SECTION 1: INTRODUCTION

The Lufran Ultrapure DI Water Heaters are designed to provide safe, uniform, energy efficient heating. To maintain Ultapure DI water quality, only high-purity fluorocarbon polymers contact the water as it is heated. The DI water makes NO contact with any metal or coated metal parts as it passes through the heating system. Wetted surfaces consist of PTFE Teflon® ensleeved heating elements and PVDF lined chamber and plumbing connections.

The Lufran Patented Purge Design introduces a small flow rate of Nitrogen through the heating element to prevent process contamination and maximum heater life. The design prevents reverse-flow permeation of entrapped moister and corrosive vapors that can cause contamination in ultra-pure process applications. Continuous purge exhaust monitoring allows the detection of even minute leaks through the Teflon® sheath before process contamination can occur.

The fluorocarbon lined, stainless steel shell column design compensates for any axial and radial expansion to allow operation pressures up to 100 PSI. The low mass-to-wattage ratio of the Lufran heater design optimizes heat-up time and minimizes overshoot due to the latent heat of the elements.

The Lufran Ultrapure DI Water Heaters are protected from accidental damage by a network of Safety Device Interlocks:

(1) Heater Over-Temperature Thermocouple
(2) Independent High Process Limit Control
(3) Temperature Controller High Temperature Alarm
(4) Capacitance-type Liquid Level Sensor
(5) Pressure Comparitor Relay Circuit
(6) Humidity Monitor
(7) Loss of Phase on SSR (Supply)
(8) Loss of Phase on SSR (Load)
(9) Shorted SSR
(10) SSR Over-temperature Bi-metallic

The patented heating element design provides the following benefits:

(1) The low mass-to-wattage ratio optimizes heat-up efficiency and minimizes overshoot caused by the latent heat of the elements.
(2) The Nitrogen purge feature protects the heating elements from the effects of permeation.
(3) The purge exhaust monitor has the ability to immediately detect and failure in the Teflon® tubing that may allow the DI water to make contact with the heater elements.

OPERATING ENVIRONMENT

Statement of Operating Environment: The LUFRAN DI Water Heater equipment fulfills the following definitions for operating conditions as defined by BS EN 61010-1: 1993.

POLLUTION DEGREE 1: No pollution or only dry, nonconductive pollution occurs within the micro-environment. The pollution has no influence. Pollution is defined as foreign matter, solid, liquid or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity.

INSTALLATION CATEGORY (OVERVOLTAGE CATEGORY) III: Classification of parts of installation systems or circuits with standardized limits for transient overvoltages, dependent on the nominal line voltage to earth.
Category III applies to distribution level and fixed installation equipment with transient overvoltages defined in IEC 664.

1.1 LUFRAN ULTRAPURE DI WATER HEATER MODEL SPECIFICATIONS

MODEL # 075-RE-480-100-U

SYSTEM POWER REQUIREMENTS:	75KW , 480 VAC, 90 AMP, 50/60 HZ, 3 PHASE

WET PART MATERIAL LIST:	
HEATER:	Patented Purged PTFE Teflon® Resistive Heater Design
CHAMBER AND FLUID CONNECTIONS:	PVDF
O-RINGS:	Red Silicon

CHAMBER:	
CHAMBER SIZE:	See Dimensional Drawings
CHAMBER VOLUME:	Approximately 4 gallons per column
CABINET:	N/A

CONNECTIONS:	
FLUID (INLET AND OUTLET):	25 mm Union Fitting
NITROGEN GAS (INLET AND OUTLET):	¼" Compression Fitting
PRESSURE RELIEF VALVE DRAIN:	N/A
CABINET DRIP PAN:	N/A
(OPTIONAL) RESISTIVITY COOLING CHAMBER:	N/A

TEMPERATURE CONTROLS:	
PROCESS CONTROL SYSTEM:	Eurotherm 808,
PROCESS CONTROL TEMPERATURE SAFETY DEVICES:	
Heater :	"E" Type Thermocouple
Process Fluid :	Titanium, PVDF ensleeved "J" Type Thermocouple
SAFETY INTERFACES:	EMO, LGFR
RELAY:	Mercury

OPERATING TEMPERATURES:	
PROCESS:	Ambient to 95 ° C
STORAGE RANGE:	-40 to 60 ° C

OPERATING PRESSURES:	
PROCESS FLUID:	10 PSIG minimum, 100 PSI maximum at 95 ° C
NITROGEN PURGE:	40 - 60 PSIG:
PRESSURE RELEIF VALVE SETTING:	Opens above 100 PSI
(OPTIONAL) RESISTIVITY COOLING CHAMBER:	
OPERATING FLOWS:	
NITROGEN GAS:	4 – 5 SCFH via 0.25" OD plastic tubing
(OPTIONAL) RESISTIVITY COOLING CHAMBER:	4 – 6 GPH

OPTIONS:	
RESISTIVITY COOLING CHAMBER:	N/A
DIGITAL FLOWMETER:	N/A

1.2 PERFORMANCE DATA

Lufran's Ultrapure DI Water Heaters are designed to provide a desired increase in temperature for a given flow rate. Lufran recommends that worst case conditions, including minimum inlet temperature, maximum outlet temperature, and maximum flow rate, be used to size the heater for the application. The accompanying tables show the maximum increase in temperature (ΔT) that can be achieved using continuous flow conditions for Lufran's Ultrapure DI Water Heaters ranging in size from 7 kW to 130 kW.

$$\text{KW required} \quad \frac{\text{GPM} \times \Delta T}{3.79}$$

$$\text{KW required} \quad \frac{\text{LPM} \times \Delta T\ (°C)}{14.35}$$

The sizing formulas are shown below. In addition, the maximum achievable temperature values have been calculated for a range of flow rates, and can be found in the chart. To use the charts, find the desired flow rate, and follow the row to the required temperature increase. The appropriate heater size is identified at the top of the column. Conversely, the maximum acceptable operating conditions for the purchased heater can be identified by following the column down to the row with the required flow rate.

Lufran Ultrapure DI Water Heater Models

Flow Rate, GPM	007	015	022	036	045	052	065	075	090	105	110	130
1	28	57	85	-	-	-	-	-	-	-	-	-
2	14	28	43	71	85	99	-	-	-	-	-	-
3	9	19	28	47	57	66	82	95	-	-	-	-
4	-	14	21	36	43	50	62	71	85	99	-	-
5	-	11	17	28	34	40	49	57	68	80	83	98
6	-	9	14	24	28	33	41	47	57	66	69	82
7	-	-	12	20	24	28	35	41	49	57	60	70
8	-	-	11	18	21	25	31	36	43	50	52	62
9	-	-	9	16	19	22	27	32	38	44	46	55
10	-	-	-	14	17	20	25	28	34	40	42	49

Flow Rate, LPM	007	015	022	036	045	052	065	075	090	105	110	130
4	27	54	81	-	-	-	-	-	-	-	-	-
6	18	36	54	90	-	-	-	-	-	-	-	-
8	13	27	40	67	81	-	-	-	-	-	-	-
10	11	22	32	54	65	75	93	-	-	-	-	-
12	9	18	27	45	54	63	78	-	-	-	-	-
14	8	15	23	38	46	54	67	77	-	-	-	-
16	-	13	20	34	40	47	58	67	81	-	-	-
18	-	12	18	30	36	42	52	60	72	84	-	-
20	-	11	16	27	32	38	47	54	65	75	79	93
22	-	10	15	24	29	34	42	49	59	68	72	85
24	-	9	13	22	27	31	39	45	54	63	66	78
26	-	-	12	21	25	29	36	41	50	58	61	72
28	-	-	12	19	23	27	33	38	46	54	56	67
30	-	-	11	18	22	25	31	36	43	50	53	62
32	-	-	10	17	20	24	29	34	40	47	49	58
34	-	-	9	16	19	22	27	32	38	44	46	55
36	-	-	9	15	18	21	26	30	36	42	44	52
38	-	-	-	14	17	20	25	28	34	40	42	49
40	-	-	-	13	16	19	23	27	32	38	39	47