POTTERTON COMMERCIAL

INSTALLATION MANUAL

EUROCONDENSE SGB
(Software-version 7.04)

Commissioning:

Important: The boiler must be commissioned following completion of installation. Operation of an uncommissioned appliance may cause injury to personel and damage to the the boiler/burner unit could invalidate the manufactures warranties.

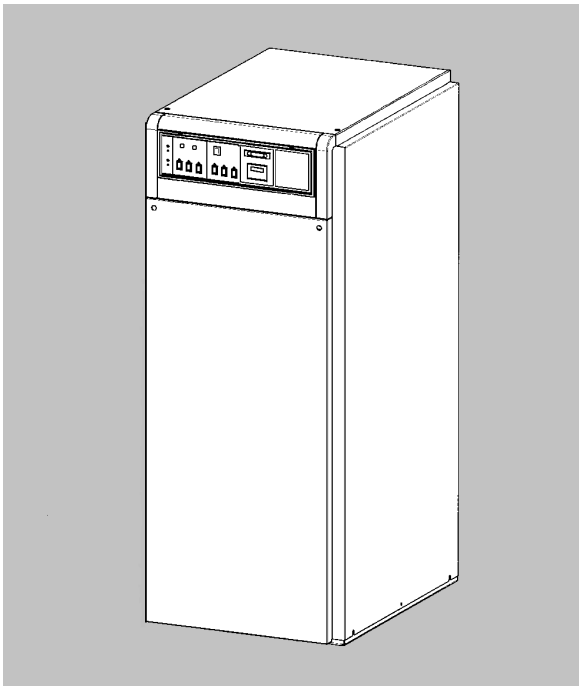
Commissioning must only be carried out by personnel approved and competent to do so. This facility is available from Potterton Commercial Service Offices
Inportant: The boiler/burner units are supplied in accordance with Potterton Commercial Quality Assurance plan registered to meet the requirements of BS EN ISO 9002. A condition of the supply of the appliance for compliance with this Quality Assurance plan is the return of the appliance commissioning report.

Electrical installation:

The work must be carried out by qualified electricians.

Gas connection:

Gas connection as well as adjustment, servicing and cleaning of the burner must be carried out by an approved gas installer.
For use with natural gas (G20) only.
Gas supply pressure 20 mbar.



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General

The Potterton EUROCONDENCE EC condensing sectional boiler is available in seven sizes with outputs at 60°C return temperature from 38.7 kW to 237 kW. Table 9 give kW outputs and technical data for each model. They are CE marked for use on Natural Gas on open vented systems and they are suitable for use on sealed systems with a maximum operating pressure of 4 bar (58.8 p.s.i.) Refer to relevant British Standards and Codes of Practice installation of condensing boilers on sealed system.
The heat exchanger consists of an aluminium - silicon alloy which gives a very compact and lightweight boiler construction with corrosion resistance high efficiency.
The fully pre-mixed burner works in a modulating range of between 40% and 100%. Therefore the boiler output is adapted to the particular heat requirements of the circuit. The gas / air ratio control ensures uniformly high CO_2 emissions and low NOX. This is obtained by comparing the target boiler temperature and the actual temperature from the sensor. If there is a difference between these two values then the internal microprocessor calculates a new fan speed. The change in fan speed in turn changes the combustion chamber static air pressure which is monitored by the gas / air ratio control and the gas rate is adjusted thus maintaining the correct gas to air ratio in the boiler. This ensures that a uniform gas / air ratio is maintained over the total range of the boiler modulation and that constant CO_2 values are achieved.
The gas train assembly, control panel and boiler case must be connected on site and apart from the incoming supply all other electrical connections are made by plug and sockets.
For high energy utilisation condensing boilers should be operated at a low return temperature. However the Eurocondense EC will also work at designed temperatures of 70/50 °C in the condensing mode as the return temperature is under the dew point. (dew point is 53° C at 8.5 % CO2).
Condensing boiler Series Eurocondense EC are designed as hot water heating systems. They correspond to EN 676, EN 677 and Category I2H, for use in GB.

Corrosion protection

The combustion air must be free from corrosive elements - especially fluorine and chlorine containing vapours which are found for example in solvent and cleaning agents, propellant gases etc. When connecting boilers to under-floor heating systems employing plastic pipe work which is not impervious to oxygen, heat exchangers must be used for separation purposes.
Mains water of drinking quality without additives (chemical additives) must be used in the primary circuit of the boiler.

System Water quality

To ensure the boiler heat exchanger remains in good condition it is essential to condition and monitor the system water to the following criteria:
Water Hardness: If the system fill water has a hardness in excess of 250 mg/l (17.5° Clark) the water should be softened prior to filling the system to ensure that excessive scaling does not occur within the heat exchanger.
Water Acidity: The system fill water should have a pH value between 7 - 8.5 to ensure corrosion of the heat exchanger does not occur.
Copper Ions: The copper content of the system water should be less than 0.05mg/l. If large quantities of copper are present red and black copper oxide Cu2O and CuO and, grey/green copper carbonate, CuCo2 will be produced. Copper will corrode any iron and aluminium within the system.
A specialist water treatment company should be consulted if in doubt.

Note: The only Inhibitors recommended by Potterton are FERNOX-COPAL or GRACE DEARBORN-SENTINEL X100

INSTALLATION / DIMENSIONS

Installation

Before starting work a risk assessment should be carried out in the boiler house and its access to ensure a safe installation and working environment. Any person installing or working on the boiler **must** be qualified and attention is drawn to the mandatory requirements of C.O.R.G.I. (ACOPS 16) registration for all Gas Intallers. Also they must be electrically competent an adhere to IEE regulations.
Manual Handling: Any person or persons moving or lifting the boiler or any part thereof should be trained in manual handling techniques and if necessary use suitable lifting equipement to reduce the risk of injury to themselves or other people.
The installation should comply with relevant British Standard Specifications, Codes of Practice and current Building Regulations, together with any special regional requirements of the Local Authorities, Gas Undertaking und Insurance Company. All electrical wiring must comply with I.E.E. Regulations for the Electrical Equipment of Buildings.
The installation of the boiler must be in accordance with the relevant requirements of:
Health & Safety at Work Act 1974.
Building Regulations 1991
Electricity at work Regulations 1989
Management of H&S at Work Regulations 1992
Manual Handling Regulations 1992
Model Water By-Laws 1986
BS 7671: 1992 – Requirements for Electrical Installations, IEE Wiring Regulations Sixteenth Edition.
BS 5440: 1990: Part 1 – Specifications for Installation of Flues
BS 5440: 1989: Part 2 – Specifications for Installation of Ventilation for Gas Appliances
BS 6644: 1991 – Installation of Gas Fired Hot Water Boilers for Inputs Between 60 kW and 2 MW
BS 7074: 1989: Part 2 – Application Selection & Installation of Expansion Vessels & Ancillary Equipment for Sealed Water Systems
BS 6880: 1988 – Codes of Practice for Low Temperature Hot Water Systems
EN 677: 1997 Gas-fired Central Heating Boilers for Condensing Boilers with a Nominal Heat Input not Exceeding 70 kW.
EN 676: 1996 Automatic Forced Draught Burners for Gaseous Fuels.
CIBSE AM3: Applications Manual for Condensing Boilers.
CP342:2 – Centralised Hot Water Supply
Gas Safety (Installation & Use) Regulations 1994
IM/11 Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters.
IGE/UP/1 – Soundness Testing & Purging Procedure for Non-Domestic Installations
IGE/UP/2 – Gas Installation Pipework, Boosters & Compressors for Industrial & Commercial Premises.
Manufacturers notes must not be taken in any way as overriding statutory obligations

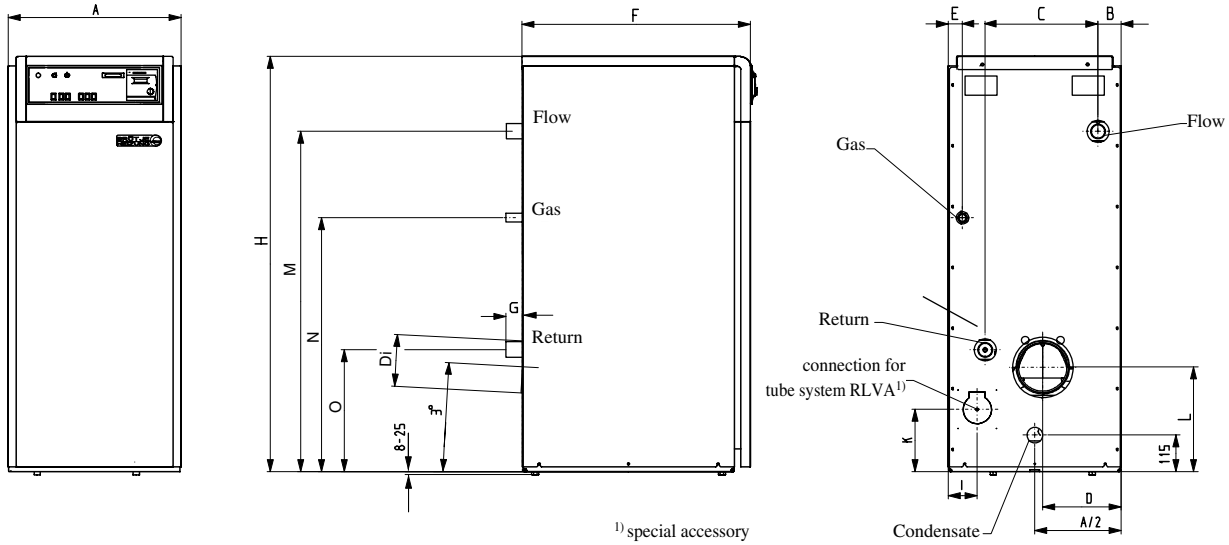
Ventilation

Safe, efficient and trouble free operation of conventionally flued boilers is vitally dependent on the provision of an adequate supply of fresh air to the room in which the appliance is installed. Account must also be taken of any other fuel burning appliance existing or to be fitted when designing the ventilation and combustion air systems.
The air supplied for boiler house ventilation shall be such that the maximum temperatures within the boiler house shall not exceed 25°C at floor level, 32°C at mid level (1.5m above floor level) and 40°C at ceiling level (or 100mm below ceiling level). Refer to BS 6644: 1991 for further details. BS 5440/989 Part 2.

Clearances

Special consideration must be given to the exhaust gas flue when selecting the position of the boiler. Sufficient space should be left at the front so that service work can be carried out.
The minimum boiler room clearance for access, erection and maintenance are as follows:-
REAR - 500 mm · SIDES - 300 mm · FRONT - 1000 mm · TOP - 500 mm

Fig. 1 Dimensions and connections



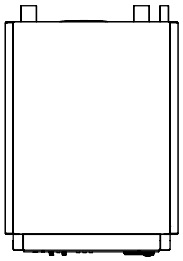


Table1 Dimensions

Modell	Connections KV/KR	Gas
EC 40	1 ½ " BSP	¾ " BSP
EC 65		
EC 90	2 " BSP	1 " BSP
EC 120		
EC 160	2 ½ " BSP	1 ½ " BSP
EC 200		
EC 250		

Dimensions

Model	Measurements in mm A	B	C	D	Di	E	F	G	H	I	K	L	M	N	O
EC 40	540	72,5	353,5	245	151,5	43	715	50	1300	90	195	328	1065	795	382
EC 65	610	77,5	463,5	250	151,5	53	715	50	1300	90	195	328	1065	795	382
EC 90	762	98,5	578,5	271	151,5	38	715	50	1300	673	195	328	1065	795	382
EC 120	910	107,5	688,5	290	151,5	57	715	50	1300	821	195	328	1065	795	382
EC 160	1150	182,5	808,5	395	181,5	91	765	52	1390	140	210	354	1165	893	472
EC 200	1150	127,5	918,5	340	181,5	91	765	52	1390	140	210	354	1165	893	472
EC 250	1250	122,5	1028,5	335	181,5	97	765	52	1390	305	170	354	1165	893	472

CENTRAL HEATING CONNECTION / EXHAUST GAS CONNECTION

Connecting central heating
Connection examples see Pages 22 and 23

Fitting a filter in the central heating return flow is recommended. In the case of old systems, the entire central heating system should be thoroughly flushed before fitting the new boiler. Using appropriate system cleaners.

Safety valve

The boiler is suitable for open vented & sealed systems and, in the case of sealed central heating systems an expansion vessel and safety valve should be incorporated.
It must not be possible to close off the connecting pipe between boiler and safety valve.
Fill-up system and test for leaks (maximum test water pressure 4 bar).

Sealed Systems

General: Potterton Commercial boilers are suitable for use on sealed systems designed in accordance with BS 6644: 1991 and BS 6880 Part 2. In addition, reference should be made to the Health & Safety Executive guidance note PM5 “Automatically Controlled Steam & Hot Water Boilers“.
Expansion Vessels : The sealed system should incorporate an expansion vessel complying with BS 4814 sized to accommodate the volumetric hydraulic expansion of the heating system between 0°C and the temperature setting of the overheat thermostat without exceeding the maximum design pressure of the boiler. The position of the expansion vessel(s) should be such that the manufacturers maximum operating temperature is not exceeded and the provision of an anti gravity tank may be required for systems operating above 100°C. In addition, the position of the expansion vessel(s) should prevent inadvertant isolation of the boiler system from the expansion vessel, where isolating devices, ie, valves, etc, are incorporated between the boiler(s) and the expansion vessel these should be capable of being locked in the open position during normal operation. See BS 6880 Part 2 for further details.

Condensation water

Condensation water may only be drained directly into the domestic drainage system if the system consists of corrosion resistant materials (e.g. PP tube, ceramic etc). The condensation water must be able to freely drain off into a funnel. An odour trap must be installed between funnel and drainage system. The condensation water hose of the boiler must be inserted through the opening in the rear. If there is no possibility of routing the condensation water drain in this way, a riser unit is recommended.

Condensate

The boiler can produce condensate at an approximate rate of 0.1 lit/hr per kWh. The condensate is slightly acidic with a pH of 3.5. Copper pipe should not be used for drainage purposes.

Attention!

The condensation water drain in the boiler must be filled with water before commissioning. For this purpose 0.25 litre of water must be poured in the flue flange before fitting the flue.

Exhaust flue connection

The flue must be designed for operating the central heating boiler with flue gas temperatures below 120°C (flue Type B).

Flue

The flue gas temperature at the boiler flue outlet will be no greater than 10°C above the return water temperature under normal running conditions and buoyancy in the stack will be relatively low. The boiler fan is therefore designed to overcome the flue resistance.
The flue gases will be at or near saturation point in all running conditions and droplets of condensate will ' precipitate onto the walls of the flue system. The flue system must therefore be corrosion resistant, water and gas tight and free draining.

Table 1 Maximum Flue Lengths (in metres) for Systems including Fittings

Boiler Size	Nominal Flue Size mm	Number of fittings			
		1 Bend*	2 Bends*	3 Bends*	4 Bends*
40	100	30	30	30	30
65	100	32	32	28	24
	150	32	32	28	24
90	150	42	42	42	42
120	150	45	45	45	45
160	180	50	50	46	46
200	180	50	50	46	46
250	180	50	50	46	46

* Bends: 90°

Typically a flue system must be constructed in 316 grade stainless steel with gasketed joints. Most flexible flue liners are unsuitable as they are not gas and water tight under positive pressure. Advice on flexible flue liners should be sought from a flue specialist.

Owing to the low flue gas temperature only single skinned flue pipe is necessary except in areas where personal protection is necessary (maximum temperature of 90°C.)

The number of bends used should be kept to a minimum. Any bend used must be of the slow radius type, 90° tees must not be used.

All flue runs should be run to allow free drainage and all low points must be drained. Material for drainage should be stainless steel or plastic, avoid the use of copper.

Flue systems should meet the applicable sections of:-

BS 6644: 1991 or BS 5440 Part 1 & 2
British Gas publication IM11
CIBSE Applications Manual AM3 - Condensing Boilers
Third Edition of the 1956 Clean Air Act Memorandum

In addition to the above requirements of the Building Regulations should be strictly observed.

Care should be exercised with tall flue systems to ensure that excess buoyancy is not created. If this is unavoidable draught stabilisers should be considered plus a time delay device to prevent the boiler short cycling otherwise frequent nuisance lockouts may occur.

The boiler should be sited in accordance with BS 6644: 1991 with respect to protecting the boiler from damage, air for combustion and ventilation, discharge of products of combustion, clearances for service and access, temperatures, noise levels, the disposal of boiler water and the effects of flooding of the boiler house or seepage from a roof top boiler house. See section 1 for required boiler clearences for service and access.

GAS CONNECTION / ELECTRICAL CONNECTION

Boiler siting and base

A level non-combustible floor capable of supporting the weight of the boiler filled with water, see Table 9, together with any additional weight bearing down on the base from connections, etc. must be provided. This will typically be a 50mm concrete plinth with an area equal to that plan of the boiler.

It is not recommended to install commercial boilers in kitchens or living areas.

Gas supply

Where there is an existing primary gas meter, the appropriate gas supplier/undertaking must be consulted to ensure that the service/meter supply capacity is adequate for the proposed installation.
The burner gas connection sizes are given in Fig. 1.
The gas supply pipe should be sized to allow the minimum operating pressure to be available at the burner inlet under full running conditions.
The pipe should be sized to prevent excessive pressure drops under full running conditions.
Where gas boosters are required attention is drawn to the Gas Act 1986, Schedule 5, Part II, paragraph 8 (4). Guidance is given in IM/16 "Guidance Notes on the Installation of Gas Pipework, Boosters and Compressors in Customers Premises" published by British Gas Plc. The gas booster should be electrically interlocked to the burner.

Adjustment by the factory

The boiler is adjusted by the factory to a maximum nominal heat load and for use with natural gas (G20)

Supply pressure

The supply pressure of natural gas must be between the following:
- 17,5 mbar
- max 25 mbar

The supply pressure is measured on the gas valve inlet (see Fig 12).
If the supply pressures are outside the range of 17.5-25 mbar, the boiler must not be put into operation. The gas utility company must be informed.

CO_2 content

When commissioning and during regular servicing of the boiler as well as after any conversion work on the boiler or the flue system, the CO_2 in the flue must be checked.

When running on natural gas, the CO_2 content must be between 8% and 8.5%. (Measure in the non condensing mode)

Too low CO_2 values may cause ignition problems. The CO_2 value is adjusted by setting the gas pressure on the gas valve (see Page 22).
The air volume set at the factory must not be changed.

Electrical Supply

A 230V 50Hz AC single phase electrical supply is required. The incoming mains supply should be terminated via a double pole fused isolator to the boiler, see Fig. 13 for wiring details. A fused supply is required. The Boiler has a 6,3A internal fuse.

Power Requirements

The electrical supply is to feed control circuits and gas vales.

Typical loadings:	EC 40	90 W
	EC 65	100 W
	EC 90	130 W
	EC 120	150 W
	EC 160	175 W
	EC 200	200 W
	EC 250	320 W

All on site wiring shall conform to I.E.E. Regulations.

Wire lengths

Wires for sensors or bus information are not fed with mains voltage but with low voltage. They should not be put parallel to mains wires (this may lead to disturbances), otherwise screened wires have to be used.
Maximum lengths of wires for all sensors:
– Copper wires upto 20 m: 0,6 mm∅
– Copper wires upto 80 m: 1 mm^2
– Copper wires upto 120 m: 1,5 mm^2
Inside the boiler, al cables have to be laid in the cable clips an, when led out of the boiler, fixed in the strain relief clamps.

Circulating pumps

The electrical permitted load for each pump output is $I_{N\ max}$ = 1 A.

Fuses

Fuses in the control and regulating unit:
- F100 - 4 A 250 V: mains
- F101 - 4 A 250 V: gas solenoid
- F102 - 6 A 250 V: fan

Fuses in the fan:
- F10 - IA/1.5 A 250 V

Connection

The block diagram must be followed!
Special accessories must be fitted and connected according to the instructions provided.
Connect to the mains. Check earth continuity and resistance to earth.
Special accessories must be connected according to the block diagram.

Outside temperature sensor (included)

The outside temperature sensor is located under the hood of the control and regulating unit. See block diagram for connection.

Replacing wires

All connecting wires apart from the mains connection must be replaced when necessary with special wire. When replacing the mains cable only cables Type H05VV-F complying with BS 6500 Table 16 must be used.

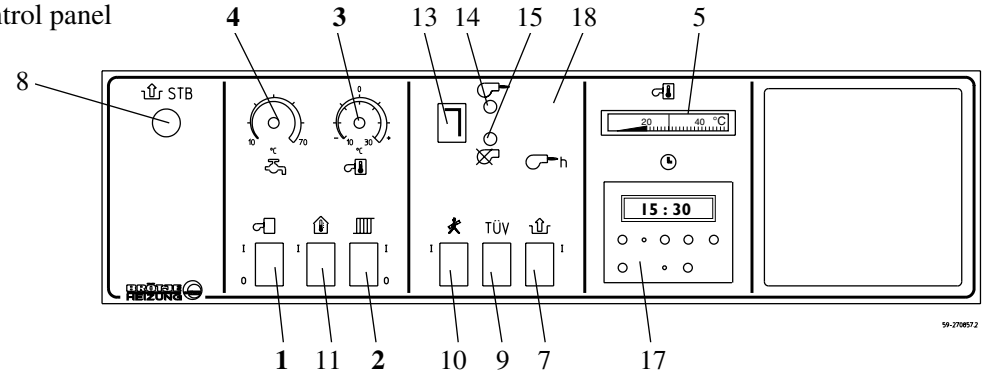
Commissioning

Before commissioning the boiler, read the operating instructions!
The exhaust gas levels must be checked.

The CO_2 content must lie between ➡ **8 - 8.5%**.
(In the non condensing mode)

If the value is not reached, the gas pressure on the regulator must be adjusted.
Commissioning must be undertaken by C.O.R.G.I. registeres installers. The latter must inform the operator about handling and operation of the unit and its safety devices and hand over the operating instruction(s) for the central heating system. These instruction(s) must be kept permanently at the place of installation.

Fig 6 Control panel



1. Operating switch
2. Heating circuit switch
3. Central heating regulator
4. Hot water regulator
5. Boiler temperature display
7. Reset button (burner)
8. High limit reset
9. Test button
10. Chimney sweep button
11. Correction button - heating characteristic
13. Display (figures and symbols)
14. Display (green = burner operation)
15. Fault lamp - red
17. Timer (see Variant C)*
18. Operating hour counter"
* Special accessories

Operation for test purpose

All variants A are for test purposes only (installer)

Attention!

Complete heating and DHW mode is only possible with outdoor temperature sensor and room control QAA 70 or time clock EMSU

No frost protection

Without the outdoor temperature sensor, no frost protection is possible

Operation without outdoor temperature sensor (for test purpose only)

Variant A1:
- set boiler temperature on regulator 3 (20-75°C),
- set DHW temperature on regulator 4 of the control panel

Short operation without DHW (installer only)

Variant A2:
The boiler is to operate for a short period (e.g. 1 hour) without DHW preparation (test purpose):
- activate regulator-stop-function (see page 13, "test button")

Operation without DHW (installer only)

Variant A3: The boiler is to operate for a longer period without DHW preparation (test purpose); i.e. operation wothout outdoor temperature sensor and room control QAA 70 or time clock EMSU:
- Do not take out resistor R3 (1400 Ω).
- Set boiler temperature on regulator 3 (20-75°C) of the control panel

Operation with outdoor temperature sensor

Variants B and C: The boiler temperature is set according to the weather conditions. By connecting the outside temperature sensor, the control is automatically changed to weather-compensation mode

Variant B1: Operation with room control QAA 70:
- Set room temperature on the QAA 70 and
- Set DHW temperature on the QAA 70

Variant C: Operation with time clock EMSU:
- Set room temperature on regulator 3 and
- Set DHW temperature on regulator 4 of the control panel.

Variant E: Operation with sequence control BCA:
- Set room temperature on the BCA and
- Set DHW temperature on the BCA (see BCA manual)

Standard values for heating characteristics

The heating characteristics is set by the factory to 2.5 (see Fig. 7). The heating characteristics can only be changed with the programming tool AZW 75.

Warmer/colder - correction

The heating characteristic curve can be corrected by hand (warmer/colder correction).
With the QAA 70 room control this is only possible if room sensor and adaption are shut off. This corresponds to the setting by the factory (delivery state of the boiler - procedure for shutting off room sensor see below). The heating characteristic is corrected in the following way: set the required correction of room temperature on central heating regulator 3 (Fig. 6) (max ± 3°C). Afterwards press button 11 on the control panel until display 13 on the control panel changes to F. Further correction of the heating characteristic is only possible after about 10 minutes.

Automatic adjustment of the heating characteristic

When using QAA 70 room control and room sensor the heating characteristic is adjusted automatically (adaption of the heating characteristic). For this purpose room influence and adaption must be released on the QAA 70 room control.

➜ Release room sensor:
Press buttons 9 and 11 on the control panel simultaneously until display 13 changes to ⌜

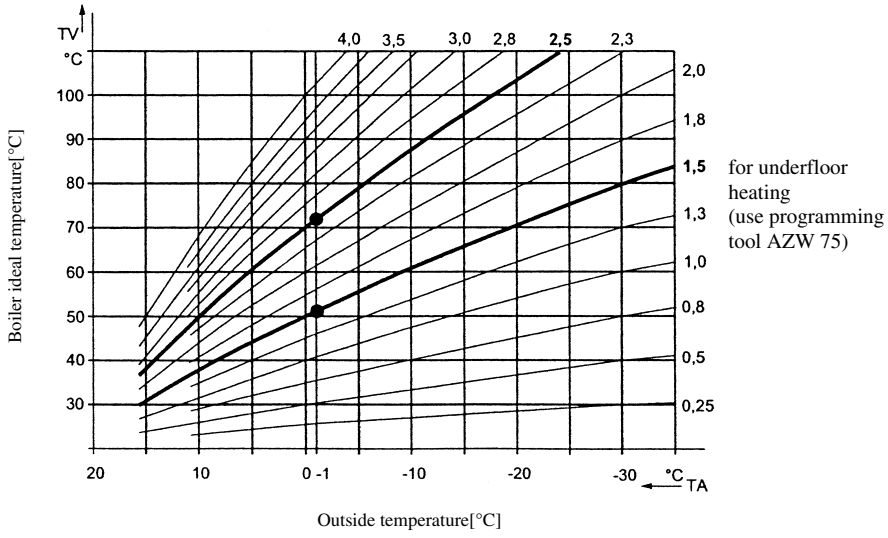
➜ Release adaption:
Press buttons 10 and 11 on the control panel simultaneously until display 13 changes to ⌜

Should a permanent heating characteristic be required again, room influence and adaption must be shut down again.

➜ Shut down room sensor:
Press button 9 and 11 on the control panel simultaneously until display 13 changes to ⌟

➜ Shut down adaption:
Press button 10 and 11 on the control panel simultaneously until display 13 changes to ⌟

Fig. 7 Standard values for heating characteristics



OPERATION / FUNCTIONS

Hot water regulation

The hot water demand has priority over heating demand.

Daytime automatic heating limit control

The heating limit switch of the daytime automatic heating limit control switches the central heating pump off when the weather is warm. When heat is demanded, the heating limit switch again activates the circulating pump. The automatic heating limit control is inactive in the “manual“ mode and when the presence button on the QAA 70 room control is activated.

Rapid heat up

Only possible when QAA 70 room control and active room sensor are connected, rapid heat up/rapid heat reduction becomes effective when the heating changes from frost protection or reduced operation to nominal operation and at the same time the ambient temperature is more than 1.5°C below the target ambient temperature (also when the target ambient temperature has been increased on the room control).
Rapid heat up stops when the ambient temperature is less than 0.25°C below the target ambient temperature.

Rapid heat reduction (with room sensor)

When the heating is switched from nominal operation to reduced operation or frost protection mode, rapid heat reduction is active (central heating pump is switched off).

Rapid heat reduction (without room sensor)

This function switches off the pump of the heating circuit, if a lower target room temperature is switched to (e.g. reduced temperature), it is designed for heating systems operating with outdoor temperature sensor, but without room sensor.
The pump of the heating circuit is switched off for max. 5 hours. At outside temperatures of less than - 10°C, the pump is not switched off.

Switch-off times:

Outdoor temp.	-10°C	0°C	+10°C
Switch-oft time	0 h	3 h	5 h

Boiler frost protection

If the boiler temperature falls below boiler frost protection, the burner and the heating circuit pump come into operation. If the boiler temperature rises above the switch off limit the burner is switched off, the circulating pump remains operating during the overrun period.

Central heating frost protection

In systems with outdoor temperature sensors, the central heating frost protection is switched on and off via the outdoor temperature.
The pump of the heating circuit is switched as follows:

Outdoor temp.	Pump
< -10°C	permanent operation
< 1,5°C	operates for 10 min every 6 hours
> 1,5°C	switched off

Frost protection for the building

The building is frost-protected in all operating modes.

- with QAA 70 (room sensor <u>activated</u>): The set room temperature for frost protection is active in all operation modes.
- with time clock EMSU or QAA 70 (room sensor <u>not activated</u>): Building frost protection is active in normal and in reduced operation mode (through heating demand).
- Room thermostat Building frost protection is active through heating demand of the room thermostat.

Hot water frost protection

The storage tank is protected against freezing; the storage tank is heated automatically if the target value is not reached

Anti-cycling function

To reduce the number of burner starts, the boiler has an anticycling function with a delay of 3 min. between two burner starts.

Chimney sweep function

By pressing button 10 (> 3 seconds) the so-called “chimney sweep function“ is activated. The burner switches on, heats up the water to the set nominal boiler temperature and switches off when the water temperature reaches 80°C. After switching off the regulator again works according to the previously active programme.

TÜV function

By simultaneous buttons (9 and 10) for more than 3 seconds, the TÜV function is activated, i.e. the internal temperature regulator and temperature control function is inactive. The boiler then fires at maximum rate until the safe temperature limiter (STB) is triggered. If one of the two buttons is released, the TÜV function is interrupted.

Test button

By pressing button 9 (> 3 seconds) the regulator stop function is activated. Therefore the speed of the fan motor - and therefore the heat output - can be set by hand on the hot water temperature regulator. Further pressing button 9 or switching off the burner ends the test function.

Modulation

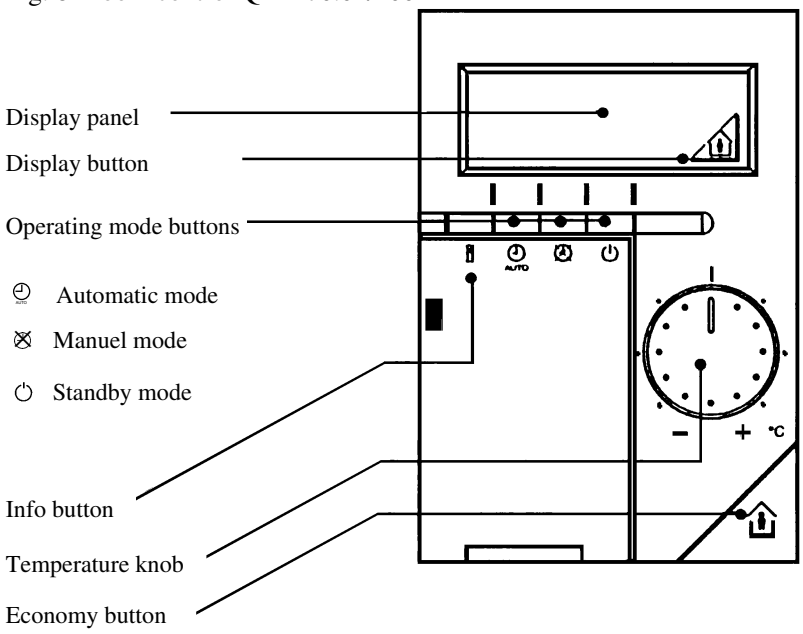
The actual boiler temperature is compared with the target boiler temperature calculated by the heating regulator via the boiler temperature sensor. If there is a difference between these values, the integrated micro-processor calculates a new fan speed. This is transmitted to the fan motor via the control signal. The new fan speed is picked up via the speed transmission cable by the heating regulator (see Fig 11). If the actual boiler temperature value has not yet reached the required level, further corrections of the fan speed take place via the control cable.

Resistance of sensors

Outdoor temperature sensor B 9		Outlet temperature sensor B1 Boiler sensor B 2 DHW sensor B3	
°C	Ω	°C	Ω
–10	642	15	1067
– 5	633	20	1090
0	623	25	1113
5	612	30	1137
10	600	35	1161
15	588	40	1185
20	575	45	1210
25	563	50	1234
		55	1260
		60	1285
		65	1311
		70	1337
		75	1363
		80	1390
		85	1417

QAA 70 room control (special equipment)

Fig. 8 Room control QAA 70.01/100



Adjustment by heating engineer

The heating engineer can activate an additional service level with the QAA 70 room control. To do this he must remove the cover of the room control and press the two buttons “arrow up“ and “arrow down“ simultaneously for at least 5 seconds until for example No. 51 appears.

Service level 51

Checking communication between QAA 70 and boiler display:
- Regular, flashing colon: communication OK
- Steady or missing colon: standby mode for communication
- Steady dashes: communication interrupted

Service level 52

Unit identification.
The identity number appears in the display.

Service level 53

Programme protection
- With Code “1“ the lock is active, i.e. all settings are only displayed at the programming level but cannot be changed.
- With Code “0“ the lock is inactive, i.e. all settings can be changed (delivery condition).

Function of entry D3/D4 (55) (terminals on the QAA 70)

- Code 1: A second room sensor (type QAW 44) is connected and activated, the display shows the temperature of the sensor (see 57)

- Code 2: Via telephone remote switch, the appliances can be switched between nominal and reduced temperature

- Code 3: Via telephone remote switch, the appliances can be switched between nominal and reduced temperature and frost protection temperature

Operating sense of the external contact of the QAA 70 (56)

If a telephone remote switch is connected to entry D3/D4 of the room control QAA 70, the operating sense can be set via param. 56:

Param. 56, "Operating sense"	Nominal temperature	Reduced temperature (if param. 55="Code 2" rsp. Frost protection temperature (if param. 55="Code 3")
000	Contact open	Contact closed
---	Contact closed	Contact open

Influence ot the external room sensor (57)

If param. 55 is set to Code 1, param 57 determines how the control weighs the temperatures of both sensors:

0%	Only the internal sensor of the QAA 70 is considered, the external sensor is neglected
50%	The control takes the mean value of both sensors
100%	Only the external sensor is considered, the internal sensor of the QAA 70 is neglected

Display of set temperature (58)

The set temperature in the display can be shown either as an absolute value ("abs") or relative to the nominal room temperature ("rel")

Temporary cancel the programming blockage

By pushing both buttons "▲" and "+" simultaneously for at least 5 seconds the programming blockage will be cancelled temporarily and the adjustments could be changed. When the lid of the room controller is closed the programming blockage then is effective.

Permanent cancellation of the programming blockage

To permanently cancel the programming blockage both buttons "▲" and "+" have to be pushed simultaneously for at least 5 seconds and in the installer programming level in service level 53 the code has to adjusted to "0".

Fault switch-off

In the case of switch-off caused by a fault, the message "error" appears in the display panel of the room control.

QAA 70 room control

With the room control (special equipment) you can amongst other things:
- Set control functions from the room (remote control)
- Make adjustments (e.g. individual time programmes)
- Call up information (e.g. temperature levels) and much more

All features are described in the manual which is supplied with the room control. Only some important functions are described below.

Buttons for operating modes

Automatic mode ⏲ : The central heating operates automatically according to the time programme set (central heating programme)

Manual mode ⊗ : The time programme is inactive.
The heating can be manually switched with the presence button at any time from nominal temperature to reduced temperature and vice versa.

Standby mode ⏻ : The central heating and hot water mode is switched off and is only again switched on if the frost protection temperature is not reached.

Economy button

You can manually intervene in the set time programme (central heating programme) with the presence button.
Display in the display panel lights up: the central heating operates at nominal temperature.
Display in the display panel: the central heating operates at reduced temperature.
The economy button works with manual mode: permanently.
With automatic mode: short term.
The set time programme (central heating programme) is again active with the next automatic changeover.
If the display in the presence button flashes when the room control is operated, this means the control unit on the boiler is in an invalid mode. If the display shows no reaction when operated, the reason for this fault can be for example defective connection with the control unit or power failure.

Temperature knob

You can adjust the nominal temperature with the temperature knob. Each dividing line corresponds to about 1°C.
Before you change the temperature on the knob, you should set the thermostat valves to the required temperature. You should only re-correct when the temperature has adapted.

Temperature sensor in the room control

The temperature sensor fitted in the room control is only active after weather control with room influence has been selected on the control unit.

DHW preparation

The DHW preparation is factory-preset to multiple loading (first loading 1 h before starting of the CH mode)

Table 1 Setting of hot water target temperature

QAA 70 operating mode	Central heating operating condition	Hot water cicuit operating condition	Hot water target temperature
Standby	–	Frost protection	10 °C *
Manual mode	Reduced operation	Reduced operation	40 °C *
	Nominal operation	Nominal operation	Target value QAA 70
Automatic mode	Reduced operation	Reduced operation	40 °C *
	Nominal operation	Nominal operation	Target value QAA 70

*Pre-set by the factory

MAINTENANCE

Cleaning

It is essential to clean the boiler, heat exchanger and burner once a year by an approved gas installer. The need to clean the boiler and burner can also be indicated by a CO emission value that exceeds 200 ppm. Before starting work, the gas isolating valve must be closed and the electricity to the boiler turned off.

Condensation water siphon

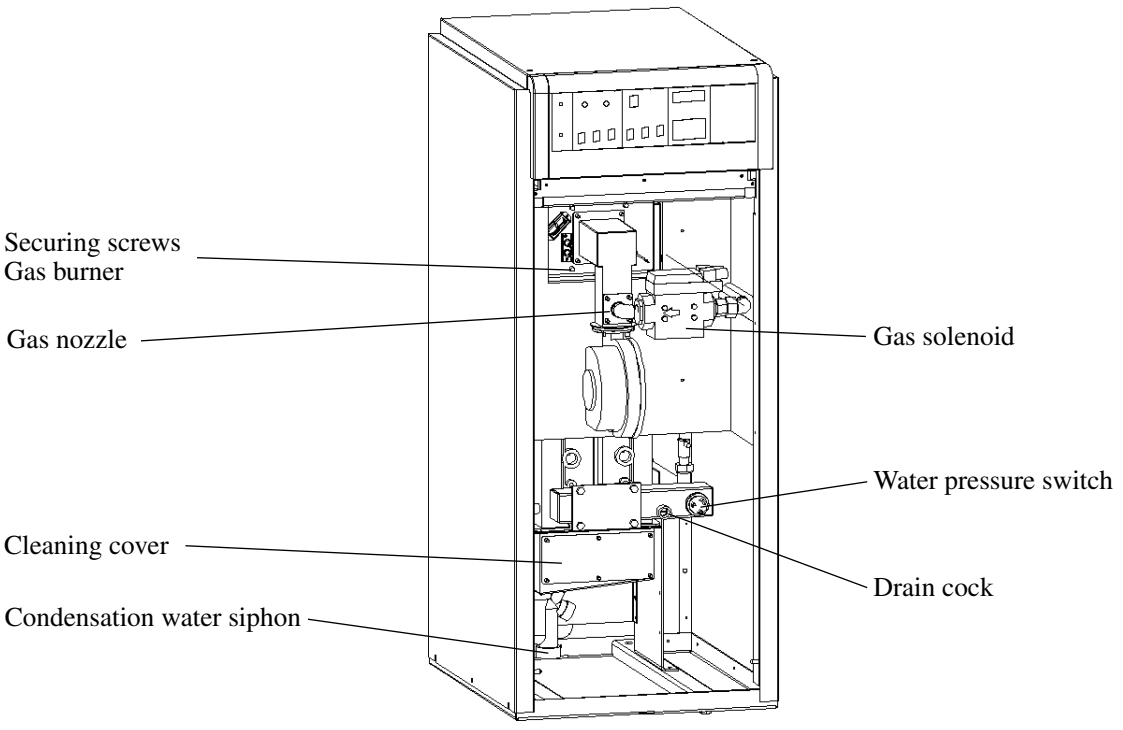
The condensation water siphon should be cleaned every one or two years. To do this the upper screw connection on the siphon is loosened and the siphon is pulled away downwards. Remove the siphon complete with hose from the boiler, disconnect and rinse through with clean water. Re-assemble the siphon in reverse order.

Removing gas burner

Remove the gas burner before cleaning the heating surfaces. To do this disconnect the electrical wiring to the fan from the terminals and pull the hose of the air pressure switch from the fan.

- Unscrew the screw connection of the gas supply pipe in front of the gas solenoid.
- Pull off electrical wires and plugs from the gas solenoid, gas pressure switch, ignition electrodes as well as the ionization electrode
- Loosen securing nuts of the burner (SW13) and pull out the burner complete with mixing chamber, fan and gas solenoid forwards
- Clean burner tubes with soft brush.

Fig. 9 Boiler view



Cleaning

Cleaning the heat exchanger and condensation water collecting sump. Electrodes

- Remove cleaning cover at the front bottom of the condensation water collecting dish
- Clean with plastic or stainless steel brush and water using a normal detergent (e.g. washing up liquid). Finally rinse off with a gentle water jet.
- Re-fit cleaning cover
- Re-install burner after cleaning is completed
- Check nominal heat load and exhaust gas values

Electrodes

In order to ensure good ignition and flame sensing, the exact fitting position and distances in accordance with Fig 10 must be used. The ionization current must have the following values when the burner is in operation.

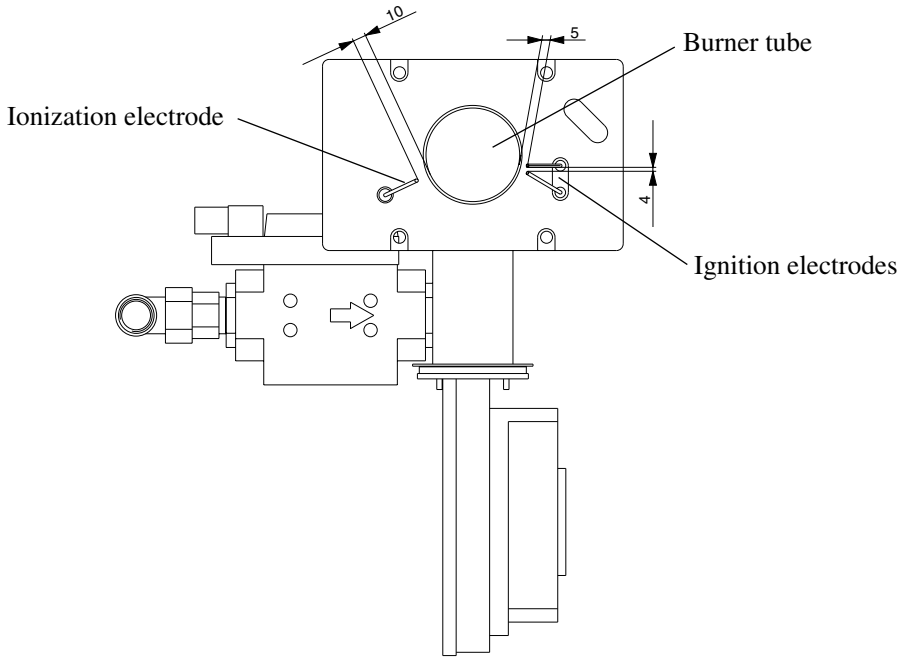
- At minimum output >	5µA DC
- At maximum output >	10µA DC

Note: To check ionisation current fit a micrometer in series with the probe connecting lead

Warning: The probe will be subject to mains voltages whilst in operation

Fig. 10 Electrodes

View from the rear (combustion chamber)



CONTROL AND REGULATING UNIT

Functional description

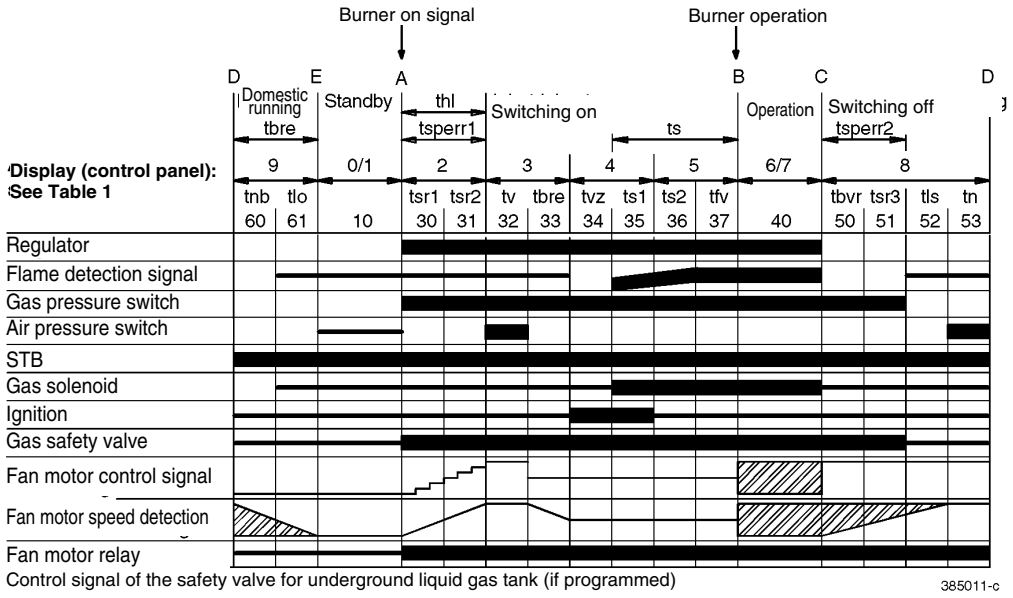
Control and monitoring of the burner by the control and regulating unit LGM 11.44 with ionization electrode.

- Automatic start-up according to programme with flame detection (Fig 11)
- The display in the control panel shows the individual operating and programme conditions by way of figures or letters (see Table 2)

Fault switch-off

Safety switch-off on flame failure during operation.
After each safety switch-off a new ignition attempt is made according to the programme. If this is not successful the boiler will shut off due to fault. Following shut-off due to fault the reset button in the control panel must be pressed.
With operating faults (red lamp) the figure on the display in the control panel indicates the cause of the fault (see Table 4).

Fig 11 Control and regulating unit LGM 11. 44 A 2590 programme sequence



Key:

- Required signals
- Un-permitted signals (during these periods a signal causes fault switch-off, start inhibit or interruption)

A Start
B Operating position of the burner
C Regulator switch-off
D End of switch-off
E End of domestic running

Times	Meaning	Phases
tnb	Tolerated overrun combustion time	60
t10	Test period: fan stationary	61
thl	Fan running to high speed time	30/31
tsr…	Test periods	30/31
tv	Pre-purge time	32
tbre	Fan braking time	33
tvz	Pre-ignition time	34
ts1	Flame formation time	35
ts2	Ignition OFF	36
tfv	Flame detection signal	37
ts	Safety time	35/37
tbvr	Test period	50
tsr3	Test period	51
tls	Fan running to high speed time	52
tn	Post purge time	53

Table 1 Operating and programme conditions of the control and regulation unit

Display (Function No.)	State of operation	Green lamp	Description of function
0	Standby	–	Burner in standby
1	Heating demand	–	Gas pressure too low, gas pressure sensing switch does not close
2	Fan start-up	–	Self-test of burner start and fan start-up
3	Pre-purge time	–	Pre-purge, fan braking-time on start load speed
4	Ignition phase	– on	Ignition, start of safety time burner lights up, ionisation current is built up
5	Flame detection	on	Flame signal stable, ignition off
6	Hot water operation	on	Hot water tank is loaded, burner on
7	Central heating operation	on	Central heating operation, burner on
8	Switching off	–	Self-test after regular switch-off
9	Changeover from switching-off to standby	–	Fan post-purge time

Table 2 Messages of control and regulation unit (**Displays flashes** and **red lamp off**)

Display flashes	Failure or operation message without lockout	Green lamp	Description Possible failure reasons resp. function mode
1	Boiler temperature sensor is missing or not connected	–	Boiler temperature sensor is defect, broken cable
2	Tank temperature sensor is missing or not connected	–	Tank temperature sensor missing, not connected or broken; broken cable
4	TÜV-function active	on	Test buttons for chimney sweep and TÜV was pressed
5	Chimney sweep function active	on	Test buttons for chimney sweep was pressed
6	Start-up inhibited (gas pressure instable) [1])	–	Instable gas pressure; gas cock closed
7	Temperature set point overiden	on	Burner modulation adjustable by hand
8	Hot water tank sensor 1: open circuit	–	Open circuit of tank sensor, cable or connector
9	Hot water tank sensor 2: open circuit	–	Open circuit of tank sensor, cable or connector (only if sensor 2 is active)
0	Hot water tank sensor 1: short circuit	–	Short circuit of tank sensor, cable or connector
A	Anti legionella function active	on	Tank is brought to 65 °C
c	Hot water tank sensor 2: short circuit	–	Short circuit of tank sensor, cable or connector (only if sensor 2 is active)
C	Chimney sweep button closed after reset	–	Operating fault: After button 7, button 10 was pressed (button 7 has to be pressed twice)
d	TÜV test button was closed after reset	–	Operating fault: After button 7, button 9 was pressed (button 7 has to be pressed twice)
E	Cycling active (with permanent 24 h operation, appliance is switched off and on	–	Self test of control unit
F	Warmer/colder correction made (only without automatic adaptation)	–	Adaptation of heating characteristic curve
L	Standard values are taken over (heating characteristic 1,8)	–	Standard values are taken over from memory
H (Pseudo 3)	Heating characteristic 0,8 (underfloor heating)	–	Standard values for underfloor heating are taken over
P	Central heating pump: short operation to prevent blockage	–	Self test of control unit
U	Hot water pump: short operation to prevent blockage	–	Self test of control unit
o	Supply pump: short operation to prevent blockage	–	Self test of control unit
n (Pseudo 1)	Adaptation released (QAA 70 control)	–	Automatic adaptation of heating characteristics (see page 11)

(Pseudo 2)	Adaptation locked (QAA 70 control)	–	Automatic adaptation of heating characteristics locked (see page 11)
(Pseudo 4)	Room influence released (QAA 70 control)	–	Room temperature is measured for automatic adaptation of heating characteristic (see page 11)
(Pseudo 5)	Room influence locked (QAA 70 control)	–	Room temperature is not measured (see page 11)
(Pseudo 6)	Communication error between EC ZRB and EUROCONTROL M, ZR EC 1/2 resp. EUROCONTROL BCA	–	Address of EC M resp. ZR EC 1/2 is wrong; bus leads or connector open circuit, EC ZRB defective
(Pseudo 9)	Amplifer correction, internal Test [2])	–	EMC problem (external influences as e. g. radio waves, electric induction, relay contacts): Check cable conducts
(Pseudo 11)	Check of sensor values (Multiplexer), internal test [2])	–	EMC problem (see above)
(Pseudo 12)	A/D transformer test, internal test [2])	–	EMC problem: electronic boards dirty, humid. Check board and connectors
(Pseudo 13)	Water pressure switch open [2])	–	Water pressure of installation too low, leakage in system. Refill with water; check water pressure switch an cables

[1]) After switching off 5 times in phase 36, there is a lockout for max. 2 hours.
[2]) Blocking the start up; boiler restarts automatically after the fault has disappeared.

Table 3 Fault messages of the control and regulation unit **(display flashes** and **red lamp on)**

Display flashes	Failure or operation message	Possible failure reasons resp. function mode
1	Defective gas valve feedback	- internal fault before exit gas valve, internal relay
2	Overheat thermostat has triggered	- Boiler temperature too high or capillary tube defective
3	Defective safety relay feedback (for gas valve)	- Internal fault on board: relay for gas valve - Check gas pressure sensing switch
4	Flame signal not permitted or flame not detected in phase 37 (no ionisation signal)	- Mains cable: L and N swapped - Ionisation electrode defective - Ionisation cable open circuit or connected to earth - Flue gas is sucked in, (CO_2), check tightness of flue system - No ignition: ignition leads or electrodes defective; gas valve does not open: - Open circuit of supply leads, connector, gas valve coils - No signal pressure from fan - Air tube from fan is bent - Gas valve not set correctly
5	Wrong fan speed	- Minimum speed limit of the fan or speed limit during pre and post purge time (has to be exeeded) Fan speed suddenly too low because of EMC problems - Fan defective, faulty PWM signal feedback [2])
6	Max. time of fan to run to high speed exceeded or air pressure control does not close during phase 52	- Fan speed is not reached within 52 sec. - Air pressure control defective, no air pressure, air tube from fan is bent
7	Flame continues to burn, tolerated overrun combustion time in phase 60 exceeded	- Gas valve internal leakage - Ionisation current still present after switch off.
9	Defective ignition feedback	- internal board fault at exit transformer [1])
0	Max. time of fan to run to high speed exceeded or air pressure control does not close during phase 31	- Fan speed is not reached within 52 sec. - Air pressure control defective, no air pressure, air tube from fan is bent
A	Fan braking time exceeded (pre purge at ignition fan speed)	- Fan speed D_A_2 has to be reached within 51 sec. - Open circuit at cable, connector to fan [2]) - Air pressure control switch does not open
H	Boiler temperature sensor open circuit	- Open circuit at sensor, cable or connector
L	Boiler temperature sensor short circuit	- Short circuit at sensor, cable or connector [2])
	All other error messages	- Control and regulation board defective (to be changed) - internal faults

[1]) Replace control and regulation board
[2]) If necessary, change defective parts with original spare part

Table 4 Fault messages of the control and regulation unit **(display** and **red** lamp **flash)**

Display flashes	Failure message	Possible failure reasons resp. function mode
3	Minimum speed limit of the fan or speed limit during pre and post purge time (has to be exeeded)	Programming fault (wrong fan speed setting)
c	Incorrect installation system selected [1]	Programming fault (choose installation system no. 8)
d	Incorrect sensor type [1]	Programming fault
(Pseudo 7) L	Ionisation signal after resetting the control unit	If this is still active after the cable of the ionisation electrode has been removed, then please change the control and regulation unit [2]
(Pseudo 12) r	Boiler was locked by the lockout reset button 7	Operation fault: (button 7 was pressed) button 7 has to be pressed again
Any other message	Control and regulation board defective	Change Control and regulation board

[1] Only after reprogramming the appliance with the programming tool AZW 75

[2] Possibly the control board is dirty or moist

Further messages of the control and regulation board **(Display, green** and **red light on)**

Display flashes	Failure message	Possible failure reasons resp. function mode
8	Reset button was pressed, or: If message disappears after a certain time: Instable power supply (voltage too low)	Operating fault Voltage too low, loose contacts from/to transformer, fuse F 101 broken, short circuit at - transformer - gas valve - overheat thermostat - gas pressure sensing switch - water pressure switch
	The following messages can only appear while the programming tool AZW 75 is connected to the control unit:	
P	Control and regulation unit is in programming mode	
L	Loading of the parameters into the AZW	
5	Parameters are stored into the control and regulation unit	
F	Fault during parameter transfer	Repeat programming

CO_2 - ADJUSTMENT / CHANGEOVER TO ANOTHER GAS QUALITY

Burner does not function:

No power at the control and regulating unit, e.g. no "burner ON" signal from the heating regulation, gas pressure switch defective or incorrectly set, water pressure too low, pressure control does not switch through etc.

Burner goes to fault:

No ignition:
No ignition. Ionisation electrode has earth contact.

Despite lighting the burner goes to fault after the safety period has finished: Ionization electrode defective or dirty. Ionization electrode does not reach the flame.

Gas/air coupled control

The gas volume is matched to the air volume set by the factory with the gas/air coupled control of the boiler.
The air volume for low load and full load (modulation from 40 to 100%) must not be changed.

The CO2 content at full load as well as at low load must be between the following values for natural gas.
CO_2 content (natural gas): 8-8.5%.
Measured in the non condensing mode.

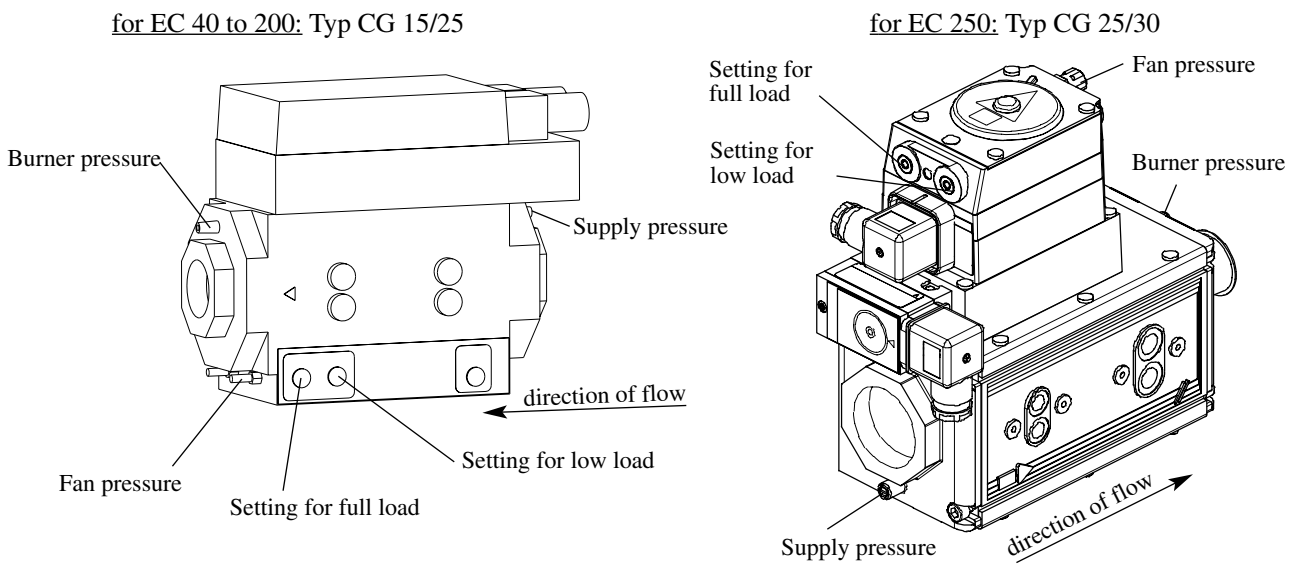
The TÜV button must be pressed (status display "7" flashes). In this operating condition the fan speed (full load/low load) can be set via the hot water temperature regulator (Item 4 in Fig 6).

CO_2 adjustment

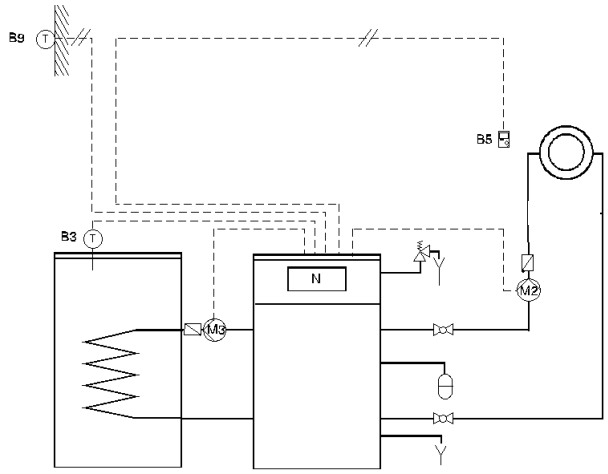
- Hot water regulator: right stop ➡ full load
  Set CO_2 content with the screw for full load on the gas valve (Fig 12)
- Hot water regulator: left stop ➡ low load
  Check CO_2 content and set this with the screw for low load on the gas valve if divergent (Fig 12).

If the low load setting is changed the full load setting must also be checked again.
To establish the setting hold the TÜV button depressed for several seconds (Status display "7" permanently lit).
The boiler switches back to heating mode.
The plate on the boiler must be changed using the additional plate "changed to….." provided.

Fig. 12 Gas valve: Make Kromschröder

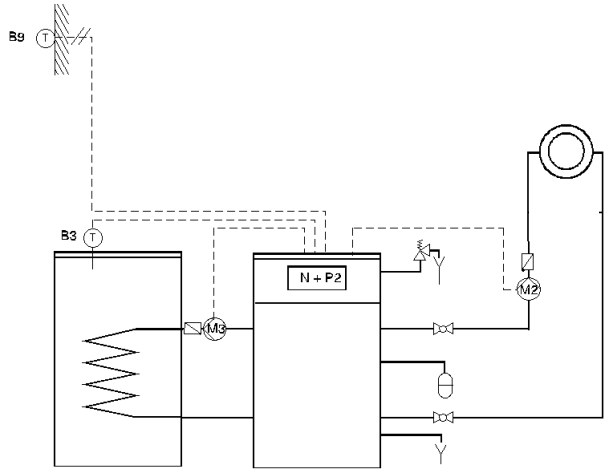


Example 1: a pump circuit with QAA 70 room control, including storage tank temperature regulation



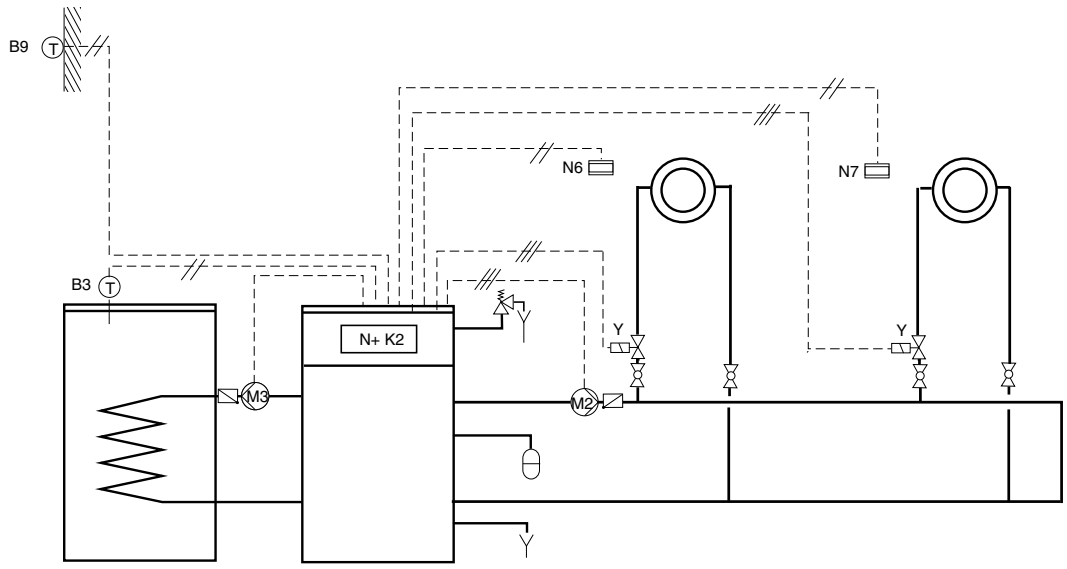
Key
B3 Storage tank sensor QAZ 21
B5 Room control QAA 70
B9 Outside temperature sensor QAC 31
M2 Pump for pump heat circuit
M3 Storage tank charging pump
N Control and regulating unit

Example 2: a pump circuit with timer (room control not possible), including storage tank temperature regulation



Key
B3 Storage tank sensor QAZ 21
B9 Outside temperature sensor QAC 31
M2 Pump for pump heat circuit
M3 Storage tank charging pump
N Control and regulating unit
P2 EMSU timer

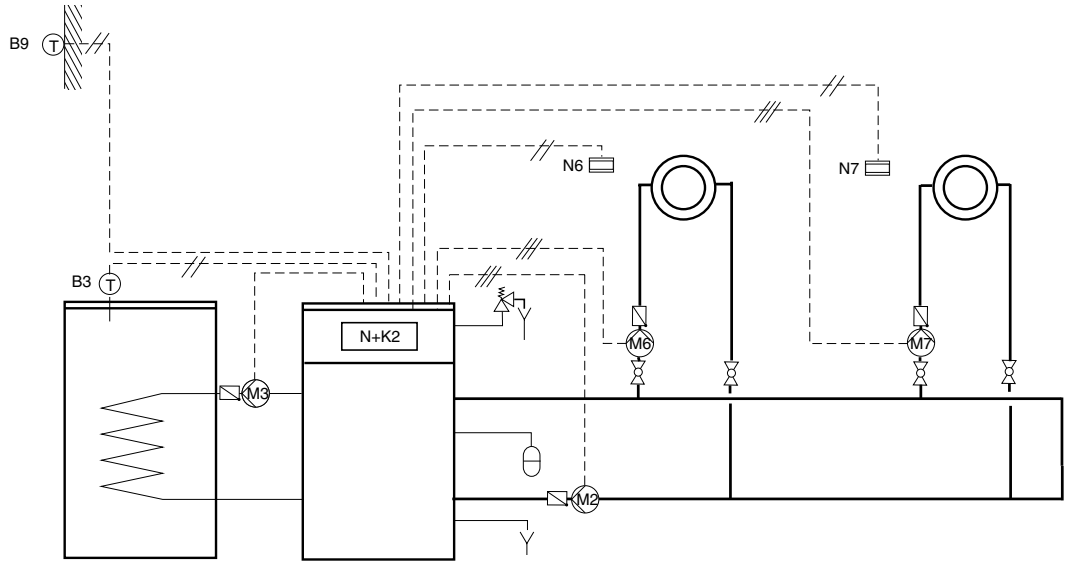
Example 3: two heating circuits with one pump with room temperature regulator, including storage tank temperature regulation (similar heating circuits)



Key

B3 Storage tank sensor QAZ 21	M3 Storage tank charging pump
B9 Outside temperature sensor QAC 31	N Control and regulating unit
K2 HTS extension module	N6 Room temperature regulator circuit 1
M2 Supply pump	N7 Room temperature regulator circuit 2
	Y1 Solenoid

Example 4: two pump heating circuits with room temperature regulator, including storage tank temperature regulation (different heating circuits)



Key

B3 Storage tank sensor QAZ 21	M3 Storage tank charging pump
B9 Outside temperature sensor QAC 31	M6 Pump circuit 1
K2 HTS extension module	M7 Pump circuit 2
M2 Supply pump	N Control and regulating unit
	N6 Room temperature regulator circuit 1
	N7 Room temperature regulator circuit 2

Diagnostic flow chart

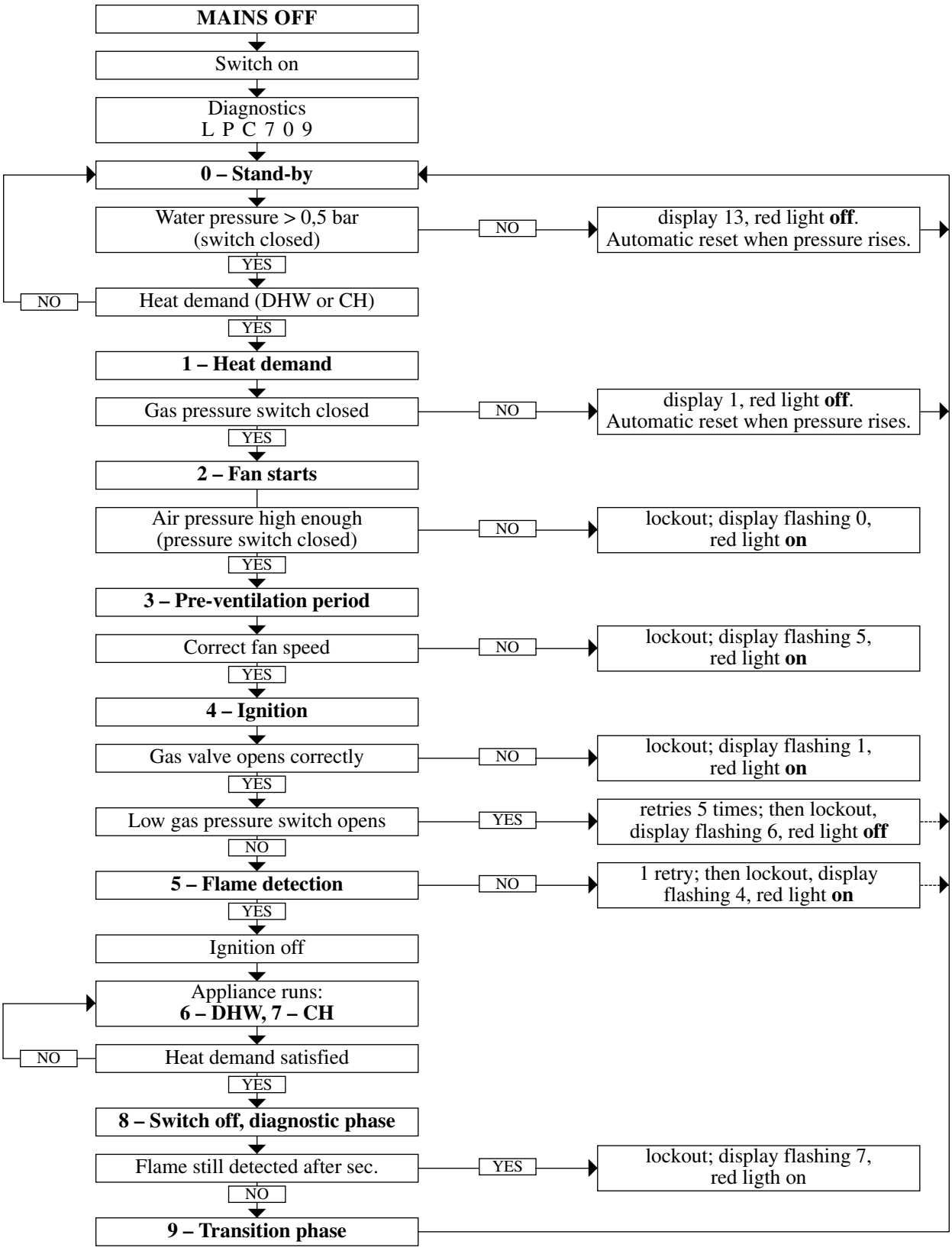
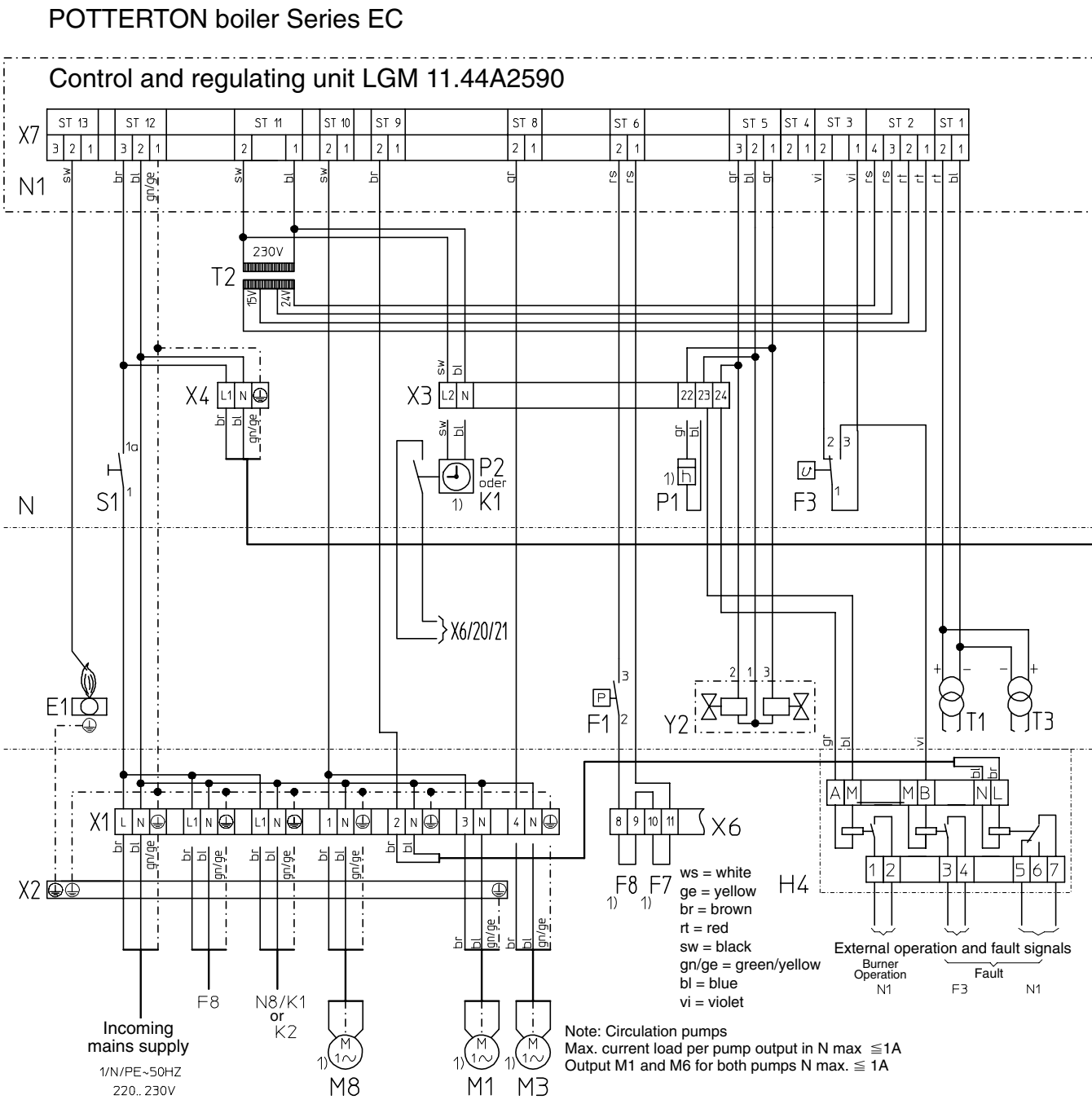
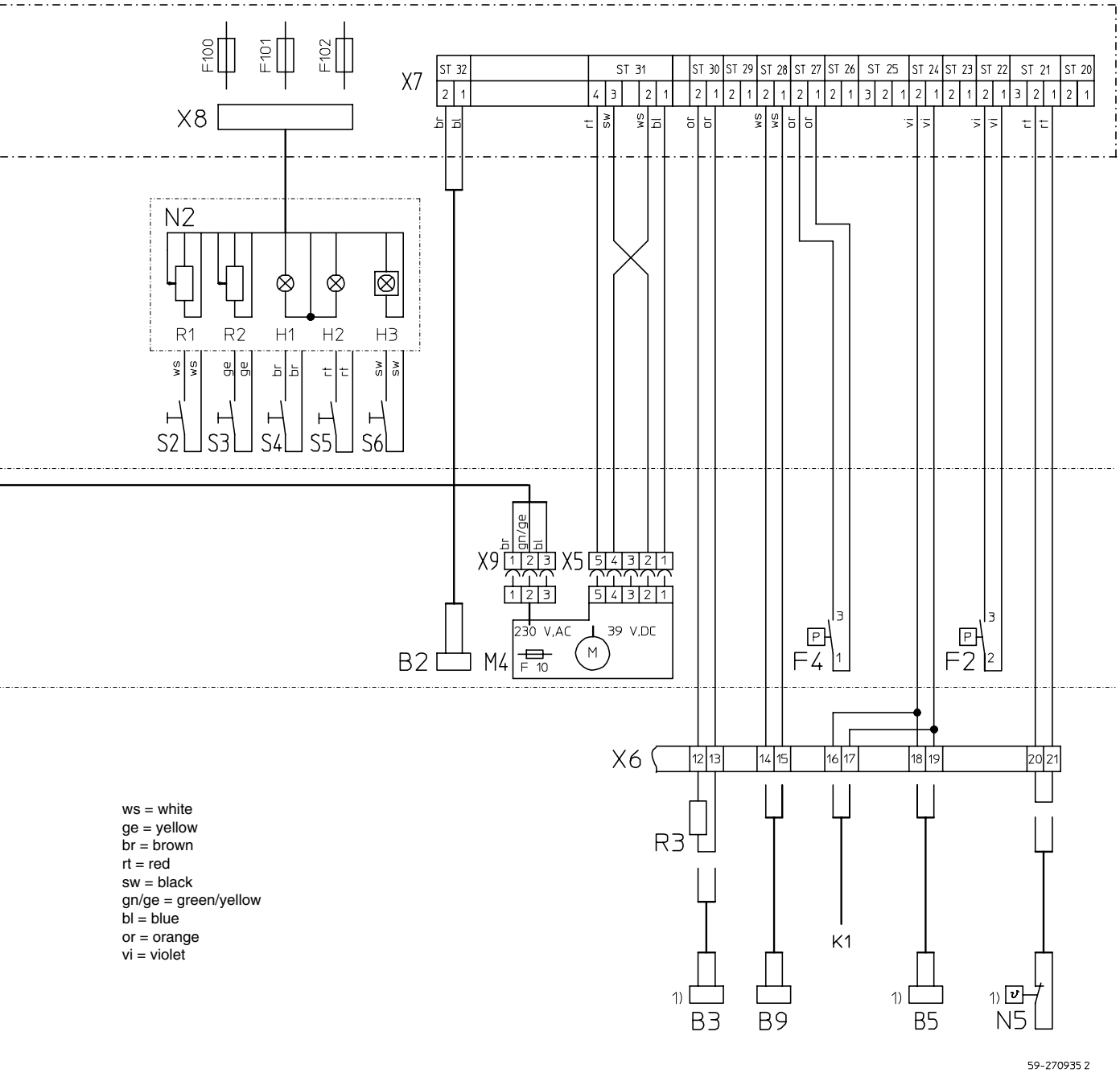


Fig. 13 Block diagram



Key:

B2	Boiler sensor	F101	Fuse T4, 0 H250 (gas solenoid)	P2	Timer EMSU [1]
B3	Storage tank sensor [1]	F102	Fuse T6, 3 H250 (fan)	N	Control and regulating unit
B5	Room control QAA 70 [1]	H1	Fault display (red)	N1	Control and regulating unit LGM 11.44A2590
B9	Outside temperature sensor	H2	Display burner operation (green)		
E1	Ionization electrode	H3	Display operating condition	N2	Control element
F1	Gas pressure switch	H4	Operation- and fault connector	N5	Room temperature regulator [1]
F2	Air pressure switch	K1	EM ZRB or EC ZRB [1]	N8	Zone regulator [1]
F3	Safe temperature limiter (high limit)	K2	HTS [1]	R1	Hot water temperature regulator
F4	Water pressure switch	M1	Pump, primary circuit	R2	Boiler temperature regulator
F7	Temperature control [1]	M3	Storage tank charging pump [1]	R3	Resistance 1400 ohms
F8	Condensation drain device [1]	M4	Burner motor		
F10	Fuse T1, 0/T1,5 (fan motor)	M8	Pump, water temperature circuit [1]		
F100	Fuse T4, 0 H250 (mains)	P1	Operating hour counter [1]		



ws = white
ge = yellow
br = brown
rt = red
sw = black
gn/ge = green/yellow
bl = blue
or = orange
vi = violet

S1	Operating switch
S2	Heat circulating switch
S3	Test button chimney sweep function
S4	Test button TÜV function
S5	Reset button
S6	Correction button room temperature
T1	Ignition transformer
T2	Mains transformer
T3	Ignition transformer (only EC 90, 120, 160 and 200)
Y2	Gas solenoid

X1	Terminal strip - mains and pumps
X2	Protection terminals - mains and pumps
X3	Terminal strip - control and regulating unit
X4	Terminal strip - mains burner motor
X5	Plug device - burner motor
X6	Terminal strip - sensor wiring
X7	Plug devices - LGM 11.44
X8	Plug device - control element
X9	Plug device - mains burner motor
X14	Plug device - flow control

[1] Special accessory

TECHNICAL DATA

Table 9 Technical data

Model			**EC 40**	**EC 65**	**EC 90**	**EC 120**	**EC 160**	**EC 200**	**EC 250**
Product-ID-No.			CE-0085AR0465						
VDE-Reg.-No.			5568						
Output at 60°C Return		kW	15.4 - 38.7	25.1 - 63.7	34.6 - 86.7	46.2 - 115.6	61.1 - 153.0	76.2 - 190.2	94.6 - 237.0
Output at 30°C Return		kW	17.0 - 42.2	27.7 - 68.6	38.8 - 94.9	50.9 - 126.4	68.0 - 166.4	84.9 - 208.0	104.2 - 257.5
Input (gross)		kW	17.6 - 44.4	28.8 - 72.1	39.9 - 99.9	53.3 - 133.2	71.0 - 176.0	89.0 - 222.0	111.0 - 277.5
Input (net)		kW	16 - 40	26 - 65	36 - 90	48 - 120	64.0 - 160.0	80.0 - 200.0	100.0 - 250
Number of Burners			1	2	3	4	5	6	7
Diameter of Injector		mm	6.00	7.50	8.50	10.0	10.0	11.0	12.3
Fuel consumption (Nat. Gas)		m^3/hr	4.2	6.7	9.2	12.7	16.9	21.2	26,5
Gas Supply Pressure		mbar	20	20	20	20	20	20	20
High fire Burner Pressure		mbar	8.0–9.5	8.0–9.5	6.5–8.0	6.0–7.5	13.0–14.0	9.5–10.5	13.5–14.5
Maximum water Pessure		Bar	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Operating water Pressure		Bar	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Nominal Flue Size		mm	150	150	150	150	180	180	180
Flue Gas Volume		m^3/hr	56.99	92.5	128.29	170.96	227.85	284.81	356.01
High Level Natural Ventilation to BS 54440 & BS 6644		cm^2	270	297	360	435	531	635	761
Low Level Natural Ventiltion to BS 5440 & BS 6644		cm^2	540	594	720	870	1062	1269	1522
Mechanical Inlet to BS 6644		m^3/sec	0.044	0.065	0.099	0.132	0.176	0.222	0.280
CO_2-content		%	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Max pressure on the flue gas flanges at high fire		mbar	1,0	1.0	1.0	1.0	1.0	1.0	1.0
Flue *)		mm	150	150	150	150	180	180	180
Boiler weight		kg	110	130	165	190	220	260	305
Boiler water content		l	6	9	12	15	20	23	26
Supplies									
Natural gas supply pressure			min. 17.5 mbar - max. 25 mbar						
Electrical connection		V/Hz	230 / 50						
Maximum electrical consumption		W	90	100	130	150	175	200	320
Hydraulic resistance	at Δt = 20 K	KPa	2	2.9	2.7	4.3	3.5	4.2	5.1
Hydraulic resistance	at Δt = 10 K	KPa	7.5	8.5	9.2	16	13.2	15.8	19.9
Water Flow	at 11°C Δt	lit/sec	0.84	1.38	1.88	2.51	3.32	4.13	5.23
Minimum Water Flow	at 25°C Δt	lit/sec	0.37	0.61	0.83	1.10	1.46	1.82	2.28
Cold Feed Size to BS 6644		mm	20	25	25	25	32	32	32
Minimum Bore									
Open Vent Size to BS 6644		mm	25	32	32	32	40	40	40
Minimum Bore									
Maximum water pressure		bar	4.0						
Max. permitted flow temperature		°C	100						
Max. achievable flow temperature		°C	82						
Dimensions									
Height		mm	1300	1300	1300	1300	1390	1390	1390
Width		mm	540	610	762	910	1150	1150	1250
Depth		mm	715	715	715	715	765	765	765

*) Adapter connections available

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