



**R40 (Evolution Range)
Gas-Fired, Wall Hung
Condensing Boiler
Installation Operation
& Maintenance Manual**

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General Regulations

Application Norms and regulations



This documentation contains important information, which is a base for safe and reliable installation, commissioning and operation of the R 40 EVO 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 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 set-point 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.

This boiler is CE approved and applies to the following European standards:

- **1992 / 42 / EEC** Boiler efficiency directive.
- **2004 / 108 / EEC** EMC directive.
- **2014/68/EU PED** directive, art.4-3.
- **2006 / 95 / EEC** Low voltage directive.
- **2009 / 142 / EEC** Gas appliance directive.
- **2009/125/CE** Energy related Products.
- **811-813/2013** EU regulation
- **EN 15502-1**, Gas-fired heating boilers. General requirements and tests.
- **EN 15502-2-1**, Gas-fired heating boilers - Specific standard for type C and devices type B2, B3, B5 with a nominal heat input not exceeding 1000 kW.
- **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.
- **EN 50165** Electrical equipment of non-electric appliances for household and similar purposes - Safety requirements.
- **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.

Additional national standards

Germany:

- RAL-UZ 61 / DIN 4702-8

Switzerland:

- SVGW

Austria:

- 15a V-BG

Belgium:

- HR TOP

UK:

- Gas Safety Installation & Use Regulations.
- BS 5440-1:2008
- BS 5440-2:2009
- BS 6644:2011 Inc corrigendum No1

General Regulations

Information for installer and maintenance service personnel

Data Plate



The use of the appliance for purposes other than those specified is strictly forbidden.

The manufacturer cannot be held responsible for any damage caused by improper, incorrect and unreasonable use of the appliance or by the failure to comply with the instructions given in this manual.



Installation, maintenance and all other interventions must be carried out in full conformity with the governing legal regulations and the instructions provided by the manufacturer. Incorrect installation can harm persons, animals and possessions; the manufacturing company shall not be held responsible for any damage caused as a result.



The boiler is delivered with protection packaging.

Once you have removed all the packaging, make sure the appliance is intact and that no parts are missing. If this is not the case, please contact your supplier.



Keep all packaging material (clips, plastic bags, polystyrene foam, etc.) out of reach of children as it may present a potential hazard.



Before any maintenance or repair work is performed on the boiler, make sure you have disconnected it from the electricity supply by switching the external double pole isolator to the OFF position.



All repairs, should only be performed using original spare parts.

Information for the User

Inform the user about the mode of operation of the system. Specifically deliver to the user the instruction manuals, informing him that they must be stored with the appliance.

Also, remind the user to:

- Periodically check the water pressure system and instruct him on how to reintegrate and bleed

- How to set the temperature and the adjusters for a correct and more economical management of the system.
- To perform, according to legislation, periodic maintenance system.
- Do not change, in any case, the settings for supply of air for combustion and gas combustion.
- Pay attention to the warnings contained in the user manual.

Symbols used on the data plate

1				2			
3			4		5		
S/N			10				
			6				
			7				
8				MAX	MIN		
9		12		Q(Hi)		14	
		13		P _{60/80C}		15	
				P _{30/50C}			
		11		$\eta = 100\%$		$\eta = \text{min.}$	
gas							
mbar							17
gas							
mbar							18
gas							
mbar							

- | | | | |
|---|------------------------------------|----|------------------------------|
| 1 | Brand | 10 | Factory settings |
| 2 | Country of origin | 11 | Maximum water pressure |
| 3 | Boiler model - Serial number | 12 | Boiler type |
| 4 | Commercial reference | 13 | NOx class / Efficiency |
| 5 | Certification number | 14 | Input rating nominal heating |
| 6 | Destination country - Gas category | 15 | Power output heating |
| 7 | Gas setting | 16 | Gases which may be used |
| 8 | Installation type | 17 | Ambient operating temp. |
| 9 | Electrical data | 18 | Max. central heating temp. |

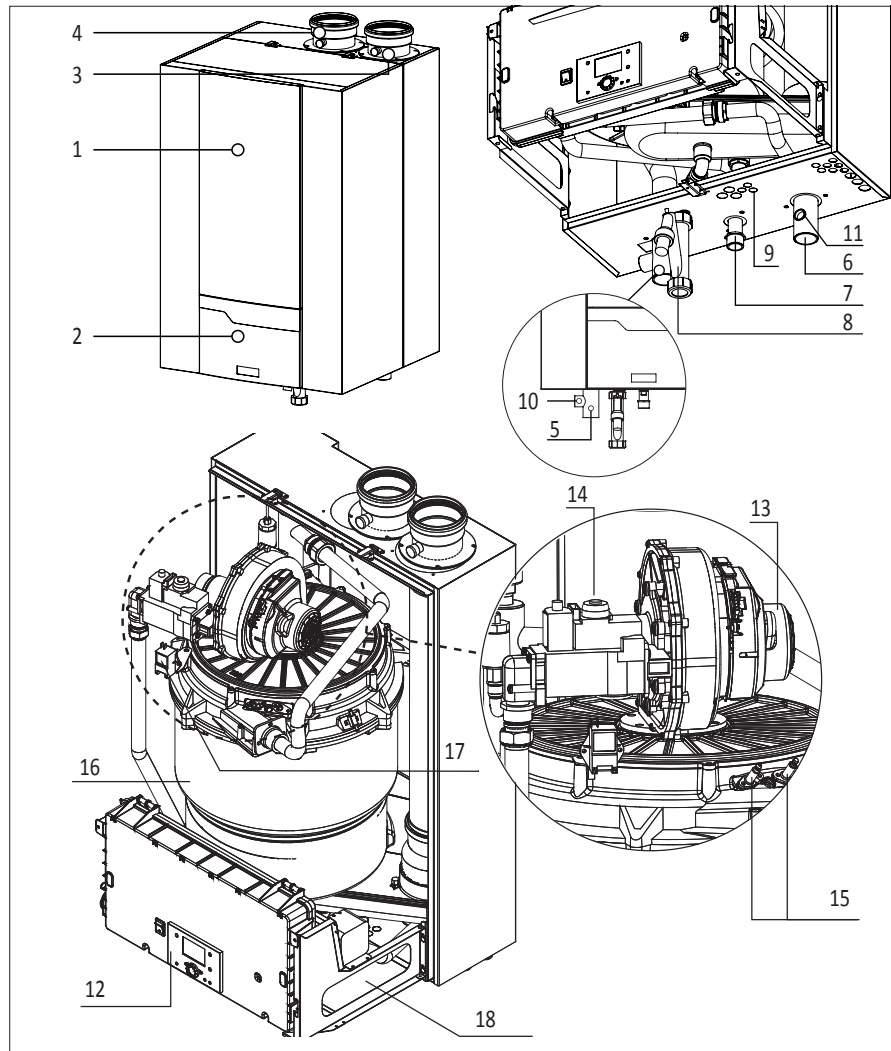
Construction

Layout of the boiler Operating principle

Layout of boiler

The R 40 EVO boiler consists of the following main components:

1. Casing
2. Access door to 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. Control Panel
13. Fan
14. Gas valve
15. Ignition and ionisation electrodes
16. Heat exchanger
17. Ignition transformer
18. Electrical input connections



Operating principle

The R 40 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 venturi 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

		R 40 EVO					
		60	70	80	100	120	140
Nominal heat output at 80/60°C max/min	kW	56,5/15,5	65,5/15,6	75,3/19,4	92,9/18,7	111,9/22,5	130,4/26,2
Nominal heat output at 50/30°C max/min	kW	60,4/17,2	70,0/17,2	79,7/21,2	98,9/20,6	118,5/24,8	137,8/28,9
Nominal heat output at 40/30°C max/min	kW	60,5/17,3	70,0/17,4	79,7/21,5	98,9/20,9	118,5/25,2	137,8/29,3
Nominal heat input Hi max/min	kW	57,9/16,0	66,8/16,0	76,8/19,8	95,2/19,0	114,3/22,9	133,3/26,7
Modulation ratio	-	3,6	4,2	3,9	5,0	5,0	5,0
Efficiency at 80/60°C max/min	%	97,6/97,0	98,0/97,5	98,0/97,9	97,6/98,3	97,9/98,3	97,8/98,3
Efficiency at 50/30°C max/min	%	104,4/107,4	104,8/107,3	103,8/107,2	103,9/108,5	103,7/108,4	103,4/108,3
Efficiency at 40/30°C max/min	%	104,5/108,3	104,8/108,5	103,8/108,6	103,9/110,0	103,7/109,9	103,4/109,8
Efficiency at 36/30°C load 30%	%	107,2	107,2	107,1	107,8	107,9	107,6
RAL 40/30 average	%	108,7	109,1	109,4	109,4	109,1	108,7
Heat Loss (Pstby)	W	81,0	81,0	81,0	92,7	92,7	92,7
Max. condensate flow	l/h	3,6	4,4	4,3	5,4	6,4	7,1
Gas consumption G20 max/min (10,9 kWh/m³)	m³/h	5,3/1,5	6,1/1,5	7,0/1,8	8,7/1,7	10,5/2,1	12,2/2,4
Gas consumption G25 max/min (8,34 kWh/m³)	m³/h	6,9/1,9	8,0/1,9	9,2/2,4	11,4/2,3	13,7/2,7	16,0/3,2
Gas consumption G31 max/min (12,8 kWh/kg)	kg/h	4,5/1,3	5,2/1,3	6,0/1,5	7,4/1,5	8,9/1,8	10,4/2,1
Gas pressure G20	mbar	20					
Gas pressure G25	mbar	25					
Gas pressure G31	mbar	30/50					
Maximum gas pressure	mbar	50					
Max. temperature flue gas (high limit)	°C	90					
Flue gas temperature at 80/60°C max/min	°C	59/57	60/57	61/58	60/56	63/56	66/57
Flue gas temperature at 50/30°C max/min	°C	43/35	44/34	45/33	44/33	46/33	48/33
Flue gas temperature at 40/30°C max/min	°C	42/33	44/33	44/33	43/32	45/32	47/32
Flue gas temperature at 36/30°C load 30%	°C	34	35	35	33	34	35
Flue gas quantity max/min	m³/h	83/22	98/22	113/27	139/27	168/33	202/38
CO level at 80/60 °C max/min	ppm	75/11	92/11	87/7	67/5	82/4	62/7
CO level at 80/60 °C max/min	mg/kWh	80/11	99/11	94/7	72/5	88/5	67/7
CO year emission EN15502	ppm	35,79	43,76	51,73	41,53	40,76	39,99
CO year emission EN15502	mg/kWh	38,44	47,00	55,56	44,60	43,78	42,95
CO ₂ level G20-G25	Max. load	8,5 (+0 -0,2)	8,4 (+0 -0,2)	8,4 (+0 -0,2)	8,4 (+0 -0,2)	8,4 (+0 -0,2)	8,2 (+0 -0,2)
	Min. load	9,0 (+0 -0,2)	9,0 (+0 -0,2)	9,0 (+0 -0,2)	8,5 (+0 -0,2)	8,5 (+0 -0,2)	8,5 (+0 -0,2)
Restriction ΔCO ₂ max.load - min. load	%	-	-	-	-	-	<0,3
CO ₂ level G31	Max. load	9,6 (0 +0,2)					
	Min. load	9,6 (0 +0,2)					
Restriction ΔCO ₂ max.load - min. load	%	CO ₂ Min. load ≤ CO ₂ Max. load					
NO _x level at 80/60 °C max/min	ppm	25/10	30/11	34/16	25/11	22/15	15/15
NO _x level at 80/60 °C max/min	mg/kWh	44/17	53/19	60/28	44/19	38/27	26/26
NO _x emission EN15502 (ppm)	ppm	13,94	18,78	23,61	28,38	22,61	16,84
NO _x emission Hi/Hs EN15502 (mg/kWh)	mg/kWh	24,60/22,15	32,61/29,36	40,61/36,57	46,67/42,03	38,19/34,40	29,71/26,76
NO _x class EN15502		6					
Max. permissible flue resistance	Pa	167	200	200	173	134	200
Water volume	l	6	6	6	9	9	9
Water pressure max/min	bar	8/1	8/1	8/1	8/1	8/1	8/1
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=20°K	m³/h	2,4	2,8	3,2	4,0	4,8	5,6
Hydraulic resistance at nominal flow rate	kPa	15	18	22	7	9	11
Electrical connection	V	230					
Frequency	Hz	50					
Mains connection fuse	A	10					
IP class with Appliance Type B23(P) **	-	IP30					

Technical data

Product information E.r.P.

		R 40 EVO					
		60	70	80	100	120	140
IP class with App. Type C13, C33, C43, C53, C63, C83,	-	IPX4D					
Weight (empty)	Kg	83	83	83	96	96	96
Weight (filled with water)	Kg	89	89	89	105	105	105
Sound Power Level (LWA)	dB	55	55	56	62	57	57
Ionisation current	µA	1,15	1,15	1,15	4,2	1,15	4,2
Rpm max / min load G20 - G25	rpm	6070/1770	7260/1800	7820/2060	6710/1570	4960/1150	5730/1300
Rpm max / min load G31	rpm	5810/1770	6710/1800	7190/2060	6090/1570	4690/1150	5460/1300
Rpm pre / post purge	rpm	2800/2800					
pre / post purge time	sec	10/30					
safety time	sec	5					
pH value condensate	-	3,2					
CE certification code	-	CE-0063CM3576					
Water connections	-	R1.1/4"			R1.1/2"		
Gas connection	-	R3/4"			R1"		
Flue gas connection (DN)	-	100					130
Air intake connect. (room sealed use) (DN)	mm	100					130
Condensate connection	mm	22					

Product informations about the directive 2009/125/EG and regulation (EU) 811-813/2013

R 40 EVO	ICON	60	70	80	100	120	140
Condensing boiler	-	Yes	Yes	Yes	Yes	Yes	Yes
Low-temperature boiler	-	No	No	No	No	No	No
B1 boiler	-	No	No	No	No	No	No
Cogeneration space heater	-	No	No	No	No	No	No
Combination heater	-	No	No	No	No	No	No

ErP Heating 1) by return temperature 30°C 2) by return temperature and feed temperature (60-80°C)

Rated heat boiler	P _{rated}	kW	57	66	75	93	112	130
At rated heat output and high-temperature regime	P4	kW	56,5	65,5	75,3	92,9	111,9	130,4
At 30 % of rated heat output and lowtemperature regime 1)	P1	kW	18,6	21,5	24,7	30,8	37,0	43,0
Seasonal space heating energy efficiency	η _s	%	91,7	91,8	91,7	92,3	92,5	92,3
At rated heat output and high-temperature regime 2)	η ₄	%	87,9	88,2	88,2	87,9	88,2	88,1
At 30 % of rated heat output and low temperature regime 1)	η ₁	%	96,5	96,5	96,4	97,1	97,2	96,9

Auxiliary electricity consumption

At full load	el _{max}	kW	0,10	0,12	0,13	0,13	0,12	0,15
At 30% load	el _{30%}	kW	0,03	0,03	0,04	0,03	0,04	0,03
In stand-by mode	PSB	kW	0,004					

Supplementary heater

Standby heat loss	P _{stby}	kW	0,081			0,093		
Ignition burner power consumption	P _{ign}	kW	NA	NA	NA	NA	NA	NA
Emissions of nitrogen oxides	NOX	mg/kWh	22	29	37	42	35	27

Technical data

Product data sheet E.r.P.

Product data about the directive 2010/30/EU and regulation (EU) 811-813/2013

R 40 EVO			60	70
Seasonal space heating energy efficiency class			A	A
Rated heat output	P _{rated}	kW	57	66
Seasonal space heating energy efficiency	η _s	%	91,7	91,8
Sound power level, indoors/ outdoors	LWA	dB	55	55

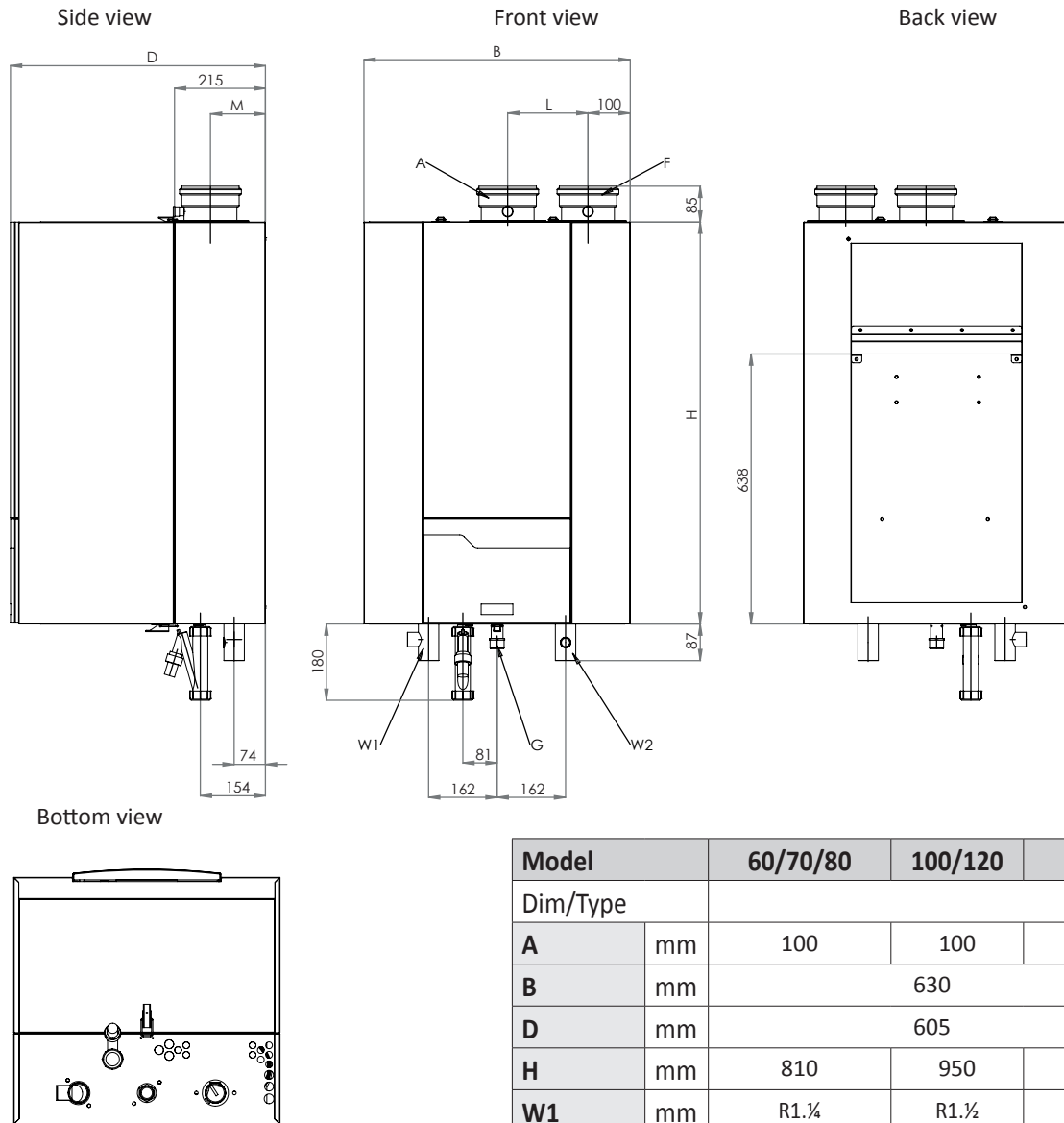
Important:

The installation, consisting of the boiler and all accessories including temperature control, together define the seasonal heating energy efficiency η_s for the various models, as listed in the below table.

R 40 EVO		60	70
Class VI , with use of components: - R 40 EVO - Ambient temperature sensor QAA 75 (option) - External temperature sensor QAC 34 Temperature controller contribution to η _s : 4%	η _s %	95,7	95,8
Class V , with use of components: - R 40 EVO - Ambient temperature sensor QAA 75 (option) Temperature controller contribution to η _s : 3%	η _s %	94,7	94,8
Class II , with use of components: - R 40 EVO - External temperature sensor QAC 34 Temperature controller contribution to η _s : 2%	η _s %	93,7	93,8

Technical data

Dimensions



Model		60/70/80	100/120	140
Dim/Type				
A	mm	100	100	130
B	mm	630		
D	mm	605		
H	mm	810	950	950
W1	mm	R1.¼	R1.½	R1.½
W2	mm	R1.¼	R1.½	R1.½
G	mm	R¾	R1	R1
F	mm	100	100	130
L	mm	140		190
M	mm	115		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 fixings	1	Together with manuals, in carton inside boiler packaging
Syphon for condensate connection	1	Inside boiler packaging
Operation and Installation manual	1	Envelope packed in cardboard box in boiler packaging
Spare parts list	1	Envelope packed in cardboard box in boiler packaging
Wiring diagram	1	Envelope packed in cardboard box in boiler packaging

Accessories

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

- 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 abuilding 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 R 40 EVO boiler and therewith 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

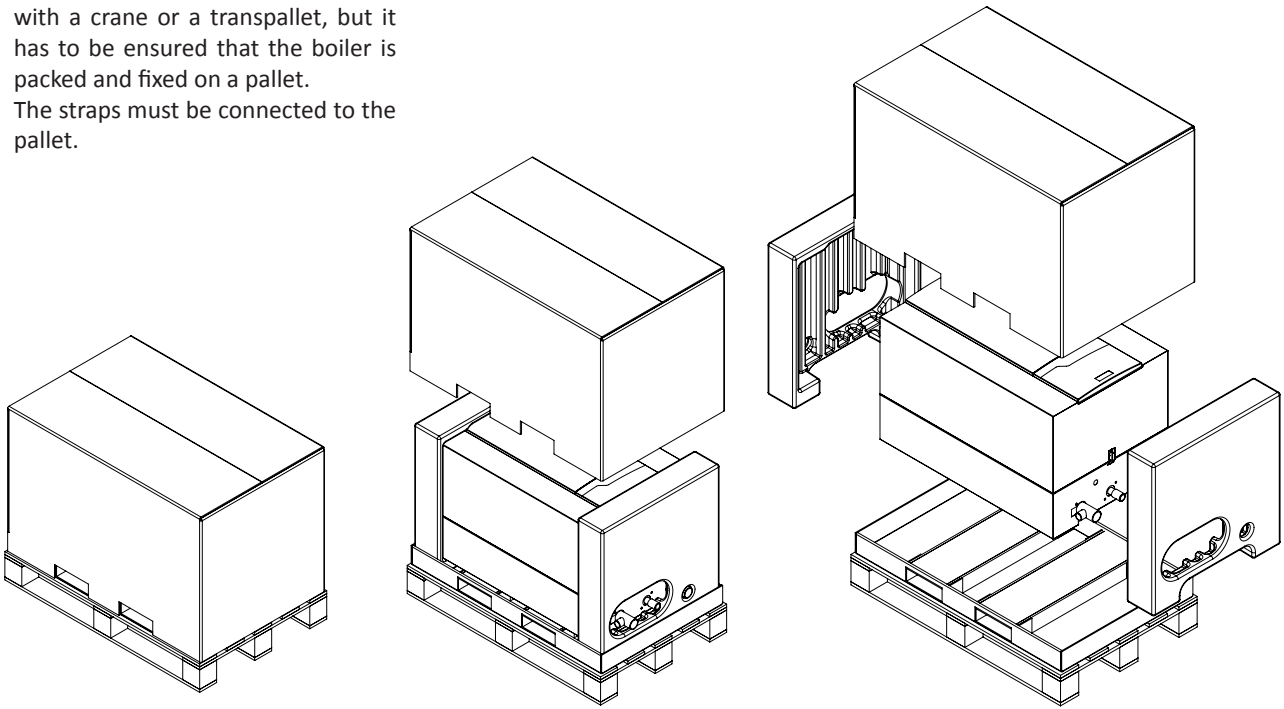
Boiler transport Removing the casing

Boiler transport

The R 40 EVO boiler will be supplied as a complete unit being fully assembled and pre-tested.

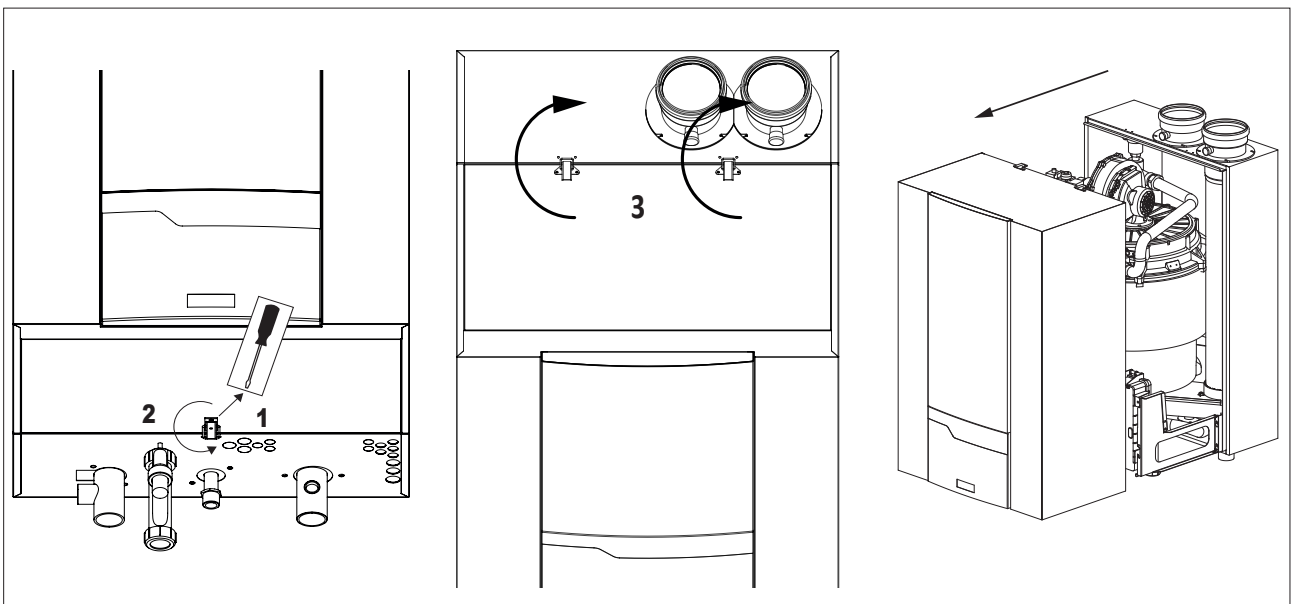
The R 40 EVO can be transported with a crane or a transpallet, but it has to be ensured that the boiler is packed and fixed on a pallet.

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 in the diagrams below.



Installation

Warnings before installation Boiler installation



Installation, first ignition, maintenance and boiler repair, must only be carried out by qualified persons.

Before installing the appliance

Before connecting the boiler, it is first necessary to perform the following operations:

- Thoroughly cleanse and flush the system pipework in order to remove any installation debris;
 - Make sure that the boiler is suitable for operation with the type of gas available (read the information on the packaging label and on the boiler data plate);
 - Make sure that there are no obstructions inside flue system and that it does not contain any discharge from other appliances, unless the flue is designed to as a cascade system serving multiple boilers.
- If connecting the boiler to an existing flue, check to make sure that it is sound and is constructed using suitable materials/components (suitable for use with over-pressure design gas fired condensing boilers).
 - The system water must be dosed with a good quality water treatment to prevent deposition of scale within the boiler components and to inhibit corrosion within the system.
 - In the event of installation on a wall constructed of combustible material (e.g. wood) make sure to protect the wall by suitable insulation;

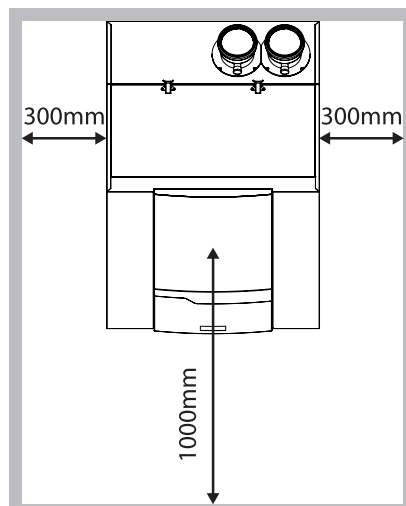
WARNING!

No inflammable items should be left near the boiler.

If dust and/or aggressive vapours are present in the room in which it is to be installed, the appliance must be installed room sealed.

Boiler installation

The boiler should be positioned in a frost-free boiler room. When positioning the boiler, please note the recommended minimum clearance in the diagram. When the boiler is positioned with less free space, maintenance activities will be more difficult.



Installation

Connecting the boiler

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 without applying undue strain to the boiler connections.

The boiler contains a connection possibility for an (optional) kit with safety valve, fill/drain valve and an expansion vessel connection. The safety valve must be connected to the flow connection (3) of the boiler, the fill/drain valve and expansion vessel 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 without applying undue strain to the gas connection (6) of the boiler. A gas tap should be mounted directly below the boiler.

ATTENTION: The Boiler is set for G20-G25 gas type. To operate with G31 gas type follow the procedures described on page 30.

Electrical connection

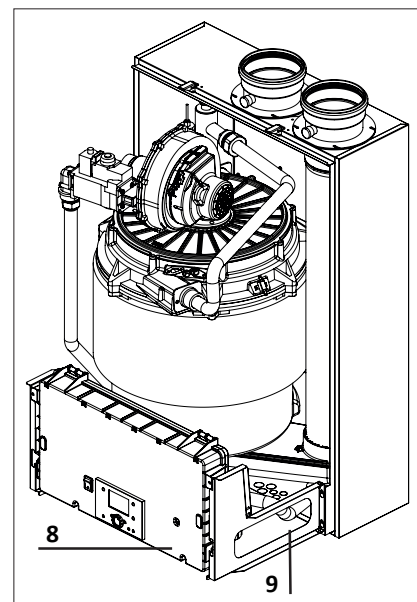
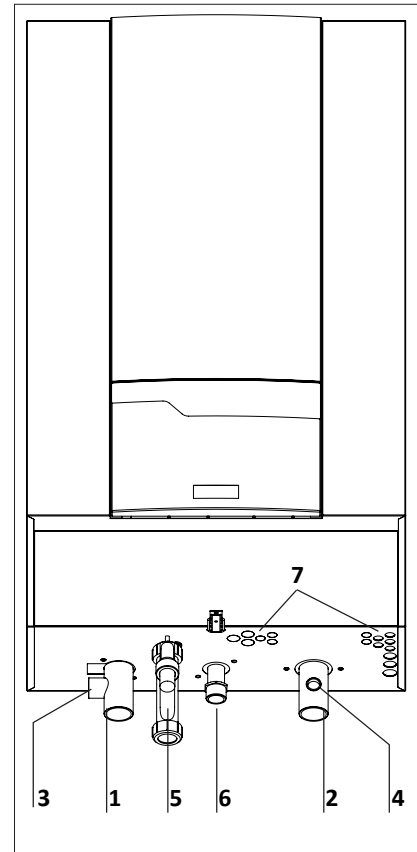
The electrical connection must be made by an authorized installer in accordance with the applicable national and local standards and regulations.

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 (according to clause 22.3 of the EN-IEC-60335-1). This switch can be used to switch off the power supply for maintenance purposes.

The boiler must be connected with a power cord type H05V2V2-F.

All cables should be lead through the cable glands (7 - 9) at the bottom of the boiler into the electro panel (8).

Connect all wires to the terminals according to the wiring diagram of the boiler, see pages 25-26

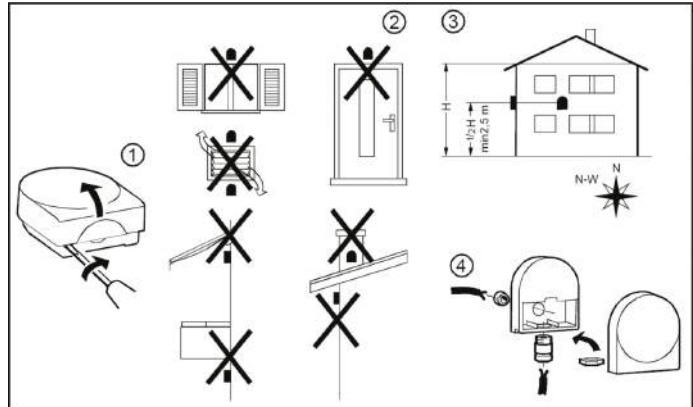


Installation

Outside sensor mounting Air intake/Flue gas system Air intake/Flue gas connections

Outside sensor mounting

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



Requirements and regulations

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. Pay attention to the following recommendations when dimensioning a flue gas system. Only approved flue gas material may be used.

The flue gas system must be properly calculated to ensure a safe functioning of the system. Flue gas system components should be removable for maintenance purposes. Horizontal flue sections must slope of not less than 3° back towards the boiler.

This Boiler is certified for the flue gas systems **B23(P)**, **C13**, **C33**, **C43**, **C53**, **C63** and **C83**.

Materials

Only materials, which are heat resistant and resistant to flue gases and aggressive condensate, and CE approved may be used.

See table on page 17 for specification of requirements flue gas components/materials

Flue gas connection (7)

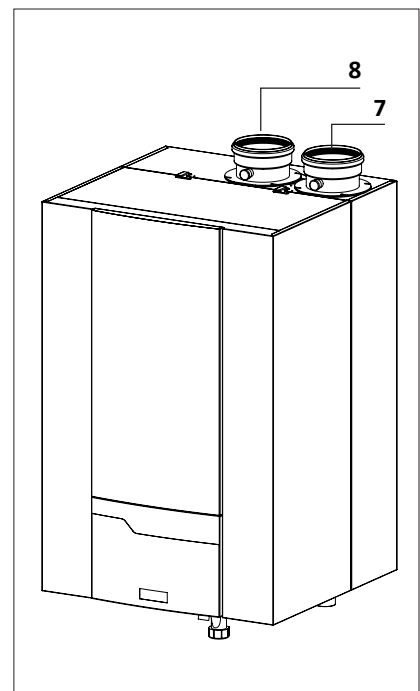
Connect the flue gas system to the flue gas connection (7) of the boiler, use flue gas systems with seamless connections only. It's not necessary to make a separate condensate drain for the flue gas system, as the condensate will be drained via the syphon of the boiler.

Please note the following points:

- 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)
- Horizontal flue sections must slope of not less than 3° back towards the boiler.

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).



Installation

Air intake / Flue gas data

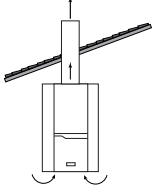
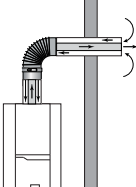
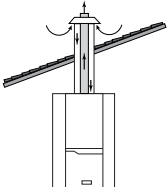
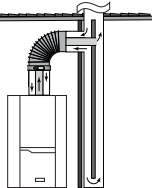
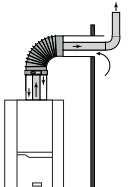
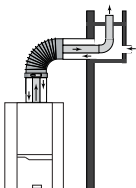
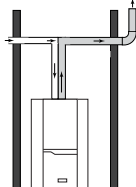
Air / Flue pipe data		
Concentric pipe nominal diam.	Ø80/125	Tolerance female Ø internal 80,5 ^{+1.0} _{-0.5} 125 ^{+1.0} _{-0.5}
	Ø100/150	Tolerance female Ø internal 101 ^{+1.0} _{-0.5} mm 150 ^{+1.0} _{-0.5} mm
Single pipe nominal diam.	Ø80	Tolerance female Ø internal 80,5 ^{+1.0} _{-0.2}
	Ø100	Tolerance female Ø internal 101 ^{±0.7} mm
	Ø130	Tolerance female Ø internal 131 ^{±0.7} mm
Material	PP (Concentric flue pipe) - Galva 0,4/Alluminium 1,3mm (Concentric air intake pipe) PP (single pipe)	
Material seal	EPDM black for corrosion class 1 / Viton for corrosion class 2	
Heat resistance	0 W/m ² K	
Wall thickness	2.2 mm	
Temperature class:	T120	
Pressure class:	P1 max. 200Pa / H1 max. 5000Pa	
Corrosion class:	W1	
Location class	Concentric pipe: Only outside buildings / Single pipe: Only inside buildings	
Fire rating class	E	
Outer wall class	(Concentric pipe only) L0	
Distance to combustible materials	Concentric pipe: 00 mm / Single pipe: 30 mm	

Flue Gas data

Boiler type	Nominal heat output		Nominal heat input		Flue gas connection (DN)	CO ₂ Level		Flue gas temperature		Flue gas quantity		Max permissible flue resistance	
	max	min	max	min		max	min	max	min	max	min	max	min
R40 EVO	kW		kW		mm	%		°C		g/s		Pa	
60	56,5	15,5	57,9	16,0	100	8,5	9,0	59	57	25	7	167	15
70	65,5	15,6	66,8	16,0	100	8,4	9,0	60	57	29	7	200	15
80	75,3	19,4	76,8	19,8	100	8,4	9,0	61	58	33	8	200	15
100	92,9	18,7	95,2	19,0	100	8,4	8,5	60	56	41	8	173	15
120	111,9	22,5	114,3	22,9	100	8,4	8,5	63	56	49	10	134	15
140	130,4	26,2	133,3	26,7	130	8,2	8,5	66	57	58	11	200	15

Installation

Air intake / Flue gas system

<p>Combustion air drawn from the room</p>	<p>B23</p>	<p>External flue gas exhaust. Air drawn from the room</p>	
<p>Combustion air intake from outside</p>	<p>C13</p>	<p>Air/exhaust gas routing through outside wall in the same pressure range. Exhaust gas/fresh air supply system through outside wall. The Terminal outlets from separate combustion and air supply circuits shall fit inside a square of 50 cm for boilers with a heat input to 70 kW and 100 cm with a heat input from 70 up to 100 kW.</p>	
	<p>C33</p>	<p>Flue gas exhaust and air suction duct from outside with roof terminal in the same range of pressure. The Terminal outlets from separate combustion and air supply circuits shall fit inside a square of 50 cm and distance between the planes of the two orifices shall be less than 50cm for boilers with a heat input below 70 kW. A square of 100 cm and distance between the planes of the two orifices shall be less than 100 cm with a heat input above 70 kW.</p>	
	<p>C43</p>	<p>Individual or shared flue gas exhaust and air suction through flue ducting built into the building.</p>	
	<p>C53</p>	<p>Flue gas exhaust leading outside and air suction duct through external wall not in the same range of pressure</p>	
	<p>C63</p>	<p>Air and exhaust connection to separate tested and supplied air / exhaust pipes. Basement / floor installation. Air and exhaust venting via exterior wall. Exhaust venting through heat insulated exhaust pipe or moisture resistant pipe. Exhaust line (standing air layer) at exterior wall. The terminals for the supply of combustion air and for the evacuation of combustion products shall not be installed on opposite walls of the building.</p>	
	<p>C83</p>	<p>Flue gas exhaust through individual or shared flue ducting built into the building. Air suction through external wall</p>	

Installation

Air intake / Flue gas system - dimensioning

Twin Pipe flue gas system

Maximum permissible length of flue gas system in m

R 40 Evo	Ø80	Ø100	Ø110	Ø125	Ø130
	Lmax [m]	Lmax [m]	Lmax [m]	Lmax [m]	Lmax [m]
60	17	62	-	-	-
70	13	52	65	-	-
80	7	36	47	-	-
100	-	13	23	56	88
120	-	2	7	22	36
140	-	-	5	14	23

Twin Pipe flue gas system	Equivalent length in m				
	Ø80	Ø100	Ø110	Ø125	Ø130
Straight pipe	1	1	1	1	1
Bend R=D 90°/87°	1.5	1.8	2	2.2	2.2
Bend R=D 45°/43°	0.8	0.9	1	1	1

Concentric flue gas system

Maximum permissible length of flue gas system in m

R40 Evo	Ø 80 / 125	Ø 100 / 150
60	12	38
70	9	33
80	4	23
100	-	10
120	-	3

Concentric flue gas system	Equivalent length in m	
	Bend R=D 90°/87°	Bend R=D 45°/43°
Ø100/150	1.5	1

Dimensioning

When dimensioning a flue gas system, it's necessary to perform a calculation check of the flue gas system in order to verify if the chosen system is applicable.

The previous tables show an example of possible flue gas system, including the maximum possible length of the system.

This example only give an indication of the possible length, but it can not be used for official flue gas layout calculation. Each flue gas system has to

be calculated by an authorized company.

The maximum negative flue gas pressure, which doesn't affect the burner modulation ratio, is 30 Pa. Higher negative pressure will lead to limitation of the burner modulation ratio.

The maximum horizontal flue gas length is 20 m. With horizontal lengths longer than 20 m, a faultless burner start in cold condition can not be guaranteed.

Concentric flue gas system

The Boiler boiler models 60, 70, 80, 100 and 120 can be connected to a concentric flue gas system.

Via a parallel-to-concentric adapter (optional) the boiler can be connected to:

- 100/150 concentric system

See table for max. permissible flue lengths.

Installation

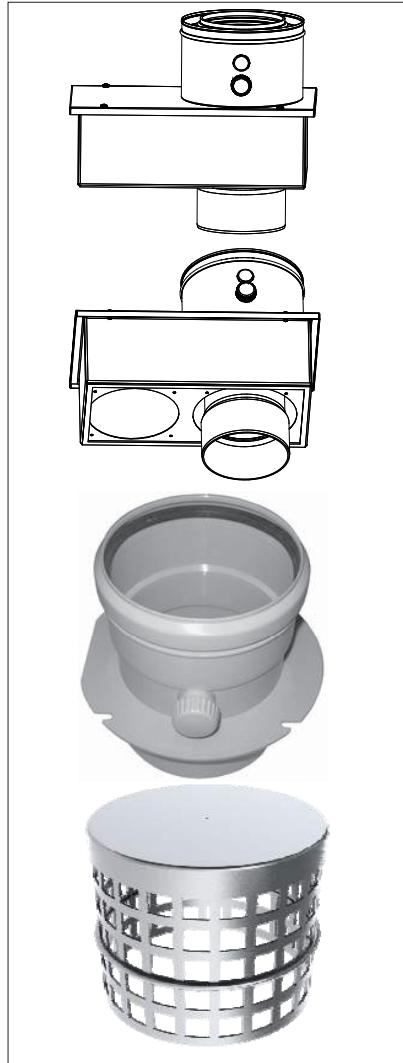
Air intake / Flue gas system Accessories

Types of boiler

Flue exhaust connection

- coaxial connection of the boiler to the supply/exhaust ducting
- split connection of the boiler to the exhaust ducting with air supply from outside.

The supply/exhaust ducting connection kits are supplied separately from the appliance, according to different installation solutions.



Flue adapter concentric

Concentric flue systems can be used on the R 40 EVO 60-120, by using a parallel to concentric adapter.

$$DN\ 100/150 = \varnothing_{int}\ 101^{\pm 0.3} / 151^{\pm 0.3}$$

$$DN\ 110/150 = \varnothing_{int}\ 111^{\pm 0.3}_{-0.6} / 151^{\pm 0.5}$$

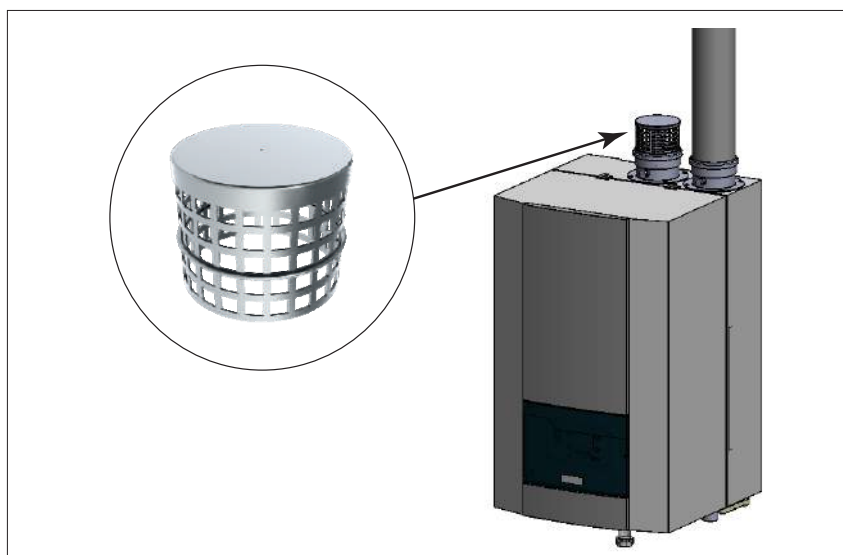
Flue adapter parallel



The boiler is equipped with a flue connection of 100mm (R 40 EVO 60-120) or 130mm (R 40 EVO 140). In case of using 110mm or 125mm flue systems, the original adapter can be replaced as follows:

- 100mm replaced by 110mm;
DN 110 = $\varnothing_{int}\ 111^{\pm 0.3}_{-0.6}$
- 130mm replaced by 125mm.
DN 125 = $\varnothing_{int}\ 126^{\pm 0.3}_{-0.6}$

Air inlet cover

The inlet cover must be used to cover the air inlet connection of the boiler in non room sealed condition, available in 100mm and 130mm.



	
100mm	60-120
130mm	140

Installation

Air intake /Flue gas system Installation instructions - concentric pipe

Installation

Fitting the flue system to the appliance must be carried out by a qualified person in accordance with these installation instructions

General

- Store material inside.
- Pipes must be installed free of tension.
- Pay attention to the flue direction. The sockets must be pointing to the terminal.
- Don't install the chimney on inflammable or wooden wall

Cutting the pipe

- Take out the inner tube by turning it until it releases from its position
- When shortening a concentric pipe, cut equal amounts from both the outer and inner tubes.
- Remove the burrs from the cutting edge to prevent cutting the seals
- Re assemble the pipes

Assembly flue gas system

Starting to assemble the pipes from the boiler.

Assemble the pipes by turning and pushing them till the bottom of the seat.

NOTE: Don't use soap or oil lubricant!
Use only water as lubricant.

Pipes bends

When using bends, the maximum permissible length of flue gas system can be determined from the table on page 19.

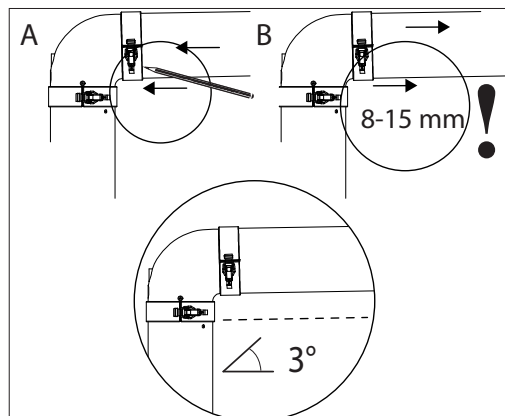
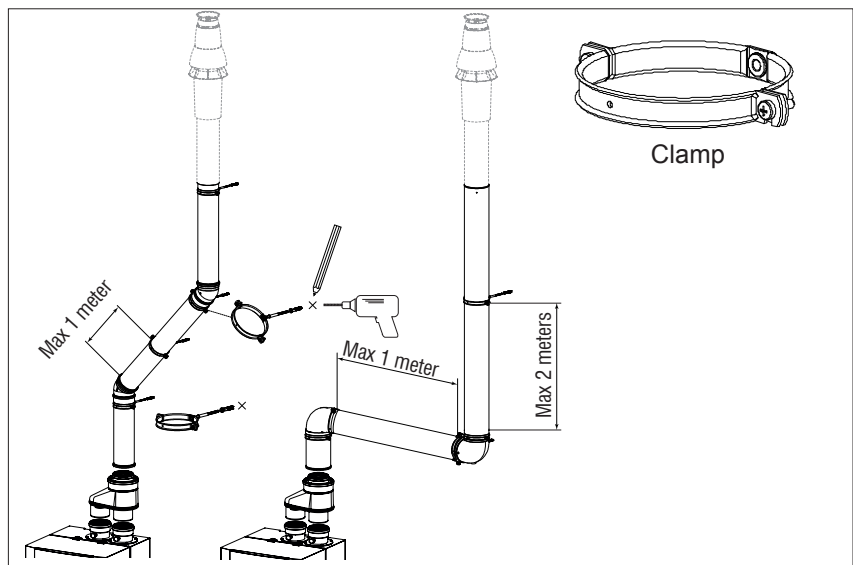
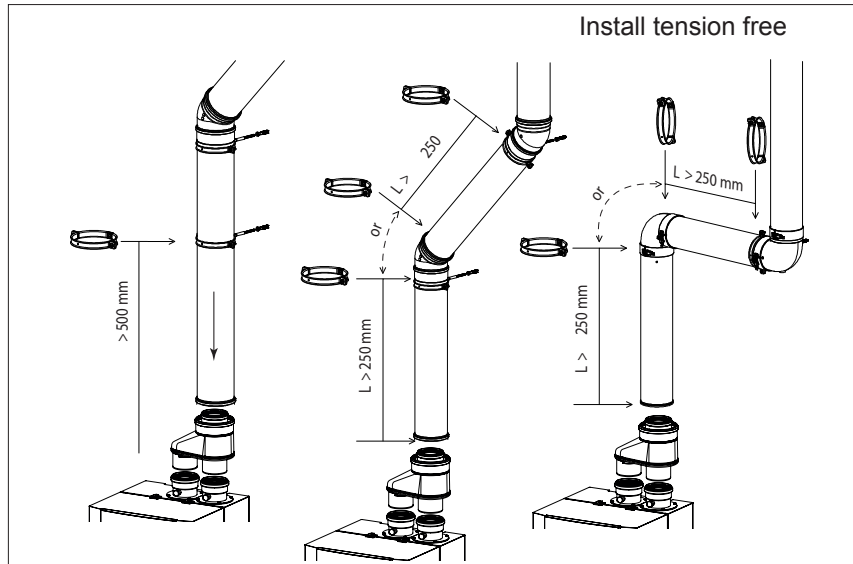
Pipe extensions must be fixed to the wall using support clips. Use one clamp for each extension directly beside the sleeve. Fit another clamp to the extension after each 90° bend.

Important

Install only outside buildings on walls constructed from fire resistant material

Cleaning

Outside can be cleaned with a wet cloth moistened with a mild detergent if necessary.



Installation

Air intake / Flue gas system Installation instructions - twin pipe

Installation

Fitting the flue system to the appliance must be carried out by a competent person in accordance with these installation instructions

General

- Store material inside.
- Pipes must be installed free of tension.
- Pay attention to the flue direction. The sockets must be pointing to the terminal.

Cutting the pipe

- Remove the burrs from the cutting edge to prevent cutting the seals

Assembly flue gas system

Start to assemble the pipes from the boiler.

Assemble the pipes by turning and pushing them till the bottom of the joint.

NOTE: Don't use soap or oil lubricant! Use only water as lubricant.

Before pipe extensions:

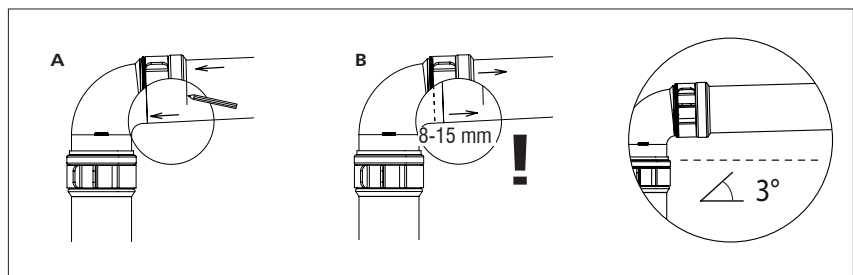
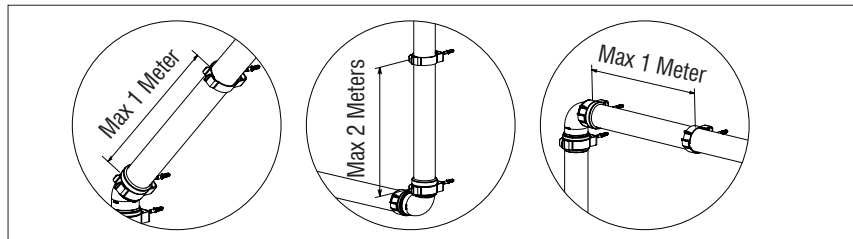
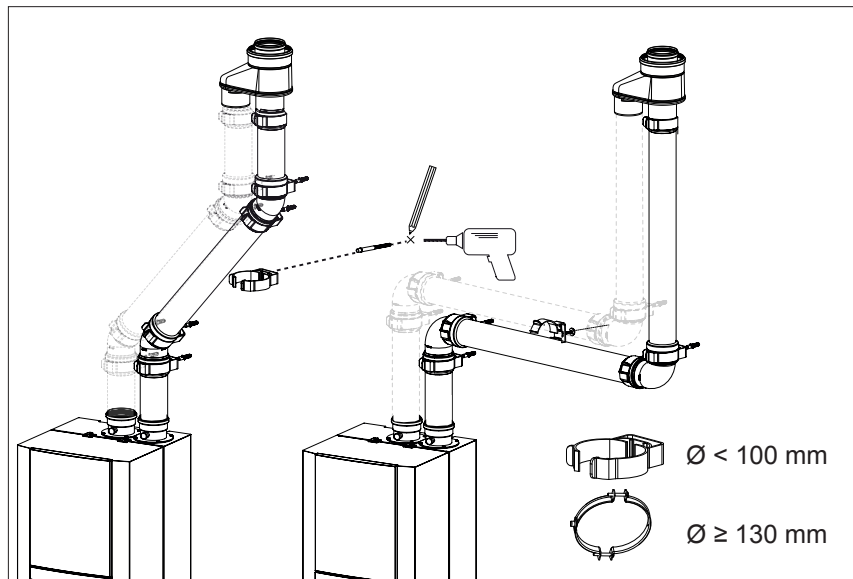
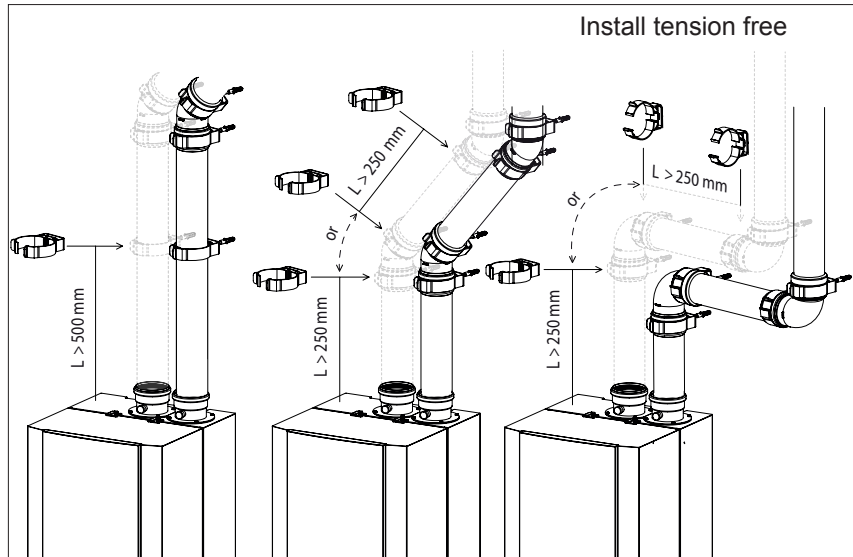
When using bends, the maximum permissible length of flue gas system can be determined from the table on pag.19.

Important

Install only outside buildings on walls constructed from fire resistant material.

Cleaning

Outside can be cleaned with a wet cloth moistened with a mild detergent if necessary.



Installation

Flue terminal Installation of vertical flue terminal

Installation

Make sure that the flue terminal is not damaged.

Different types of flue terminal:

1. Synthetic tile
2. Flat roof flashing
3. Universal pitched roof flashing

- Taking the roofing into account, determine the type of weather collar synthetic tile or universal pitched roof flashing; for a flat roof an aluminium flat roof flashing
- Determine where the flue terminal will be positioned. With a tile roof use the universal pitched roof flashing.

- A. Make a hole for the flue terminal from the outside. Ensure that no saw dust or dust gets into the boiler
- B. Fit the weather collar and carefully insert the flue terminal through the roof from the outside.

Warning! Don't turn the cap!

- C. Put the flue terminal into a vertical position using an air level.

If desired, cover plates, to be supplied separately, can be fitted.

- D. Fix the supplied wall clamp round the flue terminal and fit it to the roof construction, without tightening the clamp yet.

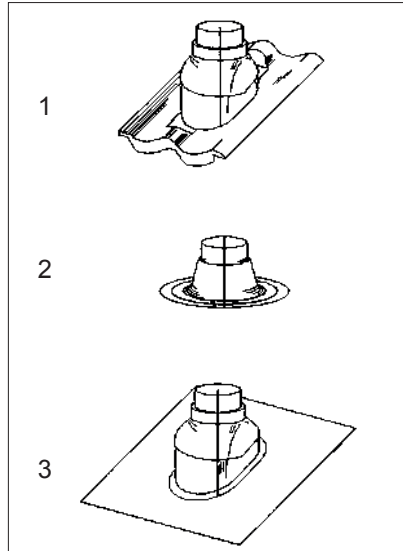
Concentric

Determine the length of the flue pipes and install these with the clamps in accordance with the installation instructions in the previous pages.

Twin pipe

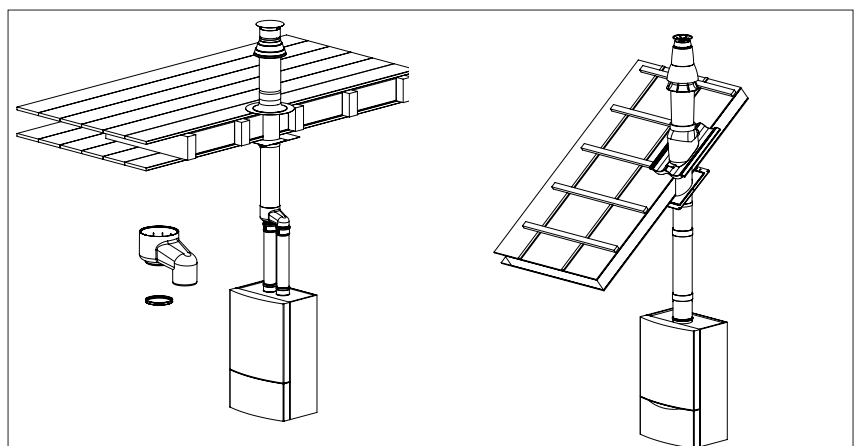
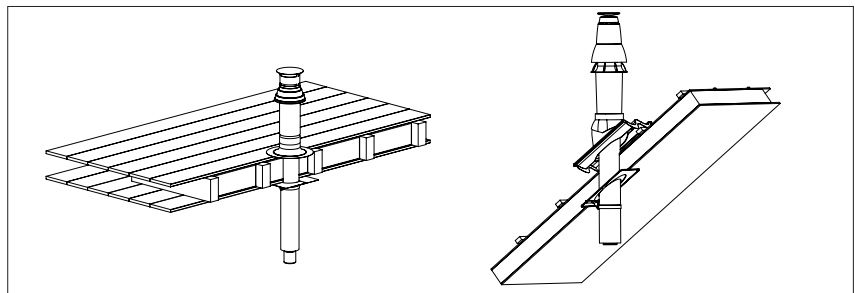
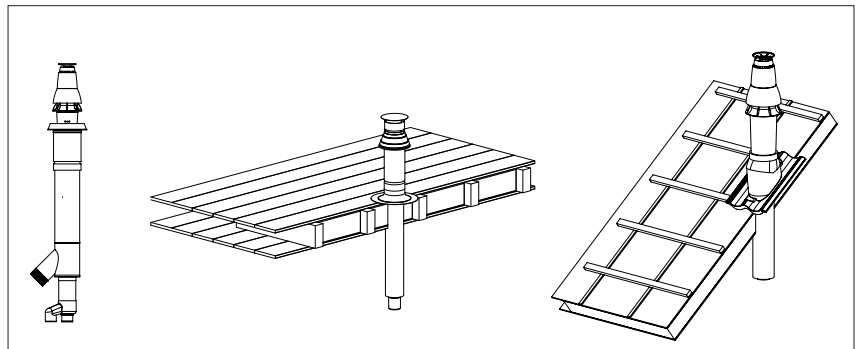
Fit the gasket and the twin tube connection. Make sure that the gasket is not damaged. Ensure that the flue tube and the air inlet tube are not exchanged; the flue tube is the pipe in the centre below the flue terminal.

- Secure the roof wall clamp and check that all steps have been carried out correctly.



Warnings

If installed near a light, insects may fly into the opening. Tell the home owner to clean the opening regularly. Ensure while installation work is being carried out that no debris such as swarf, filings or fragments of mortar are allowed to remain in the air/flue duct.



Installation

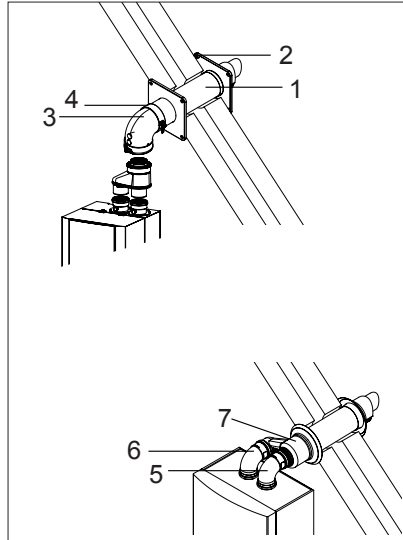
Flue terminal Installation of horizontal flue terminal

Before installing the terminal

Before assembling the flue terminal, it is first necessary to perform the following operations:

- Check the flue terminal for possible damage.
- Determine the proposed location of the flue terminal
- Drill a hole through the wall of a max. of 10mm wider than the air supply pipe for the flue terminal.
- Horizontal flue terminal with flexible exterior gaskets can be installed inside out, in which case the drilled hole must be 25mm wider than the diameter of the air supply pipe.

Take due care to protect the appliance from dust and grit during drilling



Part list:

1. Horizontal flue terminal
2. Wall plate or rosette
3. Concentric bend
4. Locking bend (optional)
5. Flue pipe
6. Air inlet pipe
7. Twin pipe connection.

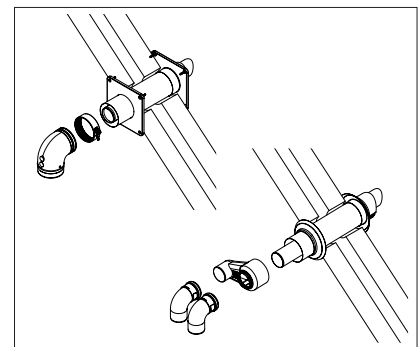
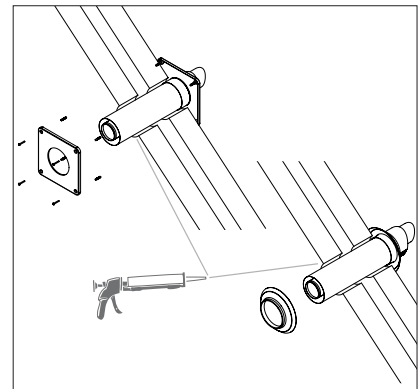
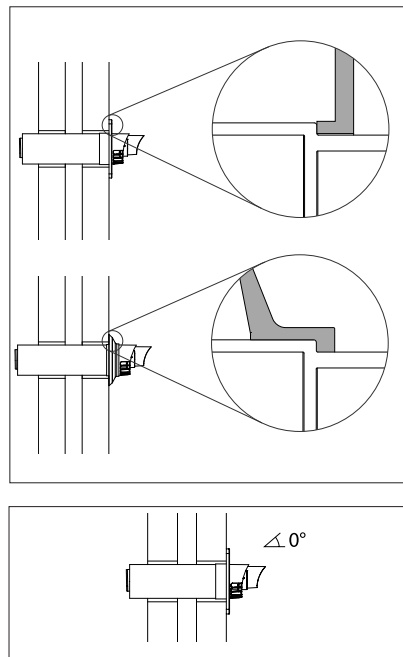
Installing the flue terminal

Determine the thickness of the wall and cut if necessary the wall terminal to the corresponding length. Remove the burs. **Attention! The length is correct if the outer wall plate or rosette are flush with the outside wall.** Insert the flue terminal into the drilled hole. The air supply pipe for the flue terminal must either be installed level or tilted slightly downwards to the outside (max. 10mm per meter).

To prevent rainwater from penetrating the system, ensure that the flue terminal is never installed upside down.

Close the gap between the air intake pipe and the hole in the wall with water resistant sealant.

Install the rosettes or wall plates around the flue terminal and attach with screws or mastic.



Connecting the flue

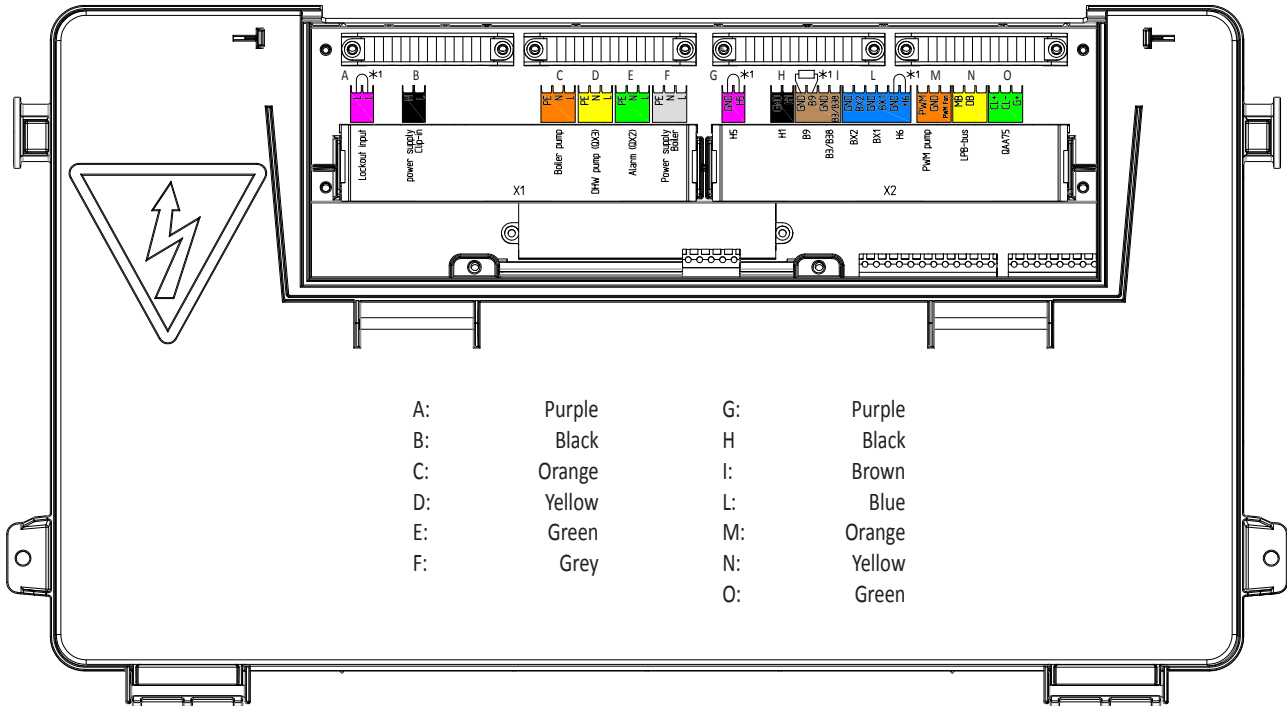
Connect the appliance to the terminal. Start at the outlet of the appliance. Don't use soap or oil lubricant! Use only water for lubricating the seals.

Important

Install products according to National Regulations. Cleaning is possible with a wet cloth moistened with a mild detergent if necessary.

Installation

Wiring diagram - Legend



A:	Purple	G:	Purple
B:	Black	H:	Black
C:	Orange	I:	Brown
D:	Yellow	L:	Blue
E:	Green	M:	Orange
F:	Grey	N:	Yellow
		O:	Green

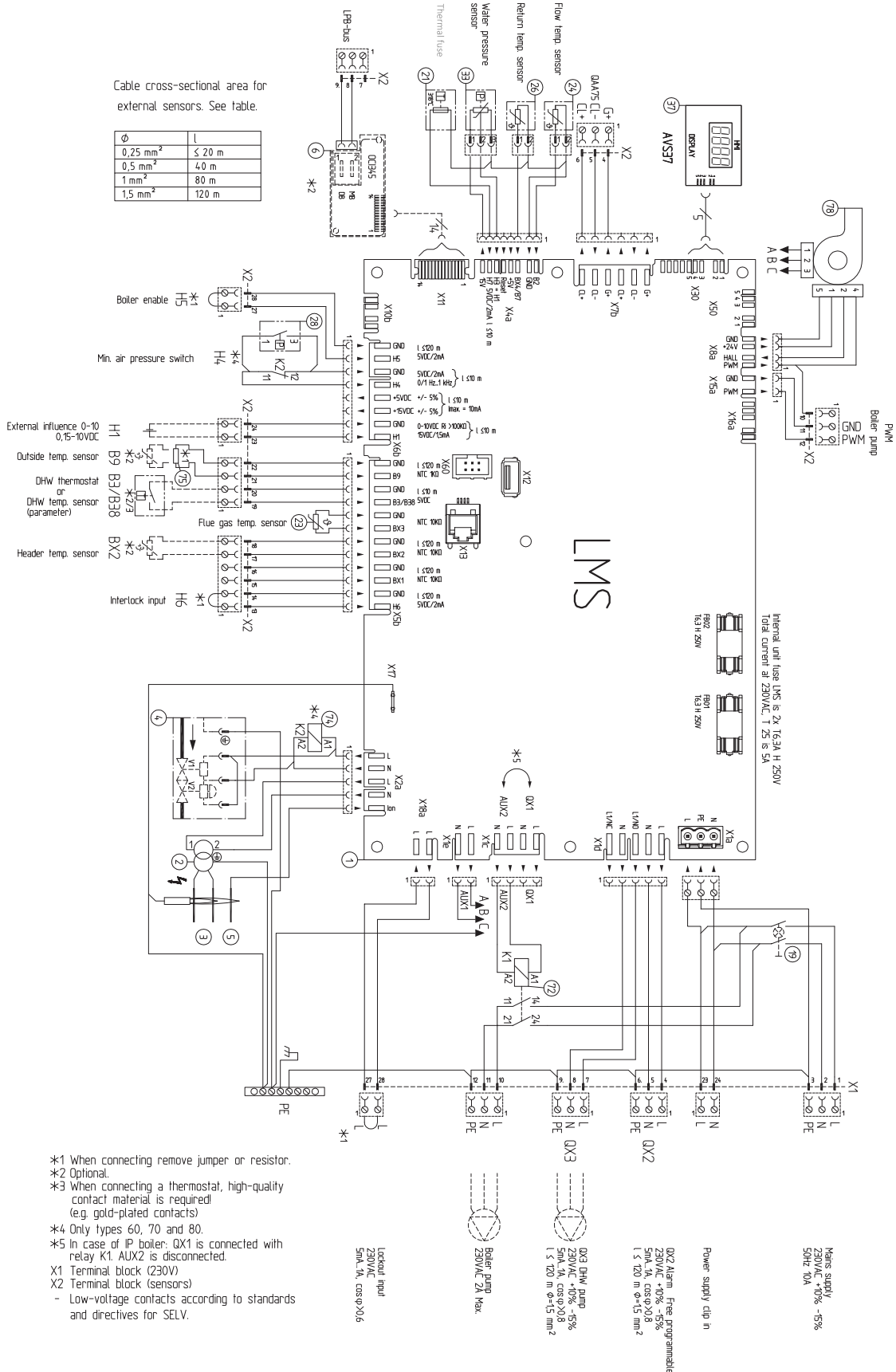
*1 If connected, remove the jumper or resistor.
 - Sections of cable for external sensor. See table.

∅	l
0,25 mm ²	≤ 20 m
0,5 mm ²	40 m
1 mm ²	80 m
1,5 mm ²	120 m

ELECTRICAL CONNECTIONS							
PLUG	DESCRIPTION	PLUG	DESCRIPTION	PLUG	DESCRIPTION	PLUG	DESCRIPTION
Grey L N PE	Power supply boiler	Orange L N PE	Boiler pump	Green G+ CL- CL+	QAA75	Blue BX2 GND	Header temp. sensor
	230VAC +10%-15%		230VAC 2AMax.		Room unit		≤ 120 m NTC 10kΩ
Green QX2	Alarm, free programmable	Black L N	Power supply clip in	Yellow DB MB	LPB - bus	Brown B3/B38 GND	DHW thermostat or temp. sensor
	230VAC +10%-15%		-		-		≤ 10m, 5VDC
Yellow QX3	DHW Pump	Purple L L	Lockout input	Orange GND PWM	PWM pump	Brown B9 GND	Outside temp. sensor
	230VAC +10%-15%		230VAC		PWM Fan		Reserved
	5mA...1A, cosφ >0,8		5mA...1A, cosφ >0,6	Blue H6 GND	Interlock input	Black H1 GND	External influence 0-10
	≤ 120m ∅=1,5mm ²				≤ 120 m 5VDC/2mA		0,15-10VDC I ≤ 10m Ri > 100kΩ
				Blue BX1 GND	≤ 120 m NTC 10kΩ	Purple H5 GND	Boiler enable
							≤ 120m 5VDC/2mA

Installation

Wiring diagram - Boiler



Commissioning

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.

Water pressure

Open the valves to the system. Check the water pressure in the system.

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

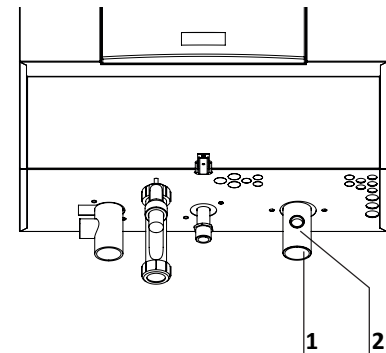
Filling can be done via the (optional) fill and drain valve (2) on the return connection (1) of the boiler.

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.

Minimum operating pressure [bar]	Flow temperature [°C]
> 1.0	90



Water quality

The system should be filled with water with a PH value between 7,0 and 9,5.

The chloride value of the water should not exceed 50 mg/l. Entry of oxygen by diffusion should be prevented at all times. Damage to the heat exchanger because of oxygen 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 refilling water for the R 40 EVO according to the the VDI2035.

The table at the right 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.

Boiler output [kW]	Max. sum of alkaline earths [mol/m3]	Max. total hardness	
		[°dH]	[°f]
60 - 200	2.0	11.2	20
200 - 600	1.5	8.4	15

Concentrate Ca(HCO ₃) ₂			Capacity of installation Q (kW)						
			150	200	250	300	400	500	600
mol/m ³	°dH	°f	Maximum water (re)fill volume V _{max} [m ³]						
≤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

Commissioning

Neutralisation systems

General

Condensate, created by the boiler should be drained into the public draining system. The condensate pH is between 3.0 and 3.5. National and/or local regulations have to be checked, in order to find out whether the condensate should be neutralised before entering the public draining system.

The maximum amount of condensate for each boiler type can be found in the chapter *Technical data*.

Neutralisation systems

The neutralisation systems can be placed in the bottom section of the boiler.

The delivery of the system contains the following components:

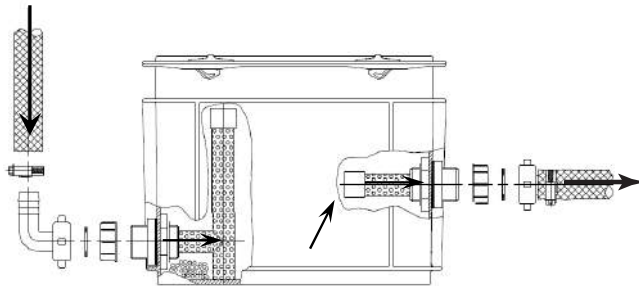
Granulate for first filling.

Connection hoses for inlet and outlet connection Boiler connection adapter.

For the neutralisation two different systems are available:

Standard neutralisation system (DN)

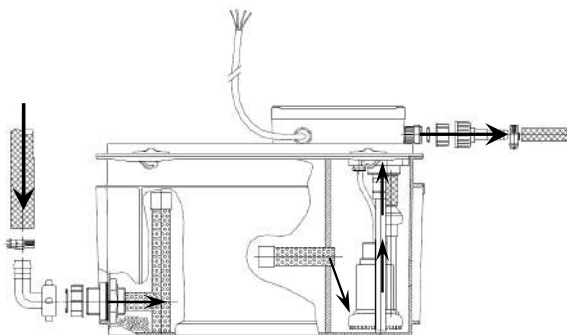
The standard neutralisation system (if required) is used when the public draining connection is at lower level than the boiler syphon connection.



Type		DN1	DN2	DN3
Applicable for	kW	75	450	1500
Length	mm	320	420	640
Width	mm	200	300	400
Height	mm	230	240	240

Neutralisation system with pump (HN)

The neutralisation system with pump is used when the public draining system is at higher level than the boiler syphon connection and the condensate needs to be transported to a higher level before draining is possible. The built-in pump of the neutralisation system takes care of the transport of the condensate.



Type		HN1.5	HN 2.5	HN 2.7
Applicable for	kW	280	540	750
Length	mm	410	640	640
Width	mm	300	400	400
Height	mm	290	240	320
Power consumption pump	W	40	150	45
Pump head	m	6	3	4

Commissioning

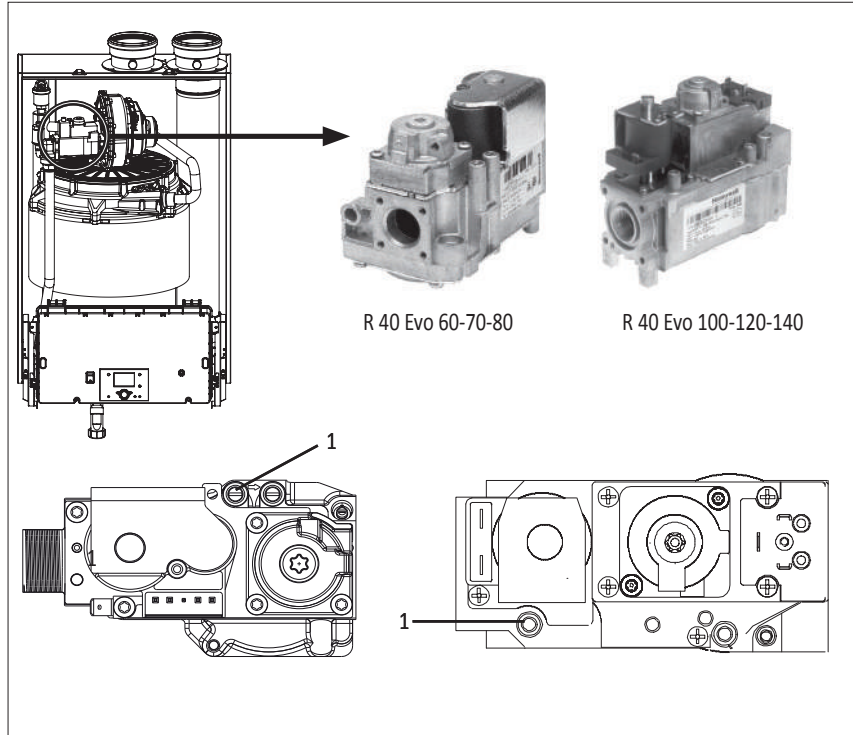
Gas supply Condensate connection Flue and air intake connections

Gas supply

Check the gas supply connection to the boiler for soundness before starting the boiler!

Purge any air between the gas valve and the gas line. This can be done at the test point (1) at the gas valve.

Don't forget to close the test point afterwards!



Condensate connection

Remove the syphon (2) from the condensate connection. Fill it with water and place it back in the original position.

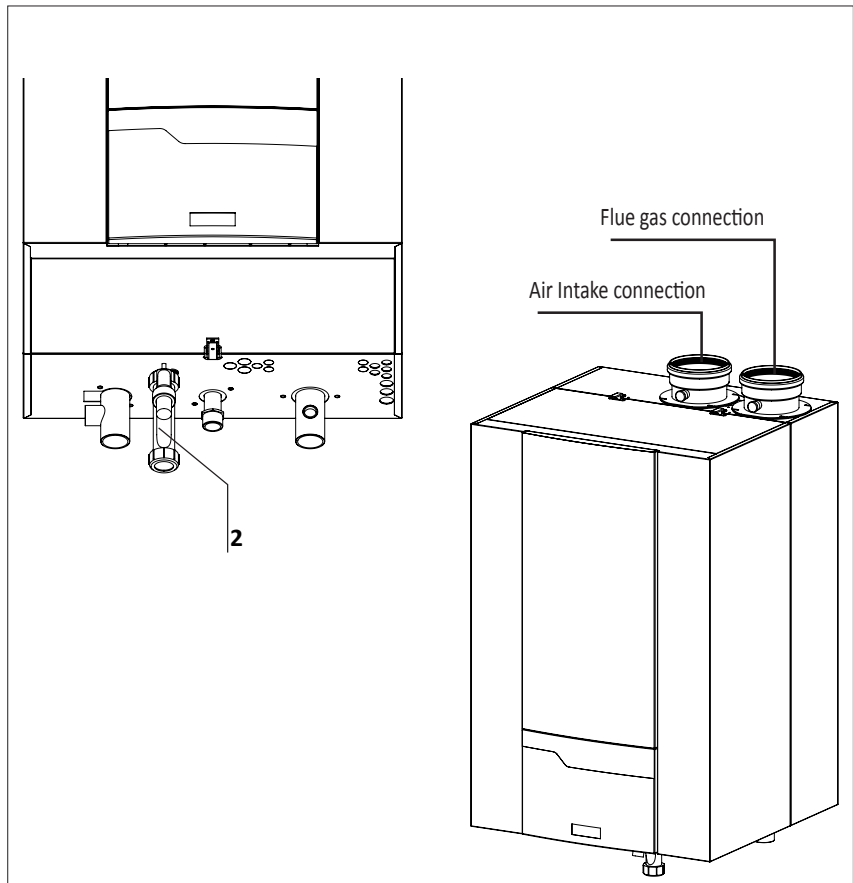
Make sure the syphon is filled before starting the boiler, in order to prevent flue gases discharging through the condensate connection!

Flue and air intake connections

Check whether the flue and air intake systems are made according to the national and local regulations. Installations which do not 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.

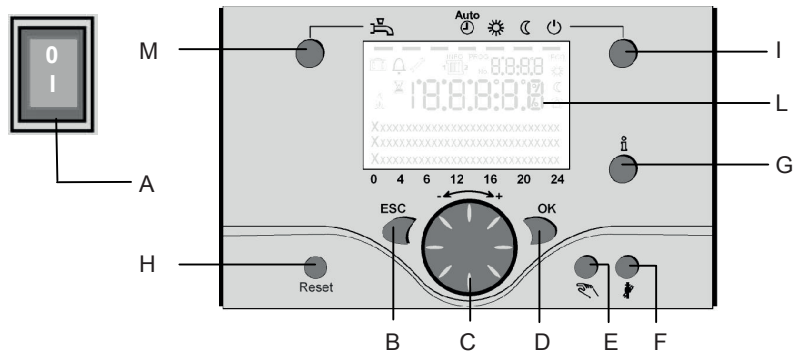


Commissioning

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



Initial procedures

To guarantee safety and the correct operation of the appliance, the boiler must be prepared for operation by a qualified technician who possesses the skills which are required by law.

Electricity supply

- Check that the voltage and frequency of the electricity supply correspond to the data shown on the boiler data plate;
- Make sure that the earthing connection is efficient.

Filling the hydraulic circuit

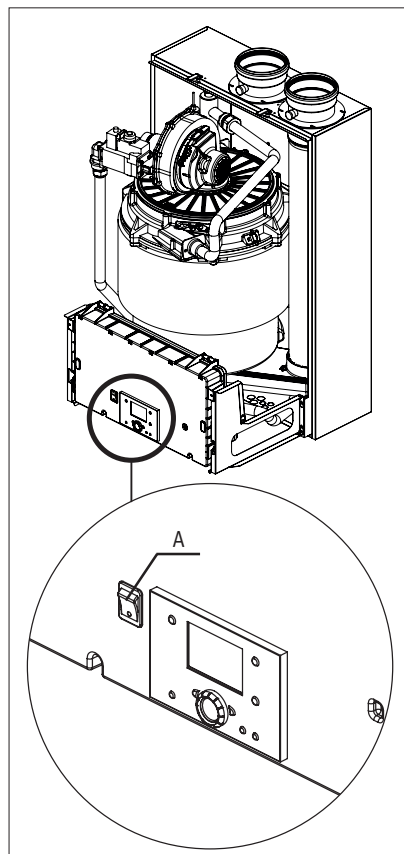
Proceed in the following manner:

- Open the system filling point and vent the hydraulic system. Continue filling the system until pressure gauge on the boiler registers 1.5 bar

Gas supply

Proceed as follows:

- Make sure that the gas supply delivers the same type of gas as indicated on the boiler data plate; **ATTENTION:** The Boiler is set for G20-G25 gas type. To operate with G31 gas type use the procedures described on "LPG settings".
- Open all doors and windows;
- Make sure there are no sparks or flames in the room;
- Make sure that the gas connections are sound.



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 Secs, the boiler goes into controller Stop 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.

LPG (G31) Settings

In order to operate with G31 gas type reaching the related parameters (9524 min. rpm and 9529 max. rpm) on the display. Values of rpm are listed on page 9:

- Push **OK** button
- Push **I** (G) for 3 seconds
- choose **installer** with wheel (C)
- Push **OK** button
- choose **branderautomat** with wheel (C)
- Push **OK** button
- choose **parameternumber** you want to change with wheel (C)
- **OK** (parameter is blinking)
- change value with wheel (C)
- **OK** (parameter is stored)

After checking the combustion values (see next page), the controller Stop mode can be exited by pushing the control mode button (I) >3 Secs.

Commissioning

Combustion analysis Combustion settings

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 drop 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.

Check the combustion settings via the test point in the chimney connection (1).

If necessary, correct the settings with the small adjustment screw in the venturi (3).

Combustion check at minimum load

Switch the boiler to minimum load (0%).

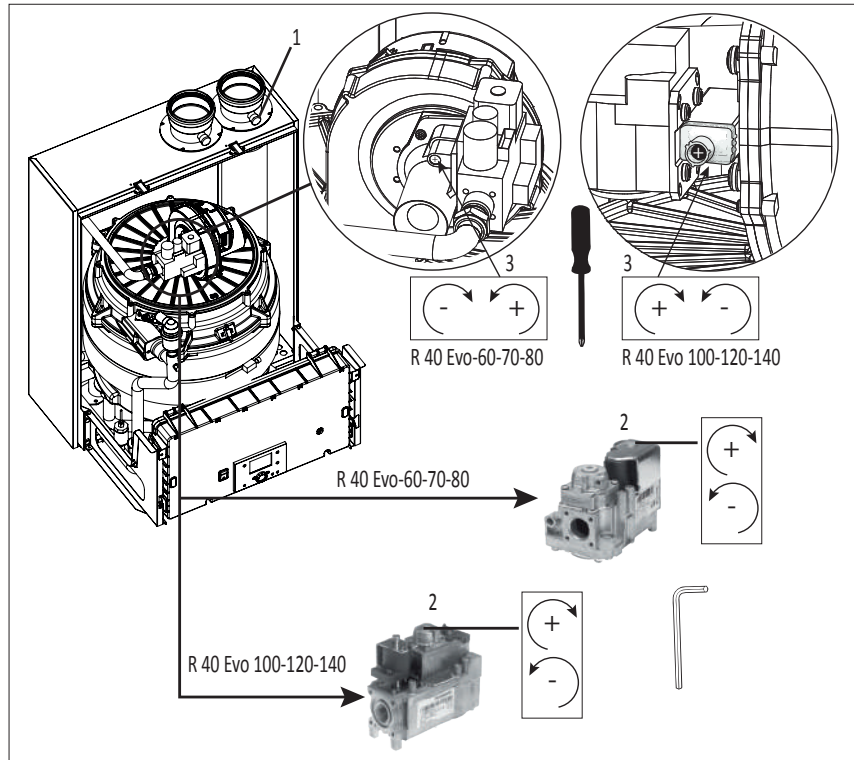
Check the combustion settings the same way as described for full load. If necessary, correct the settings with the large adjustment screw on the gas valve (2) -remove cap-.

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 CO₂ 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.



Combustion settings load for propane gas G31		
R 40 EVO		60-70-80-100-120-140
CO ₂ , max	%	9.6 ⁺⁰ _{+0.2}
CO ₂ , min	%	9.6 ⁺⁰ _{+0.2}

Combustion settings load for natural gas G20 / G25			
R 40 EVO		60	70-80
CO ₂ , max	%	8.5 ⁺⁰ _{-0.2}	8.4 ⁺⁰ _{-0.2}
CO ₂ , min	%	9.0 ⁺⁰ _{-0.2}	9.0 ⁺⁰ _{-0.2}

Combustion settings load for natural gas G20 / G25			
R 40 EVO		100-120	140
CO ₂ , max	%	8.4 ⁺⁰ _{-0.2}	8.2 ⁺⁰ _{-0.2}
CO ₂ , min	%	8.5 ⁺⁰ _{-0.2}	8.5 ⁺⁰ _{-0.2}

Commissioning

Check water flow

Check water flow

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

ΔT measurement

Check the temperature difference across the boiler (ΔT flow-return) when the boiler is running on 100% load. The nominal ΔT is 20K and must be at least between 10K and 30 K for secure boiler operation. An indication of the actual flow rate can be found with the following calculation (see table below for nominal data):

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

Δp measurement

Check the pressure difference over the boiler (Δp flow-return) when the boiler pump is running (burner on is not required).

The nominal Δp for each boiler type can be found in the table below, actual Δp 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):

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

Water flow data		R 40 EVO					
		60	70	80	100	120	140
Nominal flow rate	[m ³ /h]	2,4	2,8	3,2	4,0	4,8	5,6
ΔT at nominal flow rate	[°C]	20					
Δp at nominal flow rate	[kPa]	15	18	22	7	9	11

Commissioning

Check functionality of safety devices

Gas tightness check

Boiler shut down

Check functionality of safety devices

All safety devices must be checked for correct operation/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.

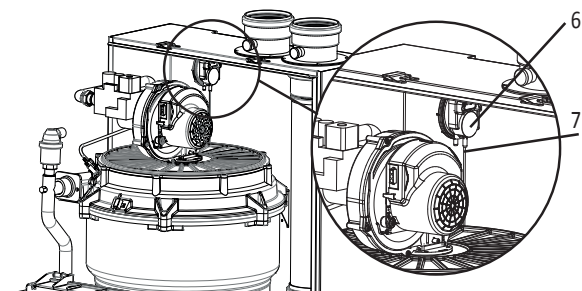
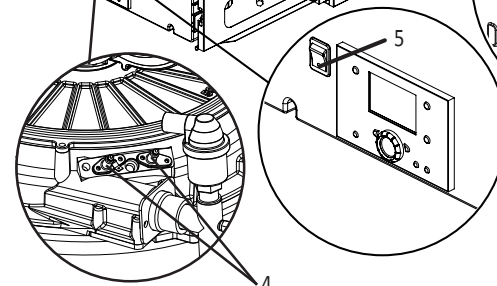
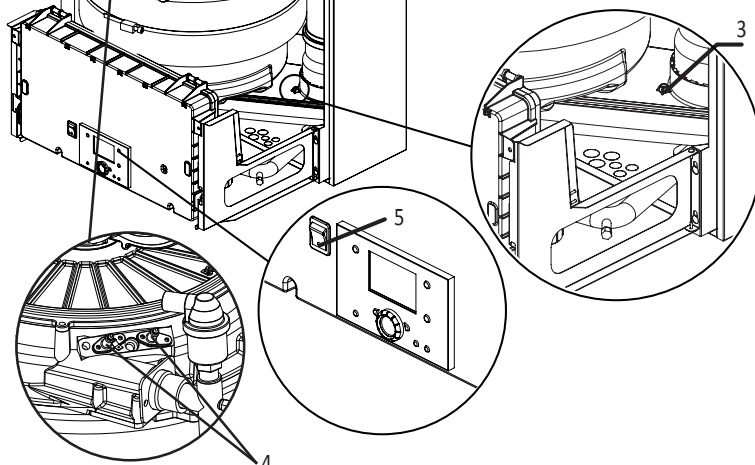
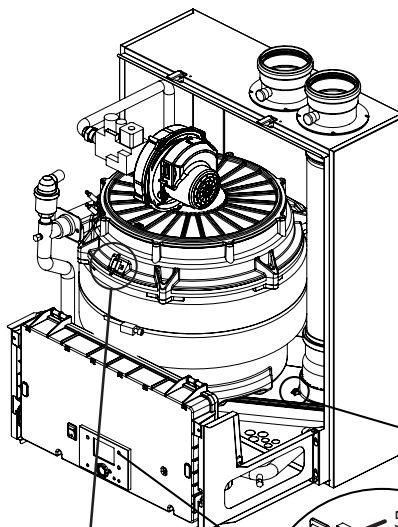
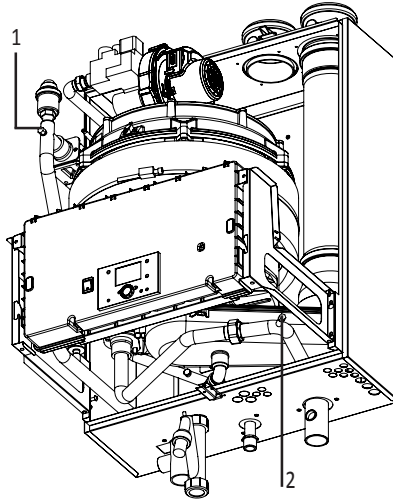
Ionisation electrode (4)

Disconnect the plug 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 plug removed, the restart will result in lockout no. 133.

When the plug is already mounted, the restart will be successful.

Measuring the ionisation current can be done by mounting a multi-meter (set to μA) in between the ionisation electrode and its plug.

The ionisation current should always be above $1.15 \mu\text{A}$ (60-70-80-120 models) $4,2 \mu\text{A}$ (100-140 models), 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 (⏻);
- 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.

Air pressure switch check (6)

(Only for models 60-70-80)

Disconnect the hose (7) from the fan and make sure that the boiler shuts down.

Commissioning

Commissioning protocol

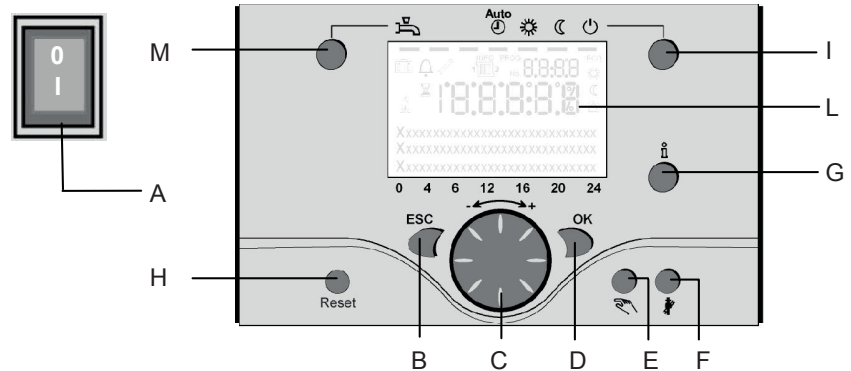
Commissioning Protocol R 40 EVO				
Project				
Boiler type	Project			
Serial number	Address			
Year	City			
Nominal load (Hi) [kW]	Date			
Nominal output (Hi) [kW]	Engineer			
System				
Water pressure	[bar]	Installation:	Roof top	<input type="checkbox"/>
Water pH	[-]		Ground floor	<input type="checkbox"/>
Water hardness	[°dH]		Basement	<input type="checkbox"/>
Water chloride	[mg/l]		Other:	<input type="checkbox"/>
Water ΔT full load	[°C]	Hydraulics:	Low velocity header	<input type="checkbox"/>
Water Δpboiler	[kPa]		Plated heat exchanger	<input type="checkbox"/>
Pump setting	[-]		Other:	<input type="checkbox"/>
Safety devices				
Wasserdruck	[bar]	Flow temp. sensor	<input type="checkbox"/>	
Temp. limiter setting	[°C]	Return temp. sensor	<input type="checkbox"/>	
Min. gas pressure switch setting	[mbar]	Fluegas temp. sensor	<input type="checkbox"/>	
Ignition time burner	[sec]	Air pressure switch	<input type="checkbox"/>	
Combustion analysis				
		100% load	50% load	Min. load
Gas consumption		[m3/h]	[m3/h]	[m3/h]
Gas pressure		[mbar]	[mbar]	[mbar]
CO ₂		[%]	[%]	[%]
O ₂		[%]	[%]	[%]
CO		[ppm]	[ppm]	[ppm]
NOx		[ppm]	[ppm]	[ppm]
T atmospheric		[°C]	[°C]	[°C]
T fluegas		[°C]	[°C]	[°C]
T water, flow		[°C]	[°C]	[°C]
T water, return		[°C]	[°C]	[°C]
Ionisation current		[μA]	[μA]	[μA]
p _{fan}		[mbar]	[mbar]	[mbar]
Remarks				

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.

Controller Stop mode

For setting the controller stop mode and insert setpoint press (⏻) > 3 sec. Press (⏻) >3 sec. again for setting combustion parameters

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 adjustable (60°C factory setting) (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)

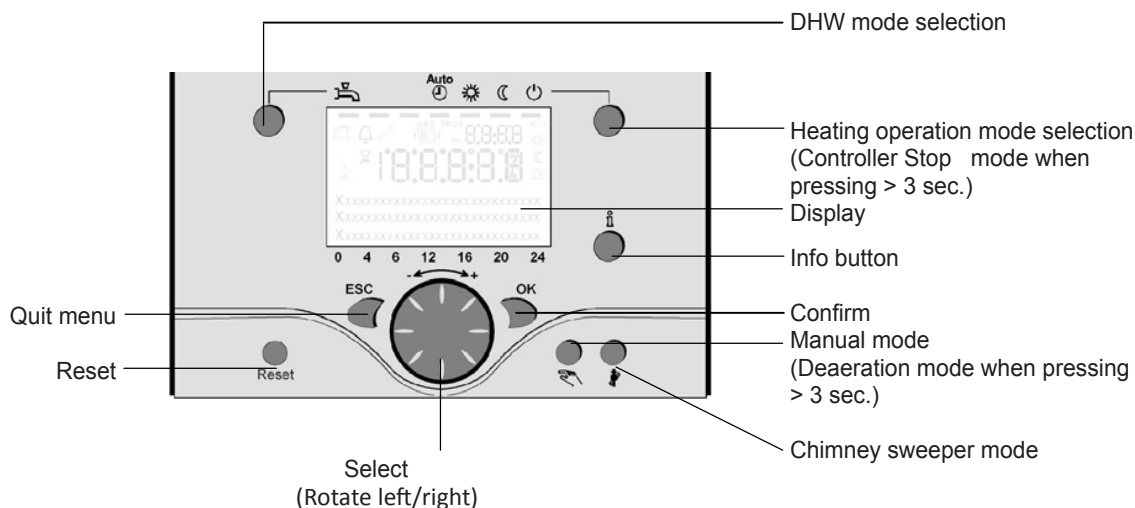
Used for combustion analysis. By pressing the button once again, or automatically after 15 minutes, the chimney sweeper mode will be deactivated (indicated by spanner symbol).

Reset button (H)

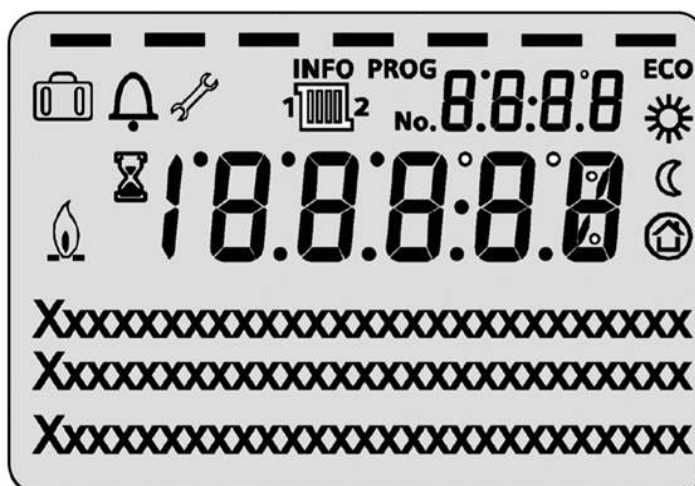
By shortly pressing the reset button a burner lockout can be cancelled.

Operating instructions

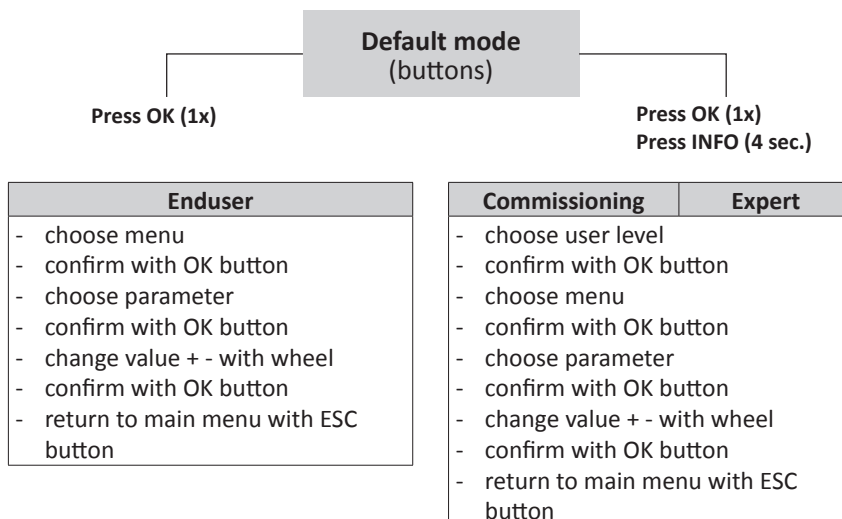
Display / Programming



	Heating to comfort setpoint Info level activated
	Heating to reduced setpoint Programming activated
	Heating for frost protection setpoint Heating temporarily switched off
	Process running – please wait ECO function active
	Burner operating (only oil / gas boiler)
	Error messages
INFO	Info level activated
PROG	Programming activated Heating temporarily switched off
ECO	ECO function active
	Holiday function active
	Reference to heating circuit
	Maintenance / special operation
No.	Parameter number



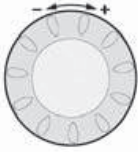

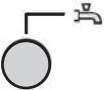
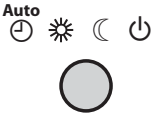



Programming











Operating instructions


Overview of main functions


Button	Action	Procedure	Display / Function
	Set room temperature	Zone 1 and zone 2 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 Comfort setpoint saved Comfort setpoint cancelled - after 3 sec. Main menu appears
	Set room temperature for zone 1 or zone 2	Zone 2 independent from zone 1 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 Comfort setpoint saved Comfort setpoint cancelled - after 3 sec. Main menu appears
	Switch on /off DHW operation	Press button	DHW mode on / off (see indication below DHW symbol) - On: DHW mode by time programm - Off: no DHW operation - Safety functions activated
	Change heating operation mode	Factory setting	Automatic mode on, 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)
		Press button 1x	Continuous COMFORT heating on, with: - Heating without time programm by comfort setpoint - Safety functions activated
		Press button 1x again	Continuous REDUCED heating on, with: - Heating without time programm by reduced setpoint - Safety functions activated - Summer/Winter automatic switching activated - ECO-functions activated
	Press button 1x again	Safety mode on, with: - Heating off - Temperature by frost protection - Safety functions activated	
Controller Stop mode	Press button > 3 sec. Press button > 3 sec. again	304: Controller Stopp mode insert setpoint after 3 sec. Main menu appears	
	Info display	Press button 1x Press button 1x again Press button 1x again	INFO Segment displayed - Status Boiler - Status DHW - Status zone 1 - Status zone 2 - Time / Date - Error indication - Maintenance indication - room temperature - room temperature minimum - room temperature maximum - outside temperature - outside temp. minimum - outside temp. maximum - DHW temperature 1 - Boiler temperature - Flow temperature
			(Info display depends on configuration) Back to main menu; INFO Segment disappears

Operating instructions

Overview of main functions

	Operation by manual setpoint Change factory setting boiler temperature	Press button 1x Press button  Press button  Turn wheel -/+ Press button  Press button  Press button 	Manual mode on (spanner symbol appears) - Heating by fixed setpoint (factory setting = 60 °C) 301: Manual mode insert setpoint? blinking temperature set value Status boiler Manual mode off (spanner symbol disappears)
	Deaeration	Press button > 3 sec. Press button > 3 sec. again	312: Deaeration on 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
RESET	Reset button	Press button (< 3 sec.) Press button again > 3 sec.	Boiler manually blocked, no release Boiler released, Alarm symbol disappears

 **DOK** = confirmation

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

Maintenance

Checklist Replacing the electrodes

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

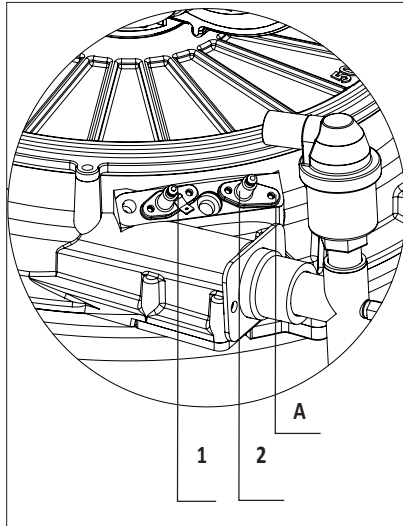
In order to ensure continued good and safe operation of the boiler, it should be inspected at least once per year.

A maintenance protocol should be filled out (see end of this chapter for example of maintenance protocol).

Checklist

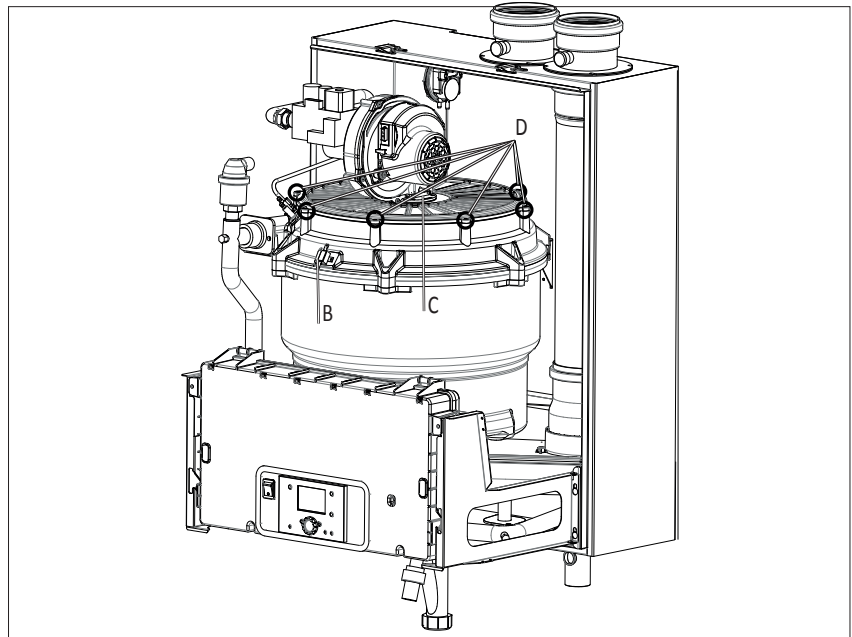
The following activities must be carried out, see following paragraphs for an extensive description of the main activities:

- Replace the ignition and ionisation electrodes;
- Clean the condensate receptacle;
- Clean and refill the syphon;
- Inspect the combustion chamber, clean if necessary (DO NOT 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;
- Make sure that the pipes are free of moisture.
- Check the functionality of all safety devices;
- Fill out a maintenance checklist.



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 in the diagram.



Torque values

Check the tightening torque of nuts and screws, in particular for the parts listed in the tab

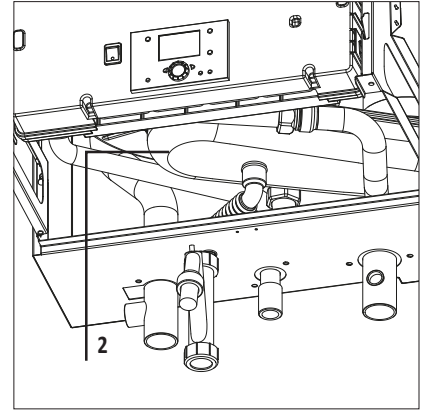
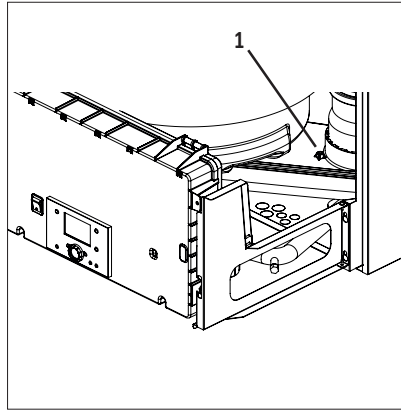
TORQUE VALUES			
SYMBOL	PART DESCRIPTION	VALUE	UM
A -B	Nuts on electrode and thermostat	3	Nm
C	Nuts on burner fan (60-70-80-100 kW)	6	Nm
C	Screws on burner fan (120-140 kW)	25	Nm
D	Cover nuts	10	Nm

Maintenance

Cleaning the condensate receptacle Cleaning and refilling the syphon Inspection of combustion chamber

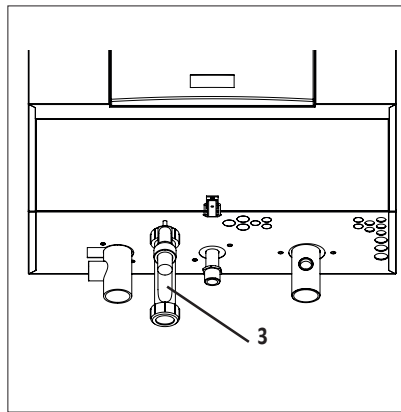
Cleaning the condensate receptacle

- 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

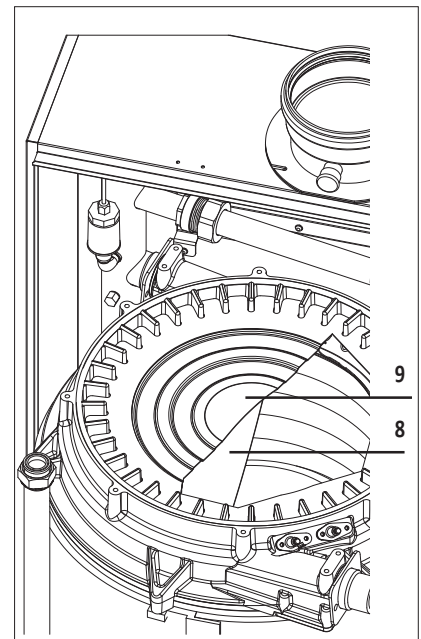
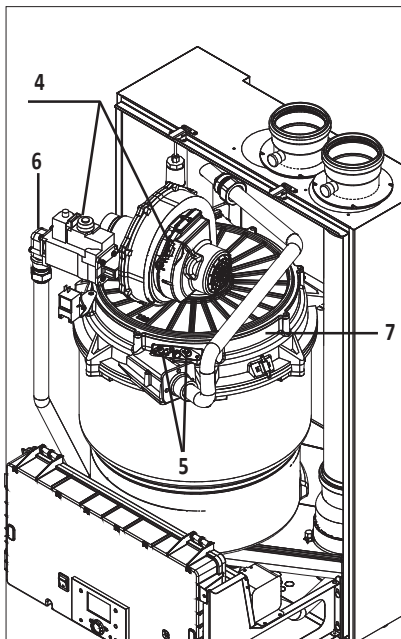
- Remove the syphon (3) from the condensate connection;
- Clean and fill it with fresh water;
- Mount the syphon back in the original position.



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 (8), deflector plate and deflector (9) from the combustion chamber;
- Inspect the combustion chamber and clean it with a vacuum cleaner if necessary;
- Assemble all components in opposite order;
- Open the gas supply and check all connections for gas leakage;
- Switch on the boiler.



Maintenance

Physical and chemical check

Check physical and chemical water

After some weeks of operation, check the main physical and chemical parameters of water:

pH:	7,0 - 9,5
Hardness:	< 10 °fH
Electrical Conductivity	<150 µS/cm
Chlorides:	<50 mg/l
Sulphides	<50 mg/l
Nitrides	<50 mg/l
Iron	<0.5 mg/l

If the values are higher, it must be used a suitable water treatment system.

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 Checklist

Maintenance checklist R 40 EVO				
Project				
Boiler type	Project			
Serial number	Address			
Year	City			
Nominal load (Hi) [kW]	Date			
Nominal output (Hi) [kW]	Engineer			
System				
Water pressure	[bar]			
Water pH	[-]			
Water hardness	[°dH]			
Water chloride	[mg/l]			
Water ΔT full load	[°C]			
Water Δpboiler	[kPa]			
Pump setting	[-]			
Safety devices				
Wasserdruck	[bar]	Flow temp. sensor	<input type="checkbox"/>	
Temp. limiter setting	[°C]	Return temp. sensor	<input type="checkbox"/>	
Min. gas pressure switch setting	[mbar]	Fluegas temp. sensor	<input type="checkbox"/>	
Ignition time burner	[sec]	Air pressure switch	<input type="checkbox"/>	
Combustion analysis				
	100% load	50% load	Min. load	
Gas consumption	[m3/h]	[m3/h]	[m3/h]	
Gas pressure	[mbar]	[mbar]	[mbar]	
CO ₂	[%]	[%]	[%]	
O ₂	[%]	[%]	[%]	
CO	[ppm]	[ppm]	[ppm]	
NOx	[ppm]	[ppm]	[ppm]	
T atmospheric	[°C]	[°C]	[°C]	
T fluegas	[°C]	[°C]	[°C]	
T water, flow	[°C]	[°C]	[°C]	
T water, return	[°C]	[°C]	[°C]	
Ionisation current	[μA]	[μA]	[μA]	
ρfan	[mbar]	[mbar]	[mbar]	
Remarks				

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.

ERR. CODE	DESCRIPTION OF ERROR	CAUSE
10	Outside sensor fault	Outside sensor fault (B9) (room model, plant frost protection, sensor value not plausible)
20	Boiler temperature 1 sensor fault	Short-circuit boiler flow sensor (B2)
		Open-circuit boiler flow sensor (B2)
26	Common flow temperature sensor fault	Common flow temperature sensor fault (B10) (sensor missing, double configured, configured on slave, ...)
28	Flue gas temperature sensor fault	Open-circuit flue gas sensor
		Short-circuit flue gas sensor
40	Return temperature 1 sensor fault	Short-circuit boiler return sensor (B7)
		Open-circuit boiler return sensor (B7)
50	DHW temperature sensor/thermostat 1 fault	DHW temperature sensor/thermostat 1 fault (B3)
52	DHW temperature sensor/thermostat 2 fault	DHW temperature sensor/thermostat 2 fault (B31)
78	Water pressure sensor fault	water pressure sensor fault (short- or open-circuit)
81	LPB short-circuit or no bus power supply	LPB short-circuit or no bus power supply
82	LPB address collision	LPB address collision
83	BSB-Wire short-circuit or no communication	BSB-Wire short-circuit or no communication
84	BSB-Wire address collision	BSB-Wire address collision
85	BSB radio communication fault	BSB radio communication fault
91	Data loss in EEPROM	Data loss EEPROM
100	Two clock time masters	Two clock time masters
105	Maintenance message	Maintenance message
110	SLT lock-out	SLT-temperature exceeded
		open TL/SLT causes lockout
		Boiler return temperature is higher than/equal to (boiler temperature + Sd_RL_groesser_VL - 2K)
		Delta-T too high
	Boiler temperature rises faster than allowed in TempGradMax	
111	Temp limiter safety shut-down	Temp limiter safety shut-down
119	Water pressure switch has cut out	Thermostat burner door
128	Loss of flame in operation	Repetition error counter exceeded
		Loss of flame in operation
130	Flue gas temperature max. limit exceeded	Flue gas temperature $\geq 90^{\circ}\text{C}$

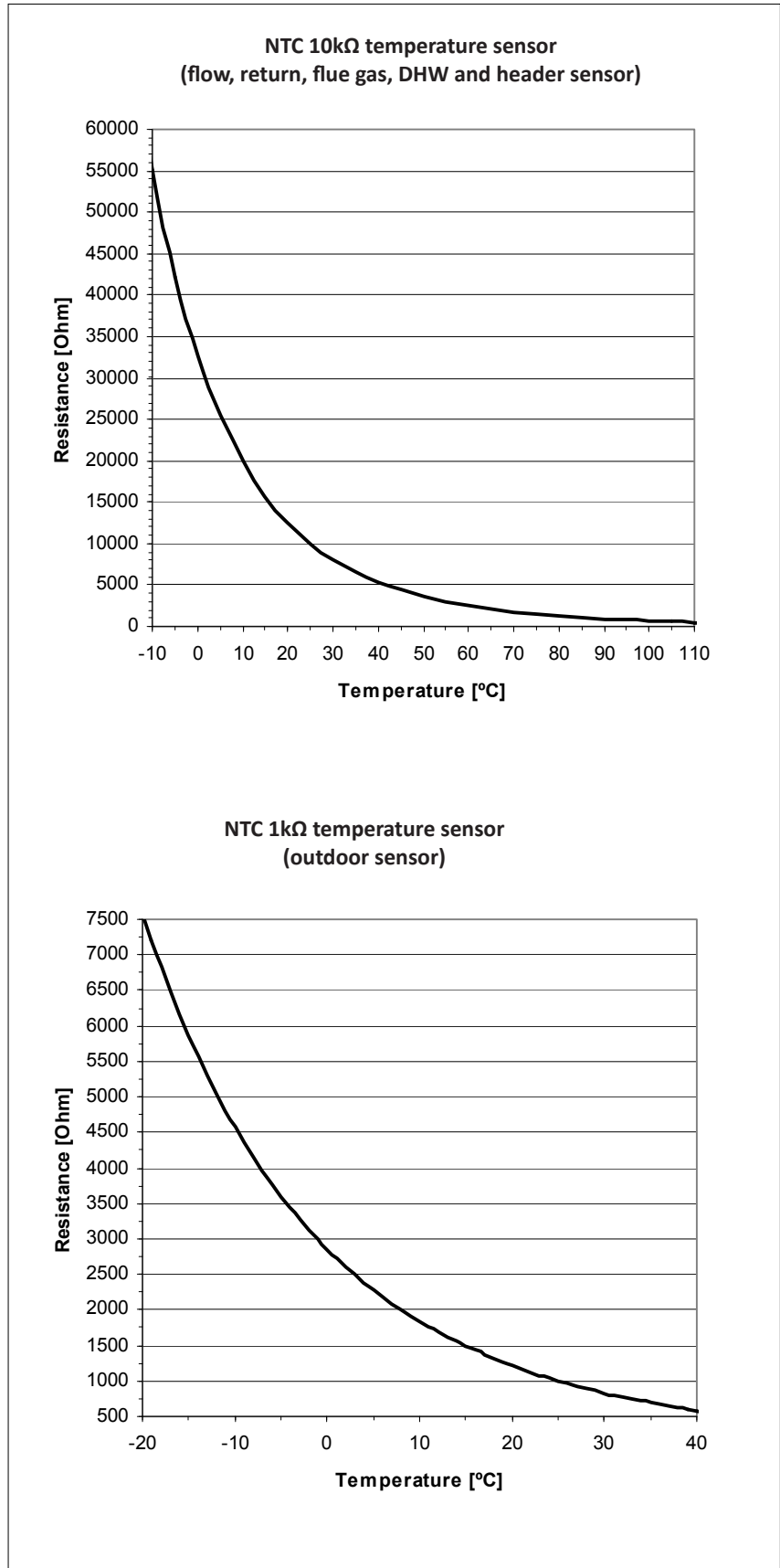
Lockouts

ERR. CODE	DESCRIPTION OF ERROR	CAUSE
132	Gas pressure switch safety shut-down	Interlock, input interrupted
		Gas pressure switch is open
133	Safety time for establishment of flame exceeded	Repetition error counter exceeded
		Safety time for establishment of flame exceeded
151	BMU fault internal	False polarity of the 230V power supply
152	Parameterization error	Reprogram PCB
153	Unit manually locked	Reset button pressed too long
160	Fan speed threshold not reached	Fan speed threshold not reached
162	APS does not close	Air pressure switch does not close
164	Flow/pressure switch HC fault	Flow/pressure switch HC fault
166	Air pressure switch does not open	Air pressure switch does not open
183	Unit in parameterization mode	Unit in parameterization mode (parameter stick)
322	Water pressure 3 too high	Water pressure on input H3 too high
323	Water pressure 3 too low	Water pressure on input H3 too low
324	Same sensor Input BX	Same sensor Input BX
330	Sensor input BX1 no function	Sensor input BX1 no function
331	Sensor input BX2 no function	Sensor input BX2 no function
332	Sensor input BX3 no function	Flue gas sensor not programmed correctly
353	Cascade flow sensor B10 missing	Cascade flow sensor B10 missing
384	Extraneous light	Short circuit ionization electrode
385	Mains undervoltage	Mains undervoltage
386	Fan speed tolerance	Fan speed tolerance exceeded
388	DHW sensor no function	configuration error sensor input B3/B38
426	Check flue gas damper	malfunction of flue gas damper
427	Config flue gas damper	Parameterization flue gas damper
432	Function ground missing	Missing earth connection

Sensor Values

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.



Declaration of conformity

Declaration of Conformity

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

R 40 EVO

Is in conformity with the following standards:

EN 15502-1
EN 15502-2-1
EN 55014-1 / -2
EN 61000-3-2 /-3
EN 60 335-1/ -2

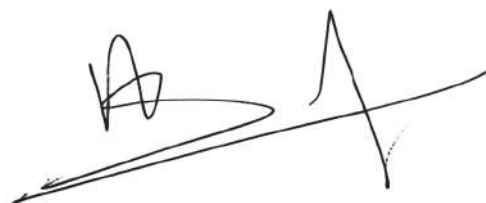
And in accordance with the guidelines of directives:

92 / 42 / EEC (boiler efficiency directive)
2009 / 142 / EEC (gas appliance directive)
2006 / 95 / EEC (low voltage directive)
2004 / 108 / EEC (EMC directive)
2014 / 68 / EU PED directive, art. 4-3
2009 / 125/ CE Energy related Products
811-813 / 2013 EU regulation

This product is designated with CE number:

CE - 0063CM3576

Kerkrade, 01-03-2016



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Plant Manager

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