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## RAG

**Air/Gas ratio regulators**

# RAG

## Gas/Air ratio regulators for gas

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### Description

The RAG type regulator has the scope of maintaining a constant air-gas ratio upstream of gas-burners on installation without preheated air. It is equipped with a by-pass adjustable on site and can be used as zero-pressure regulator.

### Features

The regulators are made of aluminum alloy die-cast, with a range for inlet/outlet connections from 1/2" up to 2".

Gas inlet pressure up to 500 mbar, air control pressure up to 120 mbar.

They are equipped with an adjustable spring and a counterspring, so that gas outlet pressure is equal to air control pressure, with a ratio 1:1 and an adjustable offset of +/-3mbar. The offset is useful to set gas flow at low fire.

RAG regulators have been designed for a flow regulation range equal to 10:1 and to generate low pressure drop.

Disc is equipped with a gasket, so RAG is able to regulate precisely very low flow.

Every model is equipped with a bypass adjustable on-site. Bypass is useful in low fire state when a very low flow is necessary or air control pressure is lower 0.5mbar.

The controls are equipped with inlet pressure compensation diaphragm for a precise regulation.

A metallic mesh filter protects the regulator seat from dirt contamination (filtration grade <1mm).

The impulse line is integrated inside the regulator. Special versions with external impulse line are available on request.

Pipe connections meet group 2.

Suitable for use with non-aggressive gases included in the 1, 2 and 3 families (EN 437). Special versions for aggressive gases (e.g. biogas).

Provided with pressure test points in the gas inlet, gas outlet and air control chamber to connect manometers, pressure switches or other equipment.

RAG can be used as zero-pressure regulator. In this case it is necessary to connect the vent port to a discharge pipe or to install the conversion kit

All components are designed to withstand any mechanical, chemical and thermal condition occurring during typical service. Effective impregnation and surface treatments have been used to improve mechanical sturdiness, sealing and resistance to corrosion of the components.

Regulators are 100% tested and fully warranted.

## Functioning and application

A ratio regulator is a device able to maintain a gas outlet pressure equal to the air control pressure. Outlet gas and control air pressure act on the two sides of the same diaphragm, hence the disc moves until outlet pressure is the same as air pressure. If outlet pressure is needed to be a bit lower or higher than air, the spring must be adjusted. If a gas flow is required to be present when air control pressure is near zero, the bypass must be set. Variation of inlet pressure does not affect outlet pressure because the disc is compensated with a specific diaphragm.

In case of using the control as zero pressure regulator, it is necessary to connect vent port to a discharge line or screw the optional kit.

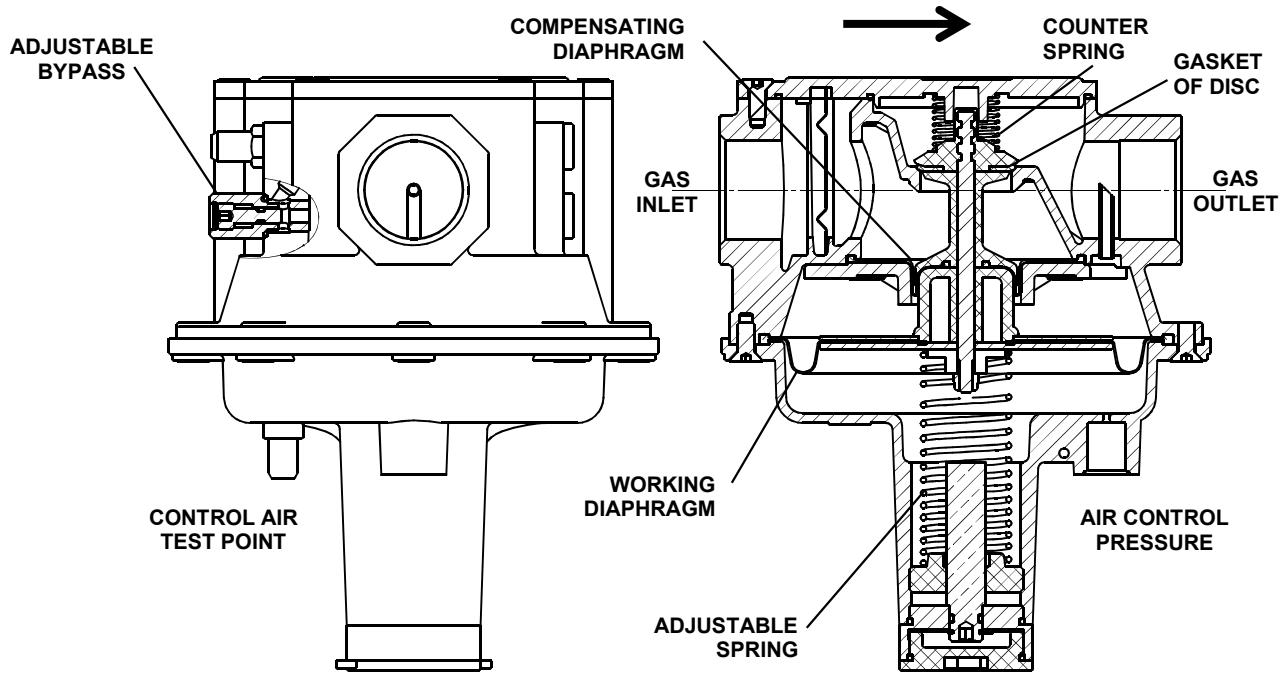


Fig 1

This device is usually installed in gas firing systems. Figure 2 shows an example of installation in combination with other Elektrogas devices.

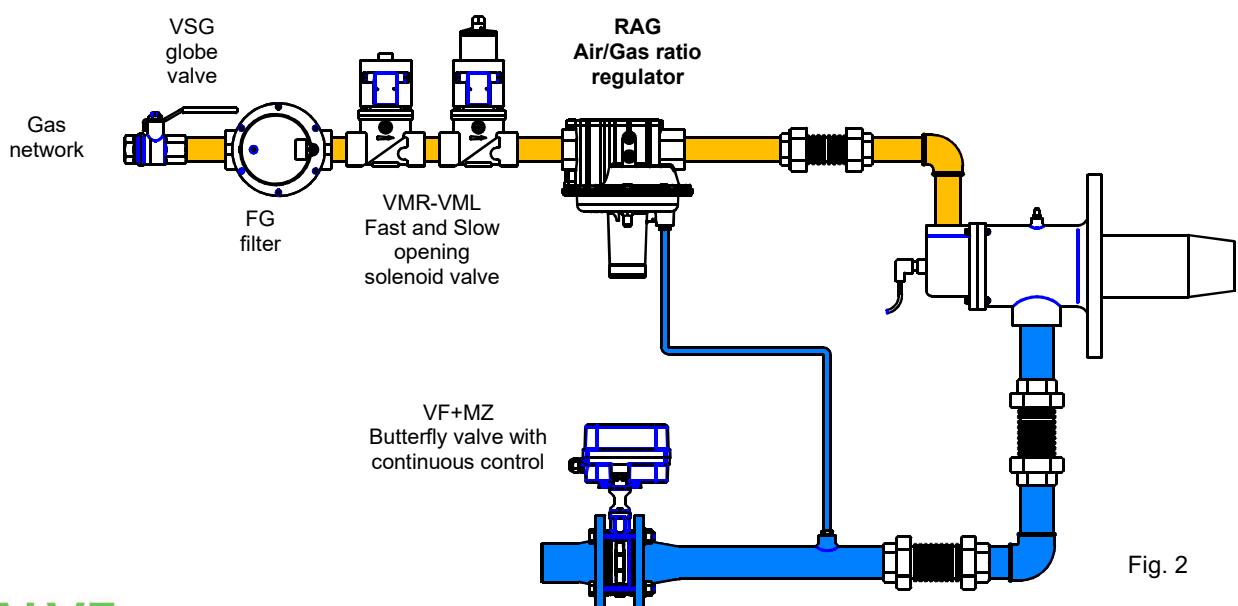


Fig. 2

## Technical specifications

Tab. 1

<b>Main connections</b>	Gas threaded f/f ISO 7-1 from Rp1/2 to Rp2 or ANSI-ASME B1.20 from 1/2"NPT to 2"NPT Flanged ISO 7005 PN16 from DN25, DN40 and DN50
<b>Air connection</b>	G1/4" for models with Rp main threads or ISO flanges 1/4"NPT for models with NPT main threads
<b>Pressure test points</b>	Nipples with internal screws and diameter 9 mm Plugs with threads G1/8" (models with Rp main threads or ISO flanges) or 1/8"NPT (models with NPT main threads)
<b>Ambient temperature</b>	-15°C ... +60°C
<b>Gas Inlet pressure P1</b>	Max 500 mbar (50 kPa) or P out + 2.5 mbar for gas Differential pressure between inlet and outlet pressure less than 100 mbar is advisable.
<b>Air control pressure P3</b>	0.5-120 mbar Gas inlet pressure has to be always higher than air control pressure
<b>Gas Outlet pressure P2</b>	Air control pressure +/- 3 mbar (adjustable offset)
<b>Accuracy</b>	$\pm 1$ mbar or $\pm 15\%$ of air control pressure (plus offset)
<b>Max testing pressure</b>	Max 750 mbar at inlet chamber – max 200 mbar at air control chamber
<b>Flow capacity</b>	See charts. Bypass flow can be set from 0 to max flow (fig.7)
<b>Filtration grade</b>	with metallic filter <1mm
<b>Installation</b>	1/2"-1": horizontal (with adjustable spring downwards) or vertical pipeline. 1 1/2"-2": only horizontal (with adjustable spring downwards)
<b>Gas type</b>	Natural gas, town gas, LPG (gaseous) of families 1,2,3 (EN437). (for biogas see next page).
<b>Materials in contact with gas</b>	Aluminum alloy, Brass, Stainless steel, plated steel Polyamide, Anaerobic adhesive, Nitrile rubber (NBR)
<b>Specifications of J version for biogas or COG</b>	Free of brass. Seals made of Fluoroelastomer (FPM). Without bypass.

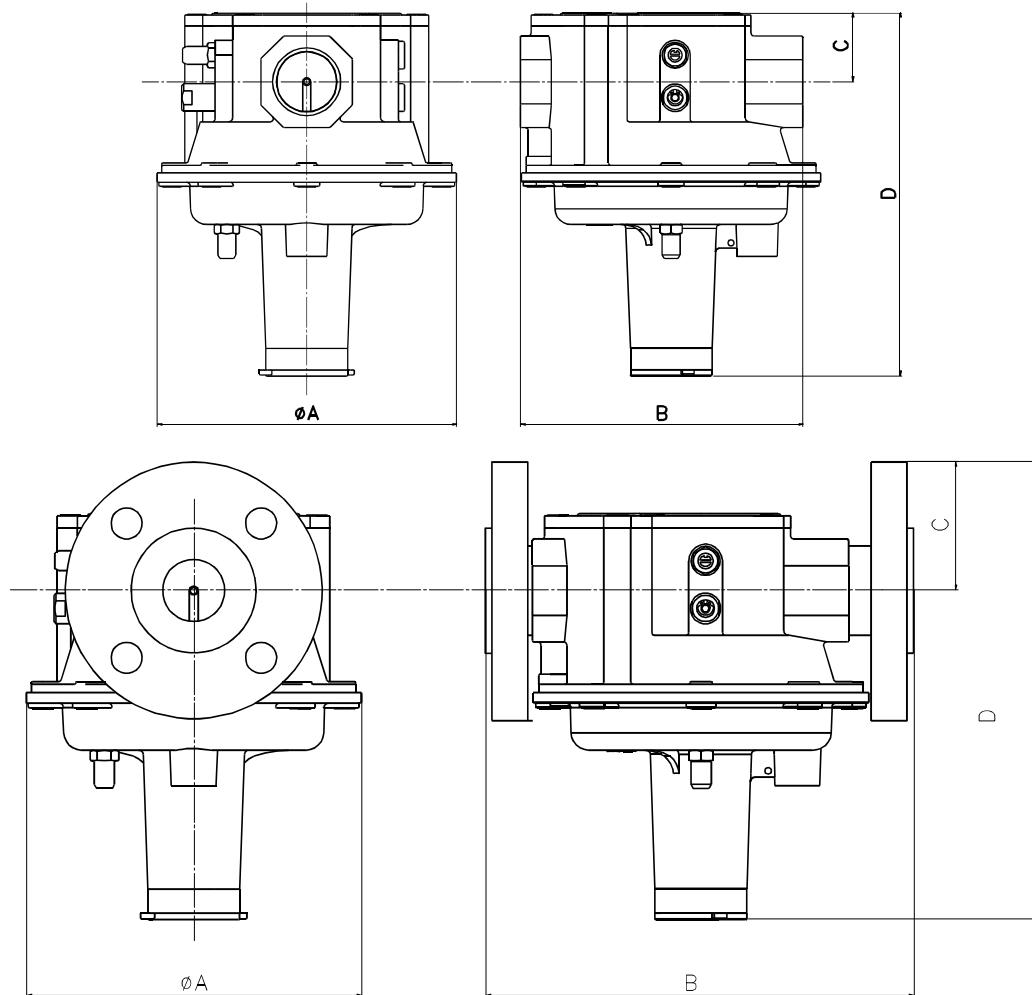


Fig. 3

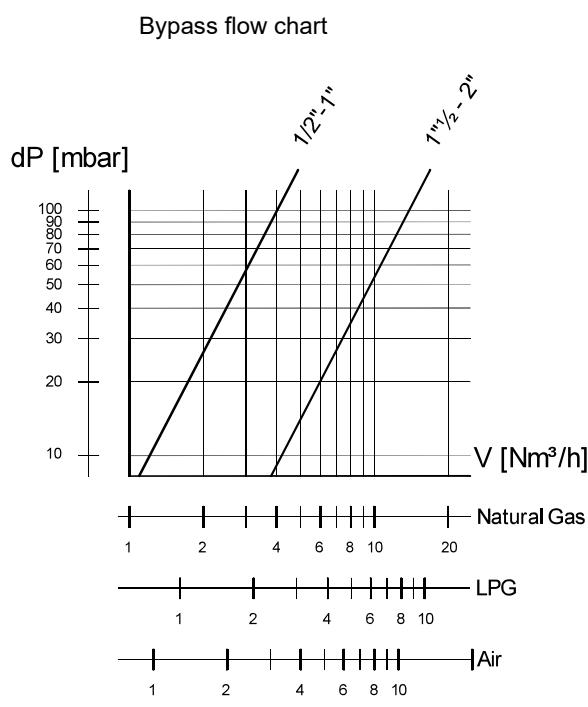
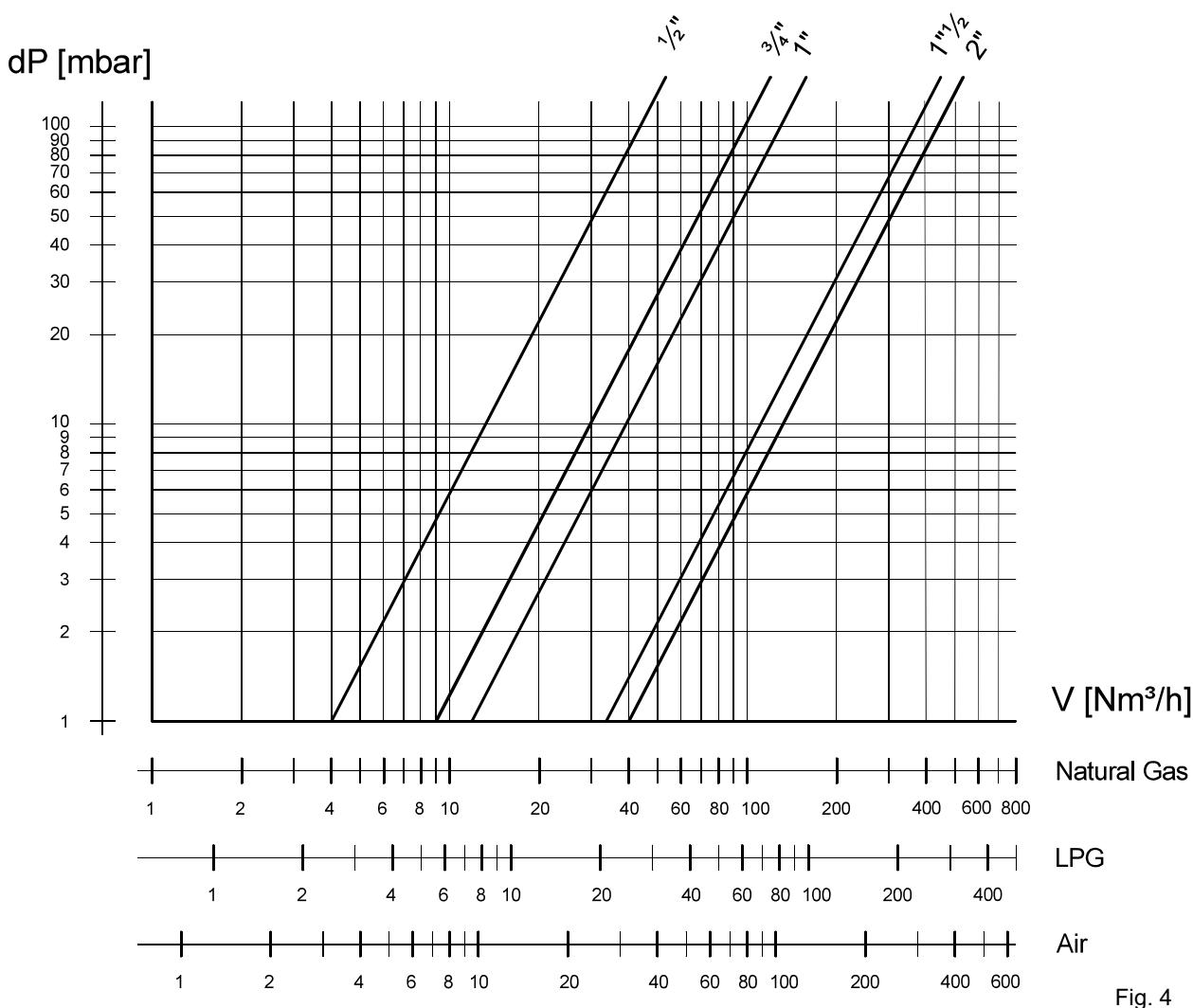
Tab 2

Model	Connection	Overall dimensions [mm]						Weight (Kg)
		A	B	C	D	E	F	
RAG1	1/2"	100	105	36	159	-	-	0,75
RAG2	3/4"	150	141,5	34	182	-	-	1,50
RAG3	1"	150	141,5	34	182	-	-	1,50
RAG4	1 1/2"	242	230	58	308	-	-	5,40
RAG6	2"	242	230	58	308	-	-	5,40
RAG4F <sup>1</sup>	DN40	242	307	75	324	110	4x18	7,50
RAG6F <sup>1</sup>	DN50	242	307	82,5	332	125	4x18	7,50

(<sup>1</sup>) with flanged connection kit mounted

## Gas flow chart

Disc blocked in open position - Pressure drop



Gas type	Density $\rho$ (typical value) [Kg/m³]	$k = \sqrt{\frac{1.25}{\rho_{GAS}}}$
Natural gas	0,80	1,25
LPG	2,08	0,77
Air	1,25	1,00

Conversion of flow from air to other gases  
(15°C, 1013 mbar, dry)

$$V_{GAS} = k \cdot V_{AIR}$$

Fig. 5

## Selection

To select a regulator, it is necessary to know:

- **Gas type (natural gas, LPG,...)**
- **Inlet gas pressure**
- **Air control pressure (high fire)**
- **Gas flowrate requested (high fire)**

The regulator will work properly if:

- gas flowrate requested is lower than max flow rate that regulator can give with available pressure drop and a suitable margin (advisable +40% for air pressure higher 40mbar and +80% for air pressure lower 20mbar) ;
- gas flowrate requested is higher than minimum flowrate of regulator. Minimum flowrate is lower than 1/10 of max flow rate.

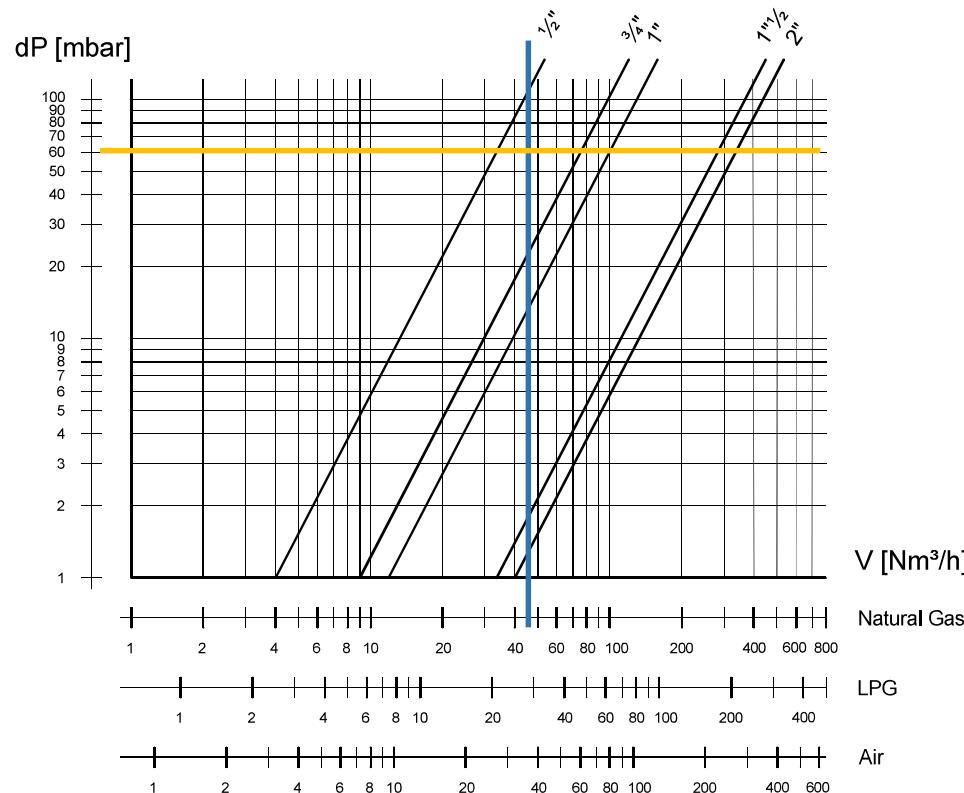
*Example:*

Select a ratio regulator:

- for Natural Gas
- gas inlet pressure 80mbar
- max air pressure 20mbar
- requested gas flow 45 Nm<sup>3</sup>/h

Considering that outlet gas pressure is equal to air pressure, the available pressure drop is:  
 $80 - 20 = 60\text{mbar}$

In fig. 4 we can see max flow rate with available pressure drop  $D_p$  60mbar (yellow line) and Natural gas. We consider only regulators with a flowrate higher than that requested (blue line).



Possible solutions are:

- RAG2  $\frac{3}{4}''$  Vmax approximately 75 Nm<sup>3</sup>/h
- RAG3 1" Vmax approximately 100 Nm<sup>3</sup>/h

and working margin is:

for RAG2  
 $75/45 - 1 = +66\%$

for RAG3  
 $100/45 - 1 = +122\%$

Considering that air pressure is 20 mabr and advisable margin is +80%, RAG3 is chosen.

The minimum flow of RAG3 is  $V_{max} / 10$  that is  $100/10 = 10 \text{ Nm}^3/\text{h}$ , requested flow is higher than such value, so this regulator will work well.

## Ordering information

RAG	3	.	-
<b>Regulator type</b> RAG = air/gas ratio regulator			
<b>Connections</b>			
1 Rp1/2 1N 1/2"NPT 2 Rp3/4 2N 3/4"NPT 3 Rp1 3N 1"NPT 4 Rp1½ 4N 1"½NPT 6 Rp2 6N 2"NPT 4F DN40 6F DN50			
<b>Special version</b> - standard J = version for Biogas			

## Special versions and optionals

The controls can be supplied in special versions for aggressive gases such as biogas and COG (version J), see Tab.1 for features. It is recommended to check compatibility of gas contents and valve materials before installation.

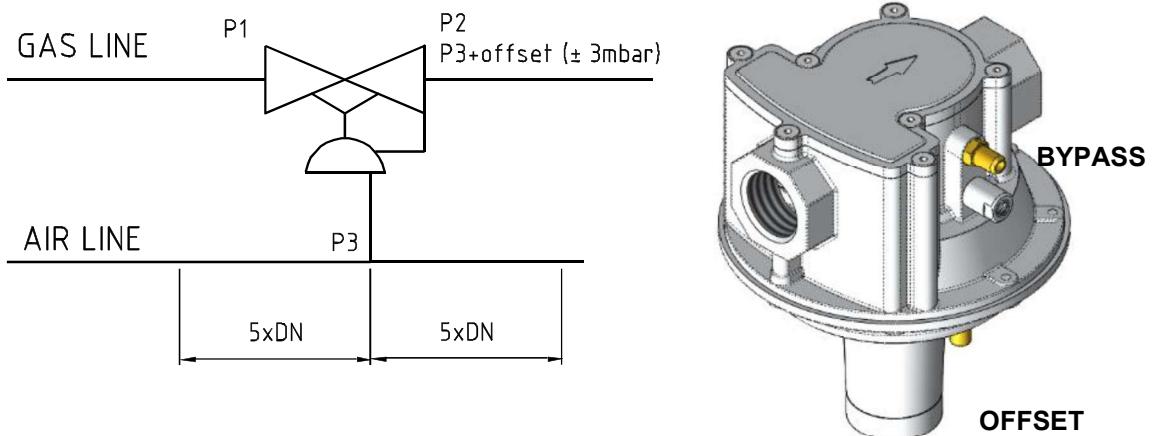
**VZ:** kit to use RAG as zero-pressure regulator

**VZ.N:** kit to use RAG NPT as zero-pressure regulator

## Design, installation and servicing

To assure a proper and safe operation, as well as a long service life of the regulator, consider the following recommendations:

- ✓ Ensure that all the features of your system comply with the specifications of the regulator (gas type, operating pressure, flow rate, ambient temperature, etc.).
- ✓ Ensure that installing area is dry
- ✓ Make sure all works are performed by qualified technicians only and in compliance with local and national codes.



- ✓ Manage the device with proper tools.
- ✓ After removing the end caps, make sure no foreign body will enter into the regulator during handling or installation (e.g. swarf or excessive sealing agent).
- ✓ Perform leak and functional tests after mounting.
- ✓ To adjust the offset, remove the protective cap and turn the adjusting screw with an Allen key. After adjustment, remount protective cap.
- ✓ To adjust the bypass, unscrew the internal screw until the requested flow.
- ✓ In case of use as zero pressure regulator, connect vent port to a discharge line or screw the optional kit.
- ✓ The controls need no maintenance.
- ✓ Due to rubber seals aging, to ensure safe operation, we recommend the governor replacement after 10 years from the date of manufacture stamped on the product.
- ✓ This device must be installed in compliance with the rules in force.
- ✓ To prevent product damage and dangerous situations, read carefully the instructions supplied with the product before use.

For more details see the [Installation and Service Instructions](#).



## Standards and approvals

The regulators are designed and manufactured according to European norm EN 88-1.

Quality Management System is certified according to UNI EN ISO 9001.



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The information in this document contains general descriptions of technical options available and based on current specifications.

The company reserves the right to make changes in specifications and models as design improvements are introduced, without prior notice.

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