DEMİRDÖKÜM

MAKSİCONDENSE 48-65

Table of contents

1 System overview and customer benefits

1.1 System overview

Space heater 48-65kW

View without casing

Potential applications

The Space heater units are intended for use as heat generators for closed domestic hot water central heating installations and for central domestic hot water generation in households.
The Space heater units are delivered only as circulation water heaters with unit outputs of **48 and 65 kW**. The domestic hot water generation is used in combination with domestic hot water cylinders (FT series; solar cylinder).

- For radiator and underfloor heating, as well as peak-load boilers (Space heater unit types).
- Space-saving installation in the central utility room for the modernisation and new construction of non-residential buildings, such as offices, businesses, restaurants, ...
- Flexible installation for systems and applications, e.g. cascade applications, hybrid applications, etc.
- Open-flued or room-sealed operation with a system-certified flue gas system.
- ErP compliant with an efficiency of 94%, **A+** (combined with class VI control; ERP)

Equipment

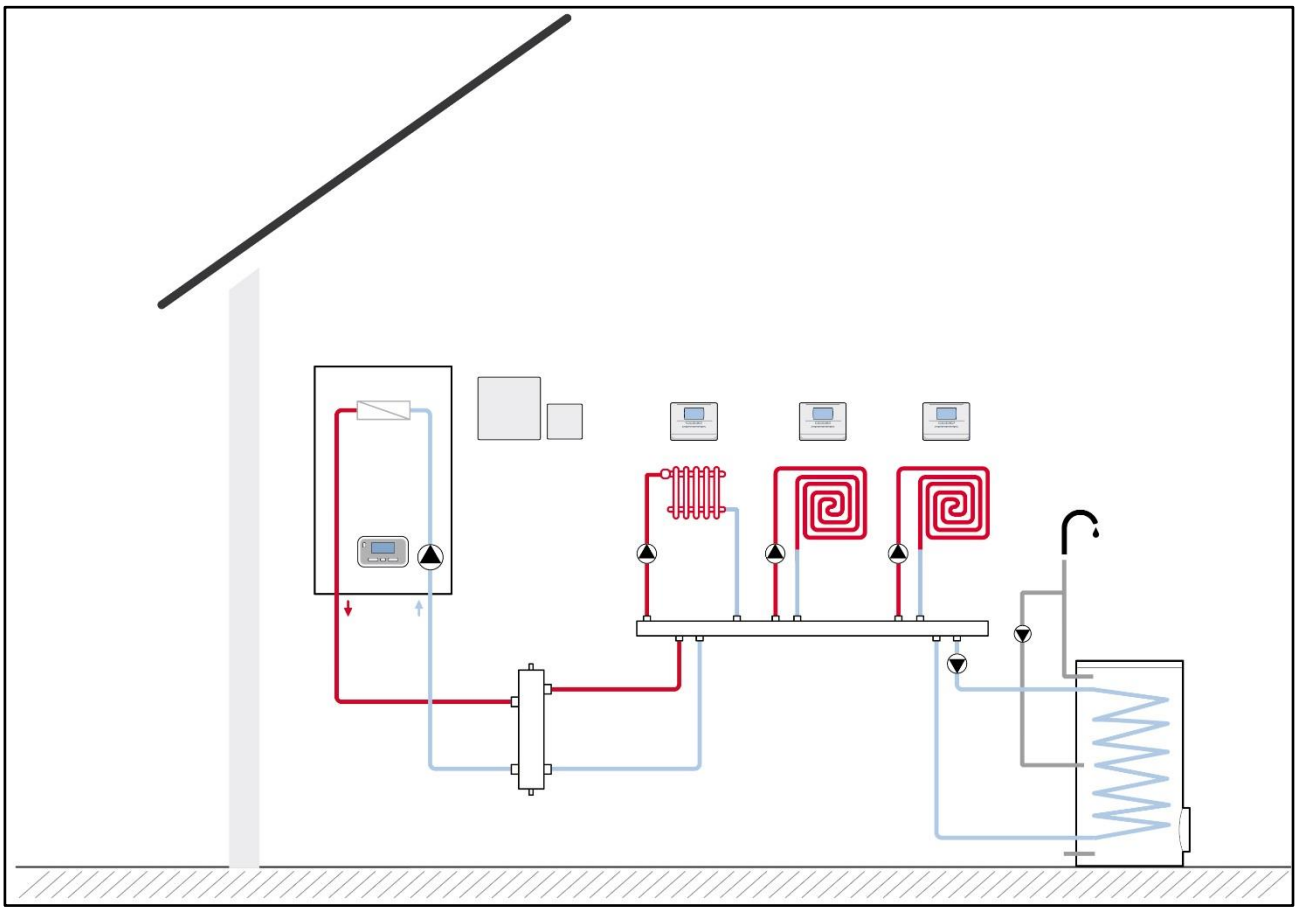
- High-efficiency pump, water pressure sensor
- Stainless steel integral condensation heat exchanger
- Integrated cylinder/domestic hot water control system with prioritising diverter valve
- Diagnostics system with illuminated plain text display
- eBUS, integration for "Connectivity" available as an option.

Notes

The new SDBG 48-65 kW condensing WHB is a compact, robust and technically proven system boiler.

Notes

1.1.1 System components (examples)

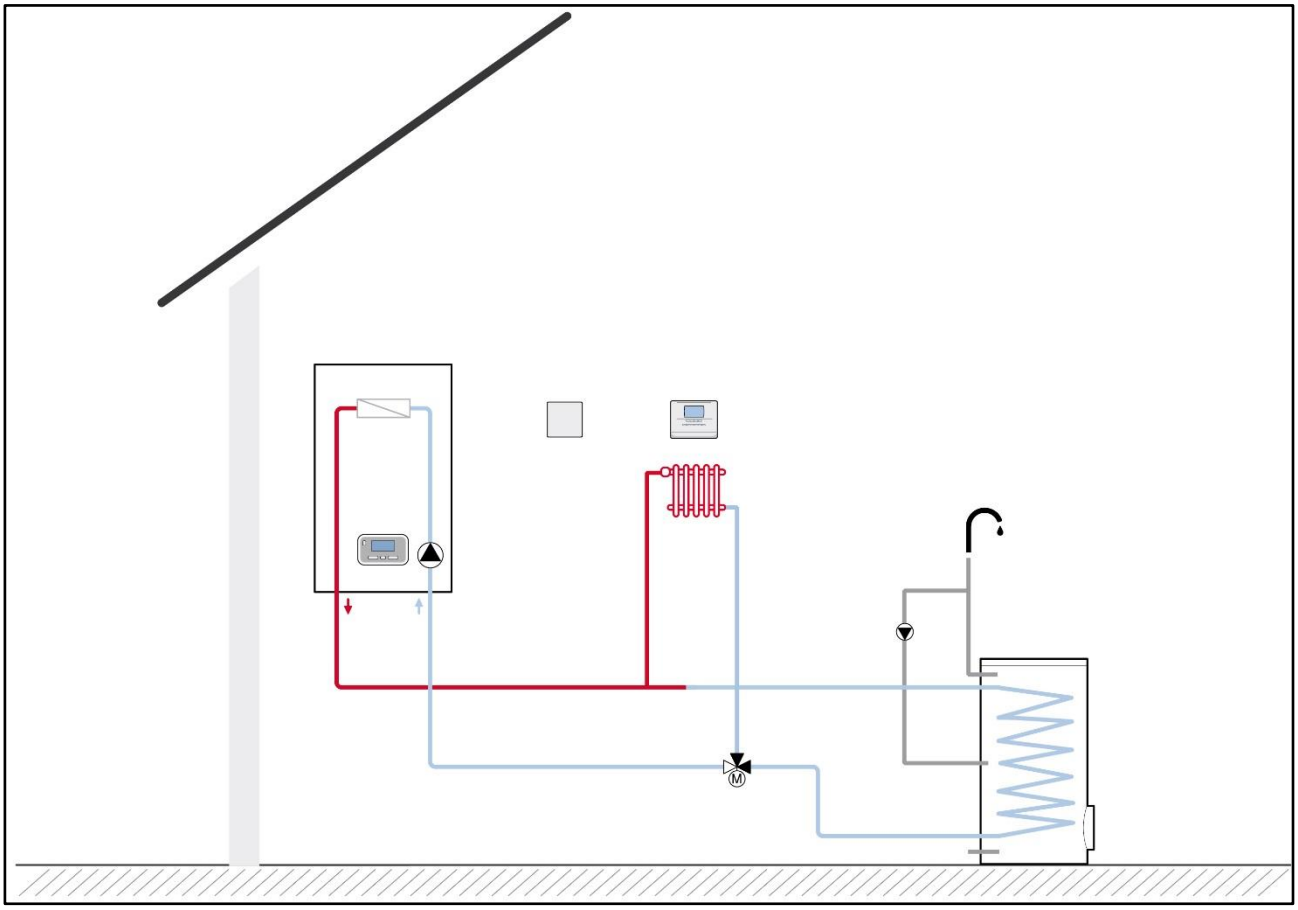


Example: Heating system with low loss header; 2 x regulated heating circuit; 1 x non-regulated heating circuit; DHW supply; 1 x MiPro; 2 x MiPro remote; 1 x RED 5 and MiLink Internet gateway.

Area of application: Single-occupancy house, apartment/office building
Remote access via "MiConnect"/MiPortal

It is easy to handle and to place, as a stand-alone appliance or in cascade combination with a selection of straight forward accessories.

Notes



Example: Heating system without low loss header; 1 x non-regulated heating circuit; domestic hot water supply; 1 x MiPro; 1 x MiLink

Area of application: Single-occupancy house
Remote access via "MiConnect"/MiPortal

EASY TIP

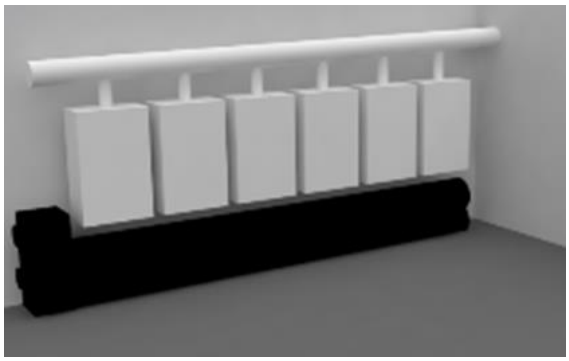
New! For 7-coil and 9-coil heat exchangers (48 kW + 65 kW)

Additional software function for the direct supply of the heating circuits, possible without low loss header.

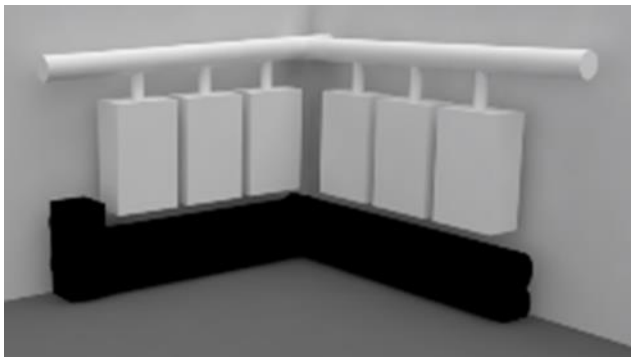
The direct supply is made possible by a new software function and a new 3 way valve (Orkli 11/4").

Notes

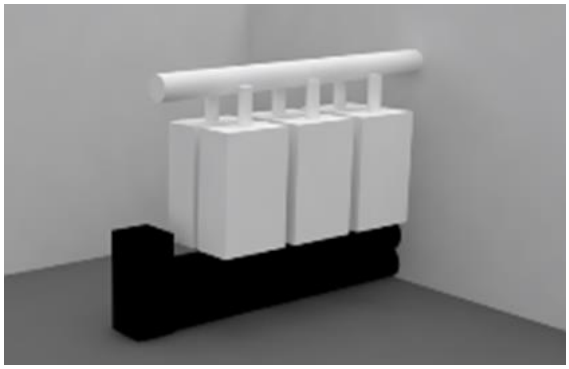
1.1.2 Cascade of boilers



In line mounting (Rig)



around the corner (Rig)



Back to back mounting with rig

Cascade installation:

- Up-to 7 appliances in cascade
- In-line (On the wall or on rigs)
- Back-to-back / Around-corner layout

Accessories range to manage single boiler installation as well as various cascade layouts:

- Hanging rig,
- Fumes /
- Hydraulic /
- Insulation /
- System management

High efficiency with boiler cascade:

Each boiler comes into operation only if the heating demand is high enough.
When the demand is low, only one boiler operates
(The stand-alone boiler system consumes more energy, even when the need for heating is low)

Notes

Notes

EASY TIP

Great modulation capability:

Modulation is the boilers capability to match the heating demand.

In a cascade system, the modulation ratio (ability to reduce the max output to the min. output) increases according to the number of boilers. This wider ratio implies a higher efficiency and comfort while reducing wear on components.

High operating reliability:

If one boiler goes down, the others continue providing heating or DHW.
The system does not stop.

Flexibility of installation:

It is easy to set and install on wall or on rigs (hydraulic advantage, auto-setting fan, degassing process)

Boilers are compact and have a lightweight design

The whole system is cost-saving

Notes

1.2 Customer benefits

1.2.1 Arguments for the installer

Feature	Function	Benefits for the installer
Flexibility of the installation and application	1) Installation without low loss header 2) Approval for liquefied petroleum gas (LPG) 3) Compact design, modular ground installation (mounting frame, rack) 4) Flue gas cascade set 5) Automatic pipe length adjustment (supply air/flue pipework)	1) Easy, economical and time-saving positioning 2) Broad range of applications 3) Easy to combine into systems 4) Approved flue pipes from one source 5) Automatic and fail-safe settings
Reliability and robustness	1) Proven stainless steel heat exchanger (PWT) 2) Reliable combustion mixture 3) Reliable pneumatic gas-air mixture 4) Comfort protection mode	1) Long, worry-free operating cycle 2) SDBG DNA 3) Use of tried-and-tested technology 4) Satisfaction, trust
Competition requirements	1) Includes a high-efficiency pump 2) LL, H gas adaptation 3) Wide modulation range 4) 94% A efficiency as per ErP; A+ possible with class VI control	1) Cost savings 2) Satisfaction 3) Save energy and reduce boiler wear 4) Energy-saving and environmentally friendly
Easy installation and start-up	1) Light and compact design 2) Automatic pipe length adjustment (supply air/flue pipework) 3) Automatic partial load adjustment 4) Simplified range of accessories	1) Easy, economical and time-saving positioning 2) No risk of faults during installation/start-up 3) Low-complexity application 4) Simplified selection of materials and easy preparation of offers 5) Efficient and safe step-by-step settings
Sales/customer service support	1) Training support 2) Service Centre support 3) Planning tools 4) Customer service support 5) Simplified range of accessories 6) Availability of spare parts	1) Complete support (exclusivity) "start-to-end" support from our professional partners, for end user satisfaction
Networking	1) MiPro control in combination with: • MiLink communication module for remote monitoring via "MiConnect" and "MiPortal"	1) One control for all applications 2) Quick remote access for diagnosis and fault analysis 3) Low complexity for new installations. 4) Quick setup and start-up of the system 5) Cost-saving service 6) Extended flexibility (service)

Notes

1.2.2 Arguments for planners and architects

Feature	Function	Benefits for the architect/planner
Flexibility of the installation and application	1) Installation without low loss header 2) Approval for liquefied petroleum gas (LPG) 3) Modular ground installation (mounting frame, rack) 4) Flue gas cascade set 5) Automatic pipe length adjustment (supply air/flue pipework)	1) Economical installation space requirements 2) Integration as per applicable requirements 4) Approved flue pipes from one source 5) Automatic and fail-safe settings
Reliability and robustness	1) Stainless steel heat exchanger 2) Reliable combustion mixture 3) Reliable pneumatic gas-air mixture 4) Comfort protection mode	1) Compliance with technical regulations 2) Group DNA 3) Use of tried-and-tested technology 4) Satisfaction, trust, long expected service life with minimised maintenance costs
Competition requirements	1) Includes a high-efficiency pump 2) LL, H gas adaptation 3) Wide modulation range 4) 94% A efficiency as per ErP; A+ possible with class VI control	1) Adapted to the market requirements 2) Compliance with technical conformity 3) Save energy and reduce boiler wear 4) Energy-saving and environmentally friendly
Easy installation and start-up	1) Light and compact design 2) Automatic pipe length adjustment (supply air/flue pipework) 3) Automatic partial load adjustment 4) Simplified range of accessories	1) Easy, economical and time-saving positioning 2) No risk of faults during installation/start-up 3) Low-complexity application 4) Simplified selection of materials and easy preparation of offers 5) Efficient and safe step-by-step settings
Planning assistance	1) Available in BIM database and the SDBG CAD plug-in 2) Planning documents 3) Planning tools	1) Quick and secure integration into construction drawings 2) Clear specification of unit and system planning for efficient operation 3) Online and offline system configuration tools for efficient and reliable planning
Sales/customer service support	1) Training support 2) Service Centre support 3) Customer service support 4) Simplified range of accessories 5) Availability of spare parts	1) Qualified and reliable SDBG expert network for efficient field support
Networking	1) VRC control in combination with: • MiLink communication module for remote monitoring via "MiConnect" and "MiPortal"	1) Modular flexibility 2) One control for all applications 3) Modular design with expansion modules 4) Quick setup and start-up of the system

Notes

1.2.3 Arguments for end customers

Feature	Function	Benefits for end customers
Flexibility of the installation and application	1) Installation without a low loss header (48 kW) 2) Approval for liquefied petroleum gas (LPG) 3) Modular ground installation (mounting frame, rack) 4) Flue gas cascade set 5) Automatic pipe length adjustment (supply air/flue pipework)	1) Several possible installation layouts and large, certified range of accessories for flexible installation and safe operation
Reliability and robustness	1) Stainless steel heat exchanger 2) Reliable combustion mixture 3) Reliable pneumatic gas-air mixture 4) Comfort protection mode	1) Long system service life with minimised maintenance costs
Competition requirements	1) Includes a high-efficiency pump 2) LL, H, LPG gas adaptation 3) Wide modulation range 4) 94% efficiency as per ErP; A+ 5) Comfort protection mode	1) Optimised operating mode for minimising energy costs and extending the unit's service life
Easy installation and start-up	1) Light and compact design 2) Automatic pipe length adjustment (supply air/flue pipework) 3) Automatic partial load adjustment 4) Simplified range of accessories 5) Start-up assistance function 6) Start-up instructions	1) Guided installation and adjustment process for safe and reliable system setting and operation. Reliability, long expected service life, guaranteed minimised energy costs
Sales/customer service support	1) Training support 2) Service Centre support 3) Customer service support 4) Simplified range of accessories 5) Availability of spare parts	1) Safety and trust 2) Qualified SDBG experts, for targeted and professional support 3) Good representation on the market makes spare parts quickly available
Networking	1) MiPro control in combination with: • MiLink communication module for remote monitoring via "MiConnect" and "MiPortal"	1) Convenient monitoring of the heating system with the "MiPortal" 2) Comfort and efficiency thanks to different user profiles and active notifications during use. 3) Intuitive access and use of the installation information 4) MiPortal access improves reliability of supply and dependability.

Notes

2 System description

EASY TIP

This section provides you with general information about the product 48–65 kW:

- Overview of the individual markets
- Unit overview
- Unit design

2.1 System components

The new boilers are a further development of the condensing technology family from the SDBD brands. The units are introduced with outputs of **48 kW** and **65 kW**

Special features

- 108% standard efficiency (Hi) (50/30 dT)
- Modulation up to 1:5
- It can be installed without a low loss header thanks to new software function
- Unit hydraulics without bypass valve 48 kW unit
- New! Integrated air separator
- Pneumatic gas-air mixture
- Electronically controlled high-efficiency pump with additional pump programmes
- Operating with natural gas E or LL and LPG liquid gas (conversion kit)
- Gas conversion kits available

Notes

Equipment with the 48–65 kW product

- High-efficiency pump, electric water pressure sensor
- Integral stainless steel condensation heat exchanger (Sermeta)
- Integrated domestic hot water control via domestic hot water charging pump actuation
- Diagnostics system with illuminated display (segments)
- eBUS

Product features of the 48–65 kW product

- Vertical pipe connections on the underside of the unit provide unhindered access when the unit is being installed.
- New! 7-coil primary heat exchanger from the A+ project with additional manual purging device for the new 9-coil version (**9-coil PWT** new development with Sermeta).
- Easy-to-clean unit siphon. The unit siphon does not necessarily have to be filled during start-up (new design).
- Lower modulation limit at approx. 20% (Space heater, depending on unit type and gas type).

The 48–65 kW product range is the latest generation of condensing technology from SDBG.

2.1.1 ErP efficiencies

Product data sheet (in accordance with EU regulation no. 811/2013)

1	Brand name			Saunier_Duval
2	Models		I	Thermomaster Condens AS 48-A (H-ES)
			II	Thermomaster Condens AS 65-A (H-ES)
			III	-
			IV	-
			V	-
			VI	-

				I	II	III	IV	V	VI
3	Room heating: Seasonal energy-efficiency class	-	-	A	A	-	-	-	-
4	Room heating: Nominal heat output (*8) (*11)	P_{rated}	kW	44	59	-	-	-	-
5	Room heating: Seasonal energy efficiency (*8)	η_s	%	94	94	-	-	-	-
6	Annual energy consumption (*8)	Q_{HF}	kWh	-	-	-	-	-	-
7	Sound power level, indoor	$L_{WA\ indoor}$	dB(A)	57	57	-	-	-	-
8	All specific precautions for assembly, installation and maintenance are described in the operating and installation instructions. Read and follow the operating and installation instructions.								
9	All of the data that is included in the product information was determined by applying the specifications of the relevant European directives. Differences to product information listed elsewhere may result in different test conditions. Only the data that is contained in this product information is applicable and valid.								
10	Temperature application	-	-	-	-	-	-	-	-

(*8) For average climatic conditions

(*11) For boilers and combination boilers with a heat pump, the nominal heat output "Prated" is the same as the design load in heating mode "Pdesignh", and the nominal heat output for an auxiliary boiler "Psup" is the same as the additional heating output "sup(T)"

Notes

2.2 Basic principles

The new product generation is being introduced in the relevant SDBG markets. The following markets are introducing the product at the start of 2018: BE; CZ; HU; IT; ES; VGI

2.2.1 Nomenclature

Individual examples of the nomenclature used for the units are presented here.

Thema Condens AS 48-A
Thema Condens AS 65-A = **Circulation water heater**
Thema Condens 48 SB-A
Thema Condens 65 SB-A = **Circulation water heater**
Panther Condens 48 KKO-A = **Circulation water heater**

2.2.1.1 Description/explanation of the nomenclature

A	s	xx	A		Meaning
x					Boiler
	x				Stainless steel combustion chamber with unit pump
		x			Heating output
			x		Gross calorific value, condensing

Nomenclature

xx	SB	A		Meaning
x				Heating output
	x			Stainless steel combustion chamber with unit pump
		x		Gross calorific value, condensing

Nomenclature

xx	KKO	A		Meaning
x				Heating output
	x			Boiler
		x		Gross calorific value, condensing

Nomenclature

Notes

2.2.1.2 Description of the unit category

I	II	2	3	H	L	P	E	(S)	K	Meaning
x										One usable gas category
	x									Two usable gas categories
		x								Second gas family (natural gases)
			x							Third gas family (liquid gases)
				x						Group H gas (high gas)
					x					Group L gas
						x				Group P gas (propane)
							x			Group E gas (G20/G25)
								x		Less power with G25
									x	NL market gas approval

Unit category

Notes

2.2.2 Unit types and scope of delivery

Space heater 48–65 market launch				
Unit	Mar-ket	Introduction	Gas cate-gory	Brand
Thema Condens AS 48-A (E-BE) Thema Condens AS 65-A (E-BE)	BE	06/ 2018	II2H3P	Bulex
Panther Condens 48 KKO-A (H-CZ)	CZ	03/ 2018	II2H3P	Protherm
Thema Condens AS 48-A (H-HU) Thema Condens AS 65-A (H-HU)	HU	06/ 2018	II2H3P	Saunier Duval
Thema Condens 48 SB-A (H-IT) Thema Condens 65 SB-A (H-IT)	IT	03/ 2018	II2H3P	Hermann Saunier Duval
Thermomaster Condens AS 48-A (H-ES) Thermomaster Condens AS 65-A (H-ES)	ES	03/ 2018	II2H3P	Saunier Duval
Thermomaster Condens AS 48-A (H-ES) Thermomaster Condens AS 65-A (H-ES)	VGI	06/ 2018	II2H3P	Saunier Duval
Maxi Condense H65 (H-TR) Maxi Condense H48 (H-TR)	TR		II2H3P	DD

Market launch table

2.2.3 G20 nominal heat input output in kW

Type	Min. load	Max. load	Modulation Heating mode
48 kW	8.1	44.9	1:5
65 kW	11.3	60	1:5

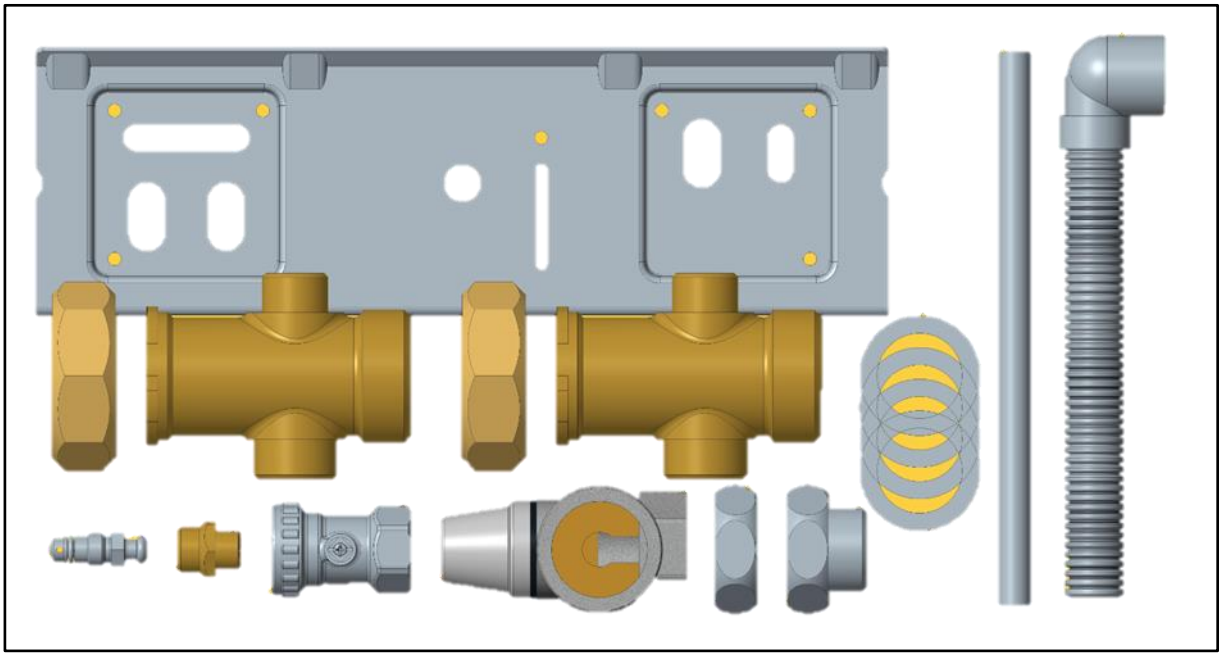
G20 nominal heat input

Notes

2.2.4 Scope of delivery

- Heat generator (boiler)
- Unit mounting bracket with screws and rawl plugs
- Wall template
- Hydraulic connections for flow and return (distribution)
- Condensate hose
- Drain hose for precipitation discharge
- Documentation
- Different hydraulic accessories depending on the market

2.2.4.1 Scope of delivery of accessories



Connection accessories included in the scope of delivery

EASY TIP The connection accessories are enclosed with the unit, 1 x connection accessories each for 48 kW and 65 kW.

Notes

2.3 Product design

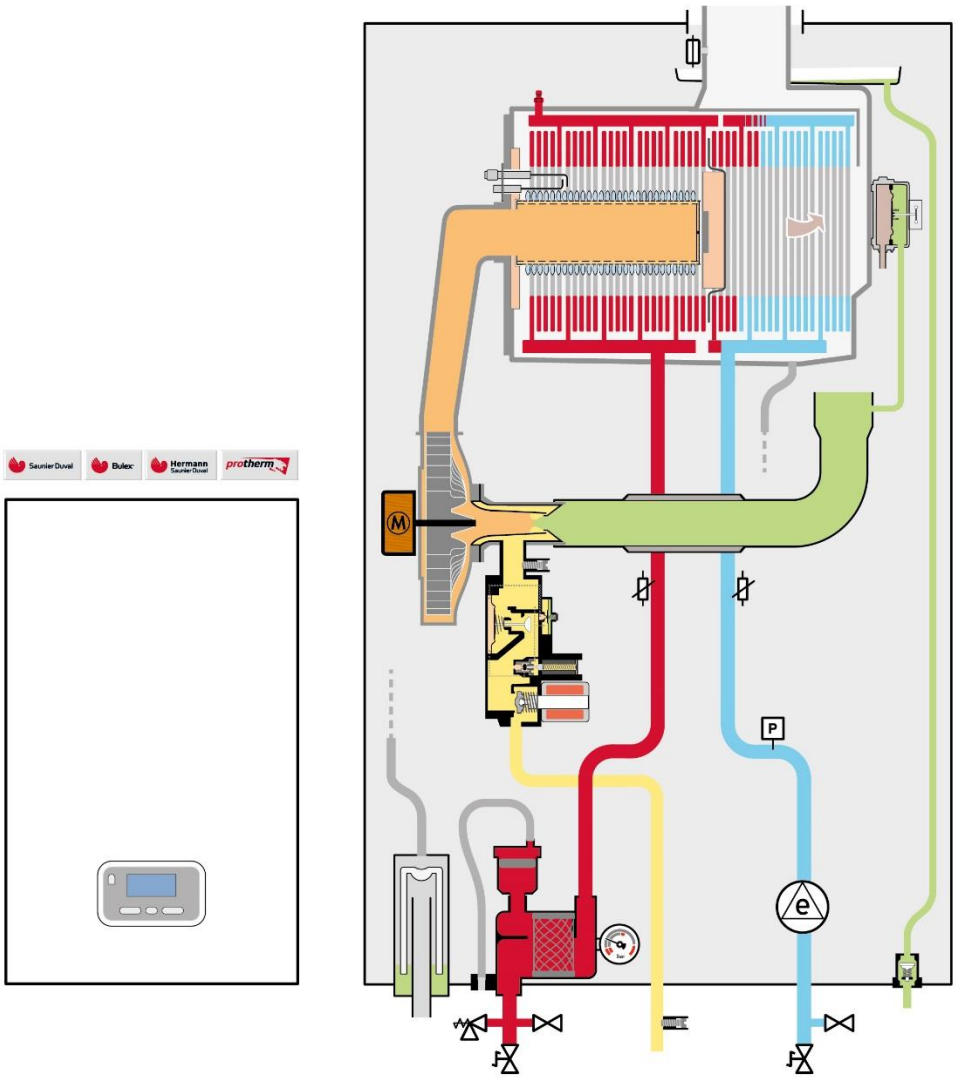
2.3.1 Boiler (circulation water heater)

48–65 kW boiler

Notes

2.4 Design

2.4.1 Functional diagram

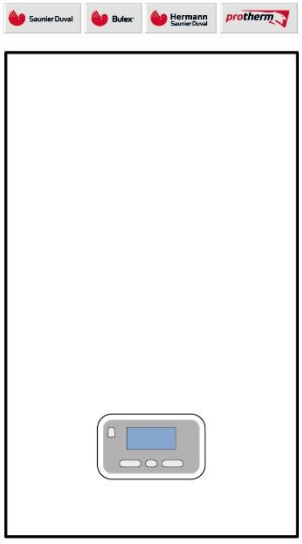


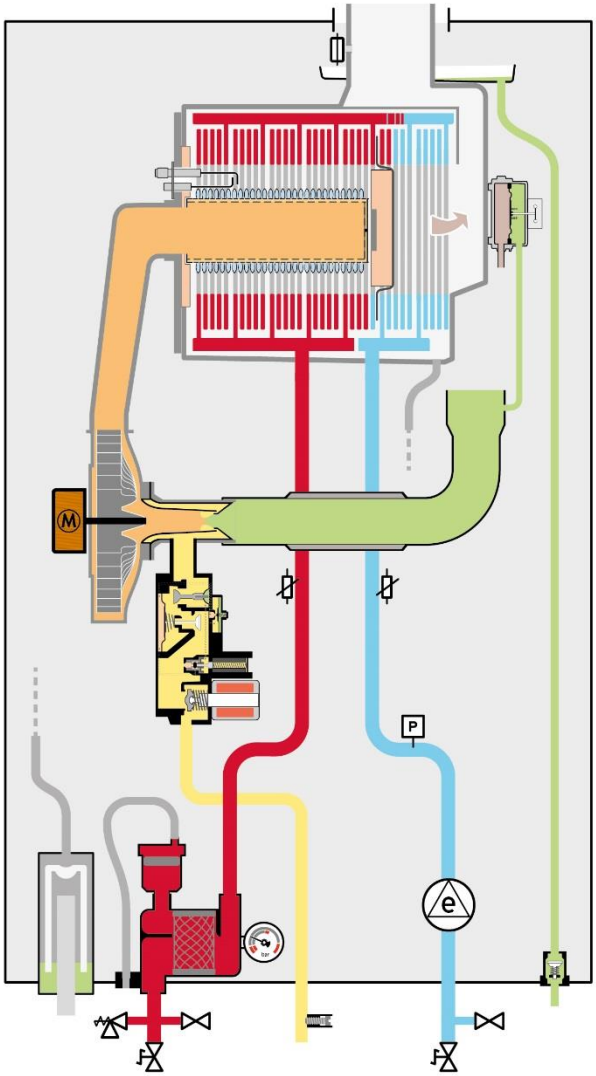
Space heater 65 kW

Key

M	Motor		Impeller sensor
	Pump		Valve
	NTC sensor		Service valve
	Expansion relief valve	P	Pressure sensor

Notes





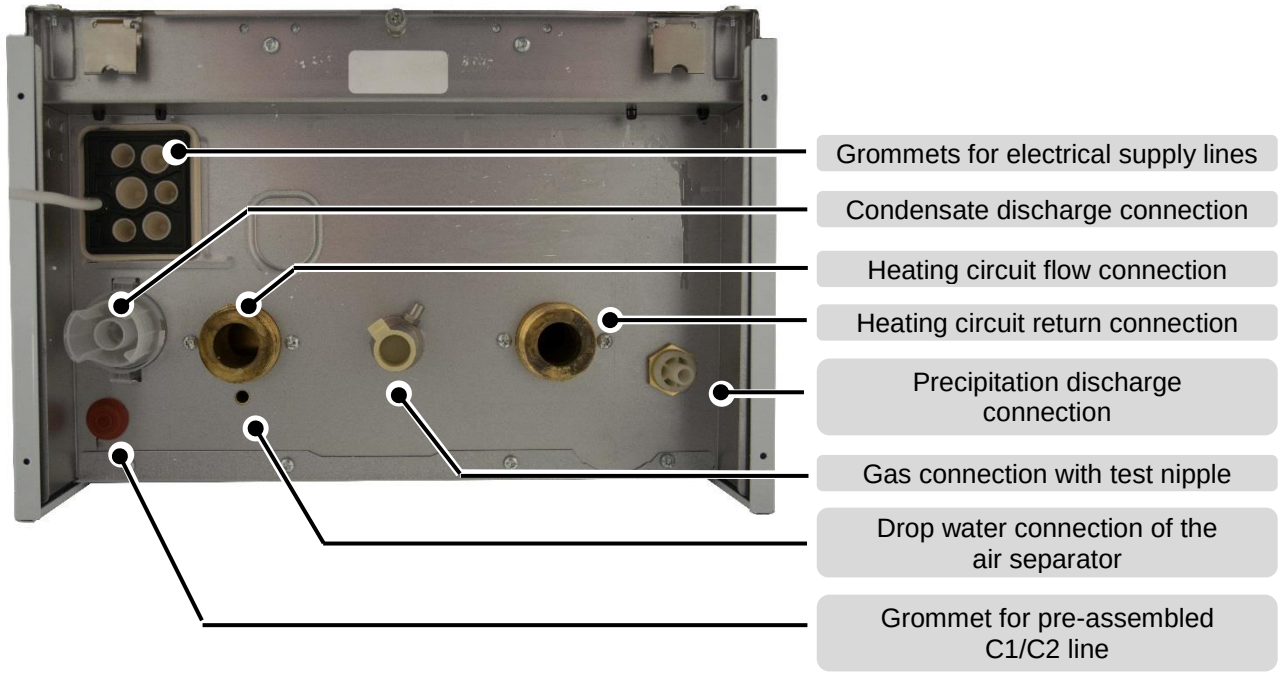
Space heater 48 kW

Key

M	Motor		Impeller sensor
	Pump		Valve
	NTC sensor		Service valve
	Expansion re-lief valve	P	Pressure sensor

Notes

2.4.2 Hydraulic connection



Underside of the 48–65 kW unit

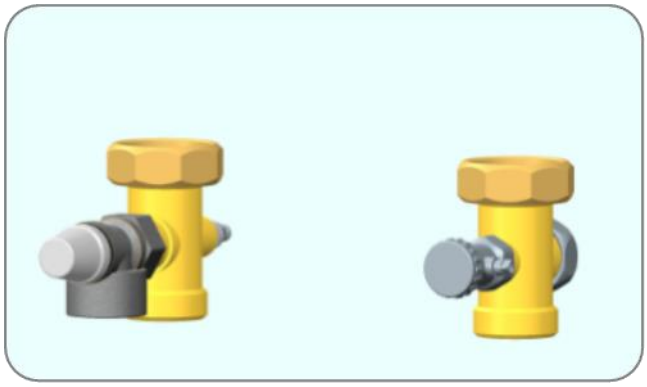
New features:

- Axial condensate connection underneath the condensate siphon housing
- 1 ¼" AG heating system flow and return connection
- Gas connection is prepared as a straight pipe for the cutting ring connector
- Additional connection for precipitation discharge from the annular gap of the concentric flue system
- Additional outlet for drop water connection of the air separator

Notes

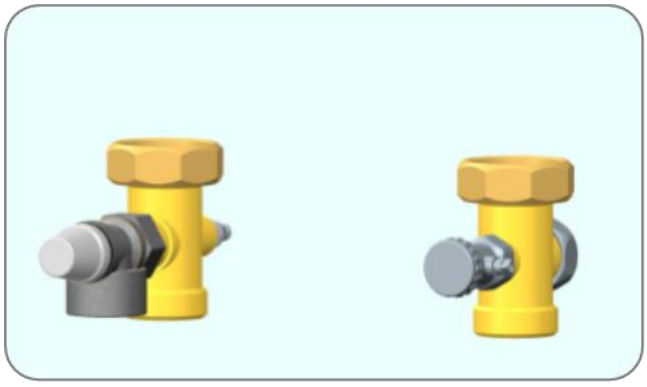
2.4.2.1 New! Hydraulic installation sets

VC, SPACE HEATER, VM: 41–48 kW (7-coil) SAP: – 0020258498



Installation set with 4 bar expansion relief valve and filling and drain cock

VC, SPACE HEATER, VM: 65 kW (9-coil) SAP: – 0020258502



Installation set with 4 bar (later 6 bar) expansion relief valve and filling and drain cock

Service valves:

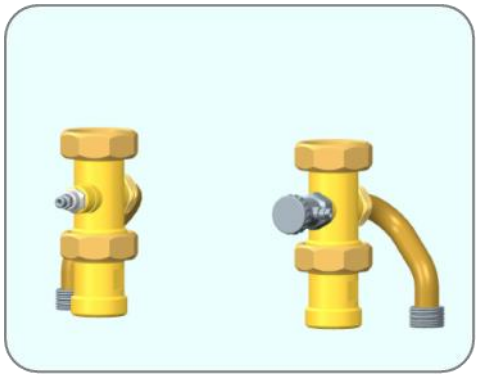
1 ¼ inch service valves optional

Notes

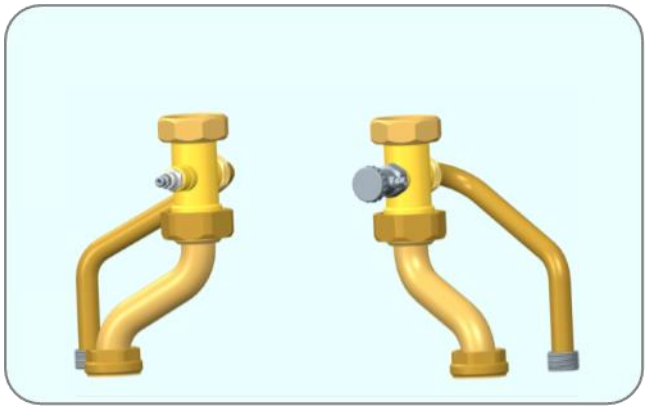
Notes

Hydraulic accessories for new build and replacement:

Connection set for existing safety valve and expansion vessel of the predecessor boiler.



Hydraulic connection with pipe group and extension for replacement



Hydraulic connection with pipe group for replacement

Notes

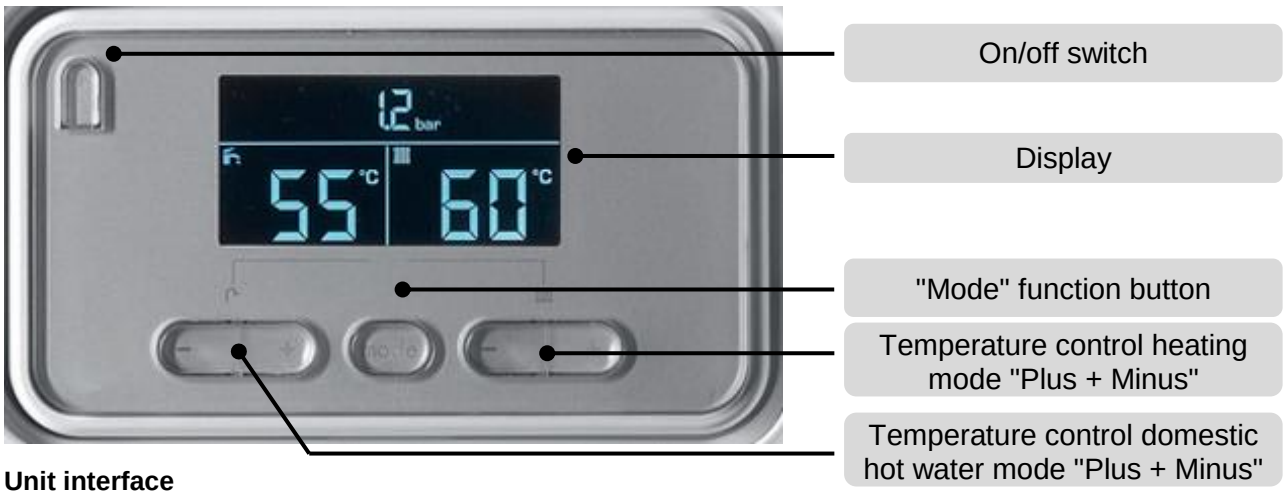
2.5 Electronics box

48–65 kW control panel

Digital information and analysis system:
The control panel comprises the unit display **(AI)**, the **On/Off** unit main switch and the reset button to acknowledge certain operating blocks in the event of a fault.

2.5.1 Control panel

2.5.1.1 Description of buttons and symbols.



Unit interface

The operating buttons below the display are required to adjust the temperatures and to set unit-specific and system-specific parameters.

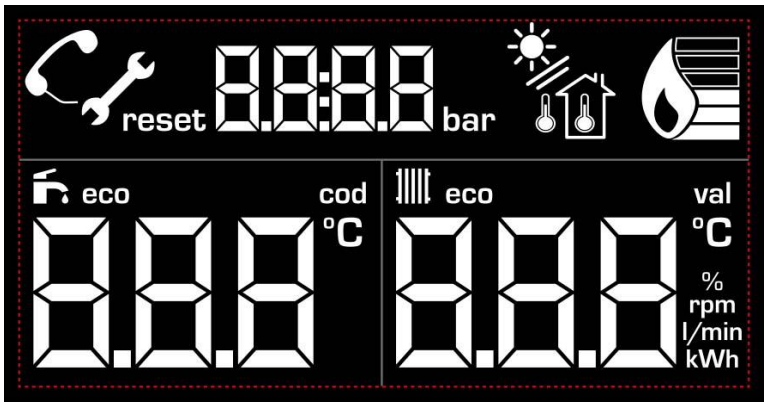
The display lighting switches on (segments are illuminated):
- If you switch the boiler on or
- If you press a button for the DIA system when it is switched on. Pressing this button does not initially activate any other function.

The display lighting switches off:
- The lighting automatically dims after one minute if you do not press any button.

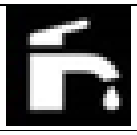
Notes

2.5.2 Unit display (AI)

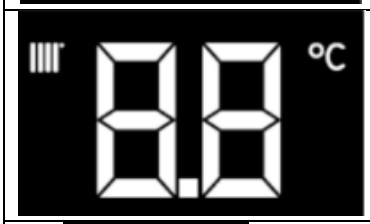
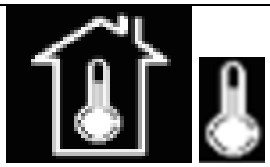
2.5.2.1 Key for the symbols on the display



SDBG unit display

Symbol	Explanation
	Display of the current burner modulation rate (bar graph)
	Displays the current filling pressure of the heating installation: **Permanently on:** The filling pressure is within the permitted range. **Flashing:** The filling pressure is outside the permitted range (≤ 0.7 or ≥ 3.0 bar).
	Heating mode active **Permanently on:** Heating mode heat demand (burner anti-cycling time active) **Flashing:** Heating mode active **Display off:** Summer mode active or terminal 24V RT open or flow temperature target value **< 20 °C**
	On boilers: **Permanently on:** Time period activated for domestic hot water generation **Flashing:** Domestic hot water cylinder is being heated, burner on
	**Maintenance required:** In the "Status", you can read any further information provided about the reason why maintenance is required If a fault code "F.XX" is also displayed, the boiler works in comfort protection mode.
	**Fault in the boiler:** Appears instead of the basic display, fault message + telephone symbol Example: "F.01" short circuit in the heating return sensor

Notes

Symbol	Explanation
	Domestic hot water mode
	Heating mode
	Symbol for room thermostat/outdoor sensor

2.5.2.2 Hidden display menus

The display comes with hidden maintenance menus. These menus contain different access levels for the diagnostics code that is to be edited. To achieve this, different codes are stored.
On the one hand, there is the level (installer) that is used to configure the unit during initial start-up. You can access this level using **code = 96**.
On the other hand, there is the level (expert) that is used to configure the unit after components have been replaced. You can access this level using **code = 35**.

The code for the installer only provides access to a restricted list of data points for starting up the unit.

The code for the expert provides access to all of the data points.

Notes

3 Components and overall function

What to expect from this section:

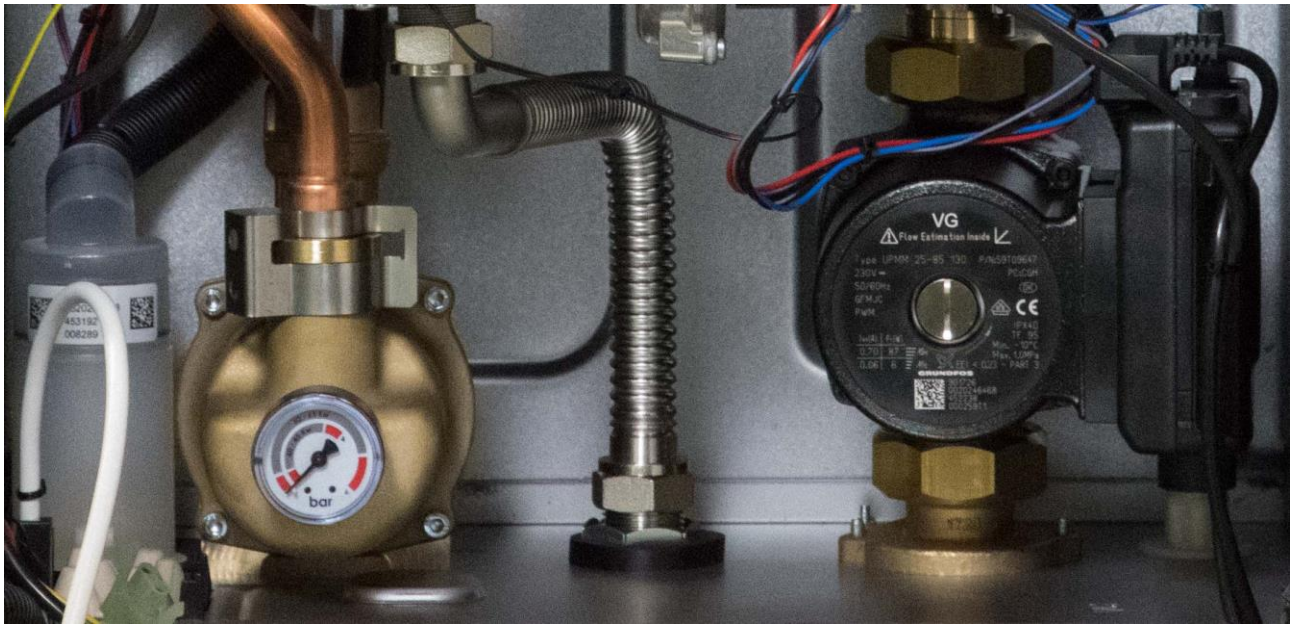
This section provides detailed information regarding the individual components used and the overall function of the unit.

The overall function is divided into:

- Standard functions
- Special functions
- Safety functions

3.1 Overview of the components

3.1.1 Hydraulic module

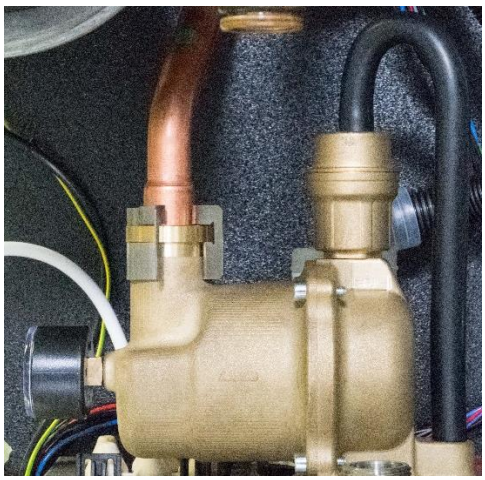


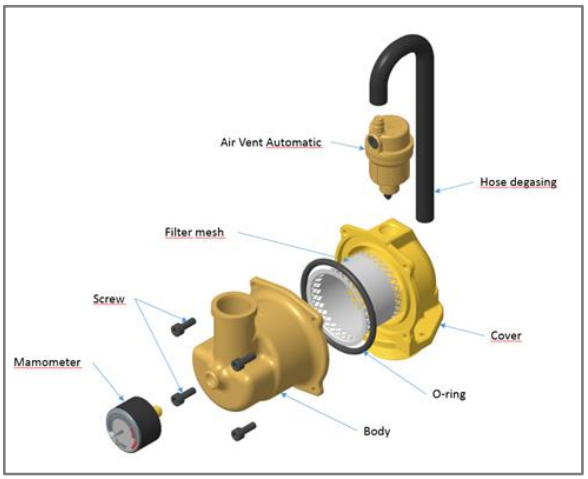
Space heater hydraulic components with HEP (Grundfos), without filling device

The hydraulic module essentially comprises the high-efficiency pump and an automatic air separator (new) combined with an analogue manometer.

Notes

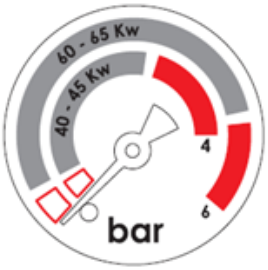
3.1.1.1 Air separator





Air separator housing with automatic float air vent/ separation plate

3.1.1.2 48–65 kW manometer



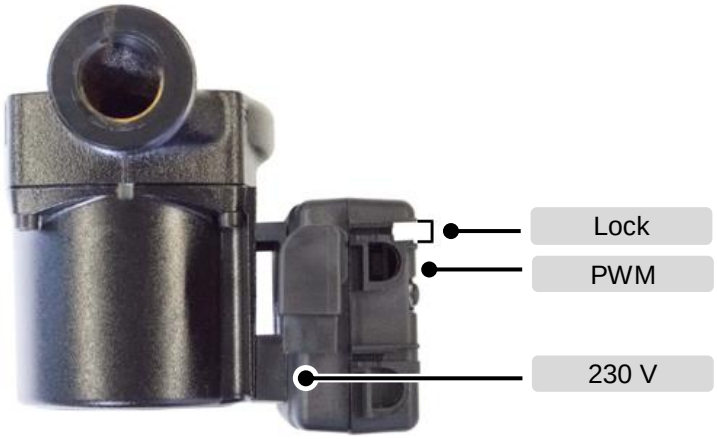
Manometer with two operating pressure ranges

- Outer pressure range for the 65 kW unit output, up to **4 bar** (later 6 bar)
- Inner pressure range for the 48 kW unit outputs, up to **4 bar**

Notes

3.1.1.3 48–65 kW heating pump (HEP)

Grundfos high-efficiency pump



Top view of pump/connection box

Design of the high-efficiency pump:
The installed Grundfos **UPMM 25–85** is a glandless circulation pump with cast iron pump housing. It features an EC motor with automatic output adjustment. The connection to the PCB is effected via a three-pin 230 V line and a separate PWM signal line.

Types	Consumption	Feed head	Supply	Number of coils
Grundfos UPMM 25–85	**6–87 W**	**8.5 m**	**230 V**	**7**
Grundfos UPMM 25–105	**3–140 W**	**10.5 m**	**230 V**	**9**

Notes

3.1.1.4 Water pressure sensor

Water pressure sensor

The units are fitted with a water pressure sensor. This continuously informs the electronics of the current heating water pressure in the unit using an electric signal.

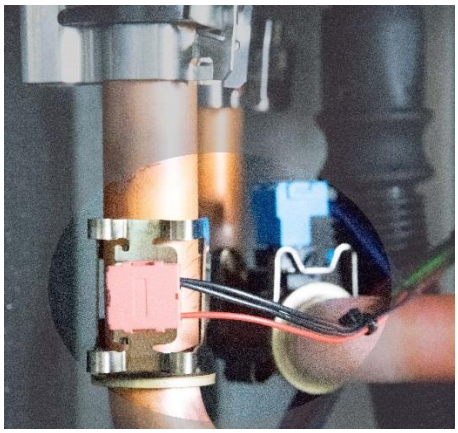
3.1.1.5 Switching limits for water pressure sensor

System pressure falls	< 0.5 bar	Switching off the unit and flashing fault message "0.0; bar". The pump does not start; fault message "F.22".
System pressure falls	> 0.5 bar	Pressure display "0.0" and the "bar" symbol flashes, burner does not start operation
System pressure increases	≥ 0.7 bar	Unit ready for operation on pressure side
System pressure increases	> 4.0 bar	Pressure display and the "bar" symbol flashes, status message "S.41"; the appliance run continuously.

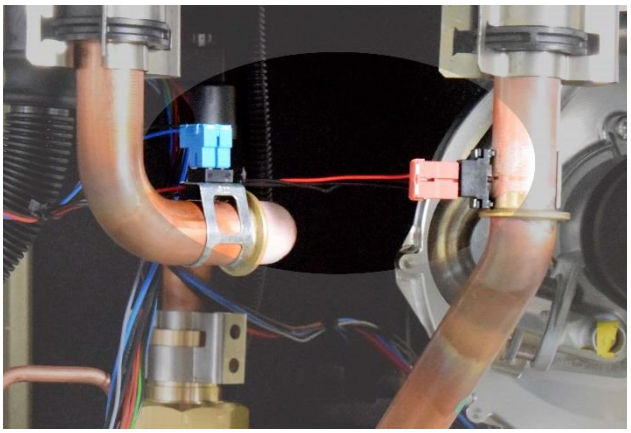
After filling the installation to over 0.7 bar, the unit automatically resumes operation and the fault message disappears.

Notes

3.1.2 Unit NTC sensor



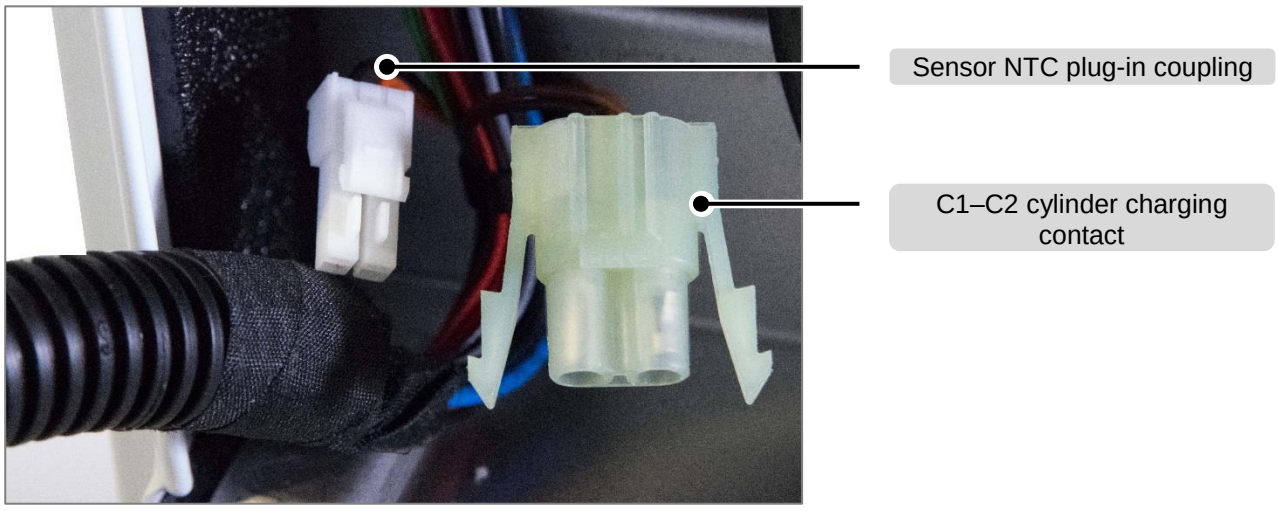
NTC 48 kW flow and return



NTC 65 kW flow and return

The units are equipped with two NTC sensors (VR 11 characteristics), with one sensor each attached to the flow and return using a clip.

3.1.2.1 NTC sensor for optional DHW cylinder charging mode/C1–C2 contact



NTC sensor/C1–C2 contact plug-in coupling

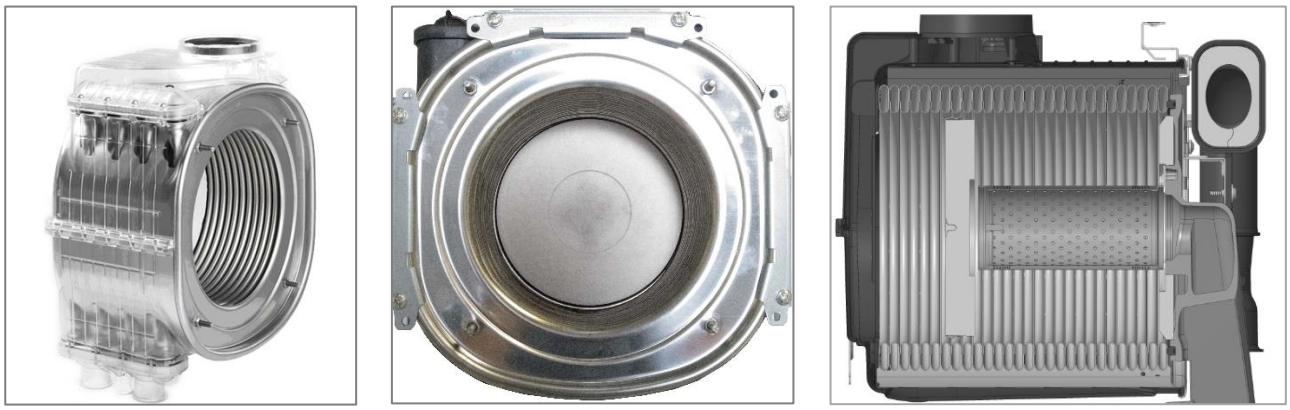
The plug-in couplings for optional cylinder charging via the unit electronics can be found on the left of the unit underside.

A **VR 10** sensor from the range of accessories must be used at the NTC sensor plug-in coupling.

A DHW thermostat contact can be connected potential-free to the **C1/C2 cylinder charging contact** plug-in coupling.

Notes

3.1.3 Primary heat exchanger



Exemplary image of the primary heat exchanger/front view with insulating plate

The heat exchanger consists of several heat exchanger elements – the coils. Each individual heat exchanger element then consists of a stainless steel bare tube coil with four threads. The heat exchanger elements that are located upstream of the insulating plate are referred to as the **"non-condensing level"** because only a very low level of condensation occurs here. The heat exchanger elements located downstream of the insulating plate are referred to as the **"condensing level"** as this is where most of the condensation occurs.

First, the hot flue gases from the burner are circulated around the (four or five) heat exchanger elements upstream of the insulating plate (non-condensing level). The flue gas that has already been cooled then heats the elements (1 or 2) downstream of the insulating plate. (Cross-flow heat exchanging principle). The advantages include very efficient heat transfer and preventing boiling noises caused by high flow speeds in the bare tubes. A further advantage of this heat exchanger is its very low tendency to calcify, as the small cross-section of the pipes causes strong turbulence. The return connection of the heat exchanger is located at the back, the flow connection at the front. A condensed water drain is connected to the heat exchanger.

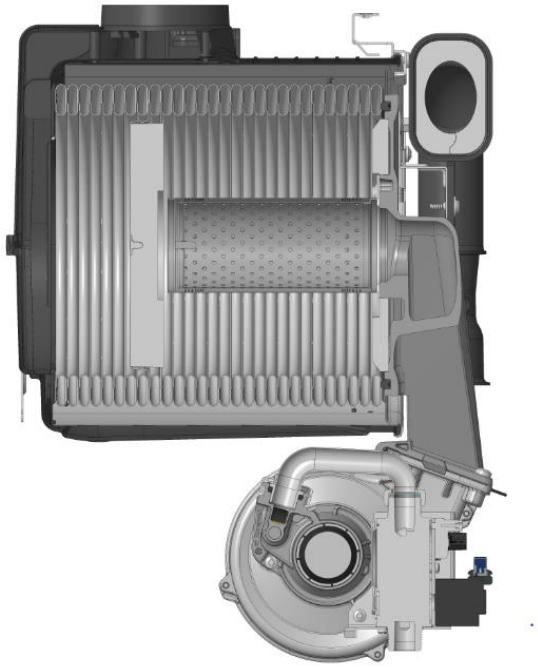
Note: Cracking noises when heating up and cooling down

Cause: As a result of the uneven thermal expansion of the burner flange and heat exchanger, cracking noises may occur in ecoTEC units when they are heated up or cooled down.

The heat exchanger (PWT) that is used benefits from the further developments in the course of the heat exchanger development (A+ project) and fully complies with the EU-wide ErP standard requirements.

Notes

Primary heat exchanger cross-sections

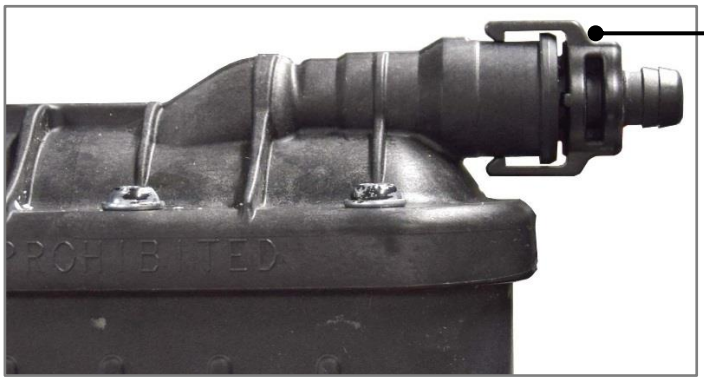


PWT 7-coil cross-section

PWT 9-coil cross-section

Notes

3.1.3.1 New! Manual purging of the primary heat exchanger



PWT 65 kW (9-coil) manual purging

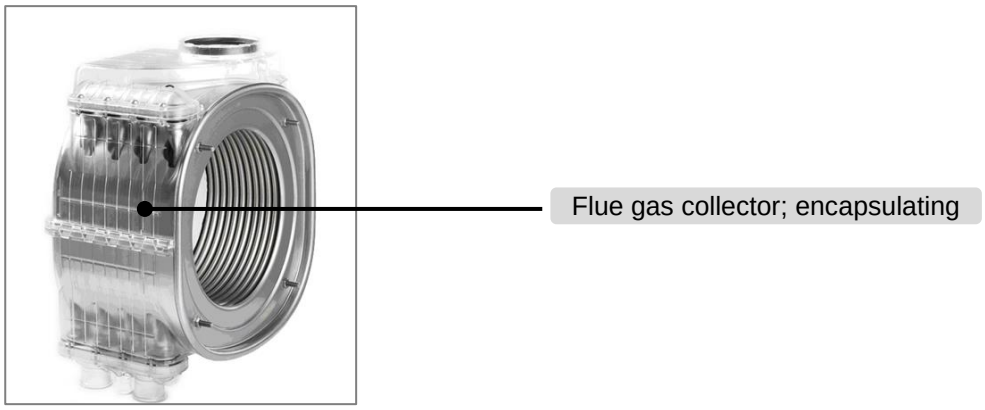
PWT front view

As a new feature, the primary heat exchanger (9-coil) of the 65 kW unit is equipped with a manual purging valve. The purging valve is located at the highest point of the heat exchanger in order to fully purge it during start-up and maintenance work so that no air remains in the heat exchanger. This type of purging also prevents melting damage on the heat exchanger.

The primary heat exchanger must be manually purged during start-up and maintenance work

Notes

3.1.3.2 Flue gas collector

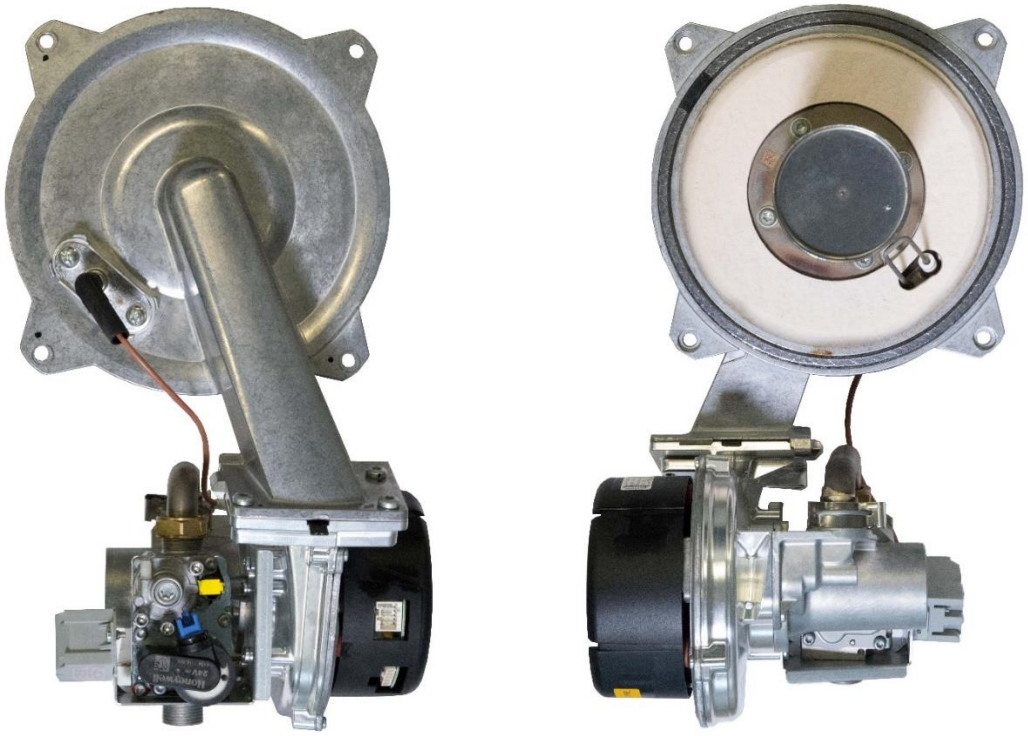


Encapsulation of the heat exchanger (PWT) – presentation model

The flue gas collector surrounds the entire heat exchanger and is constructed from plastic up to the air/flue pipe connection. Here, the entirety of the condensate that occurs and the proportional rain-water from the flue pipework on the collector drain pipes is drained

3.1.4 Gas/air technology design

3.1.4.1 New! Compact thermal module with electronic pneumatic gas-air mixture



New! Compact thermal module (48 kW)

Notes

New! Compact thermal module (65 kW)

The Space heater compact thermal module consists of the following components:

- Burner
- Ignition and monitoring electrodes
- Fan
- Venturi pipe
- Mixture pipe
- Gas valve assembly

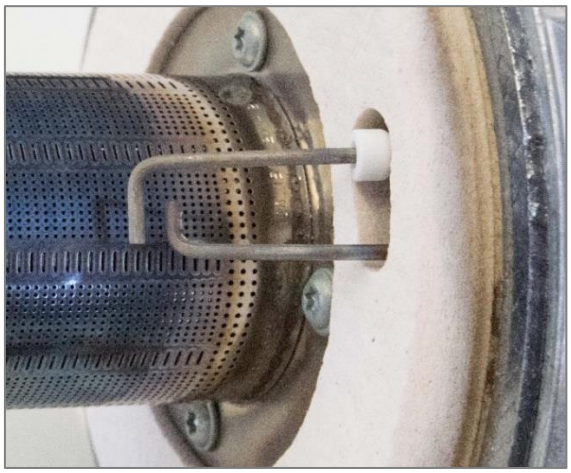
The compact module is a further development of the pneumatic gas-air mixture.
The essential changes are:

- The gas valve assembly (Honeywell)
- The connection to the Venturi pipe (stainless steel pipe)
- The ignition transformer is located on the compact module and not on the unit PCB (electronics box)
- The burner flange is not branded (neutral)
- New dual burner tube (pipe in pipe)
- New fans are used (EBM Papst)

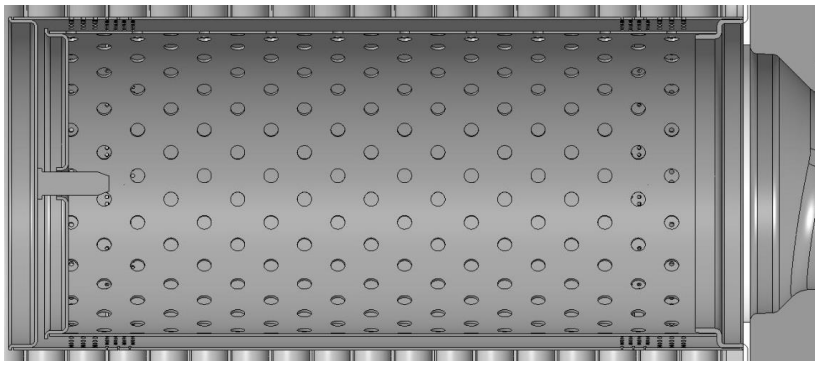
Notes

3.1.4.2 Burner with ignition and monitoring electrode

Burner flange with Space heater ignition electrode



Detailed view of ignition and monitoring electrode



Detailed view of burner design with additional mixing cylinder (Polidoro)

The combustion gas-air mixture is pumped by the fan through the gas-air channel in the cylindrical burner. The combined ignition and monitoring electrode sits below the burner. The shape of the electrode ensures that the flame is detected for all required gas qualities.
A mixing cylinder that is inserted inside the burner evenly distributes the burner gas/air mixture. This achieves a uniform heat loading across the entire burner surface.
The surface of the burner consists of a metal cylinder which is designed with a hole/slot template. The surface of the burner is made from high-temperature-resistant stainless steel. The flue gases heated by the combustion reaction and the radiation heat are transferred to the primary heat exchanger.

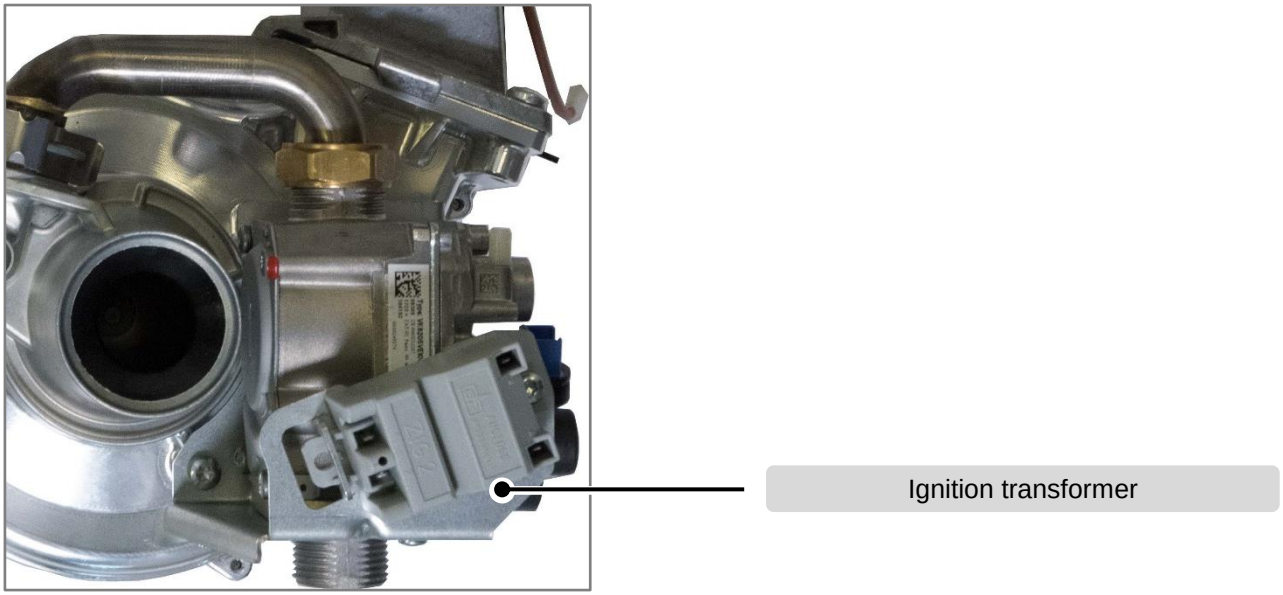
After removing the burner, the burner door seal on the module must always be replaced.

Spare part no.: 0020025929

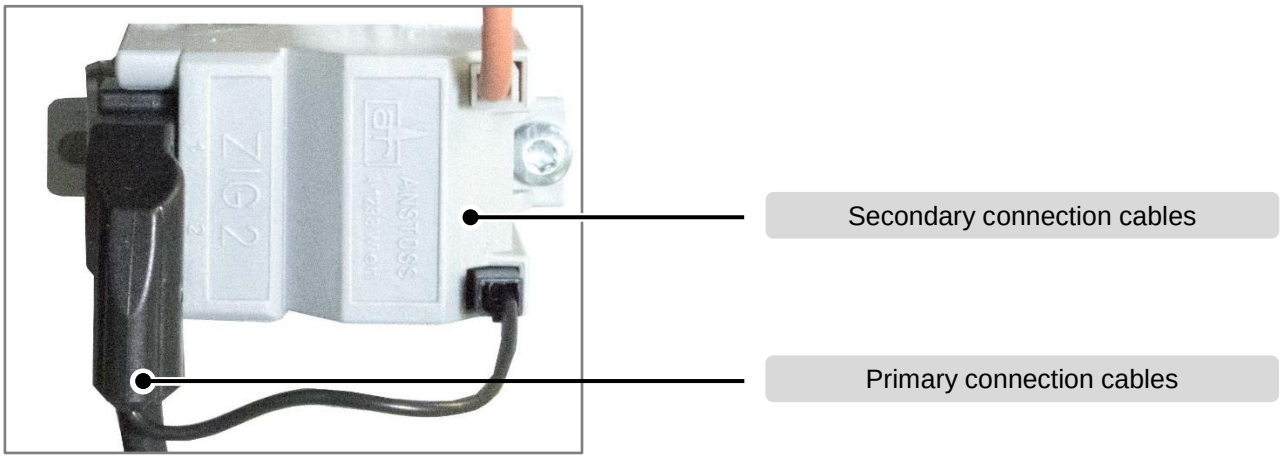
Notes

Notes

3.1.4.3 New! Ignition transformer



Detailed view of the ignition transformer

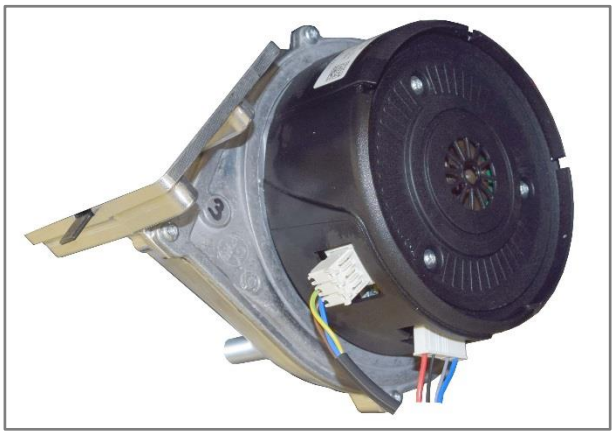


Detailed view of the ignition transformer electrical connection

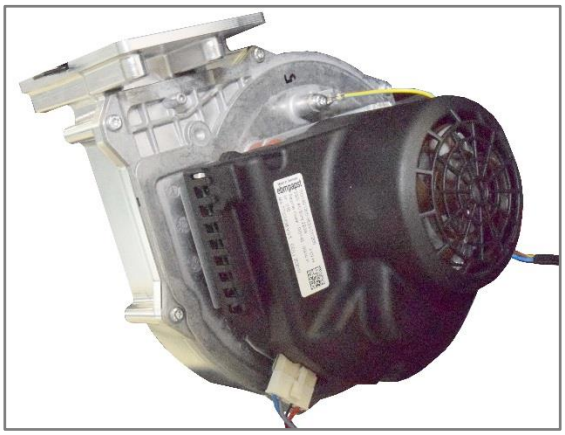
The ignition transformer is no longer a component on the PCB; instead, it is now attached to the gas valve assembly with a support plate.
As described in the detailed view, the transformer has a primary and a secondary connection side. The illustration depicts the electrical connection.

Notes

3.1.4.4 New! Space heater fan



41–48 kW Pabst Fan



65 kW Pabst Fan

The purpose of the fan is to route the oxygen required for combustion to the burner and to release the flue gases created by combustion into the atmosphere. The pressure generated when pumping the volume flow is required to overcome the pressure losses of the air/flue pipe and combustion chamber and to control the gas-air mixture.

The power of the fan and the diameter of the flue accessories determine the maximum possible length of the air/flue pipe. Unit output falls slightly as the pressure loss increases (greater resistance) in the flue system due to the dependency of the fan flow rate on the gas volume.
The speed range of the fan can be restricted. The maximum speed can be decreased under diagnostics code "D.051" and the minimum speed can be increased under diagnostics code "D.050". Changing the factory setting is only required in exceptional cases. The current fan speed can be read under "D.033" (target value) and "D.034" (actual value).

Heat exchanger freeze protection (fan speed deviation)

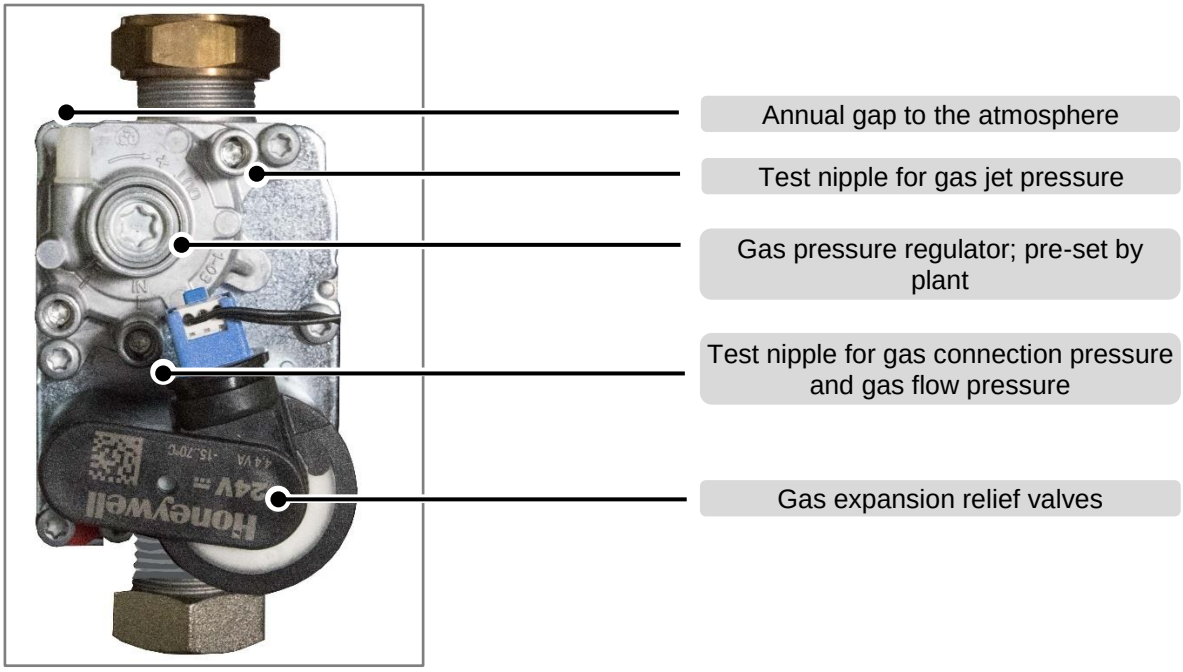
If cold combustion air of e.g. -10 °C is blown from the fan via the primary heat exchanger, without the burner being in operation, frost damage may occur in the primary heat exchanger. To ensure that this fault cannot occur, the following procedure must be followed. If the electronics do not receive a rotational speed signal within 20 seconds of the "Fan on" target signal, the fan is switched off for 10 seconds. Display **"S.32"**. A further two start-up attempts are then carried out. Then **"F.32"**. The speed deviation here is > 500 rpm.

This fault can also occur, if:

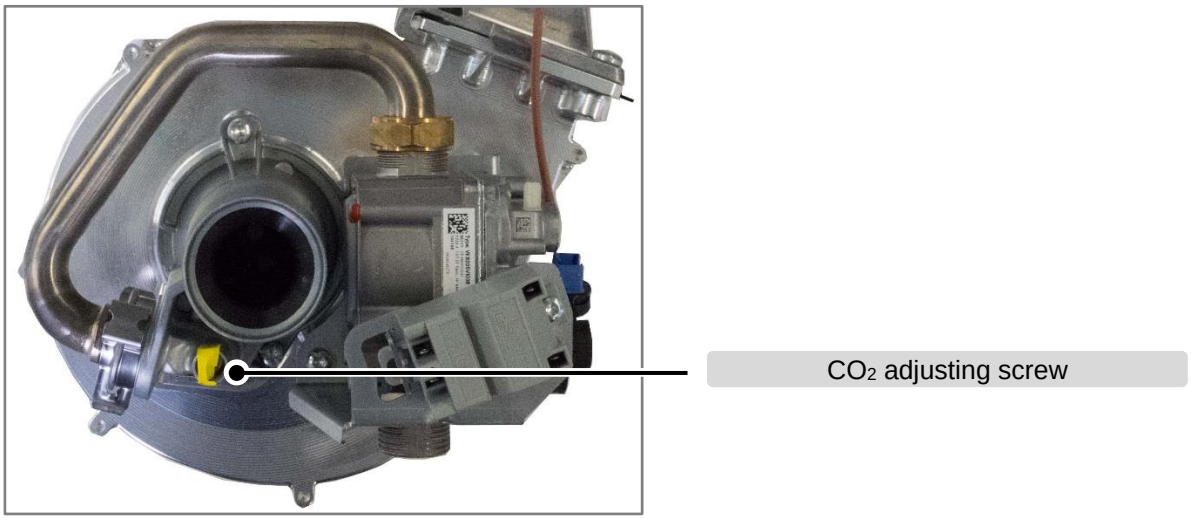
- The fan motor or hall sensor is defective,
- The plug is loose or not inserted,
- Electronics defective

Notes

3.1.4.5 New! 65 kW gas valve assembly



Honeywell VK 8205V 65 kW gas valve assembly with zero pressure regulator

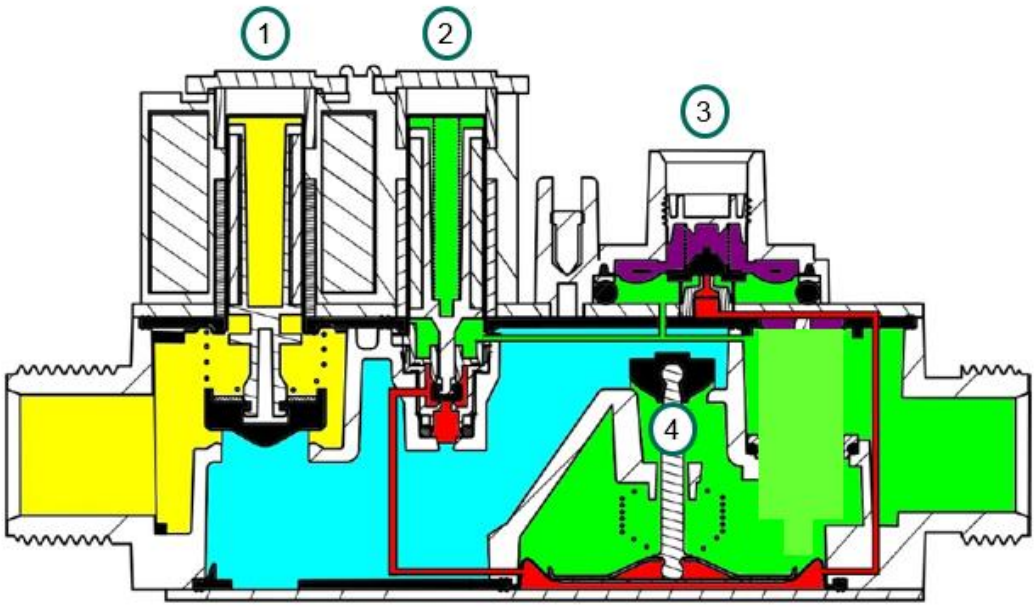


Detailed view of CO^2 adjusting screw for 65 kW output

The gas volume is adjusted to the air flow via the CO_2 setting at full load using the CO_2 adjusting screw on the **left-hand side** of the compact thermal module, which is covered by a yellow sticker as supplied. This system is not designed to let you adjust the minimum load. The inlet pressure is checked at the test nipple for gas connection pressure and gas flow pressure.

Notes

Honeywell VK 4205V 65 kW section model



Honeywell VK 8205V gas valve, source: Honeywell

Servo pressure control

The gas valves of the VK 8205VE/VK 8205V series contain a positive gas-servo system. This means that the main gas valve is kept closed even during actuation (unit start) by means of spring force. The spring force is only overcome by sufficient gas connection pressure and the main gas valve opens. This ensures that the main gas valve is automatically closed in the case of insufficient gas connection pressure (pressure drop) or a lack of electric actuation. At the heart of the system is the servo pressure regulator, which comprises a relief valve integrated into an overlying control diaphragm.

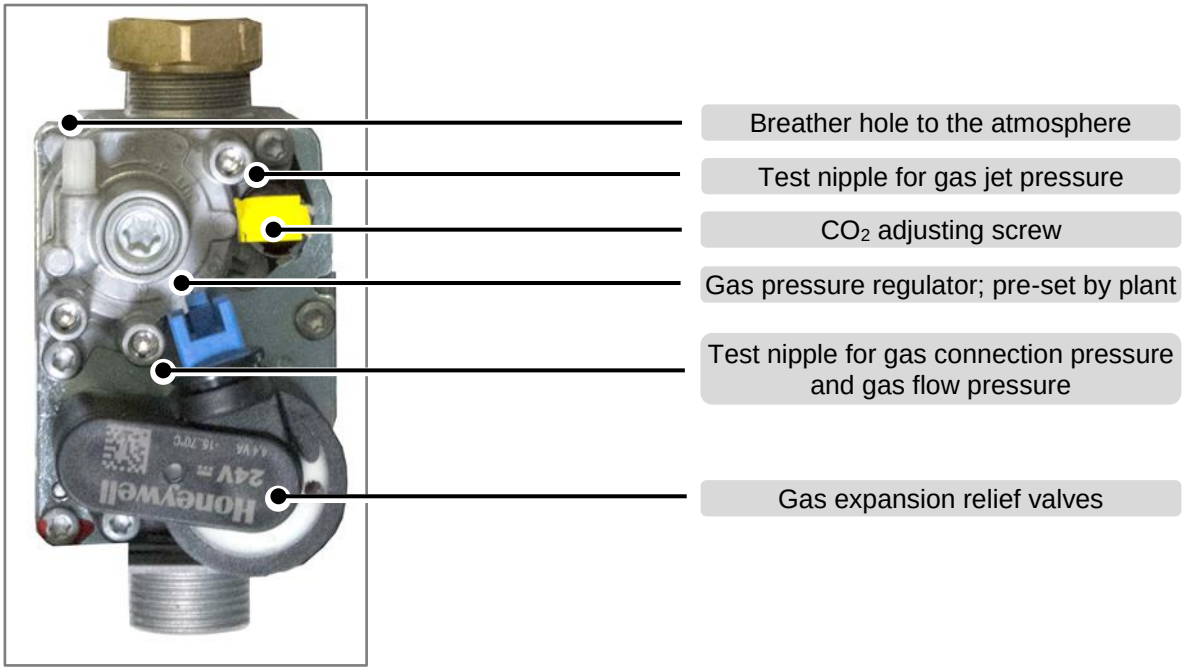
If the gas expansion relief valve **1** (1st operator) and the second gas valve **2** (2nd operator, servo operator) are now supplied with voltage, the servo gas flows into the servo system and into the gas pressure regulator **3** via the opened second gas valve. This amount of servo gas then moves the main gas valve **4** upwards, thereby opening the main gas route. As soon as the main gas valve is open, the outlet pressure (burner pressure) is only monitored by the gas pressure regulator diaphragm, which occurs via the connection of a control channel.

If the gas pressure is higher than the pre-set spring pressure (gas pressure regulator adjusting screw) at the gas pressure regulator and the current atmospheric air pressure to the diaphragm, the gas pressure regulator opens and relieves the working pressure of the gas-servo system in a defined way. This load relief reduces the gas pressure at the main gas valve and enables the main gas valve to close proportionally. The main gas valve limits the burner/jet pressure to the pre-set value with this function. As a result of the constant pressure regulation, the burner pressure remains constant even if the gas flow pressure of the gas supply fluctuates.

After the burner is switched off, the gas-servo system is drained towards the gas valve assembly outlet.

Notes

3.1.4.6 New! 48 kW gas valve assembly



48 kW gas valve assembly with zero pressure regulator

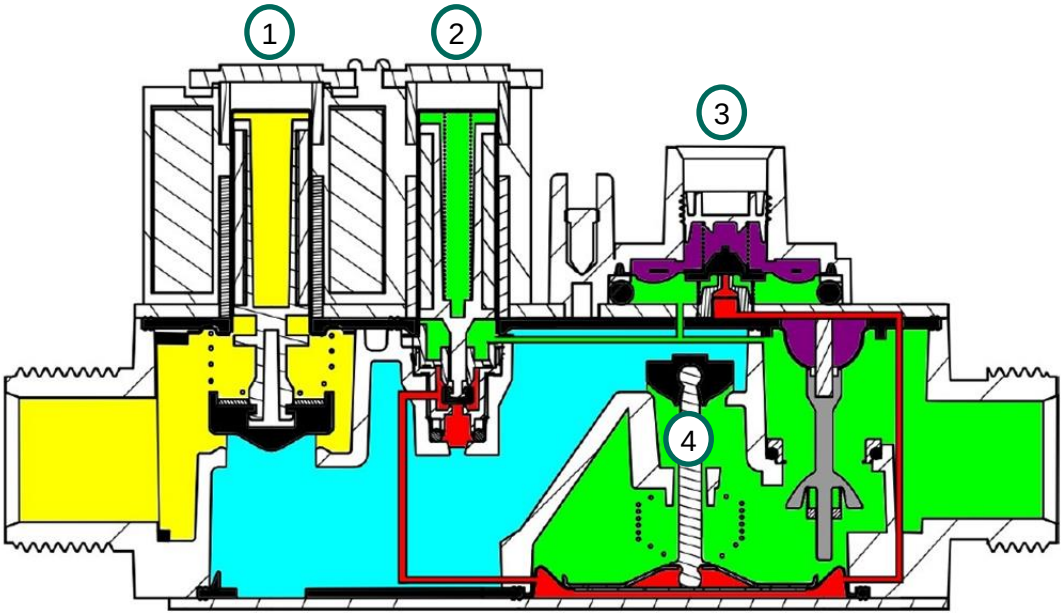
The gas volume is adjusted to the air flow via the CO_2 setting at full load using the CO_2 adjusting screw on the **front** of the gas valve assembly, which is covered by a yellow sticker as supplied. This system is not designed to let you adjust the minimum load. The inlet pressure is checked at the test nipple for gas connection pressure and gas flow pressure.

The gas pressure regulator (servo pressure regulator) must never be adjusted, otherwise the entire gas valve assembly must be replaced.

The gas valve assembly (servo pressure regulator) is pre-set and adjusted ex-works.

Notes

Honeywell VK 8205V 48 kW section model



Honeywell VK 8205VE gas valve, source: Honeywell

Servo pressure control

The gas valves of the VK 8205VE/VK 8205V series contain a positive gas-servo system. This means that the main gas valve is kept closed even during actuation (unit start) by means of spring force. The spring force is only overcome by sufficient gas connection pressure and the main gas valve opens. This ensures that the main gas valve is automatically closed in the case of insufficient gas connection pressure (pressure drop) or a lack of electric actuation. At the heart of the system is the servo pressure regulator, which comprises a relief valve integrated into an overlying control diaphragm.

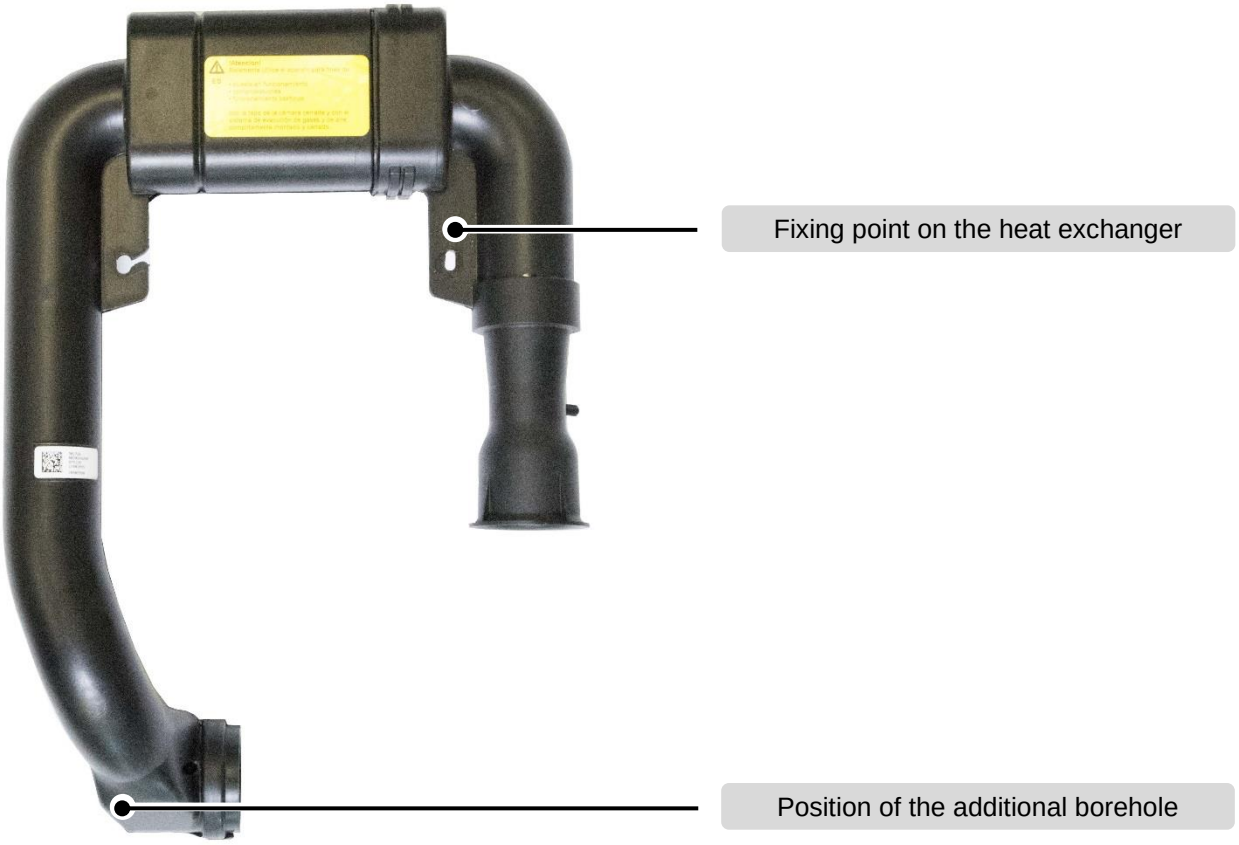
If the gas expansion relief valve **1** (1st operator) and the second gas valve **2** (2nd operator, servo operator) are now supplied with voltage, the servo gas flows into the servo system and into the gas pressure regulator **3** via the opened second gas valve. This amount of servo gas then moves the main gas valve **4** upwards, thereby opening the main gas route. As soon as the main gas valve is open, the outlet pressure (burner pressure) is only monitored by the gas pressure regulator diaphragm, which occurs via the connection of a control channel.

If the gas pressure is higher than the pre-set spring pressure (gas pressure regulator adjusting screw) at the gas pressure regulator and the current atmospheric air pressure to the diaphragm, the gas pressure regulator opens and relieves the working pressure of the gas-servo system in a defined way. This load relief reduces the gas pressure at the main gas valve and enables the main gas valve to close proportionally. The main gas valve limits the burner/jet pressure to the pre-set value with this function. As a result of the constant pressure regulation, the burner pressure remains constant even if the gas flow pressure of the gas supply fluctuates.

After the burner is switched off, the gas-servo system is drained towards the gas valve assembly outlet.

Notes

3.1.4.7 New! 48–65 kW pipe supply air

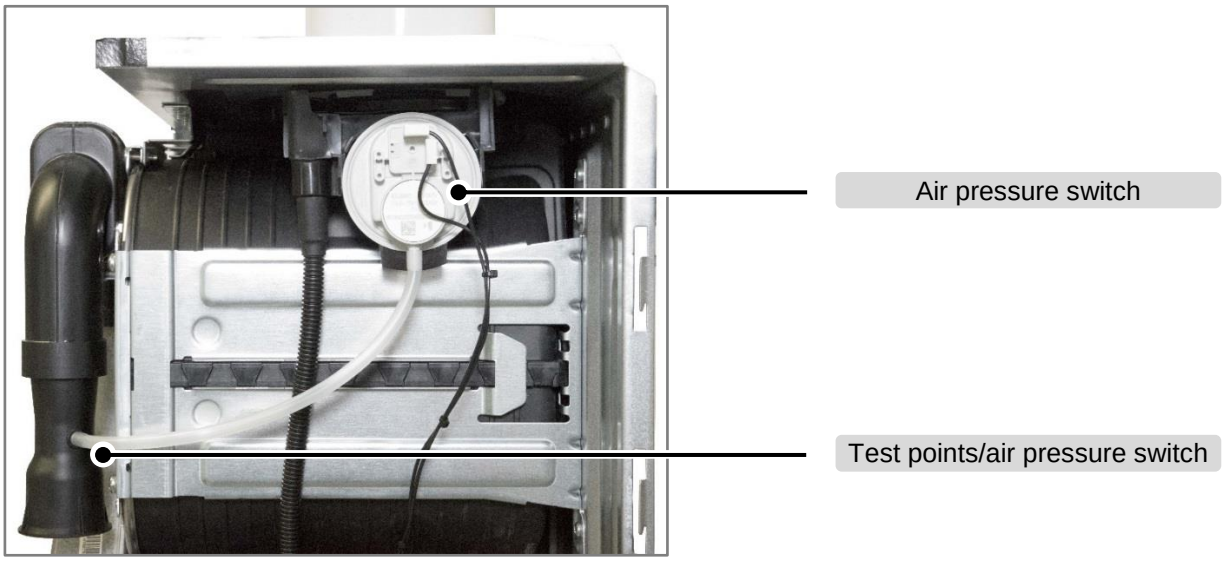


Supply air pipe with test point for the air pressure switch with warning label

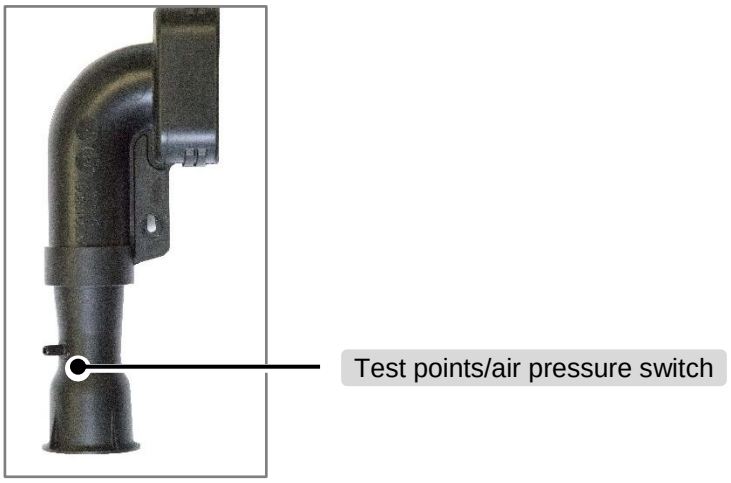
The new supply air pipe is equipped with an additional test point for an air pressure switch.
An additional borehole is located on the sleeve to the gas valve assembly Venturi pipe in both output versions.

Notes

3.1.4.8 New! Air pressure switch (pressure switch) for the supply air network



Supply air network/pressure switch

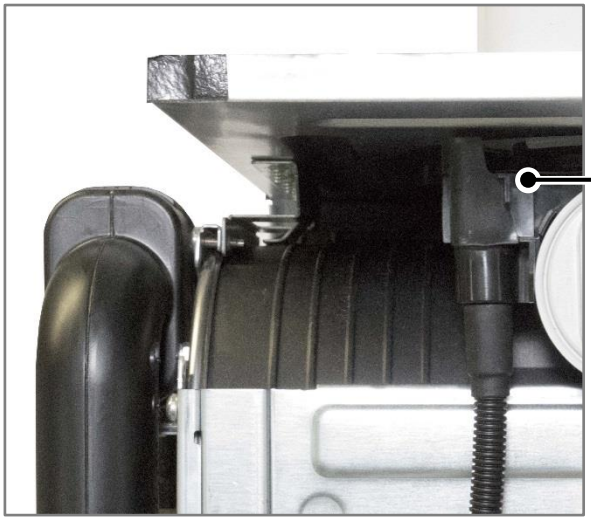


Detailed view of the air intake pipe/test point

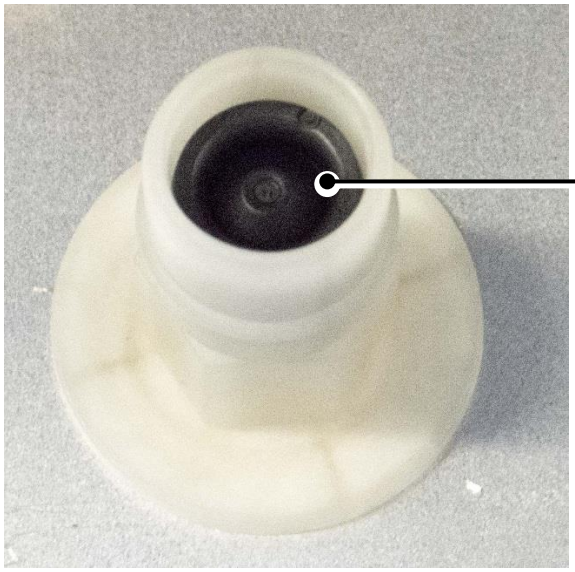
As a new feature, an air pressure switch is being added to the 48–65 kW product supply air network. The air pressure switch ensures the supply of sufficient combustion air. At the same time, the connected length of the flue gas system (resistance) is correlated to the fan output (ARA). Thanks to this correlation, blocks in the flue pipework or overly long flue pipe works are detected. If the flue gas system resistance is too high, the unit is switched off with an operating block. Possible status and fault messages are: **S.33; F.33.**
The unit always starts with the last measured speed value of the flue system automatic pipe length adjustment (ARA); should this value not be sufficient, a new ARA is initiated and carried out. If this adjustment is not sufficient, the flue pressure switch does not switch **F.33**; now the function of the pressure switch/fan or the condition of the flue system must be checked.

Notes

3.1.4.9 New! Water drain collector (precipitation)



Water drain rail with drainage

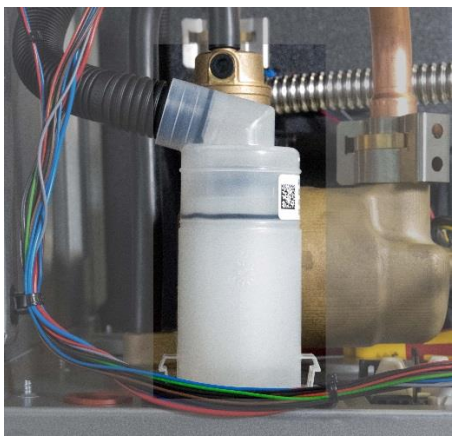


Water drain spigot with non-return device

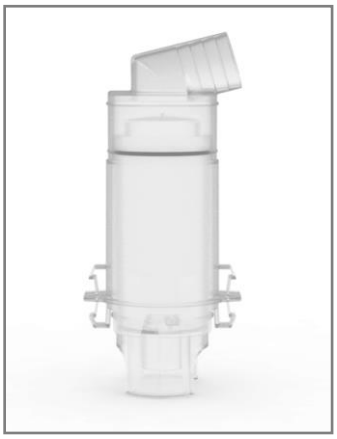
The new units are equipped with a water drain collector in order to collect and drain precipitation from the flue system's annular gap. In addition, on the right of the unit underside (floor plate), the drain hose leads to the drain spigot with a diaphragm as a non-return device so that no emissions from the installation room can reach the combustion chamber.

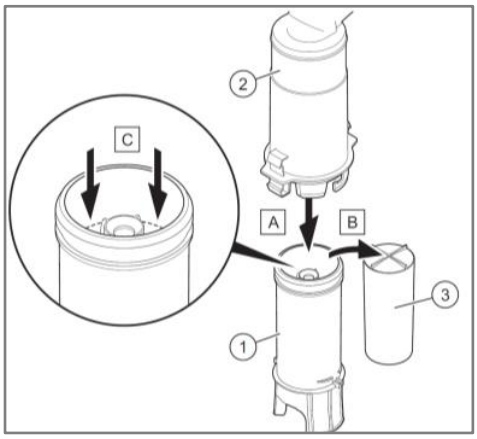
Notes

3.1.4.10 New! Condensate siphon with float valve



Condensate siphon





Exploded view

The condensate siphon is an in-house development (patented). The siphon is equipped with an additional floating element (3) that seals the path to the tundish so that it is gas-tight, even without a water reserve. The siphon therefore does not necessarily have to be filled with water during start-up.

Function:

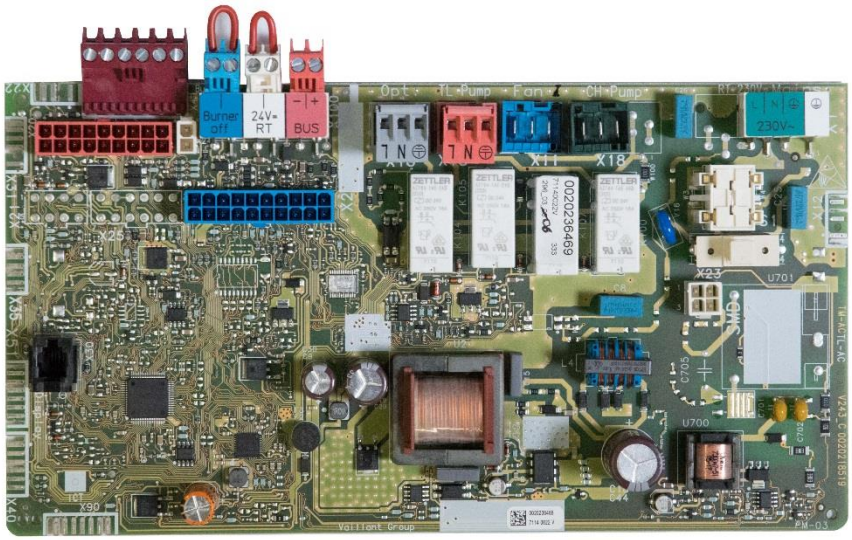
If the condensate now reaches the siphon and the condensate level increases, the internal float is raised and the condensate drips over the blocking height of the siphon in the direction of the tundish.

Thanks to its design, it is not absolutely necessary to fill the condensate siphon as the float valve also seals the path to the natural ventilation airflow network in a dry condition. It is nevertheless recommended by the factory that you fill the siphon trap with water during start-up or maintenance work.

Notes

3.1.5 Electronic components

3.1.5.1 PCB (BMU)



48–65 kW PCB (BMU)

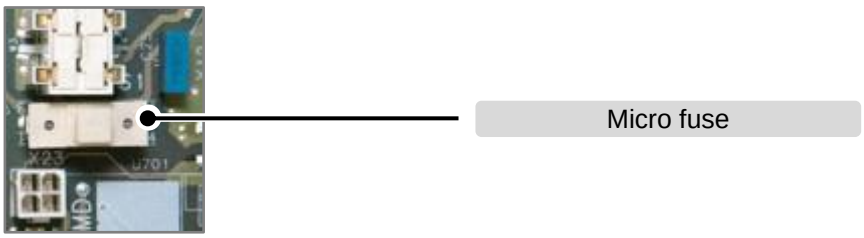
Basic information regarding the electronics:

The PCB electronics contain all of the functions for operating and monitoring the boiler. The current unit status is monitored permanently, any faults are analysed and shown in the display. All-important data is saved on the PCB.

The functions of the flame sequence control, the electronic monitoring, the power supply, the fan monitoring and the fan control are stored on the PCB. The unit does not have a separate line voltage transformer, this function is covered by an isolation transformer on the PCB.

3.1.5.2 Fuses

A 2 Ampere slow-blowing micro fuse is fitted on the PCB. This protects the PCB and the consumers against short circuits and overvoltage. If this fuse has tripped, the display remains dark.



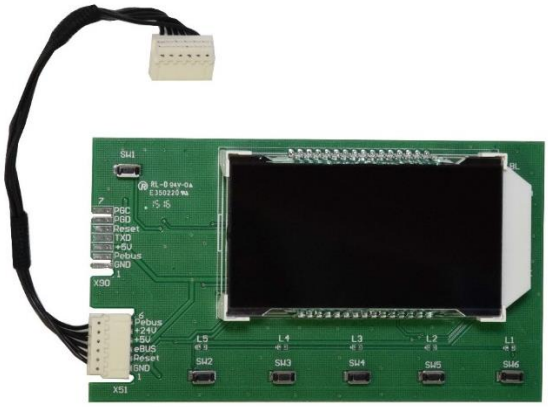
Micro fuse

Notes

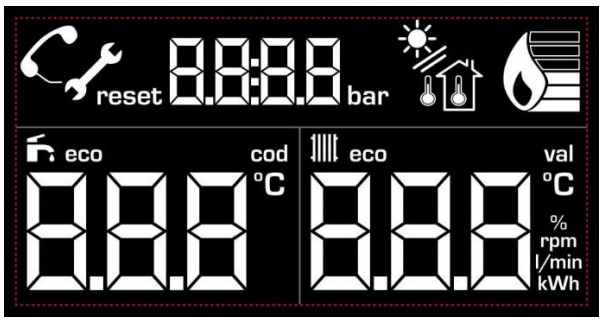
3.1.5.3 Configuration of the connection terminals

Slot colour	Designation	Description of the connection terminals
Blue	Burner off	Underfloor heating limiter thermostat. If the jumper is removed, the burner switches off immediately, **F.86**
White	24 V= RT	24 V room temperature control (on/off NL). Heating mode ends in the event of an interruption, **"D.016" = 0**
Pink	eBUS	External eBUS control
Grey	Optional	External 230 V actuators, e.g. ext. heating pump. Select with **"D.026"**
Blue	Fan	Internal fan, 230 V AC
Green	CH pump	Internal heating pump, 230 V
Olive green	L-N-PE / 230 V	Unit power supply

3.1.5.4 DIA system PCBs



Display PCB



DIA display

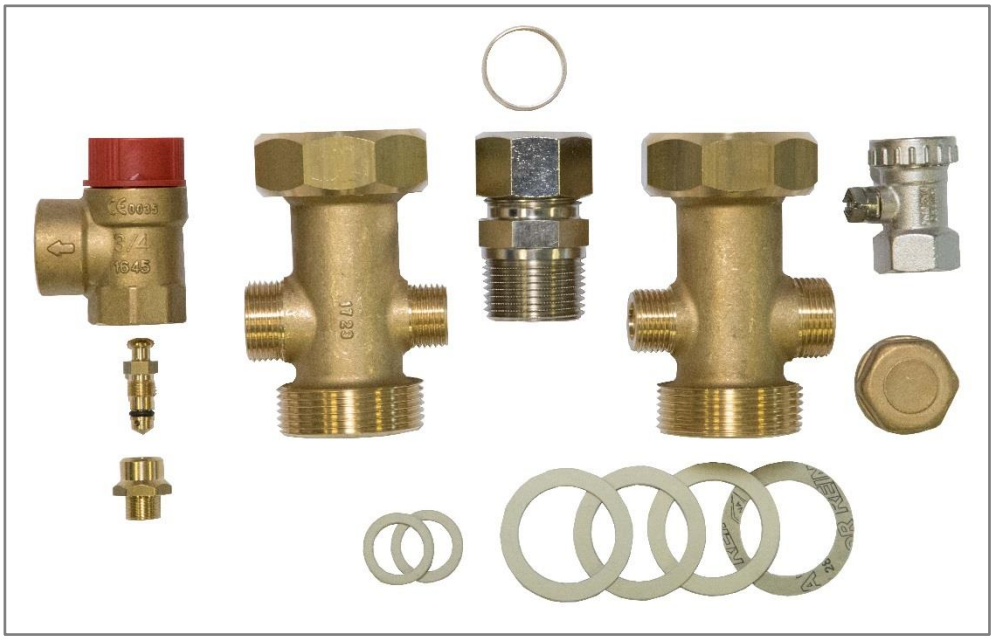
The DIA system = AI = Appliance Interface is the communication point between the user and the unit electronics.

Removal: When carrying out service work, in contrast to older units, the DIA system is removed from inside the unit's electronics box after the unit electronics have been removed first.

Notes

3.1.6 Hydraulic connection network

3.1.6.1 New! Unit connection set (scope of delivery)



Scope of delivery of the hydraulic installation set

The hydraulic set consists of:

- 4 bar **(7-coil)**, 4 bar (later 6 bar) **(9-coil)** expansion relief valve
- Drainage nipple
- 2 x 1 ¼" distributor connection
- ¾" gas cutting ring nipple
- 1 x filling and drain cock
- 1 x ¾" cap
- 4 x 1 ¼" seal
- 2 x ¾" seal

EASY TIP In addition, service valves from the SDBG range of accessories can be used, in this case observe the connection to the expansion vessel (on site).

Notes

3.1.6.2 Condensate discharge hose (scope of delivery)

Condensate hose

The hose is used to discharge the condensate to a siphon that must be additionally created on-site. The siphon feeds the condensate into the local sewage system.

The hose has a rubber connector, which is placed on the unit siphon's drain connection.

Please comply with the national regulations regarding the draining of condensate.

The units have a nominal heat input of 48–65 kW; in some markets this may lead to a neutralisation device being installed upstream.

3.1.6.3 Drain hose for precipitation discharge

As an innovation, the accessory includes an additional hose for the precipitation drainage. Still without image display.

Notes

3.2 Unit menu overview

3.2.1 DIA display operating concept

Control panel with display

3.2.1.1 Hidden display menus

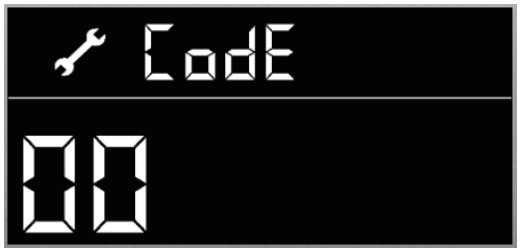
The display comes with hidden maintenance menus. These menus contain different access levels for the diagnostics code that is to be edited. To achieve this, different codes are stored.
On the one hand, there is the level (installer) that is used to configure the unit during initial start-up. You can access this level using **code = 96**.
On the other hand, there is the level (expert) that is used to configure the unit after components have been replaced. You can access this level using **code = 35**.

The code for the installer only provides access to a restricted list of data points for starting up the unit.

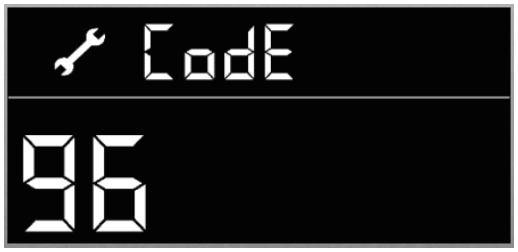
The code for the expert provides access to all of the data points.

3.2.1.2 Access for the installer/expert level

Press the button (1) for 7 seconds and the display then switches to a different view. Only use the "**+**" or "**-**" side of the button (2) to enter code **96** or **35**. After entering the value, press the button (1) to confirm.
The display now shows the first parameter.

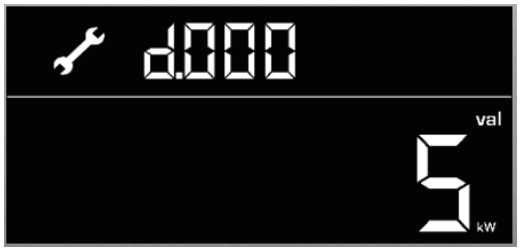


Code level



Code setting

Notes



Diagnostics level

3.2.1.3 Changing the parameter value

A parameter value can be changed using the "**+**" or "**-**" side of the button (3). The changed value is automatically saved after **three** seconds.

3.2.1.4 Selecting diagnostics parameters

To change the diagnostics parameter, press the "**+**" or "**-**" side of the button (2)

3.2.1.5 Exiting the menu levels

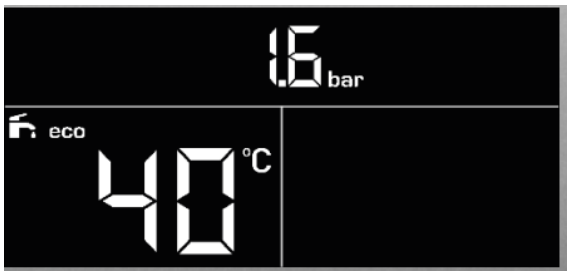
To exit the menu level, press the button (1) for three seconds, or the unit will return to normal mode after **15 minutes**.

Notes

3.2.1.6 Advanced functions/Information

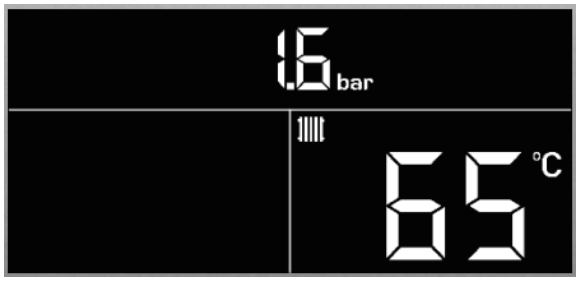
Summer mode:

Summer mode – i.e. domestic hot water generation only, heating mode off – is activated by pressing the button (1) repeatedly until the right-hand side of the display is blank.



Switch cylinder charging on or off:

If a domestic hot water cylinder is connected, you can switch off cylinder charging without switching off the heating mode. Press the button (1) repeatedly until the left-hand side of the display is blank.



Comfort protection mode:

If certain components in your boiler fail, its functions will then be restricted. The status message **"S.40"** and the symbol appear on the display. You can read the status under D.067.

Notes

3.2.1.7 Unit status

Unit control panel

This function can be selected at any time in order to receive information about the current unit status. It also provides diagnostics support in the event of a unit block.
To select the status, press and hold each "**-**" side of buttons **2** and **3** at the same time for three seconds.

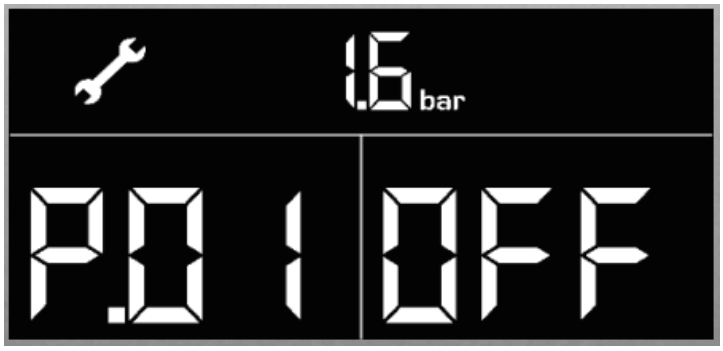
Status display

To exit the status menu, press and hold button **1** for at least three seconds.

Notes

3.2.1.8 Check programmes

By activating the different check programmes, individual test functions can be carried out. To select the check programme, press and hold button 1 and "**+**" on button **3** at the same time for three seconds.



Check programmes

Section **7** contains the list of check programmes.
To select a check programme, use the "**+**" or "**-**" side of button **2**. Then use button **1** to switch the function ON or OFF. The next check programme can only be selected when no other programme is running.
To exit the check programme, press and hold button **1** for at least five seconds.

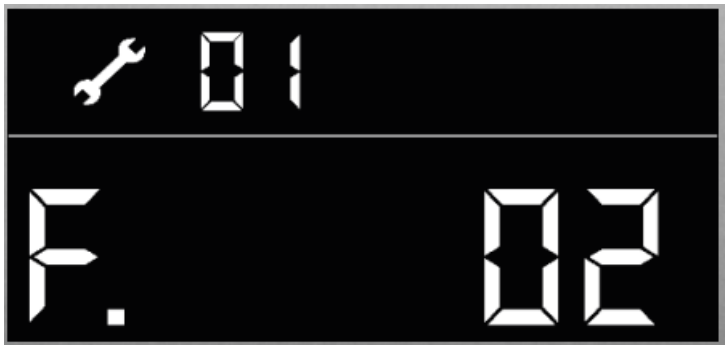
EASY TIP Use the check programmes for the start-up and for maintenance work.

Notes

3.2.1.9 Fault history of the unit

Unit control panel

You can call up the last 10 fault messages in the unit history.
To select the unit history, press and hold the "**+**" side of button 2 and the "**-**" side of button 3 for >3 seconds.



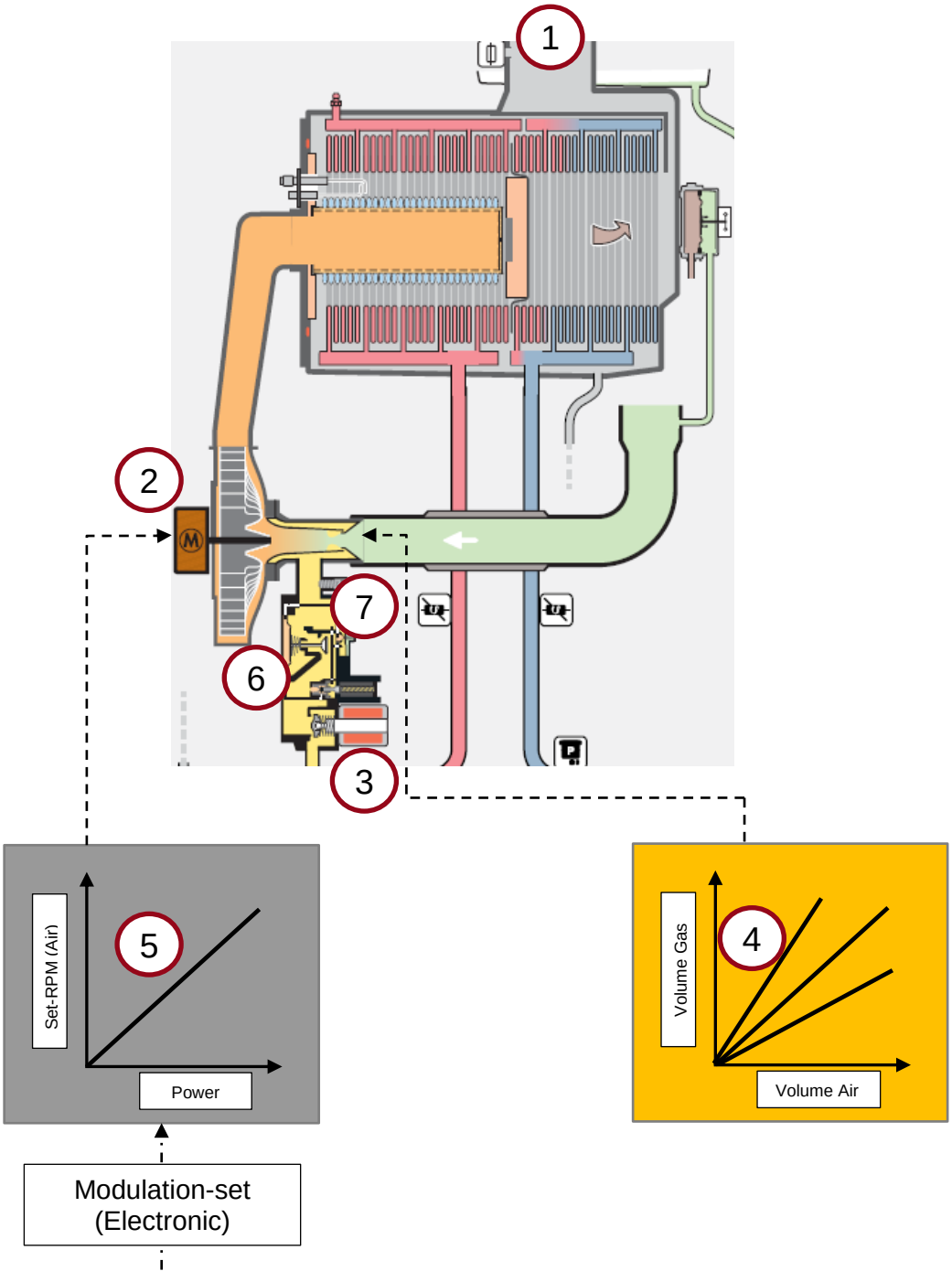
Fault message history

To delete the fault messages, press and hold the "**-**" side of button 2 and the "**+**" side of button 3 for >3 seconds, or delete the fault messages under diagnostics parameter D.094 in the diagnostics menu.

Notes

3.3 Functional description

3.3.1 Functional description of the pneumatic gas-air mixture



Notes

Key			
1	Flue gas	5	Characteristic line – Output/target speed
2	Fan motor	6	Primary gas regulation valve
3	Primary gas valve	7	Setting screw: Characteristic – Air volume/ gas volume
4	Characteristic – Air volume/ gas volume		

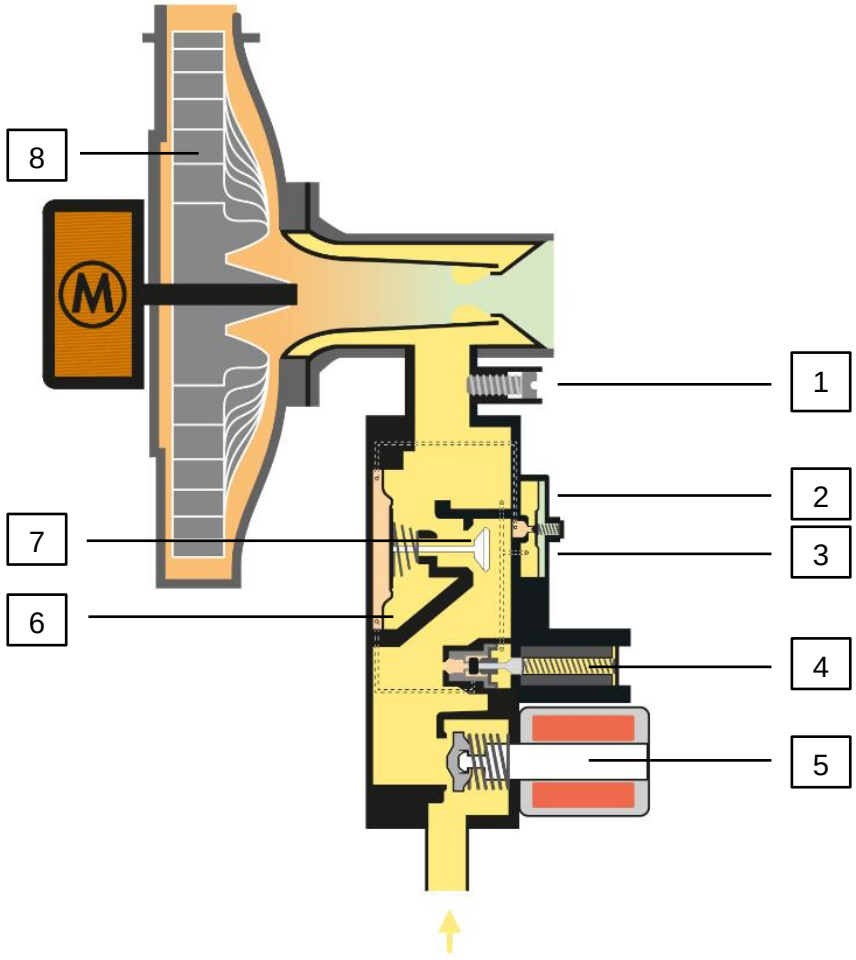
Depending on the unit output required at the time, a rotational speed target value is forwarded to the fan as a PWM signal. The burner is now always modulated by modifying the air flow (PWM signal) of the fan.

The gas volume follows the air flow in a predefined ratio through the pneumatic gas-air mixture, as both variables are linked.

This allows the air ratio to remain almost constant throughout the entire modulation range. To control the gas valve assembly using the pneumatic gas-air mixture technology, a powerful fan is required to overcome pressure losses.
It is possible to use the adjusting screw at the outlet of the gas valve assembly (2) – see the next figure – to manually adjust the gas-air flow ratio.

Notes

3.3.2 Gas valve assembly with fan (pneumatic) functional diagram



Key			
1	Adjusting screw max. load	6	Primary gas regulation diaphragm
2	Annular gap	7	Primary gas regulation valve
3	Servo pressure regulator	8	Fan
4	Servo valve		
5	Gas safety valve		

Once the electronics have detected the ignition speed of the fan, both gas valves (control valve and main gas valve) are opened. A lined air/gas intake spigot (annular gap) is fitted on the intake side of the fan. This creates a suction effect in the chamber above the primary gas regulation diaphragm in the gas valve assembly in accordance with the Venturi principle. The control valve opens further if the suction increases as a result of the fan turning faster. This means that air and gas are drawn in by the fan in an almost invariable ratio.

Notes

3.3.3 Software description; safety, special and standard functions

The operating modes or functions are handled according to the following priorities:

1. Functions for handling faults (highest priority)
2. Chimney sweep function (P1)
3. Hot water and cylinder charging mode
4. Heating mode
5. Frost protection

3.3.4 Standard functions

3.3.4.1 Conditions for heating mode

- Heating mode starts if:
- the function is "released" (see "D.023") and
- the bridge (230 V terminal) is available (see "D.016", "S.30") and
- the "burner off" bridge is available, (see S. 39 **"F.86"** or the symbol) and
- target value via eBUS > 20 °C (see "D.005") and
- the burner anti-cycling time has elapsed (see symbol) and
- hot water or cylinder charging mode is not active (active = "S.14" and "S.24") and
- a heat demand is made by the internal flow temperature control (see symbol)

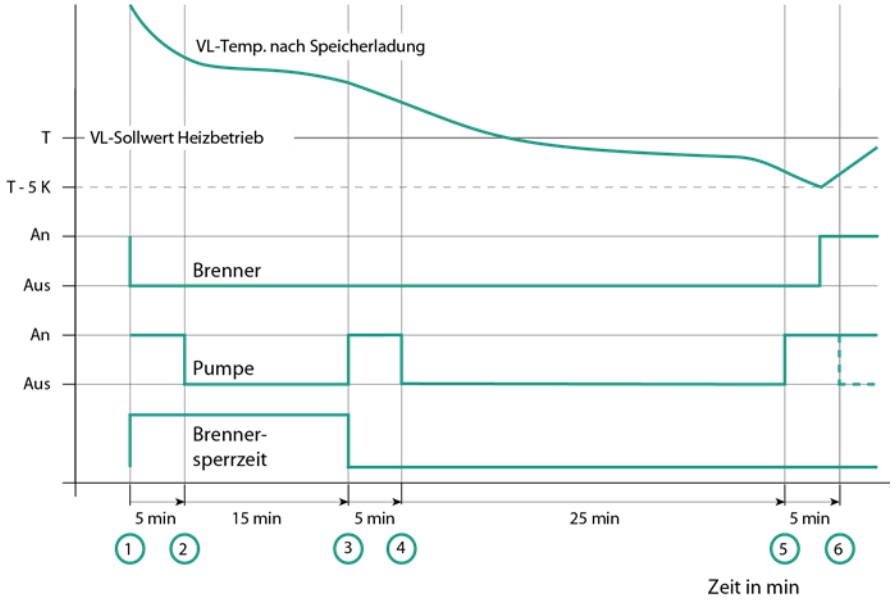
If the aforementioned "and" conditions are met, a pump start-up time occurs before the burner goes into operation. The heating water here circulates for 30 seconds in the heating circuit. The prioritising diverter valve is in the heating position. This function prevents a heating cut-off due to a high temperature in the flow NTC after HW preparation or cylinder charging, and only operates the burners for a short period.

- If the actual flow temperature (display view) is then below the required target flow temperature **"D.005"** minus a switch-on hysteresis, the burner is switched on.
- If the actual flow temperature (display view) is still greater than the required target flow temperature, the pump is actuated for max. 15 minutes. If a heat demand is identified within 15 minutes, the unit switches on. Otherwise, the pump switches off (operating mode "Pump shutdown").

The pump overrun after a regular shutdown can be set under **"D.001"** between one and 60 minutes (factory setting five minutes).

Notes

3.3.4.2 Pump modes in heating mode



Pump operation as a function of flow temperature

The heating pump can be set in various operating modes using diagnostics code "D.018".
Comfort: The pump is in operation if:

- the "Summer mode" function is not active (see "D.023") and
- the bridge (terminal 3/4 (VR 36) = 1) is available (see "D.016", "S.30") and
- the target value via eBUS > 20 °C (see "D.005")

ECO: This pump mode is useful for removing residual heat after cylinder charging when the heat demand is extremely low and large temperature differences exist between the cylinder charging and heating mode target values. This prevents the living rooms from overheating.

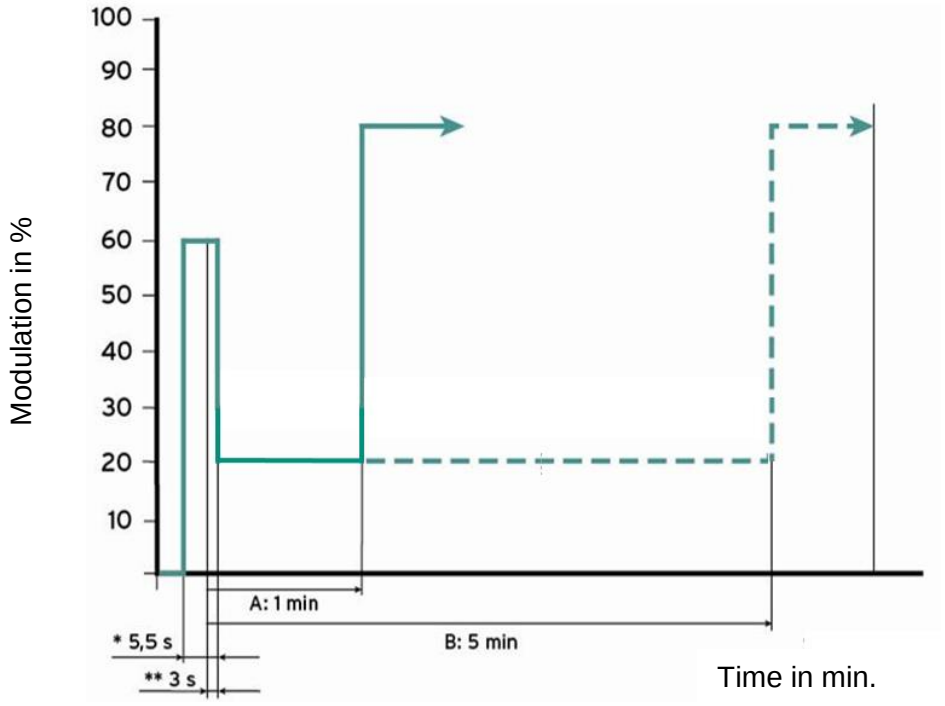
Special features: After switching off the burner, the pump overrun and burner anti-cycling time are started [1]. The pump overrun ends after, for example, 5 minutes [2] and the burner anti-cycling time ends after another, for example, 15 minutes [3]. For target values > 20 °C, the pump is initially switched on for a maximum of 5 minutes. If the flow temperature then remains above the target value of -5 K, the pump is prevented from switching on for 25 minutes [4] - [5]. After this time, the pump is activated again for 5 minutes to circulate the water again. If the flow temperature falls below the target value of -5 K during this time, the burner switches on immediately. Otherwise, after the 5 minutes [6] has passed, the pump will be blocked again for 25 minutes.

Notes

3.3.4.3 Flow temperature control

Flow temperature control is preferred for use in installations with radiators or in two-circuit, multi-circuit and cascade installations. As these installations account for the majority of applications, the units are supplied with this as the factory setting. The hysteresis of flow control is **± 5 K**.
With flow temperature control, all of the units are always operated with the lowest possible partial load in the first minute of operation.
This measure increases the burner running time, as the unit cannot switch to modulation mode within the first minute. Due to the large time constants involved for a dwelling or a building, no comfort bottlenecks are expected in heating mode.

At the end of this time, the theoretical modulation target value is determined for the second to fifth minutes of operation, which would be obtained without the modulation cut-off time. As soon as this exceeds 75%, the unit starts upward modulation. Otherwise, the unit operates in the second to fifth minute also with the smallest load. The maximum output in heating mode is limited to the set partial heat load ("D.000"). The modulation value depends on the size of the regular deviation and the speed with which the actual value approaches the target value.



Modulation rate and modulation cut-off time

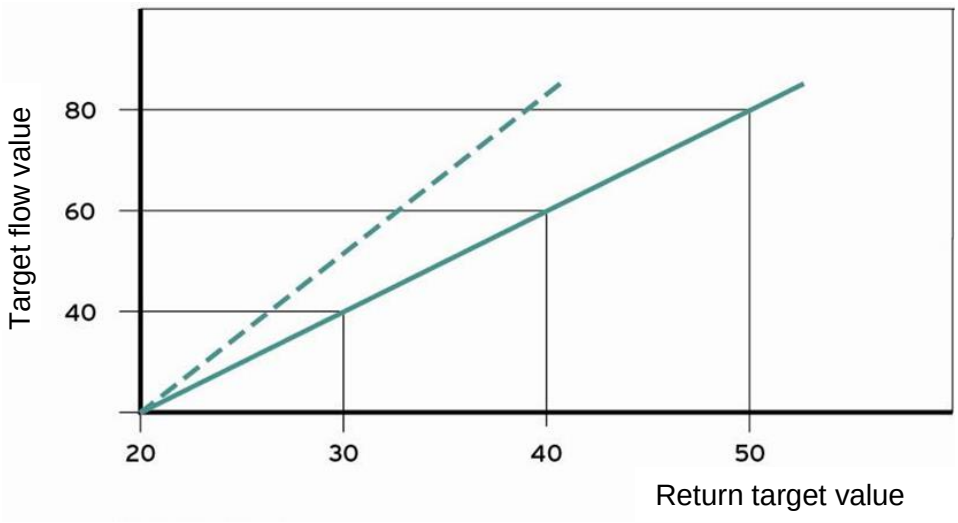
Key:

* Safety period; ** Anti-cycling time; A High demand; B Low demand

Notes

3.3.4.4 Return temperature control

The actual return temperature value is recorded by the return NTC. The hysteresis of return control is **+3/-1 K**.



Calculating the target return value

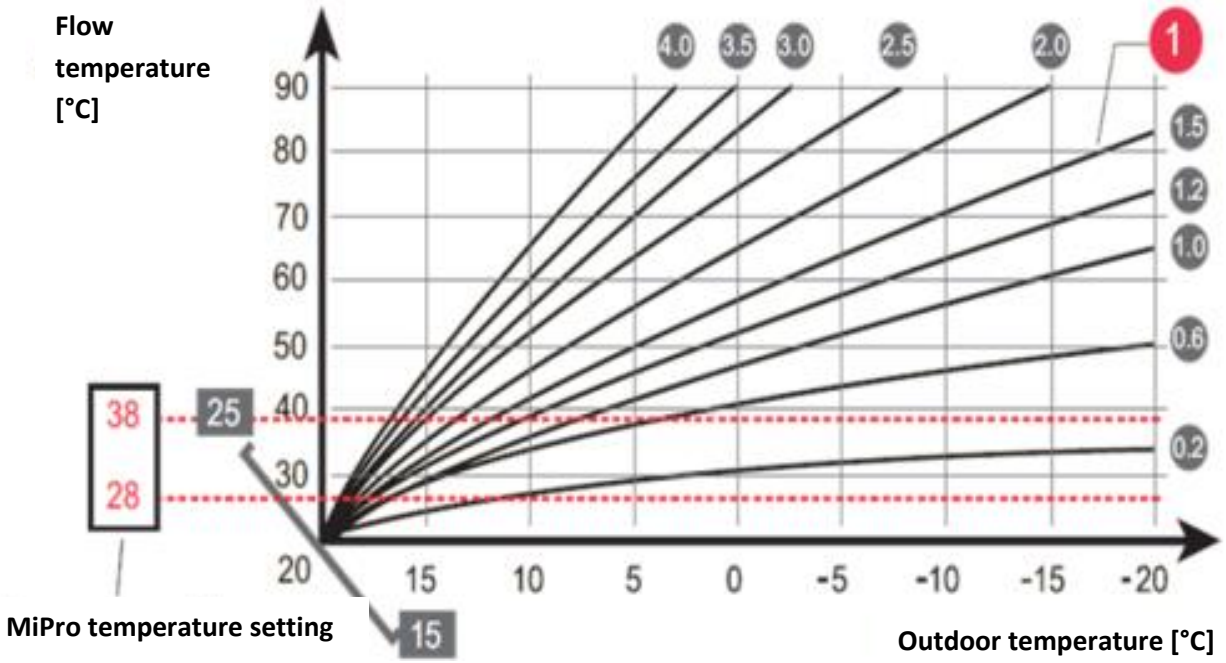
It is possible to switch from flow temperature control to return temperature control under diagnostics code "D.017". Return temperature control is preferred for use in directly fed underfloor systems without a low loss header. As the electronics only detect the target flow value (via the unit electronics or external control), the target return temperature value is calculated as follows: Target return value (°C) = 0.5 x target flow value (°C) +10 K.

Notes

3.3.4.5 Integrated outdoor temperature control system

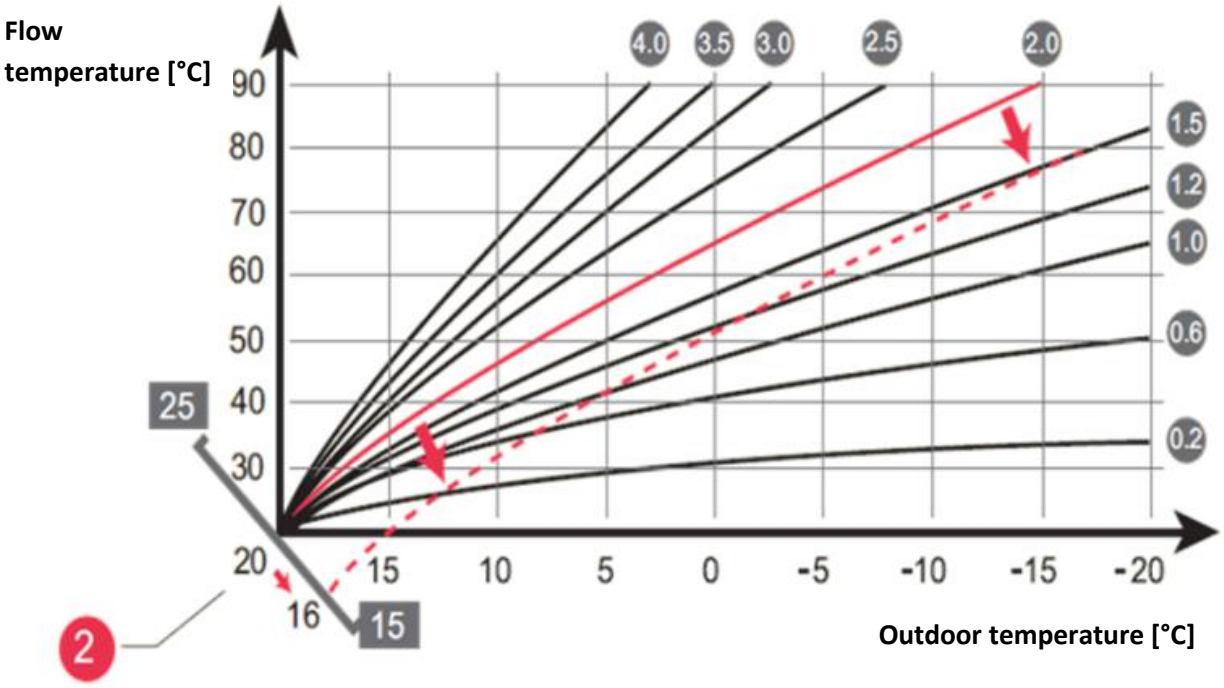
The unit is equipped with an outdoor temperature control system via a connected outdoor sensor.
To use the function, two parameters are used for setting:
- **D.043** for setting the heat curve
- **D.048** for setting the heat curve's base point

To determine the heat curve, the regional surface contact temperature for the system temperature must be determined.
The base point setting is set to **20 °C** room temperature at the factory. This parameter can be corrected between **15–25 °C** if the real room temperature deviates from the set value.
Example:
Heat demand (room) = 20 °C, real room temperature = 19 °C => correction to 21 °C



Internal heat curve with influence on the room temperature if a weather-compensated control, e.g. MiPro, is used

Notes



Base point of the heat curve

EASY TIP

The measured temperature value for the outdoor temperature sensor is related to a modulating thermostat function; due to this switching, the base point automatically shifts and therefore optimises the heat curve.

If a weather-compensated control, e.g. **MiPro**, is used, the heat curve is assigned via the control and the parameters D.043 and D.048 disappear from the unit's menu.

Notes

3.3.4.6 VRC 9642 surface-mounted thermostat

The flow temperatures in hot water underfloor heating systems are between 35 °C and 48 °C. They are limited to a maximum temperature of 55 °C to prevent damage to the heating screed. It is recommended that the flow temperature should be restricted to +10 K above the surface contact temperature.

If the surface-mounted thermostat emits the signal "Contact open", any further power infeed to the underfloor circuit is interrupted. This can occur by switching off the underfloor circuit pump or the heat demand for the boiler. To do this, the surface-mounted thermostat must be integrated into the electrical circuit of the external heating circuit pump or connected to the **"burner off"** terminal (blue plug) on the unit PCB.

3.3.4.7 Partial heat load

The partial heat load function limits the maximum heating output to the predefined value. The output setting selected depends on the heat demand of the flat or building. The default setting for the partial heat load is "Auto"; the manual adjustment range depends on the unit variant. The partial heat load can be adjusted via the DIA system (diagnostics code "D.000") and can be converted to kW units with whole figures

3.3.4.8 Adaptive partial heat load

This function is automatically activated if **"D.000"** is set to **"Auto"**. For all other set values, the function is deactivated.

Function: The partial load is corrected according to the running time of the burner. The output for the first burner start is 100%. For a short running time, the partial load is lowered and it is raised for a long running time. The following table shows how the output is corrected according to the running time of the burner:

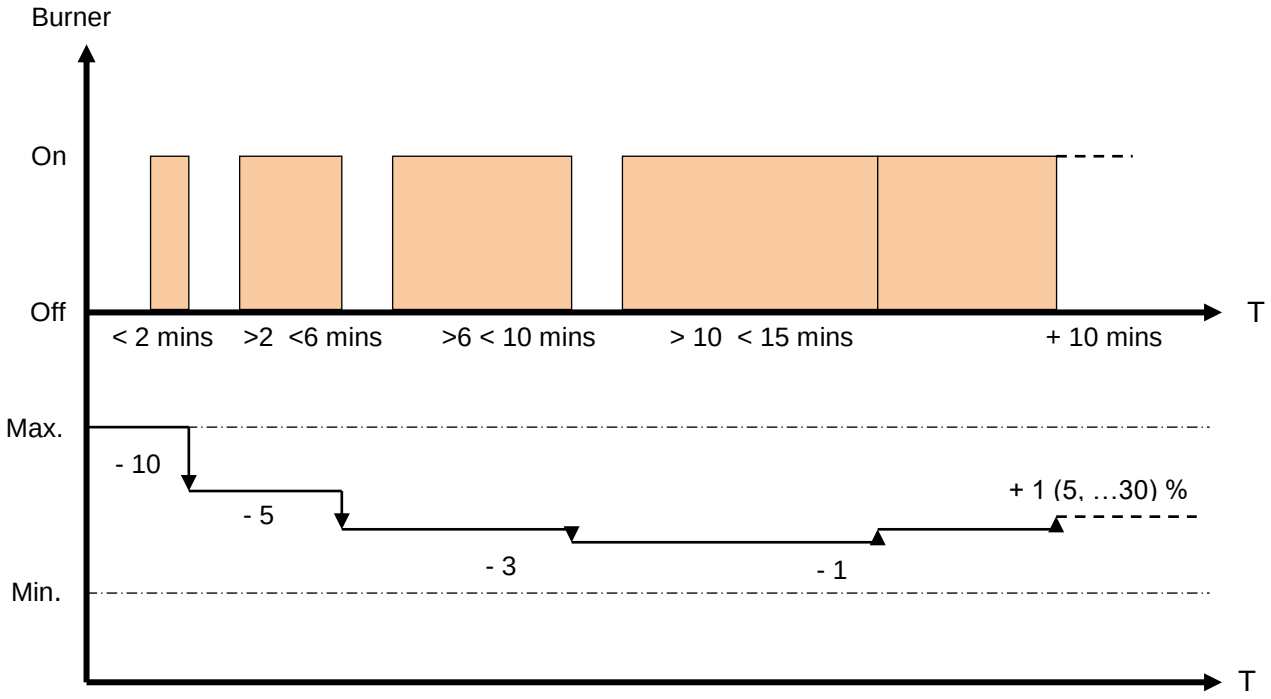
Burner running time	Correcting the output
< 2 mins	- 10 %
> 2 mins to < 6 mins	- 5 %
> 6 mins to < 10 mins	- 3 %
> 10 mins to < 15 mins	- 1 %

If the target flow temperature is not reached after 15 minutes, the current output increases every 10 minutes after this.

Target flow temp. > Actual flow temp.	Correcting the output
ΔT: 2 K – 10 K	+ 1 %
ΔT: 10 K – 16 K	+ 5 %
ΔT: 16 K – 24 K	+10 %
ΔT: 24 K – 30 K	+ 20%
ΔT: > 30 K	+ 30%

Notes

The following diagram should clarify the possible change to the active partial heat load in %:



Adaptive partial load – heating mode

After mains power "Off – On" and "Reset", the adaptive partial heat load is recalculated.

After a regular shutdown and reactivation by an external heating control, the most recently saved value for the adaptive partial heat load is used as the target value.

Notes

3.3.4.9 Burner anti-cycling time for heating mode

The burner anti-cycling time limits the number of switching cycles in Heating mode. It is started when the heat demand signal (terminals 3–4 VR 36, eBUS or internal regular shutdown) no longer exists.
Effective burner anti-cycling time:

Calculated	Set maximum burner anti-cycling time												
Flow temperature	1	5	10	15	20	25	30	35	40	48	50	55	60
20	2.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	48.0	50.0	55.0	60.0
25	2.0	4.5	9.2	14.0	18.5	23.0	27.5	32.0	36.5	41.0	48.0	50.0	54.5
30	2.0	4.0	8.5	12.5	16.5	20.5	25.0	29.0	33.0	37.0	41.0	48.0	49.5
35	2.0	4.0	7.5	11.0	15.0	18.5	22.0	25.5	29.5	33.0	36.5	40.5	44.0
40	2.0	3.5	6.5	10.0	13.0	16.5	19.5	22.5	26.0	29.0	32.0	35.5	38.5
48	2.0	3.0	6.0	8.5	11.5	14.0	17.0	19.5	22.5	25.0	27.5	30.5	33.0
50	2.0	3.0	5.0	7.5	9.5	12.0	14.0	16.5	18.5	21.0	23.5	25.5	28.0
55	2.0	2.5	4.5	6.0	8.0	10.0	11.5	13.5	15.0	17.0	19.0	50.5	55.5
60	2.0	2.0	3.5	5.0	6.0	7.5	9.0	10.5	11.5	13.0	14.5	15.5	17.0
65	2.0	1.5	2.5	3.5	4.5	5.5	6.5	7.0	8.0	9.0	10.0	11.0	11.5
70	2.0	1.5	2.0	2.5	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5
75	2.0	1.0	1	1	1	1	1	1	1	1	1	1	1

- The anti-cycling time is calculated from the target flow temperature and the maximum burner anti-cycling time that is set.
- Domestic hot water mode being on during the burner anti-cycling time does not influence the timing element.
- The timing element can be reset using the menu item **"Reset anti-cycl. time"** in the user menu or by pressing the mains switch.
- The maximum burner anti-cycling time can be adjusted under diagnostics code **"D.002"** between two and 60 minutes (factory setting 20 mins).
- The remaining burner anti-cycling time after a regular shutdown in heating mode can be called up under the menu item **"Reset anti-cycl. time"** in the user menu.

3.3.4.10 Frost protection mode

If the flow temperature (measured on the flow temperature NTX) falls below a value of 8 °C, for 30 minutes:

- The prioritising diverter valve is moved to a mid-position between heating mode and domestic hot water mode
- The heating pump is switched on.

This sends current temperature values to the flow temperature NTC from the heating installation and the heating water is mixed. If the flow temperature exceeds 10 °C, the pump is switched off again before the end of the 30 minutes. At the end of the 30 minutes or if the flow temperature falls below 5 °C, the burner is operated with the partial heat load set. Heating mode is switched off if the flow temperature exceeds 35 °C.
Frost protection mode ends irrespective of the aforementioned measures, if:

1. Domestic hot water mode or
2. Heating mode is requested.

Notes

3.3.4.11 Cylinder charging mode with uniSTOR

The units are equipped with two alternative cylinder charging options. Either via a **NTC sensor cylinder** or a **C1/C2 switching contact**.

Cylinder charging with cylinder and NTC sensor

The current cylinder temperature is reported to the electronics via the NTC. If the actual value of the cylinder NTC is **5 K** below the target value set on the electronics box, the pump and fan are switched on and the prioritising diverter valve is moved to the domestic hot water position. The burner is started after the pump start-up time.

Cylinder charging mode is ended if the cylinder temperature actual value is the same as the target value. A pump overrun that can be set in the diagnostics system (D.072, default setting = 2 min.) then occurs.

Cylinder charging can be blocked by the time programme of a weather-compensated control.

The unit output for cylinder charging mode can be set via the DIA system (diagnostics code "D.077") and can be converted to kW units with whole figures (factory setting: 100% output). The adjustment range depends on the unit.

Time limit on cylinder charging mode

To avoid long cylinder charging times, e.g. when heating a large cylinder volume, a time limit is applied to cylinder charging mode because long cylinder charging times can have a negative influence on the ease of controlling the heating. This "maximum cylinder charging time" can be set to from 20 to 90 minutes on the display under **D.075** (factory setting: 48 minutes). If the cylinder charging time exceeds the set value, the cylinder priority switch is overruled for up to 30 minutes (fixed value) to handle a heat demand. If no heat requirement for heating is received within 30 minutes, the cylinder is recharged directly if required.

Burner anti-cycling time for cylinder charging

If the cylinder temperature approaches the target value, it can cause the unit to cycle and result in a longer cylinder charging time, as the energy generated by the boiler can no longer be absorbed by the cylinder. To reduce this cycle briefly before reaching the set cylinder temperature, a burner anti-cycling time is effective after the burner shutdown (target flow temperature reached).

- A heat requirement for heating remains ineffective during the anti-cycling time.
- The burner anti-cycling time is fixed at 1 min.
- During the burner anti-cycling time, the prioritising diverter valve remains in the "domestic hot water" position and the pump continues to operate.

Notes

Frost protection on the external cylinder
When blocking the cylinder charging mode using the control, a target cylinder temperature of 15 °C is specified.

Aqua Condens System plus differs according to market (data plate data)
The target flow value for cylinder charging with NTC sensor is calculated from the target cylinder temperature plus

- 15 K.
  Example:
- Cylinder target value 50 °C
- Target flow value 65 °C (50 + 15)

This means that the actual cylinder charging temperature depends on the target cylinder temperature set. This significantly increases the combustion value benefits in cylinder charging mode. However, if the return temperature falls during cylinder charging (e.g. due to large draw-off quantities) or the unit starts to cycle, the target flow value is set to the value defined under "D.078", e.g. 80 °C (only if this is higher than the target cylinder temperature plus 15 K) and the cylinder is operated with a higher output (limited by the cylinder partial load).

Self-optimising cylinder temperature control system
To further increase the hot water comfort of an external cylinder with regards to temperature fluctuations, the cylinder must be switched off so that it has reached the exact cylinder target value shortly after the end of cylinder charging. To ensure this, the cylinder must be switched off before the cylinder temperature is reached. The difference between the switch-off temperature and the cylinder target value depends on the design of the installation. After each reset and switching the power off/on at the mains, an optimised cylinder target value is determined from the first five cylinder charging cycles according to the following principle:

- The cylinder temperature is measured five minutes after switching off the burner and compared with the set target value.
- A new cylinder target value is then calculated for the charging cycle that follows. To do this, 2/3 of the temperature difference between the cylinder target value and the cylinder actual value (five minutes after burner shutdown) is deducted from the cylinder target value that is set.

Example:

Set cylinder target value	= 60 °C
Cylinder actual value (after five minutes)	= 63 °C
Temperature difference	= 3 K
New cylinder target value	= 58 °C (60 - 2/3 of 3)

Thermal disinfection
Thermal disinfection is used to regularly warm up a cylinder with a cylinder sensor to more than 60 °C to kill off legionella. It is activated by the external eBUS-compatible heating control. You can find details on this in the associated training documents for the control.

Notes

Cylinder charging requirement with external switching contact (C1/C2)

An external control (switching) or a cylinder switching field carry out the time control and temperature regulation of the cylinder. The electronics of the unit are only notified of the cylinder heat requirement via the terminals **"C1/C2"**.

If a cylinder heat requirement is sent:

- The heating pump switches on and
- The flow temperature control receives the fixed target value set in the diagnostics system (diagnostics code "D.078") (factory setting 80 °C) and
- the prioritising diverter valve moves to the hot water position

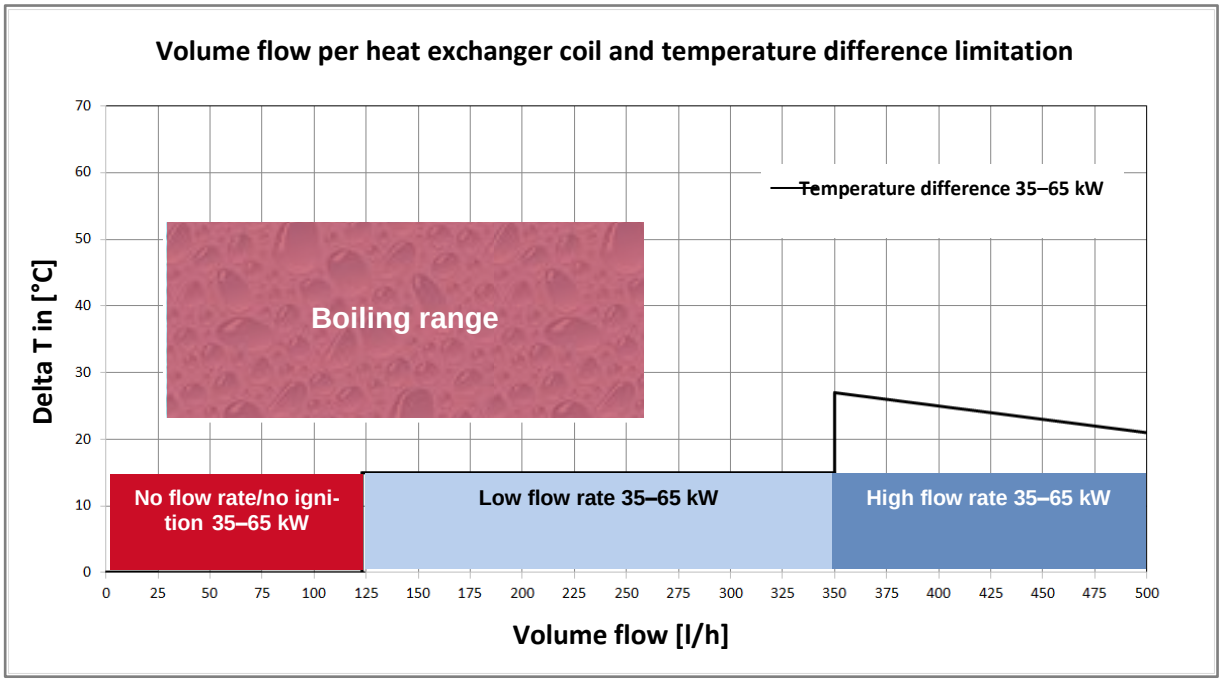
The cylinder partial load, time limit on cylinder charging mode, burner anti-cycling time for cylinder charging and pump overrun settings also apply to C1/C2. For combinations of units that actuate an external 3 way valve (e.g. via a cylinder switching field), the pump overrun for cylinder charging "D.072" must be set to "0" so that no unwanted hot water can enter the heating circuit.

Notes

3.3.5 Special functions

3.3.5.1 New! Control function of the remaining pump head, delta T limitation

This function is introduced to enable the boiler to operate without a low loss header.
You must ensure that the minimum circulation water volume is flowing through the primary heat exchanger (PWT) in order to prevent steam hammers caused by the boiling medium. The minimum circulation water volume is then distributed to the individual heat exchanger coils in the PWT. The circulation water volume per heat exchanger coil is between min. **125 l/hr** and max. **500 l/hr**, dependent on burner modulation and the stored modulation limitation delta T. The modulation limitation delta T is dependent on the actual volume flow (circulation water volume) of the boiler and is monitored via the pump PWM (pulse-width modulation) response.
The boiler operating field is separated into three operating fields' ex-works, depending on the circulation water volume per heat exchanger coil. The following graphic contains three different zones with an assigned **delta T** modulation limitation.



Delta T modulation limitation

Notes

1. **Zone:** No circulation water volume (OFR). Modulation not enabled as the minimum volume flow of **125 l/hr** per heat exchanger coil is not fulfilled. The burner therefore remains locked and the unit start is blocked.
2. **Zone:** Low circulation water volume (LFR). Modulation is enabled for a delta T of **15 K/minimum output (Pmin)**. This corresponds to a volume flow of **125 l/hr** to **350 l/hr** per heat exchanger coil. The burner is therefore enabled and the boiler starts and modulates within the delta T limitation.
3. **Zone:** High circulation water volume (HFR). Modulation is enabled for a delta T of **30 K/maximum output (Pmax)**. That corresponds to a volume flow **> 350 l/hr** per heat exchanger coil. The burner now operates without modulation limitation.
4. **Maximum delta T:** The maximum delta T limitation is at **35 K/maximum output (Pmax).**

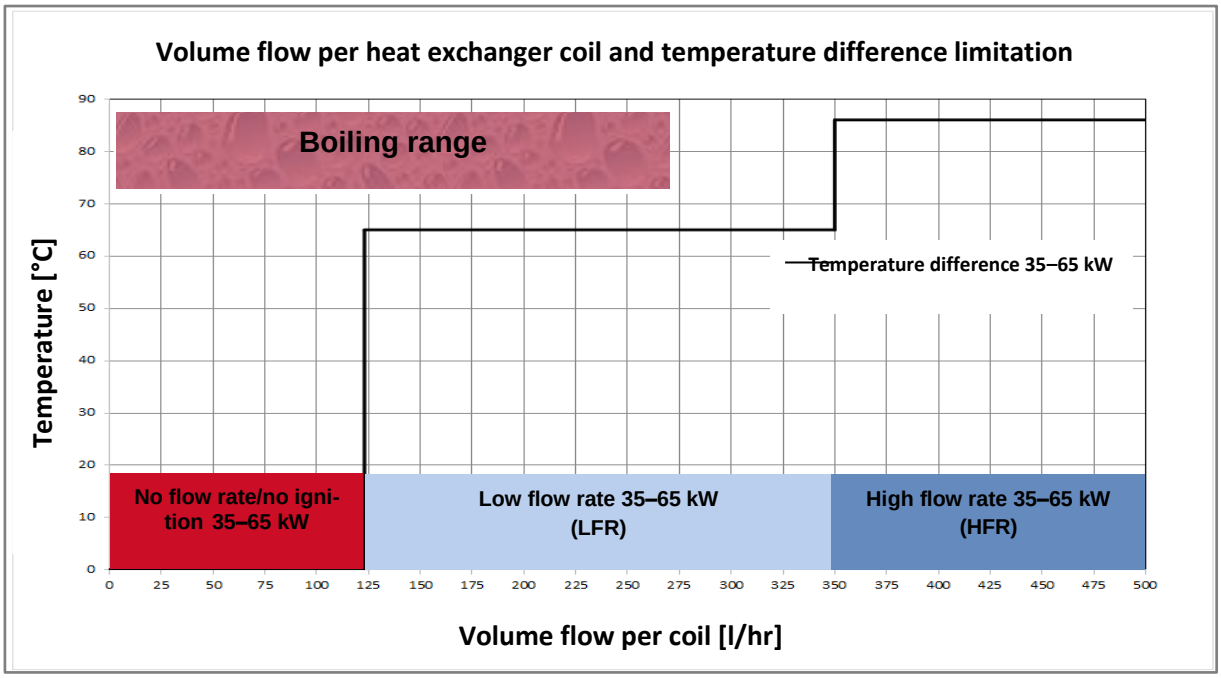
   If this temperature spread is exceeded, the burner is switched off and the boiler is blocked from continuing to operate. In this case, the heating installation should be re-evaluated by a competent person.

The unit electronics check the circulation water volume, and the status S.85 can then be read in the display.

The pump now starts every 10 minutes and the unit electronics check the response. If the volume flow has increased > LFR, the unit goes into operation and S.85 disappears.

Notes

3.3.5.2 New! Control function of the remaining pump head, temperature target value limitation



Modulation limitation max. °C

1. **Zone:** No circulation water volume (OFR). Max. Temperature target value not enabled as the minimum volume flow of **125 l/hr** per heat exchanger coil is not fulfilled. The burner therefore remains locked and the unit start is blocked.
2. **Zone:** Low circulation water volume (LFR). The max. Temperature target value is enabled for a flow temperature of **max. 65 °C**. This corresponds to a volume flow of **125 l/hr** to **350 l/hr** per heat exchanger coil. The burner is therefore enabled and the boiler starts and modulates within the temperature limitation of **65 °C**.
3. **Zone:** High circulation water volume (HFR). The temperature target value is enabled for a max. Temperature of **max. 85 °C**. That corresponds to a volume flow **> 350 l/hr** per heat exchanger coil. The burner now operates without a special temperature limitation.

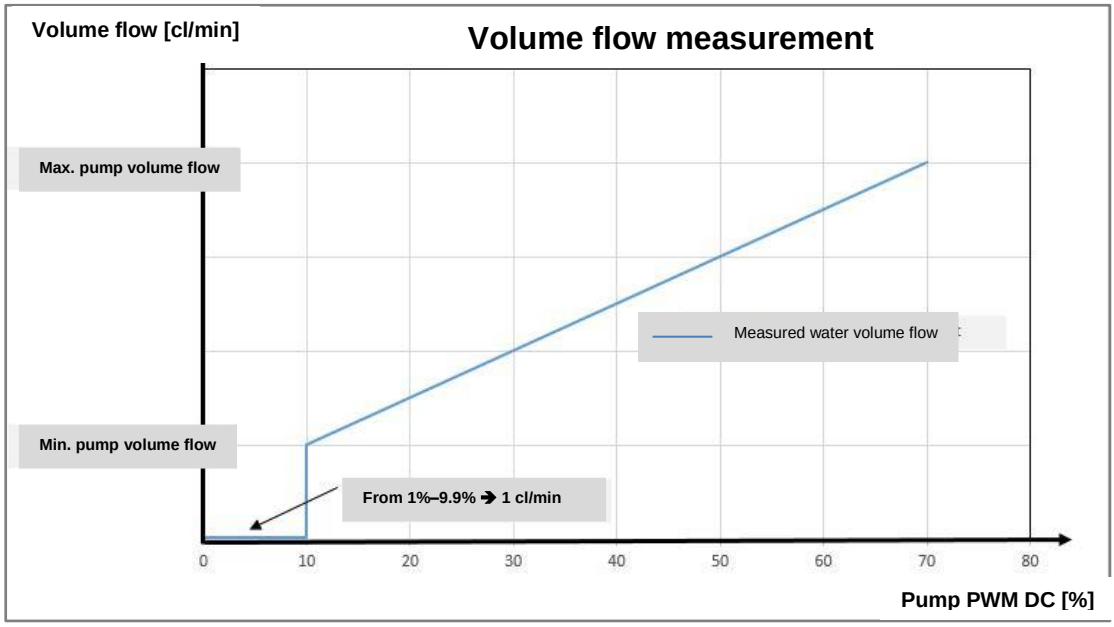
With the control functions, SDBG can ensure a continuous operation of the unit without operating blocks while supplying heat.

Furthermore, the number of switching cycles during operation is minimised (preventive maintenance).

Notes

3.3.5.3 New! Pump volume flow analysis

The units are supplied without a bypass valve for the heating circuit. The "volume flow analysis" function was added in order to measure the volume flow in the unit circuit. The measurement is carried out by analysing the pump's PWM response.
The aim of the function is to protect the primary heat exchanger against damage caused by boiling heating medium (steam hammers), with the volume flow measurement serving as a check.



Volume flow measurement and response via PWM

The volume flow analysis is also used for sophisticated pump fault indication. Under the parameter **D. 149** in the diagnosis display, **five** different messages with a defined diagnosis can be called up for troubleshooting. The current pump volume flow can be read under parameter **D. 29**.

Volume flow thresholds for fault indication:

Pump PWM DC %	Type	Fault code under D.149
77 - 82	Dry fire	Pump code **3** and **F75**
83 - 87	Alarm stop; electr. fault	Pump code **2** and **F75**
88 - 92	Alarm stop; pump blocked	Pump code **1** and **F75**
0	0% with pump running	Pump code **6** and **F75**

Notes

3.3.5.4 New! Calculating the remaining pump head (constant value)

The remaining feed head of the high-efficiency pump is calculated by the electronics for the set remaining feed head **(D.122 remaining feed head heating mode; D.148 remaining feed head cylinder charging mode)** as a constant value for the pump. Pressure losses during installation do not play a role. The focus is on the calculated remaining feed head from the project planning stage. In order to use the function, parameter **D.014 = 0** is required (0 = pump speed control relative to the constant remaining pump head)

Note:

New! For the Space heater unit, there are now two separate setting parameters for the unit pump's remaining feed head in different operating modes.

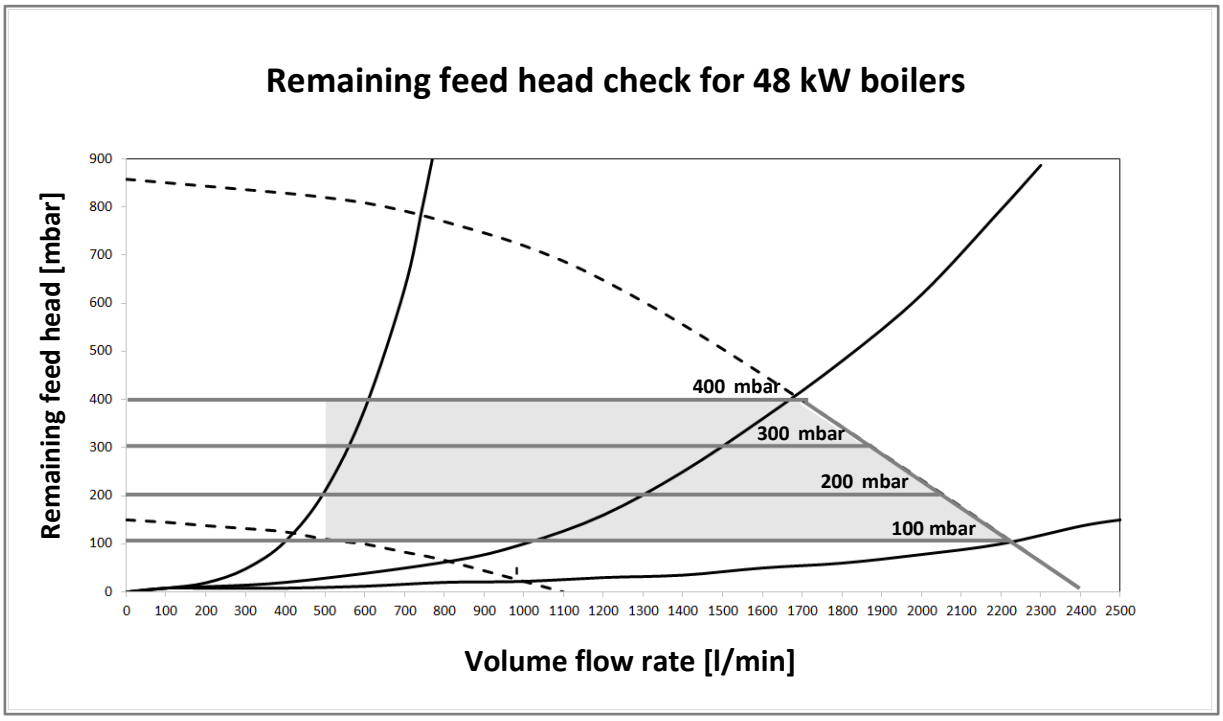
D.122 = remaining feed head in heating mode

D.148 = remaining feed head in cylinder charging mode

Via the PWM response, the electronics calculate and adapt the PWM signal for the high-efficiency pump, using the stored, pre-set remaining pump head and the actual volume flow. This ensures a constant control of the pump and the minimum circulation water volume.

Stored calculation formula:

Remaining pump head = a x PWM^2 +b x c x volume flow^2 + d x volume flow + e



Constant remaining feed head of the high-efficiency pump

Notes

Description of D.014

In addition to the diagnostics code, a further function was stored. If the **"Auto"** setting (factory setting) is stored, the pump modulates in parallel with the current burner modulation, provided that a minimum volume flow (LFR) is exceeded.

New! If the minimum volume flow (LFR) is not reached, the electronics switch the pump mode to **"constant control"** and raise the remaining pump head to the stored value of the max. Remaining feed head under **D.122** (heating mode)/**D.148** (cylinder charging mode).

The constant control will take effect in heating installations without a low loss header (e.g. non-calculated pipe systems; when replacing an old boiler). The function is not started in installations with low loss header, as the minimum volume flow is easily reached.

Notes

3.3.5.5 New! Operating without a low loss header

Units with an output of 48–65 kW are released for installation without a low loss header. In order to implement this installation type, a low or high volume flow must be ensured. The function is enabled under the parameter setting **D.014 = 0–5.**

Here, too, the operating mode as described in **sections 3.3.5.1 and 3.3.5.2** applies.

Volume flow 48 kW	
Low volume flow (Low Flow Rate LFR)	500 l/hr
High volume flow (High Flow Rate HFR)	1400 l/hr
Volume flow 65 kW	
Low volume flow (Low Flow Rate LFR)	675 l/hr
High volume flow (High Flow Rate HFR)	1900 l/hr

If the volume flow is below **500 l/hr** (0 volume flow zone; OFR Zero Flow Rate), heating mode is not possible. If there is a heat demand in this condition, the unit electronics check the current volume flow with a pump start-up every **10 min** in order to decide whether it is possible to start the heating mode.

If the volume flow is **> 500 l/hr and < 1400 l/hr** for 48 kW (low volume flow zone; LFR Low Flow Rate); **> 675 l/hr and < 1900 l/hr** for 65 kW, heating mode is possible with restricted output and flow temperature.

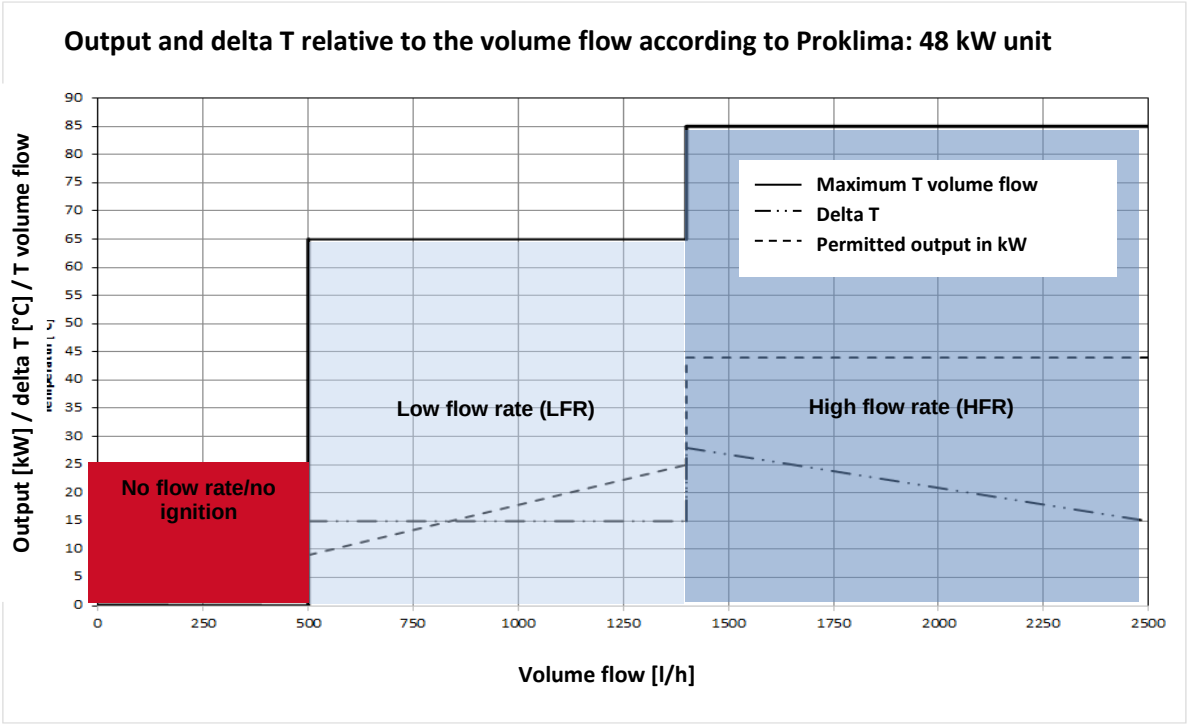
- Max. Flow temperature limitation = **65 °C**
- Max. Output limitation with delta T = **max. 15 °K**

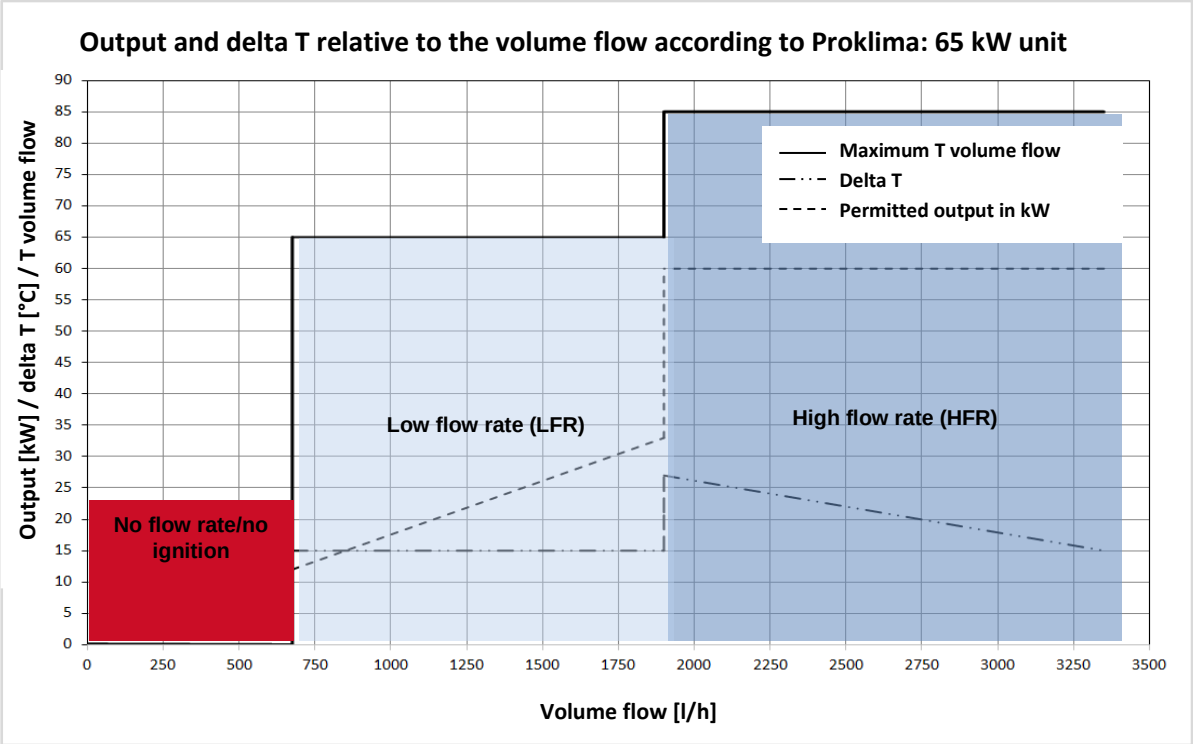
This function limitation is intended to prevent steam hammers in the PWT.

If the volume flow is **> 1400 l/hr** 48 kW **(> 1900 l/h** 65 kW**)** (high volume flow zone; HFR High Flow Rate), heating mode starts without limitation of the flow temperature and output.

Notes

The following diagram shows the function relative to the flow temperature and the output:





Notes

Note on **D.014**:

If the parameter **D.014** is set inside **1–5**, the responsible planner must calculated and ensure the volume flow on-site.

Notes

3.3.5.6 New! Fault indication for volume flow fault D.149

The parameter **D.149** describes the cause of a **F.75** fault message in order to facilitate the fault diagnosis for Customer Service or the competent person.

D.149 table:

No.	Cause	Description	Operation interlock	Status/fault **+ D.149**
1	No volume flow	Water deficiency	-	F.22
2	Pressure sensor defective	E.g. sensor is stuck at e.g. 1 bar	No	F.75 + 5
3	No volume flow + Pressure sensor defective	Water deficiency + e.g. sensor is stuck at 1 bar	No	F.75 + 3
4	No volume flow	No circulation water volume (heating circuit closed) Volume flow < LFR zone limit	-	S.85
5	No volume flow	No circulation water volume (heating circuit closed) Volume flow = 0 l/hr	-	S.85
6	No volume flow	No circulation water volume Pump blocked	No; following three unsuccessful attempts	F.75 + 1
7	No volume flow	No circulation water volume Pump is defective (pump PCB)	No; following three unsuccessful attempts	F.75 + 2
8	No volume flow	No circulation water volume Pump is defective (dry fire)	No; following three unsuccessful attempts	F.75 + 3
9	No volume flow	No circulation water volume Pump does not run (no 230 V AC)	No	F.75 + 6
10	No volume flow	Test of circulation water volume following purging not successful, Volume flow < LFR zone limit	No	F.75 + 8
11	No pump ID after switching it on	Pump ID does not match the unit	No	F.75 + 7
12	Volume flow but no PWM response	PWM response interrupted	No	F.75 + 6
13	Volume flow but no PWM control signal	PWM control signal interrupted	-	No fault

Notes

3.3.5.7 New! Pump identification

When the unit is started, the electronics check the available unit pump with an identification routine. This routine is only available in the pump electronics for the Grundfos UPMM 25–105 (65 kW) pump. No routine is available for the Grundfos UPMM 25–85 (48 kW) pump

The pump sends the following diagram via the PWM analysis response:

Pump	Type	Response 1 **[2 s]**	Response 2 **[2 s]**	Response 3
Grundfos UPMM 25–105	10.5 m	60% ± 2%	90% ± 2%	100%

In the output range of **65 kW** the Grundfos UPMM 25–105 pump must always be selected for pump replacement. Otherwise, the pump is not recognised by the unit electronics.

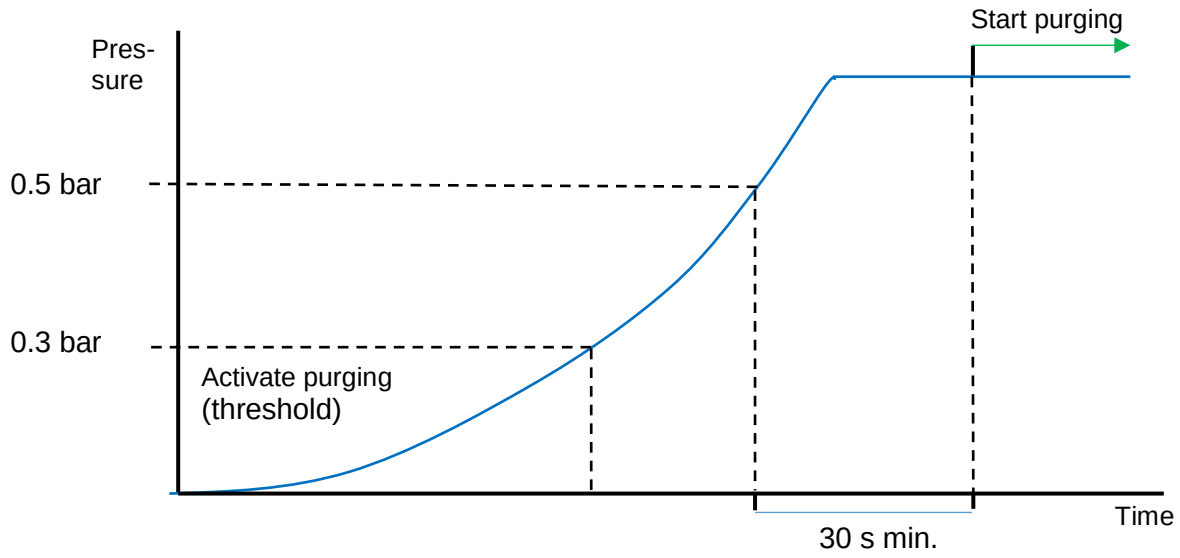
3.3.5.8 New! Automatic purging function

Start condition and boiler purging:
If the unit/system pressure has fallen below **0.3 bar** for at least **15 seconds**, the point for a purging sequence is set. The unit/installation purging is started from **0.5 bar**.
If the heating pressure in the primary circuit rises above **0.5 bar** for **30 seconds** (start-up), an automatic purging function starts. The function starts repeatedly if the system pressure has fallen below **0.3 bar** for at least **15 seconds** (e.g. purging of heating surfaces or other causes) during servicing (maintenance). After filling the installation, the purging starts if **0.5 bar** has been exceeded for at least **30 seconds**.

- The function cannot be stopped, even by the competent person.
- The burner does not start before the purging process has been completed.
- After the purging, no air remains in the unit, which reduces the risk of damage caused by cavitation and of noises in the heating installation.
- Stored time periods for automatic purging: Domestic hot water circuit **390 seconds**; heating circuit **390 seconds**.

Following the automatic purging, the volume flow is measured (heating circuit or hot-water charging circuit) to ensure that the unit has been purged. Purging is completed when the threshold of the low volume flow (Lower Flow Rate) has been exceeded.
If the threshold has not been exceeded, the purging function was not fulfilled and fault **F.75** is displayed.

Notes



Flow chart for automatic purging

Notes

3.3.5.9 48–65 kW automatic air separator

Functional principle:

The air separator used has the task of continually dividing the remaining air bubbles in the heating circuit and then separating them via a downstream automatic air vent.
The air separator is divided into four different zones, which are the following:

- **Segregation zone (dividing zone):**

  In this zone, gravity is used to separate large air bubbles from the medium (heating water).

- **Aggregation zone (collecting zone):**

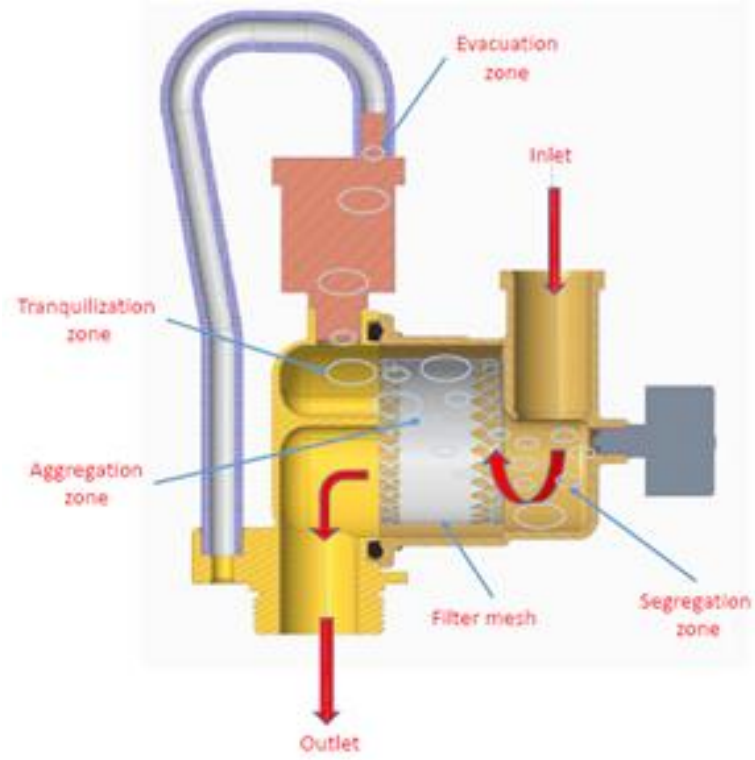
  In this zone, a fine filter mesh catches small air bubbles and diverts them to the top. Above the filter mesh, the small air bubbles join to become large air bubbles again and are separated.

- **Tranquillisation zone (deceleration/flow):**

  This zone is free from flow, shielded by the upstream fine filter. In this zone, the air bubbles rise up to the automatic air vent.

- **Evacuation zone (diversion zone):**

  A mechanical/automatic air vent continually discharges the separated air via a connected drip line.



Automatic air separator

Notes

3.3.6 Safety functions

3.3.6.1 Gas flame sequence control

Normal operation:

As soon as the conditions for a burner start are met by the target/actual value comparison and the fan has reached its ignition speed, the ignition transformer and the gas valve assembly are actuated. The safety period of 5 seconds starts. During the safety period, re-ignition is possible if the flame goes out. As soon as the flame has been recognised by the ignition/monitoring electrode, the igniter switches off and a stabilisation time of 3 seconds starts. During this time period, the flame must be permanently visible.

Fault shutdown during start-up:

If, at the end of the safety period of 5.5 seconds or within the stabilisation time, no flame is recognised, the following occurs:

- The gas valve assembly and the ignition transformer are disconnected.
- The fan runs for 7 more seconds and ventilates the burner room.
- Four further start attempts are carried out with the fan running
- After the fifth start attempt without flame recognition, the gas flame sequence control switches off (fault message "F.28").

If an ignition attempt fails, it may be possible that limit gas is preventing over-ignition of the burner. The gas quality must then be guaranteed via the supplier.

Notes

Fault shutdown in operation

If the flame shuts down in heating mode, the following occurs:

- switch-off sequence of the gas valve assembly and the fan and
- Four further start attempts (see section "Fault shutdown during start-up").
- After the last start-up attempt, a locking switch-off sequence is triggered with the fault message "**F.29**".

Simulated flame signal

Flame simulation or false burn results in a locking switch-off sequence with the fault message "**F.27**".

3.3.6.2 Safety cut-out (SCO)

The safety cut-out is triggered when the temperature in the unit is too high. In the event of a fault, a locked fault shutdown is carried out with fault message "**F.20**". The NTC resistors on the flow and return are evaluated for temperature limiting. If the flow or return temperature exceeds 97 °C while the gas valve is actuated, fault shutdown is triggered. The heating pump remains in operation until the flow temperature has fallen below 80 °C.

3.3.6.3 Dry fire protection

Dry fire protection is carried out differently in various operating situations.
Dry fire protection via pressure monitoring
Dry fire protection with flow and return sensors.
Dry fire protection with volume flow measurement (pump PWM response)

3.3.6.4 Pressure monitoring with water pressure sensor

1. Minimum pressure with pump switched off

On start-up, a minimum pressure of 0.51 bar must be measured by the water pressure sensor before switching on the pump. If the system pressure measured is < 0.49 bar when starting the unit, the pump will not switch on. The unit is blocked and the message "0.0 bar" is output flashing on the display. The block is reset once the system pressure is ≥ 0.51 bar.

2. Minimum pressure 0.7 bar with pump running

When the circulation pump is running, the pressure on the water pressure sensor must rise to the value of 0.7 bar within 20 seconds. If it does not, the unit shuts down and locks with "0.0 bar" flashing in the display. The block can only be removed by filling the installation, by the system pressure increasing to ≥ 0.7 bar, by switching the power on at the mains or by performing a reset.

3. **Maximum pressure ≥ 4.0 bar**

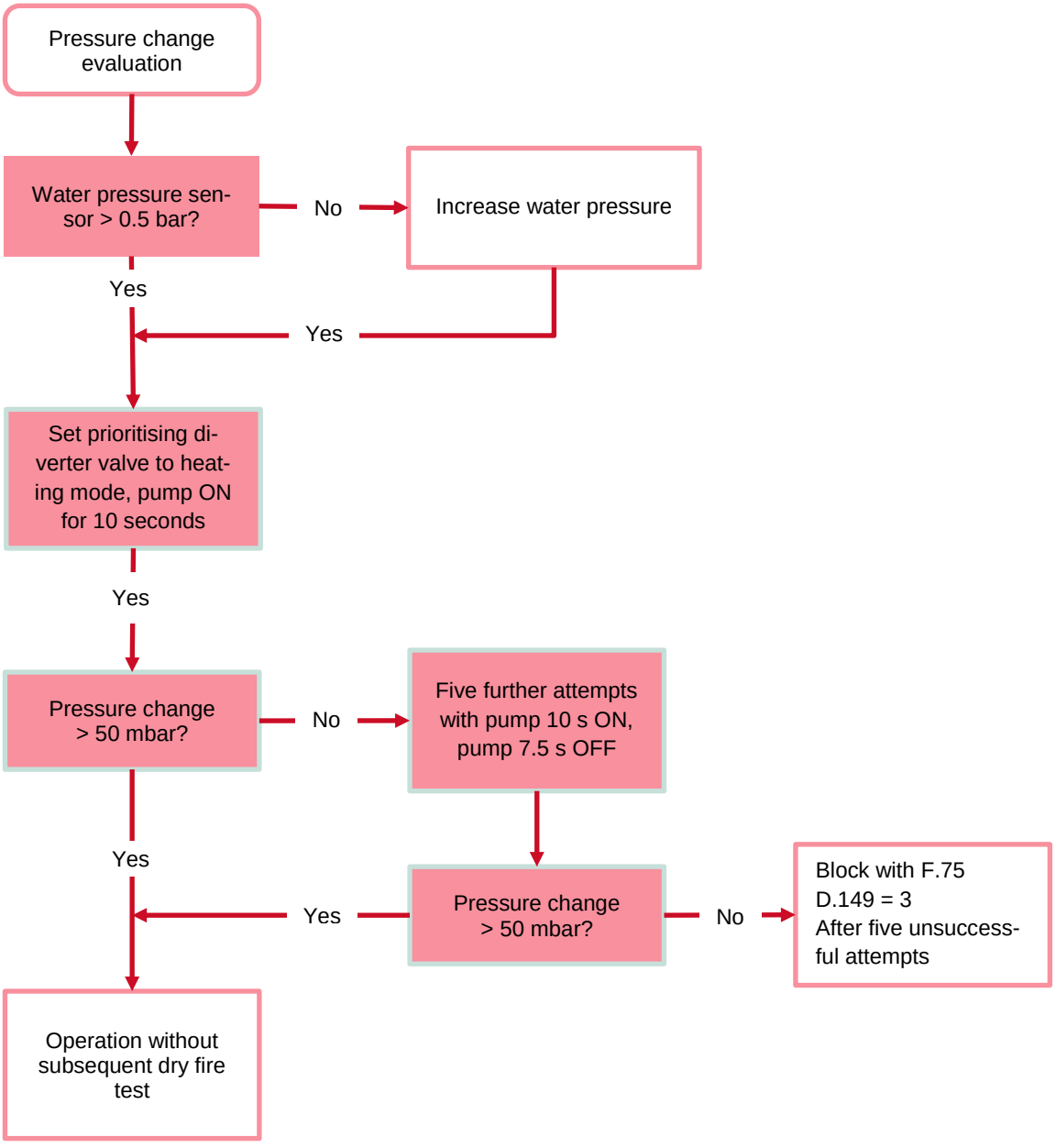
If the measured system pressure is > 4.0 bar:

- the status message "S.41" appears under "Status",
- the pressure value flashes on the display,
- the unit and its functions continue to work normally.

The status message "S.41" no longer appears in the status display when the measured system pressure is < 4.0 bar

Notes

3.3.6.5 Pressure change detection



The pressure change detection is carried out before every unit start-up

.

Notes

3.3.6.6 Dry fire test by NTC

1. Test for temperature change without burner operation

The dry fire test can already be successful during unit start-up without burner operation.

Testing process:

If the burner is not in operation and the measured temperature value at T flow is > 110 °C or at T return is > 110 °C, the burner is blocked and only the pump is started until the current measured temperature has fallen to < 80 °C. The burner is then released again.

2. Test for temperature change with burner operation

Testing process

If the burner is in operation (flame recognised) and the measured temperature value at T flow is > 97 °C or at T return is > 97 °C, the burner is stopped and blocked, the unit pump continues running until the current measured temperature has fallen to < 80 °C. The burner is then released again.

3.3.6.7 Low-water pressure protection

Temperature rise too rapid

If the flow temperature or return temperature rises quicker than 10 K/s, the unit cuts out for 10 minutes and then attempts to restart. During the block, the status message **"S.54"** appears in the display. After the fourth failed attempt in a row, the unit is shut down and locked. The fault message **"F.24"** is displayed.

Temperature difference too great

If the temperature difference between the flow and return NTC is greater than 30 K > 3 sec, the unit operates with a minimum load for 10 minutes (status message **"S.53"** in the display). If the difference of 35 K is measured, a block is imposed for 10 minutes (status message **"S.53"** in the display) and, after five subsequent attempts (to increase operating safety), a locking switch-off sequence is triggered with **"F.23"**.

3.3.6.8 Determining the volume flow

See section 3.3.5.1 and following sections.

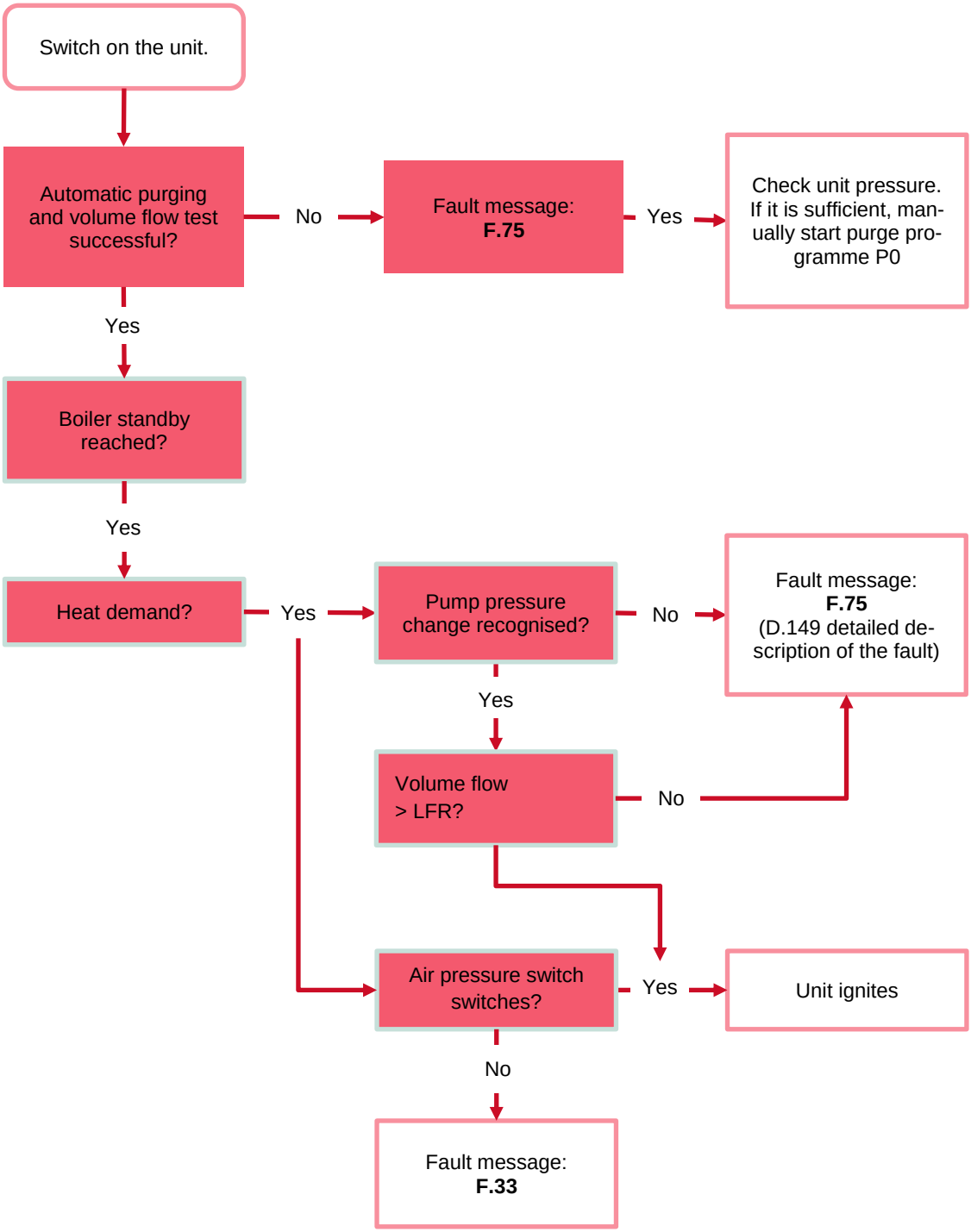
3.3.6.9 Test during operation

1. Monitoring the flame signal. Up to five ignition attempts possible.
2. Monitoring the 230 ± 5 V electric power supply

Notes

3.3.6.10 Unit start-up strategy

Unit self-test before every heat demand:



Notes

3.3.6.11 Flue gas fan ARA (automatic pipe length adjustment)

In this function, the connected length of the flue gas system (resistance) is correlated to the fan output (ARA). Thanks to this correlation, blocks in the flue pipework or overly long flue pipework's are detected. If the flue gas system resistance is too high, the unit is switched off with an operating block. Possible status and fault messages are: **S.33**; **F.33**.

The unit always starts with the last measured rotational speed value during the automatic pipe length adjustment of the flue system (ARA). If this value is not sufficient, a new ARA is initiated and carried out. If this adjustment is not sufficient, the flue pressure switch will not switch (**F.33**); now the function of the pressure switch or the condition of the flue system must be checked.

Notes

4 Accessories

What to expect from this section:

This section provides you with an illustration of the important accessories for use the with Space heater system. The full overview of all accessories can be found in the normal country-specific planning information and price lists.

4.1 Overview of accessories

4.1.1 Electrical accessories

Accessory modules for installation in the unit electronics box		
Accessories	Description	Benefits
	**Multi-functional module**	The 2 in 7 multi-functional module can be used if it is necessary to connect external components.
	**eBUS coupler** Accessory module	The modulating bus coupler must be used to expand the systems of the control or MiPro if more than one heat generator is fitted in the installation.

Notes

Room thermostats		
Accessories	Description	Benefits
	**Exacontrol E7C**	Room temperature control (eBUS) - Optimise the boiler - Combined with outdoor sensor on the boiler - Time programmes - Auto-adaptive heat curve
	**netATMO**	An intelligent room temperature control as a 1-circuit control with weather function can be used: - With a boiler (3-4-5 contact and/or 24 V RT contact) - Without a domestic hot water circuit

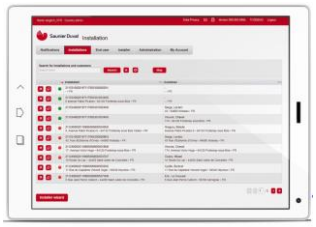
Notes

eBUS control, weather-compensated		
Accessories	**Description**	**Benefits**
	**MiPro (R)**	The inexpensive weather-compensated control unit for simple systems, e.g. for residential dwellings or detached houses
	**RED-3**	MiPro + RED-3 wiring centre: All individual configurations are possible, especially for new-build house or semi-detached houses with solar systems, heat pumps or multiple-zone systems, etc. - Can be used with MiPro (R) - Extension to up to two regulated heating circuits - Extension to a solar control for domestic hot water - Basic buffer management - Connections for actuators and sensors
	**RED-5**	MiPro + RED-5 wiring centre: for large systems e.g. multi-family dwellings for social housing - Can be used with MiPro (R) - Expansion to incorporate up to three regulated heating circuits - Extension to a solar control for domestic hot water - Basic buffer management - Connections for actuators and sensors

Notes

eBUS control, weather-compensated		
Accessories	**Description**	**Benefits**
	**MiPro remote (R)**	- Can be used with MiPro (R) - Remote control with room temperature control - Setting the target room temperature - Room air humidity measurement with activated cooling function
	**MiGo**	Intelligent eBUS control as a 1-circuit control with weather function can be used with: - A boiler (eBUS) -A domestic hot water circuit

Notes

Gateway/connectivity		
Accessories	Description	Benefits
	**MiLink**	MiLink is the central SDBG gateway — One gateway for all SDBG systems and the ability to offer additional services both today and in the future (remote access, app, EEBUS, Qivicon, single-room temperature control) — Compatible with all eBUS units from 2007 onwards — Fast set-up thanks to integrated WLAN
	**MiConnect**	• **SDBG offers access to the customer's heating system on site** – Access to millions of units on the market – Diagnosis and analysis of fault messages and status messages – Assistance with the commissioning of new systems – Optimisation of units/system applications – On-site data recording – System overview with fault indicator – Read-out of unit/system parameters – Recording of unit/system parameters – Storage of system parameters (backup file) – Support for on-site service – Application for internal warranty service/service company/service partner — Application for the external building trade/trade partners
	**MiPortal**	Diagnostics software — Remote monitoring possible — Controlling the installation — Fault diagnostics

Notes

4.1.2 Hydraulic accessories

Domestic hot water cylinder		
	Description	Benefits
	**FE standard cylinder** **Min. cylinder content of 300 litres**	— Three-components Foamed insulation allows the maximum amount of energy to be saved while also offering a compact external diameter (fits through a standard door) — Carrying aid and adjustable feet with anti-noise function installed at the factory
	**Heat exchanger for system separation**	— Market-based introduction in different sizes
	**Low loss header**	— Market-based introduction in different sizes
	**Service valves**	— 11/4“

For further components, refer to the valid list of accessories for the relevant market

Notes

Other accessories		
	Description	**Benefits**
	**230 V 3-port valve** New! 11/4", supplied by Orkli Other valves are not compatible due to the noise class	– The valve enables switching between domestic hot water and heating mode. External installation in the heat generator's installation hydraulics
	**Flue gas adapter** **80 to 110 mm**	– Integration of Space heater 48–65 kW into a cascade system
	**Flue non-return flap**	– Mechanical, 80 mm ⌀
	**Flue non-return flap with motor**	– 110 mm diameter

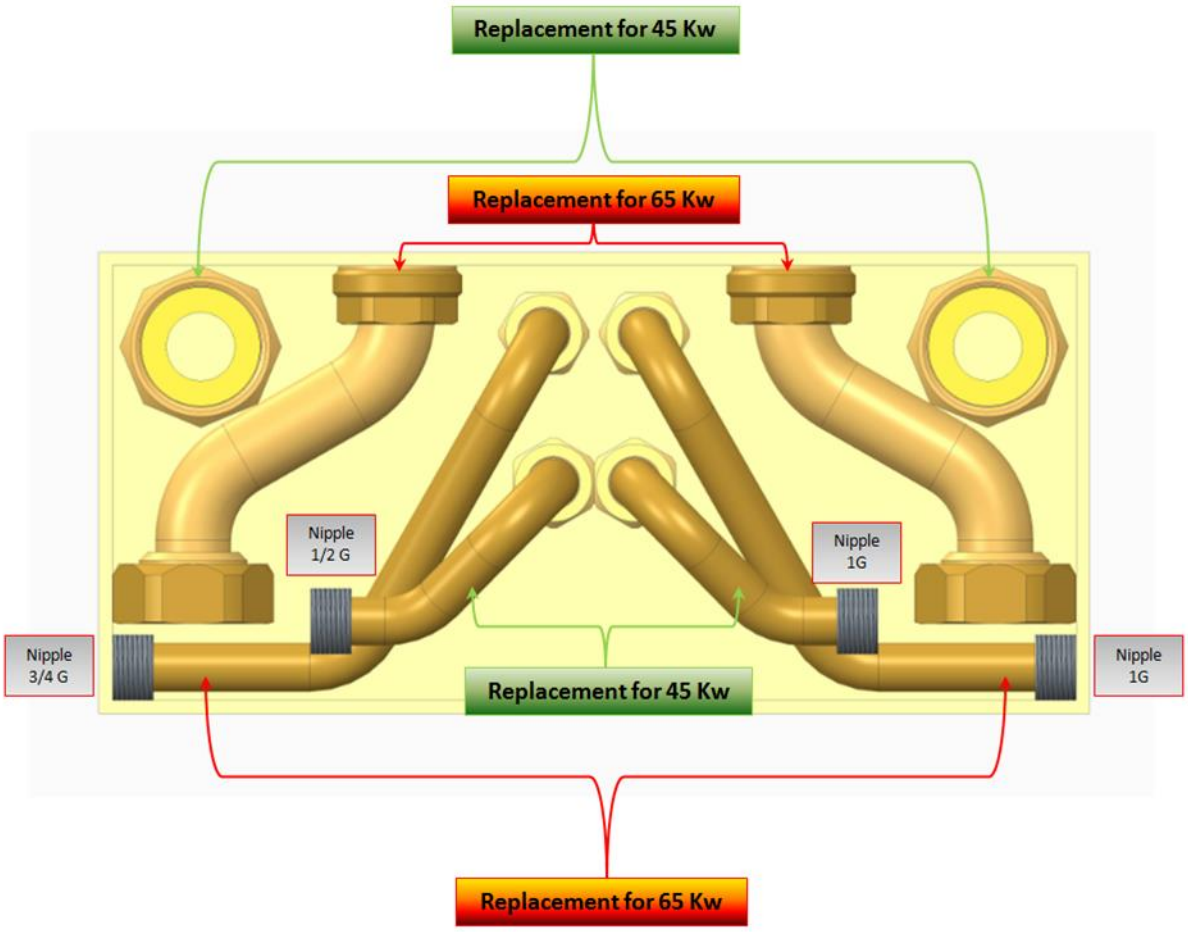
Notes

Other accessories		
	Description	**Benefits**
	**Condensate lifting unit with neutralisation**	– Up to 200 kW output
	**Neutralisation**	– Up to 450 kW
	**Condensate lifting unit with neutralisation**	– Up to 360 kW
	**Condensate lifting unit**	

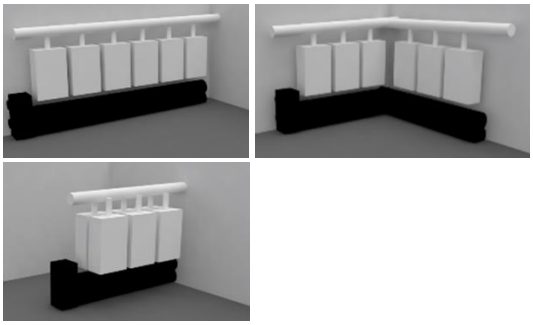
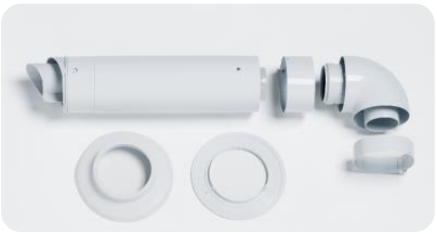
Notes

4.1.3 Overview of the different accessories New!

May vary in the different markets.



Notes

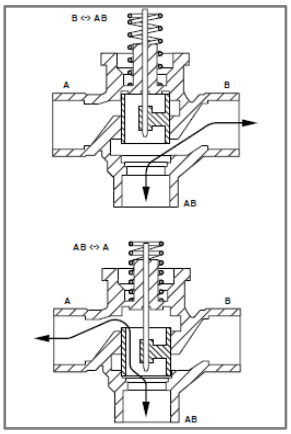
Other ecoTECplus/5-5 accessories		
	Description	Benefits
	**New! Rig installation** Improved frame for ground installation	— Installation of boiler cascades if wall-mounting is not possible (available space, statics)
	**New! Low loss header** Improved low loss header for ground installation	— Ground installation accessory
	**Tried-and-tested flue gas system from SDBG**	— System-certified

Notes

4.2 Description of the accessories

4.2.1 Use of the accessories

4.2.1.1 External 3-port valve



Installed as a manifold in the heating flow of the heat generator.

Path AB <—> A: To the domestic hot water standby zone, valve spring loaded
Path AB <—> B: To the heating buffer volume, valve spring not loaded

Wiring of the 3-port valve:
Black = control signal
Brown = continuous voltage
Blue = neutral conductor

The drawing is not the final cross-section

4.2.1.2 Water softening cartridge with water meter and accessories

Water softening cartridge fixed installation

The water softening cartridge treats the top-up water for the entire heating installation. The filling water flows through the cartridge, which is filled with granules that lower the degree of hardness of the filling water. The water volume that has flowed through the cartridge is determined with the water meter. The sticker on the cartridge states after which water volume the granules are worn out and are no longer as effective.

EASY TIP The granules are not toxic and can be disposed of as regular household waste.

Notes

Notes

4.2.1.3 Multi-functional module (2 in 7)

The 2 in 7 multi-functional module can be used if it is necessary to connect external components. The data cable is connected to slot X40 on the PCB and the 230 V power supply is routed via the power supply cable to slot X12 on the PCB.

The "2 in 7 multi-functional module" was developed for the electrical connection with the eBUS electronics boxes. The module is generally integrated into the unit's electronics box to the immediate right of the PCB.

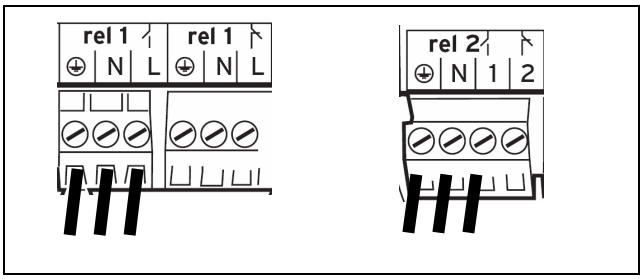
Relay 1 is programmed with the diagnostics parameter "D.027"

Relay 2 is programmed with the diagnostics parameter "D.028".

Display	Meaning	Display values/adjustable values
D.027	Switchover of relay 1 on the 2 of 7 accessory module	Circulation pump [1] External pump (default setting) [2] Cylinder charging pump [3] Flue non-return flap/extraction hood [4] External gas valve [5] External fault message [6] **Not active:** *Solar pump [7], eBUS remote control [8], Legionella protection pump [9]*
D.028	Switchover of relay 2 on the 2 of 7 accessory module	Circulation pump [1] External pump (default setting) [2] Cylinder charging pump [3] Flue non-return flap/extraction hood [4] External gas valve [5] External fault message [6] **Not active:** *Solar pump [7], eBUS remote control [8], anti-legionella pump. [9]*

Notes

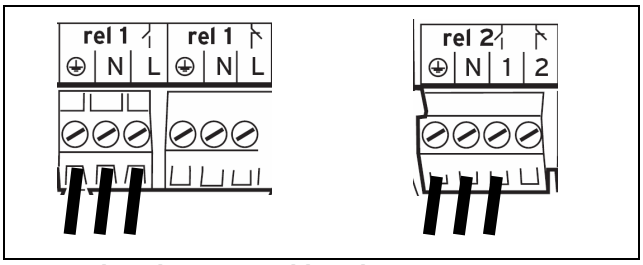
4.2.1.4 External solenoid valve



Connecting the external solenoid valve

The external solenoid valve is actuated simultaneously with the actuation of the internal gas valve.

4.2.1.5 External heating pump



Connecting the external heating pump

The external pump is only actuated, if:

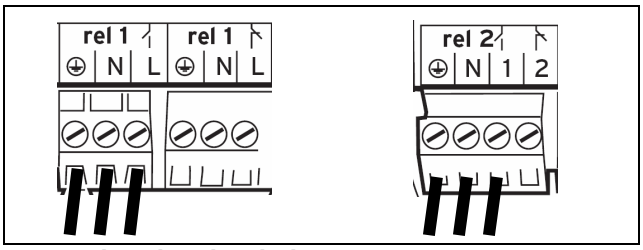
- The internal pump is actuated (mandatory condition),
- The prioritising diverter valve is in the heating position,
- A delay of 20 seconds has passed since the prioritising diverter valve was switched to the heating position.

The external pump is not actuated:

- If the prioritising diverter valve is in the domestic hot water position or
- The internal pump is not actuated.

Notes

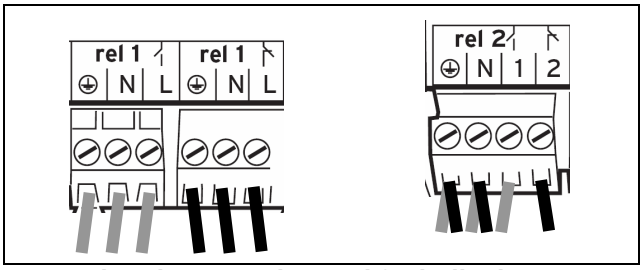
4.2.1.6 Circulation pump



Connecting the circulation pump

The electrical connection for a circulation pump is located on the external connection accessory. The time is controlled by the VRT 370(f)/VRC 700 control.

4.2.1.7 Operating and fault display



Connecting the operating and fault display

Closing contact = Fault message = grey

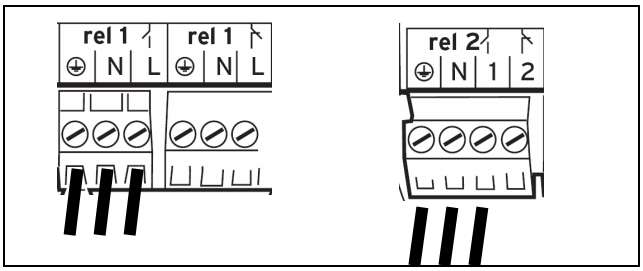
Opening contact = Operating display = black

The operating display lights up if the main switch of the unit is switched on.
The fault display is switched on in the event of:

- A flame fault,
- An active fault shutdown,
- After a failed plausibility check during locking by the freeze protection on the fan control.

Notes

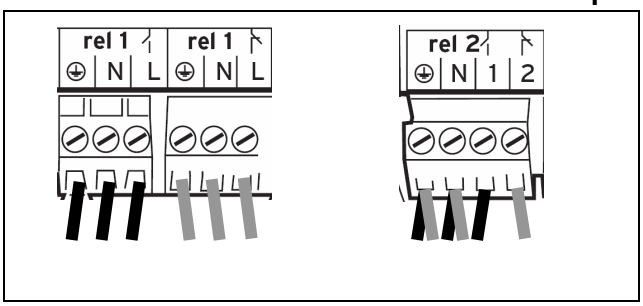
4.2.1.8 Cylinder charging pump



Connecting the cylinder charging pump

The cylinder charging pump outlet is always actuated if an external cylinder is being charged using the unit's internal control system.

4.2.1.9 Extraction hood/flue non-return flap



Connecting the flue non-return flap (black), fume extraction hood (grey)

The extraction hood is switched on when the burner is not running or 90 seconds after the unit has switched off. Otherwise, the extraction hood is locked by the module.

The flue non-return flap is actuated in the event of a heat requirement by the temperature control, in the event of a hot water demand, in cylinder charging mode and in the 90 seconds after the lapse of the heat requirement

- Closing contact = flue non-return flap = black
- Opening contact = fume extraction hood = grey

4.2.1.10 Flue non-return valve return signal

The flue non-return flap end switch reports the current position of the flue non-return flap via a two-pole wire, which is connected to a separate terminal.

The flue non-return flap end switch is closed if the flue non-return flap has reached its end position after start-up and is opened when the flue non-return valve closes. The burner is started when the flue non-return flap is opened and the end switch is closed.

Notes

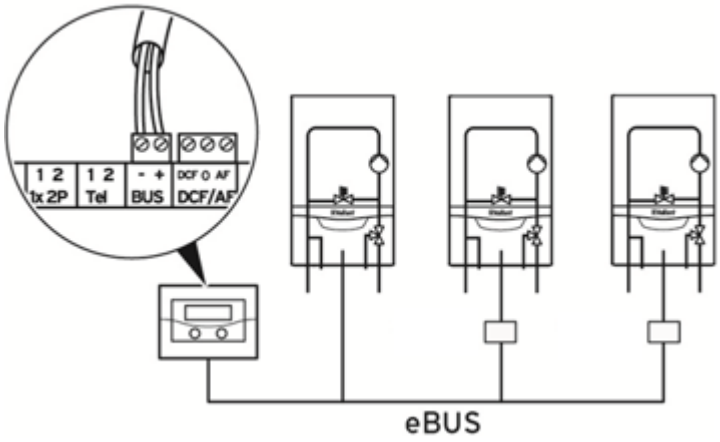
4.2.1.11 eBUS coupler connection

MiPro

The modulating bus coupler must be used to expand the systems if more than one heat generator is present in the installation. We recommend equipping **each heat generator** with a coupler.

The first unit in cascades can also work without an eBUS coupler, but here the polarity must be checked (+ to +), (- to -). The second unit is assigned the bus address 2, the third unit 3, and so on. A clear bus address must be set on the coupler with a rotary switch. The bus numbers must be assigned in ascending order. All other settings must be carried out on the central control.

Electrical wiring:



Wiring example MiPro

Notes

5 Planning requirements and practical information

In this section:

You will learn more about the planning of the heating installation. You will receive information regarding connection dimensions, basic requirements of the installation site and installation examples.

5.1 Installation sites and restrictions

Space heater 48–65 kW

- For radiator heating and underfloor heating, and as a post-heating installation (Space heater unit types) in heat pump installations with a buffer cylinder, with or without solar support
- Space-saving installation for new builds and the modernisation of single-occupancy and dual-occupancy houses, as a cascade also for apartment buildings (housing industry).
- Low-cost installation as a roof heating centre
- Open-flued or room-sealed operation with a system-certified flue gas system

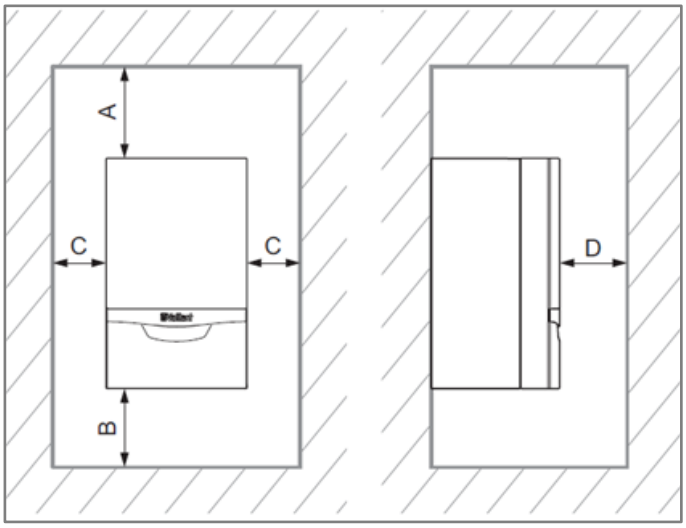
EASY TIP

The boiler is offering up-to-date performances and a good value for money, with clear and convenient handling during installation, commissioning and service operations.

Notes

5.2 Product requirements

5.2.1 Minimum clearances



Minimum clearances

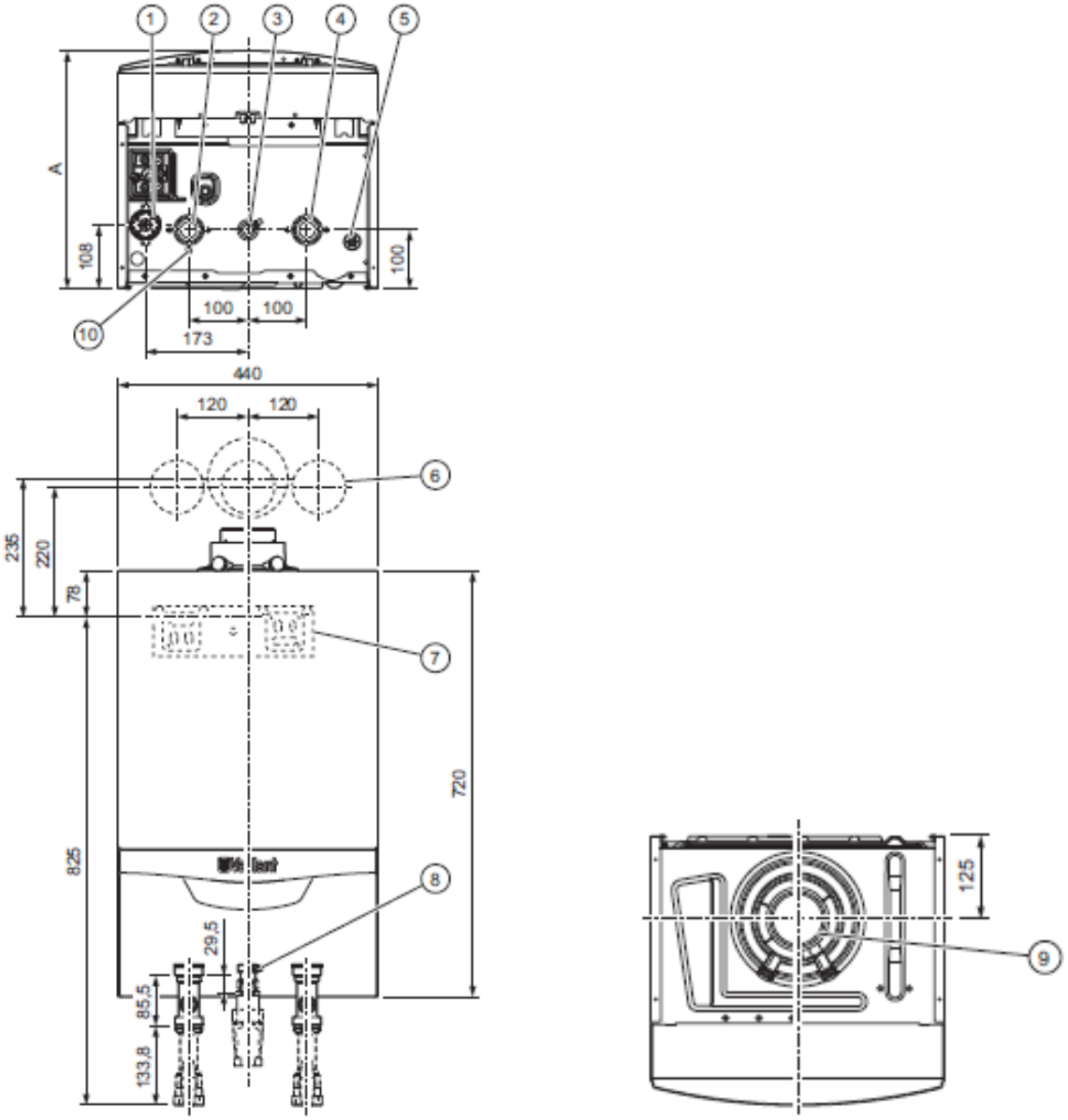
	Min. clearances	
A	**275 mm**: 80/125 mm diameter LAF	LAF = air/flue pipe
B	**180 mm**; optimal approx. 250 mm	
C	**5 mm**; optimal approx. 50 mm	
D	**500 mm**; clearance for unit maintenance that is required to open the front of the unit.	

No clearance is required between the unit and components made of combustible parts because the temperature at the unit's nominal heat output never exceeds the maximum permissible temperature of **85 °C**.

Lateral clearance is not required, but the side sections can also be removed if there is adequate side clearance (at least approx. 50 mm) to facilitate maintenance or repair work.

Notes

5.2.2 Dimension drawing and connection dimensions



48–65 kW dimension drawing

Key			
1	Condensate siphon	6	Flue connection (template)
2	Heating flow	7	Unit wall mounting
3	Gas connection	8	Gas connection pressure measuring point
4	Heating return	9	Flue connection (unit)
5	Precipitation drainage	10	Drip connection of the air separator
A	**48 kW** = 405 mm; **65 kW** = 473 mm		

Notes

5.2.3 Combustion quality requirements

The combustion air must be technically free of chemical substances such as fluorine, chlorine, sulphur, sprays, solvents and cleaning agents, paints, adhesives, etc. These types of substances may lead to corrosion damage in the unit or in the flue system during open-flued operation.
If the combustion air is guided over the shaft's annular gap and to the heat production source, the following applies:

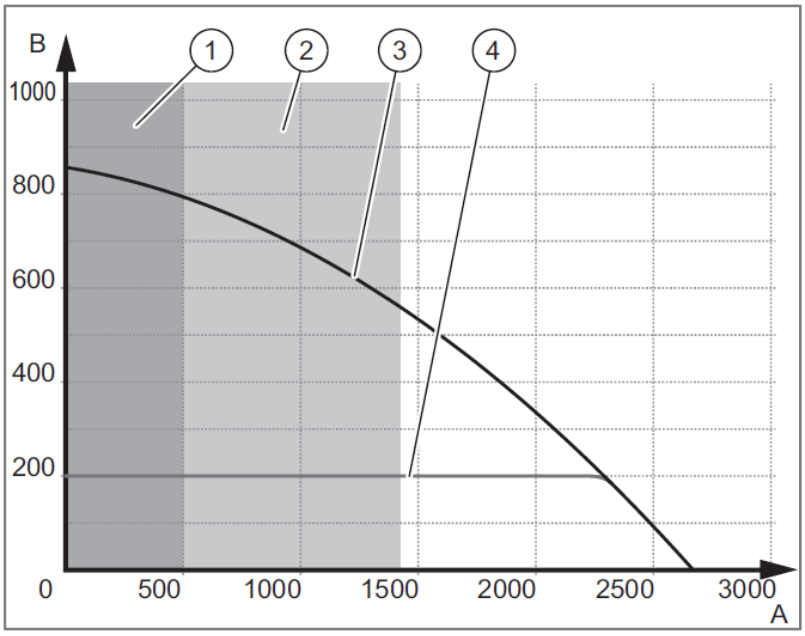
- Shafts that have been used and are not clean must be professionally cleaned and sealed before the flue system is installed. Otherwise, this may lead to operating faults.
- In this case, a double-walled system (flue gas-air mixture) should be used.

Particularly in hairdressing salons, paint shops or joiner's workshops, cleaning businesses and the like, the unit must be operated as room-sealed. Otherwise, a separate installation room is required to ensure that the combustion air is technically free of the aforementioned substances.

5.3 System requirements

5.3.1 Pump diagrams

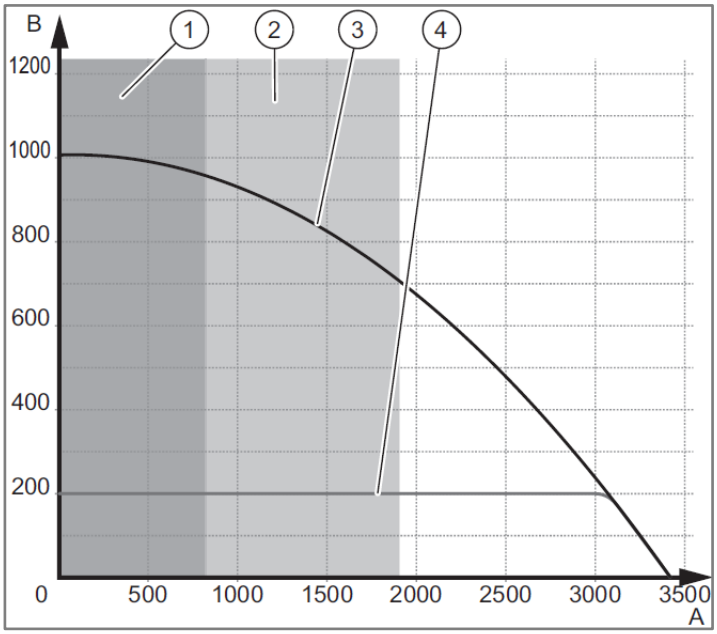
5.3.1.1 Grundfos HEP for all markets



Pump diagram for Grundfos UPMM 25–85; 7 heat exchanger coils

Key			
1	Volume flow range without unit operation	4	ΔP constant
2	Volume flow range in limited temperature and modulation mode	A	Volume flow in l/hr
3	100% pump curve	B	Remaining pump head in hPa (mbar)

Notes



Pump diagram for Grundfos UPMM 25–105; 9 heat exchanger coils

Key			
1	Volume flow range without unit operation	4	ΔP constant
2	Volume flow range in limited temperature and modulation mode	A	Volume flow in l/hr
3	100% pump curve	B	Remaining pump head in hPa (mbar)

Notes

5.3.2 Flue gas systems (certifications)

The entire Space heater range is suitable for use with SDBG DN 80/125 PP flue gas accessories and has been system-certified for use with these.
Deviating permissions (installation types) in the individual markets.

5.3.2.1 Possible flue gas installation types from the TRGI

Open-flued installation types

B 23: Flue connection to the flue system, combustion air supply via the installation room
B23P: (CE-certified flue pipe)
B 33: Connection to the flue system, supply of combustion air in external pipe via the installation room
B 33P: Connection to the flue system, combustion air supply in external pipe via the installation room (CE-certified flue pipe)
B 53: Without atmospheric sensing device and with corresponding flue pipework and wind guard
B 53P: Without down-draught diverter and with corresponding flue pipework and wind guard (CE-certified flue pipe)

Room-sealed installation types

C 13: Air/flue pipe through external wall in the same pressure range
C 13x: DE (if the flue system has no x approval, the installation room must be ventilated)
C 33: Air/flue pipe through roof in the same pressure range
C 33x: DE (if the flue system has no x approval, the installation room must be ventilated)
C 43: Connection to air/flue system (two-draw)
C 43x: DE (if the flue system has no x approval, the installation room must be ventilated)
C 53: Air supply and flue gas outlet to the outside in different pressure ranges
C 53x: DE (if the flue system has no x approval, the installation room must be ventilated)
C 63: Air/flue pipe through roof in the same pressure range
C 83: Flue connection on the flue system, multiple-flue configuration (negative pressure), Combustion air supplied through separate air pipe
C 83x: DE (if the flue system has no x approval, the installation room must be ventilated)
C 93: Combustion air supply and vertical flue gas outlet through roof.
C 93x: DE (if the flue system has no x approval, the installation room must be ventilated)
C.103: Air/flue pipe via existing air/flue system with multiple-flue configuration.
C 113: Air/flue pipe via air/flue system (concentric in the shaft) with multiple-flue configuration.

X Fresh air circulates around the flue pipe

Not all TRGI-approved flue gas systems are certified for the individual products; the selection of certifications is combined from the relevant project.

Notes

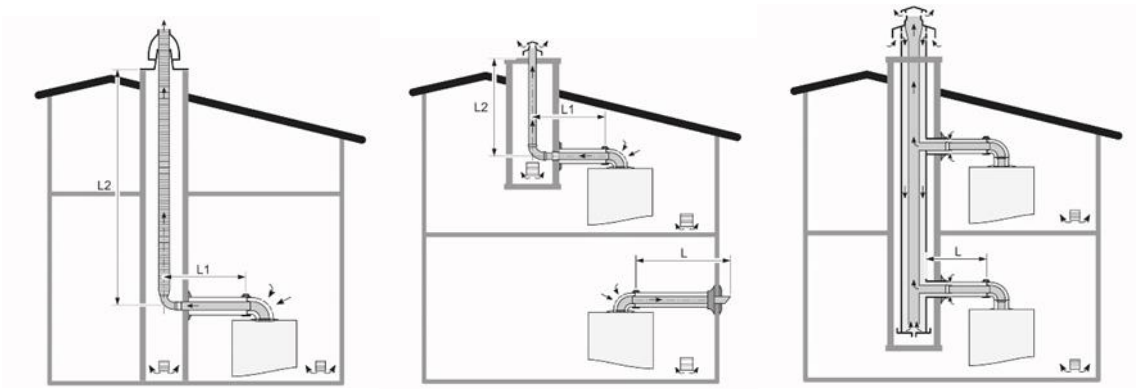
Notes

5.3.2.2 Flue gas certifications according to market

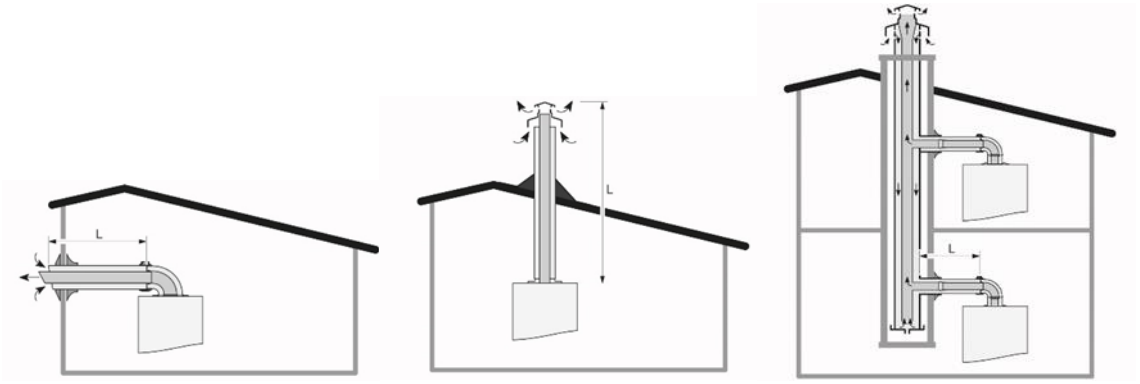
The following table shows the assignment of flue gas certifications for the product according to the different markets.

Market	Flue gas certification
HU	C13, C33, C53, C83, C93, B23, B23(P), B33, B53, B53(P)
ES, PT	C13, C33, C53, C83, C93, B23, B23(P), B33, B53, B53(P)
IT	C13, C33, C53, C63, C83, C93, B23, B23(P), B33, B53, B53(P)
BE	C13, C33, C53, C83, C93, B23, B23(P), B33, B53
CZ	C13, C33, C53, C83, C93, B23, B23(P), B33, B53, B53(P)
TR	C13, C33, C53, C93, B23, B23(P), B33, B53, B53(P)

Icons for the different certifications:

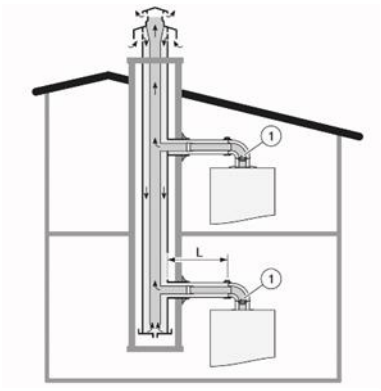


B23 **B33** **B53**

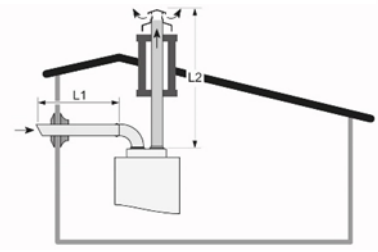


C13 **C33** **C43**

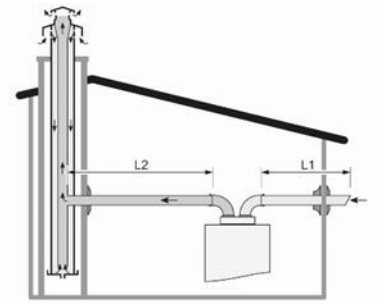
Notes



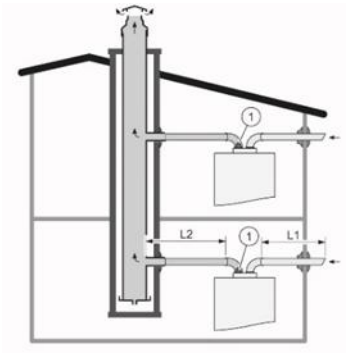
C43P



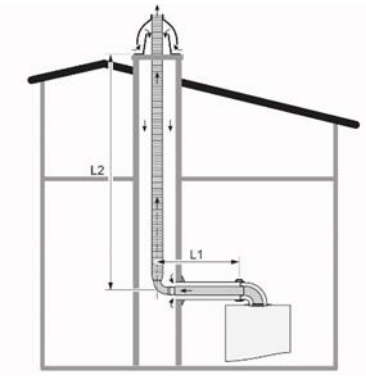
C53



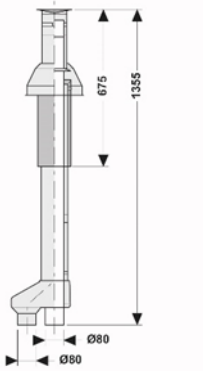
C83



C83P



C93



C63

Notes

5.3.3 Water quality

The heating water must be prepared, if

- the entire fill and make-up water volume exceeds three times the rated volume of the heating installation during the use of the unit, or
- the guideline values listed in the following table are not met.

Total heating output	Total hardness at 20 l/kW smallest floor-standing boiler heating area	Total hardness at > 20 l/kW and < 50 l/kW smallest floor-standing boiler heating area	Total hardness at > 50 l/kW and smallest floor-standing boiler heating area
kW	mol/m³	mol/m³	mol/m³
< 50	< 3	2	0.02
> 50 to ≤ 200	2	1.5	0.02

Guideline values for heating water: Water hardness

Heating water characteristics	Unit	Low in salt	Saline
Electrical conductivity at 25 °C	µS/cm	< 100	100 – 1500
Appearance		Free of sediment	
pH value at 25 °C		8.2 – 10.0	
Oxygen	mg/L	< 0.1	< 0.02

Guideline values for heating water: Salt content

If water softening is required, we recommend that you use water softener cartridges.

5.3.3.1 Water treatment

The heating installation is ideally filled with water that is free of additives. An accumulation of unsuitable additives may cause material damage to the heat generator and even the installation itself. The following supplements are permitted:

- **Cleaning agent (complete flushing required after use)**
  - Fernox F3
  - Jeanaqua 200
  - Jeanaqua 300
  - Jeanaqua 400
  - Adey MC3+
  - Adey MC5
  - Sentinel X 300
  - Sentinel X 400

Notes

– **Additives (corrosion inhibitors) intended to remain in the installation**
  - Fernox F1
  - Fernox F2
  - Fernox Superconcentrate Central Heating Restorer
  - Fernox Superconcentrate Central Heating Protector
  - Fernox Superconcentrate Boiler Noise Silencer
  - Fernox Superconcentrate Central Heating Leak Sealer
  - Fernox Hawk White
  - Jeanaqua 100
  - Jeanaqua 110
  - Adey MC1+
  - Sentinel X 100
  - Sentinel X 200

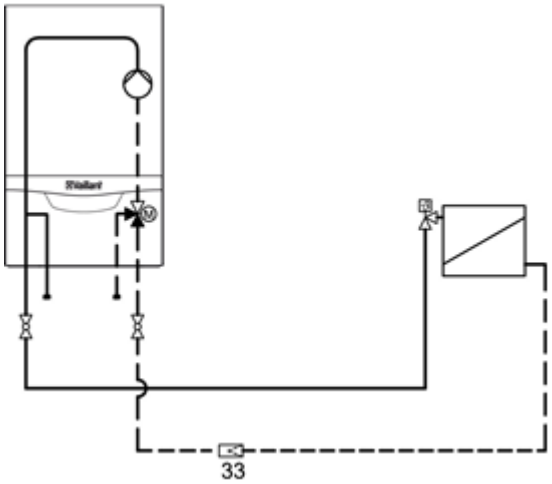
You must always observe the manufacturer's instructions for use and metering.

– **Additives for frost protection intended to remain in the installation**
  - Adey MC ZERO
  - Fernox Antifreeze Alphi 11
  - Sentinel X 500

You must always observe the manufacturer's instructions for use and metering.

Notes

5.3.4 Line strainer or magnetite filter



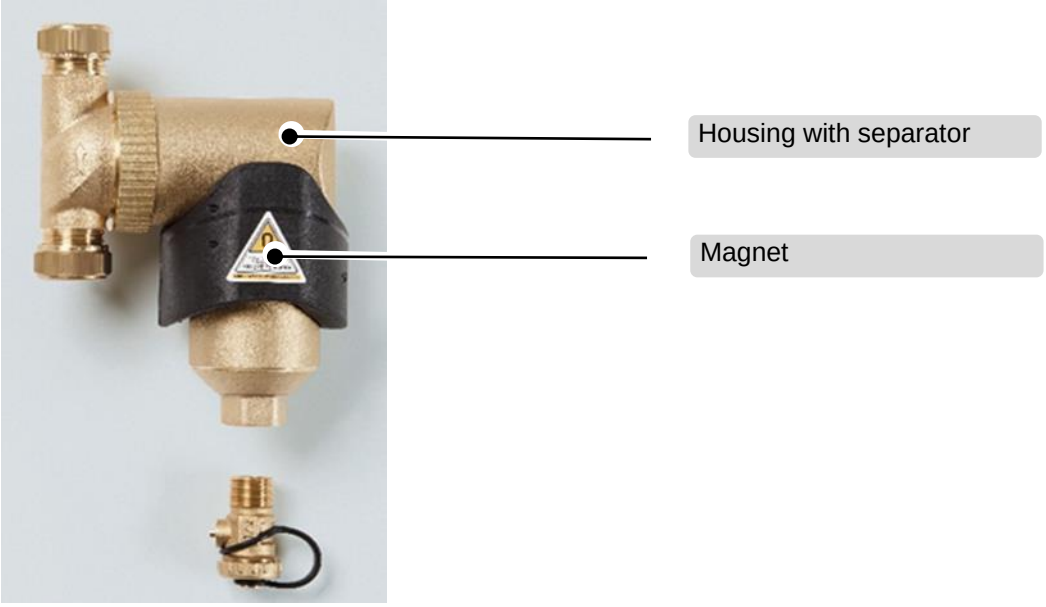
Installation position of the line strainer

When replacing the unit in an existing installation, installing a line strainer (33) in the heating installation return is recommended. It is advisable to combine the use of a line strainer with a magnetite separator. Heating installations must be flushed before starting up the unit. Contamination can otherwise build up in the unit and in the heating pump and cause localised overheating, corrosion and noise.

In the case of underfloor heating, do not separate the system using a diffusion-tight plastic pipe.

Notes

Example of a magnetite separator



Sample magnetite separator: SDBG range

Using high-efficiency pumps in all boilers that are launched in EU member states and other markets means that the use of a magnetite filter is essential.

Within the heating circuit, galvanic corrosion processes cause sludge to form which, in turn, is offset by ferrous metals. Since the high-efficiency pumps use a magnetic drive for the inner impeller, there is the immediate risk that the ferrous metals may accumulate there and may lead to a defect in the pump. The separator shown is from the SDBG range of accessories.

Dirt filter: In all installation types, it is strongly recommended that a dirt filter that is fitted on-site is used in combination with a magnetite separator.

Notes

5.4 Basic system diagrams and wiring diagrams

5.4.1 Basic system diagrams

Item	Designation	Item	Designation
1	Heat generator	7h	heat exchanger module
1a	Domestic hot water back-up boiler	7i	2-zone module
1b	Heating back-up boiler	7j	Pump group
1c	Heating/domestic hot water back-up boiler	8a	Expansion relief valve
1d	Solid fuel boiler with manual feed	8b	Potable water expansion relief valve
2	Heat pump	8e	Safety group – drinking water connection
2a	Domestic hot water heat pump	8d	Boiler safety group
2b	Air-to-water heat exchanger	8e	Heating diaphragm expansion vessel
2c	Refrigerant-split heat pump outdoor unit	8f	Diaphragm expansion vessel – potable water
2d	Refrigerant-split heat pump indoor unit	8g	Solar/brine diaphragm expansion vessel
2e	Ground water module	8h	Solar protection vessel
2f	Passive cooling module	8i	Thermal safety assembly
3	Heat generator circulation pump	9a	Single-room temperature control valve (thermostatic/motorised)
3a	Swimming pool circulation pump		
3b	Cooling circuit pump	9b	Zone valve
3c	Cooling circuit pump	9c	Flow regulator valve
3d	Well pump	9d	Bypass valve
3e	Circulation pump	9e	DHW generation prioritising diverter valve
3f	Heating pump	9f	Cooling prioritising diverter valve
3g	Heat source circulation pump	9g	Diverter valve
3h	Anti-legionella pump	9h	Filling/draining cock
3i	Heat exchanger pump	9i	Purging valve
4	Buffer cylinder	9j	Tamper-proof capped valve
5	Monovalent domestic hot water cylinder	9k	3-port mixing valve
5a	Bivalent domestic hot water cylinder	9l	Cooling 3-port mixing valve
5b	Shift-load cylinder	9m	Increase in return flow for 3-port mixing valve
5c	Combi cylinder (tank in tank)	9n	Thermostatic mixing valve
5d	Multi-functional buffer cylinder	9o	Flow meter (Taco setter)
5e	Hydraulic tower	9p	Cascade valve
6	Solar collector (thermal)	10a	Thermometer
7a	Heat pump brine filling unit	10b	Manometer
7b	Solar pump station	10c	Non-return valve
7c	Domestic hot water station	10d	Air separator
7d	Heat interface unit	10e	Line strainer with magnetite separator
7e	Hydraulic block	10f	Solar/brine collecting container
7f	Hydraulic module	10g	Heat exchanger

Notes

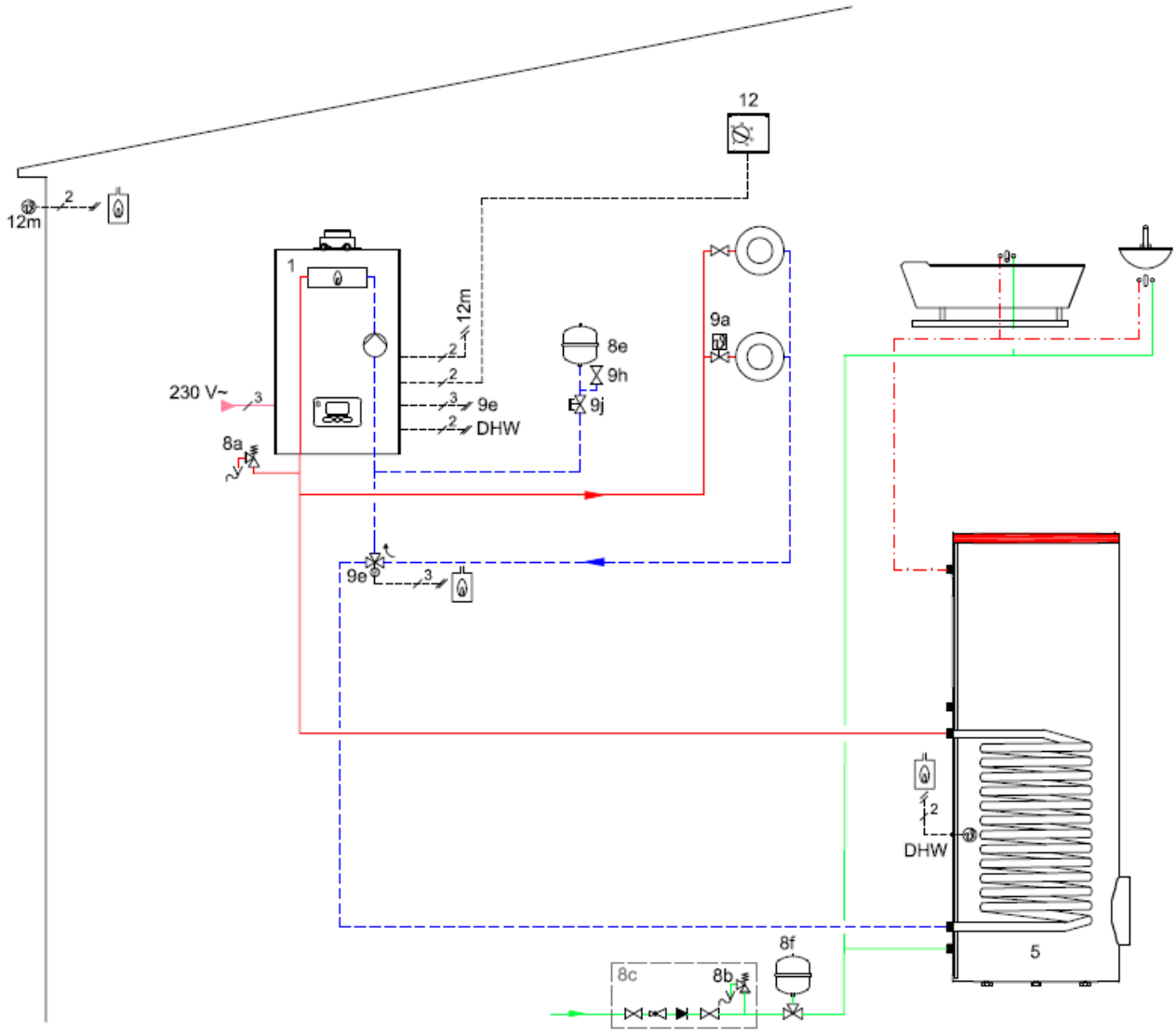
Item	Designation	Item	Designation
7g	Heat recovery module	10h	Low loss header
10i	Flexible connections	BufBtDHW	Bottom temperature sensor for DHW section of buffer cylinder
11a	Fan coil	BufTopCH	Top temperature sensor for heating section of buffer cylinder
11b	Swimming pool	BufBtCH	Bottom temperature sensor for heating section of buffer cylinder
12	System control	C1/C2	Enable cylinder charging/buffer charging
12a	Remote control unit	COL	Collector temperature sensor
12b	Remote heat pump expansion module	DEM	External heating demand for the heating circuit
12c	2 in 7 multi-functional module	DHW	Cylinder temperature sensor
12d	Expansion/wiring centre	DHWBT	Bottom cylinder temperature sensor (domestic hot water cylinder)
12e	Main expansion module	ESPACE HEATER	Energy supply company switching contact
12f	Wiring centre	FS	Flow temperature sensor/swimming pool sensor
12g	eBUS bus coupler	MA	Multi-function output
12h	Solar control	ME	Multi-function input
12i	External control	PWM	PWM signal for pump
12j	Cut-off relay	PV	Photovoltaic inverter interface
12k	Limit thermostat	RT	Room thermostat
12l	Cylinder temperature cut-out	SCA	Cooling signal
12m	Outdoor temperature sensor	SG	Interface to power grid operator
12n	Flow switch	Solar yield	Solar yield sensor
12o	eBUS power supply unit	SysFlow	System temperature sensor
12p	Radio receiver unit	TD	Temperature sensor for a ΔT control
BufTop	Temperature sensor top buffer cylinder	TEL	Switch contact for remote control
BufBt	Temperature sensor bottom buffer cylinder	TR	Isolating circuit with switching floor-standing boiler
BufTopDHW	Top temperature sensor for DHW section of buffer cylinder		

	Potable water		Solar flow
	Domestic hot water		Solar return
	Circulation		Heat source flow
	Wiring		Heat source return
	Heating flow		Cooling flow
	Heating return		Cooling return

Notes

The following hydraulic plans are a selection for the product start. Deviations may be possible in individual markets. Contact MX-MCP for any questions.

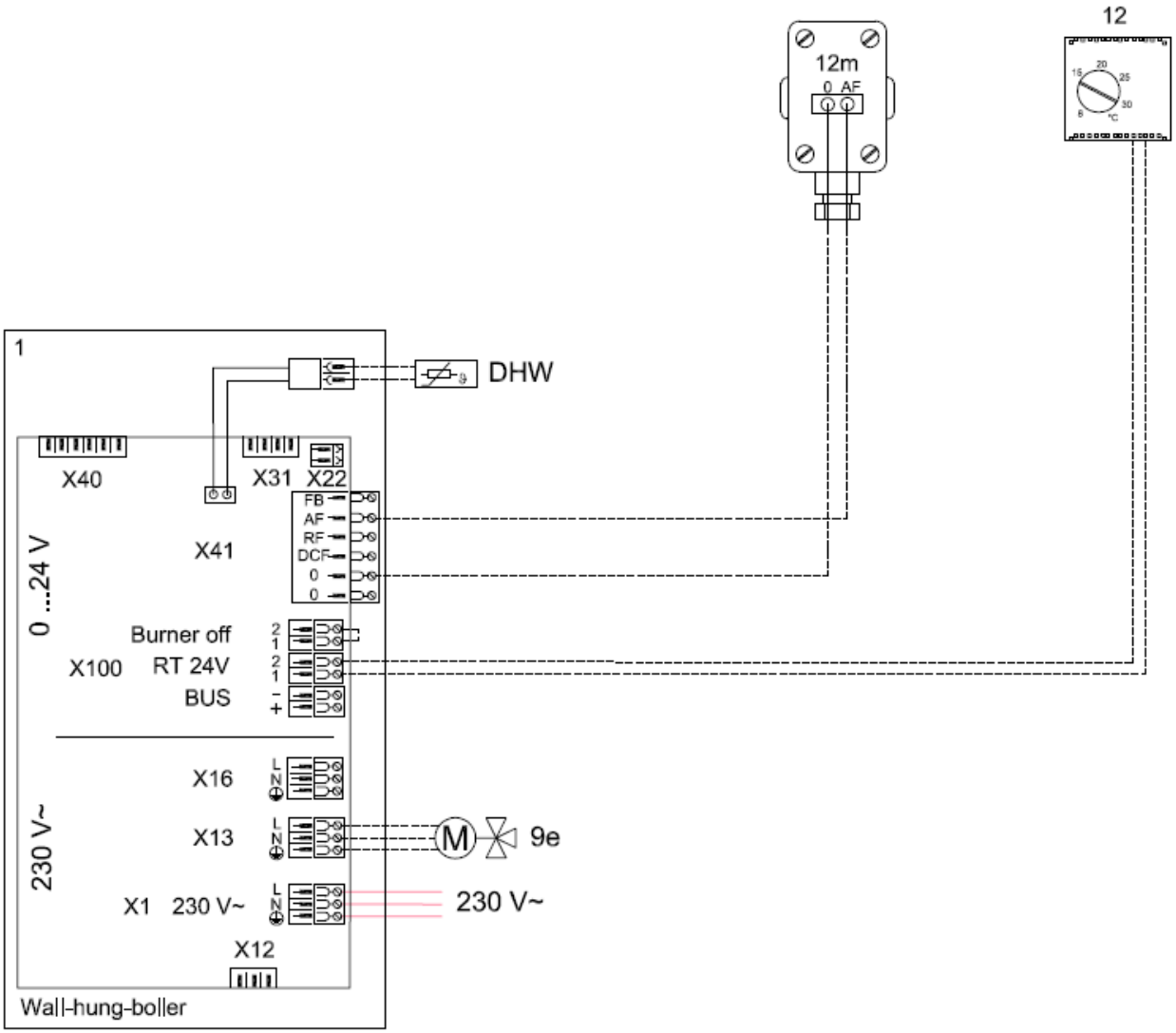
5.4.1.1 Hydraulic plan 0020253234



41-65 kW hydraulic plan; cylinder function unit; direct heating circuit without low loss header

Notes

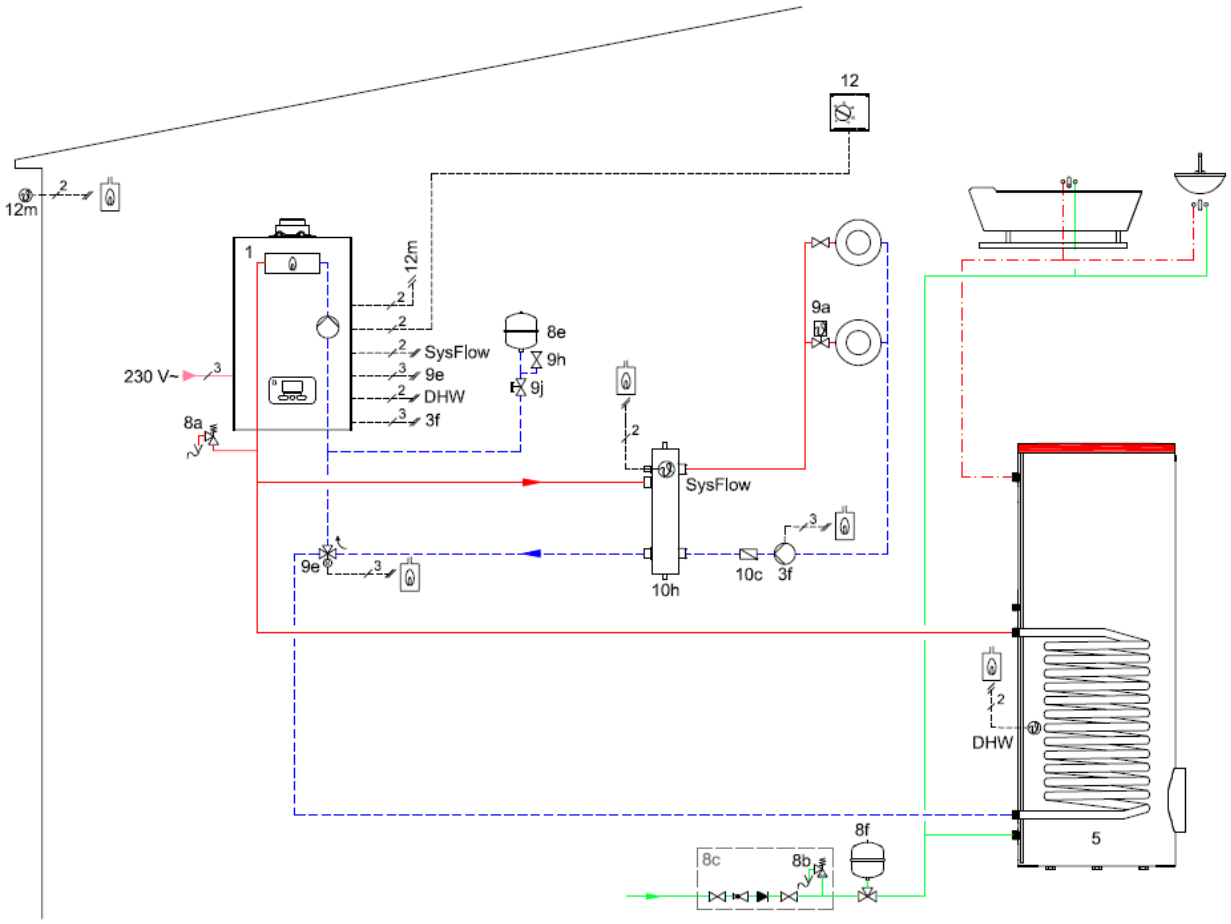
Hydraulic plan 0020253234 wiring



Connection diagram 0020253234

Notes

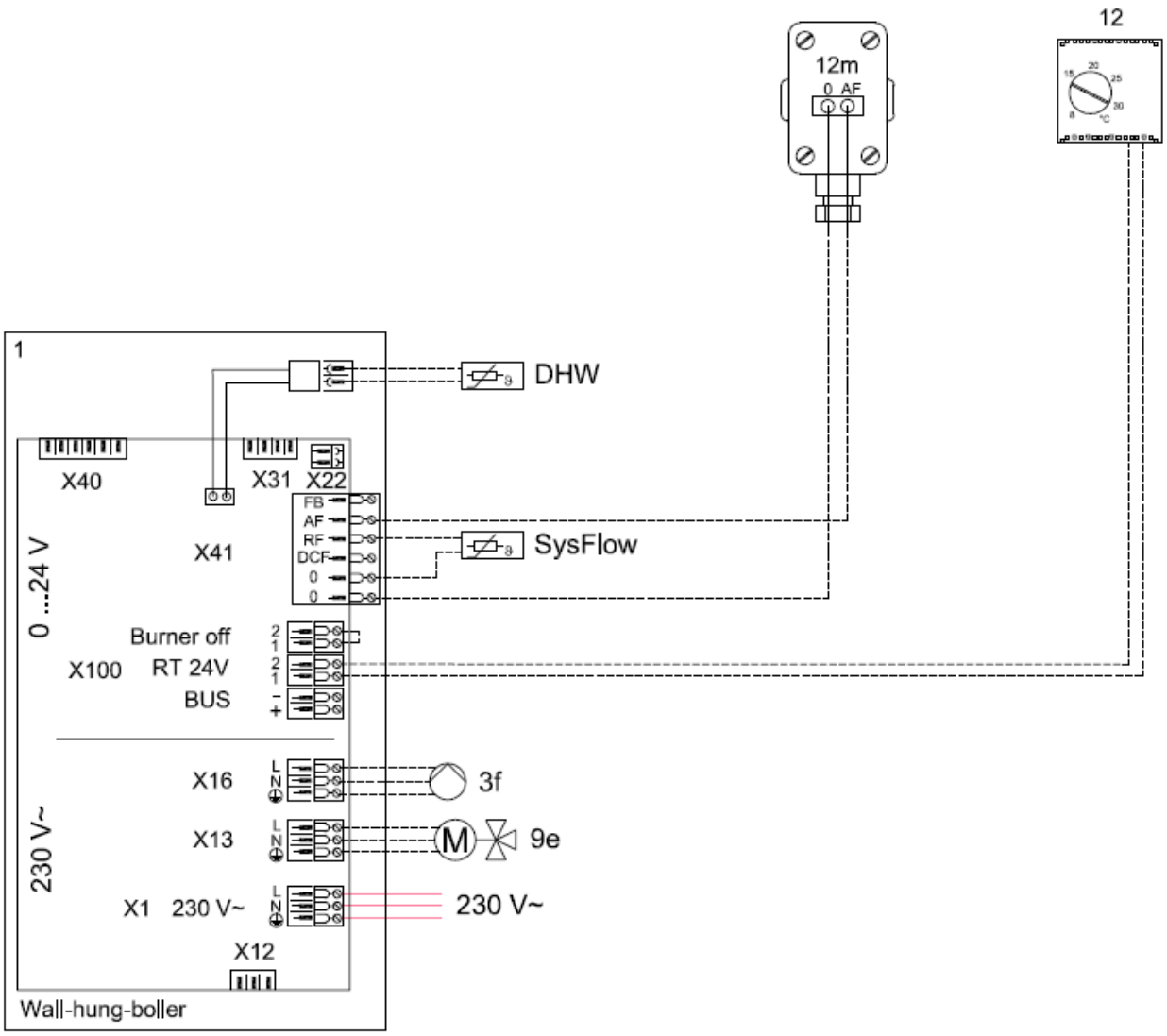
5.4.1.2 Hydraulic plan 0020253237



41-65 kW hydraulic plan; cylinder function unit; low loss header

Notes

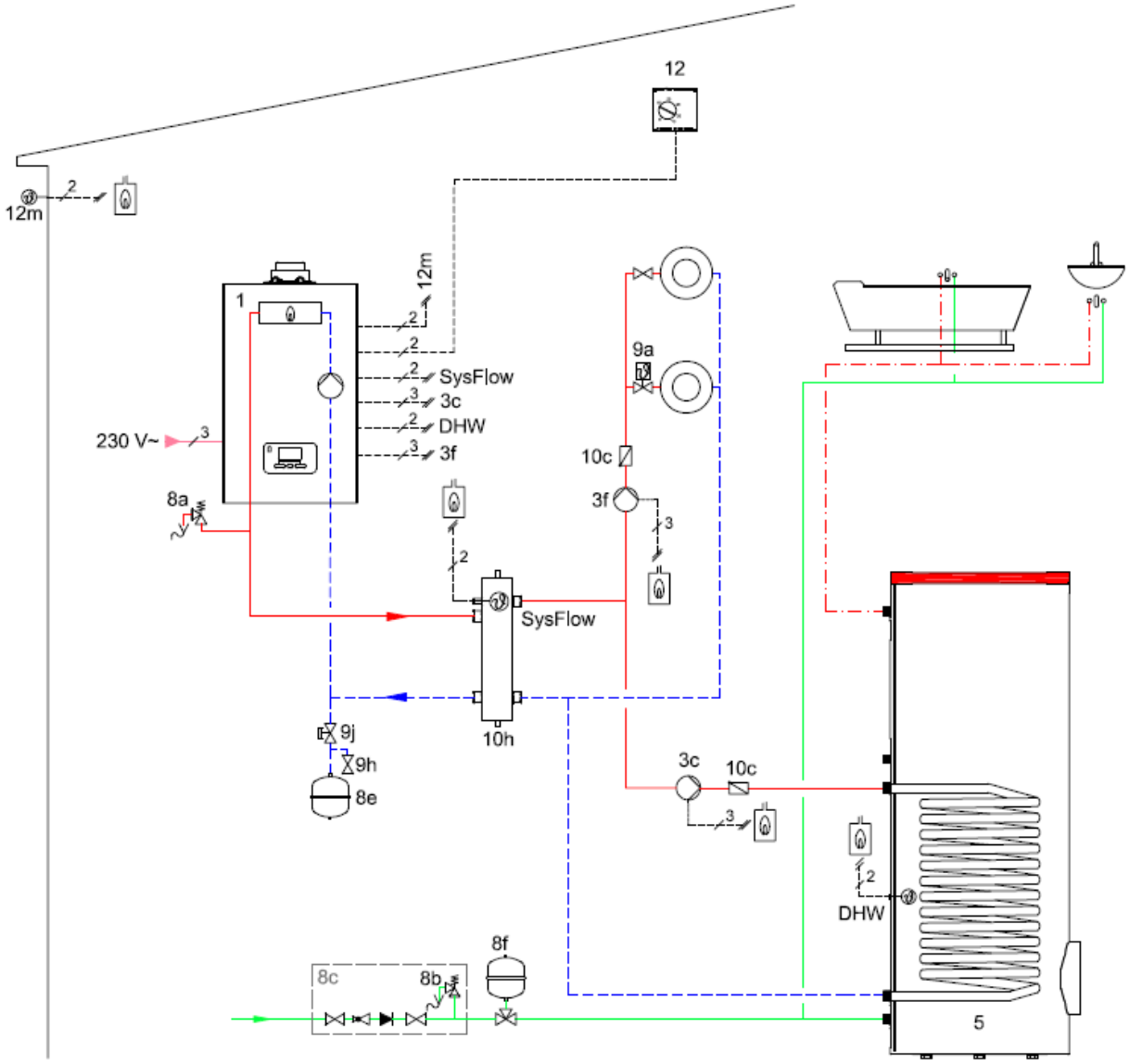
Hydraulic plan 0020253237 wiring



Connection diagram 0020253237

Notes

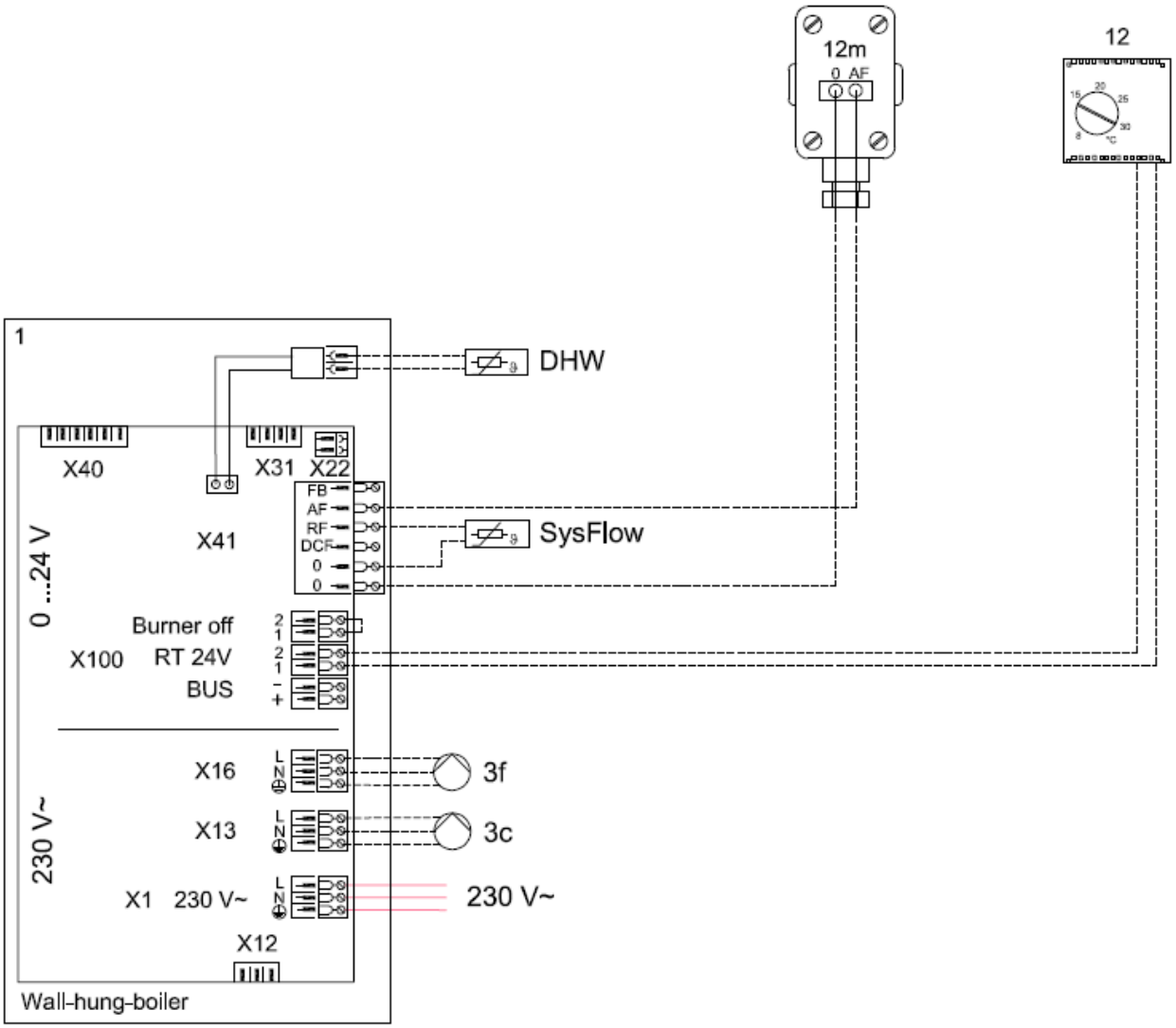
5.4.1.3 Hydraulic plan 0020259028



41-65 kW hydraulic plan; cylinder function unit; low loss header

Notes

Hydraulic plan 0020259028 wiring



Connection diagram 0020259028

Notes

6 Installation/start-up

In this section:

Here you will receive important information regarding the installation and subsequently information regarding the start-up of the unit. Please keep in mind that this information is dependent on the market. Always observe the installation instructions supplied with the unit.

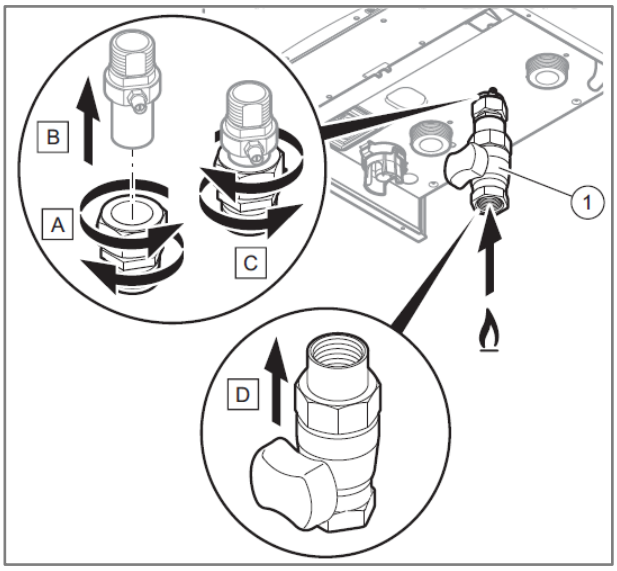
6.1 Installation checklist

Activity	Description
Wall mounting	To mount the unit, use the associated fixing accessories to mount the supplied unit mounting bracket. A drilling template is enclosed with the unit.
Connection Gas/hydraulics	The ecoTEC has vertically positioned connections for flow/return/cold water/domestic hot water/gas connection. Appropriate transition accessories are available for connection to existing installations. The gas and water connections must only be connected to the boiler once all of the required soldering work has been completed on the pipelines. The heat conduction that this creates destroys the seals and this results in leaks. Important for safety if the gas connections are not tight.
Condensate drain	If replacing an old unit that is non-condensing, a condensed water discharge must be provided. The existing waste-water pipes must be used if possible. **Section 8** provides an overview of the permitted waste-water pipes.
Air/flue connection	The space heater are fitted with an 80/125 mm diameter air/flue gas spigot as standard. The flue system can be guided through the external wall or through a shaft. Observe the installation instructions for the air/flue connection.
Electrical connection	The unit must not be installed in wet rooms from protective zone 1 (e.g. above the bath) and, in protective zones 1 and 2, the unit must not be connected via a mains plug, but instead with a fixed connection.

Notes

6.2 Detailed installation notes

The boiler has vertically positioned connections for flow/return/gas connection/condensate connection (see next figure).

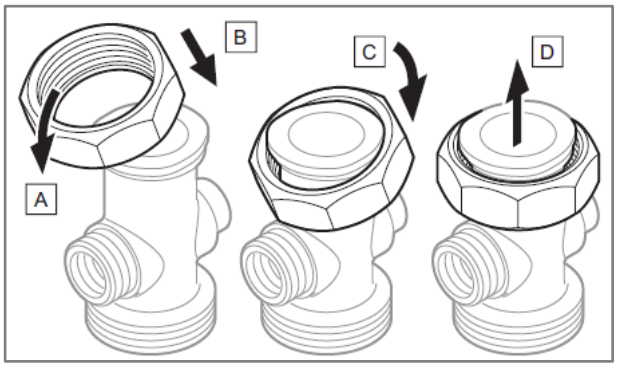


Vertical gas connection

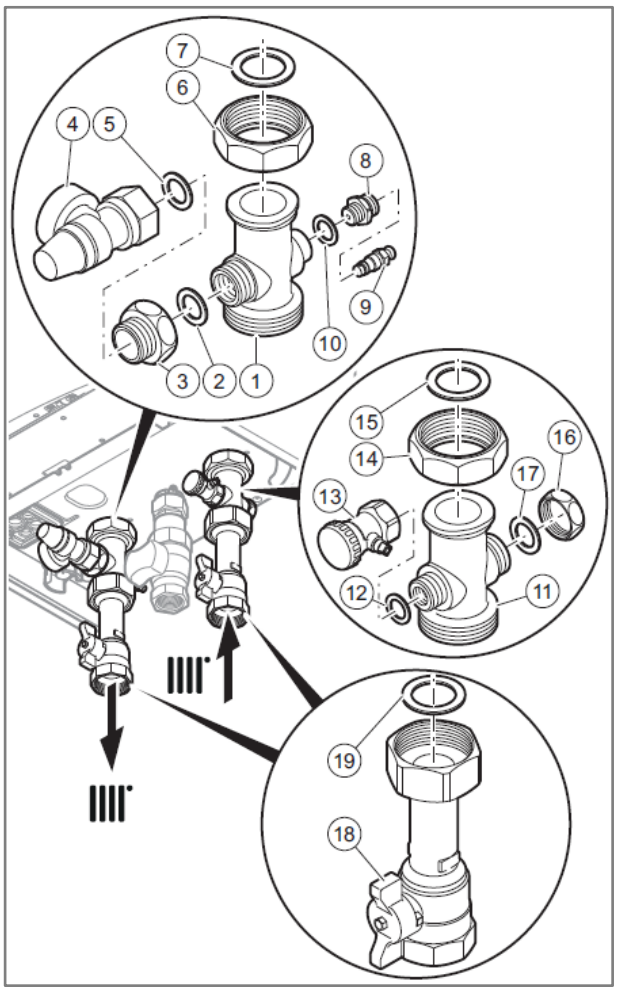
–Open the press connection (A).
–Insert the gas connection (B) into the press connection.
–Secure the connection on the gas connection (C).
–Screw the gas valve (D) onto the gas connection.
–Install the gas valve with the press connection on the ecoTEC

Notes

6.2.1 Hydraulic connection



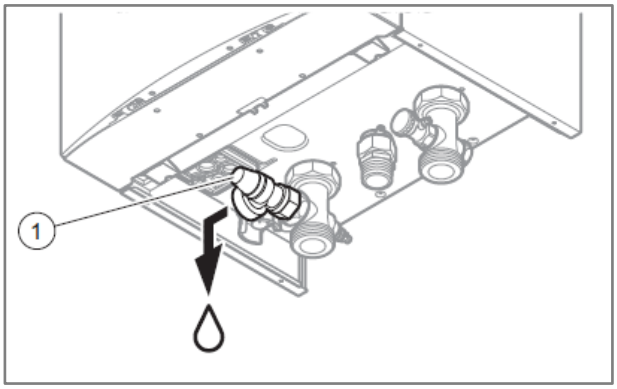
Installing the union nut in accordance with steps A to D



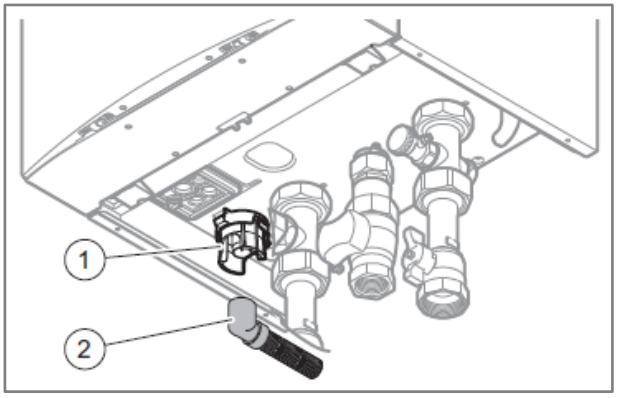
Installing the hydraulic connections

- Installing the heating circuit return (11) to (17)
- Installing the heating flow (1) to (10)
- Heating return stopcock seal (19)
- Installing the expansion vessel on the heating return

Notes



Installing the expansion relief valve (1) on the heating flow

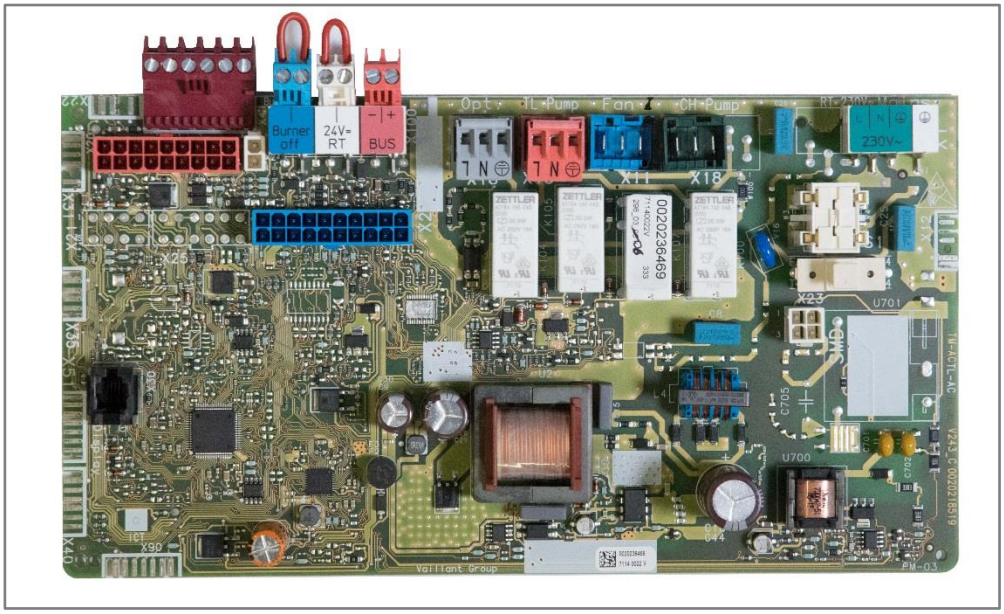


Installing the condensate discharge (2) on connection (1)

The condensate discharge must always be laid frost-free and with a downward gradient of at least 48 mm per metre. The precipitation discharge can be laid with the condensate hose together with the on-site siphon.

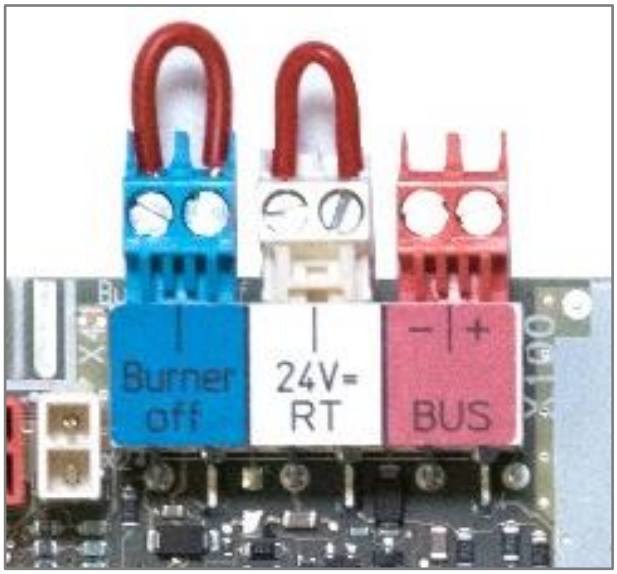
Notes

6.2.2 Electrical connection



Space heater 41–65 kW PCB (BMU) all markets

6.2.2.1 Connecting the control



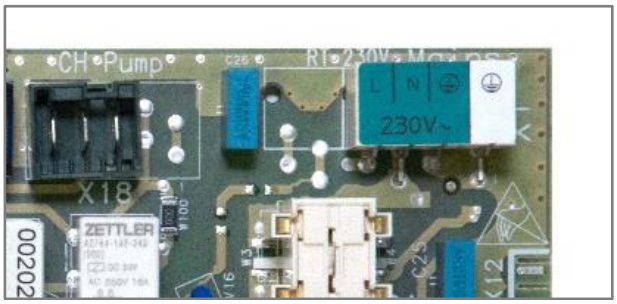
- Red: Room or weather-compensating **eBUS** control
- White: 24 V room thermostat
- Blue: Temperature cut-out (e.g. underfloor heating)

As delivered from the factory:

The "Burner off" and "24 V = RT" plugs are fitted with a conductive bridge.

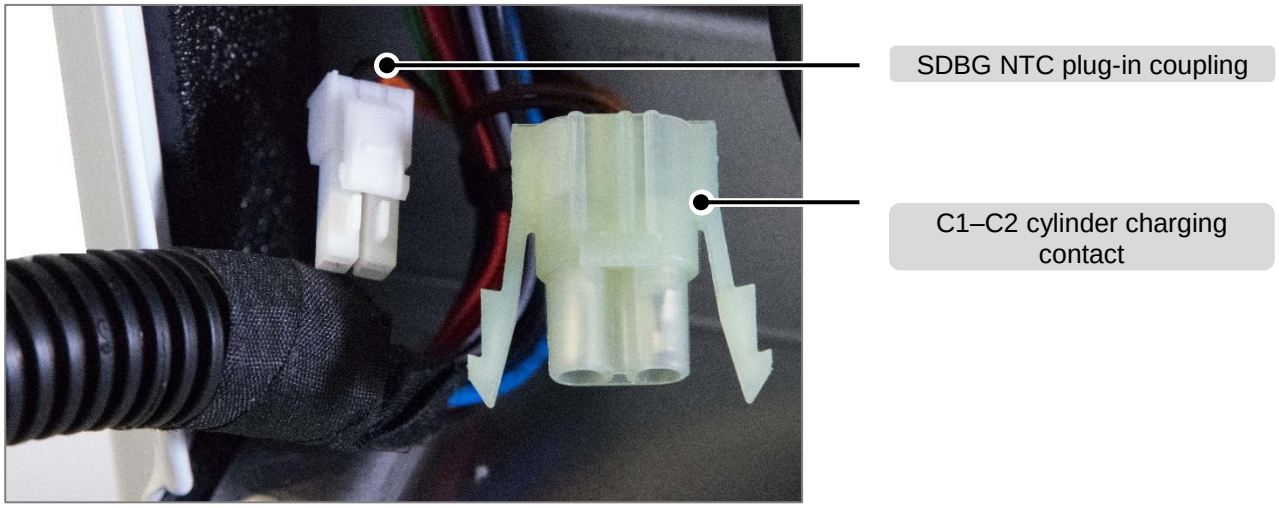
Notes

6.2.2.2 230 V connection



230 V connection

6.2.2.3 Terminal location for VR10 (cylinder sensor) and C1/C2 on the unit cable harness



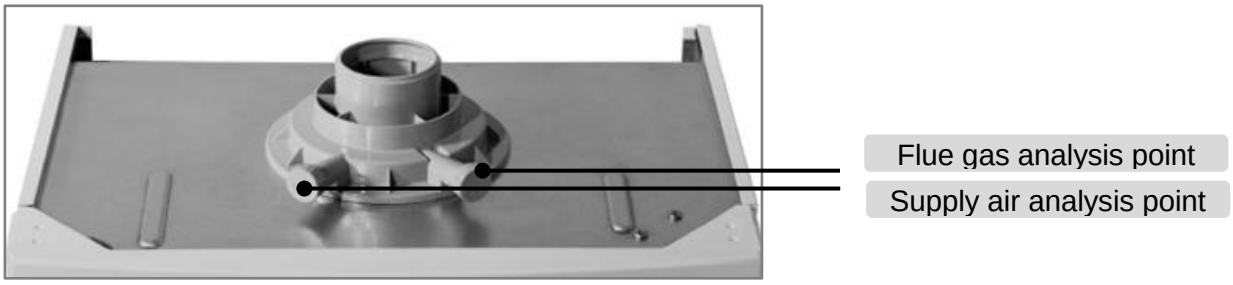
6.2.2.4 X41 plug in the boiler's scope of delivery

Item	Description	Item	Description
OT	Sensor earth	AF	outdoor temperature
DCF (Germany only)	Radio signal receiver Time, date	FB	DHW circulation pump remote switching
RF	Reference sensor (low loss header)		

Notes

6.2.3 Air and flue gas accessories

48–65 kW units are fitted with an 80/125 mm diameter air/flue gas spigot as standard. Observe the supplementary information in the flue gas accessory catalogue.



Top view of the product

Notes

6.3 Start-up checklist

Activity	Description
Rinse the heating installation	DIN EN 14336 prescribes that heating installations be rinsed or cleaned.
Fill the unit siphon	Before being put into operation, the unit siphon must be filled with water.
If required, adjust the MAG pre-charge pressure to the heating installation	The static height of the building must be taken into consideration here. The calculation for this is in the formulas in section 8.
Automatic purging mode; select **P0** if the installation is to be purged manually The pump works in cycling mode	- Purge heating circuit or - Purge hot water circuit Fill the unit and the installation to min. 1 bar
Target flow temperature	Setting the maximum target flow temperature in heating mode to 30 °C–85 °C. (Setting via the display)
Domestic hot water temperature	Preselecting the maximum DHW temperature 35 °C-65 °C. (Setting via the display)
Partial heat load	Setting the calculated partial heat load within the unit-dependent range, **D.000**.
Accessory relay 1 (2 in 7 module)	Definition of the aggregate connected to relay 1 of the 2 in 7 module (VR 40), **D.027**.
Accessory relay 2 (2 in 7 module)	Definition of the aggregate connected to relay 2 of the 2 in 7 module (VR 40), **D.028**.
Check the gas connection pressure (flow pressure) and CO2 values in accordance with the installation instructions	The check programmes "**P.01**" (full load) and "**P.02**" (minimum load) are available for this
Check the unit functions (heating mode, domestic hot water mode)	It is best to do this using the **Live Monitor**, since this allows you to read all of the main operating statuses.

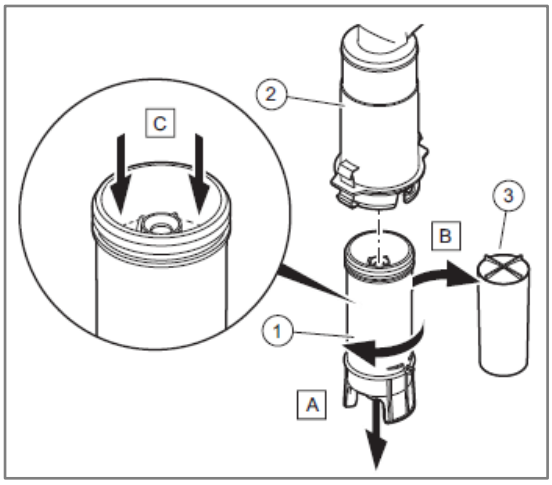
Notes

Activity	Description
Adapting the unit to the heating installation	In the diagnostics menu of the installer level, various parameters need to be changed to adapt the boiler in line with the heating installation in the best way possible. The **Diagnostics codes** table is included in the following section.
End user training/instruction	Hand over the instructions and unit documentation for safekeeping Instruct the end user on how to inspect the filling pressure of the system and on topping up or purging the heating installation Instruct the end user on the correct (economical) settings for temperature, controls and thermostatic valves Notify the end user of the need for an annual inspection/service of the installation.

6.3.1 Water composition

For the water composition requirements, see section 5.

6.3.2 Filling the siphon



A Loosen the lower section of the siphon (1) from the upper section (2).

B Remove float (3).

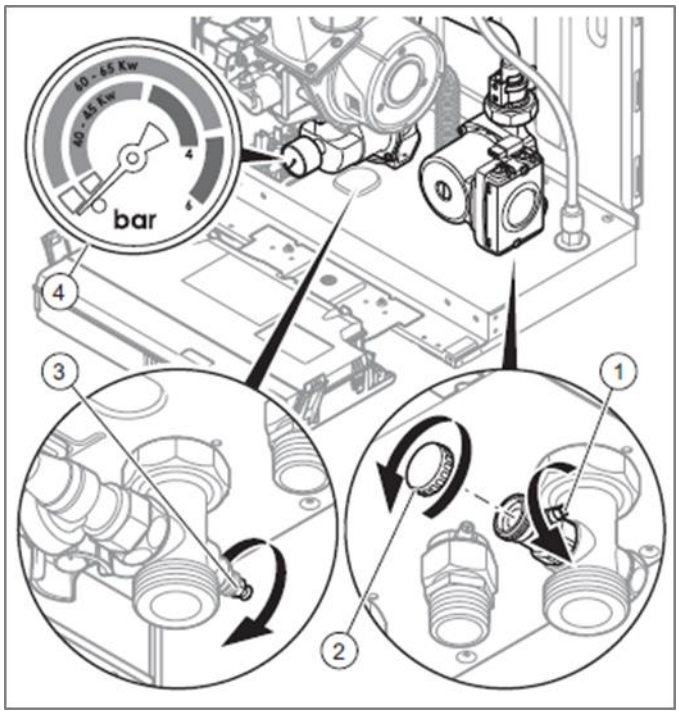
C Fill the lower section of the siphon with water up to 10 mm below the upper edge.

EASY TIP Even if the siphon is not filled with water (dried out), there is no risk of flue gas exit.

Notes

Notes

6.3.3 Filling the heating installation



1 Rinse the heating installation
2 Connect the filling/drain cock (2) to the on-site filling device
3 Open the water supply
4 Open the thermostatic valves
5 Open the service valves
6 Slowly open the filling/drain cock (1)
7 Open the purging nipple (3) and wait until the water escapes without bubbles. This nipple is only used for the first filling
8 Monitor the filling pressure with the manometer, required filling pressure 1.5–2.5 bar
9 Close the locks and check the pipe connections for tightness.

Notes

6.3.4 Starting the boiler

Actuate the mains switch. The start menu appears in the display

6.3.4.1 Check programme for purging the heating circuit

Start condition and boiler purging:
If the unit/system pressure has fallen below **0.3 bar** for at least **15 seconds**, the point for a purging sequence is set. The unit/installation purging is started from **0.5 bar**.

If the heating pressure in the primary circuit rises above **0.5 bar** for **30 seconds** (start-up), an automatic purging function starts. The function starts repeatedly if the system pressure has fallen below **0.3 bar** for at least **15 seconds** (e.g. purging of heating surfaces or other causes) during servicing (maintenance). After filling the installation, the purging starts if **0.5 bar** has been exceeded for at least **30 seconds**.

- The function cannot be stopped, even by the competent person.
- The burner does not start before the purging process has been completed.
- After the purging, no air remains in the unit, which reduces the risk of damage caused by cavitation and of noises in the heating installation.
- Stored time periods for automatic purging: Domestic hot water circuit **390 seconds**; heating circuit **390 seconds**.

Following the automatic purging, the volume flow is measured (heating circuit or hot-water charging circuit) to ensure that the unit has been purged. Purging is completed when the threshold of the low volume flow (Lower Flow Rate) has been exceeded.

If the threshold has not been exceeded, the purging function was not fulfilled and fault F.75 is displayed.

Notes

6.3.4.2 Target flow value for heating mode (limitation)

This parameter allows the required flow temperature to be set (first display level)

This setting also limits a higher temperature demand from the control.

6.3.4.3 Target domestic hot water temperature (limitation) – first display level

This parameter allows the required domestic hot water temperature to be set in connection with a domestic hot water cylinder. A cylinder sensor must be installed for this purpose.
The domestic hot water charging output can be limited under **D.077** by kW value.
That is used to adapt the output in dhw to the HEX of the dhw cylinder.

6.3.4.4 Maximum heat output

The maximum unit output can be restricted in this parameter (**D.071**)

6.3.4.5 Additional relay factory delivery

(D.026) Definition of the actuator connected to connection terminal X16 (OPT).

6.3.4.6 Optional 2 in 7 accessory relay

(D.027; D.028) Definition of the actuator connected to relay 1 of the 2 in 7 module (VR 40).

6.3.5 Checking the gas setting

6.3.5.1 Checking the factory settings

You must check whether the gas type set at the factory corresponds to the local gas type. The factory settings can be found on the data plate.

6.3.5.2 Checking the tightness of the flue gas system and recirculation

1. The flue gas system must comply with the certification
2. Check supply air. There must not be any flue gas measured in the annular gap

If flue gas is measured in the supply air and the flue gas system leak cannot be eliminated, the unit must not be started up.

Notes

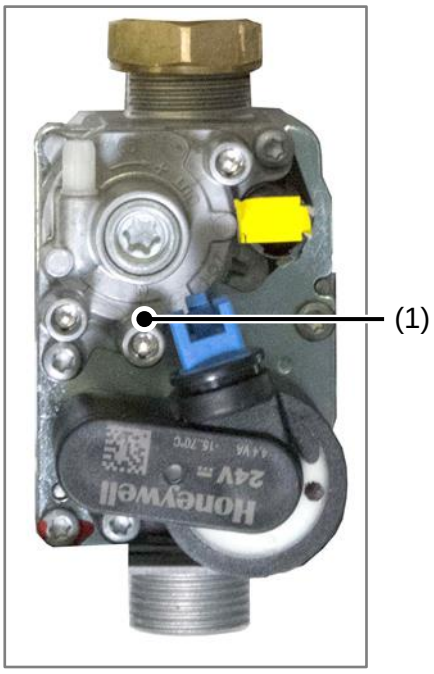
6.3.5.3 Checking the gas connection pressure and gas flow pressure

48 kW boiler

Check programmes "P.01" and "P.02" are available for this.

Check the unit functions (heating mode, domestic hot water mode)

It is best to do this using the Live Monitor, since this allows you to read all of the main operating modes.



Honeywell VK8205VE

1. Use a screwdriver to loosen the screw plug (1)
2. Connect the manometer to the test nipple (1).
3. Open the gas valve.
4. Check the gas connection pressure
5. Open the heating circuit valves.
6. Start the unit with check programme **P.01**
7. Guarantee heat consumption
8. Check whether the gas flow pressure corresponds to the specifications at full load.

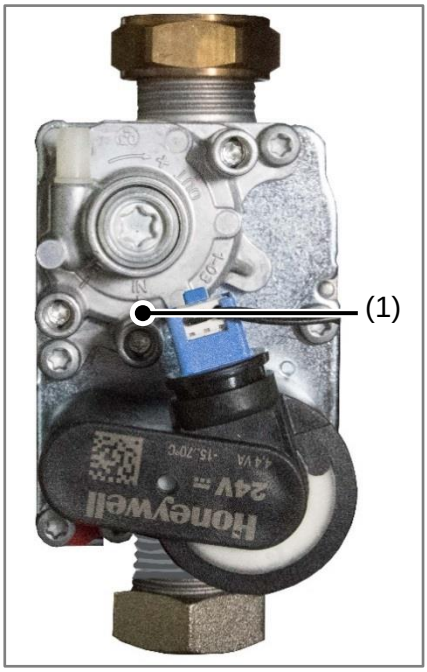
Notes

65 kW boiler

Check programmes "P.01" and "P.02" are available for this.

Check the unit functions (heating mode, domestic hot water mode)

It is best to do this using the Live Monitor, since this allows you to read all of the main operating modes.



Honeywell VK8205V

1. Use a screwdriver to loosen the screw plug (1)
2. Connect the manometer to the test nipple (1).
3. Open the gas valve.
4. Check the gas connection pressure
5. Open the heating circuit valves.
6. Start the unit with check programme **P.01**
7. Guarantee heat consumption
8. Check whether the gas flow pressure corresponds to the specifications at full load.

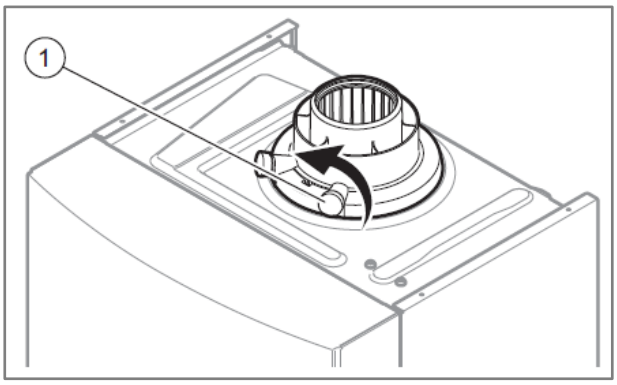
Notes

6.3.5.4 Checking the CO_2 content

Check programmes "P.01" and "P.02" are available for this.

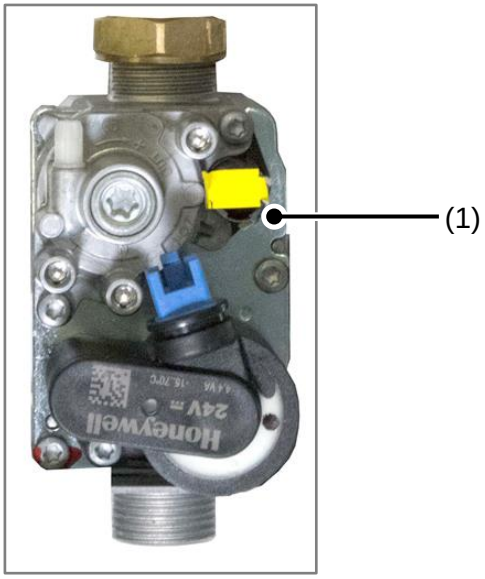
Check the unit functions (heating mode, domestic hot water mode)

It is best to do this using the Live Monitor, since this allows you to read all of the main operating modes.

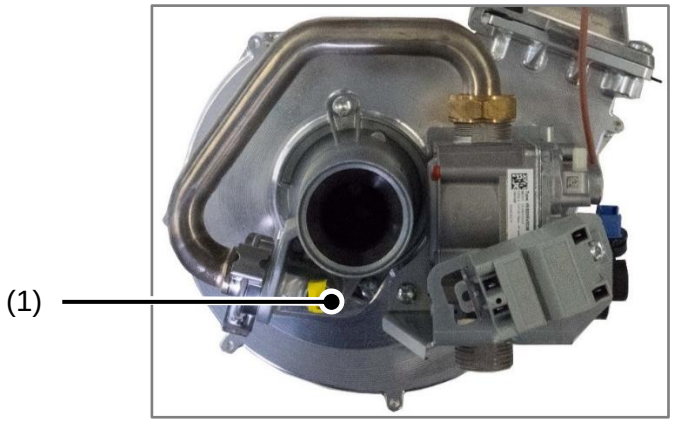


1. Guarantee the heat consumption.
2. Start the unit with check programme **P.01**.
3. Keep the unit in operation for five minutes, until it reaches its operating temperature.
4. Use a flue gas measuring instrument to measure the CO_2 content on test opening **(1)** on the boiler connection piece.
5. Compare the CO2 content with the required values from the table.

Setting the CO2 content



Space heater 41–48 kW



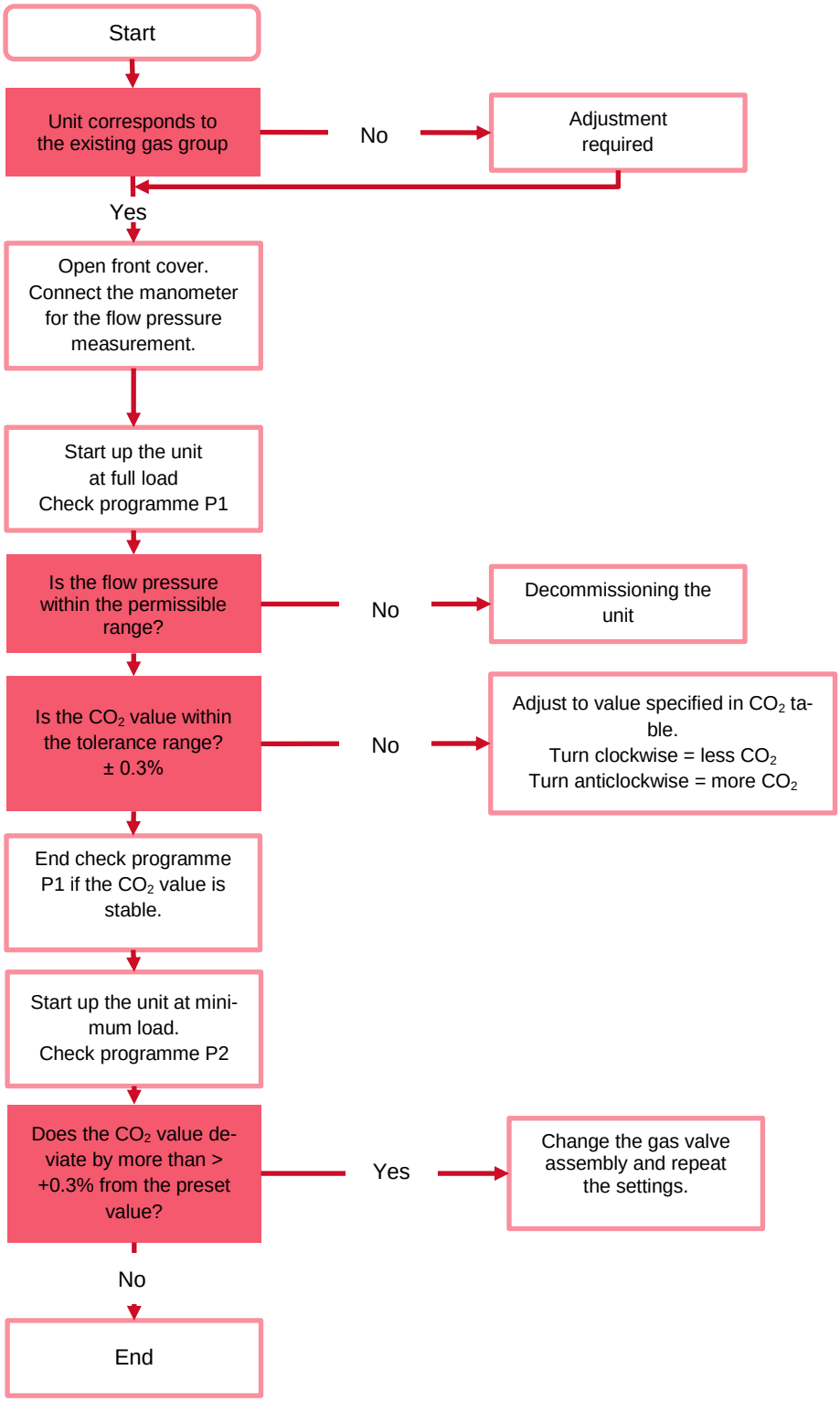
Space heater 65 kW (50 kW for CH)

The screw for the CO_2 setting at maximum load is located at position 1.

Using a hexagon socket SW 2.5 mm to turn it clockwise reduces the CO_2 content, while turning it anti-clockwise increases the CO_2 content.

Notes

6.3.5.5 Flow chart: ecoTEC 48–64 kW gas setting



Notes

Overview table for the CO_2 check
Within the ranges shown in the table, the CO2 need not be set during start-up.

7-coil 48 kW	G20 natural gas	G25 natural gas	Natural gas G25.3	Natural gas G27	Select G31	Unit
Permissible **CO_2** content after five minutes at full load with "**P.01**", **front casing open**	8.6 ± 0.3	8.6 ± 0.3	9.1 ± 0.3	8.9 ± 0.3	9.4 ± 0.3	% vol.
Permissible **CO_2** content after five minutes at full load with "**P.01**", **front casing closed**	9.2 ± 0.3	9.2 ± 0.3	9.3 ± 0.3	9.1 ± 0.3	9.9 ± 0.3	% vol.
Wobbe index kW h/m³	14.1					

9-coil 65 kW	G20 natural gas	G25 natural gas	Natural gas G25.3	Natural gas G27	G31 pro-pane	Unit
Permissible **CO_2** content after five minutes at full load with "**P.01**", **front casing open**	9 ± 0.3	9.1 ± 0.3	9.1 ± 0.3	9 ± 0.3	9.9 ± 0.3	% vol.
Permissible **CO_2** content after five minutes at full load with "**P.01**", **front casing closed**	9.2 ± 0.3	9.3 ± 0.3	9.3 ± 0.3	9.1 ± 0.3	10.1 ± 0.3	% vol.

6.3.5.6 Converting to a different gas type

You must observe all of the work steps from the gas conversion instructions that are enclosed with the conversion kit. The key steps are described as follows.

Converting from natural gas to LPG:

- Guarantee the gas connection pressure range that is permitted for the gas type.
- Before starting up the unit with propane gas, **turn the gas adjustment screw clockwise by X rotations**.
- Start up the unit and use check programme P1 to measure the CO2 and, if required, correct this using the gas adjustment screw (see the tables in the appendix for the target values)
- Check the gas connection pressure again under full load (flow pressure)
- Check the unit's functions
- Attach the conversion sticker

Notes

Gas conversion					
Value		**G20 to G25**	**G25.3 to G20**	**G20 to G27**	G20 to G31
	7-coil	**+1.5** rotations clockwise	**-1** rotation anti-clockwise	**+2.25** rotations clockwise	**-2.5** rotations anti-clockwise
	9-coil	**-3.5** rotations anti-clockwise	**+3** rotations clockwise	**-6** rotations anti-clockwise	**+4.25** rotations clockwise

Notes

6.4 Regional legislation

Notes

7 Maintenance, troubleshooting and repair

In this section:

You will receive important information regarding unit maintenance and advice for troubleshooting. You will also receive an overview of the fault messages and their cause for troubleshooting.

7.1 Maintenance checklist

A visual inspection of the following parts must be carried out during each inspection:

- Air/flue pipe for leak-tightness and correct fastening. Not blocked or damaged.
- Unit for water, condensed water and flue gas leaks,
- Vacuum chamber for dirt,
- Electrical plug connections and connections for correct seating,
- Unit siphon and on-site tundish and condensate connections for depositions,
- Ignition and combustion process,
- Burner surface,
- Status displays,

Function test of:

- Unit and control equipment
- Prioritising diverter valve (external).

Maintenance should be carried out on the following assemblies:

- Integral condensation heat exchanger
- Expansion vessel
- Unit siphon
    - The burner is maintenance-free.

Notes

A sample overview of all of the work steps required for inspection/maintenance is given in the following table:

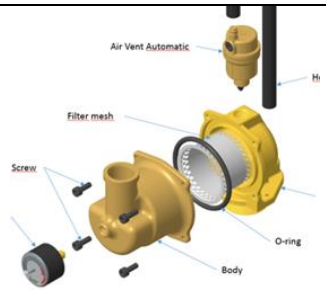
No.	Work step	Required for	
		Annu-ally	Inspection (interval)
1	Check the air/flue gas installation for tightness and to ensure that it is secure; adjust if necessary	x	
2	Check the overall condition of the product. Check the unit for flue gas, water and condensate leaks	x	
3	Clean any soiling of the product or the vacuum chamber	x	
4	Check the heat exchanger and burner for dirt/clean if necessary	x	
5	Check the gas flow pressure	x	
6	Check the CO_2 value and, if necessary, adjust it (air flow setting)	x	
7	Check whether the electrical plug connections and other connections are fitted tightly; adjust if necessary	x	
8	Check that the gas lock and service valves are functioning correctly	x	
9	Check the pre-charge pressure of the external expansion vessel		x
10	Clean the heat exchanger		x
11	Check the burner and internal flange insulation for damage		x
12	Clean the condensate siphon	x	
13	Clean the automatic air separator filter	x	
14	Check the precipitation discharge connection (all components) for blocks	x	
15	Clean the external low loss header		x
16	Carry out a test operation on the unit and heating installation including domestic hot water generation; purge if necessary	x	
17	Test ignition and burner performance	x	
18	Check the product for gas, flue gas and water tightness	x	
19	Check the position of optional heating elements for frost protection	x	
20	Carry out the product maintenance	x	

Notes

7.2 Detailed maintenance notes

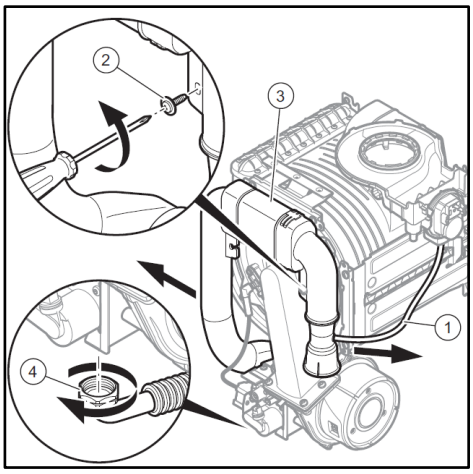
Guidelines for carrying out maintenance work on the unit	
	The flexible gas pipe may become damaged if weight is placed on it. Do not suspend the compact thermal module on the gas pipe, for example during maintenance work.
	**Burner maintenance:** The burner is maintenance-free. If the burner has been removed, its seal must be replaced. Make sure that the thermal insulating plate is in perfect condition.
	**Maintenance of the integral condensation heat exchanger:** The spiral immersion heaters of the integral condensation heat exchanger must only be cleaned with a soft brush or using household cleaning fluids to avoid damaging the surface. Then rinse with water. It is not necessary to remove the primary heat exchanger.
Heating circuit expansion vessel: The expansion vessel must be installed on-site. No product image available.	**Checking the expansion vessel:** The expansion vessel is inspected when the unit is depressurised. At < 0.7 bar, re-pump according to the static height of the heating installation. If water leaks from the measuring stub pipes, the expansion vessel must be replaced.

Notes

Guidelines for carrying out maintenance work on the unit	
	**Cleaning the unit siphon:** The unit siphon should be cleaned at regular intervals. To do this, unscrew the lower section and clean away any dirt and depositions. Then fill the lower section up to ¾ with water (factory recommendation). Do not forget to install the non-return device.
	**Cleaning the automatic air separator:** The air separator should be cleaned once a year. To do this, drain the unit and open the air separator housing. Remove and clean the filter element. Reinstall in reverse order.

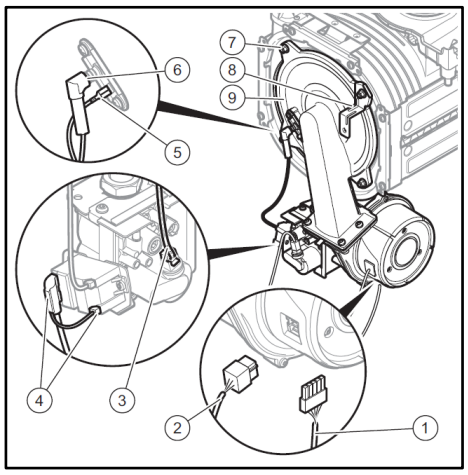
7.2.1 Installing and removing components/modules

7.2.1.1 Removing the compact thermal module



1. Disconnect the silicone hose to the air pressure switch (1).
2. Loosen the fixing screw (2) and remove the supply air pipe (3) from the supply air connection.
3. Remove the screwed gas connection (4) from the gas valve.

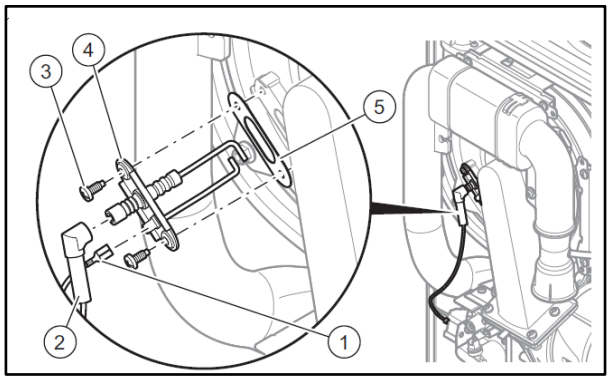
Notes



4. Unplug the ignition cable (6) and the PE connection (5).
5. Remove the power supply (4) from the ignition transformer.
6. Remove the plugs (1) and (2) from the fan motor.
7. Remove the plug (3) from the gas valve.
8. Loosen the four fixing screws (7).
9. Remove the fastening bracket (8) for the supply air pipe.
10. Remove the gas-air mixture (9) from the heat exchanger.

For assembly, carry out the steps in reverse order.

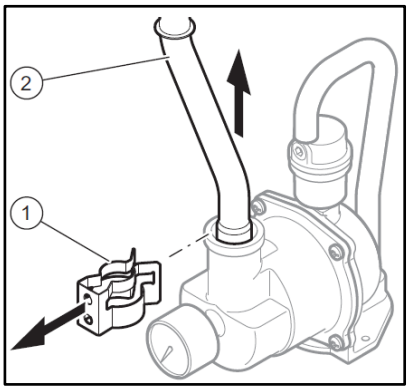
7.2.1.2 Dismantling the ignition and monitoring electrode



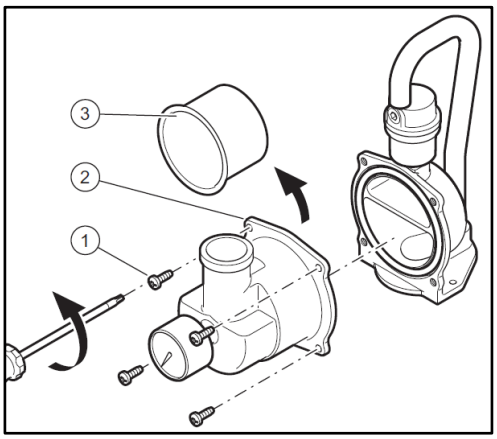
1. Remove connection (2) and PE connection (1).
2. Loosen the fixing screws (3).
3. Carefully remove the electrode (4) from the burner flange.
4. Replace the seal (5) during assembly.

Notes

7.2.1.3 Dismantling/cleaning the air separator



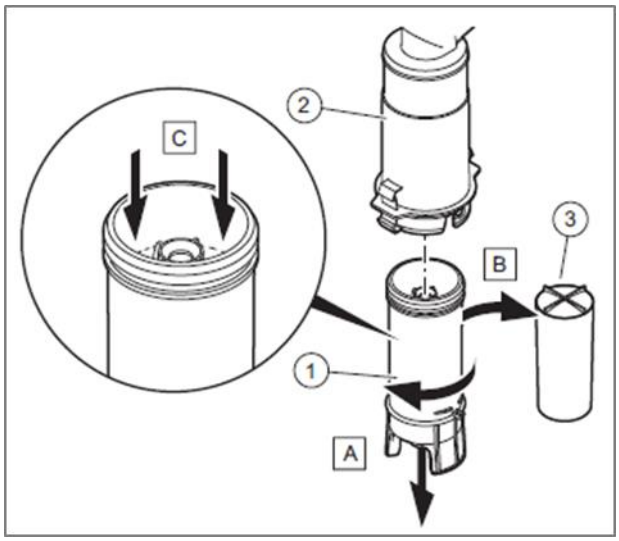
1. Pull off the clip (1).
2. Remove the connection pipe (2).



3. Loosen the fixing screws (1)
4. Remove the housing (2) from the air separator.
5. Clean the filter (3) using hot water.
6. Install the air separator in reverse order.

Notes

7.2.1.4 Dismantling/cleaning the condensate siphon



A Loosen the lower section of the siphon (1) from the upper section (2).

B Remove float (3).

C Fill the lower section of the siphon with water up to 10 mm below the upper edge.

– Install the siphon in reverse order

After cleaning the condensate siphon, do not forget to insert the internal float (3) for assembly.

If the float is not inserted, there is a risk of flue gas exit into the vacuum chamber of the product. If the flue system leads to **B xx**, there is a risk of flue gas exit into the combustion supply air chamber.

Notes

7.2.2 Recommended tools

Basic tool set

Electronic manometer

Quick response thermometer

Flue gas analyser

Electronic leak detector

Notes

7.3 Troubleshooting

7.3.1 Status codes, diagnostics codes, fault codes and check programmes

7.3.1.1 Status codes

Status messages are displayed in the Live Monitor.

Code	Meaning
Heating mode	
S.00	Heating: No heat demand
S.01	Heating mode: Fan start-up
S.02	Heating mode: Pump prerun
S.03	Heating mode: Ignition
S.04	Heating mode: Burner on
S.05	Heating mode: Pump/ fan overrun
S.06	Heating mode: Fan overrun
S.07	Heating mode: Pump overrun
S.08	Heating mode: Anti-cycling time

Code	Meaning
Domestic hot water mode SPACE HEATER; VC; VM; VHR = cylinder charging	
S.20	Domestic hot water requirement
S.21	DHW mode: Fan start-up
S.22	DHW mode: Pump prerun
S.23	DHW mode: Ignition
S.24	DHW mode: Burner on
S.25	DHW mode: Pump/fan overrun
S.26	DHW mode: Fan overrun
S.27	DHW mode: Pump overrun
S.28	Domestic hot water burner anti-cycling time (cycle suppression)

Notes

Code	Meaning
S.30	No heat demand: Controller (room thermostat terminal 3-4 = blocks heating mode)
S.31	No heat demand, summer mode (or no heat requirement from eBUS control)
S.32	Waiting time: Fan start-up (fan speed deviation)
S.34	Frost protection mode active
S.36	Control heat demand < 20 °C
S.39	Surface-mounted thermostat triggered ("burner off" contact actuated)
S.41	Water pressure too high (> 3 bar)
S.42	Flue non-return flap closed (flue non-return flap return signal blocks burner operation (in connection with VR 40) or condensate pump faulty, heat requirement is blocked)

Code	Meaning
S.53	Waiting period: Water deficiency (the boiler is within the waiting period due to water deficiency (the difference between the flow and the return is too great))
S.54	Waiting time: Water deficiency (boiler is within the waiting period due to water deficiency (temperature gradient))
S.85	Service message "Insufficient circulation water volume; product in waiting period for one to five minutes"
S.96	Return temperature sensor self-test (test running, heating demands are blocked)
S.97	Self-test: Water pressure sensor (test running, heating demands are blocked)
S.98	Self-test: Flow/return sensor (test running, heating demands blocked)
S.108	Purging function running

Notes

7.3.1.2 Diagnostics codes

The diagnostics menu is integrated in the Installer level and can only be called up after entering a password.

The diagnostics codes highlighted in bold in the following table can only be changed via the buttons of the DIA system.

The bold information in the "Adjustable values" column is default settings.

Display	Meaning/text	Display values/adjustable values
XXXX	**Parameter with code 96 entered**	**XXX**
D.000	Partial heat load	Adjustable partial heat load in kW/**Auto**
D.001	Pump overrun: Heating	2 - 60 min **(5 min)**
D.002	Max. anti-cycl. time: Heating (at 20 °C flow temperature)	2 - 60 min **(20 min)**
D.004	Cylinder temperature actual value **For Space heater:** Cylinder sensor	in °C
D.005	Heating flow temperature target value (or return temperature target value, if return control is set, "D.017" =1)	In °C; the maximum value that is set in D.071 and is restricted by means of an eBUS control (if connected)
D.007	**For SPACE HEATER:** Cylinder temperature target value	40 to 65 °C
D.009	Current flow temperature through external eBUS control	in °C
D.010	Status of internal heating pump	On[1]/off [0]
D.011	Status of external pump	On[1]/off [0]
D.012	Status of cylinder charging pump (via accessory module)	On[1]/off [0]
D.013	Status of circulation pump (via accessory module)	On[1]/off [0]

Notes

Display	Meaning/text	Display values/adjustable values
XXXX	**Parameter with code 96 entered**	**XXX**
D.014	Pump speed target value	– 0 =Auto (modulating pump control with constant pressure regulation) From 1–5 = pump fixed value control – 1 = 53% – 2 = 60% – 3 = 70% – 4 = 85% – 5 = 100%
D.015	Pump speed actual value	48 % – 100 %
D.016	Heating mode 24 V DC control	On [1] = bridge fitted or heat requirement RT 24 V= Off [0] = bridge removed or no heat requirement RT 24 V=
D.017	Control type	**Flow** [0]/return [1]
D.018	Pump mode	**Eco** [3] = intermittent Comfort [1] = continuous
D.020	Max. DHW temperature target value	In °C adjustment range: 50 °C–65 °C,
D.022	Cylinder charging requirement through internal cylinder control, C1/C2, impeller sensor or actoSTOR	On[1]/off [0]
D.023	Heating mode status	Released [1]/Blocked [0]
D.024	Status of the air pressure switch	On[1]/off [0]
D.025	Ext. eBUS signal: Cylinder charging	On[1]/off [0]
D.026	Optional internal relay	1 = Circulation pump **2 = External heating circuit pump** 3 = Cylinder charging pump 4 = Extraction hood 5 = External solenoid valve 6 = External fault message 7 = Solar pump (not active) 8 = eBUS remote control (not active) 9 = Anti-legionella pump (not active) 10 = Collective solar valve (not active)
D.027	Accessory relay 1 (2 in 7 multi-functional module/VR 40)	Circulation pump [1]/**External pump [2]**/Cylinder charging pump [3]/Extraction hood [4]/Ext. solenoid valve [5]/ Ext. fault message [6] **Not active:** Solar pump [7]/eBUS remote control [8]/Legionella protection pump [9]

Notes

Display	Meaning/text	Display values/adjustable values
XXXX	**Parameter with code 96 entered**	**XXX**
D.028	Accessory relay 2 (2 in 7 multi-functional module/VR 40)	Circulation pump [1]/**External pump [2]**/Cylinder charging pump [3]/Extraction hood [4]/Ext. solenoid valve [5]/ Ext. fault message [6] **Not active:** Solar pump [7]/eBUS remote control [8]/Legionella protection pump [9]
D.029	Current volume flow	l/min
D.033	Fan speed target value	In rpm
D.034	Fan speed actual value	In rpm
D.035	3-port valve position	Heating mode [0%]/Parallel operation [50%]/Domestic hot water mode [100%]
D.040	Actual flow temperature value	in °C
D.041	Return temperature actual value	in °C
D.044	Digitised ionisation value	0 to 1020 Good flame < 400 No flame > 800
D.047	Outdoor temperature (with weather-compensated boiler control)	Actual value in °C
D.050	Offset min. speed	0 to 3000 rpm Unit-dependent factory setting
D.051	Offset max. speed	- 990 to 0 rpm Unit-dependent factory setting
D.060	Number of safety cut-out switch-off sequences	Value
D.061	Number of flame sequence control switch-off sequences	Value
D.064	Avg. ignition time	In sec.
D.065	Max. ignition time	In sec.
D.067	Remaining anti-cycl. time for heating	In minutes
D.068	Number of first start attempts	Quantity
D.069	Number of second start attempts	Quantity
D.071	Max. Heating target flow temp.	In °C, adjustment range, 40 – 80 °C (**75 °C**)
D.072	Pump overrun after cylinder charging (warm start for SPACE HEATERW)	In min, adjustment range, 0 – 10 min **(2 min)**
D.074	Anti-legionella function (shift-load cylinder)	ON
D.075	Max. cylinder charging time (domestic hot water cylinder without own control system)	In min, adjustment range, 20 – 90 min **(48 min)**

Notes

Display	Meaning/text	Display values/adjustable values
XXXX	**Parameter with code 96 entered**	**XXX**
D.076	Device Specific Number	XX DSN
D.077	DHW partial load (output during cylinder charging SPACE HEATER)	in kW / setting range between min. and max. output
D.078	DHW max. flow temperature (for cylinder charging)	In °C, adjustment range: 50–80 °C **(75 °C)** The chosen value must be at least 15 K or 15 °C above set cylinder target value.
D.080	Heating operating hours	In hours (hr)
D.081	DHW operating hours	In hours (hr)
D.082	Heating burner starts	Number x 100 (3 corresponds to 300)
D.083	DHW burner starts	Number x 100 (3 corresponds to 300)
D.084	Maintenance in (number of hours until next service)	Adjustment range: 0 to 3000 hrs and --- for deactivated **(---)**
D.085	Minimum output (anti-sooting)	kW
D.090	Status of eBUS control	Recognised [1]/Not recognised [0]
D.091	Status DCF77	No reception [0]/Reception [1]/Synchronised [2]/Valid [3]
D.093	Unit variant setting	Current DSN number
D.094	Clear fault history	Yes [1]/No [0]
D.095	Software version: PeBUS participant	AI [3] = Digital Information and Analysis System/BMU [2] = PCB/APC = actoSTOR module
D.096	Reset to factory settings?	Yes [1]/No [0]
D.122	Remaining pump head for electric heating mode	100 to 400 mbar = **200 mbar**
D.123	Last cylinder charging	min
D.124	ECO mode cylinder charging	Not available
D.125	Cylinder outlet cylinder sensor	Not available
D.126	Solar disable recharge function	Not available
D.148	Remaining pump head for electric cylinder charging mode	100 to 400 mbar = **400 mbar**

Notes

Display	Meaning/text	Display values/adjustable values
XXXX	**Parameter with code 96 entered**	**XXX**
D.149	Detailed description of fault **F.75**	If the fault message F.75 appears, a defined indication for fault analysis can be evaluated here. 0 = No fault 1 = Pump blocked 2 = Electrical pump fault 3 = Dry fire 4 = Alarm, pump voltage too low 5 = Pressure sensor fault 6 = No response from pump (PWM) 7 = Incorrect pump identified 8 = Volume flow test after unit purging programme not successful

Notes

7.3.1.3 Detailed explanation

Diagnostics code D.014:

In addition to the diagnostics code, a further function was stored. If the **"Auto"** setting (factory setting) is stored, the pump modulates in parallel with the current burner modulation.

New! If the minimum volume flow (LFR) is not reached, the electronics switch the pump mode to **"constant control"** and raise the remaining pump head to the stored value of the max. Remaining feed head under **D.122** (heating mode)/**D.148** (cylinder charging mode).

The constant control will take effect in heating installations without a low loss header (e.g. non-calculated pipe systems; when replacing an old boiler).
The function is not started in installations with low loss header, as the minimum volume flow is easily reached.

Diagnostics code D.029:

New! The current pump volume flow in l/min can be read here. The value is measured via the pump's PWM response.

Diagnostics code D.122:

New! Electronic offset for the remaining pump head in heating mode. Adjustment range: 100–400 mbar.
Factory setting: **200 mbar**.

Diagnostics code D.148:

New! Electronic offset for the remaining pump head in cylinder charging mode. Adjustment range: 100–400 mbar. The diagnostics code can be used if hydraulics without a low loss header are in use and cylinder charging is implemented via the external 3-port valve. Factory setting: **400 mbar**.

Diagnostics code D.149:

New! This diagnostics code was introduced in order to provide an aid for the fault analysis of fault **F.75**. If fault **F.75** appears, the defective assembly can be inferred by reading the figure under **D.149**. This function facilitates troubleshooting.

Notes

7.3.1.4 Fault messages

If a fault message is present, this flashes in the display. If several fault messages are present, all of the fault messages are displayed in turn.

Display	Text display (description)	Possible cause
F.00	Interruption: Flow sensor (NTC)	NTC defective, NTC cable defective, Defective plug connection on NTC, Defective plug connection on electronics
F.01	Interruption: Return sensor (NTC)	
F.03	Interruption: Cylinder sensor	
F.10	Short circuit: Flow sensor	Plug on sensor has short to earth on housing, Short circuit in cable harness, Defective sensor
F.11	Short circuit: Return sensor	
F.13	Short circuit: Cylinder sensor (NTC)	
F.20	Safety shutdown: Temperature cut-out (safety cut-out tripped)	Earth connection between cable harness and product incorrect, Flow or return NTC defective (loose connection) Stray spark via ignition cable, ignition plug or ignition electrode
F.22	Safety switch-off: Water deficiency (dry fire)	Too little water in unit, Water pressure sensor defective, Cable to pump or water pressure sensor defective, Pump blocked or defective, Pump output too low
F.23	Safety switch-off: Temp. spread too large (temperature difference between flow and return sensor too high)	Pump blocked or defective, Pump output too low, Flow and return sensor inverted
F.24	Safety switch-off: Temp. incr. too fast	Pump blocked, Insufficient pump output, Air in unit, System pressure too low The non-return valve is blocked/installed incorrectly
F.25	Safety switch-off: Flue temp. too high	Open circuit in cable harness compact thermal module Inspect plug connections
F.27	Safety switch-off: Flame simulation	Moisture in the electronics, Electronics (flame monitor) defective, Gas solenoid valve not leak-tight

Notes

Display	Text display (description)	Possible cause
F.28	Start-up failure (unit does not start: Ignition attempts during start-up unsuccessful)	Fault in gas supply such as: Gas meter or gas pressure monitor defective, air in the gas,
F.29	Operating failure (flame goes out during operation and subsequent ignition attempts unsuccessful)	Gas supply interrupted intermittently, Incorrect earthing of unit, Flue gas recirculation,
F.32	Fault: Fan (fan speed variation too great)	Fan blocked, Plug on fan not correctly connected, Hall sensor defective, Fault on cable harness, Electronics defective
F.33	Pressure sensor is not switching	Check the supply air/flue pipe; check the plug connections; replace the pressure switch; check the fan; PCB def.
F.49	eBUS fault	Short circuit in eBUS, eBUS overload or Two power supplies with different polarities on eBUS
F.61	Fault: Fuel valve actuation	Short circuit/short to earth in cable harness for gas valves Gas valves defective (short to earth in coils), Electronics defective
F.62	Fault: Fuel valve switch-off delay	Delayed shutdown of gas valve assembly Delayed extinguishing of flame signal Gas valve assembly leaking Electronics defective
F.63	Fault: EEPROM	Electronics defective
F.64	Fault: Electronics/sensor	Short circuit in flow/return sensor Electronics defective
F.65	Fault: Electronics temp.	Electronics too hot due to external factor, Electronics defective
F.67	Fault: Electronics/flame (flame monitor input signal outside limits (0 or 5 V))	Implausible flame signal, Electronics defective
F.70	Fault: Invalid Device Specific Number (no valid unit variant detected for display and/or electronics)	Part replacement scenario: Display and electronics replaced at the same time and unit variant not reset Incorrect or missing output range coding resistor

Notes

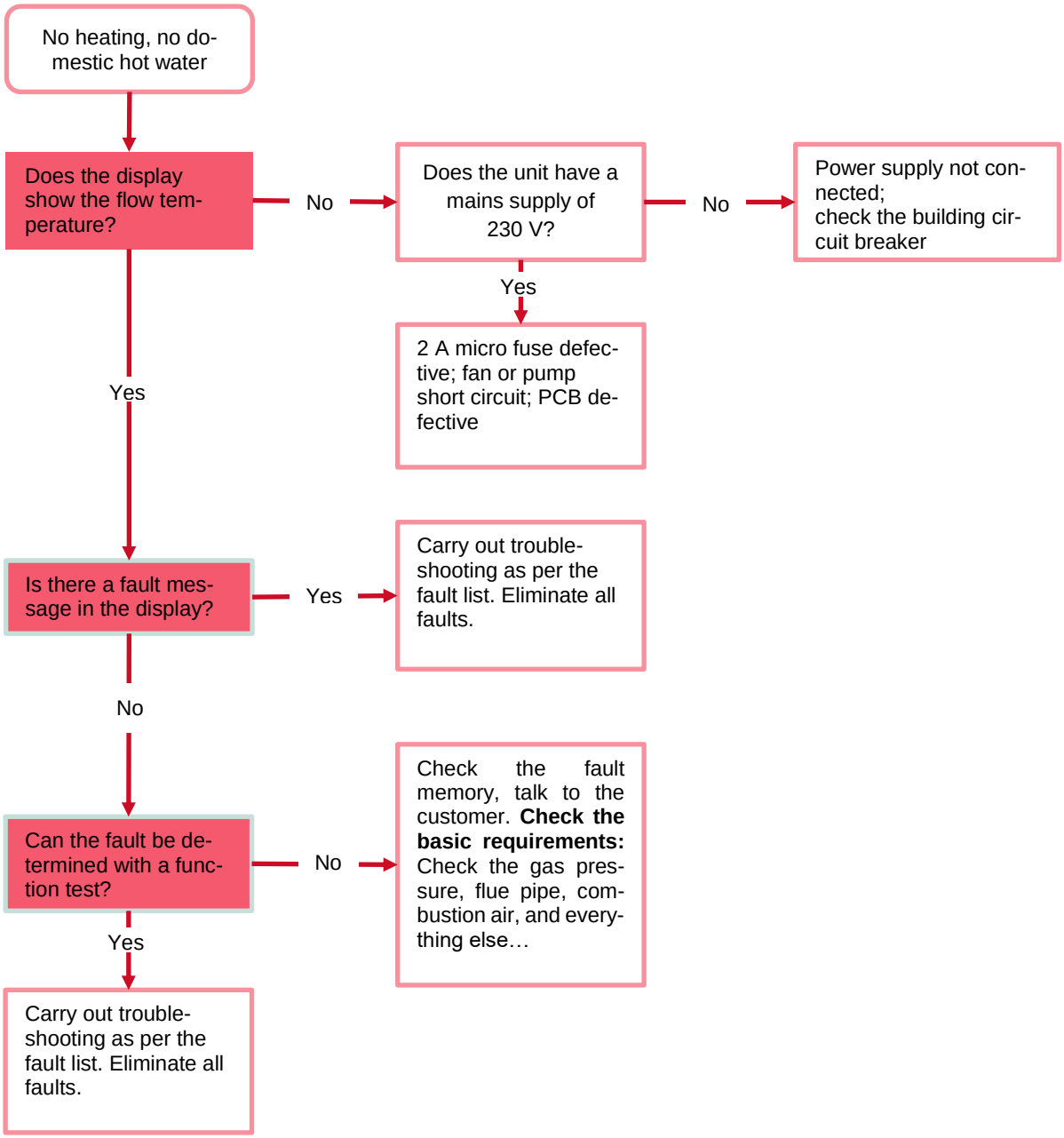
Display	Text display (description)	Possible cause
F.71	Fault: Flow sensor (flow sensor reports a constant value)	Flow sensor not correctly positioned on the flow pipe. Flow sensor defective.
F.72	Fault: Flow/return sensor	Flow and/or return sensor defective (tolerances too great)
F.73	Fault: Water press. sensor (water pressure sensor signal in the wrong range (too low))	Line break in water pressure sensor line or Short circuit to 0 V or Water pressure sensor defective
F.74	Fault: Water press. sensor (water pressure sensor signal outside correct range (too high))	Line to water pressure sensor has short circuit to 5 V/24 V or Internal fault in water pressure sensor
F.75	Fault: Pump/water deficiency (no pressure change detection when starting pump)	Water pressure sensor and/or pump defective Air in the heating system Insufficient water in unit; check external bypass; External expansion vessel connected on flow line
	D.149 = 1 Pump blocked alarm	Clean the pump; replace the pump
	D.149 = 2 Electrical pump fault	Check supply voltage; replace the pump
	D.149 = 3 Pump dry fire	Check system pressure; make sure there is no remaining air in the system. Replace the pump
	D.149 = 5 No pump jump detected	Check pressure sensor; replace pressure sensor
	D.149 = 6 No PWM response from pump	Check the pump cable harness; check the PCB; check the plug connections; check the supply voltage; replace the pump; replace the PCB
	D.149 = 7 Incorrect pump detected	The detected pump does not match the unit – pump does not have a reliable identification code; use the pump from the matching spare parts programme
	D.149 = 8 Volume flow test after purging programme not successful	Check that all locks are open or open thermostatic valves; check system pressure (≥ 1.5 bar)
F.77	Fault: Flue non-return flap/condensate pump (water level in condensate pump/no return signal (bridge) from "2 in 7" accessory module)	Condensate pump defective Cable connection defective

Notes

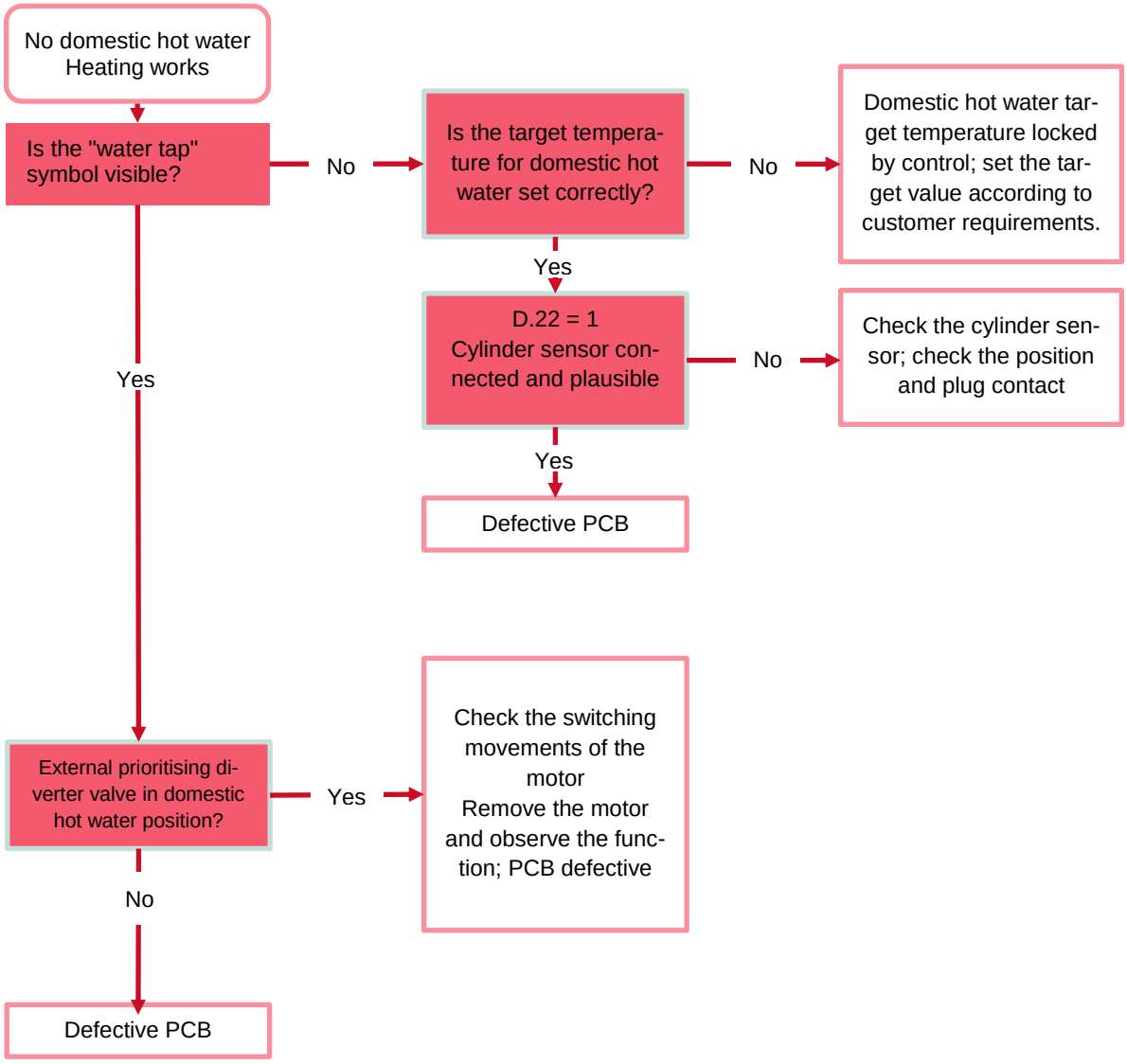
Display	Text display (description)	Possible cause
F.83	Fault: NTC temp. gradient	When the burner starts, no temperature change or an excessively small temperature change is registered by the flow or return temperature sensor. Insufficient water in unit Flow or return temperature sensor not positioned correctly on the pipe.
F.84	Fault: NTC temp. diff. implausible	Flow and return temperature sensors report implausible values. Flow and return temperature sensors not correctly installed.
F.85	Fault: Flow or return sensor fitted incorrectly	Flow and/or return sensors are installed on the same pipe or on incorrect pipes.
F.89	Fault: Pump	Pump not connected or there is a short circuit in the cable harness. Check the cable connection.
Err	No communication with PCB	Communication fault between AI display PCB and BMU PCB in the electronics box

Notes

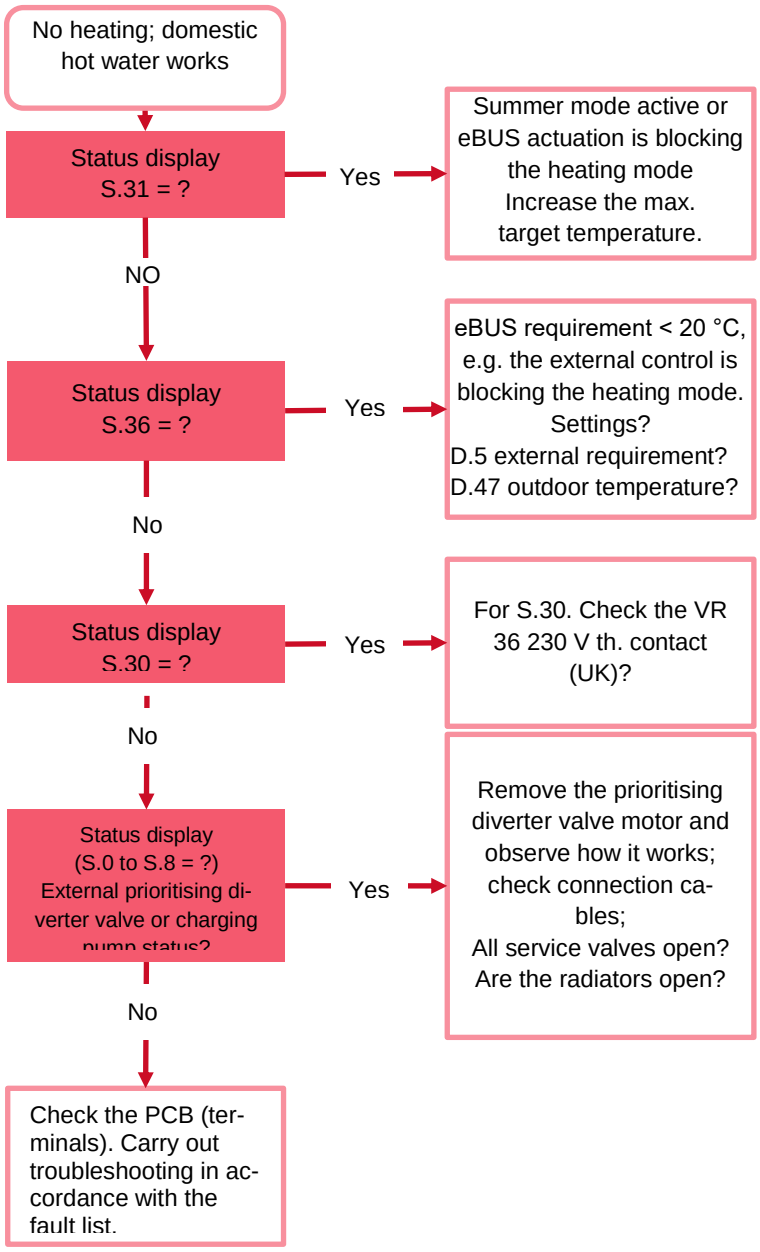
7.3.2 Troubleshooting and flowcharts



Notes


No domestic hot water Heating works
Is the "water tap" symbol visible?
No
Is the target temperature for domestic hot water set correctly?
No
Domestic hot water target temperature locked by control; set the target value according to customer requirements.
Yes
D.22 = 1 Cylinder sensor connected and plausible
No
Check the cylinder sensor; check the position and plug contact
Yes
Defective PCB
Yes
External prioritising diverter valve in domestic hot water position?
Yes
Check the switching movements of the motor Remove the motor and observe the function; PCB defective
No
Defective PCB

Notes


No heating; domestic hot water works
Status display S.31 = ?
Yes
Summer mode active or eBUS actuation is blocking the heating mode Increase the max. target temperature.
NO
Status display S.36 = ?
Yes
eBUS requirement < 20 °C, e.g. the external control is blocking the heating mode. Settings? D.5 external requirement? D.47 outdoor temperature?
No
Status display S.30 = ?
Yes
For S.30. Check the VR 36 230 V th. contact (UK)?
No
Status display (S.0 to S.8 = ?) External prioritising diverter valve or charging pump status?
Yes
Remove the prioritising diverter valve motor and observe how it works; check connection cables; All service valves open? Are the radiators open?
No
Check the PCB (terminals). Carry out troubleshooting in accordance with the fault list.

Notes

7.3.2.1 Check programmes

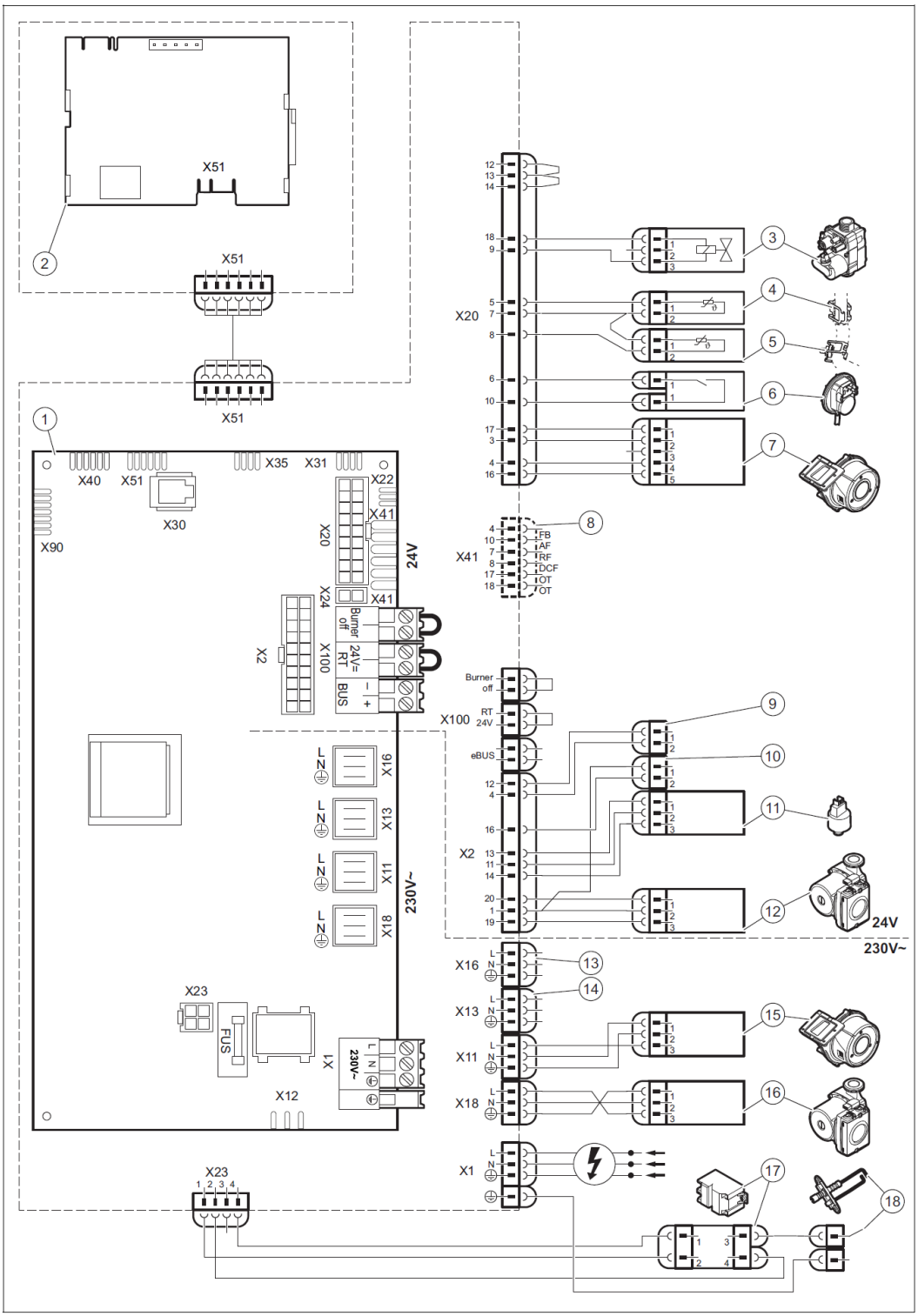
Check programme	Description
P 00	**Check programme: Purging:** The heating circuit and the domestic hot water circuit are purged via the automatic air separator. The heating pump is cyclically actuated. See automatic purge programme for the operating sequence. Stored time periods for automatic purging: Domestic hot water circuit **390 seconds**; heating circuit **390 seconds**.
P 01	**Check programme: Full load:** The unit is operated at maximum heat load on successful ignition. If the max. Volume flow cannot be achieved, the output is limited.
P 02	**Check programme: Minimum load:** The unit is operated with a minimal heat load (ignition gas volume) on successful ignition. If the min. volume flow cannot be achieved, the burner is not started. (Check S.85)
Automatic purge programme	**Automatic check programme:** Start condition and boiler purging: If the unit/system pressure has fallen below **0.3 bar** for at least **15 seconds**, the point for a purging sequence is set. The unit/installation purging is started from **0.5 bar**. If the heating pressure in the primary circuit rises above **0.5 bar** for **30 seconds** (start-up), an automatic purging function starts. The function starts repeatedly if the system pressure has fallen below **0.3 bar** for at least **15 seconds** (e.g. purging of heating surfaces or other causes) during servicing (maintenance). After filling the installation, the purging starts if **0.5 bar** has been exceeded for at least **30 seconds**. – The function cannot be stopped, even by the competent person. – The burner does not start before the purging process has been completed. – After the purging, no air remains in the unit, which reduces the risk of damage caused by cavitation and of noises in the heating installation. – Stored time periods for automatic purging: Domestic hot water circuit **390 seconds**; heating circuit **390 seconds**. Following the automatic purging, the volume flow is measured (heating circuit or hot-water charging circuit) to ensure that the unit has been purged. Purging is completed when the threshold of the low volume flow (Lower Flow Rate) has been exceeded. If the threshold has not been exceeded, the purging function was not fulfilled and fault **F.75** is displayed.

EASY TIP The check programmes are used during start-up and maintenance in order to operate the unit in a defined condition.

Notes

7.3.3 Measurement points and measured values

7.3.3.1 Internal circuit diagram



Notes

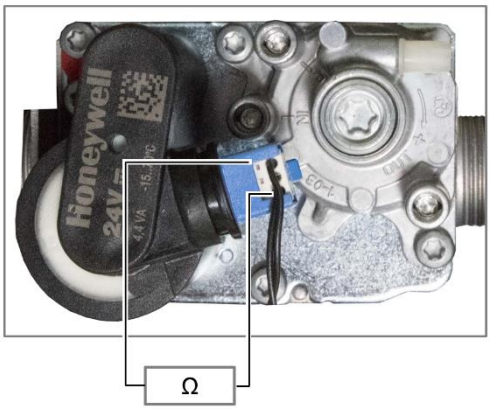
Notes

Key			
1	BMU PCB	10	C1/C2 analogue DHW contact
2	Unit display (AI)	11	Water pressure sensor
3	Gas valve supply	12	PWM for the heating circuit pump
4	Flow sensor	13	D.026 optional relay
5	Return sensor	14	3 way valve/DHW charging pump power supply
6	Air pressure switch	15	230 V fan power supply
7	Fan control signal	16	230 V heating circuit pump power supply
8	X41 edge connector for AF, RF	17	Ignition transformer
9	Plug contact for cylinder sensor	18	Ignition and monitoring electrodes

Notes

7.3.3.2 New! Honeywell gas valve assembly

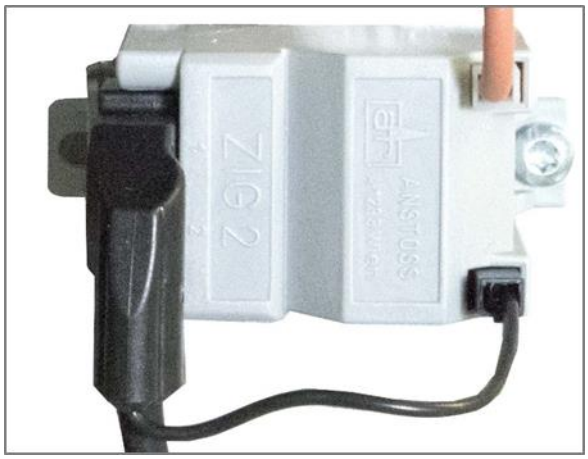
Honeywell VK 8205 VE + V



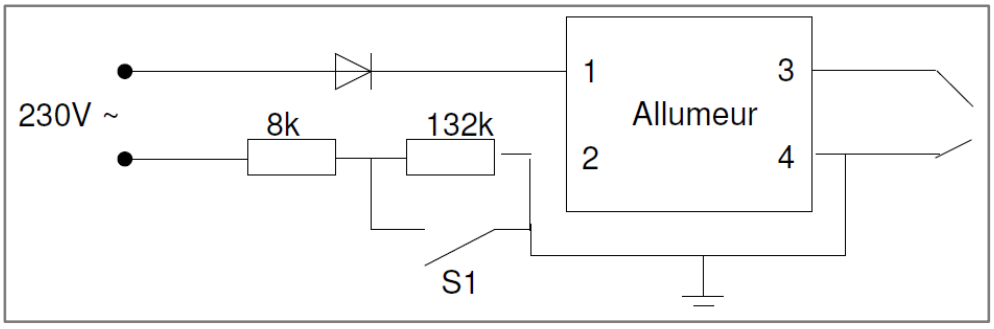
Resistance measurement at the gas coils	
Between contact 1 + 3 blue socket	**114.5 Ω**

Notes

7.3.3.3 Ignition transformer



ecoTEC xx6/5-5 ignition transformer

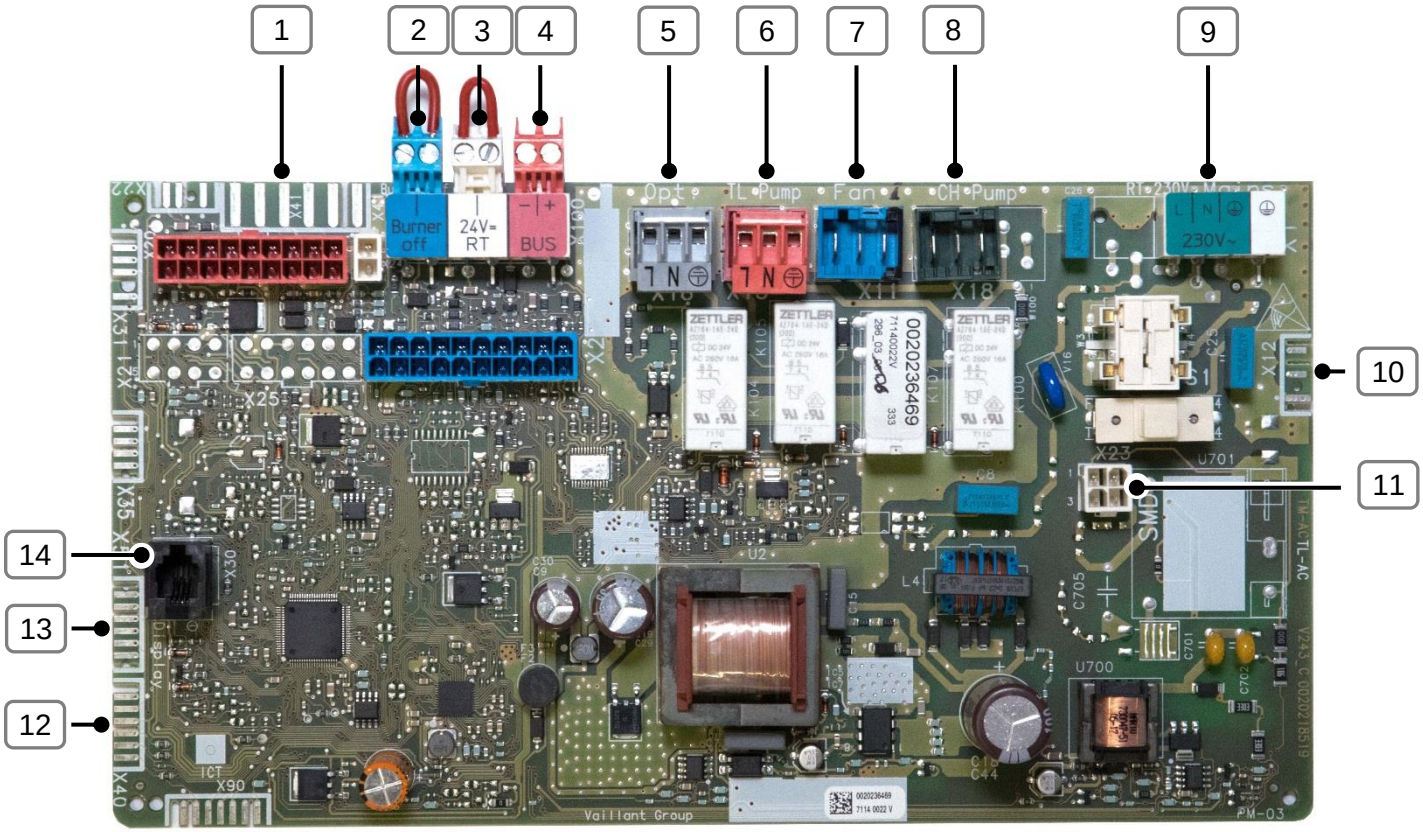


Ignition transformer circuit diagram

Step	230 V	S1	Status/measured value
0 No actuation	Off		Resistance between 3 and 4 **> 100 Mohm**
1 Actuation	On	Off	No ignition spark
2 Ignition	On	On	Ignition sparks with 25 Hz ± 4 Hz

Notes

7.3.3.4 BMU PCB terminals

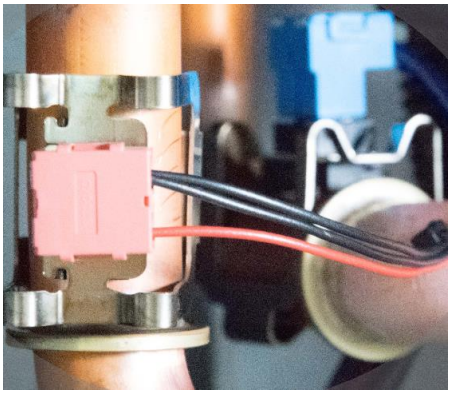


Space heater 41–65 PCB outputs and inputs

Key			
Item	Information	Item	Information
1	**X 41**: Control accessories slot Contacts: Outdoor sensor **AF**; DCF receiver **DCF**; Reference sensor **RF**; Earth **OT**	8	**CH pump**: Internal unit pump; 230 V
2	**Burner off**: Block contact, e.g. for limit thermostat; condensate pump	9	**230V**: Power supply; 230 V
3	**24V=**: Contact for 24 V room thermostat with potential-free switching	10	**X 12**: Optional 2 in 7 module power supply; 230 V
4	**BUS**: eBUS	11	**X 23**: Ignition transformer power supply; 230 V
5	**OPT**: D.026 optional relay; 230 V	12	**X 40**: Optional 2 in 7 module data contact
6	**TL pump**: DHW charging pump/3-port valve; 230 V	13	**X 51**: Unit display contact
7	**Fan**: Internal fan; 230 V	14	**X 30:** serviceDIALOG contact

Notes

7.3.3.5 NTC VR 11 sensor measured values

Temperature (°C)	Resistance (kΩ)	Image
VR 11 NTC flow and return		
15	16	
20	12.7	
25	10.1 (10 K)	
30	8.2	
35	6.6	
40	5.4	
48	4.4	
50	3.6	
55	3	
60	2.5	
65	2.1	
70	1.8	
75	1.5	
80	1.3	
85	1.1	

Notes

7.3.3.6 Table of optional cylinder sensor resistance values

Temperature (°C)	Resistance (kΩ)
10	5.39
15	4.24
20	3.37
25	2.70
30	2.17
35	1.75
40	1.43
48	1.17
50	0.96
55	0.80
60	0.66
65	0.55
70	0.47
75	0.39
80	0.33
85	0.28
90	0.24
95	0.21
100	0.18

VR 10 characteristics of cylinder sensor

Notes

7.3.3.7 Replacing PCBs

The unit variants and output ranges are stored using software on the electronic PCB (BMU) and on the display PCB (AI) at the factory.

Replacing a component:

When servicing the system, the parameters of the component not replaced are transferred to the newly installed PCB (after switching on the unit) if replacing either of the two components. It is therefore not necessary to manually enter any customer-specific parameters. If either component is selected incorrectly, the fault message **"F.70"** appears.

Replacing both components:

The unit variant only has to be programmed if replacing both components, otherwise fault message **"F.70"** appears.
Using the correct display is particularly important when programming the DSN (Device Specific Number), otherwise the unit works with the data of another unit type.
If the required display is not available, it must be obtained first before the unit is started up again.

Programming procedure:

In the installer level, program the unit variant using parameter **"D.093"**.

After saving the DSN number, the power supply must not be interrupted for approx. 60 seconds and RESET must not be actuated. Otherwise, the data exchange between BMU and AI is interrupted and fault "F.70" is again shown in the display. This information is provided in an additional insert in the spare part packaging.

Notes

8 Appendix

In this section:

- You can find all required information in tabular form
  - Technical data
  - Further information
  - A collection of formulas for planning

8.1 Technical data

Brand		SDBG	SDBG
Range of units		Space heater 48–60 kW	Space heater 48–60 kW
Heat exchanger size		7C	9C
Product designation		VC 486/5 - 5 (H-INT I) Space heater	VC 656/5 - 5 (H-INT I) Space heater
Gas		G20	G20
Gas category		II2H3P	II2H3P
Dimensions			
Height	mm	720	720
Width	mm	440	440
Depth	mm	405	473
Weight (without packaging)	kg	37.8	47.2
G31 CO2 minimum output front closed	%	9.4	9.6
G31 CO2 minimum output front open	%	9.2	9.4
G31 CO2 maximum output front closed	%	9.9	10.1
G31 CO2 maximum output front open	%	9.7	9.9
CO2 value tolerance [%]	%	0.3	0.3
Supply voltage	V	230	230
Mains frequency	Hertz	50	50
Protection class		IPX4D	IPX4D
Standby electrical power consumption	W	1.5	1.8
Pump power consumption at max.	W	85	123

All relevant technical data can be found in the country-specific installation instructions

Notes

8.2 DSN overview

Product	DSN	Product	DSN
Thema Condens AS 48-A (H-HU)	**1**	Thema Condens AS 48-A (E-BE)	**1**
Thema Condens AS 65-A (H-HU)	**2**	Thema Condens AS 65-A (E-BE)	**2**
Thermo Master Condens AS 48-A (H-ES)	**1**	Panther Condens 48 KKO-A (H-CZ)	**1**
Thermo Master Condens AS 65-A (H-ES)	**2**	Maxi Condense H48 (H-TR)	**1**
Thema Condens 48 SB-A (H-IT)	**1**	Maxi Condense H65 (H-TR)	**2**
Thema Condens 65 SB-A (H-IT)	**2**		

Notes

8.3 ErP data

Data sheet that is enclosed with the product.

Product data sheet (in accordance with EU regulation no. 811/2013)

1	Brand name			Saunier_Duval
2	Models		I	Thermomaster Condens AS 48-A (H-ES)
			II	Thermomaster Condens AS 65-A (H-ES)
			III	-
			IV	-
			V	-
			VI	-

				I	II	III	IV	V	VI
3	Room heating: Seasonal energy-efficiency class	-	-	A	A	-	-	-	-
4	Room heating: Nominal heat output (*8) (*11)	P_{rated}	kW	44	59	-	-	-	-
5	Room heating: Seasonal energy efficiency (*8)	η_s	%	94	94	-	-	-	-
6	Annual energy consumption (*8)	Q_{HE}	kWh	-	-	-	-	-	-
7	Sound power level, indoor	L_{WA} indoor	dB(A)	57	57	-	-	-	-
8	All specific precautions for assembly, installation and maintenance are described in the operating and installation instructions. Read and follow the operating and installation instructions.								
9	All of the data that is included in the product information was determined by applying the specifications of the relevant European directives. Differences to product information listed elsewhere may result in different test conditions. Only the data that is contained in this product information is applicable and valid.								
10	Temperature application	-	-	-	-	-	-	-	-

(*8) For average climatic conditions

(*11) For boilers and combination boilers with a heat pump, the nominal heat output "Prated" is the same as the design load in heating mode "Pdesignh", and the nominal heat output for an auxiliary boiler "Psup" is the same as the additional heating output "sup(Tj)"

Notes

Product information (in accordance with EU regulation no. 813/2013)

1	Brand name		Saunier_Duval
2	Models	I	Thermomaster Condens AS 48-A (H-ES)
		II	Thermomaster Condens AS 65-A (H-ES)
		III	-
		IV	-
		V	-
		VI	-

				I	II	III	IV	V	VI
11	Floor-standing condensing boiler	-	-	✓	✓	-	-	-	-
12	Low-temperature boiler (*2)	-	-	✓	✓	-	-	-	-
13	B1 floor-standing boiler	-	-	-	-	-	-	-	-
14	Room boiler with combined heat and power	-	-	-	-	-	-	-	-
15	Auxiliary boiler	-	-	-	-	-	-	-	-
16	Combination boiler	-	-	-	-	-	-	-	-
17	Room heating: Nominal heat output (*11)	P_{rated}	kW	44	59	-	-	-	-
18	Usable heat output at nominal heat output and high-temperature operation (*1)	P_4	kW	44,1	58,7	-	-	-	-
19	Usable heat output at 30% of the nominal heat output and low-temperature operation (*2)	P_1	kW	14,8	19,7	-	-	-	-
20	Room heating: Seasonal energy efficiency	η_S	%	94	94	-	-	-	-
21	Efficiency for nominal heat output and high-temperature application (*4)	η_4	%	88,5	88,5	-	-	-	-
22	Efficiency at 30% of the nominal heat output and low-temperature application (*5)	η_1	%	98,4	98,6	-	-	-	-
23	Auxiliary power consumption: Full load	el_{max}	kW	0,024	0,031	-	-	-	-
24	Auxiliary power consumption: Partial load	el_{min}	kW	0,006	0,009	-	-	-	-
25	Power consumption: Standby-mode	P_{SB}	kW	0,002	0,002	-	-	-	-
26	Heat loss: Standby	P_{stby}	kW	0,035	0,035	-	-	-	-
27	Ignition flame energy consumption	P_{ign}	kW	-	-	-	-	-	-
28	Nitrogen oxide emissions	NO_x	mg/kWh	31	29	-	-	-	-
29	Manufacturer	-	-	Saunier Duval	Saunier Duval	-	-	-	-
30	Manufacturer's address	-	-	SDECCI SAS 17 rue de la Petite Baratte 44300 Nantes France	SDECCI SAS 17 rue de la Petite Baratte 44300 Nantes France	-	-	-	-
31	All specific precautions for assembly, installation and maintenance are described in the operating and installation instructions. Read and follow the operating and installation instructions.								
32	This floor-standing boiler with natural draught must only be connected to a flue gas installation assigned to one of several dwellings in existing buildings. The flue gas installation directs combustion residues from the installation room into the open air. It draws the combustion air directly from the installation room and is equipped with an atmospheric sensing device. Due to low efficiency, you must avoid using this floor-standing boiler for any other purposes – it would lead to higher energy consumption and higher operating costs.								
33	Read and follow the operating and installation instructions regarding assembly, installation, maintenance, removal, recycling and/or disposal.								

Notes

8.4 Formulas

8.4.1 Hydraulics

8.4.1.1 Volume flow (flow rate)

$\dot{V} = A\,x\,v$	**$\dot{V}$ Volume flow**	$\frac{m3}{s}$	**A**	**Pipe cross-section**	**m²**
$\dot{V} = \frac{V}{t}$			V	Flow speed	$\frac{m}{s}$
			V	Volume	m³
			T	Time	s

8.4.1.1 Calculation: Expansion vessel for closed heating installations

Pressure factor calculation Df			
$Df = \frac{Pe - Po}{Pe + 1}$	Df	Pressure factor	Value
$Pe = Psv - 0.5bar$	Pe	System pressure	bar
$Po = static\ height\ (bar)$	Po	Static height	bar
	Psv	Expansion relief valve pressure set-ting	bar

Expansion volume Vv			
$Vv = n(\%)\,x\,Vges\ (l)$	Vv	Expansion volume	l
	n	Expansion coefficient (water)	4%
	$Vges$	System volume	l

Expansion vessel expansion volume calculation Vn			
$Vn = \frac{Vv}{Df}$	Vn	Volume Expansion vessel	l
	Vv	Expansion Volume	l
	Df	Pressure factor	Value

Example: System volume **110 l** at a static height of **5 m**, expansion relief valve pressure is **3 bar**.

$Df = \frac{Pe - Po}{Pe + 1} = \frac{2.5 - 0.5bar}{2.5 + 1bar} = 0.57$ $\quad Df = 0.57$

$Vv = n(\%)\,x\,Vges(l) = 4\%\,x\,110\,l = 4.4\,l$ $\quad Vv = 4.4\,l$

$Vn = \frac{Vv}{Df} = \frac{4.4l}{0.57} = 7.7l$ $\quad Vn = 7.7\,l$

This sample system requires an expansion vessel with a minimum volume of 7.7 l.

Notes

8.4.1.2 Calculation of expansion vessel's pre-charge pressure in a closed heating installation

Expansion vessel pre-charge pressure Po			
$Po = Pstat + 0.3\ bar$	Po	Pre-charge pressure of expansion vessel	**bar**
	$Pstat$	Hydrostatic pressure (building)	**bar**
	$0.3\ bar$	Default	**bar**

Example:
Height difference in the building from the lowest point of the heat generator to the highest point in the heating circuit. For this example, we are using a building with three storeys (storey height 2.70 m) and a radiator circuit (radiator height 0.80). The following therefore applies:

$Po = Pstat + 0.3\ bar = Po = 0.62\ bar\ (6.2m) + 0.3bar = 0.92\ bar\ Po = 0.92\ bar$

In the case of a self-contained central heating system with no height difference, the pre-charge pressure on the expansion vessel is pre-set to at least 0.7 bar.

8.4.1.3 Potable water expansion vessel calculation

Potable water expansion vessel calculation			
$Vn = \frac{\Delta V}{(\frac{Pe - Po}{Pe + 1} - 1 + \frac{Po + 1}{Pa + 1})}$	Vn	Nominal volume of MAG-W	l
	ΔV	Expansion Volume	l
	Pe	Final pressure in MAG-W	**bar**
	Po	Pre-charge pressure in MAG-W	**bar**
	Pa	Resting pressure downstream of pressure reducer	**bar**

$\Delta V = 0.0167\ x\ Vsp$	ΔV	Expansion volume	l
	Vsp	Domestic hot water cylinder volume	l
	0.0167	Expansion: Water factor	

$Po = Pa - 0.2\ bar$	Po	Pre-charge pressure in MAG-W	**bar**
	Pa	Resting pressure downstream of pressure reducer	**bar**
	0.2	Default	**bar**

$Pe = 0.8\ x\ Psv$	Pe	Final pressure in MAG-W	**bar**
	0.8	Default	
	Psv	Discharge pressure of expansion relief valve	**bar**

Notes

Notes

Example:
A cylinder water heater has a capacity of 300 l. The outlet pressure on the pressure reducer is $\boldsymbol{Pa}$ = 4 bar; the expansion relief valve's discharge pressure is $\boldsymbol{Psv}$ = 10 bar.
Expansion volume:
$\boldsymbol{\Delta V = 0.0167\ x\ Vsp = 0.0167\ x\ 300\ l = 5\ l}$
Pre-charge pressure in MAG-W:
$\boldsymbol{Po = Pa - 0.2\ bar = 4\ bar - 0.2\ bar = 3.8\ bar}$
Final pressure in MAG-W:
$\boldsymbol{Pe = 0.8\ x\ Psv = 0.8\ x\ 10\ bar = 8\ bar}$

Nominal volume of MAG-W:

$$\boldsymbol{Vn = \frac{\Delta V}{\left(\frac{Pe - Po}{Pe + 1} - 1 + \frac{Po + 1}{Pa + 1}\right)} = \frac{5\ l}{\left(\frac{8bar - 3.8bar}{8bar + 1bar} - 1 + \frac{3.8bar + 1bar}{4bar + 1bar}\right)} = 11.7\ l}$$

8.4.2 Gas consumption relating to nominal load

Heat output – setting the energy demand for gas units			
$\boldsymbol{\dot{V}_E = \frac{\phi_B}{H_{i,B}} * 1000\ \frac{l}{m^3} * \frac{1\ h}{60_{min}}}$	$\dot{V}_E$	Set value = input	**l/min**
	ϕ_B	Nominal input	**kW**
	$H_{i,B}$	Lower net calorific value	**kWh/m³**

Example:
You should approve a nominal input of **20.4 kW** for a gas-powered boiler. Use the gas meter display to check the consumption. To be able to continue, you must know the lower net calorific value of the gas supplier.
The value $H_{i,B}$ is calculated with **10.1 kWh/m³** as follows.

$$\boldsymbol{\dot{V}_E = \frac{\phi_B}{H_{i,B}} * 1000\ \frac{l}{m^3} * \frac{h}{60_{min}} = \dot{V}_E = \frac{20.4}{10.1} * 1000\ \frac{l}{m^3} * \frac{h}{60_{min}} = \underline{\textbf{33.7 l/min}}}$$

Notes

8.5 System checklist

Check during start-up/maintenance:

1. Hydraulic integration as per installation instructions
2. Electrical wiring as per installation instructions
3. Water composition as per installation instructions
4. Flue gas system as per planning information
5. Gas connection pressure
6. Gas flow pressure (15–25 mbar)
7. CO_2 setting (G20/25 approx. 8.7%) (G31 approx. 9.2%)

Observe the minimum circulation water volume for heating circuits without low loss header.

Notes

For the installation, always observe the installation and maintenance instructions enclosed with the unit.

Planning examples are no substitute for having every single installation planned by a professional.

Saunier Duval Eau Chaude Chauffage Industrie (SDECCI)
17, rue de la Petite Baratte - BP 41535 –
44315 Nantes Cedex 03

Training 0020260859_00 INT(en) 01/2018 • Subject to technical modifications and changes in content • All information is subject to change