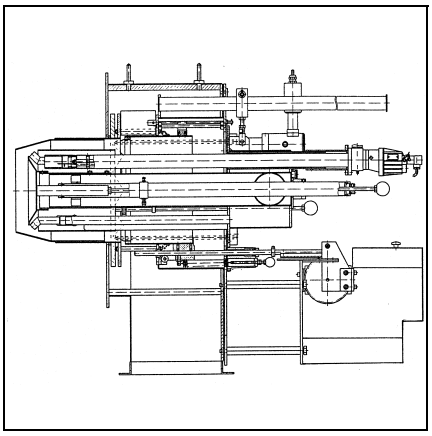
Operation Manual
For the authorized specialist

Gas Duoblock Burner
RPD 30 - 100 G-E



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Contents

General Information

Important information
The burners of type RPD 30...100G-E/R have been designed for the combustion of natural gas.
The burners should be installed and taken into operation by qualified personnel only who will be responsible for the proper performance of this work in accordance with the applicable regulations and guidelines.

Only duly authorized specialists should be entrusted with the installation of the gas system.

Any repair work on monitors, limiters and automatic furnace controllers and on the other safety facilities are allowed to be done only by the manufacturers themselves or specialists authorized by them.
Original parts should only be exchanged by a duly qualified specialist.

Standards and regulations
The following standards should be observed in the interest of a safe, easy-on-the-environment and energy-saving operation of the burner:

EN 676/ DIN 4788	Gas Burners with Fans
VDE 0116	Electrical Equipment of Furnaces

According to EN 676, the user must be instructed in the operation of the burner and according to DIN 4756, the user must be introducted in to gas firing system.

For the installation of a gas furnace system, care should be taken to observe DIN 4756, TRGI (Technical Regulation on Gas Installations), the Worksheets of DVGW (German Association of the Gas and Water Sector) and the local furnace construction regulations applicable in the country.

Screwed unions of metal used in gas lines should be fitted with approved sealing elements.

Prior to taking the burner into operation make sure to vent the gas line, but this should in no case be done through the furnace chamber.

Start-up
The furnace system should be started initially by the installer, manufacturer or other specialized personnel. Prior to taking the furnace system into operation, make a test of all automatic control, safety and control facilities for proper functional order and check them for correct setting if of adjustable type. Furthermore, check the control circuits, fans, etc. for proper fuse rating, and whether suitable precautions have been taken to prevent accidental contact.

Inspection and Maintenance
The furnace system should be inspected and serviced at least once a year by an authorized specialist of the installer to ensure its proper functional order, operational safety and energy-saving operation. Check the system for absence of leaks and functional order. For the combustion analysis proceed as described in the section entitled „Exhaust Gas Test“. It is recommended to conclude a maintenance agreement to this effect.

Warranty
Manufacturer will not accept any warranty if the operating instructions have not been duly observed in the start-up and maintenance of the burner and damages have been caused by improper installation, incorrect adjustment, unauthorized interference or operating errors.

Burner installation and accessories

Boiler lining
The boiler lining should be made of heat-resistant materials (temperature resistance >1400°C). Take care that the burner flame tube is covered by the boiler lining over its full length.
The open space between the burner flame tube and the boiler lining should be packed with mineral wool.

Checks prior to burner installation

1 Check the mixing ignition unit according to the boiler output.

2 Pilot burner setting.

3 See dimensioned drawing for setting dimensions of mixing ignition unit.

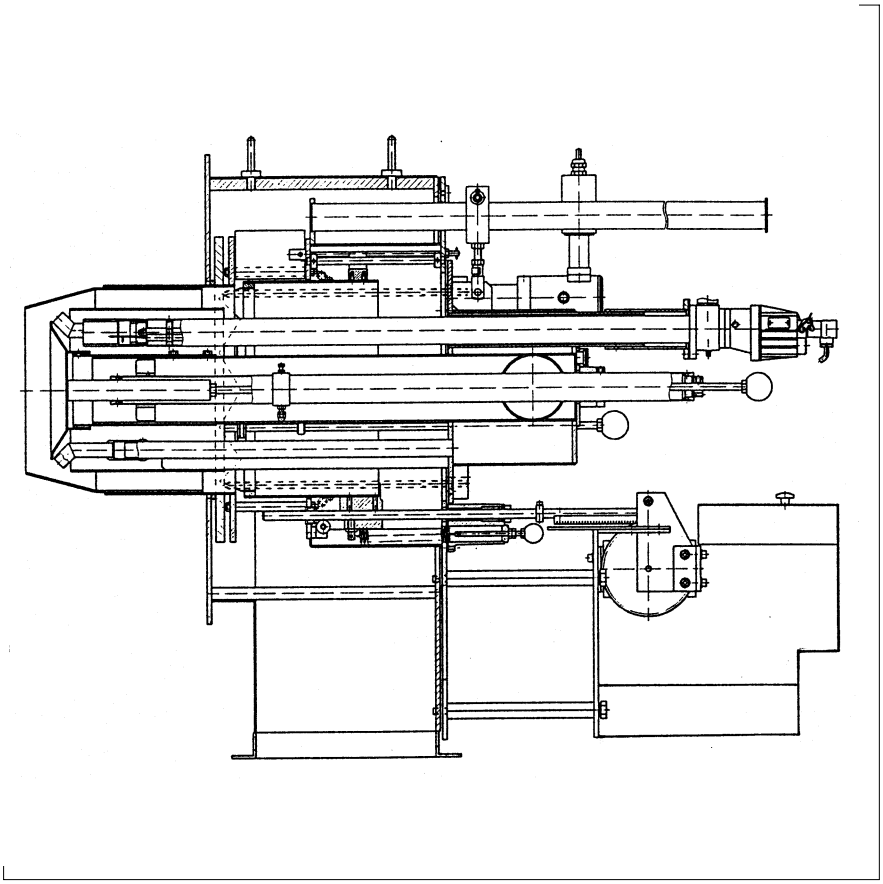
4 Check the air cylinder for proper function (possible damage in transport).

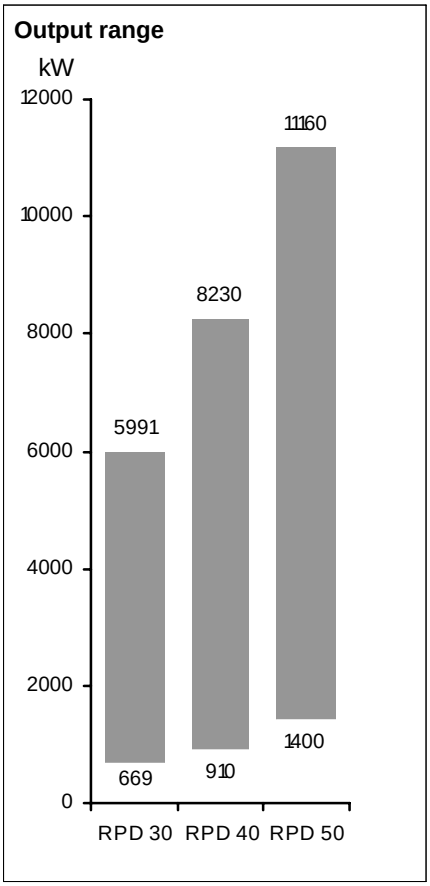
5 Check the air damper setting according to flame pattern and furnace chamber geometry.

Technical Data Sheet

Duoblock Gas Burner
RPD 30, 40 & 50 G-E

Technical Data	RPD 30	RPD 40	RPD 50
Burner output	669 - 5991 kW	910 - 8230 kW	1400 - 11160 kW
Gas flow rate	67 - 599 m³/h	91 - 823 m³/h	140 - 1116 m³/h
Operating mode	fully modulating		
Fuel type	Natural gas		
Automatic burner controller	LFL 1. , LGK 16 or other approved models		
Flame sensor	QRA 2, QRA 53 or other approved models		
Ignition burner	MAT / Hegwein ZNVL (ZT0)		
Ignition transformer	D-52 L5 KV (MAT ignition burner) Z112 K5 (Hegwein ignition burner)		
Gas butterfly valve actuator	SQM / WAN	SQM / WAN	SQM / WAN
Primary air actuator	SQM / WAN	SQM / WAN	SQM / WAN
Secondary air actuator	SQM / WAN	SQM / WAN	SQM / WAN
Gas connection	R 3"	R 3"	R 5"
Gas control organ	according to gas pressure		
Weight	400 kg	430 kg	550 kg
Pressure loss in mixing unit	30 mbar or according to diagram		





Description
Dimensions

Operating mode
Fully automatic forced draught gas burner with electronic fuel/ air ratio control system, safety equipment according to EN 676, especially designed for high turn down ratios.

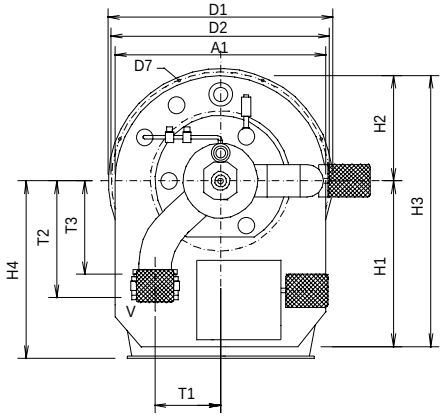
Electric design
Burner pre-wired and ready to connect. All burner components wired to the burner terminal rail. Burner control box supplied loose for installation in separate control panel.

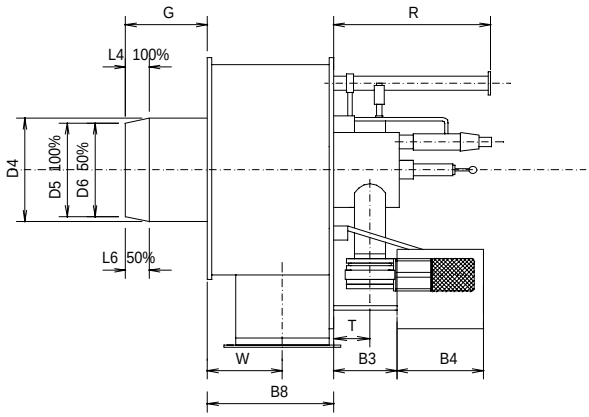
Combustion air
Separate combustion air blower with stable and pulsation-free characteristics also on appliances with a high flue gas resistance. The combustion air volume is divided into a primary and a secondary stream. The flame shape may be adapted by adjustable twist dampers.

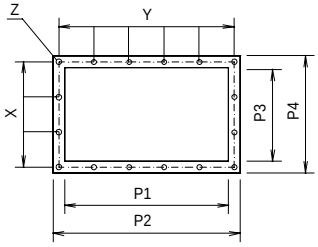
Control systems
The gas flow rate is controlled by means of an actuator fitted to the gas control valve.
The air flow rate is controlled by means of an actuator provided to the primary air damper and an actuator provided to the secondary air cylinder.

Monitoring system
Flame monitoring by means of flame sensor and tested burner control box. Combustion air monitoring achieved through differential air pressure switch, resp. speed control switch in case of burner with speed control.

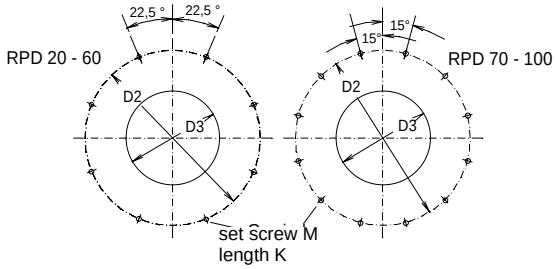
Ignition
Direct high voltage ignition, 5000 V, by means of an inbuilt ignition burner.







Details of boiler front plate



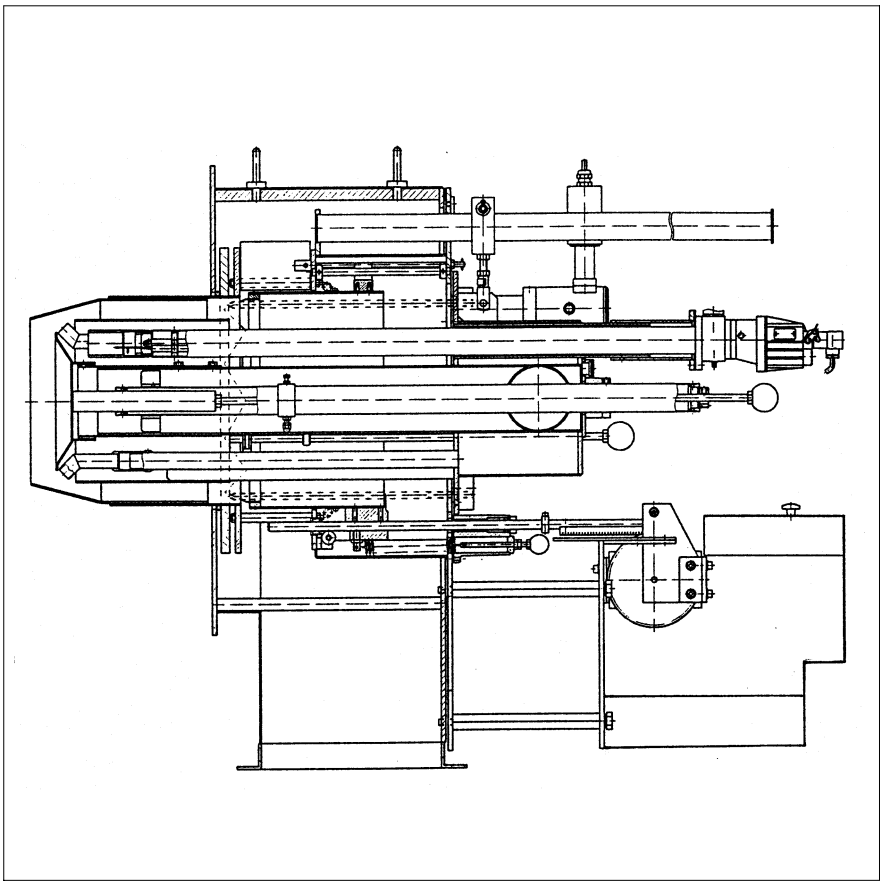
RPD	A1	B1	B2	B3	B4	B5	B6	B8	D1	D2	D3	D4	D5	D6	D7	G	H1	H2	H3	H4	K	L1	L4
30	745	-	-	200	375	-	-	416	830	790	385	371	290	323,5	17,5	317	620	373	993	650	30	-	124
40	745	-	-	200	375	-	-	416	830	790	423	409	340	367	17,5	442	620	373	993	650	30	-	95
50	950	-	-	200	375	-	-	535	1030	990	470	456	380	410	17,5	370	675	475	1150	740	30	-	110

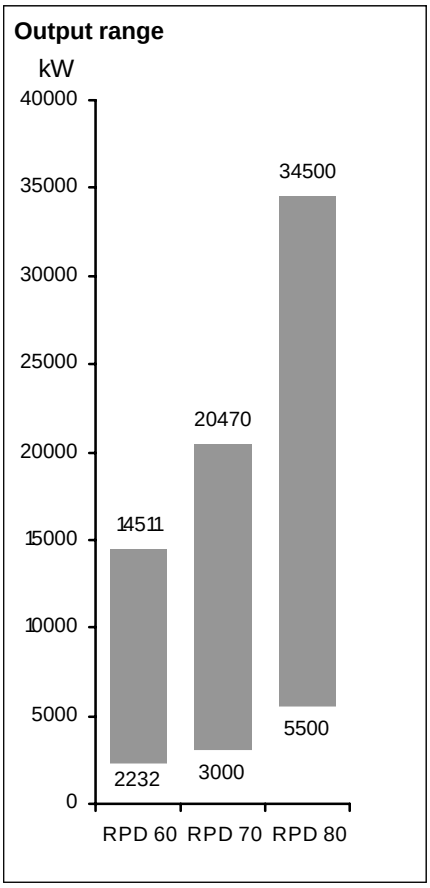
RPD	L5	L6	M	P1	P2	P3	P4	R	T	T1	T2	T3	U	V	W	X	Y	Z	LB	C	FI	F2	F3
30	-	62	12	580	670	320	410	1265	160	192	491	346	-	3"	248	4x92	5x126	10	-	-	-	-	-
40	-	50	12	580	670	320	410	1265	160	192	491	346	-	3"	248	4x92	5x126	10	-	-	-	-	-
50	-	55	12	740	830	416	506	1743	181	250	530	376	-	5"	319	3x152	5x156	10	-	-	-	-	-

Technical Data Sheet

Duoblock Gas Burner
RPD 60, 70 & 80 G-E

Technical Data	RPD 60	RPD 70	RPD 80
Burner output	2232 - 14511 kW	3000 - 20470 kW	5500 - 34500 kW
Gas flow rate	223 - 1451 m³/h	300 - 2047 m³/h	550 - 3450 m³/h
Operating mode	fully modulating		
Fuel type	Natural gas		
Automatic burner controller	LFL 1. , LGK 16 or other approved models		
Flame sensor	QRA 2, QRA 53 or other approved models		
Ignition burner	MAT / Hegwein ZNVL (ZT0)		
Ignition transformer	D-52 L5 KV (MAT ignition burner) Z112 K5 (Hegwein ignition burner)		
Gas butterfly valve actuator	SQM / WAN	SQM / WAN	SQM / WAN
Primary air actuator	SQM / WAN	SQM / WAN	SQM / WAN
Secondary air actuator	SQM / WAN	SQM / WAN	SQM / WAN
Gas connection	R 5"	R 5"	R 8"
Gas control organ	according to gas pressure		
Weight	600 kg	760 kg	1060 kg
Pressure loss in mixing unit	30 mbar or according to diagram		





RPD 60, 70 & 80 G-E

Description
Dimensions

Operating mode
Fully automatic forced draught gas burner with electronic fuel/ air ratio control system, safety equipment according to EN 676, especially designed for high turn down ratios.

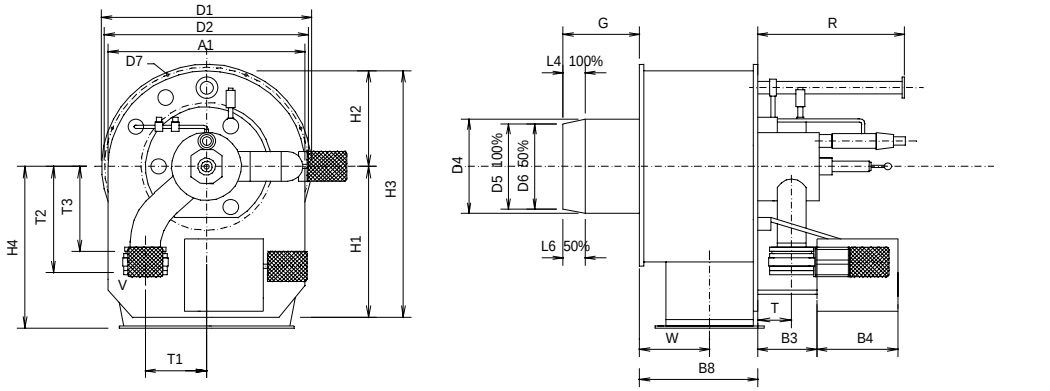
Electric design
Burner pre-wired and ready to connect. All burner components wired to the burner terminal rail. Burner control box supplied loose for installation in separate control panel.

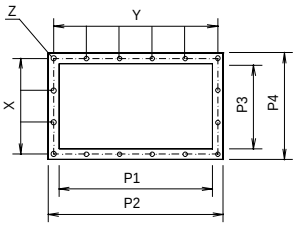
Combustion air
Separate combustion air blower with stable and pulsation-free characteristics also on appliances with a high flue gas resistance. The combustion air volume is divided into a primary and a secondary stream. The flame shape may be adapted by adjustable twist dampers.

Control systems
The gas flow rate is controlled by means of an actuator fitted to the gas control valve.
The air flow rate is controlled by means of an actuator provided to the primary air damper and an actuator provided to the secondary air cylinder.

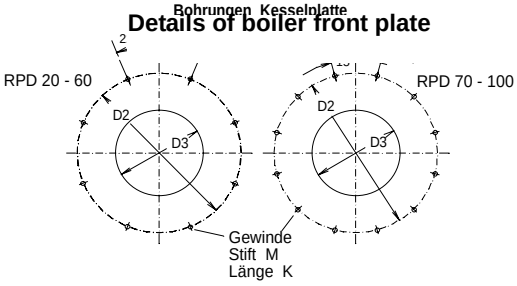
Monitoring system
Flame monitoring by means of flame sensor and tested burner control box. Combustion air monitoring achieved through differential air pressure switch, resp. speed control switch in case of burner with speed control.

Ignition
Direct high voltage ignition, 5000 V, by means of an inbuilt ignition burner.





Details of boiler front plate



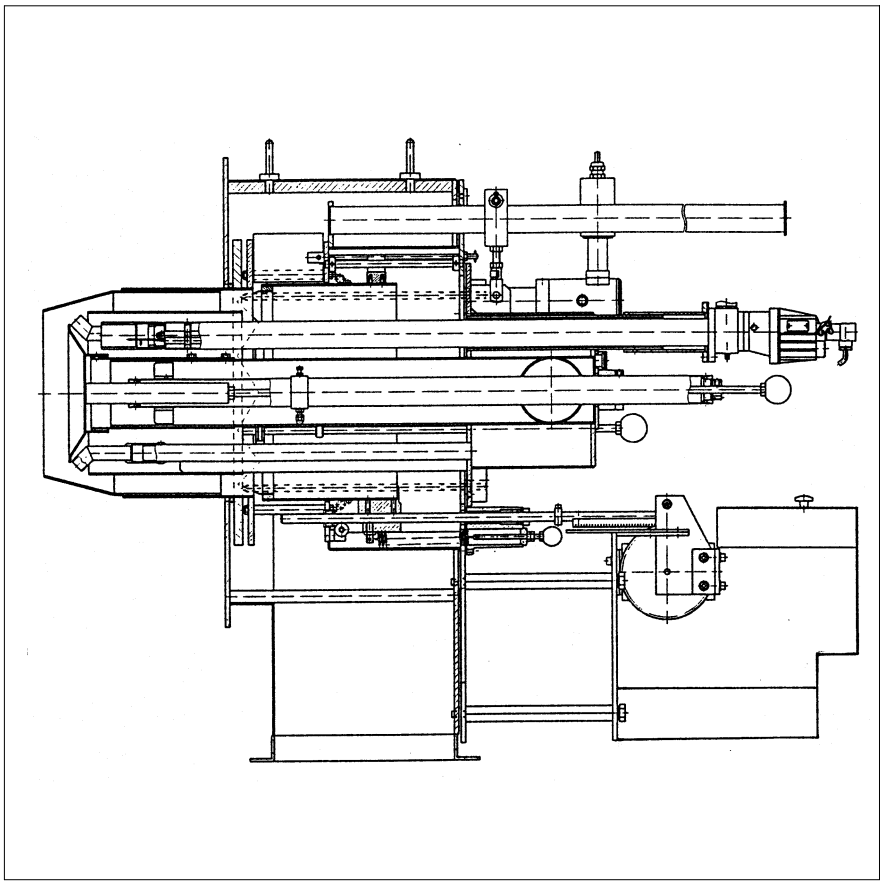
RPD	A1	B1	B2	B3	B4	B5	B6	B8	D1	D2	D3	D4	D5	D6	D7	L	L1	L2	L3	L4
60	994	-	-	200	375	-	-	622	1080	1040	520	506	420	455,5	18	312	700	497	1197	825
70	1160	-	-	260	375	-	-	731	1240	1200	640	626	520	565,5	18	469	780	580	1360	900
80	1350	-	-	260	375	-	-	860	1450	1400	740	710	597	646	18	600	820	675	1495	1000

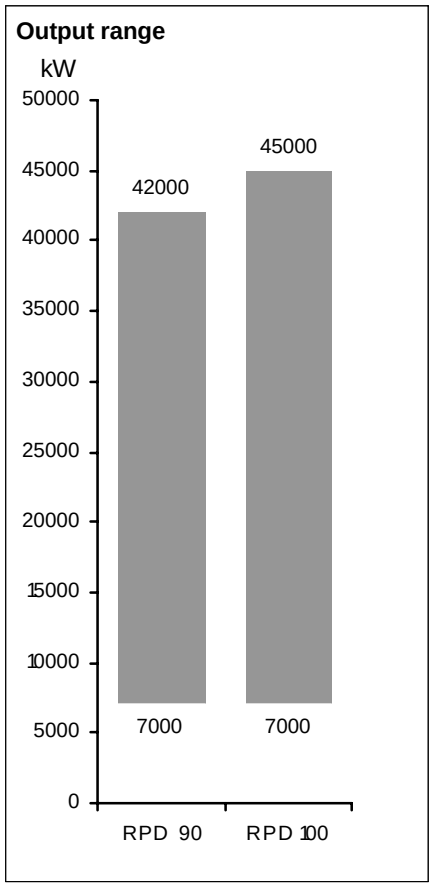
RPD	L5	L6	M	P1	P2	P3	P4	R	T	T1	T2	T3	U	V	W	X	Y	Z	LB	C	FI	F2	F3
60	-	62,5	12	750	840	470	560	1760	181	270	555	401	-	5"	379	4x129	5x160	10	-	-	-	-	-
70	-	85	12	936	1026	600	690	2010	181	365	610	450	-	5"	410	5x128	7x140	10	-	-	-	-	-
80	-	92	12	1102	1192	700	790	2320	187	310	707	495	-	8"	489	6x125	9x128	10	-	-	-	-	-

Technical Data Sheet

Duoblock Gas Burner
RPD 90 & 100 G-E

Technical Data	RPD 90	RPD 100
Burner output	7000 - 42000 kW	7000 - 45000 kW
Gas flow rate	700 - 4200 m³/h	700 - 4500 m³/h
Operating mode	fully modulating	
Fuel type	Natural gas	
Automatic burner controller	LFL 1. , LGK 16 or other approved models	
Flame sensor	QRA 2, QRA 53 or other approved models	
Ignition burner	MAT / Hegwein ZNVL (ZT0)	
Ignition transformer	D-52 L5 KV (MAT ignition burner) Z112 K5 (Hegwein ignition burner)	
Gas butterfly valve actuator	SQM / WAN	SQM / WAN
Primary air actuator	SQM / WAN	SQM / WAN
Secondary air actuator	SQM / WAN	SQM / WAN
Gas connection	R 8"	R 8"
Gas control organ	according to gas pressure	
Weight	1200 kg	1250 kg
Pressure loss in mixing unit	30 mbar or according to diagram	





RPD 90 & 100 G-E

Description
Dimensions

Operating mode
Fully automatic forced draught gas burner with electronic fuel/ air ratio control system, safety equipment according to EN 676, especially designed for high turn down ratios.

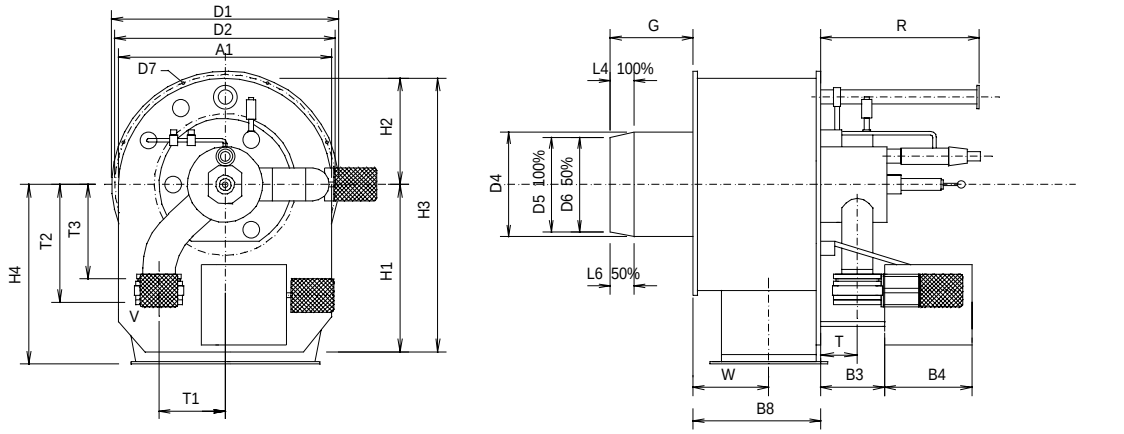
Electric design
Burner pre-wired and ready to connect. All burner components wired to the burner terminal rail. Burner control box supplied loose for installation in separate control panel.

Combustion air
Separate combustion air blower with stable and pulsation-free characteristics also on appliances with a high flue gas resistance. The combustion air volume is divided into a primary and a secondary stream. The flame shape may be adapted by adjustable twist dampers.

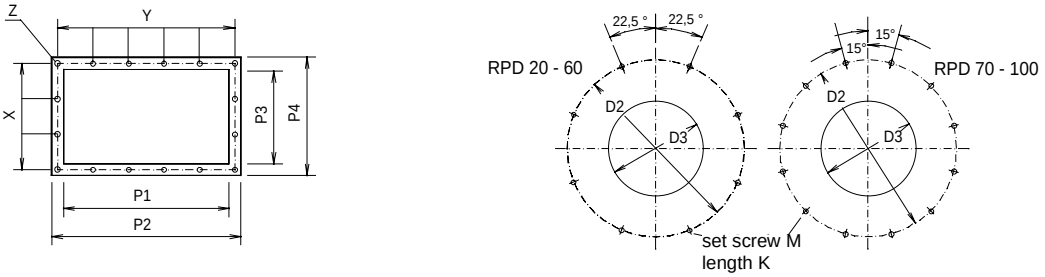
Control systems
The gas flow rate is controlled by means of an actuator fitted to the gas control valve.
The air flow rate is controlled by means of an actuator provided to the primary air damper and an actuator provided to the secondary air cylinder.

Monitoring system
Flame monitoring by means of flame sensor and tested burner control box. Combustion air monitoring achieved through differential air pressure switch, resp. speed control switch in case of burner with speed control.

Ignition
Direct high voltage ignition, 5000 V, by means of an inbuilt ignition burner.



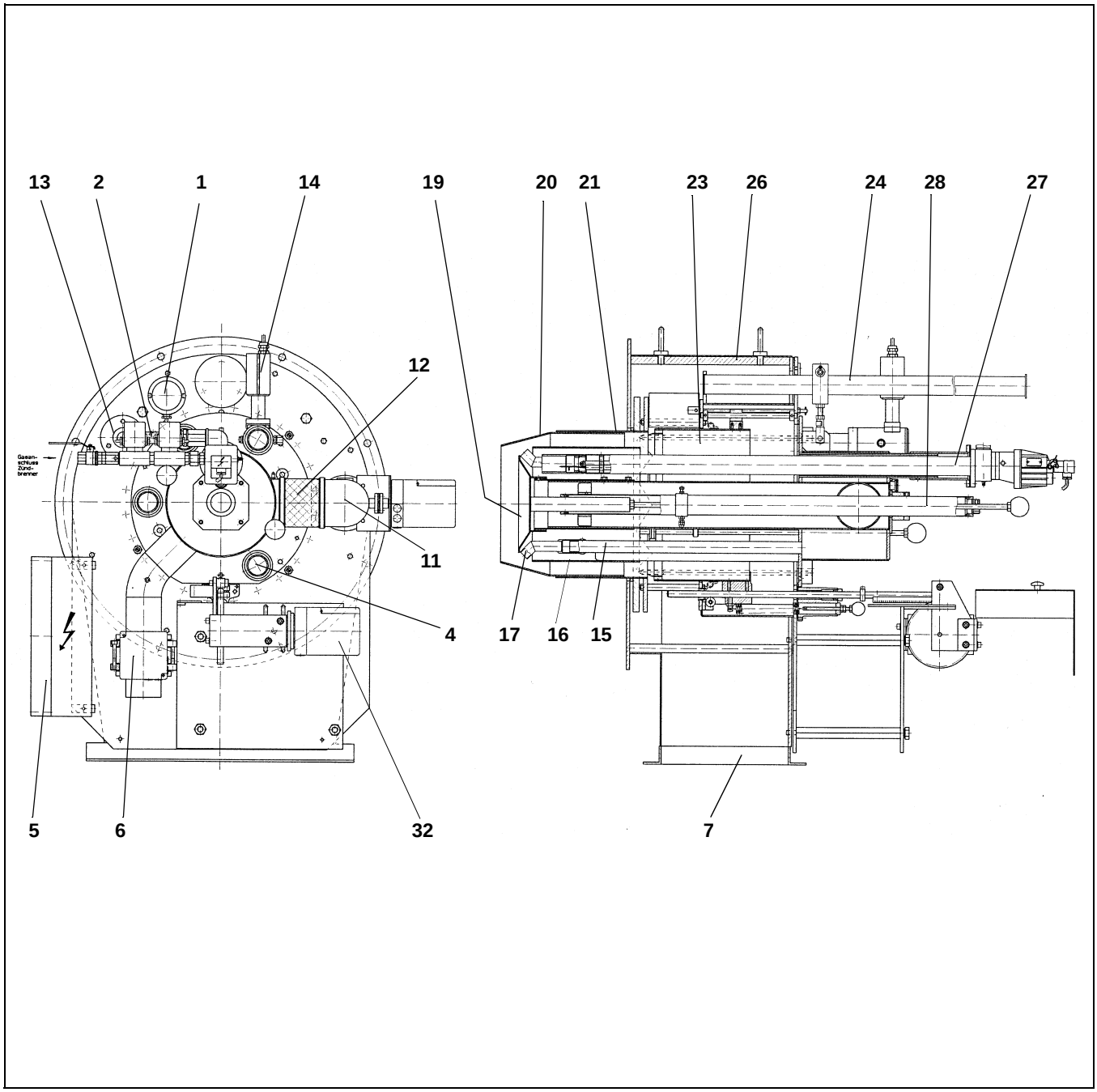
Details of boiler front plate



RPD	A1	B1	B2	B3	B4	B5	B6	B8	D1	D2	D3	D4	D5	D6	D7	G	H1	H2	H3	H4	K	L1	L4
90	1700	-	-	260	375	-	-	890	1800	1750	883	870	675	-	18	810	905	850	1755	1100	30	-	190
100	1700	-	-	260	375	-	-	890	1800	1750	935	922	830	-	18	810	905	850	1755	1100	30	-	190

RPD	L5	L6	M	P1	P2	P3	P4	R	T	T1	T2	T3	U	V	W	X	Y	Z	LB	C	FI	F2	F3
90	-	-	12	1300	1390	742	832	2720	224	310	832	620	-	8"	494	6x132	10x135	10	-	-	-	-	-
100	-	-	12	1300	1390	742	832	2720	224	310	832	620	-	8"	494	6x132	10x135	10	-	-	-	-	-

Burner Construction



1	Secondary air pressure switch	19	Stabilizer
2	Ignition gas valve group	20	Flame tube
4	Inspection glasses	21	Burner tube
5	Terminal box	23	Secondary air control valve
6	Gas flow rate control damper	24	Extracting assembly
7	Secondary air connection	26	Burner housing
11	Primary air damper	27	Ignition burner
12	Sleeve	28	Fastener of nozzle rod
13	Combustion air for ignition burner	32	Electric actuator
14	Flame monitor		
15	Gas feed pipes		
16	Air guide valve		
17	Gas nozzles		

Combustion air connection
The combustion air connection (Item 7) may be mounted at intervals of 45° for the RPD 30-60 version and 30° for the RPD 70-90 version. The burner equipment plate with control block and all valves and instruments will be retained in the vertical position in any case.

Mounting the Burner to the Boiler

The burner plate of the boiler must be fabricated to the specified dimensions. Mount the burner to the boiler with its insulation backing. Apply a layer to graphite or similar lubricant to the bolts and tighten by equal amounts. Mixing ignition units extended in length are available for boilers requiring a specific installation depth of the burner flame tube.

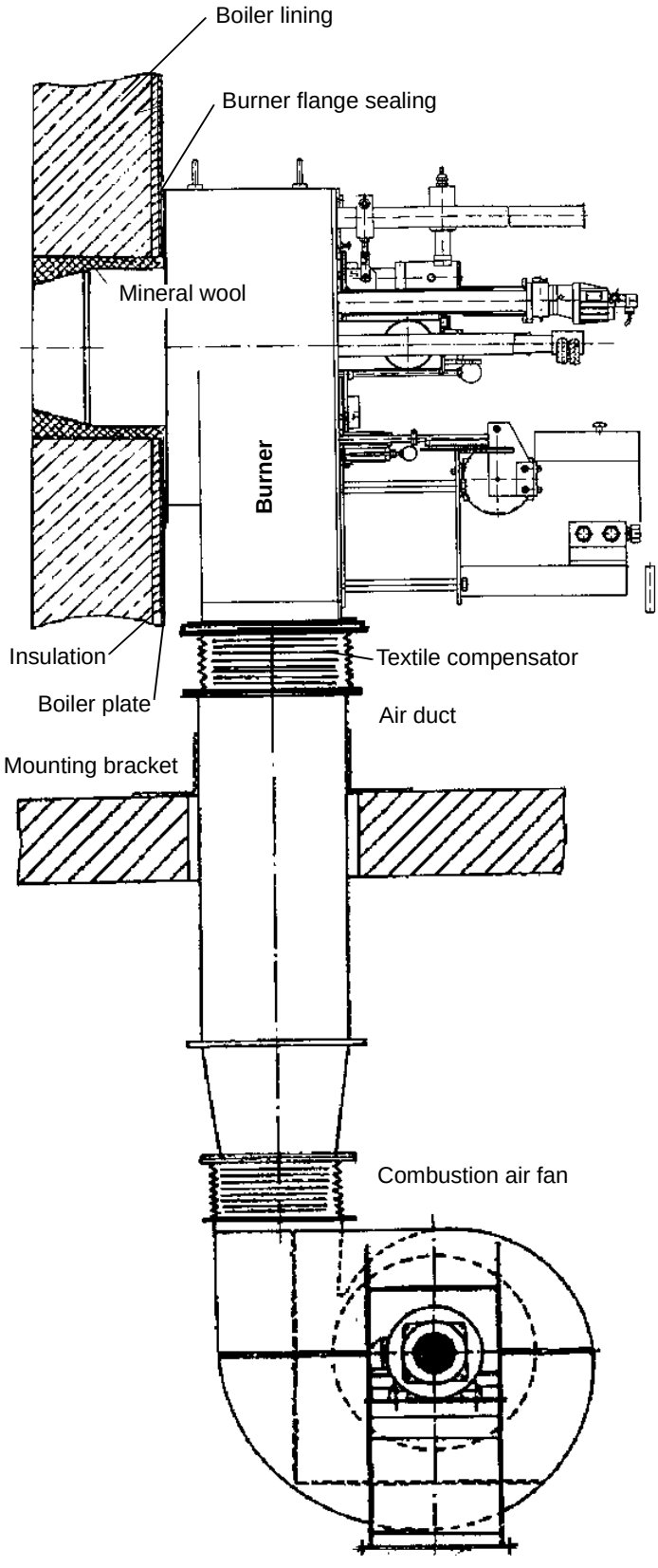
Refer to the drawing for the mounting dimensions of the burner and air duct and exhaust gas connection, if any.

Boiler lining
The boiler lining must consist of heat-resistant materials (temperature resistance >1400°C).

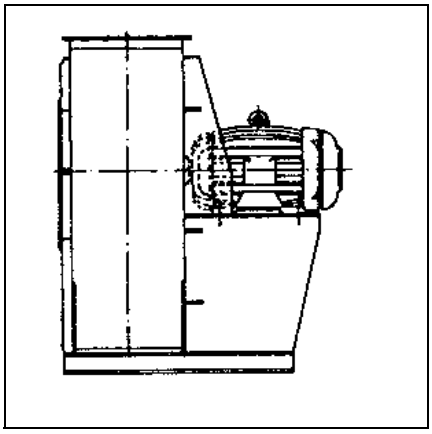
Take care that the burner flame tube is covered by the boiler lining over its full lenght.

The space between the burner flame tube and lining is packed with mineral wool.

Burner mounting inspection
1. Check the mixing ignition unit according to the boiler output.
2. Adjust the pilot burner.
3. Refer to the dimensioned drawing for adjusting the mixing ignition unit.

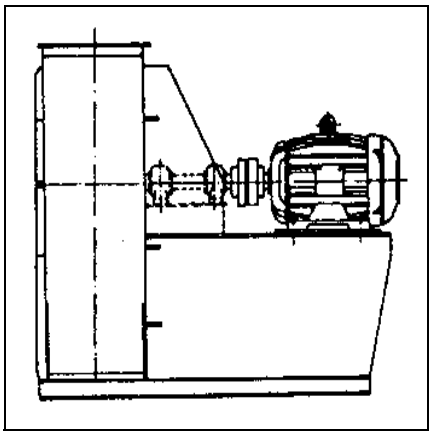


Combustion Air Fan
Drive Modes

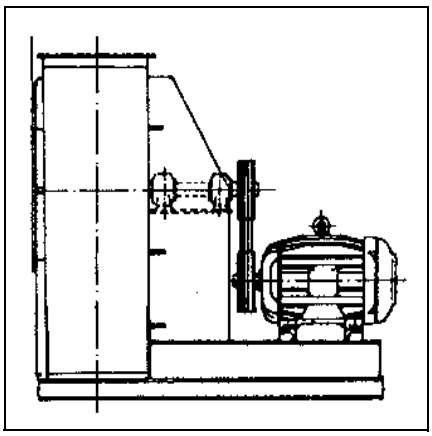


1. Direct drive
In this concept the motor is coupled directly to the fan impeller. The fan impeller is mounted directly on the motor shaft end. The speeds used are those of the drive motors only. The bearing of the motor shaft must be specifically designed for the fan impeller used.

Recommendation: up to 10 MW output



2. Drive via flexible coupling
The fan impeller is mounted on its own shaft by means of a bearing specifically designed for the purpose. The power is transmitted from the drive motor via a torsionally flexible coupling. The speeds used are those of the drive motor.



3. V-belt drive
The fan impeller is mounted on its own shaft by means of a bearing specifically designed for the purpose. The power is transmitted from the drive motor via V-belts which can provide practically any desired speed.

Air duct and fan

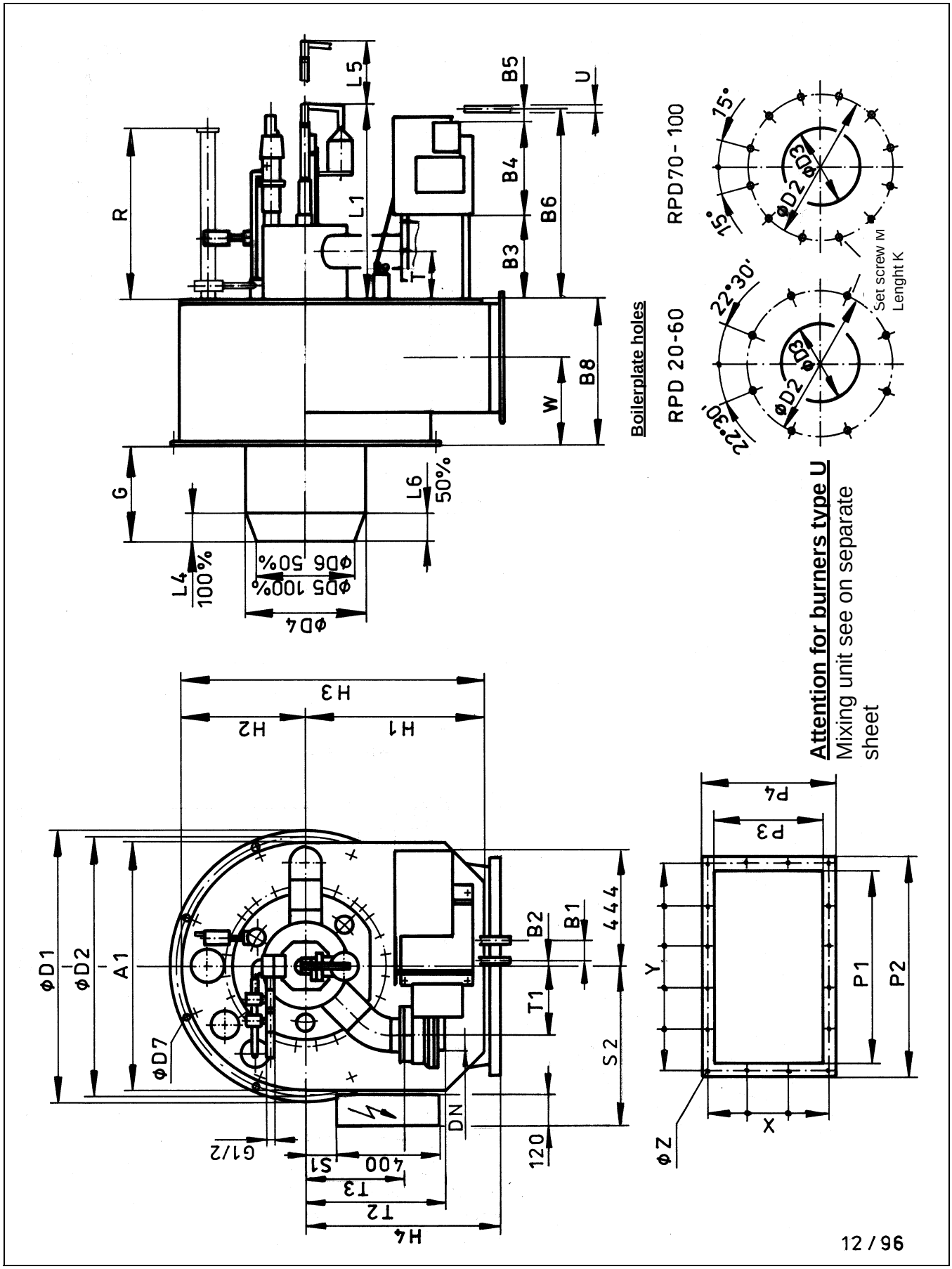
Baseframe: Pre-mount exactly. Do not prestress for mounting.

Direction of rotation: Check for proper direction of rotation.

Fans with V-belt drive should be chekked for V-belt tension after about 12 hours of operation and the V-belts retensioned if necessary. If the V-belts are not properly tensioned this will cause slip with resultant lower speed and a considerably reduced service life. Mount the air ducts in a way to ensure an accurate and reliable fixing of the fan. Connect the air duct by means of a compensator to avoid transmission of stress. The air ducts are made from 3-4 mm metal sheet.

Dimensioned Drawing for RPD Burner 20 - 100

Oil, Gas and Dual-fuel Burners
(without external exhaust gas return)



Dimensions of RPD Burner 20 - 100
Oil, Gas and Dual-fuel burners
(without external exhaust gas return)

*) Note: If longer flame tubes are used, the extended lenght must be added to the dimensiones G, R, L5

**) D4 = burner tube outside diameter

***) Flange acc. to DIN 2631 for RPD 20 to 70, and acc. to DIN 2633 for RPD 80, 90 and 100

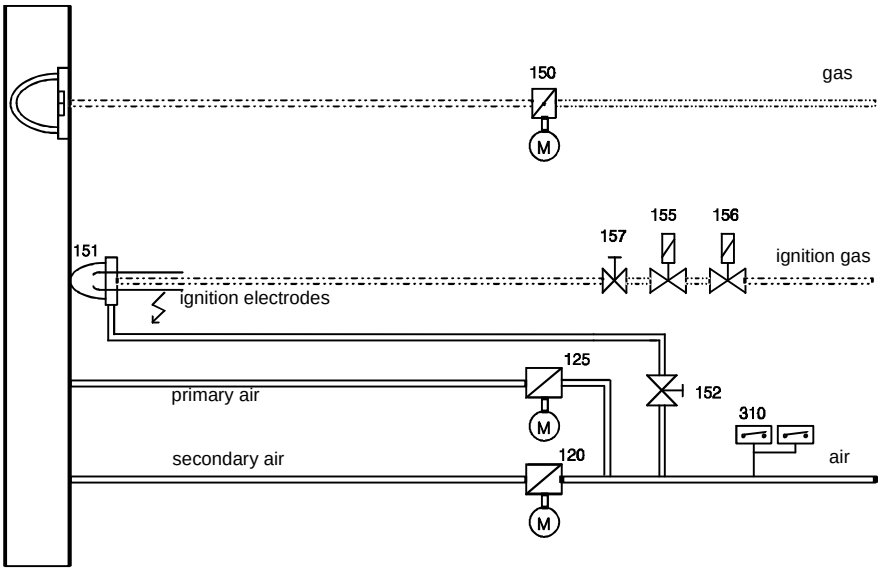
RPD	A1	B1	B2	B3	B4	B5	B6	B8	D1	D2	D3	D4 **)	D5 100%	D6 50%	D7	G *)	H1	H2	H3	H4	K	L1 MAT	L1 RDG 1250	L4 100%	L5 *)
20	530	53	29	90	314	91	560	325	530	500	270	260	210	-	12	250	385	265	650	425	30	465	-	68	780
30	745	78	19	260	375	70	705	416	830	790	385	371	290	323	17,5	317	620	373	993	650	30	550	700	124	1350
40	745	78	19	260	375	70	705	416	830	790	423	409	340	367	17,5	442	620	373	993	650	30	550	700	95	1425
50	950	78	19	315	375	70	760	535	1030	990	470	456	380	410	17,5	370	675	475	1150	740	30	600	770	110	1620
60	994	78	19	315	375	70	760	622	1080	1040	520	506	420	455	18	312	700	497	1197	825	30	650	735	125	1695
70	1160	78	19	315	375	75	765	731	1240	1200	640	626	520	565	18	469	780	580	1360	900	30	740	-	170	1995
80	1350	75	19	315	375	75	765	860	1450	1400	740	710	597	646	18	600	820	675	1495	1000	30	700	-	185	2285
90	1700	75	3	420	375	75	870	890	1800	1750	883	870	675	-	18	810	905	850	1755	1100	30	745	-	190	2585
100	1700	75	3	420	375	75	870	890	1800	1750	945	922	830	-	18	810	905	850	1755	1100	30	745	-	190	2585

RPD	L6 50%	M	P1	P2	P3	P4	R *)	S1	S2	T	T1	T2	T3	U	DN ***)	W	X	Y	Z
20	-	10	430	510	236	316	-	-	-	112	150	240	-	18x1,5	50	190	2x143	4x120	10
30	62	12	580	670	320	410	1265	140	497	160	192	491	346	22x1,5	80	248	4x92	5x126	10
40	50	12	580	670	320	410	1265	140	497	160	192	491	346	22x1,5	80	248	4x92	5x126	10
50	55	12	740	830	416	506	1743	115	595	181	250	530	376	22x1,5	125	319	3x152	5x156	10
60	62	12	750	840	470	560	1760	195	622	181	270	555	401	22x1,5	125	379	4x129	5x160	10
70	85	12	936	1026	600	690	2010	270	705	181	365	610	450	28x1,5	125	410	5x128	7x140	10
80	92	12	1102	1192	700	790	2320	310	800	187	310	707	495	28x1,5	200	489	6x125	9x128	10
90	-	12	1300	1390	742	832	2720	240	845	224	310	832	620	28x1,5	200	494	6x132	10x135	10
100	-	12	1300	1390	742	832	2720	240	845	224	310	832	620	28x1,5	200	494	6x132	10x135	10

Burner scheme
Gas train

RPD 30 - 100 G - E

Burner scheme TRD 604 - 72 h

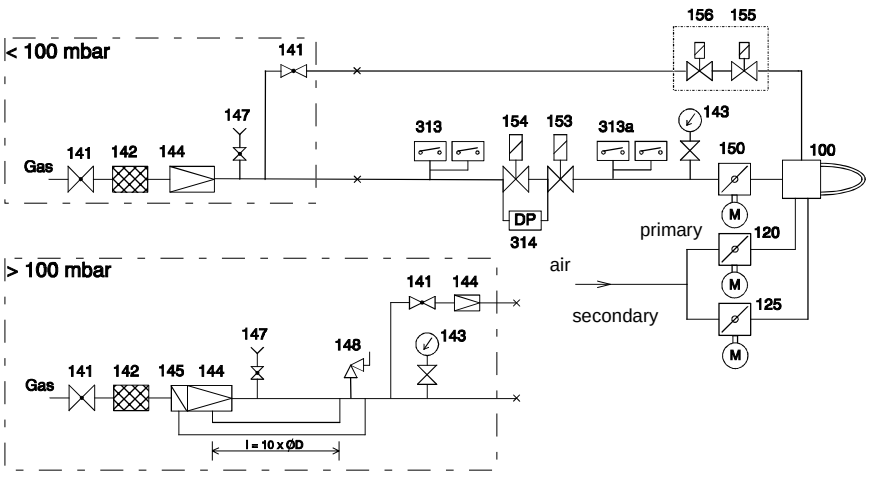


TRD 604 - 72 hr :
The 310, 313 and 313a pressure switches are approved in dual mode or under the code of "special construction requirements".

TRD 604 - 24 hr :
The 310, 313 and 313a pressure switches are designed in single mode.

EN :
The 310, 313 and 313a pressure switches are designed in single mode. The 313a max. pressure switch is not available.

Gas train TRD 604 - 72 h



100 Burner
120 Secondary air cylinder
125 Primary air damper
141 Ball valve
142 Gas filter
143 Pressure gauge
144 Gas pressure regulator
145 Safety shutt-off valve
147 Test burner w. push button valve
148 Safety blow off valve
150 Gas butterfly valve
151 Ignition burner
152 Air regulating valve
153 Main gas solenoid valve
154 Safety shutt-off solenoid valve
155 Ignition gas solenoid valve
156 Ignition gas solenoid valve
157 Gas regulating valve
310 Air pressure switch
313 Gas pressure switch, (min)
313a Gas pressure switch, (max)
314 Gas leakage control
350 Actuator

Mounting Position
Leak Test
Ignition Gas Connection
Ignition Burner Type ZT0

Mounting position
Gas pressure regulators and valves can be mounted in vertical lines in any position within the 360° range. In horizontal lines they must not be mounted overhead and only 180° in the upper sector. The ball valve and filter can be mounted in any desired position. Take care that the housing does not make contact with the wall and is clear by minimum 20 mm. Do not use the spring bolt of the regulator and the solenoid elements of the valves as levers.

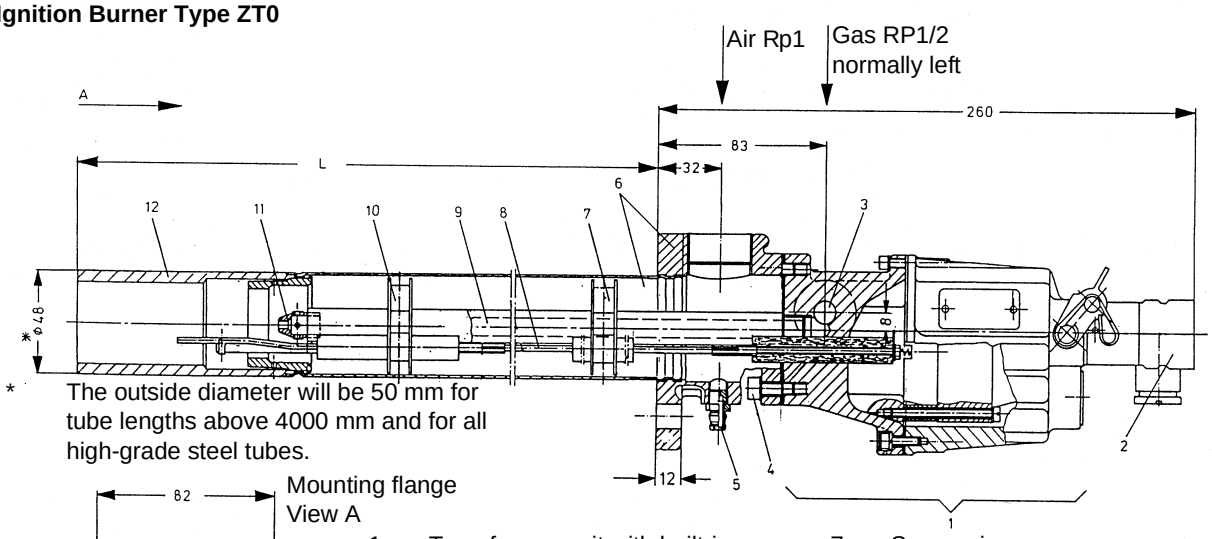
Leak test
Check the screwed joints and flanged connections for absence of leaks. The leak test of the joints should be made under pressure using only foaming agents approved by DVGW and not causing corrosion.

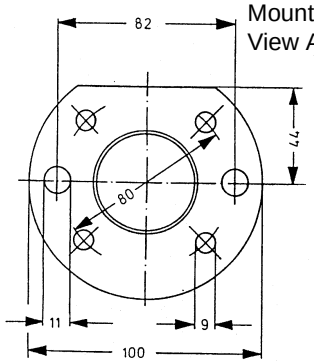
Electrical wiring of gas valves
Check that the data given on the nameplate of the gas valves agree with the mains voltage.
Open the terminal box of the valve.
Feed the connection cable through the screwed union (conduit thread Pg 13.5) and connect the terminals marked accordingly.
L = phase
N = zero conductor
= protective conductor (green-yellow)

Disconnectable joint
An easy-to-disconnect joint with flat sealing (e.g. compensator) should be provided to allow the boiler door to be swivelled out if required for maintenance work on the boiler (furnace chamber). This compensator should also be designed to accommodate the axial or lateral expansion and absorb vibrations.

Ignition gas connection
An ignition burner is used to ignite the main gas flame. The ignition gas line is branched out of the gas control group between the two gas valves and installed to the ignition burner on the shortest possible way. In the case of oil and dual-fuel burners the burner is ignited with propane supplied through a separate R „ propane connection. The ignition gas flow rate may be adjusted on the volumetric flow control valve of the ignition gas valve or directly on the ignition gas burner. The required gas pressure for the ignition gas burner is 50-150 mbar. It is advisable to install a gas pressure regulator upstream of the ignition gas burner. The air pressure for the ignition gas burner should be between 10 and 30 mbar. The boiler back pressure shall not be taken into account. The air pressure should be adjusted in accordance with the gas pressure to ensure an undelayed ignition and a good flame pattern.

Ignition Burner Type ZT0





1 Transformer unit with built-in ignition transformer
2 Electrical angular plug connector
3 Gas connection, may be connected on either side right and left with gas test socket
4 Air connection, mounted to transformer unit
5 Air test socket
6 Igniter tube, mounted to air flange
7 Spacer ring
8 Ignition electrode connection rods
9 Gas tube
10 Ignition electrode connection rods
11 Gas nozzle for natural gas or propane
12 Mixing chamber

Technical Data

Technical data of ignition gas burner type ZT0

Fuel	gases according to G 260
Flame power	max. 120 kW
Flame length	max. 600 mm
Gas connection	Rp 1/2 right or left
Air connection	Rp 1, may be turned by 4x90°
Air flow rate	max. 50 m³/h
Air index	0.3-0.5; remaining air rate must be available from furnace chamber
Max. ambient temperature	500°C in tube; if temperature is higher, keep combustion air connected partly as cooling air; 0°C to +60°C in transformer unit

Transformer unit

Connection voltage	230 V, 50 Hz
Connector type	plug connector
Power input	ignition transformer 100 VA, 20% duty cycle (with thermal winding shield) ignition 5 kV (2-3 seconds via automatic furnace controller)

Ambient temperature 0°C to +60°C
Degree of protection IP 54

Electrical connection

Cl. 1 (Mp)		
Cl. 8 (Ph)	ignition transfer, primary	Use shielded cable Z 912 F 00 for flame feedback.
Cl. 10	ionization signal	**NOTE:** The shield must not make contact with earth.

Construction according to sectional drawing
The igniter consists mainly of the transformer unit (Item 1) housing the ignition transformer, the igniter tube with air and mounting flange (Item 6), a gas tube (9) with nozzle (11) and the electrode carrier ring (10). The igniter tube with the Rp1 air connection is bolted to the transformer unit. After the 4 bolts (Item 4) have been unscrewed it may be removed or turned by 90° if required by the position of the air connection. When turning the tubes care must be taken not to change the position of the inner supporting rings and rods because this might lead to operational trouble.
The gas supply may be connected either to the left-hand or right-hand opening. The opening not used is closed with a screw plug which also carries the screw-in gas test socket (3). The electrode support ring (Item 10) is mounted to the end of the gas tube.

The ionization electrode and ignition electrode are extended with connecting rods (Item 8). These rods are installed through the bottom of the transformer housing in 2 ceramic insulators and carried by intermediate supporting rings (Item 7) spaced at 300 mm.

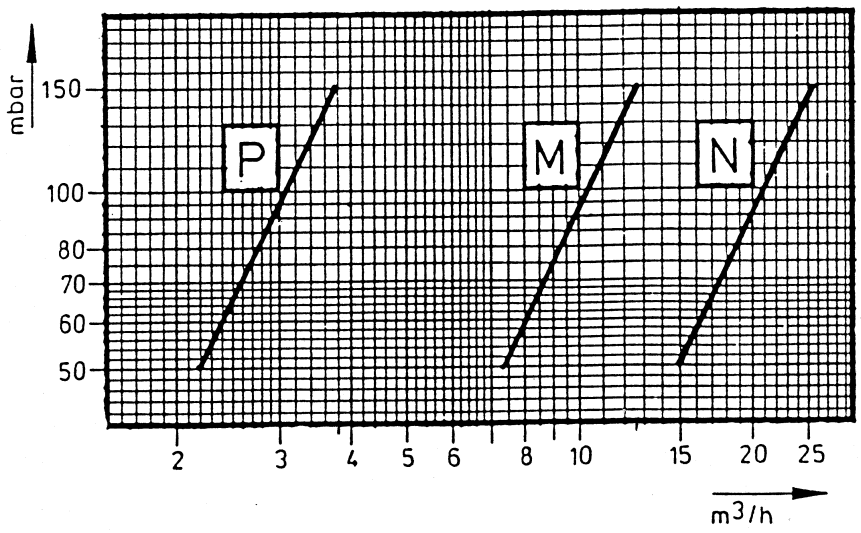
Flame monitor
An ionization electrode is provided for flame monitoring. The flame signal is generated by d.c. current which due to the ionization effect and the rectifier effect of the flame is caused to flow from the igniter tube earth via the flame to the ionization electrode and via the connecting rod to the amplifier in the automatic furnace controller. The ionization electrode and ignition electrodes are adjusted in accordance with the drawing.

When installing new electrodes these must be bent, cut to length and adjusted as required.
The internal resistance of the ionization system amounts to some megohms. Such a high resistance ensures a good insulating capacity of the electrodes and connecting rods. In a dust-laden combustion air environment it is therefore important to clean the insulators at shorter intervals. Humidity should be kept out. See also electrical function.
The ceramic insulator of the ionization electrode must not be allowed to heat up above 500 °C because this could lead to shutdown on trouble. Therefore, a minimum air flow rate (10-20 % of the full-load rate) should be allowed to flow if this temperature is likely to be reached by radiation or convection with the furnace chamber in hot condition and the burner flame turned off.

Ignition Burner Type ZT0

Gas Pressure Adjustment
Parts List

Gas pressure adjustment
In standard version the igniters are suitable for a working range 50-150 mbar. If a higher gas pressure is required in the customer's order, the two threaded gas inlet connections will be fitted with restrictors by the manufacturer already. The igniter will in this way be adjusted to the pressure above 150 mbar.
If the higher inlet pressure is recognized at a later stage only, a restriction to maximum 150 mbar can also be achieved by means of a ball valve, for example.



Characteristic line	Gas type	Nozzle holes	Flame length
P	Propane	1x2,5 + 6x1,0	approx. 600 mm
M	Natural gas	1x4,0 + 6x1,3	approx. 500 mm
N	City gas	1x5,0 + 8x2,3	approx. 500 mm

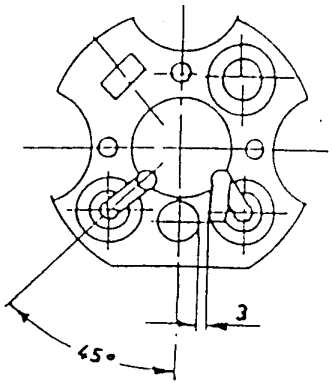
Parts list

Item.	Qty.	Description	Part No.	Material
1	1	Transformer unit	Z 112 K 5	Housing of GAL
2	1	Right-angle plug with 2 unions	A 5 Z 1	10-pole, max. 2.5
3	1	Gas test socket	Z 138 Z 2	Ms 58
4	4	Hexagon socket head screw	W 826 F 10	
5	1	Air test socket	Z 138 Z 1	Ms 58
6	1	Igniter tube with rolled-in mixing chamber and mounting flange with Rp1 air inlet thread	Z 1050 Z...**	GAL / steel
7	*	Intermediate supporting ring with 2 ceramic insulators Z 545 F11	Z 960 K 4	St VII 23
8	2	Connecting rods	Z 781 F...**	Zinc-plated steel
9	1	Gas tube	Z 521 F...**	St 35
10	1	Electrode carrier ring	Z 960 K 13	St VII 23
11	1	Gas nozzle Natural gas Propane City gas	Z 330 F 4013 Z 330 F 2510 Z 985 F 1	High-grade steel 1. 4104 High-grade steel 1. 4104 High-grade steel 1. 4104
12	-	Mixing chamber with mixing ring	Included in Item 6	High-grade steel, heat-resistant

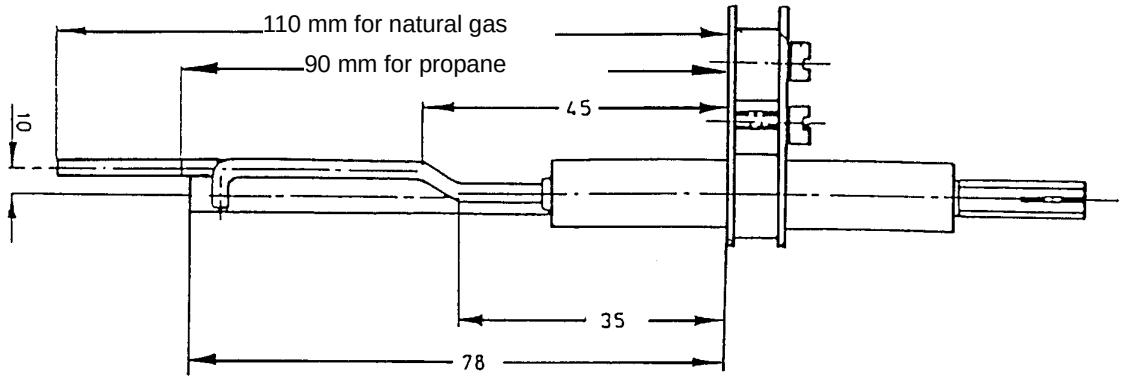
* Quantity depends on pipe length: 3 intermediate rings per metre of tube length.
** Additional data according to type (tube length).

Ignition Burner Settings
Electrode Carrier Ring

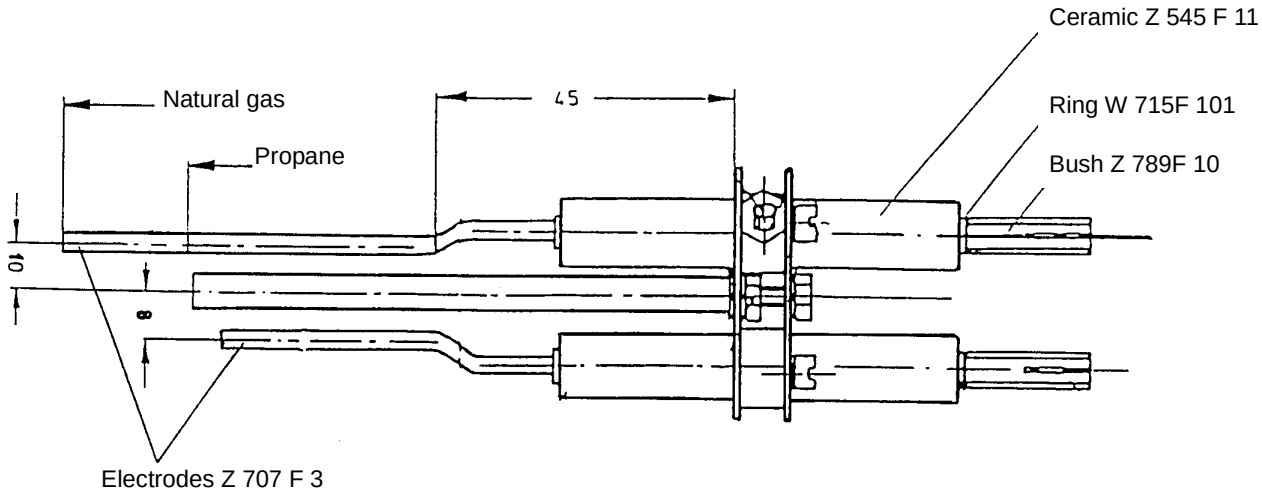
Front view



Side view



Top view



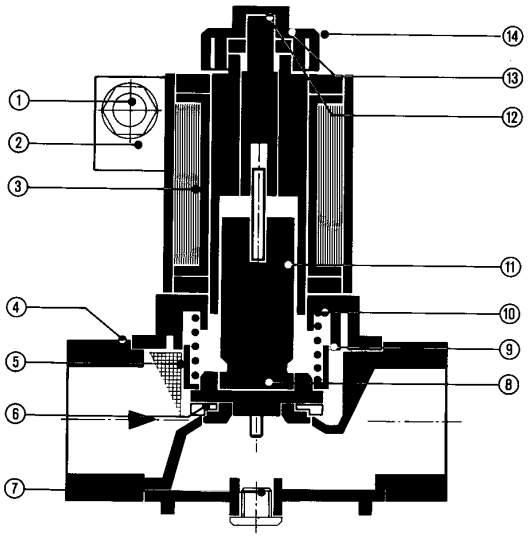
Preset amount of bend and adjustment
Cut ionization electrode to length according to gas type.

Ignition Gas Solenoid Valve

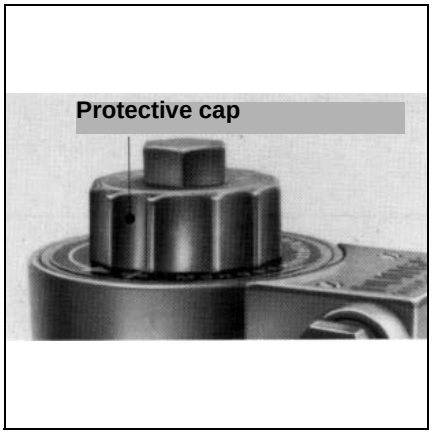
Type MVD 505 / 5 single-stage

Technical data:

Nominal bore:	R1/2“
Max. operating pressure:	500 mbar
Opening time:	< 1 sec
Closing time:	< 1 sec
Ambient temperature:	-15°C to +60°C
Mounting position:	solenoid in upright position vertical to horizontal
Voltage/frequency:	(AC) 230 V (+10% -15%)
Duty factor:	100% CD
Degree of protection:	IP 54, IP 65
Power rating:	15 VA



1	Cable union	8	Valve disk
2	Electric terminal box	9	Mud guard
3	Solenoid	10	Closing compression spring
4	Housing	11	Anchor
5	Screen	12	Main flow rate adjuster
6	Valve seat	13	Lock nut
7	Connector for earthing contact K01/1	14	Protective cap



Main flow rate adjuster type series MVD

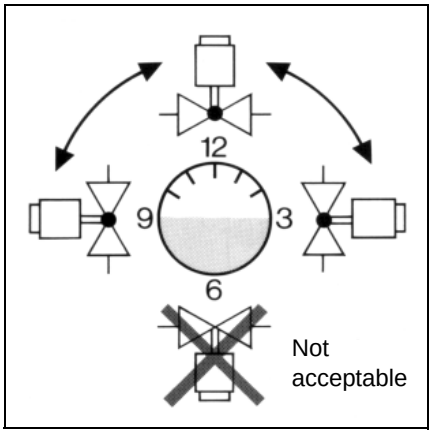
Unscrew the protective cap and remove the lock nut to allow the main flow rate to be adjusted. The main flow rate adjuster is supplied ex works in fully opened position.
Turning clockwise will reduce the gas flow rate.
Turning counterclockwise will increase the gas flow rate.
After having adjusted the flame control on the gas burner make sure to tighten the lock nut again. Screw on the protective cap again.

Solenoid replacement type series MV, MVD

Disconnect the electrical terminals; remove the screw cap; lift off the solenoid. For installation proceed in reverse order.

Electrical connection

Feed in the cable through cable union (conduit thread Pg 11). Make the electrical connection by means of the screw terminals in the terminal box of the solenoid housing.
Take care to observe the connection diagram.

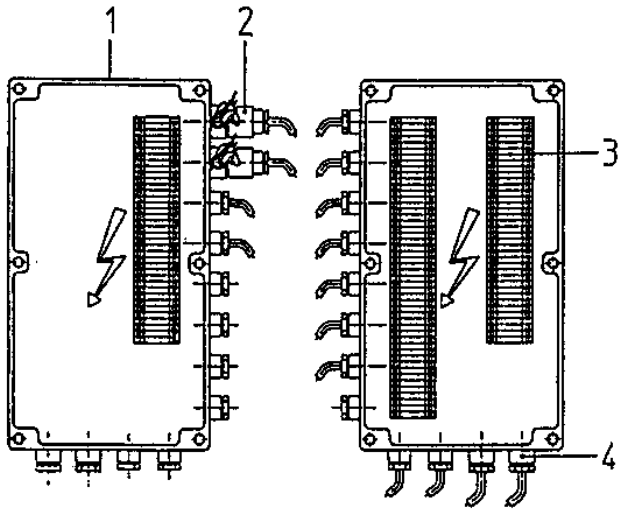


Installation

When installing the valve in the pipeline take care to observe the arrow on the valve housing and the required mounting position. For screwing the pipeline into the valve housing do not use the magnet as a lever but apply a suitable tool against the valve housing.
After installation make a test for absence of leaks and proper operation.

Burner Electrical Connection

Electrical connection

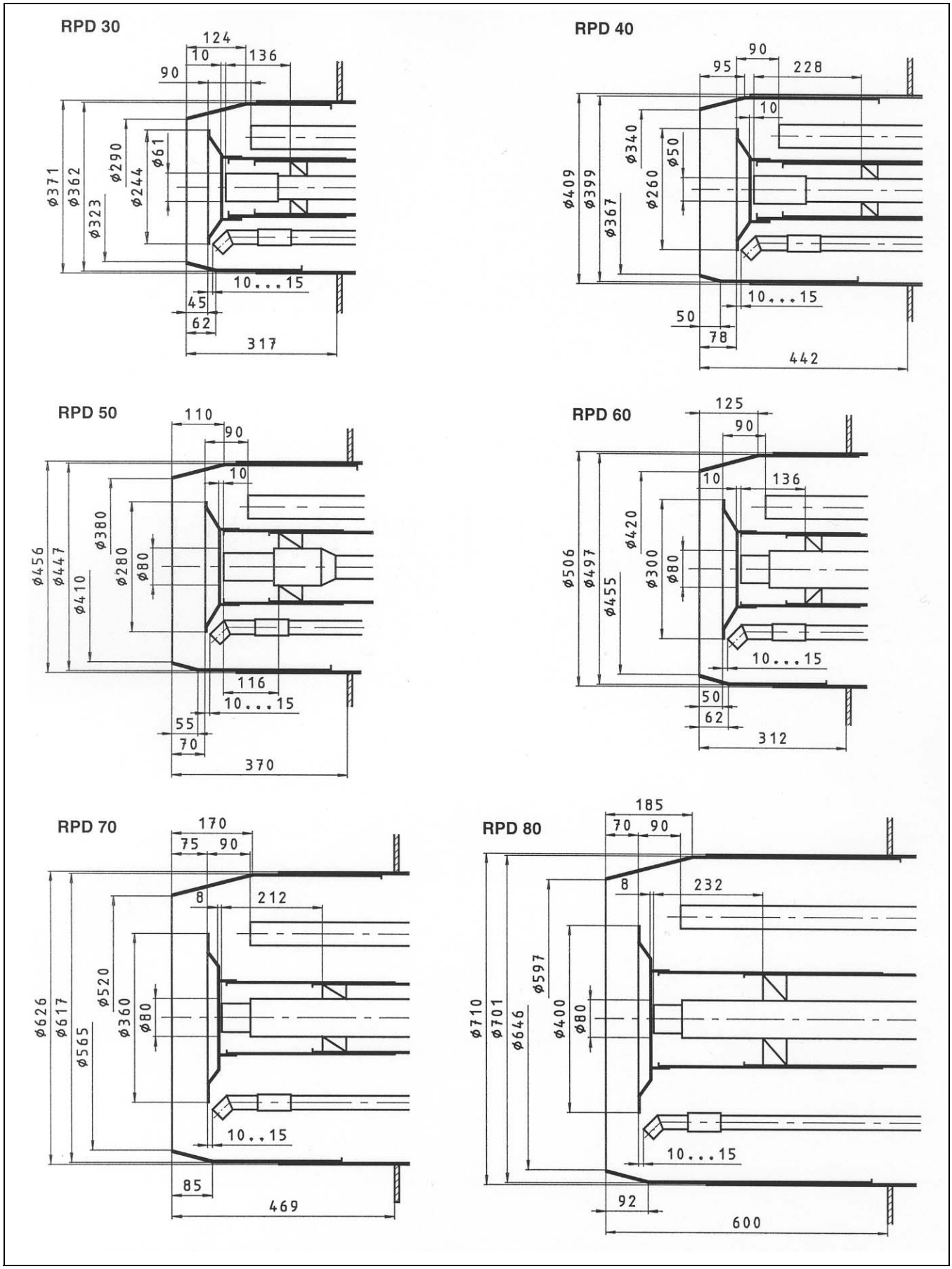


1 Electrical terminal box
2 Plug connector
3 Terminal strip
4 Cable bushings

The installation material and all electrical connections and earthing points must be in accordance with the VDE 0116 specifications and the local regulations. The electrical connection of the burner must be made as shown in the circuit diagram attached hereto. The electrical control lines are installed through the screwed cable joints and connected to the numbered terminal strip in accordance with the circuit diagram. Control boxes related to the burner must also be connected in accordance with the enclosed circuit diagram and VDE 0116 and taking into account the local regulations. After the electrical connections have been completed a check must be made for the correct wiring of all items of the equipment.
Also the direction of rotation of the fan should be checked.

Dimensions of the Mixing Unit (standard versions)

RPD 30 - RPD 80

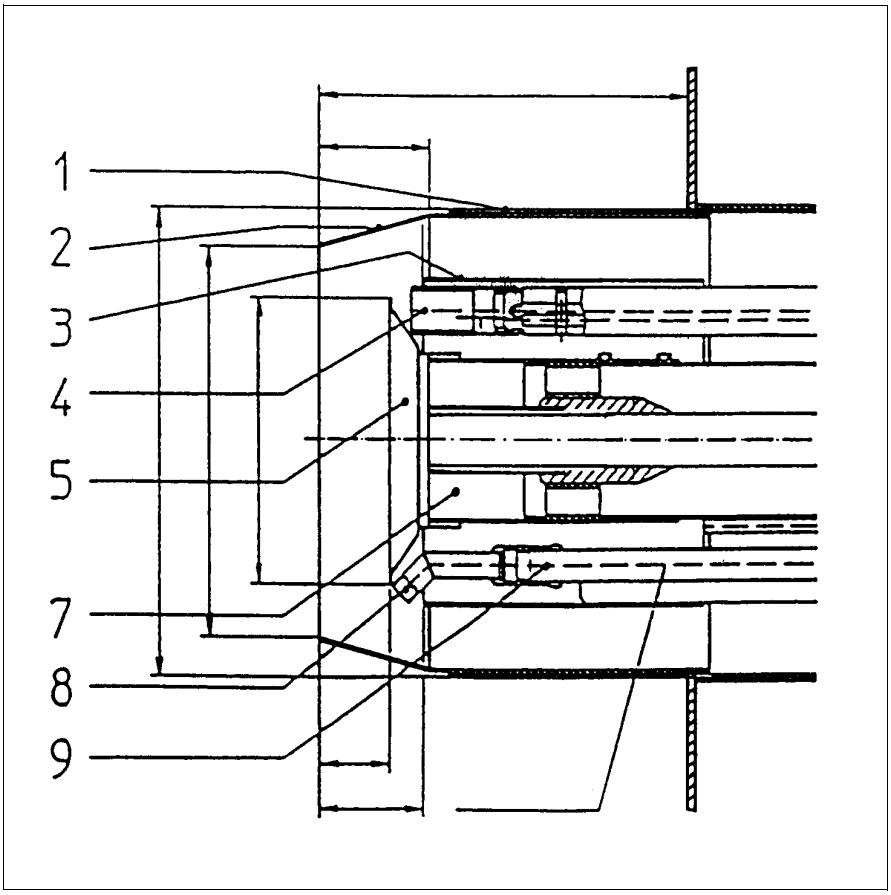


Draw-out and Swing Mechanism

Burner Settings

Draw-out and swing mechanism
The duobloc burners type RPD are equipped with a draw-out and swing mechanism. This makes it possible to pull out and swing away the complete central tube for maintenance access to the mixing head and for adjusting the mixing and ignition units.
Prior to this, the fastening bolts of the central tube must be unscrewed. The baseplate of the central tube carries the ignition burner, flame detector, nozzle rod assembly (only for oil and dual-fuel burners) and primary air connection.
After the central tube has been removed, the air damper in the burner housing will also be accessible.

NOTE: Before removing and swinging away the central tube take care to mount the draw-out and swing mechanism, disconnect the electric plug connectors of the flame detector and ignition burner, remove the primary air connection and disconnect the oil hoses (in oil and dual-fuel burners) with the quick-action couplings provided for this purpose.



Burner combustion head
1 Burner tube
2 Flame tube
3 Cylinder for air stabilization
4 Ignition Burner
5 Turbulator
7 Primary air duct
8 Gas nozzle
9 Gas lances

Burner head adjustments

Burner combustion head adjustments
In order to enable service work on the burner combustion head and for adjustments of the ignition system the complete burner insert can be removed (see burner hinge arrangement). In case of component replacements or service work on the components of the burner head the correct position of the burner head components have to checked and if necessary the appropriate adjustments have to be carried out.
The correct measurements can be seen in the burner dimensional sheet.
The ignition electrodes must be set according to the dimensions shown in the diagramm.

Air Flow Adjustment
Gas Rate Adjustment

Air flow adjustment
Check the air swirler setting in relative to the furnace chamber geometry and re-adjust if required. Set the air swirlers to their closed air inlet positions at the inlet of the air connection socket to ensure an equal distribution. The air curve of the compound controller is factory-set so that the air cylinder is closed in minimum position and opened in maximum position.
The combustion air feed rate (primary and secondary air) is controlled according to the fuel feed rate by means of an electronic fuel-air compound control system over the whole output range and checked by an exhaust gas test.
In the case of a large control range the minimum furnace output is controlled by the primary air.
It should be noted for the adjustment that the air pressure of the central pipe (primary air) is higher by 1.5-2 mbar than the pressure in the furnace compartment.

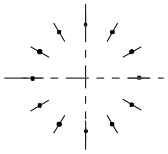
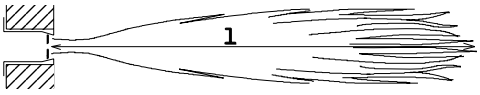
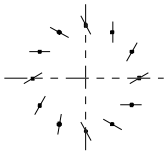
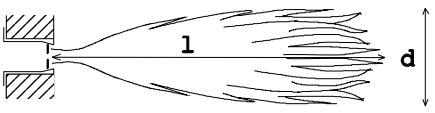
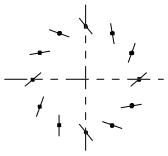
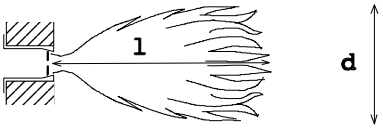
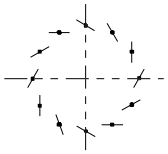
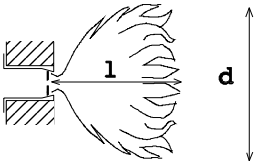
Gas rate adjustment
The gas control damper is factory-equipped with an actuator.
The minimum and maximum positions and the intermediate positions are also selected by means of the electronic compound controller.
If required, the gas pressure can be varied with the gas pressure controller.

For the step-by-step adjustment of the load points (fuel flow rate, air flow rate), proceed as described in the operation manual of the electronic compound controller.

Make a fuel measurement at each stage if possible.

The electric actuators must be adjusted and selected in accordance with the electronic compound control system used.

Flame formation

		Air swirler position		
POS 1				
Air swirler angle	0 - 20°			Spindle-flame
Pressure loss	30 mbar			
POS 2				
Air swirler angle	20 - 40°			Long flame
Pressure loss	38 mbar			
POS 3				
Air swirler angle	40 - 55°			Average length flame
Pressure loss	45 mbar			
POS 4				
Air swirler angle	55 - 70°			Short flame
Pressure loss	55 mbar			

Gas Pressure Switch
Air Pressure Switch

Gas pressure switch A5

Gas pressure switch A6

Gas pressure switch GW...A5/A6
The gas pressure switch is designed to monitor the gas flow pressure. It can be used for monitoring either falling pressure (minimum) or rising pressure (maximum, specified for equipment according to TRD 604).
The types GW...A5/A6 may be used as pressure switches of specific design according to VdTÜV Leaflet "Pressure 100/1" for application in furnace systems complying with TRD 604. The setpoint (switching point) may be selected by means of a setting disk with scale.

Gas pressure switch setting
Remove the protective hood. Measure the gas flow pressure at full load. By subtracting approx. 20 % you will get the cut-off pressure. Proceed by turning the scale disk (item 1) until the desired cut-off pressure appears opposite to the arrow. Note that the scale readings are approximate values.
Then slowly close the gas stop valve until the desired cut-off pressure has been reached. Move the scale disk until the burner stops. Put the protective hood in place again and tighten bolts.

Technical data:

Type of gas:
Gases according to DVGW Worksheet G 260/1, gas families 1, 2, 3

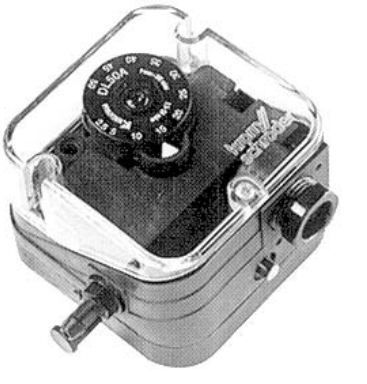
Degree of protection: IP 54

Ambient temperature: -15°C to +70°C

Mounting position: any

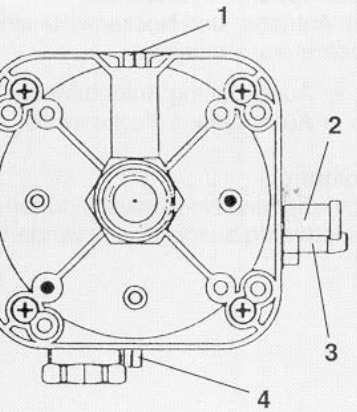
Operating pressure up to:

GW 50/150 A5A6	500 mbar
GW 500/ A5/A6	600 mbar



Air pressure switch
The air pressure switch is provided for monitoring the pressure of the combustion air fan.
The pressure switch DL 50A has been designed for switching on, off or over an electric circuit in the case of changes of the actual pressure levels from the setpoint setting. The pressure switch DL 50A can be used as overpressure, vacuum or differential pressure monitor for air and non-aggressive gases but not for gases according to DVGW Worksheet G 260/l.

Certification
The pressure switch has been tested in accordance with DIN 3398 Part 2 and is registered by CE/DIN-DVGW. It has been registered in other important gas consumption countries.



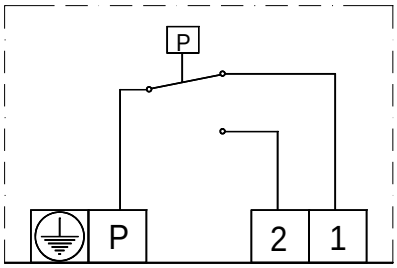
Determining the differential pre-flushing pressure and adjusting the differential pressure switch
- Burner in the pre-aeration phase.
- Measure pressure on test connection (2).
- Measure vacuum on test connection (3).
- Add the measured pressures.
- Set the scale to 90% of the calculated value.

Switch function test
Test buttons are provided to check the switch functions for proper operation (with safety cut-out and interlock). The burner is normally run in partial-load condition when testing the safety functions. On pressing button (4) the vacuum will be removed which causes the differential pressure to drop below the required level. If it is necessary to test the pressure switch functions under full-load conditions this may be done by pressing button (1).

Setting Pressure Switches and Control System

Setting of the air pressure switch
The differential pressure between burner housing (overpressure) and air box (subatmospheric pressure) is measured with the burner in full-load condition. The pressure setting of the air pressure switch must therefore be smaller than the differential pressure measured. For adjustment, remove the protective hood and turn the setting scale accordingly.

Air pressure / gas pressure switch circuit



Switching functions of air pressure switch/gas pressure switch
With increasing pressure:
P1 opens
P2 closes
With decreasing pressure:
P1 closes
P2 opens

KS 92

An **industrial controller type KS 92** is used for the steplessly adjustable burners. This controller has been specifically designed for use with burner systems. It is mainly employed for temperature or pressure control operations in conjunction with burners with a steadily adjustable fuel throughput rate. A specific software system is provided for adjusting the controller to the controlled variable, the desired setpoint range and the way of actual-value recording.
Technical documentation KS 92 PMA

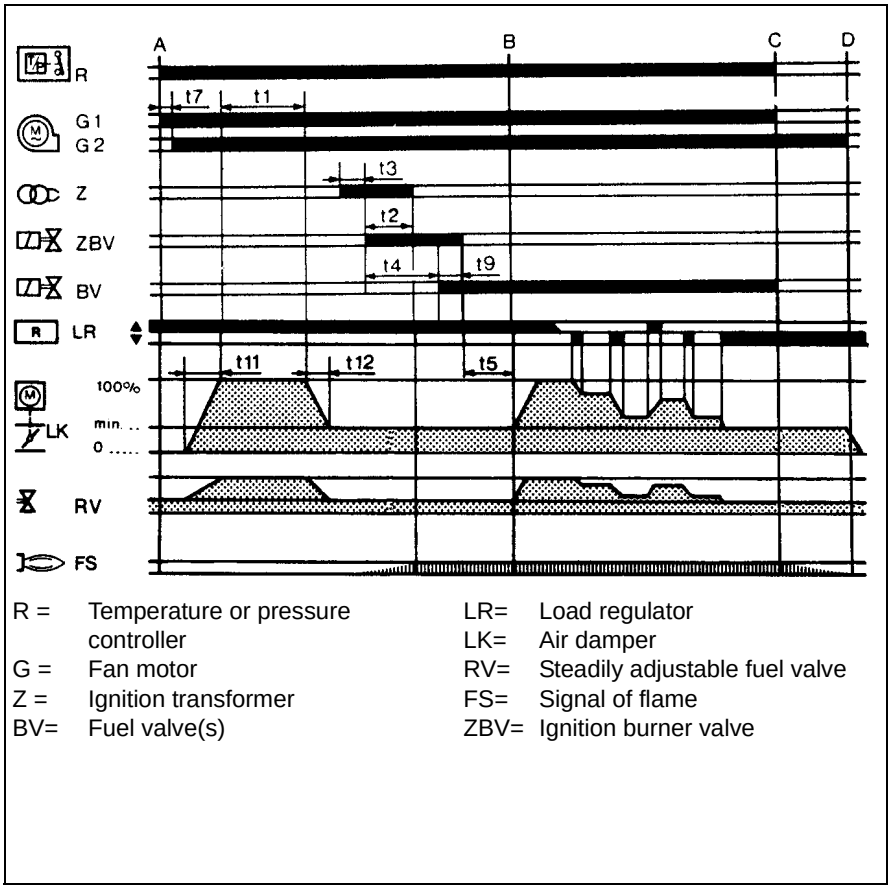
Infinitely variable control (modulating) with RWF 32 controller
A universal controller type RWF 32 can also be used with infinitely variable controllable burners. This controller is specially designed for furnace temperature and pressure control of burners using constantly changing types of fuel. Depending on the use, the RWF 32 will function as either PID, PD or P controller. As the P part, which is correcting time and the D part can be adjusted to cover a wide range of limits, it is possible to adapt the control behaviour of the installation to exact standards. The operating time of the drive for compound control of fuel and air must be at least 2 secs. for the "small flame - nominal load setting" range.
The actual value reading (temperature, pressure or combustion chamber pressure) is achieved by means of sensors and range or zone plugs in the form of a resistance value. The control output of the controller is a floating three-point switch used to control reversible servomotors. The control signals for the actuating direction OPEN (y1) and CLOSED (y2) are displayed by LEDs, whilst the adaptation of the controller to the control led variable and the required specified value range is effected via the so-called range or zone plugs, which form the sensor part of the controller measuring bridge. The range or zone plug is also fitted with the setpoint scale. On the other hand, the setpoint value generator itself, which can be changed to be a remote setpoint value generator, is a fixed component of the controller.

Setting the controller
Setting a complete, infinitely variable heating installation required excellent technical and controller knowledge. The actual setting and commissioning of the installation is made considerably easier by the special setting instructions issued with the RWF 32 controller. Comprehensive special issues are available if required.
The differential pressure between the burner housing (excess pressure) and the air receiver (negative pressure) is measured during the full load adjustment. The pressure set at the air pressure switch must be below the measured differential pressure. To carry out the setting remove the protective cover and turn the setting scale as required.

Automatic Furnace Controller LFL 1... / LGK 16...

The LGK 16… type controller is designed to control and monitor burners working according to a stepwise or modulating principle. A detailed functional description with technical data and project planning information with respect to the automatic combustion controllers can be found in the annex and in the documents

LFL 1...-7451 D
LGK 16...-7785 D



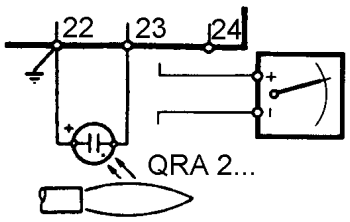
R = Temperature or pressure controller
G = Fan motor
Z = Ignition transformer
BV= Fuel valve(s)
LR= Load regulator
LK= Air damper
RV= Steadily adjustable fuel valve
FS= Signal of flame
ZBV= Ignition burner valve

Functional diagram
LFL 1... / LGK 16...

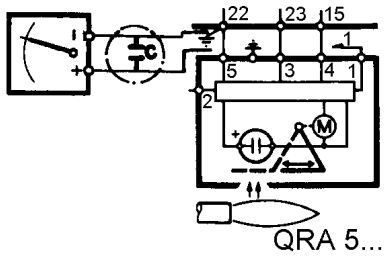
A = Starting type interval
A-B= Flame development interval
B = Burner has reached operating position
B-C= Burner operation (heat generation)
C-D= regular shut-off
t1 Pre-ventilating time
t2 Safety time
t3 Pre-ignition time
t4 Fuel valve enable
t5 Load regulator enable
t11 „OPEN“ run time of air damper
t12 „CLOSE“ run time of air damper

Flame Monitor
Sensor Current Measurement

Autom. furnace controller LFL 1...
UV sensor with QRA 2...



Autom. furnace controller LGK 16...
UV Sensor with QRA 5...



Flame monitor with UV sensor
The UV radiation of hot flame gases is utilized for generating the flame signal. The radiation detector used is a UV-sensitive tube with two electrodes and being live all the time. This UV tube will ignite when subject to light from the 190-270 nm range of the spectrum and thus cause a current to flow to the flame signal amplifier.
The UV tube will not respond to the after-glowing refractory lining of the furnace, sunlight, daylight or light of the boiler room lighting system.
The service life of the UV tube is about 10,000 hours at ambient temperatures up to 50°C; higher ambient temperatures will considerably reduce its service life.

Burners operated continuously or intermittently for more than 24 hours without interruption (e.g. boiler sequence control) or burners operated on steam boilers must be equipped with the automatic furnace controller of type LGK 16... and its associated self-controlling flame monitoring circuit (QRA 5...).
For data and design instructions refer to automatic furnace controller:

LFL 1...	No. 7451 D
LGK 16...	No. 7785 D

UV current measurement with QRA 5
For an accurate UV current measurement it is recommended to make use of the **tester KF 8832**. If a normal meter (microammeter) is used for UV current measurement it is advisable to make the measurement as shown in the figure. For this, a capacitor
C = 470 µF, 15V (or with higher electric strength) must be integrated in the measuring circuit.
Meter: 100 µA/Ri = 3 kΩ
Connect the meter between the automatic furnace controller and the UV flame sensor QRA 5... (terminal 22 (-) and 5 (+)).
Take care to observe the right polarity.

Alignment of the UV sensor QRA 5...
The mounting flange is movable supported on the sensor tube to allow the exact alignment of the sensor window relative to the direction of incidence of the UV radiation.

NOTE: The terminal (22) must be connected to earth all the time.

Cleaning the sensor
Check the UV sensor window for possible accumulation of dirt at regular intervals and clean if required. Take care the sensor window is free of dust all the time.
If upon cleaning the sensor does not properly work it will be required to replace it by a new one.

Sensor currents

Automatic controller	Minimum required	Maximum possible
Monitor	with UV	with UV
* LFL 1...	70 µA	630 µA
* LGK 16...	**	**

Recommended instrument range:
UV monitor 0 - 1000 µA

* See technical data for automatic furnace controller LFL 1 / LGK 16...

** See data on unit KF 8832 for sensor current measurement.

Electronic Compound Control

Ratio controller VMS

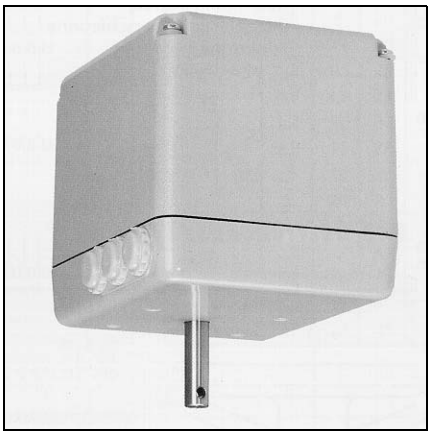
Ratio controller Etamatic

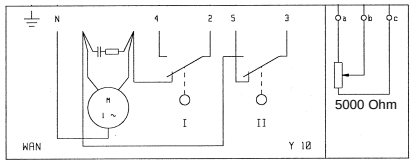
Refer to the documentation supplied with the electronic compound control system for the pre-operational work on the burner, the checking requirements (e.g. actuators, limit switches, potentiometers, etc.) and the instructions for the initial operation of the electronic compound control system.

Actuator Type ARIS, WAN 2A / N2A, WAN 3/N3

Technical Data:

	WAN 2A / N2A	WAN 3 / N3
Voltage:	220 V +/- 10%	220 V +/- 10%
Frequency:	50 Hz +/- 5%	50 Hz +/- 5%
Operating time:	60(50) sec. at 90°	30 sec. at 90°
Torque:	21 Nm	30 Nm
Contacts:	max.250 V 10(3) A	max.250 V 10(3) A
Ambient temperature:	-15 °C till + 60 °C	-15 °C till + 60 °C
Protection class:	IP 54, DIN 400 50	IP 54, DIN 400 50
Installation position:	no restriction	no restriction
Weight:	2,6 kg	2,8 kg





Description

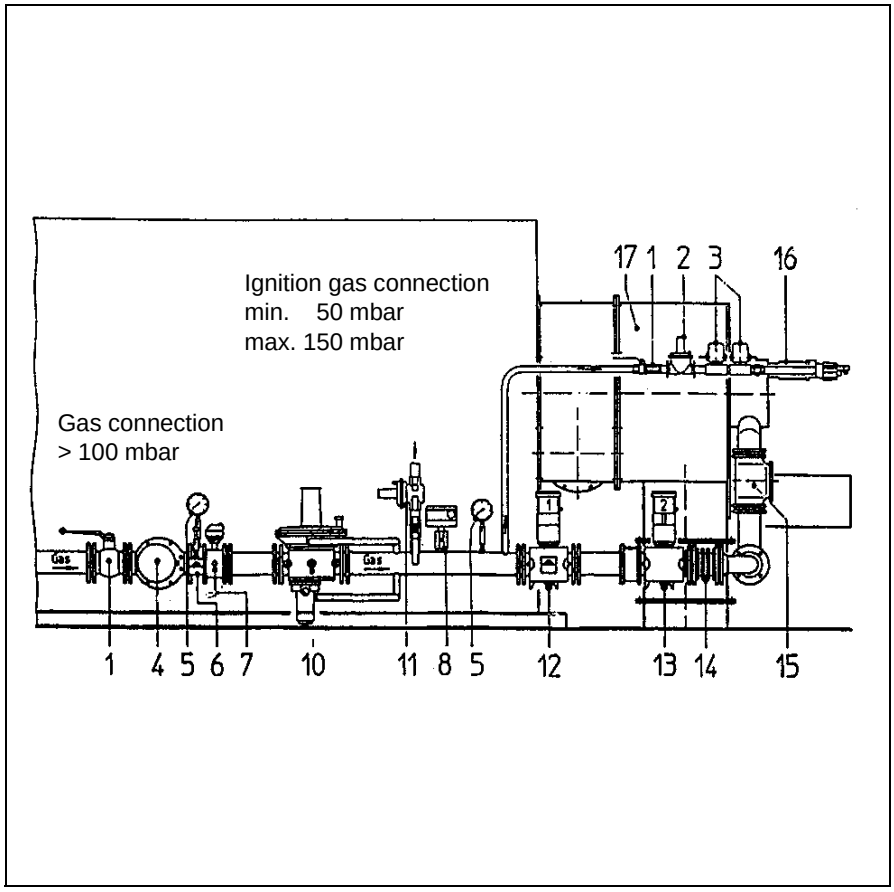
The actuator type ARIS-WAN is designed as a controlling element for oil/gas or dual-fuel burners with sliding or modulating control concept. The actuator is equipped with a short-circuit-proof synchronous a.c. motor which drives a shaft via a maintenance free spur-gear unit with permanent grease lubrication. The shaft end carries a coupling for operating the controlling element for fuel (oil and gas) and for primary and secondary air. The actuator is designed for two-wire control by controllers or switching units with change-over contact (single-wire control is possible). A feedback potentiometer of 5000 ohm rating is used as a standard feature.

Gas Connection

For the installation and taking into operation of the gas lines care should be taken to observe the regulations of DVGW (German Association of the Gas and Water Sector) especially DVGW-TRGI (Technical Regulation for Gas Installations) and TRF (Technical Regulation for Furnaces).
DIN 4756 and TRD 412 contain specifications for the construction, design and safety requirements of gas furnaces in heating installations. Furnace systems of higher operating pressures are subject to the DVGW Worksheets G 460 and G 461. The gas lines must meet specifications set out in DVGW-TRGI in the case of furnace systems with operating pressures up to 100 mbar or above 100 mbar.

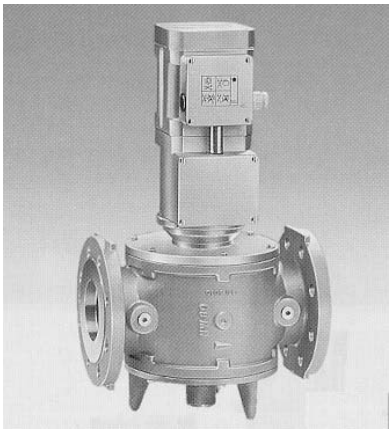
Gas control group with two gas valves and leak tester:
The gas section is designed in accordance with EN 676 and TRD 412, two gas valves and leakage tester are prescribed for burners with a capacity above 1200 kW.
The operation, mounting and adjustment of the valve leak testers is described in detail on a separate sheet.

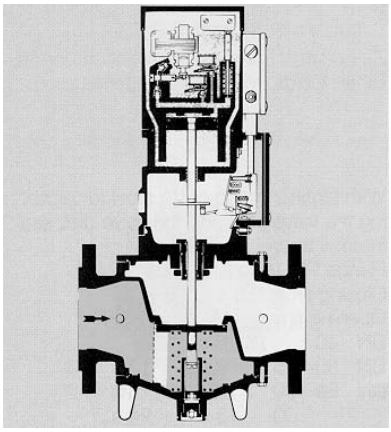
Gas connection pressure:
The gas line must be dimensioned in accordance with the throughput rate and the available gas pressure and installed to the burner on the shortest possible way with minimum pressure loss.
To provide the most effective conditions for start-up, take care that the burner and gas stop valve are installed with the minimum possible distance between one another. This means that the 2nd gas valve (looking in the direction of the gas flow) should be mounted in the immediate vicinity of the burner.
Note the gas pressure loss of the gas control group and burner. The gas control group can be connected directly to the gas feed line. Note the order in which the valves and instruments are mounted and the direction of flow. Prior to installation and taking into operation, check the valves and instruments and the connection fittings for the possible accumulation of dirt and foreign matter.



1 Gas stop valve
2 Ignition gas pressure regulator
3 Ignition gas solenoid valves
4 Gas filter
5 Pressure gauge with pushbutton valve
6 Test burner
7 Gas meter
8 Gas pressure switch
10 Gas pressure regulator with safety blow-off valve
11 Safety blow-off valve
12 Gas motor valve 1/solenoid valve
13 Gas motor valve 2/solenoid valve
14 Compensator
15 Gas butterfly control valve
16 Gas pilot burner
17 Burner

Gas Motor Valve VK





Gas motor valve VK..

- Automatic shut-off valve of Class A according to EN 161.
- Sturdy design for long service life.
- Energy-saving through motor self-stop.
- Available in single-stage or double stage design with signal switch.
- Valve housing available in GGG 50.
- Valve top can be supplied in explosion-proof design.
- EC prototype tested and certified **(CE)**.

Application

The gas motor valve is used to ensure and control the gas and air supply to gas burners and other gas-firing equipment, also for two-stage operation. The VK..G with GGG 50 housing meets the requirements according to TRD 412, par. 4.2 (application in outdoor installations), par. 5.1 (shut-off valve outside of the boiler room) and GUV 17.4 (use in landfills).
In areas subject to an explosion hazard (zones 1 and 2) it is recommended to use VK..X, e.g. in lacquer and varnish factories, paint shops, refineries, chemical plants, sewage treatment plants, landfills, gas/oil extraction plants, etc.

Operation

The motor valve type VK is a hydraulically actuated safety valve which is in closed position when dead.
On application of mains voltage the internal pump of the valve will build up an oil pressure which causes the valve disk to be forced down slowly via a piston. The pump will stop as soon as the fully opened position has been reached. As the pressure decreases the pump will be shortly run again. For closing the valve, shut off the voltage which will cause the oil pressure to return to zero and the closing spring force down the valve disk within 1 s.

General technical data

Type of gas:
City gas, natural gas, liquid gas (gaseous state) and air; also suitable for biogas and landfill gas

Valve housing:
AlSi for VK..A DN 40 to DN 200;
GGG 50 for VK..G DN 50 to DN 200;
inside and outside with epoxy resin powder coating. The two housings can be combined with different tops.

Maximum inlet pressure: see Table of Data; VK..G are pressure proof up to 8 bar and pressure surge proof up to 20 bar.

Valve top: AlSi

Valve disk sealing:
Perbunan up to DN 150
Polyurethane for DN 200
alternatively, Viton for DN 40-150
acc. to EN 161, Class A, Group 2
Measuring or pilot flame connection Rp on either side of input and in output; with stainless steel screen to protect valve seat and valve sealing.

Inside thread Rp according to ISO 7-1

Flange PN 16 according to ISO 7005

Closing time: 0.8 s

Opening time:	VK	VK..H
DN 40	5 s	-
DN 50 - 65	8 s	12 s
DN 80 -100	10 s	18 s
DN 125 - 200	13 s	24 s

Ambient temperature: see versions

Storage and handling temperature:
-40°C to +60°C

Mains voltage: see versions

Power consumption: see table

Duty factor: CD 100%

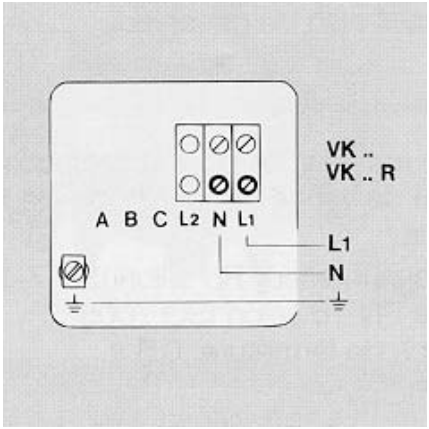
Connection: conduit thread Pg 13.5

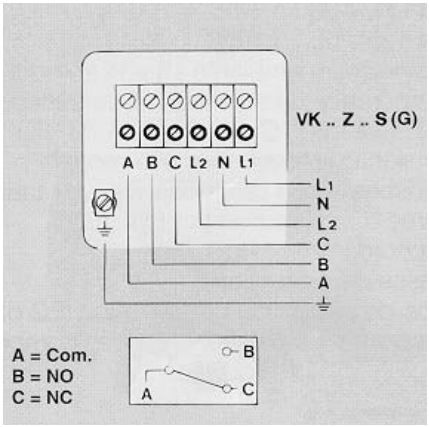
Protection classification: 1

Degree of enclosure: IP 54 according to IEC 529

Take care to observe the regulations of the local electric power supply companies.

Gas Motor Valve VK





VK.., VK..H

VK..: single-stage top; slowly opening

VK..H: top with higher actuating force for higher input pressures; slowly opening

VK.., VK..H:
For electrical connection see figure at the top left.

The following versions are available:

- with volumetric flow control valve (standard);
- with signal switch (option);
- with holding relay for manual restart (option);
- with standard appliance plug according to DIN 43650 (option)

VK..Z

Top of double-stage type; slowly opening.
For electrical connection see figure centre left.
The following versions are available:

- with volumetric flow control valve (standard):
  The 1st stage can be adjusted with a switch between 0% and 90% of the maximum output. The 2nd stage can be adjusted with the volumetric flow control valve from the bottom between 0% and 100%.
  Factory setting: maximum volumetric flow rate.
- with signal switch (standard)

VK... VK..H, VK..Z
Technical data
Mains voltage:

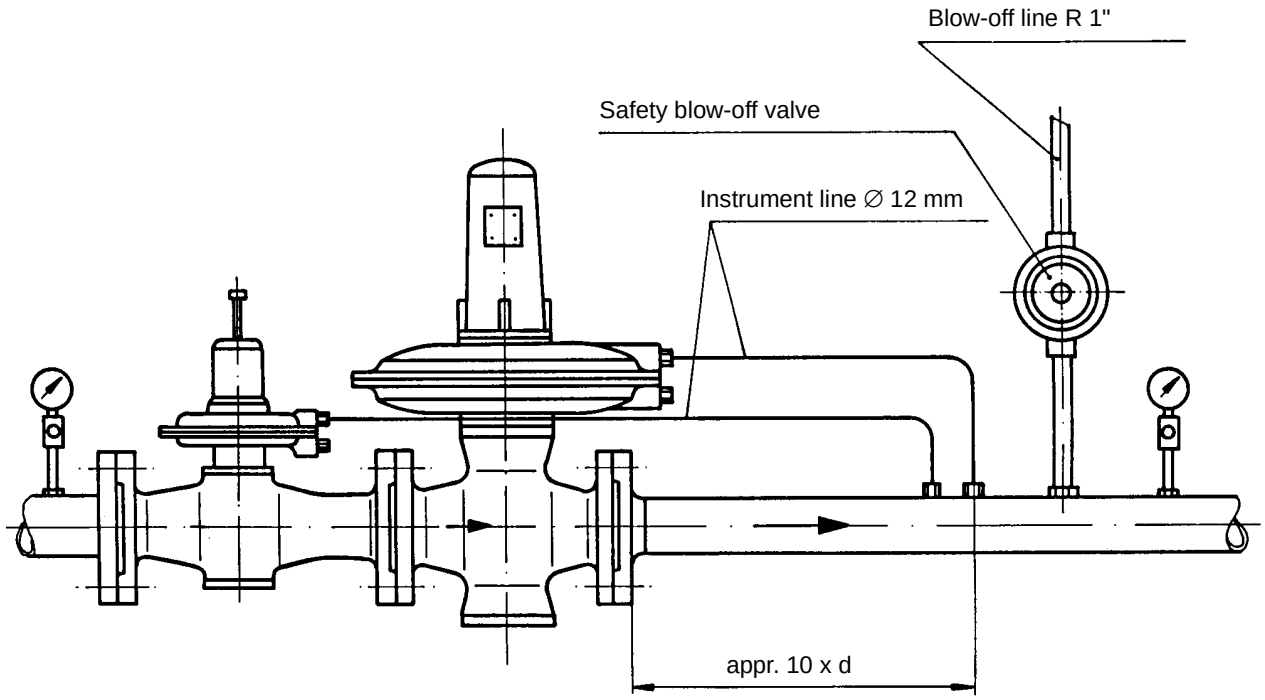
220/240 V~	+10/-15%	50 Hz (standard)
220 V~	+10/-15%	60 Hz
200 V~	+10/-10%	50/60 Hz
120 V~	+10/-15%	60 Hz
110 V~	+10/-15%	50/60 Hz
100 V~	+10/- 5%	50/60 Hz

Ambient temperature: -15°C to +60°C

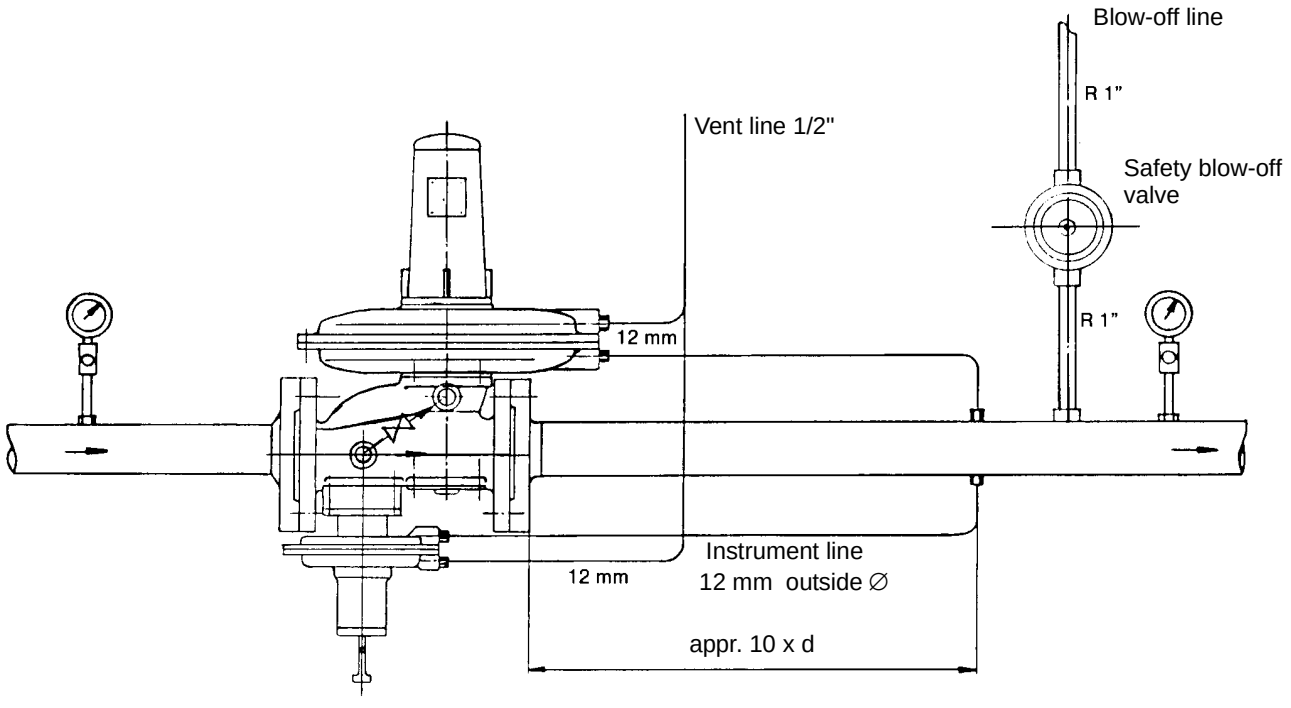
Installation:
in horizontal or vertical lines

Gas Pressure Regulator

Gas pressure regulator with separate safety blow-off valve



Gas pressure regulator with built-in safety blow-off valve



Gas Pressure Regulator with Safety Diaphragm, Inlet Pressure Compensator, Zero Lock

Installation and Adjustment

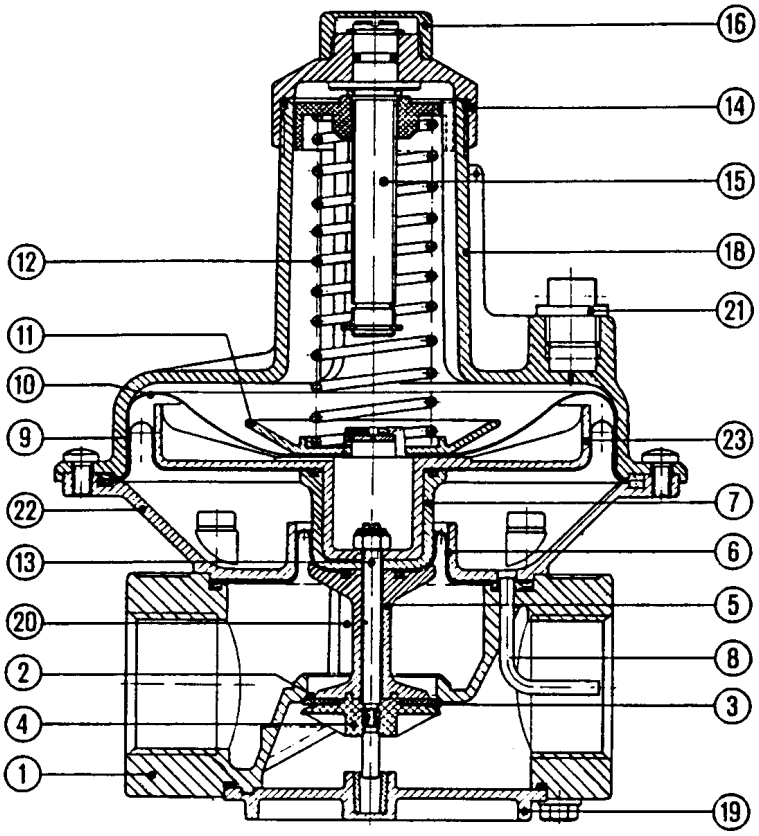
Setpoint adjustment
The setpoint will be adjusted by selecting the desired range of the setpoint spring and adjusting the setting spring accordingly. The layout of ranges is according to the spring configuration.

Instrument line
It will not be necessary to reposition the instrument line because the controller is equipped with an internal pulse sensor as a standard feature.

Inlet pressure variations
Any variations between the minimum and maximum inlet pressure levels will be compensated for by the compensator diaphragm to avoid outlet pressure variations.

Installation
Prior to installation check that the connecting lines and regulators are free of dirt. Dirt-carrying gas may cause damage to the seat and cone of the regulator. For the installation take care to observe the direction of the arrow. Hold regulators with threaded connections only by means of suitable tools engaging the surfaces intended for this purpose. For the connection of flanged joints take care to tighten the bolts by even amounts all around.

Control and start-up
With the setpoint setting known to be in its correct position:
Proceed with slowly opening the stop valve upstream of the regulator. Then turn on the gas-consuming equipment. Depending on the mounting position it might be necessary to slightly readjust the pressure (turning the setpoint setting screw clockwise or counterclockwise will increase or decrease the pressure, respectively).
With the setpoint setting not known or in its incorrect position:
Proceed with fully relieving the setpoint spring of load (turning counterclockwise); open the stop valve slowly and cautiously; set the desired setpoint to an approximate position with the gas-consuming equipment not turned on and proceed with the exact setpoint setting at nominal load. If the setting range of the setpoint spring is not sufficient, select the correct spring from the table of springs.



1	Housing bottom	15	Adjusting screw
2	Regulator seat	16	Screw cap
3	Regulator sealing	17	Position indicator for DN 40/DN 150
4	Regulator disk	18	Cover
5	Bottom spacer sleeve	19	Bottom cover
6	Compensating diaphragm	20	R1/4" thread on either side of inlet pressure chamber for inserting the test socket
7	Top spacer sleeve	21	Leakage gas connection R 1/4" for DN15/DN25 (R 1/2"/R 1") R1/2" for DN 40/DN150
8	Override tube	22	Diaphragm cup
9	Working diaphragm	23	Diaphragm plate
10	Safety diaphragm		
11	Diaphragm disk		
12	Setting pressure spring		
13	Screw		
14	Screw plug		

Maintenance
The gas pressure regulator is maintenance free. Dirt-carrying gas may however necessitate an occasional cleaning of the unit. In case of a failure of the working, safety or compensating diaphragms due to the impact of excessively high pressure it will be necessary to order a new measuring element for the particular type (all functional parts of the regulator available as a kit).

Gas Pressure Regulator with Integrated Safety Valve

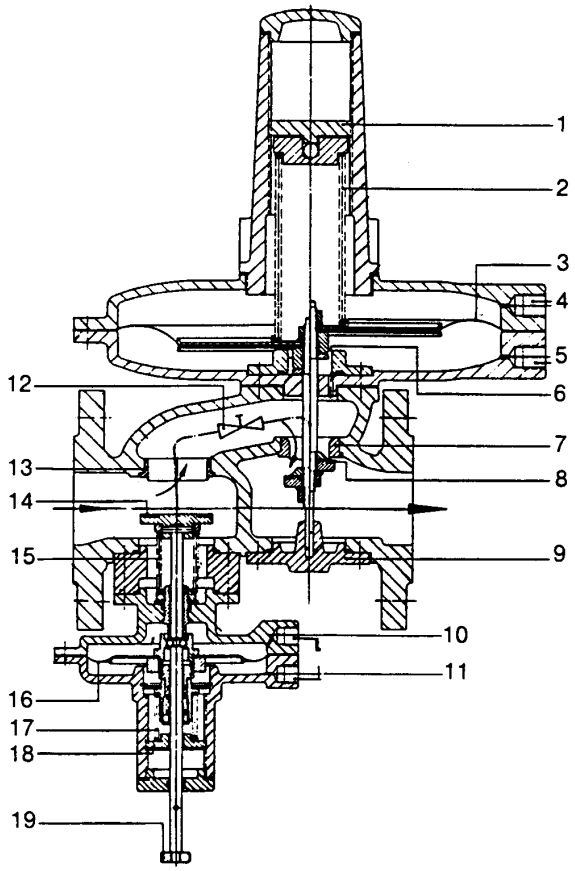
Installation and Adjustment

The gas pressure regulator has been designed to ensure a constant outlet pressure with fluctuating inlet pressure and varying consumption rates.
It is especially used for applications requiring very short response times, e.g. in the feed line to burner systems, industrial furnaces, etc.
The gas pressure regulator is installed by the exclusive use of spring-loaded mountings so that it can be arranged in any desired position. A common housing accommodates the gas pressure regulator and a safety shut-off valve which is set to stop the gas supply in case of overpressure and/or lack of pressure.

Installation
The gas pressure regulator must be installed with the arrow pointing in the direction of the gas flow. Two instrument lines must be fitted, one to the bottom diaphragm cup of the regulator part and one to the upper diaphragm cover of the safety shut-off valve (approx. 10 D downstream of the control unit). These lines should be of steel type with an outside diameter of 12 mm. The Ermeto self-sealing couplings are provided by the manufacturer.

Taking into operation
Open the gas shut-off valve very slowly. Watch the outlet pressure on the pressure gauge and readjust the load spring if required. Take care for adjustment that the gas is not flowing because otherwise the closing pressure will be added to the measured result.

Operation
The gas will flow through the regulator housing in the direction of the arrow. The main diaphragm will be charged with pressure to the outlet side from the bottom via an instrument line. The load spring is preset to the desired outlet pressure. The single-seat valve is directly hung and isolated from the inlet pressure by an intermediate diaphragm. The diaphragm of the safety shut-off valve is charged with outlet pressure via an instrument line. Overpressure and/or lack of pressure will cause the measuring element to lift or lower. This will actuate the tripping mechanism with the closing spring pressing the valve disk against the valve seat.



1	Setting screw	11	Vent opening
2	Load spring	12	Inlet pressure compensating valv
3	Main diaphragm	13	Safety shut-off valve seat
4	Vent opening R 3/8"	14	Valve sealing
5	Instrument connection R 3/8"	15	Closing spring
6	Inlet pressure compensating diaphragm	16	Safety shut-off valve diaphragm
7	Valve seat	17	Maximum spring
8	Valve sealing	18	Setting screw
9	Closing cover	19	Pull knob
10	Instrument connection R 1/4"		

Gas Filter
Safety Vent Valve

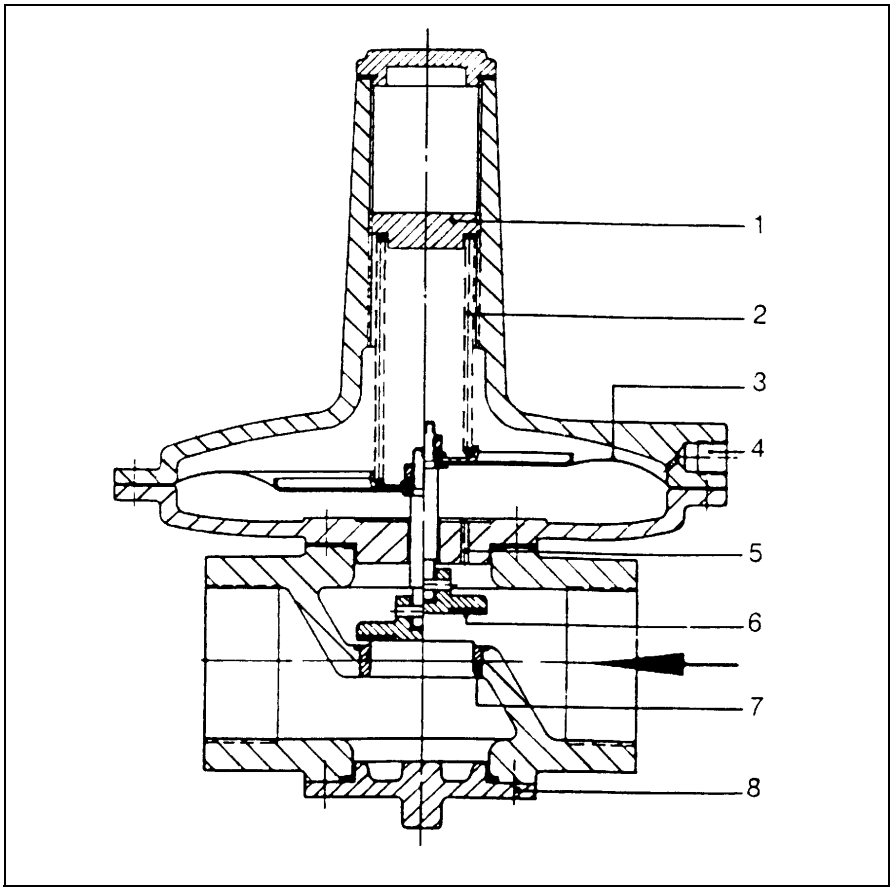
Installation and mounting of the gas filter
The gas filter may be installed in any desired position. Take care only to observe the direction of flow of the gas (arrow on filter housing). Make sure there is adequate clearance to facilitate the removal of the cover and replacement of the filter cartridge.

Filter replacement
The filter cartridge should be replaced by a new one as soon as a high pressure drop is noticed. If a new filter cartridge is not at hand it will be possible to wash the filter mat in 40°C water adding some light-duty detergent. Allow the mat to dry before reinstallation.

NOTE: For the installation of the filter mat take care to observe the marking or sticker.

Safety vent valve
Connection: R 1“, R 11/2“
Relief pressure: max. 1 bar
Single-seat valve
Tight zero lock
Maintenance free

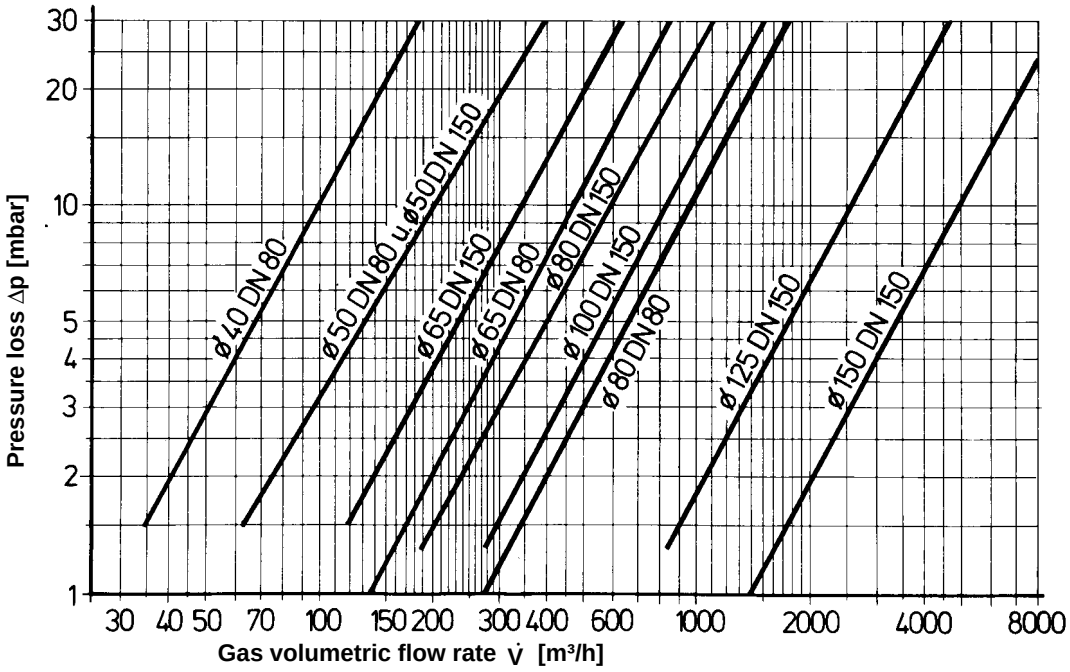
The safety vent valve type SL 10 is provided to relieve short-time pressure surges upstream of burner installations or to avoid pressure increases beyond an acceptable limit.



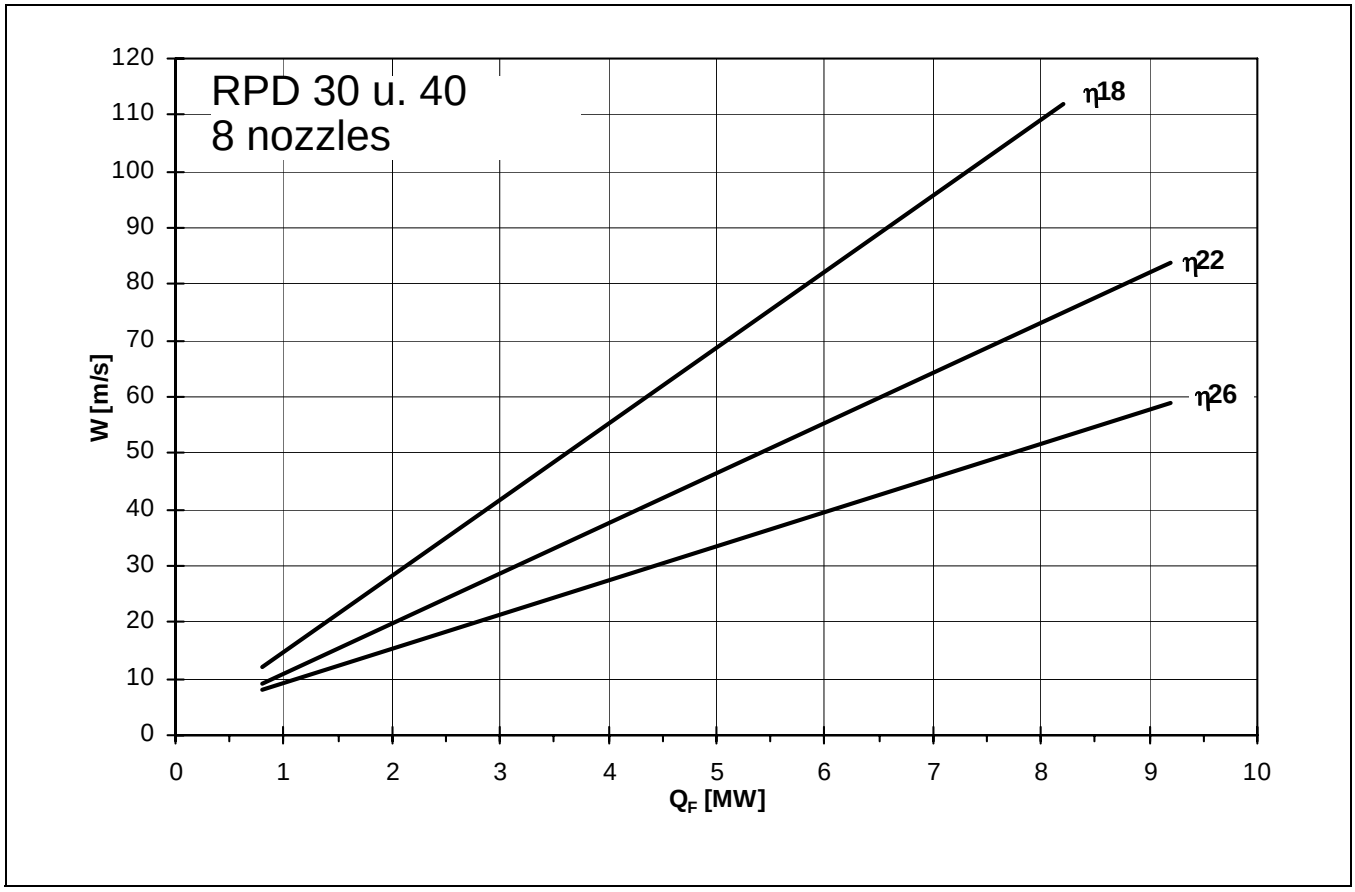
1 Setting screw
2 Load spring
3 Diaphragm
4 Vent opening R „
5 Internal influencing feature
6 Valve sealing
7 Valve seat
8 Closing cover

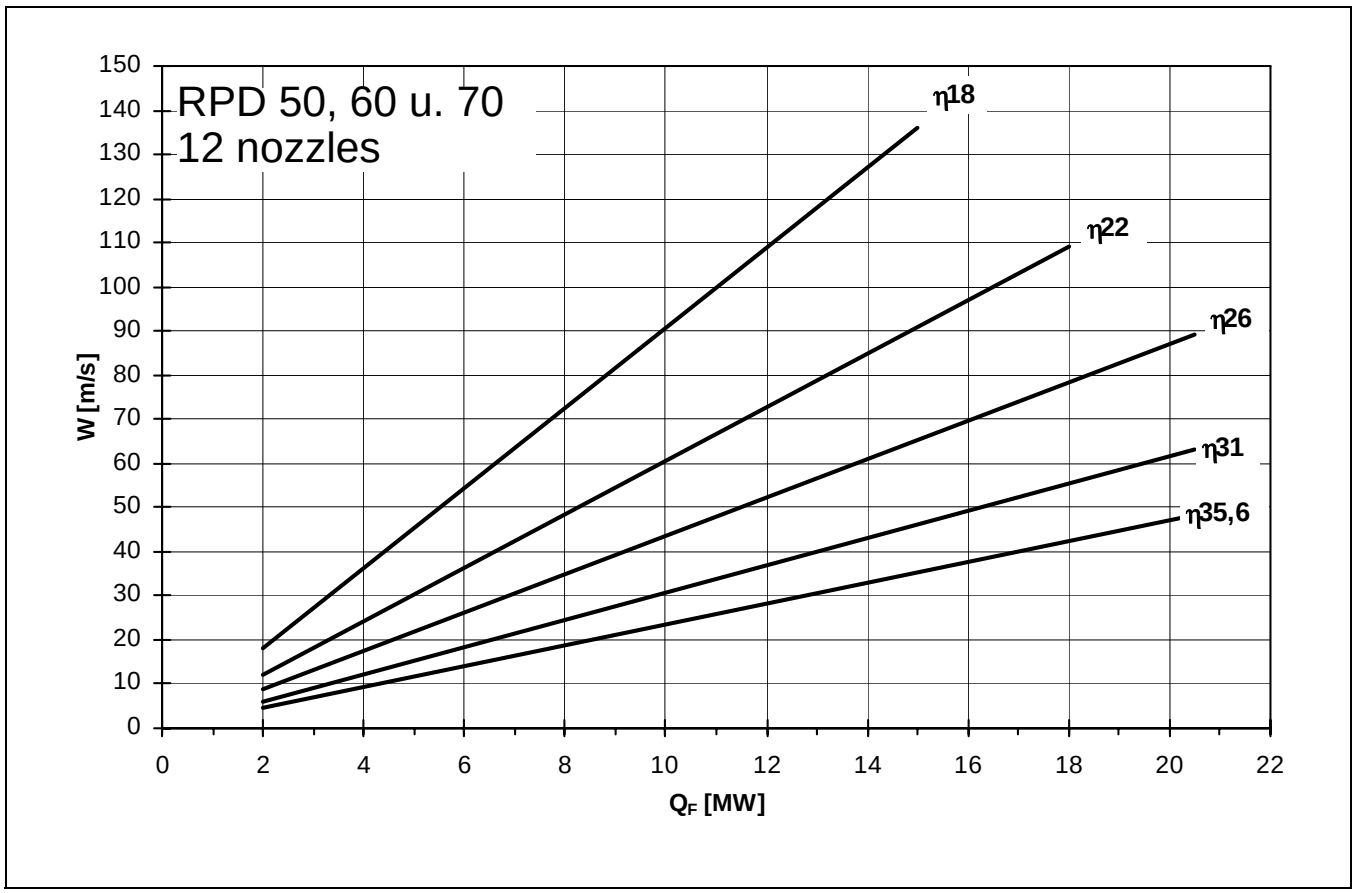
Diagram Pressure Loss

Pressure loss with fully opened gas dampers
For the various gas qualities it will be necessary to multiply the p value read as a function of the volumetric flow rate by the specific gravity of the gas. Reading example:
damper dia. = 50 mm; V = 150 m³/h natural gas; Δp reading = 6 mbar; specific gravity of natural gas = 0.81 kg/m³;
results in a pressure loss with fully opened gas damper, Δp = 0.81 x 6 = **4.86 mbar**

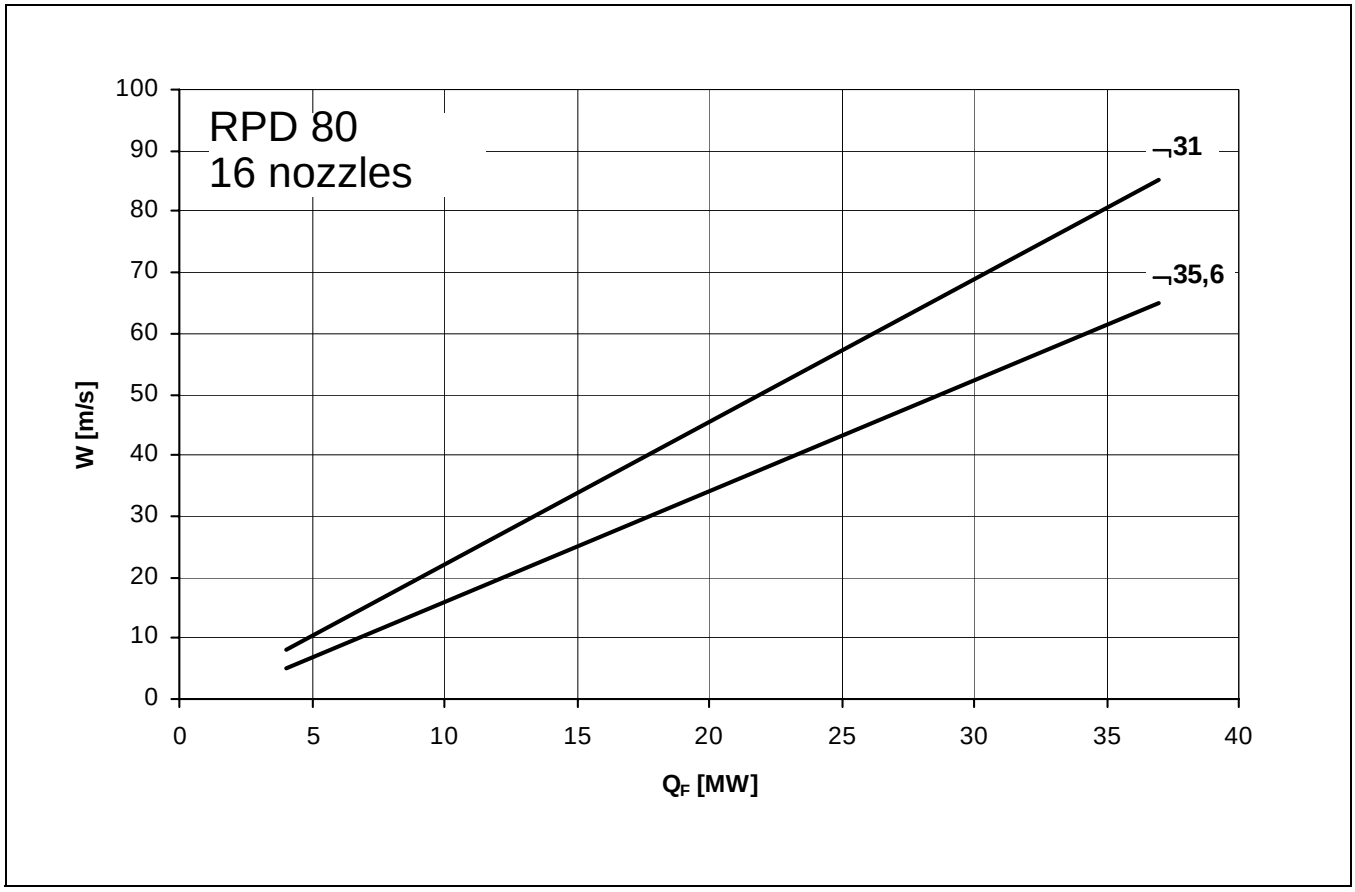


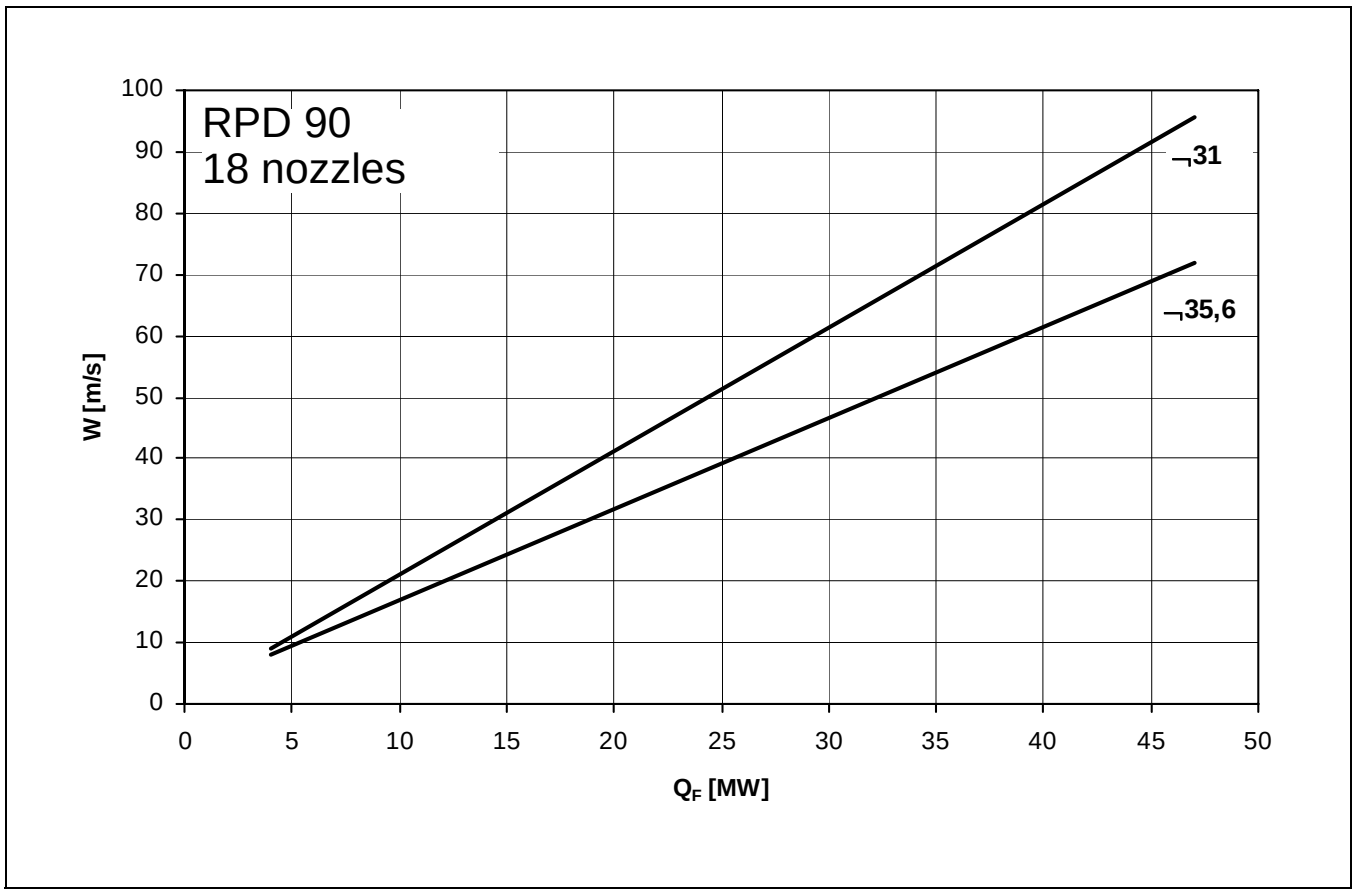
Discharge Speed, Gas Nozzles





Discharge Speed, Gas Nozzles





Preoperational Checks
Functional Test without Fuel
Gas Start-up

Checks prior to operation
Check the following prior to the initial operation of the boiler system:

- Take care to observe the operating instructions supplied by the boiler manufacturer.
- Check the boiler system for correct electrical wiring of all parts including the valves and instruments.
- Check the air fan motor for correct direction of rotation.
- Check for the proper setting of the temperature and pressure controllers, limiters and safety switches.
- Check for adequate fuel supply and sufficiently high gas connection pressure.
- Make a leak test of the fuel-carrying lines (ensure they are free of air).
- Ensure that the exhaust gas ports are open and fresh air is taken in at the required rate.
- Make sure the burner is in starting position.
- Check that automatic furnace controller is unlocked.

A pressure test should be made of the gas valves and instruments group using air or nitrogen at the 1.1-fold operating pressure but at least 60 mbar above the operating pressure. Joints like flanges, screwed unions, etc. must be sprayed with foaming agents and checked for absence of leaks. Take care to observe the maximum operating pressure of the valves and instruments. After the temperature has been allowed to equalize make sure the test pressure does not drop for a subsequent test period of 10 minutes.

Gas line venting
The gas line and valves/instruments must be vented before taking the burner into operation. Use a test burner for detecting any residual gas in the system.

Functional test without fuel
Check the burner for proper functional order without using a fuel. In gas operating mode close the gas stop valve.

Start-up
For taking the duoblock burner type RPD into operation, it will be required to carefully adjust the burner system by duly following the adjusting instructions and procedures. After the burner and boiler have been tested in the way described above, the burner may be taken into operation.

Gas start-up
- Set the emergency and main switches to their „ON“ positions.
- Open the ball stop valve upstream of the gas valve and check the gas pressure on the pressure gauge mounted upstream of the gas pressure controller.
- Set the fuel selector switch to its „Gas“ position.
- Set the control switch to its position „1“.
- Set the load selector switch to its position „0“ = Partial Load or „1“ = Regulating Load, as required. For adjusting the burner make sure the switch is in its „Regulating Load“ position.
- Set the service switch also to its position „1“.
- The „Manual-Automatic“ selector switch is in its „Automatic“ position during start-up and operation.
- When adjusting the burner be sure the switch is changed over to its „Manual“ position.
- Unlock the automatic furnace controller.If a leak test is made with the valves the automatic furnace controller should not be unlocked until the leak test has been successfully completed. The burner will start according to the program flow preset by the automatic furnace controller. The burner will now be in operation. In case a leak is detected with the valves the program will not proceed to the automatic furnace controller.

Burner Shutdown
Measures in Case of Trouble

Burner shutdown

1. Set the control switch to position „0“.
2. Set the fuel selector switch to position „0“.
3. Close the gas stop valve.
4. For short periods of shutdown the fuel stop valves may remain in their open positions.
5. For longer periods of shutdown and for inspections make sure to set all switches to their „OFF“ positions and close the gas stop valve.
6. Have the furnace system inspected at least once a year by the local service company to ensure its efficient operation and compliance with the applicable air pollution control regulations.
7. Any conditions deviating from standards and any faults should immediately be reported to the installer of the system and eliminated without delay.

Measures in case of trouble

Any trouble of the burner will be indicated by the illuminated pushbutton switch (red light) in the control cabinet or automatic furnace controller. If the trouble can be eliminated the automatic furnace controller can be unlocked by pressing any of the two illuminated pushbutton switches causing the burner to restart in accordance with the program. If the burner returns to its trouble position the local service personnel should be called to site. In case of a negative result of the valve leak test make sure to close the gas stop valve at once and call the service personnel to site.

Regular checks and maintenance measures

- Check the gas pressure on the pressure gauge.
- Check the safety time of the automatic furnace controller by pulling out the UV flame monitor.
- The safety time must be 2 seconds for start-up while during normal operation the burner must be shut down without delay.
- Clean the UV tube if dirt has accumulated.
- Clean all filters at regular intervals and check for absence of leaks. Wash the filter mat of gas filters with water (max. 40°C) adding a commercial light-duty detergent if required. Do not hose down the filters with a high-pressure water jet. Dry the filter mat and reinstall in filter housing. When reinstalling the filter cartridge take care that it is located by the filter housing groove and the filter cover.

Exhaust Gas Test

Exhaust gas test
To ensure an economically efficient and trouble-free operation of the system it will be necessary to adjust the burner specifically in accordance with the furnace system. This is achieved by means of a fuel-combustion air compound control unit which adjusts the burner to ensure a proper combustion. Exhaust gas tests are required for this purpose. The percentage CO_2 and O_2 and the exhaust gas temperature will have to be measured to determine the efficiency and combustion quality.
Prior to any measurement make sure to check the boiler and exhaust gas system for absence of leaks.

Secondary air will falsify the measured results
Check that the exhaust gases have a residual oxygen (O_2) content as low as possible and a carbon dioxide (CO_2) content as high as possible.
The carbon monoxide content of the exhaust gases must be below the currently applicable specifications in all load stages.

Determining the volumetric gas flow rate
The thermal furnace output of a boiler (Q_F) is the amount of heat supplied with the gas in a unit of time.
When taking the burner into operation the volumetric fuel flow rate should be selected according to the nominal thermal capacity of the boiler.

Example:

Nom. thermal output	Q_N	1000 kW
Boiler efficiency	n_K	0,88
Calorific value of gas	H_u	9,1 kWh/m³
Gas pressure	p_u	100 mbar
Barometer reading	p_{amb}	980 mbar
Gas temperature	t_{gas}	15 °C
Standard pressure	p_n	1013 mbar

$$\dot{Q}_F = \frac{\dot{Q}_N}{n_K} = \frac{1000}{0,88} = \underline{1136\ kW}$$

Volumetric gas flow rate at STP:

$$\dot{V}_{Bn} = \frac{\dot{Q}_N}{H_u \cdot n_K} = \frac{1000}{9,1 \cdot 0,88} = \underline{125\ m^3/h}$$

Volumetric gas flow rate in operating condition:

$$\dot{V}_{BB} = \dot{V}_{Bn} \cdot \frac{T}{273} \cdot \frac{p_n}{p_{amb} + p_ü} = \ m^3/h$$

$$= 125 \cdot \frac{273 + 15}{273} \cdot \frac{1013,25}{980 + 100} = \underline{123,9\ m^3/h}$$

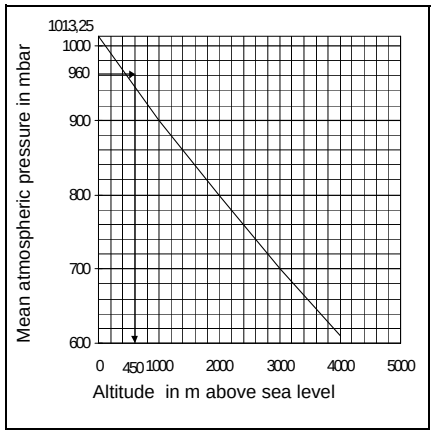
Ratio between O_2- and CO_2- for natural gas H (CO_{2max} =11,86%)

$$O_2 = 21 \times \frac{CO_{2max} - CO_{2gem}}{CO_{2max}} = \ \%$$

$\%O_2$	$\%CO_2$	$\%O_2$	$\%CO_2$
0,00	11,86	3,00	10,16
0,10	11,80	3,10	10,10
0,20	11,75	3,20	10,04
0,30	11,69	3,30	9,99
0,40	11,63	3,40	9,93
0,50	11,58	3,50	9,87
0,60	11,52	3,60	9,82
0,70	11,46	3,70	9,76
0,80	11,41	3,80	9,70
0,90	11,35	3,90	9,65
1,00	11,29	4,00	9,59
1,10	11,24	4,10	9,53
1,20	11,18	4,20	9,48
1,30	11,12	4,30	9,42
1,40	11,07	4,40	9,36
1,50	11,01	4,50	9,31
1,60	10,95	4,60	9,25
1,70	10,90	4,70	9,19
1,80	10,84	4,80	9,14
1,90	10,78	4,90	9,08
2,00	10,73	5,00	9,02
2,10	10,67	5,10	8,97
2,20	10,61	5,20	8,91
2,30	10,55	5,30	8,85
2,40	10,50	5,40	8,80
2,50	10,44	5,50	8,74
2,60	10,38	5,60	8,68
2,70	10,33	5,70	8,63
2,80	10,27	5,80	8,57
2,90	10,21	5,90	8,51

Mean barometer readings

	Sea level [m]	Mean barometer readings [mbar]
Aachen	205	991
Berlin	50	1009
Dresden	120	1000
Erfurt	315	978
Frankfurt/M.	104	1004
Hamburg	22	1011
Cologne	45	1009
Leipzig	130	998
Magdeburg	79	1005
Munich	526	955
Nuremberg	310	980
Rostock	4	1013
Stuttgart	297	984
Schwerin	59	1010
Ulm	479	960



O_2, CO_2, Lambda Conversion Table

Natural Gas

Relation between O_2 and CO_2 value for natural gas (CO_{2max}=11,8 %)

$$O_2 = 21 \times \frac{CO_{2max} - CO_{2gem}}{CO_{2max}} = \%$$

%O_2	%CO_2	Air index	%O_2	%CO_2	Air index	%O_2	%CO_2	Air index
0,00	11,80	1,00	4,00	9,55	1,24	8,00	7,30	1,62
0,10	11,74	1,00	4,10	9,50	1,24	8,10	7,25	1,63
0,20	11,69	1,01	4,20	9,44	1,25	8,20	7,19	1,64
0,30	11,63	1,01	4,30	9,38	1,26	8,30	7,14	1,65
0,40	11,58	1,02	4,40	9,33	1,27	8,40	7,08	1,67
0,50	11,52	1,02	4,50	9,27	1,27	8,50	7,02	1,68
0,60	11,46	1,03	4,60	9,22	1,28	8,60	6,97	1,69
0,70	11,41	1,03	4,70	9,16	1,29	8,70	6,91	1,71
0,80	11,35	1,04	4,80	9,10	1,30	8,80	6,86	1,72
0,90	11,29	1,04	4,90	9,05	1,30	8,90	6,80	1,74
1,00	11,24	1,05	5,00	8,99	1,31	9,00	6,74	1,75
1,10	11,18	1,06	5,10	8,93	1,32	9,10	6,69	1,76
1,20	11,13	1,06	5,20	8,88	1,33	9,20	6,63	1,78
1,30	11,07	1,07	5,30	8,82	1,34	9,30	6,57	1,79
1,40	11,01	1,07	5,40	8,77	1,35	9,40	6,52	1,81
1,50	10,96	1,08	5,50	8,71	1,35	9,50	6,46	1,83
1,60	10,90	1,08	5,60	8,65	1,36	9,60	6,41	1,84
1,70	10,84	1,09	5,70	8,60	1,37	9,70	6,35	1,86
1,80	10,79	1,09	5,80	8,54	1,38	9,80	6,29	1,87
1,90	10,73	1,10	5,90	8,48	1,39	9,90	6,24	1,89
2,00	10,68	1,11	6,00	8,43	1,40	10,00	6,18	1,91
2,10	10,62	1,11	6,10	8,37	1,41	10,10	6,12	1,93
2,20	10,56	1,12	6,20	8,32	1,42	10,20	6,07	1,94
2,30	10,51	1,12	6,30	8,26	1,43	10,30	6,01	1,96
2,40	10,45	1,13	6,40	8,20	1,44	10,40	5,96	1,98
2,50	10,40	1,14	6,50	8,15	1,45	10,50	5,90	2,00
2,60	10,34	1,14	6,60	8,09	1,46	10,60	5,84	2,02
2,70	10,28	1,15	6,70	8,04	1,47	10,70	5,79	2,04
2,80	10,23	1,15	6,80	7,98	1,48	10,80	5,73	2,06
2,90	10,17	1,16	6,90	7,92	1,49	10,90	5,68	2,08
3,00	10,11	1,17	7,00	7,87	1,50	11,00	5,62	2,10
3,10	10,06	1,17	7,10	7,81	1,51	11,10	5,56	2,12
3,20	10,00	1,18	7,20	7,75	1,52	11,20	5,51	2,14
3,30	9,95	1,19	7,30	7,70	1,53	11,30	5,45	2,16
3,40	9,89	1,19	7,40	7,64	1,54	11,40	5,39	2,19
3,50	9,83	1,20	7,50	7,59	1,56	11,50	5,34	2,21
3,60	9,78	1,21	7,60	7,53	1,57	11,60	5,28	2,23
3,70	9,72	1,21	7,70	7,47	1,58	11,70	5,23	2,26
3,80	9,66	1,22	7,80	7,42	1,59	11,80	5,17	2,28
3,90	9,61	1,23	7,90	7,36	1,60	11,90	5,11	2,31

O_2, CO_2, Lambda Conversion Table

Liquid Gas

Relation between O_2 and CO_2 value for for liquid gas (CO_{2max}=13,8 %)

$$O_2 = 21 \times \frac{CO_{2max} - CO_{2gem}}{CO_{2max}} = \%$$

%O_2	%CO_2	Air index	%O_2	%CO_2	Air index	%O_2	%CO_2	Air index
0,00	13,80	1,00	4,00	11,17	1,24	8,00	8,54	1,62
0,10	13,73	1,00	4,10	11,11	1,24	8,10	8,48	1,63
0,20	13,67	1,01	4,20	11,04	1,25	8,20	8,41	1,64
0,30	13,60	1,01	4,30	10,97	1,26	8,30	8,35	1,65
0,40	16,54	1,02	4,40	10,91	1,27	8,40	8,28	1,67
0,50	13,47	1,02	4,50	10,84	1,27	8,50	8,21	1,68
0,60	13,41	1,03	4,60	10,78	1,28	8,60	8,15	1,69
0,70	13,34	1,03	4,70	10,71	1,29	8,70	8,08	1,71
0,80	13,27	1,04	4,80	10,65	1,30	8,80	8,02	1,72
0,90	13,21	1,04	4,90	10,58	1,30	8,90	7,95	1,74
1,00	13,14	1,05	5,00	10,51	1,31	9,00	7,89	1,75
1,10	13,08	1,06	5,10	10,45	1,32	9,10	7,82	1,76
1,20	13,01	1,06	5,20	10,38	1,33	9,20	7,75	1,78
1,30	12,95	1,07	5,30	10,32	1,34	9,30	7,69	1,79
1,40	12,88	1,07	5,40	10,25	1,35	9,40	7,62	1,81
1,50	12,81	1,08	5,50	10,19	1,35	9,50	7,56	1,83
1,60	12,75	1,08	5,60	10,12	1,36	9,60	7,49	1,84
1,70	12,68	1,09	5,70	10,05	1,37	9,70	7,43	1,86
1,80	12,62	1,09	5,80	9,99	1,38	9,80	7,36	1,87
1,90	12,55	1,10	5,90	9,92	1,39	9,90	7,29	1,89
2,00	12,49	1,11	6,00	9,86	1,40	10,00	7,23	1,91
2,10	12,42	1,11	6,10	9,79	1,41	10,10	7,16	1,93
2,20	12,35	1,12	6,20	9,73	1,42	10,20	7,10	1,94
2,30	12,29	1,12	6,30	9,66	1,43	10,30	7,03	1,96
2,40	12,22	1,13	6,40	9,59	1,44	10,40	6,97	1,98
2,50	12,16	1,14	6,50	9,53	1,45	10,50	6,90	2,00
2,60	12,09	1,14	6,60	9,46	1,46	10,60	6,83	2,02
2,70	12,03	1,15	6,70	9,40	1,47	10,70	6,77	2,04
2,80	11,96	1,15	6,80	9,33	1,48	10,80	6,70	2,06
2,90	11,89	1,16	6,90	9,27	1,49	10,90	6,64	2,08
3,00	11,83	1,17	7,00	9,20	1,50	11,00	6,57	2,10
3,10	11,76	1,17	7,10	9,13	1,51	11,10	6,51	2,12
3,20	11,70	1,18	7,20	9,07	1,52	11,20	6,44	2,14
3,30	11,63	1,19	7,30	9,00	1,53	11,30	6,37	2,16
3,40	11,57	1,19	7,40	8,94	1,54	11,40	6,31	2,19
3,50	11,50	1,20	7,50	8,87	1,56	11,50	6,24	2,21
3,60	11,43	1,21	7,60	8,81	1,57	11,60	6,18	2,23
3,70	11,37	1,21	7,70	8,74	1,58	11,70	6,11	2,26
3,80	11,30	1,22	7,80	8,67	1,59	11,80	6,05	2,28
3,90	11,24	1,23	7,90	8,61	1,60	11,90	5,98	2,31

Exhaust Gas Test

Trouble Shooting Instructions

Exhaust gas loss
Exhaust gas loss by way of free heat will occur as a result of the temperature difference between the fuel-air mixture entering the furnace chamber and the gases discharged. Any increase in the excess of air and the resultant higher exhaust gas volume will cause the exhaust gas loss to rise. The exhaust gas loss can be calculated as follows:

$$q_A = (t_A - t_L) \cdot \left(\frac{A_1}{CO_2} + B\right)$$

q_A = exhaust gas loss in %
t_A = exhaust gas temperature in °C
t_L = combustion air temperature in °C
CO_2 = volumetric content of carbon dioxide in %
O_2 = volumetric content of oxygen in %

	Natural gas	Town gas	L.P.G.
A_1 =	0,370	0,350	0,420
B =	0,009	0,011	0,008

Example:
Data measured in natural gas mode:
CO_2 content of exhaust gases 10,8%
Exhaust gas temperature 195°C
Air intake temperature 22°C

The exhaust gas loss can be calculated as follows:

$$q_{Af} = (195\text{-}22)\left(\frac{0,37}{10,8} + 0,009\right) = \underline{7,48\ \%}$$

In any case of trouble proceed with checking the basic conditions for a proper operation of the boiler system:
1.Is electric power available?
2.Is ther any gas pressure?
3.Are the shut-off valves opened?
4.Are all control and safety instruments such as boiler thermostat, water supply failure cut-out, limit switches, etc. properly set?

1. Ignition failure

Cause	Remedy
Ignition electrode short circuit.	Adjust electrodes.
Wide ignition electrode spacing.	Adjust electrodes.
Dirty and wet electrodes.	Clean electrodes.
Cracked insulator.	Replace insulator.
Defective ignition transformer.	Replace transformer.
Defective automatic furnace controller.	Replace controller.
Burnt ignition cable.	Replace cable; search for cause and eliminate.
Pilot burner failure.	Adjust ignition gas pressure
Ignition gas valve does not open.	Search for cause and eliminate
Defective solenoid.	Replace

2. Motor running failure

Cause	Remedy
Motor protection relay and fuses.	Check and replace if required.
Air pressure switch not changed over or defective.	Check and replace if required.
Defective motor.	Replace motor.
Defective power contactor.	Replace contactor.
Air fan motor starts but stops after 20-25 secs.	Check for solenoid leaks
Air fan motor starts, but stops after about 10 secs in pre-ventilating mode.	Air pressure switch fails to change over; replace switch if defective; clean switch if dirt has accumulated; check electrical connections.

3. No response to flame by automatic furnace controller with flame sensor

Cause	Remedy
Dirty flame sensor.	Clean flame sensor.
Burner fails to start.	Check connection of automatic furnace controller.
Trouble lamp lights; flame trouble.	Unlock and search for cause
UV-Radiation too weak.	Check combustion setting.
Burner starts without flame formation. Solenoid valve fails to open.	Defective coil or rectifier. Check connection.
Lack of gas or gas pressure too low.	Check gas pressure controller, gas valve, gas filter. Is the equipment gas cock open?

Trouble Shooting Instructions

4. Mixing unit gives poor combustion data

Cause	Remedy
Incorrect settings.	Correct settings.
Incorrect mixture ignition unit.	Replace unit.
High or low combustion air flow rate.	Readjust burner.
Furnace chamber not sufficiently ventilated.	Furnace chamber to be ventilated through a non-closed opening with a cross section of min. 50 % of all chimney cross sections of the furnace system. Take care to observe the application regulations.

5. Solenoid valve fails to open

Cause	Remedy
Defective coil.	Replace coil.
Defective automatic furnace controller.	Replace automatic furnace controller.
Valve does not close tightly; dirt accumulated on sealing surfaces.	Open valve; remove foreign matter; replace valve if required.

6. Cleaning and lubricating instructions

Depending on the amount of dirt introduced by the combustion air it will be necessary to clean the fan impeller, ignition electrodes, flame sensors and air dampers as required.

For burner with mechanical compound controller:
Lubricate the ball heads of the compound controller setting screws with grease.

The bearing points of the burner moving parts require no maintenance.
Damages of ball bearings should be detected and eliminated at an early stage to avoid greater subsequent trouble. Listen to the motor bearing noise to identify possible irregularities.

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