

GB Forced draught gas burners

Progressive two-stage or modulating operation

CODE	MODELE - MODEL	TYPE
3897406	AS 68/M BLU	846 T
3897606	AS 120/M BLU	847 T

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N.B.

Figures mentioned in the text are identified as follows:

1)(A) = part 1 of figure A, same page as text;

1)(A) p.4 = part 1 of figure A, page number 4.

TECHNICAL DATA

MODEL			AS 68/M BLU		AS 120/M BLU	
TYPE			846 T		847 T	
OUTPUT ⁽¹⁾	MAX.	kW	350 - 860		600 - 1300	
		Mcal/h	301 - 740		516 - 1118	
	MIN.	kW	150		300	
		Mcal/h	130		258	
FUEL			NATURAL GAS: G20 - G21 - G22 - G23 - G25			
			G20	G25	G20	G25
- Net calorific value		kWh/Sm ³	9.45	8.13	9.45	8.13
		Mcal/Sm ³	8.6	7.4	8.6	7.4
- Absolute density		kg/Sm ³	0.71	0.78	0.71	0.78
- Max. delivery		Sm ³ /h	86	100	130	151
- Pressure at max. delivery ⁽²⁾		mbar	11.7	17.3	22.5	33.3
OPERATION			<ul style="list-style-type: none"> On-Off (1 stop min each 24 hours). Progressive two-stage or modulating by kit (see ACCESSOIRES). 			
STANDARD APPLICATIONS			Boilers: water, steam, diathermic oil			
AMBIENT TEMPERATUR		°C	0 - 40			
COMBUSTION AIR TEMPERATURE		°C max	60			
NOISE LEVELS ⁽³⁾	Sound pressure	dBA	77		78.5	
	Sound power		88		89.5	

(1) Reference conditions: Ambient temperature 20°C - Barometric pressure 1000 mbar - Altitude 100 m s.l.m.

(2) Pressure at test point 16)(A) p.3, with zero pressure in the combustion chambre, with open gas ring 2)(B) p.7 an maximum burner output.

(3) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output. The sound power is measured with the "Free Field" method, as per EN 15036, and according to an "Accuracy: Category 3" measuring accuracy, as set out in EN ISO 3746.

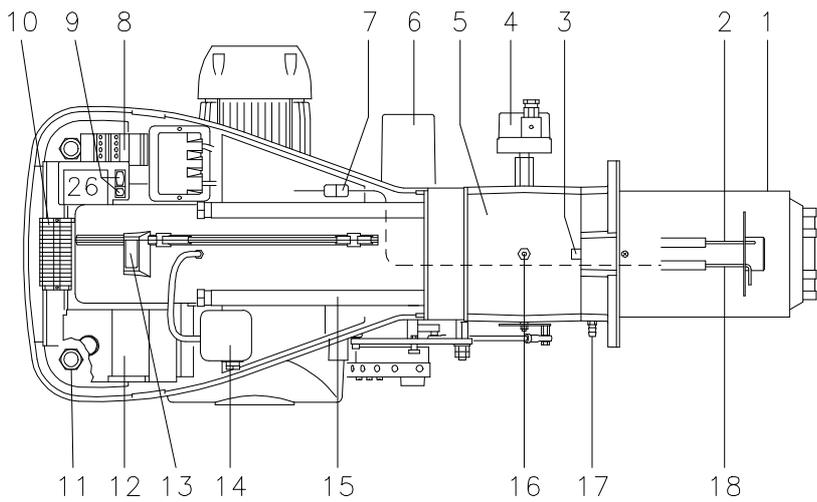
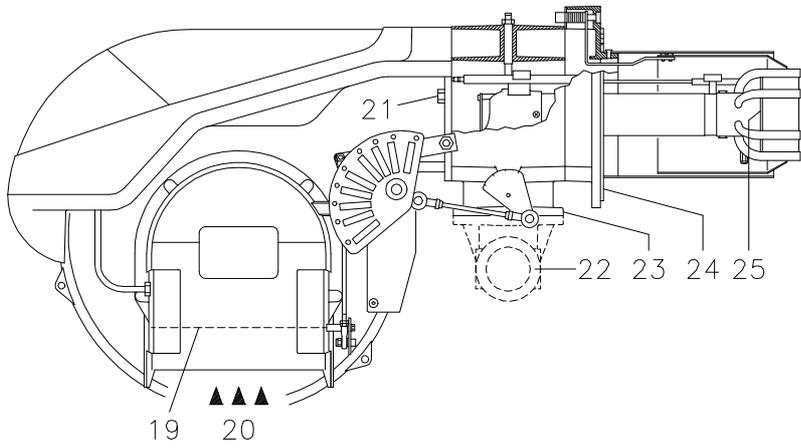
ELECTRICAL DATA

MODEL		AS 68/M BLU		AS 120/M BLU		
ELECTRICAL SUPPLY		V	230 - 400 with neutral ~ +/-10%			
		Hz	50 - three-phase			
ELECTRIC MOTOR IE3		rpm	2890		2890	
		W	1500		2200	
		V	220-240 / 380-415		220-240 / 380-415	
		A	5.9 - 3.4		8- 4.6	
IGNITION TRANSFORMER		V1 - V2	230 V - 1 x 8 kV			
		I1 - I2	1 A - 20 mA			
ELECTRICAL POWER CONSUMPTION		W max	1500		2200	
ELECTRICAL PROTECTION			IP 44			

Country	Category
SE-FI-AT-GR-DK-ES-GB-IT-IE-PT-IS-CH-NO	I _{2H}
DE	I _{2ELL}
NL	I _{2L} - I _{2E} - I ₂ (43.46 ÷ 45.3 MJ/m ³ (0°C))
FR	I _{2Er}
BE	I _{2E(R)B}
LU - PL	I _{2E}

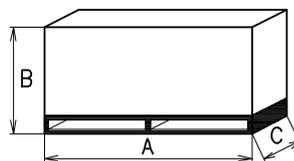
VARIANTS

Burner model	Blast tube length mm
AS 68/M BLU AS 120/M BLU	255 - 390

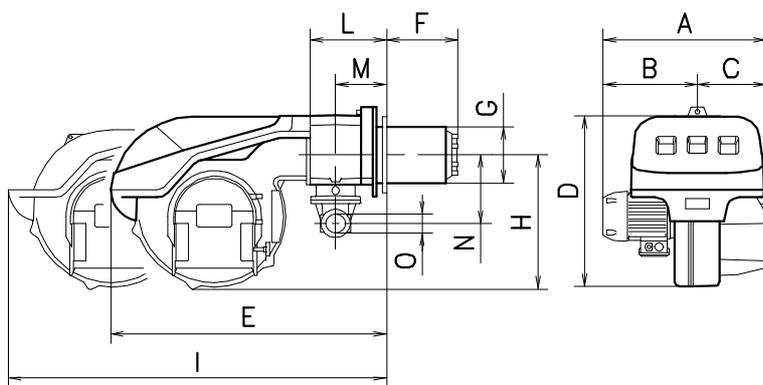


(A)

mm	A (1)	B	C	kg (1)
AS 68/M BLU	1190-1340	740	692	70-72
AS 120/M BLU	1190-1340	740	692	76-78



(B)



(C)

mm	A	B	C	D	E	F (1)	G	H	I	L	M	N	O
AS 68/M BLU	511	312	215	555	840	255-390	189	430	1161-1296	214	134	221	2"
AS 120/M BLU	553	338	215	555	840	255-390	189	430	1161-1296	214	134	221	2"

(1) Blast tube: short-long

BURNER DESCRIPTION (A)

- 1 Combustion head
- 2 Ignition electrode
- 3 Screw for combustion head adjustment
- 4 Max. gas pressure switch
- 5 Sleeve
- 6 Servomotor controlling the gas butterfly valve and the air gate valve (by means of a variable profile cam mechanism).
When the burner is stopped the air gate valve will be completely closed to reduce heat loss due to the flue draught, which tends to draws air from the fan air inlet.
- 7 Plug-socket on ionisation probe cable
- 8 Motor contactor and thermal cut-out with reset button
- 9 Power switch for different operations:
automatic - manual - off
Button for:
power increase - power reduction
- 10 Terminal strip for electrical connection
- 11 Fairleads for electrical connections by installer
- 12 Control box with lock-out pilot light and lock-out reset button
- 13 Flame inspection window
- 14 Minimum air pressure switch (differential operating type)
- 15 Slide bars for opening the burner and inspecting the combustion head
- 16 Gas pressure test point and head fixing screw
- 17 Air pressure test point
- 18 Flame sensor probe
- 19 Air gate valve
- 20 Air inlet to fan
- 21 Screws securing gas to sleeve
- 22 Gas input pipework
- 23 Gas butterfly valve
- 24 Boiler mounting flange
- 25 Flame stability disk
- 26 Bracket for mounting the power regulator RWF

Two types of burner failure may occur:

- **CONTROL BOX LOCK-OUT:**
if the control box 12)(A) pushbutton lights up, it indicates that the burner is in lock-out. To reset, press the pushbutton.
- **MOTOR TRIP:**
two-phase electricity supply; release by pressing the pushbutton on thermal cutout 8)(A).

PACKAGING - WEIGHT (B) - Approximate measurements

- The burners stands on a wooden base which can be lifted by fork-lifts. Outer dimensions of packaging are indicated in (B).
- The weight of the burner complete with packaging is indicated in Table (B).

MAX. DIMENSIONS (C) - Approximate measurements

The maximum dimensions of the burner are given in (C). Bear in mind that inspection of the combustion head requires the burner to be opened by withdrawing the rear part on the slide bars. The maximum dimension of the burner, when open is give by measurement I.

STANDARD EQUIPMENT

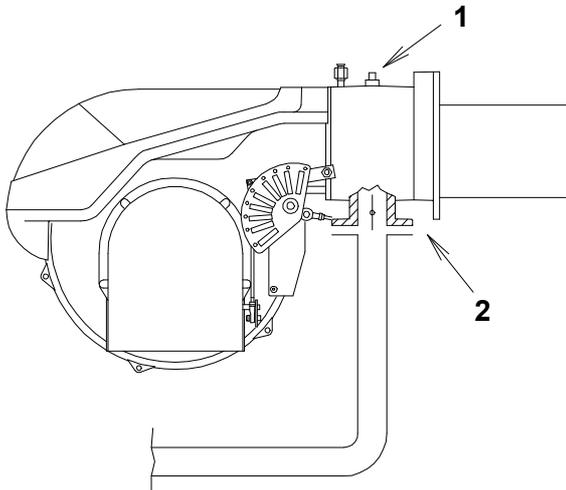
- 1 - Gas train flange
- 1 - Flange gasket
- 4 - Flange fixing screws M 10 x 35
- 1 - Thermal insulation screen
- 4 - Screws to secure the burner flange to the boiler: M 12 x 35
- 1 - Instruction booklet
- 1 - Spare parts list

AS 68/M BLU Δp (mbar)

kW	1	2
350	2.0	0.1
400	2.9	0.2
450	3.9	0.2
500	5.0	0.2
550	5.8	0.3
600	6.8	0.3
650	7.7	0.3
700	8.6	0.4
750	9.7	0.4
800	10.6	0.5
860	11.7	0.5

AS 120/M BLU Δp (mbar)

kW	1	2
600	4.4	0.3
650	6.0	0.3
715	7.6	0.4
760	9.2	0.4
825	10.8	0.5
890	12.4	0.5
955	14.0	0.6
1020	15.5	0.7
1090	17.2	0.8
1170	18.7	0.8
1250	19.5	1.0
1300	22.5	1.2

(A)**(B)****GAS PRESSURE**

The adjacent tables show minimum pressure losses along the gas supply line depending on the burner output in 2nd stage operation.

Column 1

Pressure loss at combustion head.

Gas pressure measured at test point 1)(B), with:

- Combustion chamber at 0 mbar;
- Burner operating in 2nd stage;
- Gas ring 2)(B) p.7 adjusted as indicated in diagram (C) p. 7.

Column 2

Pressure loss at gas butterfly valve 2)(B) with maximum opening: 90°.

The values shown in the various tables refer to: natural gas G 20 NCV 9.45 kWh/Sm³ (8.2 Mcal/Sm³)

With:

natural gas G 25 NCV 8.13 kWh/Sm³ (7.0 Mcal/Sm³) multiply tabulated values:

- col mn 1: by 1.3;
- col mn 2: by 1.49.

Calculate the approximate maximum output of the burner thus:

- subtract the combustion chamber pressure from the gas pressure measured at test point 1) (B).
- Find the nearest pressure value to your result in column 1 of the table for the burner in question.
- Read off the corresponding output on the left.

Example - AS 68/M BLU:

- 2nd stage operation
 - Natural gas G 20 NCV 9.45 kWh/Sm³
 - Gas ring 2)(B) p. 7 adjusted as indicated in diagram (C) p. 7.
 - Gas pressure at test point 1)(B) = 11.6 mbar
 - Pressure in combustion chamber = 3.0 mbar
- $$11.6 - 3 = 8.6 \text{ mbar}$$

A 2nd stage output of 700 kW shown in Table AS 68/M BLU corresponds to 8.6 mbar pressure, column 1.

This value serves as a rough guide, the effective delivery must be measured at the gas meter.

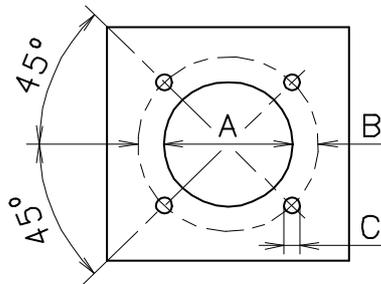
To calculate the required gas pressure at test point 1)(B), set the output required from the burner in 2nd stage operation:

- find the nearest output value in the table for the burner in question.
- Read off the pressure at test point 1)(B) on the right in column 1.
- Add this value to the estimated pressure in the combustion chamber.

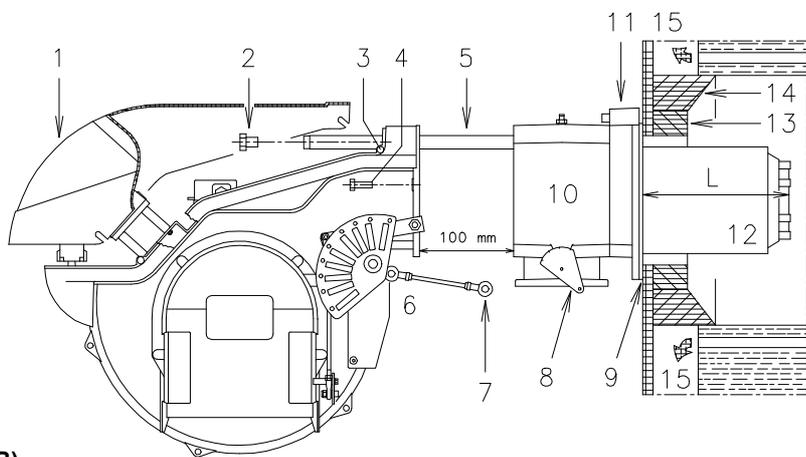
Example - AS 68/M BLU:

- Required burner output in 2nd stage operation: 700 kW
 - Natural gas G 20 NCV 9.45 kWh/Sm³
 - Gas ring 2)(B) p. 7 adjusted as indicated in diagram (C) p. 7.
 - Gas pressure at burner output of 700 kW, taken from table AS 68/M BLU, column 1 = 8.6 mbar
 - Pressure in combustion chamber = 3.0 mbar
- $$8.6 + 3 = 11.6 \text{ mbar}$$
- pressure required at test point 1)(B).

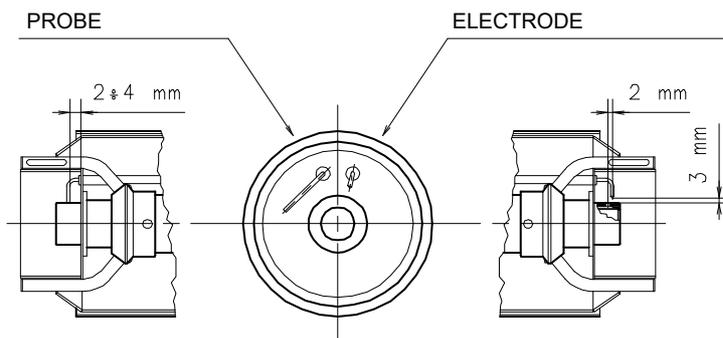
mm	A	B	C
AS 68/M BLU	195	275-325	M 12
AS 120/M BLU	195	275-325	M 12



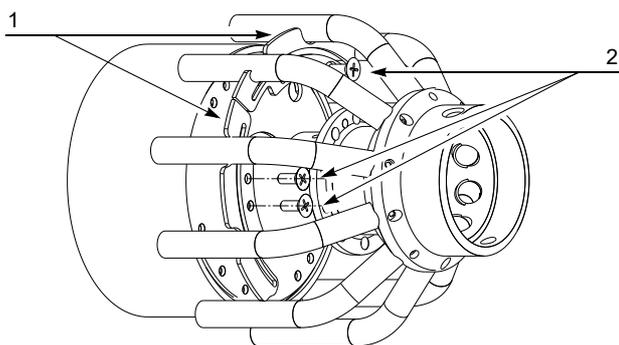
(A)



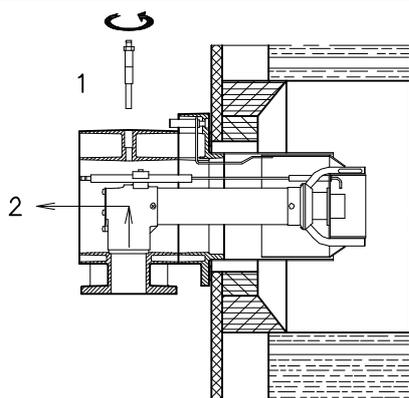
(B)



(C)



(D)



(E)

INSTALLATION

BOILER PLATE (A)

Drill the combustion chamber locking plate as shown in (A). The position of the threaded holes can be marked using the thermal screen supplied with the burner.

BLAST TUBE LENGTH (B)

The length of the blast tube must be selected according to the indications provided by the manufacturer of the boiler, and in any case it must be greater than the thickness of the boiler door complete with its fettling. The range of lengths available, (mm), is as follows:

Blast tube 12)	AS 68/M BLU	AS 120/M BLU
• short	255	255
• long	390	390

For boilers with front flue passes 15) or flame inversion chambers, protective fettling in refractory material 13), must be inserted between the boiler's fettling 14) and the blast tube 12).

This protective fettling must not compromise the extraction of the blast tube.

For boilers having a water-cooled front the refractory fettling 13)-14)(B) is not required unless it is expressly requested by the boiler manufacturer.

SECURING THE BURNER TO THE BOILER

(B)

Before securing the burner to the boiler, check through the blast tube opening to make sure that the flame sensor probe and the ignition electrode are correctly set in position, as shown in (C).

Now detach the combustion head from the burner, fig. (B):

- Loosen the four screws 3) and remove the cover 1).
- Disengage the articulated coupling 7) from the graduated sector 8)
- Remove the screws 2) from the two slide bars 5).
- Remove the two screws 4) and pull the burner back on slide bars 5) by about 100 mm.
- Disconnect the wires from the probe and the electrode and then pull the burner completely off the slide bars.

COMBUSTION HEAD CALIBRATION

At this point check, for model AS 120/M BLU, whether the maximum delivery of the burner in 2nd stage operation is contained in area A or in area B of the firing rate. See page 4.

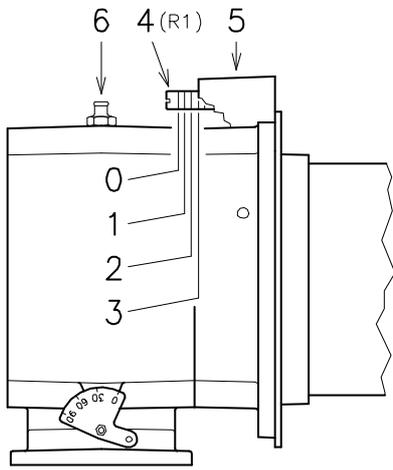
If it is in area A then no operation is required. If, on the other hand, it is in area B, before starting the burner remove the 4 circular sectors 1)(D) fastened behind the stabilizing disc by removing the 8 screws 2)(D).

Once this operation has been carried out (if it was required), secure the flange 11)(B) to the boiler plate, interposing the thermal insulating screen 9)(B) supplied with the burner. Use the 4 screws, also supplied with the unit, after first protecting the thread with an anti-locking product.

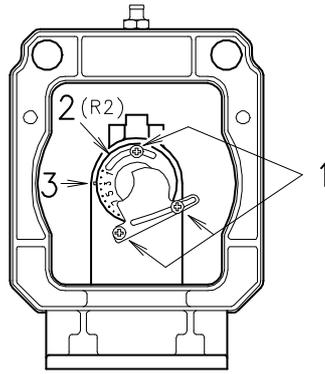
The seal between burner and boiler must be airtight.

If you noticed any irregularities in positions of the probe or ignition electrode during the check mentioned above, remove screw 1)(E), extract the internal part 2)(E) of the head and proceed to set up the two components correctly.

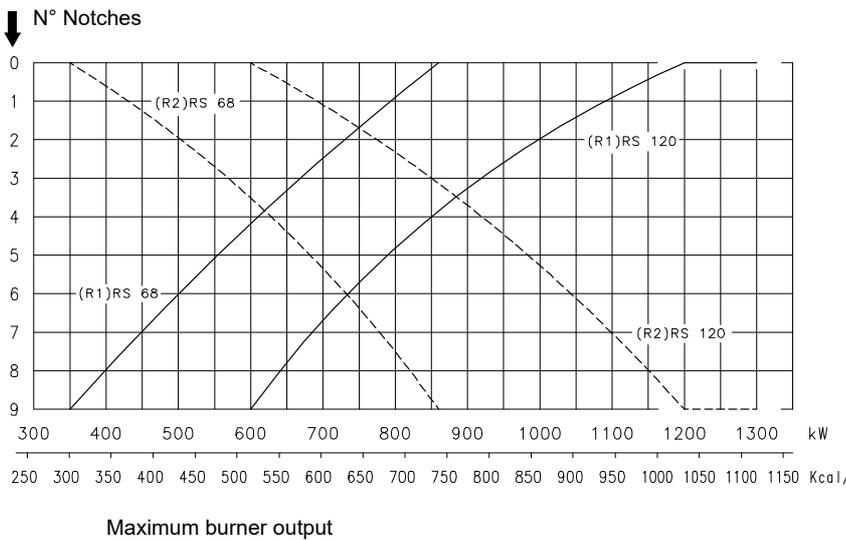
Do not attempt to turn the probe. Leave it in the position shown in (C) since if it is located too close to the ignition electrode the control box amplifier may be damaged.



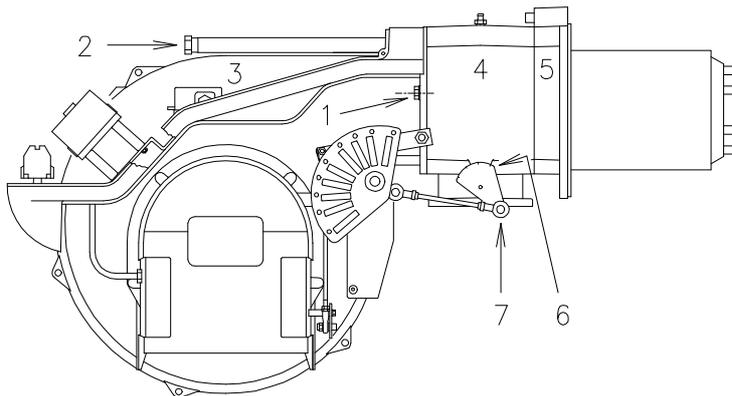
(A)



(B)



(C)



(D)

COMBUSTION HEAD SETTING

Installation operations are now at the stage where the blast tube and sleeve are secured to the boiler as shown in fig. (A). It is now a very simple matter to set up the combustion head, as this depends solely on the MAX output developed by the burner.

It is therefore essential to establish this value before proceeding to set up the combustion head.

There are two adjustments to make on the head:

- air delivery R1
- gas delivery R2

In diagram (C) find the notch to use for adjusting the air and the gas, and then proceed as follows:

Air adjustment (A)

Turn screw 4)(A) until the notch identified is aligned with the front surface 5)(A) of the flange.

IMPORTANT: In order to facilitate adjustment, loosen screw 6)(A), adjust and then tighten.

Gas adjustment (B)

Loosen the 3 screws 1)(B) and turn ring 2) until the notch identified is aligned with index 3). Tighten the 3 screws 1) fully down.

Example

AS 68/M BLU, Burner output = 500 kW.
If we consult diagram (C) we find that for this output the adjustments are:

- air: R1 = notch 6;
- gas: R2 = notch 2.

Note

Diagram (C) indicates an optimal regulation for a type of boiler seen in fig. (B) page 4.

If the pressure of gas allows it, by closing ring nut 2)(B) a reduction of the formation of NOx is obtained.

Continuing with the previous example, page 5 indicates that for burner AS 68/M BLU with output of 500 kW a pressure of approximately 5.0 mbar is necessary at test point 6)(A). If this pressure cannot be reached, open the ring 2)(B) to notch 4 or 5.

Make sure that the combustion characteristics are satisfactory and free of pulsations.

Once you have finished setting up the head, refit the burner to the slide bars 3)(D) at approximately 100 mm from the sleeve 4)(D) burner positioned as shown in fig. (B) p. 6 " insert the flame detection probe cable and the ignition electrode cable and then slide the burner up to the sleeve so that it is positioned as shown in fig. (D).

Refit screws 2) on slide bars 3).
Secure the burner to the sleeve by tightening screw 1).

Reconnect the articulation 7) to the graduated sector 6).

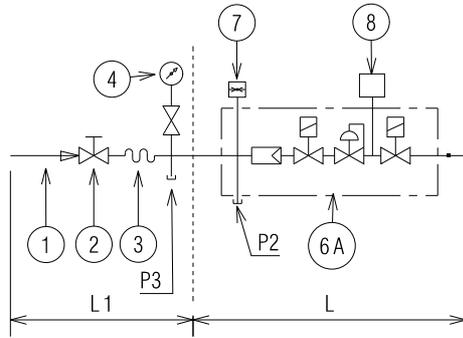
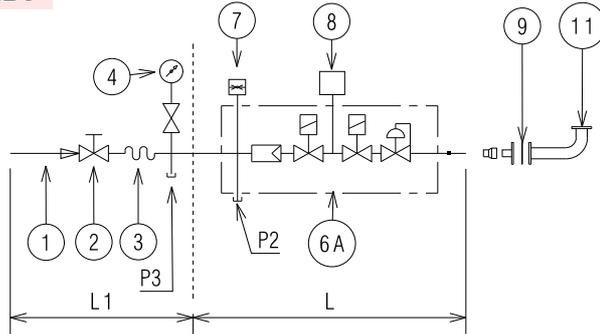
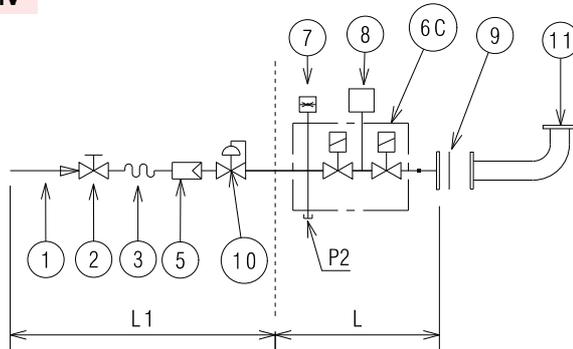
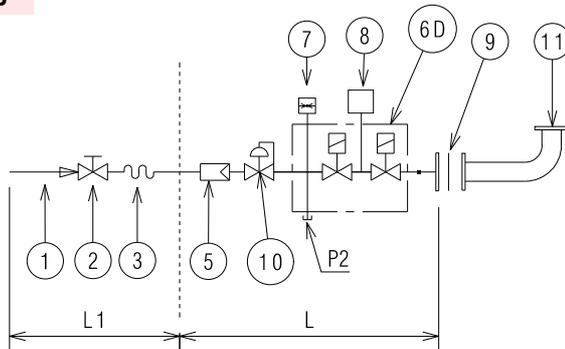


Important

When fitting the burner on the two slide bars, it is advisable to gently draw out the high tension cable and flame detection probe cable until they are slightly stretched.



The data of thermal output and combustion head gas pressure are related to full open (90°) gas butterfly valve.

MB**(A)****MBC****(B)****DMV****(C)****CB****(D)****GAS LINE**

Explosion danger due to fuel leaks in the presence of a flammable source.

ATTENTION

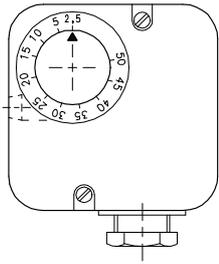
Precautions: avoid knocking, attrition, sparks and heat.

Make sure that the fuel interception tap is closed before performing any operation on the burner.

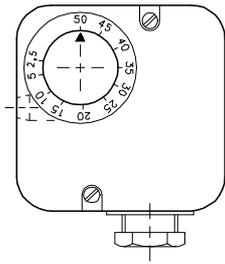
The fuel supply line must be installed by qualified personnel, in compliance with current standards and laws.

KEY (A)-(B)-(C)-(D)

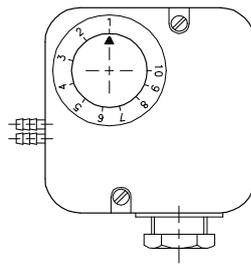
- 1 Gas input pipe
- 2 Manual valve
- 3 Vibration damping joint
- 4 Pressure gauge with pushbutton cock
- 5 Filter
- 6A Includes:
 - filter
 - working valve
 - safety valve
 - pressure adjuster
- 6B Includes:
 - working valve
 - safety valve
 - pressure adjuster
- 6C Includes
 - safety valve
 - working valve
- 6D Includes:
 - safety valve
 - working valve
- 7 Minimum gas pressure switch
- 8 Leak detection device, supplied as an accessory or incorporated, based on the gas train code. In compliance with the EN 676 standard, the leak detection control is compulsory for burners with maximum outputs over 1200 kW.
- 9 Gasket
- 10 Pressure adjuster
- 11 Train-burner adaptor, supplied separately
- P2 Upstream pressure of valves/adjuster
- P3 Upstream pressure of the filter
- L Gas train supplied separately
- L1 The responsibility of the installer



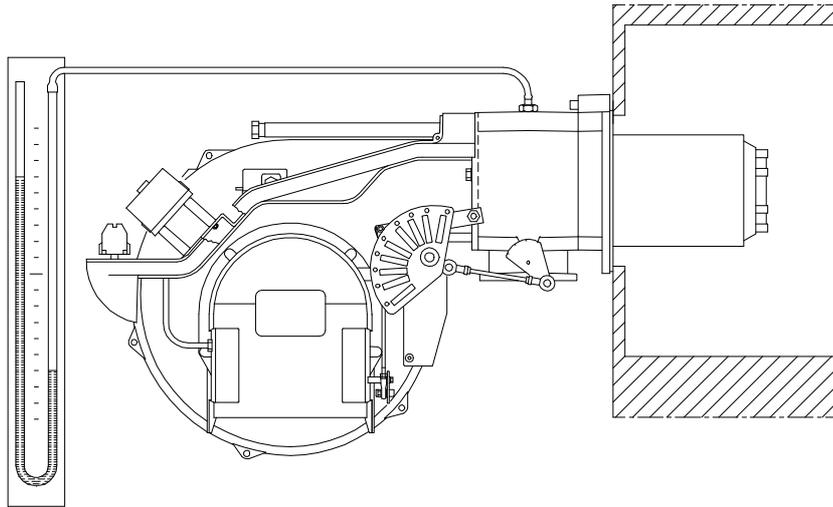
(A)



(B)

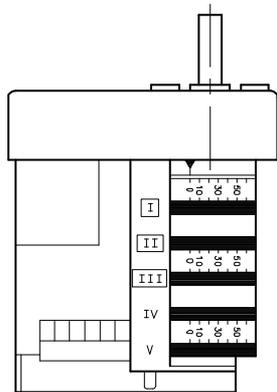


(C)

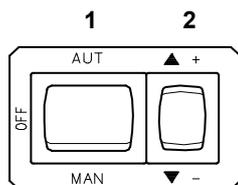


(D)

SERVOMOTOR



(E)



(F)

ADJUSTMENTS BEFORE FIRST FIRING

Adjustment of the combustion head, and air and gas deliveries has been illustrated on page 7. In addition, the following adjustments must also be made:

- open manual valves up-line from the gas train.
- Adjust the minimum gas pressure switch to the start of the scale (A).
- Adjust the maximum gas pressure switch to the start of the scale (B).
- Adjust the air pressure switch to the zero position of the scale (C).
- Purge the air from the gas line.
Continue to purge the air (we recommend using a plastic tube routed outside the building) until gas is smelt.
- Fit a U-type manometer (D) to the gas pressure test point on the sleeve.
The manometer readings are used to calculate MAX. burner power using the tables on page 5.
- Connect two lamps or testers to the two gas line solenoid valves to check the exact moment at which voltage is supplied.
This operation is unnecessary if each of the two solenoid valves is equipped with a pilot light that signals voltage passing through.

Before starting up the burner it is good practice to adjust the gas train so that ignition takes place in conditions of maximum safety, i.e. with gas delivery at the minimum.

SERVOMOTOR (E)

The servomotor provides simultaneous adjustment of the air gate valve, by means of the variable profile cam, and the gas butterfly valve. It rotates through 130 degrees in 33 seconds. Do not alter the factory setting for the 5 cams; simply check that they are set as indicated below:

- Cam I** : 130°
Limits rotation toward maximum position.
When the burner is at max output the gas butterfly valve must be fully open: 90°.
- Cam II** : 0°
Limits rotation toward the minimum position.
When the burner is shut down the air gate valve and the gas butterfly valve must be closed: 0°.
- Cam III** : 30°
Adjusts the ignition position and the MIN output.
- Cam IV - V** : integral with cam III

BURNER STARTING

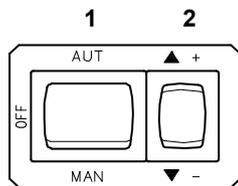
Close the control devices and set switch 1)(F) to "MAN".

As soon as the burner starts check the direction of rotation of the fan blade, looking through the flame inspection window 13)(A) p.3. Make sure that the lamps or testers connected to the solenoids, or pilot lights on the solenoids themselves, indicate that no voltage is present. If voltage is present, then **immediately** stop the burner and check electrical connections.

BURNER FIRING

Having completed the checks indicated in the previous heading, the burner should fire. If the motor starts but the flame does not appear and the control box goes into lock-out, reset and wait for a new firing attempt. If firing is still not achieved, it may be that gas is not reaching the combustion head within the safety time period of 3 seconds. In this case increase gas firing delivery. The arrival of gas at the sleeve is indicated by the U-type manometer (D). Once the burner has fired, now proceed with global calibration operations.

 Refer to paragraph "Safety test - with gas ball valve closed" on page 15 before the first start-up.



(A)

BURNER CALIBRATION

The optimum calibration of the burner requires an analysis of the flue gases at the boiler outlet.

Adjust successively:

- 1 - First firing output
- 2 - MAX burner output
- 3 - MIN burner output
- 4 - Intermediate outputs between MIN and MAX
- 5 - Air pressure switch
- 6 - Maximum gas pressure switch
- 7 - Minimum gas pressure switch

1 - FIRING OUTPUT

According to EN 676 Regulations.

Burners with MAX output up to 120 kW

Firing can be performed at the maximum operation output level. Example:

- max. operation output : 120 kW
- max. firing output : 120 kW

Burners with MAX output above 120 kW

Firing must be performed at a lower output than the max. operation output. If the firing output does not exceed 120 kW, no calculations are required. If firing output exceeds 120 kW, the regulations prescribe that the value be defined according to the control box safety time "ts":

- for "ts" = 2s, firing output must be equal to or lower than 1/2 of max. operation output;
- for "ts" = 3s, firing output must be equal to or lower than 1/3 of max. operation output.

Example: MAX operation output of 600 kW.

Firing output must be equal to or lower than:

- 300 kW with s = 2 s
- 200 kW with s = 3 s

In order to measure the firing output:

- disconnect the plug-socket 7)(A) p.3 on the ionization probe cable (the burner will fire and then go into lock-out after the safety time has elapsed).
- Perform 10 firings with consecutive lock-outs.
- On the meter read the quantity of gas burned. This quantity must be equal to or lower than the quantity given by the formula, for ts = 3 s:

$$\frac{\text{Sm}^3/\text{h} \text{ (max. burner delivery)}}{360}$$

Example: for gas G 20 (9.45 kWh/Sm³):

Max. operation output: 600 kW corresponding to 63.5 Sm³/h.

After 10 firings with lock-outs, the delivery read on the meter must be equal to or lower than:

$$63.5 : 360 = 0.176 \text{ Sm}^3$$

2 - MAX. OUTPUT

Max. output of the burner must be set within the firing rate range shown on page 4.

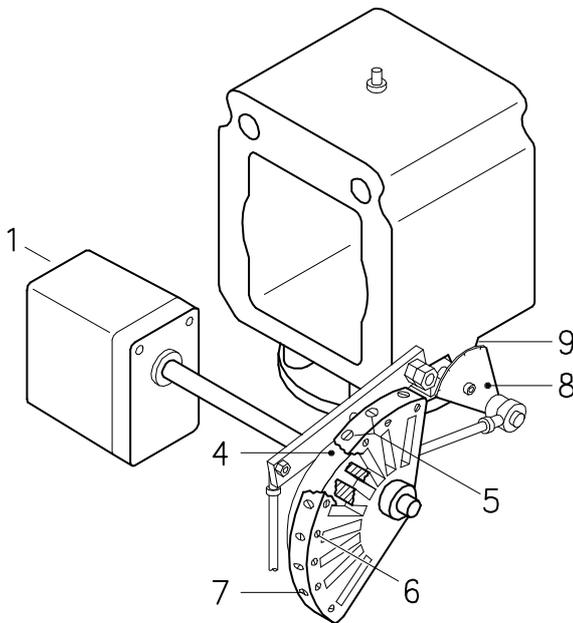
In the above instructions we left the burner running in MIN. output operation. Now press button 2)(A) "increase output" and keep it pressed until the servomotor has opened the air gate valve and the gas butterfly valve.

Gas calibration

Measure the gas delivery at the meter.

A guideline indication can be calculated from the tables on page 5, simply read off the gas pressure on the U-type manometer, see fig. (D) on page 9, and follow the instructions on page 5.

- If delivery needs to be reduced, diminish outlet gas pressure and, if it is already very low, slightly close adjustment valve VR.
- If delivery needs to be increased, increase outlet gas pressure.



- 1 Servomotor
- 2 Servomotor 1) - Cam 4): engaged
- 3 Servomotor 1) - Cam 4): disengaged
- 4 Adjustable profile cam
- 5 Adjustment screws for cam starting profile
- 6 Adjustment fixing screws
- 7 Adjustment screws for cam and profile
- 8 Graduated sector for gas butterfly valve
- 9 Index for graduated sector 8
- 10 Key for cam III adjustment

Adjusting air delivery

Progressively adjust the end profile of cam 4)(A) by turning the screws 7).

- Turn the screws clockwise to increase air delivery.
- Turn the screws counter-clockwise to reduce air delivery.

3 - MIN OUTPUT

Min output must be selected within the firing rate range shown on page 4.

Press button 2)(A) p.10 "output reduction" until the servomotor has closed the air gate valve and the gas butterfly valve to 20° (factory set adjustment).

Adjusting gas delivery

Measure the gas delivery at the gas meter.

- If this value is to be reduced, decrease the angle of cam III (B) slightly by proceeding a little at a time until the angle is changed from 20° to 18° - 16°....
- If it has to be increased press the button "output increase" 2)(A) p.10 (i.e. open the gas butterfly valve by 10-15°), increase the cam III angle (B) with small successive movements, i.e. take it from angle 20° to 22° - 24°.... Then press the button "output decrease" until the servomotor is taken to the minimum opening position and measure the gas delivery.

NOTE

The servomotor follows the adjustment of cam III only when the cam angle is reduced. If it is necessary to increase the cam angle, first increase the servomotor angle with the key "output increase", then increase the cam III angle, and finally bring the servomotor back to the MIN output position with the key "output decrease".

In order to adjust cam III, especially for fine movements, the key 10)(B), held by a magnet under the servomotor, can be used.

Adjustment of air delivery

Progressively adjust the starting profile of cam 4)(A) by turning the screws 5).

It is preferable not to turn the first screw since this is used to set the air gate valve to its fully-closed position.

4 - INTERMEDIATE OUTPUTS

Adjustment of gas delivery

No adjustment of gas delivery is required.

Adjustment of air delivery

Press the key 2)(A) p.10 "output increase" a little so that the servomotor turns by about 15°. Adjust the screws until optimal combustion is obtained. Proceed in the same way with the other screws.

Take care that the cam profile variation is progressive.

Switch the burner off with the switch 1)(A) p.10, at OFF position, disengage the cam 4)(A) from the servomotor, by pressing the button 3)(B) and moving it to the right, and check more than once that the movement is soft and smooth, and does not grip, by rotating the cam 4) forward and backward by hand.

Engage the cam 4) to the servomotor again by moving the button 2)(B) to the left.

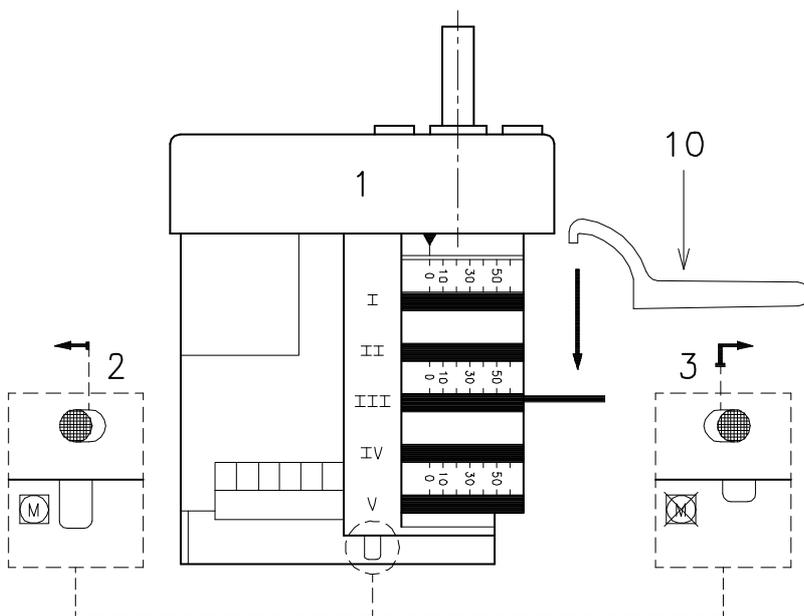
As far as is possible, try not to move those screws at the ends of the cam that were previously adjusted for the opening of the air gate to MAX and MIN output.

NOTE

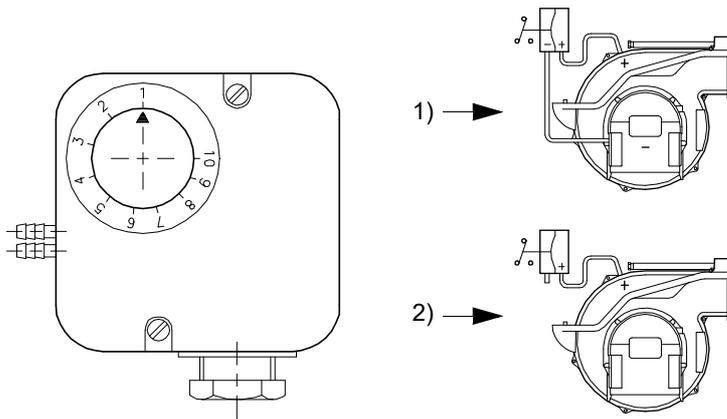
Once you have finished adjusting outputs MAX - MIN - INTERMEDIATE, check ignition once again: noise emission at this stage must be identical to the following stage of operation. If you notice any sign of pulsations, reduce the ignition stage delivery.

Finally fix the adjustment by turning the screws 6)(A).

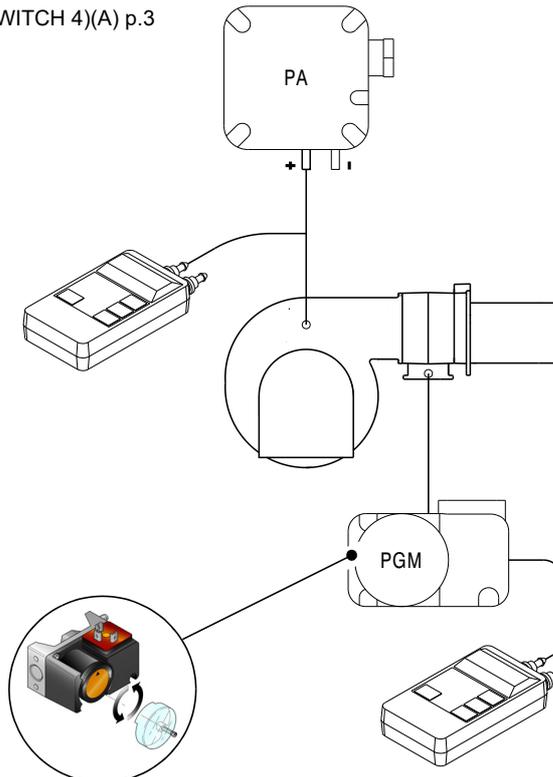
(A)



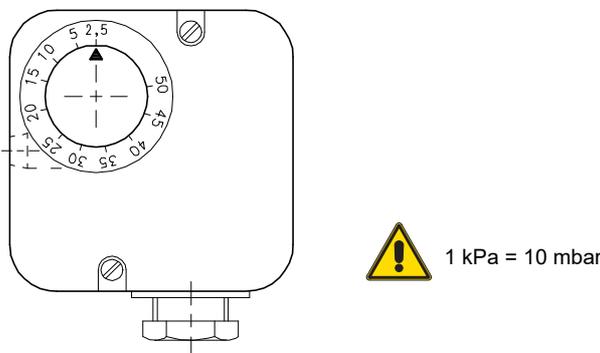
(B)



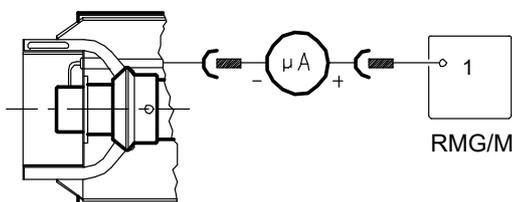
(A)



(B)



(C)



(D)

5 - AIR PRESSURE SWITCH (A)

The air pressure switch is differentially connected, see 1)(A), it is activated by both the negative pressure and the general pressure from the fan.

In this way the burner can operate even in negative pressure combustion chambers and with high modulation ratios: MIN / MAX outputs of up to 1/6.

In this case the air pressure switch needs no adjustment and its function is limited to controlling fan operation.

Attention: the use of the air pressure switch with differential operation is allowed only in industrial applications and where rules enable the air pressure switch to control only fan operation without any reference to CO limit.

In civil applications the pipe from the fan air inlet should be removed, see 2)(A) and adjust the pressure switch as follows.

Air pressure switch connected as 2)(A):

adjust the air pressure switch after having performed all other burner adjustments with the air pressure switch set to the start of the scale (A). With the burner operating at min. output, increase adjustment pressure by slowly turning the relative knob clockwise until the burner locks out.

Then turn the knob anti-clockwise by about 20% of the set point and repeat burner starting to ensure it is correct.

If the burner locks out again, turn the knob anti-clockwise a little bit more.

Attention: as a rule, the air pressure switch must limit the CO in the fumes to less than 1% (10,000 ppm).

To check this, insert a combustion analyser into the chimney, slowly close the fan suction inlet (for example with cardboard) and check that the burner locks out, before the CO in the fumes exceeds 1%.

6 - MAXIMUM GAS PRESSURE SWITCH (B)

Adjust the maximum gas pressure switch (B) after making all other burner adjustments with the maximum gas pressure switch set to the end of the scale.

To calibrate the maximum gas pressure switch, open the tap and then connect a pressure gauge to its pressure test point.

The maximum gas pressure switch must be regulated to a value no higher than 30% of the measurement read on the gauge when the burner is working at maximum output.

After making the adjustment, remove the pressure gauge and close the tap.

7 - MINIMUM GAS PRESSURE SWITCH (C)

Adjust the minimum gas pressure switch (C) after having adjusted the burner, the gas valves and the gas train stabiliser. With the burner operating at maximum output:

- install a pressure gauge downstream of the gas train stabiliser (for example at the gas pressure test point on the burner combustion head);
- choke slowly the manual gas cock until the pressure gauge detects a decrease in the pressure read of about 0.1 kPa (1 mbar). In this phase, verify the CO value which must always be less than 100 mg/kWh (93 ppm).
- Increase the adjustment of the gas pressure switch until it intervenes, causing the burner shutdown;
- remove the pressure gauge and close the cock of the gas pressure test point used for the measurement;
- open completely the manual gas cock.

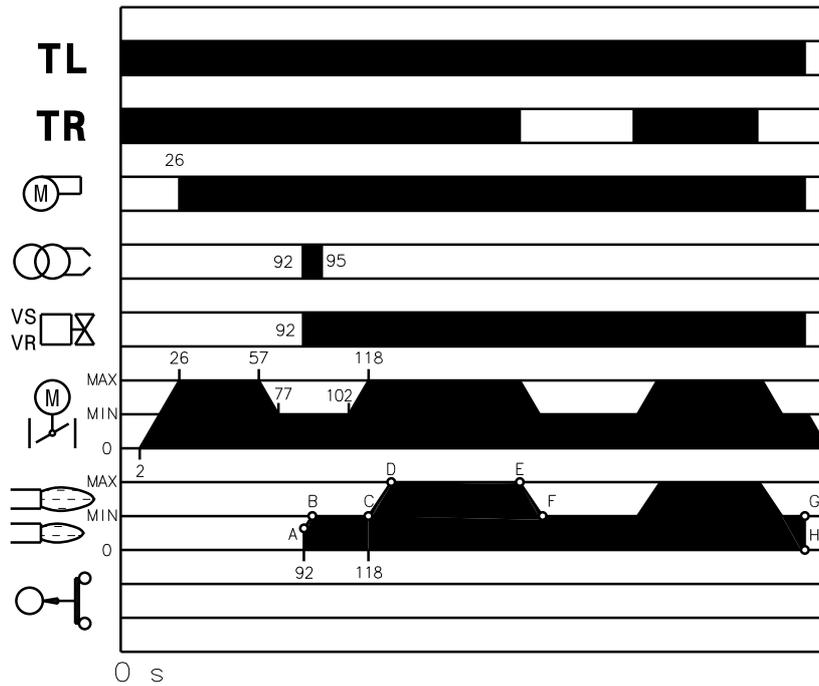
FLAME PRESENT CHECK (D)

The burner is fitted with an ionisation system which ensures that a flame is present. The minimum current for plant operation is 4 µA. The burner provides a much higher current, so that controls are not normally required. However, if it is necessary to measure the ionisation current, disconnect the plug-socket 7)(A) p.3 on the ionisation probe cable and insert a direct current microammeter with a base scale of 100 µA. Carefully check polarities!

BURNER OPERATION

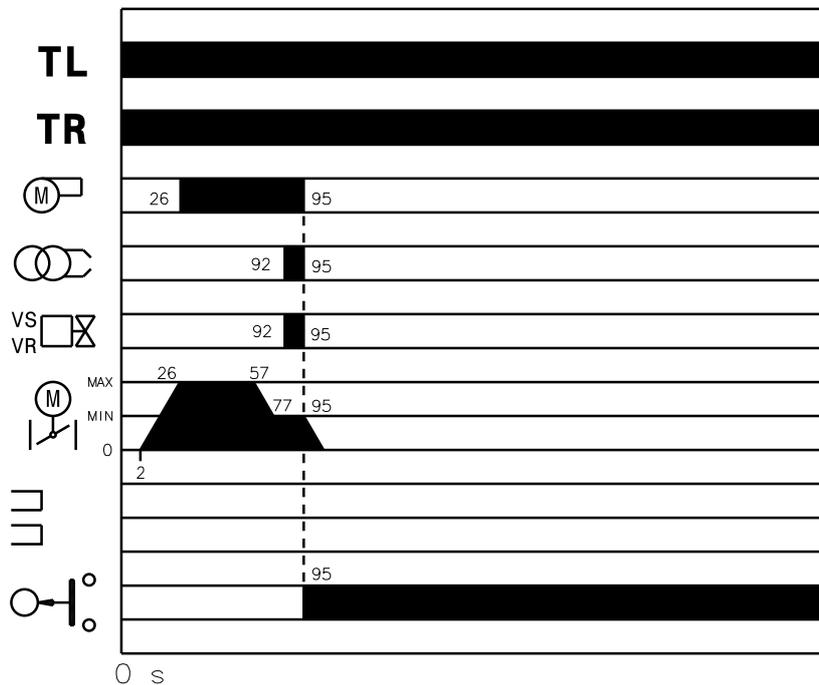
NORMAL FIRING

(n° = seconds from instant 0)



(A)

NO FIRING



(B)

BURNER START-UP (A)

- 0s: Closure of thermostat/pressure switch TL.
- 2s: Start of electrical control box programme. Servomotor starts: rotate to the left by 90°, i.e. until the contact intervenes with cam I (E) p. 9.
- 26s: The air damper arrives to the MAX. output position. The fan motor starts up. Start of the pre-purging phase.
- 57s: The servomotor rotates towards the right, as far as the angle set on cam III (E) p. 9 for MIN. output.
- 77s: The air damper and the gas butterfly valve adopt the MIN output position (with cam III)(E) p. 9 at 15°).
- 92s: Ignition electrode strikes a spark. The safety valve VS opens, along with the adjustment valve VR, quick opening. The flame is ignited at a low output level, point A. Delivery is then progressively increased, with the valve VR opening slowly up to MIN. output, point B.
- 94s: The spark goes out.
- 118s: The start-up cycle ends.

STEADY STATE OPERATION (A)

Burner without modulating operation kit

Once the start-up cycle is completed, the servomotor command moves on to the thermostat/pressure switch TR that controls the pressure or the temperature in the boiler, point C.

(The electrical control box still continues to check the presence of the flame and the correct position of the air and gas pressure switches).

- If the temperature or the pressure is low, so the thermostat/pressure switch TR is in the output request position, the burner progressively increases the output up to the MAX value (tract C-D).
- If the temperature or the pressure increases until the commutation of TR, the burner progressively reduces the output up to the MIN value (tract E-F). And so on.
- The burner locks out when demand for heat is less than the heat supplied by the burner at min. output, (section G-H). The thermostat/pressure switch TL opens, and the servomotor returns to the angle 0°. The damper closes completely to reduce thermal dispersions to a minimum.

Burner with modulating operation kit

See the handbook enclosed with the regulator.

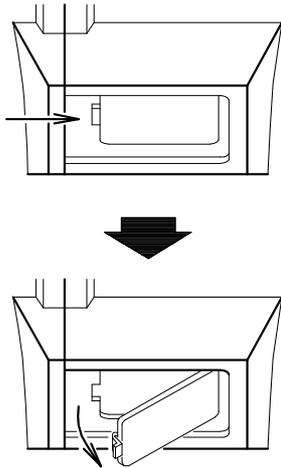
IGNITION FAILURE (B)

If the burner does not switch on, the gas valve goes into lockout within 3s of the opening.

BURNER FLAME GOES OUT DURING OPERATION

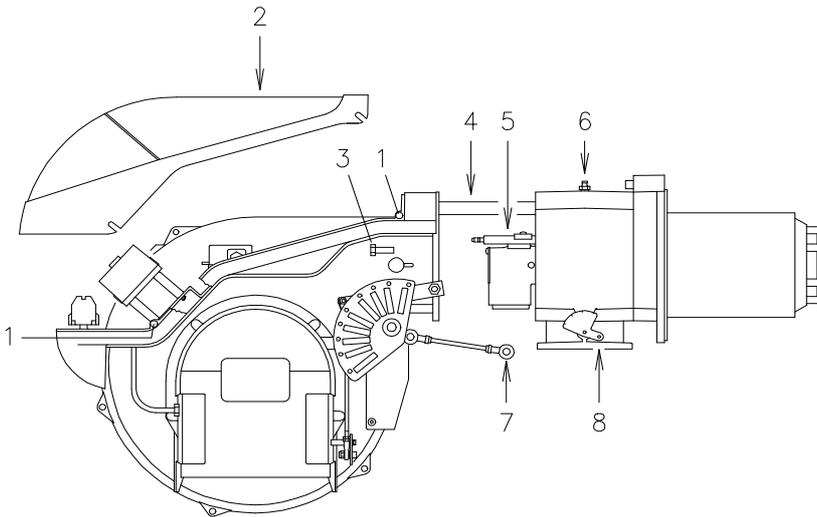
If the flame goes out by accident during the operation, the burner goes into lockout within 1s.

FLAME INSPECTION WINDOW



(A)

OPENING THE BURNER



(B)

FINAL CHECKS (with burner running)

- Disconnect one of the wires on the minimum gas pressure switch:
- Open remote control device TL:
- Open remote control device TS:
the burner must stop
- Disconnect the common wire P from the maximum gas pressure switch:
- Disconnect the common wire P from the air pressure switch:
- Disconnect the ionisation probe lead:
the burner must lock out
- Make sure that the mechanical locking systems on the various adjustment devices are fully tightened.

MAINTENANCE

Combustion

The optimum calibration of the burner requires an analysis of the flue gases. Significant differences with respect to the previous measurements indicate the points where more care should be exercised during maintenance.

Gas leaks

Make sure that there are no gas leaks on the pipework between the gas meter and the burner.

Gas filter

Change the gas filter when it is dirty.

Flame inspection window

Clean the flame inspection window (A).

Combustion head

Open the burner and make sure that all components of the combustion head are in good condition, not deformed by the high temperatures, free of impurities from the surroundings and correctly positioned. If in doubt, disassemble the elbow fitting 5)(B).

Servomotor

Disengage the cam 4)(A) p.11 from the servomotor, by pressing and moving button 3)(B) p.11 towards the right, and turn it backwards and forwards by hand to make sure it moves freely. Now engage the cam again by moving the button 2)(B) p.11 to the left.

Burner

Check for excess wear or loose screws in the mechanisms controlling the air gate valve and the gas butterfly valve. Also make sure that the screws securing the electrical leads in the burner connections are fully tightened.

Clean the outside of the burner, taking special care with the transmission joints and cam 4)(A) p.11.

Combustion

Adjust the burner if the combustion values found at the beginning of the operation do not comply with the regulations in force, or at any rate, do not correspond to good combustion. Use the appropriate card to record the new combustion values; they will be useful for subsequent controls.

TO OPEN THE BURNER (B):

- switch off the electrical power.
 - Loosen 4 screws 1) and withdraw cover 2).
 - Disengage the articulated coupling 7) from the graduated sector 8).
 - Fit the two standards supplied extensions onto the slide bars 4) (models with 390 mm blast tube).
 - Remove screws 3), and pull the burner back by about 100 mm on the slide bars 4). Disconnect the probe and electrode leads and then pull the burner fully back.
- Now extract the gas distributor 5) after having removed the screw 6).

TO CLOSE THE BURNER (B):

- push the burner until it is about 100 mm from the sleeve.
 - Re-connect the leads and slide in the burner until it comes to a stop.
 - Refit screws 3), and pull the probe and electrode leads gently out until they are slightly stretched.
 - Re-couple the articulated coupling 7) to the graduated sector 8).
- Remove the two extensions from the slide bars 4).

SAFETY TEST - WITH GAS BALL VALVE CLOSED

It is fundamental to ensure the correct execution of the electrical connections between the gas solenoid valves and the burner to perform safely the commissioning.

For this purpose, after checking that the connections have been carried out in accordance with the burner's electrical diagrams, an ignition cycle with closed gas ball valve -dry test- must be performed.

- 1 The manual ball gas valve must be closed
- 2 The electrical contacts of the burner limit switch need to be closed
- 3 Ensures closed the contact of the low gas pressure switch
- 4 Make a trial for burner ignition

The start-up cycle must be as follows:

- Starting the fan for pre-ventilation
- Performing the gas valve seal control, if provided
- Completion of pre-ventilation
- Arrival of the ignition point
- Power supply of the ignition transformer
- Electrical Supply of solenoid gas valves

Since the manual gas ball valve is closed, the burner will not light up and its control box will go to a safety lockout condition.

The actual electrical supply of the solenoid gas valves can be verified by inserting a tester. Some valves are equipped with light signals (or close/open position indicator) that turn on at the same time as their power supply.



IF THE ELECTRICAL SUPPLY OF THE GAS VALVES OCCURS AT UNEXPECTED TIMES, DO NOT OPEN MANUAL GAS BALL VALVE, SWITCH OFF POWER LINE; CHECK THE WIRES; CORRECT THE ERRORS AND REPEAT THE COMPLETE TEST.

SAFETY COMPONENTS

The safety components must be replaced at the end of their life cycle indicated in the following Table. The specified life cycles do not refer to the warranty terms indicated in the delivery or payment conditions.

Safety component	Life cycle
Flame control	10 years or 250,000 operation cycles
Flame sensor	10 years or 250,000 operation cycles
Gas valves (solenoid)	10 years or 250,000 operation cycles
Pressure switches	10 years or 250,000 operation cycles
Pressure adjuster	15 years
Servomotor (electronic cam) (if present)	10 years or 250,000 operation cycles
Oil valve (solenoid) (if present)	10 years or 250,000 operation cycles
Oil regulator (if present)	10 years or 250,000 operation cycles
Oil pipes/ couplings (metallic) (if present)	10 years
Flexible hoses (if present)	5 years or 30,000 pressurised cycles
Fan impeller	10 years or 500,000 start-ups

BURNER START-UP CYCLE DIAGNOSTICS

During start-up, the indications are explained in the following table:

COLOUR CODE TABLE	
Sequences	Colour code
Pre-purging	● ● ● ● ● ● ● ● ● ●
Ignition phase	● ○ ● ○ ● ○ ● ○ ●
Operation, flame OK	□ □ □ □ □ □ □ □ □ □
Operation with weak flame signal	□ ○ □ ○ □ ○ □ ○ □
Electrical supply lower than ~ 170V	● ▲ ● ▲ ● ▲ ● ▲ ●
Lockout	▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲
Extraneous light	▲ □ ▲ □ ▲ □ ▲ □ ▲
Key to layout:	○ Off ● Yellow □ Green ▲ Red

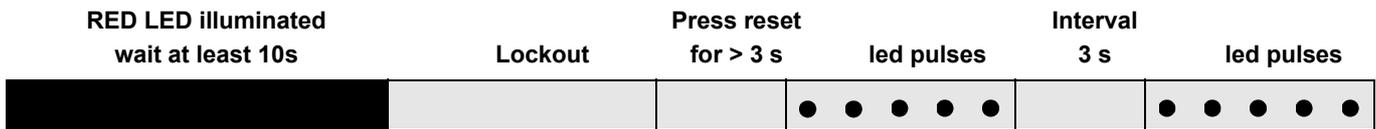
RESET OF CONTROL BOX AND DIAGNOSTICS USE

The control box supplied features a diagnostics function, through which any causes of malfunctioning can be easily identified (indicator: **RED LED** signal).

To use this function, wait at least 10 seconds from when the safety condition has been set (**lockout**), then press the reset button.

The control box generates a sequence of led pulses (1 second apart) that is repeated at constant intervals of 3 seconds.

Once the number of LED pulses has been visualised, and the possible cause identified, it is necessary to reset the system, keeping the button pressed for 1-3 seconds.



Below, a list of the possible methodologies for carrying out the resetting of the control box and for using the diagnostics.

CONTROL BOX RESET

To reset the control box, proceed as follows:

- Press and hold the button for 1-3 seconds.
The burner starts up again, 2 seconds after the button is released.
- If the burner does not restart, make sure the limit thermostat is closed.

VISUAL DIAGNOSTICS

Indicate the type of burner fault that leads to the lockout.

To display the diagnostic, proceed as follows:

- Keep the button pressed for more than 3 seconds from when the red LED (burner lockout) switches on.
The end of the operation will be shown by a yellow led pulse.
Release the button when you see the flashing. The number of flashes indicates the cause of the malfunctioning, on the basis of the code given in the table on page 17.

SOFTWARE DIAGNOSTICS

Gives an analysis of the life of the burner, through optical connections with a PC showing the working hours, number and types of lockout, control box serial number etc.

To display the diagnostic, proceed as follows:

- Keep the button pressed for more than 3 seconds from when the red LED (burner lockout) switches on.
The end of the operation will be shown by a yellow led pulse.
Release the button for 1 second, then press it again for more than 3 seconds, until you see another yellow flash.
When you release the button, the red led will flash intermittently with high frequency: only then is it possible to insert the optical connection.

When the operation is completed, it is necessary to reset the start-up condition of the control box, using the reset procedure described above.

PRESSURE ON THE BUTTON	STATE OF CONTROL BOX
From 1 to 3 seconds	Reset of the control box without visualisation of the visual diagnostics.
More than 3 seconds	Visual diagnostics of the lockout condition: (led flashes at 1 second intervals).
More than 3 seconds, starting from the condition of visual diagnostics	Software diagnostics, with the help of optical interface and PC (possibility to visualise the working hours, irregularities, etc.)

The sequence of led pulses issued by the control box identifies the possible types of fault, which are listed in the table on page 17.

Signal	Problem	Possible cause	Recommended remedy
2 blinks ● ●	Once the pre-purging phase and safety time have passed, the burner goes into lockout without the appearance of the flame	1 - The operation solenoid lets little gas through 2 - One of the two solenoid valves does not open. 3 - Gas pressure too low 4 - Ignition electrode incorrectly adjusted 5 - Electrode grounded due to broken insulation 6 - High voltage cable defective 7 - High voltage cable deformed by high temperature 8 - Ignition transformer defective. 9 - Incorrect valve or transformer electrical wiring 10 - Defective control box 11 - A closed valve upline the gas train 12 - Air in pipework 13 - Gas valves unconnected or with interrupted coil	Increase Replace Increase pressure at governor Adjust, see fig. (C) page 6 Replace Replace Replace and protect Replace Check Replace Open Bleed air Check connections or replace coil
3 blinks ● ● ●	The burner does not switch on, and the lockout appears	14 - Air pressure switch in operating position	Adjust or replace
	The burner switches on, but then stops in lockout	- Air pressure switch inoperative due to insufficient air pressure: 15 - Air pressure switch incorrectly adjusted. 16 - Pressure switch pressure test point pipe blocked 17 - Poorly adjusted head 18 - High pressure in the furnace	Adjust or replace Clean Adjust Connect air pressure switch to fan suction line
	Lockout during pre-purging phase	19 - Defective motor control contactor (only three-phase version) 20 - Defective electrical motor. 21 - Motor lockout (defective electrical motor)	Replace Replace Replace
4 pulses ● ● ● ●	The burner switches on, but then stops in lockout	22 - Flame simulation	Replace the control box
	Lockout when burner stops	23 - Permanent flame in the combustion head or flame simulation	Eliminate persistence of flame or replace control box
6 blinks ● ● ● ● ● ●	The burner switches on, but then stops in lockout	24 - Defective or incorrectly adjusted servomotor.	Adjust or replace
7 blinks ● ● ● ● ● ● ●	The burner goes into lockout immediately following the appearance of the flame	25 - The operation solenoid lets little gas through 26 - Ionisation probe incorrectly adjusted 27 - Insufficient ionisation (less than 5 A) 28 - Earth probe 29 - Burner poorly grounded. 30 - Phase and neutral connections inverted 31 - Defective flame detection circuit	Increase Adjust, see fig. (C) page 6 Check probe position Withdraw or replace cable Check grounding Invert them Replace the control box
	Burner locks out when shifting from minimum to maximum output and vice versa	32 - Too much air or too little gas	Adjust air and gas
	Burner goes into lockout during operation	33 - Probe or ionisation cable grounded.	Replace worn parts
10 blinks ● ● ● ● ● ● ● ●	The burner does not switch on, and the lockout appears	34 - Incorrect electrical wiring	Check
	The burner goes into lockout	35 - Defective control box	Replace
		36 - Presence of electromagnetic disturbances in the thermostat lines 37 - Presence of electromagnetic disturbance	Filter or eliminate Use the radio disturbance protection kit
No blink	The burner does not start	38 - No electrical power supply	Close all switches - Check connections
		39 - A limiter or safety control device is open	Adjust or replace
		40 - Line fuse blocked.	Replace
		41 - Defective control box	Replace
		42 - No gas supply	Open the manual valves between contactor and train
	The burner continues to repeat the start-up cycle, without lockout	43 - Mains gas pressure insufficient	Contact your GAS COMPANY
		44 - Minimum gas pressure switch fails to close.	Adjust or replace
		45 - Servomotor fails to move to min. ignition position	Replace
		46 - The gas pressure in the gas mains lies very close to the value to which the minimum gas pressure switch has been set. The sudden drop in pressure after valve opening causes temporary opening of the pressure switch itself, the valve immediately closes and the burner comes to a halt. Pressure increases again, the pressure switch closes again and the ignition cycle is repeated. And so on	Reduce the minimum gas pressure switch intervention pressure. Replace the gas filter cartridge.
		Ignition with pulsations	47 - Poorly adjusted head
48 - Ignition electrode incorrectly adjusted 49 - Incorrectly adjusted fan air damper: too much air 50 - Output during ignition phase is too high.	Adjust, see fig. (C) page 6 Adjust Reduce		
Burner does not reach maximum output	51 - Remote control device TR fails to close.	Adjust or replace	
	52 - Defective control box 53 - Defective servomotor.	Replace Replace	
Burner stops with air damper open	54 - Defective servomotor	Replace	

NORMAL OPERATION / FLAME DETECTION TIME

The control box has a further function to guarantee the correct burner operation (signal: **GREEN LED** permanently on). To use this function, wait at least ten seconds from the burner ignition and then press the control box button for a minimum of 3 seconds. After releasing the button, the GREEN LED starts flashing as shown in the figure below.



The pulses of the LED constitute a signal spaced by approximately 3 seconds. The number of pulses will measure the probe DETECTION TIME since the opening of gas valves, according to the following table:

SIGNAL	FLAME DETECTION TIME
1 blink ●	0.4s
2 blinks ● ●	0.8s
6 blinks ● ● ● ● ● ●	2.8s

This is updated in every burner start-up. Once read, the burner repeats the start-up cycle by briefly pressing the control box button.
WARNING
 If the result is > 2s, ignition will be retarded. Check the adjustment of the hydraulic brake of the gas valve, the air damper and the combustion head adjustment.

APPENDIX

Electrical connections



NOTES

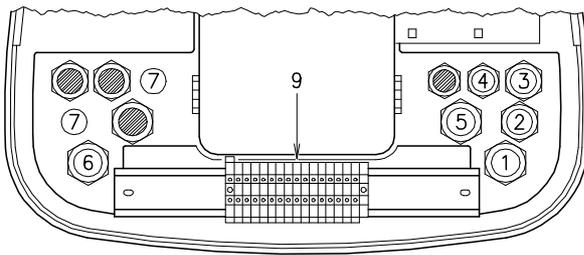
The electrical wirings must be carried out in conformity with the regulations in force in the countries of destination, and by qualified personnel. Manufacturer cannot accept any responsibility for modifications or connections other than those shown in these diagrams.

Use flexible cables according to EN 60 335-1 Regulations:

- if in PVC sheath, use at least H05 VV-F;
- if in rubber sheath, use at least H05 RR-F.

All the wires to connect to the burner terminal strip 9)(A) must enter through the supplied fairleads.

The fairleads and hole press-outs can be used in various ways; the following lists show one possible solution:



AS 68/M - 120/M BLU

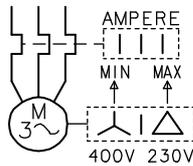
- 1- Pg 13,5 Three-phase power supply
- 2- Pg 11 Single-phase power supply
- 3- Pg 11 Remote control device TL
- 4- Pg 9 Remote control device TR or probe RWF
- 5- Pg 13,5 Gas valves
- 6- Pg 13,5 Gas pressure switch or gas valve leak detection control device
- 7- Pg 11 Open the hole, if a pipe union is to be added

CALIBRATION OF THERMAL CUT-OUT

This is required to avoid motor burn-out in the event of a significant increase in power absorption caused by a missing phase.

- If the motor is star-powered, **400 V**, the cursor should be positioned to "MIN".
- If the motor is delta-powered, **230 V**, the cursor should be positioned to "MAX".

Even if the scale of the thermal cut-out does not include rated motor absorption at 400 V, protection is still ensured in any case.



NOTES

- Burner AS 68/M - 120/M BLU leaves the factory preset for 400 V power supply. If 230 V power supply is used, change the motor connection from star to delta and change the setting of the thermal cutout as well.
- The AS 68/M - 120/M BLU burner has been type- approved for intermittent operation. This means it should compulsorily be stopped at least once every 24 hours to enable the control box to perform checks of its own efficiency at start-up. Burner halts are normally provided for automatically by the boiler load control system. If this is not the case, a time switch should be fitted in series to IN to provide for burner shut-down at least once every 24 hours.
- The TR and TL load controls are not required when the RWF is connected, as their function is performed by the RWF itself.

MODULATING OPERATION

If the output power regulator kit RWF or the converter 0...10V / 4...20mA is connected, in 3-point signal, the thermostat/pressure TR must be removed.

In addition, the function Q13 - Q14 of the regulator RWF can substitute the thermostat/pressure switch TL.

In this case, the thermostat/pressure switch TL connected to the X7 must be removed.

On the contrary, if you want to maintain the thermostat/pressure switch TL, it must be adjusted so as not to interfere with the working of the regulator RWF.

The thermal cutout k1 (RWF) can be connected to the terminals:

- **2 - 3**, to replace the remote control TL;
- **AL - AL1**, to control an alarm device.

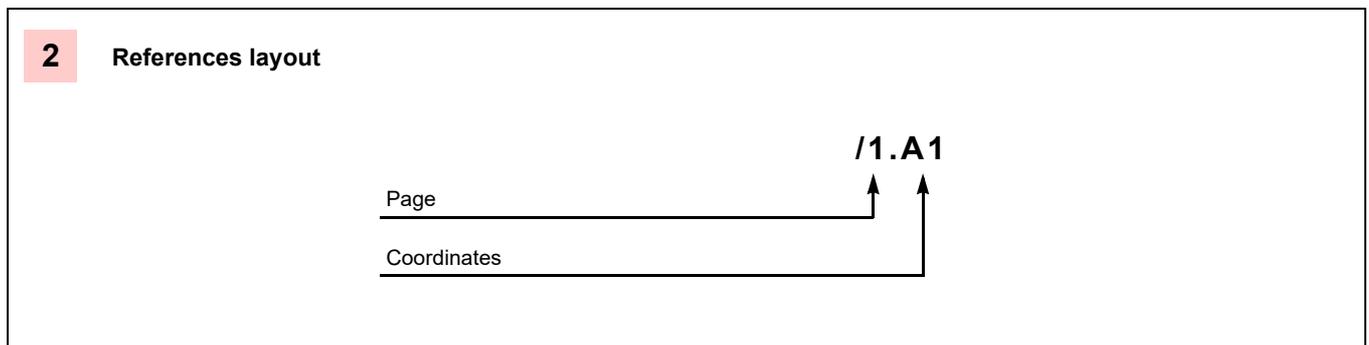


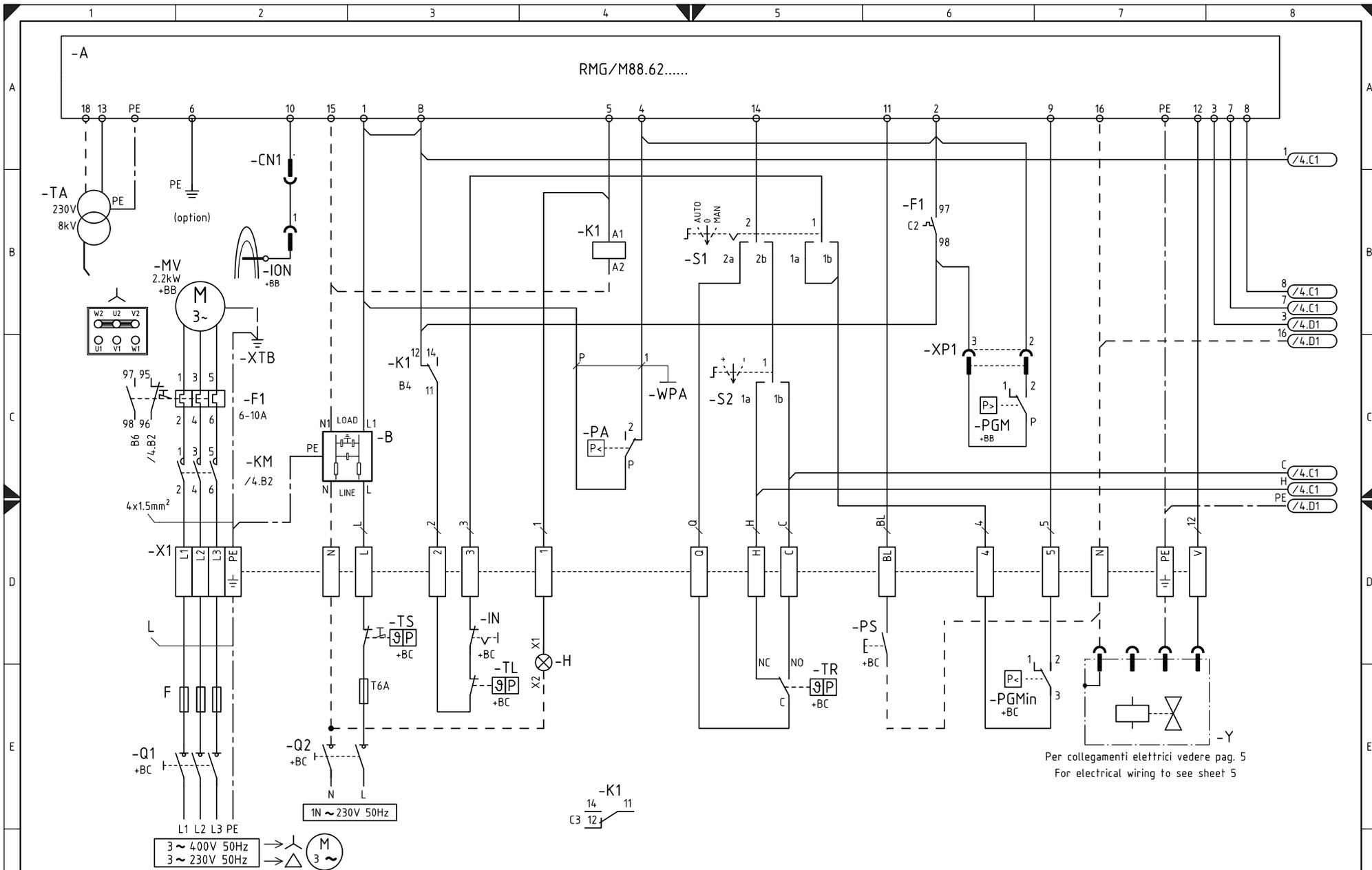
ATTENZIONE:

- Do not invert the neutral with the phase in the electrical supply line. An inversion would lead to lockout due to ignition failure.
- Replace the components only with original spare parts.

Layout of electric panel board

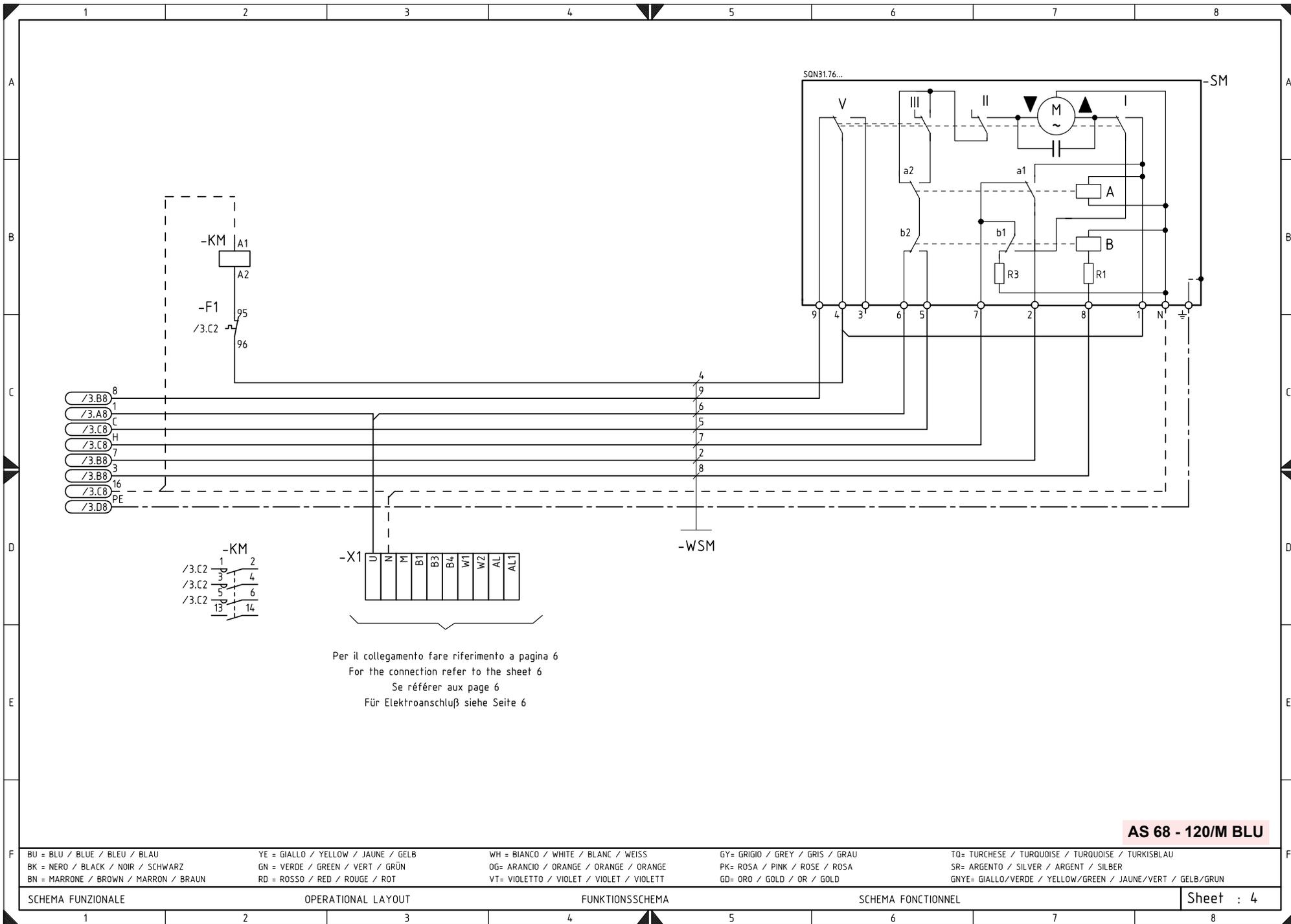
1	Contents
2	References layout
3	RMG/M... Operational layout
4	Operational layout
5	Electrical connections set by installer
6	Operational layout (RWF50)





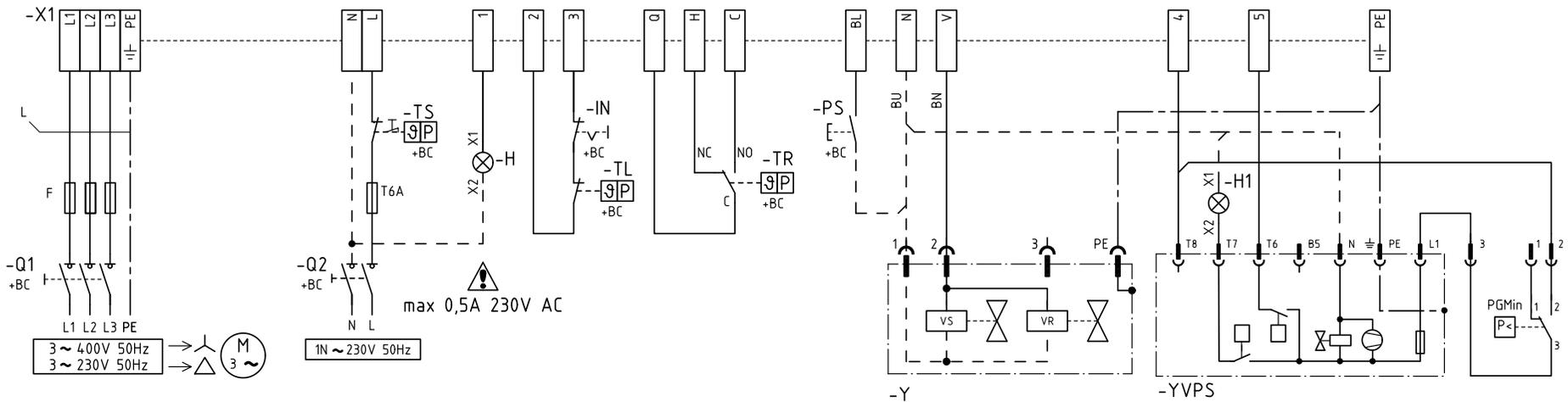
AS 120/M BLU

BU = BLU / BLUE / BLEU / BLAU	YE = GIALLO / YELLOW / JAUNE / GELB	WH = BIANCO / WHITE / BLANC / WEISS	GY = GRIGIO / GREY / GRIS / GRAU	TQ = TURCHESE / TURQUOISE / TURQUOISE / TURKISBLAU
BK = NERO / BLACK / NOIR / SCHWARZ	GN = VERDE / GREEN / VERT / GRÜN	OG = ARANCIO / ORANGE / ORANGE / ORANGE	PK = ROSA / PINK / ROSE / ROSA	SR = ARGENTO / SILVER / ARGENT / SILBER
BN = MARRONE / BROWN / MARRON / BRAUN	RD = ROSSO / RED / ROUGE / ROT	VT = VIOLETTO / VIOLET / VIOLET / VIOLETT	GD = ORO / GOLD / OR / GOLD	GYE = GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN



AS 68 - 120/M BLU

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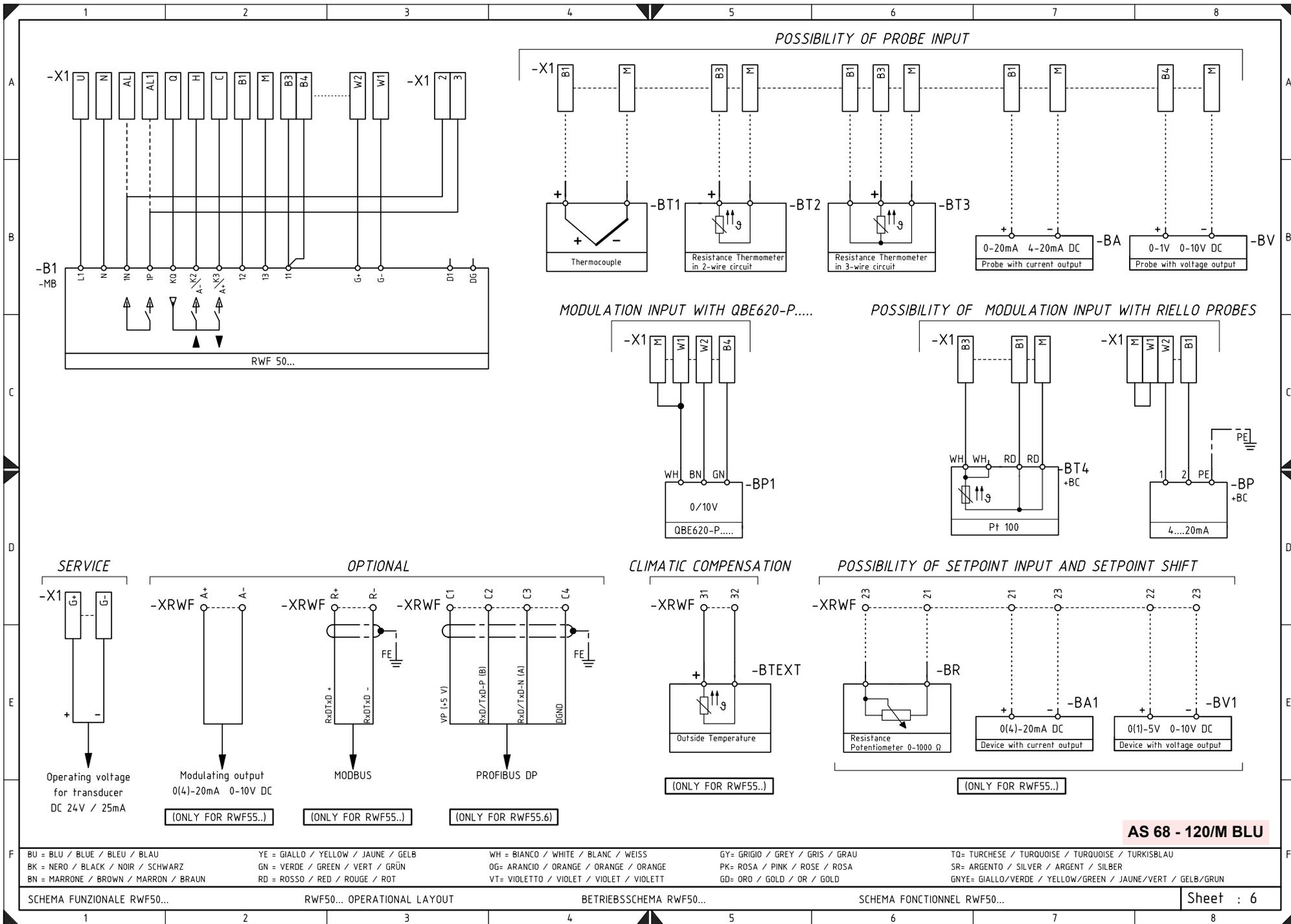


NEL CASO DI INTERRUTTORE MAGNETOTERMICO
SCEGLIERE IL TIPO C
WITH A MAGNETO-THERMAL SWITCH
CHOOSE TYPE C
EN CAS D' INTERRUPTEUR MAGNÉTO-THERMIQUE
CHOISIR LE TYPE C
IM FALLE EINES MAGNETOTHERMISCHEN
SCHALTERS TYP C WÄHLEN

AS 68 - 120/M BLU

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COLLEGAMENTI ELETTRICI A CURA DELL' INSTALLATORE ELECTRICAL CONNECTIONS SET BY INSTALLER ELEKTROANSCHLÜSSE VOM INSTALLATEUR AUSZUFÜHREN RACCORDEMENTS ÉLECTRIQUE EFFECTUÉ PAR L' INSTALLATEUR Sheet : 5



POSSIBILITY OF PROBE INPUT

MODULATION INPUT WITH QBE620-P.....

POSSIBILITY OF MODULATION INPUT WITH RIELLO PROBES

SERVICE

OPTIONAL

CLIMATIC COMPENSATION

POSSIBILITY OF SETPOINT INPUT AND SETPOINT SHIFT

AS 68 - 120/M BLU

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KEY TO ELECTRICAL LAYOUT

A	- Electrical control box
B	- Radio noise filter
B1	- Output power regulator RWF
BA	- Input under current 4...20 mA DC
BA1	- Input under current 4...20 mA DC to modify the setpoint
+BB	- Components on burners
+BC	- Components on boiler
BP	- Pressure probe
BP1	- Pressure probe
BR	- Remote setpoint potentiometer
BT1	- Thermocouple probe
BT2	- Two-wire probe Pt100
BT3	- Three-wire probe Pt100
BT4	- Four-wire probe Pt100
BTEXT	- External probe for climatic setpoint compensation
BV	- Input under voltage 0...10 V DC
BV1	- Input under voltage 0...10 V DC to modify the remote setpoint
CN1	- Ionisation probe connector
F1	- Fan motor thermal relay
H	- Remote lockout signalling
H1	- Lockout YVPS
IN	- Manual burner stop switch
ION	- Ionisation probe
K1	- Relay
KM	- Motor contact maker
MV	- Fan motor
PA	- Air pressure switch
PGM	- Maximum gas pressure switch
PGMin	- Low gas pressure switch
PS	- Lock-out reset button
Q1	- Three phase knife switch
Q2	- Single-phase knife switch
S1	- Unlit / automatic/ manual selector switch
S2	- Power increase/decrease selector switch
SM	- Servomotor
TA	- Ignition transformer
TL	- Limit thermostat/pressure switch
TR	- Adjustment thermostat/pressure switch
TS	- Safety thermostat/pressure switch
Y	- Gas regulation valve + gas safety valve
YVPS	- Gas valve leak detection control device
X1	- Burner terminal strip
XP1	- Modulation kit socket
XRWF	- Output power regulator RWF terminal strip
XTB	- Shelf earth

