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ESTIA

R134a

AIR TO WATER HEAT PUMP
Service Manual

Domestic Hot Water Heat Pump
Model name:
HWS-G1901CNMR-E **HWS-G1901CNRR-E** **HWS-G1901CNXR-E**
HWS-G1901ENXR-E **HWS-G2601CNMR-E** **HWS-G2601CNRR-E**
HWS-G2601CNWR-E **HWS-G2601ENXR-E**

Model naming convention:

H	W	S	-	G	1	9	0	1	C	N	M	R	-	E

Area	
E	Europe

Factory	
R	TCEU

Tank Type	
M	Standard Tank (45°)
R	180° variant tank
X	Deluxe PCB

Tank Material	
N	Enamelled Steel

Coil Type	
C	Coil
E	Extra coil

Series Number	
1	Series 1

Water Tank Capacity	
190	190l Capacity
260	260l Capacity

Model Type	
G	Thermodynamic HWS

Type	
HWS	A2W

Contents

01.00   Safety precautions

- The product shall be installed, commissioned, repaired only by qualified technicians. Incorrect installation can result in damage to property and/or injuries to people and animals.
- The unit shall be disconnected from the power supply when the cover is off.
- The unit shall not be used by children or people with limited physical or mental capacity.
- Children should be supervised to ensure that they do not play with the appliance.
- Cleaning and maintenance shall not be made by children without supervision.
- Do not place flammable materials in contact or close to the unit.
- The water system and the air system should be installed as stated in the manual.
- When in service, the unit should not be placed in sub-zero temperature areas.
- When not in service, the unit can be placed in sub-zero temperature areas, but all the water in the tank or in the condensate drain should be removed.
- Hot water can cause serious burns if directly connected to the taps. The installation of a mixing valve is suggested.
- The unit should be used only for its specified use. The manufacturer is not liable for any damages due to failure to observe this manual.
- Take all the possible precautions to avoid incidents.
- The product contains HFC-R134a
- The electrical supply, for the domestic hot water heat pump, must be protected by an earth leakage breaker and an overcurrent protection device (fuse or circuit breaker).
  Failure to comply with this precaution may result in electric shock or fire
- This unit must be connected to the main power supply using a circuit breaker or switch with a contact separation of at least 3mm

Introduction

The aim of this manual is to give information, instructions and warnings on the domestic hot water heat pump. The manual is to be used by service engineers, since it contains important safety, diagnosis and operational indications. The manual is a part of the domestic hot water heat pump and it is to be conserved with care, since it contains important installation and maintenance instructions that can be useful to assure a long life time and an efficient operation.

About the product

The product is a domestic hot water heat pump (DHWHP) that has been designed according to EU directives. The product is intended for hot water production for domestic use or for similar applications. The unit has been designed to be ready for installation.

General

The domestic hot water heat pump is composed of a water tank, a refrigerant circuit, a cabinet and a display connected to a control board. The main scope of the appliance is to heat water stored in a tank.

Operation

The unit is programmed to start heating the water inside the tank when its temperature falls below a predetermined level, BT3 (T Tank Top) is 5K<SP. The unit stops when the water temperature reaches a set point (SP) that can be regulated by the user. In general, the appliance is designed to produce enough hot water to cover the need of a household of 4 persons or more.

There are two ways in which the DHW-HP can heat the water:
1) Heat pump operation
   In the operation with heat pump, a heating cycle utilizes the operation of a compressor and the extraction of the heat from the air to heat the water in the tank. This is the standard way used to heat the domestic hot water, since it leads to lower electricity consumption, hence also lower running costs.

2) Electric heater operation
   The water is heated using an electric heater. An electric resistance is powered to heat the water in a safe, fast and flexible way. However, using the electrical heater can become an expensive way to produce hot water. This operation should be used as a back-up or as integration of the standard operation.

The electric heater is activated in case of:
- Failure of the heat pump operation, this requires an override command from the end user to be confirmed
- Too high or too low air temperature
- The quantity of hot water produced is not enough.

Note: The amount of water heated by the electric heater is at a reduced volume; see the performance data for these values.

Heating circuit

As depicted in the figure below, the heat pump cycle can be divided in four main processes: compression (1-2), condensation 2-3), expansion (3-4) and evaporation (4-1) described below.

- At the suction of the compressor (1) the superheated gas refrigerant enters the compressor at a low pressure.
- In the compressor, the gas is compressed to a higher pressure and temperature level (2).
- The gas is first de-superheated and condensed in the condenser, exchanging heat with the water stored in the tank.
- The refrigerant exits the condenser in a subcooled, liquid form (3)
- Through the thermostatic expansion valve the pressure of the refrigerant is lowered to allow its evaporation at a lower temperature (4)
- The refrigerant is evaporated in the fin-coil heat exchanger that uses forced air as a heat source (1)
- The process goes on until the power supply to the compressor is stopped.
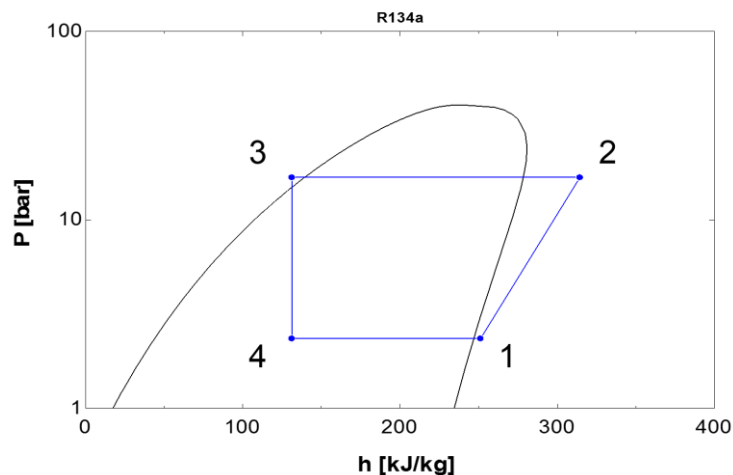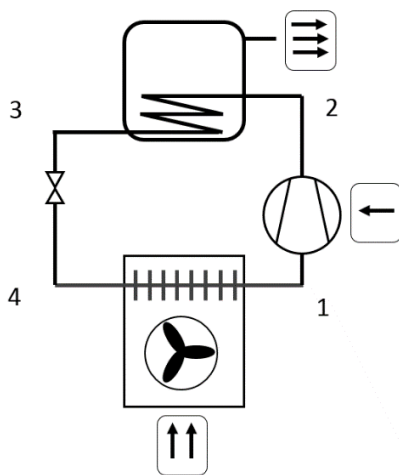
Note: the extensive use of the electric heater leads to a higher electricity consumption and it may lead to high electricity bills. The operation with the heat pump normally consumes more than 3 times less electricity than the operation with electric heater. The energy released to the condenser (2-3) is, in fact, the sum between the free energy extracted from the air in the evaporator (1-4) and the energy supplied to the compressor (2-1). On average, the energy absorbed by the evaporator is more than double of the energy used to run the compressor.

Safety instructions – Heating circuit

- Only skilled and trained technicians shall carry out repair and service of the heat pump circuit.
- Before opening the heating circuit, discharge the refrigerant to a level that allows safe working conditions.
- The refrigerant can be toxic if inhaled or if in high concentrations.
- Special attention should be given if the work is carried out with an open flame.

02.00   Specifications

Physical data

Domestic Hot Water Heat Pump		HWS-G1901CN*R-E	HWS-G2601CN*R-E	HWS-G1901ENXR-E	HWS-G2601ENXR-E
Dimensions (Height x Diameter)	mm	1600x620	1960x620	1600x620	1960x620
Weight (dry / wet)	kg	91 / 281	106 / 366	107 / 295	126 / 383
Nominal insulation thickness	mm	50	50	50	50
Refrigerant		R134A	R134A	R134A	R134A
Refrigerant charge	kg	1.2	1.28	1.2	1.28
Refrigerant charge CO2 equivalent	ton	1.70	1.80	1.70	1.80
Water connections (cold & hot water)	inch	3/4	3/4	3/4	3/4
Water connections (entry angle)	deg.	45 / 180	45 / 180	45 / 180	45 / 180
Condensates water connections	mm	Ø19	Ø19	Ø19	Ø19
Max water side operating pressure	Mpa	0.6	0.6	0.6	0.6
Power supply	V-ph-Hz	230-1-50	230-1-50	230-1-50	230-1-50

Performance data

Domestic Hot Water Heat Pump		HWS-G1901CN*R-E	HWS-G2601CN*R-E	HWS-G1901ENXR-E	HWS-G2601ENXR-E
Energy Class	-	A+	A+	A+	A+
COP at Air7°C W10°C-52,9°C (EN16147)	-	3.57	3.69	3.57	3.69
Heat up time (A7°C W10°C-53,5°C)	hh:mm	06:27	09:12	06:27	09:12
COP at Air20°C W10°C-52,9°C (EN16147)	-	4.13	4.2	4.13	4.2
Heat up time (A20°C W10°C-53,5°C)	hh:mm	05:15	07:09	05:15	07:09
Cylinder volume	l	190	260	184	252
V40 volume (W52.9°C)	l	247	347	234	331
Maximum Qty of water by electric heater only	l (%)	75 (40%)	130 (50%)	75 (40%)	130 (50%)
Maximum water temperature	°C	60	60	60	60
Corrosion protection		Magnesium anode	Magnesium anode	Magnesium anode	Magnesium anode
Heat pump operating range (min/max)	°C	-7 / +40	-7 / +40	-7 / +40	-7 / +40
Electrical heater Power	W	1500	1500	1500	1500
Maximum Power input	W	2185	2185	2185	2185
Auxiliary Power input (Paux)	W	1.61	1.61	1.61	1.61
Standby Power input (Pes)	W	17	20	17	20
Sound power level - Air7°C W10°C-52,9°C (EN16147)	dB(A)	49	49	49	49
Sound power level - Air20°C W10°C-52,9°C (EN16147)	dB(A)	55.6	55.6	55.6	55.6
Airflow rate nominal (min - max)	m³/h	450 (0 - 800)	450 (0 - 800)	450 (0 - 800)	450 (0 - 800)
Maximum fan power	W	85	85	85	85
Maximum external static pressure	Pa	200	200	200	200
Air duct connections	mm	Ø160	+Ø160	Ø160	Ø160
Minimum room volume (non-ducted unit)	m³	60	60	60	60

Fan Curve
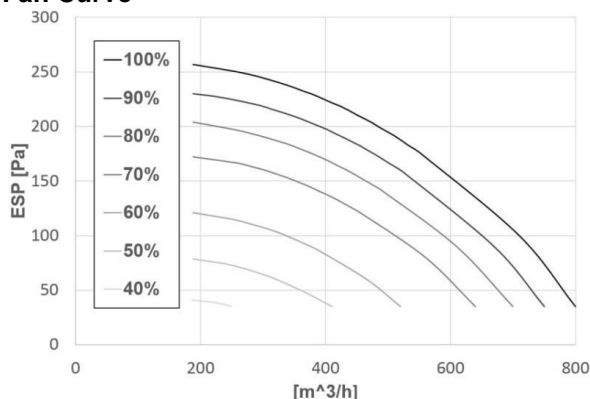
The graph shows the external static pressure vs airflow at different fan speeds.

In order to assure an efficient operation, it is suggested to keep the external pressure drops below 200 Pa.

Seasonal Performance data

TOSHIBA Estia HWS-G1901 (190L) - EN16147 - Tapping L - Water set point: 53.5°C											
	Unit	Outdoor air				Indoor air		Exhaust air / Extract air				
Air temperature	[°C]	-7	0	7	15	15	20	20				
Wet bulb temperature	[°C]	-8	-1	6	12	12	15	12				
Air flow	[m^3/h]	350	350	350	350	-	-	70	126	190	300	400
COP	[-]	2.4**	2.8**	3.57	3.95*	3.87*	4.13*	2.98*	3.54*	3.82*	4.13*	4.35*
Heat up time	[hh:mm]	10:45**	08:45**	06:28	05:40*	05:40*	05:15*	-	-	06:00*	-	-
Stand-by heat losses	[W]	-	-	17	17*	17*	17*	-	-	17*	-	-
Heating capacity	[kW]	0.90**	1.10**	1.43	1.70*	1.70*	1.83*	-	-	1.60*	-	-
Compressor power	[kW]	0.31**	0.36**	0.38	0.41*	0.41*	0.42*	-	-	0.40*	-	-
V40 Volume	[L]	247										
Sound Power	[dB(A)]	49				55.6		46 - 49				

Performance data are subject to 3rd party tests:
Outdoor air applications: test at LCIE (France).
Indoor air applications: test at WPZ (Switzerland).
Sound power: test at DTI (Denmark).

Marked performance not subject to 3rd party tests:
* Internal tests at METRO THERM A/S
** Results based on simulations at METRO THERM A/S

TOSHIBA Estia HWS-G2601 (260L) - EN16147 - Tapping XL - Water set point: 53.5°C											
	Unit	Outdoor air				Indoor air		Exhaust air / Extract air				
Air temperature	[°C]	-7	0	7	15	15	20	20			
Wet bulb temperature	[°C]	-8	-1	6	12	12	15	12			
Air flow	[m^3/h]	350	350	350	350	-	-	70	126	190	300
COP	[-]	2.5**	2.9**	3.69	4.00**	3.95**	4.20	3.0**	3.5**	3.8**	4.2**
Heat up time	[hh:mm]	14:45**	12:00**	09:12	7:45**	7:45**	7:09	-	-	-	-
Stand-by heat losses	[W]	-	-	20	20**	21*	21	-	-	-	-
Heating capacity	[kW]	0.90**	1.10**	1.43	1.70**	1.70*	1.83	-	-	-	-
Compressor power	[kW]	0.30**	0.34**	0.37	0.40**	0.40*	0.41	-	-	-	-
V40 Volume	[L]	347									
Sound Power	[dB(A)]	49				55.6		46 - 49			

Performance data are subject to 3rd party tests:
Outdoor air applications: test at LCIE (France).
Indoor air applications: test at WPZ (Switzerland).
Sound power: test at DTI (Denmark).

Marked performance not subject to 3rd party tests:
* Internal tests at METRO THERM A/S
** Results based on simulations at METRO THERM A/S

03.00   DHW-HP drawing
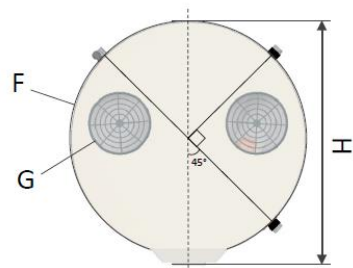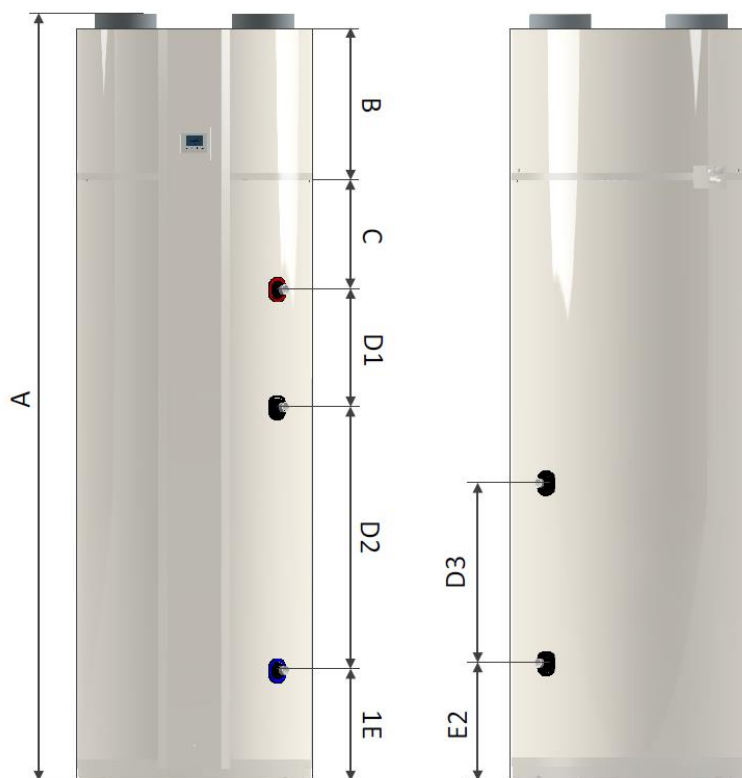
HWS-G1901**XR-E (45° Water Pipe Entry)
HWS-G2601**XR-E (45° Water Pipe Entry)

Pipe Connections: G 3/4 (Male)
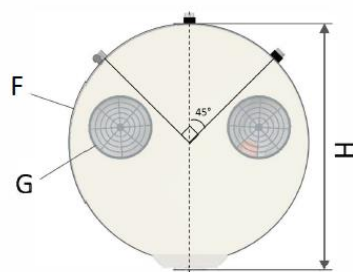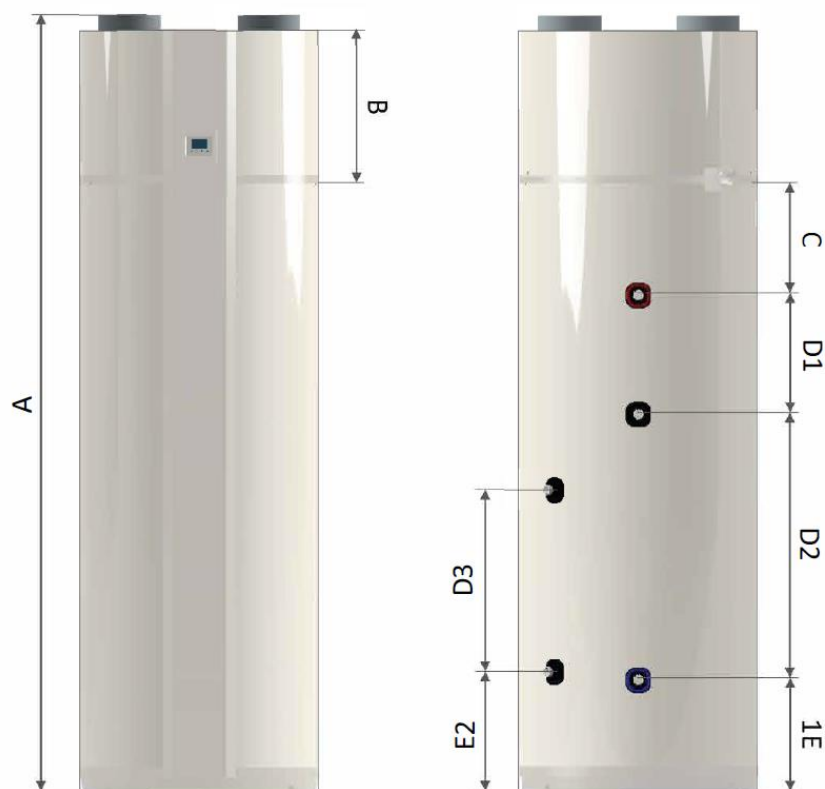
HWS-G1901**RR-E (180° Water Pipe Entry)
HWS-G2601**RR-E (180° Water Pipe Entry)

Pipe Connections: G 3/4 (Male)

Parameter	Unit	HWS-G1901***R-E	HWS-G2601***R-E
Dimensional Data			
A – Height	mm	1610	1960
B	mm	385	385
C	mm	280	280
D1	mm	180	300
D2	mm	435	670
D3	mm	375	375
E1	mm	285	285
E2	mm	305	305
F – Diameter	mm	603	603
G – Diameter	mm	160	160
H – Max Diameter	mm	620	620
Height required for installation	mm	1700	2040
Standard DHW-HP weight dry/wet	kg	91 / 281	106 / 366
Additional coil DHW-HP weight dry/wet	Kg	107 / 295	126 / 383
Nominal insulation thickness	mm	50	50

Refrigerant circuit
GQ1: Compressor
GQ2: Fan
RM1: Check valve
EP1: Condenser
EP2: Evaporator
HZ1: Filter drier
QN1: Solenoid valve
QN2: Thermostatic expansion valve
XL3: Service valve

Water circuit
XL1: Water outlet
XL2: Water inlet
XL4*: Coil top
XL5*: Coil bottom
XL6: Air outlet
XL7: Air inlet
XL8: Condensate outlet
XL9*: Hot water circulation
EP3*: Coil
EB1: Electric heater
FR1: Anode
FN1: Thermal protection

The items with * are optional.
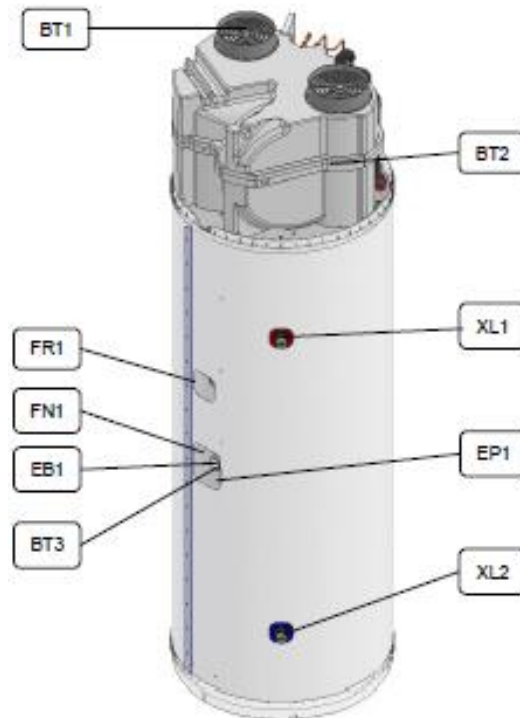
Figure 4 – Design of the heating circuit and the main components

Sensors
BT1: Air inlet temperature
BT2: Evaporator temperature
BT3: Tank water temperature
BT4*: Additional temperature
BT5*: Additional temperature
(not included)
BP1: Pressostat

Electric components
AA1: Main printed circuit board
AA2: Display circuit board
WF1: Modbus port
GC1*: Solar 0-3V/10V
QA1*: SG-ready port
GP1*: Additional supply to pump
or damper

The items with * are optional.
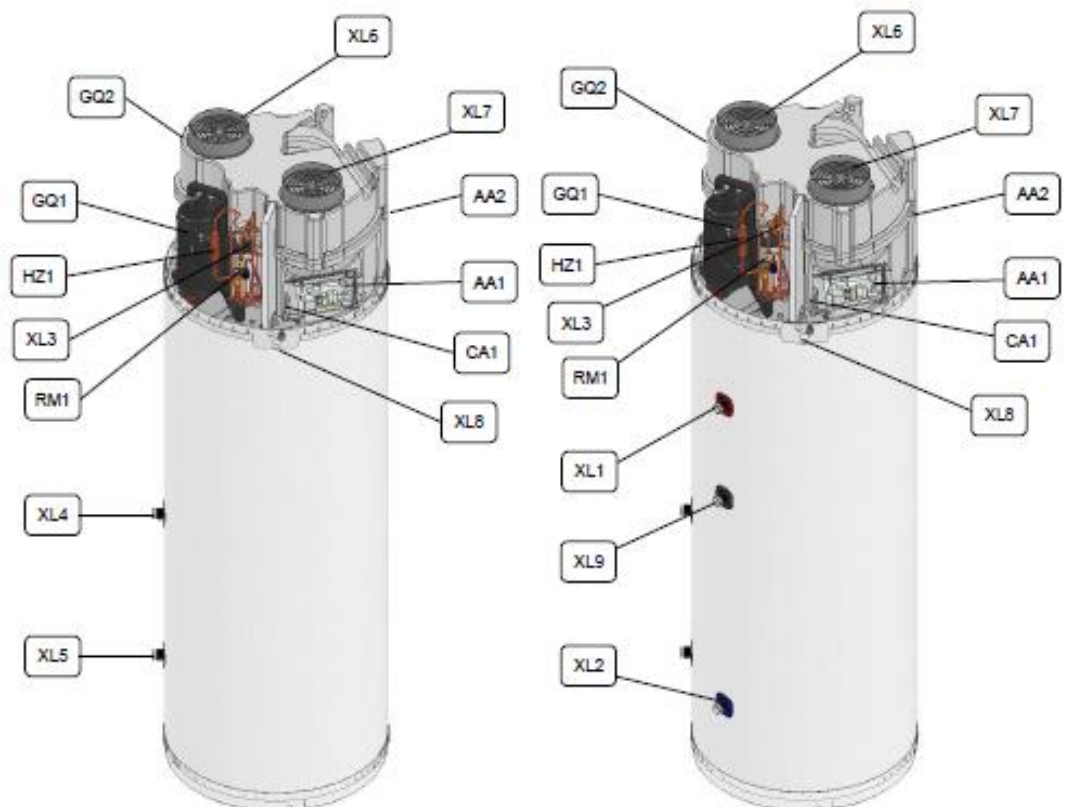
Figure 5 – Design of tank, condenser and related components

Nomenclature according to standard
IEC 81346-1 and 81346-2.

04.00   Wiring diagram
04.01   PC Board and connections
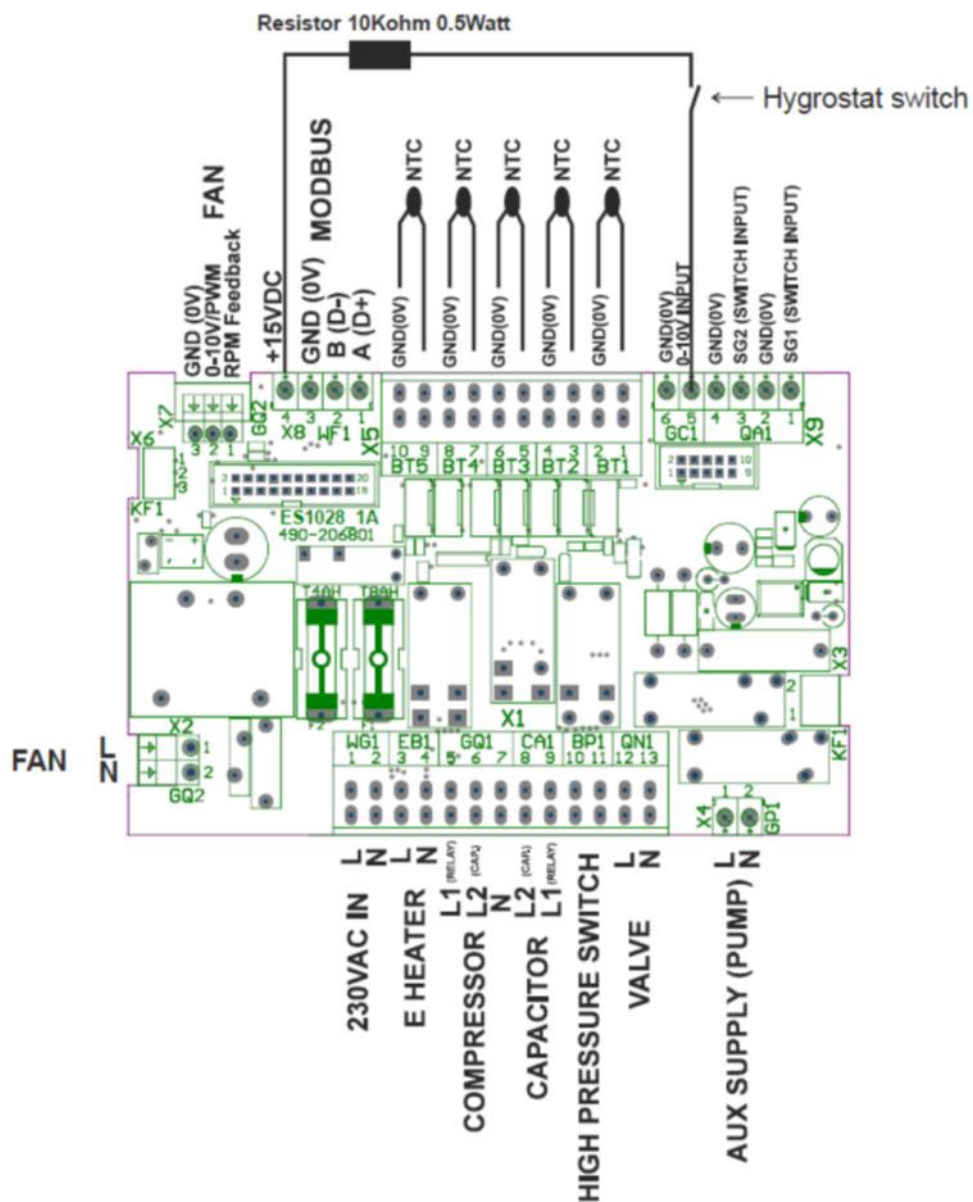
04.02   Schematic
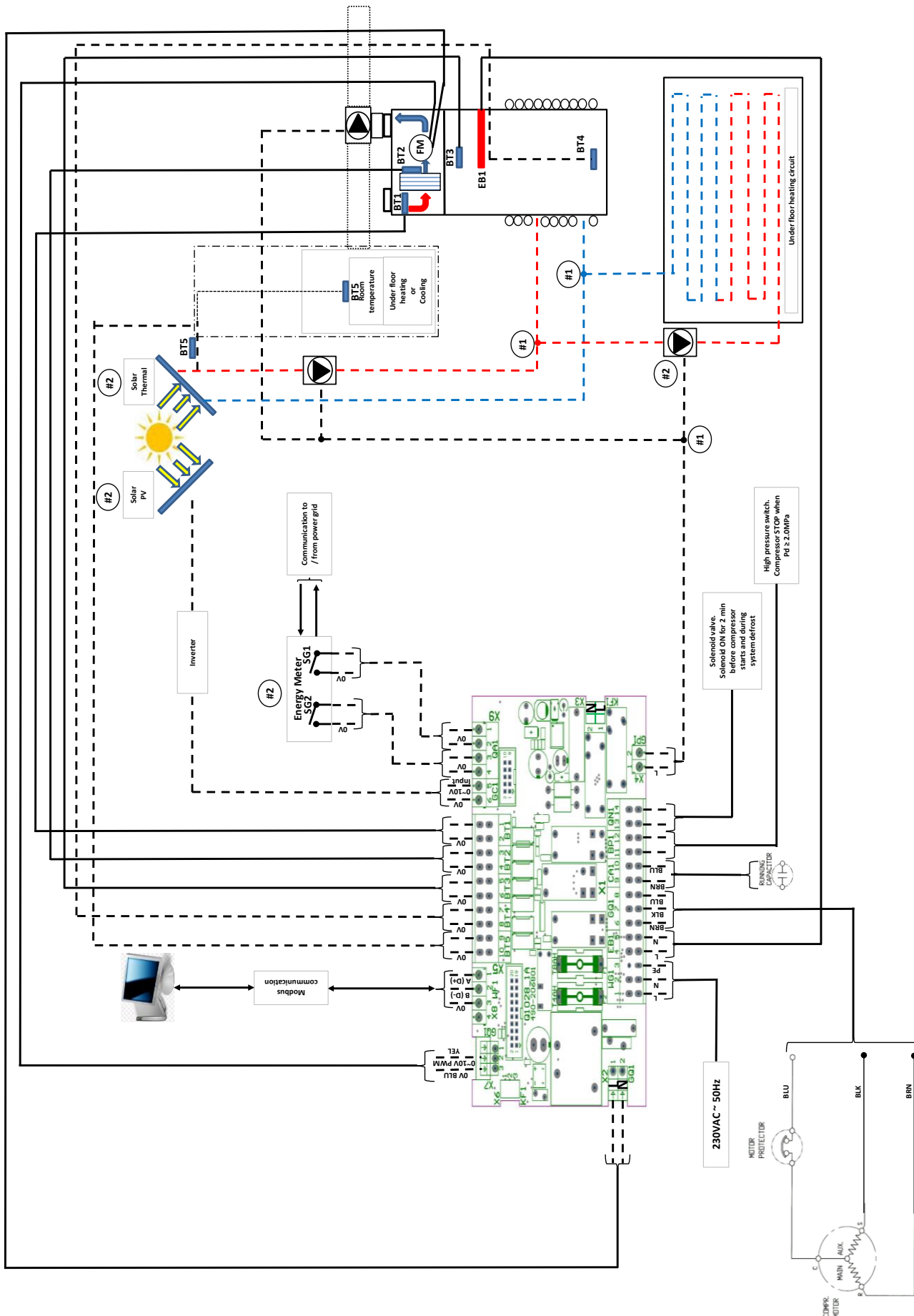
05.00　　　　Key electric component rating

No.	Component Name	Model Standard	Model Deluxe	Type	Rating
Refrigeration					
1	Highly compressor	o	o	WHP01900BUV-H8JU	Winding resistance 4.82/6.22Ω (at 20°C)
2	Case thermostat	o	o	B110-160-241E	Contact open: 160±10°C Contact Close: 70±10°C
3	Fan motor	o	o	R3G220-RC05-17	230V / 0.7A / 50-60Hz
4	Solenoid	o	o	FDF2.5A 08	230V / 50-60Hz
5	High pressure switch	o	o	UL1015 18AWG	Open press: 20±1 bar
Electrical					
6	Heating element	o	o	Kanthal D or 0Cr23AI5	230V / 1500W
7	Heater thermostat (x2)	o	o	El Matik KB	80±3°C
Sensors					
8	BT1 Motron	o	o	AHC3.782.244-65A (L=400mm)	$R25=22.00k\Omega$ +/-1%, -30 to +105°C
9	BT2 Motron	o	o	AHC3.782.244-65B (L=900mm)	$R25=22.00k\Omega$ +/-1%, -30 to +105°C
10	BT3 Motron	o	o	AHC3.782.244-65C (L=2200mm)	$R25=22.00k\Omega$ +/-1%, -30 to +105°C
11	BT4 Motron	-	o	AHC3.782.244-65D (L=2700mm)	$R25=22.00k\Omega$ +/-1%, -30 to +105°C
12	BT5 Motron	-	o	AHC3.782.244-65D (L=2700mm)	$R25=22.00k\Omega$ +/-1%, -30 to +105°C

R-ntc [ohm] vs Temperature [C]

06.00   Refrigerant cycle / water system diagram
06.01   Refrigerant cycle

06.02   Water system cycle

XL1: Water outlet pipe connection
XL2: Water inlet pipe connection
XL4: Coil top*
XL5: Coil bottom*
XL9: Water circulation connection*
QN3: Shut-off valve water outlet
QN4: Shut-off valve water inlet
QN5: Drain valve
QN6: Safety valve**
QN7: Expansion tank**
QN8: Shut-off valve pump inlet*
QN9: Shut-off valve pump outlet*
RM3: Check valve
RM4: Check valve water circulation*
GP1: Water circulation pump*

*   Optional additional coil
** Safety equipment required for the installation to be locally sourced (i.e. safety group, expansion vessel)

Example of a standard circuit with the DHW-HP installation
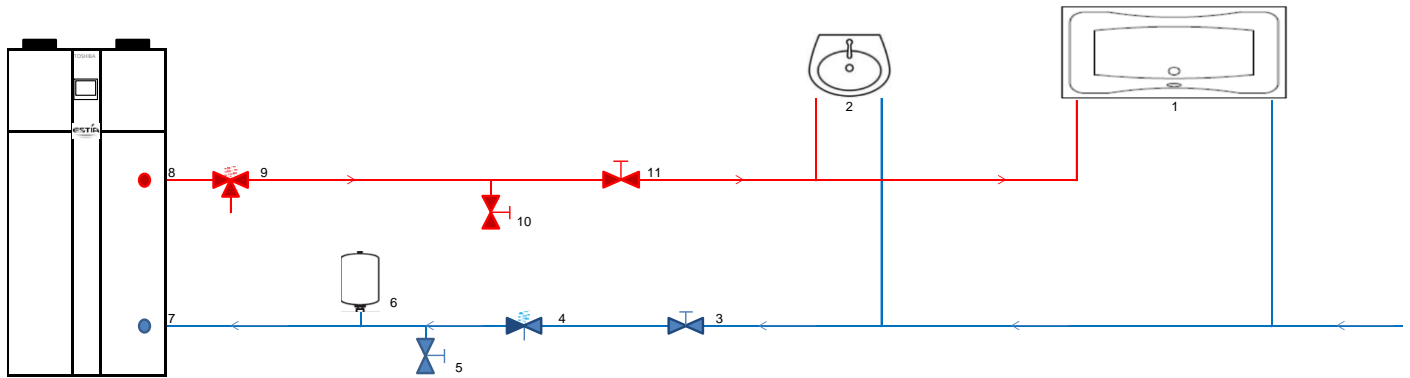
Example of a circulation circuit with the DHW-HP installation
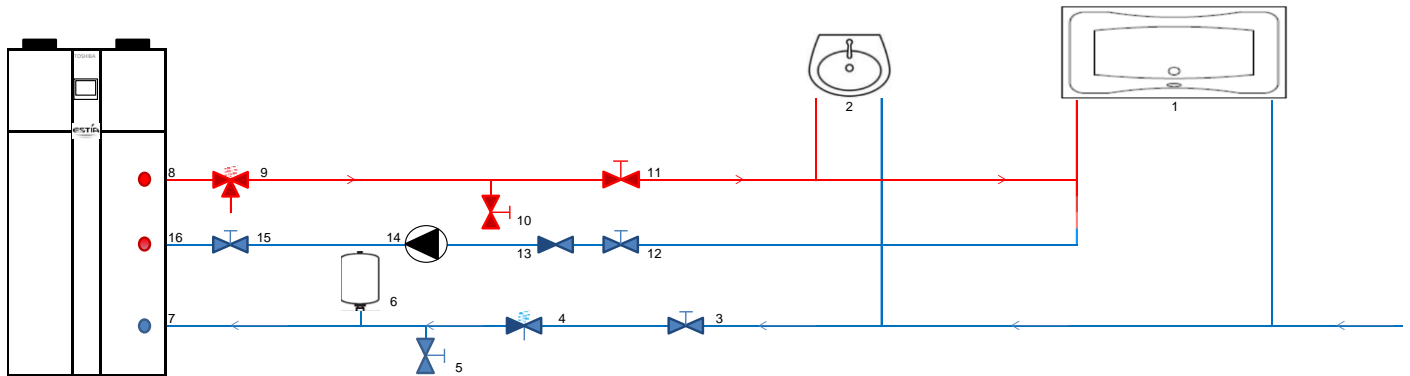
Example of solar thermal circuit with the DHW-HP installation
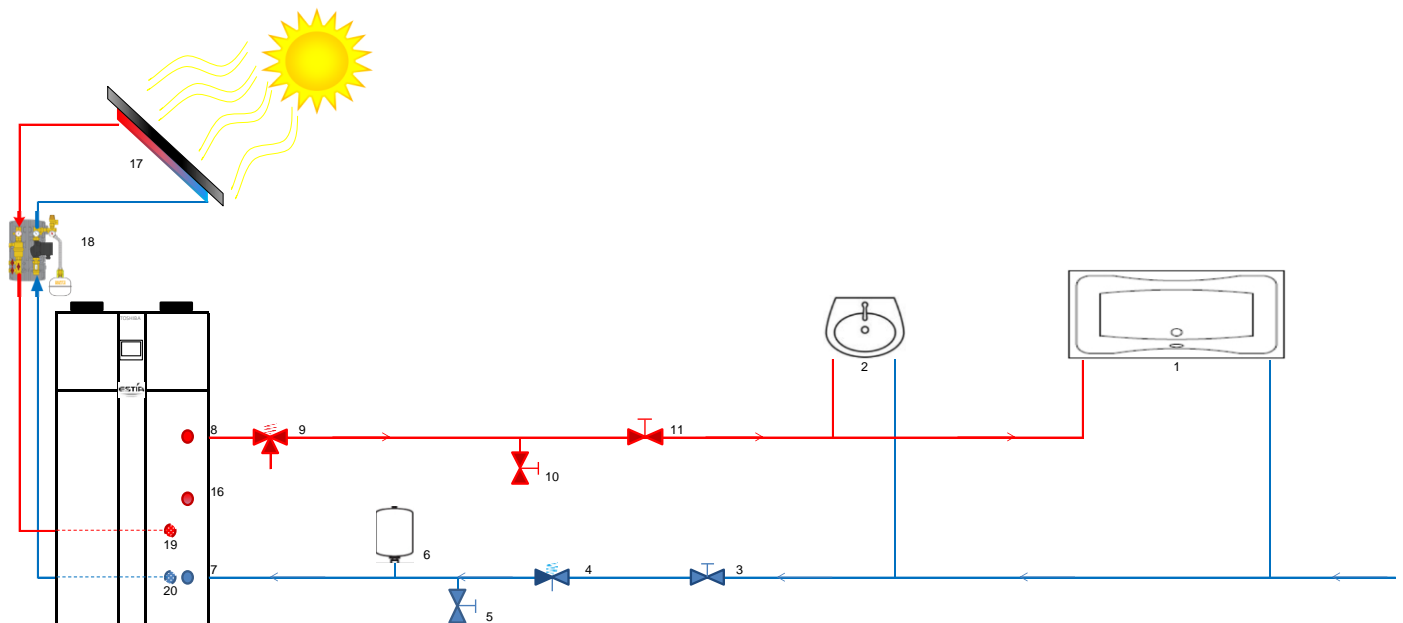
1	Bath	11	Hot water supply shut off valve
2	Sink	12	Isolation valve return flow
3	Cold water supply shut off valve	13	Check valve
4	Safety group	14	Circulation pump
5	Cold water supply drain valve	15	Isolation valve circulation
6	Expansion vessel	16	Water circulation connection point
7	Cold water supply pipe connection	17	Solar thermal collectors
8	Hot water outlet pipe connection	18	Pump & expansion vessel
9	Temperature & pressure relief valve (6 bar / 90°C)	19	Extra coil inlet
10	Hot water supply drain valve	20	Extra coil outlet

06.03   Typical Cycle data

Code	Sensor	Description	Min. Air Inlet (-7°C)	Rated Air Inlet (7°C)	Air Inlet (20°C)	Units
-	Setpoint	Water setpoint	53.5	53.5	53.5	°C
BT1	T air i	The air temperature at the inlet of the unit	-7	7	20	°C
BT2	T air o	The evaporator temperature at the outlet of the unit	-13	0	9	°C
BT3	T water t	The water temperature at the top of the unit	32	32	32	°C
BT4	T water b	The water temperature at the bottom of the unit	31	31	31	°C
V1	Fan %	The actual speed of the fan in %	70	70	70	%
I7	W el	The calculated instantaneous electricity consumption in W	380	400	400	W
I9	W th	The calculated instantaneous heating capacity is displayed in W	1040	1370	1760	W
I11	EL MWh	The electricity consumption of the electric resistance in MWh	0	0	0	MWh
R2	Defrost	The operation of the relay that controls the solenoid valve for the defrosting function is shown	OFF	OFF	OFF	ON/OFF
R4	HP	The operation of the compressor is shown	ON	ON	ON	ON/OFF
R5	EL	The electric heater operation is shown	OFF	OFF	OFF	ON/OFF

Note these values are a guide-line, site values will differ due to water and air temperature variations.

07.00   Operational description
07.01   P1 AUTO mode
This is the standard operation mode for the domestic hot water heat pump.

The temperature is set from main menu, by pressing the 'OK' button.

Select 'A Temperatures' and then A1 AUTO to set temperature for auto mode, default set point is 53°C.

As long as the air inlet temperature, BT1, is within the specified temperature range, default -7 ~ +40°C then the DHW-HP will operate normally, if BT1 temperature is outside of its operating range then the water will be heated using the electrical heater only.

Code	Set Point Name	Description	Range	Factory setting
A1	T AUTO	The temperature level at which the DHW-HP heats the water when AUTO mode is selected.	50 ~ 60	53.5

The DHW-HP will then heat the water to set point using the heat pump only.

If the water temperature, BT3, reduces by 5°C then the DHW-HP will start to reheat the water temperature back to set point.
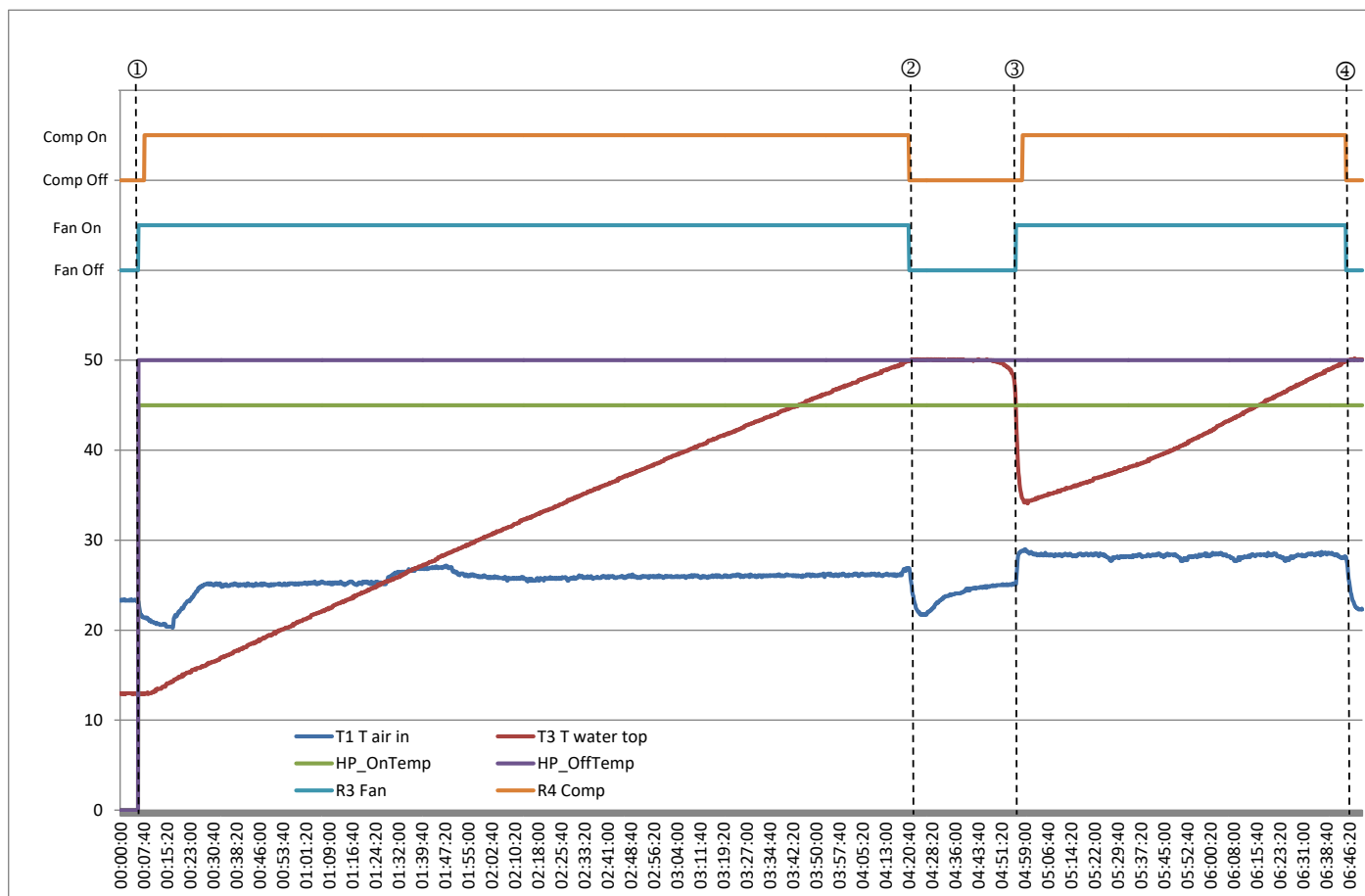
① DHW-HP starts operation on selection of AUTO mode, T AUTO <SP -5k

② DHW-HP stops when BT3 = T AUTO SP (53.5°C factory setting)

③ DHW-HP restarts when T AUTO = SP -5k

④ DHW-HP stops when BT3 = T AUTO SP (53.5°C factory setting)

07.02   P2 ECO mode

This is the standard operation mode for the domestic hot water heat pump.

The temperature is set from main menu, by pressing the 'OK' button.

Select 'A Temperatures' and then A2 ECO to set temperature for eco mode, default set point is 50°C.

As long as the air inlet temperature, BT1, is within the specified temperature range, default -7 ~ +40°C then the DHW-HP will operate normally, if BT1 temperature is outside of its operating range then the water will be heated using the electrical heater only.

Code	Set Point Name	Description	Range	Factory setting
A2	T ECO	The temperature level at which the DHW-HP heats the water when ECO mode is selected. For domestic hot water preparation do not use a set-point lower than 50°C, due the risk of legionella.	10 ~ 55	50

The DHW-HP will then heat the water to set point using the heat pump only.

If the water temperature, BT3, reduces by 5°C then the DHW-HP will start to reheat the water temperature back to set point.
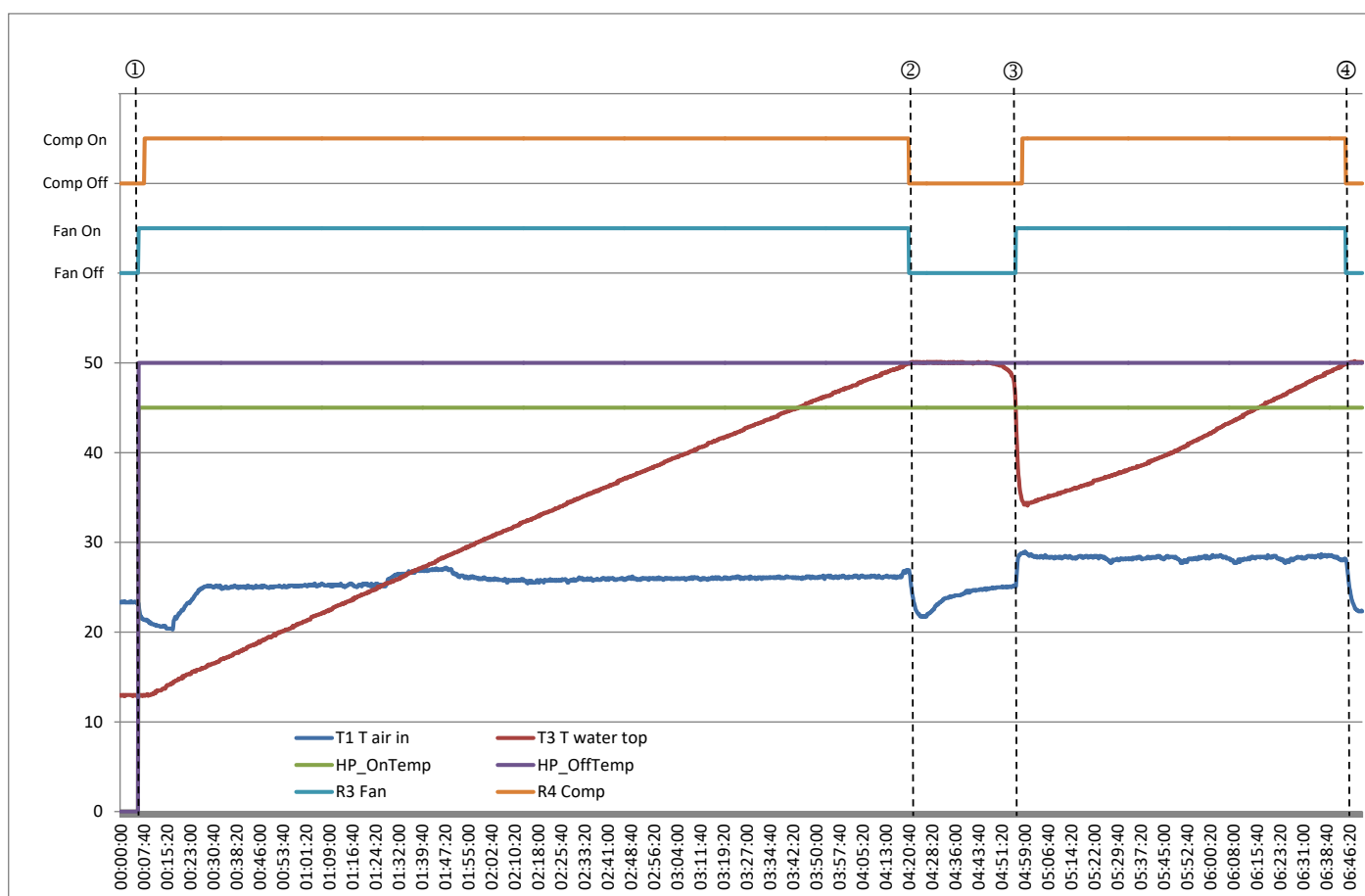
① DHW-HP starts operation on selection of ECO mode, T ECO <SP -5k

② DHW-HP stops when BT3 = T ECO SP (50°C factory setting)

③ DHW-HP restarts when T ECO = SP -5k

④ DHW-HP stops when BT3 = T ECO SP (50°C factory setting)

07.03   P3 BOOST mode

The temperature is set from main menu, by pressing the 'OK' button.

Select 'A Temperatures' and then A2 ECO to set temperature for eco mode, default is 50°C.

The heat pump and the electric heater operate simultaneously if air temperature BT1 is below set-point D 34 (Air T Boost). If the air temperature BT1 is above D34 (Air T Boost) the electric heater is deactivated and only the heat pump operates. The unit starts when the water temperature BT3 is more than 5 °C below A3 (T BOOST) and it stops when this temperature is reached. If A3 (T BOOST) is higher than D33 (T HP max) the compressor stops when the temperature D33 (T HP max) is reached. The remaining temperature lift is accomplished with only the electric heater.

Code	Set Point Name	Description	Range	Factory setting
A3	T BOOST	The temperature level at which the DHW-HP heats the water when BOOST mode is selected.	50 ~ 65	55

In this case 8°C below BOOST mode temperature set point (A3 = 63°C).

NOTE: Volume of water heated by EL heater is only a percentage of the full water volume, as follows: 190l = 75l (40%)

260l = 130l (50%)
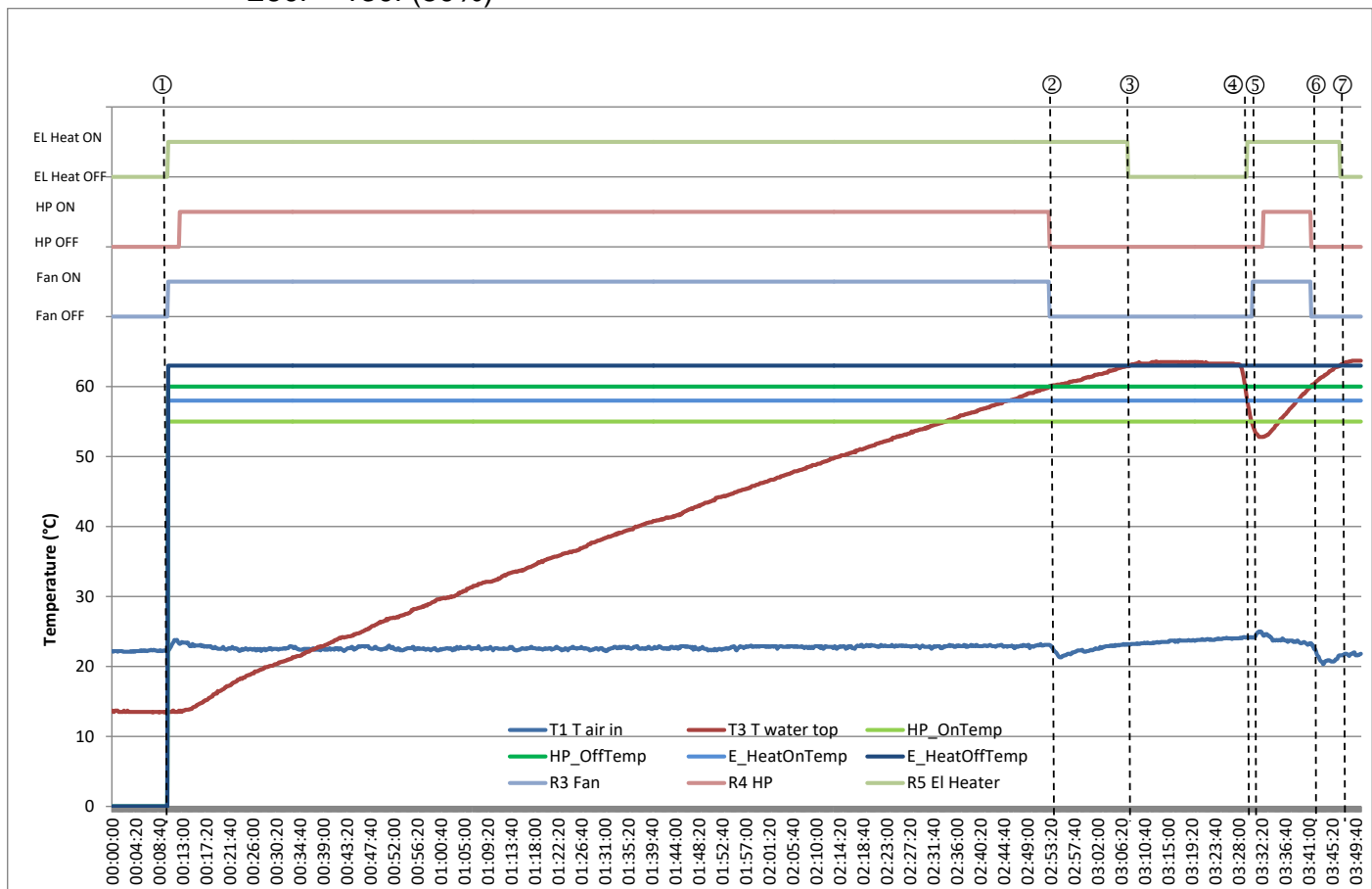
① DHW-HP starts operation on selection of BOOST mode, T BOOST <SP -5k
② HP stops operation at Temp HP Max SP (D33) 60°C
③ DHW-HP continues heating water using EL only until SP (63°C)
④ Electric Heater restart is based on SP (63°C) -5k (58°C)
⑤ HP restart is based on Temp HP Max (D33 = 60°C) -5k (55°C)
⑥ HP stops operation at Temp HP Max SP (D33) 60°C
⑦ DHW-HP continues heating water using EL only until SP (63°C)

07.04   P4 BACKUP mode

This is an emergency mode. The water is heated up by the electric heater only at a lower set temperature. The water temperature set point is set in the installer menu, D12 (Backup T).
In the case of an error, a message is displayed on the LCD display requesting if Back Up mode is required. There is a yes/no input selection required to activate or disable.

The legionella control remains active.

Code	Set Point Name	Description	Range	Factory setting
D12	Backup T	The temperature level at which the El heater heats the water when BACK UP mode is activated /selected	0 ~ 65	35

EL starts when BT3 (T Tank t) < D12 (BACKUP T) -5°C
EL stops when BT3 (T Tank t) = D12 (BACKUP T)

Note: Back up mode can only be deactivated after rectifying the cause of the fault. Once the fault has been repaired a power cycle (Off/ On) is required to reset the error code. Normal operation can be resumed by pressing the arrow, up or down, buttons to select the required operating mode.

If an error occurs, using the up or down buttons, select Yes or No, if no is selected the unit has No operation.

If Yes is selected the DHW-HP changes to BACKUP operation and the unit operates at the BACKUP mode temperature setting from D12.
After fault rectification and power reset, using the mode selection screen, choose operation mode.

07.05   P5 SILENT mode
This mode decreases the fan speed to D5 (Min fan speed) in order to minimize the sound emissions

The DHW-HP is controlled by the A1 AUTO operation mode
The unit starts when BT3 (T Tank t) < A1 (T AUTO) -5°C
The unit stops when BT3 (T Tank t) = A1 (T AUTO)
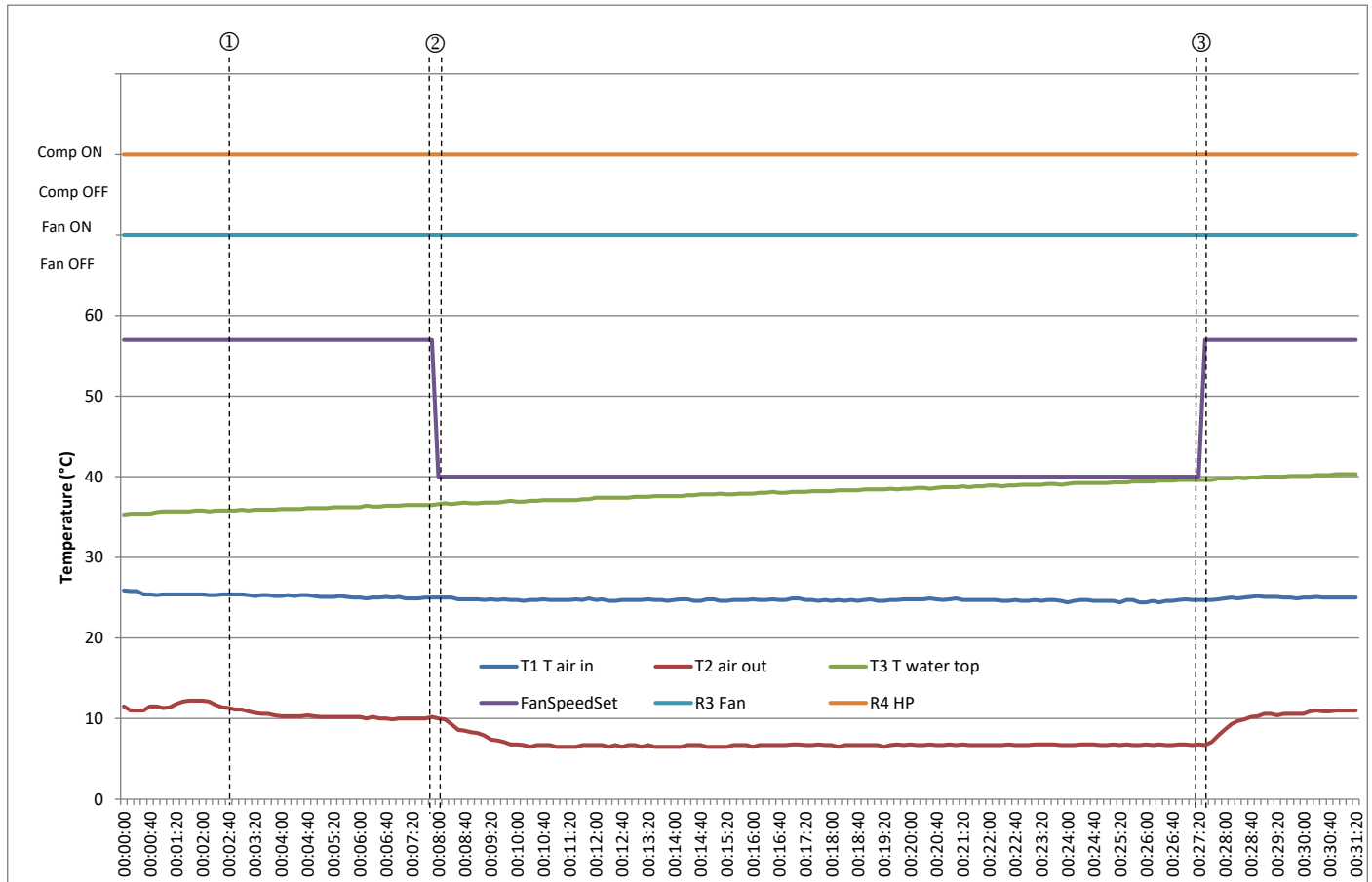
① System operating in AUTO mode
② Operating mode changed to SILENT.
   Fan speed lowers from D6 (AUTO Speed) SP of 57% (factory set point) to D5 (Min Fan Speed)
   SP of 40% (factory set point)
③ Operating mode returned to AUTO mode
   Fan speed raises from D5 (Min Fan Speed) SP of 40% to D6 (AUTO speed) of 57%

Note: In SILENT mode the controlled temperature set point is from AUTO mode.

07.06   P6 HOLIDAY mode
DHW-HP does not start when the water heating is required. The HP is OFF except during Legionella control, which is still activated once a week on the selected day from D15 (Legionella date).
The HOLIDAY mode is connected to B4 (Hot on Time). After the HOLIDAY period is completed, the unit goes back to the previous mode of operation.

07.07   B4 Hot on time

The unit can be programmed to deliver hot water from 1 to 30 days from the moment in which the function is activated and the HOLIDAY mode is selected.

The unit switches to A1 AUTO mode after the desired number of days is reached. If OFF is selected the function is not active.

i.e. To set a 7 day Hot on Time function
1. Push the 'OK' button for the main menu
2. Use the Up or Down arrows to highlight 'B Functions' menu and push the 'OK' button
3. Use the Up or Down arrows to highlight 'B4 Hot on Time' and push the 'OK' button.
4. Use the Up and Down arrows to select the number of days required for the unit to switch on to A1 AUTO mode and push the 'OK' button.
The duration of the HOLIDAY mode is now set.

Note: This function is not activated until 'HOLIDAY' is selected from the mode selection screen, accessed by pushing the Up or Down arrow from the home screen.

07.08   B3 Low Tariff

The low tariff allows the electric heater and the heat pump to run only during periods with low electricity prices, according to the menu item that regulate the program of the low tariff D17/ D18 (Low tariff weekday/weekends). The unit runs only during pre-defined hours of the day.

Code	Set point name	Description	Range	Factory setting
B3	Low Tariff Standard	If the PV function (B5) is active, this allows the electric heater and the heat pump to run outside the low tariff period.	OFF/ Standard/ Optimal 1/ Optimal 2	OFF
	Low Tariff Optimal 1	This function allows the maximum exploitation of the lower electricity price during the night periods between 00:00 and 05:00		
	Low Tariff Optimal 2	This function allows the maximum exploitation of the lower electricity price during the night periods between 00:00 and 05:00. During the day, the unit works according to Low Tariff periods D17 and D18		

Electric heater operation (Optimal 1 and Optimal 2)
- The EL can operate only at night, between 01:00 and 05:00
- The EL starts operating when the amount of heat that can be produced by the HP (Qdisp) is not sufficient to cover the amount of heat needed to reach the water temperature set point by 5:00 (Qreq).
- The EL cannot operate more than3 hours/day. 2 other hours are used to calculate the Qreq and Qdisp (normallybetween00:00-01:00 and 02:00-03:00) and EL cannot be used in these periods.
- The EL, if activated, works for at least one continuous hour.
- If the water set point temperature has not been reached by 4:00, EL will operate for the last hour(until05:00), or until the water temperature set point is reached.
- In normal conditions, the EL is activated only if also the HP is active.
- If the heat pump is not operating, the EL will be activated only in case the external ambient conditions don't allow HP operation (Inlet air temperaturebelow-7°C or above 40 °C.

Heat pump operation (Optimal 1 and Optimal 2)

- If the water temperature is below set point temperature minus hysteresis, the HP starts its operation (normally at 00:00).
- **Optimal 1**: The HP is allowed to run also during the day(according to MODE of operation
- **Optimal 2**: The HP is always allowed to run in the night period(between00:00 and 5:00) plus it is allowed to run in the periods described by D17/D18 (Low tariff period weekday/weekend)

LOW TARIFF : "OPTIMAL"

Equations

$Qdisp = Vn * dw * cw * (T3(h-1) - T3(h-2)) * (yy-h)/1$ [Wh]

$Qreq = Vn * dw * cw * (A1\ T\ AUTO - T3(h-1))$ [Wh]

Nomenclature

Set points:
- A1 T AUTO: water set point

Information:
- T3 T tank t: measured water temperature

Other:
- Qdisp: heat that can be produced by HP alone (Wh)
- Qreq: heat to be produced by unit before yy (Wh)
- Vn: nominal volume (190 or 260 l)
- dw: water density (1 kg/l)
- cw: specific heat (1,16 Wh/(kg-K))
- T3(h-1): water temperature at the end of the period h-1 (C)
- yy: end of the night period according to Titre V (05:00)
- xx: beginning of the night period according to Titre V (00:00)
- h: summer time hours (hours)

07.09   B1 Ventilation

This mode is used for the ventilation of air from a room and distributed either into the DHW-HP room location or ducted outside of the building.

Using the function B1 (Ventilation) the DHW-HP can be set to 3 operation modes, Off, single speed or 2 speed

To complete the ventilation mode setup B2 (Ventilation Fan Speed) can be set.

Code	Set point name	Description	Range	Factory setting
B1	Ventilation OFF	The fan switches off when the heat pump does not run.	OFF/ Single Speed/ 2Speeds	OFF
	Single speed	The fan is always running at a single fixed speed (B2 Fan speed), both when the heat pump is operating and when it is not.		
	2 Speeds	The fan is always in operation but it runs normally at a higher speed D6 (Fan AUTO Speed) when the heat pump starts operating and at (B2 Fan speed) when it is not operating.		
B2	Fan speed	The main fan speed regulation for the ventilation function. There are three ventilation level that can be selected: LOW D5 (Min Fan Speed), MEDIUM D4 (Fan medium speed) HIGH D3 (Max fan speed).	LOW/ MEDIUM/ HIGH	HIGH

Single Speed Operation
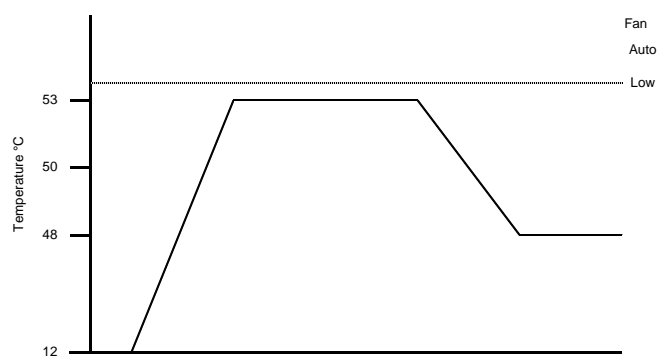
T3:Temperature Tank Top

DHW AUTO mode set point of 53°C
<u>Ventilation ON</u>
Ventilation fan speed LOW
Ventilation mode single speed
Note: This may have an impact on performance due to fan reduction in DHW mode

2 Speed Operation
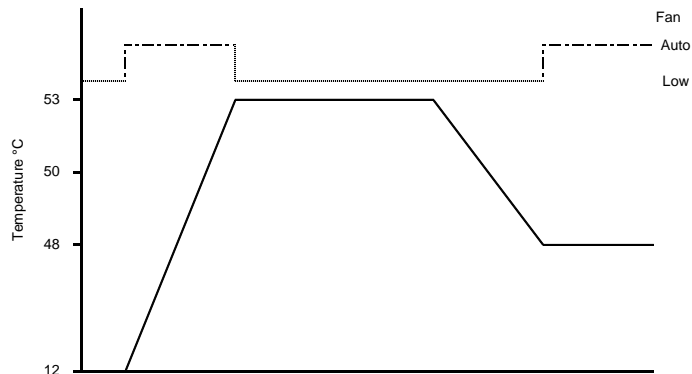
T3:Temperature Tank Top

DHW AUTO mode set point of 53°C
<u>Ventilation ON</u>
Ventilation fan speed LOW
Ventilation mode 2 speed

07.10   B5 Photovoltaic

The domestic hot water heat pump (DHWHP) can be controlled by a signal from a solar photovoltaic (PV) converter or an energy meter, either as simple start/stop via a potential free contact or by a variable signal.

The diagrams below represent possible installation configurations with or without energy meter.

Using the variable signal option, a certain output (VDC or mA) from the (PV) inverter or the energy meter corresponds to a given amount of excess power for use in the DHWHP. This excess power can be used to activate either the electrical immersion heater, the heat pump (HP) or both.

TB1:   DC/AC Inverter
BU: Energy meter
E1-2-3: Electric loads
WG1:   Heat pump power supply
GC1:   Photovoltaic function input signal (0-10 VDC 0-3 VDC, 4-20 mA).
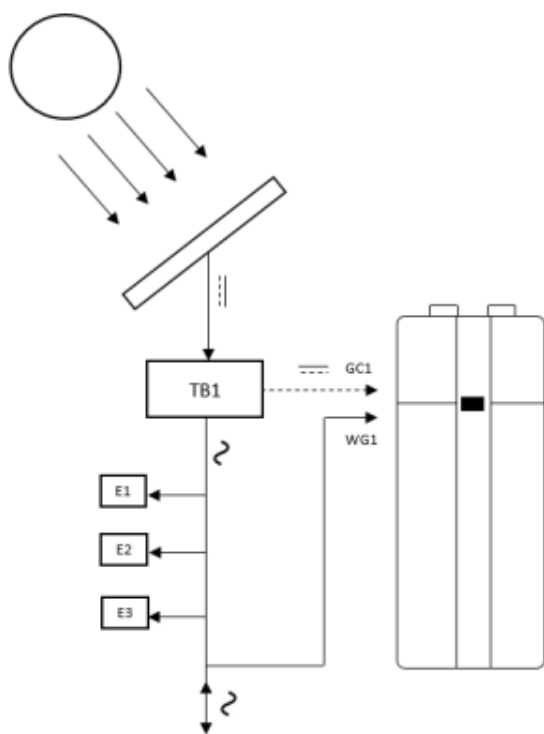
PV installation 1: control signal from inverter.
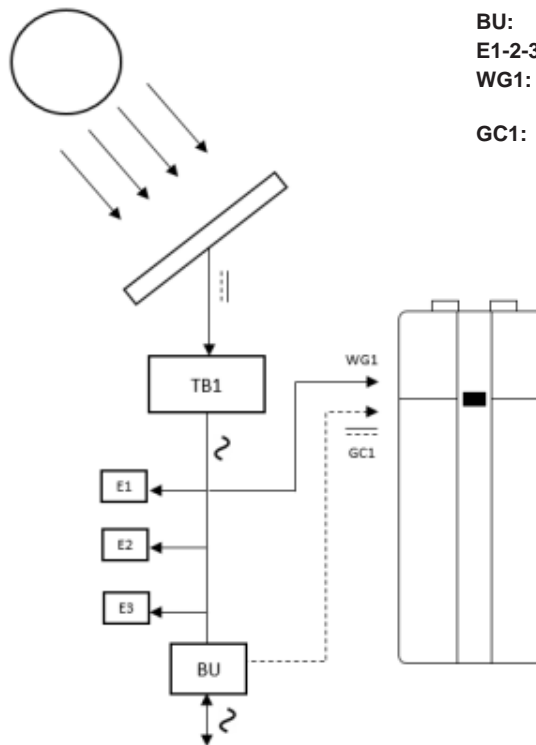
PV installation 2: control signal from energy meter.

A graph to convert the signal input to % is available in figure 21
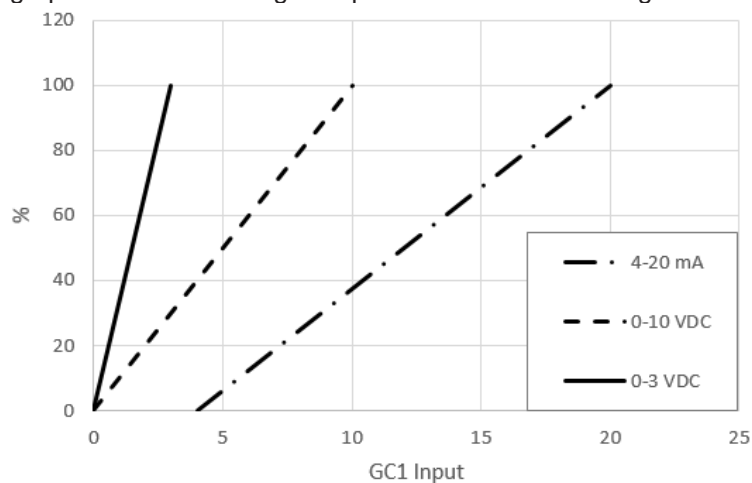
Conversion table of the controller input signal to percentage

The following schematic shows the electrical connections for the Solar PV operation
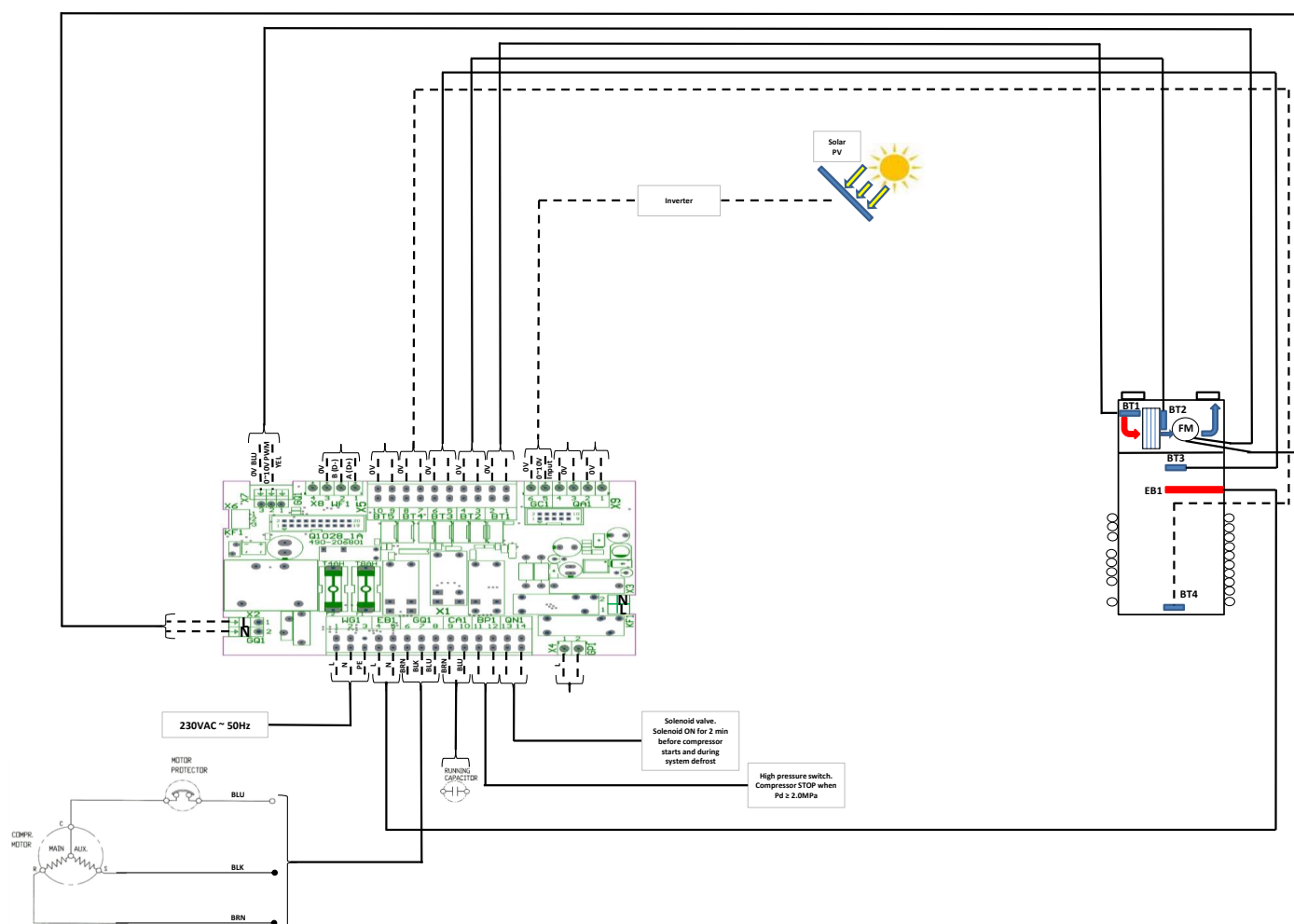
PV operation is set up using a combination of the following functions:

Code	Set point name	Description	Range	Factory setting
B5	OFF	The PV function is not active. If this function is activated, the heat pump and the electric heater can start only if the input voltage in GC1 (0-10V) is higher than D20/D21 (PV min Voltage HP/EL) for longer than D22 (PV min time).	OFF/ ECO/ STORAGE	ECO
	PV ECO	The PV function allows for water heating only with the heat pump until temperature set point defined by the MODE of operation is reached.		
	PV STORAGE	The PV function allows for water heating to the maximum temperature level, giving priority to the operation of the heat pump if the BOOST or BACK UP mode is not active. The heat pump operates alone until the max allowed temperature for the heat pump operation D33 (T HP Max) is reached. The electric heater operates only from D33 to the maximum allowable temperature D9 (Water T max).		
D20	PV min Voltage HP	The minimum voltage (V) required to start the HP when the PV function is active.	0-10	0
D21	PV min Voltage EL	The minimum voltage (V) required to start the electric heater when the PV function is active.	0-10	0
D22	PV min time	The minimum time (minutes) at which the input voltage from the PV panel should be above the set point D20/D21 (PV min Voltage HP/EL) in order to start the electric heater or heat pump when the PV function is active D22 also regulates the minimum heat pump operational time when started by the PV function.	1-120	15

The following operational charts have these settings applied:
 i) D20 (PV min voltage HP) set to 5V
 ii) D21 (PV min voltage EL) set to 8V
 iii) D22 (PV min time) set to 5mins
 iv) PV mode selected from B5 dependant on operation required (ECO or STORAGE)

07.10.01   PV ECO operation in AUTO mode

When the photovoltaic mode is set to PV ECO and the DHW-HP mode is set to AUTO, there is no operation of the electrical heater, even if the 0~10V input rises above the D21 (PV Min Voltage EL) set point.
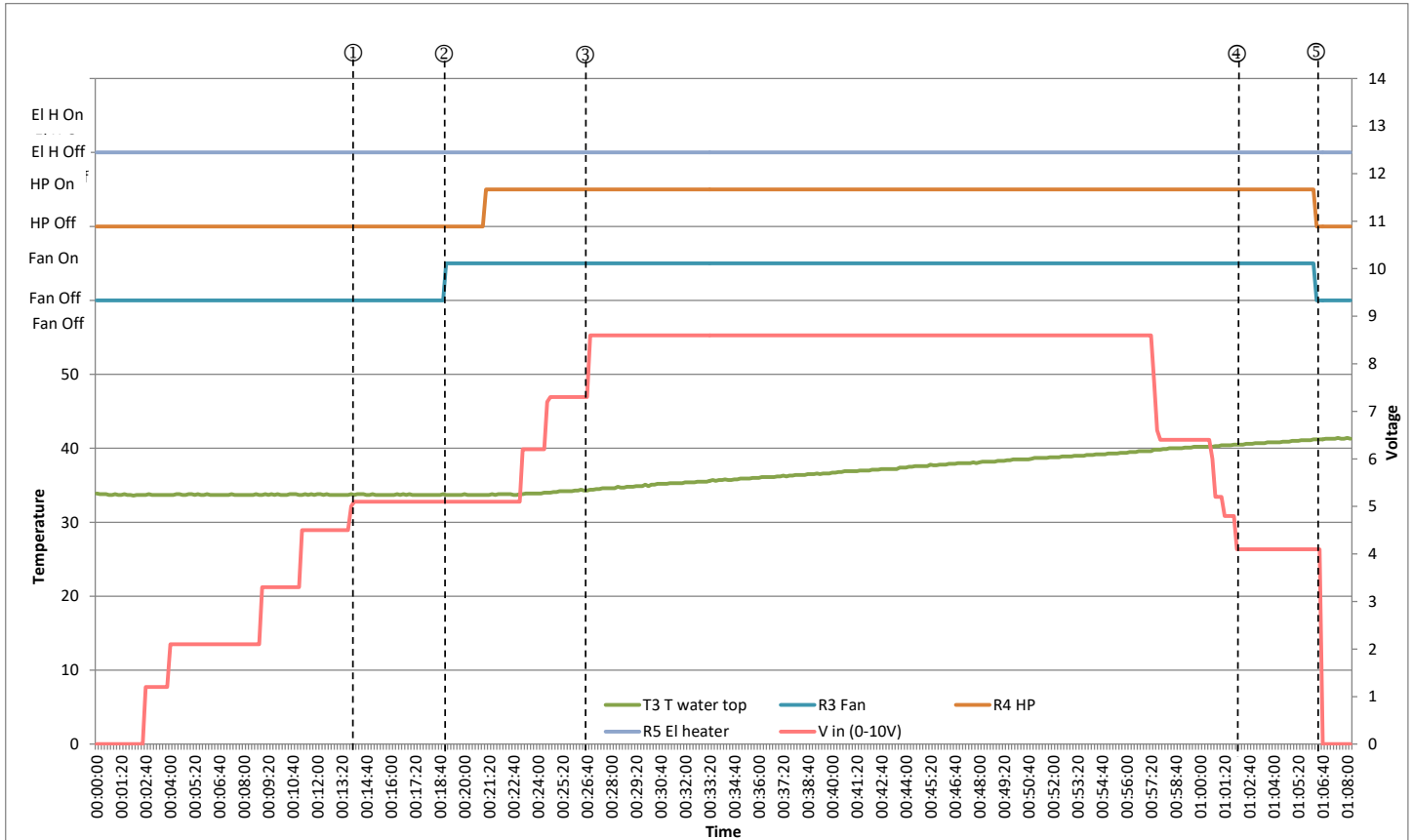
① 0~10V input raised in small steps until >5V, set from D20 (PV Min Voltage HP)
② HP starts after 5 minutes delay, set from D22 (PV Min Time)
③ In ECO / AUTO mode the heater should not operate, Voltage raised to >8V D21 (PV Min Voltage EL)
④ 0~10V input decreased until <5V, set from D20 (PV Min Voltage HP)
⑤ HP stops after 5 minutes delay, set from D22 (PV Min Time)

Note: If water set point temperature is achieved then the heat pump stops operation.

07.10.02   PV ECO operation in BOOST mode

When the photovoltaic mode is set to PV ECO and the DHW-HP mode is set to BOOST, there is no operation of the electrical heater, even if the 0~10V input rises above the D21 (PV Min Voltage EL) set point.
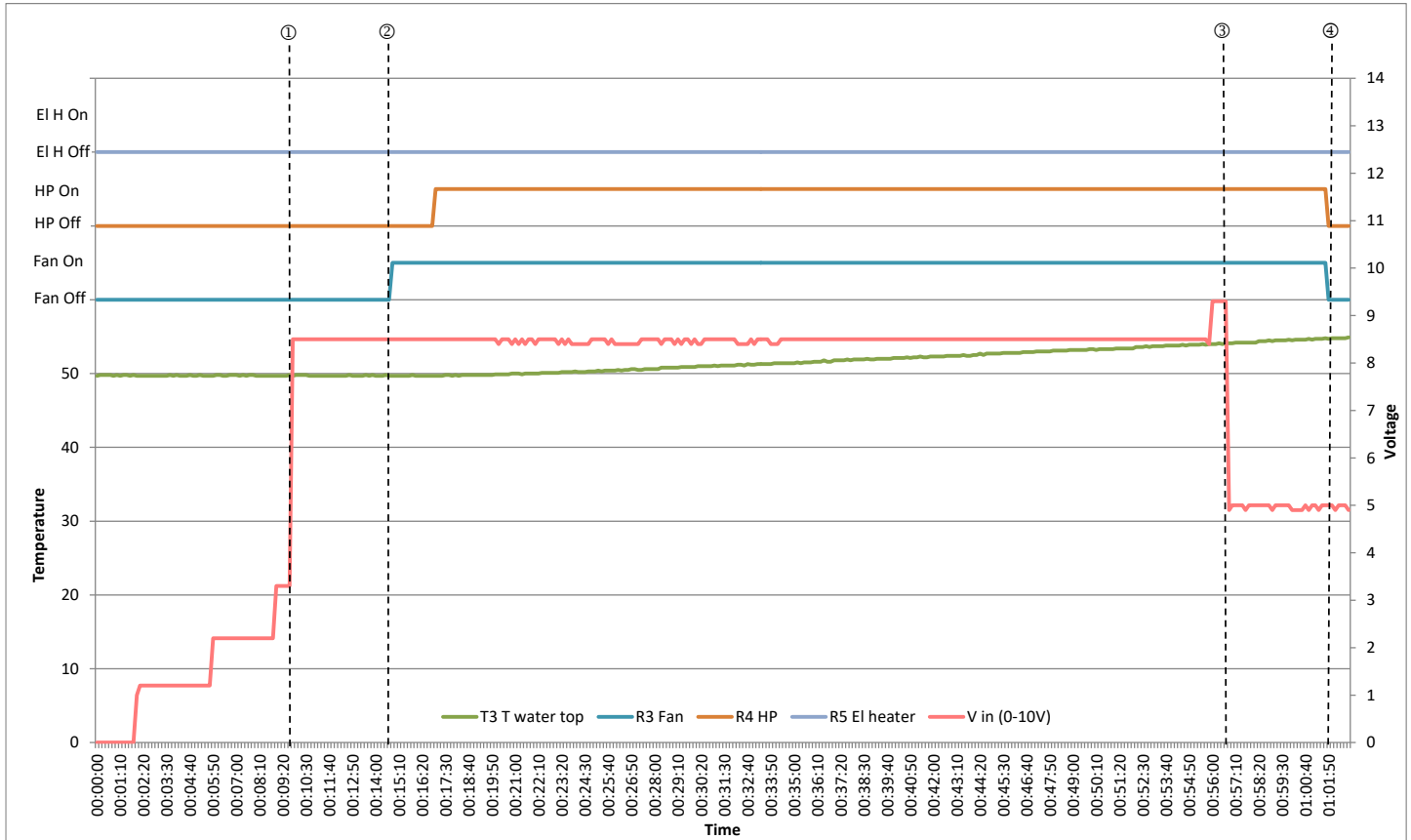
① 0~10V input raised until >8V, set from D20 (PV Min Voltage HP) & D21(PV Min Voltage EL)
② HP starts after 5 minutes delay, set from D22 (PV Min Time). Electric heater does not start due to PV ECO mode being selected.
③ 0~10V input decreased until <5V, set from D20 (PV Min Voltage HP)
④ HP stops after 5 minutes delay, set from D22 (PV Min Time)

Note: If water set point temperature is achieved then the heat pump stops operation.

07.10.03   PV Storage operation in BOOST mode

When the photovoltaic mode is set to PV STORAGE and the DHW-HP mode is set to BOOST, the HP operates when the 0~10V input rises above the D20 (PV Min Voltage HP) and the electrical heater operates when the 0~10V input rises above the D21 (PV Min Voltage EL) set point.
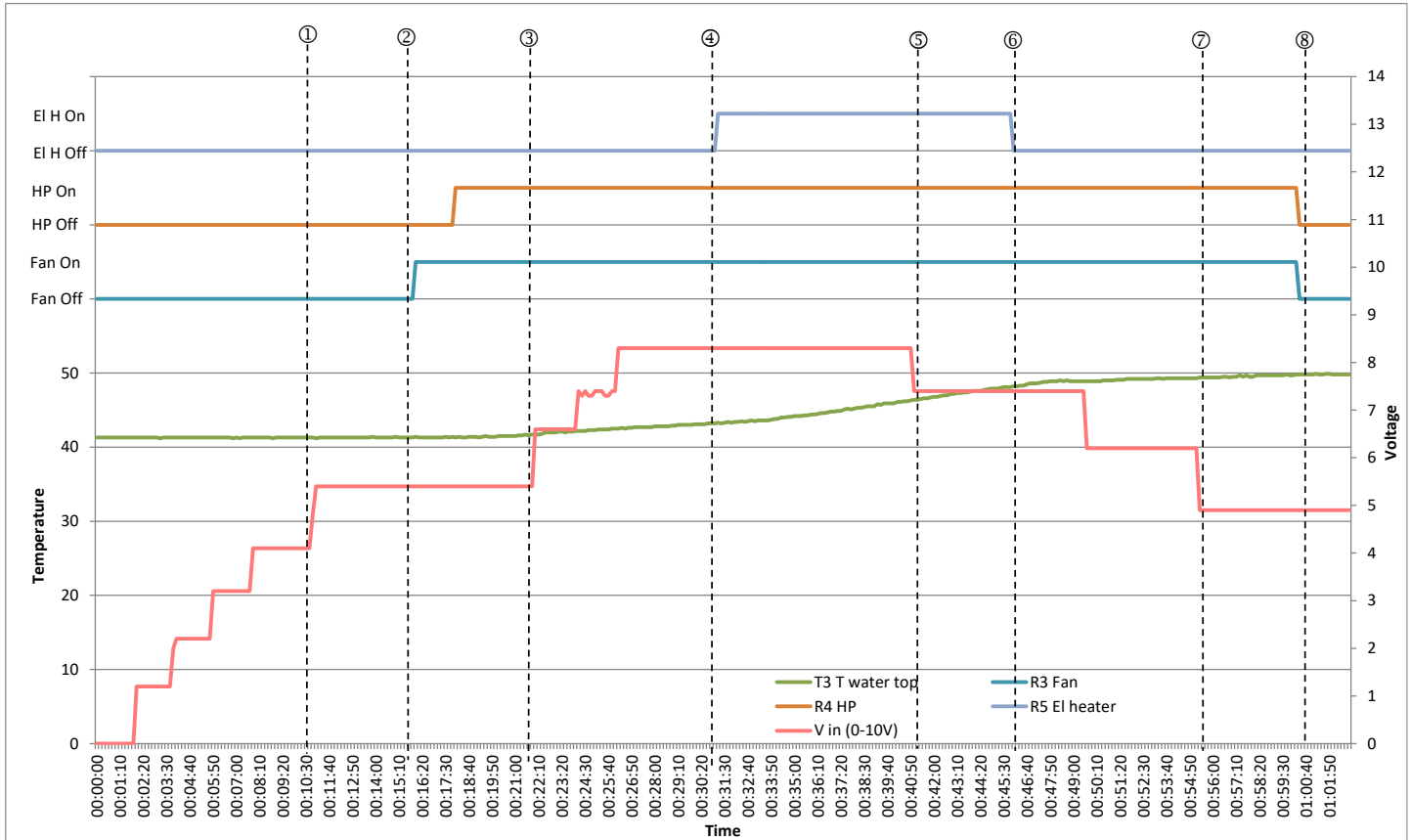
① 0~10V input raised in small steps until >5V, set from D20 (PV Min Voltage HP)
② HP starts after 5 minutes delay, set from D22 (PV Min Time)
③ 0~10V input raised in small steps until >8V, set from D21 (PV Min Voltage EL)
④ EL starts after 5 minutes delay, set from D22 (PV Min Time)
⑤ 0~10V input decreased until <8V, set from D20 (PV Min Voltage HP)
⑥ EL stops after 5 minutes delay, set from D22 (PV Min Time)
⑦ 0~10V input decreased until <5V, set from D20 (PV Min Voltage HP)
⑧ HP stops after 5 minutes delay, set from D22 (PV Min Time)

Note: If water set point temperature is achieved then the heat pump stops operation.

07.11   D26 Extra Function (Only available with the deluxe DHW-HP)

There are 2 additional modes available for the Deluxe model DHW-HP, solar and cooling functions, (Floor function is not supported by TOSHIBA). These are activated from D26 Extra Function accessed within the Installer menu.

NOTE: It is only possible to connect one of these options to the DHW-HP at any time.

Code	Set point name	Description	Range	Factory setting
D26	Extra function	The desired extra function is selected here. The possible functions are Solar, or Cooling (Floor function is not supported by TOSHIBA). Once the function is activated, move to the function menu and adjust the set point as desired.	OFF/ Solar/ Floor/ Cooling	OFF

07.11.01   B6 Solar

The Solar function allows the water to be heated up by the solar collector, activating a water pump controlled by the extra relay (GP1).
The setup of the solar function is carried out using the function menu and B6 (Solar)

Code	Set point name	Description	Range	Factory setting
B6	Solar	The Solar function allows the water to be heated up by the solar collector, activating a water pump controlled by the extra relay (GP1). The pump starts when BT5 > BT3 + D24 (Solar DT min). The pump stops if the temperature in the tank goes above D23 (Solar T max) or if BT5 is below BT3.	OFF/ON	OFF

The following schematic shows the electrical connections for the Solar Thermal operation
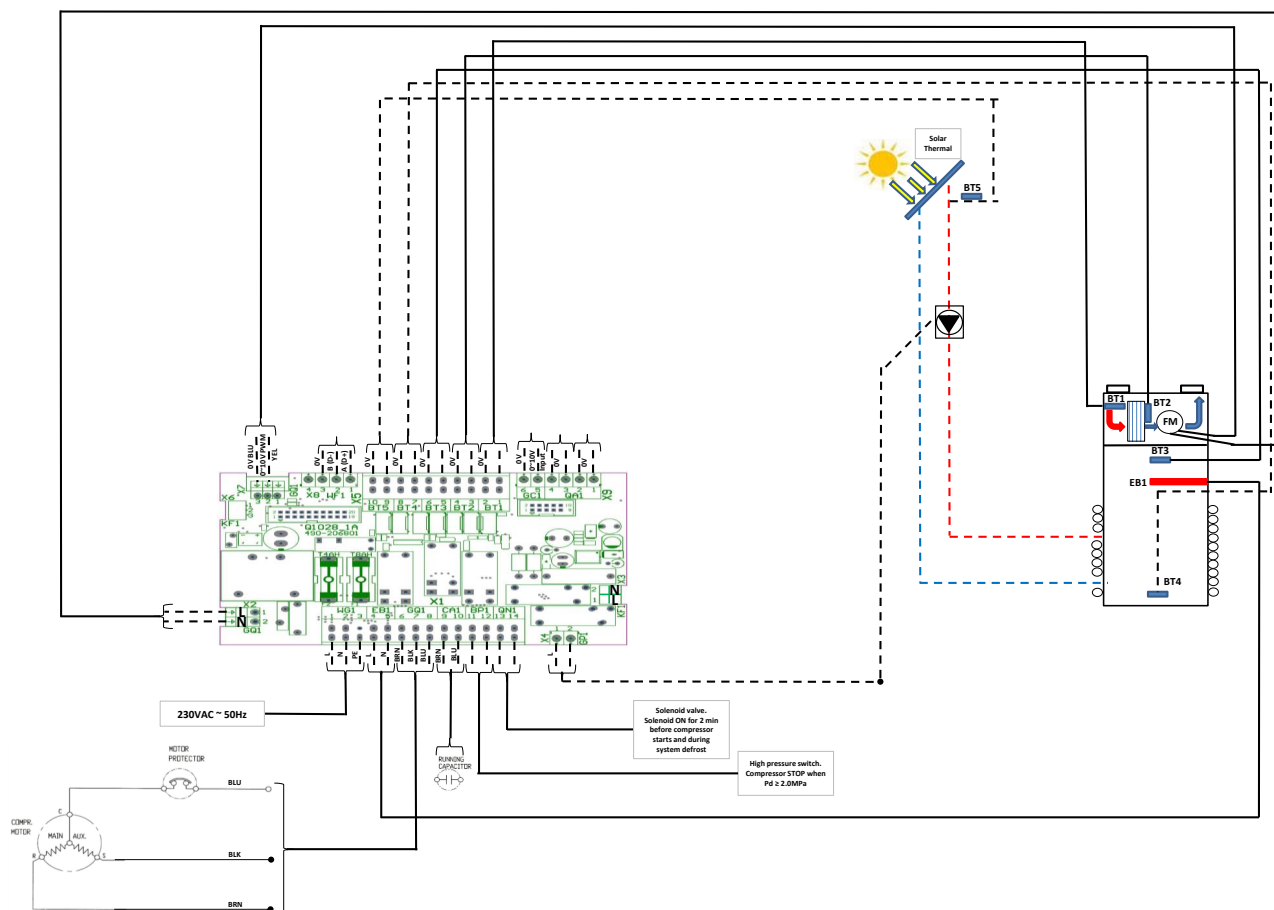
07.11.02   B9 Cooling / B10 Cooling T

The cooling function activates a three-way damper, which directs the cold exhaust air to a room with cooling requirements. The two functions operate the damper in opposite directions.

The Cooling function allows an area to be cooled up by the DHW-HP exhaust air, activating a damper motor controlled by the extra relay (GP1).

The setup of the cooling function is carried out using the function menu B9 (Cooling) & B8 (Cooling T) and installer menu D28 m(Cooling type)

Code	Set point name	Description	Range	Factory setting
B9	Cooling	The Cooling function can be activated. See installer menu D28 (Cooling type).	OFF/ON	OFF
B10	Cooling T	The air temperature set point (°C) below which the heat pump stops, when the unit is in the Cooling function.	10 - 30	21
D28	Cooling 1	The fan and heat pump run until the additional temperature sensor, BT5, placed in the room environment is below a certain level. The water temperature can only reach the maximum temperature allowed in the tank D33 (T HP max). The cooling function activates a three-way damper, which directs the cold exhaust air to a room with cooling requirements. The two functions operate the damper in opposite directions	Cooling1 / Cooling2	Cooling1
	Cooling 2	Cooling 1 (2). If BT5 is higher than B10 T Cooling, the extra relay that operates the damper (GP1) switches ON (OFF). If BT5 is lower than B10 (T Cooling), the extra relay that operate the damper (GP1) switches OFF (ON).		

The following schematic shows the electrical connections for the cooling operation

T3:Temperature Tank Top
T5: Temperature Extra (Room)
Cooling
Type 1
Cooling temperature set point 20°C
Note: If DHW temperature is greater than Auto set point (>53°C)
        then HP OFF when Cool satisfied
        If cooling demand during this time then HP start at 65°C set point
CAUTION: DHW temperature could be hot 60°C

DHW AUTO mode set point of 53°C

T3:Temperature Tank Top
T5: Temperature Extra (Room)
Cooling
Type 2
Cooling temperature set point 20°C
Note: If DHW temperature is greater than Auto set point (>53°C)
        then HP OFF when Cool satisfied
        If cooling demand during this time then HP start at 65°C set point
CAUTION: DHW temperature could be hot 60°C

DHW AUTO mode set point of 53°C

07.12   D27 SG Ready

A smart grid is an electrical grid which includes a variety of operational and energy measures including smart meters, smart appliances, renewable energy resources, and energy efficient resources. Electronic power conditioning and control of the production and distribution of electricity are important aspects of the smart grid. The DHW-HP is controlled based on inputs received from the Smart Grid energy meter on QA1and set up using installer menu D27.

Code	Set point name	Description	Range	Factory setting
D27	SG Ready	The SG ready function can be activated by the installer here. Three possible modes can be selected. This function allows the start of the heat pump from an external access (See QA1).	OFF	OFF
		The heat pump and electric heater must start, if below the max water temperature allowed in the tank. Both Heat Pump and Electric heater are forced to operate (SG1 ON and SG2 ON).	SG BOOST	
		The heat pump operates minimizing costs, only the heat pump is activated (SG1 OFF, SG2 ON).	SG ECO	
		The unit can be stopped even if there is a need for hot water (SG1 ON, SG2 OFF).	SG BLOCK	

TB1: DC/AC Inverter
BU: Energy meter
E1-2-3: Electric loads
WG1: Heat pump power supply
GC1: Photovoltaic function input signal (0-10 VDC 0-3 VDC, 4-20 mA).
____ : represents the cables to the switch inputs SG1 & SG2

The following schematic shows the electrical connections for the SG Ready operation
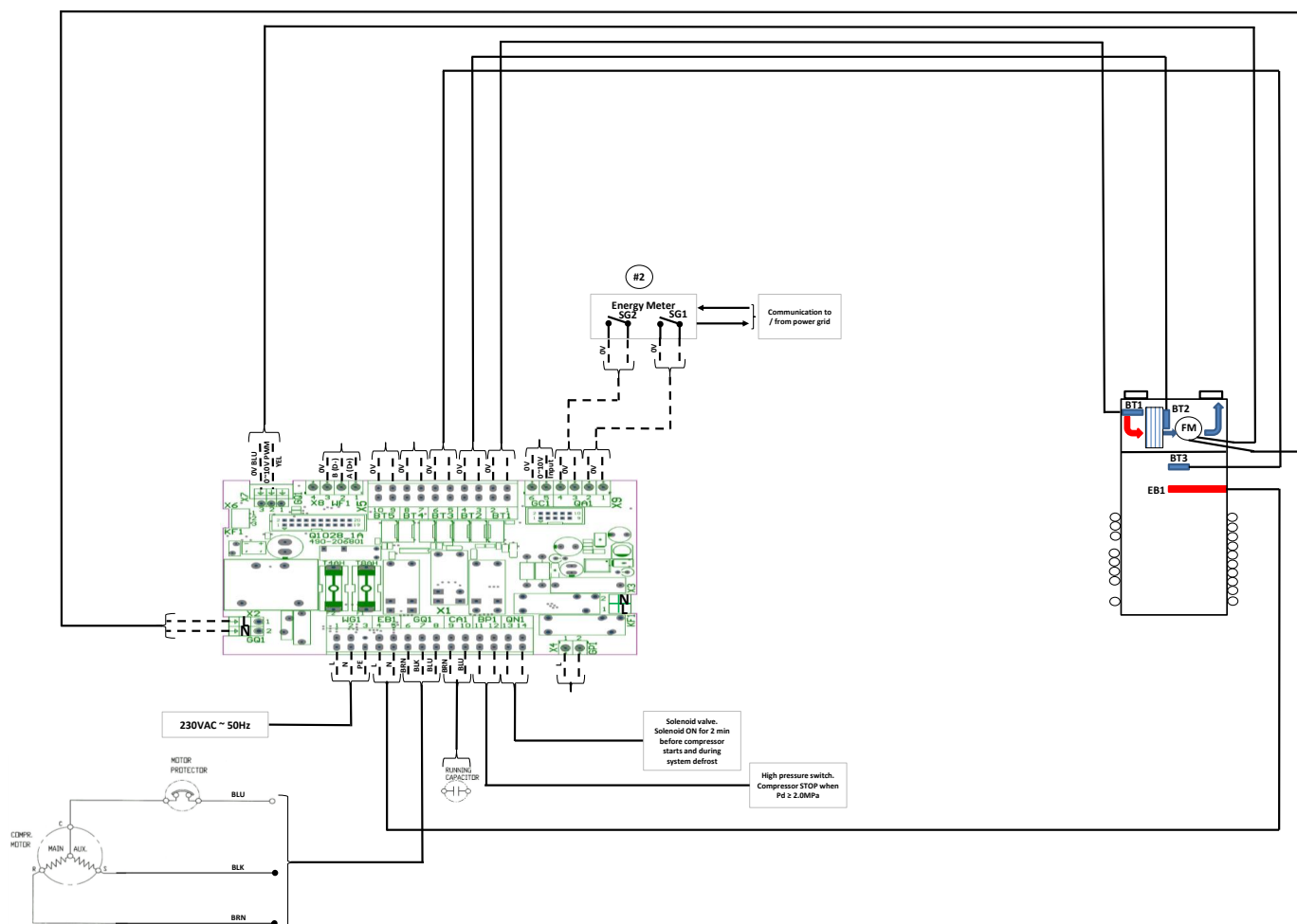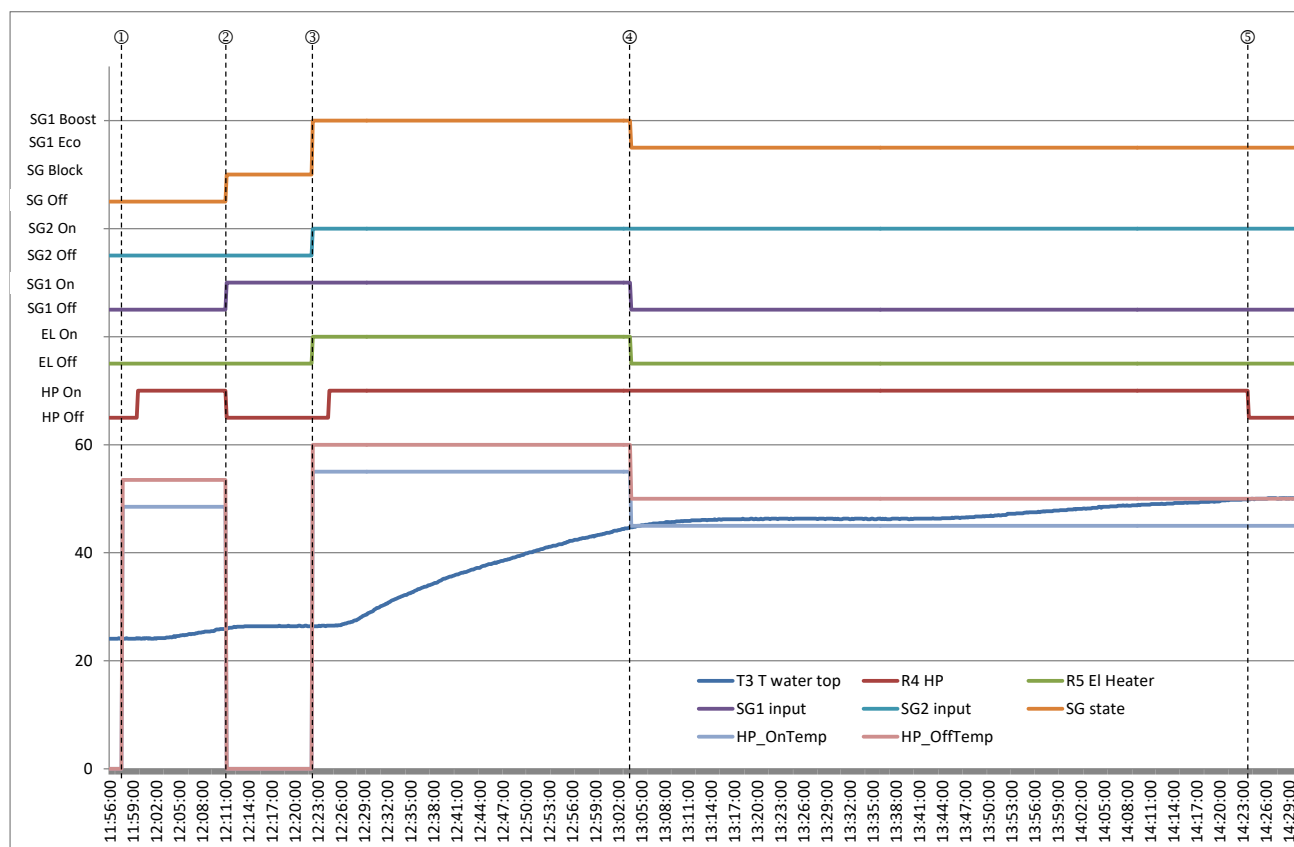
① DHW-HP normal operation
② SB Block – SG switch positions: SG1 ON, SG2 Off – DHW-HP stops operation
③ SG Boost – SG switch positions; SG1 On, SG2 On – DHW-HP operates with HP & EL Heater
④ SG Eco – SG Switch positions; SG1 Off, SG2 On – DHW-HP operates with HP only
⑤ When DHW-HP reaches mode set point (AUTO mode = 53.5°C), DHW-HP stops operation

07.13   D29 External control
This function allows for the external control of the ventilation function using a 0 ~ 10 Volt input.

Using the installer menu, D29 (External control) function.

Code	Set point name	Description	Range	Factory setting
D29	OFF	Normal operation.	OFF/ Hygrostat/ Ventilation Max/ Start-Stop	OFF
	Hygrostat	The fan always runs according to the input signal in GC1 (0-10V) from an external hygrostat, CO_2 – sensor or similar appliances. 1. If the voltage is between 0-3.0V the fan speed id D5 (Fan min speed) 2. If the voltage is between 3.0-8.0V the fan speed is D4 (Fan medium speed) 3. If the voltage is higher than 8V the fan speed is D3 (Fan max speed)		
	Ventilation max	If the ventilation function is already selected, a signal higher of 2V to GC1 leads to maximum air flow.		
	Start/ Stop	If GC1 receives a signal higher than 2V, the unit operation is stopped.		

Hygrostat Function – fan speed control

The air flow is automatically adjusted depending on the ambient air conditions or by manual adjustments.

The fan constantly runs changing the speed level depending on the 0~10V input signal from external humidity sensors, CO_2 sensors or human interface panel:

- When the input signal is from 0 to 3.3V, the fan switches to minimum speed level (from D5)
- When the input signal is from 3.3 to 8V, the fan switches to medium speed level (from D4)
- When the input signal is from 8 to 10V, the fan switches to high speed level (from D3)

Possible Installation Layout with Honeywell RF module
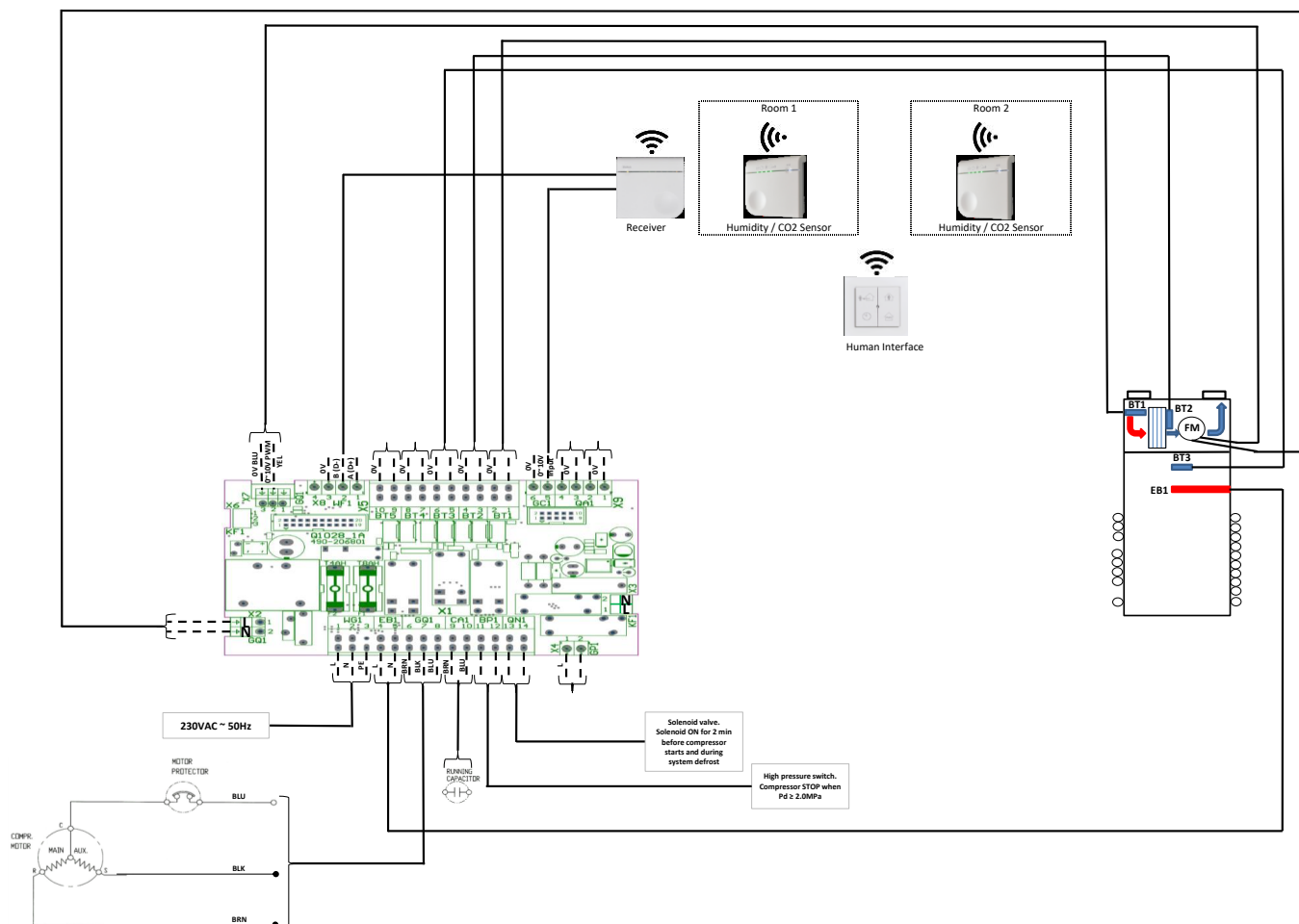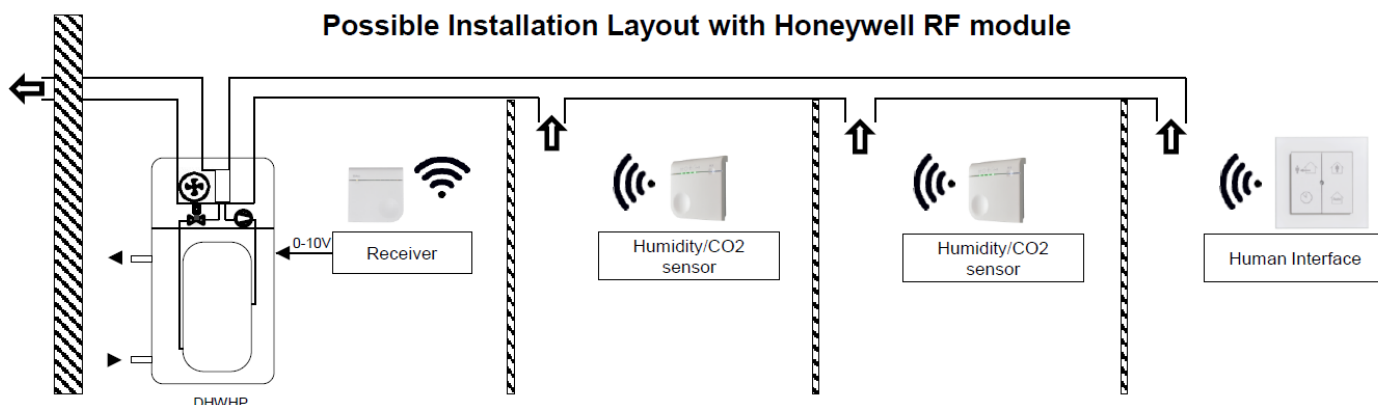
07.14   Defrost operation

When the evaporation temperature (BT2) falls below 0°C, the evaporator starts to accumulate ice on its fins. In order to maintain the unit reliability and performance, an automatic defrosting operation is activated.

Defrosting can occur between 60 minutes and 120 minutes from the last defrosting or from the last moment in which the evaporation temperature was above 0°C.

Defrosting can occur with two different strategies according to the conditions of the inlet air.
1) If the air temperature is above 4°C, then the defrosting occurs running both compressor and fan. The fan runs at speed D3 (Fan max speed).

2) If the air temperature is below 4°C, then the defrosting occurs running the compressor and stopping the fan.

Before defrosting is completed the fan stops for a short period to allow the excess water in the unit to leave the unit from the condensate drain.

Defrosting automatically stops when the temperature of the evaporator (BT2) becomes higher than the set point (D10).

If defrosting lasts more than 10 minutes, the compressor and fan stops for other 10 minutes in order to assure complete melting of the ice. If this occurs, a message is displayed to inform the user.
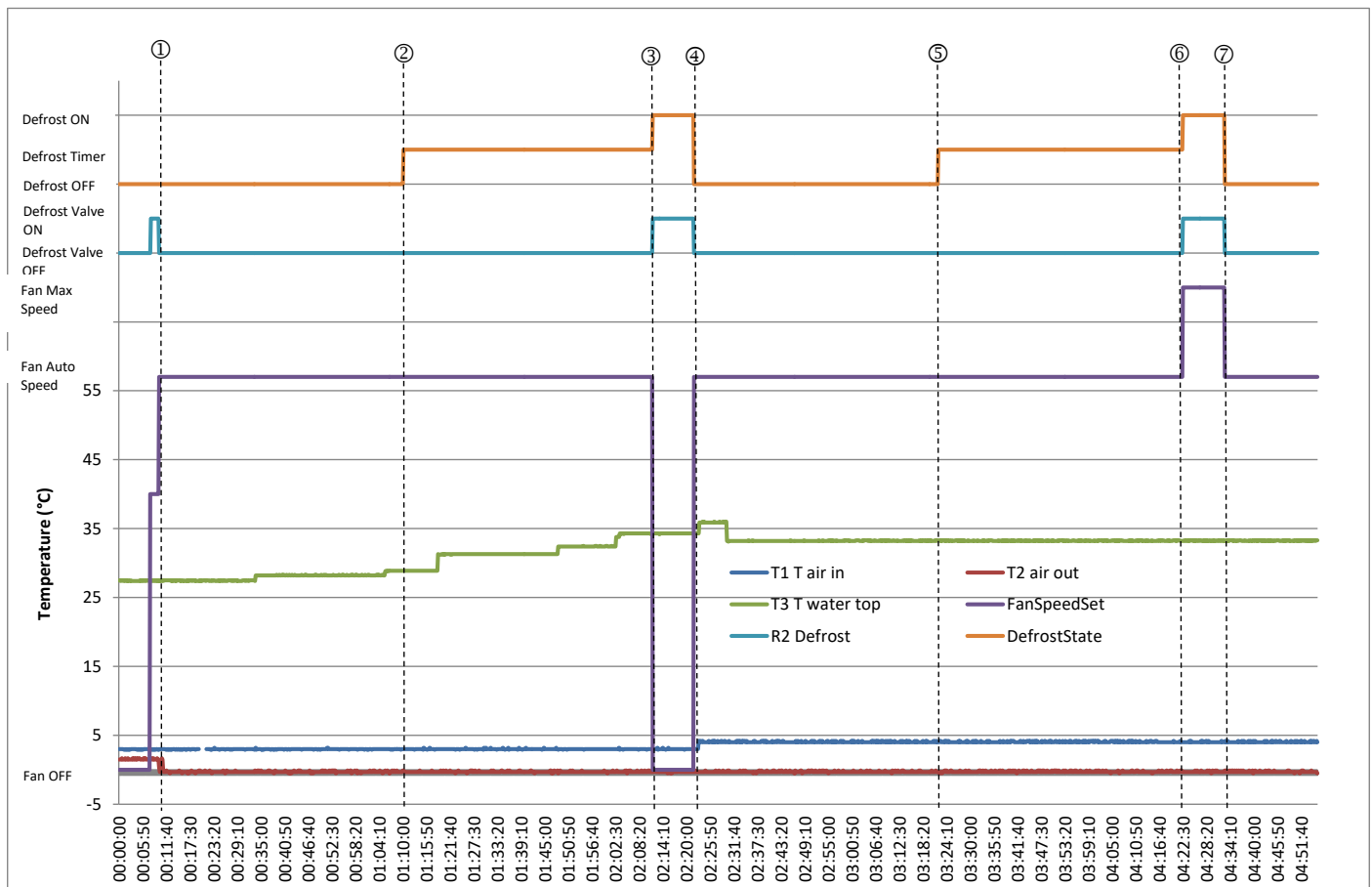
① System start up with BT1 (Air Inlet Temp) at 3°C
② After 60 minute operation the defrost countdown timer is activated
③ After a further 60 minutes, the DHW-HP enters defrost operation
   The solenoid valve opens and because the BT1 temperature is <4°C the compressor stays on and the fan stops operation
④ Defrost operation stops after a maximum time limit of 12 minutes or when BT2 (T Air Out), evaporator temperature, becomes higher than the set point of D10 (Defrosting Temp Stop), factory set to 4°C.
⑤ BT1 (Air Inlet Temp) raised to 4.2°C
⑥ After a further 60 minutes, the DHW-HP enters defrost operation
   The solenoid valve opens and because the BT1 temperature is >4°C the compressor and fan operate. The fan increases operation to Max Fan Speed, D3 (Fan Speed Max) set point.
⑦ Defrost operation stops after a maximum time limit of 12 minutes or when BT2 (T Air Out), evaporator temperature, becomes higher than the set point of D10 (Defrosting Temp Stop), factory set to 4°C.

07.15   Legionella operation

In order to prevent the possibility of legionella bacteria accumulating in the DHW-HP, a pasteurisation, or anti-legionella cycle, should be performed weekly.

Using the installer menu set up parameters D13 to D15 (detailed below). It is possible to select the day, temperature and to enable or disable the anti-legionella cycle.

The anti-legionella cycle is activated at midnight (00:00) on the day set (code D15) but the higher temperature is not activated until the next compressor start operation (DHW demand condition).
Note:
   i)   If there is no DHW demand, and therefore no compressor start, within 24 hours of the anti-legionella control becoming active the anti-legionella control is forced to start regardless of the water temperature inside the DHW-HP
   ii) When the DHW-HP is set in HOLIDAY mode the anti-legionella control operates on the selected day and starts the heat pump at 00:00.

Code	Set point name	Description	Range	Factory setting
D13	Legionella	The legionella function can be activated. The legionella function does not switch the heat pump on, but just continues the heat up cycle to a higher temperature D14 (Legionella T). The legionella operation works only with the heat pump until 60°C. The remaining temperature lift is accomplished with the electric heater alone. During Legionella operation the external pump is stopped.	OFF/ON	OFF
D14	Legionella Temp	The legionella temperature set point can be regulated.	60-65	60
D15	Legionella date	The legionella week day can be set	Monday/ Sunday	Sunday

① Anti-legionella control activates at midnight (00:00). No operation of heat pump due to no demand.

② Heat pump starts operation when demand is required and the HP off temperature is raised to the legionella set point temperature, in this case D14 is set to standard factory setting of 60°C.

③ Heat pump stops operation when legionella set point is achieved, 60°C.

08.00   Modbus

As standard the Toshiba Domestic Hot Water Heat Pump units are supplied with a ModBus controller. The controller provides a secondary port to be connected to a system network thanks to an RS485 bus. The controller has the ability to communicate without an amplifier. The length of the bus does not exceed 500m.

Description	Line Spec.	Maximum Length (m)	Connection Destination			
RS-485 connection	2 wire shielded	500m	PCB WF1	Pin 1	A	+RS485
				Pin 2	B	-RS485
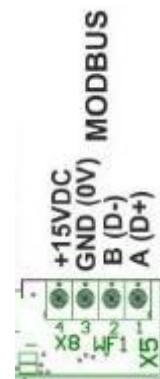
The following schematic shows the electrical connections for the Modbus operation
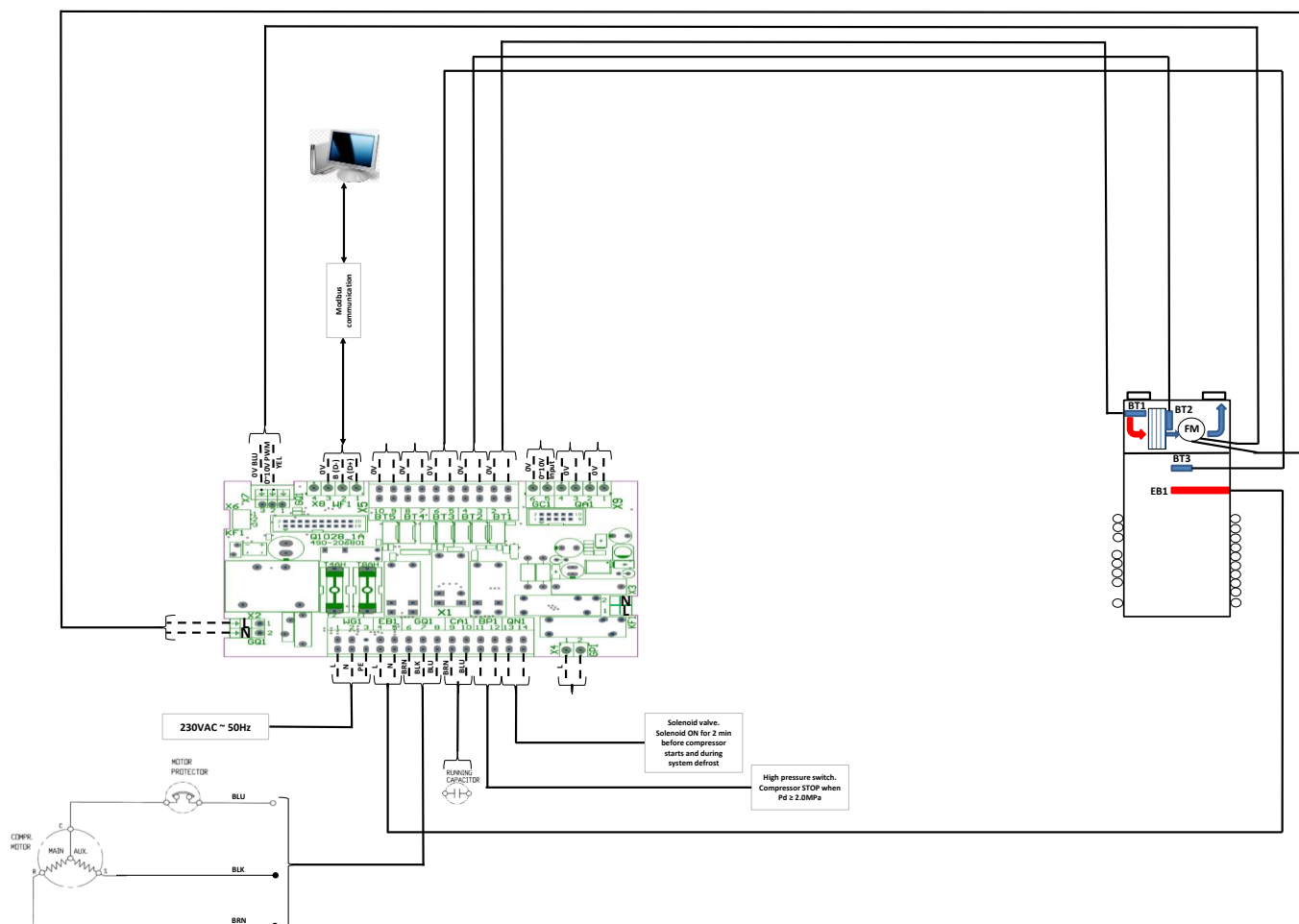
ModBus should be set form the installer menu D2, see the table below:

Code	Set point name	Description	Range	Factory setting
D2 Modbus	D2.1 Address	The Modbus address can be selected between 1 and 247	1 ~ 247	30
	D2.2 Baud Rate	The Modbus baud rate can be selected or de-activated	9600 ~ 19200	19200
	D2.3 Parity	The Modbus parity can be selected or de-activated	Even / Odd / OFF	Even
	D2.4 Modify	If this function is activated, it is possible to modify the set points kept for development with a data logger	OFF / ON	OFF

Note: Stop bits are factory set to 1.

ModBus can be accessed by means of the XB/WF1 connection and by the use of the micro-USB connection on the front panel, located under the display surround. The factory settings are displayed in the table below.

Parameter	MODBUS Via connector X8/WF1	MODBUS via USB
Modbus Mode:	RTU	
Baud rate:	19200 / 9600 (Default = 19200)	
Data bits:	8	
Parity:	Even / Odd / None (Default = Even)	
Stop bits:	1	
Modbus Address	1 ~ 247 (Default = 30)	Only 30

ModBus has 2 control levels.
The first control level is used for monitoring functions only and the second can be used for reading or writing data depending on the status of installer menu parameter D2.4 ModBus Modify. This parameter can only be changed by using the controller on the front of the DHW-HP.

08.01   Monitoring Functions

Modbus Code	Parameter	Format	Unit	Modbus Code	Parameter	Format	Unit
3x0000	ADC value CH2	*1	-	3x0021	R3 Fan	*1	OFF/ON
3x0001	ADC value CH3	*1	-	3x0022	R4 HP	*1	OFF/ON
3x0002	ADC value CH4	*1	-	3x0023	R5 El Heater	*1	OFF/ON
3x0003	ADC value CH7	*1	-	3x0024	R6 Pressostat	*1	OFF/ON
3x0004	ADC value CH10	*1	-	3x0025	SG1 Input	*1	OFF/ON
3x0005	ADC value CH11	*1	-	3x0026	SG2 Input	*1	OFF/ON
3x0006	ADC value CH12	*1	-	3x0027	V in (0/3-10V)	*10	Volt
3x0007	ADC value CH13	*1	-	3x0028	Temperature avg air	*10	°C
3x0008	ADC value CH14	*1	-	3x0029	Temperature avg evap	*10	°C
3x0009	ADC value CH15	*1	-	3x0030	El Power	*100	-
3x0011	BT1 T air in	*10	°C	3x0031	Total power	*100	-
3x0012	BT2 T air out	*10	°C	3x0032	Heating C	*100	-
3x0013	BT3 T water top	*10	°C	3x0033	Water P	*100	-
3x0014	BT4 T water low	*10	°C	3x0035	BT1 Error	*1	OFF/ON
3x0015	BT5 T extra	*10	°C	3x0036	BT2 Error	*1	OFF/ON
3x0019	R1 Extra	*1	OFF/ON	3x0037	BT3 Error	*1	OFF/ON
3x0020	R2 Defrost	*1	OFF/ON	3x0038	BT4 Error	*1	OFF/ON
3x0039	BT5 Error	*1	OFF/ON	3x0058	Max Fan Speed At Start Up	*1	OFF/ON
3x0040	HP Error	*1	OFF/ON	3x0059	Compressor State	*1	OFF/ON
3x0041	Evaporator Error	*1	OFF/ON	3x0060	WP_State Timer	*1	Seconds
3x0042	Cold Evap Error	*1	OFF/ON	3x0061	Defrost Valve Off Timer	*1	Seconds
3x0043	Modbus Error	*1	OFF/ON	3x0062	Compressor On Timer	*1	Seconds
3x0044	Filter Error	*1	OFF/ON	3x0063	T without Defrost Cnt	*1	Seconds
3x0045	HotEvapError	*1	OFF/ON	3x0064	BT3 Stable Cnt	*1	Seconds
3x0047	Fan speed set	*100	%	3x0065	BT1 Stable Cnt	*1	Seconds
3x0048	HP_On temp	*10	°C	3x0066	Fan Stable Cnt	*1	Seconds
3x0049	HP_Off temp	*10	°C	3x0067	BT1 minus BT2 old	*10	°C
3x0050	HP_Released	*1	OFF/ON	3x0068	Defrost On Cnt	*1	Seconds
3x0051	E_Heat On Temp	*10	°C	3x0069	BT1 minus BT2 step	*1	
3x0052	E_Heat Off Temp	*10	°C	3x0072	HP_Hours_Sec	*1	Seconds
3x0053	E_Heat Released Level	*1	OFF/ON	3x0073	El_Hours_Sec	*1	Seconds
3x0054	Cold Mode On	*1	OFF/ON	3x0074	Fan_Hours_Sec	*1	Seconds
3x0055	Hot Mode ON	*1	OFF/ON	3x0075	Back Up Mode Rest Time_sec	*1	Seconds
3x0056	Defrost State	*1	OFF/ON	3x0076	Hot On Rest Time_sec	*1	Seconds
3x0057	Defrost Fan Off	*1	OFF/ON	3x0077	Back Up Mode On Time_sec	*1	Seconds
3x0077	Back Up Mode On Time_sec	*1	Seconds	3x0096	Optimal Release HP	*1	OFF/ON
3x0078	Filter On Time_sec	*1	Seconds	3x0097	Optimal EL ON	*1	OFF/ON
3x0079	Defrost Run Out Cnt	*1	Seconds	3x0098	Legionella State	*1	-
3x0081	BT1_Error Cnt	*1	Seconds	3x0099	Low Tariff On/Off	*1	
3x0082	BT2_Error Cnt	*1	Seconds	3x0100	PV State	*1	Binary

Modbus Code	Parameter	Format	Unit	Modbus Code	Parameter	Format	Unit
3x0083	BT3_Error Cnt	*1	Seconds	3x0101	SG State	*1	
3x0084	BT4_Error Cnt	*1	Seconds	3x0102	Cooling State	*1	
3x0085	BT5_Error Cnt	*1	Seconds	3x0103	Extern Control State	*1	
3x0086	Pressostat Error Cnt	*1	Seconds	3x0105	Power Fan	*1	
3x0087	Evap Error Cnt	*1	Seconds	3x106	Power Compressor	*1	
3x0088	Cold Evap Error Cnt	*1	Seconds	3x107	HPWe (Compressor + Fan)	*1	
3x0089	Modbus Error Cnt	*1	Seconds	3x111	HPWe Acc Temp Debug	*1	
3x0090	HotEvapErrorCnt	*1	Seconds	3x0112	El Acc Temp Debug	*1	
3x0093	ErrorList	*1	Binary	3x0113	Water P Acc Temp Debug	*1	
3x0095	Fan RPM	*1	RPM	3x0116	Password O K Cnt Down	*1	

08.02   Read & write functions

Modbus Code	Parameter	Read / Write Modbus Modify		Data Range	Value Range	Format	Unit
		D02.4 = 0	D02.4 = 1				
4x0000	P Mode (0=AUTO 1=ECO 2=BOOST 3=BACKUP 4=SILENT 5=HOLIDAY)	R	R/W		0 ~ 5	*1	-
4x0001	D16.3 Low tariff weekday start hour #2	R	R/W	-	0 ~ 23	*1	Hours
4x0002	D16.4 Low tariff weekday end hour #2	R	R/W	-	0 ~ 23	*1	Hours
4x0003	D16.5 Low tariff weekday start hour #3	R	R/W	-	0 ~ 23	*1	Hours
4x0004	D16.6 Low tariff weekday end hour #3	R	R/W	-	0 ~ 23	*1	Hours
4x0005	D17.3 Low tariff weekend start hour #2	R	R/W	-	0 ~ 23	*1	Hours
4x0006	D17.4 Low tariff weekend end hour #2	R	R/W	-	0 ~ 23	*1	Hours
4x0007	Um8	R	R/W	-	0	*1	-
4x0008	A1 T Auto	R	R/W	500 ~ 650	50 ~ 65	*10	°C
4x0009	A2 T ECO	R	R/W	100 ~ 550	10 ~ 55	*10	°C
4x0010	A3 BOOST	R	R/W	500 ~ 650	50 ~ 65	*10	°C
4x0011	D17.5 Low tariff weekend start #3	R	R/W	-	0 ~ 23	*1	Hours
4x0012	D17.6 Low tariff weekend end hour #3	R	R/W	-	0 ~ 23	*1	Hours
4x0013	B01 Ventilation (0=OFF, 1=Single speed, 2=2xSpeed)	R	R/W	-	0 ~ 2	*1	-
4x0014	B02 Ventilation Speed (0=Low, 1=Medium, 2=High)	R	R/W	-	0 ~ 2	*1	-
4x0015	B03 Low tariff (0=OFF, 1=Standard, 2=EL Optimal 1, 3=EL Optimal 2)	R	R/W	-	0 ~ 3	*1	OFF/ON
4x0016	B04 Hot on time	R	R/W	-	0 ~ 30	*1	Days
4x0017	B05 PV (0=OFF, 1=ECO, 2=STORAGE)	R	R/W	-	0 ~ 2	*1	-
4x0018	B06 Solar 1(= ON)	R	R/W	-	0 ~ 1	*1	OFF/ON
4x0019	B07 Floor (1 = ON) **(Not supported by TOSHIBA)**	R	R/W	-	0 ~ 1	*1	OFF/ON
4x0020	B08 Floor temperature **(Not supported by TOSHIBA)**	R	R/W	50 ~ 500	5 ~ 50	*10	°C
4x0021	B09 Cooling (1 = ON)	R	R/W	-	0 ~ 1	*1	OFF/ON
4x0022	B10 Cooling temperature	R	R/W	100 ~ 300	10 ~ 30	*10	°C
4x0023	Um24	R	R/W	-	0	*1	
4x0024	Sm1	R	R/W	-	0	*1	
4x0025	C0 Reset (1 = Reset)	R	R/W	-	0 ~ 1	*1	NO/YES
4x0026	C1.1 Model	R	R	-	0 ~ 65535	*1	Seconds

Modbus Code	Parameter	Read / Write Modbus Modify		Data Range	Value Range	Format	Unit
		D02.4 = 0	D02.4 = 1				
4x0027	C1.2 Software	R	R	0 ~ 65530	0 ~ 6553	*10	Seconds
4x0028	C1.3 Version	R	R	-	0 ~ 65535	*1	-
4x0029	C2.1 Hour	R	R/W	-	0 ~ 23	*1	Hours
4x0030	C2.2 Minutes	R	R/W	-	0 ~ 23	*1	Minutes
4x0031	C3.1 Date	R	R/W	-	0 ~ 31	*1	Days
4x0032	C3.2 Month	R	R/W	-	0 ~ 12	*1	Month
4x0033	C3.3 Year	R	R/W	-	0 ~ 99	*1	Year
4x0034	C4 Day (1=Monday 7=Sunday)	R	R/W	-	1 ~ 7	*1	DoW
4x0035	C5 Language (0=UK, 1=DE, 2=FR, 3=DK, 4=NL, 5=PL, 6=ITA)	R	R/W	-	0 ~ 6	*1	-
4x0036	C6 Contrast	R	R/W	-	0 ~ 8	*1	-
4x0038	D0 Reset All (1 = Reset)	R	R/W	-	0 ~ 1	*1	NO/YES
4x0039	D02.1 Modbus address	R	R/W	-	0 ~ 247	*1	-
4x0040	D02.2 Modbus baud rate (0=9600 1=19200)	R	R/W	-	0 ~ 1	*1	
4x0041	D02.3 Modbus parity (0=None 1=Even 2=Odd)	R	R/W	-	0 ~ 2	*1	
4x0042	D02.4 Modbus modify (0=Write Disabled)	R	R/W	-	0 ~ 1	*1	OFF/ON
4x0043	D03 Ventilation min speed	R	R/W	-	0 ~ 100	*1	%
4x0044	D05 Ventilation max speed	R	R/W	-	0 ~ 100	*1	%
4x0045	D06 AUTO speed	R	R/W	-	0 ~ 100	*1	%
4x0046	D07 Air Temperature max	R	R/W	-70 ~ 100	-7 ~ 10	*10	°C
4x0047	D08 Air temperature min	R	R/W	300 ~ 400	30 ~ 40	*10	°C
4x0048	D09 Water temperature max	R	R/W	550 ~ 650	55 ~ 65	*10	°C
4x0049	D10 Defrosting temperature stop	R	R/W	0 ~ 100	0 ~ 10	*10	°C
4x0050	D11 Evaporator temperature max	R	R/W	100 ~ 400	10 ~ 40	*10	°C
4x0051	D12 Temperature Backup	R	R/W	0 ~ 650	0 ~ 65	*10	°C
4x0052	D13 Legionella (1 = ON)	R	R/W	-	0 ~ 1	*1	OFF/ON
4x0053	D14 Legionella temperature	R	R/W	600 ~ 650	60 ~ 65	*10	°C
4x0054	D15 Legionella date (1=Monday 7=Sunday)	R	R/W	-	1 ~ 7	*1	Day
4x0055	D16 Forced operation (1 = ON)	R	R/W	-	0 ~ 1	*1	OFF/ON
4x0056	D17.1 Low tariff weekday start hour #1	R	R/W	-	0 ~ 23	*1	Hour
4x0057	D17.2 Low tariff weekday end hour #1	R	R/W	-	0 ~ 23	*1	Hour
4x0058	D18.1 Low tariff weekend start hour #1	R	R/W	-	0 ~ 23	*1	Hour
4x0059	D18.2 Low tariff weekend end hour #1	R	R/W	-	0 ~ 23	*1	Hour
4x0060	D04 Ventilation medium speed	R	R/W	-	0 ~ 100	*1	%
4x0061	D19 Daylight saving (1 = ON)	R	R/W	-	0 ~ 1	*1	OFF/ON
4x0062	D20 PV voltage HP	R	R/W	0 ~ 100	0 ~ 10	*10	Volt
4x0063	D21 PV voltage EL	R	R/W	0 ~ 100	0 ~ 10	*10	Volt
4x0064	D22 PV min time	R	R/W	-	1 ~ 120	*1	Minutes
4x0065	D23 Solar temperature max	R	R/W	550 ~ 890	55 ~ 89	*10	°C
4x0066	D24 Solar DT min	R	R/W	10 ~ 50	1 ~ 5	*10	°C
4x0067	D25 Floor temperature start **(Not supported by TOSHIBA)**	R	R/W	250 ~ 450	25 ~ 45	*10	°C
4x0068	D26 Extra function (0=OFF 1=Solar 2=Floor 3=Cooling)	R	R/W	-	0 ~ 3	*1	-
4x0069	D27 SG ready (1 = ON)	R	R/W	-	0 ~ 1	*1	OFF/ON

Modbus Code	Parameter	Read / Write Modbus Modify		Data Range	Value Range	Format	Unit
		D02.4 = 0	D02.4 = 1				
4x0070	D28 Cooling type (0=Normal 1=Inverted)	R	R/W	-	0 ~ 1	*1	OFF/ON
4x0071	D29 External control (0=OFF 1=Hygrostat 2=Max 3=ON/OFF)	R	R/W	-	0 ~ 3	*1	-
4x0072	D30 Filter timer	R	R/W	-	0 ~ 1	*1	OFF/ON
4x0073	D31 Filter interval	R	R/W	-	1 ~ 9	*1	Months
4x0074	D32 Filter reset (1 = YES)	R	R/W	-	0 ~ 1	*1	NO/YES
4x0075	D33 Temperature HP max	R	R/W	500 ~ 650	50 ~ 65	*10	°C
4x0076	D34 Air T Boost	R	R/W	-70 ~400	-7 ~ 40	*10	°C
4x0081	M01 Minimum time defrosting	R	R/W	-	0 ~ 999	*1	Minutes
4x0082	M02 Timer 1	R	R/W	-	0 ~ 999	*1	Minutes
4x0083	M03 max interval defrosting	R	R/W	-	0 ~ 999	*1	Minutes
4x0084	M04 Admitted variation defrosting	R	R/W	0 ~ 100	0 ~ 10	*10	°C
4x0085	M05 Delta T defrosting min	R	R/W	0 ~ 100	0 ~ 10	*10	°C
4x0086	M06 Fan defrosting temperature	R	R/W	-50 ~ 150	-5 ~ 15	*10	°C
4x0087	M07 Max time defrosting	R	R/W	-	0 ~ 30	*1	Minutes
4x0088	M08 Temperature water for max fan	R	R/W	0 ~ 1000	0 ~ 100	*10	°C
4x0089	M09 Delta T heat on	R	R/W	10 ~ 100	1 ~ 10	*10	°C
4x0090	M10 Password	R	R/W	-	0 ~ 65535	*1	-
4x0091	M11 Reset event log (1 = YES)	R	R/W	-	0 ~ 1	*1	NO/YES
4x0092	M12 Save restore set points (1=Restore 2=Save)	R	R/W	-	0 ~ 2	*1	
4x0096	HP MWHe	R	R/W	-	0 ~ 65535	*1	-
4x0097	HP MWHt	R	R/W	-	0 ~ 65535	*1	-
4x0098	EL MWHe	R	R/W	-	0 ~ 65535	*1	-
4x0099	EL Start / Stops	R	R/W	-	0 ~ 65535	*1	-
4x0100	E2 HP hours (2 hours)	R	R/W	-	0 ~ 65535	*1	-
4x0101	E3 EL hours (2 hours)	R	R/W	-	0 ~ 65535	*1	-
4x0102	E4 Fan hours (2 hours)	R	R/W	-	0 ~ 65535	*1	-
4x0103	Back up mode rest time	R	R/W	-	0 ~ 65535	*1	-
4x0104	Hot on rest time	R	R/W	-	0 ~ 65535	*1	-
4x0105	Power on count	R	R/W	-	0 ~ 65535	*1	-
4x0106	Back up mode on time	R	R/W	-	0 ~ 65535	*1	-
4x107	Filter (2 hours)	R	R/W	-	0 ~ 65535	*1	-
4x0115	Last Legionella (date / month)	R	R/W	-	0 ~ 65535	*1	-

09.00   Method of defect analysis
09.01   Matters to be confirmed first
In addition, check out the following questions before contacting an installer

- Is the cold water supply open?
- Has the periodic cleaning of evaporator, condensation drain and fan as described in the maintenance section been followed?
- Has any of the safety features disengaged the heat pump/electrical emersion heater?
- Has external short-circuiting of terminals disengaged the heat pump?
- Has factory resetting been tested?
- If it is not one of the above errors, please contact the installer.

Please have data from name plate ready (silver plate on the unit).

Problem	Possible reasons	Possible Solution
The product does not supply hot water	The unit is not connected to the power supply	Make sure the display turns ON
	Alarms from the controller stop the operation of the unit	Check the alarms in the Info menu Er
	Low water temperature set points	Increase all temperature set points in menu A Temperatures
	Low airflow in evaporator	Clean the evaporator and the air ducts
	Fan does not work	Make sure that the fan is connected to the PCB or substitute the component.
	SG Ready function is active	Switch OFF SG Ready function
	Thermal safety switch FN1 opens and stops the power supply to the electric heater	Restore the original conditions of the thermal safety switch FN1.
High sound emissions	Too high maximum fan speed	Reduce the fan maximum speed in the Installer menu
		Activate the SILENT mode
	Obstruction of the air ducts.	Remove the obstruction
	Dirt on fan or evaporator.	Clean the evaporator and the fan. Do not use cleaning spray that can be damage the EPS housing
	Components vibration	Make sure all components as compressor and solenoid valve are well fastened

09.01.01   Check the supply voltage
Ensure the power is switched on and the display is on and that the voltage is correct, the voltage should be between 220VAC & 240VAC

Note: For the Deluxe model an extreme low voltage may result in the DHW-HP running as a Standard unit.

09.01.02   Check the cold water supply
Ensure the cold water feed is turned on and there is water flow.

Note: If the unit is low on water or has been switched off: turn on the water supply and bleed the DHW-HP by opening a tap at the furthest point from the unit to 'bleed' the system.

09.02   In the event of an error – how to operate BACK-UP mode

In the event of an error occurring it is possible to produce domestic hot water by operating the DHW-HP in Back-Up mode, for more information see section 7.4.
If Yes is selected the unit operates at the lower set point set by D12 (BACK-UP Temp)

Note: The Back-up mode uses the electric heater only to heat a smaller volume of water to set point. In the 190l tank this is 80l and in the 260l tank this is 130l.

Code	Set point name	Description	Range	Factory setting
D12	BACK-UP Temp	The water temperature at which the unit stops the backup mode with only the electric heater.	0-65	35

09.03   Error codes

The following error codes are shown on the remote controller LCD screen at the time of a fault.

Class	Code	Menu Item	Description
Er	Er1	BT1 Error	The temperature sensor BT1 is out of range (-30°C > Value > 90°C).
	Er2	BT2 Error	The temperature sensor BT2 is out of range (-30°C > Value > 90°C).
	Er3	BT3 Error	The temperature sensor BT3 is out of range (-30°C > Value > 90°C). If BT3 Error occurs, the unit does not heat the water in any way.
	Er4	BT4 Error*	The temperature sensor BT4 is out of range (-30°C > Value > 90°C). The error Er4 is ignored and the unit runs normally
	Er5	BT5 Error*	The temperature sensor BT5 is out of range (-30°C > Value > 90°C). The error Er5 is ignored and the unit runs normally
	Er6	Err HP	The pressure switch opens, when the pressure in the heating circuit is above the limit of pressure specified on the high pressure switch
	Er7	Err Evap	The temperature sensor BT2 is above BT1 - 2°C for more than one hour. To prevent nuisance errors, when first triggered the defrost value is activating / deactivating. The error is automatically reset for a maximum of two times per week. At the third time the unit stops and shows error name.
	Er8	Err C Evap	The temperature BT2 is below - 25°C. To help prevent Err C Evap, if an evaporation temperature BT2 of -20°C is reached: fan and defrosting setpoints are automatically adapted to minimize this alarm and improve the operation of the unit. The message on display "Fan speed increased" is shown on display to inform the user. If operation is not improved and BT2 of -20°C is reached for more than 3 times per week, the unit is stopped, and the alarm name is shown on display.
	Er9	Err H Evap	The temperature BT2 is above D11 (Evaporator T max)
	Er10	Filter	Replace filter. The alarm is displayed on the main screen, but the operation of the unit is not affected.

09.04   Error Code Analysis

| Alarm	Meaning	Possible reasons	Possible solutions
Er1, Er2, Er3, Er4, Er5	Temperature sensors out of range	The temperature sensor BT1, BT2, BT3, BT4 or BT5 is defective or not connected to the PCB	Check that the sensor is connected to the PCB
			Substitute the temperature sensor
Er- Err HP	High pressure switch	High pressure in the heating system	Reduce the water temperature set point
			Reduce the fan maximum speed in the installer
		High pressure switch BP1 is defective or not connected to the PCB	Substitute component
Er 7 - Err Evap / Er9 - Err H Evap	High evaporator temperature	Wrong position of the temperature sensor	Check that BT2 is positioned in the evaporator
		Leakage of refrigerant	Fix leakages and charge refrigerant
Er- Err C Evap	Low evaporation temperature	Mal-functioning fan	Make sure that the fan is connected to the PCB or substitute the component
		Low air flow	Increase the minimum fan speed in the installer menu
		Low air inlet temperature BT1	Increase the minimum air temperature in the installer menu
Er10 - Filter	Change filter	Substitute the air filter	

09.04.01   Er1 ~ Er5 – Temperature sensor error analysis

Temperature sensor errors occur if:

The measured temperature is < -29 or >129
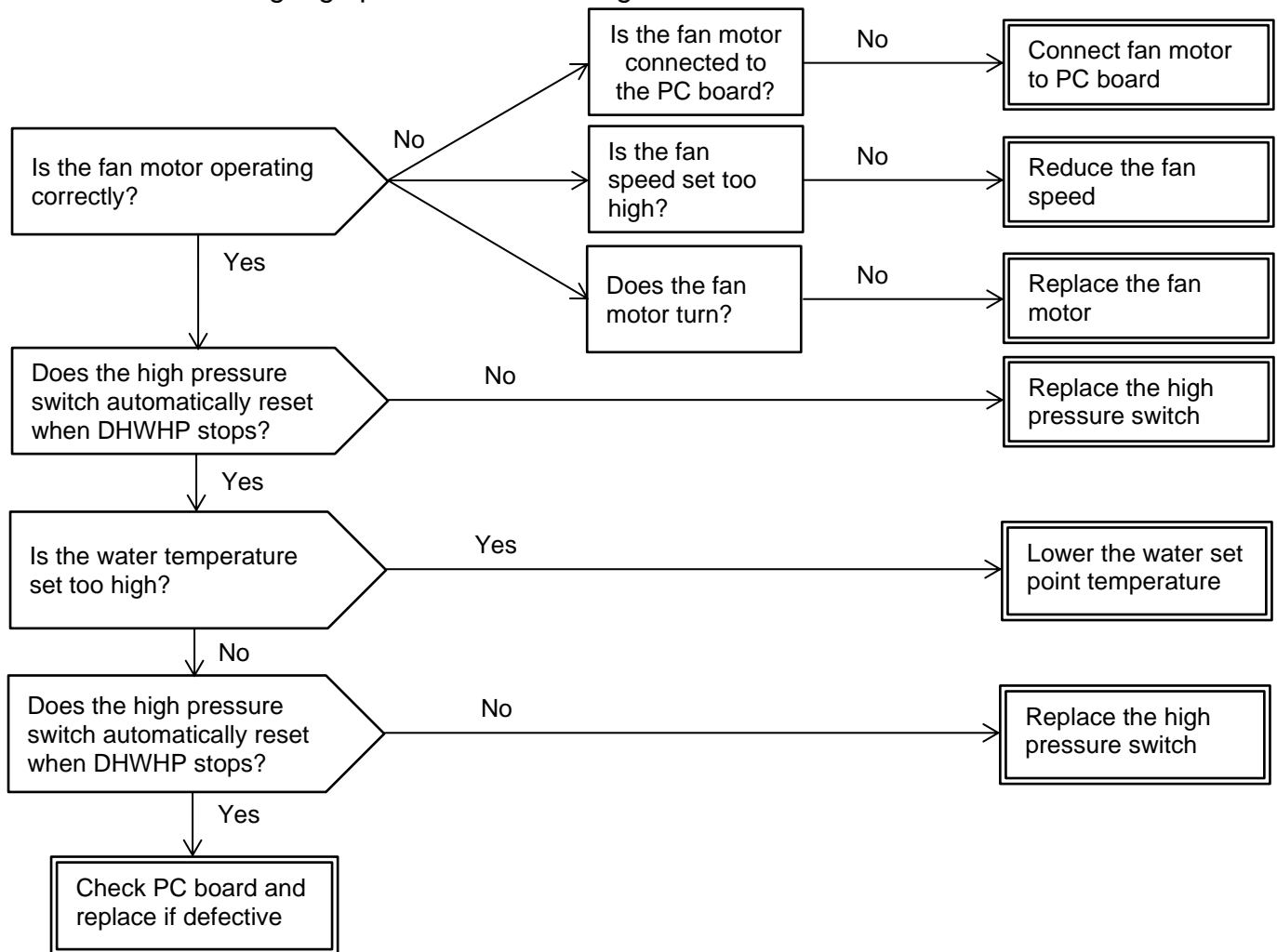
If the sensor is disconnected form the PCB, the measured value will be -30, so an error will occur.

The DHWHP operation is interrupted and the error is displayed only for BT1, BT2 and BT3.
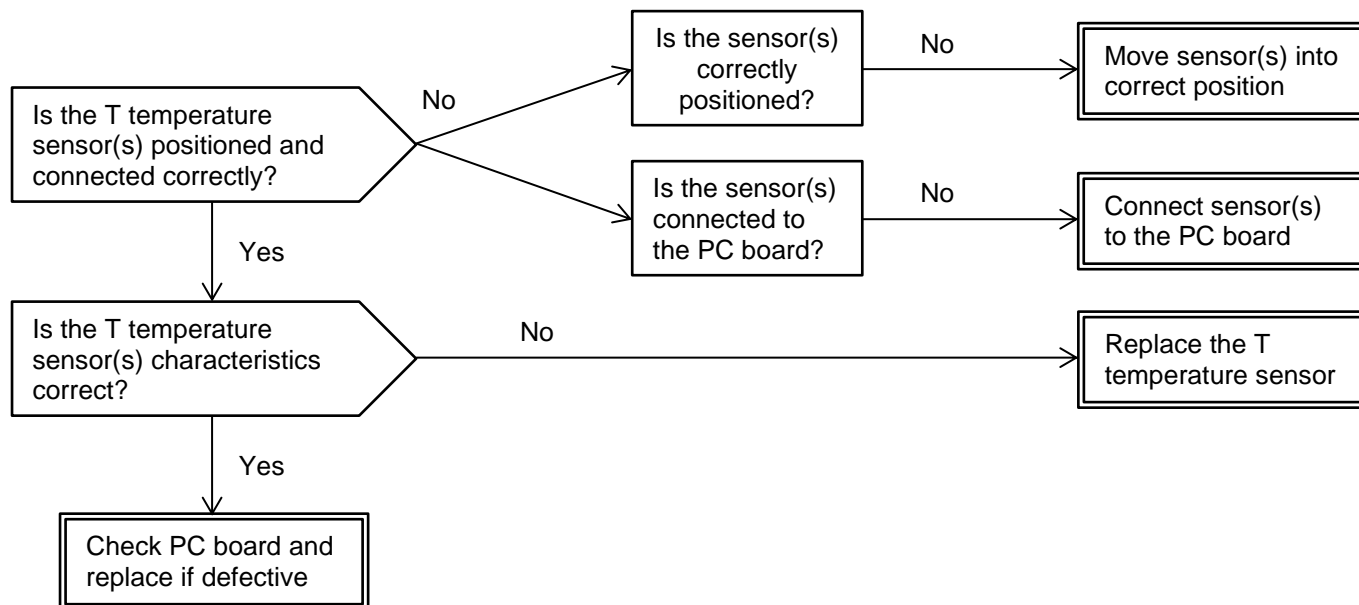
09.04.02   Er HP – High pressure switch error analysis
An error occurs if the gauge pressure in the refrigerant circuit reaches a value of 20bar

```
┌─────────────────────┐           ┌──────────────────┐    No    ┌─────────────────┐
│ Is the fan motor    │─── No ───▶│ Is the fan motor │────────▶│ Connect fan motor│
│ operating correctly?│           │ connected to     │         │ to PC board      │
└─────────────────────┘           │ the PC board?    │         └─────────────────┘
         │                        └──────────────────┘
         │                        ┌──────────────────┐    No    ┌─────────────────┐
         │                        │ Is the fan       │────────▶│ Reduce the fan  │
         │                        │ speed set too    │         │ speed           │
         │                        │ high?            │         └─────────────────┘
         │                        └──────────────────┘
         │                        ┌──────────────────┐    No    ┌─────────────────┐
         │                        │ Does the fan     │────────▶│ Replace the fan │
         │                        │ motor turn?      │         │ motor           │
         │                        └──────────────────┘         └─────────────────┘
        Yes
```

- Is the fan motor operating correctly? — No → Is the fan motor connected to the PC board? — No → Connect fan motor to PC board
- Is the fan speed set too high? — No → Reduce the fan speed
- Does the fan motor turn? — No → Replace the fan motor
- (Yes) Does the high pressure switch automatically reset when DHWHP stops? — No → Replace the high pressure switch
- (Yes) Is the water temperature set too high? — Yes → Lower the water set point temperature
- (No) Does the high pressure switch automatically reset when DHWHP stops? — No → Replace the high pressure switch
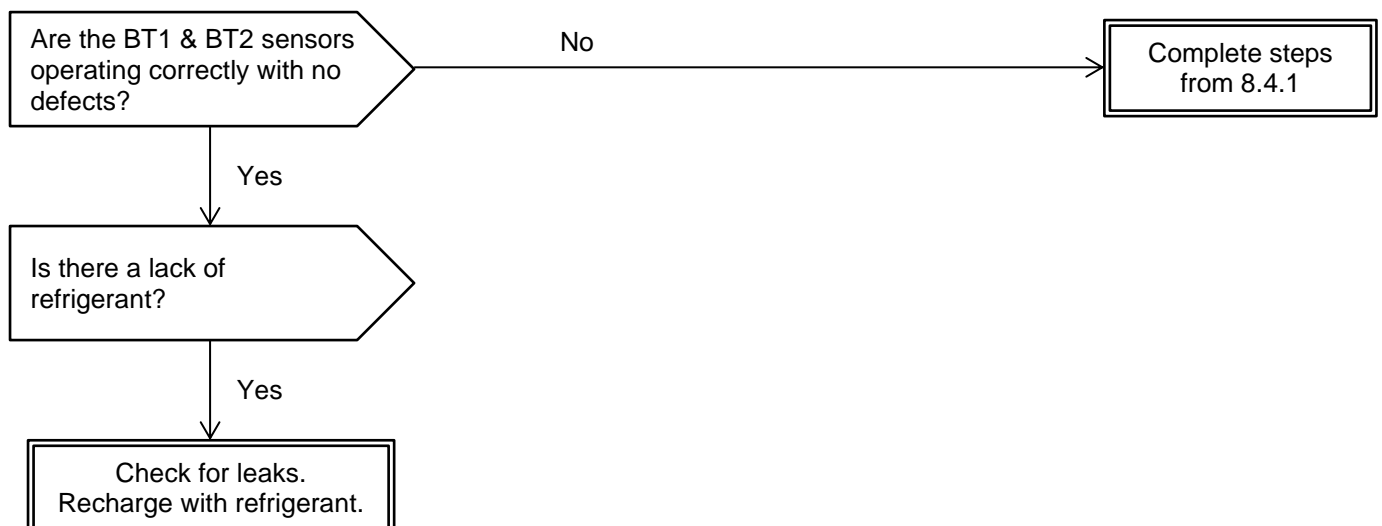- (Yes) Check PC board and replace if defective

09.04.03   Er Evap – Evaporator temperature error analysis

Er Evap is activated in the case of a possible leak in refrigerant; the control is activated if:

BT2>BT1 -2k
The compressor is ON
The duration of the temperature difference is longer than one hour.

- Are the BT1 & BT2 sensors operating correctly with no defects? — No → Complete steps from 8.4.1
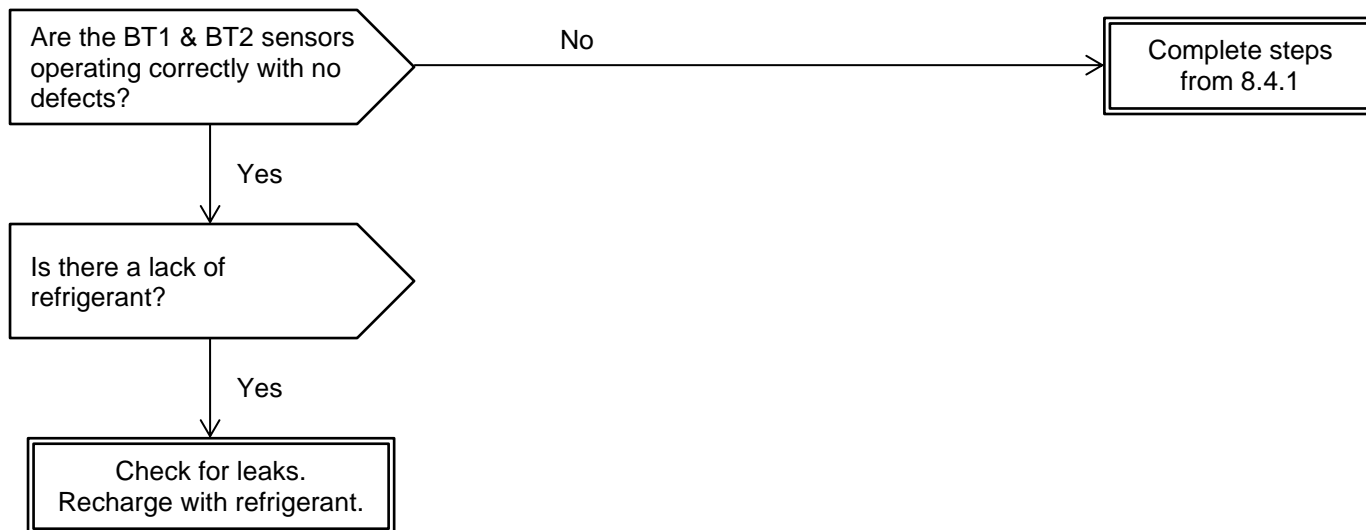- (Yes) Is there a lack of refrigerant? — Yes → Check for leaks. Recharge with refrigerant.

09.04.04   Er H Evap – High evaporator temperature error analysis

Er H Evap (high evaporator temperature) is activated under the following conditions:
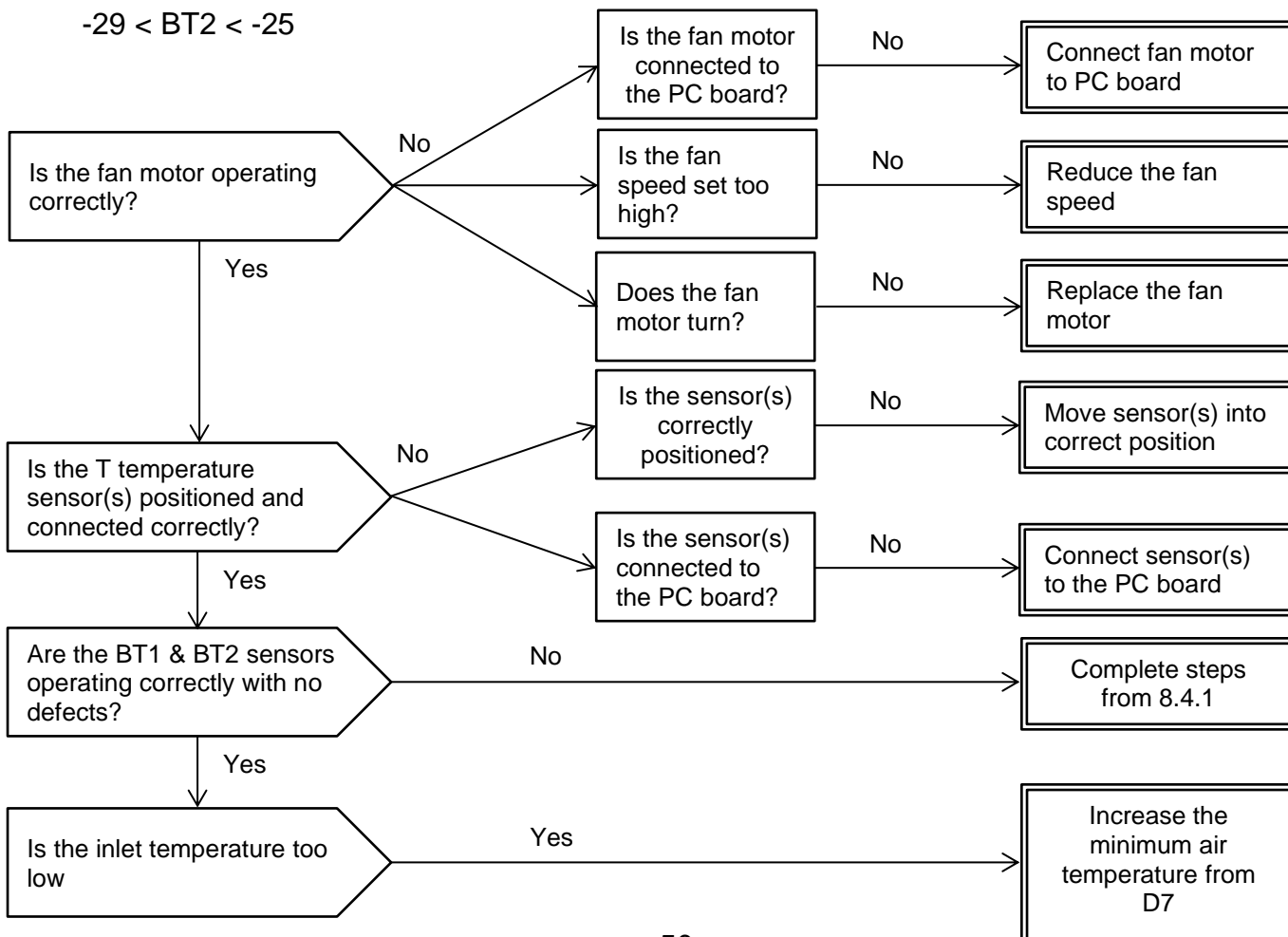
Compressor in ON
BT2 > Evaporator Temperature Max (D11 Evaporator temp max, factory setting 30°C)
The control is active 10 minutes after compressor starts and is activated after 5 minutes.

```
┌─────────────────────────┐
│ Are the BT1 & BT2 sensors│───── No ─────────────────────────────►┌──────────────┐
│ operating correctly with no│                                      │ Complete steps│
│ defects?                  │                                       │ from 8.4.1    │
└─────────────────────────┘                                        └──────────────┘
          │
         Yes
          │
          ▼
┌─────────────────────────┐
│ Is there a lack of       │
│ refrigerant?             │
└─────────────────────────┘
          │
         Yes
          │
          ▼
┌─────────────────────────┐
│ Check for leaks.         │
│ Recharge with refrigerant.│
└─────────────────────────┘
```

09.04.05   Er C Evap – Low evaporator temperature error analysis

The Low evaporation temperature error occurs if:

$-29 < BT2 < -25$

```
┌────────────────────┐
│ Is the fan motor    │── No ──►┌──────────────┐
│ operating correctly?│        │ Is the fan motor│── No ──►┌──────────────┐
└────────────────────┘        │ connected to   │        │ Connect fan motor│
          │                   │ the PC board?  │        │ to PC board     │
         Yes                  └──────────────┘        └──────────────┘
          │                   ┌──────────────┐
          │                   │ Is the fan     │── No ──►┌──────────────┐
          │                   │ speed set too  │        │ Reduce the fan │
          │                   │ high?          │        │ speed          │
          │                   └──────────────┘        └──────────────┘
          │                   ┌──────────────┐
          │                   │ Does the fan   │── No ──►┌──────────────┐
          │                   │ motor turn?    │        │ Replace the fan│
          │                   └──────────────┘        │ motor          │
          │                                            └──────────────┘
          ▼
┌────────────────────┐
│ Is the T temperature│── No ──►┌──────────────┐
│ sensor(s) positioned│        │ Is the sensor(s)│── No ──►┌──────────────┐
│ and connected       │        │ correctly      │        │ Move sensor(s) into│
│ correctly?          │        │ positioned?    │        │ correct position  │
└────────────────────┘        └──────────────┘        └──────────────┘
          │                   ┌──────────────┐
         Yes                  │ Is the sensor(s)│── No ──►┌──────────────┐
          │                   │ connected to   │        │ Connect sensor(s)│
          │                   │ the PC board?  │        │ to the PC board │
          │                   └──────────────┘        └──────────────┘
          ▼
┌────────────────────┐
│ Are the BT1 & BT2   │── No ────────────────────────────►┌──────────────┐
│ sensors operating   │                                   │ Complete steps│
│ correctly with no   │                                   │ from 8.4.1    │
│ defects?            │                                   └──────────────┘
└────────────────────┘
          │
         Yes
          ▼
┌────────────────────┐
│ Is the inlet        │───── Yes ────────────────────────►┌──────────────┐
│ temperature too low │                                   │ Increase the  │
└────────────────────┘                                    │ minimum air   │
                                                          │ temperature from│
                                                          │ D7            │
                                                          └──────────────┘
```

09.04.06   Er Filter – Change filter error analysis

Filter error occurs if D30 (Filter Timer) is ON and the time of the D31 (Filter Timer Time) has elapsed since the last time the filter timer has been reset in D32 (Filter Reset).

The filter timer has elapsed ————— Yes —————> Replace or clean filters
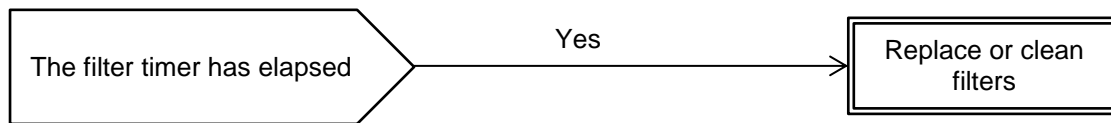
09.05   Resetting of error code & BACK-UP mode

Once the cause of the error has been corrected or a repair has been completed the DHW-HP can be reset to normal operation.

To reset the error code a power cycle musty be established. Switch the electrical supply to the DHW-HP OFF and then back ON after approximately 30 seconds.

Once the power has been reset, using the Up & Down arrow buttons on the remote controller, select the operation mode required, i.e. AUTO mode.

The unit should now operate correctly.

10.00   Trouble-shooting Abnormal Noise

To trouble shoot abnormal noise please check and rectify the alignment of the following components: -

10.01   Compressor Earth Cable

Ensure that the compressor earthing cable does not touch the top cover by making it vertical.
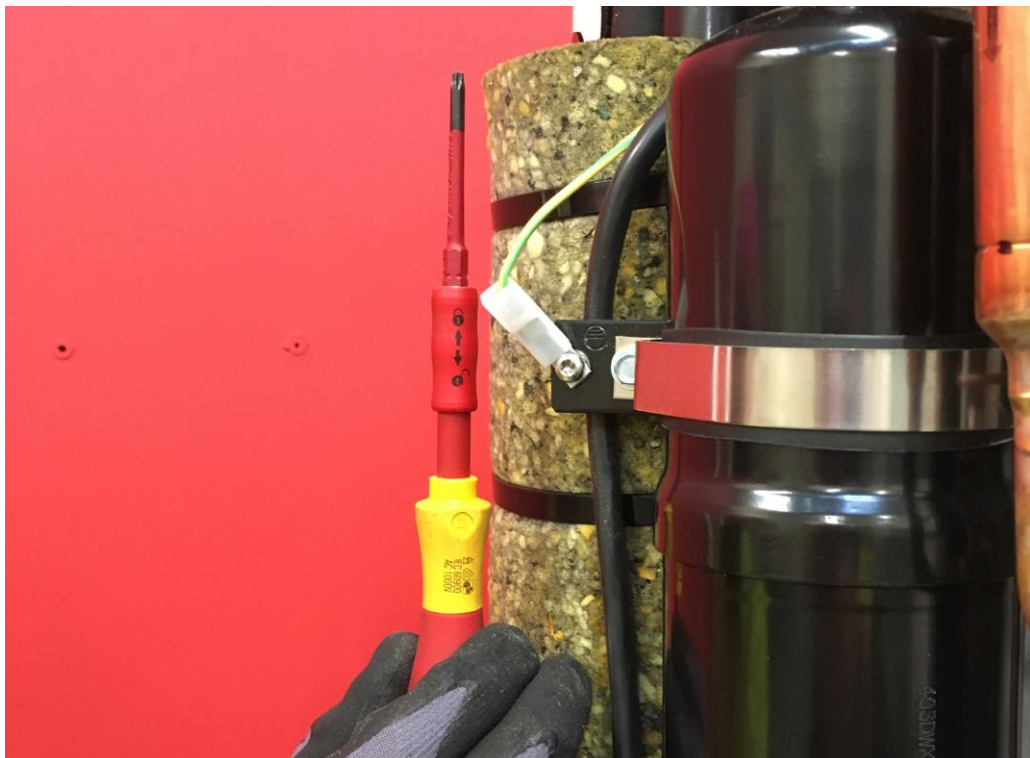
10.02   Compressor Suction Pipe

Ensure that the compressor suction pipe does not touch the compressor suction cup, if so, press the suction pipe away from the compressor suction cup.
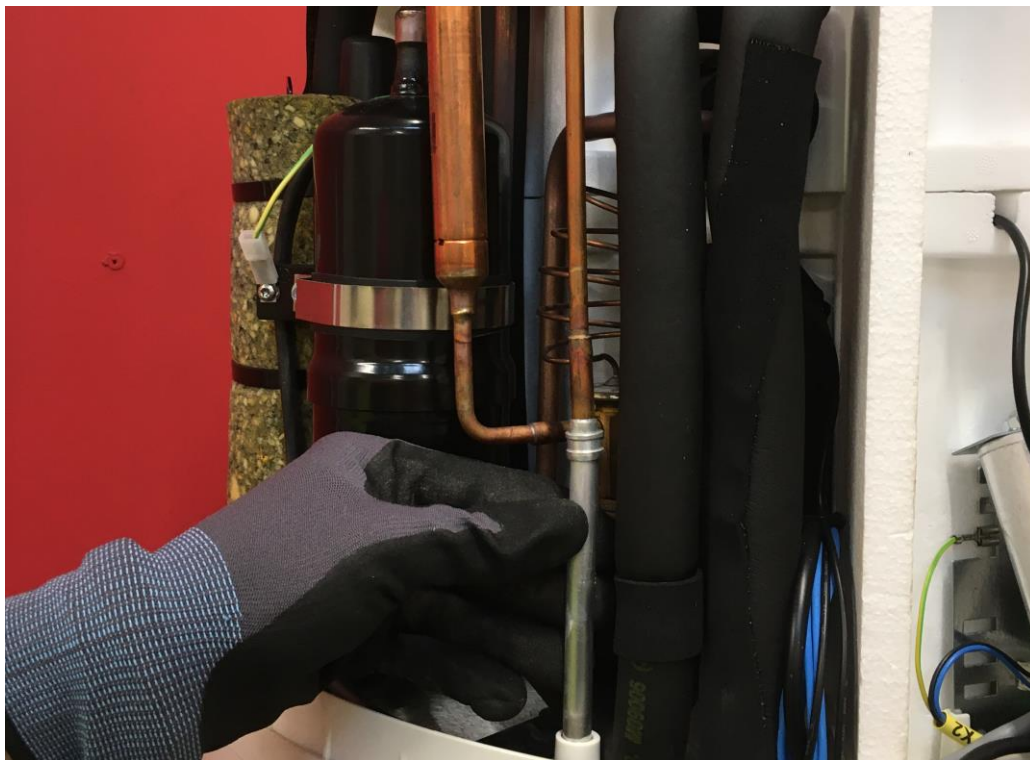
10.03   Thermostatic Expansion Valve (TEV) Capillary Pipe

Ensure that the capillary tube from the thermostatic expansion valve (TEV) does not touch any other copper pipes.

10.04   Solenoid screw

Ensure that the solenoid screw is in place and properly tightened if not it can cause rattling noises during start-up and defrosting.

10.05   Compressor Alignment

The compressor tubes can sometimes cause the compressor to be in a non-neutral position either touching the top cover or the EPS enclosure

Uneven gap = Non-neutral
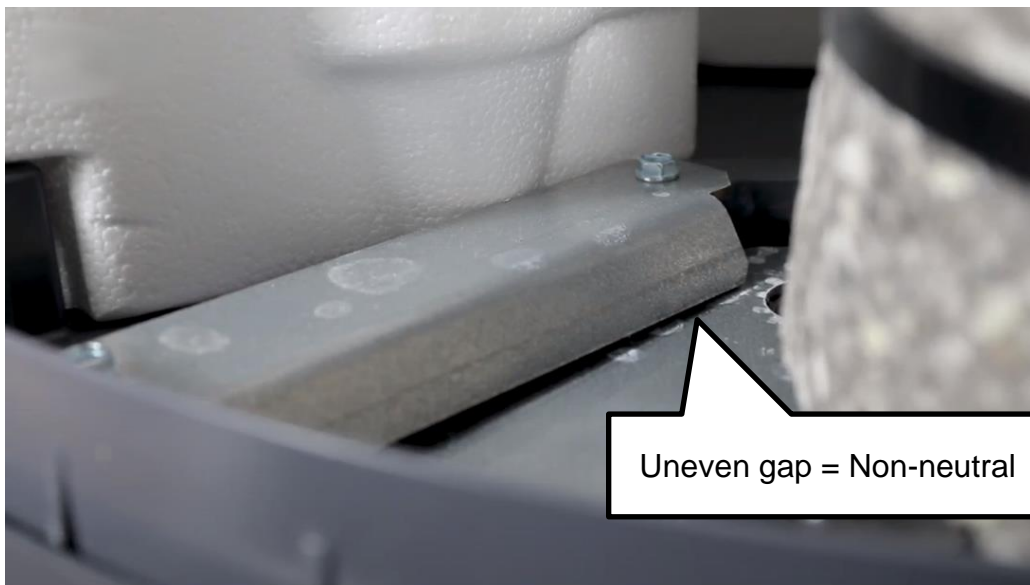
This can be corrected by adjusting the compressor tubes.
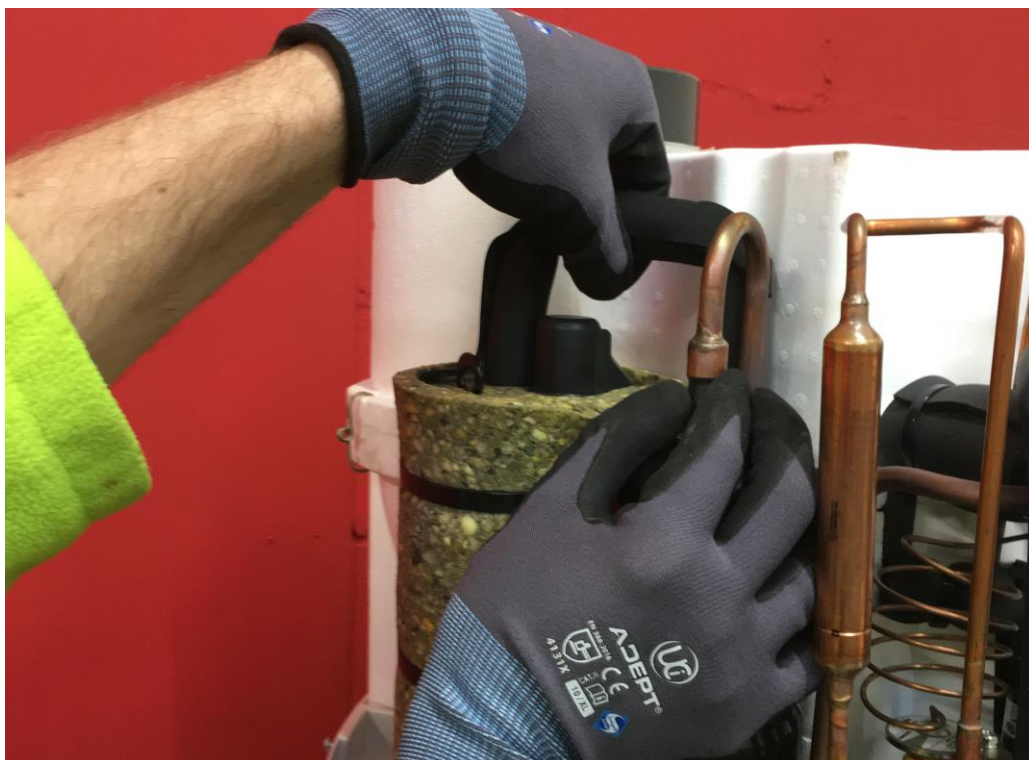
Once corrected the compressor should be in neutral alignment with an even gap under the mounting plate.
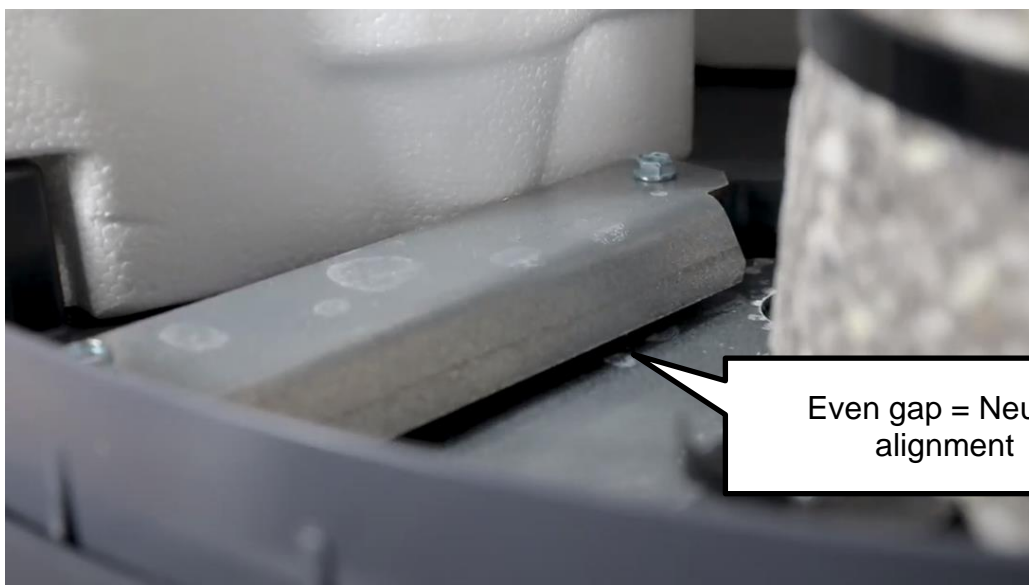
Even gap = Neutral alignment

10.06   Compressor Rubber Feet
Ensure that the compressor rubber vibration feet are corrected mounted on the compressor

10.07   Compressor Fixation Clips
Ensure that the compressor fixation clips are in place (there are three clips in total).

10.08   EPS Housing

Abnormal noise from the fan can occur if there is a gap between the top and the Bottom part of the EPS housing.
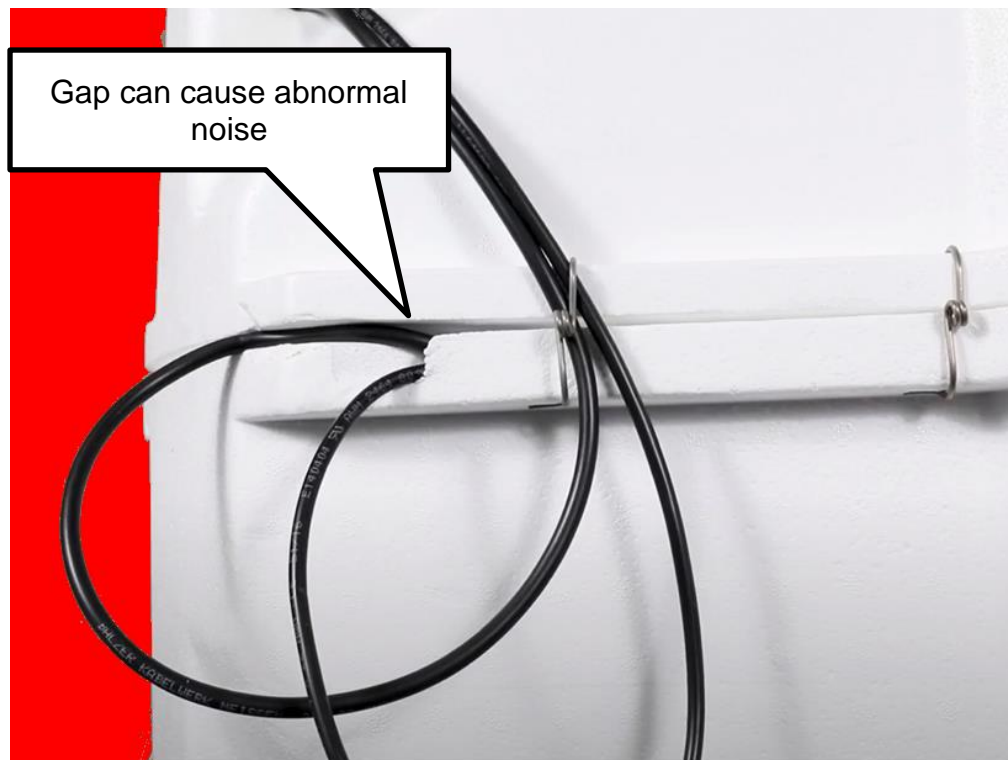
Please ensure that no cables are stuck, and the two parts are tightly together

11.00   DHW-HP settings
11.01   Home view
The unit can be controlled from the control panel described in Figure 17. From the home view, all the main operational modes, functions, set points and information on the unit can be accessed.
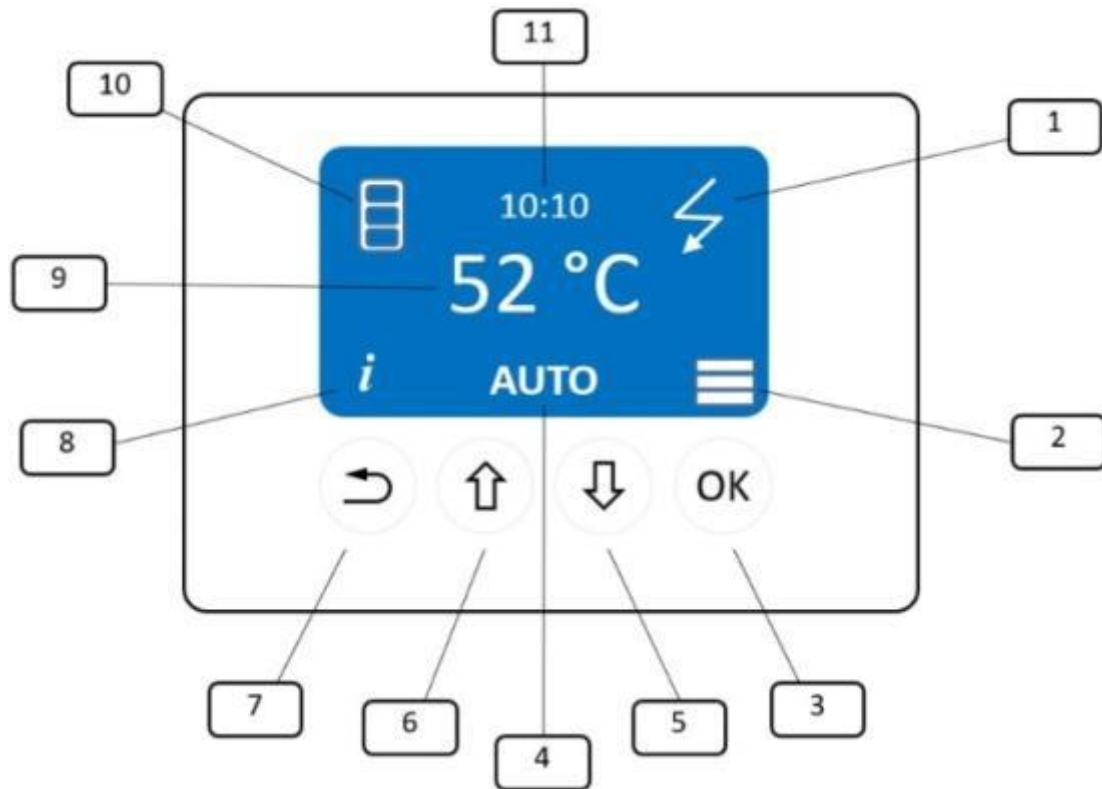
1: Electric heating state (ON/OFF)
2: Main menu (Can be open by pressing OK)
3: OK/Enter
4: Mode (Change with ⇩ or ⇧)
5: Scroll down
6: Scroll up
7: Return back
8: Information (open with ⤺)
9: Temperature set point
10: Heat pump operation (Heat pump, Ventilation, Defrosting)
11: Time

The top part of the screen gives information about the unit operation, time and temperature set point. This part is passive and it is changed automatically.

The bottom part of the screen is active, meaning that the icon on the screen contains other menu items. This part is divided in three menus:

- INFORMATION MENU (8), that can be accessed by pressing (⤺)
- MODE MENU (4), that can be accessed by pressing (⇩) or (⇧)
- MAIN MENU (2), that can be accessed by pressing (OK)
  The MAIN MENU is composed of 4 sub menus:
  – Temperatures
  – Functions
  – General
  – Installer
- The menu items with * are optional functions.

11.01.01   Information Menu
The information menu can be opened pressing button (⤺) from the home view. This menu gives all the operational information of the unit. The available information are divided in four groups:

- Temperatures (T)
- Collected data on the unit operation and performance (I)
- The state of the relays of the unit (R)
- The errors and alarms of the unit (Er)

All the information that can be shown in the information menu are described in the following table. All temperatures are in °C.

Class	Code	Menu Item	Description
T	BT1	T air i	The air temperature at the inlet of the unit
	BT2	T air o	The evaporator temperature at the outlet of the unit
	BT3	T water t	The water temperature at the top of the unit
	BT4	T water b	The water temperature at the bottom of the unit
	BT5	T extra	The temperature measured by the additional sensor
V	V1	Fan %	The actual speed of the fan in %
	V2	Input V	The actual input signal in GC1 (0-10V) from the PV or hygrostat in Volts
I	I1	HP hr	The total amount of hours that the compressor has been running
	I2	EL hr	The total amount of hours that the electric heater has been running
	I3	Fan hr	The total amount of hours that the fan has been running
	I4	T Avg a	The average air temperature with operating unit is displayed in °C since last Reset All
	I5	T Avg e	The average evaporator temperature with operating unit in °C since last Reset All
	I6	HP ON	The number of START/STOPS for the entire unit life time since last Reset All
	I7	W el	The calculated instantaneous electricity consumption in W since last Reset All
	I8	MWh el	The total calculated electricity consumption in MWh since last Reset All
	I9	W th	The calculated instantaneous heating capacity is displayed in W

Class	Code	Menu Item	Description
I	I10	MWh th	The total calculated hot water production is displayed in MWh since last Reset All
	I11	EL MWh	The electricity consumption of the electric resistance in MWh since last Reset All
R	R1	Extra	The operation of the extra relay, for example for the operation of a circulation
	R2	Defrost	The operation of the relay that controls the solenoid valve for the defrosting function is shown
	R3	Fan	The fan speed is shown in %
	R4	HP	The operation of the compressor is shown
	R5	EL	The electric heater operation is shown
Er	Er1	BT1 Error	The temperature sensor BT1 is out of range
	Er2	BT2 Error	The temperature sensor BT2 is out of range
	Er3	BT3 Error	The temperature sensor BT3 is out of range. If BT3 Error occurs, the unit does not heat the water in any way
	Er4	BT4 Error	The temperature sensor BT4 is out of range. The error Er4 is ignored and the unit runs normally
	Er5	BT5 Error	The temperature sensor BT5 is out of range. The error Er5 is ignored and the unit runs normally
	Er6	Err HP	The pressure switch opens, when the pressure in the heating circuit is above the limit of pressure specified on the high pressure switch
	Er7	Err Evap	The temperature sensor BT2 is above BT1 - 2°C for more than one hour
	Er8	Err C Evap	The temperature BT2 is below - 25°C
	Er9	Err H Evap	The temperature BT2 is above D11 (Evaporator T max)
	Er10	Filter	Replace filter. The alarm is displayed on the main screen, but the operation of the unit is not affected.

*Optional

11.01.02   Mode of operation

Different strategies to heat the water can be selected from the main control panel pressing 5 or 6 (Scroll down or scroll up) from the home view.
The possible modes of operation to choose from are found in the following table:
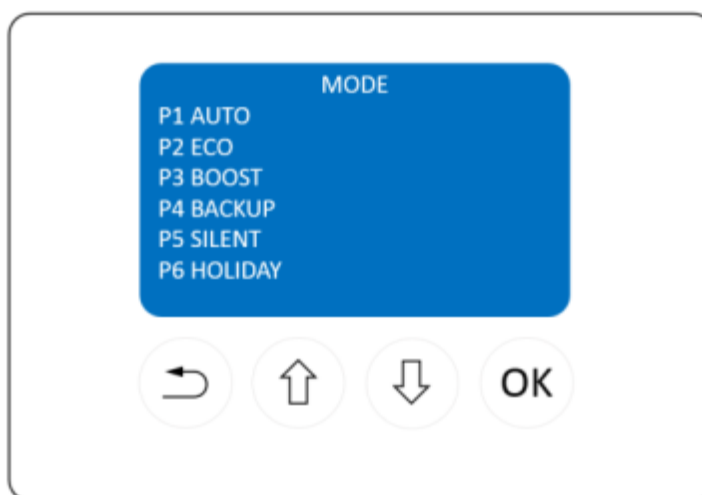

Figure 18 – Modes of operation

Code	Set point name	Description
P1	AUTO	The heat pump heats the water when required, normally using the heat pump operation. The unit starts when the water temperature BT3 is more than 5°C below A1 (T AUTO) and it stops when this temperature is reached. If the air temperature is out of the feasible limits, the water is heated with the electric heater.
P2	ECO	The heat pump consumes as low energy as possible The heat pump has a lower water temperature set point A2 (T ECO). The heat pump heats the water to a lower temperature compared to the other operations.
P3	BOOST	The heat pump and the electric heater operate simultaneously if air temperature BT1 is below set-point D 34 (Air T Boost). If the air temperature BT1 is above D34 (Air T Boost) the electric heater is deactivated and only the heat pump operates. The unit starts when the water temperature BT3 is more than 5 °C below A3 (T BOOST) and it stops when this temperature is reached. If A3 (T BOOST) is higher than D33 (T HP max) the compressor stops when the temperature D33 (T HP max) is reached. The remaining temperature lift is accomplished with only the electric heater.
P4	BACKUP	This is an emergency mode. When an error occurs, preventing the operation of the heat pump, the water cannot be heated. On the display the possibility to activate the BACKUP mode is asked to the user. In BACKUP mode the water is heated up by the electric heater at a lower temperature than the desired one. The Legionella control is active in any case. The unit starts when the water temperature BT3 is more than 5 °C below D13 (BACKUP T) and it stops when this temperature is reached.
P5	SILENT	The fan speed decreases to the minimum in order to minimize the sound emission of the unit in operation. The unit starts when the water temperature BT3 is more than 5 °C below BT1 (T AUTO) and it stops when this temperature is reached.
P6	HOLIDAY	The heat pump is turned off and only the LCD display is active. The heat pump does not start when water heating is required. The compressor is OFF except during LEGIONELLA control in which it can be activated. The HOLIDAY mode is connected to the Hot on time function B4 (Hot on time). After the HOLIDAY period is completed, the unit goes back to the previous mode of operation.

Note: the unit can be turned off switching to HOLIDAY mode.

11.01.03   Temperatures

Code	Set point name	Description	Range	Factory setting
A1	T AUTO	The temperature level at which the unit heats the water when the AUTO mode is selected. The unit starts if the temperature of the water in BT3 falls of 5 °C below the set point.	50 - 60	53
A2	T ECO	The temperature level at which the unit heats the water when the ECO mode is selected. The unit starts if the temperature of the water in BT3 falls of 5 °C below the set point. For domestic hot water preparation do not use a set-point lower than 50°C, due the risk of legionella.	10 - 55	50
A3	T BOOST	The temperature level at which the unit heats the water when the BOOST mode is selected. The unit starts if the temperature of the water in BT3 falls of 5 °C below the set point.	50 - 65	55

11.01.04   Functions

The functions are similar to the modes of operation but they cannot be accessed directly from the home view and they can vary from unit to unit

In addition, since SOLAR and COOLING (called extra functions) cannot be used simultaneously, the choice of these functions should be made from the Installer menu (D26 Extra function). In the function menu, only one of these extra functions is normally shown.

The function menu is described in the following table.

Code	Set point name	Description	Range	Factory setting
B1	Ventilation OFF	The fan switches off when the heat pump does not run.	OFF/ Single Speed/ 2Speeds	OFF
	Single speed	The fan is always running at a single fixed speed (B2 Fan speed), both when the heat pump is operating and when it is not.		
	2 Speeds	The fan is always in operation but it runs normally at a higher speed D6 (Fan AUTO Speed) when the heat pump starts operating and at (B2 Fan speed) when it is not operating.		
B2	Fan speed	The main fan speed regulation for the ventilation function. There are three ventilation level that can be selected: LOW D5 (Min Fan Speed), MEDIUM D4 (Fan medium speed) HIGH D3 (Max fan speed).	LOW/ MEDIUM/ HIGH	HIGH
B3	Low Tariff Standard	The low tariff allows the electric heater and the heat pump to run only during periods with low electricity prices, according to the menu item that regulate the program of the low tariff D17/ D18 (Low tariff weekday/weekends). The unit runs only during pre-defined hours of the day.	OFF/ Standard/ Optimal 1/ Optimal 2	OFF
	Low Tariff Optimal 1	This function allows the maximum exploitation of the lower electricity price during the night periods between 00:00 and 05:00		
	Low Tariff Optimal 2	This function allows the maximum exploitation of the lower electricity price during the night periods between 00:00 and 05:00. During the day, the unit works according to Low Tariff periods D17 and D18		
B4	Hot on time	The unit can be programmed to deliver hot water from 1 to 30 days from the moment in which the function is activated and the HOLIDAY mode is selected. The unit switches to AUTO MODE in the desired number of days. If OFF is selected, the function is not active.	OFF/ON	OFF

Code	Set point name	Description	Range	Factory setting
B5	OFF	The PV function is not active. If this function is activated, the heat pump and the electric heater can start only if the input voltage in GC1 (0-10V) is higher than D20/D21 (PV min Voltage HP/EL) for longer than D22 (PV min time).	OFF / ECO / STORAGE	ECO
	PV ECO	The PV function allows for water heating only with the heat pump until temperature set point defined by the MODE of operation is reached.		
	PV STORAGE	The PV function allows for water heating to the maximum temperature level, giving priority to the operation of the heat pump if the BOOST or BACK UP mode is not active. The heat pump operates alone until the max allowed temperature for the heat pump operation D33 (T HP Max) is reached. The electric heater operates only from D33 to the maximum allowable temperature D9 (Water T max).		
B6	Solar	The Solar function allows the water to be heated up by the solar collector, activating a water pump controlled by the extra relay (GP1). The pump starts when BT5 > BT3 + D24 (Solar DT min). The pump stops if the temperature in the tank goes above D23 (Solar T max) or if BT5 is below BT3.	OFF/ON	OFF
B7	Floor	Not supported by TOSHIBA.	OFF/ON	OFF
B8	Floor T	Not supported by TOSHIBA	15 - 40	35
B9	Cooling	The Cooling function can be activated. See installer menu D28 (Cooling type).	OFF/ON	OFF
B10	Cooling T	The air temperature set point (°C) below which the heat pump stops, when the unit is in the Cooling function.	10 - 30	21

11.01.05   General

The general section collects all the standard settings that have little or no effect on the heat pump operation, except for the menu item Reset.

Activating the Reset function brings all the set points to the factory settings value. The set points of the General menu are described in the Table below

Code	Set point name	Description	Range	Factory setting
C0	Reset	The set points in the user menu are reset. The more advanced settings can be reset only from the installer menu. The information as number of hours of the compressor and fan cannot be reset	OFF/ON	OFF
C1	Info	The software version is displayed	-	-
C2	Time	The time can be adjusted here	-	-
C3	Date	The date can be adjusted here	-	-
C4	Day	The day can be adjusted here	-	Monday
C5	Language	More languages can be selected here	-	English
C6	Contrast	The brightness of the screen can be adjusted here	0 – 10	5

11.01.06   Installer

The installer menu should be accessed only by qualified personnel. Some of the set points that can be regulated from this menu can have large effects on the unit performance depending on the type of commissioning and installation. There should be a proper match between installer set points and type of installation in order to optimize the performance and lifetime of the unit.

In order to access the Installer Menu, a 4-digits password needs to be entered. The password is: 2016. All temperatures are expressed in °C.

Code	Set point name	Description	Range	Factory setting
D0	Reset all	All the set points and alarm messages are reset to original factory settings. The Information menu and the installer set points are modified.	OFF/ON	OFF
D1	Errors	The alarms of the unit can be checked here.	-	-
D2	D2.0 Address	Modbus address. The Modbus address can be selected between 1 and 247.	1-247	30
	D2.1 Baud Rate	Modbus baud rate. The ModBus baud rate can be selected between 19200 and 9600.	9600/ 19200	19200
	D2.2 Parity	Modbus parity. The ModBus parity can be chosen between Even or Odd or deactivated.	Even/ Odd/	Even
	D2.3 Write enable	Modbus modify. If this function is activated, it is possible to modify the set points kept for development with a data logger.	OFF/ON	ON
D3	Fan max speed	The maximum fan speed (%) can be regulated. This is the highest limit at which the fan can run both when the ventilation function is active and when the heat pump is in standard operation.	0-100	70
D4	Fan medium speed	The medium fan speed (%) can be adjusted.	0-100	50
D5	Fan min speed	The minimum fan speed (%) can be adjusted.	0-100	40
D6	AUTO speed	The automatic speed of the fan (%) when the heat pump is running in AUTO and ECO mode can be regulated. This is a nominal value while the fan speed may automatically vary its speed at a higher level, depending on the operating conditions.	0-100	57
D7	Air Temp min	The minimum air temperature allowed during the operation of the heat pump can be regulated here. If BT1 is below Air T min the electric heater starts and it works alone until the set point is reached. (Even if the air temperature increases in the meanwhile).	(-7) - (+10)	-7
D8	Air Temp max	The maximum air temperature allowed during the operation of the heat pump can be regulated here.	30-40	40
D9	Water Temp max	The maximum allowed temperature in the tank.	55-65	65
D10	Defrosting Temp Stop	The temperature of BT2 at which the defrosting function stops. The defrosting function is automatic and it occurs not more often than once every hour.	0-10	4
D11	Evaporator Temp max	The maximum evaporator temperature allowed during the operation of the heat pump can be regulated here. If BT2 has a higher temperature than the set point, then use electric heater. This function is active 10 minutes after the compressor start.	10-40	30

Code	Set point name	Description	Range	Factory setting
D12	BACK-UP Temp	The water temperature at which the unit stops the backup mode with only the electric heater.	0-65	35
D13	Legionella	The legionella function can be activated. The legionella function does not switch the heat pump on, but just continues the heat up cycle to a higher temperature D14 (Legionella T). The legionella operation works only with the heat pump until 60°C. The remaining temperature lift is accomplished with the electric heater alone.	OFF/ON	OFF
D14	Legionella Temp	The legionella temperature set point can be regulated.	60-65	60
D15	Legionella date	The legionella week day can be set	Monday/ Sunday	Sunday
D16	Forced operation	The forced operation of the heat pump can be activated here. The heat pump starts even if there is no demand for hot water. When the maximum temperature allowed by the heat pump is reached the unit will stop. This function is to use for testing purposes. It becomes OFF again after one heat up cycle is completed.	OFF/ON	OFF
D17	Low Tariff weekday	The start and stop time of the low electricity tariff period for weekdays. Three periods can be selected.	0-23 0-23 0-23	0 0 0
D18	Low Tariff weekend	The start and stop time of the low electricity tariff period for weekends. Three periods can be selected.	0-23 0-23 0-23	0 0 0
D19	Light Saving Time	Light Saving Time can be deactivated.	OFF/ON	ON
D20	PV min Voltage HP	The minimum voltage (V) required to start the HP when the PV function is active.	0-10	0
D21	PV min Voltage EL	The minimum voltage (V) required to start the electric heater when the PV function is active.	0-10	0
D22	PV min time	The minimum time (minutes) at which the input voltage from the PV panel should be above the set point D20/D21 (PV min Voltage HP/EL) in order to start the electric heater or heat pump when the PV function is active D22 also regulates the minimum heat pump operational time when started by the PV function.	1-120	15
D23	Solar Temp max	The maximum allowed temperature (°C) in the solar collector.	55-89	89
D24	Solar DT min	The minimum temperature (°C) difference between solar collector and tank.	1-5	5
D25	Floor Temp start	Not Supported by TOSHIBA.	25-45	35
D26	Extra function	The desired extra function is selected here. The possible functions are Solar, or Cooling (Floor function is not supported by TOSHIBA). Once the function is activated, move to the function menu and adjust the set point as desired.	OFF/ Solar/ Floor/ Cooling	OFF

Code	Set point name	Description	Range	Factory setting
D27	SG Ready	The SG ready function can be activated by the installer here. Three possible modes can be selected. This function allows the start of the heat pump from an external access (See QA1 in Figure 16). SG ready is not active if there is not external input (SG1 OFF, SG2 OFF).	OFF	OFF
		The heat pump and electric heater must start, if below the max water temperature allowed in the tank. Both Heat Pump and Electric heater are forced to operate (SG1 ON and SG2 ON).	SG BOOST	
		The heat pump operates minimizing costs, only the heat pump is activated (SG1 OFF, SG2 ON).	SG ECO	
		The unit can be stopped even if there is a need for hot water (SG1 ON, SG2 OFF).	SG BLOCK	
D28	Cooling 1	The fan and heat pump run until the additional temperature sensor, BT5, placed in the room environment is below a certain level. The water temperature can only reach the maximum temperature allowed in the tank D33 (T HP max). The cooling function activates a three-way damper, which directs the cold exhaust air to a room with cooling requirements. The two functions operate the damper in opposite directions	Cooling1 / Cooling2	Cooling1
	Cooling 2	Cooling 1 (2). If BT5 is higher than B10 T Cooling, the extra relay that operates the damper (GP1) switches ON (OFF). If BT5 is lower than B10 (T Cooling), the extra relay that operate the damper (GP1) switches OFF (ON).		
D29	OFF	Normal operation.	OFF/ Hygrostat/ Ventilation Max/ Start-Stop	OFF
	Hygrostat	The fan always runs according to the input signal in GC1 (0-10V) from an external hygrostat, CO_2 – sensor or similar appliances. 1. If the voltage is between 0-3.0V the fan speed id D5 (Fan min speed) 2. If the voltage is between 3.0-8.0V the fan speed is D4 (Fan medium speed) 3. If the voltage is higher than 8V the fan speed is D3 (Fan max speed)		
	Ventilation max	If the ventilation function is already selected, a signal higher of 2V to GC1 leads to maximum air flow.		
	Start/ Stop	If GC1 receives a signal higher than 2V, the unit operation is stopped.		
D30	Filter timer	The filter function is activated (ON) or deactivated (OFF).	OFF/ON	OFF
D31	Filter timer time	If the filter function is ON then the timer of the filter can be selected. This set point determines the number of months after which the filter alarm is displayed.	0 -12	3
D32	Filter reset	Once the air filter has been replaced, activate this function to reset the filter timer.	OFF/ON	OFF
D33	Temp HP max	The maximum water temperature that can be reached by the heat pump in °C .	50-65	60
D34	Air T Boost	Inlet air set-point for electric heater operation during Boost mode in °C.	-7 ~ 40	10

12.00   Periodic inspection items

Please observe local rules and regulations regarding potential periodical inspections of the domestic hot water heat pump by skilled personnel.

12.01   Environmental requirements

When repairing or dismantling the domestic hot water heat pump please follow the environmental regulations and legal requirements in relation to the recycling and disposal of materials.

12.02   Heating system and fan

Servicing primarily consists of cleaning the evaporator if no air inlet filter is installed.
- Remove the top plate of the unit.
- Relocate cables from the top part of the EPS housing.
- Remove the top part of the EPS housing off the unit.
- Clean the evaporator and fan with a bottle and brush.

NOTE: Do not use air conditioner cleaning fluids and aerosols, the chemicals contained in these products can damage the EPS parts.

Be careful not to remove balancing weights on the fan wheel during this process, as this will cause an imbalance and lead to a higher noise level as well as wear and tear on the fan.

12.03   Condensation and condensate drain

Together with inspecting and cleaning of the fan, the condensate drain shall be cleaned of dirt. Pour some water in the lower half of the EPS part and check if the water flows freely. If not, then the drain must be cleaned.

12.04   Water circulation and water tank
12.04.01   Pressure relief valve

Your installer has installed a pressure relief valve near the cold water connection on the domestic hot water tank to protect the water tank against excessive pressures when the domestic water expands during the heating process.

The back pressure valve (check valve), which is installed in front of the pressure relief valve on the cold water pipe, prevents water from the tank flowing back into the cold water pipe. Therefore, the pressure relief valve opens. The redundant water discharges. If the pressure relief valve did not open, the water tank would burst.

The pressure relief valve must be operated regularly to remove lime deposits and to verify that it is not blocked. It is tested by pressing the lever/turning the handle on the pressure relief valve while checking that water discharges. Damage due to a faulty pressure relief valve are not covered by the warranty

Please note that the water may drip from the discharge pipe of the pressure relief valve due to heating of the water.

12.04.02   Anode
In order to prevent corrosion of the enamelled hot water tank, a magnesium anode is installed behind the front panel at the top half of the water tank.
The anode has a life expectancy of approximately 2-5 years depending on the water quality.
It is recommended to inspect the anode every year.

- Disconnect the electrical power supply or pull out the power plug
- Remove the plastic front cover. This allows access to the anode.
- Disconnect the wire connection between the anode and the tank (se picture below).
- Insert a multimeter (range mA) between the anode and the tank.
  - Anode current >0.3mA: Anode is active and ok.
  - Anode current <0.3mA: Anode should be checked and possibly be replaced.
- Reconnect the wire connection between the anode and the tank. Close the front cover and switch on the unit.
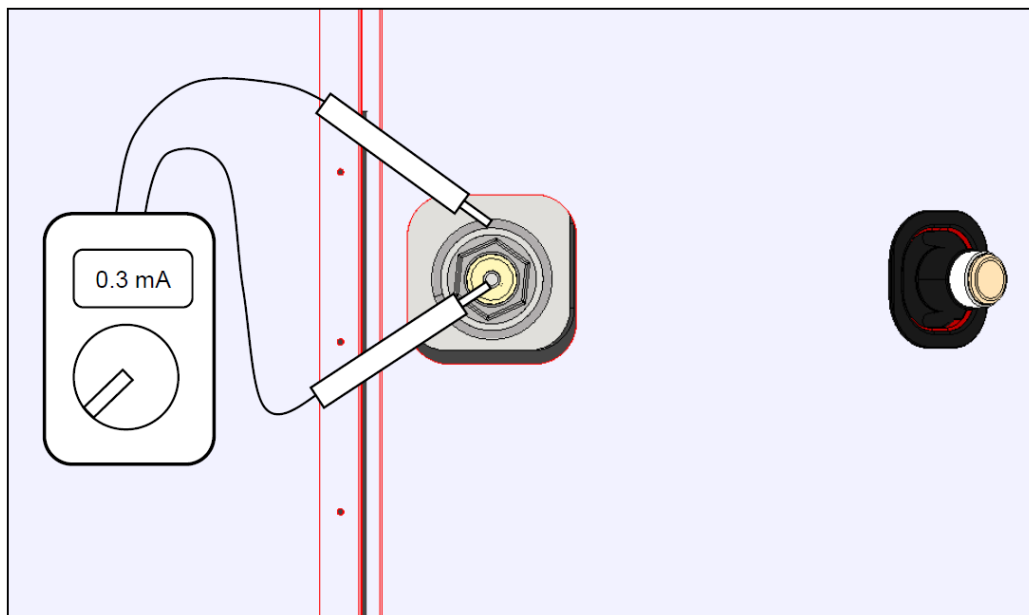
Figure 21 – Anode control

Please note that the water has to be heated to operational temperatures at least once before the test above can be performed.

In order to replace the anode the following should be done:

- Close the water inlet.
- Connect a hose to the drain valve so the water from the water from the tank can run to the nearest drain.
- Open a hot water tapping point (to avoid vacuum in the water tank).
- When the water level in the tank is below the anode, this can be removed for inspection and replacement

Check and replacement of anode must be performed by skilled personnel.

13.00   Part exploded view, parts list
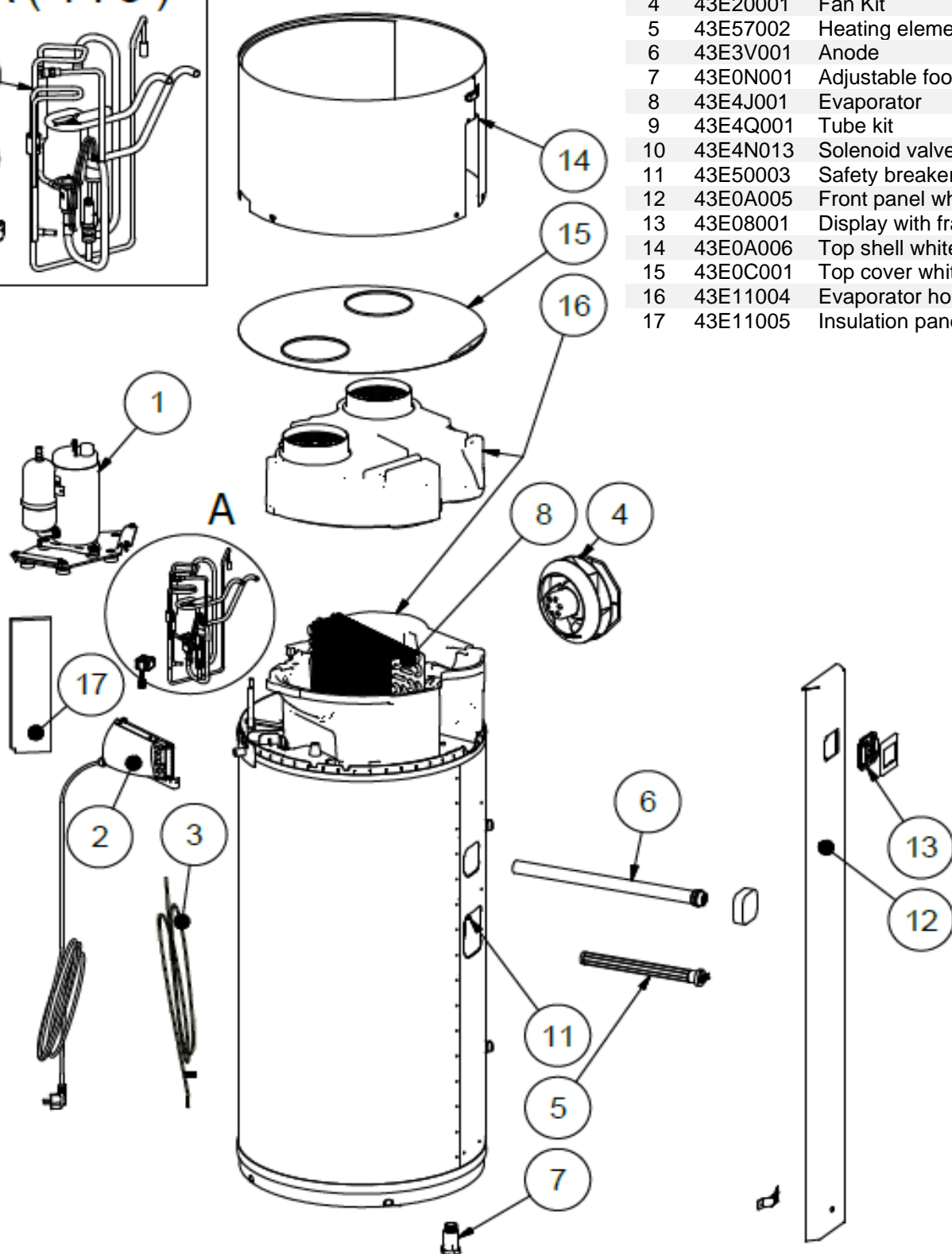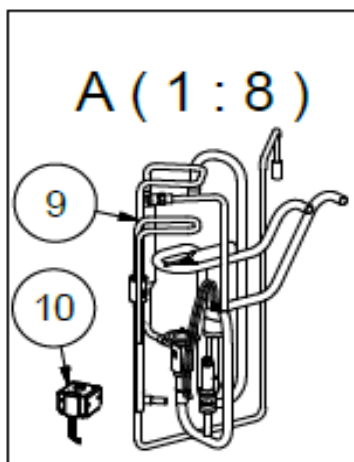
Ref No	Part Number	Description
1	43E41001	Compressor
2	43E6V002	PCB Board standard
	43E6V003	PCB Board deluxe
3	43E50002	Sensor, thermo
4	43E20001	Fan Kit
5	43E57002	Heating element
6	43E3V001	Anode
7	43E0N001	Adjustable foot
8	43E4J001	Evaporator
9	43E4Q001	Tube kit
10	43E4N013	Solenoid valve, coil
11	43E50003	Safety breakers
12	43E0A005	Front panel white
13	43E08001	Display with frame
14	43E0A006	Top shell white
15	43E0C001	Top cover white
16	43E11004	Evaporator housing
17	43E11005	Insulation panel

A (1 : 8)

14.00   Replacement of parts
Warning: Turn off power supply before removing or replacing any parts

14.01   Open & remove the front panel
Tools: BT20 Torx Screwdriver ⬡

1.

Using the BT20 Torx screwdriver remove the screw at the base of the unit.

2.

A lip on the top edge of the front panel stops it from moving. Lift the panel upwards and over the lip to remove.

3.

① Disconnect the grounding cables from the top shell.

② Disconnect the ribbon cable connector from the rear of the display.

The front cover is now disconnected and can be removed

14.02   **Remove the top shell & top cover**

Tools: BT20 Torx Screwdriver ⬡

1.
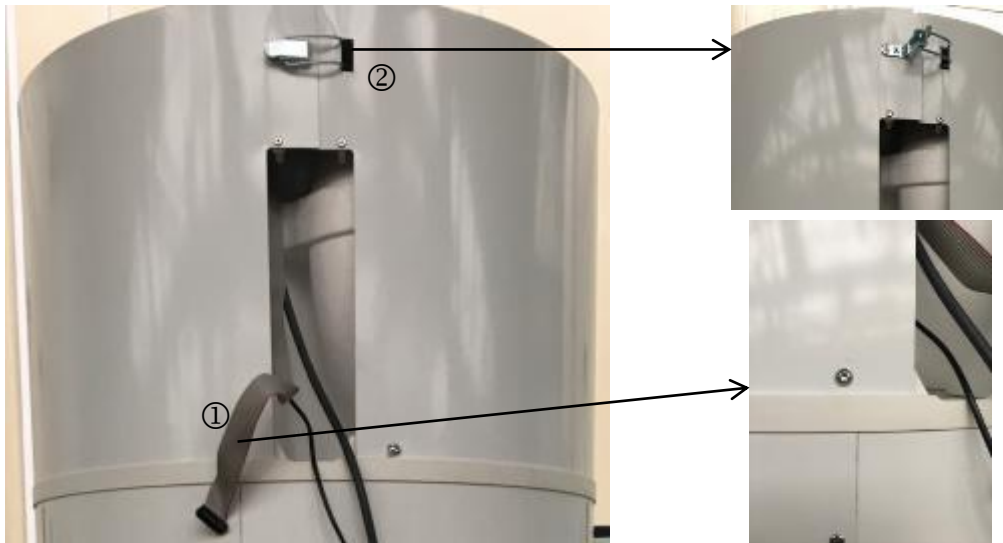
Complete step 13.1

① Using the BT20 Torx screwdriver, remove the screw on the lower left hand side of the cable entry slot.

② Lift latch on clip lock and un hook from locking slot

2.

① Open the left hand side of the cabinet slowly and disconnect the earth cable from the top shell

② There are 3 'L' shaped location points around the base of the top shell. Twist the top shell anti-clockwise to release and lift the top shell off the DHW-HP

3.

To remove the top cover, lift it up over the top of the fan guards.

14.03   Remove the evaporator housing

Tools: BT20 Torx Screwdriver ⭕

1.
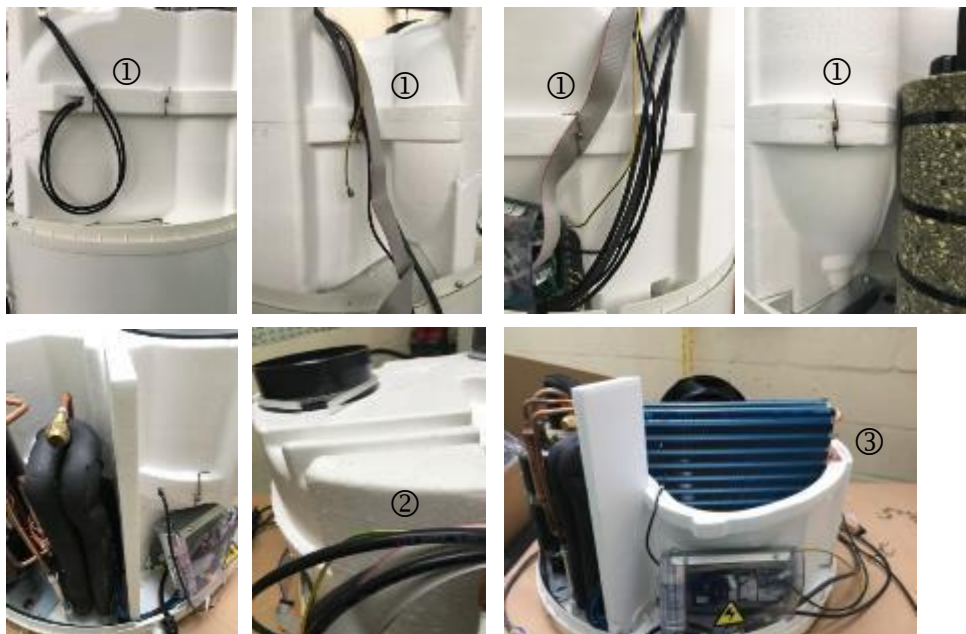
Complete steps 13.1 & 13.2

① There are 6 spring clips holding the upper evaporator housing to the lower half of the housing. Remove the clips taking note of the cable positions and routing

② Lift off the cables located on the top of the evaporator housing, taking note of cable location and routing.

③ Remove upper evaporator housing by lifting upwards

14.04   Replace the heating element

Tools: BT20 Torx Screwdriver ⭕

1.
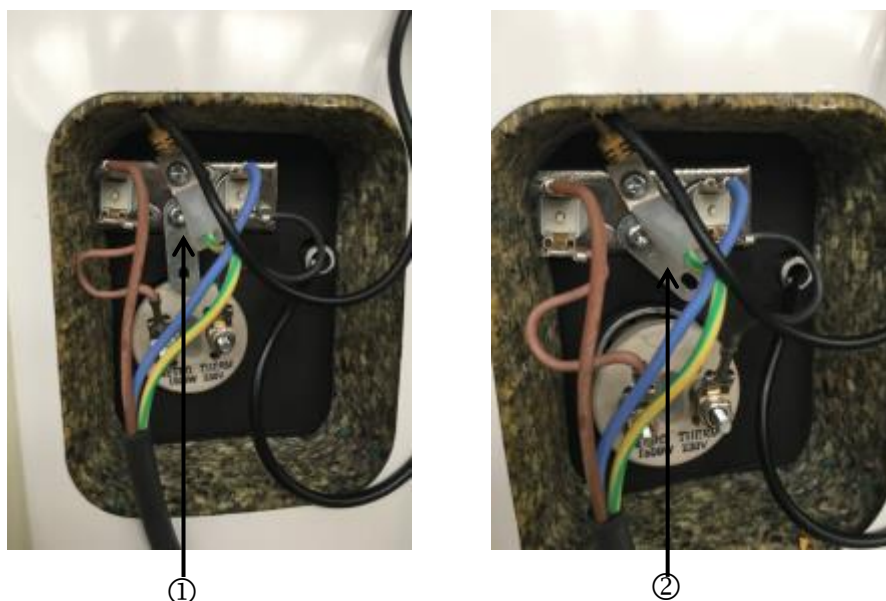
Complete step 13.1

① Using the BT20 Torx screwdriver loosen the screw holding the electric heater retaining bracket

② Twist the retaining bracket to the side until the electric heater becomes loose

Remove the power cables, the electric heater can now be removed by sliding it out of the tube

14.05 Replace the safety breakers

Tools: BT20 Torx Screwdriver ⊙, drill, rivet gun

1.

① ②

Complete step 13.1

① Remove the cables to the safety breaker(s).

② Using the drill: gently drill the rivets to remove the safety breaker.

Note: the new safety breakers must be riveted back on to the DHW-HP.

14.06 Replace the anode

Tools: BT20 Torx Screwdriver ⊙, 14mm socket, 34mm socket

1.
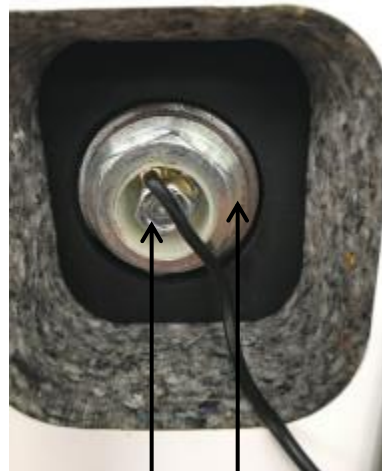
① ② ③

Complete step 13.1

Drain the tank so the water level is below the level of the anode.

① Remove the foam insulation covering the anode location

② Using the 14mm socket, remove nut retaining the grounding cable.

③ Using the 34mm socket remove the anode from the tank.

14.07   Replace the solenoid valve, coil

Tools: BT20 Torx Screwdriver ⟲ , No.2 Philips screwdriver, terminal screwdriver

1.

Complete steps 13.1 & 13.2

① The solenoid coil is located at the rear of the unit behind the refrigeration circuit pipe work

② Remove the insulation panel by sliding the panel out

③ The solenoid valve coil is now easily visible and accessible

④ Using the No.2 Philips screwdriver remove the retaining screw and lift the coil to remove

⑤ The cables connect to the PC board on terminals 12 & 13 (QN1), bottom left corner of the board. This terminal has a push to fit type connector. Using the terminal screwdriver push into the top of the terminal to release and pull the cable downwards

14.08   Replace the fan kit

Tools: BT20 Torx Screwdriver ⚙
1.

Complete steps 13.1, 13.2 & 13.3

① The fan assembly is located to the rear right of the DHW-HP

② Disconnect the 2 cables and plugs from the PC Board, GQ2 (X2 & X7), taking note of the routing of the cables

③ To remove the fan carefully lift upwards out of the lower evaporating housing

14.09   Replace the BT1 sensor

Tools: BT20 Torx Screwdriver ⚙, terminal screwdriver
1.

Complete steps 13.1, 13.2 & 13.3

① The BT1 sensor is located to the right hand side of the insulation panel. Take note os sensor position

② Remove the cables from the terminal block at the top of the PC Board, labelled BT1.
The connection block is a push fit type, using the terminal screwdriver in the slot, push up and pull the cable up to remove.

14.10   Replace the BT2 sensor

Tools: BT20 Torx Screwdriver ⊙, terminal screwdriver

1.
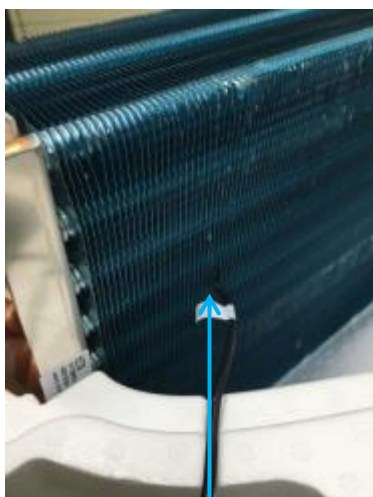
Complete steps 13.1, 13.2 & 13.3

① The BT2 sensor is located into the heat exchanger at the front of the DHW-HP. The sensor is placed into the heat exchanger 11cm from the top, 7.5 cm from the edge and 3cm in.

② Remove the cables from the terminal block at the top of the PC Board, labelled BT2. The connection block is a push fit type, using the terminal screwdriver in the slot, push up and pull the cable up to remove.

14.11   Replace the BT3 sensor

Tools: BT20 Torx Screwdriver ⊙, terminal screwdriver

1.

Complete step 13.1 & 13.2

① The BT3 sensor is located into the top pocket to the right of the electric heating element. The sensor is inserted all the way in until it stops.

② Remove the cables from the terminal block at the top of the PC Board, labelled BT3. The connection block is a push fit type, using the terminal screwdriver in the slot, push up and pull the cable up to remove.

14.12   Replace the BT4 sensor

Tools: BT20 Torx Screwdriver ⬡, terminal screwdriver

1.
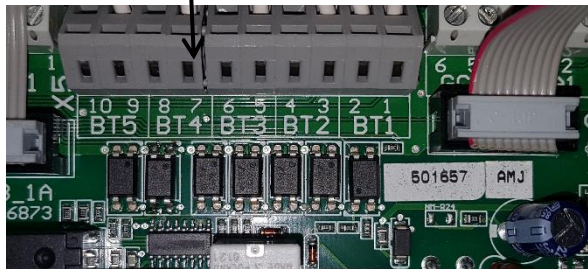
Complete steps 13.1 & 13.2

① The BT4 sensor is located into the lower pocket to the right of the electric heating element. The sensor is inserted all the way in until it stops.

② Remove the cables from the terminal block at the top of the PC Board, labelled BT4. The connection block is a push fit type, using the terminal screwdriver in the slot, push up and pull the cable up to remove.

14.13   Replace the compressor

Tools: BT20 Torx Screwdriver ⬡ , 8mm socket, reclaim equipment, brazing equipment

1.
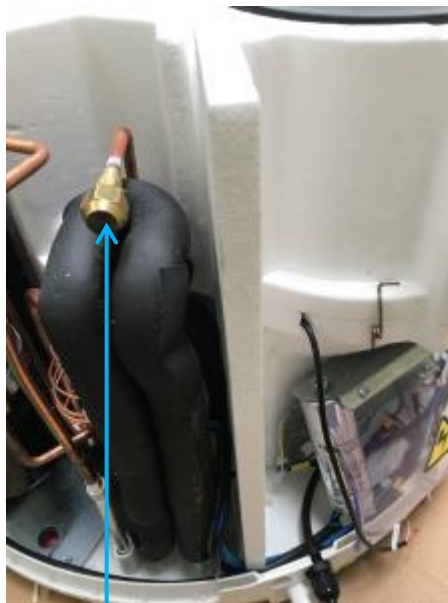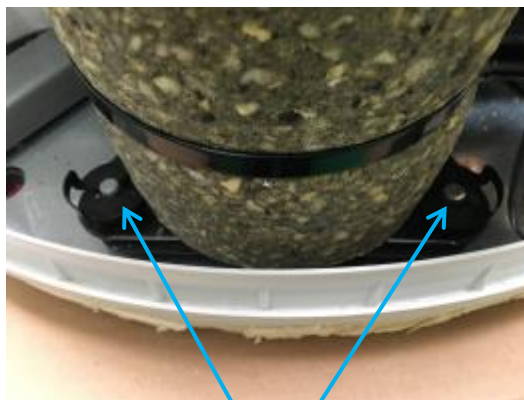
① ② ③ ④ ⑤ ⑥ ⑦

Complete steps 13.1, 13.2 & 13.3

① The compressor is located at the rear of the DHW-HP

② The service port is located to the right of the refrigeration circuit. Remove the cap and connect the reclaim equipment.

③ Using the 8mm socket remove the compressor connection cap.

④ Take note of the compressor connections. Snip the cable ties which hold the lead in place. Disconnect the compressor connections and move the cable and overload protector away from compressor location.

⑤ Remove the insulation tape to the compressor discharge pipe and peel back away from the compressor

⑥ Using the brazing equipment, de-braze the suction and discharge pipes from the compressor

⑦ Remove the compressor retaining clips, 2 at the front and 1 at the rear, and lift the compressor free from the unit.
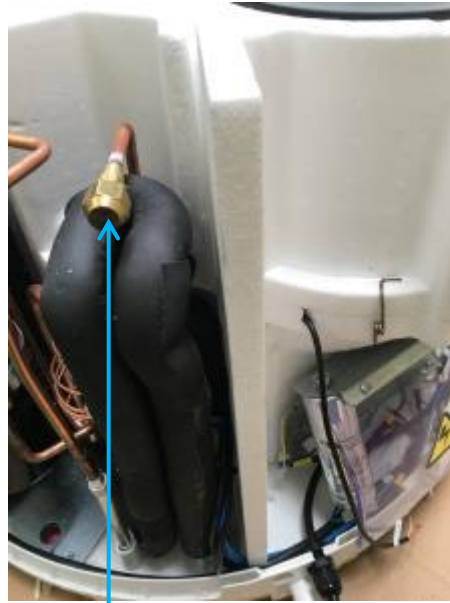
14.14   Replace the tube kit

Tools: BT20 Torx Screwdriver ⬡, 8mm socket, reclaim equipment, brazing equipment
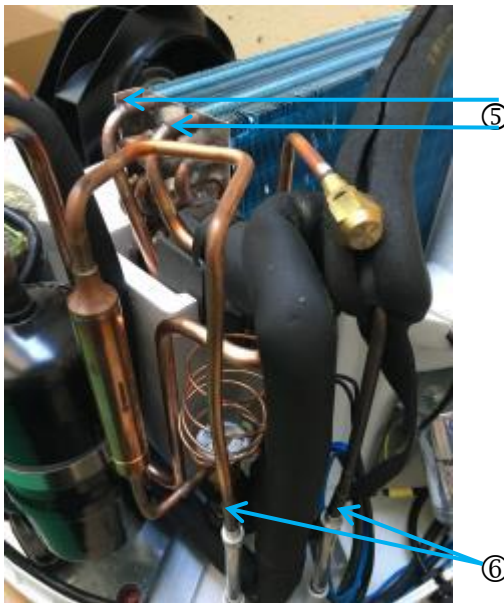
1.

① ② ③ ④ ⑤ ⑥

Complete steps 13.1, 13.2 & 13.3

① The tube kit is located at the rear of the DHW-HP

② The service port is located to the right of the refrigeration circuit. Remove the cap and connect the reclaim equipment.

③ Remove the insulation tape to the compressor discharge pipe and peel back away from the compressor and remove insulation, jacket and wiring.

④ Using the brazing equipment, de-braze the suction and discharge pipes from the compressor

⑤ De-braze pipes from the heat exchanger.

⑥ Remove the insulation tape and move the insulation on the condenser pipe. De-braze pipe at joint just above mechanical fitting.

14.15 Replace the PCB board, Standard (1.) & Deluxe (2.)

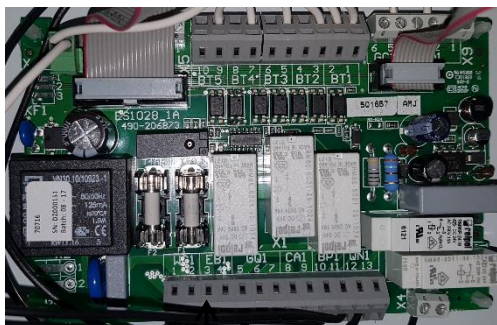**Tools:** BT20 Torx Screwdriver ⬡, terminal screwdriver

1.

Complete steps 13.1 & 13.2, Std PCB

① Although all cables are identified for location, take note of the conductor colour for the terminal block connection

② The PC Board is held on to the PC board bracket using plastic mounts, pinch to release

③ The PC Board bracket can be removed by use of a BT20 Torx screwdriver

2.

Complete steps 13.1 & 13.2, Deluxe PCB

① Although all cables are identified for location, take note of the conductor colour for the terminal block connection

② The PC Board is held on to the PC board bracket using plastic mounts, pinch to release

③ The PC Board bracket can be removed by use of a BT20 Torx screwdriver

14.16 Replace the display & frame

Tools: BT20 Torx Screwdriver ⬡

1.
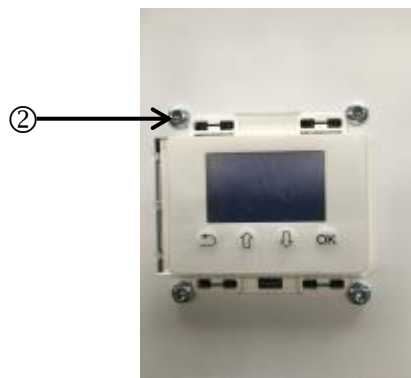
Complete step 13.1

① Unclip the display frame from the display by gently pulling the top edge.

② Using the BT20 Torx screwdriver, remove the 4 retaining screws from the panel.

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