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 p_{ds} 100 – 300 p_{ds} 300 – 2000	AC 10 AC 5 AC 2.5	SG 20 SG 10 SG 5	p_{dso} 50 – 700 p_{dso} 700 – 3000	AG_o 10 AG_o 5	p_{dsu} 5 – 30 p_{dsu} 30 – 1500	AG_u 30 AG_u 10

Different control groups on request

MR HP20: Gas pressure regulator, inlet pressure 20 bar, nominal diameter DN 25, 50, 80, 100

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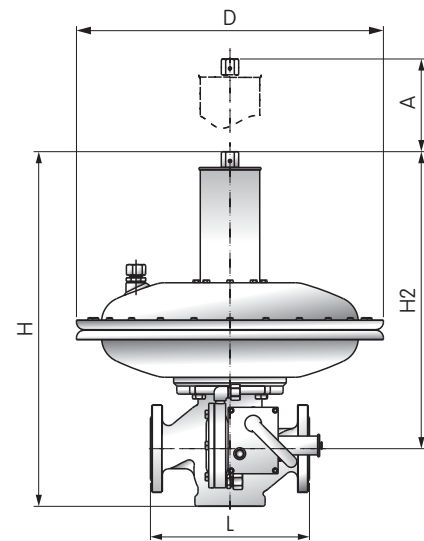
These regulators are suitable for use with previously filtered, non-corrosive gases.

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 $p2 \leq 0.5 \cdot p1$:

$$K_G = \frac{2 \cdot Q_n}{p1}$$

$$Q_n = p1 \cdot \frac{K_G}{2}$$

- At subcritical flow behaviour $p2 > 0.5 \cdot p1$:

$$K_G = \frac{Q_n}{\sqrt{p2 \cdot (p1 - p2)}}$$

$$Q_n = K_G \cdot \sqrt{p2 \cdot (p1 - p2)}$$

Q_n = maximum flow rate [m³/h] under normal conditions

p_b = atmospheric pressure in bar (absolute pressure)

$p1$ = $p_u + p_b$ inlet pressure absolute (bar absolute)

$p2$ = $p_d + p_b$ 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 [m³/h]

A = Free cross-sectional area

w = Flow velocity [m/s]

p_{abs} = Lowest pressure at measuring point ($p1_{min} + p_b$ or $p2_{min} + p_b$)

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:

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

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

Calculation example

Given:

Maximum inlet pressure	$p1_{max}$ =	15 bar absolute
Minimum inlet pressure	$p1_{min}$ =	6 bar absolute
Outlet pressure	p2 =	1.8 bar absolute
Flow	Q_n =	2400 Nm³/h natural gas

1. Step: Determination of the required flow coefficient K_G
critical flow behaviour: $p2 \leq 0.5 \cdot p1$

$$K_G = \frac{2 \cdot Q_n}{p1} = \frac{2 \cdot 2400}{6} = 800$$

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

$$w_{inlet} = \frac{Q_n}{DN^2 \cdot p1_{abs}} \cdot 360 = \frac{2400}{50^2 \cdot 6} \cdot 360 = 57.6 \frac{m}{s}$$

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

$$w_{outlet} = \frac{Q_n}{DN^2 \cdot p2_{abs}} \cdot 360 = \frac{2400}{50^2 \cdot 1.8} \cdot 360 = 192 \frac{m}{s}$$

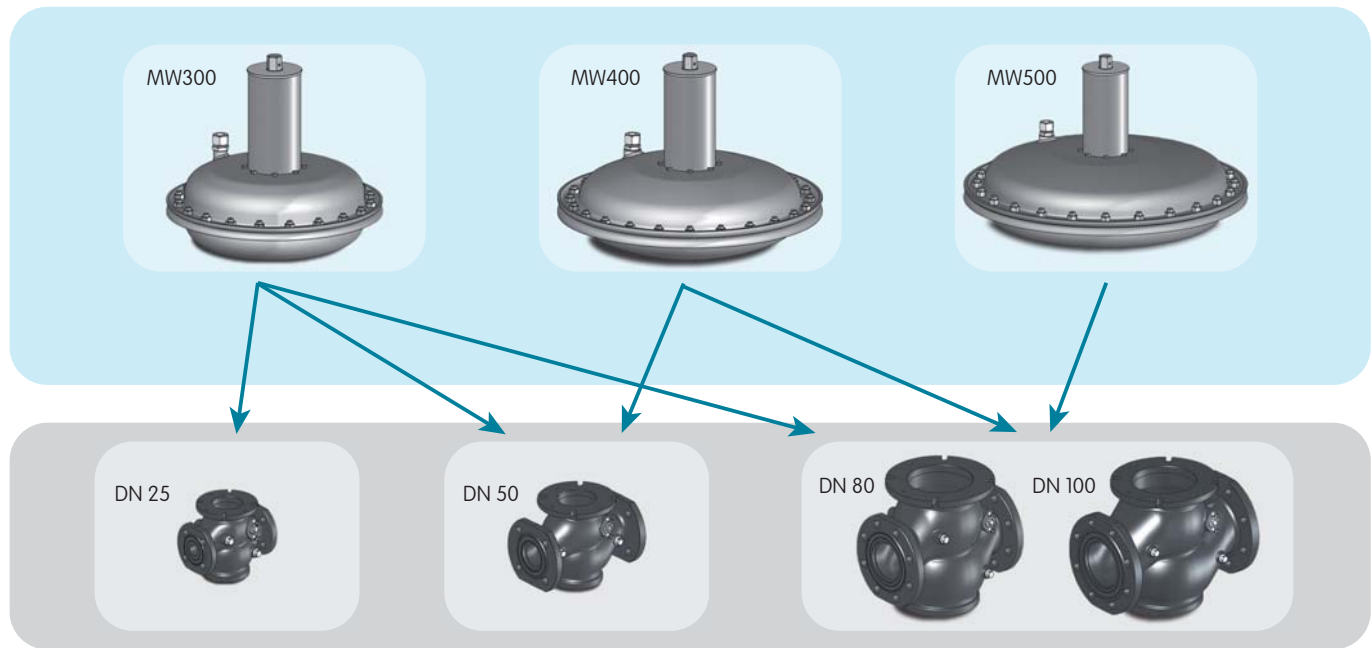The gas velocity at the outlet is lower than the maximum velocity of 200 m/s.

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

$$w_{impulse} = \frac{Q_n}{DN^2 \cdot p2_{abs}} \cdot 360 = \frac{2400}{200^2 \cdot 1.8} \cdot 360 = 12 \frac{m}{s}$$

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

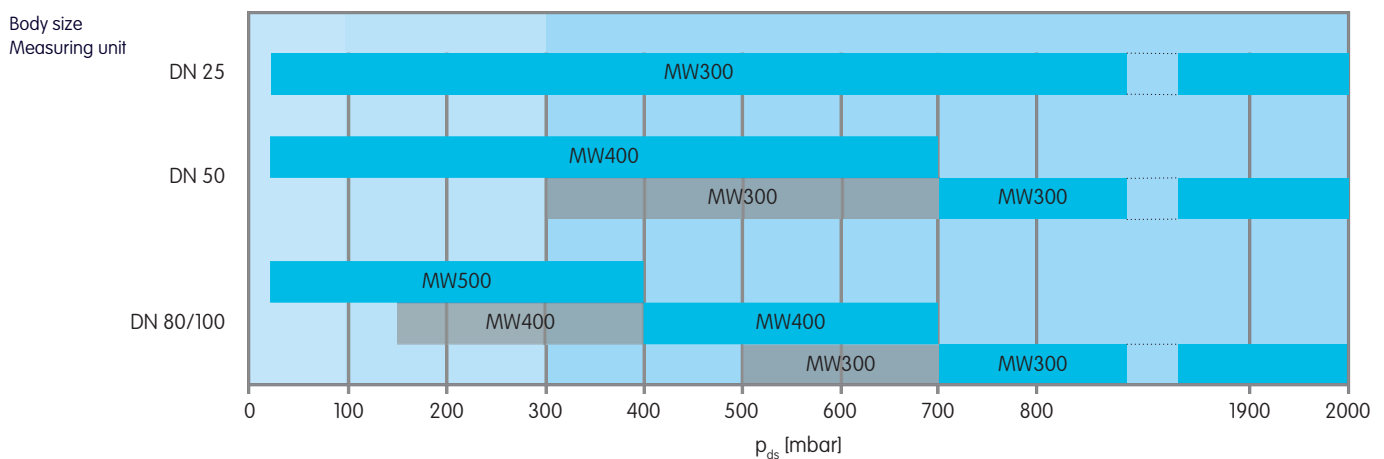The device with the nominal diameter DN 50 can be operated under these conditions.

MR HP20: Gas pressure regulator, inlet pressure 20 bar, nominal diameter DN 25, 50, 80, 100

Regulator configuration

MW300   MW400   MW500

DN 25   DN 50   DN 80   DN 100

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.
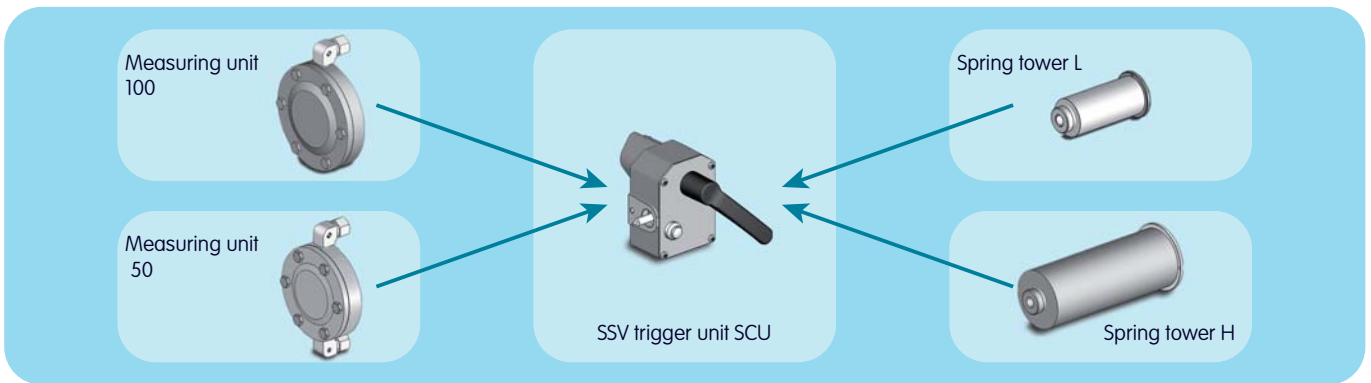
Standard accuracy and lock-up classes

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

Body size
Measuring unit

DN 25   MW300

DN 50   MW400   MW300   MW300

DN 80/100   MW500   MW400   MW400   MW300   MW300

0   100   200   300   400   500   600   700   800   1900   2000

p_{ds} [mbar]

SSV configuration

Measuring unit 100

Measuring unit 50

SSV trigger unit SCU

Spring tower L

Spring tower H

SSV set range [mbar]			
Type	L100	L50	H50
p_{dso}	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	RL
SSV remote indication	RI

MR HP20: Gas pressure regulator, inlet pressure 20 bar, nominal diameter DN 25, 50, 80, 100

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]

p_{dso} spring

p_{dsu} spring

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
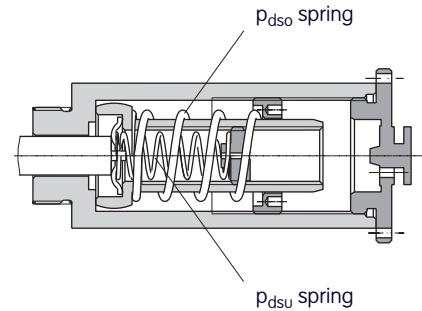
Setpoints in mbar (setpoints for horizontal installation)

Material specifications

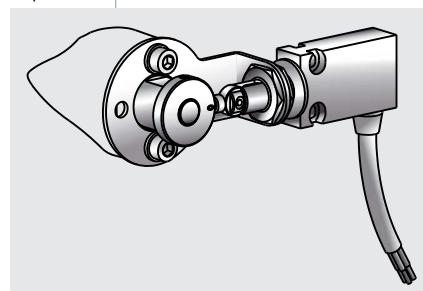|	Regulator	SSV
Body	Spheroidal graphite cast iron: EN-GJS-400-15	
Corrosion protection	Cataphoretic paint	
Covers	Sheet steel (S355/S420)	Steel (S235)
Valve seats (orifices)	Brass	
Valve discs and O-rings	Nitrile synthetic rubber	Nitrile synthetic rubber
Spindle	Stainless steel	Stainless steel
Diaphragms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

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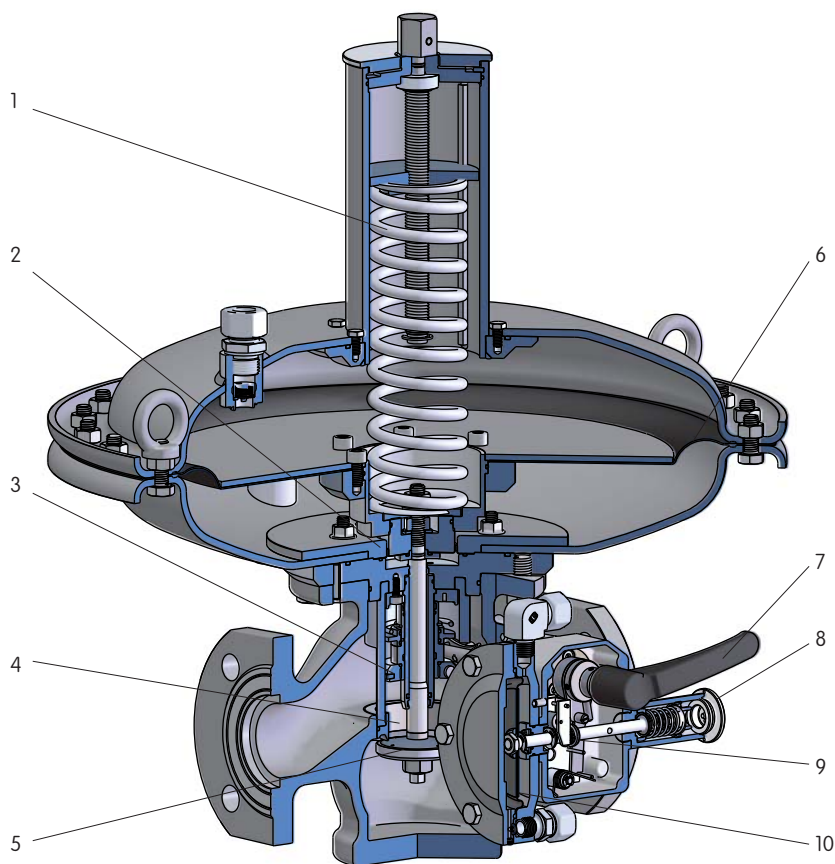
1: Set spring
2: Balancing diaphragm
3: SSV Valve plate
4: Orifice
5: Valve plate
6: Main diaphragm
7: SSV Reset lever
8: SSV set point adjusting spring
9: SSV trigger unit SCU
10: SSV main diaphragm

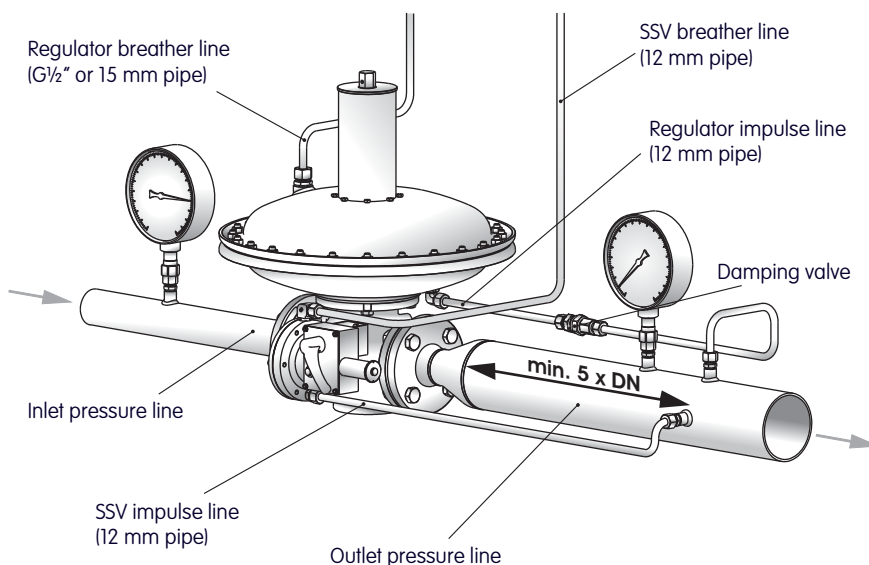| Spare parts	
Order No.	Spare part set
73020791	Sparekit MR HP, measuring unit MW400
73021573	Sparekit MR HP, measuring unit MW500
73021572	Sparekit MR HP, measuring unit MW300
73021663	Sparekit MR HP, valve DN 25
73020790	Sparekit MR HP, valve DN 50
73021574	Sparekit MR HP, valve DN 80/100
73020789	Sparekit MR HP, SCU

Option	
Order No.	73021628
Option	Remote indicator switch EEx

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Connecting diagram

MR HP20

- SSV breather line (12 mm pipe)
- Regulator breather line (G½" or 15 mm pipe)
- Regulator impulse line (12 mm pipe)
- Damping valve
- Inlet pressure line
- min. 5 x DN
- SSV impulse line (12 mm pipe)
- Outlet pressure line

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 been 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 ½"
Regulator breather pipe	Bite type fitting 15L (15 mm pipe) or G ½"
SSV-impulse pipe	Bite type fitting 12L (12 mm pipe) or G ¼"
SSV-breather pipe	Bite type fitting 12L (12 mm pipe) or G ¼"

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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