SERVICE MANUAL

FOR CO2 ELECTRIC PRESSURE-BUILDING VAPORIZER MODELS 9 KW – 56 KW

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PLEASE READ

INTRODUCTION:

An Allcryo, Inc. carbon dioxide pressure-building vaporizer is not a complicated piece of equipment, although basic knowledge of the hazards involved with the mix of electrical and carbon dioxide is essential. The information in the manual is intended to inform and assist a qualified CO_2 serviceman.

RECOMMENDATIONS:

1. This system operates under high pressure and high voltage! Only experienced personnel should install or operate it.

2. Unit must be installed in a well ventilated area.

3. Line safeties should be installed in between all valves.

DISCLAIMER:

The material in this manual is for information purposes only. The contents and the product it describes are subject to change without notice. Allcryo, Inc. makes no representations or warranties with respect to this manual. In no event shall Allcryo, Inc. be liable for any damages, direct or incidental, arising out of, or related to, the use of this manual.

CO2 ELECTRIC PRESSURE-BUILDING VAPORIZER FOR MODELS 9 KW – 56 KW

GENERAL:

Allcryo's carbon dioxide pressure-building vaporizers are designed for low maintenance operation. A typical unit consists of an insulated pressure vessel, an immersion type electric heating element, and necessary controls, and piping. The unit's liquid inlet should be connected to a bulk carbon dioxide storage receiver; the return line must be connected to the receiver's vapor outlet. The unit is automatically controlled by means of a pressure switch. The switch operates off the receiver's vapor pressure, and is field-connected by means of ¼" copper or stainless line. In a normal operated mode, the unit is de-energized as long as the internal pressure in the receiver is above 250 psig. If the pressure falls below 250 psig, the pressure switch activates a magnetic contactor and the elements become energized. Liquid carbon dioxide from the receiver is then vaporized and returned to the top of the receiver. When enough liquid is vaporized to raise the pressure to 260 psig, the unit will de-energize.

APPLICATION:

There are many applications where a carbon dioxide pressure-building vaporizer would be required. They would include most vapor use applications and many large liquid use applications. These locations often have a bulk carbon dioxide receiver installed. Removal of modest quantities of vapor or large quantities of liquid will result in a pressure drop in the receiver. Most carbon dioxide receivers are designed to operate at temperatures above -20°F and 200 psig. The pressure-building vaporizer is designed to handle this requirement.

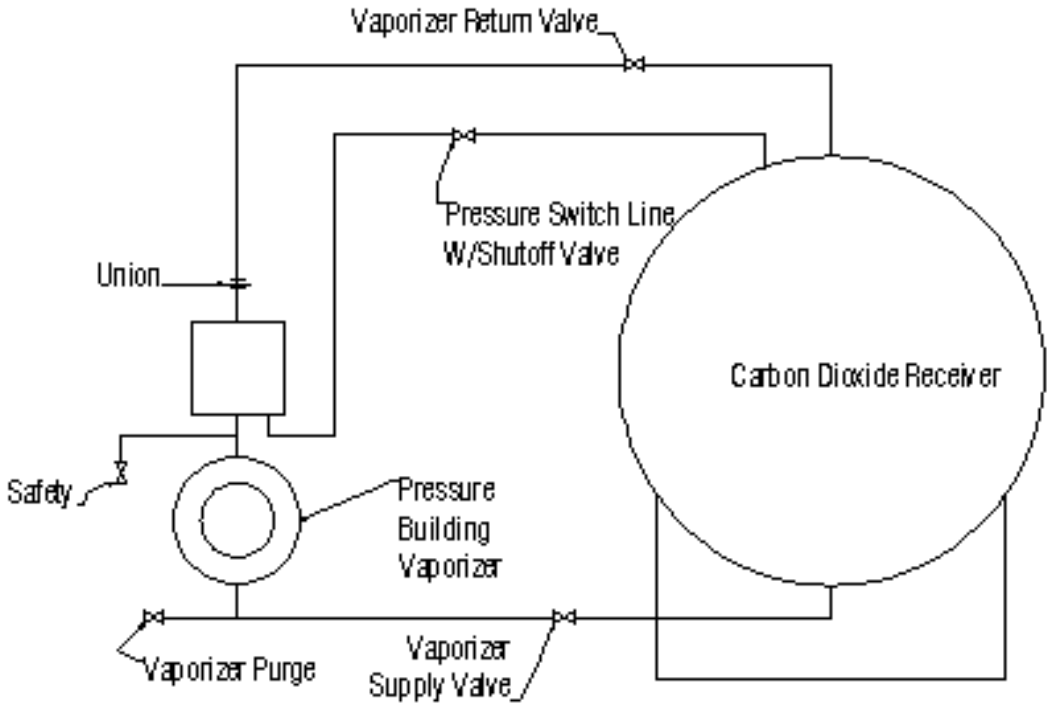
OPERATION:

The unit's operation is completely automatic. It will energize any time the pressure is below 250 psig and shut off at 260 psig. The unit is protected by two high temperature cutouts, which are factory set at 35°F. Liquid carbon dioxide is vaporized by the heating elements and returns to the top of the storage receiver via the vaporizer return line. The electrical pressure switch senses the pressure in the receiver and controls the operation of the unit accordingly.

INSTALLATION:

A.) PIPING & VALVES

The unit is designed to be installed alongside a carbon dioxide storage receiver. The unit should be placed as low and near the supply and return line as possible. Supply and return lines should be as straight as possible without traps. The liquid supply line should come off the lowest point possible on the receiver without an internal or external trap. The liquid supply line must be a minimum of 1" schedule 80 A106-B pipe (or equivalent type K copper). A ball valve must be installed in the inlet and return lines. The valve used should be rated for 600 psig and have materials compatible with carbon dioxide. The liquid in the vaporizer return lines should be leak-tested and insulated with a minimum of 1" of urethane. The pressure switch should be connected to the low pressure side of the receiver's instrument piping or to a vapor outlet on the receiver. It is not necessary to insulate this line. A sketch of a typical installation is shown below:



INSTALLATION CONTINUED:

B.) ELECTRICAL

This unit comes completely wired and ready to operate. CONSULT A QUALIFIED ELECTRICIAN FOR PROPER HOOK-UP OF THIS EQUIPMENT. A disconnect switch must be installed near the unit. Note: the unit is factory wired for either 230 or 460 volt 3 phase. Confirm that the unit is wired correctly for your requirements by checking the voltage tag on the electrical enclosure. If it is determined that a wiring change is necessary, please refer to the wiring drawing. The heating elements and the control voltage transformer both must be rewired. Amp load of the various model pressure-building vaporizers are listed below:

CT-9 KW	9,000 WATTS @ 230 VOLT	3PHASE	60 HZ	23 AMPS
	12,000 WATTS @ 460 VOLT	3PHASE	60 HZ	15 AMPS
CT-18 KW	18,000 WATTS @ 230 VOLT	3PHASE	60 HZ	45 AMPS
	24,000 WATTS @ 460 VOLT	3PHASE	60 HZ	30 AMPS
CT-28 KW	28,000 WATTS @ 230 VOLT	3PHASE	60 HZ	70 AMPS
	28,000 WATTS @ 460 VOLT	3PHASE	60 HZ	35 AMPS
CT-56 KW	56,000 WATTS @ 230 VOLT	3PHASE	60 HZ	140 AMPS
	56,000 WATTS @ 460 VOLT	3PHASE	60 HZ	70 AMPS

C.) INITIAL PRESSURIZATION OF THE VAPORIZER

Upon completion of the installation process, slowly open the vaporizer return valve. This will pressurize the vaporizer with the vapor. Check the unit for leaks and repair if necessary. CAUTION: NEVER ATTEMPT TO REPAIR A LEAK UNDER PRESSURE. The vaporizer purge valve may be used to depressurize the vaporizer.

D.) INITIAL STARTUP

Insure that the power is turned off. Slowly open the vaporizer return valve and pressurize the vaporizer. Close the vaporizer return valve and open the vaporizer purge valve. This procedure should be repeated several times to remove any trapped air from the lines and vessel. Slowly open the vaporizer return valve (full open), open the vaporizer liquid supply valve. In a matter of a few moments the unit will be flooded with liquid carbon dioxide. OPEN THE VAPOR SUPPLY TO THE PRESSURE SWITCH. The unit is now ready to operate. The pressure switch is factory set at 250 on and 260 off. Slight control adjustments may be necessary due to the rough handling the unit receives in shipment. They can be checked with the power off using a carbon dioxide cylinder to pressurize the switch. Monitor the contact operation and adjust if necessary. The high temperature cutouts are factory set at 35°F. Check the setting and adjust if necessary.

Turn on the power. Monitor its operation for several days to insure proper operation.

MAINTENANCE

A.) PURGING (IMPURITIES)

Product impurities tend to collect in the bottom of pressure-building vaporizers. There are several reasons, one of which is that it is the lowest point in the system; another is the heating of the carbon dioxide tends to separate impurities from the liquid. Therefore, it is necessary to purge the vaporizer weekly. The purging process is as follows: at the end of the last working day of the week turn the electric power to the vaporizer off. Close the vaporizer liquid supply valve. Leave the system in this configuration all weekend. Upon returning to work Monday morning close the vaporizer return valve and open the vaporizer purge valve. All the impurities will be blown out of the unit along with a small amount of carbon dioxide. Once this process is complete, close the vaporizer purge valve, slowly open the vaporizer return valve to full open position, open the vaporizer liquid supply valve and turn on the power. CAUTION: DO NOT DEVIATE FROM THIS SEQUENCE.

B.) FEATURES & SPECIFICATIONS

- Pressure vessel built to the ASME code specs
- 525 psig working pressure
- Safety set at 450 psig
- Nema 3R electrical enclosure
- 2000 # forged steel fittings minimum
- Schedule 80 SA-106 pipe
- Built to requirements of the National Electric Code
- UL listed electrical components
- Durable electric-immersion heating elements
- 2” urethane insulation on vessel
- ½” urethane insulation on pipe
- Minimum of threaded fittings to lower leak potential
- Adjustable leveling devices
- Supplied with 1” purge valve
- Supplied with inlet and outlet unions

DIAGNOSTIC SECTION

NOTE:
DISCONNECT THE MAIN POWER BEFORE OPENING THE ELECTRICAL CABINET. MOST TROUBLE-SHOOTING CAN BE ACCOMPLISHED BY QUALIFIED PERSONNEL USING A MULTIPURPOSE VOLT-AMP METER WITH THE POWER OFF.

TROUBLE	PROBABLE CAUSE	REMEDY
VAPORIZER WILL NOT ENERGIZE	NO POWER	CHECK POWER
	DEFECTIVE CONTROL VOLTAGE TRANSFORMER	REPLACE AS REQ'D
	DEFECTIVE CONTROL VOLTAGE FUSE	REPLACE AS REQ'D
	DEFECTIVE HIGH TEMPERATURE CUTOUT	REPLACE AS REQ'D
	HIGH TEMPERATURE CUTOUT SET TOO LOW	RESET TO 35°F
	IMPROPERLY WIRED	CHECK & REWIRE AS REQ'D
	DEFECTIVE CONTACTOR COIL	REPLACE AS REQ'D
UNIT ENERGIZES, BUT SHORT CYCLES	LIQUID SUPPLY VALVE CLOSED OR NOT FULLY OPEN	OPEN VALVE
	VAPOR RETURN VALVE CLOSED OR NOT FULLY OPEN	OPEN VALVE
	DEFECTIVE PRESSURE SWITCH	REPLACE AS REQ'D
	HIGH TEMPERATURE SET TOO LOW	RESET TO 35°F

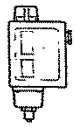
	VAPORIZER VESSEL FULL OF IMPURITIES	PURGE AS REQ'D
	BLOCKAGE IN LIQUID SUPPLY LINE	NO POWER

TROUBLE	PROBABLE CAUSE	REMEDY
UNIT ENERGIZED BUT WILL NOT SHUT OFF	PRESSURE LINE FROM RECEIVER TO PRESSURE SWITCH NOT CONNECTED	CONNECT ¼" COPPER LINE
	PRESSURE SWITCH SUPPLY VALVE CLOSED	OPEN VALVE
	PRESSURE SWITCH SET TO HIGH	RESET TO 250 ON & 260 OFF
	IMPROPERLY WIRED	CHECK & REWIRE AS REQ'D
	DEFECTIVE PRESSURE SWITCH	REPLACE AS REQ'D
CO2 RECEIVER PROBLEMS ASSOCIATED WITH PRESSURE-BUILDING VAPORIZERS		
RECEIVER PRESSURE LOW	BURNED OUT HEATING ELEMENT	REPLACE DEFECTIVE ELEMENT
	CUSTOMER OVERDRAWING UNIT	CHECK WITHDRAWAL RATE
	VAPORIZER INLET OR OUTLET VALVE CLOSED	OPEN VALVE
	HIGH TEMPERATURE CUTOUT SET TOO LOW	RESET TO 35°F
	VAPORIZER VESSEL FULL OF IMPURITIES	PURGE VESSEL
	POWER TO UNIT OFF	TURN ON POWER
	IMPROPER VOLTAGE	CHECK VOLTAGE
	BLOWN CONTROL VOLTAGE FUSE	REPLACE FUSE
	DEFECTIVE HIGH-TEMPERATURE CUTOUT	REPLACE AS REQ'D
	DEFECTIVE CONTACTOR	REPLACE AS REQ'D

	DEFECTIVE CONTACTOR COIL	REPLACE COIL
	UNIT WIRED IMPROPERLY	CHECK & REWIRE AS REQ'D
	DEFECTIVE CONTROL VOLTAGE TRANSFORMER	REPLACE TRANSFORMER

INSTRUCTIONS

RT 5, 110, 112, 116, 117, 121, 200



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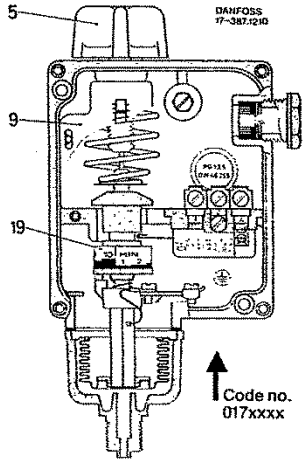
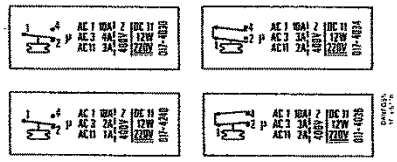


Fig. 1



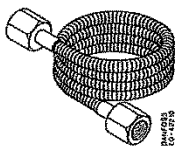


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Fig. 2

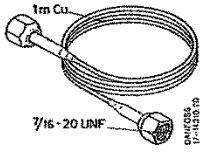

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Fig. 3

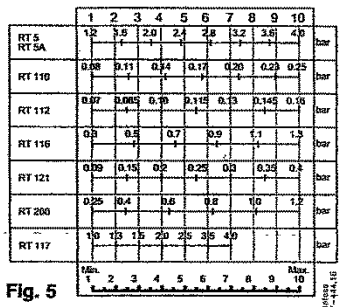


Fig. 5

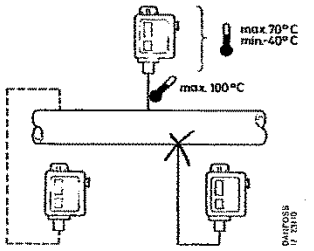


Fig. 4

017R9315

ENGLISH

Data

Pressure controllers types RT 5, 110, 112, 116, 117, 121, 200

Max. test pressure

RT 110, 112, 121:	8 bar$_e$
RT 5, 116, 200:	25 bar
RT 117:	47 bar

Fitting

Damp out strong pressure pulsations. A damping coil, fig. 2 or fig. 3, will often be sufficient.

Insert a water-filled tube loop as a temperature lock (e.g. a 10 mm Cu tube) if at high plant temperatures there is a risk that the pressure connection of the control will become heated to more than 150°C.

Position the pressure control so that on water plant it cannot be exposed to frost. It can operate on an air cushion, for example.

Setting

The pressure controller is set by rotating the knob (5), at the same time reading the main scale (9). See fig. 1.

The differential is set by rotating the differential adjusting nut (19) to the value indicated by the use of the nomogram in fig. 5. The maximum operating pressure is thus the sum of the setting pressure and the differential.

Example

It is desired to control the pressure in an oilfired steam boiler by the use of an RT 116. Maximum pressure 9 bar. Minimum pressure 8.2 bar. Differential 9 – 8.2 = 0.8 bar.

1. Connect the oil burner to terminals 1-2 of the pressure controller.
2. Set the pressure controller for 8.2 bar by rotating the knob (5).
3. Set the differential adjusting nut (19) at the figure 6 which is found by reading the nomogram in fig. 5.

ESPAÑOL

Características

Presostatos tipos RT 5, 110, 112, 116, 117, 121, 200

Presión de prueba máxima:

RT 110, 112, 121:	8 bar$_e$
RT 5, 116, 200:	25 bar
RT 117:	47 bar

Montaje

Amortiguar las pulsaciones acusadas o golpes de presión. Para ello, será suficiente en la mayoría de los casos, el empleo de un serpentín de amortiguación tal como de muestra en las figuras 2 o 3.

Intercalar un bucle tubular lleno de agua para que actúe a modo de protector o cierre térmico (usar, por ejemplo, un tubo de cobre de 10 mm), en el caso de que a elevadas temperaturas de la planta exista el riesgo de que la conexión del control pueda llegar a alcanzar temperaturas superiores a los 150°C. Situar el presostato de forma que en instalaciones de agua nunca quede expuesto a la formación de escarcha. Por ejemplo, puede funcionar protejido por una masa envolvente de aire.

Ajuste

El presostato se ajusta de acuerdo con el funcionamiento – establecimiento o interrupción de la corriente, – que ha de producirse cuando la presión decae (ajuste de gama).

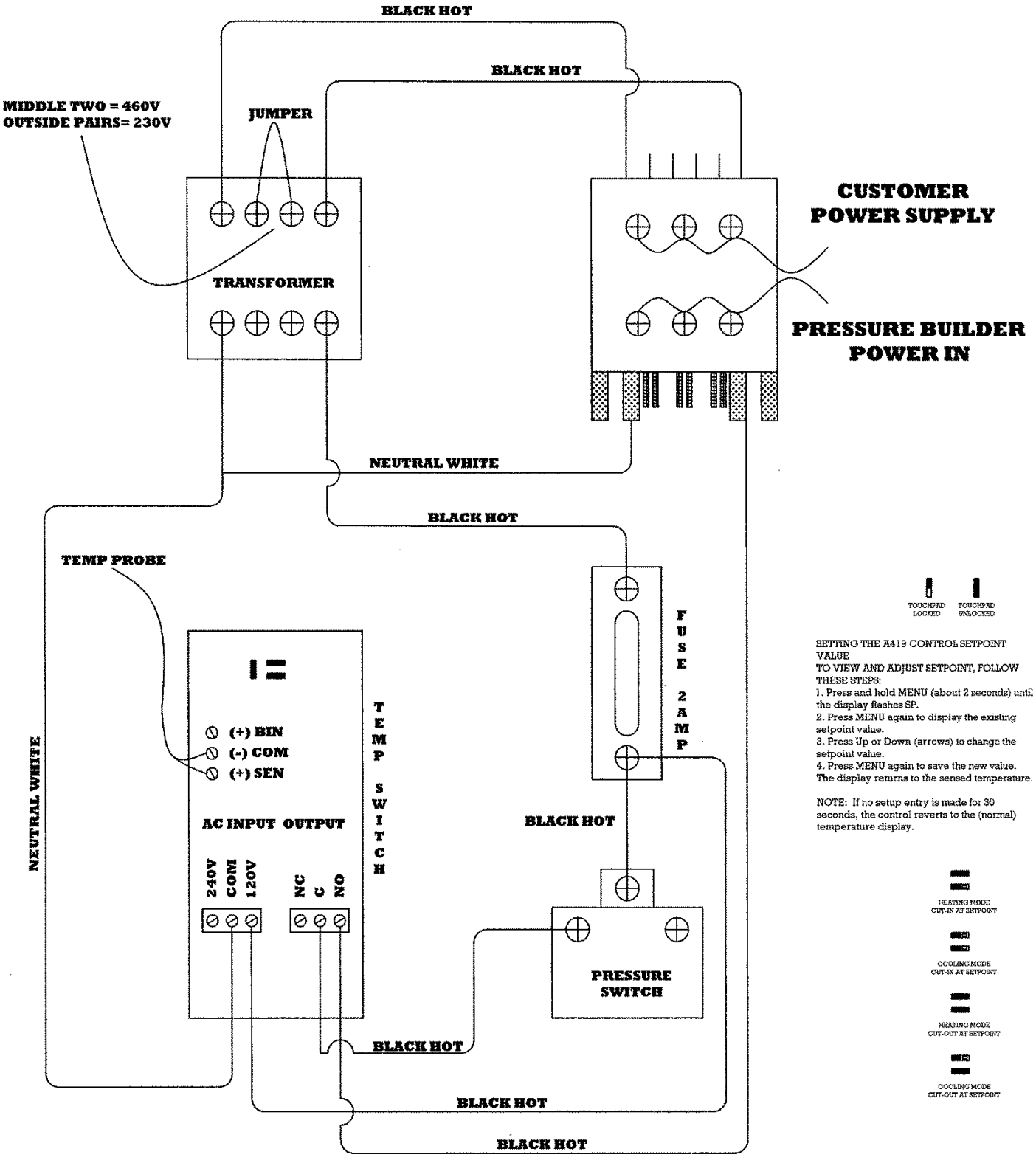
El reglaje se hace girando el botón (5) y leyendo al mismo tiempo la escala principal (9). Véase la figura 1.

El diferencial se ajusta haciendo girar la tuerca de ajuste diferencial (19) de acuerdo con el nomograma de la fig. 5. La presión de funcionamiento máxima es por consiguiente la suma de la presión de ajuste y del diferencial.

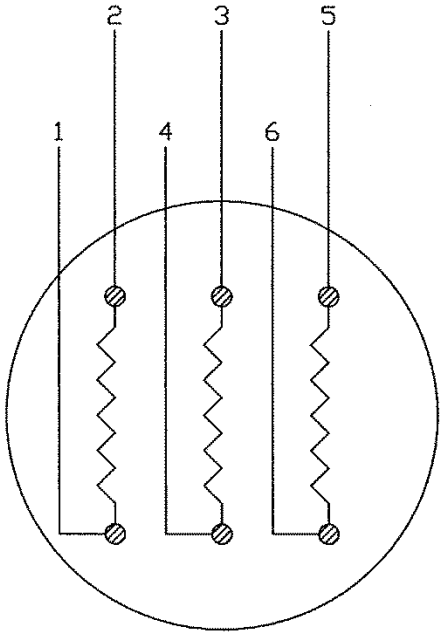
Ejemplo

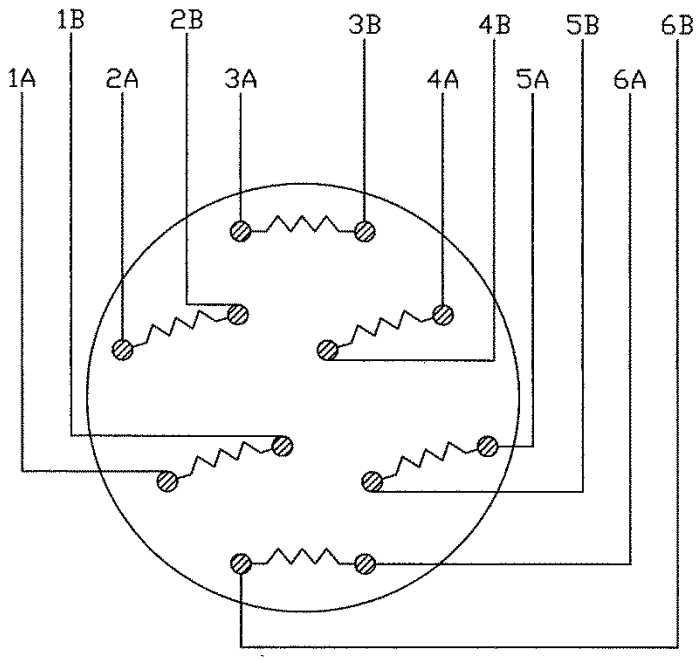
Se desea regular la presión en una caldera de vapor calentada por gas-oil, utilizando un aparato RT 116. Presión máxima: 9 bar. Presión mínima: 8,2 bar. Diferencial: 9 – 8,2 = 0,8 bar.

1. Conectar el quemador de aceite a los terminales 1-2 del presostato.
2. Ajustar el presostato para 8,2 bar haciendo girar el botón 5.
3. Ajustar la tuerca de reglaje del diferencial (19) en la figura 6 siguiendo las indicaciones del nomograma de la figura 5.


BLACK HOT
BLACK HOT
MIDDLE TWO = 460V
OUTSIDE PAIRS= 230V
JUMPER
TRANSFORMER
CUSTOMER
POWER SUPPLY
PRESSURE BUILDER
POWER IN
NEUTRAL WHITE
BLACK HOT
TEMP PROBE
FUSE 2AMP
(+) BIN
(-) COM
(+) SEN
AC INPUT OUTPUT
240V COM 120V
NC C NO
TEMP SWITCH
NEUTRAL WHITE
BLACK HOT
PRESSURE
SWITCH
BLACK HOT
BLACK HOT
BLACK HOT
TOUCHPAD
LOCKED
TOUCHPAD
UNLOCKED
SETTING THE A419 CONTROL SETPOINT
VALUE
TO VIEW AND ADJUST SETPOINT, FOLLOW
THESE STEPS:
1. Press and hold MENU (about 2 seconds) until
the display flashes SP.
2. Press MENU again to display the existing
setpoint value.
3. Press Up or Down (arrows) to change the
setpoint value.
4. Press MENU again to save the new value.
The display returns to the sensed temperature.
NOTE: If no setup entry is made for 30
seconds, the control reverts to the (normal)
temperature display.
HEATING MODE
CUT-IN AT SETPOINT
COOLING MODE
CUT-IN AT SETPOINT
HEATING MODE
CUT-OUT AT SETPOINT
COOLING MODE
CUT-OUT AT SETPOINT

WARREN ELECTRIC HEATING ELEMENT WIRING PROCEDURES





9KW and 18KW

A) 460VOLT, 3 PHASE

1. TIE LINES 1, 4 & 5
2. L1 TO 2
3. L2 TO 3
4. L3 TO 6

B) 230VOLT, 3 PHASE

1. L1 TO 2 AND 3
2. L2 TO 1 AND 6
3. L3 TO 4 AND 5

28KW

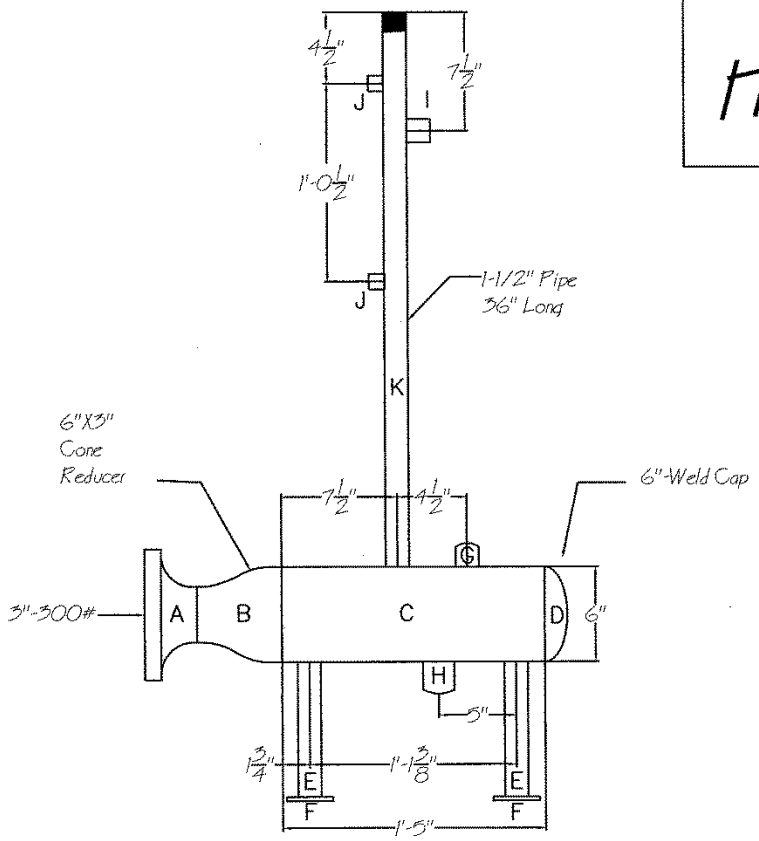
A) 460VOLT, 3 PHASE

1. TIE LINES 1A TO 6B
   2B TO 3A
   4B TO 5A
2. L1 TO 6A AND 5B
   L2 TO 4A AND 3B
   L3 TO 2A AND 1B

B) 220VOLT, 3 PHASE

1. L1 TO 1A, 6A, 5B AND 4A
   L2 TO 6B, 1B, 2A AND 3B
   L3 TO 5A, 4B, 3A AND 2B

9 KW HEATER



9 KW HEATER BILL OF MATERIALS

Mark	Qty.	Size	Description
A	1	3"x300#	Weld Neck Flange
B	1	6"x3"	Cone-reducer
C	1	18"	6" Sch 80 Pipe
D	1	6"	6" Sch. 80 W. Cap
E	2	8 1/2"	1-1/2" Sch. 40 Pipe Legs
F	2	3"x12"	3/8" Flat Bar Base Plate
G	1	3/4"	3000# Thrd'd Cplg
H	1	1"	3000# Thrd'd Cplg
I	1	1/2"	3000# Thrd'd Cplg
J	2	1"	1"x12" Square Tubing
K	1	36"	1-1/2" Sch. 80 Pipe

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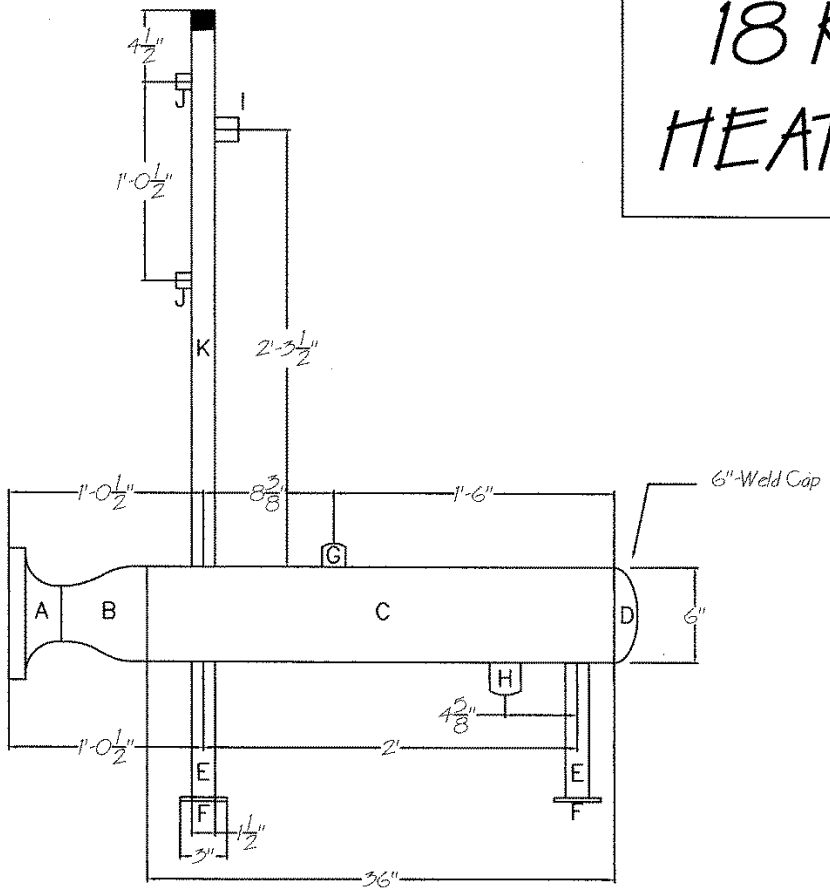
18 KW HEATER



18 KW HEATER BILL OF MATERIALS

Mark	Qty.	Size	Description
A	1	3"x300#	Weld Neck Flange
B	1	6"x3"	Cone–reducer
C	1	30"	6" Sch. 80 Pipe
D	1	6"	6" Sch. 80 W. Cap
E	2	8 1/2"	1–1/2" Sch. 40 Pipe Legs
F	2	3"x12"	3/8" Flat Bar Base Plate
G	1	3/4"	3000# Thrd'd Cplg
H	1	1"	3000# Thrd'd Cplg
I	1	1/2"	3000# Thrd'd Cplg
J	2	1"	1"x12" Square Tubing
K	1	36"	1–1/2" Sch. 80 Pipe

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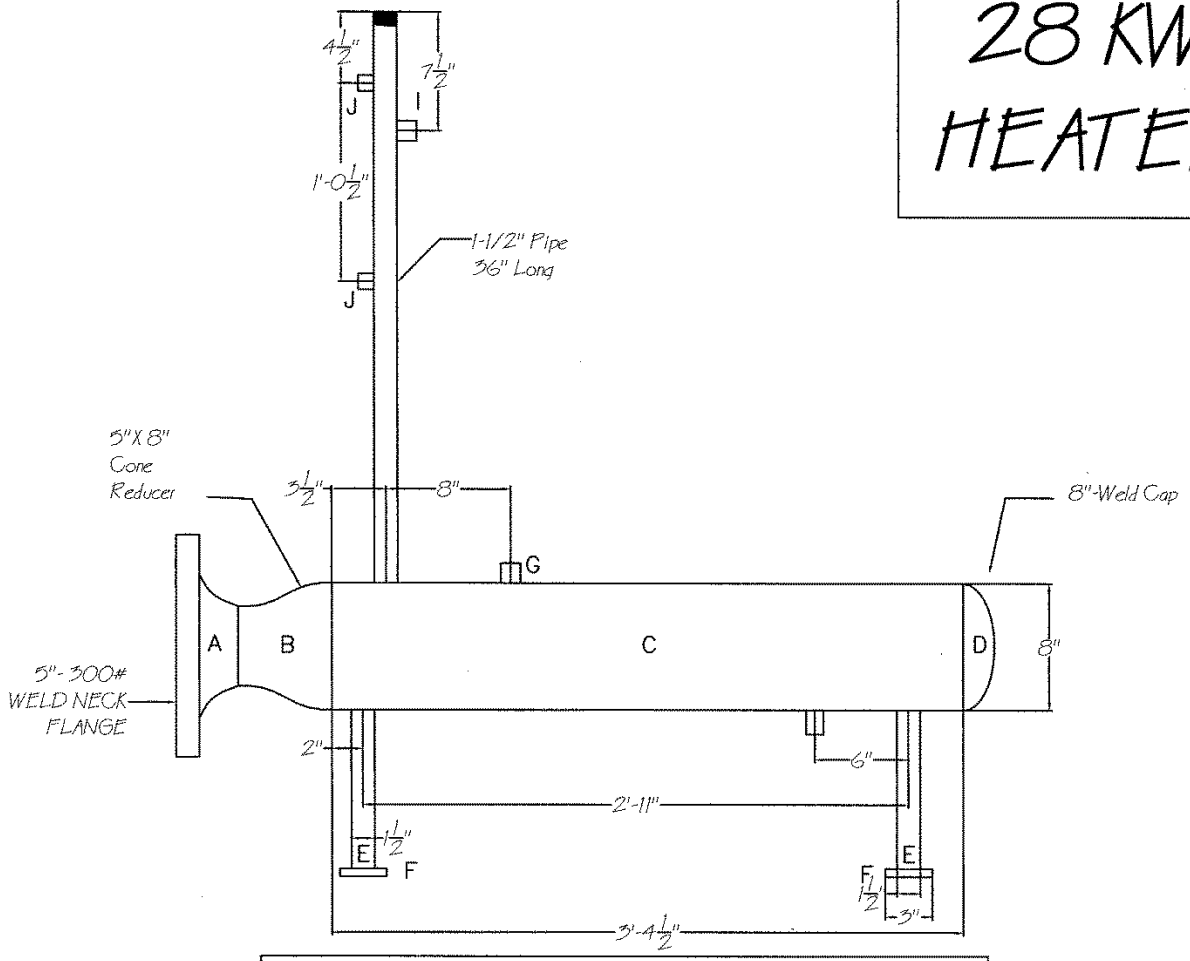
28 KW HEATER



28 KW HEATER BILL OF MATERIALS

Mark	Qty.	Size	Description
A	1	5"x300#	Weld Neck Flange
B	1	5"x 8"	Cone–reducer
C	1	40–1/2"	8" Sch. 80 Pipe
D	1	8"	8" Sch. 80 Weld Cap
E	2	10"	1–1/2" Sch. 40 Pipe Legs
F	2	3"x16"	3/8" Flat Bar Base Plate
G	1	3/4"	3000# Thrd'd Cplg
H	1	1"	3000# Thrd'd Cplg
I	1	1/2"	3000# Thrd'd Cplg
J	2	1"	1"x12" Square Tubing
K	1	36"	1–1/2" Sch. 80 Pipe

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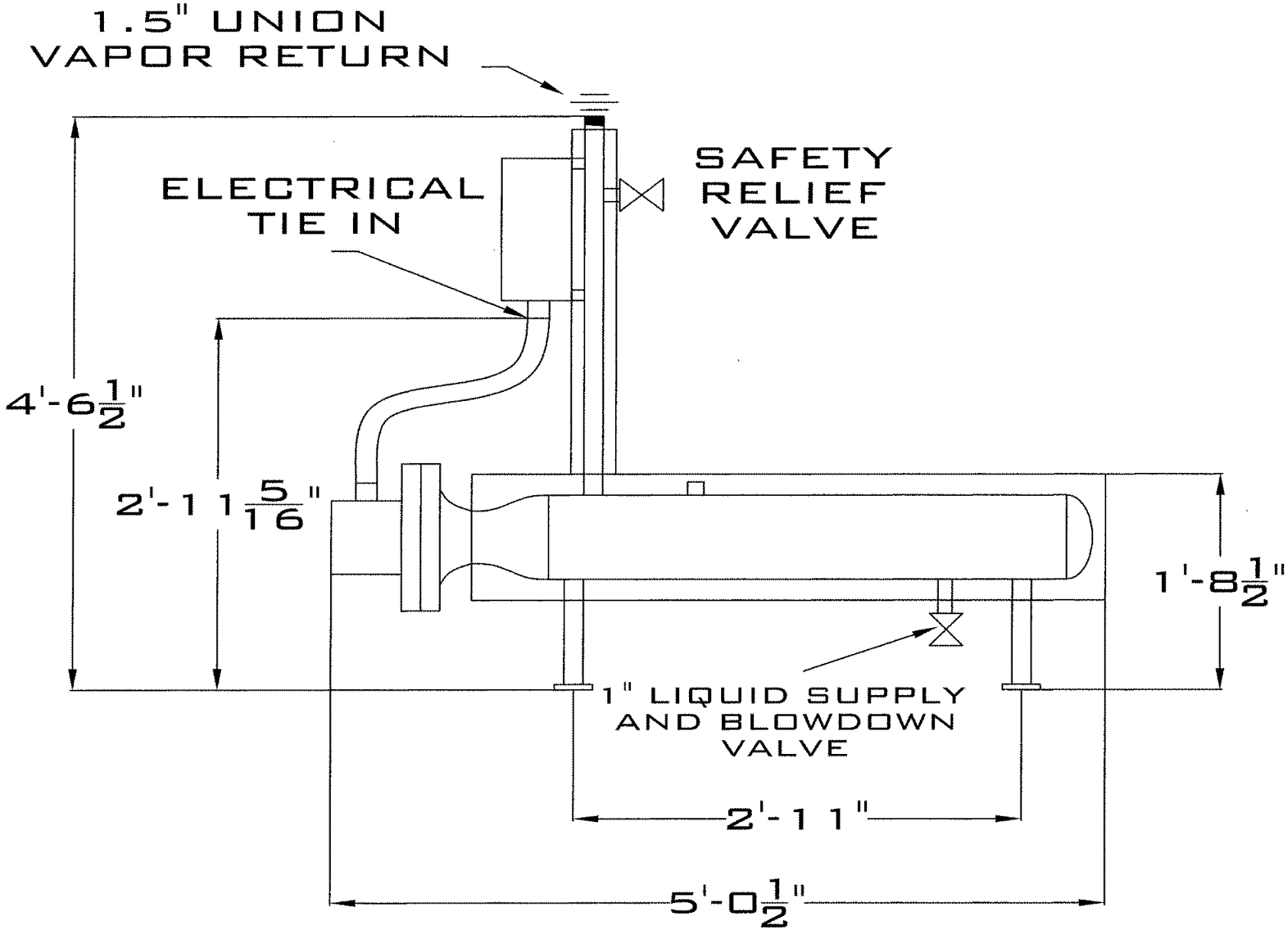
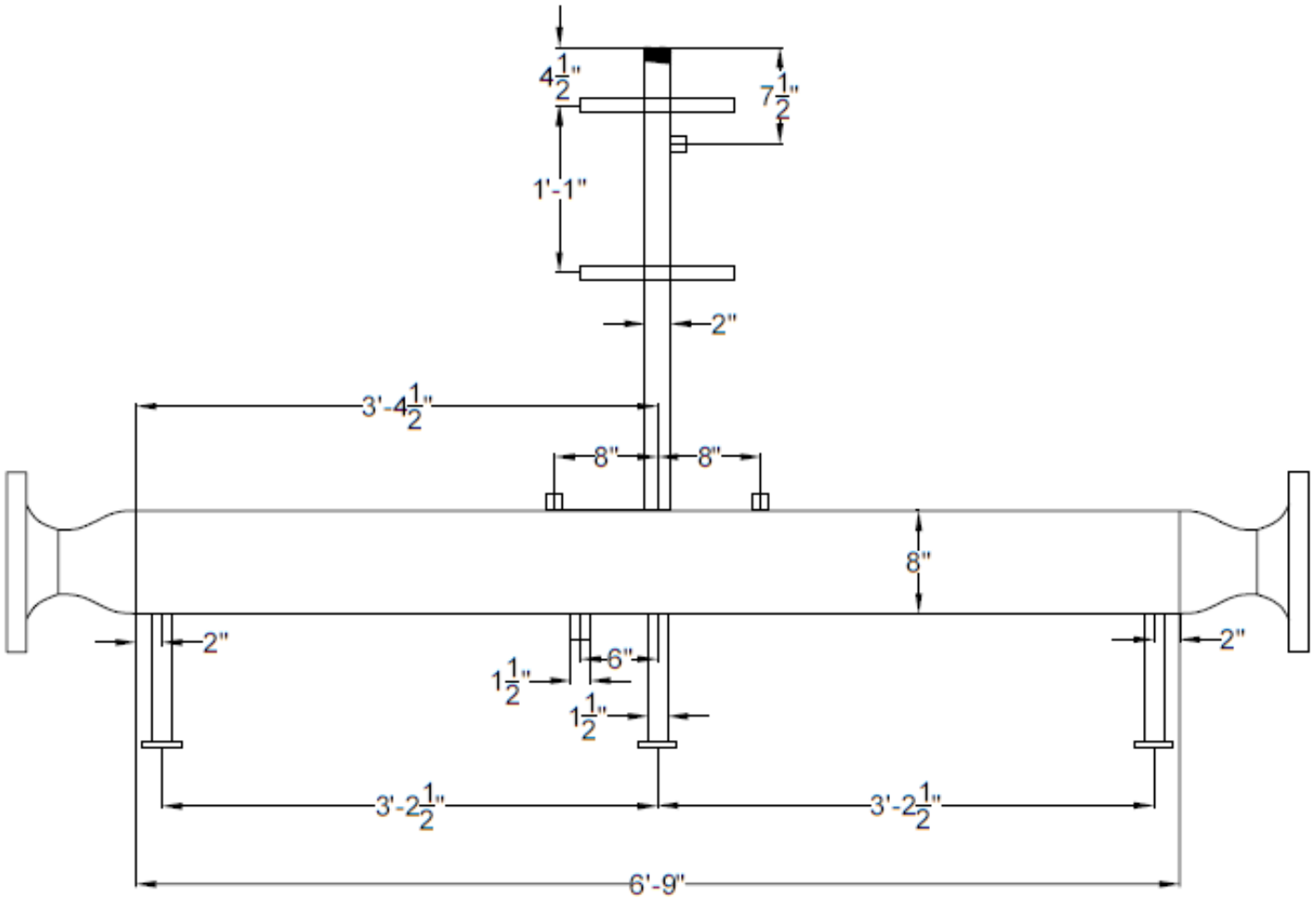


28 KW HEATER ROUGH SPECS

56 KW Heater



Weight: 580Lbs