Pressure regulating units with safety assemblies for Weishaupt Gas and Dual Fuel Burners

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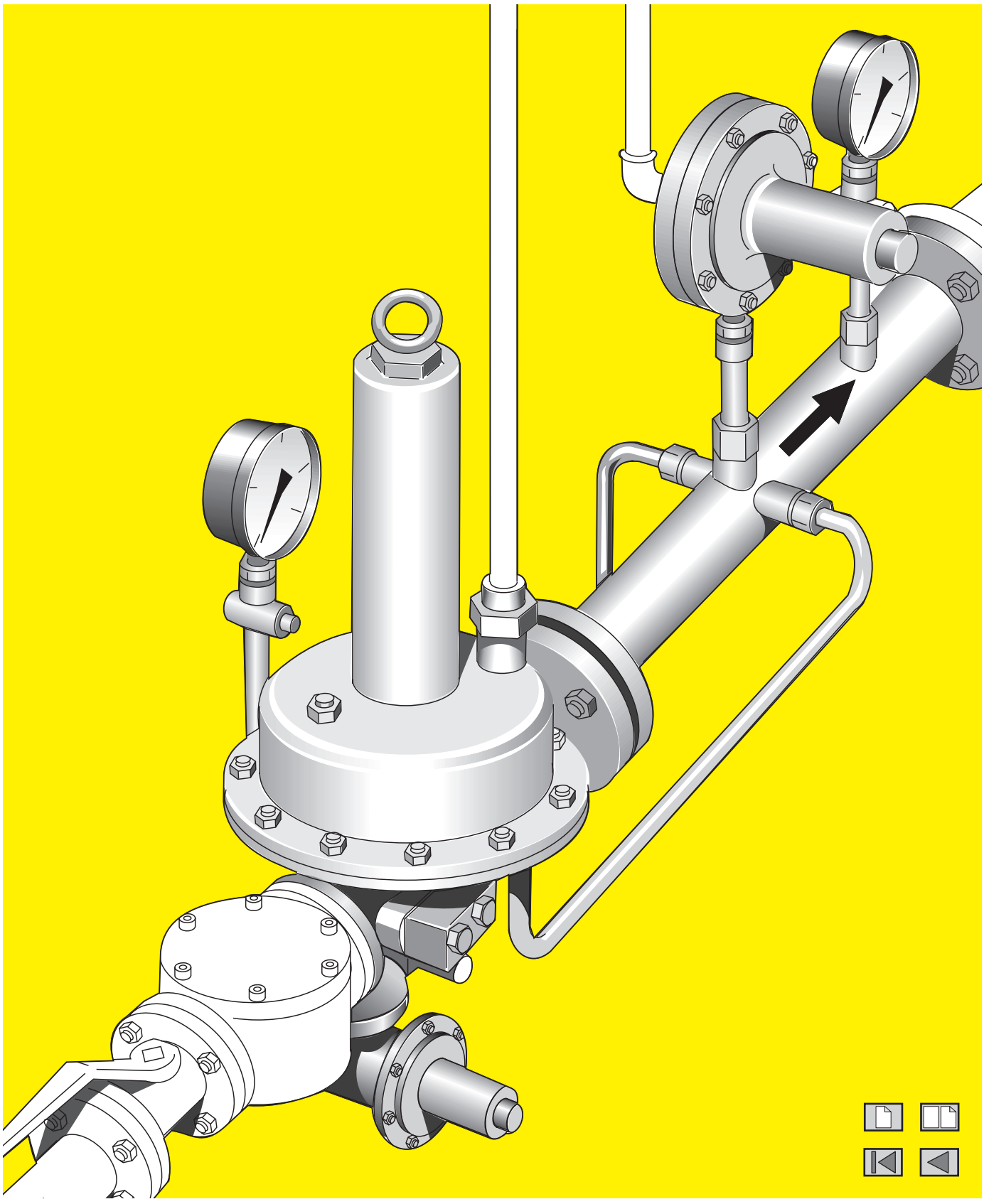

Description

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General
The gas pressure regulators fitted to all gas and dual fuel burners are subject to very high dynamic demands owing to the speed of switching operations of the burner's gas valves and the small volumes of gas between the gas regulator and the safety shut off valve of the burner.

The gas pressure regulators described here are direct acting units and are in accordance DIN 4788, Part 2 or EN 676 "Forced Draught Gas Burners"

The opening / closing times of the safety valves of the burners are short, so the gas pressure regulators need to react quickly to this, as well as burner load-changes during operation. They must also react to emergency shut off of the burner from full load operation. In these cases the safety shut off valve is usually activated.

The correct installation of pressure regulators and safety equipment with the associated impulse- lines ensure trouble free operation. The impulse lines are fitted and dimensioned to ensure correct function and thus ensure the required reaction speed of the units.

Only the breather and blow off lines have to be fitted to the installation. Relevant guidelines can be found in section "Installation notes".

This group of regulators is made to suit the DVGW regulations, however, some regulations of the DVGW work sheets for gas pressure regulator installations of the gas supplier do not apply to burner installations. Here, the problem with back pressure does not exist. On burner installations, the outlet pressure for operating and shut down mode $\leq P_a$ is permitted, and is equal to the required pressure of the plant.

Matched to the Weishaupt burner programme
The gas pressure regulators and safety assemblies covered in this brochure are specially matched to Weishaupt gas burners. Outlet gas pressures of 200, 140, 100, 50 and 20 mbar are catered for. Operating pressures above and below these can be set by spring adjustment. The safety assemblies are factory pre-set, values see "Technical Data".

This encompasses the entire Weishaupt burner programme, and the connections to the burner valve trains are of the correct size.

The pre-assembled groups have been individually tested for soundness and operation. This soundness and operations tests has to be repeated during commissioning, and at burner services.

These regulators are designed for burner operation and should not be used as regulator stations.

On installations which operate more than one burner, each burner should be fitted with it's own regulator.

Contrary to some instructions that suggest that installations having a main service pressure regulator fitted then do not need each appliance to have it's own regulator, each burner must be fitted with one of the regulators detailed here. The regulators for gas pressure regulation of the mains supply have a different responsibility, which is not suitable for burner operation. Furthermore ratings-related pressure deviations will occur, for example, the gas throughput changes between partial and full load. The commissioning engineer familiar with the burner regulators has immediate access to setting gas pressures required for each individual burner's requirements.

Components of the burner and type testing
The standard for forced draught gas burners classes the burner a one complete unit. This operational unit includes all gas and air equipment. The burners are tested as such. Pressure regulators with safety assemblies are also tested. The technical leaflet described here forms part of this test report. If other units are used the burner can not be appended with the CE Label.

The pressure regulators are fitted to the burner as part of the valve train.

The rating, operation and safety can only be ensured if the correct units for the burners are used.

Max. inlet pressure
Operating pressures of up 0.3 bar are classed as low pressure supply, whereas operating pressures > 0.3 bar are classed as medium to high pressure supplies.

The units described in this brochure are designed for a max. inlet pressure, see table.

Refer to DVGW work sheets for partially pre-adjusted high gas pressure regulators. For gas pressures in excess of 4 bar extreme demands are made on the installation and equipment , therefore it is not possible to have pressures greater than 4 bar in boiler houses.

Safeguard against excess gas throughput
The gas pressure regulator ensure virtually constant gas pressure to the burner across all load points.

With gas inlet pressures above 0.3 bar, the gas pressure is again safeguarded by the safety assemblies SAV and SBV. These also protect the regulator and gas valve train from excess gas pressure.

Purpose of the gas pressure regulator
Gas pressure regulators have the purpose of maintaining the outlet gas pressure for every burner load point, irrespective of the gas inlet pressure within the range of the unit.

If outlet pressure exceeds set value, or under zero flow conditions the gas regulator will close its throughput orifice.

Purpose of the safety shut off valve (SAV)
Safety shut off valves serve as a primary safeguard against excess pressure and gas throughput. The SAV shuts off the gas supply if it's set pressure has been reached. During normal operation this is open. The safety shut off valve must not reopen automatically. Resetting must be carried out manually.

The safety shut off valve forms part of the relevant gas pressure regulator. Via an impulse-line the SAV senses the outlet pressure from the pressure regulator section, and if this pressure exceeds the set value of the SAV, the SAV shuts off the flow of gas entering the gas-train.

Setting and operations checks form part of the commissioning. This includes checking the closing procedure, i.e. if it functions correctly.

The set point is determined on site and depends on the pressure at which the gas pressure regulator shuts off. The set point must not be higher than the maximum inlet pressure of the valve trains.

Please note the setting advice given at the end of this document.

Purpose of the safety relief valve (SBV)
Safety relief valves are required as additional safety equipment. If internal gas leakage (pressure-creep) is detected, i.e. if the gas pressure regulator does not close it's seat, the safety relief valve vents the excess pressure to atmosphere.

Excess pressure increase is possible, if the gas pressure regulator supplies an excess outlet pressure due to faulty operation, or if an SAV does not close its seat and leakage via the seat occurs.

If the set pressure is exceeded the valve opens against the closing spring. Once the excess pressure has decreased the SBV closes automatically. A vent line to atmosphere should be provided to ensure that possible internal gas leakage can be vented safely. By setting the vent pressure of the SBV below the tripping set point of the SAV it is possible to make the SBV respond first, and only with a further pressure increase will the SAV trip.

The SBV must always be fitted downstream of the appropriate gas pressure regulator.

With types 08/1 and 09/1 and 1-5/1 (type 133..., 233..., 244...) the main safety equipment (SAV) and the safety equipment (SBV) form one unit in the gas pressure regulating assembly.

Contents **Page**

Type of construction

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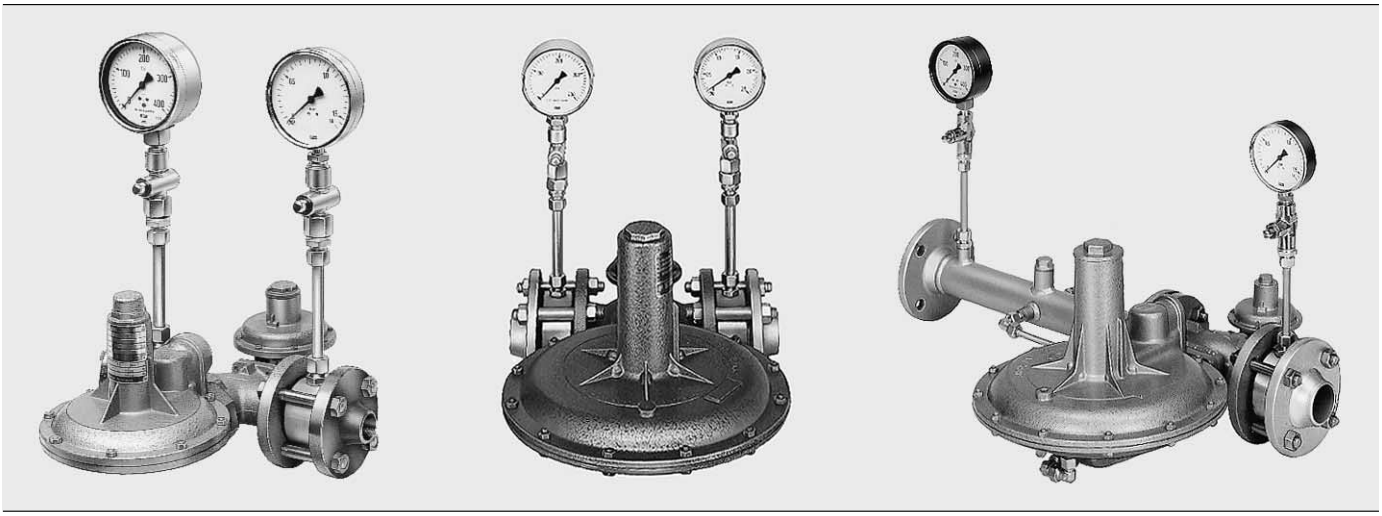
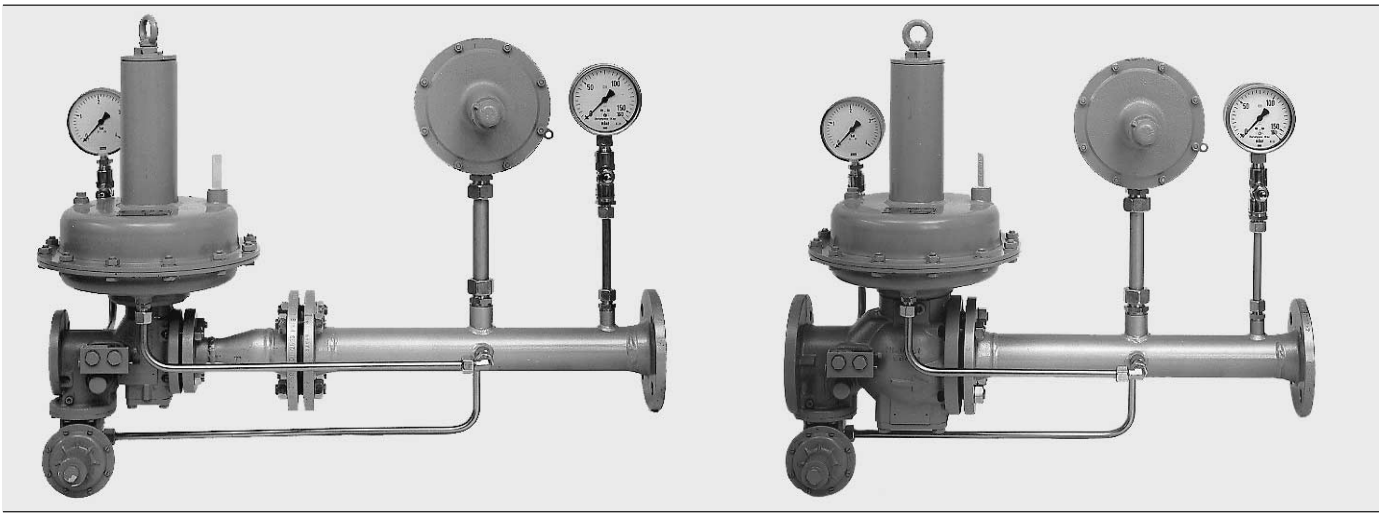
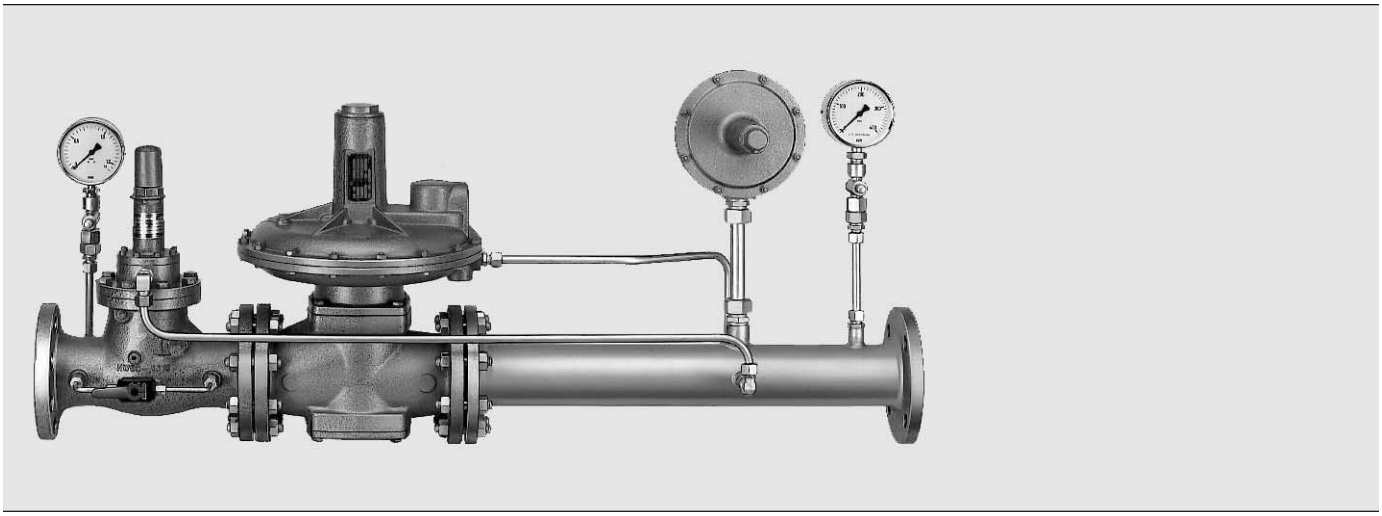


Pressure regulators type 08/1 and 09/1 | Types 1/1 to 4/1 | Type 5/1



Pressure regulator type 5/1 – 25/50 | Type 8/1 – 80/80



Pressure regulator type 9 – 100/100

High pressure gas supply: Two burners each fitted with pressure regulating and safety equipment

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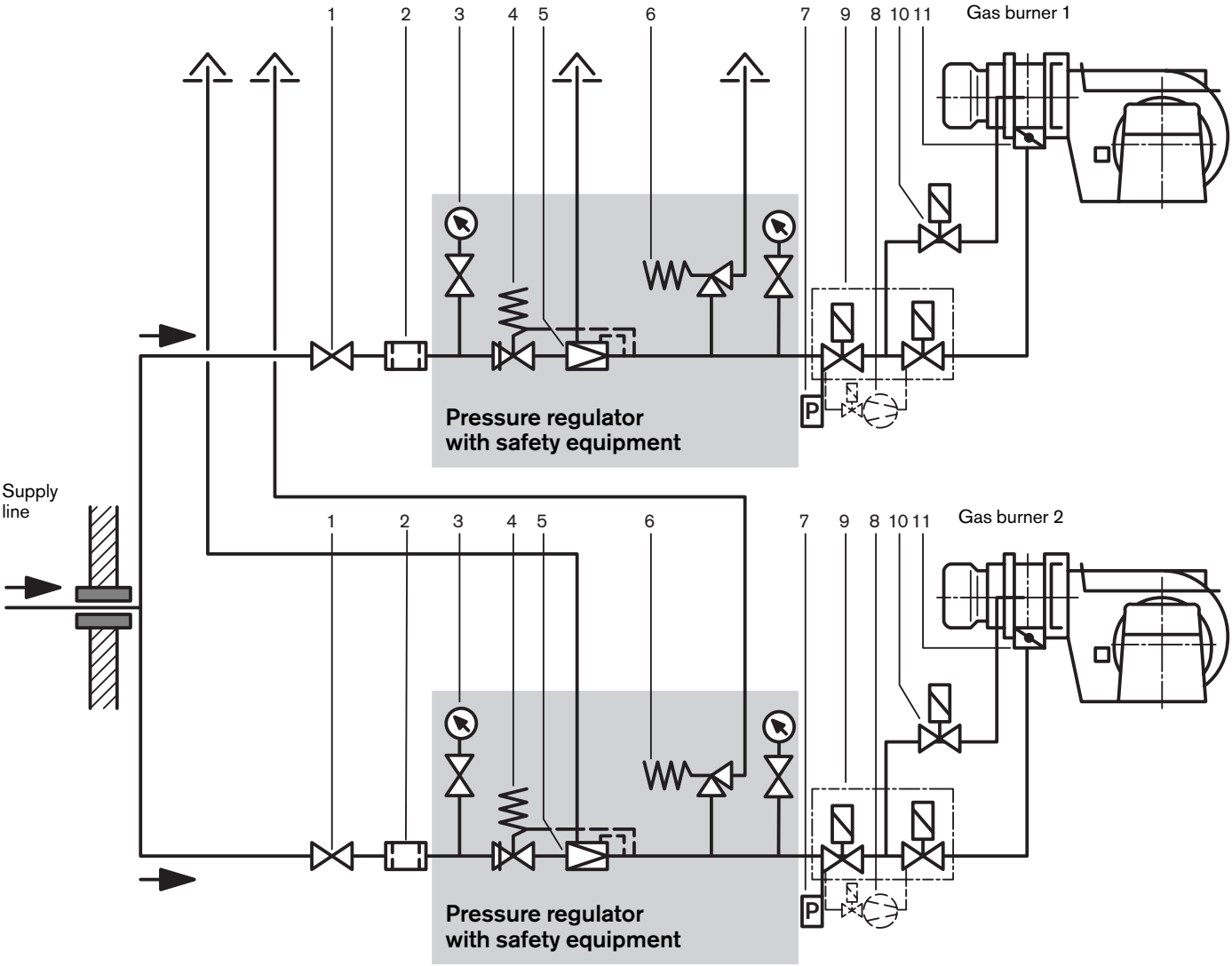

The burners are each supplied with one pressure regulator with safety equipment , which is in accordance with DVGW worksheet G 490.

Regulator stations are often connected in series, reducing the inlet pressure from > 4 to 100 bar obtaining an operating pressure at which the regulators described here can be used on the burner.

Legend

1 Ball valve
2 Gas filter
3 Manometer with push button valve
4 Safety shut off valve (SAV)
5 Pressure regulator
6 Safety relief valve (SBV)
7 Gas pressure switch
8 Valve proving
9 Main gas solenoid valve
10 Ignition gas solenoid valve
11 Gas butterfly valve

Gas filter and ball valve
Pressure loss chart

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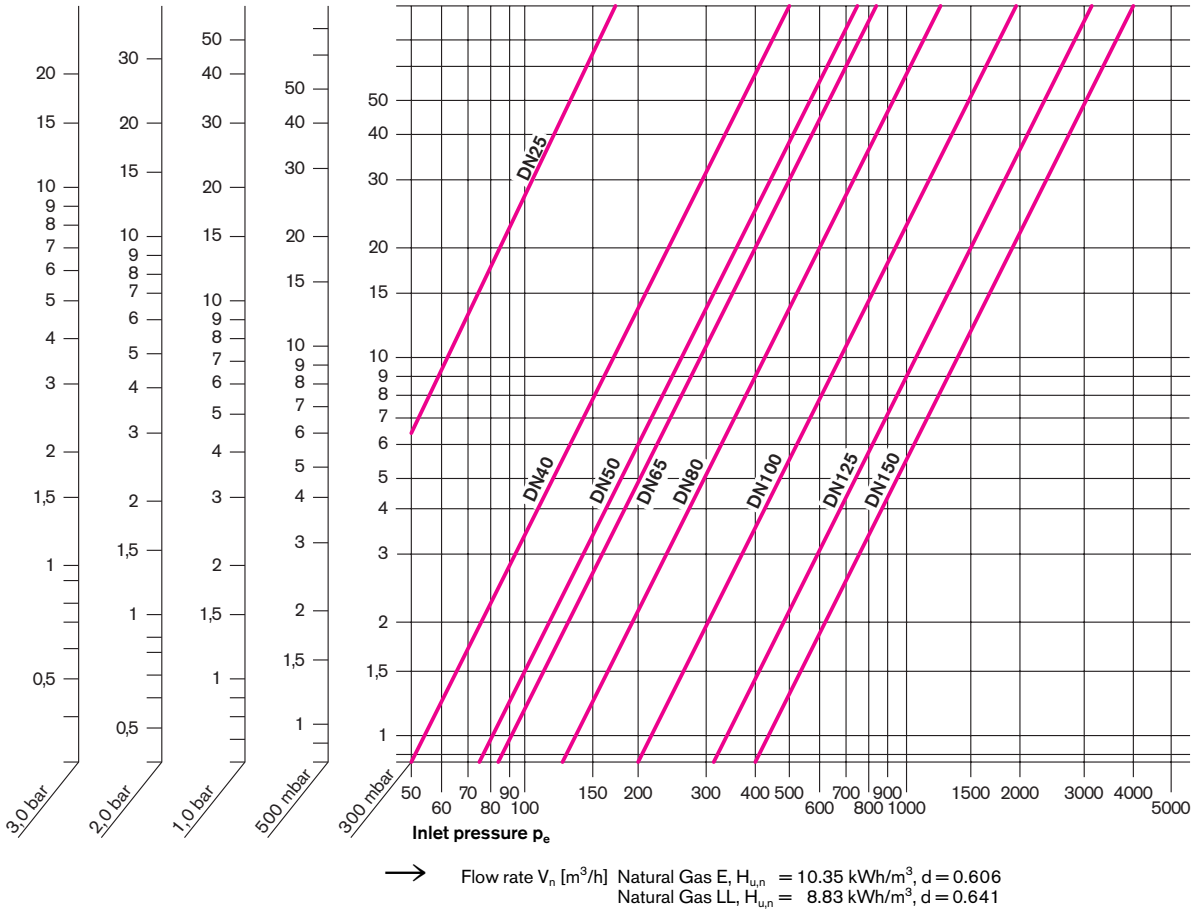
Pressure loss Δ p [mbar] at inlet pressure (see below)



Please note:
Gas filter and ball valve must be selected not to exceed a pressure loss of approx. 50 mbar.

Up to this value the admissible flow velocity is not exceeded and the filtration will be satisfactory. The nominal diameter should be selected the same or larger than the inlet nominal diameter of the high pressure regulator.

Note:
The pressure loss of the gas filter and ball valve has been included in the graph.

Conversion of liquid gas, towns gas etc. to equivalent natural gas throughput:

$V_{Natural\ Gas} = V_{Gas} \times f$

$V_{Gas} = Q_{Br} / H_{u,Gas}$

$f = \sqrt{d_{Gas}/d_{Natural\ Gas}} = \sqrt{d_{Gas}/0{,}641}$

Example:

Type of gas	Calorific value H_u kWh/m^3_n	Density kg/m^3	relative density d	Correcting factor f
Propane	25,89	2,011	1,555	1,557
Butane	34,39	2,708	2,094	1,807
Town gas 1	4,89	0,513	0,397	0,787
Town gas 2	4,30	0,624	0,483	0,868
Town gas 3	6,40	1,060	0,820	1,131
Town gas 4	4,20	0,801	0,620	0,967

Application:

Burner rating — Q_{Br} = 1500 kW, Propane

$V_{Propane}$ = 1500 / 25,89 = 57,9 m^3_n/h

Value on Natural Gas graph — $V_{Natural\ Gas}$ = 57,9 x 1,557 = 90,1 m^3_n/h

Weishaupt pressure regulators type 08/1, 09/1 and 1/1 to 5/1 with safety equipment

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Technical data

Weishaupt Type	Regulator Type	ID	Nozzle mm	Inch	Max. inlet pressure bar	Outlet pressure mbar	SAV-spring colour	SAV-setting range mbar	Product ID number	Weight approx. kg	Ordering No.
08/1	133-4-72	25	6,3	1/4"	3,0	100 – 210	green	140 – 450	CE-0085 AQ 1090	15	151 336 2640/0
09/1	133-4-72	25	12,5	1/2"	1,5	100 – 210	green	140 – 450	CE-0085 AQ 1090	15	151 336 2647/0
1/1	233-12-4-72	50	10	3/8"	4,0	100 – 210	green	140 – 450	CE-0085 AQ 1092	27	151 336 2648/0
2/1	233-12-4-72	50	12,5	1/2"	4,0	100 – 210	green	140 – 450	CE-0085 AQ 1092	27	151 336 2649/0
3/1	233-12-4-75	50	20	3/4"	2,5	100 – 210	green	140 – 450	CE-0085 AQ 1092	27	151 336 2650/0
4/1	233-12-4-72	50	25	1"	1,0	100 – 210	green	140 – 450	CE-0085 AQ 1092	27	151 336 2651/0
5/1	244-12-72	50	27,5	–	4,0	100 – 210	green	140 – 450	CE-0085 AQ 1094	31	151 336 2652/0

Springs for outlet pressure - adhesive plate

Type	Outlet pressure mbar	Colour coding	Ordering No.	Adhesive plate ordering No.
08/1 and 09/1	12 – 20	blue	490 031	793 530
08/1 and 09/1	15 – 35	green	490 032	793 526
08/1 and 09/1	30 – 70	orange	490 033	793 527
08/1 and 09/1	70 – 140	black/white	490 030	793 528
08/1 and 09/1	100 – 210	silver	490 029	793 529
1/1-5/1	15 – 35	green	490 085	793 526
1/1-5/1	30 – 70	orange	490 086	793 527
1/1-5/1	70 – 140	black	490 087	793 528
1/1 -5/1	100 – 210	silver	490 088	793 529

Notes:
The pressure regulators are supplied as standard with springs for the highest outlet pressure (type 08 and 09, type 1 - 5 with silver spring).
The actual outlet pressure has to be determined for each individual installation. This outlet pressure should be quoted when ordering, as well as the spring required. The pressure regulator will then be supplied with the correct spring and adhesive plate.

Included in delivery
1 Pressure regulator assembly consisting of: pressure regulator safety shut off valve (SAV) and safety relief valve (SBV)
1 Inlet pressure gauge with push button valve
1 Outlet pressure gauge with push button valve
2 Intermediate pieces
Connection parts, screws, nuts, gaskets additional on type 5/1:-
stabilising section with connections and control line for pressure regulator and SAV

The assembly is tested for soundness.

Legend to page 7
1 Cover screw
2 Pressure regulator
3 Regulator spring
4 Adjusting screw
5 Sealing cap
6 Diaphragm
7 Breather port
8 Breather line connection
9 Connection section
10 Inlet and outlet pressure gauge with push button valve
11 Control orifice
11a Impulse line (SAV)
12 SAV spring
13 SAV measuring mechanism
14 Valve adjusting rod
15 Cover cap
16 Diaphragm casing
16a Impulse line (pressure regulator)
17 Safety relief valve (SBV)
18 Diaphragm support
19 Lever system
20 Valve stem
21 Flange connection
22 Cotter pin
23 Valve disc
24 Orifice
25 SAV valve disc
26 Flange connection
27 Blocking spring
28 Safety shut off valve (SAV)
29 Operating stem

Pressure regulator function description
The diaphragm (6) of the pressure regulator is loaded with a spring (3) and transfers its movements via a lever system (19) to the valve disc (23). The level of outlet pressure is achieved by an appropriate spring load.

Without gas pressure the regulator is open, i.e. the spring tension presses the diaphragm (6) and the lever system (19) downwards so that the valve disc (23) is raised from the orifice (24). As the gas flow is released, the gas flows through the orifice (24). This allows the pressure to increase and produces a force on the diaphragm (6) counter acting the spring tension. If the resulting force of gas pressure exceeds the adjusted spring loading, the lever system (19) is raised by the diaphragm (6) and the valve disc (23) starts to constrict the orifice (24), thus throttling the gas flow and terminating the pressure increase. If, due to gas reduction the gas pressure behind the orifice and consequently in the diaphragm casing (16) drops, the valve disc (23) is opened by the force of the spring.

This alternating process repeats itself until a balance prevails between the force of the spring and the force of the gas pressure on the diaphragm (6), depending on the throughput.

Safety shut off valve (SAV) function description
If damage now occurs to the orifice (24), or the lever rods (19) jam, the pressure in the diaphragm area (16) and behind the orifice (24) can rise only until the safety shut off valve responds, thus interrupting the gas supply.

The measuring mechanism (13) of the safety shut off valve is connected to a spring loaded operating stem (29) and transfers its movement to the valve disc (25). The switching pressure is taken via an impulse line form the outlet pressure area of the regulating section and temporarily delayed by the throttle effect of the control orifice (11), so that even with a sudden reduction of capacity and momentary pressure increase resulting therefrom, no closure of the safety shut off valve will be effected.

When the pressure rises above the value adjusted by the spring (12) the diaphragm (13) overcomes the resistance of the operating stem (29). The blocking spring (27) presses the valve disc (25) against the valve seat thus closing the gas supply.

The measuring mechanism is separated from the inlet pressure space by an O ring seal.

Safety relief valve (SBV) function description
The safety relief valve (17) is sized so that if the regulator fails, then the flow capacity of the orifice (24) can be vented without any inadmissible rise in outlet pressure. The safety blow off pressure is approx. 30 mbar ± 10% above the outlet pressure. The excess pressure is released to the vent connection (8) via the SBV.

Installation and mounting
- In order to avoid damage and operational faults, care must be taken that the connection line and the regulator are free from contamination.
- Jointing ring must be in place.
- The pressure regulator is installed in such a way that the directional arrow on the casing points in the direction of the gas flow. Due to the spring load, the installation of the pressure regulator is independent of its position. Due to the flange connection (21) between valve body and the casing of the diaphragm on the one hand and the valve body and the casing of the safety shut off valve (SAV) on the other hand, various installation possibilities are available. In the standard execution, regulator, SAV and gas flow are horizontal. The assembly may however be installed in any position but care must be taken that the outlet pressure is re-adjusted.
- On the breather port (7) a line leading into safe open atmosphere is connected.
(For installation instructions see page 14).
- Once the pressure regulating assembly has been installed in the valve train section of the burner, a soundness test must be carried out in accordance with the burner operating instructions.
- Prior to commissioning the pressure regulating assembly must be tested for correct function.
- This also applies to the setting of the safety shut off valve (SAV).Furthermore, the appropriate recommendations of the German Association of Gas and Water Codes DVGW or Institution of Gas Engineers UP/4, and the respective regulations of the local professional associations must be adhered to.

Commissioning

- Function test of the burner with ball valve closed (see installation and operating instructions of the burner).
- Setting pressure to be set according to installation and operating instructions of burner.
- The ball valve can be opened slowly.
- It is usually necessary to re-adjust the outlet pressure. To do this the sealing cap (5) must be removed. By turning the adjusting screw (4) the pressure can be set to the required value. Pressure increases when turning clockwise. Adjustments should only be made under gas flow conditions. This can be done during operation, as all gas carrying areas of the regulators sealed.
- Should a fault on the pressure regulator result in a closure of the safety shut off valve (28), the valve can be reset manually once the cause of the fault has been eliminated. In order to open the SAV valve disc (25), first the cover cap (15) is removed and then the valve adjusting rod (14) is set to the point where the operating stem (29) will re-engage. It should be noted that a small quantity of gas is discharged via the valve adjusting rod after the cover cap (15) has been removed. It is necessary for the plant working pressure to be below the set response limit of the valve.
- Afterwards the cover cap (15) with the sealing gasket has to be replaced. The Safety shut off valve (28) is ready for operation. Check the cover cap (15) for leaks (by using Nekal or soap solution).

Adjustment and operational check of safety shut off valve (SAV)

Once burner settings have been completed, a controlled shut down is carried out.

- SAV responds:
  Increase shut off pressure by clockwise rotation of the adjusting screw SAV (12) until there is no further response on controlled shut down.

- SAV does not respond:
  Reduce shut off pressure by anti-clockwise rotation of the adjusting screw, until SAV responds on controlled shut down.
  After determining the shut off pressure, turn the setting screw 1/2 to 1 turn clockwise.
  Check by means of further controlled shut downs whether the SAV remains in the open position.

- SAV cannot be reset
  The blow off pressure of the SBV is always approx. 30 mbar above the outlet pressure. If the shut off pressure of the SAV is less than this figure, reset is not possible.

- SAV does not engage
  Decrease pressure on the outlet side.

Visual test

A visual test is carried out during annual maintenance, when conditions and operation of the units are checked for deviations in the desired conditions (gas throughput, gas pressure, set points).

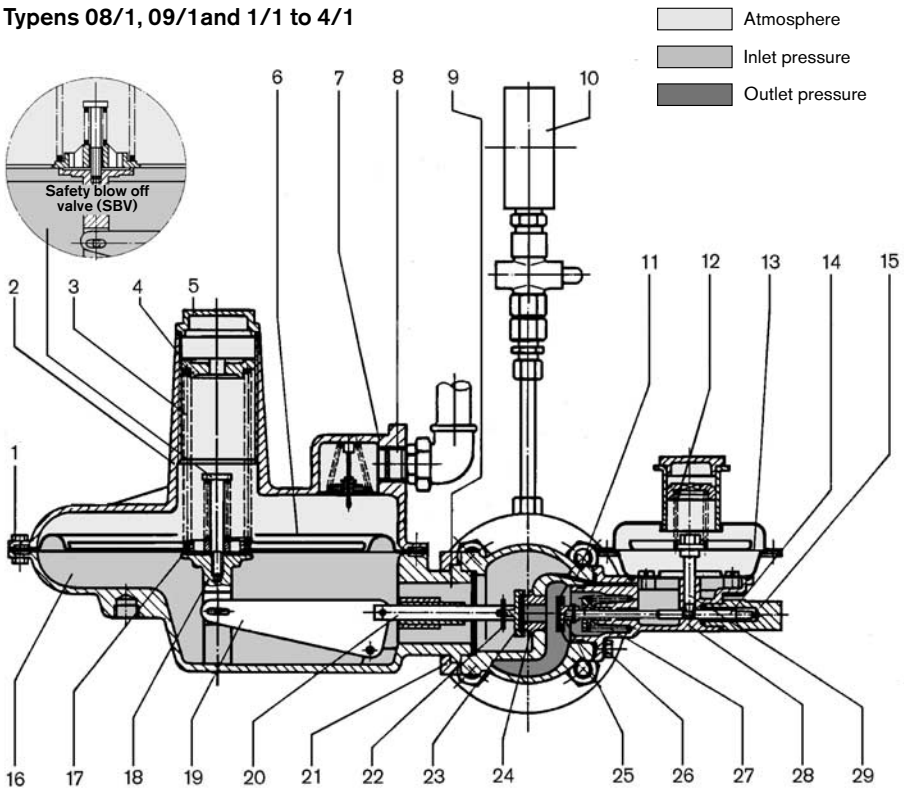
Sequence test

After the visual test, the setting and operation of the pressure regulators SAV and SBV are checked. Please pay attention to the notes on page 15.

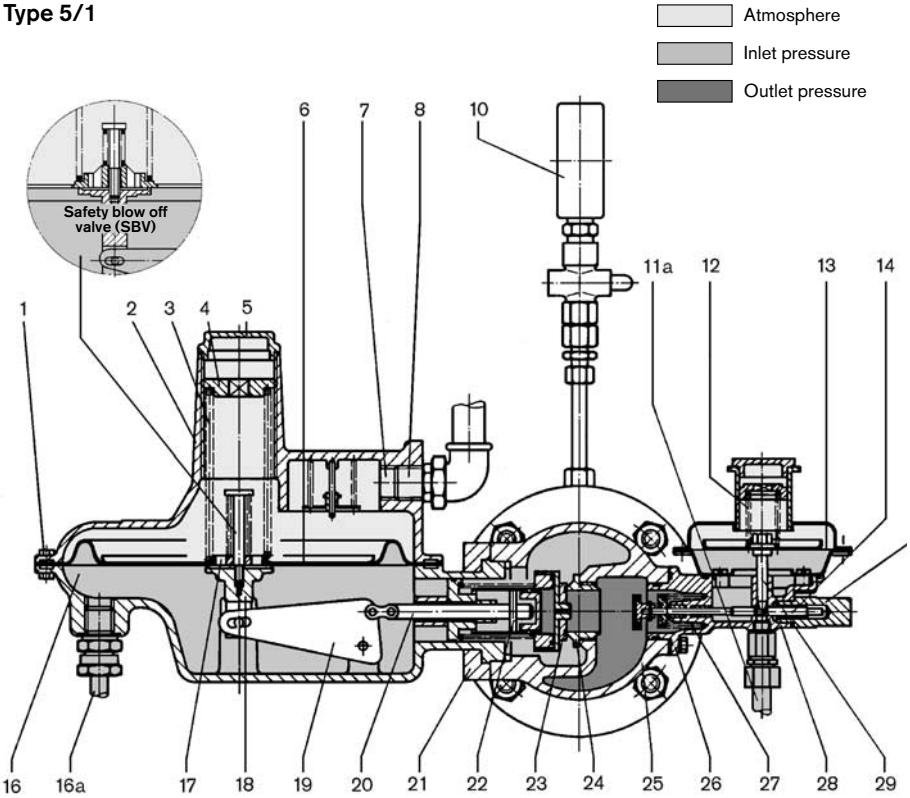
Maintenance

The pressure regulators require practically no maintenance. Damage to the orifice (24)due to contaminants in the gas is however possible. Therefore a gas filter should be fitted upstream of the pressure regulator.

Typens 08/1, 09/1and 1/1 to 4/1



Type 5/1



Selection chart for outlet pressure p_a: 200 mbar, 140 mbar, 100 mbar, 50 mbar, 20 mbar

Example 2

Example 1

Inlet pressure p_e [bar] in front of regulator ↑

→ Flow rate V_n [m^3/h] Natural Gas H, $H_{u,n}$ = 10.35 kWh/m^3, d = 0.606
Natural Gas L, $H_{u,n}$ = 8.83 kWh/m^3, d = 0.641

The type required can be selected with the aid of the chart. The following must be known:
- Type of gas (calorific value, density)
- Burner rating
- Inlet pressure [bar]
- Outlet pressure required p_a.

The type is determined by referring to the point of intersection of the flow rate and the inlet pressure and **the type shown to the right** is selected.

If a gas filter and ball valve are installed upstream the pressure loss of these components must be deducted form the inlet pressure (see example).

Selection example 1

Type of gas	Natural gas
	$H_{u,n}$ = 10.35 kWh/m^3_n, d = 0.606
Gas throughput	90 m^3_n/h
Inlet pressure p_e:	480 mbar
Outlet pressure p_a:	100 mbar (valve train selection)

1. Pressure loss Δp of filter and ball valve ID 50 (see pressure loss chart on page 5) approx. 1 mbar
2. To selection chart type 3/1.

Selection example 2

Type of gas	Propane gas
	H_u = 25.89 kWh/m^3_n, d = 1.555
Burner rating	4,556 kW
Gas throughput V_{Gas}:	176 m^3_n/h
Gas throughput relat. to Natural Gas :	275 m^3_n/h (see page 9)
Inlet pressure p_e:	2.9 bar

1. Pressure loss Δp of filter and ball valve ID 50 approx. 1 mbar
2. Selection regulator type 5/1 (for regulator type 3/1 permitted operating pressure exceeded)
3. Check: regulating range partial load 1,500 kW Q_{2max} = 520 m^3_n/h (Natural Gas) = 520/1.557 = 333 m^3_n/h; Propane Q_{min} = 1.500/25,89 = 58 m^3_n/h ⇨ regulating range 1:5,7 < 1:20. Therefore selection is ok.

Outlet DN 80	Outlet DN 100	Outlet DN 150

The stabilising section at the outlet must be enlarged according to the gas flow rate, so that the permissible velocity is not exceeded.

Note:
The flow rate curves comply to regulator standard RG10. The maximum regulation deviation is ± 10% of the desired outlet value. At the minimum throughput qmin, the outlet pressure pa rises by 10%, at the maximum throughput qmax, the outlet pressure pa drops by 10%.

The gas pressure regulators are direct operating regulators and have a turn down ratio of 20:1, which means that the smallest adjustable flow quantity is 5% of the maximum flow rate. The max. flow rate can be read off the flow rate curve for the appropriate inlet pressure (see example 2).

Conversion of liquid gas, towns gas etc. to equivalent natural gas throughput:

$V_{Natural\ Gas} = V_{Gas} \times f$ $V_{Gas} = Q_{Br} / H_{u,Gas}$ $f = \sqrt{d_{Gas}/d_{Natural\ Gas}} == \sqrt{d_{Gas}/0.641}$

Example:

Type of gas	Calorific value H_u kWh/m^3_n	Density kg/m^3	Relative Density d	Correction factor f
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Towns gas 2	4,30	0,624	0,483	0,868
Towns gas 3	6,40	1,060	0,820	1,131
Towns gas 4	4,20	0,801	0,620	0,967

Possible application: Burner rating Q_{Br} = 1500 kW, Propane

$V_{Propane}$ = 1500 / 25,89 = 57,9 m^3_n/h

Indicated value on Natural Gas side $V_{Natural\ gas}$ = 57,9 x 1,557 = 90,1 m^3_n/h

☐	to	700 m^3/h _____ DN 50	▒	>	1750 to 2700 m^3/h _____ DN 100
▒	>	700 to 1750 m^3/h _____ DN 80	■	>	2700 m^3/h _____ DN 150

Weishaupt pressure regulators types 5/1 to 9 with safety equipment

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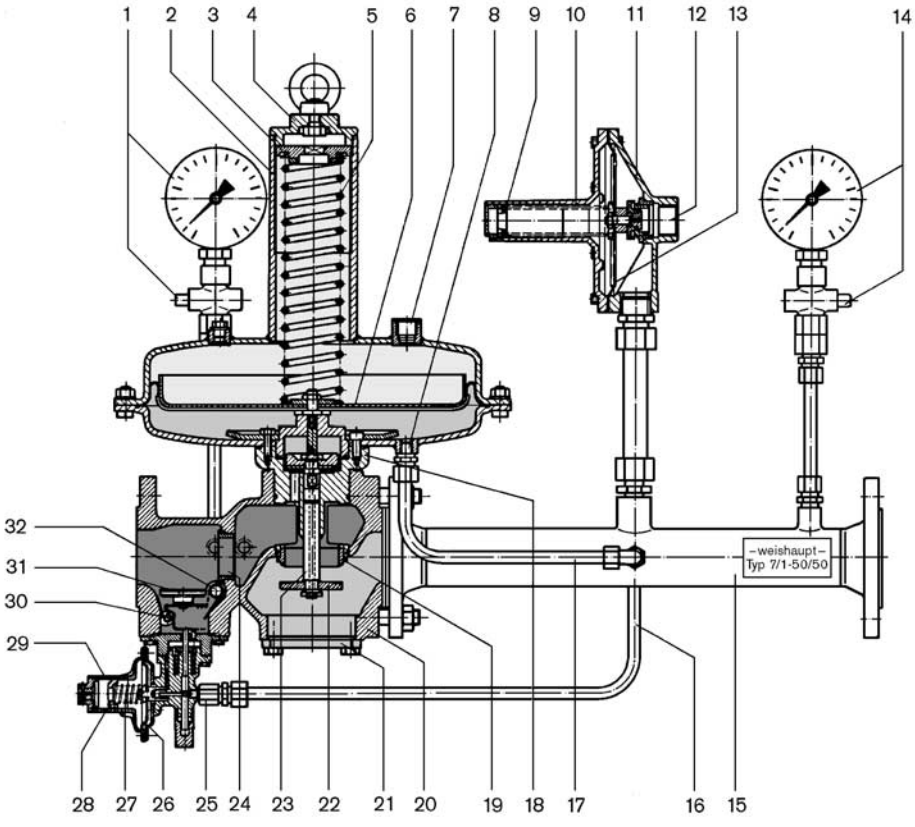
Technical data:

Weishaupt Type	Connection ID Inlet	Outlet	Weight approx. kg	Ordering No.	Gas pressure regulator Type	ID	Nozzle Ø mm	max. inlet pressure bar	outlet pressure in mbar	Spring colour	Product ID number
5/1-25-50	25	50	46	151 336 2637/0	RR 16-25-31-8N-033	25	31	4,0	100 – 210	green-white	CE-0085 AQ 1103
5/1-25-80	25	80	58	151 336 2653/0	RR 16-25-31-8N-033	25	31	4,0	100 – 210	green-white	CE-0085 AQ 1103
6/1-50-50	50	50	44	151 336 2638/0	RR 16-50-31-8N-033	50	31	4,0	100 – 210	green-white	CE-0085 AQ 1103
6/1-50-80	50	80	57	151 336 2659/0	RR 16-50-31-8N-033	50	31	4,0	100 – 210	green-white	CE-0085 AQ 1103
7/1-50-50	50	50	54	151 336 2640/0	RR 16-50-54-12N-033	50	54	4,0	100 – 210	black	CE-0085 AQ 1103
7/1-50-80	50	80	68	151 336 2641/0	RR 16-50-54-12N-033	50	54	4,0	100 – 210	black	CE-0085 AQ 1103
7/1-50-100	50	100	73	151 336 2642/0	RR 16-50-54-12N-033	50	54	4,0	100 – 210	black	CE-0085 AQ 1103
8/1-80-80	80	80	86	151 336 2643/0	RR 16-80-82-12N-033	80	82	4,0	100 – 210	black	CE-0085 AQ 1103
8/1-80-100	80	100	100	151 336 2644/0	RR 16-80-82-12N-033	80	82	4,0	100 – 210	black	CE-0085 AQ 1103
8/1-80-150	80	100	120	151 336 2645/0	RR 16-80-82-12N-033	80	82	4,0	100 – 210	black	CE-0085 AQ 1103
9-100-100	100	100	122	151 336 2620/0	12-4-12	100	107	2,0	100 – 210	silver	CE-0085 AQ 1095
9-100-150	100	150	149	151 336 2627/0	12-4-12	100	107	2,0	100 – 210	silver	CE-0085 AQ 1095

The regulator RR 16 … is fitted in an integrated SAV, spring colour green, settings range 140 – 400 mbar (set to 350 mbar as standard)

Included in delivery:
1 Pressure regulator
1 Safety shut off valve (SAV)
1 Safety relief valve (SBV)
1 Inlet pressure gauge with push button valve
1 Outlet pressure gauge with push button valve
1 By-pass line with ball valve
1 Impulse line (pressure regulator)
1 Impulse line (SAV)
1 Stabilising piece with connections
1 Key for SAV resetting with screw and gaskets

Unit completely assembled ready for installation and tested for soundness.



Legend:
1 Inlet pressure gauge with push button valve
2 Gas pressure regulator
3 Setting screw (pressure regulator)
4 Cover
5 Spring (pressure regulator)
6 Diaphragm (pressure regulator)
7 Breather connection 1"
8 Impulse line connection (pressure regulator)
9 Setting screw (SBV)
10 Spring (SBV)
11 Safety blow off valve (SBV)
12 Vent line connection R 3/4"
13 Diaphragm
14 Outlet pressure gauge with push button
15 Stabilising line
16 Impulse line (SAV)
17 Impulse line (pressure regulator)
18 Intermediate piece
19 Nozzle (pressure regulator)
20 Valve body
21 Base plate
22 Valve disc
23 Valve stem
24 SAV seat
25 Impulse line (SAV)
26 Diaphragm (SAV)
27 Spring (SAV)
28 Setting screw (SAV)
29 Safety shut off valve (SAV)
30 Latch lever
31 SAV valve
32 Reset shaft

Atmosphere
Inlet pressure
Outlet pressure

only on types 9-100/100 and 9-100/150							on types 5… to 9…				
SAV Type	**ID**	**Spring colour**	**Setting range mbar**	**$P_e$max. bar**	**DIN-DVGW-No.**	**valid til**	**SBV Type**	**ID**	**Spring colour**	**Setting-range mbar**	**Product-ID number**
SH-I	100	grün	140 – 310	4	87.09 e 056	1997	275 D	3/4”	black	150 – 500	CE-0085 AQ 1102

The type RR16 regulator has an integral SAV which is adjustable between 140 – 400 mbar (factory pre-set at 350 mbar).

Springs for outlet pressure - adhesive plate

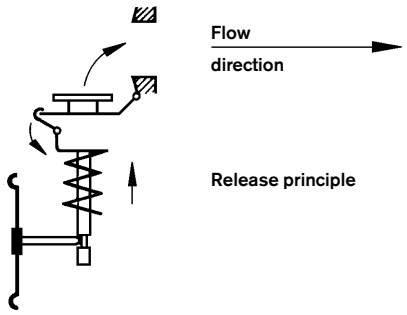
Outlet pressure mbar	**Colour coding**	**Ordering No.**	**Ordering No. adhesive plate**	**Application in Type**				
				5/1-25-50 5/1-25-80	**6/1-25-50 6/1-25-80**	**7/1-50-50 7/1-50-80 7/1-50-100**	**8/1-80-80 8/1-80-100 8/1-80-150**	**9/1-100-100 9/1-100-150**
15 – 35	orange/grey	490 190	793 526	●	●			
15 – 35	yellow/black	490 191	793 526			●	●	
15 – 35	green	490 085	793 526					●
30 – 70	yellow/black	490 191	793 527	●	●			
30 – 70	red/blue	490 192	793 527			●	●	
30 – 70	orange	490 086	793 527					●
70 – 140	red/blue	490 192	793 528	●	●			
70 – 140	blue/green	490 193	793 528			●	●	
70 – 140	black	490 087	793 528					●
100 – 210	green/white	490 194	793 529	●	●			
100 – 210	black	490 195	793 529			●	●	
100 – 210	silver	490 088	793 529					●

Note:
The pressure regulators are fitted as standard with springs for the highest outlet pressure (see table technical data). The actual outlet pressure must be determined for the individual installation. This outlet pressure and the required spring must be shown on the order. The pressure regulators will then be supplied with the relevant spring and adhesive plate.

Function description pressure regulator
The diaphragms of the pressure regulator (6) transfer the movement via the valve stem (23) to the valve disc (22). The outlet pressure is transferred via impulse line (17) into the space below the diaphragms (6). This pressure is adjusted by the adjusting screw (3) and be set by appropriately altering the spring (5) loading. At zero gas flow the pressure regulator (2) is closed. The valve disc (22) tightly closes the nozzle (19). Without gas pressure the pressure regulator (2) is open. The spring tension presses the diaphragms (6) with the valve stem (23) downward. The valve disc (22) is thus lifted off the nozzle (19). When gas flows through the nozzle (19), pressure can build up via the impulse line (17) below the diaphragms (6). If the gas pressure exceeds the adjusted spring tension, the valve stem (23) and valve disc (22) are lifted and the orifice of nozzle (19) is constricted. The gas flow is reduced, the pressure rise terminated. If the gas pressure behind the nozzles (19) drops due to gas reduction, the valve cross section is again enlarged by the increased spring tension.

Function SAV
During normal operation the SAV is open, it automatically shuts off the gas flow if the pressure rises above the permissible amount. After responding it remains shut and can only be re-opened manually.
The shut off valve disc, coated with vulcanised synthetic rubber, is spring loaded and is retained by the latch lever (30) in the open position. Once the trip pressure downstream of the valve has been reached, the shut off valve is tripped and shut by the spring tension.

As the gas flow presses the valve tightly onto the valve seat, a tight seal is achieved. The SAV is reset by the reset shaft (32).The shut off point of the SAV is set via the setting screw (27). The SAV must not be set higher than the pe, max of the readjusted solenoid valves.



Function description SBV
During normal operation the SBV is closed. The SBV (11) is adjusted in such a manner that that this valve will be the first to respond to an inadmissible high outlet pressure. Only then will the SAV (29) become operative. The blow off quantities are vented into safe open atmosphere via the blow off line (12). With a pressure rise the diaphragms (13) are raised by the valve disc. Gas can thus flow through the valve. When the diaphragms drop again at a pressure reduction, the valve will be closed.
The level of the blow off pressure is adjusted via adjusting screw (9).

Installation

- Care must be taken to ensure that the connecting lines and assembly are free from contamination, in order to avoid damage and operational faults.
- Installation position, in a horizontal line, the spring housing of the gas pressure regulator must be placed vertically upwards.
- The assembly must be installed in such a manner that the directional arrows on the regulator and on the SAV point in the direction of the gas flow.
- When installing, particular attention must be paid that the impulse lines (16 & 17) are not damaged.
- The blow off line connection (12) should be connected to the breather port R 3/4" and led into safe open atmosphere.
- Once the completed pressure regulator assembly has been installed within the gas valve train of the burner a soundness test must be carried out as stipulated in the burner installation and operating instruction.
- Prior to commissioning the pressure regulator must be tested for correct function. This also applies to the setting of the SAV.

Commissioning

- Slowly open the shut off isolating valve on the inlet pressure side.
- The outlet pressure of the pressure regulator (8), the shut off pressure of the SAV (2) and the shut off pressure of the SBV (17) are factory pre-set as follows:

  Pressure regulator _____ approx. 140 mbar
  SAV approx. _____ 350 mbar
  SBV approx. _____ 300 mbar

  If a different outlet pressure is required, this can be achieved by adjusting the setting screw (3). For instructions on pressure adjustment see page 15.
- Should an operational fault on the pressure regulator effect a closure of the SAV (2) it may again be opened manually on the reset shaft (32), after previously opening the ball valve in the bypass line (equalisation of pressure).

Visual test

A visual test is carried out during annual maintenance, when the condition and operation of the units are checked for deviations in the desired condition (gas throughput, gas pressure, set point).

Sequence test

After the visual test the setting and operation of the pressure regulators SAV and SBV are checked. Please pay attention to the notes on page 15.

Maintenance

The pressure regulators with safety equipment are practically maintenance free. A gas filter should be fitted in front of the regulator group.

Faults

Vibration: The regulator is frequently held responsible for pulsations, whereas in reality pulsations originate mainly in the pipe line. A close check should therefore be made first, as to whether the pipe line is well supported and does not have any points causing vibrations (half opened valves and pipe work and pipework with many changes in direction etc.).

Pulsation in the regulator can only have been caused by distorted diaphragm or valve rods, which happens very rarely.

Fluctuations (pumps): The regulator has a large orifice and consequently a very large throughput in comparison to its connection size. At very low throughputs the valve disc barely lifts from the orifice. When this happens the regulator may become unstable. To overcome this proceed as follows:

If the regulator surges at normal throughput the fault can be cured by throttling the impulse line. Generally a reduction in the cross section of the impulse line effects an attenuation and consequently a slower response period of the pressure regulator.

Surging of the regulator can often be eliminated by reducing the breather cross section (see rubber washer, page 13).
Where operating conditions permit, a different spring may also be used.

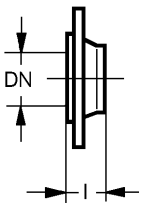
No zero cut off: The cause may be:
damaged valve seat, leaky nozzle attachment (fresh greasing of the O ring will frequently help, if the ring itself is not damaged). Damaged nozzle; contamination. The valve disc is easily accessible after removal of the inspection plate.

Note:

All impulse connections to the SAV are fitted with a nozzle ø 1,6 mm as standard. All RR16… regulators are fitted with a nozzle ø 3 mm as standard. This information should be checked if the equipment does not function correctliy.

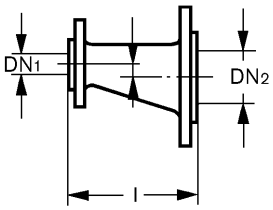
Connection parts / accessories

–weishaupt–



Weldable flange-table: DIN 2633 PN 16

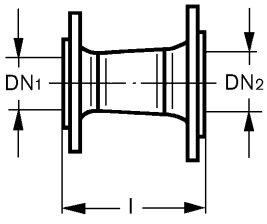
DN	l	Weight kg	Ordering No.
20/ 26,9	38	0,9	452 940
25/ 33,7	38	1,1	452 941
40/ 48,3	42	1,8	452 942
50/ 60,3	45	2,5	452 936
65/ 76,1	45	3,0	452 910
80/ 88,9	50	3,7	452 911
100/114,3	52	4,6	452 913
125/139,7	55	6,3	452 914
150/168,3	55	7,7	452 918



Flanged aluminium eccentric reducer.
(max. permitted operating pressure 3 bar, flange connection: DIN 2633 PN 16.
Must not be fitted upstream of the high pressure regulator).

DN_1	DN_2	l	b	Weight kg*	Ordering No.
25	40	144	7,5	2,6	151 329 2630/2
25	50	159	12,5	2,7	151 329 2631/2
25	65	172	20,0	3,3	151 329 2632/2
25	80	177	27,5	3,7	151 329 2683/2
40	50	163	5,0	3,7	151 329 2634/2
40	65	177	12,5	4,1	151 329 2635/2
40	80	181	20,0	4,4	151 329 2684/2
40	100	195	31,0	6,0	151 329 2637/2
50	65	180	7,5	4,4	151 329 2638/2
50	80	185	15,0	5,1	151 329 2685/2
50	100	197	26,0	6,3	151 329 2640/2
65	80	185	7,5	5,1	151 329 2686/2
65	100	197	18,5	6,6	151 329 2642/2
65	125	227	31,0	7,7	151 329 2643/2
80	100	207	11,0	7,0	151 329 2687/2
80	125	232	23,5	8,2	151 329 2688/2
100	125	234	12,5	9,4	151 329 2646/2
100	150	247	26,5	12,0	151 329 2647/2
125	150	250	14,0	12,8	151 329 2648/2

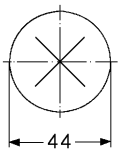
Nuts, bolts and gaskets for 2 connection joints are included in delivery.



Flanged concentric reducer in steel or grey cast iron or ductile cast iron.
(max. permitted operating pressure 16 bar, flange connection DIN 2633 PN 16).

DN_1	DN_2	l	Material	Weight kg*	Ordering No.
25	40	150	steel	4,5	151 327 2671/2
25	50	165	steel	5,3	151 327 2680/2
25	65	173	steel	6,0	151 330 2620/2
25	80	182	steel	7,0	151 330 2621/2
40	50	200	grey cast iron	7,0	151 330 2625/2
50	65	200	grey cast iron	9,0	151 327 2682/2
50	80	200	ductile iron	7,2	151 329 2689/2
50	100	200	ductile iron	8,1	151 327 2644/2
65	80	200	ductile iron	8,2	151 330 2608/2
80	100	200	ductile iron	9,3	151 329 2690/2
80	125	200	ductile iron	10,5	151 329 2691/2
80	150	200	ductile iron	12,0	151 330 2622/2
100	125	200	ductile iron	11,4	151 327 2689/2
100	150	200	ductile iron	12,8	151 328 2626/2
125	150	200	ductile iron	14,1	151 330 2623/2

Nuts, bolts and gaskets for 2 connection joints are included in delivery.



Rubber washer

Dimensions	Ordering No.
ø 44 mm, 2 mm thick	151 336 2616/7

Notes and installation see page 10.

* The weights given include nuts, bolts and gaskets.
Dimensions are approximate. Right to alter in light of further developments reserved.

Installation example and instructions

–weishaupt–

1 Ball valve
2 Gas filter
3 Safety shut off valve
4 Pressure regulator
5 Safety relief valve (SBV)
6 Compensator
7 Reducing flange
8 Pressure gauge with push button valve
9 Breather line SBV
10 Breather line pressure regulator

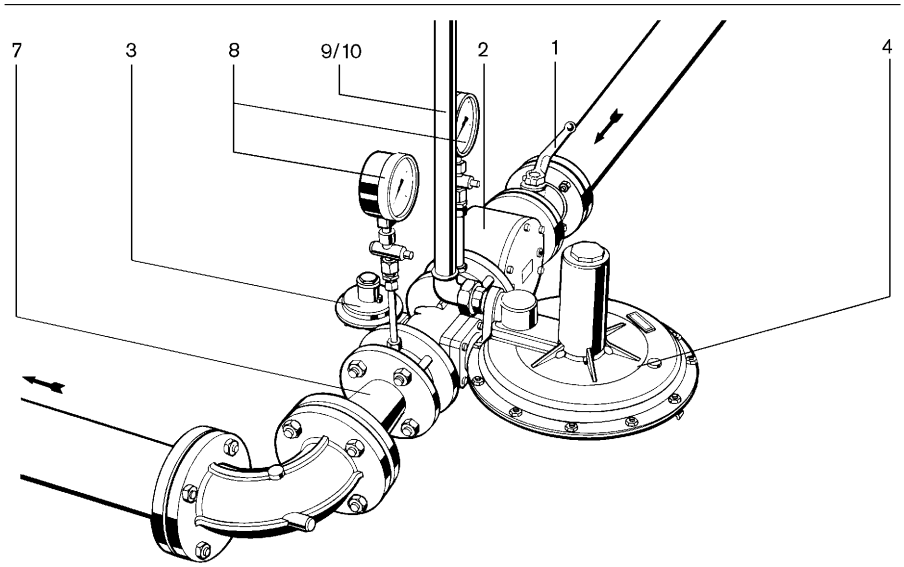
Installation instructions

- In many cases the sizes of the inlet and outlet of the pressure regulators are smaller than the valve train parts, particular with high gas pressures. The variety of sizes of items necessitates a whole series of flanged reducers. To enable installation to be carried out quickly and correctly, all the necessary connecting parts are included in the range (see page 13).
- The distance between the solenoid valve and the pressure regulator can be small or several meters long. With large distances the gas flow can “stabilise” and a buffer volume is obtained.
- There must be an ambient temperature of - 15°C to + 60°C for the pressure regulators and the safety equipment. If necessary the regulators must be shielded from heat radiation or too low temperatures. Protection is also necessary against damp, dust and dirt.
- The breather line (10) is the line between the space above the diaphragm of the pressure regulator or safety shut off valve and free atmosphere. Correct operation can only be guaranteed if the air column above the diaphragm can quickly move without undue resistance. The line diameters as shown must be allowed for with the following length of line.

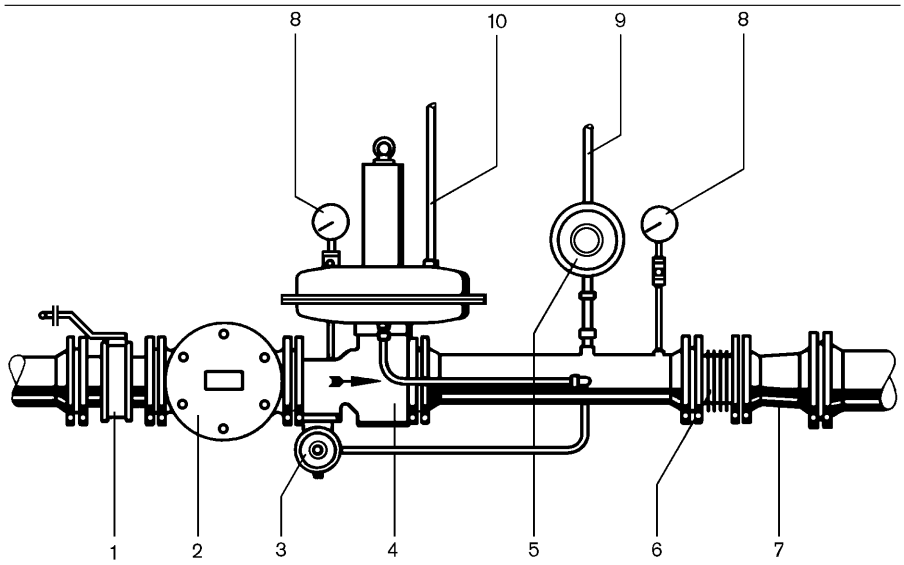
ø mm	length m
15	3
20	5
25	> 5

For longer lengths up to 30 m ø 25 mm is sufficient.

- Due to the SAV shut off cap which is fitted with a diaphragm it is not necessary to fit a breather line from the SAV diaphragm housing to atmosphere.
- Multiple breather lines from the gas pressure regulator can be manifolded together or separately over the roof. The common line must be laid with a larger diameter. It should be noted that no mutual interference is caused by this.
- The blow off line (9) is the line between safety blow off valve and free atmosphere. This line must be installed separately and terminate in a fire trap.
  Connection for
  Types 5/1 to 9 _____ R 3/4”
- There is a common breather and blow off line (9/10) on pressure regulator type 08/1 and 09/1 and types 1/1 to 5/1. This line must be installed separately. For the nominal diameter, the same instructions as for the breather line apply.
  Connection for:
  Typen 08/1 und 09/1 _____ R 3/4”
  Typen 1/1 bis 5/1 _____ R 1”
- The termination of the lines must be an adequate distance from sources of ignition and and installed so that any out-flowing gas cannot enter buildings. The line must also be protected against entry of rainwater and blockage.



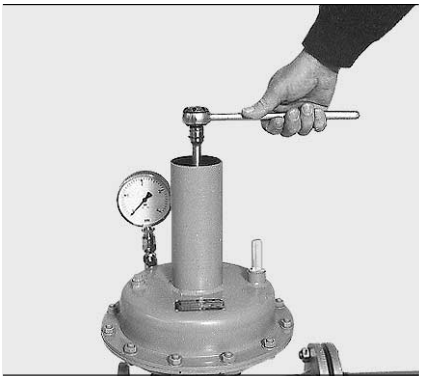
Example of an installation of pressure regulator types 08/1 to 09/1 and 1/1 to 4/1



Example of an installation of pressure regulator types 5/1 to 8/1

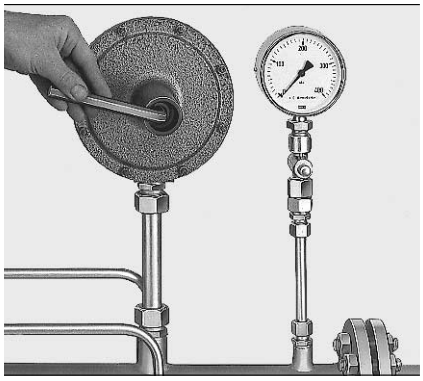
- Attention must be paid to installation expansion and movement. Compensators can be used for this.
- The gaskets supplied should be inserted between the flanges as approved by DVGW.
- The complete assembly must be tested for soundness before commissioning. The outlet side is tested according to the instructions given in the burner installation and operating manual. For valve seal tightness proving of inlet side see page 15.
- Prior to commission check for correct function, including the closed position test of the safety shut off valve. The installation must be purged carefully and the pressure increased by slowly filling with gas.

Notes on adjustment



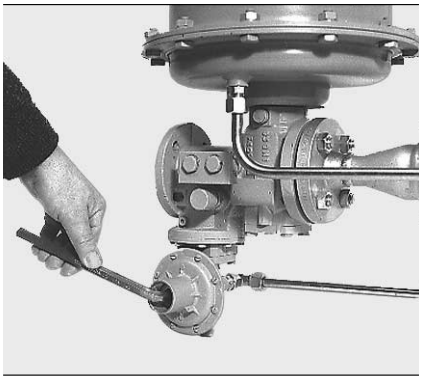
Picture 1

Adjusting outlet pressure (picture 1)
- When reading the pressure gauge the push button valve must be depressed.
- The outlet pressure of the regulator can be decreased by turning the setting screw (position 3, page 10) anti clockwise and increased by turning the screw clockwise.



Picture 2

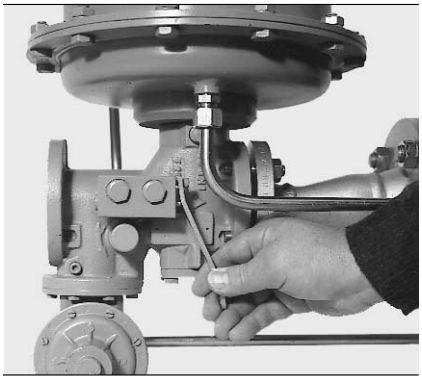
SBV adjustment (picture 2)
- The SBV is factory preset to 300 mbar
- This setting does not normally require an adjustment
- The setting pressure of the SBV can be decreased by turning the setting screw (position 9, page 10) anti-clockwise and increased by turning the screw clockwise.
- The relief pressure must be lower than the max. permitted inlet pressure of the solenoid valve.



Picture 3

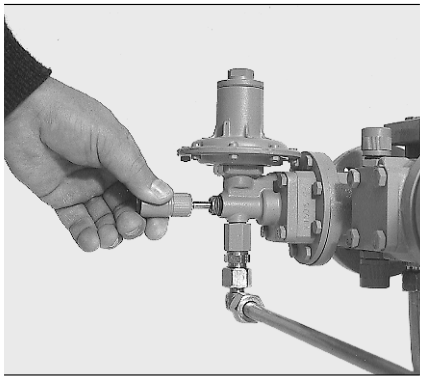
SAV adjustment (picture 3)
- The SAV has been factory preset to 350 mbar
- This setting does not normally require an adjustment
- The setting pressure of the SAV can be decreased by turning the setting screw (position 8, page 10) anti-clockwise and increased by turning the screw clockwise.
- The setting pressure may only be as high as the max. permitted setting pressure of the solenoid valve.

The SAV cannot be reset
This will be the case if the blow off pressure of the SBV is set higher than the shut down pressure of the SAV.



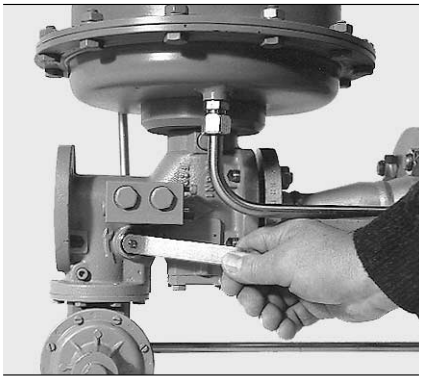
Picture 4

Resetting the SAV
- Pressure equalisation by opening the by-pass valve (picture 4).



Picture 5

- Unscrew sealing cap and pull back valve rod until it engages (picture 5, only possible if outlet pressure less than blow off pressure SAV).



Picture 6

- Turn reset shaft ant-clockwise until the valve disc arm in the release arm engages (picture 6).
- Screw on sealing cap.
- Manual by-pass valve must be closed.

Soundness test:
Once installed and prior to commissioning, the complete regulator assembly has to be tested for soundness following the instructions given in the burner installation and operating manual. When testing in the 1st. Test phase connection on the filter is possible.

SAV soundness test:
- The SAV is activated when the pressure downstream of the regulator increases.
- Release of pressure in the regulator section by opening the test point downstream of the regulator. (ball valve closed).
- Connect the pressure gauge to the test point and check if pressure increases when the ball valve is opened.

Test of zero shut down of the regulator:
- Open ball valve and wait until outlet pressure of the regulator is constant.
  Note: SBV must be closed!
- Close ball valve
- Check if pressure difference between inlet and outlet pressure remains constant.

Dimensions

Max Weishaupt GmbH, D-88475 Schwendi
Tel. (07353) 8 30
Fax (07353) 8 33 58
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Weishaupt (U.K.) Ltd.
Stoke Gardens, Slough SL1 3QD
Tel. (01753) 51 23 45
Fax (01753) 51 25 85

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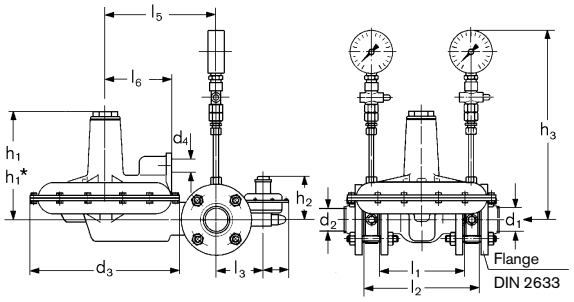
Picture 1 – Type 08/1 to 09/1 and 1/1 to 4/1

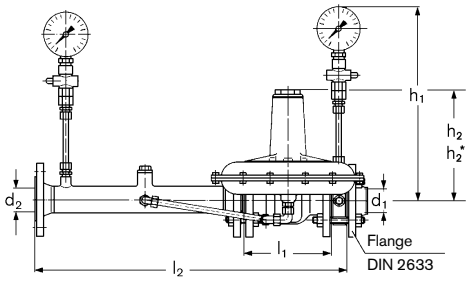


Types	d_1/d_2	d_3	d_4	h_1	h_1*	h_2	h_3
08/1 to 09/1	25	190	3/4"	155	345	100	380
1/1 to 4/1	50	350	1"	250	445	100	490
Types	l_1	l_2	l_3	l_4	l_5	l_6	
08/1 to 09/1	160	250	100	60	160	100	
1/1 to 4/1	200	290	110	60	260	150	

* Maß für Federausbau

Dimensions in mm are approximate
(Counter flange not included in delivery, for exact extent of delivery see page 6)

Picture 2 – Type 5/1 (compact)

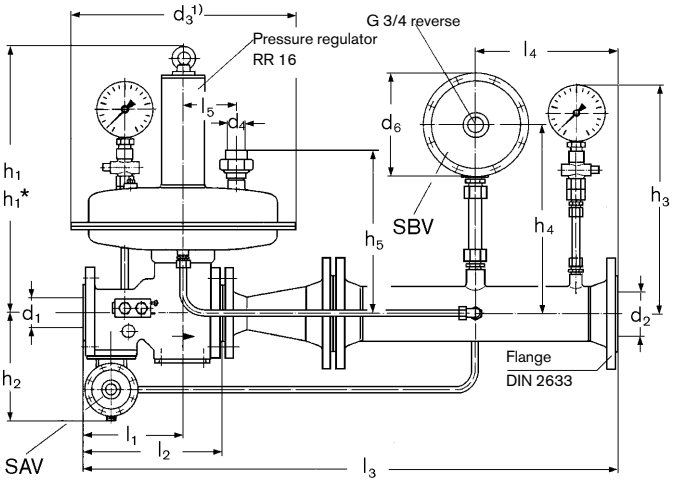


Typ	d_1	d_2	l_1	l_2	h_1	h_2	h_2*
5/1	50	50	200	750	490	250	445

* Dimension for disassembled spring height

All other dimension can be taken from the table for pressure regulators type 1/1 to 4/1.

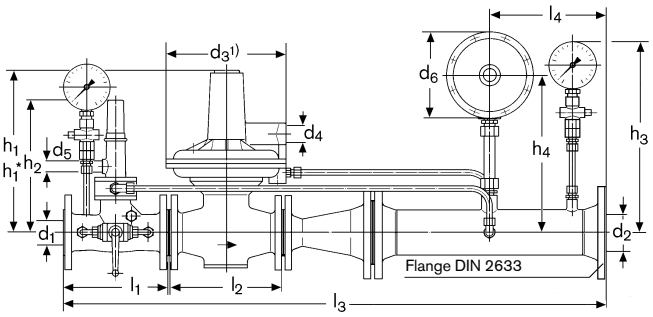
Picture 3 – Types 5/1 to 8/1



Types	d_1	d_2	d_3 1)	d_4	d_6	h_1	h_1*	h_2
5/1-25/50	25	50	310	1"	190	470	660	195
5/1-25/80	25	80	310	1"	190	470	660	195
6/1-50/50	50	50	310	1"	190	485	680	195
6/1-50/80	50	80	310	1"	190	485	680	195
7/1-50/50	50	50	405	1"	190	485	680	195
7/1-50/80	50	80	405	1"	190	485	680	195
7/1-50/100	50	100	405	1"	190	485	680	195
8/1-80/80	80	80	405	1"	190	545	735	240
8/1-80/100	80	100	405	1"	190	545	735	240
8/1-80/150	80	150	405	1"	190	545	735	240
Types	h_3	h_4	h_5	l_1	l_2	l_3	l_4	l_5
5/1-25/50	430	350	280	133	180	847	250	95
5/1-25/80	430	360	280	133	180	1016	250	95
6/1-50/50	430	350	295	179	250	752	250	95
6/1-50/80	430	350	295	179	250	1104	250	95
7/1-50/50	430	350	295	179	250	752	250	95
7/1-50/80	450	360	295	179	250	1104	250	95
7/1-50/100	460	370	295	179	250	1204	250	95
8/1-80/80	450	360	355	210	300	952	250	95
8/1-80/100	460	370	355	210	300	1254	250	95
8/1-80/150	480	400	355	210	300	1254	250	95

1) Diaphragm ø and largest width * Dimension for disassembled spring height

Picture 4 – Type 9



Types	d_1	d_2	d_3 1)	d_4	d_5	d_6	h_1	h_1*
9-100/100	100	100	360	1"	1/2"	190	425	620
9-100/150	100	150	360	1"	1/2"	190	425	620
Types	h_2	h_3	h_4	l_1	l_2	l_3	l_4	
9-100/100	365	455	375	350	350	1455	250	
9-100/150	365	480	400	350	350	1655	250	

1) Diaphragm ø and largest width
* Dimension for disassembled spring height