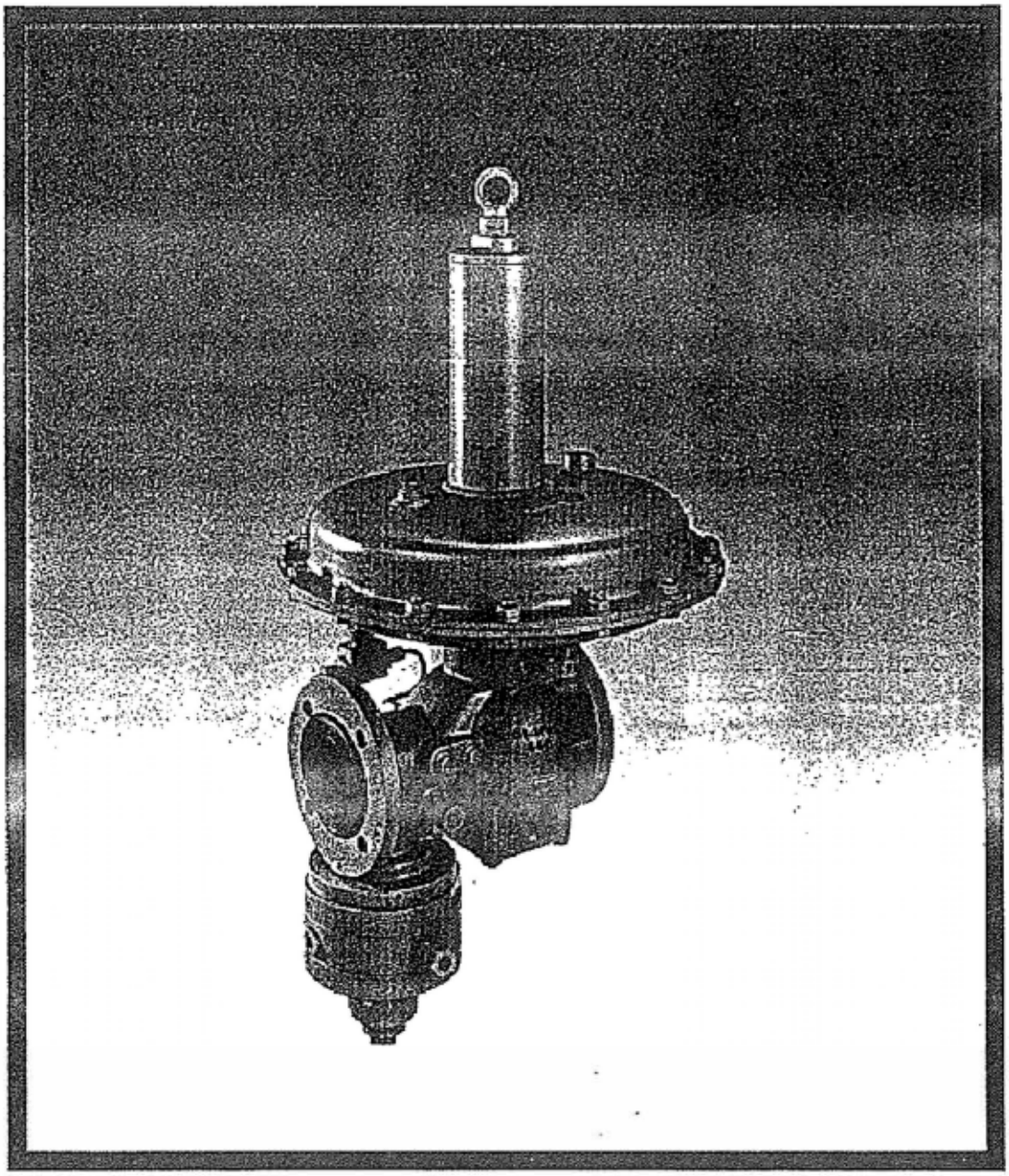
Gas Pressure Regulator Type RR 16

With Integrated Safety Shutoff Valve



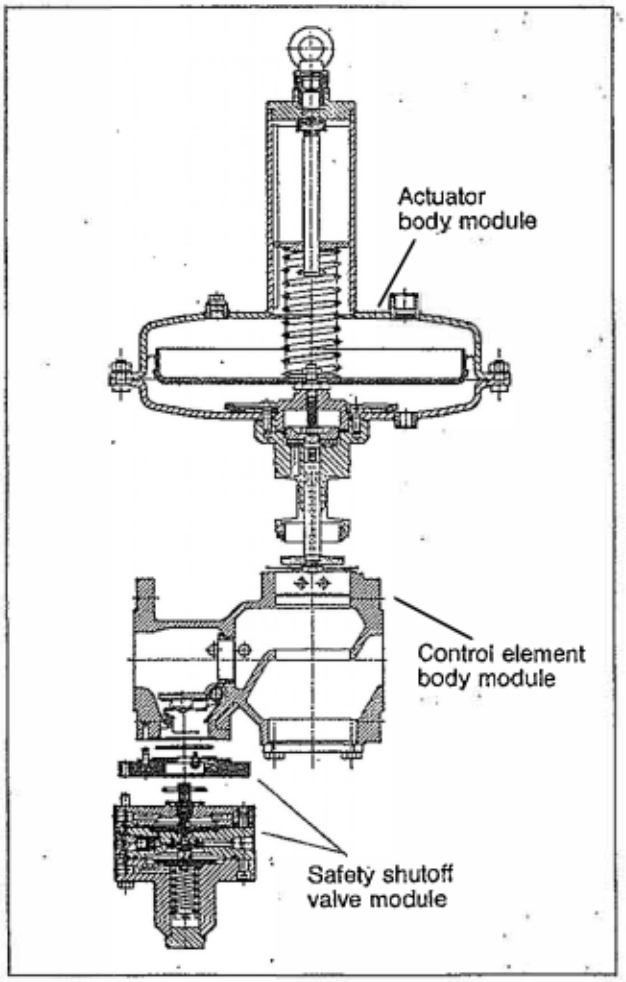
Gas Pressure Regulator Type RR 16
Pressure category PN 16
With integrated safety shutoff valve
Spring-action
In conformance with DIN 3380/3381
DIN and DVGW approved

Application

This gas pressure regulator is designed to maintain a certain controlled quantity such as, for instance, outlet pressure at a constant level by actuating a control element so as to offset the influence of spurious factors like inlet pressure and/or flow fluctuations.

Design

The ROMBACH RR 16 gas pressure regulator is a spring-loaded device featuring a control element equipped with a static and dynamic inlet pressure equalisation system. RR 16 regulators can be adapted to a wide variety of pressure and flow conditions by modifying their actuators and orifice sizes. **Exchangeable modules** ensure outstanding maintenance-friendliness, for these modules can be replaced by functionally tested spares whenever required.



The integrated **safety shutoff valve (SSV)** will automatically cut off the flow of gas as soon as a specific upper or lower response pressure is reached within the system. After automatic closure, the valve can be reopened only manually.

The RR 16 pressure regulator is designed for gas distribution in municipal, commercial, and industrial net works.

While in operation, the unit will run very quietly because of the thickness of the body walls; an optional silencer may be installed as well.

The figure on page 3 shows the design of the RR 16 gas pressure regulator in outline.

Function (Regulator)

Regulated pressure is conveyed by a tap line to the underside of the actuator diaphragm, where the actual outlet pressure is compared to the pressure set on the control spring. Any deviations will result in the immediate activation of the actuator. This initiates a change in flow which persists until the outlet pressure equalises with the set pressure. Under zero flow conditions, the unit shuts off tightly.

RR 16 Materials

Control element body	: GGG-40 DIN 1693
Actuator body	: Galvanised drawn steel (StW24)
Orifices	: Galvanised steel
Control rods	: Stainless steel
Control element	: Steel 9 S Mn Pb 28 / NBR
Actuator	: NBR / fabric-reinforced NBR
SSV measuring systems	: Aluminum, Al Mg Si F 28 or equivalent
Operating temperature range	: -15°C to +60°C
Ambient temperature range	: -30°C to +60°C

Characteristics (Regulator)

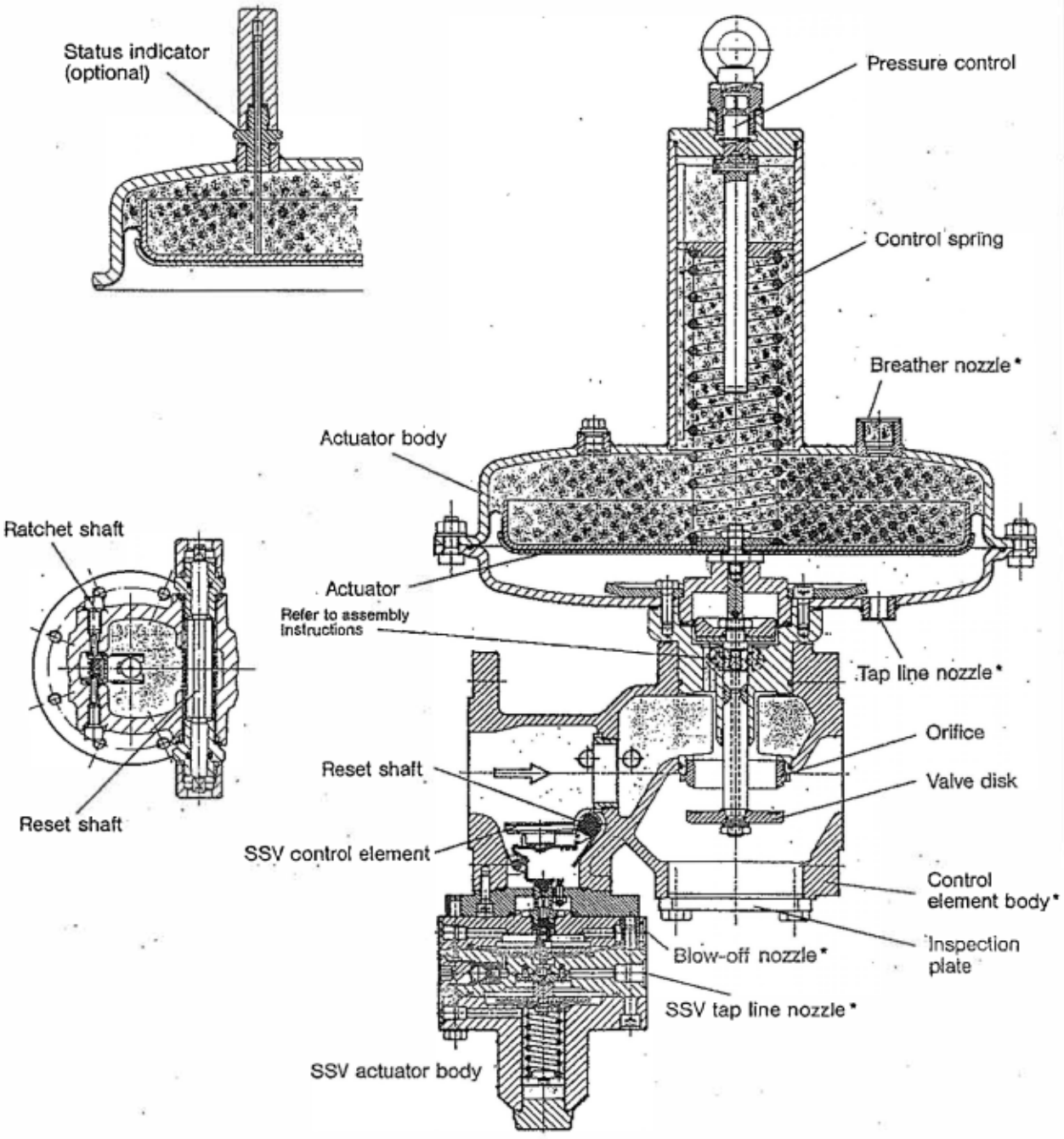
- Designed for rapid load changes.
- With or without SSV.
- Outstanding control precision.
- Control element with pressure equaliser.
- Non-integral tap line.
- Easy maintenance through exchangeable modules.
- Regulator with safety diaphragm (PN 1) under preparation.

Characteristics (SSV)

The outstanding characteristics of the integrated SL and SID safety shutoff valves are:

- Rugged, spring-loaded initiator.
- Valve pressure equaliser (SID only).
- Easy maintenance.
- Manual emergency actuation.
- Easy reset thanks to powerful leverage.
- Highly precise response.
- Status indicator (initiator) and electric remote control systems easily installed.
- Easy replacement of loading-pressure bearing control devices.

RR 16 Gas Pressure Regulator Design



Gas Pressure Regulator with integrated safety valve

Inlet pressure

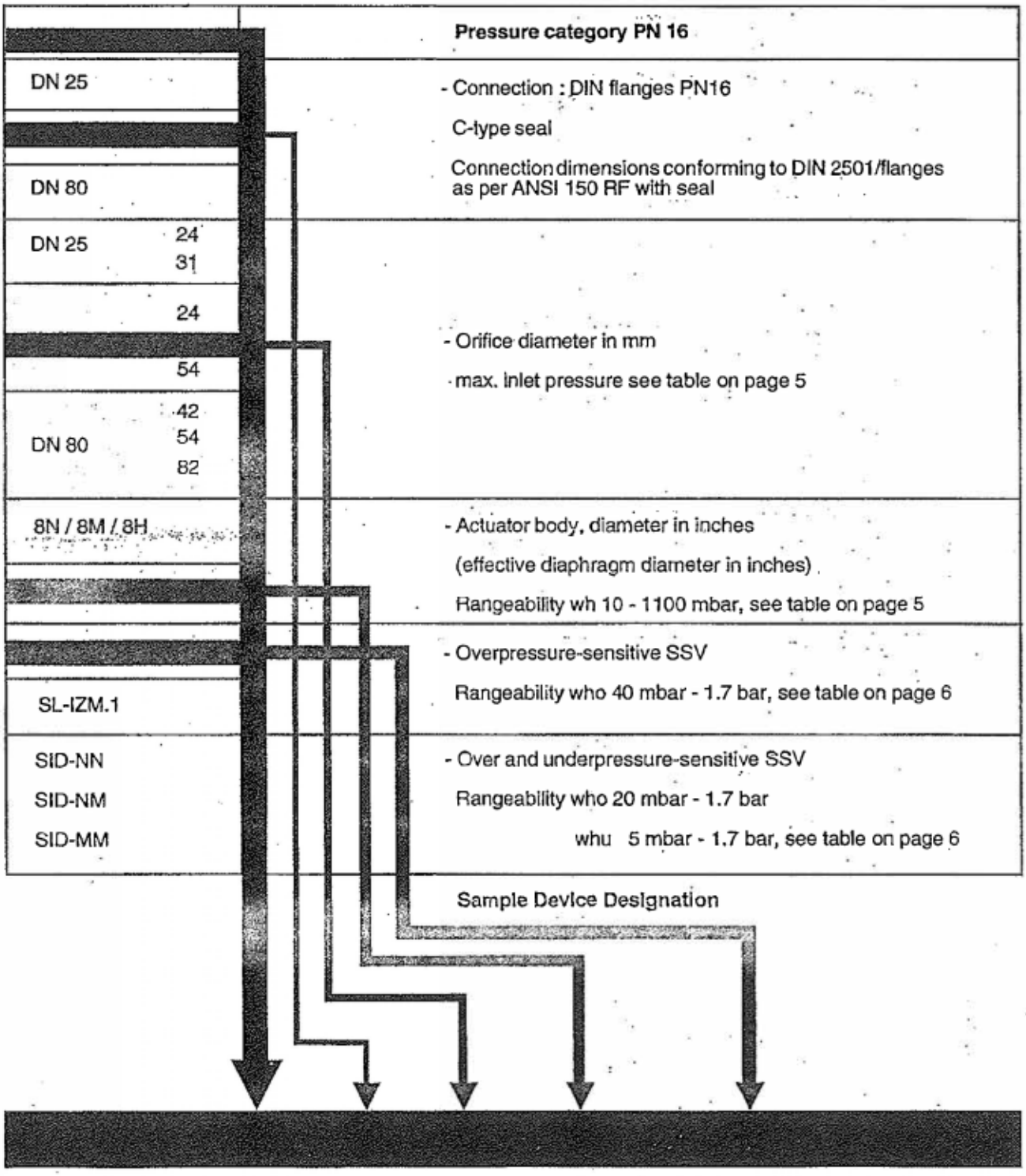
Outlet pressure

Atmospheric pressure

Connection size indicated

*(see page 11)

RR 16 Type Overview



RR 16 Rangeability

Type	Maximum operating pressure	Maximum inlet pressure	Maximum inlet pressure differential	DN 25			DN 50			DN 80		
	pzul	pe	△ pe max	Orifice Ø mm	Rangeability wh (mbar)	Actuator body	Orifice Ø mm	Rangeability wh (mbar)	Actuator body	Orifice Ø mm	Rangeability wh (mbar)	Actuator body
RR16	16	4	<4	31	10 - 110	8 N	54	10 - 225 90 - 450 350 - 1100	12 M 8 M 8 H	82	10 - 225 90 - 450 350 - 1100	12 M 8 M 8 H
		16	10	31	20 - 110 90 - 450 350 - 1100	8 N 8 M 8 H	31	20 - 225 90 - 450 350 - 1100	12 M 8 M 8 H	54	20 - 225 90 - 450 350 - 1100	12 M 8 M 8 H
		16	<16	24	20 - 110 90 - 450 350 - 1100	8 N 8 M 8 H	24	20 - 225 90 - 450 350 -1100	12 M 8 M 8 H	42	20 - 225 90 - 450 350 - 1100	12 M 8 M 8 H

			DN 25			DN 50 / DN 80				
Type	Actuator body	mbar	Control spring	Colour code	Wire Ø	Actuator body	mbar	Control spring	Colour code	Wire Ø
RR16	8 N	10 - 25	955-202-70	colourless	2,6	12 M	10 - 25	955-202-77	brown	4,25
		20 - 55	955-202-71	white	3,6		20 - 55	955-202-78	blue	4,75
		45 - 110	955-202-73	red	4,25		45 - 125	955-202-79	green	5,6
	8 M	90 - 250	955-202-79	green	5,6	8 M	100 - 180	955-202-80	orange	6,3
							150 - 225	955-202-81	black	7
							90 - 250	955-202-79	green	5,6
		200 - 350	955-202-80	orange	6,3		200 - 350	955-202-80	orange	6,3
		300 - 450	955-202-81	black	7		300 - 450	955-202-81	black	7
	8 H	350 - 650	955-202-82	yellow	9,5	8 H	350 - 650	955-202-82	yellow	9,5
		600 - 1100	955-202-83	grey	11		600 - 1100	955-202-83	grey	11

SSV Rangeability
SL Safety Shutoff Valve
Sensitive to Overpressure

	Rangeability who	Spring No.	Colour code	Wire Ø mm
SL-IZN.1	40 - 250 mbar 200 - 800 mbar	955-202-36 955-202-37	red green	1,8 2,5
SL-IZM.1	0,6 - 1,7 bar	955-202-38	yellow	3,6

The differential between the set pressure of the regulator and the response pressure of the SSV should be no less than 20mbar at SL-IZN.1.

Response pressures should be defined in relation to cutoff pressure and response pressure categories (see table on page 14).

SSV Rangeability
SID Safety Shutoff Valve
Sensitive to Overpressure and Underpressure

Rangeability	Spring No.	Colour code	Wire Ø mm
Low-pressure measuring system N who and whu			
5 - 110 mbar	955-201-65	-	3,2
Medium-pressure measuring system M who and whu			
100 - 250 mbar	955-201-65	-	3,2
200 - 470 mbar	955-201-66	-	4,0
0,45 - 1,7 bar	955-201-67	-	5,6

N Measuring System

The differential between the set pressure and the lower response pressure should be no less than 10mbar. For overpressure response, the pressure differential should be no less than 20mbar.

In combinations of low and medium-pressure measuring systems (SID-MN), **the upper response threshold should be no higher than 1.5bar.**

Caution!

The maximum response pressure (p_{so}) should not exceed the following:

Combination regulator and actuator:

12", 300mbar above outlet pressure p_{as}
8", 600mbar above outlet pressure p_{as}

RR 16 Regulator Sizes

Flow in m³/h of natural gas under standard conditions ($\rho_n = 0.78$ kg/m³).

RR 16			DN 25		DN 50			DN 80		
Inlet pressure pe		Outlet pressure pa	KG value in m3/h		KG value in m3/h			KG value in m3/h		
			210	430	450	580	1440	1410	2300	3440
			Valve seat diameter in mm		Valve seat diameter in mm			Valve seat diameter in mm		
mbar	bar	mbar	24	31	24	31	54	42	54	82
40		10	37	75	80	100	160	245	400	485
100		10	64	130	135	175	370	425	700	990
		20	60	125	130	165	360	405	660	900
		50	48	100	105	135	190	325	530	810
200		10	93	190	200	255	615	620	1015	1365
		20	91	185	195	250	615	610	990	1365
		50	84	170	180	230	460	565	920	1185
		100	70	145	150	195	295	470	770	990
400		10	130	270	285	365	885	890	1450	2070
		20	130	270	280	365	885	885	1440	2070
		50	130	260	275	355	800	860	1400	1950
		100	120	250	260	335	700	815	1330	1710
		200	105	210	220	285	430	695	1130	1305
700		10	175	360	380	485	1225	1185	1930	2835
		20	175	360	375	485	1225	1180	1925	2835
		50	175	355	375	480	1150	1170	1910	2700
		100	170	350	365	475	1070	1150	1880	2385
		200	165	335	350	450	800	1070	1790	2085
		400	135	280	290	375	590	920	1500	1270
	1	10	210	430	450	585	1455	1420	2315	3465
		20	210	430	450	585	1455	1420	2315	3465
		50	210	430	450	580	1455	1415	2310	3380
		100	210	430	450	580	1380	1410	2300	3060
		200	205	425	445	570	1035	1390	2265	2790
		400	190	395	415	535	880	1300	2120	2100
		700	150	310	320	415	650	1010	1650	1950
	2	10	315	645	675	875	2065	2125	3465	5220
		20	315	645	675	875	2065	2125	3465	5220
		50	315	645	675	875	2065	2125	3465	5220
		100	315	645	675	875	1980	2125	3465	3690
		200	315	645	675	875	1605	2125	3465	3420
		400	315	645	675	875	1260	2125	3465	3060
		700	315	640	670	865	1185	2105	3430	3060
		1000	300	610	640	820	1060	2000	3265	3060
	3	10	420	860	900	1165	2600	2830	4615	6480
		20	420	860	900	1165	2600	2830	4615	6480
		50	420	860	900	1165	2600	2830	4615	6480
		100	420	860	900	1165	2600	2830	4615	5100
		200	420	860	900	1165	2140	2830	4615	4900
		400	420	860	900	1165	1605	2830	4615	4250
		700	420	860	900	1165	1530	2830	4615	4250
		1000	420	860	900	1165	1420	2830	4615	4250

RR 16 Regulator Sizes

Flow in m³/h of natural gas under standard conditions (ρ_n = 0.78 kg/m³).

RR 16			DN 25		DN 50			DN 80		
Inlet pressure pe		Outlet pressure pa	KG value in m3/h		KG value in m3/h			KG value in m3/h		
			210	430	450	580	*(1440)	1410	2300	*(3440)
			Valve seat diameter in mm		Valve seat diameter in mm			Valve seat diameter in mm		
mbar	bar	mbar	24	31	24	31	54	42	54	82
	4	10	525	1080	1130	1455	3060	3535	5765	7650
		20	525	1080	1130	1455	3060	3535	5765	7650
		50	525	1080	1130	1455	3060	3535	5765	7650
		100	525	1080	1130	1455	3060	3535	5765	5900
		200	525	1080	1130	1455	2450	3535	5765	5500
		400	525	1080	1130	1455	2450	3535	5765	5100
		700	525	1080	1130	1455	2450	3535	5765	5100
		1000	525	1080	1130	1455	2450	3535	5765	5100
	7	10	840	1720	1800	2325		5650	9215	
		20	840	1720	1800	2325		5650	9250	
		50	840	1720	1800	2325		5650	9215	
		100	840	1720	1800	2325		5650	9215	
		200	840	1720	1800	2325		5650	9215	
		400	840	1720	1800	2325		5650	9215	
		700	840	1720	1800	2325		5650	9215	
		1000	840	1720	1800	2325		5650	9215	
	10	10	1155	2370	2480	3195		7765	12665	
		20	1155	2370	2480	3195		7765	12665	
		50	1155	2370	2480	3195		7765	12665	
		100	1155	2370	2480	3195		7765	12665	
		200	1155	2370	2480	3195		7765	12665	
		400	1155	2370	2480	3195		7765	12665	
		700	1155	2370	2480	3195		7765	12665	
		1000	1155	2370	2480	3195		7765	12665	
	16	10	1785	*3660	3830	*4935		11995	*19565	
		20	1785	3660	3830	4935		11995	19565	
		50	1785	3660	3830	4935		11995	19565	
		100	1785	3660	3830	4935		11995	19565	
		200	1785	3660	3830	4935		11995	19565	
		400	1785	3660	3830	4935		11995	19565	
		700	1785	3660	3830	4935		11995	19565	
		1000	1785	3660	3840	4935		11995	19565	

*Refer to the table at the top of page 5 (maximum inlet pressure differential).

The above flow rates are attained only if flow velocities downstream of the regulator conform to state-of-the-art conditions **(20m/s max.)**.

Some Comments on Flow Rates

Regulators should be sized in accordance with minimum inlet pressures and maximum outlet pressures.
Rangeability (Qmin : Qmax) normally is 1:10; please enquire for engineered versions featuring greater rangeabilities.
Pressure losses that might be caused by integrated SSVs and crown silencers have been allowed for in the tables.
Any values not specified may be calculated by interpolation.
Regulators belonging to the RR 16 family may be used for fiscal gas measurements (in accordance with DIN-DVGW Data Sheet G 685) because of their outstanding control performance.

Flow Conversion Factors for Other Gases

To arrive at the equivalent flow rates of other gases, multiply the values given in the tables by one of the correction factors listed below.

Gas type	Density ρ_n kg/m³	Correction factor
Butane	2,70	0,53
Air	1,29	0,77
Propane	2,02	0,62
Nitrogen	1,25	0,79
Town gas	0,56	1,18

For all other gases, the correction factor is = $\sqrt{\frac{0.78}{\text{Density}}}$

Sound Pressure Levels

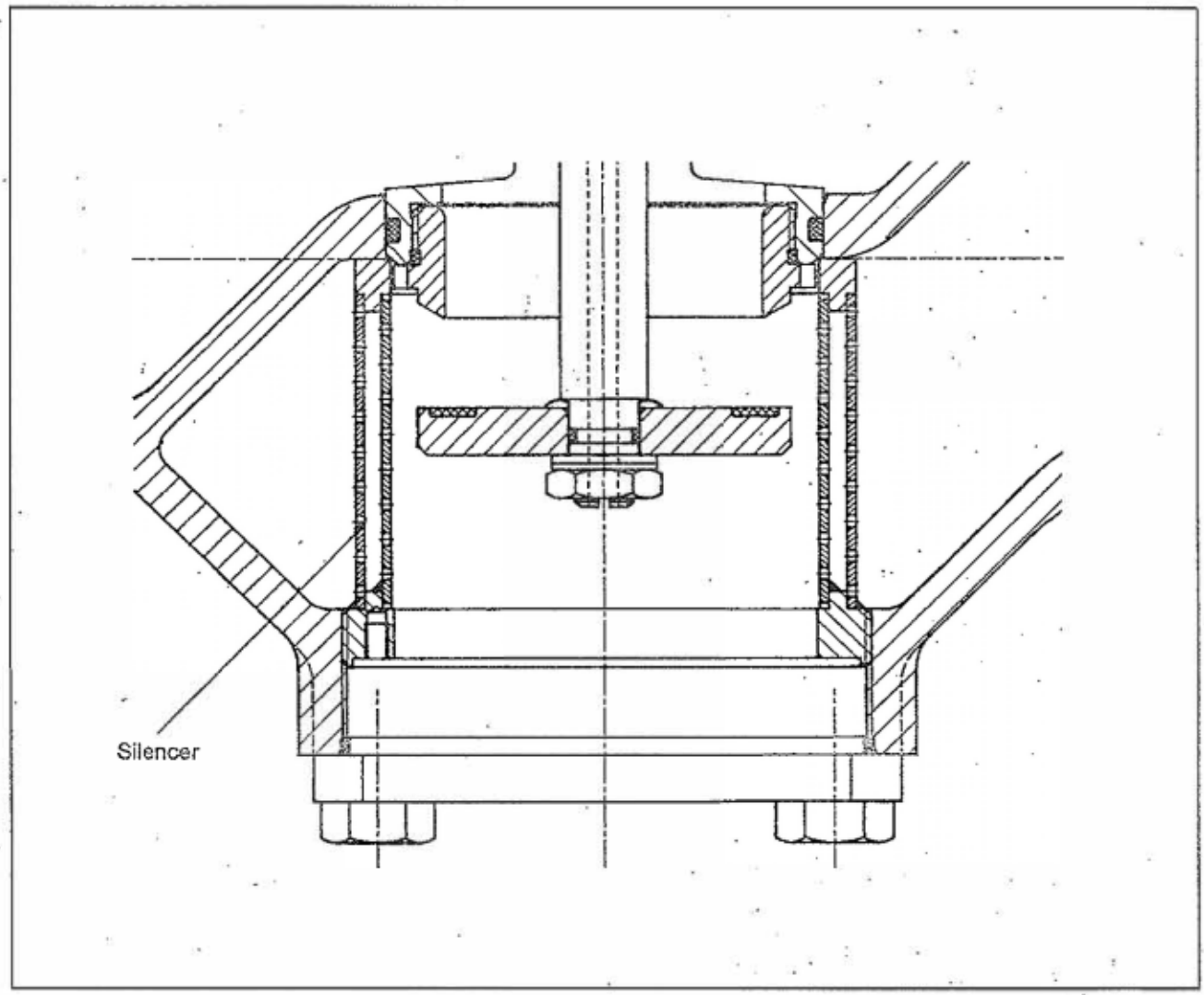
Sound pressure levels will be determined individually on the basis of your own technical specifications.

Installing a crown silencer may reduce sound pressure levels by as much as 12 ± 3dB(A). No allowances are made for any upstream or downstream installations. Noise emissions may be reduced yet again by installing a ROMBACH silencer.

Special Versions
Differential Pressure Regulator with SSV

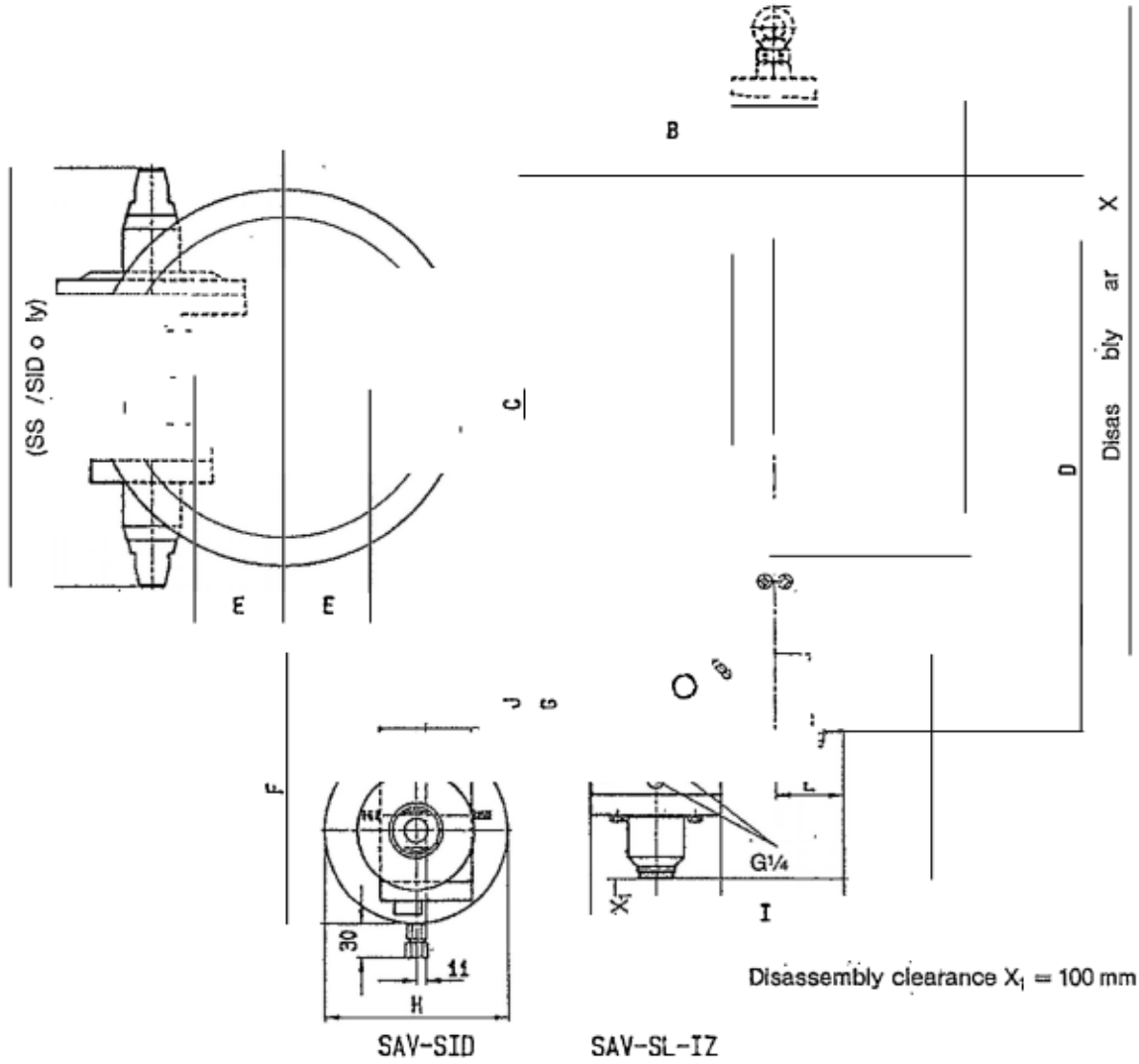
Differential pressure regulators control the pressure differential between two pressurised systems. Thus, they may be used to control the pressure differential between two-line systems carrying gas and air as, for instance, in fuel burners. To this end, a second tap line must be installed and connected to the breather nozzle above the actuator.

Pressure differential regulators may also be used to keep constant the pressure differential upstream and downstream of an orifice.



Governor with integrated silencer

Dimensions



Dimensions (Governor)

Nominal diameter	Actuator casing	A	B	C	D	E	K	L	M	X
DN 25	8 N	310	180	420	475	95	90	46,5	225	525
	8 M	310	180	500	555	95	90	46,5	225	605
	8 H	310	180	550	610	95	90	46,5	225	660
DN 50	8 M	310	250	515	600	95	105	71	240	650
	8 H	310	250	570	650	95	105	71	240	700
	12M	405	250	515	600	95	105	71	240	650
DN 80	8 M	310	300	575	675	95	165	90	300	750
	8 H	310	300	630	730	95	165	90	300	805
	12M	405	300	575	675	95	165	90	300	750

Dimensions (SSV)

DN	F			G	H			I	J
	SL-IZ N, M	SID-			SL-IZ N, M	SID-			
		N	M			N	M		
25	240	290	280	105	Ø 140	Ø 200	Ø 130	140	132
50	245	290	280	108	Ø 140	Ø 200	Ø 130	200	135
80	285	335	325	151	Ø 140	Ø 200	Ø 130	240	178

Weights and Connection Dimensions

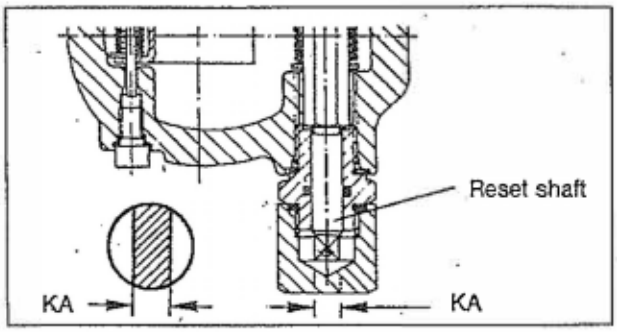
DN	Weights in kg			Connection Screw type			
	SL-IZ			Number of bores	Thread	*Hexagon-head screw DIN 931-5.6	*Hexagon nut DIN 934-5
	8 N/M	8 H	12 M				
25	30	36,8	--	4	M 12	M 12 x 40	M 12
50	35	41,8	45	4	M 16	M 16 x 45	M 16
80	53	59,8	63	8	M 16	M 16 x 70	M 16

In SID units, the weight is that of an SL unit + 6 kg.

* Optional extra (1) DIN 2509 screw bolt

Reset Shaft Dimensions

	Reset shaft	
DN	Ø	Key aperture
25	8	6
50	8	6
80	11,8	6



Line Connections

Regulator breather line	Without screw connection	G 1/2
Regulator tap line	Without screw connection	G 1/4
SSV tap line	Non-soldered taper-bush connestion, DIN 235, for 12 x 1.5 lines	Thread G 1/4
SSV(SL) blow-off line	Non-soldered taper-bush connestion, DIN 234, for 12 x 1.5 lines	Thread G 1/4
SSV (SID) breather line	Non-soldered taper-bush connestion, DIN 234, for 12 x 1.5 lines	Thread G 1/4

Tap, breather, and blow-off line connections are marked in colour. The direction of flow is indicated by arrows on the control element body.

***Standard Version:**

Regulator tap line connection
Right in the direction of flow — yellow

Regulator breather connection
Downstream in the direction of flow — blue

SSV/SL-tap line connection
Right in the direction of flow — yellow

SSV/SL blow-off line connection
Left in the direction of flow — red

SSV* relief
Left in the direction of flow
(*Auxiliary line for SSV commissioning.)

SL Safety Shutoff Valve (Released in Conformance with DIN 3381, 1984 Revision)

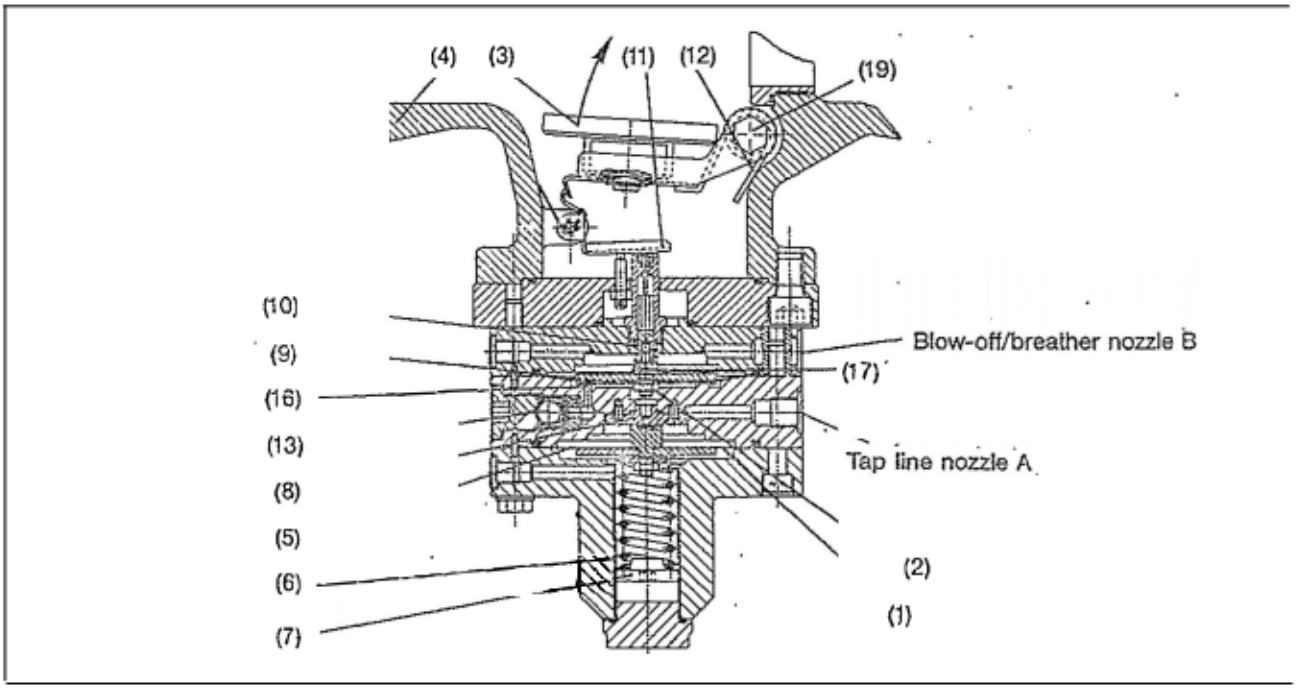
For overpressure shutoff
Type SL-IZN.1/SL-IZM.1
With diaphragm burst shutoff

Application, Design, and Function

SL-IZN.1/SL-IZM.1 safety shutoff valves will cut off automatically the flow of gas through a gas pressure regulation system as soon as the pressure within the protected system reaches a **specific upperresponse threshold (overpressure).**

These safety shutoff valves feature a monitor (1) which, by pneumatically actuating the initiator (2), closes the butterfly valve (3). Both the initiator and the monitor are mounted on the control element body (4).

Line pressure impinges on a control diaphragm (5) via a tap line connected to nozzle A. The upper side of the control diaphragm is held down by the control spring (6). By turning a set screw (7), the response threshold can be modified.



To increase the response pressure, turn the set screw clockwise.

To decrease the response pressure, turn the set screw counter-clockwise.

As soon as pressure rises beyond the set limit, the diaphragm assembly (5) is raised and a nozzle (8) is opened through which gas enters. The resultant pressure increase activates the initiator diaphragm (9) against the force of the weak coil spring (10) and/or the friction of the locking system.

As pressure acts on the initiator, the ratchet (11) is disengaged, and the butterfly valve (3) is closed by the torsion spring (12). This torsion spring is powerful enough to ensure that the valve closes tightly even at minimum operating pressures.

There is a manual bypass for commissioning purposes which equalises pressure at the butterfly valve (3), enabling the SSV to be opened again by turning the reset shaft (19).

Diaphragm Burst Shutoff

Safety shutoff valves fully conform to all requirements of DIN 3381 in the version of June 1984. Units conforming to this standard must be equipped with a device for shutting off the SSV in the event of the diaphragm (5) of the monitor (1) being damaged.

To this end, ROMBACH safety shutoff valves are equipped with a pressure relief valve (13) in the monitor (1). Should the comparator diaphragm (5) be damaged, gas will penetrate into the chamber above the diaphragm. Pressure in that chamber will build up and activate the pressure relief valve (13), so that the flow of gas through the bore (16) actuates the shutoff valve. The pressure in the initiator (2) then drains away through a small bore (17), while the gas flow is now routed through the blow-off/breater line B.

SID Safety Shutoff Valve

For overpressure and underpressure response
Released in conformance with DIN 3381, 1984 Revision

Application

SID safety shutoff valves are designed to cut off automatically the flow of gas through a gas pressure regulation system as soon as pressure in that system rises beyond a certain maximum (overpressure) or falls beyond a certain minimum (underpressure).

Connections

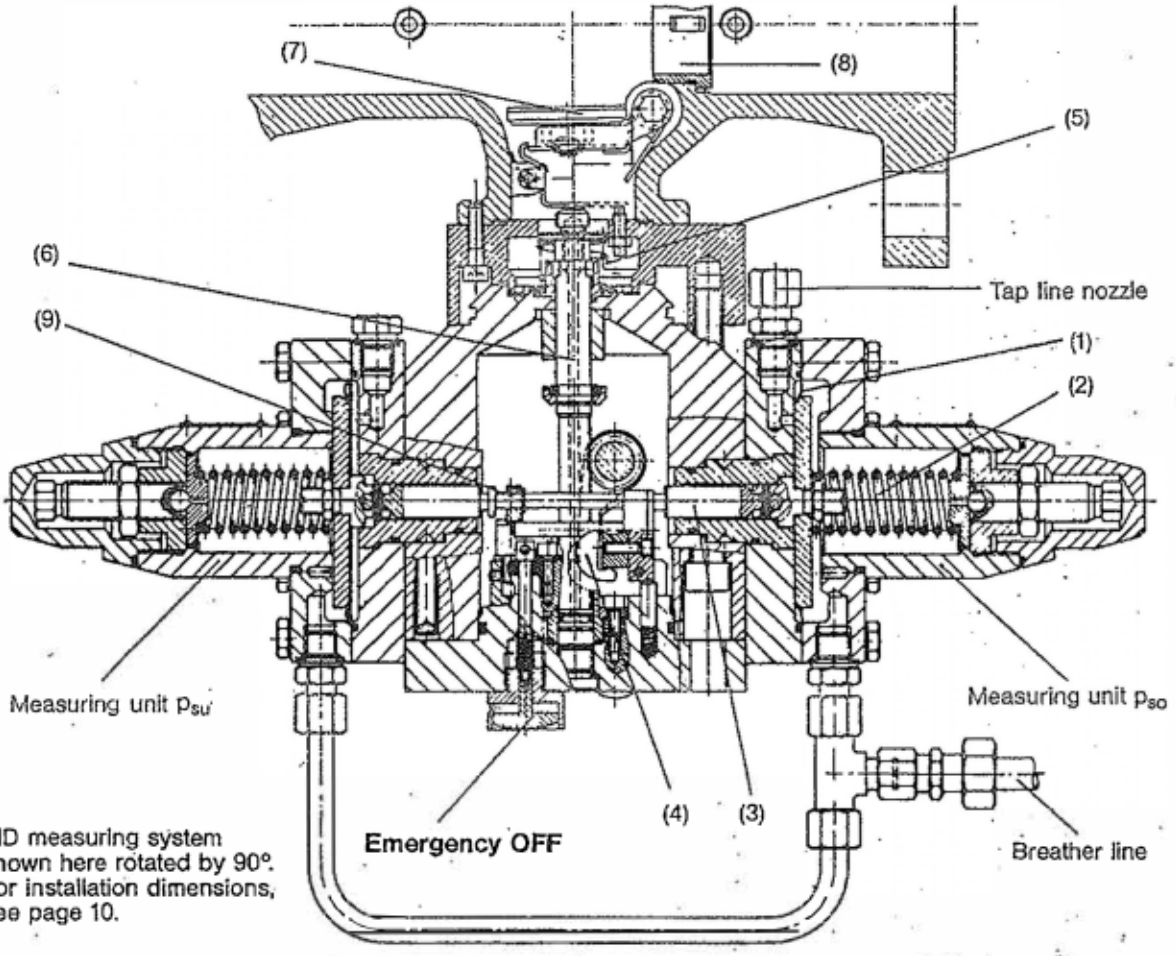
Breather and tap lines: Non-soldered joints with taper bushings, DIN 2353, for 12x1.5mm lines

Materials

N, M measuring systems	: Aluminum, AlMgSi1F28 or equivalent
Interior components	: Steel, brass
Operating temperature range	: -15°C to +60°C
Ambient temperature range	: -30°C to +60°C

Type Designations

SID-NN	: Low-pressure measuring system (pso/psu)
SID-MM	: Medium-pressure measuring system (pso/psu)
SID-MN	: Medium and low-pressure measuring system (pso/psu)



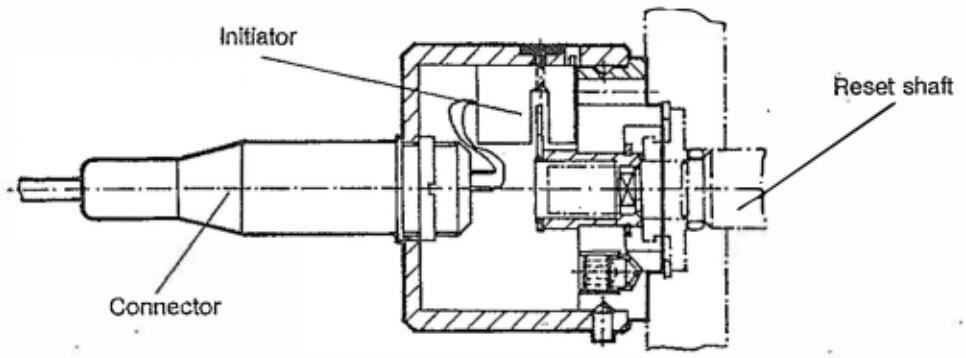
SID measuring system shown here rotated by 90°. For installation dimensions, see page 10.

Functions

I - As the outlet pressure increases, the diaphragm in the pso measuring unit (1) rises against the force of the control spring (2). The rod (3) interacts with a lever system (4) and unlocks the spring-loaded (5) actuator (6) with its attached control element (7) so that the governor (8) slams shut.

II - As the outlet pressure declines, the force of the control spring acting on the psu measuring unit diaphragm is transmitted to a rod (9) which unlocks the lever

SSV Status Indicator, SL and SID Series



(Not for open-air installations)

SSV status indicators are designed for mounting either on the reset shaft (SL) or the initiator gear (SID).

SSV Response Pressure Categories

Response pressure categories define the maximum admissible positive and negative deviation from the response pressure Aw. They are expressed in % of the theoretical response pressure (pso/psu) for each safety device.

Regulation and Cutoff Pressure Categories

pas	Regulation category	Cutoff pressure category
10 - 20 mbar	RG 20	SG 30
20 - 100 mbar	RG 10	SG 20
> 100 mbar	RG 5	SG 10

SL SSV Response Pressure Categories

Measuring system N :	0,05	-	0,25 bar	AG	10
	0,10	-	0,80 bar	AG	5
Measuring system M :	0,6	-	1,7 bar	AG	10

Optional Extras:

- Remote-control solenoid for power-on and power-failure initiation.
- Remote indication of SSV status by proximity or mercury end switches.

SID SSV Response Pressure Categories

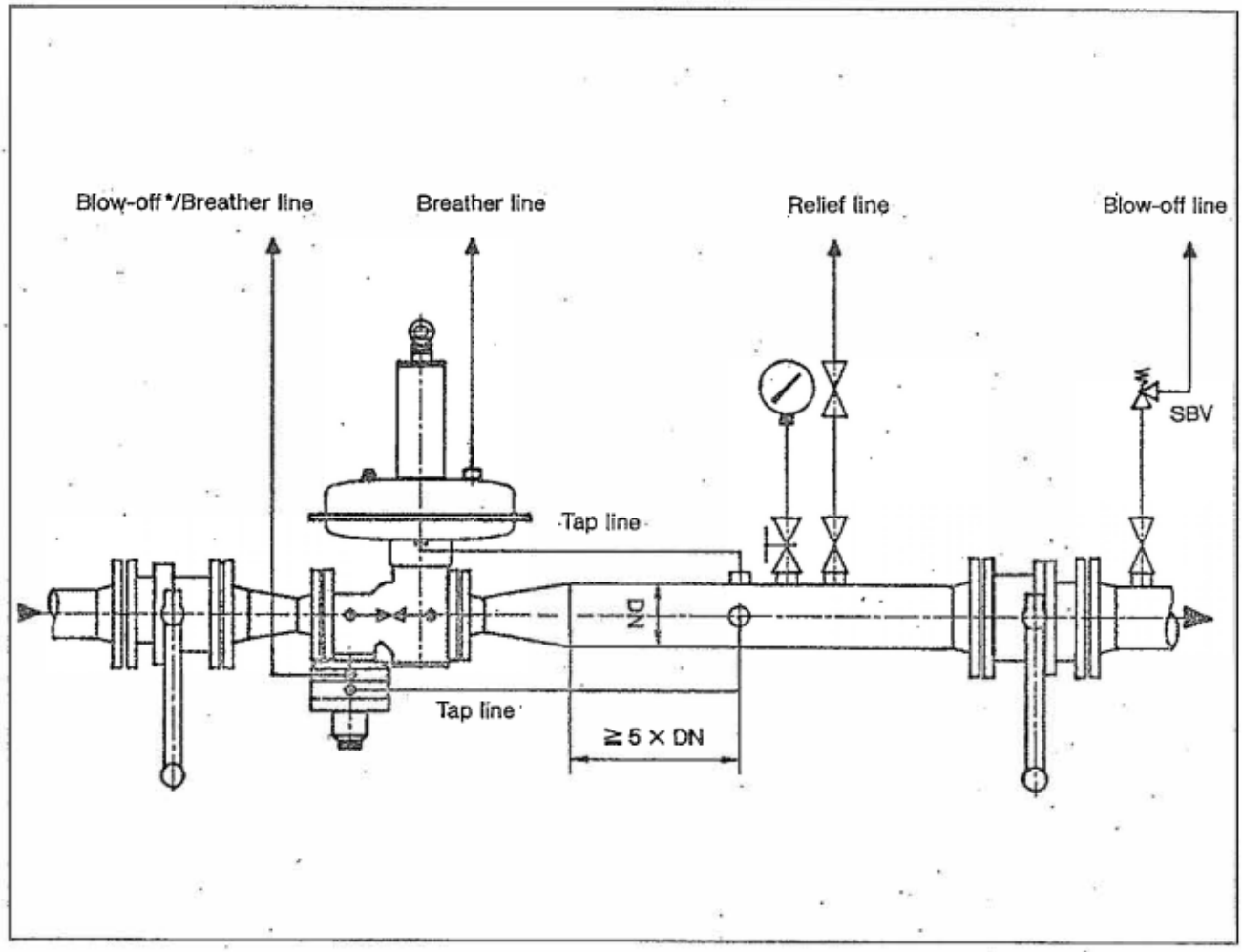
Measuring System N (0,005 bar - 0,11 bar)		
Overpressure:	0,02 bar - 0,04 bar:	AG 10
	0,04 bar - 0,11 bar:	AG 5
Underpressure:	0,005 bar - 0,02 bar:	AG 30
	0,02 bar - 0,11 bar:	AG 15
Measuring System M (0,1 bar - 1,2 bar)		
Overpressure:	0,1 bar - 0,45 bar:	AG 10
	0,45 bar - 1,0 bar:	AG 5
	0,1 bar - 1,7 bar:	AG 1
Underpressure:	0,1 bar - 0,45 bar:	AG 15
	0,45 bar - 1,7 bar:	AG 5

DIN-DVGW Approval Codes*
Homologation as per DIN 3380/3381

	DN 25	DN 50	DN 80
RR 16	92.01 e 056	92.02 e 056	92.03 e 056

Sample Installation

The figure below shows a sample installation of a ROMBACH RR 16 gas pressure regulator with an integrated SL-IZ SSV. These regulators are normally installed horizontally.



Tap lines should be connected to a length of outlet pipe where turbulences are low, i.e. at a minimum distance downstream from the regulator of 5 times the nominal pipe diameter. Pressure gauges should be installed in the vicinity of the tap line nozzle.

To ensure that the device will respond properly in the event of rapid load changes, the regulator breather line should have the following dimensions:

Breather lines up to 3m long, DN-15.
Breather lines up to 5m long, DN-20.
Breather lines up to 5m long, DN-25.
Breather lines more than 15m long, DN-50.

Preferably, test devices should be connected by flexible hoses carrying either the system medium or some extraneous medium such as, for instance, nitrogen. See DIN-DVGW Data Sheets G 490 and 491.

SL-IZ SSVs

*This combination blow-off and breather line may be connected to the common breather line under the follo wing conditions:

- The cross section of the connected breather line should be equivalent to no more than 1/3 of the cross section of the common line.
- In systems that feature two or more safety shutoff valves of this type, the blow-off/breather lines of all valves must be connected separately to the commonline.

The common line should lead into the open in the usual manner, without restrictions or valves.