



BURNERS
BRULEURS
BRENNER
QUEMADORES
BRUCIATORI

MANUAL OF - INSTALLATION - OPERATION - MAINTENANCE

LPG BURNERS

S3

S5

S10

S18

SINGLE STAGE VERSION

M03971CB Rev. 01 01/02



DANGERS, WARNINGS AND NOTES OF CAUTION

THIS MANUAL IS SUPPLIED AS AN INTEGRAL AND ESSENTIAL PART OF THE PRODUCT AND MUST BE DELIVERED TO THE USER.

INFORMATION INCLUDED IN THIS SECTION ARE DEDICATED BOTH TO THE USER AND TO PERSONNEL FOLLOWING PRODUCT INSTALLATION AND MAINTENANCE.

THE USER WILL FIND FURTHER INFORMATION ABOUT OPERATING AND USE RESTRICTIONS, IN THE SECOND SECTION OF THIS MANUAL. WE HIGHLY RECOMMEND TO READ IT.

CAREFULLY KEEP THIS MANUAL FOR FUTURE REFERENCE.

1) GENERAL INTRODUCTION

- The equipment must be installed in compliance with the regulations in force, following the manufacturer's instructions, by qualified personnel.
- Qualified personnel means those having technical knowledge in the field of components for civil or industrial heating systems, sanitary hot water generation and particularly service centres authorised by the manufacturer.
- Improper installation may cause injury to people and animals, or damage to property, for which the manufacturer cannot be held liable.
- Remove all packaging material and inspect the equipment for integrity. In case of any doubt, do not use the unit - contact the supplier.

The packaging materials (wooden crate, nails, fastening devices, plastic bags, foamed polystyrene, etc), should not be left within the reach of children, as they may prove harmful.

- Before any cleaning or servicing operation, disconnect the unit from the mains by turning the master switch OFF, and/or through the cut-out devices that are provided.
- Make sure that inlet or exhaust grilles are unobstructed.
- In case of breakdown and/or defective unit operation, disconnect the unit. Make no attempt to repair the unit or take any direct action.

Contact qualified personnel only.

Units shall be repaired exclusively by a servicing centre, duly authorised by the manufacturer, with original spare parts and accessories.

Failure to comply with the above instructions is likely to impair the unit's safety.

To ensure equipment efficiency and proper operation, it is essential that maintenance operations are performed by qualified personnel at regular intervals, following the manufacturer's instructions.

- When a decision is made to discontinue the use of the equipment, those parts likely to constitute sources of danger shall be made harmless.
- In case the equipment is to be sold or transferred to another user, or in case the original user should move and leave the unit behind, make sure that these instructions accompany the equipment at all times so that they can be consulted by the new owner and/or the installer.
- This unit shall be employed exclusively for the use for which it is meant. Any other use shall be considered as improper and, therefore, dangerous.

The manufacturer shall not be held liable, by agreement or otherwise, for damages resulting from improper installation, use and failure to comply with the instructions supplied by the manufacturer. The occurrence of any of the following circumstances may cause explosions, polluting unburnt gases (example: carbon monoxide CO), burns, serious harm to people, animals and things:

- Failure to comply with one of the WARNINGS in this chapter
- Incorrect handling, installation, adjustment or maintenance of the burner
- Incorrect use of the burner or incorrect use of its parts or optional supply

2) SPECIAL INSTRUCTIONS FOR BURNERS

- The burner should be installed in a suitable room, with ventilation openings complying with the requirements of the regulations in force, and sufficient for good combustion.
- Only burners designed according to the regulations in force should be used.
- This burner should be employed exclusively for the use for which it was designed.
- Before connecting the burner, make sure that the unit rating is the same as delivery mains (electricity, gas oil, or other fuel).
- Observe caution with hot burner components. These are, usually, near to the flame and the fuel pre-heating system, they become hot during the unit operation and will remain hot for some time after the burner has stopped.

When the decision is made to discontinue the use of the burner, the user shall have qualified personnel carry out the following operations:

- a Remove the power supply by disconnecting the power cord from the mains.
- b Disconnect the fuel supply by means of the hand-operated shut-off valve and remove the control handwheels from their spindles.

Special warnings

- Make sure that the burner has, on installation, been firmly secured to the appliance, so that the flame is generated inside the appliance fire-box.
- Before the burner is started and, thereafter, at least once a year, have qualified personnel perform the following operations:
 - a set the burner fuel flow rate depending on the heat input of the appliance;
 - b set the flow rate of the combustion-supporting air to obtain a combustion efficiency level at least equal to the lower level required by the regulations in force;
 - c check the unit operation for proper combustion, to avoid any harmful or polluting unburnt gases in excess of the limits permitted by the regulations in force;
 - d make sure that control and safety devices are operating properly;
 - e make sure that exhaust ducts intended to discharge the products of combustion are operating properly;
 - f on completion of setting and adjustment operations, make sure that all mechanical locking devices of controls have been duly tightened;
 - g make sure that a copy of the burner use and maintenance instructions is available in the boiler room.
- In case of a burner shut-down, reset the control box by means of the RESET pushbutton. If a second shut-down takes place, call the Technical Service, **without trying to RESET further**.
- The unit shall be operated and serviced by qualified personnel only, in compliance with the regulations in force.

3) GENERAL INSTRUCTIONS DEPENDING ON FUEL USED

3a) ELECTRICAL CONNECTION

- For safety reasons the unit must be efficiently earthed and installed as required by current safety regulations.
- It is vital that all safety requirements are met. In case of any doubt, ask for an accurate inspection of electrics by qualified personnel, since the manufacturer cannot be held liable for damages that may be caused by failure to correctly earth the equipment.
- Qualified personnel must inspect the system to make sure that it is adequate to take the maximum power used by the equipment shown on the equipment rating plate. In particular, make sure that the system cable cross section is adequate for the power absorbed by the unit.
- No adaptors, multiple outlet sockets and/or extension cables are permitted to connect the unit to the electric mains.
- An omnipolar switch shall be provided for connection to mains, as required by the current safety regulations.
- The use of any power-operated component implies observance of a few basic rules, for example:
 - do not touch the unit with wet or damp parts of the body and/or with bare feet;
 - do not pull electric cables;
 - do not leave the equipment exposed to weather (rain, sun, etc.) unless expressly required to do so;
 - do not allow children or inexperienced persons to use equipment;
- The unit input cable shall not be replaced by the user. In case of damage to the cable, switch off the unit and contact qualified personnel to replace. When the unit is out of use for some time the electric switch supplying all the power-driven components in the system (i.e. pumps, burner, etc.) should be switched off.

3b) FIRING WITH GAS, LIGHT OIL OR OTHER FUELS

GENERAL

- The burner shall be installed by qualified personnel and in compliance with regulations and provisions in force; wrong installation can cause injuries to people and animals, or damage to property, for which the manufacturer cannot be held liable.
- Before installation, it is recommended that all the fuel supply system pipes be carefully cleaned inside, to remove foreign matter that might impair the burner operation.
- Before the burner is commissioned, qualified personnel should inspect the following:
 - a the fuel supply system, for proper sealing;
 - b the fuel flow rate, to make sure that it has been set based on the firing rate required of the burner;
 - c the burner firing system, to make sure that it is supplied for the designed fuel type;
 - d the fuel supply pressure, to make sure that it is included in the range shown on the rating plate;
 - e the fuel supply system, to make sure that the system dimensions are adequate to the burner firing rate, and that the system is equipped with all the safety and control devices required by the regulations in force.
- When the burner is to remain idle for some time, the fuel supply tap or taps should be closed.

SPECIAL INSTRUCTIONS FOR USING GAS

Have qualified personnel inspect the installation to ensure that:

- a the gas delivery line and train are in compliance with the regulations and provisions in force;
- b all gas connections are tight;
- c the boiler room ventilation openings are such that they ensure the air supply flow required by the current regulations, and in any case are sufficient for proper combustion.
- Do not use gas pipes to earth electrical equipment.
- Never leave the burner connected when not in use. Always shut the gas valve off.
- In case of prolonged absence of the user, the main gas delivery valve to the burner should be shut off.

Precautions if you can smell gas

- a do not operate electric switches, the telephone, or any other item likely to generate sparks;
- b immediately open doors and windows to create an air flow to purge the room;
- c close the gas valves;
- d contact qualified personnel.
- Do not obstruct the ventilation openings of the room where gas appliances are installed, to avoid dangerous conditions such as the development of toxic or explosive mixtures.

DIRECTIVES AND STANDARDS

Gas burners

European directives

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

Harmonized standards

- UNI EN 676 (Automatic forced draught burners for gaseous fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

Light oil burners

European directives

- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

Harmonized standards

- UNI EN 267:2011 (Automatic forced draught burners for liquid fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

Heavy oil burners

European Directives

- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

Harmonized standards

- UNI EN 267 (Automatic forced draught burners for liquid fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

Gas - Light oil burners

European Directives

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

Harmonized standards

- UNI EN 676 (Automatic forced draught burners for gaseous fuels)
- UNI EN 267 (Automatic forced draught burners for liquid fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

Gas - Heavy oil burners

European directives:

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

Harmonized standards

- UNI EN 676 (Automatic forced draught burners for gaseous fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

Industrial burners

European directives

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

Harmonized standards

- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 746-2 (Industrial thermoprocessing equipment - Part 2: Safety requirements for combustion and fuel handling systems)
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- EN 60335-2 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements)

Burner data plate

For the following information, please refer to the data plate:

- burner type and burner model: must be reported in any communication with the supplier
- burner ID (serial number): must be reported in any communication with the supplier
- date of production (year and month)
- information about fuel type and network pressure

| | |
|--------------|----|
| Type | -- |
| Model | -- |
| Year | -- |
| S.Number | -- |
| Output | -- |
| Oil Flow | -- |
| Fuel | -- |
| Category | -- |
| Gas Pressure | -- |
| Viscosity | -- |
| El. Supply | -- |
| El. Consump. | -- |
| Fan Motor | -- |
| Protection | -- |
| Drwaing n° | -- |
| P.I.N. | -- |

SYMBOLS USED



WARNING!

Failure to observe the warning may result in irreparable damage to the unit or damage to the environment



DANGER!

Failure to observe the warning may result in serious injuries or death.



WARNING!

Failure to observe the warning may result in electric shock with lethal consequences

Figures, illustrations and images used in this manual may differ in appearance from the actual product.

BURNER SAFETY

The burners - and the configurations described below - comply with the regulations in force regarding health, safety and the environment. For more in-depth information, refer to the declarations of conformity that are an integral part of this Manual.



DANGER! Incorrect motor rotation can seriously damage property and injure people.

Residual risks deriving from misuse and prohibitions

The burner has been built in order to make its operation safe; there are, however, residual risks.



Do not touch any mechanical moving parts with your hands or any other part of your body. Injury hazard
Do not touch any parts containing fuel (i.e. tank and pipes). Scalding hazard
Do not use the burner in situations other than the ones provided for in the data plate.
Do not use fuels other than the ones stated.
Do not use the burner in potentially explosive environments.
Do not remove or by-pass any machine safety devices.
Do not remove any protection devices or open the burner or any other component while the burner is running.
Do not disconnect any part of the burner or its components while the burner is running.
Untrained staff must not modify any linkages.



After any maintenance, it is important to restore the protection devices before restarting the machine.
All safety devices must be kept in perfect working order.
Personnel authorized to maintain the machine must always be provided with suitable protections.



ATTENTION: while running, the parts of the burner near the generator (coupling flange) are subject to overheating. Where necessary, avoid any contact risks by wearing suitable PPE.

PART I: INSTALLATION MANUAL

TECHNICAL DATA

| BURNER TYPE | | S3 | S5 | S10 | S18 |
|-----------------------------|---------------------|-----------------|-----------------|-----------------|-----------------|
| Input | min. kW | 20 | 35 | 65 | 80 |
| | max. kW | 35 | 70 | 120 | 200 |
| | min. kcal/h | 17.200 | 30.000 | 55.900 | 68.800 |
| | max. kcal/h | 30.000 | 60.200 | 103.200 | 172.000 |
| Fuel | | LPG | LPG | LPG | LPG |
| Category | | I ₃₊ | I ₃₊ | I ₃₊ | I ₃₊ |
| Gas flow rate min. - max. | Stm ³ /h | 0.7 - 1.25 | 1.25 - 2.5 | 2.3 - 4.3 | 2.8 - 7.1 |
| Gas pressure min.* | mbar | 30 | 30 | 30 | 30 |
| Gas pressure max. | mbar | 65 | 200 | 200 | 200 |
| Electric supply - frequency | | 230V - 50 Hz | 230V - 50 Hz | 230V - 50 Hz | 230V - 50 Hz |
| Total power consumption | W | 230 | 250 | 400 | 400 |
| Fan motor (2800 rpm) | W | 50 | 100 | 150 | 150 |
| Protection | | IP40 | IP40 | IP40 | IP40 |
| Approx. weight | Kg | 12.5 | 14 | 14.5 | 23.5 |
| Gas train size | | 1/2" | 1/2" | 3/4" | 1" |
| Gas connection | | Rp1/2 | Rp1/2 | Rp3/4 | Rp1 |
| Operation | | single stage | single stage | single stage | single stage |
| Destination country | | * | * | * | * |

* Minimum pressure requested to get the maximum rate with any back-pressure in combustion chamber (referring to the performance curves). The burner operates correctly also with lowest pressure only if these are enough to guarantee the necessary gas rate.

BURNER MODEL IDENTIFICATION

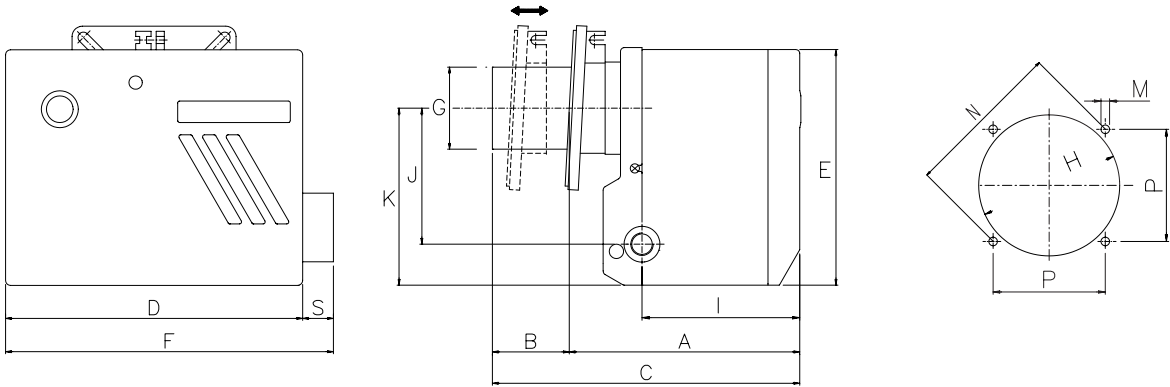
Burners are identified by burner type and model. Burner model identification is described as follow.

| | | |
|-------------------------|----------------------------|--|
| Type: S3 | Model: | L-. TN. S. *. A. 0. 15 |
| (1) | (2) | (3) (4) (5) (6) (7) (8) |
| (1) BURNER TYPE | | |
| (2) FUEL | | L - LPG |
| (3) OPERATION | Available versions | TN - Single stage |
| (4) BLAST TUBE LENGHT | (See overall dimensions) | |
| | L-.Available versions | S - Standard |
| | | L - Long |
| (5) DESTINATION COUNTRY | | * - See data plate |
| (6) SPECIAL VERSIONS | | A - Standard B - Bread ovens |
| (7) BURNER EQUIPMENT | Available versions | 0 - 2 valves |
| | | 1 - 2 valves + leak detection monitor (optional for input < 1200 kW) |
| (8) GAS TRAIN SIZE | (See technical data) | |
| | 15= Rp1/2 20=Rp3/4 25= Rp1 | |

OVERALL DIMENSIONS

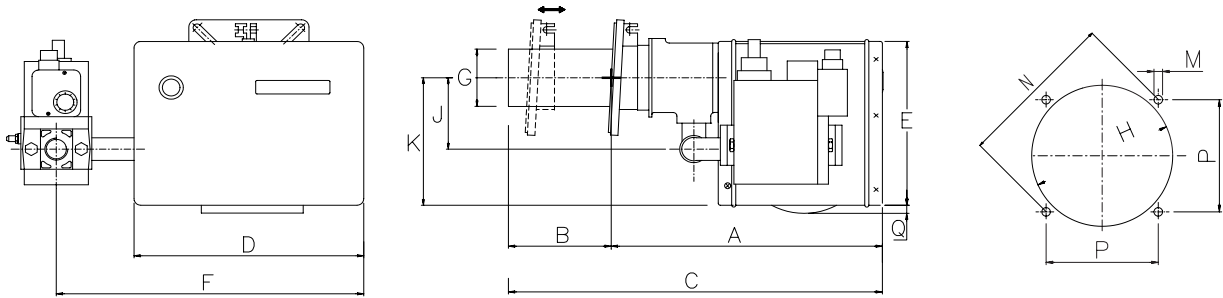
S3

Fig. 4a



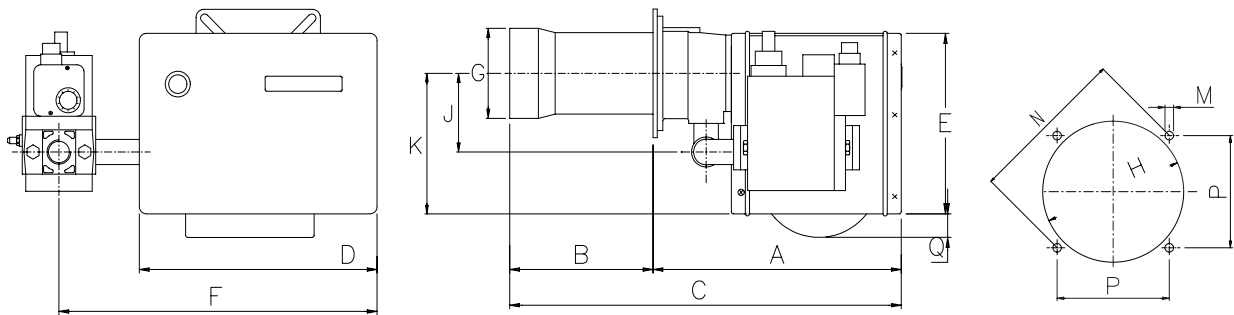
S5

Fig. 4b



S10 - S18

Fig. 4c



| | A | B | BL | C | CL | D | E | F | G | K | J | I | H | S | P | M | N | Q |
|----|-----|------|-------|-----|-----|-----|-----|-----|----|-----|-----|-----|----|----|-----|----|-------|---|
| S3 | 225 | 75÷0 | 150÷0 | 300 | 375 | 290 | 420 | 320 | 80 | 175 | 135 | 155 | 90 | 30 | 110 | M8 | 155.5 | - |
| S5 | 325 | 80÷0 | 180÷0 | 410 | 510 | 310 | 420 | 395 | 80 | 180 | 85 | - | 90 | - | 110 | M8 | 155.5 | 7 |

| | A | B | BL | C | CL | D | E | F | G | K | J | H | P | M | N | Q |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-------|----|
| S10 | 355 | 180 | 275 | 535 | 630 | 340 | 255 | 455 | 108 | 200 | 110 | 125 | 120 | M8 | 169.7 | 30 |
| S18 | 355 | 205 | 300 | 560 | 655 | 340 | 255 | 455 | 126 | 200 | 110 | 132 | 120 | M8 | 169.7 | 30 |

PERFORMANCE CURVES



Fig. 5

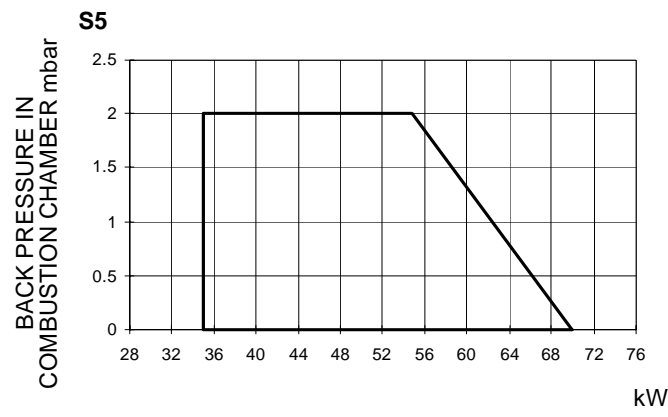


Fig. 6

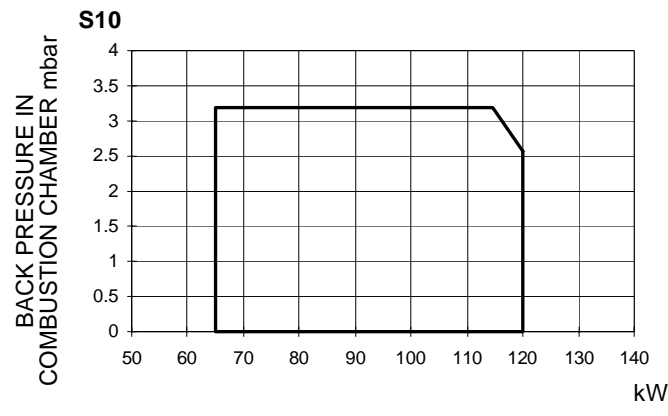


Fig. 7

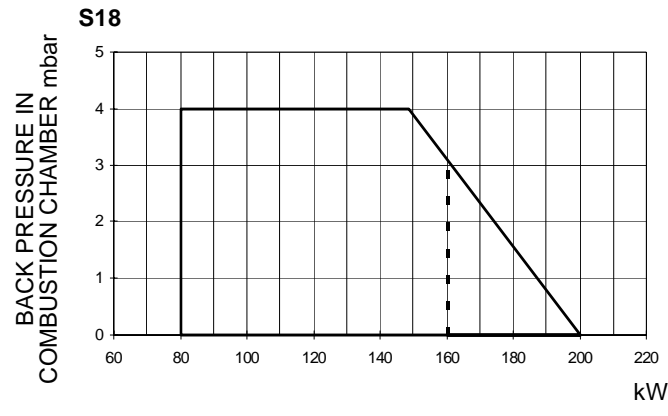


Fig. 8

To get the power in Kcal/h, multiply the value in kW by 860.

MOUNTINGS AND CONNECTIONS

Packing

The burners are despatched in cardboard packages of dimensions:

| | |
|-------------------------|--------------------------------|
| S3 | 400 x 300 x 360 mm (W x H x D) |
| S5 | 370 x 560 x 310 mm (W x H x D) |
| S10/S18 | 420 x 620 x 340 mm (W x H x D) |
| S10/S18 long blast tube | 770 x 440 x 510 mm (W x H x D) |

Packing cases of this kind are affected by humidity and are not suitable for stacking. The following are placed in each packing case.

- 1 burner with detached gas train (excluded S3);
- 1 gasket to be inserted between the burner and the boiler;
- 1 envelope containing this manual

To get rid of the burner's packing and in the event of scrapping of the latter, follow the procedures laid down by current laws on disposal of materials.

Fig. 9 - Fitting the burner to the boiler

Fix the flange of the burner to the boiler as shown in Fig. 9.

After fitting the burner to the boiler ensure that the space between the blast tube and the refractory lining is sealed with appropriate insulating material (ceramic fibre cord or refractory cement).

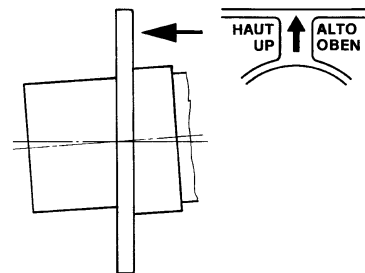


Fig. 9

Matching the burner to the boiler

The burners described in this manual have been tested with combustion chambers that comply with EN676 regulation and whose dimensions are described in the diagram in Fig. 10. In case the burner must be coupled with boilers with a combustion chamber smaller in diameter or shorter than those described in the diagram, please contact the supplier, to verify that a correct matching is possible, with respect of the application involved.

To correctly match the burner to the boiler verify the necessary input and the pressure in combustion chamber are included in the burner performance curve; otherwise the choice of the burner must be revised consulting the burner manufacturer.

To choose the blast tube length follow the instructions of the boiler manufacturer. In absence of these consider the following:

- Cast-iron boilers, three pass flue boilers (with the first pass in the rear part): the blast tube must protrude no more than 100 mm into the combustion chamber.

The length of the blast tubes does not always allow this requirement to be met, and thus it may be necessary to use a suitably-sized spacer to move the burner backwards.

- Pressurised boilers with flame reversal: in this case the blast tube must penetrate at least 50 - 100 mm into combustion chamber in respect to the tube bundle plate.

Key

- a) Heat input Q in kW
- b) Length of the flame tube in meters
- c) Flame tube firing intensity in kW/m³
- d) Combustion chamber diameter (m)

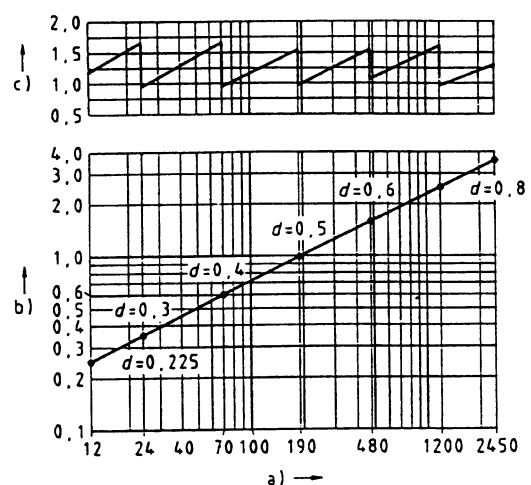


Fig. 10 - Firing intensity, diameter and length of the test flame tube as a function of the heat input Q..

ELECTRICAL CONNECTIONS

- Remove the burner cover.
- Carry out the electrical connections to the multiple connector as shown in Fig. 11.
- Refit the burner cover.

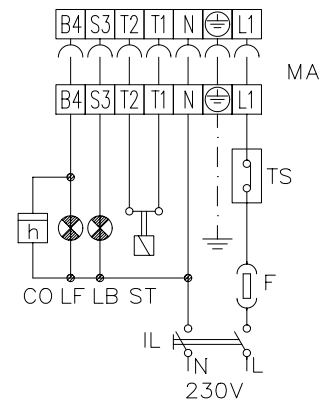


Fig. 11

RESPECT THE BASIC SAFETY RULES. MAKE SURE OF THE CONNECTION TO THE EARTHING SYSTEM. DO NOT REVERSE THE PHASE AND NEUTRAL CONNECTIONS. FIT A DIFFERENTIAL THERMAL MAGNET SWITCH ADEQUATE FOR CONNECTION TO THE MAINS.

GAS TRAIN INSTALLATION DIAGRAM

The diagrams in Fig. 12a and Fig. 12b show the components of the gas train which are included in the delivery and those which must be fitted by the installer. The diagrams comply with regulations in force.

Fig. 12a

Burners equipped with two separate gas valves

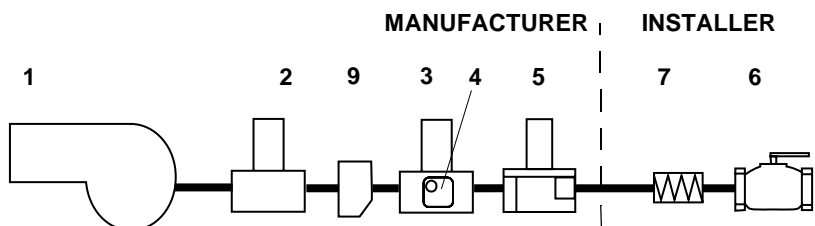
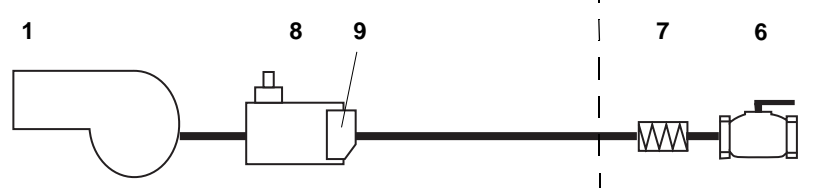


Fig. 12b

Burners equipped with Multibloc DUNGS MB-DLE... valves group, or BM771; (2 valves + pressure switch + gas filter + governor)



Key

- 1 Burner
- 2 Gas valve EV2
- 3 Gas valve EV1
- 4 Minimum gas pressure switch
- 5 Governor + gas filter
- 6 Manual shut-off valve
- 7 Bellow joint
- 8 Multibloc valves group
- 9 Leakage control device

SETTINGS

WARNING!
THE SEALED SCREWS MUST NOT BE UNSCREWED!
IN A SUCH CASE THE DEVICE WARRANTY IS IMMEDIATELY INVALIDATE!

Fig. 13 - Multifunction gas valve BM771

The multifunction gas valve BM 771 includes 2 gas valves, a pressure governor and a gas filter.

- To carry out the regulations, use the fitted 2 mm Allen key.
- Gas flow regulation is possible by means of the RP regulator: screwing, the gas flow increases and unscrewing it decreases.
- To set the ignition gas flow, turn the screw VR: screw to increase and unscrew to decrease.

Note: PP= gas pressure gauge

Settings

- Connect the manometer to the pressure gauge PP
- Turn on the burner with adequate air flow, measure the gas pressure at burner start and during normal operation (10 s after ignition). The pressure during ignition must be lower than during normal operation.
- If the ignition pressure is too high and settings by means of the screw RP are not successful, reduce the ignition pressure by means of the screw VR.

Coil replacement

To remove the coil slacken the screw VSB and pull the coil upward.

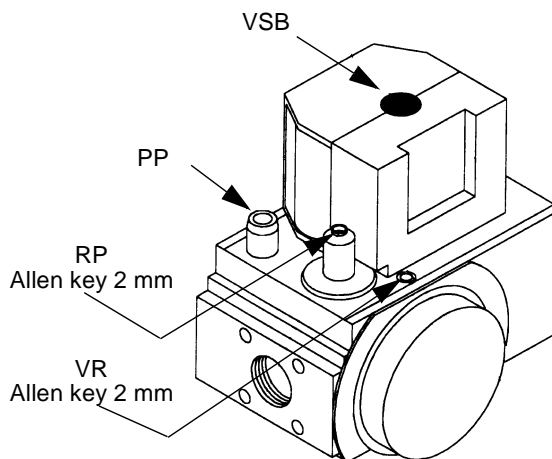


Fig. 13

Fig. 14 - Solenoid valve Brahma EG..L

- To adjust the gas flow unscrew the screw VB and turn the element n° 3.
- Screw to decrease the gas rate and unscrew to increase.
- To set the fast stroke turn the screw n° 1; screw to increase the opening time and unscrew to decrease.
- The nut n° 2 allows to set the ignition gas rate; use a 6 mm key. Screw to decrease the gas rate and unscrew to increase.

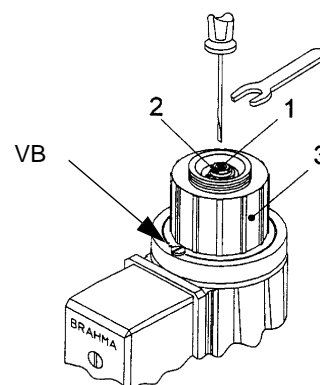


Fig. 14

Fig. 15 - Solenoid valve Brahma EG..S

- To adjust the flow rate unscrew the plug T and use an Allen key on the regulator VR, located in the bottom side of the valve.
 - Screw to decrease the gas rate and unscrew to increase.
- At the end of settings refit the plug T.

Coil replacement

- Remove the retaining ring on the upper section and withdraw the coil (B).
- Refit the retaining ring after settings.

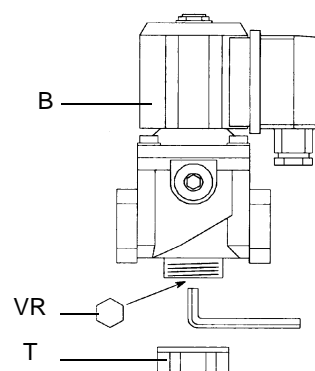


Fig. 15

Gas valve Dungs MV-DLE

- To adjust the gas flow rate loosen the screw VB and rotate the regulator RP as necessary. Flow decreases screwing and increases unscrewing.
- Tighten the screw VB.
- To set the fast opening remove cover T, reverse it upside down and use it as a tool to rotate the screw VR. Clockwise rotation reduces the ignition flow rate, anticlockwise rotation increase it.

Note: the screw VSB must be removed only in case of replacement of the coil.

Do not use a screwdriver on the screw VR!

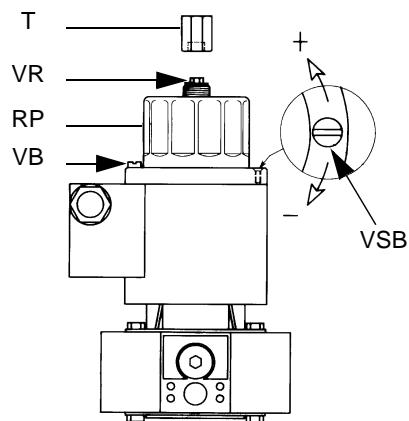


Fig. 16

Fig. 17 - Multibloc MB-DLE - VPS504

The multibloc unit is a compact unit consisting of two valves, gas pressure switch, pressure stabilizer and gas filter. It can be paired jointly to the Dungs VPS504 sealing controls.

The gas flow is adjusted by means of the RP regulator after slackening the locking screw VB by a number of turns. By unscrewing the regulator RP the flow increases and screwing it is reduced.

To set the fast opening remove cover T, reverse it upside down and use it as a tool to rotate screw VR. Clockwise rotation reduces start flow rate, anticlockwise rotation increases it.

Do not use a screwdriver on the screw VR!

The pressure stabilizer is adjusted by operating the screw VS located under the cover C. By screwing down the pressure is increased and by unscrewing it is reduced.

Note: the screw VSB must be removed only in case of replacement of the coil.

Leakage control device VPS504 (Optional)

The VPS504 check the operation of the seal of the gas shut off valves constituting the MB-DLE. This check, carried out as soon as the boiler thermostat gives a start signal to the burner, creates, by means of the diaphragm pump inside it, a pressure in the test space of 20 mbar higher than the supply pressure. When wishing to monitor the test, install a pressure gauge ranged to that of the pressure supply point PA. If the test cycle is satisfactory, after a few seconds the consent light LC (yellow) comes on. In the opposite case the lockout light LB (red) comes on.

To restart it is necessary to reset the appliance by pressing the illuminated pushbutton LB.

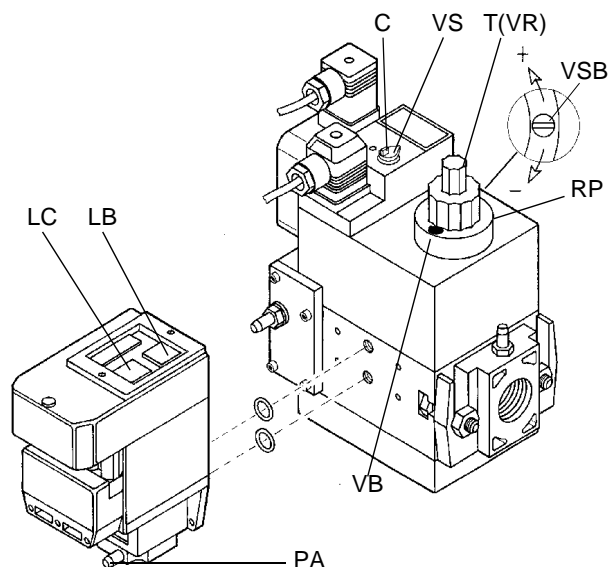


Fig. 17

Pressure governor

Remove the cap T.

To increase the gas pressure at the outlet use a screwdriver on the screw TR as shown in Fig. 18.

Screw to increase the pressure, unscrew to decrease.

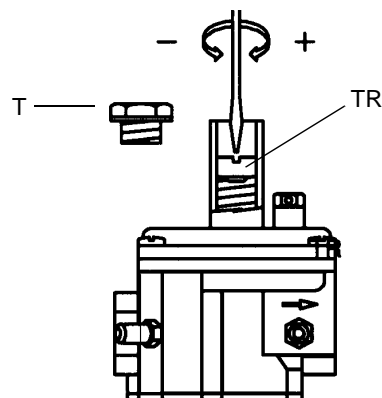


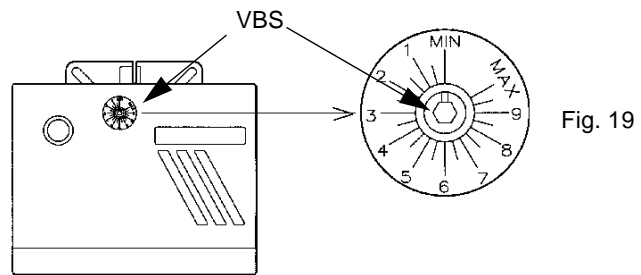
Fig. 18

AIR FLOW SETTING

WARNING: During commissioning operations, do not let the burner operate with insufficient air flow (danger of formation of carbon monoxide); if this should happen, shut down the burner, increase the opening of the air damper and start up the burner again to ensure the purging of the carbon monoxide from the combustion chamber.

Type S3

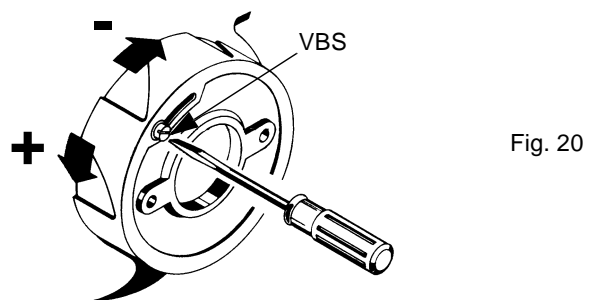
Adjust the air flow rotating the screw VBS.



Type S5, S10 and S18

Slacken the screw VBS and turn the air damper manually as required.

At the end of adjustment tight the screw VBS.



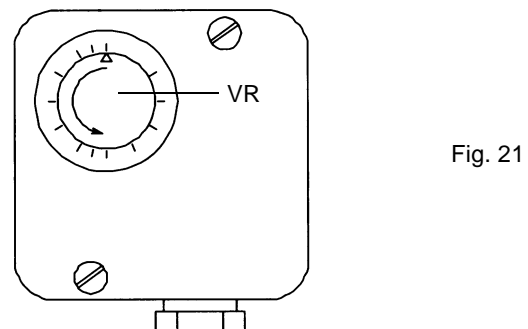
NOTE: Check the combustion with the cover fitted on the burner!

IMPORTANT: Set the air flow rate referring to the following values: minimum CO₂ value for G20, 9.75%; if the burner is calibrated to its minimum rate the value must be 9%.

Calibration of air pressure switch

Calibration is carried out as follows.:

- Remove the transparent plastic cap.
- With the burner in operation, after air and gas setting have been completed, slowly turn the adjusting ring nut VR in the clockwise direction until the burner lockout, read the value on the pressure switch scale and reduce it by 0.5 mbar.
- Repeat the ignition cycle of the burner and check it starts properly.
- Refit the transparent plastic cover on the pressure switch.



Calibration of minimum gas pressure switch

Calibration is carried out as follows:

- Remove the transparent plastic cap (not on SIT pressure switch).
- With the burner in operation test the pressure on the pressure port at the input of the gas filter; slowly close the manual shut-off valve (n. 6 in Fig. 12a and Fig. 12b) until the detected pressure is reduced by 50%.
- Fully open the manual shut-off valve n. 6 in Fig. 12a and Fig. 12b.
- Refit the transparent plastic cover on the pressure switch (not on SIT pressure switch).

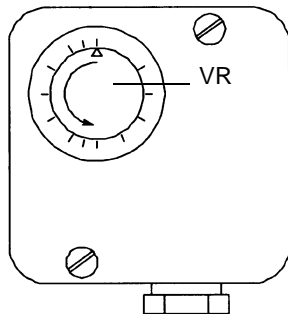


Fig. 22

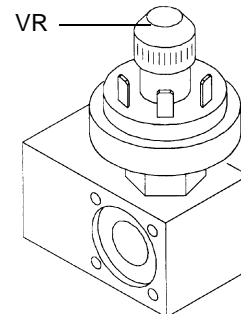


Fig. 23 - Pressure switch SIT

Adjusting the combustion head

The burner is adjusted in the factory with the combustion head in the "MAX" position, corresponding to the maximum capacity. To operate at a reduced capacity move back the burner head progressively, towards the "MIN" position.

Adjust the combustion head by means of the screw VRT as shown in Fig. 24 and Fig. 25.

Burner type S3

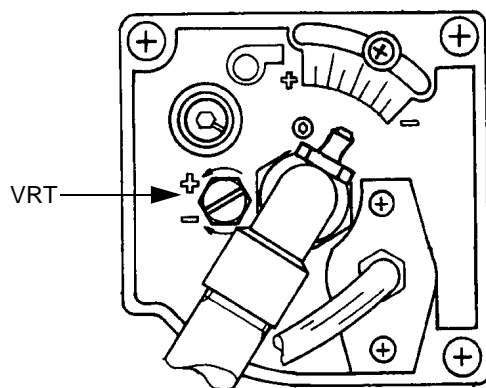


Fig. 24

Burners type S5, S10 and S18

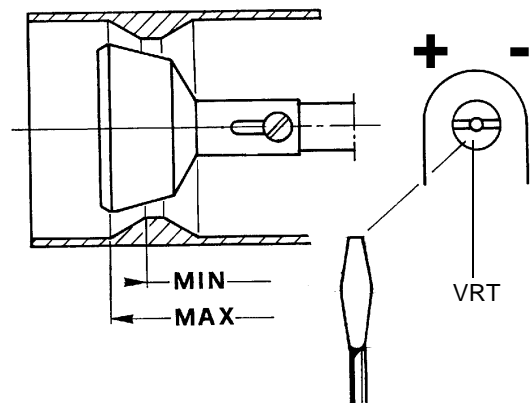


Fig. 25

LIMITATIONS OF USE

THE BURNER IS AN APPLIANCE DESIGNED AND CONSTRUCTED TO OPERATE ONLY AFTER BEING CORRECTLY CONNECTED TO A HEAT GENERATOR (E.G. BOILER, HOT AIR GENERATOR, FURNACE, ETC.), ANY OTHER USE IS TO BE CONSIDERED IMPROPER AND THEREFORE DANGEROUS.

THE USER MUST GUARANTEE THE CORRECT FITTING OF THE APPLIANCE, ENTRUSTING THE INSTALLATION OF IT TO QUALIFIED PERSONNEL AND HAVING THE FIRST COMMISSIONING OF IT CARRIED OUT BY A SERVICE CENTRE AUTHORISED BY THE COMPANY MANUFACTURING THE BURNER.

A FUNDAMENTAL FACTOR IN THIS RESPECT IS THE ELECTRICAL CONNECTION TO THE GENERATOR'S CONTROL AND SAFETY UNITS (CONTROL THERMOSTAT, SAFETY, ETC.) WHICH GUARANTEES CORRECT AND SAFE FUNCTIONING OF THE BURNER.

THEREFORE, ANY OPERATION OF THE APPLIANCE MUST BE PREVENTED WHICH DEPARTS FROM THE INSTALLATION OPERATIONS OR WHICH HAPPENS AFTER TOTAL OR PARTIAL TAMPERING WITH THESE (E.G. DISCONNECTION, EVEN PARTIAL, OF THE ELECTRICAL LEADS, OPENING THE GENERATOR DOOR, DISMANTLING OF PART OF THE BURNER).

NEVER OPEN OR DISMANTLE ANY COMPONENT OF THE MACHINE.

OPERATE ONLY THE MAIN SWITCH ("ON-OFF"), WHICH THROUGH ITS EASY ACCESSIBILITY AND RAPIDITY OF OPERATION ALSO FUNCTIONS AS AN EMERGENCY SWITCH, AND ON THE RESET BUTTON.

IN THE EVENT OF REPEATED LOCKOUTS, DO NOT PERSIST WITH THE RESET BUTTON AND CONTACT QUALIFIED PERSONNEL WHO WILL PROCEED TO ELIMINATE THE MALFUNCTION.

WARNING: DURING NORMAL OPERATION THE PARTS OF THE BURNER NEAREST TO THE GENERATOR (COUPLING FLANGE) CAN BECOME VERY HOT, AVOID TOUCHING THEM SO AS NOT TO GET BURNT

OPERATION

- Turn on the burner operating on the boiler main switch.
- Check the flame control device is not locked and, if necessary, reset it operating on the reset button, accessible from the hole on the burner's casing.
- Check the serie of thermostats or pressure switches enable the burner to operate.
- (Only burners fitted with leakage control device): the check cycle of the leakage control starts, the end of check is signalled by the lamp LC on the leakage control device. Once the check has been completed, the ignition cycle of the burner starts. In the event of a gas leak in a valve, the leakage control device locks and the LB lamp lights. To release press the button LB on the device.
- The burner starts and the flame control device drives the burner's fan.
- At the end of pre-purge phase the gas solenoid valves are energized and the burner starts up.

At least once a year carry out the maintenance operations listed below. In the case of seasonal servicing, it is recommended to carry out the maintenance at the end of each heating season; in the case of continuous operation the maintenance is carried out every 6 months.

N.B. All operations on the burner must be carried out with the power disconnected

PERIODIC OPERATIONS

- Remove, check and clean the combustion head (see Fig. 26a, Fig. 26b, Fig. 26c);
- Check the ignition electrode, clean and adjust it and, if necessary, replace it (Fig. 27);
- Check the detection electrode, clean and adjust it and, if necessary, replace it (Fig. 27). If in doubt, verify the detection circuit with the burner in operation, referring to the diagram in Fig. 28.

NOTE: The check on the ignition and detection electrodes is carried out after removing the combustion head.

Removing the combustion head

Type S3 (Fig. 26a) and S5 (Fig. 26b)

- Remove the burner from the gas supply;
- Slacken the screw VE on the blast tube and pull off the burner: at this point the combustion head and the electrodes are easy accessible.

S3

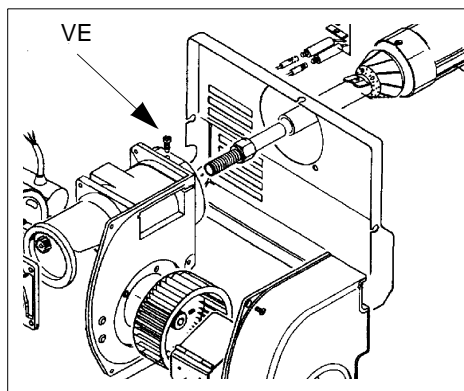


Fig. 26a

S5

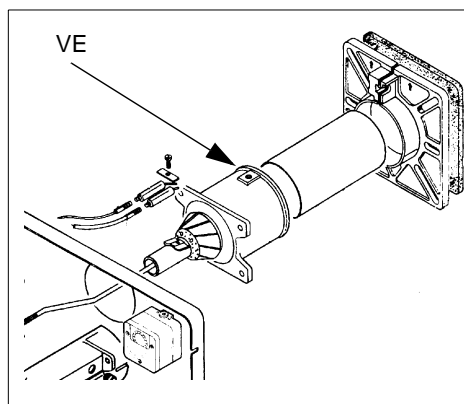


Fig. 26b

S10 - S18

Type S10 - S18 (Fig. 26c)

- Remove the burner from the gas supply;
- To access the combustion head and the electrodes, slacken the screw VE on the blast tube and pull off the burner; provide a stable surface where leave the burner during such operations.

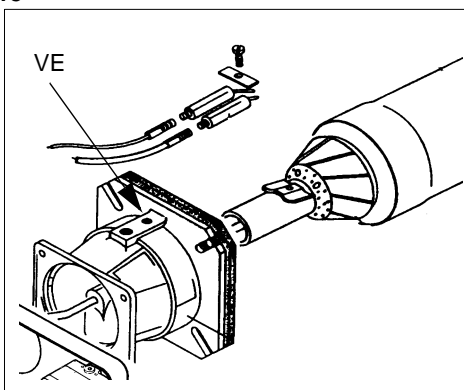


Fig. 26c

Correct electrodes position

To guarantee a proper ignition, the measures indicated in Fig. 27 must be respected.

Ensure the locking screw of the electrodes group is tight before refit the burner.

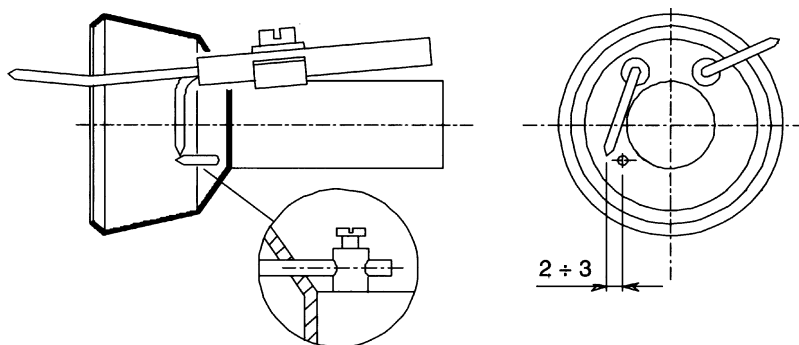


Fig. 27

Checking the ionization current

To measure the detection signal intensity, follow the scheme in Fig. 28.

If the signal is less than the value indicated, check the position of the detection electrode, the electric contacts and, if necessary, replace the electrode.

| Flame controller | Minimum flame signal |
|------------------|----------------------|
| LGB21/22 | 3 μ A |
| LMG21/22 | 3 μ A |
| VM41 | 12 μ A |

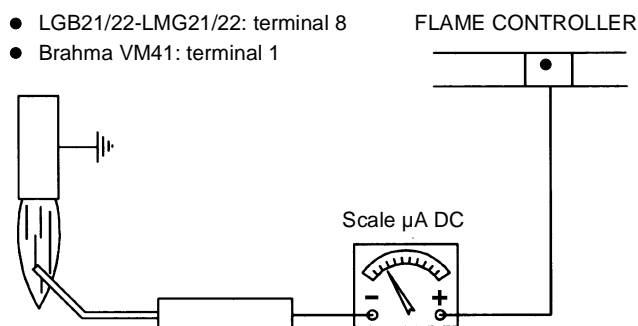


Fig. 28

If the power supply to the burner is 230V phase-phase (without a neutral), with the Landis LGB2... o LMG2... flame control device, between the terminal 2 on the board and the earth terminal, an RC Landis RC466890660 filter must be inserted

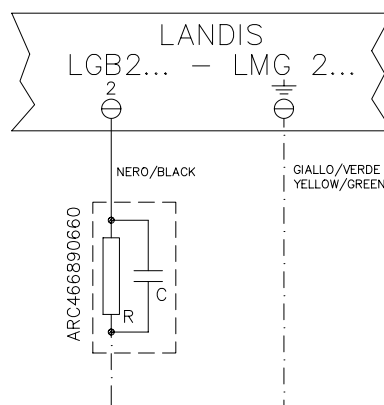


Fig. 29a

If the power supply to the burner is 230V phase-phase (without a neutral), with the Brahma VM4., to increase the voltage between the electrode and the ground, you need to use the insulation transformer Brahma AR1 (our code 2531006), connected as shown in Fig. 29b

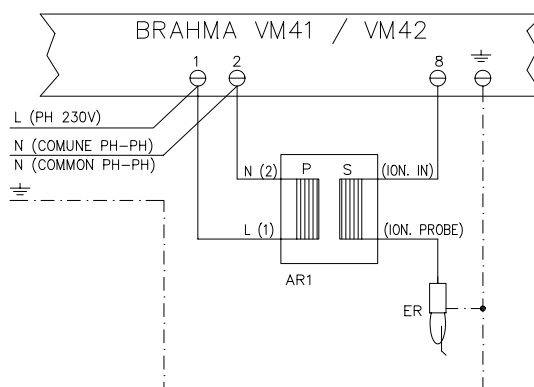


Fig. 29b

Key

- AR1 Brahma insulation transformer
- ER Detection electrode
- L Phase
- N Common
- P Transformer primary winding
- S Transformer secondary winding
- VM4..Brahma flame control device

TROUBLESHOOTING

| | BURNER DOESN'T START | BURNER CONTINUES PRE-PURGE PHASE | BURNER DOESN'T START AND LOCKS | BURNER DOESN'T START AND REPEATS CYCLE | BURNER STARS AND REPEATS CYCLE | BURNER LOCKS DURING OPERATION | BURNER SHUTS OFF AND REPEATS CYCLE DURING OPERATION | FLAME CONTROLLER REPEATS THE CYCLE WITHOUT GIVE CONSENT | BURNER STARTS AND LOCKS |
|--|-------------------------|-------------------------------------|-----------------------------------|--|-----------------------------------|----------------------------------|---|--|----------------------------|
| LACK OF GAS | ● | | | | | | | | |
| GAS PRESSURE SWITCH FAULT | ● | | | | | | | | |
| OPEN THERMOSTATS OR PRESSURE SWITCHES ON BOILER | ● | | | | | | | | |
| FLAME CONTROLLER FAULT | ● | ● | ● | | | ● | | | ● |
| PRESSURE SWITCH FAULT OR BAD SETTING | ● | | ● | | | ● | | ● | |
| FUSES INTERVENTION | ● | | | | ● | | | | |
| GAS PRESSURE SWITCH BAD SETTING | | | | ● | ● | | ● | | |
| IGNITION TRANSFORMER FAULT | | | ● | | | | | | |
| IGNITION ELECTRODE BAD POSITION | | | ● | | | | | | |
| PHASE-PHASE ELECTRICAL SUPPLY* | | | | | | | | | ● |
| GAS GOVERNOR FAULT | | | | ● | ● | | ● | | |
| DETECTION ELECTRODE BAD POSITION | | | | | | ● | | | ● |

* See Fig. 29a and Fig. 29b.

ELECTRICAL DIAGRAMS

Electrical diagrams complete key

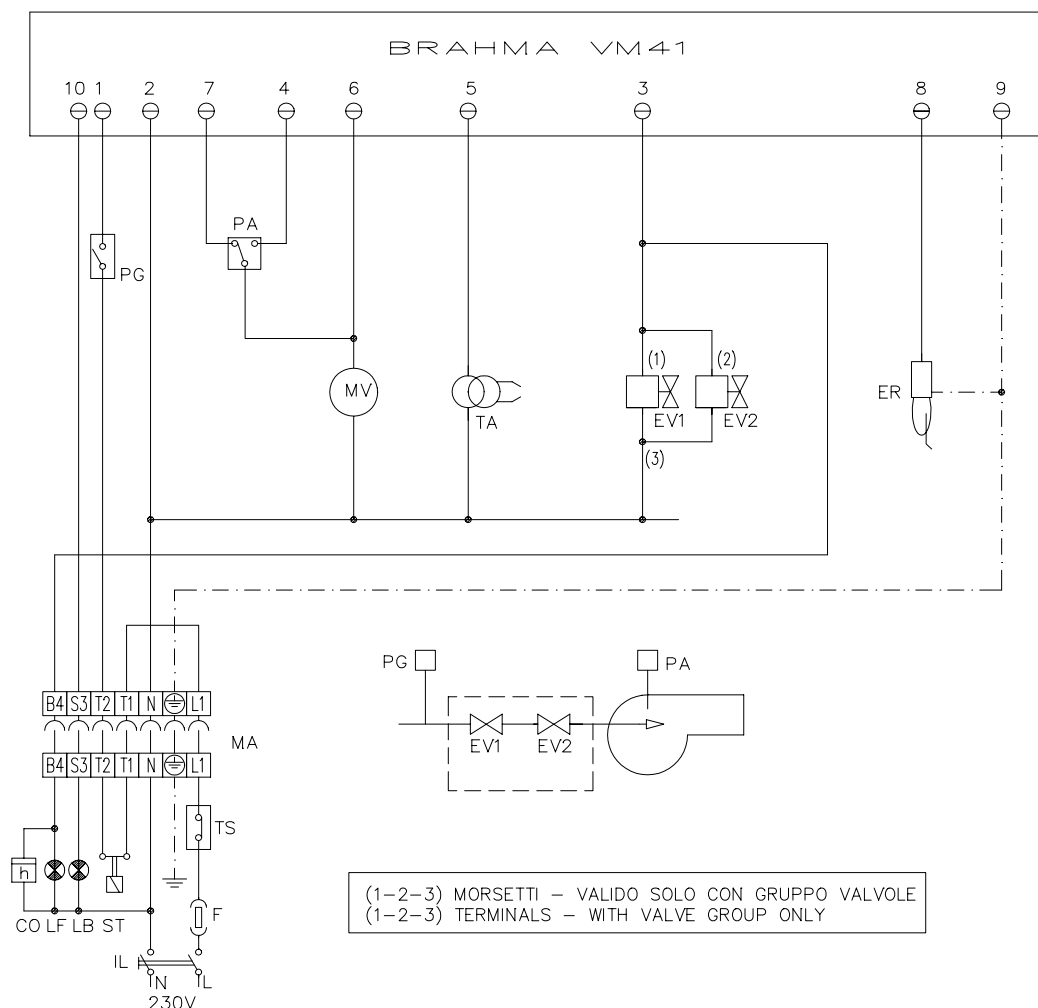
| | |
|-------------------|---|
| CO | Operation time counter |
| ER | Flame detection electrode |
| EV1 | Network side solenoid gas valve (or valves group) |
| EV2 | Burner side solenoid gas valve (or valves group) |
| F | Fuse |
| IL | Line switch |
| L | Phase |
| LB | Flame lockout signalization light |
| LF | Burner in operation light |
| LGB.. / LMG.. | Landis flame control device |
| MA | Burner power supply terminal block |
| MV | Fan motor |
| N | Neutral |
| PA | Air pressure switch |
| PG | Minimum gas pressure switch |
| ST | Thermostats or pressure switches group |
| STA12B3.41/63N21L | Berger servocontrol for air damper |
| TA | Ignition transformer |
| TS | Boiler safety thermostat/pressure switch |
| VM41 | Brahma flame control device |
| VPS504 | Dungs valves leakage control device (optional) |

NOTE: The bridge between terminals 7 and 9 must be present only if LANDIS LGB21.33 flame controller is used.

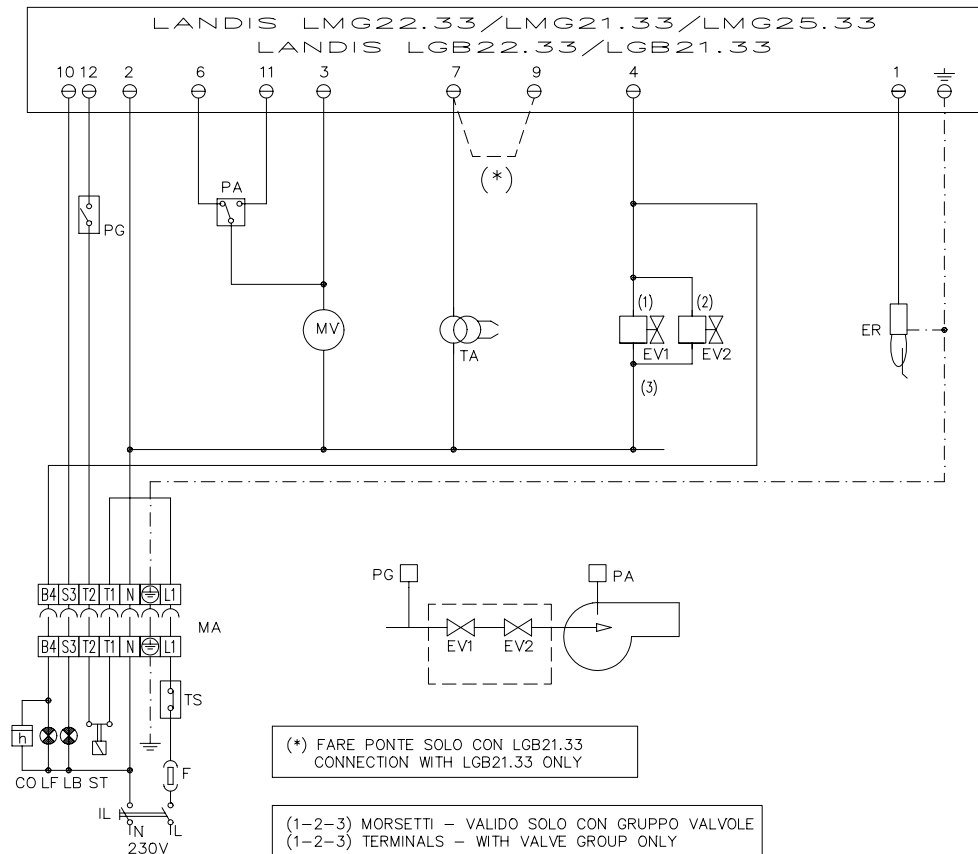
WARNING:

- 1 - Electrical supply 230V 50/60Hz 2N a.c.
- 2 - Do not reverse phase with neutral
- 3 - Ensure the burner is properly hearsed

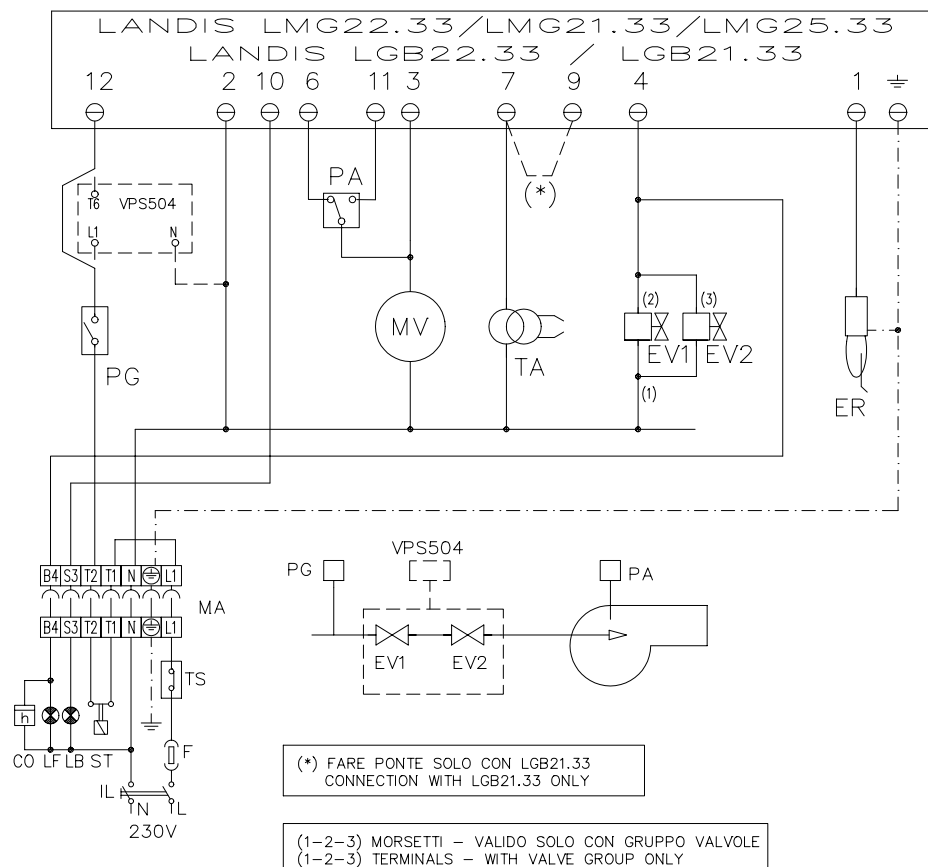
Electrical diagram code 01-374 - Burner type S3



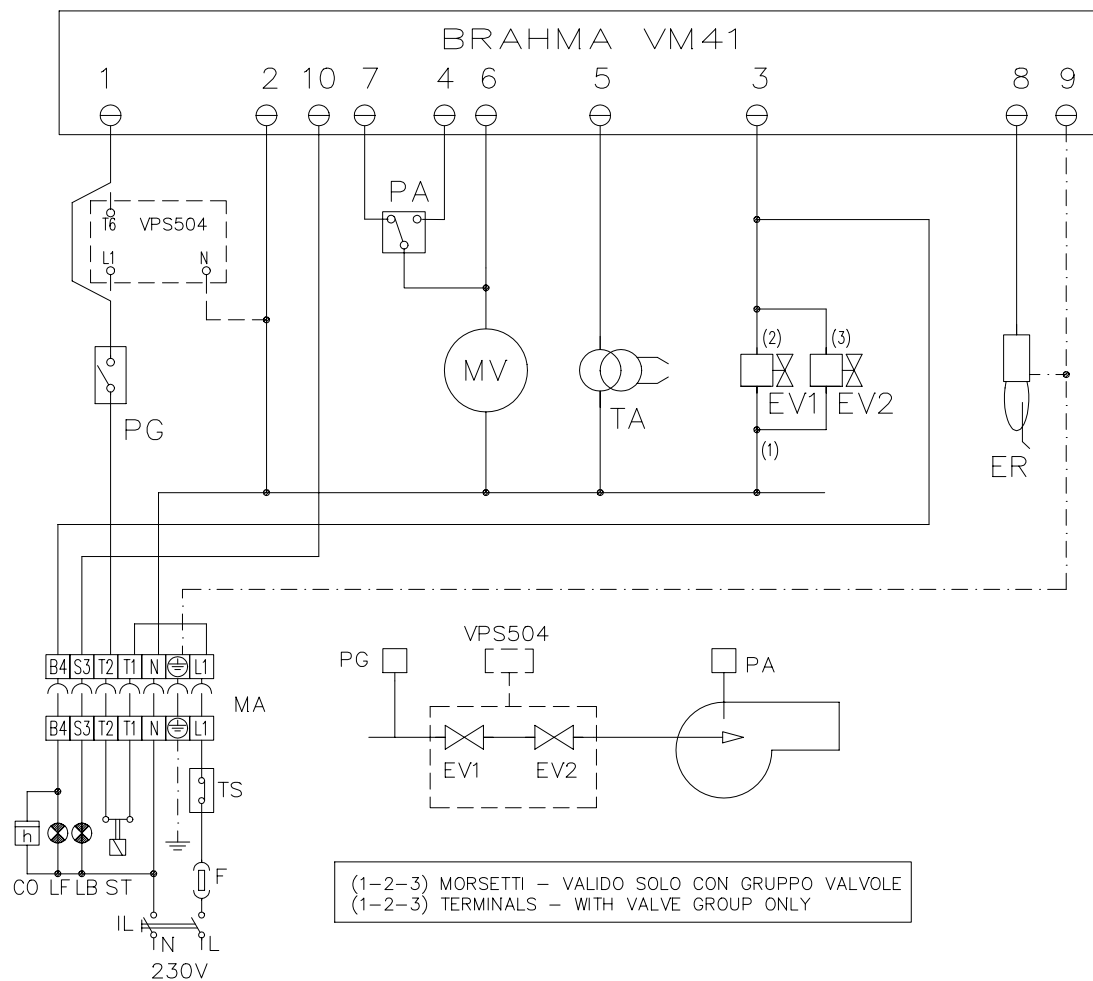
Electrical diagram code 01-318/4 - Burners type S3



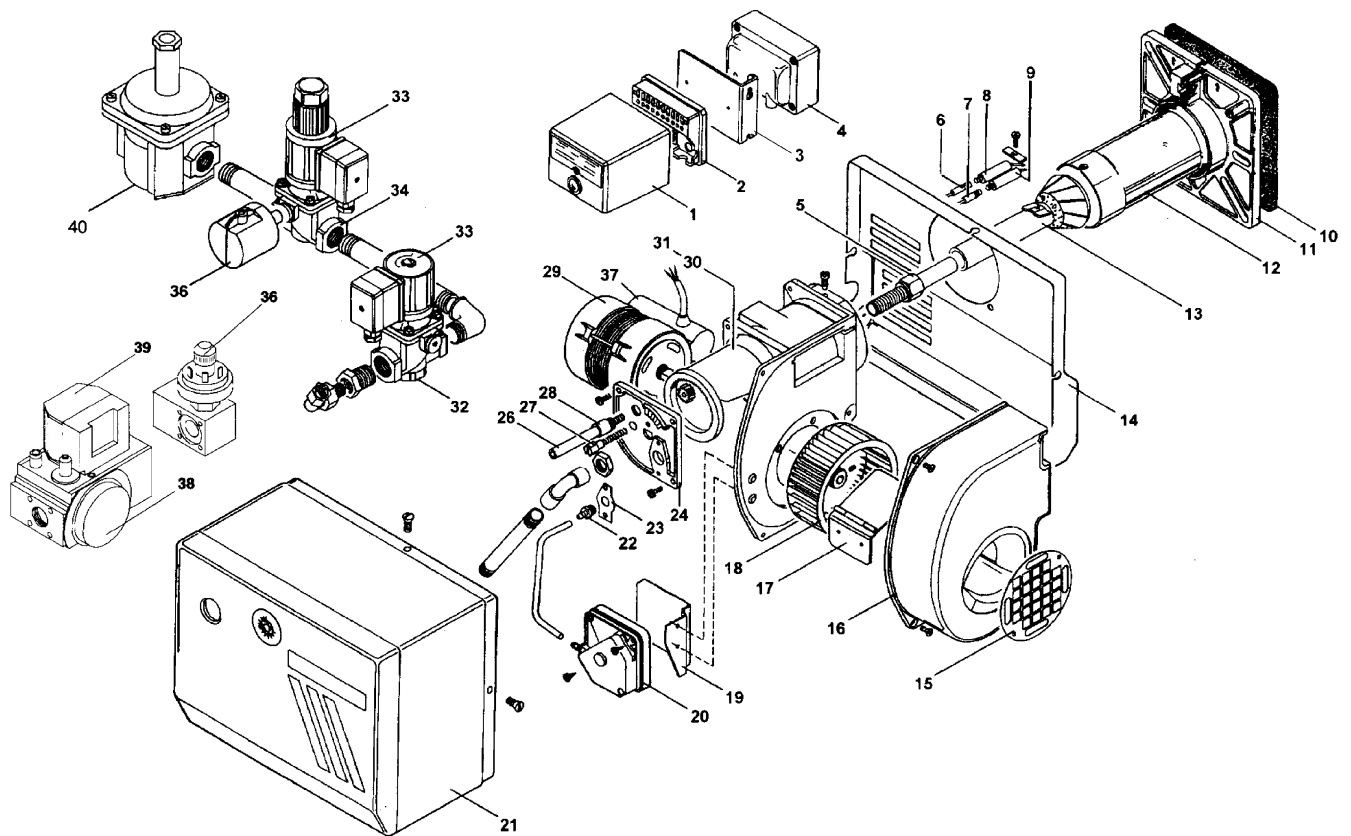
Electrical diagram code 01-319/3 - Burners type S5 - S10 - S18



Electrical diagram code 01-324/2 - Burners type S5 - S10 - S18

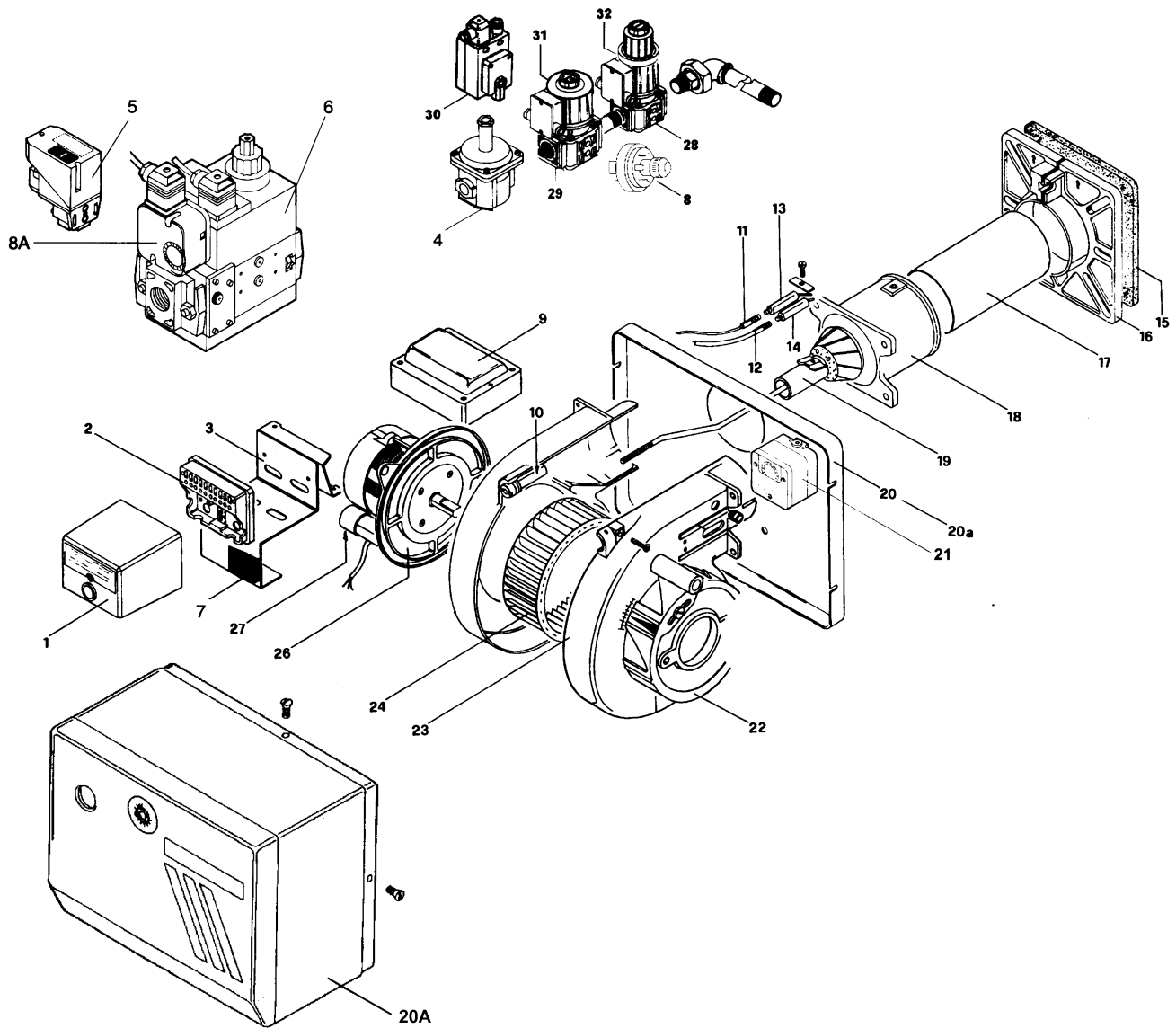


SPARE PARTS
BURNERS TYPE S3



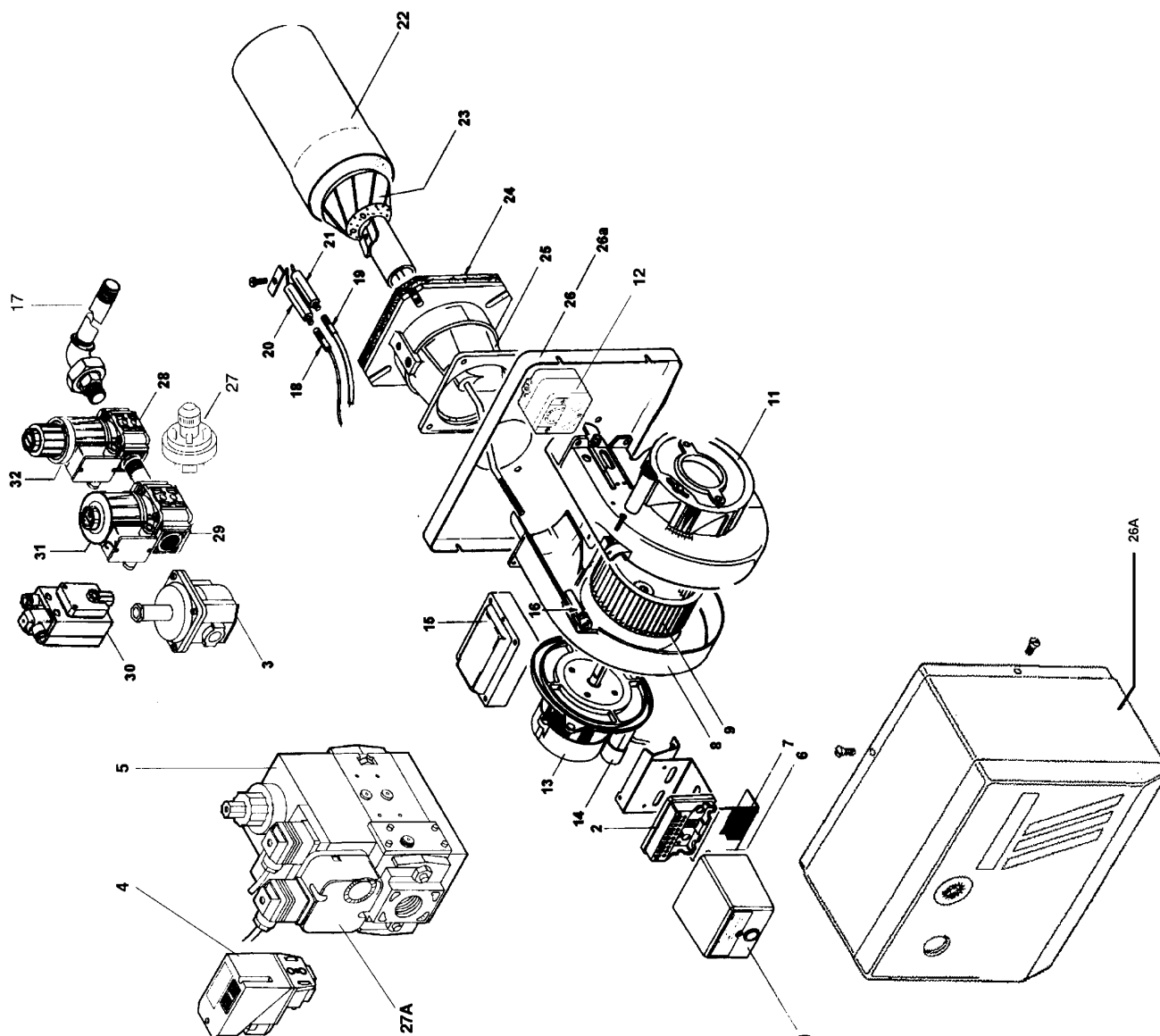
| POS. | DESCRIPTION | CODE |
|------|---|---------|
| 1 | FLAME CONTROL DEVICE VM 41 | 2020221 |
| 1A | FLAME CONTROL DEVICE LGB 21 | 2020443 |
| 1B | FLAME CONTROL DEVICE LMG 21 | 2020450 |
| 1C | FLAME CONTROL DEVICE LMG25 | 2020444 |
| 2 | SOCKET FOR FLAME CONTROL DEVICE VM 41 | 2030205 |
| 2A | SOCKET FOR FLAME CONTROL DEVICE LGB-LMG | 2030415 |
| 3 | SUPPORT BRACKET FOR FLAME CONTROL DEVICE | 2430019 |
| 4 | TRANSFORMER | 2170119 |
| 5 | COMBUSTION HEAD CENTRAL TUBE | 22701C0 |
| 6 | DETECTION CABLE | 6050211 |
| 7 | IGNITION CABLE | 6050119 |
| 7A | IGNITION CABLE FOR LONG BLAST TUBE MODEL | 6050122 |
| 8 | DETECTION ELECTRODE | 2080108 |
| 9 | IGNITION ELECTRODE | 2080218 |
| 10 | GASKET | 2110027 |
| 11 | SLIDING FLANGE | 2100025 |
| 12 | BLAST TUBE | 30900B8 |
| 12A | LONG BLAST TUBE | 30900C1 |
| 13 | COMBUSTION HEAD | 3060039 |
| 13A | COMBUSTION HEAD FOR LONG BLAST TUBE MODEL | 30600A0 |
| 14 | BOTTOM END | 3190102 |
| 15 | PROTECTION MESH | 2040202 |
| 16 | COMPLETE HOUSING | 2050270 |
| 17 | AIR DAMPER | 2140206 |
| 18 | FAN | 2150020 |
| 19 | THERMOSTAT SUPPORT BRACKET | 2430090 |
| 20 | AIR PRESSURE SWITCH | 2160060 |
| 21 | BURNER COVER | 3010045 |
| 22 | PRESSURE GAUGE | 23500A9 |
| 23 | SUPPORT PLATE | 2030230 |
| 24 | COMBUSTION HEAD SUPPORT FLANGE | 2100070 |
| 26 | AIR DAMPER ADJUSTING SCREW | 2320024 |
| 27 | COMBUSTION HEAD ADJUSTING SCREW | 2320031 |
| 28 | SLOT FOR AIR DAMPER ADJUSTING SCREW | 2320025 |
| 29 | MOTOR | 2180056 |
| 30 | CYLINDRICAL AIR DAMPER | 2140205 |
| 31 | AIR DAMPER GEAR | 2140501 |
| 32 | GAS VALVE EG12 SR | 2190502 |
| 33 | GAS VALVE COIL EG12 BE6-GM0 | 2580302 |
| 34 | GAS VALVE EG12 L | 2190510 |
| 36 | GAS PRESSURE SWITCH | 2160059 |
| 37 | CAPACITOR | 6030001 |
| 38 | MULTIFUNCTION VALVE BM 771 | 21903G1 |
| 39 | COIL FOR GAS VALVE BM 771 | 2580047 |
| 40 | FILTER WITH GOVERNOR | 2800047 |

BURNER TYPE S5



S5

| POS. | DESCRIPTION | CODE |
|------|--|---------|
| 1 | FLAME CONTROL DEVICE VM 41 | 2020221 |
| 1A | FLAME CONTROL DEVICE LGB21 | 2020443 |
| 1B | FLAME CONTROL DEVICE LMG25 | 2020444 |
| 2 | SOCKET FOR FLAME CONTROL DEVICE VM41 | 2030205 |
| 2A | SOCKET FOR FLAME CONTROL DEVICE LGB-LMG | 2030415 |
| 3 | SUPPORT BRACKET FOR FOR FLAME CONTROL DEVICE | 2430004 |
| 3A | SPACER | 2060002 |
| 4 | FILTER WITH GOVERNOR | 2800048 |
| 5 | LEAKAGE CONTROL DEVICE (Optional) | 2191604 |
| 6 | MULTIBLOC VALVES GROUP | 2190339 |
| 7 | CONNECTOR 7 PINS FEMALE | 6200043 |
| 7A | CONNECTOR 7 PINS MALE | 6200042 |
| 8 | MINIMUM GAS PRESSURE SWITCH | 2160059 |
| 8A | MINIMUM GAS PRESSURE SWITCH | 2160052 |
| 9 | IGNITION TRANSFORMER | 2170108 |
| 10 | HEAD ADJUSTING SCREW | 2320003 |
| 11 | DETECTION CABLE | 6050211 |
| 12 | IGNITION CABLE | 6050119 |
| 13 | DETECTION ELECTRODE | 2080108 |
| 14 | IGNITION ELECTRODE | 2080218 |
| 15 | GASKET | 2110027 |
| 16 | SLIDING FLANGE | 2100025 |
| 17 | BLAST TUBE | 3090001 |
| 17A | LONG BLAST TUBE | 3090076 |
| 18 | FLANGE PIECE | 2300020 |
| 19 | COMBUSTION HEAD | 30600A1 |
| 19A | COMBUSTION HEAD FOR LONG BLAST TUBE MODEL | 30600A4 |
| 20 | BOTTOM SIDE | 2010112 |
| 20A | COVER | 3010018 |
| 21 | AIR PRESSURE SWITCH | 2160053 |
| 22 | AIR DAMPER | 1010701 |
| 23 | COMPLETE HOUSING | 2050238 |
| 24 | FAN | 2150003 |
| 26 | MOTOR | 2180013 |
| 27 | CAPACITOR | 6030005 |
| 28 | GAS VALVE EV2 EG25 L3 | 2190512 |
| 29 | GAS VALVE EV1 EG25 S3 | 2190513 |
| 30 | LEAKAGE CONTROL DEVICE (Optional) | 2191601 |
| 31 | COIL FOR SOLENOID VALVE EV1 BM8 GM0 | 2580304 |
| 32 | COIL FOR SOLENOID VALVE EV2 BM8 GM0 | 2580304 |



S10 - S18

| POS. | DESCRIPTION | S10 | S18 |
|------|---|---------|---------|
| 1 | FLAME CONTROL DEVICE VM 41 | 2020221 | --- |
| 1A | FLAME CONTROL DEVICE LGB 21 | 2020443 | 2020443 |
| 1B | FLAME CONTROL DEVICE LMG 21 | 2020450 | 2020450 |
| 2A | SOCKET FOR FLAME CONTROL DEVICE LGB 21 | 2030415 | 2030415 |
| 3 | FILTER WITH GOVERNOR | 2800048 | 2800050 |
| 4 | LEAKAGE CONTROL DEVICE (Optional) | 2191604 | 2191604 |
| 5 | VALVES GROUP | 2190340 | 2190341 |
| 6 | SUPPORT BRACKET FOR FLAME CONTROL DEVICE | 2430004 | 2430004 |
| 6A | SPACER | --- | 2060002 |
| 7 | CONNECTOR 7 PINS FEMALE | 6200043 | 6200043 |
| 7A | CONNECTOR 7 PINS MALE | 6200042 | 6200042 |
| 8 | COMPLETE HOUSING | 2050216 | 2050216 |
| 9 | FAN | 2150004 | 2150004 |
| 11 | AIR DAMPER | 1010702 | 1010702 |
| 12 | AIR PRESSURE SWITCH | 2160053 | 2160053 |
| 13 | MOTOR | 2180005 | 2180005 |
| 14 | CAPACITOR | 6030005 | 6030005 |
| 15 | TRANSFORMER | 2170108 | 2170108 |
| 16 | HEAD ADJUSTING SCREW | 2320003 | 2320003 |
| 17 | EXTENSION SCREW | 2130016 | 2130027 |
| 18 | DETECTION CABLE | 6050211 | 6050211 |
| 19 | IGNITION CABLE | 6050122 | 6050122 |
| 20 | DETECTION ELECTRODE | 2080108 | 2080108 |
| 21 | IGNITION ELECTRODE | 2080218 | 2080218 |
| 22 | BLAST TUBE | 3090002 | 3090036 |
| 22A | LONG BLAST TUBE | 3090010 | 3090037 |
| 23 | COMBUSTION HEAD | 30600A6 | 30600A2 |
| 23A | COMBUSTION HEAD FOR LONG BLAST TUBE MODEL | 30600A7 | 30600A5 |
| 24 | GASKET | 2110031 | 2110031 |
| 25 | FLANGE PIECE | 2300050 | 2300050 |
| 26 | BOTTOM END | 2010102 | 2010102 |
| 26A | COVER | 3010019 | 3010019 |
| 27 | MINIMUM GAS PRESSURE SWITCH | 2160076 | 2160076 |
| 27A | MINIMUM GAS PRESSURE SWITCH | 2160052 | 2160052 |
| 28 | GAS VALVE EV2 EG25 L3 | 2190512 | --- |
| 29 | GAS VALVE EV1 EG25 S3 | 2190513 | --- |
| 30 | LEAKAGE CONTROL DEVICE (Optional) | 2191604 | 2191604 |
| 31 | COIL FOR SOLENOID VALVE EV1 BE8 GM0 | 2580304 | --- |
| 32 | COIL FOR SOLENOID VALVE EV2 BE8 GM0 | 2580304 | --- |

APPENDIX: COMPONENTS CHARACTERISTICS

| | |
|--|----|
| LANDIS LGB 21/22.. FLAME CONTROLLER | 27 |
| LANDIS LMG21/22/25 FLAME CONTROLLER | 30 |
| GAS MULTIBLOC REGULATOR DUNGS MB-DLE 405-407-410-412-415-420 | 32 |
| VALVE PROVING SYSTEM DUNGS VPS504 | 32 |
| SAFETY SOLENOID VALVES DUNGS MV/5, MVD/5, MVDLE/5 SINGLE STAGE | 32 |
| MULTIFUNCTIONAL VALVE DUNGS BM 771 | 33 |
| BRAHMA GAS SOLENOID VALVE FOR LOW PRESSURE BURNERS | 33 |

LANDIS LGB 21/22.. FLAME CONTROLLER

Function

The programme run is shown in the diagrams. The required and permissible input signals for the control part and flame supervision part are pictured as a hatching correspondingly in the function diagrams. If these input signals are missing, the controller interrupts the start-up programme and initiates a lock-out at the place where the safety regulations demand it.

The LGB types are fitted with under voltage protection, i.e. the load relay AR is de-energized when the supply voltage falls below 140 V. The burner control automatically attempts a new start-up when the supply voltage again exceeds 140 V

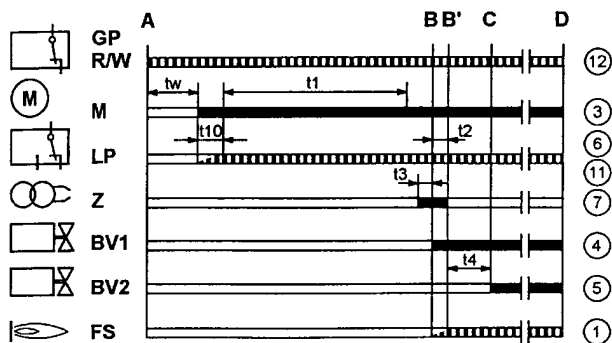
A Start-up command from the temperature or pressure controller "R"

A-C Start-up programme

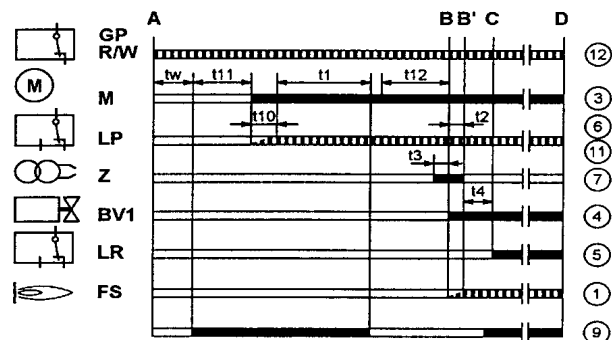
C-D Burner operation (heat production corresponding to the control commands)

D Controlled shut-down by "R"

LGB21



LGB22



Key for operation diagram

- A Start-up (control start-up by "R")
- B-B' Interval for flame establishment
- C Operating position of the burner or release of the 2nd stage via load controller LR
- D Controlled shut-down by "R"
- tw Waiting time, 8 sec. for LGB21; 9 sec. for LGB22
- t1 Controlled pre-purge time, 30 sec.
- t2 First safety time, 3 sec.
- t3 Pre-ignition time, 2 sec. for LGB21; 3 sec. for LGB22
- t4 Interval BV1- BV2 = Interval BV1- LR, 8 sec.
- t10 Specified time for the air pressure signal, 5 sec. for LGB21; 3 sec for LGB22
- t11 Programmed time to open the damper SA, max 12 sec.
- t12 Programmed running time for air damper from OPEN to LOW FLAME position, max 11 sec.
- BV Fuel valves
- FS Flame presence signal
- GP Gas pressure switch
- LP Air pressure switch
- LR Load controller
- M Fan motor
- R Temperature or pressure controller
- W Safety thermostat or pressure switch
- Z Ignition transformer

ZV1 Main flame ignition gas valve or BV1 for burners with main flame supervision

1...12 Terminals of the burner flame controls on AGK11's socket

■ Command signal from flame control

▨ Input signals

Conditions for starting up the burner:

- The burner control must not be locked out.
- The contacts of the gas pressure switch "GP", the temperature or pressure switch "W" and the controller "R", must be closed.

Start-up programme

A Start-up command (controlled start-up)

The regulator "R" supplies (due to terminal 12) the mechanism; the fan starts up for pre-purge. The actuator SA moves the air damper to the maximum load position (after the time t11).

tw Waiting time

During this time the air pressure switch check for correct operation.

t11 Running time for complete damper opening (OPEN) (only for LGB22)

The fan motor is started only after the air damper has reached the full load position.

t10 Specified time for the air pressure signal

When this time has elapsed, the set value of air pressure must have built up, or a lock-out is initiated.

t1 Pre-purge time

For LGB21.. purging of the combustion chamber with the nominal air load; for LGB22.. purging of the combustion chamber with the maximum air load. During this time, the pressure switch LP must give its consent. The real time of pre-purge is between the end of tw and the start of t3.

t12 Programmed time to close the damper SA (MINIMUM)

During the time t12, the air damper moves to the low flame position.

t3 Pre-ignition time

During this time, and until to the end of the safety time t2, the flame relay is forced to close. When time t3 has elapsed, the fuel release is initiated at terminal 4.

t2 Safety time

At the end of safety time there must be a flame signal at the input 1 of the flame signal amplifier, which must continues uninterruptedly until controlled shut-down occurs, or the flame relay will deenergize, and remains blocked in the fault position.

t4 Interval

When time t4 has elapsed, the controller starts.

B - B' Interval for flame establishment

C Burner operation position

C - D Burner operation (heat production)

Operation of the burner at the maximum strenght or, with a flame controller for the load.

D Controlled by "R" shutdown

The burner stops, waiting for the next ignition.

Command program in the event of a defect

In the event of a defect the inflow of fuel is interrupted. When the block occurs in the prevention time (not indicated by the symbol) the causes may be the air pressostat LP or a premature signal of flame presence.

- With voltage failure: repetition of the start-up with complete programme
- Premature presence of flame at the start of prevention time: safety stop (block)
- Contact of air pressostat LP stuck during time t_w : start-up cannot take place.
- Air pressure failure after t_{10} : safety stop after safety time t_2
- Absence of confirmation of air pressure: safety stop(block) after t_{10}
- Failure to start up the burner: safety stop after safety time t_2
- Absence of flame during functioning: immediate safety stop.
- Checking the ignition spark with QRE: with absence of spark there is no consent to the fuel, safety stop (block) after time t_2 .

Unblocking the appliance

Unblocking of the appliance can be effected immediately after the safety stop without causing modification of the programme.

Indicator of the command programme of the defective item

On the front part of the safety appliance is located a plexiglass lunette under which there is the indicator disc of programme's progress.

In the event of safety stop, the programmer stops. The disc shows, as follows, the position of the programme at which the interruption occurred:

- no start-up, the command ring is open
- |||| interval t_w or t_{10} on LGB21; t_w or t_{11} on LGB22
- ▲ air damper open (LGB22)
- P safety stop (block) through absence of the air pressure signal (LGB21) or because (LGB22) the air damper is not open
- ➡➡ interval t_1 , t_3 (t_{12})
- ▼ fuel consent (LGB22)
- 1 safety stop (block) through absence of the flame signal at the end of the 1st safety time
- 2 consent of the 2nd fuel valve (LGB 21) or consent at the power regulator (LGB22)
- oooo functioning of the burner at partial or maximum power (or return to the service position)

Specifications

| | |
|---|-------------------------------|
| Supply voltage | 220 V AC -15%...240 VAC +10% |
| Frequency | 50 Hz -6%...60 Hz +6% |
| Consumption | 3 VA |
| Flow rate of the contacts at terminals | |
| - terminal 3 | max. 3 A (15 A max. for 0.5s) |
| - terminals 4, 5, 7 | max. 2 A |
| - terminal 10 | max. 1 A |
| - terminal 12 (for Umax 264 V) | max.5 A |
| Fuse max. | 10 A, with slow blow-out |
| Radio disturbance | N - VDE0875 |
| Current at input to terminal 12 | max 5 A 1 |
| Protection | IP40 |
| Permissible ambient temperature | |
| - operating | -20....+ 60°C |
| - transport and storage | -40....+ 70°C |
| Mounting pos. permitted | any |
| Mass (weight) without/with basec. | 230/310 g |
| Mass (weight) AGK66 | c. 12 kg |
| 1) At permissible voltage and that is 187...264 V | |

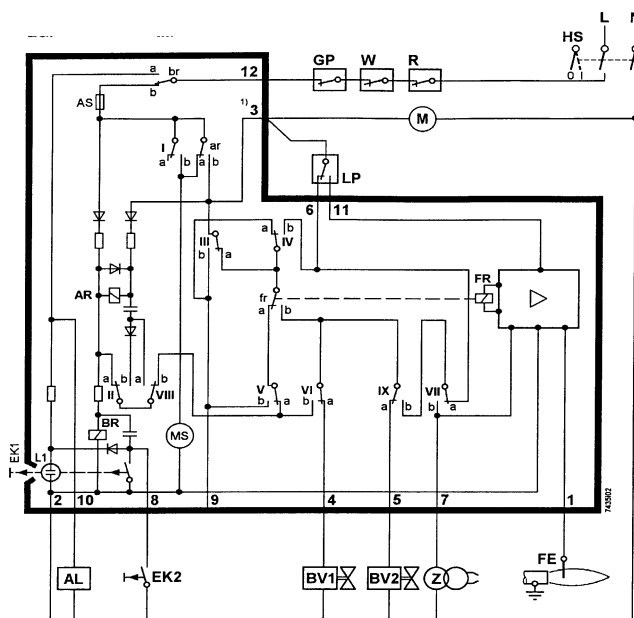
KEY - internal diagram

| | |
|------|---------------------------------|
| AL | Block signal |
| AR | Main relay with "ar" contacts |
| BR | Block relay with "br" contacts |
| BV | Fuel valve |
| Dbr1 | U bolt |
| EK | Unblocking button |
| FE | Detection electrode |
| FR | Flame relay with "fr" contacts |
| GP | Gas pressostat |
| HS | Main selector |
| L | Phase conductor |
| L1 | Block light (blinking) |
| LP | Air pressostat |
| M | Fan motor |
| MS | Synchronous motor |
| N | Neutral conductor |
| R | Thermostat or pressostat |
| W | Safety thermostat or pressostat |
| Z | Ignition transformer |

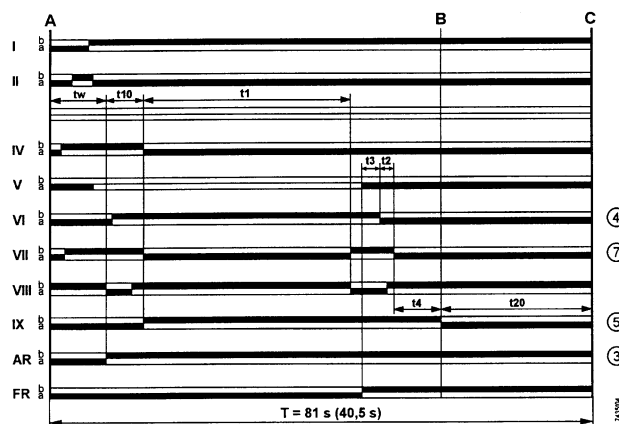
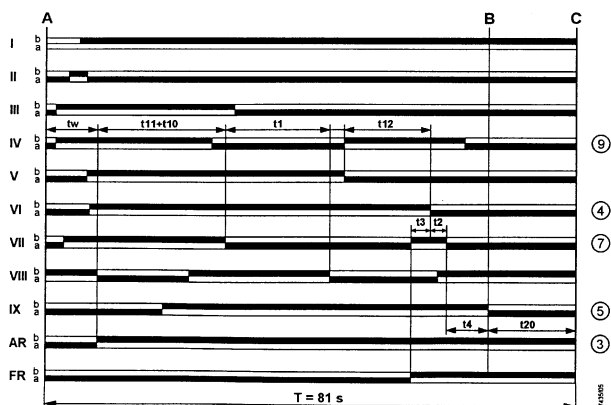
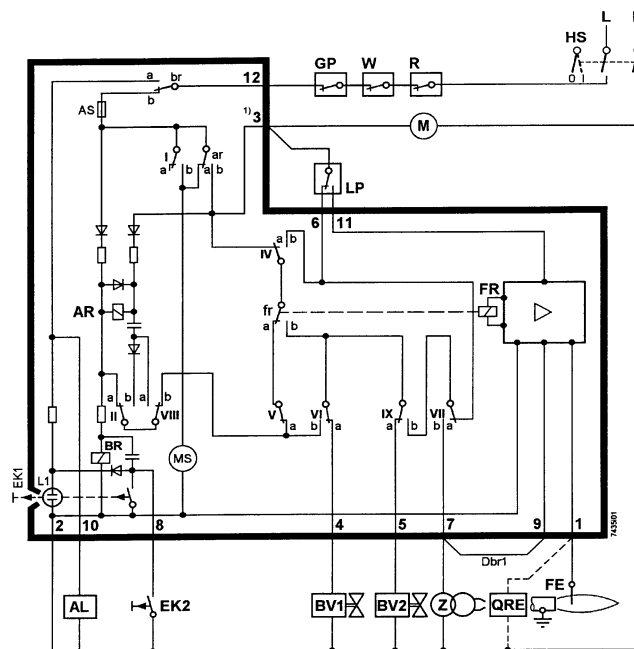
Key - programmer's diagram

| | |
|-----|---|
| A | start-up (command from regulator "R") |
| AR | main relay |
| B | burner operation |
| C | program start position (start up) |
| FR | flame relay |
| tw | waiting time |
| t1 | pre-ventilation time |
| t2 | safety time |
| t3 | pre-ignition time |
| t4 | interval of time BV1-BV2 or BV1-LR |
| t10 | waiting time for confirmation of air pressure |
| t11 | air damper movement time to open position |
| t12 | air damper movement time to close position |
| t20 | travel time for auto-return of the programmer |
| T | programmer's total time |
| I.X | contacts of programmer's cams |

LGB21



LGB22



LANDIS LMG21/22/25 FLAME CONTROLLER

FEATURES

The series of equipment LMG.. is interchangeable with the series LGB.., all diagrams and accessories are interchangeable, the main features are:

- Protection against overvoltage:
with voltages lower than 160V ~ (with input 230V ~) the equipment stops, when the voltage overcome 195V ~ (with input 230V ~) the equipment starts again and repeats the starting cycle;
- Indications of error codes by a signalling red light in the release button;
- Programmer times fix for the digital management of signals.
In case of lack of the flame during working the model LMG 25.33 doesn't stop but repeat the starting cycle maximum 3 times), if the problem persists, after the fourth starting the equipment stops .

Comparative table

| Old series LGB | New series LMG |
|----------------|----------------|
| --- | LMG 25.33 |
| LGB 21.33 | LMG 21.33 |
| LGB 22.33 | LMG 22.33 |

Conditions for startup

- Burner control is reset
- All contacts in the line are closed
- Fan motor "M" or AGK25 is connected
- Air pressure monitor "LP" is in idle position
- No undervoltage

Undervoltage

- Safety shutdown in the event the mains voltage is lower than typically AC 160V;
- a restart is made when the mains voltage exceeds AC 195V

Reversed polarity protection

If the connections of line (terminal 12) and neutral (terminal 2) have been exchanged, the burner control will initiate lockout at the end of "TSA"

Operations key

- BV Fuel valve
FS Flame presence signal
GP Gas detection pressure switch
LP Air pressure switch
LR Burner's output regulation
M Fan motor
R Safety thermostat or pressure switch
SB Safety limit
W Regulation thermostat or pressure switch
Z Ignition transformer
tw Waiting time
t1 Pre-ventilation time
TSA Ignition safety time
t3 Pre-ignition time
t3n Ignition time during "TSA"
t4 Interval BV-BV2 or BV1-LR
t10 Specified time for air pressure signal
t11 Programmed opening time for actuator SA
t12 Programmed closing time for actuator SA

Startup program

A Start-up, controlled by LR

-fan command after the waiting time t_w for LMG21/25, or after the period t_{11} for LMG22.

tw Waiting time.

During this time the air pressure switch and the flame relay are tested for correct contact position.

t1 Pre-purge time.

Purging of the combustion chamber and the secondary heating surfaces with low-load combustion head for LMG21/25, or with fully load combustion air for LMG22. The affective pre-purge time comprises the interval between the end of t_w and the start of t_3 .

TSA Ignition safety time.

Opening of fuel valve BV1; the flame signal must be present at the terminal 1 up to the end of TSA.

t3 Pre-ignition time.

Ignition time until the opening of BV1.

t3n Ignition time during "TSA".

Interval between the start of TSA and the shut-off of ignition transformer Z. The transformer is shut-off 400ms before the end of TSA.

t4 Interval BV-BV2 or BV1-LR.

Interval between the end of TSA and the consent to the second fuel valve BV2 or to the load regulator LR.

t10 Specified time for the air pressure signal.

When this time has elapsed, the set value of air pressure must have built up, else a lock-out is initiated.

t11 Programmed time for the opening of the servocontrol SA, only with LMG22. The servocontrol SA moves to the low flame position.

B-B' Interval for the flame establishment.

C Operating position of the burner.

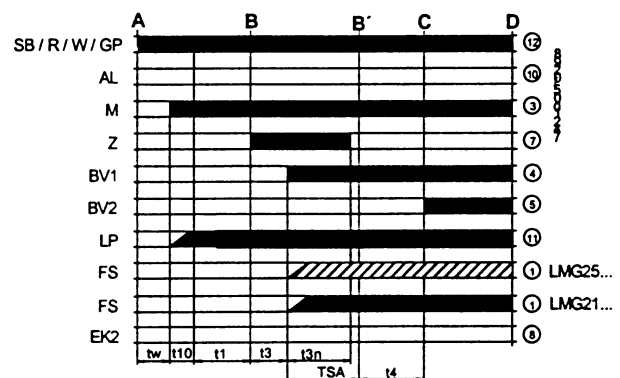
C-D Burner operation (heat production)

D Controlled shut-down by LR.

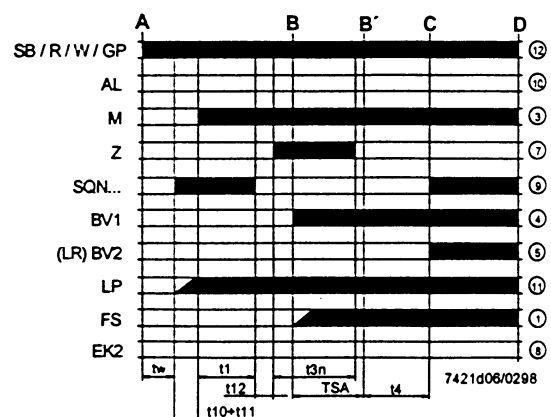
The burner is shut-off immediately and the flame control device is ready for a new start.

FUNCTIONS

LMG21.../LMG25...



LMG22...



Control program in the event of fault

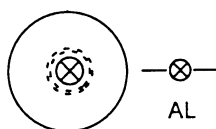
- If a fault occurs, all outputs will immediately be deactivated (in less than 1s).
- On restoration of power, a restart will be made with the full program sequence.
- If the operating voltage drops below the undervoltage threshold.
- If there is a premature faulty flame signal during t1, a lockout occurs.
- If the contact of air pressure monitor LP has welded in the working position, prevention of startup and, after 8.5s: lockout.
- If the contact of the air pressure monitor LP has welded in the idle position: lockout at the end of t10.
- If the burner doesn't ignite by the end of TSA: lockout
- If flame is lost during operation: lockout

IMPORTANT:

- The release of the equipment can be carried out after each stop pressing the release button for 0.5- 3 seconds. Then the equipment pulses to signal the happened release.
- To control the stop cause it is necessary to wait for 10 seconds, then press the release button for more than 3 seconds and count pulses (the equipment repeats pulses at regular intervals).

Flame control device stopped

- Stop red lamp switched on.



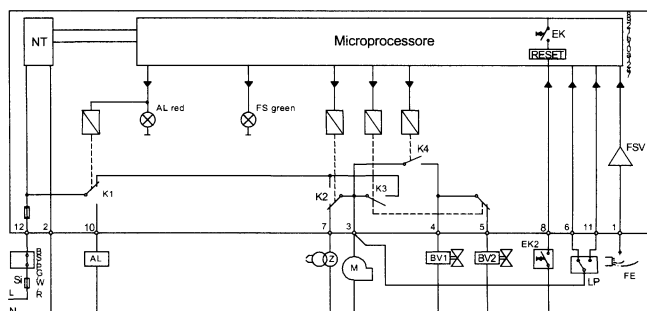
Release of the flame control device

- Press the release button for 0.5 ÷ 3 seconds.

Diagnosis of troubles

- Wait at least 10s.
- Press the release button for >3s.
- Count the number of flashing of the green lamp and compare with the "Diagnosis Table"

Internal diagram LMG21/25



Diagnosis table

Number of flashing

- Possible causes

2 flashing **

No flame at the end of the "Safety time":

- Detection electrode dirty
- Fuel valve faulty
- Gas doesn't reach the burner

3 flashing ***

The air pressure switch doesn't commute or is at rest:

- Pressure switch faulty
- The fan motor doesn't work
- Air lock servocontrol (where arranged) faulty

4 flashing ****

The air pressure switch is not commuted at rest as well as on air, or it remains commuted on air:

- Pressure switch faulty
- The calibration of air pressure switch is too sensible

5 flashing *****

Foreign light

7 flashing *****

Lack of flame during working:

- Calibration of the burner not optimum
- Trouble or gag of the fuel valve

8 ÷ 17 flashing *** ÷ ****

Not used

18 flashing *****

During pre-ventilation the pressure switch commutes and then comes back to the rest:

- Air pressure switch faulty or calibration too high

19 flashing *****

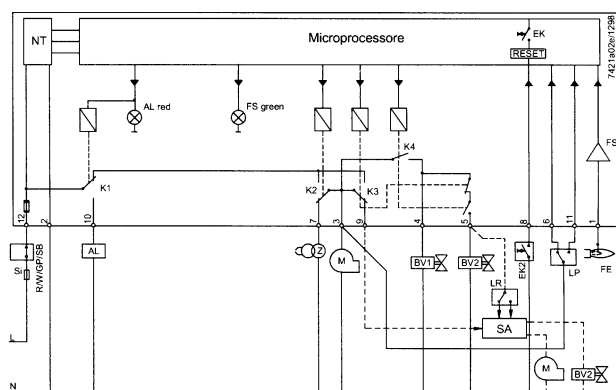
Trouble of contacts outlet:

- Errors of electric connection
- Anomalous voltage to outlet terminals

20 flashing *****

Internal error of the flame control equipment

Internal diagram LMG22



GAS MULTIBLOC REGULATOR DUNGS MB-DLE 405-407-410-412-415-420

Specifications

Nominal diameters - Flange with pipe threads as per ISO 7/1 (DIN 2999)

MB 405-407: Rp1/2, 3/4 and their combinations

MB 410-412: Rp3/4, Rp1, Rp1_{1/4} and their combinations

MB 415 B01: Rp1, Rp1_{1/4}, Rp1_{1/2}, Rp2 and their combinations

MB420 B01: Rp1, Rp1_{1/4}, Rp1_{1/2}, Rp2 and their combinations

Max. operating pressure 360 mbar

Output pressure range 4 mbar to 20 mbar

Pressure stage PN1

Media gas of families 1, 2, 3 and other neutral gaseous media

Ambient temperature -15 °C to +70 °C

Dirt trap Sieve with 0.8 mm mesh width, filter made of random laid nonwoven fabric microfilter, two-layer, changing the filter is possible without removing the valve.

Pressure switches Types GW A5, GW A2, NB A2, ÜB A2 mountable as per DIN EN 1854.

Pressure regulator Pressure regulator compensated for residual pressure, leakproof seal when switched off by means of valve V1 as per DIN EN 88 Class A. Setpoint spring permanently installed (no spring exchange possible). A vent line above roof is not required. Internal pulse tap provided.

Solenoid valve 1 Valve as per DIN EN 161, Class A, Group 2, fast closing, fast opening

Solenoid valve 2 valve as per DIN EN 161, Class A, Group 2, fast closing, slow opening

Measuring/ignition gas connection

For G 1/8 as per DIN ISO 228

Burner pressure monitor pBr

Connection downstream of valve V2, pressure switch A2 mountable on adapter laterally

Closed position signal contact Closed position signal contact type K01/1 (DIN tested), mountable on V2

Voltage/frequency ~ (AC) 50-60Hz 230 V -15% +10%
Preferred voltages 240VAC, 110-120VAC, 24-28VDC, 48VDC

Electrical connection Plug connection as per DIN 43 650, IEC 335, IEC 730 (VDE 0700, VDE 0722) for valves and pressure switches

Rating power/consumption upon request

Switch on duration 100% ED

Degree of protection IP54 as per IEC 529 (EN 60529)

Radio interference Interference degree N

Material of gas-conveying parts

housing: aluminium die casting;

diaphragms, seals: NBR basis, Silopren (silicone rubber)

solenoid drive: steel, brass, aluminium.

Installation position

Solenoid vertically upright or lying horizontally as well as its intermediate positions

VALVE PROVING SYSTEM DUNGS VPS504

Specifications

Operating pressure max. 500 mbar (50 kPa)

Test volume 4.0 l

Pressure increase by motor pump 20 mbar

Nominal voltage ~ (AC) 230V -15%...240V +10% DC 24V

Frequency 50 Hz

Rating requirement during pumping time approx. 60 VA, in operation 17 VA

Prefuse (provided by the customer) 10 A quick-acting fuse or 6.3 slow-blow fuse

Fuse installed in housing cover, replaceable microfuse 6.3 A slow-blow L 250 V; IEC-127-2/III (DIN 41 662)

Degree of protection IP40 (IP54 series 04, 05)
Ambient temperature 50 Hz 230 VAC -15°C to +70°C, others: -15°C to +60°C

Release time Approx. 10 - 26s, depending on test volume and input pressure

Sensitivity limit max. 50 l/h

Switch on duration of control 100%

Max. number of test cycles 20/h

Installation position upright, horizontal, not inverted

SAFETY SOLENOID VALVES DUNGS MV/5, MVD/5, MVDLE/5 SINGLE STAGE

Specifications

Flange Connection flange as per DIN 2501 Part1

Max. operating pressure up to 200 mbar (20 kPa), 360 mbar (36kPa) or up to 500 (50 kPa) mbar
Valve as per EN 161, Class A, Group 2, single-stage mode

Solenoid valve PN 1

Pressure stage < 1 s

Closing time < 1 s for MVDLE approx. 20 s at room temperature 20°C and without fast stroke

Opening time Adjustable

Fast stroke Manually adjustable on MVD and MVDLE

Materials of gas-conveying parts

Housing aluminium, steel, brass

Seals NBR basis

Voltage/frequency 230 V AC (+10 % -15 %); 50-60 Hz - other voltages on request

Rating / power consumption Refer to type overview

Switch-on duration 100 %

Degree of protection P 54, IP 65 on request

Electrical connection At screw terminals via PG* 11 cable gland (* = heavy-gauge conduit thread)

Plug connection as per DIN 43650 can be retrofitted

Switching rate

MVD.../5 max. 1000/h MVD 2200,

MVDLE.../5 max. 100/h MV 5100/5 S, MV 2125/5 S

MV 2150/5 S max. 20/h

Measuring/ignition gas connection G 1/4 ISO 118, on both sides in inlet section, additionally G 3/4 on input side, form size DN 40 (flange) upwards

Dirt trap Sieve installed, mesh width 1 mm

Ambient temperature -15 ° C to + 60 ° C

Installation position Solenoid from vertically upright to horizontally lying

Closed position signal contact Type K01/1, DIN-tested, mountable on DN 10 - DN 150

Valve proving system Type VDK 200 A S02, mountable via G1/4 test connection, Type VPS 504, mountable with adapter up to DN 80

MULTIFUNCTIONAL VALVE DUNGS BM 771

| | |
|-------------------------------|--|
| Nominal diameter | DN 15 |
| Gas connections | RP 1/2 ISO 7/1 |
| Threaded flange | RP 1/2 ISO 7/1 |
| Pilot gas output | M10 x 1 Ø 6 mm Ø 4 mm or 1/4 o.d. |
| Max. input pressure | 65 mbar |
| Output pressure field | 2.5 mbar to 38 mbar |
| Flow rate | 3.7 m³/h (air) with Dp 5 mbar, adjusted to p1 20 mbar and p2 15mbar |
| Ambient temperature | 0° C up to 70° C |
| Safety valve | class A, according to EN 161 |
| Group | 2 |
| Servocontrolled regulator | class C |
| Protection level | IP 40 |
| Opening time | fast < 1 s slow < 10 s |
| Shut off time | < 1 s |
| Intermittent | 100% ED |
| Voltage and frequency | ~AC 50/60Hz 24V +10% -15% ~AC 50-60Hz 230V +10% -15% |
| Coil absorption | 2 x 0.80 VA 2 x 8.8 VA |
| Electric connection, standard | flat connector according to DIN 46244, connector socket according to DIN 43650 |
| On request | RAST 5 male connector |
| Mounting position | any |

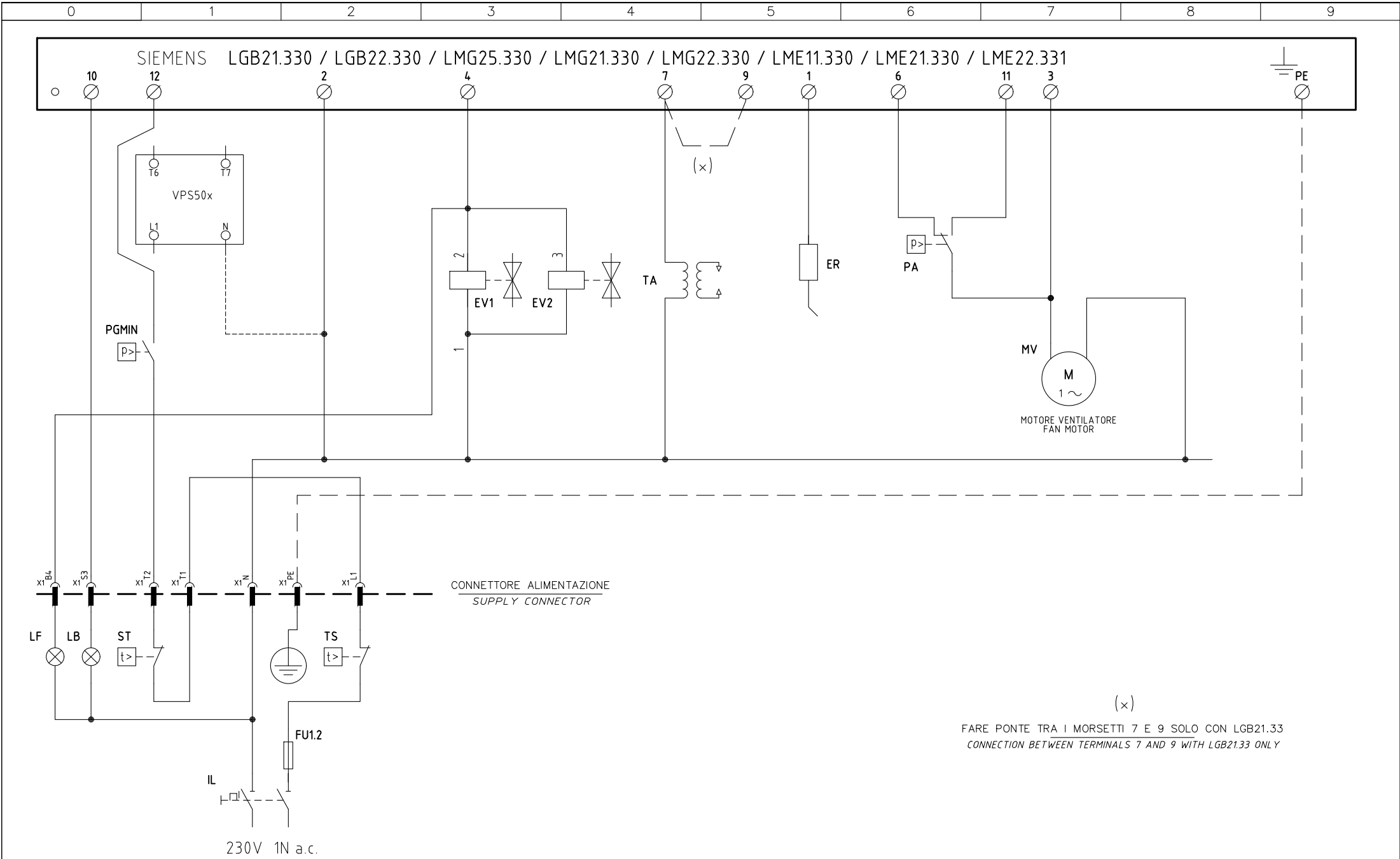
BRAHMA GAS SOLENOID VALVE FOR LOW PRESSURE BURNERS**Specifications**

| | |
|-----------------------|---|
| Approval mark | EG 12 |
| Class | A2 |
| Approvals | Min. of Interior prot. 3787/27 DIN DWG (cert.St 1852 of 24.9.85) |
| Operation | Valve normally closed with rapid opening and closing and with direct action |
| Body | Made of die-cast aluminium |
| Filter | Formed from pressed nylon gauze |
| Seal | Made of NBR to DIN3535 standard |
| Fixed and mobile core | Made of stainless steel |
| Springs | Made of stainless steel |
| Internal passage | Ø 15 mm |
| Assembly | any position |
| Union thread | R 1/2" |
| Pressure test points | 2 lateral upstream test-points at inlet |
| Coil | All coils use Class H wire (180 C with DIN standard designation: V 180) and are designed for continuous operation |
| Standard voltage | 220 V 50 Hz On request versions with DC or AC can be supplied for other voltages and frequencies |
| Coil covering | Made of pressed nylon |
| Protection grade | IP54 |
| Spare coil | BE6GMO |
| Fairlead | PG9 |
| Ambient temperature | -10° C +60° C |
| Operating Pmax | 250 mbar |




***CIB* UNIGAS**

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| | | | |
|------|------------------------------------|----------|-----------|
| 05 | SIEMENS LME... & TYPE ADDED | 10/07/20 | U. PINTON |
| 04 | TYPES NG-NGX-LG70/90/140/200 ADDED | 01/09/05 | U. PINTON |
| 03 | SIEMENS LMG... ADDED | 07/09/99 | U. PINTON |
| 02 | "MA" TERMINAL BLOCK MODIFIED | 18/03/97 | U. PINTON |
| 01 | BRIDGE FOR LGB21.33 ADDED | 07/11/96 | U. PINTON |
| REV. | MODIFICA | DATA | FIRME |

| | | | | | | |
|---|--|---------------------|-----------------------------|-------------------|---------|----------|
|  | Impianto TIPI/TYPES NG(X)-LG(X) 35/70/90/120/140/200 MODELLO/MODEL x-.TN.x.xx.A.x.xx | Ordine | | Data 06/02/1996 | PREC. | FOGLIO |
| | Descrizione | Commessa | Data Controllato 10/07/2020 | Revisione 05 | / | 1 |
| | | Esecutore U. PINTON | Controllato M. MASCHIO | Dis. N. 01 - 0319 | SEGUE 2 | TOTALE 2 |

| SIGLA/ITEM | FOGLIO/SHEET | FUNZIONE/FUNCTION [1] | FUNZIONE/FUNCTION [2] |
|-----------------------|--------------|---|---|
| ER | 1 | ELETTRODO RILEVAZIONE FIAMMA | FLAME DETECTION ELECTRODE |
| EV1 | 1 | ELETTROVALVOLA GAS LATO RETE (0 GRUPPO VALVOLE) | UPSTREAM GAS SOLENOID VALVE (OR VALVES GROUP) |
| EV2 | 1 | ELETTROVALVOLA GAS LATO BRUCIATORE (0 GRUPPO VALVOLE) | DOWNSTREAM GAS SOLENOID VALVE (OR VALVES GROUP) |
| FU1.2 | 1 | FUSIBILE DI LINEA | LINE FUSE |
| IL | 1 | INTERRUTTORE GENERALE | MAINS SWITCH |
| LB | 1 | LAMPADA SEGNALAZIONE BLOCCO BRUCIATORE | INDICATOR LIGHT FOR BURNER LOCK-OUT |
| LF | 1 | LAMPADA SEGNALAZIONE FUNZIONAMENTO BRUCIATORE | INDICATOR LIGHT BURNER OPERATION |
| LGB.. / LMG.. / LME.. | 1 | APPARECCHIATURA CONTROLLO FIAMMA | CONTROL BOX |
| MV | 1 | MOTORE VENTILATORE | FAN MOTOR |
| PA | 1 | PRESSOSTATO ARIA | AIR PRESSURE SWITCH |
| PGMIN | 1 | PRESSOSTATO GAS DI MINIMA PRESSIONE | MINIMUM GAS PRESSURE SWITCH |
| ST | 1 | SERIE TERMOSTATI/PRESSOSTATI | SERIES OF THERMOSTATS OR PRESSURE SWITCHES |
| TA | 1 | TRASFORMATORE DI ACCENSIONE | IGNITION TRANSFORMER |
| TS | 1 | TERMOSTATO/PRESSOSTATO DI SICUREZZA | SAFETY THERMOSTAT OR PRESSURE SWITCH |
| VPS50x | 1 | CONTROLLO DI TENUTA VALVOLE GAS (OPTIONAL) | GAS PROVING SYSTEM (OPTIONAL) |

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|-----------|------------|-------|--------|
| Data | 06/02/1996 | PREC. | FOGLIO |
| Revisione | 05 | 1 | 2 |
| Dis. N. | 01 - 0319 | SEGUE | TOTALE |
| | | / | 2 |