







Introduction

NORVAL pressure regulators are direct acting devices for low and medium pressure applications controlled by a diaphragm and counter spring.

These regulators are suitable for use with previously filtered, non corrosive gases.





Main Features

Modular design of pressure regulator Norval allows application of slam shut or device for use as "in line monitor" on the same body without changing the face-to-face dimension.

Furthermore the truly "top entry design" allows an easy periodical maintenance without removing body from the line. The features of **Norval** regulators make of it a product suitable for any application.

The fast response time makes it ideal for burner or industrial applications or whenever sudden changes of flowrate are part of the process. The high accuracy against any inlet pressure variation makes of Norval an optimum product also for gas district systems, an application generally not suitable for direct acting regulators.

An extremely easy maintenance an reduced number of parts are the background of low cost operation.



Norval

Designed With Your **Needs In Mind**

- Compact Design
- Easy Maintenance
- Top Entry
- Fast Response Time
- High Turn Down Ratio
- High Accuracy
- Low Operation Cost
- Wide Range of Applications



Main Features

-Design pressure: up to 19 bar (275 Psi)
-Design temperature: -20 °C to +60 °C (-4 to + 140 °F)
-Ambient temperature: -20 °C to +60 °C (-4 to + 140 °F)
-Max inlet pressure bpe: Size 1 "to 3" 16 bar (232 Psi) Size 4" to 8" 8 bar (116 Psi)
-Outlet pressure range of Wh: Size 1 " to 4":8 to 4400 mbar (3"w.c. to 63,8 psig) Size 6" to 8" 12 to 1800 mbar (5"w.c. to 26,1 Psig)
-Accuracy class AC: up to 5
-Closing pressure class SG: up to 10
-Available size DN: 1" - 1"^{1/2} - 2" - 2"^{1/2} - 3" - 4" - 6" - 8"
-Flanging: class 150 RF according to ANSI B16.5 and PN16 according to ISO 7005.

Materials	
Body	Cast steel ASTM A216 WCB for all sizes
	Spheroidal ductile iron GS 400-18 ISO 1083 for Size \leq 6"
Head covers	Drop-forged carbon steel
Diaphgram	Rubberized canvas
Valve seat	Stainless steel
Seals	Nitril rubber
Compression fittings	According to DIN 2353 in zinc-plated carbon steel

The characteristics listed above are referred to standard products. Special characteristics and materials for specific applications may be supplied upon request.





Norval

Choosing the pressure regulator

Sizing of regulators is usually made on the basis of Cg valve and K_G sizing coefficients (table 1). Flow rates at fully open position and various operating conditions are related by the following formulae where:

Q = flow rate in Stm³/h Pu = inlet pressure in bar (abs)Pd = outlet pressure in bar (abs).

A > When the Cg and K_G values of the regulator are known, as well as Pu and Pd, the flow rate can be calculated as follows:

A-1 in sub critical conditions: (Pu<2xPd)

$$Q = K_G \times \sqrt{Pd} \times (Pu - Pd)$$
 $Q = 0.526 \times Cg \times Pu \times sen \left(K1 \times \sqrt{\frac{Pu - Pd}{Pu}}\right)$

A-2 in critical conditions: (Pu≥2xPd)

$$Q = \frac{K_G}{2} \times Pu \qquad \qquad Q = 0.526 \times Cg \times Pu$$

B > Vice versa, when the values of Pu, Pd and Q are known, the Cg or KG values, and hence the regulator size, may be calculated using:

B-1 in sub-critical conditions: (Pu<2xPd)

$$K_{G} = \frac{Q}{\sqrt{Pd \ x \ (Pu - Pd)}} \qquad Cg = \frac{Q}{0.526 \ x \ Pu \ x \ sen \ x \ \left(K1 \ x \ \sqrt{\frac{Pu - Pd}{Pu}}\right)}$$

B-2 in critical conditions (Pu≥2xPd)

$$K_{G} = \frac{2 \times Q}{Pu}$$
 $Cg = \frac{Q}{0,526 \times Pu}$

NOTE: The sin val is understood to be DEG.

Table 1: Cg, KG and K1 valve coefficient

Nominal diameter (mm)	25	40	50	65	80	100	150	200
Size (inches)	1"	1 " 1/2	2"	2"1/2	3"	4"	6"	8"
Cg coefficient	331	848	1360	2240	3395	5100	10600	16600
KG coefficient	348	892	1430	2356	3571	5365	11151	17463
K1 coefficient	106,78	106,78	106,78	106,78	106,78	106,78	106,78	106,78



Being a direct acting regulator, in order to obtain a good precision it is advised not to use100% of the gas flow rate value resulting from the application of the calculation formula.

The formulae are applicable to natural gas having a relative density of 0.61 w.r.t. air and a regulator inlet temperature of 15 °C. For gases having a different relative density S and temperature t in °C, the value of the flow rate, calculated as above, shall be multiplied by a correction factor, as follows:

Fc =
$$\sqrt{\frac{175.8}{5 \times (273.16 + t)}}$$

Table 2 lists the correction factors Fc for a number of gases at 15 $^{\circ}$ C.

Table 2: Correction factors FC											
Type of gas	Relative density	Fc Factor									
Air	1.0	0.78									
Propane	1.53	0.63									
Butane	2.0	0.55									
Nitrogen	0.97	0.79									
Oxygen	1.14	0.73									
Carbon dioxide	1.52	0.63									

Caution:

in order to get optimal performance, to avoid premature erosion phenomena and to limit noise emissions, it is recommended to check gas speed at the outlet flange does not exceed 150 m/sec. The gas speed at the outlet flange may be calculated by means of the following formula:

V = 345.92 x
$$\frac{Q}{DN^2}$$
 x $\frac{1 - 0.002 \text{ x Pd}}{1 + Pd}$

where:

V = gas speed in m/sec

Q = gas flow rate in Stm³/h

DN = nominal size of regulator in mm

Pd = outlet pressure in barg.



Control Heads

Outlet pressure range is determined by the control head installed. Table 3 sums up the heads available for every size and the ranges of outlet pressure expressed in mbar.

Table: 3	Table: 3													
Size (mm)	25	40	50	65	80	100	150	200						
Inches	1"	1 " 1/2	2"	2"1/2	3"	4"	6"	8"						
ø 817							12 ÷ 79	12 ÷ 79						
ø 658							75 ÷ 405	75 ÷ 405						
ø 630				10 ÷ 80	10 ÷ 80	12 ÷ 80	220 ÷ 650	220 ÷ 650						
ø 495	16 ÷ 83	16 ÷ 83	16 ÷ 83	81 ÷ 530	81 ÷ 530	81 ÷ 530	405 ÷ 1800	405 ÷ 1800						
ø 375	81 ÷ 1100	81 ÷ 1100	81 ÷ 1100	470 ÷ 2800	470 ÷ 2800	470 ÷ 2800								
ø 375TR	920 ÷ 4400	920 ÷ 4400	920 ÷ 4400	920 ÷ 4400	920 ÷ 4400	920 ÷ 4400								

Slam-Shut Valve

This is a device stopping immediately gas flow (SAV) when, whatsoever downstream pressure exeeds giveen set-point. Device can be actuated also manually.

Incorporated SN Slam-Shut

SN Slam shut (see figure 2) can be incorporated on the standard regulator and on the in-line monitor. The regulator with the incorporated slam-shut has Cg coefficients equal to 95% of those of the basic regulator. A further advantage of the incorporated slam-shut valve is that it can be retro fitted at any time on a previously installed **Norval** (size 3"only) without modifying the regulating unit.

The main features of this slam-shut device are:

- design pressure 16 bar for all the components;
- accuracy (AG): ±1% of the pressure set-point for pressure increase; ±5% for pressure decreasing;
- internal by-pass;
- intervention for over pressure and/or under pressure;
- manual push-button control;
- possibility of pneumatic or electromagnetic remote control;
- compact overall dimensions;
- easy maintenance;
- possibility of application of devices for remote signal (contact or inductive microswitches).





Table 3 shows the available pressure switches

Table: 3 Slam-Shut pressure switches											
Pressure switch	SN 91	SN 92									
Set point range for Overpressure (OPSO)	0,025 ÷ 1,20	0,75 ÷ 5,5									
Set point range for Underpressure (UPSO)	0,01 ÷ 0,9	0,25 ÷ 2,7									
Working pressure in bar											

Functioning as Monitor

The monitor is an emergency regulator which comes into operation in place of the main regulator if, in the event of failure, the latter allows the downstream pressure to reach the monitor set-point.

Operation of the Norval functioning as Monitor

NORVAL functioning as an in-line monitor is a regulator which, in addition to the standard version, has a further mobile assembly balancing device (**ER**) guaranteeing greater accuracy of regulated pressure and therefore an equally precise value for the intervention pressure without risk of interference with main regulator (see figure 3). This device can be retro fitted on a standard existing regulator.





Installation

To ensure proper operation and optimal performance, the following should be observed while installing **Norval** pressure regulator:

- a) filtering: the gas flowing in the piping shall be adequately filtered.
- It is also recommended that the piping upstream from the regulator is clean withaut impurities; b) sensing line: for correct operation, sensing line pick up must be appropriately positioned.
- Between the regulator and the downstream take-off there must be a lenght of pipe \geq 4 times the diameter of the outlet pipe; beyond the take-off, there must be a further lenght of pipe \geq 2 times the same diameter.

Possible installation schemes









Norval with slam shut SN and Monitor



Overal dimensions in mm

				с		ø 817			ø 658			ø 630			ø 495			ø 375			ø 375TR		R
Size (mm)	Inches	s*	b	b1	b2	а	a1	d	а	a1	d	а	a1	d	а	a1	d	а	a1	d	а	a1	d
25	1"	183	100	200	250										460	630	175	415	585	150	425	595	155
40	1"1/2	223	120	220	270										475	645	190	435	605	165	445	615	170
50	2"	254	120	220	270										475	645	190	435	605	165	445	615	170
65	2"1/2	277	140	240	290							540	710	220	500	670	210	455	625	190	465	635	195
80	3"	298	140	240	290							540	710	220	500	670	210	455	625	190	465	635	195
100	4"	352	180	280	330							640	810	310	600	770	300	555	725	275	565	735	280
150	6"	451	220	320	370	760	930 4	400	720	890	380	675	845	380	670	840	375						
200	8"	543	260	360	410	860	10305	500	820	990	480	775	845	480	770	940	475						

(*) ANSI 150 - UNI PN16 - UNI PN 40

Weights in Kgf

Size (mm)	25	40	50	65	80	100	150	200	
Inches	1″	1 " 1/2	2"	2"1/2	3"	4″	6"	8"	
Norval	42	48	50	77	92	121	206	291	
Norval with slam-shut/SN	47	53	55	82	97	126	211	296	
Norval with monitor	48	55	58	85	100	129	216	302	
Norval with slam-shut/SN and monitor	53	60	63	90	105	134	221	307	

The Norval regulator conform to ISA 4.1 standard Face to face dimensions S according to IEC 534-3 and EN 334



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