Dival 600

Pressure Regulators

Pietro Fiorentini ®
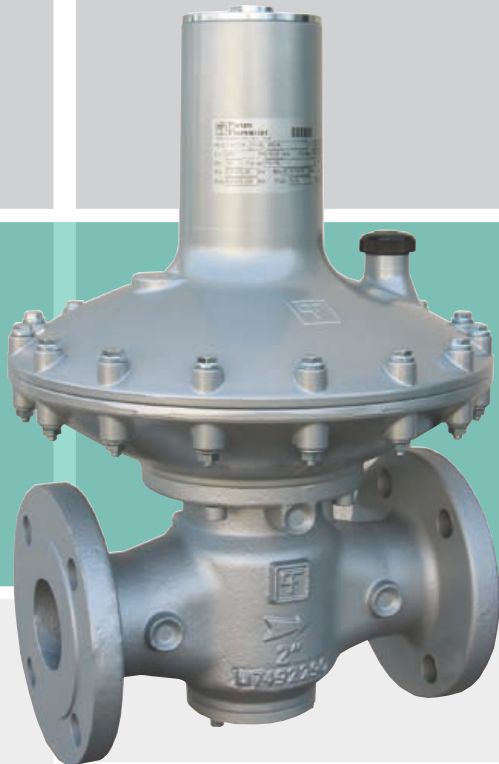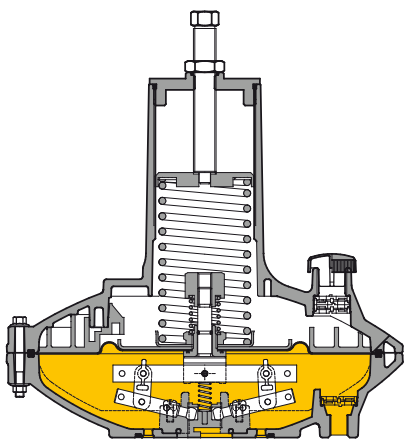
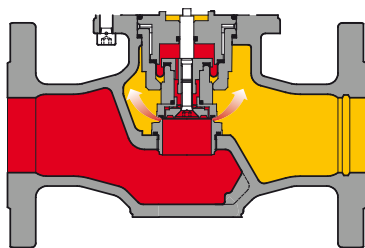# Dival 600

> Pressure regulators

Introduction

Dival 600 series pressure regulators are direct acting devices for low and medium pressure applications controlled by a diaphragm and counter spring.
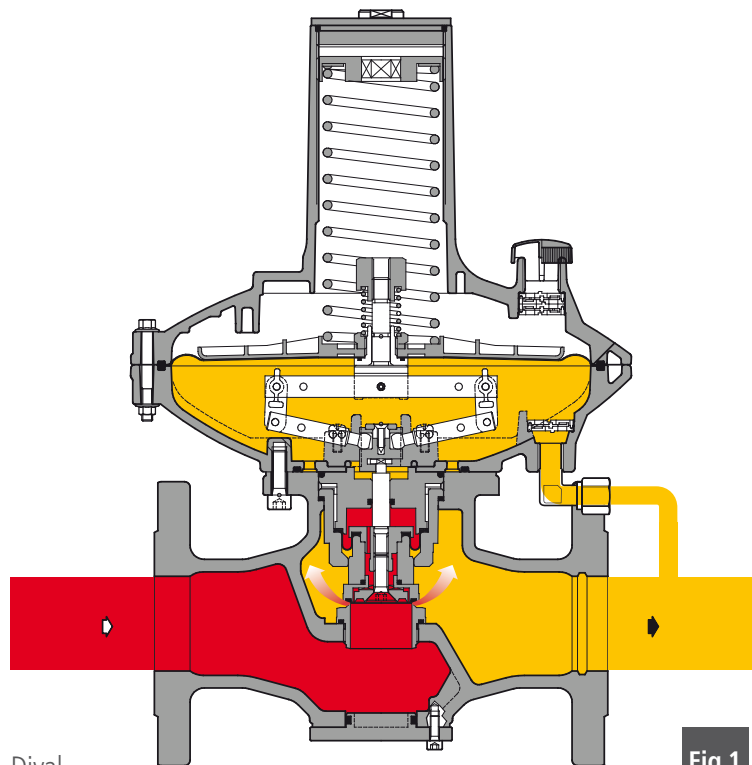
These regulators are suitable for use with previously filtered, non corrosive gases.

TR Head

3 ways body

Dival

Fig.1

Main Features

Modular design of pressure regulator **Dival 600 series** allows the installation of an incorporated 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 **Dival 600 series** regulators make 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 **Dival 600 series** an optimum product also for gas district systems, an application generally where piloted operating regulators are preferred.

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

Accessories on request:

- Incorporated slum shuh-valve
- In line monitor function
- Silencer;
- Incorporated relief valve.

Dival series 600

Dival series 600 + LA/...

Designed With All 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 **PS**: up to 20 bar (290 Psi)

-Design temperature: -20 °C to +60 °C (-4 °F to + 140 °F)

-Ambient temperature: -20 °C to +60 °C (-4 °F to + 140 °F)

-Max inlet pressure **Pu**: 20 bar (290 Psi)

-Outlet pressure range of **Wd**: from 12 to 4200 mbar (6"w.c. to 60,9 psig)

-Accuracy class **AC**: up to 5

-Lock-up pressure class **SG**: up to 10

-Available size **DN**: 1″ (25) -1″$^{1/4}$ (32) - 1"$^{1/2}$ (40) - 2″ (50)

-Flanging: class PN 16/25 according to ISO 7005-1, ISO 7005-2; class ANSI 150RF according to ANSI B16.5, ASME B16.42
 and class ANSI 125 FF according to ASME B16.1

-Threaded connections: DN 2" Rp ISO 7-1 or DN 2"NPTF ASME B1.20.1 (only ductile iron)

Materials

Body	Cast steel ASTM A216 WCB
	Ductile cast iron GS 400-18 ISO 1083
Head covers	Die cast alluminium EN AC-AISI 12 UNI EN 1706
Diaphgram	Rubberized canvas
Valve seat	Brass
Seals	Nitril rubber

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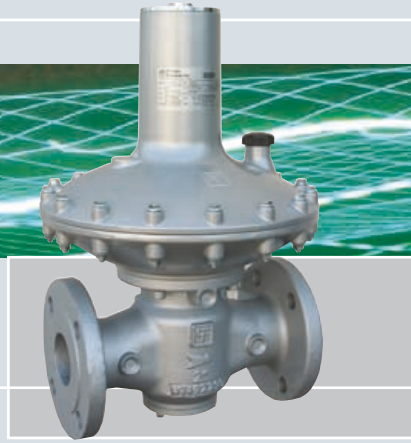
Choosing the pressure regulator

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)

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

A-2 in critical conditions: (Pu≥2xPd)

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

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

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

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

B-2 in critical conditions (Pu≥2xPd)

$$K_G = \frac{2 \times Q}{Pu} \qquad Cg = \frac{Q}{0,526 \times Pu}$$

NOTE: The sin val is understood to be DEG.

Table 1: Cg, K_G and K1 valve coefficient

Heads	ø 280				ø280/TR			
Nominal diameter (mm)	25	32	40	50	25	32	40	50
Size (inches)	1"	1" 1/4	1" 1/2	2"	1"	1" 1/4	1" 1/2	2"
Cg coefficient	269	300	652	781	315	334	692	770
KG coefficient	383	315	685	821	331	351	727	809
K1 coefficient	94	95	94	86	97	97	95	97

> Pressure regulators

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:

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

Table 2 lists the correction factors Fc for a number of gases at 15 °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:

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

where:

V = gas speed in m/sec

Q = gas flow rate in Stm^3/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.
The control heads used are:
- head Ø 280 from 12 to 340 mbar
- head Ø 280/TR from 300 to 4200 mbar

Slam-Shut Valve

This is a device which stops immediately gas flow whenever downstream pressure exeeds given set-point. Device can be actuated also manually.

Incorporated LA/... Slam-Shut

LA Slam shut (see figure 2) can be incorporated in the standard regulator and in the in-line monitor.
The regulator with the incorporated slam-shut has Cg and K_G coefficients equal to those in table 3.
A further advantage of the incorporated slam-shut valve is that it can be retro fitted at any time on a previously installed **Dival 600 series** without modifying the regulating unit (only with 4 ways body).
Further the slam-shut can be positioned in four different positions (rotation on its axis) in such way to be fixed in the most apropriated position versus the surrounding encumbrance if any.

The main features of this slam-shut device are:
- design pressure 20 bar for all the components;
- accuracy (AG): ap to 5 for pressure increase, up to 15 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
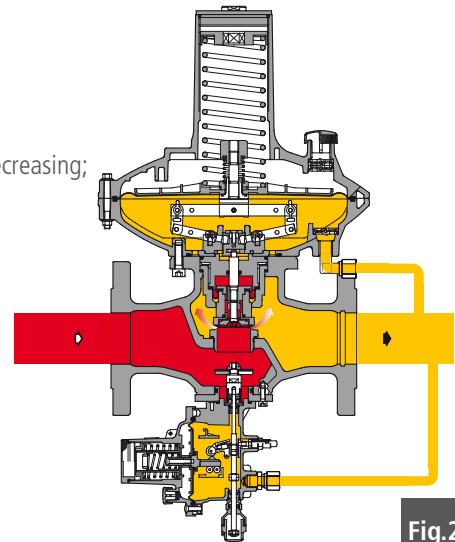 (contact or inductive microswitches).

Fig.2

Table 3: Cg, K_G and K1 coefficient with incorporated slam shut

Heads	ø 280				ø280/TR			
Nominal diameter (mm)	25	32	40	50	25	32	40	50
Size (Inches)	1"	1" 1/4	1" 1/2	2"	1"	1" 1/4	1" 1/2	2"
Cg coefficient	267	298	698	818	311	330	749	811
K_G coefficient	280	313	733	859	327	347	786	852
K1 coefficient	94	95	94	86	97	97	95	97

Table 4 shows the available pressure switches

| Table: 4 Slam-Shut pressure switches			
Pressure switch	LA/BP	LA/MP	LA/TR
Set point range for Overpressure Wdo	0,030 ÷ 0,180	0,140 ÷ 0,450	0,25 ÷ 5,5
Set point range for Underpressure Wdu	0,006 ÷ 0,060	0,010 ÷ 0,240	0,1 ÷ 3,5
Working pressure in bar			

Dival 600 series 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 Dival 600 series functioning as Monitor

Dival 600 series functioning as an in-line monitor is a regulator which, in addition to the standard version, has a further mobile assembly balancing device guaranteeing greater accuracy of regulated pressure and therefore an equally precise value for the intervention pressure without risk of interference with main regulator.
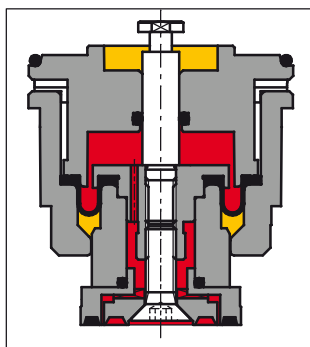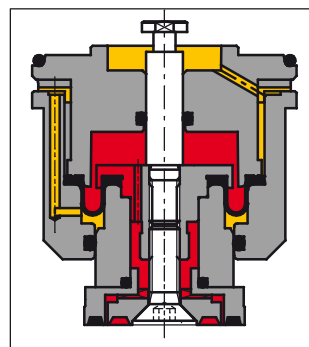
Standard regulator   Monitor regulator

Fig.3

Incorporated Relief Valve

To avoid that small leak when there is no flow required or that sudden and of temporary overpressures such as deriving from rapid switching or overheating of the gas cause intervention of the slam shut, the **DIVAL 600** it is possible to activate an incorporated relief valve (SBV).

Incorporated silencer

Whenever specific noise limits are required, the silencer allows you to considerably reduce the decibel (dBA) noise emissions during the gas pressure regulators operation.
The **Dival 600** pressure regulator can be supplied with an incorporated silencer in either the standard version, with incorporated slam-shut or in line monitor version.
With the built-in silencer the Cg and K_G valve coefficients are not affected. Given the modular arrangement of the regulator, the silencer may be retrofitted to both standard **Dival 600** version as well as those with incorporated slam-shut or monitor version, without any need to piping modification. Pressure reduction and control operate the same manner as in standard version.

Installation

To ensure proper operation and optimal performance, the following should be observed while installing **Dival 600 series** 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 without 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 ≥4 times the diameter of the outlet pipe; beyond the take-off, there must be a further lenght of pipe ≥2 times the same diameter.

Assembly positions
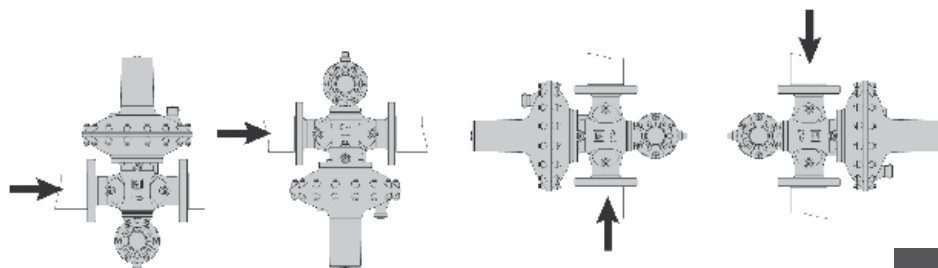
Fig.4

Possible installation schemes

DIVAL SERIES 600 + LA/.. + DIVAL SERIES 600
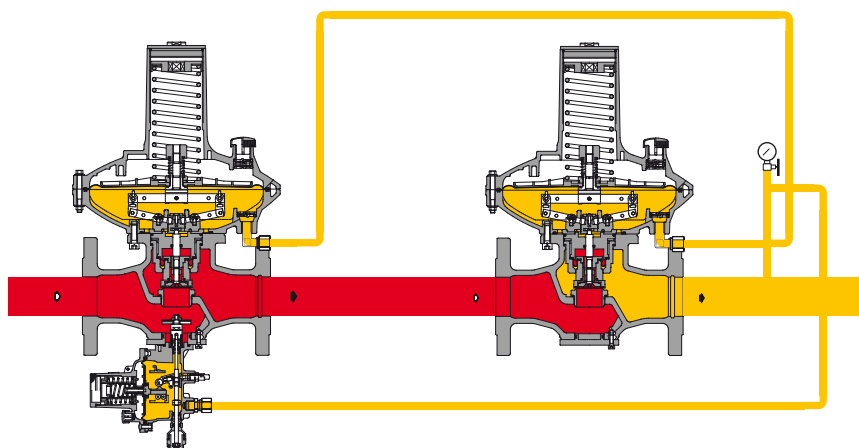
Fig.5

DILOCK 108 + DIVAL SERIES 600 + LA/...

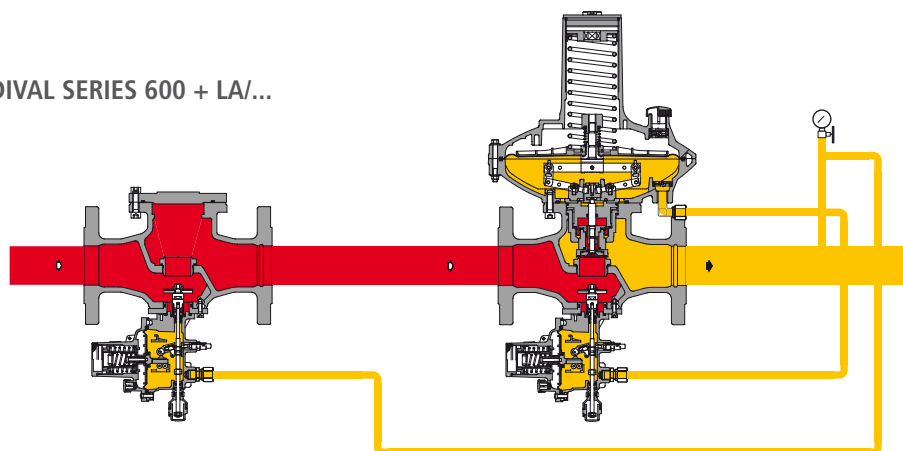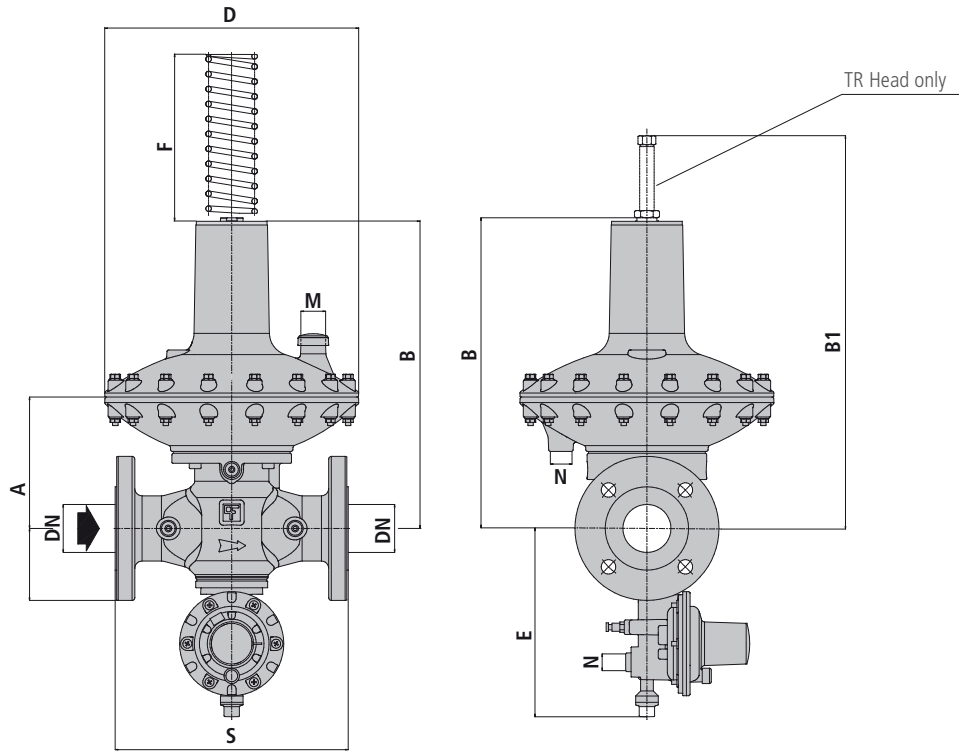Fig.6

■ **Inlet pressure**

■ **Outlet pressure**

Dival Series 600

TR Head only

Overal dimensions in mm

Tipe	DN	NPS	S	A	B	B1	D	E	F	M	N
Dival 600	25	1"	183	145	343	433	280	215	200	Rp$^{1/2}$"	Rp$^{1/4}$"
Dival 600	32	1"$^{1/4}$	183	145	343	433	280	215	200	Rp$^{1/2}$"	Rp$^{1/4}$"
Dival 600	40	1"$^{1/2}$	223	145	343	433	280	215	200	Rp$^{1/2}$"	Rp$^{1/4}$"
Dival 600	50	2"	254	145	343	433	280	215	200	Rp$^{1/2}$"	Rp$^{1/4}$"
Dival 600	G 2"	2" NPTF	254	145	343	433	280	215	200	Rp$^{1/2}$"	Rp$^{1/4}$"

Weights in Kgf

Tipe	DN	NPS	Dival	Dival with slam shut LA/...
Dival 600	25	1"	15	16
Dival 600	32	1"$^{1/4}$	15	16
Dival 600	40	1"$^{1/2}$	17	18
Dival 600	50	2"	20	21
Dival 600	G 2"	2" NPTF	18	19

Face to face dimensions S according to IEC 534-3 and EN 334

Pietro Fiorentini ®

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