BURNERS
BRULEURS
BRENNER
QUEMADORES
BRUCIATORI

MANUAL FOR
- INSTALLATION
- OPERATION
- MAINTENANCE

HEAVY OIL BURNER

N18

M03929CE Rev. 4.1 01/12

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LV 73/23/CEE

Technical Documentation ***CIB Unigas S.p.a.*** - Campodarsego (PD)

PREFACE

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 INFORMATIONS ABOUT OPERATING AND USE RESTRICTIONS, IN THE SECOND SECTION OF THIS MANUAL. WE HIGHLY COMMEND 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.

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.

* For all the units that have been modified or have options fitted then original accessory equipment only shall be used.

* 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.

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 firebox.

* 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 repeated burner shut-downs, do not continue re-setting the unit manually. Contact qualified personnel to take care of such defects.

* 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 saftey 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, GASOIL 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.

TECHNICAL DATA

BURNER TYPE		N18
Output	min kcal/h	90.000
	max kcal/h	180.000
	min kW	105
	max kW	209
Oil firing rate	kg/h min.	8
	kg/h max.	18
Fuel		Heavy oil
Electrical supply		230/400 V 50Hz
Motor 2800 rpm	kW	0.55
Auxiliary relays	kW	0.5
Pre-heater resistor	kW	1.5
Total power consumption	kW	2.55
Approx. Weight	Kg	20
Operation		single stage

BURNER MODEL IDENTIFICATION

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

Type: **N18**	*Model:*	**N-.**	**TN.**	**S.**	***.**	**A.**
(1)		(2)	(3)	(4)	(5)	(6)

(1) BURNER TYPE — N18

(2) FUEL — N = Heavy oil (Viscosity: 7°E at 50°C)

E = Ecoden - fuel with a low sulphur content with viscosity of 12 to 20E° at 50°C

(3) ADJUSTMENT — TN = Single Stage

(4) BLAST TUBE LENGHT (See overall dimensions)

S = Standard

(5) DESTINATION COUNTRY — * see data plate

(6) SPECIAL VERSIONS — A = Standard

OVERALL DIMENSIONS

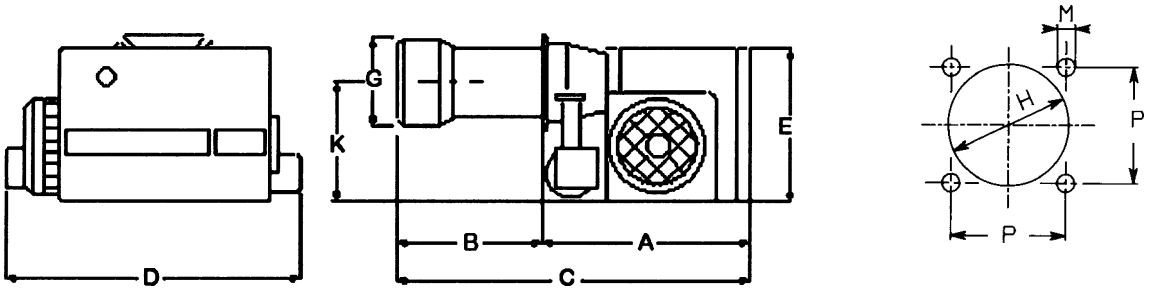


Fig. 1

	A	B	C	D	E	G	K	H	Pmin	Pmax	M
N18	400	70÷200	470÷600	480	300	126	270	132	105	134	M8

PERFORMANCE CURVE

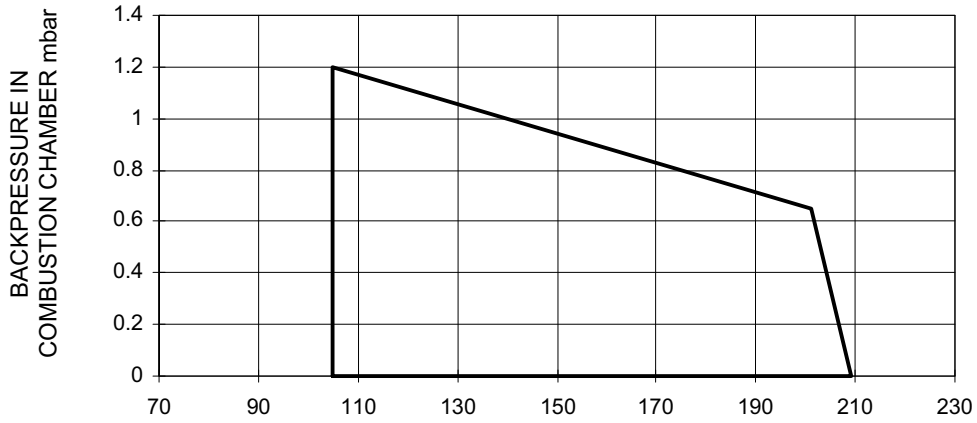


Fig. 2

MOUNTINGS AND CONNECTIONS

The burners are despatched in cardboard packages.

The packaging contains the following items:

1 burner;
2 flexible pipes;
1 oil filter;
1 gasket to be inserted between the burner and the boiler;
1 this manual, the Guarantee Certificate and the test certificate.

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.

ELECTRICAL CONNECTIONS DIAGRAM

- Remove the burner housing.
- Carry out electrical connections to the multiple connector, supplied with the burner, according to the diagram shown in fig. 4.
- Refit the burner housing.

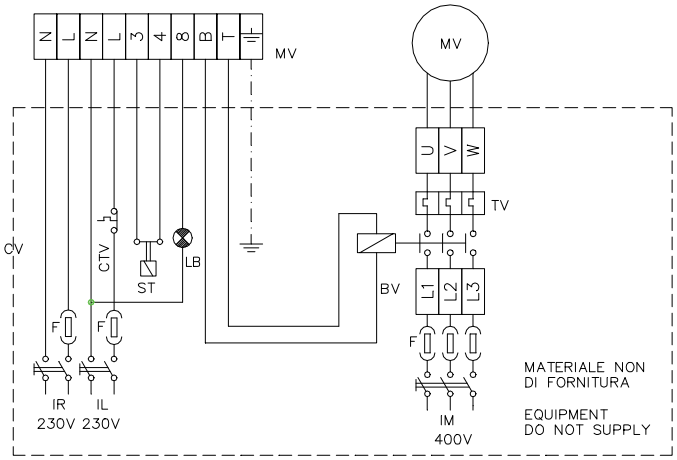


Fig. 3

INSTALLATION DIAGRAM 3ID0010 FOR HEAVY OIL FEED
(See complete key on page 8)

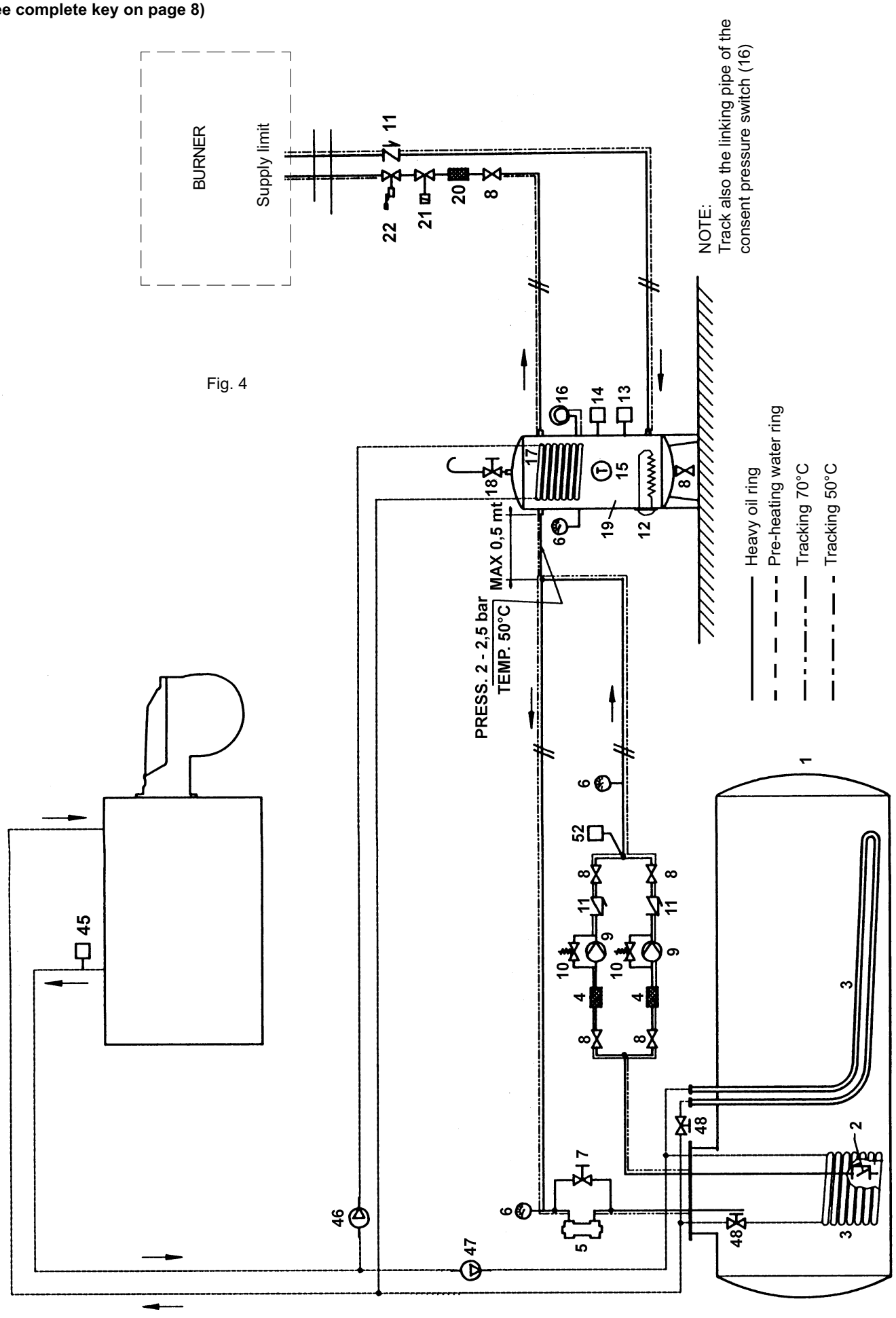


Fig. 4

KEY - Hydraulic diagram 3ID0010

1 Oil tank
2 Bottom valve
3 Pre-heating pipe
4 Oil filter (filtration, 1mm)
5 Circuit pressure regulator
6 Manometer, scale: 0 to 10 bar
7 Pressure regulation by-pass valve
8 Manual valve
9 Circuit oil pump
10 Pump pressure relief valve
11 Unidirectional valve
12 Oil tank electric heater
13 Heating tank thermostat
14 Thermostat for burner consent
15 Thermometer (scale 0° to 90°C)
16 Pressure switch for tank resistor and burner consent
17 Oil tank heating pipe
18 Oil tank air drain valve
19 Oil heating tank (capacity approx. 600 litres)
20 Oil filter (filtration, 0.3 mm)
21 Fuel detection solenoid valve
22 Fuel detection valve
46 Water pump for pre-heating tank (1)
47 Water pump for main tank pre-heating (19)
48 Valves for setting of pre-heating balancing water
52 Oil ring max. pressure switch

SINGLE PIPE INSTALLATION

The burners come from the factory prepared for a twin-pipes operation, however the single-pipe operation is possible. See the appendix for further details.

Starting up the burner

After the filling of the pre-heating tank, the burner is ready for operation.

Operate on the mains switch on the burner's elecreical board; the pre-heating time starts until the appropriate temperature is reached (fix it by means of the thermostat TCN).

The pre-heating resistors will continue to operate until the temperature fixed by the thermostat TR is reached.

When the thermostat TCN operates, the motor starts, activating the fan and the oil pump, starting this way the pre-purgue phase. During this phase the heavy oil flows through the filter (1), is sucked-up by the pump (2) and introducted in the burner pre-heating tank (3) where it is warmed up.

The heavy oil flows then through the antigas valve (7), to the nozzle (10), which is obstructed by the pin (12), flows through the normally open valve (9) and returns to the tank.

The pre-purgue phase is needed to eliminate fuel residues remained from previous operations and to free the pipes and the atomizer block from any kind of waste.

At the end of the pre-purgue phase, the atomizer and the burner pre-heating tank are at the same temperature.

The flame control device energizes the antigas valve (7) and the fuel pressure forces the pin (12) to move back, allowing the fuel flowing to the nozzle (10). This way to operate is the same for all heavy oil burners.

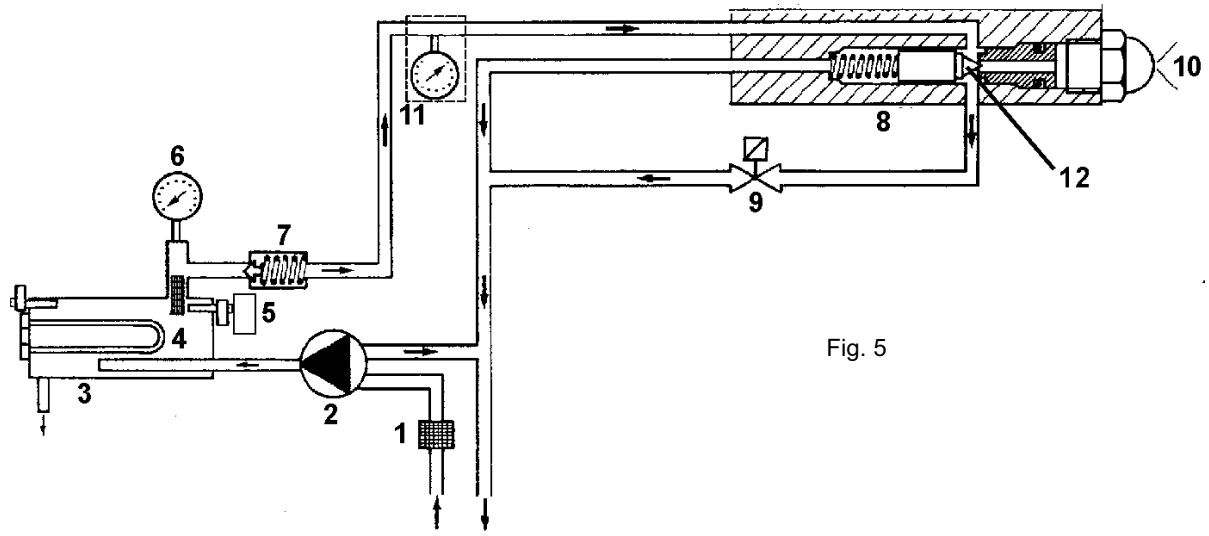


Fig. 5

1 Heavy oil filter
2 Heavy oil pump
3 Burner pre-heating tank
4 Heavy oil pre-heating resistor
5 Group of resistors thermostats (TR) and fuel consent thermostats (TCN)
6 Thermometer
7 Antigas valve
8 Nozzle support
9 Normally open valve
10 Nozzle
11 Manometer point
12 Nozzle obstruction pin

THERMOSTATS SETTING

Thermostat for heavy oil consent TCN

To set this thermostat, remove its cover from the opposite side than the pre-heater resistors; set the consent temperature following the values reported in the table below.

Resistors consent thermostat TR

The value to set is reported in the table below.

This setting must be carried out during burner's operation, watching the value of temperature on the thermometer mounted on the pre-heater.

During the settings, the use of a mercury thermometer is recommended, instead the one fitted with the burner; the scale must be up to 200°C.

Type of heavy oil (°E)	3 to 5	5 to 7	12 to 20
TCN (°C)	90	100	110
TR (°C)	110	120	135
Heavy oil pressure (bar)	25	25	25

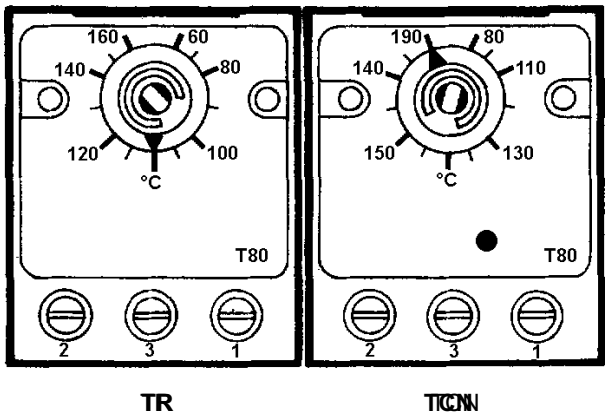


Fig. 6

HEAVY OIL PUMP Suntec E4NC

Suction height:	0.5 bar
Advised value to prevent air separation from oil:	0.35 bar
Rated speed:	max. 3600 rpm
Operation viscosity:	from 2.8 to 800 cSt
Inlet pressure:	1.5 to 3.5 bar

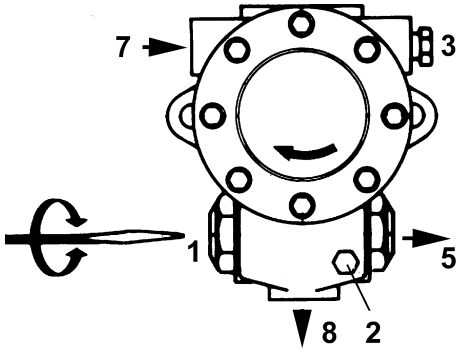


Fig. 7

Key

1 Pressure regulator
2 Manometer point
3 Vacuum-meter
5 Nozzle
7 Suction
8 Return

AIR FLOW SETTINGS

Loose the screw VBS and rotate the air damper in the desired position, to set the air flow.
At the end of settings, tight the screw VBS.

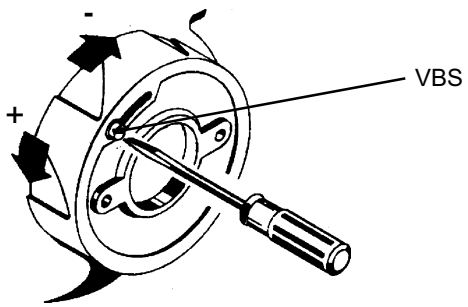


Fig. 8

COMBUSTION HEAD ADJUSTMENT

The burner is factory-adjusted with the combustion head in the “max” position (maximum output).
Move back the combustion head towards the “MIN” position, turning the screw VRT clockwise.

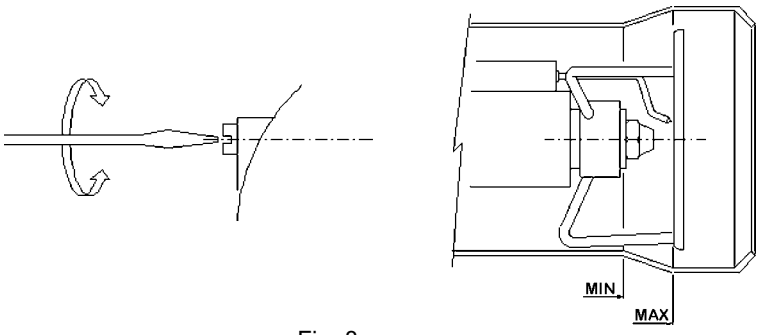


Fig. 8a

PART II: OPERATION MANUAL

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.

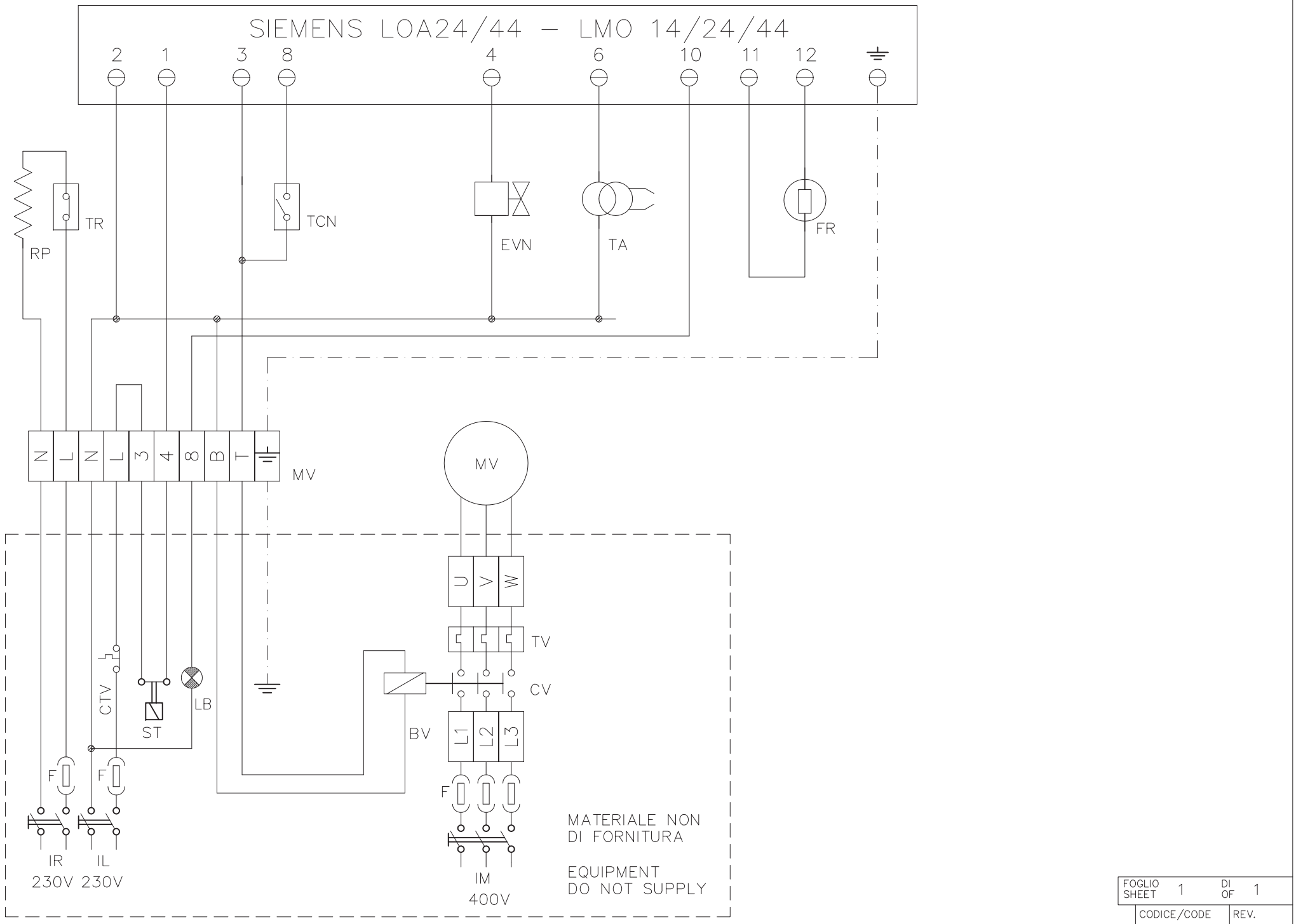
THEREFORE ANY OPERATION OF THE APPLIANCE MUST BE PREVENTED WHICH DEPARTS FROM THE INSTALLATION OPERATIONS OR WHICH HAPPENS AFTER TOTAL OR PARTIAL TAMPERING WITH THESE (E.G. DISCONNECTION, EVEN PARTIAL, OF THE ELECTRICAL LEADS, OPENING THE GENERATOR DOOR, DISMANTLING OF PART OF THE BURNER).

DO NOT EVER OPEN OR DISMANTLE ANY COMPONENT OF THE MACHINE.

OPERATE ONLY THE MAIN SWITCH, WHICH THROUGH ITS EASY ACCESSIBILITY AND RAPIDITY OF OPERATION ALSO FUNCTIONS AS AN EMERGENCY SWITCH, AND ON THE RE-SET BUTTON.

IN THE EVENT OF REPEATED LOCKOUTS, DO NOT PERSIST WITH THE RE-SET 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.



FOGLIO SHEET	1	DI OF	1
CODICE/CODE	01–103	REV.	03

L E G E N D A cod. 01-103 Rev.3

BV	-	Bobina contattore motore ventilatore
CTV	-	Contatti termico motore ventilatore
CV	-	Contatti contattore motore ventilatore
EVN	-	Elettrovalvola nafta
F	-	Fusibili
FR	-	Fotoresistenza
IL	-	Interruttore ausiliari bruciatore
IM	-	Interruttore motore ventilatore
IR	-	Interruttore resistenze preriscaldatore
L	-	Fase
LB	-	Lampada segnalazione blocco fiamma
LOA../LMO..	-	Apparecchiatura SIEMENS controllo fiamma
MA	-	Morsettiera di alimentazione bruciatore
MV	-	Motore ventilatore
N	-	Neutro
RP	-	Resistenze preriscaldatore
TA	-	Trasformatore di accensione
TCN	-	Termostato consenso nafta
TR	-	Termostato resistenze preriscaldatore
TV	-	Termico motore ventilatore

NOTA :
Si raccomanda di eseguire i collegamenti esterni di alimentazione in modo tale che un'eventuale apertura degli interruttori IR provochi l'arresto del bruciatore interrompendo l'alimentazione monofase dello stesso.

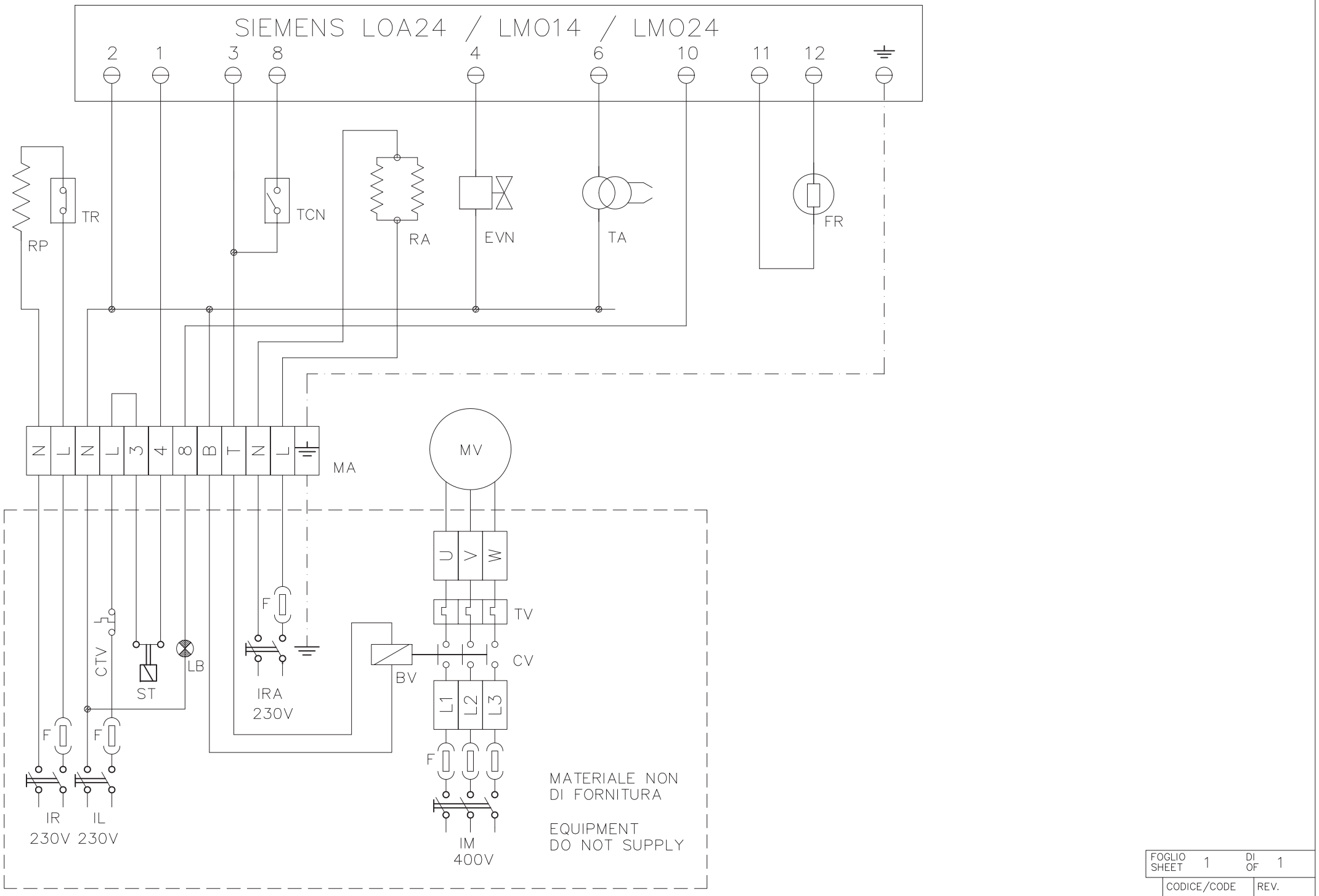
ATTENZIONE:
1 - Alimentazione elettrica 400V 50/60Hz 3 a.c. per ventilatore + 230V 50/60Hz 2N a.c. per bruciatore
2 - Non invertire fase con neutro
3 - Assicurare una buona messa a terra del bruciatore

L E G E N D cod. 01-103 Rev.3

BV	-	Fan motor remote contactor coil
CTV	-	Fan motor overload contacts
CV	-	Fan motor contactor
EVN	-	Oil electro-valve
F	-	Fuses
FR	-	Photoresistor
IL	-	Burner auxiliary line switch
IM	-	Fan motor switch
IR	-	Trim heater switch
L	-	Phase
LB	-	Burner lockout warning light
LOA24../LMO..	-	SIEMENS flame monitor device
MA	-	Supply terminal block
MV	-	Fan motor
N	-	Neutral
RP	-	Trim heater
TA	-	Ignition transformer
TCN	-	Fuel oil interlock thermostat
TR	-	Thermostat oil trim heater
TV	-	Fan motor thermal

NOTE :
Electric feeding connections must be arranged in order to ensure burner stop if IR switchs are opened.
This shall be obtained by the automatic interruption of single phase to the burner.

WARNING:
1 - Electrical supply 400V 50/60Hz 3 a.c. fan motor + 230V 50/60Hz 2N a.c. burner
2 - Do not reverse phase with neutral
3 - Ensure burner is properly earthed



FOGLIO SHEET	1	DI OF	1
CODICE/CODE	01 – 236	REV.	04

L E G E N D A cod. 01-236 Rev.4

BV	-	Bobina contattore motore ventilatore
CTV	-	Contatti termico motore ventilatore
CV	-	Contatti contattore motore ventilatore
EVN	-	Elettrovalvola nafta
F	-	Fusibili
FR	-	Fotoresistenza
IL	-	Interruttore ausiliari bruciatore
IM	-	Interruttore motore ventilatore
IR	-	Interruttore resistenze preriscaldatore
IRA	-	Interruttore resistenze ausiliarie
L	-	Fase
LB	-	Lampada segnalazione blocco fiamma
LOA../LMO..	-	Apparecchiatura SIEMENS controllo fiamma
MA	-	Morsettiera di alimentazione bruciatore
MV	-	Motore ventilatore
N	-	Neutro
RA	-	Resistenze ausiliarie
RP	-	Resistenze preriscaldatore
TA	-	Trasformatore di accensione
TCN	-	Termostato consenso nafta
TR	-	Termostato resistenze preriscaldatore
TV	-	Termico motore ventilatore

NOTA :
Si raccomanda di eseguire i collegamenti esterni di alimentazione in modo tale che un'eventuale apertura degli interruttori IR provochi l'arresto del bruciatore interrompendo l'alimentazione monofase dello stesso.

ATTENZIONE:
1 - Alimentazione elettrica 400V 50/60Hz 3 a.c. per ventilatore + 230V 50/60Hz 2N a.c. per bruciatore
2 - Non invertire fase con neutro
3 - Assicurare una buona messa a terra del bruciatore

L E G E N D cod. 01-236 Rev.4

BV	-	Fan motor remote contactor coil
CTV	-	Fan motor overload contacts
CV	-	Fan motor contactor
EVN	-	Oil electro-valve
F	-	Fuses
FR	-	Photoresistor
IL	-	Burner auxiliary line switch
IM	-	Fan motor switch
IR	-	Trim heater switch
IRA	-	Auxiliary trim heater switch
L	-	Phase
LB	-	Burner lockout warning light
LOA../LMO..	-	SIEMENS flame monitor device
MA	-	Supply terminal block
MV	-	Fan motor
N	-	Neutral
RA	-	Auxiliary trim heater
RP	-	Trim heater
TA	-	Ignition transformer
TCN	-	Fuel oil interlock thermostat
TR	-	Thermostat oil trim heater
TV	-	Fan motor thermal

NOTE :
Electric feeding connections must be arranged in order to ensure burner stop if IR switchs are opened.
This shall be obtained by the automatic interruption of single phase to the burner.

WARNING:
1 - Electrical supply 400V 50/60Hz 3 a.c. fan motor + 230V 50/60Hz 2N a.c. burner
2 - Do not reverse phase with neutral
3 - Ensure burner is properly earthed

PART III: MAINTENANCE

At least once a year carry out the following maintenance procedures.
If servicing is on a seasonal basis, it is recommended at the end of the season; routine sevice should be carried out every month.

Note: Any operation on the burner must be carried out with the main electricity switched off.

PERIODICAL SERVICING

- Clean and examine the oil filter cartridge and replace it if necessary;
- Examine the condition of the oil flexible pipeworks and check for possible leaks;
- Clean and examine the filter inside the oil pump;
- Dismantle, examine and clean the combustion head. When reassembling respect the measures reported in fig. 9;
- Examine the ignition electrodes and their ceramic insulators, adjust and replace if necessary (fig. 9);
- Dismantle and clean the oil nozzle (important: use solvents for cleaning and not metal utensils).

At the end of the maintenence procedures replace the burner, light it and check the shape of the flame: if in doubt replace the nozzle(s);
where the burner is used intensively it is recommended to replace the nozzles at the beginning of the operating season;

- Examine and carefully clean the flame detector photoelectric cell and replace if necessary. If in doubt light the burner and then check the detector circuit as shown in fig. 10.

ELECTRODES POSITION

To guarantee a good ignition, respect the measures reported in the figure below. Be sure the locking screw is fasted \before re-assemble the burner.

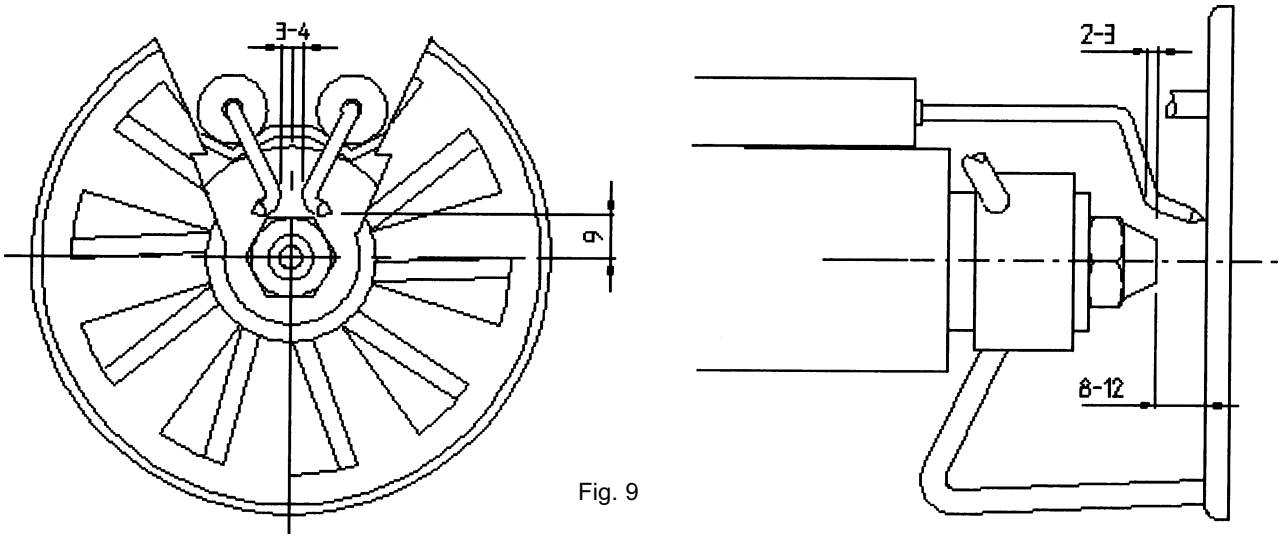


Fig. 9

CHECK OF THE IONIZATION CURRENT

To measure the detection current follow the diagram in fig. 10.
If the signal is not within the prescribed range, check the electrical contacts, the combustion head cleaning and the correct position of the photoelectric cell; replace it if necessary.

Minimum current with flame	65µA
Maximum current without flame	5µA
Max. allowed current with flame	200µA

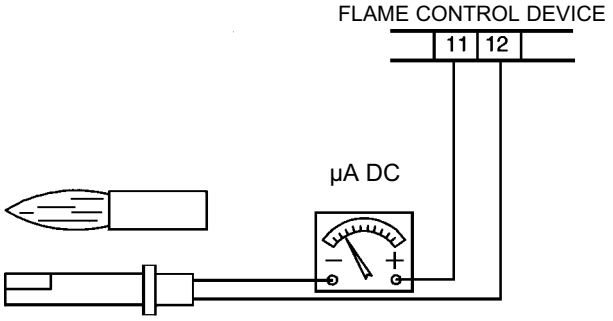


Fig. 10

SPARE PARTS

	DESCRIPTION	N18	
		N-.TN.x.x.A	E-.TN.x.x.A
1	FLAME CONTROL DEVICE	2020445	2020445
2	IGNITION TRANSFORMER	2170107	2170107
3	PIMP	2590104	2590115
4	HEAWY OIL SOLENOID VALVE	2190421	2190421
5	FAN MOTOR	2180088	2180088
6	RESISTORS	6060002	6060002
7	PUMP AUXILIARY RESISTORS	---	6060010
8	DISTRIB. BLOCK AUXILIARY RESISTORS	---	6060015
9	TWIN THERMOSTAT	2560020	2560020
10	ANTIGAS VALVE	2190627	2190627
11	NOZZLE HOLDER	3020090	3020090
12	FILTER	2090224	2090224
13	FLEXIBLE HOSES	2340003	2340003

APPENDIX

SIEMENS OIL BURNERS AUTOMATIC CONTROLLER LOA24

Use

LOA... safety devices are intended for use solely with QRB... photoresistors, for lighting and controlling low capacity forced air light oil burners with max. capacity 30 kg/h in accordance with standard DIN 4787.

The One or two flamess are lit through electrical connections with or without post-ignition.

To replace LAI... AND LAB.. WITH LOA...

LOA... models can be used as replacement for LAI... and LAB.. controllers by means of the adapter KF8819 and without the need to change the electrical wiring. Because the LOA is smaller in dimensions, when it is used with the adapter the external dimensions are almost identical, which means that there is no need to move the reset button.

Performance

The controllers just need plugging in, so they can be mounted in almost any position: on the burner, on the electrical panel or on the control panel. The casing is made of robust heat-resistant plastic and contains:

- the thermic programmer operating a multiple switch control system with ambient temperature compensator
- flame signal amplifier with flame relay
- warning light indicating lockout and associated sealed reset button.

The plug-in socket, also made of robust heat-resistant plastic, contains the 12 terminals and also:

- 3 neutral terminals, ready wired up to terminal 2
- 4 earth terminals for earthing the burner
- 2 supplementary terminals numbered “31” and “32”.

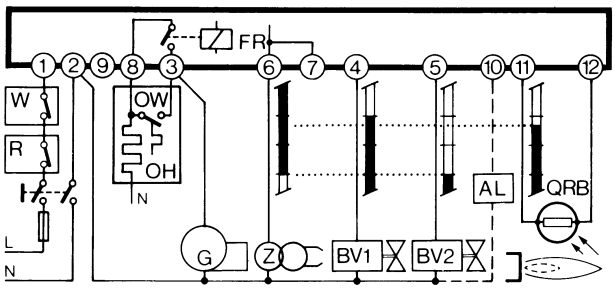
The socket has two openings at the bottom for the leads; 5 others with threaded connection for cable holders PG11 or 3/4UNP for non-metallic sleeves are located on a mobile stuffing box, one on either side and 3 on the front.

There are two flexible metal tongues on the sides of the socket for mounting.

To dismantle it only requires gentle pressure with a screw driver in the slot of the mounting guide. The base dimensions of the socket are exaclty the same as for types LAB/LAI and there is no difference in the diameter of the reset button, the two mounting screws and the flange of the burner earth.

Safety at low voltage levels

Safety devices against any reduction in the mains voltage operate on a special electronic circuit which, in the event of the power supply falling below 165V~, stops the burner switching on without releasing the fuel and locks out the apparatus.



Wiring diagram of the programme

To ensure correct wiring it is essential to observe local standards and follow the instructions of the burner manufacturer with regard to assembly and start-up.

Program's legend:

Controller output signals
Required input signals

A’Burner start up with light oil pre-heater OH

A Burner start-up without light oil pre-heater
B Flame lit
C Normal operation
D Normal stop through R
tw Oil pre-heating time until operational all clear given through contact OW
tl Pre-purge time
t3 Pre-ignition time
t2 Safety time
t3n Post-ignition time
t4 Interval between the flame lighting and energising of solenoid 2a at terminal 5

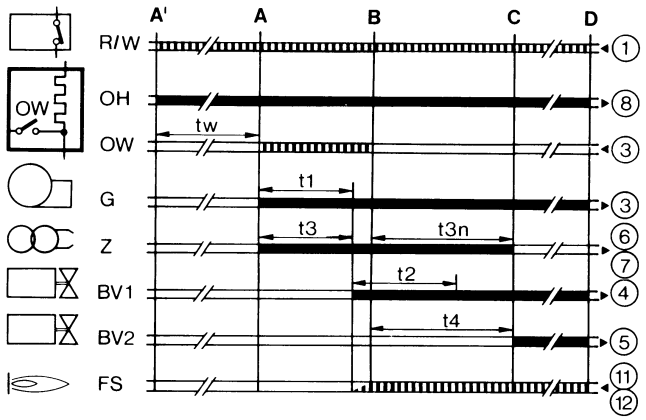
Internal layout

AL Optical alarm
BV. Fuel valve
EK Reset button
FR Flame relay
fr Flame relay contacts
FS Flame alight signal
G Burner motor
K Flame relay anchor to delay the tzl command in the event of a premature flame signal or endorse it where the signal is correct.
OH light oil pre-heater
OW Operational all-clear contact
QRB Photo-resistant cell (flame detector)
R Thermostat or pressure switch
TZ Thermo-electric programmer (bimetal system)
tz.. TZ contacts
V Flame signal amplifier
W Safety thermostat or pressure switch
Z Ignition transformer

The above are safety devices!

To tamper with them in any way may have unforeseeable consequences!

Do not open them!



Technical characteristics

Voltage	220V -15%..240V+10% or 100V -15%...110V+10%
Frequency	50...60Hz +/- 6%
External fuse	max.10A slow action
Contact flow:	
- terminal 1	5A
- terminal 3	5A (incl.capacity absorbed by motor and pre-heater)
Terminal flow:	
terminals 4, 5 &10	1A
terminals 6&7	2A
terminal 8	5A
Absorbed cap	3VA
Protection	IP40
Premitted temp:	
operational	-20...+60°C
transport & storage	-50...+60°C

Emplacement	any
Mass (weight)	controller 180g, socket 50g, AGK accessories 12 g.

Commands in the event of operational interference

Stray light/premature ignition

During pre-purge and/or pre-ignition there should be no flamesignal. If there is a flame signal, eg from premature ignition due to a faulty solenoid, external light, short circuit in the photoresisto or wiring, malfunction in the flame signal amplifier, etc., at the end of pre-purge and safety time the controller locks out the burner and stops the fuel flow even during safety time.

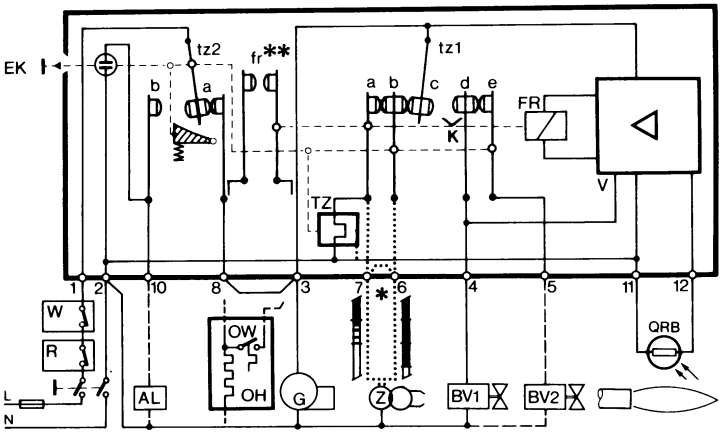
Absence of flame

If there is no flame at the end of safety time the controller locks out immediately.

Absence of flame during operation

If there is no flame during operation the controller cuts off the supply of fuel and automatically initiates a fresh start-up programme: at the end of t4 the start-up programme ends.

Whenever there is a safety stop, terminals 3-8 and 11 are de-energised in less than 1 second; at the same time a remote lockout signal is transmitted through terminal 10. The controller can be reset after c. 50 seconds.



SIEMENS OIL BURNERS AUTOMATIC CONTROLLER SIEMENS LMO14 - LMO24 - LMO44

The LMO... burner controls are designed for the start-up and supervision of single- or 2-stage forced draught oil burners in intermittent operation. Yellow-burning flames are supervised with photoresistive detectors QRB..., blue-burning flames with blue-flame detectors QRC...

In terms of housing dimensions, electrical connections and flame detectors, the LMO... are identical to the LOA... oil burner controls.

Preconditions for startup

- Burner control is reset
- All contacts in the line are closed
- No undervoltage
- Flame detector is darkened, no extraneous light

Undervoltage

- Safety shut-down in the operating position takes place should the mains voltage drop below about AC 165 V
- Restart is initiated when the mains voltage exceeds about AC 175 V

Time supervision oil pre-heater

If the oil pre-heater's release contact does not close within 10 minutes, the burner control will initiate lock-out.

Controlled intermittent operation

After no more than 24 hours of continuous operation, the burner control will initiate an automatic safety shut-down followed by a restart.

Control sequence in the event of fault

If lock-out occurs, the outputs for the fuel valves and the ignition will immediately be deactivated (< 1 second).

Cause	Response
After a mains failure	Restart
After voltage has fallen below the undervoltage threshold	Restart
In the event of a premature, faulty flame signal during «t1»	Lock-out at the end of «t1»
In the event of a premature, faulty flame signal during «tw»	Prevention of start-up, lock-out after no more than 40 seconds
If the burner does not ignite during «TSA»	Lock-out at the end of TSA
In the event the flame is lost during operation	Max. 3 repetitions, followed by lock-out
Oil pre-heater's release contact does not close within 10 min.	Lock-out

Lock-out

In the event of lock-out, the LMO... remains locked (lock-out cannot be changed), and the red signal lamp will light up. This status is also maintained in the case of a mains failure.

Resetting the burner

Whenever lock-out occurs, the burner control can immediately be reset. To do this, keep control the lock-out reset button depressed for about 1 second (< 3 seconds).

Ignition program with LMO24.113A2

If the flame is lost during «TSA», the burner will be reignited, but not later than at the end of «TSAmax.». This means that several ignition attempts can be made during TSA (refer to «Program sequence»).

Limitation of repetitions

If the flame is lost during operation, a maximum of 3 repetitions can be made. If the flame is lost for the 4th time during operation, the burner will initiate lock-out. The repetition count is restarted each time controlled switching on by «R-W-SB» takes place.

Operation

Lock-out reset button «EK...» is the key operating element for resetting the burner control and for activating / deactivating the diagnostic functions.

The multicolour «LED» is the key indicating element for both visual diagnosis and interface diagnosis.

s Red
l Yellow
o Green

Colour code table		
Status	Colour code	Colour
Oil pre-heater heats, waiting time «tw»	lllllllllll	Yellow
Ignition phase, ignition controlled	lmlmlmlmlml	Yellow-off
Operation, flame o.k.	ooooooooooo	Green
Operation, flame not o.k.	omomomomomo	Green-off
Undervoltage	lslslslslsl	Yellow-red
Fault, alarm	sssssssssss	Red
Output of fault code (refer to Fault code table)	smsmsmsmsm	Red-off
Extraneous light prior to burner start-up	osososososo	Green-red
Interface diagnosis	sssssssssssss	Red flicker light

Key

m Off
l Yellow
o Green
s Red

Diagnosis of cause of fault

After lock-out, the red fault signal lamp remains steady on.

In that condition, the visual diagnosis of the cause of fault according to the error code table can be activated by pressing the lock-out reset button for more than 3 seconds.

Error code table	
Blink code	**Possible cause**
2 blinks **	No establishment of flame at the end of TSA ● Faulty or soiled fuel valves ● Faulty or soiled flame detector ● Poor adjustment of burner, no fuel ● Faulty ignition
3 blinks ***	Free
4 blinks ****	Extraneous light on burner startup
5 blinks *****	Free
6 blinks ******	Free
7 blinks *******	Too manny losses of fleme during operation (limitattion og the number of repetitions) ● Faulty or soiled fuel valves ● Faulty or soiled flame detector ● Poor adjustment of burner
8 blinks ********	Time supervision oil pre-heater
9 blinks *********	Free
10 blinks **********	Wiring error or internal error, output contacts

During the time the cause of fault is diagnosed, the control outputs are deactivated.

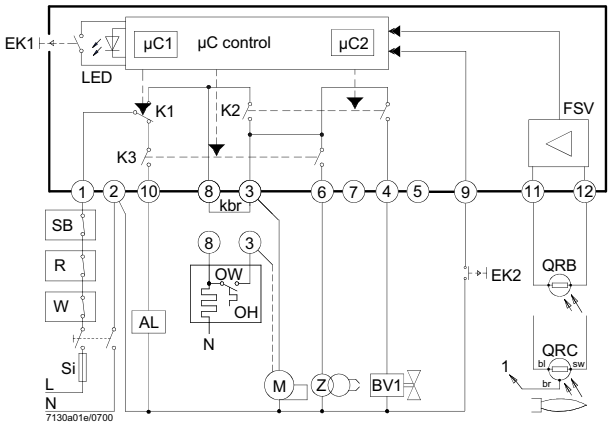
- Burner remains shut down
- Fault status signal «AL» at terminal 10 is activated

The diagnosis of the cause of fault is quit and the burner switched on again by resetting the burner control.

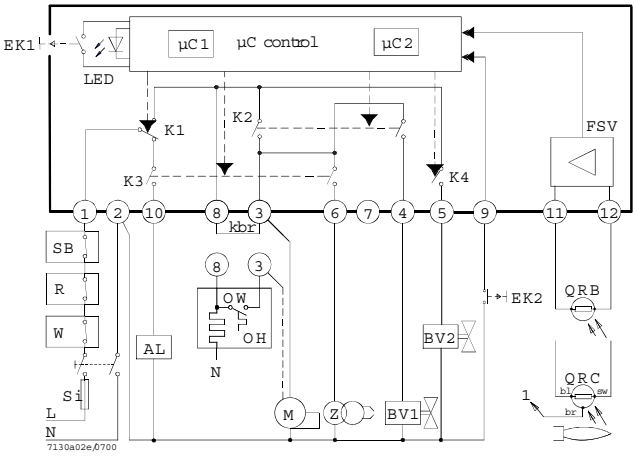
Press lock-out reset button for about 1 second (< 3 seconds).

Connection diagram and internal diagram

LMO14

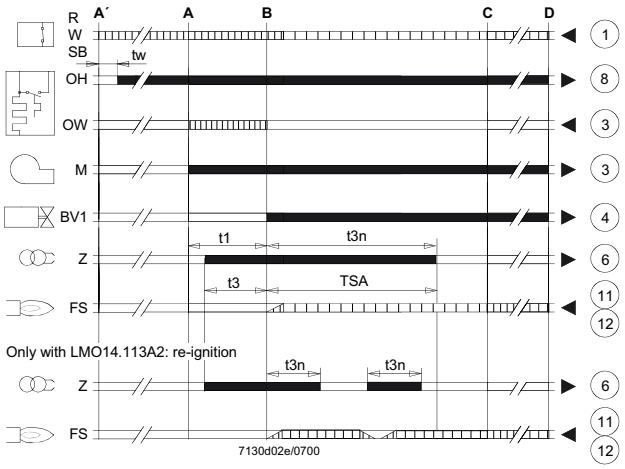


LMO24 - LMO44

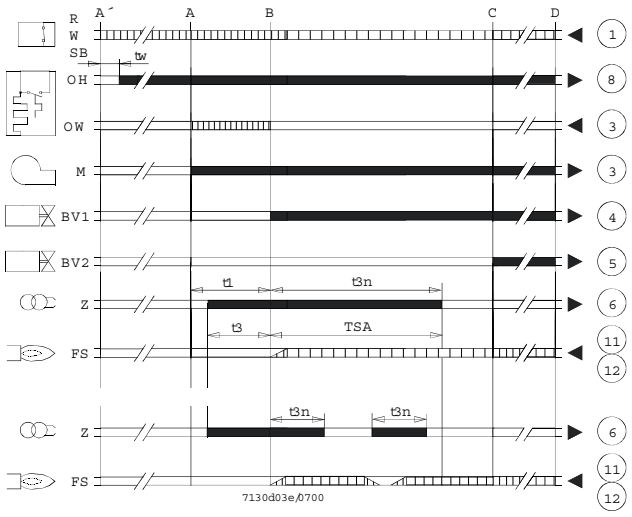


Control sequence

LMO14



LMO24 - LMO44



Key

AL	Alarm device
kbr...	Cable link (required only when no oil pre-heater is used)
BV...	Fuel valve
EK1	Lock-out reset button
EK2	Remote lock-out reset button
FS	Flame signal
FSV	Flame signal amplifier
K...	Contacts of control relay
LED	3-colour signal lamps
M	Burner motor
OW	Release contact of oil pre-heater
t1	Pre-purge time
t3	Pre-ignition time
t3n	Post-ignition time
A´	Beginning of start-up sequence with burners using an oil pre-heater
A	Beginning of start-up sequence with burners using no oil pre-heater
	Controller output signals
	Required input signals
OH	Oil pre-heater
QRB	Photoresistive detector
QRC	Blue-flame detector
bl = blue	
br = brown	
sw = black	
R	Control thermostat or pressurestat
SB	Safety limit thermostat
Si	External primary fuse
W	Limit thermostat or pressure switch
Z	Ignition transformer
t4	Interval from flame signal to release «BV2»
TSA	Ignition safety time
tw	Waiting time for oil pre-heating
B	Time of flame establishment
C	Operating position
D	Controlled shut-down by «R»
µC1	Microcontroller 1
µC2	Microcontroller 2

General unit data

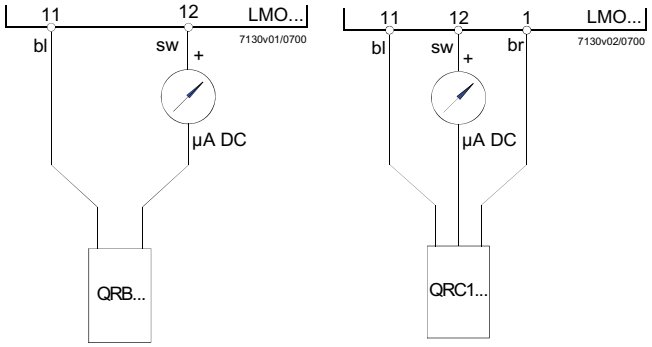
Mains voltage	AC 230 V +10 % / -15 % AC 120 V +10 % / -15 %
Mains frequency	50...60 Hz ±6 %
External primary fuse (Si)	6.3A (slow)
Power consumption	12 VA
Mounting orientation	optional
Weight	approx. 200 g
Degree of protection	IP40 (to be ensured through mounting)
Perm. cable lengths	max. 3m at line capacitance of 100 pF/m
Detector cable laid separately	10 m
Remote reset laid separately	20m

	LMO14	LMO24	LMO44
Terminal 1	5 A	5 A	5 A
Terminals 3 and 8	3 A	5 A	5 A
Terminals 4, 5 and 10	1 A	1 A	1A
Terminals 6	1 A	1 A	2A

Flame supervision with QRB and QRC

	QRB	QRC
Min. detector current required (with flame)	45 µA	70 µA
Min detector current permitted (without flame)	5.5 µA	5.5 µA
Max. possible with flame (tipically)	100 µA	100 µA

Measurement circuit for detector current



Key

µA DC	DC microamperometer with an internal resistance of 5 kΩ max.
bl	Blue
sw	Black
br	Brown

HEAVY OIL PUMP SUNTEC E4NC

The “Suntec E Serie” pump, is fitted with a pressure regulation valve with cut-off function.

This pump is suitable for the use with high-densiti oils.

Operation

The gear set sucks heavy oil from from the tank, through the filter and drive it under pressure to the valve, which regulates the pressure in the nozzle line.

The oil in excess that doesn’t flow through the nozzle line is drained, through the valve, to the return pipe or to the tank or, in the single pipe installation, to the gear set input in the suction-side.

The regulation valve has also a cut-off function as follows.

The drain function is obtained by means of a groove in the piston. During the time of start-up, when the speed increases, the oil flows completely through the groove and drains on the return. The valve is closed until the motor resches such speed in which the quantity of oil feeded by the gear set is higher then the one that can flow trhough the drain groove of the piston.

The pressure into the valve increases rapidly until it overcomes the opposition of the spring and tha valve opens.

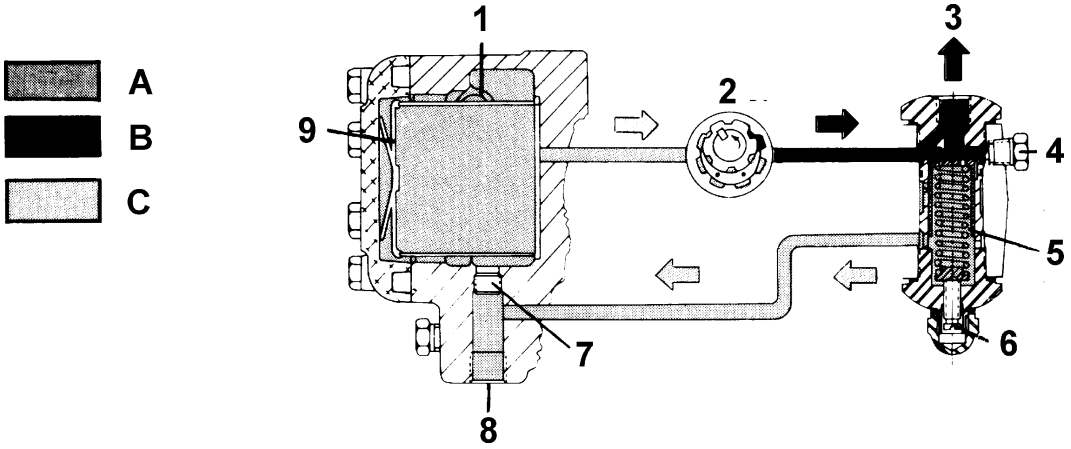
During the stopping phase, the gear set speed decreases and the valve shuts-off when the flow rate of the gear set is lower than the flow rate in the drain groove. The shut-off speed and the opening speed depend by the gear set dimensions and by the pressure choosen.

TECHNICAL DATA

Mounting on flange (DIN 24220)	
Rounded-headed in accordance with ISO R228, NFE 03005 - DIN 259	
Supply and return	G 1/2”
Delivery to tthe nozzle	G 1/4”
Pressurepoint	G 1/8”
Vacuum point	G 1/2”
Valve function	pressure regulation and cut-off
Filter surface	45 cm^2 , N= 550µ, C= 170µ
Shaft	11mm according with DIN 24220
By-pass plug	inserted for twin pipe installation; remove in case of single pipe operation
Weight	4 Kg
Rotation and delivery position, wiewing from shaft side	
	A - clockwise / right
	B - clockwise / left
	C - counterclockwise / left
	D - counterclockwise / right
Pressure range	14 to 30 bar to the nozzle, adjusted at the factory to 20 bar
Viscosity range	from 2,8 to 800 cSt

Key

1 Input from tank
2 Gear set
3 To nozzle
4 Pressure point
5 Pressure regulation valve
6 Regulation screw
7 By-pass plug
8 Return
9 Filter
A Oil under suction
B Oil under pressure
C By-passed oil returned to tank or to suction



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