

GasMultiBloc®

Combined servo pressure regulator and safety shut-off valves

MBC-... 1000/602(L)
MBC-... 2500/602(L)
MBC-... 4000/602(L)

DUNGS®
Combustion Controls



Two normally closed automatic shutoff valves and servo regulator in one housing. Each valve has the following approvals.

UL Listed / Recognized

- UL 429
- File #MH16727

CSA Certified

- ANSI Z21.21 / CSA 6.5
- C/I marking
- ANSI Z21.18 / CSA 6.3
- File # 1641073

FM Approved

- FM 7400
- File No. 3046043

Commonwealth of Massachusetts Approved Product

- Approval code G3-1008-119

CSA Certified / FM Approved Models

- MBC 1000/602
- MBC 2500/602
- MBC 4000/602

UL Listed / FM Approved Models

- MBC 1000/602L
- MBC 2500/602L

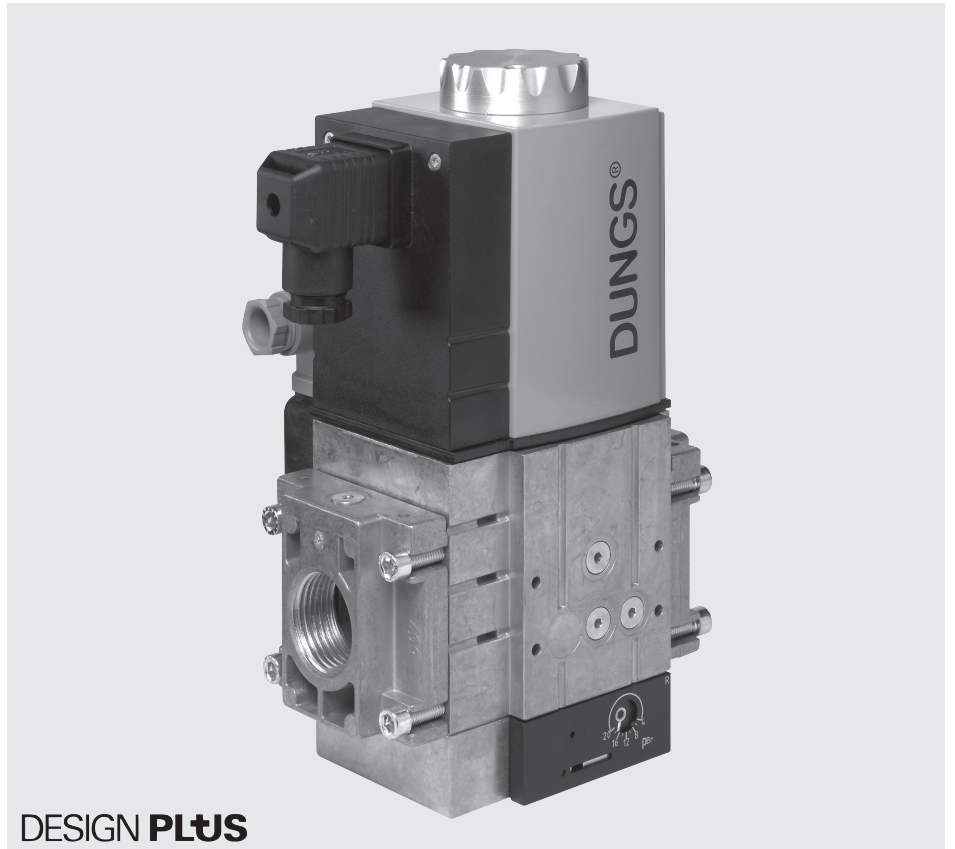
UL Recognized / CSA / FM Models

- MBC 4000/602L

Codes and Standards

This product is intended for installations covered by but not limited to ANSI Z83.4, ANSI Z83.18, ANSI Z21.13, UL 795, CSD-1 or CSAB149.1, CSA B149.3 and NFPA 37.

**DUNGS is an ISO 9001
manufacturing facility.**



DESIGN PLUS

Technical Description

The DUNGS multifunctional control MBC... integrates filter, two safety shut-off valves and servo pressure regulator with the following functions:

- MBC-SE as positive pressure regulator
 - MBC-SE S02 as zero governor
 - MBC-VEF as gas / air proportionator
- each version also features:
- Dirt trap: Microfilter
 - 2 fast opening / fast closing safety shut-off valves up to 5 PSI
 - Servo pressure regulator with vent limiting device
 - Outlet pressure ranges:
SE Version: -0.8 to +120 in. W.C.
VEF Versions: +6 to +40 in. W.C.
 - Precision regulation of outlet pressure
 - Flanged joints with pipe threads to ISO 7/1 or NPT
 - Easy to install
 - Low weight

The modular system design allows integration of valve proving systems, high and low gas pressure switches and other system accessories. The compact design allows for high flow rates at low pressure drop.

Application

The DUNGS MBC is recommended for commercial heating applications that require two safety shutoff valves.

For SE Versions, the servo pressure regulator permits optimal mixing in forced air burners and premix burners in conjunction with mechanical or electronic integrated gas-air regulation units; this applies to modulating and multi-stage floating operating mode. For VEF Versions, the servo pressure regulator permits optimal mixing for gas / air ratio regulation.

Functional Description

Gas flow

1. When valves V1 and V2 are closed, chamber a is subjected to inlet pressure.
2. The low gas pressure switch (optional) is connected to chamber a. If the inlet pressure drops below the setpoint on the pressure switch, the switch opens the limit circuit.
3. Once enabled by the control system, valves V1 and V2 open. Gas flow is released through chambers "a" and "b".

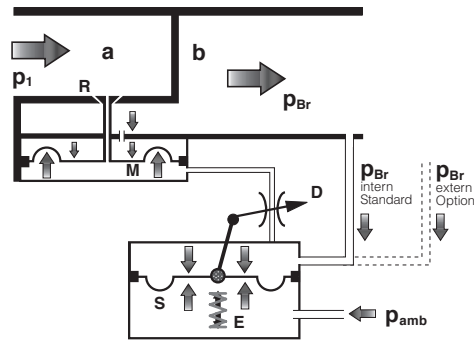
Closing function

Upon interruption of power supply, valves V1 and V2, are closed by the closing springs within <1s.

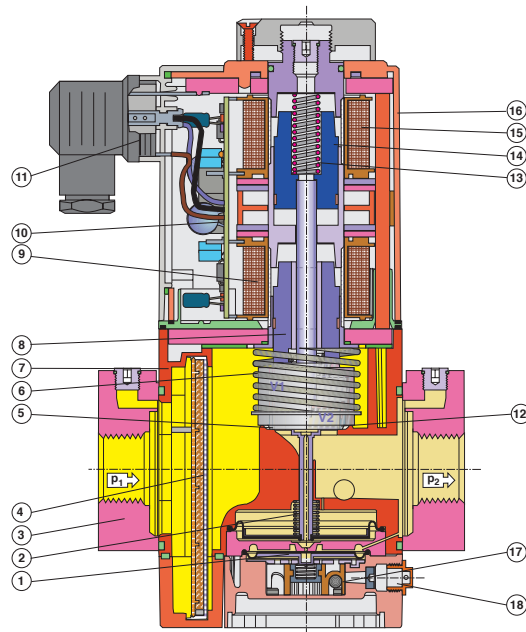
Zero Governor Versions

If atmospheric diaphragm ruptures, the zero governor regulating disc closes.

Schematic diagram MBC...SE

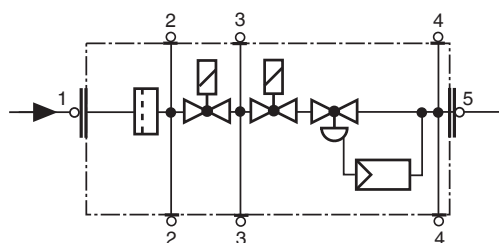


M	Working diaphragm	a, b	Pressure chambers in flow direction
D	Restrictor	p _i	Inlet pressure
S	Servo diaphragm (Atmospheric)	p _{Br}	Outlet pressure
E	Setting spring for outlet pressure p _{Br}	p _{amb}	Ambient pressure
R	Regulator disc		



1	Pressure regulator unit	8	Plunger V1	15	Solenoid V2
2	Regulator spring	9	Solenoid V1	16	Solenoid housing
3	Connecting flange	10	PCB	17	Adjustment: - Gas pressure p _{Br}
4	Coarse and microfilters	11	Electrical connection	18	Breathing Port
5	Valve V1	12	Valve V2		
6	Closing spring V1	13	Closing spring V2		
7	Housing	14	Plunger V2		

Pressure taps, gas train diagram MBC...SE



1, 2, 3, 4, 5 Screw plug G 1/8

Functional Description

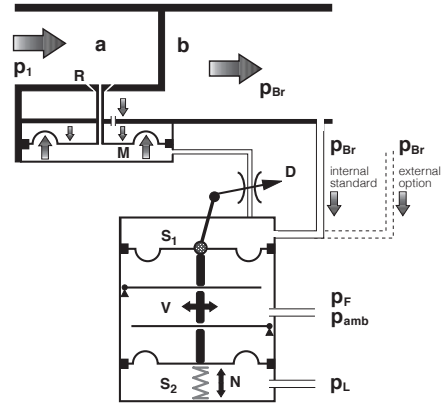
Gas flow

1. If the V1 and V2 valves are closed, chamber a is under inlet pressure.
2. The min. pressure switch (option) is connected to chamber a via a bore-hole.
If the inlet pressure exceeds the reference value set in the pressure switch, the switch switches through to the automatic burner control.
3. The V1 and V2 valves open after they are enabled by the combustion flame safeguard.
Gas flow through the chambers a and b is enabled.

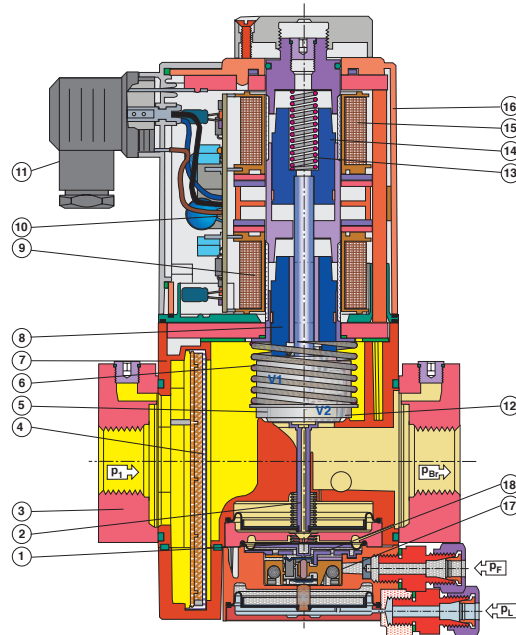
Closing function

If the supply voltage of the coils of V1 and V2 valves is interrupted, the pressure springs close the valves in <1s.

Block diagram MBC...VEF

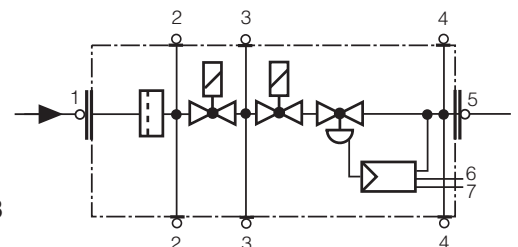


M	Working diaphragm	a, b	Pressure chambers
D	Restrictor		in flow direction
S1	Servo diaphragm	p_1	Inlet pressure
	(atmospheric)	p_{Br}	Burner pressure, outlet pressure:
S2	Servo diaphragm for	p_{amb}	Ambient pressure
	blower pressure	p_L	Blower pressure
R	Regulator disc		



1	Pressure regulator unit	7	Housing	14	Plunger V2
2	Regulator spring	8	Plunger V1	15	Solenoid V2
3	Connecting flange	9	Solenoid V1	16	Solenoid housing
4	Coarse filter and microfilters	10	Printed circuit board		Setting:
5	Valve V1	11	Electrical connection	17	Gas-air ratio
6	Closing spring V1	12	Valve V2	18	Zero point correction
		13	Closing spring V2		

Pressure taps, gas train diagram MBC...VEF




1, 2, 3, 4, 5	Screw plug G 1/8
6, 7	Seal plug G 1/8

Specifications

Nominal widths	MBC 1000	MBC 2500	MBC 4000
Flanges with pipe threads to ISO 7/1 (DIN 2999)	NPT 1/2, 3/4, 1, 1 1/4, 1 1/2 and their combinations	NPT 1, 1 1/4, 1 1/2, 2 and their combinations	NPT 1, 1 1/4, 1 1/2, 2 and their combinations
Safety Shutoff Valves & Regulator			
Maximum Operating Pressure	5 PSI (138 in. W.C.)		
For SE Versions, recommended inlet pressure for optimal performance of the regulator*	S22/S82: $p_{in} = 6 - 138$ in. W.C. S302: $p_{in} = 14 - 138$ in. W.C. S02 & N: $p_{in} = 4 - 41$ in. W.C.	*Regulator complies with ANSI Z21.18/CSA 6.3 for up to 5 PSI. Inlet pressures higher than recommended inlet pressures are possible provided the appliance complies with the applicable performance requirements.	
For SE Versions, outlet pressure ranges	S22: $p_{Br} = 1.6 - 8$ in. W.C. S82: $p_{Br} = 2 - 32$ in. W.C. S302: $p_{Br} = 12 - 122$ in. W.C. S02 & N: $p_{Br} = 0 \pm 0.4$ in. W.C.		
For VEF Versions, Inlet gas pressure range	$p_{in} : 6$ to 138 in. W.C.		
Air loading line range	$p_L : 0.16$ to 41 in. W.C.		
Burner pressure range	$p_{Br} : 0.27$ to 41 in. W.C.		
Ambient temperature	-40 °F to +140 °F (-40 °C up to +60 °C) for CSA Versions +5 °F to +140 °F (-15 °C up to +60 °C) for UL Versions (in LPG applications, do not operate MBC below 0 °C. Only suitable for gaseous LPG, liquid hydrocarbons destroy the seal materials)		
Inlet filter	50 micron filter of two layer nonwoven fabric. Filter replaceable without removing MBC from application.		
Gas Pressure switch (optional)	Types GAO-A2, GML-A2, GMH-A2 For further information refer to Gas Pressure Switch Sales Brochure. (# 226 359)		
SE Versions Servo pressure regulator	Servo pressure regulator with adjustable outlet pressure. Versions for constant positive pressure and zero pressure available.		
VEF Versions • Servo pressure regulator	<ul style="list-style-type: none"> • Gas/Air ratio control with adjustable ratio V as well as correction of zero point N and combustion chamber pressure connection • Ratio $V = p_{Br} / p_L = 0.4:1 \dots 3:1$, other ratios on request • Adjustable • Downstream of V2 • G 1/8 connection as per DIN ISO 228 for burner pressure (pBr; GAS), blower pressure (pL; AIR), firing chamber pressure (pF; combustion, atmosphere) 		
• Ratio setting range V			
• Zero point correction N			
• Burner pressure monitoring p_{Br}			
• Pulse and connection lines	Impulse and connection lines must be made of steel.		
Vent limiting device	Factory installed, vent limiter per ANSI Z21.18 / CSA 6.3		
Safety shut-off valve V1, V2	Two valves in series (fast-closing, fast-opening)		
Test ports / Pressure switch mounting ports	G 1/8 DIN ISO 228, at inlet and outlet flanges, on both sides downstream of filter, between V1 and V2, downstream of V2. (fitting pressure switch may partially exclude measuring gas connection)		
Voltage/frequency	110 - 120 VAC 50 - 60 Hz, 24 VAC 50 - 60 Hz, 24 VDC, 12 VDC. See Approval table and Power Consumption table on page 5.		
Electrical connection	DIN-connector with 1/2" NPT conduit connection for UL Versions. Order separately for CSA Versions.		
Rating/power consumption	See power consumption table		
Switch-on duration	100 % Duty Cycle		
Switching cycles	60 per hour (30 s on/off)		
Enclosure rating	NEMA Type 12		
Radio interference suppression	Interference level N		
Materials of gas-conveying parts	Housing	die-cast aluminium	
	Diaphragms, seals	on NBR base	
	Solenoid drive	steel, aluminium	
Installation position	MBC S02 Vertical with upright solenoid only MBC-VEF & MBC S22, 82, 302 Vertical with upright solenoid or horizontal with horizontal solenoid.		

MBC Accessories			MBC Accessories	
Flange for	Thread type	Order No.		Order No.
MBC 1000	NPT 1/2	222371	Port 3 Pressure switch mounting adapter	273777
MBC 1000	NPT 3/4	222368	1/2" Conduit adapter for P/N 210-319	240671
MBC 1000	NPT 1	221999	Burkert DIN Connector supplied with UL listed and UL recognized versions.	253731
MBC 1000	NPT 1 1/4	231718	DUNGS DIN Connector for CSA / FM. Order separately.	210319
MBC 1000	NPT 1 1/2	244021	G 1/8" Test nipple with gasket	219008
MBC 2500 / MBC 4000	NPT 1	222369	Gasket for G 1/8" test nipple	171260
MBC 2500 / MBC 4000	NPT 1 1/4	222370	1/2 " NPT pilot/vent adapter	225043
MBC 2500 / MBC 4000	NPT 1 1/2	222003	1/4" NPT adapter	225047
MBC 2500 / MBC 4000	NPT 2	221997	MBC 1000 replacement filter	241916
			MBC 2500 replacement filter	242072
			MBC 4000 replacement filter	245624

Shutter Flanges		
Part description	MBC 1000	MBC 2500 / MBC 4000
1 " NPT (flange only)	253205	256789
1" NPT Flange set (with o-ring and 4 screws)	255132	256791
1.5" NPT (flange only)	NA	253206
1.5" NPT Flange set (with o-ring and 4 screws)	NA	255133

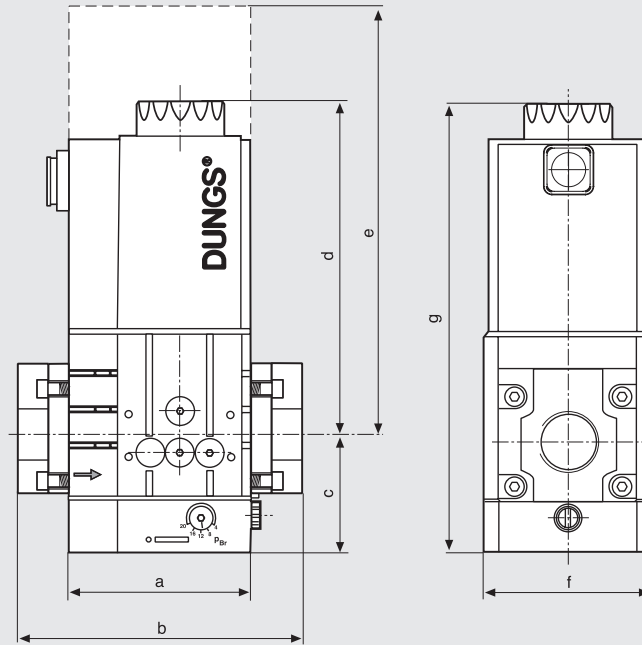
 Flanges and system accessories must be ordered separately.

Power Consumption Table					
Valve Body Size	Rated voltage	Inrush P _{max.} [VA] for t = 3 s	Inrush current peak (A)	Holding P _{max.} [VA] Operation	Recommended power of supply transformer (VA)
MBC 1000	12 VDC	140	20.1	16	DC battery
MBC 2500		160	20.1	20	DC battery
MBC 4000		–	–	–	–
MBC 1000	24 VDC	130	13.4	16	DC battery
MBC 2500		160	13.4	20	DC battery
MBC 4000		160	14	30	DC battery
MBC 1000	24 VAC	120	14.7	20	250
MBC 2500		160	13.9	20	300
MBC 4000		–	–	–	–
MBC 1000	120 VAC	120	3.1	16	250
MBC 2500		180	3.0	20	300
MBC 4000		160	2.4	25	300

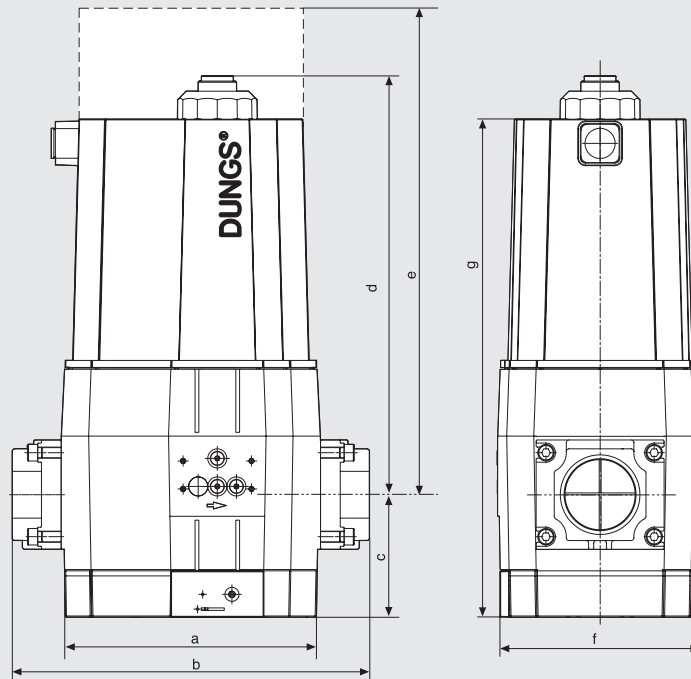
Approval Table				
Type	FM Approved	CSA Certified	UL Listed	UL Recognized
MBC 1000/602	12 VDC, 24 VDC, 24 VAC, 120 VAC	12 VDC, 24 VDC, 24 VAC, 120 VAC		
MBC 2500/602	24 VDC, 24 VAC, 120 VAC	12 VDC, 24 VDC, 24 VAC, 120 VAC		
MBC 4000/602	24 VDC, 24 VAC, 120 VAC	12 VDC, 24 VDC, 24 VAC, 120 VAC		
MBC 1000/602L	24 VDC, 24 VAC, 120 VAC		12 VDC, 24 VDC, 24 VAC, 120 VAC	
MBC 2500/602L	24 VDC, 24 VAC, 120 VAC		12 VDC, 24 VDC, 24 VAC, 120 VAC	
MBC 4000/602L				12 VDC, 24 VDC, 24 VAC, 120 VAC

Mounting dimensions [mm]

MBC-1000/2500



MBC-4000



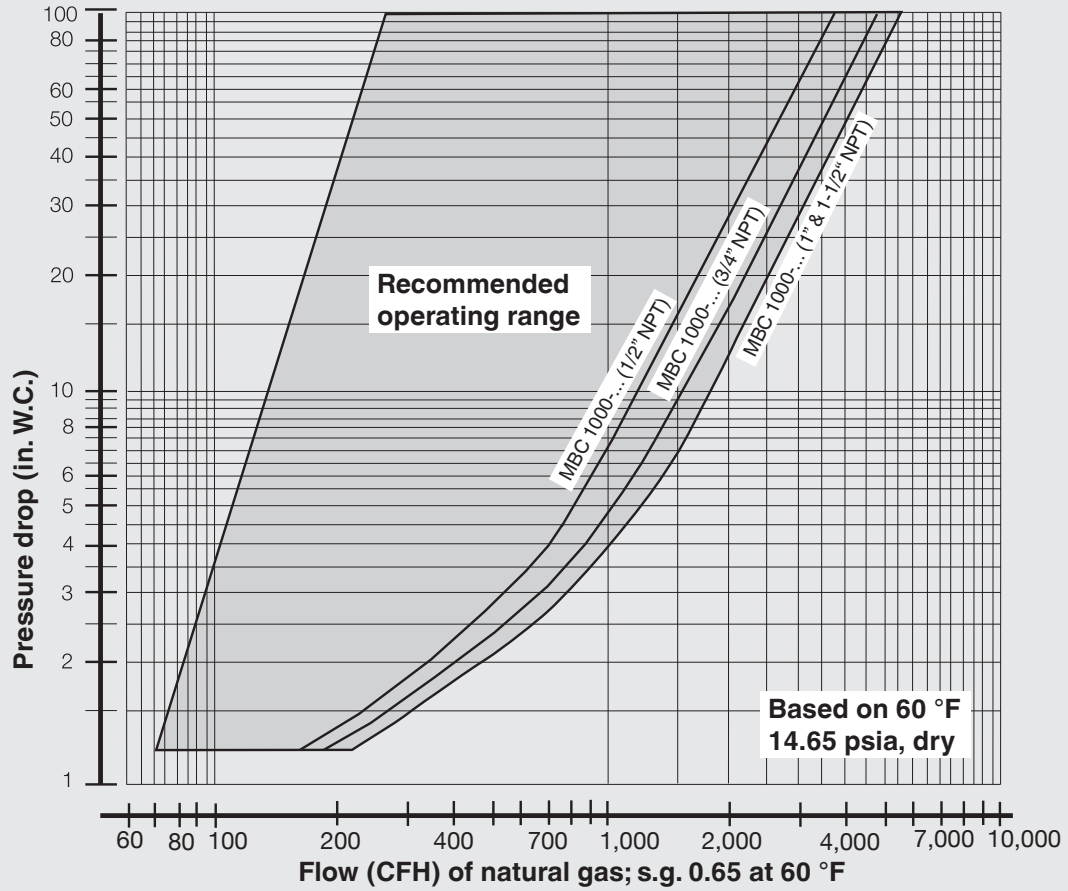
e = space requirement for solenoid replacement

Type	DN Rp	Opening time	Dimensions [inch] Dimensions [mm]							Solenoid No.	Weight [lbs] [kg]
			a	b	c	d	e	f	g		
MBC 1000	1/2 - 1 1/2	< 1 s	4.0	5.6	2.4	6.8	10.6	3.4	9.2	032/P	8.4
			95	143	61	173	269	87	234		3,8
MBC 2500	1 - 2	< 1 s	5.0	6.9	3.1	7.3	11.1	4.5	10.4	042/P	14.2
			126	176	80	186	281	114	265		6,5
MBC 4000	1 - 2	< 1 s	18	10	3.1	13	20.9	6.3	16.7	052/P	37.0
			204	261	80	328	530	161	424		16.8

Pressure drop v.s. flow

Volume flow pressure difference characteristics in steady state with microfilter

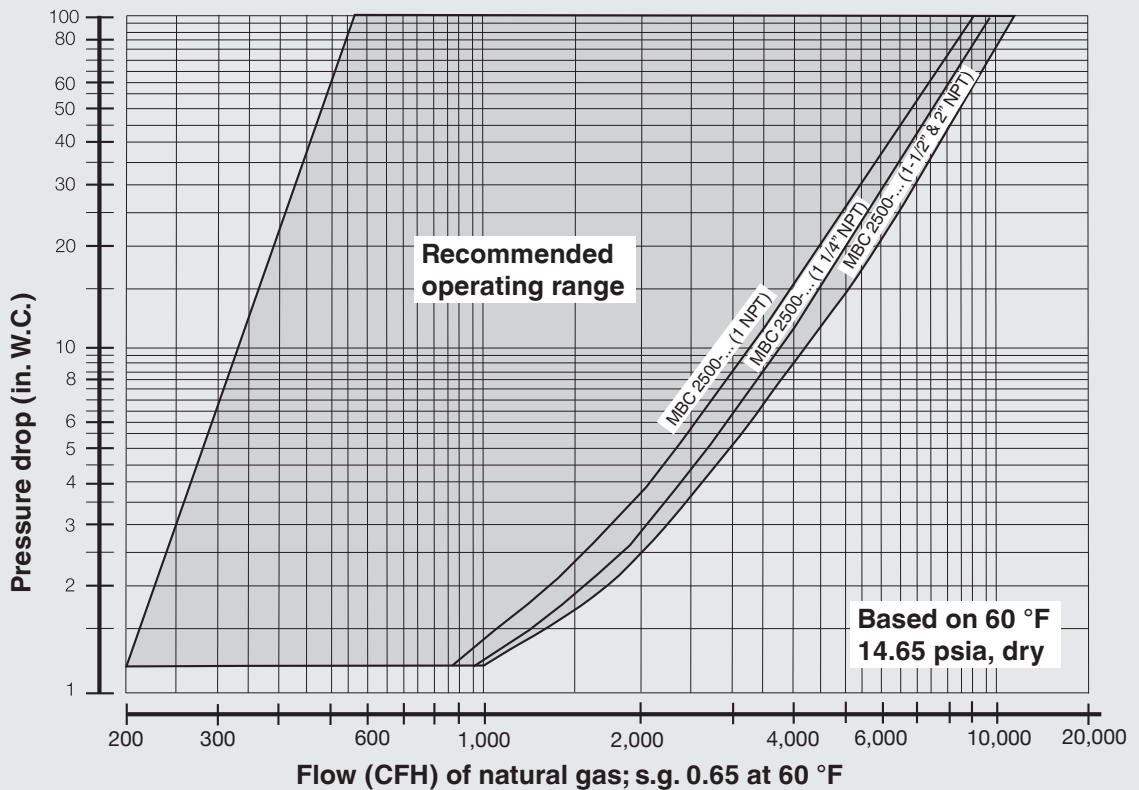
MBC 1000



Pressure drop v.s. flow

Volume flow pressure difference characteristics in steady state with microfilter

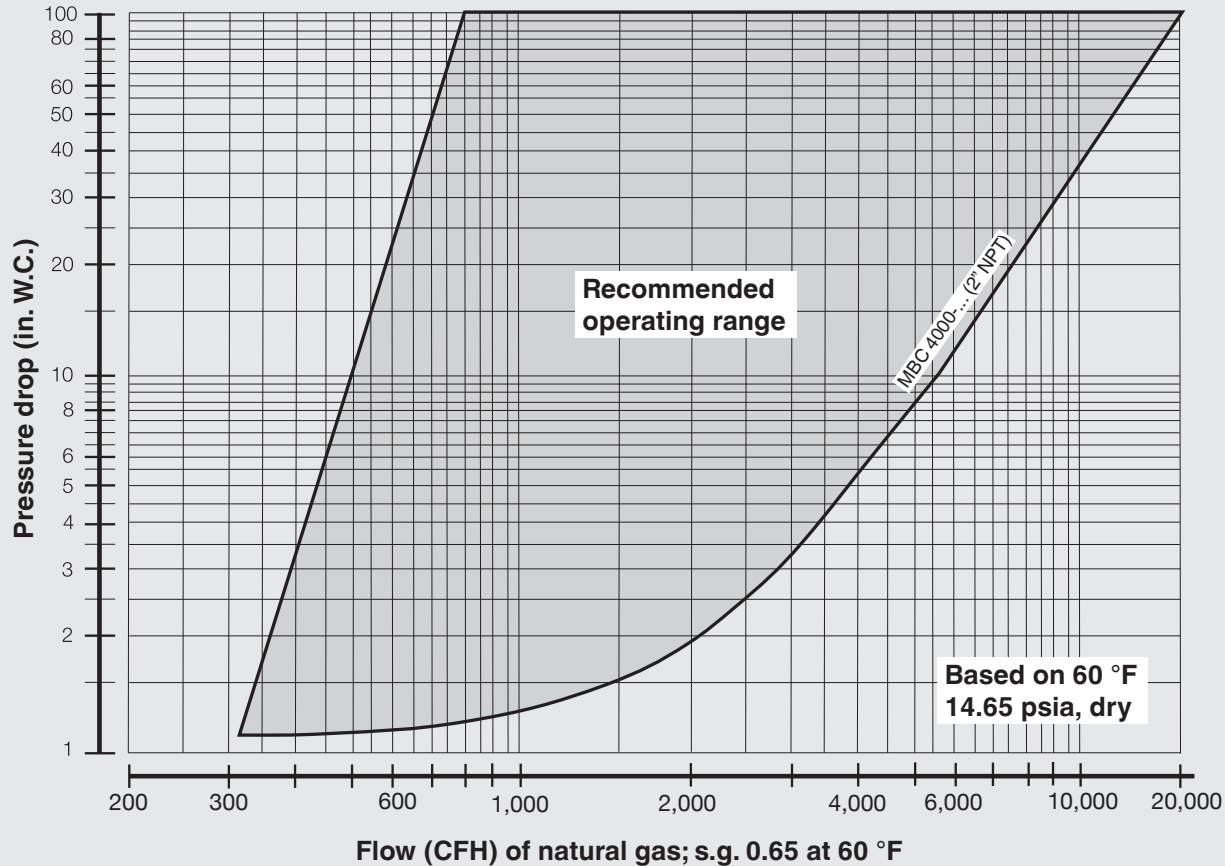
MBC 2500



GasMultiBloc®
 Combined servo pressure regulator
 and safety shut-off valves
 MBC-... 1000/602(L)
 MBC-... 2500/602(L)
 MBC-... 4000/602(L)



Pressure drop v.s. flow
Volume flow pressure difference characteristics in steady state with microfilter
MBC 4000



$$\dot{V}_{\text{gas used}} = \dot{V}_{\text{Natural gas}} \times f$$

$$f = \frac{\text{Density of Natural gas}}{\text{Density of gas used}}$$

Type of gas	Density [kg/m³]	s.g.	f
Natural gas	0.81	0.65	1.00
Butane	2.39	1.95	0.58
Propane	1.86	1.50	0.66
Air	1.24	1.00	0.80

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

Karl Dungs, Inc.
 3890 Pheasant Ridge Drive NE
 Suite 150
 Blaine, MN 55449, U.S.A.
 Phone 763 582-1700
 Fax 763 582-1799
 e-mail info@karldungsusa.com
 Internet <http://www.dungs.com/usa/>

Karl Dungs GmbH & Co. KG
 P.O. Box 12 29
 D-73602 Schorndorf, Germany
 Phone +49 (0)7181-804-0
 Fax +49 (0)7181-804-166
 e-mail info@dungs.com
 Internet <http://www.dungs.com>