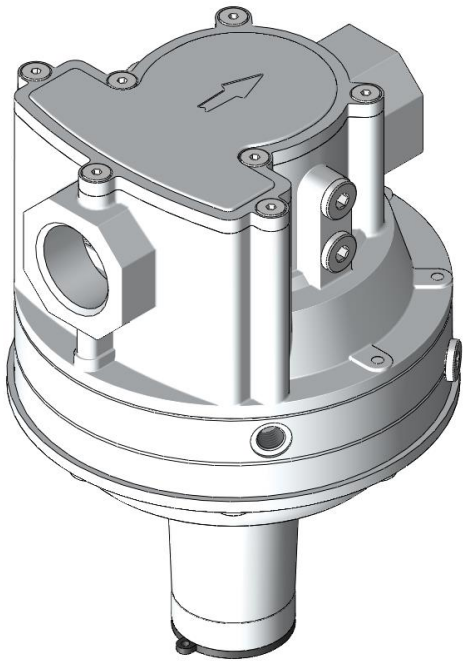


RAGH

Air differential / Gas ratio regulators

RAGH
Gas / Air differential ratio regulators for gas

Contents

Description

The RAGH type regulator has been designed for burner with preheated air. It is able to maintain a constant ratio between air and gas flow during the different phases of burner working. In a regenerative or recuperative burner with the same air inlet pressure, the air flow changes during burner working and aging. Air flow depends on air preheating grade and the presence of dirty on recuperator or regenerator. RAGH is able to supply a gas pressure proportional to Air differential pressure, which is directly linked with air flow.

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 differential pressure up to 35 mbar.

They are equipped with an adjustable spring, so that gas outlet pressure is equal to air control differential pressure, with a ratio 1:4 and an adjustable offset of +/-3mbar.

RAGH regulators can be used also with modulating burner with preheating, they have been designed for a flow regulation range equal to 4:1. Design is optimized to generate low pressure drop.

The controls are equipped with inlet pressure compensating diaphragm for 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.

Provided with pressure test points in gas inlet, outlet and air control chamber to connect manometers, pressure switches or other equipments. On request pressure test points can be provided with nipples Ø9 for fast connection of measuring instruments.

It is possible to provide RAGH with a bypass adjustable on-site. Bypass is useful in low fire state when a constant low gas flow is necessary.

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).

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

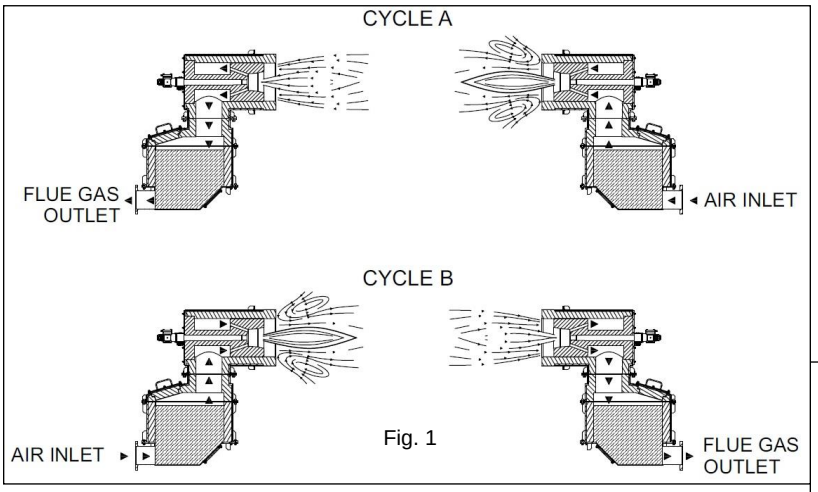


Fig. 1

In fig. 1 it is described the working of regeneratives burners: when a burner ignites the heat exchanger is very hot, so air warms, expands and its flow is lower. During burner working, heat exchanger cools and air flow increase.

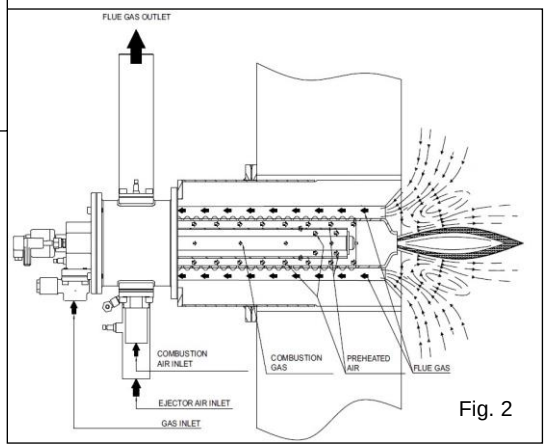


Fig. 2

In fig. 2 it is sketched a recuperative burner: when it ignites the recuperator is cold, so air flow is higher, after some time recuperator warms, air warms and its flow decrease. If recuperative burner are used with pulse firing control, air flow is always changing, so a correct gas flow is very important for an efficient combustion.

Furthermore air flow can change due to dirty accumulation on heat exchanger: dirty reduce heat exchange and reduce air flow.

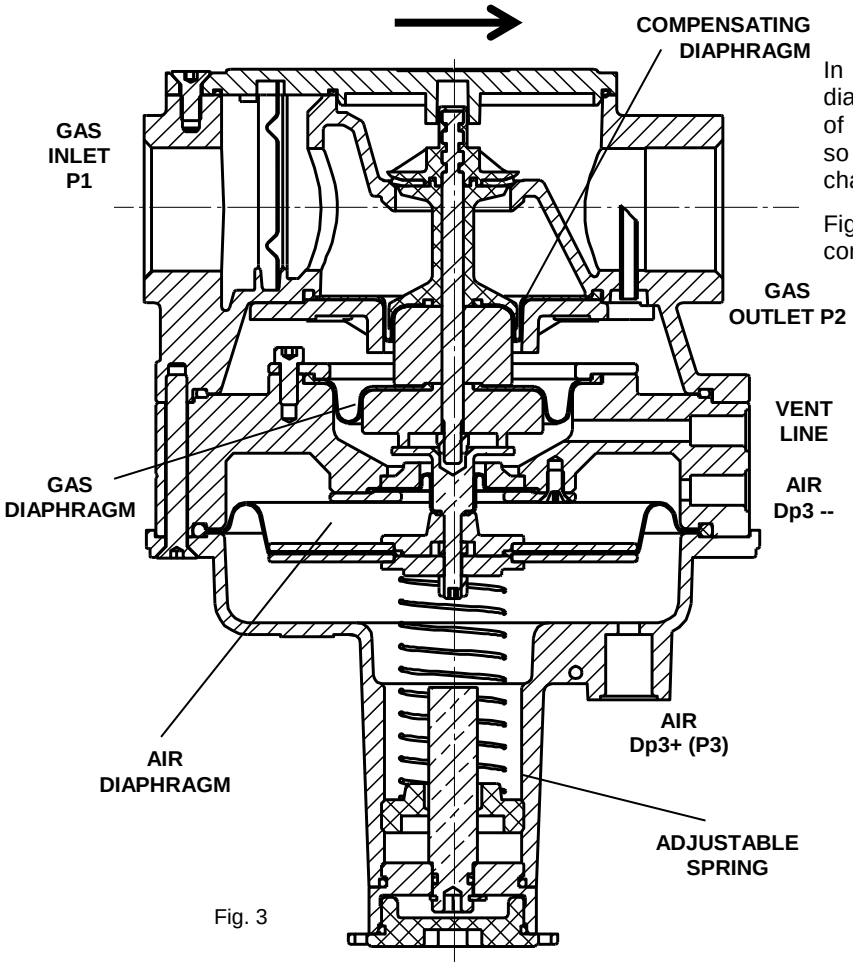


Fig. 3

In RAGH outlet gas pressure pushes gas diaphragm and air differential pushes the two sides of air diaphragm. The two diaphragm are coupled so a change in air differential pressure results in a change of gas outlet pressure.

Figure 4 shows an example of installation in combination with other Elektrogas devices.

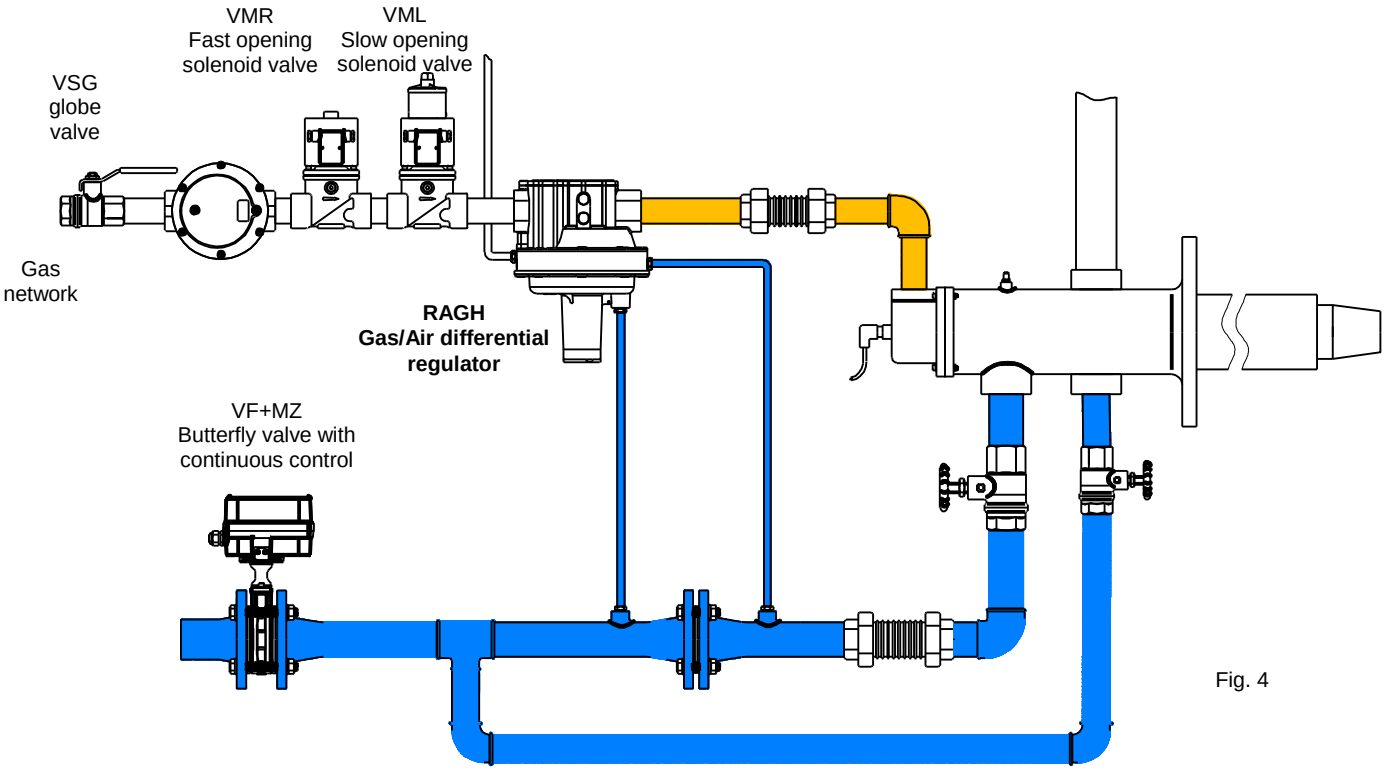


Fig. 4

Tab. 1

Technical specifications

Connections	Gas threaded f/f ISO 7-1 from Rp1/2 to Rp2
Ambient temperature	-15°C ... +60°C
Gas Inlet Pressure P1	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.
Air differential pressure Dp3	2-35 mbar
Air pressure P3	Max 150mbar
Gas Outlet pressure P2	4 x Air control differential pressure +/- 3 mbar (adjustable offset)
Accuracy	±1mbar or ±15% of 4 x Dp3 (plus offset)
Max testing pressure	Max 750 mbar at inlet chamber – max 50 mbar at air control chambers
Flow capacity	See charts. Bypass flow can be set from 0 to max flow (fig.7)
Filtration grade	with metallic filter <1mm
Installation	Horizontal pipeline with adjustable spring downwards
Gas type	Natural gas, town gas, LPG (gaseous) of families 1,2,3 (EN437). On request special version for biologically produced methane without non-ferrous material and special seals.
Materials in contact with gas	Aluminum alloy, Brass, Stainless steel, plated steel Polyamide, Anaerobic adhesive Nitrile rubber (NBR), Fluoroelastomer (FPM), Polytetrafluoroethylene (PTFE)

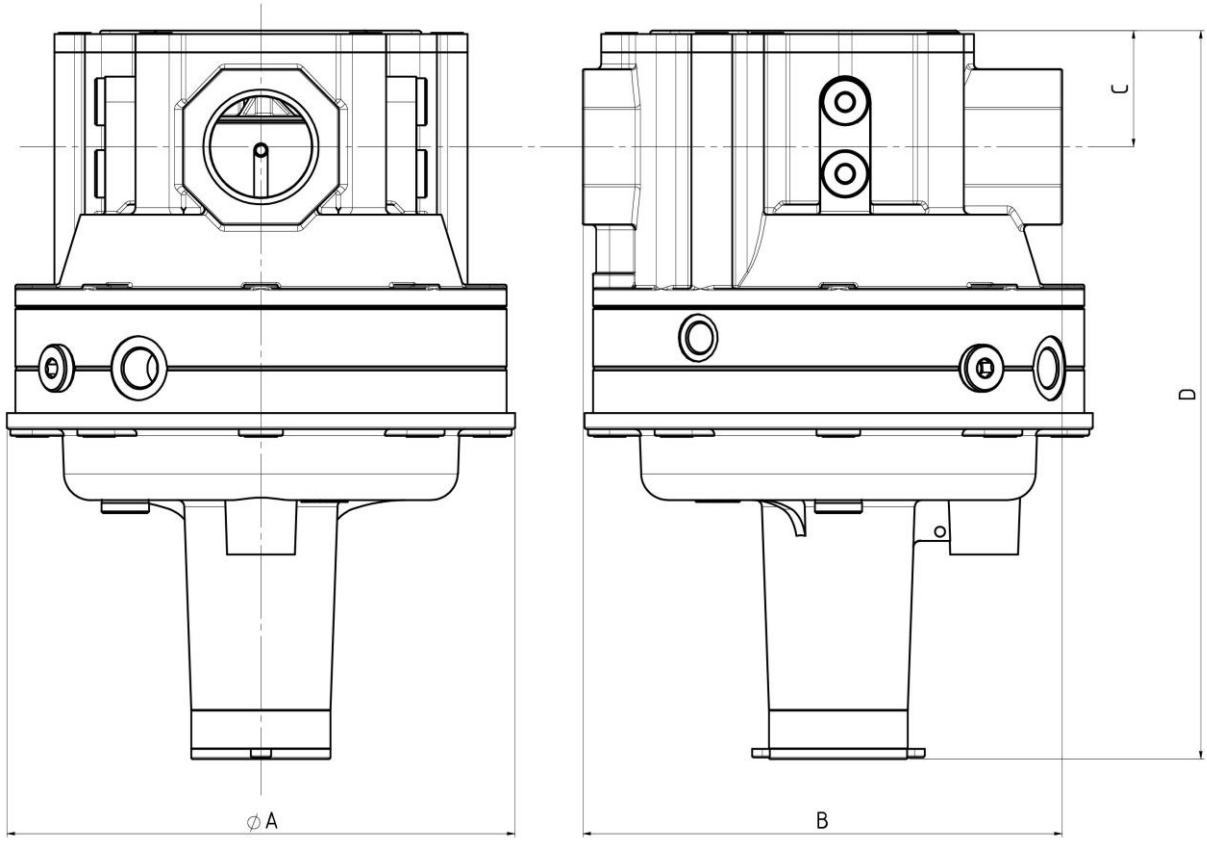


Fig. 4

Tab 2

Model	Connection	Overall dimensions [mm]						Weight (Kg)
		A	B	C	D			
RAGH1(*)	Rp 1/2	118	105	22	202	-	-	1,10
RAGH2	Rp 3/4	150	141.5	34	216	-	-	1,50
RAGH3	Rp 1	150	141.5	34	216	-	-	1,50
RAGH4(*)	Rp 1½	150	224	60	340	-	-	2,55
RAGH6(*)	Rp2	150	224	60	340	-	-	2,45

([1]) with flanged connection kit mounted
(*) Not available, project in progress

Gas flow chart with disc blocked in open position

(Pressure drop)

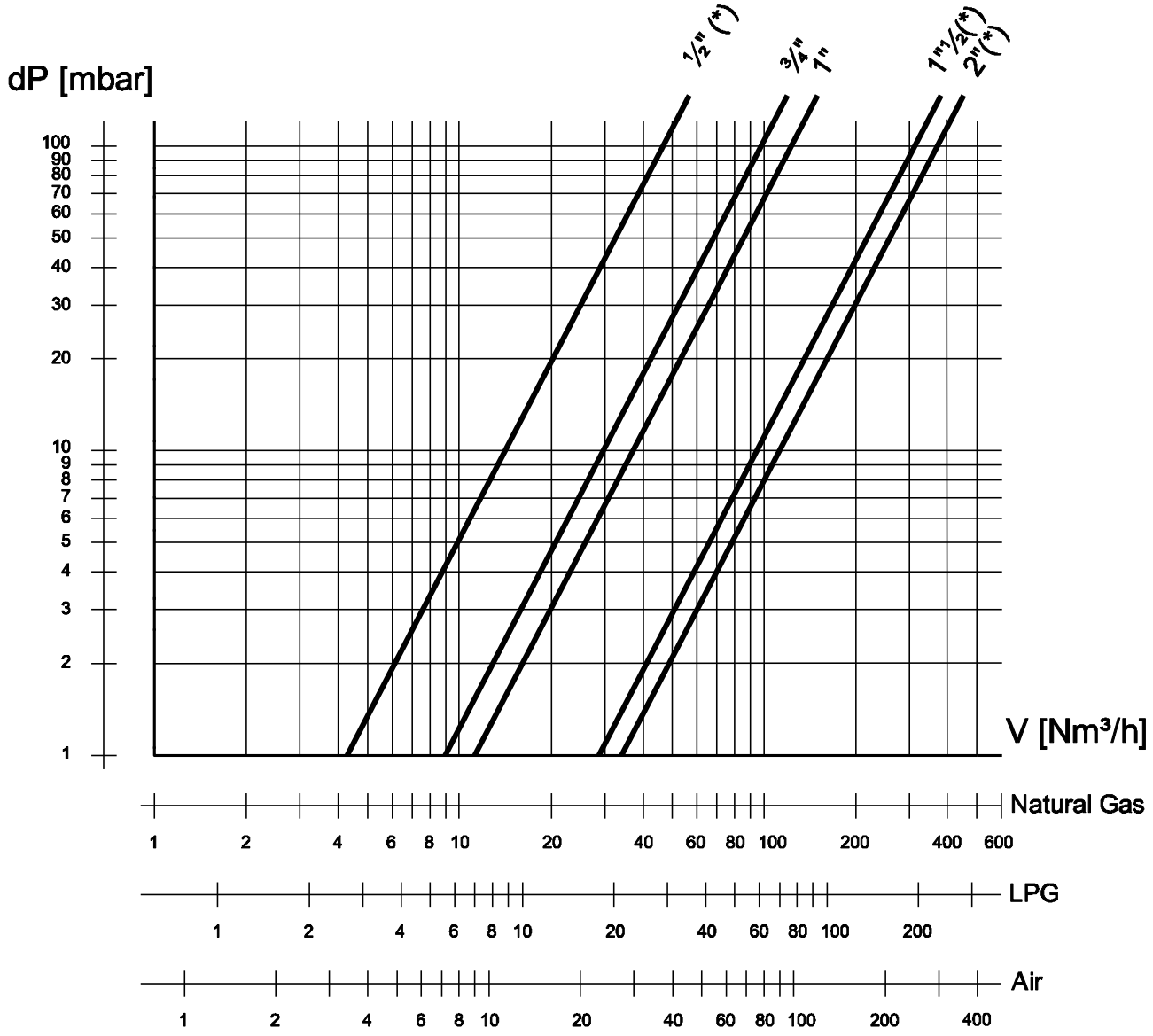


Fig. 5

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

Tab. 3

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

Gas type	Specific gravity **ρ** (typical value) [Kg/m³]	$k = \sqrt{\frac{125}{\rho_{GAS}}}$
Natural gas	0,80	1,25
LPG	2,08	0,77
Air	1,25	1,00

Maximum Flow chart in operation (P1 200mbar)

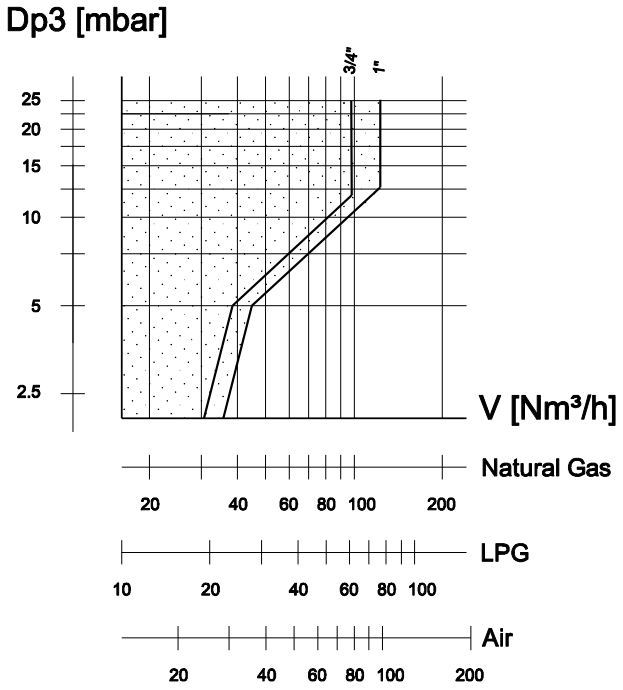


Fig. 6

Bypass Flow (on request)

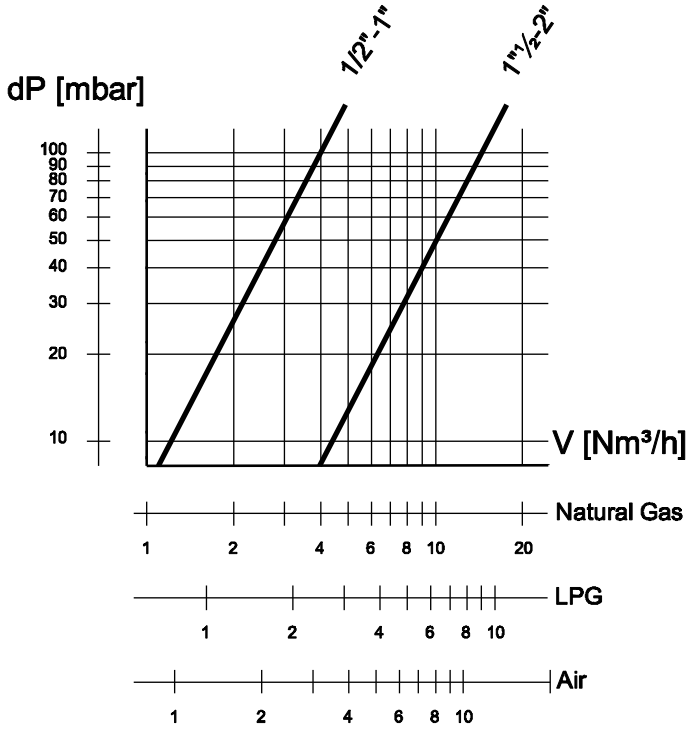


Fig. 7

Selection

To select a regulator, it is necessary to know:

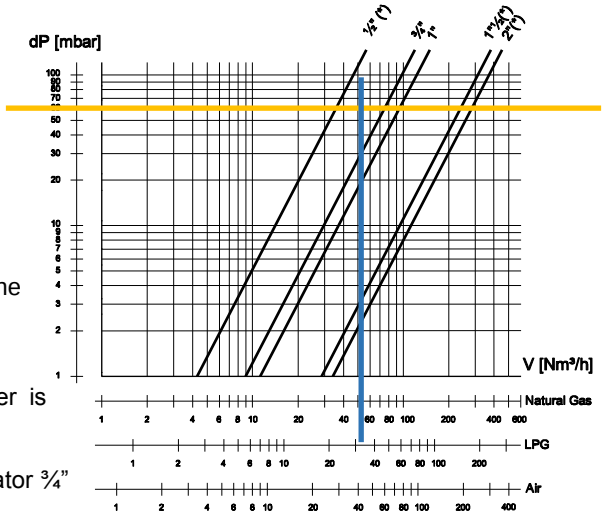
- **gaseous media (natural gas, LPG,…)**
- **inlet gas pressure**
- **max differential pressure of control air**
- **gas flow at max differential air pressure**

The regulator will work properly if:

- available pressure drop is higher than requested pressure drop

- gas flow is lower than maximum gas flow considering differential pressure of air

Requested pressure drop can be seen from fig. 5, while maximum gas flow from fig. 6



Example:

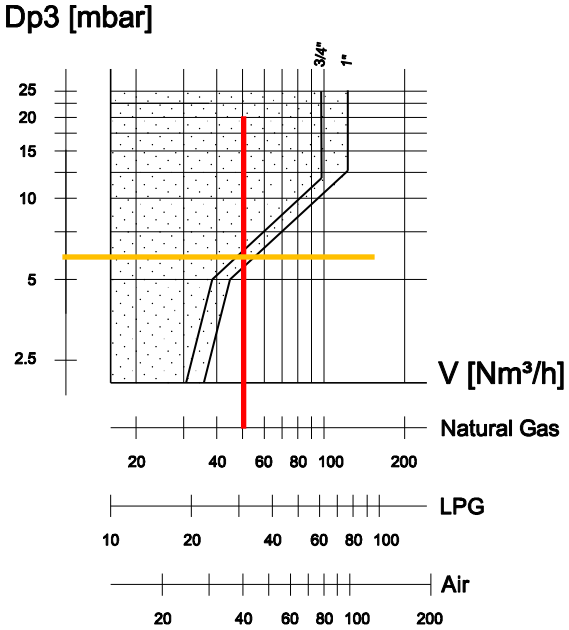
Select a ratio regulator :
- for Natural Gas (CH_4)
- gas inlet pressure 80mbar
- max air differential pressure 6mbar
- max gas flow 50 Nm^3/h

Considering inlet and outlet pressure, the available pressure drop is:
80 – 20 = 60mbar

In fig. 5 we see that a regulator ¾" or higher is needed.

Now we consider the maximum flow of a regulator ¾" in operation (Fig.6).

Considering this graph, we see that the working point is out of the area of correct working of regulator ¾", while it is inside the limit of a regulator 1".
RAGH3 1" will work properly (tolerances prescribed by EN88).



We can also check:

-the margin of pressure drop (at least 50%):
RAGH 1" - 50 Nm^3/h of Natural Gas
Requested pressure drop - fig. 5: 18mbar
Available pressure drop: 60mbar
60 : 18 = 333% > 150% → OK

- the minimum air pressure must be higher than 2mbar, or we have to use special version with bypass

-the gas speed at outlet to avoid noise and excessive turbulence (speed lower than 30m/sec are advisable):
Pipe 1", internal diameter 28mm, speed 20 Nm/s → OK

Note that when differential pressure of air is zero or negative, a minimum flow can be present: with no control pressure, outlet pressure is equal or inferior to 2mbar. For sure, if safety valves are close, no gas flow is present.

Ordering information

	RAGH	3	.	-
Regulator type **RAGH = regulator for preheated air**				
Connections size 1 = Rp1/2 2 = Rp3/4 3 = Rp1 4 = Rp1½ 6 = Rp2				
Special version - standard B = version with bypass J = version for bio and coke gas				

Special versions and optionals

The control can be supplied with a bypass adjustable on site.

Controls can be supplied in special versions for aggressive gases such as biogas and COG (version J), they are free of non-ferrous metals and provided with rubber part made of FKM.

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.

✓ Vent line must be connected to a vent line conveyed to a safe area. Vent line must be at atmospheric pressure. 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 Directive on the Gas Appliances Directive 2009/142/EC, on the basis of norm EN88. The certification process is in progress.

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

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.

Elektrogas is a brand name of:

Elettromeccanica Delta S.p.A.
Via Trieste 132
31030 Arcade (TV) – ITALY

tel +39 0422 874068
fax +39 0422 874048
www.delta-elektrogas.com
info@delta-elektrogas.com