coil temperature of +23°C).
- *2. There is variation between products, but actual values are 30% minimum for AC and 10% minimum for DC. To ensure release, use a value that is lower than the specified value.

Contact Ratings

Item	Load	Resistive load	Inductive load (cos φ = 0.4, L/R = 7 ms)
Rated load		5 A at 220 VAC 5 A at 24 VDC	2 A at 220 VAC 2 A at 24 VDC
Rated carry current		5 A	
Maximum contact voltage		250 VAC, 125 VDC	
Maximum contact current		5 A	
Contact configuration		DPDT	
Contact structure		Single	
Contact materials		Ag	

Item	Type	Standard models	Model with built-in operation indicator, diode, or CR circuit
Ambient operating temperature*1		–55 to 70°C	–55 to 60°C*2
Ambient operating humidity		5% to 85%	

- *1. With no icing or condensation.
*2. This limitation is due to the diode junction temperature and elements used.

Characteristics

Item	Type	Standard models	Models with built-in operation indicators	Models with built-in CR circuits	Models with built-in diodes	Model with built-in operation indicator and diode	Model with built-in operation indicator and CR circuit
Contact resistance ¹		50 mΩ max.					
Operation time ²		20 ms max.					
Release time ²		20 ms max.					
Maximum operating frequency	Mechanical	18,000 operations/h					
	Rated load	1,800 operations/h					
Insulation resistance ³		100 MΩ min.					
Dielectric strength	Between coil and contacts	2,000 VAC at 50/60 Hz for 1 min.					
	Between contacts of different polarity						
	Between contacts of the same polarity						
Vibration resistance	Destruction	10 to 55 to 10 Hz, 0.5-mm single amplitude (1.0-mm double amplitude)					
	Malfunction	10 to 55 to 10 Hz, 0.5-mm single amplitude (1.0-mm double amplitude)					
Shock resistance	Destruction	1,000 m/s ²					
	Malfunction	200 m/s ²					
Endurance	Mechanical	AC: 50,000,000 operations min. DC: 100,000,000 operations min. (switching frequency: 18,000 operations/h)					
	Electrical ⁴	500,000 operations min. (rated load, switching frequency: 1,800 operations/h)					

Item	Number of poles	2 poles
Failure rate P value (reference value) ⁵		1 mA at 5 VDC
Weight		Approx. 35 g

Note: These are initial values.

*1. Measurement conditions: 1 A at 5 VDC using the voltage drop method.

*2. Measurement conditions: With rated operating power applied.
Ambient temperature condition: 23°C

*3. Measurement conditions: For 500 VDC applied to the same location as for dielectric strength measurement.

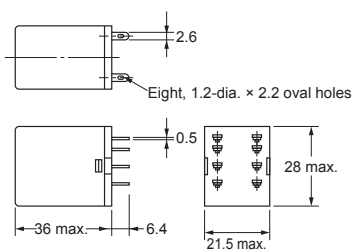
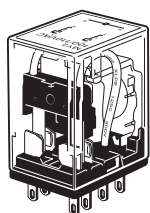
*4. Ambient temperature condition: 23°C

*5. This value was measured at a switching frequency of 120 operations per minute.

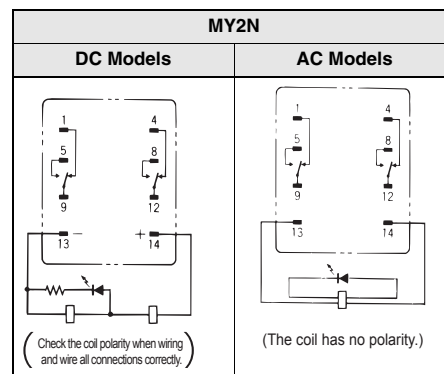
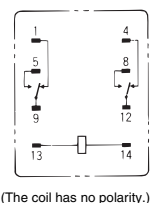
Dimensions

(Unit: mm)

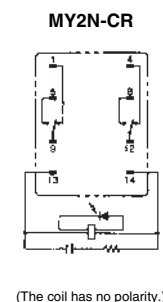
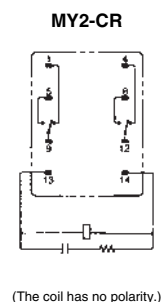
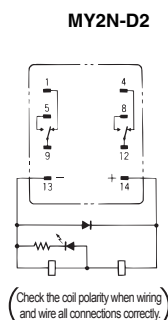
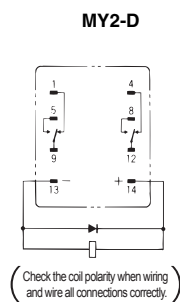
MY2, MY2N, MY2-D, MY2N-D2, MY2-CR, and MY2N-CR



Terminal Arrangement/Internal Connections (Bottom View) Standard Models



Note: 1. An AC model has coil disconnection self-diagnosis.
2. For the DC models, check the coil polarity when wiring and wire all connections correctly.
3. The indicator is red for AC and green for DC.
4. The operation indicator indicates the energization of the coil and does not represent contact operation.



SIGNAL ISOLATORS

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 Fax: +49 5231 14-292083
 www.weidmueller.com



The configurable MAS/MAZ DC/DC select and MAS DC/DC select HI: DC signal isolating converters with external power supply in 6.1 mm width, for transmitting and isolating standardised analogue DC current and voltage signals. The input and output parameters can be configured as required using DIP switches. The isolating transformers are designed with 0.5 kV or 2.5 kV (DC/DC select HI) of complete electrical isolation. The 24 V DC voltage supply can be bridged module by module using the ZQV 4N plug-in cross-connectors. The MI 8 A-I/O S-SUBD15B interface module makes it easy to carry out byte-wise system wiring with pre-assembled cables on the inputs or outputs. They can be used in many applications around the world because of their international approvals (cULus, C1D2 and ATEX Zone2).

General ordering data

Type	MAZ DC/DC select
Order No.	8594840000
Version	MICROSERIES, Signal converter/insulator
GTIN (EAN)	4032248252473
Qty.	1 pc(s).

**MICROSERIES
MAZ DC/DC select**

Weidmüller Interface GmbH & Co. KG
 Klingenbergstraße 16
 D-32758 Detmold
 Germany
 Fon: +49 5231 14-0
 Fax: +49 5231 14-292083
 www.weidmueller.com

Technical data**Dimensions and weights**

Length	92 mm	Width	6.1 mm
Depth	97.8 mm	Net weight	49 g

Temperatures

Operating temperature	0 °C...55 °C	Storage temperature	-20 °C...85 °C
-----------------------	--------------	---------------------	----------------

Probability of failure

MTTF	440 Years
------	-----------

Input

Number of inputs	1	Input voltage	0...10 V
Input resistance, voltage	100 kΩ	Input current	0...20 mA, 4...20 mA
Input resistance, current	≤ 5 Ω	Voltage drop	< 0.1 V @ I _N = 20 mA (current input)

Output

Number of outputs	1	Output voltage, note	0...10 V
Output current	0...20 mA, 4...20 mA	Cut-off frequency (-3 dB)	> 100 Hz
load impedance voltage	≥ 10 kΩ	load impedance current	≤ 500 Ω

General data

Accuracy	< 0.5 % of end value	Current-carrying capacity of cross-connect.	≤ 20 A
Galvanic isolation	3-way isolator	Input/Output	configurable
Mounting rail	TS 35	Power consumption	ca. 0.6 W
Supply voltage	24 V DC ± 15 %	Temperature coefficient	≤ 150 ppm/K of of final value
Type of connection	Tension clamp connection		

Insulation coordination

EMC standards	DIN EN 61326	Galvanic isolation	3-way isolator
Insulation voltage	500 V _{eff} / 1 s	Insulation voltage input or output/rail	500 V _{eff} / 1 s
Insulation voltage input or output/supply	500 V _{eff} / 1 s	Pollution severity	2
Rated voltage	50 V	Standards	DIN EN 61010, DIN EN 60079, DIN EN 61326-1
Surge voltage category	II		

Connection data

Type of connection	Tension clamp connection	Clamping range, rated connection	1.5 mm ²
Clamping range, rated connection, min.	0.5 mm ²	Clamping range, rated connection, max.	2.5 mm ²

Classifications

ETIM 3.0	EC001774	ETIM 4.0	EC002653
ETIM 5.0	EC002653	ETIM 6.0	EC002653
UNSPSC	31-12-10-07	eClass 5.1	27-21-01-20
eClass 6.2	27-21-01-20	eClass 7.1	27-21-01-20
eClass 8.1	27-21-01-20	eClass 9.0	27-21-01-20

Creation date May 14, 2015 9:09:00 PM CEST

Data sheet

**MICROSERIES
MAZ DC/DC select**

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 Klingenbergstraße 16
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 www.weidmueller.com

Technical data

Product information

Descriptive text accessories Cross-connectors for power supplies and markers – refer to Accessories

Approvals

Approvals



ROHS Conform

Downloads

Package insert [instruction sheet.pdf](#)
 Declaration of Conformity [Declaration of Conformity.pdf](#)
 EPLAN [8594840000.ema](#)

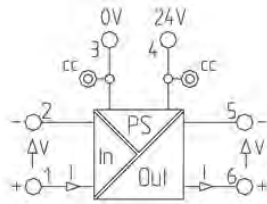
Data sheet

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Drawings

Electric symbol



PRESSURE TRANSMITTERS

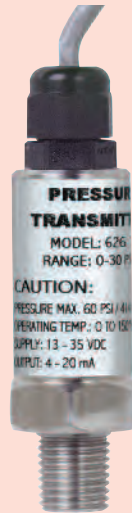


Series
626 & 628

Industrial Pressure Transmitter

Complete Offering of Ranges, Connections and Outputs

312/324



General Purpose Housing (-GH)



General Purpose Housing (-GH) with DIN C



626 with LED Display (CH housing only)



Conduit Housing (-CH)



Scan here
to watch
product video

*Please see our website for dimensional drawings.

The Series 626 Pressure Transmitters possess a highly precise 0.25% full scale accuracy piezo-resistive sensor contained in a compact, rugged, NEMA 4X (IP66) stainless steel general purpose housing or cast aluminum conduit housing.

The Series 628 Pressure Transmitters are ideal for OEMs with 1% full scale accuracy sensors. The transmitter is also available in the general purpose stainless steel housing and the cast aluminum conduit housing.

The corrosion resistant 316L stainless steel wetted parts allow the Series 626 and 628 transmitters to measure the pressure in a multitude of processes from hydraulic oils to chemicals. The Series 626 and 628 are available in absolute and pressure ranges with a variety of optional outputs, process connections and electrical terminations to allow you to select the right transmitter for your application.

APPLICATIONS

- Compressors
- Pumping systems
- Irrigation equipment
- Hydraulic
- Industrial process monitoring

FEATURES

- Metal conduit housing option
- Robust 316 SS oil filled sensor
- Compact design

SPECIFICATIONS

Service: Compatible gases and liquids.

Wetted Materials: Type 316L SS.

Accuracy:

626 : 0.25% F.S.;

: 0.20% RSS;

628 : 1.0% F.S.;

: 0.5% RSS;

626 Absolute Ranges: 0.5% F.S.;

: 0.30% RSS.

(Includes linearity, hysteresis, and repeatability.)

Temperature Limit: 0 to 200°F (-18 to 93°C).

Compensated Temperature Range: 0 to 175°F (-18 to 79°C).

Thermal Effect: ±0.02% FS/°F (includes zero and span).

Pressure Limits: See table.

Power Requirements: 10-30 VDC (for 4-20 mA, 0-5, 1-5, 1-6 VDC outputs); 13-30 VDC (for 0-10, 2-10 VDC outputs); 5 VDC ±0.5 VDC (for 0.5-4.5 VDC ratio-metric output).

Output Signal: 4-20 mA, 0-5 VDC, 1-5 VDC, 0-10 VDC, or 0.5-4.5 VDC.

Response Time: 300 ms.

Loop Resistance: 0-1000 Ohms max. R max = 50 (Vps-10) Ohms (4-20 mA output), 5K Ohms (0-5, 1-5, 1-6, 0-10, 2-10, 0.5-4.5 VDC output).

Stability: 1.0% FS/year (Typ.).

Current Consumption: 38 mA maximum (for 4-20 mA output); 10 mA maximum (for 0-5, 1-5, 1-6, 0-10, 2-10, 0.5-4.5 VDC output); 140 mA maximum (for all 626/628/629-CH with optional LED).

Electrical Connections: Conduit Housing (-CH): terminal block, 1/2" female NPT conduit; General Purpose Housing (-GH): cable DIN EN 175801-803-C.

Process Connection: 1/4" male or female NPT and BSPT.

Enclosure Rating: NEMA 4X (IP66).

Mounting Orientation: Mount in any position.

Weight: 10 oz (283 g).

Agency Approvals: CE.

Pressure Limits

Range Number	Pressure Range	Maximum Pressure (psig)	Over Pressure (psig)	Range Number	Pressure Range (psig)	Maximum Pressure (psig)	Over Pressure (psig)
00	0-15 psia	30	45	12	0-200	400	1000
30	15-0 psia	30	45	13	0-300	600	1500
06	0-5 psig	10	50	14	0-500	1000	2500
07	0-15 psig	30	150	15	0-1000	2000	5000
08	0-30 psig	60	300	16	0-1500	3000	5000
09	0-50 psig	100	300	18	0-3000	6000	7500
10	0-100 psig	200	500	19	0-5000	7500	10000
11	0-150	300	750	26	0-8000	10000	12000

Ordering Chart

Accuracy	626						0.25% Full-Scale Accuracy 1.0% Full-Scale Accuracy
Range		-00 -01 -02 -03 -04 -05 -06 -07 -08 -09 -10 -11 -12 -13 -14 -22 -15 -16 -18 -19 -26 -67 -71 -75 -81					0-15 psia 0-30 psia 0-50 psia 0-100 psia 0-200 psia 0-300 psia 0-5 psi 0-15 psi 0-30 psi 0-50 psi 0-100 psi 0-150 psi 0-200 psi 0-300 psi 0-500 psi 0-600 psi 0-1000 psi 0-1500 psi 0-3000 psi 0-5000 psi 0-8000 psi 0-0.5 bar 0-2.5 bar 0-10 bar 0-40 bar
Housing		-CH -GH					Conduit Housing General Purpose Housing
Process Connection			-P1 -P2 -P3 -P5 -P9				1/4" male NPT 1/4" female NPT 1/4" male BSPT 1/4" female SAE with Refrigerant Valve Depressor ① 1/2" male NPT ①
Electrical Connection			-E1 -E3 -E4 -E5 -E6 -E8				Cable Gland with 3' of Prewired Cable Cable Gland with 9' of Prewired Cable DIN EN 175801-803-C ① 1/2" female NPT Conduit ② M-12 4 Pin Connector Packard Connector
Signal Output				-S1 -S2 -S4 -S5 -S7			4-20 mA 1-5 VDC 0-5 VDC 0-10 VDC 0.5-4.5 VDC ③
Options					-AT -NIST -LED		Aluminum Tag NIST Traceable Certificate Bright Red LED display ②③

- ① Available with -GH Housing only
- ② Available with -CH Housing only
- ③ LED option is not NEMA 4X (IP66)
- ④ Power Requirement: 5 VDC ±10%

ACCESSORIES

- A-164, 16.4' (5 m) cable with M-12 4-pin female connector
- A-960, 3' packard cable
- A-961, 9' packard cable
- A-962, 20' packard cable

DIFFERENTIAL PRESSURE TRANSMITTERS

Rosemount 2051C Coplanar Pressure Transmitter



2051C Coplanar Pressure Transmitter

Configuration	Transmitter output code
4-20 mA HART 2051 2051 with Selectable HART ⁽¹⁾	A
Lower Power 2051 2051 with Selectable HART ⁽¹⁾	M
FOUNDATION fieldbus	F
PROFIBUS	W
Wireless	X

(1) The 4-20mA with Selectable HART device can be ordered with Transmitter Output option code A plus any of the following options codes: M4, QT, DZ, CR, CS, CT, HR5, HR7.

Additional information

- Specifications: [page 43](#)
- Certifications: [page 53](#)
- Dimensional Drawings: [page 61](#)

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See [page 51](#) for more information on Material Selection..

Table 1. Rosemount 2051C Coplanar Pressure Transmitters Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	Transmitter type		
2051C	Coplanar Pressure Transmitter		
Measurement type			
D	Differential		★
G	Gage		★
Pressure range			
	2051CD	2051CG	
1	-25 to 25 inH ₂ O (-62.2 to 62.2 mbar)	-25 to 25 inH ₂ O (-62.2 to 62.2 mbar)	★
2	-250 to 250 inH ₂ O (-623 to 623 mbar)	-250 to 250 inH ₂ O (-623 to 623 mbar)	★
3	-1000 to 1000 inH ₂ O (-2.5 to 2.5 bar)	-393 to 1000 inH ₂ O (-0.98 to 2.5 bar)	★
4	-300 to 300 psi (-20.7 to 20.7 bar)	-14.2 to 300 psi (-0.98 to 20.7 bar)	★
5	-2000 to 2000 psi (-137.9 to 137.9 bar)	-14.2 to 2000 psi (-0.98 to 137.9 bar)	★

Table 1. Rosemount 2051C Coplanar Pressure Transmitters Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Transmitter output				
A ⁽¹⁾	4–20 mA with Digital Signal Based on HART Protocol			★
F	FOUNDATION fieldbus Protocol			★
W	PROFIBUS PA Protocol			★
X	Wireless			★
M	Low-Power, 1–5 Vdc with Digital Signal Based on HART Protocol			
Materials of construction				
	Process flange type	Flange material	Drain/vent	
2	Coplanar	SST	SST	★
3 ⁽²⁾	Coplanar	Cast C-276	Alloy C-276	★
5	Coplanar	Plated CS	SST	★
7 ⁽²⁾	Coplanar	SST	Alloy C-276	★
8 ⁽²⁾	Coplanar	Plated CS	Alloy C-276	★
0	Alternate Process Connection			★
Isolating diaphragm				
2 ⁽²⁾	316L SST			★
3 ⁽²⁾	Alloy C-276			★
5 ⁽³⁾⁽⁴⁾	Tantalum			
O-ring				
A	Glass-filled PTFE			★
B	Graphite-filled PTFE			★
Sensor fill fluid				
1	Silicone			★
2 ⁽⁴⁾	Inert			★
Housing material			Conduit entry size	
A	Aluminum		½–14 NPT	★
B	Aluminum		M20 × 1.5	★
J	SST		½–14 NPT	★
K ⁽⁵⁾	SST		M20 × 1.5	★
P ⁽⁶⁾	Engineered Polymer		No Conduit Entries	★
D	Aluminum		G½	
M ⁽⁵⁾	SST		G½	

Table 1. Rosemount 2051C Coplanar Pressure Transmitters Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Integral mount primary element⁽¹¹⁾⁽¹²⁾		
S4 ⁽¹³⁾	Assemble to Rosemount 405A, 485, or 585 Annubar [®] primary element or 1195 Integral Orifice primary element	★
S3	Assemble to Rosemount 405C or 405P Compact Orifice Plate	★
Seal assemblies⁽¹²⁾		
S1 ⁽¹⁴⁾	Assemble to one Rosemount 1199 diaphragm seal	★
S2 ⁽¹⁵⁾	Assemble to two Rosemount 1199 diaphragm seals	★
Mounting brackets		
B1	Traditional Flange Bracket for 2-in. Pipe Mounting, CS Bolts	★
B2	Traditional Flange Bracket for Panel Mounting, CS Bolts	★
B3	Traditional Flange Flat Bracket for 2-in. Pipe Mounting, CS Bolts	★
B4	Coplanar Flange Bracket for 2-in. Pipe or Panel Mounting, all SST	★
B7	B1 Bracket with Series 300 SST Bolts	★
B8	B2 Bracket with Series 300 SST Bolts	★
B9	B3 Bracket with Series 300 SST Bolts	★
BA	SST B1 Bracket with Series 300 SST Bolts	★
BC	SST B3 Bracket with Series 300 SST Bolts	★
Product certifications		
E1 ⁽⁵⁾	ATEX Flameproof	★
E2 ⁽⁵⁾	INMETRO Flameproof	★
E3 ⁽⁵⁾	China Flameproof	★
E4 ⁽⁵⁾	TIIS Flameproof	★
E5	FM Explosion-proof, Dust Ignition-proof	★
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
E7 ⁽⁵⁾	IECEx Flameproof	★
EW	India (CCOE) Flameproof Approval	★
I1 ⁽⁵⁾	ATEX Intrinsic Safety	★
I2 ⁽⁵⁾	INMETRO Intrinsically Safe	★
I3 ⁽⁵⁾	China Intrinsic Safety	★
I4 ⁽⁵⁾⁽⁶⁾	TIIS Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
I6	CSA Intrinsically Safe	★
I7 ⁽⁵⁾	IECEx Intrinsic Safety	★
IA ⁽¹⁶⁾	ATEX FISCO Intrinsic Safety	★
IE ⁽¹⁶⁾	FM FISCO Intrinsically Safe	★
IF ⁽¹⁶⁾	CSA FISCO Intrinsically Safe	★

TEMPERATURE TRANSMITTERS

Rosemount 248 Temperature Transmitter

- *Basic temperature transmitter offers a reliable solution for temperature monitoring points*
- *Standard transmitter design provides flexible and reliable performance in process environments*
- *Experience lower over-all installation costs when compared to wiring sensor directly, reducing the need for expensive extension wires and multiplexers*
- *Explore the benefits of a Complete Point Solution from Rosemount Temperature*



Contents

Rosemount 248 Temperature Transmitter.....	page 2
Ordering Information	page 3
Transmitter Specifications	page 6
Product Certifications	page 9
Dimensional Drawings.....	page 12

Rosemount 248

Transmitter Specifications

FUNCTIONAL SPECIFICATIONS

Inputs

User-selectable; sensor terminals rates to 42.4 Vdc. See "Transmitter Accuracy and Ambient Temperature Effects" on page 8 for sensor options.

Output

2-wire 4–20 mA, linear with temperature or input; digital output signal superimposed on 4–20 mA signal, available for a Field Communicator or control system interface.

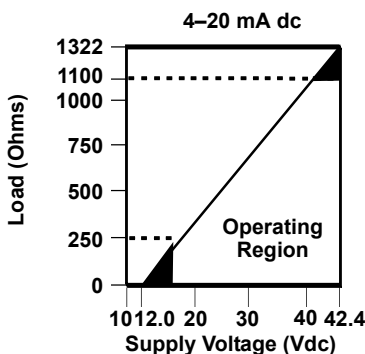
Isolation

Input/output isolation tested to 500 Vac rms (707 Vdc) at 50/60 Hz.

Power Supply

An external power supply is required for HART devices. The transmitter operates on 12.0 to 42.4 Vdc transmitter terminal voltage with load resistance between 250 and 1100 ohms. A minimum of 17.75 Vdc power supply is required with a load of 250 ohms. Transmitter power terminals are rated to 42.4 Vdc.

Maximum Load = 40.8 x (Supply Voltage – 12.0)



Humidity Limits

0–99% relative humidity, non-condensing

NAMUR Recommendations

The 248 meets the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility (EMC) for Process and Laboratory Apparatus
- NE 43 – Standard of the signal level breakdown information of digital transmitters
- NE 89 – Standard of temperature transmitters with digital signal processing

Transient Protection

The optional Rosemount 470 Transient Protector prevents damage from transients induced by lightning, welding, heavy electrical equipment, or switch gears. Refer to the 470 Product Data Sheet (document number 00813-0100-4191) for more information.

Temperature Limits

Operating Limit

- –40 to 85 °C (–40 to 185 °F)

Storage Limit

- –50 to 120 °C (–58 to 248 °F)

Turn-on Time

Performance within specifications in less than 5.0 seconds after power is applied to transmitter, when damping value is set to zero seconds.

Update Rate

Less than 0.5 seconds

Damping

32 seconds maximum. 5 seconds default

Custom Alarm and Saturation Levels

Custom factory configuration of alarm and saturation levels is available with option code C1 for valid values. These values can also be configured in the field using a Field Communicator.

Recommended Minimum Measuring Span

10 K

Software Detected Failure Mode

The values at which the transmitter drives its output in failure mode depends on whether it is configured to standard, custom, or NAMUR-compliant (NAMUR recommendation NE 43) operation. The values for standard and NAMUR-compliant operation are as follows:

Figure 1. Operation Parameters

	Standard ⁽¹⁾	NAMUR NE43-Compliant ⁽¹⁾
Linear Output:	3.9 ≤ I ≤ 20.5	3.8 ≤ I ≤ 20.5
Fail High:	21 ≤ I ≤ 23 (default)	21 ≤ I ≤ 23 (default)
Fail Low:	I ≤ 3.75	I ≤ 3.6

⁽¹⁾ Measured in milliamperes

Certain hardware failures, such as microprocessor failures, will always drive the output to greater than 23 mA.

Product Data Sheet

00813-0100-4825, Rev JA

November 2010

Rosemount 248

PHYSICAL SPECIFICATIONS

Field Communicator Connections

Communication Terminal: Clips permanently fixed to the terminals

Materials of Construction

Electronics Housing

- Noryl® glass reinforced

Universal (option code U and H) and Rosemount Connection (option code A and G) Heads

- Housing: Low-copper aluminum (option codes U and A)
Stainless Steel (option codes G and H)

- Paint: Polyurethane
- Cover O-Ring: Buna-N

BUZ Head (option code B)

- Housing: Aluminum
- Paint: Aluminum lacquer
- O-Ring Seal: Rubber

Mounting

The 248R attaches directly to a wall or a DIN rail. The 248H installs in a connection head or universal head mounted directly on a sensor assembly or apart from a sensor assembly using a universal head. The 248H can also mount to a DIN rail using an optional mounting clip (see Table 14).

Weight

Code	Options	Weight
248H	Headmount Transmitter	42 g (1.5 oz)
248R	Railmount Transmitter	250 g (8.8 oz)
U	Universal Head	520 g (18.4 oz)
B	BUZ Head	240 g (8.5 oz)
C	Polypropylene Head	90 g (3.2 oz.)
A	Rosemount Connection Head	524 g (18.5 oz)
S	Polished Stainless Steel (SST) Head	537 g (18.9 oz)
G	Rosemount Connection Head (SST)	1700 g (60 oz)
H	Universal Head (SST)	1700 g (60 oz)

Enclosure Ratings

The Universal (option code U) and Rosemount Connection (option code A) Heads are NEMA 4X, IP66, and IP68. The Universal Head with 1/2 NPT threads is CSA Enclosure Type 4X. The BUZ head (option code B) is NEMA 4 and IP65.

PERFORMANCE SPECIFICATIONS

EMC (ElectroMagnetic Compatibility)

NAMUR NE21 Standard

The 248 meets the requirements for NAMUR NE21 Rating

Susceptibility	Parameter	Influence
ESD	<ul style="list-style-type: none"> • 6 kV contact discharge • 8 kV air discharge 	None
Radiated	• 80 – 1000 MHz at 10 V/m AM	None
Burst	• 1 kV for I.O.	None
Surge	<ul style="list-style-type: none"> • 0.5 kV line–line • 1 kV line–ground (I.O. tool) 	None
Conducted	• 150 kHz to 80 MHz at 10 V	None

CE Mark

The 248 meets all requirements listed under IEC 61326: Amendment 1, 2006.

Power Supply Effect

Less than ±0.005% of span per volt

Vibration Effect

The 248 is tested to the following specifications with no effect on performance:

Frequency	Vibration
10 to 60 Hz	0.21 mm displacement
60 to 2000 Hz	3 g peak acceleration

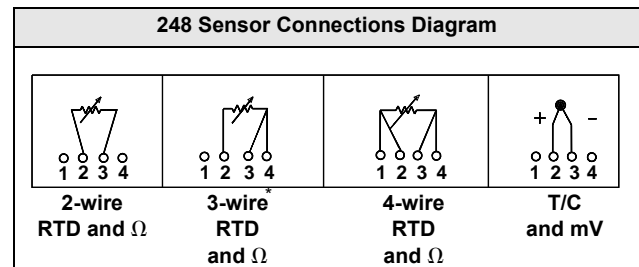
Stability

For RTD and thermocouple inputs the transmitter will have a stability of ±0.1% of reading or 0.1 °C (whichever is greater) for twelve months

Self Calibration

The analog-to-digital measurement circuitry automatically self-calibrates for each temperature update by comparing the dynamic measurement to extremely stable and accurate internal reference elements.

Sensor Connections



* Rosemount Inc. provides 4-wire sensors for all single element RTDs. You can use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.

FLOW METERS



SF-1210 DUAL TURBINE INSERTION FLOW METER ANALOG OUTPUT

Made in the USA

DESCRIPTION

Systecon insertion turbine flow meters are suitable for measuring electrically conductive water-based liquids. The SF-1210 model provides non-isolated 4-20 mA and 0-10 V analog output signals that are linear with the flow rate.

APPLICATIONS

- Chilled water, hot water, condenser
- Water, and water/glycol/brine for HVAC
- Process water and water mixtures
- Domestic water

GENERAL SPECIFICATIONS

ACCURACY

- ±0.5% OF READING at calibrated velocity
- ±1% OF READING from 3 to 30 ft/s (10:1 range)
- ±2% OF READING from 0.4 to 20 ft/s (50:1 range)

SENSING METHOD

Electronic impedance sensing
(non-magnetic and non-photoelectric)

PIPE SIZE RANGE

2 ½ " through 72" nominal

SUPPLY VOLTAGE

24±4 V AC/DC at 40 mA

LIQUID TEMPERATURE RANGE

Standard: 180° F continuous, 200° F peak

High Temp: 280° F continuous, 300° F peak
Meters operating above 250° F require
316 stainless steel construction option.

AMBIENT TEMPERATURE RANGE

-5 to 160° F (-20 to 70° C)

OPERATING PRESSURE

400 PSI maximum

PRESSURE DROP

Less than 1 PSI at 20 ft/s in 2 ½ " pipe,
Decreasing in larger pipes and lower velocities.

OUTPUT SIGNALS PROVIDED:

ANALOG OUTPUTS (NON – ISOLATED)

Voltage output: 0-10 V (0-5 V available)
Current output: 4-20 mA

FREQUENCY OUTPUT

0-15 V peak pulse, typically less than 300 Hz

MATERIAL

Wetted metal components
Standard: Electroless nickel plated brass
Optional: 316 stainless steel

ELECTRONICS ENCLOSURE

Standard: Weathertight aluminum enclosure
Optional: Submersible enclosure

ELECTRICAL CONNECTIONS

3-wire minimum for 4-20 mA or 0-10 V output
Second analog output and/or frequency
Output requires additional wires
Standard: 10' of cable with ½ " NPT conduit
connection
Optional: Indoor DIN connector with 10' of
Plenum rated cable

CALIBRATION

Every Systecon flow meter is wet-calibrated in our flow laboratory against primary volumetric standards directly traceable to NIST. Certification of calibration is included with every meter.

FEATURES

Excellent Long-term Reliability – Patented electronic sensing is resistant to scale and particulate matter. Low mass turbines with engineered jewel bearing systems provide a mechanical system that virtually does not wear.

Industry Leading Two-year "No-fault" Warranty

Reduces start-up costs with extended coverage to include accidental installation damage (miswiring, etc.). Certain exclusions apply; see our complete warranty statement for details.

Installation Flexibility – Patented dual turbine models deliver outstanding accuracy in short pipe runs.

Simplified Hot Tap Insertion Design –

Standard on every insertion flow meter. Allows for insertion and removal by hand without system shutdown.

Recommended Installation

Meter should be installed in a minimum of 15 pipe diameters of straight run of pipe. The meter should be located with 10 pipe diameters preceding the meter, and 5 pipe diameters after the meter. If 15 pipe diameters of straight run are not available, the meter should be placed in the longest straight run, with 2/3 of the length preceding the meter, and 1/3 after the meter.

OPERATING RANGE FOR COMMON PIPE SIZES

0.17 TO 20 ft/s
± 2% accuracy begins at 0.4 ft/s

Pipe Size (Inches)	Flow Rate (GPM)
2½	2.5 - 230
3	4 - 460
4	8 - 800
6	15 - 1800
8	26 - 3100
10	42 - 4900
12	60 - 7050
14	72 - 8600
16	98 - 11,400
18	120 - 14,600
20	150 - 18,100
24	230 - 26,500
30	360 - 41,900
36	510 - 60,900

F-1210 Wiring Information

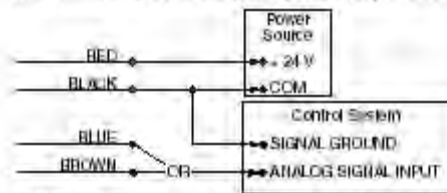
WIRE COLOR CODE	NOTES
RED	(+) 24 V AC/DC supply voltage, 50 mA
BLACK	(-) Common ground (Common with pipe ground)
GREEN	(+) Frequency output signal: 0-15 V peak pulse
BLUE	(+) Analog signal: 4-20 mA (non-isolated)
BROWN	(+) Analog signal: 0-10 V (non-isolated)
DIAGNOSTIC SIGNALS	
ORANGE	Bottom turbine frequency
WHITE	Top turbine frequency

Connect to power supply positive
Connect to power supply negative & analog input ground
Required when meter is connected to local display or BTU meter
Both signals may be used independently

These signals are for diagnostic purposes - connect to local display or BTU Meter

F-1210 Wiring Diagram

Flow Meter into Control System (No Display or BTU Meter)

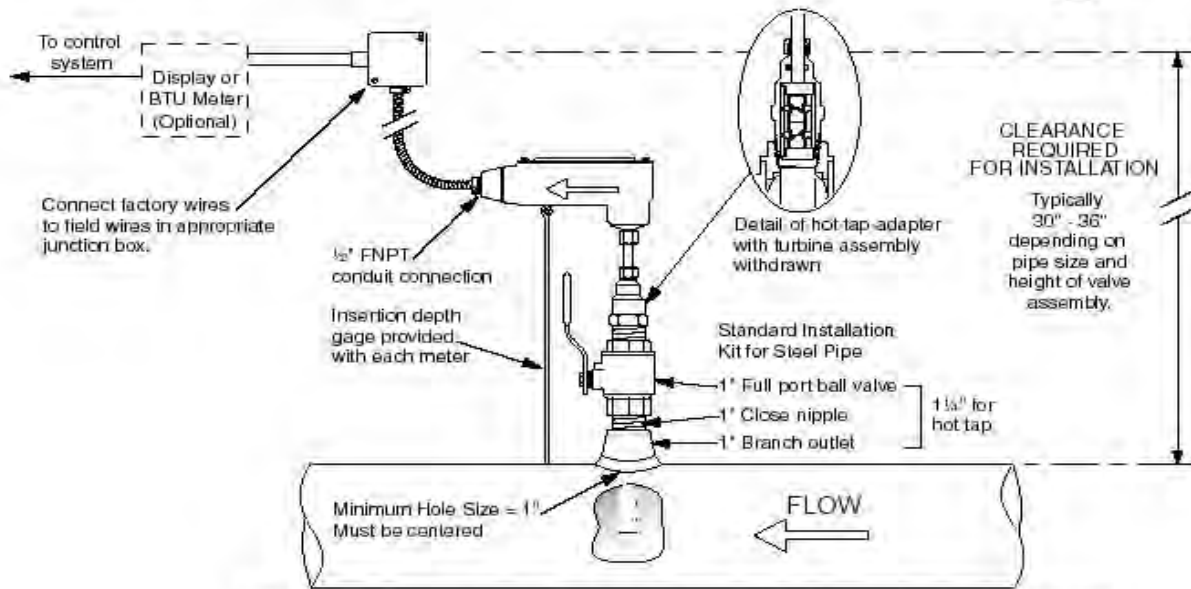


NOTE: 1. Black wire is common with the pipe ground (typically earth ground).

Typical Meter Installation

(New construction or scheduled shutdown)

- Acceptable to install in vertical pipe
- Position meter anywhere in upper 180° for horizontal pipe



Note: Installation kits vary based on pipe material and application. For installations in pressurized (live) systems, use "Hot tap" 1 ½ inch installation kit and drill hole using a 1 inch wet tap drill.