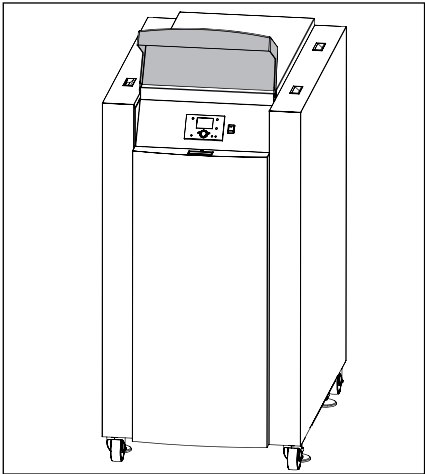


Operation and Installation manual
for authorized technicians only



R600 EVO



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Application Norms and regulations

This documentation contains important information, which is a base for safe and reliable installation, commissioning and operation of the 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.
- **2016 / 426 / EEC** Gas appliance regulation.
- **2009/125/EC** Directive of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products.
- **811-813-814/2013** EU regulation
- **2014 / 30 / EU** The Electromagnetic Compatibility (EMC) Directive.
- **2014 / 35 / EU** Low Voltage Directive.
- **EN 13203-2: 2015** (Gas-fired domestic appliances producing hot water - Part 2: Assessment of energy consumption).
- **EN 15036-1: 2006** Heating boilers - Test regulations for airborne noise emissions from heat generators - Part 1: Airborne noise emissions from heat generators.
- **EN-ISO 3743-1: 2010** Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for small movable sources in reverberant fields - Part 1: Comparison method for a hard-walled test room.
- **EN 15502-1: 2012 +A1:2015** (Gas-fired heating boilers - Part 1: General requirements and tests).
- **EN 15502-2-1: 2012** (Gas-fired central heating boilers - Part 2-1: Specific standard for type C appliances and type B2, B3 and B5 appliances of a nominal heat input not exceeding 1000 kW).
- **EN 60335-1** Household and similar electrical appliances - Safety- Part 1: General requirements.
- **EN 60335-2-102: 2016** Household and similar appliances - Safety - Part 2-102: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections.
- **EN 55014-1: 2006** Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus Part 1: Emission A1:2009, A2:2011.
- **EN 55014-2: 2015** Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus Part 2: Immunity - Product family standard.
- **EN 61000-3-2: 2014** Electromagnetic compatibility (EMC) Part 3-2: Limits — Limits for harmonic current emissions equipment input current ≤ 16 A per phase.
- **EN 61000-3-3: 2013** Electromagnetic compatibility (EMC) Part 3-3: Limits — 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

Informations for installer and maintenance service



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 bipolar switch to the OFF position.



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



= Danger for health



= Danger for equipment

Information for the User

Inform the user on 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.



This product conforms to Directive WEEE 2012/19/EU.

The symbol of the crossed waste paper basket on the appliance indicates that at the end of its working life the product should be disposed of separately from normal domestic household rubbish, it must be disposed of at a waste disposal centre with dedicated facilities for electric and electronic appliances or returned to the retailer when a new replacement product is purchased. The user is responsible for the disposal of the product at the end of its life at an appropriate waste disposal centre.

The waste disposal centre (which using special treatment and recycling processes effectively dismantles and disposes of the appliance) helps to protect the environment by recycling the material from which the product is made.

For further information about waste disposal systems visit your local waste disposal centre or the retailer from which the product was purchased.

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

General Regulations

Data Plate Operating principle

Symbols used on the data plate

1				2			
3			4	5			
S/N			10				
			6				
			7				
8				MAX	MIN		
9		12	Q(Hi)	14			
			P _{60/80°C}	15			
		13	P _{30/50°C}				
	11	$\eta = 100\%$	$\eta = \text{min.}$				
gas							
mbar							17
gas							
mbar			16				
gas							18
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.

Operating principle

The R600 EVO 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 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 bottom 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.

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:

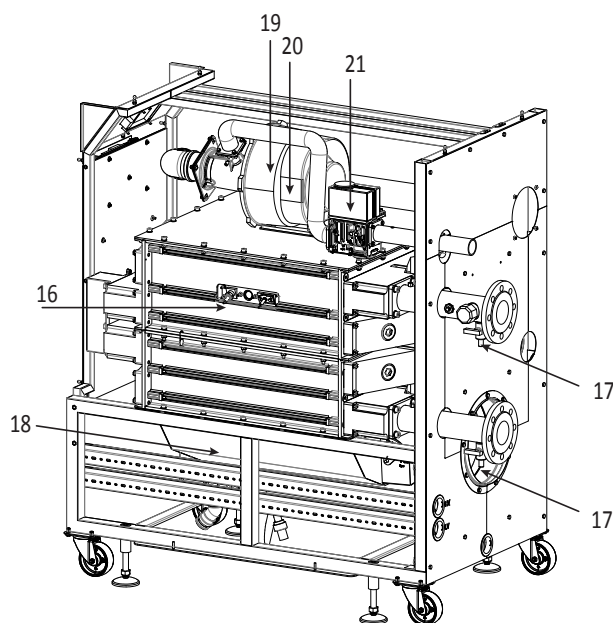
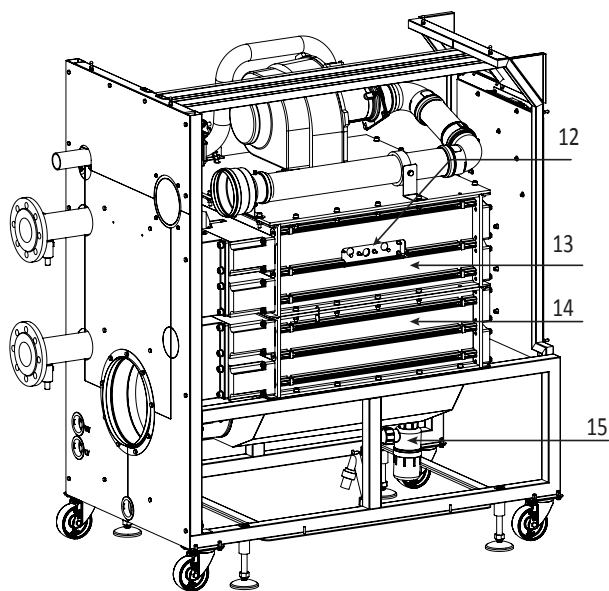
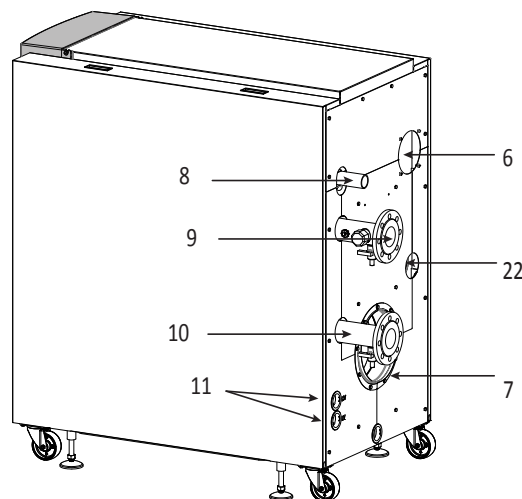
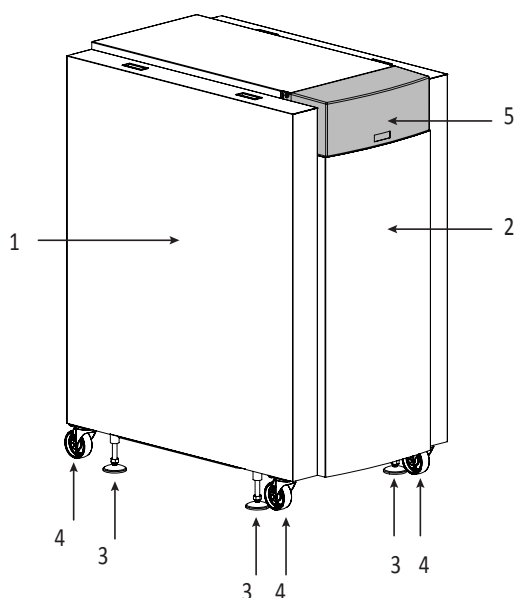
- Boiler control (stand alone operation);
- weather compensated operation (with optional outdoor sensor);
- with 0-10V external influence (temperature or capacity) from a building management system.

Layout of the boiler

Layout of boiler

The R600 EVO boiler consists of the following main components:

1	Side panel	13	Burner/1st heat exchanger assembly
2	Front panel	14	2nd/3rd heat exchanger assembly
3	Adjustable feet	15	Syphon
4	Wheel	16	Ignition and ionisation electrodes
5	Control panel (below cover)	17	Filling/draining valve
6	Air intake connection (under casing)	18	Condens tray
7	Flue gas connection	19	Fan
8	Gas connection	20	Gas/air mixing system
9	Flow water connection	21	Gas valve / Gas pressure switch
10	Return water connection	22	2nd (hot) return water connection (for split system use, accessory)
11	Electrical input entries (HV/LV)		
12	Viewing glass		



Technical data

	Measure unit	R600 EVO		
		R601	R602	R603
Nominal heat output at 80/60°C max/min	kW	142,3/31,3	190,4/42,0	237,6/47,0
Nominal heat output at 40/30°C max/min	kW	151,2/35,4	202,3/47,4	252,3/53,4
Nominal heat input Hi max/min	kW	145,0/32,2	194,0/43,1	242,0/48,4
Efficiency at 80/60°C	%	98,2	98,2	98,2
Efficiency at 40/30°C	%	104,3	104,3	104,2
Annual efficiency (NNG 40/30°C)	%	110,4	110,4	110,4
Max. condensate flow	l/h	9,2	12,4	15,4
Gas consumption G20 max/min (10,9 kWh/m³)	m³/h	13,3/3,0	17,8/4,0	22,2/4,4
Gas consumption G25 max/min (8,34 kWh/m³)	m³/h	17,4/3,9	23,3/5,2	29,0/5,8
Gas consumption G31 max/min (12,8 kWh/kg)	kg/h	11,3/2,5	15,2/3,4	18,9/3,8
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	°C	90		
Flue gas temperature at 80/60°C max/min	°C	75/58	75/58	75/58
Flue gas temperature at 40/30°C max/min	°C	54/30	54/30	55/30
Flue gas quantity max/min H-gas	m³/h	188/43	251/57	313/64
CO ₂ level G20/G25 max/min	%	10,2/9,4 ±0,2 (Restriction type 570 delta max/min ≥0,8%)		
CO ₂ level G31 max/min	%	11,9/10,0 ±0,2		
NO _x 80/60°C max/min	mg/kWh	38/19	38/19	36/18
CO 80/60°C max/min	mg/kWh	14/3	14/3	14/5
Max. permissible flue resistance max/min	Pa	200/10	200/10	200/10
Water volume	l	26	31	33
Water pressure max/min	bar	8/1		
Max. water temperature (High limit thermostat)	°C	100		
Maximum temperature setpoint	°C	90		
Nominal water flow at dT=20K	m³/h	6,1	8,1	10,1
Hydraulic resistance at nominal water flow	kPa	11,2	26,8	31,2
Electrical connection	V	230/400		
Frequency	Hz	50		
Mains connection fuse	A	16		
IP class		IP20		
Power consumption boiler max/min (excl. pump)	W	176/56	267/56	286/69
Power consumption speed controlled pump (opt)	W	190/9	190/9	280/12
Weight (empty)	Kg	290	332	366
Sound Power Level (LWA)	dB	70,3	70,3	70,3
Ionisation current average	µA	10,6/4,4		
pH value condensate	-	3,2		
CE certification code	-	CE - 0063CQ3970		
Water connections	-	R2"	R2"	R2"
Gas connection	-	R1.1/2"	R1.1/2"	R1.1/2"
Flue gas connection (DN)	mm	150	150	200
Air intake connection (for room sealed use) (DN)	mm	130	130	130
Condensate connection	mm	32		

Technical data

	Measure unit	R600 EVO			
		R604	R605	R606	R607
Nominal heat output at 80/60°C max/min	kW	285,7/56,5	381,3/75,2	476,7/94,6	540,2/120,0
Nominal heat output at 40/30°C max/min	kW	303,3/64,2	404,3/85,6	505,2/106,9	572,8/135,1
Nominal heat input Hi max/min	kW	291,0/58,2	388,0/77,6	485,0/97,0	550,0/122,2
Efficiency at 80/60°C	%	98,2	98,3	98,3	98,2
Efficiency at 40/30°C	%	104,2	104,2	104,2	104,2
Annual efficiency (NNG 40/30°C)	%	110,4	110,4	110,4	110,3
Max. condensate flow	l/h	18,5	24,7	30,7	34,8
Gas consumption G20 max/min (10,9 kWh/m³)	m³/h	26,7/5,3	35,6/7,1	44,5/8,9	50,5/11,2
Gas consumption G25 max/min (8,34 kWh/m³)	m³/h	34,9/7,0	46,5/9,3	58,2/11,6	65,9/14,7
Gas consumption G31 max/min (12,8 kWh/kg)	kg/h	22,7/4,5	30,3/6,1	37,9/7,6	43,0/9,5
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	°C	90			
Flue gas temperature at 80/60°C max/min	°C	75/58	75/59	75/59	76/58
Flue gas temperature at 40/30°C max/min	°C	55/30	56/30	56/30	56/30
Flue gas quantity max/min H-gas	m³/h	377/77	502/102	628/128	712/161
CO ₂ level G20/G25 max/min	%	10,2/9,4 ±0,2 (Restriction type 570 delta max/min ≥0,8%)			
CO ₂ level G31 max/min	%	11,9/10,0 ± 0,2			
NO _x 80/60°C max/min	mg/kWh	36/18	34/17	37/18	40/19
CO 80/60°C max/min	mg/kWh	14/5	14/8	16/5	18/1
Max. permissible flue resistance max/min	Pa	160/10	400/10	300/10	484/10
Water volume	l	60	63	71	77
Water pressure max/min	bar	8/1			
Max. water temperature (High limit thermostat)	°C	100			
Maximum temperature setpoint	°C	90			
Nominal water flow at dT=20K	m³/h	12,2	16,3	20,3	23,1
Hydraulic resistance at nominal water flow	kPa	11,9	32,3	34,3	57,1
Electrical connection	V	230/400			
Frequency	Hz	50			
Mains connection fuse	A	16			
IP class		IP20			
Power consumption boiler max/min (excl. pump)	W	230/69	486/69	620/64	676/61
Power consumption speed controlled pump (opt)	W	495/12	530/25	580/25	800/38
Weight (empty)	Kg	434	496	540	595
Sound Power Level (LWA)	dB	70,3	77,3	77,3	77,3
Ionisation current average	µA	10,6/4,4			
pH value condensate	-	3,2			
CE certification code	-	CE - 0063CQ3970			
Water connections	-	DN65PN16			
Gas connection	-	R1.1/2"	R1.1/2"	R2"	R2"
Flue gas connection (DN)	mm	200	250	250	250
Air intake connection (for room sealed use) (DN)	mm	130	130	150	150
Condensate connection	mm	32			

Technical data

Product information E.r.P.

Product information about the directive 2009/125/EG and regulation (EU) 813/2013

R600 EVO	Icon	Unit	R601	R602	R603	R604	R605
Condensing boiler	-	-	Yes	Yes	Yes	Yes	Yes
Low-temperature boiler	-	-	No	No	No	No	No
B1 boiler	-	-	No	No	No	No	No
Cogeneration space heater	-	-	No	No	No	No	No
Combination heater	-	-	No	No	No	No	No

ErP Heating

Rated heat boiler	P _{rated}	kW	140	190	237	286	381
At rated heat output and high-temperature regime	P4	kW	142,3	190,4	237,6	285,7	381,3
At 30% of rated heat output and low-temperature regime 1)	P1	kW	47,5	63,5	79,2	95,2	127,1
Seasonal space heating energy efficiency	η _s	%	93,4	93,5	93,5	93,6	93,6
At rated heat output and high-temperature regime 2)	η ₄	%	88,4	88,4	88,5	88,5	88,5
At 30% of rated heat output and low temperature regime 1)	η ₁	%	98,3	98,3	98,3	98,3	98,3

Auxiliary electricity consumption

At full load	el _{max}	W	176	267	286	230	486
At 30% load	el _{min}	W	56	56	69	69	69
In stand-by mode	P _{sb}	W	7	7	7	7	7

Supplementary heater

Standby heat loss	P _{stby}	W	286	286	310	310	310
Ignition burner power consumption	P _{ign}	W	N/A	N/A	N/A	N/A	N/A
Emissions of nitrogen oxides	NO _x	mg/kWh	25	25	24	24	24

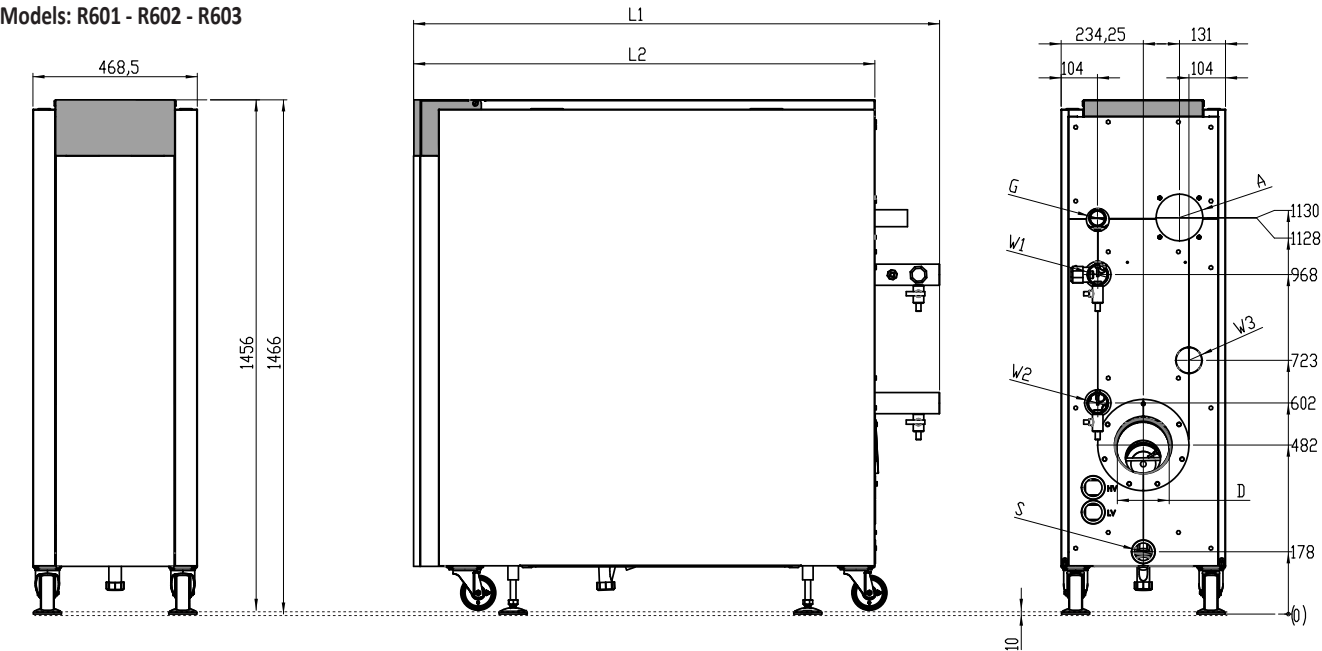
1) by return temperature 30°C

2) by flow temperature and return temperature (80-60°C)

Technical data

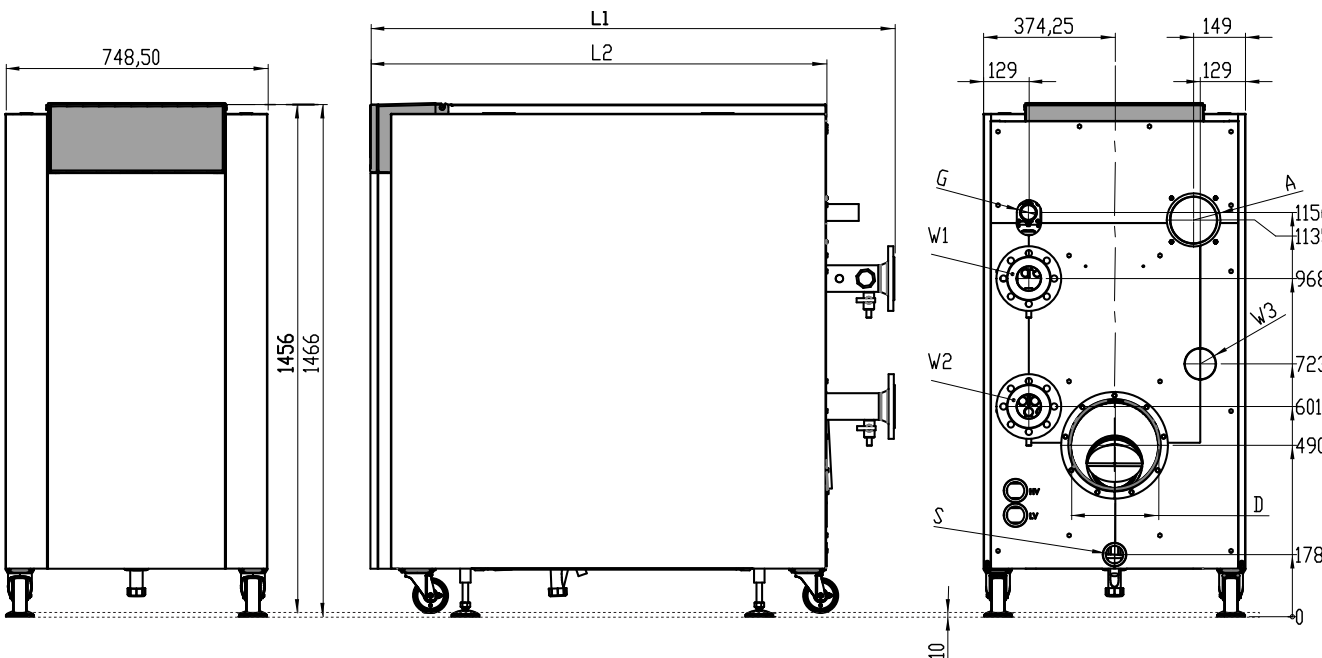
Dimensions

R600 EVO -
Models: R601 - R602 - R603



R600 EVO model	R601	R602	R603	R604	R605	R606	R607
L1 [mm]	1349	1499	1649	1348	1496	1646	1769
L2 [mm]	1165	1315	1465	1152	1302	1452	1602
A [mm]	ø130					ø150	
G	1 ½ "					2 "	
D [mm]	ø150 ± 1	ø150 ± 1	ø200 ± 1	ø200 ± 1	ø250 ± 1		
S [mm]	32						
W1, W2, W3	2 "			DN65 PN16			

R600 EVO -
Models: R604 - R605 - R606 - R607



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	Mounted on pallet and sealed in PE foil
Syphon for condensate connection	1	Inside boiler packaging
Operation and Installation manual	1	Map attached to back panel of the boiler
Conversion kit for I3P and I3B/P incl. instructions	1	Inside boiler packaging

Accessories

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

- Speed controlled pump.
- Safety valve, manometer and deaerator (3 and 6 bar).
- 2x max. water pressure switch and 1 external high limit thermostat.
- Gas filter incl. connection kit.
- Max. gas pressure switch.
- External high limit thermostat.
- Gas valve leakage tester.
- 2nd Return connection for Split System use.
- Bypass (incl. pump).
- Plate heat exchanger (dT=10K/15K or dT=20K).
- Low velocity header, suitable for dT=10K/15K and dT=20K.
- Duo header for connecting 2 boilers in cascade.

Extension module AVS75 for heating zone control or external gas valve and/or room fan control. For each boiler a maximum of 3 AVS75 modules (2x heating zone, 1x ext. gas valve / room fan) can be integrated in the boiler.

- Additional RVS63 heating zone controller, when controlling more than 2 zones.

The above accessories are specially designed for the R600 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.

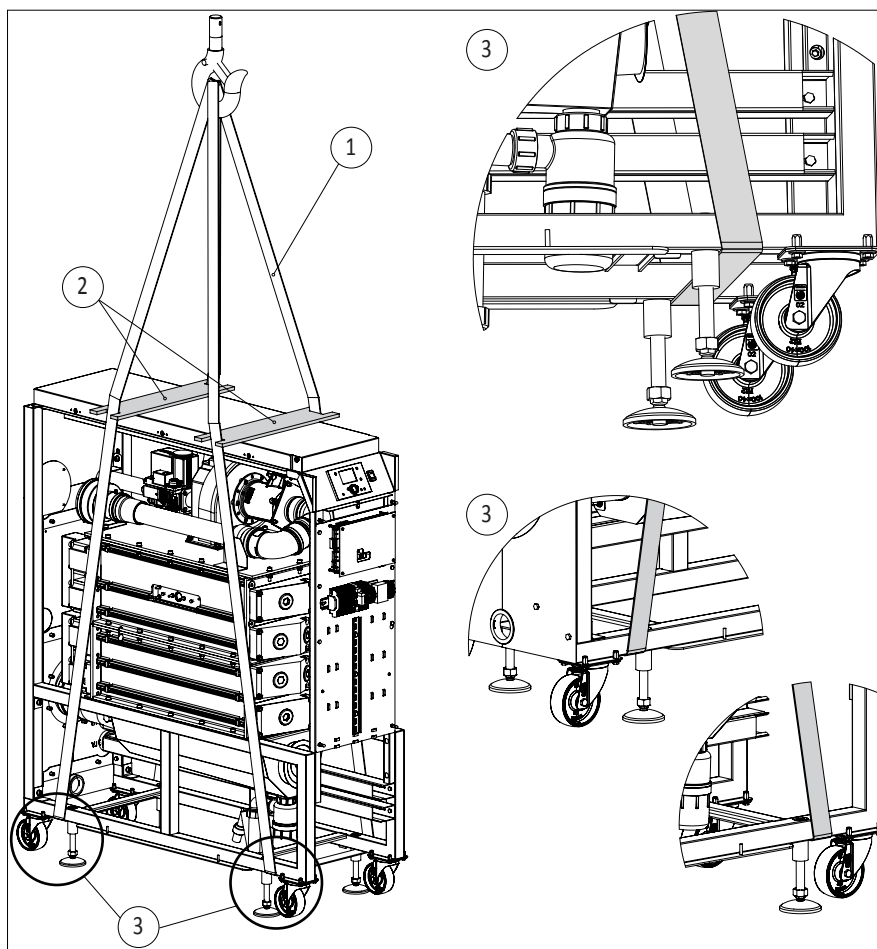
Boiler transport

Boiler transport

The R600 EVO boiler will be supplied as a complete unit being fully assembled and pre-tested. The maximum width is 466 mm for models 150-250 and 746 mm for models 300-570, which makes it possible to transport all models through a normal door in one piece. The boiler can be transported by using the wheels or with a pallet truck, entering only from the side.

Whenever necessary, the boiler can be dismantled into smaller parts for easier transport inside the building. The table below shows the main dismantled parts with their weight and dimensions.

When the boiler has to be transported with a crane, it is necessary to remove the casing before connecting the boiler to the crane. Always connect the crane to the frame of the boiler by using straps.



1. Hoisting belt
2. Wooden retaining beam
3. Hoisting belt position

Component		R601	R602	R603	R604	R605	R606	R607
Burner/1st heat exchanger assembly	Weight [kg]	90	110	120	140	160	190	200
	Length [mm]	735	885	1035	735	885	1035	1185
	Width [mm]	400	400	400	680	680	680	680
	Height [mm]	321	321	321	321	321	321	321
2nd/3rd heat exchanger assembly	Weight [kg]	100	110	120	160	170	200	220
	Length [mm]	735	885	1035	735	885	1035	1185
	Width [mm]	400	400	400	680	680	680	680
	Height [mm]	244	244	244	244	244	244	244
Condens tray	Length [mm]	589	739	889	589	739	889	1039
	Width [mm]	385	385	385	665	665	665	665
	Height [mm]	225	225	225	225	225	225	225
Frame	Length [mm]	990	1140	1350	1100	1320	1470	1620
	Width [mm]	624	624	624	724	724	724	724
	Height [mm]	335	335	335	335	335	335	335

Installation

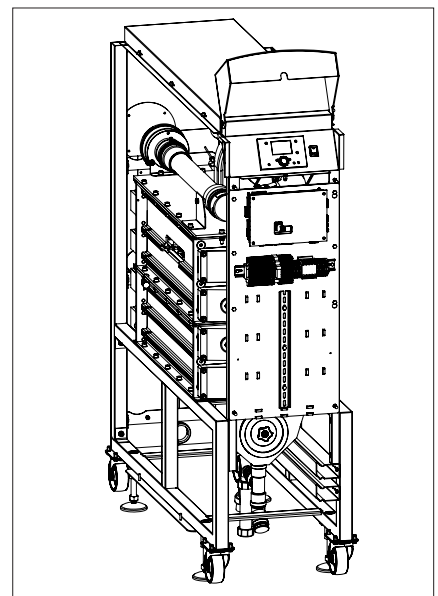
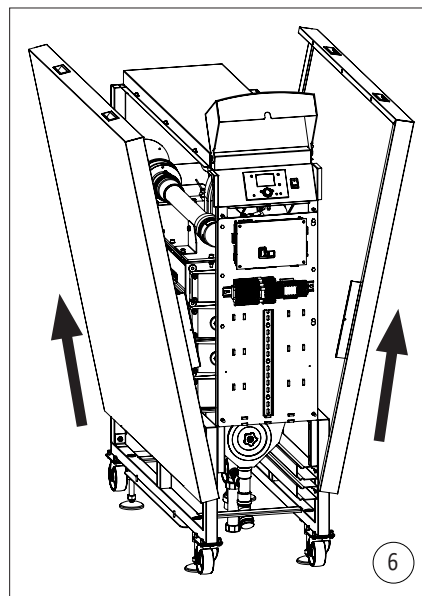
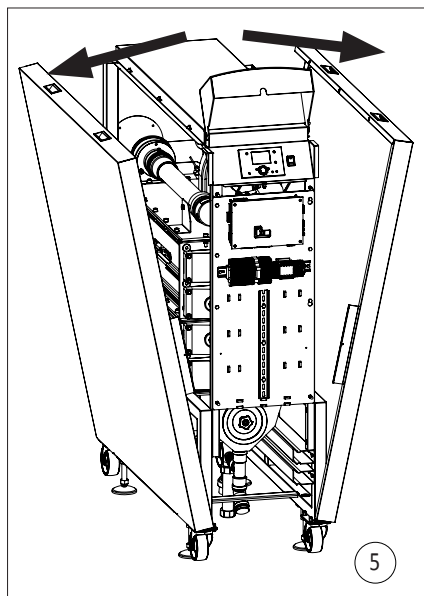
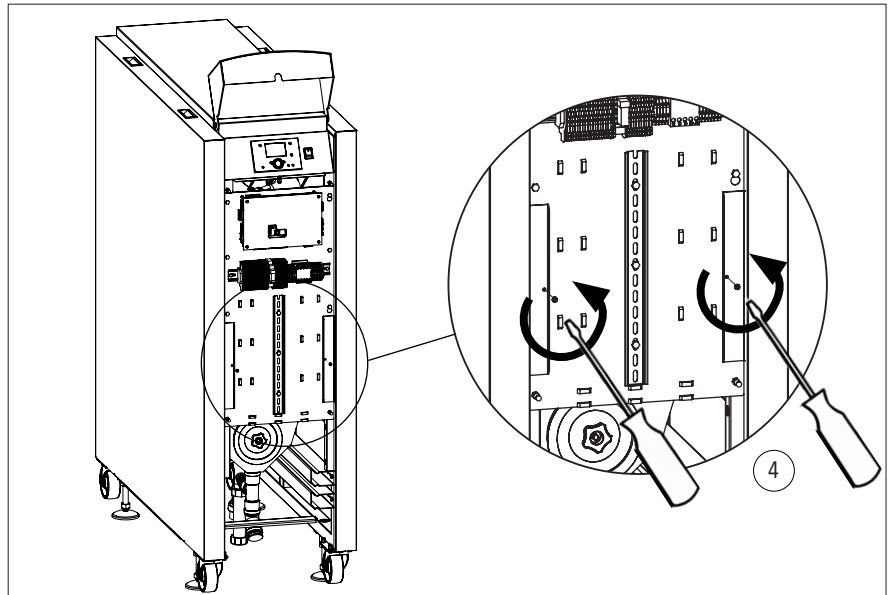
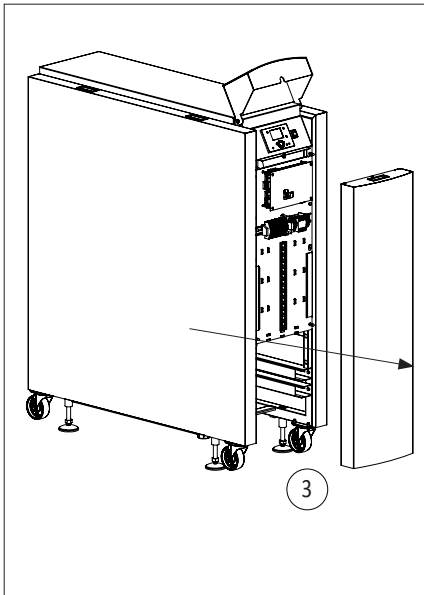
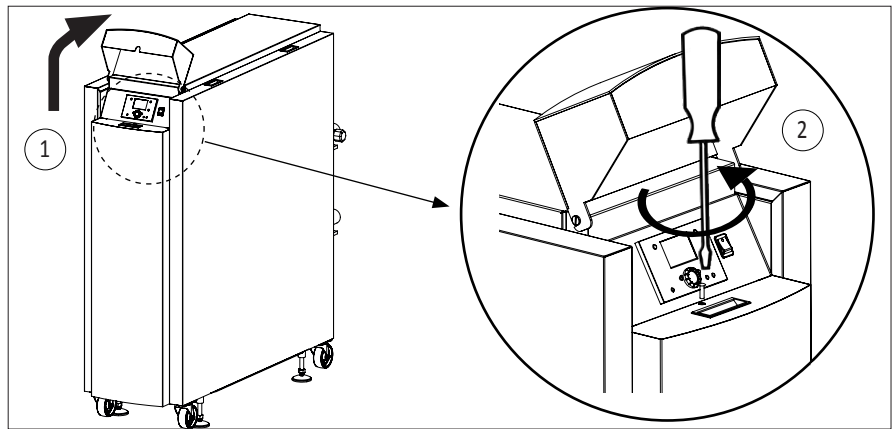
Disassemble the casing

Disassemble the casing

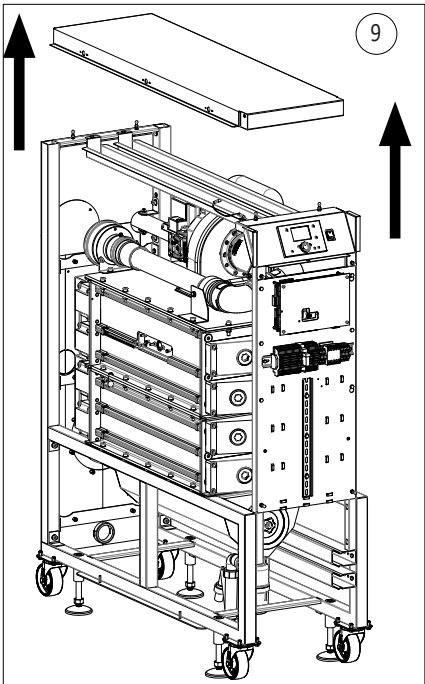
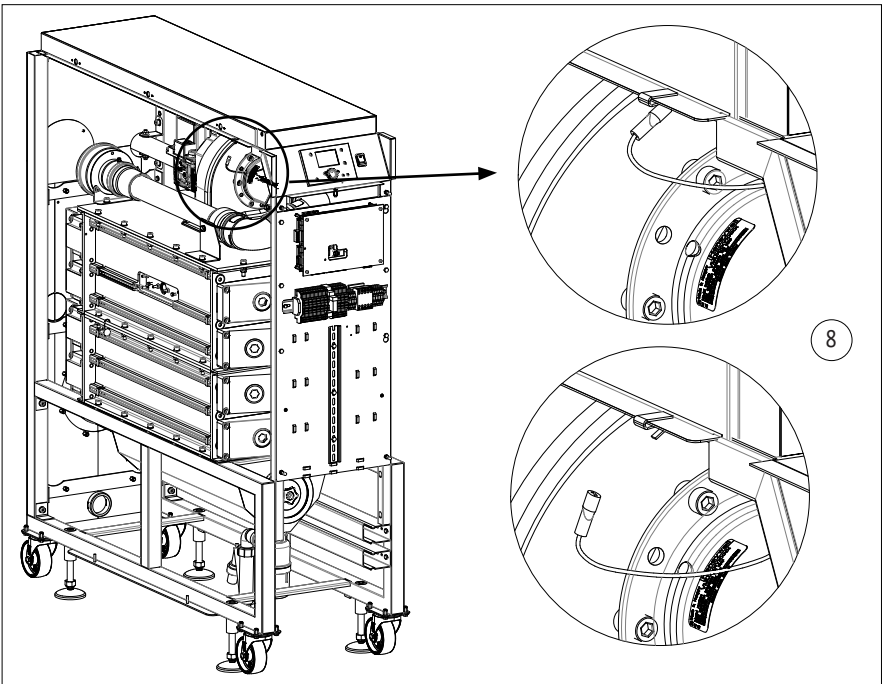
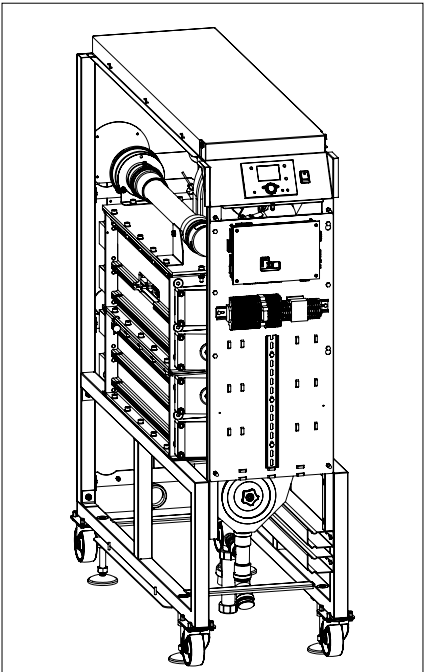
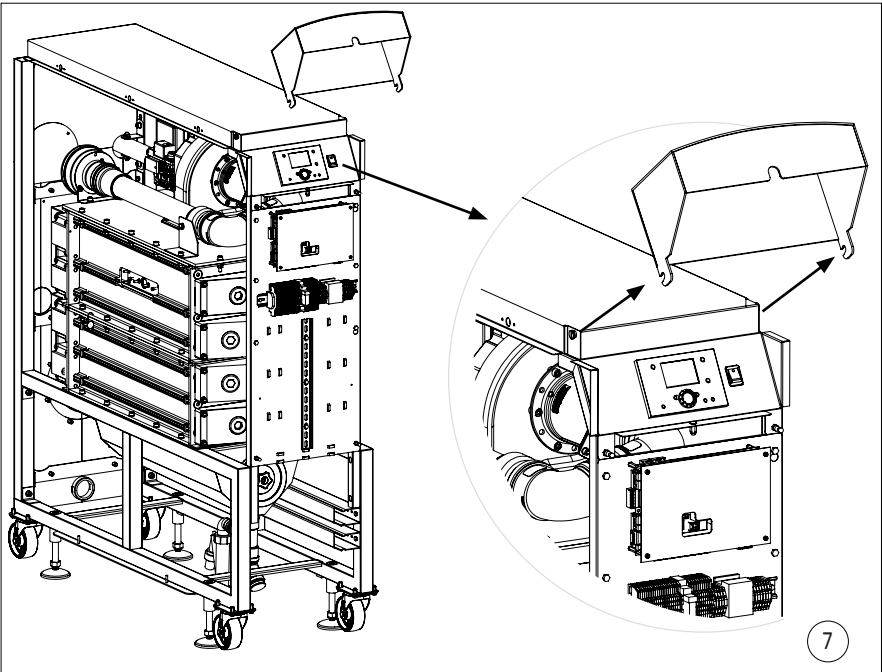
Disassemble the casing before transporting the boiler. Disassembling the casing is done according the following steps.

For re-assembly of the casing the same steps have to be taken but reversed.

Starting with the top casing. Make sure the earth cable and screws are re-assembled as they ensure a safe operating condition!



Disassemble the casing



Warnings before installation

Boiler installation



Installation, first ignition, maintenance and boiler repair, must be performed by qualified persons, according to the national installation provisions and any requirements of the local authorities and public health agencies.

Before installing the appliance

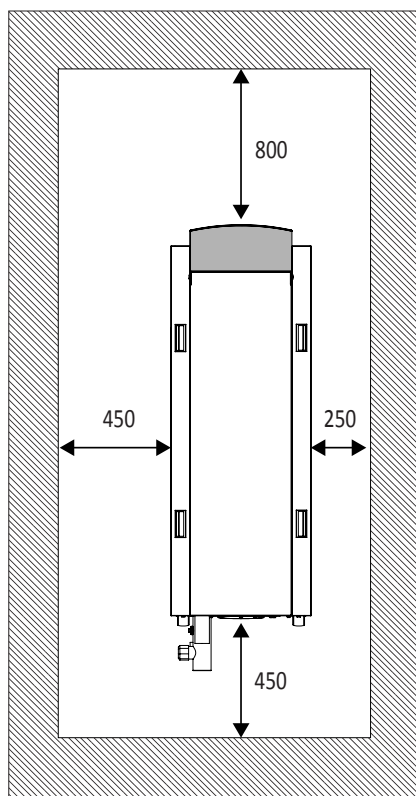
Before connecting the boiler, it is first necessary to perform the following operations:

- Carefully wash the system piping in order to remove any screw thread or welding residues, or any dirt which might prevent the boiler from operating correctly;
- Make sure that the boiler is set up 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 obstacles inside flue exhaust and that it does not contain any discharge from other appliances, unless the flue is meant to serve more than one boiler (in accordance with current legal requirements);

- Where there is already a connection to existing flue exhausts, check that these exhausts have been perfectly cleaned and are without residues, because any disconnection could obstruct the passage of fumes and create potentially dangerous situations;
- In areas with particularly hard water, limescale may build up on the components inside the boiler and reduce its overall efficiency;
- In case of installation near wall sensitive to heat (for example wood) make sure to protect it by suitable insulation.

WARNING!

No flammable items should be left near the boiler. Make sure the installation site and any systems to which the appliance must be connected are fully compliant with the current applicable legislation. Install the boiler respecting the minimum distances from any flammable materials. If dust and/or aggressive vapours are present in the room in which it is to be installed, the appliance must operate independently of the air inside the room.



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.

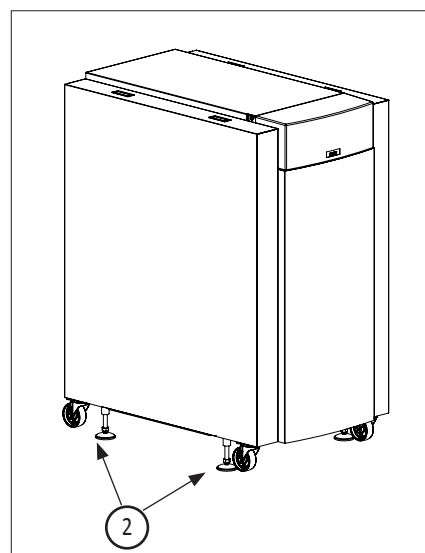
To optimize the position of the boiler in the room it is possible to exchange the position of the electrodes from the right side of the boiler to the left side of the boiler.

This also means that the required space as indicated in the picture will be mirrored.

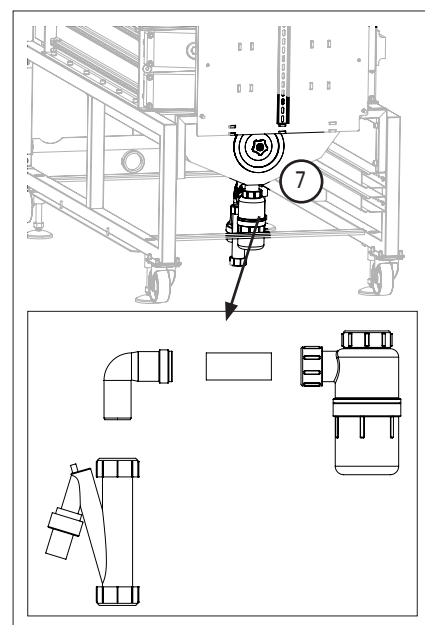
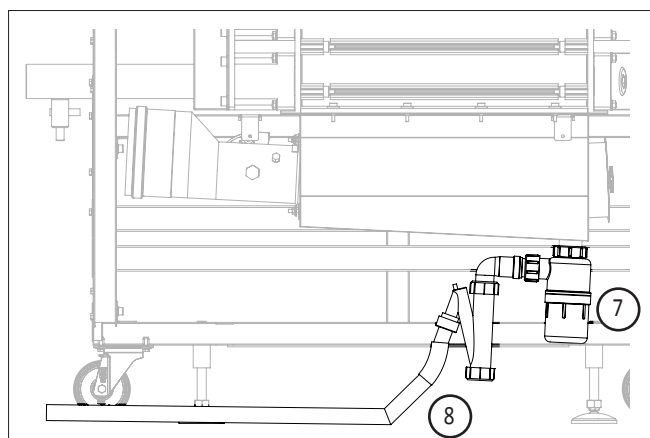
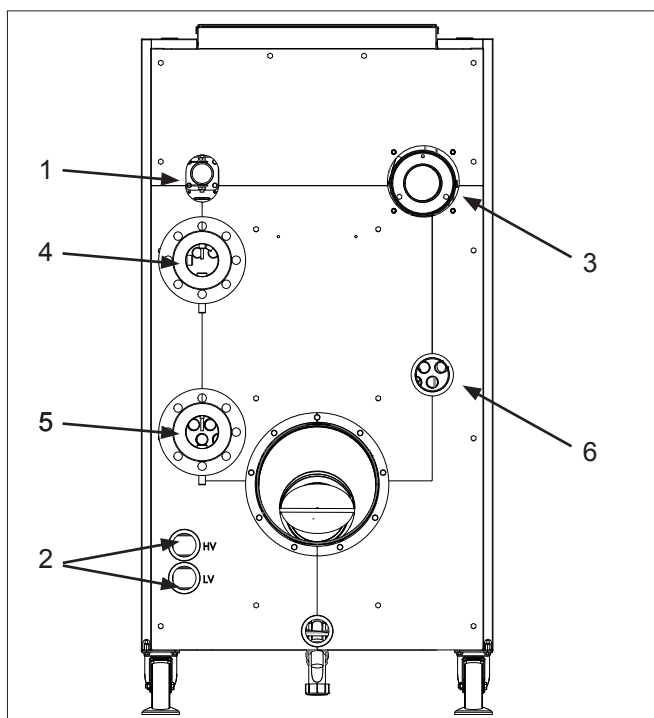
Normal: Left 250mm / Right 450mm
Modified: Left 450mm / Right 250mm
Once the boiler is in the correct position, the adjustable feet (2) (with vibration absorption dampers) should be adjusted to the right height and

the boiler should be horizontal. Ensure that the wheels are not in contact with the floor!

Water and gas connections should be done after adjusting the feet, as they affect the exact height of all connections.



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 (under casing)
- 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

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 (4) and return (5) of the boiler tension free to the system. The (optional) 2nd return kit allows the boiler to be used in a system with two return circuits. The common return becomes the low temperature return, the 2nd return

connection (6) is the high temperature return.

The (optional) accessory kit with safety valve, manometer and deaerator should be mounted on the flow connection (4) of the boiler, before connecting to the system.

The (optional) pump kit should be mounted directly to the return connection (5) of the boiler, before connecting to the system.

Condensate connection

The syphon (included in delivery) should be installed to the connection at the bottom of the condens tray (7).

Lead the pipe over the floor (8) and connect it 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

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 (1) of the boiler. A gas isolating valve should be mounted directly behind the boiler.

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

Air/Flue gas system

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.

The installer is responsible to apply the correct diameter, length and type of flue gas system. If any questions arise during the calculation contact your local manufacturer office for more information.

FLUE GAS DATA

Boiler type	Nominal heat output		Nominal heat input		Flue gas connection	CO ₂ Level		Flue gas temperature		Flue gas quantity		Max permissible flue resistance	
R600 EVO	kW		kW		mm	%		°C		g/s		Pa	
	max	min	max	min		max	min	max	min	max	min	max	min
R601	142.3	31.3	145.0	32.2	150 ± 1	10.2 ± 0.2	9.4 ± 0.2	75 ± 2	60 ± 2	53.7	12.8	200	10
R602	190.4	42.0	194.0	43.1	150 ± 1					71.9	17.1	200	10
R603	237.6	47.0	242.0	48.4	200 ± 1					89.6	19.2	200	10
R604	285.7	56.5	291.0	58.2	200 ± 1					107.8	23.0	160	10
R605	381.3	79.6	388.0	80.5	250 ± 1					143.7	30.7	400	10
R606	476.7	94.6	485.0	97.0	250 ± 1					179.7	38.4	300	10
R607	540.2	120.0	550.0	122.2	250 ± 1					203.7	48.4	480	10

The above table shows the maximum permissible flue resistance were the boiler is still working within specifications. Nominal heat input -5%.

Installation

Air intake connection

The air intake can be connected in case of room sealed installation. The cover (3) must be disassembled in order to connect the air intake piping to the connector inside the boiler.

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).

Flue gas connection

Connect the flue gas system to the flue gas connection (4) 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 issues:

- We recommend to use the flue gas connection diameter as the minimum diameter for the flue system.
- 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 page 22).
- Construct horizontal ways with a minimum angle of 3°.

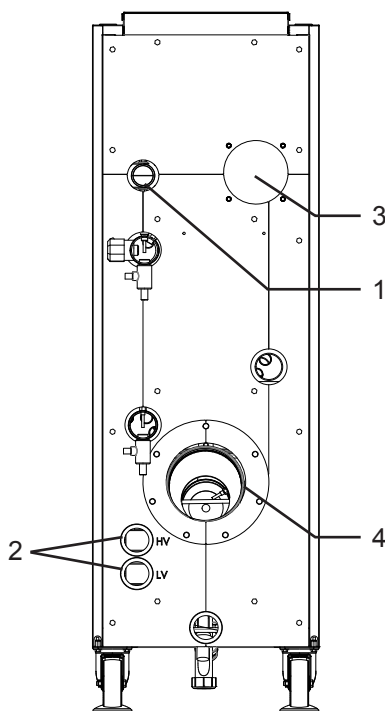
Connecting the flue

The flue gas system must not be in contact with or placed near flammable materials, and must not cross building structures or walls made using flammable material.

This boiler has an integrated high limit thermostat function for the flue gases. When the flue gas temperature exceeds 90 °C, the burner is switched off. With this function, an additional (external) safety device is not necessary.

When replacing an old boiler, the ventilation and flue gas exhaust system must always be replaced.

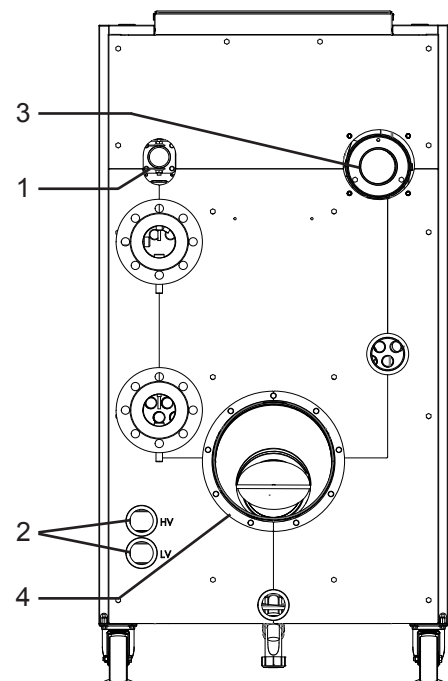
The flue gas system should be created using a male/female coupling and a seal. Couplings should always be arranged so that they go against the direction of the condensate flow.



R600 EVO -
Models: R601 - R602 - R603

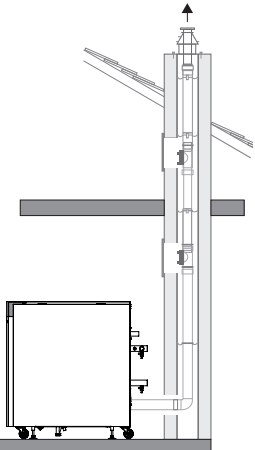
Legend:

1. Gas Connection
2. Electrical connection
3. Air intake connection
4. Flue gas connection



R600 EVO -
Models: R604 - R605 - R606 - R607

Dimensioning single



Calculation base:
Total connection length in boiler room ≤ 1.5 m; 1x 87°-bend
Maximum permissible length (m) of flue gas system

Boiler Type	Ø130	Ø150	Ø200	Ø250	Ø300
R601	50	50	50		
R602	42	50	50		
R603		48	50	50	
R604		25	50	50	
R605			50	50	50
R606			50	50	50
R607			50	50	50

Max length reduction

- 90°/87° bend: -2,5 meters
- 45°/43° bend: -1,5 meters

Dimensioning

The flue gas system has to be designed and calculated to guarantee that the correct materials are used and that the boiler can work correctly.

The following table shows the maximum vertical flue length in combination with 1 bend, maintaining the flue resistance below 200Pa.

The table is only an indication of the possible length. Calculation done with rigid tube and exit without cap ("free" opening).

In order to choose the correct flue material, the maximum flue pressure has to be calculated. Below table shows the different pressure classes and their limits.

	Pressure class	Temperature class	Condensate resistant	Corrosion class	Fire resistant
Flue resistance <200Pa	P1	Min: T120	W	V1, V2 or Vm	E or higher
Flue resistance >200Pa <5000Pa	H1	Min: T120	W	V1, V2 or Vm	E or higher

The used material must comply with the following standards:

EN1856 for metal materials (Stainless steel and aluminum)

EN14471 for plastic materials.

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

The maximum negative flue pressure, which does not affect the burner modulation ratio, is 30Pa. Higher negative pressure will lead to limitation of the burner modulation ratio.

Installation variants for individual boilers

Ambient combustion air			
B23 B23P	Flue gas duct into the chimney, aspiration of air from the surroundings. End section of the waste gas duct above the roof.		
Combustion air taken from the surroundings			
C13	Flue gas duct and suction air over the outer wall, must be in the same square area.		
C33	The flue gas and suction air ducts via the roof terminal, must be in the same square area.		
C43	Suction air and waste gas duct via the chimney system, which is integrated in the building.		
C53	Section the air and waste gas exhaust to the outside, in areas with different pressures. Vertical end section of the waste gas duct.		
C63	Specially developed equipment, for connection to certified air-/waste gas systems that operate separately from one another.		
C83	Air suction on the outside of the building, waste gas duct via the chimney.		

Installation

Electrical connections

Electrical connection

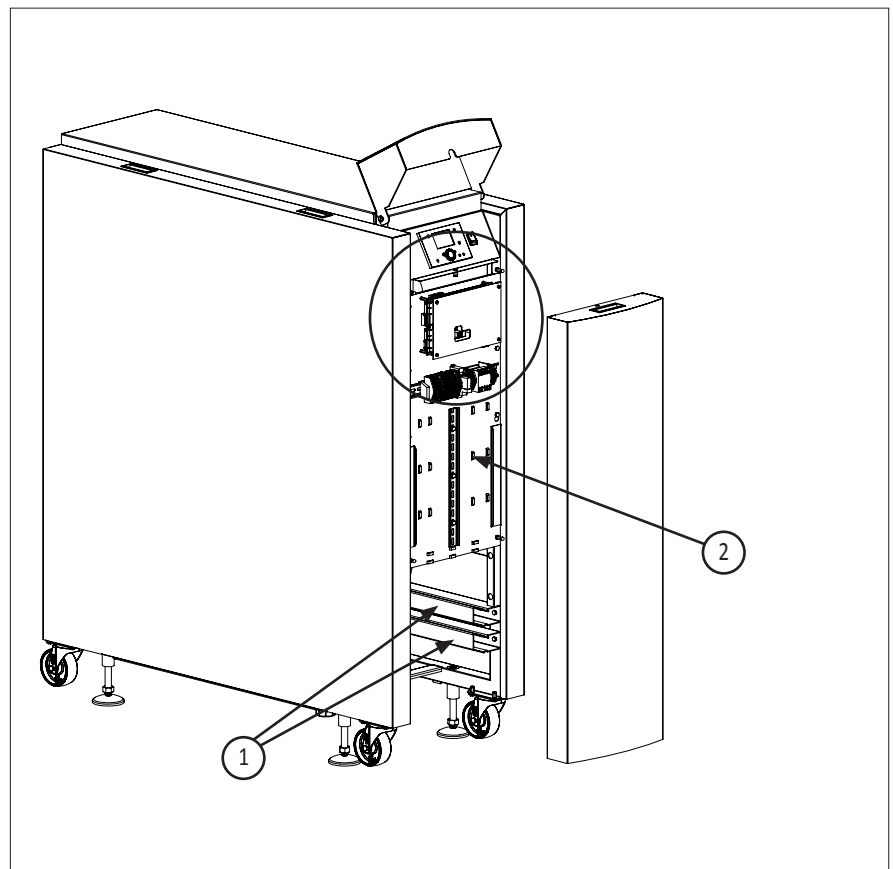
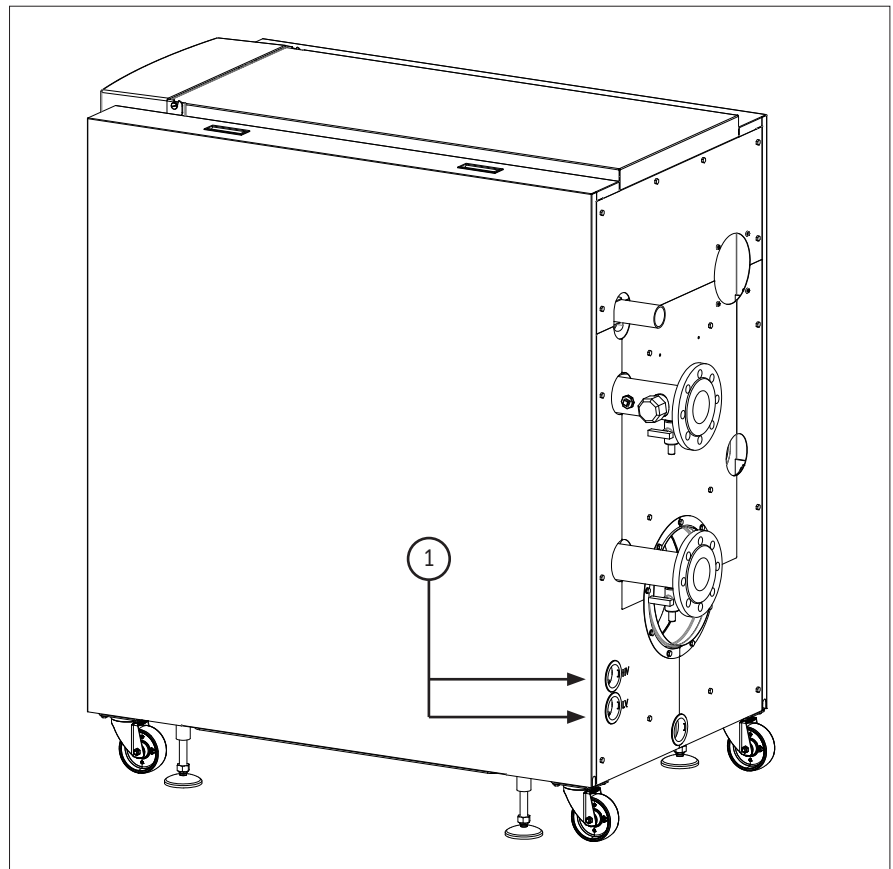
The electrical connection must be made by an authorized installer in accordance with the applicable national and local standards and regulations.

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.

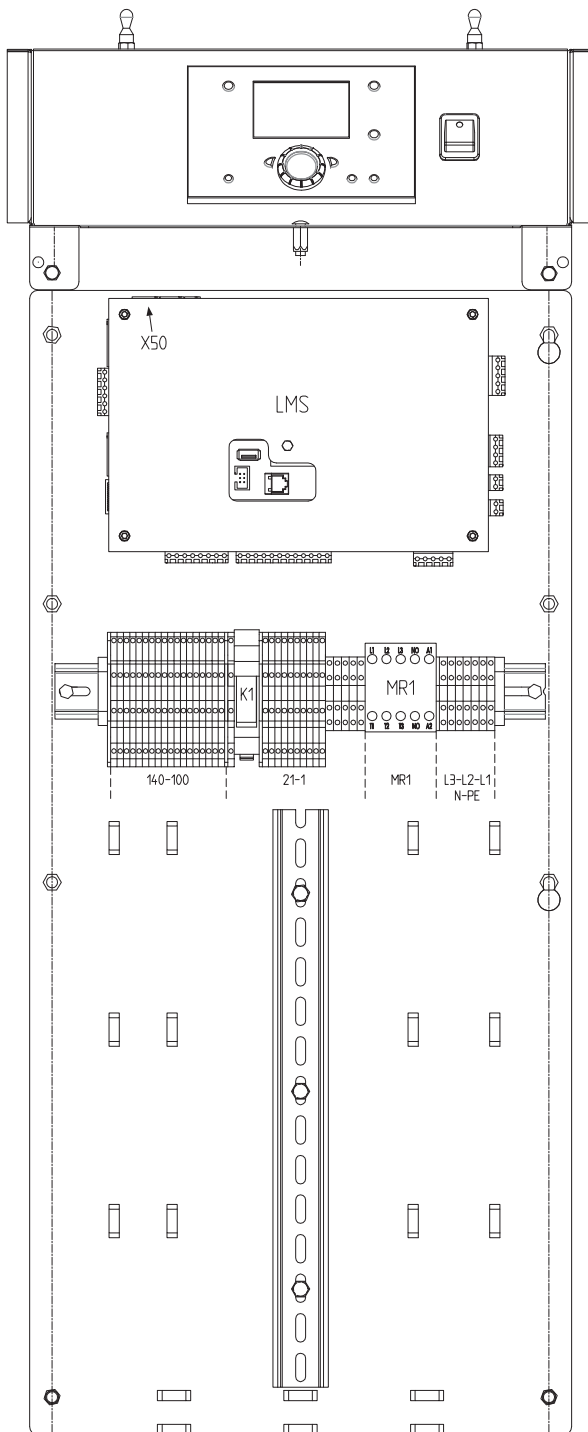
All cables should be lead through the cable gant from the back of the boiler (1) into the electric panel (2). To access to the electric panel, remove the front casing panel as shown on page 17.

Connect all wires to the terminals according to the wiring diagram of the boiler (see next pages).

It is mandatory connecting the boiler to a suitable earth connection

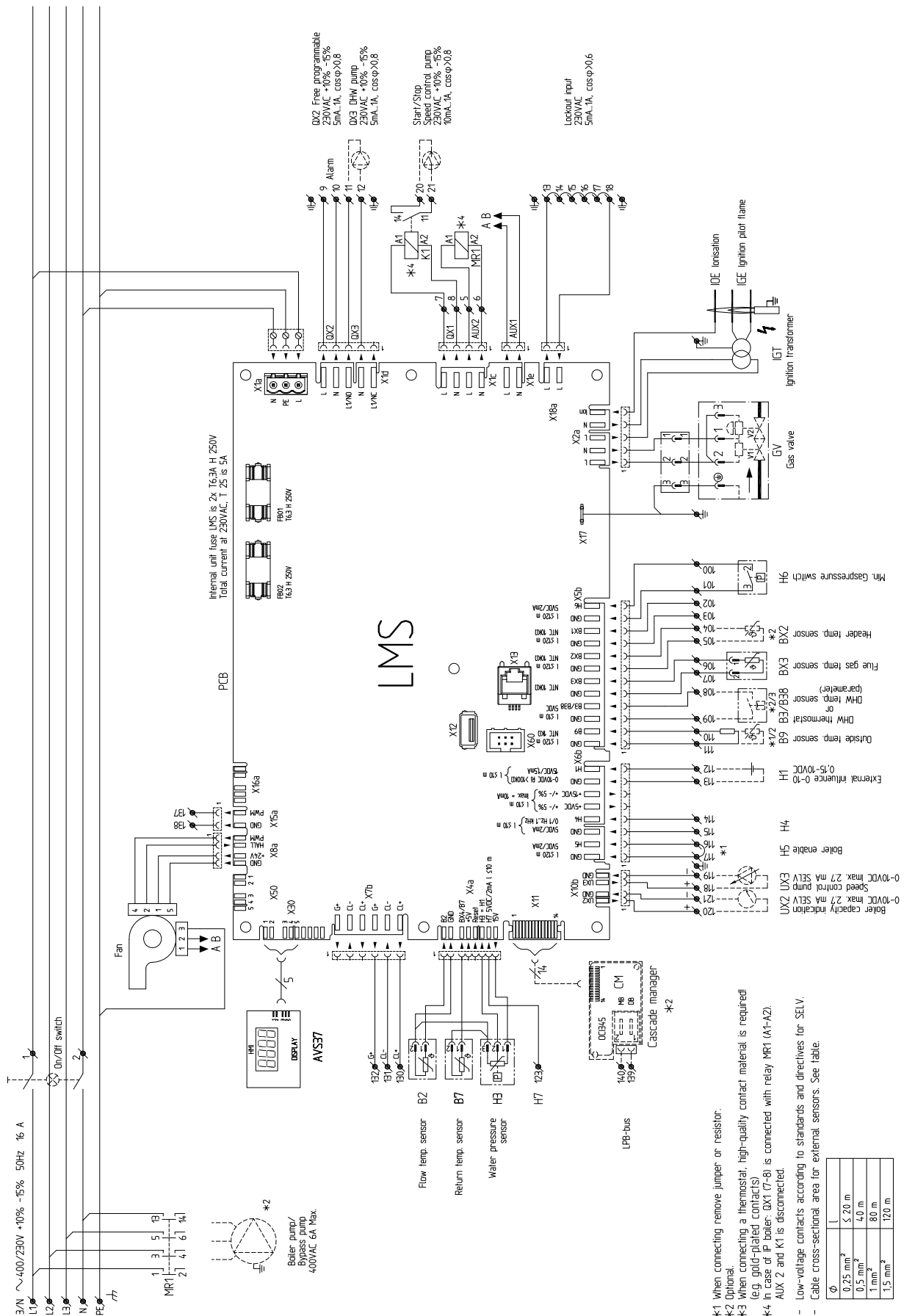


Wiring diagram - Boiler



Electrical connections	
connections	Description
L1 / L2 / L3 / N / PE	Power supply boiler 230VAC +10% -15% 50Hz 16A
9 10 (N)	QX2 Alarm, free programmable 230VAC +10% -15% 5mA...1A, $\cos \phi > 0,8$ $I \leq 120 \text{ m } \phi = 1,5 \text{ mm}^2$
11 12 (N)	QX3 DHW pump 230VAC +10% -15% 5mA...1A, $\cos \phi > 0,8$ $I \leq 120 \text{ m } \phi = 1,5 \text{ mm}^2$
13/14/15/ 16/17/18	Lockout input 230VAC 5mA...1A, $\cos \phi > 0,6$
20 21	Start/Stop Speed control pump 230VAC +10% -15% 10mA...1A, $\cos \phi > 0,8$
102 103 (GND)	BX1, free programmable $I \leq 120 \text{ m } \text{NTC } 10\text{K}\Omega$
104 105 (GND)	BX2 Header temp. Sensor $I \leq 120 \text{ m } \text{NTC } 10\text{K}\Omega$
108 109 (GND)	B3/B38 DHW thermostat/temp. sensor (Parameter) $I \leq 10 \text{ m } 5\text{VDC}$
110 111 (GND)	B9 Outside temp. sensor $I \leq 120 \text{ m } \text{NTC } 1\text{K}\Omega$
112 113 (GND)	H1 External influence $0,15\text{-}10\text{VDC } I \leq 10 \text{ m } R_i > 100\text{K}\Omega$
114 115 (GND)	H4, free programmable
116 117 (GND)	H5 Boiler enable $I \leq 120 \text{ m } 5\text{VDC}/2\text{mA}$
118 119 (GND)	Speed control pump $0\text{-}10\text{VDC } I_{\text{max.}} 2.7 \text{ mA SELV}$
120 121 (GND)	Boiler capacity indication $0\text{-}10\text{VDC } I_{\text{max.}} 2.7 \text{ mA SELV}$
130 (CL+) 131 (CL-) 132 (G+)	QAA75 Room unit
137 138 (GND)	PWM pump
139 (DB) 140 (MB)	LPB-bus
MR1 (Relay) 2 T1 4 T2 6 T3 14 NO	Boiler/bypass pump 400VAC 6A Max.
X50 (LMS)	BSB-EM

Wiring diagram - Boiler



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.

Water quality

(refer to tab. 1 and 2)

The system should be filled with water with a pH value between 7 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 indicated in the Standard VDI 2035.

The table on the right gives an indication of the relation between the water quality and the maximum water filling volume during the lifetime of the boiler.

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.

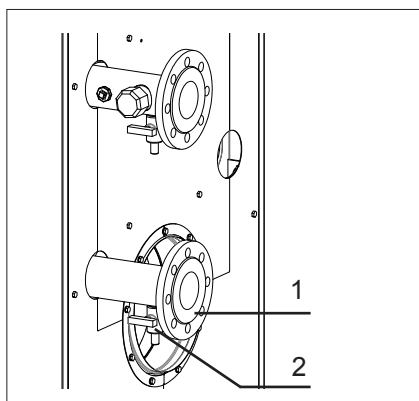
Filling can eventually be done via the (optional) fill and drain valve (2) on the return connection (1) of the boiler.

Tab. 1	Central Heating	
	System water	Filling water
Working temperature	10 - 90°C	10 - 25°C
Minimum operating water pressure	>1.5 bar @ 90°C >(0.5*) 1.5 @ 80°C	-
pH water	8,2 - 10,0	7,0 - 9,5
Water hardness	"Actual table from VDI2035 (see sheet ""CH hardness"")"	"Actual table from VDI2035 (see sheet ""CH hardness"")"
Water electrical conductivity	<100µS/cm	<100µS/cm
Oxygen content	<0,05mg/l	<0,05mg/l
Chlorides content	<50 mg/l	<50 mg/l
Sulphides content	<50 mg/l	<50 mg/l
Nitrides content	<50 mg/l	<50 mg/l
Iron content	<0,2mg/l	<0,2mg/l

* R600 EVO is allowed to run 0,5 bar with maximum dT20K with a special parameter setting. The parameters have to be changed only by an authorised specialist.

TOTAL HEATING OUTPUT [kW]	Tab. 2 Accepted hardness related to specific volume of installation		
	SPECIFIC VOLUME		
	< 20 l/kW	≥ 20 l/kW - < 50 l/kW	≥ 50 l/kW
50kW - ≤ 200kW	≤ 11.2°dH (2.0 mol/m³)	≤ 8.4°dH (1.5 mol/m³)	≤ 5.6°dH (1.0 mol/m³)
200kW - ≤ 600kW	≤ 8.4°dH (1.5 mol/m³)	≤ 5.6°dH (1.0 mol/m³)	≤ 2.8°dH (0.5 mol/m³)
600kW - ≤ 1200kW	≤ 5.6°dH (1.0 mol/m³)	≤ 2.8°dH (0.5 mol/m³)	≤ 0.11°dH (0.02 mol/m³)
> 1200kW	≤ 2.8°dH (0.5 mol/m³)	≤ 0.11°dH (0.02 mol/m³)	≤ 0.11°dH (0.02 mol/m³)

Use water softening in case maximum values are exceeded (mandatory for warranty!)



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.

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.

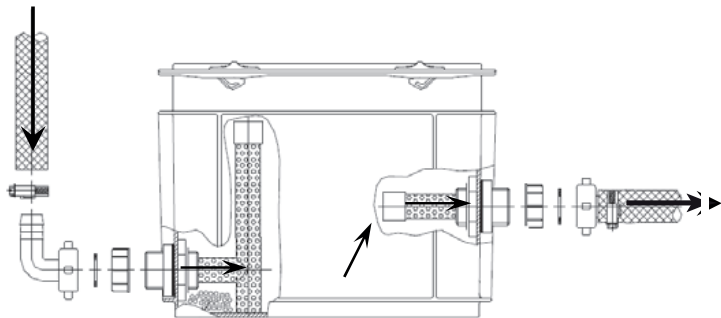
The delivery of the system contains the following components:

- Granulate for first filling;
- Connection hoses for inlet and outlet connection;
- Boiler connection adapter.

For the neutralisation are available two different systems:

Standard neutralisation system (DN)

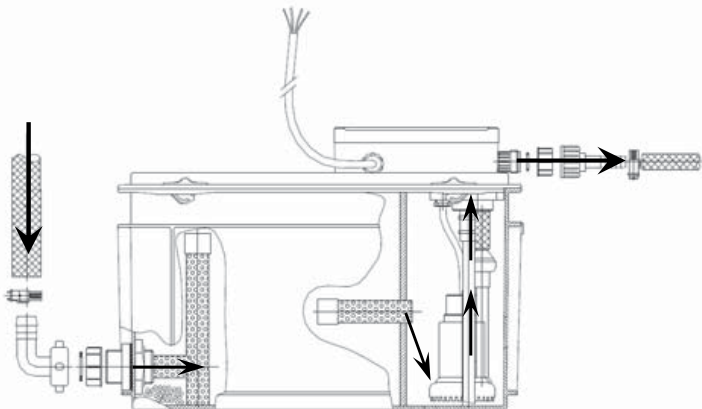
The standard neutralisation system is used when the public draining connection is at lower level than the boiler syphon connection.



Type		DN2	DN3
Applicable for	kW	450	1500
Length	mm	420	640
Width	mm	300	400
Height	mm	240	240

Neutralisation system with pump (HN)

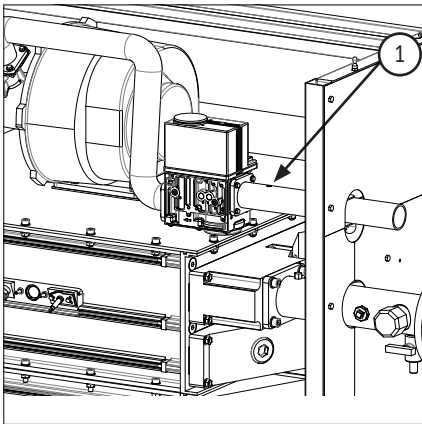
The neutralisation system with pump is used, when the public draining system is at higher level than the boiler syphon connection and the condensate needs to be transported to a higher level before draining is possible. The built-in pump of the neutralisation system takes care of the transport of the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



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

Commissioning

Gas supply Flue and air intake connections Condensate connection



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.

Consult the conversion kit instruction if the boiler is to be installed with natural gas or LPG.

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.

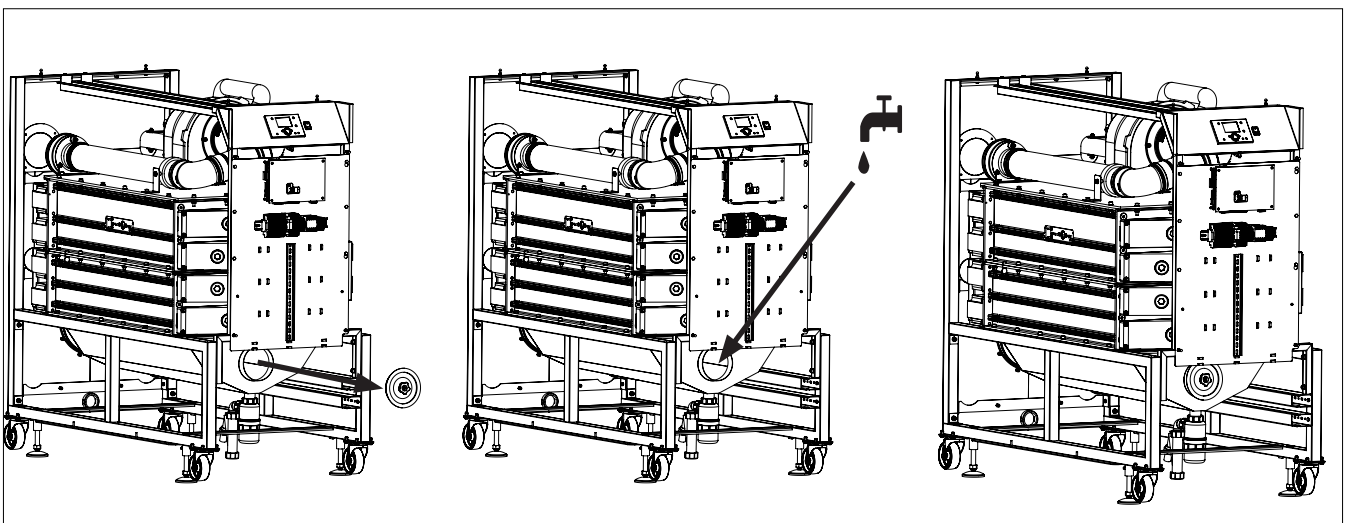
Make sure that all connections are free.

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

Condensate connection

Fill the syphon as shown on the pictures with water.

Check the connections, make sure the syphon is filled and that the cover of the condensate tray is closed before starting the boiler, in order to prevent flue gases discharging through the condensate tray and syphon!

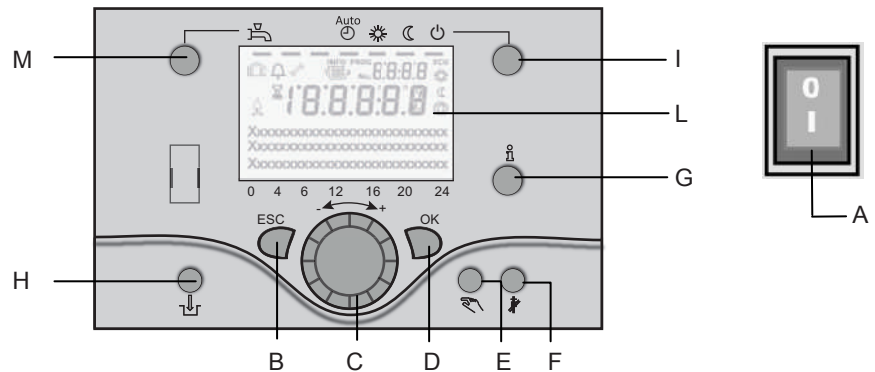


Commissioning

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

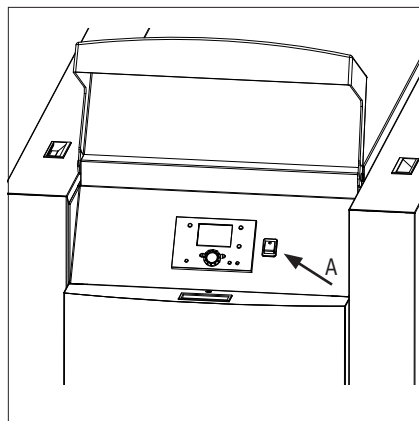
Proceed in the following way:

- Open cold water inlet tap;
- Gradually open the valve under the boiler;
- Open each air release tap starting with the lowest point and close it only when clear water, free of air, is visible;
- Close the valve under the boiler when at least 1,5 bar registers on the pressure gauge.


Gas supply

Proceed in the following manner:

- Make sure that the main gas supply uses the same type of gas as indicated on the boiler data plate;
- Open all doors and windows;
- Make sure there are no sparks or naked flames in the room;
- Make sure that the system does not leak fuel.



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 stand-by 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 Sec., 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.

After checking the combustion value (see next page), the controller Stop mode can be stopped by pushing the control mode button (I) >3 Sec.

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.

Check the combustion settings, if necessary, correct the settings with the small adjustment screw (1) under the cap (2) at the top of the gas valve.

Combustion settings max. load			
for natural gas G20 / G25			
CO ₂ max.	G20 / G25	%	10,2 ± 0.2
Combustion settings min. load			
for natural gas G20 / G25			
CO ₂ min.	G20 / G25	%	9,4 ± 0.2

Combustion settings max. load			
for natural gas G20 / G25			
O ₂ max.	G20 / G25	%	2,7 ± 0.3
Combustion settings min. load			
for natural gas G20 / G25			
O ₂ min.	G20 / G25	%	4,1 ± 0.2

IMPORTANT:
2E/2H/2EK ≤ 20% H₂

Combustion settings max. load			
for G31 (I3P)*			
CO ₂ max.	G31 (I3P)	%	11,9 ± 0.2
Combustion settings min. load			
for G31 (I3P)*			
CO ₂ min.	G31 (I3P)	%	10,0 ± 0.2

Combustion settings max. load			
for G30 / G31 (I3B/P)*			
CO ₂ max.	G30 (I3B/P)	%	12,7 ± 0.2
CO ₂ max.	G31 (I3B/P)	%	10,9 ± 0.2
Combustion settings min. load			
for G30/G31 (I3B/P)*			
CO ₂ min.	G30 (I3B/P)	%	11,9 ± 0.2
CO ₂ min.	G31 (I3B/P)	%	10,0 ± 0.2

*Use conversion kit for I3P and I3B/P

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 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.

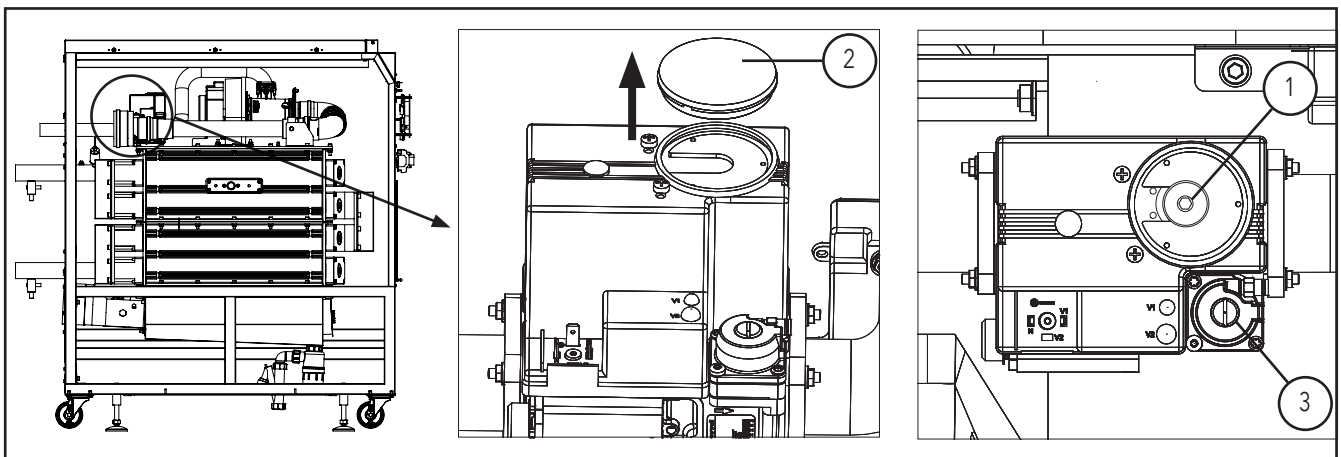
Make sure that the boiler is set to automatic operation and controller stop mode is disabled after the combustion test is finished.

Important

This appliance is suitable for G20 gas containing up to 20% hydrogen (H₂). Due to variations in the percentage of H₂, the percentage of CO₂ may vary over time.

(For example: 20% of H₂ in the gas may lead to a 1.5% decrease of CO₂ in the flue gases).

Under these circumstances it is recommended NOT to adjust the gas control valve.

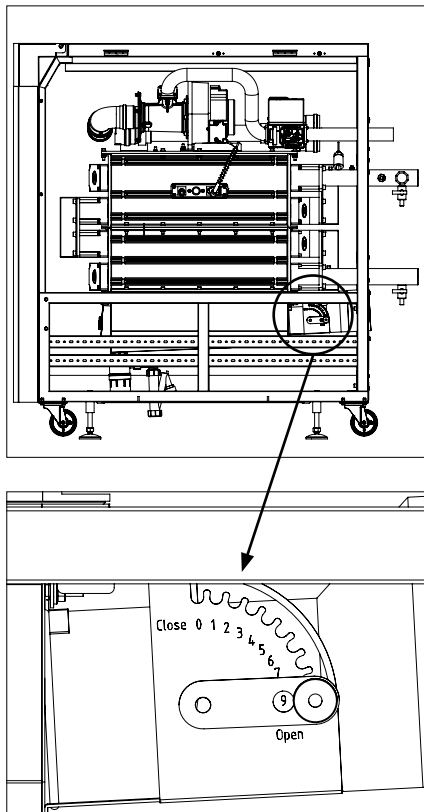


Commissioning

Check gas Valve Check water flow

Gas valve

Due to the length of the chimney system draft or a resonance can occur. This draft can have a negative impact on the ignition and stability of the combustion. To reduce the influence of the draft or to remove the resonance the flue gas valve can be adjusted. For this 10 positions are available, several test on different flue gas valves positions are to be executed to find the optimal position for the complete installation.



Check water flow

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

ΔT measurement

Check the temperature difference over 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 30K 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):

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

Water flow data		R600 EVO						
		R601	R602	R603	R604	R605	R606	R607
Nominal flow rate	[m³/h]	6.1	8.1	10.1	12.2	16.3	20.4	23.1
ΔT at nominal flow rate	[°C]	20						
Δp at nominal flow rate	[kPa]	11.2	26.8	31.2	11.9	32.3	34.3	57.1

Check functionality of safety devices

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.

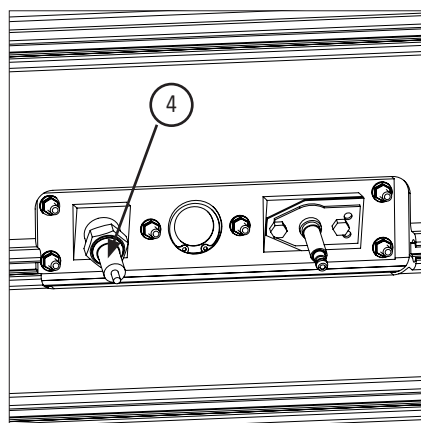
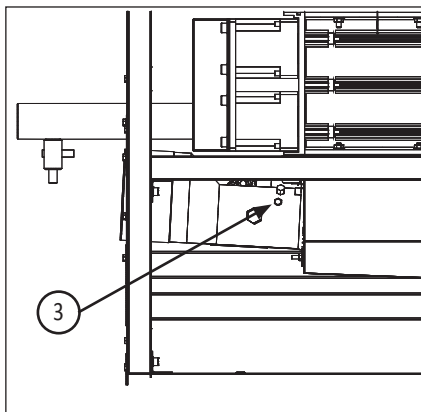
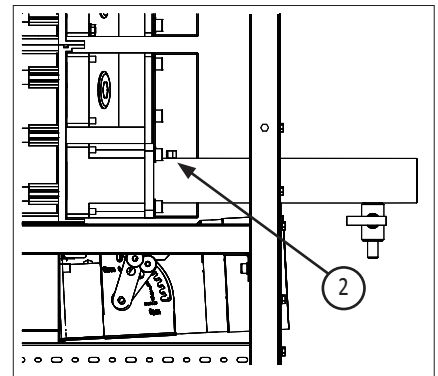
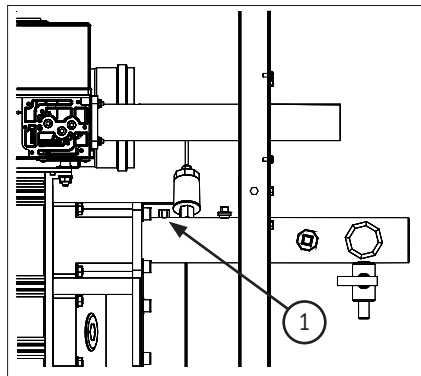
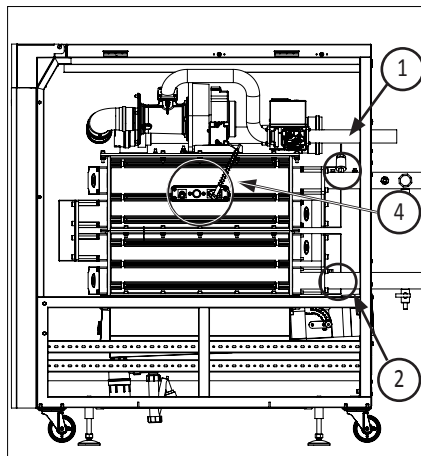
The lockout should disappear as soon as the plug is placed back in position, the boiler will restart.

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 μA) in between the ionisation electrode and its electrical connection.



The ionization current in normal conditions will be between 4.4 - 10.6 μA

The minimum ionization current is:

- 1.51 μA (Type 150/200/300)
- 2.5 μA (Type 250)
- 3.2 μA (Type 400/570)
- 3.6 μA (Type 500)

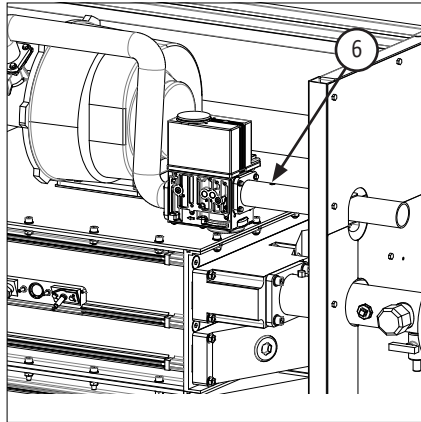
Commissioning

Gas tightness check Boiler shut down

Gas tightness check


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

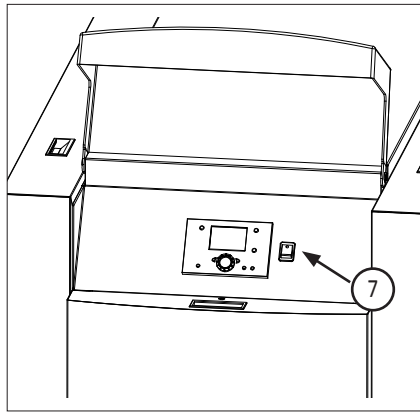
- Test points (6);
- Bolt connections;
- Gaskets of mixing system, etc.



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 (7);
- Disable power supply to the boiler by deactivating the mains isolator switch in the boiler room;
- Close the gas supply to the boiler.



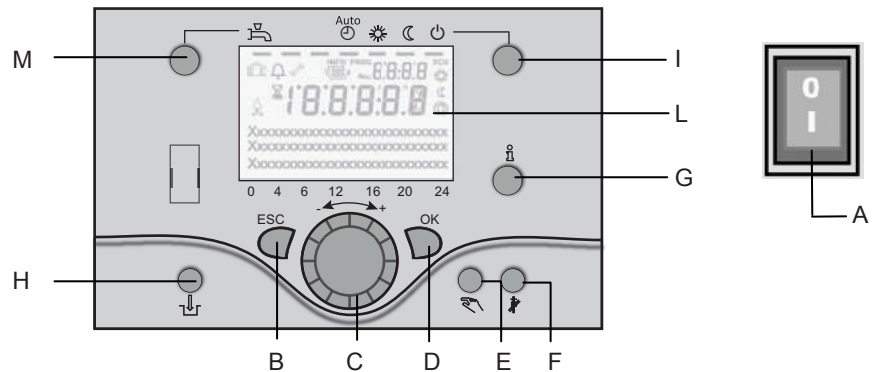
Commissioning protocol

Commissioning Protocol R600 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"/>
Water flow	[m³/h]		Bypass boiler	<input type="checkbox"/>
Pump setting	[-]		Other:	<input type="checkbox"/>
Safety devices				
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]			
Ignition time burner	[sec]			
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]	
NO _x	[ppm]	[ppm]	[ppm]	
Tatmospheric	[°C]	[°C]	[°C]	
Tfluegas	[°C]	[°C]	[°C]	
Twater, flow	[°C]	[°C]	[°C]	
Twater, return	[°C]	[°C]	[°C]	
Ionisation current	[μA]	[μA]	[μA]	
pfan	[mbar]	[mbar]	[mbar]	
ptop panel	[mbar]	[mbar]	[mbar]	
pcombustion chamber	[mbar]	[mbar]	[mbar]	
Remarks				

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 program;
- 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 stanby 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.

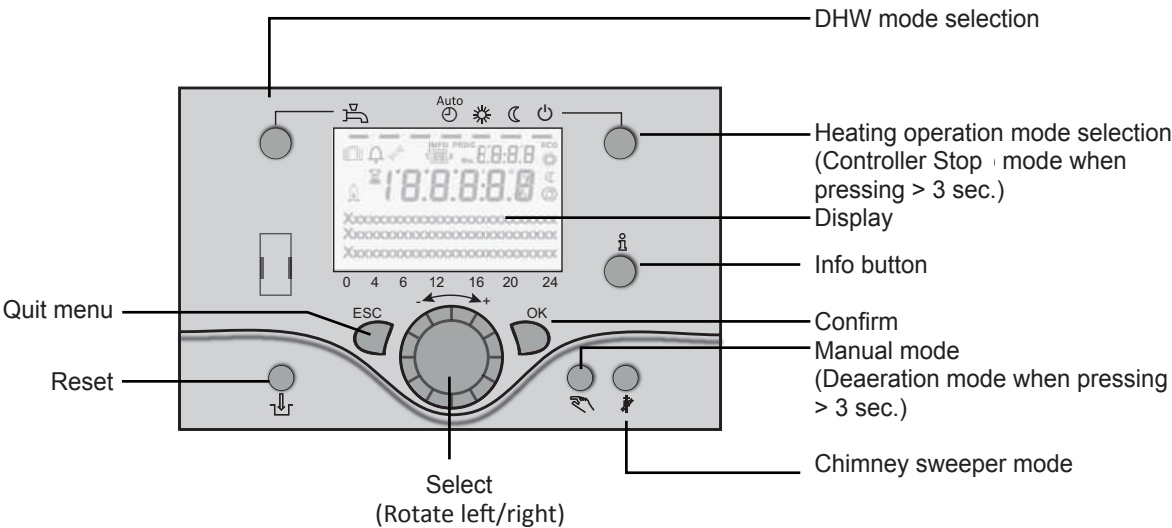
Chimney sweeper mode (F)

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).

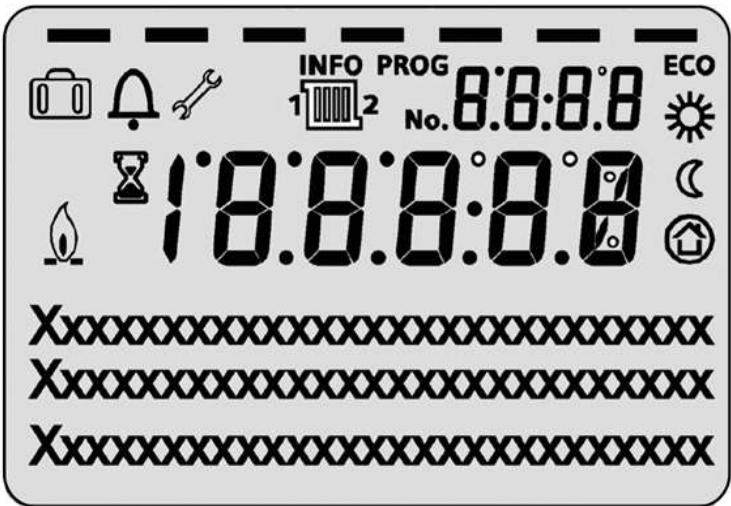
Reset button (H)

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

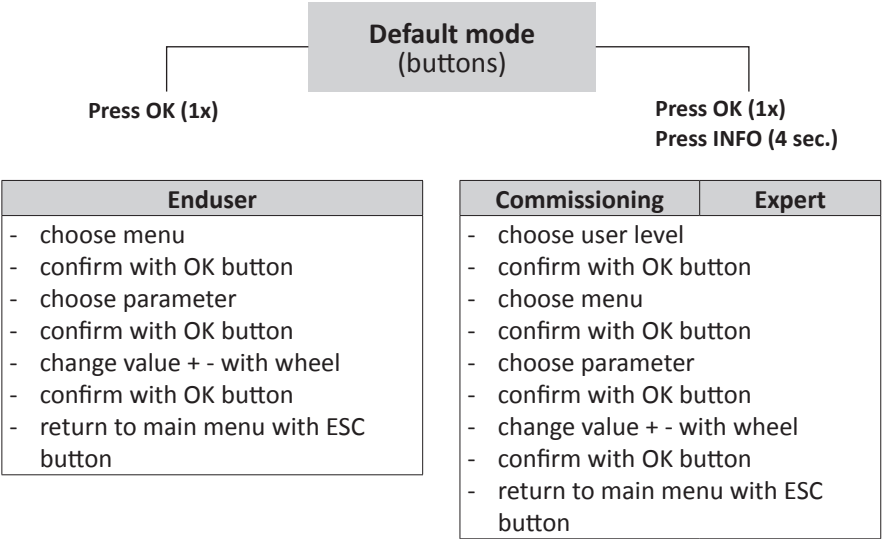
Display / Programming




	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





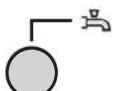




Operating instructions

 OK = confirmation










 ESC = cancel,
return to main menu

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 Stop mode 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 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 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.

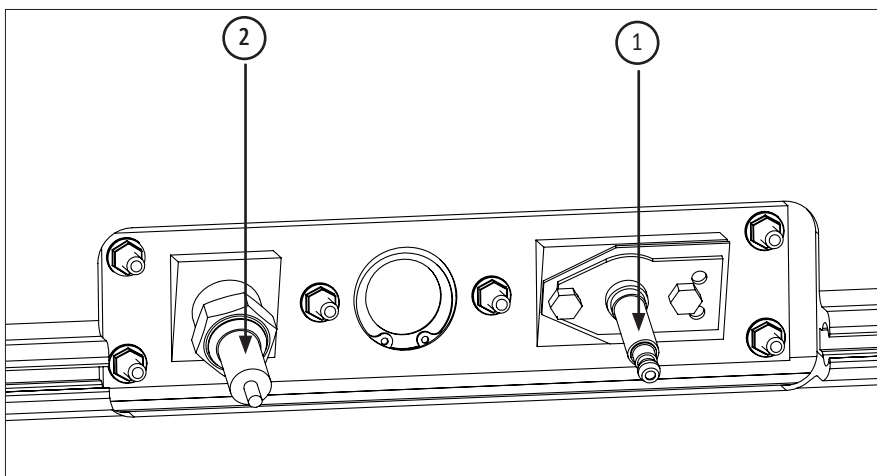
In order to ensure continued good and safe operation of the boiler, it should be inspected at least once per year.

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 condens tray;
- Clean and refill the syphon;
- Inspect the combustion chamber, clean if necessary;
- 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.



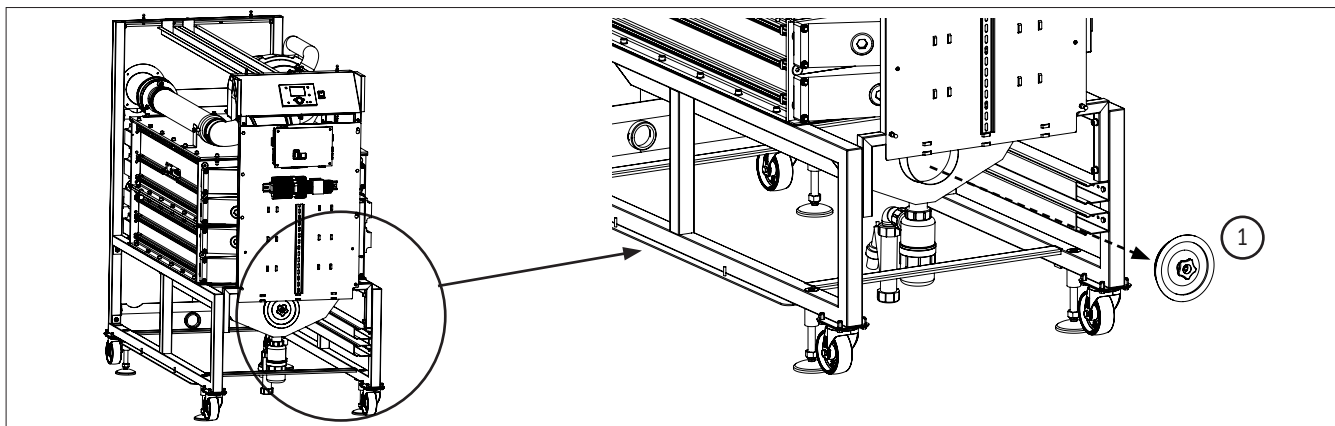
Replacing the electrodes

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

Cleaning the condens tray Cleaning and refilling the syphon

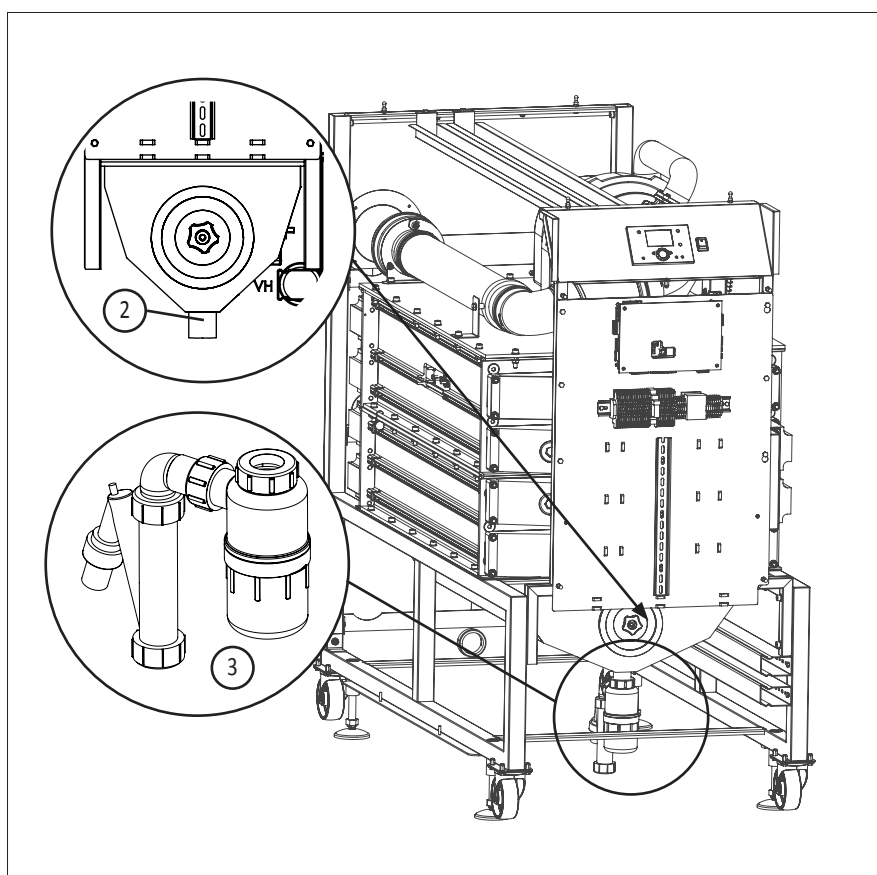
Cleaning the condens tray

- Remove the cover on the condens tray (1);
- Clean the tray;
- Close the condens tray;



Cleaning and refilling the syphon

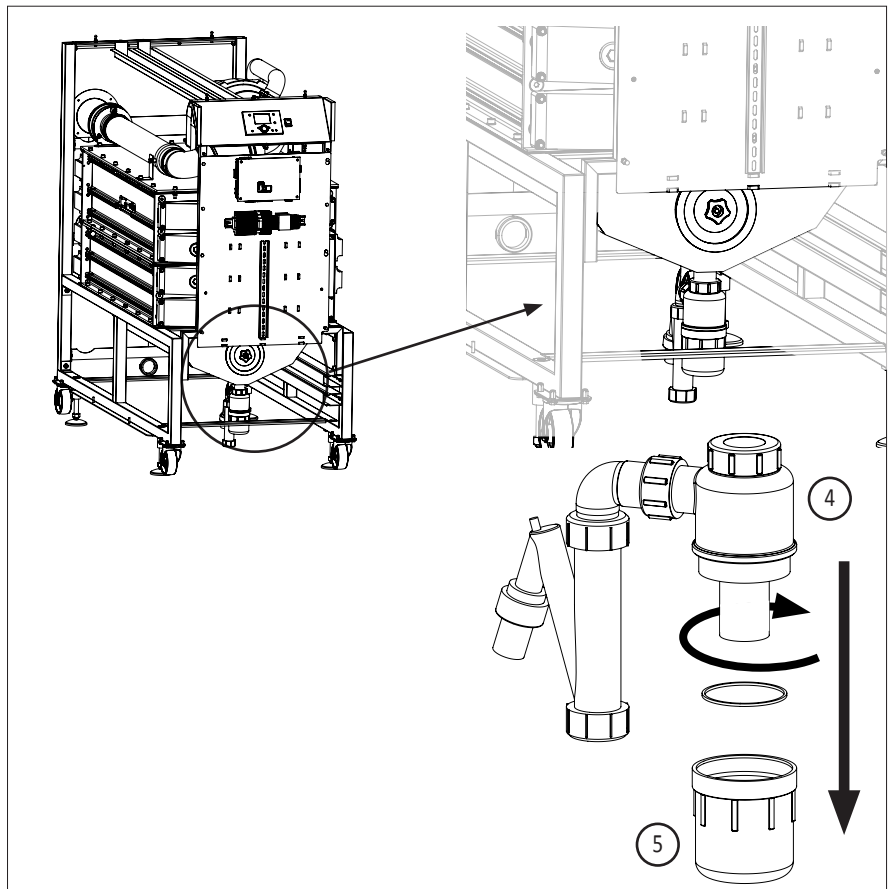
- Remove the syphon (3) from the condensate connection (2);
- Clean and fill it with fresh water;
- Mount the syphon back in the original position.



Cleaning the dirt collector Inspection of combustion chamber

Cleaning the dirt collector

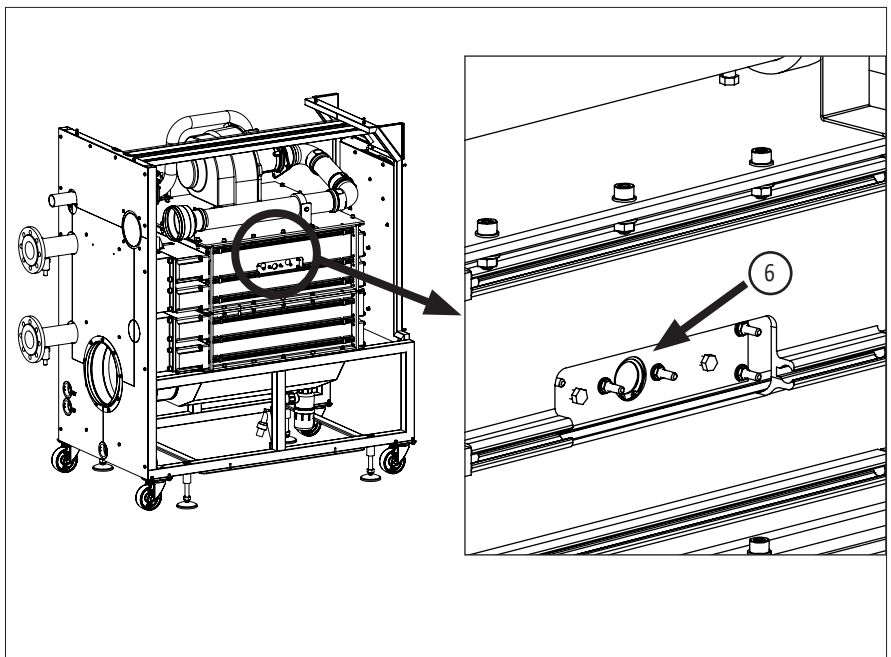
- Remove the syphon from the condensate connection;
- Remove the cap (5) from the dirt collector on the bottom of the syphon (4);
- Clean it with plenty fresh water;
- Close the cap of the dirt collector
- Reconnect the syphon to the condense connector.



Inspection of combustion chamber

The sight glass (6) is positioned on the left hand side of the boiler.

- Inspect the combustion chamber by viewing through the sight glass.



Maintenance

Water physical and chemical check Gas and water quality Safety devices

Check physical and chemical water

After some weeks of operation, check the main physicals and chemicals parameters of water.

Consult the chapter “commissioning: water and hydraulic system” for more detailed information.

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

Water pressure and quality

Check if the water pressure and quality meet the requirements.

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 R600 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]		
Water flow		[m³/h]		
Pump setting		[-]		
Safety devices				
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]		
Ignition time burner		[sec]		
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]
p _{top panel}		[mbar]	[mbar]	[mbar]
p _{combustion chamber}		[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 $\geq 90^{\circ}\text{C}$

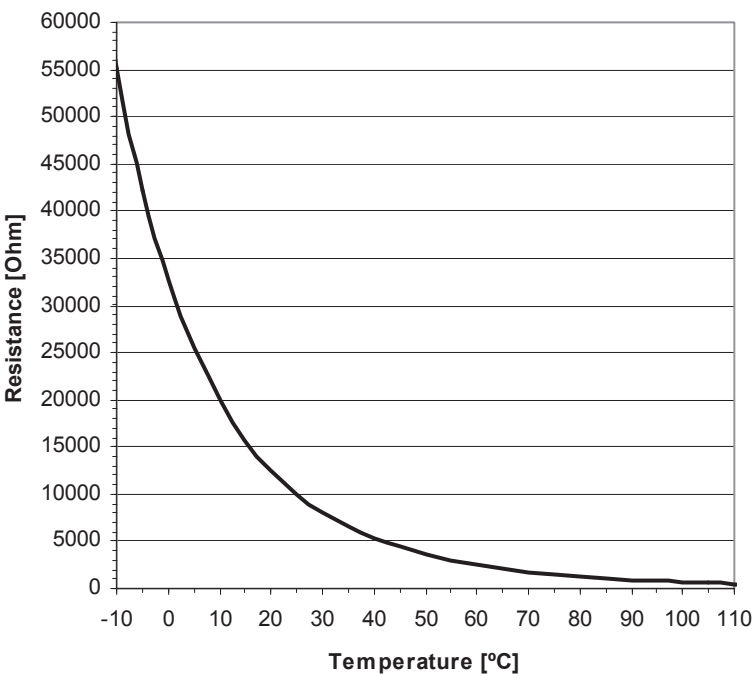
ERR. CODE	DESCRIPTION OF ERROR	CAUSE
132	Gas pressure switch safety shut-down	Interlock, input interrupted
		Gas pressure switch is open
133	Safety time for establishment of flame exceeded	Repetition error counter exceeded
		Safety time for establishment of flame exceeded
151	BMU fault internal	False 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	Air pressure switch failure
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

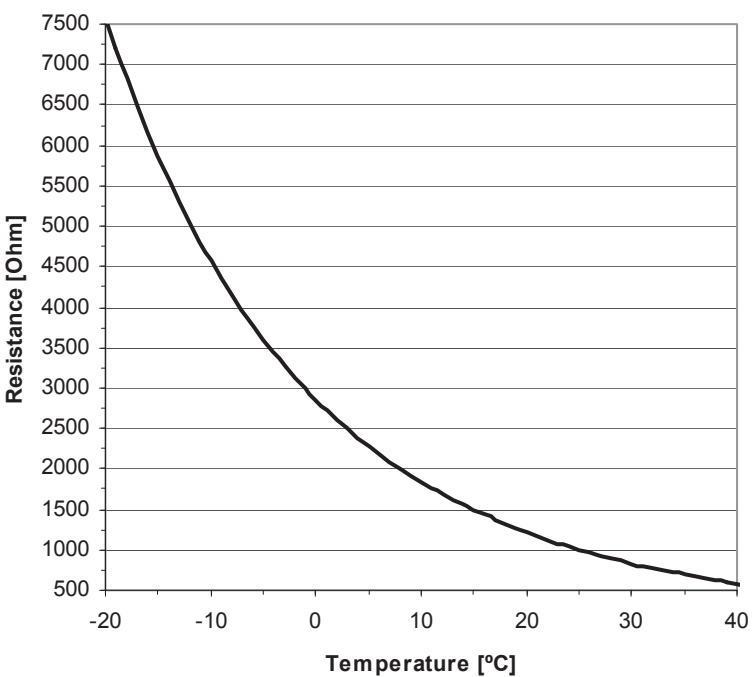
The diagrams show the sensor values for all boiler sensors and optional sensors available in accessory kits. The diagrams contain average values, as all sensors are liable to tolerances.

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

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



NTC 1kΩ temperature sensor
(outdoor sensor)



Declaration of conformity

We, Elco BV, Hamstraat 76, 6465 AG Kerkrade (NL),
declares under our responsibility that the product

**R601 EVO, R602 EVO, R603 EVO,
R604 EVO, R605 EVO, R606 EVO, R607 EVO**

**R601 EVO IP, R602 EVO IP, R603 EVO IP,
R604 EVO IP, R605 EVO IP, R606 EVO IP, R607 EVO IP**

is in conformity with the following standards:

EU Gas appliance Regulation	2016/426/EU	EN 15502-1: 2015 EN 15502-2-1: 2012 +A1:2016
Boiler Efficiency Directive	1992/42/EEC	art.7 (§2), art.8 and annex III, IV, V
Low Voltage Directive	2014/35/EU	EN 60335-1: 2012, +AC/+A11: 2014, +A13: 2017, +A1/+A2/+A14: 2019, +A15: 2021 EN 60335-2-102: 2016
EMC Directive	2014/30/EU	EN 61000-3-2: 2014 EN 61000-3-3: 2013 EN 55014-1: 2006, EN 55014-2: 2015
Ecodesign Directive	2009/125/EU	Regulation (EU) 813/2013 Communication 2014/C 207/02
Restriction of Hazardous Substances	2015/863/EU	EN IEC 63000: 2018

The notified bodies (KIWA) have performed the Products indicated in compliance with the
above Community harmonization legislations and harmonized standards.

This product is designated with CE number:

CE – 0063CQ3970

Kerkrade, 01-01-2023

Elco BV

B. Nelissen
Plant Director Elco

Service:

ELCO BV
NL - 6465 AG Kerkrade

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