KTP90A - KTP91A
KTP92A - KTP93A
KTP512A - KTP515A
KTP520A - KTP525A

Progressive and fully-modulating gas - heavy oil burners

MANUAL OF INSTALLATION - USE - MAINTENANCE

CIB UNIGAS

BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

M039221CA Rev. 0 08/2008

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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 90/396/CEE - Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/CEE 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/CEE 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/CEE 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 :

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Gas - Light oil burners

European directives:

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National standards :

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

PART I: INSTALLATION MANUAL

Burner model identification

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

Type **KTP91A** Model **MN. PR. S. *. A. 1. 50** (1) (2) (3) (4) (5) (6) (7) (8)	
(1) BURNER TYPE	**KTP90A - KTP91A - KTP92A - KTP93A - KTP512A - KTP515A - KTP520A - KTP525A**
(2) FUEL	N - Heavy oil, standard viscosity <= 7° E @ 50° C D - Heavy oil, high viscosity <= 50° E @ 50° C E - Ecological heavy oil, viscosity between 7°E and 15°E @ 50° C
(3) OPERATIONAvailable versions	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 Gas valves + gas proving systeml 8 = 2 Gas valves + gas proving system + gas leakage pressure switchl
(8) GAS CONNECTION	50 = Rp2 65 = DN65 80 = DN80 100 = DN100

Specifications

BURNERS		**KTP90A**	**KTP91A**	**KTP92A**	**KTP93A**
Output	min. - max. kW	320 - 2300	480 - 2670	480-3050	550 - 4100
Fuel		Natural gas - Heavy oil			
Gas category		(see next paragraph)			
Oil viscosity	°E @ 50 °C	50 max			
Gas rate	min. - max. (Stm^3/h)	34 - 243	51 - 283	51 - 323	58 - 434
Gas pressure	min. - max. mbar	(Note2)			
Heavy oil rate	min. - max. kg/h	28 - 205	43 - 238	43 - 272	49 - 365
Power supply		230V 3~ / 400V 3N~ 50Hz			
Total power consumption	kW	13.6	19.6	19.6	25.6
Pump motor	kW	1.1			
Pre-heating resistors	kW	12	18	18	24
Protection		IP40			
Operation		Progressive - Fully modulating			
Gas Train 50	Valves size / Gas connection	2” / Rp 2			
Gas Train 65	Valves size / Gas connection	2” 1/2 / DN65			
Gas Train 80	Valves size / Gas connection	3” / DN80			
Gas Train 100	Valves size / Gas connection	4” / DN100			
Operating temperature	°C	-10 ÷ +50			
Storage temperature	°C	-20 ÷ +60			
Working service*		Intermittent			

BURNERS		KTP512A	KTP515A	KTP520A	KTP525A
Output	min. - max. kW	600 - 4500	770 - 5200	1000 - 6400	2000 - 9750
Fuel		Natural gasHeavy oil			
Gas category		(see next paragraph)			
Oil viscosity	°E @50 °C	50 max			
Gas rate	min. - max. Stm^3/h	63 - 476	81 - 550	106 - 677	212 - 1032
Gas pressure	min. - max. mbar	(Note2)			
Heavy oil rate	min. - max. kg/h	53 - 401	69 - 463	89 - 570	178 - 869
Power supply		230V 3~ / 400V 3N ~ 50Hz			400V 3N ~ 50Hz
Total power consumption	kW	24	32	44.7	52.5
Pump motor	kW	1.5	1.5	2.2	4
Pre-heating resistors	kW	24	30	42	48
Protection		IP40			
Operation		Progressive - Fully modulating			
Gas Train 50	Valves size/Gas connection	2" / Rp 2			
Gas Train 65	Valves size / Gas connection	2" 1/2 / DN65			
Gas Train 80	Valves size / Gas connection	3" / DN80			
Gas Train 100	Valves size / Gas connection	4" / DN100			
Operating temperature	°C	-10 ÷ +50			
Storage temperature	°C	-20 ÷ +60			
Working service*		Intermittent			

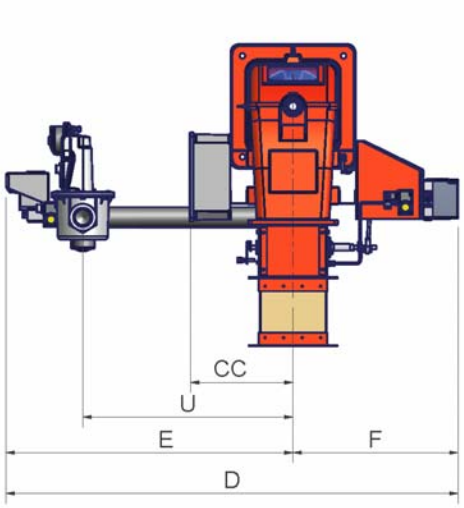
Note1:	**All gas flow rates are referred to Stm^3/h (1013 mbar absolute pressure, 15 °C temperature) and are valid for G20 gas (nett calorific value H_i = 34.02 MJ/Stm^3).**
Note2:	**Maximum gas pressure = 500mbar (with Siemens VGD.. gas valves / MBC.. gas valves).** **Minimum gas pressure = see gas curves.**

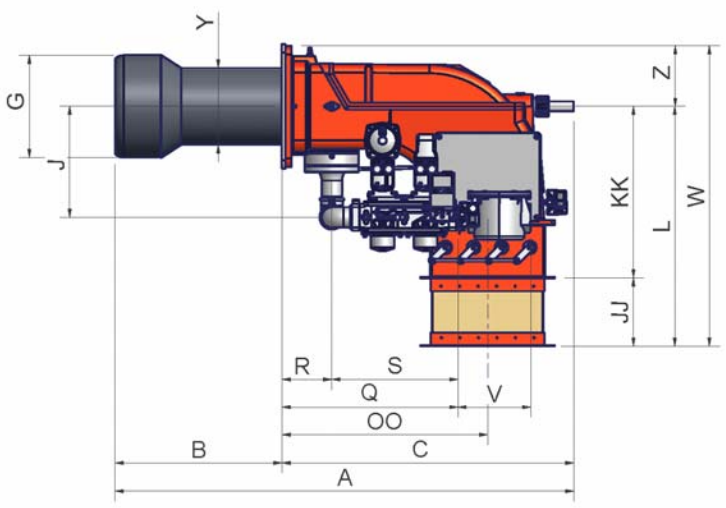
*** NOTE ON THE BURNER WORKING SERVICE:** for safety reasons, one controlled shutdown must be performed every 24 hours of continuous operation.

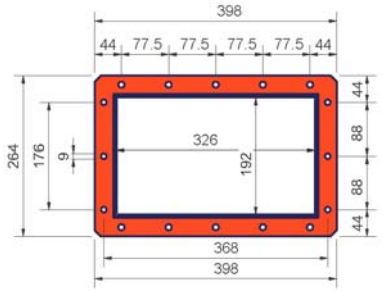
Country and usefulness gas categories

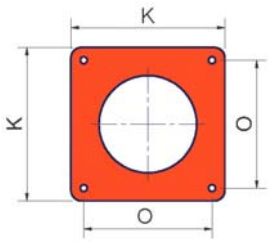
GAS CATEGORY	COUNTRY																								
I_{2H}	AT	ES	GR	SE	FI	IE	HU	IS	NO	CZ	DK	GB	IT	PT	CY	EE	LV	SI	MT	SK	BG	LT	RO	TR	CH
I_{2E}	LU	PL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
$I_{2E(R)B}$	BE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I_{2L}	NL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I_{2ELL}	DE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I_{2Er}	FR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Overall dimensions (mm)

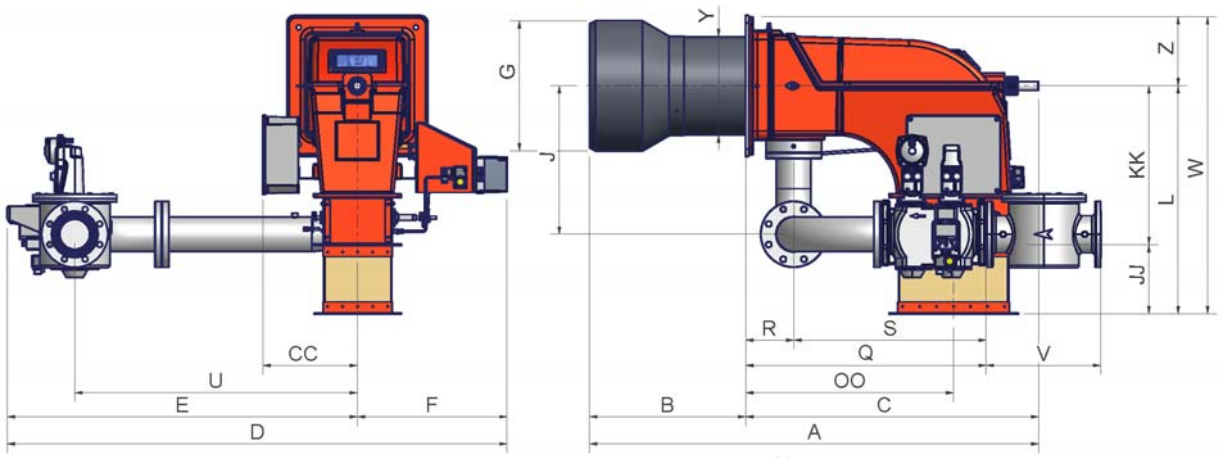


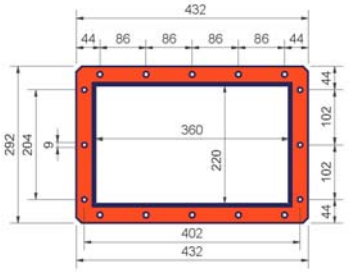




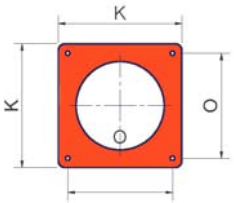


	DN	A	B	C	CC	D	E	F	G	H	J	JJ	K	KK	L	M	N	O	OO	P	Q	R	S	U	V	W	Y	Z
KTP90A	50	1356	490	866	305	1342	852	490	234	264	329	185	360	510	695	M14	424	300	610	300	522	148	374	624	216	875	198	180
KTP90A	65	1356	490	866	305	1447	957	490	234	264	288	185	360	510	695	M14	424	300	610	300	551	148	403	750	293	875	198	180
KTP90A	80	1356	490	866	305	1449	959	490	234	264	307	185	360	510	695	M14	424	300	610	300	592	148	444	750	322	875	198	180
KTP90A	100	1356	490	866	305	1539	1049	490	234	264	447	185	360	510	695	M14	424	300	610	300	672	148	524	824	382	875	198	180
KTP91A	50	1356	490	866	305	1342	852	490	265	295	329	185	360	510	695	M14	424	300	610	300	522	148	374	624	216	875	228	180
KTP91A	65	1356	490	866	305	1447	957	490	265	295	288	185	360	510	695	M14	424	300	610	300	551	148	403	750	293	875	228	180
KTP91A	80	1356	490	866	305	1449	959	490	265	295	307	185	360	510	695	M14	424	300	610	300	592	148	444	750	322	875	228	180
KTP91A	100	1356	490	866	305	1539	1049	490	265	295	447	185	360	510	695	M14	424	300	610	300	672	148	524	824	382	875	228	180
KTP92A	50	1356	490	866	305	1342	852	490	269	299	329	185	360	510	695	M14	424	300	610	300	522	148	374	624	216	875	228	180
KTP92A	65	1356	490	866	305	1447	957	490	269	299	288	185	360	510	695	M14	424	300	610	300	551	148	403	750	293	875	228	180
KTP92A	80	1356	490	866	305	1449	959	490	269	299	307	185	360	510	695	M14	424	300	610	300	592	148	444	750	322	875	228	180
KTP92A	100	1356	490	866	305	1539	1049	490	269	299	447	185	360	510	695	M14	424	300	610	300	672	148	524	824	382	875	228	180
KTP93A	50	1361	495	866	305	1342	852	490	304	344	329	185	360	510	695	M14	424	300	610	300	522	148	374	624	216	875	228	180
KTP93A	65	1361	495	866	305	1447	957	490	304	344	288	185	360	510	695	M14	424	300	610	300	551	148	403	750	293	875	228	180
KTP93A	80	1361	495	866	305	1449	959	490	304	344	307	185	360	510	695	M14	424	300	610	300	592	148	444	750	322	875	228	180
KTP93A	100	1361	495	866	305	1539	1049	490	304	344	447	185	360	510	695	M14	424	300	610	300	672	148	524	824	382	875	228	180

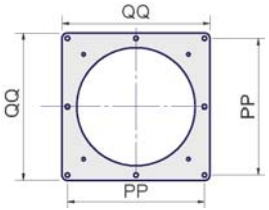




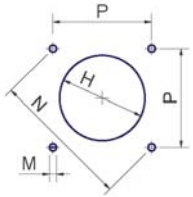
Air inlet flange



Burner flange



Burner counterflange (recommended)



Boiler drilling plate

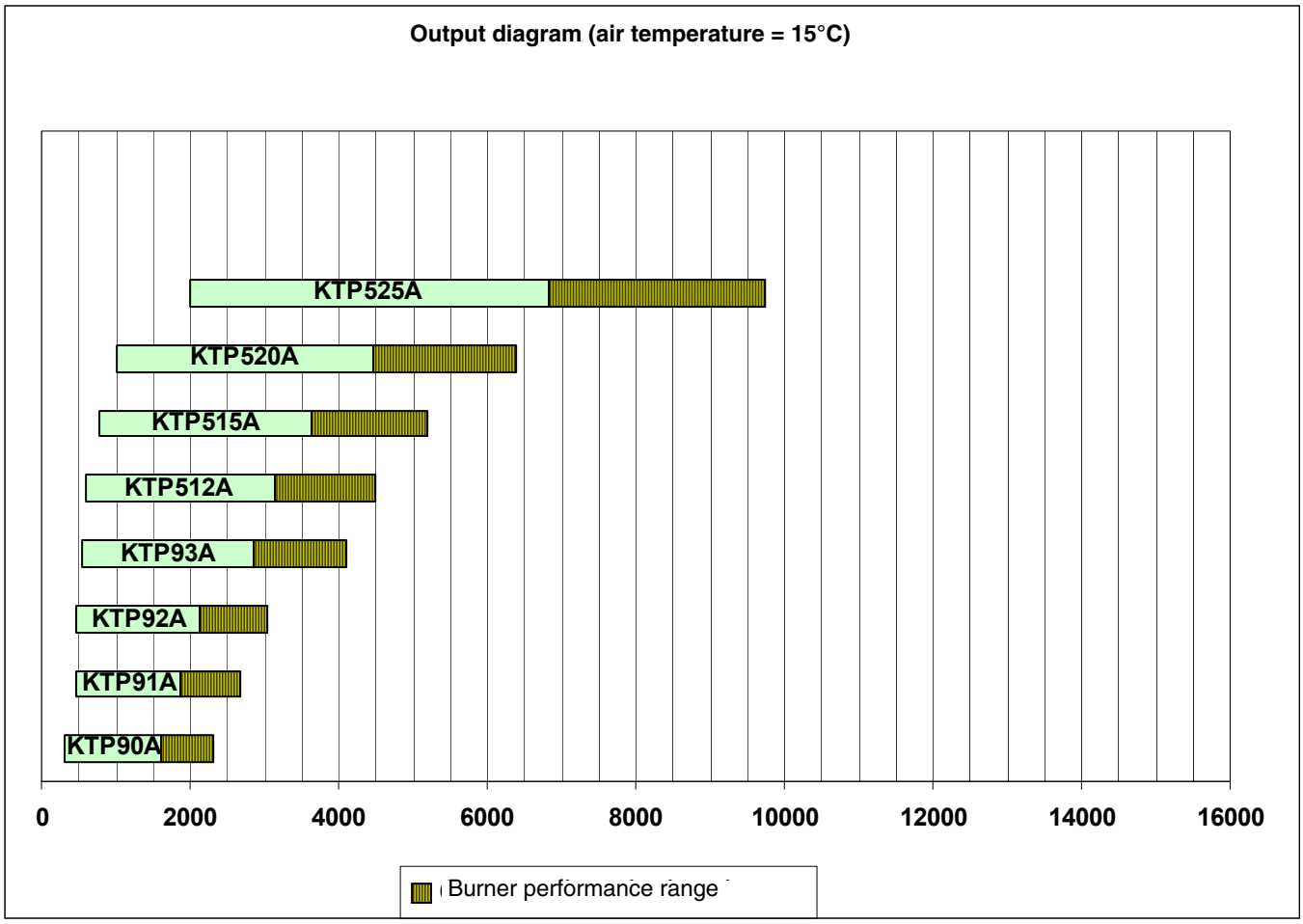
	DN	A	B	C	CC	D	E	F	G	H	J	JJ	K	KK	L	M	N	O	OO	P	PP	Q	QQ	R	S	U	V	W	Y	Z
KTP512A	50	1475	520	955	314	1570	1071	499	340	380	494	185	460	530	715	M14	552	390	693	390	x	765	x	160	605	843	216	945	286	230
KTP512A	65	1475	520	955	314	1548	1049	499	340	380	494	185	460	530	715	M14	552	390	693	390	x	643	x	160	483	843	293	945	286	230
KTP512A	80	1475	520	955	314	1583	1084	499	340	380	494	185	460	530	715	M14	552	390	693	390	x	695	x	160	535	875	322	945	286	230
KTP512A	100	1475	520	955	314	1666	1167	499	340	380	494	185	460	530	715	M14	552	390	693	390	x	802	x	160	642	942	382	945	286	230
KTP515A	50	1491	520	971	314	1570	1071	499	380	420	494	185	460	530	715	M14	552	390	693	390	x	765	x	160	605	843	216	945	312	230
KTP515A	65	1491	520	971	314	1548	1049	499	380	420	494	185	460	530	715	M14	552	390	693	390	x	643	x	160	483	843	293	945	312	230
KTP515A	80	1491	520	971	314	1583	1084	499	380	420	494	185	460	530	715	M14	552	390	693	390	x	695	x	160	535	875	322	945	312	230
KTP515A	100	1491	520	971	314	1666	1167	499	380	420	494	185	460	530	715	M14	552	390	693	390	x	802	x	160	642	942	382	945	312	230
KTP520A	50	1497	520	977	314	1570	1071	499	400	440	494	185	460	530	715	M14	552	390	693	390	x	765	x	160	605	843	216	945	328	230
KTP520A	65	1497	520	977	314	1548	1049	499	400	440	494	185	460	530	715	M14	552	390	693	390	x	643	x	160	483	843	293	945	328	230
KTP520A	80	1497	520	977	314	1583	1084	499	400	440	494	185	460	530	715	M14	552	390	693	390	x	695	x	160	535	875	322	945	328	230
KTP520A	100	1497	520	977	314	1666	1167	499	400	440	494	185	460	530	715	M14	552	390	693	390	x	802	x	160	642	942	382	945	328	230
KTP525A	50	1497	520	977	314	1570	1071	499	434	474*	494	185	460	530	715	M14	721*	390	693	510*	510*	765	550*	160	605	843	216	945	328	230
KTP525A	65	1497	520	977	314	1548	1049	499	434	474*	494	185	460	530	715	M14	721*	390	693	510*	510*	643	550*	160	483	843	293	945	328	230
KTP525A	80	1497	520	977	314	1583	1084	499	434	474*	494	185	460	530	715	M14	721*	390	693	510*	510*	695	550*	160	535	875	322	945	328	230
KTP525A	100	1497	520	977	314	1666	1167	499	434	474*	494	185	460	530	715	M14	721*	390	693	510*	510*	802	550*	160	642	942	382	945	328	230

DN = gas valves size.

* It is recommended to fit a counterflange between burner and boiler. As an alternative, make a smaller hole H, but greather than Y and fit the blast tube from the internal side of boiler

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

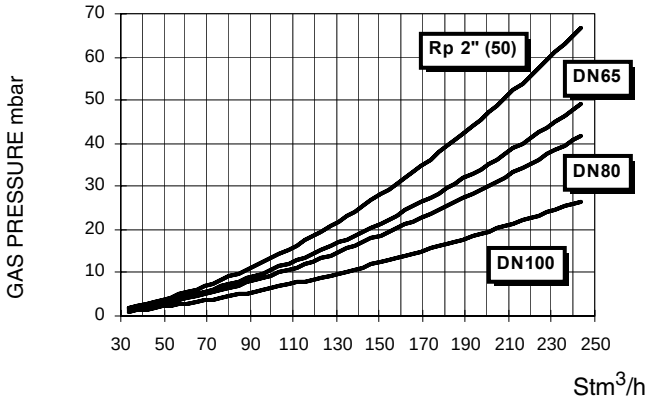
Performance Curves



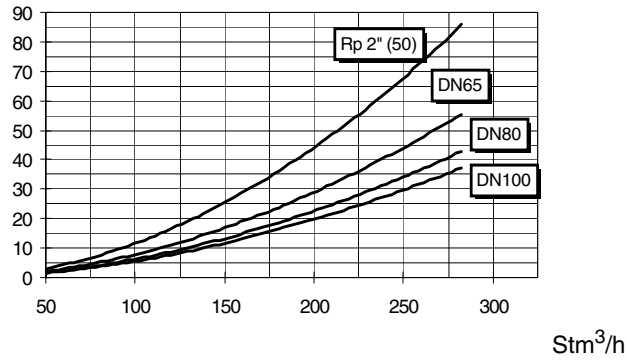
To get the input in kcal/h, multiply value in kW by 860.
Data are referred to standard conditions: atmospheric pressure at 1013mbar, ambient temperature at 15°C.

Pressure in the network - gas rate curves

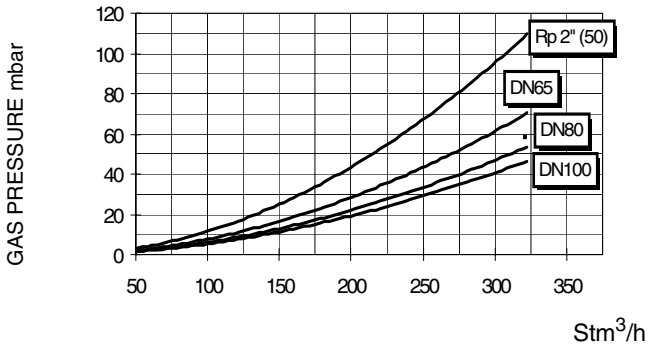
KTP90A



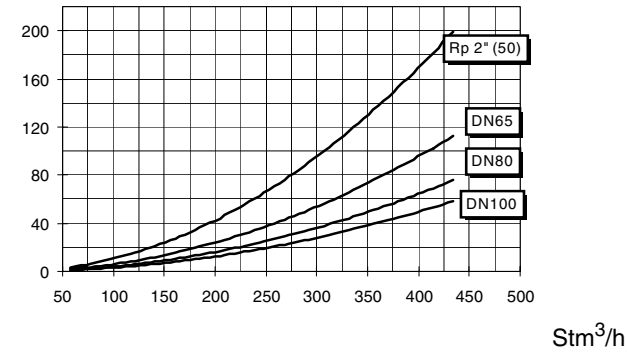
KTP91A



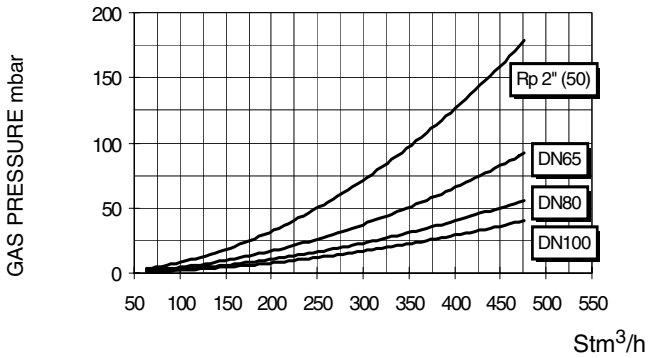
KTP92A



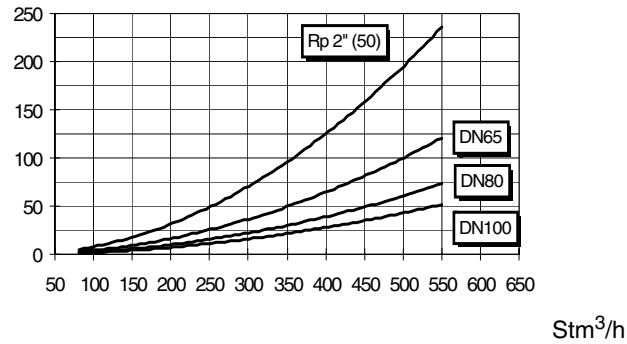
KTP93A



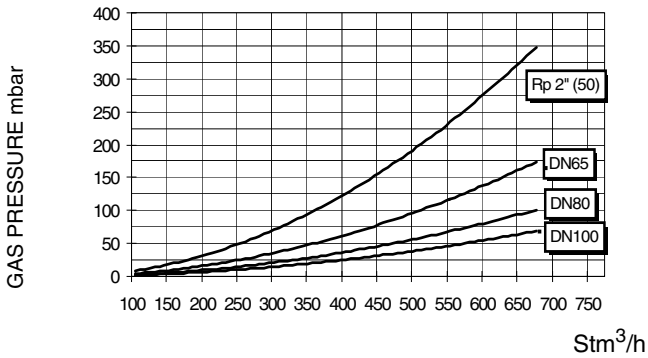
KTP512A



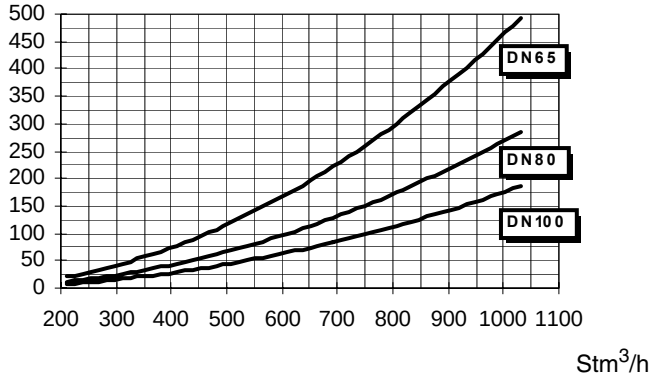
KTP515A



KTP520A



KTP525A



MOUNTINGS AND CONNECTIONS

Packing

The burners are despatched wooden cages whose dimensions are:
KTP91A-KTP92A-KTP93A: 1730mmx 1280mm x 1020mm (L x P x H)
KTP512A-KTP515A-KTP520A-KTP525A: 1730mm x 1430mm x 1130mm (L x P x H)
Pumping unit: 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. The following are placed in each packing case:

1 burner with gas train detached;
1 gasket to be inserted between the burner and the boiler;
2 flexible oil pipes;
1 oil filter;
1 envelope containing this manual

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

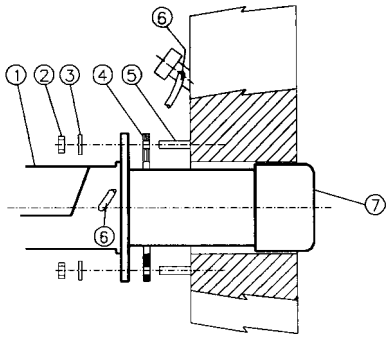
Handling the burner

	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.

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) on the hole of the boiler's door, according to the burner's drilling plate described on paragraph "Overall dimensions";
4 fasten the 4 stud bolts;
5 place the gasket on the burner flange;
6 install the burner into the boiler;
7 fix the burner to the stud bolts, by means of the fixing nuts, according to the next picture.
8 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 Sealing gasket
5 Stud bolt
7 Blast tube

Set the upper side of the burner flange in a horizontal position, in order to obtain the correct inclination of the pre-heating tank.

Key

1 Burner flange (upper side indicated)

2 Bracket

3 Pre-heating tank on the burner

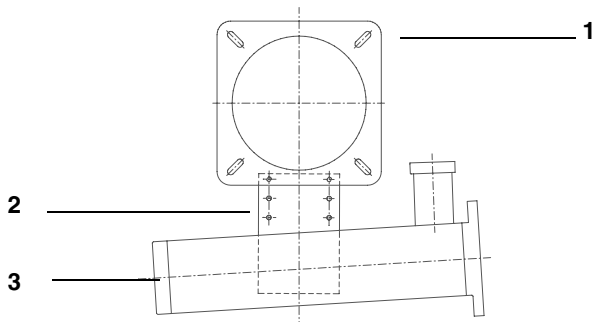


Fig. 1

Fan installation

Pay attention when designing the air duct: dimensioning must be performed according to the flow rate, the temperature, the distance between the fan and the burner and according to the fan features as well.

ATTENTION! The bellows unit provided is made of canvas and is provided with blocking spacers to avoid breaking it during installation: **first** place the bellows unit between flanges, **then** remove the spacers. Canvas has to be stretched after the installation, but not stressed.

Matching the burner to the boiler

The burners described in this manual have been tested with combustion chambers that comply with EN676 regulation and whose dimensions are described in the diagram . In 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 no more than 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).

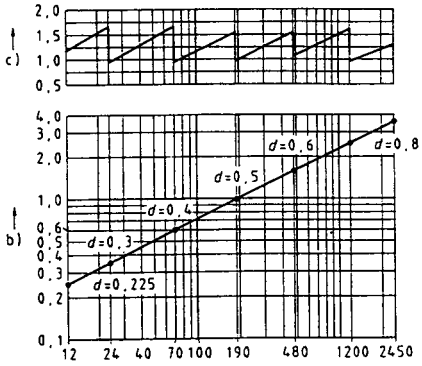


Fig. 2

Key

a) Heat output in kW

b) Lenght of the flame tube in meters

c) Flame tube firing intensity in MW/m^3

d) Combustion chamber diameter (m)

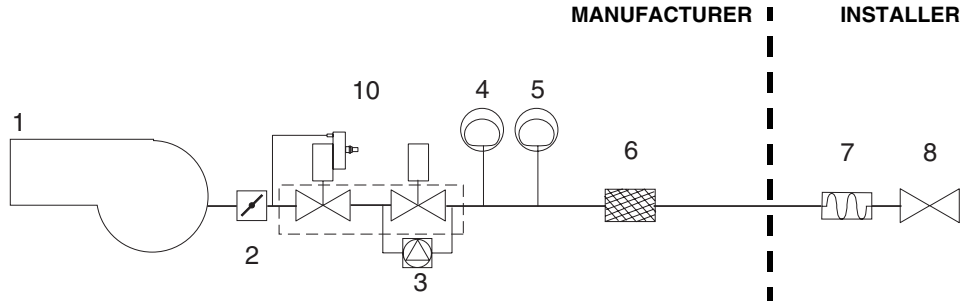
Fig. 2 - Firing intensity, diameter and lenght of the test flame tube as a function of the heat input in kW.

Gas train connections

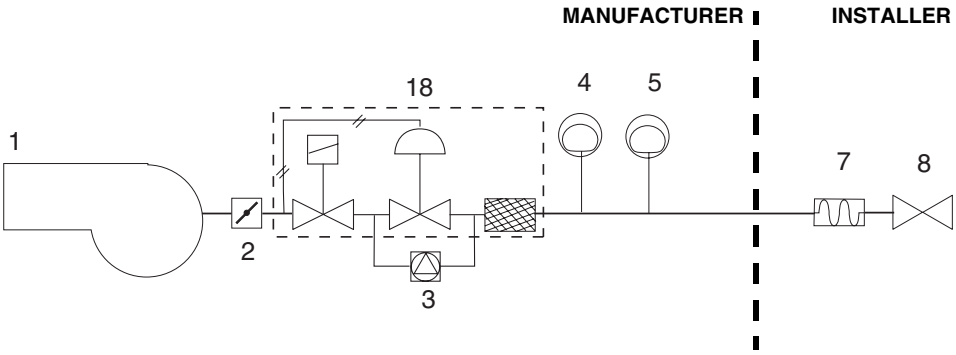
The diagrams show the components of the gas trai included in the delivery and which must be fitted by the installer.The diagrams are in compliance with the current laws.

⚠	**ATTENTION:** BEFORE EXECUTING THE CONNECTIONS TO THE GAS PIPE NETWORK, BE SURE THAT THE MANUAL CUTOFF VALVES ARE CLOSED.

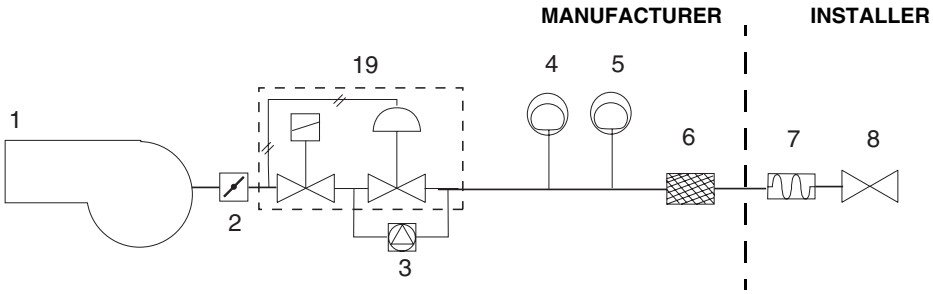
Gas train - 1 - Gas train with valves group VGD 20/40 with built-in gas pressure governor + VPS504 gas proving system



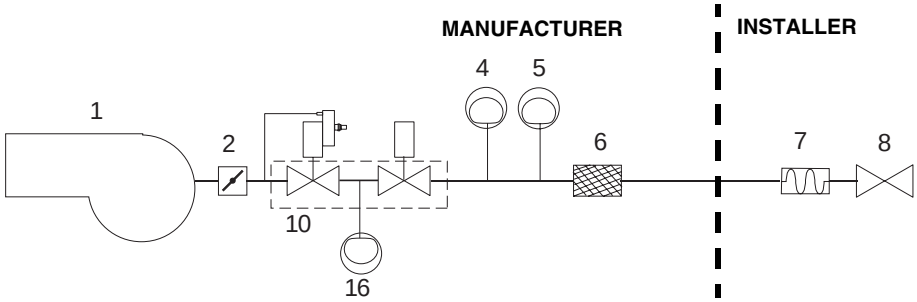
Gas train - 2 (Rp2) - Gas train with valves group MBC 1200SE(2 valves + gas filter + pressure governor + pressure switch) + VPS504 gas proving system



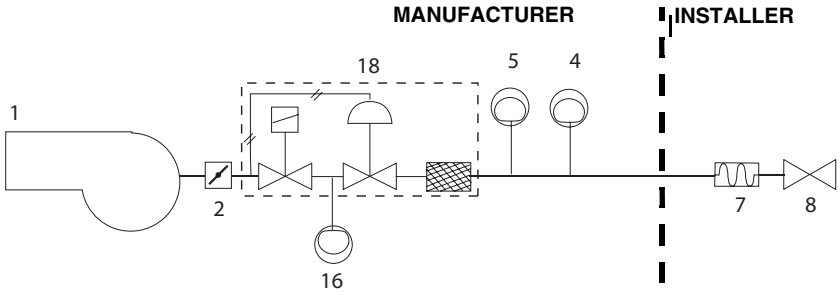
Gas train 3(DN65/80/100) - Gas train with valves group MBC 1900/3100/5000SE (2 valves + gas filter + pressure governor + pressure switch) + VPS504 gas proving system



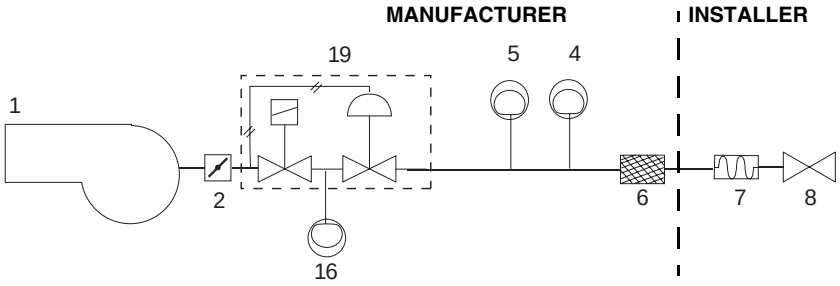
Gas train - 4 - Gas train with valves group VGD 20/40.. with built-in gas pressure governor + PGCP gas leakage pressure switch (with Siemens LDU/Siemens LMV)



Gas train - 5 (Rp2) - Gas train with valves group MBC 1200SE (2 valves + gas filter + pressure governor) + PGCP gas leakage pressure switch (with Siemens LDU/Siemens LMV)



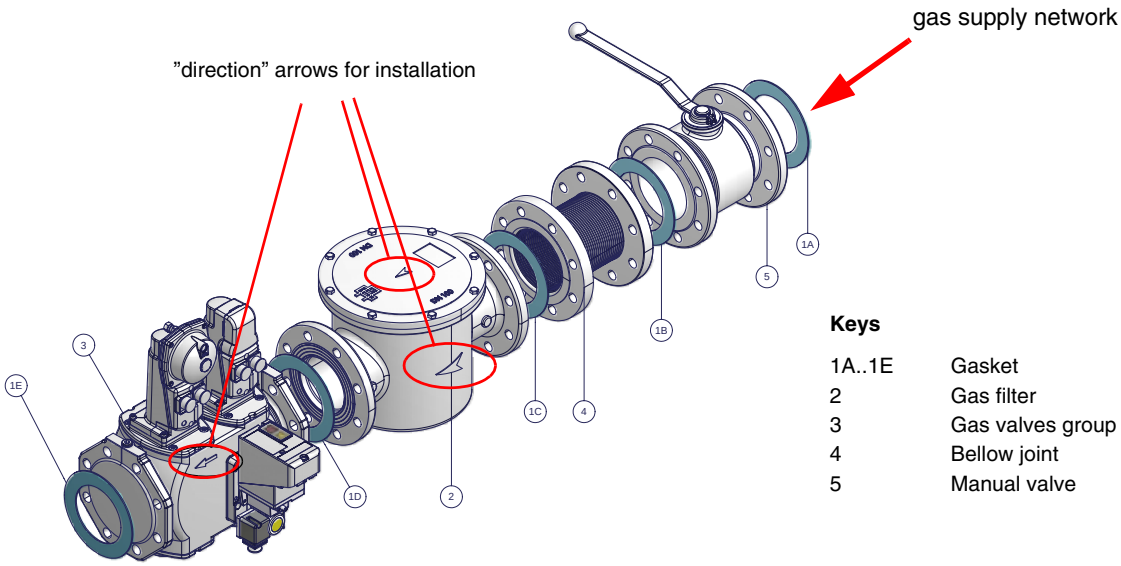
Gas train - 6(DN65/80/100) - Gas train with valves group MBC 1900/3100/5000SE (2 valves + gas filter + pressure governor) + PGCP gas leakage pressure switch (with Siemens LDU/Siemens LMV)



Keys

1 Burner
2 Butterfly valve
3 Gas proving system
4 Maximum gas pressure switch (option)
5 Minimum gas pressure switch
6 Gas filter
7 Bellow joint
8 Manual cutoff valve
10 VGD Valves group
16 PGCP gas leakage pressure switch
18 MBC Valves group (2” with built-in filter)
19 MBC Valves group (DN65/80/100)

Assembling the gas grain



Keys

1A..1E	Gasket
2	Gas filter
3	Gas valves group
4	Bellow joint
5	Manual valve

Fig. 3 - Example of 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. 3) between the elements

NOTE: the bellow joint, 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. 3, 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 showed 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..

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

Mounting

1. Mount flange onto tube lines. Use appropriate sealing agent (see Fig. 4)
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

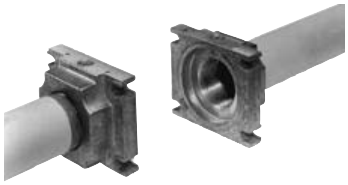
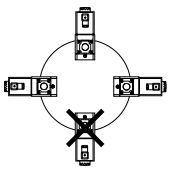
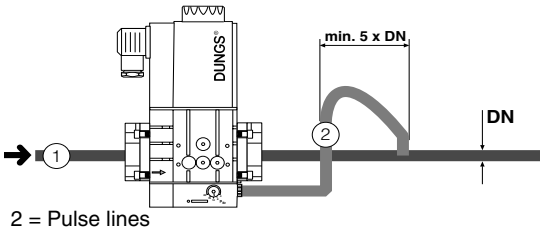


Fig. 4

MOUNTING POSITIONS



OPTION



2 = Pulse lines

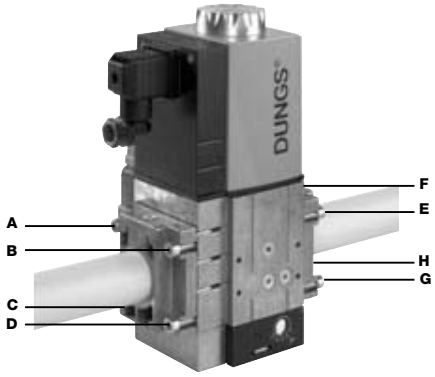


Fig. 5

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

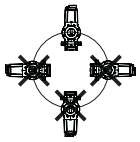
Mounting

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

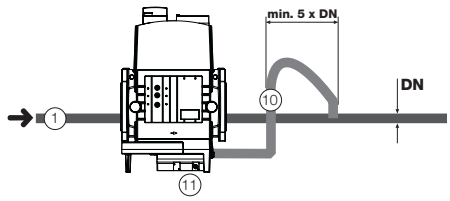
Ensure correct seating of the seal!

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

Mounting positions



OPTION



2 = pulse lines

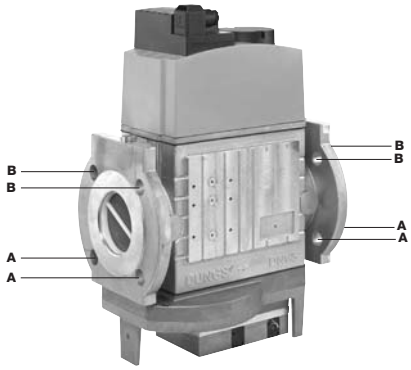


Fig. 6

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

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), 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.

WARNING: removing the four screws BS causes the device to be unserviceable!

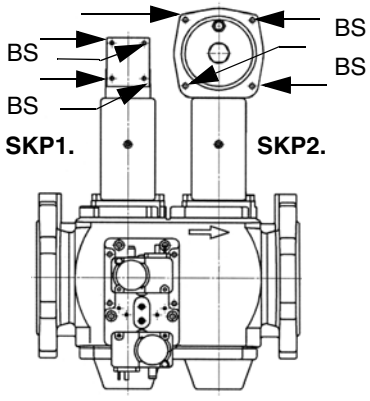


Fig. 7

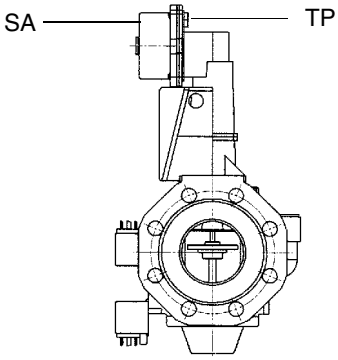


Fig. 8

SIEMENS VGD..MOUNTING POSITIONS

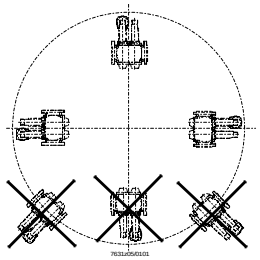


Fig. 9

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

ATTENTION: once the gas train is mounted according to the diagram on Fig. 3, the gas proving test mus be performed, according to the procedure set by the laws in force.

Hydraulic system

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

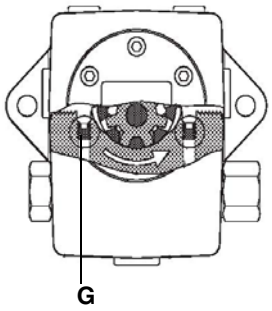
Single-pipe system: a single pipe drives the oil from the tank to the pump's inlet. Then, from the pump, the pressurised oil is driven to the nozzle: a part comes out from the nozzle while the other part goes back to the pump. In this system, the by-pass plug, if provided, must be removed and the optional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

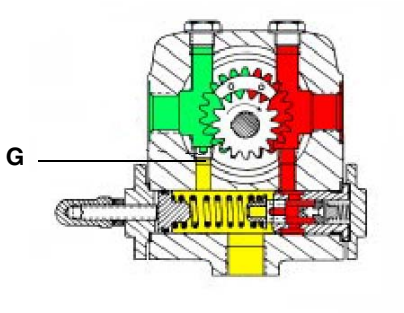
Burners come out from the factory provided for double-pipe systems. They can be suited for single-pipe system (recommended in the case of gravity feed) as decribed before.To change from a 1-pipe system to a 2-pipe-system, insert the by-pass plug **G** (as for ccw-rotation- referring to the pump shaft).

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

Danfoss KSM..



Suntec TA



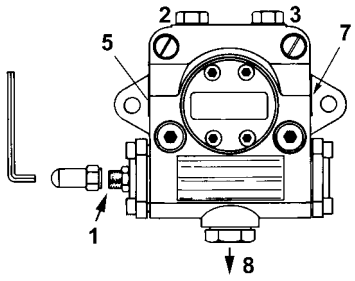
Bleed

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.

Oil pumps

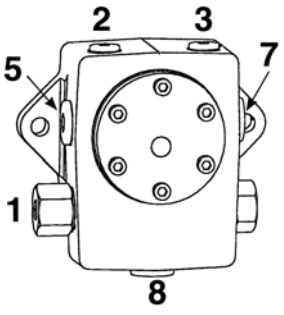
Suntec TA..

Oil viscosity	4 - 450 cSt
Oil temperature	0 - 140°C
Min. suction pressure	- 0,45 barto avoid gasing
Max. suction pressure	5 bar
Max. return pressure	5 bar
Rotation speed	3600 rpm max.



Danfoss KSM..

Oil viscosity	2,5 ÷ 450 cSt
Oil temperature	-10 ÷ 160 °C
Max. suction pressure	4 bar
Min. suction pressure	-0,45 to avoid gasing
Max. return pressure	4 bar
Rotation speed	3450 rpm max

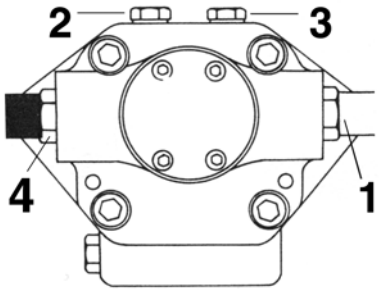


Keys

1 Pressure governor
2 Pressure/Vacuum gauge port to measure inlet pressure/vacuum
3 Pressure gauge port
5 Inlet
7 To the nozzle
8 Return

Suntec T pump

Viscosity	4 - 800 cSt
Oil temperature	0 - 140 °C
Minimum suction pressure	- 0.45 bar to prevent gasing
Maximum suction pressure	5 bar
Rated speed	3600 rpm max.



Key

1 To pressure adjusting valve G3/4
2 Pressure/vacuum gauge port to measure the inlet pressure/vacuum G1/4
3 Pressure gauge port G1/4
4 Inlet G3/4

Suntec TV Pressure governor

Pressure adjustment

Remove cap-nut 1 and the gasket 2, unscrew the lock nut 4. To increase pressure, twist adjusting screw 3 clockwise.

To decrease the pressure, twist screw counterclockwise. Tight the lock nut 4, refit the gasket 2 and the cap nut 1.

Key

1 Cap nut
2 Gasket
3 Adjusting screw
4 Lock nut
5 Gasket

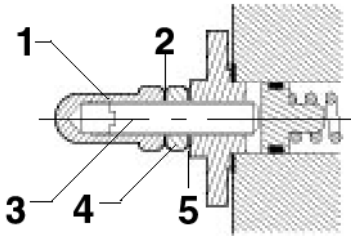


Fig. 11

About the use of fuel pumps

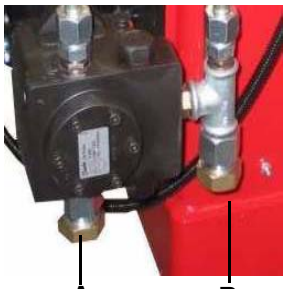
- Make sure that the by-pass plug is not used in a single pipe installation, because the fuel unit will not function properly and damage to the pump and burner motor could result.
- Do not use fuel with additives to avoid the possible formation over time of compounds which may deposit between the gear 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.

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 of the pump;

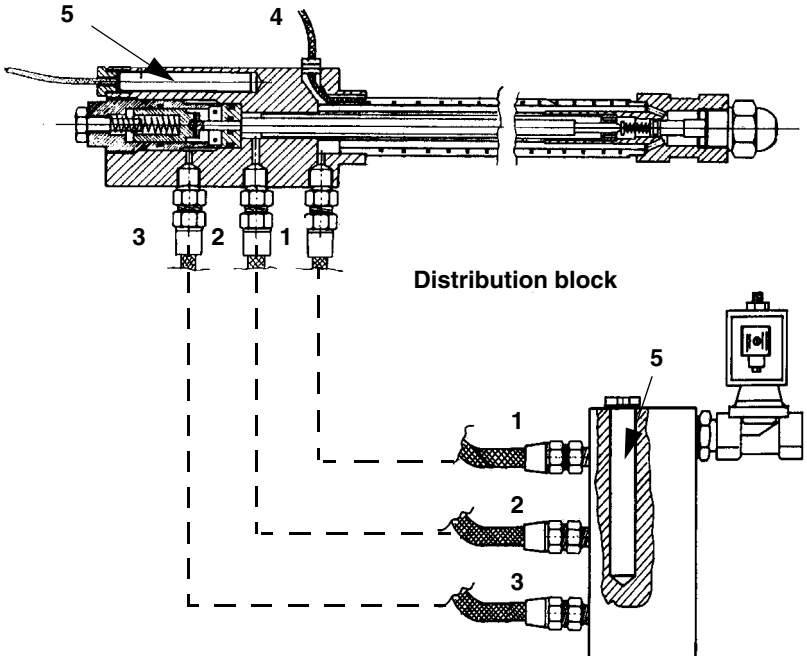
screw the rotating nut of the two flexible hoses on the pump **being careful to avoid exchanging the inlet and return lines**: see the arrows marked on the pump that show the inlet and the return (see previous paragraph).

Suntec TA..	Danfoss KSM..
	

Connections to the oil gun

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

Gun with the oil nozzle inside



Guidelines for the appropriate use of heavy oil

For a correct operation of heavy oil or dual fuel burners (gas - heavy oil), the supply plant must be correctly build and it must ensure two fundamental conditions:

- CONSTANT PRESSURE
- CONSTANT TEMPERATURE

Here below we explain why it is essential to heat the oil and keep it under pressure.

Consider, as an example, a fuel oil with the following properties:

- Fuel oil BTZ (low sulphur rate)
- Viscosity from 3 to 5 °E at 50 °C

Such a fuel (see curve n. 3 in Fig. 12), at a temperature of 20° C, changes its viscosity from 3 - 5 °E to 15-20 °E and, at 10° C the viscosity exceeds 40° E.

In such conditions, obviously, the fuel couldn't be carried from the tank to the burner.

Once the oil has been heated, it can't be sucked by the burner pump, unless you keep it in pressure. In fact, as shown on drawing in Fig. 14, the pump manufacturer states that the minimum feeding pressure must be 1 bar at 40 °C temperature.

Should you try to suck the heated oil directly from the tank, you could get cavitation. The burner pump would constantly loose pressure as long as you heat the fuel. In this way you bring the nozzle pressure to values different from the one stated by the nozzle manufacturer. In such way the atomization would result incorrect.

From the diagram in Fig. 13, you will find the pre-heating temperature of the oil according to viscosity and, from diagram in Fig. 14, you get the pump feeding pressure according to temperature.

Therefore, it is necessary in order to set up a suitable oil circuit, look at the diagrams in Fig. 16 and Fig. 17, taken from UNI 9248 "FEEDING LINES FOR LIQUID FUELS TRANSPORT FROM TANK TO BURNER".

In any case, whatever is the choosen solution to realise the oil circuit, you must act according to what is mentioned here above (constant pressure and constant temperature).

After setting up the feeding circuit, you have to decide the temperature and pressure values to be set up in the components of the feeding pipeline and of the burner.

Please find here below, a set up table regarding several types of fuels.

FUEL	VISCOSITY AT 50 °C		PIPELINE PRESSURE	PIPELINE TEMPERATURE*	PUMP SUPPLY TEMPERATURE (DIAGRAM IN Fig. 12)
	°E		bar	°C	°C
Fluid BTZ (ecoflu)	3	7	1 - 2	20	30
High viscosity BTZ (Ecoden)	7	15	1 - 2	50	50
High viscosity	15	50	1 - 2	65	80

Tab. 1 - Supply pipeline

FUEL	VISCOSITY AT 50 °C		NOZZLE PRESSURE MEASURED IN THE GUN	RETURN NOZZLE PRESSURE		TEMPERATURE ON THE PRE-HEATING RESISTORS THERMOSTAT TR*		TEMPERATURE OF THE RESISTORS SAFETY THERMOSTAT TRS	TEMPERATURE ON THE OIL ENABLING THERMOSTAT TCN	TEMPERATURE ON THE PLANT ENABLING THERMOSTAT TCI
				min.	max.	min.	max.			
	°E		bar	bar		°C		°C	°C	°C
Fluid BTZ (ecoflu)	3	7	25	7	20	100	115	190	80	-
High viscosity BTZ (Ecoden)	7	15	25	7	20	125	140	190	100	60 - 80
High viscosity	15	50	25	7	20	145	160	190	110	70 - 90

Tab. 2 - Burner

* The temperature in the pre-heater must be set to get a viscosity in the nozzle from 1.4 to 1.6 °E.

VISCOSITY UNITS CONVERSION TABLE						
Cinematics Engler (Degrees) °E	**Cinematics (Centistokes) cSt**	**Cinematics (Centipoises) cps**	**Saybolt Universal (Seconds) S.S.U.**	**Saybolt Furol (Seconds) S.S.F.**	**Redwood n. 1 (Seconds) R.S.I**	**Redwood n. 2 (Seconds) R.S.II**
2.95	20.60	20.60	100		88.4	
3.21	23.00	23.00	110		97.1	
3.49	25.3	25.3	120		105.9	
3.77	27.5	27.5	130		114.8	
4.04	29.8	29.8	140		123.6	
4.32	32.1	32.1	150		132.4	
4.59	34.3	34.3	160		141.1	
4.88	36.5	36.5	170		150.0	
5.15	38.7	38.7	180		158.8	
5.44	41.0	41.0	190		167.5	
5.72	43.2	43.2	200	23	176.4	
6.28	47.5	47.5	220	25.3	194.0	
6.85	51.9	51.9	240	27.0	212	
7.38	56.2	56.2	260	28.7	229	
7.95	60.6	60.6	280	30.5	247	
8.51	64.9	64.9	300	32.5	265	
9.24	70.4	70.4	325	35.0	287	
9.95	75.8	75.8	350	37.2	309	
10.7	81.2	81.2	375	39.5	331	
11.4	86.6	86.6	400	42.0	353	
12.1	92.0	92.0	425	44.2	375	
12.8	97.4	97.4	450	47.0	397	
13.5	102.8	102.8	475	49	419	
14.2	108.2	108.2	500	51	441	
15.6	119.2	119.2	550	56	485	
17.0	120.9	120.9	600	61	529	
18.5	140.7	140.7	650	66	573	
19.9	151.3	151.3	700	71	617	
21.3	162.3	162.3	750	76	661	
22.7	173.2	173.2	800	81	705	
24.2	184.0	184.0	850	86	749	
25.6	194.8	194.8	900	91	793	
27.0	206	206	950	96	837	
28.4	216	216	1000	100	882	
34.1	260	260	1200	212	1058	104
39.8	303	303	1400	141	1234	122
45.5	346	346	1600	160	1411	138
51	390	390	1800	180	1587	153
57	433	433	2000	200	1703	170
71	541	541	2500	250	2204	215
85	650	650	3000	300	2646	255
99	758	758	3500	350	3087	300

Tab. 3

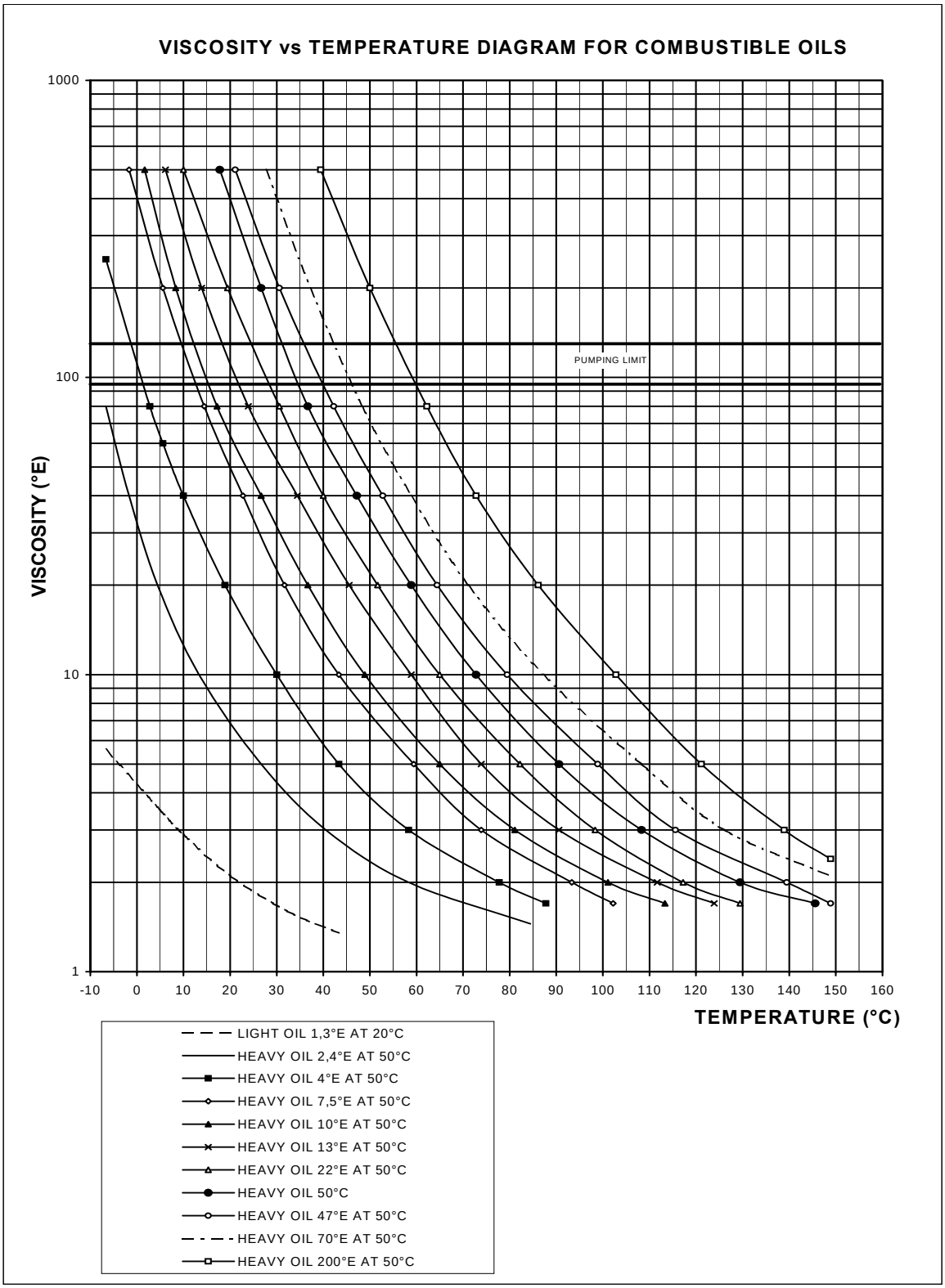


Fig. 12

The burners must be feeded with fuel with a minimum temperature at the pump inlet, as a function of the oil viscosity, as indicated in Fig. 12, Fig. 13 and Fig. 15.

Minimum feeding temperature vs. oil viscosity

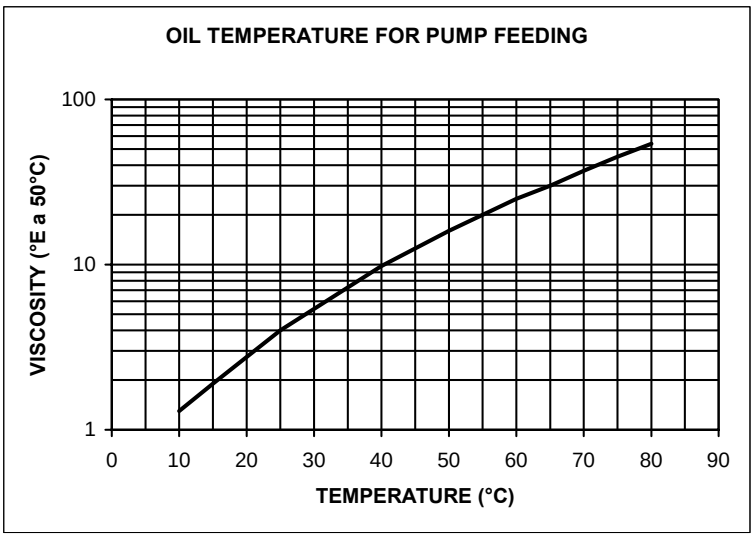


Fig. 13

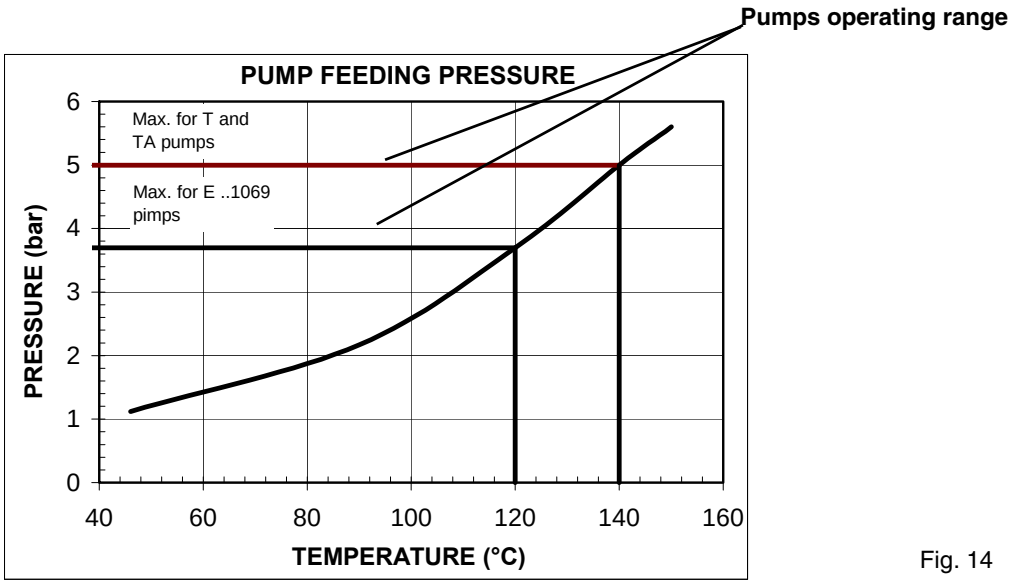


Fig. 14

The use of heavy oil forces to feed the burner to a pressure strictly related to the oil temperature. This avoids damage to the pump caused by gassification.

VISCOSITY vs. TEMPERATURE DIAGRAM

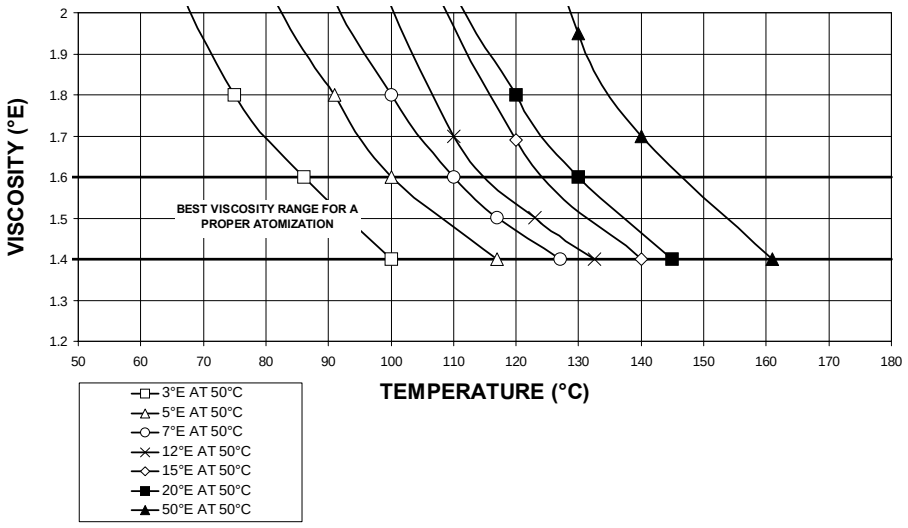


Fig. 15

HYDRAULIC DIAGRAMS

Fig. 16 - **Hydraulic diagram 3ID0023 - Single burner configuration**

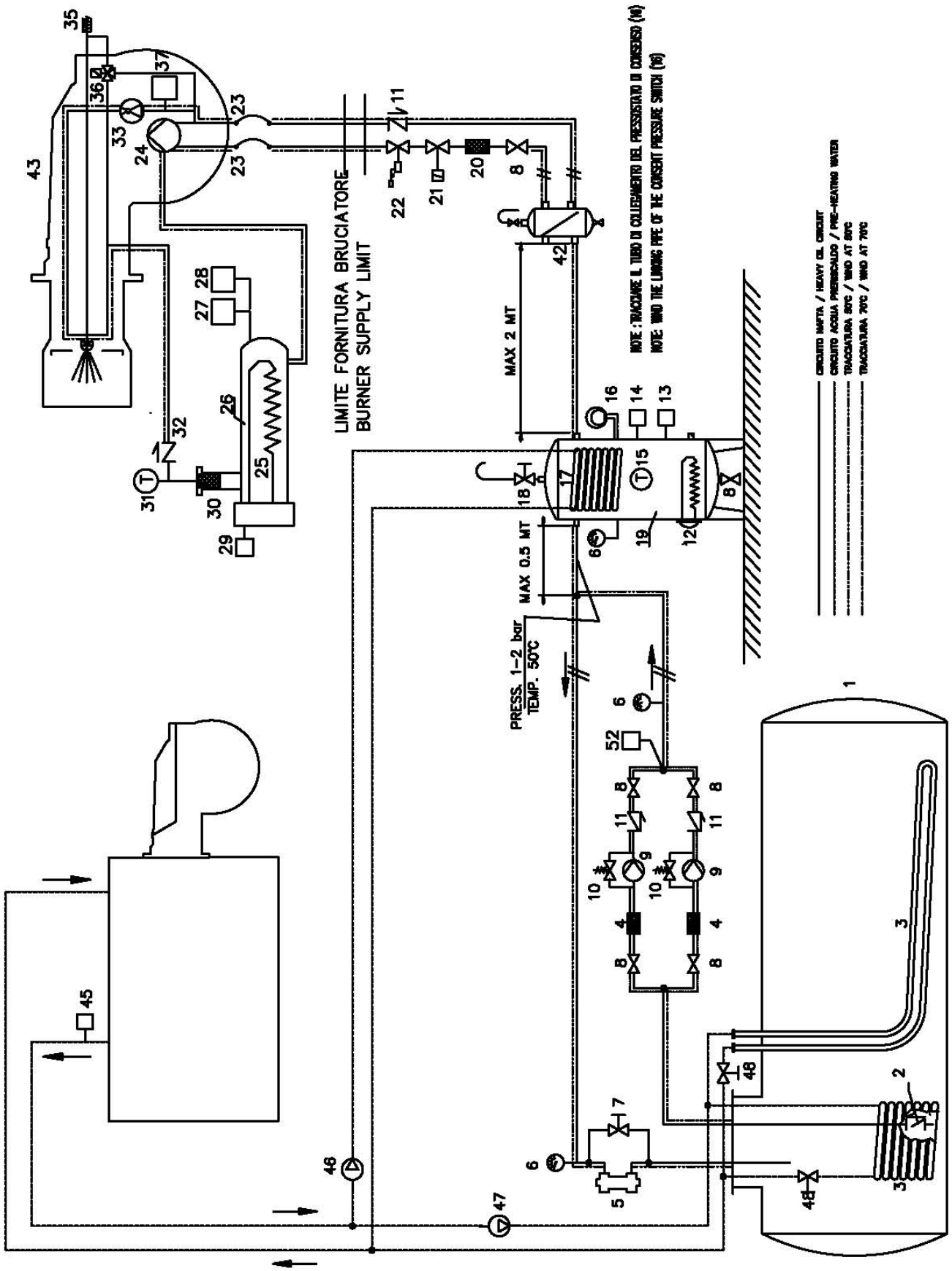
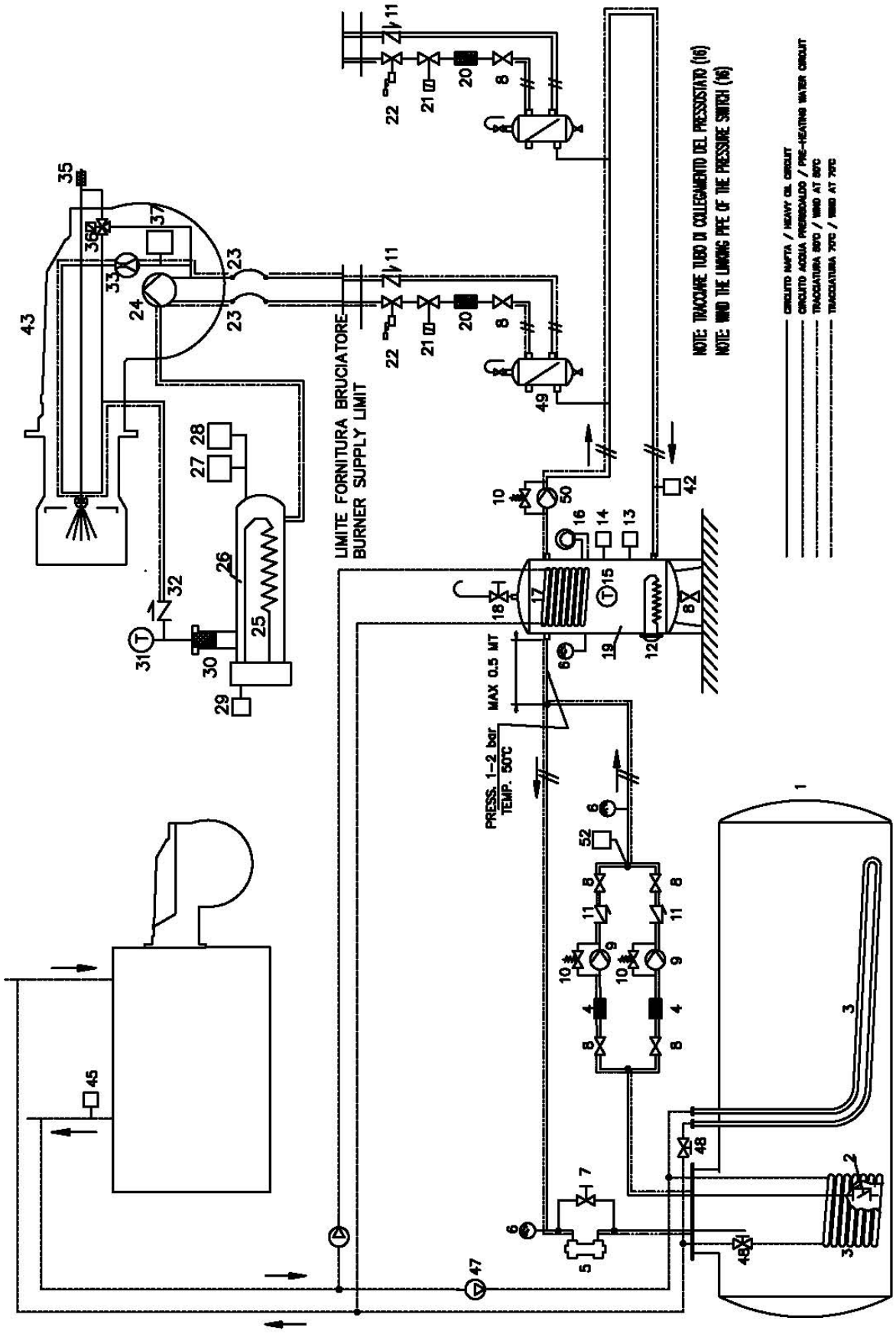


Fig. 17 - **Hydraulic diagram 3ID0014 - Two or more burners configuration**



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Hydraulic Diagram 3ID0014

1 Main tank
2 Bottom valve
3 Main tank pre-heating pipe
4 Oil filter (filtration, 1mm)
5 Circuit pressure regulator
6 Manometer
7 Pressure regulation by-pass valve
8 Manual valve
9 Oil pump
10 Pump pressure regulator
11 Unidirectional valve
12 Service tank pre-heating resistor
13 Service tank pre-heating thermostat
14 Burner consent thermostat
15 Thermometer
16 Consent pressure switch for service tank resistor
17 Service tank heating pipe
18 Service tank air drain valve
19 Service tank
20 Oil filter
21 Fuel solenoid valve
22 Fuel valve
23 Burner pump flexible hoses
24 Burner oil pump
25 Pre-heating tank resistor
26 Pre heating tank
27 Oil consent thermostat
28 Heather safety thermostat
29 Thermostat for oil temperature setting
30 Tank filter
31 Thermometer
32 Check valve
34 Burner safety solenoid valve
35 Oil needle drive piston
36 Oil rate regulator
37 Burner consent thermostat
42 Burner start consent thermostat
43 Burner
45 Thermostat for pipes pre-heating pumps
46 Water pump for service tank pre-heating (1)
47 Water pump for main tank pre-heating (19)
48 Water pre-heating balance setting valve
50 Oil circulation pump
52 Oil ring max. pressure switch

Hydraulic Diagram 3ID0023

1 Main tank
2 Bottom valve
3 Main tank pre-heating pipe
4 Oil filter
5 Circuit pressure regulator
6 Manometer
7 Pressure regulation by-pass valve
8 Manual valve
9 Oil pump
10 Pump pressure regulator
11 Unidirectional valve
12 Service tank pre-heating resistor
13 Service tank pre-heating thermostat
14 Burner consent thermostat
15 Thermometer
16 Consent pressure switch for service tank resistor
17 Service tank heating pipe
18 Service tank air drain valve
19 Service tank
20 Oil filter
21 Fuel solenoid valve
22 Fuel valve
23 Burner pump flexible hoses
24 Burner oil pump
25 Pre-heating tank resistor
26 Pre heating tank
27 Oil consent thermostat
28 Pre-heating tank resistors safety thermostat
29 Thermostat for oil temperature setting
30 Pre-heating tank filter
31 Thermometer
32 Check valve
33 Return pressure regulator
34 Burner safety solenoid valve
35 Oil needle drive piston
36 Three way valve for piston drive
37 Burner consent thermostat
42 Air separation bottle
43 Burner
45 Thermostat for pipes pre-heating pumps
46 Water pump for service tank pre-heating (1)
47 Water pump for main tank pre-heating (19)
48 Valves for setting of pre-heating water balance
52 Oil ring max. pressure switch

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.

	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.
	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 Fig. 18-Fig. 19).

NOTE: if the burner is provided with separate control panel, please refer to the attached wiring diagrams.

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.

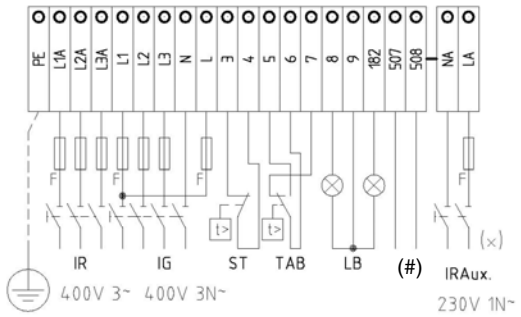


Fig. 18 - Progressive burners

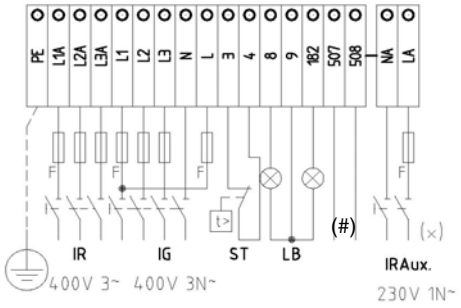


Fig. 19 - Fully modulating burners

(#) Free contact for "Faulty heater resistor contactor"

.

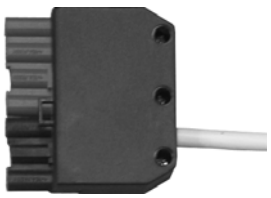


Fig. 21

Probes connections by means of the 7-pin plug (Fig. 21) - see Fig. 20 for connections.

Probes connection

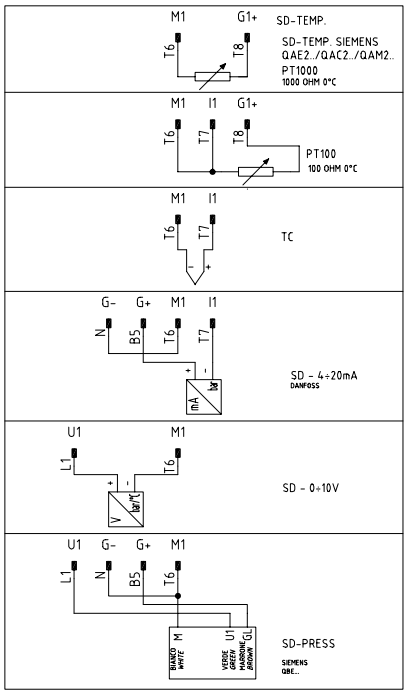


Fig. 20

Key

IG	Burner main switch
IR	Pre-heater resistors switch
IR1	Pre-heater "A" resistors switch
IR2	Pre-heater "B" resistors switch
IRAux.	Auxiliary resistors line switch
LB	Burner lockout lamp
LSPG	Burner lockout for gas leak lamp
N	Neutral
ST	Thermostats/pressure switches series
TAB	High-Low flame thermostat (if fitted remove the bridge between terminals 6 and 7 on terminal board MA

Rotation of fan motor and pump motor

Once the electrical connection of the burner is executed, remember to check the rotation of the motor. The motor should rotate according to the indication on the body. In the event of wrong rotation, reverse the three-phase supply and check again the rotation of the motor.

NOTE (except delta-star startup motorst): 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.

Connecting the oil heating resistors

2.4 - 4.5 kW

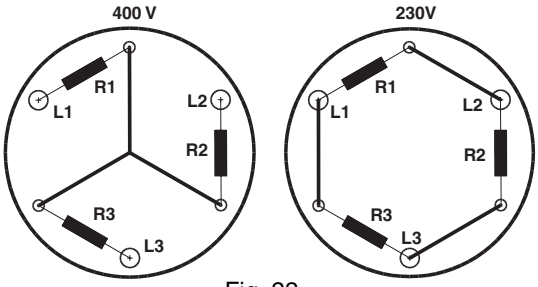


Fig. 22

8 - 12 kW

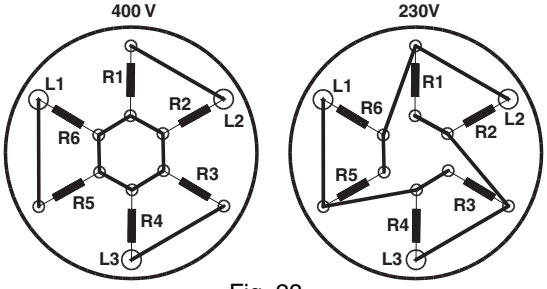


Fig. 23

18 - 24 kW

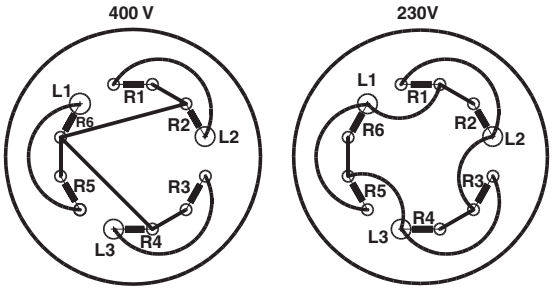


Fig. 24

ELECTRIC MOTOR CONNECTION

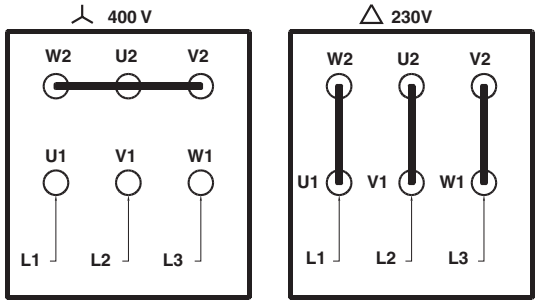


Fig. 25

ADJUSTMENT

Oil thermostat adjustment

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

NOTE: the **TCI** thermostat is provided only on burners fired with oil whose viscosity exceeds 15° E at 50° C.

TCN - Oil enabling thermostat (Fig. 25)

Adjust this thermostat to a value 10% lower than that showed in the viscosity-temperature diagram (Fig. 12).

TRS - Resistor safety thermostat (Fig. 25)

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.

TR - Resistor thermostat (Fig. 25)

Adjust this thermostat to the correct value according to the viscosity-temperature diagram (Fig. 12) and check the temperature by using a thermometer with a scale of up to 200° C mounted on the pre-heating tank.

TCI - Installation enabling thermostat (Fig. 25)

This thermostat is fitted on burners fired with oil whose viscosity is over 15° E at 50° C only. Set the thermostat according to the data shown on page 20.

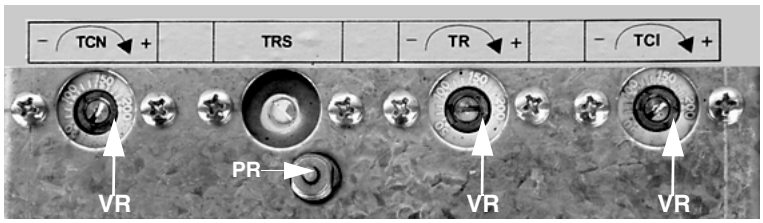


Fig. 26

Adjusting air and gas flow rates

⚠	**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 gas decrease slowly until the normal combustion values are achieved.
	WARNING: NEVER LOOSE THE SEALED SCREWS! OTHERWISE, THE DEVICE WARRANTY WILL BE IMMEDIATELY INVALIDATE!

⚠	**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 <=7°E a 50 °C	11 ÷ 12	4.2 ÷ 6.2
Heavy oil >=7°E a 50 °C	11 ÷ 12.5	4.7 ÷ 6.7

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 (3% of residual O_2 in the flues and CO in the standard limits). During this stage, the combustion head, the gas butterfly valve and the servocontrol are at the maximum opening. Refer to Fig. 27, 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.

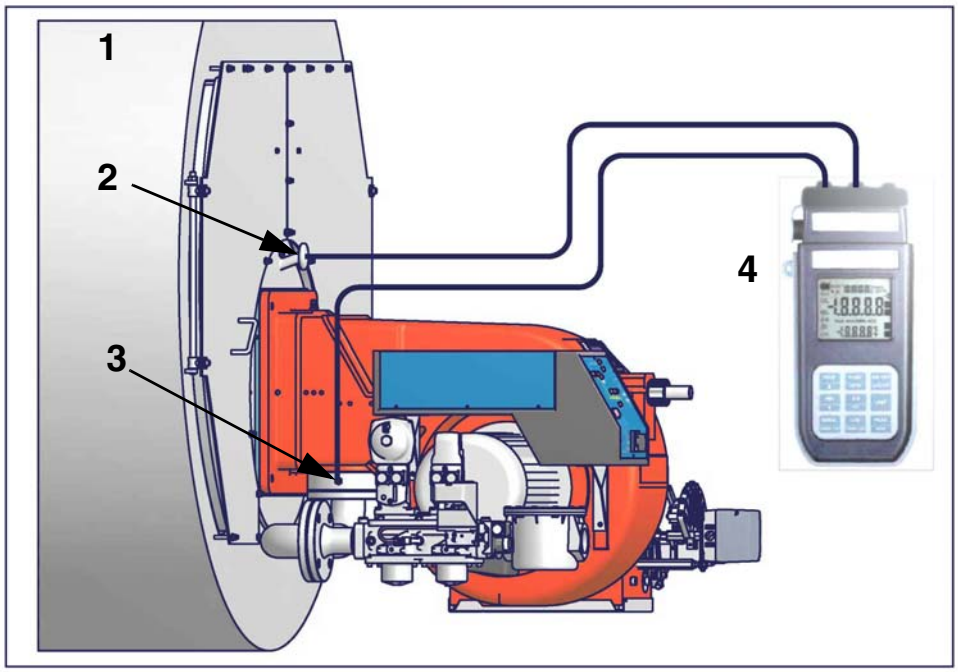


Fig. 27

Key

1 Boiler
2 Gas pressure outlet on the boiler
3 Gas pressure outlet on the butterfly valve
4 Differential pressure gauge

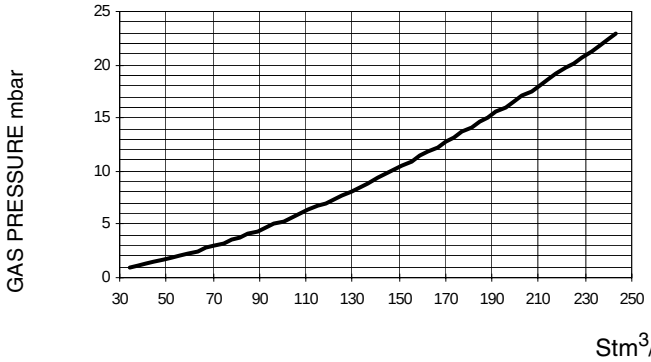
Measuring the gas pressure in the combustion head

In order to measure the pressure in the combustion head, insert the pressure gauge probes: one into the boiler's pressure outlet (Fig. 27-2) to get the pressure in the combustion chamber and the other one into the butterfly valve's pressure outlet of the burner (Fig. 27-3). On the basis of the measured differential pressure, it is possible to get the maximum flow rate: in the pressure - rate curves (showed 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.

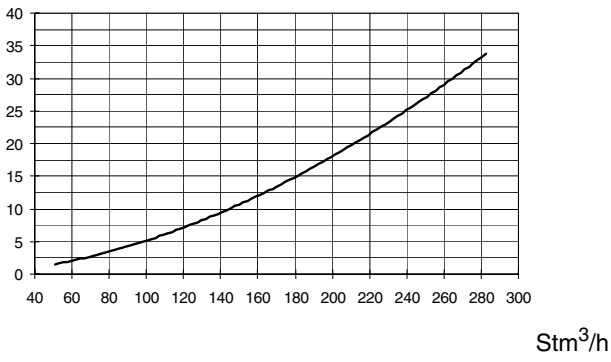
NOTE: THE PRESSURE-RATE CURVES ARE GIVEN AS INFORMATION ONLY; FOR A PROPER SETTING OF THE GAS RATE, PLEASE REFER TO THE GAS METER READING.

Pressure in combustion head - gas rate curves

KTP90A



KTP91A



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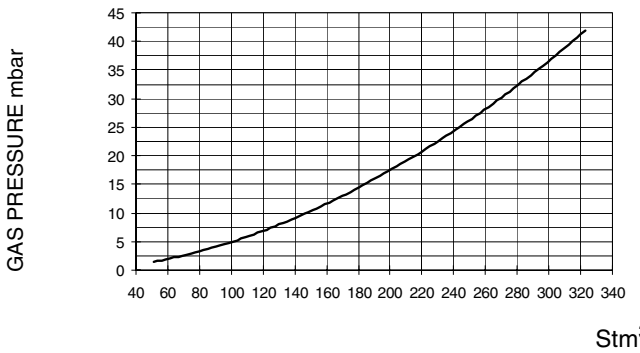

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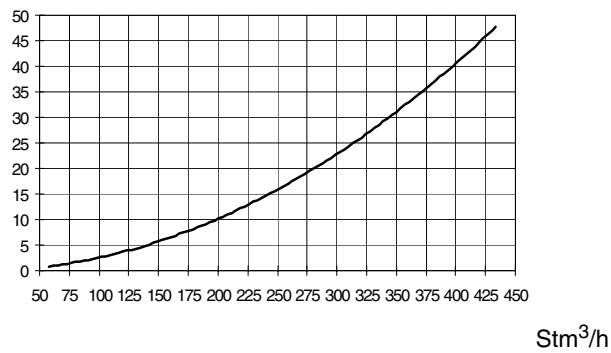

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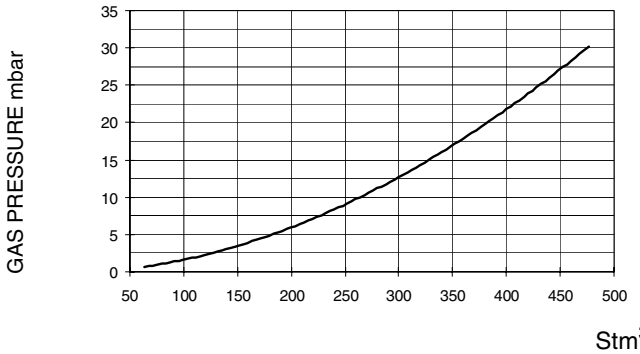
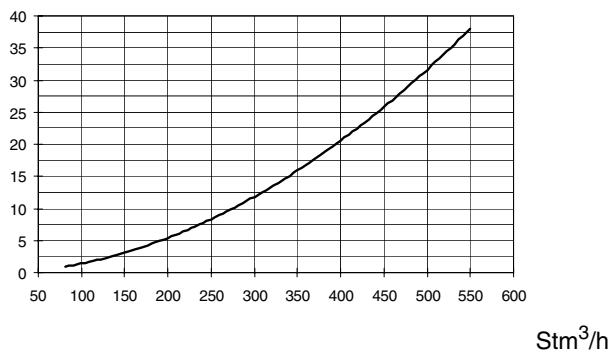


KTP515A



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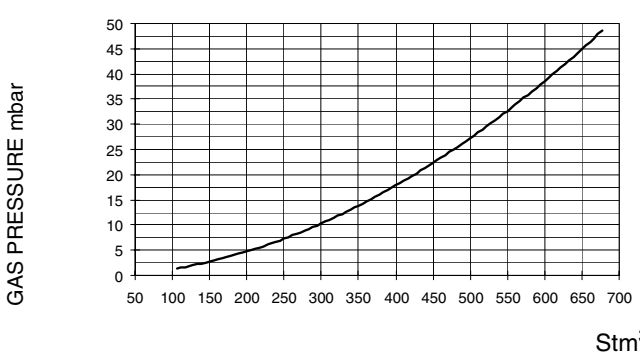
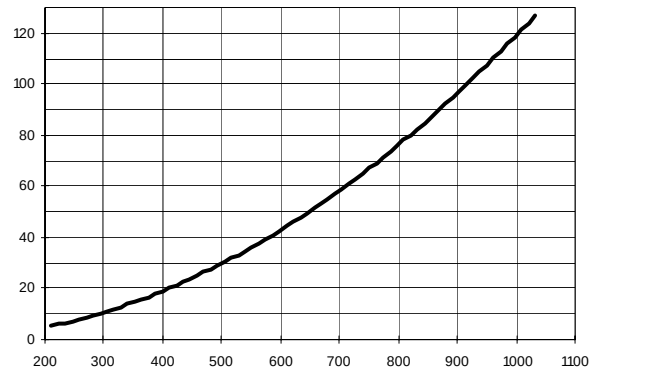


KTP525A



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 rapidly blocking. The filter is normally installed upstream 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.

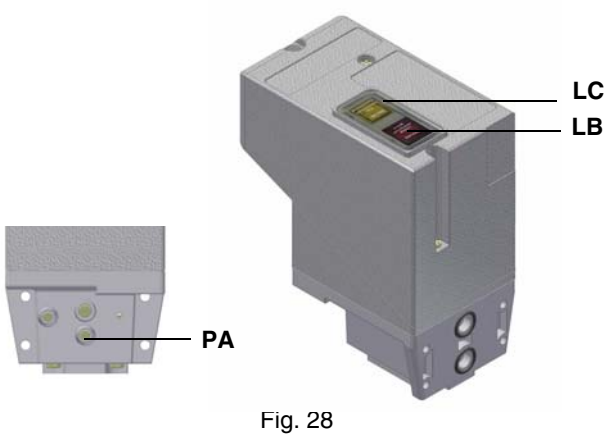


Fig. 28

Actuator

The actuator provided can be either Berger STM30.. (see page 33) or Siemens SQL33.. (see page 35).

Adjustments - brief description

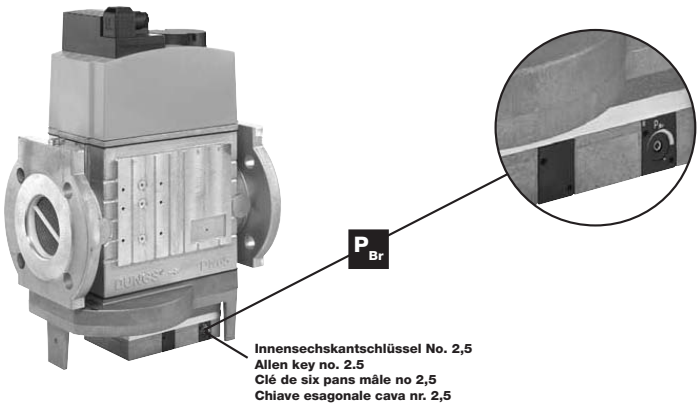
Adjust the air and gas flow rates at the maximum output (“high flame”) first, by means of the air damper and the adjusting cam respectively.

- 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 page 30.
- 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.

Adjustment procedure

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 setting

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.

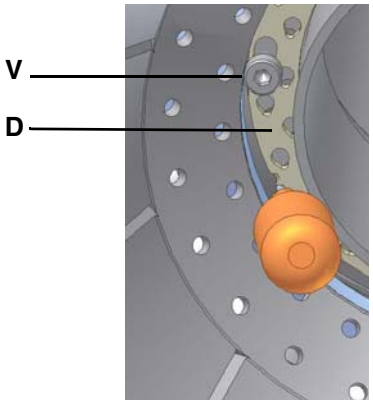
To adjust the gas flow, partially close the holes, as follows:

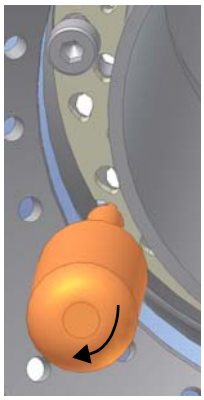
1 loosen the three **V** screws that fix the adjusting plate **D**;

2 insert a screwdriver on the adjusting plate notches and let it move CW/CCW as to open/close the holes;

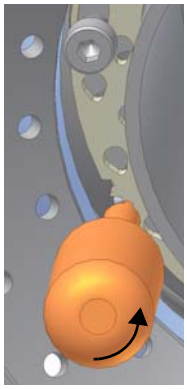
3 once the adjustmet is performed, fasten the **V** screws.

- KTP90A - KTP91A - KTP92A - KTP93A



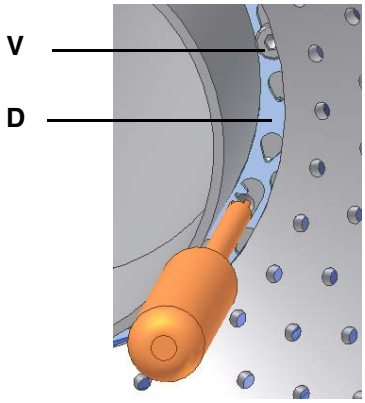


open holes

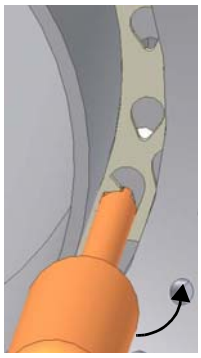


closed holes

- KTP512A - KTP515A - KTP520A - KTP525A



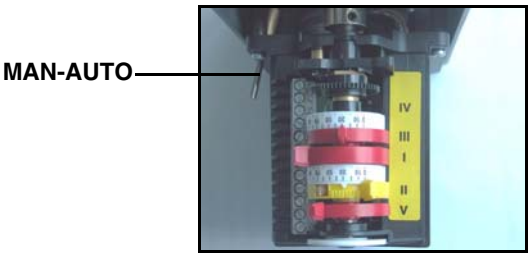
open holes



closed holes

Now, adjust the burner according to the actuator model provided.

Air and Gas Flow Rate Settings by means of Berger STM30.. actuator



STM30.. actuator cams

I	High flame
II	Stand-by and Ignition
III	Low flame (gas)
V	Low flame (oil)

1 set GAS fuel by means of the burner **CM** switch (it is placed on the burner control panel - see page 44)

2 check the fan motor rotation (see “Rotation of fan motor and pump motor” on page 27).

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 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**.

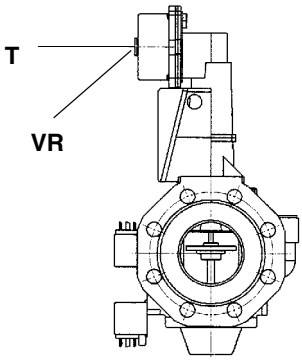
6 Then move progressively the microswitch to higher values until it reaches the high flame position; always check the combustion values and eventually adjusting the gas by means of the valves group stabiliser.

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:

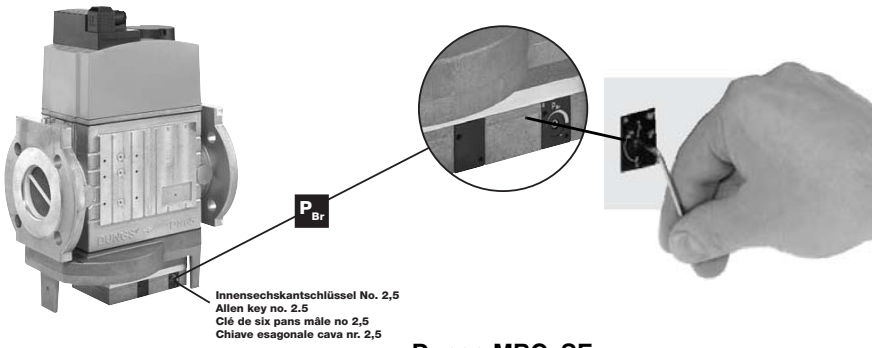
- Siemens VGD valves group: remove cap **T** and act on the **VR** adjusting screw to increase or decrease the pressure and consequently the gas rate; screwind **VR** the rate increases, unscrewing it decreases (see next figure).

- Dungs MBC..SE valves group: act on its pressure governor to increase or decrease the pressure and consequently the gas rate.



:

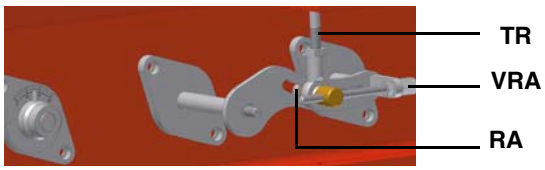
Siemens VGD..



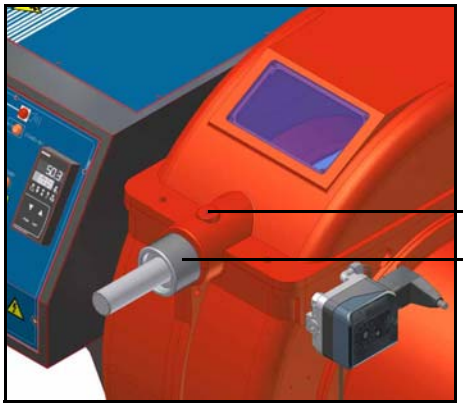
Dungs MBC..SE

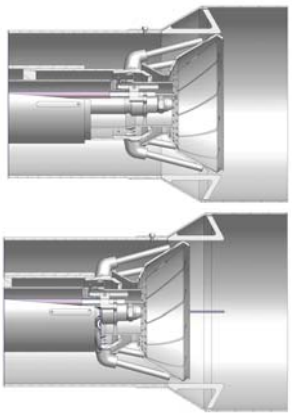
9 To adjust the **air flow rate in the high flame stage**, loose the **RA** nut and screw **VRA** as to get the desired air flow rate: moving the rod **TR** towards the air damper shaft, the air damper opens and consequently the air flow rate increases, moving it far from the shaft the air damper closes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

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.

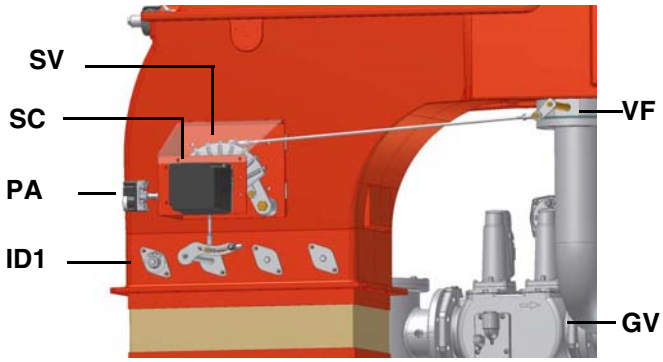
12 as for the point-to-point regulation, move the gas low flame microswitch (cam III) a little lower than the maximum position (90°);

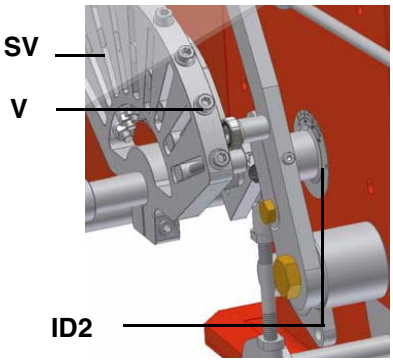
13 set the **TAB** thermostat to the minimum in order that the actuator moves progressively towards the low flame position;

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 next par.).





Keys
GV gas valves group
ID1 air damper index
ID2 index
PA air pressure switch
SC actuator
SV adjusting cam
V adjusting screws
VF butterfly valve

Gas butterfly valve closed

Gas butterfly valve open

17 If it is necessary to change the burner output in the low flame stage, move cam III: the low flame position must never match the ignition position, that is why cam III must be set 20°- 30° more than cam II.

18 Turn the burner off; then start the burner up again. If the adjustment is not correct, repeat the previous steps.

Adjustment by the Siemens SQL33.. actuator

1 set GAS fuel by means of the burner **CM** switch (it is placed on the burner control panel - see page 44)

2 check the fan motor rotation (see “Rotation of fan motor and pump motor” on page 27).

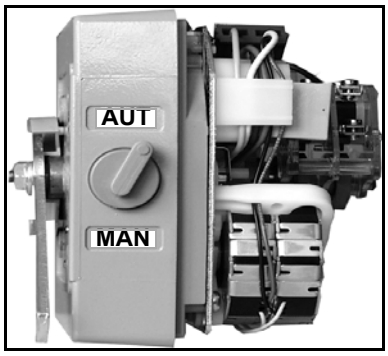
3 Start the burner up by means of the thermostat series and wait unitl the pre-purge phase comes to end and that burner starts up;

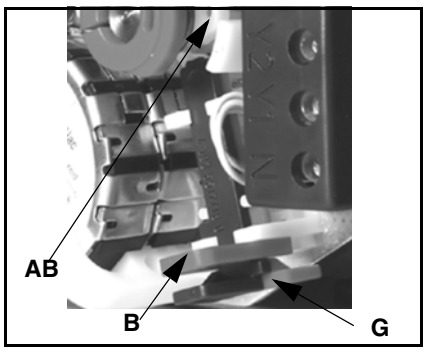
4 the burner starts up with the actuator on the ignition position, set it to the **MAN** (manual mode), by the **MAN/AUTO** selector (ignition position= read on the air damper index **ID1** - see picture on pag.37);

5 disconnect the **TAB** thermostat removing the wire from the terminal no. 6 or by setting MAN on the RWF40 modulatore or by setting 0 by means of the **CMF** switch (only for fully-modulating burners);

6 set the actuator on the manual mode (MAN) by means of the MAN/AUTO switch (see next pictures).

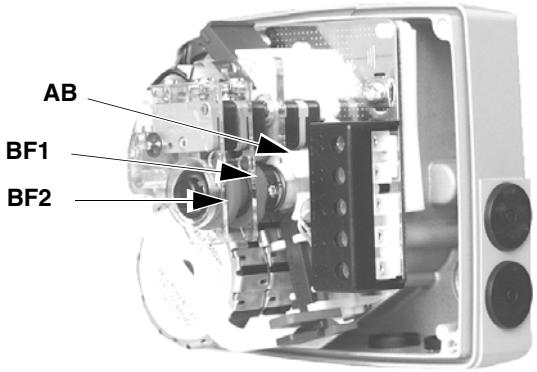
7 manually drive the adjusting cam **SV1** to the high flame position and set the actuator to the AUTO mode (by the related switch - see picture) to lock the adjusting cam.





SQL33.. actuator cams

AB = High flame cam
BF1 = Low flame (GAS)
BF2 = Low flame (OIL)
B = plastic clamp
G = cam locking lever

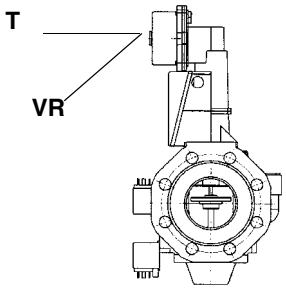


8 go on adjusting air and gas flow rates: check, continuosly, the flue gas analisys, as to avoid combustion with little air; dose the air according to the gas flow rate change following the steps below;

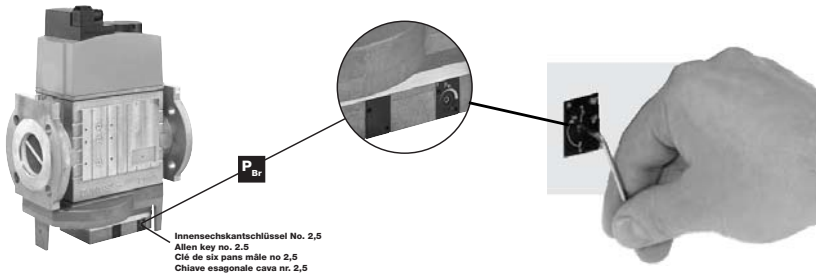
9 acting on the pressure stabiliser of the valves group, adjust **the gas flow rate in the high flame stage** as to meet the values requested by the boiler/utilisation:

- 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.



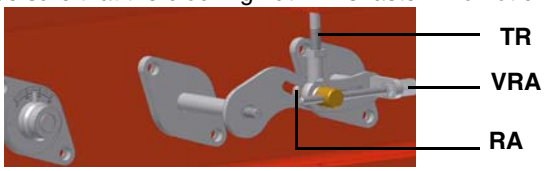
Siemens VGD..



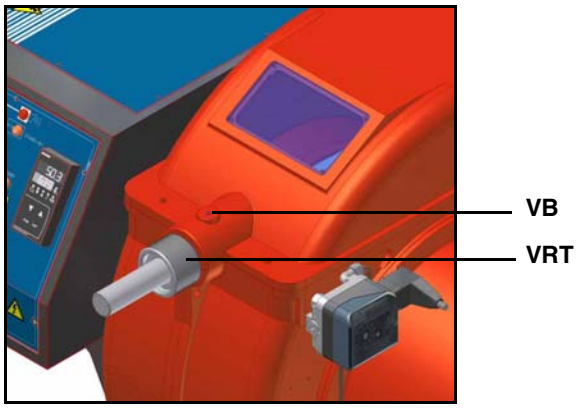
Dungs MBC..SE

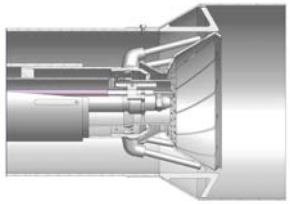
10 To adjust the **air flow rate in the high flame stage**, loose the **RA** nut and screw **VRA** as to get the desired air flow rate: moving the rod **TR** towards the air damper shaft, the air damper opens and consequently the air flow rate increases, moving it far from the shaft the air damper closes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

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.

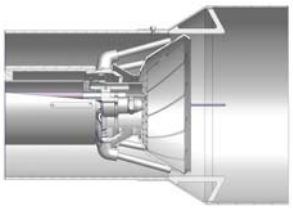


11 If necessary, chenge the combusiton head position: to let the burner operate at a lower output, loose the **VB** screw and move progressively back the combustion head towards the MIN position, by turning clockwise the **VRT** ring nut. Fasten **VB** screw when the adjustment is accomplished.





"MAX" head position head position



"MIN" head position head position

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

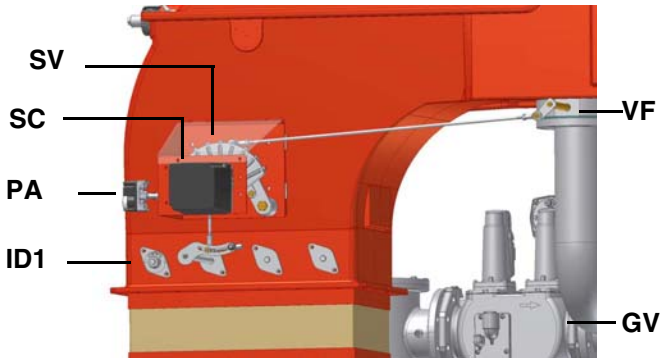
12 the air and gas rate are now adjusted at the maximum output, go on with the point to point adjustment on the **SV1** adjusting cam as to reach the minimum output point: gradually move the adjusting cam in order to adjust each of the **V1** screws as to set the cam foil shape as described on the next steps:

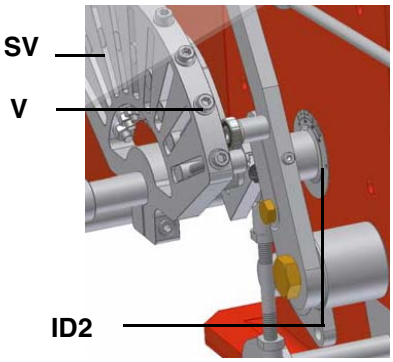
13 to change the **SV1** position set the actuator on the manual mode (MAN), turn the adjusting cam **SV1** and set again the actuator to the AUTO mode to lock the adjusting cam;

14 act on the **V1** screw that mathces the bearings referring to the adjusting cam position;

15 to adjust the next screw, set again the actuator mode to MAN, turn the adjusting cam and set the actuator to AUTO mode to lock the adjusting cam on the next screw; adjust it and go on this way to adjust all the screws in order to set the cam foil shape, according to the combustion values read.

16 Once the cam foil shape is defined, reconnect the **TAB** thermostat reconnecting the wire to the terminal no.6 or setting the RWF40 burner modulator to AUTO or the CMF switch to 3 (only for fully-modulating burner).





Keys
GV gas valves group
ID1 air damper index
ID2 index
PA air pressure switch
SC actuator
SV adjusting cam
V adjusting screws
VF butterfly valve

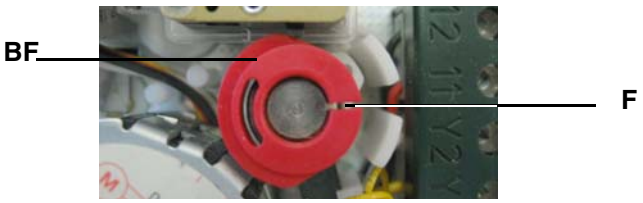
Gas butterfly valve closed

Gas butterfly valve open

17 Turn the burner off, then start it up again.

18 Once the pre-purge time comes to end, drive the burner to the high flame stage by the **TAB** thermosta and check the combustion values;

19 drive the burner to low flame, if necessary adjust the low flame size (ouput) by inserting a screwdriver on the slot **F** to move the **BF1** cam.



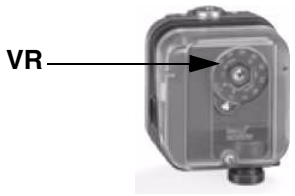
20 The low flame position must never match the ignition position that is why cam **BF1** must be set 20°- 30° more than the ignition position (see **ID1** index on previous pictures).

21 Now adjust the pressure switches (see page 38).

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:

- Remove the transparent plastic cap.
- Once air and fuel setting have been accomplished, startup the burner.
- During the pre-purge phase o the operation, turn slowly the adjusting ring nut **VR** in the clockwise direction (to increase the adjusting pressure) until the burner lockout, then read the value on the pressure switch scale and set it to a value reduced by 15%.
- Repeat the ignition cycle of the burner and check it runs properly.
- Refit the transparent plastic cover on the pressure switch.

Calibration of low gas pressure switch

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

- Be sure that the filter is clean.
- Remove the transparent plastic cap.
- While the burner is operating at the maximum output, test the gas pressure on the pressure port of the minimum gas pressure switch.
- 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.
- Check that the burner is operating correctly.
- Clockwise turn the pressure switch adjusting ring nut (as to increase the pressure value) until the burner stops.
- Slowly fully open the manual cutoff valve.
- Refit the transparent plastic cover on the pressure switch.

Adjusting the high gas pressure switch (when provided)

To calibrate the high pressure switch, proceed as follows:

1 remove the plastic cover;
2 measure the gas pressure in the network, when flame is off;
3 by means of the adjusting ring nut **VR**, set the value read on step 2, increased by the 30%;
4 replace the plastic cover.

PGCP Gas leakage pressure switch (witn Siemens LDU burner control/Siemens LMV Burner Management System)

- remove the pressure switch plastic cover;
- adjust the PGCP pressure switch to the same value set for the minimum gas pressure switch;
- replace the plastic cover.

Adjusting heavy oil flow rate

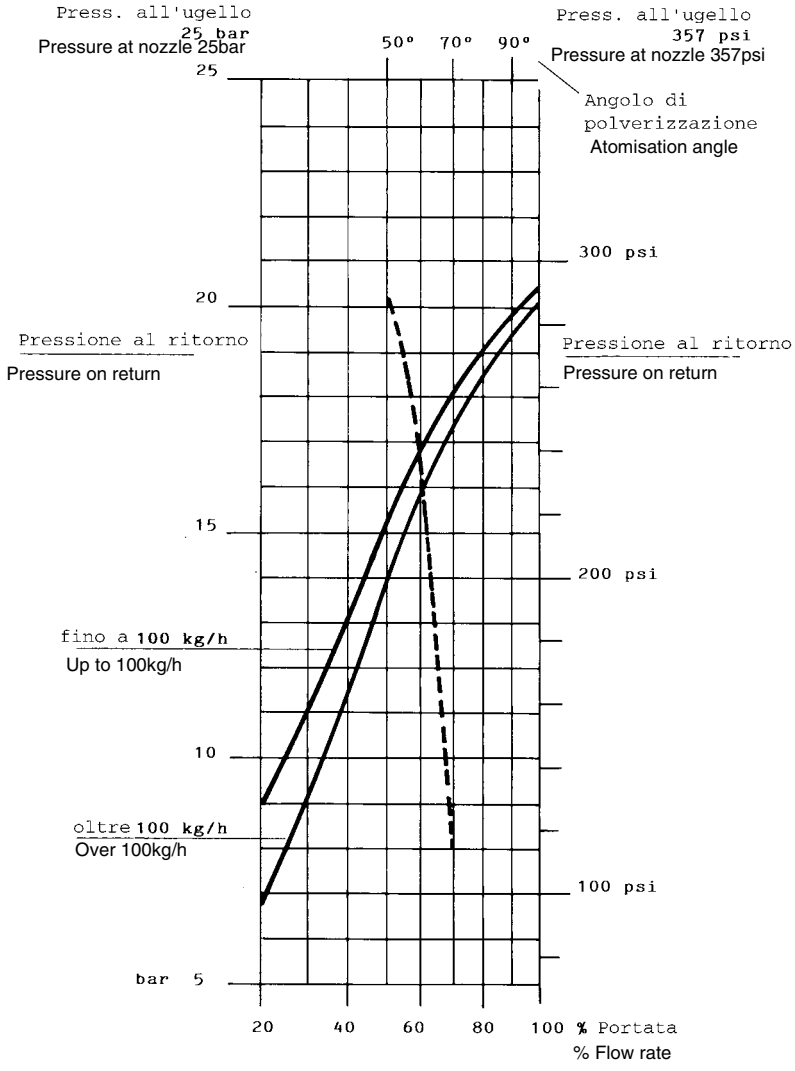
The light oil flow rate can be adjusted choosing a by-pass nozzle that suits the boiler/utilisation output and setting the delivery and return pressure values according to the ones quoted on the chart below and the diagram on Fig. 29 (as far as reading the pressure values, see next paragraphs).

NOZZLE	DELIVERY PRESSURE bar	RETURN PRESSURE MAX. bar	RETURN PRESSURE MIN. bar
FLUIDICS WR2	25	20	7

	FLOW RATE kg/h	
DIMENSIONS	**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

Tab. 4

Fig. 29



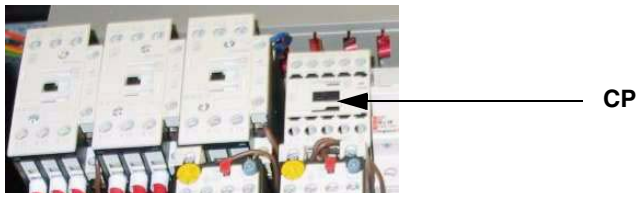
----------Atomisation angle according to the return pressure
_____ % Flow rate

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. 29).

Oil Flow Rate Settings by means of Berger STM30.. actuator

1 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 44).

2 with the electrical panel open, prime the oil pump acting directly 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;



3 bleed the air from the **M** pressure gauge port (Fig. 30) by loosing the cap without removing it, then release the contactor.

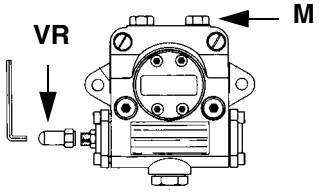
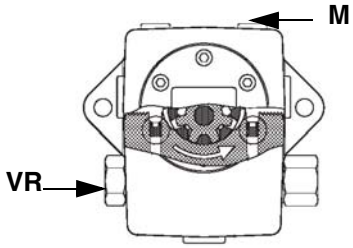
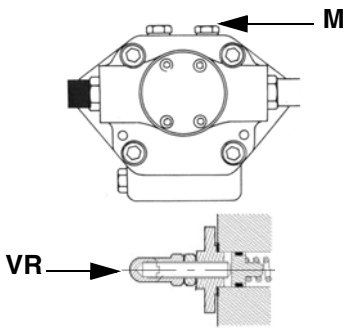
Suntec TA..	Danfoss KSM..	Suntec T..
		

Fig. 30

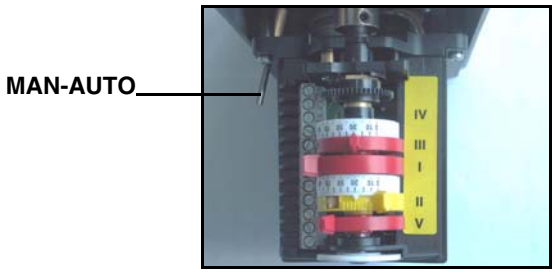
4 Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operates at the lowest output) to achieve safely the high flame stage .

5 record the high flame value set during the gas operation adjustments (see prevoius paragraphs);

6 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;

7 drive the burner to high flame stage, by means fo the thermostat **TAB**.

8 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).



STM30.. actuator cams

I	High flame
II	Stand-by and Ignition
III	Low flame (gas)
V	Low flame (oil)

9 the nozzle suplly pressureis 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 on Fig. 31 and act on on the pump adjusting screw **VR** (see Fig. 30) as to get the nozzle pressure at 25bar (Fluidics nozzles - see diagram on page 39).

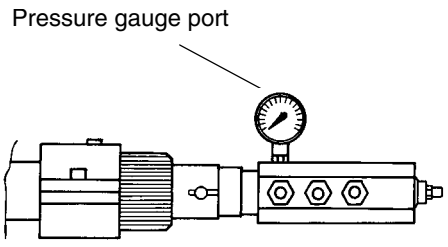


Fig. 31

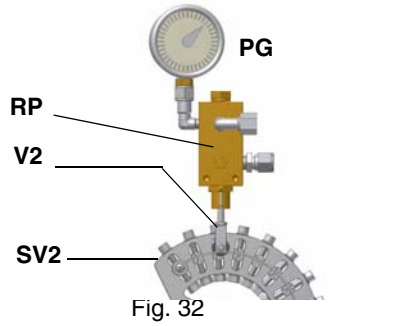


Fig. 32

10 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.

11 as for the point-to-point regulation in order to set the cam foil shape, move the low flame microswitch (cam V) a little lower than the maximum position (90°);

12 set the **TAB** thermostat to the minimum in order that the actuator moves progressively towards the low flame position;

13 move cam V 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 showed on diagram in Fig. 28, according to the requested rate.

14 Move again cam V 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.

15 The low flame position must never match the ignition position that is why cam **V** must be set 20°- 30° more than the ignition position.

Turn the burner off; then start it up again. If the adjustment is not correct, repeat the previous steps.

Adjustment by the Siemens SQL33.. actuator

1 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 44).

2 with the electrical panel open, prime the oil pump acting directly 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;

3 bleed the air from the **M** pressure gauge port (Fig. 30) by loosing the cap without removing it, then release the contactor.

4 record the high flame value set during the gas operation adjustments (see prevoius paragraphs);

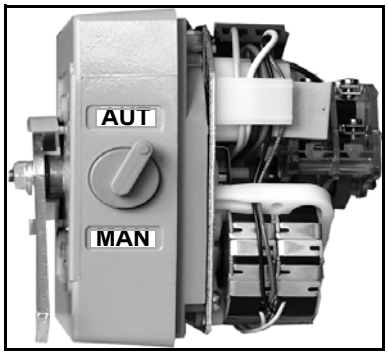
5 Start the burner up by means of the thermostat series and wait unitl the pre-purge phase comes to end and that burner starts up;

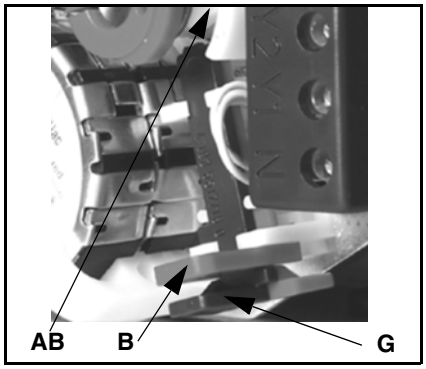
6 the burner starts up with the actuator on the ignition position, set it to the **MAN** (manual mode), by the **MAN/AUTO** selector (ignition position= read on the air damper index **ID1** - see picture on page 37);

7 disconnect the **TAB** thermostat removing the wire from the terminal no. 6 or by setting MAN on the RWF40 modulatore or by setting 0 by means of the **CMF** switch (only for fully-modulating burners);

8 set the actuator on the manual mode (MAN) by means of the MAN/AUTO switch (see next pictures).

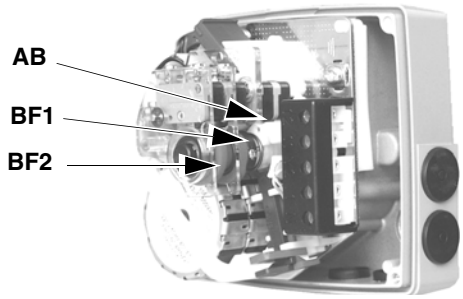
9 manually drive the adjusting cam **SV2** to the high flame position and set the actuator to the AUTO mode (by the related switch - see picture) to lock the adjusting cam.





SQL33.. actuator cams

AB = High flame cam
BF1 = Low flame (GAS)
BF2 = Low flame (OIL)
B = plastic clamp
G = cam locking lever



The nozzle supply pressureis 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 on Fig. 30 and act on on the pump adjusting screw **VR** (see Fig. 30) as to get the nozzle pressure at 25bar (Fluidics nozzles - see diagram on page 39).

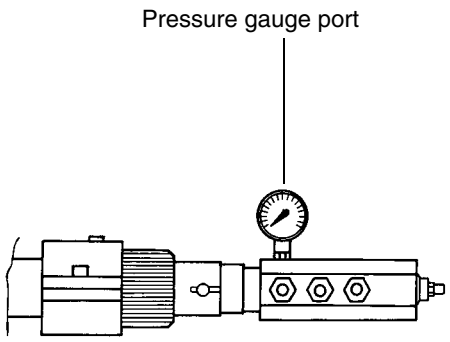


Fig. 33

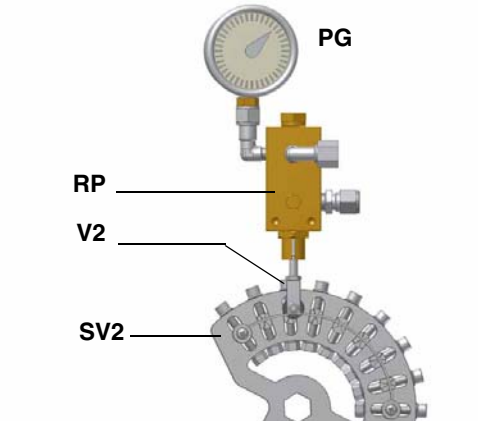


Fig. 34

10 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.

11 once the air and oil flow rate have been adjusted at the maximum output, go on with the point to point adjustment on the **SV2** adjusting cam as to reach the minimum output point: gradually move the adjusting cam in order to adjust each of the **V2** screws as to describe the cam foil shape.

12 to change the **SV2** position set the actuator on the manual mode (MAN), turn the adjusting cam **SV2** and set again the actuator to the AUTO mode to lock the adjusting cam;

13 act on the **V2** screw that mathces the bearings referring to the adjusting cam position;

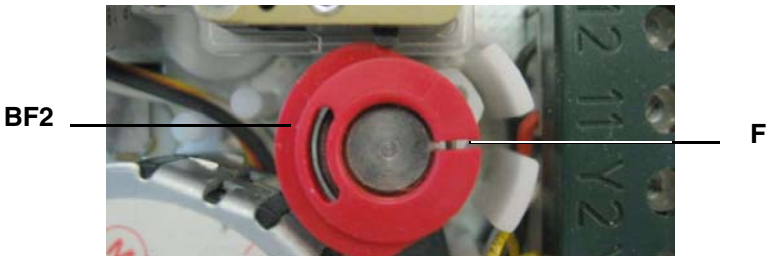
14 to adjust the next screw, set again the actuator mode to MAN, turn the adjusting cam and set the actuator to AUTO mode to lock the adjusting cam on the next screw; adjust it and go on this way to adjust all the screws in order to set the cam foil shape, according to the combustion values read.

15 Once the cam foil shape is defined, reconnect the **TAB** thermostat reconnecting the wire to the terminal no.6 or setting the RWF40 burner modulator to AUTO or the CMF switch to 3 (only for fully-modulating burner).

16 Turn the burner off then start it up again.

17 Once the pre-purge time comes to end, drive the burner to the high flame stage by the **TAB** thermostat: check the combustion values;

18 drive the burner to low flame, if necessary adjust the low flame size (output) by inserting a screwdriver on the slot **F** to move the **BF2** cam.



19 The low flame position must never match the ignition position that is why cam **BF2** must be set 20°- 30° more than the ignition position.

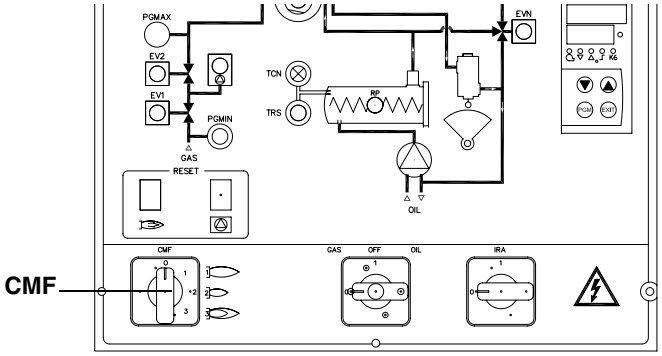
Turn the burner off; then start it up again. If the adjustment is not correct, repeat the previous steps.

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

Heavy oil gun

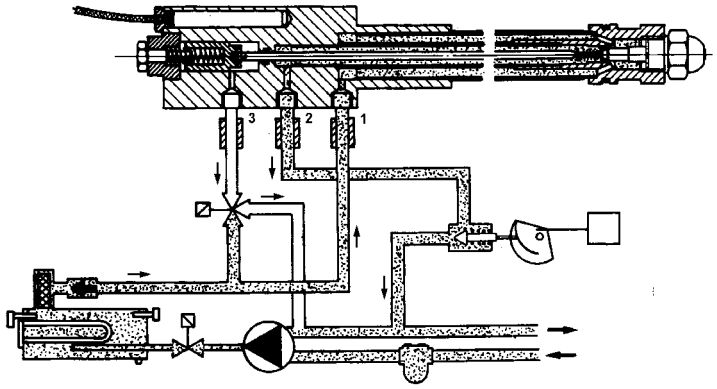


Fig. 35 - Nozzle pre-purge

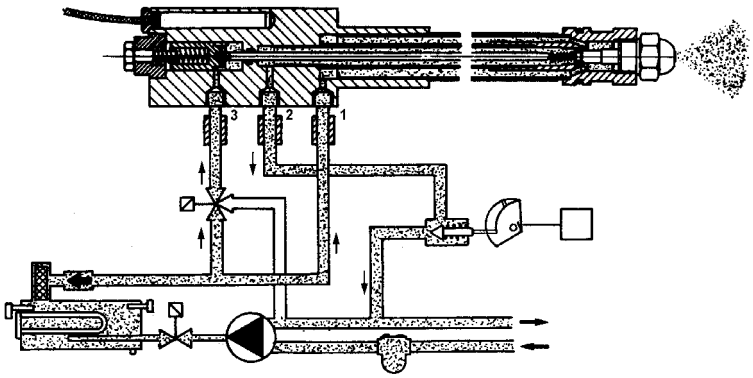


Fig. 36 -Ignition

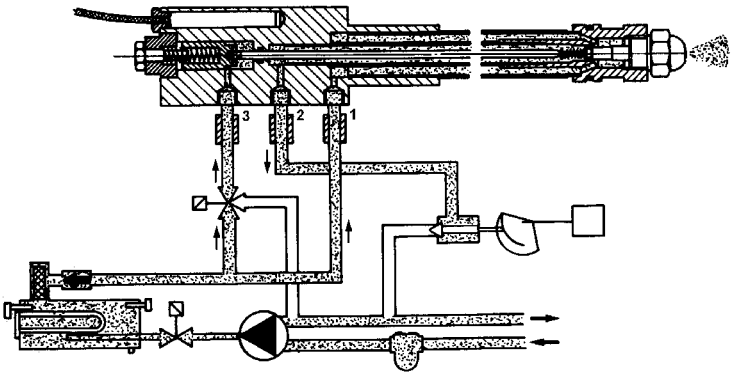


Fig. 37 -High flame

PART II: OPERATION

LIMITATIONS OF USE

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

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

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

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

NEVER OPEN OR DISMANTLE ANY COMPONENT OF THE MACHINE.

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

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

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

OPERATION

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".**

- Select the fuel by turning the switch CM on the burner control panel .

N.B. if the heavy oil is used, be sure the cutoff valves on the delivery and return pipes are OPEN.

- 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 valve proving test begins.
- At the beginning of the start-up cycle the the air damper moves to the maximum opening, the fan motor starts and the pre-purge phase begins. During the pre-purge phase the complete opening of the air damper is signalled by the LED **F** on the front panel.
- At the end of the pre-purge stage, the air damper moves to the ignition position, the ignition transformer is energised (signalled by LED **C** on the panel) and, after few sec.onds the two gas valves EV1 and EV2 are energised (indicator lights **H** and **G** on). Few seconds after the opening of the gas valves, the ignition transformer is de-energised and LED **C** is off.
- To move from the low flame position, the actuator opening time (<10 s) is controlled by the control box. When this time elapses, the burner operates according the plant needs.

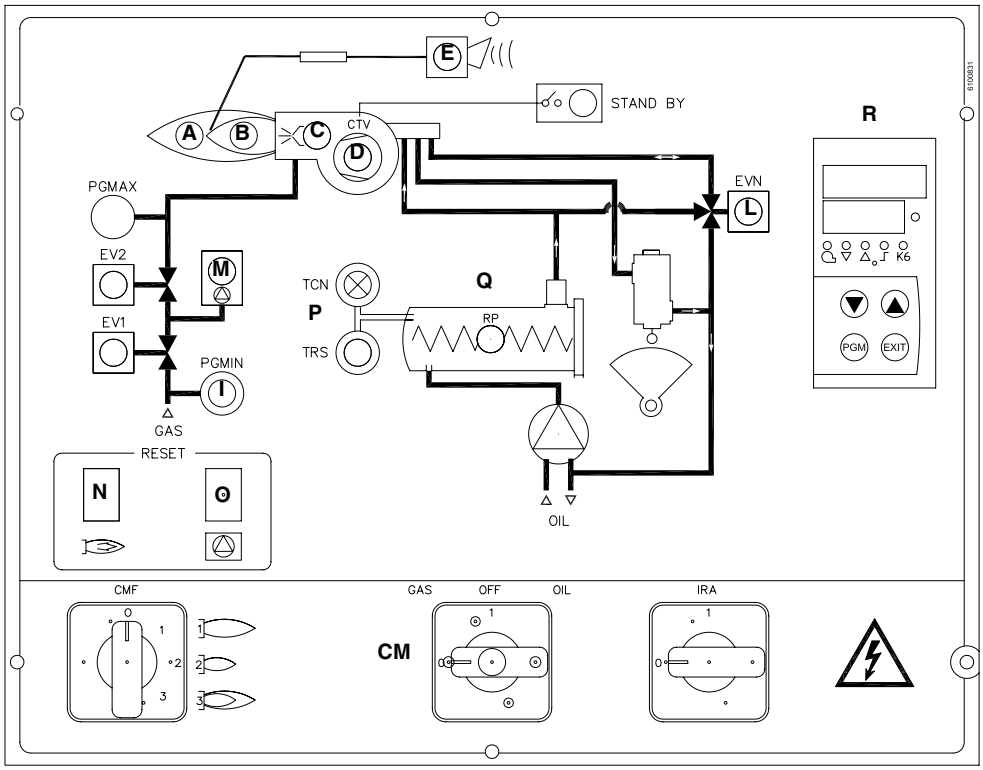
Heavy oil Operation

- At the beginning of the start-up cycle the air damper moves to the maximum opening, the fan motor starts and the pre-purge phase begins. During the pre-purge phase the complete opening of the air damper is signalled by LED **F** on the front panel.
- At the end of the pre-purge the air damper is brought to the ignition position and the ignition transformer is energised (signalled by LED **C** on the panel). Few seconds later, the oil valve opens and the ignition transformer is de-energized (LED **C** off).

The burner is now operating and after some seconds the burner is automatically driven into high flame (LED **A** on), or remains in low flame (LED **B** on) according to the plant needs.

Burner front panel

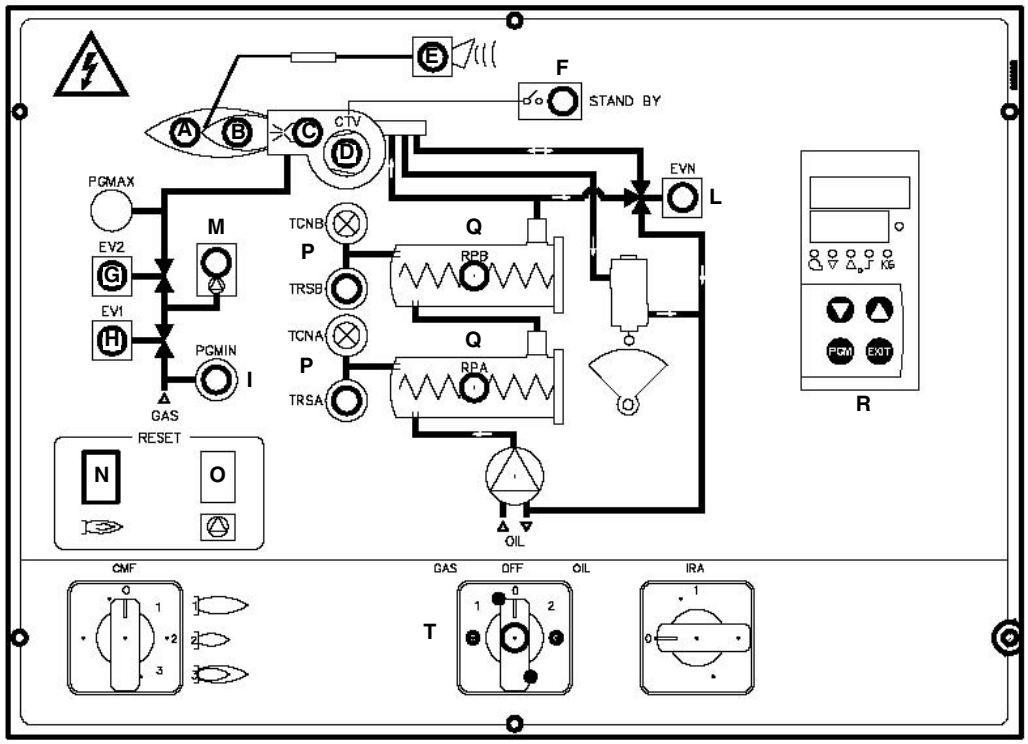
KTP91A - KTP92A - KTP93A - KTP512A



Key

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

KTP515A - KTP520A - KTP525A



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

- Clean and examine the gas filter cartridge and replace it if necesssary (see next paragraph).
- Check and clean the oil filter cartridge; replace it if necessary (see next paragraphs).
- Examine the condition of the oil flexible hoses and check for possible leaks.
- 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.

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. Routine inspections must be carried out to determine the frequency of cleaning.*

- 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.
- Remove and clean the combustion head (page 47).
- Examine and clean the ignition electrodes, adjust and replace if necessary (see page 48).
- Examine and clean the detection probe, adjust and replace if necessary (see page 49).
- Examine the detection current (see page 48).
- Remove and clean (page 47) 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.
- Clean and grease joints and rotating parts.

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

⚠	**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.

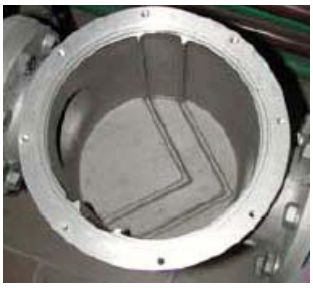
To clean or remove the filter, proceed as follows:

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 Or ring into its place (C) and replace the cover fastening by the proper screws (A).

A

B

C



Inspection and replacement of the MULTIBLOC DUNGS MBC..SE filter (Threaded valves group)

Inspect the filter at least once a year.

- Change the filter, if pressure value between pressure connections 1 and 2 is greather than 10 mbar.
- Change the filter, if pressure value between pressure connections 1 and 2 is twice as high compared to the last inspection.

1. Interrupt gas supply: close ball valve
2. Remove screws 1-2
3. Replace the filter insert 3
4. Screw in screws 1-2 without use force to fasten.
5. Perform leakage and funcion test.

Space requirements for fitting filter, A: from 150 to 230 mm.

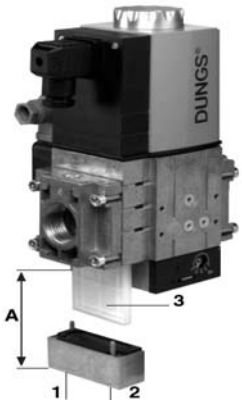
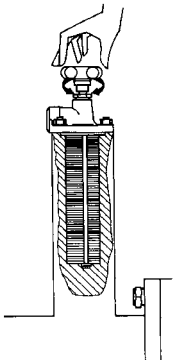


Fig.38

Self-cleaning filter

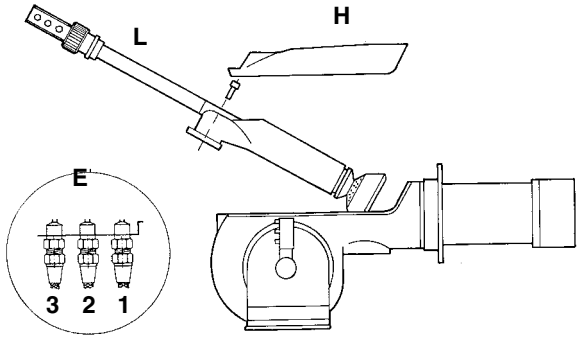
Fitted only on high viscosity oil burners. Periodically turn the knob to clean the filter.

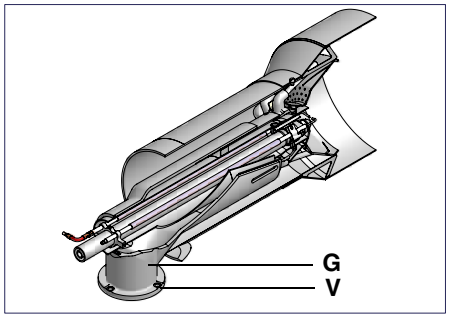


Removing the combustion head

1 Remove the cover **H**.
2 Slide the photoresistance out of its housing.
3 Unscrew the **V** screws that block the gas collector **G**, loosen the three jionts **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.





Key

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.

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 showed on pag.: 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.

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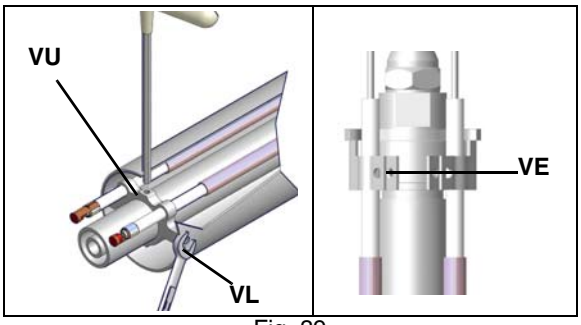
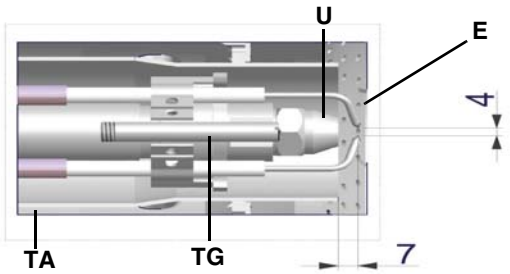


Fig. 39

Adjusting the electrodes position

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



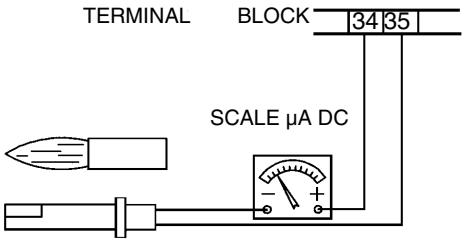
Keys

E	electrodes
TA	air pipe
TG	ignition gas pipe
U	nozzle

Fig. 40

Checking the detection current

To check the flame itensity signal, follow the diagram showed 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	Minimum detection signal
Siemens LFL1.333	70µA

Fig. 41

Cleaning and replacing the detection photocell

The photocell working life is about 10000 working hours (about 1 year), at max 50°C after which it must be replaced.

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.

Seasonal stop

To stop the burner in the seasonal stop, proceed as follows:

1 turn the burner's main switch to 0 (Off position)
2 disconnect the power mains
3 close the fuel valve in 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".

TROUBLESHOOTING

CAUSE / TROUBLE	BURNER DOESN'T START	CONTINUES PRE-PURGE PHASE	DOESN'T START AND GOES TO LOCKOUT	DOESN'T START AND REPEATS CYCLE	STARTS AND REPEATS CYCLE	DOESN'T SWITCH TO HIGH FLAME	LOCKOUT DURING OPERATION	SHUTS OFF AND REPEATS CYCLE DURING OPERATION	NOISY FUEL PUMP
MAIN SWITCH OPEN	●								
LINE FUSES BROKEN	●								
LACK OF GAS	●								
FAULTY GAS PRESSURE SWITCH	●								
FAULTY HIGH PRESSURE SWITCH	●								
FAN THERMAL CUTOUT INTERVENTION	●								
AUXILIARIES FUSE INTERVENTION	●								
FAULTY AIR PRESSURE SWITCH	●		●				●		
FAULTY CONTROL BOX	●	●	●				●		
FAULTY ACTUATOR		●							
AIR PRESSURE SWITCH UNCALIBRATED OR FAULTY							●		
GAS PRESSURE SWITCH UNCALIBRATED			●	●	●			●	
IGNITION TRANSFORMER DEFECTIVE			●						
ELECTRODES BAD POSITION			●						
GAS BUTTERFLY UNCALIBRATED			●						
GAS GOVERNOR DEFECTIVE				●	●			●	
HI-LO FLAME THERMOSTAT DEFECTIVE						●			
ACTUATOR CAM UNCALIBRATED						●			
PHOTOCELL DIRTY OR BAD POSITION							●		
FUEL LOW PRESSURE			●						
FAULT ON LIGHT OIL SOLENOID VALVES			●						
FUEL FILTERS DIRTY									●

SPARE PARTS

Desription	Code		
	KTP91A	**KTP92A**	**KTP93A**
CONTROL BOX	2020448	2020448	2020448
IGNITION ELECTRODE	2080292	2080292	2080256
OIL FILTER	2090207	2090207	2090207
GAS FILTER - Rp 2	2090119	2090119	2090119
GAS FILTER - DN65	2090117	2090117	2090117
GAS FILTER - DN80	2090112	2090112	2090112
GAS FILTER - DN100	2090113	2090113	2090113
GASKET	2110048	2110048	2110048
AIR PRESSURE SWITCH	2160065	2160065	2160065
GAS PRESSURE SWITCH- DUNGS GW50 A5	2160076	2160076	2160076
GAS PRESSURE SWITCH- DUNGS GW150 A5	2160077	2160077	2160077
GAS PRESSURE SWITCH- DUNGS GW500 A6	2160087	2160087	2160087
GAS PRESSURE SWITCH- DUNGS GW500 A5	2160089	2160089	2160089
GAS PRESSURE SWITCH- ANTUNES DMG050	21600A2	21600A2	21600A2
GAS PRESSURE SWITCH- ANTUNES DMG150	21600A3	21600A3	21600A3
GAS PRESSURE SWITCH- ANTUNES DMG500	21600A4	21600A4	21600A4
GAS PRESSURE SWITCH- ANTUNES FCG500	21600A7	21600A7	21600A7
IGNITION TRANSFORMER	2170302	2170302	2170302
PUMP MOTOR	2180202	2180202	2180202
GAS VALVE GROUP - Rp2" - Siemens VGD20..	2190171	2190171	2190171
GAS VALVE GROUP - DN65 - Siemens VGD40..	2190172	2190172	2190172
GAS VALVE GROUP - DN80 - Siemens VGD40..	2190169	2190169	2190169
GAS VALVE GROUP - DN100 - Siemens VGD40..	2190174	2190174	2190174
GAS VALVE ACTUATOR SKP15	2190181	2190181	2190181
GAS VALVE ACTUATOR SKP25	2190183	2190183	2190183
GAS VALVE GROUP - Rp2" - Dungs MBC1200SE	21903M5	21903M5	21903M5
GAS VALVE GROUP - DN65 - Dungs MBC1900SE	21903M6	21903M6	21903M6
GAS VALVE GROUP - DN80 - Dungs MBC3100SE	21903M7	21903M7	21903M7
GAS VALVE GROUP - DN100 - Dungs MBC5000SE	21903M8	21903M8	21903M8
OIL SOLENOID VALVE	2190437	2190437	2190437
GAS PROVING SYSTEM	2191604	2191604	2191604
FLEXIBLE HOSE L=1500	2340004	2340004	2340004
FLEXIBLE HOSE L=335	2340087	2340087	2340087
FLEXIBLE HOSE L=385	2340088	2340088	2340088
FLEXIBLE HOSE L=435	2340089	2340089	2340089
SMALL ADJUSTING CAM FOIL	2440013	2440013	2440013
BIG ADJUSTING CAM FOIL	2440014	2440014	2440014
ACTUATOR (SIEMENS SQL33.03)	2480040	2480040	2480040
ACTUATOR (BERGER STM30/24)	2480090	2480090	2480090
UV PROBE	2510001	2510001	2510001
THERMOSTAT 50-200°C	2560026	2560026	2560026
THERMOSTAT 190°C	2560028	2560028	2560028
MOTOR-PUMP COUPLING	2540019	2540019	2540019
OIL GOVERNOR	2570054	2570054	2570077
BURNER MODULATOR (only on fully-modulating burners)	2570112	2570112	2570112
PUMP - SUNTEC	2590119	2590119	2590119
PUMP - DANFOSS	2590311	2590311	2590311
NOZZLE	2610202	2610202	2610203
OIL GUN	2700231	2700231	2700236
COMBUSTION HEAD	30600R3	30600R3	30600R3
BLAST TUBE	3091070	3091080	30910M0
IGNITION CABLE	6050108	6050108	6050112
OIL HEATER RESISTOR	6060007	6060007	6060008
PRINTED CIRCUIT BOARD	6100533	6100533	6100533

Desription	**Code**			
	KTP512A	**KTP515A**	**KTP520A**	**KTP525A**
CONTROL BOX	2020448	2020448	2020448	2020448
IGNITION ELECTRODE	2080292	2080292	2080292	2080292
OIL FILTER	2090212	2090018	2090018	2090018
GAS FILTER - Rp 2	2090119	2090119	2090119	-
GAS FILTER - DN65	2090117	2090117	2090117	2090117
GAS FILTER - DN80	2090112	2090112	2090112	2090112
GAS FILTER - DN100	2090113	2090113	2090113	2090113
GASKET	2110047	2110047	2110047	2110047
AIR PRESSURE SWITCH	2160065	2160065	2160065	2160065
GAS PRESSURE SWITCH- DUNGS GW50 A5	2160076	2160076	2160076	2160076
GAS PRESSURE SWITCH- DUNGS GW150 A5	2160077	2160077	2160077	2160077
GAS PRESSURE SWITCH- DUNGS GW500 A6	2160087	2160087	2160087	2160087
GAS PRESSURE SWITCH- DUNGS GW500 A5	2160089	2160089	2160089	2160089
GAS PRESSURE SWITCH- ANTUNES DMG050	21600A2	21600A2	21600A2	21600A2
GAS PRESSURE SWITCH- ANTUNES DMG150	21600A3	21600A3	21600A3	21600A3
GAS PRESSURE SWITCH- ANTUNES DMG500	21600A4	21600A4	21600A4	21600A4
GAS PRESSURE SWITCH- ANTUNES FCG500	21600A7	21600A7	21600A7	21600A7
IGNITION TRANSFORMER	2170302	2170302	2170302	2170302
PUMP MOTOR	2180223	2180223	2180211	2180283
GAS VALVE GROUP - Rp2" - Siemens VGD20..	2190171	2190171	2190171	2190171
GAS VALVE GROUP - DN65 - Siemens VGD40..	2190172	2190172	2190172	2190172
GAS VALVE GROUP - DN80 - Siemens VGD40..	2190169	2190169	2190169	2190169
GAS VALVE GROUP - DN100 - Siemens VGD40..	2190174	2190174	2190174	2190174
GAS VALVE ACTUATOR SKP15	2190181	2190181	2190181	2190181
GAS VALVE ACTUATOR SKP25	2190183	2190183	2190183	2190183
GAS VALVE GROUP - Rp2" - Dungs MBC1200SE	21903M5	21903M5	21903M5	21903M5
GAS VALVE GROUP - DN65 - Dungs MBC1900SE	21903M6	21903M6	21903M6	21903M6
GAS VALVE GROUP - DN80 - Dungs MBC3100SE	21903M7	21903M7	21903M7	21903M7
GAS VALVE GROUP - DN100 - Dungs MBC5000SE	21903M8	21903M8	21903M8	21903M8
OIL SOLENOID VALVE	2190437	2190403	2190403	2190750
GAS PROVING SYSTEM	2191604	2191604	2191604	2191604
FLEXIBLE HOSE L=1500	2340004	2340004	2340004	2340004
FLEXIBLE HOSE L=335	2340087	2340087	2340087	2340087
FLEXIBLE HOSE L=385	2340088	2340088	2340088	2340088
SMALL ADJUSTING CAM FOIL	2440013	2440013	2440013	2440013
BIG ADJUSTING CAM FOIL	2440014	2440014	2440014	2440014
ACTUATOR - (SIEMENS SQL33.03)	2480040	2480040	2480040	2480040
ACTUATOR - (BERGER STM30/24)	2480090	2480090	2480090	2480090
UV PROBEUV PROBE	2510001	2510001	2510001	2510001
MOTOR-PUMP COUPLING	2540126	2540126	2540126	-
OIL GOVERNOR - SUNTEC TV	-	-	-	2570036
OIL GOVERNOR	2570077	25700B2	25700B2	25700A7
BURNER MODULATOR (only on fully-modulating burners)	2570112	2570112	2570112	2570112
PUMP: - SUNTEC	2590120	2590121	2590121	2590124
PUMP: - DANFOSS	2590312	2590313	2590313	-
NOZZLE	2610203	2610203	2610203	2610203
OIL GUN	2700232	2700232	2700232	2700232
COMBUSTION HEAD	30600R4	30600R5	30600R6	30600R6
BLAST TUBE	3091075	3091076	30910H4	30910L9
IGNITION CABLE	6050108	6050108	6050108	6050108
OIL HEATER RESISTOR (12 kW)	-	6060006	-	-
OIL HEATER RESISTOR (18 kW)	-	6060007	6060007	-
OIL HEATER RESISTOR (24 kW)	6060008	-	6060008	6060008 x 2
PRINTED CIRCUIT BOARD	6100533	6100533	6100533	-

APPENDIX

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 MINIMUM signal for the auxiliary contact of the damper servo motor at terminal 8.

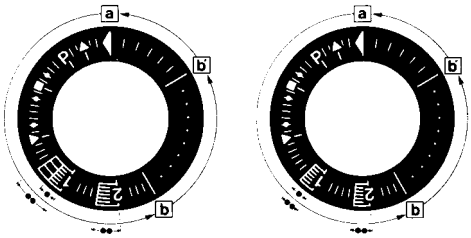
1 Block due to absence of flame signal at the end of the 1st safety period.

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

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

▌ Blockdue 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 Start-up programme

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')-aPost-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

t3 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

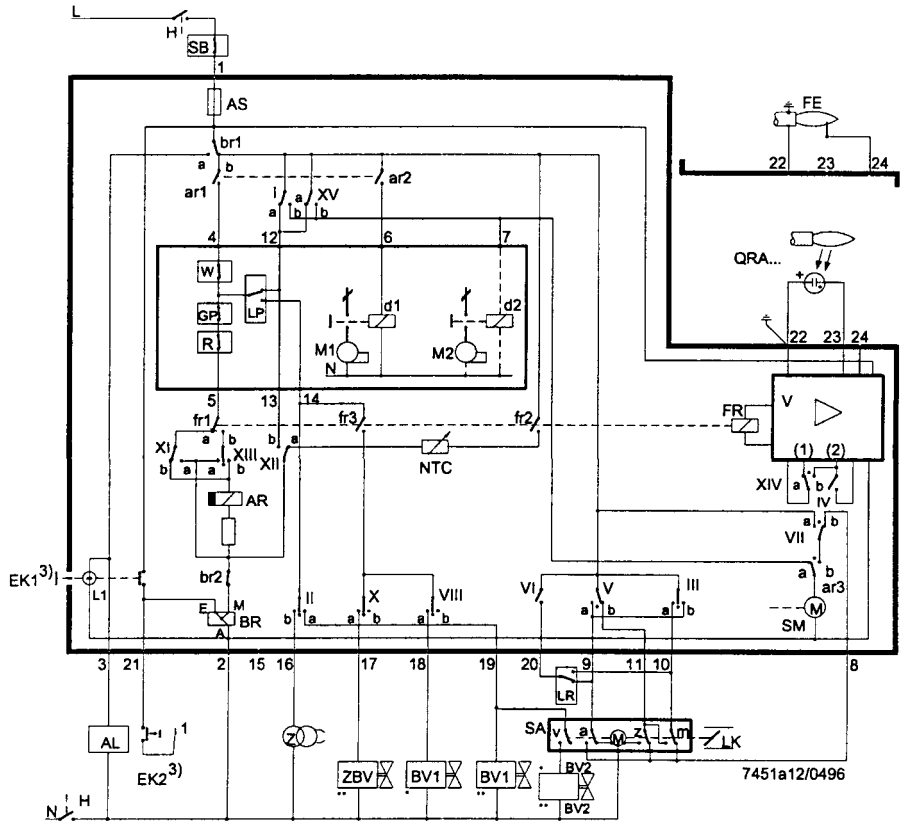
A	limit contact switch for damper OPEN position
AI	block remote signal
AR	main relay (working network) with contacts "ar"
AS	Monitor fuse
BR	block relay with "br" contacts
BV	fuel valve
EK	reset button
FE	detector electrode of ionisation circuit
FR	flame relay with "fr" contacts
G	ventilator motor or 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.


L
H
SB
1
AS
br1
ar1
ar2
XV
4
12
6
7
W
GP
LP
R
d1
d2
M1
M2
N
FE
22
23
24
QRA...
5
13
14
fr1
fr3
fr2
FR
V
(1) (2)
XI
XIII
XII
NTC
AR
XIV
IV
VII
EK1 3)
L1
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E
M
BR
A
II
X
VIII
VI
V
III
ar3
SM
3
21
2
15
16
17
18
19
20
9
11
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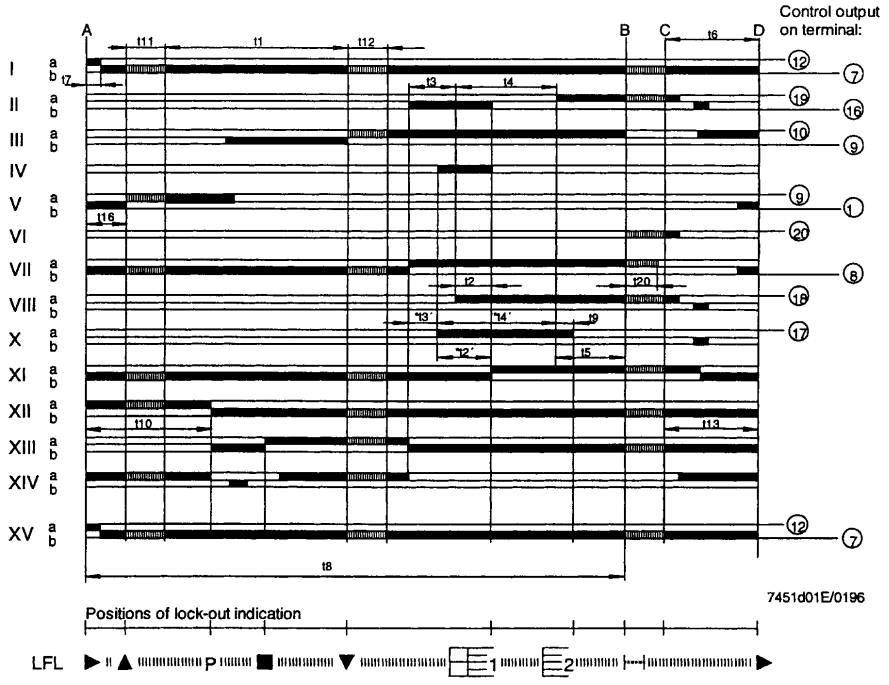
8
LR
SA
LK
AL
EK2 3)
ZBV
BV1
BV2
N
H
7451a12/0496


Control output on terminal:
A
B
C
D
t11
t1
t12
t6
t7
t3
t4
t16
t2
t20
t13
t14
t9
t12
t5
t10
t13
t8
I
II
III
IV
V
VI
VII
VIII
X
XI
XII
XIII
XIV
XV
12
7
10
9
1
20
8
18
17
16
19
7451d01E/0196
Positions of lock-out indication
LFL
P
1
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C.I.B. UNIGAS S.p.A.
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