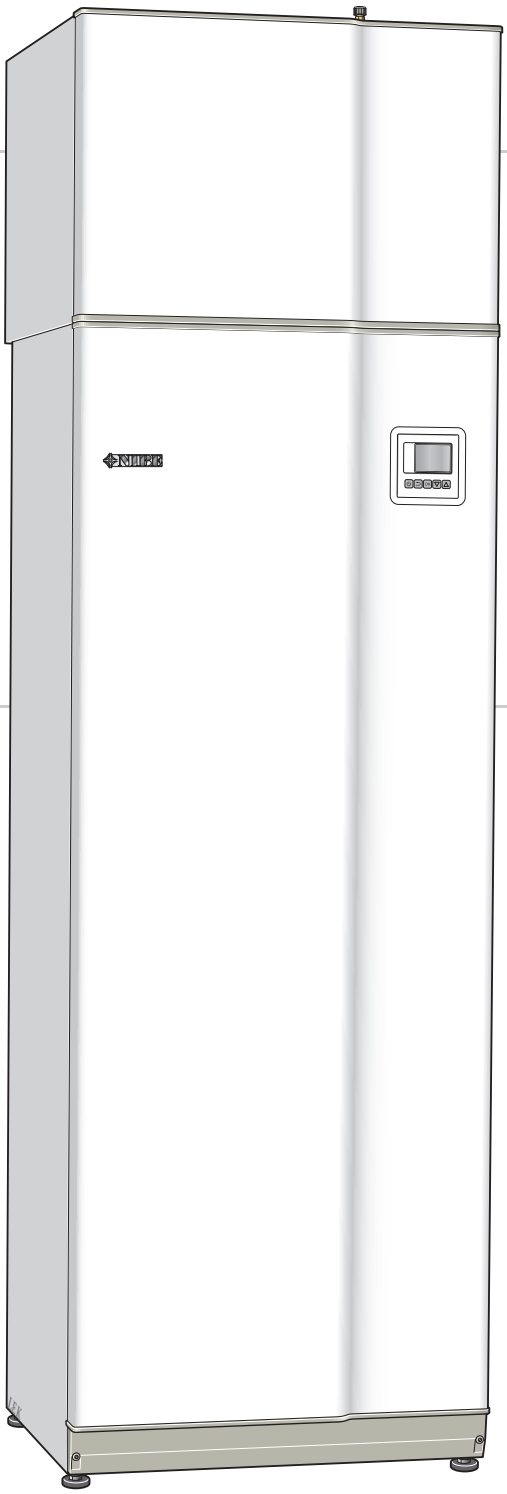
NIBE



Service manual

F110

Exhaust air heat pump

SEM EN 1726-1
431556

Table of Contents

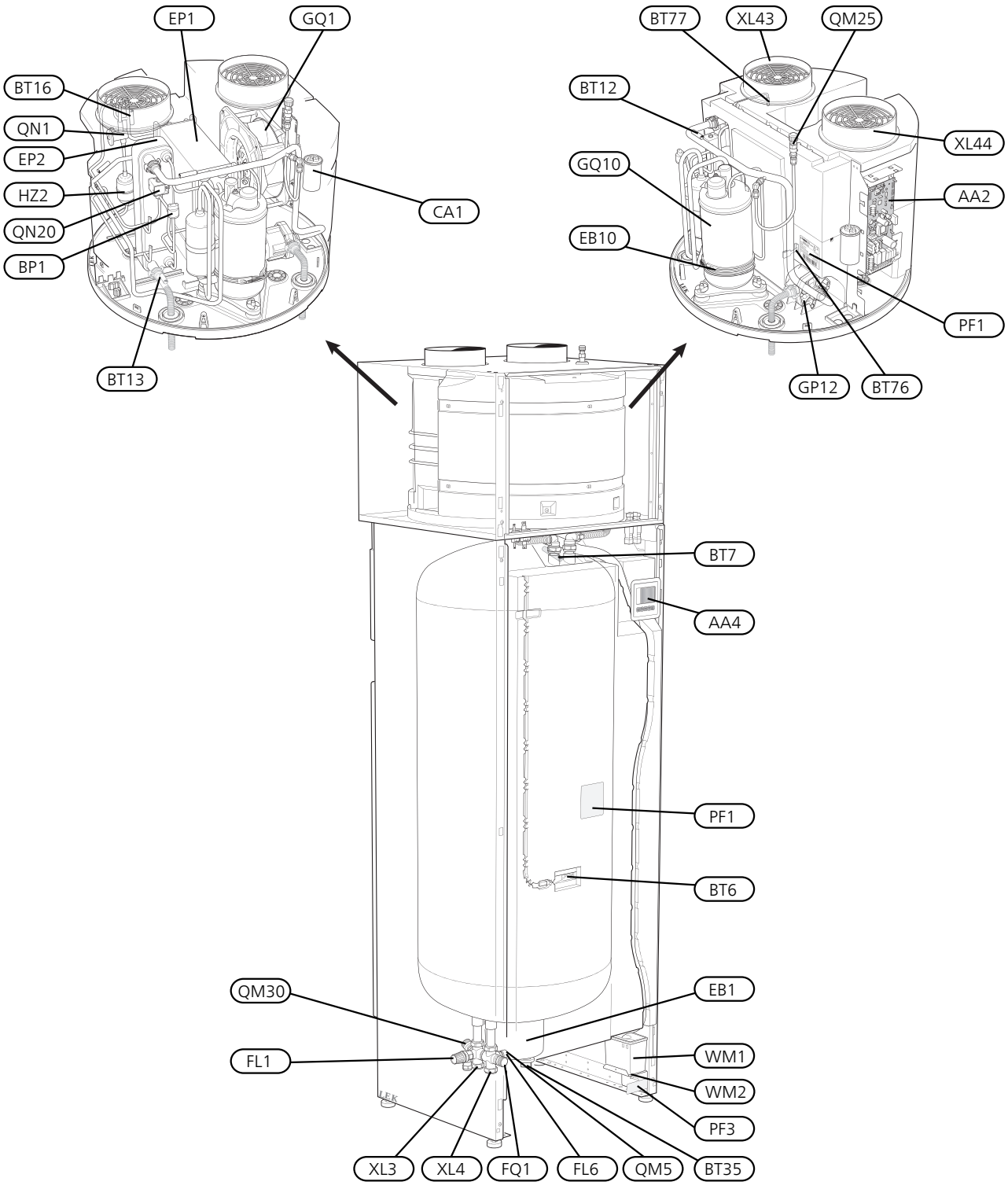
1 Important information

Document information

This technical manual is a complement to the Installer handbook for F110, containing:

- Description of functions and component description.
- Information to facilitate fault-tracing.
- Instructions for replacing components.
- Supplementary technical information.

2 The heat pump design



Pipe connections

XL 3	Connection, cold water
XL 4	Connection, hot water
XL43	Connecting incoming air
XL44	Connecting outgoing air
WM2	Overflow water discharge[1]

HVAC components

FL 1	Safety valve, water heater
FL 6	Vacuum valve (only F110 Cu)
FQ 1	Mixer valve, hot water
GP12	Circulation pump, charging
QM 5	Vent screw (only F110 R)
QM25	Venting, hot water
QM 30	Shut-off valve, hot water
WM 1	Overflow cup
WM 2	Overflow water discharge

Sensors etc.

BP1	High pressure pressostat
BT 6	Temperature sensor, hot water, control
BT 7	Temperature sensor, hot water, display
BT12	Temperature sensor, condenser out
BT13	Temperature sensor, heating medium return before condenser
BT16	Temperature sensor, evaporator
BT 35	Thermostat
BT76	Temperature sensor, defrosting
BT77	Temperature sensor, incoming air

Electrical components

AA2	Base card
AA 4	Display unit
CA1	Capacitor
EB 1	Immersion heater
EB10	Compressor heater
FD 1	Temperature limiter[1]

Cooling components

EP1	Evaporator
EP2	Condenser
GQ10	Compressor
HZ2	Drying filter
QN1	Expansion valve
QN20	Solenoid valve, defrosting

Ventilation

GQ1	Fan
HQ12	Air filter[1]

Miscellaneous

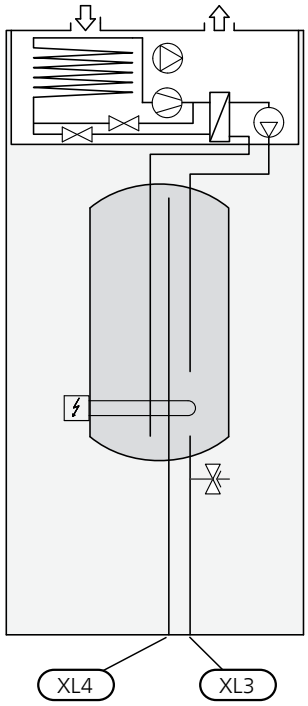
PF1	Rating plate
PF3	Serial number plate

[1]Not visible in the image

Designations in component locations according to standard IEC 81346-1 and 81346-2.

3 System description

Principle of operation



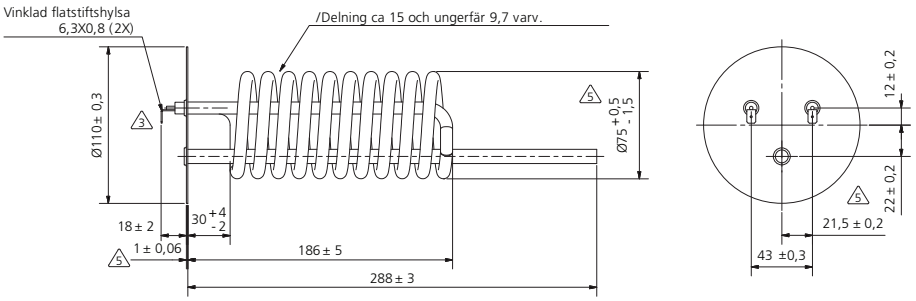
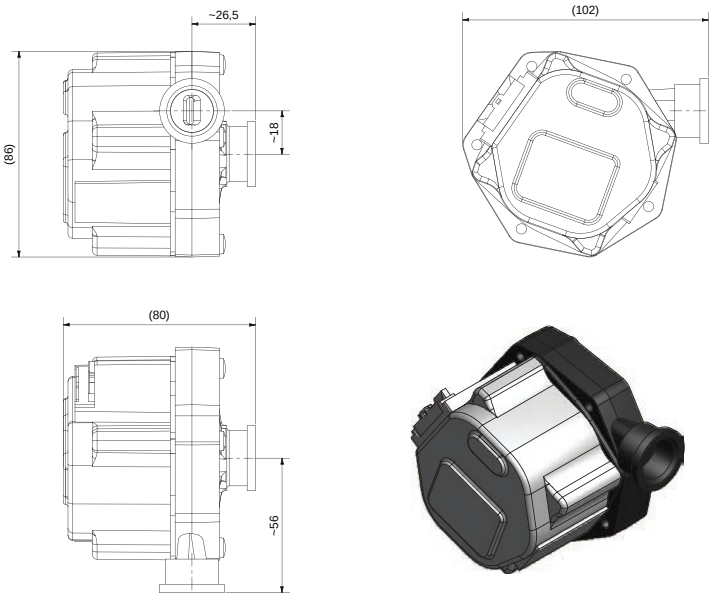
XL3	Connection, cold water
XL4	Connection, hot water
FL1	Safety valve

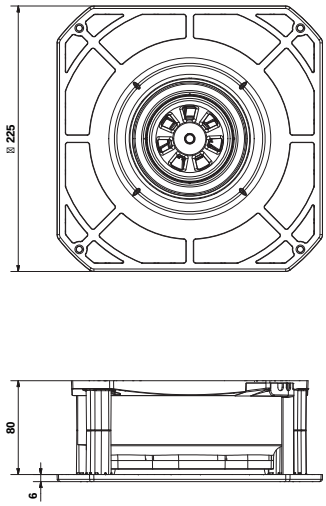
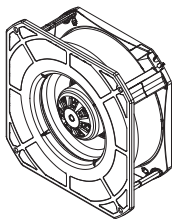
Symbol key

Symbol	Meaning
	Shut-off valve
	Immersion heater
	Safety valve
	Circulation pump
	Fan
	Compressor
	Radiator system
	Domestic hot water
	Under floor heating systems
test	Test2

4 Component description

Components

Component	Description
Immersion heater (EB1)	**SAR 15-115** 1.3kW, resistance 41 Ohm ELPATRON SAR 15-115 
Circulation pump (GP12)	Panasonic PY-11 
High pressure switch (BP1)	Breaking value: 22 bar. Reconnection differential: 7 bar
Compressor (GQ10)	Hitachi-Highly WHP01900BSV Resistance between phases At start: 7.62 ohm During normal operation: 5.84 ohm

Component	Description
Fan (GQ1)	EBM-PABST K3G190-RC05-03  
Filter (HQ12)	Filter class G2 445 x 196 mm
Exp. valve (QN1)	Danfoss TUC 068U3514 R134A

Sensors

Temperature sensor data

Temperature (°C)	Resistance (kOhm)	Voltage (VDC)
-40	351.0	3.256
-35	251.6	3.240
-30	182.5	3.218
-25	133.8	3.189
-20	99.22	3.150
-15	74.32	3.105
-10	56.20	3.047
-5	42.89	2.976
0	33.02	2.889
5	25.61	2.789
10	20.02	2.673
15	15.77	2.541
20	12.51	2.399
25	10.00	2.245
30	8.045	2.083
35	6.514	1.916
40	5.306	1.752
45	4.348	1.587
50	3.583	1.426
55	2.968	1.278
60	2.467	1.136
65	2.068	1.007
70	1.739	0.891
75	1.469	0.785
80	1.246	0.691
85	1.061	0.607
90	0.908	0.533
95	0.779	0.469
100	0.672	0.414

Electronics

Base card (AA2)

Output	Function
AA2-X2:1-2	Immersion heater EB1
AA2-X2:3-4	Compressor GQ10
AA2-X2:5-6	Compressor heater EB10
AA2-X2:7-8	Solenoid valve QN20
AA2-X9:1	Fan GQ1 GND
AA2-X9:2	Fan GQ1 PWM
AA2-X9:3	Fan GQ1 Tachometer
AA2-X9:4	Fan GQ1 10°V
AA2-X10:1	Circulation pump GP12 24V
AA2-X10:2	Circulation pump GP12 GND
AA2-X10:3	Circulation pump GP12 PWM
AA2-X10:4	Circulation pump GP12 Tachometer
AA2-X14:1-3	High pressure switch BP1
AA2-X9:1-4	Fan GQ1

Input	Function
AA2-X4:1-2	BT6 Temperature sensor, hot water, control
AA2-X4:3-4	BT7 Temperature sensor, hot water, display
AA2-X5:1-2	BT76 Temperature sensor, defrosting
AA2-X5:3-4	BT77 Temperature sensor, incoming air
AA2-X5:5-6	BT16 Temperature sensor, evaporator
AA2-X6:3-4	BT12 Temperature sensor, condenser supply
AA2-X6:5-6	BT13 Temperature sensor, heating medium return before condenser
AA2-X13:1-2	AUX 1
AA2-X13:3-4	AUX 2

Display board, AA4

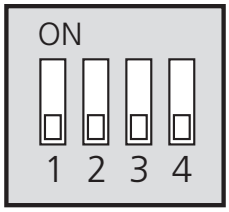
The display comprises:

- A colour screen on which all information is presented.
- Standby, Back button, OK button and up and down buttons.

Output	Function
AA2-X8:1	AA4-12V, Display
AA2-X8:2	AA4-GND, Display
AA2-X8:3	AA4-B, Display
AA2-X8:4	AA4-A, Display

Dipswitch

Default setting for F110.



5 Troubleshooting

Alarm list

Alarm

For alarms that do not affect immersion heater operation, “Activate auxiliary operation?” is shown in addition to “Info text”.

Users can tick if they want auxiliary operation to be activated. For each alarm defined below, there is information about the relevant alarm. Note! If the user decides to active auxiliary operation and thereby ends up in operating mode Additional heat only, the user reverts automatically to operating mode Auto when the alarm is acknowledged. If this way, there is no risk of getting caught in immersion heater operation after the fault has been rectified.

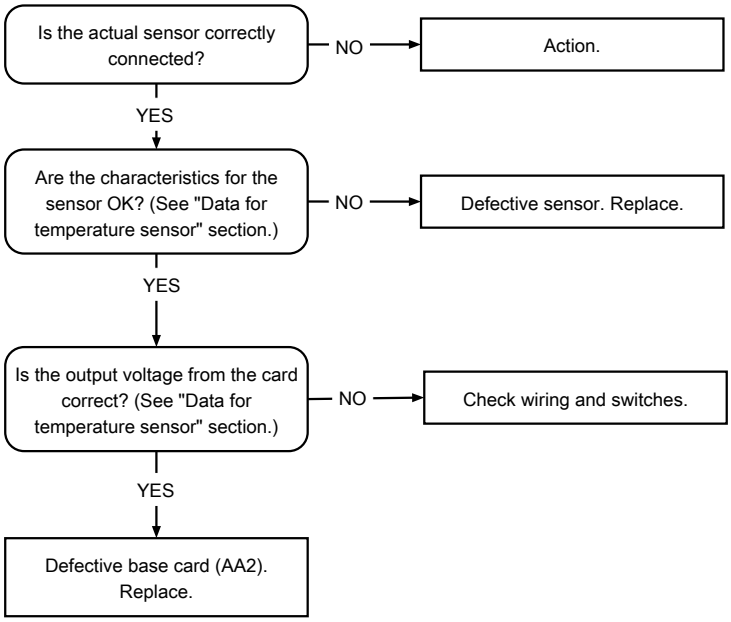
Alarm no.	Alarm text on the display	Cause	Heat pump action.	May be due to
6	Sensor fault BT6	The input for the sensor receives unreasonably high or low value for longer than 2 seconds. (hot water, controlling)	If BT7 is available, control continues on this sensor. Automatic reset.	Defective sensor and its connections. See fault-tracing schedule page 14.
7	Sensor fault BT7	The input for the sensor receives unreasonably high or low value for longer than 2 seconds. (Hot water, top)	Control is not affected by the sensor fault. Automatic reset.	Defective sensor and its connections. See fault-tracing schedule page 14.
12	Sensor fault BT12	The input for the sensor receives unreasonably high or low value for longer than 2 seconds. (condenser flow)	Compressor blocked. The fan stops, but not during exhaust air operation. The charge pump stops. Immersion heater is stopped, although not during anti-freeze. Automatic reset.	Defective sensor and its connections. See fault-tracing schedule page 14.
13	Sensor fault BT13	The input for the sensor receives unreasonably high or low value for longer than 2 seconds. (heating medium return before condenser)	Compressor blocked. The fan stops, but not during exhaust air operation. The charge pump stops. Immersion heater is stopped, although not during anti-freeze. Automatic reset.	Defective sensor and its connections. See fault-tracing schedule page 14.
16	Sensor fault BT16	The input for the sensor receives unreasonably high or low value for longer than 2 seconds. (evaporator)	Compressor blocked. The fan stops, but not during exhaust air operation. The charge pump stops. Immersion heater is stopped, although not during anti-freeze. Automatic reset.	Defective sensor and its connections. See fault-tracing schedule page 14.

Alarm no.	Alarm text on the display	Cause	Heat pump action.	May be due to
71	Product not selected	Dip switches are set according to the replacement board.	F110 blocked, no functions permitted.	Set dip switch for F110, see page 10.
83	Unsuccessful defrosting.	Alarm in event of three defrosts within a 60 minute period.	Compressor blocked. If exhaust air operation is not selected: Fan stop Charge pump, stops. Immersion heater operation, stops to provide indirect indication to the user. Manual reset.	- Check ventilation flow and exhaust air temperature. - Check the defrosting function and the sensors that control it.
136	Sensor fault BT76	The input for the sensor receives unreasonably high or low value for longer than 2 seconds. (defrosting)	Automatic reset	Defective sensor and its connections. See fault-tracing schedule page 14.
137	Sensor fault BT77	The input for the sensor receives unreasonably high or low value for longer than 2 seconds. (incoming air)	Automatic reset	Defective sensor and its connections. See fault-tracing schedule page 14.
158	Low defr. temp.	Alarm for low temperature at the defrosting sensor, BT76.	Compressor blocked If exhaust air operation is not selected: Fan stop Charge pump, stops. Immersion heater operation, stops to provide indirect indication to the user. Defrosting interrupted. Manual reset.	Check the defrosting sensor (BT76).
159	High evaporation	The temperature of the evaporation sensor BT16 is higher than 50°C.	Compressor blocked. If exhaust air operation is not selected: Fan stop Charge pump, stops. Immersion heater operation, stops to provide indirect indication to the user. Defrosting interrupted. Manual reset.	Check the evaporation sensor BT16 as well as whether/or the solenoid valve QN20 has hung after defrosting.
248	Communication error	10 sec. without successful communication between display unit AA4 and base board AA2.	Compressor blocked. If exhaust air operation is not selected: Fan stop Charge pump, stops.	Check cables between display unit AA4 and base board AA2.

Alarm no.	Alarm text on the display	Cause	Heat pump action.	May be due to
290	Fan	Issues alarm if PWM signal is lower than 29%.	Compressor blocked. If exhaust air operation is not selected: Fan stop Charge pump, stops. Immersion heater operation, stops to provide indirect indication to the user. Defrosting interrupted. Manual reset.	Check cables between fan GQ10 and base board AA2.
291	Charge pump	Issues alarm if PWM signal is lower than 7%.	Compressor blocked. If exhaust air operation is not selected: Fan stop Charge pump, stops. Immersion heater operation, stops to provide indirect indication to the user. Defrosting interrupted. Manual reset.	Check cables between circulation pump GP12 and base board AA2.

Troubleshooting guide

Alarm – sensor fault



Function check, components

Relay test - forced control

The heat pumps relay outputs can be force controlled from menu 5.6.

1. Tick "activated". Forced control is then activated for 10 minutes.
2. Tick the outputs that you want to activate.
3. Check the relay/component function.

WARNING!

Forced control must only be used by users familiar with the system. When forced control is activated, the alarm functions are disabled.

Internal outputs

Output	Function
AA2-K1	Immersion heater EB1
AA2-K2	Compressor GQ10
AA2-K3	Compressor heater EB10
AA2-K4	Solenoid valve QN20
AA2-K5	Fan GQ1
AA2-K6	Circulation pump GP12

Function check

With forced control of the heating medium pump (GP12) or the exhaust air fan (GQ1), it may be necessary to check the supply (230 V AC) and the control signal (0-10 V DC) to the circulation pump.

Circulation pump (GP12)

Pump speed GP12	PWM, X10:3
0 %	approx. 0 V DC
50 %	approx. 5 V DC
100 %	approx. 10 V DC

Exhaust air fan (GQ1)

Fan speed GQ1	PWM2, X2:3-4
0 %	approx. 0 V DC
50 %	approx. 5 V DC
100 %	approx. 10 V DC

Forced control

The various components in the heat pump's relay outputs can be force-controlled from menu 5.6.

1. Tick Activated. Forced control is then activated for 10 minutes
2. Tick the outputs that you want to activate
3. Check the relay/component function.

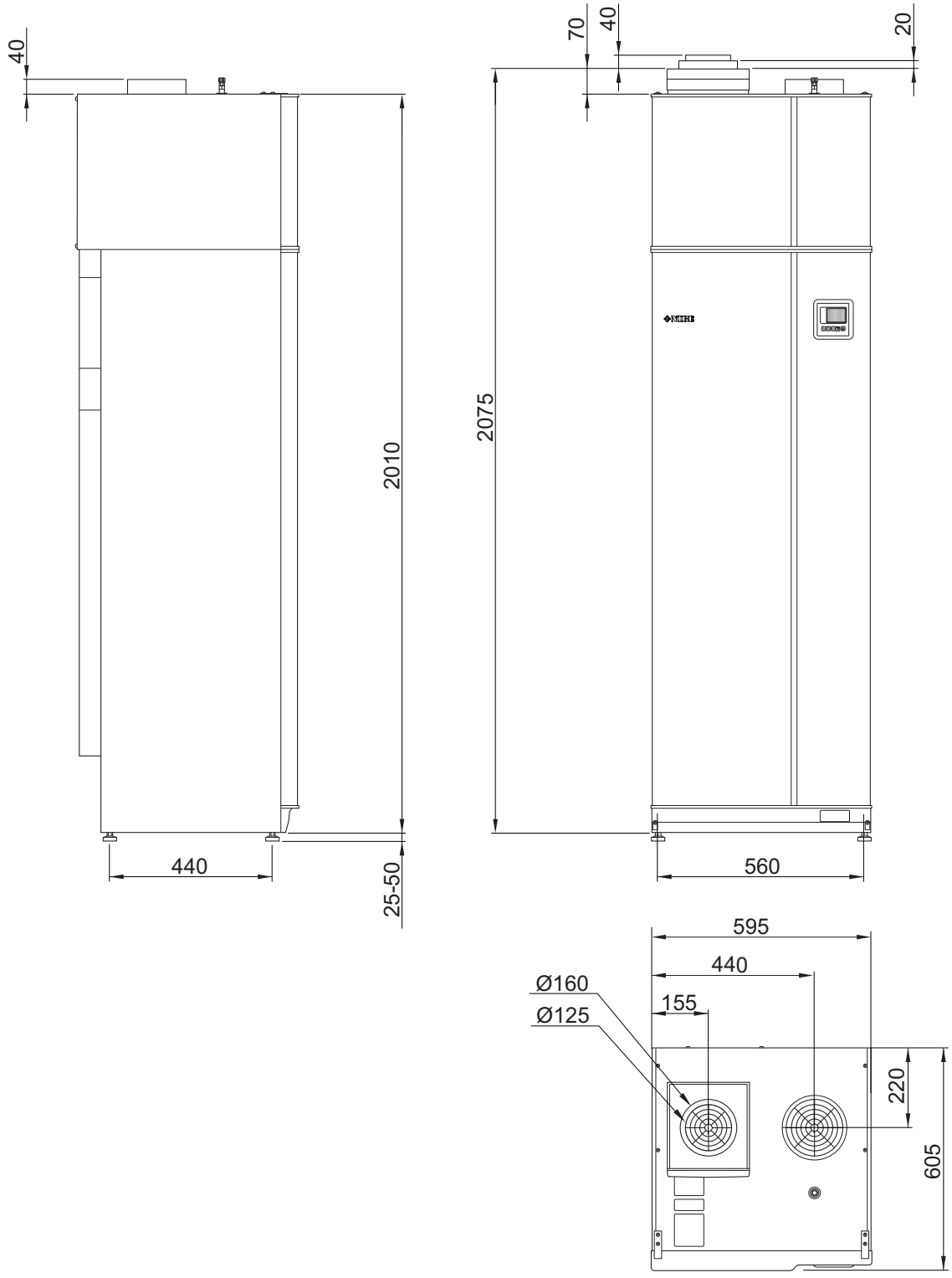
Output	Function
K1	Immersion heater EB1
K2	Compressor heater EB10
K3	Compressor GQ10
K4	Solenoid valve QN20
K6	Fan GQ1 Speed 50%.
K7	Circulation pump GP12 speed 50%.

Default setting: nothing activated.

If no buttons are pressed within 10 minutes, the forced control is automatically deactivated

6 Technical data

Dimensions and setting-out coordinates



Technical specifications

Technical specifications

1x230 V		Exhaust air	Outdoor air	Surrounding air
Output data				
Capacity (P_H)	kW	1.32[1]	1.08[2]	1.32[1]
COP		2.89	2.36	3.27
Additional power				
Max power, immersion heater (factory setting)	kW	1.3 ( )		
Electrical data				
Rated voltage	V	230 V ~ 50 Hz		
Max operating current	A	9.1		
Min. fuse rating	A	10		
Driving power circulation pump	W	5-20		
Driving power fan	W	20-75		
Enclosure class		-		
Refrigerant circuit				
Type of refrigerant		R134A		
GWP refrigerant		1430		
Volume	kg	0.38		
CO_2 equivalent	ton	0.54		
Compressor type		Rotation		
Cut-out value pressostat HP	MPa/bar	2.2 / 22.0		
Air flow requirement				
Min. air flow at exhaust air temperature below 10°C	l/s	-	83	-
Min. air flow at exhaust air temperature at least 10°C	l/s	25	42	25
Temperature range for compressor operation	°C	10 - 37		
Sound effect level according to EN 12 102				
Sound power level ($L_{W(A)}$)[3]	dB(A)	47.0		
Sound pressure levels according to EN ISO 11 203				
Sound pressure level in the boiler room ($L_{P(A)}$)[4]	dB(A)	43.0		
Pipe connections				
Hot water ext Ø	mm	22		
Cold water ext Ø	mm	22		
Safety valve ext. Ø	mm	15		
Ventilation ext Ø	mm	160		
Filter box ext. Ø	mm	160/125		

Other 1x230 V		Copper	Stainless
Water heater			
Volume, hot water heater	litre	265	
Min pressure in water heater	MPa/bar	0.2 / 2.0	
Max pressure in hot water heater	MPa/bar	1.0 / 10.0	
Safety valve deploys at	MPa/bar	0.9 / 9.0	1.0 / 10.0
Max temperature with compressor	°C	56	
Max temperature with additional heat	°C	95	
Capacity hot water heating according to EN 16 147[5]			
Tap volume 40 °C at Normal comfort (V_{max})	litre	365	
Specified compressor output[6]		1.32	
Idle loss at Normal comfort (P_{es})	W	42	
Dimensions and weight			
Width	mm	600	
Depth	mm	605	
Height		2,030 - 2,060	
Required ceiling height	mm	2,110	
Weight	kg	144	127
Part No.		066 083	066 025

[1] at 180 m³/h and 20°C air temperature

[2] at 250 m³/h and 7°C air temperature

[3]The value varies with the selected fan speed. Visit www.nibe.eu for more detailed acoustic data, including sound to ducts

[4]The value can vary with the room's damping capacity. These values apply with 4 dB of damping

[5]A20(12), air flow 180 m³/h

[6]180 m³/h

7 Item register

Item register

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