



**Stokvis R40 Boiler  
Gas-Fired  
Wall Hung  
Condensing**

**Installation, Operation & Maintenance  
Manual**

**STOKVIS ENERGY SYSTEMS**

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# Safety

## General regulations Application Norms and regulations

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### General regulations

This documentation contains important information, which is a base for safe and reliable installation, commissioning and operation of the R40 boiler. All activities described in this document may only be executed by authorized companies.

Changes to this document may be effected without prior notice. We accept no obligation to adapt previously delivered products to incorporate such changes.

Only original spare parts may be used when replacing components on the boiler, otherwise warranty will be void.

### Application

The R40 boiler may be used for heating and hot water production purposes only. The boiler should be connected to closed systems with a maximum temperature of 100°C (high limit temperature), maximum setpoint temperature is 90°C.

### Norms and regulations

When installing and operating the boiler, all applicable norms (European and local) should be fulfilled:

- Local building regulations for installing combustion air and flue gas systems;
- Regulation for connecting the boiler to the electrical appliance;
- Regulations for connecting the boiler to the local gas network;
- Norms and regulations according to safety equipment for heating systems;
- Any additional local laws/regulations with regard to installing and operating heating systems.

### The R40 boiler is CE approved and applies to the following European standards:

- 92 / 42 / EEC  
Boiler efficiency directive
- 2009 / 142 / EEC  
Gas appliance directive
- 2006 / 95 / EEC  
Low voltage directive
- 2004 / 108 / EEC  
EMC directive
- EN 483  
Gas-fired central heating boilers - Type C boilers of nominal heat input not exceeding 70 kW
- EN 15420  
Gas-fired central heating boilers - Type C boilers of nominal heat input exceeding 70 kW, but not exceeding 1000 kW
- EN 15417  
Gas-fired central heating boilers - Specific requirements for condensing boilers with a nominal heat input greater than 70 kW but not exceeding 1000 kW
- EN 50165  
Electrical equipment of non-electric appliances for household and similar purposes - Safety requirements
- EN 15502-1  
Gas-fired central heating boilers - Part 1: General requirements and tests
- EN 55014-1 (2000)  
Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
- EN 55014-2 (1997)  
Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity - Product family standard

- EN 61000-3-2 (2000)  
Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current 16 A per phase)
- EN 61000-3-3 (2001)  
Electromagnetic compatibility (EMC) - Part 3-3: Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current 16 A per phase and not subject to conditional connection
- EN 60335-1 (2002)  
Household and similar electrical appliances - Safety - Part 1: General requirements
- EN 60335-2-102 (2006)  
Household and similar electrical appliances: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections

### Additional national standards

#### Germany:

- RAL - UZ 61 / DIN 4702-8

#### Switzerland:

- SVGW
- Vorschriften der kantonalen Instanzen (z.B. Feuerpolizeivorschriften)

#### Netherlands:

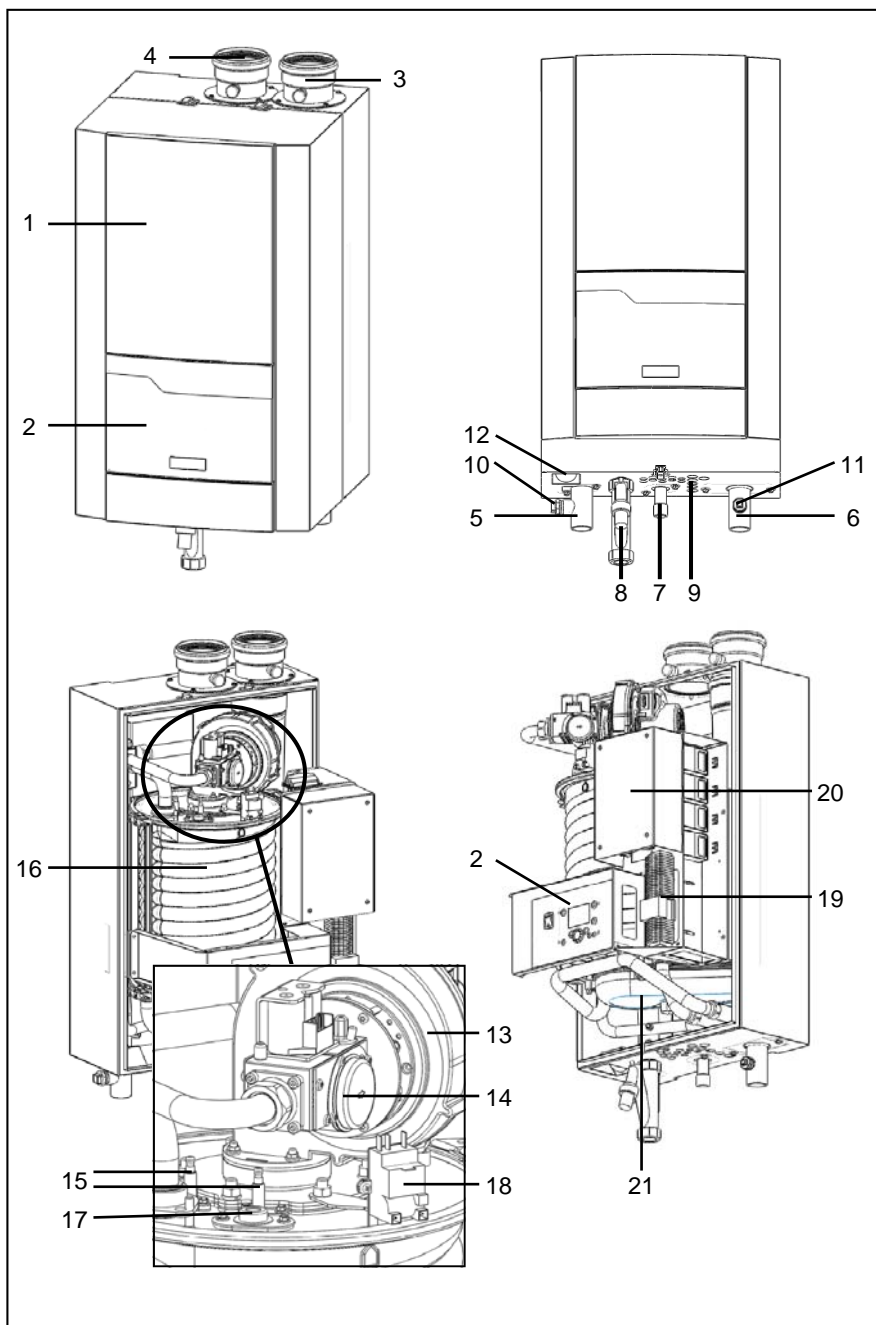
- GASKEUR BASIS
- GASKEUR SV
- GASKEUR HR107

#### Belgium:

- HR TOP

# Construction

## Layout of boiler Operating principle



### Layout of boiler

The R40 boiler consists of the following main components:

- 1 Casing
- 2 Control panel
- 3 Flue gas connection (+ test point)
- 4 Air intake connection (+ test point)
- 5 Flow water connection
- 6 Return water connection
- 7 Gas connection
- 8 Syphon
- 9 Input for wiring
- 10 Connection for safety valve
- 11 Connection for fill/drain valve
- 12 Manometer
- 13 Fan
- 14 Gas valve
- 15 Ignition and ionisation electrodes
- 16 Heat exchanger
- 17 Inspection window
- 18 Ignition transformer
- 19 Electrical input connections
- 20 Controller
- 21 Condensate receptacle

### Operating principle

The R40 is a fully modulating boiler. The control unit of the boiler adapts the modulation ratio automatically to the heat demand requested by the system. This is done by controlling the speed of the fan. As a result, the Whirlwind mixing system will adapt the gas ratio to the chosen fan speed, in order to maintain the best possible combustion figures and therewith the best efficiency. The flue gases created by the combustion are transported downwards through the heat exchanger

and leave the boiler at the top into the chimney connection.

The return water from the system enters the boiler in the lower section, where is the lowest flue gas temperature in the boiler. In this section condensation takes place. The water is being transported upwards through the heat exchanger, in order to leave the boiler at the flow connection. The cross flow working principle (water up, flue gas down) ensures the most efficient combustion results.

The LMS14 control unit can control the boiler operation based on:

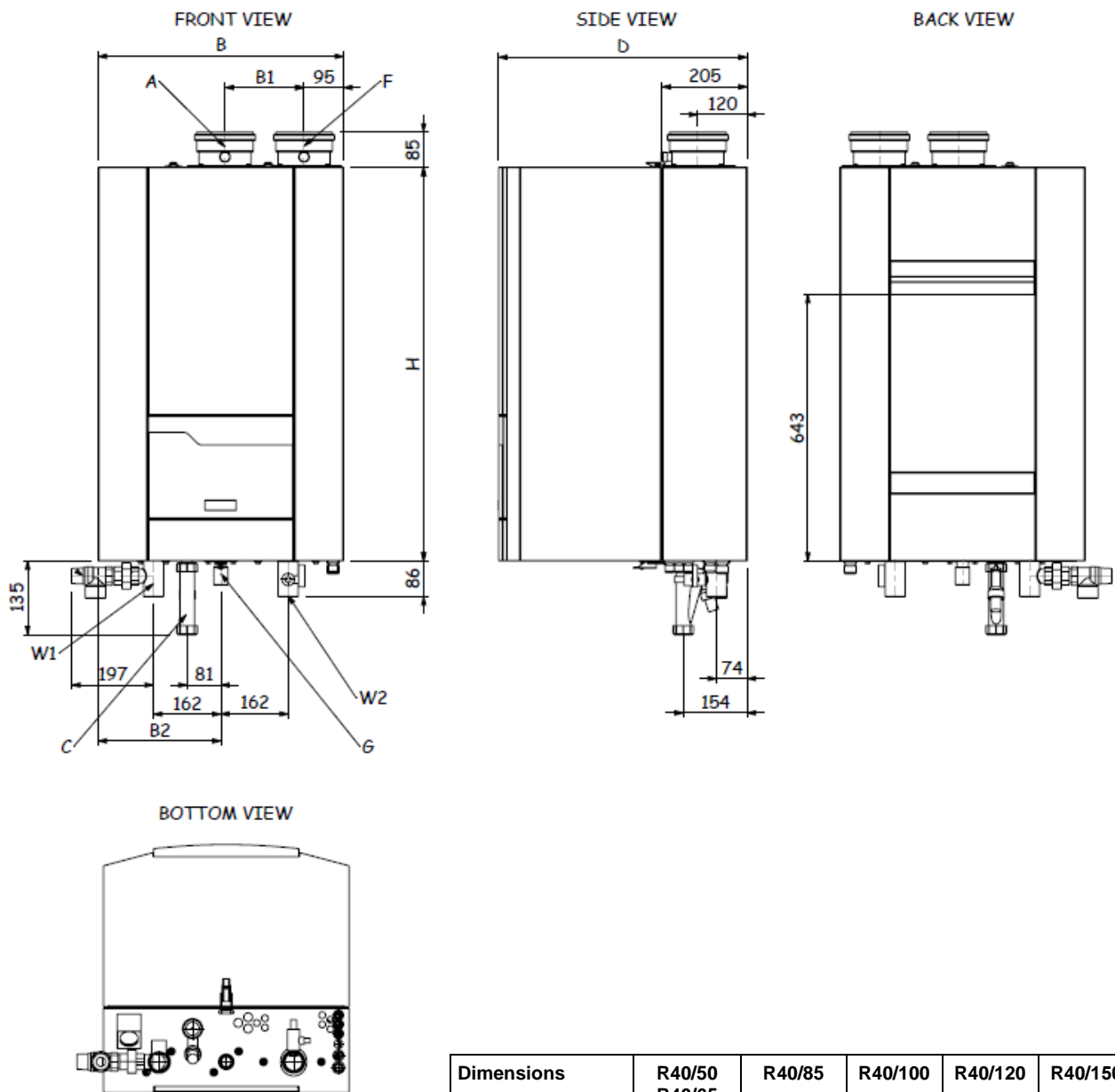
- Boiler control (stand alone operation);
- weather compensated operation (with optional outdoor sensor);
- with 0-10V external influence
- (temperature or capacity) from a
- building management system.

# Technical data

		R40 50	R40 65	R40 85	R40 100	R40 120	R40 150
Nominal heat output at 80/60°C max/min	kW	45.7/7.7	60.8/10.1	81.1/13.4	92.9/15.6	111.6/18.7	132.2/23.3
Nominal heat output at 75/60°C max/min	kW	45.8/7.7	60.9/10.1	81.3/13.4	93.1/15.6	111.8/18.7	132.5/23.3
Nominal heat output at 40/30°C max/min	kW	48.0/8.4	63.9/11.1	85.3/14.8	100.0/17.2	120.0/20.6	142.3/25.6
Nominal heat input Hi max/min	kW	46.9/7.8	62.4/10.4	83.3/13.8	95.2/16.0	114.3/19.2	135.5/23.9
Efficiency at 80/60°C	%	97.4	97.4	97.4	97.6	97.6	97.6
Efficiency at 40/30°C	%	102.4	102.4	102.4	105.0	105.0	105.0
Annual efficiency (NNG 75/60°C)	%	106.2	106.2	106.2	106.2	106.2	106.2
Annual efficiency (NNG 40/30°C)	%	>110	>110	>110	>110	>110	>110
Standstill losses (T <sub>water</sub> = 70°C)	%	0.20	0.20	0.20	0.20	0.20	0.20
Max. condensate flow	l/h	2.6	3.5	4.8	6.4	7.7	9.1
Gas consumption G20 max/min (10,9 kWh/m <sup>3</sup> )	m <sup>3</sup> /h	4.3/0.7	5.7/1.0	7.6/1.3	8.7/1.5	10.5/1.8	12.4/2.2
Gas consumption G25 max/min (8,34 kWh/m <sup>3</sup> )	m <sup>3</sup> /h	5.6/0.9	7.5/1.2	10.0/1.7	11.4/1.9	13.7/2.3	16.3/2.9
Gas consumption G31 max/min (12,8 kWh/kg)	kg/h	-/-	-/-	-/-	-/-	-/-	-/-
Gas pressure natural gas G20	mbar	20	20	20	20	20	20
Gas pressure natural gas G25	mbar	25	25	25	25	25	25
Gas pressure liquid gas G31	mbar	-/-	-/-	-/-	-/-	-/-	-/-
Maximum gas pressure	mbar	50	50	50	50	50	50
Flue gas temperature at 80/60°C max/min	°C	76/63	76/63	76/63	76/63	76/63	76/63
Flue gas temperature at 40/30°C max/min	°C	55/39	55/39	55/39	55/39	55/39	55/39
Flue gas quantity max/min	m <sup>3</sup> /h	89/14	119/19	159/25	178/29	213/35	253/44
CO <sub>2</sub> level natural gas G20/G25 max/min	%	8.5/8.5	8.5/8.5	8.5/8.5	8.7/8.5	8.7/8.5	8.7/8.5
CO <sub>2</sub> level liquid gas G31 max/min	%	-/-	-/-	-/-	-/-	-/-	-/-
NO <sub>x</sub> level	mg/kWh	39	39	39	39	39	39
CO level max/min	mg/kWh	98/7	98/7	98/7	98/7	98/7	98/7
Max. permissible flue resistance max/min	Pa	150/15	150/15	150/15	150/15	200/15	200/15
Water volume	l	4.0	3.5	4.8	6.4	7.7	9.1
Water pressure max/min	bar	8/1.5	8/1.5	8/1.5	8/1.5	8/1.5	8/1.5
Max. water temperature (High limit thermostat)	°C	100	100	100	100	100	100
Maximum temperature setpoint	°C	90	90	90	90	90	90
Nominal water flow at dT=20K	m <sup>3</sup> /h	1.9	2.6	3.4	4.0	4.8	5.6
Hydraulic resistance at nominal water flow	kPa	9	16	29	15	22	34
Electrical connection	V	230	230	230	230	230	230
Frequency	Hz	50	50	50	50	50	50
Mains connection fuse	A	10	10	10	10	10	10
IP class	-	IPX4D	IPX4D	IPX4D	IPX4D	IPX4D	IPX4D
Power consumption boiler max/min (excl. pump)	W	98/26	98/26	167/38	195/30	228/36	248/44
Power consumption 3-step pump (optional)	W	150	150	205	150	210	385
Power consumption speed controlled pump (opt)	W	124	124	124	130	130	130
Weight (empty)	kg	60	60	68	80	90	97
Noise level at 1 meter distance*	dB(A)	56/50	56/50	56/50	56/50	56/50	56/50
Ionisation current minimum	µA	3	3	3	3	3	3
PH value condensate	-	3.2	3.2	3.2	3.2	3.2	3.2
CE certification code	-	CE-0063BU9068					
Water connections	-	R1.1/4"	R1.1/4"	R1.1/4"	R1.1/2"	R1.1/2"	R1.1/2"
Gas connection	-	R3/4"	R3/4"	R3/4"	R1"	R1"	R1"
Flue gas connection	mm	100	100	100	100	100	130
Air intake connection (for room sealed use)	mm	100	100	100	100	100	130
Condensate connection	mm	22	22	22	22	22	22

\* non room sealed / room sealed

# Technical data



Dimensions		R40/50 R40/65	R40/85	R40/100	R40/120	R40/150
B	mm	490	490	590	590	590
B1	mm	140	140	140	140	190
B2	mm	245	245	295	295	295
D	mm	500	500	600	600	600
H	mm	810	810	950	950	950
W1	mm	R 1 1/4"	R 1 1/4"	R 1 1/2"	R 1 1/2"	R 1 1/2"
W2	mm	R 1 1/4"	R 1 1/4"	R 1 1/2"	R 1 1/2"	R 1 1/2"
G	mm	R 3/4"	R 3/4"	R 1"	R 1"	R 1"
F	mm	100	100	100	100	130
A	mm	100	100	100	100	130

# Extent of delivery

## Standard boiler Accessories

### Standard boiler

A boiler delivery package contains the following components:

Component	Pcs.	Package
Boiler fully assembled and tested	1	Cardboard box on pallet
Mounting bracket incl. mounting material	1	Together with manuals, in folding box inside boiler packaging
Syphon for condensate connection	1	Inside boiler packaging
Operation and Installation manual	1	Map packed in cardboard box in boiler packaging
Spare parts list	1	Map packed in cardboard box in boiler packaging
Wiring diagram	1	Map packed in cardboard box in boiler packaging

### Accessories

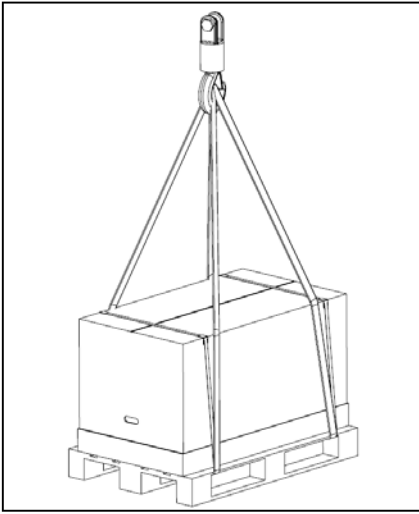
Additional to the boiler, the following accessories can be ordered:

- Standard 3-step pump incl. connection kit;
- Speed controlled pump incl. connection kit;
- Safety valve, fill/drain valve and connection for expansion tank;
- Set with water (2x) and gas (1x) cocks;
- Gas filter incl. connection kit;
- Min. gas pressure switch;
- Plate heat exchanger (dT=10K/15K or dT=20K) incl. connection kit;
- Low velocity header, suitable for dT=10K/15K and dT=20K incl. connection kit;
- Plug & play cascade kit (see cascade manual for more details);
- Extension module AGU2.551 for 0-10V control of a modulating pump and/or boiler capacity feedback to a building management system;
- Electrical connection for external gas valve and/or room fan.
- Extension module AGU2.550 for heating zone control or external gas valve and/or room fan control in combination with an alarm signal.  
For each boiler a maximum of 3 AGU2.550 modules (2x heating zone, 1x ext. gas valve / room fan in combination with alarm) can be integrated in the boiler;
- Additional RVS63 heating zone controller, when controlling more than 2 zones (incl. wall hung box, all necessary sensors and sockets and connection material for bus communication).

The above accessories are specially designed for the R40 boiler and therefore easy to install (plug and play). By choosing a combination of the kits mentioned above, you can create your own complete system solution. Ask your supplier for more detailed information.

# Installation

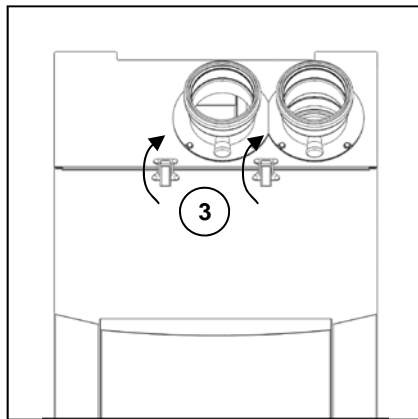
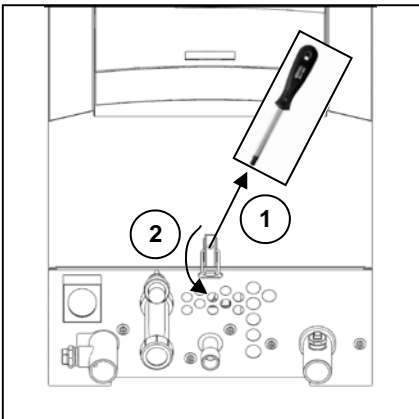
## Boiler transport Removing the casing



### Boiler transport

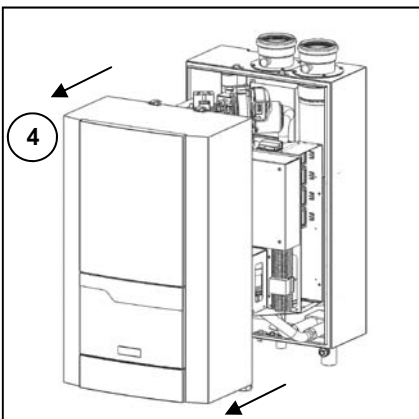
The R40 boiler will be supplied as a complete unit being fully assembled and pre-tested. The packaging dimension is 1050x572x575mm for boiler types 50-85 and 1185x674x665mm for boiler types 100-150, which makes it possible to transport all models through a normal door in one piece.

The R40 can be transported with a crane, but it has to be ensured that the boiler is packed and fixed on a pallet. The straps must be connected to the pallet.



### Removing the casing

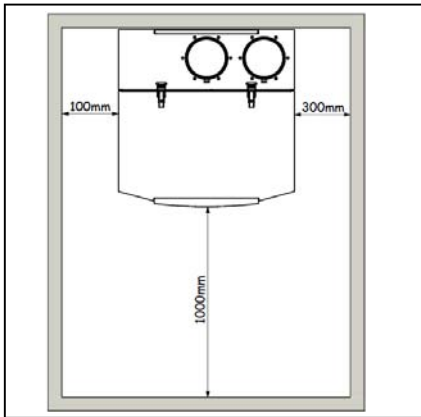
Remove the casing before installing the boiler, in order to avoid damage to the casing parts. Removing the casing is done as shown on the pictures.





# Installation

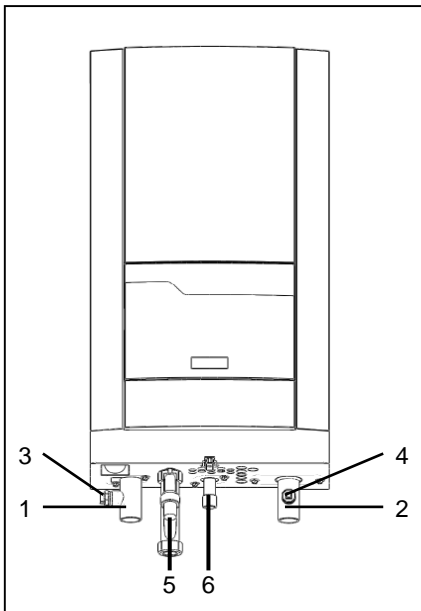
## Boiler installation Connecting the boiler



### Boiler installation

The boiler should be positioned in a frost-proof boiler room. If the boiler room is on the roof, the boiler itself may never be the highest point of the installation.

When positioning the boiler, please note the recommended minimum clearance in the picture. When the boiler is positioned with less free space, maintenance activities will be more difficult.



### Connecting the boiler

This chapter will explain how to make all connections to the boiler with regard to:

- Hydraulic connections
- Condensate drain connection
- Gas connection
- Flue gas connection
- Air intake connection
- Electrical connection

The boiler should always be connected in such a way, that the system applies to all relevant standards and regulations (European, national and local). It's the responsibility of the installer to ensure that all standards and regulations are respected.

### Hydraulic connections (1,2,3,4)

The boiler should always be connected in such a way, that water flow through the boiler can be ensured at all times. Connect the flow (1) and return (2) connection of the system tension free to the boiler connections.

The boiler contains a connection possibility for an (optional) kit with safety valve, fill/drain valve and an expansion tank connection. The safety valve must be connected to the flow connection (3) of the boiler, the fill/drain valve and expansion tank connection must be connected to the return connection (4).

The (optional) pump kit should be mounted directly to the return connection (2) of the boiler, before connecting to the system.

### Condensate connection (5)

After filling with water, the syphon (included in delivery) should be installed to the connection (5) at the bottom of the boiler. Connect the hose to the draining system in the boiler room. The connection to the draining system should always be done with an open connection, in order to avoid a flooding of the boiler in case of a blocked drain.

### Gas connection (6)

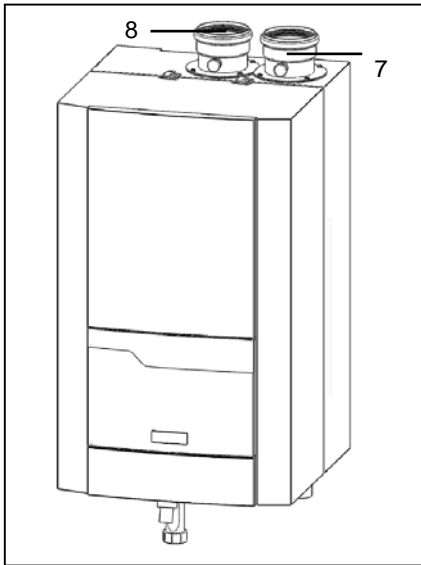
The gas connection must be made by an authorized installer in accordance with the applicable national and local standards and regulations.

Connect the gas line from the system tension free to the gas connection (6) of the boiler. A gas cock should be mounted directly behind the boiler.

A gas filter can be mounted directly on the gas connection of the boiler.

# Installation

## Connecting the boiler



### Flue gas connection (7)

Regulations for the construction of flue gas systems are very different for each country. It should be ensured that all national regulations with regard to flue gas systems are respected.

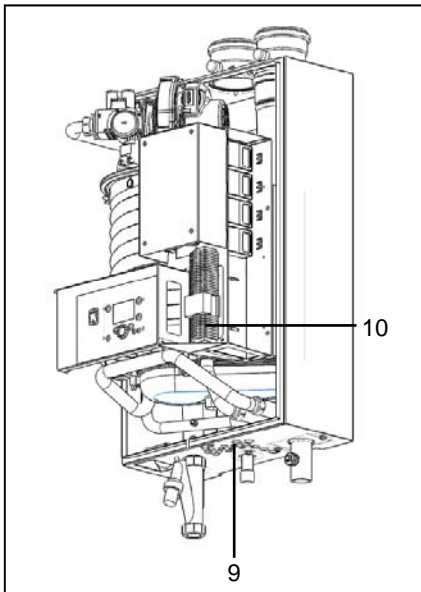
Connect the flue gas system to the flue gas connection (7) of the boiler, use fluegas systems with seamless connections only. It's not necessary to make a separate condensate drain for the flue gas system, as the condensate will be drained via the syphon of the boiler.

Please note the following issues:

- It's recommended to use stainless steel or PPS fluegas systems
- The diameter of the flue gas system must be chosen by calculation according to the national regulations
- Construct the flue gas system as short as possible (for maximum length see planner documentation)
- Construct horizontal ways with a minimum angle of 3°

### Air intake connection (8)

The air intake can be connected in case of room sealed installation. The diameter should be calculated according to the national regulations, together with the flue gas system. The total resistance of both systems should never overcome the maximum permissible resistance of the fan inside the boiler (see also chapter: Technical data).



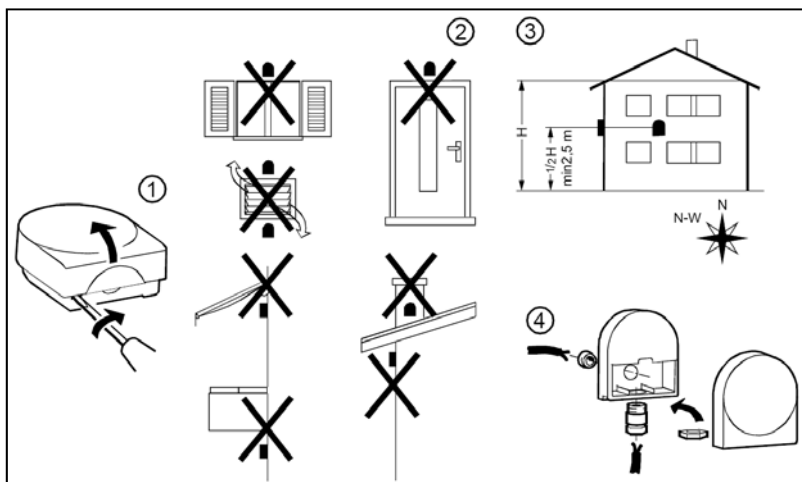
### Electrical connection

The electrical connection must be made by an authorized installer in accordance with the applicable national and local standards and regulations.

For the power supply it's necessary to use a mains isolator switch with a contact opening of at least 3 mm within the boiler room. This switch can be used to switch off the power supply for maintenance purposes.

All cables should be lead through the cable glands (9) at the bottom of the boiler of the boiler boiler into the electro panel (10).

Connect all wires to the terminals according to the wiring diagram of the boiler, see pages 11-12.

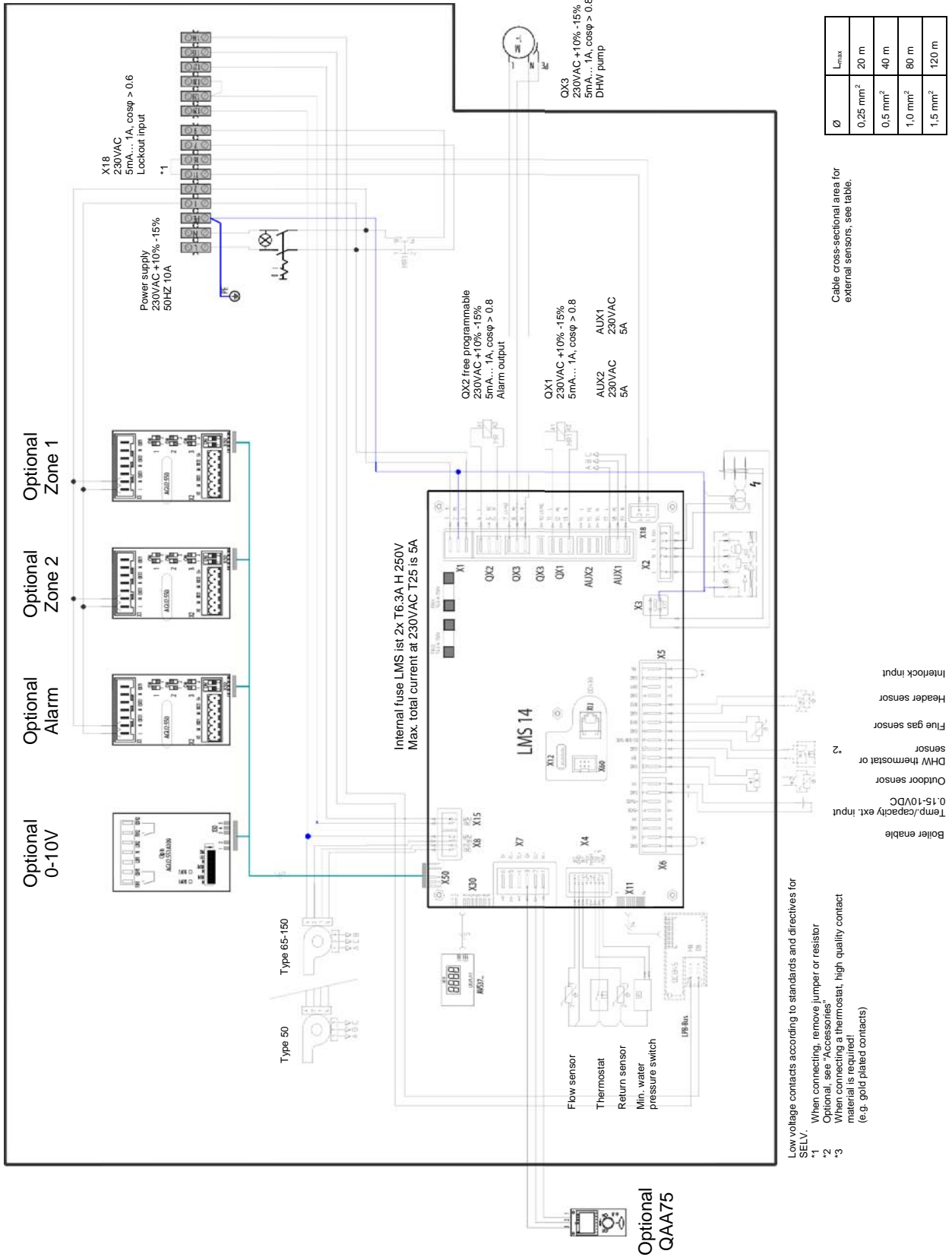


### Outside sensor mounting

If an outside sensor (accessory) is connected to the boiler, the sensor should be positioned as shown on the drawing.

# Installation

## Wiring diagram - Boiler

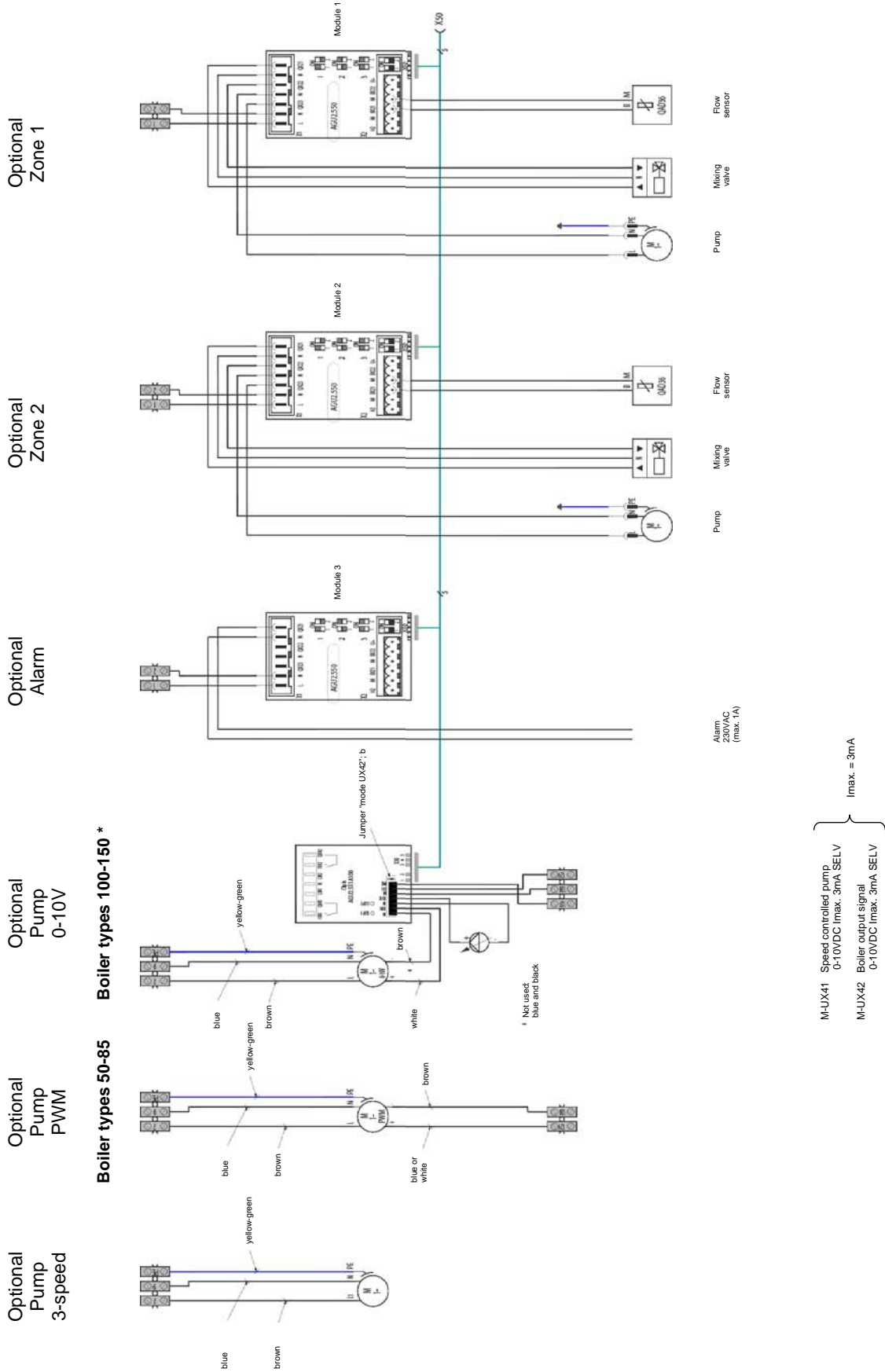


Low voltage contacts according to standards and directives for SELV:

- \*1 When connecting, remove jumper or resistor
- \*2 Optional, see "Accessories"
- \*3 When connecting a thermostat, high quality contact material is required (e.g. gold plated contacts)

# Installation

## Wiring diagram - Accessories



# Commissioning

## Water and hydraulic system

Commissioning of the boiler should be carried out by authorized personnel only. Failure to respect this condition makes the guarantee void. A protocol of the commissioning should be filled out (see end of this chapter for example of commissioning protocol).

This chapter explains the commissioning of the boiler with the standard boiler controller. When an additional system controller is installed, please refer to its manual for commissioning the controller.

Boiler output [kW]	Max. sum of alkaline earths [mol/m <sup>3</sup> ]	Max. total hardness	
		[°dH]	[°f]
50 - 200	2.0	11.2	20
200 - 600	1.5	8.4	15

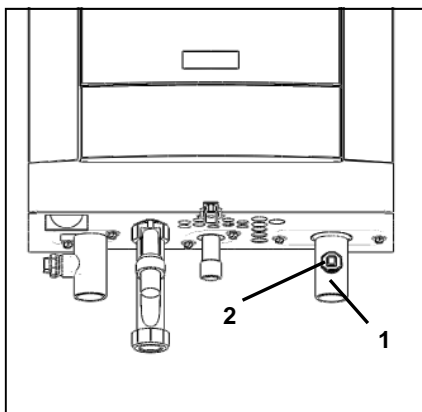
### Water quality

The system should be filled with water with a PH value between 8,0 and 9,5. The chloride value of the water should not exceed 50 mg/l. Entry of oxygene by diffusion should be prevented at all times. Damage to the heat exchanger because of oxygene diffusion will not be taken under warranty.

In installations with higher water volumes, it's necessary to respect the maximum filling and additional volumes with corresponding hardness values as stated in the german VDI2035 standard. In the table you can find the nominal values for filling and additional water for the R40 according to the the VDI2035.

Concentrate Ca(HCO <sub>3</sub> ) <sub>2</sub>			Capacity of installation Q (kW)						
			150	200	250	300	400	500	600
mol/m <sup>3</sup>	°dH	°f	Maximum water (re)fill volume V <sub>max</sub> [m <sup>3</sup> ]						
≤0.5	≤2.8	≤5	-	-	-	-	-	-	-
1.0	5.6	10	-	-	-	-	-	-	-
1.5	8.4	15	3	4	5	6	8	10	12
2.0	11.2	20	3	4	5	6	6.3	7.8	9.4
2.5	14.0	25	1.9	2.5	3.1	3.8	5.0	6.3	7.5
≥3.0	≥16.8	≥30	1.6	2.1	2.6	3.1	4.2	5.2	6.3

The table at the left gives an indication of the relation between the water quality and the maximum water filling volume during the lifetime of the boiler. Consult the original text of the VDI2035 for more detailed information.



### Water pressure

Open the valves to the system. Check the water pressure in the system. If the water pressure is too low (see table below), increase the pressure up to at least the minimum required water pressure in the table.

Minimum operating pressure [bar]	Flow temperature [°C]
> 1.5	90

Filling can eventually be done via the (optional) fill and drain valve (2) on the return connection (1) of the boiler.

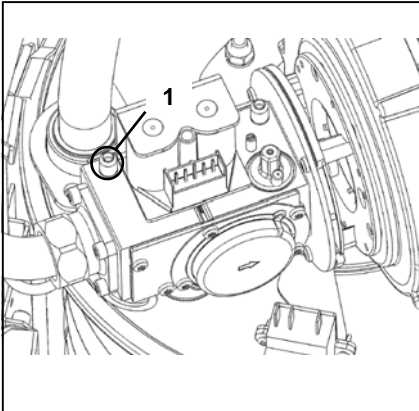
### Hydraulic system

Check if the boiler is hydraulically connected to the system in such way, that water flow can be secured at all times during burner operation. The water flow is supervised by ΔT-protection in the boiler and a lack of flow will lead to a direct burner stop and lockout of the boiler.

# Commissioning

## Gas supply Condensate connection Flue and air intake connections

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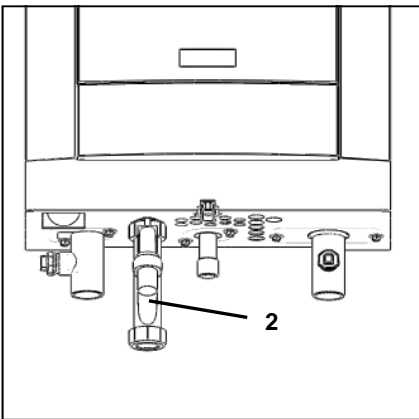


### Gas supply

Check the gas supply connection to the boiler for tightness. If any leakage is found, reseal the leakage before starting the boiler!

Remove any air between the gas valve and the gas line. This can be done at the test point (1) at the gas pressure switch. Don't forget to close the test point afterwards!

Check the gas type and values with the local gas company, in order to know for which gas type the boiler should be commissioned.



### Condensate connection

Remove the syphon (2) from the condensate connection. Fill it with water and place it back in the original position. Make sure the syphon is filled before starting the boiler, in order to prevent flue gases discharging through the condensate connection!

### Flue and air intake connections

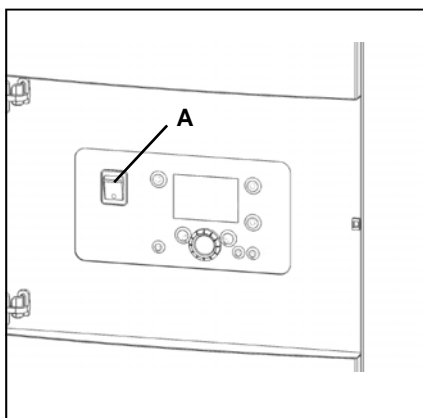
Check whether the flue and air intake systems are made according to the national and local regulations. Installations which don't comply with the regulations, are not allowed to be commissioned.

Make sure that all connections are free.

The size of flue gas and air intake connections may not be reduced.

# Commissioning

## Prepare boiler for first startup



### Legend:

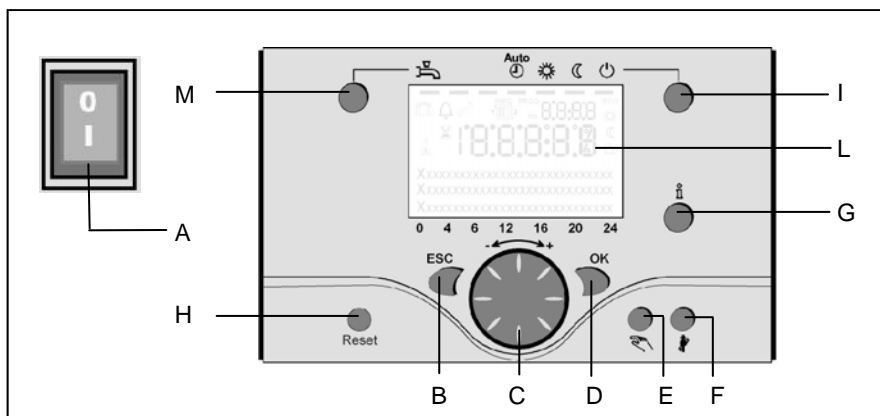
- A On/off switch
- B Return (ESC)
- C Room temperature control
- D Confirmation (OK)
- E Manual mode
- F Chimney sweeper mode
- G Info mode
- H Reset button
- I Operation mode heating zone(s)
- L Display
- M Operation mode DHW

### Preparation for first startup

- Open the gas supply;
- Enable the power supply to the boiler;
- Switch on the boiler with the on/off switch (A);
- Make sure the boiler is in standby mode (⏻);
- Check the pump operation: make sure the pump runs in the right direction;
- Release all air from the pump motor.

It's recommended to put the boiler on 50% load after the first startup, as this is the best starting point to do a proper combustion analysis. This can be done with the following procedure:

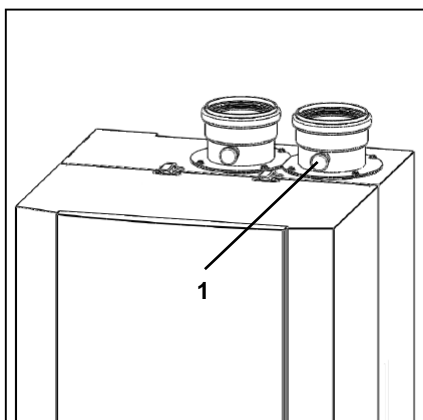
- Push button I >3 Sek, the boiler goes into controller Stopp mode.
- Push the Info button (G), the actual boiler load (%) appears in the display;
- Choose „set up“ (confirm with OK button), now the boiler load can be changed by rotating the wheel (C) and confirming the 50% setting with the OK button.



After checking the combustion values (see next page), the controller Stopp mode can be stopped by pushing the control mode button (I) >3 Sek.

# Commissioning

## Combustion analysis

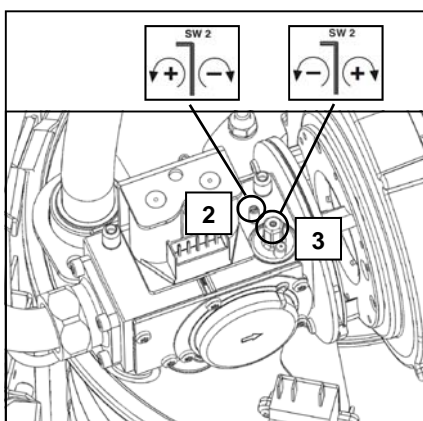


### Combustion check at full load

Start the boiler in controller stop mode and go to 50% load. Now the boiler operates at 50% load. Allow the boiler to stabilise the combustion for 3 minutes. Then increase the boiler load step by step up to 100%. Check the gas pressure on the inlet of the gas valve while increasing the boiler load: the gas pressure should never go below the minimum required value → see technical data. When an (optional) minimum gas pressure switch is connected, this must be set to 75% of the required gas pressure.

Combustion settings max. load for natural gas G20 / G25		
		R40/50-150
CO <sub>2, max</sub>	%	8.5 ± 0.2

Combustion settings min. load for natural gas G20 / G25		
		R40/50-150
CO <sub>2, min</sub>	%	8.5 ± 0.2



Check the combustion settings via the test point in the chimney connection (1). If necessary, correct the settings with the small adjustment screw at the top of the gas valve (2).

### Combustion check at minimum load

Switch the boiler to minimum load (0%). Check the combustion settings the same way as described for full load. If necessary, correct the settings with the large adjustment screw at the top of the gas valve (3).

### Combustion check at 50% load

An additional reference check of combustion values at 50% load is recommended in order to check if the gas valve is set in such way, that the modulating behaviour is normal. The CO<sub>2</sub> value should be in between the settings of full load and minimum load. CO value should be equal to full load and minimum load values.

Make sure that the boiler is set to automatic operation and controller stop mode is disabled after the combustion test is finished.



# Commissioning

## Check water flow

---

### Check water flow

The water flow through the boiler can be checked with two different methods shown below.

#### $\Delta T$ measurement

Check the temperature difference over the boiler ( $\Delta T$  flow-return) when the boiler is running on 100% load. The nominal  $\Delta T$  is 20K and must be at least between 10K and 20K for secure boiler operation. An indication of the actual flow rate can be found with the following calculation (see table below for nominal data):

$$q_{\text{actual}} = (\Delta T_{\text{nominal}} / \Delta T_{\text{measured}}) * q_{\text{nominal}} \quad [\text{m}^3/\text{h}]$$

#### $\Delta p$ measurement

Check the pressure difference over the boiler ( $\Delta p$  flow-return) when the boiler pump is running (burner on is not required). The nominal  $\Delta p$  for each boiler type can be found in the table below, actual  $\Delta p$  must be within:

$1.0 * \Delta p_{\text{nom.}} \leq \Delta P \leq 4.0 * \Delta p_{\text{nom.}}$ . An indication of the actual flow rate can be found with the following calculation (see table below for nominal data):

$$q_{\text{actual}} = \sqrt{(\Delta p_{\text{measured}} / \Delta p_{\text{nominal}})} * q_{\text{nominal}} \quad [\text{m}^3/\text{h}]$$

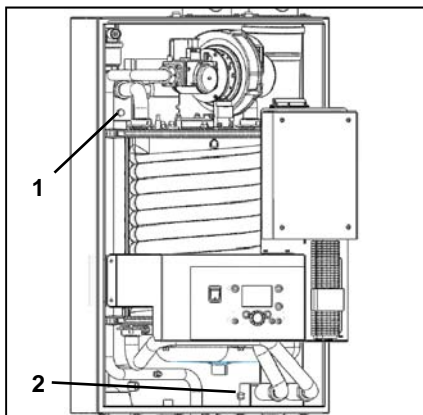
Water flow data							
		R40/50	R40/65	R40/85	R40/100	R40/120	R40/150
Nominal flow rate	[m <sup>3</sup> /h]	1.9	2.6	3.4	4.0	4.8	5.6
$\Delta T$ at nominal flow rate	[°C]	20					
$\Delta p$ at nominal flow rate	[kPa]	9	16	29	15	22	34

# Commissioning

## Check functionality of safety devices

### Gas tightness check

### Boiler shut down

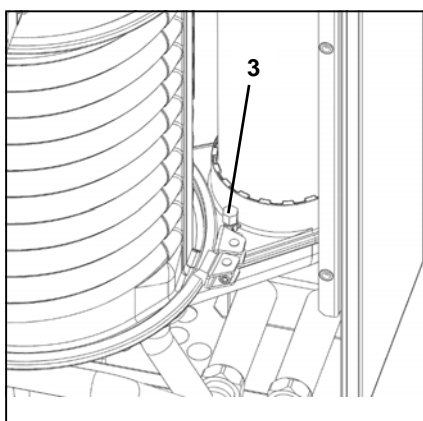


#### Check functionality of safety devices

All safety devices have to be checked on good functioning. Safety devices on a standard boiler are a water flow temperature sensor, water return temperature sensor, fluegas temperature sensor and ionisation electrode. These devices can be checked as described below.

#### Flow temperature sensor (1)

Disconnect the plug from the sensor while the boiler is switched on. This should result in a lockout no. 20. The lockout should disappear as soon as the plug is placed back in position, the boiler will restart.

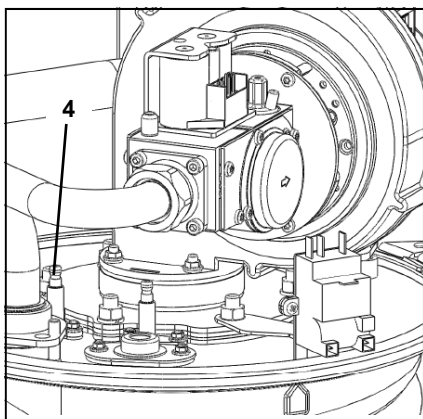


#### Return temperature sensor (2)

Disconnect the plug from the sensor while the boiler is switched on. This should result in a lockout no. 40. The lockout should disappear as soon as the plug is placed back in position, the boiler will restart.

#### Flue gas temperature sensor (3)

Disconnect the plug from the sensor while the boiler is switched on. This should result in a lockout no. 28. The lockout should disappear as soon as the plug is placed back in position, the boiler will restart.



#### Ionisation electrode (4)

Remove electrical connection from the ionisation electrode while the boiler is running, the boiler will go in lockout no. 128. The boiler will try to restart. With the electrical connection removed, the restart will result in lockout no. 133. When the connection is already mounted, the restart will be successful.

Measuring the ionisation current can be done by mounting a multi-meter (set to  $\mu\text{A}$ ) in between the ionisation electrode and its electrical connection. The ionisation current should always be above  $1.2 \mu\text{A}$ , in normal conditions it will be  $6 \mu\text{A}$  and above.

#### Gas tightness check

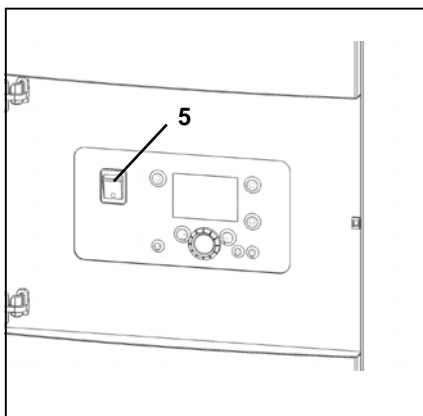
Check the gas tightness of all sealed connections with an approved soap or electronic gas analyzer, for example:

- Test points;
- Bolt connections;
- Gaskets of mixing system, etc.

#### Boiler shut down

When the boiler will not be used for longer periods, shut down the boiler by following procedure:

- Switch the boiler in standby operation ( $\odot$ );
- Switch off the boiler with the on/off switch (5);
- Disable power supply to the boiler by deactivating the mains isolator switch in the boiler room;
- Close the gas supply to the boiler.



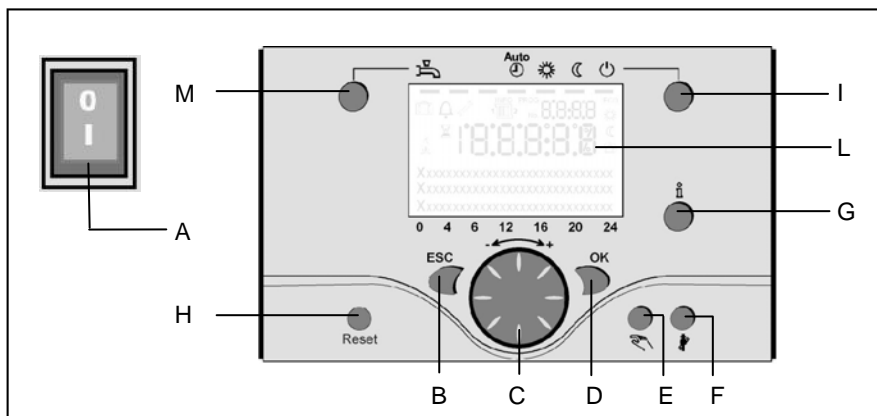
# Commissioning

## Commissioning protocol

Commissioning Protocol R40			
<b>Project</b>			
Boiler type		Project	
Serial number		Address	
Year		City	
Nominal load (Hi) [kW]		Date	
Nominal output (Hi) [kW]		Engineer	
<b>System</b>			
Water pressure [bar]	Installation:	Roof top	<input type="checkbox"/>
Water pH [-]		Ground floor	<input type="checkbox"/>
Water hardness [°dH]		Basement	<input type="checkbox"/>
Water chloride [mg/l]		Other: .....	<input type="checkbox"/>
Water $\Delta T$ full load [°C]	Hydraulics:	Low velocity header	<input type="checkbox"/>
Water $\Delta p_{\text{boiler}}$ [kPa]		Plated heat exchanger	<input type="checkbox"/>
Water flow [m <sup>3</sup> /h]		Bypass boiler	<input type="checkbox"/>
Pump setting [-]		Other: .....	<input type="checkbox"/>
<b>Safety devices</b>			
High limit setting [°C]	Water flow sensor checked		<input type="checkbox"/>
Temp. limiter setting [°C]	Fluegas sensor checked		<input type="checkbox"/>
Min. gas pressure switch setting [mbar]	Water flow switch checked		<input type="checkbox"/>
Ignition time burner [sec]			
<b>Combustion analysis</b>			
	<b>100% load</b>	<b>50% load</b>	<b>Min. load</b>
Gas consumption [m <sup>3</sup> /h]	[m <sup>3</sup> /h]	[m <sup>3</sup> /h]	[m <sup>3</sup> /h]
Gas pressure [mbar]	[mbar]	[mbar]	[mbar]
CO <sub>2</sub> [%]	[%]	[%]	[%]
O <sub>2</sub> [%]	[%]	[%]	[%]
CO [ppm]	[ppm]	[ppm]	[ppm]
NOx [ppm]	[ppm]	[ppm]	[ppm]
T <sub>atmospheric</sub> [°C]	[°C]	[°C]	[°C]
T <sub>fluegas</sub> [°C]	[°C]	[°C]	[°C]
T <sub>water, flow</sub> [°C]	[°C]	[°C]	[°C]
T <sub>water, return</sub> [°C]	[°C]	[°C]	[°C]
Ionisation current [µA]	[µA]	[µA]	[µA]
p <sub>fan</sub> [mbar]	[mbar]	[mbar]	[mbar]
p <sub>top panel</sub> [mbar]	[mbar]	[mbar]	[mbar]
p <sub>combustion chamber</sub> [mbar]	[mbar]	[mbar]	[mbar]
<b>Remarks</b>			

# Operating instructions

## Controls



### Legend:

- A On/off switch
- B Return (ESC)
- C Room temperature control
- D Confirmation (OK)
- E Manual mode
- F Chimney sweeper mode
- G Info mode
- H Reset button
- I Operation mode heating zone(s)
- L Display
- M Operation mode DHW

### Operation mode DHW (M)

For switching on the DHW operation (indication in display below DHW symbol)

### Operation mode heating zone(s) (I)

For setting 4 different heating modes:  
 Auto (clock): Automatic operation by time programm  
 Comfort (sun): 24/7 heating in comfort mode  
 Reduction (moon): 24/7 heating in reduced mode  
 Standby: heating off, frost protection activated.

### Display (L)

### Info mode (G)

Display possibility of following info without influence on boiler control: temperatures, operation mode Heating / DHW, error code.

### Room temperature control (C)

- for changing room comfort temperature
- for changing settings when programming.

### Confirmation (OK) (D)

### Return (ESC) (B)

These buttons are used for programming in combination with the wheel.

By pressing the ESC button it's possible to go back one level, changed values are not taken over by the controller.

By pressing the OK button it's possible to arrive in the next level or confirm changed values.

### Manual mode (E)

This button is used for switching the boiler into manual mode. In manual mode all pumps will run and the mixing valves are no longer controlled, the burner setpoint is 60°C (indicated by spanner symbol).

### On/off switch (A)

Position 0:  
 Boiler and connected electrical components are no powered. Frost protection is not secured.

Position I

The boiler and connected electrical components are powered and standby for operation.

### Deaeration mode (E)

By pressing the manual mode button longer than 3 seconds, the automatic hydraulic deaeration is activated. During deaeration the system is put in standby mode



The pumps are switched on and off for several times. After deaeration, the boiler automatically returns to normal operation.

### Chimney sweeper mode (F)


Used for combustion analysis. By pressing the button once again, or automatically after 15 minutes, the chimney sweeper mode will be deactivated (indicated by spanner symbol).


### Reset button (H)

By shortly pressing the reset button a burner lockout can be cancelled.

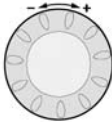

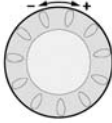











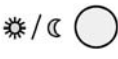


# Operating instructions

 **DOK** = confirmation

 **ESC** = cancel, return to main menu

## Overview of main functions

Button	Action	Procedure	Display / Function
	Set room temperature	<b>Zone 1 and zone 2</b> Actuate wheel left/right Turn wheel Confirm with OK button or wait 5 sec. or press 	Comfort setpoint with blinking temperature Blinking temperature in 0,5 °C steps from 10 to 30 °C  <b>Comfort setpoint saved</b> <b>Comfort setpoint cancelled</b> - after 3 sec. Main menu appears
	Set room temperature for zone 1 or zone 2	<b>Zone 2 independent from zone 1</b> Actuate wheel left/right Confirm with OK button Actuate wheel left/right Confirm with OK button or wait 5 sec. or press 	Choose heating zone Heating zone is chosen Blinking temperature in 0,5 °C steps from 10 to 30 °C  <b>Comfort setpoint saved</b> <b>Comfort setpoint cancelled</b> - after 3 sec. Main menu appears
	Switch on /off DHW operation	Press button	<b>DHW mode on / off</b> (see indication below DHW symbol) - On: DHW mode by time programm - Off: no DHW operation - Safety functions activated
	Change heating operation mode	Factory setting  Press button 1x  Press button 1x again  Press button 1x again	<b>Automatic mode on</b> , with: - Heating by time programm - Temperature setpoint by heating programm - Safety functions activated - Summer/Winter automatic switching activated - ECO-functions activated (see indication below operation symbol) <b>Continuous COMFORT heating on</b> , with: - Heating without time programm by comfort setpoint - Safety functions activated <b>Continuous REDUCED heating on</b> , with: - Heating without time programm by reduced setpoint - Safety functions activated - Summer/Winter automatic switching activated - ECO-functions activated <b>Safety mode on</b> , with: - Heating off - Temperature by frost protection - Safety functions activated
	Controller Stop mode	Press button > 3 sec. Press button > 3 sec. again	<b>304: Controller Stopp mode</b> <b>insert setpoint</b> after 3 sec. Main menu appears
	Info display	Press button 1x Press button 1x again Press button 1x again .....  Press button 1x	INFO Segment displayed - Status Boiler                      - room temperature - room temperature minimum - Status DHW                        - room temperature maximum - Status zone 1                      - outside temperature - Status zone 2                      - outside temperature minimum - outside temperature maximum - Time / Date                        - DHW temperature 1 - Error indication                 - Boiler temperature - Maintenance indication       - Flow temperature (Info display depends on configuration) Back to main menu;                INFO Segment disappears
	Operation by manual setpoint	Press button 1x	<b>Manual mode on</b> (spanner symbol appears) - Heating by fixed setpoint (factory setting = 60 °C)
	Change factory setting boiler temperature	Press button  Press button  Turn wheel +/- Press button  Press button  Press button 	<b>301: Manual mode</b> <b>insert setpoint?</b> blinking temperature set value  <b>Status boiler</b> Manual mode off (spanner symbol disappears)
	Deaeration	Press button > 3 sec. Press button > 3 sec. again	<b>312: Deaeration on</b> Deaeration off
	Activate chimney sweeper mode	Press button (< 3 sec.) Press button again (< 3 sec.)	Chimney sweeper mode on Chimney sweeper mode off
	Temporary reduction of reduced temperature on QAA75	Press button Press button again	Heating by reduced setpoint Heating by comfort setpoint
<b>RESET</b>	Reset button	Press button (< 3 sec.) Press button again > 3 sec.	Boiler manually blocked, no release Boiler released, Alarm symbol disappears

# Maintenance

## Checklist Replacing the electrodes

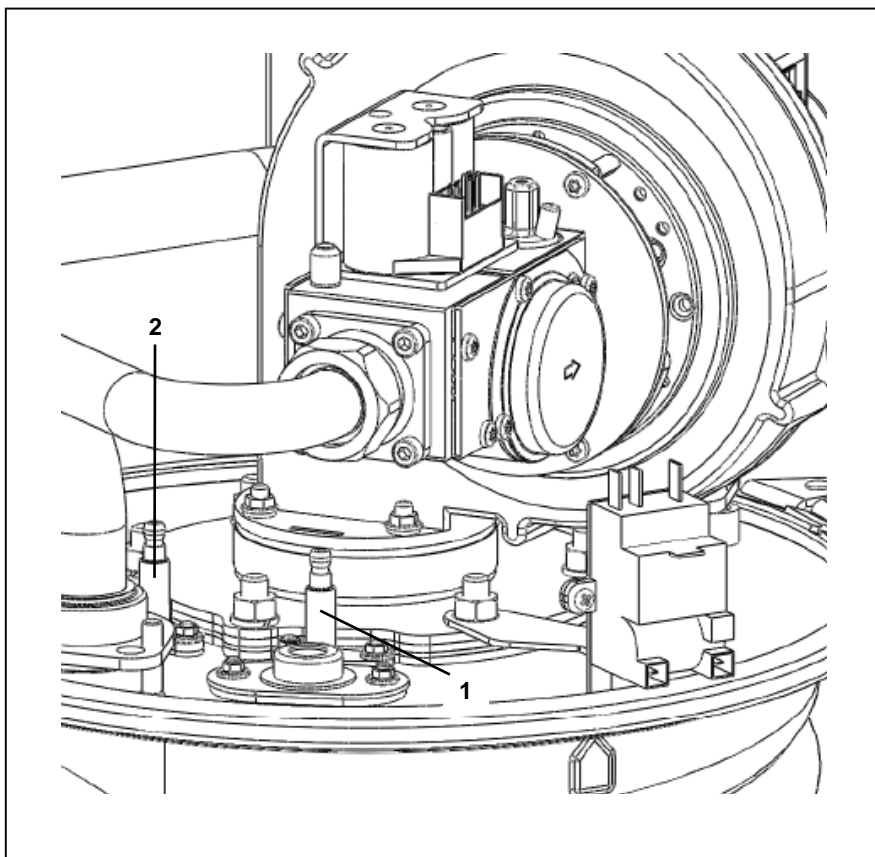
Maintenance of the boiler should be carried out by authorized personnel only.

In order to ensure continued good and safe operation of the boiler, it should be inspected at least once per year. A maintenance protocol should be filled out (see end of this chapter for example of maintenance protocol).

### Checklist

The following activities must be carried out, see following paragraphs for an extensive description of the main activities:

- Replace the ignition and ionisation electrodes;
- Clean the condensate receptacle;
- Clean and refill the syphon;
- Inspect the combustion chamber, clean if necessary (DON'T use water !);
- Check the water pressure of the system;
- Check the water quality of the system water as well as supply water;
- Check the water flow rate through the boiler;
- Check/correct the combustion values at full and minimum load with a combustion analyzer;
- Check the gas pressure to the boiler;
- Check the tightness of all sealed connections and test points;
- Check the functionality of all safety devices;
- Fill out a maintenance protocol.



### Replacing the electrodes

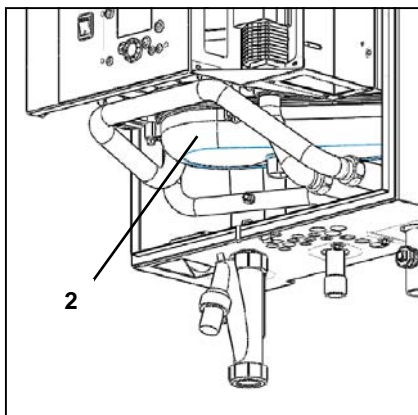
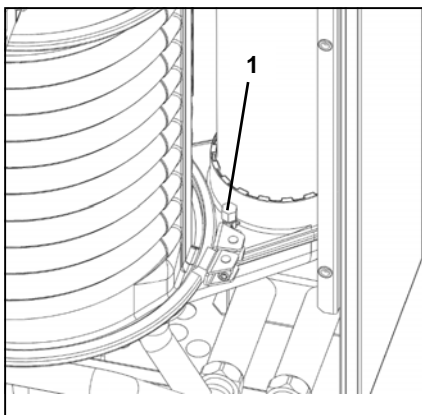
The electrodes are positioned on the top side of the boiler. Replace the ignition electrode (1) and ionisation electrode (2) as shown on the picture.

# Maintenance

## Cleaning the condensate receptacle

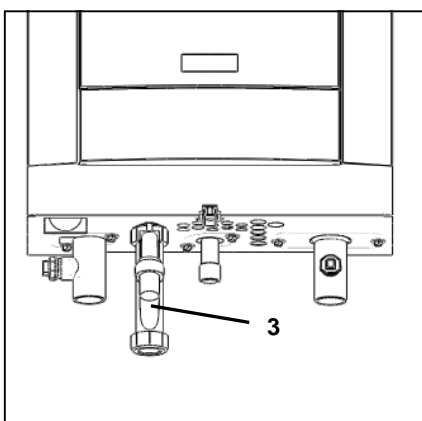
## Cleaning and refilling the syphon

## Inspection of combustion chamber



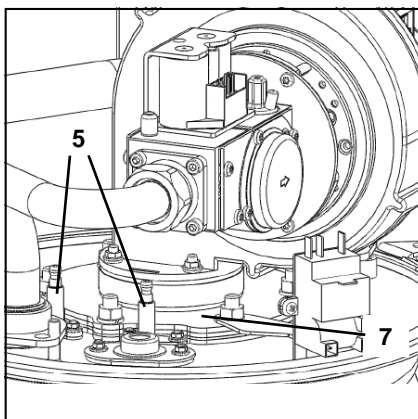
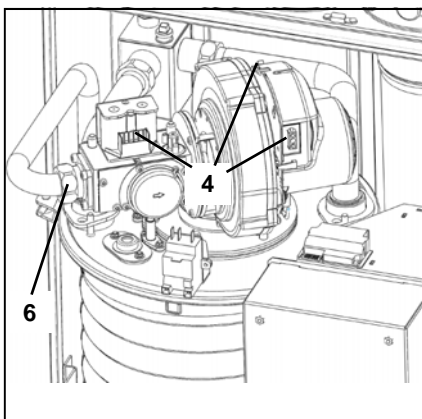
### Cleaning the condensate receptacle

- Disconnect the plug of the fluegas temperature sensor (1);
- Remove the condensate receptacle (2);
- Clean the receptacle;
- Mount the condensate receptacle;
- Connect the plug of the fluegas temperature sensor.



### Cleaning and refilling the syphon

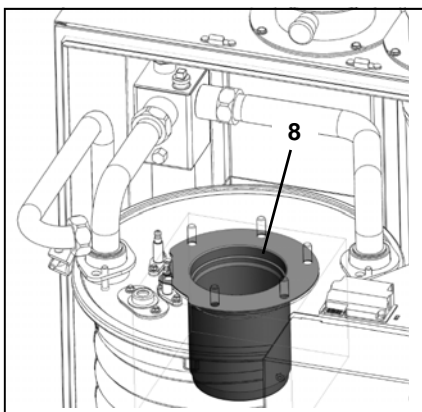
- Remove the syphon (3) from the condensate connection;
- Clean and fill it with fresh water;
- Mount the syphon back in the original position.



### Inspection of combustion chamber

For inspection of the combustion chamber the mixing system and burner must be disassembled.

- Switch off the boiler and close the gas supply;
- Remove the electrical connection from the fan and gas valve (4);
- Remove the electrical connection from the electrodes (5);
- Undo the gas connection at the inlet of the gas valve (6);
- Disassemble the top plate incl. mixing system (7);
- Remove the burner from the combustion chamber (8);
- Inspect the combustion chamber and clean it with a vacuumcleaner if necessary;
- Assemble all components in opposite order;
- Open the gas supply and check all connections for gas leakage;
- Switch on the boiler.





# Maintenance

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## **Water pressure and quality**

Check if the water pressure and quality meet the requirements. Consult the chapter “commissioning: water and hydraulic system” for more detailed information.

## **Water flow rate**

Check if the water flow rate through the boiler is within the limits. Consult the chapter “commissioning: check water flow” for more detailed information.

## **Combustion analysis**

Check the combustion at full load and minimum load, correct the settings if necessary. An additional reference check at 50% load is recommended. Consult the chapter “commissioning: combustion analysis” for more detailed information.

## **Gas pressure**

Check the dynamic pressure of the gas supply to the boiler, when the boiler is running at full load. In case of a boiler cascade, all boilers should be running at full load. See technical data for required values.

## **Gas tightness check**

Check the tightness of all sealed connections with an approved soap or electronic analyzer, for example:

- Test points;
- Bolt connections;
- Gaskets of mixing system, etc.

## **Safety devices**

Check the functionality and the settings of all safety devices connected. Consult the chapter “commissioning: Check functionality of safety devices” for more detailed information.

# Maintenance

## Maintenance Protocol

Maintenance Protocol R40			
<b>Project</b>			
Boiler type		Project	
Serial number		Address	
Year		City	
Nominal load (Hi)	[kW]	Date	
Nominal output (Hi)	[kW]	Engineer	
<b>System</b>			
Water pressure	[bar]		
Water pH	[-]		
Water hardness	[°dH]		
Water chloride	[mg/l]		
Water $\Delta T$ full load	[°C]		
Water $\Delta p_{\text{boiler}}$	[kPa]		
Water flow	[m <sup>3</sup> /h]		
Pump setting	[-]		
<b>Safety devices</b>			
High limit setting	[°C]	Water flow sensor checked	<input type="checkbox"/>
Temp. limiter setting	[°C]	Fluegas sensor checked	<input type="checkbox"/>
Min. gas pressure switch setting	[mbar]	Water flow switch checked	<input type="checkbox"/>
Ignition time burner	[sec]		
<b>Combustion analysis</b>			
	<b>100% load</b>	<b>50% load</b>	<b>Min. load</b>
Gas consumption	[m <sup>3</sup> /h]	[m <sup>3</sup> /h]	[m <sup>3</sup> /h]
Gas pressure	[mbar]	[mbar]	[mbar]
CO <sub>2</sub>	[%]	[%]	[%]
O <sub>2</sub>	[%]	[%]	[%]
CO	[ppm]	[ppm]	[ppm]
NO <sub>x</sub>	[ppm]	[ppm]	[ppm]
T <sub>atmospheric</sub>	[°C]	[°C]	[°C]
T <sub>fluegas</sub>	[°C]	[°C]	[°C]
T <sub>water, flow</sub>	[°C]	[°C]	[°C]
T <sub>water, return</sub>	[°C]	[°C]	[°C]
Ionisation current	[µA]	[µA]	[µA]
P <sub>fan</sub>	[mbar]	[mbar]	[mbar]
P <sub>top panel</sub>	[mbar]	[mbar]	[mbar]
P <sub>combustion chamber</sub>	[mbar]	[mbar]	[mbar]
<b>Remarks</b>			

# Lockouts

In case of a lockout, a warning symbol (⚠) and a flashing error code appears on the display. The cause of a fault should first be determined and eliminated before the boiler is being reset. The table below shows all possible lockouts with indication of possible cause.

Error code	Description of error
0	No error
10	Outside temperature sensor error
20	Boiler temperature 1 sensor error
26	Common flow temperature sensor error
28	Flue gas temperature sensor error
30	Flow temperature 1 sensor error
32	Flow temperature 2 sensor error
38	Flow temperature primary controller sensor error
40	Return temperature 1 sensor error
46	Return temperature cascade sensor error
47	Common return temperature sensor error
50	DHW temperature 1 sensor error
52	DHW temperature 2 sensor error
54	DHW primary controller sensor error
57	DHW circulation temperature sensor error
60	Room temperature 1 sensor error
65	Room temperature 2 sensor error
70	Buffer storage tank temperature 1 sensor error
71	Buffer storage tank temperature 2 sensor error
72	Buffer storage tank temperature 3 sensor error
73	Collector temperature 1 sensor error
74	Collector temperature 2 sensor error
82	LPB address collision
83	BSB wire short-circuit
84	BSB address collision
85	BSB RF communication error
91	EEPROM error lockout information
98	Extension module 1 error (collective error)
99	Extension module 2 error (collective error)
100	2 clocktime masters (LPB)
102	Clocktime master without reserve (LPB)
103	Communication error
105	Maintenance message
109	Boiler temperature supervision
110	STB lockout
111	TW cutout
119	Safety thermostat on burner door interrupted
121	Flow temperature 1 (HC1) supervision
122	Flow temperature 2 (HC2) supervision
125	Pump supervision error
126	DHW charging supervision
127	Legionella temperature not reached
128	Loss of flame during operation
129	Fan error or LP error
130	Flue gas temperature limit exceeded
131	Burner fault
132	GP or LP error
133	No flame during safety time

# Lockouts

Error code	Description of error
146	Configuration error collective message
151	Internal error
152	Parameterization error
153	Unit manually locked
160	Fan error
162	LP error, does not close
164	Error heating circuit flow switch
166	LP error, does not open
171	Alarm contact H1 or H4 active
172	Alarm contact H2 (EM1, EM2 or EM3) or H5 active
173	Alarm contact H6 active
174	Alarm contact H3 or H7 active
178	Limit thermostat heating circuit 1
179	Limit thermostat heating circuit 2
183	Unit in parameterization mode
193	Pump supervision error after flame on
216	Fault boiler
217	Fault sensor
241	Flow sensor solar sensor error
242	Return sensor solar sensor error
243	Swimming pool temperature sensor error
270	Limit function
317	Mains frequency outside permissible range
320	DHW charging temperature sensor error
322	Water pressure too high
323	Water pressure too low
324	BX same sensors
325	BX / extension module same sensors
326	BX / mixing group same sensors
327	Extension module same function
328	Mixing group same function
329	Extension module / mixing group same function
330	Sensor BX1 no function
331	Sensor BX2 no function
332	Sensor BX3 no function
333	Sensor BX4 no function
334	Sensor BX5 no function
335	Sensor BX21 no function (EM1, EM2 or EM3)
336	Sensor BX22 no function (EM1, EM2 or EM3)
337	Sensor BX1 no function
338	Sensor BX12 no function
339	Collector pump Q5 not available
340	Collector pump Q16 not available
341	Solar Collector sensor B6 not available
342	DHW sensor B31 not available
343	Solar integration not available
344	Solar controlling element buffer K8 not available
345	Solar controlling element swimming pool K18 not available

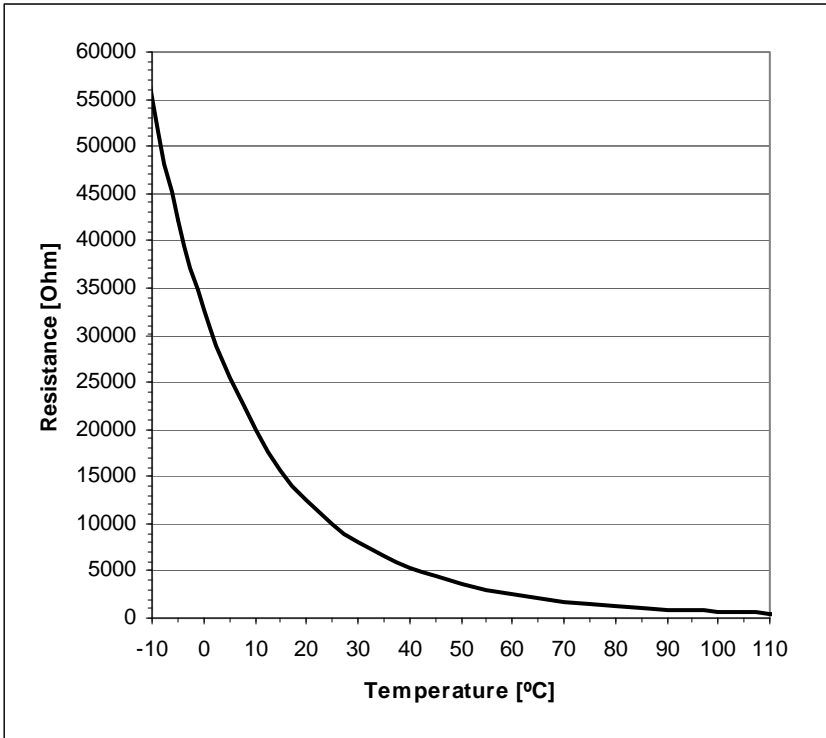
# Lockouts

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Error code	Description of error
346	Solid fuel boiler pump Q10 not available
347	Solid fuel boiler comparison sensor not available
348	Solid fuel boiler address error
349	Buffer return valve Y15 not available
350	Puffer address sensor
351	Primary controller / system pump address error
352	Pressureless header address error
353	Common flow sensor B10 not available
371	Flow temperature 3 (heating circuit 3) supervision
372	Limit thermostat heating circuit 3
373	Extension module 3 error (collective error)
349	Buffer return valve Y15 not available
350	Puffer address sensor
351	Primary controller / system pump address error
352	Pressureless header address error
353	Common flow sensor B10 not available
371	Flow temperature 3 (heating circuit 3) supervision
372	Limit thermostat heating circuit 3
373	Extension module 3 error (collective error)
386	Fan speed has lost valid range
388	DHW error no function
426	Feedback flue gas damper
427	Configuration flue gas damper
431	Sensor primary heat exchanger
432	Functional earth not connected
433	Temperature primary heat exchanger to high

# Sensor values

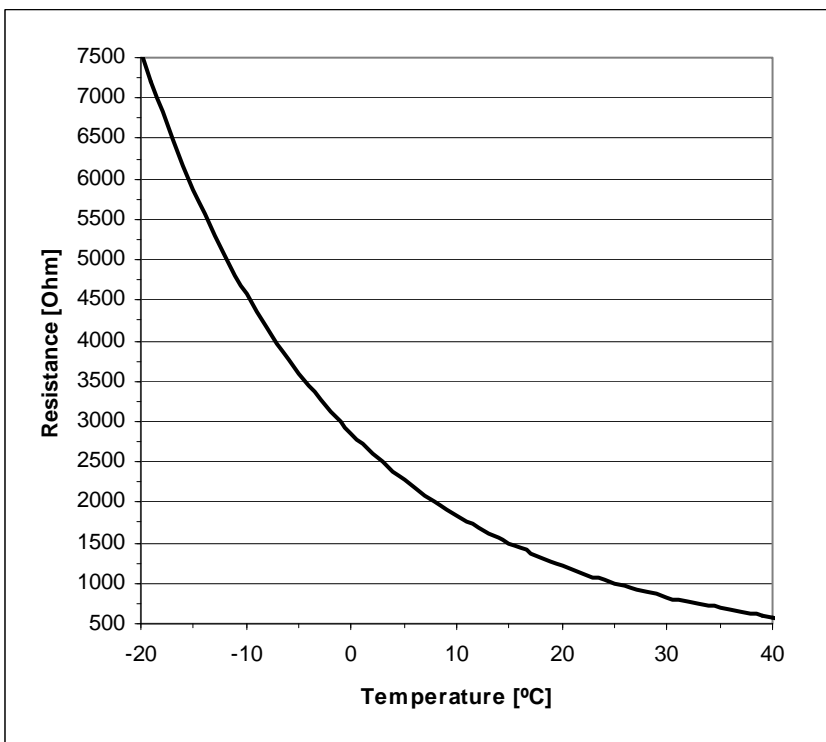
**NTC 10kΩ temperature sensor  
(flow, return, flue gas, DHW and header sensor)**



The diagrams show the sensor values for all boiler sensors and optional sensors available in accessory kits. The diagrams contain average values, as all sensors are liable to tolerances.

When measuring the resistance values, the boiler should always be switched off. Measure close to the sensor, in order to avoid value deviations.

**NTC 1kΩ temperature sensor  
(outdoor sensor)**



# Declaration of Conformity

## Declaration of Conformity

Rendamax BV, Hamstraat 76, 6465 AG Kerkrade (NL),  
Declares that the product

### R40

Is in conformity with the following standards:

EN 298  
EN 483  
EN 15420  
EN 55014-1 / -2  
EN 61000-3-2 /-3  
EN 60 335-1/ -2

And in accordance with the guidelines of directives:

92 / 42 / EEC (boiler efficiency directive)  
2009 / 142 / EEC (gas appliance directive)  
2006 / 95 / EEC (low voltage directive)  
2004 / 108 / EEC (EMC directive)

This product is designated with CE number:

### CE – 0063CM3576

Kerkrade, 16-11-2010



ing. G.A.A. Jacobs  
Managing Director

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