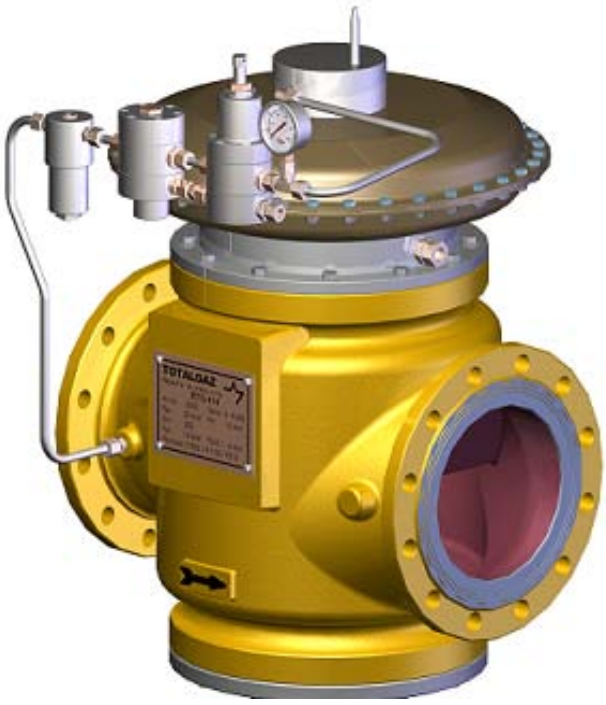
TOTALGAZ INDUSTRIE

PILOT-OPERATED PRESSURE REGULATOR RTG 414



Introduction

RTG 414 pressure regulators are of indirect action type and are used for reducing and regulating the pressure of non-corrosive fluids (natural gases, LPG, etc.). The regulators ensure constant maintenance of outlet pressure within the limits of the regulating class, irrespective of the fluctuations of inlet pressure and flow rate. The regulators are designed for industrial use, in natural gas distribution networks. The regulators can be used in all installations with rapid variations of flow. The excellent performance of the pilot system ensures precise regulation of pressure and fast response of regulator.

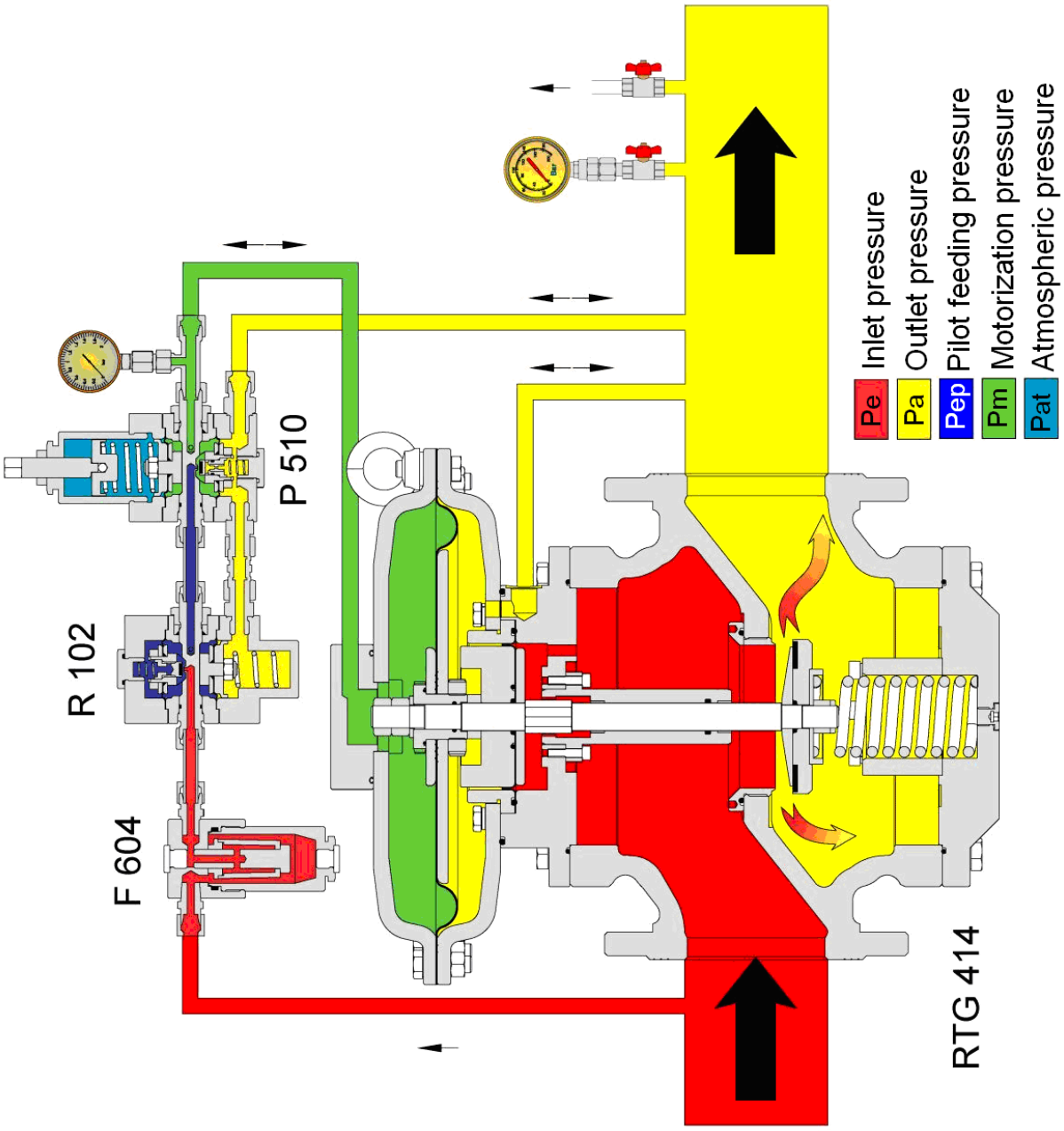


Figure 1 - RTG 414 operating diagram

Advantages of RTG 414 pressure regulators

RTG 414 regulators of indirect action type offer a series of advantages such as:

- fast response of regulator to variations in flow rate;
- precise, exact and constant operation even if the inlet pressure fluctuates greatly;
- easy adjustment of outlet pressure value;
- easy change of the regulator setting range, if desired;
- high flow rate due to the body special design (high flow coefficient);
- excellent reliability due to high quality materials, precise machining and rigorous control;
- reduced overall dimensions compared to similar products;
- wide range of dimensions intended to provide optimal solution to any problem mentioned;
- easy maintenance, without removing the regulator from the installation;
- low noise level during operation even at high flow rates.

Technical characteristics

Table 1 – RTG 414 regulators technical characteristics

Regulator type	RTG 414
Inlet/outlet connection diameter	Flanşa DN 25÷DN 400 PN 16 ÷ PN 20/ ANSI Class 150
Inlet pressure [bar]	0.2 ÷ 6
Outlet pressure [bar]	0.015 ÷ 5.5
Differential pressure Δp [bar]	0.2
Working medium	Natural gas (SR 3317-2003) or other non-corrosive gases
Working temperature [^{o}C]	-20 ÷ 60
Ambient temperature [^{o}C]	-30 ÷ 80
Accuracy class AC [%]	±1 ÷ 5
Lock-up pressure class SG [%]	5 ÷ 10
Intervention accuracy class AG [%]	- minimum up to 2.5% - maximum up to 1% (depending on the control pressure)

RTG 414 pressure regulator constructive variants

RTG 414 – basic variant – has only regulating functions;

RTG 414 SB 750 – variant with incorporated shut-off valve – has regulating and protection functions in case of pressure increase and decrease by means of the shut-off valve (depending on the SB configuration).

Materials

Part	Material
Body	Cast carbon steel
Seat	Stainless steel
Rod	Stainless steel
Servomotor	Carbon steel
Internal parts	Stainless steel, aluminium alloys, brass
Valve plate	Rubber (NBR) or polyurethane
Diaphragm	Rubber (NBR) with textile insert
O-rings	Rubber (NBR), Viton

Selection of pressure regulator

According to EN 334+A_1:2009, the flow coefficient Kg is taken into consideration when selecting the regulator size.

The maximum flow rate is established assuming that the regulator is totally open.

The following formulas are used to determine the maximum flow rate:

a) in subcritical conditions, when $\frac{P_a}{P_e} \geq 0.5$

$$Q = K_g \cdot \sqrt{(P_e - P_a) \cdot P_a}$$

b) in critical conditions, when $\frac{P_a}{P_e} < 0.5$

$$Q = \frac{K_g}{2} \cdot P_e$$

Symbols:

Q – flow rate [Nm^3/h]

P_e – absolute inlet pressure [bar]

P_a – absolute outlet pressure [bar]

K_g – natural gas flow coefficient [Nm^3/h]

DN	25	32	40	50	80	100	150	200	250	300	400
Kg	331	574	847	1502	3392	5633	10593	18336	23655	43260	69370

For regulators, the recommended gas velocity in the outlet flange is less than 150 m/s. The erosion phenomenon accelerates and the noise level increases significantly at greater velocity. The pipes are sized for gas velocities lower than 20 m/s.

Gas velocity in the outlet flange or in pipes is calculated using the formula:

$$V = 345.92 \times \frac{Q \times (1 - 0.002 \cdot p_a)}{D_i^{\,2} \times (1 + p_a)}$$

where:

V – gas velocity [m/s]

Q – flow rate [Stm^3/h]

D_i – inner diameter [mm] – for pressure regulators D_i = DN

p_a – outlet pressure [bar]

Safety devices and optional accessories

Pilot equipment

The pilot equipment mounted on the pressure regulators of RTG 414 type consist of:

- *microfilter* F 604;
- *preregulator* R 100 (R 102 or R 106);
- *pilot* P 510 (P 510, P 510 A).

The type of pilot mounted on the regulator is selected depending on the required outlet pressure (P_a), as follows:

P 510 A	Wh = 0.02 ÷ 2.4 bar
P 510	Wh = 0.20 ÷ 12 bar

Table 2 – Pilot adjustment spring

Pilot	Code	Setting range [bar]
P 510 A	1450224	0.02 ÷ 0.10
	1450225	0.10 ÷ 0.40
	1450226	0.4 ÷ 1.2
	1450227	0.8 ÷ 2.4
P 510	1450228	0.2 ÷ 0.6
	1450229	0.5 ÷ 2
	1450230	1 ÷ 3.5
	1450231	2 ÷ 7
	1450232	4 ÷12

SB 75 valve operation

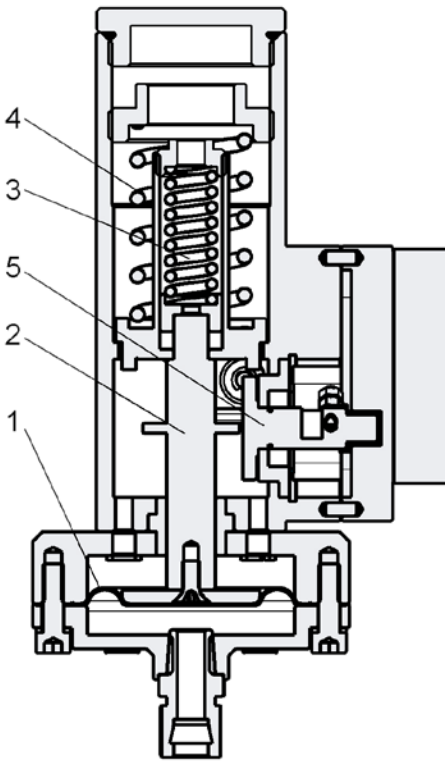


Figure 2 – SB 75 control mechanism

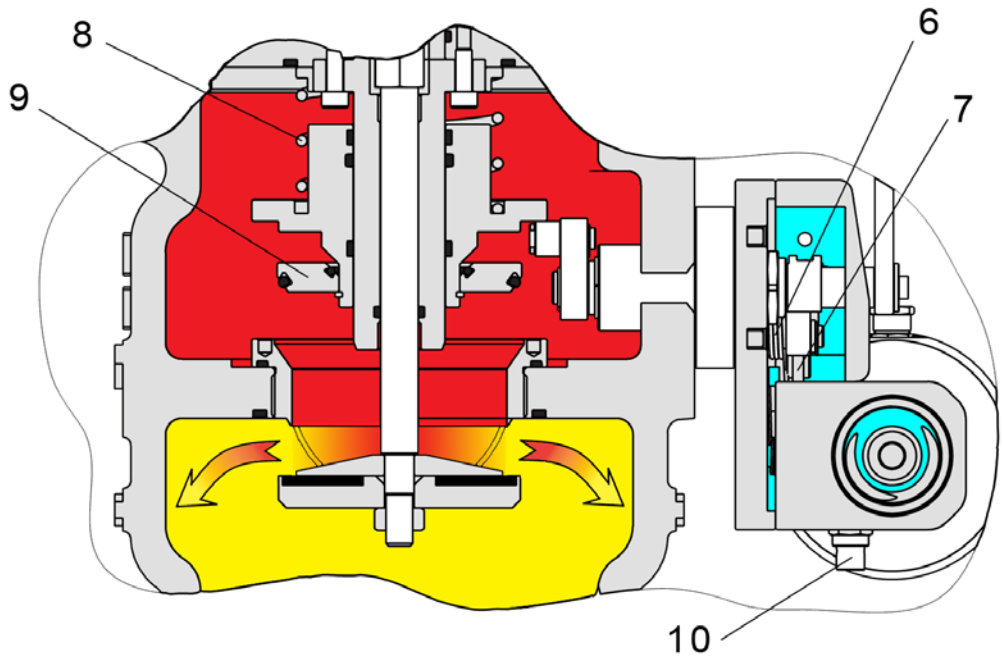


Figure 3 – SB 750 shut-off valve

The description of SB 750 valve operation references Figures 2 and 3. When the regulated pressure is within the working range, the shut-off valve is open.

The main components of SB 750 valve:

1. diaphragm
2. rod
3. minimum spring
4. maximum spring
5. fork
6. spring
7. cam
8. spring
9. valve plate holder
10. reset knob

The regulated pressure acts on the diaphragm (1) of the servomotor, maintaining the rod (2) in balance position. Thus, the movement of the cam (7) under the action of the spring is prevented by the fork (5) whose radial movement is determined by the rod (2).

If the pressure increases over the maximum allowable value, the force of the spring (4) is overcome; this determines the rod (2) to move. The fork (5) releases the cam (7) which moves under the action of the spring (6) and releases the valve plate holder (9).

If the pressure decreases under the minimum allowable value, the force of the spring (3) moves the rod (2) which rotates the fork (5), releasing the cam (7). The cam moves and releases the blocking mechanism, under the action of the spring (6).

The movement of the valve plate holder (9) under the action of the spring (8) closes the valve. Sealing is ensured by the O-ring.

Table 3 – Adjustment springs for SB 75 control mechanism

Servomotor type	Minimum spring		Maximum spring	
	Code	Adjustment range [bar]	Code	Adjustment range [bar]
SM 37	1450352	0.2 ÷ 0.5	1450366	2.04 ÷ 4.1
	1450353	0.4 ÷ 0.9	1450367	3.9 ÷ 7.8
	1450354	0.7 ÷ 1.5	1450368	7.6 ÷ 15.4
	1450355	1.4 ÷ 2.9		
	1450358	1.6 ÷ 3.3		
	1450359	3.2 ÷ 6.5		
	1450360	6.4 ÷ 12.4		
SM 50	1450351	0.06 ÷ 0.14	1450364	0.27 ÷ 0.55
	1450352	0.12 ÷ 0.25	1450365	0.53 ÷ 1.07
	1450353	0.21 ÷ 0.44	1450366	1.0 ÷ 2.0
	1450354	0.37 ÷ 0.75	1450367	1.9 ÷ 3.8
	1450355	0.72 ÷ 1.40	1450368	3.7 ÷ 7.6
	1450356	0.21 ÷ 0.43		
	1450357	0.42 ÷ 0.85		
	1450358	0.81 ÷ 1.63		
	1450359	1.60 ÷ 3.20		
	1450360	3.13 ÷ 5.60		
SM 70	1450351	0.03 ÷ 0.08	1450361	0.02 ÷ 0.04
	1450352	0.06 ÷ 0.1	1450362	0.03 ÷ 0.08
	1450353	0.1 ÷ 0.2	1450363	0.06 ÷ 0.14
	1450354	0.1 ÷ 0.4	1450364	0.13 ÷ 0.28
	1450355	0.3 ÷ 0.7	1450365	0.27 ÷ 0.55
	1450356	0.1 ÷ 0.2	1450366	0.51 ÷ 1.02
	1450357	0.2 ÷ 0.5	1450367	0.98 ÷ 1.95
	1450358	0.4 ÷ 0.8	1450368	1.92 ÷ 3.85
	1450359	0.8 ÷ 1.7		
	1450360	1.6 ÷ 2.9		

Overall dimensions

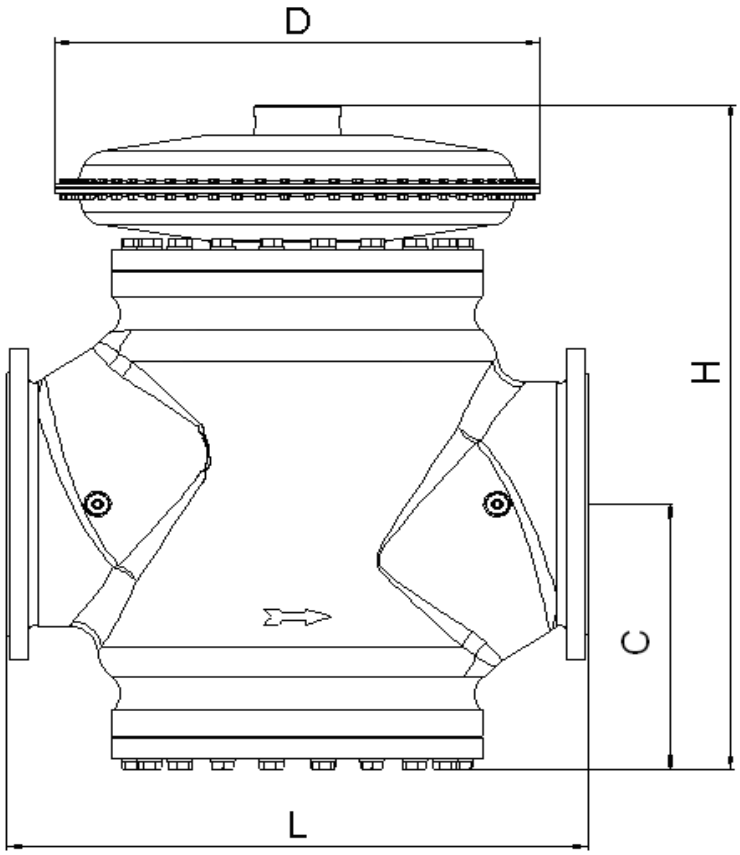


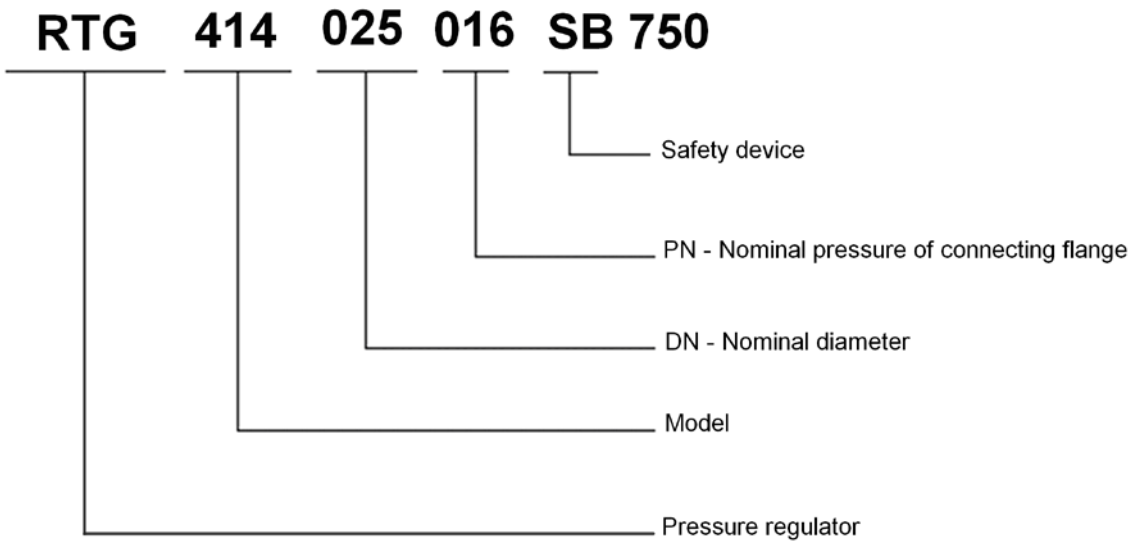
Figure 4 – Overall dimensions of RTG 414

Table 4 – RTG 414 constructive dimensions

DN	ØD [mm]	H [mm]	C [mm]	L [mm]
25	270	222	125	184
32	270	235	132	200
40	270	258	140	222
50	388	270	155	254
80	388	310	200	298
100	388	350	210	352
150	540	425	230	451
200	540	505	275	543
250	720	570	350	673
300	720	710	382	737
400	850	810	514	1016

Ordering code

The pressure regulators are identified by specifying the constructive variant, the nominal dimension of inlet-outlet connections and the maximum working pressure.
Example:



For example, the notation RTG 414-25-16-SB 75 designates a 414 pressure regulator with DN 25 flanged connections, maximum working pressure 16 bar, equipped with an SB 750 shut-off valve.
Additional requirements, if any, must be specified when placing the order.

The manufacturer reserves the right to make modifications without any prior notification.

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