



WMT-SEC-GLY-32/160-208

SUBMITTAL

October 17, 2024

RAE Corporation
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RAE CORPORATION
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WMT-SEC-GLY-32/160 Submittals

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Please contact our customer service department at service@rae-corp.com or 918-825-7222 if you have any questions, comments or issues with this equipment. Provide the serial and model number when contacting us.

Submittal Revision Summary

Project Number: WMT-SEC-GLY
Project Name: Walmart Secondary Glycol
Original Submittal Date: 10/19/2023

Date:	Drawings Affected:	Revision Description:
10/30/23	U1, PID1, Cutsheets	• Noted Fluid connections on PID • Revised EEV Selections to Emerson EXV • Revised EEV controller cutsheet to Emerson EXD
12/7/23	Refrigeration Line Sizing	• Removed 2-5/8 common header selection
	Heat Exchanger (Min Capacity)	• Updated heat exchanger rating for lower flowrate
	All	• Updated unit model #
1/10/24	PID1 / Glycol Pump	• Revised Pump selection
03/29/24	Electrical Drawings	• Added the convenience outlet • Removed RAE.Connect option
05/8/24	Electrical Drawings	• Removed Current Switches
	Unit and P&ID	• Relocated BTV on ship loose spools • Corrected Unit clearance • Added Glycol Feeder drawings
05/30/24	E1A	• Noted Fluid connections on PID
06/10/24	E1B	• Disconnect for Convenience Outlet shown
6/14/24	Pump Curve	• Updated Pump curve for 35% glycol
6/24/24	PID 1	• End of Line Bypass Valve Shown
7/9/24	Unit Drawing	• Updated Circuit Callouts
7/10/24	Glycol Feeder Tank Electrical Drawing	• Changed Max Fuse Size
9/11/24	PID 1	• Differentiated skid and field piping

Submittal Revision Summary

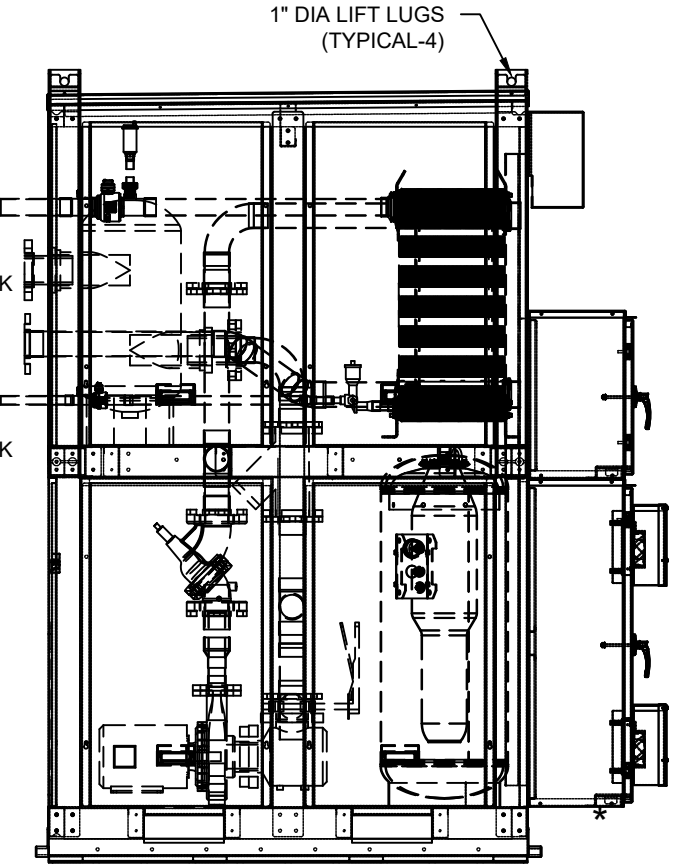
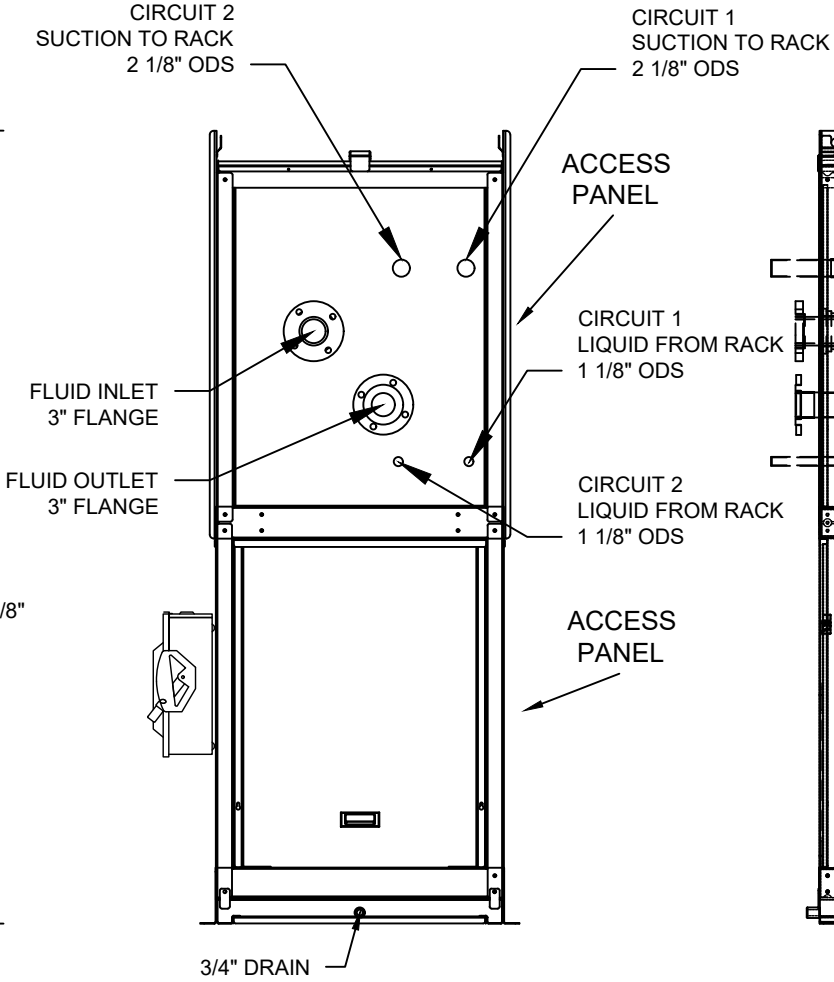
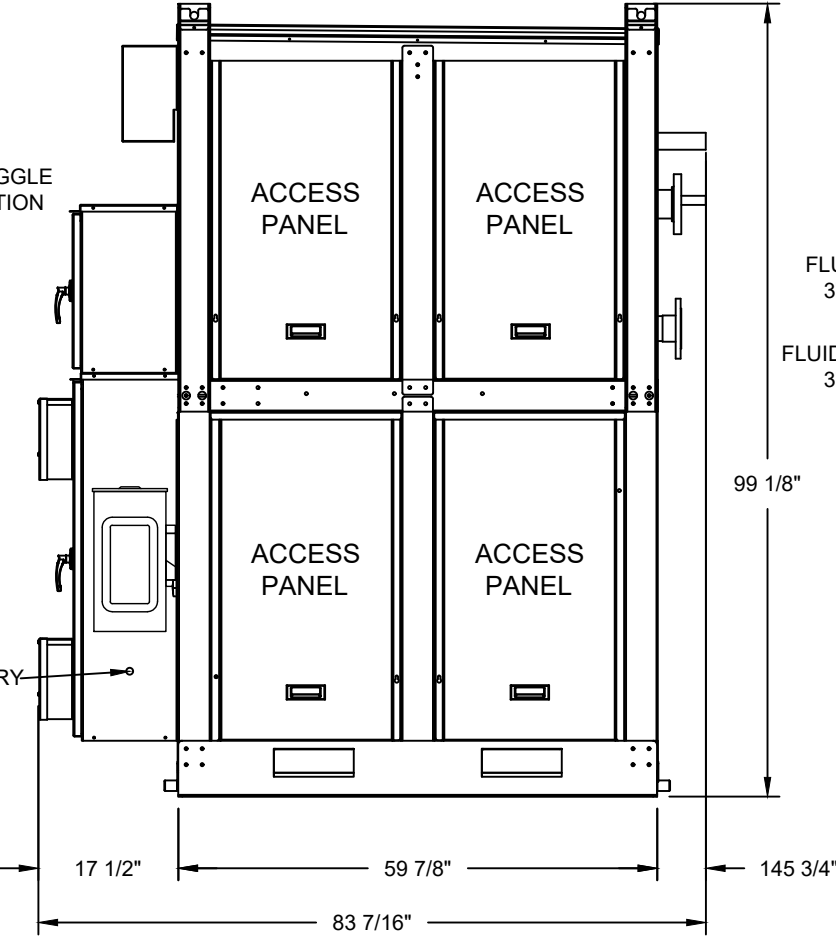
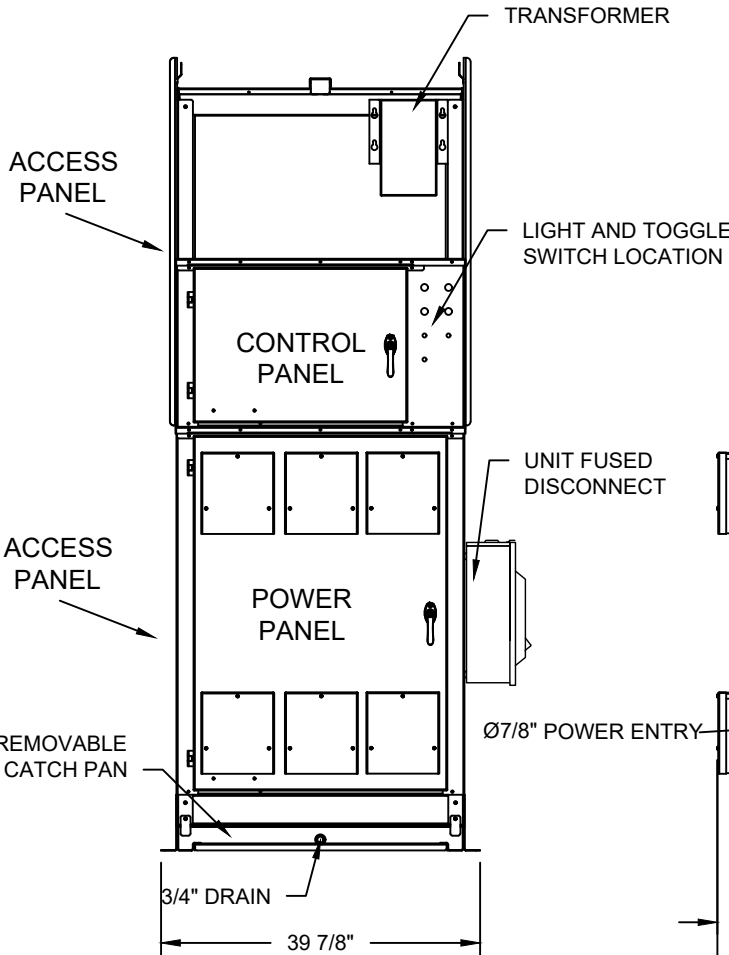
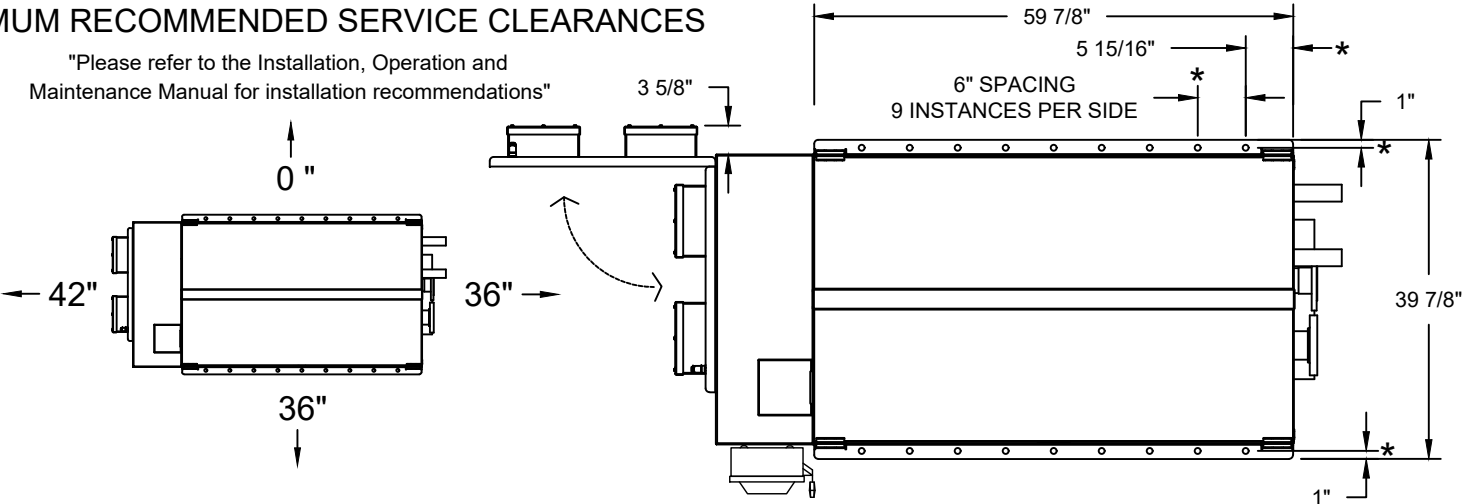
Project Number: WMT-SEC-GLY
Project Name: Walmart Secondary Glycol
Original Submittal Date: 10/19/2023

<i>Date:</i>	<i>Drawings Affected:</i>	<i>Revision Description:</i>
10/17/24	Unit Drawing	• Power entry call outs shown
	P&ID	• Glycol Feeder PRV specified as Field supplied

NOTE: 304 S.S REMOVABLE DRAIN PAN

MINIMUM RECOMMENDED SERVICE CLEARANCES

"Please refer to the Installation, Operation and Maintenance Manual for installation recommendations"



- Revised Circuit Callouts, CM 070824 5
REVISED SERVICE CLEARANCES 4
REVPOWER PANEL AND DISC 3
ADD VENT FAN 2
ADD STRAINER 1

* 3/4"Ø MOUNTING HOLES
Est. Shipping Weight: 2,738#
Est. Operating Weight: 2,999#

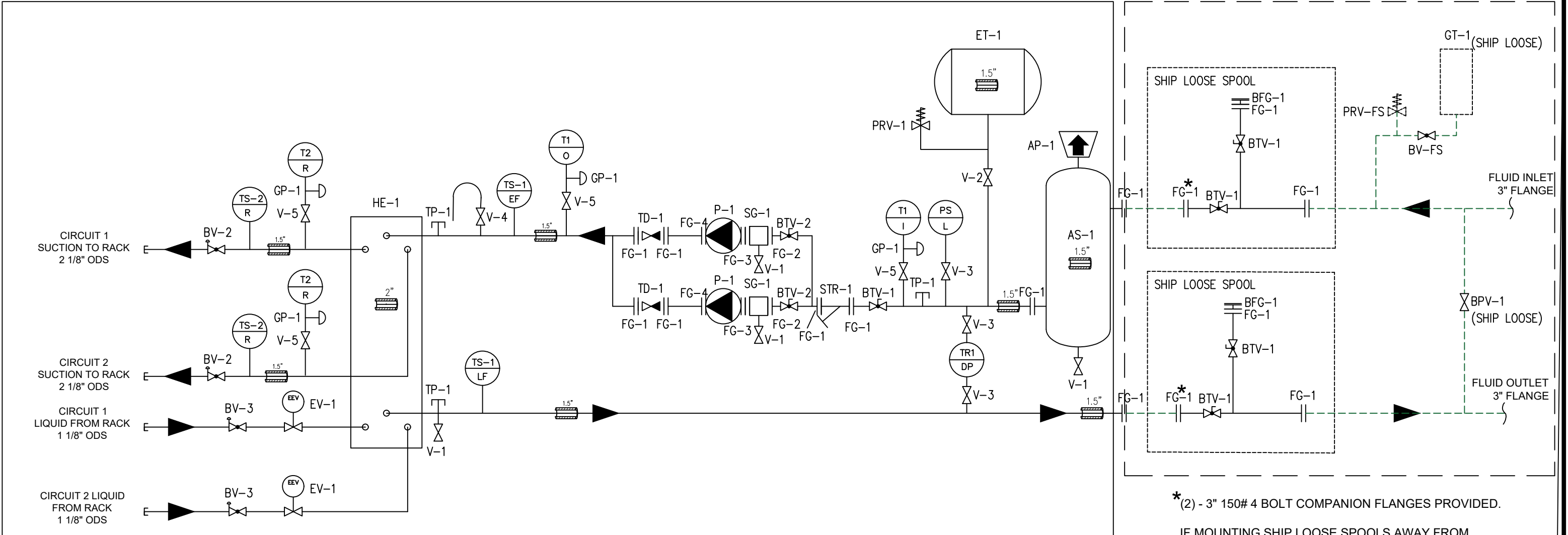


TITLE:
UNIT DRAWING
WMT-SEC-GLY-32/160

SCALE: 1/2"=1'-0"	ENGINEERING APPROVED BY:	QUALITY CONTROL APPROVED BY:	DRAWN BY: CM	REVISED BY:	DATE:	REV. NO:
DATE: 10-12-23			FILE LOC: ACAD149000	CM	11-2-23	1
SUB-TITLE:			DRAWING NUMBER: WMT-SEC-GLY-32/160-208	CM	12-28-23	2
				JD	01/08/24	3
				M.L	04-29-24	4

RAE SKID

FIELD PIPING



*(2) - 3" 150# 4 BOLT COMPANION FLANGES PROVIDED.

IF MOUNTING SHIP LOOSE SPOOLS AWAY FROM RAE SKID (2) ADDITIONAL COMPANION FLANGES ARE REQUIRED. ENSURE COMPATIBILITY WITH CTS FLANGE PART # BF003.

AP-1	AIR PURGE VALVE
AS-1	AIR SEPARATOR
BFG-1	3" BLIND FLANGE
BPV-1	2" BYPASS VALVE
BTV-1	3 1/8" BUTTERFLY VALVE
BTV-2	2 1/2" BUTTERFLY VALVE
BV-FS	BALL VALVE (FIELD SUPPLY)
BV-2	2 1/8" BALL VALVE
BV-3	1 1/8" BALL VALVE
ET-1	EXPANSION TANK
EV-1	EXPANSION VALVE

FG-1	3" FLANGE
FG-2	2.5" FLANGE
FG-3	1.5" FLANGE
FG-4	1" FLANGE
GP-1	GAUGE PORT 1/4"
GT-1	GLYCOL FEEDER TANK
HE-1	HEAT EXCHANGER
P-1	PUMP
PRV-1	PRESSURE RELIEF VALVE
PRV-FS	PRV (FIELD SUPPLY)
PS	PRESSURE SWITCH

SG-1	SUCTION GUIDE
STR-1	STRAINER
T1	TRANS. -15 to 135 PSI
T2	TRANS. 0 to 261 PSI
TD-1	TRIPLE DUTY VALVE
TP-1	PETES PLUG
TR-1	DIFF PRESS TRANSMITTER
TS-1	SENSOR
TS-2	SENSOR
V-1	HAND VALVE 3/4"

V-2	HAND VALVE 7/8"
V-3	HAND VALVE 1/4"
V-4	HAND VALVE 1/2"
V-5	HAND VALVE 3/8"
- - - - - FIELD PIPED	
- - - - - SHIP LOOSE	
- - - - - FACTORY PIPED	
# INSULATE/THICKNESS	

RELOCATED BTV-1 IN THE SHIP LOOSE AREA. ADDED 2 V-3 (M.L. 04-29-24)

ADDED FG-2, FG-3, FG-4

CHANGED BTV ON PUMP SUCTION TO 2.5"

ADDED BUTTERFLY VALVE BEFORE STRAINER

ADD STRAINER



TITLE:
UNIT DRAWING
WMT-SEC-GLY-32/160

SCALE: NONE

DATE:

SUB-TITLE:

ENGINEERING
APPROVED BY:

QUALITY CONTROL
APPROVED BY:

DRAWN BY:

FILE LOC: ACAD WALMART DRAWINGS

DRAWING NUMBER:
WMT-SEC-GLY-32/160-208

REVISED BY:

CM

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DATE:

11-2-23

11-10-23

12-28-23

12-29-23

REV. NO:

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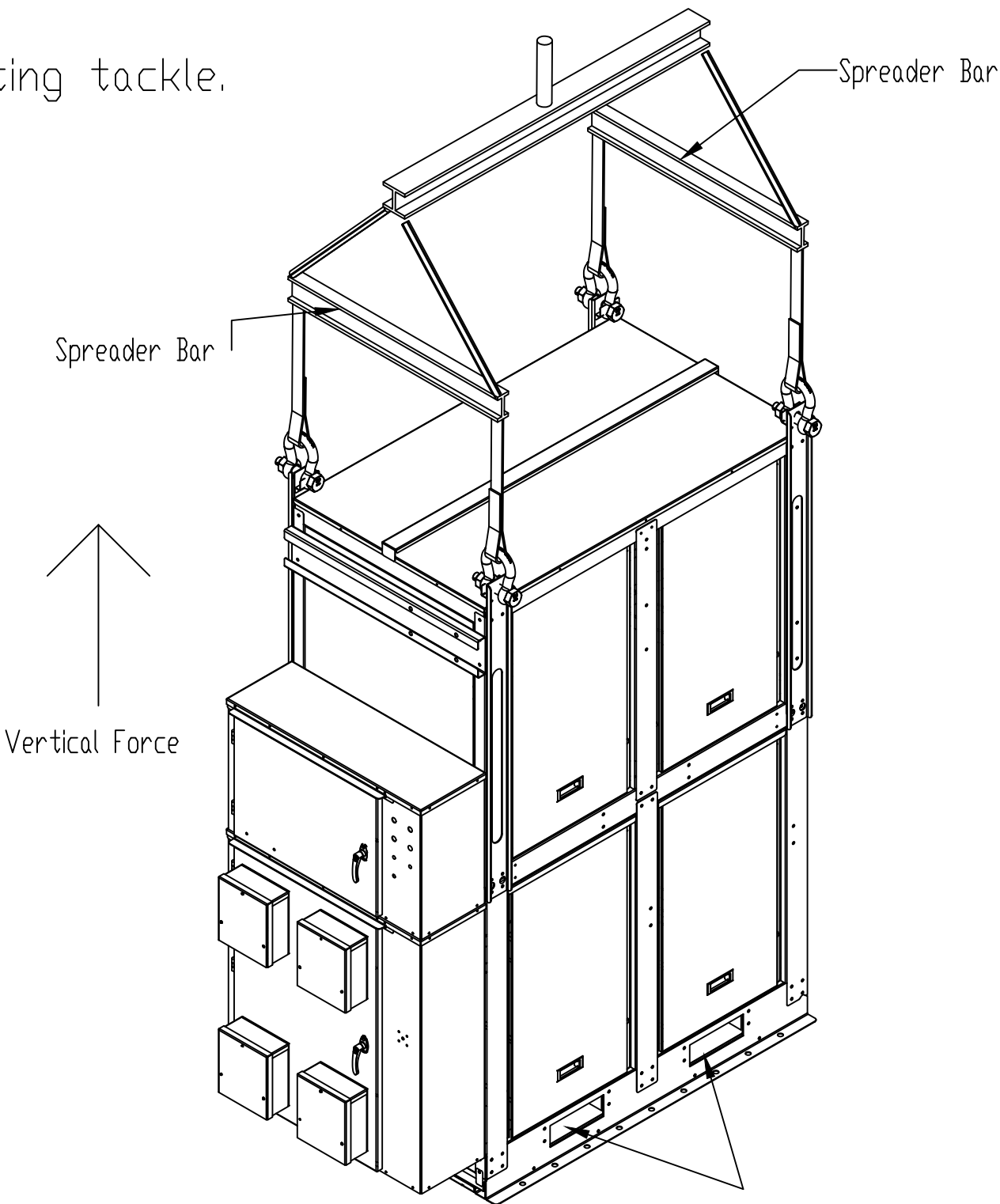
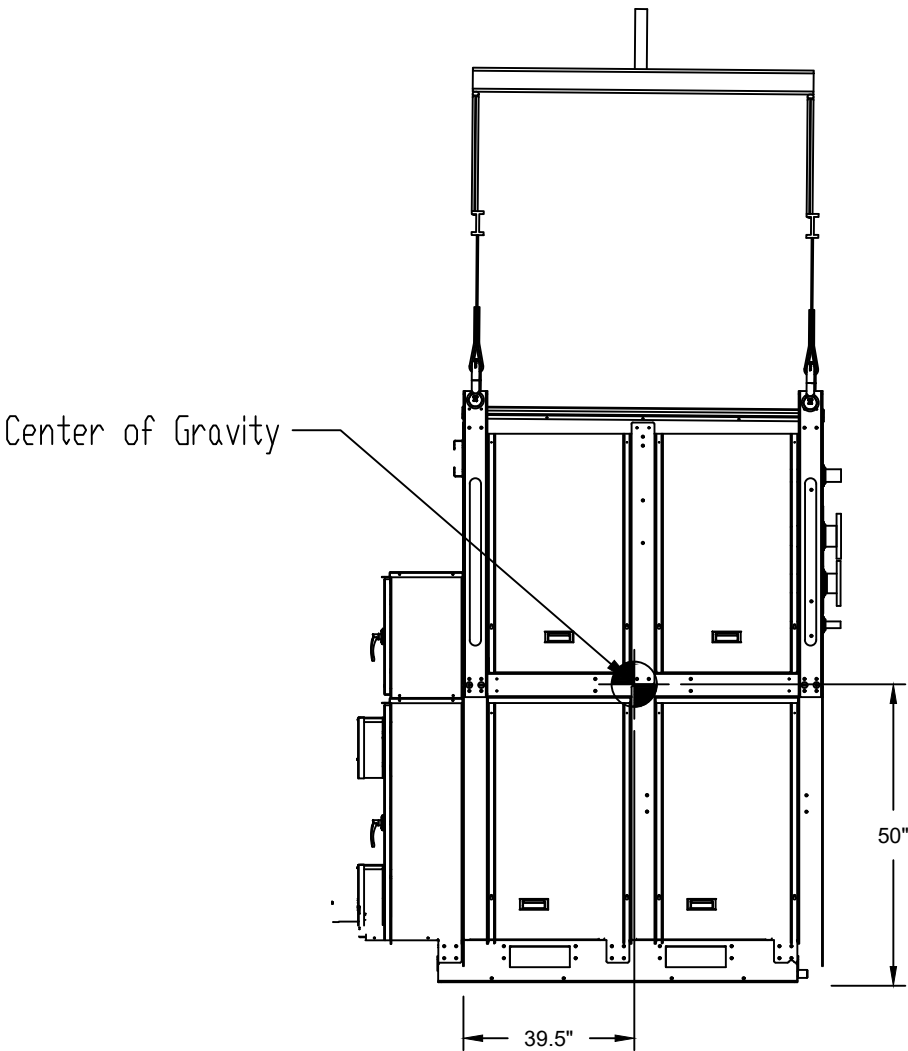
4

Lifting Requirements:

- 1. Use all lifting points.
- 2. A spreader bar must be used to keep vertical force on lifting tackle.

Failure to use each lifting point, along with spreader bars and/or neglecting proper lifting procedures may lead to property damage, injury, or death.

UNIT WEIGHT LISTED ON U1 UNIT DRAWING.



FORKS MUST EXTEND ALL THE WAY THROUGH UNIT WHEN LIFTING WITH FORK LIFT

	SCALE:	ENGINEERING APPROVED BY:	QUALITY CONTROL APPROVED BY:	DRAWN BY: M.L.
	DATE: 05/02/2024			
	SUB-TITLE: WMT-GLY-LIFTING			DRAWING NUMBER: WMT-SEC-GLY-RIGGING

NOTES:

PRESSURE LINE COLOR CODE	
FREEZE	BLUE
LOW	BLUE
HIGH	RED
FAN CYCLE	RED
OIL HIGH	BLACK
OIL LOW	BLUE

LEGEND

AA-Audible Alarm
ADC-Alarm Dry Contact
AFI-Air Flow Interlock
BBH-Belly Band Heater
BLM-Blower Motor
C-Contactor
CCH-Crankcase Heater
CF-Condenser Fan
COMP-Compressor
CPR-Crankcase Press. Reg.
CST-Cooling Stage T'stat
CT-Current Transformers
DDPR-Diff. Disch. Press. Reg.
DEF-Evap. Defrost Load
DPH-Drain Pan Heaters
DS-Door Interlock Sol.
DSHS-Desuperheat hot gas sol.
DTS-Discharge Line Temp. Stat
EF-Evap. Fan Load
EPR-Evap. Press. Reg.
FCS-Fan Cycle Control
FS-Flow Switch
FZ-Freeze Safety
GR/G-Ground
HCC-Heater Cable, Chiller
HCR-Heater Cable, Receiver
HGBS-Hot Gas Bypass Sol.
HGD-Hot Gas Defrost Sol.
HP-High Pressure Safety
HTR-Unit Heater
LALT-Low Amb. Lock Out T'stat
LIS-Liquid Injection Sol.
LLL-Low Liquid Level
LLPS-Load Limit Press. Switch
LLS-Liquid Line Sol.
LO-Lo Press. Control
LO-UPS-Close On Rise UPS
MET-Meter Elapsed Time
MSD-Man.Sw. Door
MSHS-Man. Sw. Horn Silence
MSHOA - Man. Sw. Hand-Off-Auto
MSLL-Man. Sw. Lead Lag
MSPD-Man. Sw. Pumpdown
MSPDOR-Man. Sw. Pumpdown Off Run
MSPHM-Man.Sw. Phase Monitor
OF- Oil Failure Safety
OS-Oil Separator Sol.
OVL-Overload
PHM-Phase Monitor
PM-Power Module, Compressor Box
R-Relay
RH-Evap. Reheat Load
RHC-Reheat Control
RHS-Reheat 3 Way Valve Solenoid
SPR-Spray Pump
SUMP-Sump Heater
TD-Time Delay
TM/TD-Time Delay
TPWS-Timer Part Wind Start
UC DISC-Unit Cooler Disconnect
ULS-Unloader Sol.
UPS-Unloading Press. Sw.

FILE# ACADWMT-24

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DATE: 01/04/24

SCALE: N/A

ENGINEERING APPROVED BY:

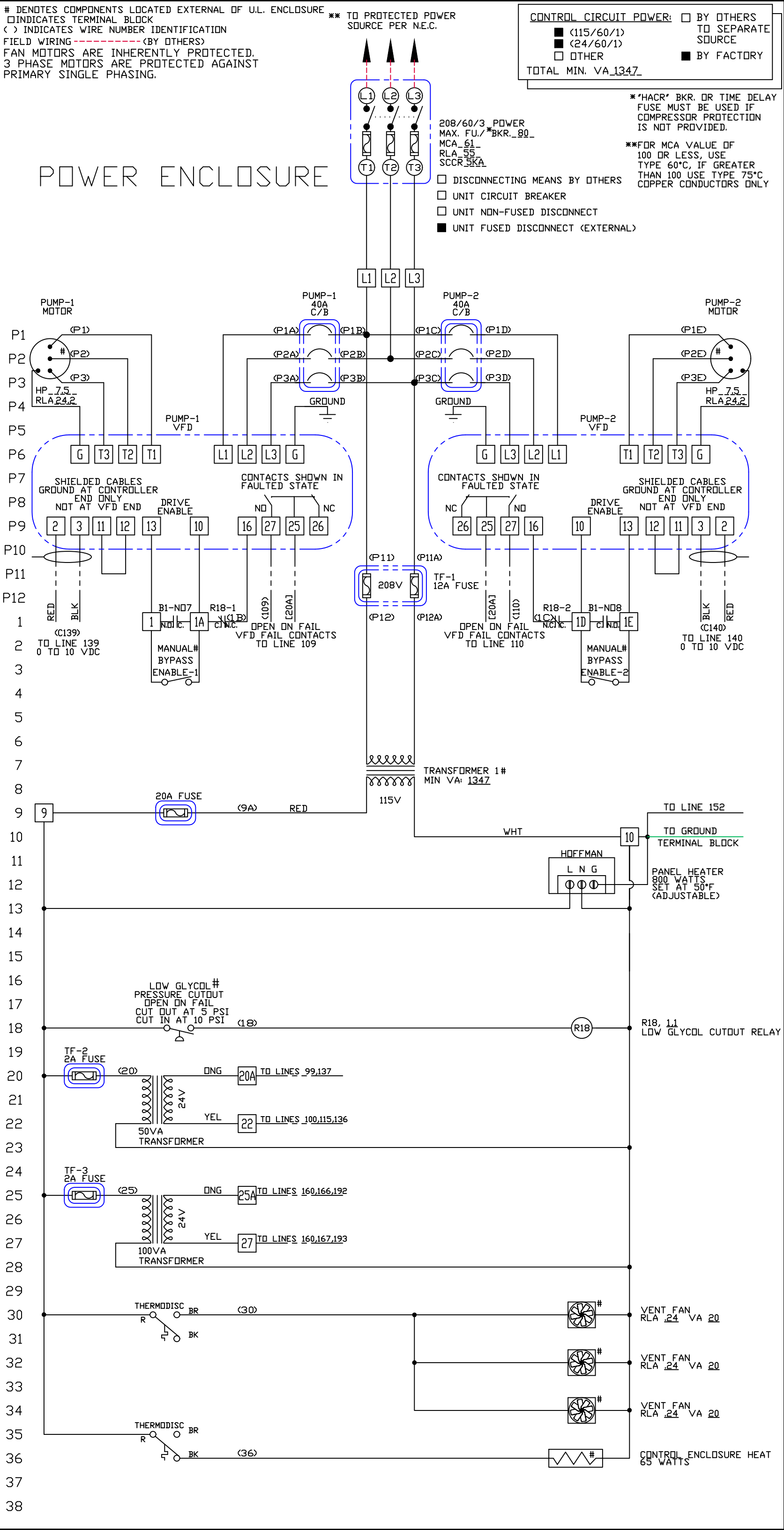
QUALITY CONTROL APPROVED BY:

DRAWN BY: RJP

DRAWING NUMBER: WMT-GLY-32/160-208

WMT-SEC-GLY-32/160

WMT-GLY-32/160-208



NOTES:

LEGEND

AA-Audible Alarm
ADC-Alarm Dry Contact
AFI-Air Flow Interlock
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FILE# ACADWMT-24

7	6	5	4	3	2	1	No.
							By
							Date

SCALE: N/A

DATE: 01/04/24

SUB-TITLE: ELECTRICAL SCHEMATIC

ENGINEERING APPROVED BY:

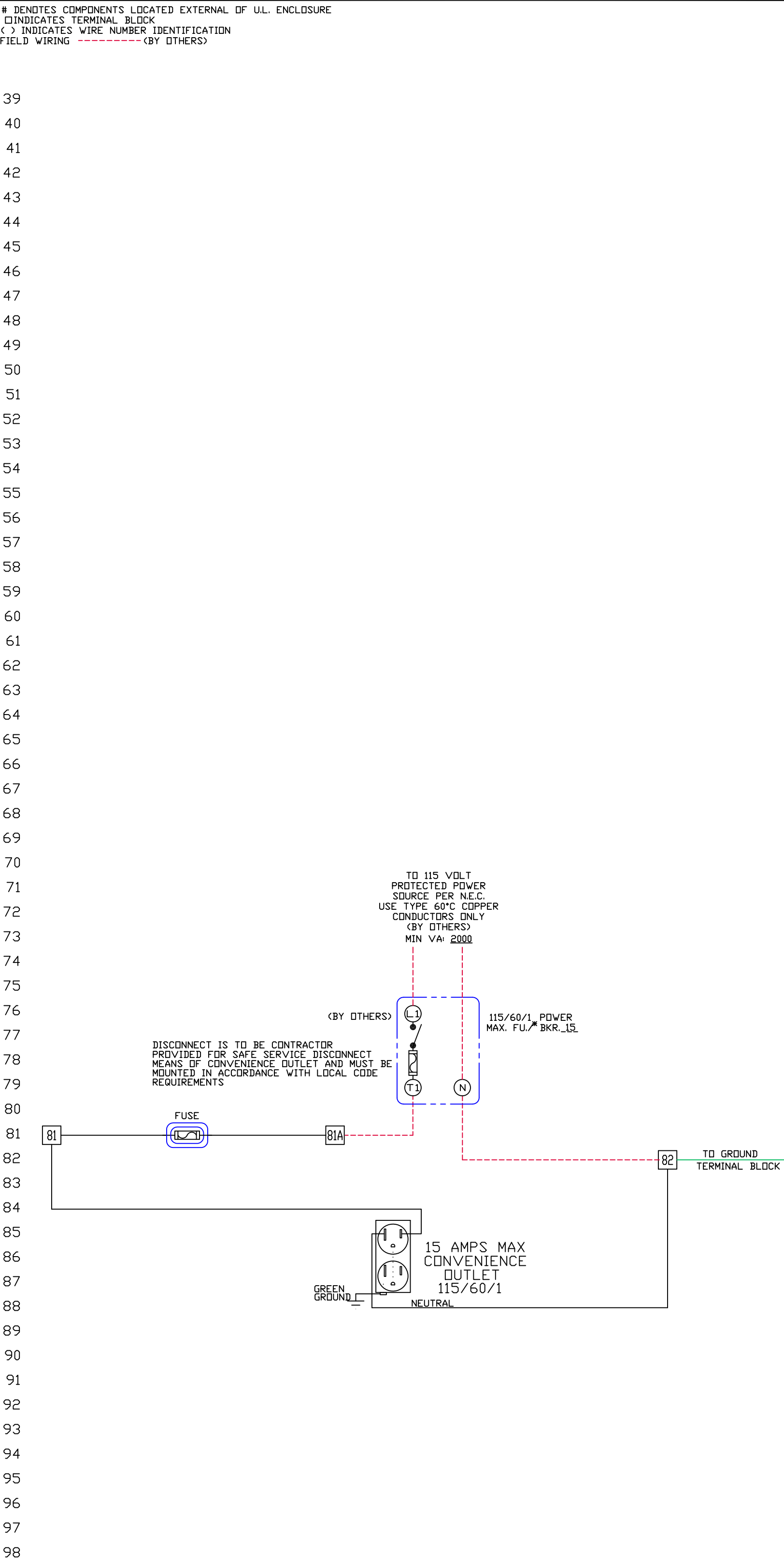
QUALITY CONTROL APPROVED BY:

DRAWN BY: RJP

DRAWING NUMBER: WMT-GLY-32/160-208

CORPORATION

WMT-SEC-GLY-32/160



NOTES:

DENOTES COMPONENTS LOCATED EXTERNAL OF U.L. ENCLOSURE
□ INDICATES TERMINAL BLOCK
< > INDICATES WIRE NUMBER IDENTIFICATION
FIELD WIRING - - - - - (BY OTHERS)

LEGEND

AA-Audible Alarm
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FILE# ACADWMT-24

REVISIONS

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NOTES:

DENOTES COMPONENTS LOCATED EXTERNAL OF U.L. ENCLOSURE
□ INDICATES TERMINAL BLOCK
< > INDICATES WIRE NUMBER IDENTIFICATION
FIELD WIRING - - - - - (BY OTHERS)

LEGEND

AA-Audible Alarm
ADC-Alarm Dry Contact
AFI-Air Flow Interlock
BBH-Belly Band Heater
BLM-Blower Motor
C-Contactor
CCH-Crankcase Heater
CF-Condenser Fan
COMP-Compressor
CPR-Crankcase Press. Reg.
CST-Cooling Stage T'stat
CT-Current Transformers
DDPR-Diff. Disch. Press. Reg.
DEF-Evap. Defrost Load
DPH-Drain Pan Heaters
DS-Door Interlock Sol.
DSHS-Desuperheat hot gas sol.
DTS-Discharge Line Temp. Stat
EF-Evap. Fan Load
EPR-Evap. Press. Reg.
FCS-Fan Cycle Control
FS-Flow Switch
FZ-Freeze Safety
GR/G-Ground
HCC-Heater Cable, Chiller
HCR-Heater Cable, Receiver
HGBS-Hot Gas Bypass Sol.
HGD-Hot Gas Defrost Sol.
HP-High Pressure Safety
HTR-Unit Heater
LALT-Low Amb. Lock Out T'stat
LIS-Liquid Injection Sol.
LLL-Low Liquid Level
LLPS-Load Limit Press. Switch
LLS-Liquid Line Sol.
LO-Lo Press. Control
LO-UPS-Close On Rise UPS
MET-Meter Elapsed Time
MSD-Man.Sw. Door
MSHS-Man. Sw. Horn Silence
MSHOA - Man. Sw. Hand-Off-Auto
MSLL-Man. Sw. Lead Lag
MSPD-Man. Sw. Pumpdown
MSPDOR-Man. Sw. Pumpdown Off Run
MSPHM-Man.Sw. Phase Monitor
OF- Oil Failure Safety
OS-Oil Separator Sol.
OVL-Overload
PHM-Phase Monitor
PM-Power Module, Compressor Box
R-Relay
RH-Evap. Reheat Load
RHC-Reheat Control
RHS-Reheat 3 Way Valve Solenoid
SPR-Spray Pump
SUMP-Sump Heater
TD-Time Delay
TM/TD-Time Delay
TPWS-Timer Part Wind Start
UC DISC-Unit Cooler Disconnect
ULS-Unloader Sol.
UPS-Unloading Press. Sw.

FILE# ACADWMT-24

REVISIONS

12 CORPORATION

WMT-SEC-GLY-32/160

DATE: 01/04/24

SCALE: N/A

SUB-TITLE: ELECTRICAL SCHEMATIC

ENGINEERING APPROVED BY:

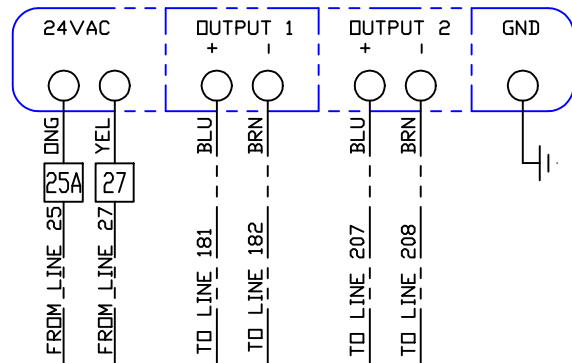
QUALITY CONTROL APPROVED BY:

DRAWN BY: RJP

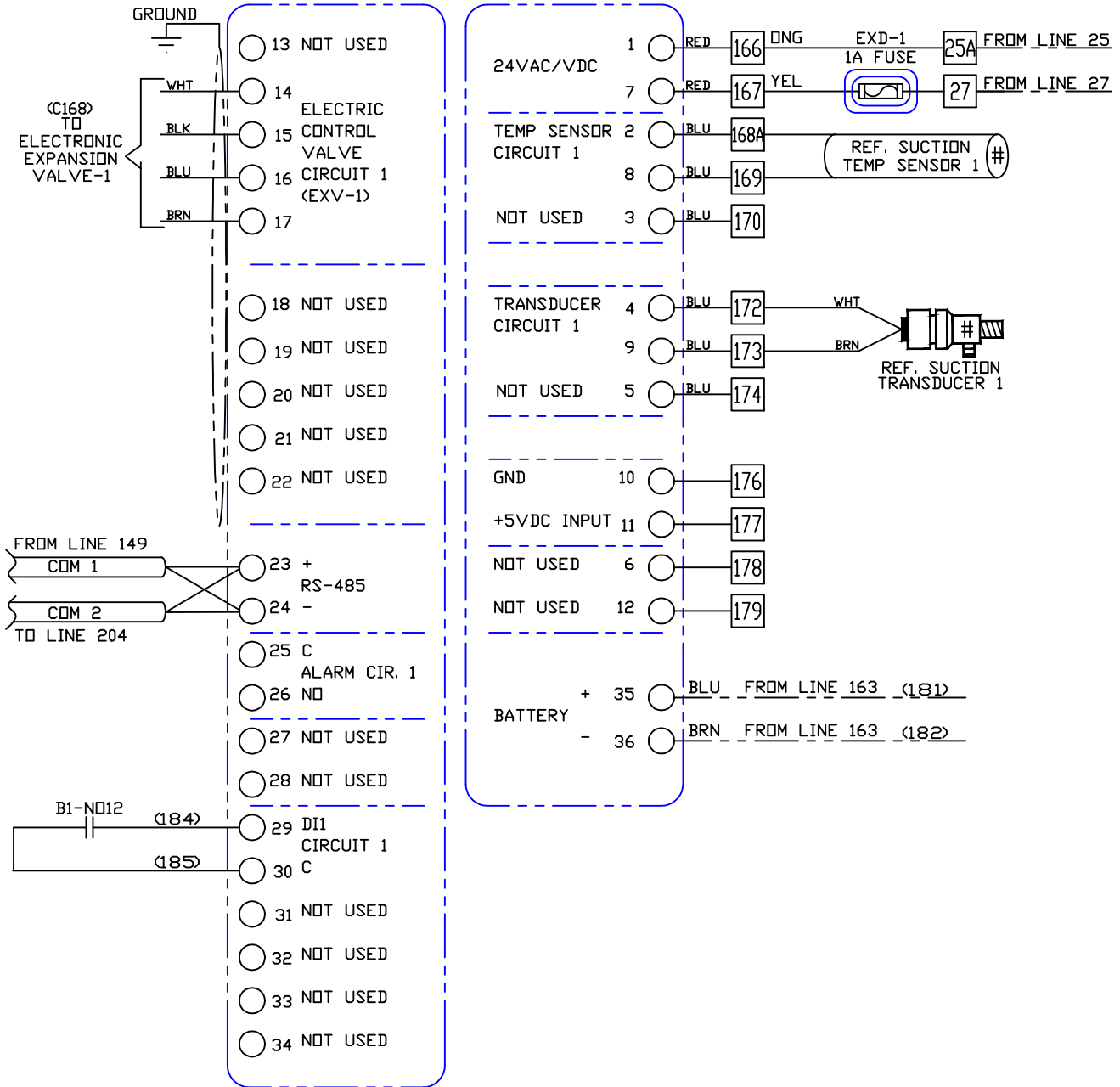
DRAWING NUMBER: WMT-GLY-32/160-208

CONTROLS ENCLOSURE

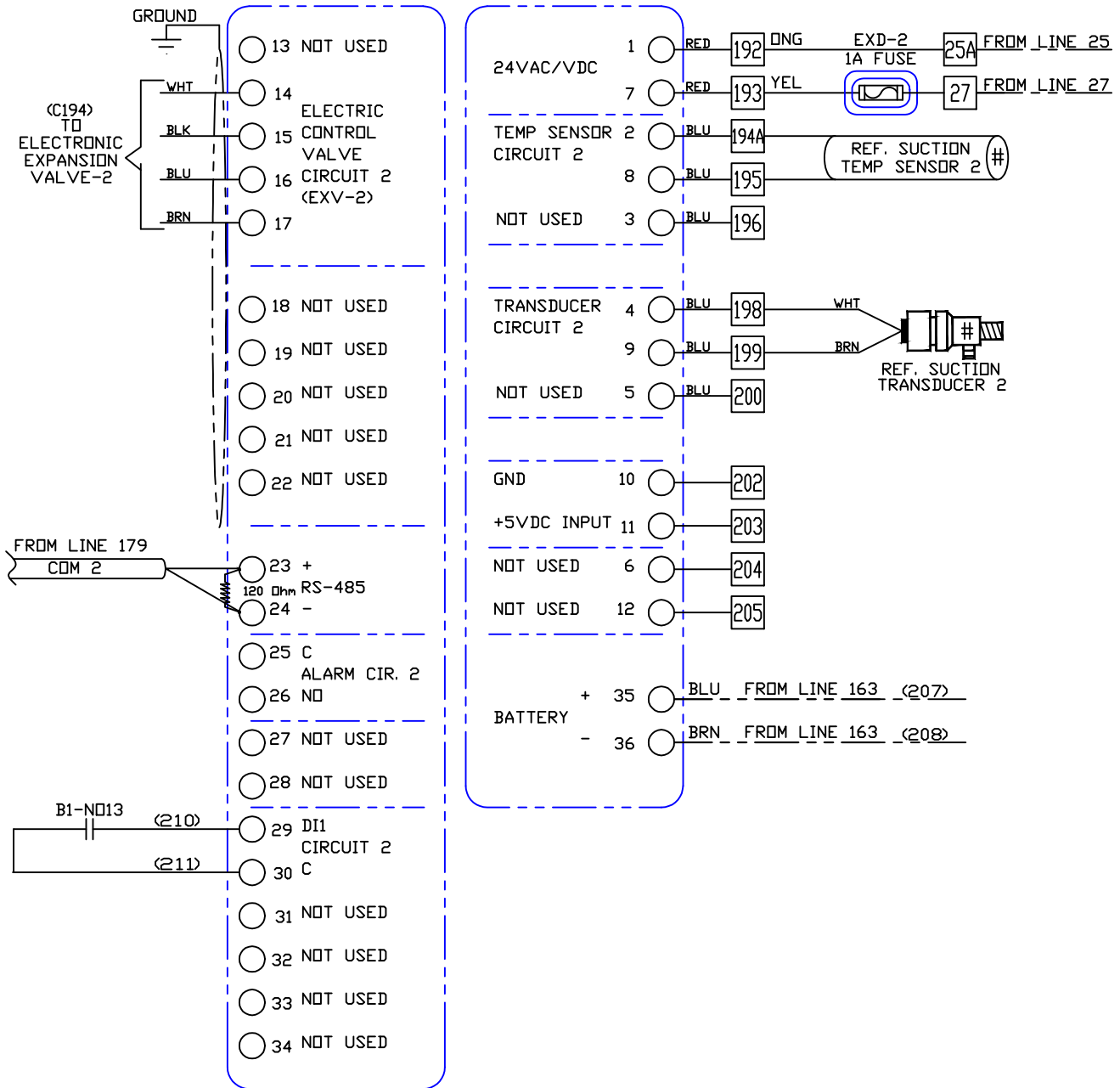
POWER SUPPLY
ECP-024



EXD-SHIA



EXD-SHIB



Suction Line per Circuit @ (Full Load)

SUCTION LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A
 Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
 Liquid Temperature (°F): 90 Line Capacity (tons): 22.2
 Vapor Volume (ft³/lbm): 0.9554 Vapor Flow Rate (lbm/min): 69.7
 Abs Viscosity (lbf-s/ft²): 2.361e-007

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
2-1/8	1.9850	1.177e+006	3098	1.1	0.98

Suction Line per Circuit @ (Full Load)

SUCTION LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A
 Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
 Liquid Temperature (°F): 60 Line Capacity (tons): 22.2
 Vapor Volume (ft³/lbm): 0.9554 Vapor Flow Rate (lbm/min): 59.4
 Abs Viscosity (lbf-s/ft²): 2.361e-007

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
2-1/8	1.9850	1.003e+006	2640	0.81	0.72

Suction Line per Circuit @ (Min Load)

SUCTION LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A
 Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
 Liquid Temperature (°F): 90 Line Capacity (tons): 14.5
 Vapor Volume (ft³/lbm): 0.9554 Vapor Flow Rate (lbm/min): 45.5
 Abs Viscosity (lbf-s/ft²): 2.361e-007

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
2-1/8	1.9850	7.686e+005	2023	0.49	0.44

Suction Line per Circuit @ (Min Load)

SUCTION LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A
 Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
 Liquid Temperature (°F): 60 Line Capacity (tons): 14.5
 Vapor Volume (ft³/lbm): 0.9554 Vapor Flow Rate (lbm/min): 38.8
 Abs Viscosity (lbf-s/ft²): 2.361e-007

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
2-1/8	1.9850	6.551e+005	1725	0.37	0.33

Liquid Line @ Full Load

LIQUID LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A Vertical Height (ft): 5.0
Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
Liquid Temperature (°F): 90 Line Capacity (tons): 44.4

Liquid Density (lbm/ft³): 66.42 Liquid Flow Rate (lbm/min): 139
Abs Viscosity (lbf-s/ft²): 2.651e-006

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
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1-3/8	1.2650	3.289e+005	240	3.1	0.99
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Liquid Line @ Full Load

LIQUID LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A Vertical Height (ft): 5.0
Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
Liquid Temperature (°F): 50 Line Capacity (tons): 44.4

Liquid Density (lbm/ft³): 72.40 Liquid Flow Rate (lbm/min): 113
Abs Viscosity (lbf-s/ft²): 3.506e-006

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
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1-3/8	1.2650	2.024e+005	180	3.0	1.5
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Liquid Line @ Min Load

LIQUID LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A Vertical Height (ft): 5.0
Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
Liquid Temperature (°F): 90 Line Capacity (tons): 14.5

Liquid Density (lbm/ft³): 66.42 Liquid Flow Rate (lbm/min): 45.5
Abs Viscosity (lbf-s/ft²): 2.651e-006

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
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1-3/8	1.2650	1.074e+005	78.5	2.4	0.77
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Liquid Line @ Min Load

LIQUID LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A Vertical Height (ft): 5.0
Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
Liquid Temperature (°F): 60 Line Capacity (tons): 14.5

Liquid Density (lbm/ft³): 71.00 Liquid Flow Rate (lbm/min): 38.8
Abs Viscosity (lbf-s/ft²): 3.274e-006

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
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1-3/8	1.2650	7.414e+004	62.6	2.5	1.1
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Liquid Line per Circuit @ (Max Load)

LIQUID LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A Vertical Height (ft): 5.0
Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
Liquid Temperature (°F): 90 Line Capacity (tons): 22.2

Liquid Density (lbm/ft³): 66.42 Liquid Flow Rate (lbm/min): 69.7
Abs Viscosity (lbf-s/ft²): 2.651e-006

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
1-1/8	1.0250	2.030e+005	183	2.9	0.93

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Liquid Line per Circuit @ (Max Load)

LIQUID LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A Vertical Height (ft): 5.0
Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
Liquid Temperature (°F): 60 Line Capacity (tons): 22.2

Liquid Density (lbm/ft³): 71.00 Liquid Flow Rate (lbm/min): 59.4
Abs Viscosity (lbf-s/ft²): 3.274e-006

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
1-1/8	1.0250	1.401e+005	146	2.9	1.3

=====

Liquid Line per Circuit @ (Min Load)

LIQUID LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A Vertical Height (ft): 5.0
Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
Liquid Temperature (°F): 90 Line Capacity (tons): 14.5

Liquid Density (lbm/ft³): 66.42 Liquid Flow Rate (lbm/min): 45.5
Abs Viscosity (lbf-s/ft²): 2.651e-006

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
1-1/8	1.0250	1.326e+005	120	2.6	0.82

=====

Liquid Line per Circuit @ (Min Load)

LIQUID LINE PRESSURE DROP DATA
(Using NIST RefProp DLL)

Refrigerant R- R448A Vertical Height (ft): 5.0
Evaporator Temperature (°F): 17 Equivalent Length (ft): 50
Liquid Temperature (°F): 60 Line Capacity (tons): 14.5

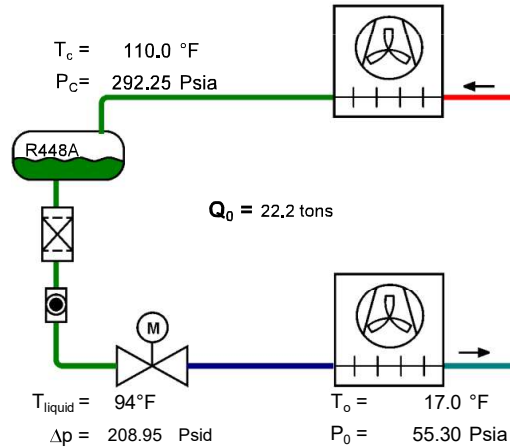
Liquid Density (lbm/ft³): 71.00 Liquid Flow Rate (lbm/min): 38.8
Abs Viscosity (lbf-s/ft²): 3.274e-006

Tube OD (in)	Tube ID (in)	Reynolds Number	Velocity (ft/min)	ΔP (psi)	ΔT (°R)
1-1/8	1.0250	9.149e+004	95.3	2.7	1.2

Electrical control valves

Expansion valve

Refrigerant: R448A	
Evaporating temperature	17.0 °F
Condensing temperature	110.0 °F
Subcooling	16.0 °F
System cooling capacity	22.2 tons
Pressure drop *	28.00 Psid
*) Liquid line, filter drier, solenoid valve, sight glass, liquid distributor and evaporator	



High performance stepper motor ECV



Type	Part No.	MWP	Ratio
EX6-M21	800 621	870 Psid	
EX6-M31	800 623	870 Psid	59% OK

Maximum valve capacity at selected conditions (tons)

Type	R448A
EX8-M21	276
EX7-M21	104
EX6-M21	38
EX5-U21	16
EX4-M21	5.2

Standard stepper motor EXV (To > -35°C)



Type	Part No.	MWP	Ratio
#N/A	#N/A	#N/A Psid	
#N/A	#N/A	#N/A Psid	#N/A

Type	R448A
FX9-U17	-
FX8-M42	-
FX7.5-U11	-
FX7-U11	-
FX6.5-M28	-
FX6-M28	-
FX5-U07	-

Standard stepper motor EXV (To > -35°C)



Type	Part No.	MWP	Ratio
#N/A	#N/A	#N/A Psid	#N/A

Type	R448A
EXL-B1G	-
EXL-B1F	-
EXM-B0E	-
EXM-B0D	-
EXM-B0B	-
EXM-B0A	-

PWM driven EXV



Orifice

Type	Part No.	MWP	Ratio *
EX2-M00	801 091	40 Psid	
EX2-I00	801 090	40 Psid	
CX2-I00	801 095	90 Psid	

#N/A	#N/A		#N/A
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Type	R448A	
	100%	80% *
EX2/CX2-I00/M00	5.40	4.32
EXO-004	3.42	2.74
EXO-003	2.26	1.81
EXO-002	1.35	1.08
EXO-001	1.01	0.80
EXO-000	0.50	0.40
EXO-00X	0.28	0.23

* 20% oversized valve for PWM function at highest load

ASC3 Coil

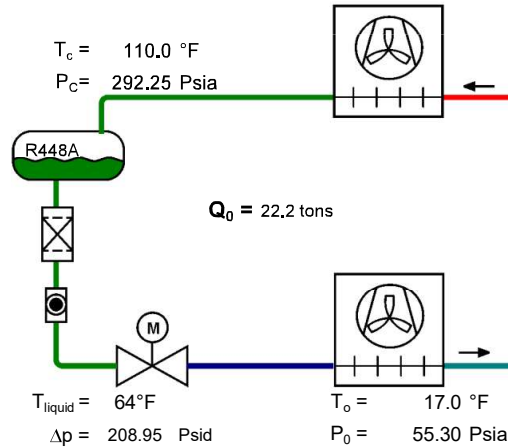
Type	Part No.
ASC3-24V 50Hz	801 079
ASC3-230V 50Hz	801 077

#VALUE!

Electrical control valves

Expansion valve

Refrigerant: R448A	
Evaporating temperature	17.0 °F
Condensing temperature	110.0 °F
Subcooling	46.0 °F
System cooling capacity	22.2 tons
Pressure drop *	28.00 Psid
*) Liquid line, filter drier, solenoid valve, sight glass, liquid distributor and evaporator	



High performance stepper motor ECV



Type	Part No.	MWP	Ratio
EX6-M21	800 621	870 Psid	
EX6-M31	800 623	870 Psid	48% OK

Maximum valve capacity at selected conditions (tons)

Type	R448A
EX8-M21	337
EX7-M21	126
EX6-M21	46
EX5-U21	19
EX4-M21	6.3

Standard stepper motor EXV (To > -35°C)



Type	Part No.	MWP	Ratio
#N/A	#N/A	#N/A Psid	
#N/A	#N/A	#N/A Psid	#N/A

Type	R448A
FX9-U17	-
FX8-M42	-
FX7.5-U11	-
FX7-U11	-
FX6.5-M28	-
FX6-M28	-
FX5-U07	-

Standard stepper motor EXV (To > -35°C)



Type	Part No.	MWP	Ratio
#N/A	#N/A	#N/A Psid	#N/A

Type	R448A
EXL-B1G	-
EXL-B1F	-
EXM-B0E	-
EXM-B0D	-
EXM-B0B	-
EXM-B0A	-

PWM driven EXV



Orifice

Type	Part No.	MWP	Ratio *
EX2-M00	801 091	40 Psid	
EX2-I00	801 090	40 Psid	
CX2-I00	801 095	90 Psid	

#N/A	#N/A		#N/A
------	------	--	------

Type	R448A	
	100%	80% *
EX2/CX2-I00/M00	6.58	5.27
EXO-004	4.17	3.34
EXO-003	2.76	2.20
EXO-002	1.65	1.32
EXO-001	1.22	0.98
EXO-000	0.61	0.49
EXO-00X	0.34	0.28

* 20% oversized valve for PWM function at highest load

ASC3 Coil

Type	Part No.
ASC3-24V 50Hz	801 079
ASC3-230V 50Hz	801 077

#VALUE!

Submittal

Close-Coupled Horizontal End Suction Pump * Staged by External Controls

Model: Series 4280 - 1.5x1x6 - 2p - 7.5 hp - PD (Factory Choice Motor)

Project name: undefined
Location:
Date submitted:
Engineer:
Representative:
Phone number:
e-mail:
Submitted by:

Application design data

Tag number:		Configuration:	Parallel
Service:		Suction pressure:	0 ft
Equipment Location:		Fluid:	Propylene Glycol: 35
Qty:	2	Operating temperature:	20 °F
Total system flow:	160 USgpm	Duty flow per pump:	80 USgpm
System head:	100 ft	Viscosity:	31 SSU
Total dissolved solids:	0 ppm	Specific gravity:	1.0300
NPSHR:	7.52 ft	Absorbed Power/BHP:	3.37 hp
%Mtr Safety*:	91.99%	Efficiency at Design:	61.81 %
Outlet velocity:	29.7 ft/s	Impeller diameter:	6.19 in
PEIv:	0.51	ERv:	49
Standby qty:	0	Pump/motor run qty:	2
Load Profile Location:	NA	Building Type:	NA
Climate Zone Type:	NA	Time Period:	8760 (1 Year)

*Motor safety factor above duty point.

Materials of construction

Construction:	Bronze Fitted	Impeller:	Bronze
Rating:	ANSI-125	Shaft sleeve:	316 Stainless Steel
Connections:	Inlet: 1.5 in, Outlet: 1 in	Casing gasket:	Confined Non-Asbestos Fiber
Casing (volute):	Cast Iron, E-coated		

Mechanical seal data

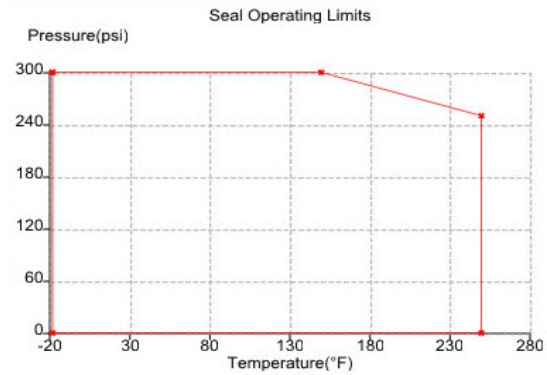
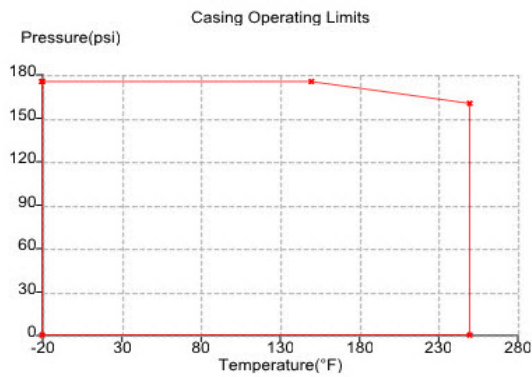
Seal type:	Inside Single Spring	Rotating face:	Sintered Silicon Carbide
Manufacturer code:	SSCsc L EPSS 2A	Stationary seat:	Sintered Silicon Carbide
Springs:	Stainless Steel	Secondary seal:	EPDM
Rotating hardware:	Stainless Steel	Maximum total dissolved solids (TDS)*:	4000 PPM

*Note: Please ensure proper seal is selected by inputting Total Dissolved Solids (TDS) in PPM in ADEPT if water quality is poor at site. Also select Flush Line Filter or Cyclone Separator if there are other contaminants in the fluid.

Electrical data

Supplier:	Factory Choice	Insulation class:	Class F Insulation
Frame size:	184JM	Motor type:	Inverter Duty
Speed:	3045 rpm	Size:	7.5 hp
Enclosure:	ODP	Efficiency:	NEMA Premium 12.12
Power supply:	208/3/60		

Operating limits (temperature - pressure)

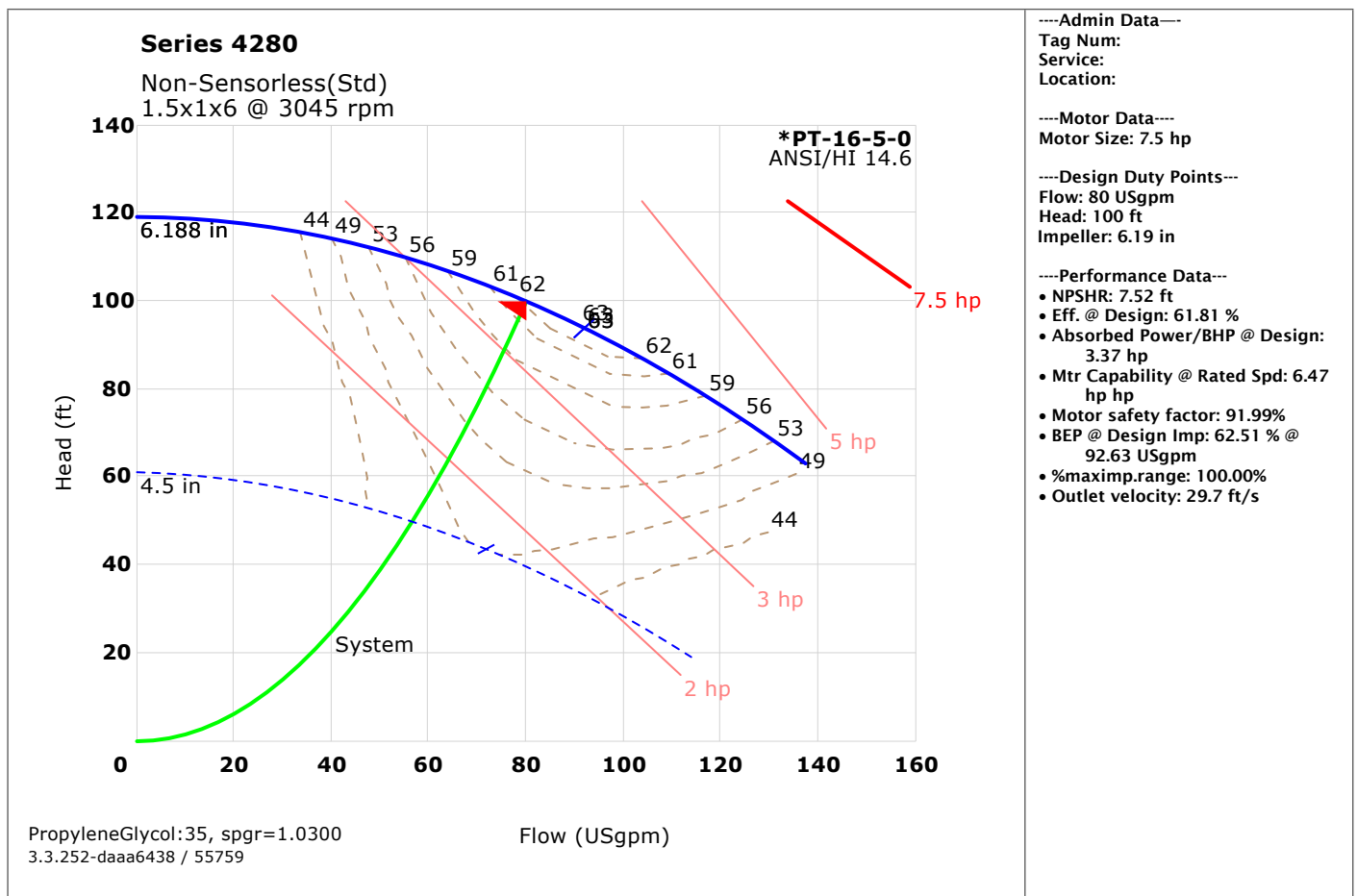


Maximum pressure: 175 psi

Maximum temperature: 250 F

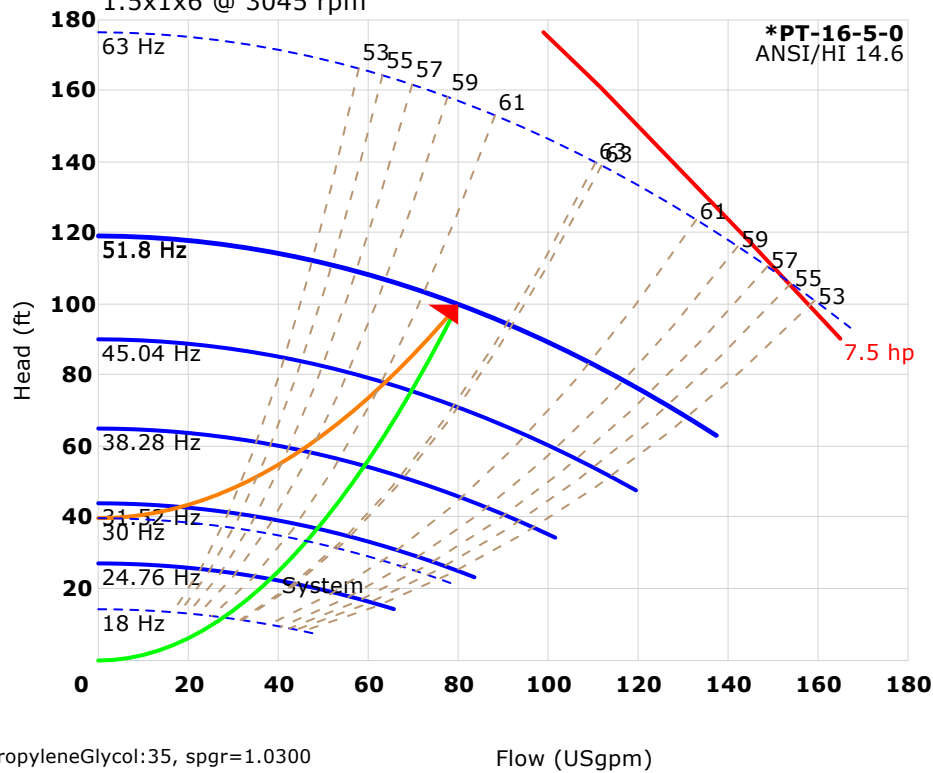
All Pump casings are hydrostatically tested to requirements of ANSI/HI 14.6 standard.

Performance curve



Series 4280

Non-Sensorless(Std)
1.5x1x6 @ 3045 rpm

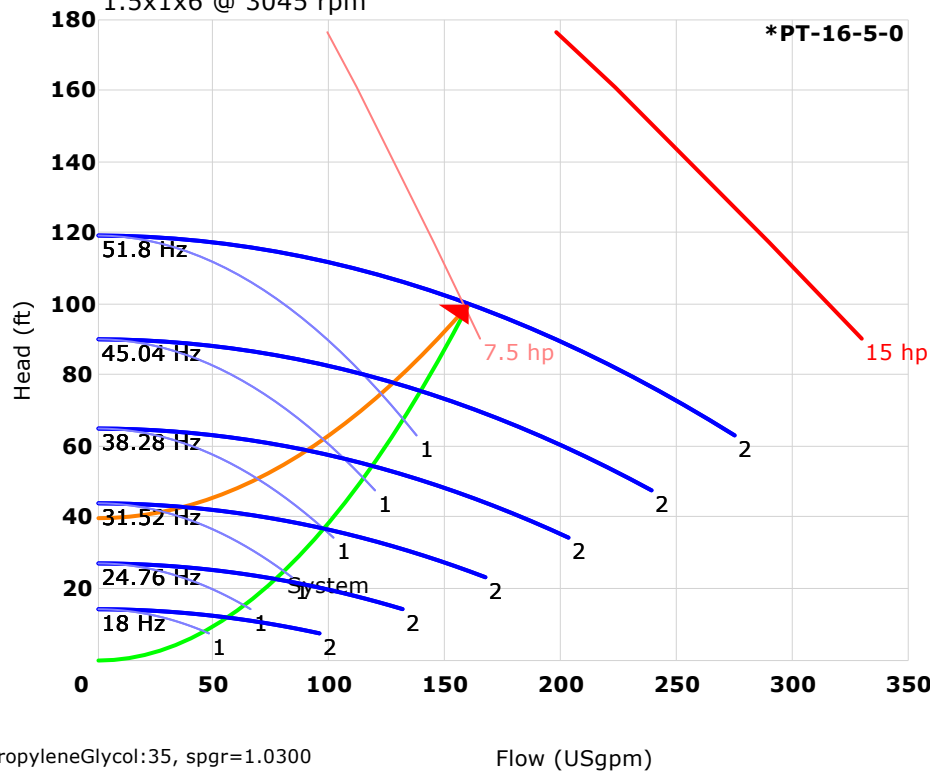


--Control Data--

1. Hmax @ 51.76 Hz:
NPSHR: 7.52 ft
Intersection Pt: 80 usgpm @ 100 ft
bhp=3.37 hp, eff=61.81 %, %bepq=86 %
2. Control (QPC) @ 47.4 Hz:
NPSHR: 6.43 ft
Intersection Pt: 70 USgpm @ 85.94 ft
bhp=2.55 hp, eff=61.27%, %bepq=82.24%
3. Control (QPC) @ 43.05 Hz:
NPSHR: 5.38 ft
Intersection Pt: 59.2 USgpm @ 72.86 ft
bhp=1.86 hp, eff=60.29%, %bepq=76.41%
4. Control (QPC) @ 38.69 Hz:
NPSHR: 4.4 ft
Intersection Pt: 47.2 USgpm @ 60.89 ft
bhp=1.28 hp, eff=58.33%, %bepq=67.67%
5. Control (QPC) @ 34.34 Hz:
NPSHR: 3.54 ft
Intersection Pt: 32.8 USgpm @ 50.09 ft
bhp=0.8 hp, eff=53.24%, %bepq=52.93%
6. Hmin: 40 ft 29.98 Hz:
NPSHR: 2.79 ft
Intersection Pt: 0 USgpm @ 40 ft (Head Q Min) Setting= 40% Hmax

Parallel Pump Curve-Series 4280

Non-Sensorless(Std)
1.5x1x6 @ 3045 rpm



Admin Data

Tag Num:
Service:
Location:

Motor Data
Motor Size: 7.5 hp

System Design Data

Piping: Parallel
Run Qty: 2
Fluid: Propylene Glycol
Sp.Gr: 1.0300,Vis= 31 SSU
Suction: 0 ft
Total Design Flow= 160 USgpm
Total Design Head= 100 ft

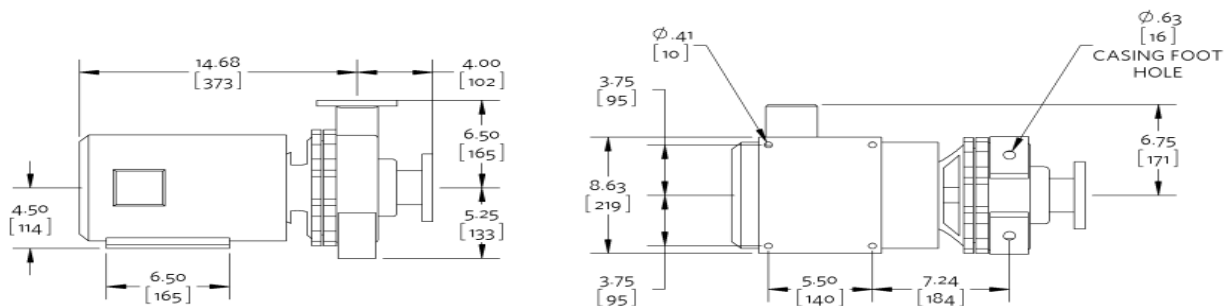
Performance Data

Total System Flow = 160 USgpm

Dimensional data (not for construction)

Side view

Top view



Inverter motor type: Inverter duty

Weight: 158 lb [71.67 kg], Units of measure: inches [millimeters]

- Not to scale
- Tolerance of ± 0.125 inch (± 3 mm) should be used
- For certified dimensions, please contact your Armstrong representative
- Pump equipped with casing drain plug and $\frac{1}{4}$ inch NPT suction and discharge gauge ports

Connection details

Connection	Size	Rating	OD	Bolt quantity*	BCD	Bolt size
------------	------	--------	----	----------------	-----	-----------

Inlet	1.5	ANSI-125	5.00	4	3.88	0.5
Outlet	1	ANSI-125	4.25	4	3.13	0.5

*Equally spaced straddling centreline

Special instructions

The program has defaulted to a NEMA Premium Efficiency motor supplied with NEMA MG-1 Part 31.4.4.2 insulation standards for inverter-fed polyphase motors.

Selected options

Testing: No Test Certification Required
 Seal Environment Accessories: None
 Space Heater: No
 Motor Thermistor: No Thermistors
 Wye-Delta Starting: No

Submittal

Close-Coupled Horizontal End Suction Pump * Staged by External Controls

Model: Series 4280 - 1.5x1x6 - 2p - 7.5 hp - PD (Factory Choice Motor)

Project name: undefined	Representative:
Location:	Phone number:
Date submitted:	e-mail:
Engineer:	Submitted by:

Application design data

Tag number:	Quantity: 2
Service:	Horsepower: 7.5 hp
Location:	

Standard features

User interface - multifunction keypad with the following: · Graphical display (shows bars and graphs) · Quick setup menu · 2 Level password protection · Intuitive help functionality	Energy conservation: · Automatic energy optimizer (AEO) for accurate load matching · Energy monitoring for measuring kWh consumption · Flow compensation for locally mounted DP sensor(s)
Power isolation: · Optional Integrated fused disconnect switch	Motor protection: · Automatic current limiting and fault protection
Pump protection: · Preventative maintenance scheduling · Dry running and end of curve protection	Condensation protection: · Motor pre-heat function to prevent condensation build-up

IVS controller data

Sensorless control:	No	Communication port:	RS 485
Communication protocol:	BACnet Native	Analog inputs:	2 (current or voltage)
Enclosure:	UL Type 12/IP55	Analog outputs:	1 (current)
Fused disconnect switch:	None	Digital inputs:	4 (programmable)
Expansion card:	None	Digital outputs:	2 (programmable)
Chassis size:	A5	Cooling:	Fan cooled through back channel
Harmonic suppression:	Integrated DC link reactor**	Ambient temperature:	14°F to 104°F (up to 3280 ft elevation)
Meets ASHRAE 90.1:	IVS ashre	EMI/RFI control:	Integrated fliter to meet EN61800-3
Power supply:	208/3/60		

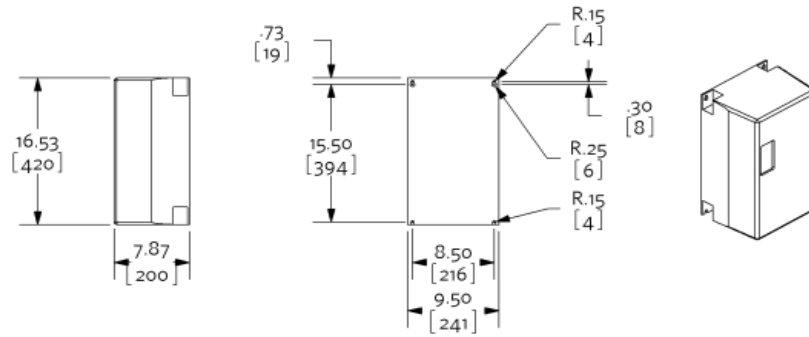
** The IVS control is a low harmonic control with a built-in DC link reactor equivalent in performance to a 5% AC line reactor. This does not guarantee performance to any system wide harmonic specification or the costs to meet a system wide specification. If supplied with the system electrical details, Armstrong will run a computer simulation of the system wide harmonics. If system harmonic levels are exceeded, Armstrong can also recommend additional harmonic mitigation and the cost for such mitigation.

Dimensional data (not for construction)

Side view

Back view

Isometric



Weight: 41 lb [18.6 kg], Units of measure: inches [millimeters]

- Not to scale
- Tolerance of +/- 0.125 inch (+/- 3mm) should be used
- For certified dimensions, please contact your Armstrong representative

Submittal

close-coupled horizontal end suction pump

Model: Series 4280 - 1.5x1x6 - 2p - 7.5 hp - PD (Factory Choice Motor)

Project name: undefined
Location:
Date submitted:
Engineer:
Representative:
Phone number:
e-mail:
Submitted by:

Application design data

Tag number:		Configuration:	Single
Service:		Suction pressure:	0 ft
Equipment Location:		Fluid:	Propylene Glycol: 35
Qty:	1	Operating temperature:	20 °F
Total system flow:	142.5 USgpm	Duty flow per pump:	142.5 USgpm
System head:	100 ft	Viscosity:	31 SSU
Total dissolved solids:	0 ppm	Specific gravity:	1.0300
NPSHR:	22.93 ft	Absorbed Power/BHP:	6.57 hp
%Mtr Safety*:	14.16%	Efficiency at Design:	56.4 %
Outlet velocity:	52.9 ft/s	Impeller diameter:	6.19 in
PEIv:	0.51	ERv:	49
Standby qty:	0	Pump/motor run qty:	1
Load Profile Location:	NA	Building Type:	NA
Climate Zone Type:	NA	Time Period:	8760 (1 Year)

*Motor safety factor above duty point.

Materials of construction

Construction:	Bronze Fitted	Impeller:	Bronze
Rating:	ANSI-125	Shaft sleeve:	316 Stainless Steel
Connections:	Inlet: 1.5 in, Outlet: 1 in	Casing gasket:	Confined Non-Asbestos Fiber
Casing (volute):	Cast Iron, E-coated		

Mechanical seal data

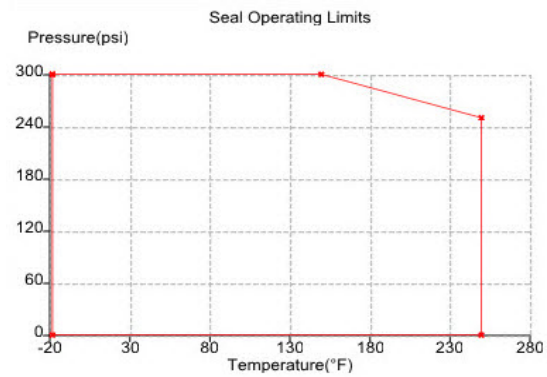
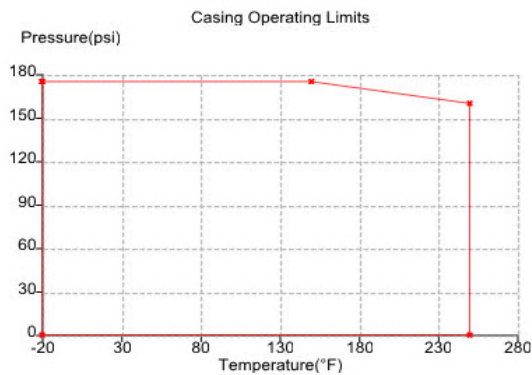
Seal type:	Inside Single Spring	Rotating face:	Sintered Silicon Carbide
Manufacturer code:	SSCsc L EPSS 2A	Stationary seat:	Sintered Silicon Carbide
Springs:	Stainless Steel	Secondary seal:	EPDM
Rotating hardware:	Stainless Steel	Maximum total dissolved solids (TDS)*:	4000 PPM

*Note: Please ensure proper seal is selected by inputting Total Dissolved Solids (TDS) in PPM in ADEPT if water quality is poor at site. Also select Flush Line Filter or Cyclone Separator if there are other contaminants in the fluid.

Electrical data

Supplier:	Factory Choice	Insulation class:	Class F Insulation
Frame size:	184JM	Motor type:	Inverter Duty
Speed:	3531 rpm	Size:	7.5 hp
Enclosure:	ODP	Efficiency:	NEMA Premium 12.12
Power supply:	208/3/60		

Operating limits (temperature - pressure)

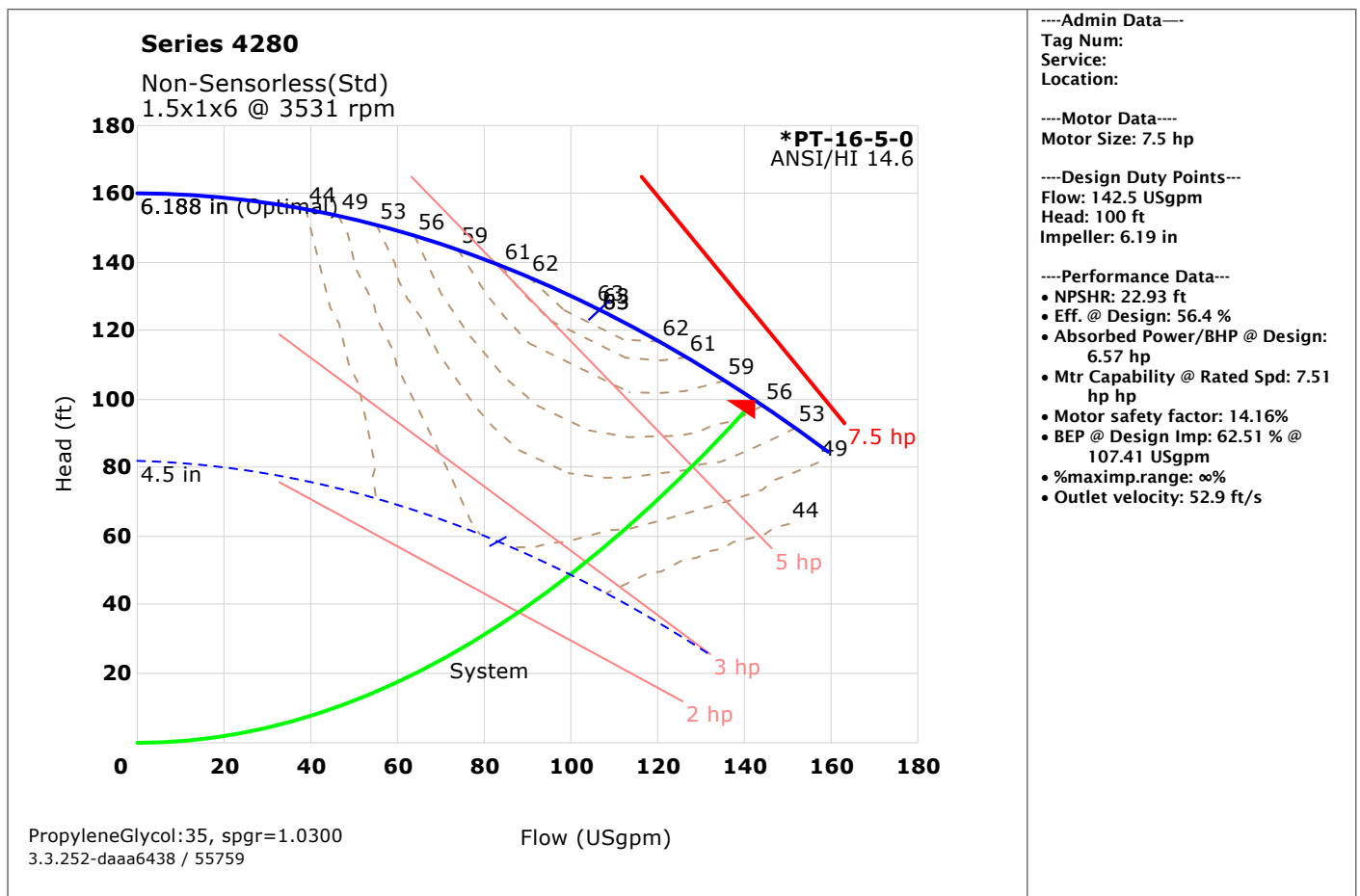


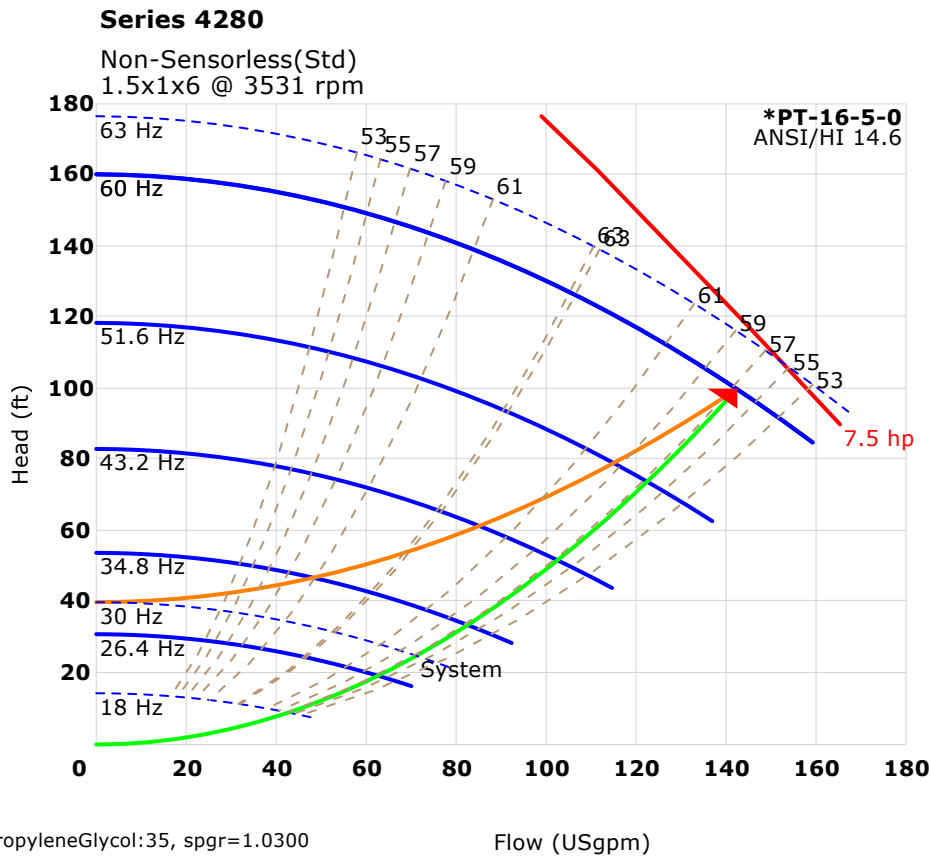
Maximum pressure: 175 psi

Maximum temperature: 250 F

All Pump casings are hydrostatically tested to requirements of ANSI/HI 14.6 standard.

Performance curve





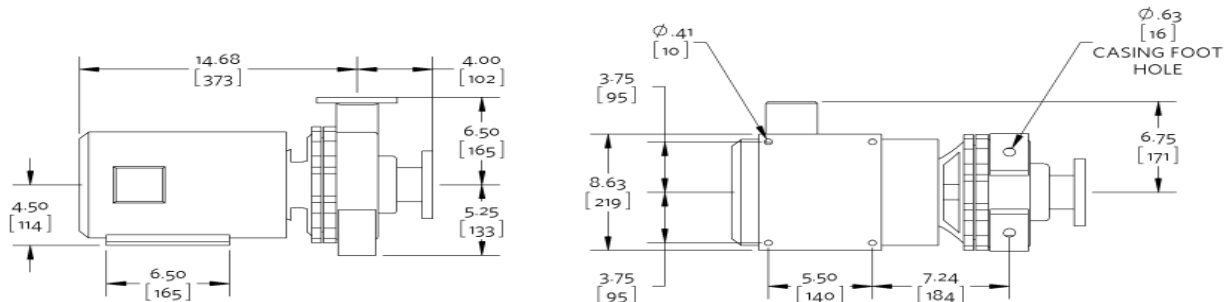
--Control Data--

1. Hmax @ 60.02 Hz:
NPSHR: 22.93 ft
Intersection Pt: 142.5 usgpm @ 100 ft
bhp=6.57 hp, eff=56.4 %, %bepq=133 %
2. Control (QPC) @ 54.01 Hz:
NPSHR: 17.17 ft
Intersection Pt: 124.69 USgpm @ 85.94 ft
bhp=4.8 hp, eff=58.07%, %bepq=127.89%
3. Control (QPC) @ 48 Hz:
NPSHR: 12.11 ft
Intersection Pt: 105.45 USgpm @ 72.86 ft
bhp=3.33 hp, eff=60%, %bepq=120.79%
4. Control (QPC) @ 42 Hz:
NPSHR: 7.88 ft
Intersection Pt: 84.08 USgpm @ 60.89 ft
bhp=2.15 hp, eff=61.92%, %bepq=109.51%
5. Control (QPC) @ 35.99 Hz:
NPSHR: 4.72 ft
Intersection Pt: 58.43 USgpm @ 50.09 ft
bhp=1.23 hp, eff=62.03%, %bepq=88.72%
6. Hmin: 40 ft 29.98 Hz:
NPSHR: 2.78 ft
Intersection Pt: 0 USgpm @ 40 ft (Head Q Min) Setting= 40% Hmax

Dimensional data (not for construction)

Side view

Top view



Inverter motor type: Inverter duty

Weight: 158 lb [71.67 kg], Units of measure: inches [millimeters]

- Not to scale
- Tolerance of ± 0.125 inch (± 3 mm) should be used
- For certified dimensions, please contact your Armstrong representative
- Pump equipped with casing drain plug and $\frac{1}{4}$ inch NPT suction and discharge gauge ports

Connection details

Connection	Size	Rating	OD	Bolt quantity*	BCD	Bolt size
------------	------	--------	----	----------------	-----	-----------

Inlet	1.5	ANSI-125	5.00	4	3.88	0.5
Outlet	1	ANSI-125	4.25	4	3.13	0.5

*Equally spaced straddling centreline

Special instructions

The program has defaulted to a NEMA Premium Efficiency motor supplied with NEMA MG-1 Part 31.4.4.2 insulation standards for inverter-fed polyphase motors.

Selected options

Testing: No Test Certification Required

Seal Environment Accessories: None

Space Heater: No

Motor Thermistor: No Thermistors

Wye-Delta Starting: No

Submittal

close-coupled horizontal end suction pump

Model: Series 4280 - 1.5x1x6 - 2p - 7.5 hp - PD (Factory Choice Motor)

Project name: undefined	Representative:
Location:	Phone number:
Date submitted:	e-mail:
Engineer:	Submitted by:

Application design data

Tag number:	Quantity: 1
Service:	Horsepower: 7.5 hp
Location:	

Standard features

User interface - multifunction keypad with the following: · Graphical display (shows bars and graphs) · Quick setup menu · 2 Level password protection · Intuitive help functionality	Energy conservation: · Automatic energy optimizer (AEO) for accurate load matching · Energy monitoring for measuring kWh consumption · Flow compensation for locally mounted DP sensor(s)
Power isolation: · Optional Integrated fused disconnect switch	Motor protection: · Automatic current limiting and fault protection
Pump protection: · Preventative maintenance scheduling · Dry running and end of curve protection	Condensation protection: · Motor pre-heat function to prevent condensation build-up

IVS controller data

Sensorless control:	No	Communication port:	RS 485
Communication protocol:	BACnet Native	Analog inputs:	2 (current or voltage)
Enclosure:	UL Type 12/IP55	Analog outputs:	1 (current)
Fused disconnect switch:	None	Digital inputs:	4 (programmable)
Expansion card:	None	Digital outputs:	2 (programmable)
Chassis size:	A5	Cooling:	Fan cooled through back channel
Harmonic suppression:	Integrated DC link reactor**	Ambient temperature:	14°F to 104°F (up to 3280 ft elevation)
Meets ASHRAE 90.1:	IVS ashre	EMI/RFI control:	Integrated fliter to meet EN61800-3
Power supply:	208/3/60		

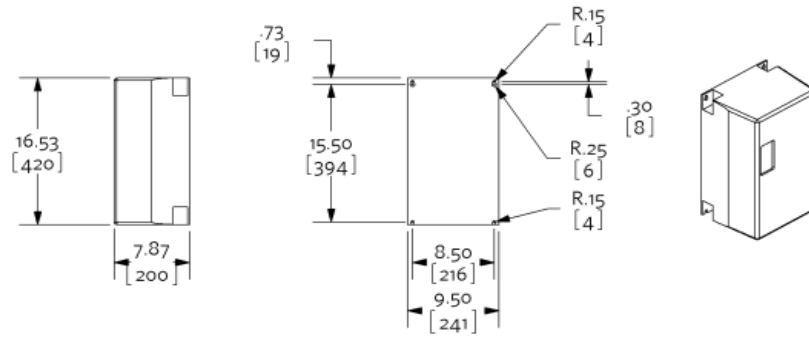
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Dimensional data (not for construction)

Side view

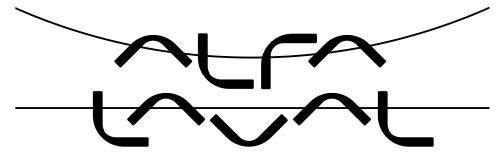
Back view

Isometric



Weight: 41 lb [18.6 kg], Units of measure: inches [millimeters]

- Not to scale
- Tolerance of +/- 0.125 inch (+/- 3mm) should be used
- For certified dimensions, please contact your Armstrong representative



Brazed Plate Heat Exchanger

Technical Specification

Model : AC502DQ-130AH-F(30751 2845 2)
Item name : Walmart Y24 #3/4 Dual 160gpm
Units : 1
Date: 2024-01-11

		Hot Side	Cold side
		Secondary side	Primary side(S4)
Fluid		35.0%Prop.glycol	R448A
Flow rate		160 gpm	7497 lb/hr
Fluid Condensed/Vapourized	lb/h	0.000	5337
Inlet temperature	°F	27.0	12.8
Dew p.	°F		17.0
Outlet temperature(vapor/liquid)	°F	20.0	22.0
Operating pressure(in/out)	psia	/	66.8/52.7
Pressure drop	psi	3.50	14.0
Velocity connection(in/out)	ft/s	7.02/7.01	64.8/46.6
Heat exchanged	kBtu/h	532.5	
Heat transfer area	ft ²	304.49	
OHTC clean conditions	Btu/(ft ² ·h·°F)	298.5	
OHTC service	Btu/(ft ² ·h·°F)	222.4	
Fouling resistance*10000	ft ² ·h·°F/Btu	0.0	
Mean Temperature Difference	°F	7.9	
Relative directions of fluids		Countercurrent	
Number of passes		1	1
Materialplate/ brazing		Alloy 316 / Cu	
ConnectionS1 (Hot-in)		Soldering/ 79.5 (3 1/8") (L39R) Alloy 304	
ConnectionS2 (Hot-out)		Soldering/ 79.5 (3 1/8") (L39R) Alloy 304	
ConnectionS3.1 (Cold-in)		Soldering/ 1 1/8" (28.7 mm) Premix (D56R) Alloy	
304			
ConnectionS4.2 (Cold-out)		Soldering/ 2 1/8" (54.2 mm) (L34R) Alloy 304	
ConnectionS4.1 (Cold-out)		Soldering/ 2 1/8" (54.2 mm) (L34R) Alloy 304	
ConnectionS3.2 (Cold-in)		Soldering/ 1 1/8" (28.7 mm) Premix (D56R) Alloy	
304			
Pressure vessel code		UL	
Design pressure at -321.000000 Fahrenheit	Psig	450.	450.
Design pressure at 400.000000 Fahrenheit	Psig	450.	450.
Design temperature	°F	-320.8/400.0	
Overall length x width x height	in	17 x 13 x 33	
Net weight, empty / operating	lb	275 / 384	

Performance is conditioned on the accuracy of customers data and customers ability to supply equipment and products in conformity therewith.

Physical Properties

(inlet/outlet)	Hot Side		Cold side	
	Liquid	Vapour	Liquid	Vapour
Dens	64.96/65.08		77.56/77.04	1.003/0.9713
Sp.heat	0.9131/0.9121		0.3253/0.3214	0.2246/0.2197
Visc	10.5/13.1		0.227/0.227	0.0112/0.0112
Th.Cond	0.249/0.247		0.0561/0.0519	0.0064/0.0066
Bub. p.				/6.4
Dew p.				/17.0
Mol.W.				86.28/86.28
Cr.pr.				675.59/675.59
Cr.Temp.				182.7/182.7
Lat.heat				95.3/89.5



Model RVW17

HOT WATER SAFETY RELIEF VALVE (17 Series)

Job Name:	Contractor:
Job Location:	P.O. Number:
Engineer:	Representative:
Tag:	Wholesale Distributor:

DESCRIPTION

ASME Section IV and CSA capacity certified bronze "uni-body" Safety Relief Valve for protection of hot water boilers, systems and similar equipment. This valve prevents excessive thermal expansion buildup in plumbing systems, tank applications or tankless water heaters.

FEATURES

- ☐ ASME Section IV Certified Capacity (3/4")
- ☐ CSA Listed and Certified to ANSI Z21.22
- ☐ 75-160 psig (5.2 – 10.3 bar) Set Pressures @ 250°F (121°C) max
- ☐ Corrosion Resistant Construction
- ☐ Male NPT inlet, Female NPT Outlet
- ☐ Made in the USA
- ☐ 100% Factory Tested
- ☐ Durable Soft Seat Design for Extended Service

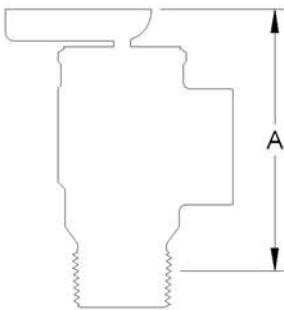
MATERIALS

Body: ASTM B584 Bronze
Spring: Stainless Steel
Seat: Silicone

DIMENSIONS

Model	Item Number	Size	A-Install Ht. (in.)
RVW17-12*	17401	1/2M x 1/2F	2.59
RVW17-34	17402	3/4M x 3/4F	2.73

* - not ASME certified



CAPACITY

CSA Capacity Certified

1/2"	15,000 BTU/Hr
3/4"	200,000 BTU/Hr

National Board Capacity Certified

Set Pressure PSIG (bar)	17402 BTU/Hr
75 (5.17)	505,000
100 (6.90)	648,000
125 (8.62)	791,000
150 (10.34)	934,000

APPROVALS



ASME Section IV Heating Boilers (17402)
CSA ANSI Z21.22 Relief Valves for Hot Water Systems
Canadian Registration Number 0G8547.5C
Conforms to HUD/FHA Requirements

Conbraco Industries, Inc. 701 Matthews Mint Hill Rd. Matthews NC 28105 USA ; www.apollovalves.com ; 704-841-6000

This specification is provided for reference only. Conbraco reserves the right to change any portion of this specification without notice and without incurring obligation to make such changes to Conbraco products previously or subsequently sold.



Submittal Form

ZETA Series

Hydronic Expansion Tank with
Fixed Diaphragm

Company Name: _____

Contact: _____

Bill to: _____

Date: _____

Ship to: _____

Purchase Order No. _____

Notes _____

Description

Zilmet USA ZETA series are ASME fixed diaphragm 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 heavy-duty diaphragm that prevents tank corrosion and waterlogging problems. All ZETA 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*

ZETA 15 thru ZETA 60: 150 PSIG*

ZETA 80 thru ZETA 280: 125 PSIG*

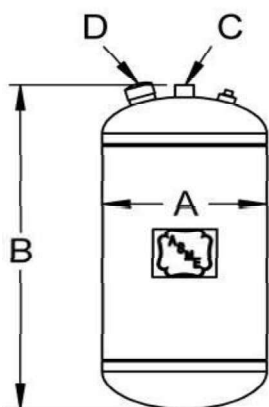
*200 & 250 PSIG available

Model Number	Part Number	Tank Volume(Gal)	Acceptance Volume (Gal.)	Tagging Information	Quantity
ZETA-15	19010015	7.8	6.3		
ZETA-20	19010020	10.9	8.8		
ZETA-40	19010040	25	20.2		
ZETA-60	19010060	35	28		
ZETA-80	19010080	45	36		
ZETA-100	19010100	60	48.5		
ZETA-120	19010120	70	56.5		
ZETA-144	19010144	80	65		
ZETA-180	19010180	90	73		
ZETA-200	19010200	115	93		
ZETA-240	19010240	140	113.5		
ZETA-260	19010260	158	128		
ZETA-280	19010280	211	171		

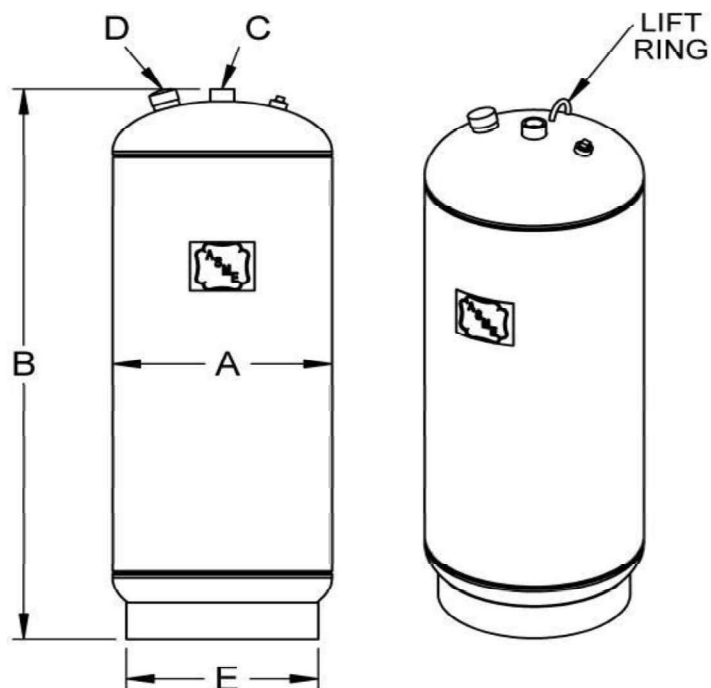
Typical Specification

Furnish and install, as shown on plans, a _____ gallon _____" diameter X _____" (high) pre-charged steel expansion tank with a fixed heavy-duty butyl diaphragm. The tank shall be equipped with a NPT system connection, 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 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 Zilmet USA model number ZETA-_____ or approved equal.



ZETA-15 & ZETA-40



ZETA-40 thru ZETA-280

Model Number	Dimensions in Inches					Approx. Ship Weight (lbs)
	A	B	System Connection	Charging Valve	E	
			C	D		
ZETA-15	12	19	3/4		-	42
ZETA-20		25				52
ZETA-40	16	34	1		14	84
ZETA-60		45				97
ZETA-80	20	39			18	148
ZETA-100		50				175
ZETA-120	24	47	0.302" -32NC	22	259	
ZETA-144		50			268	
ZETA-180		53			283	
ZETA-200		67			325	
ZETA-240	30	79		24	362	
ZETA-260		64			591	
ZETA-280		82	752			

Notes

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

Submittal Schedule Details for

Item	Tag / Equipment ID	Product ID
6		ACH580-01-024A-2

Item Description

Input Voltage: 208 VAC Three Phase
Rated Output Current: 24.2A
Enclosure: UL (NEMA) Type 1
Nominal Horsepower: 7.5 HP
Frame Size: R2
Input Disconnecting Means: None
Bypass: None
Input Impedance: 5% equivalent impedance
Short Circuit Current Rating: 100 kA with fusing
Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP)
Other Options:

Drive Input Fuse Ratings

Fuse Class	Amps (600 V)
Class T	40

Wire Size Capacities of Power Terminals

Input Wiring	Output Wiring	Ground Wiring
#20 ... #6 1.5 lbf-ft	#20 ... #6 1.5 lbf-ft	#18 ... #6 1.1 lbf-ft

Dimensions and Weights

Height <i>in</i> (mm)	Width <i>in</i> (mm)	Depth <i>in</i> (mm)	Weight <i>lbs</i> (kg)
18.6 (473)	4.9 (124)	9.0 (229)	15 (6.6)

Heat Dissipation & Airflow Requirements

Power Losses		Airflow	
BTU/Hr	Watts	CFM	CM/Hr
593	174	59	100.3

ACH580-01/-31

The ACH580 drive sets new standards in both simplicity and reliability, and ensures smooth, energy-efficient operation of your HVAC systems in normal and mission-critical situations.

ACH580-01, wall-mounted base drives

The ACH580-01 wall-mounted drives are available from 1 to 100 HP at 208/240 V, 1 to 350 HP at 480 V, and 2 to 250 HP at 575 V. The ACH580-01 drives are available in UL (NEMA) Type 1 and 12 configurations. In standard installations, the drive is mounted directly onto a wall and uses the provided conduit box. Conduit openings are provided for bottom conduit entry & exit. For mounting in a customer-supplied cabinet, the conduit box may be removed. The drive has a 100 kA SCCR rating when paired with appropriately sized upstream fuses.

ACH580-31, ultra low harmonic wall-mounted base drives

The ACH580-31 wall-mounted drives are available from 5 to 75 HP @208/230v and 5 to 400 HP @ 480 V. The ACH580-31 are available in UL (NEMA) Type 1 and 12 configurations. In standard installations, the drive is mounted directly onto a wall and uses the provided conduit box. Conduit openings are provided for bottom conduit entry and exit. For mounting in a customer-supplied cabinet, the conduit plate may be removed.

Features for HVAC

The ACH580 comes standard with an intuitive control panel used to configure, control, and monitor the drive. An optional Bluetooth control panel allows the drive to be configured via the control panel or the DriveTune app.

A robust HVAC firmware package provides drive, motor, and application protection features. Examples of drive protection features include undervoltage, overvoltage, overcurrent, and ground fault protection. The ACH580 also has a variety of motor protection features including overload and stall protections.

Application specific features, such as accepting four separate start interlocks (safeties), along with broken belt detection, are also included. The drive includes BACnet MS/TP, Modbus RTU, and Johnson N2 as standard. Additional protocols, such as BACnet/IP and LonWorks, are available with optional fieldbus adapters.

Technical specifications

Product compliance (complete list on following page)	
ACH580-01/-31	CE, UL, cUL, and EAC
Supply connection	
Input voltage (U_i)	
ACH580-xx-xxxA-2	208/230V
ACH580-xx-xxxA-4	480V
ACH580-xx-xxxA-6	600V
Input voltage tolerance	+10% / -15%
Phase	3-phase (1-phase, 240 V)
Frequency	48 to 63 Hz
Line Limitations	Max $\pm 3\%$ of nominal phase to phase input voltage
Power Factor ($\cos \phi$) at nominal load	
ACH580-01	0.98
ACH580-31	1.0
Efficiency at rated power	
ACH580-01	98.0%
ACH580-31	96.5%
Power Loss	Approximately 2% of rated power
Motor connection	
Supported motor control	Scalar and vector
Supported motor types	Asynchronous motor, permanent magnet motor (vector), SynRM (vector)
Voltage	3-phase, from 0 to supply voltage
Frequency	0 to 500 Hz
Short Term Overload Capacity Variable Torque	110% for 1 min/10min
Peak Overload Capacity Variable Torque	1.35 for 2 second (2 sec / 10 min)
Switching Frequency	2, 4, 8 or 12 kHz Automatic fold back in case of overload
Acceleration/Deceleration Time	0 to 1800 s
Short Circuit Current Rating (SCCR)	100 ka with fusing
Inputs and outputs (drive)	
2 analog inputs	Selection of Current/Voltage input mode is user programmable.
Voltage reference	0 (2) to 10 V, $R_{in} > 200 \text{ k}\Omega$
Current reference	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 reference	0 to 10 V, $R_{load} > 100 \text{ k}\Omega$
Current reference	0 to 20 mA, $R_{load} < 500 \Omega$
Applicable potentiometer	1 k Ω to 10 k Ω
Internal auxiliary voltage	24 V DC $\pm 10\%$, max. 250 mA
Accuracy	$\pm 1\%$ full scale range at 25°C (77°F)
Output updating time	2 ms
6 digital inputs	12 to 24 V DC, 10 to 24 V AC, Connectivity of PTC sensors supported by a single digital input. PNP or NPN connection (5 DIs with NPN connection).

	Programmable
Input Updating Time	2 ms
3 relay outputs	Maximum switching voltage 250 V AC/30 V DC. Maximum continuous current 2 A rms. Programmable, Form C
Adjustable filters on analog inputs and outputs	
All control inputs isolated from ground and power	
Operation	
Air temperature	0 to -15 °C (32 to 5 °F). -15 to +50 °C (5 to 122 °F): No frost allowed. Output derated above +40 °C (104 °F)
Installation site altitude	0 to 4000 m (13123 ft) above sea level Output derated above 1000 m (3281 ft)
Relative humidity	5 to 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Atmospheric pressure	70 to 106 kPa (10.2 to 15.4 PSI) 0.7 to 1.05 atmospheres
Vibration	Risk category IV Certified (IBC 2018)
Environmental protections	
Chemical Gasses	Class 3C2
Solid Particles	Class 3S2 No conductive dust allowed
Pollution degree (IEC/EN 61800-5-1)	Pollution degree 2
Product compliance	
Standards and directives	Low Voltage Directive 2006/95/EC EMC Directive 2004/108/EC 60721-3-3: 2002 60721-3-1:1997 Quality assurance system ISO 9001 and Environmental system ISO 14001 CE, UL, cUL, and EAC approvals Galvanic isolation according to PELV RoHS2 (Restriction of Hazardous Substances) EN 61800-5-1: 2007; IEC/EN 61000-3-12; EN61800-3: 2017 + A1: 2012 Category C2 (1st environment restricted distribution); Safe torque off (EN 61800-5-2) BACnet Testing Laboratory (BTL) Seismic (IBC, OSHPD) Plenum (ACH580-01 only)
EMC (according to EN61800-3)	ACH580-01 and ACH580-31 class C2 (1st environment restricted distribution)

Storage (in Protective Shipping Package)

Air Temperature	-40 to +70 °C (-40 to +158 °F)
Relative Humidity	Less than 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Chemical Gasses	Class 1C2
Solid Particles	Class 1S2 Contact ABB regarding Class 1S3
Atmospheric pressure	70 to 106 kPa 0.7 to 1.05 atmospheres
Vibration (ISTA)	
R1...R4	In accordance with ISTA 1A
R5...R9	In accordance with ISTA 3E

Transportation (in Protective Shipping Package)

Air Temperature	-40° to 70°C (-40° to 158°F)
Relative Humidity	Less than 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Atmospheric Pressure	60 to 106 kPa (8.7 to 15.4 PSI) 0.6 to 1.05 atmospheres
Free Fall	R1: 76 cm (30 in) R2: 61 cm (24 in) R3: 46 cm (18 in) R4: 31 cm (12 in) R5: 25 cm (10 in)
Chemical Gasses	Class 2C2
Solid Particles	Class 2S2
Shock/ Drop (ISTA)	
R1...R4	In accordance with ISTA 1A
R5...R9	In accordance with ISTA 3E
Vibration (ISTA)	
R1...R4	In accordance with ISTA 1A
R5...R9	In accordance with ISTA 3E

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

Technical Bulletin

EXD-SH1/2 are stand-alone universal superheat and or temperature controllers for air conditioning units or refrigeration systems.

Features

- EXD-SH1: Control of one valve
- EXD-SH2: Control of two valves in two independent circuits
- Main function

	Circuit 1	Circuit 2
EXD-SH1	Superheat or temperature control	
EXD-SH2	Superheat or temperature control	Superheat Control
- Other functions: Limitation of evaporating pressure (MOP), Low pressure switch, freeze protection and manual positioning of valve(s)
- Self-adapting superheat control function in conjunction with EMERSON EX4-8 (EX4-7-FLR) and CV4-7 series
- For multiple refrigerants, including ultralow temperature refrigerant R23
- Modbus (RTU) communication
- Integrated keyboard with two lines display
- Monitoring of sensors and detection of sensor (ECN.../TP1.../PT5N...(FLR)) /stepper motor wiring failures
- Optional upload/download key (accessory) for transmission of parameter settings among controllers with the same setting
- Low/high superheat alarm as well as other function alarms
- Electrical connection via plug-in type screw terminals included with controller and Micro Molex EXD-M03 (must be ordered separately)
- DIN rail mounting housing



EXD-SH2



EXD-M03

Selection table

Type	Description	Part No.	
		Multipack (pcs)	Single pack
Controllers			
EXD-SH1	Controller for single refrigeration circuit	-	807855
EXD-SH2	Controller for two independent refrigeration circuits	-	807856
EXD-M03	Molex terminal with 3 m wires	-	807865
Temperature sensors			
TP1-NP3	Temperature sensor with 3 m cable	804489M (20)	804489
TP1-NP6	Temperature sensor with 6 m cable	804490M (20)	804490
ECN-Z60	Ultralow Temperature sensor with 6 m cable	-	807826
Pressure transmitters: PT5N (7/16-20UNF connection)			
PT5N-07M	Sensing pressure range -0.8...7 bar	805350M (25)	805350
PT5N-18M	Sensing pressure range 0...18 bar	805351M (25)	805351
PT5N-30M	Sensing pressure range 0...30 bar	805352M (25)	805352
PT5N-50M	Sensing pressure range 0...50 bar	805353M (25)	805353
PT5N-150D	Sensing pressure range 0...150 bar (1/4- 18 NPT)	805379M (25)	805379
Pressure transmitters: PT5N (Brazing connection)			
PT5N-07T / PT5N-07P-FLR	Sensing pressure range -0.8...7 bar	805380M / 805390M (25)	805380 / 805390
PT5N-010P-FLR	Sensing pressure range -0.8...10 bar	805391M (25)	805391
PT5N-18T	Sensing pressure range 0...18 bar	805381M (25)	805381
PT5N-30T / PT5N-30P-FLR	Sensing pressure range 0...30 bar	805382M / 805389M (25)	805382 / 805389
PT5N-50T	Sensing pressure range 0...50 bar	805383M (25)	805383

Note: Pressure range 18 bar for system with R410A, 30 bar for R410A economizer, 50/150 bar for CO₂

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

Accessories

Type	Description	Part No.	
		Multipack (20 pieces)	Single pack
M12 Plug and cable for pressure transmitters PT5N(FLR)			
PT4-M15	1.5 m	804803M	804803
PT4-M30	3.0 m	804804M	804804
PT4-M60	6.0 m	804805M	804805
PT4-M60 FLR	6.0 m	-	804806
Uninterruptible Power supply			
ECP-024	Backup battery with two outputs for two controllers	-	804558
K09-P00	Electrical Terminal Kit for ECP-024	-	804560
EXD-PM	Super cap for only EXD-SH1 (two pieces of EXD-PM required for one EXD-SH2)	-	807854

Note: ⚠ **Warning -Flammable refrigerants:** EXD-SH1/2 (EXD-PM, ECP-024) has a potential ignition source and does not comply with ATEX requirements. Installation only in non-explosive environment. For flammable refrigerants only use valves and accessories approved for it!

Description of functions

Controllers are featured with a main function as superheat controller or temperature controller. The main function is selectable.

Superheat control of evaporators or economizers

This function requires the connection of temperature sensor(s) as well as pressure transmitters(s). The other functions are:

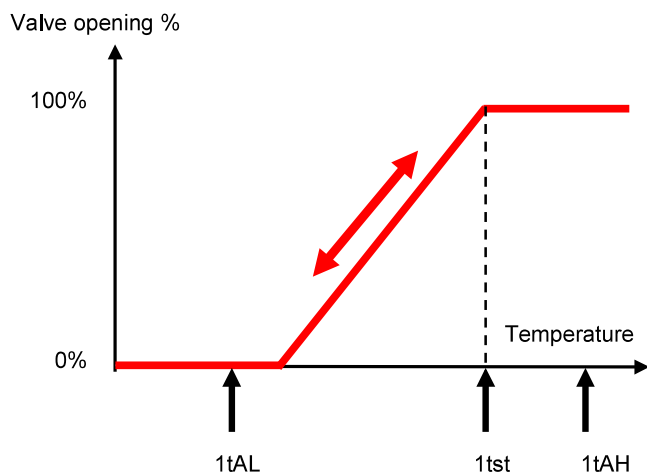
- MOP control: enables the limitation of saturated temperature of suction line (outlet of evaporator/economizer)
- Low pressure behaves similar to low pressure switch including alarm conditions
- Freeze protection is based on saturated temperature from converting measuring suction pressure. It provides alarm condition below certain adjusted temperature.

Temperature controller

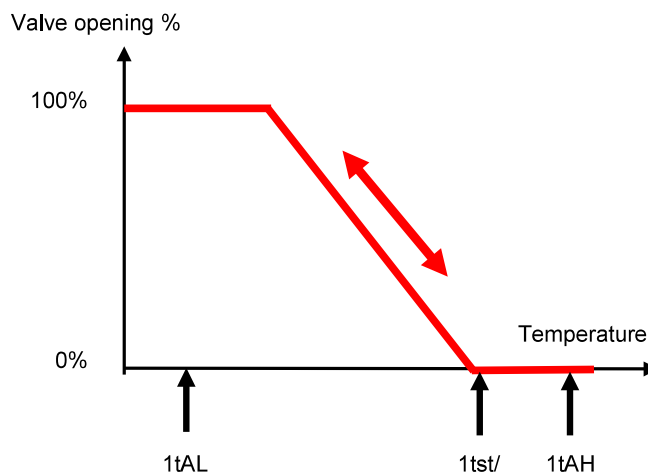
The function is to maintain desired temperature by modulating refrigerant mass flow. If controller is operated as temperature controller, the connection of pressure transmitter is not required.

In order to fulfill varieties of the applications, the refrigerant mass flow variation can be set according temperature increase or decrease.

**Temperature control in normal sense
(A: Mass flow increases if temperature rises)**



**Temperature control in reverse sense
(B: Mass flow decreases if temperature rises)**

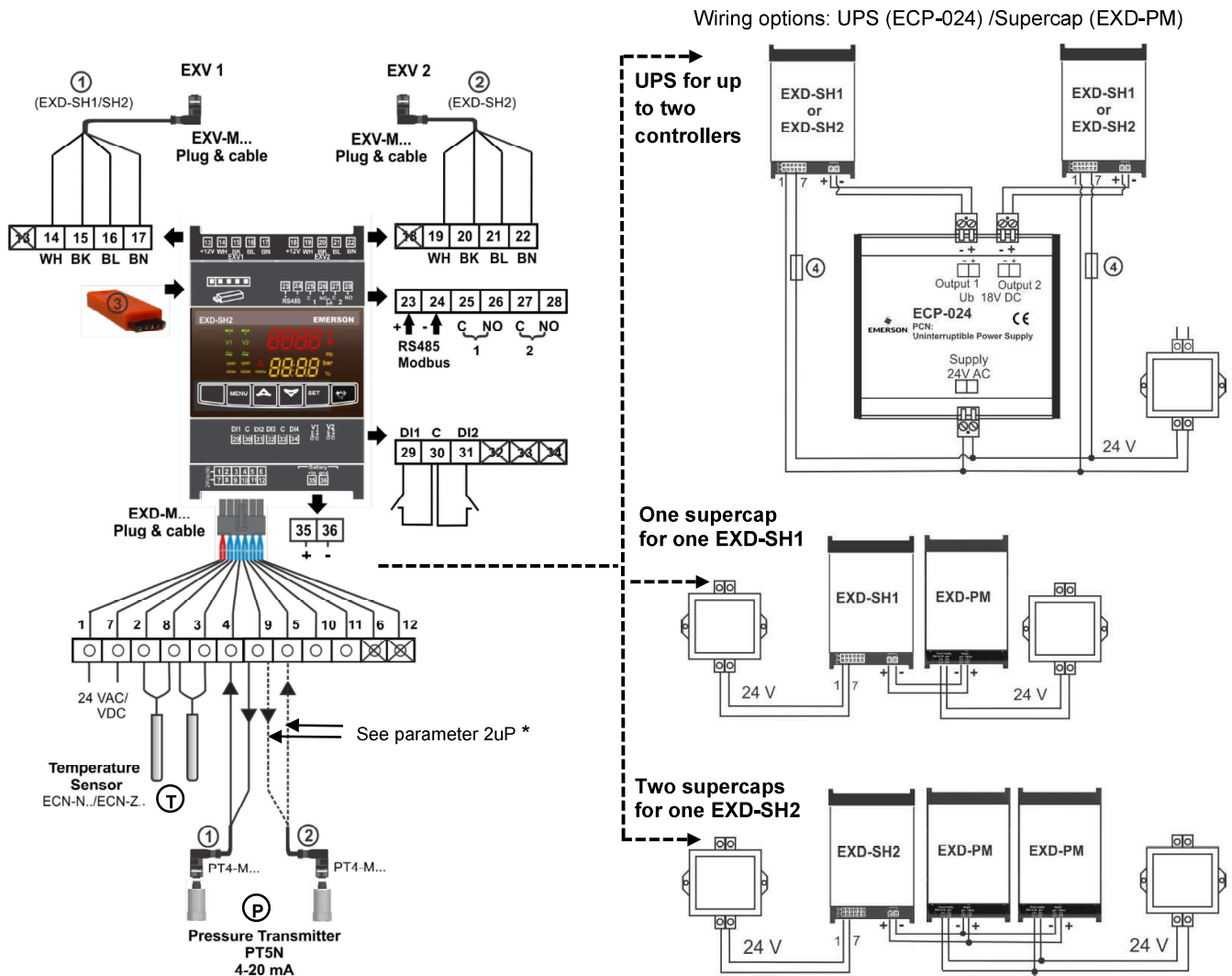


Examples of applications:

- Temperature control by throttling suction mass flow (normal sense, A)
- Temperature control by modulating hot gas into inlet or outlet of evaporators (reverse sense, B)
- Discharge temperature control by injecting liquid (normal sense, A)
- Head pressure control by means of temperature control (normal sense, A)

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

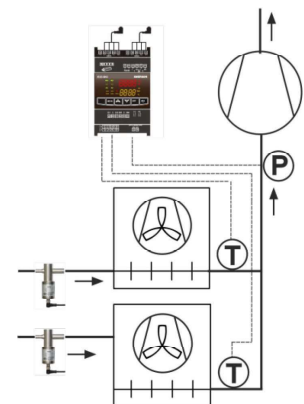
Wiring



①	Circuit 1 (EXD-SH1/SH2)	14-17	Electronic expansion valve circuit 1 (EXV1) EXV-M... Electrical plug: wire colors WH-white BK-black BL-blue BN-brown
②	Circuit 2 (EXD-SH2)	19-22	Electronic expansion valve circuit 2 (EXV2) EXV-M... Electrical plug: wire colors WH-white BK-black BL-blue BN-brown
③	Download/upload key	23 & 24	RS485 (+/-terminal)
1 & 7	Supply voltage 24 VAC/DC	25 & 26	Alarm relay circuit 1 (C, NO) – Suitable for 24 VAC/DC
2 & 8	Temperature sensor circuit 1	27 & 28	Alarm relay circuit 2 (C, NO) – Suitable for 24 VAC/DC
3 & 8	Temperature sensor circuit 2	29 & 30	Digital input circuit1 (DI1) – Dry contact, potential free
4 & 5	PT5N... circuit 1 & circuit 2 (white wire: 4...20 mA signal)	31 & 30	Digital input circuit 2 (DI2) – Dry contact, potential free
9	+ 12 VDC Voltage input for PT5N... (brown wire)	35 & 36	Battery/Super capacitor connection terminal
Alternative ratiometric third Party Pressure Transmitter:		④	Fuse EXD-SH1 (1A), EXD-SH2 (2A)
4 & 5	Pressure transmitter circuit 1 & circuit 2 (0.5...4.5 V signal)	6,12,13, 18,32-34	Not used (Terminals on EXD-SH12)
11	+ 5 VDC voltage input		
10	GND Ground		

Note: No hard failure detection if ground wire of transmitter to be interrupted.

*) Parameter 2uP with No 9 = only Pressure sensor circuit 1 is used



EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

Available configuration options

	Selectable Valves	
	EX	CV
Refrigerants	R22, R134a, R507, R404A, R407C, R410A, R124, R744 (subcritical), R407A, R407F, R23, R32, R1234ze, R448A, R449A, R450A, R513A, R290, R1270, R454C, R452B, R454B, R454A, R452A, R444B, R455A, R133zde, R1234yf	R744 (CO ₂)
Main function	Superheat or and temperature control	Superheat control
Pressure transmitters	PT5N... or 3 rd party ratio metric	PT5N....

Note:

EXD-SH1/2 IS NOT ATEX APPROVED!

Technical Data: EXD-SH1/2

Supply voltage	24 VAC/DC $\pm 10\%$, 50/60 Hz	Mounting	DIN rail mounted
Power consumption	EXD-SH1: Max. 25 VA EXD-SH2: Max. 50 VA	Temperatures storage operating/ surrounding	-25...+60°C 0...+55°C
Terminals 1 to 12	Suitable for 12 poles molex plug	Relative humidity	20...85% non-condensing
Terminals 13 to 36	Suitable for removable screw version: wire size 0.14...1.5 mm ² Included in controller delivery	Accessory (12 poles molex plug with 3 m cable)	Type: EXD-M03 (to be ordered separately)
Protection class	IP 00	Housing	Self-extinguishing ABS
Compliance	EMC, RoHS,	Weight	320 g
Marking			

Input, Output EXD-SH1/2

Description	Specification
Analogue input(s): NTC Temperature sensor Analogue input: PT1000 Temperature sensor	TP1-N... (-45...+150°C operating range) ECN-Z60 (-80...-40°C sensing range)
Analogue input(s): 4...20 mA pressure transmitters Analogue input(s): 0.5...4.5 V pressure transmitters	PT5N... Third party ratio metric pressure transmitters (total error: $\leq 1\%$)
Digital input(s)	Dry contact, potential free
Digital output(s): Alarm relay(s) Contact is closed: During alarm condition Contact is open: During normal operation and supply power OFF	Resistive Load 24 VAC/DC, max. 1 A Inductive Load 24 V AC, max. 0.5 A
Communication	RS485 RTU Modbus, two wires
Stepper motor output	Valves: EX4-8 (EX4-7-FLR), CV4-7

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

Optional EXD-PM Supercap

Supply voltage	24 VAC/DC $\pm 10\%$, 50/60 Hz
Output voltage	12 VDC
Max. output current	- 1.2 A - 350 mA during charging
Power consumption	12 VA
Terminals	Suitable for removable screw version: wire size 0,14...1,5 mm ²
Output: to driver/controller	Suitable for one EXD-SH1 Two EXD-PM for one EXD-SH2
Charging time	60 seconds
Max. cable length between EXD-PM and EXD-SH1/2	50 cm AWG18 wire size

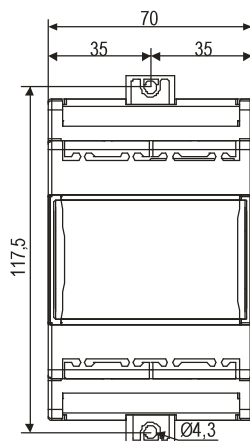
Protection class	IP 20
Mounting	DIN rail mounted
Temperatures	Storage -20...+70°C operating/ surrounding -10...+60°C
Housing	Self-extinguishing ABS
Relative humidity	20...85% non-condensing
Weight	125 g
Marking	CE, EAC

Optional Uninterruptible Power Supply ECP-024

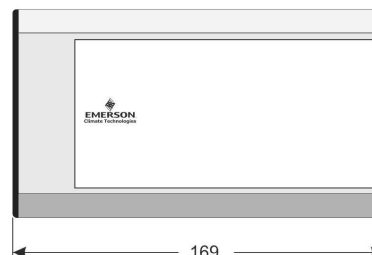
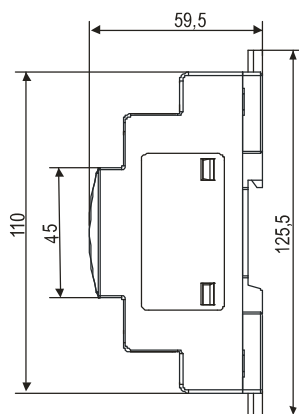
Backup battery type	Lead acid gel rechargeable battery
Number of backup batteries	2, each 12 VDC, 0,8 Ah
Supply voltage	24 VAC $\pm 10\%$, 50-60 Hz
Output voltage, UB	18 VDC
Number of outputs to drivers	2
Battery recharge time	approximately 2 hours
Temperatures	Storage -20...+65°C operating/ surrounding -10...+60°C

Protection class	IP 20
Mounting	DIN rail mounted
Housing	Aluminum
Connection	Screw terminals for wire size 0,5...2,5 mm ²
Relative humidity	< 90% non-condensing
Accessories: Terminals	K09-U00 Part No: 804559
Weight	1200 g
Marking	CE, EAC

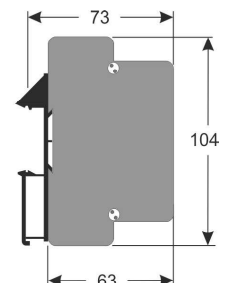
Dimensions (mm)



EXD-SH1/2 or EXD-PM



ECP-024

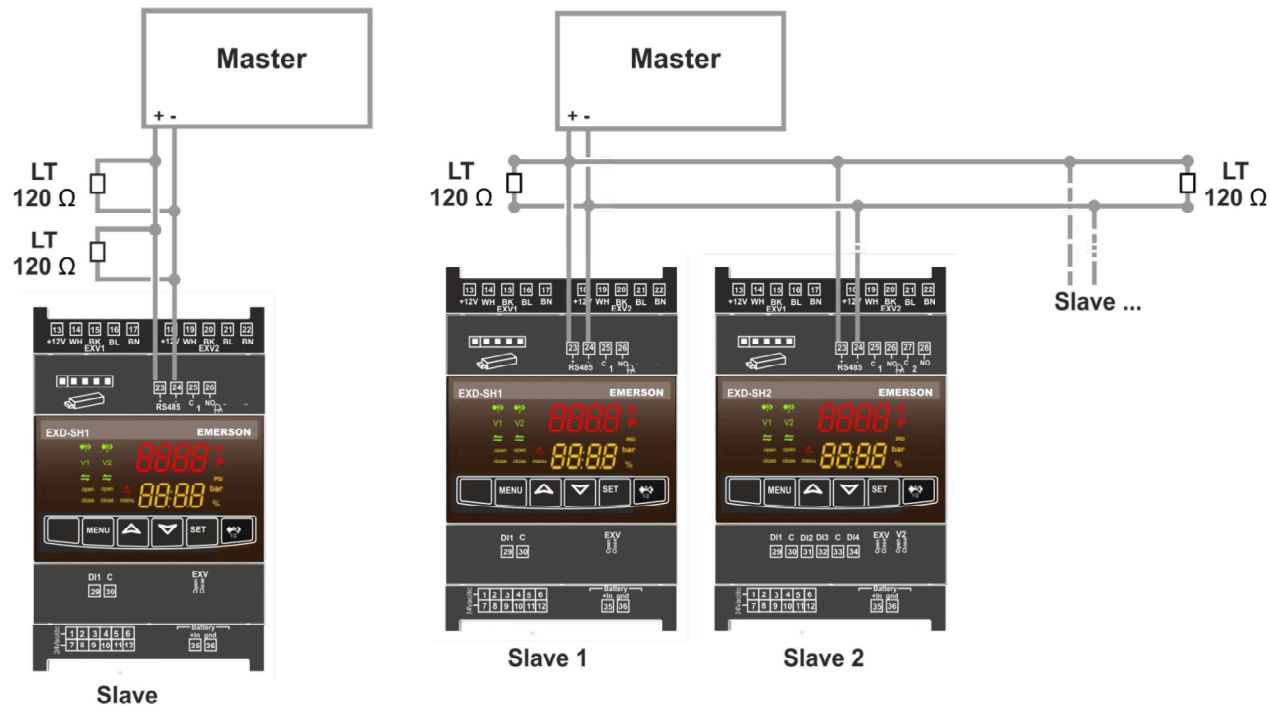


EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

Communication

The use of communication is not necessary/mandatory; however, the communication is available for connection to upper level of system controller (third party controller) in order to perform data and commands transfer as well as data logging. EXD-SH1/2 act as slave and third party controller is master. In case of several EXD-SH1/2 connections to master, each driver needs to be addressed for proper communication.

Bus topology



ModBus protocol details

- Mode: RTU
- Modbus slave address range: 1 to 127 (parameter **Adr**)
- Baud rate: 9600 bps, 19200 bps (default, parameter **Br**)
- Start bit: 1
- Data bits: 8
- Parity: even (default), no parity (parameter **Par**)
- Stop bits: 1
- Master response timeout: 500ms

Transmission Details

ModBus register address ranges

- Read-only data: Starting address: 0x0100 (256)
- Writable data: Starting address: 0x0200 (512)
- Configuration data: Starting address: 0x0300 (768)

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

Read Data transmission

Available through Modbus Function code 03 (0x03) Read Holding Registers

Request

Function code	1 Byte	0x03
Starting Address	2 Bytes	0x0000 to 0xFFFF
Register count	2 Bytes	1 to 125 (0x7D)

Response

Function code	1 Byte	0x03
Byte count	1 Byte	2 x N*
Holding Registers	N* x 2 Bytes	

*N = Quantity of Input Registers

Error

Error code	1 Byte	0x83
Exception code	1 Byte	01 or 02 or 03

01 = Function code not supported

02 = Starting Address or register count out of range

03 = Register count out of range

Write Data transmission (single register)

Available through Modbus Function code 06 (0x06) Write Holding Register

Request

Function code	1 Byte	0x06
Starting Address	2 Bytes	0x0000 to 0xFFFF
Value	2 Bytes	0x0000 to 0xFFFF

Response

Function code	1 Byte	0x06
Starting Address	2 Bytes	0x0000 to 0xFFFF
Value	2 Bytes	0x0000 to 0xFFFF

Error

Error code	1 Byte	0x86
Exception code	1 Byte	01 or 02 or 03

01 = Function code not supported

02 = Starting Address out of range

Write Data transmission (multiple registers)

Available through Modbus Function code 16 (0x10) Write Holding Registers

Request

Function code	1 Byte	0x10
Start Address	2 Bytes	0x0000 to 0xFFFF
Register count	2 Bytes	0x0001 to 0x0078
Byte count	1 Byte	2 x N
Registers values	2 x N Bytes	Value

N = register count.

Response

Function code	1 Byte	0x10
Starting Address	2 Bytes	0x0000 to 0xFFFF
Register count	2 Bytes	0x0001 to 0x0078

Error

Error code	1 Byte	0x90
Exception code	1 Byte	01 or 02 or 03

01 = Function code not supported

02 = Register Address invalid

03 = Register Value out of range

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

Read-only variables

Modbus address dec. / hex.	Description	Unit	Remarks
256 / 0x100	Software version		
Circuit 1			
257 / 0x101	Main function, circuit 1		0 = superheat control 1 = temperature control 2 = reverse temperature control
258 / 0x102	Valve opening circuit 1	1/100%	
259 / 0x103	Digital input circuit 1		0x0000: No demand 0x0001: Demand
260 / 0x104	Digital output circuit 1		0x0001: alarm relay
261 / 0x105	P1 suction pressure circuit 1	1/100 barg	
262 / 0x106	T1 suction temperature circuit 1	1/100°C	
263 / 0x107	Sat. Temp circuit 1	1/100°C	
264 / 0x108	Pressure 1 sensor failure circuit 1		0 = No failure 1 = Failure
265 / 0x109	Temp. 1 sensor failure circuit 1		0 = No failure 1 = Failure
266 / 0x10A	Functional Alarm set circuit 1		0x0001 = N/A 0x0004 = High superheat 0x0010 = Freeze 0x0040 = Min. Temp (Temp. control) 0x0002 = Low pressure 0x0008 = Low superheat 0x0020 = Max. Temp (Temp. control)
267 / 0x10B	Hardware alarm set		0x0001 = Temp sensor 1 0x0004 = Pressure sensor 0x0010 = Stepper 1 0x0040 = Modbus timeout (3 sec.) 0x0100 = Config inconsistency 2 0x0002 = Temp sensor 2 (SH2) 0x0008 = Pressure sensor 2 (SH2) 0x0020 = Stepper 2 (SH2) 0x0080 = Config inconsistency 1 0x0200 = Power Failure
268 / 0x10C	Application state circuit 1		0 = OFF 1 = Waiting startup (valve ref pending) 2 = Startup 3 = Control 4 = Closing 5 = Alarm 6 = Manual mode 7 = Power fail 8 = MOP
269 / 0x10D	Superheat set point circuit 1	1/100 K	
270 / 0x10E	Superheat circuit 1	1/100 K	
Circuit 2			
271 / 0x10F	Valve opening circuit 2	1/100%	
272 / 0x110	Digital input circuit 2		0 = no demand 1 = demand
273 / 0x111	Digital output circuit 2		0x0001: alarm relay
274 / 0x112	P2 suction pressure circuit 2	1/100 bar	
275 / 0x113	T2 suction temperature circuit 2	1/100°C	
276 / 0x114	Sat. Temp. circuit 2	1/100°C	
277 / 0x115	Pressure 2 sensor failure circuit 2		0 = No failure 1 = Failure
278 / 0x116	Temp 2 sensor failure circuit 2		0 = No failure 1 = Failure
279 / 0x117	Functional alarm circuit 2		0x0001 = N/A 0x0004 = High superheat 0x0010 = Freeze 0x0002 = Low pressure 0x0008 = Low superheat
280 / 0x118	Application state circuit 2		0 = OFF 1 = Waiting startup (valve ref pending) 2 = Startup 3 = Control 4 = Closing 5 = Alarm 6 = Manual mode 7 = Power fail 8 = MOP
281 / 0x119	Superheat setpoint circuit 2	1/100 K	
282 / 0x11A	Superheat circuit 2	1/100 K	

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

Writable variables

Modbus address dec. / hex.	Display code	Description	Units	Remarks
512 / 0x200		Factory default		1 = do a factory default
513 / 0x201		Future use		
514 / 0x202		Alarm reset		1 = Resets alarms (only the alarms which are set as manual reset)
515 / 0x203	1Ho	Manual mode Circuit 1		0 = off 1 = on
516 / 0x204	1HP	Manual valve opening Circuit 1	%	only active while manual mode is "on"
517 / 0x205		Alternative to digital input, circuit 1 via Modbus		Demand circuit 1 0 = disabled 1 = enabled
518 / 0x206		Pressure circuit 1 via Modbus	1/100 barg	Pressure if 1uP selection is Modbus Range: -0.1 to 150 barg Minimum update rate: 1s Alarm timeout: 3 sec.
519 / 0x207		Digital output circuit 1		To set the relay 1 manually, only active when manual mode circuit1 is "on" 0 = off 1 = on
520 / 0x208	2Ho	Manual mode Circuit 2		0 = off 1 = on
521 / 0x209	2HP	Manual valve opening Circuit 2	%	only active while manual mode 2 = on
522 / 0x20A		Alternative to digital input, circuit 2 via Modbus		Demand circuit 2 0 = disabled 1 = enabled
523 / 0x20B		Pressure circuit 2 via Modbus	1/100 barg	Pressure if 2uP selection is Modbus Range: -0.1 to 150 barg Minimum update rate: 1s Alarm timeout: 3 sec.
524 / 0x20C		Digital output circuit 2		To set the relay 2 manually, only active when manual mode circuit 2 is "on" 0 = off 1 = on

Note: References to control circuit 2 of EXD-SH2 are invisible in configuration/write list if disabled.

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

Basically 2 variants are possible to set the parameters:



1. Configuration parameters in flash memory - Max. 1000 overwrite cycle limitation!

2. Configuration parameters in RAM memory - unlimited overwrite cycles possible

Note: In case of power failure, the stored data from the RAM memory will be lost and controller switches to the configuration data. (Factory setting)

1. Configuration parameters In Flash memory - Max. 1000 overwrite cycle limitation

Modbus address dec. / hex.	Display code	Description	Unit	Default value	Range	Remarks
768 / 0x300	H5	Password		12	1 - 1999	
769 / 0x301	Adr	Modbus address		1	1 - 127	
770 / 0x302	br	Modbus baudrate		0	0 - 1	0 = 9600 baud 1 = 19200 baud
771 / 0x303	PAr	Modbus parity		0	0 - 1	0 = parity even 1 = no parity
773 / 0x305	-C2	Circuit 2 Enabled ²		1	0 - 1	0 = circuit 2 disabled 1 = circuit 2 enabled Only EXD-SH2
774 / 0x306	-uC	Units conversion		0	0 - 1	0 = °C, K, barg 1 = °F, psig This parameter only affects the display. Internally (as well as for MODBUS communication) the units are always SI-based.
775 / 0x307		Future use				
776 / 0x308		Future use				

Note: ²) References to control circuit 2 if EXD-SH2 are invisible in configuration/write list if disabled

Modbus address dec. / hex.	Display code	Description	Unit	Default value	Range	Remarks
Circuit 1						
777 / 0x309	1Fct	Function circuit 1		0	0 - 2	Changes only allowed if circuit 1 is in "OFF" state 0 = superheat control 1 = Temperature control Normal sense 2 = Temperature control Reverse sense
778 / 0x30A	1u4	Control mode circuit 1		0	0 - 3	0 = standard control 1 = slow control 2 = intermediate control 3 = adjustable fixed PID
779 / 0x30B	1u0	Refrigerant circuit 1		1	0 - 27	Changes only allowed if circuit 1 is in "OFF" state 0 = R22 1 = R134a 2 = R507 3 = R404A 4 = R407C 5 = R410A 6 = R124 7 = R744 8 = R407A 9 = R407F 10 = R23 11 = R32* 12 = R1234ze* 13 = R448A 14 = R449A 15 = R450A 16 = R513A 17 = R290* 18 = R1270* 19 = R454C* 20 = R452B* 21 = R454B* 22 = R454A* 23 = R452A 24 = R444B* 25 = R455A* 26 = R1233zde* 27 = R1234yf*
780 / 0x30C	1uP	Pressure sensor type 1		1	0 - 8	Changes only allowed if circuit 1 is in "OFF" state 0 = PT5N-07x 1 = PT5N-18x 2 = PT5N-30x 3 = PT5N-50x 4 = PT5N-150 5 = PT5N-10P-FLR 6 = Ratio metric(gauge) 7 = Ratio metric(absolute) 8 = Modbus
781 / 0x30D	1Prr	Ratio metric range 1	1/10 bar	30	3 - 60	If ratio metric is used
782 / 0x30E	1ut	Valve type 1		0	0 - 12	Changes only allowed if circuit 1 is in "OFF" state 0 = EX4-6 1 = EX7 2 = EX8 3 = N/A 4 = N/A 5 = N/A 6 = N/A 7 = N/A 8 = N/A 9 = N/A 10 = CV4 11 = CV5+6 12 = CV7

Note: *) EXD-SH1/2 (EXD-PM, ECP-024) has a potential ignition source and does not comply with ATEX requirements. Installation only in non-explosive environment. For flammable refrigerants only use valves and accessories approved for it!

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

1. Configuration parameters In Flash memory - Max. 1000 overwrite cycle limitation (continued)

Modbus address dec. / hex.	Display code	Description	Unit	Default value	Range	Remarks
783 / 0x30F	1uF	Valve scaling 1	%	100	5 - 100	
784 / 0x310	1uu	Start opening valve1	%	10	0 - 100	
785 / 0x311	1u9	Start opening duration valve 1	s	5	0 - 120	
786 / 0x312	1uL	Low superheat alarm mode circuit 1		1	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
787 / 0x313	1u5	Superheat setpoint circuit 1	1/10 K	6	0.5 - 30	Range = 3 – 30K with 1uL = 1 or 2
788 / 0x314	1u2	MOP mode circuit 1		1	0 - 1	0 = disabled 1 = enabled
789 / 0x315	1u3	MOP sat. temp. limit circuit1	1/10°C			see MOP table (page 16)
790 / 0x316	1P9	Low pressure alarm mode circuit1		0	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
791 / 0x317	1PA	Low pressure alarm cut-out circuit1	1/10 bar	0	-0.8 - 17.7	
792 / 0x318	1Pb	Low pressure alarm delay circuit1	s	5	5 - 199	
793 / 0x319	1Pd	Low pressure alarm cut-in circuit1	1/10 bar	0.3	-0.5 - 18	
794 / 0x31A	1P4	Freeze alarm mode circuit1		0	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
795 / 0x31B	1P2	Freeze alarm cut-out circuit1	1/10°C	0	-5 - 5	
796 / 0x31C	1P5	Freeze alarm delay circuit1	s	30	5 - 199	
797 / 0x31D	1uH	High superheat alarm mode circuit 1		0	0 - 1	0 = disabled 1 = enabled auto-reset
798 / 0x31E	1uA	High superheat alarm setpoint circuit 1	1/10 K	30	16 - 40	
799 / 0x31F	1ud	High superheat alarm delay circuit 1	min	3	1-15	
800 / 0x320	1tSt	Temperature set point	1/10°C	4	-80 - 50	
801 / 0x321	1tbd	Temperature band	1/10 K	2	1 - 10	
802 / 0x322	1tAF	Temperature Alarm Enable		0	0 - 1	0 = disabled 1 = enabled
803 / 0x323	1tAL	Min. temperature alarm set-point	1/10°C	0	-50 - 50	
804 / 0x324	1tdL	Min. temperature alarm delay	min	3	1 - 10	
805 / 0x325	1tAH	Max. temperature alarm set-point	1/10°C	15	-50 - 50	
806 / 0x326	1tdH	Max. temperature alarm delay	min	3	1 - 10	
807 / 0x327		Future use				
808 / 0x328		Future use				
809 / 0x329	1tt-	Temperature sensor type		0	0 - 1	0 = TP1-N... 1 = ECN-Z60
852 / 0x354	1P-	Superheat control circuit1 fixed PID Kp factor	1/10	1.0	0.1 - 10	Display 1/10K
853 / 0x355	1i-	Superheat control circuit1 fixed PID Ti factor	s	100	1 - 350	Ki = Kp/Ti
854 / 0x356	1d-	Superheat control circuit1 fixed PID Td factor	1/10s	3.0	0.1 – 30	Display 1/10K, Kd = Kp*Td

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

1. Configuration parameters In Flash memory - Max. 1000 overwrite cycle limitation (continued)

Modbus address dec. / hex.	Display code	Description	Unit	Default value	Range	Remarks
Circuit 2						
810 / 0x32A	2u4	Control mode circuit 2		0	0 - 3	0 = standard control 1 = slow control 2 = intermediate control 3 = adjustable fixed PID
811 / 0x32B	2u0	Refrigerant circuit 2		1	0 - 27	Changes only allowed if circuit 2 is in OFF state 0 = R22 1 = R134a 2 = R507 3 = R404A 4 = R407C 5 = R410A 6 = R124 7 = R744 8 = R407A 9 = R407F 10 = R23 11 = R32* 12 = R1234ze* 13 = R448A 14 = R449A 15 = R450A 16 = R513A 17 = R290* 18 = R1270* 19 = R454C* 20 = R452B* 21 = R454B* 22 = R454A* 23 = R452A 24 = R444B* 25 = R455A* 26 = R1233zde* 27 = R1234yf*
812 / 0x32C	2uP	Pressure sensor type circuit 2		1	0 - 9	Changes only allowed if circuit 2 is in "OFF" state 0 = PT5N-07x 1 = PT5N-18x 2 = PT5N-30x 3 = PT5N-50x 4 = PT5N-150 5 = PT5N-10P-FLR 6 = Ratio metric(gauge) 7 = Ratio metric(absolute) 8 = Modbus 9 = Pressure sensor type and refrigerant settings from circuit1
813 / 0x32D	2Prr	Ratio metric range circuit 2	1/10 bar	30	3 - 60	If ratio metric is used
814 / 0x32E	2ut	Valve type circuit 2		0	0 - 12	Changes only allowed if circuit 2 is in "OFF" state 0 = EX4-6 1 = EX7 2 = EX8 3 = N/A 4 = N/A 5 = N/A 6 = N/A 7 = N/A 8 = N/A 9 = N/A 10 = CV4 11 = CV5+6 12 = CV7
815 / 0x32F	2uF	Valve scaling circuit 2	%	100	5 - 100	
816 / 0x330	2uu	Start opening valve circuit 2	%	10	0 - 100	
817 / 0x331	2u9	Start opening duration valve circuit 2	s	5	0 - 120	
818 / 0x332	2uL	Low superheat alarm mode circuit 2		1	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
819 / 0x333	2u5	Superheat setpoint circuit 2	1/10 K	6	0.5 - 30	Range = 3 – 30K with 2uL = 1 or 2
820 / 0x334	2u2	MOP mode circuit 2		1	0 - 1	0 = disabled 1 = enabled
821 / 0x335	2u3	MOP sat. temp. limit circuit 2	1/10°C			see MOP table (page 16)
822 / 0x336	2P9	Low pressure alarm mode circuit 2		0	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
823 / 0x337	2PA	Low pressure alarm cut-out circuit 2	1/10 bar	0	-0.8 - 17.7	
824 / 0x338	2Pb	Low pressure alarm delay circuit 2	s	5	5 - 199	
825 / 0x339	2Pd	Low pressure alarm cut-in circuit 2	1/10 bar	0.3	-0.5 - 18	
826 / 0x33A	2P4	Freeze alarm mode circuit 2		0	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
827 / 0x33B	2P2	Freeze alarm cut-out circuit 2	1/10°C	0	-5 - 5	
828 / 0x33C	2P5	Freeze alarm delay circuit 2	s	30	5 - 199	
829 / 0x33D	2uH	High superheat alarm mode circuit 2		0	0 - 1	0 = disabled 1 = enabled auto-reset
830 / 0x33E	2uA	High superheat alarm setpoint circuit 2	1/10 K	30	16 - 40	

Note: *) EXD-SH1/2 (EXD-PM, ECP-024) has a potential ignition source and does not comply with ATEX requirements. Installation only in non-explosive environment. For flammable refrigerants only use valves and accessories approved for it!

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

1. Configuration parameters In Flash memory - Max. 1000 overwrite cycle limitation (continued)

Modbus address dec. / hex.	Display code	Description	Unit	Default value	Range	Remarks
831 / 0x33F	2ud	High superheat alarm delay circuit 2	min	3	1-15	
832 / 0x340	2tt-	Temperature sensor type		0	0 - 1	0 = TP1-N... 1 = ECN-Z60
833 / 0x341	2P-	Superheat control circuit 2 fixed PID Kp factor	1/10	1.0	0.1 - 10	Display 1/10K
834 / 0x342	2i-	Superheat control circuit 2 fixed PID Ti factor	s	100	1 - 350	Ki = Kp/Ti
835 / 0x343	2d-	Superheat control circuit 2 fixed PID Td factor	1/10s	3.0	0.1 - 30	Display 1/10K, Kd = Kp*Td

2. Configuration parameters in RAM memory - unlimited overwrite cycles

Note: In case of power failure, the stored data from the RAM memory will be lost and switch to the configuration data. (Factory setting)

Modbus address dec. / hex.	Display code	Description	Unit	Default value	Range	Remarks
1792 / 0x700		NA				
1793 / 0x701		NA				
1794 / 0x702		NA				
1795 / 0x703		NA				
1797 / 0x705	-C2	Circuit 2 Enabled ³		1	0 - 1	0 = circuit 2 disabled 1 = circuit 2 enabled Only EXD-SH2
1798 / 0x706	-uC	Units conversion		0	0 - 1	0 = °C, K, barg 1 = °F, psig This parameter only affects the display. Internally (as well as for MODBUS communication) the units are always SI-based.
1799 / 0x707		Future use				
1800 / 0x708		Future use				

Note: ³) References to control circuit 2 of EXD-SH2 are invisible in configuration/write list if disabled

Modbus address dec. / hex.	Display code	Description	Unit	Default value	Range	Remarks
Circuit 1						
1801 / 0x709	1Fct	Function circuit 1		0	0 - 2	Changes only allowed if circuit 1 is in "OFF" state 0 = superheat control 1 = Temperature control Normal sense 2 = Temperature control Reverse sense
1802 / 0x70A	1u4	Control mode circuit 1		0	0 - 3	0 = standard control 1 = slow control 2 = intermediate control 3 = adjustable fixed PID
1803 / 0x70B	1u0	Refrigerant circuit 1		1	0 - 27	Changes only allowed if circuit 1 is in "OFF" state 0 = R22 1 = R134a 2 = R507 3 = R404A 4 = R407C 5 = R410A 6 = R124 7 = R744 8 = R407A 9 = R407F 10 = R23 11 = R32* 12 = R1234ze* 13 = R448A 14 = R449A 15 = R450A 16 = R513A 17 = R290* 18 = R1270* 19 = R454C* 20 = R452B* 21 = R454B* 22 = R454A* 23 = R452A 24 = R444B* 25 = R455A* 26 = R1233zde* 27 = R1234yf*
1804 / 0x70C	1uP	Pressure sensor type 1		1	0 - 8	Changes only allowed if circuit 1 is in "OFF" state 0 = PT5N-07x 1 = PT5N-18x 2 = PT5N-30x 3 = PT5N-50x 4 = PT5N-150 5 = PT5N-10P-FLR 6 = Ratio metric(gauge) 7 = Ratio metric(absolute) 8 = Modbus

Note: *) EXD-SH1/2 (EXD-PM, ECP-024) has a potential ignition source and does not comply with ATEX requirements. Installation only in non-explosive environment. For flammable refrigerants only use valves and accessories approved for it!

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

2. Configuration parameters in RAM memory - unlimited overwrite cycles possible (continued)

Modbus address dec. / hex.	Display code	Description	Unit	Default value	Range	Remarks
1805 / 0x70D	1Prr	Ratio metric range 1	1/10 bar	30	3 - 60	If ratio metric is used
1806 / 0x70E	1ut	Valve type 1		0	0 - 12	Changes only allowed if circuit 1 is in "OFF" state 0 = EX4-6 1 = EX7 2 = EX8 3 = N/A 4 = N/A 5 = N/A 6 = N/A 7 = N/A 8 = N/A 9 = N/A 10 = CV4 11 = CV5+6 12 = CV7
1807 / 0x70F	1uF	Valve scaling 1	%	100	5 - 100	
1808 / 0x710	1uu	Start opening valve1	%	10	0 - 100	
1809 / 0x711	1u9	Start opening duration valve 1	s	5	0 - 120	
1810 / 0x712	1uL	Low superheat alarm mode circuit 1		1	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
1811 / 0x713	1u5	Superheat setpoint circuit 1	1/10 K	6	0.5 - 30	Range = 3 – 30K with 1uL = 1 or 2
1812 / 0x714	1u2	MOP mode circuit 1		1	0 - 1	0 = disabled 1 = enabled
1813 / 0x715	1u3	MOP sat. temp. limit circuit1	1/10°C			see MOP table (page 16)
1814 / 0x716	1P9	Low pressure alarm mode circuit1		0	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
1815 / 0x717	1PA	Low pressure alarm cut-out circuit1	1/10 bar	0	-0.8 - 17.7	
1816 / 0x718	1Pb	Low pressure alarm delay circuit1	s	5	5 - 199	
1817 / 0x719	1Pd	Low pressure alarm cut-in circuit1	1/10 bar	0.3	-0.5 - 18	
1818 / 0x71A	1P4	Freeze alarm mode circuit1		0	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
1819 / 0x71B	1P2	Freeze alarm cut-out circuit1	1/10°C	0	-5 - 5	
1820 / 0x71C	1P5	Freeze alarm delay circuit1	s	30	5 - 199	
1821 / 0x71D	1uH	High superheat alarm mode circuit 1		0	0 - 1	0 = disabled 1 = enabled auto-reset
1822 / 0x71E	1uA	High superheat alarm setpoint circuit 1	1/10 K	30	16 - 40	
1823 / 0x71F	1ud	High superheat alarm delay circuit 1	min	3	1-15	
1824 / 0x720	1tSt	Temperature set point	1/10°C	4	-80 - 50	
1825 / 0x721	1tbd	Temperature band	1/10 K	2	1 - 10	
1826 / 0x722	1tAF	Temperature Alarm Enable		0	0 - 1	0 = disabled 1 = enabled
1827 / 0x723	1tAL	Min. temperature alarm set-point	1/10 °C	0	-50 - 50	
1828 / 0x724	1tdL	Min. temperature alarm delay	min	3	1 - 10	
1829 / 0x725	1tAH	Max. temperature alarm set-point	1/10°C	15	-50 - 50	
1830 / 0x726	1tdH	Max. temperature alarm delay	min	3	1 - 10	
1831 / 0x727		Future use				
1832 / 0x728		Future use				
1833 / 0x729	1tt-	Temperature sensor type		0	0 - 1	0 = TP1-N... 1 = ECN-Z60
1876 / 0x754	1P-	Superheat control circuit1 fixed PID Kp factor	1/10	1.0	0.1 - 10	Display 1/10K
1877 / 0x755	1i-	Superheat control circuit1 fixed PID Ti factor	s	100	1 - 350	Ki = Kp/Ti
1878 / 0x756	1d-	Superheat control circuit1 fixed PID Td factor	1/10s	3.0	0.1 – 30	Display 1/10K, Kd = Kp*Td

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

2. Configuration parameters in RAM memory - unlimited overwrite cycles (continued)

Modbus address dec. / hex.	Display code	Description	Unit	Default value	Range	Remarks
Circuit 2						
1834 / 0x72A	2u4	Control mode circuit 2		0	0 - 3	0 = standard control 1 = slow control 2 = intermediate control 3 = adjustable fixed PID
1835 / 0x72B	2u0	Refrigerant circuit 2		1	0 - 27	Changes only allowed if circuit 2 is in "OFF" state 0 = R22 1 = R134a 2 = R507 3 = R404A 4 = R407C 5 = R410A 6 = R124 7 = R744 8 = R407A 9 = R407F 10 = R23 11 = R32* 12 = R1234ze* 13 = R448A 14 = R449A 15 = R450A 16 = R513A 17 = R290* 18 = R1270* 19 = R454C* 20 = R452B* 21 = R454B* 22 = R454A* 23 = R452A 24 = R444B* 25 = R455A* 26 = R1233zde* 27 = R1234yf*
1836 / 0x72C	2uP	Pressure sensor type circuit 2		1	0 - 9	Changes only allowed if circuit 2 is in "OFF" state 0 = PT5N-07x 1 = PT5N-18x 2 = PT5N-30x 3 = PT5N-50x 4 = PT5N-150 5 = PT5N-10P-FLR 6 = Ratio metric(gauge) 7 = Ratio metric(absolute) 8 = Modbus 9 = Pressure sensor type and refrigerant settings from circuit1
1837 / 0x72D	2Prr	Ratio metric range circuit 2	1/10 bar	30	3 - 60	If ratio metric is used
1838 / 0x72E	2ut	Valve type circuit 2		0	0 - 12	Changes only allowed if circuit 2 is in "OFF" state 0 = EX4-6 1 = EX7 2 = EX8 3 = N/A 4 = N/A 5 = N/A 6 = N/A 7 = N/A 8 = N/A 9 = N/A 10 = CV4 11 = CV5+6 12 = CV7
1839 / 0x72F	2uF	Valve scaling circuit 2	%	100	5 - 100	
1840 / 0x730	2uu	Start opening valve circuit 2	%	10	0 - 100	
1841 / 0x731	2u9	Start opening duration valve circuit 2	s	5	0 - 120	
1842 / 0x732	2uL	Low superheat alarm mode circuit 2		1	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
1843 / 0x733	2u5	Superheat setpoint circuit 2	1/10 K	6	0.5 - 30	Range = 3 – 30K with 2uL = 1 or 2
1844 / 0x734	2u2	MOP mode circuit 2		1	0 - 1	0 = disabled 1 = enabled
1845 / 0x735	2u3	MOP sat. temp. limit circuit 2	1/10°C			see MOP table (page 16)
1846 / 0x736	2P9	Low pressure alarm mode circuit 2		0	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
1847 / 0x737	2PA	Low pressure alarm cut-out circuit 2	1/10 bar	0	-0.8 - 17.7	
1848 / 0x738	2Pb	Low pressure alarm delay circuit 2	s	5	5 - 199	
1849 / 0x739	2Pd	Low pressure alarm cut-in circuit 2	1/10 bar	0.3	-0.5 - 18	
1850 / 0x73A	2P4	Freeze alarm mode circuit 2		0	0 - 2	0 = disabled 1 = enabled auto-reset 2 = enabled manual reset
1851 / 0x73B	2P2	Freeze alarm cut-out circuit 2	1/10°C	0	-5 - 5	
1852 / 0x73C	2P5	Freeze alarm delay circuit 2	s	30	5 - 199	

Note: *) EXD-SH1/2 (EXD-PM, ECP-024) has a potential ignition source and does not comply with ATEX requirements. Installation only in non-explosive environment. For flammable refrigerants only use valves and accessories approved for it!

EXD-SH1/2 Controller for electrical control valves with ModBus Communication Capability

2. Configuration parameters in RAM memory - unlimited overwrite cycles (continued)

Modbus address dec. / hex.	Display code	Description	Unit	Default value	Range	Remarks
1853 / 0x73D	2uH	High superheat alarm mode circuit 2		0	0 - 1	0 = disabled 1 = enabled auto-reset
1854 / 0x73E	2uA	High superheat alarm setpoint circuit 2	1/10 K	30	16 - 40	
1855 / 0x73F	2ud	High superheat alarm delay circuit 2	min	3	1-15	
1856 / 0x740	2tt-	Temperature sensor type		0	- 1	0 = TP1-N... 1 = ECN-Z60
1857 / 0x741	2P-	Superheat control circuit 2 fixed PID Kp factor	1/10	1.0	0.1 - 10	Display 1/10K
1858 / 0x742	2i-	Superheat control circuit 2 fixed PID Ti factor	s	100	1 - 350	Ki = Kp/Ti
1859 / 0x743	2d-	Superheat control circuit 2 fixed PID Td factor	1/10s	3.0	0.1 – 30	Display 1/10K, Kd = Kp*Td

MOP saturation temperature limit table

Refrigerant	°C			Refrigerant	°C			Refrigerant	°C		
	Min.	Max.	Default		Min.	Max.	Default		Min.	Max.	Default
R22	-70	50	+13	R23	-70	-18	-40	R452B	-45	66	+25
R134a	-57	66	+15	R32	-52	30	+15	R454B	-40	45	+18
R507	-75	42	+7	R1234ze	-57	66	+24	R454A	-57	66	+10
R404A	-76	42	+7	R448A	-57	66	+12	R452A	-45	66	+15
R407C	-66	48	+15	R449A	-57	66	+12	R444B	-45	66	+15
R410A	-52	30	+15	R450A	-57	66	+19	R455A	-57	66	+14
R124	-45	91	+50	R513A	-57	66	+13	R1233zde	-45	90	+15
R744	-40	-4	-5	R290	-66	48	+15	R1234yf	-52	66	+15
R407A	-66	48	+10	R1270	-66	48	+15				
R407F	-66	48	+10	R454C	-66	48	+17				

EXD-SH12_TB_EN_1120_R09.docx

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Sizes: 1/2", 3/4", 1", 1-1/4", 1-1/2" & 2"

Type: Venturi Type Manual Balancing Valve

GPM Flow Range: 1/2" - 0.20-12.1 (0.50-5.00 PSID)

3/4" - .4-15.0 (0.50-5.0 PSID)

1" - 1.6-44.7 (0.50-5.0 PSID)

1-1/4" - 3.9-53.7 (0.50-5.0 PSID)

1-1/2" - 9.9-98.4 (0.50-5.0 PSID)

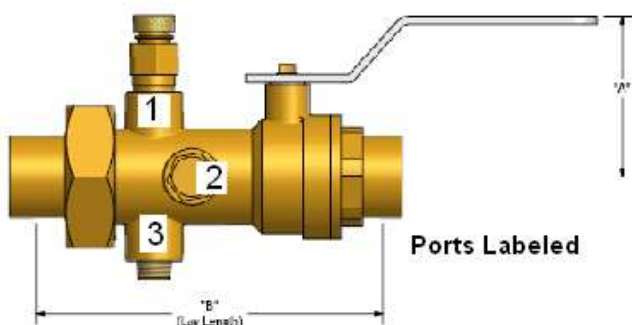
2" - 9.20 - 125.20 (0.50-5.0 PSID)

Specifications:

- Nominal Working Pressure: 600 WOG
- Working Temperature: $-4^{\circ}\text{F} (-20^{\circ}\text{C}) \leq t \leq 230^{\circ}\text{F} (110^{\circ}\text{C})$
- Solder socket to ANSI B16.18
- Preset Non-Removable Venturi Inserts
- Cv's: 1/2": 0.23, 0.46, 0.87, 1.8, 3.3, 5.4
3/4": 0.55, 1.1, 2.2, 4.0, 6.7
1": 2.3, 5.4, 9.2, 20
1-1/4": 5.5, 9.8, 20, 24
1-1/2": 14, 19, 44
2": 13, 34, 56
- Outlet Connections FSWT or FNPT
- Inlet Connections FSWT, FNPT or MNPT
- Lever Handle
- 2 Pressure/Temperature Ports and 1 plug
- Memory Stop

Options:

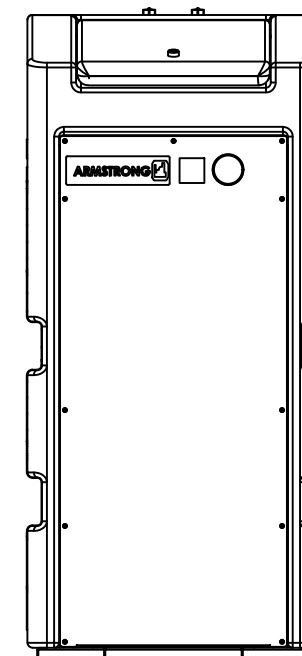
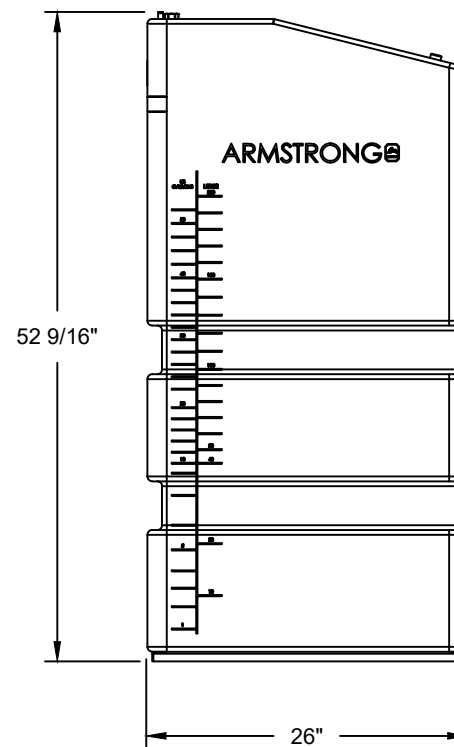
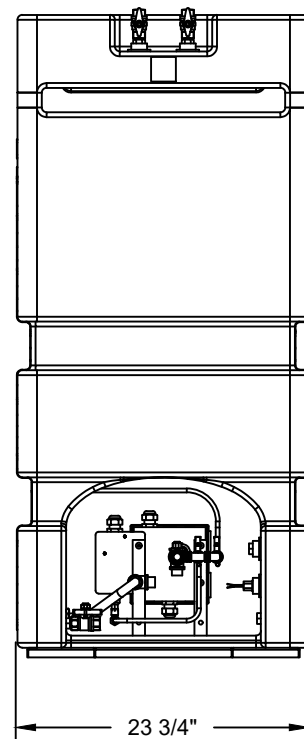
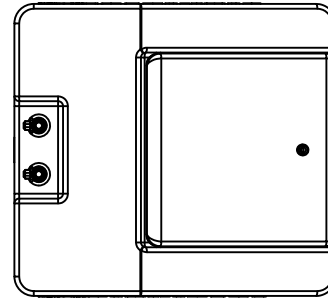
- Extended Handles & Extended Pressure/Temperature Ports¹
- Stainless Steel Tag-Chain Upon Request



MATERIAL SPECIFICATIONS	
Seats	PTFE
Ball	Chrome Plated Brass
Stem	Brass
Handle	Steel
Valve Body	Brass
Screw/Self Taping Screw	Steel
O-Rings	EPDM
Hex Socket Pipe Plug	Brass
Union Nut	Brass
Tailpiece	Brass
Fixed End	Brass
Pressure/Temperature Ports	Brass
Memory Stop	Steel

DIMENSIONS		
Size	"A"	"B"
1/2"	0.9	3.3
3/4"	0.9	3.5
1"	0.9	3.6
1-1/4"	0.9	5.1
1-1/2"	1	5.7
2"	1	6.5

¹ Extended Handles cannot be ordered without extended Pressure/Temperature Ports



Est. Shipping Weight: 174#
Est. Operating Weight: 445#



TITLE:
**UNIT DRAWING
GLYCOL FEEDER TANK**

SCALE: 1/2"=1'-0"
DATE: 10/05/23
SUB-TITLE:

ENGINEERING
APPROVED BY:

QUALITY CONTROL
APPROVED BY:

DRAWN BY: JD
FILE LOC: ACAD2023
DRAWING NUMBER:

REVISED BY:	DATE:	REV. NO:

LEGEND

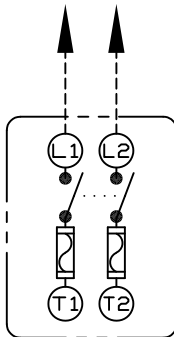
AA-Audible Alarm
ADC-Alarm Dry Contact
AFI-Air Flow Interlock
BBH-Belly Band Heater
BLM-Blower Motor
C-Contactor
CCH-Crankcase Heater
CF-Condenser Fan
COMP-Compressor
CPR-Crankcase Press. Reg.
CST-Cooling Stage T'stat
CT-Current Transformers
DDPR-Diff. Disch. Press. Reg.
DEF-Evap. Defrost Load
DPH-Drain Pan Heaters
DS-Door Interlock Sol.
DSHS-Desuperheat hot gas sol.
DTS-Discharge Line Temp. Stat
EF-Evap. Fan Load
EPR-Evap. Press. Reg.
FCS-Fan Cycle Control
FS-Flow Switch
FZ-Freeze Safety
GR/G-Ground
HCC-Heater Cable, Chiller
HCR-Heater Cable, Receiver
HGBS-Hot Gas Bypass Sol.
HGD-Hot Gas Defrost Sol.
HP-High Pressure Safety
HTR-Unit Heater
LALT-Low Amb. Lock Out T'stat
LIS-Liquid Injection Sol.
LLL-Low Liquid Level
LLPS-Load Limit Press. Switch
LLS-Liquid Line Sol.
LO-Lo Press. Control
LO-UPS-Close On Rise UPS
MET-Meter Elapsed Time
MSD-Man.Sw. Door
MSHS-Man. Sw. Horn Silence
MSHOA-Man. Sw. Hand-Off-Auto
MSLL-Man. Sw. Lead Lag
MSPD-Man. Sw. Pumpdown
MSPDDR-Man. Sw. Pumpdown Off Run
MSPHM-Man.Sw. Phase Monitor
OF-Off-Flare Safety
OS-Oil Separator Sol.
OVL-Overload
PHM-Phase Monitor
PM-Power Module, Compressor Box
R-Relay
RH-Evap. Reheat Load
RHC-Reheat Control
RHS-Reheat 3 Way Valve Solenoid
SPR-Spray Pump
SUMP-Sump Heater
TD-Time Delay
TM/TD-Time Delay
TPWS-Timer Part Wind Start
UC DISC-Unit Cooler Disconnect
ULS-Unloader Sol.
UPS-Unloading Press. Sw.

REVISIONS	
No.	By Date
1	
2	
3	
4	
5	
6	
7	

 CORPORATION		TITLE: GLYCOL FEEDER TANK	
SCALE: N/A	ENGINEERING APPROVED BY:	QUALITY CONTROL APPROVED BY:	DRAWN BY:
DATE: 07/10/24			
SUB-TITLE: ELECTRICAL SCHEMATIC		DRAWING NUMBER:	
PAGE 1 of 1			

DENOTES COMPONENTS LOCATED EXTERNAL OF U.L. ENCLOSURE
□ INDICATES TERMINAL BLOCK
() INDICATES WIRE NUMBER IDENTIFICATION
FIELD WIRING----- (BY OTHERS)
FAN MOTORS ARE INHERENTLY PROTECTED.
3 PHASE MOTORS ARE PROTECTED AGAINST
PRIMARY SINGLE PHASING.

** TO PROTECTED POWER
 SOURCE PER N.E.C.



115/60/1 POWER
MAX. FU./ *BKR. 15
MCA 10
RLA 8
SCCR 5KA

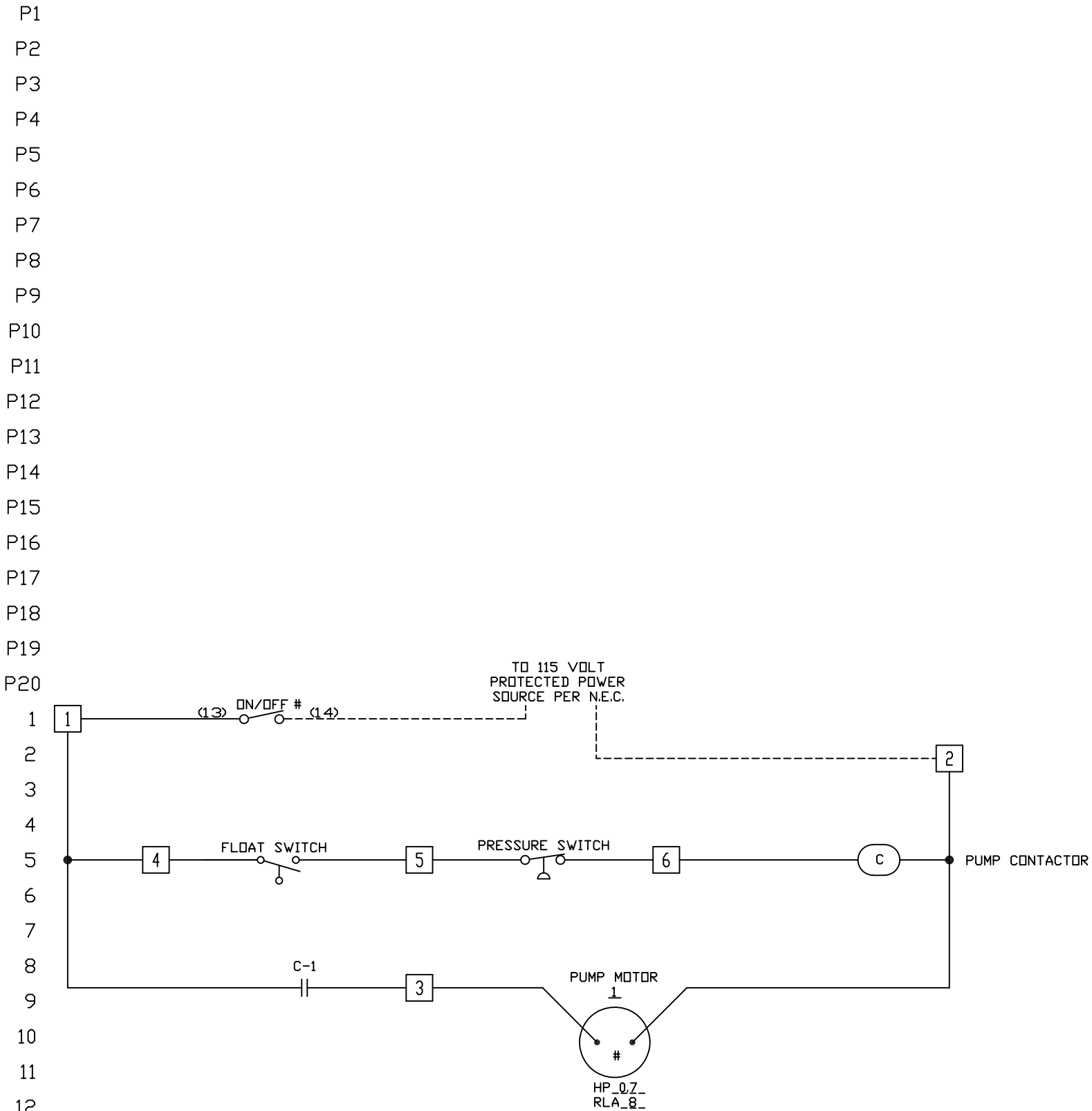
☒ DISCONNECTING MEANS BY OTHERS
☐ UNIT CIRCUIT BREAKER
☐ UNIT NON-FUSED DISCONNECT
☐ UNIT FUSED DISCONNECT

CONTROL CIRCUIT POWER: ☒ BY OTHERS
☒ (115/60/1) ☐ TO SEPARATE
☐ (230/60/1) SOURCE
☐ OTHER ☐ BY FACTORY

MIN. VA 920

* "HACR" BKR. OR TIME DELAY
FUSE MUST BE USED IF
COMPRESSOR PROTECTION
IS NOT PROVIDED.

*FOR MCA VALUE OF
100 OR LESS, USE
TYPE 60°C, IF GREATER
THAN 100 USE TYPE 75°C
COPPER CONDUCTORS ONLY



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