Gas Safety and Regulating Trains for Inlet Pressures up to max. 4 bar

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Contents

Gas Safety and Regulating Trains for Inlet Pressures up to max. 4 bar

Technical description

The gas regulating trains described in this datasheet comprise:
a central pressure train comprising
ball valve and gas filter,
safety shut-off valve as defined in DIN 3381,
pressure regulator as per DIN 3380 for inlet pressures up to 4 bar,
steadying zone comprising pressure indicators for inlet and output pressures,
safety blow-off valves as defined in DIN 3381 and pipe jointing elements

and the solenoid valve train comprising
a minimum gas pressure switch as per DIN EN 1854,
two solenoid valves, Group A safety shut-off valves as defined in EN 161,
valve proving system (Closed position indicator optional).

Depending on individual requirements, the trains are additionally equipped with
test burner and/or vent cock,
gas volume control valve,
maximum pressure switch,
gas pressure display units, gas volume measuring units
ignition gas or pilot trains, etc.

Equipment and assembly of the regulating trains for inlet pressures exceeding 100 mbar correspond to the tech-nical regulations specified in DVGW worksheets G 490 (medium pressure > 0.1 to 4 bar).

Each unit is tested for leaks and proper functioning.
The complete assembled regulation train is re-tested for leaks.

Application

Each gas regulating train is engineered individually as specified in the system requirements and geared to the burner system or gas-consumers.
They are used for a burner in industrial and commercial gas-firing systems or for several burners in supply stations with built-in pressure regulators as defined in DIN 3392 or DIN 3380, corresponding to control class RG 10.
The regulating trains are designed for non-aggressive gases as well as for all industrial fuel gases as specified in DVGW worksheet G 260/I.

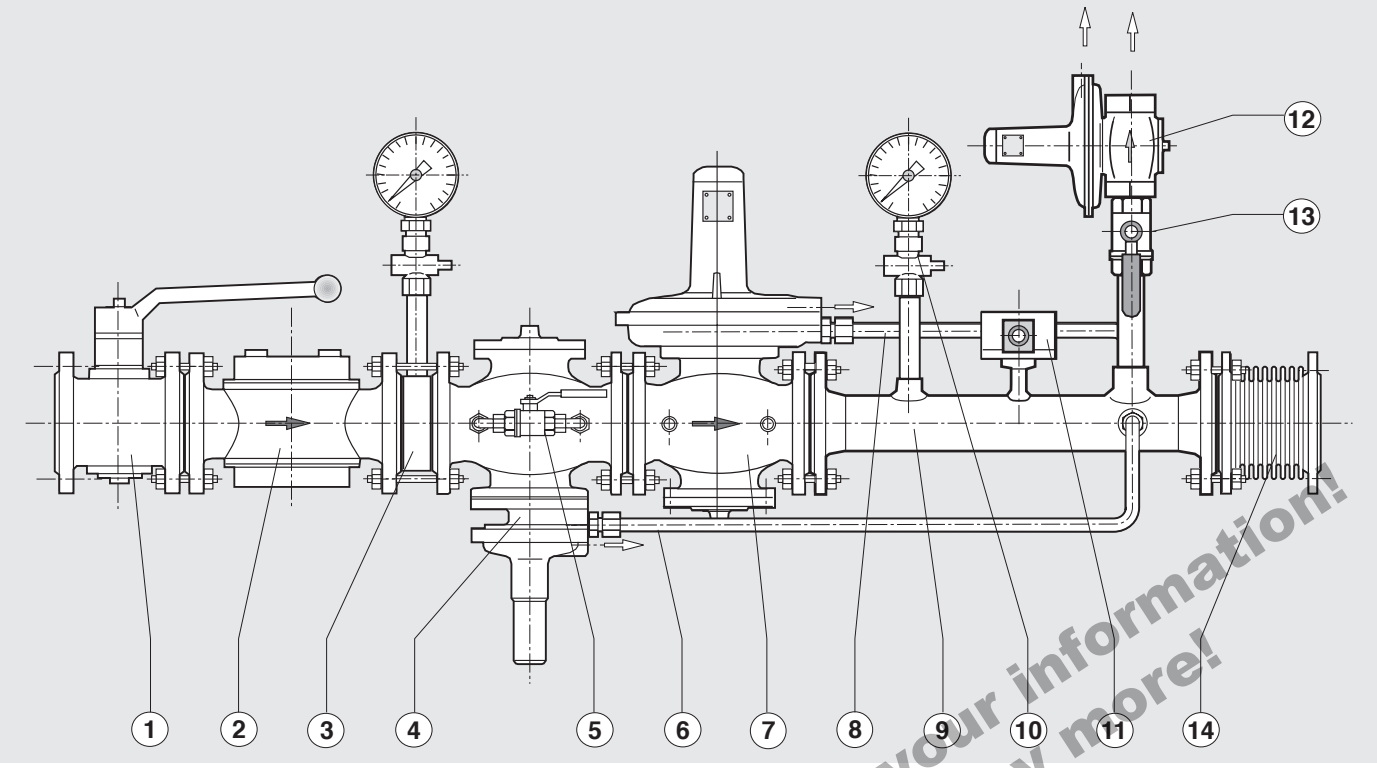
Approvals

EU type test approval as per EU Gas Appliance Directive.
Approvals in other important gas-consuming countries.

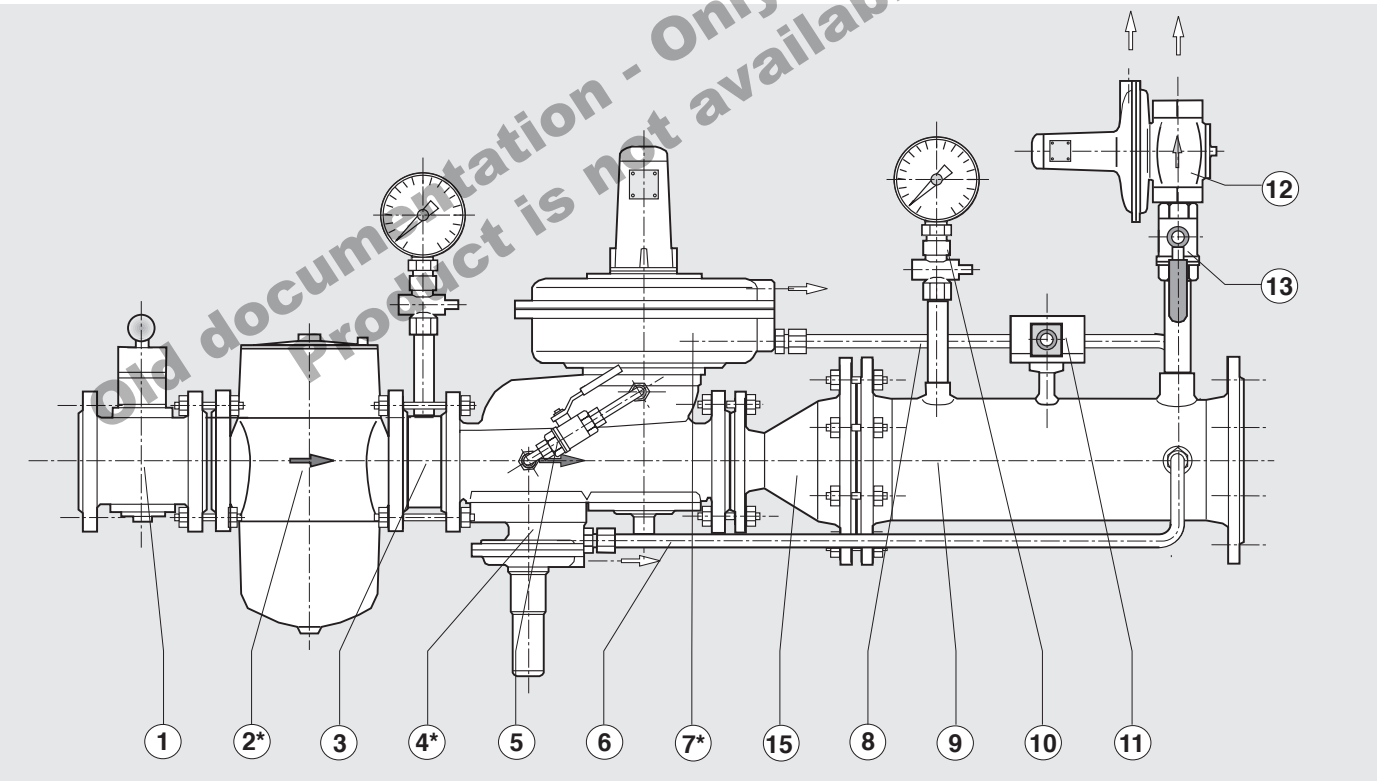
Gas train including booster section,
Installation in an IP64 control cabinet,
customer-specific application in process engineering.

Gas Regulating Trains: Medium Pressure Part for Inlet Pressures up to max. 4 bar

General layout
Regulating train comprising R 101 pressure regulator, S 100 safety shut-off valve and SL 10 blow-off valve



Regulating train comprising RS 250/RS 251 pressure regulator, built-in safety shut-off valve and SL 10 blow-off valve



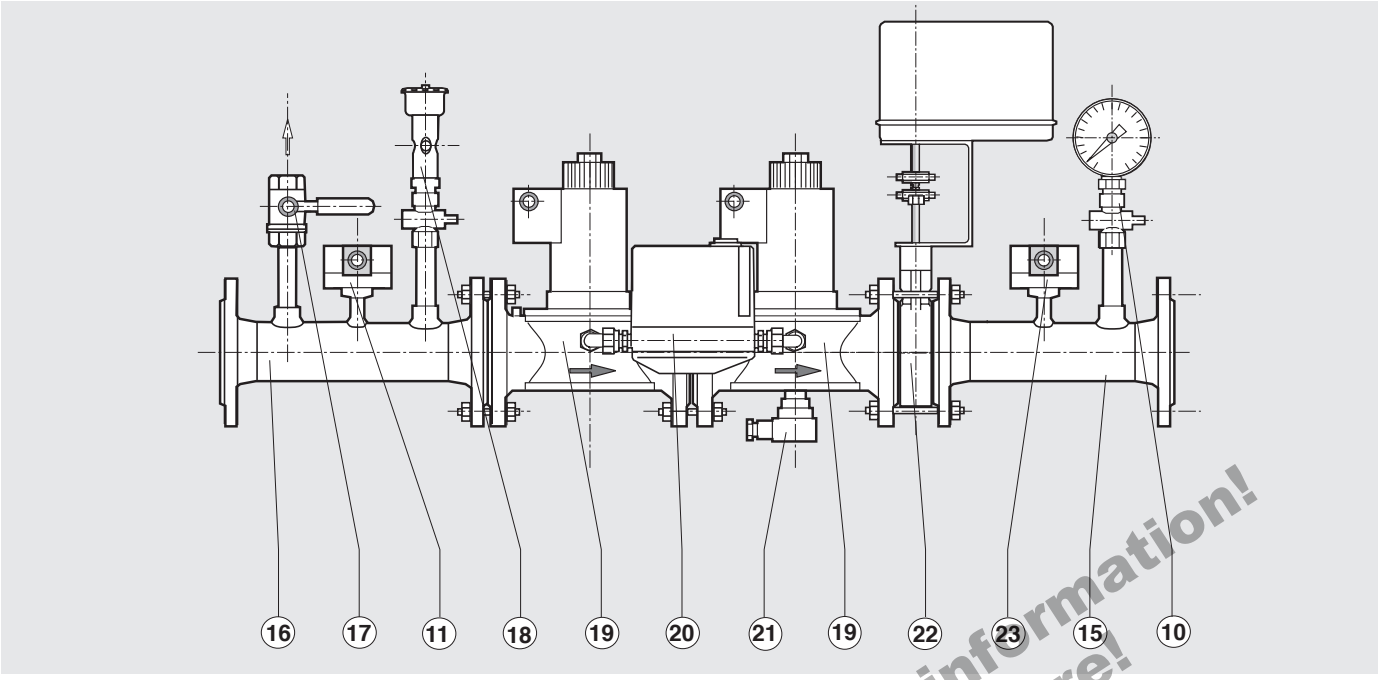
Legend

1 Ball valve
2 Gas filter
3 Adapter
4 S 100 safety shut-off valve
4* Safety shut-off valve (SAV)
5 Pressure compensation valve
6 Pulse line to SAV
7 R 101 pressure regulator
7* RS 250/RS 251 pressure regulator
8 Pulse line to pressure regulator
9 Steadying zone
10 Manometer and pushbutton valve
11 Minimum gas pressure switch
12 Safety blow-off valve (SBV)
13 Shut-off valve
14 Compensator
15 Reducer
⇧ External ventilation

* Pressure regulator and safety shut-off valve built in common housing

Gas Regulating Trains: Low-pressure Part for Inlet Pressures up to 500 mbar

General layout
Solenoid valve trains comprising control valve, valve leak tester, test burner and pressure monitor



Legend

10 Manometer and pushbutton valve
11 Minimum gas pressure switch
16 Flanged adapter
17 Blow-off valve
18 PB 2 test burner
19 Solenoid valve
20 VDK valve leak tester
21 K 01 main contact
22 Control valve and motor drive
23 Maximum gas pressure switch
External ventilation

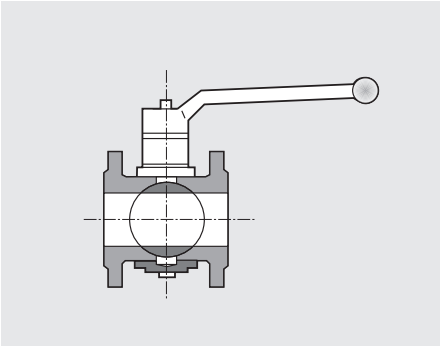
Regulating train components

Functional description of ball valve, gas filter and compensator

Ball valve

Series: **KH 160040** to **160200**,
DN 40 to DN 200,
Max. operating temperature:
up to 16 bar
Temperature range: -20°C to +70°C
Length: short - to DIN 3202
Cast-iron housing, stainless
Ball design: full ball, Perpunan seal
PN 16 flanges to DIN 2533
matching PN 16 pre-weld flanges to DIN 2633

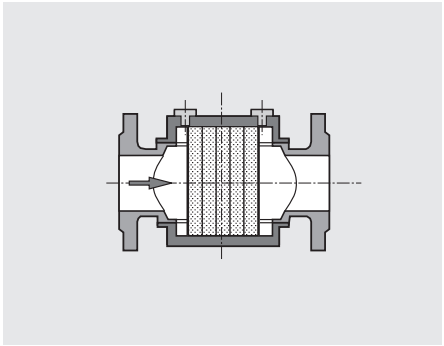
For manual shut-off and releasing of gas supply.



Gas filter up to 4 bar

Series: **GF 40040/2** to **40100/2**,
DN 40 to DN 100,
Filter as defined in DIN 3386 including extremely high dust storage capacity,
Pore size of filter insert: < 50 µm,
Max. operating pressure up to 4 bar
Temperature range: -15°C to +80°C,
Aluminium housing
Flanges to DIN 2501, part 1,
matching PN 16 pre-weld flanges to DIN 2633

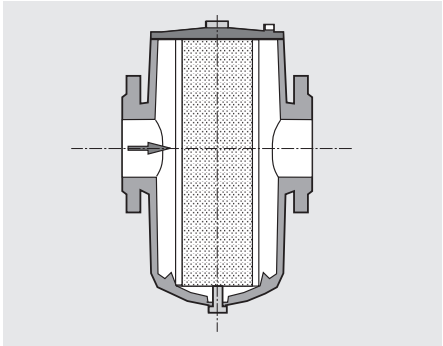
To protect downstream fittings against contamination.



Gas filter up to 16 bar

Series: **254 016** to **1506 016**,
DN 40 to DN 150,
Filter as defined in DIN 3386 including extremely high dust storage capacity
Pore size of filter insert: < 5 µm,
Max. operating pressure up to 16 bar
Temperature range: -15°C to +80°C
Nodular graphite cast-iron housing (GGG 40.3)
Flanges to DIN 2533, drilled, matching PN 16 pre-weld flanges to DIN 2633

To protect downstream fittings against contamination.



Safety Shut-off Valve (SAV)

S 100 safety shut-off valve

Series: **S 100,** DN 25 to DN 200,
Safety shut-off valve as defined in DIN 3381
Max. operating pressure up to **4 bar**,
Temperature range: -20 to +70°C
Silumin cast housing
Internal parts: stainless steel, hardened
Diaphragm: Perbunan fabric
Valve seal: vulcanized Perbunan
PN 16 flanges as defined in DIN 2533 matching PN 16 pre-weld flanges as per DIN 2633.

The safety shut-off valve (SAV) acts as the main safety device against over-pressure. It prevents an excessive in-crease in output pressure downstream of the gas pressure regulator.
The SAV is open during operation. If it attains the upper setpoint pressure, the SAV cuts off the gas supply.
At the same time the minimum gas pressure is monitored, i.e. the SAV also closes if a lower setpoint pressure (gas drop) is attained.
Only manual unlocking is possible.
The safety shut-off valve is installed upstream of the gas pressure regulator.
The SAV receives the unlocking pulse via a control line from the steadying zone located downstream of the gas pressure regulator.

S 100-K safety shut-off valve

In addition to size DN 50 of series **S 100** we can supply a safety shut-off valve with a very short length of 180 mm.
Designation: **S 100-K, DN 50**

Additional equipment

When used as gas/air drop protection, you can install a pilot valve in the pulse line (type S 50-Rp 3/8).

Note on Spring Table I:

Use a 222 mm dia. meter comprising a GMB 186 diaphragm for very low shut-off pressures. The unlocking ranges are then reduced by half.

Insert a ring in the 162 mm dia. meter for higher shut-off pressures. The unlocking ranges must then be multiplied by a factor of 2.5.

Function of SAV

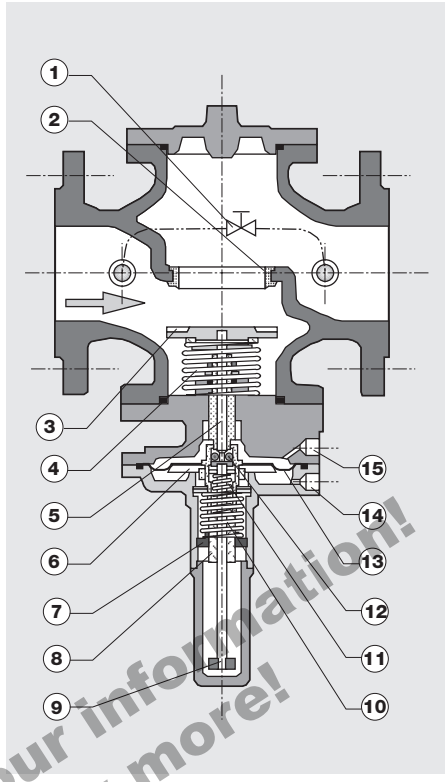
The controlled output pressure arriving from a pulse line (15) acts on the diaphragm (13) of the safety shut-off valve.
The meter (6) raises or lowers at over-pressure and/or pressure drop. The meter operates on the ball shut-off principle. If the permitted pressure is exceeded, the meter is pressed against the maxi-mum spring (10), the balls (12) release the spindle (5), and the closing spring (4) presses the valve plate (7) against the valve seat (2).

The minimum spring (11) moves the meter in the opposite direction during a pressure drop.
The trip mechanism is then activated and the closing spring presses the valve plate against the valve seat.

If you want to restore gas flow after fault elimination, pull the reset button (9) down.
Pressure compensation must first be provided on both sides of the valve plate (3) by shortly opening and then firmly closing the pressure compensation valve (1) at the housing.

If the trip pressures need to be reset due to changes in operating conditions, in-crease the maximum trip pressure by turning the spring plate (7) clockwise and reduce it by turning the spring plate counterclockwise. A minimum trip can also be set using the spring plate (8).

Block diagram of SAV, type S 100



1 Pressure compensation valve
2 Valve seat
3 Valve plate
4 Closing spring
5 Valve spindle
6 Meter
7 Minimum pressure setting
8 Maximum pressure setting
9 Reset button
10 Maximum spring
11 Minimum spring
12 Ball
13 Diaphragm
14 Vent
15 Pulse connection

S 100 shut-off valve Spring Table I (DN 25 to DN 100)

162 mm dia. meter, GMB 135 diaphragm

Trip at overpressure	Spring no.
up to 50 mbar	F 96
up to 200 mbar	F 97
up to 300 mbar	F 95
up to 400 mbar	F 94
up to 500 mbar	F 95*
up to 750 mbar	F 94*
Trip at pressure drop	**Spring no.**
10…20 mbar	F 93
20…40 mbar	F 92 B
40…60 mbar	F 92
up to 120 mbar	F 91

* Special design with ring insert

S 100 safety shut-off valve Spring Table II (DN 150 to DN 200)

183 mm dia. meter, GMB 146 diaphragm

Trip at overpressure	Spring no.
up to 50 mbar	F 38 B
up to 80 mbar	F 38
up to 140 mbar	F 39
up to 220 mbar	F 40
up to 300 mbar	F 41
up to 550 mbar	F 40*
up to 750 mbar	F 41*
Trip at pressure drop	**Spring no.**
up to 15 mbar	F 46
15… 30 mbar	F 45
40… 60 mbar	F 47
70…100 mbar	F 471
up to 0.3 bar	F 48

R 101 gas pressure regulator

Series: **R 101**, DN 25 to DN 100
Pressure regulator as defined in DIN 3380,
RG 10 regulator group and SG 20 closing pressure group
Max. inlet pressure: p_i up to **4 bar**,
Max. output pressure: p_a up to **750 mbar**,
Temperature range: -20°C to +70°C
Silumin cast housing
Internal parts: stainless steel, hardened
Diaphragms: Bellofram rolling dia-phragms
Valve seal: Perbunan, vulcanized
Single-seated valve with pre-pressure compensation, air-tight seal
PN 16 flanges as defined in DIN 2533, matching PN 16 pre-weld flanges as per DIN 2633.

The pressure regulator constantly maintains output pressure within the permitted control deviation (RG 10), irrespective of inlet pressure or gas flow rate.
The regulating group meets the operating requirements of standard firing systems.

The pressure regulator closes tight at zero flow rate and when an inlet pressure is present.

R 101-K gas pressure regulator

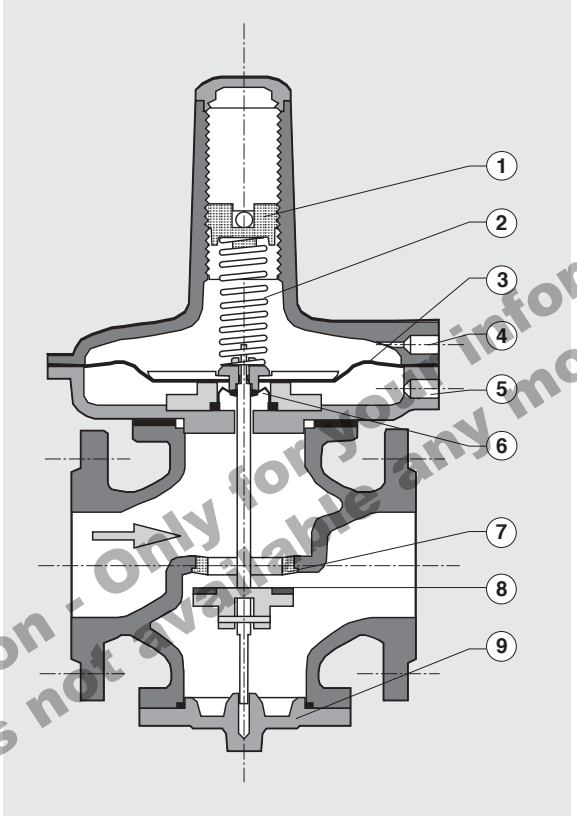
In addition to size DN 50 of series **S100**, we can supply a pressure regulator with a very short length of 180 mm.
Designation: **R 101-K, DN 50**

Function

Gas flows in the arrow direction through the housing. Pressure is applied to the main diaphragm (3) on the output side from below via a pulse line (5). The valve plate (8) is suspended directly and is independent of the inlet pressure due to an intermediate diaphragm (6). The desired output pressure can be adjusted at the setting screw (1) of the load spring (2).

Output pressure setting:
Turn the setting screw (1) clockwise to increase the output pressure and turn counterclockwise to reduce the output pressure.

Block diagram of R 101



1 Setting screw
2 Load spring
3 Main diaphragm
4 Vent
5 Pulse connection
6 Intermediate diaphragm
7 Valve seat
8 Valve plate
9 Closing cover

Note: Design with larger valves

For pressure differences up to 50 mbar, the valves can be enlargened to nearly full DN diameter. Flow rates are then increased as listed below:

	Factor	to valve
DN 25	2.0	V 17,5
DN 50	1.5	V 47,5
DN 65	1.6	V 60
DN 100	1.8	V 80

R 101 gas pressure regulator Spring Table to DN 25

Pressure range	Spring no.
up to 30 mbar	F 103 B
25… 75 mbar	F 103
70…125 mbar	F 104
110…220 mbar	F 107

R 101 gas pressure regulator Spring Table to DN 40, DN 50 Diaphragm diameter: 375 mm

Pressure setting range	Spring no.
up to 22 mbar	F 1
22… 40 mbar	F 2
38… 55 mbar	F 3
46… 65 mbar	F 4
60… 96 mbar	F 5
85…130 mbar	F 6
125…180 mbar	F 7
160…240 mbar	F 8
195…300 mbar	F 9

R 101 gas pressure regulator Spring Table to DN 40, DN 50 Diaphragm diameter: 375 mm

Pressure setting range	Spring no.
up to 10 mbar	F 1
10… 18 mbar	F 2
17… 24 mbar	F 3
21… 30 mbar	F 4
27… 42 mbar	F 5
39… 60 mbar	F 6
55… 84 mbar	F 7
71…108 mbar	F 8
88…132 mbar	F 9

Regulator pressure increases

Use different diaphragm diameters to increase the above mentioned regulator pressures as follows:

Diaphragm version Regulator pressure
205 mm dia. diaphragm 2 times
160 mm dia. diaphragm 4 times

Gas Pressure Regulator with Built-in Safety Shut-off Valve

Series:**RS 250**, DN 25 to DN 200,
Max. inlet pressure: p_i
up to DN 150: **6 bar**,
up to DN 200 **4 bar**,
max. output pressure p_o: up to **1.2 bar**,

Series: **RS 251**, DN 50 and DN 80,
max. inlet pressure p_i: up to **4 bar**,
max. output pressure p_o:
up to **750 mbar**,

Pressure regulators as defined in DIN 3380 with built-in safety shut-off valve complying with DIN 3381,
RG 10 regulator group and SG 20 closing pressure group
Temperature range: -20°C to +70°C
Silumin cast or nodular graphite cast-iron housing (GGG 40)
Internal parts: stainless steel, hardened
Diaphragm: Perbunan fabric
Valve seal: vulcanized Perbunan
PN 16 flanges as defined in DIN 2533, matching PN 16 pre-weld flanges complying with DIN 2633

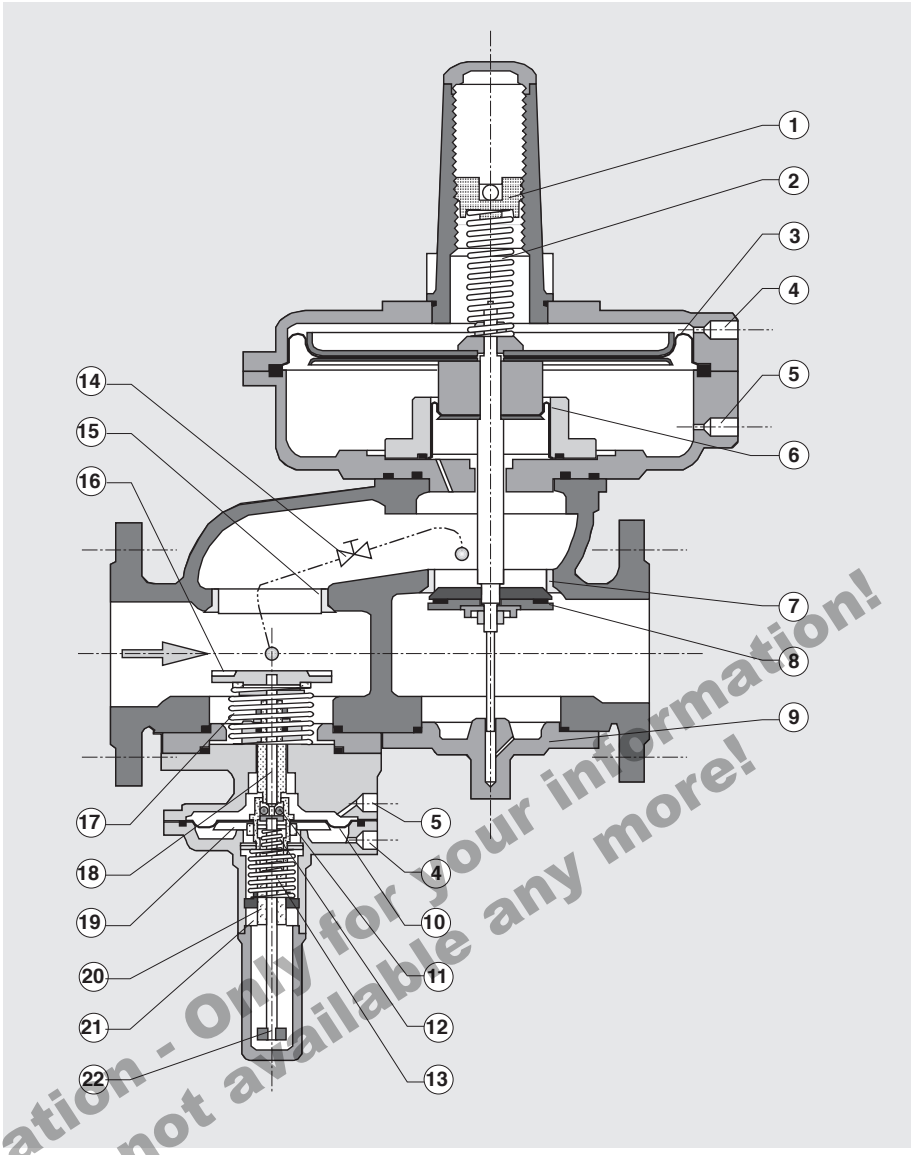
A safety shut-off valve is built in the regulator housing to cut off the gas supply at overpressure and/or pressure drop. If no SAV be installed, the opening in the housing is provided with a closing cover. This type is designed as follows: R 250/R251.

The safety shut-off valve (SAV) acts as the main protection device against overpressure. It prevents an excessive increase in output pressure downstream of the gas pressure regulator.
The SAV is open during operation. If it attains the upper setting pressure, the SAV cuts off the gas supply.
At the same time the minimum gas pressure is monitored, i.e. the SAV also closes if a lower setpoint pressure (gas drop) is attained. Only manual unlocking is possible.

The safety shut-off valve is installed upstream of the gas pressure regulator.
The SAV receives the unlocking pulse via a control line from the steadying zone located downstream of the gas pressure regulator.

The pressure regulator constantly maintains the output pressure within the permitted control deviation (RG 10), irrespective of inlet pressure or gas flow rate.
The regulating group meets the operating requirements of standard firing systems.
The pressure regulator closes tight at zero flow rate and when an inlet pressure is present.

Block diagram of RS 250/RS 251



1	Pressure regulator setting screw	12	Minimum spring
2	Load spring	13	Maximum spring
3	Main diaphragm	14	Pressure compensation valve
4	Vent	15	SAV valve seat
5	Pulse connection	16	Valve plate
6	Intermediate diaphragm	17	Closing spring
7	Valve seat	18	Valve spindle
8	Valve plate	19	Meter
9	Closing cover	20	Minimum pressure setting
10	SAV diaphragm	21	Maximum pressure setting
11	Ball	22	Reset button

Function

Gas flows in the arrow direction through the housing. Pressure is applied to the main diaphragm (3) on the output side from below via a pulse line (5). The valve plate (8) is suspended directly and is independent of the inlet pressure due an intermediate diaphragm (6).

The desired output pressure can be adjusted at the setting screw (1) of the load spring (2).

Output pressure setting:

Turn the setting screw (1) clockwise to increase the output pressure and turn counterclockwise to reduce the output pressure.

The controlled output pressure arriving from a pulse line (5) acts on the diaphragm (10) of the safety shut-off valve. The meter (19) raises or lowers at overpressure and/or pressure drop.

The meter operates on the ball shut-off principle. If the permitted pressure is exceeded, the meter is pressed against the maximum spring (13), the balls (11) release the spindle (18), and the closing spring (17) presses the valve plate (16) against the valve seat (15).The minimum spring (12) moves the meter in the opposite direction during a pressure drop. The trip mechanism is then activated and the closing spring presses the valve plate against the valve seat.

If you want to restore gas flow after fault elimination, pull the reset button (22) down.
Pressure compensation must first be provided on both sides of the valve plate (16) by shortly opening and then firmly closing the pressure compensation valve (14) at the housing.
If the trip pressures need to be reset due to changes in operating conditions, increase the maximum trip pressure by turning the spring plate (21) clockwise and reduce it by turning the spring plate counterclockwise. A minimum trip can also be set using the spring plate (22).

RS 250/251 gas pressure regulator Spring Table to DN 25 and DN 50

Pressure setting range	Spring no.
0… 17 mbar	0 1
15… 23 mbar	0 2
20… 37 mbar	0 3
35… 50 mbar	0 4
46… 70 mbar	0 5
90…100 mbar	0 6
125…135 mbar	0 7
150…210 mbar	0 8
190…260 mbar	0 9
240…500 mbar	1 0

RS 250/251 gas pressure regulator Spring Table to DN 80 and DN 100

Pressure setting range	Spring no.
0… 10 mbar	0 1
10… 18 mbar	0 2
17… 24 mbar	0 3
21… 30 mbar	0 4
27… 42 mbar	0 5
39… 60 mbar	0 6
55… 84 mbar	0 7
71…108 mbar	0 8
88…132 mbar	0 9
104…156 mbar	1 0
125…300 mbar	1 1
…500 mbar	1 2

RS 250/251 gas pressure regulator Spring Table to DN 150 and DN 200

Pressure setting range	Spring no.
0 … 10 mbar	F 70
10… 20 mbar	F 71
18… 28 mbar	F 711
25… 40 mbar	F 72
30… 60 mbar	F 73
50… 90 mbar	F 74
Can be set up to approx. 1.2 bar using different springs and meters.	

RS 250/251 safety shut-off valve Spring Table I (DN 50 to DN 100)

162 mm dia. meter, GMB 135 diaphragm

Trip at overpressure	Spring no.
up to 50 mbar	F 96
up to 200 mbar	F 97
up to 300 mbar	F 95
up to 400 mbar	F 94
Trip at pressure drop	**Spring no.**
10…20 mbar	F 93
20…40 mbar	F 92 B
40…60 mbar	F 92
up to 120 mbar	F 91

Note on Spring Table I:
Use a 222 mm dia. meter comprising a GMB 186 diaphragm for very low shut-off pressures. The unlocking ranges are then reduced by half.

Insert a ring in the 162 mm dia. meter for higher shut-off pressures. The unlocking ranges must then be multiplied by a factor of 2.5.

RS 250/251 safety shut-off valve Spring Table II (DN 150 to DN 200)

183 mm dia. meter, GMB 146 diaphragm

Trip at overpressure	Spring no.
up to 50 mbar	F 38 B
up to 80 mbar	F 38
up to 140 mbar	F 39
up to 220 mbar	F 40
up to 300 mbar	F 41
Trip at pressure drop	**Spring no.**
0…..15 mbar	F 46
15…..30 mbar	F 45
40…..60 mbar	F 47
70…100 mbar	F 471
up to 0,3 bar	F 48

Ordering information for pressure regulators, safety shut-off valves and safety blow-off valves

When ordering a pressure regulator, please supply us with the following specifications:

Device type	
Gas type	
Nominal width	DN
Flow rate	m^3_n/h
Inlet pressure P_i	bar
Output pressure range P_o	bar/mbar

When ordering a safety shut-off valve, the following additional information is required:

Trip pressure P_s (P_s = ~ 1,4…1,6 P_a)	bar

When ordering a safety blow-off valve, the following additional information is required:

Opening pressure P_o (P_o = ~ 1,1…1,3 P_a)	bar

When modifying a pressure range, the following specifications must be entered on the rating plate:

Device type (existing device)	
Device number	
Nominal width	DN
Diaphragm diameter	mm
Inlet pressure P_i	bar
Output pressure range P_o	bar/mbar
Trip pressure P_s	bar

Only trained and qualified personnel must be permitted to perform any modifications.
Finally, perform a leak test.

Safety blow-off valve (SBV)

Series: **FRSBV**, Rp 1
Max. vent pressure: up to **1 bar**,

Safety blow-off valve (SBV) as defined in DIN 3381
Temperature range: -15°C to +70°C
Silumin cast housing
Diaphragm: NBR
Valve seal: NBR
Rp thread in accordance with ISO 7/1

The safety blow-off valve (SBV) is required as an additional safety device. If a gas leak occurs, e.g. at an untight gas pressure regulator, the SBV prevents the activation of the safety shut-off valve.

An excessive pressure increase can occur if the gas pressure regulator supplies an excessive output pressure or the SAV is untight and allows leakage gas to flow.

The blow-off pressure of the SBV is adjusted to the upper trip pressure of the SAV. If an impermissible pressure increase occurs, the SBV is first activated and, if a further pressure increase occurs, the SAV is tripped.

The SBV is always installed downstrem of the gas pressure regulator.

Opening pressure range	Spring no.
20… 100 mbar	226 381
70… 350 mbar	226 382
300… 1000 mbar	226 383

Gas pressure switch

Series: **GW ..**
Pressure switch as defined in DIN EN 1854
Pressure ranges of **0.4** to **6000 mbar**,
Ambient temperature: -15°C to +60°C
Medium temperature :-15°C to +80°C
Housing: Aluminium die cast
Switch: Polycarbonate
Diaphragm: NBR or EPDM
Switch contacts: Fine silver or galvanized fine silver, gold-plated
GW.. pressure switch, UB.. and NB.. pressure limiters as well as GW../GW.. double pressure switches are designed for switching a circuit on, off or over if the pressure actual value changes in relation to the setpoint.

The switching point can be set by means of a scale integrated on the setting wheel.

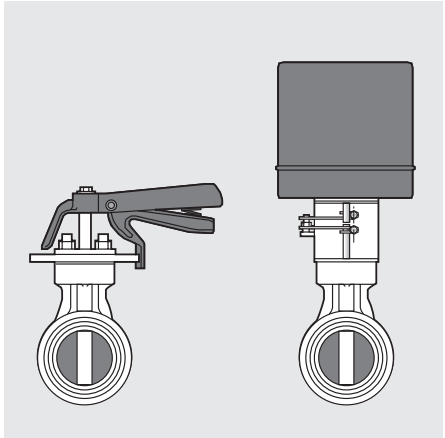
Refer to DUNGS pressure switch datasheets for detailed information on designs, ranges, protection classes, etc.

Gas volume control valve

Series: **UR-6 G**,
Gas volume control valve for installation in pipes and connection flanges as defined in DIN 2633, PN 16.
Max. operating pressure: up to **6 bar**,
Temperature range: -15°C to +60°C
Housing: GG-25, grey cast-iron
Shaft: Ms-58 brass, as defined in DIN 17660
External seal: O-rings
Regulator disk: steel, zinc-plated
Nirosta shaft and disk on request (surcharge).

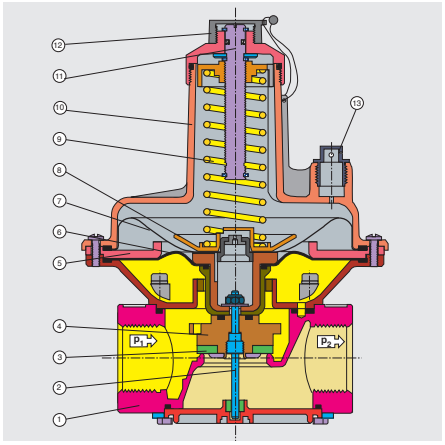
Permitted difference pressure

DN 25 -	DN 50	4 bar
DN 65 -	DN 100	2 bar
DN 125 -	DN 200	1 bar



Different setting ranges by means of toothed scale and handle with 90° grid.
We supply continuous fine adjustment or motor actuator for the regulating valve.
Actuators: Commercial motors can be retrofitted.

Sectional drawing of FRSBV

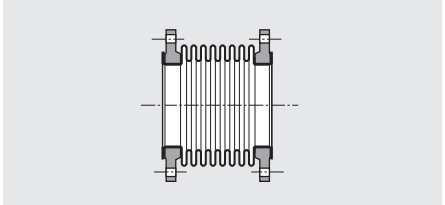


1 Housing
2 Spindle
3 Sealing ring
4 Control disk
5 Intermediate disk
6 Operating diaphragms
7 Safety diaphragms
8 Diaphragm disk
9 Reference value spring
10 Cover
11 Adjuster
12 Protective cap
13 Vent plug

GW A6

Compensator

Series: St FBDN 40 to DN 200
Compensator complying with DIN 30 681
Max. operating pressure up to **10 bar**,
Temperature range: -15°C to +80°C
Steel housing
Flanges complying with DIN 2501, Part 1, matching pre-weld flanges as defined in DIN 2633, PN 16. To protect the regulating train against stresses.



Solenoid valve

Series: **MV..., DMV...**
Safety shut-off valve of Group A as defined in EN 161
Nominal widths:
Rp 3/8 to Rp 2 1/2
or DN 20 to DN 200
Max operating overpressure:
up to **0.2 bar** or up to **0.5 bar**.
Pressure level: PN 1
Ambient temperature: -15°C to +60°C
Silumin cast housing
Internal parts: no non-ferrous metals
Valve seat seal on NBR basis
Dirt trap: integrated sieve
No-load closed
Fast open, fast close
Closing time: < 1 s
Opening time: < 1 s
Main flow manually adjustable

DC solenoid, rectifier and protected circuit in terminal box
Measuring/ignition gas connections on both sides G 1/4 DIN ISO 228 in the inlet pressure zone, additionally at the front G 3/4 from DN 40 onwards (flange version).
Voltage: 220 V AC (+10% -15%)
50-60 Hz - other voltages on request.
Pipe thread as defined in ISO 7/1
Flange: Connection flange to DIN 2501, Part 1, matching pre-weld flanges as defined in DIN 2633 (PN 16).
Main contact mountable to check the closed position of the valve.
Refer to DUNGS solenoid valve datasheets for detailed information on solenoid valve versions, e.g. slow-ope-ning, two-step, protection classes, etc.


DMV.../11

Valve leak testers

Compact valve leak tester

Series: **VDK 200 A**
Max. perm. operating pressure:
0.36 bar

Ambient temperature:
-10°C to +60°C
VDK is a compact device.
Pump, pressure switch and solenoid valve are installed in the Silumin cast housing base and the control is installed in the plastic top part.
Voltage: 220 V AC -15% up to
240 V AC + 6%
Frequency: 50 Hz
Protection class: IP 40

Max. test volume: approx. 10 l or 20 l (for 0.36 bar), test time: 30 s
Leak gas volume: <30 l/h (limit rate)
Installation position: vertical, horizontal
Pipe connection on inlet and output sides 12 mm dia. pipe with ball ring threaded joint.

See DUNGS datasheets for detailed information on the VDK Compact valve leak tester.
Refer to Test volumes Table for operating ranges.


VDK 200 A

DK 2 leak test system

Max. perm. operating pressure:
independent
Ambient temperature: -10°C to +60°C

DK 2F (DK 2A) leak testers test the leakage of two consecutive gas solenoid valves in connection with one or two gas pressure switches and auxiliary valves. A synchronous gear motor controls the DK 2 program procedure using switching cams via micro switch.

Voltage: 220 V AC -15% up to
240 V AC + 6%
Frequency: 50 Hz
Protection class: IP 40

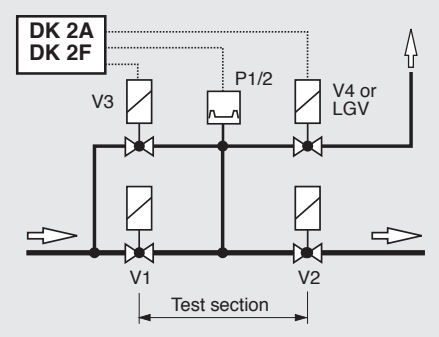
The gas inlet valve is tested by emptying the test section and monitoring the pressure increase. The burner valve is tested by filling the test section and monitoring the pressure reduction.


DK 2

If the pressure increases during the first test phase above permitted levels or if the pressure drops excessively during the second test phase, the DK2 interlocks in fault position and prevents burner activation or gas release.

For detailed information on the DK valve leak testers, refer DUNGS

Block diagram of DK 2



Legend

V1	Safety solenoid valve
V2	Burner solenoid valve
V3	Test gas solenoid valve
V4	Vent solenoid valve
LGV	Leak gas solenoid valve
P 1/2	Test pressure switch

Data on Regulating Train Definition

To define a gas regulating train, the follwoing gas specifications must be known.

The specifications for firing systems help to define the train to system requirements.

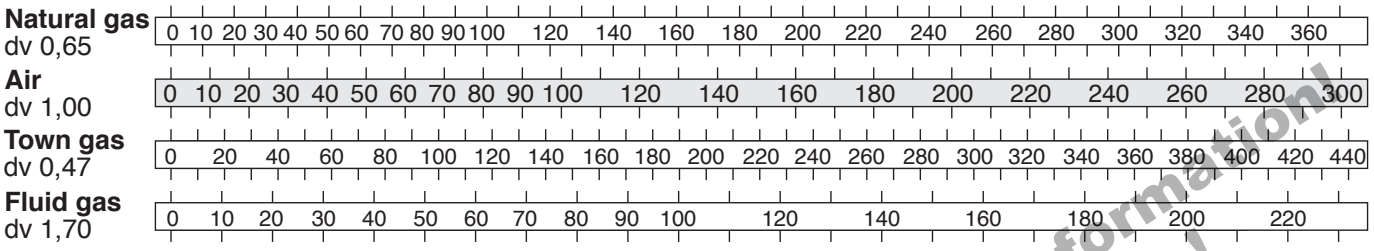
1. Gas specifications for regulating train

Gas type: Natural gas / town gas
fluid gas
Density relationship (to air = 1):dv.....
Heating value H_u/m^3_n: MJ/kW
Inlet pressure P_i: ..... bar
Output pressure P_a :..... mbar
SAV trip pressure:..... mbar
Max. flow rate.:.....m^3_n/h
Min. flow rate.:.....m^3_n/h

2. Firing system

Max. heating performance: ..... kW
Max. gas flow rate.: .....m^3_n/h
Divided in single
thermal power ratings: ..... kW
Max. gas flow rate: .....m^3_n/h
Min. gas flow rate: .....m^3_n/h
Burner inlet pressure:..... mbar
(to cope with all resistances on burner and waste gas sides)

Estimated flow rate conversion dependent on density relationship



Calculation of fitting nominal widths (example: calculation of all pressure losses)

ΣP_F = Pressure losses of firing system
ΣP_G = Sum of pressure losses
ΣP_{GZ} = Total pressure loss and margin

Pressure losses at .....m^3/h				**mbar**			
ΔP_K	Firing chamber/waste gas resistances						
ΔP_B	Burner head/burner resistances						
ΔP_L	Pipes, bends, etc. upstream of burner fittings				alternative		mbar
Item	Fittings	Type	DN	ΣPF	Type	DN	ΣPF
1	Control valve						
2	Burner solenoid valve						
3	Safety solenoid valve						
4	Gas pressure regulator						
5	Filter						
6	Ball valve						
7	Safety shut-off valve						
Total pressure loss calculated			ΣPG		alternative ΣPG		
10% safety margin		x 1,10	ΣPGZ			ΣPG	

Definition of control valve and solenoid valve nominal widths

After defining the system resistances, a nominal width is selected depending on the flow rate.
Control valve and solenoid valves are sized so that the sum of all pressure losses is less than the output pressure P_o of the gas pressure regulator.

Example for reading off the control valve size:

Required flow rate = 300 m^3_n/h natural gas

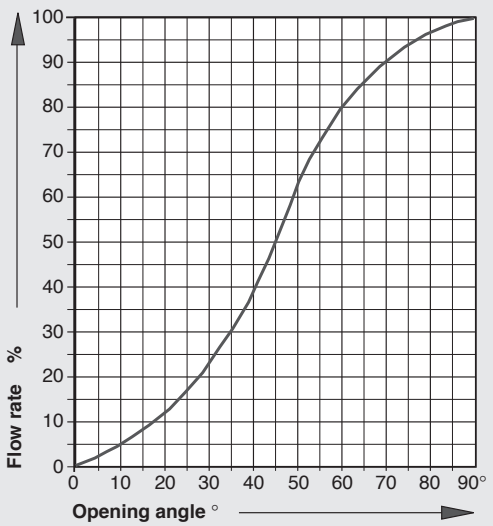
DN 65: Low pressure loss of 2.3 mbar, but poor regulation since the flow rates only modify to an opening angle of approx. 50°.

DN 50: Pressure loss of 6.5 mbar, good regulation (flow rate modification) up to an opening angle of approx. 72°.

DN 40: High pressure loss of 20 mbar, but good regulation over the total adjustment range of 0-90°.

If a DN 65 line exists and if a higher pressure loss is possible, DN 40 flap can be installed with a DN 40 reduction.

Control valve flow rate characteristic



Nominal Width Definition of Regulating Train Fittings Dependent on Flow Rate and Pressure Difference

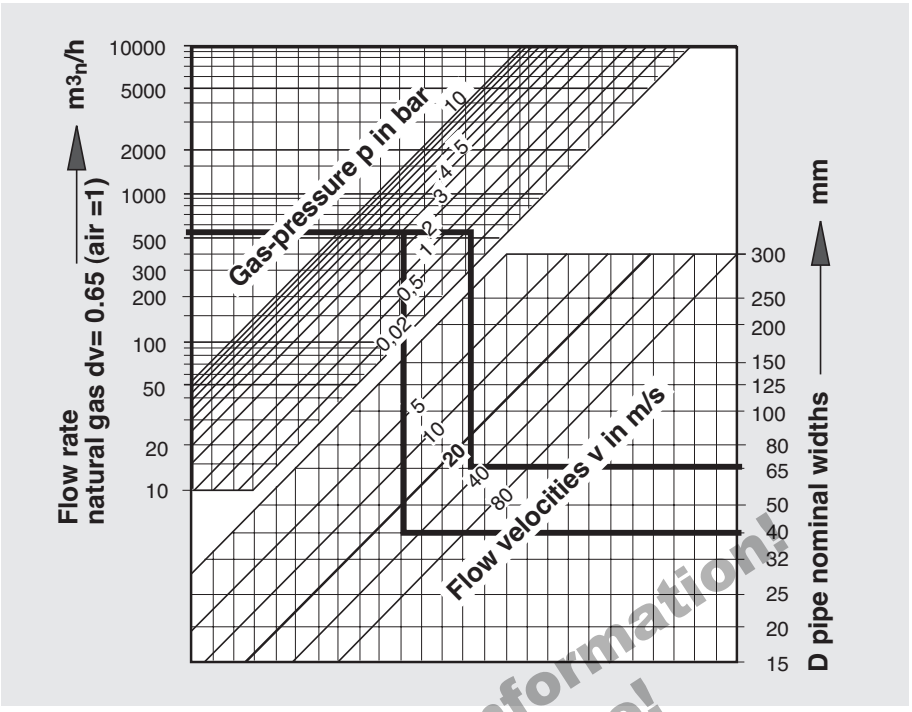
Definition of pipe nominal widths

If the flow velocity limit value of 30 m/s (standard for the gas line) is not exceeded in the connection pipes, flow noise in a gas pressure system is normally a secondary factor.
For industrial systems, the limit value can be 50 m/s.
However, if there are higher flow velocities in the system or even in partial sy-stem zones (e.g. in the safety fittings), the impact of flow noise on total noise must be taken into account.

Irregularities in the flow route are the cause of flow noises. Any deviation, diameter modification or inserts as well as flow behaviour in the limit zone result in local changes in flow velocity and thus in instabilities which may cause noise.

Example for the definition of a pipe nominal width:

Diagram to define the size of the pipe nominal widths:

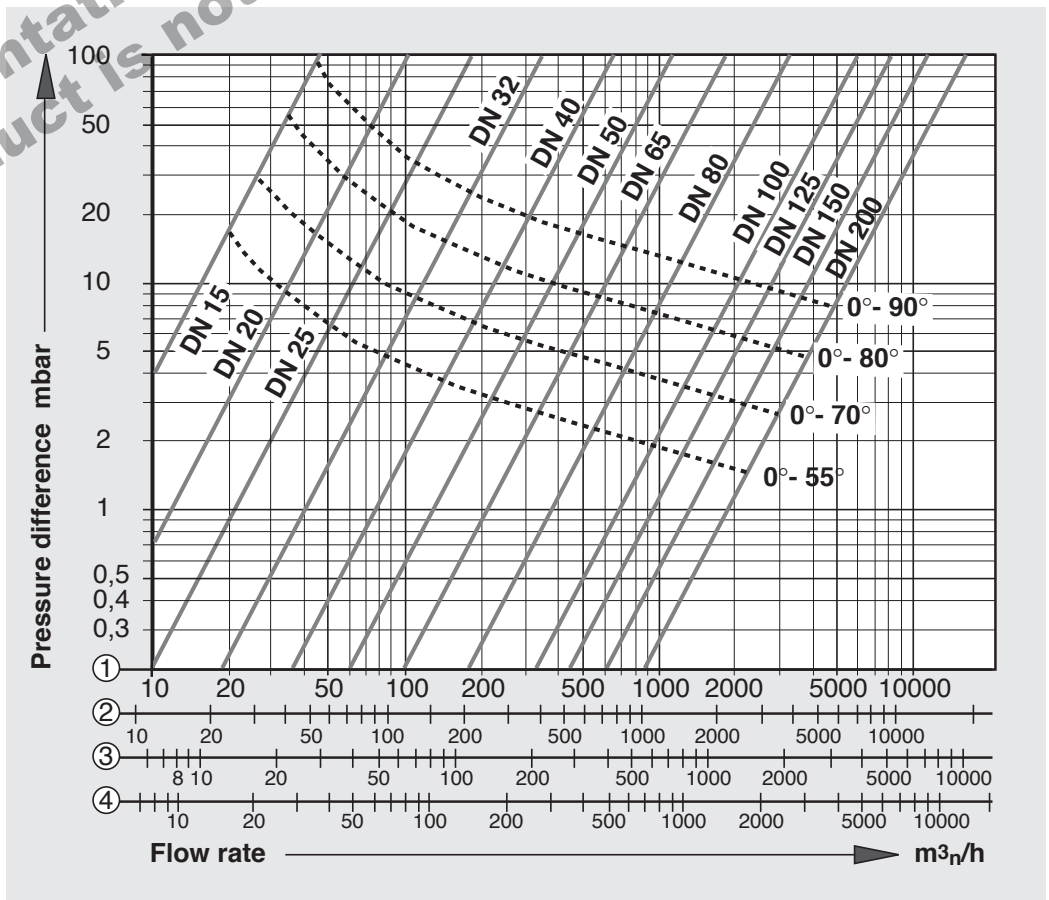


Flow rate $q_{n\,max.}$	500 m^3_n/h	calculated:
Gas pressure inlet p_i	3 bar	required DN for 40 mm inlet
Gas pressure output p_a	0.5 bar	required DN for 65 mm output
Flow velocity	30 m/s	

Size definition of control valve nominal width, volume flow V in m^3_n/h

The control valve must be sized so that the flow rate can be modified at the largest opening angle possible.

See example on page 12:
Definition of control valve nominal width and flow rate characteristic

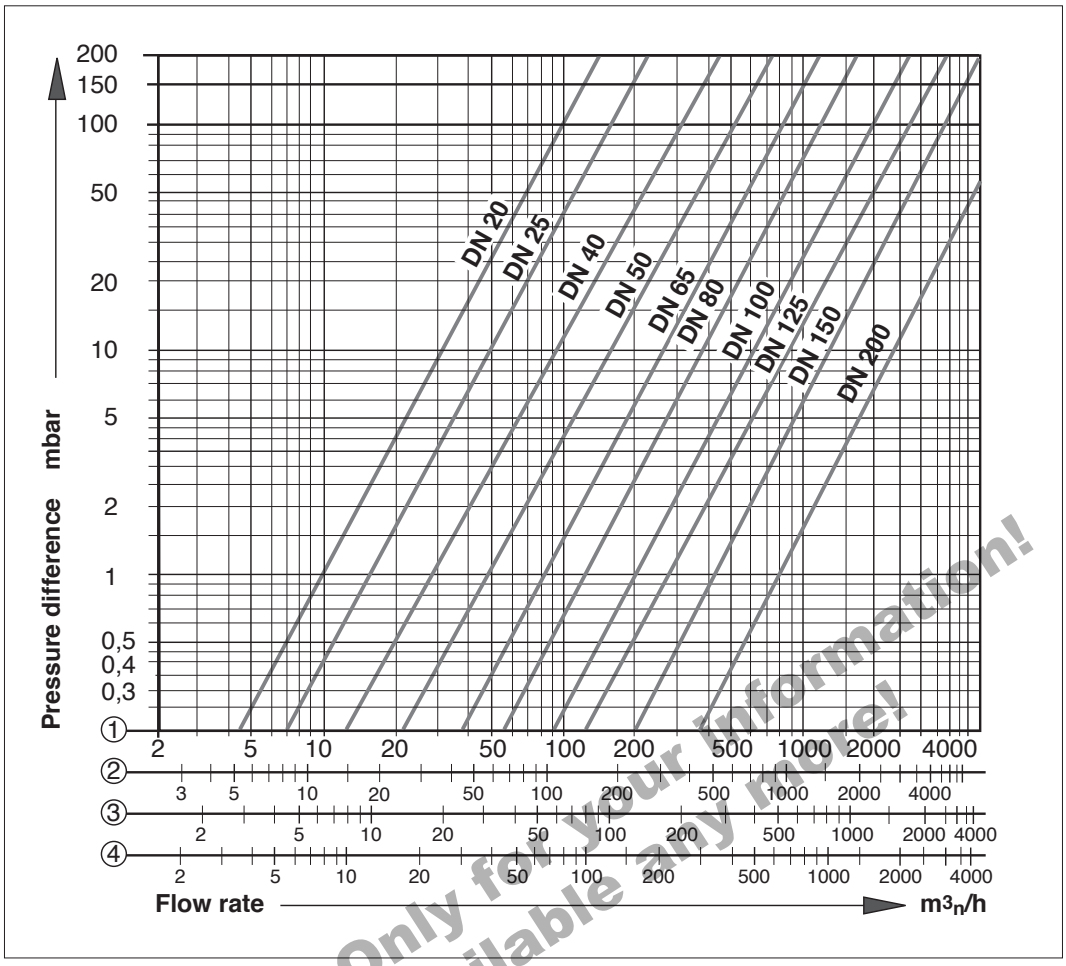


1 Natural gas $d_v = 0.65$
2 Town gas $d_v = 0.45$
3 Fluid gas $d_v = 1.56$
4 Air $d_v = 1.00$

Nominal Width Definition of Regulating Train Fittings Dependent on Flow Rate and Pressure Difference

Flow rate and pressure difference of solenoid valves

When calculating the pressure difference of solenoid valves, consider that **two** solenoid valves are built in the regulating train, i.e. one burner and one safety solenoid valve.



1	Natural gas	$d_v = 0.65$
2	Town gas	$d_v = 0.45$
3	Fluid gas	$d_v = 1.56$
4	Air	$d_v = 1.00$

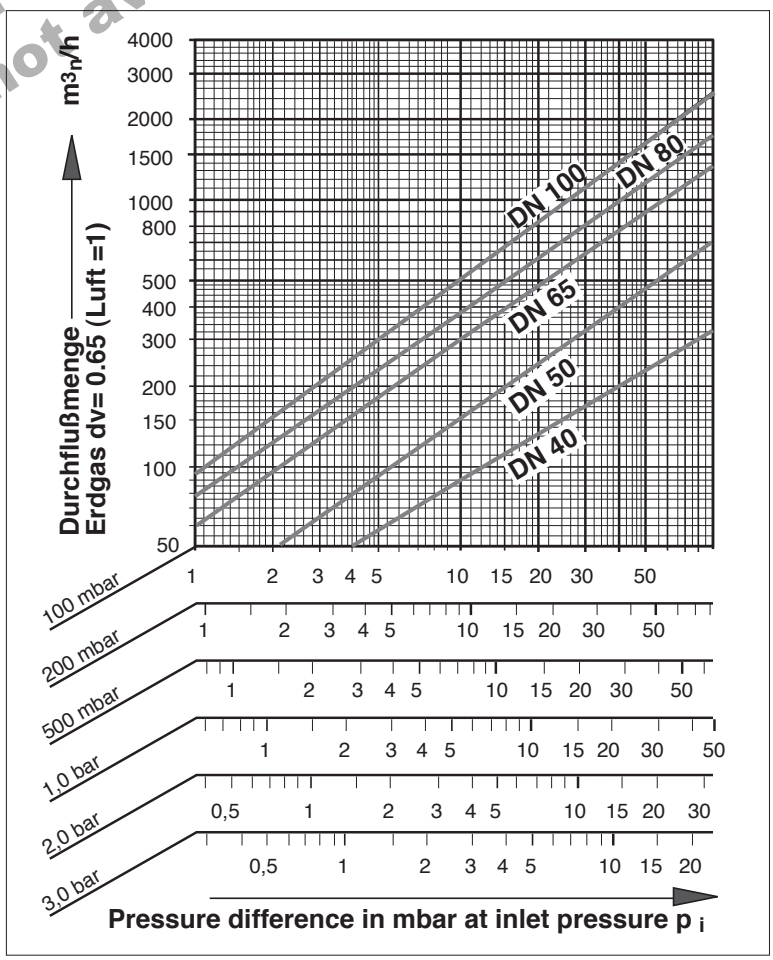
Flow rate and pressure difference of ball valve and GF gas filter types

Size gas filter and ball valve so that the max. pressure loss is less than 50 mbar.

The permitted flow velocity is not exceeded with this value and the requested dust separation is attained.

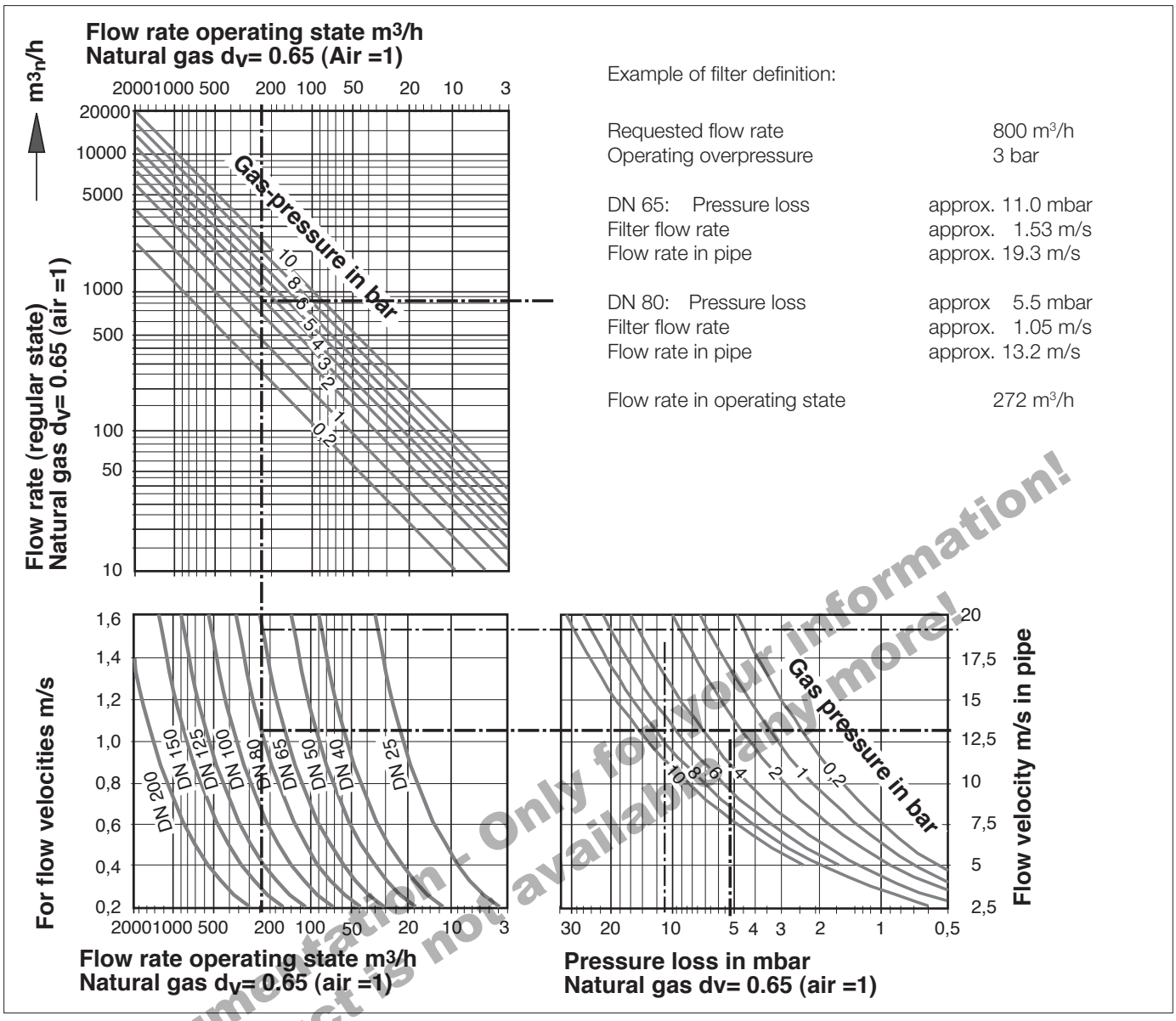
For low inlet pressures (under 200 mbar), the max. pressure loss should not exceed 10 mbar.

Select filter and ball valve nominal width so that the pressure loss remains relatively low. As regards the selection of pressure regulators, a larger pressure drop is available.



Nominal Width Definition of Regulating Train Fittings Dependent on Flow Rate and Pressure Difference

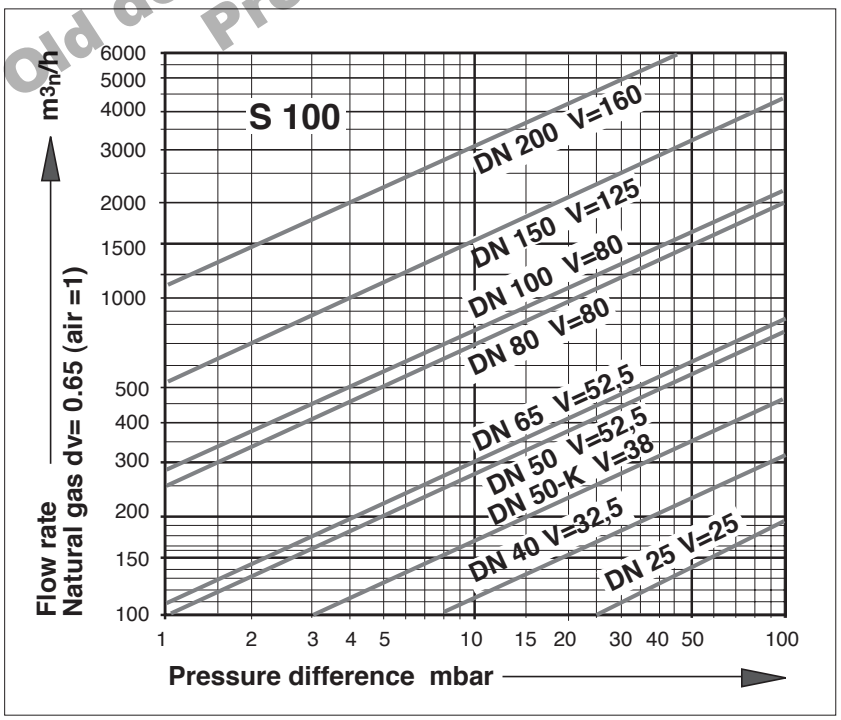
High-pressure filters - Flow rate, pressure difference and flow velocity



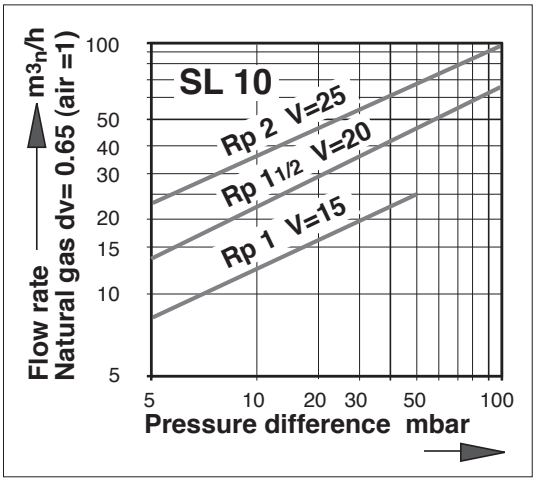
Example of filter definition:

Requested flow rate	800 m³/h
Operating overpressure	3 bar
DN 65: Pressure loss	approx. 11.0 mbar
Filter flow rate	approx. 1.53 m/s
Flow rate in pipe	approx. 19.3 m/s
DN 80: Pressure loss	approx 5.5 mbar
Filter flow rate	approx. 1.05 m/s
Flow rate in pipe	approx. 13.2 m/s
Flow rate in operating state	272 m³/h

Performance characteristics of S 100 safey shut-off valve

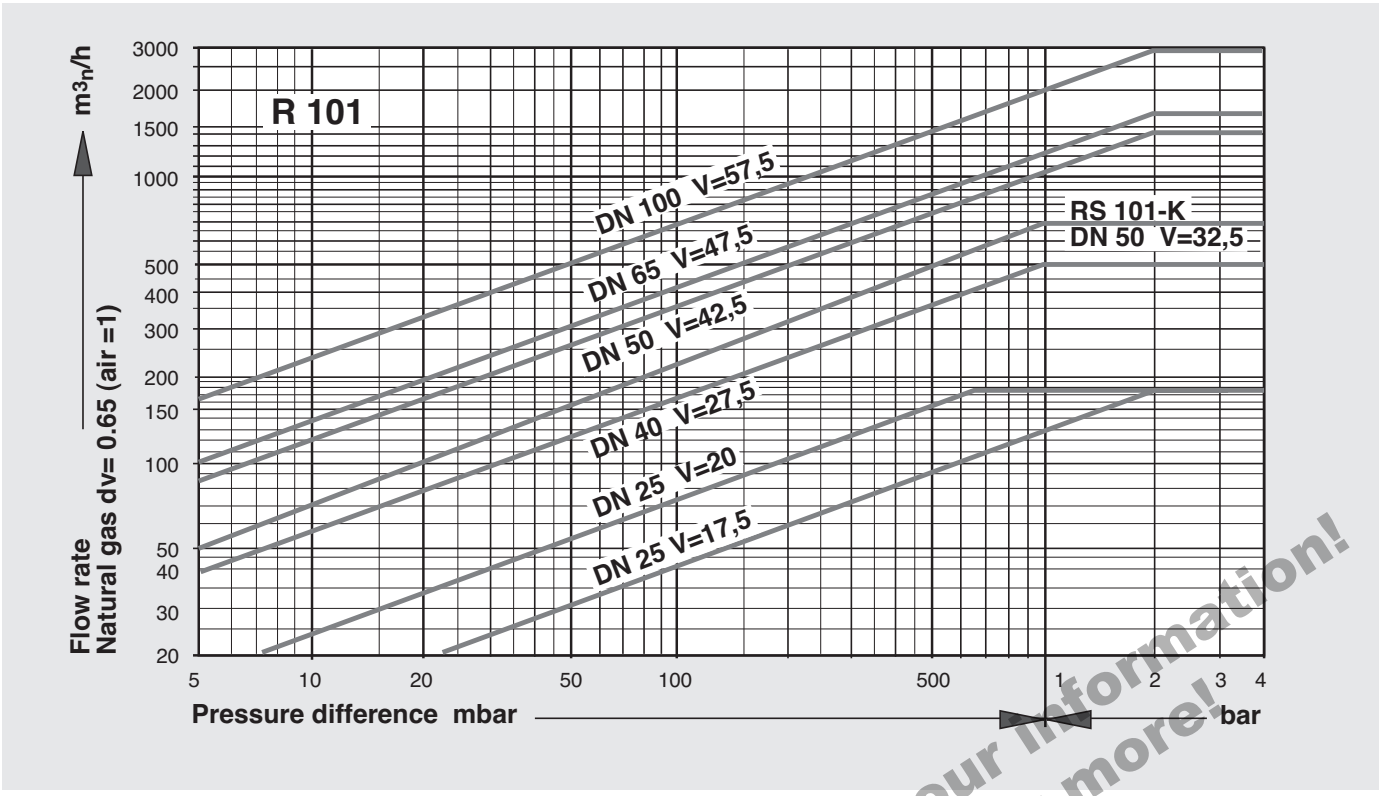


SL 10 safety shut-off valve

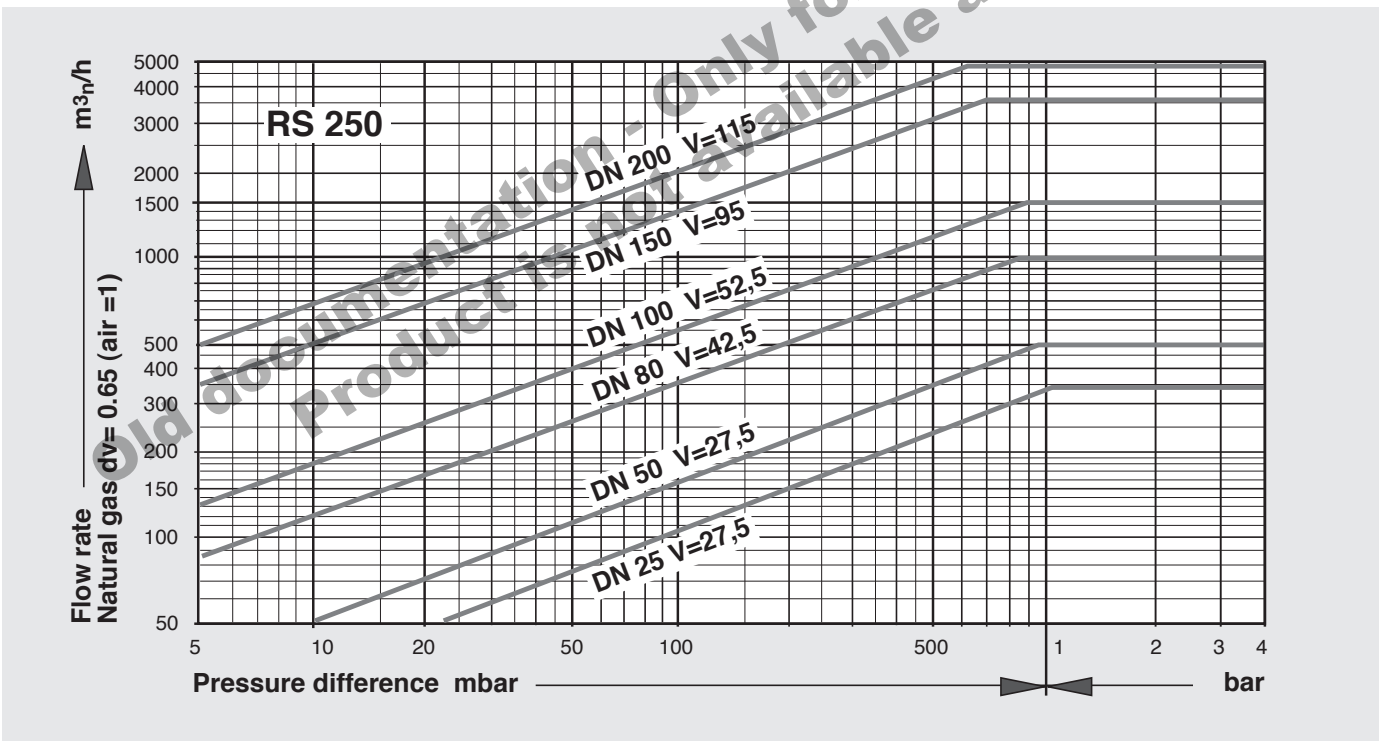


Nominal Width Definition of Regulating Train Fittings Dependent on Flow Rate and Pressure Difference

Performance characteristics of R 101 pressure regulator



Performance characteristic of gas pressure regulator and built-in RS 250 safety shut-off valve



Example of pressure regulator selection:

Remark:
The regulator pressure difference must be less than the max. possible pressure loss.

System parameters:

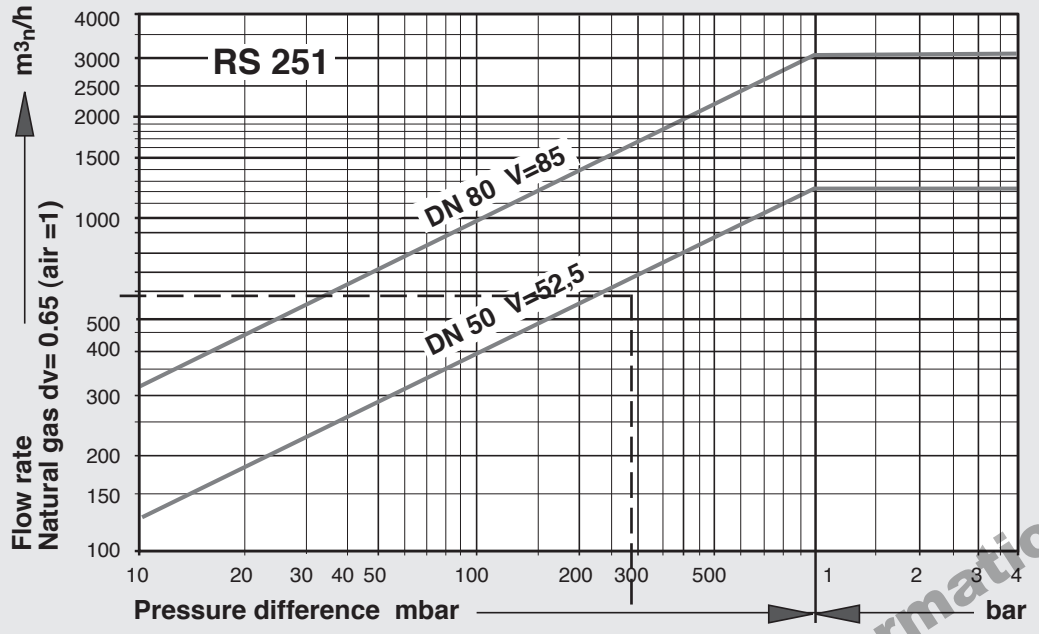
Flow rate	1000 m^3_n/h
Inlet pressure	1.5 bar
Output pressure	0.3 bar
$p_i - p_a$	1.2 bar

Selection:

Pressure regulator	R 101
Nominal width	DN 65
F8 spring/160 diaphragm	...400 mbar
Pressure difference	700 mbar
Pressure regulator and SAV	R 250
Nominal width	DN 80
12 spring	...500 mbar
Pressure difference	850 mbar

Nominal Width Definition of Regulating Train Fittings Dependent on Flow Rate and Pressure Difference

Performance characteristic of gas pressure regulator and built-in RS 251 safety shut-off valve



Example of pressure regulator selection:

Remark:
The regulator pressure difference must be less than the max. possible pressure loss.

System parameters:		Selection:	
Flow rate	620 m^3_n/h	Pressure regulator and SAV RS 251	
Inlet pressure	0.5 bar	Nominal width	DN 50
Output pressure	0.2 bar	09 spring	190-250 mbar
$p_i - p_a$	300 mbar	Pressure difference	250 mbar

Installation and mounting

The prevailing guidelines and regulations as defined in DVGW and DIN for installing and commissioning the regulating train must be observed.
Only trained and qualified personnel must be permitted to perform work on gas regulators and safety devices.

Install the regulating train directly upstream of the gas-consuming devices.

Install the regulating train so that the direction arrows point towards the filter, safety shut-off valve, pressure regulator and solenoid valves in the direction of gas flow.

Normally, the gas passage is horizontally.
The installation of the regulating trains is independent of position due to the spring loads. The device works therefore in any position.
If necessary, re-adjust the output pressure.

Position the pulse lines for SAV and pressure regulator so that you can monitor a steady output pressure (ap-prox. 10 x DN). Designed with 12 mm dia. steel pipe and cutting ring unions.

Take particular care that pulse lines are not damaged during mounting.

Connect the vent lines to the vent connections and route them outdoors.

Ensure that the sealing rings are inserted.

Ensure that the connection lines and the devices are free from contamination to avoid damages and operational faults.

Leak test

Perform a leak test on the fully mounted gas regulating train at the erection site using air or inert gas at 1.1 times the highest permitted operating pressure.

Connect the tester to the gas filter or SAV. Close the shut-off valve upstream of the gas filter and open the SAV and the pressure compensation valve at the SAV.
Test the pressure regulator function before commissioning. This also includes the close position of the SAVs.

Commissioning

Slowly open the ball valve upstream of the regulating train and then the burner ball valve (if installed).

Observe the output pressure at the manometer and, if necessary, re-adjust at the load spring. Ensure that there is no zero consumption, otherwise the closing pressure must also be measured.

The output pressure in the pressure regulator, the switch-off pressure in the SAV and the vent pressure in the SBV are set at our factory to the values specified in the enclosed datasheet.

Output pressure adjustment

The output pressure Pa must be higher than the sum of resistances of all downstream fittings and gas-consuming devices.
If it is necessary to correct the output pressure, re-adjust the pressure regulator setting screw. Open the closing cover. Then change the pressure to the desired value by turning the setting screw. Pressure will increase by turning clockwise.
You can only adjust the output pressure P_a while gas is flowing.

This can be performed during operation since all gas-conveying chambers in the regulator are closed.

If the SAV close due to a operating fault at the pressure regulator, you can manually open the SAV after eliminating the fault.

SBV adjustment

Adjust the safety blow-off valve before adjusting the SAV setpoint.

After you have successfully set the burner, switch off the regulator.
Determine the pressure at which the SBV blows off (noise!) by turning the SBV setting screw counterclockwise. At the same time observe the output manometer.

Re-adjust the vent pressure to a higher value by turning the setting screw clockwise.
Switch off the burner nominal load to attain a higher pressure peak.
Set the vent pressure by approx. 20 mbar higher than the already determined pressure by turning the setting screw counterclockwise.

Ensure that the vent pressure P_o (approx. 1.1. to 1.3 • Pa) is lower than the max. perm. operating pressure of the solenoid valves. P_o = < P_{max} solenoid valves.

Ensure that the shut-off valve upstream of the SBV is always open since it only monitors the SAV function.

SAV release

A ball valve is mounted on the regulator housing to compensate the pressure upstream and downstream the valve seat.
After opening the pressure compen-sation valve, you can again release the SAV easily by hand using the reset button.
To open the SAV valve plate, firstly re-move the closing cover and then the valve bar until the ball lock shut-off re-engages. After removing the closing cover, some leak gas can escape at the valve bar. This is not dangerous.
When the SAV is released, screw the closing cover and seal back on again.
The safety shut-off valve is again ready to operate. Perform a leak test on the closing cover (soap using nekal or soap solution).

SAV release

SAV function test and SAV adjustment

Perform a test by switching off the burner:

Adjusting the overpressure switch-off:
P_s= ~1,4..1,6 · P_a

SAV trips
Increase the switch-off pressure by turning the SAV setting screw clockwise until the SAV no longer trips when the regulator switches off.

SAV does not trip
Reduce the switch-off pressure by turning the setting screw counterclockwise until the SAV trips when the regulator switches off. After deter-mining the switch-off pressure, turn the setting screw by 1/2 to 1 turn clockwise.
Check by performing further regulator switch-offs whether the SAV remains open.

The SAV cannot be released
This occurs when the blow-off pressure of the SBV is set higher than the switch-off pressure of the SAV.

The SAV does not engage:
Excessive pressure in the SAV pulse line must be relieved.

Adjusting switch-off at pressure drop:

$$P_{min} = \sim 0{,}5..0{,}6 \cdot P_a$$

Increase the switch-off pressure in the event of pressure drop by turning the setting screw for pressure drop clockwise.
Reduce by turning counterclockwise.

Fault causes

Vibrations
They are very often attributed to the regulator although they mostly occur in the gas supply line to the burner. Check first whether the regulating train and pipe are properly supported and do not contain any fittings which cause vibration (semi-open valves, broken diaphragm or valve stem guides, etc.).

Pulsation
Since the pressure regulator has a large nozzle with very high flow rate in comparison with the connection nominal width, the valve plate can only raise a little from the nozzle and the regulator may become instable.

If the regulator pulsates at normal flow rates, restrict the pulse line using a choke.
A reduction in the pulse line diameter often causes damping and thus a slower response of the pressure regulator.

A reduction of the vent diameter often stops pulsing in the pressure regulator.

Use a different spring and the requested result will be achieved subject to the operating conditions.

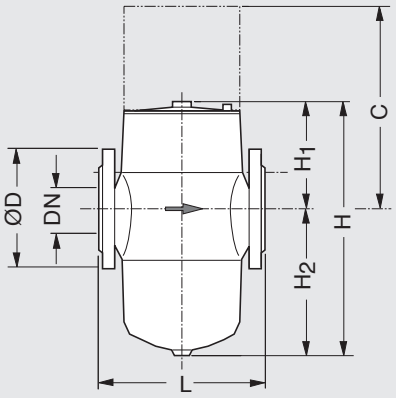
If the minimum flow rates are under 10% of the maximum rate specified for the relevant operating pressures, we can install a steeper regulator cone at our factory.

No zero shut-off
Caused by:
damaged valve seat,
untight nozzle mounting
damaged nozzle or
contamination
The valve plate is easily accessible after removing the inspection plate.

You can remove the complete SAV mechanisms when an SAV fault occurs. The housing remains in the pipe and this results in less servicing.

Maintenance
The regulating train comprising pressure regulator and safety devices is maintenance-free.
The train may require cleansing, depending on the contamination, humidity and chemical composition of the gas.
Clean the gas filter located upstream of the regulator group at regular intervals or meter the contamination by performing difference pressure measurements.

HD - Filter

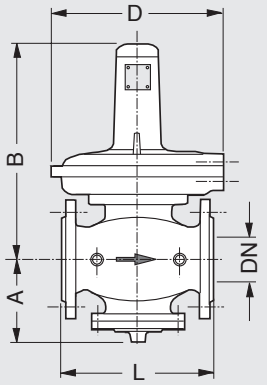


High-pressure filters

Housing made of grey cast-iron

Connection	Type	$P_{max.}$ bar	L	H	H_1	H_2	C	Ø D	Weight kg
DN 25	254 016		145	115	58	58	100	115	4.3
DN 40	404 016		195	150	75	75	130	150	7.7
DN 50	506 016		210	203	90	113	170	165	12.4
DN 80	806 016	16.0	268	323	135	188	290	200	27.3
DN 100	1006 016		318	392	167	225	350	220	41.0
DN 125	1256 016		360	457	188	269	410	250	55.0
DN 150	1506 016		400	542	225	317	500	285	77.0

R 101

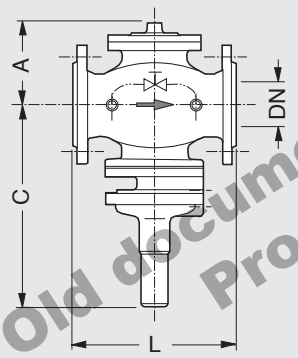


R 101 gas pressure regulators

Housing made of Silumin cast

Connection	P_i max. bar	P_a max. mbar	A	B	D	L	Weight kg	Order spec.
DN 25			75	350	320	160	10.0	**P_i, P_a**
DN 40			75	350	320	160	11.0	
DN 50	4.0	750	115	395	265	250	14.0	**Q**
DN 65			105	375	375	220	20.0	
DN 100			200	600	375	350	35.0	
DN 50-K	4.0	750	100	345	320	180	12.0	

S 100



S 100 safety shut-off valves

Housing made of Silumin cast

Connection	P_i max. bar	P_a max. mbar	A	B	C	D	L	Weight kg	Order spec.
DN 25			70	250	215	160/320	160	3.5	Trip pressure P_s
DN 40			100	350	230	160/320	160	5.0	
DN 50			115	360	340	265/375	250	8.5	
DN 65			110	375	330	265/375	220	7.0	P_s = ~1.4..1.6·P_a
DN 80	4.0	0.3	140	385	350	265/375	280	13.0	
DN 100			150	395	360	265/375	300	15.0	
DN 150			195	590	410	265/375	380	32.0	Q
DN 200			240	635	460	265/375	420	49.0	
DN 50-K	4.0	0.3	100	345	230	160/320	180	5.5	

RS 250 gas pressure regulators with built-in safety shut-off valve

Connection	P_i max. bar	P_a max. bar	A	B	D	d	L	Weight kg **	Order spec.
DN 25			325	275	160/230	162	230	10	P_i, P_a
DN 50			345	280	160/230	162	230	14/24*	
DN 80	6.0	1.2	400	300	205/375	162	310	26/40*	P_s
DN 100			415	320	205/375	162	350	32/48*	
DN 150			740	425	265/485	185	480	110*	Q
DN 200	4.0		810	450	265/485	185	600	75	

Housing made of Silumin cast, on request GGG 40**

RS 251 gas pressure regulators with built-in safety shut-off valve

Connection	P_e max. bar	P_a max. mbar	A	B	D	d	L	Weight kg	Order spec.
DN 50	4.0	750	440	260	265	162	310	18	s.
DN 80			680	320	375	162	410	28	RS 250

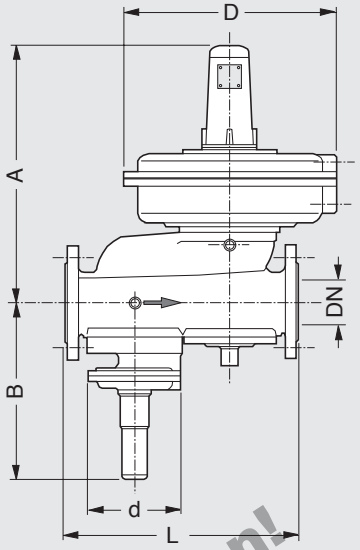
FRSBV safety blow-off valves

Housing made of Silumin cast

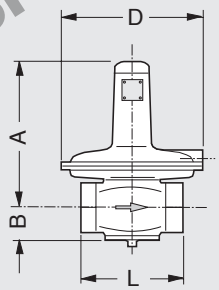
Connection	P_e max. bar	P_a max. bar	A	B	D	L	Weight kg	Order spec.
Rp 1			180	50	145	100	2.5	Opening
Rp 1 1/2	10.0	1.0	215	55	145	140	3.5	pressure P_o
Rp 2			225	60	145	160	4.0	P_o= ~1,1..1,3·P_a

All dimensions refer to standard versions.
P_e max.-specifications in accordance with the test as defined in DIN DVGW.

RS 250/251

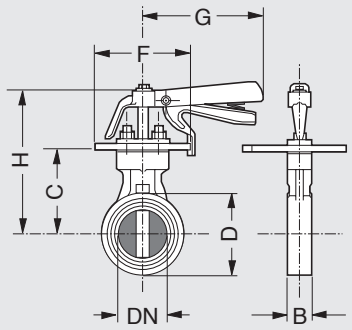


FRSBV

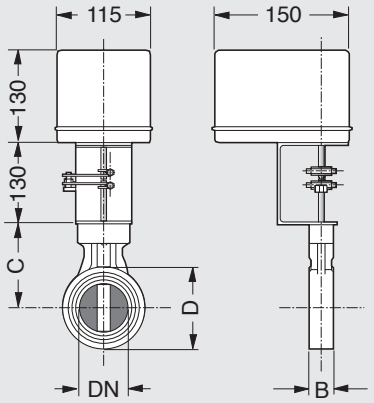


Technical Specifications, Dimensions, Ordering Information

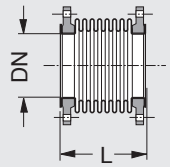
Control valve



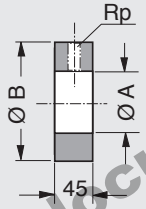
Control valve with motor drive



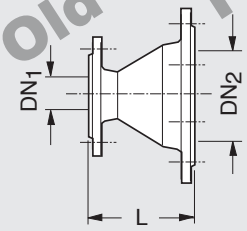
Compensator



Intermediate ring



Reduction



URG-6-G control valve

Housing made of grey cast-iron

Connection	P max. bar	B	D	C	H	F	G	Weight kg w/o Motor	Weight kg with
DN 25		25	60	73	130	100	105	2.20	4.80
DN 40		25	75	81	138	100	105	2.50	5.10
DN 50		25	85	84	141	100	105	2.70	5.30
DN 65	6.0	25	105	93	153	115	120	3.00	5.60
DN 80		30	120	103	163	115	120	4.00	6.60
DN 100		30	140	113	173	115	120	4.50	7.10
DN 125		35	170	135	200	115	150	5.80	8.40
DN 150		40	195	145	212	115	150	6.50	9.90
DN 200		40	255	174	239	115	150	11.00	14.40

St FB compensators

Connection	P max. bar	L	Weight kg	Order no.
DN 40		75	4.00	217 221
DN 50		95	4.80	217 222
DN 65		110	5.80	217 223
DN 80	10.0	125	7.50	217 224
DN 100		150	8.70	170 970
DN 125		175	11.00	217 225
DN 150		200	13.50	217 226
DN 200		240	18.00	217 227

Intermediate rings

Ø A	Ø B	Weight kg	Order no.
45	93	0.66	196 300
57	105	0.80	196 310
76	125	0.98	196 320
89	140	1.20	196 330
108	160	1.46	196 340
133	192	1.74	196 350
159	218	2.05	196 360
216	273	2.40	196 370

PN 16 pre-weld flanges

DN/DN1	Ø D	Ø k	h1	d2
40	150	110	42	18
50	165	125	45	18
65	185	145	45	18
80	200	160	50	18
100	220	180	52	18
125	250	210	55	18
150	285	240	55	23
200	340	295	62	23

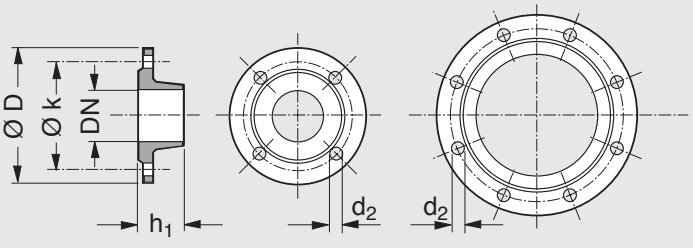
Reductions

DN2	L
50	167
65	184
80	189
100	206
125	238
150	254
200	273

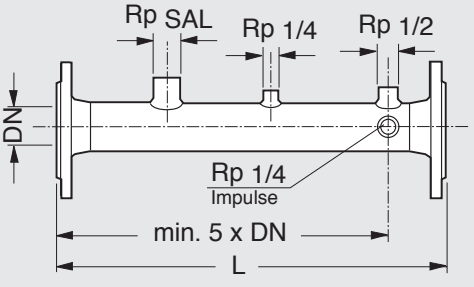
Steadying zones

Connection	Rp	L
DN 40	inclu-	620
DN 50	ding	620
DN 65	Rp 1/4	620
DN 80	Rp 1/2	670
DN 100	Rp 1	670
DN 125	threads	750
DN 150	others on	920
DN 200	request	1190

Pre-weld flange



Steadying zone



Gas regulating trains

DUNGS engineers manufactures complete systems at their factory in Osnabrück: Gas regulating and safety trains for industrial, thermal production processes, with inlet pressures up to 4 bar and nominal widths up to DN 200.

Each system is designed accor-ding to the special requirements of the customer and the regulations of DVGW, DIN and TRGI and are manufactured based on the common directives of gas suppliers or regional directives.
In addition to fittings and compo-nents of the DUNGS product range, devices of known manufactu-rers are also used.

Since 1970 more than 20,000 gas trains have been manufactured for projects inland and abroad.

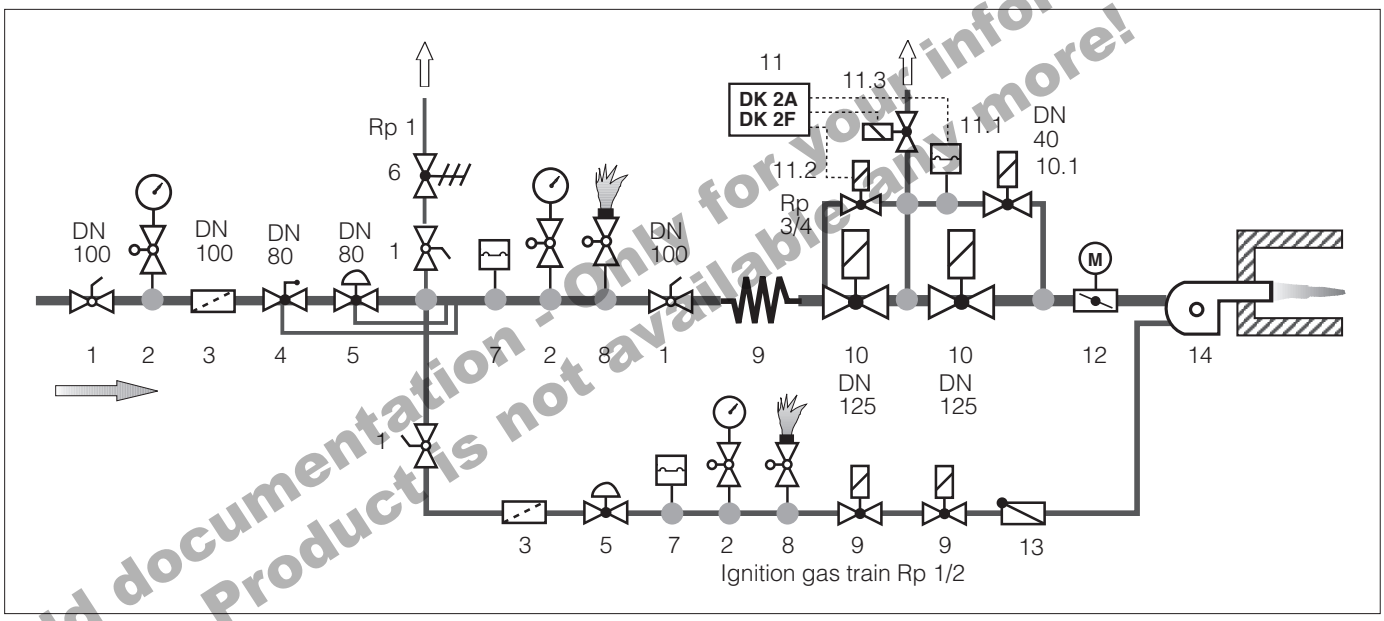
Switching systems

DUNGS has been manufacturing custom, high-quality control cabi-nets for thermal, vent and process engineering projects for more than 40 years.

On request, we can prepare and offer a switching system designed for your gas regulating train project. Refer to the datasheet for detailed informations on DUNGS control cabinets.

Example: Customer-specific gas regulating train for a lignite dust firing with auxiliary natural gas firing

Gas pre-pressure P_i: 1.0 bar
Gas output pressure P_a: 0.1 bar
Burner capacity: 12.5 MW
Volume flow: 1340 m^3_n/h



1	Ball valve	7	Min. pressure switch	11.2	Test solenoid valve
2	Manometer with pressure pushbutton valve	8	Test burner	11.3	Leak gas solenoid valve
3	Filter	9	Compensator	12	Gas control valve
4	Safety shut-off valve (SAV)	10	Solenoid valve	13	Reset device
5	Gas pressure regulator	10.1	Bypass solenoid valve	14	Firing
6	Safety blow-off valve (SBV)	11	Leak tester, DK 2 system		
		11.1	Test pressure switch		

DUNGS Product Range

Automatic gas-firing machines
Flame switches
Test and control devices
Valve leak testers
Pressure sensors
Flow sensors/switches
Modules
Control cabinets

Gas pressure regulators
Gas solenoid valves
Double solenoid valves
MultiBlocs
Ball valves
Gas filter
Test burners, ignition burners
Accessories

Gas pressure switches
Air pressure switches
Centrifugal switches
KlimaSets
Main contacts

Gas safety and regulating trains

Gas Safety and Regulating Trains
for Inlet Pressures
up to max. 4 bar

DUNGS®

Industrial gas safety and regulating systems
Consulting
Engineering
Production
Marketing and sales

Karl Dungs GmbH & Co. KG
Werk Osnabrück Systeme
Kiebitzheide 34
D-49084 Osnabrück
Tel. +49 (0)541-50 04 20
Fax +49 (0)541-50 04 22 4

Subject to change in the interest of technical progress.

Head Offices and Factory
Karl Dungs GmbH & Co. KG
Siemensstraße 6-10
D-73660 Urbach, Germany
Telephone +49 (0)7181-804-0
Fax +49 (0)7181-804-166

Postal address
Karl Dungs GmbH & Co. KG
Postfach 12 29
D-73602 Schorndorf, Germany
e-mail info@dungs.com
Internet www.dungs.com