GORTER
CONTROLS

the **specialist** in the **efficient, sunstainable** and **safe distribution** of **gasses**

high pressure regulators R100 series

general

R100, R100S, R100SO
R100(S)-M and R101S

R100

The R100 series consists of several effective high pressure regulators (monitors) for use in gas transmission systems, gas distribution networks and industrial gas pressure regulating systems.

The R064, the predecessor of the R100, has demonstrated its quality and usability for over 25 years. With regard to the R064, the R100 has been improved considerably and modified according to current technology.

The R100 is a pilot controlled regulator with direct acting features. The direct acting part is extremely fast, while the somewhat slower pilot minimises set point deviations.

The R100 series consists of five types of regulators:
- R100   : the pilot-controlled standard model;
- R100SO   : same as R100 but spring to open;
- R100S   : same as R100/R100SO but with
  R100(S)-SO low-noise cage;
- R100(S)-M : monitor version of the R100 with or
               without low-noise cage;
- R101S   : same as R100 with hybrid low-noise cage;

All standard models are supplied with a pilot and are suitable for an inlet pressure up to 100 bar and an outlet pressure range of 0.5 up to and including 60 bar.

R100S

The R100S pressure regulator is a low-noise version of the R100, with noise reduction up to 40 dB(A). The special low-noise cage reduces the sound at the source instead of damping it and is therefore very effective and satisfies the current requirements on sound level. Except for the low-noise cage, the R100S is identical to the standard version R100. Higher outlet pressures are available on request.
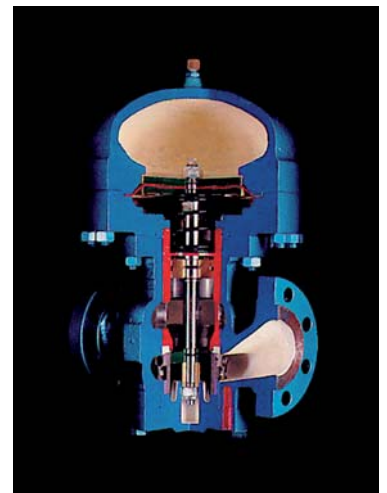
R100(S)-M

The R100(S)-M can be used as working or as a fully open monitor. A monitor is an emergency regulator that is activated immediately after the main regulator fails open. In contrast to other safety devices, such as safety shut-off or safety cut-off devices, the gas supply is not interrupted if the main regulator fails to open. The construction and operation of the R100(S)-M are similar to those of to the standard R100 regulator. This gives the R100(S)-M its unique properties with respect to fast action, low lock-up pressure, accuracy and stabillity, making it superior to other fully open and working monitor designs. The monitor can be supplied with (R100S-M) or without low-noise cage (R100-M) and acceleration pilot.

R101S

The R101S is a regulator with a hybrid low-noise cage. Using a low-noise cage always results in a reduction of capacity. There are circumstances when the regulator must maintain a specific nominal capacity in combination with a low-noise level in case of both high and low inlet pressures. In those instances, a regulator with a greater nominal diameter normally has to be selected.

As an alternative to this, Gorter Controls has succesfully developed the hybrid low-noise cage. This hybrid low-noise cage guarantees noise reduction under normal operating conditions. In extreme situations where inlet pressure and gas speeds are low as is noise generation, the noise reduction potential can be optimised in combination with maximum capacity and minimum nominal diameter. In this way, over-dimensioning is prevented.

R100S

features

>> **Low maintenance costs**

> **Long maintenance interval because of:**
- minimal friction
- minimal number of parts

> **Easy to assemble / disassemble:**
- regulator body remains in line during maintenance
- seat ring is easy to inspect

> **The use of economical materials**

>> **Optimal noise reduction**

Using patented techniques and a noise-reducing cage, the BAAI R100(S) can reduce noise production to an acceptable minimum. Noise reduction up to 40 dB(A) is possible, depending on the user's environment.

>> **Optimal control at pressure differences from 0.5 bar**

The BAAI R100(S) distinghuises itself from the competition by its ability to control the gas pressure perfectly at pressure differences from 0.5 bar. The optimally balanced valve construction of the BAAI R100(S) thus makes it highly suitable for extreme applications.

>> **Special patented valve seat**

- long maintenance interval due to the erosion-free enclosure of the seat ring
- bubble-tight even at low temperatures
- low lock-up pressure

>> **Excellent control characteristics**

- high degree of control accuracy ($\leq$1%)
- low lock-up pressure ($\leq$2,5%)
- fast response

because of:
- voluminous actuator
- large diaphragm area
- minimal hysteresis
- low set point deviation due to a two-stage pilot
- balanced design

>> **High specific flow rate**

- hydrodynamically favourable design of regulator body

>> **Remote or flow control**

- By using a special pilot, the regulator can be remote controlled or used as a flow controller in combination with the proper instrumentation.
- Compared to normal control valves, this has the advantage that pressure control is continued even if external power is lost.

>> **Clear and complete technical documentation**

- satisfies current requirements
- available in different languages

Because of its special construction, the low-noise cage has a noise reduction effect that is virtually independent of the flow rate. Moreover, noise reduction increases as the difference in pressure across the regulator increases.

Patented valve seat

Seatring

Control member

Low-noise cage R100S

| R100 | R200 | C210 | HSV086 | A050 | COCON |
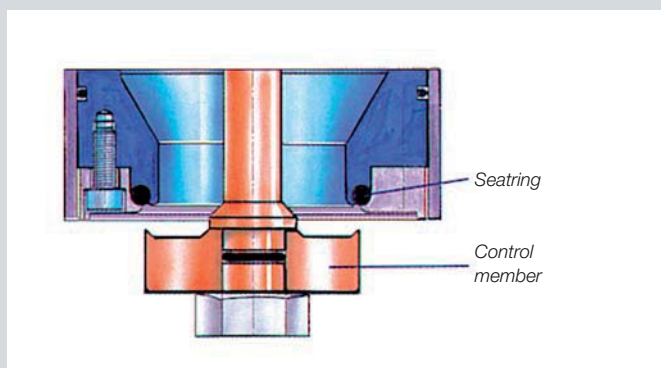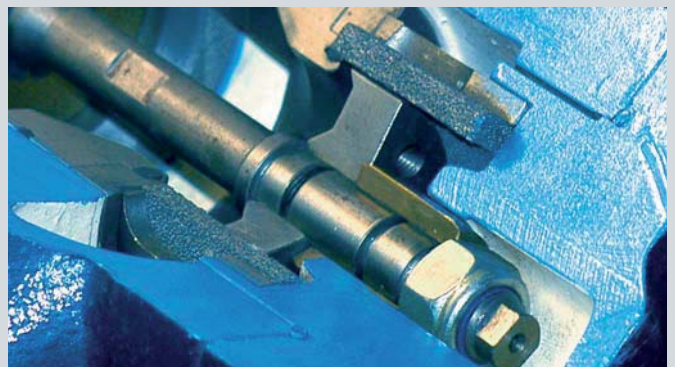
operation R100 / R100S / R101S / R100(S)-M

R100 / R100S / R101S

In a balanced situation, the control member (10) allows a flow rate equal to the gas demand; the outlet pressure Pa is equal to the set pressure. When the outlet pressure is lowered, for example by an increase in gas demand, the direct control loop of the regulator begins to function. The lower outlet pressure under the diaphragm (8) leads directly to a diaphragm shift and the control member (10) also opens further, which quickly allows a greater flow rate to pass the control member (10), and the outlet pressure Pa is consequently raised.

The diaphragm shift causes gas volume to increase in the actuator (7) and the spring (9) is further compressed. Thus a new balance situation is created at a lower outlet pressure. The indirect control loop of the pilot corrects this decrease in pressure. Due to the pressure drop mentioned, the diaphragm (3) of the pilot will attain a lower position, by which the pilot valve (4) will be opened further, which causes a gas flow to the actuator (7). This causes the pressure in the actuator to increase almost to the point that the set outlet pressure is reached. The outlet pressure is set using the adjusting screw (1) and set point adjusting spring (2). The gas flow to the pilot valve (4) is provided by the stabiliser part. The stabiliser (6) is a small regulator that maintains a fixed difference between the outlet pressure and the feeding pressure (5) despite variations in inlet pressure Pe.

An increase in outlet pressure causes the opposite to occur. If gas demand ceases, the control member shuts completely and the actuator pressure is reduced to with the outlet pressure, enabling the power of the spring (9) to shut the control member (10).
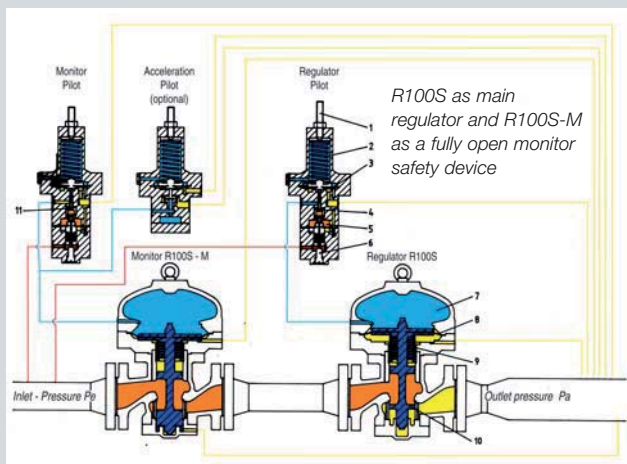
R100(S)-M

The operation of the R100(S)-M, used as working or as a full open monitor is similar to the standard regulator R100(S). In normal operation, the monitor control member is in a fully open position because the monitor set point is higher than the set point of the regulator (valve of the monitor pilot (11)). When the regulator fails, causing the regulator control member to open, the monitor becomes active at the very moment the outlet pressure reaches the set point of the monitor. The valve of the monitor pilot (11) closes and causes a temporary gas flow from the actuator to the outlet. The motorisation pressure decreases and the monitor control member travels in closing direction untill the outlet pressure equals the set point of the monitor. After the monitor has taken over control, it operates in a similar manner to the regulator R100(S).

To limit the take over time an acceleration pilot can be added. The acceleration pilot is only active during the takeover and causes an extra flow from the actuator to the outlet.

R100-SO / R100(S)-SO

The R100 is available in a spring to open configuration. It fails open.
In case: - The main diagram ruptures.
             - The pilot circuit is not fed.
             - Operation is identical to the R100 / R100S / R101S.

Operation scheme

R100S as main regulator and R100S-M as a fully open monitor safety device

technical specifications

General

Type indication	BAAI-R100 series
Pressure class	ANSI 300 and ANSI 600(*)
Inlet pressure range	3 to 50 bar ANSI 300, 100 bar ANSI 600
Outlet pressure range	1-49.5 bar ANSI 300
	1-60 bar ANSI 600
Min. pressure difference needed for correct operation	0.5 bar
Operating temperature	-20°C to + 60°C
Ambient temperature	-30°C to + 60°C

(*) Other pressure classes up to ANSI 2500 are available.

Flow coefficient

Nominal size (inches/mm)		Cg value R100 \ R100-M \ R100SO	R100S \ R100(S)-M \ R100(S)-(SO)
1"	25	400	370
2"	50	2,000	1,210
3"	80	4,000	2,800
4"	100	6,760	4,970
6"	150	14,400	10,100
8"	200	27,100	19,700
10"	250	37,000	30,000
12"	300	48,000	38,500

Flow coefficient for R101S on request.

Classification acc. DIN 3380 / EN334

Accuracy class /	Pa ≤ 3 bar : RG 2.5 / SG 10
lock-up pressure class	Pa > 3 bar : RG 1 / SG 2.5
Lock-up pressure zone	SZ = 2.5
DIN-DVGW registered & CE marked	

Note: All pressures listed are overpressures.

Measurements (mm) and weights (kg)

Nominal Size (inches/mm)

Inches	mm	A	B	C	L	Weight
1"	25	260	230	75	216	50
2"	50	355	290	120	292	95
3"	80	415	350	150	356	160
4"	100	480	430	175	432	280
6"	150	640	625	240	559	690
8"	200	790	655	300	660	950
10"	250	1110	655	320	838	1250
12"	300	1400	521	320	838	1600

10" and 12" are top entry design

Material specifications (standard)

Part	Material	Part	Material
Valve body	A352-LCC(QT) (1"/DN25 S355N)	Diaphragm	NBR with nylon reinforcement
		Silencer	Metal foam (CvNi)
Guide bushing	S355 or equal	Dynamic O-rings	Viton
Bottom flange	A352-LCC(QT) (1"/DN25 S355)	Static O-rings	NBR
		Pilot body	S355N or equal

Special materials upon request.

Capacity calculation

The following formulas can be used to determine the capacity.

$$Q_n = \frac{13.94}{\sqrt{d(Te + 273)}} . Cg . \sqrt{(Pe-Pa).Pa}$$

$$for \quad \frac{Pa}{Pe} \geq 0.5$$

$$Q_n = \frac{6.97}{\sqrt{d(Te + 273)}} . Cg . Pe$$

$$for \quad \frac{Pa}{Pe} \leq 0.5$$

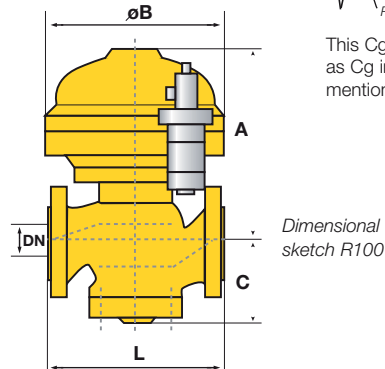|		
Qn	=	capacity in m_n^3/h
Pe	=	inlet pressure in bars
Pa	=	outlet pressure in bars
Cg	=	flow coefficient
d	=	relative density (air=1)
Te	=	temperature of the gas at the inlet of the regulator
rn	=	density of the gas in normal conditions (with T=273 Kelvin)

For natural gas with ρ_n = 0.83 kg/m³
d = 0.643

For gasses other than natural gas
d = ρ_n gas/1.29

In case of a combination regulator and monitor, use the following serial thesis:

$$Cg\_tot = \sqrt{\frac{1}{\left(\frac{1}{Cg_{Regulator}}\right)^2 + \left(\frac{1}{Cg_{Monitor}}\right)^2}}$$

This Cg-tot can be filled in as Cg in one of the above mentioned formulas.

Dimensional sketch R100

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