DTH Electric Boilers

Models ranging from 42 kW to 144 kW :
240 Volts (1 phase) , 480 and 600 Volts (3 phases).

USE & CARE MANUAL

WITH INSTALLATION INSTRUCTIONS FOR THE CONTRACTOR

Your *DTH's Electric Boiler* has been carefully assembled and factory tested to provide years of trouble-free service. In order to ensure performance, the following information and safety precautions are provided to enable proper installation, operation, and maintenance of this product.

It is imperative that all persons who are expected to install, operate or adjust this electric boiler should read these instructions carefully to fully understand how to do so.

Any questions regarding the operation, maintenance, service or warranty of this electric boiler should be directed to the supplier.

When all installation steps have been completed, insert this installation manual in its original envelope, and keep in a safe place (close to the boiler) for future reference.

THERMO 2000 INC. Revision June 2014
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Section 1 : Dimensions & Specifications

Table 1: Electric Ratings for 240 VAC (1 phase) Electric Boilers:

Model	P Kw	Current Amp Heating Elements	Elements	Stages	Aquastats	Lights	Contactors	Sequencers
DTH 42	42	175	7 X 6KW	7	7	7	2	1
DTH 48	48	200	8 X 6KW	8	8	8	2	1
DTH 54	54	225	9 X 6KW	9	9	9	3	2
DTH 60	60	250	10 X 6KW	10	10	10	3	2
DTH 66	66	275	11 X 6KW	11	11	11	3	2
DTH 72	72	300	12 X 6KW	12	12	12	3	2
DTH 78	78	325	13 X 6KW	13	13	13	4	3
DTH 84	84	350	14 X 6KW	14	14	14	4	3
DTH 90	90	375	15 X 6KW	15	15	15	4	3
DTH 96	96	400	16 X 6KW	16	16	16	4	3

Table 2: Electric Ratings for 480 VAC (3 phases) Electric Boilers:

C US

Model	P Kw	Current Amp	Élements (277V)	Stages	Aquastats	Lights	Power contactors	Secondary contactors	Sequencers
DTH 45	45	54	9 X 5KW	3	3	3	2	3	1
DTH 54	54	65	9 X 6KW	3	3	3	2	3	1
DTH 60	60	72	12 X 5KW	4	4	4	2	4	1
DTH 72	72	87	12 X 6KW	4	4	4	2	4	1
DTH 78	78	94	12 X 5KW 3 X 6KW	5	5	5	3	5	2
DTH 90	90	108	15 X 6KW	5	5	5	3	5	2
DTH 99	99	119	9 X 5KW 9 X 6KW	6	6	6	3	6	2
DTH 102	102	123	12 x 6KW 6 x 5Kw	6	6	6	3	6	2
DTH 108	108	130	18 x 6 KW	6	6	6	3	6	2
DTH 120	120	144	24 X 5KW	8	8	8	4	8	3
DTH 132	132	159	12 X 5KW 12 X 6KW	8	8	8	4	8	3
DTH 144	144	173	24 X 6KW	8	8	8	4	8	3

Table 3: Electric Ratings for 600 VAC (3 phases) Electric Boilers:

Model	P Kw	Current Amp	Élements (347V)	Stages	Aquastats	Lights	Power contactors	Secondary contactors	Sequencers
DTH 45	45	43	9 X 5KW	3	3	3	2	3	1
DTH 54	54	52	9 X 6KW	3	3	3	2	3	1
DTH 60	60	58	12 X 5KW	4	4	4	2	4	1
DTH 72	72	69	12 X 6KW	4	4	4	2	4	1
DTH 78	78	75	12 X 5KW 3 X 6KW	5	5	5	3	5	2
DTH 90	90	87	15 X 6KW	5	5	5	3	5	2
DTH 99	99	95	9 X 5KW 9 X 6KW	6	6	6	3	6	2
DTH 102	102	98	12 x 6KW 6 x 5Kw	6	6	6	3	6	2
DTH 108	108	104	18 x 6 KW	6	6	6	3	6	2
DTH 120	120	115	24 X 5KW	8	8	8	4	8	3
DTH 132	132	127	12 X 5KW 12 X 6KW	8	8	8	4	8	3
DTH 144	144	139	24 X 6KW	8	8	8	4	8	3

Table 4: Connections sizes & Boiler overall dimensions

Connections sizes		Boiler overall dimensions	
Boiler inlet	2 " NPT M	Height	33 po
Boiler outlet	2 " NPT M	Depth	46 po
Waterworks	1/2 " NPT M	Width	22 po
Safety valve	3/4 " NPT F	Shipping weight	395lbs
Drain valve	3/4 " NPT M	Volume	35.6 Gal US.

Operating temperature : from 50°F to 190°F.;

Maximum operating pressure:

Models at 480 & 600V :

45 to 72 kW : 30 psi. or 60psi (See boiler identification plate)

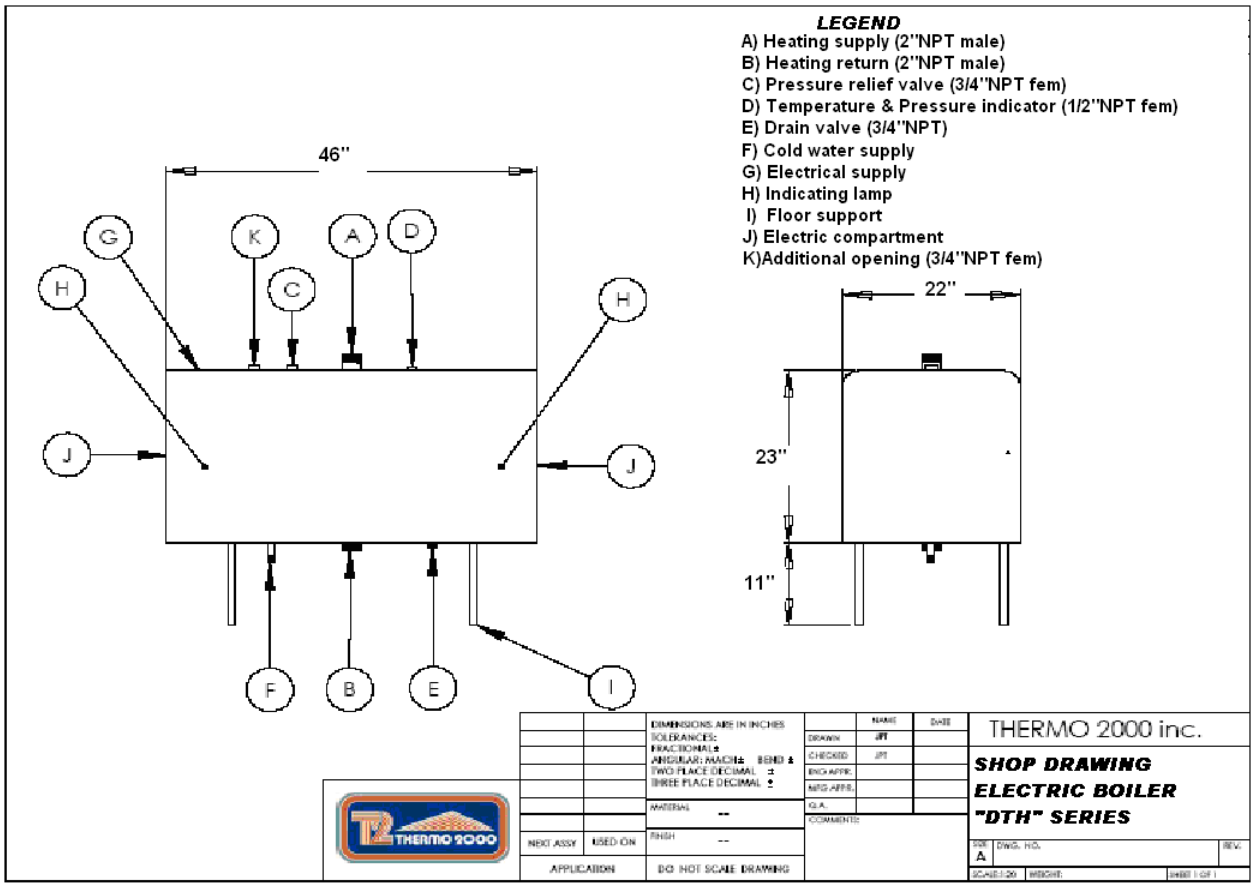
78 to144kW :: 60psi

Models at 240V/1ph :

42 & 48kW : 30 psi ou 60lpsi (See boiler identification plate)

54 to 96kW : 60 psi

Figure 1 : Component identification



General Safety Precautions

Be sure to read and understand the entire Use & Care Manual before attempting to install or to operate this electric boiler. Pay particular attention to the following General Safety Precautions. Failure to follow these warnings could cause property damage, bodily injury or death. Should you have any problems understanding the instructions in this manual, STOP, and get help from a qualified installer or technician.

Section 2 : Introduction

WARNING

The important safeguards and instructions appearing in this manual are not meant to cover all possible conditions and situations that may occur. It should be understood that common sense, caution and care are factors which cannot be built into every product. They are the responsibility of the person(s) caring for and operating the unit.

2.1 LOCAL INSTALLATION REGULATIONS

This electric boiler must be installed in accordance with these instructions and in conformity with local codes, or in the absence of local codes, with the National Plumbing Code and the National Electric Code current edition. In any case where instructions in this manual differ from local or national codes, the local or national codes take precedence.

2.2 CORROSIVE ATMOSPHERE

The electric boiler should not be located near an air vent containing a corrosive atmosphere or high humidity. The limited warranty is void when the failure of the electric boiler is due to a corrosive atmosphere.

2.3 SHIPMENT INSPECTION

Inspect the electric boiler for possible shipping damage. The manufacturer's responsibility ceases upon delivery of goods to the carrier in good condition. Consignee must file any claims for damage, shortage in shipments, or non-delivery immediately against carrier.

2.4 CHECK LIST

Please check the identification tag on the unit to make sure you have the right model, voltage and pressure rating.

List of components shipped with the unit :

- **Pressure relief valve.**
- **Drain valve.**
- **Tridicator (temperature & pressure gage).**

CAUTION

The electric boiler should not be located in an area where leakage of the tank or water connections will result in damage to the adjacent area or to lower floors of the structure. When such areas cannot be avoided, a suitable drain pan or non-flammable catch pan, adequately drained, must be installed under the boiler. The pan must be connected to a drain.
NOTE: Auxiliary catch pan MUST conform to local codes.

Section 3 : INSTALLATION

⚠ WARNING

The manufacturer's warranty does not cover any damage or defect caused by installation, or attachment, or use of any special attachment other than those authorized by the manufacturer, into, onto, or in conjunction with the boiler. The use of such unauthorized devices may shorten the life of the boiler and may endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized devices

3.1 SECURITY CONSIDERATIONS

Domestic and commercial installations have a maximum design operating pressure limited to 30 psi (207 kPa) or 60psi (414kPa) by a safety relief valve.

Boiler maximum operating temperature is 190°F by design. This boiler is designed **to be used only** in a hot water heating system.

⚠ CAUTION

The heat transfer medium must be water or other non-toxic fluid. An antifreeze solution with propylene glycol specially formulated for heating system could be used up to a maximum concentration of 50%

3.2 LOCATION

The electric boiler should be installed in a clean, dry location. Long hot water lines should be insulated to conserve energy. The electric boiler and water lines should be protected from exposure to freezing temperatures.

The electric boiler must be installed horizontally directly on the floor or wall. Supporting legs are included but wall mounting brackets are not.

The electric boiler must be located or protected so as not to be subject to physical damage, for example, by moving vehicles, area flooding, etc. All models can be installed on combustible floors and in alcoves. Ambient temperature must not exceed 80°F or 27°C.

3.3 CLEARANCE

Minimum clearances for adequate inspection and servicing are listed in the following table:

Table 4: Boiler clearance

Left side	14 inches
Right side	14 in.(78to144kW 480&600v) (54to96kWx 240v) 0in. Other models
Top & bottom of the boiler	12 inches
Front side of the boiler	24 inches
Back side of the boiler	0 inch

3.4 SYSTEM SETUP

The recommended piping arrangement is shown in Figure 4, 5 and 6 including the pump, expansion tank, drain valve, pressure relief valve, air vent, flow check valve and pressure-temperature gauge. Details about each item follow.

3.4.1 Boiler connections

This electric boiler may be connected individually or in parallel with other boilers. If two or more boilers are connected, the "reverse-return piping" method (whereby the boiler with the first return inlet also has the last supply outlet and so forth until the last return inlet corresponds to the first supply outlet) should be used to connect the boilers in parallel, to ensure an equal water flow rate through each boiler.

The boiler water supply, located on the top side, and the boiler water return, located on the bottom side of the boiler are steel pipes (male NPT threaded connection) where supply and return line connections are to be made.

Installing a union is recommended on the boiler water supply and return lines to facilitate boiler disconnection for servicing.

Dielectric unions are required for protection of the boiler and piping if dissimilar pipe material such as galvanized steel and copper are present.

Use only clean, new piping for boiler water lines. Local codes or regulations shall govern the exact type of material to be used.
Insulate all pipes containing hot water, especially in unheated areas.
Install shutoff (ball) valves for servicing convenience. Thermometer(s) should be installed on the boiler water supply and return lines.
Cap or plug unused connections on the boiler. **Do not cap the pressure relief valve** on the boiler since it will damage and shorten the life of the boiler and may endanger life and property.

3.4.2 Flow check valve

If the heating system includes a single pump, then to minimize flow by gravity and heat loss during non-draw periods, **a flow check valve must be installed.**

3.4.3 Pressure relief valve

An automatic pressure relief valve must be installed during boiler setup. The pressure rating of the relief valve must not exceed the pressure design of the boiler as shown on the pressure vessel name plate. The safety relief valve must meet the requirements of the *ASME Boiler and Pressure Vessel Code* and limit the maximum operating boiler pressure. It is a safety device, not an operating control.
The BTU per hour rating of the relief valve must equal or exceed the BTU per hour input of the boiler(s) or heat source(s) as marked on the boiler(s) rating plate.
Connect the outlet of the relief valve to a discharge line with its lower tip at most 6" above a floor drain, well clear of any live electrical parts. The discharge line must pitch downward from the valve to allow complete draining by gravity of the relief valve and discharge line, and be of a diameter no smaller than that of the valve outlet. The tip of the discharge line should not be threaded or concealed and should be protected from freezing. No valve of any type, restriction or reducer coupling should be installed on the discharge line. Local codes shall govern the installation of relief valves.

3.4.4 System pressure control and expansion tank

Pressure control devices within the system ensure that each component operates within minimum and maximum allowable pressures and maintain minimum pressure for all normal operating temperatures. They also allow air bleeding, prevent cavitation at the pump inlet and prevent water from boiling within the system; all this is accomplished with minimal addition of new water.

The increase in boiler water volume resulting from higher temperature is stored in the expansion tank during periods of high operating temperature and is returned to the system when the temperature decreases.

The expansion tank must be able to store the required volume of boiler water during maximum design operating temperature without exceeding the maximum allowable operating pressure, and to maintain the required minimum pressure when the system is cold. Contact your installing contractor, plumbing supply house, or local plumbing inspector for assistance.
The point where the expansion tank is connected should be carefully selected to avoid the possibility that normal operation of automatic check or manual valves will isolate the tank from a hot boiler or any part of the system. Pre-charged diaphragm expansion tanks are preferable to air control (see section 3.4.6). These tanks incorporate a balloon-like bladder or diaphragm. It is inflated, prior to filling the system, to a pressure equal to the setting of the water pressure makeup regulator.
The expansion tank should be located on the suction or intake side of the pump. The pump can be located either just upstream or just downstream from the boiler.

3.4.5 Water pressure makeup regulator

Make-up systems **must be employed** as required by codes. An a**utomatic fill valve** must be used with a backflow preventer as required, to maintain minimum system pressure by supplying water to make up for leakage.

3.4.6 Air bleeder

Oxygen should be excluded from the system to prevent corrosion. As hinted at in section 3.4.4, this precludes the use of air in direct contact with the boiler water as a pressurization means.

Installation of manual or automatic air vent devices prevents air from accumulating in the system. Air vents should be installed at all high points to remove trapped air during initial setup and to ensure that the system is tight. Regularly purge the air out of the system while taking care to avoid personal injuries or property damage caused by hot boiler water spray.

3.4.7 Circulator zoning recommendations

The preferred location of the circulator pump for each zone is on the boiler supply side, with the expansion tank between the boiler and the pump.

A flow check valve must be installed in each zone, preferably on the outlet side of each circulator pump, to prevent water flow to other zones where no heat is required.

3.4.8 Zone valve zoning recommendations

The preferred location of the circulator pump is on the boiler supply side, with the expansion tank between the boiler and the circulator. Use zone valves with low pressure drop.

3.4.9 Pump & pipe sizing

3.4.9.1 Boiler water temperature drop (BWTD) through the heating loop

A simplified design method based on a 20°F temperature drop (BWTD) between boiler outlet and inlet is commonly used. Although such a method is widely used and generates satisfactory system performance when applied properly, it does not determine the system operating point. The pipe size is often uneconomically large, and the actual system flow rate is likely to be much higher than intended. Such design methods seldom consider temperature drops higher than 20°F, which results in overdesign.

Another method by which the boiler water temperature drop (BWTD) could be calculated is to assume a constant supply boiler water temperature minus the return boiler water temperature. For example a boiler might have a return temperature of 140 °F. Assuming a constant supply boiler temperature of 180 °F, the BWTD would be 40 °F (= 180 °F – 140 °F). Second example: If the boiler water has a return temperature of 120 °F and the boiler supply is at 140 °F, then the temperature drop is 20 °F (=140 °F – 120 °F).

The following table suggests temperature drops (BWTD) to be used in calculating the pump flow rate.

Table 5: Temperature rise through the boiler

PROPOSED BOILER WATER TEMPERATURE RISE THROUGH THE BOILER (BWTD)			
System type	Boiler water **Supply** tempera-ture	Boiler water **Return** tempera-ture	**BWTD**
Baseboards	190°F to 140°F	170°F to 120°F	20°F to 40°F
Cast Iron Radiators	160°F to 130°F	140°F to 110°F	20°F to 40°F
Radiant In-Floor	130°F to 90°F	110°F to 70°F	10°F to 20°F

3.4.9.2 Pump flow rate calculation

The boiler output rating must correspond to the calculated heating load. Use the equation below to calculate the pump flow rate.

Pump flow rate = Boiler output ÷ BWTD ÷ 500

- Pump flow rate is expressed in US gallons per minute or GPM.
- The Boiler output (in net BTU per hour) is the maximum amount of heat to be transferred through the heating loop to meet the heating load.
- BWTD is the boiler water temperature drop

For example, an electric boiler rated at 144KW has a power output of 491,328 BTU per hour. The system is designed for a temperature drop (BWTD) of 20°F.

Required pump flow rate = 491,328 ÷ 20 ÷ 500 = 49.1 GPM

The following table lists the required pump flow rate as a function of boiler power and BWTD.

Table 6: Temperature rise vs flow rate (GPM)

Model	KW	BWTD			
		10°F	20°F	30°F	40°F
DTH 42	42	28,8	14,4	9,6	7,2
DTH 45	45	30,8	15,4	10,3	7,7
DTH 48	48	32,9	16,4	11,0	8,7
DTH 54	54	37,0	18,5	12,3	9,2
DTH 60	60	41,1	20,6	13,7	10,3
DTH 66	66	45,2	22,6	15,1	11,3
DTH 72	72	49,3	24,7	16,4	12,3
DTH 78	78	53,4	26,7	17,8	13,4
DTH 84	84	57,6	28,8	19,2	14,3
DTH 90	90	61,7	30,8	20,6	15,4
DTH 96	96	65,8	32,9	21,9	16,4
DTH 99	99	67,8	33,9	22,6	17,0
DTH 102	102	69,6	34,8	23,2	17,4
DTH 108	108	73,7	36,8	24,6	18,4
DTH 120	120	82,2	41,1	27,4	16,1
DTH 132	33	90,5	45,2	30,2	22,6
DTH 144	36	98,7	49,3	32,9	24,7

3.4.9.3 Pipe sizing criteria

Proper selection of pipe size is important to efficient system operation. A large pipe size results in lower friction losses and may allow the selection of smaller, more economical pump. The increased pipe size, however, costs more initially and must be balanced against the cost savings realized be smaller pump. Likewise, small pipe costs less initially but must be balanced against the increased operating cost of pumping water through a system with high friction losses. An economical balance should be reached between pump size, operating costs, and pipe diameter.

The ASHRAE fundamentals handbook states the general range of pipe friction loss used for the design of hydraulic systems and upper limits of water velocity in piping.

A variety of upper limits of water velocity and/or pressure drop in piping and piping systems are used. One recommendation places a velocity limit of 4 feet per second for 2 inch pipe and smaller, and a pressure drop limit of 4 feet of water per hundred feet for piping over 2 inches. These limitations are imposed either to control the levels of pipe and valve noise, erosion and water hammer pressure or for economic reasons.

Please note that in the smaller pipe sizes, this velocity limit permits the use of friction loss rates higher than 4 feet per 100 feet.

Fluid velocity should be above 1-1/2 to 2 feet per second in order to carry entrained air along to a high point in the system where it can be purged.

It is generally accepted that if proper air control is provided to eliminate air and turbulence in the system, the maximum flow rate can be established by a piping friction loss rate of 4 feet of water per 100 feet. This allows velocities greater than 4 feet per second in pipe sizes 2 inches and larger.

As piping ages, friction losses increase. It is recommended that for most commercial design purposes a safety factor of 10 to 15 % be added to the values in the tables.

What is a “foot of water”? A column of water at 60°F, 5 feet tall, creates a constant pressure of 5 feet of water at the bottom of the column. If the water column is 2.31 feet tall, the mass of water creates a constant pressure (head) of one (1) psi (pound per square inch). Pressure losses are expressed either in “feet of water” or in psi. Pump manufacturers usually prefer feet of water units.

3.4.9.4 Pump or circulator selection

Performance characteristics of centrifugal pumps are described by pump curves, which plot flow versus head or pressure together with other information such as efficiency and power. Consult the manufacturer’s pump curves to select the proper model or ask your pump dealer or your HVAC wholesaler for a recommendation.

3.5 ELECTRICAL POWER SUPPLY

Wiring must conform to the National Electrical Code and to state or local code requirements.

The electric boiler must be electrically grounded in accordance with local codes, or, in the absence of local codes, with the National Electrical Code.

3.5.1 240Vac models

Wiring must be from a 240 Volt (single phase, 60 Hz) circuit protected by a properly sized breaker. Wire gage (2 wires+ ground) must be properly sized. Consult the boiler rating plate to select the proper breaker and wire gage.

3.5.2 480 or 600Vac model

Line wiring must be from a 480 or 600 Volt (3 phase, 60 Hz) circuit protected by a properly sized breaker. Wire gage (3 wires+ground) must be properly sized. Consult the boiler rating plate to select the proper breaker and wire gage.

3.6 PUMP POWER SUPPLY

3.6.1 240Vac, 480 and 600Vac models

Use a relay (Honeywell #RA-889, RA-89A) or the secondary contact of a zone valve (if the heating system is zoned using 4-wire zone valves). When a thermostat calls for heat: the relay will power either the boiler pump or the zone valve (the zone valve will power the boiler pump upon opening fully). See figure 7 for more details.

If the heating system is set up to use only a single pump, then to minimize flow by gravity & heat loss during non-draw periods, **a flow check must be installed.**

3.7 CONNECTING THE THERMOSTAT

The thermostat shall not be connected directly on the boiler. Its function is to activate the circulating pump(s) to bring cold return water from the heating system to the boiler. The heating element will then be activated to raise the boiler temperature. The boiler is always maintained hot.

3.7.1 For 240Vac, 480 and 600Vac models

3.7.1.1 Single heating zone

Connect the low voltage thermostat to a relay (Honeywell #RA-889, RA-89A). See figure 7.

3.7.1.2 Multiple heating zones

Zone valve zoning

Connect the low voltage thermostat to the zone valve. Components must be wired to ensure that only the zone valve corresponding to the zone calling for heat is actuated and that the circulator is powered on a demand from any zone.The transformer used to power the zone valves must be sized for the load represented by all zone valves in the heating system.

Circulator zoning

Connect the low voltage thermostat to the relay (Honeywell #RA-889, RA-89A). Components must be wired to ensure that only the circulator corresponding to the zone calling for heat is actuated.

3.8 CBE-EM DUAL ENERGY INSTALLATION

Your DTH boiler can be hooked up to an existing oil or gas boiler.

The CBE-EM-SV dual-energy control is specially designed for those applications. The CBE-EM-SV control selects the least expensive energy source,either oil or electricity based on user manual choice or a contact from an external controller. The DTH boiler is equipped with an external terminal block facilitating the connection between the two units.

In “Oil Mode” The CBE-EM dual-energy control will start up the oil burner upon receiving a demand signal. It will shut off when the temperature in the boiler reaches its target on the Limit Control or when the heat demand has been satisfied.

In “Electric Mode” the electric boiler is activated and will maintain its temperature hot at the temperature selected on its aquastats always ready to distribute heat to the heating system. When the temperature of the boiler will drop, the heating elements will come on.

Figure 2: Wiring diagram DTH 96KW 240V

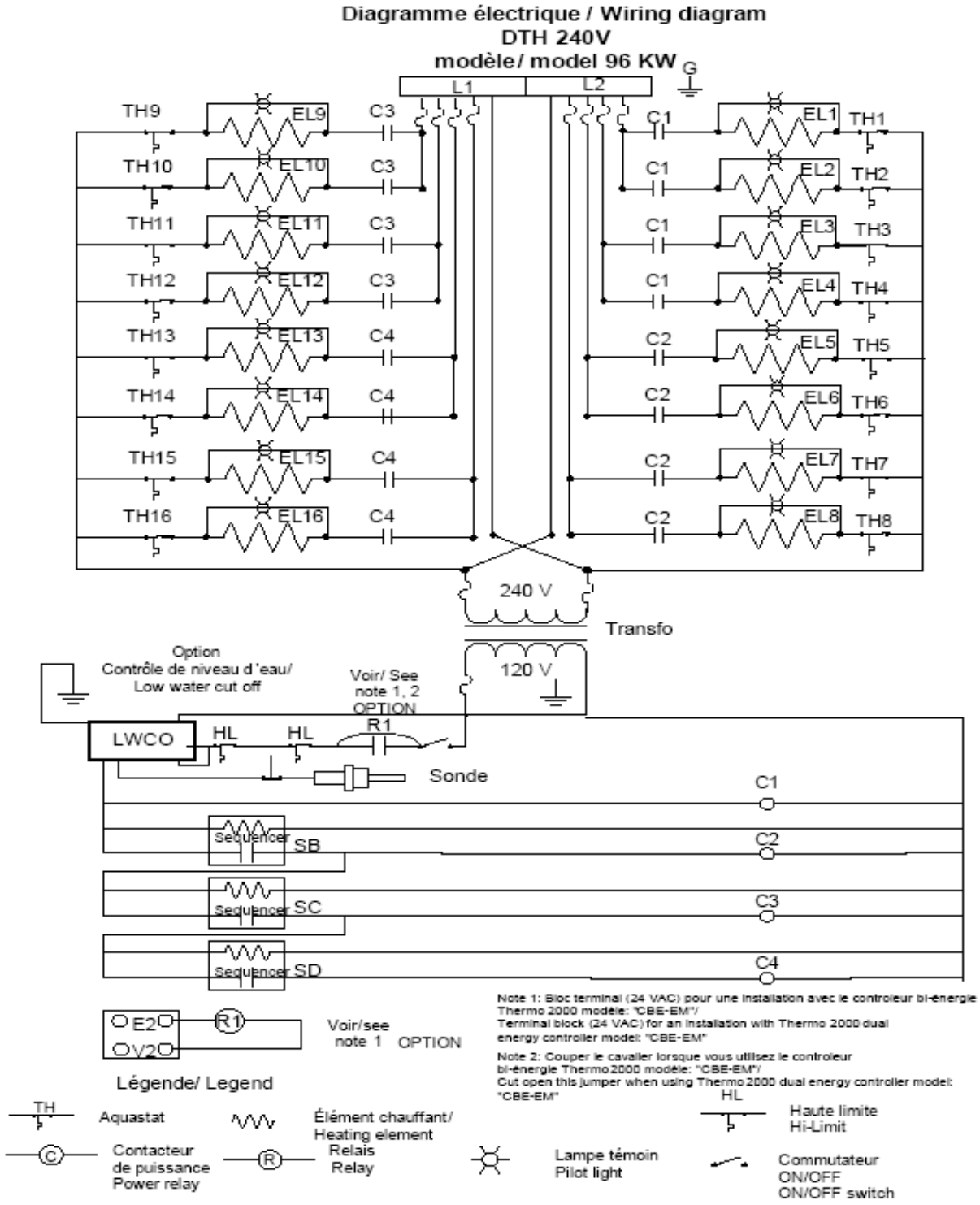


Figure 3: Wiring diagram DTH 144KW 480V

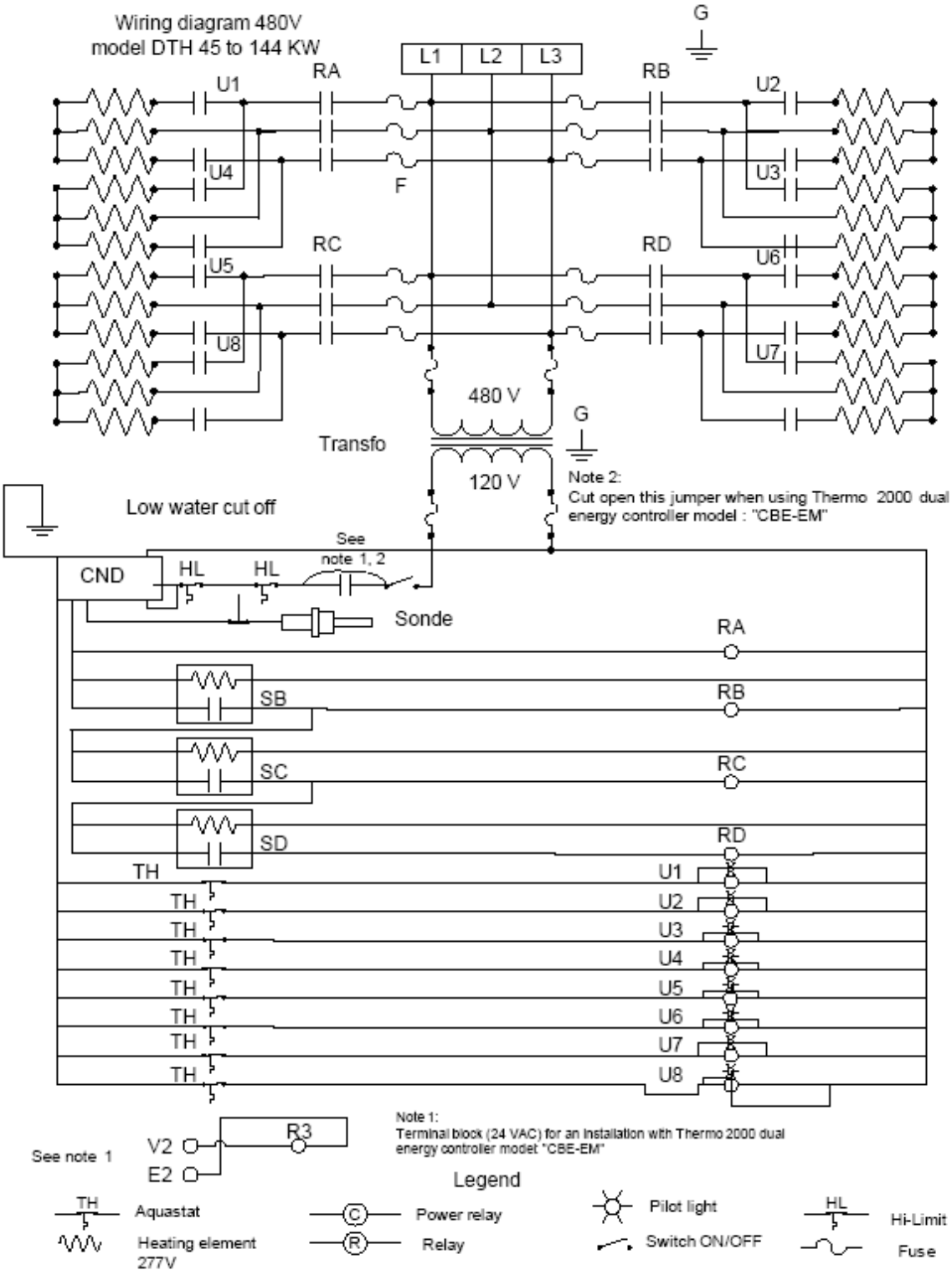


Figure 4: Wiring diagram DTH 144KW 600V

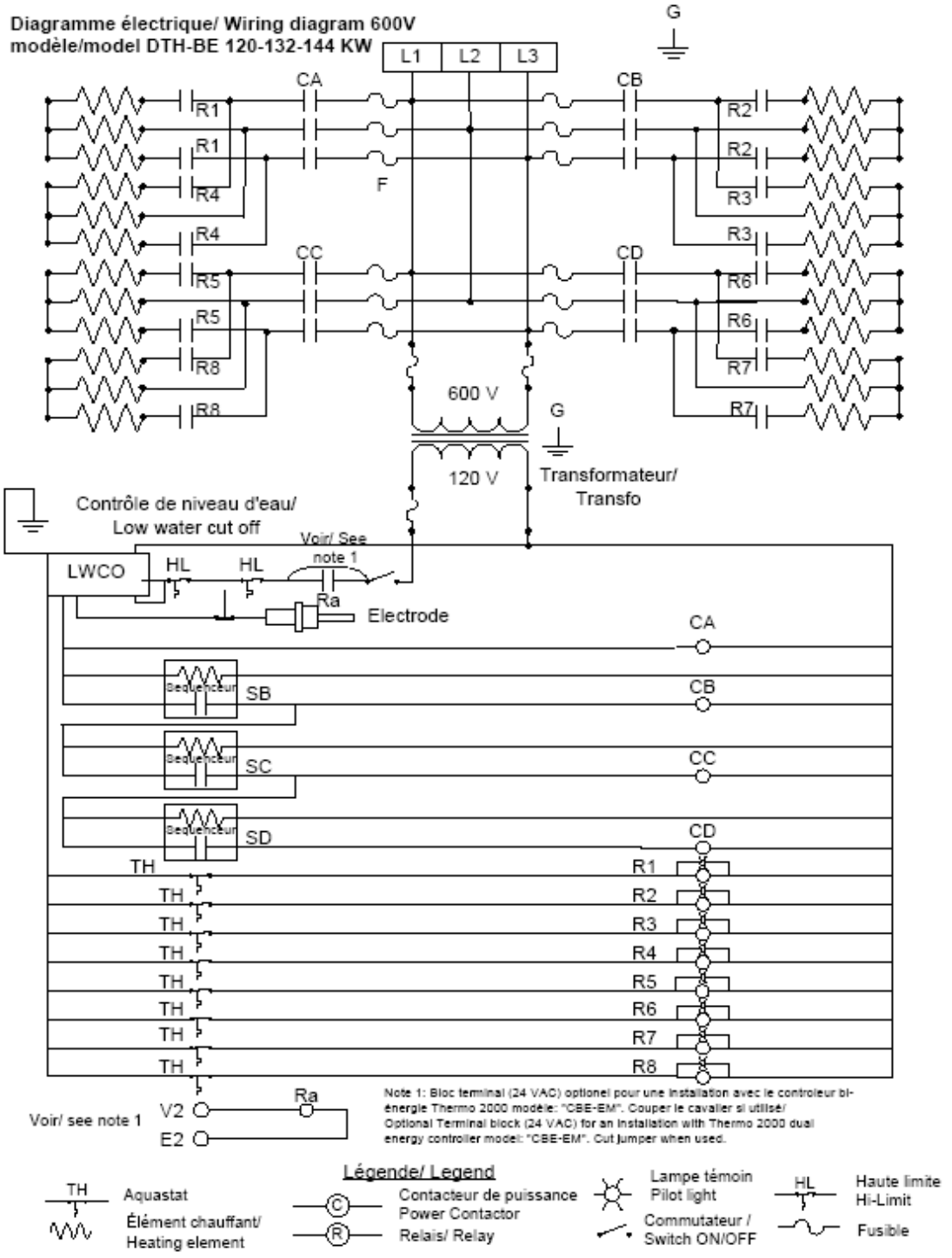
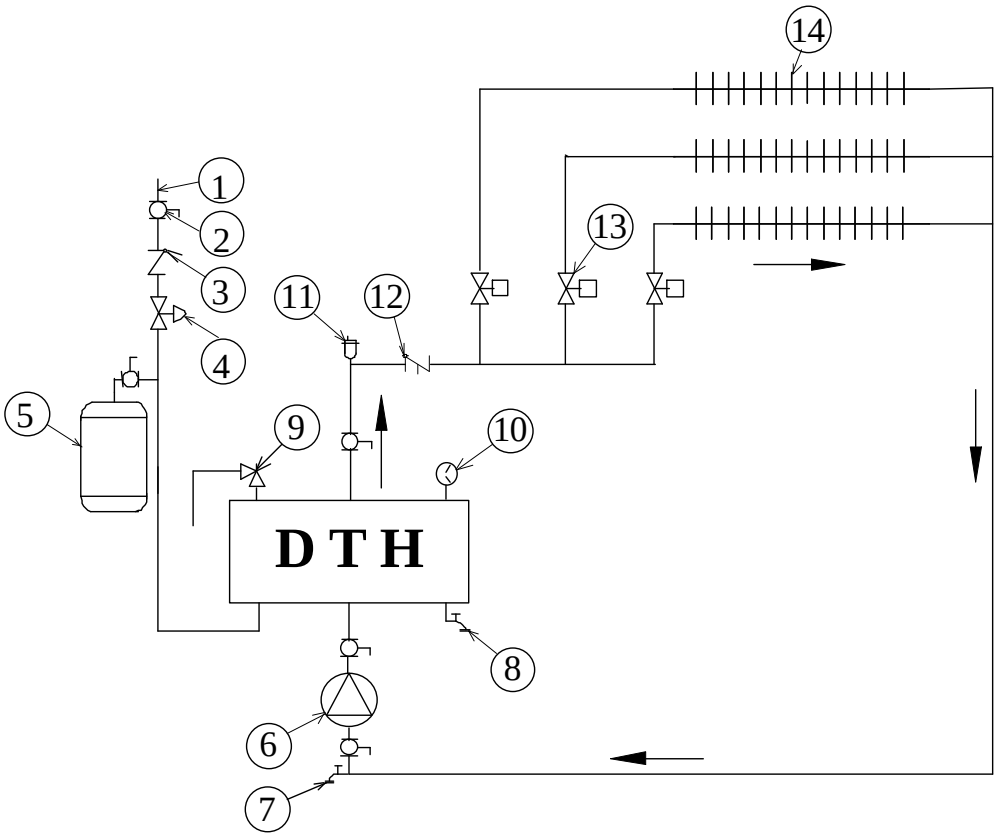


Figure 5: System piping layout

SYSTEM PIPING LAYOUT:/
SCHEMA D'INSTALLATION GÉNÉRAL:

VALVE ZONING TO BASEBOARDS/
ZONAGE DE PLINTHES PAR ROBINETS MOTORISÉS



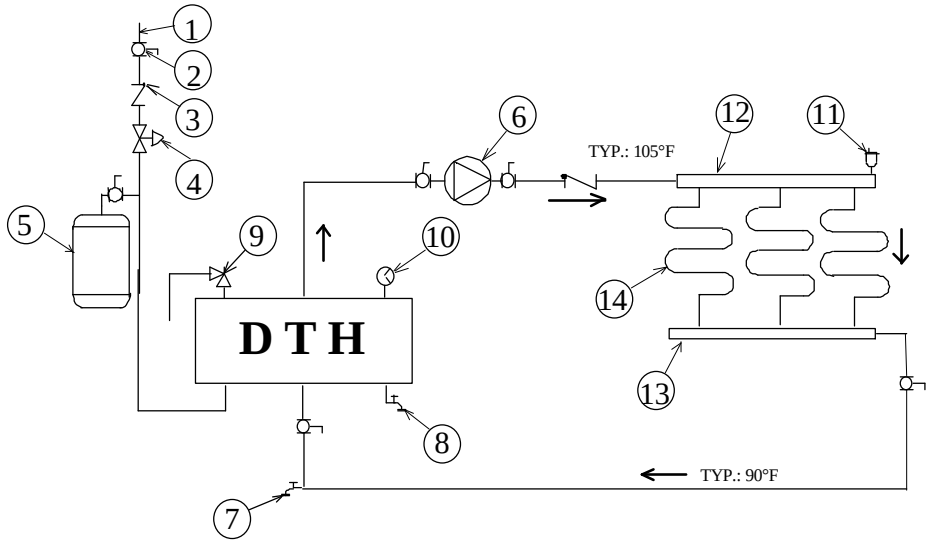
LEGEND/ LÉGENDE :

1- MAIN WATER SUPPLY/ ALIMENTATION D'EAU
2-MAINTENANCE VALVE/ VALVE D'ENTRETIEN
3-CHECK VALVE/ CLAPET ANTI-RETOUR
4-PRESSURE REDUCER/ RÉDUCTEUR DE PRESSION
5-EXPANSION TANK/ RÉSERVOIR DE DILATATION
6-CIRCULATING PUMP/ POMPE CIRCULATRICE
7-PURGE VALVE/ ROBINET D'ÉLIMINATION D'AIR
8-DRAIN VALVE/ VALVE DRAINAGE
9-SAFETY VALVE/ SOUPAPE DE SÛRETÉ
10-TEMPERATURE AND PRESSURE GAUGE/ THERMOMANOMÈTRE
11-AUTOMATIC AIR VENT/ PURGEUR D'AIR
12-FLOW CHECK VALVE (REQUIRED ON SYSTEMS WITHOUT MOTORIZED ZONE VALVES)/ CLAPET ANTI-GRAVITÉ (REQUIS SUR SYSTÈME N'AYANT PAS DE ROBINETS MOTORISÉS)
13-MOTORIZED ZONE VALVE/ ROBINETS MOTORISÉS
14-HOT WATER BASEBOARD/ PLINTHES CHAUFFAGES

Figure 6: System piping layout

SYSTEM PIPING LAYOUT:/
SCHÉMA D'INSTALLATION GÉNÉRAL

DIRECT BOILER WATER SUPPLY TO RADIANT HEATING LOOP/
PLANCHER CHAUFFANT DIRECT



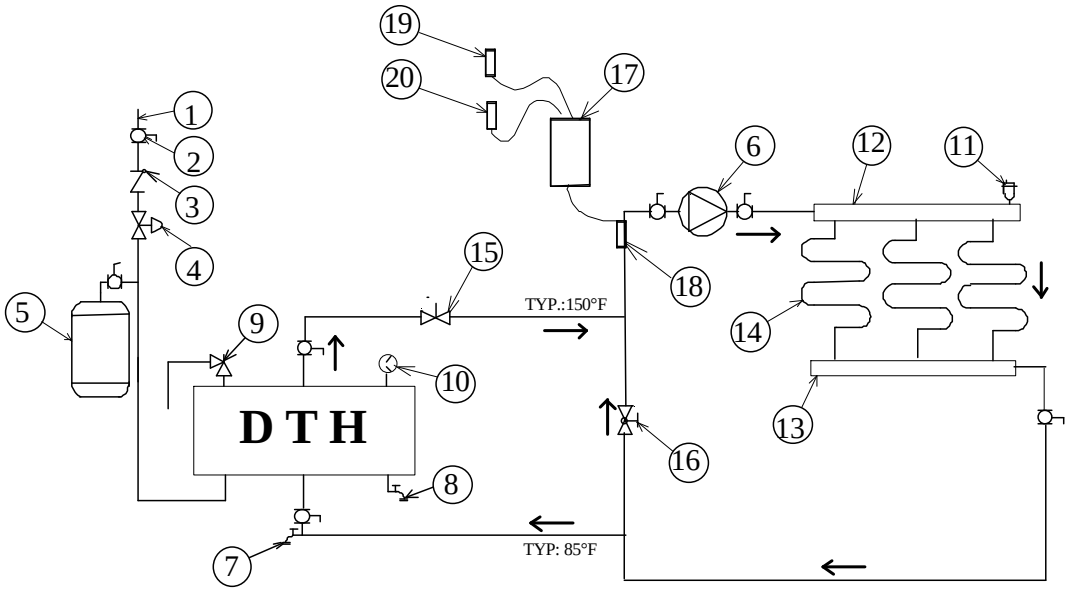
LEGEND/ LÉGENDE :

1- MAIN WATER SUPPLY/ ALIMENTATION D'EAU
2-MAINTENANCE VALVE/ VALVE D'ENTRTIEN
3-CHECK VALVE/ CLAPET ANTI-RETOUR
4-PRESSURE REDUCER/ RÉDUCTEUR DE PRESSION
5-EXPANSION TANK/ RÉSERVOIR DE DILATATION
6-CIRCULATING PUMP/ POMPE RECIRCULATION
7-PURGE VALVE/ ROBINET D'ÉLIMINATION D'AIR
8-DRAIN VALVE/ VALVE DE DRAINAGE
9-SAFETY VALVE/ SOUPAPE DE SÛRETÉ
10-TEMPERATURE AND PRESSURE GAUGE/ THERMOMANOMÈTRE
11-AUTOMATIC AIR VENT/ PURGEUR D'AIR
12-SUPPLY HEADER/ COLLECTEUR D'ALIMENTATION
13-RETURN HEADER/ COLLECTEUR DE RETOUR
14-RADIANT IN-FLOOR PIPING/ PLANCHER CHAUFFANT

Figure 7: System piping layout

SYSTEM PIPING LAYOUT:/
SCHÉMA D'INSTALLATION GENERAL

MODULATING BOILER WATER SUPPLY TO RADIANT HEATING LOOP/
PLANCHER CHAUFFANT MODULANT



LEGEND :

1- MAIN WATER SUPPLY/ ALIMENTATION D'EAU
2-MAINTENANCE VALVE/ VALVE D'ENTRETIEN
3-CHECK VALVE/ CLAPET ANTI-GRAVITÉ
4-PRESSURE REDUCER/ RÉDUCTEUR DE PRESSION
5-EXPANSION TANK/ RÉSERVOIR DE DILATATION
6-CIRCULATING PUMP/ POMPE RECIRCULATION
7-PURGE VALVE/ ROBINET D'ÉLIMINATION D'AIR
8-DRAIN VALVE/ VALVE DE DRAINAGE
9-SAFETY VALVE/ SOUPAPE DE SÛRETÉ
10-TEMPERATURE AND PRESSURE GAUGE/ THERMOMANOMÈTRE
11-AUTOMATIC AIR VENT/ PURGEUR D'AIR
12-SUPPLY HEADER/ COLLECTEUR D'ALIMENTATION
13-RETURN HEADER/ COLLECTEUR DE RETOUR
14-RADIANT IN-FLOOR PIPING/ PLANCHER CHAUFFANT
15-INJECTION VALVE (SLOW OPENNING)/ VALVE D'INJECTION
16-CIRCUIT BALANCING VALVE/ VALVE DE BALANCEMENT
17-INDOOR / OUTDOUR CONTROLLER/ CONTRÔLEUR MODULANT INT.-EXT.
18-BOILER WATER SUPPLY TEMP. SENSOR/ SONDE DE TEMPÉRATURE D'EAU
19-EXTERIOR TEMPERATURE SENSOR/ SONDE TEMP. EXT.
20-AMBIANT TEMPERATURE SENSOR/ SONDE TEMP. AMBIANTE

Figure 8: Wiring diagram pump - thermostat

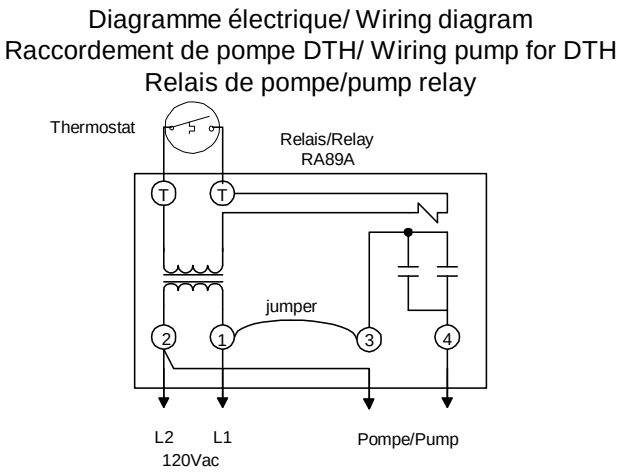


Fig. 8.1 Heating systems with pumps

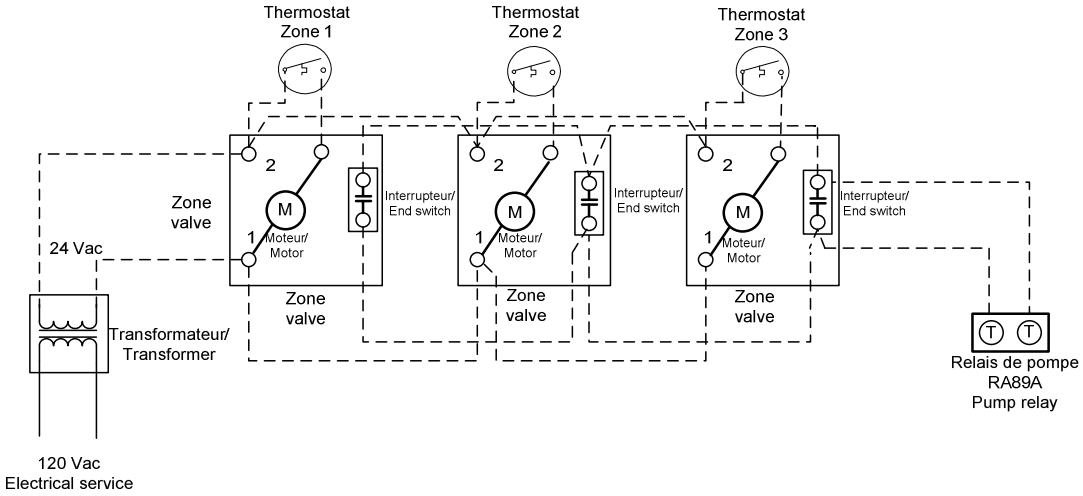
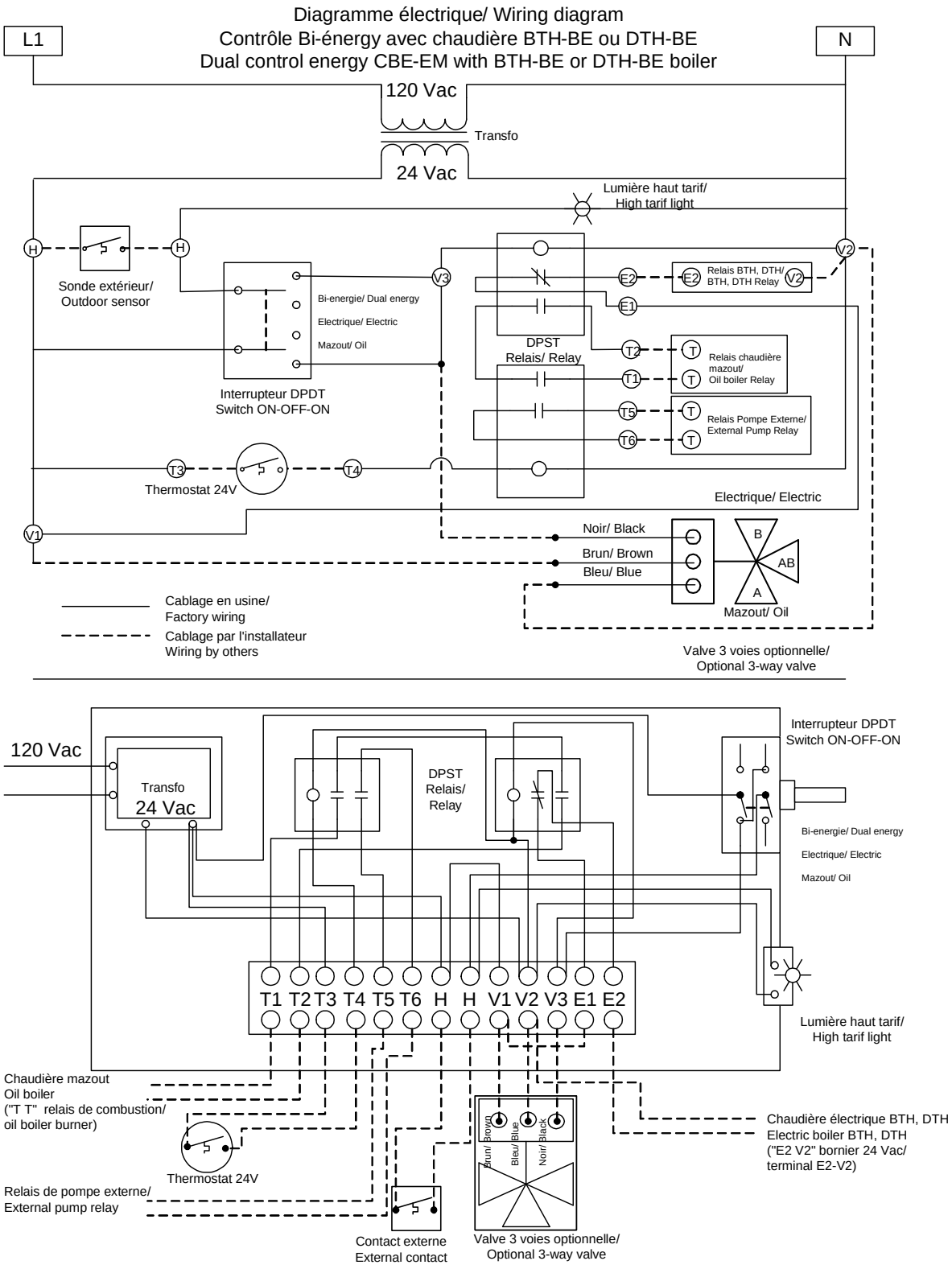


Fig. 8.2 Heating systems with zone valves

Figure 9: Diagramme électrique Bi-énergie avec CBE-EM



Section 4: Operation

⚠ SAFETY PRECAUTIONS

Before operating this boiler, be sure to read and follow these instructions, as well as the warnings printed in this manual. Failure to do so can result in unsafe operation of the boiler resulting in property damage, bodily injury, or death. Should you have any problems reading, following or difficulty in understanding the instructions in this manual, STOP, and get help from a qualified person.

Do not turn on the boiler unless it is filled with water. Do not turn on the boiler if the cold water supply shut-off valve is closed.

After the boiler has been plumbed and wired, it is now ready to be set for automatic operation.

4.1 FILLING THE BOILER

Open the shutoff valve (and on a zone valve system, manually open zone valve) on the supply piping from the boiler.

Open cold water supply valve (fill or makeup water valve) to boiler.

To let the air out of the boiler tank during the fill process open the relief valve on top of the boiler.

Leave all shutoff valves open. Return zone valves to automatic operation.

Check system for leaks and repair.

Purge air from the remaining zones, if necessary. Check boiler pressure gage reading. The indicated pressure should be lower than the pressure relief valve design rating.

4.2 AQUASTAT ADJUSTMENT

After the system has been manually purged of air, and all components (valves, vents, controllers) have been set properly, the boiler can be started. Never operate this boiler until this has been done.

Safety and energy conservation are factors to be considered when setting the boiler water temperature using the aquastats. The most energy-efficient operation will result when the temperature setting of each aquastat is the lowest that satisfies the heating needs. **Please refer to table 5 for more details.**

Each aquastat controls one stage (in the 240V model each electric element has it own aquastat; in the 600V model there is one aquastat per 3 elements). Set the temperature on the aquastat using the knob graduated in degrees Celsius and Fahrenheit.

Set the temperature on the first aquastat to the highest supply temperature required by the heating system.

Set the temperature on the second aquastat from 1°F to 5°F below the setpoint of the first aquastat.

Proceed in a similar manner for the 3rd, 4th and any supplementary aquastats.

The elements will thus be activated (and de-activated) in the number required by the set points and the drop (or rise) in boiler water temperature.

On initial start up (on the first day of the heating season) with a cold tank, a considerable amount of time may be required for the tank to reach desired temperature. Check the temperature on the boiler temperature gage.

Adjust the boiler's aquastats as needed. Note that setting the aquastat to a lower setting will not have an immediate effect. The stored boiler water heat will first have to be consumed. Additional checks of the water temperature should follow completion of a cycle. Further adjustments may be necessary as you use your boiler and space heating system.

Note: The temperature setting of the aquastats is adjustable from 50F to 190F and an "Off" position is also selectable.

4.3 STARTUP PROCEDURE

1. Fill the boiler as described in section 4.1.
2. Set the boiler operating temperature as described in section 4.2.
3. Turn down all heating demands from the distribution system.
4. Turn on the boiler power breakers and switch.
5. The main contactors should be activated in sequence and all elements should cone in operation. Pilot lights should be on.
6. Temperature inside the boiler should increase. Elements and pilot lights should turn off one by one as they reach their set point.
7. When all elements are off, establish an heating demand from the distribution system.
8. The circulator should start .
9. The elements should turn on in sequence as the boiler water temperature drops below the aquastat set points. This could take many minutes.
10. The circulator stays on for as long as there is a demand for heating.
11. When the circulator turns off, temperature inside the boiler should increase. Elements and pilot lights should turn off one by one at they reach their aquastat set point.

This way, the power drawn by the boiler depends on the actual heating load of the building. If you need only one stage to heat your home, only one will be turned on; if you need two stages, two will be turned on. Excessive cycling and wear and tear of electric components will be avoided, thus increasing their life reducing heating cost.

Section 5: Maintenance

Properly maintained, your boiler will provide years of dependable, trouble free service. It is recommended that a regular routine maintenance program be established and followed by the user. Components are subject to eventual failure that requires service. Failure to use the correct procedures or parts in these circumstances may make the unit unsafe or reduce the life of the boiler.

The owner should have the following inspection and maintenance procedures performed:

5.1 BOILER WATER PIPING:

- ❑ Yearly visual inspection.

Check all piping for signs of leakage near joints, unions and shut-off valves. Repair as needed.

5.2 PRESSURE RELIEF VALVE

- ❑ Twice a year.

Check for possible leak at the outlet of the safety relief valve. If a leak is detected and that the pressure at the indicator is less than the opening pressure setting of the valve, change the pressure relief valve by a new one having similar characteristics. If the boiler pressure is higher than the setting of the valve, ask your heating service agency to determine the cause of the high pressure and have it corrected rapidly. Do not plug the outlet of this valve if a dripping condition occurs.

5.3 AIR PURGE

- ❑ Twice a yeat

Check for proper operation of the automatic air purgers and activate manual air vents to eliminate air present.

5.4 ELECTRIC INSPECTION:

- ❑ Annually

It is recommended to perform a visual inspection of the boiler electric compartment annually, during the heating season, to ensure it is watertight and that there are no signs of component or wiring overheating. Repair as soon as possible if necessary. Defective components should always be replaced with the Original Manufacturer's parts.

⚠ WARNING

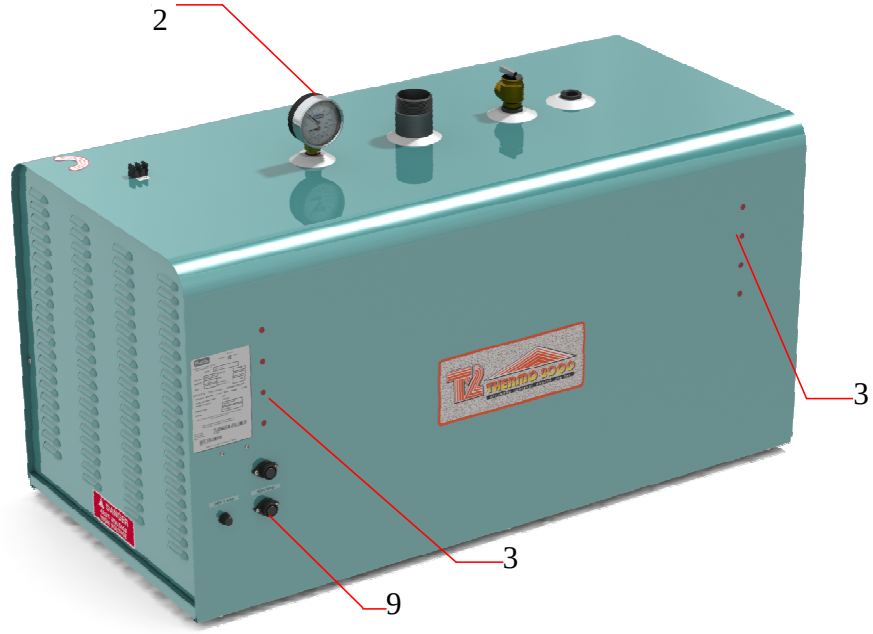
The manufacturer's warranties DO NOT cover tank failure due to improper installation or maintenance. If the pressure relief valve on the heater discharges periodically, this may be due to thermal expansion. Immediately call a qualified service technician to inspect and to remedy as needed.

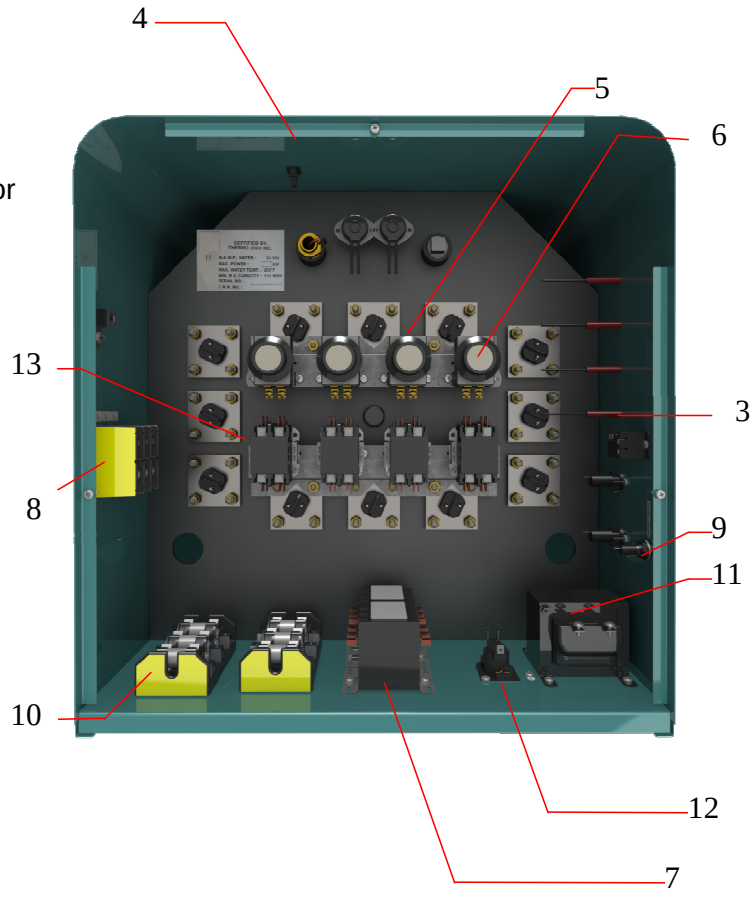
NOTE: To prevent premature tank failure, the air trapped inside the tank must be purged periodically.

⚠ DANGER

Before manually operating the relief valve, make certain no one will be spayed with the hot water released by its opening. The water may be hot enough to create a SCALD hazard. The water released should be directed to a suitable drain to prevent injury or damage.

Figure 10: Parts List DTH 600V





1. Pressure relief valve 30 or 60psi
2. Temperature & pressure indicator
3. Indicating lamp
4. Hi-limit temperature control
5. Operating temperature control (aquastat)
6. heating element (see table 1)
7. Power contactor
8. Main supply terminal block
9. Fuse holder (controls)
10. Main power fuse holder
11. Transformer
12. Sequencer
13. Secondary power relay

DTH LIMITED WARRANTY

Warranty Coverage for Residential Installation.

Thermo 2000 Inc. hereby warrants to the original residential purchaser that the DTH tank installed in a residential setting shall be free of leaks during normal use and service for a period of fifteen (15) years from the date of purchase as long as the original residential purchaser owns the home in which the unit was originally installed. Residential setting shall mean usage in a single-family dwelling in which the consumer resides on a permanent basis. Also, residential setting shall mean use in multiple family dwellings in which one (1) DTH tank is to be use in only one (1) dwelling. In the event that a leak should develop and occur within this limited warranty period due to defective material or workmanship, such leak having been verified by an authorized company representative, Thermo 2000 inc. will repair or replace at our sole option the failed unit with the nearest comparable model at the time of replacement.

The original residential purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from manufacturing plant. The replacement unit will be warranted for the remaining portion of the original Warranty.

Warranty Coverage for Commercial Installation.

Thermo 2000 Inc. warrants to the original purchaser that the DTH tank installed in a commercial setting for fifteen years.
Commercial setting shall mean use in other than residential setting stated above in the residential setting definition. In the event that a leak should develop and occur within this limited warranty period due to defective material or workmanship, such leak having been verified by an authorized company representative, Thermo 2000 inc. will repair or replace at our sole option the failed unit with the nearest comparable model at the time of replacement.

The original purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from Manufacturer. The replacement unit will be warranted for the remaining portion of the original Warranty.

Limited two years warranty on all DTH components & parts

All other DTH components & parts are warranted for a period of two (2) years against defects due to defective material or workmanship. The original purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from Manufacturer. The components, repaired or replaced are warranted for the residual period of the initial warranty on the unit.

Exclusions.

This warranty is void and shall not apply if:

1. Defects or malfunctions resulting from installation, repair, maintenance and/or usage that are not done in conformity with the manufacturer's installation manual; or
2. Defects or malfunctions resulting from installation, maintenance, or repair that are not done in accordance with regulations in force; or
3. Defects or malfunctions resulting from improper installation, maintenance or repair done carelessly or resulting from consumer damage (improper maintenance, misuse, abuse, accident or alteration); or
4. Installation in which a relief valve (pressure) is not installed or if it is not functioning properly, or when it is not connected to a drain to avoid damage to the property; or
5. Installation in which liquid circulating in the tank does not remain in closed circuit or installation in which piping is leaking; or
6. A polybutylene pipe or radiant panel installation without an oxygen absorption barrier is used; or
7. Installation where the acidity of water is not within the normal Environmental Protection Agency (EPA) (between pH 6.5 – 8.5) guidelines or the domestic water contains abnormal levels of particulate matter or water exceeding 10.5 gpg; or
8. Your home contains any type of water softener system and the unit is not installed and maintained in accordance with the manufacturer specifications; or
9. The DTH unit is being subject to non authorized modifications; or
10. Defects or malfunction resulting of storing or handling done elsewhere than Thermo 2000's manufacturing plant; or
11. Units on which the serial number is removed or obliterated.

Limitations.

Thermo 2000 shall not be responsible for any damage, loss, and inconvenience of any nature whatsoever, directly or indirectly, relating to the breakdown or malfunction of the unit. This warranty limits its beneficiary's rights. Nevertheless, the beneficiary may have other rights, which vary from state to state.

This warranty replaces any other expressed or implicit warranty and constitutes the sole obligation of Thermo 2000 towards the consumer. The warranty does not cover cost of removal, reinstallation or shipping to repair or replace the unit, nor administration fees incurred by the original consumer purchaser.

Thermo 2000 reserves its rights to make changes in the details of design, construction, or material, as shall in its judgment constitute an improvement of former practices.

This warranty is valid only for installations made within the territorial limits of Canada and the United States.

Warranty service procedure

Only authorized BTH dealers are permitted to perform warranty obligations. The owner or its contractor must provide Thermo 2000's head office or authorized depot with defect unit together with the following information: DTH model and serial number, copy of the original sales receipt and owner's identification certificate.

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