

# MR HP20

Gas pressure regulator

Inlet pressure 20 bar

Nominal diameter DN 25, DN 50, DN 80, DN 100



## Applications

Pressure reduction for:

- District distribution
- Industrial uses

## Brief information

The gas pressure regulator MR HP20 is spring loaded and fully inlet pressure balanced. The device has a standard integrated safety shut-off valve (SSV). It is a member of the MR regulator family, which is known for excellent regulation and lock-up behaviour and easy maintenance.

The MR HP20 has been designed on a modular basis which allows the regulator mechanism to be removed without disturbing the pipework. By removing only four screws, the MR HP20 module can be removed from the body. This allows routine servicing and maintenance to be undertaken under workshop conditions.

The MR HP20 can be used in industrial or commercial applications.

The unit is approved by DVGW according to the Pressure Equipment Directive 97/23/EC (PED) in conjunction with EN 334 / EN 14382.

Registration number: CE-0085CL0053.

## Technical data

- Inlet pressure range  $p_U$ : 200 mbar respectively  $p_{ds} + 100$  mbar to 20 bar
- Outlet pressure range  $p_{ds}$ : 20 to 2000 mbar

Ordering example: Gas pressure regulator MR HP20 with over and under pressure shut-off valve.

- Nominal diameter DN ...
- Flange connection PN or ANSI
- Inlet pressure ... to ... bar
- Regulator set range (Diaphragm size MW)
- Outlet pressure set range (optional: set point)
- Over pressure shut-off spring range (optional: set point)
- Under pressure shut-off spring range (optional: set point)

## Main features

- Spring loaded
- Fully inlet pressure balanced
- Modular design
- User-friendly spring adjustment
- High flow rate
- Integral strength according to EN 334
- Integrated safety shut-off valve for over and under pressure
- SSV functional class A according to EN 14382
- Minimum differential pressure 100 mbar
- Easy maintenance through
  - exchangeable regulator head
  - easy SSV diaphragm maintenance
- Sizes DN 25, 50, DN 80, DN 100
- Flanged connections to EN 1092-2, PN16/PN20 or ANSI 150
- Operating temperature -20 °C to +60 °C

## Option

- SSV remote indicator
- Flow direction right - left

## Pressure ranges & accuracy classes for outlet pressure and safety devices

Regulator			Safety shut-off valve			
Control pressure range	Control accuracy class	Lock-up pressure class	Over pressure set point Set range	Accuracy group	Under pressure set point Set range	Accuracy group
mbar	%	%	mbar	%	mbar	%
$p_{ds}$ 20 – 100	AC 10	SG 20	$p_{dso}$ 50 – 700	AG <sub>O</sub> 10	$p_{dsu}$ 5 – 30	AG <sub>U</sub> 30
$p_{ds}$ 100 – 300	AC 5	SG 10	$p_{dso}$ 700 – 3000	AG <sub>O</sub> 5	$p_{dsu}$ 30 – 1500	AG <sub>U</sub> 10
$p_{ds}$ 300 – 2000	AC 2.5	SG 5				

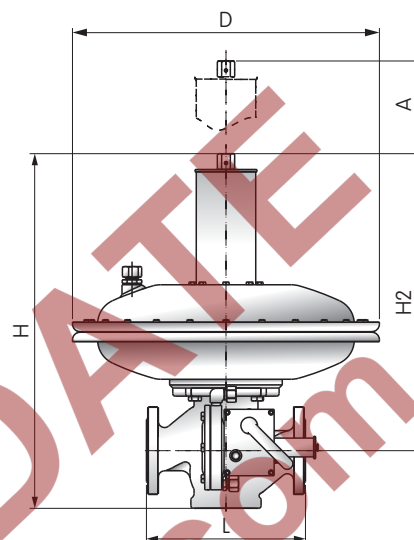
Different control groups on request

## Dimensions and weights

Dimensions											
Measuring unit	MW300				MW400			MW500			
	L	H2	H	D	H2	H	D	H2	H	D	A
DN 25	184	457	534	418	-	-	-	-	-	-	120
DN 50	254	474	566	418	484	576	512	-	-	-	150
DN 80	298	527	662	418	517	652	512	554	689	628	200
DN 100	352	527	662	418	517	652	512	554	689	628	200

Weights [kg]			
Measuring unit	MW300	MW400	MW500
DN 25	38	-	-
DN 50	58	69	-
DN 80	63	77	109
DN 100	67	81	113

Flow coefficient				
Diameter	DN 25	DN 50	DN 80	DN 100
Flow coefficient $K_G$	400	1400	3600	4500
Valve seat diameter	25	50	90	90



These regulators are suitable for use with previously filtered, non-corrosive gases.

## Sizing

### 1. Determination of the required $K_G$ value

To select the device size, first the required  $K_G$  value has to be calculated:

- At critical flow behaviour  $p_2 \leq 0.5 \cdot p_1$ :

$$K_G = \frac{2 \cdot Q_n}{p_1}$$

$$Q_n = p_1 \cdot \frac{K_G}{2}$$

- At subcritical flow behaviour  $p_2 > 0.5 \cdot p_1$ :

$$K_G = \frac{Q_n}{\sqrt{p_2 \cdot (p_1 - p_2)}}$$

$$Q_n = K_G \cdot \sqrt{p_2 \cdot (p_1 - p_2)}$$

$Q_n$  = maximum flow rate [m<sup>3</sup>/h]  
under normal conditions

$p_b$  = atmospheric pressure in bar  
(absolute pressure)

$p_1$  =  $p_u + p_b$  inlet pressure absolute  
(bar absolute)

$p_2$  =  $p_d + p_b$  outlet pressure absolute  
(bar absolute)

$K_G$  = Flow coefficient in  $\frac{m^3}{h \cdot bar}$

### 2. Selection of the device

After calculation of the required  $K_G$  value, the regulator can be selected from flow coefficient table (page 2). We recommend selecting the  $K_G$  value of the regulator at least 20% greater than the calculated  $K_G$  value.

### 3. Determination of gas velocities

To optimize performance, reduce erosion and noise emissions, it is necessary to limit the gas velocity at the outlet flange of the regulator.

$$w = \frac{Q_n}{d^2 \cdot p_{abs}} \cdot 360$$

or

$$w = \frac{Q_n}{DN^2 \cdot p_{abs}} \cdot 360$$

$Q_b$  = Flow  
in operational cubic metres [m<sup>3</sup>/h]

A = Free cross-sectional area

w = Flow velocity [m/s]

$p_{abs}$  = Lowest pressure at measuring point  
( $p_{1_{min}} + p_b$  or  $p_{2_{min}} + p_b$ )

d = Inner diameter of pipe [mm]

DN = Nominal size of device

Max. gas velocity at inlet flange: 70 m/s

Max. gas velocity at outlet flange: 200 m/s

Max. gas velocity at impulse tap: 20 m/s

This calculation applies to gas temperatures of about 15 to 20 ° C. For different temperatures, the velocity has to be corrected as follows:

$$w_{\text{korr}} = w \cdot \frac{t_{\text{gas}} + 273}{290}$$

$w_{\text{korr}}$  = Temperature corrected velocity [m/s]  
 $t_{\text{gas}}$  = Gas temperature

### Calculation example

Given:

Maximum inlet pressure	$p_{1\text{max}}$ =	15 bar absolute
Minimum inlet pressure	$p_{1\text{min}}$ =	6 bar absolute
Outlet pressure	$p_2$ =	1.8 bar absolute
Flow	$Q_n$ =	2400 Nm <sup>3</sup> /h natural gas

1. Step: Determination of the required flow coefficient  $K_G$   
 critical flow behaviour:  $p_2 \leq 0.5 \cdot p_1$

$$K_G = \frac{2 \cdot Q_n}{p_1} = \frac{2 \cdot 2400}{6} = 800$$

2. Step: Selection of the device

$$800 + 20\% \cdot 800 = 960$$

chosen: MR HP20 DN 50  $K_G = 1400$

3. Step: Determination of gas velocities

$$w_{\text{inlet}} = \frac{Q_n}{DN^2 \cdot p_{1\text{abs}}} \cdot 360 = \frac{2400}{50^2 \cdot 6} \cdot 360 = 57.6 \frac{\text{m}}{\text{s}}$$

The gas velocity at the inlet is lower than the maximum velocity of 70 m/s.

$$w_{\text{outlet}} = \frac{Q_n}{DN^2 \cdot p_{2\text{abs}}} \cdot 360 = \frac{2400}{50^2 \cdot 1.8} \cdot 360 = 192 \frac{\text{m}}{\text{s}}$$

The gas velocity at the outlet is lower than the maximum velocity of 200 m/s.

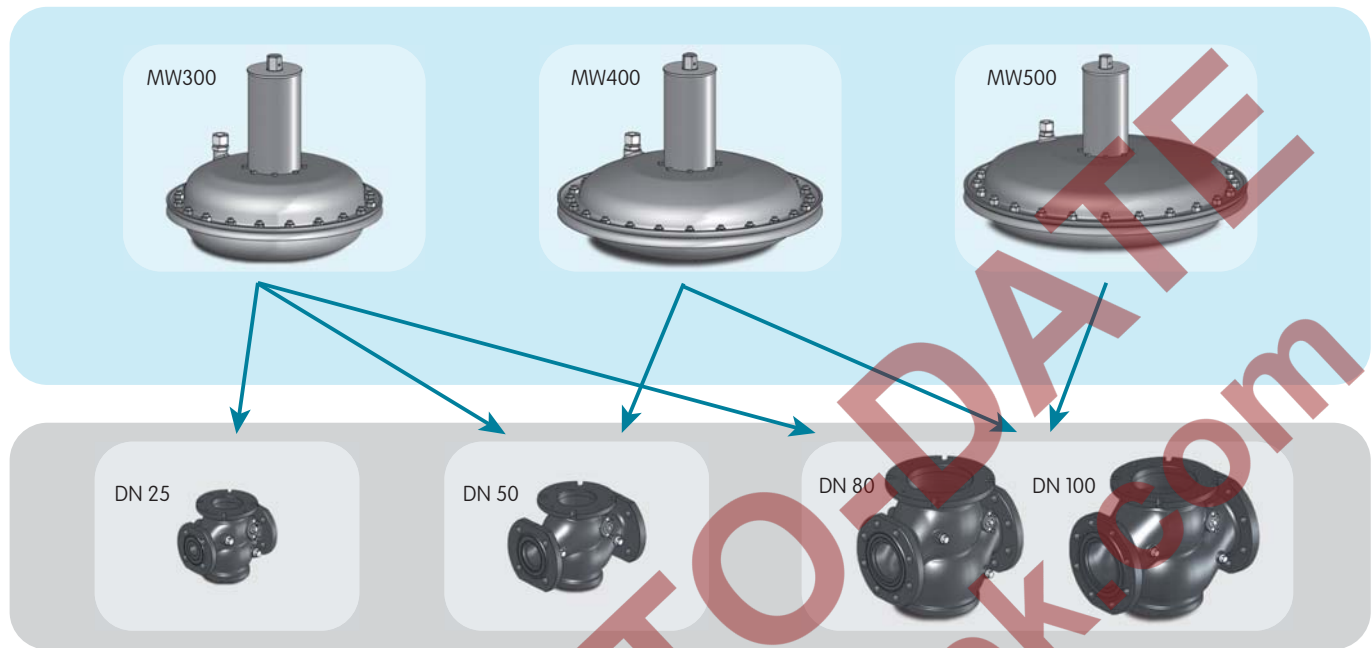
After the device, the pipe is expanded to DN 200:

$$w_{\text{impulse}} = \frac{Q_n}{DN^2 \cdot p_{2\text{abs}}} \cdot 360 = \frac{2400}{200^2 \cdot 1.8} \cdot 360 = 12 \frac{\text{m}}{\text{s}}$$

The gas velocity at the outlet is lower than the maximum velocity of 20 m/s.

The device with the nominal diameter DN 50 can be operated under these conditions.

### Regulator configuration



Measuring unit mapping [mbar]

	MW500	MW400	MW300
DN 25	-	-	20 – 700
DN 50	-	20 – 700	700 – 2000 (300 – 700)*
DN 80/100	20 – 400	400 – 700 (150 – 400)*	700 – 2000 (500 – 700)*

\* For these ranges, the advanced control accuracy classes and lock-up pressure classes are valid.

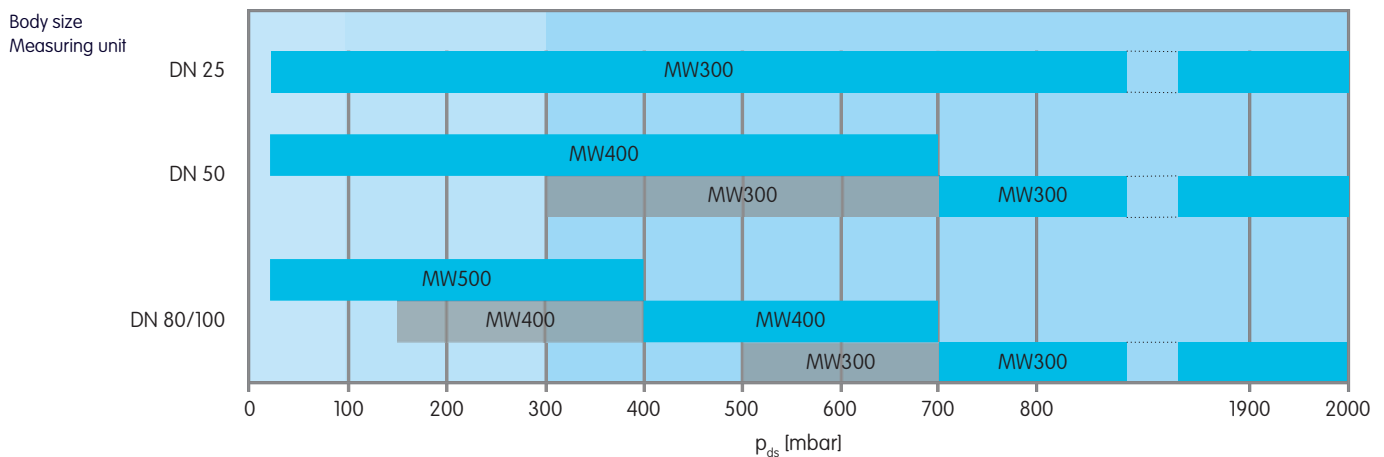
Standard accuracy and lock-up classes

$p_{ds}$	AC	SG
20 – 100	10	20
100 – 300	5	10
300 – 2000	2.5	5

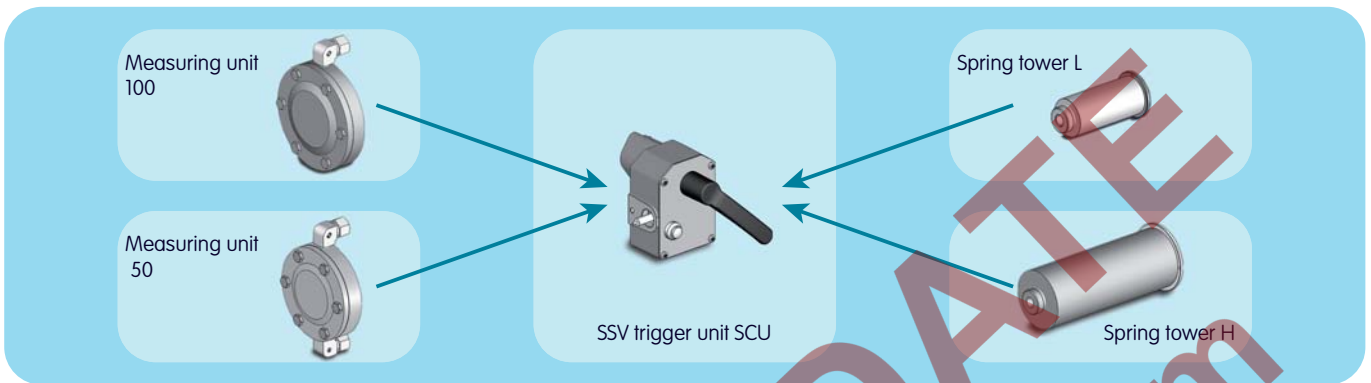
Extended accuracy and lock-up classes

$p_{ds}$	AC	SG
150 – 300	10	30
300 – 700	5	20

■ Standard accuracy and lock-up classes  
■ Extended accuracy and lock-up classes



### SSV configuration



SSV set range [mbar]			
Type	L100	L50	H50
$p_{ds0}$	50 – 700	200 – 1800	400 – 3000
$p_{dsu}$	5 – 200	80 – 800	300 – 1500

Maximum difference between $p_{ds}$ and SSV set point or maximum allowable outlet pressure (above $p_{ds}$ )			
	MW300	MW400	MW500
DN 25	500	-	-
DN 50	700	400	-
DN 80	700	400	300
DN 100	700	400	300

Values in mbar

### Configuration code

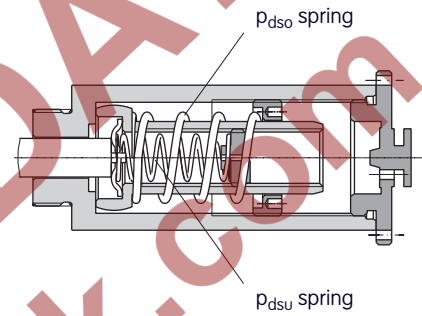
	MR HP20	50	PN16	400	L100	RL
Type designation	MR HP20					
Nominal pressure level						
DN	25	25				
DN	50	50				
DN	80	80				
DN	100	100				
Nominal flange pressure level						
		ANSI 150	A 150			
		PN 16	PN 16			
		PN 20	PN 20			
Nominal size of measuring unit						
			MW300	300		
			MW400	400		
			MW500	500		
SSV type						
					L100	
					L50	
					H50	
Option						
						Flow direction right-left
						SSV remote indication
						RL
						RI

Gas pressure regulator MR HP20 spring ranges, outlet pressure									
Order No.	73019471	73019472	73019473	73019474	73019475	73019476	73019477	73019478	73019479
Colour	white	yellow	green	blue	red	brown	black	white	yellow
Measuring unit MW300	-	20 – 100	50 – 200	100 – 400	300 – 600	500 – 800	700 – 1000	900 – 1400	1000 – 2000
Measuring unit MW400	20 – 30	25 – 50	45 – 100	90 – 200	150 – 300	250 – 400	350 – 500	450 – 600	550 – 700
Measuring unit MW500	20 – 25	22 – 45	40 – 80	70 – 150	90 – 200	150 – 300	250 – 400	-	-

SSV spring ranges [mbar]

L100				
Order No.	73008955	73008956	73008957	73018496
$P_{dso}$	50 – 110	90 – 220	200 – 400	250 – 700
Colour	white	light blue	cadmium yellow	black

Order No.	73008959	73008960	73020783
$P_{dsu}$	5 – 49	47 – 146	100 – 200
Colour	white	light blue	yellow chromated



L50				
Order No.	73008955	73008956	73008957	73018496
$P_{dso}$	200 – 400	350 – 800	700 – 1300	1000 – 1800
Colour	white	light blue	cadmium yellow	black

Order No.	73008959	73008960	73020783
$P_{dsu}$	80 – 160	150 – 400	350 – 800
Colour	white	light blue	yellow chromated

H50				
Order No.	73008994	73008991	73011389	73009287
$P_{dso}$	400 – 800	700 – 1200	1100 – 2300	2000 – 3000
Colour	silver-grey	broom yellow	yellow chromated	blue-grey

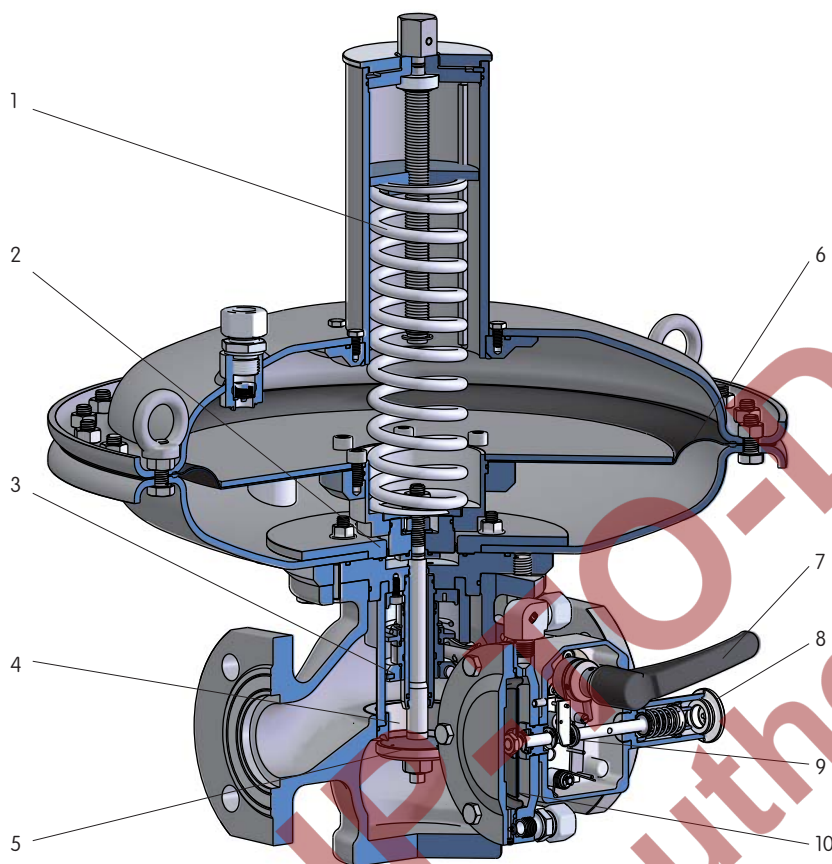
Order No.	73008956	73008957
$P_{dsu}$	300 – 700	600 – 1500
Colour	light blue	cadmium yellow

Setpoints in mbar (setpoints for horizontal installation)

Material specifications

	Regulator	SSV
Body	Spheroidal graphite cast iron: EN-GJS-400-15	
Corrosion protection	Cathaphoretic paint	
Covers	Sheet steel (S355/S420)	Steel (S235)
Valve seats (orifices)	Brass	
Valve discs and O-rings	Nitrile synthetic rubber	Nitrile synthetic rubber
Spindle	Stainless steel	Stainless steel
Diaphragms	Reinforced nitrile synthetic rubber	Nitrile synthetic rubber
Bearings	Plastic (POM)	Plastic (POM)
Adjusting springs	Carbon steel, zinc plated and passivated	Carbon steel, zinc plated and passivated

Device components



- 1: Set spring
- 2: Balancing diaphragm
- 3: SSV Valve plate
- 4: Orifice
- 5: Valve plate
- 6: Main diaphragm
- 7: SSV Reset lever
- 8: SSV set point adjusting spring
- 9: SSV trigger unit SCU
- 10: SSV main diaphragm

Spare parts

Order No. Spare part set

73020791 Sparekit MR HP, measuring unit MW400

73021573 Sparekit MR HP, measuring unit MW500

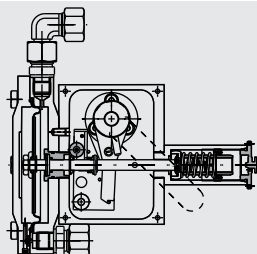
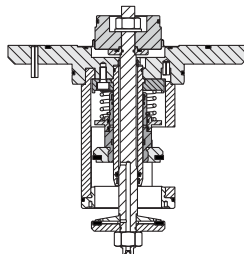
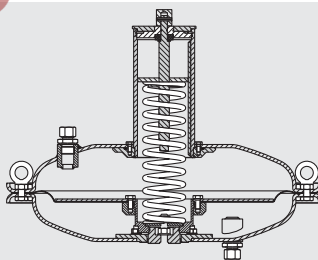
73021572 Sparekit MR HP, measuring unit MW300

73021663 Sparekit MR HP, valve DN 25

73020790 Sparekit MR HP, valve DN 50

73021574 Sparekit MR HP, valve DN 80/100

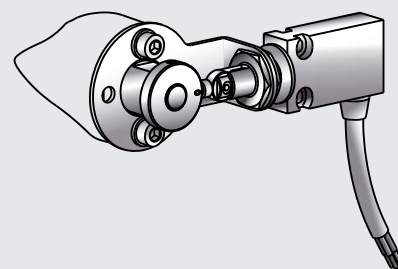
73020789 Sparekit MR HP, SCU



Option

Order No. 73021628

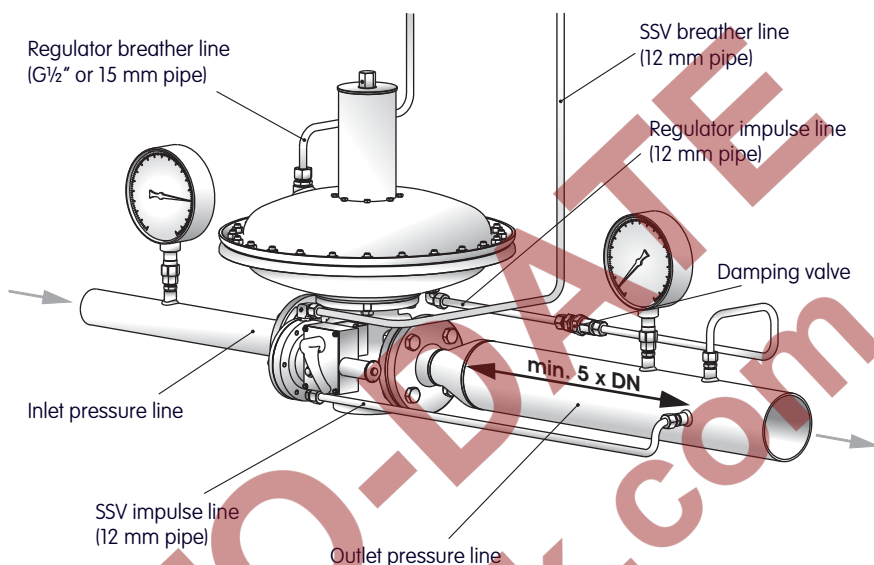
Option Remote indicator switch EEx





## Connecting diagram

### MR HP20



## Installation instructions

- The preferable installation position is horizontal.
- In addition, a valve must be installed respectively upstream and downstream of the gas pressure regulator.
- It is recommended that a gas filter is installed upstream of the gas pressure regulator (filter quality 5 µm, in special cases up to 50 µm).
- Install a pressure gauge or test point in the inlet and outlet pressure area.
- Install limited capacity relief valve (G491) if required.
- The gas pressure regulator must be installed free of mechanical stress. The connection pipes must be suitable for bearing the weight of the regulator. If necessary supports must be provided.
- The regulator must be installed in the direction of flow, according to the arrow on the body.
- The sealing surfaces must be clean and plane. Always use new gaskets when installing.
- The connection of the impulse line should be at least 5 DN downstream of the control device or an expansion. Shorter connection lengths are available depending on the system configuration.
- The maximum flow velocity of 20 m/s should not be exceeded at the impulse. If necessary the outlet pipe is to be widened accordingly.
- The devices are generally supplied with a damping valve, which shall be installed in the line for the external impulse.

### Impulse - and breather pipes

Regulator impulse pipe	Bite type fitting 12L (12 mm pipe) or G 1/2"
Regulator breather pipe	Bite type fitting 15L (15 mm pipe) or G 1/2"
SSV-impulse pipe	Bite type fitting 12L (12 mm pipe) or G 1/4"
SSV-breather pipe	Bite type fitting 12L (12 mm pipe) or G 1/4"

All impulse and breather lines must be connected. When installing in closed rooms the breather line must be lead into open.

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