



# Submittal

Prepared For: **MESSER**

Date: May 01, 2023

Job Name:  
Eli Lilly

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

## Product Summary

### Qty Product

1 Trane System Completion Module (Pump Package)

**Kyle Kurtz**  
Trane U.S. Inc.  
7446 Webster Street  
Dayton, OH 45414

*The attached information describes the equipment we propose to furnish for this project, and is submitted for your approval.*

*Product performance and submittal data is valid for a period of 6 months from the date of submittal generation. If six months or more has elapsed between submittal generation and equipment release, the product performance and submittal data will need to be verified. It is the customer's responsibility to obtain such verification.*

**SHOP DRAWING REVIEW**

ACTION			
<input checked="" type="checkbox"/>	No Exceptions Taken		Amend & Resubmit
<input type="checkbox"/>	Make Corrections Noted (No Resubmission Required)		Rejection - Resubmit

Engineer's Review is for general conformance with the design concept and contract documents. Markings or comments shall not be constructed as relieving the Contractor from compliance with the project plans and specifications, nor departures therefrom. The Contractor remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly, and for performing his work in a safe manner.

MUSSETT, NICHOLAS & ASSOCIATES, Inc.  
Engineers + Architects

By Andrew Wegeng Date 05-16-2023

**Tag Data - Trane Pump Package (Qty: 1)**

Item	Tag(s)	Qty	Description	Model Number
A1	EI-8660	1	System Completion Module	SCMA C000 0E00 0200 0100 000E W

**Item: A1 Qty: 1 Tag(s): EI-8660**

System Completion Module

Indoor Rated

Single Point Power Connection

Circuit Breaker Disconnect Switch

High Short Circuit Current Rating

Structural Steel Skid with Diamond plate deck

Field provided Controls: Devices landed to terminal blocks

Wrapped for shipment

Integral Pump Package With:

850 Gallon ASME Vertical Chilled Water Buffer Tank

Pump Isolator Pads

Pump Discharge Check Valves: Keckley Flanged Globe Style 6-CG2R-CS-36336

Pump Suction Strainer (1/8" perf)

Pump Suction Flex Connectors

Pump Discharge Vaneflex Connectors

3 – ABB ACH580 20 HP VFD NEMA 1 Frame: ABB ACH580-01-027A-4

Drives to be configured for High Resistance Ground with correct Jumpers configuration

Emergency Stop Button

36W 24VDC Power Supply: AB 1606-XLB36EH

Safety Relay: AB 440RS13R2

Disables Pump VFDs

Contact wired to Terminal block for field monitoring

ASME Expansion Tank: Wessels NLAP-560

Pressure Relief Valve (ASME 80 PSI)

Discharge Piped to GMU Tank

Rosemount Magnetic Flow Meter with Isolation and Manual Bypass Line

Rosemount 8705 Series with 8732 Transmitter display

8705TSA060C1M0B3Q4 - Flow meter sensor

8732EMT2A1M4Q4 - Transmitter

6", &amp; 4" Pipe, Valves, and Fittings

Pump Pressure Gauges

Rigid Electrical Conduit with Liquid tight ends

Chemical Feeder: Wessels SS-CPBF-5F

With Bag Filter (25 micron): Wessels 9PG1P25 (x2)

Spare filter to ship loose

Pressure Gauges

Circuit Balance Valve

2" Carbon Steel Flanged Ball Valves

Wessels Glycol Feed Tank: Wessels GMPT-33050

Pump Suction and Discharge Butterfly Isolation Valves

Pump Pressure Gauges

1 – Temperature Sensor: Rosemount

214CRTSMA1S3E0060SLXAXW (RTD Temperature Sensor)

114CE0040TAA2SF020AXW (Thermowell)

3144PD1A1NAXA (Transmitter)

2 – Pressure Sensors: Rosemount 3051TG2A2B21AK5M5Q4

Pump Suction

Pump Discharge

1 – Pressure Switch ACSO PA21B/RD20A21

Expansion Tank Line

Flanged System Connections

**Customer Provided (Trane sales office) Components to TCS: Provided by Local Trane Office – installed by Trane Creative Solutions**

3 - Pumps: B&amp;G e-1532 3EB, 4x3x11, 364 GPM @ 110 ft head, 30% PG, 1750 rpm, 20HP, ODP Premium, John Crane T21 Seal

3 - Suction Diffusers: B&amp;G GE-3X

- 1 - Air Separator: B&G RL-6F
- 1 - High Capacity Auto Air Vent: B&G #107A

**1 year parts warranty included on pumping package.**

**Parts warranty on chiller by others**

**Labor warranty by others**

#### **Pump Package Notes:**

1. The mechanically cooled chilled water piping shall be insulated in the field by others.
2. At the design point of 728 GPMs and 110 feet of head; there shall be 98.0 feet of head available for the system off of the chiller.
3. The pump is to be supplied to Trane Creative Solutions by others.
4. Pumping package will hold 1037 gallons of 30% PG.
5. Control of the pump package shall be by others. Pump VFDs and other components shall be wired to terminal blocks within the VFD panel. See field wiring diagram to connections.
6. The expansion tank was selected to match customer spec.
7. Will meet following wire color code:
  - Single Conductor Wiring
    - I. Black – 120VAC Hot
    - II. White – 120VAC Neutral
    - III. Green – Ground
    - IV. Green w/Yellow Tracer – Signal Ground
    - V. Red – 120VAC Control
    - VI. Blue– 24VDC Positive
    - VII. White w/Blue Stripe – 24VDC Common/Negative
    - VIII. Light Blue – Intrinsic Safe Wiring
  - Twisted-Pair Cable
    - I. Red – Positive (+)
    - II. Black – Common/Negative (COM or -)
8. Flanged system connections
9. Drawings in submittal are representative only and not all brackets and supports are shown.
10. Due to the potential differences in CAD model dimensions, and actual unit dimensions, these drawings are intended to be representative only to give a close approximation of dimensional representation. Therefore as-built dimensions may change during production. If any field prefabrication is required before unit arrival, dimension coordination with Trane, or certified drawings may be requested. Drawings would be available a week or two prior to unit shipment. Trane will not be responsible for field rework.

#### **Revision 2 Notes (4/11/2023 MAG):**

1. Submittal and drawings indicate 10 pipe diameters before and after flow meter, but the spec sheet for the flow meter indicates 5 pipe diameters upstream and 2 downstream of the flow meter. Followed meter spec for pipe lengths up and down.
2. Updated check valves to flanged globe style based on comment needing to be flanged versus wafer, and carbon steel.
3. Updated Flow meter, and Temperature sensor to Rosemount brand.
4. Pump VFDs to be mounted external to enclosure and have a NEMA 1 Rating.
5. Skid is Indoor rated only.
6. There was a comment about hand switch position on the field wiring. HOA switches do not exist as the drive display shall be accessible and can be placed in hand at the display. The drives do not have a relay capable of indicating when in hand mode.
7. Updated component datasheets
8. Added Wiring diagrams

#### **Revision 3 Notes (5/1/2023 MAG)**

1. Updated Expansion tank to a NLAP-560 based on previous submittal comments.
2. Pumps are closed coupled so do not have a coupling between the pump and motor.
3. Drives do come standard with a Form C relay board. Parameter 10.24, Relay 1 source will be programmed for 24 [Remote Control], Relay 2 is used for drive running status, and Relay 3 is used for drive alarm/Fault status.
4. Corrected the Flanged Check valve verbiage in mechanical specification section.
5. Updated P&ID labels based on submittal comments.
6. Updated wiring diagrams to include relay 1 remote source.
7. Corrected Expansion tank data sheet.



**Performance Data – System Completion Module**

<b>Tags</b>	<b>EI-8660</b>
<b>GENERAL INFO</b>	
Skid Location	Indoor
<b>Electrical Information</b>	
Single Point Power MCA (A)	92.42
Single Point Power MOP (A)	110.00
Short Circuit Current Rating (A)	65000.00
<b>Pressure Drop Information</b>	
Pump Package PD (ft H2O) (1)	12.0
Avail head pressure at water connection (ft H2O) (1)	98.0
<b>DIMENSIONS &amp; WEIGHTS</b>	
Shipping weight (lb.)	12702.0
Operating weight (lb.)	22584.0
Length (in)	243.000
Width (in)	101.000
Height (in)	122.000
<b>Primary Chiller Pump Information</b>	
Pump Tags	P-8660E,F,G
Pump Model Number (B&G)	e-1532 3EB
Number of Pumps	3
Pump Horsepower (HP)	20
Pump Flow Rate (GPM)	364.00
Pump Head (ft H2O)	110.00
Pump FLA (Amps)	27.0
Chiller Piping Size (inches)	6
Fluid type	Propylene Glycol
Fluid concentration (%)	30
Friction Loss per 100 Foot of Pipe (Feet) (1)	4.37
Velocity of Water (Feet Per Second) (1)	8.09

(1) Data with two pumps running at 728 GPM

**Mechanical Specifications – System Completion Module****Item: A1 Qty: 1 Tag(s): EI-8660****System Completion Module**

The System Completion Module (SCM) shall be furnished and factory built by the Chiller Manufacturer. The SCM shall be factory equipped with a triple pump piping package. Details of selected options are denoted on the piping schematic in the following pages. **All cold chilled water piping and equipment shall be insulated in the field by others** The system inlet and outlet shall be flanged connections per the piping schematic page. The suction diffuser strainer will protect the pump.

2" and larger piping shall be butt welded and flanged schedule 40 carbon steel piping.

1" and smaller piping shall be threaded schedule 80, or copper piping (brazed/threaded).

Unit shall be ETL listed and labeled, classified in accordance with UL 1995/ANSI Z83.8, certified to CAN/CSA standard C22.2 No. 236 and CSA standard C22.2 No. 2.6. Unit shall be manufactured with UL listed components and wired in accordance with the NEC.

**Structural Steel Base**

There shall be a bolted/welded structural steel base that is made of 6" x 8.2# ASTM A-36 channel iron which is laid on edge. The new base shall also have lifting lugs. This is laid out in the following sheets on unit rigging. The skid shall be covered with non-slip deck plate (diamond plate). The structural steel base shall be cleaned, primed with a grey 2 part epoxy, and then finished coated with a 2 part grey urethane to match the color of the chiller.

**Power Connections**

Power connections to the system completion module shall include main three-phase power to a single point circuit breaker disconnect.

**Primary Pumps**

The control of the pumps is by others. See field wiring diagram for termination information.

**B&G Series 1532 Horizontal Close Coupled Pumps**

Furnish and install pumps with capacities as shown on plans. Pumps shall be close coupled, single stage, end suction design, capable of being serviced without disturbing piping connections. Pump volute shall be Class 30 cast iron. The impeller shall be cast bronze enclosed type, balanced, keyed to the shaft and secured by a locking cap screw. The liquid cavity shall be sealed off at the motor shaft by an internally flushed mechanical seal with ceramic seal seat and carbon seal ring, suitable for continuous operation at 225°F. A replaceable shaft sleeve of bronze alloy shall completely cover the wetted area under the seat. Pumps shall be rated for 175 psi maximum working pressure. Volute shall have gauge tapings at the suction and discharge nozzles and vent and drain tapings at the top and bottom. Motor shaft shall meet NEMA specifications and shall be of the size, voltage and enclosure called for on the plans. It shall have heavy duty grease lubricated ball bearings, completely adequate for the maximum load for which the motor is designed. The pumps selected shall conform to ANSI/HI 9.6.3.1 standards for Preferred Operating Region (POR) unless otherwise approved by the engineer. The pump NPSH shall conform to the ANSI/HI 9.6.1-1997 standards for Centrifugal and Vertical Pumps for NPSH Margin. Each pump shall be factory tested per Hydraulic Institute standards. It shall then be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment. The pump shall be manufactured, assembled and tested in an ISO approved facility.

**Suction Diffuser**

The unit shall be factory equipped with an angle pattern flow straightening fitting equipped with a combination diffuser-strainer-orifice cylinder, flow straightening vanes, and start-up strainer. The combination diffuser-strainer-orifice cylinder shall be designed to withstand pressure differential equal to the system pump shutoff head and shall have a free area equal to five times the cross section area of the pump suction opening. The length of the flow straightening vanes shall be no less than 2-1/2 times the diameter of the system pump suction connection. The flow-straightening fitting shall be of cast iron and rated for a Maximum Working Pressure of 175 PSIG. The full-length carbon steel flow straightening vanes shall provide non-turbulent flow to the suction side of the system pump. The start-up strainer shall be of 16-mesh bronze and will need to be permanently removed after the fill and flush period of start-up is complete. All internal components shall be replaceable.

**Globe Style Silent Check Valve**

Furnish and install check valves on the pump discharge. Check valves shall be of the Globe style, center-guided, silent, nonslam type. Check valves to have carbon steel body, stainless steel disc and seat, and stainless steel spring\*. Valves shall be ANSI B16.1 class 125/250. The valve is to have a cracking pressure of equal to or less than

1/2 psi, and fully open at less than 1/2 pound per square inch pressure. Operation of the valve shall not be affected by position of installation. Valve shall be capable of fully closing prior to reversal of flow, and shall eliminate water hammer. When specified, a Buna-N seal shall be furnished to provide bubble tight shutoff. All component parts shall be field replaceable.

### **B&G Rolairtrol Air Separator**

Furnish and install as shown on plans, a centrifugal type air separator. The unit shall have Flanged inlet and outlet connections tangential to the vessel shell. Vessel shell diameter is to be three times the nominal inlet/outlet pipe diameter. The unit shall have an internal stainless steel air collector tube with 5/32" diameter perforations and 63% open area designed to direct accumulated air to the compression tank via an NPT connection at top of unit. Manufacturer to furnish data sheet specifying air collection efficiency and pressure drop at rated flow. The air separator(s) must be designed, constructed, and stamped for 125 psig @ 350°F in accordance with Section VIII, Division I of the ASME Boiler and Pressure Vessel Code, and registered with the National Board of Boiler and Pressure Vessel Inspectors. The air separator(s) shall be painted with one shop coat of light gray air dry enamel. A Manufacturers Data Report for Pressure Vessels, Form U-1 as required by the provisions of the ASME Boiler and Pressure Vessel Code shall be furnished for each air separator upon request.

### **ASME Expansion Tank:**

Furnish and install a precharged vertical ASME Stamped steel expansion tank with a replaceable heavy duty butyl bladder. The tank shall have a NPT system connection, and a .302"-32 charging valve connection (standard tire valve) to facilitate on-site charging of the tank to meet system requirements. The tank must be designed for a maximum working pressure of 125 psi and a maximum temperature of 240°F

### **ASME Vertical Chilled Water Buffer Tank**

The unit shall be factory equipped with a 850-gallon carbon steel storage tank. The tank will be capable of holding pressures up to the maximum head pressure of the chilled water pump and certified at 125 psig. The tank inlet shall be located on the side of the tank towards the bottom, and the outlet shall be located in the other side of the tank towards the top to promote mixing. The tank shall come with a manual vent and drain valves. The tank shall be ASME stamped and manufactured by Taco.

### **Glycol Makeup Unit**

Furnish and install, as indicated on the plans and specifications, a prefabricated, automatic and autonomous twin make-up package to a paired glycol system or to a system where fail-safe redundancy is required. The package shall consist of two paired, 110V, 60 Hz powered, autonomous pumping assemblies, a sturdy steel frame, and a graduated polyethylene solution container with removable lid designed to work together to maintain a specific fill pressure in the glycol system(s). The makeup package must feature HOA controls for each magnetic starter, a protective low water cut-off alarm, two alternating 1/3 HP motors with brass rotary vane pumps and a fail-safe alternator that allows one pump to operate if the other pump malfunctions, a pressure tank with pressure controls, pressure reducing valves, pressure gauges, and a system isolation valve. A 110V signal shall be available for a remote alarm. Each glycol make-up package shall be model GMPT-33050 as manufactured by Wessels Company.

### **Wessels Chemical Feeder:**

Typical Specification Furnish and install, as indicated on the plans and specifications, a 5 gallon chemical pot feeder bag filter bypass tank. The vessel shall incorporate a chemical fill basin with a minimum dimension of 6" to help facilitate complete introduction of required solutions. The vessel shall be constructed for 150 psi working pressure and 300°F. Vessels are designed to accommodate common industrial filter bag sizes #1 and #2. The SS-CPBF shall be equipped with a 25 µ filter bag. Each tank shall be model SS-CPBF-5F as manufactured by Wessels Company.

### **Rosemount Magnetic Flow Meter and Display**

Rosemount 8705 Flanged Magnetic Flow Meter Sensors provide long-lasting, reliable performance in even the most challenging applications. An all-welded construction provides a hermetic seal that protects against moisture and other contaminants. The sealed housing ensures maximum sensor reliability by protecting all internal components and wiring from even the most aggressive environments. A removable and replaceable terminal block enables easy repair in the field without the need to replace the entire meter.

#### *Specifications:*

Accuracy: Up to 0.15% of volumetric flow rate accuracy over 13:1 flow turndowns, 0.25% over 40:1 flow turndown

Line Sizes: 1/2-36 inch (15-900 mm)

Liner Materials: PTFE

Electrode Materials: 316L Stainless Steel

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Flange Ratings: ASME B16.5 Class 150-2500DIN PN 10-40AS 2129 Table D and EAWWA C207 Table 3 Class D (30-36 inch only)

Submergence Protection: IP68 (Recommended with sealed cable glands)

Interchangeability: Compatible with all 8700 Series transmitters

**Flanged Cast Iron Y-Type Strainer:**

Strainers to be of the "Y" pattern type. Strainer body to be ASTM A126-B cast iron with flanged end connections and 304 stainless steel screen. Flange drilling to be class 125 as appropriate for the application. Screen access by way of bolted cover and blow off plug. Operating pressures and temperatures to be 175psi-wog @ 150°F. For water service, 4" thru 16" to have .125 perforations.



**Pump Curve – System Completion Module**  
 Item: A1 Qty: 1 Tag(s): EI-8660



**Submittal**

<b>Job/Project:</b> Eli Lilly	<b>Representative:</b> Steffens-Shultz, Inc	
<b>ESP-Systemwize:</b> WIZE-26BA36CF	<b>Created On:</b> 04/10/2023	<b>Phone:</b> (614) 274-5515
<b>Location/Tag:</b> P-8660E,F,G	<b>Email:</b> quotes@steffens-shultz.com	
<b>Engineer:</b>	<b>Submitted By:</b> Jeff Turner	<b>Date:</b> 4/7/23
<b>Contractor:</b>	<b>Approved By:</b>	<b>Date:</b>

**Close Coupled Foot Mounted End Suction Pump**

**Series: e-1532**

**Model: 3EB**



**Features & Design**

- Best in Class hydraulic performance
- Best choice for lowest life cycle cost
- Internally self-flushing mechanical seals
- Hydrostatic testing of each pump standard

-Certified

\*The Bell & Gossett Series e-1532 is available in 26 sizes and a variety of configuration options that enables customization and flexibility to fit a broad range of operating conditions.

**MG-1 Rated at 93.0% Max Eff off NEMA 12-12, ODP Premium John Crane T21 Seal 230/460V/3PH/60HZ**

**Pump Selection Summary**

Duty Point Flow	364 US gpm
Duty Point Head	100 w/10%
Control Head	33 ft
Duty Point Pump Efficiency	76.9 %
Part Load Efficiency Value (PLEV)	70.1 %
Impeller Diameter	11 in
Motor Power	20 hp
Duty Point Power	13.5 bhp
Motor Speed	1800 rpm
RPM @ Duty Point	1708 rpm
NPSHr	6.02 ft
Minimum Shutoff Head	120 ft
Minimum Flow at RPM	97.5 US gpm
Flow @ BEP	488 US gpm
Fluid Temperature	68 °F
Fluid Type	30% Propylene glycol
Weight (approx. - consult rep for exact)	719 lbs
Pump Floor Space Calculation	3.36 ft <sup>2</sup>

**Performance Curve**

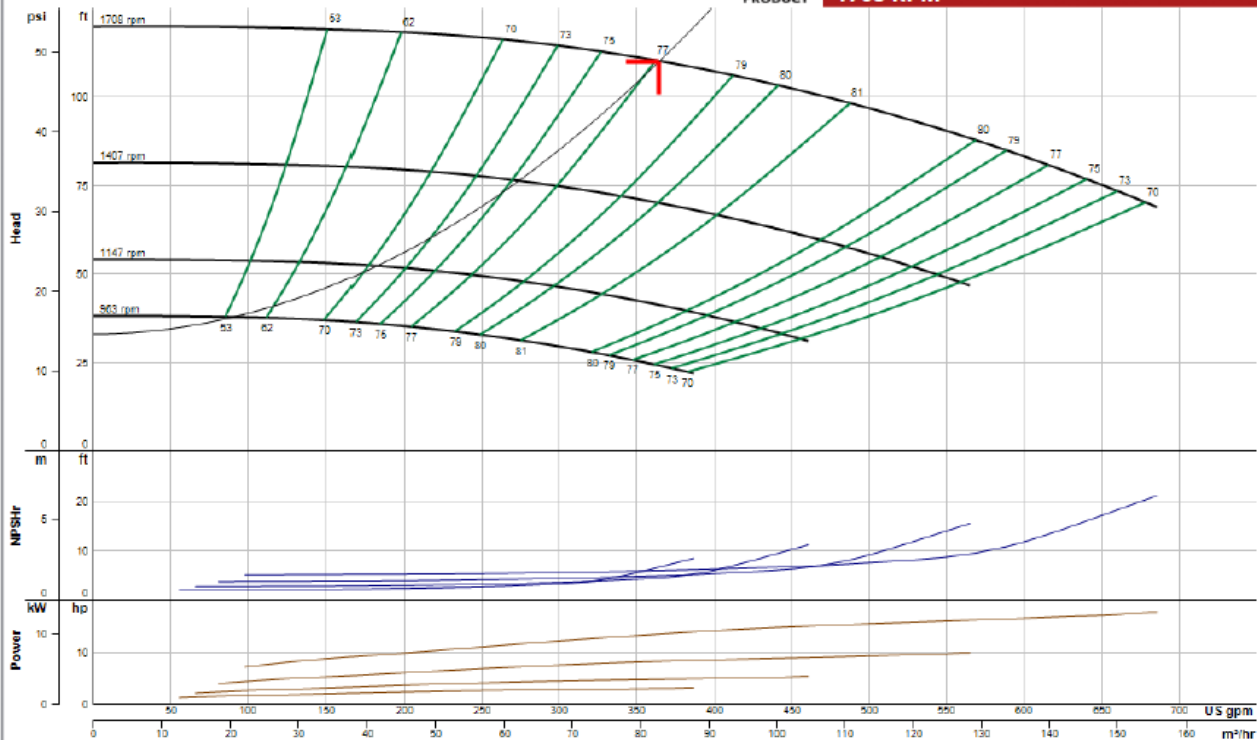
**Energy Efficiency Ratings:**

Pump & Motor PEIcI: 0.93 ERcI: 7  
 Pump, Motor & Drive: PEIvI: 0.45 ERvI: 55



**e-1532**

**3EB**  
**1708 RPM**



Specific Gravity: 1.0255, Viscosity: 2.9301 | Performance curve meets 14.6 / ISO 9906 acceptance criteria | Available Phase: 3, Available Voltage(s) [V]: 575, 200, 230/460

WIZE-26BA36CF

Unit Dimensions – System Completion Module

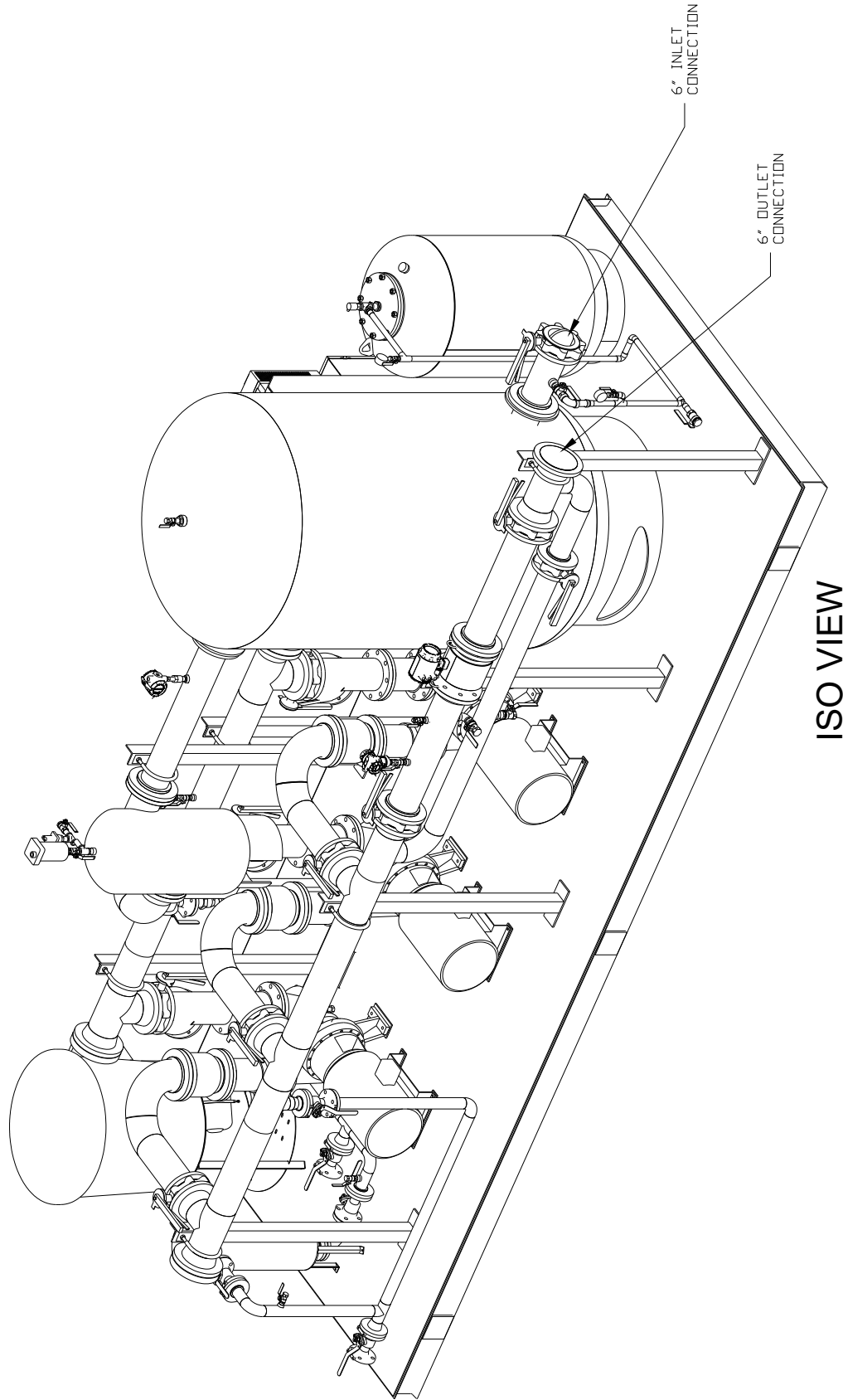
Item: A1 Qty: 1 Tag(s): EI-8660

INLET/OUTLET WATER  
CONNECTION SIZE

6 INCH

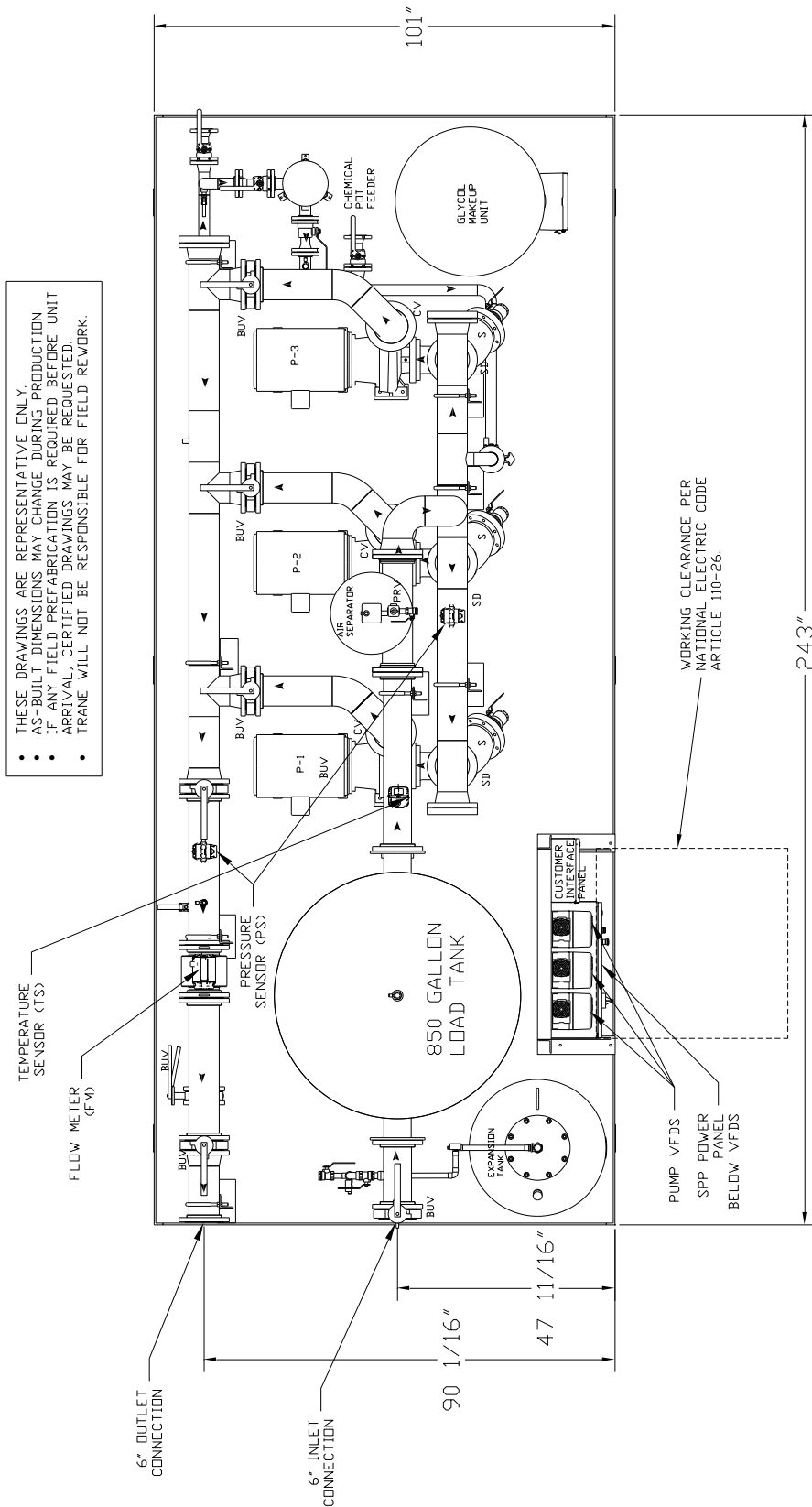
SCM WATER  
VOLUME /STORAGE

1174.0 GALLONS



Unit Dimensions – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660

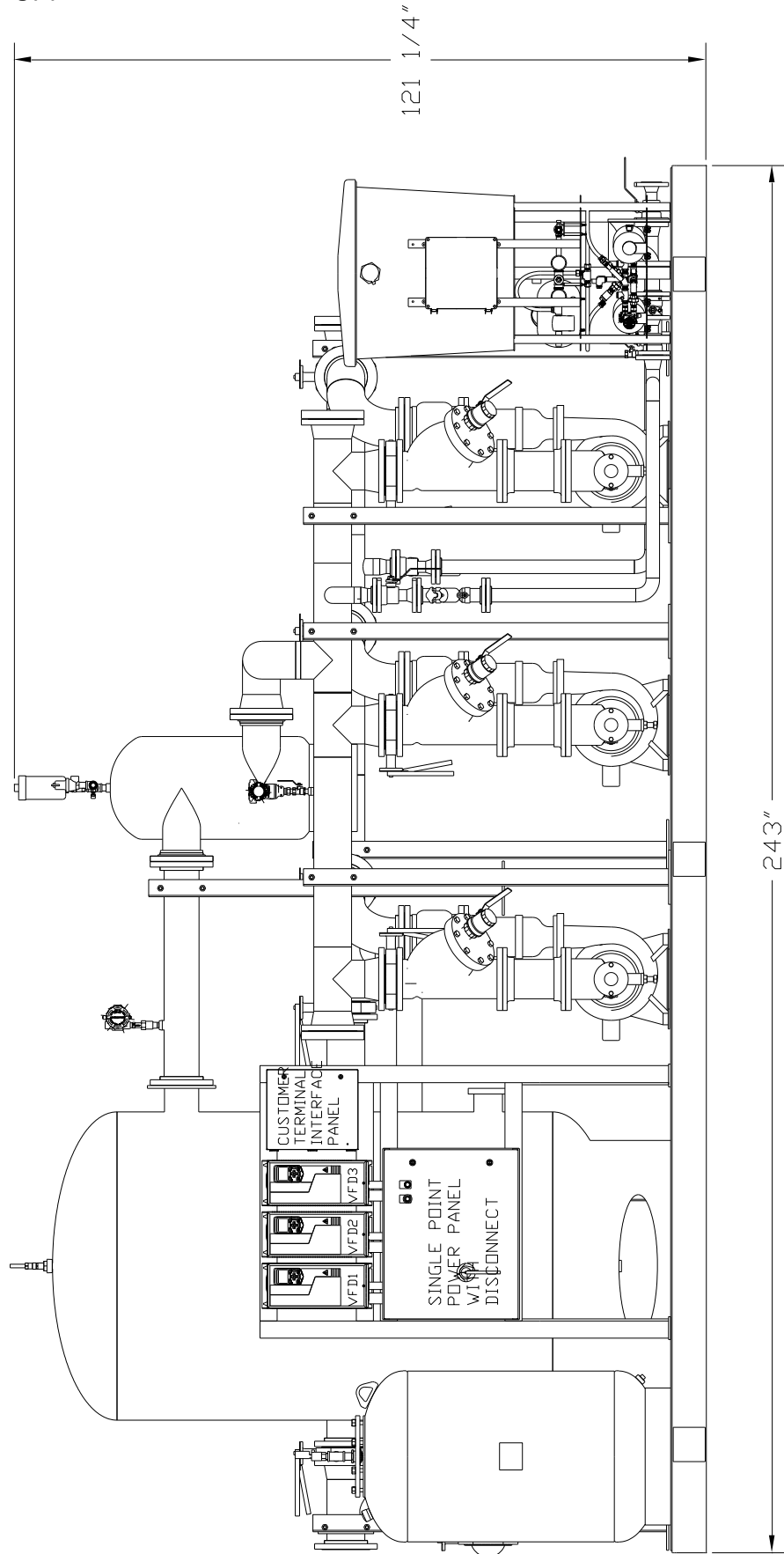


- THESE DRAWINGS ARE REPRESENTATIVE ONLY.
- AS-BUILT DIMENSIONS MAY CHANGE DURING PRODUCTION
- IF ANY FIELD PREFABRICATION IS REQUIRED BEFORE UNIT ARRIVAL, CERTIFIED DRAWINGS MAY BE REQUESTED.
- TRANE WILL NOT BE RESPONSIBLE FOR FIELD REWORK.

TOP VIEW

Unit Dimensions – System Completion Module

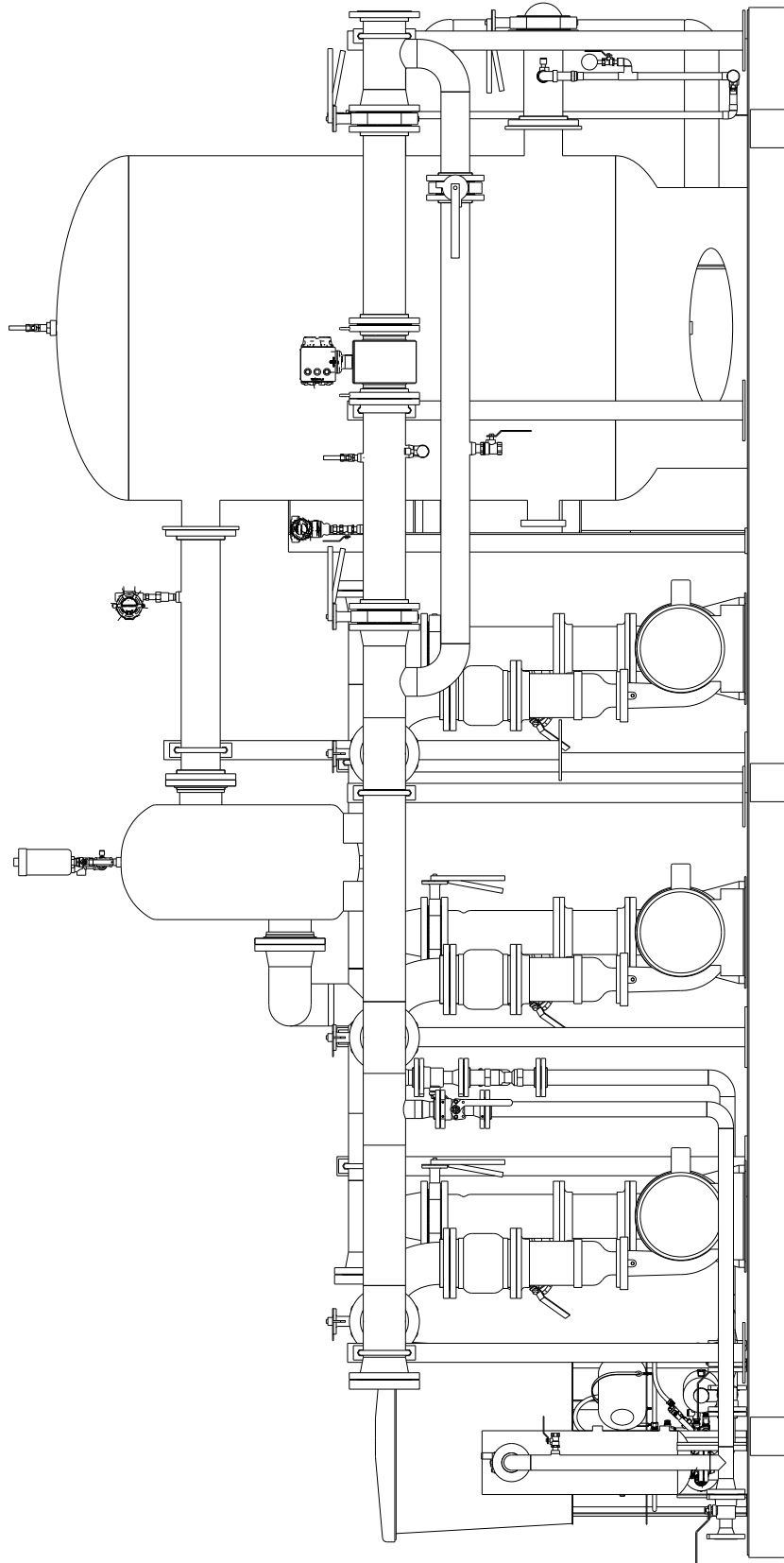
Item: A1 Qty: 1 Tag(s): EI-8660



FRONT VIEW

Unit Dimensions – System Completion Module

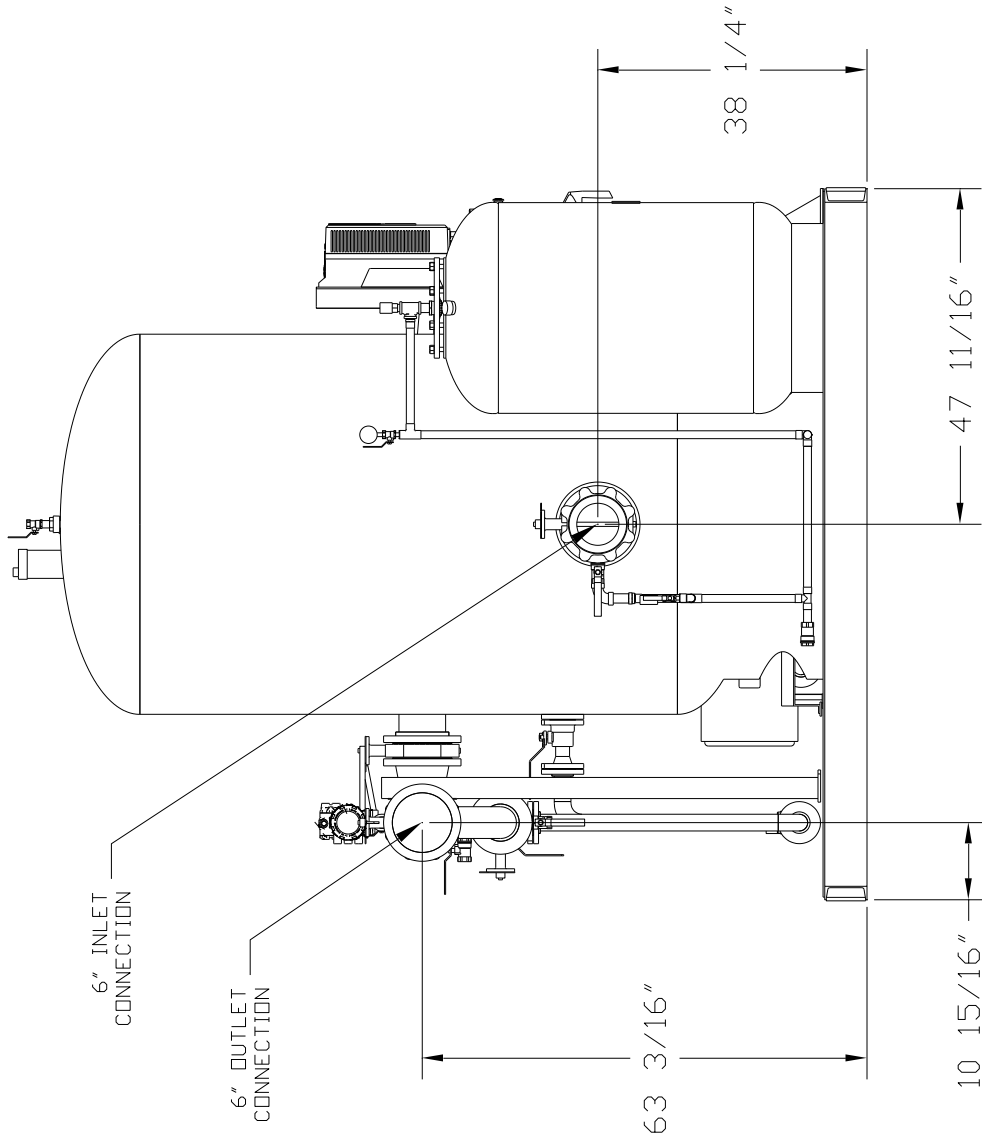
Item: A1 Qty: 1 Tag(s): EI-8660



BACK VIEW

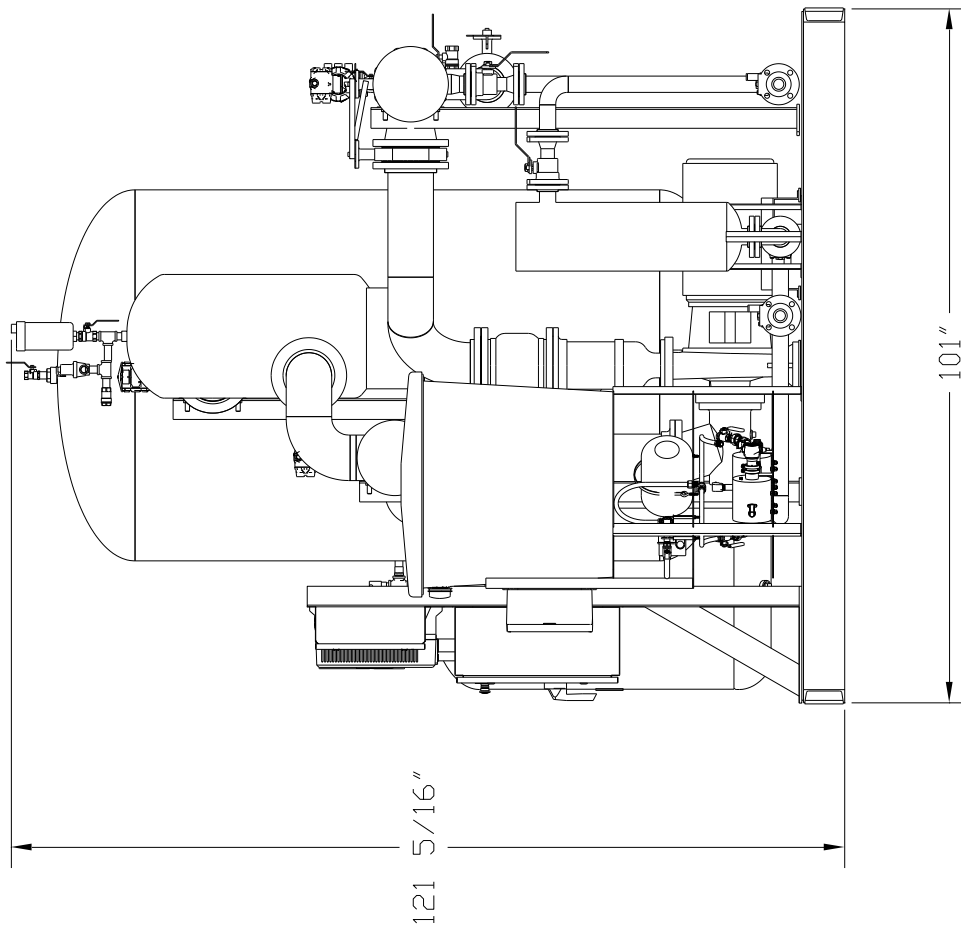
Unit Dimensions – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660



Unit Dimensions – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660



RIGHT VIEW

**Rigging View – System Completion Module**

Item: A1 Qty: 1 Tag(s): EI-8660

**NOTES:**

1. LIFTING CHAINS/CABLES WILL NOT BE THE SAME LENGTH. ADJUST TO KEEP UNIT LEVEL WHILE LIFTING.
2. DO NOT FORK LIFT UNIT.
3. LIFTING DIAGRAM IS GENERIC REPRESENTATION FOR ALL UNITS. IT MAY NOT REPRESENT SIZE OF UNIT SELECTED.
4. DO NOT ALLOW LIFTING STRAPS TO CONTACT THE UNIT DURING LIFTING.

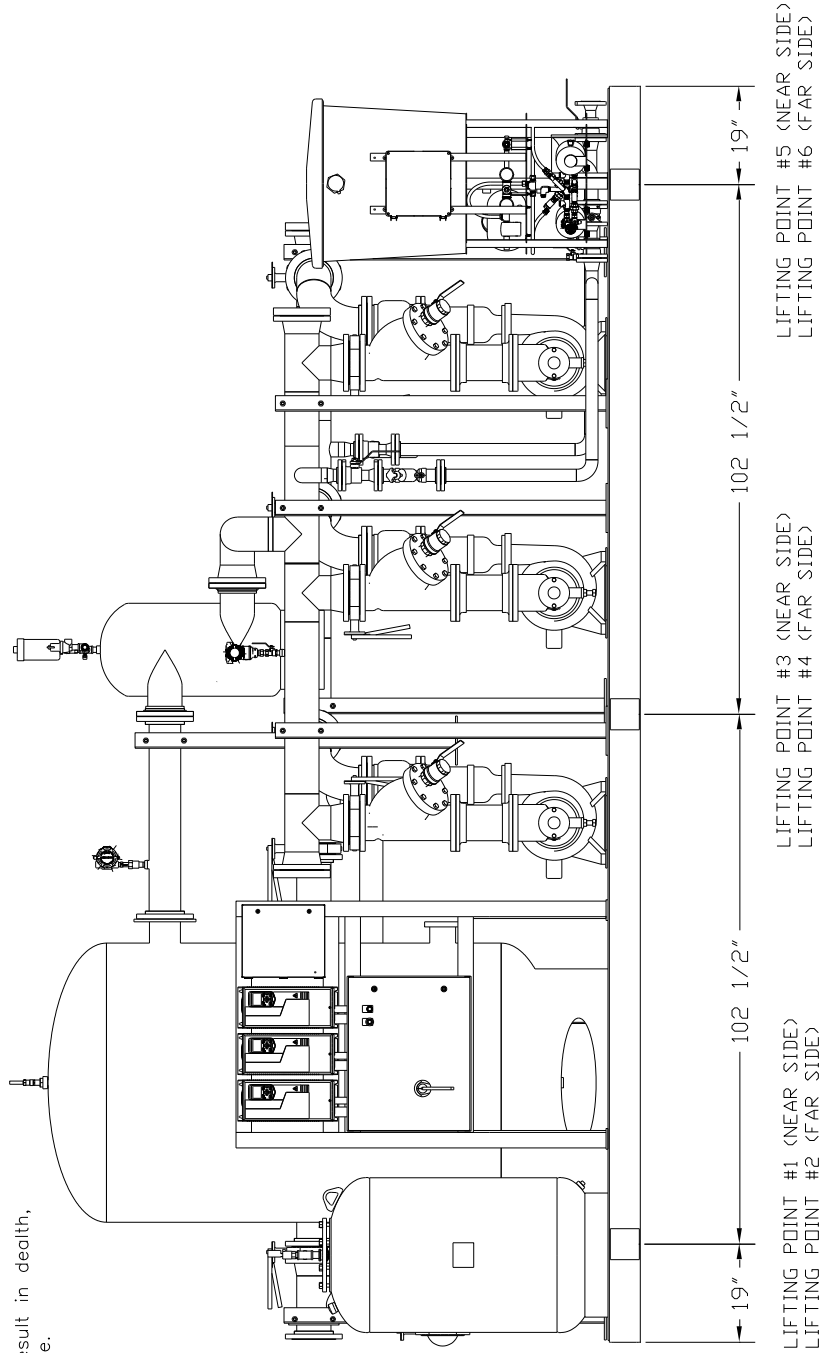
**WARNING**

**LIFTING AND MOVING INSTRUCTIONS!**

Use the spreader bar as shown in diagram. Refer to installation instructions located inside control panel for further rigging information.

Other lifting arrangements could result in death, serious injury or equipment damage.

LIFTING WEIGHT 1	LIFTING WEIGHT 2	LIFTING WEIGHT 3	LIFTING WEIGHT 4	LIFTING WEIGHT 5	LIFTING WEIGHT 6	TOTAL SHIPPING WEIGHT
2585.0 lb	2447.0 lb	2628.0 lb	2647.0 lb	1139.0 lb	1255.0 lb	12702.0 lb



**Operating Weights – System Completion Module**

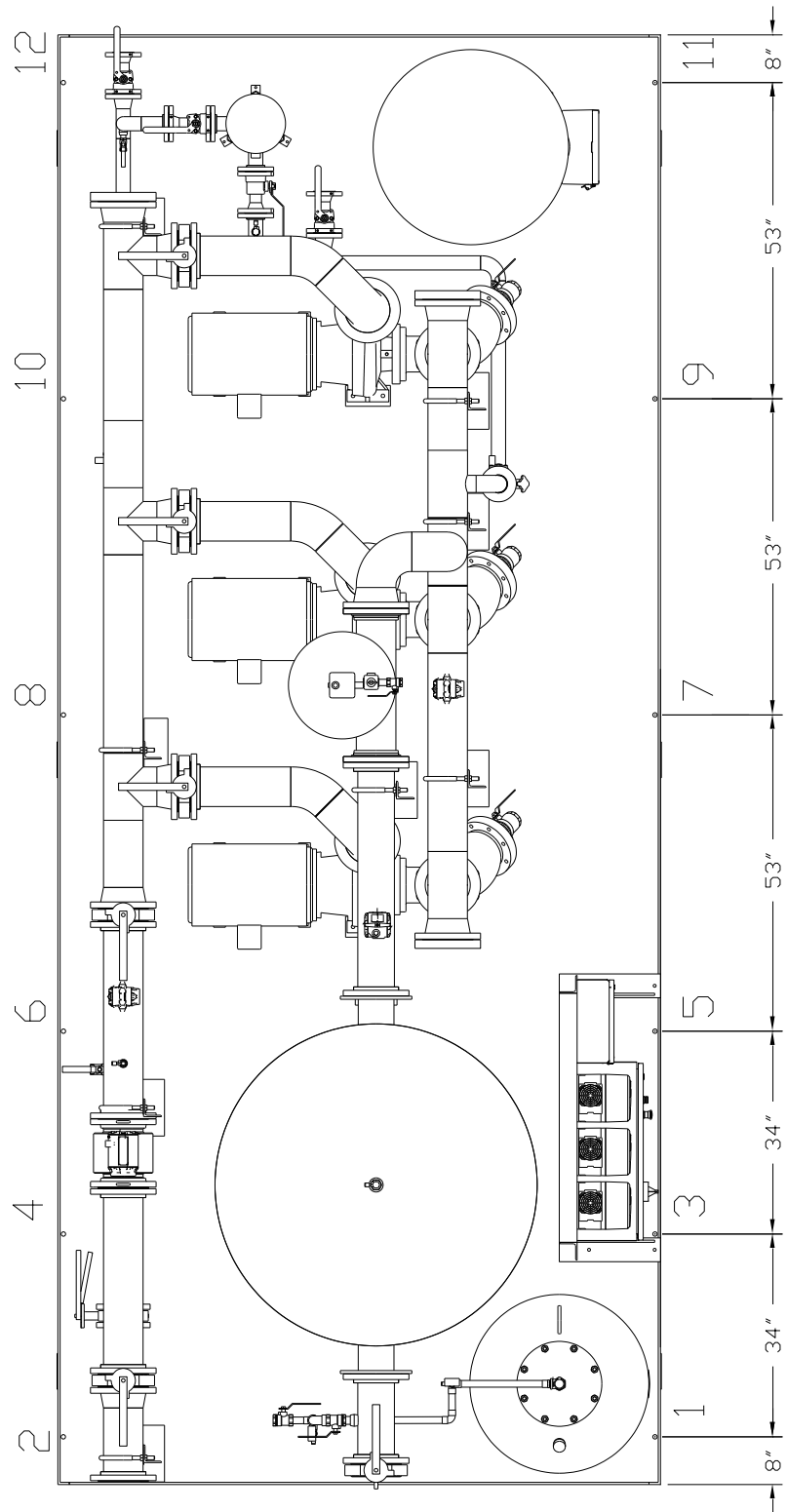
Item: A1 Qty: 1 Tag(s): EI-8660

UNIT WEIGHT (LBS.)		MOUNTING LOCATIONS & POINT LOAD WEIGHTS (LBS.)											
SHIPPING WEIGHT	12,702	1	2	3	4	5	6	7	8	9	10	11	12
OPERATING WEIGHT	22,584	2258	2105	2848	2486	3015	2835	1411	1500	1207	1470	680	771

DIMENSION TOLERANCE FOR MOUNTING LOCATIONS +/- 0.5"

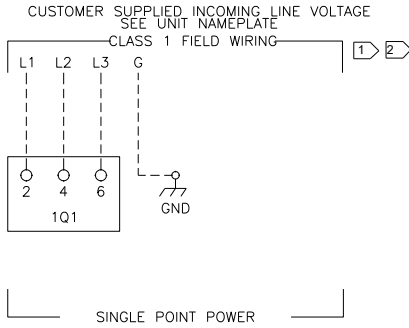
MOUNTING HOLE DIAMETER 3/4"

WEIGHT TOLERANCE +/- 10%



**Field Wiring – System Completion Module**

Item: A1 Qty: 1 Tag(s): EI-8660



DEVICE PREFIX & LOCATION CODE	
AREA	LOCATION
1	MAIN POWER PANEL
2	CUSTOMER INTERFACE PANEL
3	SKID MOUNTED
4	CUSTOMER PROVIDED DEVICES

- ① SINGLE SOURCE POWER IS PROVIDED AS STANDARD ON THESE PRODUCTS. FIELD CONNECTIONS ARE MADE TO 101. WIRE LUG SIZE IS (1) #4-#4/0 PER PHASE.
- ② ALL UNIT POWER WIRING MUST BE 600 VOLT COPPER CONDUCTORS ONLY AND HAVE A MINIMUM TEMPERATURE INSULATION RATING OF 90 DEGREE C. REFER TO UNIT NAMEPLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION DEVICE. PROVIDE AN EQUIPMENT GROUND IN ACCORDANCE WITH APPLICABLE ELECTRIC CODES.

**NOTICE**

UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS.

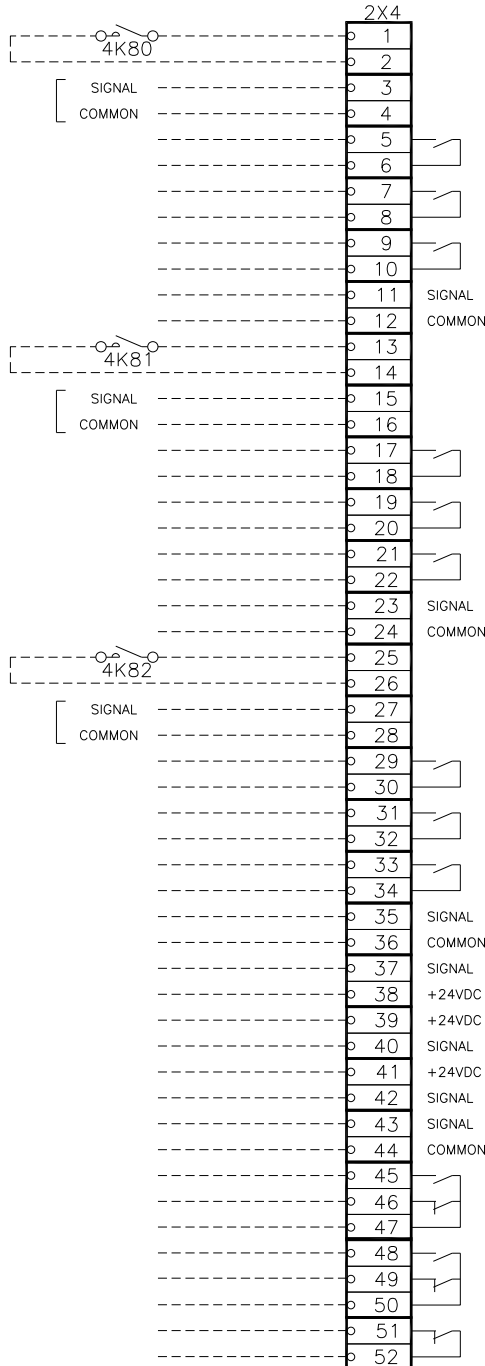
FAILURE TO DO THE ABOVE COULD RESULT IN EQUIPMENT DAMAGE.

**WARNING**

HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOWING 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 COULD RESULT IN DEATH OR SERIOUS INJURY.



PUMP 1 START/STOP COMMAND	BINARY INPUT	CONTACT CLOSURE WILL ENABLE THE CHILLED WATER PUMP
PUMP 1 SPEED COMMAND	ANALOG INPUT	4-20 mA SIGNAL CONTROLS THE SPEED OF THE PUMP FROM 22-60HZ
PUMP 1 REMOTE CONTROL STATUS	BINARY OUTPUT	CONTACT CLOSURE INDICATES THAT THE PUMP VFD IS IN REMOTE CONTROL. OPEN IS LOCAL.
PUMP 1 RUNNING STATUS	BINARY OUTPUT	CONTACT CLOSURE INDICATES THAT THE PUMP IS RUNNING.
PUMP 1 VFD FAULT STATUS	BINARY OUTPUT	A CONTACT CLOSURE INDICATES THAT THE VFD IS NORMAL. OPEN INDICATES NO POWER, OR ALARM PRESENT.
PUMP 1 FEEDBACK	ANALOG OUTPUT	4-20 mA SIGNAL INDICATES 0-100% (CONFIGURABLE)
PUMP 2 START/STOP COMMAND	BINARY INPUT	CONTACT CLOSURE WILL ENABLE THE CHILLED WATER PUMP
PUMP 2 SPEED COMMAND	ANALOG INPUT	4-20 mA SIGNAL CONTROLS THE SPEED OF THE PUMP FROM 22-60HZ
PUMP 2 REMOTE CONTROL STATUS	BINARY OUTPUT	CONTACT CLOSURE INDICATES THAT THE PUMP VFD IS IN REMOTE CONTROL. OPEN IS LOCAL.
PUMP 2 RUNNING STATUS	BINARY OUTPUT	CONTACT CLOSURE INDICATES THAT THE PUMP IS RUNNING.
PUMP 2 VFD FAULT STATUS	BINARY OUTPUT	A CONTACT CLOSURE INDICATES THAT THE VFD IS NORMAL. OPEN INDICATES NO POWER, OR ALARM PRESENT.
PUMP 2 FEEDBACK	ANALOG OUTPUT	4-20 mA SIGNAL INDICATES 0-100% (CONFIGURABLE)
PUMP 3 START/STOP COMMAND	BINARY INPUT	CONTACT CLOSURE WILL ENABLE THE CHILLED WATER PUMP
PUMP 3 SPEED COMMAND	ANALOG INPUT	4-20 mA SIGNAL CONTROLS THE SPEED OF THE PUMP FROM 22-60HZ
PUMP 3 REMOTE CONTROL STATUS	BINARY OUTPUT	CONTACT CLOSURE INDICATES THAT THE PUMP VFD IS IN REMOTE CONTROL. OPEN IS LOCAL.
PUMP 3 RUNNING STATUS	BINARY OUTPUT	CONTACT CLOSURE INDICATES THAT THE PUMP IS RUNNING.
PUMP 3 VFD FAULT STATUS	BINARY OUTPUT	A CONTACT CLOSURE INDICATES THAT THE VFD IS NORMAL. OPEN INDICATES NO POWER, OR ALARM PRESENT.
PUMP 3 FEEDBACK	ANALOG OUTPUT	4-20 mA SIGNAL INDICATES 0-100% (CONFIGURABLE)
WATER TEMPERATURE SENSOR	ANALOG OUTPUT	10K TYPE 2 THERMISTOR
PUMP SUCTION PRESSURE SENSOR	ANALOG OUTPUT	4-20 mA SIGNAL INDICATES 0-150 PSI (ADJUSTABLE)
PUMP DISCHARGE PRESSURE SENSOR	ANALOG OUTPUT	4-20 mA SIGNAL INDICATES 0-150 PSI (ADJUSTABLE)
FLOW METER	ANALOG OUTPUT	4-20 mA SIGNAL INDICATES 0-TBD GPM
EXPANSION TANK PRESSURE SENSOR	BINARY OUTPUT	CHANGES STATE WHEN PRESSURE DROPS BELOW SETPOINT.
GLYCOL MAKEUP UNIT LOW LEVEL ALARM	BINARY OUTPUT	CHANGE OF STATE INDICATES LOW LEVEL ALARM PRESENT.
EMERGENCY STOP OUTPUT	BINARY OUTPUT	OPEN STATUS INDICATES EMERGENCY STOP HAS BEEN PRESSED

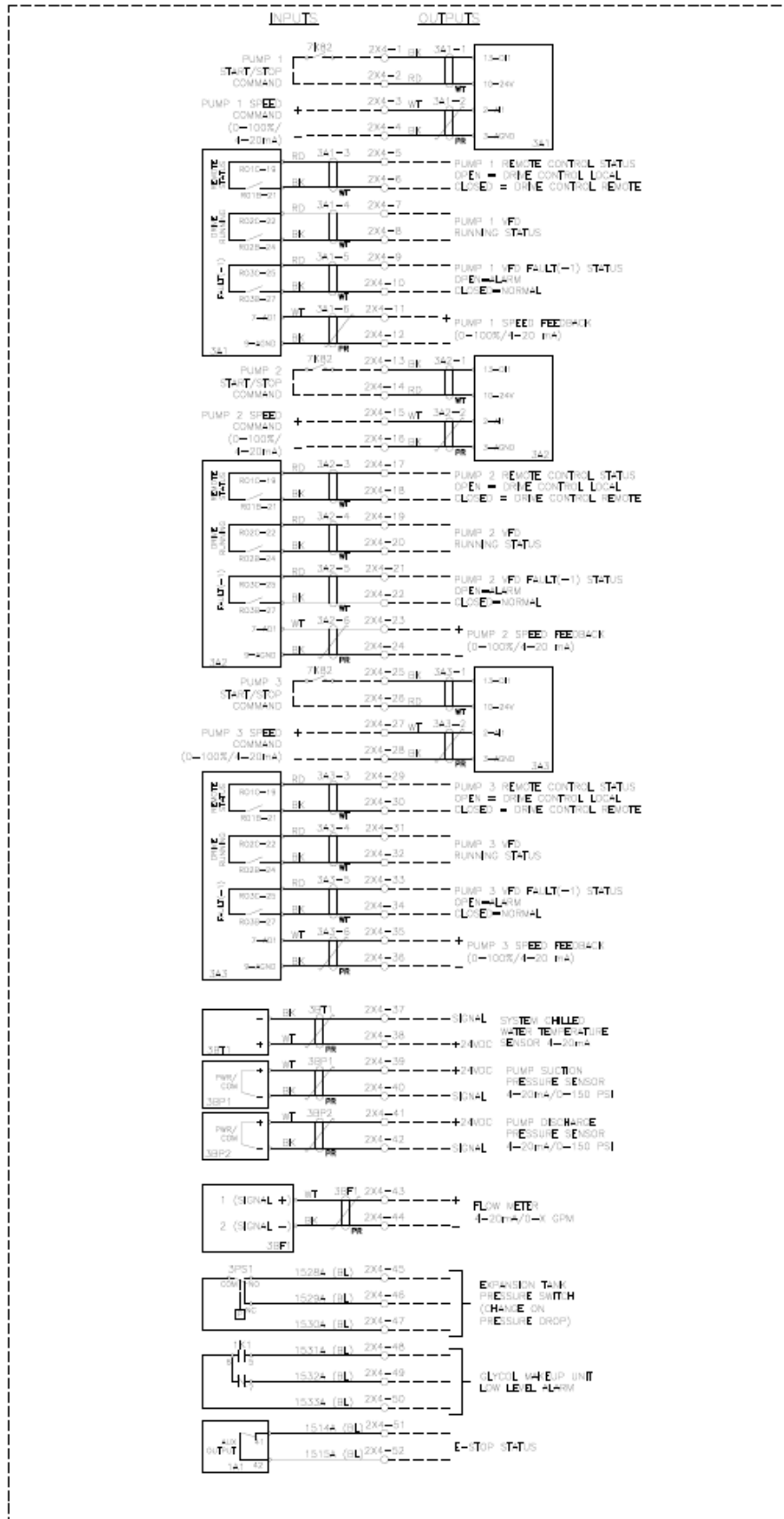






Wiring Diagrams – System Completion Module  
Item: A1 Qty: 1 Tag(s): EI-8660

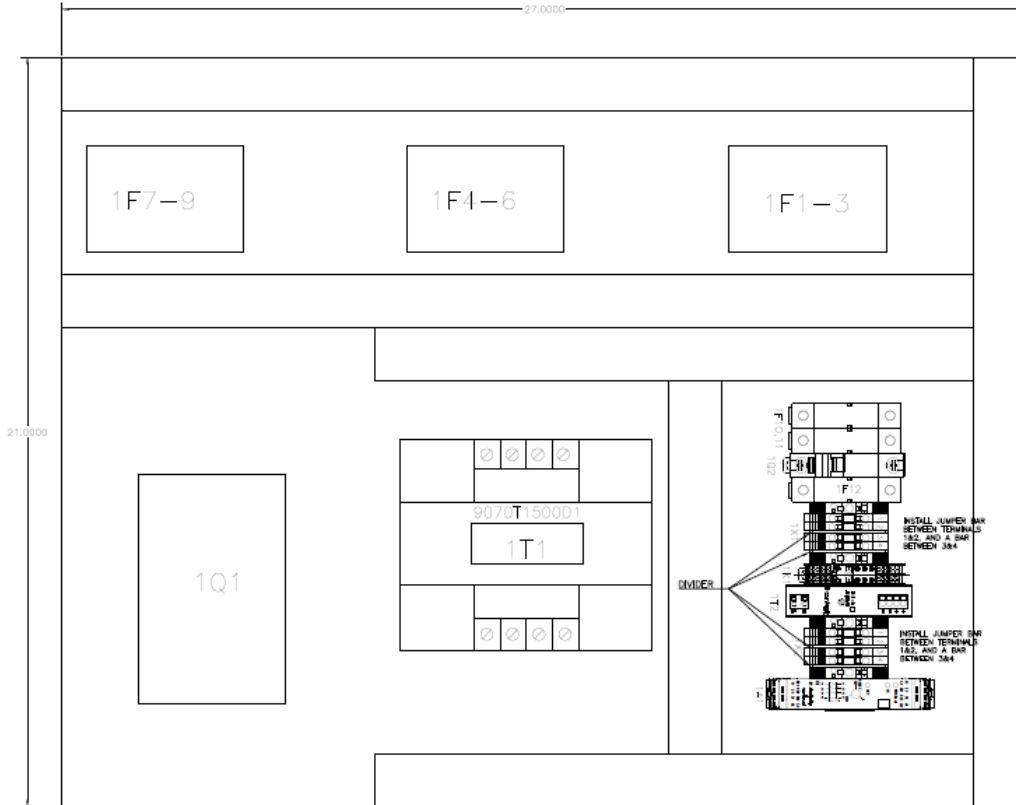
CUSTOMER INTERFACE CONNECTIONS



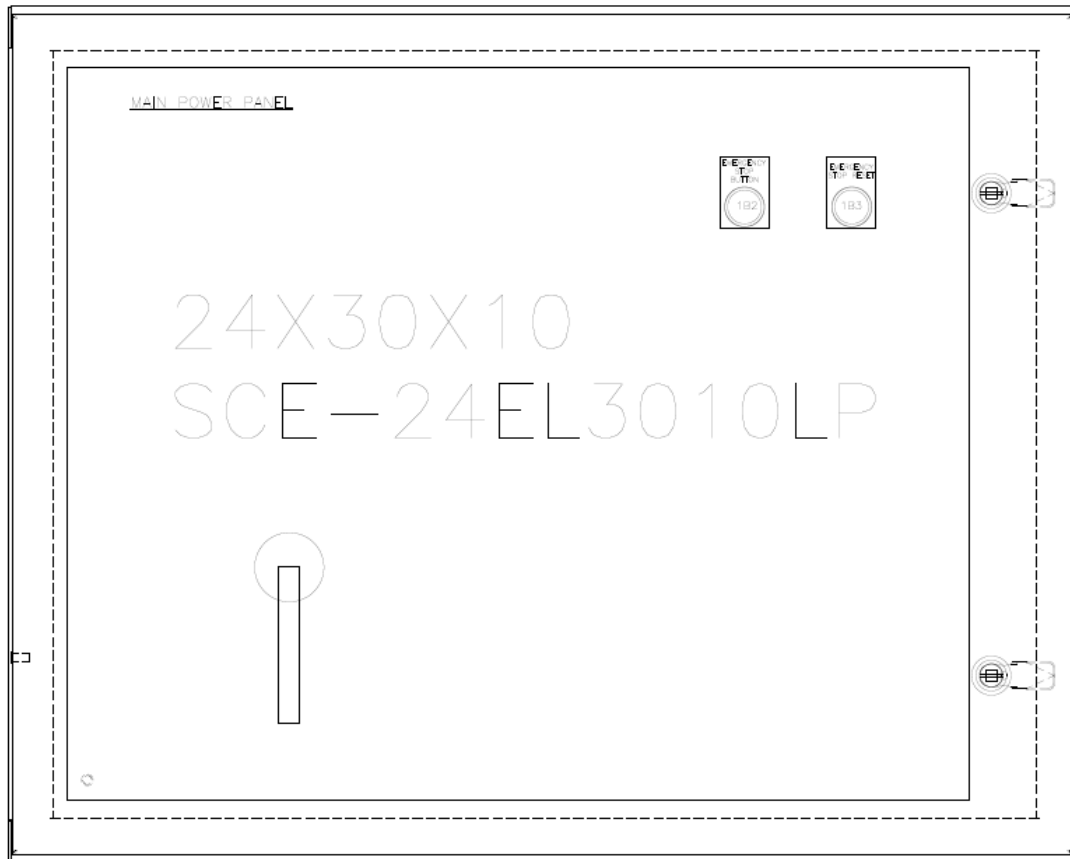
Wiring Diagrams – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660

MAIN POWER PANEL LAYOUT



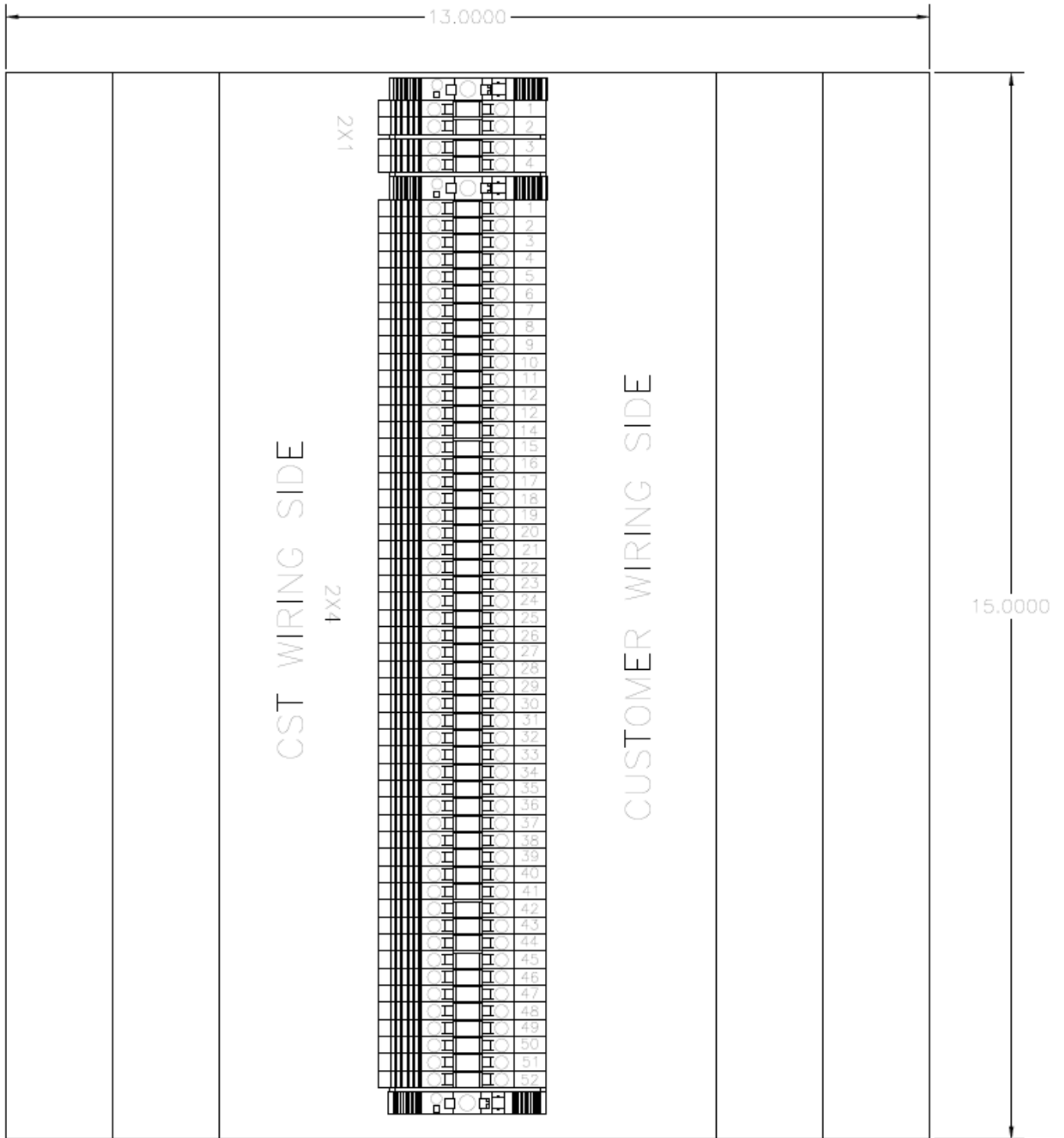
PRELIM



Wiring Diagrams – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660\

CUSTOMER INTERFACE PANEL LAYOUT



**PRELIM**

**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**



**Submission Data Information**  
**“BTL” Flanged Vertical Storage Tanks**  
**with Low Connections**

401-189

SUPERSEDES: May 25, 2016

EFFECTIVE: June 1, 2016

Job: \_\_\_\_\_

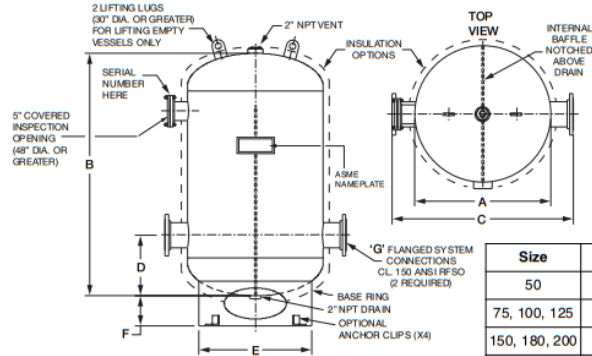
ITEM	LOCATION	MODEL	QUANTITY	GALLONS
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**SPECIFICATIONS**

- Designed and constructed per ASME Code Section VIII, Division 1.
- Construction: Carbon Steel with exterior red oxide primer finish
- Maximum Design Pressure and Temperature: 125 psi @ 375°F
- Flanged inlet and outlet System Connections (standard sizes shown)
- Registered with the National Board of Pressure Vessel Manufacturers

**OPTIONS (Consult Factory)**

- Optional materials of construction
  - None
  - Chilled Water 1/2" Armaflex
  - Heating Water 1" Silicon Blanket
- Optional Connection Types
  - T Female NPT Threaded 2" & 2 1/2" only  
Available only on sizes, BTL0050 thru BTL0350
- 150 PSI Working Pressure
- Anchor Clips (4)



Size	Dia.	°C Dim.	
		2" T	2-1/2" T
50	20	23 3/8	23 5/8
75, 100, 125	24	27 3/8	27 5/8
150, 180, 200	30	33 3/8	33 5/8
250, 300, 350	36	39 3/8	39 5/8

\*Complete Model Number as shown below:  
 BTL0050F02-125N

**SIZES & DIMENSIONS**

All dimensions shown are subject to change and should not be used for pre-piping. Contact your local Taco representative should certified dimensional drawings be required.



Nozzle Size offered circled below.  
 Example: (3)

MODEL* NUMBER	TANK VOLUME	A DIAMETER	B	C**	D	E DIAMETER	F	G	APPROX. WEIGHT
	GAL.	INCH	INCH	INCH	INCH	INCH	INCH	SIZE	
BTL0050F__-125N	50	20	43	30	11 1/2	16	6 3/4	2, 3, 4	190
BTL0075F__-125N	75	24	46	34	12 5/8	20	6 3/4	2, 3, 4	240
BTL0100F__-125N	100	24	61	34	12 5/8	20	6 3/4	2, 3, 4	280
BTL0125F__-125N	125	24	76	34	12 5/8	20	6 3/4	2, 3, 4	330
BTL0150F__-125N	150	30	60	40	14 1/4	24	8	2, 3, 4	510
BTL0180F__-125N	180	30	71	40	14 1/4	24	8	2, 3, 4	590
BTL0200F__-125N	200	30	78	40	14 1/4	24	8	2, 3, 4	630
BTL0250F__-125N	250	36	69	46	16 1/4	30	7 7/8	3, 4, 6	710
BTL0300F__-125N	300	36	82	46	16 1/4	30	7 7/8	3, 4, 6	820
BTL0350F__-125N	350	36	94	46	16 1/4	30	7 7/8	3, 4, 6	910
BTL0400F__-125N	400	48	65	58	18 7/8	40	8 5/8	4, 6, 8	1,010
BTL0450F__-125N	450	48	72	58	18 7/8	40	8 5/8	4, 6, 8	1,080
BTL0500F__-125N	500	48	79	58	18 7/8	40	8 5/8	4, 6, 8	1,160
BTL0700F__-125N	700	48	100	58	18 7/8	40	8 5/8	4, 6, 8	1,300
<b>BTL0850F__-125N</b>	<b>850</b>	<b>54</b>	<b>99</b>	<b>64</b>	<b>22 5/8</b>	<b>44</b>	<b>9 3/8</b>	<b>4, 6, 8</b>	<b>1,880</b>
BTL1050F__-125N	1050	60	99	70	24 3/4	50	9 3/4	6, 8, 10	2,130
BTL1250F__-125N	1,250	60	115 7/8	70	25 11/16	50	10	6, 8, 10, 12	2,235
BTL1500F__-125N	1,500	60	137 7/8	70	25 11/16	50	10	6, 8, 10, 12	2,740
BTL1750F__-125N	1,750	72	113 1/4	82	28 3/8	64	14 1/16	6, 8, 10, 12	3,340
BTL2000F__-125N	2,000	72	128 1/4	82	28 3/8	64	14 1/16	6, 8, 10, 12	3,640
BTL2500F__-125N	2,500	84	123 1/2	94	32	72	14 1/8	6, 8, 10, 12	5,340
BTL3000F__-125N	3,000	84	145 1/2	94	32	72	14 1/8	6, 8, 10, 12	6,140

\*\*Add 2" to " C" dimension when specifying 10" or 12" nozzles

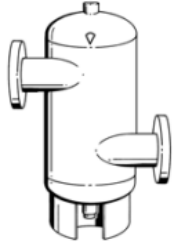
**Taco Comfort Solutions™** A Taco Group Company  
 Taco, Inc., 1160 Cranston Street, Cranston, RI 02920 | Tel: (401) 942-8000 | FAX: (401) 942-2360  
 Taco (Canada), Ltd., 8450 Lawson Road, Suite #3, Milton, Ontario L9T 0J8 | Tel: (905) 564-9422 | FAX: (905) 564-9436  
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Component Cut Sheets – System Completion Module  
Item: A1 Qty: 1 Tag(s): EI-8660

# Bell & Gossett

**SUBMITTAL**
**A-326.2**

<b>JOB:</b>	<b>REPRESENTATIVE:</b>	
<b>UNIT TAG:</b>	<b>SUBMITTED BY:</b>	<b>DATE:</b>
<b>ENGINEER:</b>	<b>APPROVED BY:</b>	<b>DATE:</b>
<b>CONTRACTOR:</b>		



## ROLAIRTROL<sup>®</sup>

### Air Separator

Flanged Less Strainer  
Air Control and Elimination

#### DESCRIPTION

The Rolairtrol Air Separator is an ASME vessel designed with tangential openings to create a low velocity vortex where air is separated and removed from the circulating water.

#### MAXIMUM WORKING PRESSURE

125 PSIG (862 kPa)

#### MAXIMUM OPERATING TEMPERATURE

-20°F to +350°F (1770°C)

#### CONSTRUCTION

- Designed and constructed per ASME Section VIII, Division 1
- Shell: Steel
- Air Collector Tube: Stainless steel with 5/32" (4mm) diameter perforations and 63% open area
- Baffle/Collector Tube Support Assembly: Steel

#### SCHEDULE

PART NUMBER	MODEL NUMBER	Capacity GPM (M3/Hr)	Flanged Tangential Opening Inches (MM)	TAGGING INFORMATION	QUANTITY
5363-03F-12-001	RL-3F	190 (43.2)	3 (76.2)		
5363-04F-12-001	RL-4F	300 (68.1)	4 (101.6)		
5363-05F-12-001	RL-5F	530 (120.4)	5 (127.0)		
5363-06F-12-001	RL-6F	850 (193.0)	6 (150.0)		
5363-08F-12-001	RL-8F	1,900 (431.5)	8 (203.2)		
5363-10F-12-001	RL-10F	3,600 (817.6)	10 (254.0)		
5363-12F-12-001	RL-12F	4,800 (1090.1)	12 (300.0)		
5363-14F-12-001	RL-14F	6,100 (1385.3)	14 (355.6)		
5363-16F-12-001	RL-16F	8,000 (1,816.8)	16 (406.4)		
5363-18F-12-001	RL-18F	9,700 (2,202.9)	18 (457.2)		
5363-20F-12-001	RL-20F	12,000 (2,725.2)	20 (508.0)		
5363-22F-12-001	RL-22F	15,000 (3,406.5)	22 (588.8)		
5363-24F-12-001	RL-24F	17,000 (3,860.7)	24 (635.0)		
5363-03F-12-002	RL-3FB	190 (43.2)	3 (76.2)		
5363-04F-12-002	RL-4FB	300 (68.1)	4 (101.6)		
5363-05F-12-002	RL-5FB	530 (120.4)	5 (127.0)		
5363-06F-12-002	RL-6FB	850 (193.0)	6 (150.0)		
5363-08F-12-002	RL-8FB	1,900 (431.5)	8 (203.2)		
5363-10F-12-002	RL-10FB	3,600 (817.6)	10 (254.0)		
5363-12F-12-002	RL-12FB	4,800 (1090.1)	12 (300.0)		
5363-14F-12-002	RL-14FB	6,100 (1385.3)	14 (355.6)		
5363-16F-12-002	RL-16FB	8,000 (1,816.8)	16 (406.4)		
5363-18F-12-002	RL-18FB	9,700 (2,202.9)	18 (457.2)		
5363-20F-12-002	RL-20FB	12,000 (2,725.2)	20 (508.0)		
5363-22F-12-002	RL-22FB	15,000 (3,406.5)	22 (588.8)		
5363-24F-12-002	RL-24FB	17,000 (3,860.7)	24 (635.0)		

For 20"-36" sizes contact factory for performance characteristics.  
Model numbers with a B suffix include bracket supports.

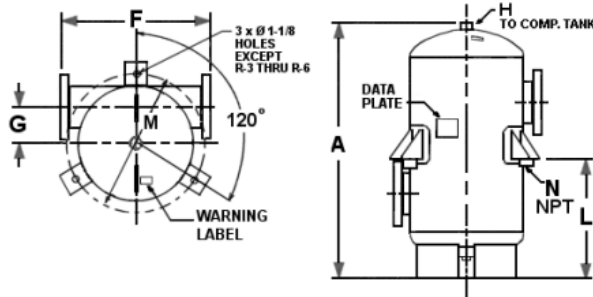


Component Cut Sheets – System Completion Module

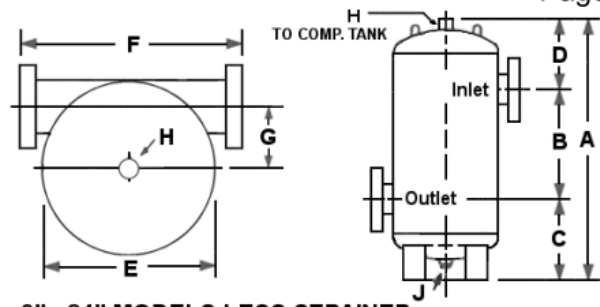
Item: A1 Qty: 1 Tag(s): EI-8660

ROLAIRTROL - Flanged Less Strainer

A-326.2  
Page 2



3" - 24" MODELS LESS STRAINER  
AND OPTIONAL BRACKET SUPPORTS



3" - 24" MODELS LESS STRAINER

Flange connections for field piping drilled and faced per 150# ANSI standards.

DIMENSIONS in Inches (MM) AND WEIGHTS in Lbs (kg.)

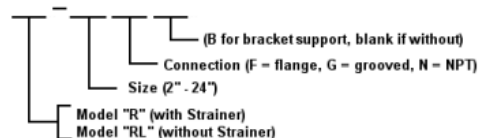
MODEL NUMBER	A	B	C	D	E	F	G	H	J	Cv	Approx. Volume in Gallons (Ltr.)	Approx. Shpg. Wt. in Lbs. (Kg)	Flood Wt. Less Bracket in Lbs. (Kg)
RL-3F (B)	26-7/8 (683)	8 (203)	10-13/16 (275)	8-1/16 (205)	10-3/4 (273)	22-3/4 (578)	3-5/8 (92)	1-1/4 (32)	1 (25)	215	7 (26)	92 (42)	151 (69)
RL-4F (B)	31-7/16 (799)	10 (254)	12 (305)	9-7/16 (240)	12-3/4 (324)	20-1/2 (521)	4-1/8 (105)	1-1/2 (38)	1 (25)	370	13 (49)	100 (45)	210 (95)
RL-5F (B)	37 (940)	12 (305)	14 (356)	11 (279)	16 (406)	23-3/4 (603)	5-1/8 (130)	1-1/2 (38)	1 (25)	580	25 (95)	160 (73)	365 (166)
RL-6F (B)	44-1/16 (1,119)	14 (356)	16-13/16 (427)	13-1/4 (337)	18 (457)	25-3/4 (654)	5-11/16 (144)	1-1/2 (38)	1 (25)	850	36 (136)	205 (93)	505 (229)
RL-8F (B)	54-1/2 (1,384)	18 (457)	20 (508)	16-1/2 (419)	24 (610)	31-3/4 (806)	7-11/16 (195)	2 (51)	1 (25)	1,445	87 (329)	400 (181)	1,130 (513)
RL-10F (B)	64-11/16 (1,643)	22 (559)	22-3/4 (578)	19-15/16 (506)	30 (762)	37-3/4 (959)	9-5/8 (244)	2 (51)	1 (25)	2,340	162 (613)	630 (286)	1,985 (900)
RL-12F (B)	75-3/8 (1,915)	27 (686)	25-3/4 (654)	22-5/8 (575)	36 (914)	46-3/4 (1,187)	11-5/8 (295)	2 (51)	1 (25)	3,300	282 (1,067)	980 (445)	3,335 (1,513)
RL-14F (B)	95 (2,413)	31-1/2 (800)	35 (889)	28-1/2 (724)	42 (1,067)	54-1/2 (1,384)	14 (356)	2 (51)	1 (25)	3,900	472 (1,787)	1,700 (771)	5,640 (2,558)
RL-16F (B)	105-3/4 (2,686)	36 (914)	38-1/8 (968)	31-5/8 (803)	48 (1,219)	62-1/2 (1,588)	16 (406)	2 (51)	1 (25)	5,100	723 (2,737)	2,325 (1,055)	8,360 (3,792)
RL-18F (B)	123 (3,124)	40-1/2 (1,029)	44-3/4 (1,137)	37-3/4 (959)	54 (1,372)	70-1/4 (1,784)	18 (457)	2 (51)	1 (25)	6,410	1,149 (4,349)	3,275 (1,486)	12,875 (5,840)
RL-20F (B)	135-3/8 (3,439)	45 (1,143)	48-5/8 (1,235)	41-3/4 (1,060)	60 (1,524)	78 (1,981)	20(508)	2 (51)	1 (25)	8,000	1,577 (5,969)	5,140 (2,332)	18,300 (8,301)
RL-22F (B)	148 (3,759)	49-5/8 (1,260)	52-5/8 (1,337)	45-3/4 (1,162)	66 (1,676)	85-7/8 (2,181)	22 (559)	2 (51)	1 (25)	10,000	1,958 (7,411)	6,190 (2,808)	22,530 (10,220)
RL-24F (B)	159-3/8 (4,048)	54 (1,372)	56-1/8 (1,426)	49-1/4 (1,251)	72 (1,829)	93-1/2 (2,375)	24 (610)	2 (51)	1 (25)	11,700	2,463 (9,322)	7,465 (3,386)	28,020 (12,710)

MODEL NUMBER	L	M	N	Weights of Brackets
RL-3FB	13-3/8 (340)	14 (356)	2 (51)	9 (4)
RL-4FB	15-3/8 (391)	16-1/8 (410)	2 (51)	9 (4)
RL-5FB	18-1/2 (470)	19-3/8 (492)	2 (51)	9 (4)
RL-6FB	22-1/8 (562)	21-3/8 (543)	2 (51)	9 (4)
RL-8FB	26 (660)	29-1/2 (749)	2 (51)	29 (13)
RL-10FB	31-5/8 (803)	35-1/2 (902)	2 (51)	29 (13)
RL-12FB	37-5/8 (956)	41-1/2 (1,054)	2 (51)	32 (15)
RL-14FB	46 (1,168)	48-1/2 (1,232)	3 (76)	56 (25)
RL-16FB	52 (1,321)	54-1/2 (1,384)	3 (76)	56 (25)
RL-18FB	61-5/8 (1,565)	60-5/8 (1,540)	3 (76)	63 (29)
RL-20FB	68 (1,727)	66-3/4 (1,695)	4 (102)	78 (35)
RL-22FB	73-5/8 (1,870)	72-3/4 (1,848)	4 (102)	78 (35)
RL-24FB	80(2,032)	79 (2,007)	4 (102)	98 (44)

SUPPORT NOTES:

- Model "R" Rolairtrol Air Separators have strainers which must be removed and cleaned after 24 hours operation, 30 days operation and as required to maintain proper system air separation. Before installing the model "R" Rolairtrol, refer to (K) in the dimensions and weights table, which notes minimum distances to be maintained between the blowdown connection and the floor or other equipment for strainer removal.
- Rolairtrol sizes through an "R8" or "RL8" can be supported in the piping system as long as pipe hangers are attached to the tangential nozzles as close to the Rolairtrol shell as possible. Sizes larger than an "R8" or "RL8" will need to have additional supports such as a cradle under the Rolairtrol acting on a diameter as close to the Rolairtrol outside diameter as possible, or factory installed clips welded to the shell for overhead hanging, or floor mount support.
- Lifting lugs are for the transportation and installation of the empty vessel, and are not to be used for complete or partial support of the flood vessel.
- The RL skirt can support flooded vessel weight, but an R model bottom flange (strainer housing) cannot support the flooded weight of the vessel.
- Welding to the pressure vessel boundary will void the ASME stamp.

MODEL NUMBERING

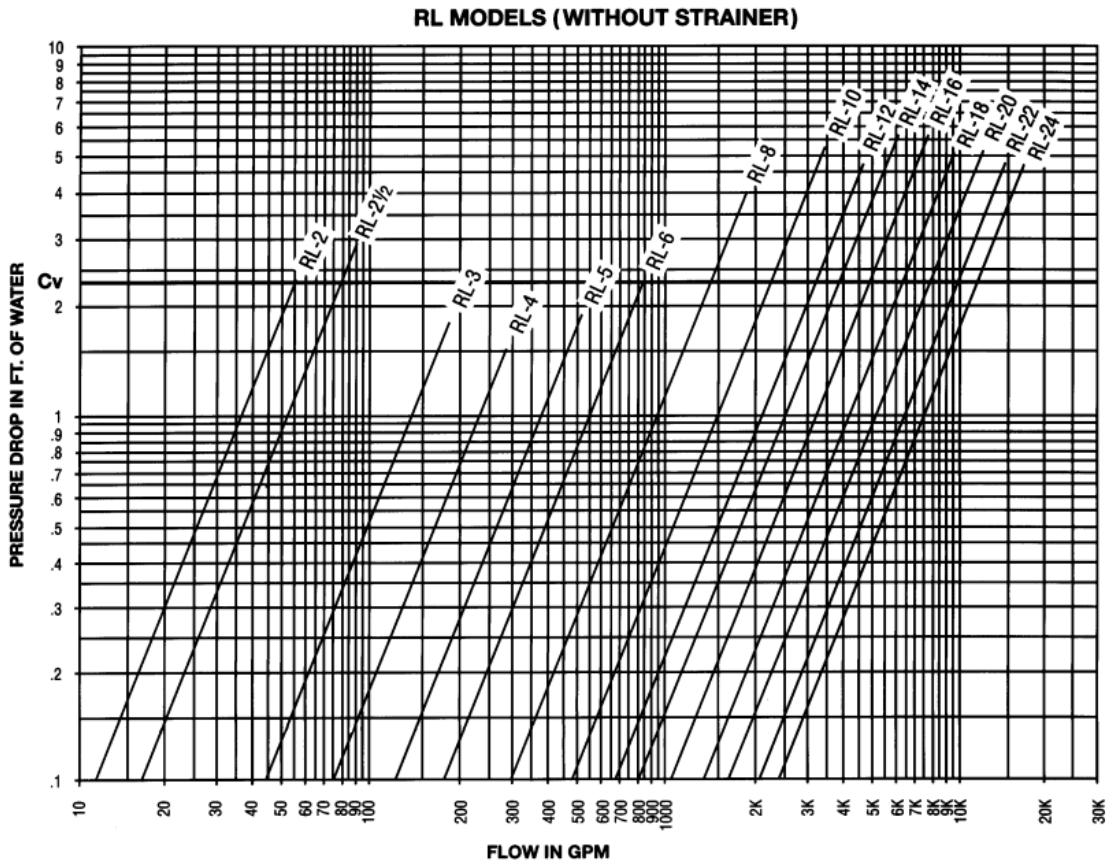


Component Cut Sheets – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660

ROLAIRTROL - Flanged Less Strainer

A-326.2  
Page 3



**TYPICAL ROLAIRTROL SPECIFICATIONS**

Furnish and install, as shown on plans, a centrifugal type air separator. The unit shall have \_\_\_\_" inlet and outlet flanged connections tangential to the vessel shell. The unit shall have an internal stainless steel air collector tube with 5/32" (4mm) diameter perforations and 63 percent open area designed to direct accumulated air to the compression tank (air control system) or air vent (air elimination system) via an NPT vent connection at top of unit.

A blowdown connection shall be provided to facilitate routine cleaning of the strainer and the separator. Specify B&G Model MBV- 1 Rolairtrol accessory for manual blowdown. Manufacturer to furnish data sheet specifying air collection efficiency and pressure drop at rated flow.

Vessel shell diameter to be three times the nominal inlet/outlet pipe diameter, with a minimum vessel volume for sufficient velocity reduction.

The air separator must be designed, constructed and stamped for 125 psig @ 350°F (862 kPa @ 177°C) in accordance with Section VIII, Division I of the ASME Boiler and Pressure Vessel Code, and registered with the National Board of Boiler and Pressure Vessel Inspectors. The air separator(s) shall be painted with one shop coat of light gray air dry enamel.

A manufacturer's Data Report for Pressure Vessels, Form U-1 as required by the provisions of the ASME Boiler and Pressure Vessel Code, shall be furnished for each air separator upon request.

Each air separator shall be ITT Bell & Gossett Model No. \_\_\_\_\_ Rolairtrol Air Separator for \_\_\_\_\_ GPM ( \_\_\_\_\_ m<sup>3</sup>), Shell Dia. \_\_\_\_\_" ( \_\_\_\_\_ mm)and Min. Vessel Volume \_\_\_\_\_ Gal ( \_\_\_\_\_ liters).

Refer to submittal A-329 for information on the MBV-1 manual blowdown valve.



**Bell & Gossett**

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



**Component Cut Sheets – System Completion Module**  
 Item: A1 Qty: 1 Tag(s): EI-8660



FILE NO: 36.511  
 DATE: July 9, 2008  
 SUPERSEDES: 36.511  
 DATE: July 21, 2004

**ARMflo Circuit Balancing Valves**

CBV-VS Solder Style, CBV-VT NPT Threaded, CBV-VB BSP Threaded

**SUBMITTAL**

JOB:	REPRESENTATIVE:	
ENGINEER:	ORDER NO:	DATE:
CONTRACTOR:	SUBMITTED BY:	DATE:
	APPROVED BY:	DATE:

MODEL NUMBER	QTY REQ'D	IDENTIFICATION	MODEL NUMBER	QTY REQ'D	IDENTIFICATION

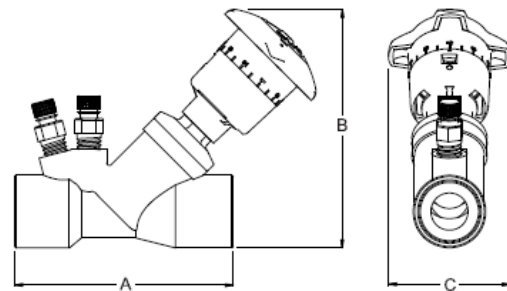
TECHNICAL DATA	
Connection	Model CBV-VS - Solder Joint Model CBV-VT - Threaded NPT Model CBV-VB - Threaded BSP
Maximum Working Pressure	300 psi / 20 bar (PN20)
Operating Temperature Range	-4°F to 300°F (-20°C to 150°C)

MATERIALS OF CONSTRUCTION	
Body, Bonnet	Brass alloy CW617
Stem and Disk	Brass alloy B16
Elastomers	EPDM
Handwheel	Reinforced Nylon; ABS

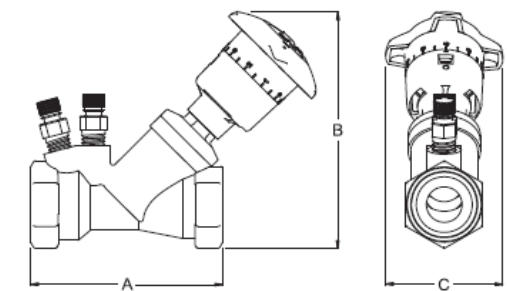
DIMENSIONS and WEIGHTS					
Pipe Size	Model	A	B	C	Weight
<b>Solder Joint Connection</b>					
½" (DN15)	CBV050VS-LF	3.19 (81)	4.56 (116)	2.76 (70)	1.05 (0.48)
	CBV050VS				
¾" (DN20)	CBV075VS-LF	3.64 (93)	4.65 (118)	2.76 (70)	1.09 (0.49)
	CBV075VS				
1" (DN25)	CBV100VS	4.26 (108)	4.95 (126)	2.76 (70)	1.68 (0.76)
1¼" (DN32)	CBV125VS	4.94 (125)	5.40 (137)	2.76 (70)	2.26 (1.03)
1½" (DN40)	CBV150VS	5.67 (144)	5.60 (142)	2.76 (70)	3.22 (1.46)
2" (DN50)	CBV200VS	7.03 (179)	6.36 (162)	2.76 (70)	5.40 (2.45)
<b>Threaded Connection</b>					
½" (DN15)	CBV050VT-LF / VB-LF	2.99 (76)	4.60 (117)	2.76 (70)	1.07 (0.49)
	CBV050VT / VB				
¾" (DN20)	CBV075VT-LF / VB-LF	3.26 (83)	4.90 (125)	2.76 (70)	1.21 (0.55)
	CBV075VT / VB				
1" (DN25)	CBV100VT / VB	3.80 (97)	5.29 (135)	2.76 (70)	1.86 (0.84)
1¼" (DN32)	CBV125VT / VB	4.32 (110)	5.60 (143)	2.76 (70)	2.34 (1.06)
1½" (DN40)	CBV150VT / VB	5.07 (129)	5.90 (150)	2.76 (70)	3.49 (1.59)
2" (DN50)	CBV200VT / VB	6.00 (153)	6.68 (170)	2.76 (70)	5.97 (2.46)

Note: All dimensions are in inches (mm) and weights in lbs (kg)

**MODEL: CBV-VS ½" - 2" (DN15 - DN50)**



**MODEL: CBV-VT / CBV-VB ½" - 2" (DN15 - DN50)**



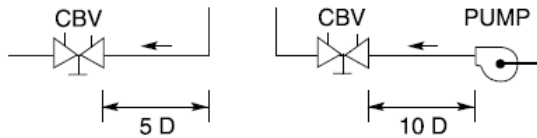
**Component Cut Sheets – System Completion Module**

Item: A1 Qty: 1 Tag(s): EI-8660



**INSTALLATION**

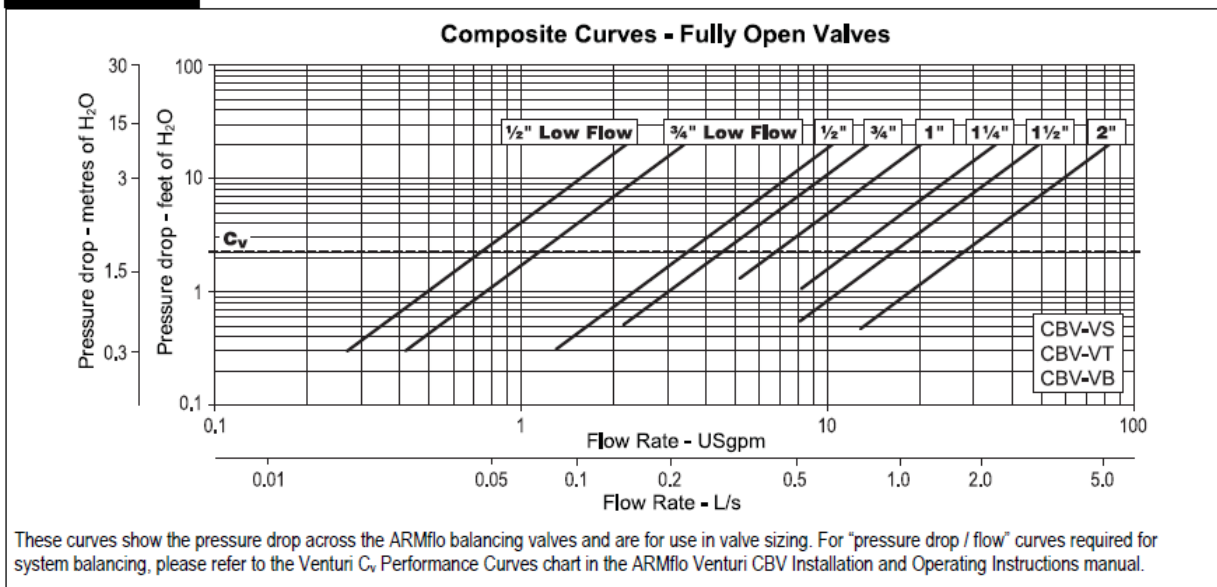
Locate the valve 5 pipe diameters downstream from a fitting. If a balancing valve is located downstream from a circulation pump, allow a distance of 10 pipe diameters between the pump and balancing valves (as illustrated).



**NOTES:**

1. Solder Style Models - Valve body must be opened at least one full turn prior to being soldered in the line.
2. For valve sizing, refer to CBV range chart, which shows the recommended operation range (dP and flow) for each valve size. For balancing, use Venturi  $C_v$  curves or slide rule, which display pressure drop across the Venturi at different flow rates.
3. Suggested differential pressure meters for use with Armstrong CBV's are DPM-15 and DPM-100 digital differential pressure meters and CBDM-135/60 and CBDM-200 analogue meters.
4. All valves furnished with probe metering ports.

**RANGE CHART**



**FLOW RATE RANGES**

Valve Size	Min. Flow	Max. Flow
1/2" Low Flow	0.26 (0.016)	2.2 (0.14)
3/4" Low Flow	0.40 (0.025)	3.4 (0.21)
1/2"	1.4 (0.086)	10.4 (0.66)
3/4"	2.1 (0.13)	13.5 (0.85)
1"	5.2 (0.33)	20.2 (1.28)
1 1/4"	8.2 (0.52)	35.5 (2.24)
1 1/2"	8.1 (0.51)	48.9 (3.09)
2"	14.0 (0.88)	83.3 (5.25)

Note: Flow in USgpm (L/s)

*Consult your local ARMSTRONG representative for literature corresponding to valves with "CR" in the model name or embossed on the valve body.*

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**Component Cut Sheets – System Completion Module**  
 Item: A1 Qty: 1 Tag(s): EI-8660



SINCE 1908  
**wessels**  
 company

SUBMITTAL

**NLAP-SERIES**  
 HYDRONIC EXPANSION TANKS

Models: NLAP-40 thru NLAP-1100

Submittal Sheet No. A-1005B

Date: 4/16

Job Name	Submitted By	Date
Location	Approved By	Date
Engineer	Order No.	Date
Contractor	Notes	
Sales Rep.		

**Description**

Wessels NLAP Tanks are ASME removable bladder type pre-charged expansion tanks. They are designed to absorb the expansion forces and control the pressure in heating/cooling systems. The system's expanded water (fully compatible with water/glycol mixtures) is contained in a full acceptance heavy-duty butyl bladder that prevents tank corrosion and waterlogging problems. All NLAP expansion tanks can be installed vertically or horizontally.

**Construction**

Shell: Carbon Steel  
 Bladder: Heavy Duty Butyl  
 System Connection: Carbon Steel

**Performance Limitations**

Maximum Design Temperature: 240°F  
 Maximum Design Pressure: 125 PSIG\*

\*200 & 250 PSIG available

Model Number	Part Number	Tank Volume (Gallons)	Tagging Information	Quantity
NLAP-40	22510040	11		
NLAP-60	22510060	15		
NLAP-100	22510100	25		
NLAP-150	22510150	39		
NLAP-220	22510220	58		
NLAP-325	22510325	85		
NLAP-400	22510400	104		
<b>NLAP-560</b>	<b>22510560</b>	<b>147</b>		
NLAP-600	22510600	158		
NLAP-700	22510700	185		
NLAP-815	22510815	215		
NLAP-950	22510950	250		
NLAP-1100	22511100	290		

**Typical Specification**

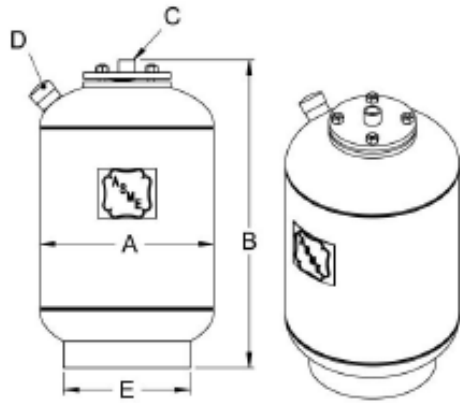
Furnish and install, as shown on plans, a 147 gallon 30" diameter X 53" (high) pre-charged steel expansion tank with heavy-duty butyl bladder. The tank shall have NPT system connections and a 0.302"-32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements. The tank shall be fitted with lifting rings and a floor mounting skirt for vertical installation. The tank must be constructed in accordance with most recent addendum of Section VIII Division 1 of the ASME Boiler and Pressure Vessel Code.

Each tank shall be Wessels model number NLAP-560 or approved equal.

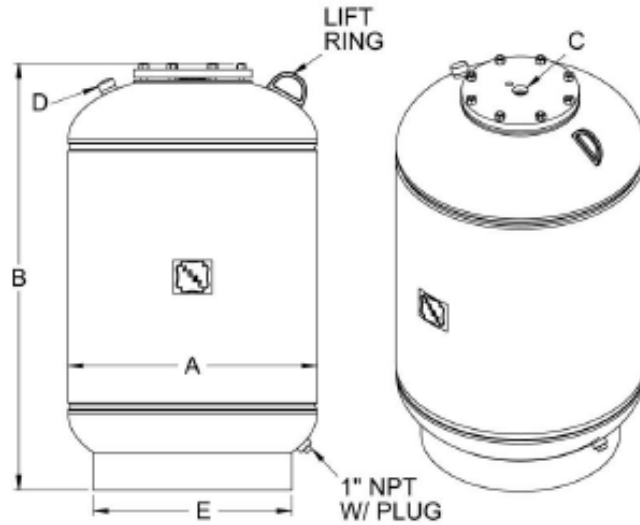
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Component Cut Sheets – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660



NLAP 40 & NLAP 60



NLAP 100 thru NLAP 1100

Dimensions & Weights

Model Number	Dimensions in Inches					Approx. Ship Wt. (lbs)
	A	B	System Connection	Charging Valve	E	
			C	D		
NLAP-40	12	27	3/4	0.302" -32NC	10	42
NLAP-60	14	26			10	52
NLAP-100	16	32	1	0.302" -32NC	11	77
NLAP-150		48 1/2			16	115
NLAP-220	20	50 1/2	1 1/2	0.302" -32NC	20	170
NLAP-325	24				57 1/2	20
NLAP-400		30	53	1 1/2	0.302" -32NC	24
NLAP-560	58					325
NLAP-600	36	66	1 1/2	0.302" -32NC	30	350
NLAP-700		58				400
NLAP-815	36	66	1 1/2	0.302" -32NC	30	475
NLAP-950		75				540
NLAP-1100		75				625

Notes

- Tanks are factory pre-charged at 12 psi and field adjustable.
- California code-sight glass is available upon request.
- Available with mounting clips.

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 Item: A1 Qty: 1 Tag(s): EI-8660



SINCE 1908  
**wessels**  
 company

SUBMITTAL

**SS-CPBF-SERIES**

STAINLESS CHEMICAL POT FEEDER TANK

Models: SS-CPBF-2 & SS-CPBF-5  
 Submittal Sheet No. K-1004C

Date: 4/23

Job Name		Submitted By		Date	
Location		Approved By		Date	
Engineer		Order No.		Date	
Contractor		Notes			
Sales Rep.					

**Description**

Wessels SS-CPBF series chemical pot feeder bag filtration bypass tanks are designed for reliable induction of chemical treatment while providing superior filtration in a closed loop HVAC system. Typically used in hydronic and process piping systems, SS-CPBF vessels support industry standard #1 or #2 filter bags (sold separately). With all stainless steel hardware, the swing-bolt closure provides easy access to the required micron filter bag. The bag's positive pressure integrity is held by a device mounted internally. 5 or 2 gallon capacity available with 2" flanged or NPT connections. Compatible with WesMag® Magnetic Filtration elements.

**Construction**

304-Stainless Steel  
 316L Stainless steel filter bag support bracket  
 Interior and exterior surfaces are passivated for enhanced corrosion protection

**Performance Limitations**

Maximum Design Temperature: 300°F  
 Maximum Design Pressure: 150 PSIG  
 1µ to 100µ size #1 or #2 bag (sold separately)

**Available Options**

WesMag® Magnetic Filtration

Model Number	Part Number	Volume (Gallons)	Tagging Information	Quantity
SS-CPBF-2	7048639	2		
SS-CPBF-5	7048629	5		
SS-CPBF-2F	7048640	2		
SS-CPBF-5F	7048630	5		

**Typical Specification**

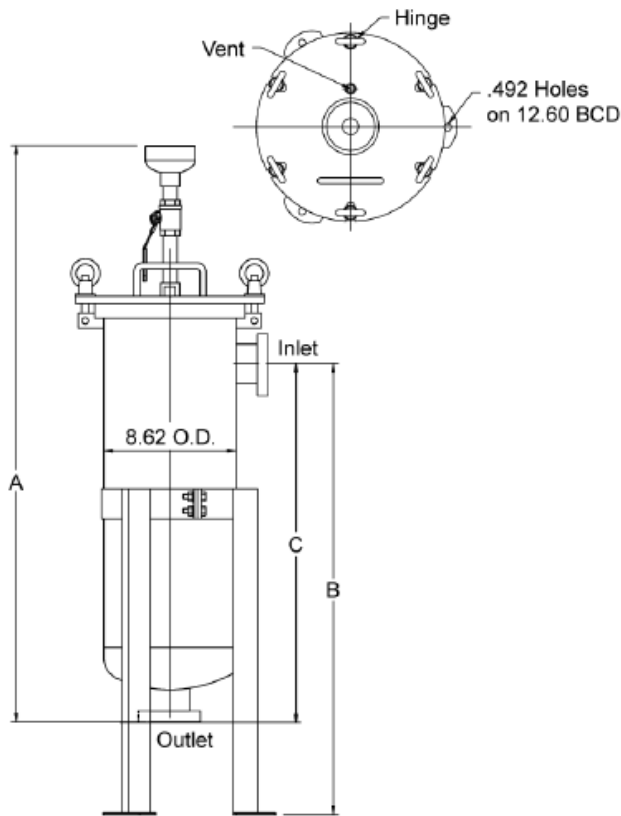
Furnish and install, as indicated on the plans and specifications, a 5 gallon chemical pot feeder bag filter bypass tank. The vessel shall incorporate a chemical fill basin with a minimum dimension of 6" to help facilitate complete introduction of required solutions. The vessel shall be constructed for 150 psi working pressure and 300°F. Vessels are designed to accommodate common industrial filter bag sizes #1 and #2. The SS-CPBF shall be equipped with a 25 µ filter bag (sold separately).

Each tank shall be model SS-CPBF-5F as manufactured by Wessels Company or approved equal. SS-CPBF vessels are also available with WesMag® Magnetic Filtration elements.

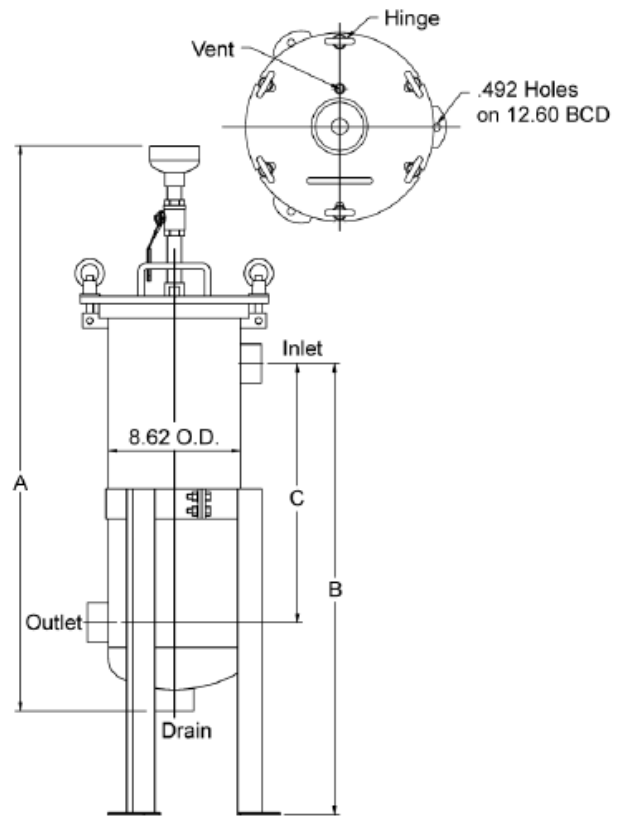
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**Component Cut Sheets – System Completion Module**

Item: A1 Qty: 1 Tag(s): EI-8660



SS-CPBF-F Flanged



SS-CPBF NPT

**Dimensions & Weights**

Model Number	Connection Size (Inches)	Connection Type (Flange/NPT)	Bag Size	Dimensions in Inches			Shipping Weight (lbs.)
				A	B	C	
SS-CPBF-2	2	NPT	#1	37 1/4	26-33	16 1/4	64
SS-CPBF-5	2	NPT	#2	51	37-52	30	82
SS-CPBF-2F	2	Flange	#1	37 1/2	27-36	24	82
<b>SS-CPBF-5F</b>	<b>2</b>	<b>Flange</b>	<b>#2</b>	<b>51</b>	<b>38-55</b>	<b>37 3/4</b>	<b>100</b>

**Notes**

- Compatible with WesMag® Magnetic Filtration elements.

**Component Cut Sheets – System Completion Module**

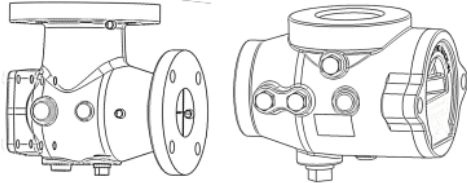
Item: A1 Qty: 1 Tag(s): EI-8660



**SUBMITTAL**

**B-826**

<b>JOB:</b>	<b>REPRESENTATIVE:</b>	
<b>UNIT TAG:</b>	<b>ORDER NO.</b>	<b>DATE:</b>
<b>ENGINEER:</b>	<b>SUBMITTED BY:</b>	<b>DATE:</b>
<b>CONTRACTOR:</b>	<b>APPROVED BY:</b>	<b>DATE:</b>



## B&G Suction Diffuser Plus

### Centrifugal Pump Accessories

**DESCRIPTION**

The Bell & Gossett Suction Diffuser Plus is designed for direct application to the pump suction and provides ideal flow conditions for the pump, providing NPSH requirements are met. Its integrated Flow Cone directs flow through the unit and into the pump suction while working with the full length straightening vanes to create a more uniform flow profile. The orifice cylinder has a free area equal to five times the cross section of the pump suction opening and serves as a coarse strainer to protect the pump from large sediment. The disposable start-up strainer helps to clean the system during the first 24-48 hours of operation before it is removed. Its optional pressure temperature ports allow you to verify that the start-up strainer has been removed without the need to take the unit apart.

**MATERIALS OF CONSTRUCTION**

Type	Body	Inlet Vanes	Orifice Cylinder	Start-Up Strainer
X	Cast Iron	Steel		16 Mesh Bronze
Z	Cast Iron	Stainless Steel		16 Mesh Bronze

**NOTES:** Type X-For Closed Systems.  
Type Z-For Domestic Water and Tower Systems.

**OPERATING DATA**

Operating Temperature: 250°F (121°C)  
Working Pressure: 175 psi (1,207 kPa)

**SCHEDULE**

MODEL NUMBER	DIMENSIONS INCHES (mm)				TAGGING INFORMATION	X QUANTITY	Z QUANTITY
	SYSTEM SIDE		PUMP SIDE				
BA-3X/BA-3Z	2 (50.8)	FPT	1-1/2 (38.1)	FPT			
BB-3X/BB-3Z	2 (50.8)	FPT	2 (50.8)	FPT			
CB-3X/CB-3Z	2-1/2 (63.5)	FPT	2 (50.8)	FPT			
CC-3X/CC-3Z	2-1/2 (63.5)	FLG	2-1/2 (63.5)	FLG			
DA-3X/DA-3Z	3 (76.2)	FPT	1-1/2 (38.1)	FPT			
DB-3X/DB-3Z	3 (76.2)	FPT	2 (50.8)	FPT			
DC-3X/DC-3Z	3 (76.2)	FLG	2-1/2 (63.5)	FLG			
DD-3X/DD-3Z	3 (76.2)	FLG	3 (76.2)	FLG			
EC-3X/EC-3Z	4 (101.6)	FLG	2-1/2 (63.5)	FLG			
ED-3X/ED-3Z	4 (101.6)	FLG	3 (76.2)	FLG			
EE-3X/EE-3Z	4 (101.6)	FLG	4 (101.6)	FLG			
FE-3X/FE-3Z	5 (127)	FLG	4 (101.6)	FLG			
FF-3X/FF-3Z	5 (127)	FLG	5 (127)	FLG			
<b>GE-3X/GE-3Z</b>	<b>6 (152.4)</b>	<b>FLG</b>	<b>4 (101.6)</b>	<b>FLG</b>			
GF-3X/GF-3Z	6 (152.4)	FLG	5 (127)	FLG			
GG-3X/GG-3Z	6 (152.4)	FLG	6 (152.4)	FLG			
HG-3X/HG-3Z	8 (203.2)	FLG	6 (152.4)	FLG			
HH-3X/HH-3Z	8 (203.2)	FLG	8 (203.2)	FLG			
JH-3X/JH-3Z	10 (254)	FLG	8 (203.2)	FLG			
JJ-3X/JJ-3Z	10 (254)	FLG	10 (254)	FLG			

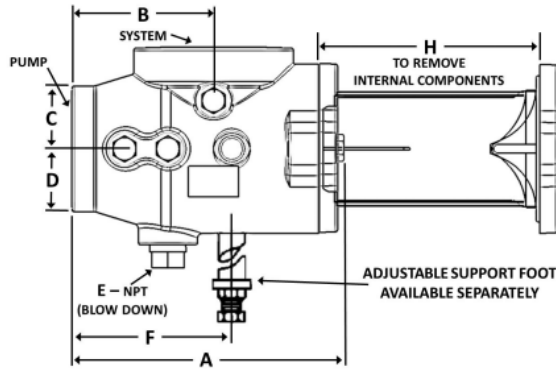


**Component Cut Sheets – System Completion Module**

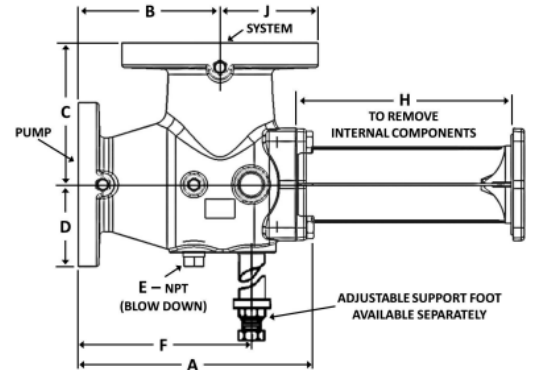
Item: A1 Qty: 1 Tag(s): EI-8660

**SUCTION DIFFUSER PLUS**

**B-826**



**Threaded x Threaded Models**



**Flange x Flange Models**

**DIMENSIONS – INCHES (mm)**

Model No.	System Side	Pump Side	A	B	C	D	E	F	G	H	J	Orifice Cylinder Free Area in <sup>2</sup> (cm <sup>2</sup> )	Approx. Shpg. Wt. Lbs. (Kg)
BA-3	2 (50.8) T	1-1/2 (38.1) T	5.96 (151)	3 (76)	2.25 (57)	2.37 (60)	3/4 (19)	3.81 (97)	5.25 (133)	5.15 (130.8)	N/A	11 (71)	13 (6)
BB-3	2 (50.8) T	2 (50.8) T	7.56 (192)	3.87 (98)	2.75 (70)	2.75 (70)	3/4 (19)	4.38 (111)	5.75 (146)	6.75 (171.5)	N/A	20-1/2 (132)	14 (6)
CB-3	2-1/2 (63.5) T	2 (63.5) T	7.56 (192)	3.87 (98)	2.75 (70)	2.75 (70)	3/4 (19)	4.38 (111)	5.75 (146)	6.75 (171.5)	N/A	20-1/2 (132)	16 (7)
CC-3	2-1/2 (63.5) F	2-1/2 (63.5) F	8.44 (214)	4.75 (121)	4.75 (121)	3.5 (89)	3/4 (19)	5.77 (147)	N/A	7.63 (193.7)	3.5 (89)	26 (168)	36 (16)
DA-3	3 (76.2) T	1-1/2 (38.1) T	7.44 (189)	3.87 (98)	2.75 (70)	2.75 (70)	3/4 (19)	4.38 (111)	5.75 (146)	6.63 (168.3)	N/A	20-1/2 (132)	17 (8)
DB-3	3 (76.2) T	2 (50.8) T	7.56 (192)	3.87 (98)	2.75 (70)	2.75 (70)	3/4 (19)	4.38 (111)	5.75 (146)	6.75 (171.5)	N/A	20-1/2 (132)	17 (8)
DC-3	3 (76.2) F	2-1/2 (63.5) F	8.75 (222)	5 (127)	5 (127)	3.50 (89)	3/4 (19)	5.77 (147)	N/A	7.63 (193.7)	3.75 (95)	26 (168)	44 (20)
DD-3	3 (76.2) F	3 (76.2) F	9.56 (243)	5.50 (140)	5.50 (140)	3.75 (95)	3/4 (19)	7.0 (178)	N/A	8.75 (222.3)	3.75 (95)	37-1/2 (242)	48 (22)
EC-3	4 (101.6) F	2-1/2 (63.5) F	11 (279)	6.50 (165)	6.50 (165)	3.50 (95)	3/4 (19)	5.77 (147)	N/A	7.63 (193.7)	4.50 (114)	26 (168)	42 (19)
ED-3	4 (101.6) F	3 (76.2) F	11 (279.4)	6.50 (165)	6.50 (165)	3.75 (95)	3/4 (19)	7.93 (201)	N/A	10 (254)	4.5 (114)	37-1/2 (242)	55 (25)
EE-3	4 (101.6) F	4 (101.6) F	11.5 (292)	6.50 (165)	6.50 (165)	4.50 (114)	3/4 (19)	7.87 (200)	N/A	10.69 (271.5)	4.50 (114)	65 (419)	72 (33)
FE-3	5 (127) F	4 (101.6) F	12.5 (318)	7.50 (191)	7.50 (191)	4.50 (114)	3/4 (19)	7.87 (200)	N/A	10.69 (271.5)	5 (127)	65 (419)	84 (38)
FF-3	5 (127) F	5 (127) F	13.67 (347)	7.50 (191)	7.50 (191)	5 (127)	3/4 (19)	10.44 (265)	N/A	12.84 (326.1)	5 (127)	90 (581)	100 (45)
GE-3	6 (152.4) F	4 (101.6) F	13.5 (343)	8 (203)	8 (203)	4.50 (114)	3/4 (19)	7.87 (200)	N/A	10.69 (271.5)	5.50 (140)	65 (419)	90 (41)
GF-3	6 (152.4) F	5 (127) F	15.67 (398)	8 (203)	8 (203)	5 (127)	3/4 (19)	10.46 (266)	N/A	13.84 (351.5)	5.50 (140)	90 (581)	105 (48)
GG-3	6 (152.4) F	6 (152.4) F	15.82 (402)	8 (203)	8 (203)	5.50 (140)	3/4 (19)	11 (279)	N/A	14.75 (374.7)	5.50 (140)	127 (819)	134 (61)
HG-3	8 (203.2) F	6 (152.4) F	15.82 (402)	9 (229)	9 (229)	5.50 (140)	3/4 (19)	11 (279)	N/A	14.75 (374.7)	6.75 (171)	127 (819)	150 (68)
HH-3	8 (203.2) F	8 (203.2) F	19.55 (497)	9 (229)	9 (229)	6.75 (171)	3/4 (19)	12.62 (321)	N/A	18.25 (463.6)	6.75 (171)	218 (1406)	250 (113)
JH-3	10 (254) F	8 (203.2) F	19.55 (497)	10 (254)	11 (279)	6.75 (171)	3/4 (19)	12.62 (321)	N/A	18.25 (463.6)	8 (203)	218 (1406)	290 (132)
JJ-3	10 (254) F	10 (254) F	22.80 (579)	11 (279)	11 (279)	8 (203)	3/4 (19)	15.68 (398)	N/A	21.50 (546.1)	8 (203)	338 (2180)	415 (188)

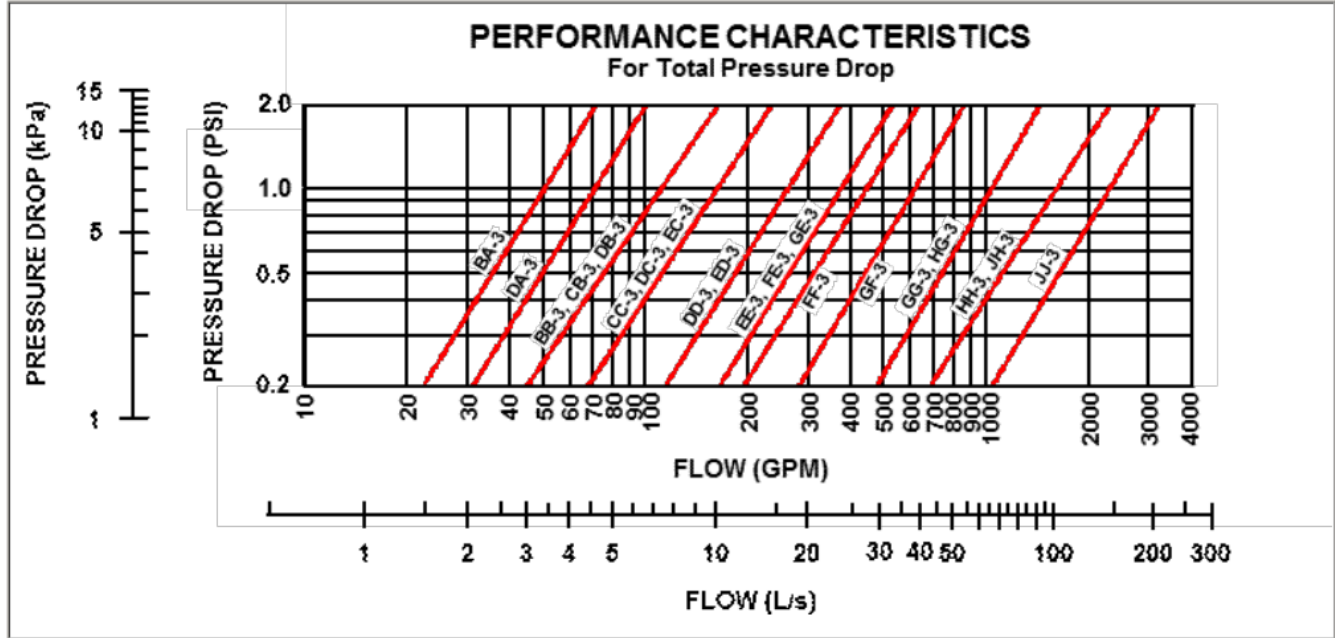
(T) Threaded - FPT (F) Flanged \*Dimensions include orifice cylinder + 2-1/2 (64) inch clearance. Dimensions are subject to change. Not to be used for construction purposes unless certified.

Component Cut Sheets – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660

SUCTION DIFFUSER PLUS

B-826



**TYPICAL SPECIFICATIONS**

Provide with each pump a Bell & Gossett Suction Diffuser Plus of the size noted on drawings. Units shall consist of angle type body, flanged system connection, integrated Flow Cone, carbon/stainless steel straightening vane and combination diffuser-strainer-orifice cylinder with 3/16" diameter openings for pump protection. The unit shall include a disposable fine mesh strainer which shall be removed after system start-up. Unit shall have pressure/temperature ports at the suction and discharge to allow for measurement of differential pressure across the unit.

Orifice cylinder shall be designed to withstand pressure differential equal to pump shut-off head (maximum \_\_\_\_\_ PSI) and shall have a free area equal to five times cross section area of pump suction opening. Vane length shall be no less than 2-1/2 times the pump connection diameter. Unit shall be provided with adjustable support foot to carry the weight of suction piping.

Unit shall be rated for 175 psi (1,207kPa) maximum working pressure and 250F (121C) maximum working temperature.

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8200 N. Austin Avenue  
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Fax: (847)965-8379  
www.bellgossett.com



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Component Cut Sheets – System Completion Module  
 Item: A1 Qty: 1 Tag(s): EI-8660

10/17



## Style A-7

Y-Strainer

Cast Iron (ASTM A 126, Class B)

125 lb. & 250 lb. Flanged



## Cast Iron Y-Strainer

### APPLICATIONS

Steam, water, oil or gas where protection from foreign matter in a pipeline is required.

### CONSTRUCTION

The Keckley Style A-7 strainers 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

The Keckley Style A-7 strainer features a machined groove in both the body and cover for proper screen alignment and to ensure accurate reseating when servicing is required. Style A-7 strainers are furnished with a synthetic fiber that is compressed between the body and cover for maximum strength and durability. Keckley Style A-7 strainers, sizes 2" - 12", are supplied with 1/4" NPT DP taps.

### SCREENS

Standard perforated 304 stainless steel screens are spot welded along the seam for maximum strength. Different size perforations and meshes are available in stainless steel, monel, and brass to meet specific media requirements. If the media is not indicated, screens for *water* will be supplied.

### SELF CLEANING

Self cleaning is accomplished by opening the valve or drain plug connected to the blow-off port. **Warning:** See Maintenance Instructions on page S6 of the Strainer Information Section for additional precautions and detailed information on servicing the strainer.

### WORKING PRESSURES - NON SHOCK

NOM. RATING	MEDIA	2" to 12"	50 mm to 300 mm	
125# F.F. & D. (STANDARD FLANGE)	STEAM	125 PSI @ 450°F	862 KPa @ 232°C	
	W.O.G.	200 PSI @ 150°F	1379 KPa @ 66°C	
	<b>MEDIA 14" and UP</b>	<b>14" and UP</b>	<b>350 mm and UP</b>	
	STEAM	100 PSI @ 353°F	690 KPa @ 178°C	
250# R.F. & D. (EX. HEAVY FLANGE)	W.O.G.	150 PSI @ 150°F	1035 KPa @ 66°C	
	<b>NOM. RATING</b>	<b>MEDIA</b>	<b>2" to 12"</b>	
	250# R.F. & D. (EX. HEAVY FLANGE)	STEAM	250 PSI @ 450°F	1724 KPa @ 232°C
	W.O.G.	500 PSI @ 150°F	3449 KPa @ 66°C	

### GOVERNMENT/MILITARY SPECIFICATIONS

Style A-7 cast iron flanged strainers meet or exceed government specification WW-S-2739 (Supersedes MIL-S-16293).

**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

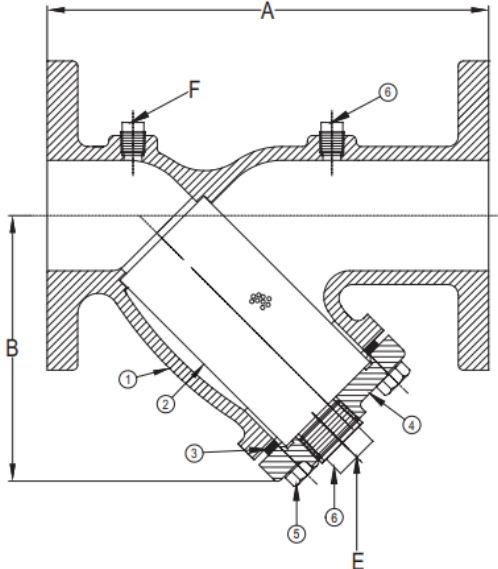
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**TECHNICAL DATA**  
**DIMENSIONS AND WEIGHTS**

# Style A-7

**Y-Strainer, 125 lb. & 250 lb. Flanged Cast Iron (ASTM A 126, Class B)**



"F" dimension is 1/4" NPT for sizes 2" - 12" only.

PARTS LIST		
ITEM	DESCRIPTION	MATERIAL
1	Body	Cast Iron (ASTM A 126, Class B)
2	Screen	Stainless Steel (304)
3	Gasket	Composition
4	Cover	Cast Iron (ASTM A 126, Class B)
5	Hex Head Cap Screw	Steel
6	Plug	Steel

SIZE		STANDARD SCREENS SUPPLIED						
in	mm	SCREEN GAGE	FOR STEAM		FOR LIQUID		OPEN AREA	
			in	mm	in	mm		
2 to 4	50 to 100	28	3/64	1.2	33%	1/16	1.6	30%
5 to 10	125 to 250	24	3/64	1.2	33%	1/8	3.2	43%
12	300	24	1/16	1.6	30%	1/8	3.2	43%
14 & up	350 & UP	20	1/8	3.2	43%	1/8	3.2	43%

Standard screens supplied are for **liquid service**, unless otherwise specified.  
 Options: Other perforations, meshes, and screen materials are available.

SIZE		DIMENSIONS										WEIGHTS					
		A				B				E		125#		250#			
		125#	250#	125#	250#	125#	250#	125#	250#	lbs	kgs	lbs	kgs				
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	lbs	kgs	lbs	kgs
2	50	7-7/8	200	9-5/16	237	5-1/16	129	6-1/4	159	1/2	15	1/2	15	17	8	33	15
2-1/2	65	10	254	11-1/16	281	6-1/8	156	7-3/4	197	1	25	1	25	24	11	49	22
3	80	10-1/8	257	12-5/8	321	6-9/16	167	8-1/4	210	1	25	1	25	31	14	57	26
4	100	12-1/8	308	15-5/8	397	8-1/16	205	10-1/8	257	1-1/2	40	1-1/4	32	50	23	106	48
5	125	15-5/8	397	18-1/4	464	11	278	12-1/2	318	2	50	1-1/4	32	86	39	157	71
6	150	18-1/2	470	20-3/16	512	12-5/8	322	14-3/8	365	2	50	1-1/2	40	114	52	215	98
8	200	21-5/8	549	25-1/8	638	15-5/8	396	17-1/2	445	2	50	1-1/2	40	203	92	315	143
10	250	25-3/4	654	29-1/8	739	17-3/4	451	21	533	2	50	2	50	293	133	525	238
12	300	29-7/8	759	33-3/4	857	21-5/16	542	23-5/8	600	2	50	2	50	489	222	700	318
14	350	33-1/4	846	37-1/4	946	26-3/4	680	27-1/8	689	2	50	2	50	772	350	1400	635
16	400	38-3/4	984	42-3/8	1076	30-1/8	765	29-1/4	743	2	50	2	50	994	451	1850	839
18	450	43-1/2	1105	--	--	33-1/4	845	--	--	2	50	--	--	1379	626	--	--
20	500	49-1/2	1257	--	--	39-1/4	997	--	--	2	50	--	--	1652	750	--	--
24	600	55-13/16	1418	--	--	41	1041	--	--	2	50	--	--	3400	1542	--	--

Certified dimensional drawings are available upon request.

†This table reflects only the nearest metric equivalents.

FLOW COEFFICIENTS							
Size	C <sub>v</sub>	Size	C <sub>v</sub>	Size	C <sub>v</sub>	Size	C <sub>v</sub>
2"	62	5"	364	12"	2261	20"	8064
2 1/2"	98	6"	585	14"	3479	(Reflects 125 lb. castings only)	
3"	155	8"	942	16"	5060		
4"	269	10"	1572	18"	6008		

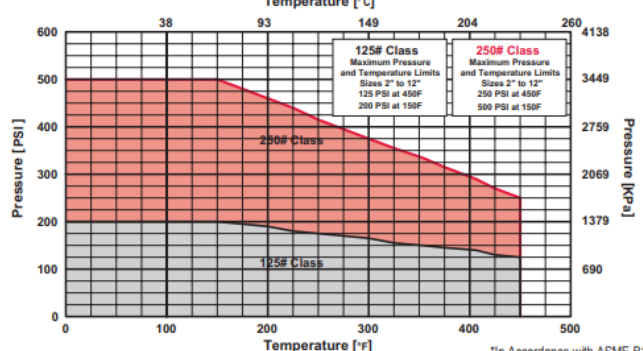
TOTAL SCREEN AREA							
Size	(in <sup>2</sup> )	Size	(in <sup>2</sup> )	Size	(in <sup>2</sup> )	Size	(in <sup>2</sup> )
2"	28.84	5"	143.94	12"	596.07	20"	2947.1
2 1/2"	45.47	6"	237.76	14"	1175.30	(Reflects 125 lb. castings only)	
3"	54.68	8"	345.30	16"	1471.34		
4"	91.12	10"	537.30	18"	2381.54		

\*See DETERMINING RATIOS on page S5 of the Strainer Information Section for calculating NET FREE AREA of the screen to inside pipe area.

### PRESSURE vs. TEMPERATURE CHART

125# & 250# Flanged Cast Iron (ASTM A 126, Class B)

Suitable for use with pipe sizes up to 12"



\*In Accordance with ASME B16.1

**Component Cut Sheets – System Completion Module**  
 Item: A1 Qty: 1 Tag(s): EI-8660



07/11

**HOW TO ORDER**

**STYLE CG PRODUCT NUMBERS**

*Below Is An Example Of Building A Part Number For Ordering A Check Valve*

Size	Valve Style	Body Class	End Connection	Body Material	Disc Material	Seat Material	Spring Material
4"	CG	1	F	CI	34	3	34

Description: 4" Style CG (Flange Silent Check Valve), 125 Lb. Class, FF Flange, Cast Iron Body, 304 SS Disc, 304SS Seats, 304 SS Spring.

Product #: 4"CG1F - CI - 34334

SIZE	BODY CLASS	
	Ordering Number	ASME Body Class
6"	1	125 Lb. Class ASME
	2	150 Lb. Class ASME
	3	250 Lb. Class ASME
	4	300 Lb. Class ASME

END CONNECTION	
Ordering Number	End Connection
F	Flat Face
R	Raised Face – Spiral Serrated

BODY MATERIAL	
Ordering Number	Body Material
CI	Cast Iron (ASTM A 126, Class B)
CS	Cast Carbon Steel (ASTM A 216, Grade WCB)
36	Cast 316 Stainless Steel (ASTM A 351, Grade CF8M)
XX	Refer to Modification Number

DISC MATERIAL	
Ordering Number	Disc Material
34	Cast 304 Stainless Steel (ASTM A 351, Grade CF8)
36	Cast 316 Stainless Steel (ASTM A 351, Grade CF8M)
B2	Cast Bronze (ASTM B 62, C83600)
CS	Cast Carbon Steel (ASTM A 216, Grade WCB)
DI	Ductile Iron (ASTM A 536, grade 65-14-12)
AL	Cast Aluminum (ASTM B 26-52T, Grade 356.0 T6)
XX	Refer to Modification Number

SEAT MATERIAL							
Ordering Number	Seat Material	Operating Temperature		Ordering Number	Seat Material	Operating Temperature	
		°F	°C			°F	°C
1	Buna – N	-20 to 250	-29 to 121	6	316L Stainless Steel Overlay	(Same as Body)	
2	Metal (Same as Body)	(Same as Body)		7	410 Stainless Steel Overlay	(Same as Body)	
3	Metal (Same as Disc)	(Same as Disc)		8	PTFE Teflon	-40 to 300	-40 to 149
4	Viton	-20 to 400	-29 to 204	9	Neoprene	-40 to 250	-40 to 121
5	EPDM	-40 to 300	-40 to 149	XX	Refer to Modification Number		

SPRING MATERIAL							
Ordering Number	Spring Material	Maximum Operating Temperature		Ordering Number	Spring Material	Maximum Operating Temperature	
		°F	°C			°F	°C
34	Type 304 Stainless Steel	500	260	IN	Inconel	700	371
36	Type 316 Stainless Steel	500	260	IX	Inconel – X 750	1100	593
ML	Monel	450	232	XX	Refer to Modification Number		

\*Other Materials are Available Upon Request.

\*\*Modification numbers are internal numbers assigned by KECKLEY to complete the product number description.

Component Cut Sheets – System Completion Module  
 Item: A1 Qty: 1 Tag(s): EI-8660

07/12



# Style CG

# Globe Silent Check Valve

Cast Iron (ASTM A 126, Class B)  
 125 lb. & 250 lb. Flanged

Carbon Steel (ASTM A 216, Grade WCB)  
 150 lb. & 300 lb. Flanged

Stainless Steel (ASTM A 351, Grade CF8M)  
 150 lb. & 300 lb. Flanged



### APPLICATIONS

Liquid or gas where protection from flow reversal in a pipeline is required.

### CONSTRUCTION

The Keckley Style CG Globe Silent Check Valves are constructed from rugged castings that are machined to exacting specifications. Their bodies have drilled flanges that are in accordance with ASME. Reference individual technical data pages for standard disc, seat, spring, and bushing.

### FEATURES

- A spring automatically closes the disc at zero flow, which prevents flow reversal and water hammer.
- The seat and disc's mating surfaces are hand lapped.
- The disc is fully guided at the top and bottom to prevent binding and cocking.
- Designed for a minimum open area equal to 110% of the pipe size.
- All sizes feature discs, which lift 1/3 of an inch from their seats for every 1" of pipe size.
- Epoxy coating is standard.
- Optional soft seat provides bubble tight shut off.
- Field serviceable without the need for special tools.

### INSTALLATION

The Style CG is used in both vertical and horizontal applications. Contact Keckley for downward vertical flow installations.

### ORDERING

Reference page C2 for Keckley Check Valve Product Numbers.

### WORKING PRESSURES - NON SHOCK

NOM. RATING	BODY MATERIAL	MEDIA	2" to 12"	14" to 24"
125#	CAST IRON (ASTM A 126, CLASS B)	W.O.G.	200 PSI @ 150°F	150 PSI @ 150°F
250#	CAST IRON (ASTM A 126, CLASS B)	W.O.G.	500 PSI @ 150°F	300 PSI @ 150°F
150#	CARBON STEEL (ASTM A 216, GRADE WCB)	W.O.G.	285 PSI @ 150°F	
	STAINLESS STEEL (ASTM A 351, GRADE CF8M)	W.O.G.	275 PSI @ 150°F	
300#	CARBON STEEL (ASTM A 216, GRADE WCB)	W.O.G.	740 PSI @ 150°F	
	STAINLESS STEEL (ASTM A 351, GRADE CF8M)	W.O.G.	720 PSI @ 150°F	

**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

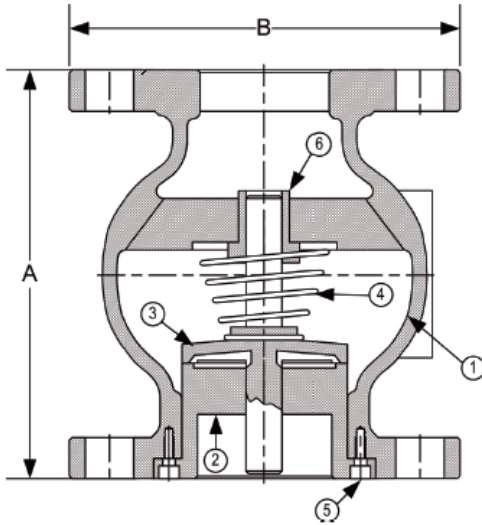
07/12



**TECHNICAL DATA**  
**DIMENSIONS AND WEIGHTS**

# Style CG

**Globe Silent Check Valve,**  
**125 lb. & 250 lb. Flanged**  
**Cast Iron (ASTM A 126, Class B)**



PARTS LIST		
ITEM	DESCRIPTION	MATERIAL
1	Body	Cast Iron (ASTM A 126, Class B)
2	Seat	Cast Bronze (ASTM B 62, C83600)
3	Disc	Cast Bronze (ASTM B 62, C83600)
4	Spring	Stainless Steel (ASTM A 182, Grade F-304)
5	Screw	Stainless Steel (ASTM A 182, Grade F-304)
6	Bushing	Stainless Steel (ASTM A 182, Grade F-304)

Above "Standard" Product Number - **CG1F-CI-B2334** (125# Class)  
 Above "Standard" Product Number - **CG3R-CI-B2334** (250# Class)  
 Other Options - Reference **C2** for available materials.

SIZE		DIMENSIONS								WEIGHTS					
		A				B				125#		250#			
		125#	250#	125#	250#	125#	250#	125#	250#	lbs	kgs	lbs	kgs		
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	lbs	kgs	lbs	kgs
2	50	6-1/4	159	6-3/4	171	6	152	6-1/2	165	22	10	26	12		
2-1/2	65	7	178	7-5/8	194	7	178	7-1/2	191	25	11	30	14		
3	80	7-1/2	191	8-1/4	210	7-1/2	191	8-1/4	210	33	15	45	20		
4	100	8-1/2	216	9-1/8	232	9	229	10	254	58	26	75	34		
5	125	9-1/2	241	10-3/8	264	10	254	11	279	75	34	135	61		
6	150	10-1/2	267	11-3/8	289	11	279	12-1/2	318	96	44	146	66		
8	200	13-1/2	343	14	356	13-1/2	343	15	381	180	82	245	111		
10	250	16-1/4	413	17	432	16	406	17-1/2	445	270	122	370	168		
12	300	20-1/4	514	20-7/8	530	19	483	20-1/2	521	455	206	675	306		
14	350	22-3/4	578	23-3/8	594	21	533	23	584	600	272	770	349		
16	400	24-3/4	629	25-5/8	651	23-1/2	597	25-1/2	648	844	383	1005	456		
18	450	22-1/2	572	24-1/8	613	25	635	28	711	900	408	1240	562		
20	500	24	610	25-5/8	651	27-17/32	699	30-1/2	775	1145	519	1780	807		
24	600	24	610	24-7/8	632	32	813	36	914	1550	703	2550	1157		

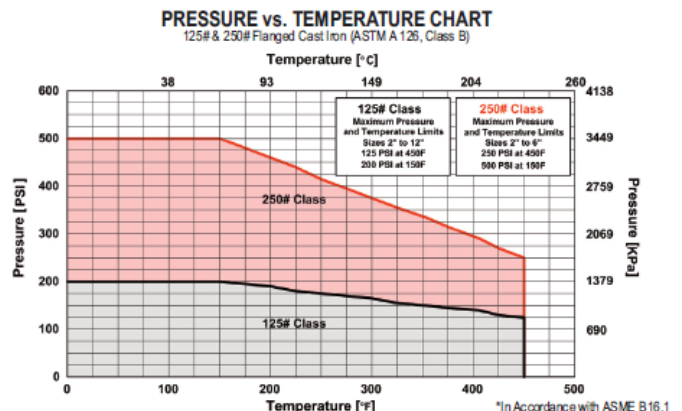
Larger sizes available upon request.

\*This table reflects only the nearest metric equivalents.

Seat Material	Operating Temperature**		Applicable Standards
	°F	°C	
Buna-N	-20 to 250	-29 to 121	• Design ASME B16.1
Viton	-20 to 400	-29 to 204	• Testing API 598
EPDM	-40 to 300	-40 to 149	• MSS SP-6
			• MSS SP-25
			• MSS SP-55

\*\*Subject to limitations of body material.

FLOW COEFFICIENTS							
Size	2"	2-1/2"	3"	4"	5"	6"	8"
C <sub>v</sub>	62	103	146	259	407	597	1095
Size	10"	12"	14"	16"	18"	20"	24"
C <sub>v</sub>	1710	2450	3250	4125	4910	6225	9625





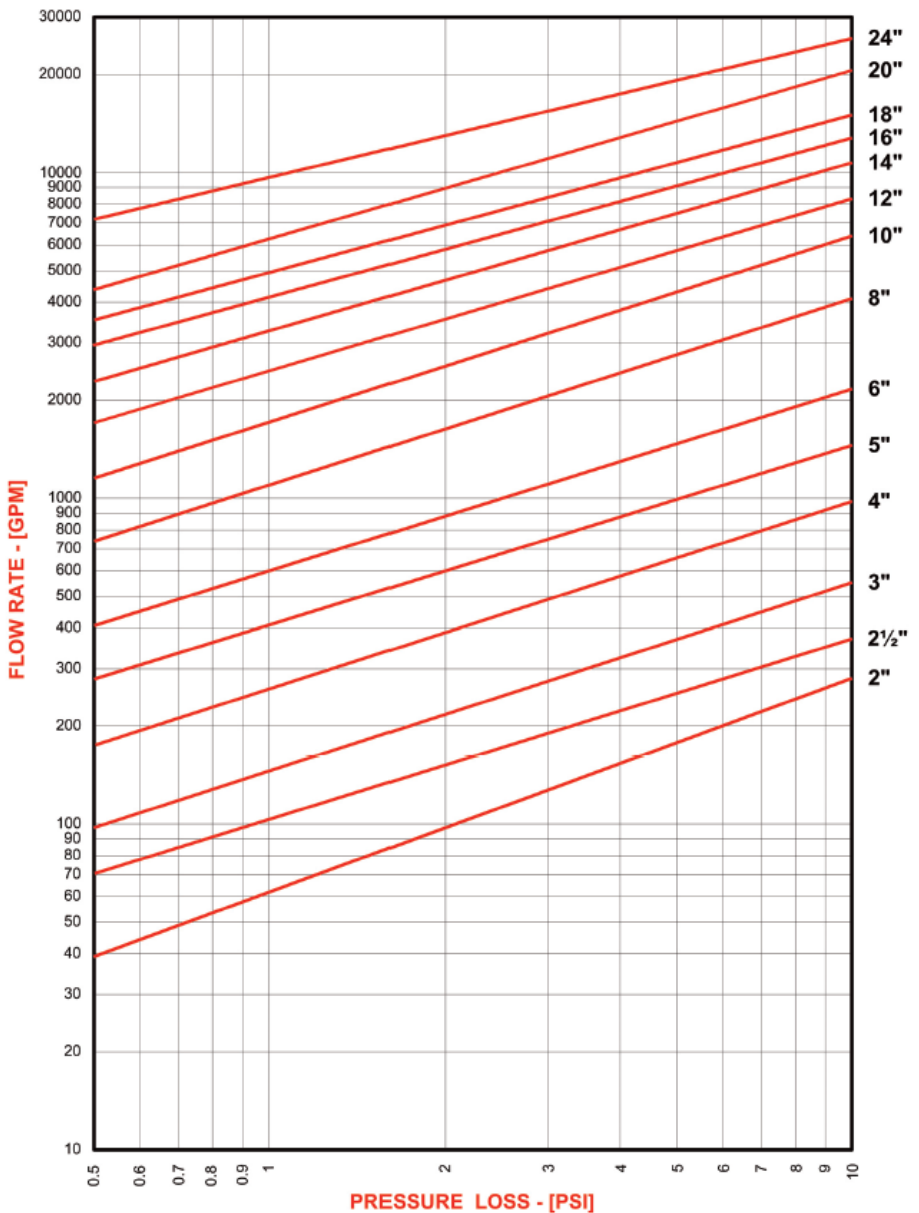
## PRESSURE DROP CHART

### Globe Silent Check Valve (Style CG)

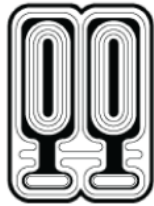
This pressure drop chart is based on the flow of clean water through the Keckley Globe Silent Check Valve. The Keckley Style CG has a cracking pressure equal to or less than 0.5 psi when mounted horizontally. Check valves should be placed at a distance equal to 5 to 10 pipe diameters from any turbulence producing device such as elbows, pumps, etc.

**TO USE CHARTS:**

Find your desired rate of flow (GPM) on the left hand side of the chart. Follow its corresponding horizontal line to the point where it intersects the diagonal line indicating the check valve pipe size. From this point of intersection, follow the vertical line down to the bottom of the chart to determine the approximate pressure drop.



**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**



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SUBMITTAL

**GMPT-SERIES**  
 TWIN GLYCOL MAKE-UP PACKAGE

**Models:** GMPT-33050 to GMPT-35100  
**Submittal Sheet No.** I-1104B **Rev.** 2 9/23/2020

Job Name	_____	Submitted By	_____	Date	_____
Location	_____	Approved By	_____	Date	_____
Engineer	_____	Order No.	_____	Date	_____
Contractor	_____	Notes	_____		
Sales Rep.	_____		_____		

**Description:**

The twin GMPT unit is designed to automatically supply a pressurized solution, such as glycol and water, to a combined two unit closed loop heating, chilled water, snowmelt, radiant heating, sprinkler, or process control system to ensure minimum system pressure requirements are met. These systems are equipped with two alternating fail-safe motors, pumps, and HOA controls that allow one pump to operate if the other pump malfunctions. These units are also equipped with an adjustable pressure reducing valve (PRV), pressure gauge, and low level alarm that cuts power to the pumps and actuates an audible and visual alarm when solution levels are too low.

**Performance Limitations:**

Maximum Temperature: 160°F  
 Factory Discharge Pressure Setting: 12 PSIG  
 Maximum Discharge Pressure: 70 PSIG\*  
 All electrical components are listed UL/CSA  
 Standard Starter Panel UL/CSA 60947-4-1  
 Optional NEMA 4X Panel UL/CSA LR19791

\*Higher discharge pressures available.

**Available Options:**

- High level alarm
- Protective skirt

MODEL NUMBER	PART NUMBER	TANK VOLUME (GAL)	TAGGING INFORMATION	QUANTITY
GMPT-33050	07103170	50		
GMPT-33100	07103175	100		
GMPT-35050	07103180	50		
GMPT-35100	07103185	100		

**Typical Specification:**

Furnish and install, as indicated on the plans and specifications, a prefabricated, automatic and autonomous twin make-up package capable of producing 1.8 GPM at 40 psig to a paired glycol system or to a system where fail-safe redundancy is required. The package shall consist of two paired, 110V, 60 Hz powered, autonomous pumping assemblies, a sturdy steel frame, and a graduated polyethylene solution container with removable lid designed to work together to maintain a specific fill pressure in the glycol system(s). The makeup package must feature HOA controls for each magnetic starter, a protective low water cut-off alarm, two alternating 1/3 HP (1/3 or 1/2) motors with brass rotary vane pumps and a fail-safe alternator that allows one pump to operate if the other pump malfunctions, a pressure tank with pressure controls, pressure reducing valves, pressure gauges, and a system isolation valve. A 110V signal shall be available for a remote alarm.

Each glycol make-up package shall be model GMPT - 33050 as manufactured by Wessels Company or approved equal.

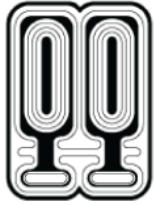
**E-mail**



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**wessels**  
**company**

101 Tank Street Greenwood, IN 46143  
 P: 317-888-9800 F: 317-865-7411  
 www.westank.com

Component Cut Sheets – System Completion Module  
 Item: A1 Qty: 1 Tag(s): EI-8660

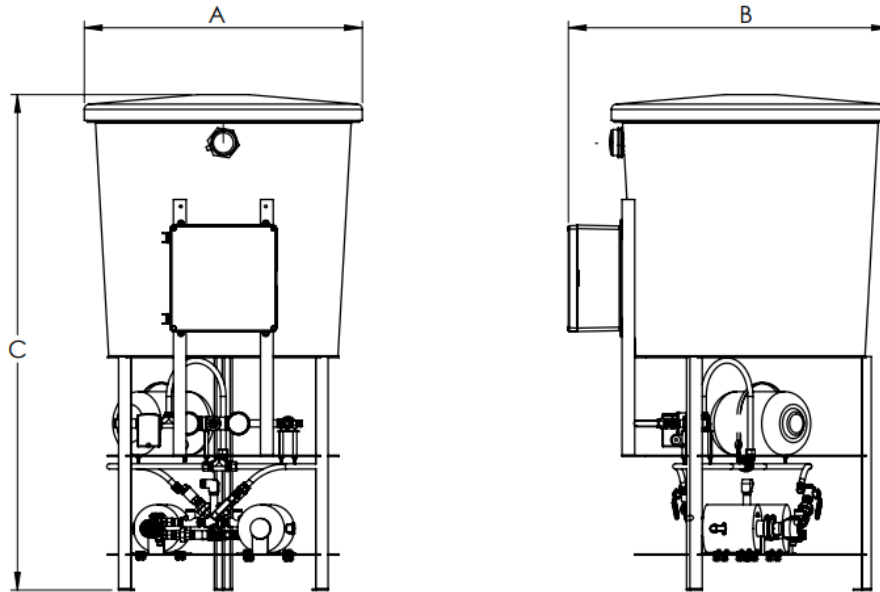


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 company

SUBMITTAL

**GMPT-SERIES**  
 TWIN GLYCOL MAKE-UP PACKAGE

Models: GMPT-33050 to GMPT-35100  
 Submittal Sheet No. I-1104B Rev. 2 9/23/2020



GMPT-33050 TO GMPT-35100

**Dimensions & Weights:**

Model Number	Dimensions in Inches			HP	Pressure Range (psi)	Make-Up Capacity (gpm @ psi)	Approx. Shipping Weight (lbs)
	A	B	C				
GMPT-33050	34	40	56	1/3	10-70	1.8 @ 70	236
GMPT-33100			80				226
GMPT-35050			56	1/2			240
GMPT-35100			80				230



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**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

# Rosemount Magnetic Sensor Specifications

Long-lasting, reliable performance in even the most challenging applications



Applications	Flanged (8705)	Wafer (8711)	Slurry (MS)	Hygienic (8721)	Utility (8750W)
Process Applications	●	●	●		
Utility Water-Based Flows	●	●			●
High Consistency Slurry	●		●		
Hygienic (Sanitary)				●	
High Pressure (Up to ANSI Class 2500)	●		●		
Nominal Line Size	½ to 36-in 15-900mm	0.15 to 8-in 4-200mm	3 to 36-in 60-900mm	½ to 4-in 15-100mm	½ to 48-in <sup>(1)</sup> 15-1200mm <sup>(1)</sup>
Standard Accuracy <sup>(2)</sup>	±0.25% of rate ±1.0 mm/sec	±0.25% of rate ±2.0 mm/sec	±0.25% of rate ±1.0 mm/sec	±0.5% of rate	±0.5% of rate
Optional High Accuracy <sup>(2)</sup>	±0.15% of rate ±1.0 mm/sec	±0.15% of rate ±1.0 mm/sec	±0.15% of rate ±1.0 mm/sec	±0.25% of rate	±0.25% of rate ±1.0 mm/sec
Measurement Range <sup>(3)</sup>	-40 to +40 ft/s, -12 to +12 m/s	-40 to +40 ft/s, -12 to +12 m/s	-40 to +40 ft/s, -12 to +12 m/s	-30 to +30 ft/s, -10 to +10 m/s	-40 to +40 ft/s, -12 to +12 m/s

<sup>(1)</sup>Line sizes up to 120-in (3000mm) available on special request. <sup>(2)</sup>Consult relevant product data sheet for full accuracy specifications. <sup>(3)</sup>Consult the PDS for specific application velocity limits such as abrasive slurries.



Liner Selection	Process Temp Limits	Line Size (8705/MS) <sup>(4)</sup>	Line Size (8711)	Line Size (8721)	Line Size (8750W)
<b>PFA/ PFA+ - Fluoropolymer<sup>(5)</sup></b> High temperature chemically aggressive applications.	-20 to 350° F (-29 to 177° C) <sup>(6)</sup>	½ to 14 inch (15 to 350 mm)	0.15 to 0.3 inch (4 to 8 mm)	½ to 4 inch (15 to 100 mm)	
<b>PTFE - Fluoropolymer<sup>(5)</sup></b> Most common liner - suitable for most applications	-20 to 350° F (-29 to 177° C) <sup>(6)</sup>	½ to 36 inch (15 to 900 mm)	½ to 8 inch (15 to 200 mm)		½ to 48 inch (15 to 1,200 mm) <sup>(7)</sup>
<b>ETFE - Fluoropolymer<sup>(5)</sup></b> Improved abrasion resistance liner - good chemically	-20 to 300° F (-29 to 149° C)	½ to 16 inch (15 to 400 mm)	½ to 8 inch (15 to 200 mm)		
<b>Polyurethane</b> Water applications with limited to no chemicals	-0 to 140° F (-18 to 60° C)	1 to 36 inch (25 to 900 mm)			½ to 48 inch (15 to 1,200 mm)
<b>Adiprene</b> Oil and gas applications with high pressure, high salinity	0-200° F (-18 to 93° C)	1 to 12 inch (25 to 300 mm)			
<b>Neoprene</b> Best for sea water / lower concentration brine solutions	-0 to 176° F (-18 to 80° C)	1 to 36 inch (25 to 900 mm)			½ to 48 inch (15 to 1,200 mm)
<b>Linatex</b> Standard liner for mining or fluid streams w/large debris	-0 to 158° F (-18 to 70° C)	1 to 36 inch (25 to 900 mm)			

<sup>(4)</sup>Capable of temperatures up to 355°F (180°C) - Consult factory for details. <sup>(5)</sup>Fluoropolymer MWP 1000psi. <sup>(6)</sup>ETFE not available on the MS Sensor <sup>(7)</sup>Limited maximum temperature of 248°F, 120°C.  
<sup>(8)</sup>MS Sensor available starting at 3-in (DN 80) line size.

**ROSEMOUNT™**



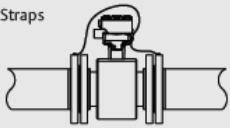
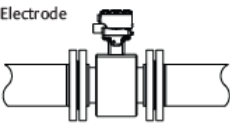
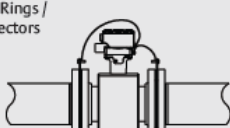
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**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

# Rosemount Magnetic Sensor Specifications

Electrode Selection		Description
<b>Type</b>	Button	Standard design. Suitable for most applications including slurries.
	Bullet-Nose	Used where coating is a concern and no solids are present.
	Flat Head	Flat electrode that is flush with the liner to minimize wear and noise in highly abrasive fluids
<b>Material<sup>(9)</sup></b>	316L Stainless Steel	Standard material. Compatible with most water-based applications.
	Nickel Alloy 276	Typically used in medium to high acid concentrations and sea water.
	Platinum <sup>(10)</sup>	Typically used in the most aggressive chemical and pulp and paper liquor applications.
	Tantalum <sup>(10)</sup>	Typically used in high concentration acids (hydrochloric, hydrofluoric).
	Titanium <sup>(10)</sup>	Typically used in high concentration caustic (sodium, potassium hydroxide).

<sup>(9)</sup>Alternate special materials available upon request. <sup>(10)</sup>Not available on 8750W.

Process Reference / Grounding			
Process Reference Type	Unlined Metallic Pipe	Lined Metallic Pipe	Plastic Pipe
Grounding Straps 	Suitable	Not Sufficient	Not Sufficient
Grounding Electrode 	Not Required	Conductivity > 100µS/cm	Not Sufficient
Grounding Rings / Lining Protectors 	Not Required	Single ring / Lining Protector: Conductivity > 20µS/cm Dual rings / Lining Protector: Conductivity < 20µS/cm	Single ring / Lining Protector: Not Sufficient Dual rings / Lining Protector: Always Use



Transmitter Options	8732E	8712E	8782	8750W
Mounting	Integral or Remote <sup>(11)</sup>	Wall Mount Remote	Wall Mount Remote	Integral, Remote or Wall Mount
Local Operator Interface (LOI)	4-button	Dedicated 15-button	Dedicated 15-button	4-button or 15-button
Output & Communication Protocols	4-20 mA, HART, Pulse FOUNDATION fieldbus, Profibus PA, Modbus	4-20 mA, HART, 10 kHz Pulse FOUNDATION fieldbus Modbus	4-20 mA, HART, 10 kHz Pulse	4-20 mA, HART, 10 kHz Pulse FOUNDATION fieldbus, Modbus
Power Supply	90-250VAC, 12-42VDC	90-250VAC, 12-42VDC	90-250VAC, 12-42VDC	90-250VAC, 12-42VDC
Optional Corrosion Protection	Optional special Off Shore Paint or SST Enclosure	None	None	Optional special paint for submersion protection
Diagnostic & Enhanced Features	Optional ordering codes: DA1/DA2 - HART 4/20 mA D01/DO2 - Digital Protocols (FF, PA, Modbus)			
Basic Diagnostics - w/ functional electronics and software checks	Standard	Standard	Standard	Standard
Installation Diagnostics - w/ Grounding & Wiring Fault Detection	DA1 / D01	DA1	Standard	DA1 / D01
Process Insight Diagnostics - w/ High Process Noise & Elect. Coating Detection	DA1 / D01	DA1	DS1	DA1 / D01
Smart Meter Verification - w/ commanded & continuous capabilities	DA2 / D02	DA2	MV	DA2 / D02

<sup>(11)</sup>2" Pipe mount.

**ROSEMOUNT™**

Emerson Automation Solutions  
 7070 Winchester Circle, Boulder, CO USA 80301 T: 800 522 6277



MC-002453 Rev A 05/2020

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**Component Cut Sheets – System Completion Module**

Item: A1 Qty: 1 Tag(s): EI-8660

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ABB DRIVES FOR HVAC ACH480 AND ACH580 SERIES, CATALOG



# ACH580-01

## All-in-one drive for wall mounting



- Take advantage of flexible, cabinet-free installation
- Save space and reduce overall costs
- Maintain process continuity in harsh conditions
- Minimize downtime and optimize HVAC operation

The ACH580-01 can be installed in normal equipment rooms, or even dusty and wet environments, thanks to the drive's wall mountable construction in both IP21 and IP55 protection classes. The robust and protective design ensures that no additional enclosures or components, such as filters and

fans, are needed. The drives provide smaller capital expenses by avoiding or advancing maintenance of external components, which in turn improves the reliability of the drive and the process.

### High protection for operation in harsh environments

The wall-mounted IP55 ACH580-01 drive is designed for applications exposed to dust, moisture and other harsh environments. It is similar in size to the compact IP21 drives, which provides significant savings in space, maintenance, engineering, material costs, as well as in setup and commissioning time.



Option code	Description
+B056	IP55/UL type 12 Unit

### Ready made accessories for simplified cabinet assembly

Installing ACH580-01 drive modules into Rittal VX25 cabinets is made easier with mechanical and electrical accessory kits. The ready made accessories will save time in design work and reduce the building time to ensure faster cabinet delivery. This will enable machine builders,

system integrators and panel builders to build drive packages using their own cabinet design with ABB technology.

For more information and ordering details, please see manual supplement 3AXD50000523191.

## Component Cut Sheets – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660

ACH580-01

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### Main disconnect switch for increased safety

The main disconnect switch option provides a possibility to disconnect the drive from the main supply when needed. It saves time, money and space as it is integrated in the drive. There is no need to install an additional, external isolation devices to the supply side of the drive. The option improves safety as it is always visible, when operating on the drive.

An auxiliary contact allows signaling the switch position to a PLC to avoid unnecessary controller alarms. The switch can be padlocked to the open position to disable drive operation during e.g. maintenance.

The ACH580-01 IP55/UL Type 12 units can be ordered with an integrated main switch and/or EMC C1 filter (R1-R5). Having the EMC C1 filter embedded to the drive, there is no need to order, install and test it separately. The integrated filter is already tested with the drive and it is prewired so there is no need for additional cabling.



Option code	Description
+B056	IP55/UL Type 12 unit (R1-R9)
+F278	Integrated main switch (R1-R5)
+E223	Integrated C1 filter (R1-R5)
+F316	Integrated main switch and C1 filter (R1-R5)

### IP20 option without a conduit box for cabinet installations

The option removes the conduit box from ACH580-01 frames R5-R9, making it easier to install the drive in cabinets with limited space. These IP20 units optimize the installation from cost and dimensioning point of view, and reduce waste. The option is also compatible with the flange mounting option for ACH580-01 frames R5-R9.



Option code	Description
+P944	IP20 option without conduit box

### Flange mounting

The ACH580-01 wall-mounted drive offers flange mounting as an option, separating the control electronics from the main circuit cooling airflow, saving space and ensuring optimal cooling. This results in better thermal management in panel installation. The flange mounting option enables smaller cabinets to be used as the backside of the drive is installed outside of the cabinet. This mounting method minimizes the need for cabinet cooling and decreases the installation cost.

The option is compatible only with the standard IP21 units. It maintains the protection class of IP55 on the backside of the drive, while the front side of the drive is IP20. The option is also available as a loose item with an MRP code. If necessary, the conduit box can be removed from the frames R5-R9.



Option code	Description
+C135	Flange mounting
+P944	Conduit box removal (R5-R9)

## Component Cut Sheets – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660

# ACH580 technical data

Mains connection	
Input voltage and output power range	3-phase, $U_N$ 200 to 240 V, +10%/-15% ACH580-01: from 0.75 up to 75 kW 3-phase, $U_N$ 380 to 480 V, +10%/-15% ACH580-01: from 0.75 up to 250 kW ACH580-04: from 250 up to 500 kW ACH580-07: from 75 up to 500 kW ACH580-31: from 4 to 110 kW ACH580-34: from 132 to 355 kW
Frequency	48 to 63 Hz
Power factor ACH580-01, ACH580-04 and ACH580-07	0.98
Power factor ACH580-31 and ACH580-34	1.0
Efficiency class (IEC 61800-9-2) ACH580-01, ACH580-04, ACH580-07	IE2
Motor connection	
Voltage	0 to $U_N$ , 3-phase
Frequency	0 to 500 Hz
Motor control	Scalar and vector
Supported motor types	Asynchronous motor, permanent magnet motor (vector), SynRM (vector)
Environmental limits	
Transportation and storage temperature	-40 to +70 °C
Operation temperature	ACH580-01, ACH580-31 and ACH580-34: -15 to +50 °C ACH580-04: -15 to +55 °C ACH580-07: 0 to +50 °C
Relative humidity	5 to 95 % no condensation allowed
Altitude	Rated current available at 0 to 1000 m Reduced by 1% per 100 m over 1000 m up to 4000 m
Degree of protection	ACH580-01 and ACH580-31: IP21 (UL Type 1) or IP55 (UL Type 12) ACH580-04 and ACH580-34: IP00 (UL Type Open) or IP20 (UL Type 1) ACH580-07: IP21 (UL Type 1), IP42 (UL Type 1 Filtered) or IP54 (UL Type 12)
Contamination level	Operation at Class 3C2, 3C3/C4 for ammonia (ACH580-01 R1-R5 frames as option), Class 3S2 according to IEC 60721-3-3 Transportation at Class 2C2, Class 2S2 according to IEC 60721-3-3 Storage at Class 1C2, Class 1S2 according to IEC 60721-3-3
Inputs and outputs (standard configuration)	
2 analog inputs	Selection of Current/Voltage input mode is user programmable.
Voltage signal	0 (2) to 10 V, $R_{in} > 200 \text{ k}\Omega$
Current signal	0 (4) to 20 mA, $R_{in} = 100 \Omega$
Potentiometer reference value	10 V $\pm 1\%$ max. 20 mA
2 analog outputs	AO1 is user programmable for current or voltage. AO2 current
Voltage signal	0 to 10 V, $R_{load} > 100 \text{ k}\Omega$
Current signal	0 to 20 mA, $R_{load} < 500 \Omega$
Internal auxiliary voltage	24 V DC $\pm 10\%$ , max. 250 mA
6 digital inputs	12 to 24 V DC, 24 V AC, Connectivity of PTC sensors supported by a single digital input. PNP or NPN connection (5 DIs with NPN connection).
3 relay outputs	Maximum switching voltage 250 V AC/30 V DC Maximum continuous current 2 A rms
Supported thermistors	Any of the analog inputs, or digital input 6, are configurable for PTC with up to 6 sensors. Both analog outputs can be used to feed the PT100, PT1000, KTY83, KTY84 or Ni1000 sensors.
External power supply	
Standard:	ACH580-01 frames R6-R9, ACH580-04 all frames, ACH580-07 all frames, ACH580-31 all frames, ACH580-34 all frames
	1.5 A at 24 V AC/DC $\pm 10\%$
With option:	ACH580-01 frames R1-R5
	1.04 A at 24 V AC/DC $\pm 10\%$
Communication	
Protocols as standard (EIA-485): BACnet MS/TP, Modbus RTU and N2. Available as 2-port plug-in options: BACnet/IP, Modbus TCP, PROFINET IO, EtherNet/IP, EtherCAT, EtherNet POWERLINK. Available as plug-in options: CANopen, DeviceNet, LonWorks, Profibus DP. Available as an external 2-port option: EtherNet adapter for remote monitoring.	
Application functions	
First start assistant Primary settings for HVAC applications Hand-Off-Auto operation mode Start interlock (de-frost) Delayed start Run permissive (damper monitoring) Override operation mode Intelligent pump control Pump dry run protection Air filter monitoring Real-time clock (scheduling) Active braking for tunnel ventilation (ACH580-31/34) Resonance monitoring PID controllers for motor and process Motor flying start Motor preheating Energy optimizer and calculators	
Protection functions	
Overvoltage controller Undervoltage controller Motor and motor cable earth-leakage monitoring Motor and motor cable short-circuit protection Motor overtemperature protection Output and input switch supervision Motor overload protection Phase-loss detection (both motor and supply) Under load supervision (belt loss detection) Overload supervision Stall protection Loss of control reference	
Product compliance	
CE Low Voltage Directive 2014/35/EU, EN 61800-5-1:2007 Machinery Directive 2006/42/EC, EN 61800-5-2:2007 EMC Directive 2014/30/EU, EN 61800-3:2004 + A1:2012 RoHS directive 2011/65/EU Quality assurance system ISO 9001 and Environmental system ISO 14001 Waste electrical and electronic equipment directive (WEEE) 2002/96/EC Galvanic isolation according to PELV UL, EAC, RCM, cUL TÜV Nord (safety functions) UKCA Ecodesign (EU) 2019/1781	
Harmonics compliance	
Built-in optimized DC choke as standard in ACH580-01/04/07 meets the requirements of IEC 61000-3-12:2011. ACH580-31/34 with active front-end helps system to comply with IEEES19 and G5/4 requirements.	
EMC compliance	
EMC according to IEC 61800-3:2004 + A1:2012 Class C1 with built-in filter as option for ACH580-01 up to 55 kW Class C2 as standard for ACH580-01/31, and ACH580-07 75 to 250 kW Class C3 as standard for ACH580-04/34, and ACH580-07 250 to 500 kW	
Functional safety	
STO according to EN 61800-5-2:2016, IEC 61508 Parts 1-2:2010, ISO 13849-1:2015, ISO 13849-2:2012, IEC 62061:2015 SIL 3/PL e	

Component Cut Sheets – System Completion Module  
Item: A1 Qty: 1 Tag(s): EI-8660

# BELL & GOSSETT

## INSTRUCTION MANUAL

**A82003**  
REVISION A



# Model 107A High Capacity Air Vent

WARNING LABEL PART NO. V56845  
INSTALLED IN THIS LOCATION.  
IF MISSING, IT MUST BE REPLACED.

## Installation, Operation and Service Instructions

**INSTALLER:** PLEASE LEAVE THIS MANUAL FOR THE OWNER'S USE.

### DESCRIPTION

The Bell & Gossett Model 107A High Capacity Air Vent is designed for use in liquid systems to purge undesirable free air that otherwise could impede system performance, increase system operating cost and contribute to the damaging effects of corrosion. The accumulation of air in the body of the Model 107A High Capacity Air Vent causes a float to drop allowing the air to be vented thru an air eliminating orifice. As the liquid level rises in the vent body, the float also rises shutting off the flow of venting gases.



### SAFETY INSTRUCTION

This safety alert symbol will be used in this manual to draw attention to safety related instructions. When used, the safety alert symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.

#### Temperature and Pressure Limits

Maximum operating temperature: 250°F  
Maximum operating pressure: 150 psig

### INSTALLATION INSTRUCTIONS

1. Install the Model 107A Vent in a location where air is expected to collect or where it is desirable to prevent air accumulation. See typical applications on back page.
2. Install the Model 107A High Capacity Air Vent with its vent connection in the top vertical position.

**CAUTION:** The generous use of pipe joint compound when installing 107A High Capacity Air Vent will foul the vent's operating mechanism allowing water to escape. Pipe joint compound must be conservatively applied to male threads only. Failure to follow this instruction can result in personal injury from hot water and/or property damage.



**CAUTION:** The use of Teflon impregnated pipe compound and Teflon tape on pipe threads provides lubricity which can lead to overtightening and breakage. Do not overtighten. Failure to follow this instruction can result in personal injury from hot water and/or property damage.



**CAUTION:** When the vent discharges air or if foreign material from the system fouls the vent's operating mechanism, it is possible for water to also be discharged. Vent must be piped to a drain. Failure to follow this instruction can result in personal injury from hot water and/or property damage.

3. A service valve should be installed upstream of the Model 107A High Capacity Air Vent.

### OPERATING INSTRUCTIONS



**CAUTION:** Liquids and additives such as hydrocarbons, which are aggressive to the EPDM elastomer seals used in the 107A Air Vent, can cause the seals to fail and allow uncontrolled discharge of system fluid. Do not use the 107A Air Vent on systems utilizing such fluids or additives. Failure to follow this instruction can result in personal injury from hot water and/or property damage.



**WARNING:** The model 107A Air Vent will discharge air and possibly some liquid during its normal functioning. Avoid eye, face or skin contact with top area of Air Vent. Bell & Gossett recommends the vent connection be piped to a drain to prevent accidental contact with discharging fluids. Failure to follow this instruction can result in serious personal injury and/or property damage.

**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

**SERVICE INSTRUCTIONS**

**⚠ WARNING:** Corrosion or leakage are indications that the 107A Air Vent may be about to cause serious damage from leakage or rupture. It should be periodically inspected and if noted, 107A Air Vent must be replaced or serviced. Failure to follow this instruction can result in serious personal injury and/or property damage.

If model 107A Air Vent does not shutoff after air has been vented off, the seat button may be replaced as follows:

**⚠ WARNING:** System fluid under pressure and/or at high temperatures can be very hazardous. Before servicing, reduce system pressure to zero or isolate the 107A Air Vent from the system. Allow system to cool below 100°F. Failure to follow this instruction can result in serious personal injury and/or property damage.

1. Remove the four capscrews that attach the cover to the body. (Item 1, Fig. 1)
2. Remove the cover from the body making sure not to damage the gasket surfaces on the cover or the body. (Item 2, Fig. 1)
3. Inspect the rubber button and its mating seating surface for damage or foreign material. (Items 3 & 4, Fig. 1 or 2) If the rubber button is damaged or has deteriorated, the lever and button assembly must be replaced.
4. The spring lever and button assembly is removed by pulling the outer wires of the spring lever out of the holes in the seat yoke. (Items 5 & 8, Fig. 2) (See Fig. 1 Note). Next, remove the spring lever and button assembly from the float by pulling it through the retaining hooks. (Item 6, Fig. 1 or 2).
5. Reverse the procedure in (4) above to install a new lever and button assembly. If the seat yoke has two sets of holes install the lever in the smaller off center holes. (See Figure 3.)

6. Thoroughly clean gasket surfaces and install a new gasket. (Item 7, Fig. 1)
7. Place cover assembly back in place on the body. Replace capscrews and tighten in a criss cross pattern to 20 ft-lbs of torque.
8. Open any shutoff valves and return the system to normal operation.
9. Check for gasket leaks. Retighten bolts or replace gasket if necessary.

**NOTE:** On some air vents, the ends of the spring lever have been welded to produce a restraining bead. To remove these spring levers it is necessary to cut the spring lever. The replacement spring lever will not have these welds and they are necessary only for shipment purposes.

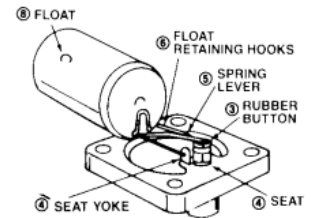
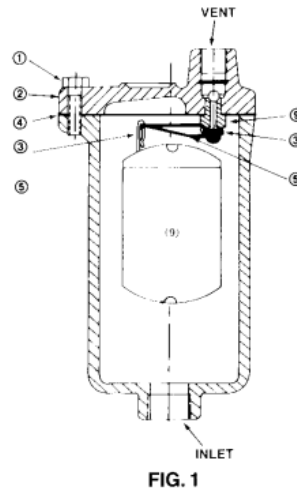
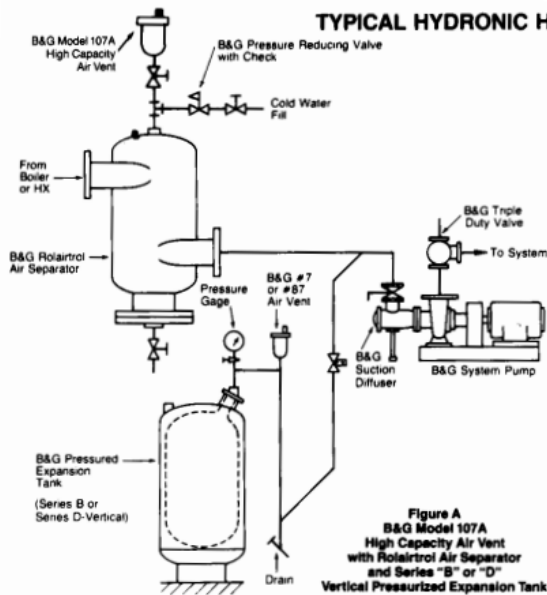


FIG. 2

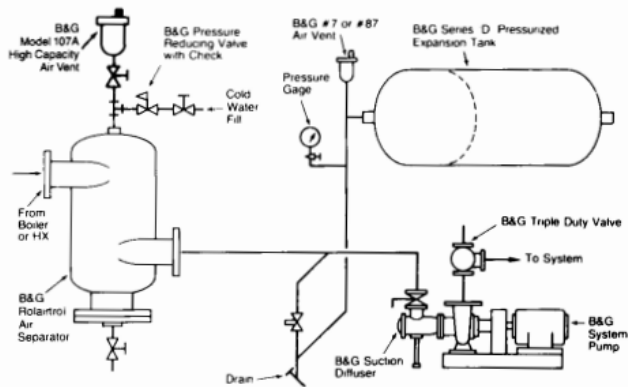


FIG. 3

**TYPICAL HYDRONIC HEATING/COOLING APPLICATIONS**



**Figure A**  
**B&G Model 107A**  
**High Capacity Air Vent**  
**with Rolairtrol Air Separator**  
**and Series "B" or "D"**  
**Vertical Pressurized Expansion Tank**



**Figure B**  
**B&G Model 107A**  
**High Capacity Air Vent**  
**with Rolairtrol Air Separator**  
**and Series "D"**  
**Horizontal Pressurized Expansion Tank**

For further information, contact ITT Bell & Gossett, 8200 N. Austin Avenue, Morton Grove, IL 60053, Phone (847) 966-3700 – Facsimile (847) 966-9052.



**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

# Series 174A, 374, 740

## ASME Water Pressure Relief Valves

For Pressure Protection of Hot  
Water Heating Boilers

Sizes: 3/4" – 2"

### Series 174A

Bronze body safety relief valves for pressure protection only of all types of hot water heating boiler equipment. Pressure range 30 to 150psi (2.1 - 10 bar) with corresponding high ratings from 650,000 to 14,370,000 BTU/hr. Female inlet and outlet connections. Sizes 3/4" - 2" (20 - 50mm).

### Series 374A

Iron body with forged brass inlet, 550,000 BTU/hr rating. 3/4" (20mm) only.

### Series 740

Iron body with expanded outlets for hot water space heating boilers. Pressure range 30 to 75psi (2 to 5 bar) with corresponding high ratings from 925,000 to 10,700,000 BTU/hr.

## Features

- Seat located above drain; water can't be trapped and sediment can't foul seat.
- Non-mechanical seat-to-disc alignment will not stick or freeze.
- Water seal of high temperature resisting material isolates spring working parts from water during relief.\*

## Specifications

### Boiler Relief Valves

An ASME Section IV certified pressure relief valve shall be installed on each boiler as noted. The valve shall have a BTU rating in excess of the BTU rating of the boiler's heating output. Each hot water space heating boiler shall be equipped with a pressure relief valve set to relieve below the maximum boiler working pressure. The valve shall feature a raised seat and non-mechanical disc alignment. Working parts and spring shall be isolated from any discharge by a high temperature resistant material.\* Valve shall be a Watts Series 174A, 374A or 740.

### NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

\* Does not apply to 374A

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.



Series 174A

Series 740

## Operation

As thermal expansion conditions develop, pressure builds up to the setting of the relief valve. This will cause discharging of small quantity of water.

Should operating controls fail, permitting runaway firing, the boiler water may reach steam temperatures. The valve will then open to discharge steam at the rate or faster than the boiler can generate it, thus restoring system pressure to a safer level.

### NOTICE

The discharge line must be the same size as the valve outlet, and must pitch downward from the valve to a safe place for disposal.

Valve lever must be tripped at least once a year to ensure that waterways are clear. This device is designed for emergency safety relief and shall not be used as an operating control.

### WARNING

It is illegal to use this product in any plumbing system providing water for human consumption, such as drinking or dishwashing, in the United States. Before installing standard material product, consult your local water authority, building and plumbing codes.



**Component Cut Sheets – System Completion Module**

Item: A1 Qty: 1 Tag(s): EI-8660



# Submittal Data Information

## Automatic Air Vents

101-2.3

Effective: November 15, 2016

Supersedes: June 1, 2010

Job: \_\_\_\_\_ Engineer: \_\_\_\_\_ Contractor: \_\_\_\_\_ Rep: \_\_\_\_\_

ITEM NO.	MODEL NO.	

**417 Coin Vent**

Installed on water or steam radiators the Taco automatic coin vent is the ideal air purging device. The coin vent features special hygroscopic cellulose discs in the valve body. When dry the discs allow air to be released from the system. Once all the air is purged the discs would then come in contact with system water, where upon they would swell to create a positive shut-off. This continuous cycle prevents the radiators from becoming air bound and speeds the process of filling the system. The vent can also be manually shut-off by means of an internal ball check. The 417 coin vent is suitable for use in water and low pressure steam applications.

**Hy-Vent®**

The Taco Hy-Vent® has become the industry standard for dependable long life service. Available in 1/8", 1/4" and 1/2" x 3/4" threaded connections, the high capacity float style vents can be placed either on the boiler or at the high points throughout the system. Now with operating pressure ratings of up to 250 psi, the brass body, nickel plated vents meet the system requirements of even the largest installation. The vents are also easily serviceable if needed, by just unscrewing the vent cap.

**409 Vent**

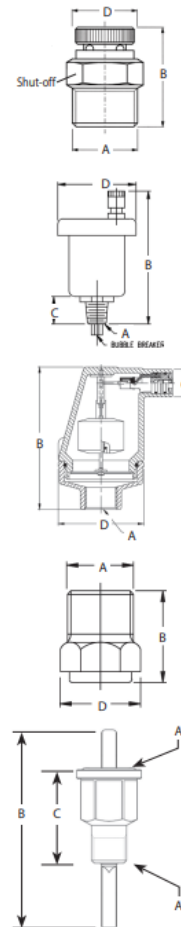
The Taco 409 air vent is a heavy duty brass vent rated to 150 psi system operating pressure. The conical shape of the vent significantly increases the clearance between the water level and internal mechanisms, reducing the potential that dirt floating on the top of the water could foul the venting operation. It features a convenient outlet connection for a 3/4" ID flex tube waste connection. It's high capacity design makes it ideal for placement throughout commercial systems.

**Hy-Vent® Waste Connector**

The Hy-Vent® Waste Connector screws onto the outlet connection of the Hy-Vents (models 400, 426, 418, 416) to provide a worry-free installation. The 1/4" threads easily connect to a waste line, preventing water damage if the vent ever leaks.

**Hy-Vent® Service Check Valve**

For easy removal of 1/8" Hy-Vents (models 400 and 416 only). The service check screws onto the Hy-Vent and allows the vent to be replaced without having to drain any fluid from the system.



**Dimensions**

Product Number	Description	A	B	C	D	Bubble Breaker	Quantity Per Box	Max. System Conditions	Max. Venting Pressure
417	Taco-Vent® Coin Vent	1/8" NPT	1"	---	35/64"	No	12	125 psi, 240°F *	125 psi
400	Hy-Vent®	1/8" NPT	3-3/16"	13/32"	1-13/16"	Yes	1	150 psi, 240°F	50 psi
416	Slim-Line Hy-Vent®	1/8" NPT	3-1/8"	13/32"	1-1/2"	Yes	14	150 psi, 240°F	115 psi
426	Hy-Vent®	1/4" NPT	3-3/16"	13/32"	1-13/16"	Yes	1	150 psi, 240°F	50 psi
418	Hy-Vent®	1/2" x 3/4" NPT	3-11/32"	17/32"	1-13/16"	No	1	150 psi, 240°F	50 psi
419	High Pressure Hy-Vent®	1/2" x 3/4" NPT	3-1/2"	17/32"	1-13/16"	No	1	250 psi, 240°F	150 psi
409	Commercially Rated Brass Vent**	3/4" NPT	4-3/4"	**	2-13/16"	No	1	150 psi, 240°F	150 psi
414	Waste Connector	1/4" NPT	3/4"	---	5/8"	---	1	150 psi, 240°F	---
415	Hy-Vent® Service Check Valve	1/8" NPT	2-1/4"	1"	---	---	1	150 psi, 240°F	---

\* Suitable for use in low pressure steam systems.

\*\* Outlet connection fits 3/4" ID Flex tubing.



Taco Inc., 1160 Cranston Street, Cranston, RI 02920 / (401) 942-8000 / Fax (401) 942-2360  
 Taco (Canada) Ltd., 8450 Lawson Road, Unit #3, Milton, Ontario L9T 0J8 / (905) 564-9422 / Fax (905) 564-9436

Component Cut Sheets – System Completion Module  
 Item: A1 Qty: 1 Tag(s): EI-8660

# ML Series-REV. D 2"-12"

Iron Butterfly Valve  
 Lug Style

200 psi Non-Shock WOG

Bi-Directional Dead End Service to 200 psi Max\*  
 Specifications: API-609 MSS SP-67 Type 1

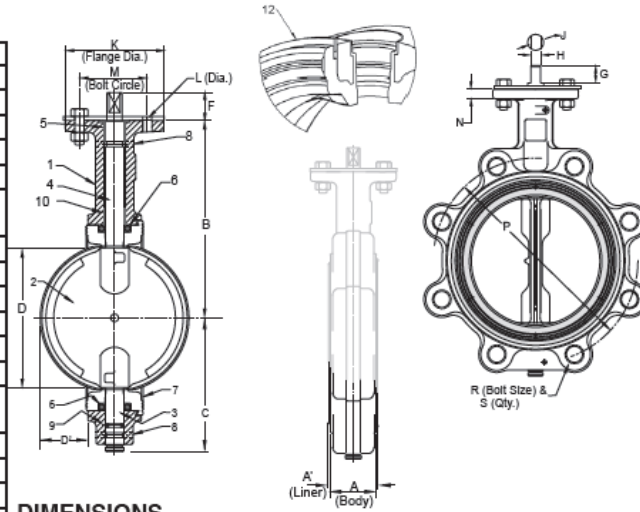


ABS Type Approved, Cat. A  
 CFR-46

### MATERIALS LIST

ITEM	PART	MATERIALS
1	BODY	CAST IRON ASTM A126 CL. B
		DUCTILE IRON ASTM A536
		DUCTILE IRON-EPOXY COATED
2	DISC	NP DUCTILE IRON ASTM A536
		ALUMINUM BRONZE ASTM B148
		STAINLESS STEEL ASTM A351 CF8M
		NYLON COATED DUCTILE IRON
		EPOXY COATED DUCTILE IRON
3	BOTTOM STEM	STAINLESS STEEL TYPE 416
		STAINLESS STEEL TYPE 316 (2)
4	TOP STEM	STAINLESS STEEL TYPE 416
		STAINLESS STEEL TYPE 316 (2)
5	TOP BEARING	REINFORCED NYLON
6	SEAL	EPDM, BUNA, VITON (1)
7	LINER	BUNA
		EPDM
		VITON
		HYPALON
		NEOPRENE BLACK-FDA
		NEOPRENE WHITE-FDA
		TEFLON OVER BUNA (150# WOG)
8	ROLL PIN	STAINLESS STEEL
9	STEM SEAL	EPDM, BUNA, VITON (1)
10	LOWER BEARING	REINFORCED NYLON
11	OPERATOR	LEVER HANDLE
		EPOXY COATED LEVER HANDLE
		GEAR OPERATOR
		GEAR OPERATOR WITH MEMORY STOP
		GEAR OPERATOR WITH LOCK
		ACTUATOR-AIR/AIR
		ACTUATOR-AIR/SPRING
		ACTUATOR-ELECTRIC
12*	RETAINING RING	1066 SPRING STEEL (65Mn)

(1) - VITON O-RINGS ARE USED WITH HYPALON, NEOPRENE, AND TEFLON LINERS.  
 (2) 316 STEM USED WITH CF8M DISC  
 \*EPDM AND BUNA LINER ONLY. ALL OTHER LINERS AND EPOXY COATED BODIES ARE UNI-DIRECTIONAL TO 150 psi.



### DIMENSIONS

	INCHES DN	VALVE SIZE									
		2	2-1/2	3	4	5	6	8	10	12	
A (Body)	INCHES	1.89	1.81	1.81	2.07	2.19	2.19	2.38	2.89	3.08	
	mm	43	46	46	52	55	55	60	68	78	
A <sup>1</sup> (Liner)	INCHES	1.82	1.94	1.94	2.20	2.32	2.32	2.51	2.82	3.21	
	mm	46	49	49	55	58	58	63	71	82	
B	INCHES	5.50	6.00	6.25	7.00	7.53	8.00	9.38	10.58	12.08	
	mm	139	152	158	177	191	203	238	268	306	
C	INCHES	3.06	3.31	3.75	4.25	4.94	5.58	5.58	7.88	9.25	
	mm	77	84	95	108	125	141	166	200	235	
D (Chord Dia)	INCHES	1.49	2.01	2.84	3.87	4.71	5.66	7.72	9.70	11.88	
	mm	37	51	67	93	119	143	196	246	296	
D <sup>1</sup> (Intrusion)	INCHES	0.28	0.44	0.89	1.06	1.50	1.94	2.84	3.89	4.50	
	mm	7	11	17	27	38	49	72	93	114	
F	INCHES	1.13	1.13	1.13	1.13	1.13	1.13	1.50	1.50	1.50	
	mm	28	28	28	28	28	28	38	38	38	
G	INCHES	0.81	0.81	0.81	0.81	0.81	0.81	1.06	1.06	1.06	
	mm	20	20	20	20	20	20	27	27	27	
H	INCHES	0.35	0.35	0.35	0.40	0.40	0.44	0.53	0.71	0.71	
	mm	8	8	8	10	10	11	13	18	18	
J	INCHES	0.50	0.50	0.50	0.56	0.56	0.62	0.75	1.00	1.00	
	mm	12	12	12	14	14	14	19	25	25	
K	INCHES	4	4	4	4	4	4	6	6	6	
	mm	101.6	101.6	101.6	101.6	101.6	101.6	152.4	152.4	152.4	
L (Dia)	INCHES	0.44	0.44	0.44	0.44	0.44	0.44	0.56	0.56	0.56	
	mm	11	11	11	11	11	11	14	14	14	
M	INCHES	3.25	3.25	3.25	3.25	3.25	3.25	5.00	5.00	5.00	
	mm	82	82	82	82	82	82	127	127	127	
N	INCHES	0.44	0.44	0.44	0.44	0.44	0.44	0.50	0.50	0.50	
	mm	11	11	11	11	11	11	12	12	12	
P	INCHES	4.75	5.50	6.00	7.50	8.50	9.50	11.75	14.25	17.00	
	mm	120	139	152	190	215	241	298	362	431	
R	INCHES	5/8-11	5/8-11	5/8-11	5/8-11	3/4-10	3/4-10	3/4-10	7/8-9	7/8-9	
	mm	15.875	15.875	15.875	15.875	19.05	19.05	19.05	19.05	19.05	
S	INCHES	4	4	4	8	8	8	8	12	12	
	mm	101.6	101.6	101.6	203.2	203.2	203.2	203.2	304.8	304.8	

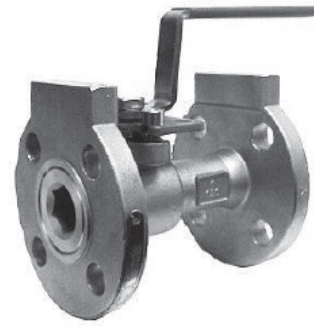
**Note:** The wetted surface of this product (In any material combination.) contacted by consumable water contains less than one quarter of one percent (.25%) of lead by weight.

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 ⚠ State of California Prop 65 **WARNING:** Cancer and Reproductive Harm. For more information visit [www.p65warnings.ca.gov](http://www.p65warnings.ca.gov).



**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

**F90/91 SERIES Ball Valve**  
**Milwaukee Valve Company**  
**F90/91CS/SS Class 150/300**



**Unibody Standard Port Flanged Ball Valve**

**Features and Benefits**

- Locking Lever for Safety Lockout
- 2 Bolt Adjustable Stem Packing Arrangement for Longer Packing Life
- Vented Ball in Ball Slot for Cavity Venting
- Optional Grounded Ball and Stem
- Four Bolt Actuator Mounting Pad for Easy Actuation
- NACE Compliant for Sour Gas Service
- Blow-out Proof Stem Design
- Fire-safe to API 607 (F91)
- Pressure Relieving Seat Design
- Meets API, ASTM, ASME and MSS Standards

**Specifications**

- Valves Sizes 1/2" through 6"
- ASME/ANSI Class 150/300
- Meets ASME B16.34 Design
- Valves Meet API 608
- Valves Meet API 607 for Fire-Safe Testing (F91)
- Valves Tested to API 598 and MSS SP-72
- Valves Meet NACE MRO175

**Operators Available**

- Locking Lever Handle, Oval Handle, Gear Operated
- Pneumatic and Electric Actuation

**Materials of Construction**

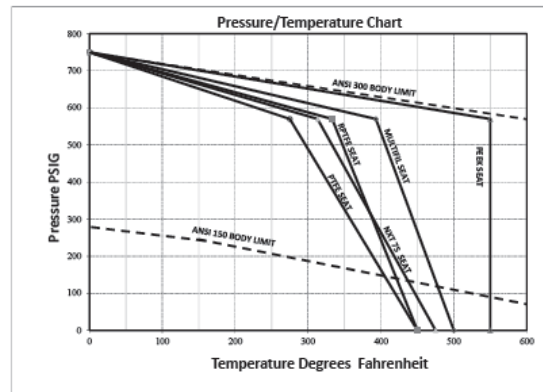
- Body: Carbon Steel or CF8M Stainless Steel
- Ball: 316 Stainless Steel
- Stem: 316 Stainless Steel
- Seats: STD (NXT-75) or Multi-Fil PTFE
- Packing: Graphite or PTFE

Pressure Ratings:	Class 150	Class 300
Carbon Steel	285 psi	740 psi
Stainless Steel	275 psi	720 psi

Valve is Rated 150 psi Steam @ 350°F.  
 Multi-Fil PTFE Suitable for Steam  
 Applications > 150 psi.

**TORQUE & CV VALUES**

Valve Size	Class 150 (0-300 PSID) Recommended Actuator Torque (in. lbs. Nm)	Class 300 (301-740 PSID) Recommended Actuator Torque (in. lbs. Nm)	Cv	Valve Size	Class 150 (0-300 PSID) Recommended Actuator Torque (in. lbs. Nm)	Class 300 (301-740 PSID) Recommended Actuator Torque (in. lbs. Nm)	Cv
1/2	40 4.5	40 4.5	15	2	240 27.1	300 33.9	120
3/4	60 6.8	60 6.8	25	3	500 56.6	750 84.8	460
1	125 14.1	125 14.1	37	4	900 101.8	1000 113.1	640
1 1/2	190 21.5	190 21.5	90	6	1900 214.9	3525 398.8	1025



How To Order Milwaukee Valve F90/F91 Series Unibody Flanged Ball Valve								
Valve Series	Body Material	Ball/Stem Material	End Connection	Port Size	Seat Material	External Options	Internal Options	Size
XXX	X	X	XXX	X	XX	XXX	XX	XXX
F90 Non-fire-safe	C-Carbon Steel (WCB)	C-Carbon Steel (WCB)	150 = ANSI 150 Flanged	R = Standard Port	N1 -NXT	OS-Stainless Oval	AD-Assemble Dry	1/2
F91 Fire safe	S-Stainless Steel (CF8M)	S-Stainless Steel (CF8M)	300 = ANSI 300 Flanged		1-Virgin PTFE	XH-Extended Handle	CC-Chlorine Cleaned	3/4
	M-Monel	M-Monel			2-Reinforced PTFE	OH-Carbon Oval	OC-Oxygen Cleaned	1
	H-Hastalloy-C	H-Hastalloy-C			3-Multi-Fil PTFE (Steam Seat 250 psi)	XLH-Extended Locking	GB-Grounded Ball	112
					08-Peek	GO- Gear Operator	VB-Vented Ball	2
								3
								4
								6
Example Product Numbers								
F91CS150RN1 100 - (1" Class Fire-safe, Flanged 150 Carbon Steel Body, Stainless Trim, NXT Seats, Lever)								

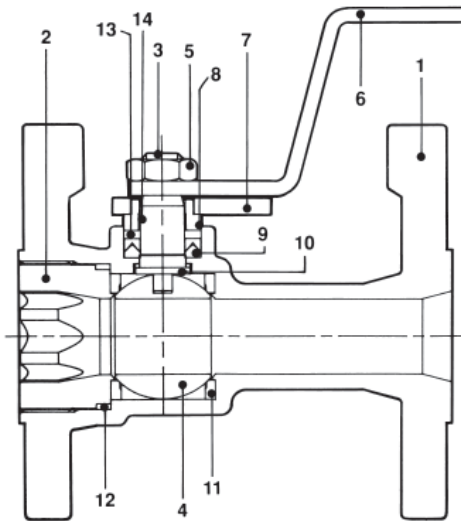
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 ⚠️ State of California Prop 65 **WARNING:** Cancer and Reproductive Harm. For more information visit [www.p65warnings.ca.gov](http://www.p65warnings.ca.gov).



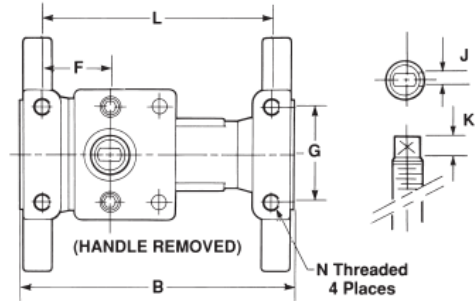
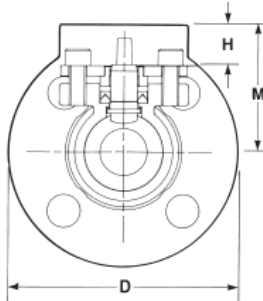
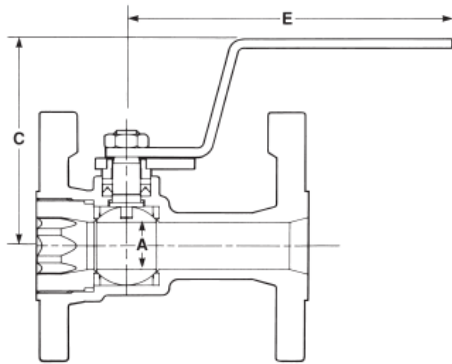
Component Cut Sheets – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660

# F90/91SS150/300, F90/91CC150/300 AND F90/91CS150/300 FLANGED-END BALL VALVE



Item	Qty.	Description	F90 Class 150/300
1	1	Body	SS ATSM A351/A744 GR CF8M CS ASTM A216 GR WCB
2	1	Ball Retainer	SS ATSM A351/A744 GR CF8M CS ASTM A216 GR WCB
3	1	Stem	SS ASTM A276 Type 316
4	1	Ball	SS ASTM 276 Type 316
5	1	Handle Nut	SS 18-8
6	1	Handle	1/2"-2" SS Type 304 3"-6" Ductile Iron
7	1	Packing Plate	1/2"-1" SS Type 304
8	1	Gland Follower	1-1/2"-6" ASTM A351 GR CF8M SS Type 304
9	1	Packing	(F90) PTFE (F91) Graphoil
10	1	Thrust Washer	NXT 75
11	2	Seat (NXT Standard)	NXT 75
12	1	Retainer Seal	PTFE
13	1	Ground Washer	Graphite
14	1	Bearing, Gland Follower	RPTFE



ANSI 150 LB. - DIMENSIONS - INCHES AND MILLIMETERS (90/91 - SERIES BALL VALVES)

SIZE	A		B		C		D		E		F		G		H		J		K		L		M		N
	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM			
1/2"	0.50	13	4.25	108	2.50	64	3.50	89	5.06	129	0.81	21	1.75	44	0.71	18	0.20	5	0.32	8	2.88	73	1.88	48	5/16 - 18
3/4"	0.69	18	4.62	117	3.65	93	3.88	99	5.97	152	0.94	24	1.75	44	0.57	15	0.28	7	0.48	12	3.13	80	2.06	52	5/16 - 18
1"	0.88	22	5.00	127	3.80	97	4.25	108	5.97	152	1.25	32	1.75	44	0.82	21	0.28	7	0.48	12	4.19	106	2.46	63	5/16 - 18
1-1/2"	1.25	32	6.50	165	4.77	121	5.00	127	8.85	225	1.81	46	1.75	44	0.06	2	0.45	12	0.63	16	5.63	143	2.50	64	5/16 - 18
2"	1.50	38	7.00	178	4.72	120	6.00	152	8.85	225	2.07	52	2.25	57	0.31	8	0.45	12	0.63	16	6.19	157	3.00	76	5/16 - 18
3"	2.31	59	8.00	203	6.80	172	7.50	191	11.00	279	3.09	79	3.50	89	0.34	9	0.45	12	1.20	31	7.13	181	3.75	95	3/8 - 16
4"	3.12	79	9.00	229	7.96	202	9.00	229	14.12	359	3.92	100	4.00	102	0.30	8	0.66	17	1.35	34	8.00	203	5.27	134	7/16 - 14
6"	4.50	114	10.50	267	9.44	240	11.00	279	18.00	457	4.70	119	4.00	102	0.58	15	0.91	23	1.88	48	9.44	240	6.63	168	7/16 - 14

ANSI 300 LB. - DIMENSIONS - INCHES AND MILLIMETERS (90/91 - SERIES BALL VALVES)

SIZE	A		B		C		D		E		F		G		H		J		K		L		M		N
	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM			
1/2"	0.50	13	5.50	140	2.50	64	3.75	95	5.06	129	0.81	21	1.75	44	0.71	18	0.20	5	0.32	8	4.00	102	1.88	48	5/16 - 18
3/4"	0.69	18	6.00	152	3.65	93	4.62	117	5.97	152	0.94	24	1.75	44	0.84	21	0.28	7	0.48	12	4.38	111	2.31	59	5/16 - 18
1"	0.88	22	6.50	165	3.80	97	4.88	124	5.97	152	1.25	32	1.75	44	0.91	23	0.28	7	0.48	12	5.69	145	2.56	65	5/16 - 18
1-1/2"	1.25	32	7.50	191	4.77	121	6.12	155	8.85	225	1.81	46	1.75	44	0.62	16	0.45	12	0.63	16	6.56	167	3.06	78	5/16 - 18
2"	1.50	38	8.50	216	4.72	120	6.50	165	8.85	225	1.97	50	2.25	57	1.10	28	0.45	12	0.63	16	7.50	191	3.80	97	5/16 - 18
3"	2.31	59	11.12	282	6.80	172	8.25	209	11.00	279	2.91	74	3.50	89	1.18	30	0.45	12	1.20	31	9.88	251	4.60	117	3/8 - 16
4"	3.12	79	12.00	305	7.96	202	10.00	254	14.12	359	3.92	100	4.00	102	0.80	20	0.66	17	1.35	34	10.68	271	5.77	147	7/16 - 14
6"	4.50	114	15.88	403	9.44	240	12.50	318	18.00	457	4.70	119	4.00	102	1.11	28	0.91	23	1.88	48	14.38	365	7.38	188	7/16 - 14

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Component Cut Sheets – System Completion Module  
 Item: A1 Qty: 1 Tag(s): EI-8660

# BA-400/400S\*

# 1/4"-2"

**BRONZE BALL VALVE  
 TWO-PIECE, FULL-PORT  
 600 PSIG WOG / 150 PSIG SWP (1)  
 THREADED ENDS  
 BLOW-OUT PROOF STEM**

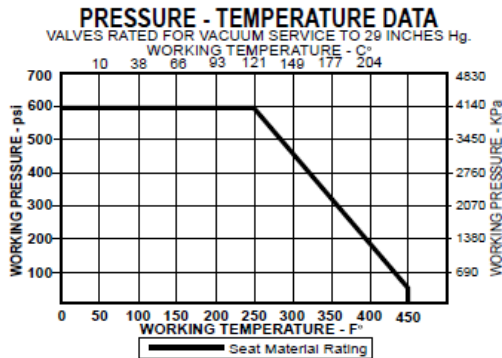
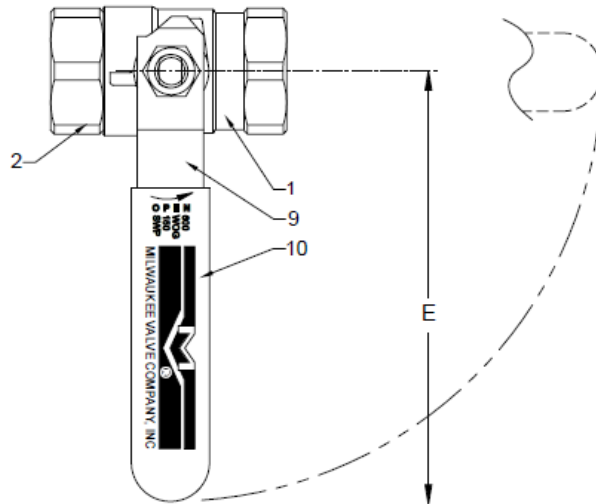
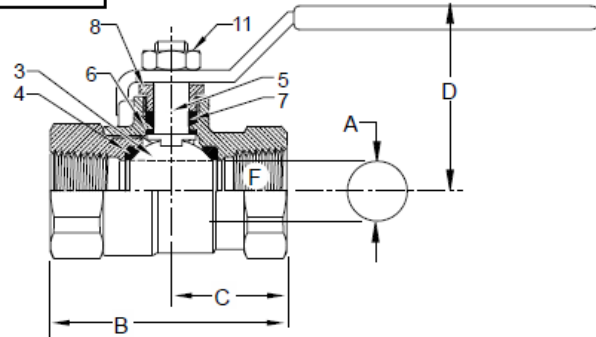
MSS SP-110

\*Not intended for use in potable water.

**MATERIALS LIST**

ITEM	PART	MATERIALS	ASTM SPEC.
1	Body	Cast Bronze	B584
2	Tailpiece	Brass	B283
		Cast Bronze (1 1/4" & up)	B584
3	Ball	Brass w/ Hard Chrome Plating	B283
		316 Stainless Steel	A276
4	Seat	RPTFE, 15% Glass Filled	
5	Stem	Brass	B16
		316 Stainless Steel	A276
6	Thrust Washer	RPTFE, 25% Glass Filled	
7	Packing	PTFE	
8	Packing Nut	Brass	B16
9	Handle	Steel w/ Zinc Plating	Commercial
10	Hand Grip	Vinyl	
11	Handle Nut	Steel w/ Zinc Plating	Commercial

(1) For steam service specify see BA400S3



**DIMENSIONS**

	UNITS	1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
		DN6	DN10	DN15	DN20	DM25	DM32	DN40	DN50
A(DIA)	INCHES	0.38	0.38	0.50	.76	1.06	1.31	1.56	2.00
	mm	9.7	9.7	12.7	19.3	26.9	33.3	39.6	51.0
B	INCHES	1.86	1.86	2.19	2.59	3.32	3.77	4.28	5.10
	mm	45.6	45.6	53.7	65.8	84.3	95.8	108.7	129.5
C	INCHES	1.00	1.00	1.10	1.30	1.59	1.81	2.06	2.37
	mm	24.5	24.5	27.0	33.0	40.4	46.0	52.3	60.2
D	INCHES	1.78	1.81	1.91	2.32	2.68	2.82	3.00	3.36
	mm	43.6	44.3	46.8	56.9	68.1	71.6	76.2	85.3
E	INCHES	3.82	3.82	3.82	4.55	6.33	6.33	6.33	7.19
	mm	93.6	93.6	93.6	115.6	160.8	160.8	160.8	182.6
F	THREAD SIZE	1/4" NPT	3/8" NPT	1/2" NPT	3/4" NPT	1" NPT	1-1/4" NPT	1-1/2" NPT	2" NPT
Cv		7	7	13	30	61	110	185	360

Note: DN (Diameter Nominal) = Metric equivalent size.

Rev. 14

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BV-17

MILWAUKEE VALVE

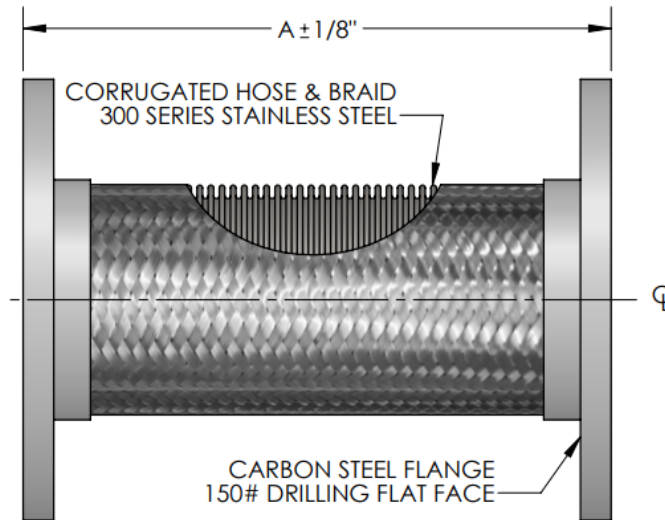


**I. VALVES ARE USED ON 1" AND SMALLER DRAIN, VENT, AND GAUGE LINES**

**Component Cut Sheets – System Completion Module**

Item: A1 Qty: 1 Tag(s): EI-8660

**MODEL METRAMINI (MMCC)  
FLANGED FLEXIBLE PUMP CONNECTOR**

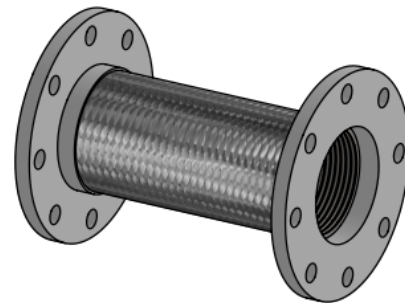


QTY	PART NUMBER	PIPE SIZE		A	PRESSURE RATING (PSI)*	WEIGHT (LBS)	PROJECT INFORMATION
		INCH	MM				
	MMCC0200	2"	50	9"	516	9	
	MMCC0250	2-1/2"	65	9"	387	13	
	MMCC0300	3"	80	9"	316	14	
	MMCC0400	4"	100	9"	232	18	
	MMCC0500	5"	125	11"	191	25	
	<b>MMCC0600</b>	<b>6"</b>	<b>150</b>	<b>11"</b>	<b>165</b>	<b>28</b>	
	MMCC0800	8"	200	12"	234	52	
	MMCC1000	10"	250	13"	230	75	
	MMCC1200	12"	300	14"	161	105	
	MMCC1400	14"	350	14"	150	115	
	MMCC1600	16"	400	14"	110	145	
	MMCC1800	18"	450	14"	85	165	

\*FOR SAFE WORKING PRESSURE ABOVE 70°F, MULTIPLY THE PRESSURE SHOWN AT 70°F TIMES THE CORRECTION FACTOR OF THE REQUIRED TEMPERATURE.

MAX INTERMITTENT OFFSET FROM CENTERLINE 1/8"  
MAX PERMANENT OFFSET FROM CENTERLINE 3/8"

TEMPERATURE (°F)	FACTOR
70	1.0
200	.91
300	.85
400	.78
500	.77
600	.76



**NSF 372 - LEAD FREE**

The wetted surface of this product contacted by consumable water contains less than one quarter of one percent (0.25%) of lead by weight. Material complies with state codes and standards, where applicable, requiring reduced lead content.

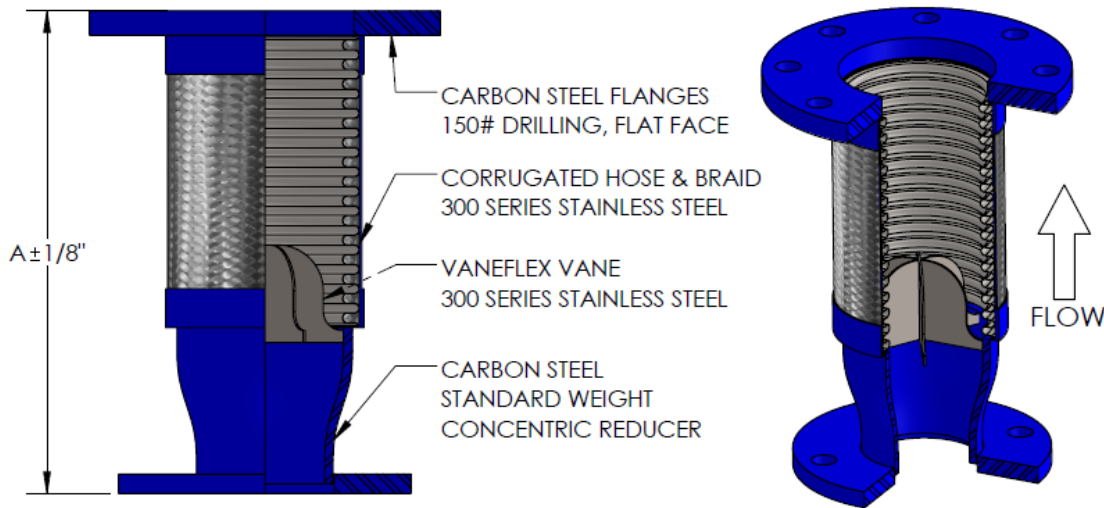
CUSTOMER: \_\_\_\_\_  
PROJECT: \_\_\_\_\_  
ENGINEER: \_\_\_\_\_

2	16" & 18" ADDED	9/21/2017
REV.	1	TEMP FACTOR UPDATED DATE 12/28/2016
		2323 W. HUBBARD ST. CHICAGO, IL 60612 TEL: 312-738-3800 FAX: 312-738-0415 WWW.METRAFLEX.COM
<b>MODEL METRAMINI (MMCC)</b> FLANGED FLEXIBLE PUMP CONNECTOR		
DRAWN BY: <b>DKISH</b>		DATE: <b>1/10/2014</b>
APPROVED: <b>JC</b>		DATE: <b>1/10/2014</b>
SCALE: <b>N/A</b>	DRAWING NUMBER: <b>MMCC-2</b>	

**Component Cut Sheets – System Completion Module**

Item: A1 Qty: 1 Tag(s): EI-8660

**MODEL VFR  
VANEFLEX WITH 150# PLATE FLANGES AND CONCENTRIC REDUCER**



QTY	PART NUMBER	PIPE SIZE		A	PRESSURE RATING (PSI)*	WEIGHT (LBS)	PROJECT INFORMATION
		SMALLER	LARGER				
	VFR0225	2"	2-1/2"	12-1/4"	387	17	
	VFR0203	2"	3"	12-1/4"	316	18	
	VFR2503	2-1/2"	3"	12-1/4"	316	19	
	VFR0204	2"	4"	12-3/4"	232	24	
	VFR2504	2-1/2"	4"	12-3/4"	232	24	
	VFR0304	3"	4"	12-3/4"	232	25	
	VFR2505	2-1/2"	5"	15-3/4"	191	33	
	VFR0305	3"	5"	15-3/4"	191	33	
	VFR0405	4"	5"	15-3/4"	191	34	
	VFR0306	3"	6"	16-1/4"	165	39	
	VFR0406	4"	6"	16-1/4"	165	39	
	VFR0506	5"	6"	16-1/4"	165	40	
	VFR0408	4"	8"	17-1/2"	234	67	
	VFR0508	5"	8"	17-1/2"	234	68	
	VFR0608	6"	8"	17-1/2"	234	68	
	VFR0610	6"	10"	19-1/2"	230	100	
	VFR0810	8"	10"	19-1/2"	230	102	
	VFR1012	10"	12"	21-1/2"	161	142	

\*FOR SAFE WORKING PRESSURE ABOVE 70°F, MULTIPLY THE PRESSURE SHOWN AT 70°F TIMES THE CORRECTION FACTOR OF THE REQUIRED TEMPERATURE.

TEMPERATURE (°F)	FACTOR
70	1.0
200	.91
300	.85
400	.78
500	.77
600	.76

MAX INTERMITTENT OFFSET FROM CENTERLINE 1/8"  
MAX PERMANENT OFFSET FROM CENTERLINE 3/8"

**NSF 372 - LEAD FREE**

The wetted surface of this product contacted by consumable water contains less than one quarter of one percent (0.25%) of lead by weight. Material complies with state codes and standards, where applicable, requiring reduced lead content. Not suitable for potable water systems due to materials of construction.

CUSTOMER: \_\_\_\_\_  
PROJECT: \_\_\_\_\_  
ENGINEER: \_\_\_\_\_

REV. 1	TEMP FACTOR UPDATED	DATE 1/4/2017
2323 W. HUBBARD ST. CHICAGO, IL 60612 TEL: 312-738-3800 FAX: 312-738-0415 WWW.METRAFLEX.COM		
<b>MODEL VFR</b>		
VF, 150# PLATE FLANGES, CONCENTRIC REDUCER		
DRAWN BY: <b>DKISH</b>	DATE: <b>11/22/2013</b>	
APPROVED: <b>JC</b>	DATE: <b>11/22/2013</b>	
SCALE: <b>N/A</b>	DRAWING NUMBER: <b>VFR-1</b>	

**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

**Data Sheet**



**1009 4 1/2" & 6" Stainless Steel Gauge**

**FEATURES**

- **PLUS!**™ Performance dampens vibration, shock and pulsation effects
- Wide selection of pressure connections and pressures ranges
- Dry and liquid-filled versions
- Micrometer adjustable pointer

**TYPICAL USES**

- Deionized water
- Refrigeration
- Hydraulics and pneumatics
- Specialized OEM equipment



**1009**  
4 1/2", 6" dial size



**SPECIFICATIONS**

Accuracy:	±1% of span (ASME B40.100 Grade 1A) 0.5% Accuracy (OPT)
Size:	4 1/2", 6"
Ranges:	A - Bronze: Vacuum, compound to 1,000 psi S - SS: Vacuum, compound to 20,000 psi P - Monel®: Vacuum, compound to 30,000 psi
Process Connection Location:	Lower or lower back
Process Connection Size:	1/4 NPT, 1/2 NPT, 3/16-18 UNF-2B for 1/4" high pressure tubing
Movement:	400 Stainless steel
Window Material:	Glass (STD.), acrylic, shatter proof glass (OPT.)
Dial:	Aluminum, white background, black figures and graduations
Pointer:	Micrometer, adjustable
Case Style:	Open front
Weather Protection:	Case not sealed. Recommended for weather protected environment only Liquid fillable IP65
Dampening:	<b>PLUS!</b> ™ Performance and liquid fill (glycerin, silicone and Halocarbon®)
Mounting:	Stem, surface (STD.) U-clamp, front flange and back flange (OPT.)
Approvals:	CRN, RoHS, CE/UKCA

**WETTED COMPONENTS**

Model	Bourdon Tube	Process Connection Material
1009A	Brass	Bronze
1009S	316L SS	316L Stainless steel
1009P	Monel®	Monel®

**KEY BENEFITS**

- Provides durability, reliability, and performance
- Well-suited for aggressive process media applications

**MIN/MAX TEMPERATURE LIMITS**

Version	Ambient	Process	Storage
Dry	-40 °F to 200 °F (-40 °C to 93 °C)	-20 °F to 250 °F (-40 °C to 121 °C)	-40 °F to 250 °F (-40 °C to 121 °C)
<b>PLUS!</b> ™	-40 °F to 150 °F (-40 °C to 66 °C)	-40 °F to 200 °F (-40 °C to 93 °C)	-40 °F to 150 °F (-40 °C to 66 °C)
Glycerin Fill	20 °F to 150 °F (-7 °C to 66 °C)	20 °F to 200 °F (-7 °C to 66 °C)	0 °F to 150 °F (-18 °C to 66 °C)
Silicone Fill	-40 °F to 150 °F (-40 °C to 66 °C)	-40 °F to 200 °F (-40 °C to 93 °C)	-40 °F to 150 °F (-40 °C to 66 °C)
Halocarbon® Fill	-40 °F to 150 °F (-40 °C to 66 °C)	-40 °F to 200 °F (-40 °C to 93 °C)	-40 °F to 150 °F (-40 °C to 66 °C)

**NON-WETTED COMPONENTS**

Model	Case	Ring
1009	304 Stainless steel, Monel®	304 Stainless steel, bayonet

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**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**



**Data Sheet**

**1009 4½" & 6" Stainless Steel Gauge**

<b>ORDERING CODE:</b>	<b>Example:</b>	45	1009	A	L	02	L	XC4	100#
<b>Dial Size</b>									
45 - 4½"		45							
60 - 6"									
<b>Model Code</b>									
1009 - 304 Stainless steel case, open front			1009						
<b>System</b>									
A - Phosphor bronze tube/brass process connection, (1,000 psi Max.)				A					
S - 316L Stainless steel tube/316L SS process connection, (20,000 psi Max.)									
P - K-Monel® 500 tube, Monel® 400 process connection, (30,000 psi Max.)									
<b>Case Fill</b>									
(blank) - Dry gauge									
L - Liquid filled case (glycerin standard)					L				
<b>Process Connection Size</b>									
02 - ¼ NPT Male, Max. pressure 20,000 psi						02			
04 - ½ NPT Male, Max. pressure 20,000 psi									
09 - ¾"-18 UNF-2B Aminco® high pressure fitting, (standard for pressures over 20,000 psi)									
<b>Process Connection Location</b>									
L - Lower							L		
B - Back									
<b>Options</b> (If choosing an option(s) must include an "X")									X__
C4 - <a href="#">Traceable calibration certificate</a>									C4
LL - <b>PLUS!</b> ™ Performance									
GV - Silicone case fill									
GX - Halocarbon® case fill									
LJ - Liquid fillable IP65									
TS - Throttle screw (standard with liquid filled, XLJ or XLL <b>PLUS!</b> ™ Performance)									
6B - Oxygen service									
PD - Plastic window (standard with liquid filled or XLJ)									
SG - Safety glass									
EP - Maximum pointer, adjustable									
EO - Adjustable red set hand (N/A with liquid fill)									
SH - Red set hand, stationary									
NH - Stainless steel tag wired to case									
FF - Front flange									
BF - Back flange									
UC - U-clamp									
SM - All Stainless steel movement									
AJ - 0.5% Accuracy									
<b>Range</b> (See range table on page 3 for all standard ranges)									
100# - 100 psi									100#

When selecting a diaphragm seal or isolation ring, refer to the [Min/Max Guide](#) for compatibility with this gauge or scan the QR code to the right.



2 of 4

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**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

**Data Sheet**



**1009 4 1/2" & 6" Stainless Steel Gauge**

SINGLE SCALE					NOTES
	psi	bar	kPa	Mpa	kg/cm2
Vacuum	30IMV	N1BR	N100KP	NO.1MP	N1KG
	-	N1/0.6BR	N100/60KP	NO.1/0.6MP	N1/0.6KG
Compound	30IMV&15#	-	-	-	-
	-	N1/1.5BR	N100/150KP	NO.1/15MP	N1/1.5KG
	30IMV&30#	-	-	-	-
	-	N1/3BR	N100/300KP	NO.1/3MP	N1/3KG
	30IMV&60#	-	-	-	-
	-	N1/5BR	N100/500KP	NO.1/5MP	N1/5KG
	-	-	-	-	-
	30IMV&100#	-	-	-	-
	-	N1/9BR	N100/900KP	NO.1/9MP	N1/9KG
	15#	1BR	100KP	0.1MP	1KG
-	1.6BR	160KP	0.16MP	1.6KG	
30#	-	-	-	-	
-	2.5BR	250KP	0.25MP	2.5KG	
60#	4BR	400KP	0.4MP	4KG	
-	6BR	600KP	0.6MP	6KG	
100#	-	-	-	-	
-	10BR	1000KP	1MP	10KG	
160#	-	-	-	-	
200#	-	-	-	-	
-	16BR	1600KP	1.6MP	16KG	
300#	-	-	-	-	
-	25BR	2500KP	2.5MP	25KG	
400#	-	-	-	-	
600#	40BR	4000KP	4MP	40KG	
800#	-	-	-	-	
-	60BR	6000KP	6MP	60KG	
1000#	-	-	-	-	
1500#	100BR	10,000KP	10MP	100KG	
2000#	-	-	-	-	
-	160BR	16,000KP	16MP	160KG	
3000#	-	-	-	-	
-	250BR	25,000KP	25MP	250KG	
4000#	-	-	-	-	
5000#	-	-	-	-	
6000#	400BR	40,000KP	40MP	400KG	
-	600BR	60,000KP	60MP	600KG	
8000#	-	-	-	-	
10,000#	-	-	-	-	
15,000#	1000BR	100,000KP	100MP	1,000KG	
20,000#	-	-	-	-	
30,000#	-	-	-	-	

Stainless steel systems only  
 Monel® systems only

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**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**



**Data Sheet**

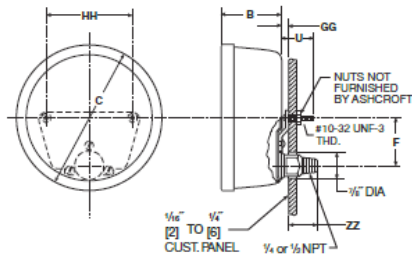
**1009 4 1/2" & 6" Stainless Steel Gauge**

**DIMENSIONS in [ ] are millimeters**

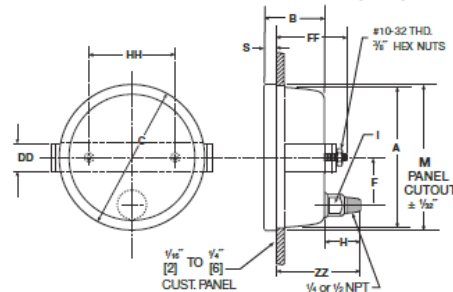
For reference only, consult Ashcroft for specific dimensional drawings

Gauge Size	A	B	C	C-1	D	DD	E	F	FF	G	GG	H	HH	I	J	L	M	S	U	ZZ	Weight	
																					Dry	LF
<b>4 1/2"</b> [114.3]	4.72 [120]	2.06 [52]	5.09 [129]	6.25 [159]	.94 [24]	1 [25]	5.69 [144]	1.63 [41]	2.31 [59]	3.94 [100]	.19 [5]	1.63 [41]	3 [76]	.63 [16]	.16 [4]	.22 [6]	4.81 [122]	.47 [12]	1.44 [37]	3.28 [83]	1.75# 0.79 kg	2.40# 1.1 kg
<b>6"</b> [152.4]	6.31 [160]	2 [51]	6.66 [169]	7.22 [194]	.84 [22]	1 [25]	7.03 [179]	1.63 [41]	2.63 [67]	4.81 [122]	.19 [5]	1.63 [41]	4.5 [114]	.63 [16]	.06 [2]	.25 [7]	6.44 [163]	.41 [10]	1.44 [37]	.63 [81]	2.25# 1 kg	4.12# 1.85 kg

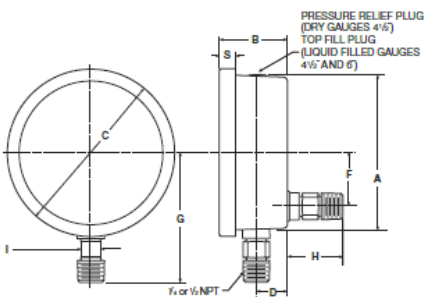
**4 1/2" & 6" 1009 BACK CONNECT, WALL MOUNTING BRACKET (XBF)**



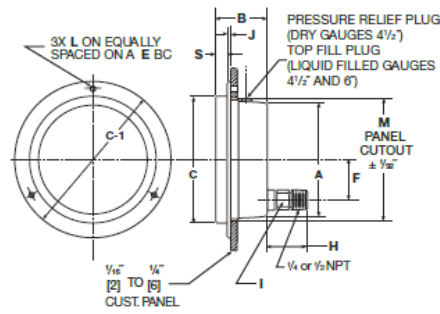
**4 1/2" & 6" 1009 BACK CONNECT U-CLAMP (XUC)**



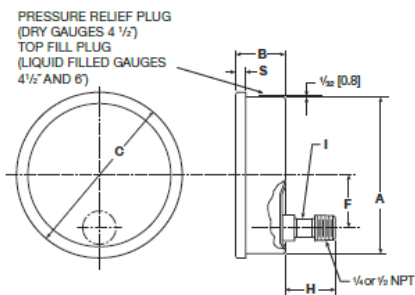
**4 1/2" & 6" 1009 LOWER OR BACK CONNECT**



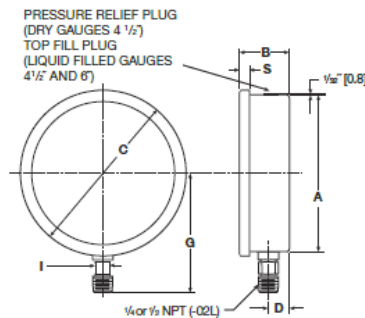
**4 1/2" & 6" 1009 BACK CONNECT FRONT FLANGE (XFF)**



**6" 1009 BACK CONNECT**



**6" 1009 LOWER CONNECT**



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## Component Cut Sheets – System Completion Module

Item: A1 Qty: 1 Tag(s): EI-8660

Rosemount 3051

December 2022

# Rosemount 3051T In-Line Transmitter ordering information



Rosemount 3051T In-Line Pressure Transmitters are the industry standard for gage and absolute pressure measurement. The in-line, compact design allows the transmitter to be connected directly to a process for quick, easy and cost effective installation.

- Loop Integrity and Plugged Impulse Line Diagnostics detect issues that might compromise the integrity of the output signal (code DA1).
- Bluetooth® Connectivity enables efficient, reliable, and safe configuration and maintenance (code BLE).
- Back-lit Graphical Display with Local Language Capability (code M6).
- Safety certification and proof testing (code QT and T9).

[CONFIGURE >](#)
[VIEW PRODUCT >](#)

## Online product configurator

Many products are configurable online using our Product Configurator. Select the **Configure** button or visit our [website](#) to start. With this tool's built-in logic and continuous validation, you can configure your products more quickly and accurately.

## Specifications and options

See the Specifications and options section for more details on each configuration. Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See the Material selection section for more information.

## Model codes

Model codes contain the details related to each product. Exact model codes will vary; an example of a typical model code is shown in [Figure 2](#).

**Figure 2: Model Code Example**

**3051TG3A2B21A WR5M6BLEDA1**

**1**

**2**

1. Required model components (choices available on most)
2. Additional options (variety of features and functions that may be added to products)

**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

December 2022

Rosemount 3051

## Optimizing lead time

The starred offerings (★) represent the most common options and should be selected for the fastest delivery times. The non-starred offerings are subject to additional delivery lead time.

## Required model components

### Model

Code	Description	
3051T	In-Line Pressure Transmitter	★

### Pressure type

Code	Description	
G	Gage	★
A <sup>(1)</sup>	Absolute	★

(1) Wireless output (code X) available in absolute measurement type (code A) with only range 1–5, with 14-NPT process connection (code 2B) and housing (code P).

### Pressure range

Code	Gage (Rosemount 3051TG) <sup>(1)</sup>	Absolute (Rosemount 3051TA)	
0	–5 to 5 psi (–344.74 to 344.74 mbar)	N/A	★
1	–14.7 to 30 psi (–1.01 to 2.06 bar)	0 to 30 psia (0 to 2.06 bar)	★
2	–14.7 to 150 psi (–1.01 to 10.34 bar)	0 to 150 psia (0 to 10.34 bar)	★
3	–14.7 to 800 psi (–1.01 to 55.15 bar)	0 to 800 psia (0 to 55.15 bar)	★
4	–14.7 to 4000 psi (–1.01 to 275.79 bar)	0 to 4000 psia (0 to 275.79 bar)	★
5	–14.7 to 10000 psi (–1.01 to 689.47 bar)	0 to 10000 psia (0 to 689.47 bar)	★
6 <sup>(2)</sup>	–14.7 to 20000 psi (–1.01 to 1378.95 bar)	0 to 20000 psia (0 to 1378.95 bar)	

(1) Rosemount 3051TG lower range limit assumes atmospheric pressure of 14.7 psig.

(2) Not available with PROFIBUS PA or Low Power 1–5 Vdc transmitter output (option code W or M), inert sensor fill fluid (option code 2), NSW drinking water approval (option code DW), or assemble to manifolds (option code S5).

### Transmitter output

Code	Description	
A	4–20 mA with digital signal based on HART® Protocol	★
F	FOUNDATION™ Fieldbus Protocol	★
W <sup>(1)</sup>	PROFIBUS® PA Protocol	★
X <sup>(2)</sup>	Wireless (requires wireless options and engineered polymer housing)	★

**Component Cut Sheets – System Completion Module**

Item: A1 Qty: 1 Tag(s): EI-8660

**Rosemount 3051**

December 2022

M <sup>(3)</sup>	Low-power, 1–5 Vdc with digital signal based on HART Protocol	
------------------	---	--

- (1) For local addressing and configuration, M4 (LOI) is required. Not available with product certification codes E4, EM, EP, I6, IM, KD, KL, KM, KP, KS, and N3.
- (2) This option is only available with intrinsically safe approvals.
- (3) Only available with C6, E2, E5, I5, K5, KB, EM, IM, KM, EP, and E8 product certifications.

**Process connection style**

Code	Description	
2B	½-14 NPT female (range 0-5 only)	★
2C <sup>(1)</sup>	G½ A EN837-1 male (range 0-4 only)	★
2F <sup>(2)</sup>	Coned and threaded, compatible with autoclave Type F-250-C (range 5-6 only)	
61 <sup>(3)(4)</sup>	Non-threaded instrument flange (range 1-4 only)	

- (1) Not available with S1, S5, or WSM. Wireless output (code X) not available with absolute pressure type or C-276 diaphragm material.
- (2) Not available with wireless (output code X) for range 5.
- (3) Not available with wireless (output code X).
- (4) Only available with 316L stainless steel isolating diaphragm.

**Isolating diaphragm**

Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

Code	Isolating diaphragm	Process connection wetted parts material	
2	316L stainless steel	316L stainless steel	★
3	Alloy C-276	Alloy C-276	★
7	Gold-plated 316 stainless steel	316L stainless steel	

**Sensor fill fluid**

Code	Description	
1	Silicone	★
2 <sup>(1)</sup>	Inert	

- (1) Not available with wireless (output code X).

**Housing material**

Code	Housing material	Conduit entry size	
A	Aluminum	½-14 NPT	★
B	Aluminum	M20 x 1.5	★
E	Aluminum, ultra low copper	½-14 NPT	
F	Aluminum, ultra low copper	M20 x 1.5	
J	Stainless steel	½-14 NPT	★
K	Stainless steel	M20 x 1.5	

Component Cut Sheets – System Completion Module  
 Item: A1 Qty: 1 Tag(s): EI-8660

# P-SERIES Pressure Switches

## Switches for Vacuum through 6000 psig with Adjustable Set Points and Fixed or Adjustable Deadband

### Features:

- Set point repeatability,  $\pm 1\%$  of operating range.
- All wiring terminals, adjustments and visual scales are accessible from the front of the switch.
- Choice of open frame type, general purpose or watertight enclosure.
- Choice of fixed, limited-adjustable or full-range adjustable deadband.
- Choice of single or two-stage units.
- Compact size.
- Mounts in any position.
- Rugged and vibration resistant; e.g., for compressors.
- Visual adjustment scales in psig and bars.
- Wide selection of transducer wetted materials suitable for air, water, oil or corrosive fluids.
- Mix and match switch and transducer components for increased stock flexibility or to change pressure ranges in field.

### General Description:

ASCO P-Series pressure switches consist of an open frame or enclosure protected switch unit and a transducer unit. They can be ordered separately for customer stocking and/or field assembly or as a complete factory-assembled unit.

### Switch

P-Series pressure switch units incorporate the unique ASCO TRI-POINT alternating fulcrum balance plate to control the operation of one or more electrical snap-action switches. The electrical snap-action switch together with the adjusting mechanism is a fully-tested, self-contained subassembly.

### Transducer

Transducer unit incorporates a diaphragm/piston type pressure sensor, and is also a fully-tested, self-contained subassembly.

### Operation

When pressure is applied to the transducer it is converted into movement of the piston. This piston movement is then used to control the operation of the electrical snap-action switch in the switch unit.

**Options** (See pages 34-35)



### Standard Electrical Ratings

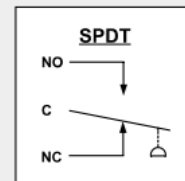
#### PA, PB, PC <sup>①</sup> Series

15 Amp Res., 125 VAC  
 10 Amp Res., 250 VAC  
 1/8 HP, 125 VAC  
 1/4 HP, 250 VAC  
 1/2 Amp Res., 125 VDC  
 1/4 Amp Res., 250 VDC

#### PG Series

15 Amp Res., 125 VAC  
 10 Amp Res., 250 VAC  
 1/8 HP, 125 VAC  
 1/4 HP, 250 VAC

- ① PC Series, UL recognized component, rated 10 Amp Res., 125/250 VAC; 1/3 HP 125/250 VAC.  
 ② Open frame construction, UL recognized component.  
 ③ FM listed for air flow interlocking service.



### Standard Temperature Ratings

**Ambient:** -4°F (-20°C) to 122°F (50°C)  
**Fluid:** For Buna "N" or Neoprene Diaphragm  
 -4°F (-20°C) to 180°F (82°C)  
 For Viton Diaphragm  
 -4°F (-20°C) to 250°F (121°C)  
 For 316 SS Diaphragm  
 -50°F (-45°C) to 300°F (149°C)  
 For Nylon Transducers  
 -4°F (-20°C) to 180°F (82°C)





# Rosemount™ 214C Temperature Sensors



## Primary product benefits

- High accuracy resistance temperature detectors (RTD) and various thermocouple types offered in a variety of element configurations
- Calibration capabilities for increased measurement accuracy for RTDs

**Component Cut Sheets – System Completion Module**

Item: A1 Qty: 1 Tag(s): EI-8660

**214CRTSMA1S3E0060SLXAXW**

214C	Rosemount 214C Temperature Sensor
RT	Sensor Type: RTD Thin-film, PT100, $\alpha = 0.00385$ , -50 to 450 °C
SM	Sensor Sheath Material: 321 SST
A1	Sensor Accuracy: Class A per IEC 60751 [RW: -100 to 450°C (-148 to 842°F) RT: 0 to 300°C (32 to 572°F)]
S3	Sensor Wire Configuration: Single, 3-Wire
E	Dimension Units: US Customary/English Units (inches)
0060	Sensor Insertion Length (L): xxx.x inches, 0 to 078.5 inches in 0.25" increments. Example: 0020 = 2" or 0150 = 15"
SL	Sensor Mounting Style (Fittings and Adapters): Spring Loaded Adapter
XA	Transmitter Assembled To Sensor: Process Ready Assembly of Transmitter and Sensor
XW	Thermowell Assembled To Sensor: Process Ready Assembly of Sensor and Thermowell

**114CE0040TAA2SF020AXW**

114C	Rosemount 114C Thermowell
E	Dimensional Units: English Units
0040	Immersion Length: XXX.X in, 1/4" increments from 0.5" to 100". Example: 0005 for 0.5" or 0062 for 6.25"
T	Mounting Style: Threaded
AA	Process Connections: 1/2 - 14 ANPT
2	Stem Style: Tapered Stem
SF	Thermowell Material: 304/ 304L Dual Rated
020	Head Length: XX.X in, 1/4" increments from 1.75" to 11.25". Example: 020 = 2" or 042 = 4.25"
A	Instrument Connection: 1/2"-14 ANPT
XW	Sensor/ Thermowell Assemble to Options: Process ready assembly of a sensor and thermowell

**3144PD1A1NAXA**

3144P	Rosemount 3144P Temperature Transmitter
D1	Housing Style   Material   Conduit Entry Size: Field Mount, Dual-Compartment Housing   Aluminum   1/2-14 NPT
A	Transmitter Output: 4-20 mA with digital signal based on HART protocol
1	Measurement Configuration: Single Sensor
NA	Product Certifications: No Approval
XA	Assemble To Options: Sensor Specified Separately and Assembled to Transmitter

**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

# Rockwell Automation

## 440R Guardmaster Safety Relays and Expansion Units

[440R-S13R2](#)



*Representative Rendering, Not The Actual Product*

Guardmaster Compatibility Input Safety Relay (CI), 1 Dual Channel Universal Input, 1 N.C. Auxiliary Output

### Product Details

SAFETY RELAY DATA	
Inputs	1 Dual Channel Universal Input
Single Wire Safe Input	N/A
Logic Configuration	None
Immediate Safety Outputs	3 N.O.
Immediate Auxiliary Outputs	1 N.C.
Delayed Safety Outputs	N/A
Single Wire Safe Output	1 SWS Output
Power Supply	24V DC
Removable Terminals	Removable
Reset	Configured Automatic/Manual or Manual Monitored Reset
SAFETY RELAY INFORMATION	
Relay Model	Guardmaster Compatibility Input Safety Relay (CI)

**Component Cut Sheets – System Completion Module**  
**Item: A1 Qty: 1 Tag(s): EI-8660**

# Rockwell Automation

## 1606 Power Supplies

[1606-XLB36EH](#)



*Representative Rendering, Not The Actual Product*

1606-XLB36EH: Basic Power Supply, 24-28V DC, 36 W, 100-240V AC Input Voltage

### Product Details

<b>SYSTEM DATA - For Selection Assistance</b>	
Product Functionality	Power Supply
Input Type	Single Phase Input
Built-In Redundancy?	No
Input Voltage	100...240 V AC
Output Voltage	24...28V DC
Connection Terminals	Push-in Terminals
<b>OPTIONAL Selection</b>	
Hazardous Location	No
Family	Basic Family
<b>POWER SUPPLY SELECTION</b>	
Would you like to see selection Tips?	Yes
Product Selection	1606-XLB36EH: Basic Power Supply, 24-28V DC, 36 W, 100-240V AC Input Voltage
<b>IMPORTANT INFORMATION</b>	
Please Note:	Input Specs Output Specs Dimensions Special Features