

INSTRUCTION MANUAL

LUFTRAN™ Fluoropolymer Inline Water Heater LUF-Series



Please supply your product model and serial numbers when ordering spare parts or when requesting technical assistance.

MODEL NO.:

SERIAL NO.:

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RELATED DOCUMENTS:

The following documents are to be used in conjunction with this manual:

ANSI/NFPA70 – National Electric Code[→], latest edition. To be used to determine appropriate electrical service, wire sizing, routing and protection.

SEMI S2 – Semiconductor Equipment Safety Guidelines, latest edition. To be used in conjunction with safe operation, access and decommissioning procedures.

ANY – State or local building codes that would cover the electrical, mechanical, or physical installation of electrical heating equipment.

National Electric Code[→]
NFPA 1999 Copyright
National Fire Protection Association
Quincy, Mass. 02269

INTRODUCTION:

The **LUFTRAN™** fluoropolymer inline water heater is designed to heat DI water with very stringent cleanliness requirements. All wetted surfaces in this unit are fluoropolymer and PVDF material. There are no metallic wetted surfaces. The cleanliness of these units has been confirmed by independent third party testing. The cleanliness report is available upon request.

The **LUFTRAN™** fluoropolymer inline water heaters are available in wattages from 24kW to 312kW. These units consist of one or more heating columns combined with a control system and all necessary power distribution circuitry in a freestanding enclosure. The table on page 10 shows the various wattages with the corresponding number of heating columns. The photo on the cover shows a typical **LUFTRAN™** unit with two heating columns.

CE certification is available as an optional feature.

INTRODUCTION (Continued):

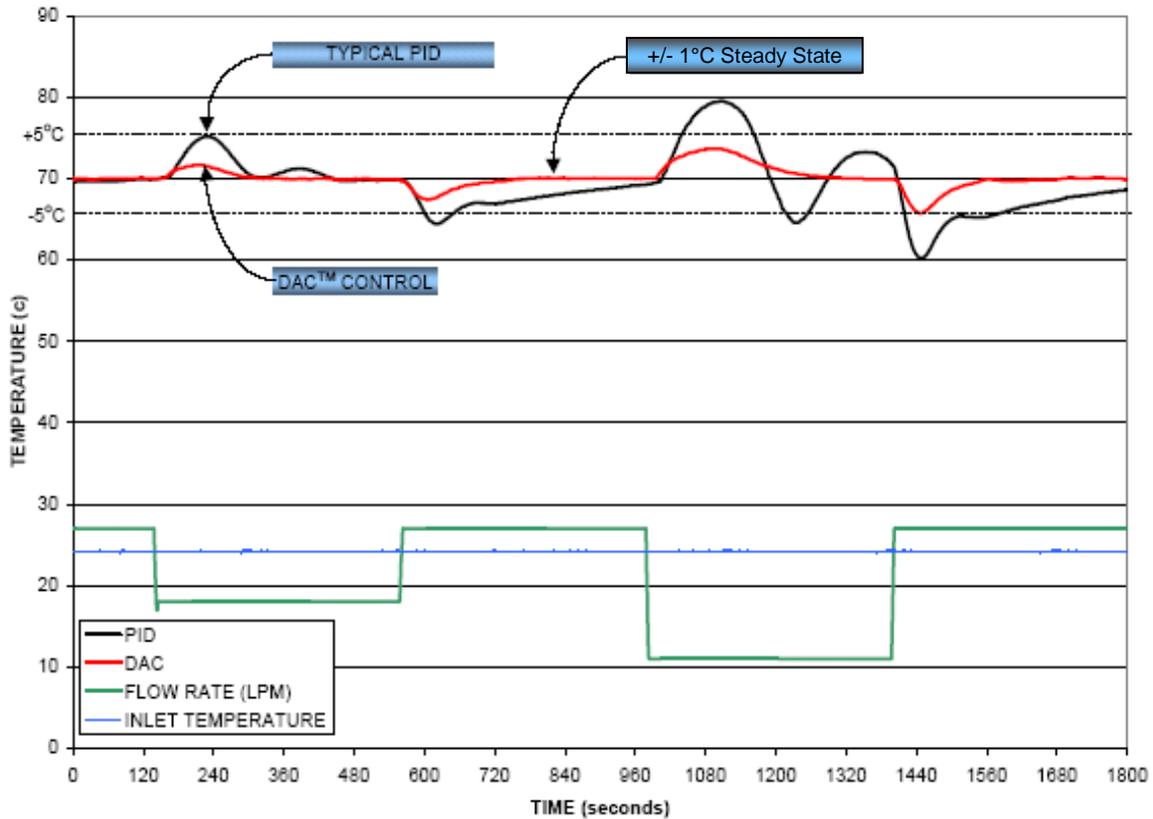
The following symbols and warning labels may appear on the unit and in the instruction manual. The table below provides an explanation of each one.

PICTORAL DESCRIPTION	DESCRIPTION
	<p>DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.</p>
	<p>WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.</p>
	<p>CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.</p>
	<p>DANGER: HAZARDOUS VOLTAGE ENCLOSED Voltage or current hazard sufficient to cause shock, burn or death. Disconnect and lock out power before servicing.</p>
	<p>WARNING: HAZARDOUS VOLTAGE Contact may cause electric shock or burn. This unit to be serviced by trained personnel only</p>
	<p>CAUTION: HOT SURFACE. DO NOT TOUCH Heater column may be hot. Allow unit to cool before servicing.</p>
	<p>EIP: Electronic Information Product Pollution Control Logo</p>
	<p>PROTECTIVE EARTH (GROUND)</p>

Table 1: Warning Labels

ENGINEERING INFORMATION:

This system features the patented DAC™ control system operating from a PLC with a touch-screen operator interface. The DAC control system provides superior temperature control and faster response to changes in conditions versus a typical PID temperature control system.



ENGINEERING INFORMATION (Continued):

The maximum possible temperature rise through the heater is dependent upon the wattage of the unit and the water flow rate through the unit. The following table illustrates the maximum temperature rise of various models based upon the water flow rate through the unit.

Flow Rate	Heater Power (Kilowatts)										
	24	52	72	105	130	144	156	210	260	288	312
L/min	Maximum Theoretical Temperature Rise (°C)										
5	68.6	-	-	-	-	-	-	-	-	-	-
10	34.3	74.3	-	-	-	-	-	-	-	-	-
15	22.9	49.5	68.6	-	-	-	-	-	-	-	-
20	17.1	37.1	51.4	75.0	-	-	-	-	-	-	-
25	13.7	29.7	41.1	60.0	74.3	82.3	-	-	-	-	-
30	11.4	24.8	34.3	50.0	61.9	68.6	74.3	-	-	-	-
35	9.8	21.2	29.4	42.9	53.1	58.8	63.7	85.7	-	-	-
40	8.6	18.6	25.7	37.5	46.4	51.4	55.7	75.0	-	-	-
45	7.6	16.5	22.9	33.3	41.3	45.7	49.5	66.7	82.5	-	-
50	6.9	14.9	20.6	30.0	37.1	41.1	44.6	60.0	74.3	82.3	-
55	6.2	13.5	18.7	27.3	33.8	37.4	40.5	54.5	67.5	74.8	81.0
60	5.7	12.4	17.1	25.0	31.0	34.3	37.1	50.0	61.9	68.6	74.3
65	5.3	11.4	15.8	23.1	28.6	31.6	34.3	46.2	57.1	63.3	68.6
70	4.9	10.6	14.7	21.4	26.5	29.4	31.8	42.9	53.1	58.8	63.7
75	4.6	9.9	13.7	20.0	24.8	27.4	29.7	40.0	49.5	54.9	59.4
80	4.3	9.3	12.9	18.8	23.2	25.7	27.9	37.5	46.4	51.4	55.7

Table 2: Flow Rate vs. Maximum Temperature Rise

The **LUF-RAN™** fluoropolymer inline water heaters include a comprehensive system of safety controls and devices to insure safe and long-lasting operation. The list of safety devices includes but is not limited to the following:

- EMO pushbutton
- Circuit breaker
- Ground fault (earth leakage) protection
- Pressure relief valve
- Liquid level sensor
- Leak detector (optional)
- High process temperature sensor
- High element temperature sensor
- Purge gas flow switch
- Moisture sensor in the purge gas exhaust line
- Sensor failure (open sensor) detection

**ENGINEERING INFORMATION:
SYSTEM SPECIFICATIONS:**

Product	LUF RAN™ fluoropolymer Inline Water Heater, LUF Series,			
Approvals (Pending)	Pending			
Available Wattages	24 kW – 312kW Refer to model number label for the wattage of any specific unit			
Available Voltages	380V-480V, 50/60Hz, three phase only (Lower voltages available with special construction, consult factory for details)			
Cabinet dimensions and unit weight:	Width	Depth	Height	Weight
24kW-72kW Units	508mm (20-in)	762mm (30-in)	2123mm (83.57-in)	270 kg (595 lbs)
105kW-156kW Units	712mm (28-in)	762mm (30-in)	2123mm (83.57-in)	340 kg (750 lbs)
195kW-312kW Units	1220mm (48-in)	997mm (39.25-in)	2142mm (84.34-in)	682 kg (1500 lbs)
Wetted surfaces: Heating elements Columns and plumbing O-rings	PTFE fluoropolymer PVDF Chemraz®			
Operating temperatures: Process inlet Process outlet Temperature accuracy	50°C maximum Up to 95°C, depending upon operating conditions +/- 1°C, depending upon operating conditions			
Ambient Air Temperature	30°C maximum			
Water flow rate range	15 l/min (4 gpm) to 150 LPM (40 gpm)			
Water pressure range	Minimum 69 kPa (0.69 bar, 10 psi) Maximum 690 kPa (6.9 bar, 100 psi)			
Purge gas flow rate required (minimum):				
24kW – 78kW	141 l/hr (5 scfh)			
105kW – 156kW	282 l/hr (10 scfh)			
210kW – 312kW	564 l/hr (20 scfh)			
Purge gas pressure range	Minimum 175 kPa (1.75 bar, 25 psi) Maximum 690 kPa (6.9 bar, 100 psi)			

Table 2: Heater Specifications

**ENGINEERING INFORMATION:
SYSTEM SPECIFICATIONS (Continued):**

RoHS (3) Compliance Table

- Lead (Pb): < 1000 ppm
- Mercury (Hg): < 100 ppm
- Cadmium (Cd): < 100 ppm
- Hexavalent Chromium (Cr VI): < 1000 ppm
- Polybrominated Biphenyls (PPB): < 1000 ppm
- Polybrominated Diphenyl Ethers (PBDE): < 1000 ppm
- Bis (2-Ethylhexyl) Phthalate (DEHP): < 1000 ppm
- Benzyl Butyl Phthalate (BBP): < 1000 ppm
- Dibutyl Phthalate (DBP): < 1000 ppm
- Diisobutyl Phthalate (DIBP): < 1000 ppm

	<i>Assembly</i>	<i>Control Circuit</i>	<i>Power Circuit</i>	<i>Enclosure</i>	<i>Fasteners</i>
Lead	O	O	O	O	O
Mercury	O	O	O	O	O
Cadmium	O	O	O	O	O
Hexavalent Chromium	O	O	O	O	O
Polybrominated Biphenyls	O	O	O	O	O
Polybrominated Diphenyl Ethers	O	O	O	O	O
Bis (2-Ethylhexyl) Phthalate	O	O	O	O	O
Benzyl Butyl Phthalate	O	O	O	O	O
Dibutyl Phthalate	O	O	O	O	O
Diisobutyl Phthalate	O	O	O	O	O

O indicates that this toxic or hazardous substance contained in the omogenous material for this part, according to the EIP-A, EIP-B,-EIP-C is below the limit requirement listed in SJ/T11363 2006.

X indicates that this toxic or hazardous substance contained in the omogenous material for this part, according to the EIP-A, EIP-B,-EIP-C is above the limit requirement listed in SJ/T11363 2006.

ENGINEERING INFORMATION:

MODEL NUMBER:

Process Technology model numbers are designed to offer some description of the heater construction, including features and options. The model number can be found on the model/serial number label located directly above the operator interface screen. Refer to figure 42 (page 49) to see the location of this label.



Figure 2: Model/Serial Number Label

Provided below is an example of a typical model number along with an explanation of each part. This key will help you understand your model number.

Model number example:

LUF-130-3LL6-SK

①
②
③
④
⑤

- ① **Heater kilowattage rating.** The table provided below identifies the standard available wattage ratings and the number of heater columns needed to provide that amount of Wattage.

Heater Model Number	Heater Wattage (W)	Number Of Heater Columns	Wattage Per Heater Column (W)	Heater Model Number	Heater Wattage (W)	Number Of Heater Columns	Wattage Per Heater Column (W)
024	24,000	1	24,000	144	144,000	2	72,000
036	36,000	1	36,000	156	156,000	2	78,000
052	52,500	1	52,500	195	195,000	3	65,000
065	65,000	1	65,000	210	210,000	4	52,500
072	72,000	1	72,000	260	260,000	4	65,000
078	78,000	1	78,000	288	288,000	4	72,000
105	105,000	2	52,500	312	312,000	4	78,000
130	130,000	2	65,000				

**ENGINEERING INFORMATION:
MODEL NUMBER (Continued):**

② **Heater Voltage.** The first character following the heater Wattage will describe the rated Voltage of the heater. Please note that all heaters are rated for Three-Phase power.

Heater Model Number	Rated Voltage (V)	Heater Model Number	Rated Voltage (V)
1	208	6	480
2	240	7	440
3	380	8	575
4	400	9	220
5	415	10	200

③ **Heater Inlet, Outlet Plumbing Connections.** The heater inlet and outlet plumbing connections are usually the same. However, it is possible to have different plumbing connections for the inlet and outlet. The characters to describe the plumbing connections have the same designation for both the inlet and outlet connections. Please refer to the table below to see the specific plumbing connections provided with the heater:

Heater Model Number	Plumbing Connection Type	Plumbing Connection Size: mm (in)
A	Flared Tube Fitting	13mm (1/2-inch)
B	Flared Tube Fitting	19mm (3/4-inch)
C	Flared Tube Fitting	25mm (1-inch)
D	Union manifold Connector	32mm (1 ¼-inch)
E	Flange	19mm (3/4-inch)
F	NPT Pipe Threads, Female	13mm (1/2-inch)
G	NPT Pipe Threads, Female	19mm (3/4-inch)
H	NPT Pipe Threads, Female	25mm (1-inch)
I	NPT Pipe Threads, Male	13mm (1/2-inch)
J	NPT Pipe Threads, Male	19mm (3/4-inch)
K	NPT Pipe Threads, Male	25mm (1-inch)
L	Butt Fusion Union	25mm (1-inch)
M	BCF Union	32mm (1 ¼-inch)
N	Socket Fusion Union	32mm (1 ¼-inch)
P	Pillar Tube Fitting	13mm (1/2-inch)
Q	Pillar Tube Fitting	19mm (3/4-inch)
R	Pillar Tube Fitting	25mm (1-inch)
U	Socket Fusion Union (Standard)	25mm (1-inch)
X	Super 300 Pillar	25mm (1-inch)
Y	Socket Fusion Union	40mm (1 1/2-inch)

ENGINEERING INFORMATION: MODEL NUMBER (Continued):

- ④ **Flow Meter Device.** The ultrasonic flow meter device is part of the DAC temperature control system. The flow meter is selected based upon total wattage of the heater and operating flow rate range. This device does not require routine maintenance or re-calibration.

Heater Model Number	Device Brand	Water Flow Range	Process Technology Part Number
0-4			
5	Thornton	2-20 LPM	8136
6	Thornton	10-70 LPM	8137
7	Honda	0.5-20 LPM	9238
8	Honda	1-50 LPM	09-6820
9	Thornton	15-150 LPM	9964

- ④ **Options:** There are several options available with the **LUFTRAN™** fluoropolymer inline water heater. Some of these options are described in greater detail in the OPERATION section of this manual. More than one option may be included in an individual heater. Please refer to the table below for a brief listing of the available options.

Heater Model Number	Description
C1	Ethernet communications
C2	Devicenet communications
C3	RS232 communications
C4	RS485 communications
C5	Modbus communications
C#	Custom communications option. Contact the Process Technology technical service department for assistance.
CE	CE certification
LK	Cabinet leak detector
R#	Customer-defined remote interface option. Contact the Process Technology technical service department for assistance.
SK	Stack light
##	Customer specific design/construction (Which may or may not include some of the above options)

ENGINEERING INFORMATION:

FACILITY REQUIREMENTS:

Before installing the LUF-RAN™ fluoropolymer inline water heater confirm the facility requirements listed below.

Space Requirements:

The LUF-RAN™ fluoropolymer inline water heater is constructed in a freestanding enclosure. This cabinet includes the common framework for the heating column(s) as well as the electrical components. No additional support is required.

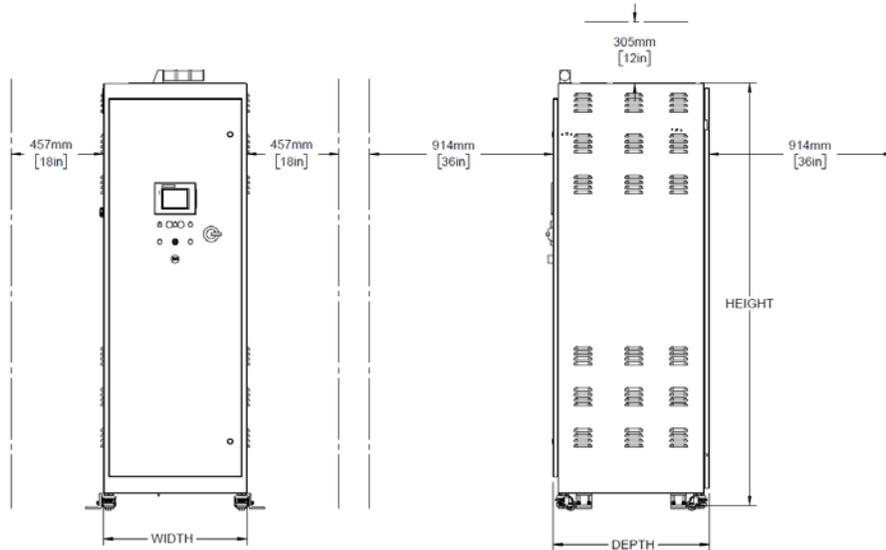


Figure 3: Clearance Dimensions

The dimensions of the specific model are based upon the unit wattage. The cabinet assembly requires ventilation. Locate equipment so that ventilation fans on the top and bottom of the enclosure and louvers on the sides are not obstructed. The ventilation fan exhausts through these openings, preventing overheating of the unit. Be sure to provide adequate clearance for normal operation and maintenance of this heater.

Typical Cabinet Dimensions				
Heater Wattage (kW)	Number of Heating Columns	Width	Depth	Height
24-78	1	508mm (20-in)	762mm (30-in)	2123mm (83.57-in)
105-156	2	712mm (28-in)	762mm (30-in)	2123mm (83.57-in)
195-312	3-4	1220mm (48-in)	997mm (39.25-in)	2142mm (84.347-in)

ENGINEERING INFORMATION: FACILITY REQUIREMENTS (Continued):

Water Plumbing Requirements:

This unit is typically supplied with a single inlet and outlet water connection located just inside the rear of the cabinet. The connections are arranged vertically and do not offset from the horizontal center of the unit. The inlet plumbing should also include a means to drain the unit for service. There are also connections for the PRV valve and the leak pan drain. Reference the unit's model number and the model number key to identify the specific plumbing connections provided with your unit.

Electrical Requirements:

Reference the unit's model number and model number key or the Electrical Specifications Table inside the front door to identify the electrical power requirements of this unit. In addition, the model number tag on the front of the unit includes the unit's Wattage, Voltage, Amperage draw and Phase. Verify that the incoming electrical service is rated and fused for the required amperage draw.

 ATTENTION	 CAUTION
Ne pas dépasser la tension nominale. Des dommages irréparables à l'appareil de chauffage entraînera.	Do not exceed the rated voltage. Irreparable damage to the heater will result.

NOTE: Ensure electrical power fusing and disconnects meet local jurisdictional requirements. Fuse ratings noted in this document are for reference only.

Purge Gas Requirements:

A source of purge gas, nitrogen (N₂) or clean dry air (CDA) is required for the heater element purge system. All **LUF**RAN™ fluoropolymer inline water heaters use 6.4-mm (0.25-inch) compression fittings as the purge gas inlet connection.

The purge gas supply must be regulated between 1.75 – 6.9 bar (25 – 100 psig) gas pressure. Each heating column inside the unit will use approximately 141 l/hr (5 SCFH) of purge gas.

If the purge gas is supplied lower than 141 lpm (5 SCFH), the control's safety circuitry will disable the heater and indicate a safety alarm.

If the gas pressure exceeds 6.9 bar (100 psi) equipment damage will result.

 ATTENTION	 CAUTION
Ne pas dépasser la pression de gaz pur de 6.9 bar (100 PSI). Des dommages irréparables à l'élément de chauffage peut entraîner.	Do not exceed pure gas pressure of 6.9 bar (100 PSI). Irreparable damage to the heater may result.

ENGINEERING INFORMATION: CUSTOMER INTERFACE:

Below is a table containing the remote communications options, their associated connection type and their connection label on the interface plate.

Customer Connections / Protocols							
Process Technology Ordering Code	Protocol	Physical Connection Type	Communications Label Unit 1	Communications Label Unit 2	Customer Interface Label Unit 1	All Units	Customer Interface Label Unit 2
C1	Modbus TCP	RJ45	PL3 MODBUS TCP	PL5 MODBUS TCP	PL1 CUSTOMER INTERFACE	USB DATALOG	PL4 CUSTOMER INTERFACE
C2	Devicenet	7/8" Mini	PL3 DEVICENET	PL5 DEVICENET	PL1 CUSTOMER INTERFACE	USB DATALOG	PL4 CUSTOMER INTERFACE
C4	Modbus RTU (RS-232/422/485)	RJ45	PL3 MODBUS RTU	PL5 MODBUS RTU	PL1 CUSTOMER INTERFACE	USB DATALOG	PL4 CUSTOMER INTERFACE
C15	Modbus RTU (RS-232/422/485)	RJ45	PL3 MODBUS RTU	PL5 MODBUS RTU	PL1 CUSTOMER INTERFACE	USB DATALOG	PL4 CUSTOMER INTERFACE
C20	EtherNet/IP	RJ45	PL3 ETHERNET/IP	PL5 ETHERNET/IP	PL1 CUSTOMER INTERFACE	USB DATALOG	PL4 CUSTOMER INTERFACE
C21	Modbus TCP	RJ45	PL3 Modbus TCP	PL5 Modbus TCP	PL1 CUSTOMER INTERFACE	USB DATALOG	PL4 CUSTOMER INTERFACE

ENGINEERING INFORMATION: OPERATOR CONTROLS:

Operator Interface Buttons:

There are two push buttons located on the front panel of the unit.

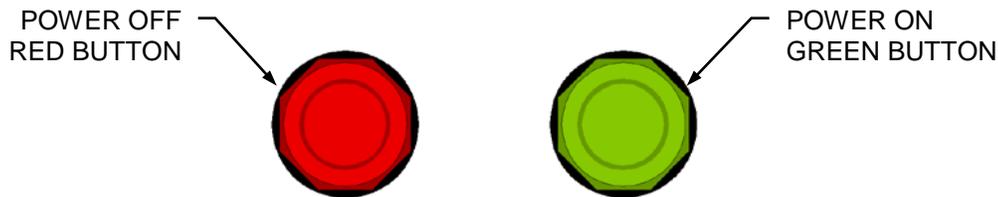


Figure 4: Operator Interface Buttons

Power On Button: When depressed, this button enables the main power safety contactor (1CON) and readies the system for operation. It illuminates to indicate the system is in an operational mode.

Power Off Button: When depressed this button disables heater operation by disengaging the main power safety contactor (1CON). It illuminates to indicate the main power is off.

HUMAN MACHINE INTERFACE (HMI):

The Human Machine Interface is an intelligent flat panel display. It is designed to interchange and display graphical data from a PLC by merely viewing or touching the screen. To ensure the effectiveness of the panel, it is important to take the following precautions:

- Do not press sharp objects against the screen.
- Do not strike the panel with hard objects.
- Do not press the screen with excessive force.

Many fields in the various displays can be adjusted by pressing the field value. This will bring-up a keypad which will allow the operator to change the value.



Figure 5: HMI Keypad

**ENGINEERING INFORMATION:
HUMAN MACHINE INTERFACE (HMI) (Continued):
Startup Menu:**



Figure 6 Startup Menu

Startup Menu Information Panel	Description
MANUFACTURE SETTINGS	This button will display a keypad to enter a password. After entering the password the display will show a manufacturer settings for system setup. There is no need for a user or operator to access these settings.
MAIN	This button will display the MAIN MENU screen.

ENGINEERING INFORMATION: HUMAN MACHINE INTERFACE (HMI) (Continued):

Main Menu:

This is the display menu for normal operation. It provided overall information and allows the operator to navigate to a number of other menus. Pressing on any of the animated heating columns will pull-up a smaller image which will provide some temperature information for that specific heating column. The image of the columns below are displayed as if looking at the heater columns from the heater side of the cabinet.

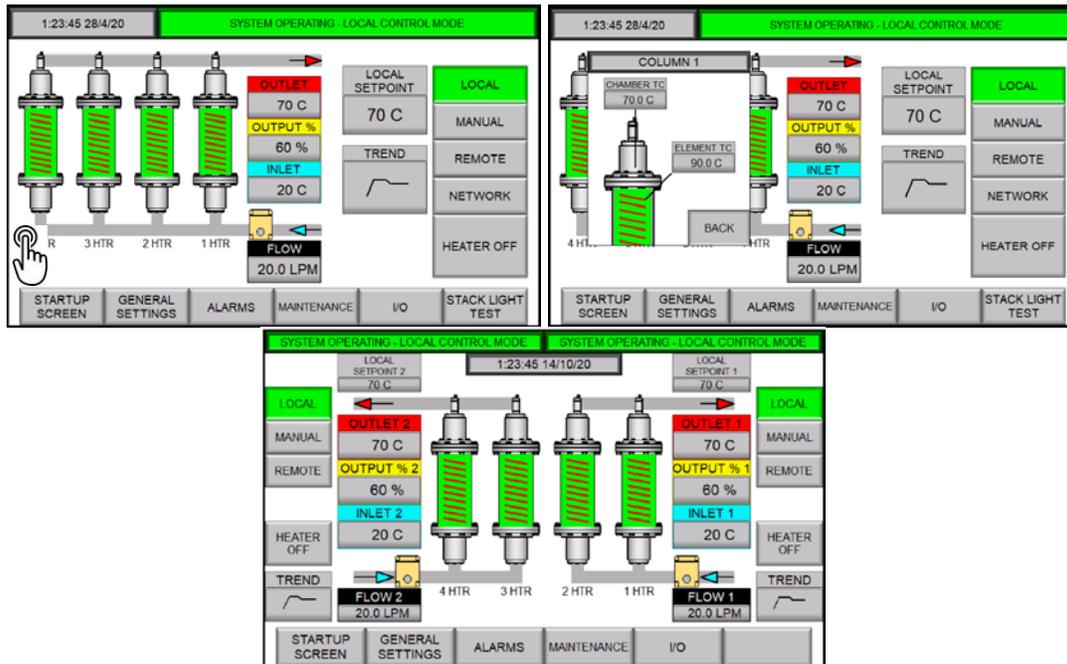


Figure 7: Main Menu (Local Control Mode Selected); Normal operation view, view with one of heating columns selected. Third image shows unit with dual inlets and outlets

Heating Column Animation:

The following images describe the condition of the heating columns shown on the MAIN MENU display.

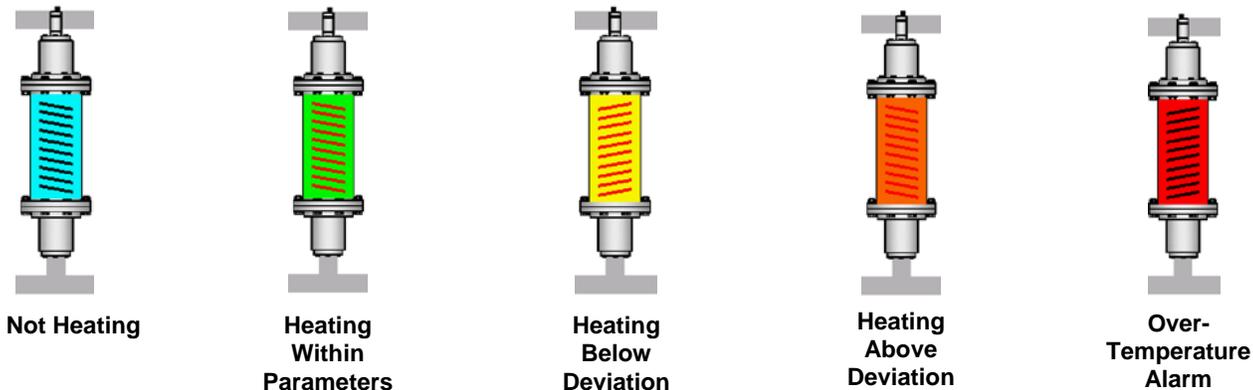


Figure 8: Main Menu, Heating Column Graphics

**ENGINEERING INFORMATION:
HUMAN MACHINE INTERFACE (HMI) (Continued):
Main Menu (Continued):**

Main Menu Information Panel	Description
OUTLET	Displays the temperature measured from the process sensor located at the outlet of the heater.
OUTPUT %	Displays the output load of the heating elements needed to provide the desired outlet temperature.
INLET	Displays the temperature measured from the sensor located at the inlet of the heater.
FLOW	Displays the water flow rate measured from the flow meter located near the inlet connection of the heater.
LOCAL SETPOINT REMOTE SETPOINT MANUAL SETPOINT	Displays the current temperature setpoint. The field will indicate LOCAL, REMOTE, or MANUAL based upon the current control mode. The LOCAL and REMOTE setpoints are outlet temperatures. The MANUAL setting is a fixed % output, independent of the outlet temperature. Press this button to bring up a keypad to change the value when in local or manual control mode.
TREND	This button will display the TREND GRAPH screen.
LOCAL, MANUAL, REMOTE, NETWORK	These buttons will switch control of the various settings between local mode, remote mode, or manual adjustments of the DAC control values. The selected control mode will be highlighted. LOCAL: The heater is controlled from the touch-screen on the front of the unit. MANUAL: The heater output is set manually. The DAC control system is not active. REMOTE: The settings of this unit are controlled by a remote device. NETWORK: The settings of this unit are controlled by a remote device through a communications network if equipped with a communication option.
HEATER ON HEATER OFF	This button will start or stop heater operation. Press the button to switch between on and off.
STARTUP SCREEN	This button will display the STARTUP MENU screen.
GENERAL SETTINGS	This button will display the GENERAL SETTINGS MENU screen.
ALARMS	This button will display the ALARMS MENU screen.
MAINTENANCE	This button will display the MAINTENANCE MENU screen.
IO	This button will display the IO MENU screen.
STACK LIGHT TEST	This button will display the STACK LIGHT TEST MENU screen.

 ATTENTION	 CAUTION
Une fois en mode de contrôle manuel, le contrôle automatisé est plus active et peut entraîner un comportement erratique ou de surchauffe conditions. Pour cette raison, la commande manuelle ne doit être utilisé par du personnel qualifié comme un outil de maintenance.	Once in manual control mode the automated control is no longer active and may result in erratic behavior or over-temperature conditions. For this reason, manual control should only be used by qualified personnel as a maintenance tool.

ENGINEERING INFORMATION:

HUMAN MACHINE INTERFACE (HMI) (Continued):

General Settings Menu:

The GENERAL SETTINGS MENU allows the operator to adjust the date and time. It also displays details about the supply voltage and heater current draw when the power meter is included with the unit.

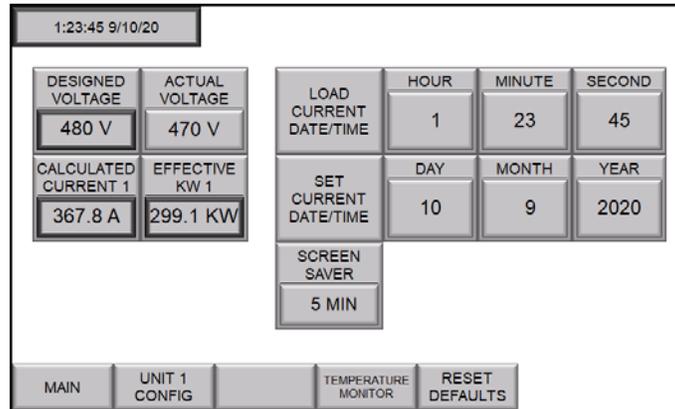


Figure 9: General Settings Menu

General Settings Information Panel	Description
DESIGNED VOLTAGE	Displays the voltage rating of the unit.
AVERAGE VOLTAGE	Displays the average power supply voltage measured by the power meter if equipped with the power monitor option.
ACTUAL VOLTAGE	This button will allow the user to enter the actual voltage from the power supply. This button is present when the power monitor option is not included.
CALCULATED CURRENT	Displays the current draw of the unit based upon the supply voltage.
EFFECTIVE KW	Displays the calculated kW rating of the unit, based upon the average voltage measurement and the calculated current draw of the unit.
LOAD CURRENT DATE/TIME	This button will enter the current date and time into the fields to the right. This can be used to speed-up the process of updating the current date and time. The operator can then press each field to make a change.
SET CURRENT DATE/TIME	This button will save the new values as the current date and time.
SCREEN SAVER	This sets the amount of time before the screen saver is activated. Set to 0 to disable.
MAIN	This button will display the MAIN MENU screen.
UNIT 1 CONFIG	This button will display the UNIT 1 CONFIGURATION MENU screen.
UNIT 2 CONFIG	This button will display the UNIT 1 CONFIGURATION MENU screen if equipped as a dual out unit.
TEMPERATURE MONITOR	This button will display the TEMPERATURE MONITOR MENU screen.
RESET DEFAULTS	This button will display the RESET DEFAULTS MENU screen.

ENGINEERING INFORMATION: HUMAN MACHINE INTERFACE (HMI) (Continued):

Alarms Menu:

The ALARMS MENU displays the status of the various alarm settings for the LUF heater. All of the alarm fields in this menu are read-only. Any alarm that has been activated will change color to red. Pressing the alarm button will bring-up a small inset view with a description of the alarm. Refer to the Alarms section of this manual for a detailed description of each alarm setting.

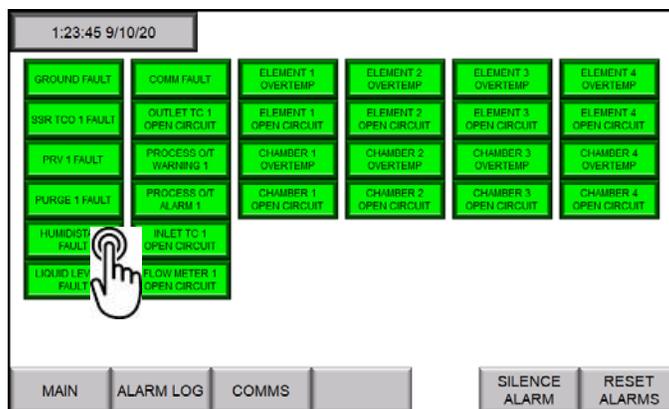


Figure 10: Alarms Menu

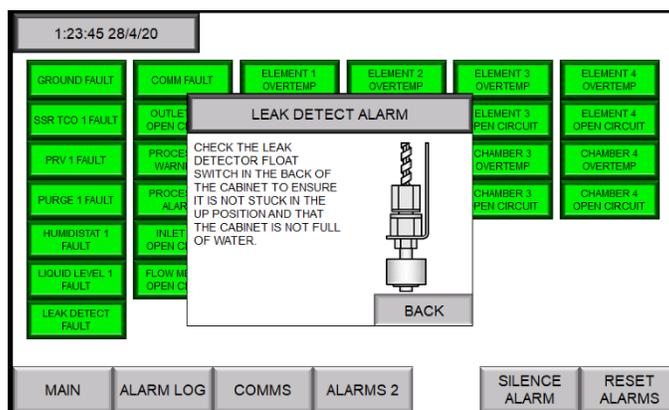


Figure 11: Alarms Menu, with Alarm Description Shown

Alarm Menu Information Panel	Description
MAIN	This button will display the MAIN MENU screen.
ALM. LOG	This button will display the ALARMS SUMMARY screen.
COMMS	This button will display COMMS alarm screen.
ALARMS 1	This button will display screen 1 of the ALARMS MENU.
ALARMS 2	This button will display screen 2 of the ALARMS MENU if equipped as a dual out unit.
SILENCE ALARM	This button will silence the audible buzzer but will not reset the alarms.
RESET ALARMS	This button will reset all alarm settings.

**ENGINEERING INFORMATION:
HUMAN MACHINE INTERFACE (HMI) (Continued):**

Alarm Log Menu:

The ALARM LOG MENU lists each alarm event detected along with the date and time at which it occurred.

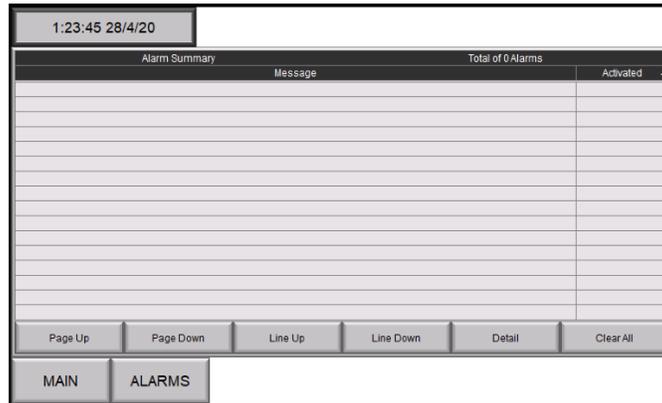


Figure 12: Alarm Log Menu

Alarm Menu Information Panel	Description
PAGE UP, PAGE DOWN, LINE UP, LINE DOWN	These buttons allow the operator to scroll up and down through the list of alarm summary lines.
DETAIL	This button will display additional details for the line selected.
CLEAR ALL	This button will erase all lines in the alarm summary.
MAIN	This button will display the MAIN MENU screen.
ALARMS	This button will display the ALARMS MENU

**ENGINEERING INFORMATION:
HUMAN MACHINE INTERFACE (HMI) (Continued):
Maintenance Menu:**

The MAINTENANCE MENU displays the list of maintenance tasks that should be performed per the prescribed timeframe. When it is time for one or more of the maintenance tasks to be performed, the MAINTENANCE button on the main menu will turn yellow. When a maintenance technician completes the task, they can press the COMPLETE button on this menu to reset the timer for the task. Refer to the MAINTENANCE portion of this manual for more information regarding these procedures.

1:23:45 28/4/20		DAYS UNTIL MAINTENANCE
INSPECT LIQUID LEVEL SENSOR(S)	COMPLETE	182
INSPECT PROCESS SENSOR(S)	COMPLETE	182
INSPECT LEAK DETECTOR	COMPLETE	182
INSPECT PURGE FLOW SWITCH	COMPLETE	182
INSPECT HUMIDISTAT	COMPLETE	182
INSPECT PRESSURE RELIEF VALVE	COMPLETE	182
INSPECT CIRCUIT BREAKER	COMPLETE	182
INSPECT SAFETY CONTACTOR(S)	COMPLETE	182
REPLACE CABINET COOLING FANS	COMPLETE	730

MAIN

Figure 13: Maintenance Menu

Maintenance Menu Information Panel	Description
COMPLETE	This button will reset the maintenance clock for the corresponding task.
MAIN	This button will display the MAIN MENU screen.

ENGINEERING INFORMATION: HUMAN MACHINE INTERFACE (HMI) (Continued): IO Menu:

The IO MENU provides a display of the input and output connections for the PLC controller. This display will be unique for the specific layout of a specific model.

Pressing on the image of the PLC base shows the IO points on the PLC base and their current state. Pressing each card will display "PLC IO Card" which shows the IO points on that card and their current state

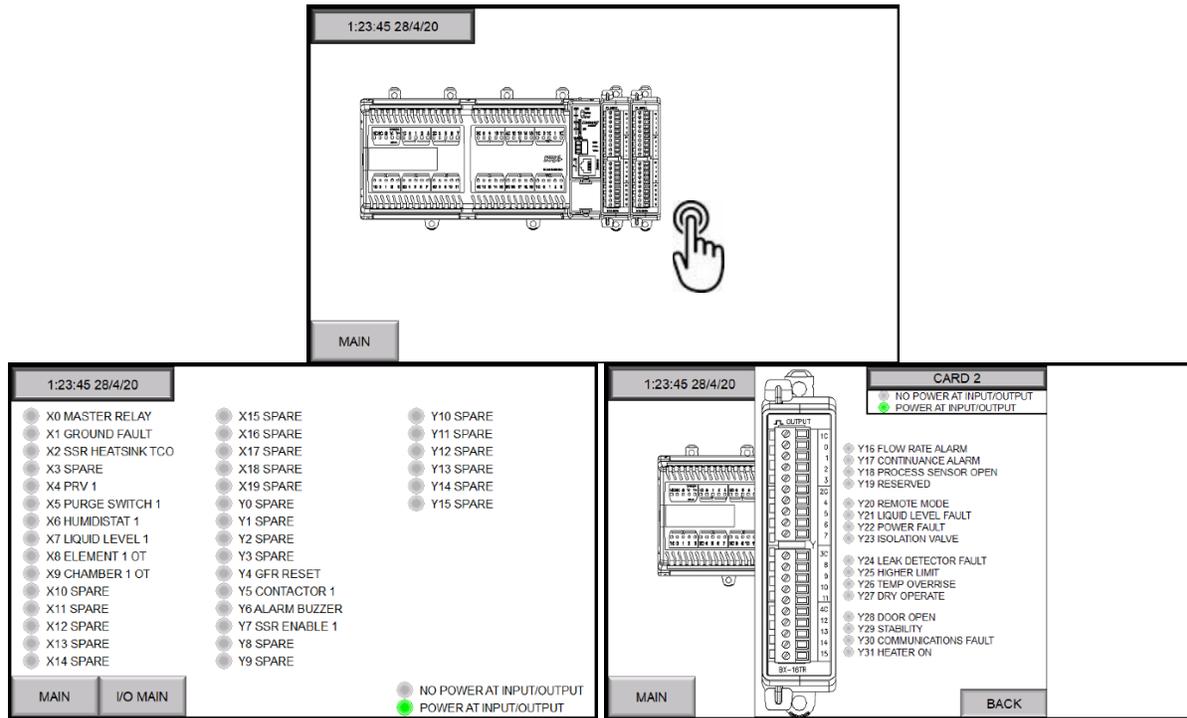


Figure 14: IO Menu, showing PLC base and card IO status

Maintenance Menu Information Panel	Description
MAIN	This button will display the MAIN MENU screen.

ENGINEERING INFORMATION:
HUMAN MACHINE INTERFACE (HMI) (Continued):
Stack Light Test Menu:

The STACK LIGHT TEST MENU allows the operator to test the condition of the indicator lamps. Two stack lights will be accessible if equipped as a dual out unit.

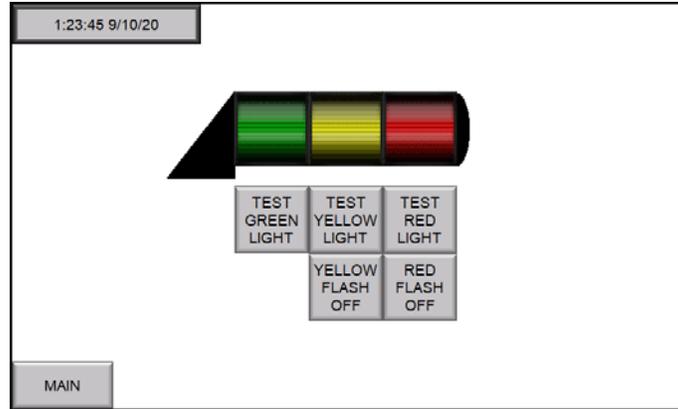


Figure 15: Stack Light Test Menu Display

Stack Light Test Menu Information Panel	Description
TEST GREEN LIGHT	This button will illuminate the green stack light.
TEST YELLOW LIGHT	This button will illuminate the yellow stack light.
TEST RED LIGHT	This button will illuminate the red stack light.
YELLOW FLASH ON/OFF	This button will switch the action of the yellow light from solid to flashing.
RED FLASH ON/OFF	This button will switch the action of the red light from solid to flashing.
MAIN	This button will display the MAIN MENU screen.

**ENGINEERING INFORMATION:
HUMAN MACHINE INTERFACE (HMI) (Continued):
Trend Graph Menu:**

The TREND GRAPH displays the graph of current datalog values. This display includes the fields to adjust the sampling rate and the switch to stop or start datalogging.

The datalog values will be automatically saved to a USB drive that is installed in the HMI unit. However if the USB drive has been removed and the operator attempts to activate the datalog then the message in yellow will appear. See below.



Figure 16: Trend Graph Display, with message about USB drive not-installed

Trend Graph Information Panel	Description
MAIN	This button will display the MAIN MENU screen.
DATALOG ON/OFF #	This button turns on or off the datalogging function for the unit number identified. Whether the datalog function is turned ON or OFF, there will always be a trend graph to view on the HMI.
SAMPLE RATE #	Displays the sampling rate for the trend graph for the unit number identified. Press this button to bring up a keypad to change the sampling rate. The range for data sampling is 1-60 seconds.

ENGINEERING INFORMATION:

HUMAN MACHINE INTERFACE (HMI) (Continued):

Unit # Configuration Menu:

The configuration menu contains a number of internal calibration settings. A password must be entered in order to access this menu. The factory default engineering password is 1234.

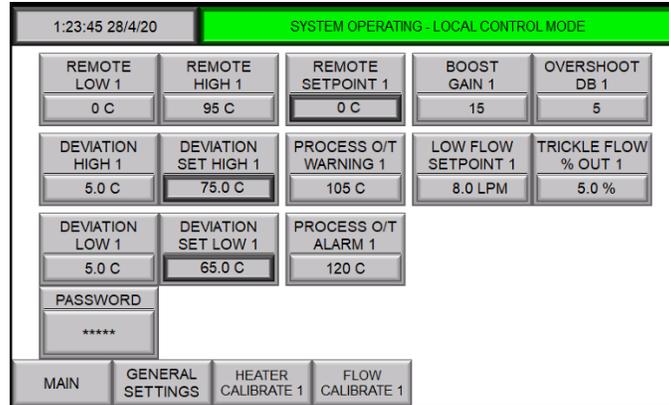


Figure 17: Configuration Menu

Configuration Menu Information Panel	Description
REMOTE LOW #	Lower scaling input value for the remote setpoint setting for the unit # specified. This setting corresponds to a 4mA input signal from the remote setpoint input.
REMOTE HIGH #	Upper scaling input value for the remote setpoint setting for the unit # specified. This setting corresponds to a 20mA input signal from the remote setpoint input.
REMOTE SETPOINT #	Displays the remote setpoint value for the unit # specified from the remote device.
BOOST GAIN #	This button allows adjustment of the BOOST GAIN setting for the unit # specified. This setting improves heater performance during initial temp rise from a low temperature. This setting has a range of 0-100 (no units). It is factory set during testing. By increasing the value of this setting (by increments of 1), the heater will increase the rate of temperature rise from a low temperature. Note however that increasing the value of this setting will result in a temperature overshoot as the heater outlet temperature reaches the process setpoint. The default value will provide the quickest rate of temperature rise with no temperature overshoot above the process setpoint.
OVERSHOOT DB #	Displays the DB set point. When the process outlet temperature exceeds this value above the set point, the unit output will become 0%. When the outlet temperature falls below this setting, DAC control of the heating elements will resume. Press the overshoot DB value to bring up a keypad to change this setting.
DEVIATION HIGH #	This button allows adjustment of the deviation high set point. When the process outlet temperature rises above this setting, the process deviation alarm is activated. Press the deviation high # value to bring up a keypad to change this setting.
DEVIATION SET HIGH #	Displays the sum of the set point + the deviation high value.
PROCESS O/T WARNING #	Displays the process O/T warning # set point. When the process outlet temperature exceeds this value, the unit output will become 0%. When the outlet temperature falls below this setting, DAC control of the heating elements will resume. Press the process O/T warning # value to bring up a keypad to change this setting.

**ENGINEERING INFORMATION:
HUMAN MACHINE INTERFACE (HMI):
Configuration Menu (Continued):**

Configuration Menu Information Panel	Description												
LOW FLOW SETPOINT #	Displays the LOW FLOW SETPOINT. This setting will disable heater operation when the flow rate through the heater falls below this setting (liters per minute). The controller will provide a warning message when the flow rate has dropped below this setting, but it will not enter an alarm state. If the heated trickle-flow option is included with the unit, this is the flow rate at which the DAC temperature controller will be replaced with a fixed % output. When the flow rate through the heater has risen above the value of this setting heater operation will continue. This setting is factory set to the valued listed below:												
	<table border="1"> <thead> <tr> <th>Heater Wattage</th> <th>Number of Heating Columns</th> <th>LOW FLOW SETPOINT</th> </tr> </thead> <tbody> <tr> <td>24Kw – 72Kw</td> <td>1</td> <td>1.0</td> </tr> <tr> <td>105Kw – 156Kw</td> <td>2</td> <td>2.0</td> </tr> <tr> <td>195Kw – 312Kw</td> <td>3-4</td> <td>4.0</td> </tr> </tbody> </table>	Heater Wattage	Number of Heating Columns	LOW FLOW SETPOINT	24Kw – 72Kw	1	1.0	105Kw – 156Kw	2	2.0	195Kw – 312Kw	3-4	4.0
	Heater Wattage	Number of Heating Columns	LOW FLOW SETPOINT										
	24Kw – 72Kw	1	1.0										
	105Kw – 156Kw	2	2.0										
195Kw – 312Kw	3-4	4.0											
TRICKLE FLOW % OUT #	This is the % output of the heater when the heated trickle-flow option is included.												
DEVIATION LOW #	This button allows adjustment of the deviation low set point. When the process outlet temperature falls below this setting, the process deviation alarm is activated. Press the deviation low # value to bring up a keypad to change this setting.												
DEVIATION SET LOW #	Displays the difference of the set point - the deviation low value.												
PROCESS O/T ALARM #	Displays the process O/T alarm # set point. When the process outlet temperature exceeds this value, the unit will trigger a high-temperature alarm. Press the process O/T alarm # value to bring up a keypad to change this setting.												
ENGINEERING PASSWORD	Displays the current engineering password. Press the password value to bring up a keypad to change the password. <i>The factory default password is 1234.</i>												
MAIN	This button will display the MAIN MENU screen.												
GENERAL SETTINGS	This button will display the GENERAL SETTINGS MENU screen.												
HEATER CALIBRATE #	This button will display the HEATER CALIBRATE # MENU screen.												
FLOW CALIBRATE #	This button will display the FLOW CALIBRATE # MENU screen.												

ENGINEERING INFORMATION:

HUMAN MACHINE INTERFACE (HMI) (Continued):

Temperature Monitor Menu:

The temperature monitor menu provides a number of internal temperature measurements.

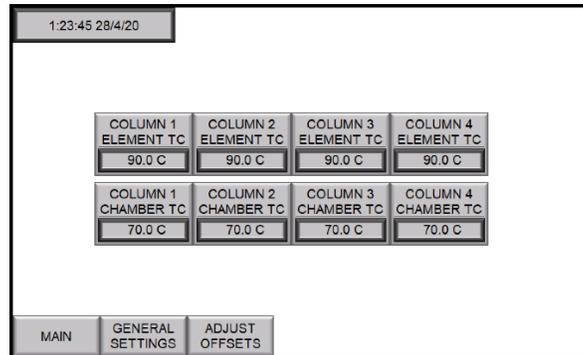


Figure 18: Temperature Monitor Menu

Temperature Monitor Menu Information Panel	Description
COLUMN # ELEMENT TC	Displays the current temperature measured by the sensor which monitors the heating element for the heating column # specified.
COLUMN # CHAMBER TC	Displays the current temperature measured by the sensor which monitors the water inside the heating column # specified.
MAIN	This button will display the MAIN MENU screen.
GENERAL SETTINGS	This button will display the GENERAL SETTINGS MENU screen.
ADJUST OFFSETS	This button will display the ADJUST OFFSETS MENU screen.

Reset Defaults Menu:

The RESET DEFAULTS menu allows the user to reset all settings to the original factory defaults. When the operator presses the YES button, all settings will be reset. This process cannot be un-done.

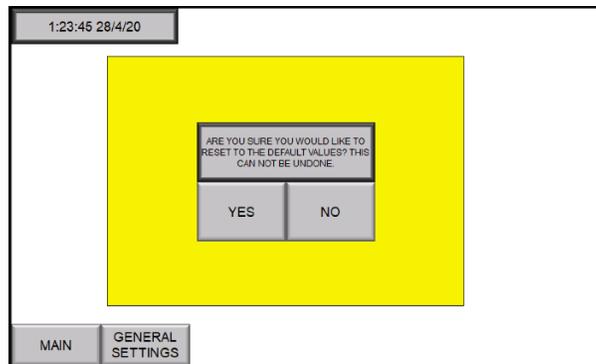


Figure 19: Reset Defaults Menu

Reset Defaults Menu Information Panel	Description
MAIN	This button will display the MAIN MENU screen.
GENERAL SETTINGS	This button will display the GENERAL SETTINGS MENU screen.

ENGINEERING INFORMATION: HUMAN MACHINE INTERFACE (HMI) (Continued):

Comms Menu:

The COMMS MENU is a diagnostic menu which provides a display of the devices that are communicating with the PLC controller. This display will be unique for the specific layout of a specific model.

An internal communications fault between these devices will be highlighted in red, as shown in the figure below.

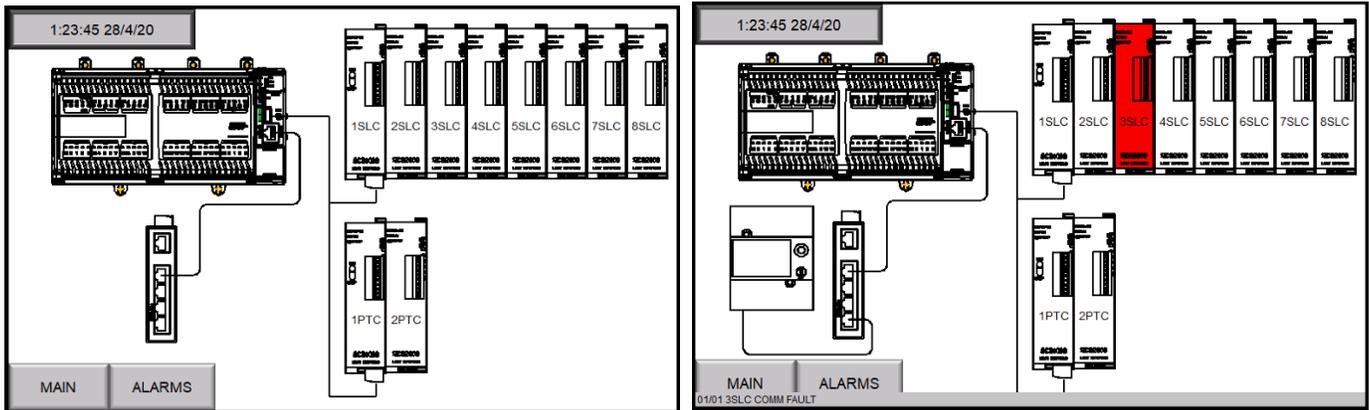


Figure 20: COMMS Menu, COMMS menu with fault shown

Comms Menu Information Panel	Description
MAIN	This button will display the MAIN MENU screen.
ALARMS	This button will display the ALARMS MENU screen.

ENGINEERING INFORMATION:

HUMAN MACHINE INTERFACE (HMI) (Continued):

Heater Calibrate # Menu:

The HEATER CALIBRATE # MENU allows the operator to calibrate the heater unit # specified. The calibration procedure will be different depending upon whether or not the unit includes a power monitor. Refer to the Heater Calibration section of this manual for the procedures.

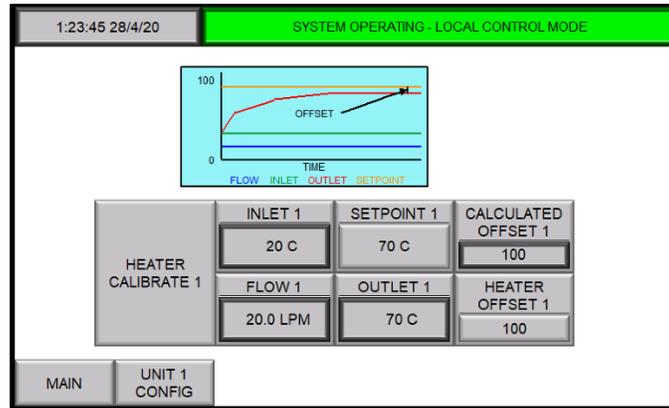


Figure 21: Heater Calibrate # Menu without power monitor

Heater Calibrate # Menu Information Panel	Description
INLET #	Displays the inlet water temperature to the unit # specified.
SETPOINT #	Displays the Outlet Setpoint for the unit # specified.
CALCULATED OFFSET #	Displays the computed offset for the unit specified. This calculation is $(\text{delta-T calc}/\text{delta-T actual}) \times 100$
FLOW #	Displays the flow rate through the unit # specified.
OUTLET #	Displays the outlet water temperature for the unit # specified.
HEATER OFFSET #	Displays the offset value resulting from heater calibration. Press the offset value button to bring up a keypad to change its value.
MAIN	This button will display the MAIN MENU screen.
UNIT # CONFIG	This button will display the UNIT # CONFIG MENU screen

ENGINEERING INFORMATION:

HUMAN MACHINE INTERFACE (HMI) (Continued):

Flow Calibrate # Menu:

The FLOW CALIBRATE # MENU allows the operator to calibrate the flow rate for the unit # specified. Refer to the Flow Calibration section of this manual for the procedures.

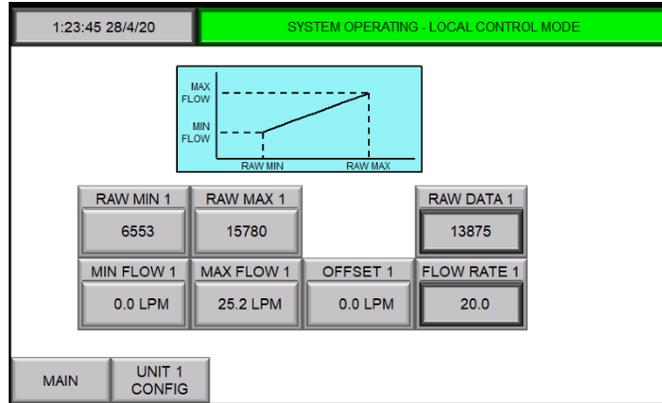


Figure 22: Flow Calibrate # Menu

Flow Calibrate # Menu Information Panel	Description
RAW MIN #	Manually entered raw data value that corresponds to the low flow value, taken from the RAW DATA # display on this menu.
RAW MAX #	Manually entered raw data value that corresponds to the high flow value, taken from the RAW DATA # display on this menu.
RAW DATA #	Displays information from the flow meter for the specified unit.
MIN FLOW #	Manually-entered flow rate used as the low-end calibration point, taken from the display on the flow meter itself for the unit # specified.
MAX FLOW #	Manually-entered flow rate used as the high-end calibration point, taken from the display on the flow meter itself for the unit # specified.
OFFSET #	Displays the offset flow in LPM.
FLOW RATE #	Displays the resulting calculated flow rate.
MAIN	This button will display the MAIN MENU screen.
UNIT # CONFIG	This button will display the UNIT # CONFIG MENU screen

ENGINEERING INFORMATION:

HUMAN MACHINE INTERFACE (HMI) (Continued):

Adjust Offsets Menu:

The ADJUST OFFSETS MENU allows the operator to change the offset value on a number of internal temperature sensors. Press the offset field and a keypad will appear to enter an adjustment value.

Figure 23: Adjust Offsets Menu

Adjust Offsets Menu Information Panel	Description
ELEMENT # OFFSET	Displays the current offset value for the element sensor in the heater column # specified.
COLUMN # ELEMENT TC	Displays the current temperature for the element sensor in the heater column # specified.
CHAMBER # OFFSET	Displays the current offset value for the chamber sensor in the heater column # specified.
COLUMN # CHAMBER TC	Displays the current temperature for the chamber sensor in the heater column # specified.
INLET TC OFFSET #	Displays the current offset value for the inlet temperature sensor for the unit # specified.
INLET #	Displays the current temperature for the inlet temperature sensor for the unit # specified.
OUTLET TC OFFSET #	Displays the current offset value for the outlet temperature sensor for the unit # specified.
OUTLET #	Displays the current temperature for the outlet temperature sensor for the unit # specified.
SAVE SETTINGS	This button will save the settings that have been entered in this menu.
MAIN	This button will display the MAIN MENU screen.
GENERAL SETTINGS	This button will display the GENERAL SETTINGS MENU screen.

ENGINEERING INFORMATION: HEATER CALIBRATION PROCEDURE:

This calibration procedure should be performed the first time the unit is operated. While this unit was tested and calibrated prior to shipment, this procedure will help correct for some offsets caused by variations in nominal supply voltages. While the DAC control system will compensate for these differences, performing this procedure will improve heater response.

This calibration startup procedure will disable the correction routines for the DAC control system and allow the unit to operate with an open loop control. By observing the performance of this unit without any error correction, the operator may adjust the heater to improve heater response. This procedure may not be performed while the unit is in MANUAL or REMOTE control mode.

This procedure must be performed by accessing the HEATER CALIBRATE # menu.

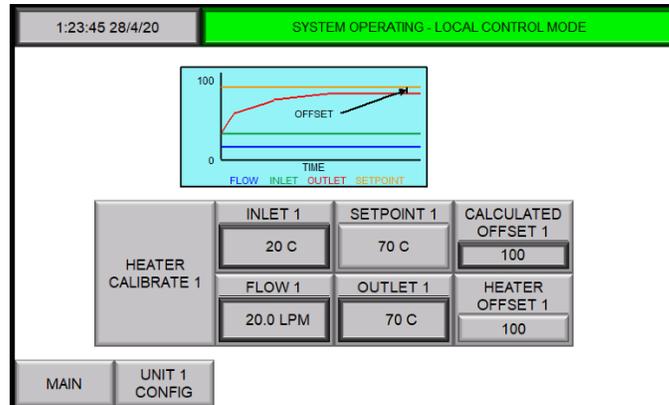


Figure 24: Heater Calibration Menu Displays (without power monitor)

Calibration Procedure without Power Monitor:

- 1) Once the installation and startup procedures are complete, adjust the water flow to the maximum expected operating flow rate. Fluctuations in water flow will affect the results of calibration.
- 2) Access the GENERAL SETTINGS MENU and adjust the ACTUAL VOLTAGE to the appropriate value.
- 3) Access the HEATER CALIBRATION menu through the SECURE MENU on the operator-interface panel (HMI). Press the HEATER CALIBRATE # button.
- 4) Access the MAIN MENU screen. Press the PROCESS SETPOINT value and using the keypad change the setpoint to the desired value.
- 5) Press the HEATER ON/OFF button to start the unit
- 6) Allow enough time for the heater to ramp up to the process setpoint and to stabilize. Depending upon the flow rate and the wattage of the unit, this could take several minutes.
- 7) When the unit is operating with a stable outlet temperature, record the value in the CALCULATED OFFSET # field.
- 8) Press the HEATER OFFSET # field and using the keypad enter the CALCULATED OFFSET # value recorded in step 7.
- 9) Press HEATER CALIBRATE # button to end the calibration process.
- 10) Return to the MAIN MENU.

ENGINEERING INFORMATION: Heater Calibration Procedure (Continued):

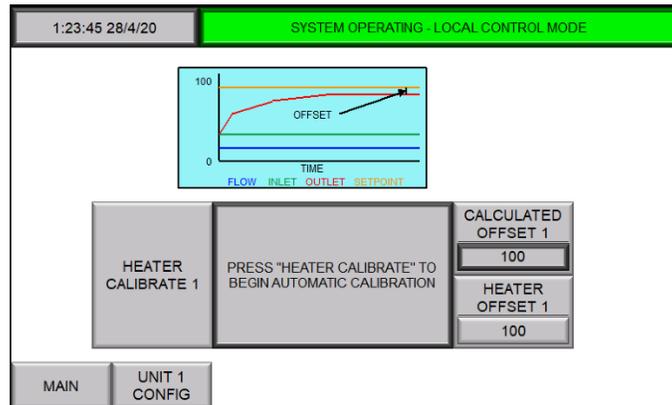


Figure 25: Heater Calibration Menu Displays (with power monitor)

Calibration Procedure with Power Monitor:

- 1) Once the installation and startup procedures are complete, adjust the water flow to the maximum expected operating flow rate.
- 2) Access the HEATER CALIBRATION menu through the SECURE MENU on the operator-interface panel (HMI). Press the HEATER CALIBRATE # button.
- 3) The unit will operate at full power for several seconds.
- 4) Once completed, the central information panel will indicate "calibration complete." A new value will appear in the CALCULATED OFFSET field.
- 5) Press the HEATER OFFSET # field and using the keypad enter the CALCULATED OFFSET # value recorded in step 4.
- 6) Press the HEATER CALIBRATE # button to exit calibration mode.
- 7) Return to main menu.

ENGINEERING INFORMATION: FLOW METER CALIBRATION PROCEDURE:

This calibration procedure has been performed at the factory prior to shipment. Flow meter calibration is only needed if the flow meter is replaced.

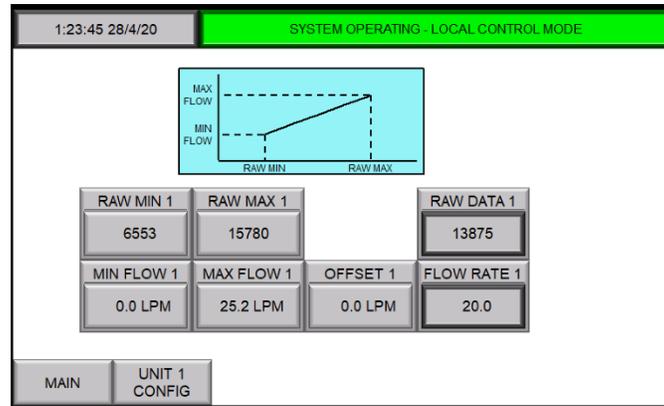


Figure 26: Flow Calibrate # Menu

- 1) Turn off heater operation by pressing the HEAT ON/OFF button on the MAIN MENU. Access the FLOW CALIBRATION # menu.
- 2) Establish the highest operating flow rate through the heater.
- 3) Open the rear cabinet door on the unit and record the flow rate displayed on the flow meter. Quickly press the MAX FLOW # value and using the keypad change the value to match the display on the flow meter.
- 4) Observe the value displayed in the RAW DATA # field. Press the RAW MAX # field and using the keypad enter the number displayed in the RAW DATA # field.
- 5) Establish the lowest operating flow rate through the heater.
- 6) Go to the back of the unit and record the flow rate displayed on the flow meter. Quickly press the MIN FLOW # value and using the keypad change the value to match the display on the flow meter.
- 7) Observe the value displayed in the RAW DATA field. Press the RAW MIN # field and using the keypad enter the number displayed in the RAW DATA field.
- 8) Establish a flow rate somewhere between the highest and lowest operating flow rates. Observe the flow rate displayed on the flow meter.
- 9) Quickly observe the FLOW RATE # value on the menu screen. If the FLOW RATE # value is +/- 0.2 LPM from the value on the flow meter, the calibration is complete.
- 10) If the values have a > 0.2 LPM difference, use the OFFSET # button to adjust the FLOW RATE # value to match the value on the flow meter.
- 11) Close the rear cabinet door. Return to the MAIN MENU.

ENGINEERING INFORMATION:

ALARMS:

The following section describes each of the alarm conditions that may occur on the **LUF-RAN™** fluoropolymer inline water heater.

Alarms Menu	Alarm History Menu	Description
Ground Fault	Ground Fault	A ground fault has occurred somewhere in the unit. This may be caused by a failed component. The cause of the ground fault must be identified and corrected before the heater is reset.
Col # Overtemp (1-4)	Column # Overtemp	The water temperature inside the heating column has risen above the setting of the associated SLC module in the SLC CONFIGURATION display. This may be caused by lack of water flow, a failed SSR or a failed sensor. When the element temperature falls below the setting of the SLC module, the unit can be reset.
Element # Overtemp (1-4)	Element # Overtemp	The element temperature has risen above the setting of the associated SLC module in the SLC CONFIGURATION display. This may be caused by lack of water flow to the unit, a failed SSR or a failed t/c sensor. When the element temperature falls below the setting of the SLC module, the unit can be reset.
Outlet TC Open Circuit	Process Sensor Disconnected	The outlet process temperature sensor has failed (open). The process temperature sensor must be replaced. This may also be caused by a disconnected sensor connection.
Element # TC Open Circuit (1-4)	Element # Sensor Disconnected	The element over-temperature sensor has failed (open). The sensor must be replaced. This may also be caused by a disconnected sensor connection.
PLC Battery Fault	PLC Battery Fault	The backup battery for the PLC is measuring low-voltage or has lost its charge. The battery must be replaced.
PLC Comm. Fault	Communication Error	PLC communications to the PTC modules or SLC modules has been interrupted. Check modules for power or disconnected wiring.
PRV Fault	Pressure Relief Valve	The liquid sensor mounted in the pressure relief valve (PRV) discharge tube has detected liquid in the discharge tube. This is caused by high water pressure applied to the unit. This may be caused by inlet water pressure exceeding 6.9 bar (100 psi). When the water pressure drops to an acceptable level and the PRV closes, the unit can be reset.
Column # TC Open Circuit (1-4)	Column # Sensor Disconnected	One of the column TC sensors has failed (open). The sensor must be replaced. This may also be caused by a disconnected sensor connection.
Humidity Fault	Humidity Fault	There is moisture detected in the humidistat connected to the purge gas outlet of the heater. This may be caused by a ruptured tube or a leaking seal in the heating column, or a normal heater response following an extended shutdown period. In most cases this leak cannot be repaired and the heating column must be replaced. If restarting the heater following an extended shutdown period, exhaust the purge gas for 8-hours before attempting to reset the unit.

**ENGINEERING INFORMATION:
ALARMS (Continued):**

Alarms Menu	Alarm History Menu	Description
SSR Fault	SSR Heatsink Fault	The thermostat on one of the heat sinks for the SSRs has tripped, indicating a high temperature on the heat sink. This may be caused by a malfunctioning fan, high ambient air temperature, inadequate air circulation through the cabinet, or a tripped power fuse in the unit. The cause of this alarm must be identified and corrected before the unit can be reset.
Liquid Level Fault	Liquid Level fault	The liquid level sensor at the top of plumbing does not detect liquid in the outlet tube of the unit. The system is disabled until the liquid level sensor detects liquid in the outlet tube of the heating column. This may be caused by a lack of water to the unit. This safety will prevent catastrophic overheat damage to the heating column. The cause of the liquid level fault must be identified and corrected before the unit can be reset.
Purge Fault	Purge Fault	The purge gas pressure switch does not detect adequate purge gas pressure. The unit has been disabled to prevent heater failure. This may be caused by shutting off the purge gas supply to the unit. When the purge gas pressure is at an acceptable pressure, the unit can be reset.
Leak Fault	Leak Fault	The optional cabinet leak detector has detected liquid in the bottom of the cabinet. The source of the liquid needs to be identified and repaired.
Flow Meter OC	Flow Meter Sensor Disconnected	The flow meter has suffered a fault and should be replaced.
Inlet TC Open Circuit	Inlet Sensor Disconnected	The inlet temperature sensor has failed (open). The inlet temperature sensor must be replaced. This may also be caused by a disconnected sensor connection.
Remote Setpoint Open Circuit	Remote Input Open Circuit	The 4-20mA input signal for the remote setpoint is not present. This alarm is disabled when the unit is in LOCAL or MANUAL control modes.

INSTALLATION:

Note: Carefully read this entire section before installation. The installation of this unit must be performed by qualified technicians.

 ATTENTION	 CAUTION
En raison du poids de l'appareil, NE PAS ESSAYER de déplacer ou de soulever l'appareil sans l'équipement de manutention de matériel approprié.	Due to the weight of the unit, DO NOT ATTEMPT to move or lift the unit without the appropriate material handling equipment.

INSPECTION AND UNCRATING:

The 1 and 2-column **LUFRAN™** fluoropolymer inline water heater are shipped in a horizontal position. The unit must be raised to a vertical orientation before it can be removed from the shipping crate. The 3 and 4-column **LUFRAN™** water heaters are shipped in a vertical orientation.

- 1) Inspect the shipping crate for evidence of damage. If any damage is detected, contact the carrier immediately.
- 2) Inspect the shock sensors located on the outside of the crate. The shock sensors will indicate if the unit experienced rough handling. If the sensors indicate that the unit has experienced rough handling, contact the carrier immediately.
- 3) Secure crate with adequate straps and carefully lift into a vertical position.
- 4) Remove one side of the crate.
- 5) Remove any protective packaging material and any other materials that may have been packed in the crate with the enclosure.
- 6) Remove any braces used to hold the unit in place during shipping.
- 7) Using a fork truck or other suitable lifting device, lift the unit from underneath and remove from the crate.
- 8) Visually inspect the unit itself for damage. If there is evidence of damage, notify Process Technology and the freight carrier immediately.



Figure 27: ShockWatch Sensor

 ATTENTION	 CAUTION
Ne pas incliner l'appareil au-delà de 10 ° à la verticale. blessures ou des dommages matériels graves peuvent en résulter.	Do not tip the unit beyond 10° from vertical. Serious personal injury or equipment damage may result.

INSTALLATION:

POSITIONING THE UNIT:

- 1) Once the LUFTM fluoropolymer inline water heater has been removed from the crate and the unit passes the damage inspection, it can be moved to the service location. Move the unit using either the lifting hooks located on top of the enclosure or by lifting the unit from underneath using a fork truck or other suitable handling equipment.

 ATTENTION	 CAUTION
<p>Les roulettes ne doivent pas être utilisés pour déplacer l'appareil sur de longues distances ou sur des surfaces inégales. Ils sont destinés à faciliter les petits ajustements à la position de l'unité à son lieu d'exploitation. Déplacez l'appareil lentement, car il n'y a aucun moyen de ralentir ou d'arrêter l'unité. Veiller à ce qu'il y a suffisamment de personnel pour déplacer l'appareil en toute sécurité. Le non-respect de ces instructions peut entraîner des blessures graves et / ou endommager l'appareil.</p>	<p>The castors should not be used to move the unit over long distances or on uneven surfaces. They are intended to facilitate small adjustments to the position of the unit at its place of operation. Move the unit slowly, as there is no means of slowing or stopping the unit. Ensure that there are sufficient personnel to move the unit safely. Failure to follow these instructions can result in serious personal injury and/or damage to the unit.</p>

- 2) The unit was shipped with the leveling feet extended. To utilize the castors the leveling feet must be retracted.
- 3) Place the unit on a hard, level surface.
- 4) Ensure the unit is secured so as not to roll as the casters are extended.
- 5) Leveling is accomplished by pulling out the adjustment lever (small metal ring) and ratcheting the leveling foot up or down. This adjustment should be made on all (4) casters until the unit is level.

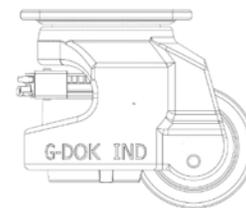


Figure 28: Leveling Foot Located on Castor

 ATTENTION	 CAUTION
<p>Assurez-vous que l'appareil est sur une surface lisse, le niveau et il y a suffisamment de personnel pour maintenir l'appareil en place. Comme les pieds de nivellement sont rétractés et l'unité repose sur les roulettes mouvement inattendu peut entraîner. Le défaut de fixer correctement l'appareil peut entraîner des blessures et / ou des dégâts matériels graves.</p>	<p>Ensure the unit is on a smooth, level surface and there are sufficient personnel to hold the unit in place. As the leveling feet are retracted and the unit rests on the castors unexpected movement may result. Failure to properly secure the unit may result in serious personal injury and/or damage to equipment.</p>

INSTALLATION:

INSTALLING SEISMIC BRACKETS (optional):

This unit includes four seismic brackets in the event such brackets are a requirement for the installation of this unit. The top-half of these brackets have already been installed on the unit.

If the heater installation requires that the seismic brackets be used, the bottom-half of these seismic brackets may be secured to the floor and then fastened to the bracket halves on the cabinet. The customer can decide whether to install the bottom half of the brackets to face inward or outward, as shown below.

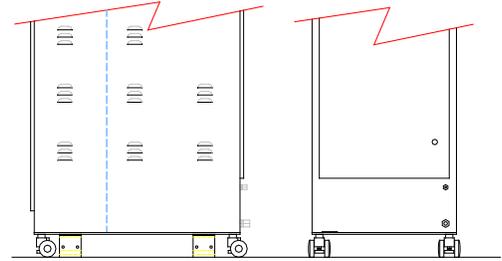
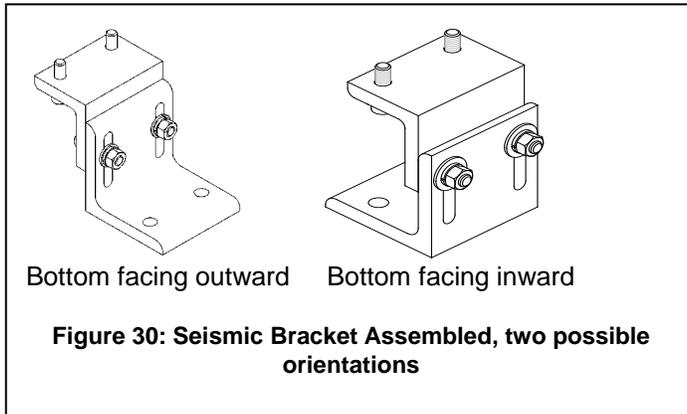


Figure 29: Seismic Brackets (top-half) Attached to Cabinet

PLUMBING:

The plumbing installation of this unit should only be performed by qualified technicians.

 ATTENTION	 CAUTION
Vérifiez que l'alimentation d'alimentation en eau et de gaz de purge est fermé, et tous les dispositifs de verrouillage / débranchement nécessaires sont correctement installés.	Verify that the water supply and purge gas supply is shut off, and any necessary lockout/tagout devices are properly installed.

INSTALLATION: PLUMBING (Continued):

The various plumbing connections are located as follows:

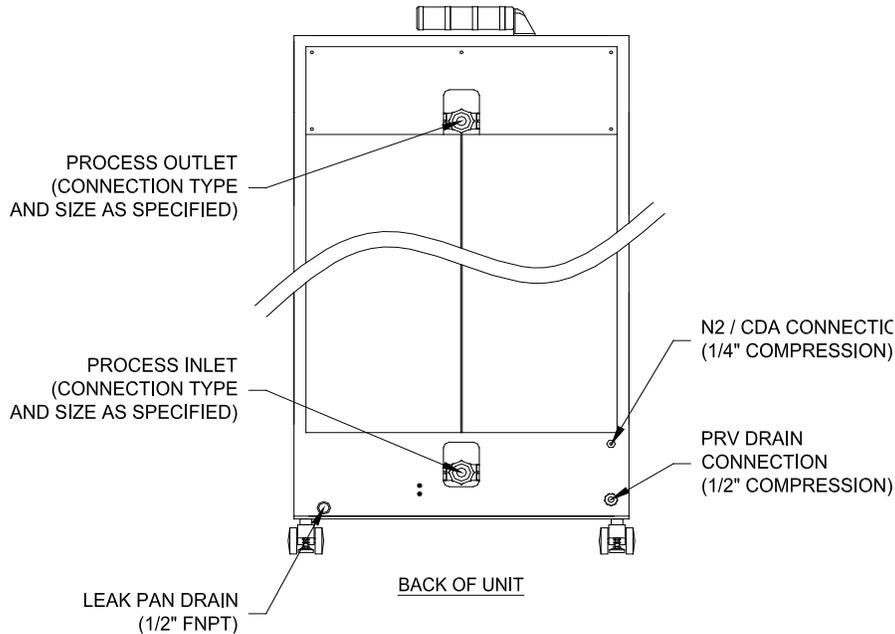


Figure 31: Plumbing Connections (stack light option shown)

Refer to the facilities print for your specific heater model to identify the exact size and type of plumbing connections that are provided on your unit.

Column Drain:

The customer must supply the means to drain the heating columns, which will be necessary in the case of replacing a heating column or some other items. The following describes a recommended means of column drain:

- 1) Install a service shutoff valve before the inlet and after the outlet of the heater.
- 2) After the inlet service shutoff valve, install a 3-way valve on the inlet side of the heater. This valve should be plumbed to direct water flow from the water supply to the heater, and then from the heater to a non-pressurized drain.
- 3) Before the outlet service shutoff valve, install a tee fitting to the outlet side of the heater. The tee portion of the fitting should be closed.

INSTALLATION:

PLUMBING (Continued):

Water Inlet, Outlet Connections:

When tightening all connections on this unit, be sure to support the internal plastic piping as close as possible to the plumbing connections, to prevent excessive torque or strain from being applied to the internal plumbing of the unit.

The various plastic piping connections available (Unions, Flared tube fittings, etc.) do not require very much force to properly seal. Once the plumbing connections have been made, test the connections for possible leaks and repair any leaks as needed.

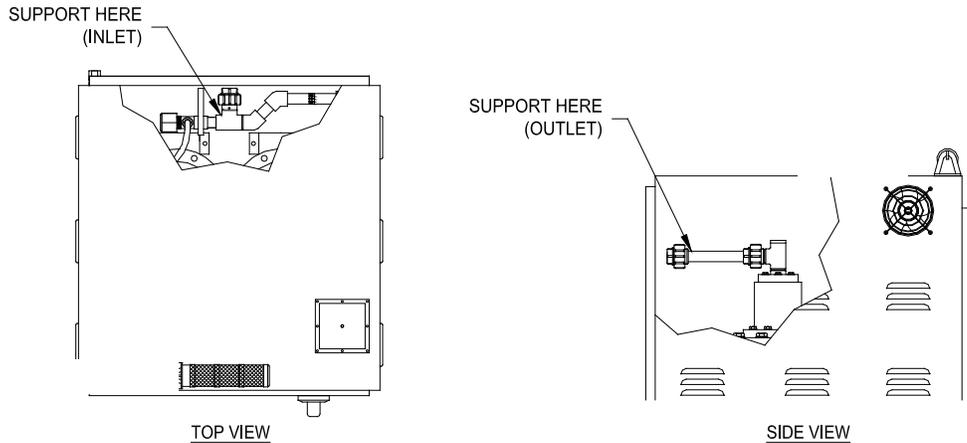


Figure 32: Support Internal Piping when Connecting Plumbing (105-156kW unit shown)



ATTENTION

Le défaut de fixer correctement la tuyauterie en plastique lors du serrage des raccords de plomberie peut causer des dommages internes à la plomberie de cet appareil. De tels dommages ne sont pas couverts par notre garantie du produit.



CAUTION

Failure to properly secure the plastic piping when tightening the plumbing connections may result in internal damage to the plumbing of this unit. Such damage is not covered under our product warranty.

Inlet/Outlet Connections; 25mm-40mm Unions (standard)

- 1) Remove the access panel(s) from the rear of the unit, exposing the internal plumbing and heater column(s). The inlet plumbing will be located just below the bottom of the access panel, and the outlet plumbing will be located just above the access panel (See figure 22).
- 2) Remove the sealing cap from plumbing connection.
- 3) Test fit the piping to ensure proper length.
- 4) Support the internal piping to avoid any damage during plumbing.
- 5) Attach the O-ring (supplied with accessories) to the male side of the union.
- 6) Orient the male 25mm union half so the threads can be engaged into the female 25mm union half (nut) of the fitting.
- 7) Attach the male and female union halves to create the inlet connection and tighten the union halves securely, until the connections are fully tightened

INSTALLATION:

PLUMBING (Continued):

Inlet/Outlet Connections; Flared Compression Tube Fittings:

Please note that the procedure specified below should only be performed once, when the tubing is first connected to the fittings. Once properly tightened, the fittings will not need to be re-tightened.

- 1) Remove the protective plastic caps from the flared fittings on the Inlet and Outlet piping of the heater assembly.
- 2) Connect properly flared tubing to the flared fitting on the heater chamber assembly.
- 3) Tighten the fitting nuts until fitting nut contacts the flared tubing. Tighten an additional ¼ turn. Then tighten fitting nut to the **maximum** required torque value. See the table for proper values.
- 4) Repeat this procedure for each of the flared tube fittings.
- 5) Turn on the water. Establish flow through the heater. Check for leaks at the fittings.
- 6) Circulate hot fluid through the filter chamber at the operating temperature of the system, allowing the filter chamber to reach operating temperature.
- 7) Cool down the heater to ambient. Re-tighten the fitting nut to the **minimum** torque value. See Table 6 for proper value.

Fitting Size	Torque Value	
	Minimum value (cold)	Maximum value (cold)
13mm (½-inch) flared	1.24 N-m (11 in-lbs).	1.8 N-m (16 in-lbs).
19mm (¾-inch) flared	1.58 N-m (14 in-lbs).	3.2 N-m (28 in-lbs).
25mm (1-inch) flared	3.39 N-m (30 in-lbs).	5.1 N-m (45 in-lbs).



ATTENTION

Ne pas serrer les écrous de fixation à des températures élevées. Des dommages irréparables aux raccords de plomberie en résultera.



CAUTION

Do NOT tighten fitting nuts at elevated temperatures. Irreparable damage to the plumbing connections will result.

INSTALLATION:

PLUMBING (Continued):

Inlet/Outlet Connections; Super 300 Type Pillar™ Tube Fittings:

Super 300 Type Pillar™ Fittings use a “gauge ring” which is used to determine the proper tightness of the fitting connections.

- 1) Remove the protective plastic caps from the fittings on the Inlet and Outlet piping of the heater assembly.
- 2) Install appropriately sized Super 300 Type Pillar “gauge ring”
- 3) Tighten the Pillar fitting nut until the bosses on the union nut makes contact with the gauge ring and pulls the blade. A clicking sound will be heard at this point. Continue tightening the union nut until the bosses make full contact with the gauge ring.

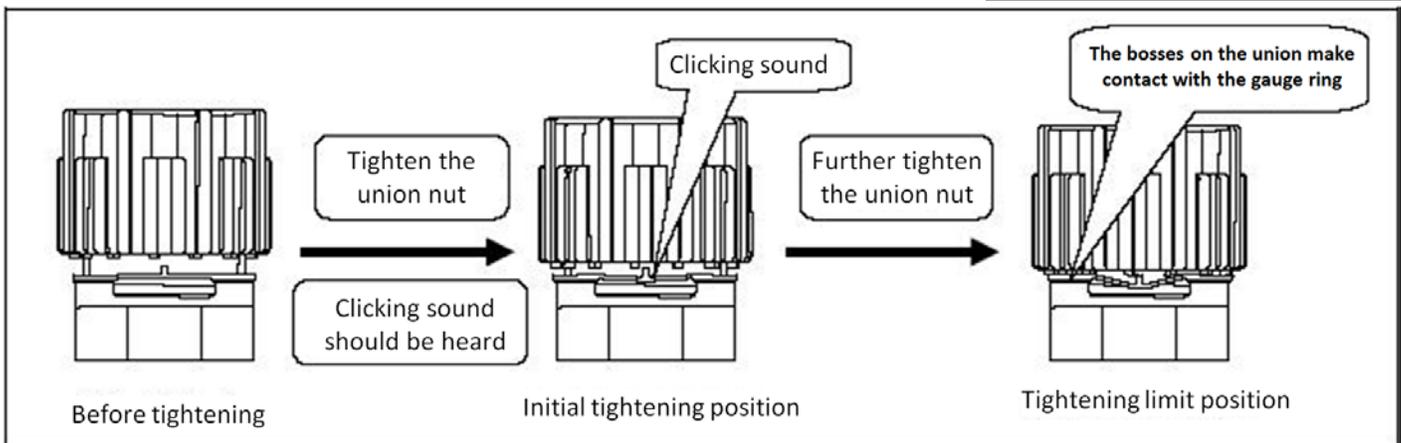
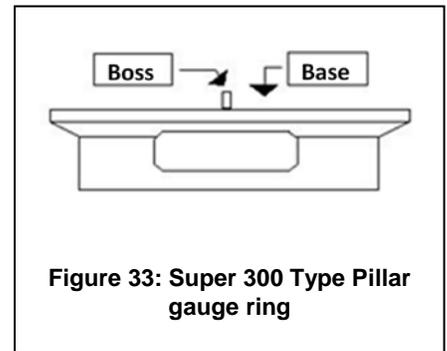


Figure 34: Super 300 type Pillar fittings tightening procedure

Pressure Relief Valve (PRV) Connection (13mm (1/2-inch) compression fitting):

Note: 210kW-312kW models have two PRV connections.

- 1) Loosen and remove the compression nut. Remove the sealing cap from plumbing connection and discard.
- 2) Test fit the tubing to ensure proper length. The tubing must be plumbed to a non-pressurized drain.
- 3) Slide the compression nut over the tubing.
- 4) Insert the tubing into the compression fitting. Tighten the compression nut securely.

Leak Pan Drain (1/2-inch FNPT (13mm) threaded connection):

- 1) Remove and discard the pipe plug.
- 2) Test fit the pipe or tubing to ensure proper length. The tubing must be plumbed to a non-pressurized drain.
- 3) Cover the male pipe threads with PTFE tape or some other approved pipe thread sealant.
- 4) Engage threads into drain connection. Tighten the threaded connection securely.

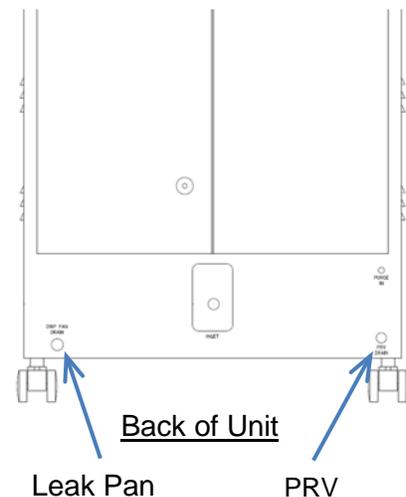


Figure 35: Pressure Relief Valve (PRV) and Leak Pan Drain Connections

INSTALLATION:

PLUMBING (Continued):

Purge Gas Supply Connection (6mm (1/4-inch) compression fitting):

- 1) Loosen and remove the compression nut. Remove the sealing cap from plumbing connection and discard.
- 2) Test fit the tubing to ensure proper length.
- 3) Slide the compression nut over the tubing.
- 4) Insert the tubing into the compression fitting. Tighten securely.

NOTE: There is no exhaust connection for the purge gas. The purge gas is exhausted inside the cabinet and released into the air.

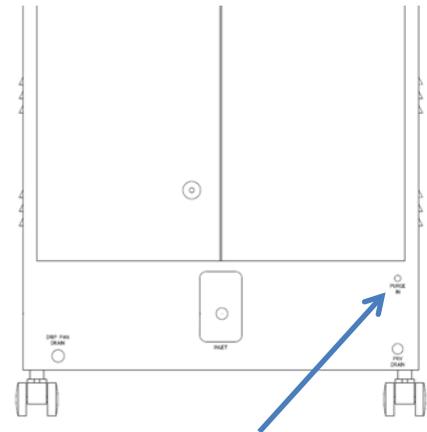


Figure 36: Purge Gas Inlet

WIRING:

The wiring of this unit should only be performed by qualified technicians.



Vérifiez que l'alimentation électrique est coupée, et tous les périphériques de verrouillage / débranchement nécessaires sont correctement installés.



Verify that the electrical supply is shut off, and any necessary lockout/tagout devices are properly installed.

Before the electrical power is connected to this unit, verify that the electrical supply is shut off. Apply any electrical lockout/tagout devices as required by factory guidelines.

Incoming power should be routed through the electrical access panel on the top of the unit. The power wires must be connected to the main circuit breaker and the ground wire must be connected to the ground lug, per the electrical prints which are provided with this manual.

In addition to providing incoming power, all high-voltage wiring connections must be inspected for connections that may have loosened during shipment. Refer to the TORQUE SPECIFICATIONS table for proper connection torque values. The torque table is located on the inside of the front door.

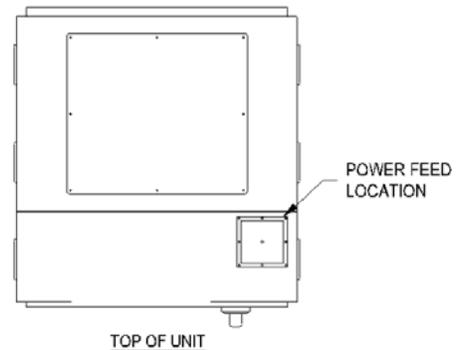


Figure 37: Electrical Access Panel (power feed location)

INSTALLATION:

WIRING (Continued):

Opening the front cabinet doors:

1-2 column (24kW – 156 kW) units:

- 1) Turn the two quarter-turn latches. They are located on the right side of the door, near the top and bottom.
- 2) Rotate the disconnect switch handle past the OFF position to the RESET position and pull the door open.

3-4 column (157 kW – 312 kW) units:

- 1) Turn the three quarter turn latches on each door. They are located near the center of the two doors, near the top, middle and bottom.
- 2) Push the disconnect switch down, past the OFF position to the RESET position.
- 3) Hold the switch in the RESET position and open the two doors.

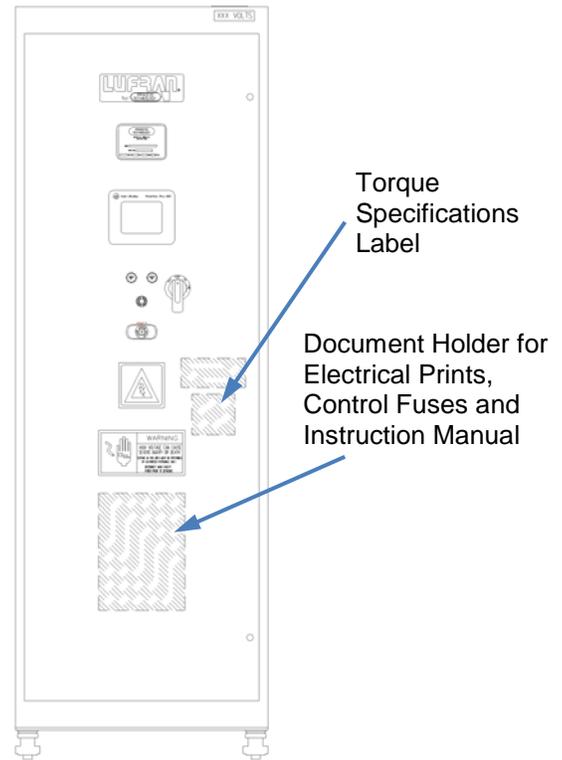


Figure 38: Location of Torque Specifications Label, Holder for Manual

Installing power supply wiring:

Check the model/serial number on the front of the unit for power requirements.

- 1) Remove electrical access panel on the top of the cabinet by loosening the cover mounting screws.
- 2) Cut a hole in the access panel for the incoming power supply. Replace the access panel on the top of the cabinet.
- 3) Fuse the incoming line for the rated amperage using an approved electrical disconnect box.
- 4) Connect the ground wire from the power feed to the ground lug.
- 5) Connect the leads from the incoming power feed to the appropriate terminals (reference the Electrical Schematic) making sure not to disturb existing wiring. Use care that no loose strands of wire are exposed out of the terminal connection. Torque all wires to the specified ratings located on the wiring diagrams and component labels.

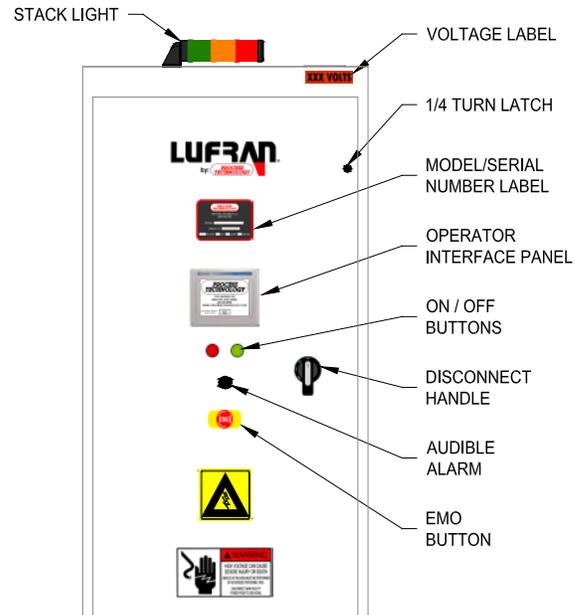
TORQUE SPECIFICATIONS	
CIRCUIT BREAKER	
DISTRIBUTION BLOCK	
PRIMARY:	
SECONDARY:	
SECONDARY:	
POWER FUSES	
SAFETY CONTACTOR	
SOLID STATE RELAYS	
INPUT :	
OUTPUT :	

Figure 39: Torque Specifications Label

INSTALLATION:

OPERATION:

The **LUFSPAN™** fluoropolymer inline water heater can be operated from the front of the unit. It can also be operated remotely through an optional or customer-provided interface cable. This section deals with controlling the heater locally from the front of the unit. For an explanation of controlling the unit remotely, refer to the **ENGINEERING** section of this manual.



**Figure 40: Front Panel Layout
(LUFSPAN™ heater shown)**

STARTUP PROCEDURE:

- 1) Turn on purge gas flow.
- 2) Turn on water at its supply source. Allow water to flow for several minutes to insure that all entrapped air has been purged from the heating column(s).
- 3) Stop water flow at point of use location and check all plumbing connections and water heater for leaks. Repair any water leaks if applicable.
- 4) Enable the power at the MAIN SERVICE DISCONNECT (provided by customer).
- 5) Ensure that the disconnect handle on the front of the unit (if provided) is ON and the EMO button on the front panel is not depressed.
- 6) Press the POWER ON button. At this time the temperature controller and all optional displays will come on.
- 7) Verify all system parameters are correct.

Note: Temperature controller set point should be set to "0" at this time to prevent accidental heater engagement during calibration procedures. Reference temperature controller section if required.

- 8) Adjust the setpoint of the temperature controller to the desired value.
- 9) Press the HEATER ON bottom on the main menu screen. If all criteria for the various safety devices have been met, the heater will begin to heat.

OPERATION:

SHUTDOWN PROCEDURE:

- 1) Press the HEATER OFF button on the main menu screen. Continue water flow through the heater to allow the heating columns to cool down.
- 2) Continue water flow through the heater until the outlet temperature display indicates 95°F (35°C) or less.

 ATTENTION	 CAUTION
Le chauffe-eau doit être désactivé et le laisser refroidir avant que le débit d'eau est coupée. températures dangereuses et des conditions de pression peuvent résulter de procédures d'arrêt inappropriées.	The heater must be disabled and allowed to cool before the water flow is turned off. Dangerous temperatures and pressure conditions may result from improper shutdown procedures.

- 3) Press the POWER OFF Button.
- 4) Turn off the MAIN SERVICE DISCONNECT to the unit (provided by customer).
- 5) Stop water flow through the unit. If the unit will be shut down will be for an extended period, open the customer supplied drain located near the inlet plumbing connection to drain the water from the unit. Once the unit is drained, dry the unit by blowing inert gas (N₂ or CDA) through the piping system.

DRAINING THE UNIT:

- 1) Close the customer installed service shutoff valves on the inlet and outlet of the unit. Apply any necessary lockout/tagout device.
- 2) Position the customer supplied 3-way valve on the inlet of the unit to open the heating columns to a non-pressurized drain.
- 3) Open the capped fitting of the customer supplied TEE fitting on the outlet of the unit. The heating columns will start draining.
- 4) Optional: the customer may apply pressurized N₂ or CDA gas to expedite the draining of the heating columns. Gas pressure must not exceed 1 Bar (14 PSI).
- 5) When the unit is finished draining, shut off the optional pressurized gas and close the fitting on the TEE fitting.
- 6) Shut off the purge gas supply. Apply lockout/tagout devices as necessary.

MAINTENANCE:

The LUF^{FRAN}TM fluoropolymer inline water heater requires only a routine inspection every 6 months to check the operation of the various operation and safety devices. The maintenance procedures listed here should only be performed by qualified technicians. Many of these devices require the control system to remain operational during inspection, while others may be checked while the unit is completely powered down.

Note: Several maintenance tasks can be completed simultaneously while the cabinet access covers are open and lockout/tagout procedures are in place.

MAINTENANCE SCHEDULE:

CATEGORIES OF ELECTRICAL HAZARDS

Type	Description
1	Equipment is energized, but live circuits are covered or insulated to prevent accidental shock.
2	Equipment is energized and energized circuits of less than 24 VDC, 240 VA and 20 joules are exposed to accidental contact.

MAINTENANCE TO BE PERFORMED EVERY 6 MONTHS:

Item to Inspect	Lockout / Tagout Required (Y/N)	Electrical Hazard Category (1-2)	Procedure Number
Outlet plumbing liquid level sensor, top-half plumbing	N	1	M1
Outlet process sensor, column TC sensor	N	1	M2
Leak detector (Optional)	N	1	M3
Purge gas flow switch	N	2	M4
Humidistat purge exhaust, humidistat switch	N	2	M5
Pressure relief valve (PRV), bottom-half plumbing	N	1	M6
Cabinet cooling fans	N	1	M7
SSR heat sink cooling fans	N	1	M8
Circuit breaker	N	2	M9
Safety Contactor	Y	2	M10

MAINTENANCE PROCEDURES:

M1: Liquid Level Sensor, Top Half Plumbing

There is one liquid level sensor located at the top of heating column 1, and for heaters with 3-4 heating columns there is another liquid level sensor at the top of column 4. These are capacitive sensors that must be inspected for proper adjustment every 6 months. If a sensor is out of adjustment, it may be re-calibrated.

The technician may choose to skip the inspection procedure and instead calibrate the liquid level sensors every 6 months.

Procedure M1-1: Liquid Level Sensor Inspection Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Continue water flow through the unit for this procedure. Allow the unit to cool to ambient inlet temperature.
- 3) Open the rear cabinet door.
- 4) Inspect all of the plumbing connections on the top half of the unit for possible leaks. Any leaks found must be repaired.
- 5) Locate the capacitance-type sensor on the (top) outlet manifold of heating column 2 and 4 (if applicable.). Notice the LED on the back of the sensor is red when detecting liquid in the outlet tube of the heating column. The liquid level sensor should be about 3.5mm (0.125-inch) away from the outlet manifold. When there is no liquid in the heating column outlet tube, the red LED will turn off and the heater will enter alarm mode.
- 6) When there is once again water in the heating column outlet tube, press the ERROR RESET button on the control display to clear the alarm.
- 7) If the red LED fails to shut off and the unit fails to enter alarm mode, then the level sensor must be re-calibrated.

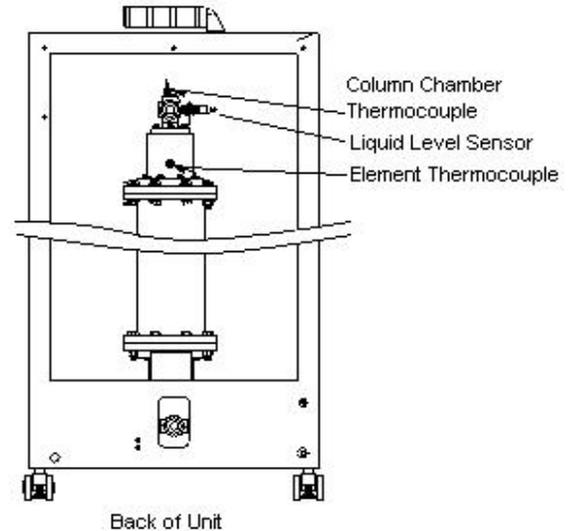


Figure 41: Liquid Level Sensor

 ATTENTION	 CAUTION
Ne pas déplacer le liquide position du capteur de niveau dans le support de montage, ou le capteur va perdre son étalonnage. Si le capteur de niveau de liquide est déplacé dans le support de montage, le capteur doit être ré-étalonné.	Do not move the liquid level sensor position in the mounting bracket, or the sensor will lose its calibration. If the liquid level sensor has shifted in the mounting bracket, then the sensor MUST be re-calibrated.

MAINTENANCE PROCEDURES:

Procedure M1-2: Liquid Level Sensor Calibration Procedure:

- 1) Insure the liquid level sensor is properly positioned in facing the outlet tube of the heating column. The sensor should be about 3.5mm (0.125-inch) away from the outlet manifold.
- 2) Using a small flat blade screwdriver, turn the sensor adjustment potentiometer on the back of the sensor clockwise until the red LED on the sensor illuminates.
- 3) Once the red LED illuminates, turn the adjustment potentiometer an additional ¼ turn clockwise.
- 4) Repeat the inspection procedure, provided on the previous page. If the sensor again fails to trip and/or reset from alarm mode, repeat the calibration procedure or replace the liquid level sensor.

Procedure M1-3: Liquid Level Sensor Replacement Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Turn OFF Power to the unit.

 ATTENTION	 CAUTION
Vérifiez que l'alimentation électrique est coupée, et tous les périphériques de verrouillage / débranchement nécessaires sont correctement installés.	Verify that the electrical supply is shut off, and any necessary lockout/tagout devices are properly installed.

- 3) Open the front and rear cabinet doors. Locate the liquid level sensor to be replaced.
- 4) Disconnect the lead wires for the liquid level sensor on the low-voltage panel in the electrical side of the cabinet.
- 5) Loosen and remove the two nuts that are holding the liquid level sensor in the bracket.
- 6) Slide the liquid level sensor out of the bracket.
- 7) Insert the new liquid level sensor into the bracket. Attach and tighten the two nuts on the liquid level sensor to fix its position.
- 8) Make sure that the position of the liquid level sensor is 3.5mm (0.125-inches) away from the outlet plumbing manifold. If necessary, adjust and re-tighten the two nuts to adjust the sensor position.
- 9) Wire the two liquid level sensor lead wires to the appropriate terminals on the low voltage panel in the electrical side of the cabinet. These will be the same terminals from where the original sensor wires were removed.
- 10) Restore power to the unit.
- 11) Perform procedure *M1-2: liquid level sensor calibration procedure* and then *M1-1: liquid level sensor inspection procedure*, provided on the previous two pages.
- 12) If the sensor is functioning properly, the unit may be restarted and returned to service.

MAINTENANCE PROCEDURES:

M2: Outlet Process Sensor, Column TC Sensor(s)

The outlet process temperature sensor is located in the TEE fitting directly before the outlet plumbing connection. The column temperature sensor(s) are located in the top manifold of each heating column, labeled COLUMN TC. These sensors should be checked for proper operation every 6 months.

Procedure M2-1: Outlet Process Temperature Sensor, Column TC Sensor Inspection Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Continue water flow through the unit for this procedure. Allow the unit to cool to ambient inlet temperature.
- 3) Open the rear cabinet door. Locate the outlet process temperature sensor located in the TEE fitting directly in front of the outlet plumbing connection.
- 4) Disconnect the plug for the outlet process temperature sensor. The heater will enter alarm mode and the stack light (if provided) will illuminate the red light.
- 5) Reconnect the plug for the outlet process temperature sensor. Press the ERROR RESET button on the control display to clear the fault condition.
- 6) Locate the column TC sensor(s), located in the top of each heating column.
- 7) Disconnect the plug for the each of the column TC sensor. The heater will enter alarm mode and the stack light (if provided) will illuminate the red light.
- 8) Reconnect the connector plugs for the column TC sensor. Press the ERROR RESET button on the control display to clear the fault condition.

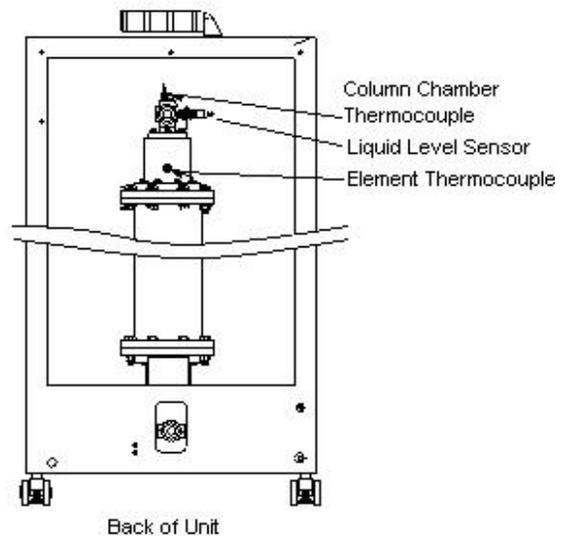


Figure 42: Thermocouple Location

MAINTENANCE PROCEDURES:

Procedure M2-2: Outlet Process or Column TC Sensor Replacement Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Turn OFF Power to the unit. Apply lockout-tagout as required by your facility.

 ATTENTION	 CAUTION
Vérifiez que l'alimentation électrique est coupée, et tous les périphériques de verrouillage / débranchement nécessaires sont correctement installés.	Verify that the electrical supply is shut off, and any necessary lockout/tagout devices are properly installed.

- 3) STOP flow of water to the unit and drain column assembly. A provision for draining the unit must be installed on the inlet plumbing when the unit is installed. If no method of draining the unit was provided, the inlet water connection must be removed.
- 4) Open the rear cabinet door. Locate the sensor to be replaced.
- 5) Disconnect the 4-pin connector plug for the sensor.
- 6) Loosen the 1/8-inch fitting and remove the sensor from the fitting.
- 7) Insert the new sensor until the black label reaches the top of the 1/8-inch compression nut. Tighten the fitting.
- 8) Connect the 4-pin connector plug.
- 9) Close the drain and allow water to flow through the unit. Check for leaks. If the fitting is not leaking, the unit may be restarted.

M3: Leak Detector (Optional)

For heaters with option “-LK” listed in the model number, there will be one leak detector sensor located at the bottom of the plumbing side of the cabinet. This device is a float switch that detects the presence of liquid in the bottom of the cabinet.

Procedure M3-1: Leak Detector Inspection Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Open the rear cabinet door.
- 3) Locate the leak detector near the bottom of the cabinet. Verify that there is no liquid in the bottom of the cabinet.
- 4) Raise the float with your hand. The heater will enter alarm mode and the stack light (if provided) will illuminate the red light.
- 5) Release the float. Press the ERROR RESET button on the panel of the panel to clear the fault condition.

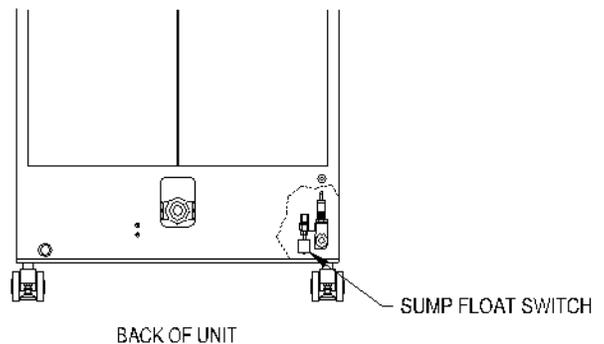


Figure 43: Leak Detector (Optional)

MAINTENANCE PROCEDURES:

Procedure M3-2: Leak Detector Replacement Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Turn OFF Power to the unit.

 ATTENTION	 CAUTION
Vérifiez que l'alimentation électrique est coupée, et tous les périphériques de verrouillage / débranchement nécessaires sont correctement installés.	Verify that the electrical supply is shut off, and any necessary lockout/tagout devices are properly installed.

- 3) Open the rear cabinet door. If the leak detector is wired to a multi-port sensor/actuator box located on the back panel, then disconnect the plug for the leak detector. When included, this connector is usually connected to port 3, but refer to your electrical prints to confirm the correct port number. If the wires for the leak detector are hard-wired to terminals on the low-voltage electrical panel, disconnect the leak detector wires from those terminals. Refer to the electrical print for the specific terminal numbers.
- 4) If needed, remove the electrical connector from the leak detector to ease in the wiring removal from the cabinet. If necessary, cut and remove any cable ties that hold the leak detector wiring.
- 5) Loosen and remove the fitting that holds the leak detector to the mounting bracket.
- 6) Slide the leak detector from the fitting on the bracket.
- 7) Install the new leak detector into the fitting.
- 8) Route the new wiring in the same pattern as the previous leak detector wiring.
- 9) Depending upon the design of your particular heater, connect the leak detector plug to multi-port sensor/actuator box or connect the wires to the terminals on the low voltage electrical panel.
- 13) Restore power to the unit.
- 14) Perform procedure *M3-1: leak detector inspection procedure*.
- 15) If the sensor passes the inspection, the unit may be restarted and returned to service.

M4: Purge Gas Flow Switch

There is one purge gas flow switch for the entire unit. It must be inspected every 6 months.

Procedure M4-1: Purge Gas Flow Switch Inspection Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
 - 2) Shut off purge gas flow. The heater will enter alarm mode and the stack light (if provided) will illuminate the red light.
 - 3) Restart purge gas flow. Verify that the purge gas supply pressure is regulated between 1.75 – 6.9 bar (25 – 100 psig).
 - 4) Press the ERROR RESET button on the control display to clear the fault condition.
- If the unit fails to generate an alarm or fails to reset, the switch must be replaced. There is no calibration procedure for this part.

MAINTENANCE PROCEDURES:

M4: Purge Gas Flow Switch, continued

Procedure M4-2: Purge Gas Flow Switch Replacement Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Turn OFF Power to the unit.

 ATTENTION	 CAUTION
Vérifiez que l'alimentation électrique est coupée, et tous les périphériques de verrouillage / débranchement nécessaires sont correctement installés.	Verify that the electrical supply is shut off, and any necessary lockout/tagout devices are properly installed.

- 3) Turn off the purge gas supply to the unit.

 ATTENTION	 CAUTION
Vérifiez que l'alimentation en gaz de purge est fermé, et tous les dispositifs de verrouillage / débranchement nécessaires sont correctement installés.	Verify that the purge gas supply is shut off, and any necessary lockout/tagout devices are properly installed.

- 4) Open the rear cabinet door.
- 5) Cut the lead wires coming out of the purge gas flow switch.
- 6) Loosen and remove the compression fitting nuts for the purge gas tubing connected to the inlet and the outlet of the purge gas flow switch. Retain the compression nuts and ferrules for use in step 13.
- 7) Remove the tubing from the inlet and outlet connections of the purge gas flow switch. Note the inlet and outlet tubing so the replacement switch will be connected properly.
- 8) Loosen the set-screw in the mounting bracket that keeps the flow switch in place. Remove the old switch.
- 9) Loosen and remove the compression fittings connected to the inlet and outlet connections of the purge gas flow switch. Retain these fittings for use in step 10. Discard the old flow switch.
- 10) Re-tape and install these two compression fittings into the new purge gas flow switch.
- 11) Install the new flow switch into the mounting bracket. Tighten the set-screw to hold the switch in position.
- 12) Splice the lead wires from the purge gas flow switch to the two wires that were cut in step 5.
- 13) Reconnect the purge gas tubing to the inlet and the outlet of the purge gas flow switch. Use the compression nuts and ferrules retained in step 6 and the tubing disconnected in step 7. Insure the tubing is connected to the correct position on the new flow switch or the switch will not function.
- 14) Turn on the purge gas supply to the unit. Check the flow switch for gas leaks.
- 15) Restore power to the unit.
- 16) Perform procedure *M4-1: Purge Gas Flow Switch Inspection Procedure*.
- 17) If the purge gas flow switch passes the inspection, the unit may be restarted and returned to service.

MAINTENANCE PROCEDURES:

M5: Humidistat Purge Exhaust, Humidistat Switch

There is one humidistat device installed in a heater with 1 or 2 heating columns. Heaters with 3 or 4 heating columns will have two humidistat devices installed. These items are responsible for monitoring the purge gas exhaust for the presence of moisture. These humidistat devices must be inspected every 6 months.

Procedure M5-1: Humidistat Inspection Procedure:

The inspection part of this procedure must be repeated for each humidistat device.

Inspect the purge gas exhaust tubing:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Open the rear cabinet door.
- 3) Locate the humidistat device(s) mounted on each heating column.
- 4) Locate the ¼-inch tubing connected between the top of each heating column and the humidistat. The outlet of the purge column is labeled EXHAUST.
- 5) Inspect the tubing for the presence of moisture.

If no moisture is present, then proceed to step 6.

If moisture is present it may be caused by the following:

- Startup following extended shutdown: If the heater was shut down for an extended period but was not drained properly, moisture will enter the purge tubing. This heater should be purged with gas for 12 hours before startup is attempted.
- Failed heating column: A hole in the heating element or a leaking purge gas fitting will allow water into the exhaust tube. Contact PROCESS TECHNOLOGY for possible replacement heating column.

Inspect the adjustment of the humidistat:

- 6) Using a screwdriver remove the four cover screws and remove the cover from each humidistat device.
- 7) Turn the adjustment knob on the humidistat clockwise. The heater will enter alarm mode and the stack light (if provided) will illuminate the red light.
- 8) To re-adjust the humidistat, turn knob fully counter-clockwise, then 1/8 turn clockwise.
- 9) Press the ERROR RESET button on the control display to clear the fault condition.
- 10) Repeat steps 7-9 for the humidistat on each humidistat device.

If the unit fails to fault when the adjustment knob is turned fully clockwise, or the unit fails to reset the alarm condition then the humidistat should be replaced. Proceed to the humidistat replacement procedure on the next page.

- 11) Replace the black plastic enclosure cover on each of the humidistat devices.

- 12) Close the rear cabinet door.

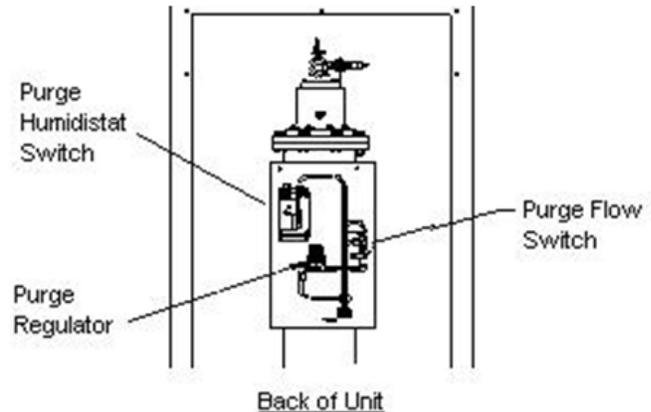


Figure 44: Purge Gas Control

MAINTENANCE PROCEDURES:

Procedure M5-2: Humidistat Replacement Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Shut down the unit. Turn off main power. Shut off the purge gas supply

 ATTENTION	 CAUTION
Vérifiez que l'alimentation électrique est coupée, et tous les périphériques de verrouillage / débranchement nécessaires sont correctement installés.	Verify that the electrical supply is shut off, and any necessary lockout/tagout devices are properly installed.

- 3) Open the rear cabinet door.
- 4) Remove the black plastic enclosure cover on the humidistat.
- 5) Remove female disconnect terminal connectors.
- 6) Remove screw from the center of the humidistat switch and remove the humidistat from the unit. Install new humidistat and replace center screw to mount the switch to the unit.

Note: Do not over tighten. The humidistat device needs to be fairly loose in the black box so that the switch setting is not impeded.

- 7) Replace female disconnect terminal connectors.
- 8) Remove electrical lockout/tag out devices as required by facility guidelines. Turn ON POWER to the unit.
- 9) Perform procedure *M5-1: Humidistat Inspection Procedure* and verify that humidistat is operating properly by performing the humidistat inspection procedure listed in this section of the manual.
- 10) Replace the black plastic enclosure cover on the humidistat.
- 11) Replace the rear cabinet panel.

MAINTENANCE PROCEDURES:

M6: Pressure Relief Valve (PRV), Bottom Half Plumbing

The PRV is located near the inlet water plumbing connection at the bottom of the heater side of the cabinet. The PRV and the inlet plumbing should be inspected every 6 months to insure that there are no leaks.

Procedure M6-1: PRV Inspection Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Continue water flow through the unit for this procedure.
- 3) Open the rear cabinet door.
- 4) Inspect all of the plumbing connections on the bottom half of the unit for leaks. Any leaks found must be repaired.
- 5) Locate the PRV which is connected to the TEE fitting that is adjacent to the inlet plumbing connection (see figure).
- 6) Inspect the discharge tubing of the PRV. Confirm that there is no liquid in the discharge tube. If the PRV is leaking it must be replaced.
- 7) Confirm that the weep hole of the PRV is not leaking.

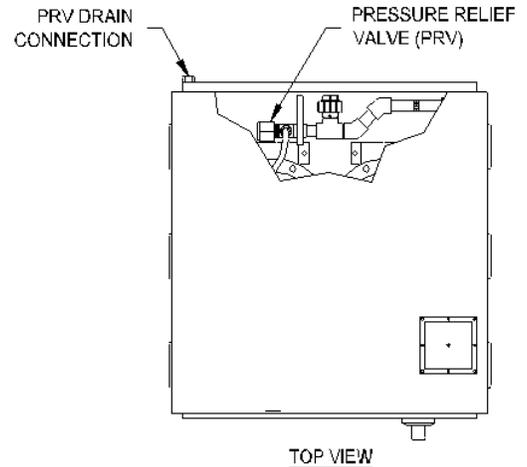


Figure 45: PRV Location

Procedure M6-2: PRV Replacement Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Continue water flow through the unit and allow it to cool to ambient temperature. Shut off power to the unit.
- 3) STOP flow of water to the unit and drain the heater. A provision for draining the unit must be installed on the inlet plumbing when the unit is installed. If no method of draining the unit was provided, the inlet water connection must be removed.

 ATTENTION	 CAUTION
<p>Vérifiez que l'alimentation électrique est coupée, et tous les périphériques de verrouillage / débranchement nécessaires sont correctement installés.</p>	<p>Verify that the electrical supply is shut off, and any necessary lockout/tagout devices are properly installed.</p>

- 4) Once the system is drained, open the rear cabinet door. The PRV is attached to the TEE on the inlet plumbing.

MAINTENANCE PROCEDURES:

Procedure M6-2: PRV Replacement Procedure (Continued):

- 5) Disconnect the ½-inch fluoropolymer discharge tube by loosening and removing the compression fitting on the PRV.
- 6) Unscrew and remove the PRV by turning the PRV body counter-clockwise.
- 7) Inspect the O-Ring located in the inlet manifold for any damage.
- 8) Screw the new PRV into the inlet manifold connector.

Note: Do not disturb the setting of the gray pvc adjustment cap. Do not over-tighten the compression fitting.

- 9) Re-connect the ½-inch discharge tubing to the PRV.
- 10) Start flow of water to the unit and check for leaks.
- 11) Close the rear cabinet door.

M7: Cabinet Cooling Fans

There are two cooling fans located in the heater cabinet. Both fans are located on the left side of the unit, near the top. One cooling fan is mounted in the electrical side, and one cooling fan is located in the plumbing side of the cabinet. These cooling fans should be operating continuously while power is applied.

The cooling fans should be replaced every 24-months.

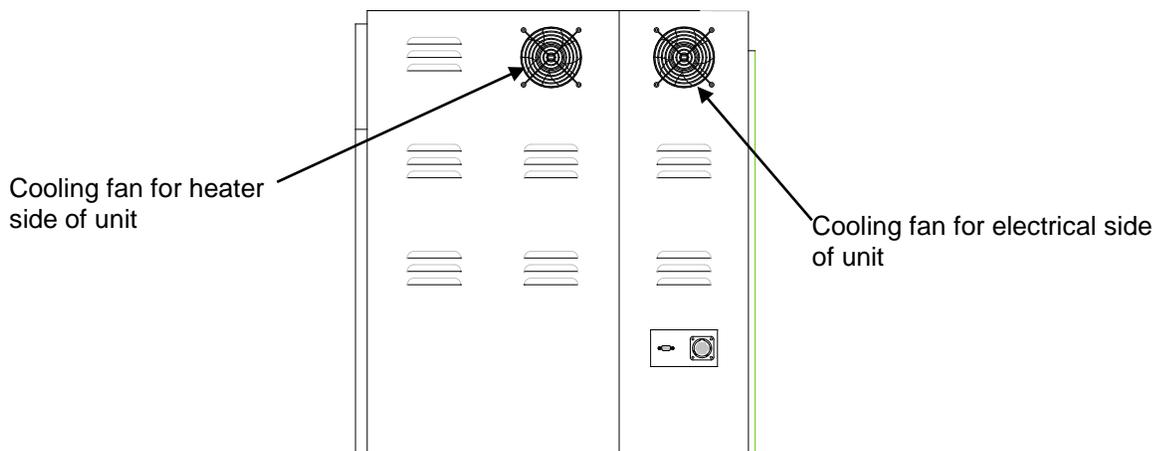


Figure 46: Cabinet Cooling Fans

Procedure M7-1: Cooling Fan Inspection Procedure:

Verify that the cooling fans are operating. If a cooling fan has stopped, it must be replaced.

MAINTENANCE PROCEDURES:

Procedure M7-2: Cooling Fan Replacement Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Turn OFF Power to the unit.

 ATTENTION	 CAUTION
Vérifiez que l'alimentation électrique est coupée, et tous les périphériques de verrouillage / débranchement nécessaires sont correctement installés.	Verify that the electrical supply is shut off, and any necessary lockout/tagout devices are properly installed.

Cooling fan located in heater side of the cabinet:

- 3) Open the rear cabinet door.
- 4) If the cooling fan is wired to a multi-port sensor/actuator box located on the back panel, then disconnect the plug for the leak detector. When included, this fan unit is usually connected to port 2, but refer to your electrical prints to confirm the correct port number. If the wires for the cooling fan are hard-wired to terminals on the low-voltage electrical panel, disconnect the wires from those terminals. Refer to the electrical print for the specific terminal numbers.
- 5) Disconnect the fan wires from the connector plug, if applicable.
- 6) Remove the cooling fan and fan guard from the sidewall of the cabinet.
- 7) Wire the leads for the replacement cooling fan the connector plug, if necessary.
- 8) Attach the replacement fan and fan guard to the side of the cabinet.
- 9) If the heater has the multi-port sensor/actuator box, then connect the plug for the cooling fan to the appropriate connection on the box. If the wires for the cooling fan were connected to terminals on the low voltage electrical panel, then connect the wires to the appropriate terminals.
- 10) Remove lockout-tagout items. Power up the unit. Confirm that the replacement fan is operating.

Cooling fan located in the electrical side of the cabinet:

- 3) Open the front cabinet door.
- 4) Locate the power wires going from the cooling fan to the terminal blocks on the low voltage panel. Refer to the electrical prints of the unit for the correct terminal block numbers. Disconnect the fan wires from the terminal blocks.
- 5) Remove the cooling fan and fan guard from the sidewall of the cabinet.
- 6) Attach the replacement fan and fan guard to the side of the cabinet.
- 7) Connect the replacement cooling fan wires to the terminal blocks.
- 8) Remove lockout-tagout items. Power up the unit. Confirm that the replacement fan is operating.

MAINTENANCE PROCEDURES:

M8: SSR Cooling Fans

Each solid state relay (SSR) module has an aluminum heat sink with a cooling fan mounted on the underside. This fan draws cool air into the unit through the underside of the cabinet. These SSR modules are located at the bottom of the electrical side of the cabinet. The cooling fan should be operating continuously while power is applied.

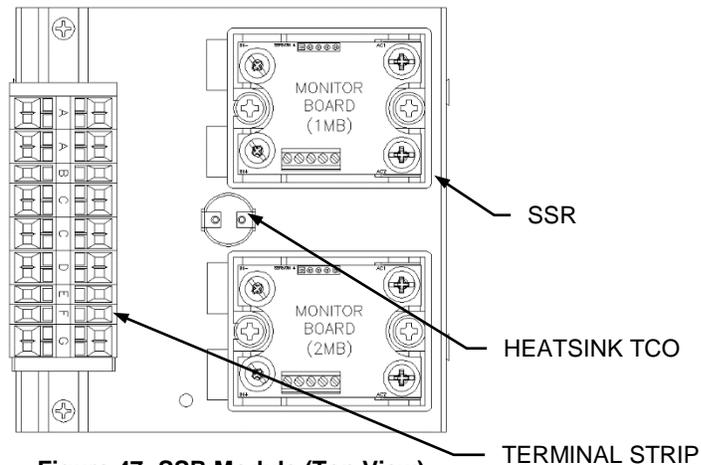


Figure 47: SSR Module (Top View)
Monitoring boards shown

Procedure M8-1: SSR Cooling Fan Inspection Procedure:

Open the front cabinet door. Verify that the cooling fans are operating. If a cooling fan has stopped, it must be replaced. Since a failed SSR fan will cause thermal stress to those SSRs mounted on the heat sink, it is recommended to replace the entire SSR module rather than just the fan.

Procedure M8-2: SSR Cooling Fan Replacement Procedure:

Refer to the instructions provided with the replacement SSR module for the replacement procedure.

MAINTENANCE PROCEDURES:

M9: Circuit Breaker

The main circuit breaker includes a test button located on its face. The circuit breaker should be inspected for proper operation every 6 months.

Procedure M9-1: Circuit Breaker Inspection Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Press the red POWER OFF button on the front of the unit.
- 3) Continue water flow through the unit for this procedure. Allow the unit to cool to ambient inlet temperature.
- 4) Open the front cabinet door.
- 5) Press the TEST button on the front of the circuit breaker. When this button is pressed, the entire unit will shut off.
- 6) Reset the circuit breaker and turn on the unit.

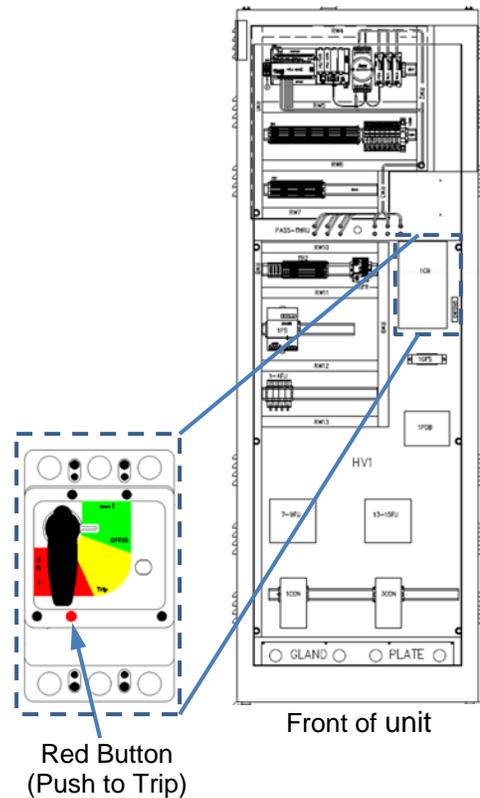


Figure 48: Circuit Breaker

MAINTENANCE PROCEDURES:

M10: Safety Contactors

The safety contactors are mounted on the high-voltage section of the electrical panel. Each safety contactor should be inspected for proper operation every 6 months.

Procedure M10-1: Safety Contactor Inspection Procedure:

- 1) If the unit is in LOCAL mode, press the HEATER ON/OFF button to the OFF position. If the unit is in REMOTE mode disable the heater from the customer supplied remote controller. This will also prevent the heaters from energizing.
- 2) Turn OFF power to the unit.

 ATTENTION	 CAUTION
Vérifiez que l'alimentation électrique est coupée, et tous les périphériques de verrouillage / débranchement nécessaires sont correctement installés.	Verify that the electrical supply is shut off, and any necessary lockout/tagout devices are properly installed.

- 3) Continue water flow through the unit for this procedure. Allow the unit to cool to ambient inlet temperature.
- 4) Open the front cabinet door.
- 5) Using an ohm meter, measure the continuity across each of the poles of each safety contactor (ie. L1 to T1, etc.). With power turned off, you should measure no continuity (infinite ohms).
- 6) If continuity is detected across any of the poles of the safety contactor at this time, when power is turned off, the contactor must be replaced.
- 7) Press and hold the test button on each safety contactor. With the button depressed, measure the continuity across each of the poles again. This time you should measure continuity (low ohms).
- 8) If no continuity is detected while the button is depressed, the contactor must be replaced.

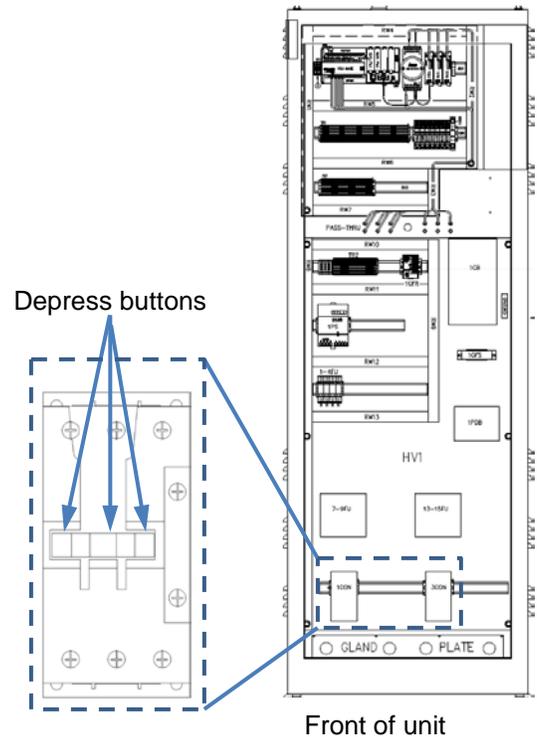


Figure 49: Safety Contactor

SPARE PARTS:

Listed below is the spare parts list for the **LUFRAN™** fluoropolymer inline water heater. These are items that may need replacement after some time in service. This is not the complete parts list, so there are some heater components that are not listed below. Please contact PROCESS TECHNOLOGY if a more complete parts list is needed.

Spare Parts List Common to all Units:

Process Technology Part #	Description	Qty
13192	POWER SUPPLY, 24VDC, 240W	1
16264	HUMAN MACHINE INTERFACE, COLOR 7-INCH SCREEN (FOR 1 AND 2-COLUMN UNITS)	1
15638	HUMAN MACHINE INTERFACE, COLOR 10-INCH SCREEN (FOR 3 AND 4-COLUMN UNITS)	1
10937	POWER ON SWITCH ASSEMBLY (pushbutton, light, base, contact block)	1
10938	POWER OFF SWITCH ASSEMBLY (pushbutton, light, base, contact block)	1
10939	EMO SWITCH ASSEMBLY (pushbutton, light, base, contact block)	1
7383	RELAY: SSR, 15Amps, 50VDC	1
8986	RELAY: SSR Module, 125Amps, 600VAC (One per heating column 24-52kW (heat sink, two SSRs, overtemp thermostat, cooling fan, guard)	1
4851	Alarm, Sonalert audible buzzer	1
9289	FAN: Cabinet Cooling Fan, 24 VDC	2
9961	HUMIDISTAT: HUMIDITY CONTROL	1
TC-L-KT-2.25	SENSOR: Inlet/outlet water temperature, J-type thermocouple	2
3947	FUSE: 10A, 600V	4

Additional Spare Parts for Specific Units:

Process Technology Part #	Part for the Following Wattage Units:	Description	Qty
**		FUSE: high voltage power distribution (Refer to page 1 of the electrical prints for the specific part number of these fuses.)	3
**		HEATER: replacement heating column (Refer to label on heating column for the specific model number of this part)	1
TC-L2-KT	Up to 52kW, 105kW	SENSOR: heating column water temperature, J-type thermocouple, one sensor per column	1
TC-L2-KT-15	65kW, 72kW, 78kW, >130kW	SENSOR: heating column water temperature, J-type thermocouple, one sensor per column	1

SPARE PARTS:

Recommendations:

- 1) One complete spare parts kit is sufficient for every 4 to 6 **LUFRAN™** fluoropolymer inline water heaters installed in a single location. Be sure to immediately reorder any parts that are used.
- 2) Sensors for the inlet/outlet process water (Part # TC-DI-L2-2.25) are a required spare part for each DI Heating Column. Spare sensors have already been provided with the unit. If needed, order 2 spare control thermocouples per heating column.

Note: Quantities may vary depending on the number of heating columns in a particular unit.

CLEANING:

The **LUFRAN™** fluoropolymer inline water heater was thoroughly cleaned prior to shipment. The inlet/outlet plumbing connections were sealed and the heating columns were charged with nitrogen gas prior to shipment. PROCESS TECHNOLOGY recommends that, at a minimum, the following steps be taken to remove any contamination that may have been added to the system during installation. Additional steps may be required for certain applications. For sanitization procedures, contact your DI Water system supplier for their recommendations. The bypass to the DI recirculation loop should be installed as close as possible to the process tank. Confirm that the bypass plumbing will be able to withstand the maximum temperature and pressure that will be generated by the system.

This procedure should only be performed by qualified technicians.

- 1) Allow DI water to flow through the unit unheated with the maximum possible flow rate for one (1) hour. The effluent should be directed to the drain.

Note: In order to prevent damage to the heater coils, the purge system must be operated any time there is fluid inside the heater column.

- 2) Turn ON the heater and set the operating temperature at 70°C
- 3) Allow the unit to run at the maximum attainable flow rate for at least three (3) hours at elevated temperature.
- 4) Sanitize the system. Refer to the material compatibility chart to verify that the o-ring material will not be damaged by the sanitizing chemicals.
- 5) Proceed with normal operation after sanitizing and rinse procedures are completed.

Notes: The time required for absolute cleaning of the system will be dependent on DI Water quality, flow rates, and installation techniques.

System Sanitizing:

Consult your DI Water equipment supplier to determine a method of sanitizing that will be compatible with *all* of the materials used throughout the system.

WARRANTY:

All PROCESS TECHNOLOGY equipment, heaters and controls have been carefully inspected before shipping and are warranted to be free from defects in workmanship and materials for a period of one year from date of purchase on a pro-rated basis. At its option, PROCESS TECHNOLOGY will repair or replace any defects that are exhibited under proper and normal use. PROCESS TECHNOLOGY disclaims any responsibility for misuse, misapplication, negligence or improper installation of equipment, tampering or other operating conditions that are beyond its control (such as excessively high or low purge gas supply pressure). PROCESS TECHNOLOGY makes no warranty or representation regarding the fitness for use or the application of its products by the customer.

All products and components not manufactured by PROCESS TECHNOLOGY will carry the original manufacturer's warranty, copies of which are available upon request. PROCESS TECHNOLOGY makes no warranty or representation, expressed or implied, with respect to the products not manufactured by PROCESS TECHNOLOGY.

Products must be installed and maintained in accordance with PROCESS TECHNOLOGY instructions.

PROCESS TECHNOLOGY is not liable for labor costs incurred in removal, reinstallation, or unauthorized repair of the product or for damage of any type including incidental or consequential damage.

PROCESS TECHNOLOGY neither assumes nor authorizes any representative of PROCESS TECHNOLOGY or any other person to assume for it any other liabilities in connection with the sale of the products. This warranty may not be verbally changed or modified by any representative of PROCESS TECHNOLOGY.

SHIPPING DAMAGES:

Claims against freight carriers for damage in transit must be filed by the customer at the time of delivery or as soon as possible.

RETURNS:

No product shall be returned to PROCESS TECHNOLOGY without first obtaining a return material authorization (RMA) number from a PROCESS TECHNOLOGY representative. All returns must be freight prepaid. Freight collect or shipments without authorization will be refused.

INFORMATION:

PROCESS TECHNOLOGY will endeavor to furnish such advice as it may be able to supply with reference to the use by buyer of any material purchased, but PROCESS TECHNOLOGY makes no guarantees and assumes no obligation or liability for advice given verbally or in print or the results obtained. Buyer assumes all risk and liability that may result from the use of any material, whether used by itself or in combination with other products. No suggestion for product use shall be construed as a recommendation for its use in infringement on any existing patent.

CONFLICT BETWEEN DOCUMENTS:

Acceptance of this offer is expressly conditioned upon agreement to all terms and conditions contained herein. In the event of a conflict between the terms and conditions of purchaser's purchase order, and PROCESS TECHNOLOGY's terms and conditions, proposal or offer, the latter shall govern.

APPENDIX:

-23 CONFIGURATION

This section applies only to units that include the “-23” optional configuration. This configuration adds the ability to operate the heating column(s) at a preset output during periods of no hot water demand, when there is a low “trickle flow” of DI water passing through the unit.

LOW FLOW BYPASS CALIBRATION STARTUP PROCEDURE:

This calibration procedure should be performed before the first time the unit is operated during a Low Flow Bypass, and whenever the flow rate during this bypass or the process set point changes.

Operation of the heater during the Low Flow Bypass will disable the DAC control system and allow the unit to operate under a manual % output form of control. The % output is designated by the operator. By observing the performance of this unit under the selected % output, the operator may adjust the heater % output to improve heater response during Low Flow Bypass, allowing the heater to maintain the process set point.

This procedure must be performed following the STARTUP PROCEDURE provided in this manual.

- 1) Once the startup procedure is complete, lower the process flow rate to the desired “Low Flow Bypass” flow rate. Ensure that this is a steady flow of water through the unit. Fluctuations in water flow will affect the results of calibration.
- 2) Access the TRICKLE FLOW menu on the touch screen interface. Use the buttons on the navigation panel to first access the MAIN menu, and then press the CONFIG button at the bottom of the main menu screen. Enter the password (default = 1234). This will bring you to the first screen of the CONFIGURATION menu. Press NEXT to reach the second screen of the CONFIGURATION menu.
- 3) Press the TRICKLE FLOW RATE button and enter the current flow rate.
- 4) Press the TRICKLE OUT % button. This button will display the CURRENT OUTPUT %. The operator can change this value by pressing the button. A numeric keypad will appear to allow the operator to enter a new % output value. The operator must press ENTER (↵) on the keypad in order to save the new value.
- 5) Press MAIN, this will return to the main menu. Restore flow and press heater enable button. Once temp has stabilized drop flow to the desired trickle flow rate. The unit will go into trickle flow mode, and output % will be value set previously. repeat process until the output % is able to maintain temperature
- 6) Compare the outlet temperature of the unit to the desired process set point.
- 7) If the outlet temperature is higher than the desired process set point, then decrease the MANUAL % OUTPUT.
- 8) If the outlet temperature is lower than the desired process set point, increase the MANUAL % OUTPUT.
- 9) Repeat steps 7-8 until the outlet temperature matches the desired process set point. Once the unit outlet temperature matches the desired process set point the unit is calibrated.
- 10) Return to the CONTROL ACCESS menu, and return the system to REM mode, to allow for remote operation.

NOTES ON OPERATIONAL CONDITIONS:

- The system will revert to low flow bypass mode when the flow rate drops below the set value. The only means to turn off the heater if needed is to return to the main menu and turn off the heater enable button
- While in “low flow bypass” mode the “Low Flow” alarm will be inactive. ALL other safety circuits ARE active.

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