GasMultiBloc
Combined regulating and safety valve
Infinitely variable air/gas ratio control mode

DUNGS®

MB-VEF 407 - 412 B01

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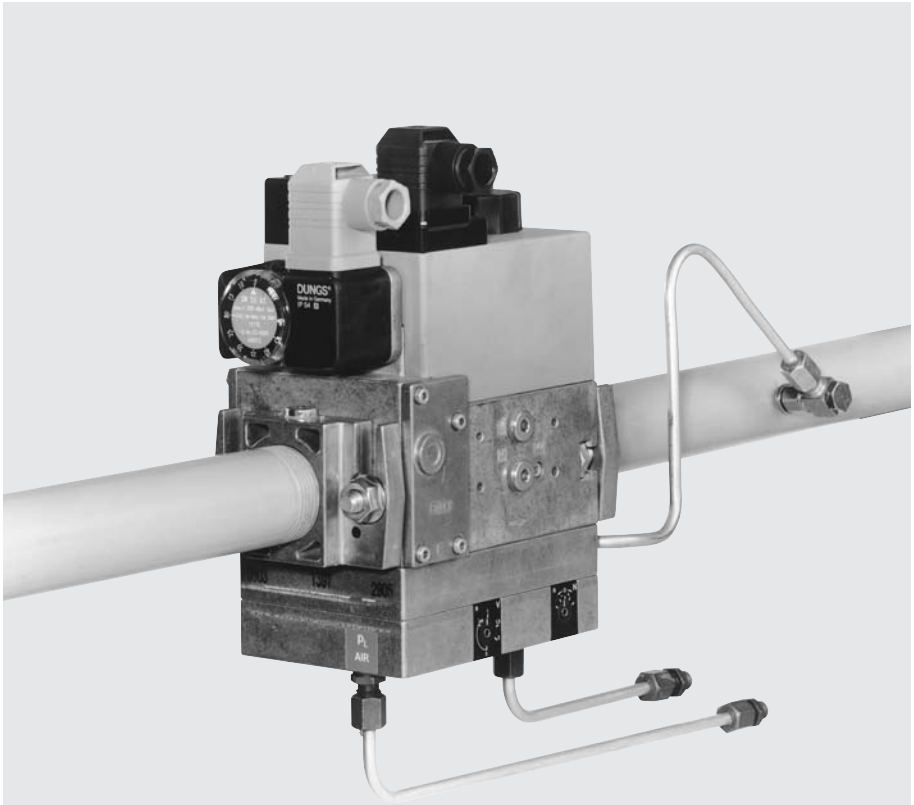

Flange, line sockets, pulse lines and screw unions are **not** contained in the scope of supply

Technical description

The DUNGS GasMultiBloc MB-VEF ... B01 integrates filter, gas-air ratio controls, valves and pressure switches in one compact fitting:

- Dirt trap: microfilter, sieve
- Solenoid valves up to 360 mbar as per DIN EN 161 Class A Group 2
- Sensitive adjustment of gas and air pressure ratio
- Servo pressure regulator as per DIN EN 88 Class A Group 2; EN 12067-1
- High flow values at low pressure drop
- Ratio V = p_{Br} / p_L 0.75 : 1 ... 3 : 1
- Zero point correction N possible
- External pulse lines
- Interference degree N
- Flange connections with pipe threads as per ISO 7/1

The modular system permits individual solutions using valve proving system, min./max. pressure switch, pressure limiter.

Application

The gas-air ratio control enables the optimum mixture formation for forced air burners and premix burners; this applies for modulating and two-stage variable operating modes. Suitable for gases of families 1, 2, 3 and other neutral gaseous media.

Approvals

EC type test approval as per EC Gas Appliance Directive:

MB-VEF…B01	CE-0085 AN 2802

EC type test approval as per EC Pressure Equipment Directive:

MB-VEF…B01	CE0036

Approvals in other important gas consuming countries.

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Functional description

Gas flow

1. If the valves V1 and V2 are closed, chamber a is under input pressure up to the double seat of valve V1.
2. A hole in the filter housing of MB 407/412 connects min. pressure switch with chamber a. If the input pressure applied to the pressure switch exceeds the incoming reference value, it switches through to the automatic burner control.
3. After release by the automatic burner control, valves V1 and V2 open. The gas flow through chambers a, b and c of the MultiBloc is then released.

Operating method of valve-regulator combination on valve V1

A regulator compensated for residual pressure is integrated in valve V1 (pressure regulating part).

Anchor V1 is not connected with the valve plate unit. When it opens, the anchor pretensions the pressure spring and releases the valve plate unit.

When the valve closes, the anchor acts directly on the valve plate unit.

Valves V1 and V2 are released at the same time.

In closed position valve V3 blocks the pressure chamber under working diaphragm M against input pressure p_e in chamber a.

The pressure under working diaphragm M is defined by a variable flow cross-section D. The comparison diaphragms for burner pressure p_{Br} and blower pressure p_L are interconnected via a rod. Moving the bearing point sets the ratio V.

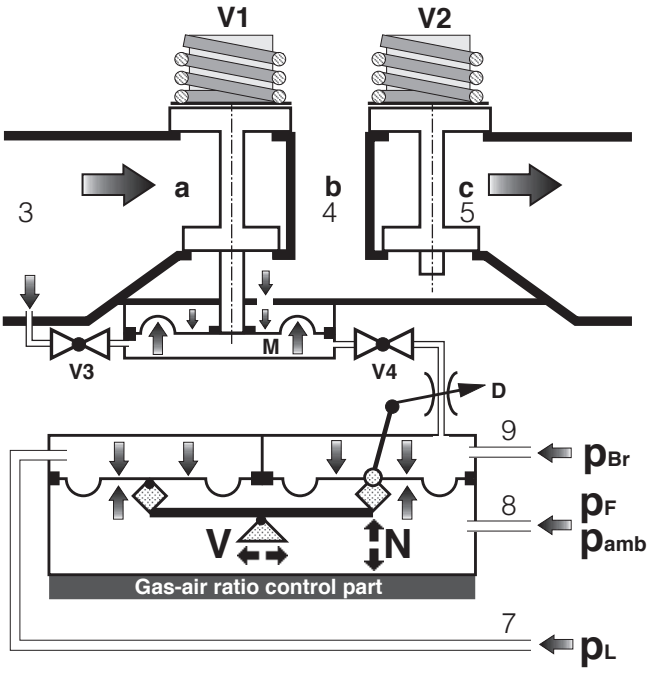
Zero point correction N acts on this rod. The ambient pressure p_{amb} or the firing chamber pressure p_F must be applied to the opposite side of the comparison diaphragms. Firing chamber pressure has a reducing effect on the burner pressure at a ratio of V > 1.

Changes resulting from the force equilibrium lead to a modification of the flow cross-section D downstream of valve V4. Pressure under the working diaphragm is re-adjusted and the valve plate unit V1 changes the free cross-section.

Operating method of valve V2

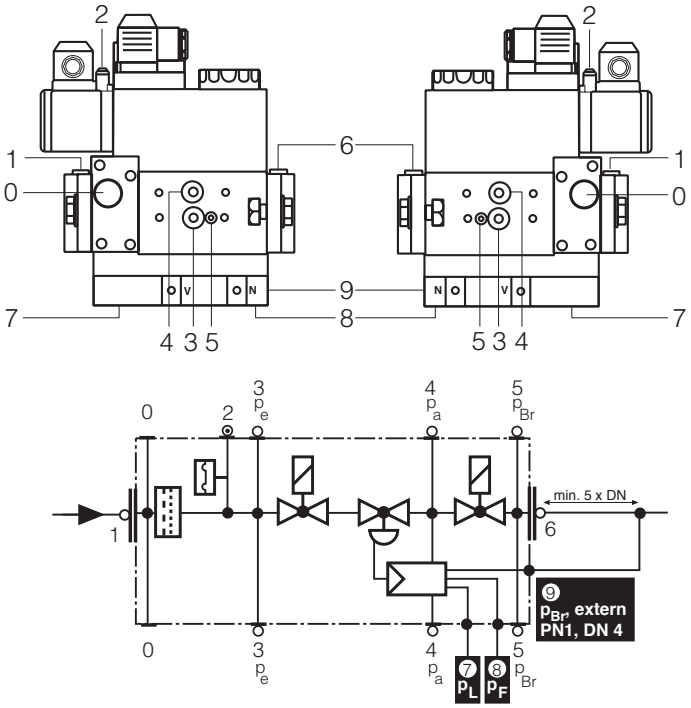
The anchor of valve V2 is connected with the valve plate unit. When it opens, the anchor pretensions the pressure spring. Valve V2 opens completely and without delay.

Block diagram MB-VEF



V1	Main valve 1		direction
V2	Main valve 2	p_{Br}	Burner pressure
V3	Control valve 3	p_F	Firing chamber pressure
V4	Control valve 4	p_{amb}	Ambient pressure
		p_L	Blower pressure
M	Working diaphragm		
D	Throttling point	1, 3, 4, 6	G 1/8 screw plug
		2	Test nipples
V	Ratio setting	5	M4 hex. screw
N	Zero point correction	7, 8, 9	Pulse lines p_L, p_F, p_{Br}
a, b, c	Pressure chambers in flow	0	Filter cup

Pressure taps, gas train diagram



Valve V4 is activated by valve V2. In closed position, valve V4 blocks the chamber under the working diaphragm M from the burner pressure.

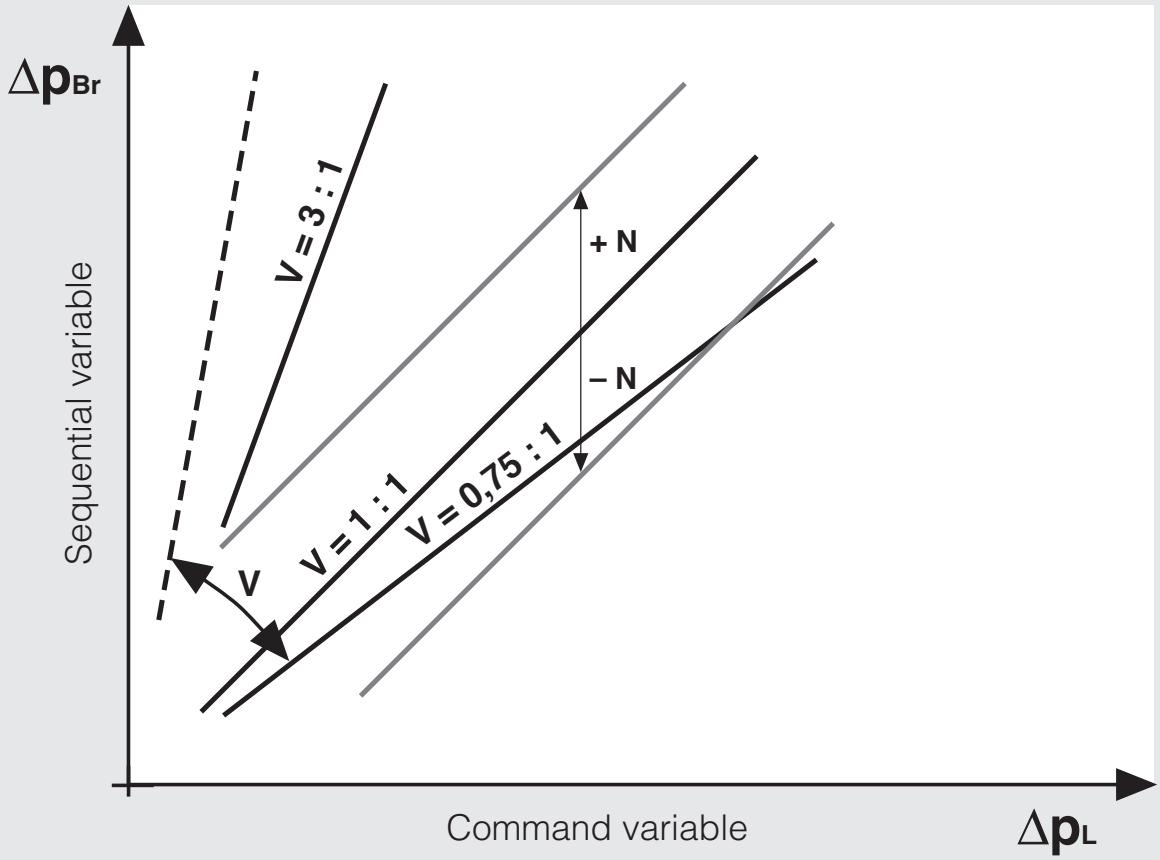
Closing function

When the supply voltage of the main valve solenoid coils is interrupted, the valves are closed within < 1 s by the compression springs.

Specifications

Nominal diameters Flange with pipe threads as per ISO 7/1 (DIN 2999)	MB-VEF 407 B01 Rp 1/2, 3/4 and their combinations	MB-VEF 412 B01 Rp 1, 1 1/4 and their combinations
Max. operating pressure **Input pressure ranges** **Guiding range** **Burner pressure range**	**360 mbar** **MB-...VEF S10 p_e: 5 mbar to 100 mbar** **MB-...VEF S30 p_e: 100 mbar to 360 mbar** **p_L: 0.4 to 100 mbar** **p_{Br}: 0.5 to 100 mbar**	
Media	Gases of families 1, 2, 3 and other neutral gaseous media	
Ambient temperature	-15 °C to +70 °C (Do not operate MB-VEF below 0 °C in liquid gas systems. Only suitable for gaseous liquid gas, liquid hydrocarbons destroy sealing materials)	
Dirt trap unit	Sieve with 0.8 mm mesh width. Filter made of random laid nonwoven fabric, two-layer microfilter. Changing the filter is possible without removing the fitting.	
Pressure switch	Types GW…A5, ÜB…A2 / NB…A2 to DIN EN 1854 may be attached. For further information, refer to Datasheets 5.02 and 5.07 “Pressure Switches for DUNGS Multiple Actuators”	
Servo pressure regulator	Pressure regulator compensated for residual pressure, leakproof seal when switched off by means of valve V1 as per DIN EN 88 Class A, Group 2; EN 12067-1 Gas-air ratio control with adjustable ratio V as well as zero point correction N and firing chamber pressure connection.	
Ratio setting range V	Ratio V = p_{Br} / p_L 0.75 : 1 ... 3 : 1; other ratios on request	
Zero point correction N	Possible	
Solenoid valves V1, V2	Valves as per DIN EN 161 Class A Group 2, fast closing, fast opening	
Measuring	G 1/8 DIN ISO 228, on inlet and outlet flange, on both sides downstream of dirt trap, on both sides between valves. (pressure switch mounting can partly exclude measuring)	
Burner pressure monitor p_{Br}	Downstream of valve V2, pressure switch ...A2 mountable to adapter	
Pulse and connection lines	G 1/8 connection as per DIN ISO 228 for burner pressure (p_{Br}; GAS), blower pressure (p_L; AIR), firing chamber pressure (p_F ; combustion, atmosphere) **Pulse and connection lines must be made of steel to PN1, DN4. Condensate of pulse and connection lines must not enter into fitting. Strictly follow the operating and mounting instructions.**	
Voltage/frequency	50 - 60 Hz, 230 V AC, -15 % +10 % Other preferred voltages: 240 VAC, 110 – 120 VAC, 48 VDC, 24 – 28 VDC	
Electrical connection	Plug connection as per DIN EN 175301-803 for valves and pressure switches	
Rating/power consumption Switch-on duration Protection type Interference suppression	see type overview 100 % IP 54 as per IEC 529 (EN 60529) interference degree N	
Materials of gas-wetted parts	Housing Diaphragms, seals	steel, brass, aluminium NBR basis, Silopren (silicon rubber)
Installation position	Vertical with solenoid pointing upward	

Adjustment limits



Terms and definitions

Max. operating pressure $p_{max.}$
Maximum permissible operating pressure at which all functions are ensured.

Input pressure range p_e
Pressure range between minimum and maximum input pressure at which optimal regulating behaviour is ensured.

Blower pressure p_L, AIR
Pressure which is created by the air blower of the gas appliance.
The static pressure of combustion air is a dimension for the mass flow. It is a command variable for burner pressure $p_{Br.}$

Burner pressure p_{Br}, GAS
Burner pressure upstream of the mixing device of the gas appliance. Pressure downstream of the last actuator of the gas safety and regulator train. The burner pressure p_{Br} follows the blower pressure p_L as a regulator variable.

Average chamber pressure p_a
Output pressure of pressure regulator part upstream of valve V2.

Firing chamber pressure p_F
Pressure existing in the firing chamber of the heat generator.
The firing chamber pressure (pressure or vacuum) can be changed as a result of :

- performance
- fouling
- varying cross-sections
- climate, etc.

The firing chamber pressure counteracts the combustion air flow. Therefore it must be integrated as an interference variable.
At a ratio setting of V = 1 : 1, inclusion of this interference variable can be neglected since the firing chamber pressure acts in the same way on both the mass flows of combustion air and burning gas.

Ratio V
Adjustable ratio between burner pressure p_{Br} and fan pressure p_L. The following pressure differences are effective:

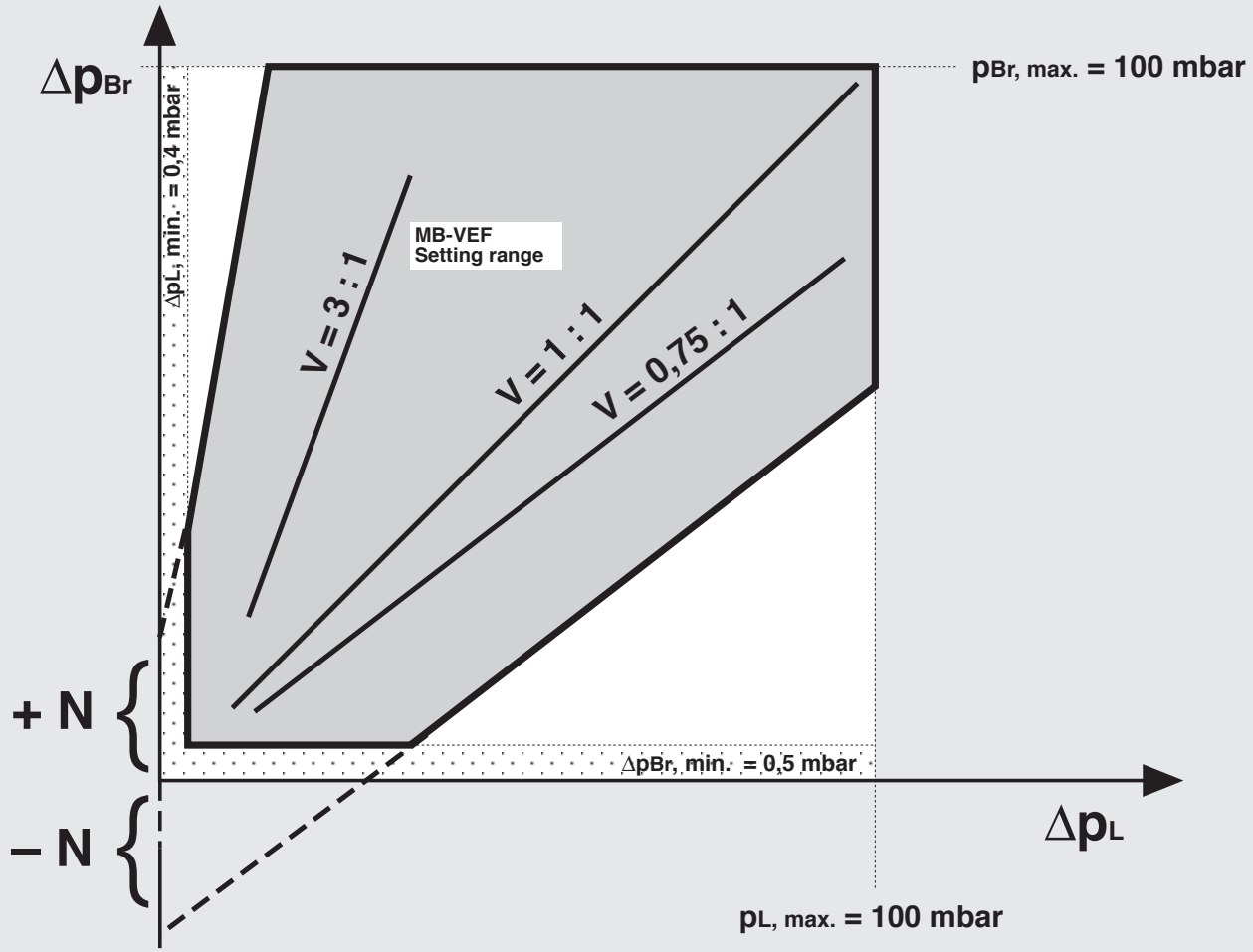
$\Delta\ p_{Br} = (p_{Br}-p_F)$ and
$\Delta\ p_L = (p_L - p_F)$

on the system of the comparison diaphragms.

Zero point correction N
Correction of disequilibrium for unequal lever lengths between comparison diaphragms for air and gas ($V \neq 1 : 1$).
Possibility of shifting the ratio setting from the origin, parallel shift (offset).

Effective pressure difference $\Delta\ p_{Br}$, $\Delta\ p_L$
The related difference drop relative to the firing chamber pressure is a decisive factor for the two mass flows, i.e. burning gas and combustion air.

Setting range



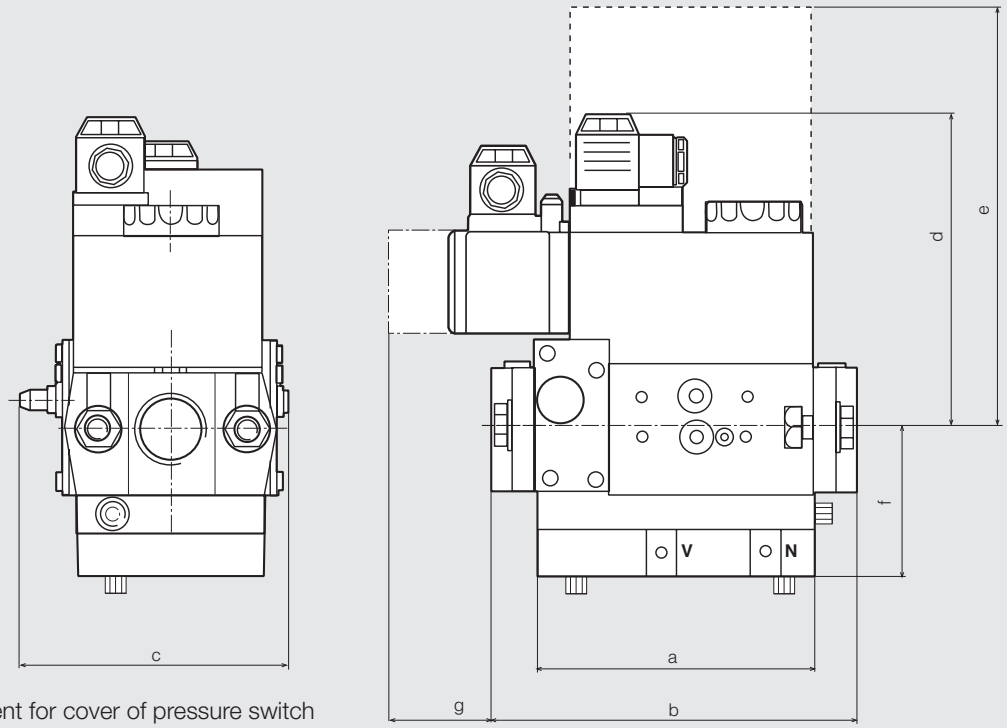
Hints and recommendations

Pressure taps, pulse lines
Shape and location of pressure taps determine the regulating result.
A representative pressure tap for the mass flow must be determined for the blower pressure (command variable) over the complete performance range of the burner.
The burner pressure must reproduce the pressure of the combustion gas upstream of the mixing device.
The interior diameter of the pulse lines must be min. 4 mm. A small partial gas flow is fed through these lines.
The firing chamber pressure must be measured via the burner or directly on the boiler. The pulse and connection lines used must be resistant to mechanical, thermal and chemical loads. They must be resistant to deformation and cracks, they must be gas-tight and durable.
DUNGS recommends pulse and connection lines made of steel.
The design of the pulse lines must avoid the condensate from not entering into the fitting and they must be closed to the fitting by the formation of a water pocket.
Avoid unnecessary lengths of pulse and connection lines.

Recommended adjustment time of air volume throttle
Two-stage variable mode:
15 s for 90°
Modulating, variable mode:
30 s for 90°

Installation hint, optimisation
The MB-VEF is a closed control circuit due to gas-air ratio control.
Changes in blower pressure and firing chamber pressure act on the burner pressure.
A constant combustion quality over the complete performance range of the burner results from the mode of operation of the pneumatic gas-air ratio control part.
Higher firing efficiencies can be achieved by setting in the range of CO_2 maximum.

Dimensions

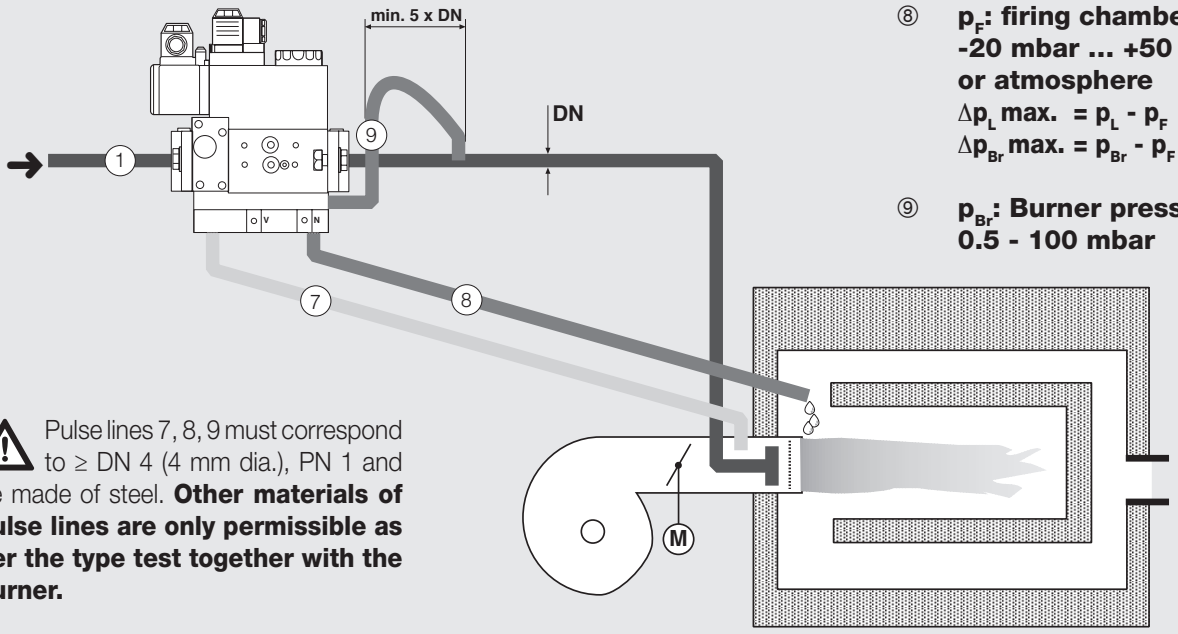


g = Space requirement for cover of pressure switch
e = Space requirement for changing solenoid

Type	Rp	Opening time	$P_{max.}$[VA]	Dimensions [mm] a	b	c	d	e	f	g	Weight [kg]
MB-VEF 407 B01	Rp 3/4	< 1 s	28	110	151	120	160	185	70	40	3.45
MB-VEF 412 B01	Rp 1 1/4	< 1 s	50	140	185	145	175	245	80	40	5.90

Pulse lines

① **p_e: gas input pressure**
S10: 5 - 100 mbar
S30:100 - 360 mbar



⑦ **p_L: blower pressure, air**
0.4 - 100 mbar

⑧ **p_F: firing chamber pressure**
-20 mbar ... +50 mbar
or atmosphere
Δp_L max. = p_L - p_F = 100 mbar
Δp_{Br} max. = p_{Br} - p_F = 100 mbar

⑨ **p_{Br}: Burner pressure, gas**
0.5 - 100 mbar

⚠ Pulse lines 7, 8, 9 must correspond to ≥ DN 4 (4 mm dia.), PN 1 and be made of steel. **Other materials of pulse lines are only permissible as per the type test together with the burner.**

⚠ Route pulse lines so that **no condensate** can flow into the MB-VEF.

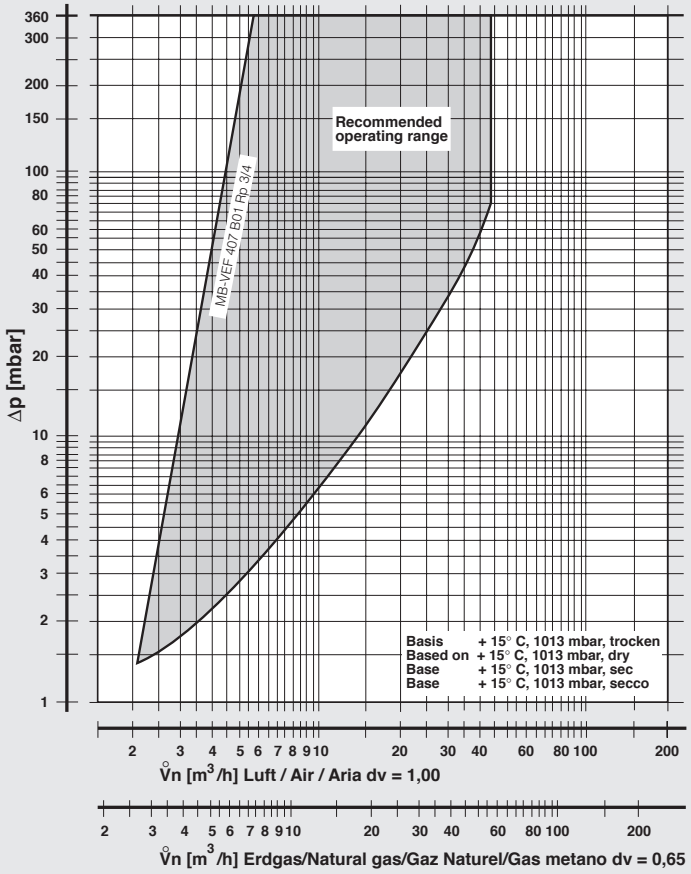
⚠ Route pulse lines resistant to cracks and deformation. **Keep pulse lines short.**

⚠ Pulse line 9 can be replaced by a pulse flange. The pulse flange permits an internal pulse tap p_{Br} in connection with the output flange.

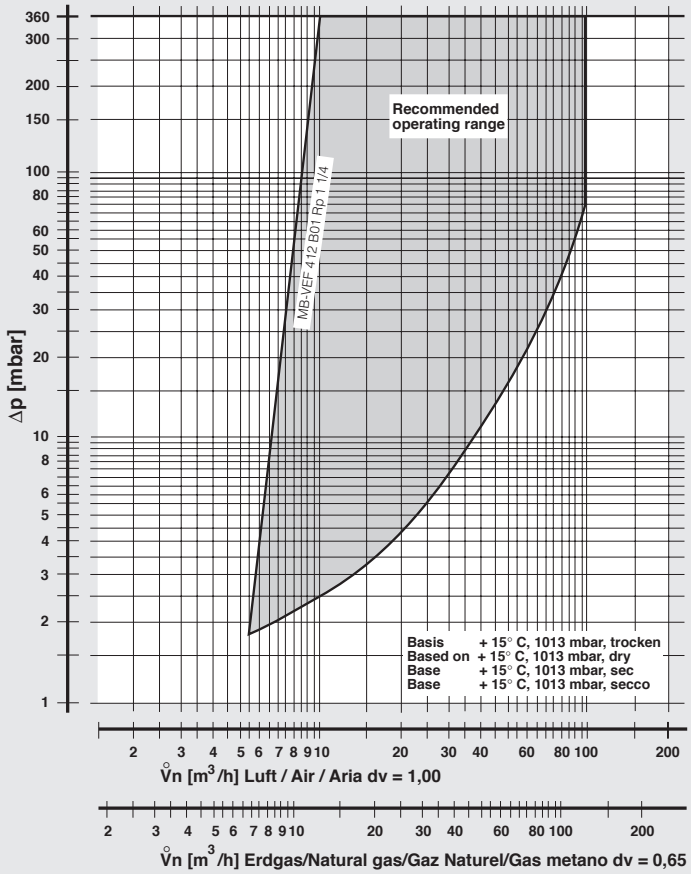
Pulse flange set for:	Order No.
MB-VEF 407 B 01	**227 507**
MB- VEF 412 B 01	**227 516**

Flow diagram pressure drop characteristics in regulated state with standard filter

MB-VEF 407 B01



MB-VEF 412 B01



$$f = \sqrt{\frac{\text{Air density}}{\text{Density of gas used}}}$$

$$\mathring{V}_{\text{gas used}} = \mathring{V}_{\text{air}} \times f$$

Type of gas	Density [kg/m³]	f
Nat gas	0.81	1.24
City gas	0.58	1.46
LPG	2.08	0.77
Air	1.24	1.00

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Combined regulating and safety valve
Infinitely variable air/gas ratio control mode

MB-VEF 407 - 412 B01

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Characteristic design data of MB-VEF layout	Application 1	Application 2
Gas Type of gas/spec. density [kg/m³]		
Volumetric flow V [m³/h] $V_{min.}$ $V_{max.}$		
Input pressure p_e [mbar] $p_{e,min.}$ $p_{e,max.}$		
Burner pressure p_{Br} [mbar] at $V_{min.}$ at $V_{max.}$		
Blower pressure p_L [mbar] at $V_{min.}$ at $V_{max.}$		
Firing chamber pressure p_F [mbar] at $V_{min.}$ at $V_{max.}$		
Control range, performance range		
Adjustment time of air volume throttle from small load to large load [s]		
Starting load [m³/h]		
Company/Address		
Name/Contact person		
Telephone No.		

We reserve the right to make any changes in the interest of technical progress.

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