Installation and servicing instructions

Gas condensing boiler

CAUTION!
Observe the safety instructions of this installation and maintenance manual before placing the boiler in operation.

DANGER!
If installation, adjustment, modification, operation or maintenance of the heating system is carried out by an unqualified person, this may result in danger to life and limb or property damage. The directions of this installation and maintenance manual must be followed precisely. Contact a qualified service company, service provider or the gas company if support or additional information is required.

CAUTION!
The operating manual is a component of the technical documentation and must be handed over to the operator of the heating system. Discuss the instruction in this manual with the owner or operator of the heating system to ensure that they are familiar with all information required for operation of the heating system. If the boiler will be installed in Massachusetts, it must be installed by an installer or dealer who is registered there.

Logano plus GB312

For qualified technicians

Please read carefully prior to installation and maintenance

PLEASE IGNORE ALL REFERENCES TO THE RC35 CONTROL WITHIN THE MANUAL AS THE RC35 IS NOT AVAILABLE UNTIL FALL 2008

7 747 010 719 (06/2007) US

Buderus

Contents

1 General safety instructions and explanation of symbols

1.1 Safety instructions

If you smell gas

- Turn off the gas valve (→ page 57).
- Open windows and doors.
- Do not operate any electrical switches or equipment such as telephones, power plugs and doorbells.
- Extinguish all open flames. Do not smoke. Do not use lighters of any kind.
- Warn all occupants of the building, but do not ring doorbells.
- If you can actually hear gas escaping, leave the building immediately. Prevent others from entering and notify the police and fire department **from outside** the building.
- **From outside the building,** call gas supplier and approved heating contractor.

If you smell flue gas

- Switch "off" the boiler (→ page 57).
- Open windows and doors.
- Inform an authorized heating contractor.

Risk of poisoning. An insufficient supply of air can result in dangerous escape of flue gas.

- Never close off or reduce the size of air inlet or outlet vents.
- The boiler must not be operated until the obstruction has been removed.
- Inform the system operator in writing of the problem and associated danger.

Danger from escaping flue gases.

- Make sure that the flue pipes and seals are not damaged.
- Use silicon as sealing compound.
- The boiler must not be fitted with a barometric damper or a thermally controlled flue flap downstream of the flue socket.
- Connect only one boiler to each flue system or chimney flue.
- Connection of another boiler may cause serious injury or death.
- The flue system piping must not feed into another air extraction duct.
- Do not route the flue system piping through or inside another air extraction duct, for example where there is a masonry or prefabricated chimney flue.

Danger of explosion of flammable gases.

- Any work on components that carry gas may only be carried out by an approved heating contractor.

Dangers posed by explosive and easily combustible materials

- Do not use or store easily combustible materials (paper, lace curtains, clothing, thinners, paints, etc.) near the boiler.
- Maintain a clearance of 16 inches from the boiler.

Combustion air

- Keep the combustion air free of corrosive substances (e.g. halogenated hydrocarbons that contain chlorine or fluorine compounds). In that way you will prevent corrosion.

Danger from electric current when the boiler is open.

- Before opening the boiler:Disconnect the heating system from the electrical power supply by means of the emergency stop switch or the relevant circuit breaker on the main fuse board.
- It is not sufficient just to switch off the control unit.
- Take measures to ensure the heating system can not be switched on again unintentionally.

Danger due to short-circuits

To prevent short circuits, only

- use genuine Buderus wiring.

Installation and conversion

- Correct and proper installation and adjustment of the burner and the programmer are the fundamental requirements for safe and economical operation of the boiler.
- The boiler may only be installed or converted by an approved heating contractor.
- Do not modify any parts that carry flue gas.
- Work on gas components may only be carried out by qualified and authorized personnel.
- Only qualified electricians are permitted to carry out electrical work. Installation regulations must be complied with.
- With **balanced flue appliances:** do not cover or reduce the size of ventilation openings in doors, windows and walls. If draft-proof windows are fitted, ensure there is an adequate supply of air to the room for combustion.
- **Never shut off safety valves.** Water may escape from the safety valve for the hot water system and piping when the water is being heated.

Maintenance and servicing

Heating systems should be regularly maintained for the following reasons:

– to achieve a high level of efficiency and to operate the system economically (low fuel consumption),
– to achieve a high level of operational reliability,
– to maintain the cleanest possible combustion.

- **Recommendation for users:** take out a maintenance and servicing contract with an approved heating contractor covering annual servicing and condition-based maintenance.
- Servicing and repairs may only be carried out by an approved heating contractor.
- Immediately correct all faults to prevent system damage.
- The operator is responsible for the general and environmental safety of the heating system.
- Use only genuine spare parts. Damage caused by the use of parts not supplied by Buderus is not covered by the Buderus warranty.

Instructing the customer

- Explain to the customer how the boiler works and how to operate it.
- Inform the customer that he/she must not carry out any alterations or repairs.

1.2 Explanation of symbols

Warnings are indicated by a warning triangle and a grey background.

Signal words are used to indicate the seriousness of the ensuing risk if measures for minimising damage are not taken.

– **Caution** indicates that minor damage to property may occur.
– **Warning** indicates that minor personal injury or severe damage to property may occur.
– **Danger** means that severe personal injury may occur. Very serious cases may result in death.

Notes are identified in the text by this symbol. They are bounded by horizontal lines above and below the text.

Notes contain important additional information.

Notes do not contain any warnings or information about hazards or risks.

2 Details of the product

These installation and servicing instructions contain important information regarding the safe and proper installation, commissioning and servicing of the Logano plus GB312 gas condensing boiler.

These installation and servicing instructions are intended for qualified heating contractors, who – as a result of their technical training and experience – are skilled in dealing with heating systems and gas installations.

The boiler can be fitted with a programming unit such as the RC35 (available separately).

Only use the boiler in the combinations and with the accessories and components that are specified in the installation and servicing instructions.

Use other combinations, accessories and consumables only if they are specifically intended for the proposed application and they do not affect performance characteristics and safety requirements.

2.1 Intended use

The Logano plus GB312 is designed for heating central heating system water and, with the use of an indirect tank, domestic hot water, for instance in apartment buildings.

2.2 Standards, regulations and directives

Observe all standards and guidelines applicable to the installation and operation of this heating system in your country.

2.2.1 National regulations

The heating system must comply with the requirements of the relevant regulatory authorities or otherwise of the National Fuel Gas Code, ANSI Z 223.1. In Canada, the requirements of CAN/CGA-B.149.1 and 2, Installation Code for Gas Burning Appliances and Equipment, must be observed.

If specified by the relevant regulatory authorities, the heating system must comply with the regulations of the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.

Carbon monoxide detectors must be installed as specified by the local regulations. The boiler must be serviced annually.

Boiler operating conditions

The heat exchanger has been designed and certified in accordance with the ASME Boiler and Vessel Code, Section IV.

Maximum boiler temperature: 200 °F

Maximum operating pressure: 50 psi

The hot water piping system must comply with the applicable legislation and regulations. If an existing boiler is replaced, the complete hot water piping system must be inspected to ensure that it is in perfect condition to ensure safe operation.

2.3 Compliance with standards and regulations

The design and mode of operation of this boiler comply with the American National Standard ANSI Z21.13/ CSA4.9, latest edition for Gas Fired Low Pressure Steam and Hot Water Boilers.

Other confirmed approvals and certifications are indicated by stickers on the boiler.

Installation of the boiler must comply with all applicable codes and regulations imposed by the national, Federal or local authorities and bodies. If no specific requirements are defined, in the USA, the latest edition of the National Fuel Gas Code ANSI Z223.1/NFPA 54 must be complied with. In Canada, installation must comply in all respects with the latest edition of the Installation Code for Gas Burning Appliances and Equipment, CAN/CGA-B.149 and the applicable local regulations and requirements for the appliance category. The relevant authorities and regulatory bodies must be informed before installation starts.

Where required by local regulations, the system must comply with the American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers (ASME CSD-1).

In the Commonwealth of Massachusetts, this appliance must be installed by a licensed pipe fitter, taps external to the boiler must be fitted with T-handles and condensate piping must be fitted in accordance with the State Plumbing Code.

2.4 Notes on installation and operation

When installing and operating the heating system observe the following:

- The local building regulations regarding the installation conditions.
- The local building regulations regarding air supply and venting systems and the chimney flue connection.
- Electrical code requirements for connection to the power supply.
- The technical regulations of the gas company regarding the connection of the gas burner to the local main gas supply.
- The regulations and standards relating to the safety systems for the water heating system.

2.4.1 Other important information

- The installation of a boiler must be notified to and approved by the relevant gas supplier.
- Only operate the boiler with the combined air/flue system specifically designed and approved for it.
- Remember that regional approvals are required for the flue system and connecting the condensate outlet to the public sewer system.

2.5 Heating system water quality

As pure water cannot be used for heat transfer, water quality is important. Poor water quality can damage heating systems due to scale formation and corrosion. For further details, please see the accompanying operator's log.

Caution: Risk of system damage due to unsuitable heating system water.

- If oxygen-permeable pipes are used, e.g. for underfloor heating systems, the systems must be separated from one another by heat exchangers. Unsuitable heating system water promotes sludge and corrosion formation. This can result in heat exchanger malfunction and damage.

2.6 Tools, materials and equipment

For the installation and maintenance of the boiler, you will require the standard tools used for central heating and gas and water systems plus set of a metric wrenches and hex keys.

The following may also prove useful:

- The RC35 programming unit is required as a monitoring device for commissioning, servicing and maintaining the boiler.

A PC with Buderus Logamatic ECO-Soft 4000/EMS and a service key can also be used as a monitoring device.

- 2 pipes (approx. 1¼", approx. 6.6 ft long) for carrying the boiler or 5 pipes (approx. R1¼", approx. 28 ins long) for placing underneath the boiler to act as rollers
- Cleaning blade and/or chemical cleaning agent for wet cleaning

2.7 Disposal

- Dispose of boiler packaging in an environmentally responsible manner.
- All heating system components that have to be replaced should be disposed of in environmentally responsible manner at an authorized disposal site.

2.8 Product description

The Logano plus GB312 (→ Fig. 1) is supplied with a fully factory-fitted and ready-wired Logamatic BC10 basic programmer (→ Fig. 2, page 9).

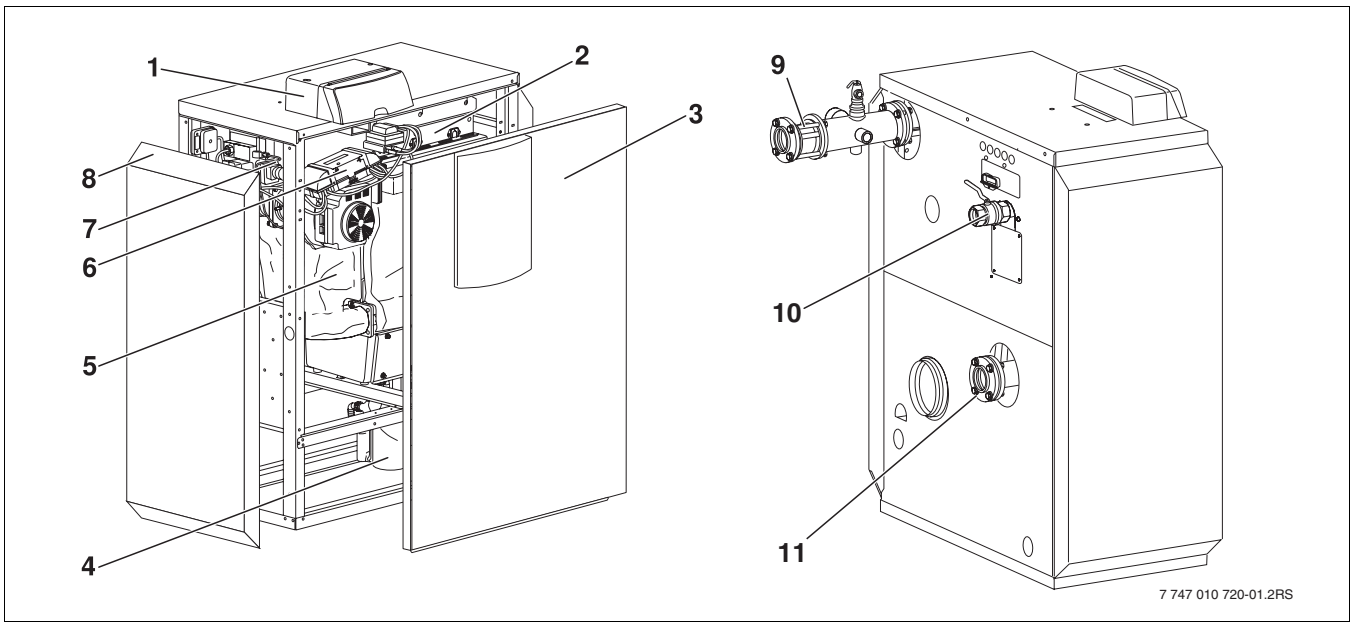


Fig. 1 Logano plus GB312 - main components

1 Programmer (MC10 and BC10)
2 Gas burner
3 Boiler front panel
4 Trap
5 Boiler heat exchanger with insulation
6 Burner control unit
7 Gas valve
8 Boiler outer casing
9 B-kit with flow check valve (supplied as standard, not factory installed)
10 Gas isolating valve (supplied as standard, not factory installed)
11 Mating flange, 2½" (included in B-kit, not factory installed)

The main components of the Logano plus GB312 (→ Fig. 1) are:

- Programmer
- Frame and casing
- Boiler heat exchanger with insulation
- Gas burner
- B-kit (standard B-kit comprising temperature/pressure gauge, pressure relief valve, supply manifold, mating flange for flow/return piping, not factory installed)
- Gas isolating valve

The programming unit monitors and controls all electrical boiler components.

The boiler heat exchanger transfers the heat generated by the burner to the heating water. The thermal insulation reduces radiant and standby heat loss.

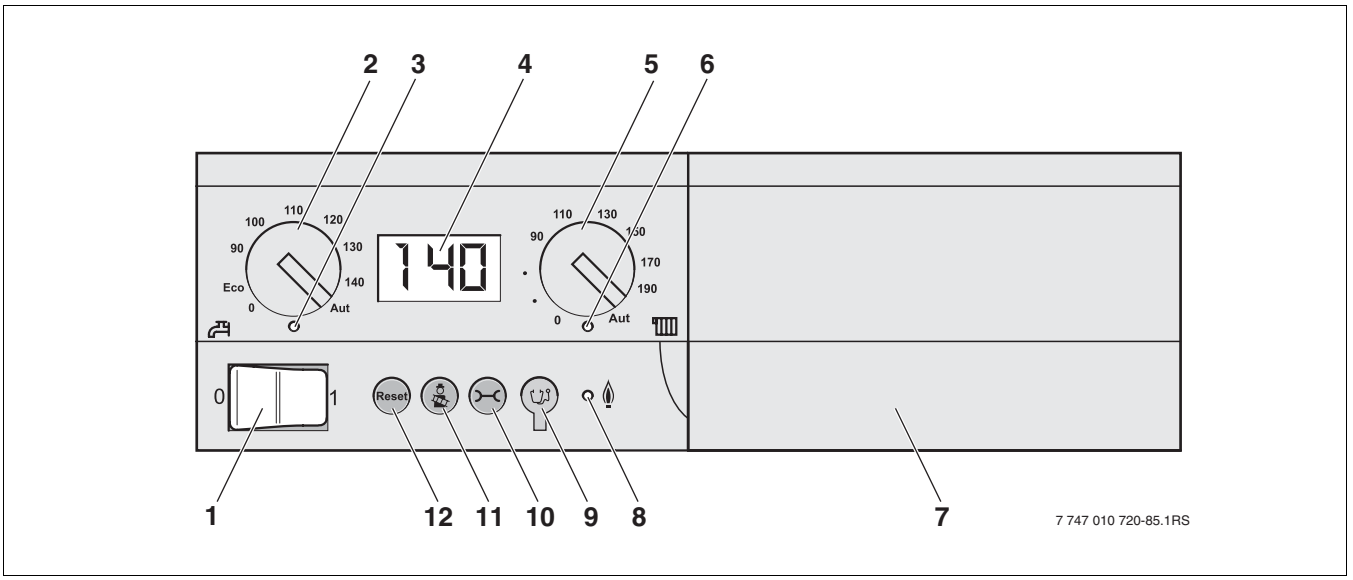


Fig. 2 Logamatic BC10 basic programmer - controls

1 On/off switch
2 Dial for DHW set point
3 “DHW heating” LED
4 Status display screen
5 Control knob for maximum boiler temperature
6 “Heat demand” LED
7 Base plate with slot for a programming unit e.g. RC35 (behind the cover panel)
8 “Burner” LED (ON/OFF)
9 Socket for connecting diagnostic plug
10 “Status display” button
11 “Flue gas test” button
12 “Reset” button

Logamatic BC10 basic programmer (→Fig. 2). The Logamatic BC10 basic programmer enables basic operation of the heating system. It provides functions such as the following for that purpose:

– Turning the heating system on/off
– Setting the DHW temperature and the maximum boiler temperature in heating mode
– Status display

On overall picture of the controls of the Logamatic BC10 basic programmer can be obtained from Fig. 2.

Many other functions for the convenient control of your heating system are available with a programming unit (such as the RC35*).

** Available separately*

2.9 Package contents

The Logano plus GB312 is supplied complete with BC10 basic control unit and MC10 programming unit.

- On delivery, check that the packaging is undamaged.
- Check that all package contents are present.
- Dispose of packaging in an environmentally responsible manner.

Component	Packaging
Boiler (fully assembled with outer casing, Logamatic MC10 programming unit, BC10 and gas isolating valve)	1 box on a pallet
Technical documentation	1 foil package
Set of adjustable feet	1 foil package
B-kit (temperature/pressure gauge, pressure relief valve, flow connector, flow/return mating flange, non-return valve)	1 box

Accessories

A wide range of accessories for the boiler is available. Refer to the catalog for precise details of suitable accessories.

The following accessories are available from the trade:

– Flue system
– Air supply system
– Programming unit, e.g. RC35

2.10 Dimensions and specifications

2.10.1 Logano plus GB312 dimensions

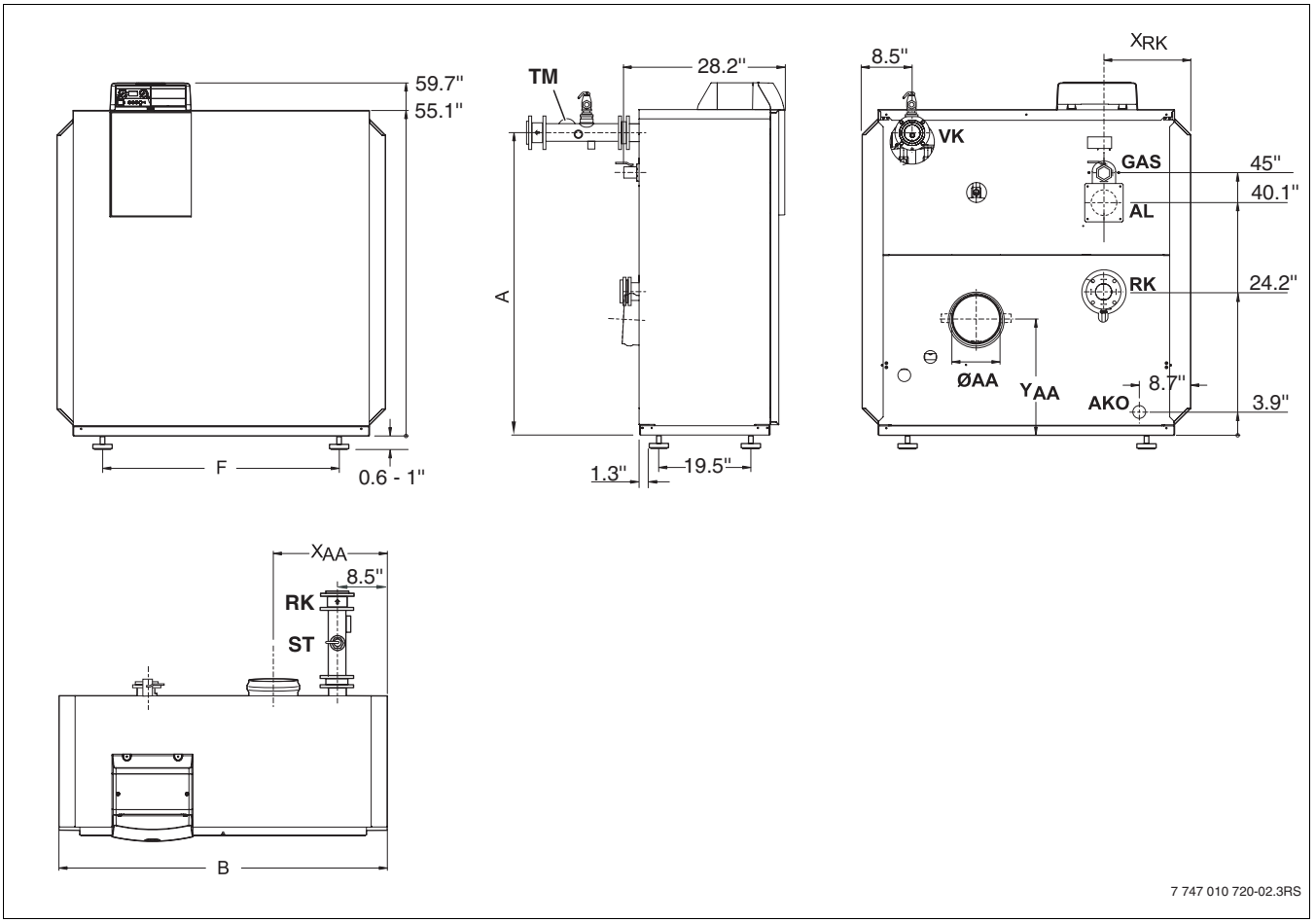


Fig. 3 Connections and dimensions for Logano plus GB312 (sizes in inches)

AA = Flue connection
AL = Combustion air pipe connection (balanced flue operation only)
VK = Boiler flow
AKO = Condensate outlet
GAS = Gas connection + main isolating valve
ST = Pressure relief valve connection
RK = Boiler return
TM = Pressure/temperature gauge

Boiler size (output - no. of heat exchanger sections)	Unit	90 - 4	120 - 4	160 - 5	200 - 6	240 - 7	280 - 8
Width B	Inches	39.1		47.3		55.5	
Dimension XAA	Inches	13.1		15.1	17.2	19.2	21.3
Dimension XRK (= XAL = XGAS)	Inches	10.6		14.7	10.6	14.7	10.6
Dimension F	Inches	31.5		39.7		47.9	
Dimension A	Inches	51.5		51.2			
AA = Flue pipe diameter	Inches	6.3			7.9		
Flue adaptor for desired manufacturer's flue system		6.3" x 5"	6.3" x 6"		7.9" x 8"		
Dimension YAA	Inches	18.5			19.5		
Dimension ZAA	Inches	5.7			12.2		
AL = Diameter of combustion air pipe (balanced flue only)	Inches	3.94					
Connections VK and RK		2½" NPT					

Tab. 1 Dimensions and connection sizes

Boiler size (output - no. of heat exchanger sections)	Unit	90 - 4	120 - 4	160 - 5	200 - 6	240 - 7	280 - 8
Connection ST (B-kit)		¾" NPT					1" NPT
Diameter GAS		1" NPT			1 ¼" NPT		

Tab. 1 Dimensions and connection sizes

2.10.2 Specifications

Observe all standards and guidelines applicable to the installation and operation of the heating system in your country. The information on the boiler rating plate is definitive and it is imperative that it is observed.

Boiler size (output - no. of heat exchanger sections)		Unit	90 - 4	120 - 4	160 - 5	200 - 6	240 - 7	280 - 8
Natural gas (gas type A)								
I-B-R Input	max. load	Btu/hr	328,250	440,510	588,250	732,590	880,670	1,028,760
	min. load	Btu/hr	132,150	132,150	176,480	219,780	264,200	308,630
I-B-R gross output 180/80 ° F	max. load	Btu/hr	305,000	409,000	544,000	676,000	810,000	944,000
I-B-R net rating 180/80 ° F	max. load	Btu/hr	265,000	356,000	473,000	588,000	704,000	821,000
Rated heat input 122/86 ° F	max. load	Btu/hr	307,090	409,460	545,940	682,430	818,910	955,400
(50/30 ° C)	min. load	Btu/hr	128,050	127,390	171,190	212,310	255,220	298,140
Flue gas mass flow rate 180/80 ° F	max. load	lb/min	4.85	6.53	9.14	11.40	13.88	16.15
Flue gas mass flow rate 122/86 ° F	max. load	lb/min	5.05	7.12	9.29	11.61	14.02	16.65
Flue gas temperature 180/80 ° F	max. load	° F	83	90	127	138	140	134
Flue gas temperature 122/86 ° F	max. load	° F	120	133	129	131	131	135
PROPANE (gas type E)								
I-B-R Input	max. load	Btu/hr	320,400	437,440	633,640	756,130	911,040	1,067,320
	min. load	Btu/hr	131,230	131,230	190,090	226,840	273,310	320,200
I-B-R gross output 180/80 ° F	max. load	Btu/hr	298,000	406,000	586,000	698,000	839,000	980,000
I-B-R net rating 180/80 ° F	max. load	Btu/hr	259,000	353,000	510,000	607,000	730,000	852,000
Rated heat input 122/86 ° F	max. load	Btu/hr	306,410	405,700	590,980	706,660	846,890	998,390
(50/30 ° C)	min. load	Btu/hr	130,880	131,420	178,000	217,680	261,420	303,820
Flue gas mass flow rate 180/80 ° F	max. load	lb/min	4.85	6.65	10.00	12.08	14.58	17.13
Flue gas mass flow rate 122/86 ° F	max. load	lb/min	4.88	6.71	10.11	12.01	14.51	17.14
Flue gas temperature 180/80 ° F	max. load	° F	83	90	130	135	146	140
Flue gas temperature 122/86 ° F	max. load	° F	85	85	121	124	129	126
CO2 content, natural gas (GAS A)	max. load / min. load	%	9.1					
CO2 content, propane (GAS E)	max. load / min. load	%	10.5					
Available flue pressure (flue draft + air supply pressure)		in. W.C.	0.4 (100 Pa)					
Air supply volumetric flow rate		cfm	95	95	130	160	190	220
Blower			G1G 170					
Honeywell gas valve			V4730C1071			V4730C1097		V4730C1063
Gas injector diameter								
Natural gas (GAS A) calorific value 1075 BTU/ft3			17.0					
Propane (GAS E) calorific value 2500 BTU/ft3			7.9		8.8	9.4	9.95	10.6
Heating water circuit								
Boiler water capacity		US gallons	4.2	4.2	5.3	6.3	7.1	7.9
Primary pressure drop		psi	→ Fig. 4 (graph)					
Maximum flow temperature, heating/hot water mode		° F	172/180					
High temperature cut-out safety limit (manual reset high limit setting)		° F	200					

Tab. 2 Specifications

Boiler size (output - no. of heat exchanger sections)		Unit	90 - 4	120 - 4	160 - 5	200 - 6	240 - 7	280 - 8
Permissible operating pressure		psi	50					
Electrical data								
Enclosure class			IP 40					
Mains power supply		V/Hz	120 V / 60 Hz					
Power consumption	max. load	W	84	150	190	230	270	370
	min. load	W	40	40	45	50	50	50
Maximum permissible fuse rating		A	10					
Appliance dimensions and weight								
Transport clearance dimensions, width x depth x height		Inches	34x25x60		42x25x60		50x25x60	
Weight		lbs	455		530	585	665	730

Tab. 2 Specifications

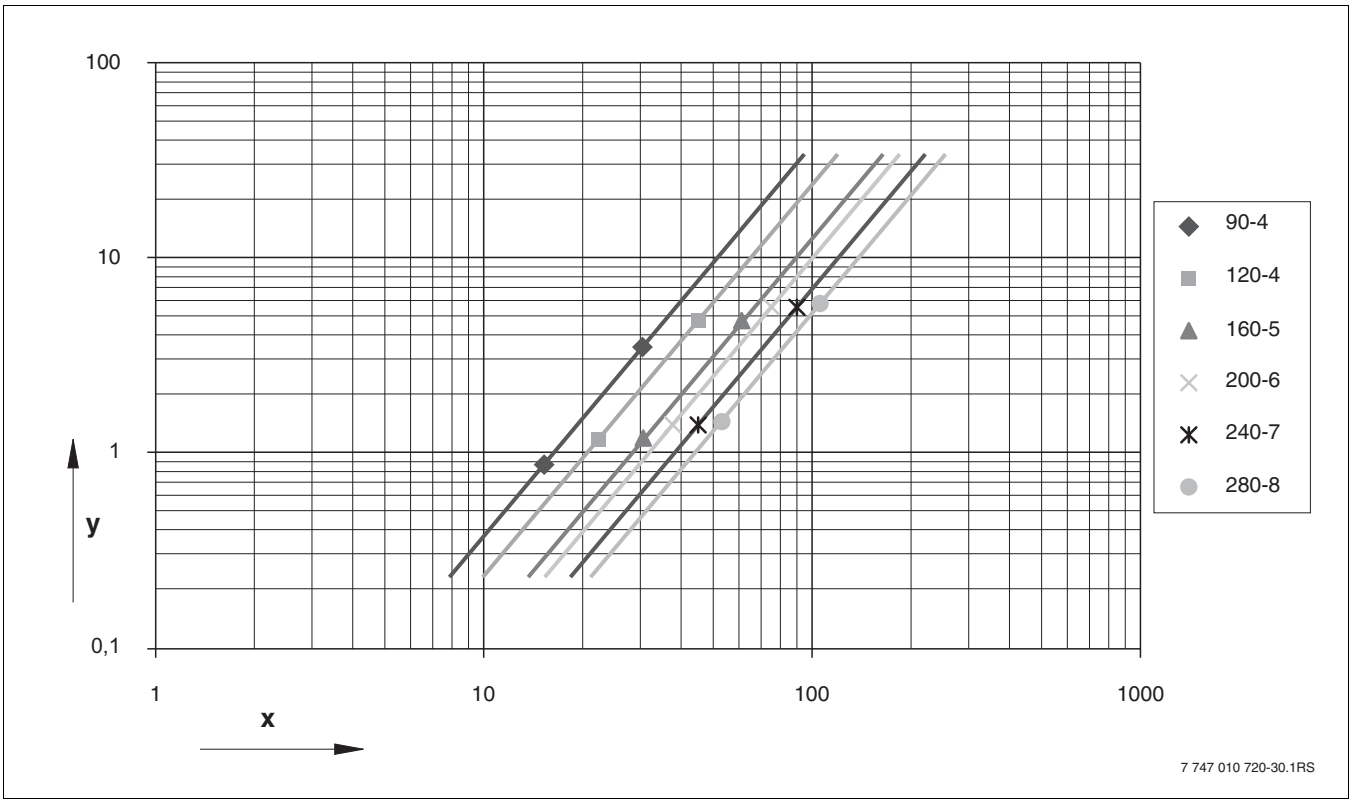


Fig. 4 Primary circuit flow resistance, GB312 with check valve

x Flow rate in gal/min (GPM)
y Primary pressure drop in psi

Boiler rating	Gas flow rate	
	Natural gas (gas type A) Calorific value 1075 BTU/ft³ cu ft/hr	Propane (gas type E) Calorific value 2500 BTU/ft³ cu ft/hr
90 - 4	324.6	118.2
120 - 4	434.4	160.8
160 - 5	579.0	233.4
200 - 6	720.6	278.4
240 - 7	868.8	335.4
280 - 8	1013.4	393.0

Tab. 3 Gas flow rate (based on gas temperature of 60 °F and air pressure of 30 ins Hg)

The boiler can be factory-set for:

– Natural gas (gas type A)

– Propane (gas type E)

3 Transporting the boiler

This section describes how to move the boiler safely and without damaging it.

Caution: Risk of system damage due to impacts.
The boiler as delivered contains components that are sensitive to shocks.

- If the boiler has to be moved after delivery, protect all components against shocks and impacts.
- Observe the transport instructions on the packaging.

If the boiler is not to be installed immediately, protect the connections from entry of dirt.

Dispose of packaging in an environmentally responsible manner.

3.1 Lifting and carrying the boiler

The boiler can be carried to its installation site using 2 pipes (1¼", approx. 80 inches long).

- Unscrew the locking screw from the top centre of the boiler front panel.
- Lift font panel slightly and draw forwards to remove.
- Unscrew the locking screws from the side panels at the front and back of the boiler.
- Slightly lift the side panels and remove.

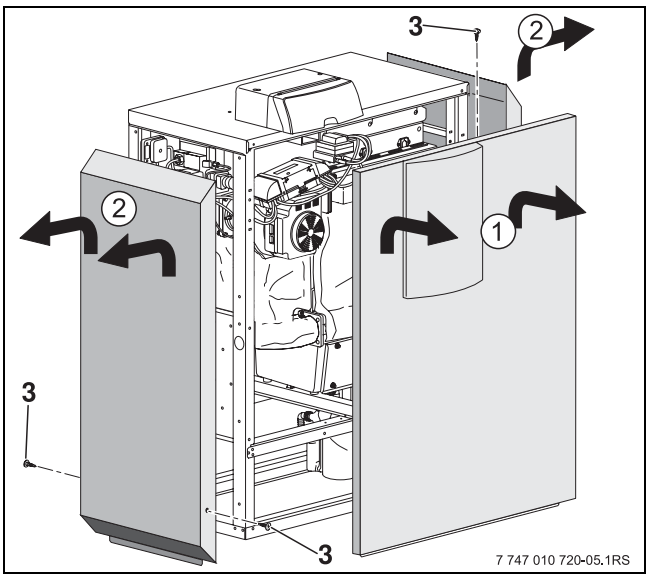


Fig. 5 Removing front and side panels

1 Front panel
2 Side panel
3 Locking screw

- Unscrew the securing screws.
- Lift the boiler off the pallet.

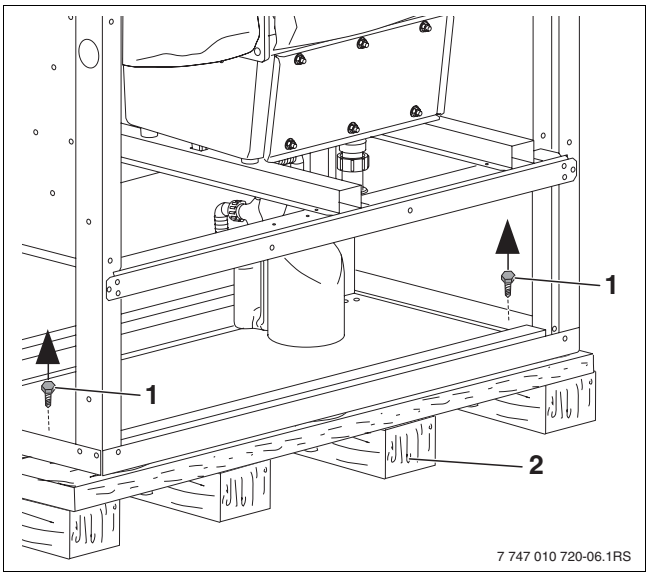


Fig. 6 Lifting the boiler off the pallet.

1 Locking screw
2 Pallet

Caution: Risk of injury from carrying heavy loads.

- Always lift and move the appliance with the assistance of another person and using the grip positions shown.
- Secure the boiler against slipping.

- Push the pipes through the holes at the front and rear of the boiler (→ Fig. 7).
- Secure the pipes against slipping in the positions shown in Fig. 7, using adhesive tape for example.
- Carry the boiler to the installation site.

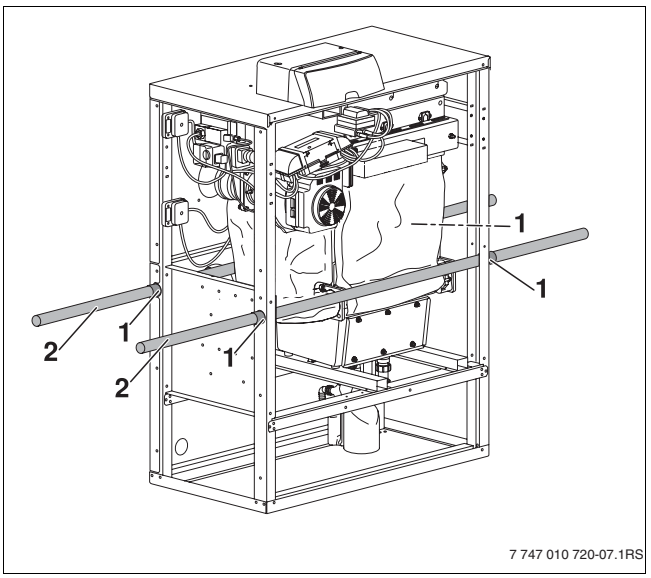


Fig. 7 Transporting the boiler using pipes

1 Positions for securing the boiler against slipping
2 Pipe (for carrying)

3.2 Transporting the boiler on rollers

If the route to the installation site is flat, the boiler can also be rolled. This requires at least 5 lengths of pipe approx. 28 inches long (diameter 1¼") to be placed underneath to act as rollers.

- Lay the lengths of pipe on the floor spaced about 16 inches apart.
- Lift the boiler onto the lengths of pipe and carefully transport it to the boiler room.

You can also use standard transport rollers.

- So that the bottom plate is not pressed in, it is essential to ensure that the weight is evenly distributed across the load-bearing parts.

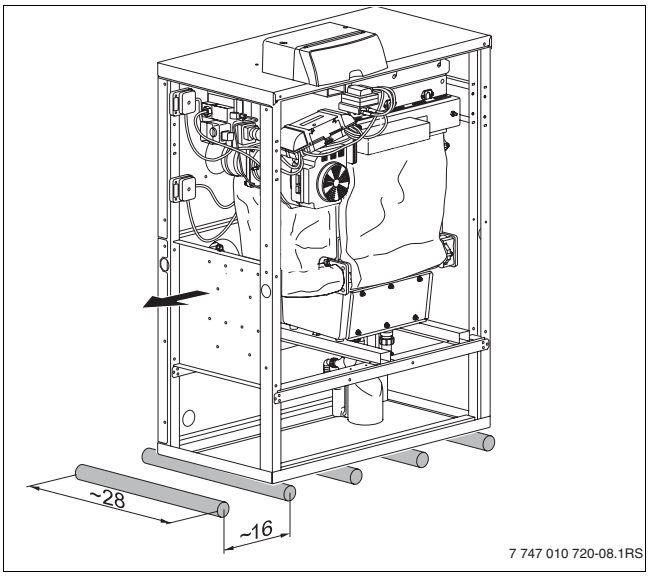


Fig. 8 Transporting the boiler on rollers (dimensions in inches)

4 Installing the boiler

This section explains how to erect and position the boiler correctly in the boiler room.

4.1 Boiler room requirements

Warning: Risk of system damage due to freezing.

- Install the heating system in a frost-free room.

Danger: Dangers posed by explosive and easily combustible materials.

- Do not use or store easily combustible materials (paper, lace curtains, clothing, thinners, paints, etc.) near the boiler.
- Maintain a clearance of 16.2 inches from the boiler.

Warning: Risk of boiler damage from contaminated combustion air.

- Do not use cleaning agents that contain chlorine or halogenated hydrocarbons (e.g. in spray cans, solvents and cleaning agents, paints, glues).
- Do not store or use such substances in the boiler room.
- Avoid excessive dust accumulation (building dust) on or near the boiler.

4.2 Recommended wall clearances

When deciding on the installation site, the clearances for the flue piping and the connecting pipes must be observed (→ Fig. 9 and Section 6, Connecting the flue system and water and gas piping).

Dimension	Wall clearance (inch)	
	minimum	Recommended
A	20	28
B[1)]	22	28
C	20	28
D	20	28
E[1)]	6	14

Tab. 4 Recommended and minimum wall clearances (dimensions in inches). It is imperative that the minimum clearance (dimension E) is maintained.

1) This clearance dimension is dependent on the flue system fitted

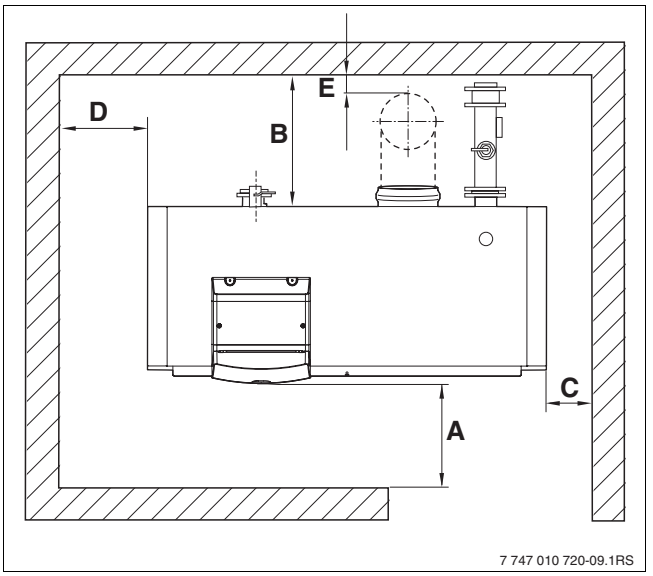


Fig. 9 Wall clearances in the boiler room

Where applicable, allow extra wall clearances for additional components such as DHW tank, pipe connections or other flue components, etc.

4.3 Leveling the boiler

To prevent air collecting in the boiler and to allow the condensate to drain freely from the condensate pan, the boiler must be leveled.

Caution: Risk of boiler damage due to inadequate load-bearing capacity of floor or unsuitable base.

- Make sure that the surface on which the boiler stands has sufficient load-bearing capacity.
- The boiler may stand on a base made of combustible material but not on carpet.

- Place the boiler in its final position.
- Level the boiler horizontally by turning the adjustable feet and using a spirit level.

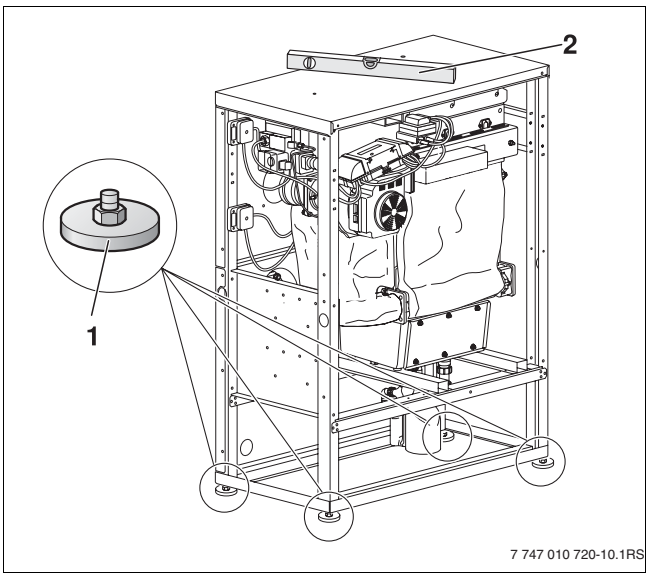


Fig. 10 Leveling the boiler

1 Adjustable feet
2 Spirit level

5 Openings for combustion air supply and venting

To ensure an adequate combustion air supply and venting of the heating system, suitable measures must be taken in accordance with the National Fuel Gas Code, NFPA 54 (ANSI Z223.1), Section 5.3, Air for Combustion and Ventilation, or the local building code. In Canada the regulations in accordance with CAN/CSA B 149.1 and 2 Installation Codes apply.

Caution: Risk of boiler damage and malfunctions due to missing or inadequate openings for combustion air and venting of the boiler room.

The openings for combustion air supply and venting are always required regardless of whether the combustion air is drawn from the room (conventional flue) or supplied directly to the boiler through ducts (balanced flue). **Inadequate venting of the boiler room may result in excessive ambient temperatures. This can damage the boiler. Inadequate combustion air supply may cause malfunctions in operation.**

- Make sure that air inlet or outlet vents are not closed off or their size reduced and that they are adequately dimensioned.
- The boiler must not be operated until the obstruction has been removed.
- Draw the operator's attention to any deficiencies and the potential dangers.

Caution: Risk of boiler damage from contaminated combustion air.

- Never use cleaning agents that contain chlorine or halogenated hydrocarbons (e.g. in spray cans, solvents and cleaning agents, paints, glues).
- Do not store or use such substances in the boiler room.
- Avoid excessive dust accumulation.

If impurities in the combustion air are possible (e.g. installation near swimming pools, dry cleaners or hairdressing salons), operation independent of room air is recommended.

Caution: Dangers posed by explosive and easily combustible materials.

- Do not use or store easily combustible materials (paper, lace curtains, clothing, thinners, paints, etc.) near the boiler.
- Maintain a clearance of 16 inches from the boiler.

Overall air supply within the building

Make sure that the boiler room has two permanent air vents that are connected to one or more other rooms. When calculating the cross-sectional areas of the vent apertures, the total burner output of all gas-fired appliances in the connected rooms must be taken into account. Each vent must have a minimum cross-section of one square inch per 1000 Btu/h of the total burner output of all gas-fired appliances inside the connected rooms. Make sure that the cross-sectional area of each vent is at least 100 square inches. One of the vents must be no more than 12" from the ceiling and the other no more than 12" from the floor of the boiler room, measured from the outer edge of the vent aperture. The smallest dimension of all inlet and outlet vents must be not less than 3".

Total air supply from outside the building

Make sure that the boiler room has two permanent air vents, one of which must not be more than 12" from the ceiling and the other not more than 12" from the floor of the boiler room, measured from the outer edge of the vent aperture. The vents must be connected either directly or via air ducts to the outside or to rooms that have an unobstructed connection to the open air (crawl passage or roof space). The smallest dimension of all inlet and outlet vents must be not less than 3".

– If there is a direct connection to the outside, each opening must have a minimum cross-section of one square inch per 4000 Btu/h of the total combustion output of all gas-fired appliances inside the closed room.
– If there is a connection to the outside through a ventilated attic with vertical ventilation ducts, each vent aperture must have a minimum cross-section of one square inch per 4000 Btu/h of the total burner output of all gas-fired appliances inside the closed room. The attic must be ventilated at both ends of the house.
– If there is a connection to the outside through horizontal ventilation ducts, each vent aperture must have a minimum cross-section of one square inch per 2000 Btu/h of the total burner output of all gas-fired appliances inside the closed room. The duct cross sectional area must not be smaller than the free area of the inlet.
– If there is a connection to the outside through a ventilated attic and ventilated crawl space, each opening must have a minimum cross-section of one square inch per 4000 Btu/h. The attic must be ventilated at both ends of the house.

6 Installing the boiler

This chapter details how to install the boiler. The individual steps involved are:

– Flue and air supply system
– Heating circuit connection
– Connecting the fuel supply
– Making the electrical connections

General notes on installing the flue and air supply system

The boiler requires a flue system approved for Category IV (condensing, positive pressure; to ANSI Z21.13/ CSA4.9). The material must consist of 316L or AL 29-4C stainless steel and conform to UL 1738 or UL 103.

In Canada, the flue system material must conform to ULC-636.

We recommend stainless steel flue systems made by the following manufacturers:

Manufacturer	Flue system
heat fab	Saf-T Vent EZ Seal
Z-Flex	Z-Vent IV special gas vent
Metal Fab	CorrGuard
Pro-Tech	Fasnseal
Security Chimneys	CI-system

Tab. 5 Recommended flue systems

In the USA, CPVC pipes to Schedule 80-ASTM D1784 can also be used. We recommend the following manufacturers:

Manufacturer	System
Spears	CPVC pipe to Schedule 80 ASTM D1784

Tab. 6 Recommended system for USA

If a plastic system (CPVC) is used in Canada, it must be approved as a type "BH gas venting system" (ULC-S636). Components made by different manufacturers must not be used in the same flue system nor may any uncertified components or materials be used in the flue system. The components, adhesives and adhesive primers specified by the flue system manufacturer must be used. Only components, adhesives, adhesive primers, etc. made by the same manufacturer may be used.

The following system is approved for use in Canada and may be used with this boiler:

Manufacturer	Flue system
IPEX	System 636 CPVC

Tab. 7 Recommended flue system for Canada

Flue/air supply system installation must comply with Part 10, Venting of Equipment, of the National Fuel Gas Code NFPA 54 (ANSI Z223.1), or CAS B.149 or other applicable local building code regulations.

The flue and air supply system (for design of air supply connection → Section 6.5, page 25) must be designed for a max. pressure of 0.40 inches W.C. (100 Pa) for the overall system (flue and air supply system).

Observe the following points when installing the flue ducting:

– The cross-sectional area of the flue pipe must calculated according to the applicable regulations. Guidance on the dimensioning of the flue/air supply system can also be obtained from the planning manual GB312 US/CA.
– Select the shortest possible route for the flue pipe.
– Install flue pipes with an upward slope from the boiler (¼" per foot).

We recommend the fitting of a protective grille (bird screen) to the flue pipe terminal.

For details of correct dimensioning, contact the manufacturer concerned.

All instructions relating to all parts of the flue system, and especially the instructions of the flue system manufacturer, must be followed. Use only flue pipes with the appropriate diameter for the output rating of the boiler and made by the recommended manufacturers listed in Table 5, 6 or 7.

Flue system for multi-boiler systems (cascading systems)

These instructions relate only to single-boiler systems. Flue/air supply systems for multi-boiler systems must be designed by qualified heating engineers and approved and guaranteed by the flue system manufacturer. The flue system must prevent back-flow of flue gas through boilers that are not in operation.

Danger: Risk of fatal injury from escaping flue gases in the boiler room.

- The seal in the condensate pan flue connection must be present, undamaged and correctly inserted.
- Fitting an air inlet flap in the flue system is not permitted.

Caution: Risk of system damage due to inadequate condensate drainage.

- The condensate that forms in the flue pipe must be drained away from the boiler via the condensate drain on the condensate pan..

Caution: Disruption of operation due to high wind.

If no T-piece or 90° elbow is fitted on the end of flue pipe, high winds may cause the boiler to shut down.

- Always make sure that there is a T-piece or a 90° elbow fitted depending on the design of the flue system.
- Use only a T-piece or 90° elbow (Category IV) made by the selected flue system manufacturer.

With regard to possible restrictions and inspections for flue systems, consult the local building and fire safety authorities. Observe the national regulations.
In the Commonwealth of Massachusetts the requirements about carbon monoxide detectors must be followed.

In the case of flue systems sealed with silicon from a cartridge, the slilicon must be allowed to dry for 24 hours before commissioning the boiler.

Danger: Risk of fatal injury due to poisoning by escaping flue gas.

- After carrying out any of the installation instructions referred to, check that all connections throughout the entire flue system are properly joined and sealed.
- Check seams and joints for leaks.
- Have the entire flue system checked once a year by a qualified heating contractor.

6.1 Connecting the flue pipe to the boiler

Fit the selected flue system manufacturer's appropriate flue pipe adaptor for the boiler according to the manufacturer's instructions.

The condensate that forms in the flue pipe can be drained via the condensate pan. To facilitate this, the flue pipe must be installed with an upward slope (¼" per foot) from the boiler.

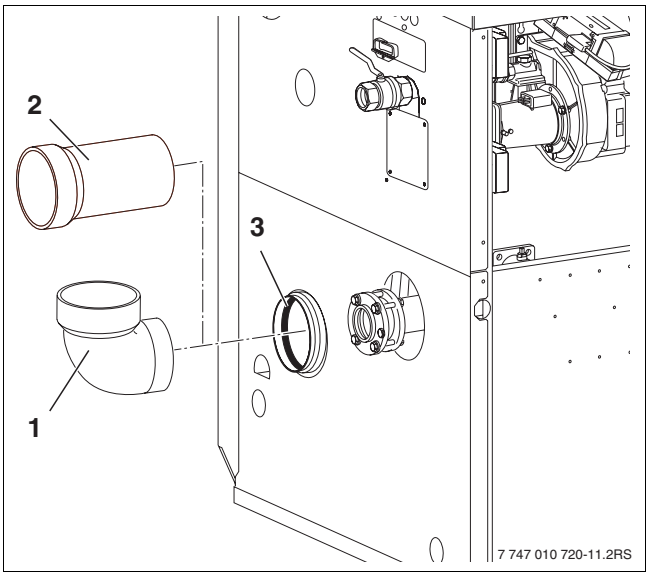


Fig. 11 Connecting the flue

1 Flue pipe adaptor (available separately)
2 Flue pipe adaptor (available separately)
3 Fitted gasket

6.2 Installing the flue system

To ensure perfect operation and prevent foreign bodies entering the flue system, it must be fitted with a terminal (a T-piece or a 90°-elbow is required).

In areas subject to heavy snowfalls, the flue system terminal must be at least 12" higher than the maximum depth of snow.

The flue system must not terminate less than 14 feet above any public surfaced footway or path.

Make sure that the terminal is at least 10 feet away from the combustion air intake of any other boiler.

The flue system must terminate more than 6 feet away from any other opening in a building, from gasometers, equiment controls, combustible components or similar.

The flue system must terminate at least 4 feet below, 4 feet (6 feet in Canada) horizontally away from or 1 foot above any door, window or air vent in any a building.

Ensure a minimum distance of 6" from combustible components.

Warning: Risk of slipping hazard due to ice formation.

- Do not site air intake and flue piping directly above footways. Dripping condensate can result in ice formation on the footway.

6.3 Installing the wall exit for a horizontal flue

Please carefully read the following instructions and information on the installation of the wall exit and make sure you observe the safety instructions.

The wall exit must be installed in accordance with the specified regulations and/or local building code regulations.

All instructions issued by the flue system manufacturer concerned regarding the fitting of the wall exit must be followed. Use only those that are required for the flue pipe diameter. The use of a T-piece or a 90°-elbow as the external terminal for the flue pipe is required.

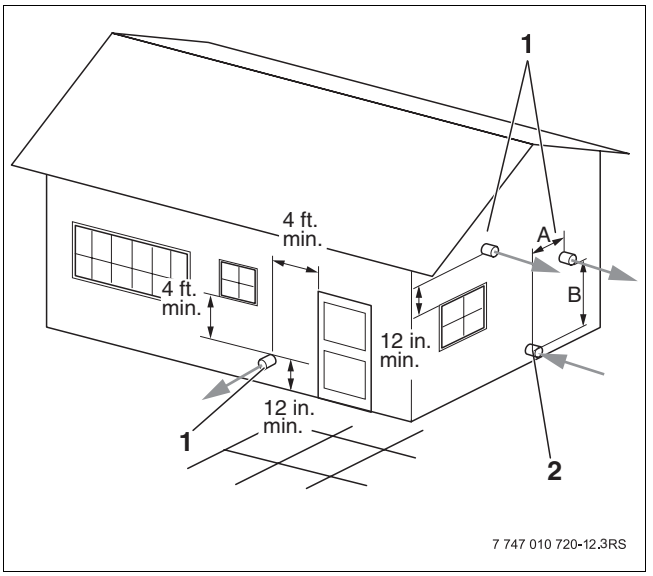


Fig. 12 Specified clearances to ANSI Z223.1 for horizontal flues

1 Flue wall exit
2 Air intake wall exit
A Minimum horizontal distance from air intake of another appliance = 10 ft, minimum distance from own air intake for directly vented appliances = 4 ft.
B Minimum vertical distance from air intake of another appliance = 3 ft, with directly vented appliances the flue outlet can be positioned level with the appliance's own air intake (observe minimum horizontal separation of 4 ft).

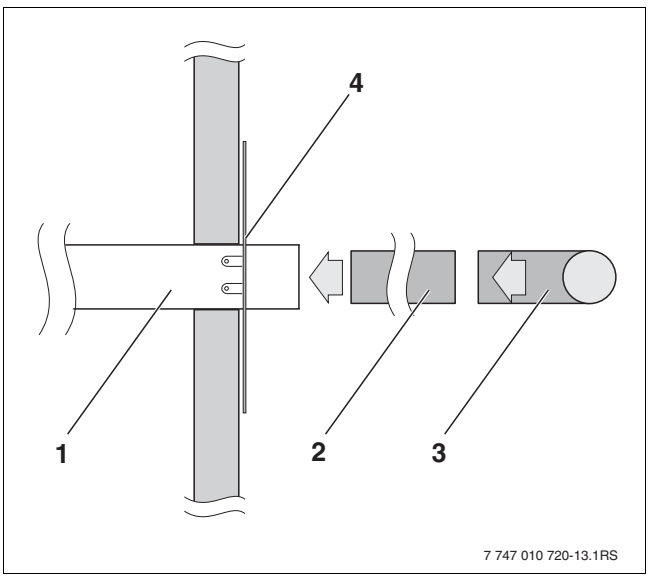


Fig. 13 Wall penetration

1 Wall penetration
2 Flue pipe
3 End piece of flue pipe (t-piece or 90°-elbow)
4 External cover plate

6.4 Installation of the roof penetration of a vertical flue systems

All instructions issued by the flue system manufacturer concerned regarding the fitting of the roof exit must be followed. Use only those that are required for the necessary flue pipe diameter. The use of a T-piece or a 90°-elbow as the external terminal for the flue pipe is required.

Always make sure that the flue is connected with a downward slope towards the boiler (¼" per foot).

Observe the clearances for the roof exit above the roof (→ Fig. 14).

If the flue passes through ceilings at any points, fire plates (→ Fig. 14, [2]) must be fitted.

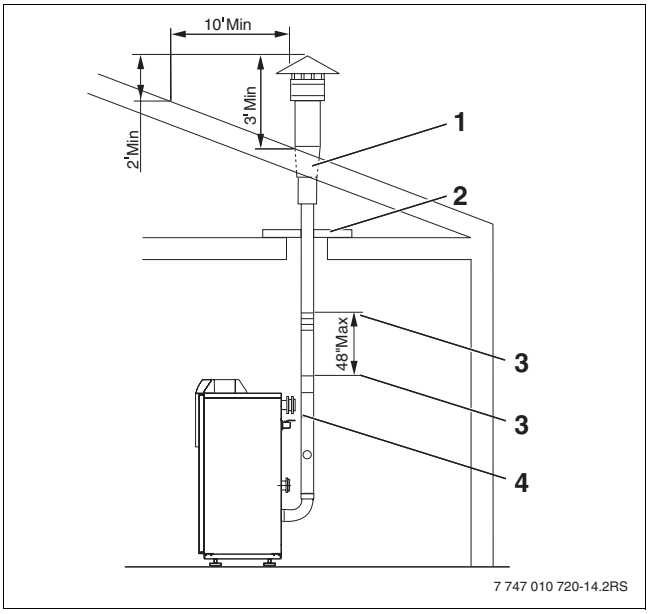


Fig. 14 Vertical flue system

1 Roof penetration
2 Fire protection collar
3 Fastening the flue pipe
4 Flue pipe adaptor (available separately)

6.5 Connecting the air supply (for direct vent operations)

The combustion air is supplied to the boiler either through an external wall connection, through a chimney flue or through a separate pipe in the chimney flue. For balanced flue operation, a suitable air supply system must be used (made of PVC or CPVC, galvanized steel or other suitable material).

The flue and air supply system (for design of flue connection → Section 6, page 21) must be designed for a max. pressure of 0.40 inches W.C. for the overall system (flue and air supply system).

We recommend that the air supply pipe diameter matches the flue pipe diameter.

Boiler rating	Required air supply volumetric flow rate [ft_N^3/m]	Recommended air supply pipe diameter [inches]
90 - 4	95	5
120 - 4	95	6
160 - 5	130	6
200 - 6	160	8
240 - 7	190	8
280 - 8	220	8

Tab. 8 Air supply volumetric flow rate/Air supply pipe diameter

- Remove the side panel if not already removed.
- Unscrew the cover plate from the rear panel.

To avoid problems when fitting the gas connection, it is best to fit a 90° elbow for the air pipe connection.

- Connect the air pipe 90° elbow to the air pipe socket through the rear panel and seal.
- Construct the air supply pipe using a standard air pipe system according to the national requirements.

We recommend the fitting of a protective grille (bird screen) to the air pipe terminal. For details of correct dimensioning, contact the manufacturer concerned.

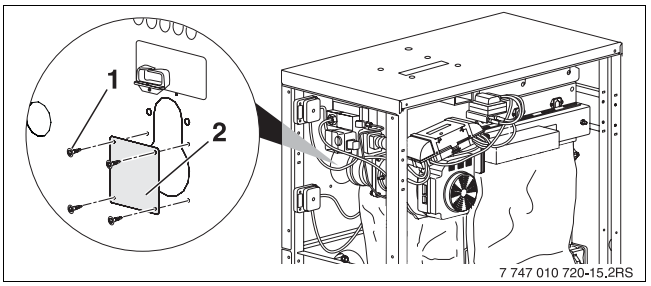


Fig. 15 Connecting the air supply for balanced flue operation

1 Screw
2 Cover plate

6.6 Installing the wall exit for the air pipe

To prevent possible recirculation of flue gas, the flue system installer must take account of effects such as the prevailing wind conditions, any eddy zones, the specifics of the site, etc. in the design of the flue and air supply systems. Buderus can not be held responsible for such potentially deleterious effects on boiler operation. The clearances detailed or illustrated in Fig. 12 and Fig. 16 should be seen as the absolute minimum and may in some circumstances not be adequate for specific installations.

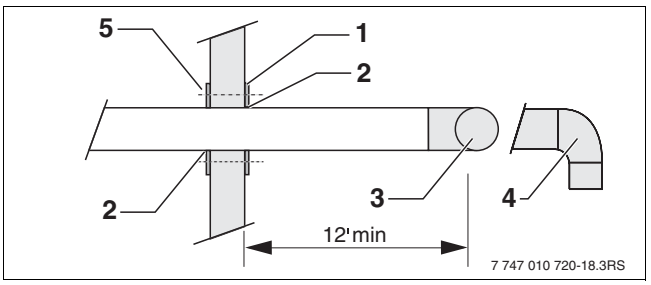


Fig. 16 Design of air pipe wall exit

1 Outer wall retaining plate
2 Sealant
3 T-piece or **4)** 90° elbow
5 Inner wall centering and retaining plate

6.7 Installing the roof exit for the air pipe

To prevent possible recirculation of flue gas, the flue system installer must take account of effects such as the prevailing wind conditions, any eddy zones, the specifics of the site, etc. in the design of the flue and air supply systems. Buderus can not be held responsible for such potentially deleterious effects on boiler operation. The clearances detailed or illustrated in Fig. 14 and Fig. 17 should be seen as the absolute minimum and may in some circumstances not be adequate for specific installations.

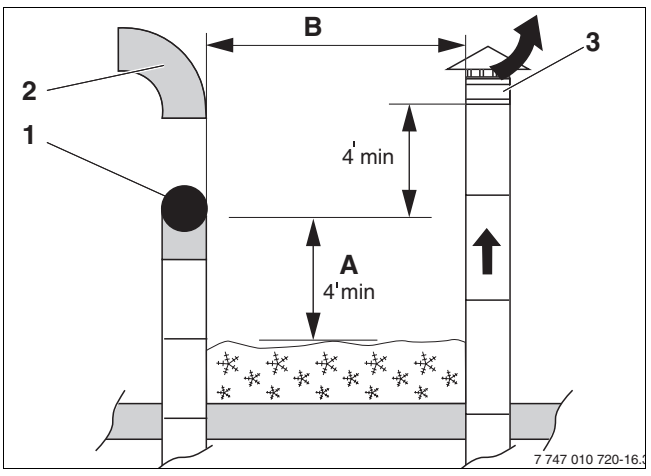


Fig. 17 Design of air pipe roof exit

1 T-piece or **2)** 90° elbow
3 Flue outlet
B Minimum horizontal distance from air intake of another appliance = 10 ft, minimum distance from own air intake for directly vented appliances = 4 ft.

6.8 Design of flue and air pipe for balanced flue operation

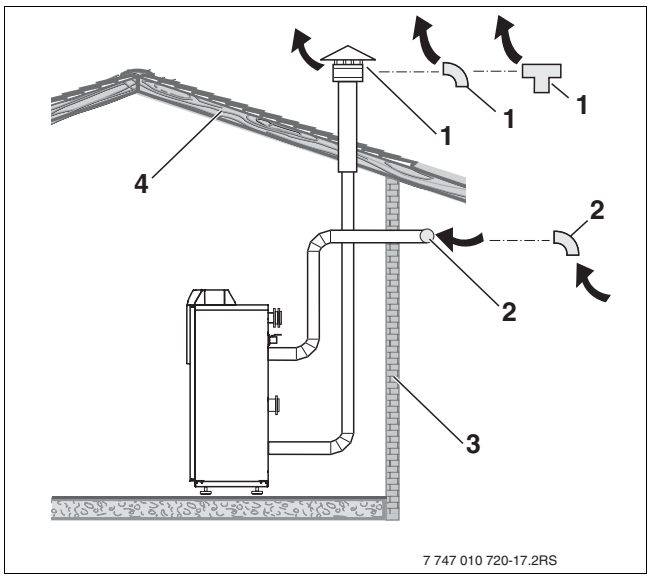


Fig. 18 Wall-exit air pipe, roof-exit flue

1 Flue outlet (type of outlet depends on chosen manufacturer, e.g. 90° elbow or T-piece)
2 Air inlet (T-piece fitted horizontally or 90° elbow)
3 External wall
4 Roof

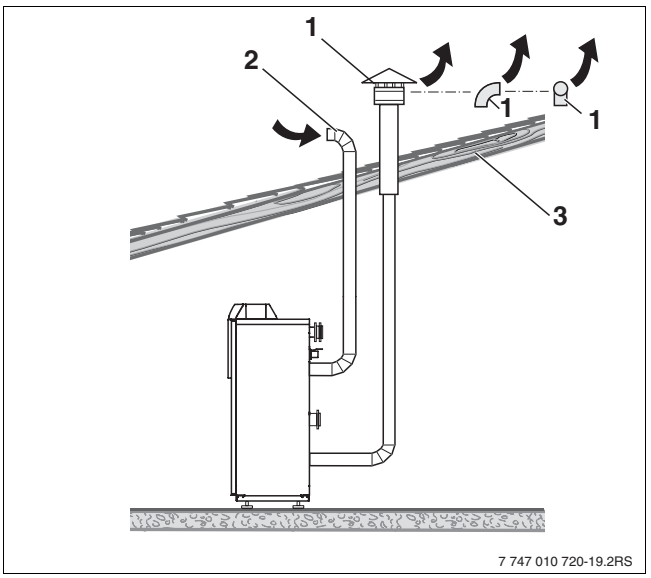


Fig. 20 Roof-exit air pipe and flue

1 Flue outlet (type of outlet depends on chosen manufacturer, e.g. 90° elbow or T-piece), observe clearances specified in Fig. 17
2 Air inlet terminal (90° elbow pointing away from flue outlet)
3 Roof

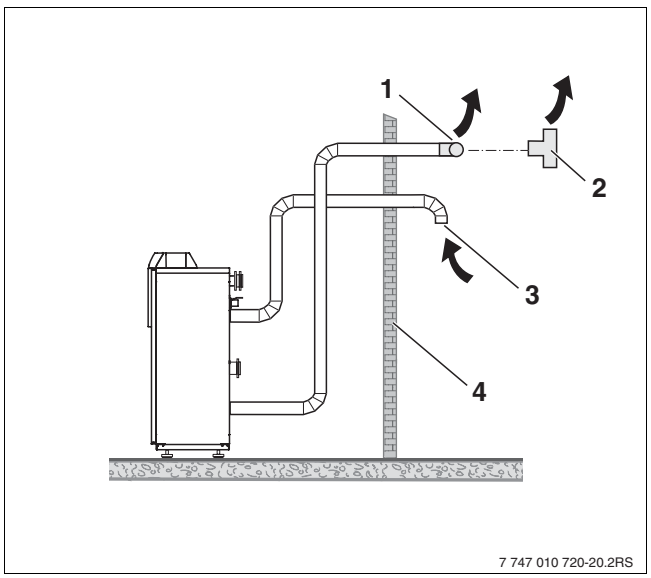


Fig. 19 Wall-exit air pipe and flue

1;2 Flue outlet (external-wall flue requires horizontally or vertically mounted T-piece), observe clearances specified in Fig. 12
3 Air intake terminal (90° elbow facing vertically downwards)
4 External wall

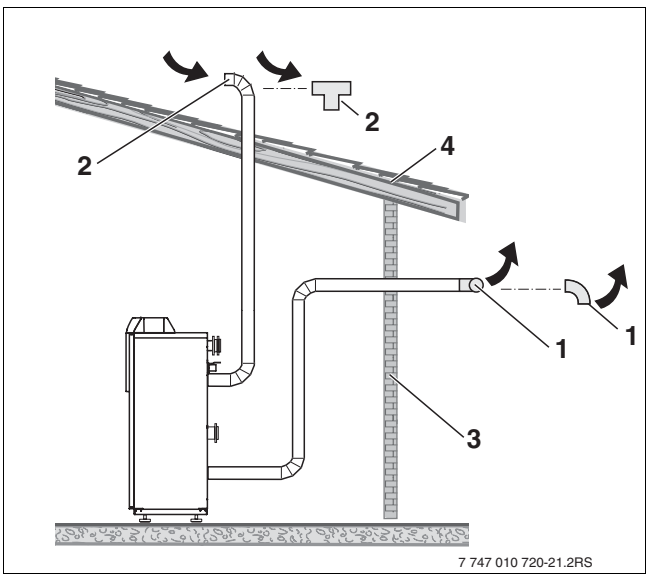


Fig. 21 Roof-exit air pipe, wall-exit flue

1 Flue outlet (external-wall flue requires horizontally mounted T-piece or 90° elbow facing downwards)
2 Air inlet (90° elbow or T-piece)
3 External wall
4 Roof

6.9 Connecting the heating system

This section explains how the boiler is connected to the heating system. The individual steps involved are:

- General safety instructions
- Installing B-Kit
- Connecting the central heating supply and return
- Installing the condensate drain

Examples for possible hydraulic installations are given in the hydraulic schemes on page 113, 114 and 115.

6.9.1 General safety instructions

Caution: Risk of boiler damage due to moisture.

- Protect the individual components of the control system and the burner from damp (dripping water, water spray, rain) during installation, operation and servicing (e.g. pump replacement, programmer replacement, etc.

Caution: Risk of system damage due to overheating as a result of lack of water.

- Make sure that if the boiler is located above the level of the heating system, it is fitted with a low-water cut-off.
- The low-water cut-off must be used when the boiler is installed (→ Fig. 22).

Caution: Risk of system damage due to high temperature variations in the heating system.

- If the boiler is operated in conjunction with an air conditioning system, it is essential to ensure that the pipes for the refrigerant fluid are connected in parallel with the boiler system using suitable valves to prevent the refrigerant from entering the boiler.
- The piping system of a boiler connected to the heating coils of hot-air heating systems that may be exposed to the circulation of cooled air must be fitted with a flow-control valve or some other automatic system for preventing the boiler water from circulating during the cooling cycle.

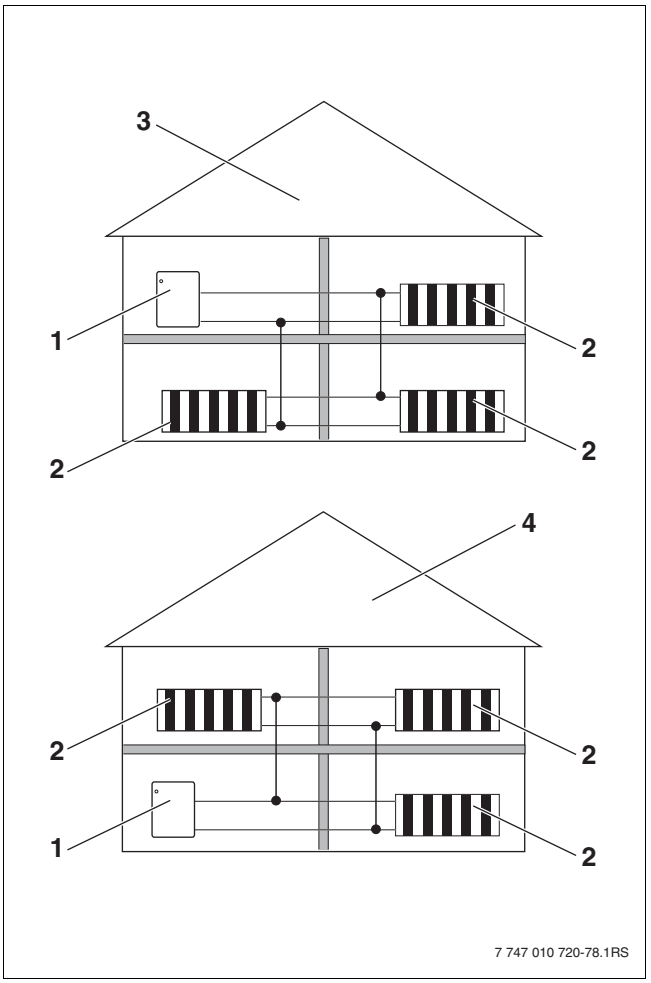


Fig. 22 Low-water cut-off

1 Boiler
2 Radiator
3 Heating system with low-water cut-off
4 Heating system without low-water cut-off

6.9.2 Connecting the boiler to the heating system

Caution: Risk of system damage due to leaking connections.

- Connect up the connecting pipes to the boiler in such a way that they are not under stress.

Boiler	Boiler supply (VK) Boiler return (RK)
90-4 to 280-8	2½" NPT

Tab. 9 Water connection sizes

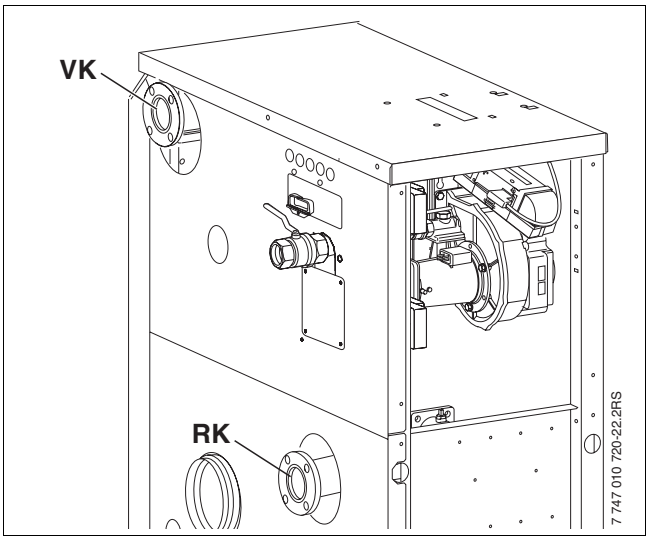


Fig. 23 Water connections

RK Boiler return
VK Boiler supply

6.9.3 Installing B-Kit

The pressure relief valve, the temperture/pressure gauge and the non-return check valve are connected to the boiler supply VK using the supply manifold (included in B-kit).

Caution: Risk of system damage due to incorrectly fitted B-kit or failure to fit non-return valve.

- Make sure that the non-return check valve is fitted correctly (observe arrow). The arrow indicates the direction of flow. The non-return check valve prevents water flow in the opposite direction to the arrow.

- Fit the B-kit including non-return check valve with the direction of flow away from the boiler (observe arrow on non-return valve).
- Align the B-kit so that the temperature/pressure gauge faces horizontally outwards to the side of the boiler and the pressure relief valve points upwards (→ Fig. 24).
- Insert seal in flange joint and tighten evenly.

Fitting an automatic air vent to the B-kit on the flow pipe is recommended.

- Fit and seal the pressure relief valve in the connection provided using the NPT double union supplied (→ Figs. 23 and 24).
- Fit and seal the temperature/pressure gauge in the connection provided (→ Fig. 24).
  Any additional safety devices required can be fitted and sealed in the remaining connections. Follow the manufacturers' instructions.

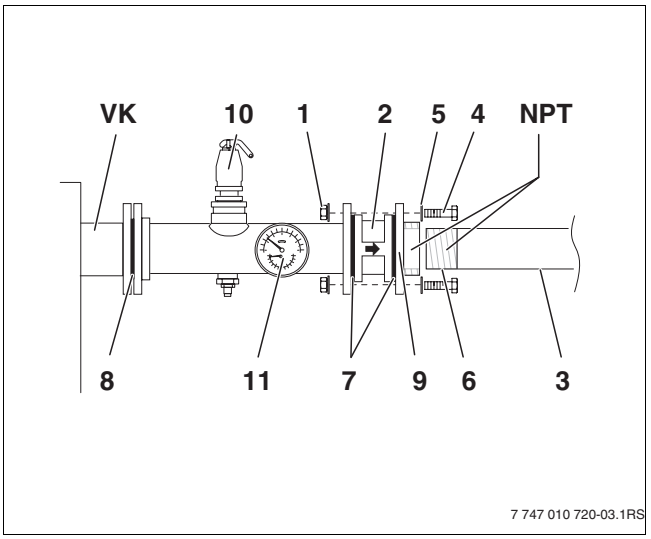


Fig. 24 Installing B-Kit

1 Nut and washer x 4
2 Non-return check valve x 1
3 Supply pipe (external)
4 Bolt x 4
5 Washer x 4
6 NPT thread (on external supply pipe)
7 Seal x 2
8 Seal x 1
9 Threaded flange, 2½" x 2½", NPT
10 Pressure relief valve (safety valve)
11 Pressure/temperature gauge
VK Boiler supply

- Close off unused connections with ¾" NPT plugs and seal.
- Fit a blow-off pipe to the external side of the pressure relief valve.

Caution: Risk of system damage due to incorrect fitting.
- Make sure that the B-kit including pressure relief valve and non-return check valve is not omitted from the boiler flow VK and correctly connected.

Do not fit the safety valve until the leak test (→ Section 6.10 page 33) has been completed.
- Fit the pressure relief valve vertically.
- Fit the pressure relief valve in accordance with the requirements of the ANSI/ASME Boiler and Pressure Vessel Code, Section IV.

We recommend fitting a dirt filter (y-strainer, available separately) externally to the boiler return RK to prevent contamination of the boiler by the water.

Observe the local regulations for connection of boiler systems.

Danger: Risk of fire from flammable materials or liquids.
- Do not store flammable materials or liquids in the immediate vicinity of pipes that carry hot water.
- Maintain a clearance of 2" from pipes carrying hot water.

6.9.4 Connecting the central heating supply

- Fit and seal the heating system supply pipe to the threaded flange supplied.
- Insert the seal in the flange joint and tighten the bolts evenly.

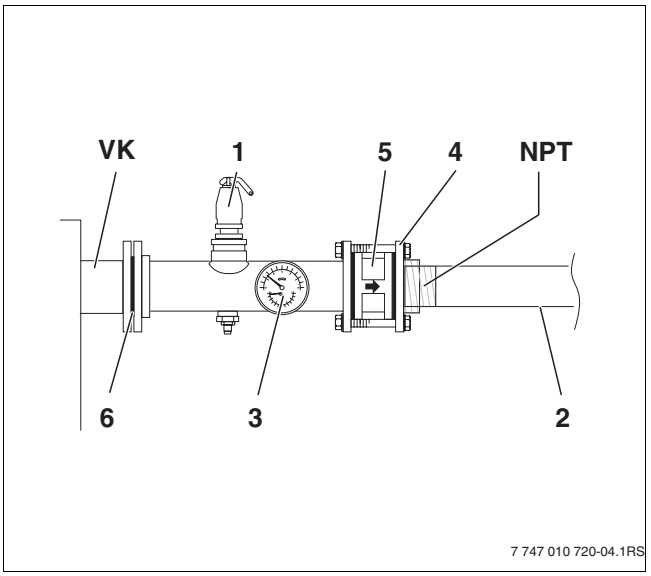


Fig. 25 Fitting the flow pipe

1 Pressure relief valve
2 Supply pipe (external with NPT thread)
3 Pressure/temperature gauge
4 Threaded flange
5 Non-return check valve (observe direction of flow)
6 Washer
VK Boiler supply

6.9.5 Fitting the heating system return

- Fit and seal the heating system return pipe to the threaded flange supplied.
- Insert the seal in the flange joint and tighten the bolts evenly.

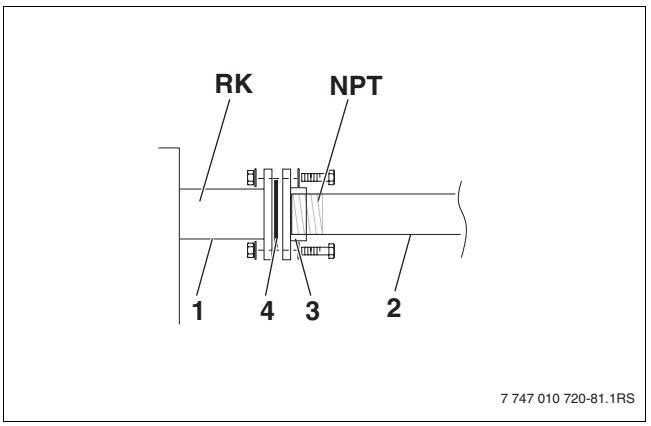


Fig. 26 Fitting the return pipe

1 Thread on boiler return
2 Return pipe (external with NPT thread)
3 Threaded flange
4 Washer
RK Boiler return

6.9.6 Installing the DHW Tank

A DHW Tank can be connected to the connections VK (after the B-kit) and RK. The required cylinder charging pump can be controlled by the control unit MC10 + BC10 (see instructions MC10 + BC10).

6.9.7 Installing the condensate drain

Notes on condensate drainage.

- The condensate that forms in the boiler and possible in the flue pipe must be properly drained away from the boiler.
- The condensate which forms in the flue pipe can be drained via the boiler (install flue pipe with downward slope towards the boiler).
- Make sure that drainage of the condensate into the public sewer system conforms with the applicable national regulations.
- Also observe any applicable local regulations.

- Remove the trap.
- Unscrew the cap and fill the trap with approx. 0.3 gallons of water.

Danger: Risk of fatal injury from poisoning.
If the trap is not filled with water or other connections are left open, escaping flue gas can place lives at risk.

- Fill the trap with water.
- Seal the trap and flue connections.
- Make sure that the washer and seal are properly seated in the cap.

- Refit the trap.

Condensate may possibly escape through the trap vent hole.

- Be sure to run the drain pipe from the trap so that it slopes downwards.

Danger: Risk of fatal injury from poisoning.

- The boiler's internal trap must be used, make sure that the condensate from the flue system drains correctly.

A condensate neutralizer is available as an accessory.

- Install the neutralizer according to the installation instructions.
- Fit the trap supplied to the condensate pan drain outlet.

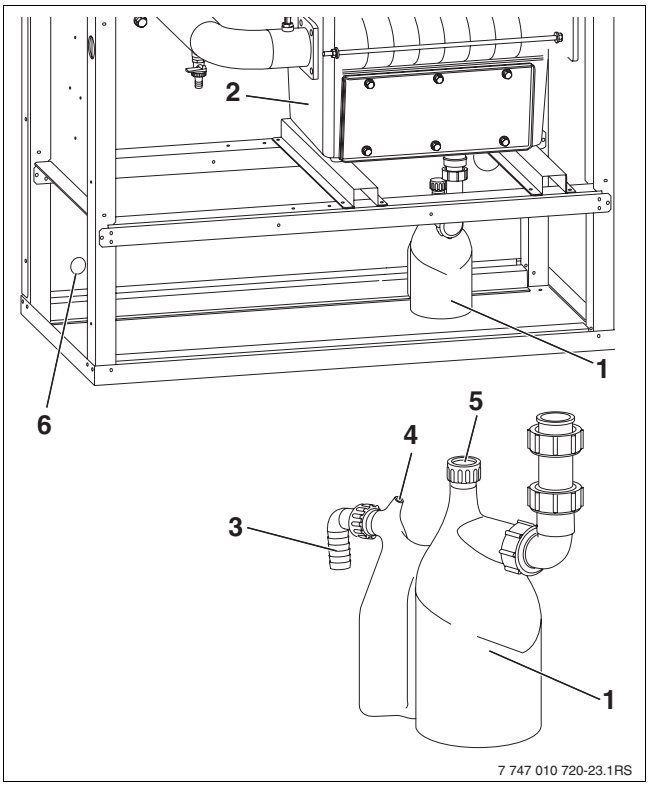


Fig. 27 Installing the condensate drain

1 Trap
2 Condensate pan
3 Trap outlet to neutralizer/waste pipe
4 Trap vent
5 Blanking cap
6 Hole for condensate drain hose

6.10 Filling the heating system and checking for leaks

To ensure that leaks do not occur when the system is in operation, check for leaks before commissioning the heating system. Pressurize the heating system with a pressure equal to the response pressure of the pressure relief valve.

Caution: Risk of system damage due to scale formation in the boiler.

- Refer to the information provided in the "Water quality requirements for Logano plus GB312" manual (7747010722).

Caution: Risk of system damage due to excess pressure when testing for leaks.

Pressure, control and safety equipment may be damaged by excessive pressure.

- When you carry out a leakage test, make sure that no pressure, control or safety equipment that cannot be isolated from the boiler water chamber is fitted.

- Carry out the leakage test according to the local regulations.

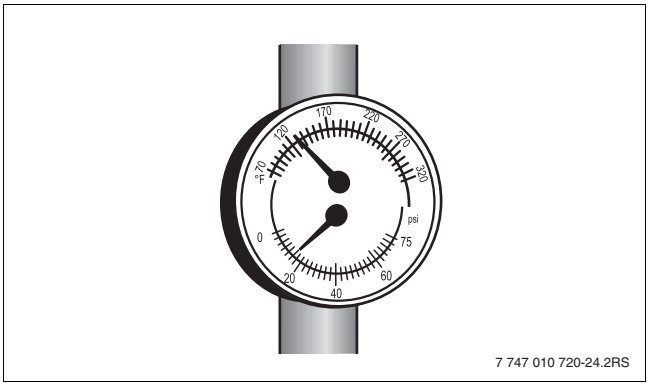


Fig. 28 Pressure/temperature gauge

Caution: Risk of damage to system

If you fill the heating system when it is hot, the resulting temperature stresses can cause stress cracks. The boiler will then leak.

- Only fill the heating system when cold (the flow temperature should be no more than 104 °F).
- When the heating system is in operation, do not fill it via the boiler fill & drain valve. Instead, use the filler valve in the heating system pipework (return).
- Pay attention to the water quality as specified in the operator's log, and record the volume and quality of the water used to fill the system.

- Open the mixing and shut-off valves on the heating water (primary) side.

Caution: Risk of system damage due to unsuitable heating system water.

- Pay attention to the quality of the water used to fill the heating system. Poor water quality can damage heating systems due to scale formation and corrosion. For further details, please see the accompanying "Water quality requirements for Logano plus GB312" manual (7747010722).

Maximum operating pressure [psi]		Maximum testing pressure [psi]
50	with the pressure relief valve supplied	75

Caution: Health risk from contaminated domestic water.

- It is imperative that you observe all regulations and standards applicable in your country regarding prevention of domestic water contamination.

- Connect the hose to the water tap. Push hose onto the hose connection of the boiler fill & drain valve, fasten with a hose clip and fill with water.
- Turn on the boiler fill & drain valve.
  Slowly fill the heating system. Observe the pressure gauge (pressure/temperature gauge) while doing so.
- Turn off the water tap and the boiler fill & drain valve once the required testing pressure has been reached.
- Check the connections and pipework for watertightness.
- Bleed the boiler by carefully opening the safety valve or an automatic vent (supplied separately) on the B-kit when the boiler circulation pump is running.
- Bleed the system via the radiator bleed valves.
- Top up with water if the pressure drops as a result of bleeding the system.
- Remove the hose from the boiler fill and drain valve.

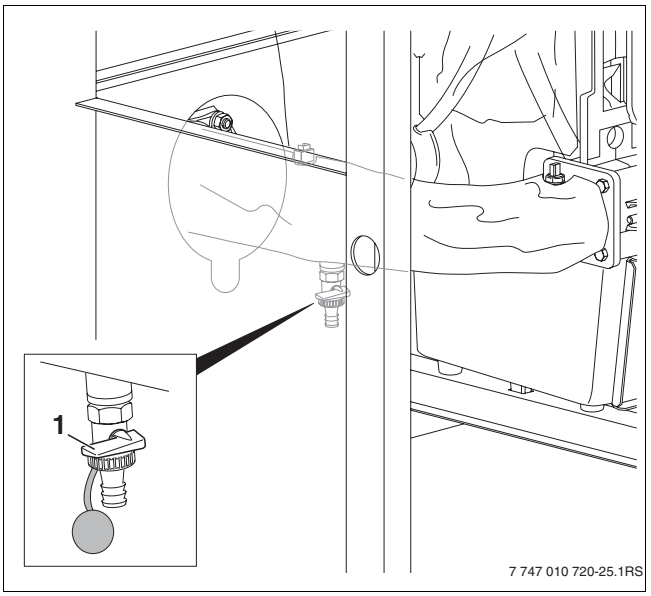


Fig. 29 Boiler fill & drain valve on return pipe

1 Boiler fill & drain valve

6.11 Connecting the fuel supply

Danger: Risk of fatal injury from the explosion of flammable gases.

- Work on gas components may only be carried out by qualified and authorized personnel.

6.11.1 Installing gas feed

For details of the required gas pipe diameter, refer to Table 10 and Table 11 on page 36. Make absolutely sure that the pipe fittings have the correct thread size.

- Make sure that a sediment trap is fitted at the inlet for the gas supply pipe to the boiler.

Fit and seal the gas isolating valve supplied to the boiler's gas connection.

- The gas pipes must be fastened outside the boiler.

Observe the local regulations or else the requirements the National Fuel Gas Code, ANSI Z 223.1 or CAN/CSA B149.1 in Canada, when connecting the gas supply.

Where required by local regulations, the installation must comply with the American Code for Controls and Safety Devices for Automatically Fired Boilers (ASME CSD-1). Accessories to comply with ASME CSD-1 are available (please see page 113 and 94 in parts list).

Danger: Risk of explosion

Leakage from the gas pipes and gas connections may cause an explosion.

- Carry out a proper leakage test using soap solution.

Danger: Risk of damage to system due to short-circuits.

- Cover the areas at risk before carrying out the leakage test.
- Do not spray leak detector onto cable conduits, plugs or electrical connecting leads or allow it to drip onto them.

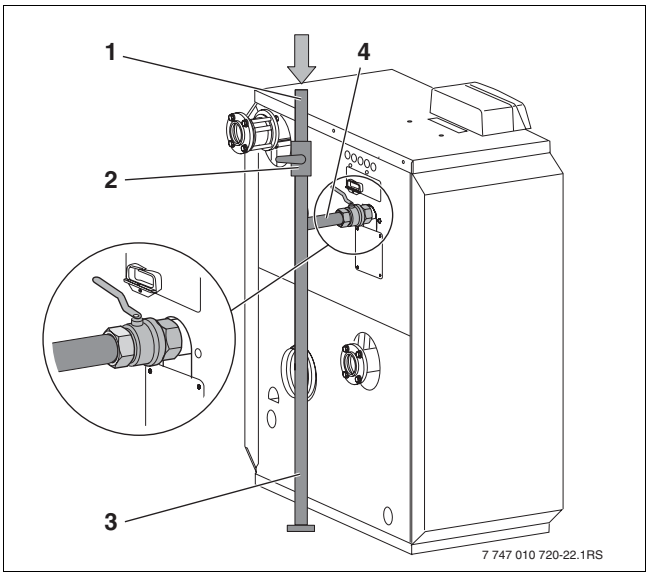


Fig. 30 Gas valve pipe connection

1 Gas supply
2 Manual shut-off valve (supplied)
3 Sediment trap
4 Gas connection with isolating valve

Length of pipe in feet	Gas pipe delivery rate in cubic feet of gas per hour[1)]				
	1"	1¼"	1½"	2"	2½"
10	520	1060	1600	3050	4800
20	350	730	1100	2100	3300
30	285	590	890	1650	2700
40	245	500	760	1450	2300
50	215	440	670	1270	2000
75	175	360	545	1020	1650
100	160	305	480	870	1400
150	120	250	380	710	1130

Tab. 10 Gas pipe delivery rate

1) Maximum gas pipe delivery rate in cu ft/hr based on a gas specific gravity of 0.60 and a gas pressure of 0.5 psi or less and a pressure drop equivalent to a water column of 0.3 inches.

Iron pipe nominal diameter (in inches)	Equivalent lengths for pipe fittings in feet			
	Pipe fitting type			
	90° elbow	T-piece	Shutoff valve	Gas cock
	Equivalent lengths in feet			
1	3	5	0.6	1.60
1¼	4	6	0.8	2.15
1½	5	7	1.0	2.50
2	7	10	1.3	3.00
2½	8	12	1.6	3.50

Tab. 11 Equivalent lengths for pipe fittings

Disconnect the boiler and its gas isolating valve form the gas supply pipe system if that system is subjected to pressure tests in which the testing pressure exceeds ½ psi.

If the gas supply piping system is subjected to pressure tests in which the testing pressure is ½ psi or less, it is sufficient to isolate the boiler from the gas supply piping system by closing the relevant isolating valve.

- Test the boiler and gas supply connections for leaks before commissioning (→ page 42).

Use only sealant that is resistant to corrosion by LPG for the pipe connections. The sealant must be applied sparingly to the external thread of the pipe connections.

6.11.2 Installation at high altitudes

The boiler is designed for installation at altitudes below 2000 feet above sea level. If it is to be installed at altitudes higher than 2000 feet it can be converted accordingly.

Contact Buderus if the installation site is at a high altitude.The boiler must only be converted as specified in the relevant technical documentation and using the conversion components (available separately) approved by Buderus.The technical documentation is supplied with the conversion components.

6.12 Electrical connections

The electrical connections to the boiler must conform to the locally applicable regulations and the relevant requirements of the National Electrical Code, ANSI/NFPA-70 or Canadian Electrical Code CSA C22.1 Part 1.

The boiler must be grounded in accordance with the regulations of the relevant authorities or else the requirements of the National Electrical Code, ANSI/NFPA-70 or Canadian Electrical Code CSA C22.1 Part 1.

The boiler is fully functional with the factory-installed programming unit.

Observe the following points regarding the electrical connections:

- Only carry out electrical work on the heating system if you are properly qualified for the work in question. If you do not have the proper qualifications, have the work done by a suitably qualified electrician.
- Observe the local regulations.

6.12.1 Connecting the main power supply

Establish a permanent connection to the main power supply in accordance with the locally applicable regulations.

- Fit a power switch near to the boiler.

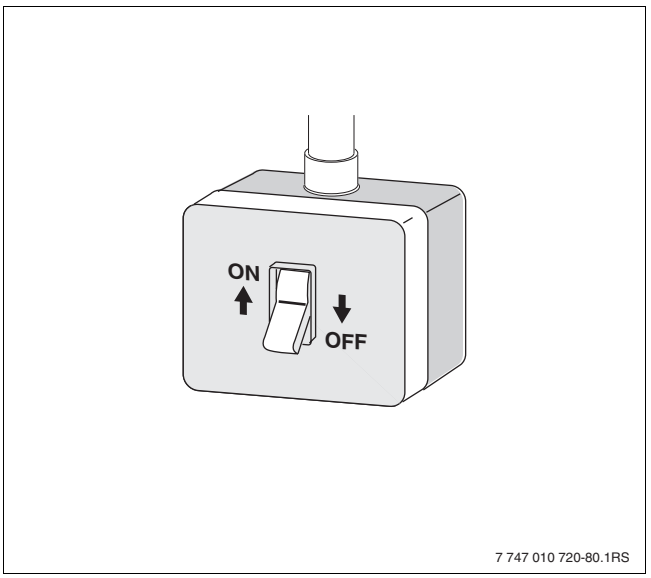


Fig. 31 On/off switch

- Feed the power cable through the hole in the rear panel of the boiler and along the cable conduit provided to the programming unit.
- Fit a union for metallic cable sheathing at the point of entry.

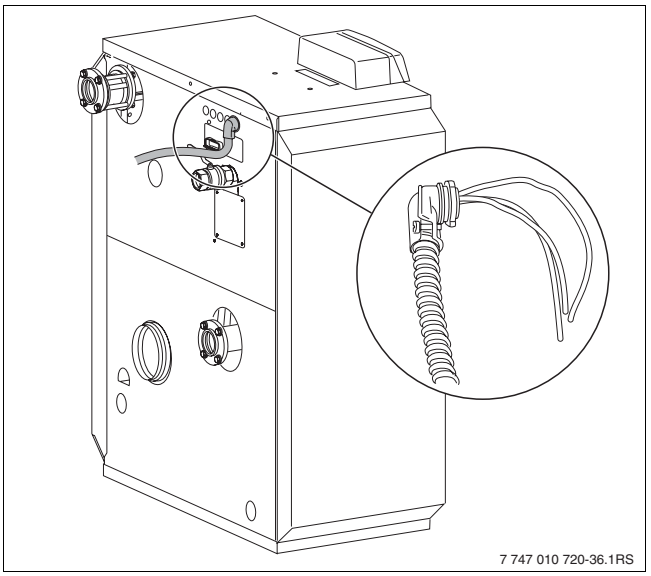


Fig. 32 Connecting the power supply

When making the electrical connections, refer to wiring diagram MC10 and installation manual M10 which are both part of the delivery.

- Undo the two screws on the programming unit cover and remove the cover.

Danger: Risk of fatal injury from electric current.
- When carrying out servicing work, label all electrical leads before disconnecting them.
- If leads are connected to the wrong terminals the boiler may not operate correctly with potentially dangerous consequences.

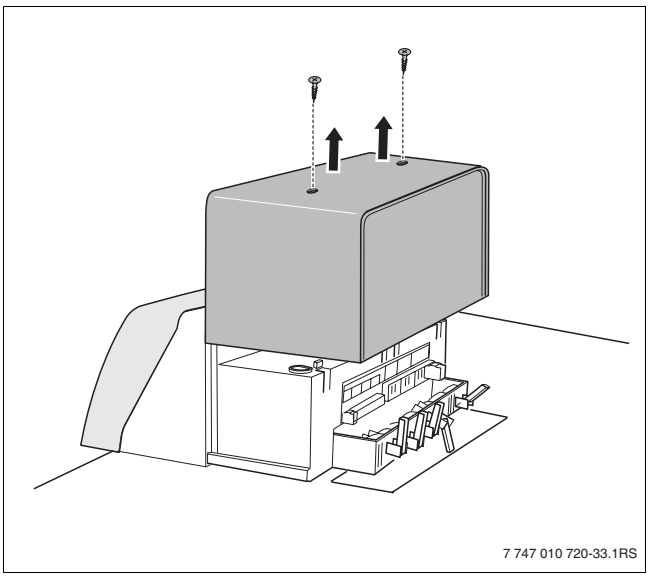


Fig. 33 Cover, removing

- Always check that the heating system is working properly after carrying out any servicing work.

Danger: Fire hazard from hot boiler components.
Hot components may damage electrical wiring.
- Ensure that all wiring is routed through the cable conduits provided or on the boiler insulation.

- Route all cables through the cable conduits to the programming and connect them in accordance with the wiring diagram.
  Secure all cables with cable grips (supplied).
- Insert the cable grip together with the cable from the top into the slots in the frame (step 1).
- Slide the cable grip downwards (step 2).
- Push against the grip (step 3).
- Flip the toggle up (step 4).

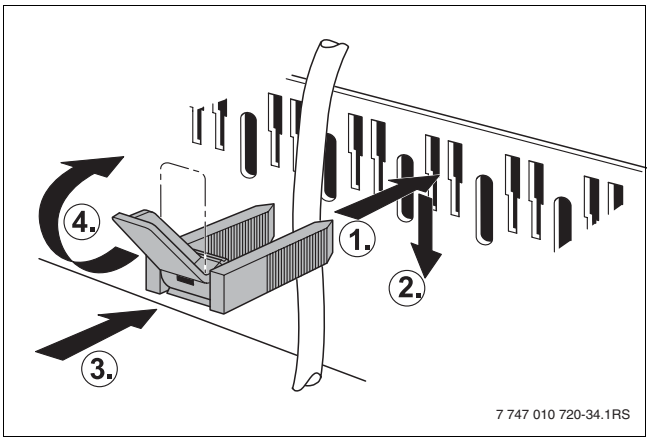


Fig. 34 Securing cables with cable grips

- Slot the programming unit cover into the guides and slide downwards.
- Secure the programming unit cover with the two screws.

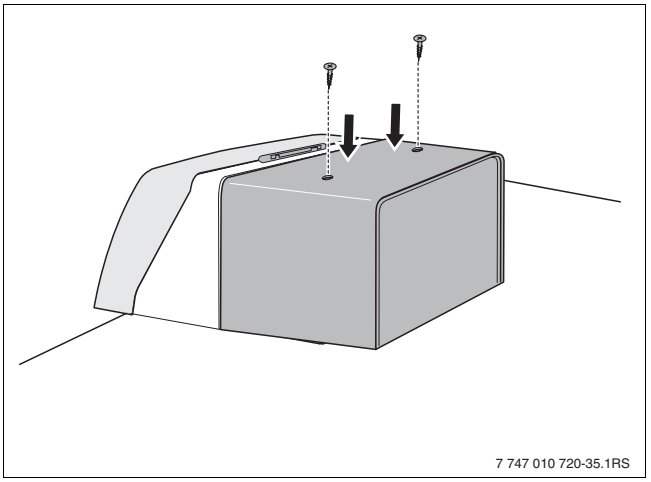


Fig. 35 Fitting the cover

6.12.2 Leveling the boiler

The boiler must be leveled so that the side panels and front panel can be fitted.

- Loosen the nuts.
- Screw the adjustable feet in or out so as to level the boiler with the aid of a spirit level.
- Retighten the nuts.

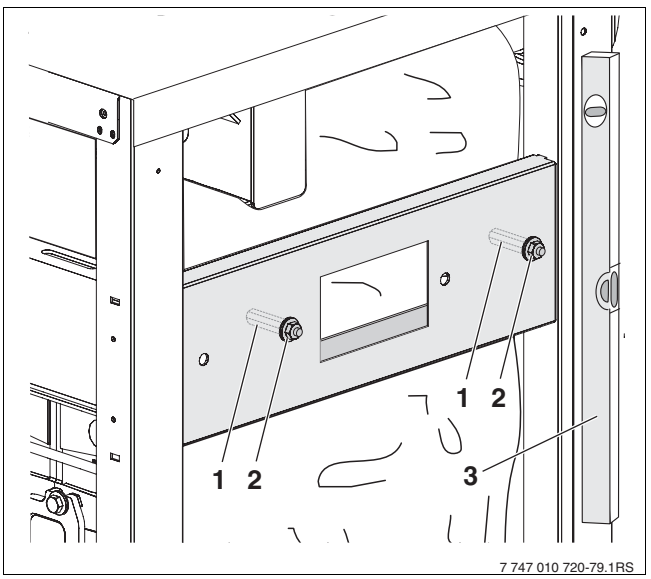


Fig. 36 Leveling the boiler

1 Screw
2 Nut
3 Spirit level

7 Recommissioning the heating system

This section describes the commissioning procedure using the programming unit's basic control panel.

To ensure safe operation of the heating system and to test specific performance indicators, the burner/gas valve unit fitted in the boiler have been factory-tested as described in detail in ANSI Z21.13 and CGA 4.9.

Danger: Risk of fatal injury from electric current when appliance is opened up.
- Before opening the boiler:Disconnect the heating system from the electrical power supply by means of the emergency stop switch or the relevant circuit breaker on the main fuse board.
- Take measures to ensure the heating system can not be switched on again unintentionally.

- After completing the work described below, fill out the commissioning log (→ Section 7.21, page 56).

Caution: Risk of boiler damage due to excessive dust and airborne plant seed levels.
- Do not operate the boiler when there is a lot of dust in the boiler room, e.g. due to building work.
- An air filter must be fitted if the supply of combustion air contains large quantities of dust (e.g. from unpaved roads and tracks or dusty workplaces such as quarries, mines, etc.) or airborne seeds from plants.

Warning: Risk of boiler damage from contaminated combustion air.
- Do not use cleaning agents that contain chlorine or halogenated hydrocarbons (e.g. in spray cans, solvents and cleaning agents, paints, glues).
- Do not store or use such substances in the boiler room.

- **If the burner has become dirty as a result of building work, it must be cleaned before being commissioned.**
- **Inspect flue and combustion air piping and the vents for combustion air supply and ventilation (→ Section 5, page 19).**

Read the following carefully before switching on so as to avoid potentially fatal situations:

Danger: Risk of fatal injury due to failure to follow the commissioning instructions and consequent incorrect operation.
- If these instructions are not followed exactly, a fire or explosion may be caused resulting in serious damage to property, serious injury or loss of life.
- It is imperative that the commissioning instructions are followed!

Danger: Risk of explosion

If you smell gas there is a danger of explosion!
- Extinguish all naked flames. Do not smoke.
- Avoid creating sparks.
  Do not operate any electrical switches or equipment such as telephones, power plugs and doorbells!
- Turn off the gas cock (→ page 40)!
- Open windows and doors!
- Do not operate any electrical switches.
- Warn other occupants of the building!
- Leave the building.
- **From outside** the building, call gas company, heating installer or fire department.

Danger: Risk of fatal injury due to water damage.
- The appliance must not be used if any part of it has been under water.
- Have the appliance checked by a qualified service contractor.
- Any parts of the programming unit or the gas valve that have been under water must be replaced by a qualified service contractor.

7.1 Checking the operating pressure

- Before commissioning, check the water pressure in the heating system and adjust if necessary.

Caution: Risk of system damage due to scale formation in the boiler.
- Refer to the information provided in the operator's log.

- Set the red needle on the temperature/pressure gauge to the required operating pressure of at least **15 psi** (applies to sealed heating systems).

Caution: Risk of damage to system
If you fill the heating system when it is hot, the resulting temperature stresses can cause stress cracks. The boiler will then leak.
- Only fill the heating system when cold (the flow temperature should be no more than 104 °F).
- Pay attention to the water quality as specified in the "Water quality requirements for Logano plus GB312" document, and record the volume and quality of the water used to fill the system in the operator's log.

Caution: Health risk from contaminated domestic water.
- It is imperative that you observe all regulations and standards applicable in your country regarding prevention of domestic water contamination.

- Top up the heating water or drain via the boiler fill and drain valve until the required operating pressure is obtained.
- While filling, bleed the heating system using the radiator bleed valves.

The boiler is fitted with a low-pressure monitor (low-water cut-off). This prevents the boiler starting up if the pressure is below approx. **8.7 psi**.

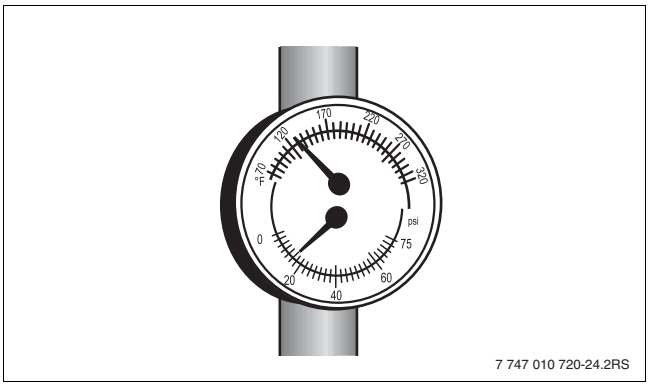


Fig. 37 Pressure/temperature gauge

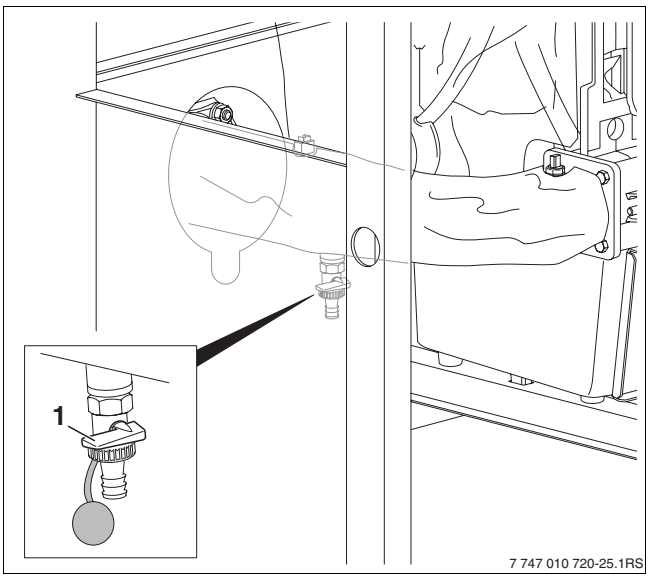


Fig. 38 Topping up heating water/draining via the boiler fill & drain valve

1 Boiler fill & drain valve

7.2 Checking for leaks

Before commissioning, all new sections of gas piping must be checked for external leaks.

Danger: Risk of explosion
Leakage from the gas pipes and gas connections may cause an explosion.

- Carry out a proper leakage test using soap solution.

Danger: Risk of system damage due to short-circuits.

- Before testing for leaks, cover the areas at risk, e.g. the internal water pressure sensor and the return sensor on the boiler return.
- Do not spray leak detector onto cable conduits, plugs or electrical connecting leads or allow it to drip onto them.

- Check the new section of piping for external leaks up to the sealed joint where it directly joins the gas valve. If the leak test identifies a leak, further leak tests must be carried out on all joints using a foaming agent. The agent must be approved for gas leak testing. Do not apply the agent to electrical connecting leads.
- Confirm completion of the leakage test in the commissioning log.

7.3 Checking appliance equipment

Gas type	Factory settings
Natural gas (gas type A)	Delivered factory-set ready for use. The gas valve is set and sealed. Calorific value for 60 °F, 30 ins Hg Set to 1075 Btu/ft^3
Propane (gas type E)	Delivered factory-set ready for use. The gas valve is set and sealed. Calorific value for 60 °F, 30 ins Hg Set to 2500 Btu/ft^3

Tab. 12 Factory settings

Caution: Risk of boiler damage
The burner may only be used with the type of gas fuel specified for it.

- Check that the actual gas supplied matches the gas type specified on the rating plate.

Check the factory settings in the case of LPG (→ Fig. 50, page 52).

7.4 Checking the air supply/ventilation and flue pipe connection

- Check that the air supply/outlet vents comply with the local regulations and/or gas installation requirements.

Danger: Risk of fatal injury from poisoning.
Insufficient ventilation may cause dangerous flue gas leaks.

- Never close off or reduce the size of air inlet or outlet vents.
- The boiler must not be operated until the obstruction has been removed.
- Inform the system operator in writing of the problem and associated danger.

- Check that the flue pipe connection complies with the applicable regulations (→ Section 6.8, page 27).
- Check that the flue pressure does not exceed the available pressure of 0.4 inches W.C. (100 Pa).

7.5 Checking the air inlet diaphragm

- Check that the air inlet diaphragm on the air inlet socket is present and in contact with the pipe.
- Check that the air inlet diaphragm on the air inlet socket is able to move and is not sticking to the pipe.

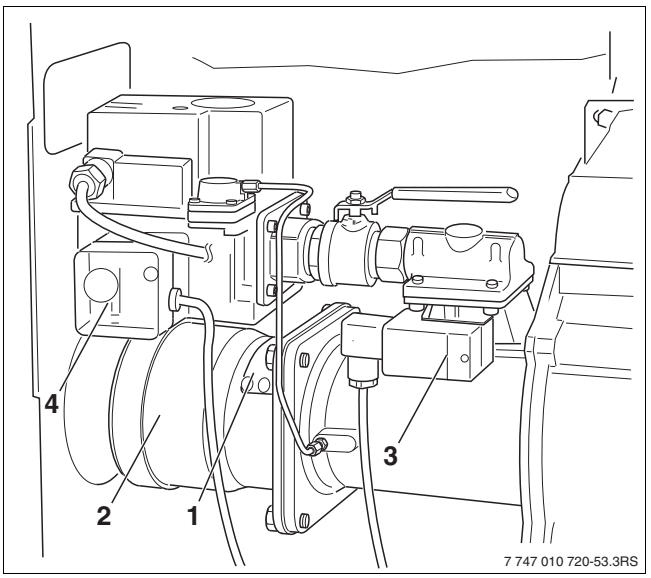


Fig. 39 Checking the air inlet diaphragm

1 Air inlet diaphragm
2 Air inlet socket
3 High gas pressure switch (available separately)
4 Low gas pressure switch (available separately)

7.6 Purging the gas pipe

- Remove blanking plug from testing point for gas supply dynamic pressure on gas valve inlet flange.
- Fit gas pressure testing nipple.
- Fit hose onto pressure testing nipple.
- Slowly open the gas isolating valve on the back of the boiler.
- Burn off the escaping gas through a water seal.
- Once no more air is expelled, remove the hose.
- Remove the gas pressure testing nipple.
- Carefully refit and tighten blanking plug in testing point for gas supply dynamic pressure.
- Close the gas isolating valve on the back of the boiler.

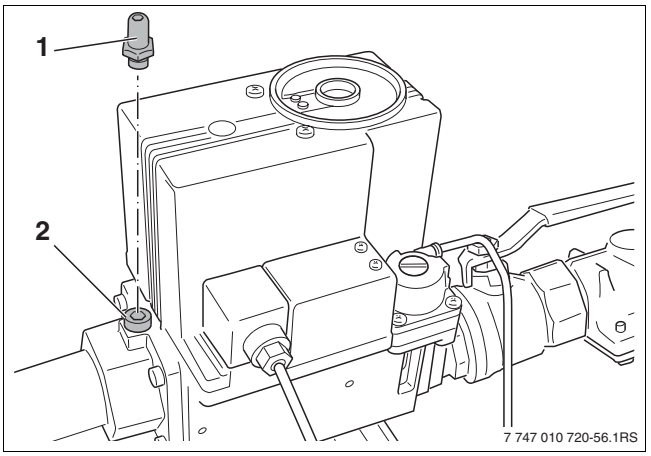


Fig. 40 Purging the gas pipe

1 Pressure testing nipple for testing gas supply dynamic pressure and purging gas valve: Honeywell V4730C
2 Blanking plug

7.7 Making the heating system ready for operation

- Turn on the fuel supply on the main fuel container and downstream of the gas valve.
- Switch on the heating system emergency stop switch (if present) and/or the appropriate circuit-breaker.

7.8 Commissioning the control unit and burner without programming unit RC35.

Follow the instruction manual for the BC10.

If the boiler is not being used with an RC35 programming unit, it can be commissioned using a PC running the Logamatic Eco-Soft 400/EMS software and a Service Key.

Please contact Buderus for more detailed information.

7.9 Commissioning the control unit and burner with programming unit RC35

7.9.1 Boiler intended to be used with Logamatic 4000

If the boiler is subsequently to be run in conjunction with a Logamatic 4000 programming unit, the following operations must be carried out:

- Switch off the Logamatic 4000 programming unit.
- Use the RC35 programming unit.
- Continue commissioning procedure as described in Section 7.9.3.

7.9.2 Boiler intended to be used with RC35

- Use the RC35 programming unit.

7.9.3 Continuing commissioning procedure with RC35

- Turn the "maximum boiler temperature" control knob and "hot water temperature" control knob to 0.
  This ensures that the boiler does not start up at this point (no demand for heat).
- Set the ON/OFF switch on the basic control unit to position “1”.
  This turns on the entire heating system. When first commissioned, the display briefly shows a flashing "-" before showing fault message "4A"-"700". The fault message “4A”-“700” is displayed because the burner is at fault setting when delivered.
- Wait about 1 minute while the EMS connection to the RC35 programming unit (available separately) is established.
- Press the “Reset” button on the BC10. The status display on the BC10 lights up and the current boiler temperature in °F is shown.

If fault message”A11” appears, you must set the date and time on the RC35 programming unit. Only then will the current boiler water temperature be displayed.

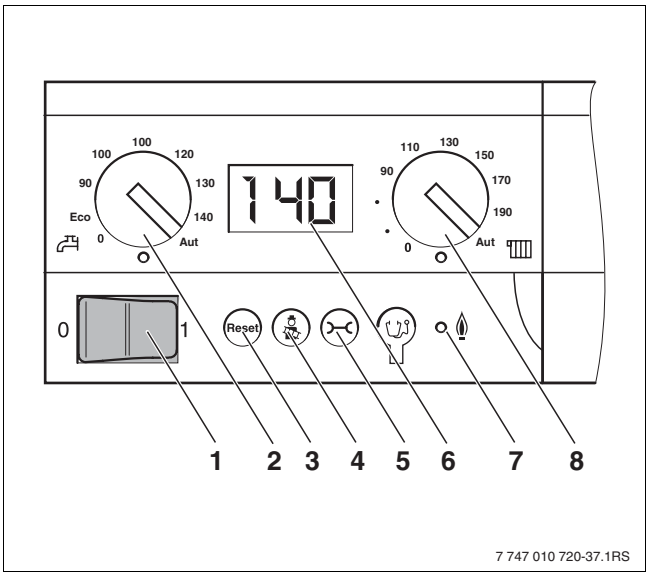


Fig. 41 Logamatic BC10 basic control unit

1 On/off switch
2 Control knob for "hot water temperature"
3 “Reset” button
4 "Engineer" button for flue gas test
5 "Status display" button
6 Display
7 “Burner (On/Off)” LED
8 Control knob for "maximum boiler temperature" in heating mode

Before continuing the commissioning procedure, set the correct parameters on the RC35 programming unit. In particular the DHW configuration (central heating pump and cylinder charging pump) must be adjusted correctly to ensure the heating system works properly. Refer to the installation and servicing instructions for the RC35 programming unit for information on how to do so.

7.10 Switching on the boiler on the BC10

- Set the ON/OFF switch on the basic control unit to position ”1”.
  This turns on the entire heating system. The status display on the basic control unit lights up and shows the current boiler water temperature in °F.

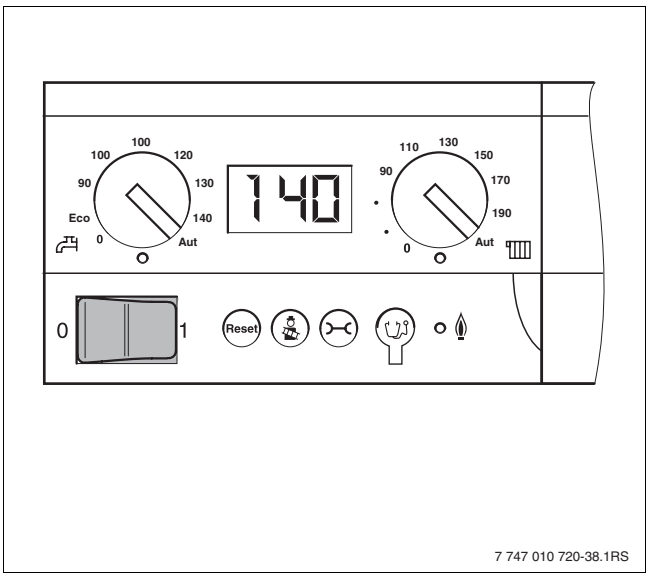


Fig. 42 Switching on the basic control unit

7.10.1 Conducting a flue gas test

The (button) button is used by the heating engineer for the flue gas test.

The control system runs the heating at a raised flow temperature for 30 minutes. During the flue gas test, the decimal point on the status display lights up.

- Press and hold the (button) button until the decimal point on the status display lights up (at least 2 seconds).
- Conduct the flue gas test.
- Cancel the flue gas test and press the (button) button again.

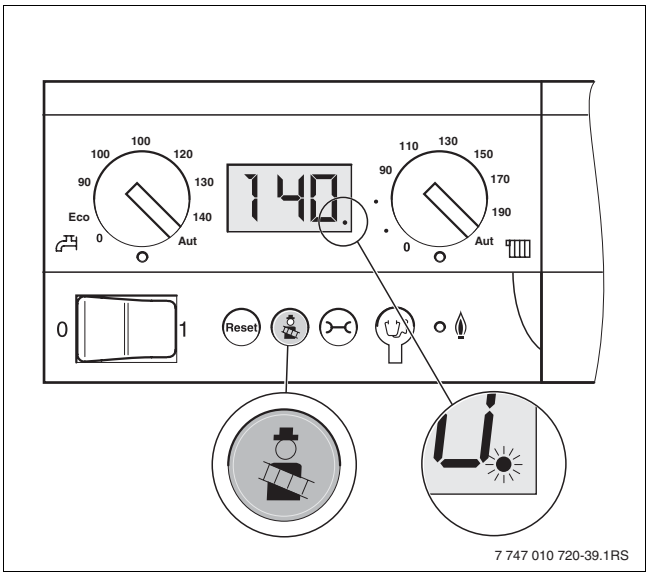


Fig. 43 Starting the flue gas test

7.10.2 Opening the Service menu and viewing monitor data on the RC35

A PC running the Buderus Logamatic ECO-Soft 4000/EMS software together with a service key can also be used as a monitoring device. Please contact Buderus for more detailed information.

- Simultaneously press the Menu/OK + Info + buttons to open the **SERVICE MENU**.
- Turn the rotary selector counter-clockwise to select **Diagnosis** (indicated by ►).

```
SERVICE MENU
 quick operation
 settings
▸diagnosis
 servicing
```

- Press the Menu/OK button to open the **SERVICE/DIAGNOSIS** menu.
- Turn the rotary selector counter-clockwise to select **Monitor reading** (indicated by ►).

```
SERVICE|DIAGNOSIS
 function test
▸monitor reading
 diagnosis
 servicing
```

- Press the Menu/OK button to open the **DIAGNOSIS/MONITOR READING** menu.
- Turn the rotary selector counter-clockwise to select **Boiler/Burner** (indicated by ►).

```
DIAGNOSIS|MON.READING
▸Boiler/Burner
 domestic hot water
 heating circuit 1
 bus users
```

- Press the Menu/OK button to open the **BOILER/BURNER** menu.
  The monitor readings are displayed as a list, i.e. turning the selector scrolls down to more readings.

These menus enable you to read off the current boiler output (set/actual) and the flame ionization current.

7.11 Adjusting and checking CO_2 level at maximum output

Boiler rating	Gas orifice diameter for natural gas (gas type A), calorific value 1075 Btu/ft³	Gas orifice diameter for propane HD5 (gas type E), calorific value 2500 Btu/ft³
90-4	17	7.9
120-4	17	7.9
160-5	17	8.8
200-6	17	9.4
240-7	17	9.95
280-8	17	10.6

Tab. 13 Gas injector diameter

- Read off output on RC35 or using Service Key.
- Wait until output reaches at least 70%.
- Insert the sensor through a testing hole in the flue pipe (→ Fig. 47, page 48) into the centre of the gas flow.
- Measure the pressure in the flue using a suitable pressure tester (for location of testing point, see Fig. 47, page 48).

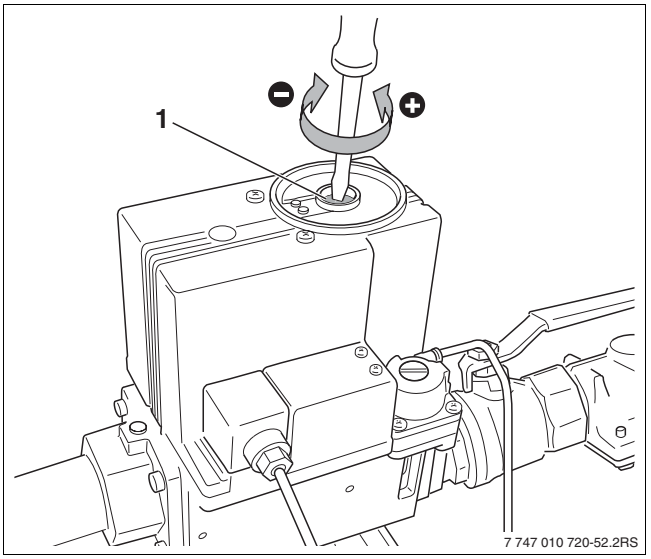


Fig. 44 Checking the CO_2 setting at maximum output

1 High-output adjusting screw

7.11.1 CO_2 content, natural gas type A

If CO_2 content is below 8.5%.

- Adjust the level to 9.1% CO_2 using the high-output adjusting screw.
  - Turning the screw clockwise reduces the CO_2 level.
  - Turning the screw counter-clockwise increases the CO_2 level.

7.11.2 CO_2 content, propane gas type E

If CO_2 content is below 10%.

- Adjust the level to 10.5% CO_2 using the high-output adjusting screw.
  - Turning the screw clockwise reduces the CO_2 level.
  - Turning the screw counter-clockwise increases the CO_2 level.

7.12 Adjusting and checking CO_2 level at medium output

- Set to 30%.
- To do so, press and hold the button until the decimal point on the status display **lights up** (at least 2 seconds).
  This turns on the flue gas test.
- Simultaneously press and hold the and buttons for approx. 5 seconds.
  At the factory setting, the display shows "L - -".
- Press the Reset button to reduce the boiler output to a percentage of maximum until the display shows "L30.".
- Read off output on RC35 or using a Service Key.
- Wait until the output drops to 30%.

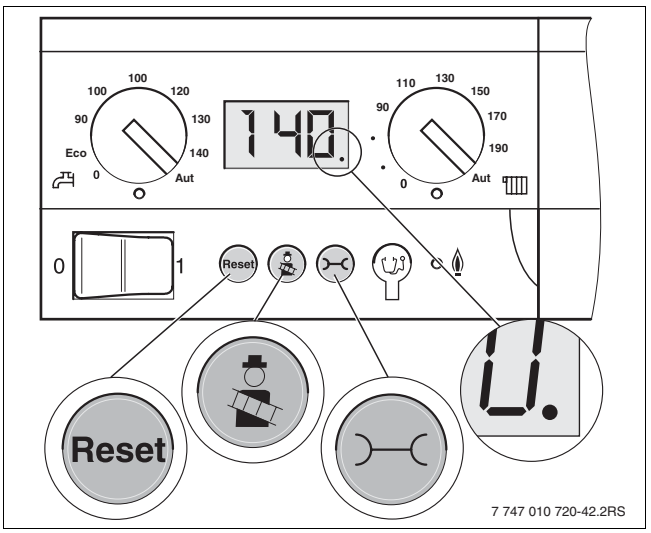


Fig. 45 Setting medium output

7.12.1 CO_2 content, natural gas type A (medium output)

If CO_2 content is below 9.0% or above 9.5%.

- Adjust the level to 9.1% CO_2 using the low-output adjusting screw.
  - Turning the screw clockwise increases the CO_2 level.
  - Turning the screw counter-clockwise reduces the CO_2 level.

7.12.2 Checking the CO_2 content, propane gas type E (medium output)

If CO_2 content is below 10.2% or above 10.7%.

- Adjust the level to 10.5% CO_2 using the low-output adjusting screw.
  - Turning the screw clockwise increases the CO_2 level.
  - Turning the screw counter-clockwise reduces the CO_2 level.

7.12.3 Reading off and comparing CO_2 levels

- After reading off the CO_2 level or adjusting on the Monitor readings/Burner menu, read off the flame ionization current and compare with the specified levels.

7.13 Checking and monitoring CO_2 level at maximum output

- Press the button to increase the boiler output to a higher percentage.
- Read off output on RC35 or using Service Key.
- Wait until output reaches at least 70%.
- Check CO_2 content again (→ Table 13, page 47).
- Read off flame ionization current (and compare with the specified levels).

7.14 Recording measured values

- Take the following readings at a testing point on the flue pipe and record them in the commissioning log (→ Section 7.21, page 56):
  - Flue pressure
  - Flue gas temperature t_A
  - Carbon dioxide content (CO_2) or oxygen content (O_2)
  - Carbon monoxide content (CO)

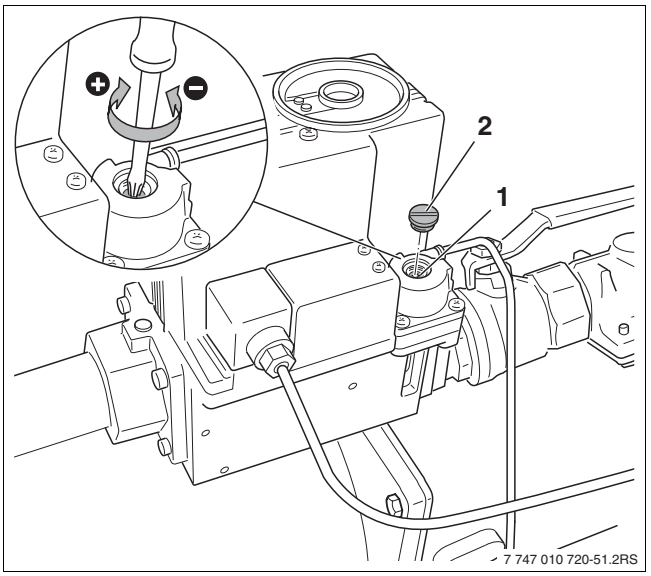


Fig. 46 Checking CO_2 setting at medium output

1 Low-output adjusting screwGas valve: Honeywell V4730C
2 Cap screw

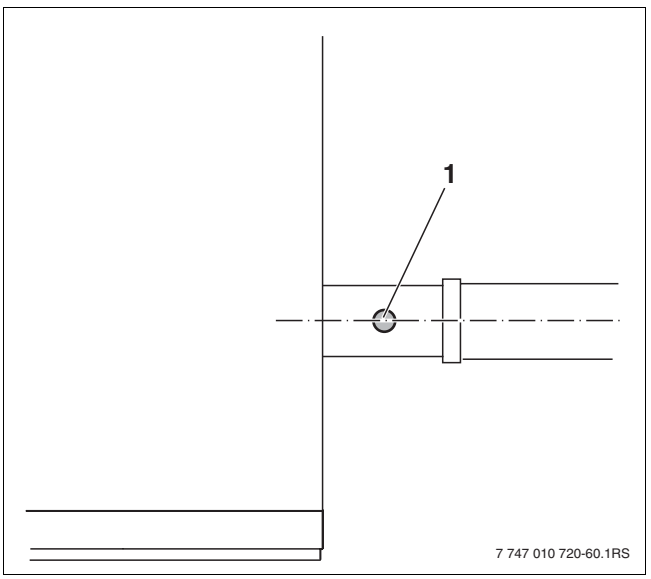


Fig. 47 Recording measured values

1 Recommended location for testing point on flue pipe

7.14.1 Switching the status display on the BC 10 to show the boiler temperature

- Press the button to change the display to the next status.
  Current operating pressure P1.7 is displayed.
- Press the button to change the display to the next status.
  Operating status 04 (display code) is displayed.
- Press the button to change the display to the next status.
  Boiler temperature is displayed.

7.14.2 Returning to operating mode from the flue gas test

- Press the button to cancel the flue gas test.
- Switch the RC35 back to operating mode.
- Close the flap on the RC35.
- If the boiler is intended to be used with the Logamatic 4000 control system, remove the RC35 again. Switch on the Logamatic 4000 control system.

7.14.3 Flue pressure

The required flue pressure for the flue/air supply system installed must not be greater than 0.4 inches W.C.

- If the flue pressure at maximum output is higher than 0.4 inches W.C., contact the relevant flue system planner and check the calculations and and design of the flue/air supply system.

Danger: Risk of fatal injury due to poisoning by escaping flue gas.

- Only operate the boiler in conjunction with a chimney flue or flue system (→ Table 1, page 11).

7.14.4 Carbon monoxide content

CO levels in the absence of air must be below 400 ppm or 0.04% by vol.

Levels above 100 ppm indicate incorrect burner adjustment, incorrect appliance settings, dirt in the burner or heat exchanger or burner faults.

- Identify and eliminate the fault.

7.15 Converting propane (gas type E) burner to natural gas (gas type A)

Danger: RISK OF FATAL INJURY DUE TO INCORRECT INSTALLATION OF THE CONVERSION KIT.
THE CONVERSION KIT SHALL BE INSTALLED BY A QUALIFIED SERVICE AGENCY IN ACCORDANCE WITH THE MANUFACTERER'S INSTRUCTIONS AND ALL APPLICABLE CODES AND REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION. IF THE INFORMATION IN THESE INSTRUCTIONS IS NOT FOLLOWED EXACTLY, A FIRE, AN EXPLOSION OR PRODUCTION OF CARBON MONOXIDE MAY RESULT CAUSING PROPERTY DAMAGE, PERSONAL INJURY OR LOSS OF LIFE.

- THE SERVICE AGENCY IS RESPONSIBLE FOR THE PROPER INSTALLATION OF THIS KIT.
- THE INSTALLATION IS NOT PROPER AND COMPLETE UNTIL THE OPERATION OF THE CONVERTED APPLIANCE IS CHECKED AS SPECIFIED IN THE MANUFACTURER'S INSTRUCTIONS SUPPLIED WITH THE KIT.

The conversion kit consists of

– Gas orifice (see Tab. 14)
– Converted burner Label Natural Gas
– Conversion Label Natural Gas
– Installation and servicing instructions manual

Danger: Risk of fatal injury due to incorrect gas type conversion.
Burner gas type conversion is only possible from propane (gas type E) to natural gas (gas type A). It is not possible to convert a natural gas (gas type A) burner to propane (gas type E).

- On no account must a natural gas (gas type A) burner be converted to a different gas type.

The burner is converted to natural gas by replacing the gas injectors.

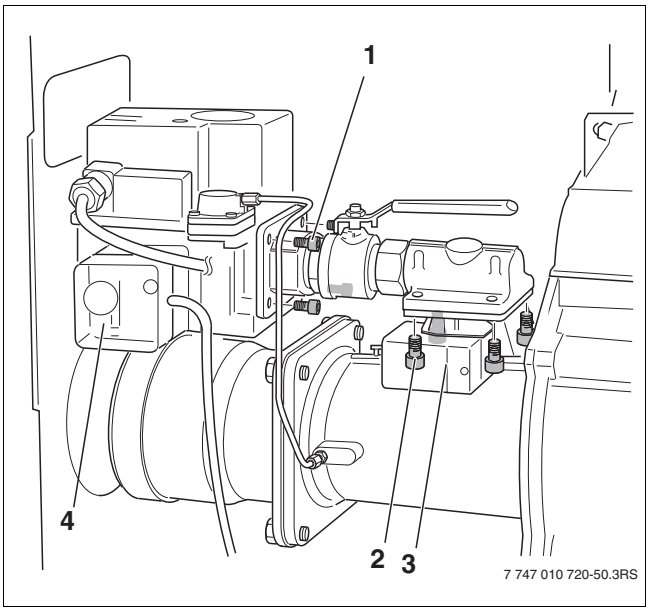


Fig. 48 Replacing gas orifice

1 Socket-head bolts on gas valve outlet flange
2 Socket-head bolts on connection adaptor
3 High gas pressure switch (available separately)
4 Low gas pressure switch (available separately)

Installation at high altitudes

The conversion kit is designed for installation at altitudes below 2000 feet above sea level. If it is to be installed at altitudes higher than 2000 feet it can be converted accordingly.

Contact Buderus if the installation site is at a high altitude. The boiler must only be converted as specified in the relevant technical documentation and using the conversion components (available separately) approved by Buderus. The technical documentation is supplied with the conversion components.

Use only the gas injectors specified in Table 14.

Caution: Risk of fatal injury from the explosion of flammable gases and from electrical current.

- The gas supply shall be shut off prior to disconnecting the electrical power, before proceeding with the conversion.

- Turn off main gas supply cock and gas isolating valve on back of boiler.
- Remove socket-head bolts (4 off) from the gas valve outlet flange.
- Remove bolts (4 off) securing connection adaptor to venturi using Allen key.
- Remove propane gas orifice using open-ended wrench.
- Screw in natural gas orifice as per table below and tighten using open-ended wrench.
- Check seal is properly seated.
- Refit bolts (4 off) securing connection adaptor to venturi and tighten in diagonal sequence.
- Refit and tighten socket-head bolts (4 off) on gas valve outlet flange in diagonal sequence.

Boiler size	Gas orifice diameter, natural gas (gas type A), calorific value 1075 Btu/ft^3
90-4	17
120-4	17
160-5	17
200-6	17
240-7	17
280-8	17

Tab. 14 Gas orifice diameter

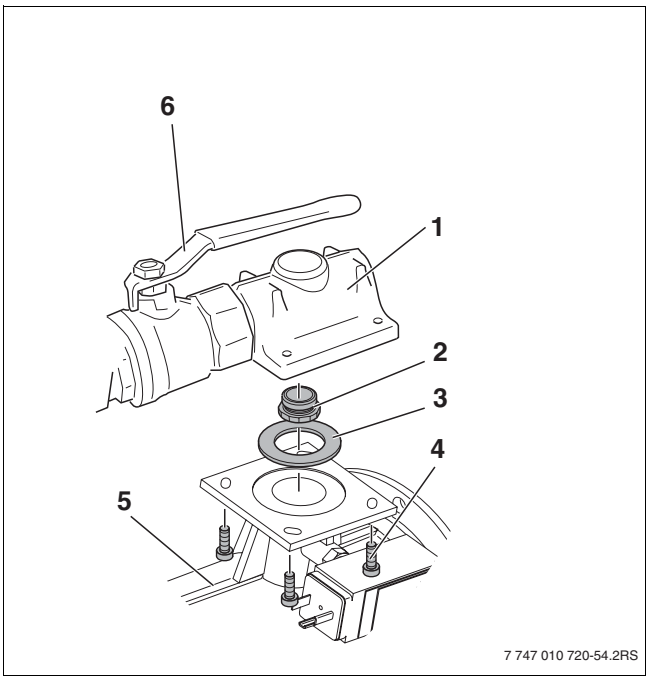


Fig. 49 Replacing gas orifice

1 Venturi connector
2 Gas orifice
3 Washer
4 Bolts
5 Venturi
6 Isolating valve

- Adjust the CO_2 level as per Section 7.11, page 47ff.
- Carry out the remaining settings and checks as set out in the sections that follow (→ Section 7.15.1, page 52 to Section 7.20, page 55), the natural gas input ratings are listed in Table 2, page 12.
- Record the readings taken in the commissioning log (→ Section 7.21, page 56).

7.15.1 Attaching the conversion label

- Attach the conversion label adjacent to the rating plate on the side panel.
- Attach the converted burner label on the front of the manifold burner.

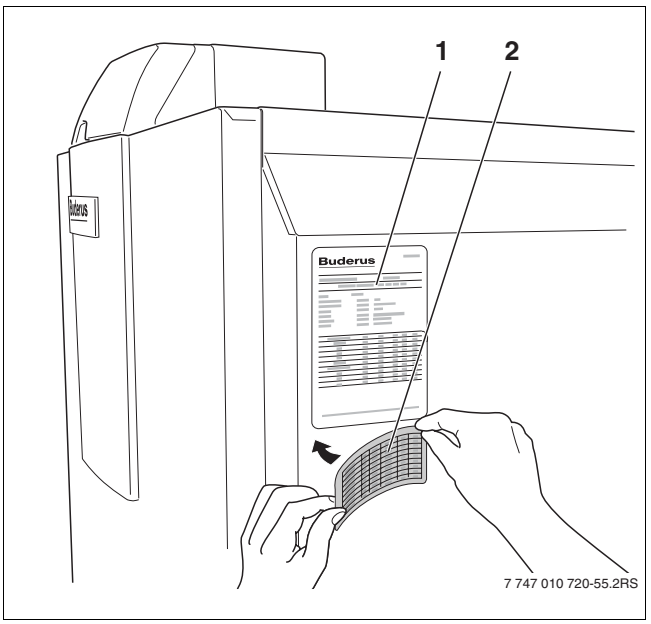


Fig. 50 Attaching the conversion label

1 Nameplate
2 Conversion label

7.15.2 Purging the gas pipe

- Remove blanking plug from testing point for gas supply dynamic pressure on gas valve inlet flange.
- Fit gas pressure testing nipple.
- Fit hose onto pressure testing nipple.
- Slowly open the gas isolating valve on the back of the boiler.
- Flare the escaping gas through a water seal.
- Once no more air is expelled, remove the hose.
- Remove the gas pressure testing nipple.
- Carefully refit and tighten blanking plug in testing point for gas supply dynamic pressure.
- Close the gas isolating valve on the back of the boiler.

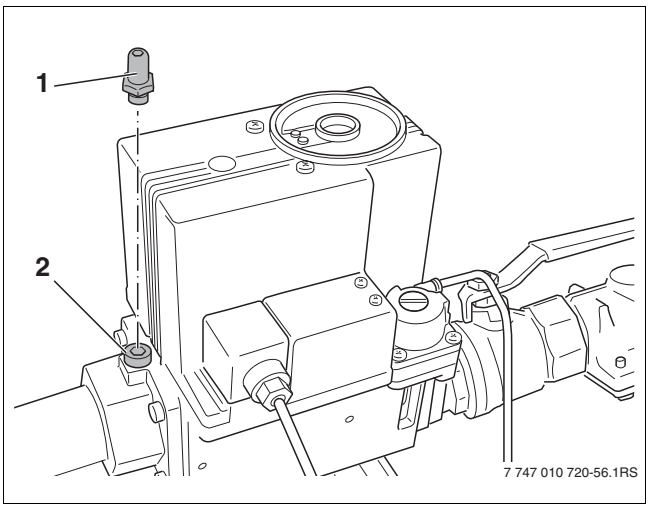


Fig. 51 Purging the gas pipe

1 Pressure testing nipple for testing gas supply dynamic pressure and purgingGas valve: Honeywell V4730C
2 Blanking plug

7.16 Function checks

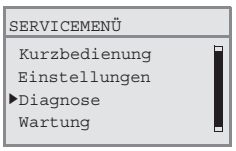
During commissioning and annual servicing, check all control and safety devices for proper functioning and, where adjustment is possible, check that the settings are correct.

7.16.1 Checking the (flame) ionization current

A PC running the Buderus Logamatic ECO-Soft 4000/EMS software together with a service key can also be used as a monitoring device. Please contact Buderus for more detailed information.

Opening the Service menu on the RC35

- Open flap on RC35.
- Simultaneously press the Menu OK + Info + ⮌ buttons to open the **SERVICE MENU**.
- Turn the rotary selector ◯ counter-clockwise to select **Diagnosis** (indicated by ►).



- Press the Menu OK button to open the **SERVICE/DIAGNOSIS** menu.
- Turn the rotary selector ◯ counter-clockwise to select **Diagnosis** (indicated by ►).
- Press the Menu OK button to open the **SERVICE/DIAGNOSIS** menu.

The menu items shown will vary depending on the heating system.

- Press and hold the Menu OK button and simultaneously turn the rotary selector ◯ to change the setting, e.g. to flame ionization current.
  The change takes effect when you release the button.
- Read off the ionization current and record the reading in the commissioning log (→Section 7.21, page 56). To ensure trouble-free operation, the ionization current at medium and maximum output (when flame is lit) should be at least 3 µA.
- Switch the RC35 back to operating mode.
- Close the flap on the RC35.

7.17 Measuring the gas supply dynamic pressure

- Close the gas isolating valve on the back of the boiler.
- Remove blanking plug from testing point for gas supply dynamic pressure on gas valve inlet flange.
- Fit gas pressure testing nipple.
- Fit pressure gauge hose onto pressure testing nipple.
- Slowly open the gas isolating valve on the back of the boiler.
- Measure the gas supply dynamic pressure with the burner running.
  Record the reading taken in the commissioning log.
  – If the gas supply dynamic pressure is inadequate, contact the gas company responsible for the supply.
  – If the gas supply dynamic pressure is too high, install an additional gas pressure regulator upstream of the gas valve.
- Remove the pressure gauge hose.
- Carefully refit and tighten blanking plug in testing point for gas supply dynamic pressure on the gas valve inlet flange.
- Turn on the gas isolating valve on the back of the boiler.

Gas type	Supply pressure[1)]		
	Min.	Rated	Max.
Natural gas (gas type A)	3.5" W.C.	7.0" W.C.	10.5" W.C.
Propane (gas type E)	8.0" W.C.	11.0" W.C.	13.0" W.C.

1) The gas company must guarantee the min. and max. pressures (as per national regulations for public gas supply).

7.18 Checking for leaks during operation

- With the burner running, use a foaming leak detecting agent to test all joints along the entire burner gas supply route, e.g.:

– Blanking plug in testing point for gas supply dynamic pressure
– Unions, etc.

The agent must be approved for gas leak testing.

Caution: Risk of system damage due to short-circuits.
- Before testing for leaks, cover the areas at risk, e.g. the internal water pressure sensor and the return sensor on the boiler return.
- Do not spray leak detector onto cable entries, plugs or electrical connecting leads. Do not allow it to drip onto them either.
- To avoid corrosion, carefully wipe off the leak detector afterwards.

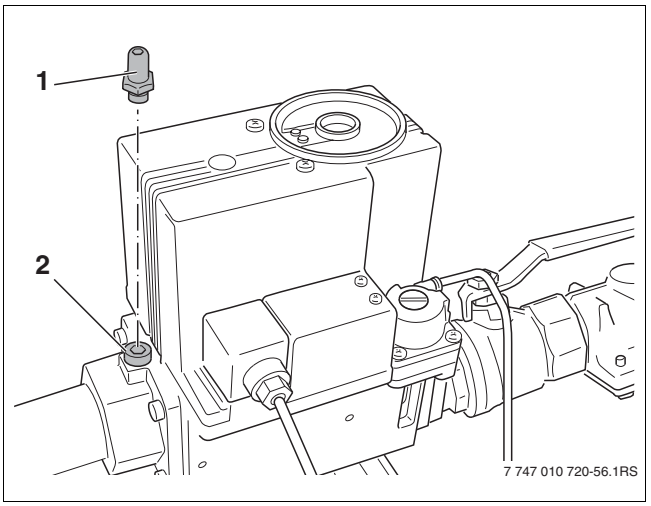


Fig. 52 Measuring gas supply pressure

1 Pressure testing nipple for testing gas supply dynamic pressure and purgingGas valve: Honeywell V4730C
2 Blanking plug

7.19 Fitting outer casing components

If the boiler side panels/front panel will not fit properly, level the boiler (→ Section 6.12.2, page 39).

- Slot the bottom of the side panels into position first, then raise slightly and slot in at the top.
- Secure the side panels at the front and back of the boiler using the securing screws.
- Slot the bottom of the front panel into position first, then raise slightly and slot in at the top.
- Secure the front panel at the top of the boiler using the securing screw.
- Attach the clear wallet containing the technical documentation in a visible position on the boiler side panel.

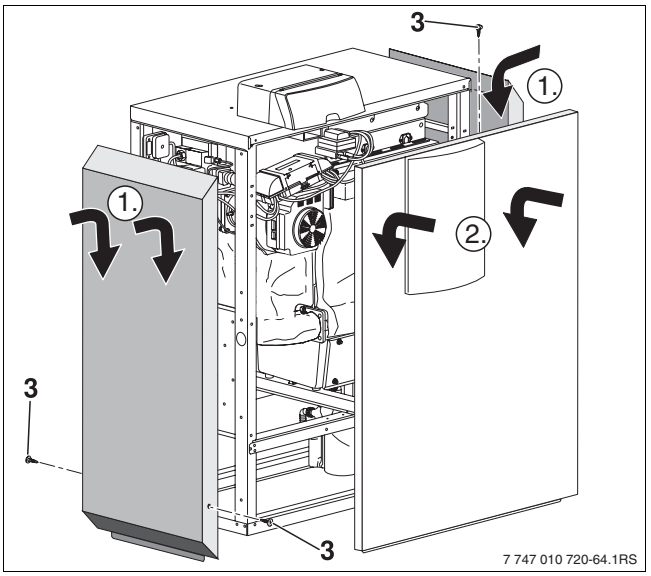


Fig. 53 Fitting outer casing components

1 Side panel
2 Front panel
3 Screw

7.20 Informing the owner/oprerator and handing over technical documentation

Familiarize the owner/operator with the entire heating system and the operating instructions for the boiler.

Shut down and restart the system together with the owner/operator.

With the aid of the operating instructions, explain to the customer what to do in an emergency, e.g. a fire.

Hand over the technical documentation to the owner/operator and then both sign the commissioning log (→ Section 7.21, page 56).

7.21 Commissioning log

- Initial and date the commissioning operations carried out.

	Commissioning operations	Page	Readings taken		Comments
1.	Fill heating system and check for leaks		☐		
	– Heating system pressure		_____ psi		
2.	Details in water quality log taken into account		☐		
	– Concentration of any additives		Add.:_____	Conc.:___%	
3.	Record gas characteristics: calorific value	42	_____ BTU/ft³		
4.	Check gas pipe for leaks	42	☐		
	Purging the gas pipe	51	☐		
5.	Bringing the system up to operating pressure	41	☐		
6.	Check air inlet/outlet vents and flue pipe connection	43	☐		
7.	Check air inlet diaphragm	43	☐		
8.	Check appliance equipment	42	☐		
9.	Starting up the control and the burner	44	☐		
10.	Adjust burner setting if necessary	45			
11.	Record readings taken	48	max. load	part load	
	Flue pressure		___in W.C.	___in W.C.	
	Flue gas temperature		_____ °F	_____ °F	
	Air temperature		_____ °F	_____ °F	
	Carbon dioxide content (CO_2) or oxygen content (O_2)		_____ %	_____ %	
	Carbon monoxide content (CO), without air		_____ ppm	_____ ppm	
12.	Measuring the gas supply dynamic pressure	53	_____ in W.C.		
13.	Checking for leaks during operation	53	☐		
14.	Function checks	52			
	Check ionization current		_____ µA		
15.	Fitting outer casing components	54	☐		
16.	Informing the end user and handing over technical documentation	54	☐		
17.	Correct commissioning confirmed by installer		Signature:_____		
18.	Signature of operator		Signature:_____		

Tab. 15 Commissioning log

8 Shutting down the heating system

Caution: Risk of system damage due to freezing.
If the heating system has been switched off, it may freeze up at sub-zero temperatures.

- Protect the heating system from freezing when there is a danger of frost. To do so, drain the water out of the heating system from its lowest point. When doing so, the vent at the highest point of the system must be open.

8.1 Shutting down the heating system using the programmer

Turn off the heating system on the Logamatic BC10 basic control unit. When the Logamatic BC10 basic control unit is switched off, the burner is automatically shut down at the same time. For more detailed information about using the Logamatic BC10 basic control unit, refer to Section 7, page 40.

- Switch off the heating system with the BC10 ON/OFF switch.
- Turn off the main isolating valve.

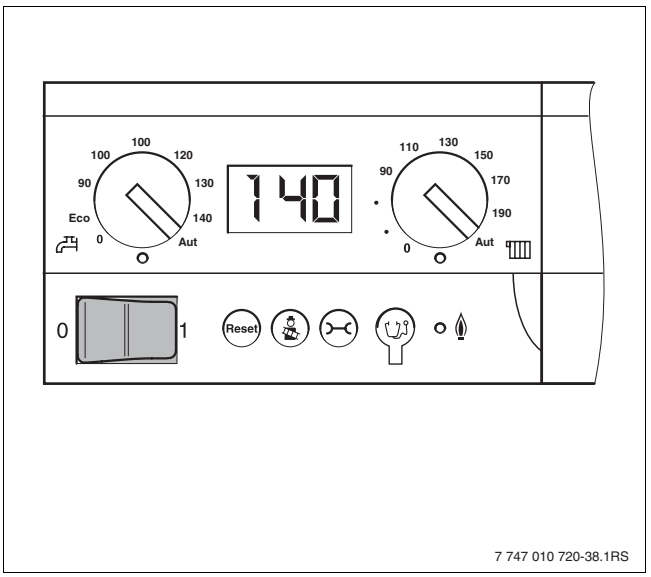


Fig. 54 Logamatic BC10 basic control unit

8.2 Shutting down the heating system in an emergency

The circuit-breaker for the boiler room or the heating emergency stop switch should only be used to switch off the heating system in an emergency.

8.2.1 Action in an emergency

Explain to the customer what to do in an emergency, e.g. a fire.

- Never put yourself at risk of fatal injury. Your own safety must always take the highest priority.
- Turn off the main isolating valve.
- Disconnect the heating system from the electrical power supply by means of the emergency stop switch or the appropriate circuit-breaker.

9 Heating system servicing

Heating systems should be regularly maintained for the following reasons:

- to achieve a high level of efficiency and to operate the system economically (low fuel consumption),
- to achieve a high level of operational reliability,
- to maintain the cleanest possible combustion,
- to ensure reliable operation and long service life.

Servicing work may only be carried out by a qualified service technician. If parts are replaced, only Buderus-approved components may be used. A service must be carried out once a year. The results of the services must be recorded in the servicing and maintenance log.

Spare parts can be ordered from Buderus using the parts list.

9.1 Preparing the boiler for servicing

Danger: Risk of fatal injury from electric current.

- Before opening up the boiler, isolate it completely from the mains power supply and ensure the power cannot be inadvertently reconnected.

- Shut down the heating system.
- Unscrew the securing screw from the top centre of the boiler front panel.
- Lift font panel slightly and draw forwards to remove.

Danger: Risk of fatal injury from the explosion of flammable gases.

- Operations on the gas pipes may only be carried out by a properly licensed gas contractor.

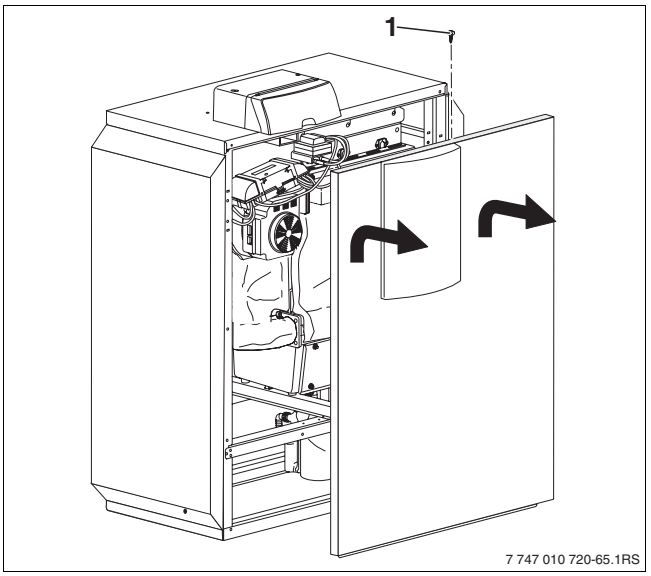


Fig. 55 Removing the front panel

1 Screw

9.2 General operations

The following operations are not described in any further detail in this document. They have to be carried out nevertheless:

- Checking the general condition of the heating system.
- Visual inspection and function check of the heating system.
- Checking the air supply and flue pipes for proper functioning and safety.
- Checking all gas and water piping for signs of corrosion.
- Replacing any corroded pipes.
- Checking the charge pressure of the diaphragm expansion vessel.
- Check the concentration of possibly used additives in the water annually.

9.3 Checking the flue system inc. combustion air supply, inlet and outlet air vents

Check the flue system including air supply system and any air inlet/outlet vents. Immediately rectify any deficiencies identified. Make sure that the combustion air supply and the air inlet and outlet vents are not blocked at any point.

9.4 Checking the heating system operating pressure

Establish an operating pressure of at least 15 psi.

- Check system pressure
  If the temperature/pressure gauge needle drops below the minimum pressure marker, the operating pressure is too low. The heating system must be topped up.

Caution: Health risk from contaminated domestic water.

- It is imperative that you observe all regulations and standards applicable in your country regarding prevention of domestic water contamination.

Caution: Risk of system damage due to frequent topping up

If you have to top up the heating water frequently, the heating system may suffer damage from corrosion or scaling, depending on the water quality (see operator's log in "Water quality requirements for Logano plus GB312" document).

- Bleed the heating system while filling.
- Check the heating system for leaks.
- Check that the expansion vessel functions properly.

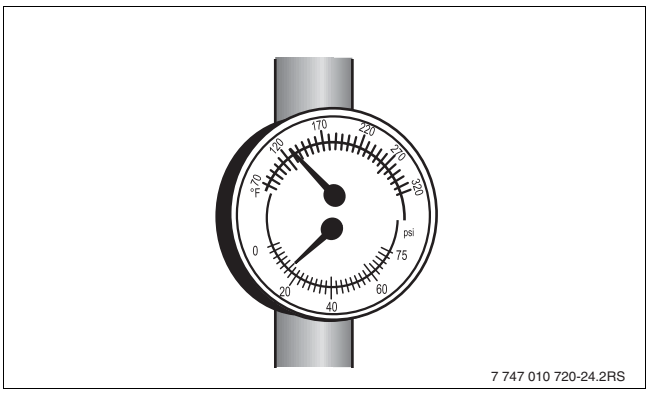


Fig. 56 Pressure/temperature gauge

- Replenish with water via the boiler fill & drain valve.
- Bleed the boiler by carefully opening the safety valve or an automatic vent (supplied separately) on the B-kit when the boiler circulation pump is running.
- Bleed the system via the radiator bleed valves.
- Check the operating pressure again.
- Record the amount of water added in the operator's log.

Read off the operating pressure from the programmer (e.g. "P15" means 15 psi).

- Refit boiler front panel (→ Fig. 5, page 14).

9.5 Measuring the carbon dioxide content

- Insert the sensor through the testing hole in the flue pipe into the centre of the gas flow.
- Record the flue gas readings.
  If the CO_2 content differs from the specified level by 0.5% (→ Sections 7.11 to 7.13, pages 47 to 48), adjust the burner as described in Sections 7.11 to 7.13, pages 47 to 48.

9.6 Determining how dirty the burner and heat exchanger are and cleaning them

The boiler can be dry or wet-cleaned.

A long and a short blade are available as accessories for dry cleaning. Cleaning equipment for wet cleaning is also available as an accessory.

Before cleaning the burner or heat exchanger, carry out the following tasks:

9.6.1 Determining the extent of contamination

- Remove the blanking plug from the manifold or resonator (natural gas rating 90 kW and 120 kW).
- Fit gas pressure testing nipple.
- Connect differential pressure tester to burner pressure testing nipple and and a pressure testing point on the flue socket (→ Fig. 57)

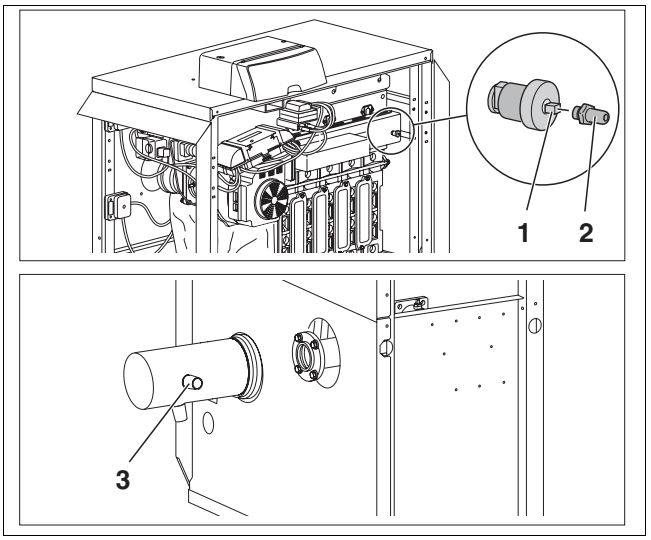


Fig. 57 Determining the extent of contamination

1 Blanking plug
2 Pressure testing nipple.
3 Testing point on boiler flue socket

Switching on the heating system on the BC10

Follow the instruction manuals for the BC10 and RC35.

If the boiler is not being used with an RC35 programming unit, it can be commissioned using a PC running the Logamatic Eco-Soft 400/EMS software and a Service Key.

Please contact Buderus for more detailed information.

If the boiler is intended to be used with the Logamatic 4000 control system, the following operations must be carried out:

- Switch off the Logamatic 4000 control system.
- Install the RC35 programming unit or the service key.
- Set the ON/OFF switch on the basic control unit to position ”1”.

This turns on the entire heating system. The status display on the basic control unit lights up and shows the current boiler water temperature in °F.

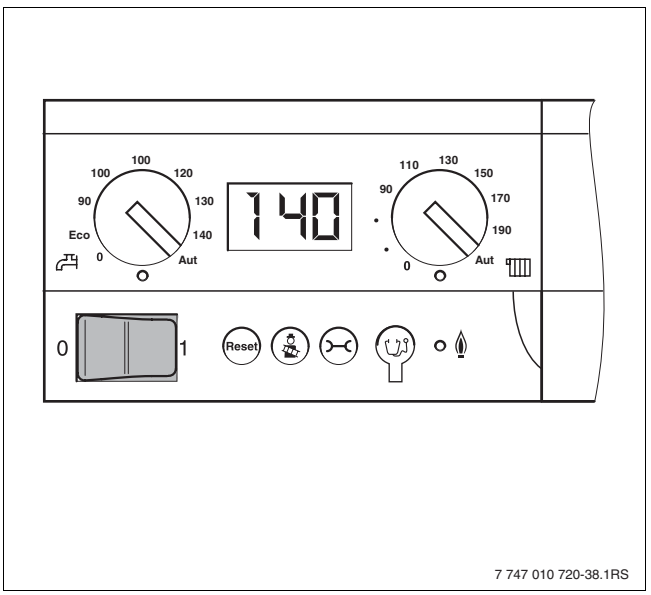


Fig. 58 Switching on the basic control unit

Conducting a flue gas test

The (🔧) button is used by the heating engineer for the flue gas test.

The control system runs the heating at a raised flow temperature for 30 minutes. During the flue gas test, the decimal point on the status display lights up.

- Press and hold the (🔧) button until the decimal point on the status display lights up (at least 2 seconds).
- Conduct the flue gas test.
- Cancel the flue gas test and press the (🔧) button again.

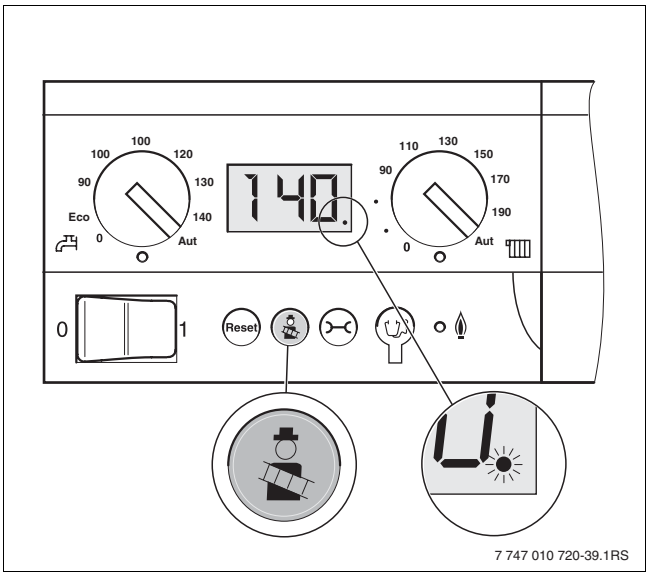
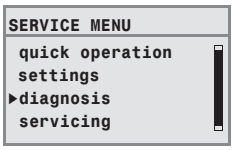


Fig. 59 Starting the flue gas test

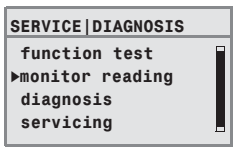
Opening the Service menu on the RC35

A PC running the Buderus Logamatic ECO-Soft 4000/EMS software together with a service key can also be used as a monitoring device. Please contact Buderus for more detailed information.

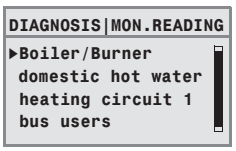
- Simultaneously press the Menu/OK + Info + ⮌ buttons to open the **SERVICE MENU**.
- Turn the rotary selector ◯ counter-clockwise to select **Diagnosis** (indicated by ►).



- Press the Menu/OK button to open the **SERVICE/DIAGNOSIS** menu.
- Turn the rotary selector ◯ counter-clockwise to select **Monitor reading** (indicated by ►).



- Press the Menu/OK button to open the **DIAGNOSIS/MONITOR READING** menu.
- Turn the rotary selector ◯ counter-clockwise to select **Boiler/Burner** (indicated by ►).



- Press the Menu OK button to open the **BOILER/BURNER** menu.
  The monitor readings are displayed as a list, i.e. turning the selector scrolls down to more readings.
- Press the button to increase the boiler output to a higher percentage.
- Read off output on RC35.
- Wait until output reaches 100%.
- Read off differential pressure from the tester and compare with the levels shown in Table 15.
  If the differential pressure measured is higher than the figure in the table, the heat exchanger must be cleaned using either the dry or wet method.
- Remove differential pressure tester from burner pressure testing nipple and pressure testing point on flue socket
- Seal the testing point on the flue pipe.
- Remove the pressure testing nipple from the burner and carefully refit, seal and tighten the blanking plug.

Boiler rating	Differential pressure in inches W.C. (Pa)
90-4	1.45 (360)
120-4	1.85 (460)
160-5	2.21 (550)
200-6	2.13 (530)
240-7	2.17 (540)
280-8	2.25 (560)

Tab. 16 Cleaning threshold – differential pressure

9.6.2 Cleaning the burner and heat exchanger

- Shut down the heating system (→Section 8, page 57).
- Turn off the main gas supply cock and secure to prevent it being inadvertently turned on again.
- Allow boiler to cool.
- Remove the trap from condensate pan drain outlet.
- Place a bucket under the condensate pan outlet.

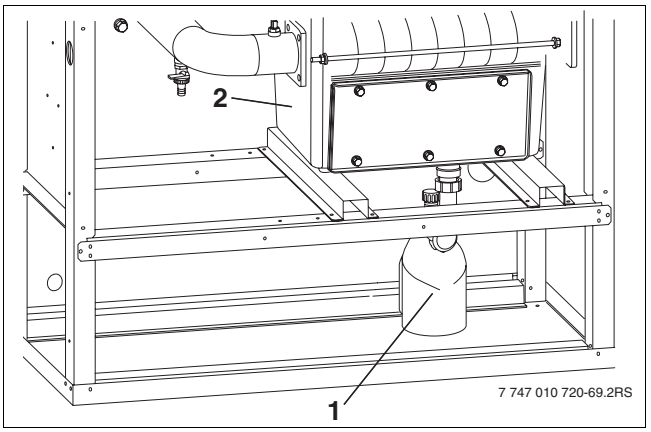


Fig. 60 Removing the trap

1 Trap
2 Condensate pan

Removing the burner

- Disconnect all electrical connectors on the burner.

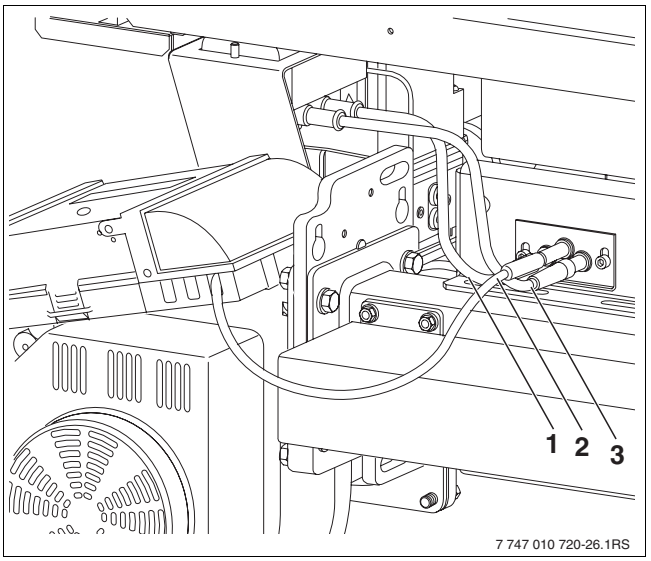


Fig. 61 Disconnecting electrical connectors on the burner

1 Ignition cable
2 Monitor lead
3 Ignition cable

- Unscrew the fixing nuts (3) from the top and bottom of the burner shield.
- Bolts (2) on the side of the fan: Undo the two rear hex-head bolts by two turns; remove the front two hex-head bolts.
- Carefully draw the burner forwards to remove it.

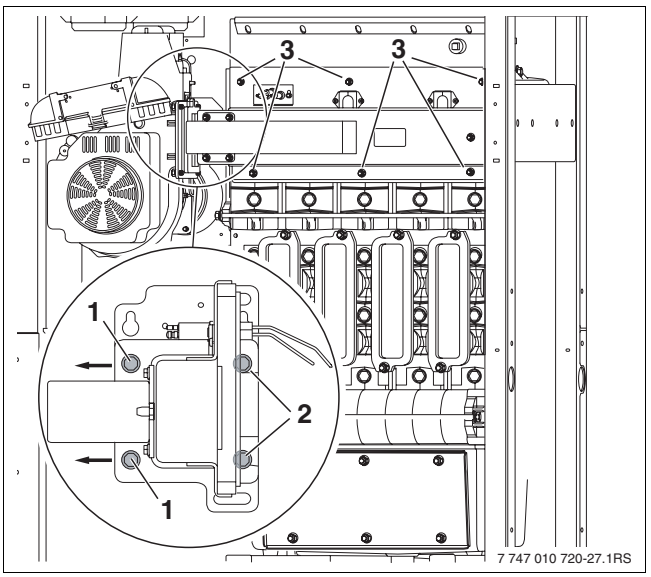


Fig. 62 Removing the burner from the heat exchanger

1 Front hex-head bolt
2 Rear hex-head bolt
3 Fixing nuts

- Unscrew fixing nuts from the cleaning covers at the top and bottom of the heat exchanger.
- Remove the cleaning covers.
- Unscrew the fixing nuts from the top and bottom of the condensate pan cover.
- Remove the cover.

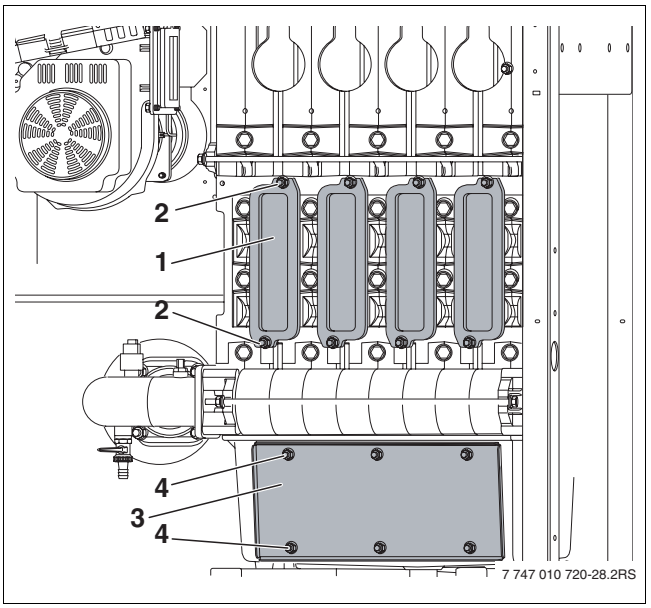


Fig. 63 Opening the cleaning covers

1 Cleaning cover on heat exchanger
2 Fixing nuts on cleaning cover
3 Condensate pan cover
4 Fixing nuts on the condensate pan cover

Dry cleaning the heat exchanger

Caution: Risk of injury from sharp edges on the cleaning blades.

- To avoid injury, wear gloves when cleaning the boiler using cleaning blades (available separately).

- Clean the heat exchanger baffles horizontally and diagonally, using the long cleaning blade.
- Clean the back of the gas baffles from below by reaching through the condensate tray with the short cleaning blade.

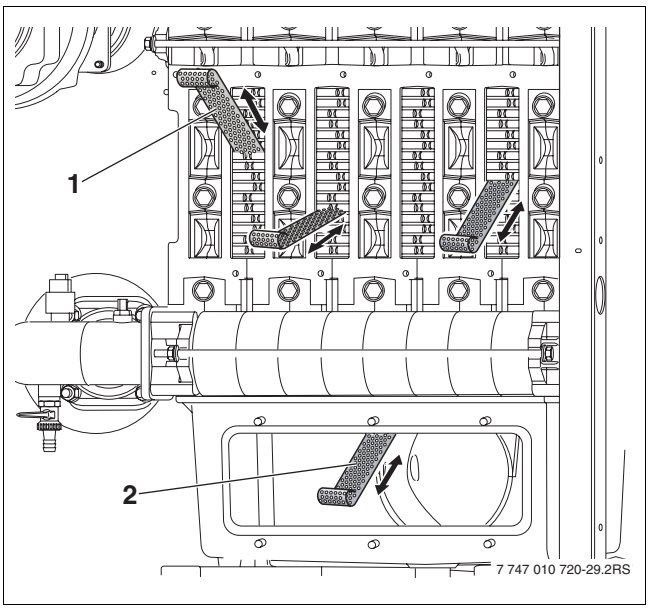


Fig. 64 Dry cleaning the heat exchanger

1 Long cleaning blade (available separately)
2 Short cleaning blade (available separately)

Wet cleaning the heat exchanger

For wet cleaning use a cleaning agent appropriate for the degree of soiling (soot or scale). The cleaning agent must be approved for use with aluminium.

Warning: Risk of fatal injury from escaping flue gases.

- When refitting the cleaning covers, check that the seals are not damaged and the cover is seated correctly.

- Screw the cleaning covers back in place.
- Clean the heat exchanger with water or an approved cleaning agent (see instructions provided by the manufacturer of the cleaning agent).

Protect electrical components from moisture.

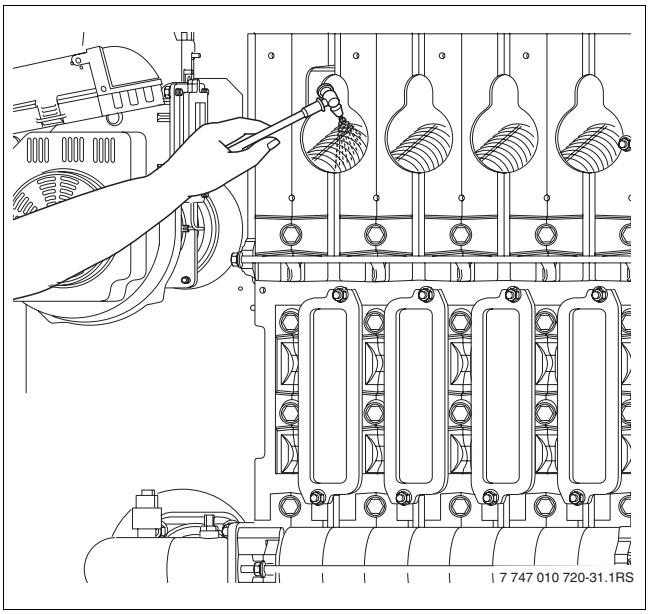


Fig. 65 Wet cleaning the heat exchanger

Operations required on the heat exchanger when wet or dry cleaning

- Use a hose to flush any dirt residues into the bucket.
- Clean the trap with water.

Warning: Risk of fatal injury from poisoning. If the trap is not filled with water, escaping flue gas can place lives at risk.

- Fill the trap with approx. 0.3 gallons of water.

- Refit the trap.

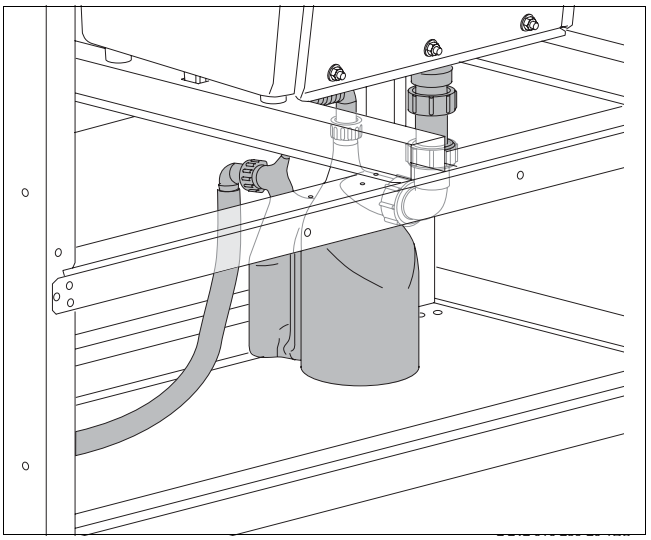


Fig. 66 Cleaning the trap

Cleaning the burner

- Blow-clean the burner rods and manifold from inside and outside with compressed air.

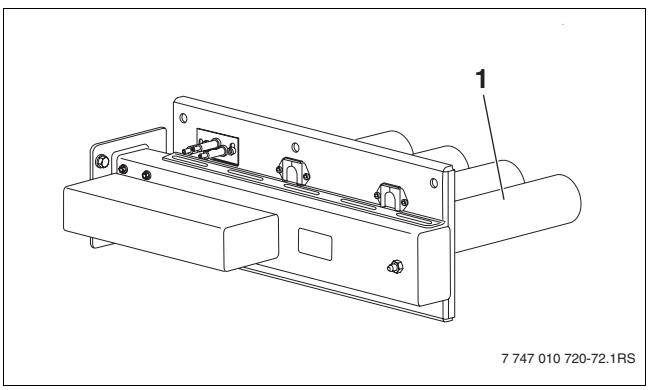


Fig. 67 Cleaning the burner

1 Burner rods

Servicing natural gas (gas type A) burner electrodes

Checking and adjusting electrode position

- Measure the distances between the electrodes as shown in Fig. 68 and adjust as necessary.
- Undo screws on burner rod.

A 5 mm Allen key can be used as a gauge for checking the gap.

- Adjust the burner rod so that the electrodes are in the position shown in Fig. 68. The electrodes must be positioned above the row of slots.
- Tighten the screws on the burner rod.

Length

- Check how far the electrode has burned down, i.e. the ignition electrode gap.

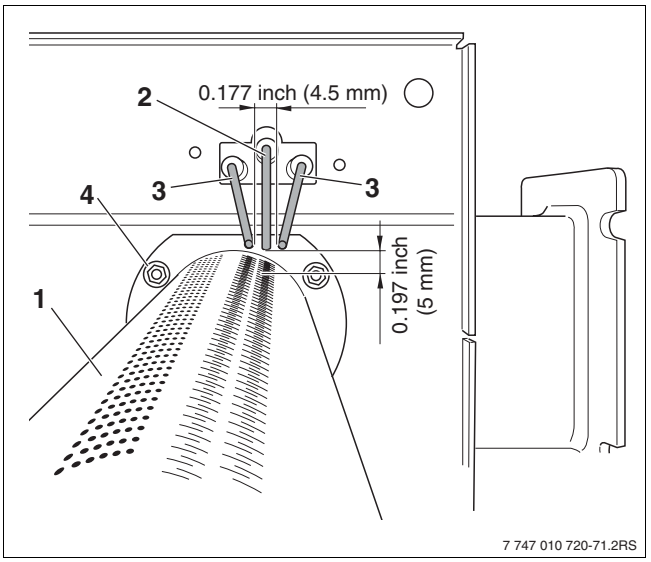


Fig. 68 Checking electrode position for natural gas

1 Burner rod
2 Ionization electrode
3 Ignition electrode
4 Bolts

Servicing propane (gas type E) burner electrodes

Checking and adjusting electrode position

- Measure the distances between the electrodes as shown in Fig. 70 and adjust as necessary.

Check that the burner rod surface near the electrodes is in perfect condition (no protruding fibers).If burner rod fibers come into contact with the electrodes, a fault may result causing the boiler to shutdown.This electrode setting also applies to propane (gas type E) burners converted to natural gas (gas type A).

- Undo the screws on the electrode bracket.
- Adjust the electrode bracket so that the electrodes are in the position shown in Fig. 70.

A 4 mm and a 6 mm Allen key can be used as gauges for checking the gaps.

- Tighten the screws on the electrode bracket.

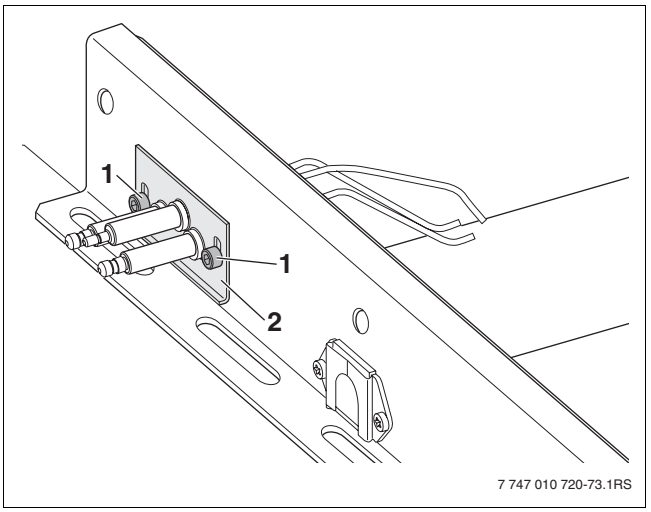


Fig. 69 Adjusting the electrode bracket

1 Screw
2 Electrode bracket

Length

- Check how far the electrode has burned down, i.e. the ignition electrode gap.

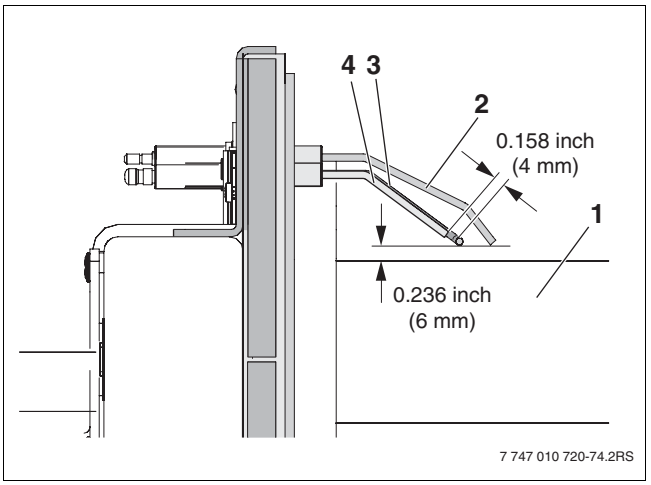


Fig. 70 Checking electrode position for propane

1 Burner rod
2 Ionization electrode
3 Ignition electrode
4 Ignition electrode

Refitting parts removed

- Refit all boiler parts that have been removed for servicing and maintenance purposes in the reverse order of removal.
- Check all gaskets for wear and damage.
- Replace gaskets if necessary.

There is an indicator window on the top of the flange to enable the presence of the gasket to be checked from the outside.

- Check the flat gasket in the flange and replace, if necessary, after completion of servicing and maintenance work.

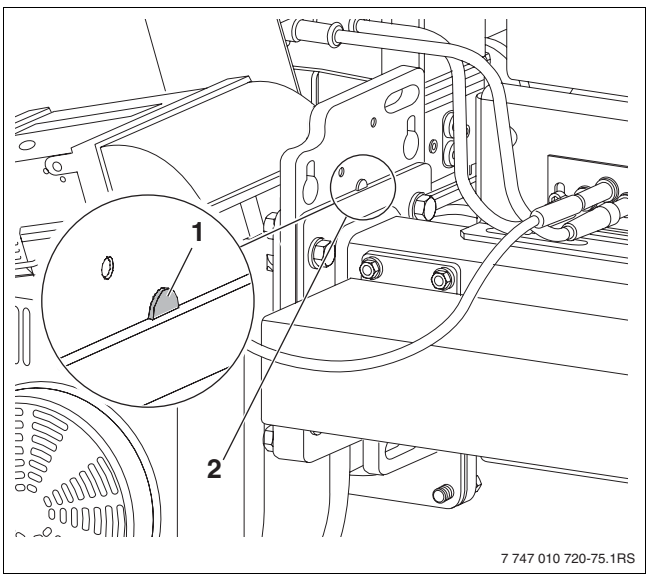


Fig. 71 Checking that the gasket is in place

1 Indicator window on flange
2 Flange

9.7 Checking gas valve for leaks

The purpose of this procedure is to check the solenoid valves in the gas valve for leaks. The test should only be carried out by trained and experienced service technicians when servicing or replacing the gas valve.

Danger: Risk of fatal injury from electric current.
- Disconnect boiler from the mains electricity supply.
- Unplug the power plug for the gas valve.

- Disconnect the boiler from the electrical power supply and unplug the power plug from the gas valve.
- Turn off the gas isolating valve A on the back of the boiler.
- Make sure that the manual isolating valve E on the testing apparatus (→Fig. 72, page 70) is turned off.
- To test the 1st solenoid valve (B), remove the blanking plug P from the gas valve and fit a testing nipple.
- Turn on the isolating valve A to pressurize the 1st solenoid valve (B).
- Hold the end of a testing tube with a 1/4 inch internal diameter 1/2 inch below the surface in a glass of water.
- Slowly turn on the manual isolating valve E on the testing apparatus.
- Once a stable flow of bubbles is escaping from the testing tube, the number of bubbles in the space of 10 seconds must be counted. The permissible number of bubbles is 6 (equates to 0.008 ft^3/h) for boiler sizes 90-4 to 240-7, and 7 (equates to 0.01 ft^3/h) for boiler size 280-8.
- Turn off the gas isolating valve A on the back of the boiler again.
- Remove the testing nipple from testing point P and carefully refit and seal the blanking plug using an appropriate sealant.
- To test the 2nd solenoid valve (C), remove the blanking plug from testing point 4 on the gas valve outlet flange and fit a testing nipple.
- Turn off the gas isolating valve D downstream of the gas valve.
- Remove the blanking plug from testing point 3 on the gas valve and fit a testing nipple. Connect the hand pump G, which is part of the testing apparatus, and connect a pressure tester H (→Fig. 72, page 70). Carefully build up a testing pressure of 7 inches W.C. using the hand pump H and then turn off the isolating valve F on the testing apparatus.

Caution: Risk of burner damage due to excessive pressure when testing for leaks.
The gas pressure regulator and other gas valve components can be damaged if the testing pressure is too high.
- On no account use a higher testing pressure than 7 inches W.C.

- Hold the end of a testing tube with a 1/4 inch internal diameter 1/2 inch below the surface in a glass of water.
- Slowly turn on the manual isolating valve E on the testing apparatus.
- Once a stable flow of bubbles is escaping from the testing tube, the number of bubbles in the space of 10 seconds must be counted. The permissible number of bubbles is 6 (equates to 0.008 ft^3/h) for boiler sizes 90-4 to 240-7, and 7 (equates to 0.01 ft^3/h) for boiler size 280-8.
- Remove the testing nipples from testing points 3 and 4 and carefully refit and seal the blanking plugs using an appropriate sealant.

After completing the test, proceed as follows.

- Ensure that the gas isolating valve D on the outlet side of the gas valve is closed.
- Reconnect the power plug to the gas valve and switch on the power supply to the boiler again.
- Turn on the gas isolating valve A on the back of the boiler again.
- Switch on the boiler and run the burner 1 start sequence.

Caution: Risk of system damage due to short-circuits.
- Cover the fan and other at-risk areas before searching for leaks.
- Do not spray leak detector onto cable conduits, plugs or electrical connecting leads. Do not allow it to drip onto them either.

- Check all joints on the gas valve for leaks using a suitable leak detecting agent. Turn on the gas isolating valve D on the outlet side of the gas valve again. Reset the boiler to normal operating mode.

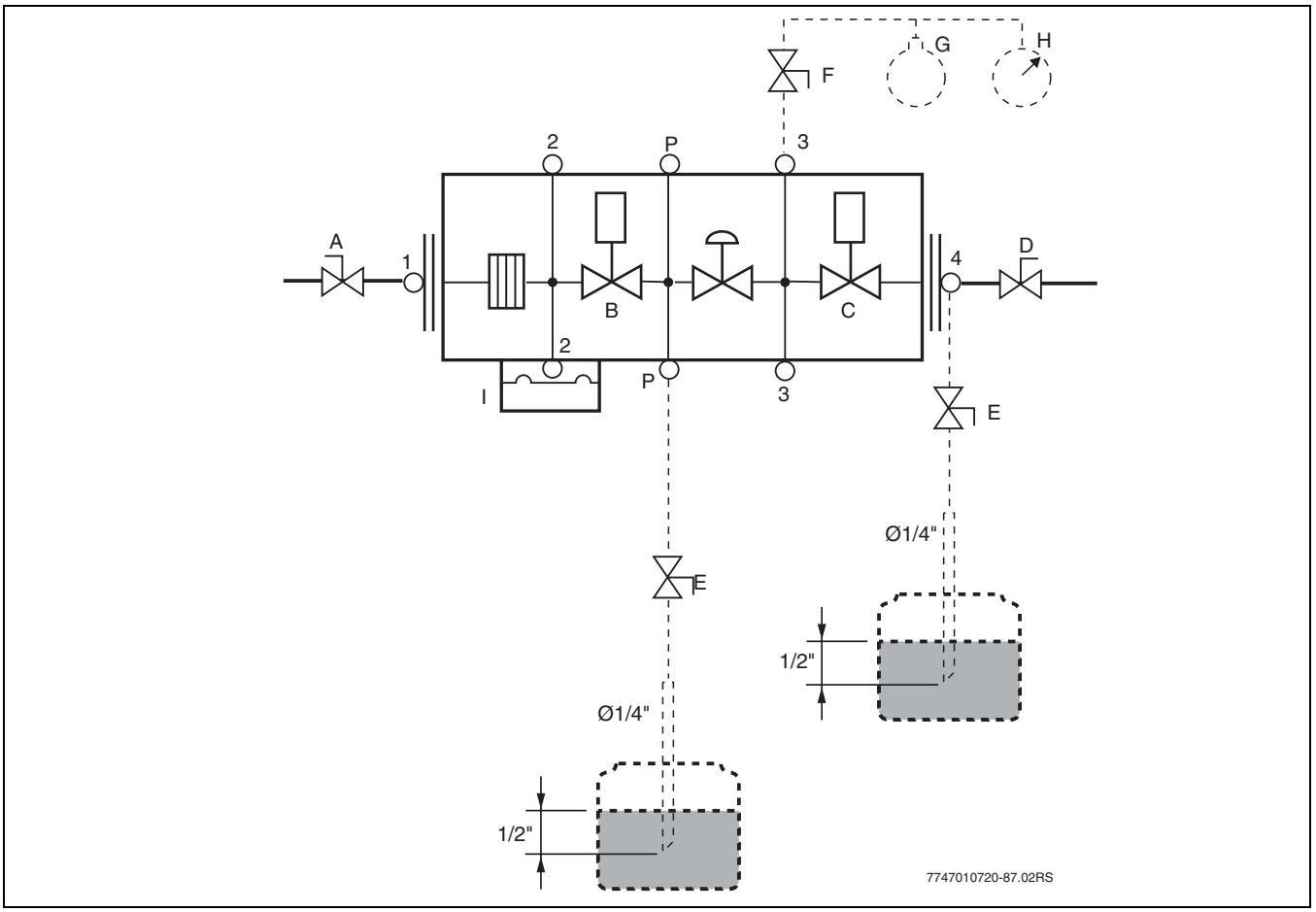


Fig. 72 Testing apparatus set-up for gas valve leak testing

A Main isolating valve on gas valve inlet side
B Solenoid valve 1
C Solenoid valve 2
D Gas isolating valve on gas valve outlet side
E Manual isolating valve (testing apparatus)
F Manual isolating valve (testing apparatus)
G Hand pump (testing apparatus)
H Pressure tester (testing apparatus)
I Low pressure switch (available separately)
1, 2, 3, 4, P Pressure testing points

9.8 Checking for leaks during normal operation

Caution: Risk of system damage due to short-circuits.

- Cover the fan and other at-risk areas before searching for leaks.
- Do not spray leak detector onto cable conduits, plugs or electrical connecting leads. Do not allow it to drip onto them either.

- Start up the boiler and check the flange for leaks at maximum output.
- Check all around the flange for leaks using a leak detecting agent.
- For details of other leakage checks, refer to Section 7.18, page 54.

9.9 Testing ionization current

To ensure trouble-free operation, the ionization current at medium and maximum output (when flame is lit) should be at least 3 mA.

The (flame) ionization current can be read off on the RC35 programming unit under "SERVICE MENU DIAGNOSIS/ MONITOR READING" (→ Section 7.16.1, page 53).

A PC running the Buderus Logamatic ECO-Soft 4000/EMS software together with a service key can also be used as a monitoring device. Please contact Buderus for more detailed information.

9.10 Concluding servicing/maintenace

9.10.1 Removing instruments

Follow the instruction manuals for the BC10 and RC35.

If you are not using an RC35 programming unit for the boiler, please note the following when concluding the servicing/maintenance procedure:

- Remove the RC35 programming unit.
- If a Logamatic 4000 control system is connected to the boiler, it can be switched on after the RC35 programming unit has been removed.

9.10.2 Fitting outer casing components

- Refit outer casing panels (→ Fig. 53, page 55).

9.10.3 Confirming servicing/maintenance

- Sign the servicing and maintenance log in this manual (→ Section 9.11, page 72).

9.11 Servicing and maintenance logs

- Initial and date the servicing operations completed.

The inspection and servicing logs can also be used as copy masters.

	Service work	Page	Maximum output	Medium output	Maximum output	Medium output
1.	Check general condition of heating system (visual inspection and function check)	-	☐		☐	
2.	Check the gas and water-carrying components of the system for:					
	internal leaks		☐		☐	
	visible signs of corrosion	-	☐		☐	
	signs of ageing	-	☐		☐	
3.	Check concentration of additives in heating water (see additive manufacturer's documentation and water quality log)		Concentration____ %		Concentration____ %	
4.	Check heating system operating pressure	60	☐		☐	
5.	Check air inlet/outlet vents and flue pipe connection	43	☐		☐	
6.	Record readings taken:	48				
	Flue pressure		____in W.C.	____in W.C.	____in W.C.	____in W.C.
	Aggregate flue gas temperature t_A		_____ °F	_____ °F	_____ °F	_____ °F
	Carbon dioxide content (CO_2)or oxygen content (O_2)		_____ %	_____ %	_____ %	_____ %
	Determine extent of contamination: Clean burner and/or heat exchanger as needed		☐	☐	☐	☐
	Carbon monoxide content (CO), without air		_____ ppm	_____ ppm	_____ ppm	_____ ppm
7.	Carry out function checks:	53				
	Check ionization current		_____ mA	_____ mA	_____ mA	_____ mA
8.	Checking for leaks during operation	54	☐		☐	
9.	Check that the programming unit settings are as required (see programming unit documentation)	–	☐		☐	
10.	Final check of servicing work	–	☐		☐	
	Confirmation of properly completed servicing Company stamp/Date/Signature					

	Maximum output	Medium output	Maximum output	Medium output	Maximum output	Medium output	Maximum output	Medium output
1.	☐		☐		☐		☐	
2.								
	☐		☐		☐		☐	
	☐		☐		☐		☐	
	☐		☐		☐		☐	
3.	_____%		_____%		_____%		_____%	
4.	☐		☐		☐		☐	
5.	☐		☐		☐		☐	
6.								
	____in W.C.	____in W.C.	____in W.C.	____in W.C.	____in W.C.	____in W.C.	____in W.C.	____ in W.C.
	____°F	____°F	____°F	____°F	____°F	____°F	____°F	____°F
	____%	____%	____%	____%	____%	____%	____%	____%
	☐	☐	☐	☐	☐	☐	☐	☐
	_____ ppm	_____ ppm	_____ ppm	_____ ppm	_____ ppm	_____ ppm	_____ ppm	_____ ppm
7.								
	_____mA	_____mA	_____mA	_____mA	_____mA	_____mA	_____mA	_____mA
8.	☐		☐		☐		☐	
9.	☐		☐		☐		☐	
10.	☐		☐		☐		☐	

If any condition requiring maintenance work is identified in the course of servicing, that work must be carried out as required.

10 Troubleshooting

10.1 Identifying operating modes and resetting faults

In the event of a fault, the fault code will flash on the control unit display. The programming unit shows faults as messages in plain language.

A fault is present if the display flashes and indicates something other than the current boiler water temperature or a message related to normal operation.

Example: “6A” = Burner has failed to ignite

A overview of the operating, fault and service codes together with details of possible causes and remedies can be found in the → programmer documentation and Section 10.2, page 75 below.

- Press and hold down the “Reset” button for about 5 seconds to clear the fault.

The display shows “rE” while the reset is being carried out. A reset is only possible if a flashing fault indication is shown.

If the display then reverts to a normal operation message, the fault has been eliminated. Should the fault recur, repeat the reset two or three times.

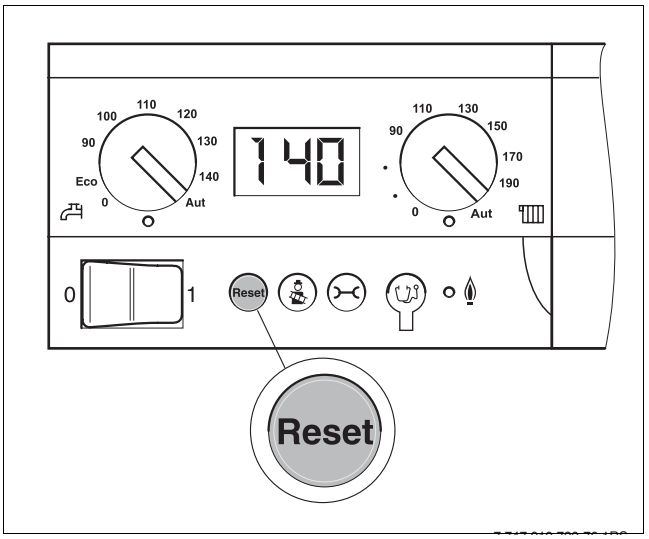


Fig. 73 Clearing a fault with the Reset button

Caution: Risk of system damage due to freezing.

The heating system can freeze up in cold weather if it has been switched off by a fault shutdown.

- Rectify the fault immediately and restart the heating system.
- If that is not possible, protect the heating system against freezing by draining the heating system and hot water pipes from the lowest point.

10.2 Operating and fault messages

10.2.1 Operating messages

Type [1)]	Display code	Event code	Cause	Description	Testing sequence/ Cause	Action
	2P	564	Boiler sensor temperature gradient too steep (>126°F/min; >70°K/min).	Heat exchanger cut-out due to excessive rate of temperature rise.	Little or no heat draw (e.g. thermostatic valves and mixer closed). Boiler flow rate too small. Circulation pump not working. Circulation pump fitted opposite way round to intended direction of flow. Deposits in water carrying parts of boiler (dirt from heating system, limescale).	Ensure heat draw. Fit adequately dimensed pumps. Check whether pump is being activated. Replace pump if necessary. Fit pump correct way round. Flush/clean water side of boiler heat exchanger with agents suitable and approved for aluminum.
BC	OA	-	Appliance is in optimized switching mode.	A new call for burner operation has occurred within the optimized switching period. Appliance is in anti-cycle phase. The standard optimized switching period is 10 min.	Check output setting on BC10 basic control unit. Check control setting on RC35 programming unit.	Adjust boiler output to required heat demand for building. Adjust control setting to system conditions.
BC	OH	-	The appliance is in standby mode; no heat demand present.	The boiler is on standby and there is no call for heat from the heating system.	-	-
BC	OY	-	The current boiler water temperature is higher than the set boiler water temperature.	The current boiler water temperature is higher than the set boiler water temperature. The boiler is shut down.	-	-
BC	OP	-	Waiting for fan to start up.	Start-up of the fan has to be detected before the sequence can be continued.	-	-

Tab. 17 Operating codes1) V = locking; B = inhibiting; BC = operating code

Type [1)]	Display code	Event code	Cause	Description	Testing sequence/ Cause	Action
BC	OE	-	The appliance is in standby mode, heat demand is present but too much heat is being delivered.	The current heat demand from the system is lower than that supplied by the minimum burner modulation setting.	-	-
BC	OU	-	Beginning of sequence for starting up burner.	-	-	-
BC	OC	-	Beginning of burner start-up.	-	-	-
BC	OL	-	Gas valve opening.	-	-	-
BC	OF	-	Lack of flow through boiler.	Temperature difference between supply and return > 13 °F, > 15 K, Temperature difference between supply and high limit temperature sensor > 13 °F, 15 K.	Check supply temp. with BC10, Check return temp. with RC35 or S-Key, Check resistance of high limit sensor.	Adjust setting of boiler pump. Check surface temp. of cast section with mounted high limit sensor with temp. meter. Check if cast section is blocked with dirt.

Tab. 17 Operating codes1) V = locking; B = inhibiting; BC = operating code

10.2.2 Fault messages

Type [1)]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
B	2E	207	The water pressure is < 8.7 psi (0.6 bar).	-	Is system pressure at least 14.5 psi (1 bar)?	Adjust operating pressure.
B	2U	565	Difference between supply and return too great. (>72 °F; >40 K)	Heat exchanger cut-out due to excessive temperature spread.	System configuration problems.	Check system configuration.
V	2U	575	Boiler sensor/ISTB sensor.	The maximum permissible temperature at the ISTB has been reached.	Check water flow.	Check water flow. Check non-return valve direction of flow. Check boiler sensor/STB.
V	3C	537	No speed signal.	The SAFe is not receiving a speed signal even though the fan is supposed to be running.	Check connecting leads between SAFe and fan for poor contact, breaks and damage. Check connectors on SAFe and fan.	Establish good electrical contact. Replace lead if necessary. If fan has power (but is not running) replace fan. If fan has no power, replace the SAFe
V	3C	538	Fan speed too slow.	The actual speed detected is slower than the set speed.	Dirt in fan. Fan defective.	Clean fan if necessary. Replace fan.
V	3C	540	Fan speed too fast.	The actual speed detected is faster than the set speed.	Check PWM signal/ SAFe connecting lead for poor contact, breaks and damage. Check connectors for damage.	Establish good electrical contact. Replace lead if necessary Replace fan.
V	4A	520	Boiler safety temperature limiter (STB).	The flow temperature has reached 200 °F/93 °C (cut-out temperature of boiler temperature limiter).	Fault can only occur as a result of faults in system configuration (e.g. only with 2-boiler systems).	Check system configuration. Check non-return valve is fitted correct way round.

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

Type [1)]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
V	4U	521	Temperature difference at twin boiler sensor too great.	Temperature difference between flow temperature sensors 1 and 2 too great (divergence of > 9 °F/2s; 5 K/2s).	Check connectors on boiler sensor and SAFe for dirt/damage. Check boiler sensor resistance against sensor characteristic/visually check temperature sensor. Check boiler sensor voltage levels against table (SAFe documentation).	Clean contacts/ replace connecting lead if necessary. If there are discrepancies in the sensor readings or the connector is defective, the temperature sensor must be replaced. Replace SAFe if there are discrepancies.
V	4U	522	Short circuit between boiler sensors 1 and 2.	A fault has been detected in temperature sensor test mode.	Check sensor lead. Check connector. Check sensor readings against sensor characteristic. Check temperature sensor voltage levels against table (SAFe documentation).	Replace if damaged. If dirty, clean or replace as necessary. If connector is loose, reconnect properly. Replace temperature sensor if there are discrepancies. Replace SAFe if there are discrepancies.
V	4Y	523	Circuit break on flow temperature sensor.	Temperature at flow temperature sensor. < 23 °F (< -5 °C)	Check sensor lead. Check connector. Check sensor readings against sensor characteristic. Check temperature sensor voltage levels against table (SAFe documentation).	Replace if damaged. If dirty, clean or replace as necessary. If connector is loose, reconnect properly. Replace temperature sensor if there are discrepancies. Replace SAFe if there are discrepancies.

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

Type [1]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
V	4U	524	Flow temperature sensor short circuit.	Temperature at flow temperature sensor > 266 °F (> 130 °C)	Check sensor lead. Check connector. Check sensor readings against sensor characteristic. Check temperature sensor voltage levels against table (SAFe documentation).	Replace if damaged. If dirty, clean or replace as necessary. If connector is loose, reconnect properly. Replace temperature sensor if there are discrepancies. Replace SAFe if there are discrepancies.
V	4A	575	ISTB response.	The boiler flow temperature has reached the maximum limit.	High temperature safety cut-out has tripped.	Check gas valve.
B	5L	542	Incomplete communication with SAFe.	The MC10 registers this fault if not all required data is supplied by the SAFe.	Check wiring connections between SAFe and MC10.	If connections OK, replace SAFe

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

Type [1]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
B	5L	543	No communication with SAFe.	The MC10 is not receiving any data from the SAFe.	Check whether the connecting leads (bus lead and power lead) between the SAFe and the MC10 are properly connected. On the MC10, check whether 120 V is present at the "Netz SAFe" terminals. Check whether the connecting leads (bus lead and power lead) between SAFe and MC10 are damaged. Check whether the green indicator lamp on the SAFe is lit. Disconnect the bus lead and check whether the boiler goes into emergency mode (runs up to boiler temperature of approx. 140° (60°)). Check whether the SAFe or the MC10 is defective by replacing them.	If connector is loose, reconnect properly. If 120 V is not present, the MC10 is defective and must be replaced. Replace connecting lead. If the lamp is not lit, the SAFe is probably defective and should be replaced. If the boiler does not start up, the SAFe is defective and must be replaced. Replace SAFe/ MC10.
B	6L	515	Loss of ionization signal when boiler is running.	Ionization signal is lost when the burner is in operation.	-	None; the SAFe will initiate a restart.
B	6L	514	Flame failure during the flame stabilization period.	No flame signal was detected within the flame stabilization period.	-	None; the SAFe will initiate a restart.

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

Type [1)]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
V	6C	576	Ionization current > 0.9 µA during pre-ventilation.	No flame signal was detected within the preventi-lation phase.	Check ionization electrode. Make sure that metal fibers of propane burner are not in contact with with electrodes. Check function of gas valve.	Check ionization electrode gap. Replace ionization electrode. Replace gas valve.

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

Type [1]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
B	6A	577	No flame detected within the safety period.	Ionization current < 1.1 µA during safety period.	Gas supply/dynamic pressure too low.	If pressure too low, inform gas company.
					Gas pressure regulator not set to required gas flow rate.	Fit gas pressure regulator adjusted to required gas flow rate; inform gas company if necessary.
					Cross-sectional area of gas pipe insufficient (min. cross-sectional area of gas supply pipe).	Fit adequately dimensioned gas piping.
					Air in gas pipe.	Purging the gas pipe.
					Flue back-pressure too high due to unfavourable configuration (too many bends, cross-section too small, too long, horizontal runs too long).	Fit properly dimensioned and configured flue system.
					Ignition/ionization electrode dirty.	Clean/replace ignition/ionization electrode.
					Check connecting lead between SAFe and ionization electrode for poor contact, breaks and damage.	Establish good electrical contact. Replace lead if necessary.
					Check electrode gaps and ignition/ ionization electrode for damage.	Align burner rod/ electrode. Replace defective electrode.
					Check connecting lead between ignition transformer and ignition electrode for poor contact (at electrode and transformer), breaks and damage.	Establish good electrical contact. Replace lead if necessary.

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

Type [1)]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
B	6A	577	No flame detected within the safety period.	Ionization current < 1.1 µA during safety period.	SAFe burner control unit defective. Ignition transformer defective (delayed or non-existent spark, "violent" start-up).	Replace SAFe. Replace ignition transformer.
V	6L	561	5 power-up sequences (power supply disconnection during burner start-up).	The burner control unit has switched off 5 times during the burner start-up sequence.	Check the 120V power supply to the control unit.	Reset burner control unit. Rectify power supply problem.
B	7A	550	Voltage too low.	The power supply voltage is too low.	The power supply voltage must not drop below 102V.	Ensure adequate power supply voltage.
B	7A	551	Power failure.	There has been a brief loss of power.	Check power supply lead for loose contacts. Check wiring and proper contact of power plug on MC10/SAFe.	Rectify any contact problems.

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

Type [1)]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
B	8L	579	No gas pressure.	There is no gas pressure. (→Section 10.3, page 90 ff.)	Check that the gas cock is turned on.	Turn on gas cock if necessary.
					Check that gas pressure is present.	Measure gas pressure.
					Check setting of low pressure switch (available separately).	Correct low pressure switch (available separately) settings.
					Check continuity on SAFe pressure switch, air supply pressure switch, flue gas pressure switch and high gas pressure switch (available separately)	If there is no continuity on SAFe pressure switch: – Check whether manual gas cock before Venturi is open. – Check connector on gas valve is properly seated. – Replace pressure switch.
						If no continuity on pressure/air supply pressure/flue gas pressure/high gas pressure switch: Replace pressure switch concerned.
					If continuity OK on SAFe, air supply pressure, flue gas pressure and high gas pressure switch	Replace low gas pressure switch and wiring.

Tab. 18 Fault messages
1) V = locking; B = inhibiting; BC = operating code

Type [1]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
V	8Y	590	Pressure switch in safety assembly has tripped.	Break in pressure switch safety assembly during burner operation.	Check whether low gas pressure switch (available separately) is breaking circuit during operation. Check if the air supply switch or flue gas pressure switch opens while the boiler is operating. Check whether SAFe or high gas pressure switch (available separately) is breaking circuit during operation Section 10.3, page 87 ff	Measure the gas pressure at 100% boiler modulation. Check low gas pressure switch (available separately) setting. Check flue/air supply pipe for blockages. Replace gas valve
V	8Y	591	Error checking safety assembly.	SAFe pressure switch has not tripped.	Check whether gas supply pressure is > 3 inches w.c. Check setting of SAFe pressure switch. Check connector on gas valve is properly seated.	Ensure gas supply pressure is > 3 inches w.c. Adjust setting of SAFe pressure switch to 3 inches w.c. Insert connector properly. Replace SAFe pressure switch and wiring. Replace SAFe.
V	9Y	500 501 502 503	Internal SAFe relay fault.	Internal electronic fault on SAFe.	Press Reset button and wait to see if fault is eliminated.	If fault recurs after reset, SAFe must be replaced.

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

Type [1)]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
V	CY	566	Return temperature < 23 °F (< -5 °C) (circuit break)	Control unit is receiving implausible signals from return sensor.	Check connecting lead between SAFe and return sensor. Check electrical connection of connecting lead to SAFe. Check resistance levels of temperature sensor against table. Check voltage at temperature sensor terminals on SAFe against table.	Replace connecting lead if necessary. Rectify any contact problems. Replace temperature sensor if necessary. If temperature sensor resistances are correct but voltages incorrect, replace SAFe.
V	CY	567	Return temperature > 266 °F (> 130 °C) (short circuit)	Control unit is receiving implausible signals from return sensor.	Check connecting lead between SAFe and return sensor. Check electrical connection of connecting lead to SAFe. Check resistance levels of temperature sensor against table. Check voltage at temperature sensor terminals on SAFe against table.	Replace connecting lead if necessary. Rectify any contact problems. Replace temperature sensor if necessary. If temperature sensor resistances are correct but voltages incorrect, replace SAFe.
V	CO	568	Water pressure sensor fault (break in cable).	Water pressure sensor circuit break (voltage > 3.5 V)	Check connection between SAFe and water pressure sensor for poor contact, breaks and damage. Check water pressure sensor.	Establish good electrical contact. Replace lead if necessary. Replace water pressure sensor.
V	CO	569	Water pressure sensor fault (short circuit).	Water pressure sensor short circuit (voltage < 0.5 V).	Check connecting lead to water pressure sensor. Check water pressure sensor.	Rectify any short circuits. Replace water pressure sensor.

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

Type [1)]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
V	CY	573	Flow temperature < 23 °F (< -5 °C) (circuit break)	Control unit is receiving implausible signals from flow temperature sensor.	Check connecting lead between SAFe and return sensor. Check electrical connection of connecting lead to SAFe. Check resistance levels of temperature sensor against table Check voltage at temperature sensor terminals on SAFe against table	Replace connecting lead if necessary Rectify any contact problems Replace temperature sensor if necessary If temperature sensor resistances are correct but voltages incorrect, replace SAFe
V	CY	574	Flow temperature >266°F (>130°C) (short circuit)	Control unit is receiving implausible signals from flow temperature sensor.	Check connecting lead between SAFe and return sensor. Check electrical connection of connecting lead to SAFe. Check resistance levels of temperature sensor against table Check voltage at temperature sensor terminals on SAFe against table	Replace connecting lead if necessary Rectify any contact problems Replace temperature sensor if necessary If temperature sensor resistances are correct but voltages incorrect, replace SAFe
V	LP	570	Too many resets via the interface.	Too many resets have been received via the interface within a certain period. Important: this fault can only be reset by the button on the SAFe.	Faults have continually been simply reset and not rectified. There is a fault on the BC10 causing continual resets. There is a malfunction on the SAFe.	Identify and eliminate the cause of the problem causing the resets. Replace BC10. Replace SAFe.

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

Type [1]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
V	LL	571	Too many restarts despite resetting.	15 directlly consecutive restarts have taken place. In other words, the same problem was still present after resetting. Important: this fault can only be reset by the button on the SAFe.	Faults have continually been simply reset and not rectified.	Identify and eliminate the cause of the problem causing the resets.
V	EE	601	Flow temperature sensor reading.	Successive flow temperature readings are too widely divergent.	Check lead to boiler sensor. Check connector. Check sensor readings against table. Check temperature sensor voltage levels against table.	Replace if damaged. If dirty, clean or replace as necessary. If connector is loose, reconnect properly. Replace temperature sensor if there are discrepancies. Replace SAFe if there are discrepancies.
V	EE	612	Return sensor reading.	Successive return temperature readings are too widely divergent.	Check lead to boiler sensor. Check connector. Check sensor readings against table. Check temperature sensor voltage levels against table.	Replace if damaged. If dirty, clean or replace as necessary. If connector is loose, reconnect properly. Replace temperature sensor if there are discrepancies. Replace SAFe if there are discrepancies.

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

Type [1)]	Display code	Fault code	Cause	Description	Testing sequence/Cause	Action
V	EE	626	Electrode voltage incorrect.	Voltage to ionization electrode too low.	Check connecting lead between SAFe and electrode for breaks or damage.	Replace defective lead or rectify breaks.
					Check electrode gaps and electrode for damage.	Align burner rod/ electrode Replace defective electrode.
					Check power supply voltage at MC10 input (at least 102 V).	Ensure power supply voltage is correct.
					Check if voltage dips are occurring (e.g. when large electrical consumers are switched on)	Eliminate voltage dips.
						If all checks OK, replace SAFe.

Tab. 18 Fault messages

1) V = locking; B = inhibiting; BC = operating code

10.3 Troubleshooting safety sequence/ pressure switch

Description: there is no gas pressure present/a pressure switch in the safety sequence has tripped.

Fault 8L/579 inhibiting

Cause: no gas supply pressure/safety sequence pressure switch cut out.

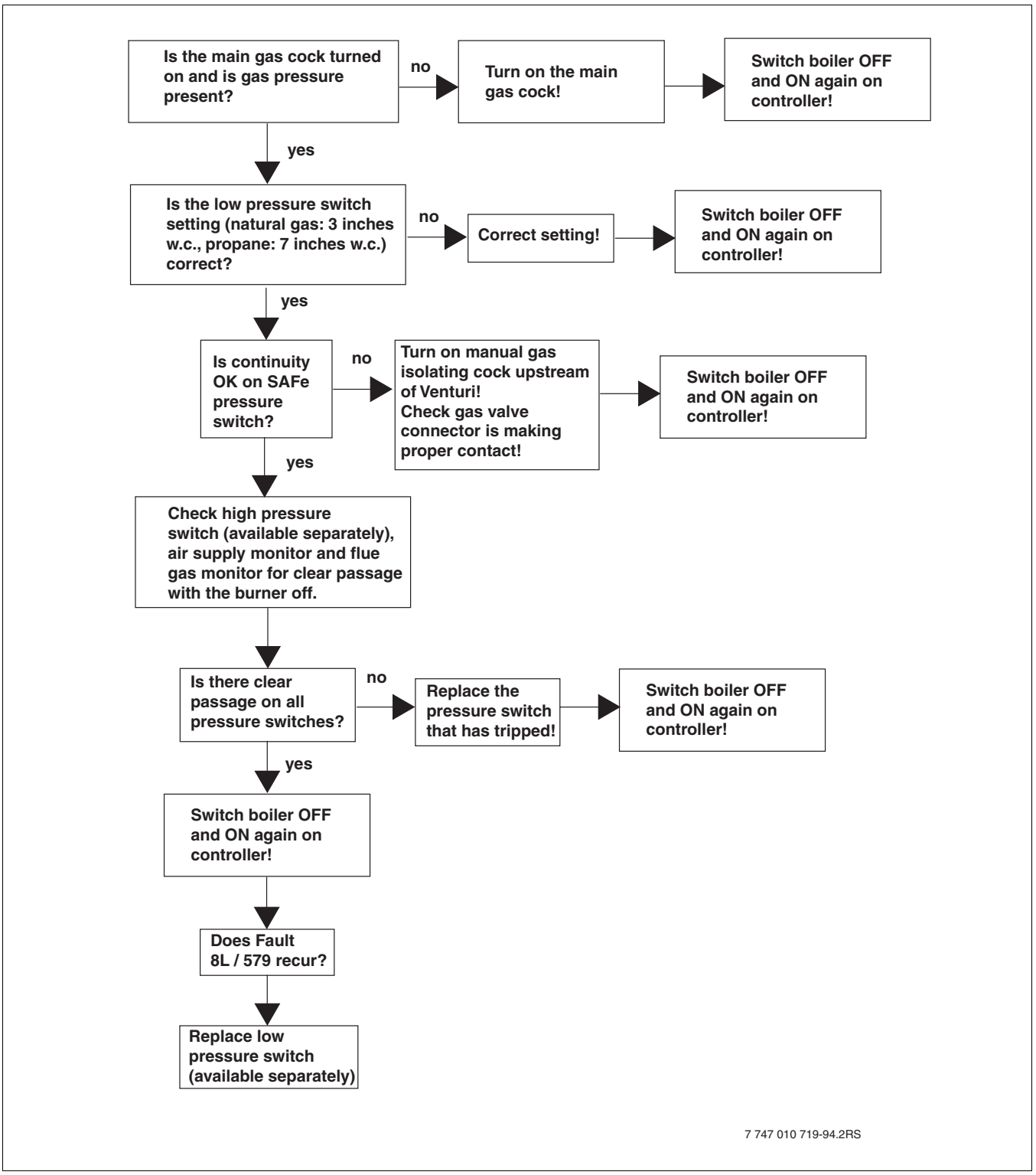


Fig. 74 Fault elimination sequence 8L/579

Fault 8Y/590 (locking)

Cause: pressure switch in safety sequence has tripped.

Description: cut-out in pressure switch safety sequence during burner operation.

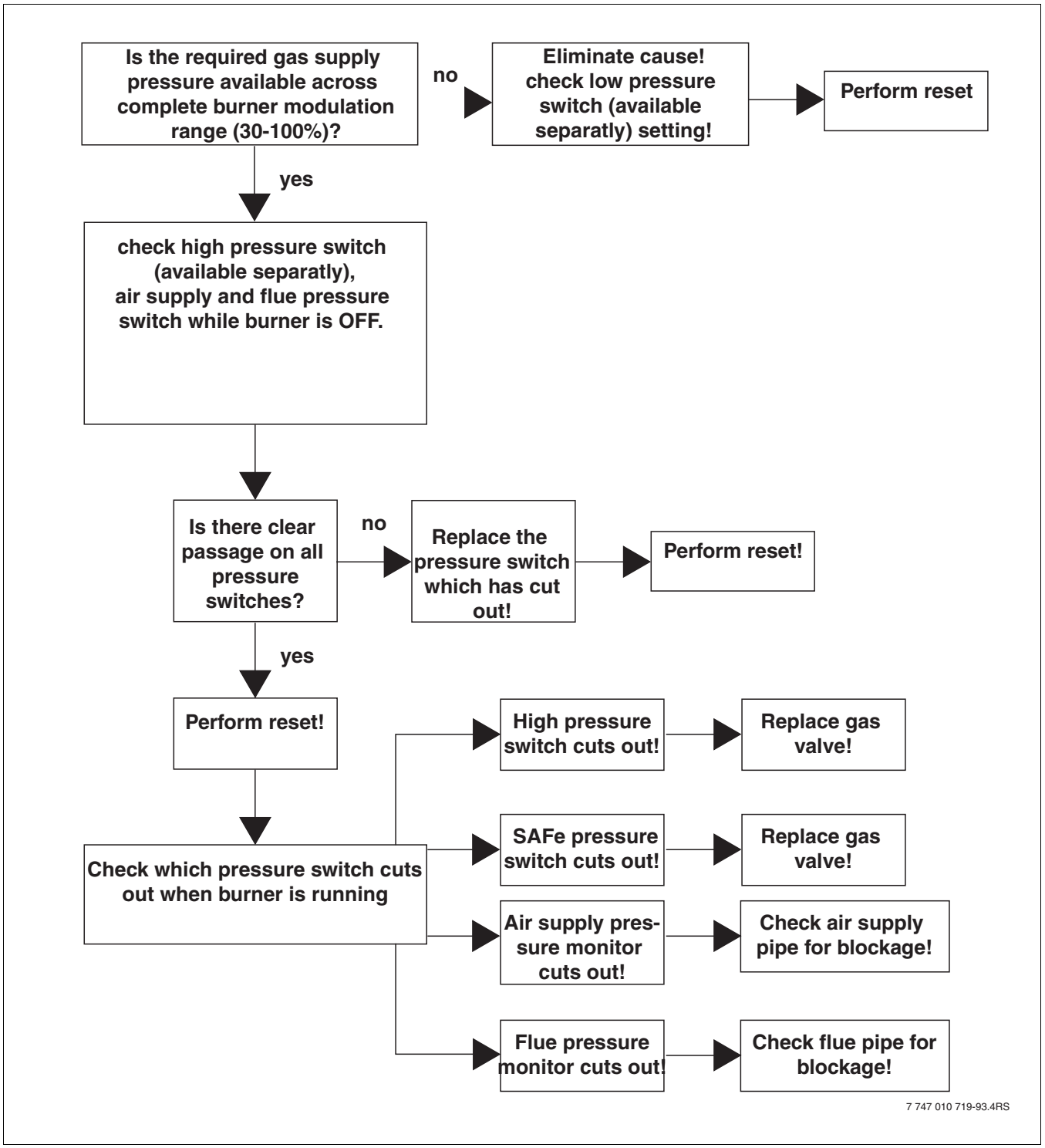


Fig. 75 Fault elimination sequence 8Y/590

Fault 8Y/591 (locking)
Cause: Error checking safety assembly.

Description: SAFe pressure switch has not responded during safety check.

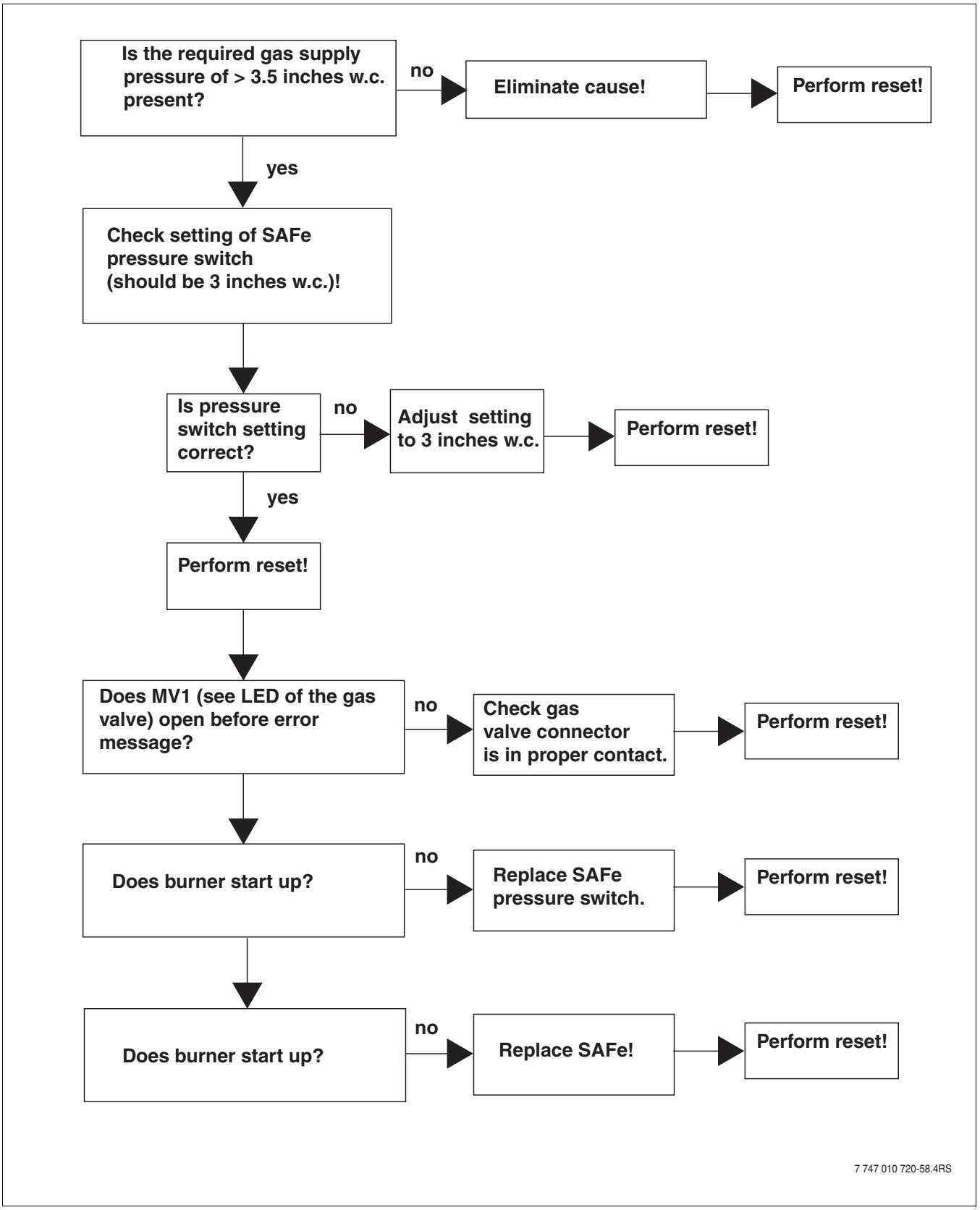


Fig. 76 Fault elimination sequence 8Y/591

11 Sensor characteristics

Danger: Risk of fatal injury from electric current.

- Isolate the heating system from the electrical power supply before taking any readings.

Always measure the temperatures being compared (room, flow, outside and flue gas temperatures) close to the sensor. The chracteristics represent average levels and are subject to tolerances. Measure resistance at cable ends.

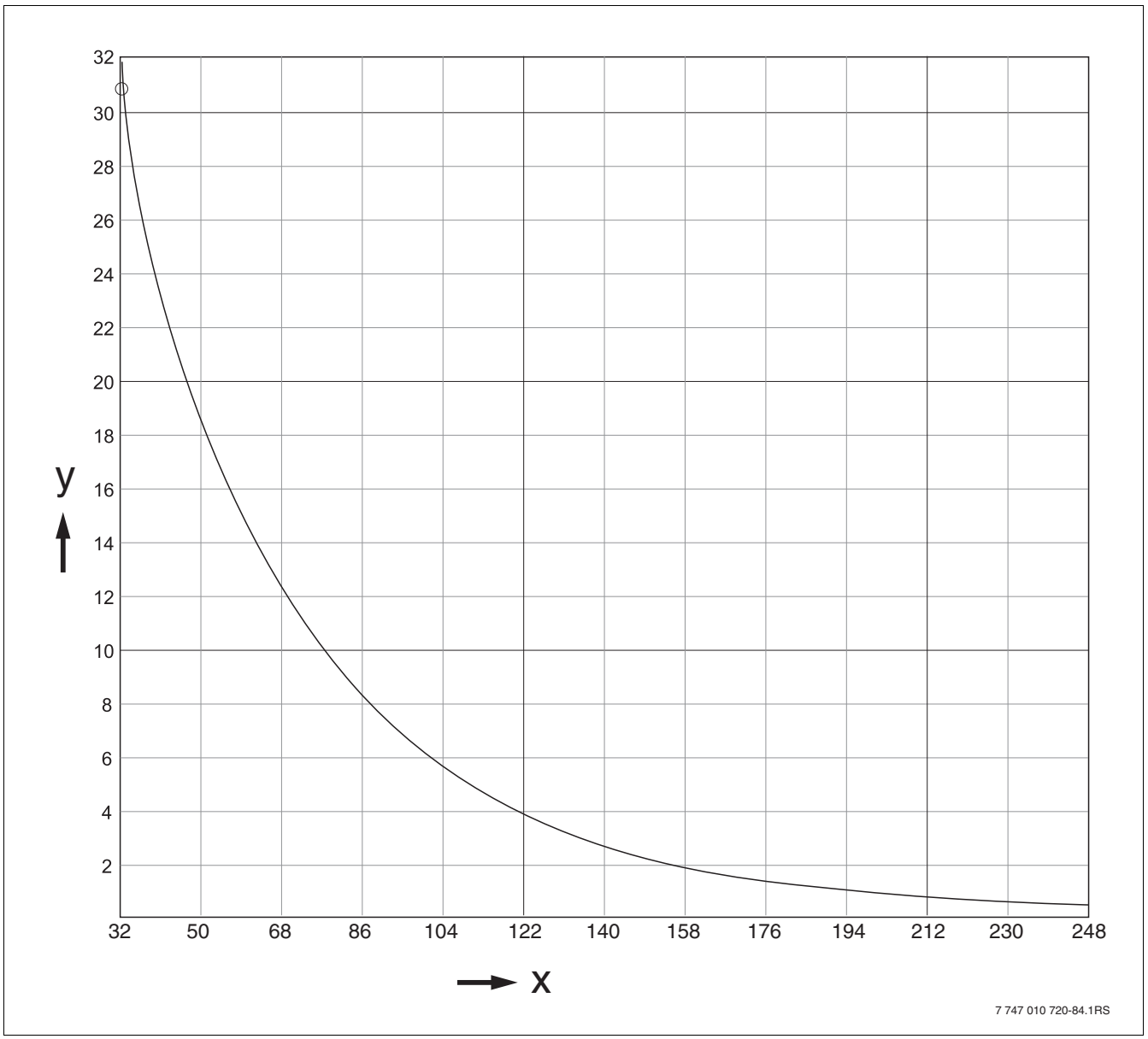


Fig. 77 Sensor characteristics: high limit temperature, return and supply sensors

x Temperature in °F
y Resistance in kΩ

Two identical "dual sensors" fitted in the sensor housing are used as high limit temperature sensors.

All temperature sensors on the GB312 have the same sensor characteristic.

12 Spare parts

The following replacement parts are available from BBT Thermotechnik.

Boiler heat exchanger (→ Fig. 78)

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
10	Boiler heat exchanger GB312 4Gld "US/CA"	7747016291	1	1	-	-	-	-
10	Boiler heat exchanger GB312 5Gld "US/CA"	7747016292	-	-	1-	-	-	-
10	Boiler heat exchanger GB312 6Gld "US/CA"	7747016293-	-	-	-	1	-	-
10	Boiler heat exchanger GB312 7Gld "US/CA"	7747016294	-	-	-	-	1	-
10	Boiler heat exchanger GB312 8Gld "US/CA"	7747016295	-	-	-	-	-	1
	Spare parts available for replacement heat exchanger							
20	Piping VK GB312-4Gld "US/CA"	7747016300	1	1	-	-	-	-
20	Piping VK GB312-5Gld "US/CA"	7747016301	-	-	1	-	-	-
20	Piping VK GB312-6Gld "US/CA"	7747016302	-	-	-	1	-	-
20	Piping VK GB312-7Gld "US/CA"	7747016303	-	-	-	-	1	-
20	Piping VK GB312-8Gld "US/CA"	7747016304	-	-	-	-	-	1
30	Screw set for boiler flow piping	63037175	1	1	1	1	1	1
40	Flat gasket D31/47x6 Shore 70EPDM with glass fabric tape D48/63x0.25 PTFE coated.	See below for gasket set for GB312 boiler heat exchanger						
45	O-ring 80x5 Shore 70EPDM	See below for gasket set for GB312 boiler heat exchanger						
47	Threaded studs	(x)	6	6	6	6	8	8
50	Blanking flange 110x110 GB312 "US/CA"	7747015946	3	3	4	5	6	7
60	Cleaning cover for heat exchanger GB312 V3	63046604	1	1	1	1	1	1
70	Sq cord 10x5 silicon self-adhesive	63038372	1	1	1	1	1	1
80	Condensate pan cover GB312-4Gld	63037299	1	1	-	-	-	-
81	Condensate pan cover GB312-5Gld	63037300	-	-	1	-	-	-
82	Condensate pan cover GB312-6/7/8Gld	63037301	-	-	-	1	1	1
91	Lip gasket DN160 for 4 and 5 sections	63037867	1	1	1	-	-	-
92	Lip gasket DN200 for 6, 7 and 8 sections	63037868	-	-	-	1	1	1
100	Spacer bolt M8x46	See below for assembly parts for expansion vessel G135 V2/GB312						
110	Hex nut EN 1661 M8 A3k serrated	See below for assembly parts for expansion vessel G135 V2/GB312						
115	Flow restrictor R3/4 - D11x63	7747006047	1	1	1	1	1	1
	Available spare parts that are not part of replacement heat exchanger.							
120	Piping RK GB312-2 1/2 "US/CA"	7747016311	1	1	1	1	1	1
130	Single sensor G1/4 45lg	63041677	1	1	1	1	1	1
140	Pressure transmitter type 505	63038366	1	1	1	1	1	1
150	Boiler fill/drain valve 1/2 with thread sealing washer	63005974	1	1	1	1	1	1
155	Reducer nipple Rp 3/4"xG1/4" (MS)	63038415	1	1	1	1	1	1
156	Boiler sensor G 1/4 75lg	63029641	1	1	1	1	1	1
161	B-kit GB312 "US/CA" 90-280kW	7747017656	1	1	1	1	1	1
	Available spare parts for B-kit GB312 "US/CA":							
170	Non-return valve GB312 "US"	7747016327	1	1	1	1	1	1
180	Gasket 124x73x1.7	7747016326	3	3	3	3	3	3
191	Pressure relief valve 3/4"Fx1"F 50PSI 90-280kW	7747017645	1	1	1	1	1	1
200	Temperature/pressure gauge WINTERS 1/2"M	7747016332	1	1	1	1	1	1
220	Immersion sleeve 3/4"M x 125	7747016330	1	1	1	1	1	1
230	Immersion sleeve 3/4"M x 160	7747016331	1	1	1	1	1	1
	Available accessories for B-kit GB312 "US/CA":							
210	Low water cut-off SAFGARD 3/4"M	7747016333	1	1	1	1	1	1
240	High temperature cut-off 3/4"M	7747016328	1	1	1	1	1	1
270	**Resonator D110x250 for GB312 pan assy. only for boiler ratings 120kW + 90kW**	63041096	1	1	-	-	-	-
	Components:							

Tab. 19 Boiler heat exchanger

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
	Resonator D=110x250 1 off	(x)	-	1	-	-	-	-
	(X) Hex-head bolt DIN6921 M8x12 8.8 A3k SV		-	2	-	-	-	-
280	Gasket D=40x2 SIL24 k	See below for gasket set for GB312 boiler heat exchanger						
290	Trap GB312/SB barrier height 145	63037864	1	1	1	1	1	1
300	**Trap with 145mm barrier height V2**	63043767	1	1	1	1	1	1
	Components:							
	Elbow 90 DN32		1	1	1	1	1	1
	Union nut PP gray 11/4		3	3	3	3	3	3
	Pipe Da32-110 long with flared end		1	1	1	1	1	1
	Seal D37.7x31.5x4		3	3	3	3	3	3
	Hose elbow with union nut 3/4"-20		2	2	2	2	2	2
	Seal 15x23.5x2.5		2	2	2	2	2	2
	Sealing washer 24x2		1	1	1	1	1	1
330	Hose DN4x2x500 silicon blue	7747016336	1	1	1	1	1	1
331	Hose DN5x1.5x800 Viton	7747016337	1	1	1	1	1	1
340	Appliance feet M10x51mm (set of 4)	5236440						
	Gasket set for boiler GB312	63037291						
	Components:							
	O-ring		2	2	2	2	2	2
	Flat gasket D31/47x6 Shore 70EPDM		8	8	8	8	8	8
	Glass fabric tape D48/63x0.25 PTFE coated		8	8	8	8	8	8
	Gasket D=40x2 SIL24		1	1	1	1	1	1

Tab. 19 Boiler heat exchanger

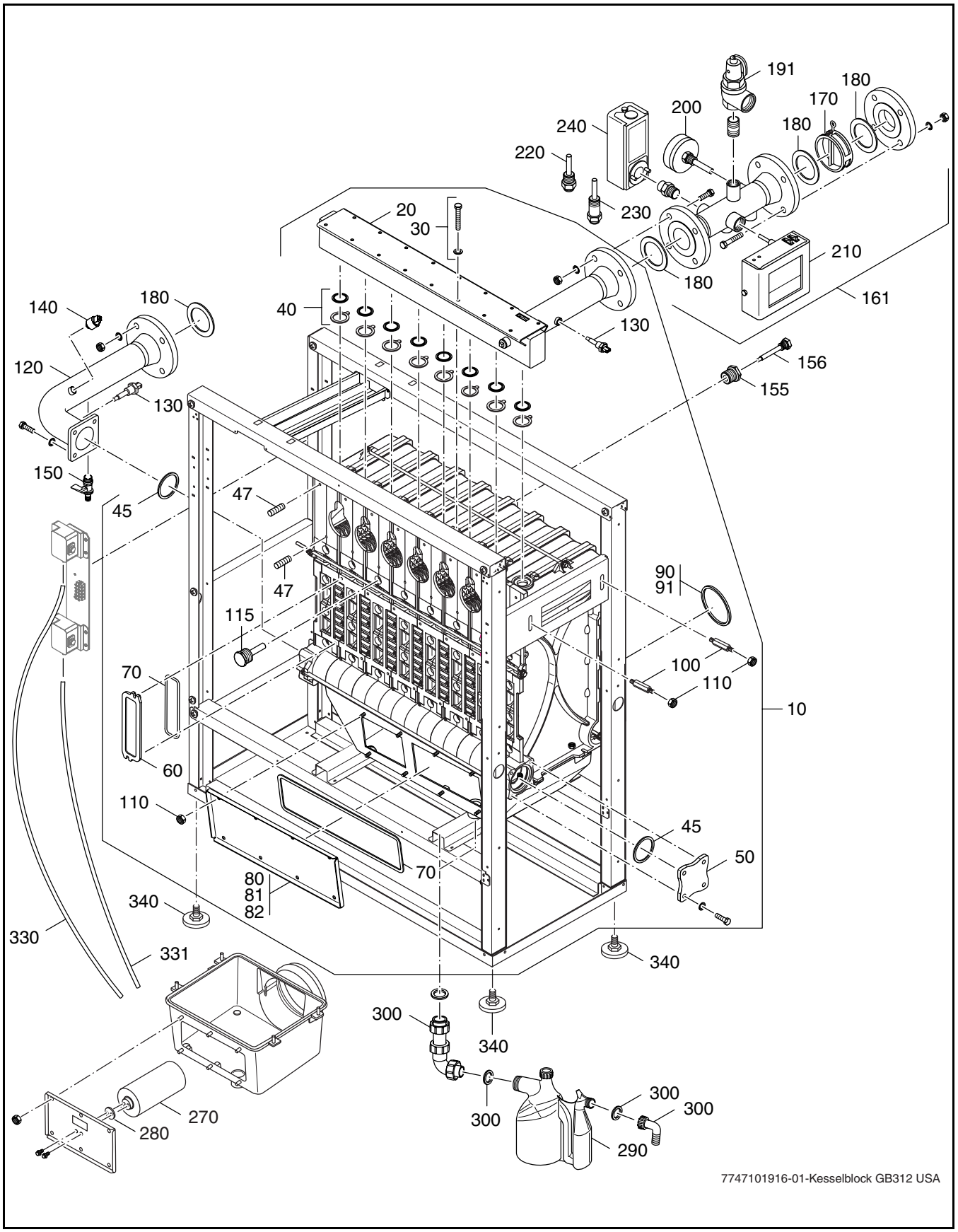


Fig. 78 Boiler heat exchanger

Boiler outer casing (→ Fig. 79)

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
10	Top rear panel GB312-90/120	63038942	1	1	-	-	-	-
10	Top rear panel GB312-160	63038943	-	-	1-	-	-	-
10	Top rear panel GB312-200	63038944	-	-	-	1	-	-
10	Top rear panel GB312-240	63038945	-	-	-	-	1	-
10	Top rear panel GB312-280	63038946	-	-	-	-	-	1
20	Bottom rear panel GB312-120 V2	7747011121	1	1	-	-	-	-
20	Bottom rear panel GB312-160 V2	7747011122	-	-	1	-	-	-
20	Bottom rear panel GB312-200 V2	7747011123	-	-	-	1	-	-
20	Bottom rear panel GB312-240 V2	7747011124	-	-	-	-	1	-
20	Bottom rear panel GB312-280 V2	7747011125	-	-	-	-	-	1
30	Top cover panel GB312 90/120	63038961	1	1	-	-	-	-
30	Top cover panel GB312 160/200	63038960	-	-	1	1	-	-
30	Top cover panel GB312 240/280	63038959	-	-	-	-	1	1
	Available spare part:							
35	Cover plate	7099258	1	1	1	1	1	1
40	Side panel GB312	63038949	1	1	1	1	1	1
50	Front panel GB312-90/120	63038952	1	1	-	-	-	-
50	Front panel GB312-160/200	63038951	-	-	1	1	-	-
50	Front panel GB312-240/280	63038950	-	-	-	-	1	1
60	Appliance insignia Logano plus GB312	63032873	1	1	1	1	1	1
70	Top cross member GB312	63039085	1	1	1	1	1	1
80	Top U-section member GB312 90/120	63039095	2	2	-	-	-	-
80	Top U-section member GB312 240/280	63039094	-	-	-	-	2	2
80	Top U-section member GB312 160/200	63039093	-	-	2	2	-	-
90	Frame reinforcing plate GB312	63039092	1	1	1	1	1	1
100	Air socket cover GB312	63038962	1	1	1	1	1	1
110	Fascia panel G244/GB312	63037441	1	1	1	1	1	1
120	Cable conduit GB312	63038445	1	1	1	1	1	1
130	Panhead screw ST3.9x40	(x)	1	1	1	1	1	1
140	Panhead screw ST3.9x9.5	(x)	21	21	21	21	21	21
150	Blind rivet 4x8 St/St	(x)	2	2	2	2	2	2
160	Cover panel US	7747018781	1	1	1	1	1	1

Tab. 20 Boiler outer casing

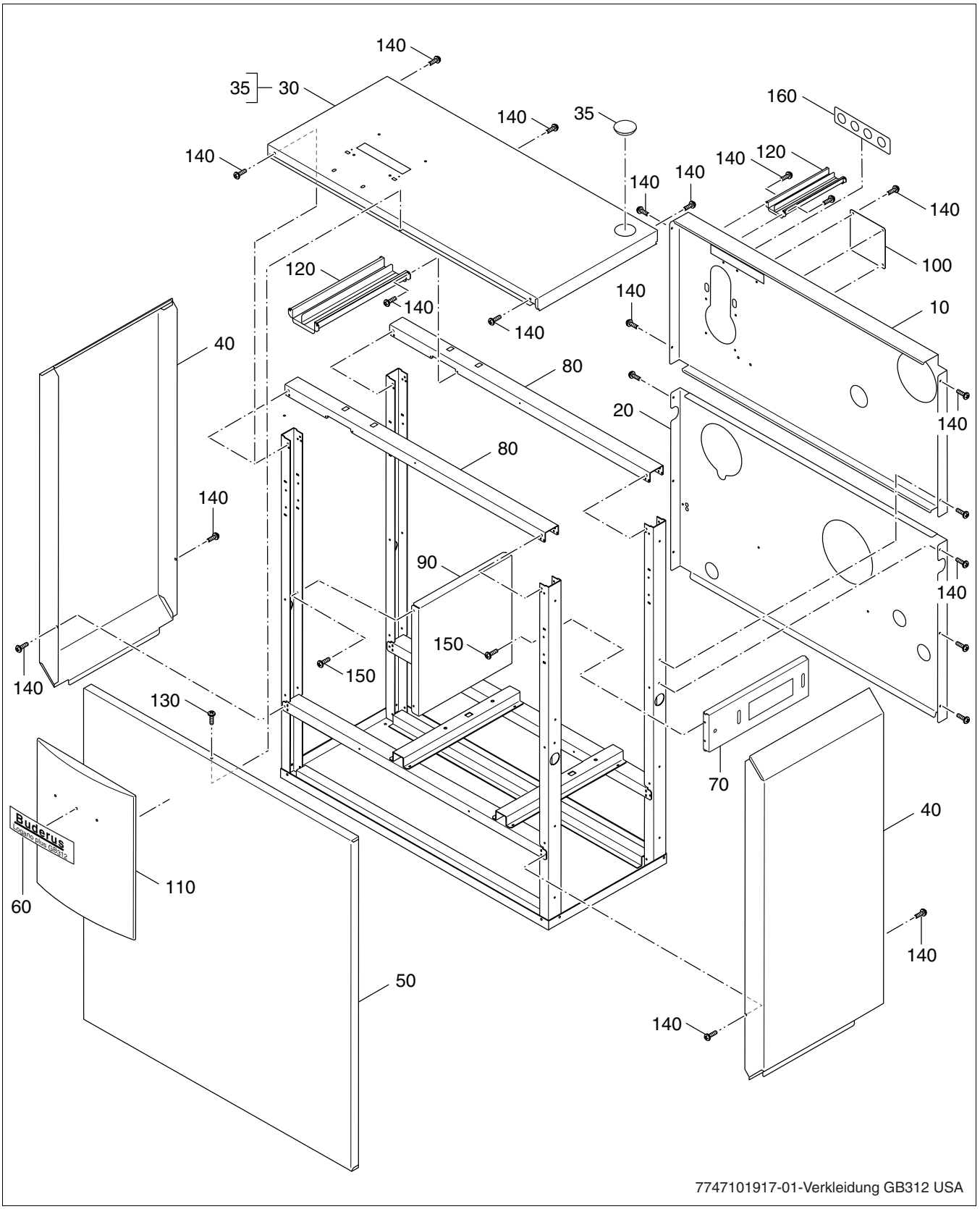


Fig. 79 Boiler outer casing

Heat insulation and programmer (→ Fig. 80)

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
10	Heat exchanger insulation GB312-90/120	63039100	1	1	-	-	-	-
10	Heat exchanger insulation GB312-160	63039099	-	-	1	-	-	-
10	Heat exchanger insulation GB312-200	63039098	-	-	-	1	-	-
10	Heat exchanger insulation GB312-240	63039097	-	-	-	-	1	-
10	Heat exchanger insulation GB312-280	63039096	-	-	-	-	-	1
20	Flow pipe insulation GB312	63039091	1	1	1	1	1	1
30	Bracket for insulation GB312-90/120	63038957	1	1	-	-	-	-
30	Bracket for insulation GB312-160	63038956	-	-	1	-	-	-
30	Bracket for insulation GB312-200	63038955	-	-	-	1	-	-
30	Bracket for insulation GB312-240	63038954	-	-	-	-	1	-
30	Bracket for insulation GB312-280	63038953	-	-	-	-	-	1
40	Spring clip for insulation	476378	6	6	6	6	6	6
50	Spring clip	63043772	2	2	2	2	2	2
60	Front insulation GB312-120	7747011126	1	1	-	-	-	-
60	Front insulation GB312-160	7747011127	-	-	1	-	-	-
60	Front insulation GB312-200	7747011128	-	-	-	1	-	-
60	Front insulation GB312-240	7747011129	-	-	-	-	1	-
60	Front insulation GB312-280	7747011130	-	-	-	-	-	1
70	Return pipe insulation GB312	7747011132	1	1	1	1	1	1
	control							
80	RMC10*BLol/16840 everp	7747016491	1	1	1	1	1	1
90	Cartridge fuse 6.3x32 UL67006 T10 A pack of 10	67903389	1	1	1	1	1	1
100	BC10 basic control unit for UBA3 "US"	63033278	1	1	1	1	1	1
110	Outside temperature sensor FA	5991374	1	1	1	1	1	1
120	Module EM10 US	18358	1	1	1	1	1	1

Tab. 21 Heat insulation and programmer

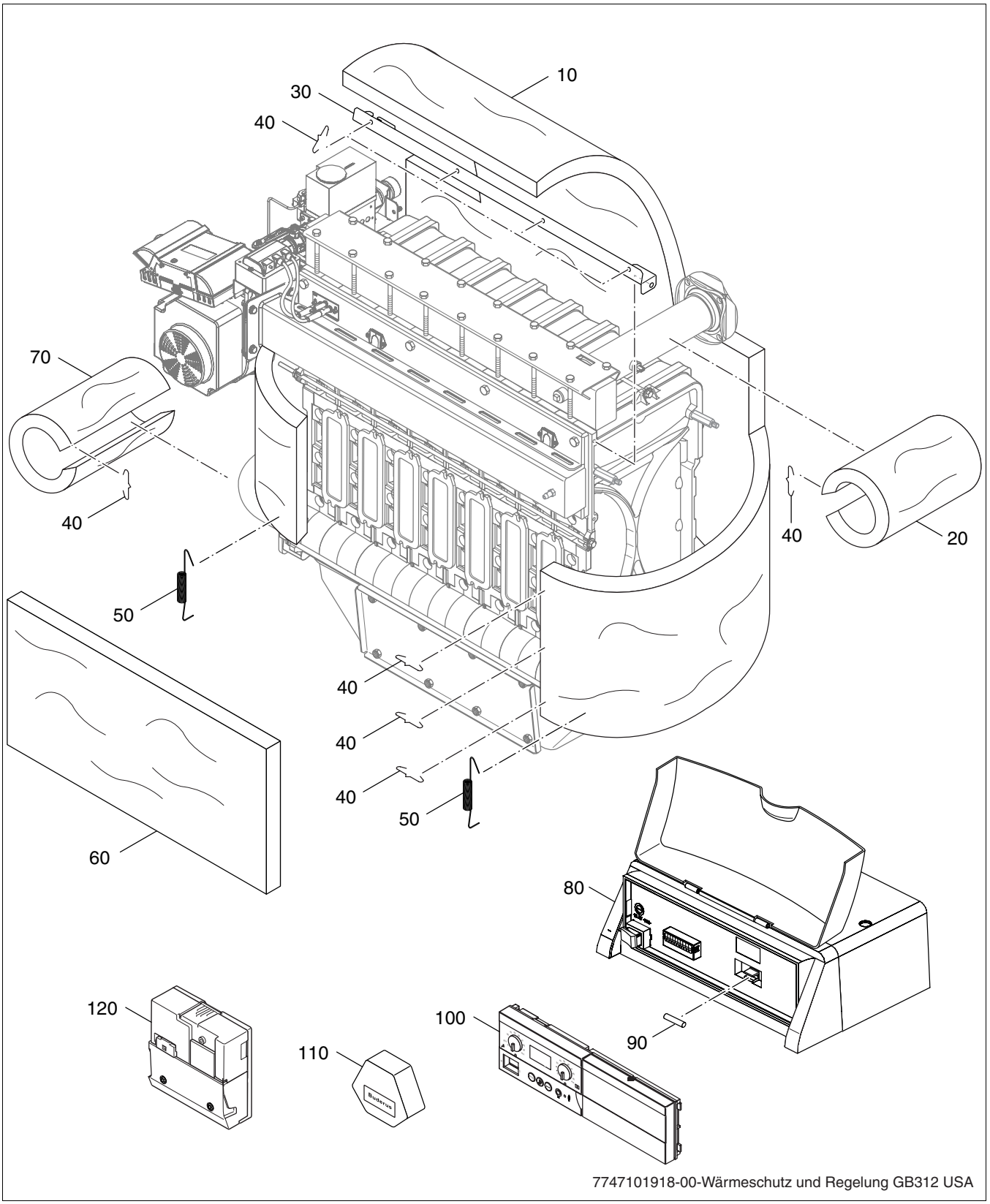


Fig. 80 Heat insulation and programmer

Neutralizer (→ Fig. 81)

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
10	Neutralization unit NE 0.1 V2	63035899	1	1	1	1	1	1
	Available spare parts:							
20	Top cover NE 0.1	63015907	1	1	1	1	1	1
30	Set of filter tubes NE 0.1 V1	(x)	2	2	2	2	2	2
	Note: if required order set of filter tubes NE 0.1 V2							
40	Set of filter tubes NE 0.1 V2 (inserted)	63038062	2	2	2	2	2	2
50	Inlet/outlet connection NE 0.1	63015904	2	2	2	2	2	2
	Hose 19x3.5x1000mm (condensate inlet) (not illustrated)	7115124	1	1	1	1	1	1

Tab. 22 Neutralizer

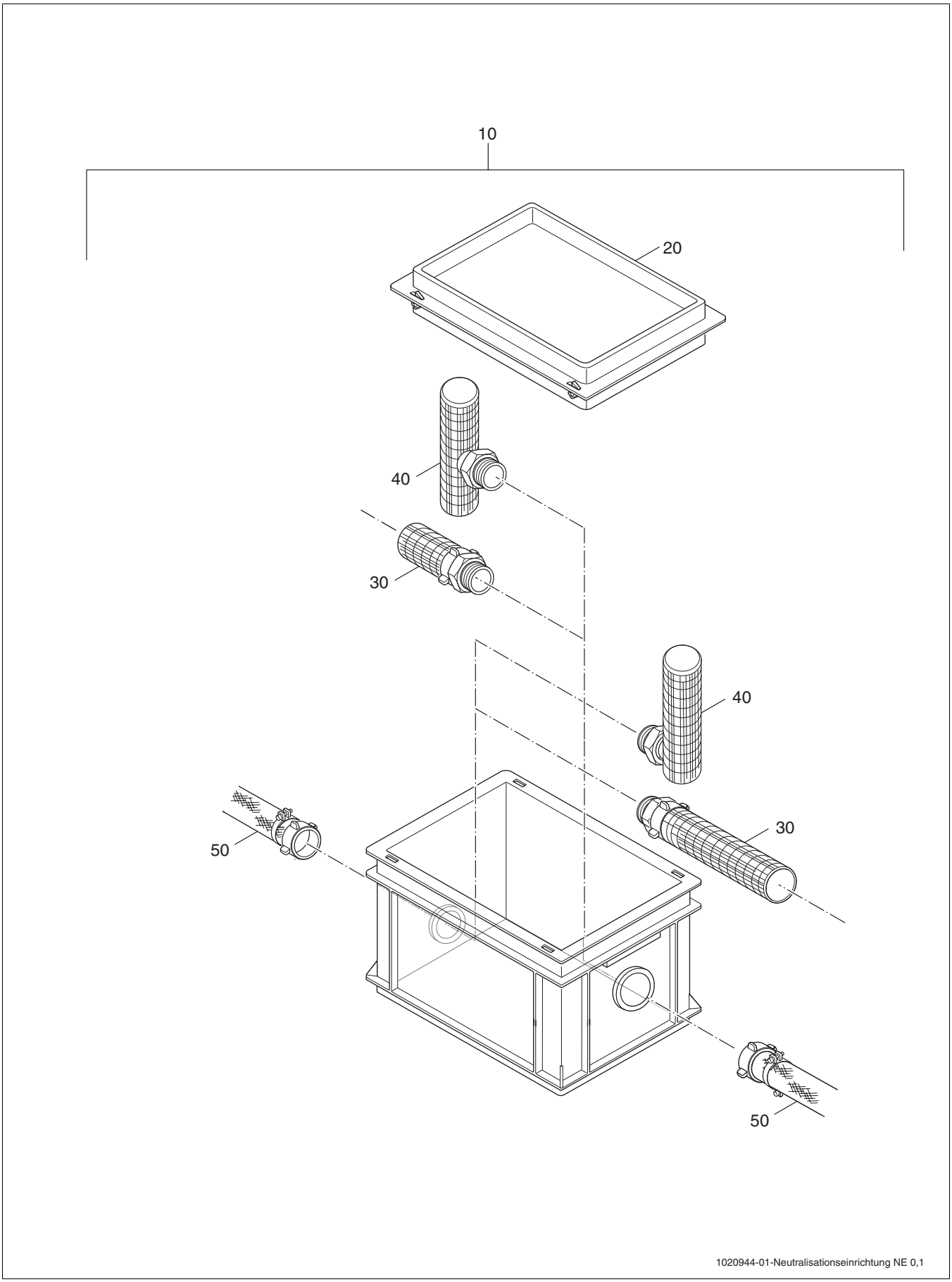


Fig. 81 Neutralizer

Burner variants, rating plate VM312 US

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
10	Gas premixer burner VM312-90 "US" EG	7747303939	1	-	-	-	-	-
11	Gas premixer burner VM312-120 "US" EG	7747303940	-	1	-	-	-	-
12	Gas premixer burner VM312-160 "US" EG	7747303941	-	-	1	-	-	-
13	Gas premixer burner VM312-200 "US" EG	7747303942	-	-	-	1	-	-
14	Gas premixer burner VM312-240 "US" EG	7747303943	-	-	-	-	1	-
15	Gas premixer burner VM312-280 "US" EG	7747303944	-	-	-	-	-	1
	Components:							
20	Backplate VM312-90 US EG	7747016642	1	-	-	-	-	-
21	Backplate VM312-120 US EG	7747016643	-	1	-	-	-	-
22	Backplate VM312-160 US EG	7747016644	-	-	1	-	-	-
23	Backplate VM312-200 US EG	7747016645	-	-	-	1	-	-
24	Backplate VM312-240 US EG	7747016646	-	-	-	-	1	-
25	Backplate VM312-280 US EG	7747016647	-	-	-	-	-	1
30	Fan unit VM312-90 US EG	7747016629	1	-	-	-	-	-
31	Fan unit VM312-120 US EG	7747016630	-	1	-	-	-	-
32	Fan unit VM312-160 US EG	7747016631	-	-	1	-	-	-
33	Fan unit VM312-200 US EG	7747016632	-	-	-	1	-	-
34	Fan unit VM312-240 US EG	7747016633	-	-	-	-	1	-
35	Fan unit VM312-280 US EG	7747016634	-	-	-	-	-	1
40	Gas premixer burner VM312-90 "US" FG	7747303933	1-	-	-	-	-	-
41	Gas premixer burner VM312-120 "US" FG	7747303934	-	1	-	-	-	-
42	Gas premixer burner VM312-160 "US" FG	7747303935	-	-	1	-	-	-
43	Gas premixer burner VM312-200 "US" FG	7747303936	-	-	-	1	-	-
44	Gas premixer burner VM312-240 "US" FG	7747303937	-	-	-	-	1	-
45	Gas premixer burner VM312-280 "US" FG	7747303938	-	-	-	-	-	1
	Consisting of:							
50	Backplate VM312-90 US FG	7747016648	1	-	-	-	-	-
51	Backplate VM312-120 US FG	7747016649	-	1	-	-	-	-
52	Backplate VM312-160 US FG	7747016650	-	-	1	-	-	-
53	Backplate VM312-200 US FG	7747016651	-	-	-	1	-	-
54	Backplate VM312-240 US FG	7747016652	-	-	-	-	1	-
55	Backplate VM312-280 US FG	7747016653	-	-	-	-	-	1
60	Fan unit VM312-90 US FG	7747016635	1	-	-	-	-	-
61	Fan unit VM312-120 US FG	7747016636	-	1	-	-	-	-
62	Fan unit VM312-160 US FG	7747016637	-	-	1	-	-	-
63	Fan unit VM312-200 US FG	7747016638	-	-	-	1	-	-
64	Fan unit VM312-240 US FG	7747016639	-	-	-	-	1	-
65	Fan unit VM312-280 US FG	7747016640	-	-	-	-	-	1

Tab. 23 Burner variants, rating plate VM312 US

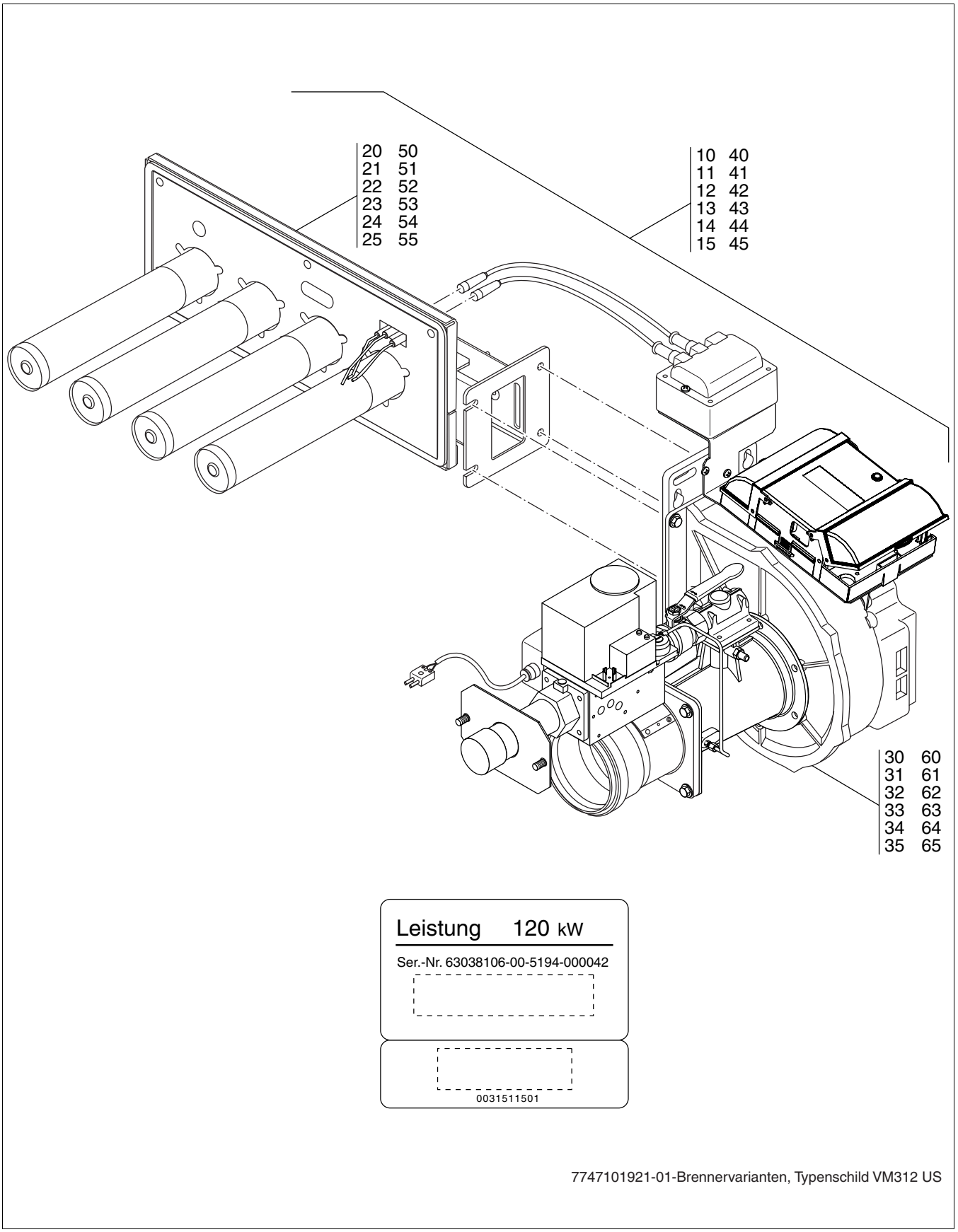


Fig. 82 Burner variants, rating plate VM312 US

Burner rods, heat shield VM312 US

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
10	Seal VM312-90/120	63036113	1	1	-	-	-	-
11	Seal VM312-160	63036114	-	-	1	-	-	-
12	Seal VM312-200	63036115	-	-	-	1	-	-
13	Seal VM312-240	63036116	-	-	-	-	1	-
14	Seal VM312-280	63036117	-	-	-	-	-	1
20	Heat shield assy. VM312-90/120	63036107	1	1	-	-	-	-
21	Heat shield assy. VM312-160	63036108	-	-	1	-	-	-
22	Heat shield assy. VM312-200	63036109	-	-	-	1	-	-
23	Heat shield assy. VM312-240	63036110	-	-	-	-	1	-
24	Heat shield assy. VM312-280	63036111	-	-	-	-	-	1
	Available spare part:							
30	Thermofix ceramic adhesive tube 115 g	2037312						
	Note! When replacing burner rods order matching heat shield.							
	Important! When ordering a replacement burner rod note material of existing burner rods. Mixing metal fiber and metal burner rods is not permitted.							
40	Burner rod, metal fiber, VM312	63040093						
41	Burner rod, metal, VM312	63036120						
	Available spare parts:							
30	Thermofix ceramic adhesive tube 115 g	2037312	1	1	1	1	1	1
50	Burner rod gasket VM312	63036119	1	1	1	1	1	1
60	Hex nut EN1661 M5 10 A3K with serrated washer	5834400						

Tab. 24 Burner rods, heat shield VM312 US

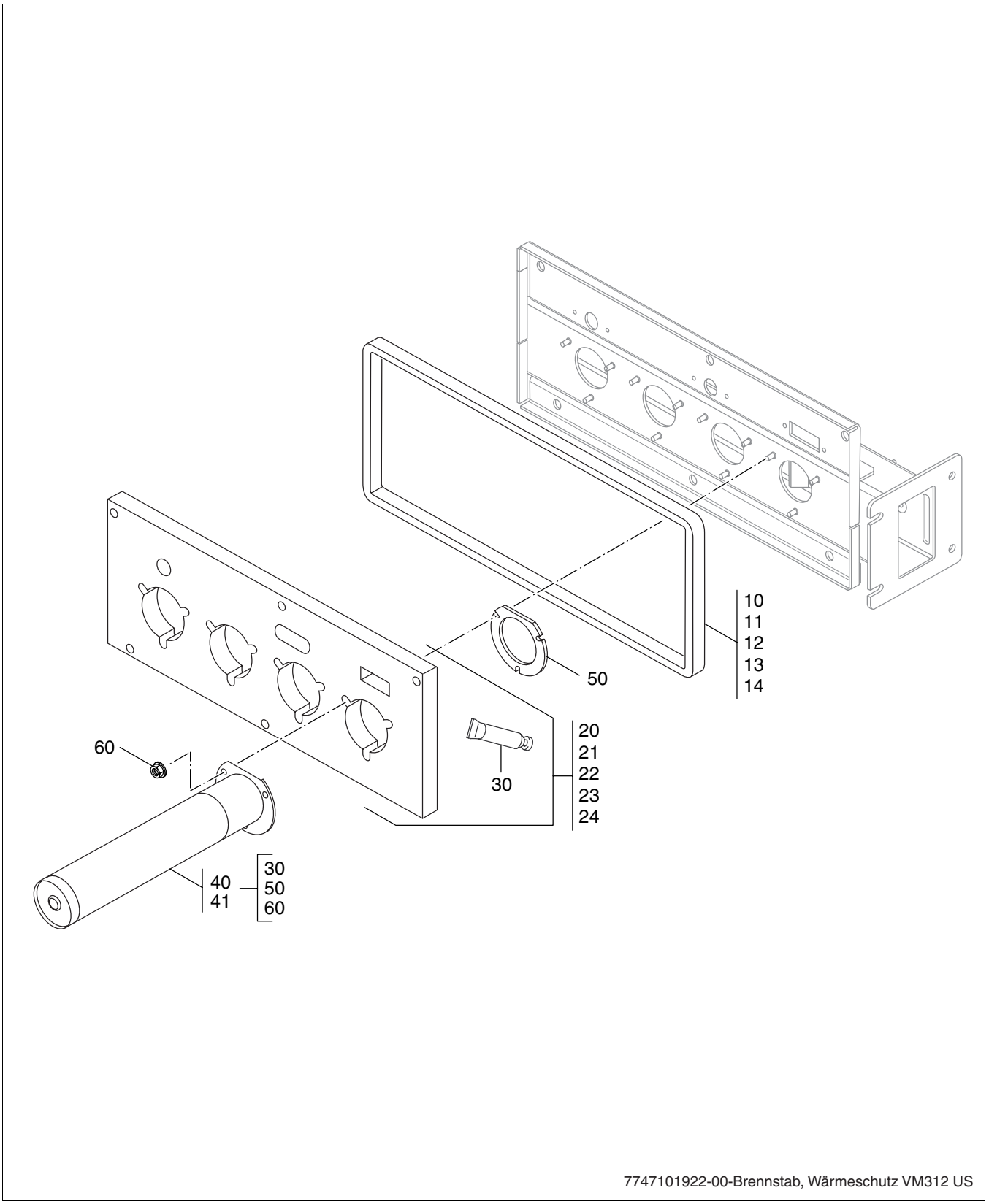


Fig. 83 Burner rods, heat shield VM312 US

Manifold VM312 US

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
	Note! Manifolds are supplied without seal and heat shield. See assembly "Burner rod, heat shield GB312"							
10	Manifold VM312-90/120 US with resonator	7747016656	1	1	-	-	-	-
12	Manifold VM312-90/120 US FG with resonator	7747016657	1	1	-	-	-	-
13	Manifold VM312-160 US EG/FG with resonator	7747016659	-	-	1	-	-	-
14	Manifold VM312-200 US EG/FG with resonator	7747016660	-	-	-	1	-	-
15	Manifold VM312-240 US EG/FG with resonator	7747016661	-	-	-	-	1	-
20	Manifold VM312-280 US EG/FG without resonator	7747016662	-	-	-	-	-	1
	Available spare parts:							
50	Inspection window assy. VM312	63036099	1	1	1	1	1	1
	Comprising:							
60	Screw DIN7500 CE M4x12 A3K	(x)	1	1	1	1	1	1
70	Bracket for inspection window glass	(x)	1	1	1	1	1	1
80	Inspection window glass, Tempax 30x30x3.3mm	5447620	1	1	1	1	1	1
90	Inspection window seal	(x)	1	1	1	1	1	1
100	Hex-head bolt DIN6921 M8x12 (12 off)	63036122	1	1	1	1	1	1
110	Burner bracket	(x)	1	1	1	1	1	1
120	Burner bracket seal VM312-12mm	63046223	1	1	1	1	1	1

Tab. 25 Manifold VM312 US

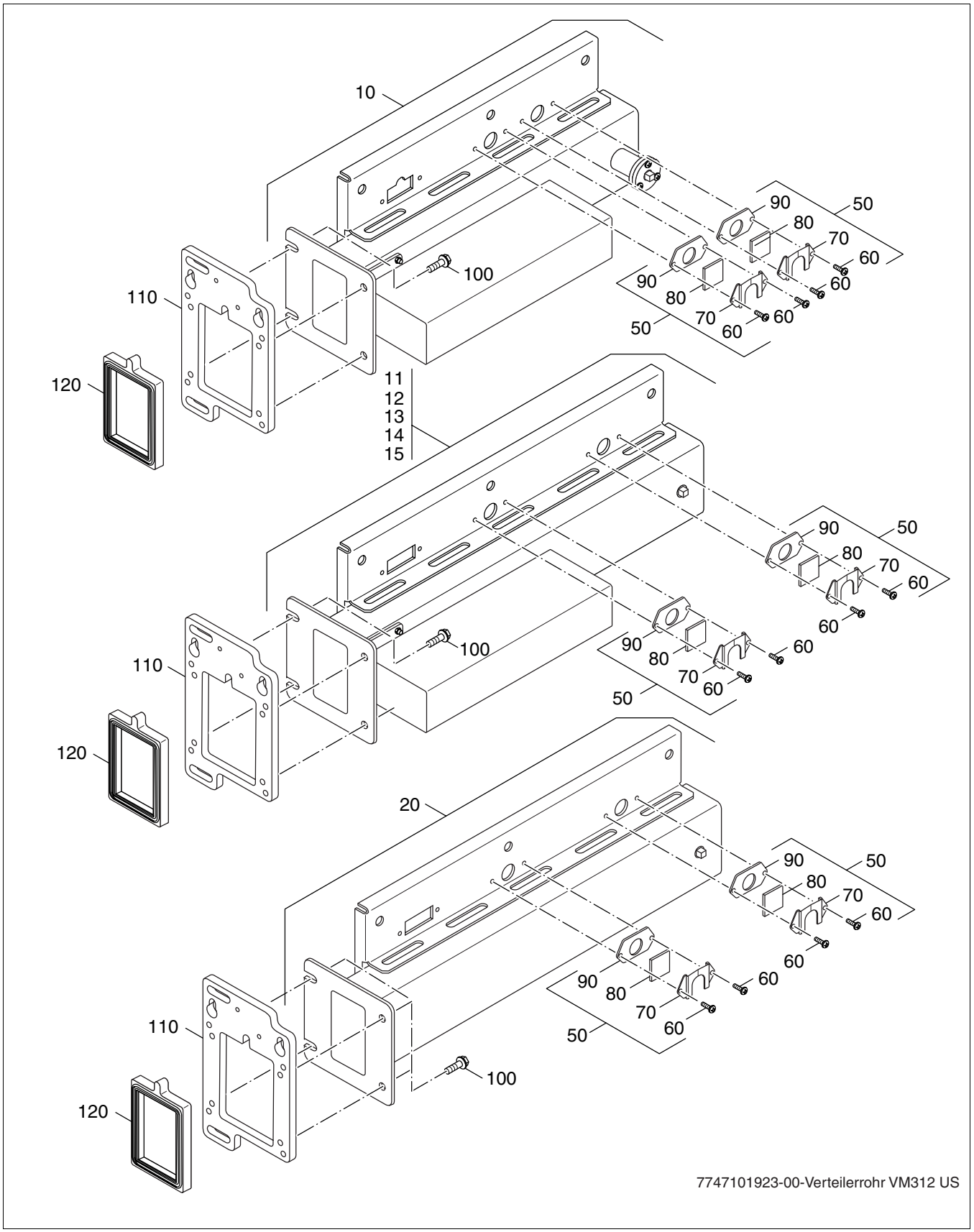


Fig. 84 Manifold VM312 US

Igniter system, fan VM312 US

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
10	Igniter electrode VM312 V1 (metal fiber)	63036098						
11	Igniter electrode VM312 V2 (metal)	774002335						
	Available spare part:							
20	Machine screw DIN912 M5x12	63022871	10	10	10	10	10	10
30	Ingniter cable VM312 US	7747016666	1	1	1	1	1	1
40	Fixing bracket for SAFe VM312 vertical	(x)	1	1	1	1	1	1
50	Serrated washer A 5.3 DIN6797	5883334	1	1	1	1	1	1
60	Ignition transformer TRG1035 US	7747016667	1	1	1	1	1	1
70	Torx bolt set M5x55 DIN7500	7747016667	10	10	10	10	10	10
80	Fan ebm G1G170-AB 120V60Hz	7747016667	1	1	1	1	1	1
	Available spare part:							
90	Hex-head bolt DIN6921 M8x12	63036122	12	12	12	12	12	12
100	Burner bracket seal VM312-12mm	63046223	1	1	1	1	1	1
110	Burner bracket	(x)	1	1	1	1	1	1

Tab. 26 Igniter system, fan VM312 US

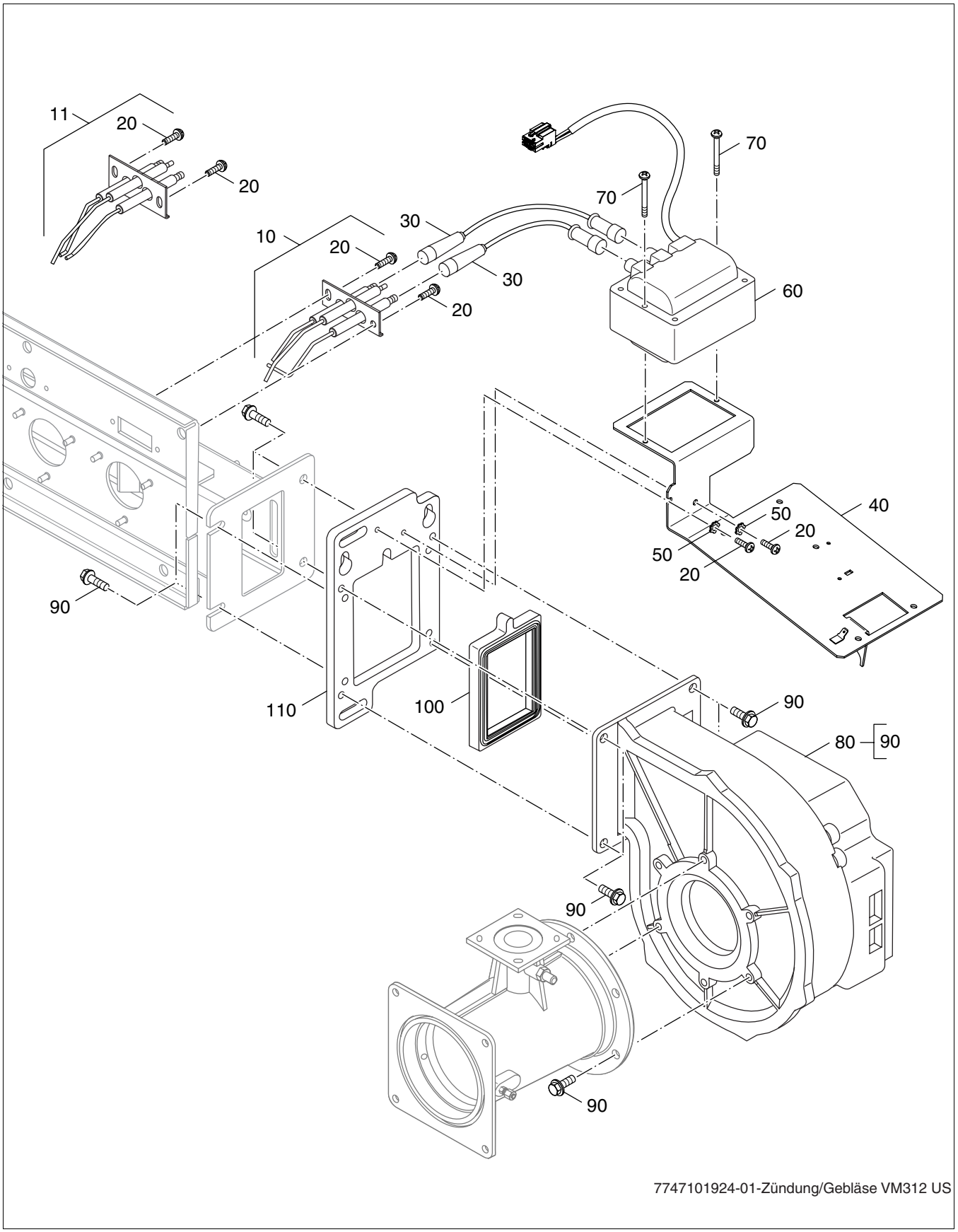


Fig. 85 Igniter system, fan VM312 US

Air inlet, venturi VM312 US

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
10	Air inlet connector assy. VM312	63036066	1	1	1	1	1	1
	Available spare parts:							
20	Lip gasket VM312	63036067	1	1	1	1	1	1
30	Screw M8x25, self-tapping A3K	63019140	1	1	1	1	1	1
40	Air flow restrictor fixing bracket for 200, 240kW	(x)	-	-	-	1	1	1
50	Air flow restrictor assy. D25 VM312, 200kW	63036094	-	-	-	1	-	-
51	Air flow restrictor assy. D20 VM312, 240kW	63036092	-	-	-	-	-	1
	Available spare part:							
60	Hex-head bolt DIN6921 M8x12	63036122	12	12	12	12	12	12
70	Venturi VMU150 US VM312 90 & 120kW	7747016676	1	1	-	-	-	-
80	Venturi VMU185 US VM312 160kW	7747016677	-	-	1	-	-	-
90	Venturi VMU300 US VM312 200, 240 & 280kW	7747016678	-	-	-	1	1	1
	Available spare part:							
100	Hex-head bolt DIN6921 M8x12	63036122	12	12	12	12	12	12
110	Tester lead set VM312 US	7747016670	1	1	1	1	1	1
	Comprising:							
120	Compensation lead VM312 US	(x)	1	1	1	1	1	1
130	Union, Honeywell 5/4	(x)	1	1	1	1	1	1
140	Gas type conversion parts VM312 US EG	7747016679	1	1	1	1	1	1
	Components:							
	Gas orifice D17 SW24 VM312 for Version EG		1	1	1	1	1	1
	Converted burner Label Natural Gas		1	1	1	1	1	1
	Conversion Label Natural Gas		1	1	1	1	1	1
	Installation and servicing instructions		1	1	1	1	1	1
141	Gas orifice D7.90 SW24 VM312 rating 90/120 for version FG	7747016886	1	1	-	-	-	-
142	Gas orifice D8.80 SW24 VM312 rating 160 for version FG	7747016887	-	-	1	-	-	-
143	Gas orifice D9.40 SW24 VM312 rating 200 for version FG	7747016888	-	-	-	1	-	-
144	Gas orifice D9.95 SW24 VM312 rating 240 for version FG	7747016889	-	-	-	-	1	-
145	Gas orifice D10.6 SW24 VM312 rating 280 for version FG	7747016890	-	-	-	-	-	1
150	Venturi gasket VM312	63040179	1	1	1	1	1	1

Tab. 27 Air inlet, venturi VM312 US

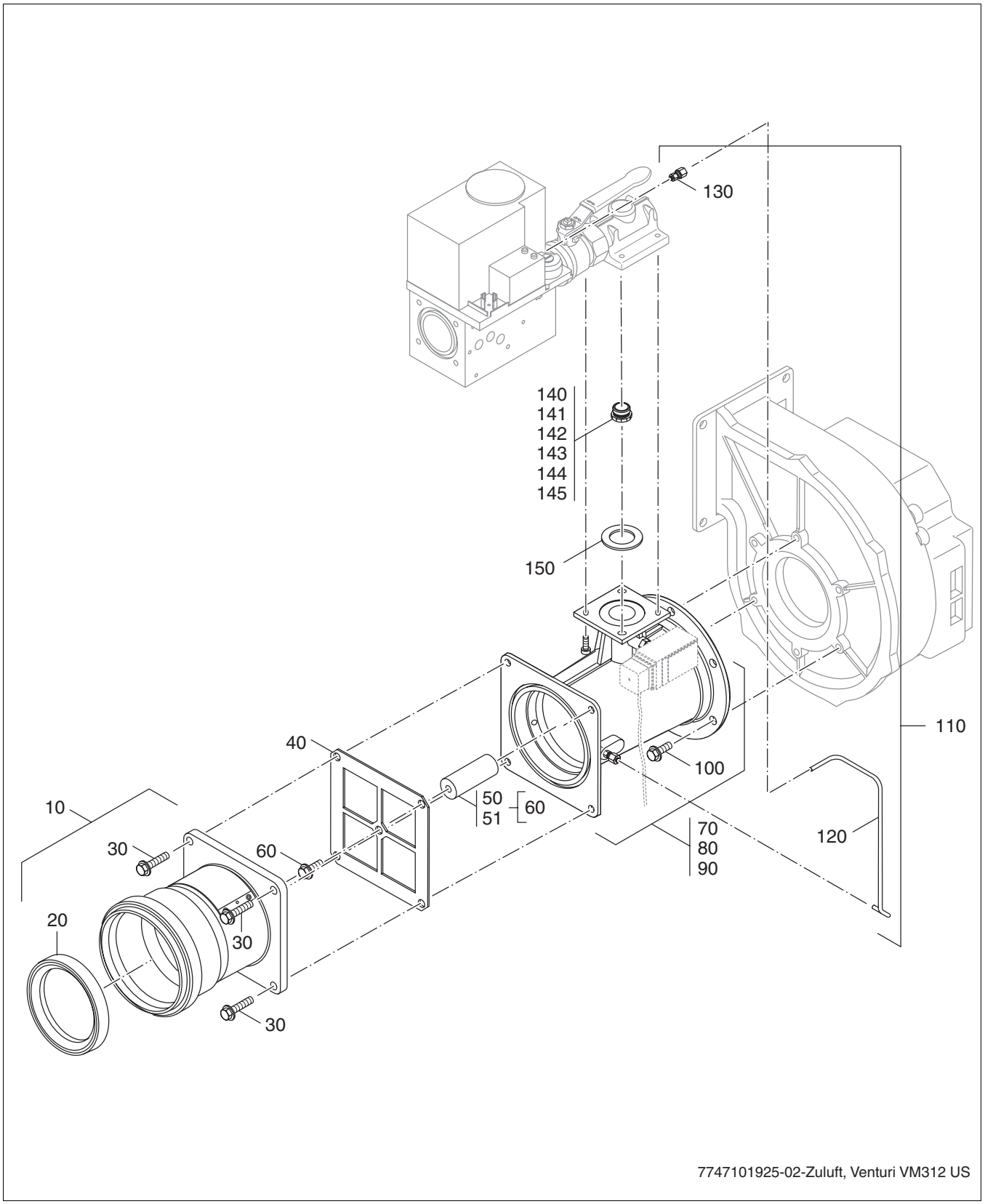


Fig. 86 Air inlet, venturi VM312 US

Gas valve VR4730, gas connecting pipe VM312 US

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
10	Adapter with ball valve	7747016682	1	1	1	1	1	1
	Available spare parts:							
20	Machine screw DIN912 M5x12	63022871	10	10	10	10	10	10
30	Venturi gasket VM312	63040179	1	1	1	1	1	1
40	Machine screw DIN912 M5x16	63040095	8	8	8	8	8	8
50	O-ring 52.39 x 3.53	63036065	1	1	1	1	1	1
60	Valve assy. V4370 1063 90-160 kW	7747016673	1	1	1	-	-	-
61	Valve assy. V4370 1071 280 kW	7747016674	-	-	-	-	-	1
62	Valve assy. V4370 1097 200 & 240 kW	7747016675	-	-	-	1	1	-
	Available spare parts:							
20	Machine screw DIN912 M5x12	63022871	10	10	10	10	10	10
40	Machine screw DIN912 M5x16	63040095	8	8	8	8	8	8
50	O-ring 52.39 x 3.53	63036065	1	1	1	1	1	1
80	Gas connecting pipe VM312 US 1" mit O-ring and screws	7747016680						
81	Gas connecting pipe VM312 US 11/4" mit O-ring and screws	7747016681						
	Available accessories for burner VM312 US:							
70	Gas pressure monitor set CSD1 with pressure switch C6097A1061 and DG15-CTG15W	7747019985	1	1	1	1	1	1
	Available spare parts:							
40	Machine screw DIN912 M5x16	63040095	8	8	8	8	8	8
50	O-ring 52.39 x 3.53	63036065	1	1	1	1	1	1
90	Ball valve DN25 RUBS92F41 1"	7747016685						
91	Ball valve DN32 RUB S92G41 11/4"	7747016688						
100	SAFe Pressure switch	7747021498	1	1	1	1	1	1

Tab. 28 Gas valve VR4730, gas connecting pipe VM312 US

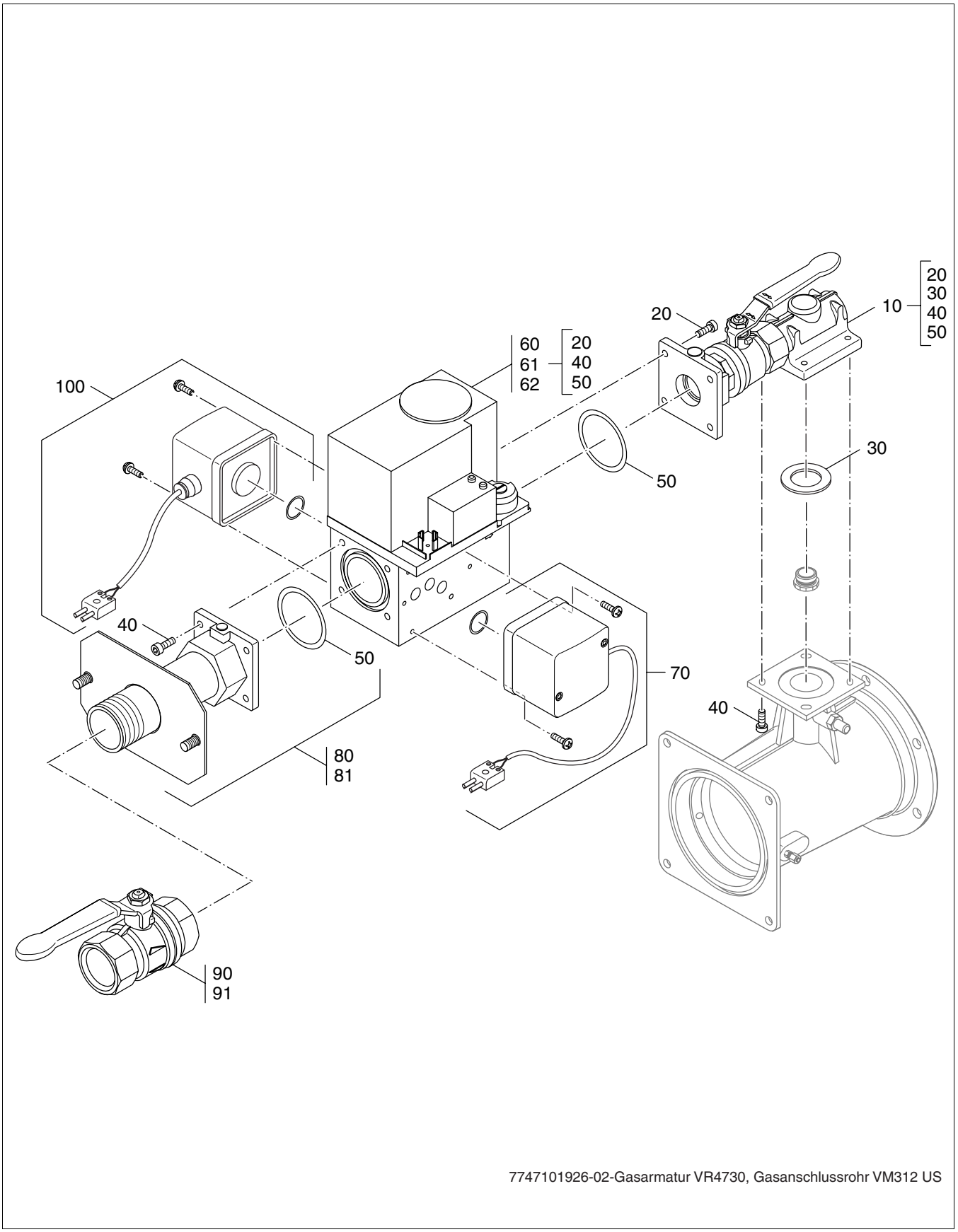


Fig. 87 Gas valve VR4730, gas connecting pipe VM312 US

Safe 40 with connecting lead VM312 US

Item no.	Description	Buderus article number	90-4	120-4	160-5	200-6	240-7	280-8
20	SAFe casing terminal cover	63023925	1	1	1	1	1	1
30	SAFe40 US	7747016490	1	1	1	1	1	1
	Available spare part:							
	SAFe casing bottom part	63023930	1	1	1	1	1	1
50	Rivet	(x)	1	1	1	1	1	1
60	Module BIM40 GB312-90 US for service technicians only	7747014772	1	-	-	-	-	-
61	Module BIM40 GB312-120 US for service technicians only	7747014773	-	1	-	-	-	-
62	Module BIM40 GB312-160 US for service technicians only	7747014774	-	-	1	-	-	-
63	Module BIM40 GB312-200 US for service technicians only	7747014775	-	-	-	1	-	-
64	Module BIM40 GB312-240 US for service technicians only	7747014776	-	-	-	-	1	-
65	Module BIM40 GB312-280 US for service technicians only	7747014777	-	-	-	-	-	1
70	Fixing bracket for SAFe 40 GB312	(x)	1	1	1	1	1	1
80	Connecting cable mains/fan everp.	7747022909	1	1	1	1	1	1
90	Ionization signal lead, natural gas GB312	63035353	1	1	1	1	1	1
100	Connecting lead, fan/pressure trans. PWM WIDW GB312	63035357	1	1	1	1	1	1
110	Pressure monitor set GB312/90-160kW "US/CA"	7747016334	1	1	1	-	-	-
111	Pressure monitor set GB312/200-280kW "US/CA"	7747017923	-	-	-	1	1	1
120	Connecting lead, flow/return sensor	63035355	1	1	1	1	1	1
130	Connecting lead with grommet, boiler sensor/SAFe BE	63039214	1	1	1	1	1	1
140	Data lead, SAFe/MC10	63034190	1	1	1	1	1	1
150	Connecting lead, solenoid valve 1/burner UL	7747016588	1	1	1	1	1	1

Tab. 29 Safe 40 with connecting lead VM312 US

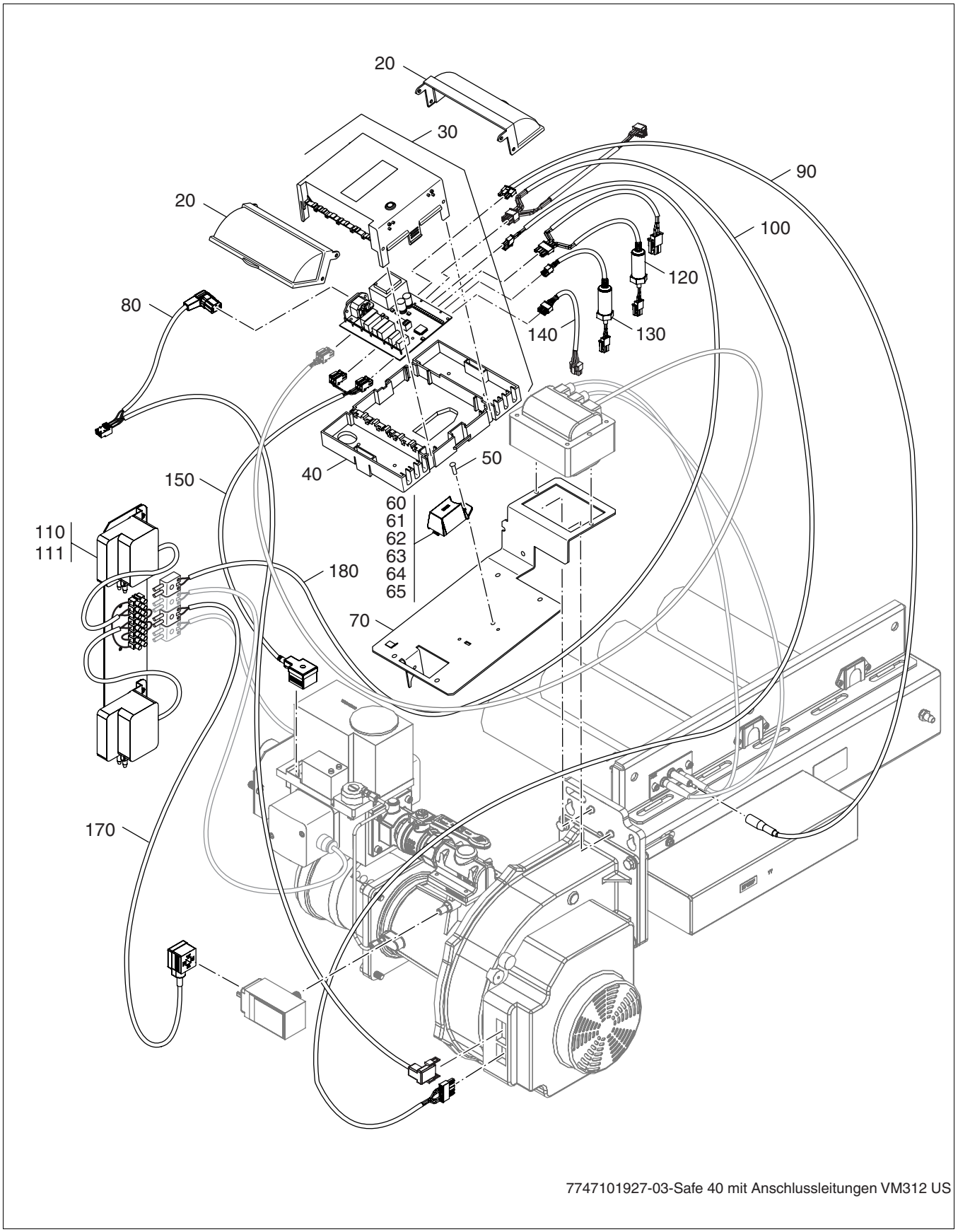


Fig. 88 Safe 40 with connecting lead VM312 US

13 Boiler internal wiring diagram

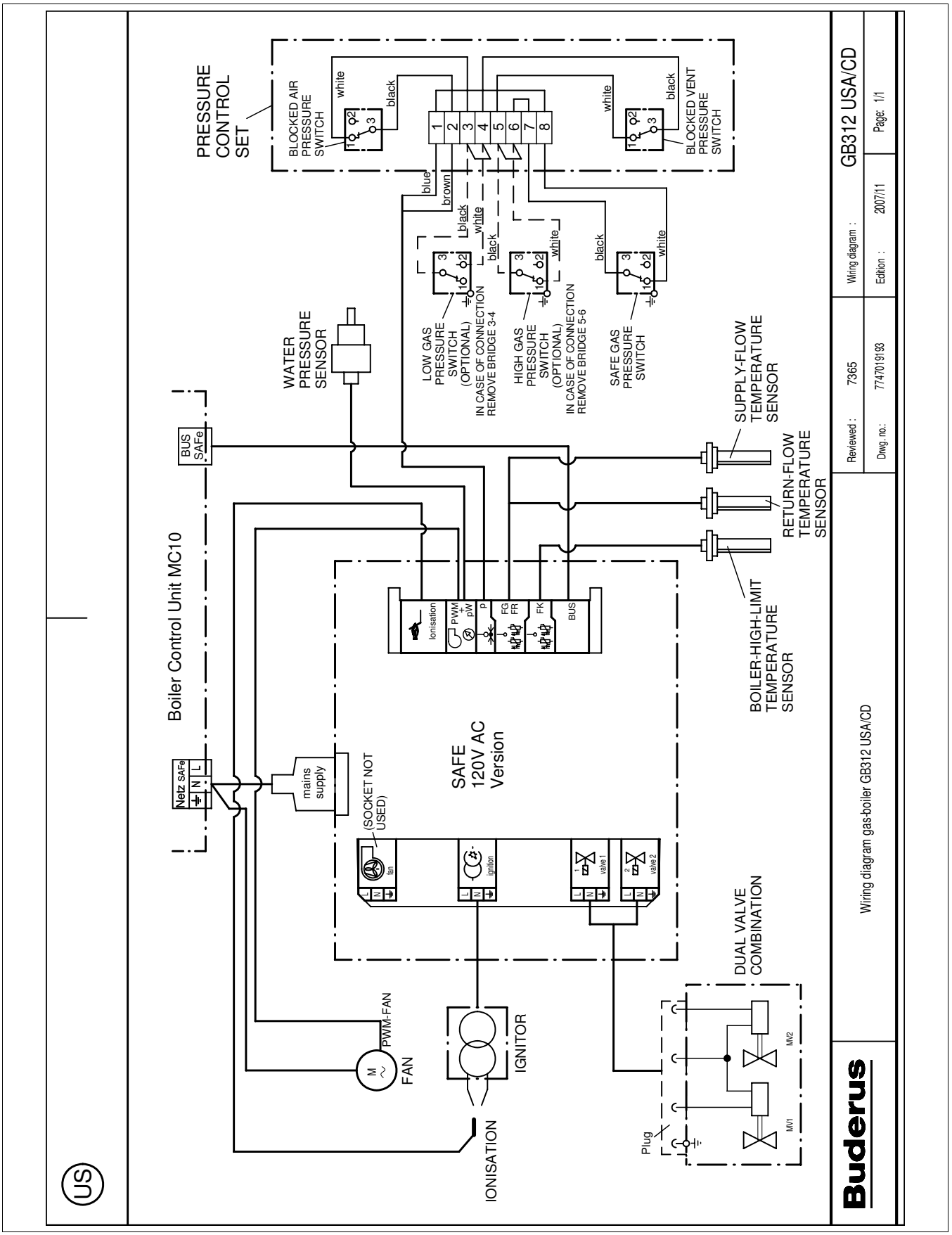


Fig. 89 Boiler internal wiring diagram, gas boiler GB312 USA/CD

14 Examples of Installations

14.1 Boiler, low-loss header, AM10

FV	Flow temperature sensor	PS	Cylinder charging pump
FW	DHW sensor	RK	Non-return valve
MAG	Diaphragm expansion vessel	SA	Branch equalizer valve
PH	Heating system pump	SH	Heating system adjuster (mixer)
PZ	Circulation pump	THV	Thermostatic valve

Tab. 30 Legend

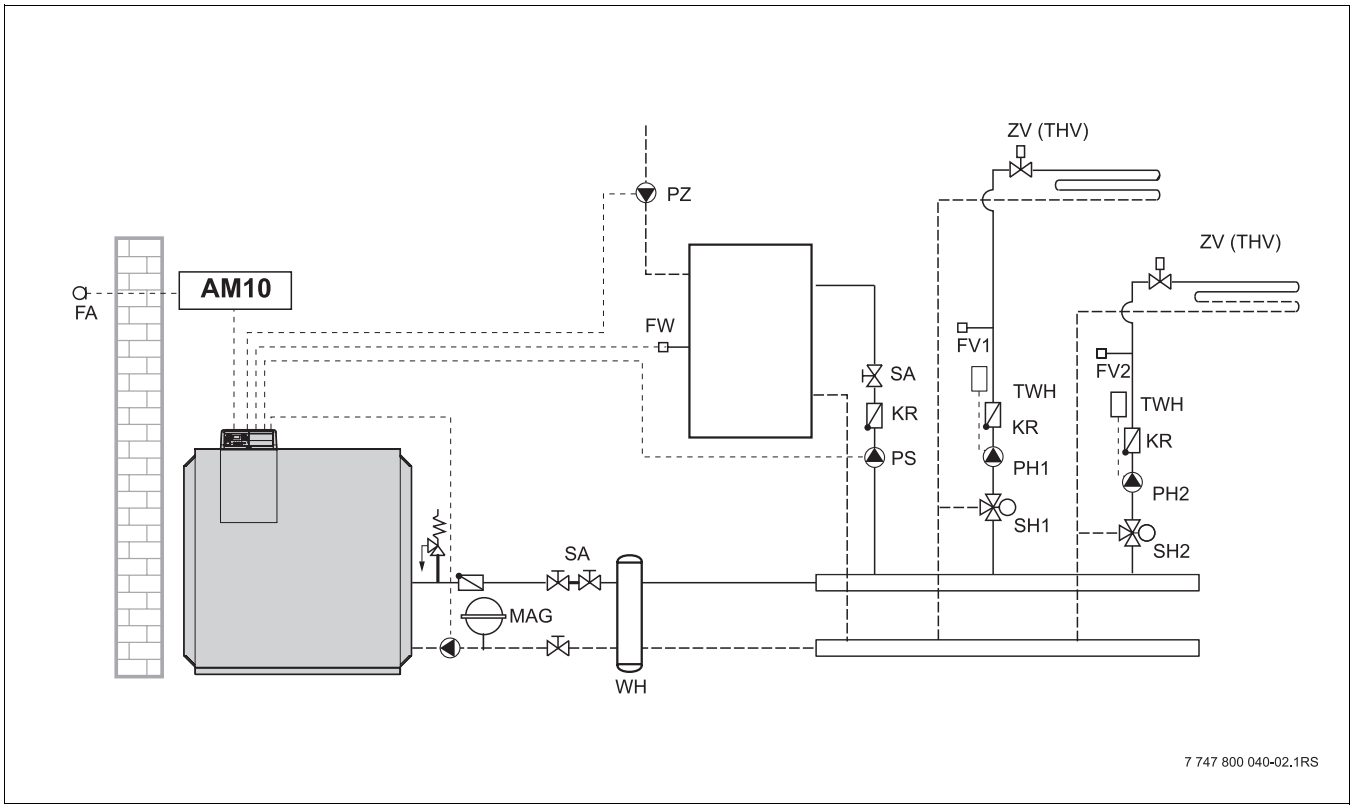


Fig. 90 Example of installation: Logano plus GB312, low-loss header, AM10. Schematic diagram, not necessarily representative of complete system.

PH = Differential pressure controlled pumps.
The low-loss header should be fitted as close as possible to the boiler.

14.2 Boiler, low-loss header, Logamatic 4000

FV	Flow temperature sensor	PS	Cylinder charging pump
FW	DHW sensor	RK	Non-return valve
MAG	Diaphragm expansion vessel	SA	Branch equalizer valve
PH	Heating system pump	SH	Heating system adjuster (mixer)
PZ	Circulation pump	THV	Thermostatic valve

Tab. 31 Legend

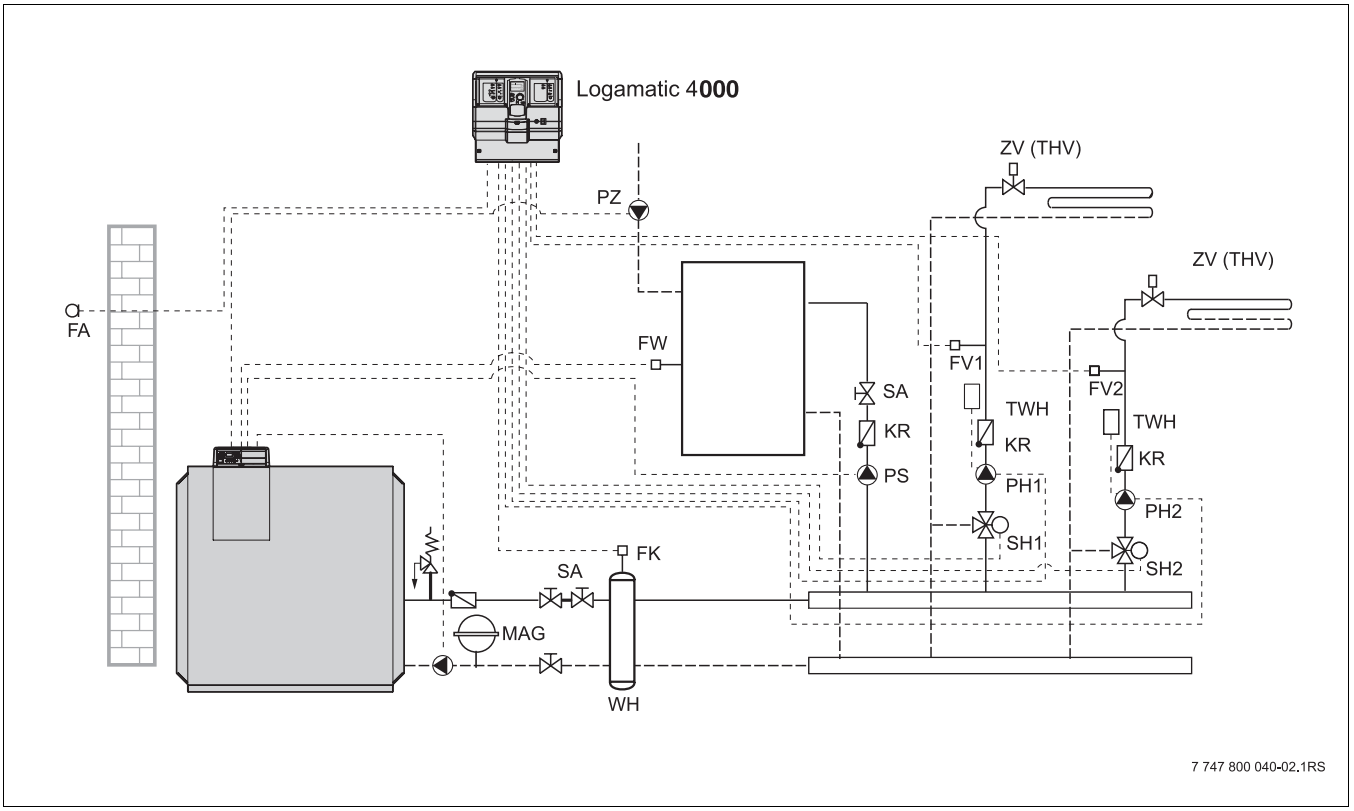


Fig. 91 Example of installation: Logano plus GB312, low-loss header, Logamatic 4000. Schematic diagram, not necessarily representative of complete system.

PH = Differential pressure controlled pumps.
The low-loss header should be fitted as close as possible to the boiler.

14.3 2 Boilers , low-loss header, Logamatic 4000 with FM 456 Module

FV	Flow temperature sensor	PS	Cylinder charging pump
FW	DHW sensor	RK	Non-return valve
MAG	Diaphragm expansion vessel	SA	Branch equalizer valve
PH	Heating system pump	SH	Heating system adjuster (mixer)
PZ	Circulation pump	THV	Thermostatic valve

Tab. 32 Legend

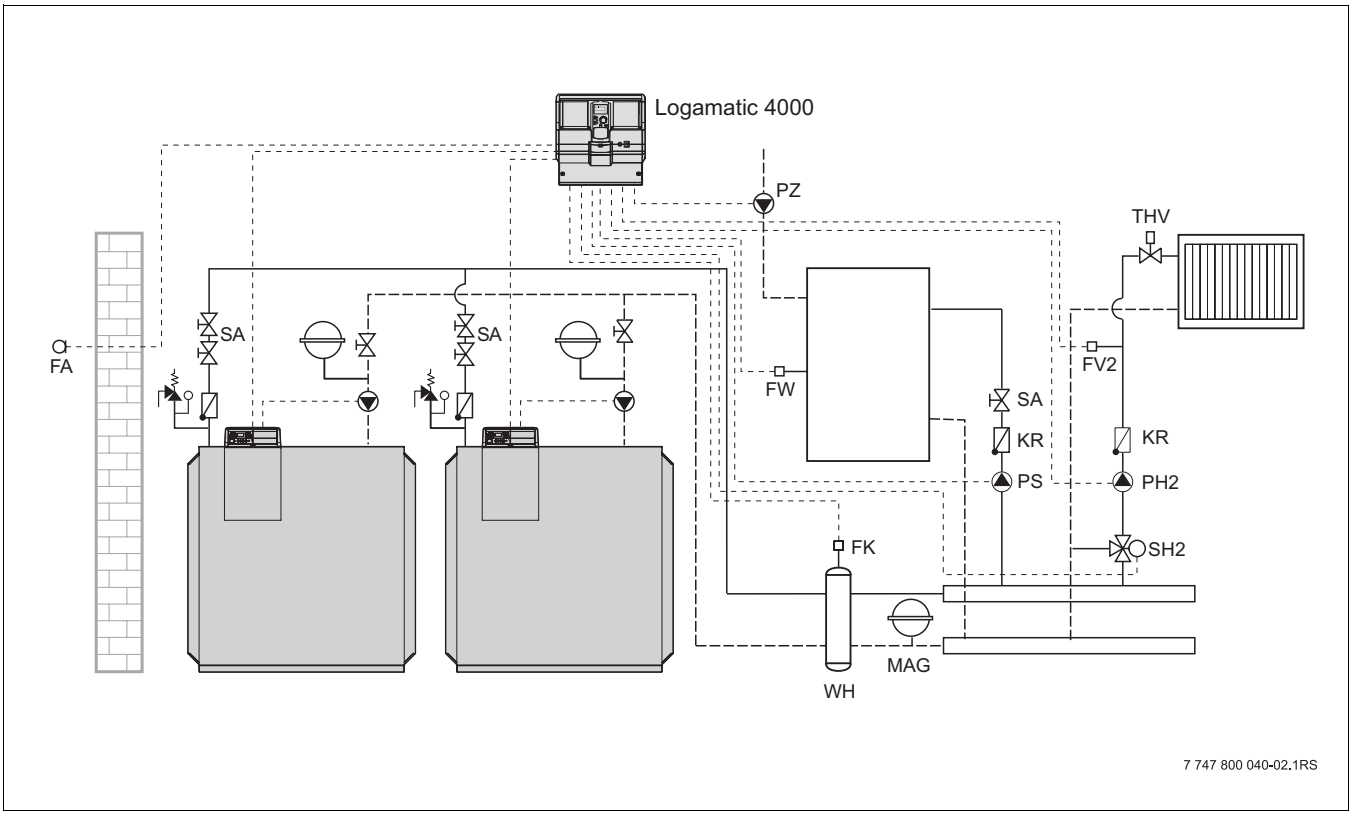


Fig. 92 Example of installation: 2 boilers, low-loss header, Logamatic 4000 with FM 456 Module. Schematic diagram, not necessarily representative of complete system.

PH = Differential pressure controlled pumps.
The low-loss header should be fitted as close as possible to the boiler.

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