KP91A – KP92A – KP93A
KR512A – KR515A
KR520A - KR525A

Dual fuel
Natural gas – heavy oil
Burners

MANUAL OF INSTALLATION – USE - MAINTENANCE

CIB UNIGAS

BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

M039216CC Rel.2.0 10/2012

WARNINGS

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.
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 a burner shut-down, reser 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 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, 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:
- Directive 2009/142/EC - Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

Harmonised standards :
-UNI EN 676 (Gas Burners;
-CEI EN 60335-1 (Household and similar electrical appliances - Safety. Part 1: General requirements;
- EN 50165 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

Light oil burners

European directives:
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

Harmonised standards :
-CEI EN 60335-1 (Household and similar electrical appliances - Safety. Part 1: General requirements;
- EN 50165 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

National standards :
-UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

Heavy oil burners

European directives:
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

Harmonised standards :
-CEI EN 60335-1 Household and similar electrical appliances - SafetyPart 1: General requirements;
- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

National standards :
-UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

Gas - Light oil burners

European directives:
- Directive 2009/142/EC - Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

Harmonised standards :
-UNI EN 676 Gas Burners
-CEI EN 60335-1 (Household and similar electrical appliances - Safety. Part 1: General requirements;
- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

National standards :
-UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

Gas - Heavy oil burners

European directives:
- Directive 2009/142/EC - Gas Appliances;
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National standards :
-UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods.

GENERAL FEATURES

How to interpret the burner's "Performance curve"

To check if the burner is suitable for the boiler to which it must be installled, the following parameters are needed:

- furnace input, in kW or kcal/h (kW = kcal/h / 860);
- backpressure (data are available on the boiler's ID plate or in the user's manual).

Example:

Furnace input: 600kW

Backpressure: 4mbar

In the "Performance curve" diagram (Fig.1), draw a vertical line matching the furnace input value and an horizontal line matching the backpressure value. The burner is suitable if the intersection point A is inside the performance curve.

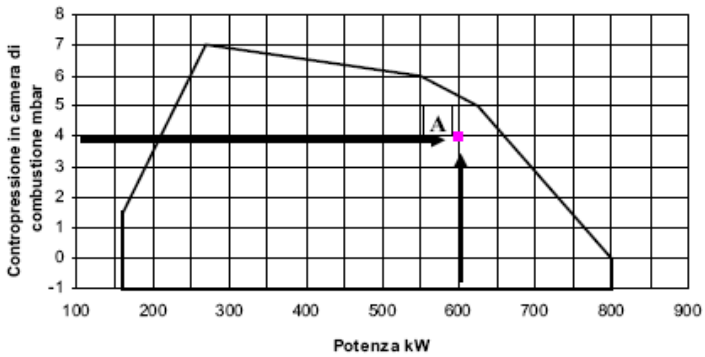


Fig. 1

Data are referred to standard conditions (atmospheric pressure at 1013mbar, ambient temperature at 15°C).

Checking the proper gas train size

To check the proper gas train size, it is necessary to know the available gas pressure value upstream the burner's gas valve. Then subtract the backpressure. The result is called pgas. Draw a vertical line matching the furnace input value (600kW, in the example), quoted on the x-axis, as far as intercepting the network pressure curve, according to the installed gas train (DN65, in the example). From the interception point, draw an horizontal line as far as matching, on the y-axis, the value of pressure necessary to get the requested furnace input. This value must be lower or equal to the pgas value, calculated before.

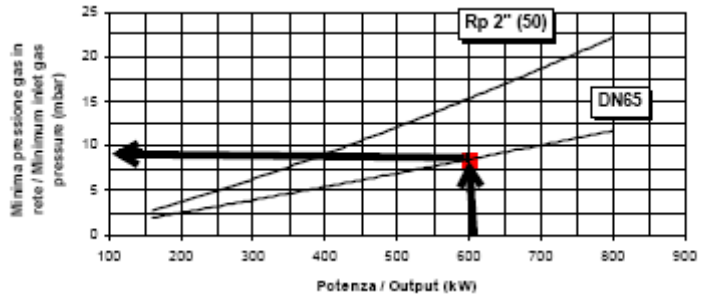


FIg. 2

Burner model identification

Burner model identification is described as follows.

Type KR512A (1) **Model** MN. (2) PR. (3) S. (4) *. (5) A. (6) 1. (7) 80. (8)	
(1) BURNER TYPE	KR512A
(2) FUEL	M - Natural gas N – heavy oil, viscosity ≤ 50 cSt (7°E) at 50° C E – heavy oil, viscosity ≤ 110 cSt (15°E) at 50° C D - heavy oil, viscosity ≤ 400 cSt (50°E) at 50° C P – petroleum, viscosity = 89 cSt (12°E) at 50° C
(3) OPERATION	PR - Progressive MD - Fully modulating
(4) BLAST TUBE	S - standard
(5) DESTINATION COUNTRY	* - see data plate
(6) BURNER VERSION	A - standard
(7) EQUIPMENT	1 = 2 valves + gas proving system 8 = 2 valves + gas proving system + max gas pressure switch
(8) GAS CONNECTION - see Specifications	50 = Rp2 65 = DN65 80 = DN80 100 = DN100

Technical specifications

		KP91A	**KP92A**	**KP93A**
Output	min - max kW	480 - 2670	480-3050	550 - 4100
Fuel		Natural gas – heavy oil		
Category		(see next paragraph)		
Gas rate	min.- max. Stm3/h	51 - 283	51 - 323	58 - 434
Gas pressure	min.- max. mbar	(see Note 2)		
Oil viscosity	cSt at 50 °C	See table "Burner model identification"		
Oil train inlet pressure	max bar	4		
Oil rate	min.- max. kg/h	43 - 238	43 - 272	49 - 365
Power supply		400V 3N ~ 50Hz		
Total power output	kW	23.6	25.1	33.1
Total power output (petroleum)	kW	17.9	19.1	27.1
Fan motor output	kW	4	5.5	7.5
Pump motor output	kW	1.1		
Pre-heater resistor output	kW	18	18	24
Pre-heater resist. output (petroleum)	kW	12	12	18
Protection		IP40		
Operation		Progressive - Fully modulating		
Gas train 50	Ø Valves / Connection	50 / Rp 2”		
Gas train 65	Ø Valves / Connection	65 / DN65		
Gas train 80	Ø Valves / Connection	80 / DN80		
Gas train 100	Ø Valves / Connection	100 / DN100		
Operating temperature	°C	-10 ÷ +50		
Storage Temperature	°C	-20 ÷ +60		
Working service*		Intermittent		

		KR512A	KR515A	KR520A	KR525A
Output	min - max kW	600 - 4500	770 - 5200	1000 - 6400	2000 - 8000
Fuel		Natural gas – heavy oil			
Category		(see next paragraph)			
Gas rate	min.- max. Stm3/h	63 - 476	81 - 550	106 - 677	212 - 847
Gas pressure		(see Note 2)			
Oil rate	min.- max. kg/h	53 - 401	69 - 463	89 - 570	178 – 713
Oil viscosity	cSt at 50 °C	See table "Burner model identification"			
Oil train inlet pressure	bar	4 max	4 max	4 max	4 max
Power supply		400V 3N~ 50	400V 3N~ 50	400V 3N~ 50	400V 3N~ 50
Total power consumption	kW	35.2	43	59.7	69.2
Total power consump. (petroleum)	kW	29.2	31	47.7	57.2
Fan motor consumption	kW	9.2	11	15	18.5
Pump motor consumption	kW	1.5	1.5	2.2	2.2
Pre-heater resistor consumption	kW	24	30	42	48
Pre-heater resist. consumpt. (petr.)	kW	18	18	30	36
Protection		IP40	IP40	IP40	IP40
Operation		Progressive - Fully modulating			
Gas train 50	Ø Valves / Connection	50 / Rp2	50 / Rp2	50 / Rp2	50 / Rp2
Gas train 65	Ø Valves / Connection	65 / DN65	65 / DN65	65 / DN65	65 / DN65
Gas train 80	Ø Valves / Connection	80 / DN80	80 / DN80	80 / DN80	80 / DN80
Gas train 100	Ø Valves / Connection	100 / DN100	100 / DN100	100 / DN100	100 / DN100
Operating temperature	°C	-10 ÷ +50	-10 ÷ +50	-10 ÷ +50	-10 ÷ +50
Storage Temperature	°C	-20 ÷ +60	-20 ÷ +60	-20 ÷ +60	-20 ÷ +60
Working service*		Intermittent	Intermittent	Intermittent	Intermittent

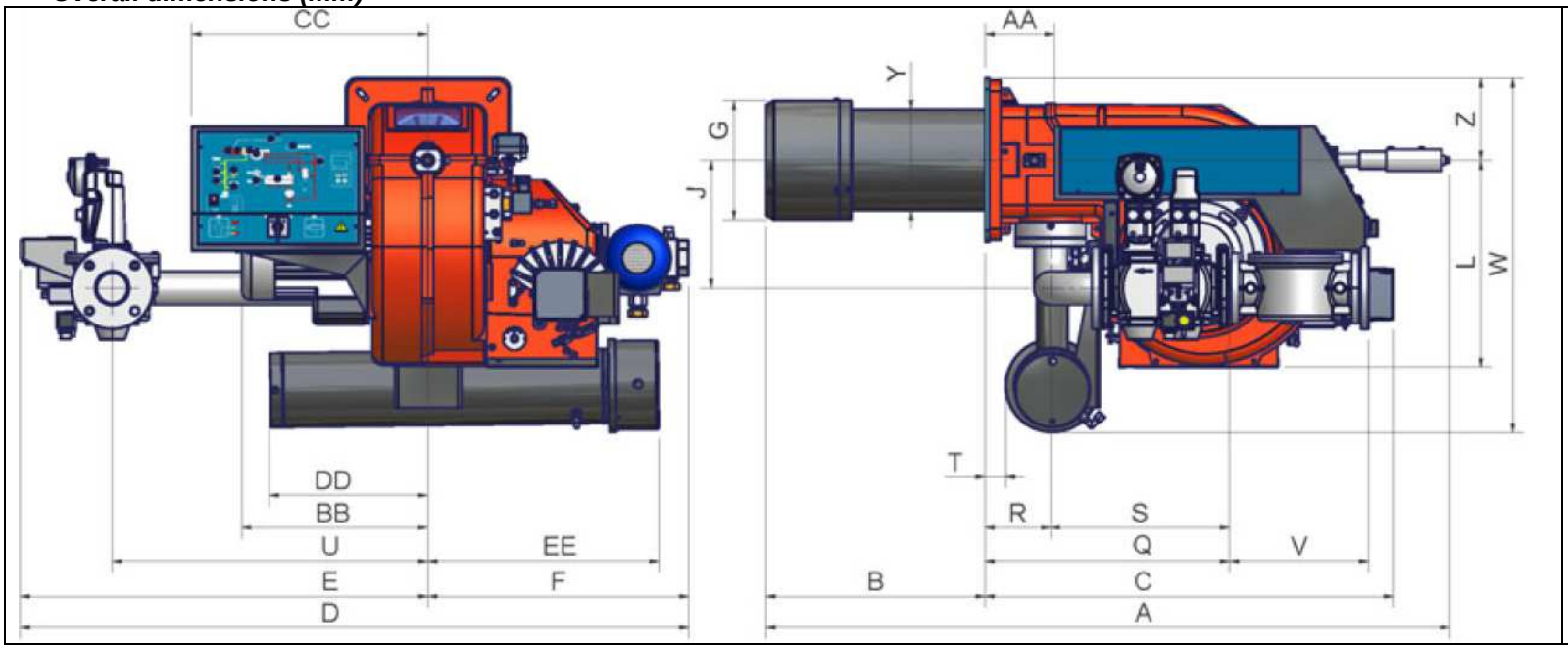
Note1:	all gas flow rates are referred to Stm3/h (1013 mbar absolute pressure, 15 °C temperature) and are valid for G20 gas (net calorific value Hi = 34.02 MJ/Stm3).
Note2:	Maximum gas pressure = 500mbar (with Siemens VGD gas valves). Minimum gas pressure = see gas curves.

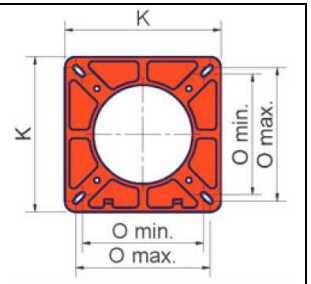
*** NOTE ON THE BURNER WORKING SERVICE: for safety reasons, one controlled shutdown must be performed every 24 hours of continuous operation**.

Country and usefulness gas categories

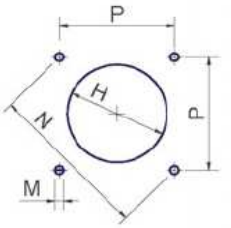
GAS CATEGORY	COUNTRY																								
I2H	AT	ES	GR	SE	FI	IE	HU	IS	NO	CZ	DK	GB	IT	PT	CY	EE	LV	SI	MT	SK	BG	LT	RO	TR	CH
I2E	LU	PL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I2E(R) B	BE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I2L	NL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I2ELL	DE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I2Er	FR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Overall dimensions (mm)





Burner flange

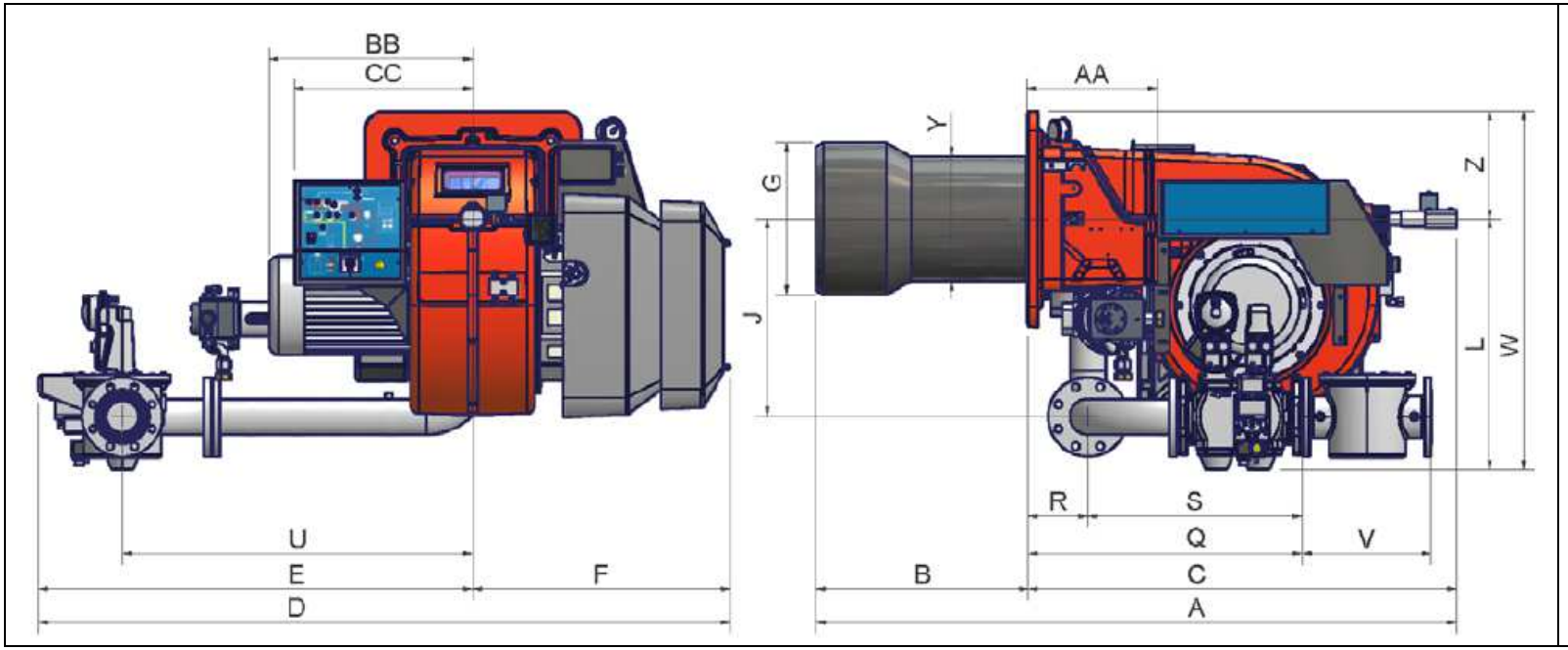


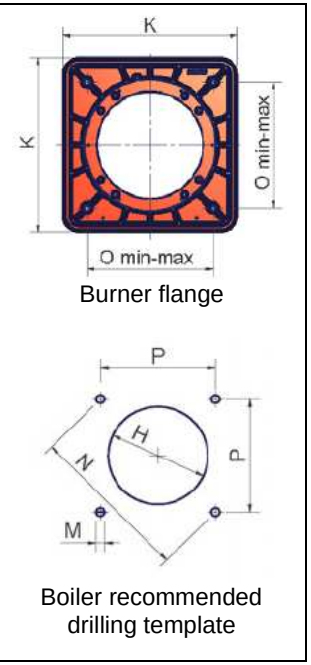
Boiler recommended drilling template

	DN	A	AA	B	BB	C	CC	D	DD	E	EE	F	G	H	J	K	L	M	N	Omin	Omax	P	Q	R	S	T	U	V	W	Y	Z
KP91A	50	1538	157	490	419	918	532	1439	356	852	520	587	265	295	329	360	466	M12	417	280	310	295	522	148	374	47	624	216	798	228	185
KP91A	65	1538	157	490	419	918	532	1544	356	957	520	587	265	295	288	360	466	M12	417	280	310	295	551	148	403	47	750	292	798	228	185
KP91A	80	1538	157	490	419	918	532	1546	356	959	520	587	265	295	307	360	466	M12	417	280	310	295	592	148	444	47	750	322	798	228	185
KP91A	100	1538	157	490	419	918	532	1636	356	1049	520	587	265	295	447	360	592	M12	417	280	310	295	672	148	524	47	824	382	798	228	185
KP92A	50	1538	157	490	419	918	532	1439	356	852	520	587	269	299	329	360	466	M12	417	280	310	295	522	148	374	47	624	216	798	228	185
KP92A	65	1538	157	490	419	918	532	1544	356	957	520	587	269	299	288	360	466	M12	417	280	310	295	551	148	403	47	750	292	798	228	185
KP92A	80	1538	157	490	419	918	532	1546	356	959	520	587	269	299	307	360	466	M12	417	280	310	295	592	148	444	47	750	322	798	228	185
KP92A	100	1538	157	490	419	918	532	1636	356	1049	520	587	269	299	447	360	592	M12	417	280	310	295	672	148	524	47	824	382	798	228	185
KP93A	50	1543	157	495	460	918	532	1439	356	852	520	587	304	344	329	360	466	M12	417	280	310	295	522	148	374	47	624	216	798	228	185
KP93A	65	1543	157	495	460	918	532	1544	356	957	520	587	304	344	288	360	466	M12	417	280	310	295	551	148	403	47	750	292	798	228	185
KP93A	80	1543	157	495	460	918	532	1546	356	959	520	587	304	344	307	360	466	M12	417	280	310	295	592	148	444	47	750	322	798	228	185
KP93A	100	1543	157	495	460	918	532	1636	356	1049	520	587	304	344	447	360	592	M12	417	280	310	295	672	148	524	47	824	382	798	228	185

*DN = gas valves size

NOTE: the overall dimensions are referred to burners provided with Siemens VGD valves.





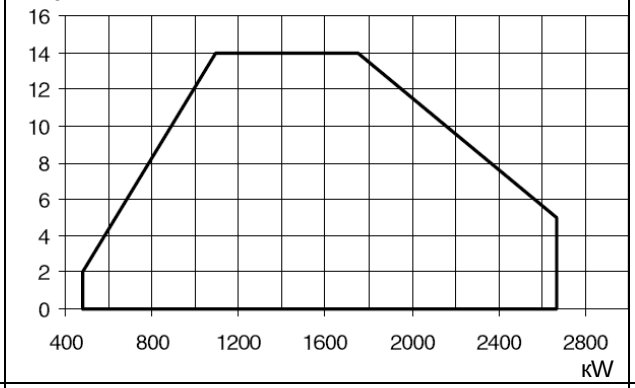
	DN*	A	AA	AD	AN	AP	B	BB	C	CC	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	U	UU	V	W	Y	Z
KR512A	50	1649	144	35	594	100	530	508	1119	598	1713	1071	642	340	380	494	540	492	M14	552	390	390	755	150	605	845	36	216	762	328	270
KR512A	65	1649	144	35	612	118	530	508	1119	598	1693	1051	642	340	380	494	540	492	M14	552	390	390	634	150	485	845	36	292	762	328	270
KR512A	80	1649	144	35	626	132	530	508	1119	598	1726	1084	642	340	380	494	540	492	M14	552	390	390	685	150	535	875	36	322	762	328	270
KR512A	100	1649	144	35	639	145	530	508	1119	598	1809	1167	642	340	380	494	540	492	M14	552	390	390	792	150	642	942	36	382	762	328	270
KR515A	50	1676	144	35	594	100	530	508	1146	598	1713	1071	642	380	420	494	540	492	M14	552	390	390	755	150	605	845	36	216	762	328	270
KR515A	65	1676	144	35	612	118	530	508	1146	598	1693	1051	642	380	420	494	540	492	M14	552	390	390	634	150	485	845	36	292	762	328	270
KR515A	80	1676	144	35	626	132	530	508	1146	598	1726	1084	642	380	420	494	540	492	M14	552	390	390	685	150	535	875	36	322	762	328	270
KR515A	100	1676	144	35	639	145	530	508	1146	598	1809	1167	642	380	420	494	540	492	M14	552	390	390	792	150	642	942	36	382	762	328	270
KR520A	50	1682	144	35	594	100	530	508	1152	598	1713	1071	642	400	440	494	540	492	M14	552	390	390	755	150	605	845	36	216	876	340	270
KR520A	65	1682	144	35	612	118	530	508	1152	598	1693	1051	642	400	440	494	540	492	M14	552	390	390	634	150	485	845	36	292	876	340	270
KR520A	80	1682	144	35	626	132	530	508	1152	598	1726	1084	642	400	440	494	540	492	M14	552	390	390	685	150	535	875	36	322	876	340	270
KR520A	100	1682	144	35	639	145	530	508	1152	598	1809	1167	642	400	440	494	540	492	M14	552	390	390	792	150	642	942	36	382	876	340	270
KR525A	50	1682	144	35	594	100	530	650	1152	598	1713	1071	642	434	484	494	540	492	M14	552	390	390	755	150	605	845	94	216	934	340	270
KR525A	65	1682	144	35	612	118	530	650	1152	598	1693	1051	642	434	484	494	540	492	M14	552	390	390	634	150	485	845	94	292	934	340	270
KR525A	80	1682	144	35	626	132	530	650	1152	598	1726	1084	642	434	484	494	540	492	M14	552	390	390	685	150	535	875	94	322	934	340	270
KR525A	100	1682	144	35	639	145	530	650	1152	598	1809	1167	642	434	484	494	540	492	M14	552	390	390	792	150	642	942	94	382	934	340	270

*DN = gas valves size
NOTE: the overall dimensions are referred to burners provided with Siemens VGD valves. Burners with separate heating/pumping unit provided (KR512A excepted).

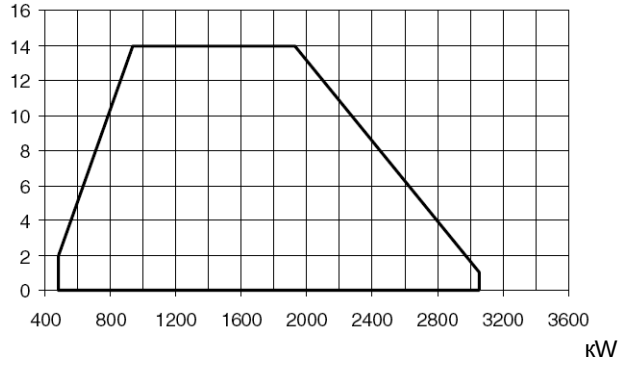
Performance curves

BACK PRESSURE IN COMBUSTION CHAMBER mbar

KP91A



KP92A



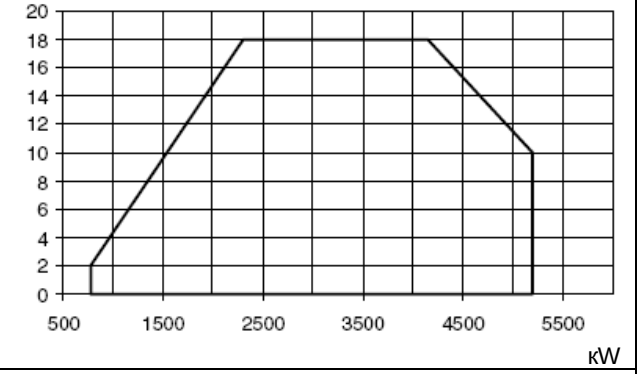
BACK PRESSURE IN COMBUSTION CHAMBER mbar

KP93A

BACK PRESSURE IN COMBUSTION CHAMBER mbar

KR512A

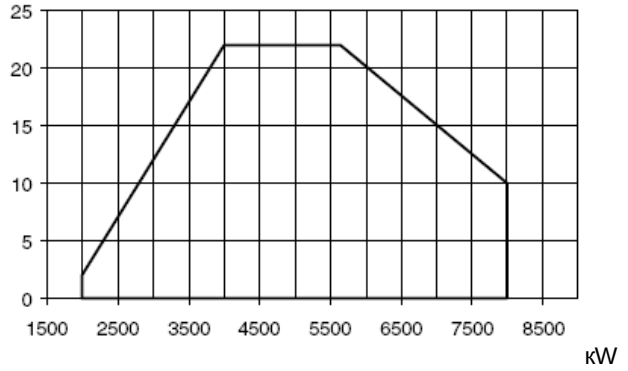
KR515A



BACK PRESSURE IN COMBUSTION CHAMBER mbar

KR520A

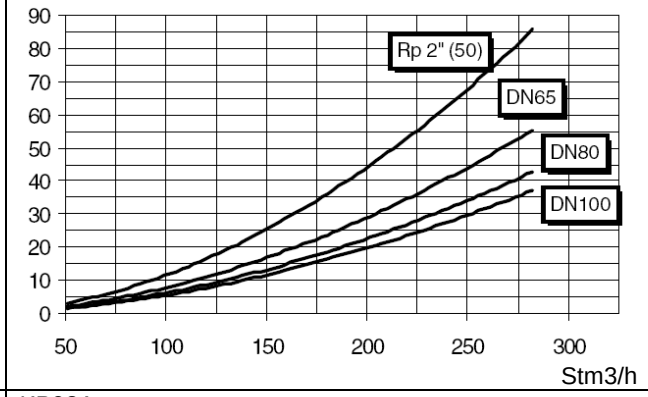
KR525A



To get the input in kcal/h, multiply value in kW by 860.
Data are referred to the following conditions: 1013mbar atmospheric pressure, 15°C ambient temperature**.**
NOTE: The performance curve is a diagram that represents the burner performance in the type approval phase or in the laboratory tests, but does not represent the regulation range of the machine. On this diagram the maximum output point is usually reached by adjsuting the combustion head to its “MAX” position (see paragraph “Adjusting the combustion head”); the minimum output point is reached setting the combustion head to its “MIN” position. During the first ignition, the combustion head is set in order to find a compromise between the burner output and the generator specifications, that is why the minimum output may be different from the Performance curve minimum.

Pressure/rate in the network curves

KP91A



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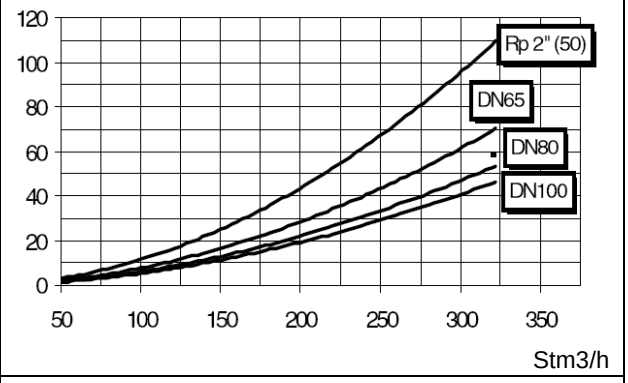

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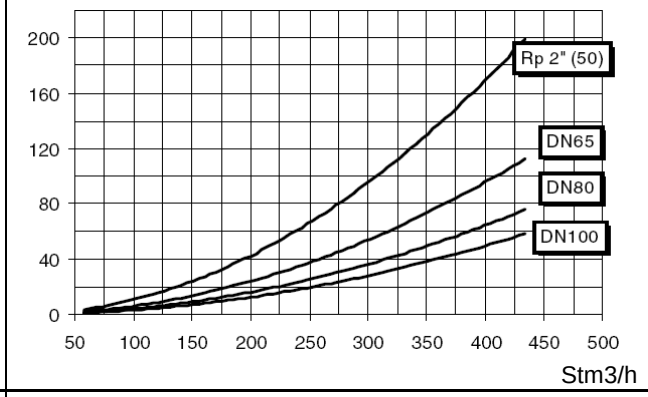
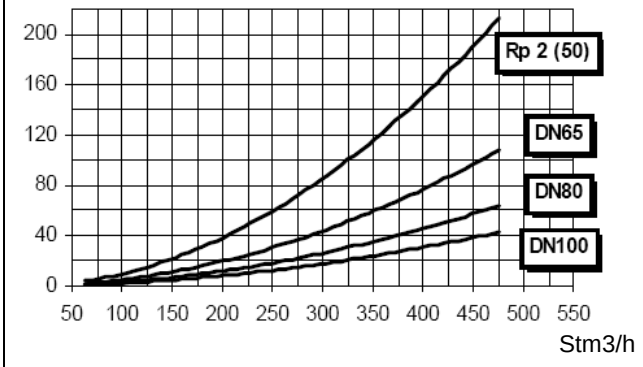
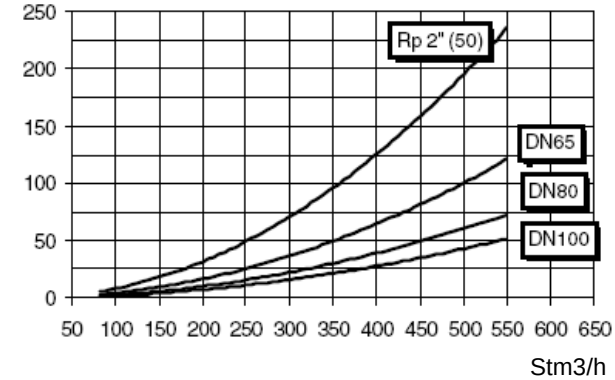


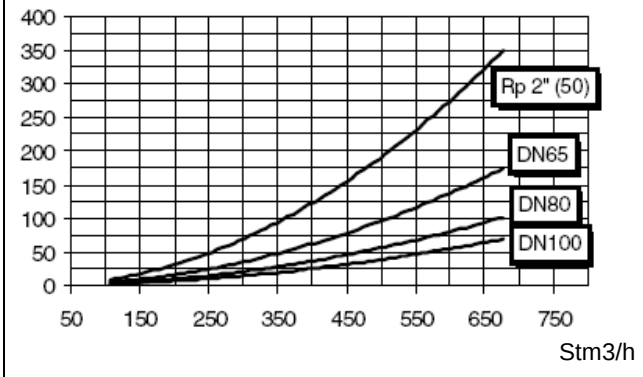
KR512A



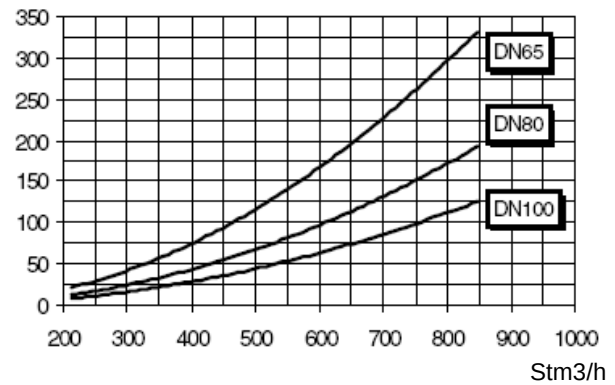
KR515A



KR520A



KR525A

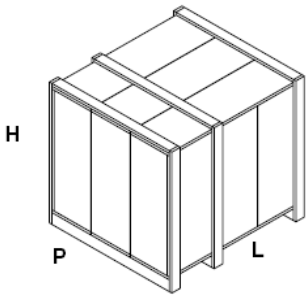


⚠	**Caution**: the gas rate value is quoted on the x-axis, the related network pressure is quoted on the y-axis (pressure value in the combustion chamber is not included). To know the minimum pressure at the gas train inlet, necessary to get the requested gas rate, add the pressure value in the combustion chamber to the value read on the y-axis.

MOUNTING AND CONNECTING THE BURNER

Packing

The burners are despatched wooden cages whose dimensions are:
Series 9xx: 1730mm x 1280mm x 1020mm (L x P x H)
Series 5xx: 1730mm x 1430mm x 1130mm (L x P x H)



The following are placed in each packing case.

- Burner with detached gas train;
- Gasket to be inserted between boiler and burner
- Envelope containing documents.

Oil heating/pumping unit (when separate): 1170mm x 470mm x 1510mm (L x P x H)

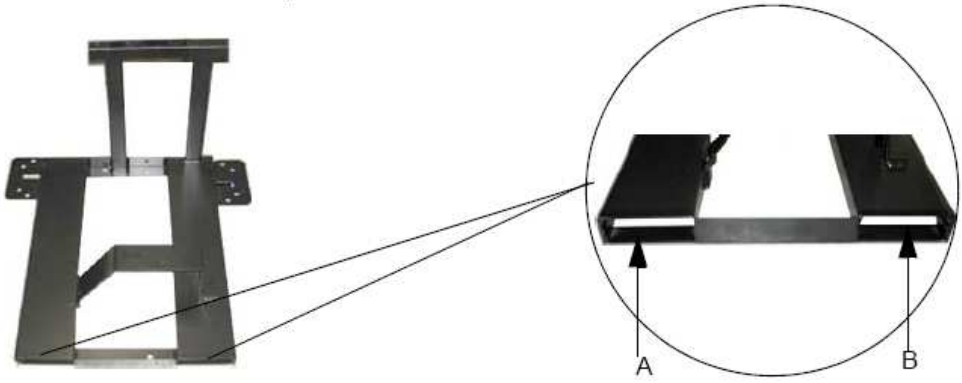
Packing cases of this kind are affected by humidity and are not suitable for stacking.

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

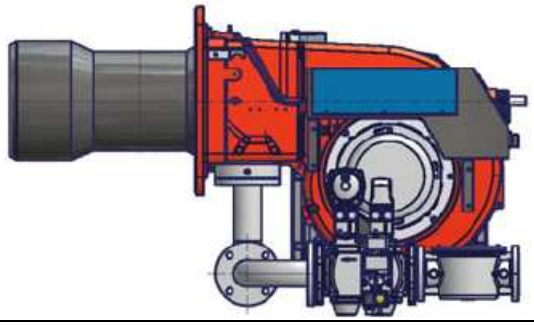
Handling the burner

⚠	ATTENTION! The lhandling operations must be carried out by specialised and trained personnel. If these operations are not carried out correctly, the residual risk for the burner to overturn and fall down still persists.
	To move the burner, use means suitable to support its weight (see paragraph "Technical specifications"). The unpacked burner must be lifted and moved only by means of a fork lift truck.

The burner is mounted on a stirrup provided for handling the burner by means of a fork lift truck: the forks must be inserted into the A anb B ways. Remove the stirrup only once the burner is installed to the boiler.



The burner is designed to work positioned according to the picture below. For different installations, please contact the Technical Department.



Fitting the burner to the boiler

To install the burner into the boiler, proceed as follows:

1 make a hole on the closing door of the combustion chamber as described on paragraph “Overall dimensions”)

2 place the burner to the boiler: lift it up and handle it according to the procedure described on paragraph “Handling the burner”;

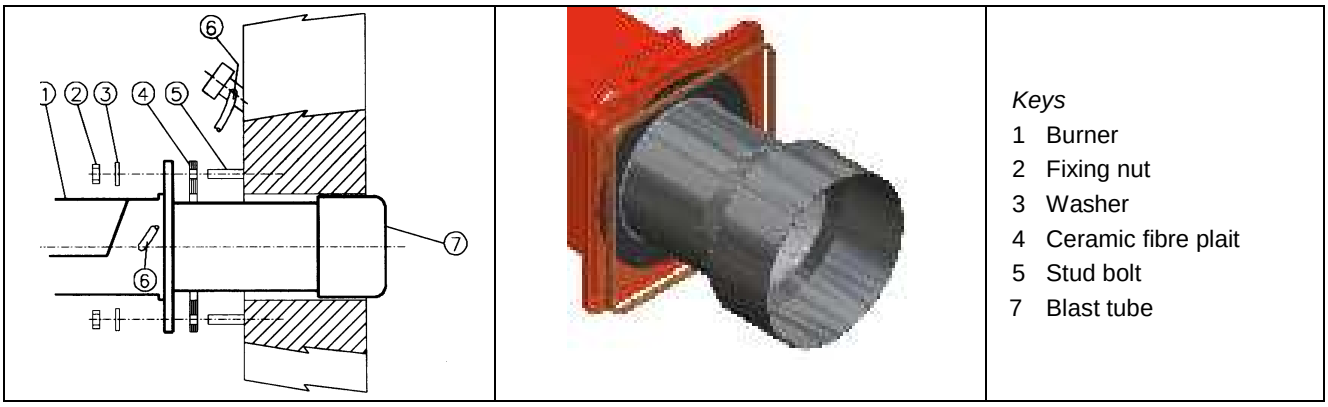
3 place the 4 stud bolts (5), according to the burner’s drilling plate described on paragraph “Overall dimensions”;

4 place the ceramic fibre plait on the burner flange;

5 install the burner into the boiler;

6 fix the burner to the stud bolts, by means of the fixing nuts, according to the next picture.

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



Keys

1 Burner
2 Fixing nut
3 Washer
4 Ceramic fibre plait
5 Stud bolt
7 Blast tube

Matching the burner to the boiler

The burners described in this manual have been tested with combustion chambers that comply with EN676/EN267 regulation and whose dimensions are described in the diagram . 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 lenght 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 for a value between 0 and 100 mm into the combustion chamber.
- 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.

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 or to design a blast tube tha suites the utilisation (please, contact the manifacturer).

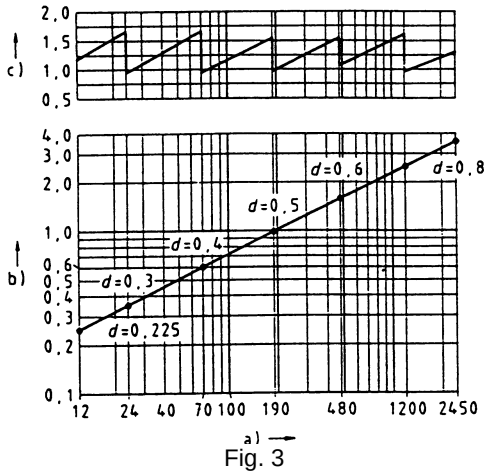


Fig. 3

Keys

a) Heat output in kW

b) Length of the flame tube in meters

c) Flame tube firing intensity in MW/m3

d) Combustion chamber diameter (m)

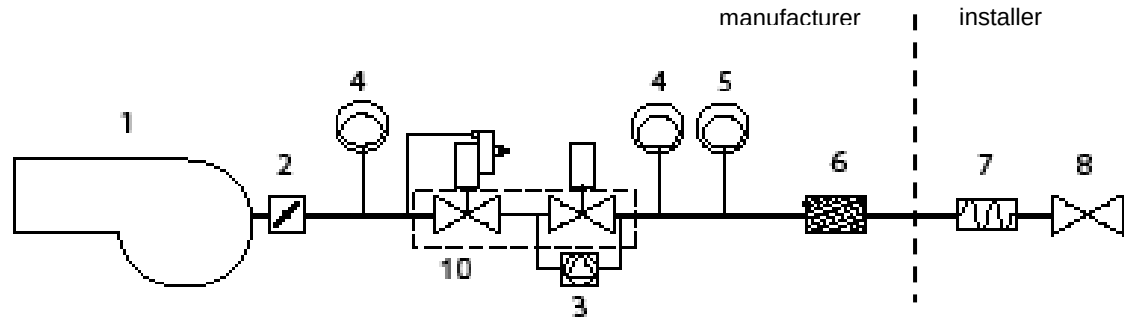
Fig.3: Firing intensity, diameter and lenght of the test flame tube as a function of the heat input in kW

Gas train connections

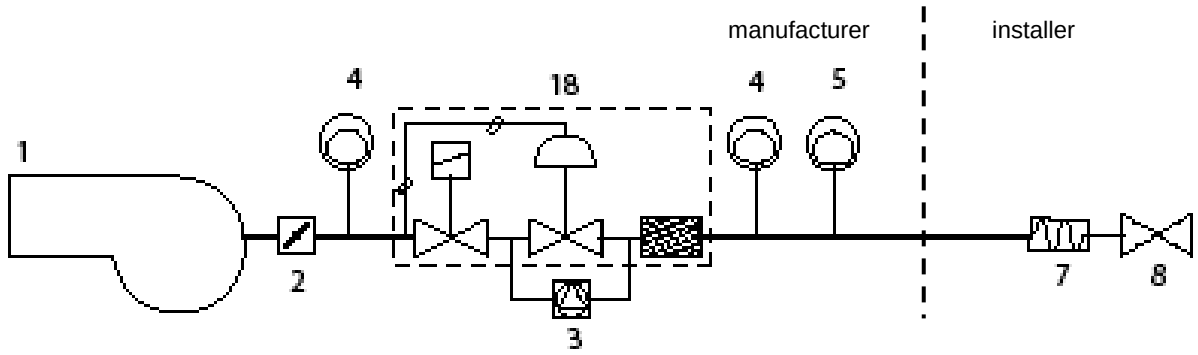
The diagrams show the components of the gas train included in the delivery and which must be fitted by the installer.The diagrams are in compliance with the current laws.

⚠	ATTENTION: BEFORE EXECUTING THE CONNECTIONS TO THE GAS PIPE NETWORK, BE SURE THAT THE MANUAL CUTOFF VALVES ARE CLOSED. READ CAREFULLY THE "WARNINGS" CHAPTER AT THE BEGINNING OF THIS MANUAL.

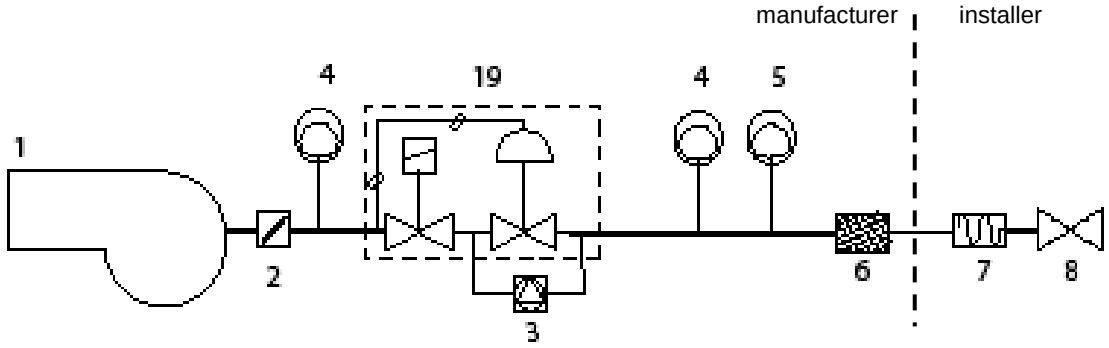
Gas train with valves group VGD 20/40.. with built-in gas pressure governor + VPS504 gas proving system



Gas train with valves group MBC 1200SE (2 valves + gas filter + pressure governor) + VPS504 gas proving system



Gas train with valves group MBC 1900/3100/5000SE (2 valves + gas filter) + pressure governor + VPS504 gas proving system

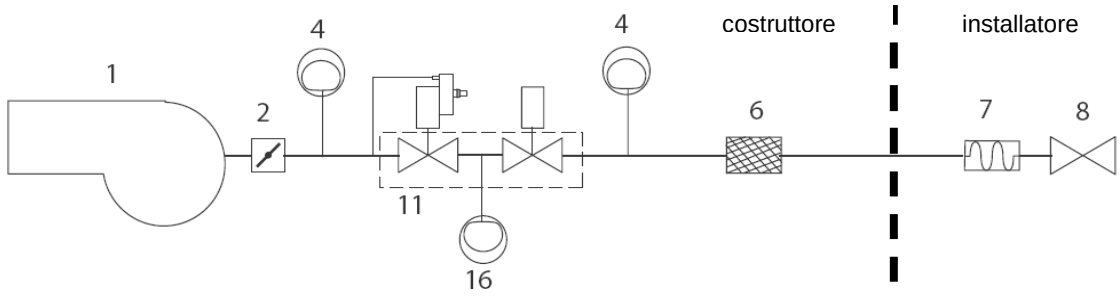


Keys

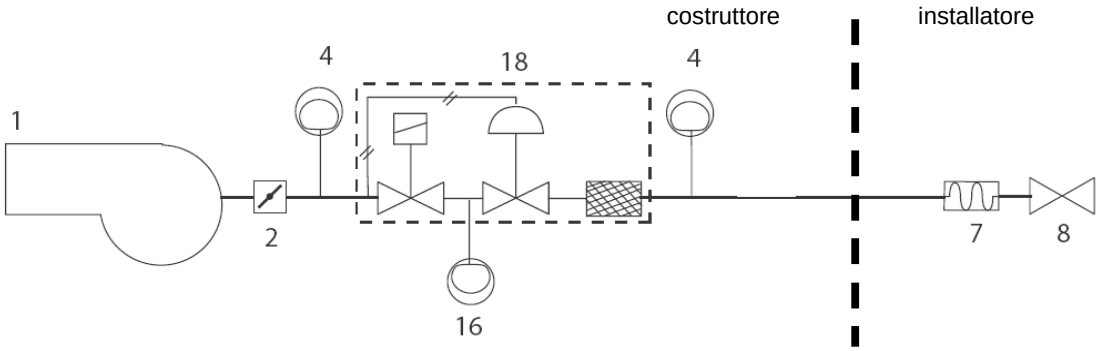
1. Burner
2. Butterfly valve
3. Gas proving system
4. Maximum gas pressure switch (optional*)
5. Minimum gas pressure switch
6. Gas filter
7. Bellows unit
8. Manual cutoff valve
10. VGD Valves group
18. MBC Valves group (2" with filter provided)
19. MBC Valves group (DN65/80/100)

*** Note:** the maximum gas pressure switch can be mounted either upstream or downstream the gas valve but upstream the butterfly gas valve (see item no.4 in the scheme above).

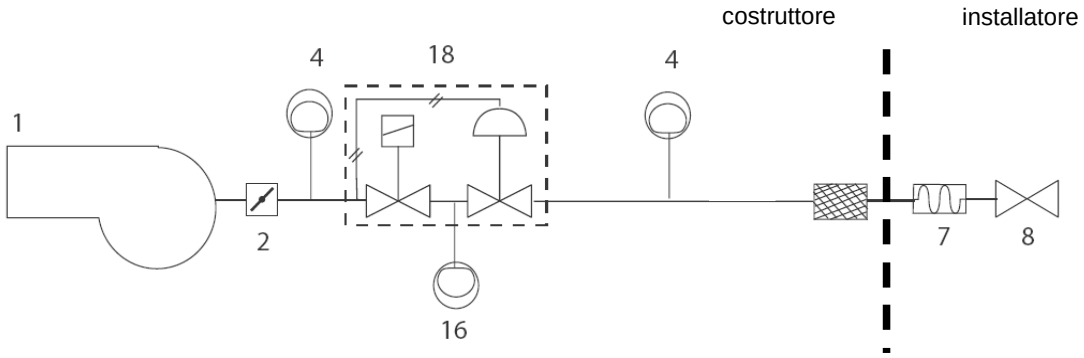
Gas train with valves group VGD 20/40.. with built-in gas pressure governor + PGCP gas proving system pressure switch



Gas train with valves group MBC SE1200 (2 valves + gas filter + press. governor) + PGCP gas proving system pressure switch



Gas train with valves group MBC SE1900/3100/5000 (2 valves + gas filter)+ press. governor + PGCP gas proving system pressure switch



Keys

1. Burner
2. Butterfly valve
3. Gas proving system
4. Maximum gas pressure switch (optional*)
5. Minimum gas pressure switch
6. Gas filter
7. Bellows unit
8. Manual cutoff valve
10. VGD Valves group
16. Gas proving system pressure switch (PGCP)
18. MBC Valves group (2" with filter provided)
19. MBC Valves group (DN65/80/100)

*** Note:** the maximum gas pressure switch can be mounted either upstream or downstream the gas valve but upstream the butterfly gas valve (see item no.4 in the scheme above).

Assembling the gas train

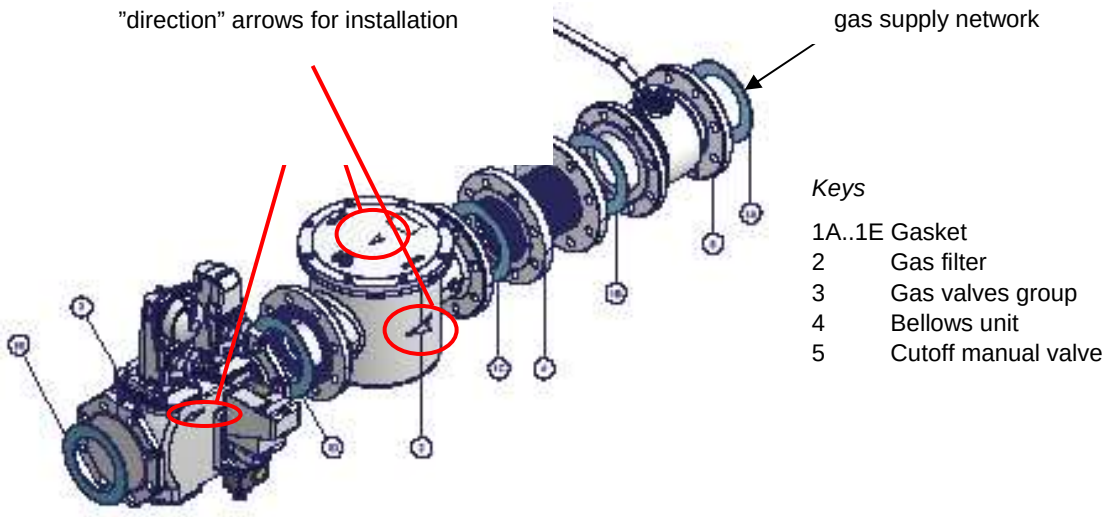


Fig. 4 - Example for gas train

To mount the gas train, proceed as follows:

1-a) in case of threaded joints: use proper seals according to the gas used;

1-b) in case of flanged joints: place a gasket (no. 1A..1E - Fig. 5) between the elements.

2) fix the components by means of screw, following the schemes and the mounting directionfor all the item.

NOTE: the bellows unit, the manual valve and the gaskets are not part of the standard supply.

⚠	ATTENTION: once the gas train is mounted according to the diagram on Fig. 4, the gas proving test mus be performed, according to the procedure set by the laws in force

The procedures of installation fo the gas valves are shown in the next paragraphs, according to the gas train used:

- threaded gas trains with Multibloc Dungs MBC..SE 1200 or Siemens VGD20..
- flanged gas trains with Multibloc Dungs MBC..SE 1900-3100-5000 or Siemens VGD40..

⚠	ATTENTION: it is recommended to mount filter and gas valves to avoid that extraneous material drops inside the valves, during maintenance and cleaning operation of the filters (both the filters outside the valves group and the ones built-in the gas valves).

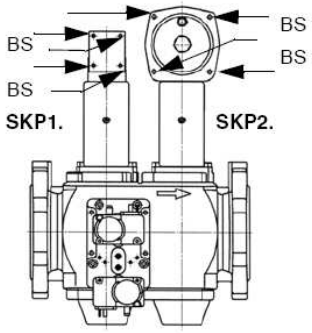
Siemens VGD20.. and VGD40.. gas valves - with SKP2.. (pressure governor)

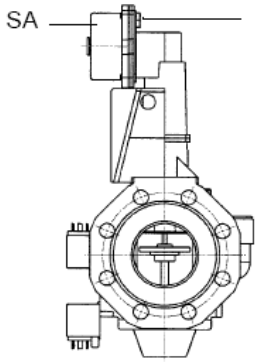
Mounting

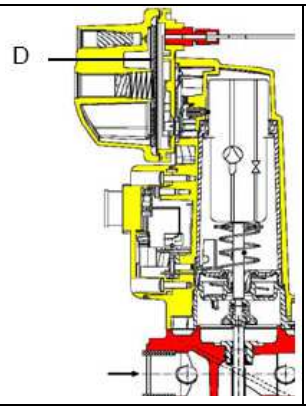
- When mounting the VGD.. double gas valve, two flanges are required (as for VGD20.. model, the flanges are threaded);
- to prevent cuttings from falling inside the valve, first fit the flanges to the piping and then clean the associated parts;
- install the valve;
- the direction of gas flow must be in accordance with the direction of the arrow on the valve body;
- ensure that the bolts on the flanges are properly tightened;
- ensure that the connections with all components are tight;
- make certain that the O-rings and gaskets between the flanges and the double gas valve are fitted.
- Connect the reference gas pipe (TP in figure; 8mm-external size pipe supplied loose), to the gas pressure nipples placed on the gas pipe, downstream the gas valves: gas pressure must be measured at a distance that must be at least 5 times the pipe size.

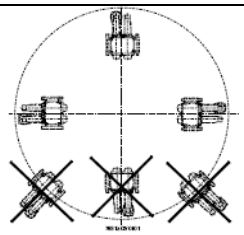
Leave the blowhole free (SA in figure). Should the spring fitted not permit satisfactory regulation, ask one of our service centres for a suitable replacement.

Caution: the SKP2 diaphragm D must be vertical (see next pictures).
WARNING: removing the four screws BS causes the device to be unserviceable!!

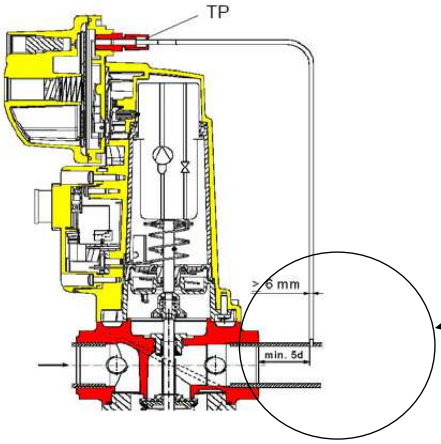


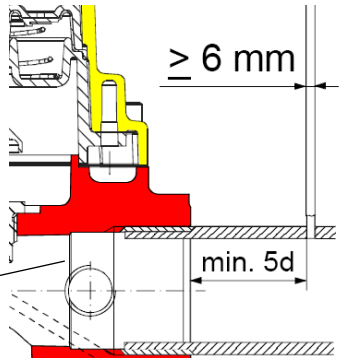






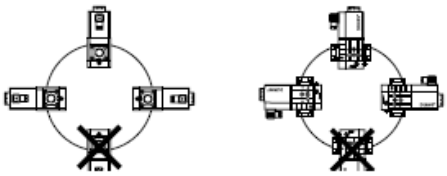
MOUNTING POSITIONS



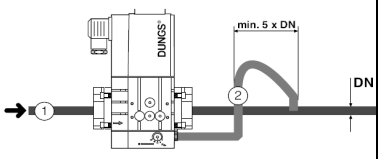


MULTIBLOC DUNGS MBC300-700-1200SE (Threaded valves group)

Mounting
1. Mount flange onto tube lines. Use appropriate sealing agent (see Fig. 5)
2. Insert MBC...SE. Note position of O rings (see Fig. 5).
3. Tighten screws A – H
4. After installation, perform leakage and functional test.
5. Disassembly in reverse order



MOUNTING POSITIONS



OPTION
2 = pulse line

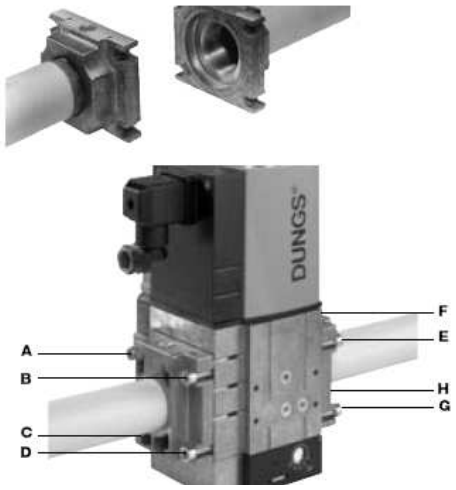


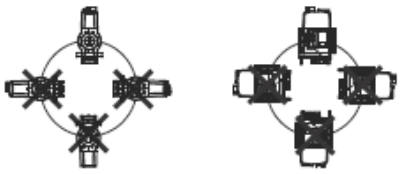
Fig. 5

MULTIBLOC DUNGS MBC1900-3100-5000SE (Flanged valves group)

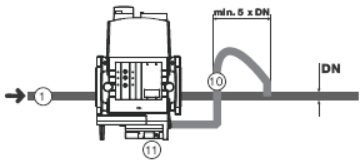
Mounting
1. Insert setscrews A
2. Insert seals
3. Insert setscrews B
4. Tighten setscrews A + B.

Ensure correct seating of the seal!

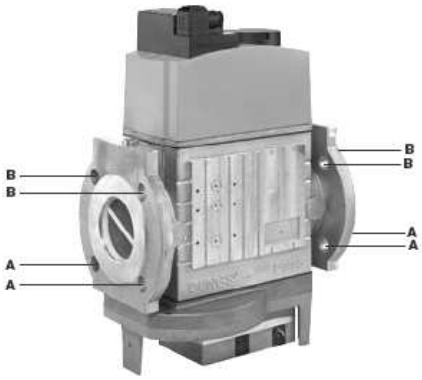
6. After installation, perform leakage and functional test.
7. Disassembly in reverse order.



MOUNTING POSITIONS

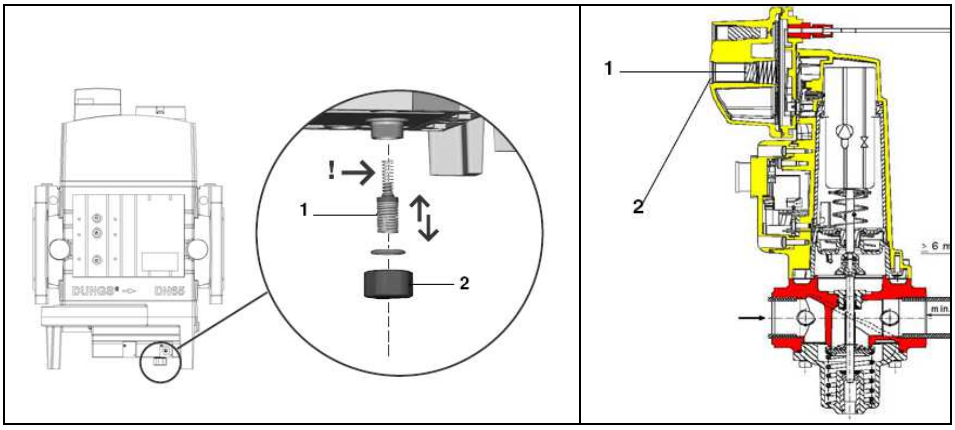


OPTION
10 = pulse line



Pressure adjusting range

The pressure adjusting range, downstream the gas valves group, changes according to the spring provided with the valve group.



Keys
1 spring
2 cup

DUNGS MBC

Performance range (mbar)	4 - 20	20 - 40	40 - 80	80 - 150
Spring colour	-	red	black	green

Siemens VGD with SKP

Performance range (mbar)	0 - 22	15 - 120	100 - 250
Spring colour	neutral	yellow	red

Once the train is installed, electrically connect all its elements: gas valves group, pressure switches, gas proving system.

ATTENTION: once the gas train is mounted according to the diagram on Fig. 4, the gas proving test must be performed, according to the procedure set by the laws in force**.**

Hydraulic circuit

The pumps that are used can be installed both into single-pipe and double-pipe systems.

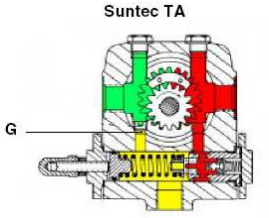
Single-pipe system: a single pipe drives the oil from the tank to the pump's inlet. Then, from the pump, the pressurised oil is driven to the nozzle: a part comes out from the nozzle while the othe part goes back to the pump. In this system, the by-pass plug, if provided, must be removed and the optional return port, on the pump's body, must be sealed by steel plug and washer.

Double-pipe system: as for the single pipe system, a pipe that connects the tank to the pump's inlet is used besides another pipe that connects the pump's return port to the tank, as well. The excess of oil goes back to the tank: this installation can be considered self-bleeding. If provided, the inside by-pass plug must be installed to avoid air and fuel passing through the pump.

Burners come out from the factory provided for double-pipe systems. They can be suited for single-pipe system (recommended in the case of gravity feed) as decribed before.

To change from a 1-pipe system to a 2-pipe-system, insert the by-pass plug G (as for ccw-rotation- referring to the pump shaft).

⚠	Caution: Changing the direction of rotation, all connections on top and side are reversed.



Bleed

Bleeding in two-pipe operation is automatic: it is assured by a bleed flat on the piston. In one-pipe operation, the plug of a pressure gauge port must be loosened until the air is evacuated from the system.

About the use of fuel pumps

Make sure that the by-pass plug is not used in a single pipe installation, because the fuel unit will not function properly and damage to the pump and burner motor could result.

Do not use fuel with additives to avoid the possible formation over time of compounds which may deposit between the gear teeth, thus obstructing them.

After filling the tank, wait before starting the burner. This will give any suspended impurities time to deposit on the bottom of the tank, thus avoiding the possibility that they might be sucked into the pump.

On initial commissioning a "dry" operation is foreseen for a considerable length of time (for example, when there is a long suction line to bleed). To avoid damages inject some lubrication oil into the vacuum inlet.

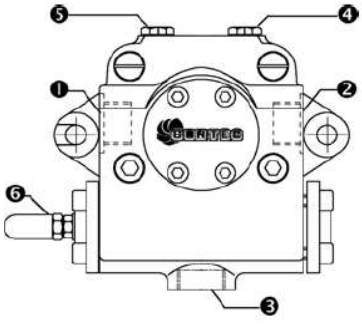
Care must be taken when installing the pump not to force the pump shaft along its axis or laterally to avoid excessive wear on the joint, noise and overloading the gears.

Pipes should not contain air pockets. Rapid attachment joint should therefore be avoided and threaded or mechanical seal junctions preferred. Junction threads, elbow joints and couplings should be sealed with removable sg component. The number of junctions should be kept to a minimum as they are a possible source of leakage.

Do not use PTFE tape on the suction and return line pipes to avoid the possibility that particles enter circulation. These could deposit on the pump filter or the nozzle, reducing efficiency. Always use O-Rings or mechanical seal (copper or aluminium gaskets) junctions if possible.

An external filter should always be installed in the suction line upstream of the fuel unit.

Pumps

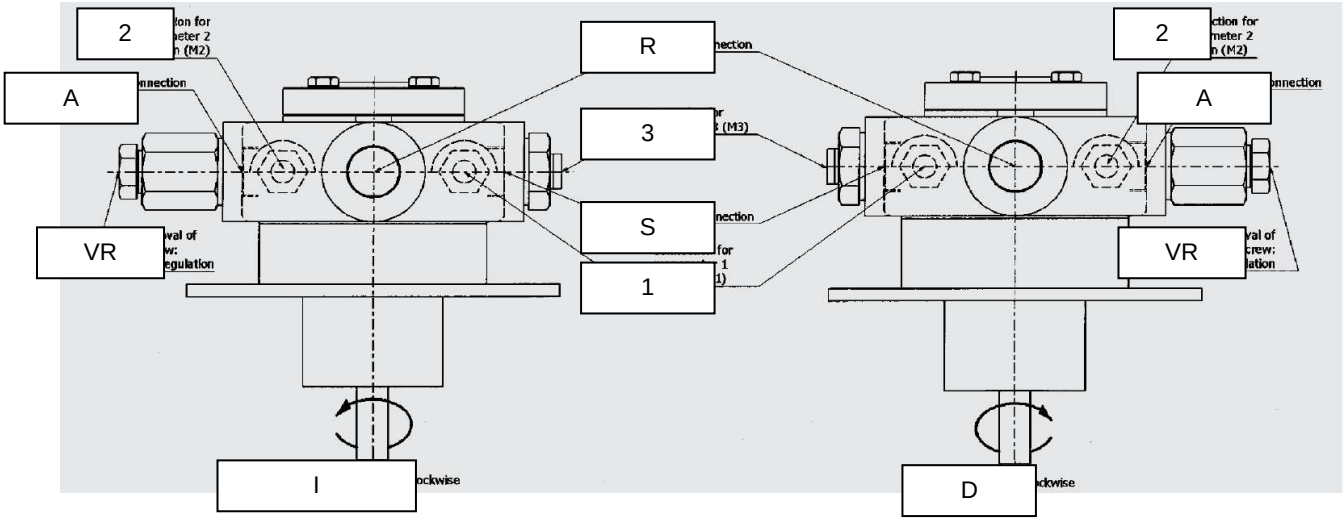
Suntec TA..		
Viscosity	3 - 75 cSt	
Oil temperature	0 - 150 °C	
Min. suction pressure	- 0.45 bar to avoid gasing	
Max. suction pressure	5 bar	
Max. return pressure	5 bar	
Rotation speed	3600 rpm max	

Keys

1 Inlet G1/2
2 To the nozzle G1/2

3 Return G1/2
4 Pressure gauge port G1/4
5 Vacuum gauge port G1/4
6 Pressure governor

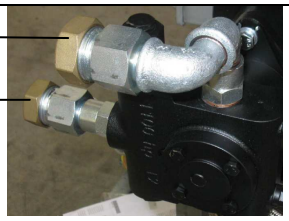
HP Technik UHE-A..	
Viscosity	3 - 75 cSt
Oil temperature	0 - 150 °C
Min. suction pressure	- 0.45 bar to avoid gassing
Max. suction pressure	5 bar
Maximum return pressure	5 bar
Speed	3600 rpm max



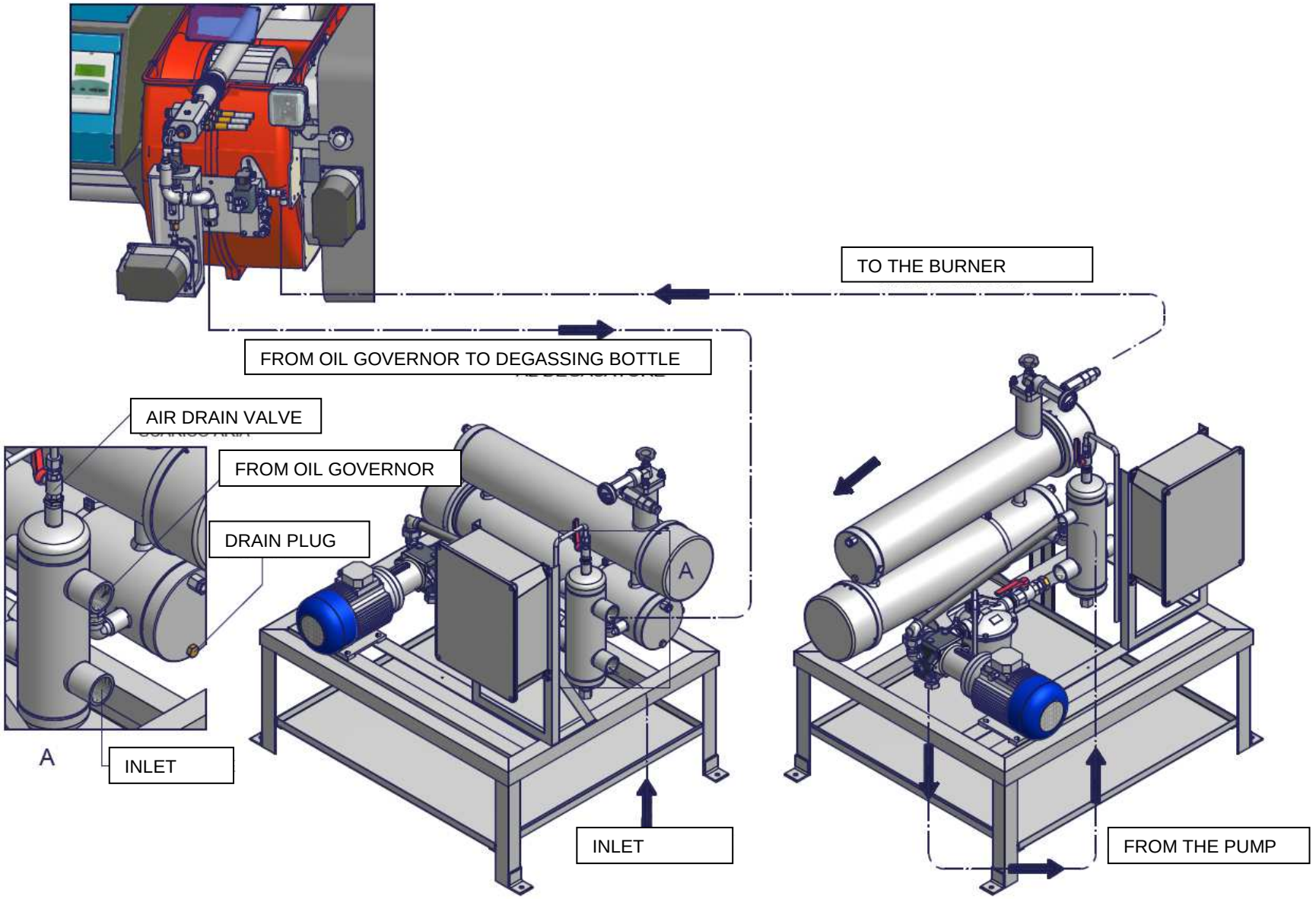
1.Connection for manometer 1 – delivery (M1) – G1/4
2.Connection for manometer 2 – suction (M2) – G1/4
3.Connection for manometer 3 (M3)
A. Suction connection– G1/2
D. Direct - clockwise
I. Indirect – counter clockwise
R. By-pass connection– G1/2
S. Delivery connection – G1/2
VR. After removal of cover screw: pressure regulation

Assembling the light oil flexible hoses

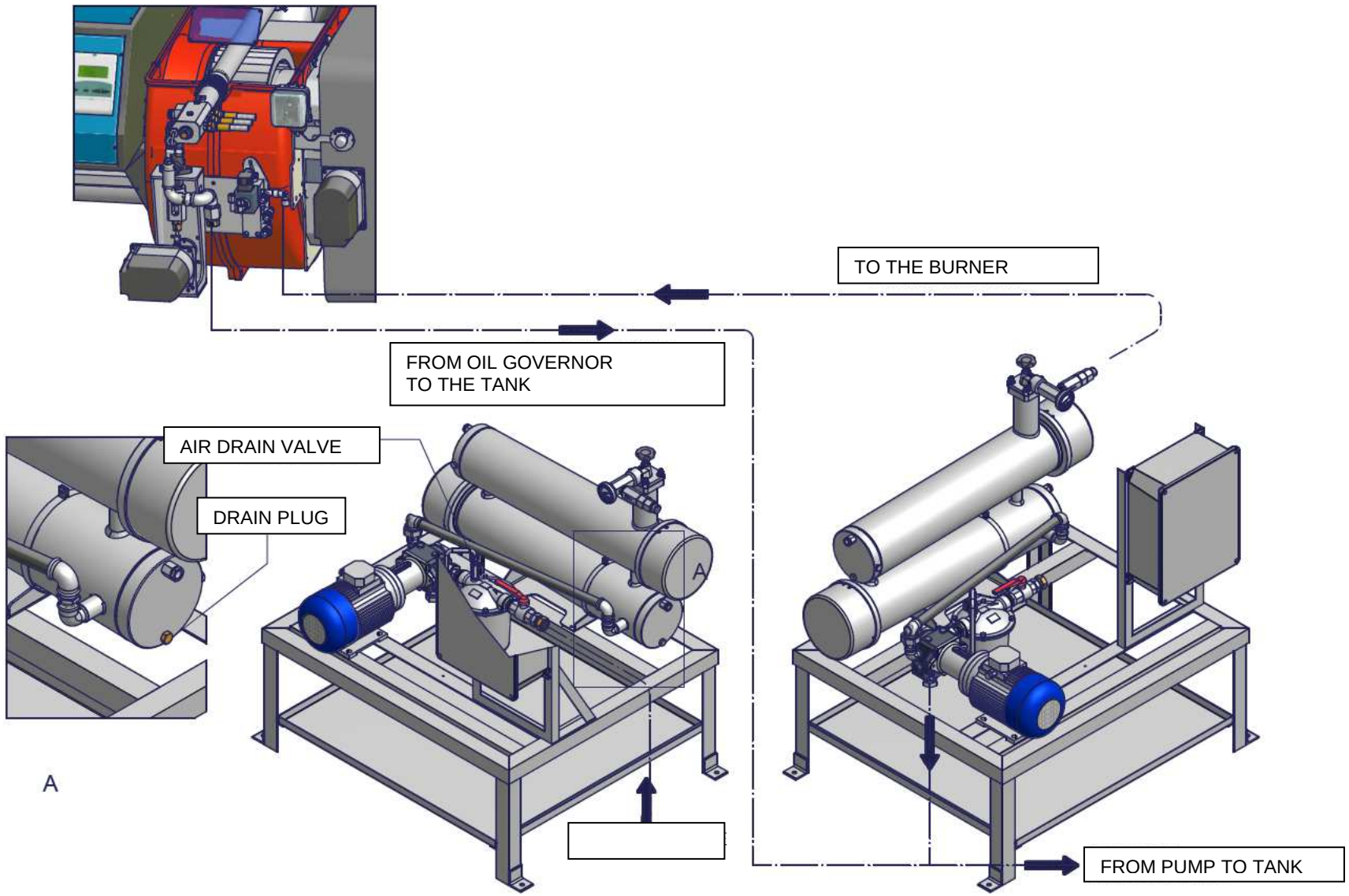
To connect the flexible light oil hoses to the pump, proceed as follows, according to the pump provided:
1. remove the closing nuts A and R on the inlet and return connections;
2. screw the rotating nut of the two flexible hoses on the pump being careful to avoid exchanging the inlet and return lines: see the arrows marked on the pump that show the inlet and the return (see prevoius paragraph).

Suntec TA	HP Technik UHE
	

Connecting the burner to the oil pumping unit
PLANT WITH DEGASSING BOTTLE

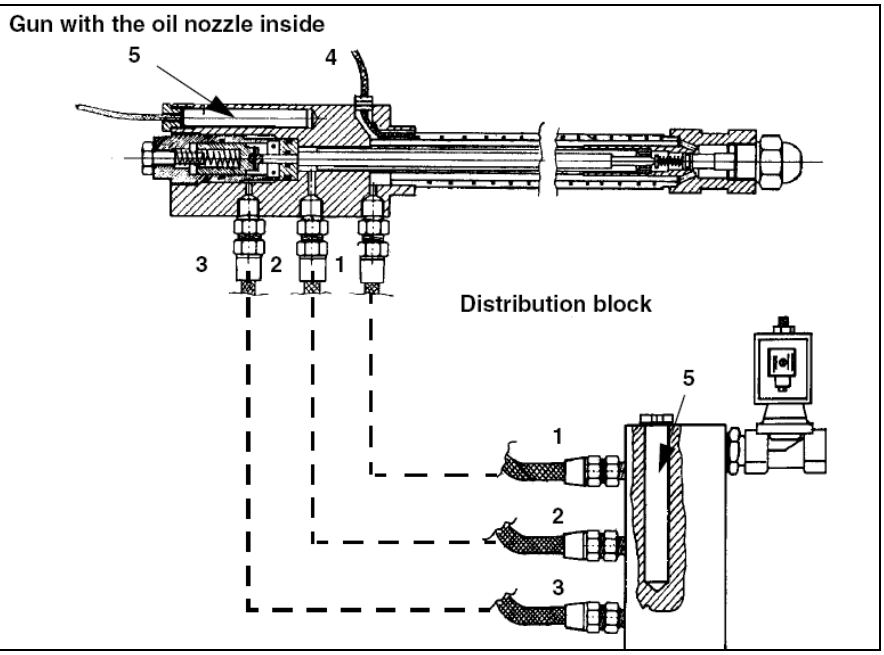


PLANT WITHOUT DEGASSING BOTTLE



Connections to the gun

1 Inlet
2 Return
3 Gun opening
4 Heating wire (only for high density oil burners)
5 Cartdrige-type heater (only for Ecoden or heavy oil burners)



Recommendations to design heavy oil feeding plants

This paragraph is intended to give some suggestions to make feeding plants for heavy oil burners. To get a regular burner operation, it is very important to design the supplying system properly. Here some suggestions will be mentioned to give a brief description.

The term “heavy oil” is generic and summarises several chemical-physical properties, above all viscosity. The excessive viscosity makes the oil impossible to be pumped, so it must be heated to let it flow in the pipeline; because of the low-boiling hydrocarbons and dissolved gases, the oil must be also pressurised. The pressurisation is also necessary to feed the burner pump avoiding its cavitation because of the high suction at the inlet. The supplying system scope is to pump and heat oil.

The oil viscosity is referred in various unit measures; the most common are: °E, cSt, Saybolt and Redwood scales. Table 3 shows the various unit convertions (e.g.: 132 cSt viscosity corresponds to 17.5°E viscosity).

The diagram in Fig. 6 shows how the heavy oil viscosity changes according to its temperature.

Example: an oil with 22°E viscosity at 50°C once heated to 100°C gets a 3 °E viscosity.

As far as the pumping capability, it depends on the type of the pump that pushes the oil even if on diagram in a generic limit is quoted at about 100 °E, so it is recommended to refer to the specifications of the pump provided.

Usually the oil minimum temperature at the oil pump inlet increases as viscosity does, in order to make the oil easy to pump. Referring to the diagram on Fig. 7, it is possible to realise that to pump an oil with 50°E viscosity at 50°C, it must be heated at about 80°C.

Pipe heating system

Pipe heating system must be provided, that is a system to heat pipes and plant components to mantain the viscosity in the pumping limits. Higher the oil viscosity and lower the ambient temperature, more necessary the pipe heating system.

Inlet minimum pressure of the pump (both for supplying system and burner)

A very low pressure leads to cavitation (signalled by its peculiar noise): the pump manifacturer declares the minimum value. Therefore, check the pump technical sheets. By increasing the oil temperature, also the minimum inlet pressure at the pump must increase, to avoid the gassification of the oil low-boiling products and the cavitation. The cavitation compromises the burner operation, it causes the pump to break too. The diagram on Fig. 8 roughly shows the inlet pump pressure according to the oil temperature.

Pump operating maximum pressure (both for the supplying system and burner)

Remember that pumps and all the system components through which the oil circulates, feature an upper limit. Always read the technical documentation for each component. Schemes on Fig. 10 and Fig. 11 are taken from UNI 9248 "liquid fuel feeding lines from tank to burner" standard and show how a feeding line should be designed. For other countries, see related laws in force. The pipe dimensioning, the execution and the winding dimensioning and other construcitve details must be provided by the installer.

Adjusting the supplying oil ring

According to the heavy oil viscosity used, in the table below indicative temperature and pressure values to be set are shown.

Note: the temperature and pressure range allowed by the supplying ring components must be checked in the specifications table of the components themselves.

HEAVY OIL VISCOSITY AT 50 °C		PIPELINE PRESSURE	PIPELINE TEMPERATURE
cSt (°E)		bar	°C
	< 50 (7)	1 - 2	20
> 50 (7)	< 110 (15)	1 - 2	50
> 110 (15)	< 400 (50)	1 - 2	65

Tab. 1

Burner adjustments

The table below shows indicative values of temperature and pressure to be set on the burner devices, according to the viscosity of the heavy oil used. The oil temperature should be set on TR resistor thermostat (“Oil” on electronic thermostat) in order to get about 1.5°E viscosity at the nozzle.

VISCOSITY AT 50 °C		NOZZLE PRESSURE MEASURED IN THE GUN	RETURN NOZZLE PRESSURE)		TEMPERATURE FOR RESISTOR THERMOSTAT TR		TEMPERATURE FOR SAFETY RESISTOR THERMOSTAT TRSS	TEMPERATURE FOR THERMOSTAT TCN	TEMPERATURE FOR THERMOSTAT TCI
		.	MIN.	MAX.	MIN.	MAX.			
cSt (°E)		bar	bar		°C		°C		°C
	< 50 (7)	25	7-9	19-20	100	120	190-200	80	100
> 50 (7)	< 110 (15)	25	7-9	19-20	120	130	190-200	100	110
> 110 (15)	< 400 (50)	25	7-9	19-20	130	140	190-200	110	120
89 (12)		25	7-9	19-20	60	70	190-200	40	50

Tab. 2

Viscosity units conversion table

Cinematics viscosity Centistokes (cSt)	Engler degrees (°E)	Saybolt Seconds Universal (SSU)	Saybolt Seconds Furol (SSF)	Redwood n.1 Seconds (Standard)	Saybolt n. 2 Seconds (Admiralty)
1	1	31	--	29	--
2.56	1.16	35	--	32.1	--
4.3	1.31	40	--	36.2	5.1
7.4	1.58	50	--	44.3	5.83
10.3	1.88	60	--	52.3	6.77
13.1	2.17	70	12.95	60.9	7.6
15.7	2.45	80	13.7	69.2	8.44
18.2	2.73	90	14.44	77.6	9.3
20.6	3.02	100	15.24	85.6	10.12
32.1	4.48	150	19.3	128	14.48
43.2	5.92	200	23.5	170	18.9
54	7.35	250	28	212	23.45
65	8.79	300	32.5	254	28
87.6	11.7	400	41.9	338	37.1
110	14.6	500	51.6	423	46.2
132	17.5	600	61.4	508	55.4
154	20.45	700	71.1	592	64.6
176	23.35	800	81	677	73.8
198	26.3	900	91	762	83
220	29.2	1000	100.7	896	92.1
330	43.8	1500	150	1270	138.2
440	58.4	2000	200	1690	184.2
550	73	2500	250	2120	230
660	87.6	3000	300	2540	276
880	117	4000	400	3380	368
1100	146	5000	500	4230	461
1320	175	6000	600	5080	553
1540	204.5	7000	700	5920	645
1760	233.5	8000	800	6770	737
1980	263	9000	900	7620	829
2200	292	10000	1000	8460	921
3300	438	15000	1500	13700	--
4400	584	20000	2000	18400	--

Tab. 3

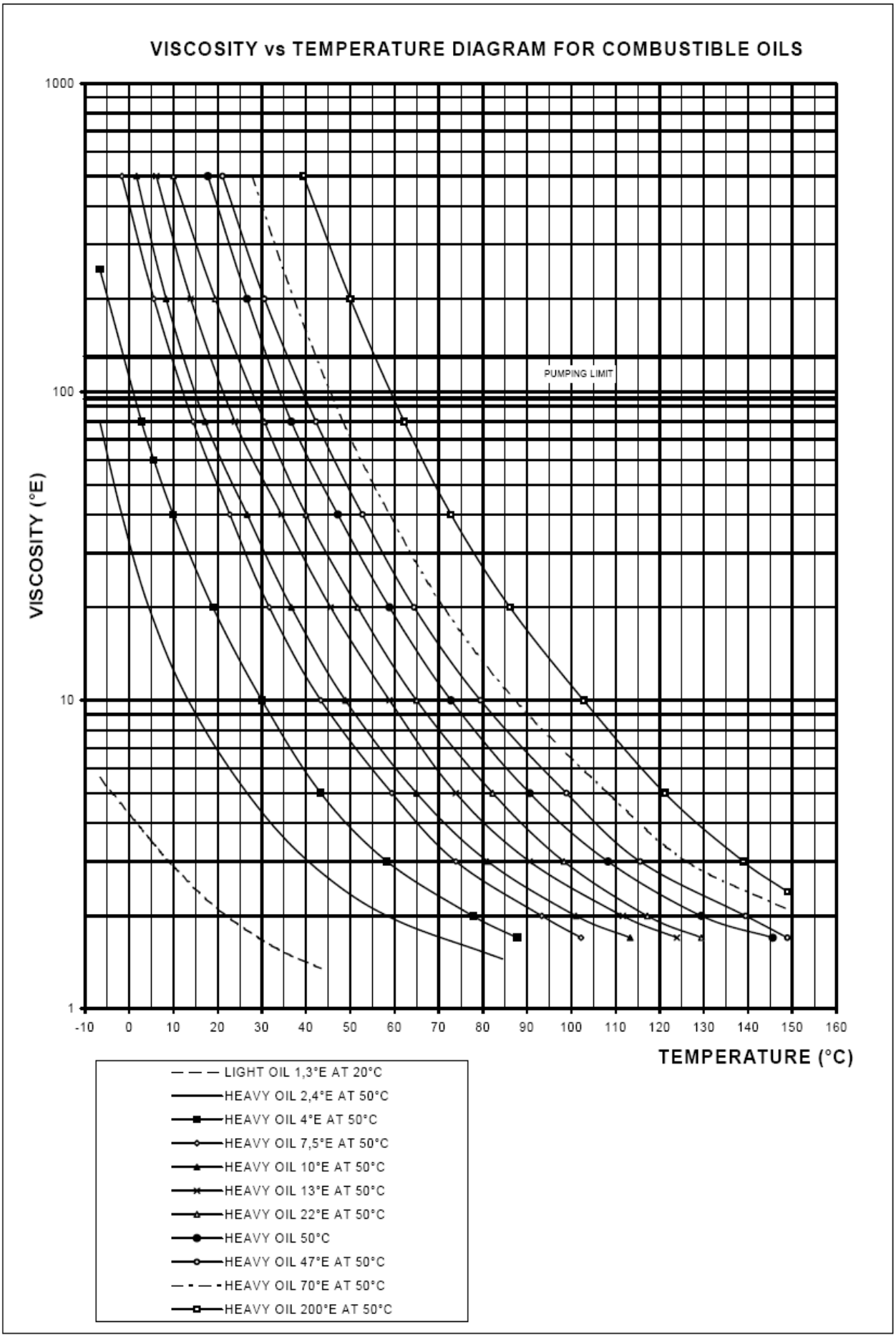

VISCOSITY vs TEMPERATURE DIAGRAM FOR COMBUSTIBLE OILS
1000
100
10
1
VISCOSITY (°E)
PUMPING LIMIT
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
TEMPERATURE (°C)
LIGHT OIL 1,3°E AT 20°C
HEAVY OIL 2,4°E AT 50°C
HEAVY OIL 4°E AT 50°C
HEAVY OIL 7,5°E AT 50°C
HEAVY OIL 10°E AT 50°C
HEAVY OIL 13°E AT 50°C
HEAVY OIL 22°E AT 50°C
HEAVY OIL 50°C
HEAVY OIL 47°E AT 50°C
HEAVY OIL 70°E AT 50°C
HEAVY OIL 200°E AT 50°C

Fig. 6

Indicative diagram showing the oil temperature at burner pump inlet vs. oil viscosity
Example: if the oil has a 50°E @ 50°C viscosity, the oil temperature at the pump inlet should be 80°C (see diagram).

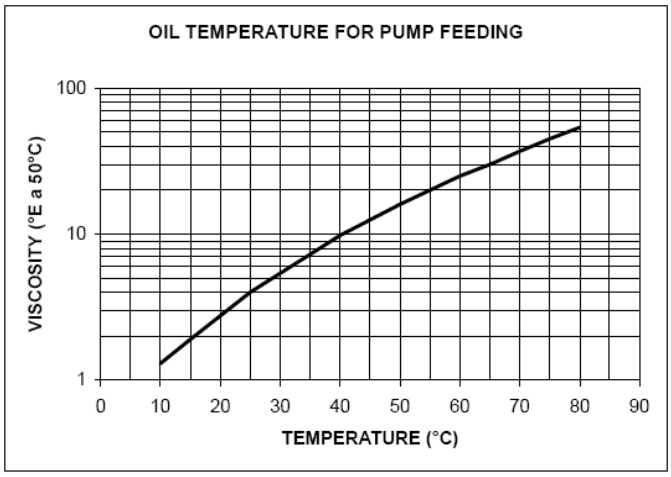


Fig. 7

Indicative diagram showing the oil pressure according to its temperature.

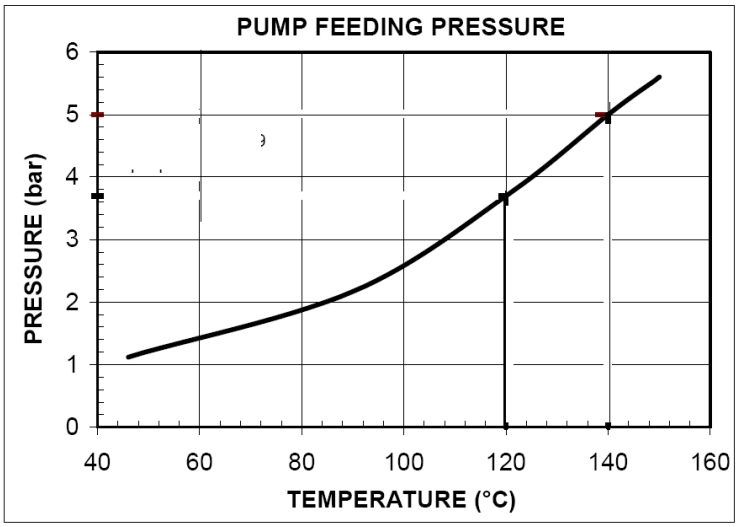


Fig. 8

.Indicative diagram showing the oil atomising temperature according to its viscosity
Example: if the oil has a 50°E @ 50°C viscosity, the oil atomising temperature should be between 145°C and 160°C (see diagram).

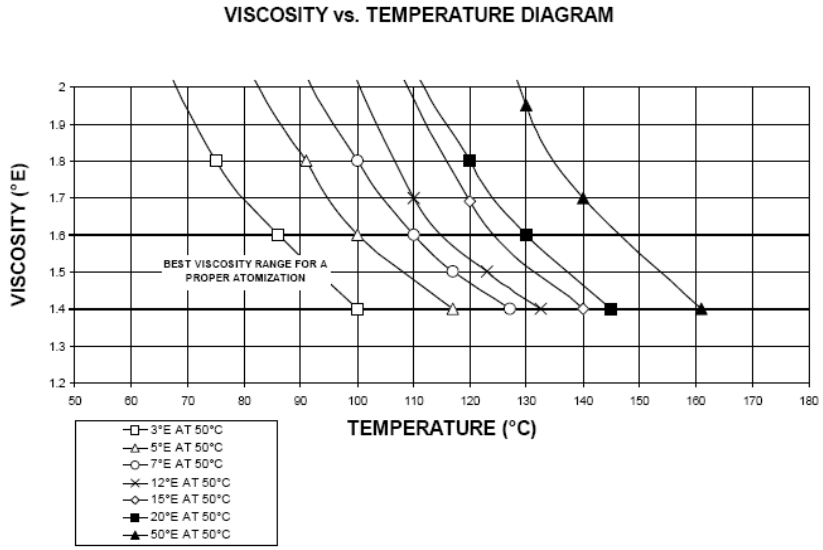


Fig. 9

Hydraulic schemes

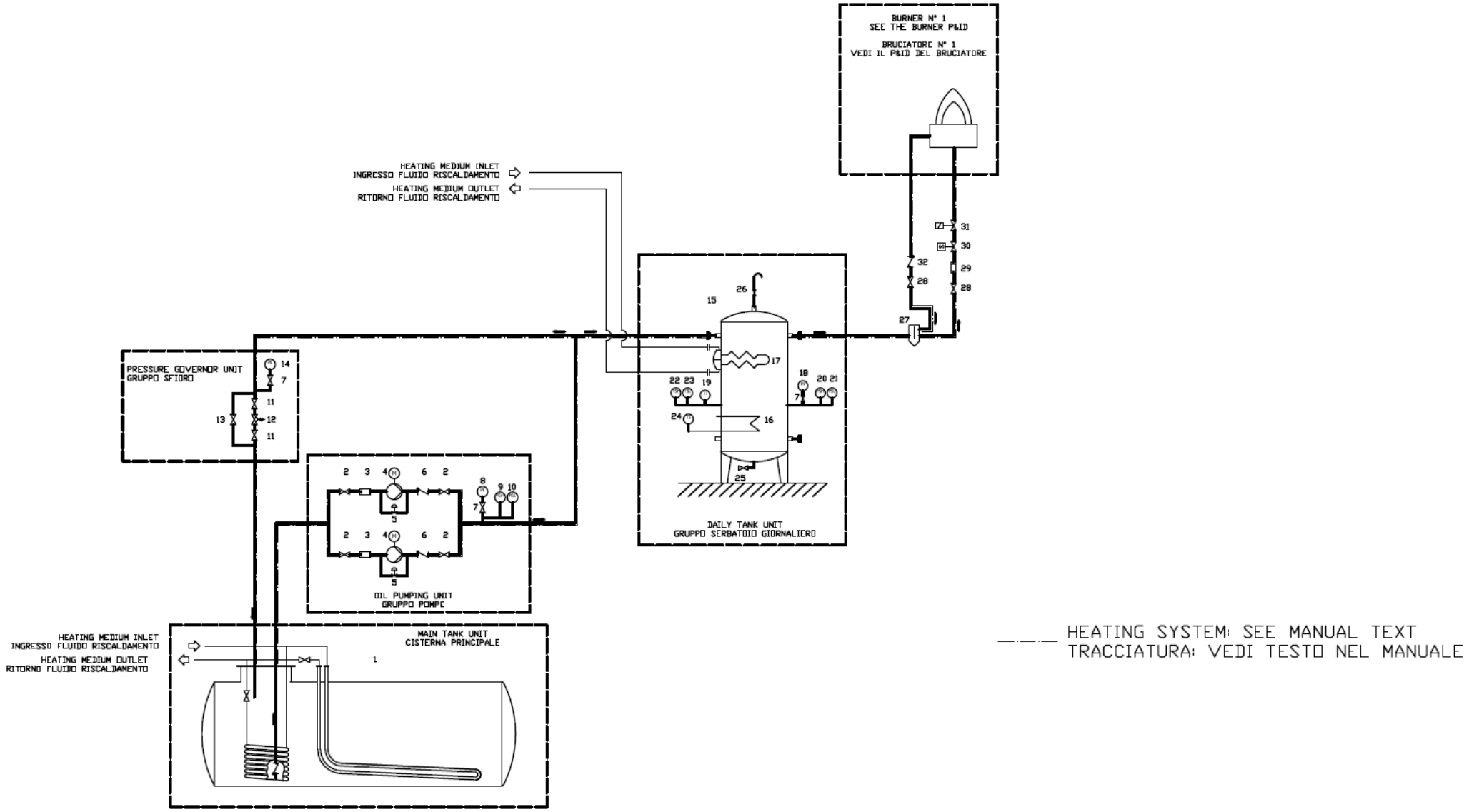


Fig. 10 - 3ID0023 - Single burner configuration

	KEYS
POS	**OIL TRAIN**
1	Main tank
	OIL PUMPING UNIT
2	Manual valve
3	Filter
4	Pump coupled to electrical motor
5	Safety valve
6	One-way valve
7	Manual valve
8	Pressure gauge
9	Maximum pressure switch
10	Minimum pressure switch
	PRESSURE GOVERNOR UNIT
11	Manual valve
12	Pressure governor
13	Needle valve
14	Pressure gauge
	DAILY TANK
15	Daily tank
16	Electrical resistor
17	Heating device
18	Pressure gauge
19	Thermometer
20	High pressure switch
21	Low pressure switch
22	Thermostat (high)
23	Thermostat (low)
24	Thermostat
25	Manual valve
26	Manual valve
	TO THE BURNER
27	Degassing bottle
28	Manual valve
29	Filter (supplied loose with the burner)
30	Solenoide valve
31	Safety valve
31	One-way valve

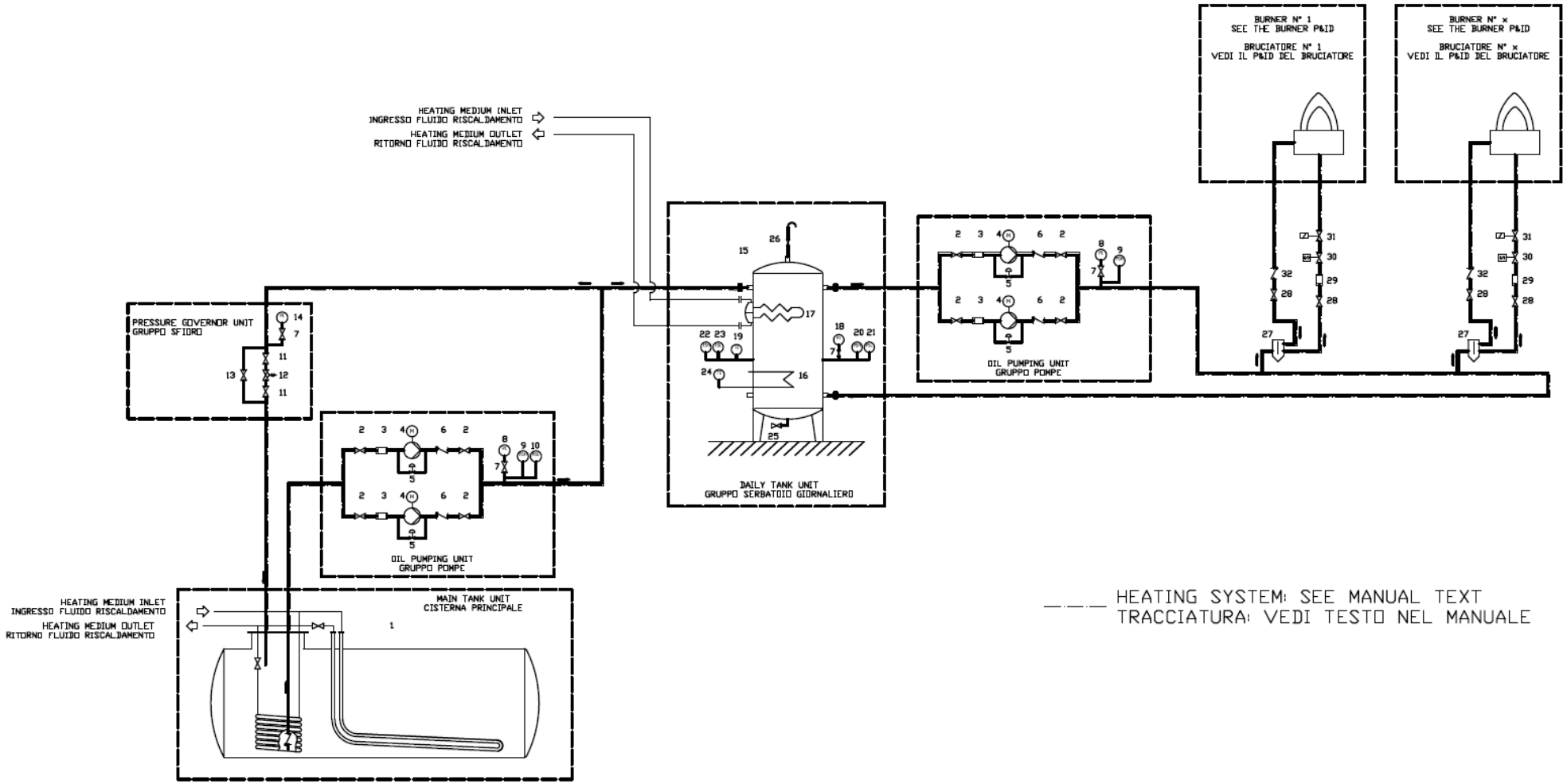


Fig. 11 - Two or more burners configuration

3ID0014	KEYS
POS	**OIL TRAIN**
1	Main tank
	OIL PUMPING UNIT
2	Manual valve
3	Filter
4	Pump coupled to electrical motor
5	Safety valve
6	One-way valve
7	Manual valve
8	Pressure gauge
9	Maximum pressure switch
10	Minimum pressure switch
	PRESSURE GOVERNOR UNIT
11	Manual valve
12	Pressure governor
13	Needle valve
14	Pressure gauge
	DAILY TANK
15	Daily tank
16	Electrical resistor
17	Heating device
18	Pressure gauge
19	Thermometer
20	Maximum pressure switch
21	Minimum pressure switch
22	Thermostat (high)
23	Thermostat (low)
24	Thermostat
25	Manual valve
26	Manual valve
	TO THE BURNER
27	Degassing bottle
28	Manual valve
29	Filter (supplied loose with the burner)
30	Solenoide valve
31	Safety valve
32	One-way valve

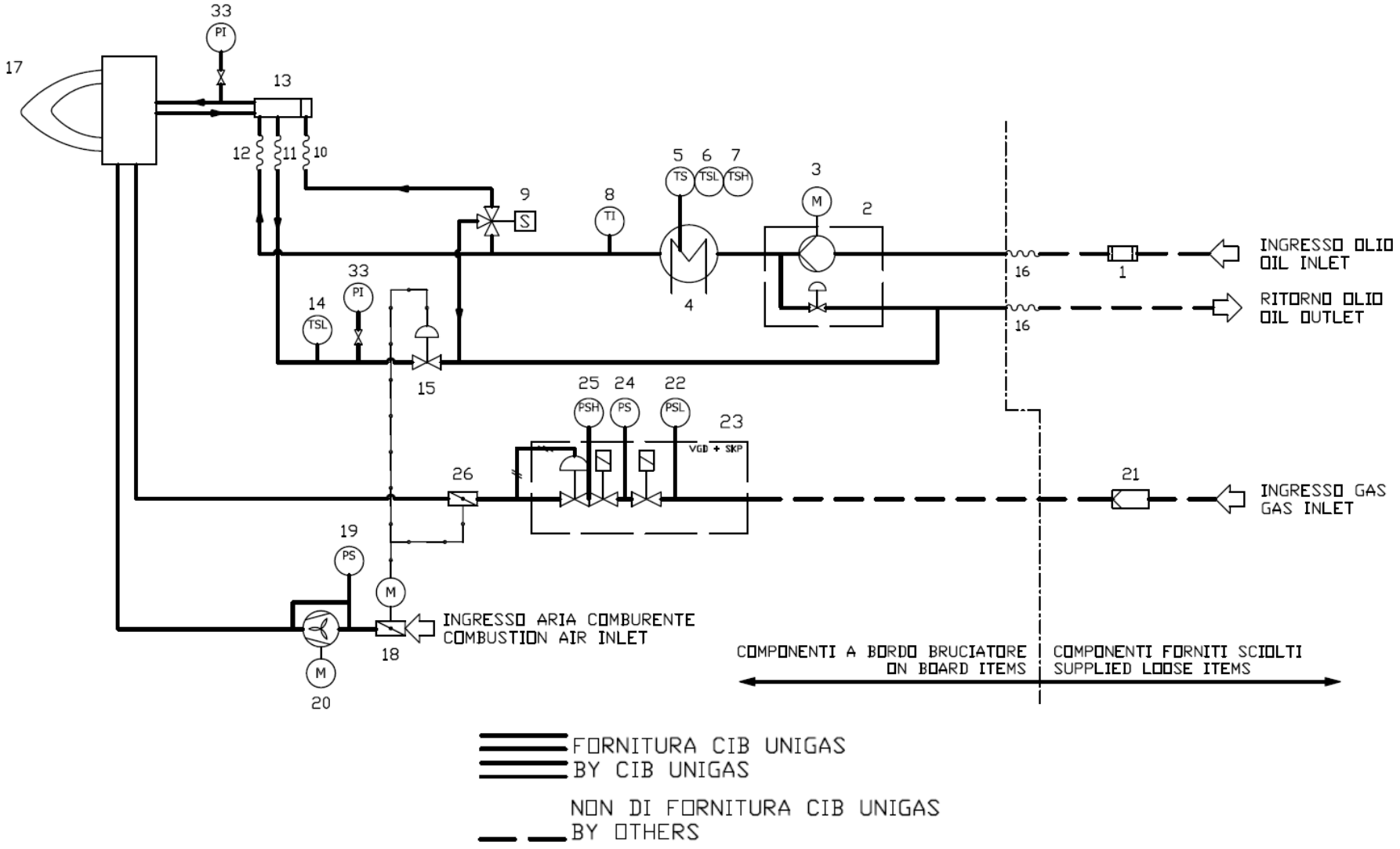


Fig. 12 – P&ID – 3I2MD-12

3I2MD-12	KEYS
POS	**OIL TRAIN**
1	Filter
2	Pump and pressure governor
3	Electrical motor
33	Pressure gauge with manual valve
4	Electrical preheater tank
4.1	Electrical preheater tank
5	Thermostat - TR
6	Low thermostat - TCN
7	High thermostat - TRS
8	Thermometer
9	3-way solenoid valve
10	Flexible hose
11	Flexible hose
12	Flexible hose
13	Oil distributor
14	Low thermostat - TCI
15	Pressure governor
16	Flexible hose
17	Burner
	COMBUSTION AIR TRAIN
18	Air damper with actuator
19	Pressure switch - PA
20	Draught fan with electromotor
	MAIN GAS TRAIN
21	Filter
22	Pressure switch - PGMIN
23	Safety valve with built in gas governor
24	Proving system pressure switch - PGCP
25	Pressure switch - PGMAX
26	Butterfly valve
NOTE	POS 25 is an optional supply
	POS 33 is an optional supply

Serie KR5x (escluso KR512A)

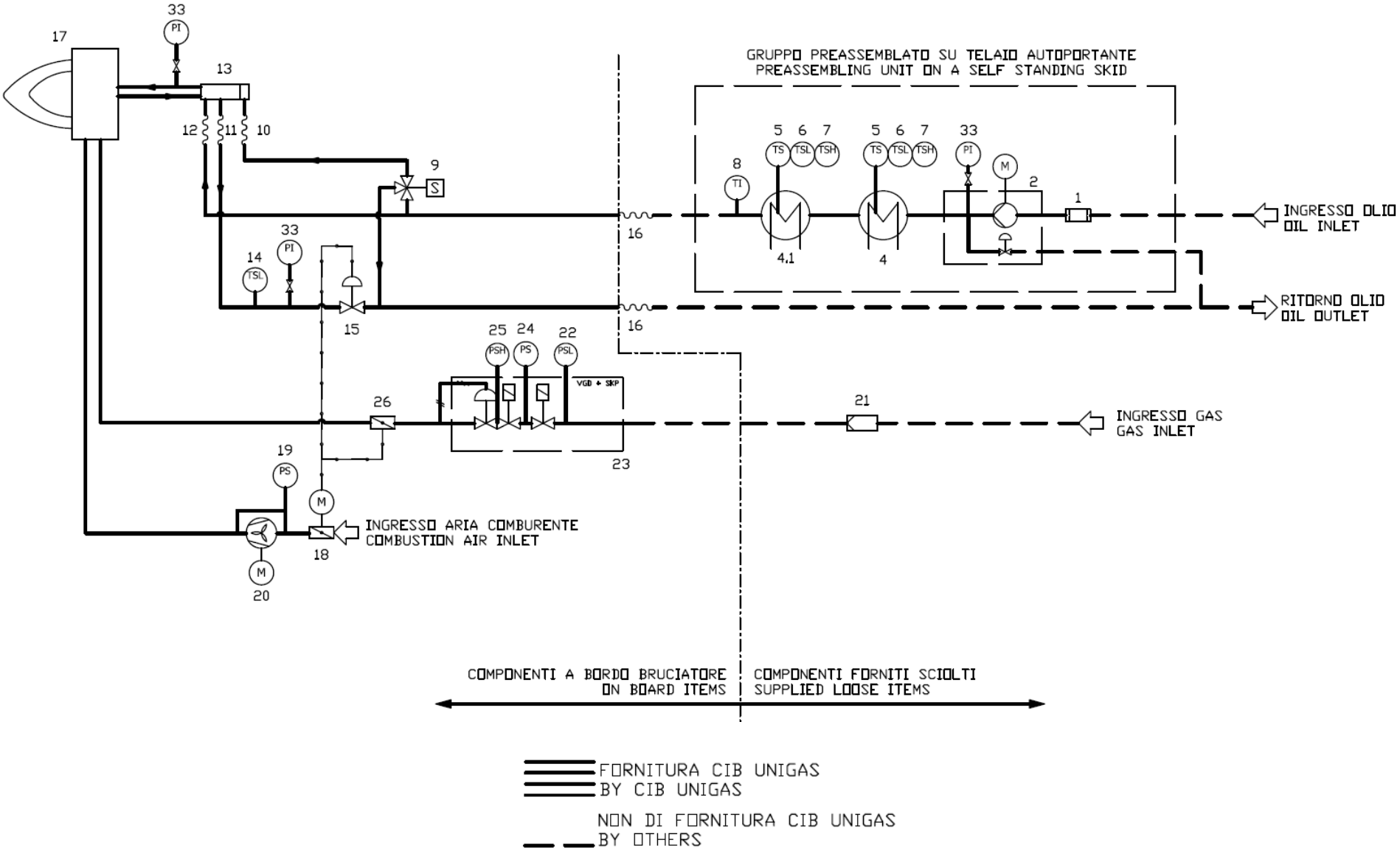


Fig. 13 – P&ID – 3I2MD-16

3I2MD-16	KEYS
POS	**OIL TRAIN**
1	Filter
2	Pump and pressure governor
3	Electrical motor
33	Pressure gauge with manual valve
4	Electrical preheater tank
4.1	Electrical preheater tank
5	Thermostat - TR
6	Low thermostat - TCN
7	High thermostat - TRS
8	Thermometer
9	3-way solenoid valve
10	Flexible hose
11	Flexible hose
12	Flexible hose
13	Oil distributor
14	Low thermostat - TCI
15	Pressure governor
16	Flexible hose
17	Burner
	COMBUSTION AIR TRAIN
18	Air damper with actuator
19	Pressure switch - PA
20	Draught fan with electromotor
	MAIN GAS TRAIN
21	Filter
22	Pressure switch - PGMIN
23	Safety valve with built in gas governor
24	Proving system pressure switch
25	Pressure switch - PGMAX
26	Butterfly valve

NOTE POS 25 is an optional supply
POS 33 is an optional supply

Electrical connections

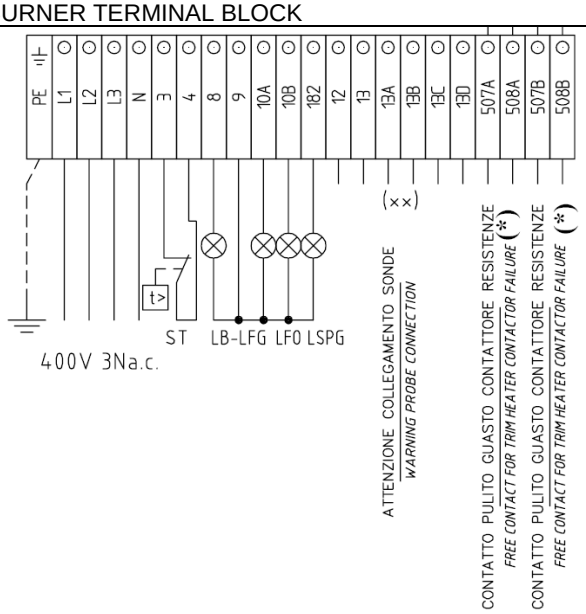
	Respect the basic safety rules. make sure of the connection to the earthing system. do not reverse the phase and neutral connections. fit a differential thermal magnet switch adequate for connection to the mains.
	ATTENTION: before executing the electrical connections, pay attention to turn the plant's switch to OFF and be sure that the burner's main switch is in 0 position (OFF) too. Read carefully the chapter "WARNINGS", and the "Electrical connections" section.

Remove the cover of the electrical board mounted on the burner.

Execute the electrical connections to the power supply terminal board as shown here following (refer to the attached Electrical wiring diagrams), check the direction of rotation of the fan and pump motors (see next paragraph) and refit the electrical board cover.

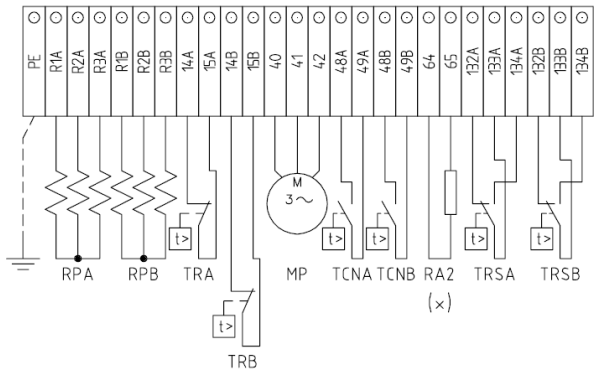
	WARNING: The burner is provided with an electrical bridge between terminals 6 and 7; when connecting the high/low flame thermostat, remove this bridge before connecting the thermostat.
	IMPORTANT: Connecting electrical supply wires to the burner teminal block MA, be sure that the ground wire is longer than phase and neutral ones.
	IMPORTANT: auxiliary contacts are provided (terminals no. 507 and no. 508 of the MA terminal block) to connect an intervention system (alarm/power supply cutoff) in case of fault of the oil resistor contactor (see pictures below).

BURNER TERMINAL BLOCK



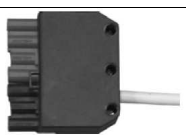
(*) free contact for pre-heating resistor contactor fault

OIL/HEATING PUMPING UNIT TERMINAL BLOCK (when provided)



Keys

LB	Burner lockout lamp
LFG	Gas operation signaling lamp
LFO	Oil operation signaling lamp
LSPG	Gas valve leaking signaling lamp
MP	Pump motor
RA2	Auxiliary resistors
RPA	Auxiliary resistors
RPB	Auxiliary resistors
ST	Thermostats/pressure switches series
TCNA	Oil enabling thermostat for pre-heater A
TCNB	Oil enabling thermostat for pre-heater B
TRA	Regulation thermostat for pre-heater A
TRB	Regulation thermostat for pre-heater B
TRSA	Safety thermostat for pre-heater A
TRSB	Safety thermostat for pre-heater B



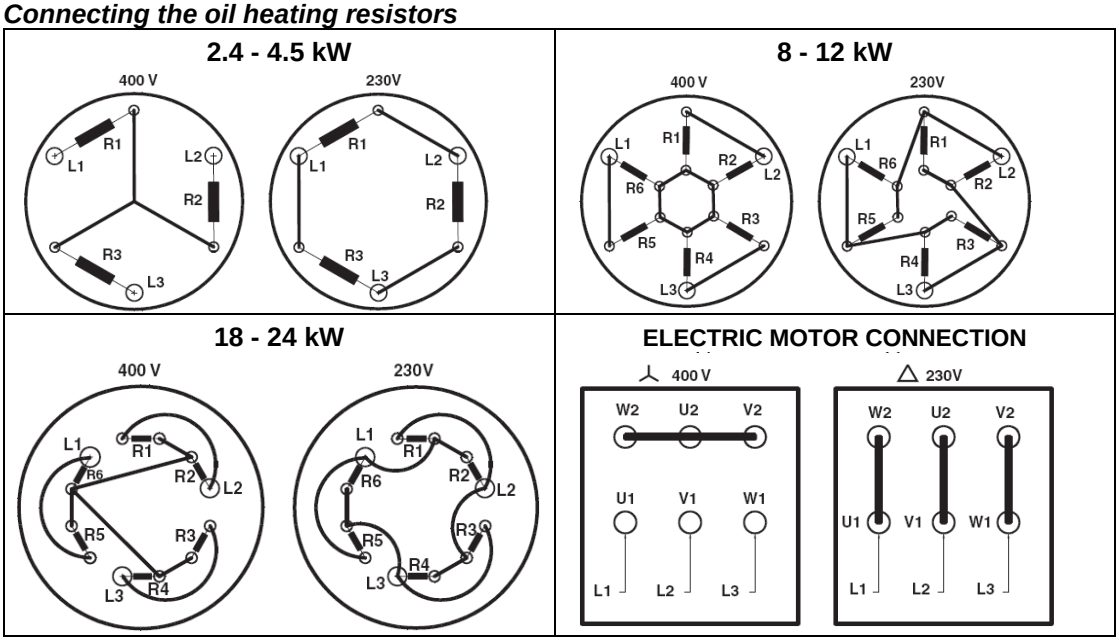
Probes connections by means of the 7-pin plug (see picture) - see wiring diagrams for connections.

Rotation of fan motor

Once the electrical connection of the burner is executed, remember to check the rotation of the fan motor. The motor should rotate according to the “arrow” symbol on the body. In the event of wrong rotation, reverse the three-phase supply and check again the rotation of the motor.
NOTE: the burners are supplied for three-phase 400V supply, and in the case of three-phase 230V supply it is necessary to modify the electrical connections into the terminal box of the electric motor and replace the overload tripped relay.

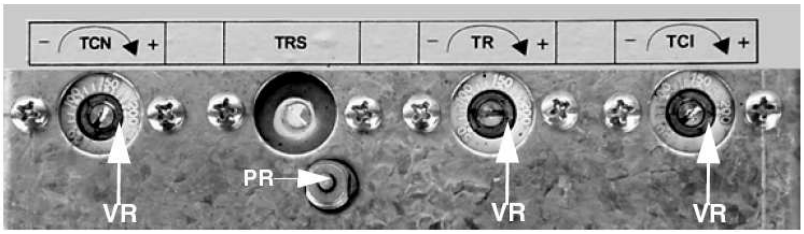
⚠	CAUTION: check the motor thermal cut-out adjustment.

Connecting the oil heating resistors



Oil thermostat adjustment

To access the thermostats, remove the cover of the burner switchboard. Calibrate using a screwdriver on the VR screw as shown in figure. As far as burners provided with electronic thermostat (on the burner control panel), see relevant manual.
NOTE: thermostat TCI is fitted on burners fired with fuel oil with a viscosity of 400cSt (50 °E) at 50° C only.



Electronic thermostat

TCN - Oil enabling thermostat: alibrate this thermostat to a value 10% lower than that indicated in the viscosity-temperature diagram).

TRS - Resistor safety thermostat: The thermostat is set during factory testing at a value of about 190°C.
This thermostat trips when the operating temperature exceeds the set limit. Ascertain the cause of the malfunction and reset the thermostat using the PR button.

TR - Resistor thermostat: Calibrate this thermostat to the correct value according to the viscosity-temperature diagram and check the temperature using a thermometer mounted on the pre-heating tank.

TCI - Installation enabling thermostat: This thermostat is fitted on burners fired with oil at a viscosity of 400cSt (50°E) at 50°C only. Set the thermostat to a temperature about 40°C lower than the TR.

Thermostat adjustment for petroleum burners

To find the thermostats, remove the burner switchboard cover. Adjust them using a screwdriver on the VR screw as shown in the next picture.

TCI -Installation enabling thermostat - Set this thermostat to about 40° C.

TCN - Oil enabling thermostat - Adjust this thermostat to a value between 45 and 50°C. Anyway, set TCN to a value possibly lower than the one set for TR (see below).

TR - Resistor thermostat - Adjust this thermostat to a value between 45 and 50°C. Check the temperature by using a thermometer mounted on the pre-heating tank.

TRS - Resistor safety thermostat - The thermostat is set during factory testing at about 190° C.

This thermostat trips when the operating temperature exceeds the set limit. Ascertain the cause of the malfunction and reset the thermostat by means of the PR button (see picture).

CAUTION: even if the adjusting ranges for the TR (Resistor thermostat) and TCN (Oil enabling thermostat) are the same, set TCN to a value lower than the one set for TR.

Combustion head gas pressure curves depending on the flow rate

Curves are referred to pressure = 0mbar in the combustion head!

The curves referred to the gas pressure in the combustion head, depending on the gas flow rate, are referred to the burner properly adjusted (percentage of residual O2 in the flues as shown in the "Recommended combustion values" table and CO in the standard limits). During this stage, the combustion head, the gas butterfly valve and the actuator are at the maximum opening. Refer to Fig. 14, showing the correct way to measure the gas pressure, considering the values of pressure in combustion chamber, surveyed by means of the pressure gauge or taken from the boiler's Technical specifications.

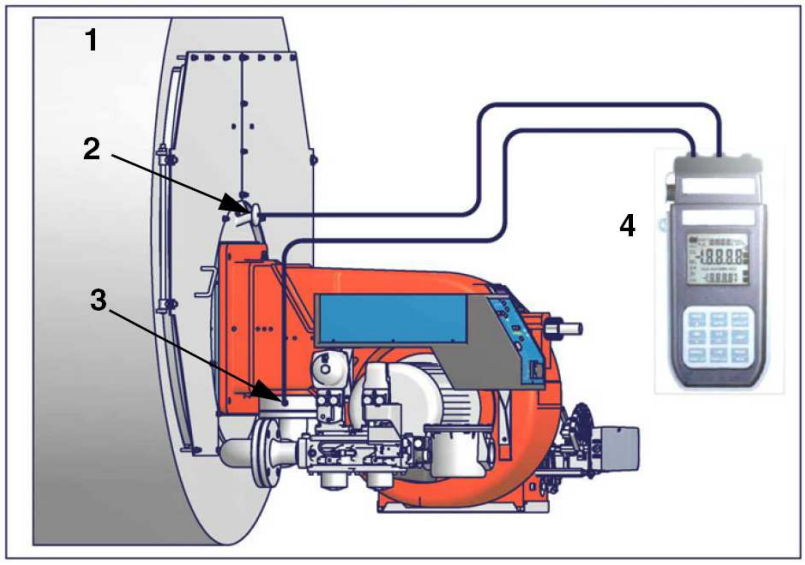


Fig. 14

Keys

1. Generator
2. Pressure outlet on the combustion chamber
3. Gas pressure outlet on the butterfly valve
4. Differential pressure gauge

Measuring the gas pressure in the combustion head

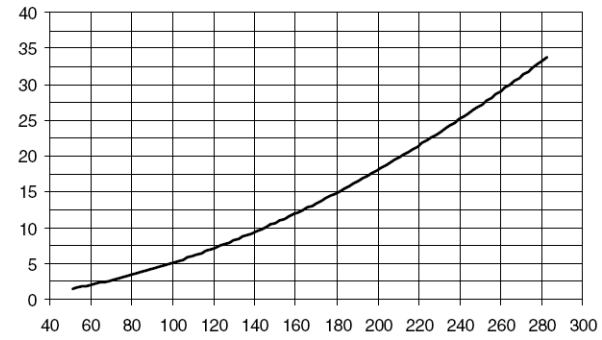
In order to measure the pressure in the combustion head, insert the pressure gauge probes: one into the combustion chamber's pressure outlet (Fig. 14-2) to get the pressure in the combustion chamber and the other one into the butterfly valve's pressure outlet of the burner (Fig. 14-3). On the basis of the measured differential pressure, it is possible to get the maximum flow rate: in the pressure - rate curves (shown on the next paragraph), it is easy to find out the burner's output in Stm3/h (quoted on the x axis) from the pressure measured in the combustion head (quoted on the y axis). The data obtained must be considered when adjusting the gas flow rate.

NOTE: THE PRESSURE-RATE CURVES ARE GIVEN AS INFORMATION ONLY; FOR A PROPER SETTING OF THE GAS RATE, PLEASE REFER TO THE GAS METER READING.

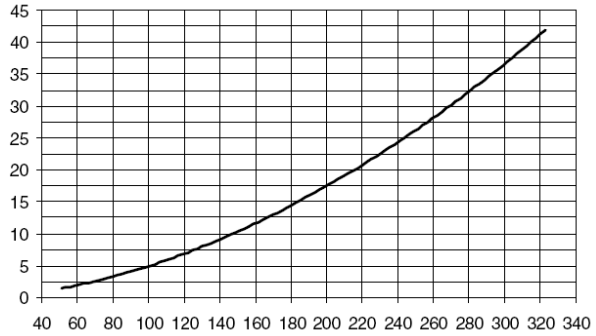
Pressure in combustion head - gas rate curves

GAS PRESSURE mbar

KP91A

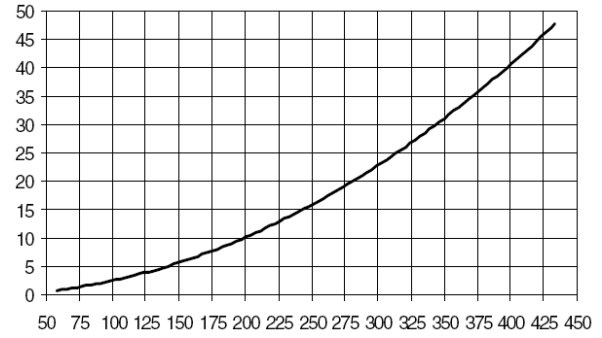


KP92A



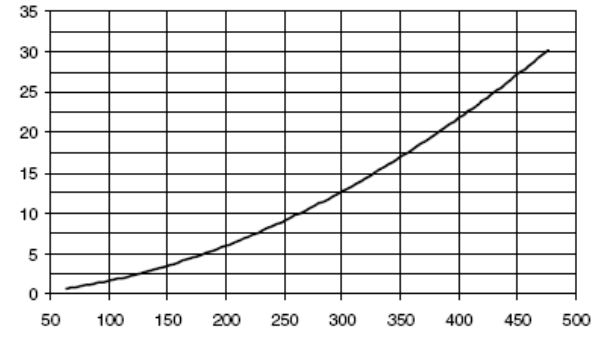
GAS PRESSURE mbar

KP93A

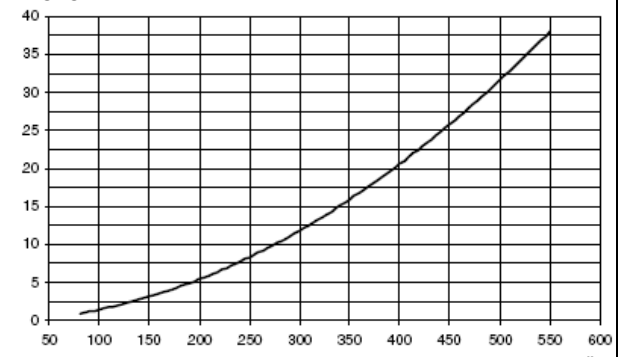


GAS PRESSURE mbar

KR512A

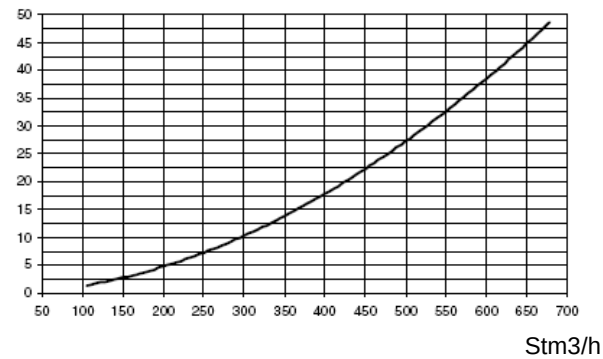


KR515A

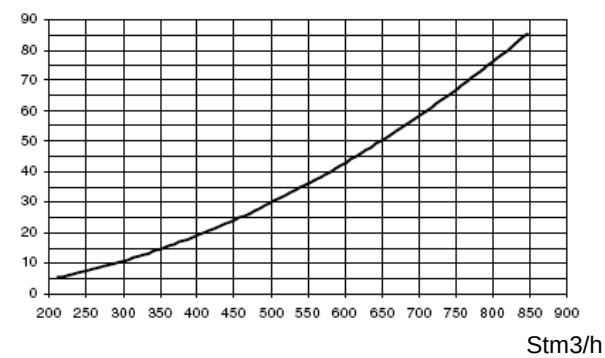


GAS PRESSURE mbar

KR520A



KR525A



ADJUSTMENTS

	ATTENTION: before starting the burner up, be sure that the manual cutoff valves are open and check that the pressure upstream the gas train complies the value quoted on paragraph "Technical specifications". Be sure that the mains switch is closed.
	ATTENTION: During commissioning operations, do not let the burner operate with insufficient air flow (danger of formation of carbon monoxide); if this should happen, make the fuel decrease slowly until the normal combustion values are achieved.
	WARNING: NEVER LOOSE THE SEALED SCREWS! OTHERWISE, THE DEVICE WARRANTY WILL BE INVALIDATE!
	Prior to start up the burner, make sure that the return pipe to the tank is not obstructed. Any obstruction would cause the pump seal to break.

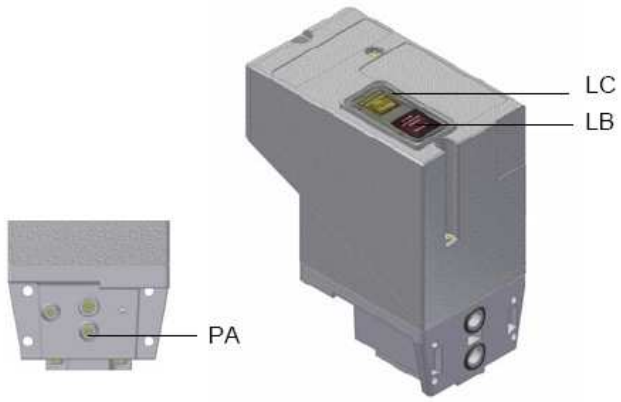
	IMPORTANT! the combustion air excess must be adjusted according to the in the following chart:

Recommended combustion parameters		
Fuel	***Recommended (%) CO_2***	***Recommended (%) O_2***
Natural gas	9 ÷ 10	3 ÷ 4.8
Heavy oil	11 ÷ 12	4.2 ÷ 6.2

Gas filter

The gas filters remove the dust particles that are present in the gas, and prevent the elements at risk (e.g.: burners, counters and regulators) from becoming rapidly blocked. The filter is normally installed upstream from all the control and on-off devices.

VPS504 Gas proving system

The VPS504 check the operation of the seal of the gas shut off valves. This check is carried out as soon as the boiler thermostat gives a start signal to the burner, creating, 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.	

Adjustments - brief description

Adjust the air and gas flow rates at the maximum output ("high flame") first, by means of the air damper and the adjusting cam respectively.

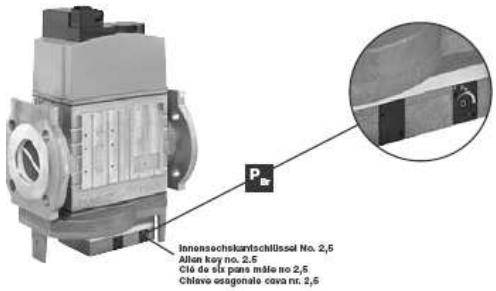
- Check that the combustion parameters are in the suggested limits.
- Check the flow rate measuring it on the counter or, if it was not possible, verifying the combustion head pressure by means of a differential pressure gauge, as described on par. "Measuring the gas pressure in the combustion head" on page 39.
- Then, adjust the combustion values corresponding to the points between maximum and minimum: set the shape of the adjusting cam foil. The adjusting cam sets the air/gas ratio in those points, regulating the opening-closing of the throttle gas valve.
- Set, now, the low flame output, acting on the low flame microswitch of the actuator in order to avoid the low flame output increasing too much or that the flues temperature gets too low to cause condensation in the chimney.

To change the burner setting during the testing in the plant, follows the next procedure, according to the actuator model provided.

Adjustment procedure for gas operation

To change the burner setting during the testing in the plant, follow the next procedure.

On the DUNGS MBC..SE gas valves group, set the pressure regulator to 1/3 of its stroke, using a 2.5 allen key.



PRESSURE GOVERNOR

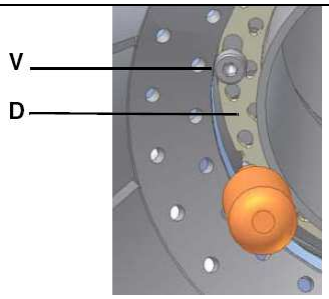
⚠	**CAUTION: perform these adjustments once the burner is shut offf and cooled.**

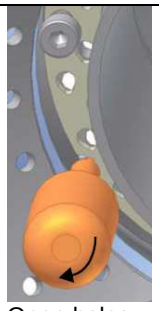
The burner is factory-set wih the adjusting plate holes fully open, and the combustion head at its MAX position, so it is fit to work at the maximum output.

To adjust the gas flow, partially close the holes, as follows:

1. loosen the three V screws that fix the adjusting plate D;
2. insert a screwdriver on the adjusting plate notches and let it move CW/CCW as to open/close the holes;
3. once the adjustmet is performed, fasten the V screws.

Serie KP9x

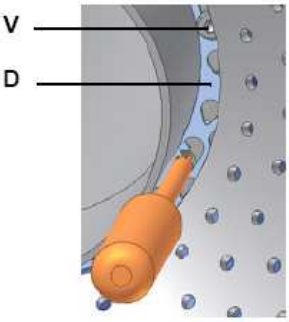




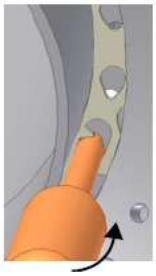
Open holes

Closed holes

Serie KR5x



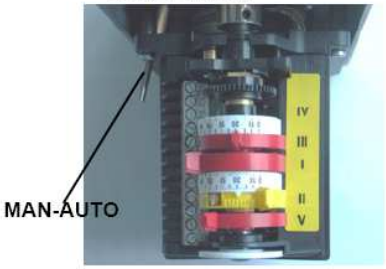
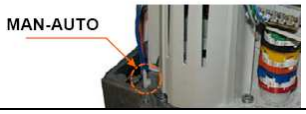
Open holes



Closed holes

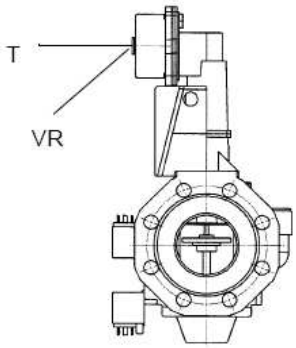
Go on with the adjustments according to the actuator provided.

Settings by means of Berger STM30.. /Siemens SQM40.. actuator

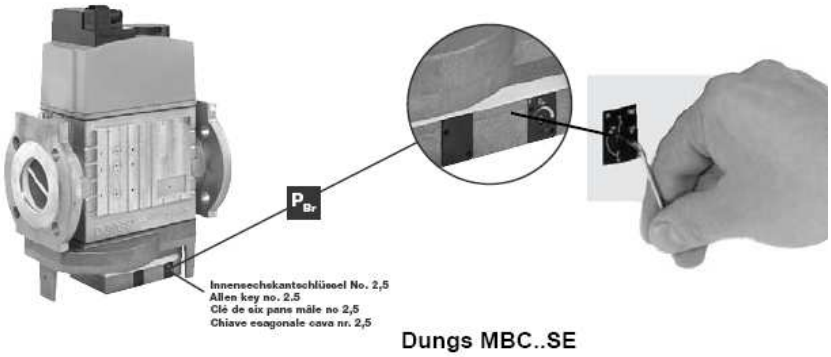
Berger STM30	Siemens SQM40	
	 	*Cam description* I High flame II Stand-by and Ignition III Low flame - gas IV Low flame - oil (SQM40..) V Low flame - oil (STM30..)

1. Set GAS fuel by means of the burner CM switch (it is placed on the burner control panel - see page 49);
2. check the fan motor rotation (see “Rotation of fan motor and pump motor” on page 38).
3. Before starting the burner up, drive the actuator high flame microswitch matching the low flame one (in order to let the burner operates at the lowest output) to safely achieve the high flame stage.
4. Start the burner up by means of the thermostat series and wait unitl the pre-purge phase comes to end and that burner starts up;
5. drive the burner to high flame stage, by means fo the thermostat TAB (high/low flame thermostat - see Wiring diagrams), as far as fully-modulating burners, see related paragraph.
6. then move progressively the microswitch to higher values until it reaches the high flame position; always check the combustion values and eventually adjusting the gas by means of the valves group governor).
7. go on adjusting air and gas flow rates: check, continuosly, the flue gas analisys, as to avoid combustion with little air; dose the air according to the gas flow rate change following the steps quoted below.
8. acting on the pressure stabiliser of the valves group, adjust the gas flow rate in the high flame stage as to meet the values requested by the boiler/utilisation:

- **Siemens VGD valves group:** remove cap T and act on the VR adjusting screw to increase or decrease the pressure and consequently the gas rate; screwind VR the rate increases, unscrewing it decreases (see next figure).
- **Dungs MBC..SE valves group:** act on its pressure governor to increase or decrease the pressure and consequently the gas rate.

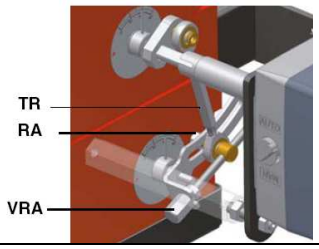
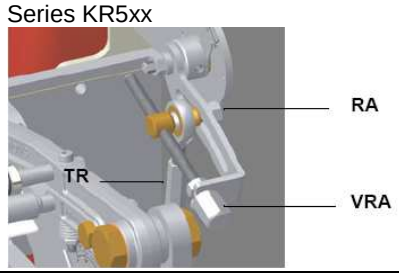


Siemens VGD..

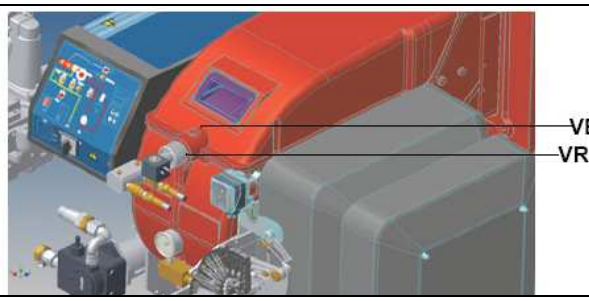


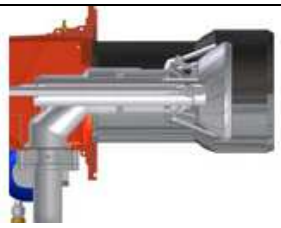
Dungs MBC..SE

9. To adjust the air flow rate in the high flame stage, loose the RA nut and screw VRA as to get the desired air flow rate: moving the rod TR towards the air damper shaft, the air damper opens and consequently the air flow rate increases, moving it far from the shaft the air damper closes and the air flow rate decreases.

Series KP9xx	Series KR5xx	
		***Note: once the procedure is perfomed, be sure that the blocking nut RA is fasten. Do not change the position of the air damper rods.***

10. Only if necessary, change the combusiton head position: to let the burner operate at a lower output, loose the VB screw and move progressively back the combustion head towards the MIN position, by turning clockwise the VRT ring nut. Fasten VB screw when the adjustment is accomplished.





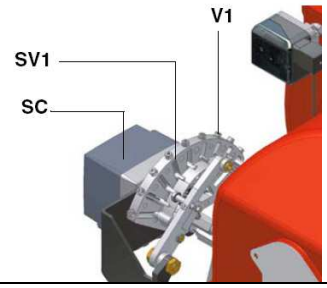
“MAX” head position

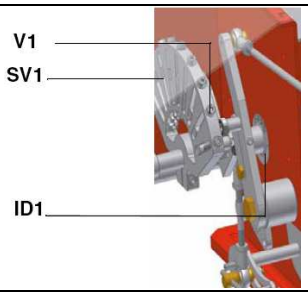
“MIN” head position

⚠	**Attention! if it is necessary to change the head position, repeat the air and gas adjustments described above.**

11. the air and gas rate are now adjusted at the maximum power stage, go on with the point to point adjustement on the SV1 (gas side) adjusting cam as to reach the minimum output point.

Series KP9xx

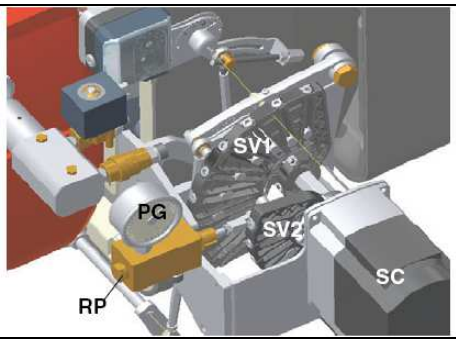




Gas throttle valve open

Gas throttle valve closed

Series KR5xx



Gas throttle valve open

Gas throttle valve closed

12. as for the point-to-point regulation, move the gas low flame microswitch (cam III) a little lower than the maximum position (90°);
13. set the TAB thermostat to the minimum in order that the actuator moves progressively towards the low flame position;
14. move cam III to the minimum to move the actuator towards the low flame until the two bearings find the adjusting screw that refers to the lower position: screw V1 to increase the rate, unscrew to decrease.
15. Move again cam III towards the minimum to meet the next screw on the adjusting cam and repeat the previous step; go on this way as to reach the desired low flame point.
16. Now adjust the pressure switches (see relevant paragraph).

Calibration of air and gas pressure switches

The air pressure switch locks the control box if the air pressure is not the one requested. If it happens, unlock the burner by means of the control box unlock pushbutton, placed on the burner control panel.
The gas pressure switches check the pressure to avoid the burner operate when the pressure value is not in the requested pressure range.

Calibration of air pressure switch

To calibrate the air pressure switch, proceed as follows:
1. Remove the transparent plastic cap.
2. Once air and gas setting have been accomplished, startup the burner.

3. During the pre-purge phase o the operation, turn slowly the adjusting ring nut VR in the clockwise direction until the burner lockout, then read the value on the pressure switch scale and set it to a value reduced by 15%.
4. Repeat the ignition cycle of the burner and check it runs properly.
5. Refit the transparent plastic cover on the pressure switch..

Calibration of low gas pressure switch (and gas proving pressure switch PGCP, when provided)

As for the gas pressure switch calibration, proceed as follows:

1. Be sure that the filter is clean.
2. Remove the transparent plastic cap.
3. While the burner is operating at the maximum output, test the gas pressure on the pressure port of the minimum gas pressure switch.
4. Slowly close the manual cutoff valve (placed upstream the pressure switch, see gas train installation diagram), until the detected pressure is reduced by 50%. Pay attention that the CO value in the flue gas does not increase: if the CO values are higher than the limits laid down by law, slowly open the cutoff valve as to get values lower than these limits.
5. Check that the burner is operating correctly.
6. Clockwise turn the pressure switch adjusting ring nut (as to increase the pressure value) until the burner stops.
7. Slowly fully open the manual cutoff valve.
8. Refit the transparent plastic cover on the pressure switch.

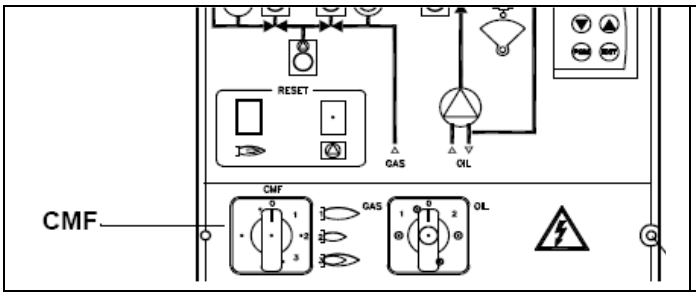
Adjusting the maximum gas pressure switch (when provided)

To calibrate the maximum pressure switch, proceed as follows according to its mounting position:

1. remove the pressure switch plastic cover;
2. if the maximum pressure switch is mounted upstreaam the gas valves: measure the gas pressure in the network, when flame is off; by means of the adjusting ring nut VR, set the value read, increased by the 30%.
3. if the maximum pressure switch is mounted downstream the “gas governor-gas valves” group and upstream the butterfly valve: light the burner, adjust it according to the procedure in the previous paragrph. Then, measure the gas pressure at the operating flow rate, downstream the “gas governor-gas valves” group and upstream the butterfly valve; by means of the adjusting ring nut VR, set the value read on step 2, increased by the 30%;
4. replace the plastic cover.

Fully modulating burners

To adjust the fully-modulating burners, use the CMF switch on the burner control panel (see next picture), instead of the TAB thermostat as described on the previous paragraphs about the progressive burners. Go on adjusting the burner as described before, paying attention to use the CMF switch intead of TAB.
The CMF position sets the oprating stages: to drive the burner to the high-flame stage, set CMF=1; to drive it to the low-flame stage, set CMF=2.
To move the adjusting cam set CMF=1 or 2 and then CMF=0.



CMF = 0 stop at the current position
CMF = 1 high flame operation
CMF = 2 low flame operation
CMF = 3 automatic operation

ADJUSTMENT IN THE HEAVY OIL OPERATION

The heavy oil flow rate can be adjusted choosing a by-pass nozzle that suits the boiler/utilisation output and setting the delivery and return pressure values according to the ones quoted on the chart below and the diagram on Fig.15).

NOZZLE	DELIVERY PRESSURE bar	HIGH FLAME RETURN PRESSURE bar	LOW FLAME RETURN PRESSURE bar
FLUIDICS WR2/UNIGAS M3	25	19 - 20	7(recommended)

	FLOW RATE kg/h	
NOZZLE SIZE	MIN	MAX
40	13	40
50	16	50
60	20	60
70	23	70
80	26	80
90	30	90
100	33	100
115	38	115
130	43	130
145	48	145
160	53	160
180	59	180
200	66	200
225	74	225
250	82	250
275	91	275
300	99	300
330	109	330
360	119	360
400	132	400
450	148	450
500	165	500
550	181	550
600	198	600
650	214	650
700	231	700
750	250	750
800	267	800

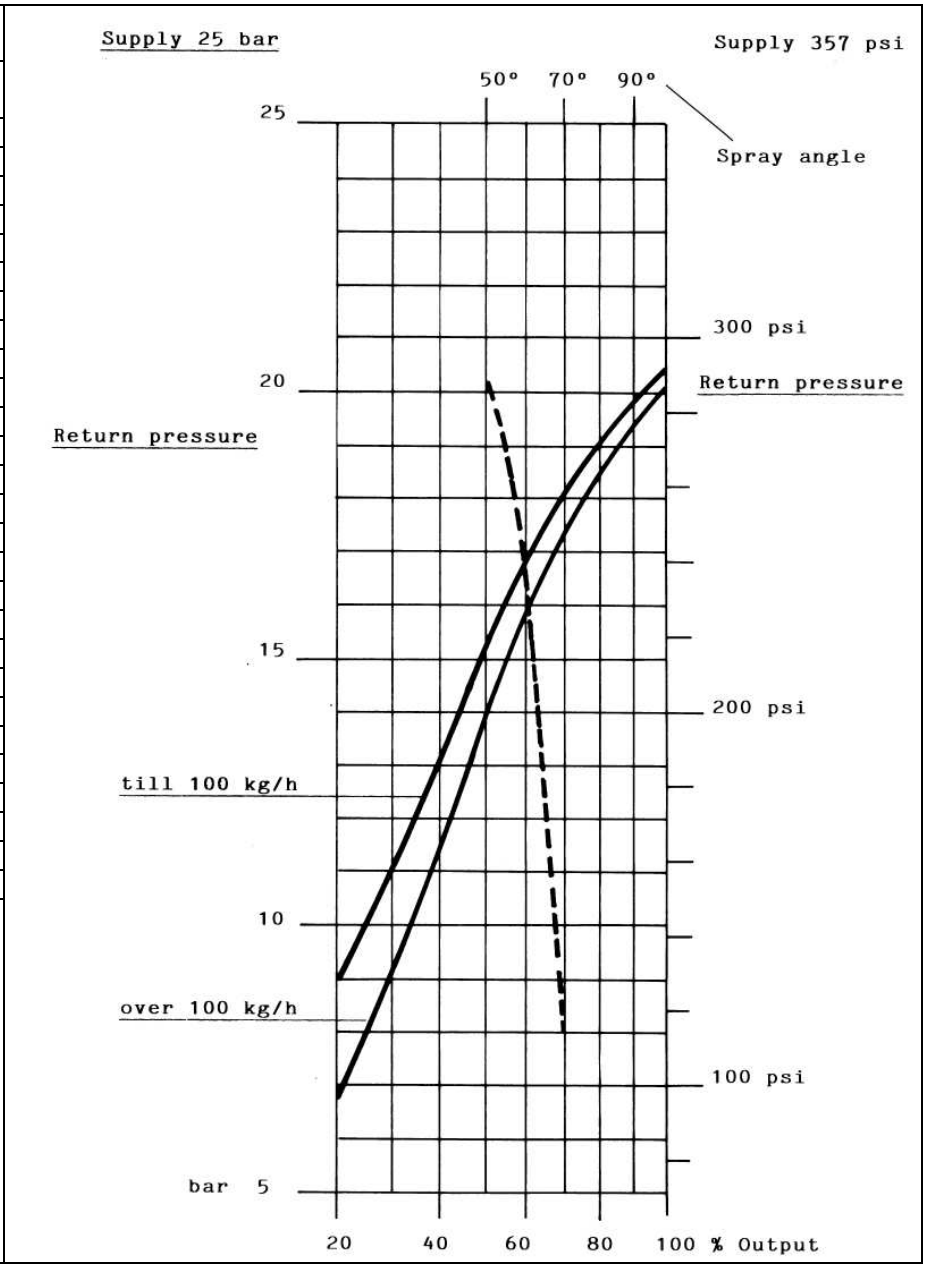


Fig. 15

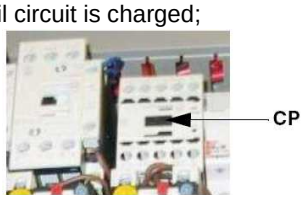
---------- atomisation angle according to the return pressure
———————— flow rate %

Example: as far as over 100kg/h nozzles, the 80% of the nozzle flow rate can be obtained with a return pressure at about 18bar (see Fig. 15).

Settings by means of Berger STM30../Siemens SQM40.. actuator

Once the air and gas flow rates are adjusted, turn the burner off, switch the CM switch to the heavy oil operation (OIL, on the burner control panel (see page 49).

1. prime the oil pump acting on the related CP contactor (see next picture): check the pump motor rotation and keep pressing for some seconds until the oil circuit is charged;



2. bleed the air from the M pressure gauge port (Fig. 16) by loosing the cap without removing it, then release the contactor.

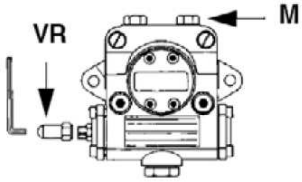
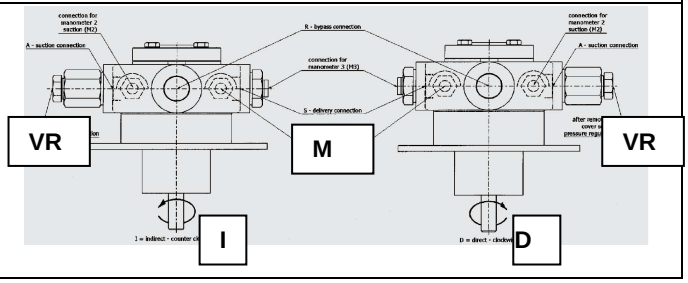
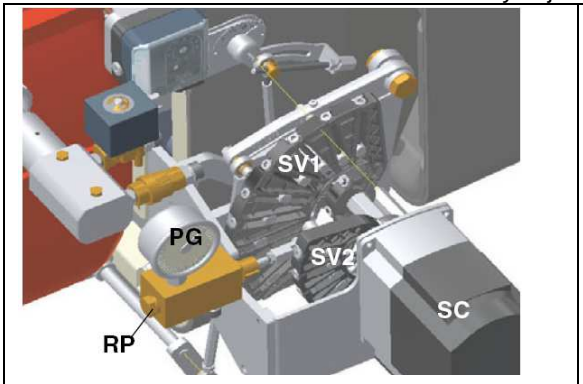
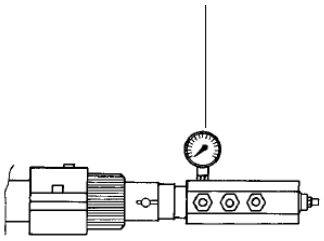
Suntec TA	HP Technik UHE
	

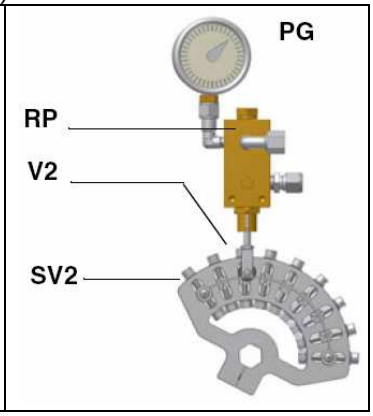
Fig. 16

3. Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operates at the lowest output) to achieve safely the high flame stage).
4. record the high flame value set during the gas operation adjustments (see previous paragraphs);
5. drive the burner to high flame stage, by means fo the thermostat TAB (high/low flame thermostat - see Wiring diagrams), as far as fully-modulating burners, see related paragraph.
6. Then move progressively the microswitch to higher values until it reaches the high flame position; always check the combustion values and eventually adjusting the oil pressure (see next step).



Pressure gauge port



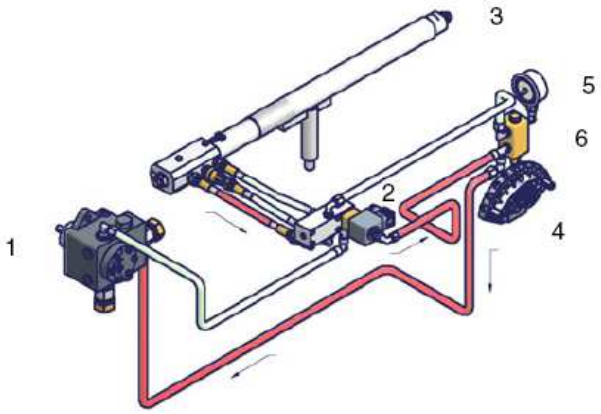
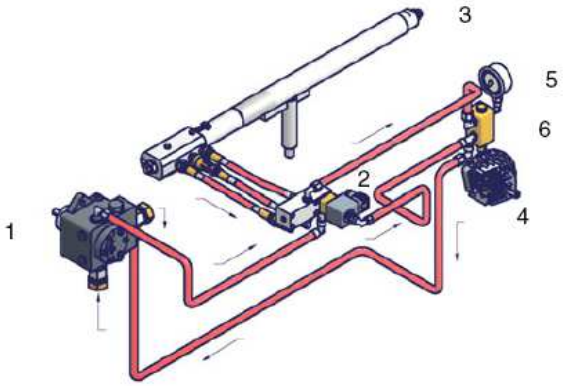
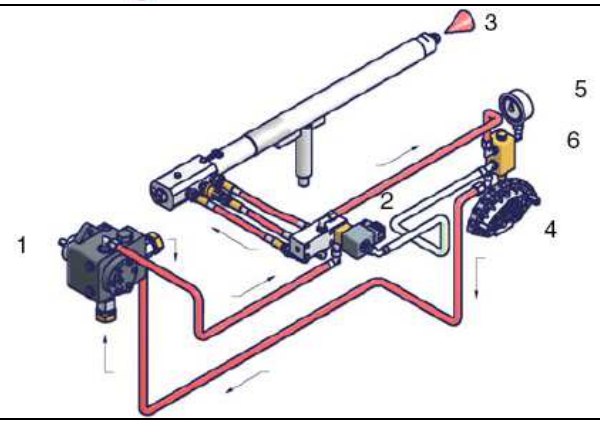
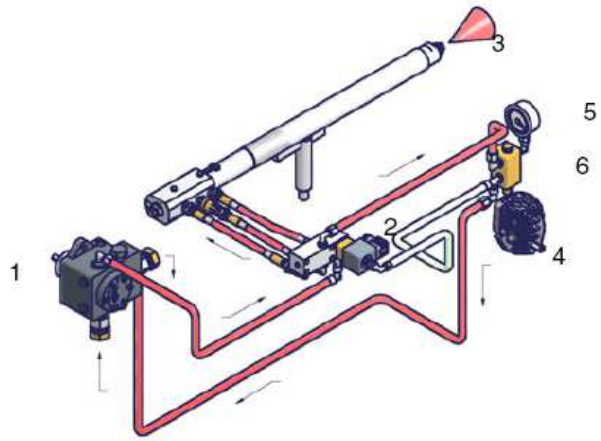


7. the nozzle supply pressure is already factory-set and must not be changed. Only if necessary, adjust the supply pressure as follows (see related paragraph); insert a pressure gauge into the port shown above and act on on the pump adjusting screw VR (see Fig. 16 – and page 20) as to get the nozzle pressure at 25bar (according to the nozzle provided: Fluidics/UNIGAS M3 see diagrams on page 46).
8. in order to get the maximum oil flow rate, adjust the pressure (reading its value on the PG pressure gauge) without changing the air flow rate set during the gas operation adjustments (see prevoius paragraph): checking always the combustion parameters, the adjustment is to be performed by means of the SV2 adjusting cam screw (see picture) when the cam has reached the high flame position.
9. as for the point-to-point regulation in order to set the cam foil shape, move the low flame microswitch a little lower than the maximum position (90°) ;
10. set the TAB thermostat to the minimum in order that the actuator moves progressively towards the low flame position;
11. move the “oil low flame” cam towards the minimum to move the actuator towards the low flame until the two bearings find the adjusting screw that refers to a lower position: screw V2 to increase the rate, unscrew to decrease, in order to get the pressure as shown on diagrams page 46, according to the requested rate.
12. Move again the “oil low flame” cam towards the minimum to meet the next screw on the adjusting cam and repeat the previous step; go on this way as to reach the desired low flame point.
13. The low flame position must never match the ignition position that is why the “oil low flame” ca must be set 20°-30° more than the ignition position.
14. Turn the burner off; then start it up again. If the adjustment is not correct, repeat the previous steps.

As far as fully-modulating burners, see the related paragraph.

Oil circuit

The fuel is pushed into the pump 1 to the nozzle 3 at the delivery pressure set by the pressure governor. The solenoid valve 2 stops the fuel immission into the combustion chamber. The fuel flow rate that is not burnt goes back to the tank through the return circuit. The spill-back nozzle is feeded at constant pressure, while the return line pressure is adjusted by means of the pressure governor controlled by an actuator coupled to an adjusting cam. The fuel amount to be burnt is adjusted by means of the burner actuator according to the adjustments set (see prevoius paragraph".

	Stand-by
	Prepurge
	Low flame
	High flame *Keys* 1. Pump 2. Solenoid valve 3. Nozzle 4. Adjusting cam 5. Pressure gauge 6. Pressure governor

PART II – OPERATION

LIMITATION 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, WHICH THROUGH ITS EASY ACCESSIBILITY AND RAPIDITY OF OPERATION ALSO FUNCTIONS AS AN EMERGENCY SWITCH, AND ON THE RESET BUTTON.

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.

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.

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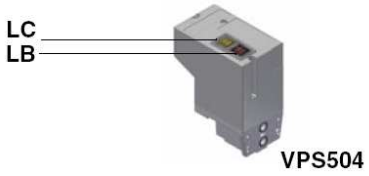
OPERATION

⚠	Before starting up the burner, be sure that the main switch is on and the manual shutoff valves are open, check the pressure value upstream the gas train meets the value quoted on the specifications. be sure that the mains switch is closed. read "warnings" chapter carefully. CAUTION: if the heavy oil is used, be sure the cutoff valves on the delivery and return pipes are OPEN..

- Select the fuel by turning the switch CM on the burner control panel.
- Check that the burner is not locked (LED E lights up); if so, reset it by pressing the reset button N.
- Check that the series of thermostats (or pressure switches) enable the burner to start up.

Gas operation

- Check that the gas pressure in the circuit is high enough (LED I on).
- the gas proving test cycle begins, when the chegking test is performed, the relevant light turns on. When the proving test ends, the burner startup cycle begins: if a gas valve leaks, the gas proving system locks our and light E turns on.
- To unlock press the reset button on the gas proving system for burners provided with VPS504 (LB in the picture), or pressing O button on the control panel, for burners provided with SIEMENS LDU11.



NOTE: for burners provided with VPS504, the prepurge phase starts after the gas proving test comes to a positive end.
- As the prepurge phase must take place with the maximum air flow rate, the control box enables the actuator opening and when the maximum opening position is reached, the pre-purge time counting starts.
- At the end of the pre-purge time, the actuator drives to its complete closeing position (gas ignition position) and when it is reached the ignition trasformer is energised (light C on); the gas valves open.
- Few seconds after the gas valve opening, the ignition transformer is de-energised and light C turns to off.
- The burner is now lighted and the actuator drives to the high flame position; few seconds later, the two-stage operation starts and the burner drives automatically to the low flame or high flame stage according to the plant requirements.
- The low/high flame operation is shown by A/B lights on the mimic panel.

Oil operation

- - As the prepurge phase must take place with the maximum air flow rate, the control box enables the actuator opening and when the maximum opening position is reached, the pre-purge time counting starts.
- At the end of the pre-purge time, the actuator drives to its complete closeing position (gas ignition position) and when it is reached the ignition trasformer is energised (light C on); the oil valves open. Few seconds after the gas valve opening, the ignition transformer is de-energised and light C turns to off.
- The burner is now lighted and the actuator drives to the high flame position; few seconds later, the two-stage operation starts and the burner drives automatically to the low flame or high flame stage according to the plant requirements.
- The low/high flame operation is shown by A/B lights on the mimic panel

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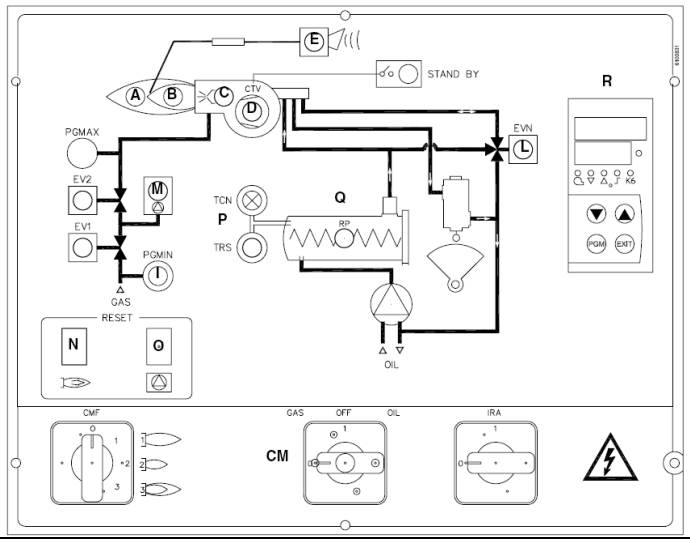
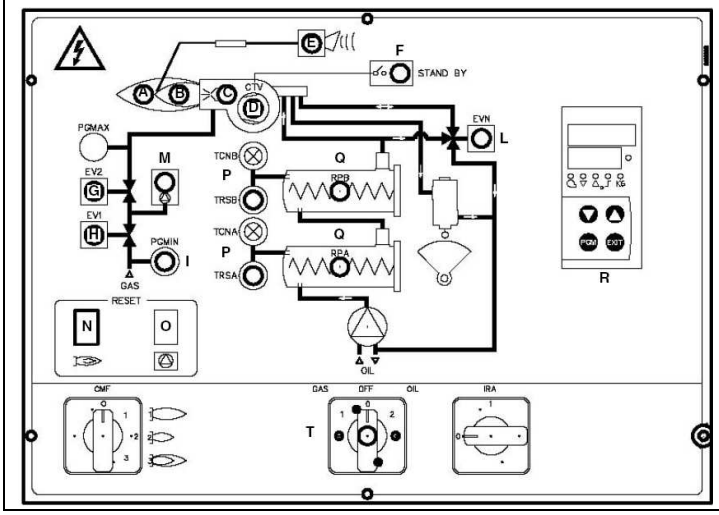
Serie KP9xx



Keys

A	High flame mode indicating light
B	Low flame mode indicating light
C	Ignition transformer operation
D	Fan motor overload tripped intervention
E	Burner lockout iindicationg light
F	Stand-by mode indicating light
G	Gas valve EV2 operation
H	Gas valve EV1 operation
I	Gas pressure switch consent
IRA	Pre-heater resistor switch
L	Oil solenoid valve operation
M	Gas proving system intervention
N	Flame monitor device reset pushbutton
O	Gas proving system device reset pushbutton
P	Pre-heating resistors safety thermostat
Q	Pre-heating oil tank
R	Modulator
CM	Main switch/operation mode Gas / Oil

Serie KR5xx



As far as fully-modulating burners, refer to the burner modulator manual..

PART III: MAINTENANCE

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.

	WARNING: ALL OPERATIONS ON THE BURNER MUST BE CARRIED OUT WITH THE MAINS DISCONNECTED AND THE FUEL MANAUL CUTOFF VALVES CLOSED!
	ATTENTION: READ CAREFULLY THE "WARNINGS" CHAPTER AT THE BEGINNIG OF THIS MANUAL.

ROUTINE MAINTENANCE

1. Clean and examine the gas filter cartridge and replace it if necesssary (see next paragraph).
2. Check and clean the oil filter cartridge; replace it if necessary (see next paragraphs).
3. Examine the condition of the oil flexible hoses and check for possible leaks.
4. Check and clean if necessary the oil heaters and the tank, according to the fuel type and its use; remove the heaters flange fixing nuts and remove the heaters from the tank: clean by using steam or solvents and not metallic things.
5. Clean and examine the filter inside the oil pump. Filter must be thoroughly cleaned at least once in a season to ensure correct working of the fuel unit. To remove the filter, unscrew the four screws on the cover. When reassemble, make sure that the filter is mounted with the feet toward the pump body. If the gasket between cover and pump housing should be damaged, it must be replaced. An external filter should always be installed in the suction line upstream of the fuel unit.
6. Remove and clean the combustion head (page 51).
7. Examine and clean the ignition electrodes, adjust and replace if necessary (see page 51).
8. Examine and clean the detection probe, adjust and replace if necessary (see page 53).
9. Examine the detection current (see page 53).
10. Remove and clean (page 52) the heavy oil nozzle (Important: use solvents for cleaning, not metal utensils) and at the end of the maintenance procedures, after replacing the burner, turn it on and check the shape of the flame; if in doubt replace the nozzle. Where the burner is used intensively it is recommended to replace the nozzle as a preventive measure, at the begin of the operating season.
11. Clean and grease joints and rotating parts.

IMPORTANT:Remove the combustion head before checking the ignition electrodes.

	ATTENTION: when servicing, if it was necessary to disassemble the gas train parts, remember to execute the gas proving test, once the gas train is reassembled, according to the procedure imposed by the law in force.
	CAUTION: avoid the contact of steam, solvent and other liquids with the electric terminals of the resistor. On flanged heaters, replace the seal gasket before refitting it. Periodic inspections must be carried out to determine the frequency of cleaning.

Gas filter maintenance

	ATTENTION: Before opening the filter, close the manual cutoff valve downstream the filter and bleed the gas; check that inside the filter there is no pressurised gas.

To clean or remove the filter, proceed as follows:

1. remove the cap unscrewing the fixing screws (A);
2. remove the filtering cartridge (B), clean it using water and soap, blow it with compressed air(or replace it, if necessary)
3. replace the cartridge in its proper position taking care to place it inbetween the guides as not to hamper the cap replacement;
4. be sure to replace the "O" ring into its place (C) and replace the cover fastening by the proper screws (A).

A

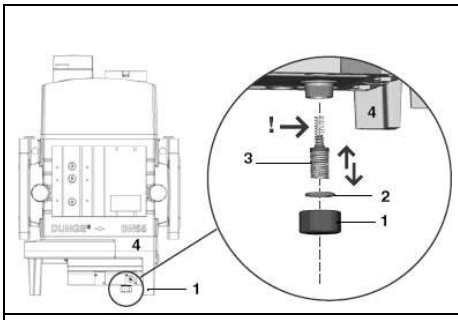
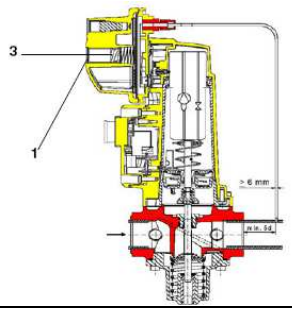
B

C

Replacing the spring in the gas valve group

To replace the spring in the gas valve group,proceed as follows:

1. Carefully twist the protection cap 1 and the O-ring 2.
2. Remove the “set value” spring 3 from housing 4.
3. Replace spring 3.
4. Carefully insert the new “set value” spring. Pay attention to mount properly. First insert the spring part with smaller diameter in the housing.
5. Place O-ring 2 in protective cap 1. Screw in the protective cap with the O-ring in it.
6. Stick the adhesive label for spring identification on the type plate.

	
DUNGS MBC..SE	***SKP Siemens actuator***

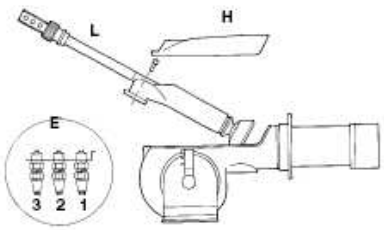
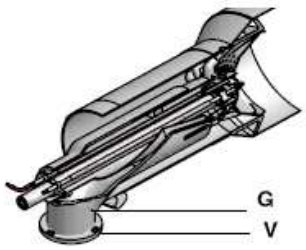
Self-cleaning filter

Fitted on burners for oil viscosity > 110 cSt (15 °E) at 50 °C. Periodically turn the knob to clean the filter	

Removing the combustion head

1. Remove the cover H.
2. Slide the photocell out of its housing, disconnects the electrodes cables and the oil flexible hoses.
3. Unscrew the V screws that block the gas collector G, loosen the three joints E and remove the ass.y as shown on the following picture.
4. Clean the combustion head by means fo a vacuum cleaner; scrape off the scale by means fo a metallic brush .

Note: to remount the burner, floow the same procedure in the reversed order.

		*Keys* 1 Inlet 2 Return 3 Gun opening E Oil piping connections G Gas manifold H Cover L Oil gun V Screws

Removing the oil gun, replacing the nozzle and the electrodes

	ATTENTION: avoid the electrodes to get in touch with metallic parts (blast tube, head, etc.), otherwise the boiler operation would be compromised. Check the electrodes position after any intervention on the combustion head. Check that the nozzles is placed according to Fig. 17).

To remove the oil gun, proceed as follows:

1. remove the combustion head as described on the prevoius paragraph;
2. loosen the VL screw and remove the oil gun and the electrodes: check the oil gun, replace it if necessary;
3. after removing the oil gun, unscrew the nozzle and replace it if necessary;
4. in order to replace the electrodes, unscrew the VE fixing screws and remove them: place the new electrodes being careful to observe the measures shown on : reassemlbe following the reversed procedure.

	**Caution**: adjust the nozzle position according to the air pipe, by means of the VU screw, ance the VL screw is fastened).

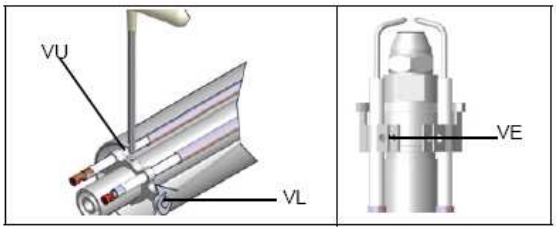
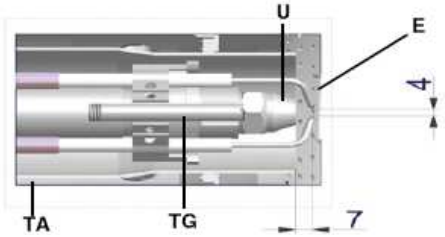


Fig. 17

Adjusting the electrodes and nozzle position

Adjust the electrodes position, according to the quotes shown in the next picture.



Keys
E electrodes
TA air pipe
TG gas ignition pipe
U nozzle

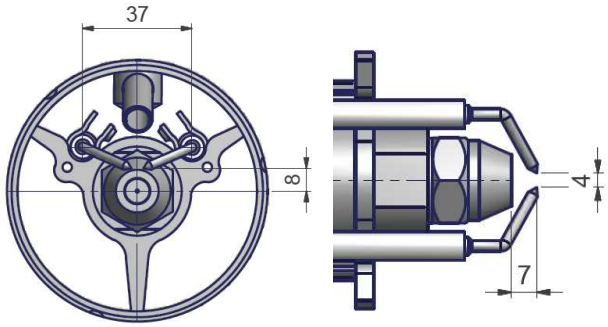


Fig.18

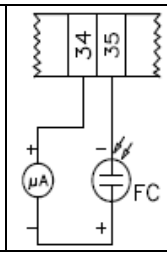
Cleaning and replacing the detection photocell

To clean/replace the detection photocell, proceed as follows:
1. Disconnect the system from the electrical power supply.
2. Shut off the fuel supply
3. remove the photocell from its slot (see next figure);
4. clean the bulbe if dirty, taking care not to touch it with bare hands;
5. if necessary, replace the bulb;
6. replace the photocell into its slot.

Checking the detection current

To check the flame itensity signal, follow the diagram shown on the next picture. If the measured value is lower than the suggested one, check the probe position, the electrical contacts. Replace the probe if necessary.

Control box: Siemens LFL1.3../LME7x
Minimum detection signal: 70µA



Seasonal stop

To stop the burner in the seasonal stop, proceed as follows:
- turn the burner main switch to 0 (Off position)
- disconnect the power mains
- close the fuel valve of the supply line

Burner disposal

In case of disposal, follow the instructions according to the laws in force in your country about the “Disposal of materials”.

WIRING DIAGRAMS

WARNING:
1 - Electrical supply 400V 50Hz 3N a.c.
2 - Don’t reverse phase with neutral
3 - Ensure to the burner a proper earthing

See the attached wiring diagrams.
WIRING DIAGRAM (KP91A-92A-93A-KR512A) – SE05-706 (Progressive)
WIRING DIAGRAM (KP91A-92A-93A-KR512A) – SE05-709 (Fully-modulating)
WIRING DIAGRAM (KR515A – KR520A) - SE11-316 (Progressive)
WIRING DIAGRAM (KR515A – KR520A) - SE11-360 (Fully-modulating)

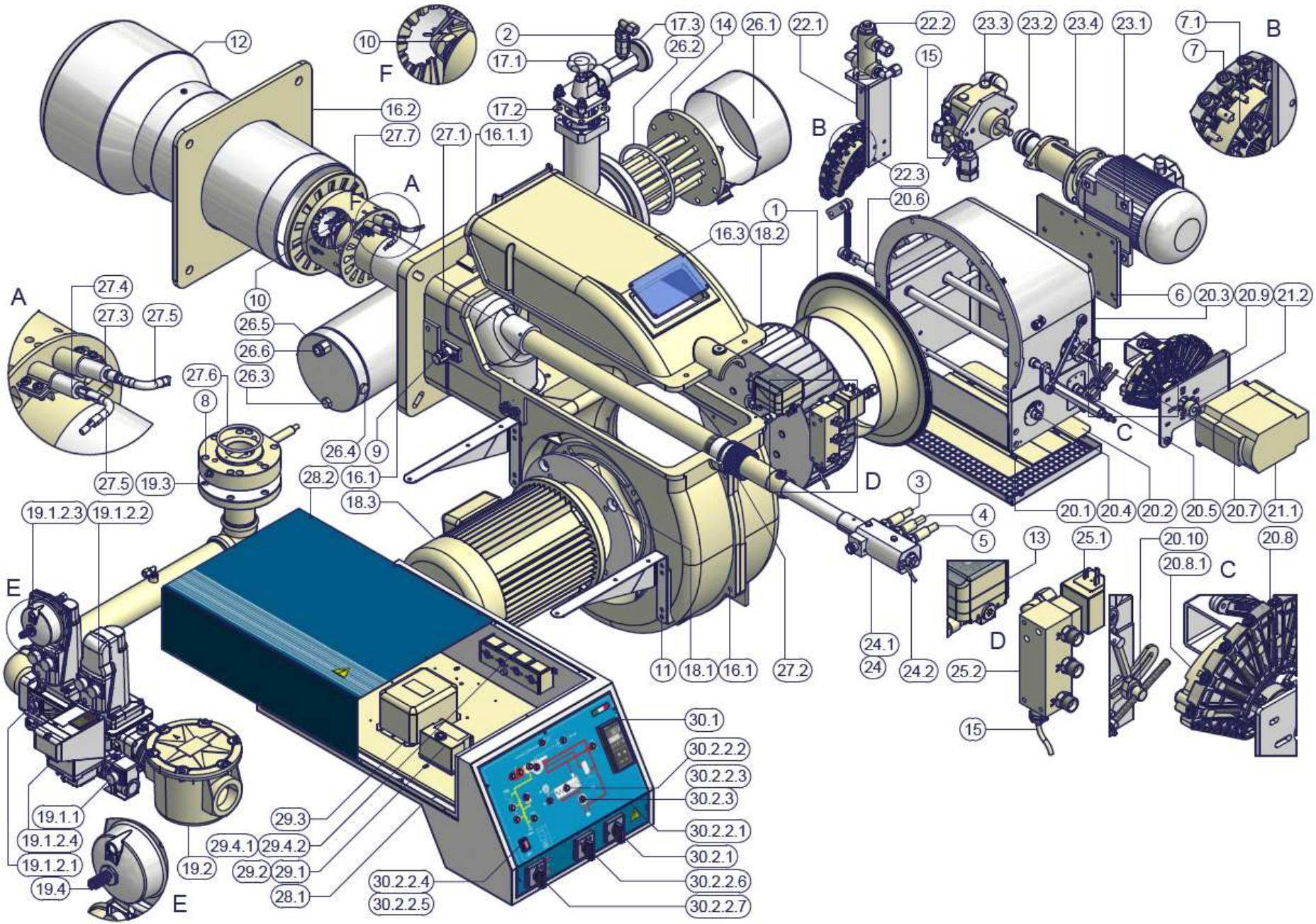
BURNER EXPLODED VIEW
KP9xx

POS.	DESCRIZIONE
1	AIR INLET CONE
2	GAS BLEEDING VALVE
3	OIL FLEXIBLE HOSE
4	OIL FLEXIBLE HOSE
5	OIL FLEXIBLE HOSE
6	PLATE
7	ADJUSTING CAM
7.1	ADJUSTING CAM FOIL
8	BUTTERFLY GAS VALVE
9	PHOTOCELL
10	NOZZLE
11	BRACKET
12	BLAST TUBE
13	AIR PRESSURE SWITCH
14	RESISTOR
15	RESISTOR
16.1	BURNER HOUSING
16.1.1	COVER
16.2	GENERATOR GASKET
16.3	INSPECTION GLASS
17.1	OIL FILTER
17.2	GASKET

POS.	DESCRIZIONE
17.3	THERMOMETER
18.1	MOTOR MOUNTING FLANGE
18.2	FAN WHEEL
18.3	MOTOR
19.1.1	GAS PRESSURE
19.1.2.1	GAS VALVE BODY
19.1.2.2	SKP ACTUATOR
19.1.2.3	SKP ACTUATOR
19.1.2.4	GAS PROVING SYSTEM
19.2	GAS FILTER
19.3	GASKET
19.4	SKP PRESSURE GOVERNOR SPRING
20.1	AIR INTAKE DAMPER
20.2	AIR INTAKE DAMPER
20.3	AIR INTAKE
20.4	LOUVER SHAFT
20.5	LOUVER SHAFT
20.6	PIN
20.7	ADJUSTING CAM SHAFT
20.8	ADJUSTING CAM
17.3	THERMOMETER
18.1	MOTOR MOUNTING FLANGE

POS.	DESCRIZIONE
20.8.1	ADJUSTING CAM FOIL
20.9	BRACKET
20.10	AIR LOUVER LEVERAGE
21.1	ACTUATOR
21.2	CONNECTOR
22.1	OIL GOVERNOR CYLINDER
22.2	PRESSURE GOVERNOR
22.3	BRACKET
23.1	MOTOR
23.2	COUPLING
23.3	PUMP
23.4	BRACKET
24	STANDARD COMPLETE OIL GUN
24.1	COMPLETE OIL GUN
24.2	RESISTOR
25.1	SOLENOID VALVE
25.2	OIL MANIFOLD
26.1	COVER
26.2	O RING
26.3	PLUG
26.4	PLUG
26.5	OIL PRE-HEATER

POS.	DESCRIZIONE
27.5	IGNITION CABLE
27.6	O RING
27.7	COMBUSTION HEAD
28.1	BOARD
28.2	COVER
29.1	CONTROL BOX
29.2	CONTROL BOX SOCKET
29.3	IGNITION TRANSFORMER
29.4.1	THERMOSTAT
29.4.2	THERMOSTAT
30.1	OUTPUT CONTROLLER
30.2.1	SWITCH
30.2.2.1	FRONT CONTROL PANEL
30.2.2.2	LIGHT
30.2.2.3	LIGHT
30.2.2.4	PROTECTION
30.2.2.5	FLAME UNLOCK BUTTON
30.2.2.6	SWITCH
30.2.2.7	SWITCH
30.2.3	LIGHT


12
10
F
2
17.1
17.3
14
26.2
26.1
22.1
22.2
23.3
23.2
23.4
23.1
7.1
7
B
15
16.2
27.7
17.2
27.1
16.1.1
A
F
B
22.3
20.6
1
16.3
18.2
A
27.4
27.3
27.5
10
26.5
26.6
26.3
27.6
8
6
20.3
20.9
21.2
C
26.4
9
28.2
16.1
18.3
27.5
19.3
D
3
4
5
20.1
20.4
20.2
20.5
20.7
21.1
19.1.2.3
19.1.2.2
E
13
25.1
20.10
20.8.1
20.8
C
D
24.1
24
24.2
25.2
15
11
18.1
16.1
27.2
30.1
30.2.2.2
30.2.2.3
30.2.3
30.2.2.1
30.2.1
30.2.2.6
30.2.2.7
29.3
29.4.1
29.4.2
29.2
29.1
28.1
30.2.2.4
30.2.2.5
19.1.1
19.1.2.4
19.1.2.1
19.4
19.2
E

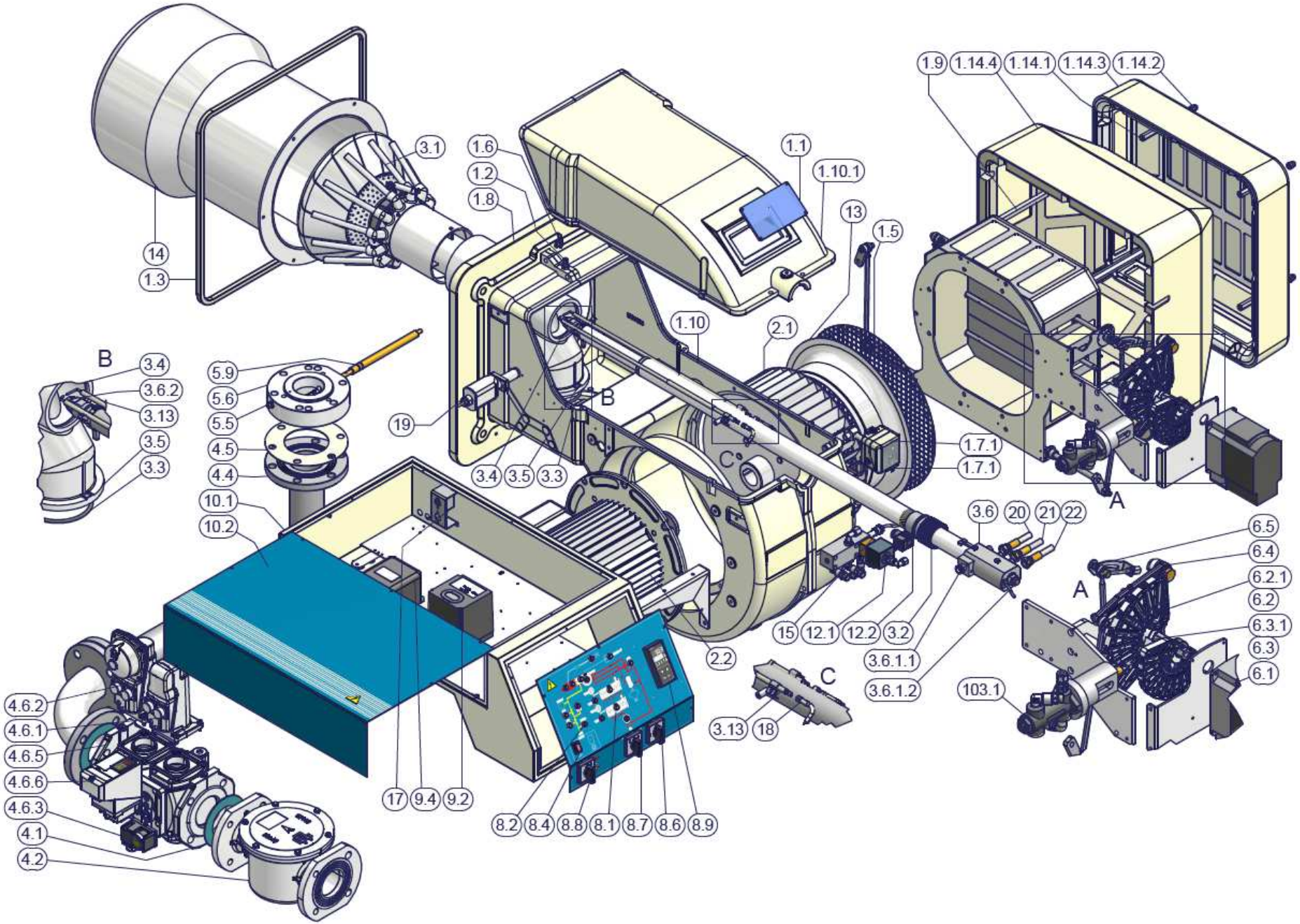
KR5xx

POS.	DESCRIZIONE
1.1	INSPECTION GLASS
1.2	INLET
1.3	CERAMIC FIBRE ROPE
1.5	NET
1.6	PRESSURE PLUG
1.7.1	AIR PRESSURE SWITCH
1.8	FLANGE
1.9	AIR INTAKE DAMPER
1.10	BURNER HOUSING
1.10.1	COVER
1.14.1	SPACER
1.14.3	SILENCER
1.14.4	SILENCER
2.1	FAN WHEEL
2.2	MOTOR
3.1	STANDARD COMBUSTION HEAD
3.5	GAS MANIFOLD
3.2	RING NUT
3.3	O RING
3.4	O RING

POS.	DESCRIZIONE
3.6	STANDARD COMPLETE OIL GUN
3.6.1.2	RESISTOR
3.6.1.1	
3.6.2	NOZZLE
3.13	IGNITION ELECTRODE
4.1	GASKET
4.2	GAS FILTER
4.4	REVERSIBLE PIPE
4.5	GASKET
4.6.1	SKP ACTUATOR
4.6.2	SKP ACTUATOR
4.6.3	GAS PRESSURE
4.6.5	GAS VALVE BODY
4.6.6	GAS PROVING SYSTEM
5.5	PRESSURE PLUG
5.6	BUTTERFLY GAS VALVE
5.9	O RING
6.1	ACTUATOR
6.2	ADJUSTING CAM
6.2.1	ADJUSTING CAM FOIL

POS.	DESCRIZIONE
6.3	ADJUSTING CAM
6.3.1	ADJUSTING CAM FOIL
6.4	LEVERAGE
6.5	CAM
8.1	LIGHT
8.2	LIGHT
8.4	FLAME UNLOCK BUTTON
8.6	SWITCH
8.7	SWITCH
8.8	SWITCH
8.9	OUTPUT CONTROLLER
9.2	CONTROL BOX
9.4	IGNITION TRANSFORMER
11.1	PRESSURE GOVERNOR
12.1	SOLENOID VALVE
12.2	CONNECTOR
10.1	BOARD
10.2	COVER
13	AIR INLET CONE
14	STANDARD BLAST TUBE

POS.	DESCRIZIONE
15	RESISTOR
17	THERMOSTAT
18	IGNITION CABLE
19	PHOTOCELL
20	FLEXIBLE HOSE
21	FLEXIBLE HOSE
22	FLEXIBLE HOSE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3.6.1.2
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3.13
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4.6.5
4.6.6
4.6.3
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4.2
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9.4
9.2
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8.4
8.8
8.1
8.7
8.6
8.9

TROUBLESHOOTING

CAUSE	TROUBLE										
	THE BURNER DOESN'TSTART	CONTINUE WITH PRE-PURGE	DOESN'T START AND LOCK-OUT	DOESN'T START AND REPEATS THE CYCLE	STARTS AND REPEATS THE CYCLE	STARTS AND LOCKS OUT	THE FLAME MONITOR DEVICE DOESN'T GIVE CONSENT TO START	DOESN'T SWITCH TO HIGH FLAME	DOESEN'T RETURN IN LOW FLAME	LOCK-OUT DURING OPERATION	TURNS OFF AND REPEAT CYCLE DURING OPERATION
MAIN SWITCH OPEN	●										
LACK OF GAS	●			●							
MAXIMUM GAS PRESSURE SWITCH DEFECTIVE	●		●								
THERMOSTATS/PRESSURE SWITCHES DEFECTIVES	●			●							●
OVERLOAD TRIPPED	●										
AUXILIARIES FUSE INTERRUPTED	●										
CONTROL BOX	●	●	●			●				●	
DEFECTIVE ACTUATOR	●	●	●								
AIR PRESSURE SWITCH FAULT OR BAD SETTING	●					●	●			●	
MINIMUM GAS PRESSURE SWITCH DEFECTIVE OR GAS FILTER DIRTY	●			●	●		●				●
IGNITION TRANSFORMER FAULT			●								
IGNITION ELECTRODES BAD POSITION			●								
BUTTERFLY VALVE BAD SETTING			●			●					
DEFECTIVE GAS GOVERNOR			●	●	●						●
GAS VALVE DEFECTIVE			●								
BAD CONNECTION OR DEFECTIVE HIGH/LOW FLAME THERMOSTAT OR PRESSURE SWITCH								●	●		
WRONG SETTING OF ACTUATOR CAM							●	●	●		
UV PROBE DIRTY OR DEFECTIVE			●			●				●	

SIEMENS LFL 1.3.. control BOX

Automatic programme in the event of interruption and indication of position when interrupted

By default, in the event of any kind of interruption, the flow of fuel is immediately interrupted. At the same time the programmer stops and this indicates the position at the time of the interruption.

A symbol on the indicator disc shows each time the type of stoppage:

◀ No start-up (for example fault in the CLOSED signal for the limit contact "Z" at terminal 8 or some other contact between the terminals 12 and 4 or 4 and 5 is not closed)

▲ Start-up suspended because of a fault in the OPEN signal for the limit contact "A" at terminal 8.

P Block due to absence of air pressure signal. From this moment onwards any absence of air pressure will cause a block.

■ Block due to malfunction of the flame detector circuit.

▼ Start-up interrupted because there is a fault in the MINMUM signal for the auxiliary contact of the damper servo motor at terminal 8.

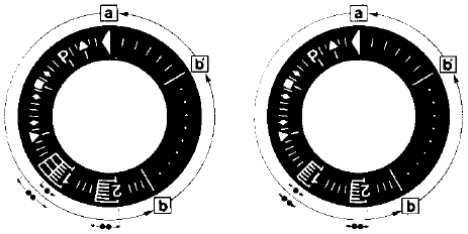
1 Block due to absence of flame signal at the end of the 1st safety period.

From this moment onwards any absence of a flame signal will cause a block.

2 Block due to absence of flame signal at the end of the 2nd safety period (flame signal of main burner).

▮ Block due to absence of flame signal or air pressure during operation.

Where a block stoppage occurs at any moment between switch on and pre-ignition without registering any symbol, the cause is normally an unscheduled flame signal.



a-b Startup program
b-b' For time variants:move the programmer on to the automatic stop after the burner starts up (b' = position of the programmer during normal burner operation).
b(b')-a Post-ventilation programme after a regulation stop.At the start-up position "a" the programmer stops automatically.
* Safety time duration for mono-tube burners
** Safety time duration for twin-tube burners
The apparatus can be reset immediately after a block. After resetting (and after the elimination of any problem causing the stoppage or after a power failure) the programmer returns to its start-up position. In this event only the terminals 7, 9, 10 and 11 are live in accordance with the monitoring programme. Only after this the device programs a new startup

Operation

The wiring system and also the control system of the programmer "P" have already been given in this manual. The response signals required for the active parts and the flame monitor circuit are shown by a hatching.
In the absence of these response signals the mechanism interrupts the start-up programme; the exact time of the interruption can be identified from the visual indicator and will cause a block if the safety code requires it.
A consent to start-up by means of the thermostat or pressostat "R"
A-B start-up program
B-C normal burner operation
C regulation stop caused by "R"
C-D programmer returns to start-up position A.
During the regulation stop only terminals 11 and 12 are live and the damper, through the limit contact "Z" of its servo-motor is in the CLOSED position.The flame detector circuit F is activated (terminals 22 and 23 or 23/4) for the detector test and the paracitic light test. Where the burners do not have dampers (or have an independent 00 damper control mechanism) there must be a bridge between terminals 6 and 8, otherwise the mechanism will not start up the burner.
For a burner to start up the following conditions must be met:
Mechanism not blocked/reset.
Damper closed.Limit contact switchZ must be in the CLOSED position and allow current to flow between terminals 11 and 8.
Any contacts checking that the fuel valve (bv...) is closed, or other contacts with similar functions, must be closed between terminal 12 and the air pressostat LP.
The contact for the air pressostat LP must be in the off position (LP test) so as to feed terminal 4.
The gas pressostat contacts GP and the safety thermostat and pressostat contacts W must also be closed.

Start-up program
A Start-up
(R closes the start-up control ring between terminals 4 and 5)
The programmer starts up.At the same time the ventilator motor is fed through terminal 6 (only for pre-ventilation) and, after t7, the ventilator motor or the combustion gas exhaust fan is fed through terminal 7 (pre-ventilation and post-ventilation).
At the end of t16, the command opening the damper passes through terminal 9; during the damper opening time the programmer does not move since terminal 8, through which the programmer is fed, is dead.
Only once the damper is fully open and the limit contact switch A has switched on, feeding terminal 8, does the programme proceed.
t1 Pre-ventilation time with damper fully open (nominal air flow).
Shortly after the beginning of the pre-ventilation time, the air pressostat should switch off the current between terminals 4 and 13;otherwisethe apparatus would block (air pressure monitor).
At the same time the terminal 14 should be live since current feeding the ignition transformer and the fuel valves passes through this circuit.
During pre-ventilation time the flame detector circuit is checked and in the event of an operational defect the monitor brings about a block.
At the end of the pre-ventilation time the monitor automatically moves the damper servo-motor, through terminal 10, to the flame ignition position which is governed by the auxiliary contact "M".
During this period the programmer stops until terminal 8, is again activatedthrough contact "M".
After a few seconds the little programmer motor is directly fed by the active part of the apparatus.
After this point terminal 8 plays no further part in the burner ignition process.

Mono-tube burner

3 Pre-ignition time waiting the response from the fuel valve at terminal 18.
t2 Safety time (start up flame strenght); at the end of the safety time a flame signal should appear at terminal 22 of the amplifier and it should stay on until a regulation stop; if this does not happen the mechanism will block.
t4 Interval; at the end of t4, terminal 19 is live.
t5 Interval At the end of t5 terminal 20 is live.At the same time the monitor outlets from 9 and 11 and terminal 8 into the active part of the apparatus are kept galvanically separatedso as to protect the monitor itself from recovery voltage through the capacity regulator circuit.

Twin-tube burners (**)

t3 Preignition time until the all clear to the pilot burner valve at
terminal 17.
t2 First safety time (pilot flame strenght); at the end of the safety time a flame signal should appear at terminal 22 of the

amplifier and it should stay on, until a regulation stop; if it does not, the apparatus will block.
t4 Interval until the consent to the fuel valve at terminal 19, for the first flame of the main burner.
t9 2nd safety time; at the end of the second safety time the main burner should be lit by means of the pilot. At the end of this period, terminal 17 is dead and therefore the pilot burner will be out.
t5 Interval; at the end of t5 terminal 20 is live. At the same time the monitor outlets from 9 to 11 and the terminal 8at the input of the active part of the apparatus are galvanically separated so as to protect the apparatus itself from recovery voltage through the strenght regulator circuit.
When the strenght regulator LR at terminal 20 gives the consent, the start-up programme for the apparatus comes to an end. Depending on time variants, the programmer stops either immediately or at the end of a set time, without effecting the position of the contacts.
B Operational position of the burner
B-C Burner operation (production of heat)
While the burner is working the strnght regulator controls the damper, according to the demand for heat, by means of the positioning at nominal load of the auxiliary contact "V" of the damper servocontrol.
C Regulation stop for operation of "R"
When there is a regulation stop the fuel valves immediately close. At the same time the programmer starts to programme:
t6 Post-ventilation time (post-ventilation with the ventilator "G" at terminal 7).Shortly after beginning of the post-ventilation time terminal 10 becomes live and moves the damper to the "MIN" position. The full closure of the damper only happens towards the end of the post-ventilation time and is prompted by an automatic signal from terminal 11
t13 Admissible post-ignition time
During this time the flame monitor circuit may still receive a flame signal without the apparatus blocking.
D-A End of automatic programme
At the end of t6, at the point where the programmer and the automatic contacts have reverted to the starter position, the detection probe test restarts.
During an operational stop even an unscheduled flame signal lasting a few seconds can cause a block because during this period an NTC in the circuit acts as retarder.This means that brief unscheduled influences cannot cause a block.
(**) Times t3, t2 and t4 only apply only to safety devices in the series 01.

Specifications

Mains voltage 220V -15%...240V +10%
Frequency 50Hz -6%...60Hz +6%
Absorbed capacity 3.5 VA
Built-in fuse T6.3/250E slow action DIN41571 No. 451915070
External fuse max. 16A
Interference N-VDE0875
Flow permitted at terminal 1 5A (DIN 0660 AC3)
Flow permitted at control terminals
4A (DIN 0660 AC3)
Flow at monitor contacts:
input at terminals 4 & 5 1A, 250V
input at terminals 4 & 11 1A, 250V
input at terminals 4 & 14 function of the load at terminals 16 and 19, min.1A, 250V
Emplacement Any
Protection IP40
Permitted ambient temp -20...+60° C
Min.temperature (trans/storage) -50° C
Weight:
apparatus approx. 1,000g.
base approx. 165g.

Ionisation monitor

voltage in detector electrode
normal working 330V ±10%
test 380V ±10%
short circuit current max. 0,5 mA
Ionisation current, min.request 6 µA
max. permitted length for connecting cables
normal cable (laid separately**) 80m
armoured cable(high frequency) protection at terminal 22
140m
UV monitor
Voltage in UV detector
normal working 330V ±10%
test 380V ±10%
Detector current, min. request* 70µA
Max. detector current
normal working 630 µA
test 1300 µA
Max.length of connecting cable
normal cable (laid separately**) 100m
armoured cable (high frequency) protected at terminal 22
200m
Weight
QRA2 60 g
QRA10 450 g.
*Connect up in parallel to the measuring device a condenser 100µF, 10...25V.
** The wire connecting up the detector electrode should not be in the same sleeve as the other conductor wires.
Ignition spark monitor with QRE1 series 02 detector
Minimum detector current 30µA

Operating times

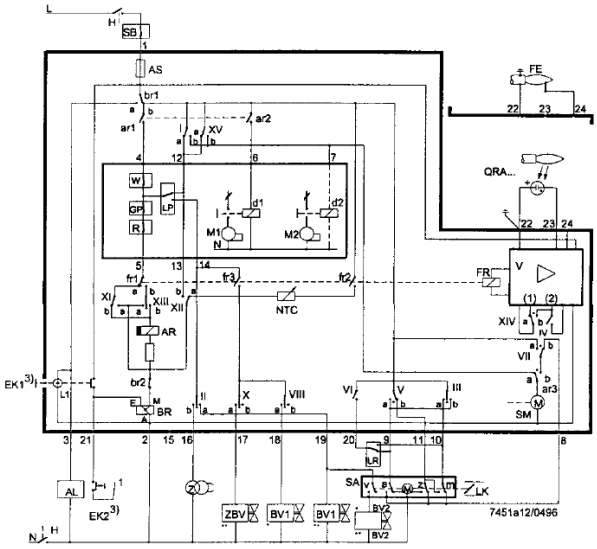
t7 initial delay for ventilator G2 2
t16 initial delay of air damper OPEN consent 4
t11 opening time for damper any
t10 initial delay for air pressure monitor 8
t1 pre-ventilation time with damper open 36
t12 travel time for air damper to MIN position any
t3 t3' pre-ignition time t3 4
t3 '-
t2 t2' safety time (1st safety time for burners with intermittent pilot lighter t2 2
t2 '-
t4 t4' interval between start of t2 and response to valve at terminal 19
t4 10
t4 '-
t9 2nd safety time for burners with intermittent pilot lighter 2
t5 interval between end of t4 and response at terminal 20 10
t20 interval before programmer cuts out after start-up -
duration of start-up 60
t6 post-ventilation time (G2 only) 12
t13 permitted post-ignition time 12
t16 initial delay from opening consent of the air damper
t20 interval until the automatic shut-off of the programming mechanism after the burner start

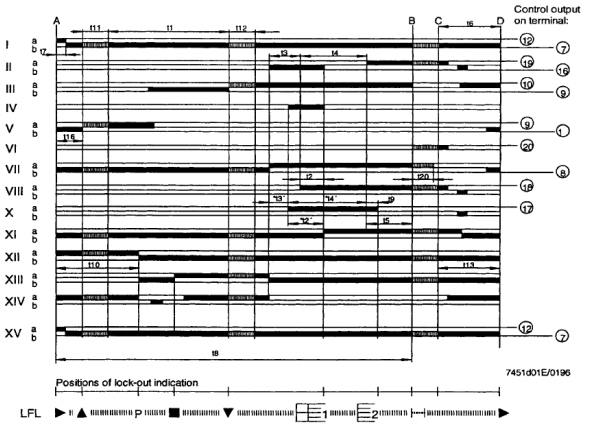
Key

A limit contact switch for damper OPEN position
AI block remote signal
AR main relay (working network) with contacts "ar"
AS Monitor fuse
BR block relay with "br" contacts
BV fuel valve
EK reset button
FE detector electrode of ionisation circuit
FR flame relay with "fr" contacts
G ventilator motor or burner motor
GP gas pressure switch
H main interruptor switch
L block stoppage LED
LK air damper
LP air pressostat
LR safety regulator
M auxiliary contact switch for damper "MIN" position
QRA UV detector
QRE ignition spark detector
R thermostat or pressostat
S fuse
SA damper servo-motor
SM synchronous programmer motor
V flame signal amplifier
V in case of servo-motor: auxiliary contact for response to fuel

valve with regard of damper position
W safety pressostat or thermostat
Z ignition transformer
Z in case of servomotor: end of limit contact switch for damper CLOSED position
ZBV pilot burner fuel valve
* for mono-tube burners
** for twin-tube burners

(1) input for raising QRA detector voltage to test level
(2) input for excitation of flame relay during flame detector test circuit (contact XIV) and during safety time (contact IV)
(3) Do not press EK for more than 10 seconds
Programmer diagram
t1 pre-ventilation time
t2 safety time
*t2 '1st safety time
t3 pre-ignition time
*t3 'pre-ignition time
t4 interval for creating current between terminals 18 and 19
*t4 'interval for creating current between terminals 17 and 19
t5 interval for creating current between terminals 19 and 20
t6 post-ventilation time
t7 interval between startup consent and current created at terminal 7
t8 duration of start-up
*t9 2nd safety time
t10 interval before air pressure monitoring begins
t11 damper opening travel time
t12 damper closure travel time
t13 permissible post-combustion time
t16 initial delay of damper OPEN response
t20 interval before programmer automatically stops
*These times are valid with the use of a series 01 safety device for monitoring burners with intermittent pilot lighter.





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