For certified companies

a member of DAIKIN group

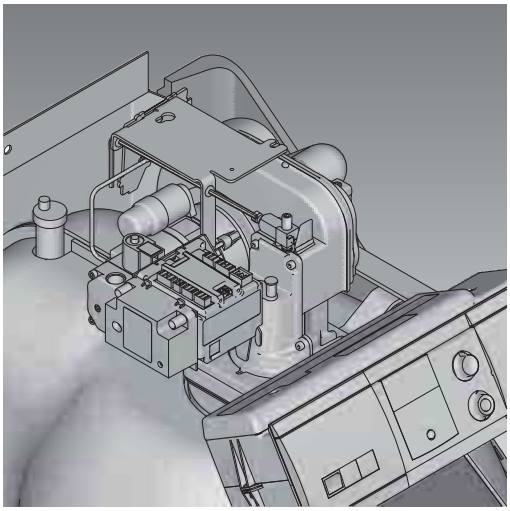
ROTEX

ROTEX
A1 BO
Installation and maintenance instructions

Oil condensing boiler

CE 0035 BM 105.3 ★★★★

Types
A1 BO 15-e
A1 BO 20-e
A1 BO 27-e
A1 BO 34-e



GB
Output 02/2014

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1 Guarantee and conformity

1.1 Warranty conditions

The legal guarantee conditions fundamentally apply. Our warranty conditions beyond that can be found online on your sales representative's webpage.

1.2 Declaration of conformity

For the central condensing heating units in the boiler range ROTEX A1 BO

We, ROTEX Heating Systems GmbH, declare under our sole responsibility that the products

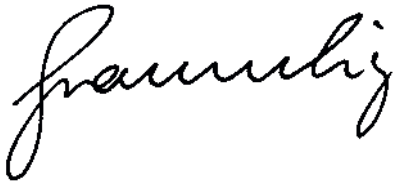
Product	Order No.	Product	Order No.
ROTEX A1 BO 15-e	15 49 60	ROTEX A1 BO 27-e	15 49 62
ROTEX A1 BO 20-e	15 49 61	ROTEX A1 BO 34-e	15 49 63

with the product ID No.: CE 0035 BM-105.3 comply, in its standard design, with the following European Directives:

2004/108/EC	Electromagnetic Compatibility Directive
2006/42/EC	EC Machinery Directive
2006/95/EC	EC Low Voltage Directive
92/42/EEC	Boiler efficiency requirements directive

Person responsible for the generation of the technical documents: Dipl.-Ing. W. Scholer

CE



Güglingen, 18.03.2013

Dr.-Ing. Franz Grammling
Managing Director

2 Safety

2.1 Observing instructions

This instruction is the >> ***Original Version*** << in your language.

Please read this manual carefully and thoroughly before proceeding with the installation or modification of the heating system.

These instructions are intended for authorised and trained heating and sanitation experts who have experience in the proper installation and maintenance of heating systems and hot water storage tanks by virtue of their technical training and knowledge.

This manual provides all the necessary information for installation, start-up and maintenance, as well as basic information on operation and settings. Please go through the attached documents for a detailed description of operation and control.

All heating parameters needed for smooth operation are already factory-set. Please refer to other relevant documents for information on setting the control.

Relevant documents

– ROTEX A1 BO:
  – For the operator
  – Operating manual for the operator.
– ROTEX RoCon BF Controller": Control System Instructions

The documents are included in the scope of supply.

2.2 Warning signs and explanation of symbols

Meaning of the warnings

Warnings in this manual are classified according into their severity and probability of occurrence.

DANGER!

Draws attention to imminent danger.

Disregarding this warning can lead to serious injury or death.

WARNING!

Indicates a potentially dangerous situation.

Disregarding this warning can result in serious injury or death.

CAUTION!

Indicates a situation which may cause possible damage.

Disregarding this warning can lead to damage to property and the environment.

This symbol identifies user tips and particularly useful information, but not warnings or hazards.

Special warning signs

Some types of danger are represented by special symbols:


Electric power


Risk of burning or scalding.


Risk of poisoning


Danger of chemical burns

Order number

Notes related to Order numbers are identified by the cart symbol .

Handling instructions

- Instructions on actions are shown as a list. Actions of which the sequential order must be maintained are numbered.
  ➔ Results of actions are identified with an arrow.

2.3 Avoid danger

ROTEX Oil condensing boiler conforms to the state-of-the-art and meets all recognised technical requirements. However, improper use may result in serious physical injuries or death, as well as property damage. Install and operate only ROTEX Oil condensing boiler to avoid danger:

– as stipulated and in perfect condition,
– with an awareness of the safety and hazards involved.

This assumes knowledge and use of the contents of this manual, the relevant accident prevention regulations and the recognised safety-related and occupational medical rules.

2.4 Proper use

The ROTEX A1 BO may only be used for the heating of hot water heating systems. It must be installed, connected and operated only according to the information in this manual.

The ROTEX A1 BO may only be operated with the integrated circulation pump and only in combination with a controller approved by ROTEX.

Any other use outside the intended use is considered as improper. The operator alone shall bear responsibility for any resulting damage.

Use as intended also involves compliance with maintenance and inspection conditions. Spare parts must at least satisfy the technical requirements defined by the manufacturer. This is the case, for example, with original spare parts.

2.5 Instructions for operating safety

2.5.1 Before working on the heating system

- Work on the heating system (such as installation, connection and initial start-up) may only be carried out by authorised, trained heating technicians.
- Switch off the main switch and secure it against unintended switching on when carrying out any work on the heating system.
- Seals must not be damaged or removed.
- Make sure that the safety valves comply with the requirements of EN 12828 when connecting on the heating side, and with the requirements of EN 12897 when connecting on the domestic water side.

2.5.2 Electrical installation

- Electrical installations must only be conducted by electrical engineers and in compliance with valid electrical guidelines as well as the specifications of the energy supply company.
- Before completing the mains connection, compare the mains voltage, indicated on the type plate (230 V, 50 Hz) with the supply voltage.
- Before beginning work on live parts, disconnect them from the power supply (switch off main switch, remove fuse) and secure against unintentional restart.
- Equipment covers and service panels must be replaced as soon as the work is completed.

2.5.3 Installation room

- Operate ROTEX A1 BO only if sufficient combustion air supply is ensured. If you operate the ROTEX A1 BO in a room-air independent manner with a concentric air/flue gas system (LAS) dimensioned as per ROTEX standard, this is fulfilled automatically and there are no other conditions for the equipment erection room. With installation in residential rooms, this method of operation applies exclusively.
- Make sure that, with installation in a room-air dependent or limited room-air independent manner, an inlet air opening to the outside of at least 150 cm^2 is provided.
- Do not operate the ROTEX A1 BO by the ambient air dependent method in rooms with aggressive vapours (e.g. hair spray, perchloroethylene, carbon tetrachloride), strong dust formation (e.g. workshop) or high humidity (e.g. laundry).
- Strictly keep the minimum distances to walls and other objects (see chapter 4.1).

2.5.4 Requirements for the heating water

Avoid damage caused by deposits and corrosion: Observe the relevant regulations of technology to prevent creation of corrosion products and deposits.

Measures for desalination, softening or hardness stabilization are necessary, if the filling and top-up water have a high total hardness (>3 mmol/l - sum of the calcium and magnesium concentrations, calculated as calcium carbonate.

Using filling water and top-up water which does not meet the stated quality requirements can cause a considerably reduced service life of the equipment. The responsibility for this is entirely that of the operator.

2.5.5 Heating system and sanitary connection

- Create a heating system according to the safety requirements of EN 12828.
- With sanitary connection, you must observe;
  - EN 1717 - Protection of domestic water from contamination in domestic water installations and general requirements concerning safety equipment for the prevention of domestic water contamination by back-flow
  - EN 806 - Technical regulations for domestic water installations (TRWI)
  - and, in addition, the country-specific legal regulations.

During operation of the ROTEX A1 BO, the storage tank temperature may exceed 60 °C, particularly when solar power is used.

- Therefore, incorporate scald protection during the installation of the system (domestic hot water mixing construcion, e.g. VTA32, **15 60 16**).

2.5.6 Fuel

- Use only the approved heating oils as fuel (see chapter 12 "Technical data").

2.5.7 Operation

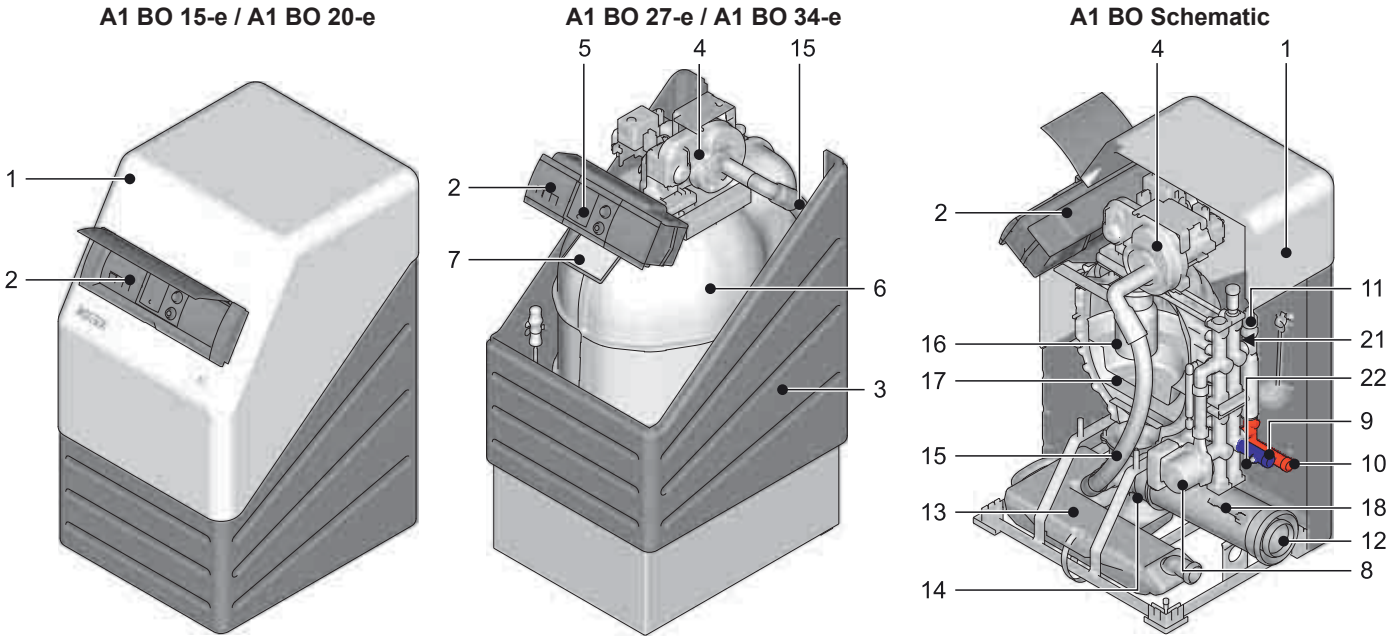
- Operate ROTEX A1 BO only with closed silencer hoods.
- Only operate the ROTEX A1 BO if all the prerequisites as per the checklist in chapter 5.2 are fulfilled.

2.5.8 Instructing the user/owner

- Before you hand over the heating system, explain to the owner how he/she can operate and check the heating system.
- Hand over the technical documentation (at least the operating instruction manual and operating handbook) to the user and advise him that these documents must be made available at all times and be stored in the immediate vicinity of the unit.
- Make a record of the handover by filling out and signing the installation and instruction forms jointly with the user/owner.

3 Product description

3.1 Boiler design and components



1	***Sound insulation hood*** ⚠	***9***	*Heating return flow (cold)*	***18***	***Flue gas temperature sensor*** ⚠
2	*Boiler control panel*	***10***	*Heating flow (hot)*	***19***	*Circuit board (electrical connections)*
3	*Boiler cladding*	***11***	***Pressure sensor*** ⚠	***20***	*Document pouch*
4	*Burner* ⚠	***12***	*Flue gas/supply air connection*	***21***	***Flow temperature sensor*** ⚠
5	*Control system*	***13***	*Condensate treatment unit*	***22***	*Return flow temperature sensor*
6	*Boiler main body with* ***heat and sound insulation*** ⚠	***14***	*Condensate drain*	⚠	*Safety devices*
		15	*Air supply hose*		
7	*Type plate with serial number*	***16***	*Flame tube*		
8	*Heating circulation pump*	***17***	*Combustion chamber insert*		

Fig. 3-1 Constituent parts of the A1 BO - view from the front + schematic

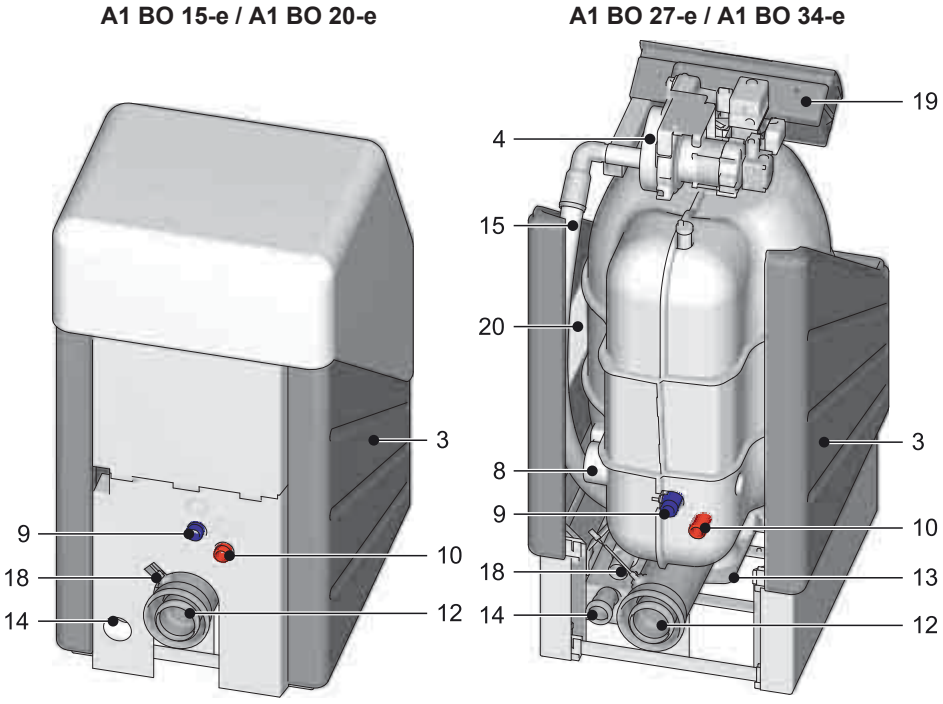


Fig. 3-2 Constituents of the A1 BO - view from the rear
for legend see fig. 3-1

3.2 Brief description

The ROTEX Oil condensing boiler in the A1 BO series is a fully preassembled oil condenser unit.

Operating instructions

The ROTEX Oil condensing boiler A1 BO is designed to be operated independently of the room air (concentric flue gas/air inlet piping). The burner suctions the combustion air directly in through an installation shaft or a double-walled flue gas pipe. This operating mode has several advantages:

– The heating room does not need any ventilation opening into the open air and therefore does not cool down.
– Lower energy consumption.
– Additional energy recovery in the flue gas pipe through preheating the combustion air.
– Contamination from the environment of the burner are not suctioned in. The heating room can thus be used as a work-space, laundry room etc. at the same time.
– Possible to set up in loft areas or attic.

The collecting condensate is neutralised in the integrated ROTEX condensate treatment unit and then conducted into the drainage system through a plastic tube.

Safety management

The safety management of the Oil condensing boiler is handled entirely by the electronic controller. If there is water shortage, oil shortage or undefined operating conditions, there is a safety shutdown. A corresponding fault signal provides an engineer with all the necessary information for troubleshooting.

Electronic control

An electronic digital controller combined with the "intelligent" automatic firing unit of the burner controls all heating and hot water functions automatically for the direct heating circuit and a storage tank charging circuit.

Optionally, connected mixer modules **RoCon M1** (**15 70 68**) can be used to connect and regulate one or more mixed circuits.

All settings, displays and functions are carried out by the RoCon B1 controller. The display and operating elements offer convenient operating possibilities.

As an option, for increased convenience, a digital room controller (**RoCon U1**, **15 70 34**) is available as an option. This can be used as a remote control and a room thermostat.

Using the optional gateway (**RoCon G1**, **15 70 56**), the controller can be connected to the internet. This means that the ROTEX A1 BO can be controlled remotely via mobile phone (using an App).

Condensing technology

Condensing technology makes optimum use of the energy contained in the heating oil. The flue gas is cooled down in the boiler and in the flue system - when operated independently of ambient air - such that the temperature is below the dew point. Part of the water vapour created on combustion of the oil thereby condenses. The condensation heat is fed to the heating, in contrast to low-temperature boilers, thus making it possible to achieve over 100% efficiency.

Fuel

The ROTEX Oil condensing boiler A1 BO can be operated using standard or low-sulphur heating oil (sulphur content <50 ppm). It is prepared for combustion of heating oil with biogenic content. As things currently stand, admixing bio-heating oil up to 20 % (B20) is permitted without an additional conversion being required.

ROTEX recommends using EL low sulphur heating oil in order to achieve the highest efficiency and to keep the maintenance expenditure low.

Condensate treatment

The condensate generated during the combustion in an Oil condensing boiler has a pH value of 1.8- 3.7. It must be neutralised before it enters the drainage system.

The ROTEX condensate treatment unit fulfils the following functions:

– Removes floating particles in the settling basin,
– Neutralises the condensate in the shell limestone.

4 Set-up and installation

WARNING!

Units which have been set-up and installed incorrectly may not operate properly and can be a health and safety risk endangering human life.

- Erection and installation of the ROTEX A1 BO only by authorised and trained heating experts.

Incorrect set-up and installation would render the manufacturer's guarantee for the unit void. If you have questions, please contact our Technical Customer Service.

4.1 Dimensions and connection dimensions

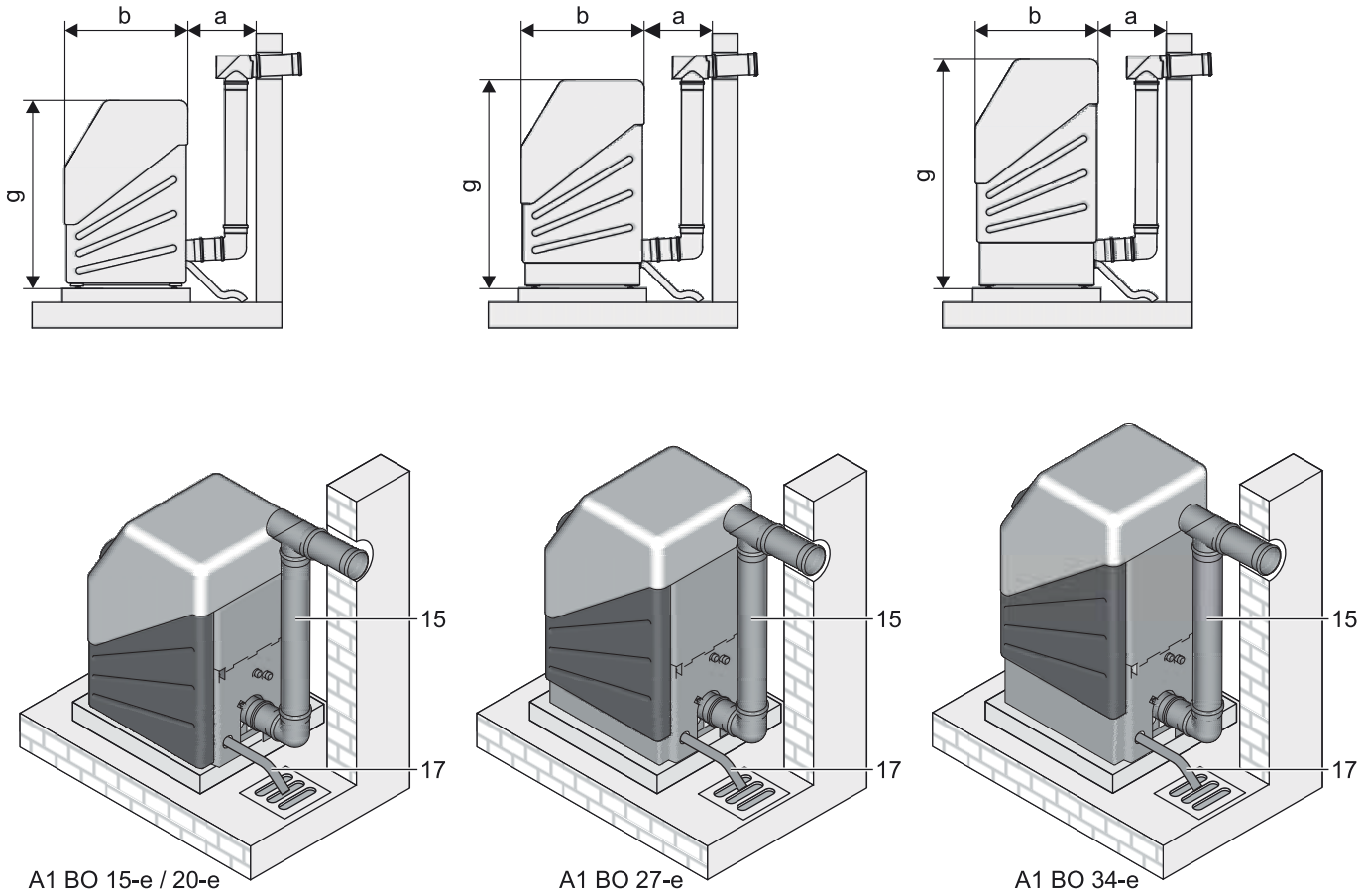


Fig. 4-1 Dimensions of model variants, side view (legend see tab. 4-1)

1	*Boiler return (1" AG)*	**9**	*Hot water (¾" IG)*	**A**	*ROTEX A1 BO*
2	*Boiler flow (1" AG)*	**10**	*Circulation (¾" IG)*	**B**	*Boiler frame KU (15 30 21)*
3	*Filling line connection on the KFE cock [1] (½" AG)*	**11**	*Heat exchanger return (¾" AG)*	**C**	*Sub-tank US 150 (16 01 52)*
		12	*Sensor immersion sleeve*		
4	*Flue gas/air intake connection (DN 80/125)*	**13**	*Heat exchanger flow (¾" AG)*	**AG**	*Male thread*
5	*Connection expansion vessel [1] (½" IG)*	**14**	*Cold water (¾" IG)*	**IG**	*Female thread*
6	*Burner*	**15**	*Air/flue system (LAS) - Connection piece (DN 80/125)*		
7	*Safety valve [1] (½" IG, flue line ¾" IG)*			**a - k**	*Dimension see tab. 4-2*
		16	*Air inlet hose (DN 50)*		
8	*3-way diverting valve [2] (1" AG)*	**17**	*Condensate drain hose (DN 40)*	[1]	*Accessory SGB A1 (15 60 18)*
				[2]	*Accessory VSA1 (15 48 22)*

Tab. 4-1 Legend from fig. 4-1 to fig. 4-3

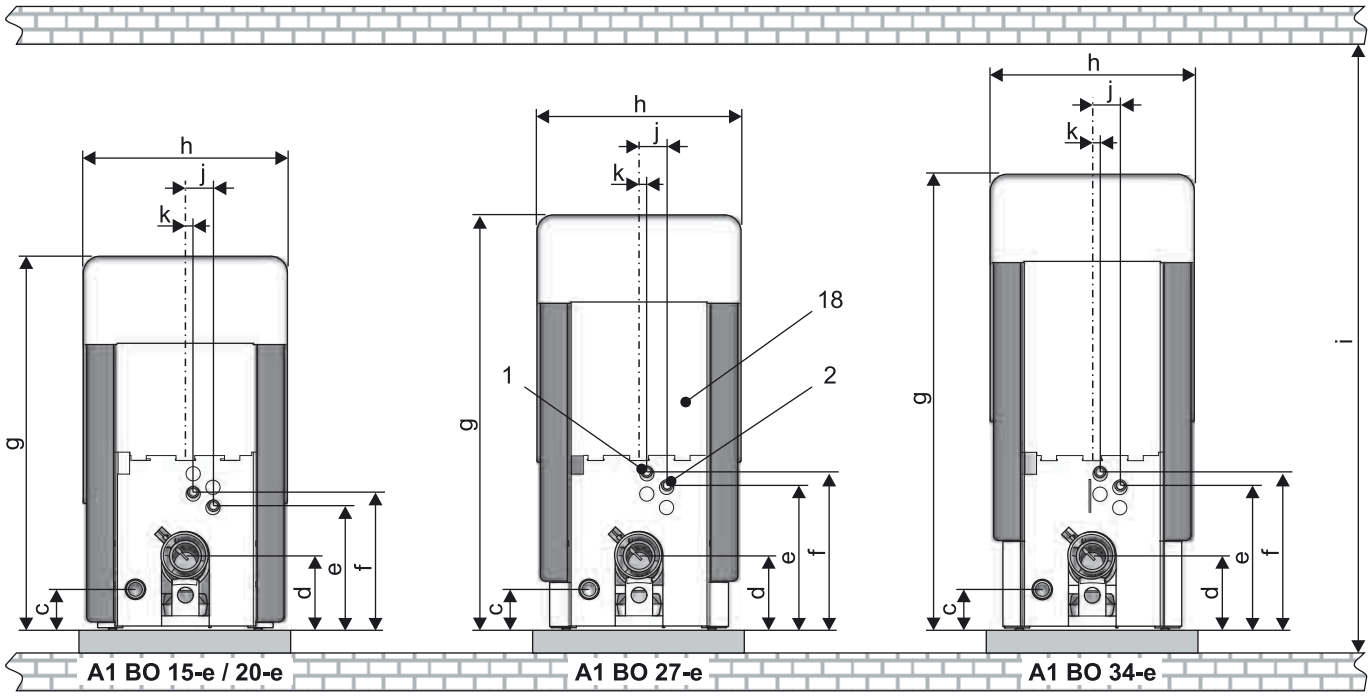


Fig. 4-2 Dimensions and connection dimensions - view from the rear (for legend see tab. 4-1)

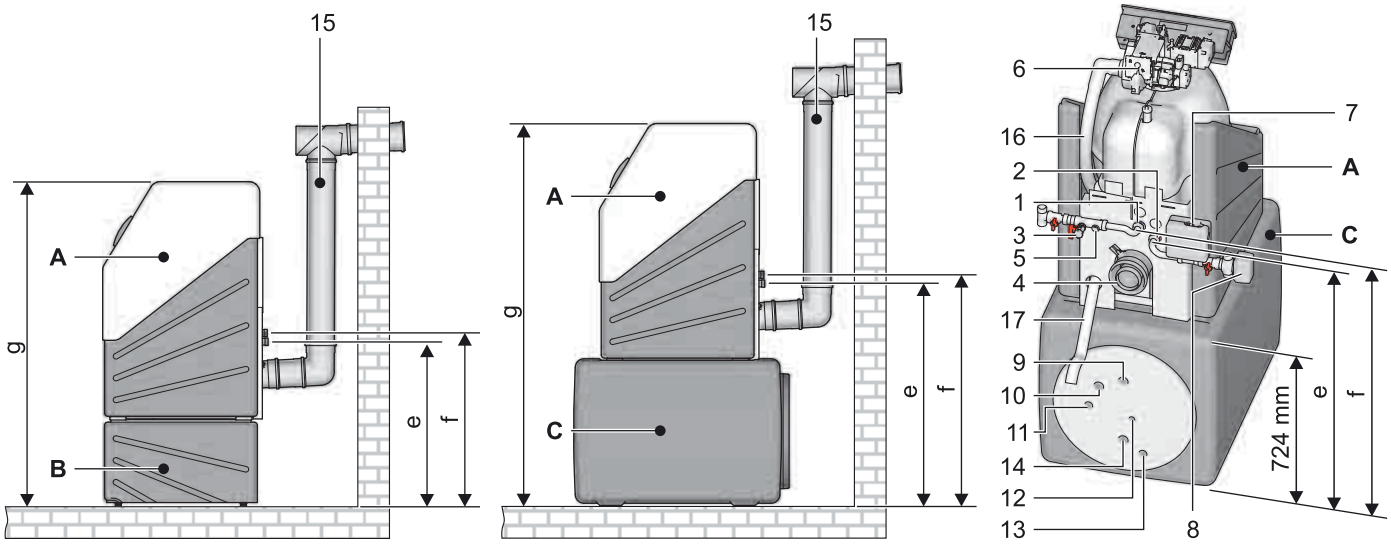
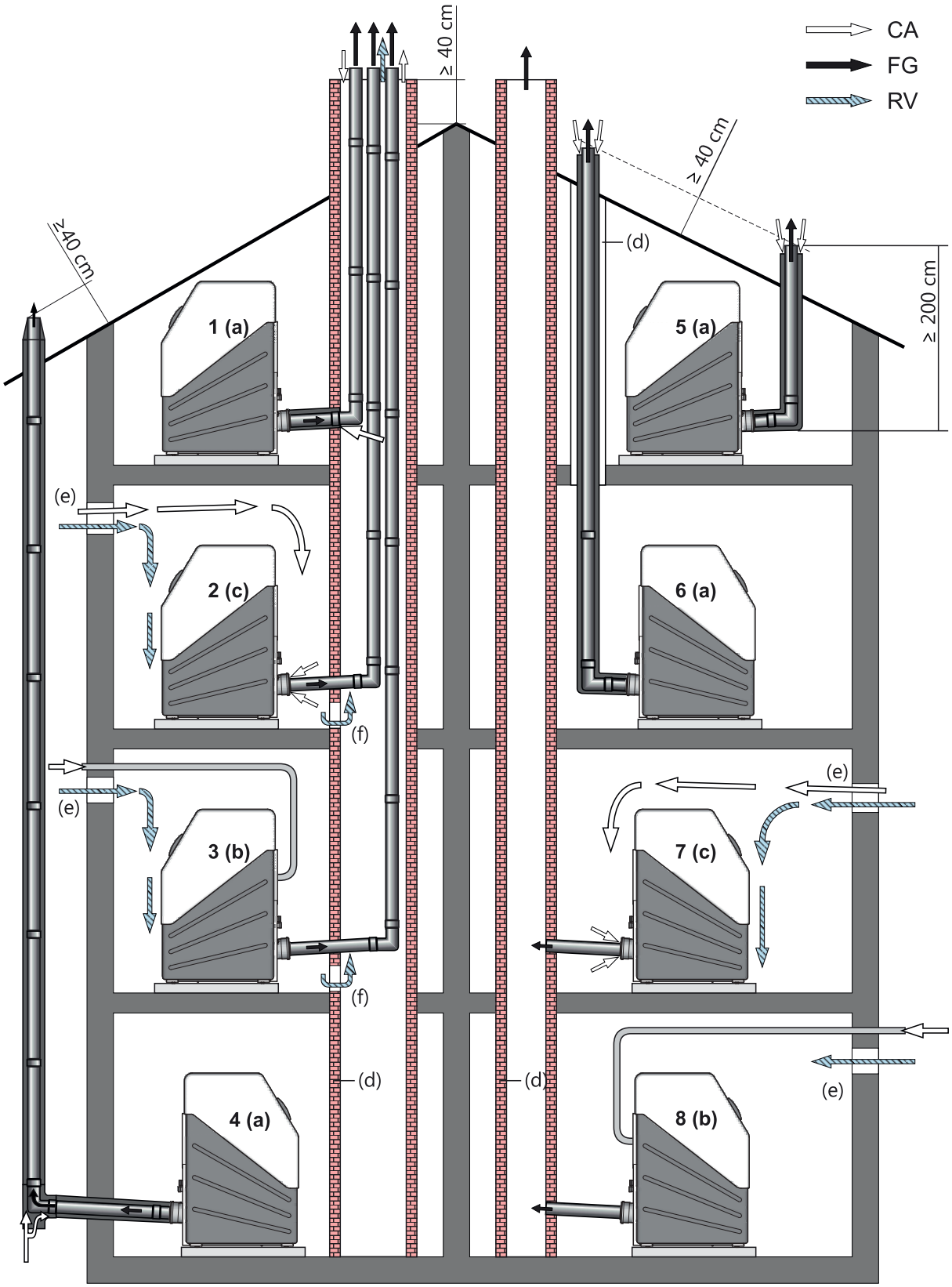


Fig. 4-3 Dimensions and connection dimensions with boiler frame and sub-tank (for legend see tab. 4-1)

	A1 BO 15-e / A1 BO 20-e			A1 BO 27-e			A1 BO 34-e		
Dimension	on the floor	on the sub-tank	on the boiler frame	on the floor	on the sub-tank	on the boiler frame	on the floor	on the sub-tank	on the boiler frame
a	≥400								
b	720								
c	$135^{\pm15}$	$785^{\pm15}$	$500^{\pm15}$	$135^{\pm15}$	$785^{\pm15}$	$500^{\pm15}$	$135^{\pm15}$	$785^{\pm15}$	$500^{\pm15}$
d	$230^{\pm15}$	$880^{\pm15}$	$590^{\pm15}$	$230^{\pm15}$	$880^{\pm15}$	$590^{\pm15}$	$230^{\pm15}$	$880^{\pm15}$	$590^{\pm15}$
e	$365^{\pm15}$	$1000^{\pm15}$	$755^{\pm15}$	$425^{\pm15}$	$1065^{\pm15}$	$815^{\pm15}$	$425^{\pm15}$	$1065^{\pm15}$	$815^{\pm15}$
f	$405^{\pm15}$	$1045^{\pm15}$	$795^{\pm15}$	$465^{\pm15}$	$1105^{\pm15}$	$855^{\pm15}$	$465^{\pm15}$	$1105^{\pm15}$	$855^{\pm15}$
g	1100	1730	1480	1220	1850	1600	1340	1970	1720
h	625								
i	≥1340	≥1890	≥1650	≥1470	≥2020	≥1770	≥1590	≥2140	≥1890
j	$85^{\pm15}$								
k	$25^{\pm15}$								

Tab. 4-2 Installation dimensions A1 BO in mm

4.2 Different set-ups



1-8 *Different set-ups (Description, see section 4.2.1 to 4.2.3)*

CA *Inlet air (combustion air)*
FG *Flue gas*
RV *Rear ventilation*

a *Set up variant for room-air independent operation (flue gas/ inlet air concentric)*
b *Set up variant for limited room-air independent operation (flue gas/ air inlet separate)*
c *Set up variant for room-air dependent operation*
d *Longitudinally ventilated shaft with fire resistance duration of 90 min (in residential buildings with low headroom 30 min). Observe country-specific regulations for fire-resistance periods!*
e *Ventilation opening (1x150 cm² or 2x75 cm²)*
f *Rear ventilation opening (150 cm²)*

Fig. 4-4 Installation variants for the Oil condensing boiler in series A1 BO

The Oil condensing boiler series A1 BO are basically designed for operation in the **room-air independent** mode. They are fitted with a concentric flue gas /air supply pipe DN 80/125.

Use of the ROTEX A1 BO in operation independent of room air with concentric flue gas/air intake is recommended by ROTEX. If possible, choose this set-up!

In the event of limited room-air independent operation (separate flue gas/ air intake) and in the event of room-air dependent operation, the installation room must have a ventilation opening of at least **150 cm²** to the outside.

This reduces the overall energy efficiency of the building in the framework of the European Guideline 2010/31/EU: EPBD.

In some cases, the resonance in the flue system can amplify the noise at the mouth of the flue gas pipe. The noise level can be effectively reduced with the application of a silencer (**E8 MSD, 15 45 78** bzw. **E11 MSD, 15 45 79**).

Air suction noises are generated during ambient air-dependent operation. The noise level can be effectively reduced with the application of a silencer (**G ZLSD, 15 45 77**).

4.2.1 Operation independent of ambient air

Set-up version 1

The ROTEX A1 BO is connected to the chminey or a suitable installation shaft using the concentric LAS connector line **Set C** or **Set D**.

– The combustible air supply from the outside runs through the chimney or through an installation shaft.
– The flue gas discharge using a flue gas pipe to the outside runs through the same shaft as the air supply.
– Minimum distance between flue gas exit and roof ridge: **40 cm**.

Set-up version 4

The ROTEX A1 BO is connected by the **Set C** or **Set D** concentric LAS connection lines to the **SET G** exterior wall system.

– The combustible air supply from the outside runs through the ring-shaped gap in the dual tube, through the outer wall (suction from below).
– The flue gas discharge to the outside runs through a concentric pipe, through the outer wall and then up to at least **40 cm** over the roof surface. In the external area, the outer air gap serves as heat insulation for the flue gas pipe.

If the wall penetration is at a height of less than a meter above the ground, ROTEX recommends introducing the combusion air through a separate intake air pipe (installation height: about 2 m). **W8 ZR, 15 50 79.00 66** or **W11 ZR, 15 50 77.00 30**.

Set-up version 5

The ROTEX A1 BO is placed directly under the roof. Connected with **SET F**.

– The combustible air supply and flue gas discharge run through a concentric dual pipe.
– The combustible air supply from the outside runs through the outer ring-shaped gap of the dual tube and the flue gas discharge to the outside runs through the inner tube.
– Minimum distance between flue gas exit and roof surface: **40 cm**.
– Minimum height of the flue gas pipe: **2 m**.

Set-up version 6

The ROTEX A1 BO does not stand directly under the roof. The dual tube for the combustible air supply and flue gas pipe runs through the roof truss.

– The combustible air supply and flue gas discharge run through a concentric dual pipe (such as Set-up version 5).
– In the area of the roof truss, the dual tube for the combustible air supply and the flue gas pipe must be laid through a protective pipe with sufficient fire resistance or be structurally separated from the roof truss.

4.2.2 Operation partially independent of ambient air

If the flue gas pipe is too high (see tab. 4-4), it may be advisable to suction the supply air through a separate air supply line with lower resistance.

The ROTEX A1 BO is operated with separately routed inlet air/ flue gas lines (2 line system).

– Combustion air inlet is routed from the outside via the adequately sealed inlet air through the external wall. The air inlet line should be sized so that the **suction resistance** at nominal power is **less than 50 Pa**.
– Flue gas dissipation to the outdoors is via the chimney or an installation shaft. If the connection line between the ROTEX A1 BO and the installation shaft is single-walled or is not completely surrounded by combustion air, a **ventilation opening** of at least **150 cm²** is required.
Appropriate measures must be taken to ensure that the burner cannot be operated if the ventilation opening is closed.
– The installation shaft where the flue gas line runs must be rear ventilated. In the lower area there must be a rear ventilation opening of at least **150 cm²** must be provided.

The cross-section of the installation shaft must be sized so that **between the external wall of the flue gas line** and the **internal face of the installation shaft** the following **minimum distance** must be maintained:
– with a rectangular shaft cross-section: **2 cm**
– with round shaft cross-section: **3 cm**.

The rear ventilation opening must not be in rooms where a positive pressure is generated (e.g. by controlled apartment ventilation, a tumble-drier etc.).

- Pull off the air supply hose at the air supply connecting manifold of the boiler body and connect the separate air supply line.

Set-up version 3

– The combustible air supply from the outside runs through a separate air supply line through the external wall.
– The flue gas discharge to the outside runs through the chimney or through an installation shaft (as in set-up version 1).

Set-up version 8

The ROTEX A1 BO is connected by the **SET A** or **SET B** to a ceramic chimney.
– The combustible air supply from the outside runs through a separate air supply line through the external wall.
– Ceramic chimney for flue gas removal must be moisture-insensitive (Class W) and suitable for overpressure operation (Class P1 or H1), as well as having an appropriate constructional approval or CE approval with a declaration of conformity.
– If the ceramic chimney for the flue gas discharge does not have an approval for overpressure operation, it must be possible to prove, using a flue gas calculation, that there is negative pressure in the shaft when the flue gas enters.

4.2.3 Ambient air dependent operation

The ROTEX A1 BO can also be connected in a manner dependent on ambient air. Thereby, only the inner flue gas pipe (plastic pipe Ø 80 mm) of the concentric air-flue gas pipe is connected to the flue gas line. The device sucks the combustible air from the installation room through the ring-shaped gap of the jacket pipe.

For the flue gas routing to the outdoors, the shaft sizing and the rear ventilation, the same conditions apply as in section 4.2.2. A **ventilation opening** to the outside of **150 cm^2** is **imperative**.

In some cases, the resonance in the flue system can amplify the noise at the mouth of the flue gas pipe. The noise level can be effectively reduced with the application of a silencer (**E8 MSD, 15 45 78** bzw. **E11 MSD, 15 45 79**).

Air suction noises are generated during ambient air-dependent operation. The noise level can be effectively reduced with the application of a silencer (**G ZLSD, 15 45 77**).

Set-up version 2

– Combustion air supply from the installation room.
– Flue gas dissipation to the outdoors is via the chimney or an installation shaft (such as Set-up version 1).

Set-up version 7

The ROTEX A1 BO is connected by the **SET A** or **SET B** to a ceramic chimney.
– Combustion air supply from the installation room.
– Ceramic chimney for flue gas removal must be moisture-insensitive (Class W) and suitable for overpressure operation (Class P1 or H1), as well as having an appropriate constructional approval or CE approval with a declaration of conformity.
– If the ceramic chimney for the flue gas discharge does not have an approval for overpressure operation, it must be possible to prove, using a flue gas calculation, that there is negative pressure in the shaft when the flue gas enters.

4.3 Transport and delivery

CAUTION!

Lifting or pushing the Oil condensing boiler on the cladding can damage the unit.

- Lift the ROTEX A1 BO only on the carrying straps provided for this purpose.

The ROTEX A1 BO is delivered on a pallet. All industrial trucks, such as lifting trucks and forklift trucks, are suitable for transporting it.

Scope of delivery

– ROTEX A1 BO (preassembled),
– Document pack,
– Toolkit (cleaning brush and scraper, burner chamber spanner, hexagonal spanner for burner and heat exchanger, burner setting gauge).

Recommended accessory

– Safety group (**SGB A1, 15 60 18**) with pressure gauge, safety valve, automatic bleeding, filling cock, connection fittings).
– Connection kit A1 (**VSA1, 15 48 22**), for hydraulic connection of a heat exchanger (storage tank temperature sensor, 3-way diverter valve with actuating motor, connection fittings).
– External temperature sensor (**RoCon OT1, 15 60 70**), for weather-controlled regulation.

Additional accessories see ROTEX price list.

4.4 Installing the Oil condensing boiler

4.4.1 Selecting the installation site

The installation location for the ROTEX A1 BO must meet the following minimum requirements.

Installation height

– The bottom edge of the condensate drain connection on the unit must be higher than the outlet height of the condensate drainage hose, otherwise condensation can accumulate in the drain.
● If installing with adjacent storage tank, the boiler must be installed on a plinth at least **80 mm** high or a boiler support frame (**KU,** 🛒 **15 30 21**).

Installation area

– The base is solid, even and horizontal, and has sufficient load bearing strength. Install a pedestal if necessary.
– Observe the set-up dimensions (see section 4.1).

Installation room in general

– There are no special conditions for ventilation of the installation room for operation independent of the ambient air (using a concentric air/flue system).
– In the event of limited room-air independent operation (separate flue gas/ air intake) and in the event of room-air dependent operation, the installation room must have a **ventilation opening** of at least **150 cm²** to the outside. If the flue gas line goes via an installation shaft to the outside, it must be rear ventilated (see section 4.2.2).
– For partial ambient air-independent and for ambient air-dependent mode, the installation room must be free from aggressive vapours (e.g. hair spray, perchloroethylene, carbon tetrachloride), heavy dust formation and high atmospheric humidity (e.g. washhouse).

Heating oil storage in the installation room

As a general rule, construction specifications allow up to 5000 litres of heating oil to be stored in the installation room (according to the Firing Ordinance of the state) if the building is in Building Category 1 and the installation room is not a living room.

Set-up in the attic

If the ROTEX A1 BO is installed in the attic and the oil is stored in the rooms below it, the oil pump of the burner is generally not adequate. Since the vacuum on the suction side exceeds the value of 0.4 bar, the oil must be supplied to the burner using a separate pump. ROTEX strongly recommends using a **suction aggregate**.

The **minimum height of the flue gas pipe** must be **2 m** in order to avoid malfunction at start or during operation of the burner.

CAUTION!

If using a pressure aggregate, oil could escape if there is a fault. Escaping oil can cause serious damage to the environment.

● Install boiler in a leakproof tray and secure using a float switch (connection through additional plug rail (**ZLÖ**, 🛒 **15 40 71**).
● Use only a metallic filter cup (never Plexiglas).

Surface temperature, minimum distance

WARNING!

The storage tank plastic wall on the ROTEX A1 BO can melt under the effects of external heat (>80 °C) and, in the extreme case, can catch fire.

● The ROTEX A1 BO can only be set up at a minimum distance of 1 m from other sources of heat (>80 °C, e.g. electric heaters, gas heaters, chimneys).

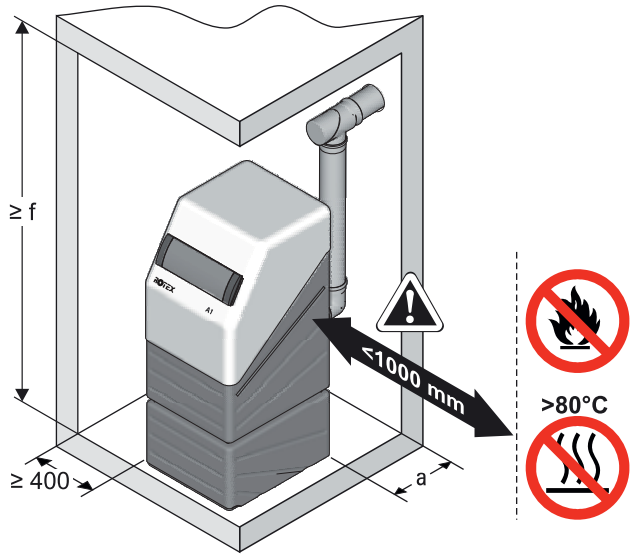


Fig. 4-5 Minimum distance for the installation of the A1 BO (for legend see tab. 4-2)

– When operating independently of the ambient air with nominal output, the design does not allow temperatures > 70 °C on any component outside the unit panels. Therefore, no minimum distance is required to components made with flammable materials.
– A minimum distance of 50 mm between the flue gas duct and flammable components should be maintained in a partial room air-independent and ambient air-dependent mode (separate flue gas/air intake line).
– Do not store or use easily inflammable and easily combustible substances directly next to the ROTEX A1 BO.

A flue gas temperature sensor connected to the ROTEX A1 BO controller effects a safety shutdown if the flue gas temperature is too high.

4.4.2 Setting up the unit

Precondition

– The installation site complies with the respective country-specific regulations, as well as the minimum requirements described in section 4.4.1.
– Install a leakproof tray on site if using a pressure device and secure the unit using a float switch.

Set-up

- Remove the packaging and dispose of it in an environmentally sound manner.
- Install ROTEX A1 BO at the place of installation. Do not lift or move the unit holding the panels.
- Position the ROTEX A1 BO so that it can be hinged open without any restriction.
  Observe the connection points of the oil hoses and the mounting position of the oil filter, line routing of the heating lines and the flue gas line.
- Check for the horizontal level and correct installation height of the ROTEX A1 BO. You can adjust the height with the four height-adjustable feet.

4.5 Air/flue system (LAS)

4.5.1 General instructions for flue system

WARNING!

There will be a **risk of poisoning** caused by flue gas escaping within enclosed rooms that are inadequately ventilated.

- Install only approved flue gas systems.
- The stipulated ventilation and rear ventilation must be ensured, depending on the set up variant.

The Firing Ordinance of the respective state and EN 15287 are valid for the model and dimensioning of the flue system.

Minimum requirements

For the design and dimensioning of the flue gas system, observe all valid national combustion ordinances and country-specific regulations.

Basically, for the flue gas system, you can use each flue gas pipe according to EN 14471 with EU label, which meets the following minimum requirements:
– Suitable for heating oil.
– Suitable for flue gas temperatures of at least 120 °C (temperature class T120 or higher).
– Suitable for at least 200 Pa overpressure (pressure class P1 or H1).
– Humidity-resistant (condensation resistance class W).
– Sufficiently corrosion-resistant (corrosion resistance class 2).

The features of the flue system must be recognisable on the installed system.

- Place the nameplate of the flue system in the installation room.

We recommend using the associated ROTEX flue gas kits. ROTEX They satisfy all requirements and are also fitted with special acid-proof seals.

Type of connections

– Straight, directly towards rear: **SET C, 15 50 79.03**.
– Height offset, towards rear: **SET D, 15 50 79.04**.
– Direct roof penetration: **SET F, 15 50 79.06**.

For other details and connection dimensions for the three versions of the flue gas pipe, see section 4.5.3.

– Each flue gas line must be installed with a suitable test adapter for checking and setting the combustion values. The ROTEX LAS construction sets each include a test adapter (**D8 PA**, **15 50 79.00 93**).

Installation position and line height

– The maximum permitted flue gas counter pressure is **200 Pa**. The pressure loss in the supply line must not exceed **50 Pa**.
– Angle of entry of the flue gas pipe into the chimney or installation shaft: **≥3°**.
– Slope for horizontal parts of the flue gas pipe: **≥3°**. Counter-slopes are not allowed at any point in the flue gas pipe.
– If the flue gas pipe needs more than 3 deflections >45°, then the maximum permitted height for the flue gas pipe is reduced by at least **1 m per deflection** (flue gas calculations may be needed).
– If the horizontal connecting piece is extended, the maximum permitted height of the flue gas pipe is reduced by exactly that length.
– Flexible flue gas lines must not be used in horizontal connection sections.

Flue gas system resistance

To ensure safe burner start-up and stable setting values, a minimum resistance is required in the flue gas line. If this is not achieved you need to fit a silencer (**E8 MSD, 15 45 78** or **E11 MSD, 15 45 79**).

- Switch the burner on (see chapter 15.2 "Emissions measurement").
- Measure the resistance with a differential pressure measurement unit on the flue gas measurement location between the flue gas and intake air measurement openings (differential pressure for the A1 BO 15/20 at least 0.5 mbar, for the A1 BO 27/34 at least 1 mbar).

The tab. 4-3 and the tab. 4-4 show the maximum permissible height of the flue gas line in the event that the ROTEX A1 BO is operated in the nominal output range.

Set-up version (ref. fig. 4-4)	A1 BO 15-e	A1 BO 20-e	A1 BO 27-e
	DN 80	DN 80	DN 80
1[1)]	16	16	16
2[1)]	21	21	21
3[1)]	17	17	17
4	16	16	16
5	17	17	17
6	17	17	17

1) Cross section of the shaft: 135 mm x 135 mm

Tab. 4-3 Maximum permitted height of the flue gas pipe in m (when operating in the nominal output range) - A1 BO 15-e to 27-e

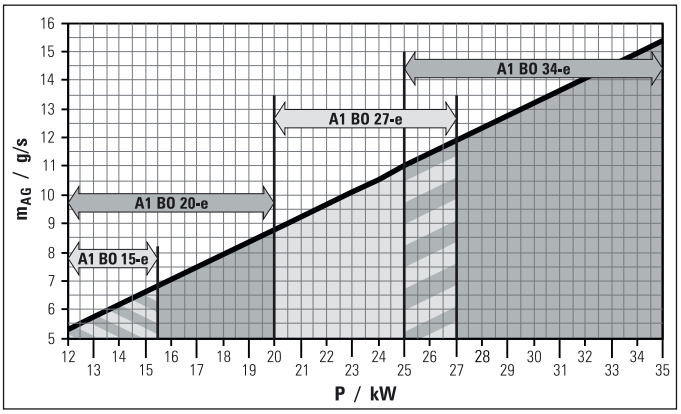
Set-up version (ref. fig. 4-4)	A1 BO 34-e		
	30 kW DN 80	34 kW DN 80	34 kW DN 110
1[1)]	20	8	24
2[1)]	21	21	30
3[1)]	21	17	30
4	20	20	28
5	11	11	23
6	11	11	23

1 Shaft cross section for DN 80: 135 mm x 135 mm; Shaft cross section for DN 110: 160 mm x 160 mm

Tab. 4-4 Maximum permissible height of the flue gas line in m (when operating in nominal output range) - A1 BO 34-e

Any restriction on the output range may require a recalculation of the maximum permitted height for the flue gas pipe. The characteristics for the flue gas calculation can be obtained from fig. 4-6 and chapter 15.2 "Emissions measurement".

The flue gas mass flow of the systems depends on the burner output set.



m_{AG} *Flue gas mass flow* ***P*** *Burner output*

Fig. 4-6 Flue gas mass flow in relation to the burner output

4.5.2 Connecting the flue gas line to the ROTEX A1 BO

Requirements

– The flue system fulfils the requirements described in section 4.5.1.
– The flue system fulfils any other required national or regional safety requirements.
– The ROTEX A1 BO is installed correctly.

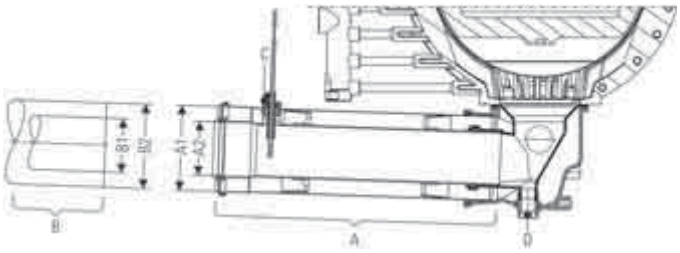
Connection

Basically, any flue gas line that complies with the minimum requirements according to the EN 14471 and that has the CE-labelling can be connected (see section 4.5.1).

Each flue gas line must be installed with a suitable test adapter for checking and setting the combustion values. The ROTEX LAS construction sets each include a test adapter (**D8 PA**, **15 50 79.00 93**).

We recommend the use of the associated ROTEX flue gas set (see fig. 4-8). They satisfy all requirements and are also fitted with special acid-proof seals.

- Connect ROTEX A1 BO to the flue gas system within the place of installation (for pipe dimensions, see fig. 4-2 or fig. 4-7).
- Place the nameplate of the flue gas pipe in the installation room.



A *Boiler connection* ***C*** *Flue gas temperature sensor*
B *Flue gas connection* ***D*** *Connection for condensate drain*

Fig. 4-7 Connection dimensions for LAS connection to the ROTEX A1 BO

Connection side	Connection	Connection dimension in mm
A Boiler side	**A1** Flue gas DN 80 Collar	Inside diameter = $80.4^{+0.8}$
	A2 Supply air DN 125 Collar	Inside diameter = $127.0^{-0.5}$
B Flue gas side	**B1** Flue gas DN 80	Outside diameter = $80.0^{+0.3}$
	B2 Supply air DN 125	Outside diameter = $126.0^{\pm0.3}$

Tab. 4-5 Connection dimensions for LAS connection to the ROTEX A1 BO

In some cases, the resonance in the flue system can amplify the noise at the mouth of the flue gas pipe. The noise level can be effectively reduced with the application of a silencer (**E8 MSD,** **15 45 78** bzw. **E11 MSD,** **15 45 79**).

Air suction noises are generated during ambient air-dependent operation. The noise level can be effectively reduced with the application of a silencer (**G ZLSD,** **15 45 77**).

4.5.3 Flue gas system kits

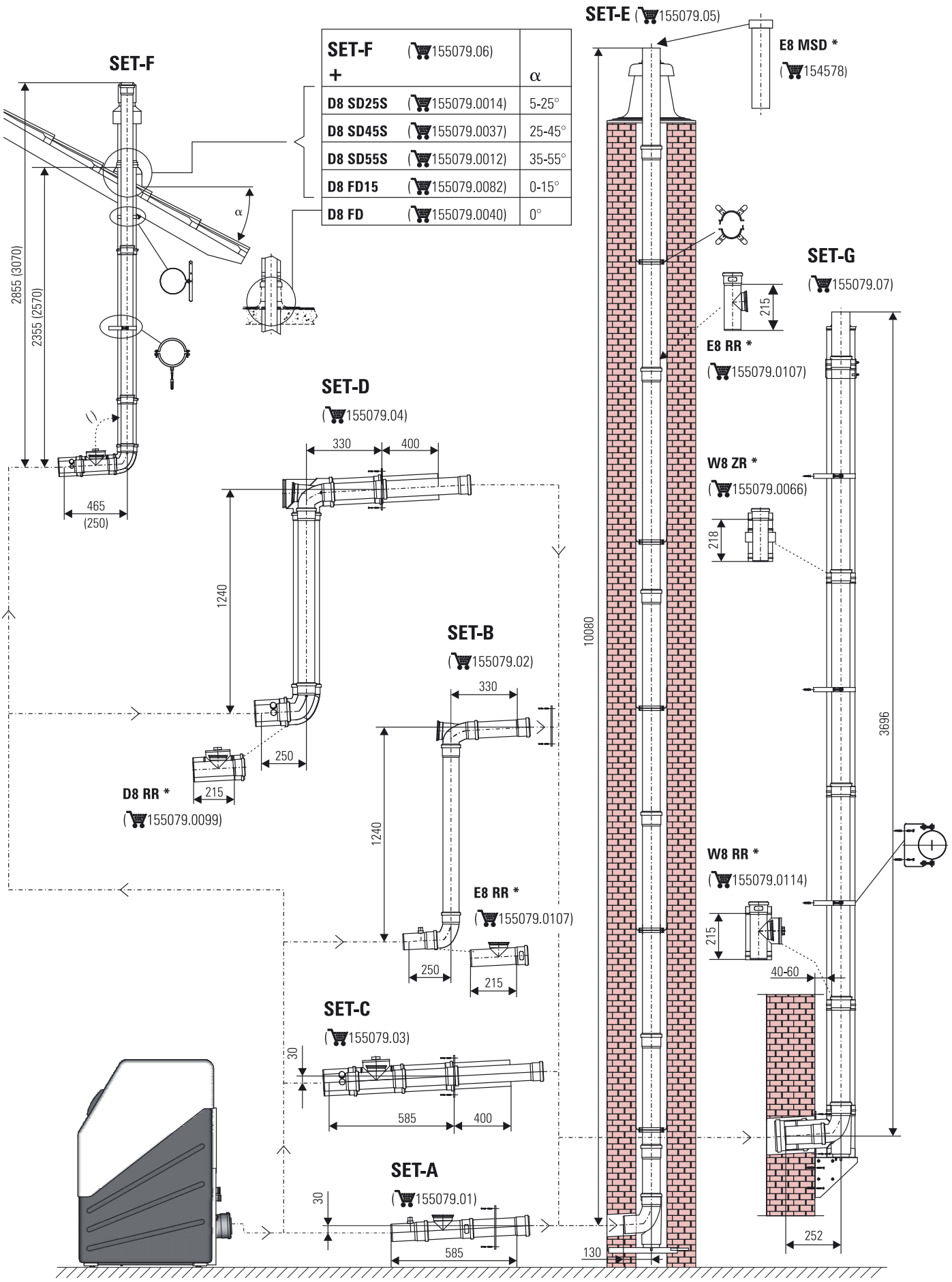


Fig. 4-8 Flue gas system components (if necessary)*

Additional kits

– Flue gas connection to a duct system (rigid flue gas line **SET E** or flexible flue gas line **SET O**)
– Flue gas connection for exterior wall line (**SET G**)

If necessary, additionally needed concentric LAS pipes for increased roof or ceiling heights, single wall PP pipes for chimney heights of more than 10 m or additional accessory components must be ordered.

4.6 Water connection

The ROTEX A1 BO has a common flow and common return for the heating circuit and storage tank filling. The connections are placed on the rear of the unit (refer to fig. 3-2).

For maintenance, it must be possible to swing the boiler up with the burner mounted. During installation of the flow and return lines leading upwards, sufficient free space must be provided for swinging the boiler up.

Instructions for water connection

CAUTION!

If the ROTEX A1 BO is connected to a heating system in which the pipelines or heating elements are made of steel or non-diffusion-sealed floor heating pipes, sludge and shavings may enter the boiler and lead to blockage, local overheating or corrosion damage.

- Rinse out the heat distribution network (in the existing heating system).
- Install the sludge separator (**SAS1**, **15 60 21**), in the heating return.

In accordance with EN 12828 you must install a safety valve in the flow line, on or in the immediate vicinity of the heat exchanger, with which you can limit the maximum permissible operating pressure in the heating system. There should be no hydraulic blocking elements between the heat generator and the safety valve.

Any steam or heating water which may escape must be diverted by a suitable blow-off line with constant gradient in a frost-protected, safe and observable manner.

A diaphragm expansion vessel of adequate dimensions and pre-set for the heating system must be connected to the return line. There should be no hydraulic blocking elements between the heat generator and the diaphragm expansion vessel.

ROTEX recommends using, for the hydraulic connection of the A1 BO, the safety group (**SBG A1, 15 60 18**) and the connection kit (**VSA1, 15 48 22**).

- Connect the blow-off line to the safety over-pressure valve and diaphragm expansion vessel in accordance with EN 12828.
- Connect the water for filling or refilling the heating system as specified by EN 1717 to avoid contamination of drinking water by backwash.

The line should be routed so that the upper half of the burner chamber of the ROTEX A1 BO can be hinged open without any problems after installation (fig. 4-10).

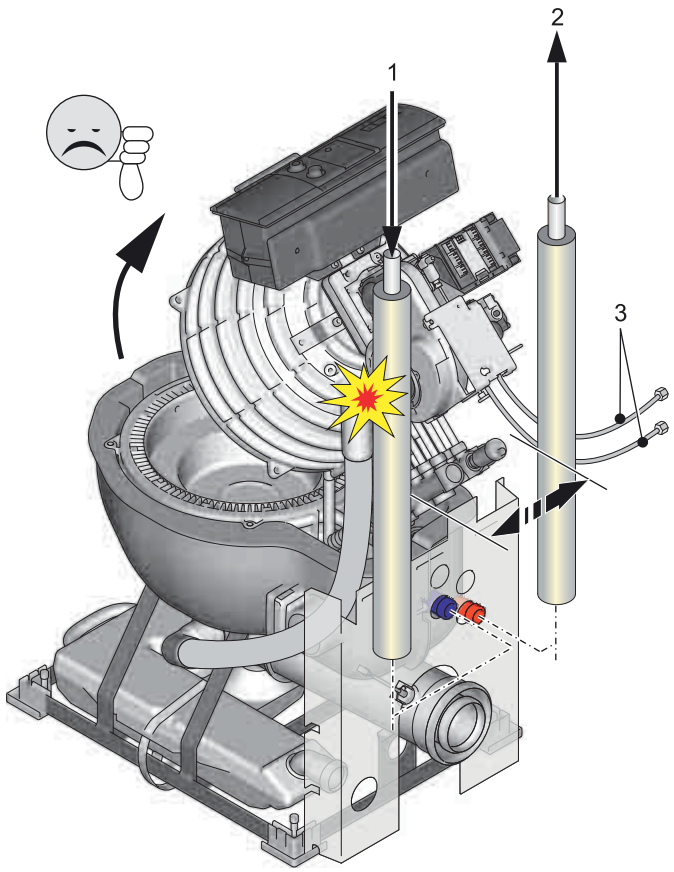


*Fig. 4-9 Heating lines installing (**Wrong**)*

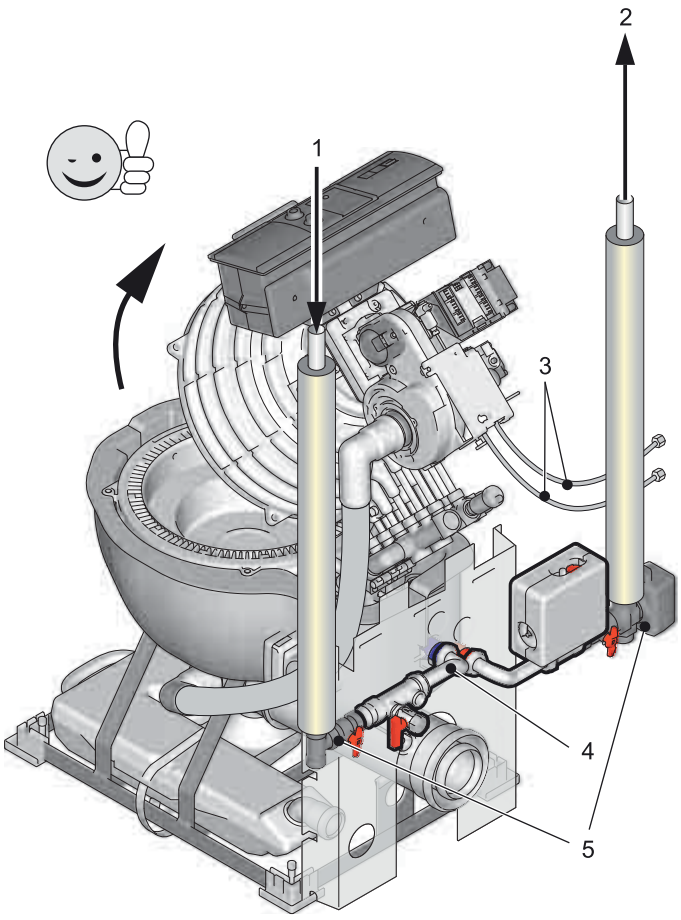


*Fig. 4-10 Heating lines installing (**Right**)*

– **Water shortage protection**: The overheating protection of the ROTEX A1 BO safely shuts off the Oil condensing boiler in case of lack of water and locks it. No additional water shortage protection is needed in the construction.
– **Avoid damages caused by deposits and corrosion:** Observe the relevant regulations of technology to prevent creation of corrosion products and deposits.
Measures for desalination, softening or hardness stabilization are necessary, if the filling and top-up water have a high total hardness (>3 mmol/l - sum of the calcium and magnesium concentrations, calculated as calcium carbonate.

4.7 Connect the condensate drain

The condensation generated in oil condensing technology has a **pH value between 1.8 and - 3.7**.

Depending on the regulations of the community waste water regulations, neutralisation can be dispensed with, if the condensing boiler is operated **exclusively** with **low-sulphur heating oil EL**.

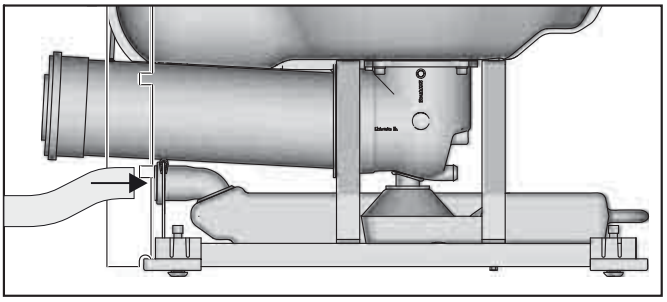


Fig. 4-11 Connecting the condensate drain hose

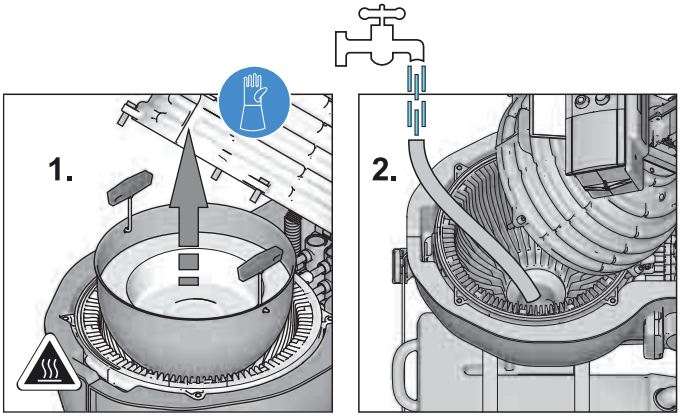


Fig. 4-12 Fill condensate box with water

Connection

The condensate box is factory-assembled in the boiler cradle and connected to the flue gas connecting piece of the boiler. The connection to the wastewater network is designed for **HT piping DN 40**.

- Lay the condensate drain sloping down from the boiler so that condensation will not accumulate in the flue gas manifold.
- In order to avoid accumulation in the flue gas connection of the boiler, make sure that no siphon is formed between the condensate drainage hose and the connection with the wastewater line.
- Fill the condensate box with water in order to prevent flue gas from escaping into the installation room. To do this, either:
  – Open the boiler body and lift out the combustion chamber insert (see section 9.2.5); top up condensate pipe using a hose (see fig. 4-12) or,
  – Unscrew the inspection lid of the connecting piece of the flue gas pipe and fill the condensate box by using a hose held in the flue gas pipe.
- Check the condensate drain section for leakage.

4.8 Establish connection and electrical equipment

4.8.1 Instructions concerning electrical connection

WARNING!

Live parts can cause an electric shock on contact and cause fatal burns or injuries.

- Before beginning work on live parts, disconnect them from the power supply (switch off fuse, main switch) and secure against unintentional restart.
- The electrical connection should only be performed by electrical engineers in compliance with valid standards and guidelines as well as the specifications of the energy supply company.

All electronic control and safety systems of the ROTEX A1 BO are connected and tested. Modifications on the electrical installation are dangerous and prohibited. The operator alone shall bear responsibility for any resulting damage.

A 3 m flexible cable is already connected inside the unit and placed in the control panel on the connecting circuit board. Only the external temperature sensor and other optional applications (e.g. storage tank sensor, circulation pump) still have to be connected to the boiler control panel.

4.8.2 Establishing the electrical connection

- Check the supply voltage (**~230 V, 50 Hz**).
- Disconnect the junction box of the domestic installation.
- Connect the mains connection of the ROTEX A1 BO to the junction box of the domestic insulation. Ensure that the polarity is correct.
- Restore power supply to the junction box of the domestic electrical installation.

Switchboard PCB

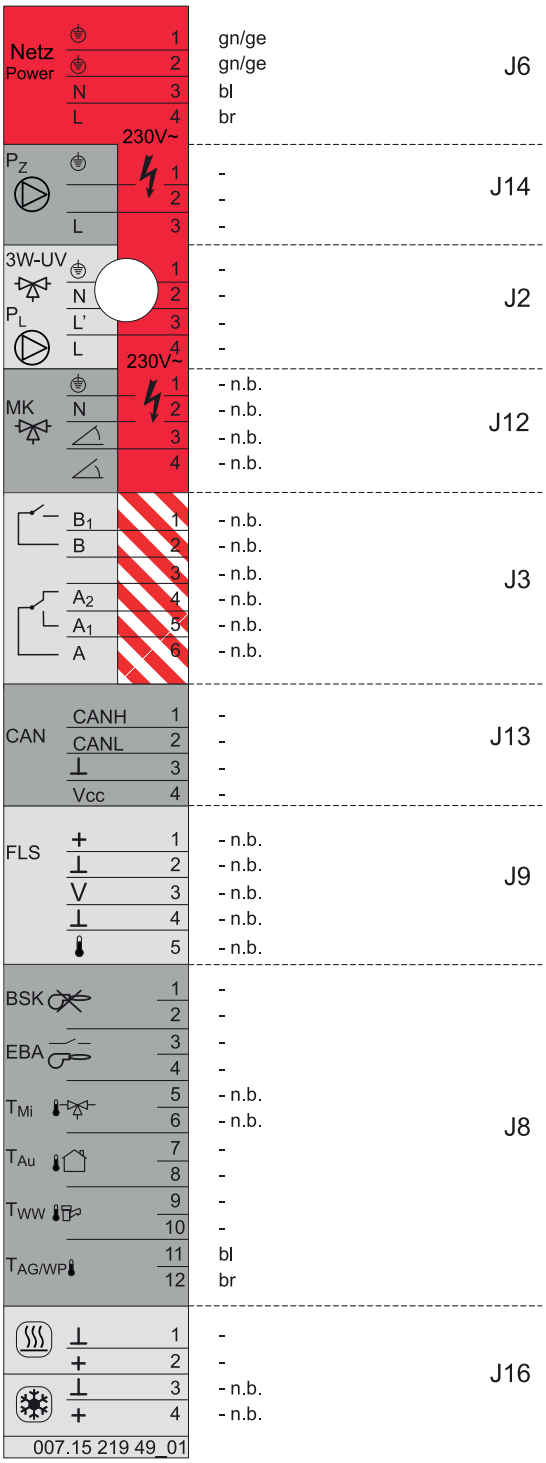


Fig. 4-13 Connection diagram of the circuit board connectors and cable colours of the factory-installed connection cables (for legend see tab. 4-6

Connections of the circuit board connectors:		*Cable colours:*	
J2	*3-way diverter valve or storage tank charging pump P_L**	***bl***	*blue*
J3	*Spare*	***br***	*brown*
J6	*Mains connection*	***ge***	*yellow*
J8	*Sensors, switching contacts*	***gn***	*green*
J9	*FlowSensor*	***n.a.***	*Contact not assigned*
J12	*Spare*		
J13	*CAN system bus*		
J14	*- Circulation pump P_Z*		
J16	*Room thermostat*		

* *3-Way diverter valve included in accessory VSA1 (🛒 15 48 22). The adapter cable (🛒 E 1500430) is needed for connecting a storage tank charging pump.*

Tab. 4-6 Legend for fig. 4-13

4.8.3 Connecting the temperature sensor

Instructions concerning temperature sensors

CAUTION!

The use of non-approved temperature sensors or ones which are not suited to the unit can lead to significant malfunctions in the regulation of the ROTEX A1 BO and damage the unit's controller.

- Use only the ROTEX temperature sensor available as an accessory.

The ROTEX A1 BO can regulate the flow temperature, dependent on the weather. For this function, you will need the external temperature sensor (**RoCon OT1,** 🛒 **15 60 70**).

The temperatures captured by the unit's internal temperature sensors (flow and return flow temperature sensor, flue gas temperature sensor) are used for the output control of the burner and for fault detection. The temperature sensors are already factory-connected and can be plugged directly to the respective sensor, if they need to be swapped.

If a hot water storage tank is used, the connected storage tank temperature sensor must be mounted at the suitable position in the hot water storage tank (observe installation instructions for the hot water storage tank).

To regulate a mixer circuit you will need the Mixer Module (**RoCon M1,** 🛒 **15 70 68**), which includes the mixer circuit flow temperature sensor.

Additional information and a detailed description can be found in the documentation "ROTEX Regulator RoCon BF Controller"". It is included in the A1 BO scope of supply.

External temperature sensor

- Choose a location at about one third of the building height (minimum distance from floor: 2 m) at the coldest side of the building (North or North-East). Thereby, exclude the proximity of external heat sources (chimney, air shafts) and direct sunshine.
- Place external temperature sensors in such a way that the cable exit points face downwards (prevents humidity ingress).

CAUTION!

The parallel layout of sensor and power lines within a single installation pipe can lead to significant malfunctions in the regulation of the ROTEX A1 BO.

- Always lay the sensor line separately.

- Lay probe line and connect to the ROTEX A1 BO controller.
- Connect the external temperature sensors with a dual core cable (minimum cross section **1 mm²**).

Storage tank temperature sensor

The storage tank temperature sensor is included in the scope of supply of the connection kit A1 (**VSA1,** 🛒 **15 48 22**) or it can be supplied separately as an accessory (**RoCon DT1,** 🛒 **15 60 68**).

- Connect the sensor line to the sensor plug **J8**, connection T_{WW} (see fig. 4-13).

4.8.4 Connect the additional electrical components

When using a hot water storage tank you must connect a 3-way diverter valve (a) or a storage tank charging pump (b) to the switching field board. For this:

a) connect the connection cable of the 3-way diverter valve, included in the scope of supply of the connecting kit A1 (**VSA1, 15 48 22**) or

b) the adapter cable for the connection of a storage tank charging pump (**E 1500430**)

the the PCB plug **J2** (see fig. 4-13).

Additional optional regulating system components (room controllers, mixer modules etc.) are connected to the switching field via the PCB plug **J13**.

Additional switching contacts can be connected to the PCB plug **J8** for external boiler control.

Additional information and a detailed description can be found in the documentation "ROTEX Regulator RoCon BF Controller"". It is included in the A1 BO scope of supply.

4.9 Connecting and filling up the oil line

The oil connection must be implemented according to the local regulations in the single strand system with an suction-side built-in ventilation oil filter.

ROTEX recommends using EL low sulphur heating oil in order to achieve the highest efficiency and to keep the maintenance expenditure low.

Admixing bio heating oils is possible (see chapter 3.2).

- Lay oil hoses. Whilst doing so, ensure the following:
  - that the combustion chamber can be opened without removing the oil hoses,
  - that oil hoses do not buckle.
- Place the ventilation oil filter such that the oil hoses are connected without tension and the top half of the boiler can be opened without hindrance.
- Insert the supplied Universal Micro-filter replacement insert MC-7 in the venting oil filter (generally use only paper filters with maximum 25 µm).
- Connect oil line Whilst doing so, ensure the following:
  - The inner diameter of the oil line must not be greater than 8 mm. As an oil line use the ROTEX VA-Oil oil feeding line or copper pipes with diameter between 6 and 8 mm as the oil line.
  - The total resistance of the suction line (total of height difference, line resistance and individual resistances) must not exceed 4 m water column (0.4 bar).
- Fill up oil line. Suction the oil by using a hand pump.
- Check the oil line in accordance with local regulations and check for leaks.

4.10 Filling the heating system

Only fill the heating system if all installation work has been completed.

Adjusting the pressure gauge

Before the initial filling of the system you must set the correct minimum pressure mark on the glass of the pressure gauge (in safety group **SGB A1, 15 60 18**):

- Rotate the pressure gauge glass in such a way that the minimum pressure mark corresponds to the **system height +2 m** (1 m water column corresponds to 0.1 bar).

Checking the water quality

- Observe the instructions concerning the water connection according to section 4.6.

Filling the system

WARNING!

Contamination of drinking water endangers the health.

- When filling the heating system, avoid backwash of the boiler water into the drinking water lines (adhere to EN 1717).

With a hot water storage tank connected using the connection kit A1 (**VSA1, 15 48 22**):

- Engage the hand lever on the 3-way diverter valve (see fig. 8-4) in the centre position (only possible when de-energised).

The centre position is on stable, when the 3-way switch valve has not power. The 3-way-switch valve unlocks automatically, when the voltage at the drive motor for the valve position AB-A is applied (storage tank charging).

ZB_RoCon_VentFkt (008.1534699)

- Connect the filling hose with return flow inhibitor (½") at the filling and draining fittings (KFE cock, fig. 4-3, pos. 3) and secure against sliding by using a hose clamp.
- Open water cock on the supply line.
- Open the KFE cock and observe the pressure gauge (in safety group **SGB A1, 15 60 18**).
- Fill the system with water until the marking of the system overpressure is roughly in the centre of the green range of the pressure gauge display.
- Close the filling & draining cock.
- Vent the entire heating network (open the system control valves).
- Check the water pressure on the pressure gauge again and top up with water if necessary.
- Close the KFE cock and the water supply cock.
- Remove the filling hose with backflush prevention from the filling and draining fitting.

- **ZB_RoCon_VentFkt (008.1534699)**

5 Start-up

WARNING!

If not started up properly, a ROTEX A1 BO can be a health and safety risk endangering human life and its operation may be adversely affected.

- The ROTEX A1 BO may only be started up by authorised and trained heating experts.

CAUTION!

A ROTEX A1 BO which was put into operation incorrectly can cause damge to property and the environment.

- Observe the relevant regulations of technology to prevent creation of corrosion products and deposits.
- Measures for desalination, softening or hardness stabilization are necessary, if the filling and top-up water has a high total hardness (>3 mmol/l - sum of the calcium and magnesium concentrations, calculated as calcium carbonate).
  – We recommend Fernox scale and corrosion protection agent **KSK (15 60 50)**.
- Whilst the installation is running, the water pressure is monitored automatically by the boiler control system. If the water pressure is too low, this will be displayed in the boiler control system, fill up if necessary.

Incorrect start-up makes the manufacturer's guarantee for the unit void. If you have questions, please contact our Technical Customer Service.

5.1 Initial start-up

Once the ROTEX A1 BO is installed and fully connected, it can be put into operation by expert technicians.

Requirements

– The ROTEX A1 BO is installed correctly. If a pressure device is used as separate oil pump, the installation site must also be secured by using a leakproof tray and a filter cup made of metal, (see chapter 4.4.1).
– The ROTEX A1 BO is fully connected.
– The heating system is filled and charged at the correct pressure.
– The oil valves are open and the oil line is topped up.

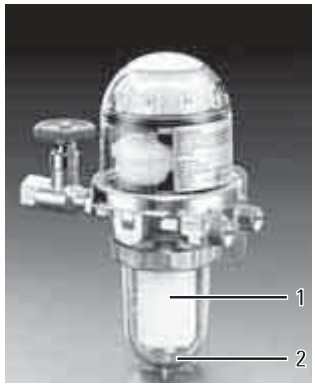
Tests prior to start-up

- Check all connections for leakage.
- Check all the points in the checklist in section 5.2. Log the test results on the checklist.

Only if **all points** on the checklist can be answered with **yes** may the ROTEX A1 BO be put into operation on a **temporarary** basis.

Bleeding the oil line, checking the oil pressure

The oil line must be completely vented at the beginning of the start-up and the oil pressure must be checked.



1 *Filter*
2 *Filter cup*

Fig. 5-1 Oil connection with bleeding oil filter

1 *Manometer connection*
2 *Vacuum meter connection*

Fig. 5-2 Oil pump

- Connect vacuum meter to the oil pump (Vacuum meter connection, fig. 5-2, pos. 2)
- Switch on the mains switch. Wait for the start phase.
- Open the venting screw on the oil filter.
- Vent oil line and measure the oil pressure on vacuum meter.
  ➔ The vacuum may be maximum 0.4 bar (better: 0.2 bar).

Start-up

- Switch on the mains switch. Wait for the start phase.
- Adjust the hand operation on the ROTEX Controller RoCon BF [Special Level] (see documentation "ROTEX Controller RoCon BF").

5 Start-up

5.2 Checklists for start-up

Checklist before start-up		
1.	Is the ROTEX A1 BO correctly set up according to an admissible set up variant and without visible damages?	❑ **yes**
2.	When using a pressure assembly: Is the installation site additionally secured (leakproof tray, filter cup of metal)?	❑ **yes**
3.	Combustion air supply secured?	❑ **yes**
4.	Adequate ventilation and extraction in the heating room with limited room-air independent (separate flue gas/intake air) or room-air dependent operation?	❑ **yes**
5.	Does the mains connection conform to the specifications?	❑ **yes**
6.	Is the mains voltage 230 V, 50 Hz?	❑ **yes**
7.	Flue gas line connected correctly with a consistent gradient (at least 3°) and no leaks?	❑ **yes**
8.	Condensate box correctly connected, filled with water and leakproof?	❑ **yes**
9.	On restoration: Heat distribution network flushed out? Sludge separator fitted in heating return?	❑ **yes**
10.	Is the diaphragm expansion tank mounted according to specifications and of the requisite size?	❑ **yes**
11.	Is the safety valve connected to a safe free drain?	❑ **yes**
12.	Has the quality of the filling water been checked and has any necessary water preparation been carried out?	❑ **yes**
13.	System water pressure within prescribed range?	❑ **yes**
14.	Are boiler and heating system vented?	❑ **yes**
15.	In case of systems with a hot water storage tank: a) Storage tank filled? b) Is the 3-way diverter valve correctly mounted on the flow connection and PCB plug inserted?	 ❑ **yes** ❑ **yes**
16.	Are all sensors connected and correctly positioned?	❑ **yes**
17.	Mixer group, mixer module and mixer circuit sensor (optional) connected correctly?	❑ **yes**
18.	Room controller (optional) correctly connected to the PCB?	❑ **yes**
19.	Oil connection connected correctly and properly in accordance with regulations and checked for leaks?	❑ **yes**
20.	Oil tank adequately filled and oil valves opened?	❑ **yes**

The system may only be started up if all questions can be answered with "Yes".

Checklist after start-up		
A	Is the heating circulation pump running? Is the heater heating up?	❑ **yes**
B	Is the oil line vented?	❑ **yes**
C	Is the oil pressure within the permissible range?	❑ **yes**
D	Have the burner settings been checked by using a flue gas analyser and readjusted if necessary?	❑ **yes**
E	Has the resistance of the flue gas pipe been measured and if so, is the measured resistance higher than the required minimum resistance?	❑ **yes**
F	In case of systems with a hot water storage tank: Has the 3-way diverter valve connector been plugged on following start-up?	❑ **yes**

The system may only be handed over to the user/owner if all questions can be answered with "Yes".

- Fill out the enclosed installation and instruction form as well as the first pages of the operating manual together with the.

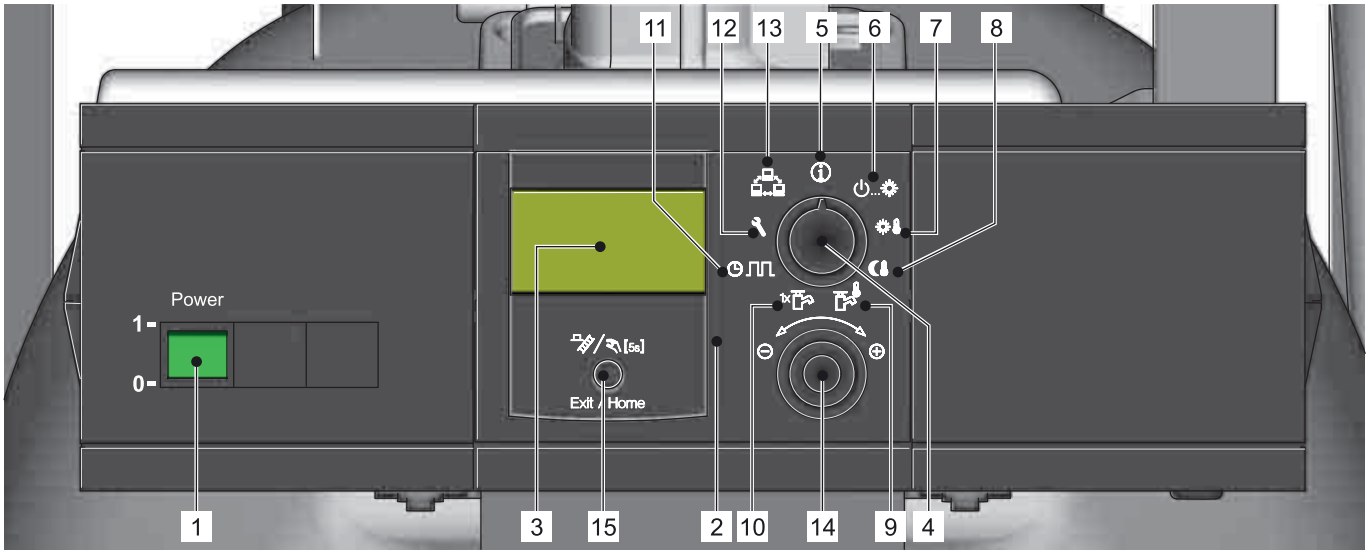
6 Control unit

6.1 Operating elements on the boiler control panel

The ROTEX A1 BO is equipped with the ROTEX RoCon BF Regulation. The fitted digital control system serves to actuate a direct heating circuit and a storage tank charging circuit.

It can be extended in many ways with accessory components.

A detailed description can be found in the documentation of the ROTEX RoCon BF Controller" Reglator.



1	*Mains switch*	***6***	*Setting: Operating Mode*	***11***	*Setting: Time Program*
2	*Operating part RoCon B1*	***7***	*Setting: Set Temp Day*	***12***	*Setting: Configuration*
3	*Clear text display*	***8***	*Setting: Set Temp Night*	***13***	*Not assigned*
4	*Rotary switch*	***9***	*Setting: DHW Set Temp*	***14***	*Rotary button*
5	*Setting: Info*	***10***	*Setting: DHW Reheating*	***15***	*Exit button (jump back, Special Level, fault rectification function)*

Fig. 6-1 Operating elements on the boiler control panel

Mains switch

Turn the ROTEX A1 BO on and off. When the heating system is on, the mains switch is illuminated green.

RoCon BF Controller" Operating Part

The operating section is equipped with a coloured backlit clear text.

Malfunctions are generally indicated by a fault code and a clear text fault message on the display.

For troubleshooting instructions refer to chapter 10 "Faults and malfunctions".

The colour of the backlighting indicates the operational status and the programming mode:

White:	Standard lighting, normal operational diaplay.
Red	Fault status, depending on the type of fault the boiler continues to operate with restrictions.
Green:	Programming mode with operator authorisation.
Blue:	Programming mode with expert authorisation.

In normal system operation, the rotary switch should be in the position ***"Info"***.

In the display on the controller the most important system temperatures and operational conditions are displayed.

Additional information and a detailed description can be found in the documentation "ROTEX Regulator RoCon BF Controller"". It is included in the A1 BO scope of supply.

6.2 Replacing the operating section RoCon B1

WARNING!

Live parts can cause an electric shock on contact and cause life-threatening burns and injuries.

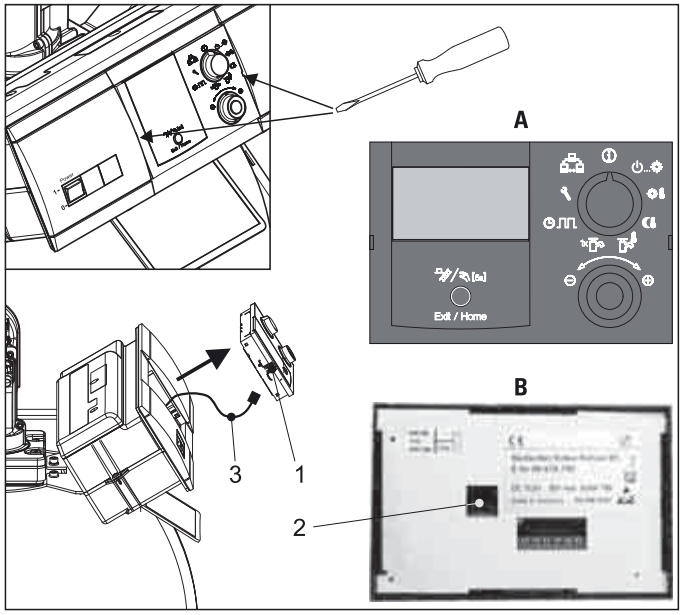
- Before beginning work on live parts, disconnect them from the power supply (switch of fuse, main switch) and secure against unintentional restart.

Removing the operating section

- Release the lugs on both sides of the operating section by sliding in a small flat bladed screwdriver in (fig. 6-2, pos. 1) and pull the operating section out to the front.
- Unplug the communication cable on the back of the operating section for complete removal.

Fitting the operating section

- Plug in the communication cable on the back of the operating section.
- Slide the operating section into the switching panel cut-out until the lugs click in place again.



A *Front view*
B *Rear view*
1 *Operating section RoCon B1*
2 *Plug connection for communication cable*
3 *Communication cable*

Fig. 6-2 Removing/fitting the operating section

6.3 Changing the boiler control panel

WARNING!

Live parts can cause an electric shock on contact and cause life-threatening burns and injuries.

- Before beginning work on live parts, disconnect them from the power supply (switch of fuse, main switch) and secure against unintentional restart.

Removal (observe sequence)

The position and arrangement of the components described below is shown in fig. 6-16 on page 29.

1. Remove the sound insulation hood (see chapter 9.2.1).
2. Remove boiler cladding (see chapter 9.2.1).
3. Remove both top heat insulation shells (see chapter 9.2.1).
4. Unscrew the switching panel cover and remove (fig. 6-3).

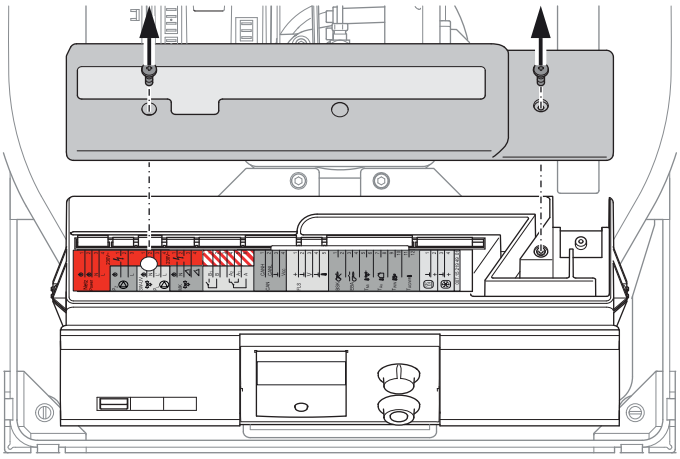


Fig. 6-3 Unscrew control panel cover

5. Pull out all plugs from the switchboard PCB (fig. 6-4).

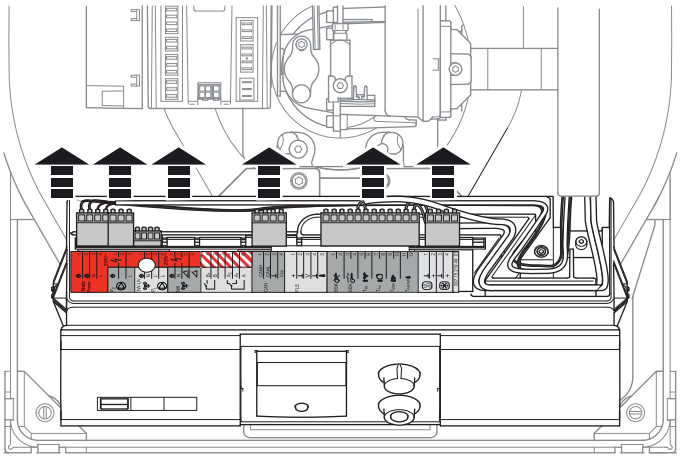


Fig. 6-4 Pull off the coded connector

6. Pull out the sensor and the connection cables from the cable ducts of the control panel (fig. 6-5).

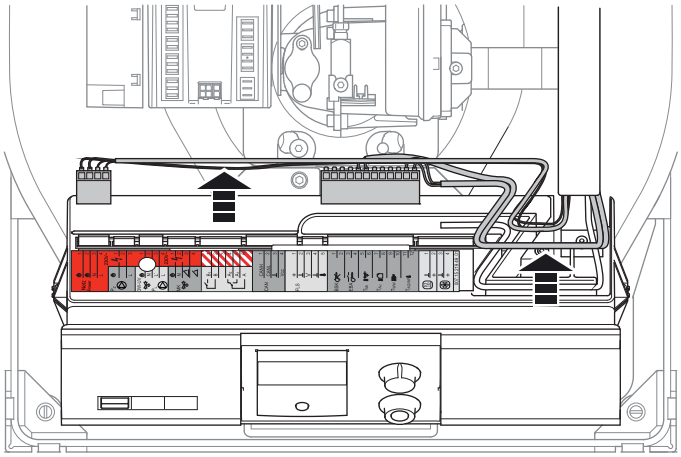


Fig. 6-5 Pull out the cable

7. Unplug the plugs on the internal cable connections from the individual components (flue gas temperature sensor, 2 pump plugs, plugs X1 and X5 on the automatic firing, pressure sensor).
8. Remove all the cables from the guiding elements.

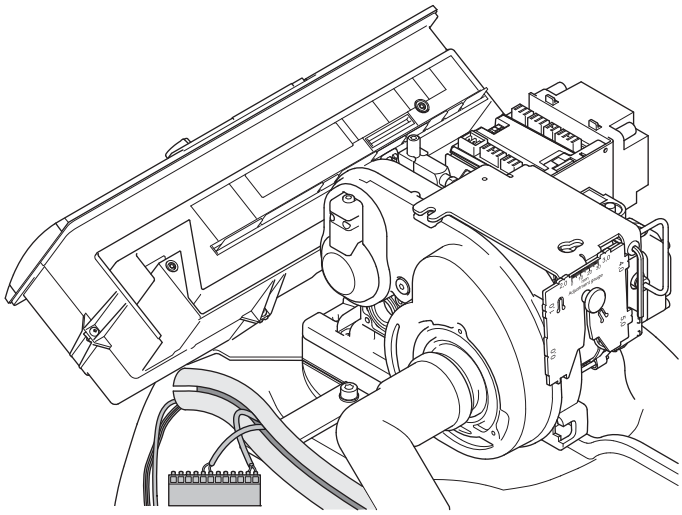


Fig. 6-6 Unhook the cable duct from the switching panel

9. Remove the fixing screws of the boiler control panel with wrench SW 8 (fig. 6-7) and remove the control panel.

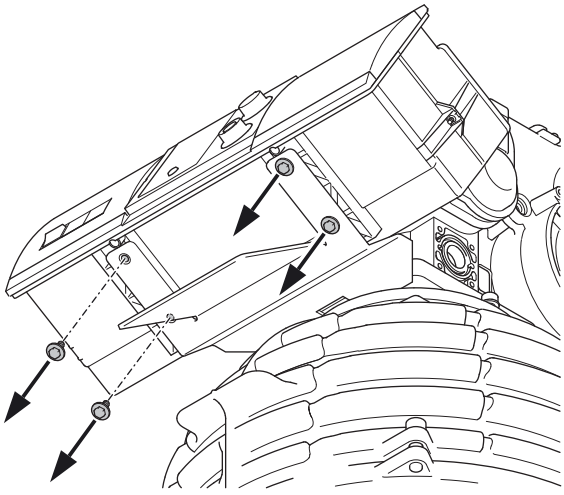


Fig. 6-7 Remove the fixing screws for the boiler control panel

Installation (observe sequence)

1. Insert the boiler control panel into the holder. Insert and tighten the fixing screws.
2. Hook the cable duct into the contrpol panel.
3. Hook in/fix the internal cables on the guiding elements provided.
4. Plug back the plugs on the internal cable connections to the individual components.
5. Place all sensor and connecting cables into the cable ducts of the control panel. Ensure the correct cable routing through the strain relief plates.
6. Insert all connectors on the switchboard PCB. The connectors are colour and shape-coded to avoid confusion. Do not force the connector!
7. Mount the control panel cover.
8. Fit both top heat insulation shells.
9. Fit the boiler cladding.
10. Replace the noise insulation hood and secure the locking screws.

6.4 Changing cables

The connection cables can be loosened either on the boiler control panel or on the component in question.
– The cables for the internal components in the unit are connected to the circuit board connectors and cannot be released. They can be released from the respective components where they are plugged in.
– The cables for external components (e.g. external temperature sensors), or for components not included in the scope of supply, are connected to the circuit board connectors with screw terminals.

WARNING!

Live parts can cause an electric shock on contact and cause life-threatening burns and injuries.

- Before beginning work on live parts, disconnect them from the power supply (switch of fuse, main switch) and secure against unintentional restart.

Changing the cables (observe sequence)

1. Remove the sound insulation hood (see chapter 9.2.1).
2. Unscrew the switching panel cover and remove (see fig. 6-3).
3. Pull out the relevant sensor or connection cable from the cable duct.
4. Unplug the associated plugs from the control panel PCB, disconnect the cable from the PCB plugs if necessary.
5. Separate the other cable end from the component (release plug connection or remove the cable from the terminal).
6. Replace the cable. Ensure that the cable cross section is correct.

Install the new cable in reverse order. Whilst doing so, ensure the following:
– The technical specification of the new cable must correspond to the values of the replaced cables (e.g. conductor cross section).
– The circuit board connectors are colour and shape-coded. Do not force the connector!

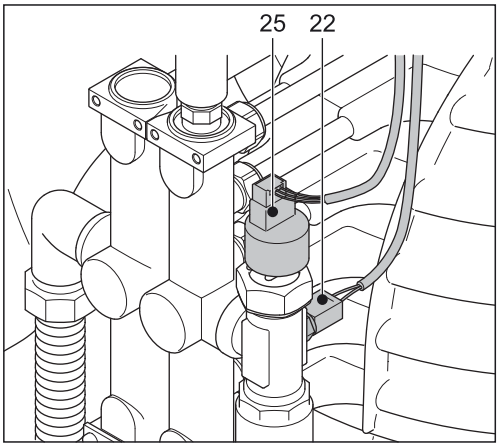
6.5 Changing the sensors

Sensors inside the unit (fig. 6-8, fig. 6-9) can be changed without having to open the boiler control panel.

WARNING!

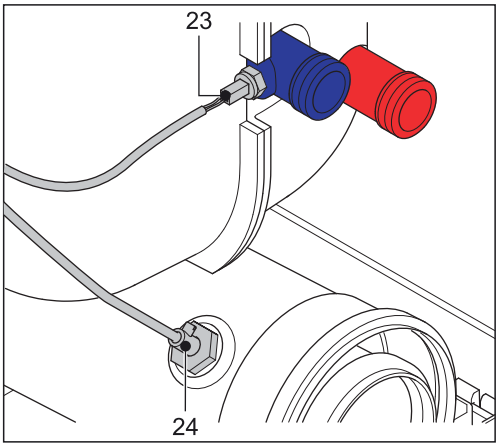
Live parts can cause an electric shock on contact and cause life-threatening burns and injuries.

- Before beginning work on the ROTEX A1 BO, disconnect therom the power supply (switch off fuse, main switch) and secure against unintentional restart.



22 *Flow temperature sensor*
25 *Pressure sensor*

Fig. 6-8 Position of the sensors on the boiler (1)



23 *Return flow temperature sensor*
24 *Flue gas temperature sensor*

Fig. 6-9 Position of the sensors on the boiler (2)

6.5.1 Changing flow / return flow temperature sensor

WARNING!

There is a danger of scalding from heating water.

flow and return flow temperature sensors are connected directly to the pressurised heating water.

- Close the ball cocks on the boiler flow and boiler return flow before removing the sensor, and depressurise the system through the KFE cock.

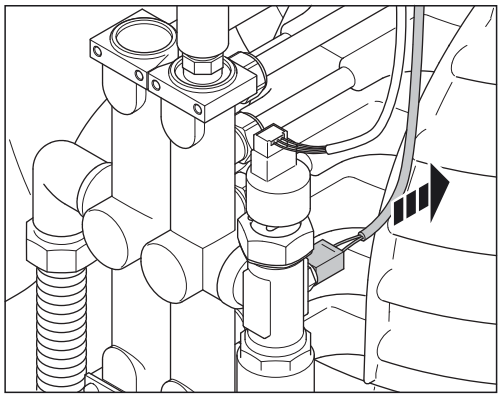


Fig. 6-10 Pull out the connector on the flow temperature sensor

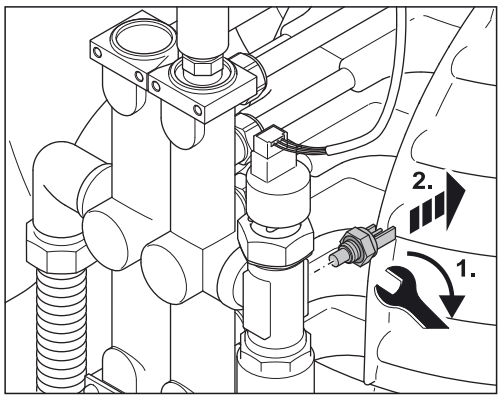


Fig. 6-11 Unscrew the flow temperature sensor

1. Remove the sound insulation hood and the boiler panelling. Remove the heat insulation shells for changing the flow temperature sensor (see section 9.2.1).
2. Pull out the connectors on the flow temperature sensor/ return flow temperature sensor (fig. 6-10).
3. Unscrew the flow /return flow temperature sensor using an open-jaw wrench SW 15 (fig. 6-11).
4. Screw in the new flow /return flow temperature sensor and plug in the cable with connector.
   The connectors are shape-coded. Do not force the connector!

6.5.2 Changing the flue gas temperature sensor

The flue gas temperature sensor is mounted in the flue gas duct of the heat generator using a packing gland and connected to the sensor cable using a floating plug connection.

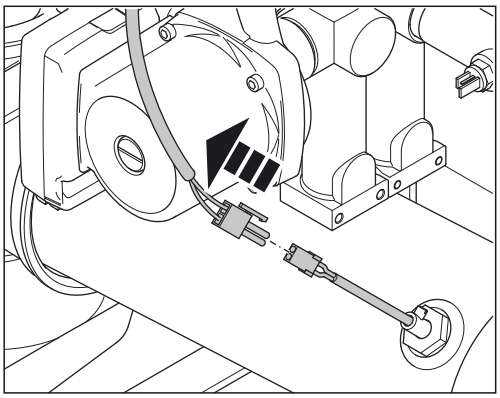


Fig. 6-12 Release the plug connection for the flue gas temperature sensor

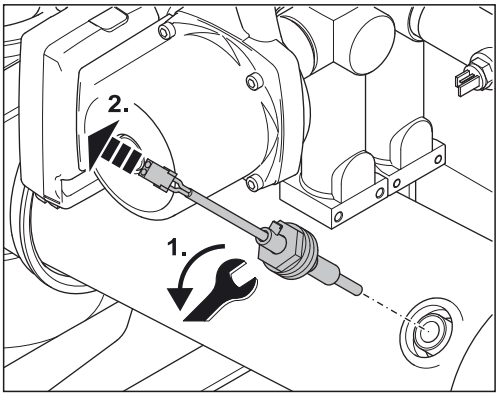


Fig. 6-13 Unscrew the flue gas temperature sensor

1. Remove the sound insulation hood and the boiler panelling. Release the plug connection on the sensor cable (fig. 6-12).
2. Unscrew the sensor sleeve from the flue gas duct by using an SW 24 wrench (fig. 6-13). The flue gas temperature sensor can only be completely changed with the sleeve.
3. Screw in the new sensor sleeve into the flue gas duct and tighten it carefully using the SW 24 wrench (plastic thread!).
4. Restore the plug connection on the sensor cable.

6.5.3 Changing the storage tank temperature sensor

The storage tank temperature sensor is connected directly to the connection terminals 9 and 10 of the 12-pin sensor connector **J8** in the boiler control panel.

For further information on fitting the storage temperature sensor see: "Storage temperature sensor" installation instructions.

1. Open the boiler control panel and pull connector **J8** off the circuit board (see section 6.3, steps 1 to 4).
2. Pull out the storage tank temperature sensor from the sensor immersion sleeve at the storage tank.
3. Bend the pressing springs on the new sensor and push the new sensor into the sensor immersion sleeve.
   ROTEX The insertion depth is marked on the ROTEX storage tank by a coloured marking, depending on the storage tank type.
4. Clamp the sensor cable on the connector of the connection terminals 9 and 10 of the 12-pin sensor connector **J8**, plug in the connector on the switchboard PCB and close the boiler control panel.

6.6 Replacing the fuse or control panel circuit board

WARNING!

Live parts can cause an electric shock on contact and cause life-threatening burns and injuries.

- Before beginning work on live parts, disconnect them from the power supply (switch off fuse, main switch) and secure against unintentional restart.

The fuse is in the switchboard PCB. Fuse type: 250 V, 4 AT IEC 60127-2/5.

1. Open the boiler control panel and pull out all connection plugs from the circuit board (see section 6.3, steps 1-4).

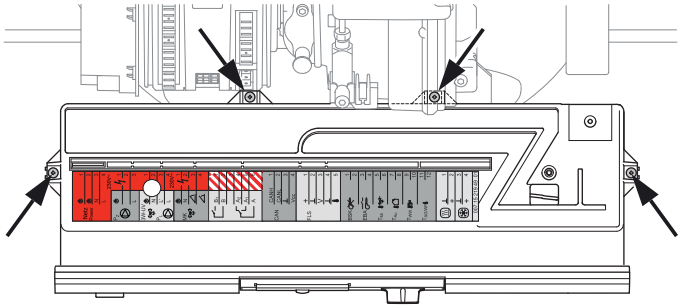


Fig. 6-14 Remove the locking screws from the control panel casing

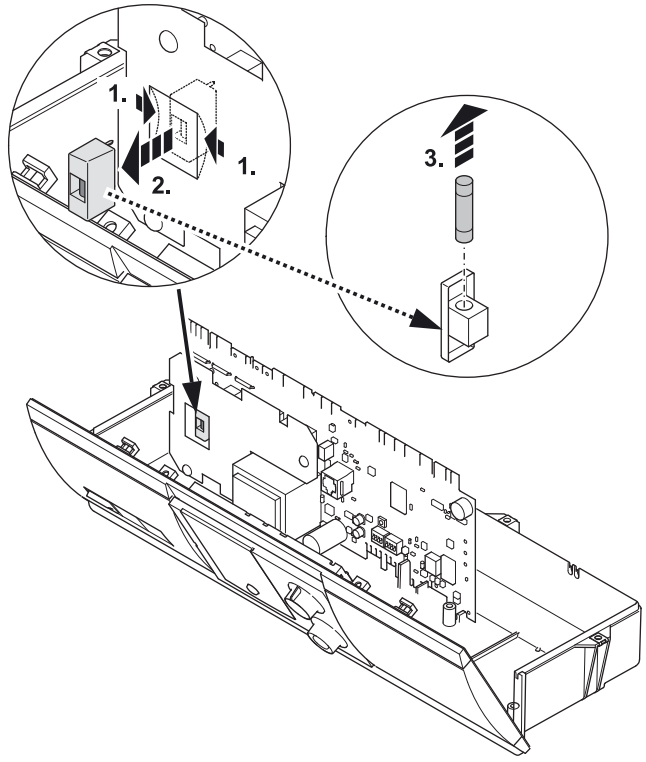


Fig. 6-15 Changing the fuse

2. Remove the 4 locking screws on the control panel casing using a screwdriver (fig. 6-14).
3. Remove the top of the casing.

CAUTION!

Electrostatic charges can lead to voltage arcing that can destroy the electronic components.

- Secure potential equalisation before touching the control panel circuit board (e.g. by touching the control panel mounting).

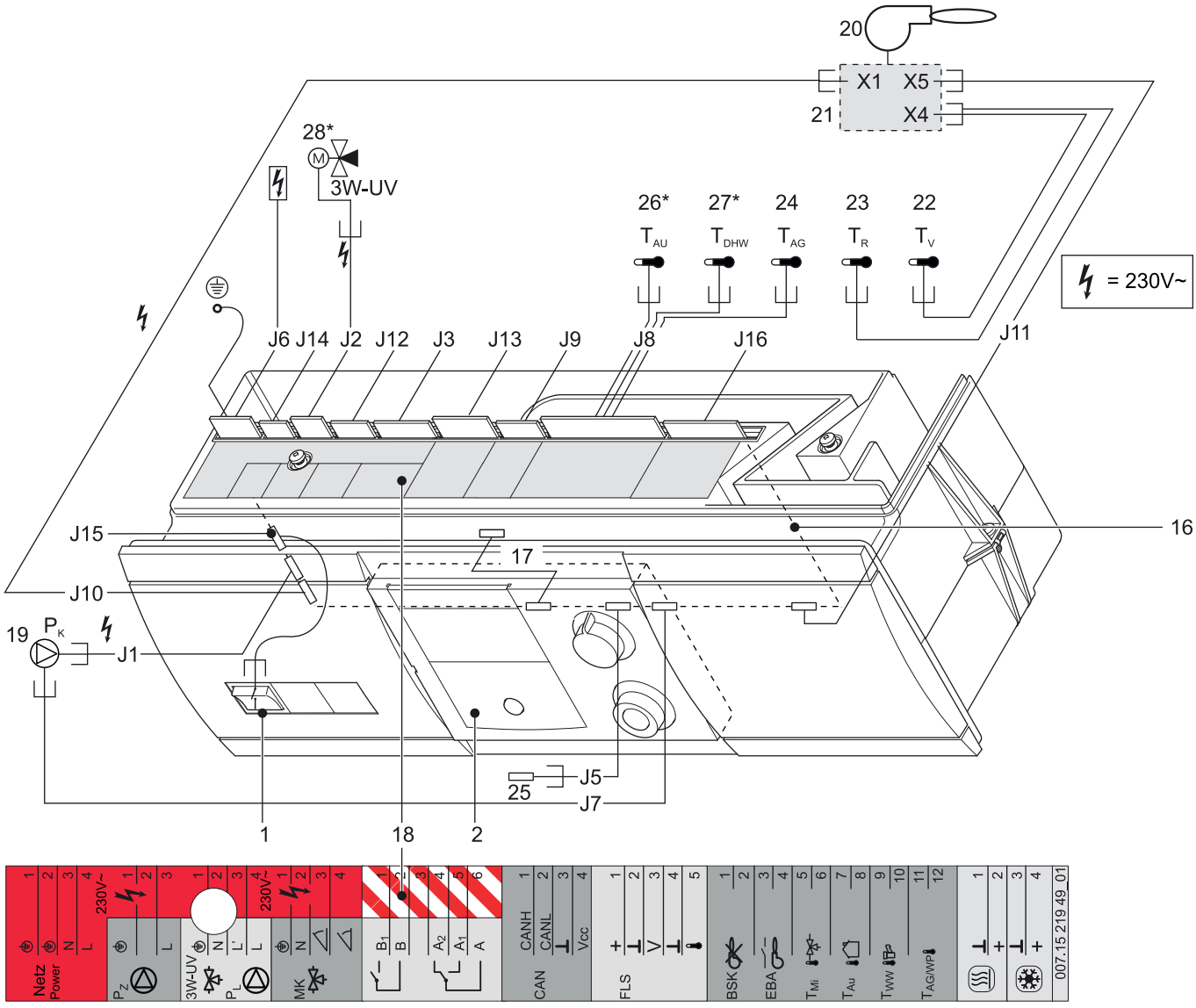
4. Lift the control panel board out of the bottom part of the housing.
5. Replacing the fuse or control panel circuit board (fig. 6-15).
6. Replace the control panel circuit board into the housing bottom section.
7. Replace top of casing.
8. Insert all connectors on the switchboard PCB. Close boiler control panel.

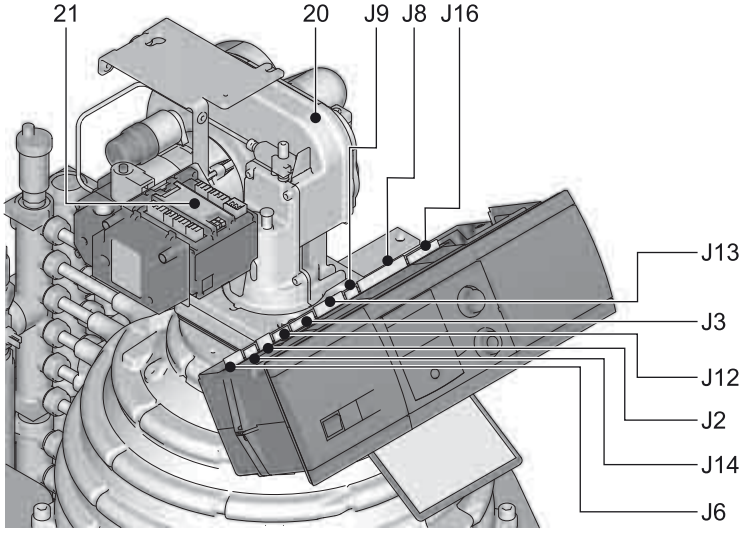
If the fuse immediately blows upon switching on again, there is a short circuit in the electrical system. Have a professional electrician remedy the cause of the short circuit before putting in a new fuse.

6.7 Wiring diagram

1	*Mains switch*
2	*Operating part RoCon B1*
16	*Switchboard PCB*
17	*Communication cable (switchboard PCB - operating section)*
18	*Stickers for connection assignment*
19	*Heating circulation pump*
20	*Oil burner*
21	*Automatic firing CM165*
22	*Flow temperature sensor*
23	*Return flow temperature sensor*
24	*Flue gas temperature sensor*
25	*Pressure sensor*
26	*External temperature sensor*
27	*Storage tank temperature sensor*
28	*3-way diverter valve*
J1	*3-pin circuit board connector with pump cable mains)*
J2	*4-pin circuit board connector with valve cable*
J3	*6-pin circuit board connector (not occupied)*
J5	*3-pin circuit board connector with pressure sensor cable*
J6	*4-pin circuit board connector with clamped mains cable and earthing slots*
J7	*2-pin circuit board with PWM signal cable for external heating circulation pump*
J8	*12-pin circuit board connector to connect sensorsand control lines flue gas temperature sensor is connected)*
J9	*5-pin circuit board connector (not occupied)*
J10	*3-pin circuit board connector with mains cable for automatic firing CM165*
J11	*5-pin circuit board connector with mains cable for automatic firing CM165*
J12	*4-pin circuit board connector (not occupied)*
J13	*4-pin circuit board connector for connecting additional regulating system components (CAN-Bus)*
J14	*3-pin circuit board connector for clamping a circulation pump*
J15	*4-pin circuit board connector with switch cable*
J16	*4-pin circuit board connector for connecting a room thermostat (digital demand contact)*
*	*Accessories*

Tab. 6-1 Legend for fig. 6-16





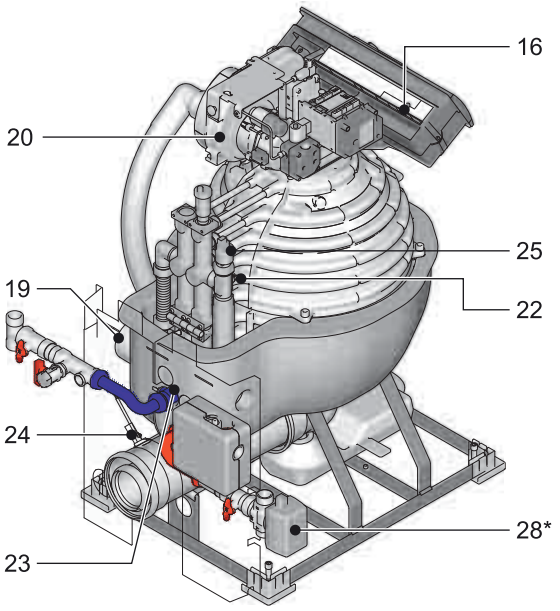
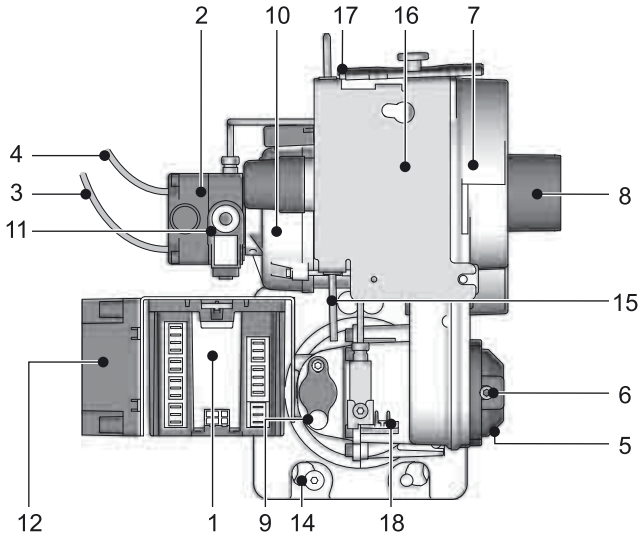


Fig. 6-16 Wiring diagram ROTEX A1 BO (for legend see tab. 6-1)

7 Oil burner

7.1 Design and brief description



1	*Automatic oil firing unit*	**15**	*Service Allen key*
2	*Oil pump*	**16**	*Holder for service position*
3	*Heating oil suction line*	**17**	*Setting gauge* [1)]
4	*Heating oil return line*	**18**	*Scale of recirculation opening*
5	*Scale air throttle*	**19**	*Flame tube*
6	*Adjusting screw for air throttle*	**20**	*Recirculation tube*
7	*Fan rigid in compression*	**21**	*Nozzle connection cover*
8	*Air supply connector*		
9	*Blower pressure measurement spigot*	[1)]	*Almost any setting and maintenance work can be carried out on the burner using the tools provided.*
10	*Electric motor*		
11	*Solenoid valves*		
12	*Ignition transformer with flame monitor*		
13	*Burner flange with seal*		
14	*Service screw*		

Fig. 7-1 Oil burner plan view (front view)

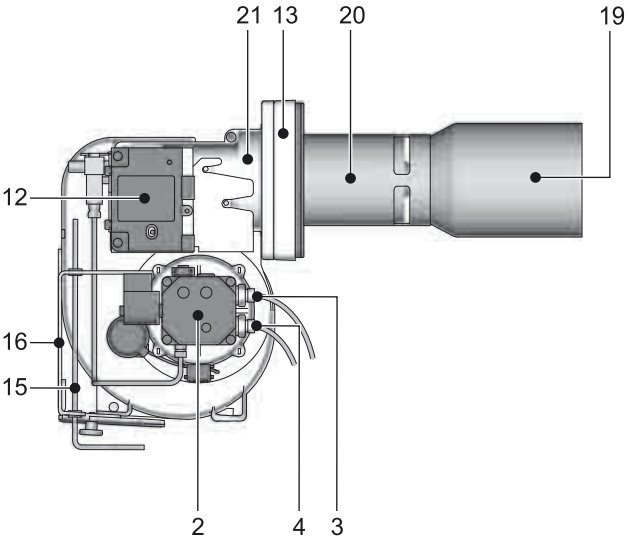


Fig. 7-2 Oil burner - side view from the left for legend see fig. 7-1

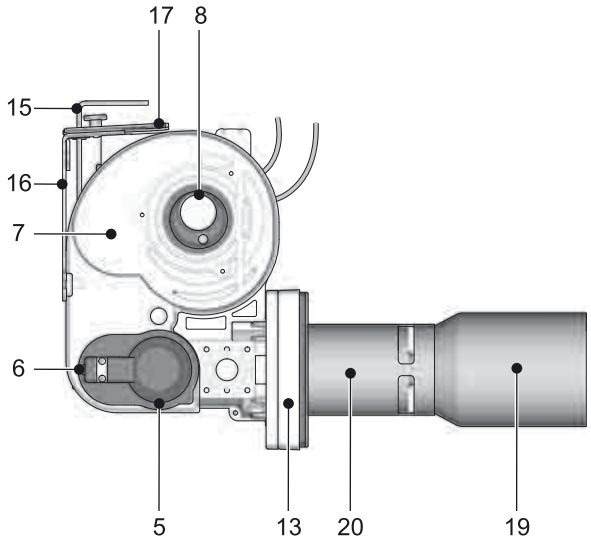


Fig. 7-3 Oil burner - side view from the right for legend see fig. 7-1

The blue burner installed as standard is similar in design and function to EN 267. The burner is engaged on the burner flange with a bayonet lock and secured with **a** service screw. The construction of the burner head with internal flue gas recirculation makes high efficiency, low nitrogen oxide combustion possible. The recirculation tube is firmly mounted in the burner flange.

Preheating oil

The heating oil is preheated during the start phase. To do this the boiler controller first switches the nozzle rod heating on. As soon as the oil preheating temperature is reached, the thermostat of the nozzle bar heating triggers the programme sequence. The heating time with a cold start is 2 - 3 minutes.

Sequence of firing programme

The firing programme is monitored by the automatic firing unit. It proceeds with the following steps:

– Oil preheating.
– Electric motor starts up, preliminary ventilation.
– Ignition switches on.
– Solenoid valve opens.
– Flame formation
– Ignition switches off.
– Burner runs, as long as there is demand for burner by the control and the flame monitor enables the burning process.
– When the burner request by the Control ends: Solenoid valve closes, oil preheating switches off.
– Post-ventilation
– Electric motor switches off.

Automatic firing CM165-R1

The oil automatic firing CM165-R1 controlled by a microprocessor controls and monitors the firing programme and the temperature sensors for the flow and return temperature. It features the following properties:
– Direct communication with the controller via the internal eBus, via which all the available information (temperature values, control signals, fault information) is transmitted. This is evaluated by the controller and displayed on the control section.
– Fulfilling all safety-relevant functions for combustion monitoring and for safety temperature limiting.
– Possibility of carrying out certain parameter adaptions via BurnerChipCard (BCC).
– Stable programme times, independent of the fluctuations in the mains voltage or ambient temperature.
– Operating safety, even in the event of power failures. The automatic firing unit switches off in the event of a power failure without a fault - signal and on again once the normal voltage has been resumed.

7.2 Safety function

Fault shutdown and malfunction indicator

A locking fault shutdown takes place if:
– if a flame signal is present during pre-ventilation (remote light monitoring - fault code 11),
– during the start (fuel release) a flame is not detected after 5 secs (safety time) and 4 additional failed start attempts,
– the flame fails 5x during continuous burner request (fault code 5),
– the flow temperature reaches the value for safety temperature limiting (fault code 1),
– the return temperature reaches the value for safety temperature limiting (fault code 1),
– the oil pre-heater has not switched after 5 mins. (fault code 15),
– inconsistencies arise when using a BurnerChipCard (BCC).

A locking fault can only be reset manually (see chapter 10.4).

A temporary fault shutdown occurs if
– the flow temperature exceeds the set maximum boiler temperature by more than 5 K (fault code 6),
– the flow or return temperature sensor does not provide a valid value (short-circuit, interruption - fault code 12),
– the flow temperature exceeds the return temperature by more than 35 K (fault code 17),
– the flow temperature rises too rapidly (fault code 19),
– the supply voltage is too low (fault code 32),
– the communication between the automatic firing and the controller is interrupted for longer than 2 mins. (fault code 48).

With a temporary fault shutdown the burner is switched off for at least 60 secs.

When the above conditions are back in the normal working range, a burner release is carried out automatically.

A fault is displayed:
– by the red backlight in the display,
– by a clear text fault message with the fault code in the display on the control section.

Unlocking burner

1. Switching ROTEX A1 BO on.
2. Push the Exit button (fig. 6-1, pos. 15) for at least 5 secs.
   ➔ Menu ***"Special Level"*** is displayed.
3. Select the *"FA failure"* level with the rotary switch.
   ➔ Fault code and request "Reset" is displayed.
4. Select "Yes" with the rotary switch.
5. Confirm the changes with a brief push of the rotary switch.
   ➔ Fault is reset.
6. Cancelling and jump back by pushing the Exit button again.
7. If there are several successive fault shutdowns, check the heating system (e.g. flue system, fuel supply).

If more than 5 faults are reset within a 15 minute period, the fault code 10 is displayed. Another release in then only possible after 15 mins.

7.3 Burner setting

CAUTION!

An inappropriate setting of the oil burner can lead to a prohibited level of pollutant emissions, heavy contamination and increased oil consumption.
- Burner setting should be carried out only by authorised and recognised heating engineers.

7.3.1 Settings

The factory-preset values are printed in bold in tab. 7-1.

In the "Air throttle" column, the settings can vary from the specified value depending on the air and flue gas flow. It is therefore absolutely essential to monitor the air surplus (Lambda) by measuring CO_2 or O_2 (CO_2 target value = 12.5 - 13.0 %).
O_2 target value = 3.3 - 4.0 %).

7 Oil burner

Unit type (Burner type)	Boiler -output	Air nozzle	Oil nozzle Danfoss 80°H	Oil pump pressure	Oil throughput	Distance oil/air nozzle	Air throttle	Fan pressure	Conversion kit
	kW	Ø / mm	USgal/h (GpH)	bar	kg/h	Dimension Y/mm	%	mbar	Type
A1 BO 15-e (oil blue burner BLB 15e)	12	17.5	0.30	10.5	1.05	0	≈10	≈5.3	URS12
	13	17.5	0.30	12.5	1.14	0	≈14	≈6.5	
	14	17.5	0.30	14.0	1.23	0	≈18	≈7.5	
	15	**17.5**	**0.35**	**10.0**	**1.32**	**1**	**≈18**	**≈7.1**	Series status
A1 BO 20-e (oil blue burner BLB 20e)	12	19	0.30	10.5	1.05	3	≈64	≈4.5	URS12
	13	19	0.30	13.0	1.14	3	≈68	≈5.0	
	14	19	0.30	15.5	1.23	4	≈80	≈5.7	
	15	19	0.40	10.0	1.32	4	≈20	≈6.3	Series status
	16	19	0.40	11.5	1.41	4	≈23	≈7.2	
	17	19	0.40	13.0	1.49	4	≈26	≈7.9	
	18	**19**	**0.40**	**14.5**	**1.58**	**4**	**≈29**	**≈8.5**	
	19	19	0.40	16.5	1.67	4	≈41	≈9.4	
	20	19	0.40	18.0	1.75	4	≈100	≈10.4	
A1 BO 27-e (oil blue burner BLB 27e)	20	22	0.50	11.3	1.77	4	≈32	≈7.4	URS20
	21	22	0.50	12.7	1.86	4	≈40	≈7.9	
	22	22	0.50	14.0	1.92	4	≈60	≈8.6	
	23	22	0.50	15.4	1.98	4	≈90	≈9.2	
	24	22	0.50	16.8	2.10	4	≈100	≈8.6	
	25	**24**	**0.55**	**11.5**	**2.16**	**4**	**≈44**	**≈6.9**	Series status
	26	24	0.55	13.0	2.25	4	≈66	≈7.8	
	27	24	0.55	14.0	2.34	4	≈100	≈8.9	
A1 BO 34-e (oil blue burner BLB 34e)	25	24	0.55	14.5	2.19	5	≈25	≈7.2	URS25e
	26	24	0.55	16.7	2.28	5	≈29	≈7.8	
	27	24	0.60	11.5	2.37	2	≈30	≈6.7	Series status
	28	24	0.60	13.0	2.48	4	≈34	≈6.5	
	29	24	0.60	13.5	2.55	4	≈46	≈7.0	
	30	**24**	**0.60**	**14.5**	**2.65**	**4**	**≈50**	**≈7.5**	
	31	24	0.60	15.5	2.72	4	≈70	≈7.8	
	32	24	0.60	16.5	2.81	4	≈78	≈8.1	
	33	27	0.65	13.0	2.90	4	≈36	≈6.2	URS35e
	34	27	0.65	13.7	2.99	4	≈40	≈6.7	

Tab. 7-1 Set values of the ROTEX A1 BO for room-air dependent operation

URS12 *Conversion kit for the output range 12-14 kW.* ***15 46 15***
URS20 *Conversion kit for the output range 20-24 kW.* ***15 46 24***
URS25e *Conversion kit for the output range 25-27 kW.* ***15 46 29***
URS35e *Conversion kit for the output range 33-34 kW.* ***15 46 36***

7.3.2 Instructions for burner setting

The oil burner is factory-set for a certain output range (see tab. 7-1, values printed in bold).

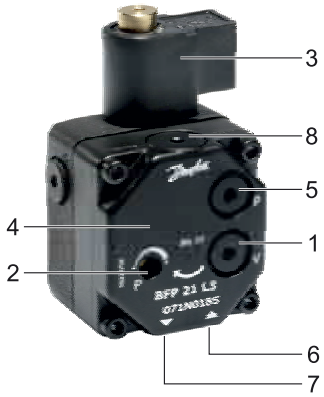
To change the burner output:
– Change the pump pressure,
– Adjust air quantity,
– Distance oil nozzle / air nozzle setting (tab. 7-1, dimension "Y"),
– if big adjustment has been made to output: change oil nozzle and air nozzle (changeover kit).

Conversion kit
To set some output ranges, a conversion kit URS is needed (see tab. 7-1).

Certain changeover sets also contain, in addition to a suitable oil nozzle, an air nozzle with a different flow cross-section (see section 7.5).

Oil nozzles
For retention of the minimum emission values ROTEX recommends using the **Danfoss** oil nozzles of the **Type 80° H** (see tab. 7-1).

7.3.3 Check vacuum in the oil pump and set the oil pump pressure



1 *Vacuum meter connection*
2 *Adjusting screw for oil pressure*
3 *Solenoid valves*
4 *Pump cover*
5 *Manometer connection*
6 *Flow connection*
7 *Return connection*
8 *Oil pump filter*

Fig. 7-4 Oil pump

Setting oil pressure

The oil pressure on the pump can be varied within the range of 10 - 18 bar. Increasing the oil pressure leads to higher boiler output, while reducing the oil pressure leads to lower boiler output.
Tools required: Allen key SW 4 mm; Pressure gauge 1/8", 0 - 20 bar.

- To increase pressure: Adjusting screw (fig. 7-4, pos. 2) for oil pressure to be turned to the **right**.
- To reduce the pressure: Adjusting screw (fig. 7-4, pos. 2) for oil pressure to be turned to the **left**.
- To check the oil pressure, connect the pressure gauge to the pressure gauge connection (fig. 7-4, pos. 5) of the oil pump.

Check vacuum

For a long and fault-free operation, the oil supply system must be adjusted such that the vacuum does not exceed 0.2 bar.

CAUTION!

If the vacuum at the oil pump is too high, it causes greater wear to the pump and can destroy it.

If the vacuum is greater than 0.4 bar, the heating oil can degasify. There will be whistling noises in the pump, the pump can be destroyed. Vacuum greater than 0.2 bar causes greater pump wear.

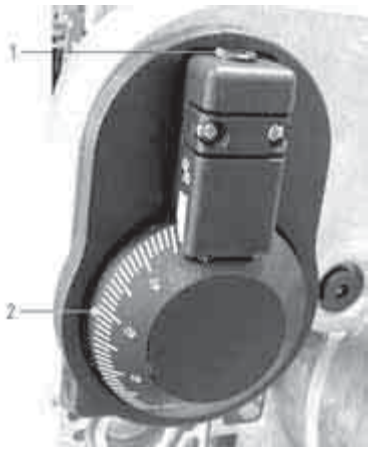
- Reduce the vacuum, check oil supply if necessary.

Tools required: Vacuum meter R 1/8"; Allen key SW 4 mm;

- Connect vacuum meter to the V connection (fig. 7-4, pos. 1) and measure vacuum with active burner.

7.3.4 Set air quantity

The ROTEX A1 BO is generally designed to be operated independently of the ambient air and is equipped with a concentric flue gas / supply air connection DN 80/125. If it is operated depending on the ambient air and it is only connected to a single wall flue gas pipe, the settings can differ considerably from the values given in tab. 7-1.



1 *Adjusting screw for air throttle*
2 *Scale air throttle*

Fig. 7-5 Setting the air throttle

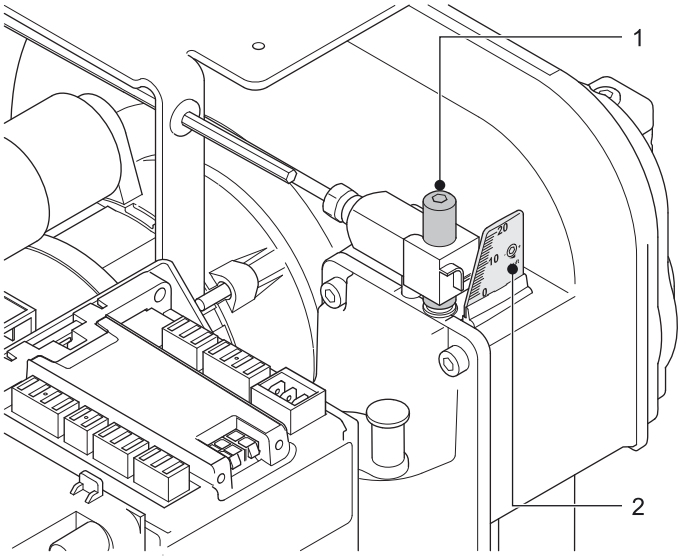
The combustion air quantity is set using the adjusting screw for the air throttle (fig. 7-5, pos. 1). The **CO_2** content in the flue gas must be regulated to **12.5 - 13.0 %** or the **O_2** content to **3.3 - 4.0 %**.

Tools required: Flue gas analysis device to determine the CO_2/O_2 content of the flue gas.

- Connect up the flue gas analysis unit.
- To reduce air quantity: Turn air throttle adjusting screw to the left (lower scale value)
  ➔ $O_2\downarrow$, $CO_2\uparrow$
- To increase air quantity: Turn air throttle adjusting screw to the right (higher scale value)
  ➔ $O_2\uparrow$, $CO_2\downarrow$

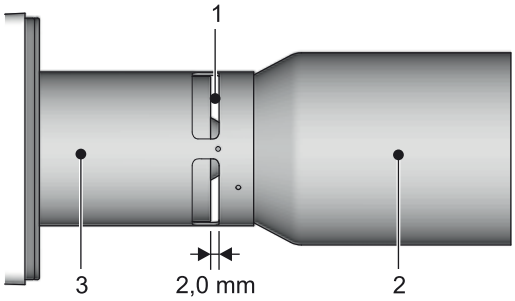
You can make a rough pilot adjustment to the air quantity by using the values from tab. 7-1. But the rough adjustment cannot replace the fine adjustment with CO_2/O_2 measurement in any case.

7.3.5 Recirculation gap



1 *Adjustment screw recirculation tube*
2 *Scale recirculation gap*

Fig. 7-6 Positioning recirculation tube



1 *Recirculation gap*
2 *Flame tube*
3 *Recirculation tube*

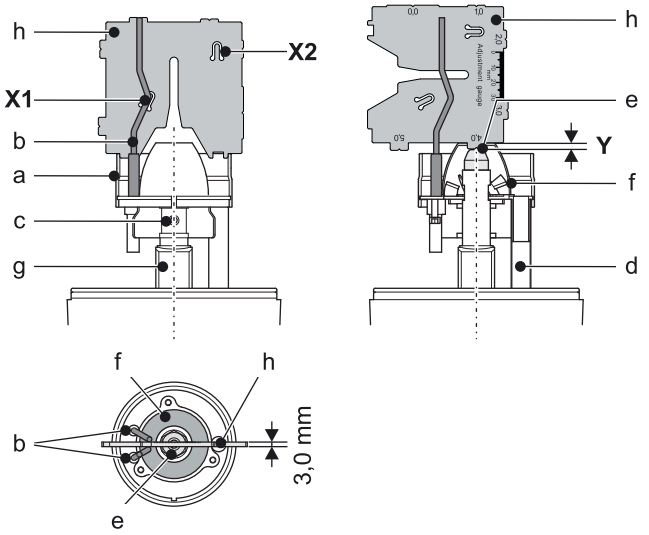
Fig. 7-7 Flame tube and recirculation gap

The recirculation gap is set to a fixed value of 2.0 mm and must not be changed. For this reason, the adjusting screw (fig. 7-6, pos. 1) is covered with a plug.

Turning the adjusting screw (fig. 7-6, pos. 1) effects an axial displacement of the mixer device in the recirculation tube (see fig. 7-7).

The scale (fig. 7-6, pos. 2) shows the set width of the recirculation gap (in mm). If the nozzle tube or the oil preheater are changed or an oil nozzle type different from the regular production type is used, there can be a difference between the scale display and the actual width of the recirculation gap.

7.3.6 Check and set electrode distance and the distance between oil nozzles and air nozzles



a	*Mixing unit*	***h***	*Setting gauge*
b	*Ignition electrodes*		
c	*Fixing screw*	***X1***	*Electrode position BLB 15e, BLB 20e and BLB 27e*
d	*Light tube*	***X2***	*Electrode position BLB 35e*
e	*Oil nozzle*	***Y***	*Distance oil nozzle - air nozzle*
f	*Air nozzle*		
g	*Nozzle rod*		

Fig. 7-8 Check electrode setting and distance oil nozzle - air nozzle

Checking and setting electrodes distance

Tools required: Setting gauge (fixed on the retainer for the service position)

- Bring burner in service position (see section 7.4.1).
- Check electrode distance and position with the setting gauge.
- If necessary, readjust electrodes by bending them.

If the ignition electrodes are worn out, they must be replaced.

Notes on replacing the ignition electrodes are given in chapter 9.2.8.

Setting the oil nozzle - air nozzle distance

Tools required: Setting gauge (fixed on the retainer for the service position) Allen key SW 4 mm;

CAUTION!

Wrong distance setting can cause unclean burning, bad starting behaviour and increased burner wear.

- Use the correct side of the feeler gauge.

- Bring burner in service position (see section 7.4.1).
- Check distance with setting gauge. For setting values refer to tab. 7-1.
- To adjust, loosen the fixing screw and push the mixing device on the nozzle rod (also refer to fig. 9-16 in chapter 9.2.8).

7.4 Removing/fitting the burner

The burner is normally in operating position. In order to carry out work on the nozzle rod (e.g. changing nozzle or electrodes) or within the flame tube, the burner is moved to the **service position**.

It may be necessary to **remove** the burner for maintenance and cleaning jobs or if there is damage in the combustion chamber area.

WARNING!

Live parts can cause an electric shock on contact and cause fatal burns or injuries.

- Switch off the heating main switch before removing the burner and secure it from being unintentionally switched on.

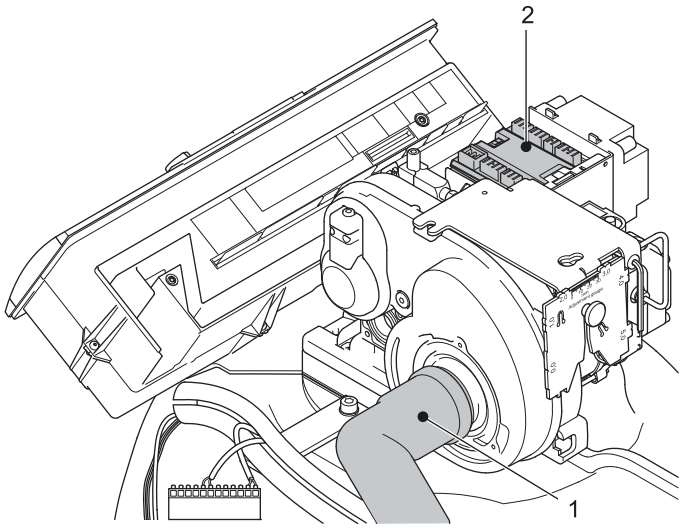
WARNING!

Danger of burning on hot surfaces.

- Let the burner cool down sufficiently before removing it.
- Wear protective gloves.

7.4.1 Move the burner to service position

1. Switch off main heater switch.
2. Remove the noise damping hood and boiler cladding (see section 9.2.1).
3. Pull off the air intake hose (fig. 7-9, pos. 1) from the burner and turn to the side.

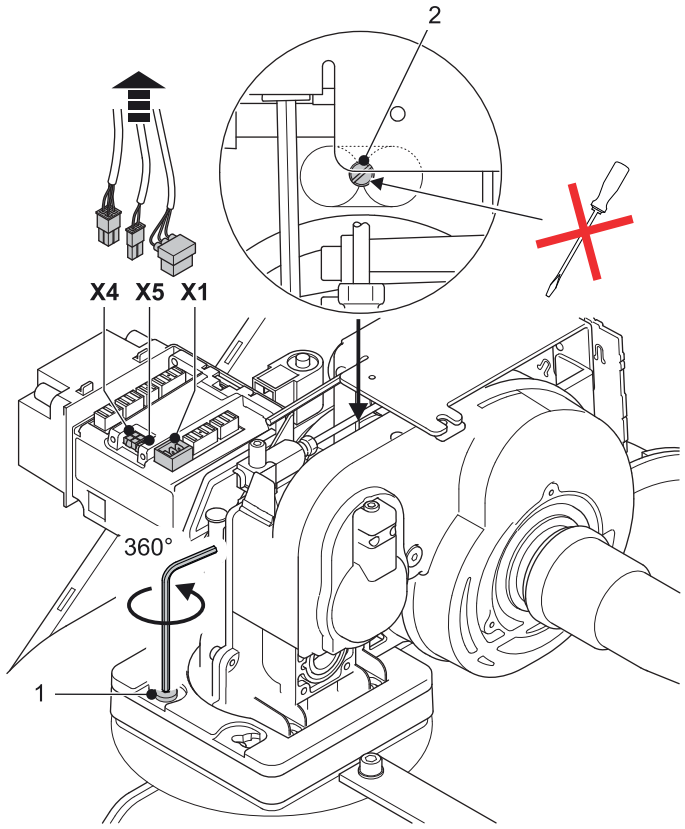


1 *Air supply hose* ***2*** *Automatic firing*

Fig. 7-9 Burner in operating position

4. Pull off the plugs X1, X4 and X5 from the automatic firing (fig. 7-10).
5. Loosen the service screw (fig. 7-10, pos. 1).

The positioning switch (fig. 7-10, pos. 2) serves for correct positioning and for the secure seating of the burner on the burner flange. It must not be released for removal.



1 *Service screw*
2 *Positioning screw*
X1 *Mains connection plug*
X4 *Plug flow and return temperature sensor*
X5 *Communication plug*

Fig. 7-10 Remove the plug from the automatic firing and release the service screw on the burner

6. Rotate burner counter-clockwise out of the bayonet lock and lift out upwards.

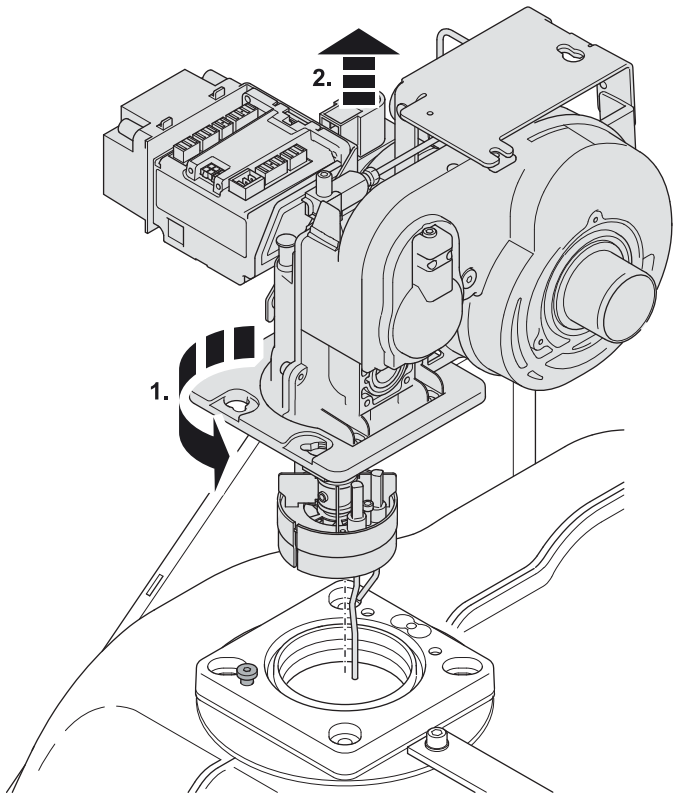


Fig. 7-11 Pull off burner

7. Rotate burner by 180° around the motor axis and put aside on the burner flange.
8. Hang in the burner through the opening in the holder plate in the service screw and engage in the bayonet lock. Tighten the service screw.
   ➔ The burner is now in service position.

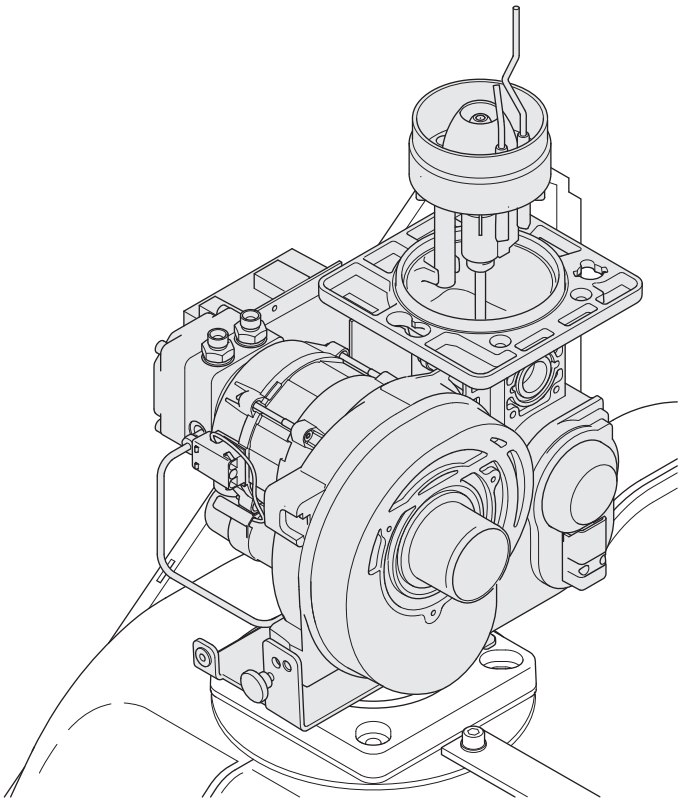


Fig. 7-12 Service position

Installation is carried out in reverse order.

7.4.2 Removing/fitting the flame tube

The flame tube can be removed with mounted burner and open boiler.

WARNING!

Danger of burning - hot surfaces (flame tube).
- Let the burner cool down sufficiently before removing the flame tube.
- Wear protective gloves.

1. Switch off main heater switch.
2. Remove the noise damping hood and boiler cladding (see section 9.2.1).
3. Open the combustion chamber (see chapter 9.2.5).
4. Rotate flame tube (turn bayonet lock counter clockwise by 1/8 rotation).

Install the flame tube in reverse sequence.

7.4.3 Removing/fitting the burner

1. Switch off main heater switch.
2. Remove the noise damping hood and boiler cladding (see section 9.2.1).
3. Unscrew the oil hoses from the oil filter.
4. Only on A1 BO 35-e:
   Removing the flame tube (see section 7.4.2).
5. Removing burner from burner flange (see section 7.4.1, working steps 3 - 6).
6. Unscrew four fixing screws from the burner flange.
7. Lift burner flange with recirculation tube and flame tube out of the burner chamber.

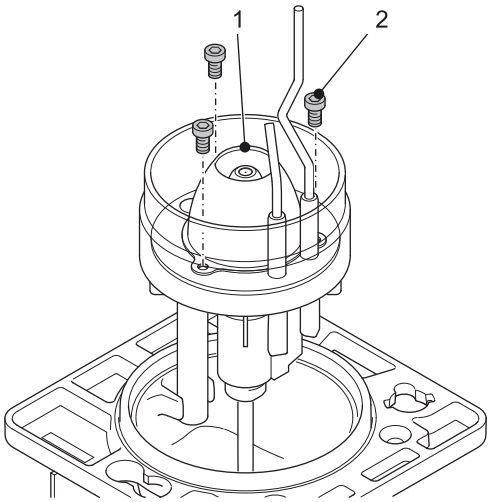
Install the burner in reverse sequence.

8. Start burner, check function and settings (see section 7.3).

7.5 Removing/fitting the air nozzle

For certain output ranges, air nozzles that differ from the series condition must be fitted in the mixer device of the burner. The appropriate air nozzle is supplied with the changeover kit URS (see tab. 7-1).

Tools required: Allen key SW 3.0 mm



1 *Air nozzle* ***2*** *Fastening bolts*

Fig. 7-13 Air nozzle in mixer device

1. Bring burner in service position (see section 7.4.1).
2. Unscrew the fixing screws (3 in number) on the air nozzle.
3. Remove the air nozzle from the mixer device.

Installation of the air nozzle is carried out in reverse order.

4. Adjust the distance of the oil-air nozzle to dimension "Y" in accordance with tab. 7-1 (see section 7.3.6).

On the burner BLB 34e the entire mixer device must be replaced for output adapting.

7.6 Automatic firing connections

The function mode of the automatic firing is described in section 7.1.

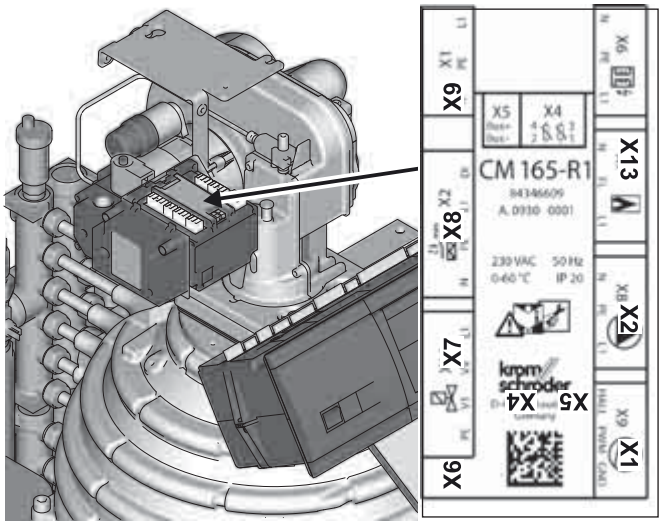


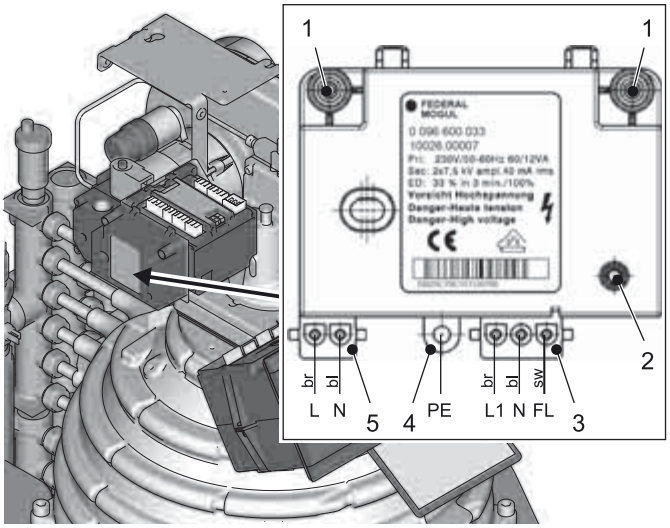
Fig. 7-14 Automatic firing CM165-R1

Connector	Pin	Cable colour	Function
X1	L1	brown	Mains connection, switched by boiler controller (connection J10)
	PE	green/yellow	
	N	blue	
X2	DI	brown	Oil preheater
	L1	black	
	PE	green/yellow	
	N	blue	
X13	L1	brown	Oil valve
	VV	n.a.	
	V1	blue	
	PE	green/yellow	
X4	1	brown	return flow temperature sensor
	3	blue	
	2	brown	Flow temperature sensor
	4	blue	
X5	BUS -	brown	Communication with boiler controller
	BUS +	blue	
X6	N	blue	ignition
	PE	n.a.	
	L	brown	
X7	N	blue	Flame monitor (N + FL: Switching output) (L1: continuous power supply)
	FL	black	
	L1	brown	
X8	N	blue	Oil pump + blower
	PE	green/yellow	
	L1	brown	
X9	HALL	n.a.	none
	PWM	n.a.	
	GND	n.a.	

n.a. Not assigned

Tab. 7-2 Assignment and colours of the connection cable on the automatic firing CM165-R1

7.7 Ignition transformer with flame monitor



1 *Ignition cable connections (2x 7.5 kV)*
2 *Status display (LED)*
3 *Connection flame monitor*
4 *Earth connection*
5 *Ignition connection (input)*

Fig. 7-15 Ignition transformer with integrated flame monitor

The ignition transformer with flame detection is a high-frequency ignition device with a vibration frequency of approx. 15 - 20 kHz. The flame of fuel-air mixture is detected by the ignition electrode via a special switching.

With a flame present, a stream of ions is set up between the ignition electrode and earth. The signal is evaluated in the ignition device. This signals the automatic firing whether there is a flame or not.

The ignition can be operated in parallel with the flame monitor, without influencing it.

A LED indicates the operating status:

- 5 seconds after burner request a flashing LED (flashing frequency 1 - 2 Hz) signals readiness (power supply present, but no flame).
- If a flame is detected, the LED switches from flashing to continuous within one second.

If the LED flickers during burner operation inadequate earthing of the burner is probable.

- Check protection earthing.

- If the flame goes out the LED is switched off for approx. 5 secs. After the 5 seconds the LED starts to flash again and thus indicates the readiness for flame monitoring.

7.8 Oil burner pump and oil filter

The oil burner pump is a self-suctioning gear pump which is connected as a two-strand pump through a venting oil filter. Suction filters and oil pressure controllers are integrated in the pump.

To protect the oil pump, either insert the enclosed micro-replacement filter insert **MC-7**, (**15 60 13**) for short filter cups or the **MC-18**, (**15 60 14**) for long filter cups in the ventilation oil filter. Only use paper filters of maximum 25 µm.

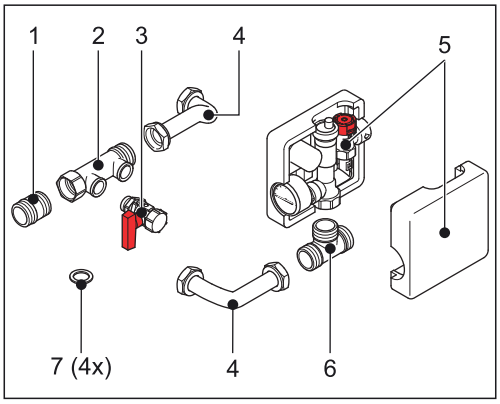
8 Hydraulic connection

8.1 Connection accessories

8.1.1 Safety group SBG A1

For the hydraulic connection of the ROTEX A1 BO you must comply with the safety technological regulations in accordance with EN 12828.

ROTEX recommends the use of the safety group offered as an accessory (**SBG A1**, **15 60 18**).



1 *Double nipple 1"*
2 *Connector for KFE cock + diaphragm expansion vessel*
3 *KFE cock*
4 *Connection elbow 1" (2x)*
5 *Boiler safety unit (KSG-mini) with safety valve 3 bar, rapid bleeder and pressure gauge*
6 *T-Piece 3x1"*
7 *Flat seal 1" (4x)*
9 *Boiler return*
10 *Boiler flow*

Fig. 8-1 Safety group SBG A1

- Install the components of the safety group SBG A1, as shown in fig. 8-2, to the flow and return connections of the ROTEX A1 BO.
  - Install the KSG-mini so that the pressure gauge can be easily seen during filling.
  - There should be no hydraulic blocking elements between the heat generator and the safety valve.
  - Any steam or heating water which may escape must be diverted by a suitable blow-off line with constant gradient in a frost-protected, safe and observable manner.
  - The line should be routed so that the upper half of the ROTEX A1 BO can be hinged open without any problems after installation.
  - A diaphragm expansion vessel of adequate dimensions and pre-set for the heating system must be connected to the return line. There should be no hydraulic blocking elements between the heat generator and the safety valve.
  - Locate the diaphragm expansion vessel in an easily accessible place (maintenance, parts replacement).

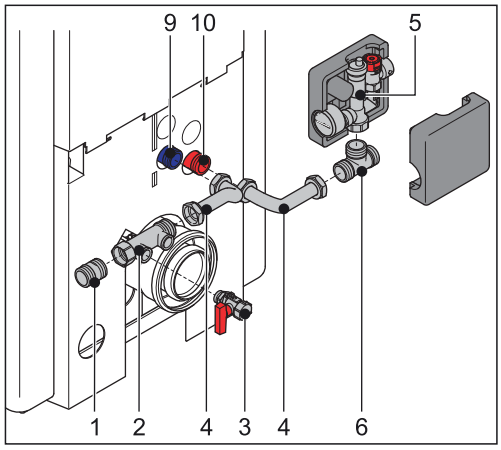


Fig. 8-2 Installation of safety group SBG A1 (for legend see fig. 8-1)

8.1.2 Connection kit A1

If a heat exchanger is to be connected to the heating system, ROTEX recommends fitting the connection kit (**VSA1**, **15 48 22**).

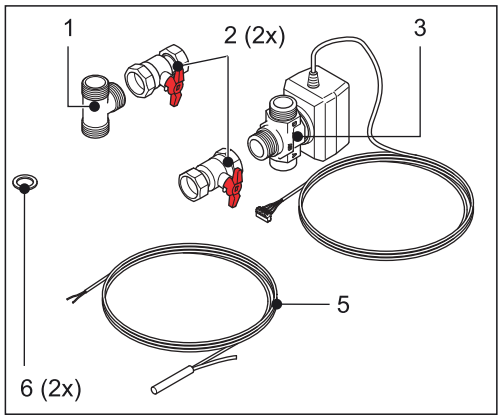
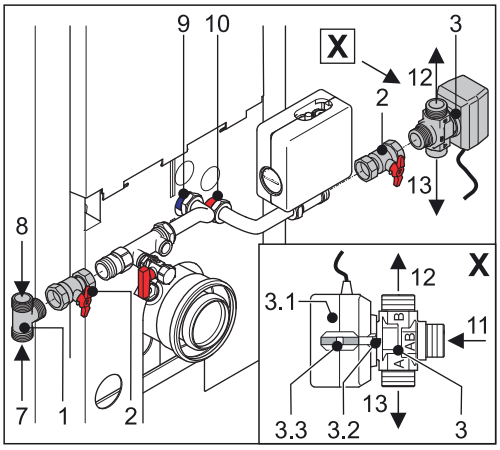


Fig. 8-3 Connection kit VSA1 (for legend see fig. 8-4)

- Install the components of the connection kit VSA1, as shown in fig. 8-4, after installation of the safety group SBG A1, to the boiler flow and return connections for the heating system.
  - Install the ball cocks in such a way that the union nuts point to the boiler.
- Mount the 3-way diverter valve on the flow connection of the safety group SBG A1. Ensure the **correct position**:
  - **Connection B: on the heating side.**
  - **Connection A: storage tank side.**



1	*T-Piece 3x1"*	***6***	*Flat seal 1" (2x)*
2	*Ball cock 1" (2x)*	***7***	*Storage tank return flow*
3	*3-way diverter valve (3UV1)*	***8***	*Heating return flow*
3.1	*Valve drive*	***9***	*Boiler return*
3.2	*Unlocking button of the drive lock*	***10***	*Boiler flow*
3.3	*Hand lever (shown in filling position)*	***11***	*Boiler flow (3UV1: connection AB)*
5	*Storage tank temperature sensor*	***12***	*Heating flow (3UV1: connection B)*
		13	*Storage tank charging flow (3UV1: connection A)*

Fig. 8-4 Installing connecting kit VSA1

- Connect the connection cable of the 3-way diverter valve to the boiler control panel, plug J2 (see chapter 4.8).
- Install the storage tank temperature sensor in the hot water storage tank and connect to the boiler control panel, plug J8 (see chapter 4.8).

- **ZB_RoCon_VentFkt (008.1534699)**

If the storage tank charging circuit is to be operated through a charging pump (parallel operation, cascade circuit etc.), a storage tank charging pump will have to be installed in the heating system instead of the 3-way diverter valve. An adapter cable is needed for controlling the storage tank charge pump (**E 1500430**).

Note the following for emergency **operation** if the valve drive is faulty:

- Press the unlocking button (fig. 8-4, pos. 3.2) and rotate the motor head of the valve drive (fig. 8-4, pos. 3.1) 1/4 turn to the **left** and remove.

  ➔ The 3-way diverter valve is set to the "Heating" position.

Note the following for the **temporary manual parallel operation** of the heating circuit and the hot water storage tank:

- Move diverter valve to centre position with hand lever (fig. 8-4, pos. 3.3) (only possible if the valve drive is already in "Heating" position).

8.2 Hydraulic system connection

Fig. 8-5 and fig. 8-6 show **examples** of the integration of a Sanicube inox hot water storage tank and a sub-tank US 150. Note that the hydraulic circuit shown does not claim to be complete and your system planning must therefore still be carried out thoroughly.

As a ROTEX certified company you will find other examples for hydraulic system connection concepts on the ROTEX Homepage.

Short name	Meaning
1	Cold water distribution network
2	Hot water distribution network
3	Heating inflow
4	Heating return flow
5	Mixer circuit
6	Circulation
7	Check valve, return valve
7a	Non return valves
3UV1	3-way switch valve (DHW)
A1	A1 oil or gas condensing boiler
CW	Cold water
DHW	Domestic hot water
S#O	Hot water storage tank SC 538/16/0
$H_1, H_2 ... H_m$	Heating circuits
MAG	Diaphragm expansion vessel
MIX	3-way-mixer with drive motor
MK1	Mixer group with high-efficiency pump
MK2	Mixer group with high-efficiency pump (PWM controlled)
P_K	Boiler circuit pump
P_{Mi}	Mixing circuit pump
P_Z	Circulation pump
RoCon BF Controller"	A1 condensing boiler
RoCon M1	Mixer circuit control
SV	Safety overpressure valve
t_{AU}	Outside temperature sensor
t_{DHW}	Storage tank temperature sensor (RoCon OT1)
t_{Mi}	Mixer circuit flow temperature sensor
VS	Burns guard VTA32

Tab. 8-1 Abbreviations on hydraulics plans

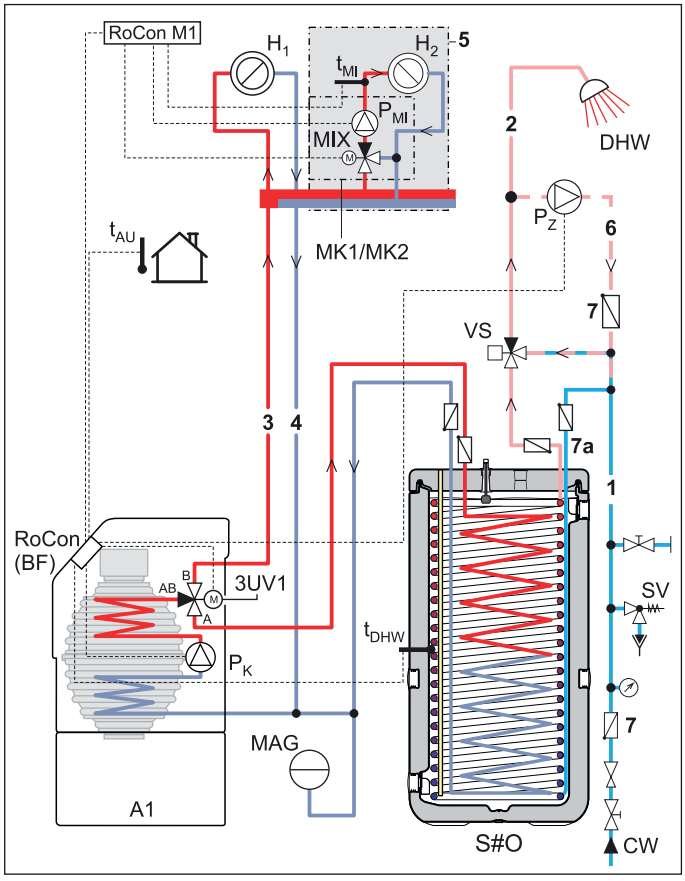


Fig. 8-5 Standard connection schematic ROTEX A1 BO with Sanicube (for legend see tab. 8-1)

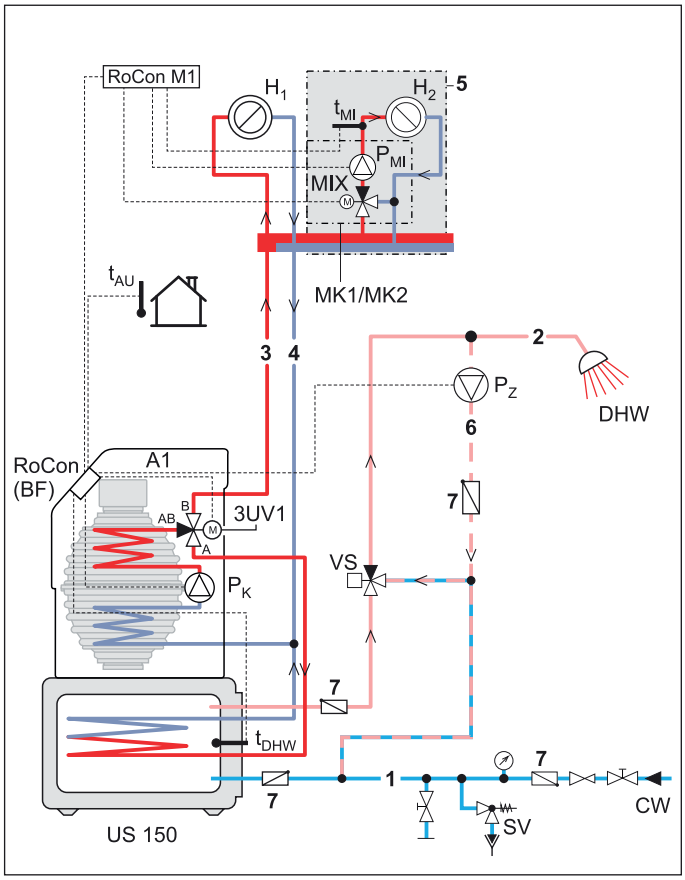


Fig. 8-6 Standard connection schematic ROTEX A1 BO with US 150 (for legend see tab. 8-1)

9 Service and maintenance

9.1 General overview of service and maintenance

Regular inspection and maintenance of the heating system reduces energy consumption and ensures a long life and smooth operation.

Have the service and maintenance carried out by authorised and trained heating engineers once a year and, if possible, **before the heating period starts**. This will avoid malfunctions during the heating period.

ROTEX recommends an inspection and maintenance contract to ensure regular inspection and maintenance.

Tests during the annual service:
- General condition of the heating system, visual inspection of connections and pipes.
- Flue gas temperature and flue gas temperature sensor.
- Functioning of the condensate treatment unit (determination of pH value).
- Burner operation and burner settings.

Maintenance work to be carried out annually:
- Cleaning the burner components, the combustion chamber and the heating surfaces.
- Cleaning the boiler panelling and the sound insulation hood.
- Cleaning and regeneration of the Condensate treatment unit.
- Replacement of the wearing parts if required).

9.2 Service and maintenance tasks

WARNING!

Live parts can cause an electric shock on contact and cause fatal burns and injuries.

- Before beginning maintenance work, disconnect the ROTEX GSU from the power supply ROTEX A1 BO (switch off fuse, main switch) and secure against unintentional restart.

WARNING!

Danger of burning - hot surfaces.

- Let the burner cool down for a reasonably long time before maintenance and service work.
- Wear protective gloves.

9.2.1 Removing panelling (and cleaning it)

For the maintenance activities, sound insulation hood, boiler panelling and heat insulation layers must be removed.

After removing the rear and two side securing screws you can easily remove the sound insulation hood.

- Remove the sound insulation hood (see fig. 9-1).

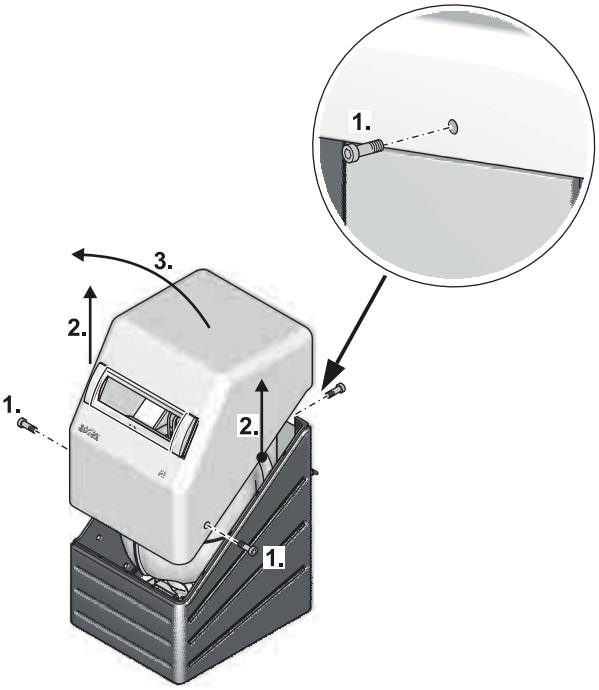


Fig. 9-1 Remove the sound insulation hood.

- Lift and remove the boiler cladding (see fig. 9-2).

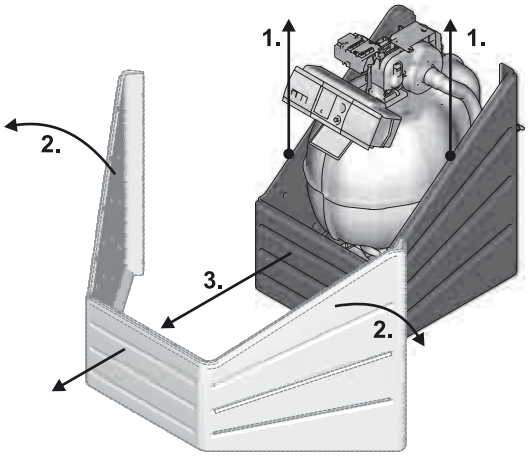


Fig. 9-2 Remove boiler cladding

- Remove the holding clamps on both upper heat insulation layers (see fig. 9-3).

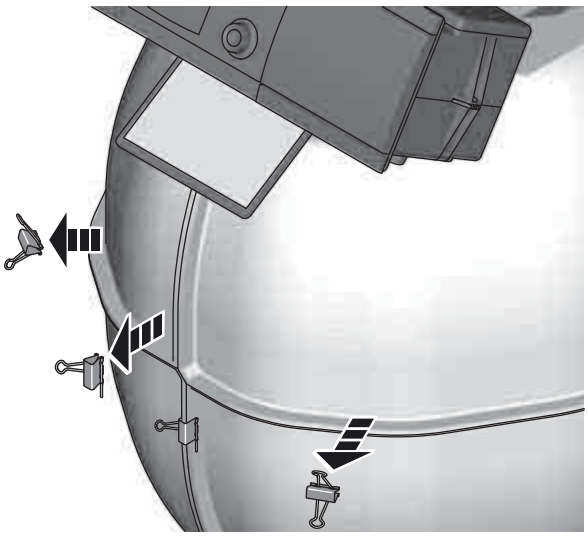


Fig. 9-3 Remove the holding clamps on the heat insulation layers

- Remove both upper heat insulation layers.

Cleaning the silencer hood and boiler cladding

- The low-maintenance plastic only needs to be cleaned with a soft cloth and a mild detergent.
- Do not use any cleaners with aggressive solvents (damage to the plastic surface may occur).

9.2.2 Checking the connections and pipes

WARNING!

Improperly performed work on live components can endanger life and health of persons and hinder the operation of the ROTEX A1 BO.

- ROTEX A1 BO Rectification of damage to live components on the ROTEX A1 BO may only be carried out by authorised and recognised heating experts.

- Check all oil and water-conducting components and connections for leakage and damage. If damaged, determine the cause and replace the damaged parts.
- Check system pressure.
  If pressure is too low:
  - Detect and remedy the cause of the pressure loss.
  - Top up the system in accordance with chapter 4.10.
- Check all components of the flue system for leakage and damage. Repair damaged parts or replace them.
- Check all electrical components, connections and pipes. Repair damaged parts.

9.2.3 Checking and cleaning the condensate drain.

The condensate treatment unit cleans the draining condensation and neutralises its pH-value. The connection and drainage line of the condensate drain must be free from impurities.

RISK OF POISONING!

Escaping gases can cause breathing problems and poisoning.

- The condensate treatment unit must always be connected and filled up when the boiler is operating, otherwise flue gases could escape into the installation room.

Checking that the condensate treatment unit is working (pH value).

The pH value measurement can be dispensed with if low sulphur EL heating oil is used exclusively and the responsible Water Authorities do not specify neutralisation.

1. Dip the indicator strips (provided with condensate treatment unit) into the water from the neutralisation box outlet.
2. Remove the indicator strips after about 1 minute and compare the colour of the indicator strip with the accompanying colour table.
   The numerical value above the colour combination corresponds to the pH value of the water.
   ➔ **pH value = $7^{\pm 1}$**: condensate treatment neutralised correctly.
   ➔ **pH value < 6**: condensate treatment not neutralised adequately.

If neutralisation is not required or if the condensate preparation adequately neutralised:

1. Open the combustion chamber and lift up the combustion chamber insert (see section 9.2.5).
2. Check the combustion chamber and clean if needed (see section 9.2.5).
3. Check condensate drain for free flow and leaks:
   - Use a hose or bucket to fill a larger amount of water (about 5 l) into the lower combustion chamber and watch it drain.
   ➔ The water must flow quickly without puddling. If the water doesn't drain quickly, the condensate box must be cleaned and the drain connector checked (see "Dismounting and regenerating the condensate box").
   - Check the connection and drain section for leakage.
   ➔ During drainage, water must not escape from the condensate drain at any point. Fix any leaks.

If the condensate box is not neutralised adequately:

1. Check the flue gas temperature (see section 9.2.4).
2. Check the combustion chamber and clean if needed (see section 9.2.5).
3. Dismantle and regenerate the condensate box.

A pH value < 5 despite regular maintenance indicates that the neutralisation medium is spent and the filling quantity is no longer sufficient. In such a case, change the neutralisation medium (**15 45 75**)

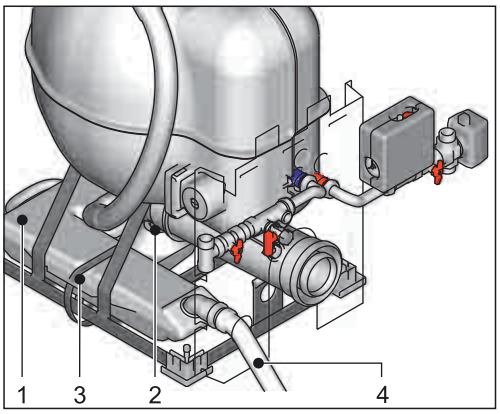
Dismounting and regenerating the condensate box

DANGER OF CHEMICAL BURNS!

The condensate box contains acidic condensate that can lead to injury upon contact with the skin or eyes.

- Wear protective clothing (safety glasses, rubber gloves) when working on the condensate box.
- If your skin comes in contact with anything, wash the affected area immediately with tap water.
- If the chemicals come in contact with eyes, immediately wash with tap water and consult an ophthalmologist.

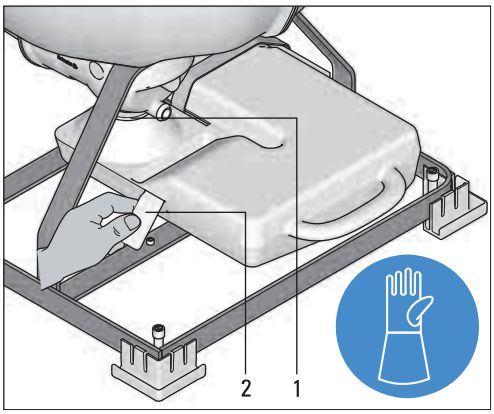
1. Open the fixing belt (fig. 9-4, pos. 3).



1 *Condensate box*
2 *Condensate plug connector on flue gas elbow*
3 *Fixing belt with snap closing*
4 *Flexible connecting hose*

Fig. 9-4 Connections to the condensate box

2. Lift the stabilising plate (fig. 9-5, pos. 2) and pull out the connecting muff (fig. 9-5, pos. 1) from the condensate drain.



1 *Connector sleeve for condensate connector*
2 *Stabilising plate*

Fig. 9-5 Condensate box (plug connector)

3. Lift the condensate box and empty it through the connection hose (fig. 9-6).

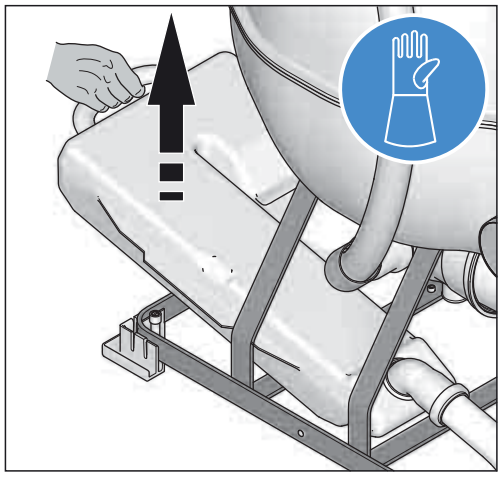


Fig. 9-6 Emptying the condensate box

4. Place collector container under the hose connection. Remove the flexible connector hose from the condensate box (fig. 9-7).

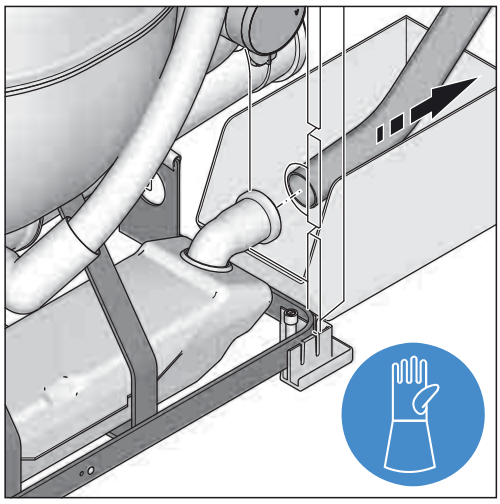


Fig. 9-7 Pull out connecting flexible hose

5. Pull the condensate box forwards under the boiler.

6. Regenerating the condensate box.
   - Rinse condensate box with flowing water against the flow until clear water emerges (fig. 9-8). The condensate box must be shaken in order to dislodge the deposits.
   - If the neutralising agent is used up, pull off the connection sleeve (fig. 9-5, pos. 1) from the condensate drain and replace the neutralisation agent via this connection.
7. Check the flexible connector hose and drain connector and clean if necessary.

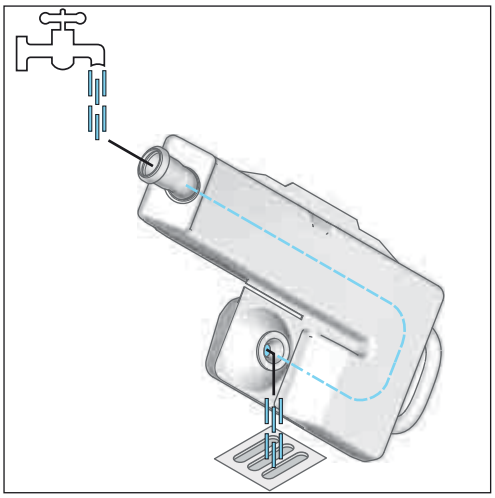


Fig. 9-8 Rinse condensate box

8. Push condensate box under the boiler.
9. Plug flexible connector hose onto the condensate box (see fig. 4-11).
10. Place the connection sleeve (fig. 9-5, pos. 1) firmly on the condensate plug connection at the flue gas elbow.
11. Rotate the stabilising plate downwards and snap into place.

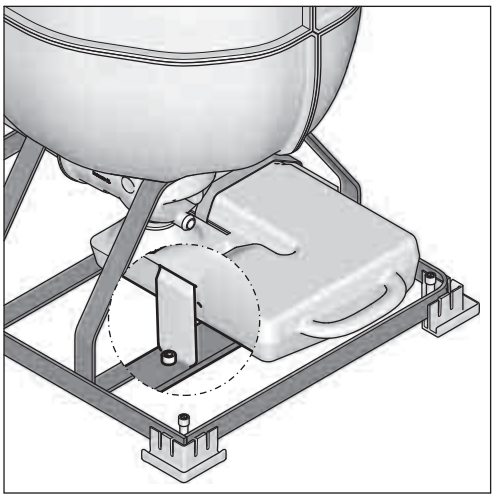


Fig. 9-9 Snap stabilising plate into place

12. Close and tighten fixing belt (see fig. 9-4, pos. 3). Tighten the belt so much that the wrapped connection cannot loosen itself (insert a wedge if necessary).
13. Fill condensate box with water (see chapter 4.7 "Connect the condensate drain").

9.2.4 Checking the flue gas temperature

The flue gas temperature can be checked
– on the operating panel in the boiler control panel, rotary switch in position: ***"Info"*** ⓘ,
– on the measuring piece of the flue gas pipe by using a flue gas thermometer.

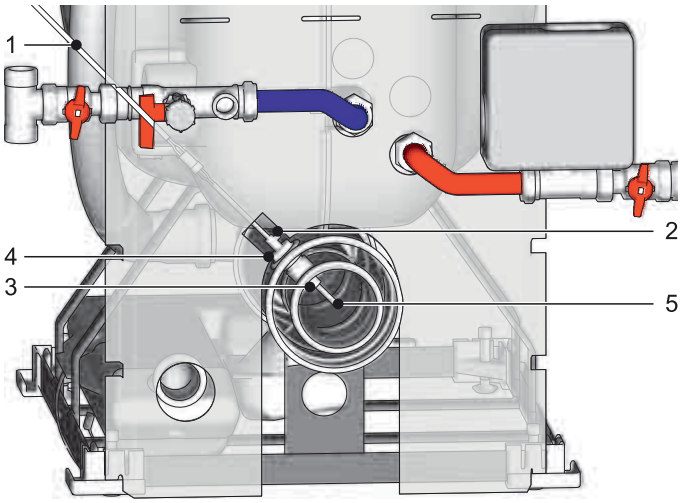
If the flue gas temperature exceeds the boiler temperature by over 20 K after 10 mins. of burner operation, the combustion chamber will have to be cleaned (see section 9.2.5).

Checking the flue gas temperature sensor

CAUTION!

The fitting position of the flue gas temperature sensors is factory-adjusted by a fixing screw. Modifying the fitting position adversely affects the correct functioning of the flue gas temperature sensor.

- Never loosen the fixing screw (fig. 9-10, pos. 2) when inspecting the flue gas temperature sensor.



1 *Sensor cable to the boiler control panel*
2 *Fixing screw - **Do not loosen!***
3 *Guide bush*
4 *Union nut*
5 *Flue gas temperature sensor*

Fig. 9-10 Position of the flue gas temperature sensor

- Unscrew the box nut (fig. 9-10, pos. 4) and pull out the flue gas temperature sensor carefully with the guide sleeve (fig. 9-10, pos. 3).
- Check the flue gas temperature sensor for cleanliness and corrosion and clean if necessary. Do not use any metallic cleaning devices (e.g. wire brush).
- When replacing the flue gas temperature sensor, ensure that the end of the flue gas temperature sensor projects **$28^{\pm 2}$ mm** out of the guide sleeve.

9.2.5 Checking and cleaning the combustion chamber

If there are impurities, or if unsatisfactory combustion values are detected, the combustion chamber must be cleaned and readjusted. If necessary, reset the burner (see chapter 7.3).

Opening the combustion chamber

WARNING!

Live parts can cause an electric shock on contact and cause fatal burns and injuries.

- Before beginning maintenance work, disconnect the ROTEX GSU from the power supply ROTEX A1 BO (switch off fuse, main switch) and secure against unintentional restart.

WARNING!

Danger of burning - hot surfaces.

- Before starting work on the burners, the combustion chamber and the combustion chamber inserts, allow them to cool down.
- Wear protective gloves.

Special tool: Combustion chamber key, fixed on the inside of the boiler panels (included in the supply).

- Remove four M10 inner hex screws (fig. 9-11).

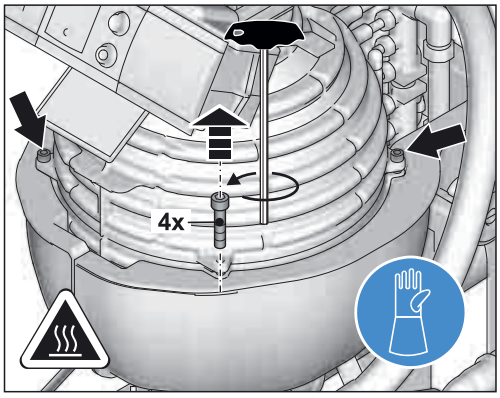


Fig. 9-11 Opening the combustion chamber

- Hinge the top half of the burner chamber upwards (fig. 9-12). An air pressure spring keeps the upper half of the combustion chamber open.

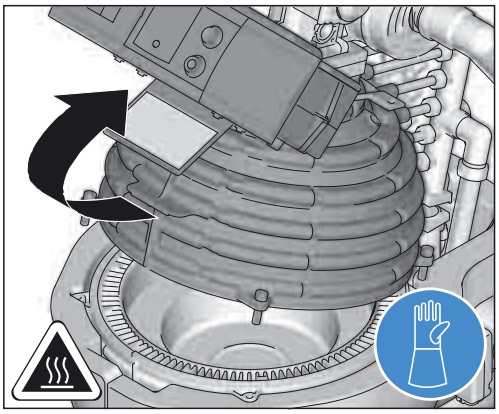


Fig. 9-12 Hinge the top half of the burner chamber upwards.

- **Only on A1 BO 27-e and A1 BO 34-e:**
  - Remove the top burner chamber ring (perforated).
  - Remove the cylindrical burner chamber.
- Remove the lower combustion chamber inset using the combustion chamber wrench (fig. 9-13).

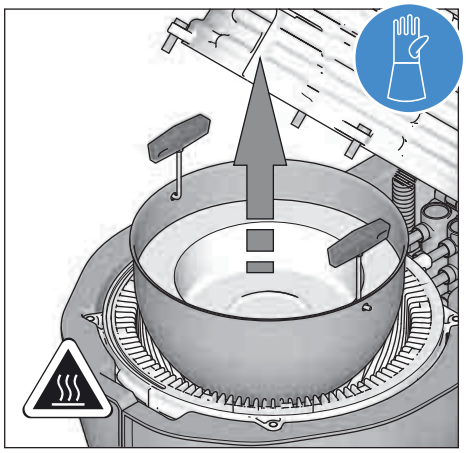


Fig. 9-13 Lifting out the bottom combustion chamber set (illustrated A1 BO 15-e / A1 BO 20-e)

Cleaning the combustion chamber

Depending on the heating oil quality and the operating temperatures, extremely different deposits and contamination are formed in the A1 BO.

Requirement:
The gap between the bottom combustion chamber half and the sound deadening shell in the joint area is covered to prevent residues from the upper combustion chamber half from falling into the gap.

Special tool: Cleaning brush and scraper fixed on the inside of the boiler panels (included in the supply).

Remove dry residue (mostly in the upper combustion chamber half):

- Loosen the dirt and soot on the combustion chamber ribs by using the cleaning brush and cleaning scraper.
- Suction off the loosened dirt and soot by using a vacuum cleaner.

Hard residues may arise in the transition region between dry and water combustion chamber surfaces (usually in the lower half shell of the boiler). These can only be removed by wet cleaning. For this:

- Loosen dirt and rust under running water spray (fig. 9-14) with cleaning brushes and scrapers.
- Rinse off loosened dirt with clean water into the drain.

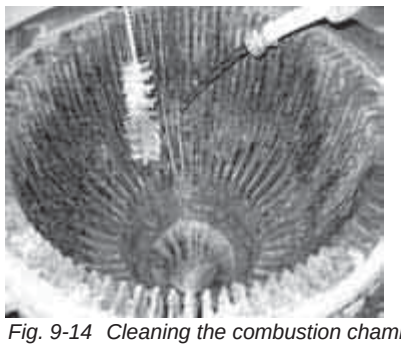


Fig. 9-14 Cleaning the combustion chamber with a water hose

Alternatively, any residue can be removed with a high-pressure cleaner.

For this:
- Close combustion chamber without combustion chamber insert.
- Unscrew burner and burner flange (see chapter 7.4 "Removing/fitting the burner").
- Clean combustion chamber through burner flange opening with high pressure cleaner (fig. 9-15).

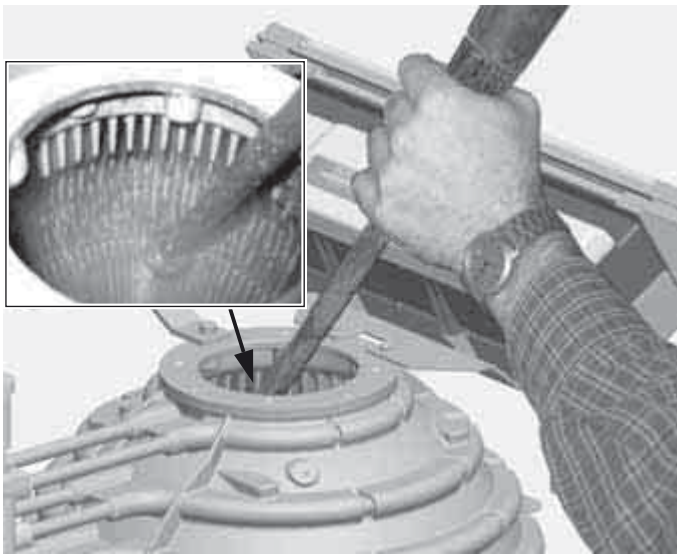


Fig. 9-15 Clean combustion chamber with high pressure cleaner

Closing the combustion chamber

The combustion chamber is closed again in reverse order to "Opening the combustion chamber".

The following must be observed:
– Replace the combustion chamber inserts completely if they were removed for cleaning of the combustion chamber.
  Only on A1 BO 27-e and A1 BO 34-e:
  – There must be no gap between the cylindrical and the lower combustion chamber insert.
  – When folding down the upper combustion chamber half you must make sure that the upper (perforated) combustion chamber ring does not tilt over.
– When **tightening** the four **allen bolts**, **start with the two front bolts**.
  Make sure that the upper combustion chamber does not tip over and that it forms a tight seal.

9.2.6 Checking the oil filter and cleaning the oil pump filter

To protect the oil pump, either insert the enclosed micro-replacement filter insert **MC-7**, (🛒 **15 60 13**) for short filter cups or the **MC-18**, (🛒 **15 60 14**) for long filter cups in the ventilation oil filter. Only use filters of maximum 25 µm.

- Check oil filter for contamination, replace if needed.

The oil pump filter is located under the oil pump cover (see fig. 7.4, chapter 7.3.3).
- Release the bolt with the oil pump filter (fig. 7-4, pos. 8), remove and clean.
- Insert new or cleaned oil pump filter.
- Check pump lid gasket and replace it if necessary.

9.2.7 Checking the burner

For exact information regarding the checking and setting of the burner, see 7.3.

For exact information regarding the assembly and disassembly of the burner, see 7.4.

The scope of inspection includes:
- Opening the combustion chamber.
  ➔ If there is damage around the combustion chamger, the burner must be removed (see chapter 7.4).
- Clean the burner surface (cloth, plastic brush).
- Visual inspection of the fuel lines for leaks, clogging and denting.
- Check oil filter of the suction line, change the filter set if necessary.
- Clean the burner head at fuel exit in the area of baffle plate.

In the course of the maintenance activities, the automatic firing unit CM165-R1 must also be rechecked to see whether it attains the rated life cycle:
– 10 years or 250,000 burner starts,

- If necessary, replace faulty parts.
- Close the combustion chamber.
- Commission the burner and allow to run with the setting "Emission Measurement" (see chapter 15.2) for approx. 10 mins.
- Check combustion values:
  – Flue gas temperature at measuring sockets of the flue gas pipe. (Target value < 120 °C),
  – O_2 or CO_2 content (see chapter 7.3),
  – CO content (target value < 50 ppm).
  – Soot number according to Bacharach-Scale < 1.
  ➔ If the combustion values do not fall within the target range, the burner must be adjusted accordingly (see chapter 7.3)

We recommend, to enter all measured values and the conducted work with the date and signature into the enclosed operating handbook.

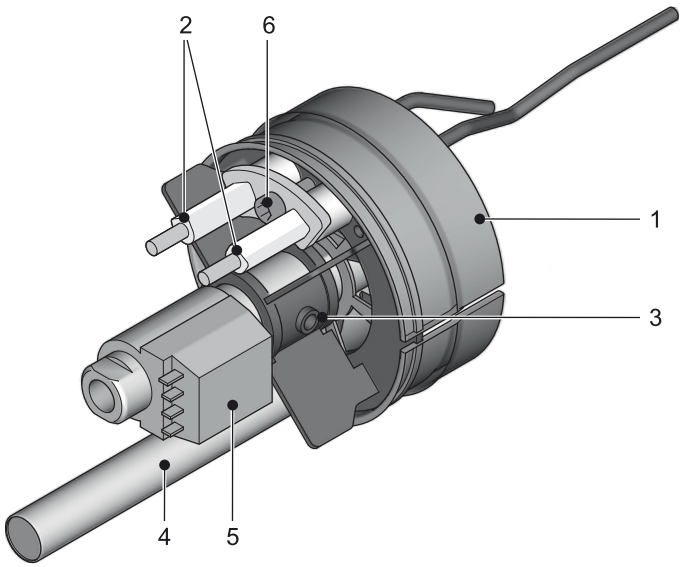
9.2.8 Replacing the oil nozzle and ignition electrodes

Requirement: Burner is in service position (see chapter 7.4).

WARNING!

Danger of burning - hot surfaces.

- Before starting work on burners and combustion chamber, allow them to cool down sufficiently.
- Wear protective gloves.



1	*Mixer device*	***5***	*Nozzle linkage (oil preheater)*
2	*Ignition electrode*	***6***	*Fixing screw for ignition electrodes*
3	*Fixing screw*		
4	*Licht tube*		

Fig. 9-16 Mixing head and ignition electrodes

Replacing ignition electrodes

If the ignition electrodes are worn out, they must be replaced.

- Release the fixing screw (fig. 9-16, pos. 6) with Allen key SW 3.
- Replacing ignition electrodes
- Tighten fixing screw with Allan key SW 3.

Removing oil nozzles

1. Pull out ignition cables from ignition electrodes (fig. 9-16, pos. 2).
2. Loosen fixing screws (fig. 9-163, pos. 3) and pull out mixing device upwards.
3. Unscrew nozzles with wrench or ring spanner SW 16. Hold back the nozzle rod with an open-end wrench SW 16.

Fitting oil nozzle

To protect the oil pump, either insert the enclosed micro-replacement filter insert **MC-7**, (**15 60 13**) for short filter cups or the **MC-18**, (**15 60 14**) for long filter cups in the ventilation oil filter. Only use filters of maximum 25 µm.

1. Screw in the oil nozzle with open end or ring spanner SW 16 on the nozzle rod. Hold back the nozzle rod with an open-end wrench SW 16.
2. Fitting mixing device. Thereby, position the light tube (fig. 9-16, pos. 4) between the guide pins in the nozzle lid (see fig. 7-2, pos. 21). Distance oil nozzle / air nozzle setting (see tab. 7-1, dimension "Y"),
3. Plug on ignition cable on the ignition electrodes.

10 Faults and malfunctions

10.1 Troubleshooting

The electronics of the ROTEX A1 BO
– signals a fault by red backlighting in the display and
– shows a fault code in the display.

An integrated fault memory stores up to 15 fault messages that have occurred most recently.

Depending on the operating mode, the fault messages are also forwarded to connected room stations or room thermostats.

You will find detailed information on the control unit and the boiler control panel as well as on the operating modes and parameter settings in chapter 6 "Control unit" and in the documentation "ROTEX RoCon BF Controller" Controller" as supplied with the associated Control unit.

Troubleshooting

- Detecting and remedying the cause of the malfunction.
- 10.3 Non-interlocking malfunctions (see section 10.3) are indicated as long as there is a malfunction. Once the cause has been eliminated, the unit continues to work normally.
- Interlocking faults with fault code in the display (see section 10.4).
  - By pushing the Exit button under the display for at least 5 secs you can call up the "Special Level" and cancel the interlock (menu-directed).

10.2 Overview of possible malfunctions

Malfunction	Possible cause	Possible solution
Heating system not functioning (main switch not illuminated, no display)	No mains voltage	● Switch on the main switch for the boiler. ● Turn on main switch of heating room ● Check / switch on fuse house connection ● Check/ renew fuse boiler control panel
Heating does not warm up	Central heating standby switched off (e.g. timer is in economy phase, outside temperature too high)	● Check operating mode setting.[1)] ● Check requirement parameter[1)] (e.g. timer programme)
Heating does not warm up enough	Heating characteristic too low	● Increase parameter value.[1)]
Hot water does not warm up	Storage charging standby switched off (e. g. timer is in economy phase)	● Check operating mode setting.[1)] ● Check demand parameters 1
Hot water does not warm up enough	Storage tank charging temperature too low	● Increase hot water set temperature.[1)]
	Draw-off rate too high	● Reduce the draw-off rate, limit throughput.
	Burner output too low	● See malfunction "Maximum burner output too low"
Maximum burner output too low	Burner setting wrong Oil nozzle wrong or dirty	● Adjust burner setting (see chapter 7.3) ● Replace oil nozzle (see section 9.2.8)
	Air/flue gas resistance too high	● Check the lines for contaminations. ● If necessary, install lines with a larger line cross-section for supply air or flue gas.
	Oil filter dirty	● Replace oil filter
Burner does not start	Interlocking malfunction	● Determine and repair the cause for the malfunction. ● Cancel interlock (see section 10.5).
Burner motor not running despite burner demand	No mains voltage on burner	● Insert X1 plug on automatic firing until it clicks in place. ● Check voltage at the terminals L-N of the X1 plug ● Check/ renew fuse.
	Plug connections switching panel PCB or automatic firing are loose	● Check/ insert plug connections
	Heater element or thermostat for preheating of the heating oil defective	● Change oil preheater.
	Burner motor defective (bearing has seized)	● Change burner motor
	Condenser defective	● Change condenser
	Oil pump has seized	● Change oil pump
Burner starting is hard	Start delay due to bad ignition	● Adjust ignition electrodes

Malfunction	Possible cause	Possible solution
No ignition	Ignition electrodes short circuited	● Set / change ignition electrodes
	Distance of ignition electrodes too large	● Adjust the ignition electrodes.
	Ignition electrodes contaminated or humid	● Clean ignition electrodes, check oil nozzle and burner setting
	Ignition electrodes burnt out	● Change ignition electrodes
	Insulating body cracked	● Change ignition electrodes
	Ignition transformer defective	● Replace ignition transformer
	Ignition cable burnt	● Change ignition cable and determine the cause
	Automatic firing unit faulty	● Replace the combustion controller.
Loud, whistling mechanical noise	Oil pump is suctioning air	● Check bolts
	Vacuum in the oil line too high	● Clean the filter, open valves fully
	Burner motor bearing defective	● Change burner motor
	Oil pump defective	● Change oil pump
Oil pump does not pump any oil	Stop valve at oil filter or in suction line closed	● Open stop valve
	Oil pump gear damaged	● Change oil pump
	Suction valve has leakage	● Clean/ change suction valve
	Oil line has leakage (pump suctions air)	● Check fittings and seal off.
	Filter clogged	● Clean the filter
	Filter not leakproof	● Change filter
	Oil pump power insufficient	● Change oil pump
	Clutch defective	● Change clutch
Oil atomisation not uniform - heavy soot deposit in flame tube	Oil nozzle loose, clogged or worn out	● Check/ tighten/ change oil nozzle
	Oil nozzle spraying angle is wrong	● Replace oil nozzle
No oil flow	Oil nozzle clogged	● Replace oil nozzle
Mixer device has thick layer of oil or heavy carbon deposits	Air supply insufficient	● Check air supply line for clogging ● Use air supply lines with larger cross-section ● Ambient air dependent operation: Check air intake opening. (min. 150 cm^2 unblockable air intake opening).
	Air supply line contaminated/clogged	● Clean air supply line
	Flue gas pipe of the LAS is leaking	● Seal the flue gas pipe, change seal
	Burner setting wrong	● Check/correct burner setting
	Oil nozzle is wrong size	● Check / change nozzle type
	Combustion air quantity wrong	● Measure fan pressure, correct burner setting
	Suction line draws air (leakage)	● Seal suction line
Soot formation on the air nozzle	Recirculation too low	● Open recirculation slightly
Solenoid valve at oil pump does not open	Coil defective	● Change coil
	Automatic firing unit faulty	● Replace the combustion controller.
Automatic flame guard does not actuate	Flame guard cable defective or bad plug connection	● Replace flame guard cable. ● Check X7 plug connection on automatic firing. ● Check 3-pin plug connector on ignition transformer.

10 Faults and malfunctions

Malfunction	Possible cause	Possible solution
STL switch off	Water throughput too low due to air inclusion	• Vent system
	Water flow too low due to valves closing too quickly along the entire heating network	• Use slow closing or timed valves, if needed, install overflow valve
	Pump standstill	• Check mains and PWM control signal connection, replace pump if necessary.
	Storage tank switched off in operation without hot water storage tank	• Disconnect storage temperature sensor • Switch off storage tank charging circuit
Flue gas temperature sensor switch off	Flue gas temperature too high	• Clean the boiler

1) see documentation "ROTEX RoCon BF Controller"

Tab. 10-1 Possible faults on the A1 BO

10.3 Fault codes

Code	Component/Designation	Fault
E1	Automatic firing unit Interlocking fault	Safety temperature limit: Flow temperature >105°C, return temperature >95°C
E4		No flame detection at burner start.
E5		More than 5 flame interruptions during a continuous burner demand.
E11		Flame detection before burner start.
E15		Oil preheater does not switch within a 5 min. period.
E34		BCC data conflict
E35		Necessary BCC not detected.
E36		BCC data conflict
E37		BCC firmware does not match automatic firing firmware.
E38		Wrong BCC number.
E39		BCC system fault
E99		Safety shutdown
E6	Automatic firing unit Non-interlocking fault	Flow temperature (t_V) is higher than the set maximum boiler temperature (parameter [Max T-HS] + 5 K).
E10		5x Reset within 15 minNew Reset only possible after 15 mins.
E17		Scatter (t_V - t_R) too big.
E19		Flow temperature increase too rapid.
E32		Supply voltage too low.
E48		No communication with the automatic firing for longer than 2 mins.
E50		BCC activation

Tab. 10-2 Fault codes (can be detected by automatic firing)

Code	Component/Designation	Fault	Possible fault rectification
E75	Outside temperature sensor	Measured value outside measuring range, temperature sensor defective.	• Check cable, terminal and plug connections. • Replace the temperature sensor.
E76	Storage tank temperature sensor		
E81	EEPROM	Internal fault	• Total reset • Replace switching panel PCB in controller.
E88	Switching panel PCB controller		
E91	Connected CAN modules	Bus detection of a CAN module doubly present.	• Set bus addresses correctly.
E100	Flue gas temperature sensor	Measured value outside measuring range, sensor / temperature sensor defective.	• Check cable, terminal and plug connections. • Replace the sensor / temperature sensor.
E129	Pressure sensor		
E200	Communication automatic firing	Fault in communication between automatic firing and switching panel PCB on controller.	• Check cable and plug connections. • Total reset • Replace switching panel PCB in controller. • Replace the combustion controller.
E8003	Flue gas temperature	The flue gas temperature has exceeded the threshold temperature.	• Clean the boiler • Check the flue gas temperature sensor.
E8004		The flue gas temperature has exceeded the permissible absolute maximum value.	
E8005	Water pressure	Measured value under permissible minimum value.	• Top up heating water. • Leak test
W8006		Warning message: Maximum permissible pressure drop exceeded.	
W8007		Warning message: Measured value over permissible maximum value.	• Check diaphragm expansion vessel. • Drain heating water.

Tab. 10-3 Fault codes (can be detected by switching panel PCB)

10.4 Rectifying burner faults and STB faults

WARNING!

Risk of burns due to very hot boiler body with STB fault.

- Do not touch any metallic parts on the boiler.
- Let the boiler cool down.
- Wear protective gloves.

The cause of the last fault is saved in the unit and can be reconstructed on restarting the unit, even after power failure.

Interlocking faults detected by the automatic firing can only be reset manually directly on the boiler.

Unlocking the automatic firing unit:

Requirements: The cause of the malfunction is rectified, the burner is electrically connected.

1. Switching ROTEX A1 BO on.
2. Push the Exit button (fig. 6.1, pos. 15) for at least 5 secs.
   ➔ Menu ***"Special Level"*** is displayed.
3. Select the *"FA failure"* level with the rotary switch.
   ➔ Fault code and request "Reset" is displayed.
4. Select "Yes" with the rotary switch.
5. Confirm the changes with a brief push of the rotary switch.
   ➔ Fault is reset.
6. Cancelling and jump back by pushing the Exit button again.

10.5 Emergency operation

In manual operation, the 3-way diverter valve is in the "Storage tank charging" position first. On reaching the maximum adjustable storage tank temperature, the 3-way diverter valve is switched to the "Heating" position.

If the 3-way diverter valve is faulty, the motor head of the valve drive can be removed (see section 8.1.2). The diverter valve is on the Heating setting.

Manual parallel operation of the heating circuit and hot water storage tank can be set **temporarily** (see chapter 8.1.2)

In the event of faults or incorrect settings in the electronic controller, emergency heating operation can be maintained.

1. Push the Exit button (fig. 6.1, pos. 15) for at least 5 secs.
   ➔ Menu ***"Special Level"*** is displayed.
2. Select the *"Manual Operation"* level with the rotary switch.
   ➔ The temperature scale, set and actual temperatures are displayed.
3. Set the flow temperature with the rotary switch.
4. Confirm the changes with a brief push of the rotary switch.
   ➔ The ROTEX A1 BO operates manually at the set flow temperature.
5. Cancelling and jump back by pushing the Exit button again.

11 Taking out of service

11.1 Temporary shutdown

CAUTION!

A heating system which is shut down can freeze in the event of frost and may suffer damage.

- Drain the heating system that is shut down if there is danger of frost.
- If the heating system is not drained and there is the risk of frost, the oil and power supplies must be secured and the main switch must remain switched on.

If a heating or hot water supply is not to be required for a longer period of time, it is possible to temporarily shut down the ROTEX A1 BO. However, ROTEX recommends putting the system into standby mode (see the documentation "ROTEX RoCon BF Controller" Controller"). The heating system is then protected from frost. The pumps and valve protection functions are active.

If it is not possible to guarantee the oil and power supply when there is danger of frost,

– the ROTEX A1 BO must be drained
– the condensate box must be emptied,
– suitable antifreeze measures must be taken for the connected heating system and hot water storage tank (e.g. draining).

Draining the heating system

- Switch off the main switch and secure against restarting.
- Close the stop valve on the oil filter.
- Bleed all the water in the entire system at the filling and draining sockets (KFE cock).

11.2 Final shutdown and disposal

For the final shutdown, the ROTEX A1 BO must be:

- taken out of service,
- disconnected from all electrical, oil and water connections,
- disposed off in a professional manner.

Recommendations for disposal

The ROTEX A1 BO is designed to be environmentally friendly. During the disposal process, the only waste created is that which can be used for material or thermal recycling. The materials used can be separated into different types.

ROTEX, thanks to the environmentally friendly design of the ROTEX A1 BO, has established the preconditions to ensure environmentally friendly disposal. Proper disposal in compliance with the respective national regulations of the country of use is the responsibility of the user/owner.

12 Technical data

12.1 Basic Data Oil Boiler

Boiler type		A1 BO 15-e	A1 BO 20-e	A1 BO 27-e	A1 BO 34-e
Parameter	Unit				
Product Identification Number (CE number)		CE 0035 BM-105.3			
Length	mm	720			
Width	mm	625			
Height	mm	1100	1100	1220	1340
Weight of the boiler body	kg	49	49	58	67
Transport weight Unit (without panels and condensate preparation)	kg	81	81	96	113
Water content	l	3.0	3.0	4.5	5.0
Nominal heat output P_n (80/60 °C in accordance with EN 303)	kW	12.0 - 14.7	12.0 - 20.3	20.0 - 27.0	24.8 - 33.7
Nominal heat output in condensing mode P_{nc} (50/30 °C in accordance with EN 15034)	kW	12.4 - 15.3	12.4 - 21.1	20.6 - 27.7	25.8 - 34.4
Set rated thermal output P (upon delivery)	kW	15	18	25	30
Setting range (burner with series configuration)	kW	15	15 - 20	25 - 27	27 - 32
Output range for burner conversion	kW	URS12: 12 - 14	URS12: 12 - 14	URS20: 20 - 24	URS25: 25 - 26 URS35: 33 - 34
Maximum permissible flow temperature	°C	80			
Maximum permitted operating overpressure PMS	bar	4			
Max. boiler efficiency	%	up to 105			
Energy efficiency according to efficiency guidelines		★★★★			
CO emission class (acc. to EN 303-2)		3			
NOx emission class (acc. to EN 303-2)		3			
Diameter of flue gas connection/air supply connection	mm	80 / 125			
Voltage	V	230 ~			
Power supply Frequency	Hz	50			
Max. electric power consumption (without / with circulation pump)	W	200 / 220	215 / 245	210 / 245	220 / 260
Max. electric power consumption in operating mode *"Standby"*	W	3.4			
Protection type		IP X0B			

Tab. 12-1 Basic data A1 BO

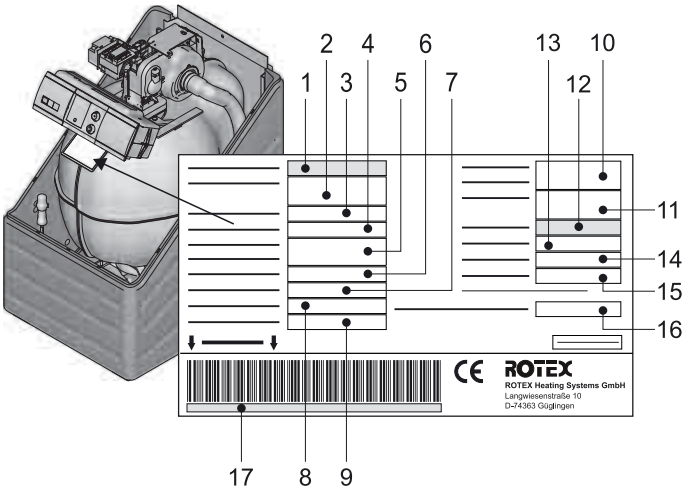
12 Technical data

Boiler type		A1 BO 15-e	A1 BO 20-e	A1 BO 27-e	A1 BO 34-e
Burner type		BLB 15e	BLB 20e	BLB 27e	BLB 34e
Parameter	Unit				
Firing heat output Q_n	kW	12.2 - 15.1	12.3 - 20.8	20.4 - 27.8	25.7 - 34.9
Oil-throughput	kg/h	1.03 - 1.29	1.04 - 1.75	1.72 - 2.34	2.17 - 2.94
Heating oil		Extra light as specified in DIN 51603-1, preferably low sulphur			
Maximum bio-heating oil ratio	%	20 (BTL or FAME in accordance with DIN V 51 603-6)			
Hydraulic system		Single stage with oil preheating			
Air regulation		Linearised air metering drum			
Regulation ratio		1:1			
Weight	kg	9.5			10.5
Test as specified in EN 267		Registration number: 5 G 966/2013			
Voltage	V	~230			
Power supply Frequency	Hz	50			
Output electrical motor at 2800 min^{-1}	W	90			180
Protection type		IP X0B			

Tab. 12-2 Basic Data Oil Boiler

Boiler type	A1 BO 15-e	A1 BO 20-e	A1 BO 27-e	A1 BO 34-e
Burner type	BLB 15e	BLB 20e	BLB 27e	BLB 34e
Automatic firing unit	Elster CM165-R1			
Ignition transformer with flame monitor	Federal Mogul ZTÜ No. 0 096 600 033: 2x 7.5 kV, 15 -20 kHz			
Solenoid valve	Danfoss Type 071 N 0051			
Oil pump, pumping capacity	Danfoss Type BFP 21 L3, No. 071 N0185			
Oil preheating	Danfoss Type FPHB 5 No. 030N2057, 30-90 W			
Motor including condenser	Hanning			
	No. O1A95-030P0009-030-001OF0-608 90 W (4 µF, 400 V)			No. O1A95-055P0018-030-001OF0-609 180 W (5 µF, 420 V)

Tab. 12-3 Classification of burner components in the A1 BO



1 Type
2 Unit type
3 Product-ID (CE-Number)
4 Power voltage supply
5 Electrical power consumption
6 Protection rating
7 Net weight
8 Water content
9 Max. permissible operating pressure
10 Nominal thermal output (80/60°C)
11 Nominal thermal output (50/30°C)
12 Set nominal thermal output
13 Firing heat output
14 Max. permissible operating temperature
15 Emission class in accordance with EN 303-2
16 Effectivity stage in accordance with EN 15034
17 Manufacturer's number (quote with queries)

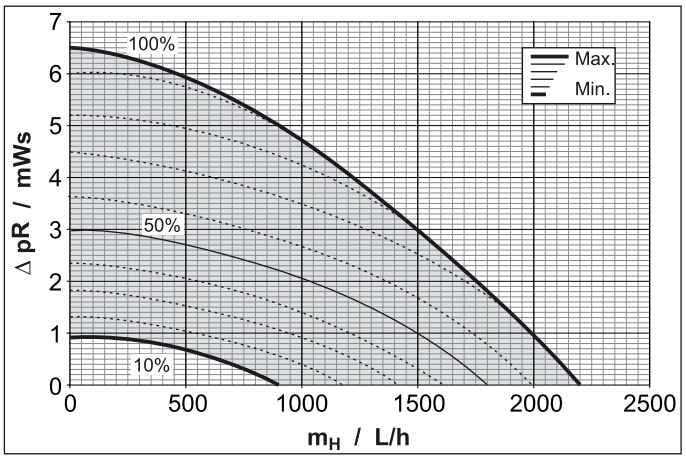
Fig. 12-1 Details on identification plate

12.2 Heating circulation pump and 3-way diverter valve (A1 BO - all types)

Parameter	Unit	Heating circulation pump
Type		Grundfos UPM2 15-70 CES87
Voltage	V	230 ~
Frequency (power supply)	Hz	50
Maximum power consumption	W	70
Protection type		IP 44
Permitted overpressure	bar	3
Maximum pumping height	m	7.0
Energy efficiency		EEI < 0.23
		3-way diverter valve (accessory)
Type		Honeywell VC4012 (SPST)
Voltage	V	230 ~
Frequency (power supply)	Hz	50
Maximum power consumption	W	4.3
Protection type		IP X0B
Turnaround time	S	6

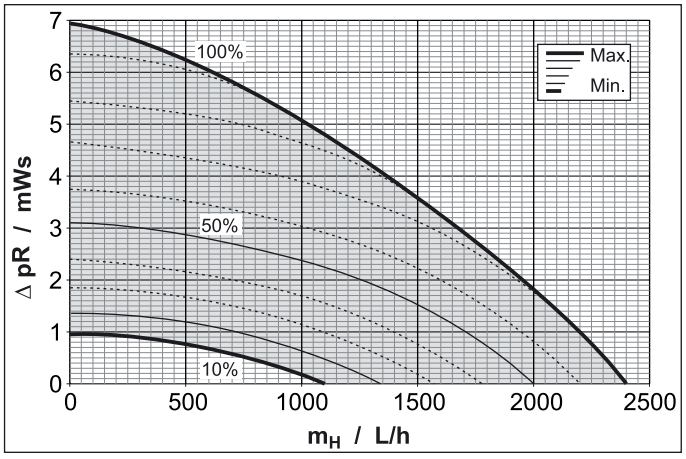
Tab. 12-4 Technical details of the integrated heating circulation pump and the 3-way diverter valve from connecting kit A1

12.3 Flow rate and residual feed height



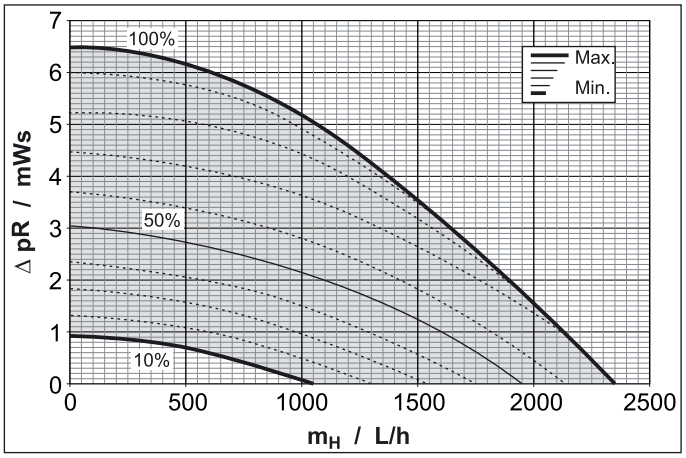
Δp_R *Remaining pumping height*
m_H *Flow heating network*

Fig. 12-2 Residual feed height A1 BO 15-e / A1 BO 20-e



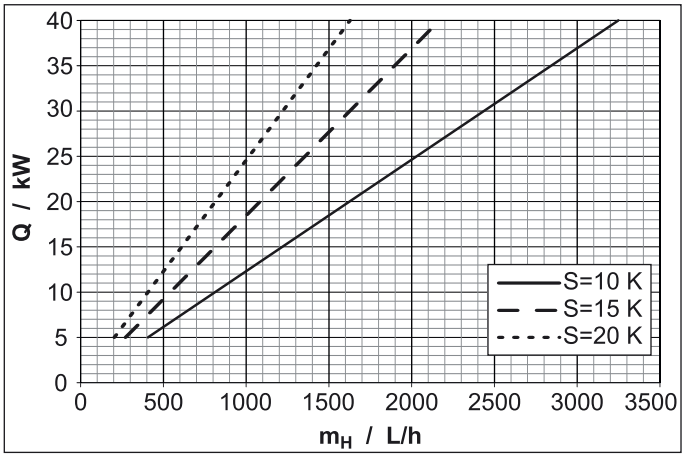
Δp_R *Remaining pumping height*
m_H *Flow heating network*

Fig. 12-4 Residual feed height A1 BO 34-e



Δp_R *Remaining pumping height*
m_H *Flow heating network*

Fig. 12-3 Residual feed height A1 BO 27-e



Q *Heating output*
m_H *Flow heating network*

Fig. 12-5 Required throughput volumes dependent on the heating output and the design temperature spread

12.4 Temperature sensor

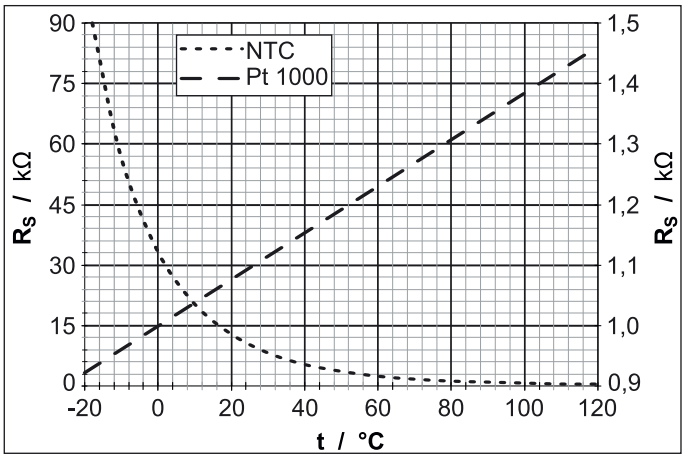


Fig. 12-6 Resistance characteristics of the temperature sensor

R_S *Sensor resistance*
t *Temperature*

NTC resistance
Flow temperature, return temperature, external temperature, storage tank temperature, mixer circuit flow temperature

Pt 1000 resistance
Flue gas temperature

Temperature sensor		Measured temperature in °C														
Type	Specification *	-20	-10	0	10	20	30	40	50	60	70	80	90	100	110	120
		Sensor resistance in Ohm according to standard or manufacturer's indications														
NTC	t_V, t_R, t_{AU}, t_{DHW}, t_{Mi}	98660	56250	33210	20240	12710	8195	5416	3663	2530	1782	1278	932	690	519	395
PT-1000	t_{AG}	922	961	1000	1039	1077	1116	1155	1194	1232	1270	1308	1347	1385	1423	1461

Tab. 12-5 Resistance values of the temperature sensor

* *Key see tab. 8.1*

13 Notes

Notes

14 List of keywords

Numerics

A

B

C

D

E

F

H

I

L

M

O

P

R

S

T

W

15 For the chimney sweep

15.1 Data for designing the flue gas pipe

Unit type	Nominal boiler heat output in kW	Flue gas mass flow (humid) in g/s		Flue gas temperature in °C		Available pumping pressure in Pa
		at 75/60 °C	at 40/30 °C	75/60 °C	40/30 °C	
A1 BO 15-e	12	5.32	5.17	70	48	150
	15	6.72	6.49	75	52	150
A1 BO 20-e	12	5.32	5.17	70	48	150
	15	6.72	6.49	75	52	150
	20	9.03	8.67	85	65	150
A1 BO 27-e	20	9.03	8.55	79	53	100
	23	10.49	9.86	84	61	100
	27	12.40	11.61	89	68	80
A1 BO 34-e	25	11.29	10.69	84	58	100
	30	13.68	12.86	95	66	100
	34	15.62	14.62	97	73	80

Tab. 15-1 Triple values for chimney design (flue gas flow dependent on heat output, see fig. 4-6, page 15)

15.2 Emissions measurement

The check measurement can be made by a simply selectable automatic function (see also "Operating Instructions - ROTEX-RoCon BF Controller" Controller").

- Depress the exit button for at least 5 secs.
  ➔ Menu ***"Special Level"*** is displayed.
- *Use the rotary switch to select the "Emission Measurement" Menu Point .*
- Confirm the changes with a brief push of the rotary switch.
- *Select the load type "Full Load"* using the rotary switch, but do not confirm it.
  ➔ Display: ***"Full Load"***
  ➔ The burner is turned on for 30 min. and is regulated at the stipulated maximum temperature.
  ➔ The emission measurement can be carried out.
- Cancel and jump back by:
  – Pushing the exit button again, or
  – Selection of a different menu using the rotary switch and confirmation.

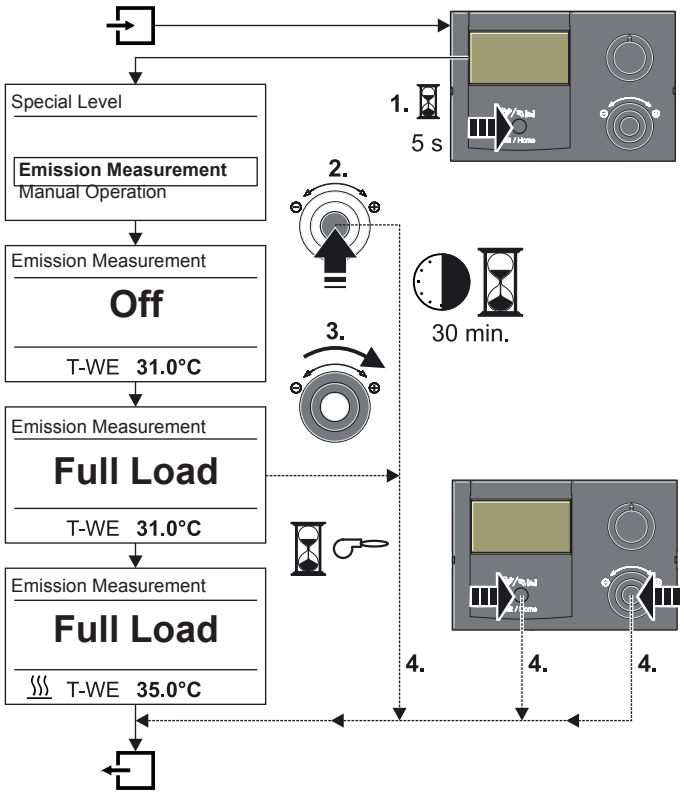


Fig. 15-1 Symbolic brief instructions for emission measurement