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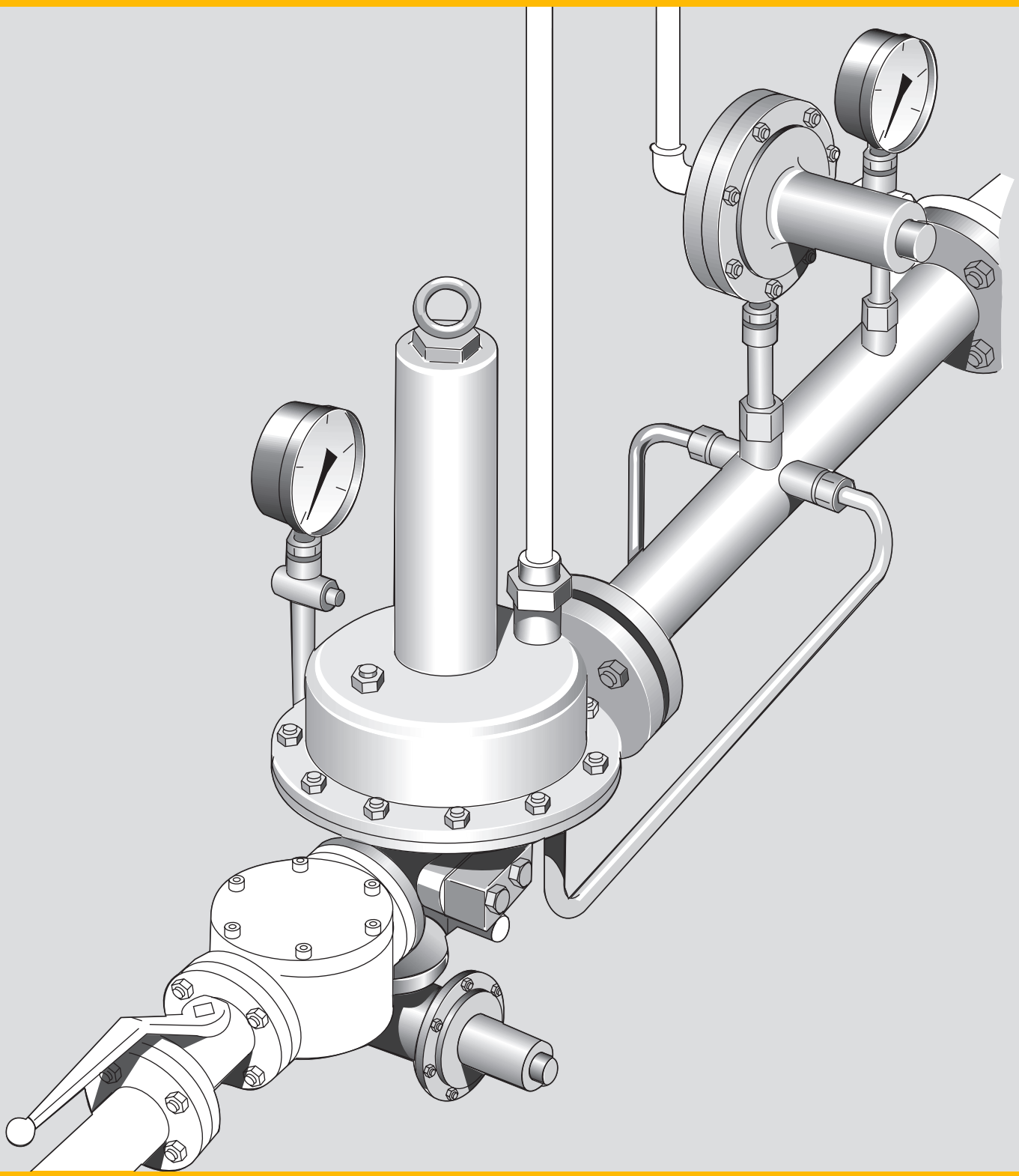
info

Information on regulators



Regulators for gas and dual fuel burners with gas supply pressures up to 4000 mbar

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 of the burner's gas valves and the small volumes of gas between the gas regulator and the burner's safety shut off valve.

The gas pressure regulators in this manual are direct acting units and are in accordance with EN 676 "Forced Draught Gas Burners".

The opening and closing times of the burner's safety valves 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 an 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 the pressure regulators and safety equipment with their associated impulse lines ensures 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 the "Installation notes" section.

This group of regulators is made to suit the DVGW regulations, however, some of the regulations 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 preset, for the values see "Technical Data".

The entire Weishaupt burner programme is covered, and the connections to the burner valve trains are of the correct size.

The pre-assembled sets have been individually tested for soundness and operation. These tests must be repeated during commissioning and servicing.

The regulators are designed for burner operation and should not be used as a main service pressure regulating station. On installations which operate more than one burner, each burner should be fitted with its own regulator.

Contrary to some instructions, which suggest that installations having a main service pressure regulator fitted do not then need each appliance to have its own individual regulator, each burner must in fact be fitted with one of the regulators detailed here. Mains supply gas pressure regulators have specific functions, which are different to those required for burner operation. Besides which, 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.

Burner components and type testing
The standard for forced draught gas burners stipulates that the burner must be treated as a single unit. This operational unit includes all gas side and air side equipment, and the burners are tested as such.

Pressure regulators with safety assemblies are also tested and this technical manual forms part of the test report. If other units are used the burner can not be appended with the CE mark.

The pressure regulators must be fitted to the burner as part of the gas valve train.

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

Maximum inlet pressures
Supply pressures of up to 0.3 bar are classed as low pressure supplies, whereas supply pressures above 0.3 bar are classed as medium or high pressure supplies.

The units described in this brochure are designed with maximum inlet pressures: see table.

Refer to DVGW work sheets for partially pre-adjusted high gas pressure regulators. Gas pressures in excess of 4 bar make particular demands on space, installation and equipment, such that their use in boiler rooms is possible only in very limited circumstances. Consequently, boiler rooms do not generally have supply pressures greater than 4 bar.

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

With gas inlet pressures above 0.3 bar, the gas pressure is further safeguarded with SAV and SBV safety assemblies. These also protect the rest of the gas valve train from pressures in excess of the permitted maxima.

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 and throughput.

The gas regulator closes tightly if the outlet pressure exceeds the set value, or under zero flow conditions.

Purpose of the SAV safety shut off valve
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 SBV safety relief valve
Safety relief valves are incorporated as an additional safety device. If internal gas leakage (pressure-creep) is detected, i.e. if the gas pressure regulator does not close its 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 any 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 then trip.

The SBV is fitted downstream of the gas pressure regulator.

With types 06/1 to 09/1 and 1-5/1 (type 133..., 233..., 244...) the SAV and the SBV form one unit in the gas pressure regulating assembly.

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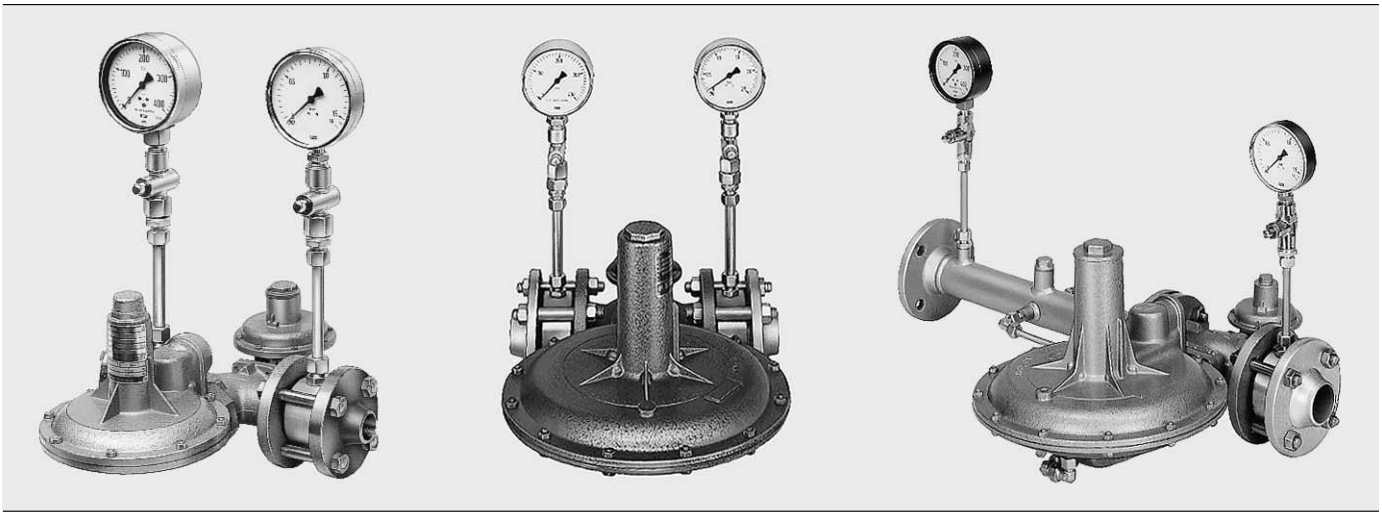
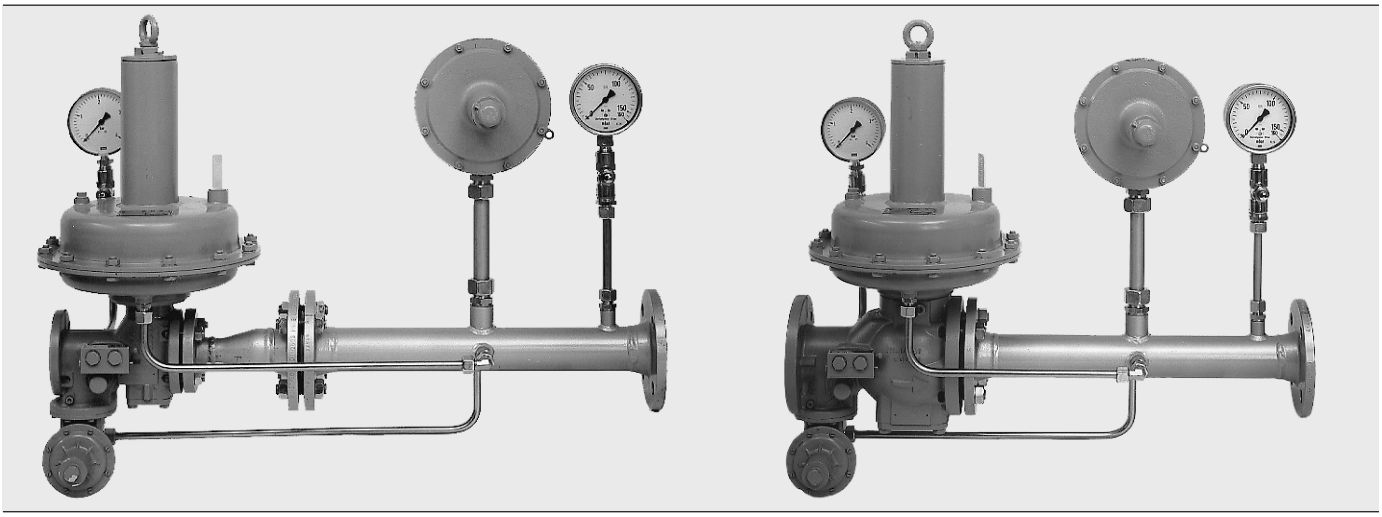
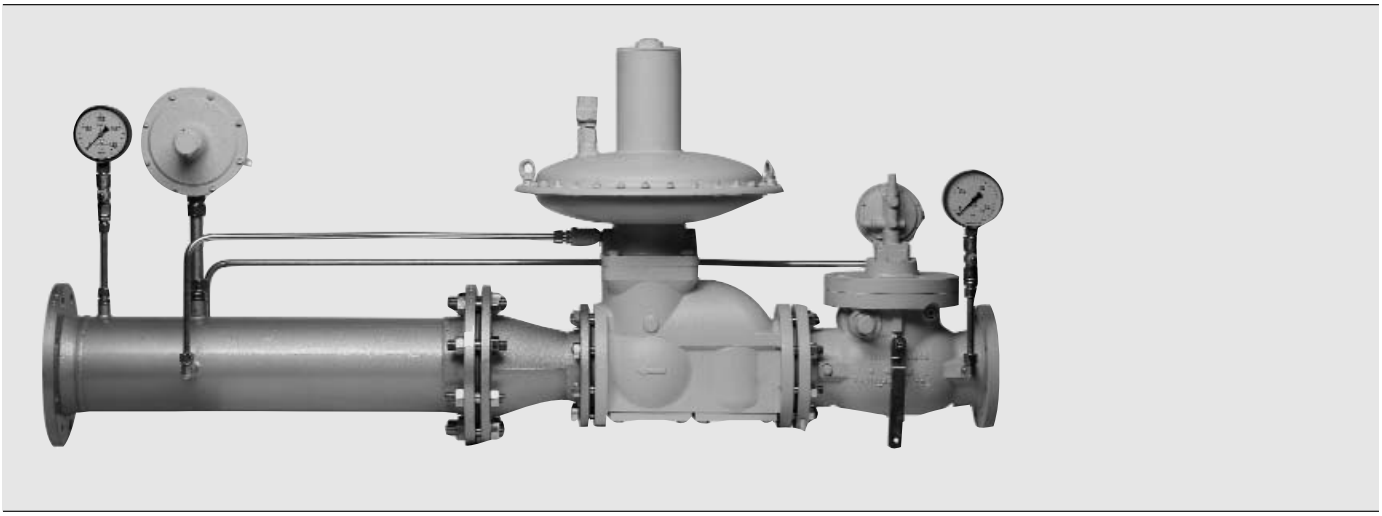


Pressure regulator, types 06/1 to 09/1 | Types 1/1 to 4/1 | Type 5/1



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



Pressure regulator, type 9/1 – 100/150

High gas pressure supply: Two burners, each with a pressure regulator with safety assemblies

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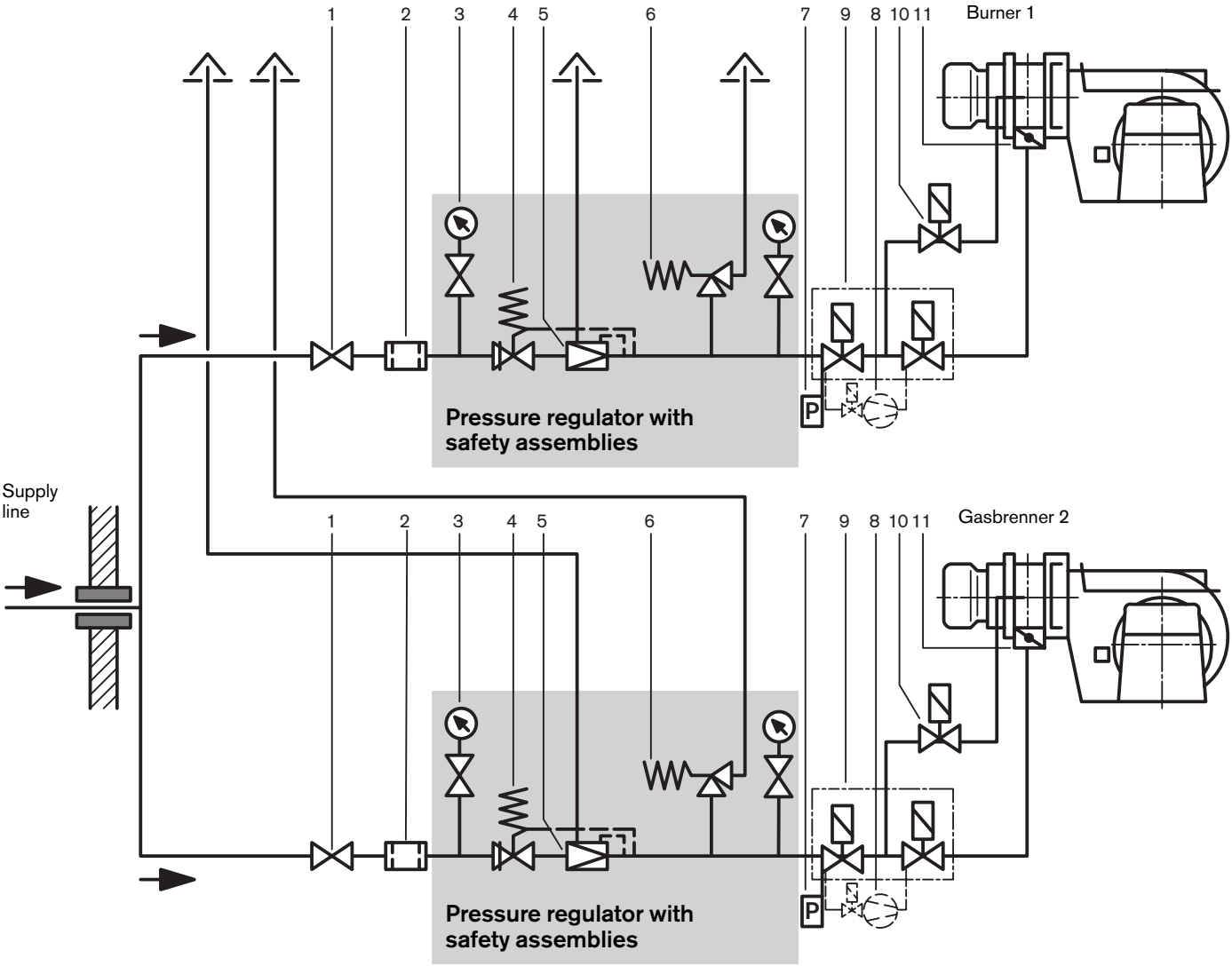

The burners are each supplied with a pressure regulator set, which is in accordance with DVGW worksheet G 490.

In many cases a mains regulator station is connected upstream, to reduce a supply pressure of between 4 and 100 bar to below 4 bar, at which the regulators described here can be used on the burners.

Legend

1 Ball valve
2 Gas filter
3 Pressure gauge 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 Double solenoid valve (DMV, up to DN 125)
10 Ignition gas solenoid valve
11 Gas butterfly valve

Weishaupt gas filter and ball valve pressure loss chart

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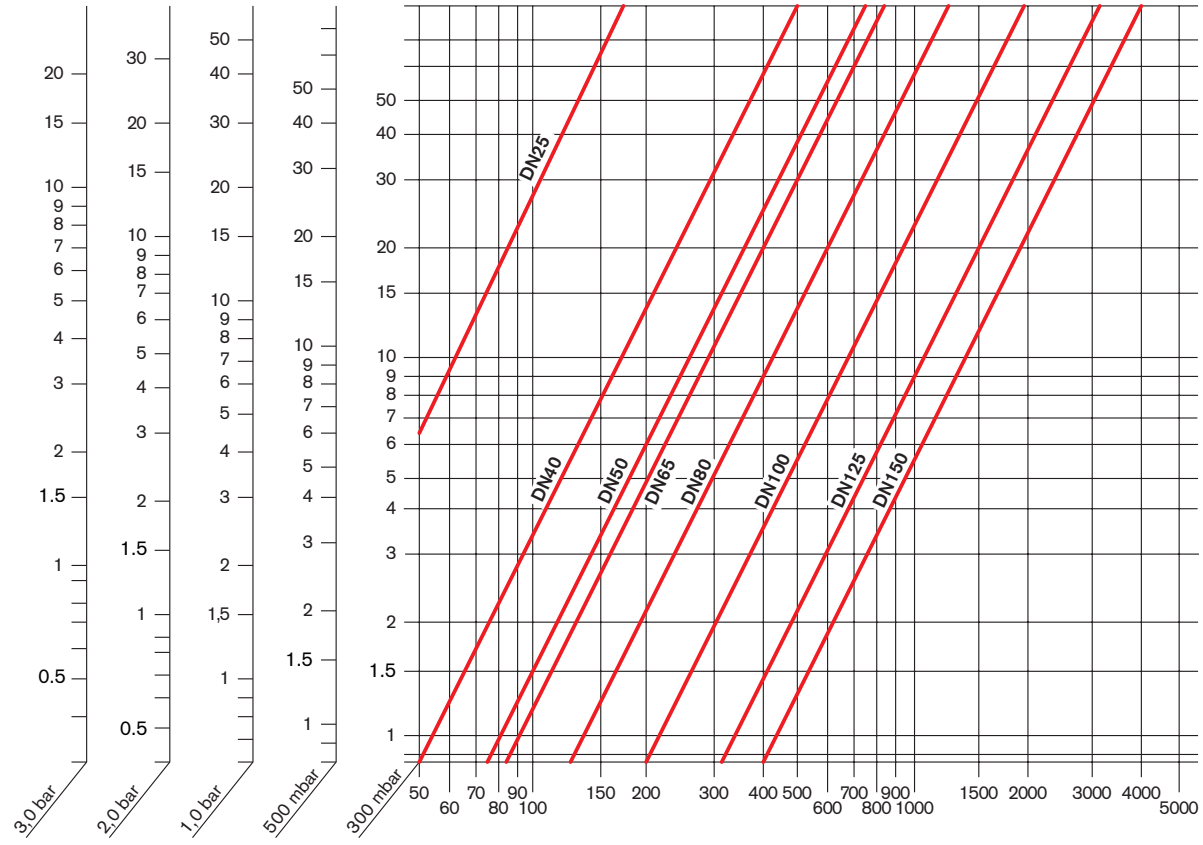
Pressure loss∆ p [mbar] at inlet pressure of (see below)



Inlet pressure p_e → Flow rate V_n [m^3/h]

Natural Gas E, $H_{u,n}$ = 10.35 kWh/m^3, d = 0.606
Natural Gas LL, $H_{u,n}$ = 8.83 kWh/m^3, d = 0.641

Please note:
Gas filter and ball valve must be selected to not 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 selected should be 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 LPG, Town's Gas etc. to equivalent Natural Gas throughputs:

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

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

$f = \sqrt{d_{Gas} / d_{Nat\ Gas}} = \sqrt{d_{Gas} / 0.641}$

Examples:

Gas type	Cal. value H_u kWh/m^3_n	Density kg/m^3	Relative density d	Correction factor f
Propane	25.89	2.011	1.555	1.557
Butane	34.39	2.708	2.094	1.807
Town's Gas 1	4.89	0.513	0.397	0.787
Town's Gas 2	4.30	0.624	0.483	0.868
Town's Gas 3	6.40	1.060	0.820	1.131
Town's 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 axis $V_{Nat\ Gas}$ = 57.9 x 1.557 = 90.1 m^3_n/h

Weishaupt pressure regulators Types 06/1 to 09/1 and 1/1 to 5/1 with safety assemblies

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Technical Data

Weishaupt type	Pressure regulator type	DN	Orifice mm	inch	Max. inlet pressure bar	Outlet pressure mbar	SAV spring colour	SAV setting range mbar	Product ID number	Approx weight kg	Order No.
06/1	133-5-72	25	3.0	1/8"	4.0	30 – 70	green	140 – 450	CE-0085 AQ 1090	15	151 336 2666/0
07/1	133-5-72	25	4.7	3/16"	4.0	30 – 70	green	140 – 450	CE-0085 AQ 1090	15	151 336 2667/0
08/1	133-5-72	25	6.3	1/4"	3.0	30 – 70	green	140 – 450	CE-0085 AQ 1090	15	151 336 2646/0
09/1	133-5-72	25	12.5	1/2"	1.5	30 – 70	green	140 – 450	CE-0085 AQ 1090	15	151 336 2647/0
1/1	233-12-5-72	50	10	3/8"	4.0	30 – 70	green	140 – 450	CE-0085 AQ 1092	27	151 336 2648/0
2/1	233-12-5-72	50	12.5	1/2"	4.0	30 – 70	green	140 – 450	CE-0085 AQ 1092	27	151 336 2649/0
3/1	233-12-5-72	50	20	3/4"	2.5	70 – 140	green	140 – 450	CE-0085 AQ 1092	27	151 336 2650/0
4/1	233-12-5-72	50	25	1"	1.0	70 – 140	green	140 – 450	CE-0085 AQ 1092	27	151 336 2651/0
5/1	244-12-5-72	50	27.5	–	4.0	70 – 140	green	140 – 450	CE-0085 AQ 1094	31	151 336 2652/0

See Print No. 1727 for regulators with safety diaphragms for connection without breather and vent lines

Outlet pressure springs and labels

Type	Outlet pressure mbar	Colour	Order No.	Label Order No.
06/1 to 09/1	12 – 20	blue	490 031	201 000 0810/7
06/1 to 09/1	15 – 35	green	490 032	201 000 0811/7
06/1 to 09/1	30 – 70	orange	490 033	201 000 0812/7
06/1 to 09/1	50 – 140	black/white	490 030	201 000 0813/7
06/1 to 09/1	100 – 210	silver	490 029	201 000 0815/7
1/1-5/1	15 – 35	green	490 085	201 000 0811/7
1/1-5/1	30 – 70	orange	490 086	201 000 0812/7
1/1-5/1	70 – 140	black	490 087	201 000 0814/7
1/1 -5/1	100 – 210	silver	490 088	201 000 0815/7

Note:
06/1 to 09/1 pressure regulators are supplied as standard with orange springs (30 to 70 mbar). Types 1 to 5 are fitted black springs (70 to 140 mbar). 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 label.

Scope of delivery:
1 Pressure regulating unit, comprising:
pressure regulator, SAV safety shut off valve and SBV safety relief valve
1 Inlet pressure gauge with push button valve
1 Outlet pressure gauge with push button valve
connection pieces, screws, nuts, gaskets, and additionally with type 5/1:
Stabilising section with connections and control line for pressure regulator and SAV

The unit 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 SBV safety relief valve
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 SAV safety shut off valve
29 Operating stem

Function of the pressure regulator
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.

Function of the SAV safety shut off valve
If damage occurs to the orifice (24), or if 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 SAV's measuring mechanism (13) 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 from the outlet pressure area of the regulating section and is 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 set with 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.

Function of the SBV safety relief valve
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 venting pressure is approx. 30 mbar above the outlet pressure, ± 10%. The excess pressure is released to the vent connection (8) via the SBV and thence safely to open atmosphere.

Installation
- In order to avoid damage and operational faults, care must be taken that the connection line and the regulator are free from contamination.
- Jointing rings 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 SAV on the other hand, various installation possibilities are available. In 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 accordingly.
- A line leading into safe open atmosphere is connected to the breather port (7).
(For installation instructions see page 14).
- Once the pressure regulating assembly has been installed in the burner's gas valve train, 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, including the closing of the SAV.
- All local legislation and directives must be observed.

Commissioning

- Function test of the burner with ball valve closed (see the burner's installation and operating instructions).
- Setting pressure to be set according to the burner's installation and operating instructions.
- 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 regulator are sealed.
- Should a fault on the pressure regulator result in a closure of the SAV (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 SAV (28) is ready for operation. Check the cover cap (15) for leaks (by using Nekal or soap solution).

Adjustment and operational check of the 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.

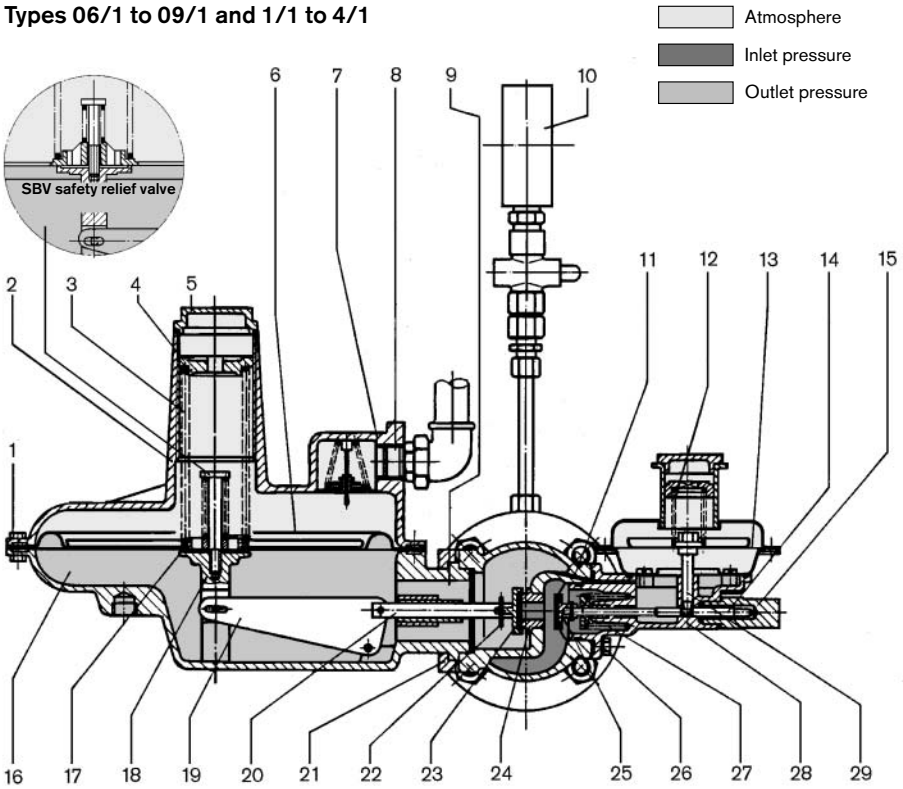
- SAV does not engage
  Decrease pressure on the outlet side.

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

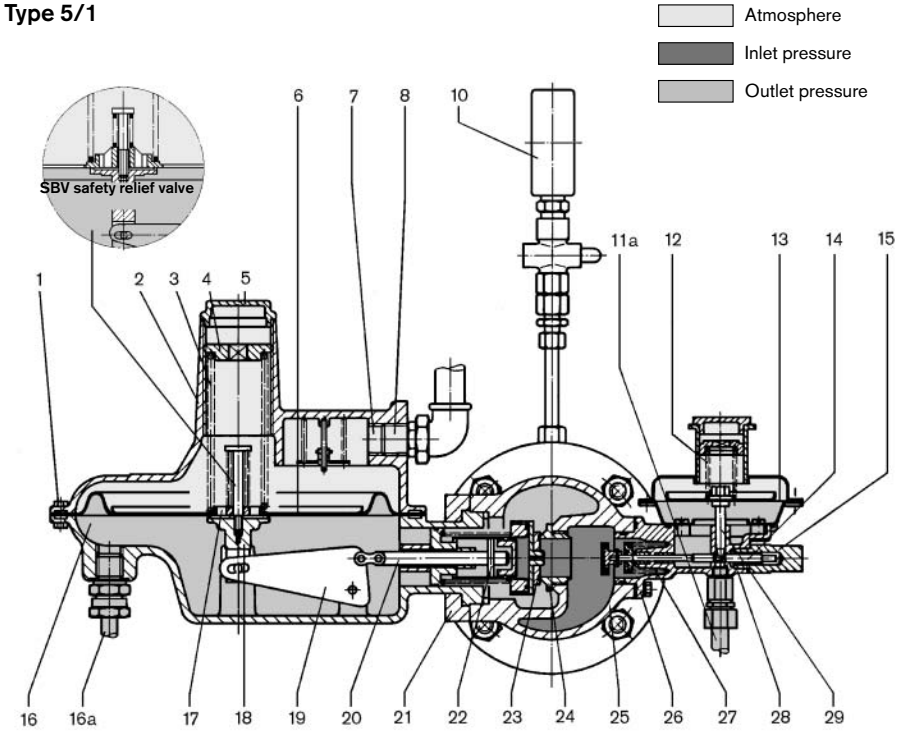
Sequence test
After the visual test, the setting and operation of the pressure regulator, SAV and SBV are checked. Please pay attention to the notes on page 15.

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.

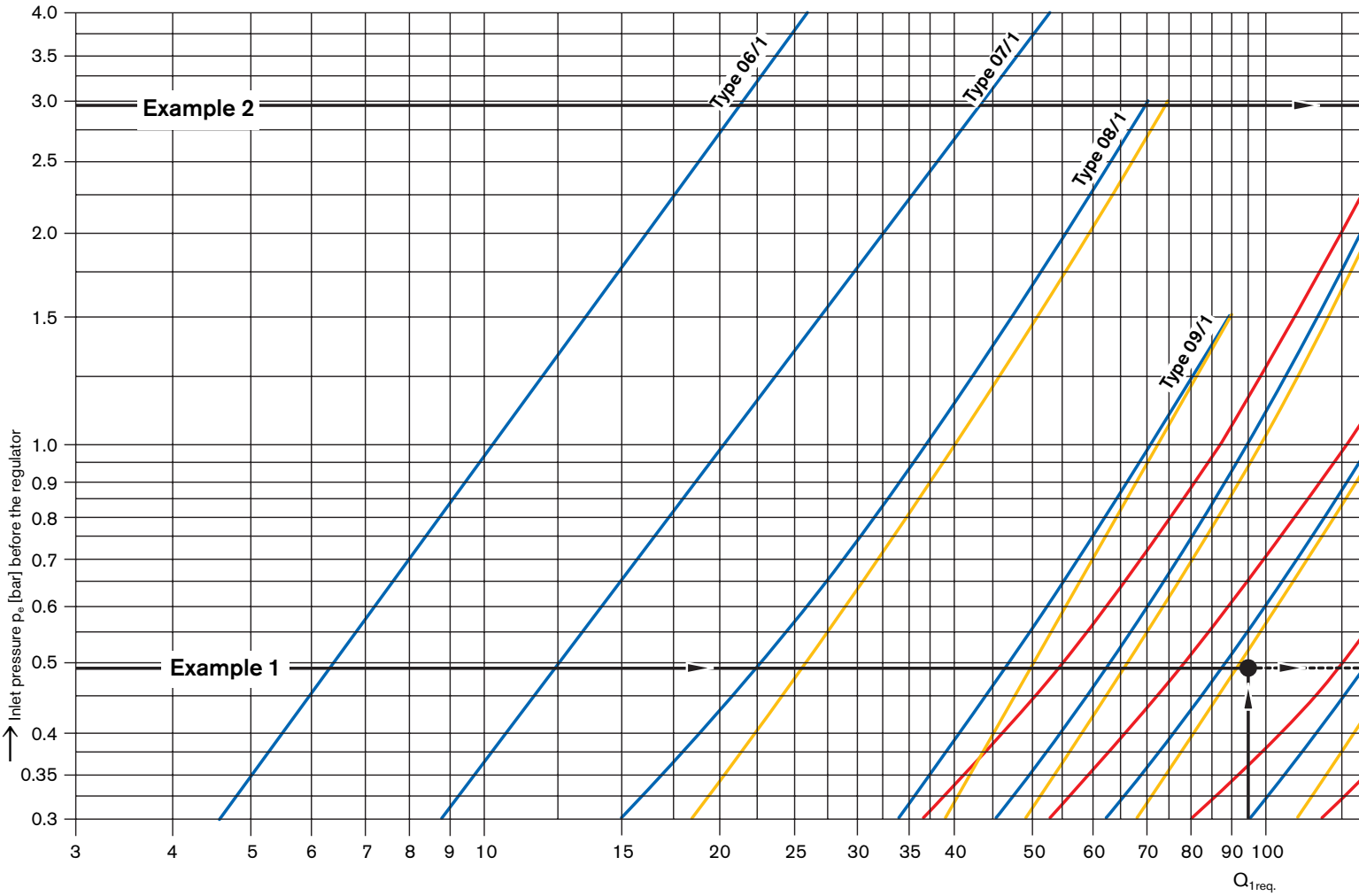
Types 06/1 to 09/1 and 1/1 to 4/1



Type 5/1



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



→ 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 of regulator required can be selected using the chart. The following must be known:
- Gas type (calorific value, density)
- Burner rating
- Inlet pressure [bar]
- Required outlet pressure p_a.

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

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

Selection example 1

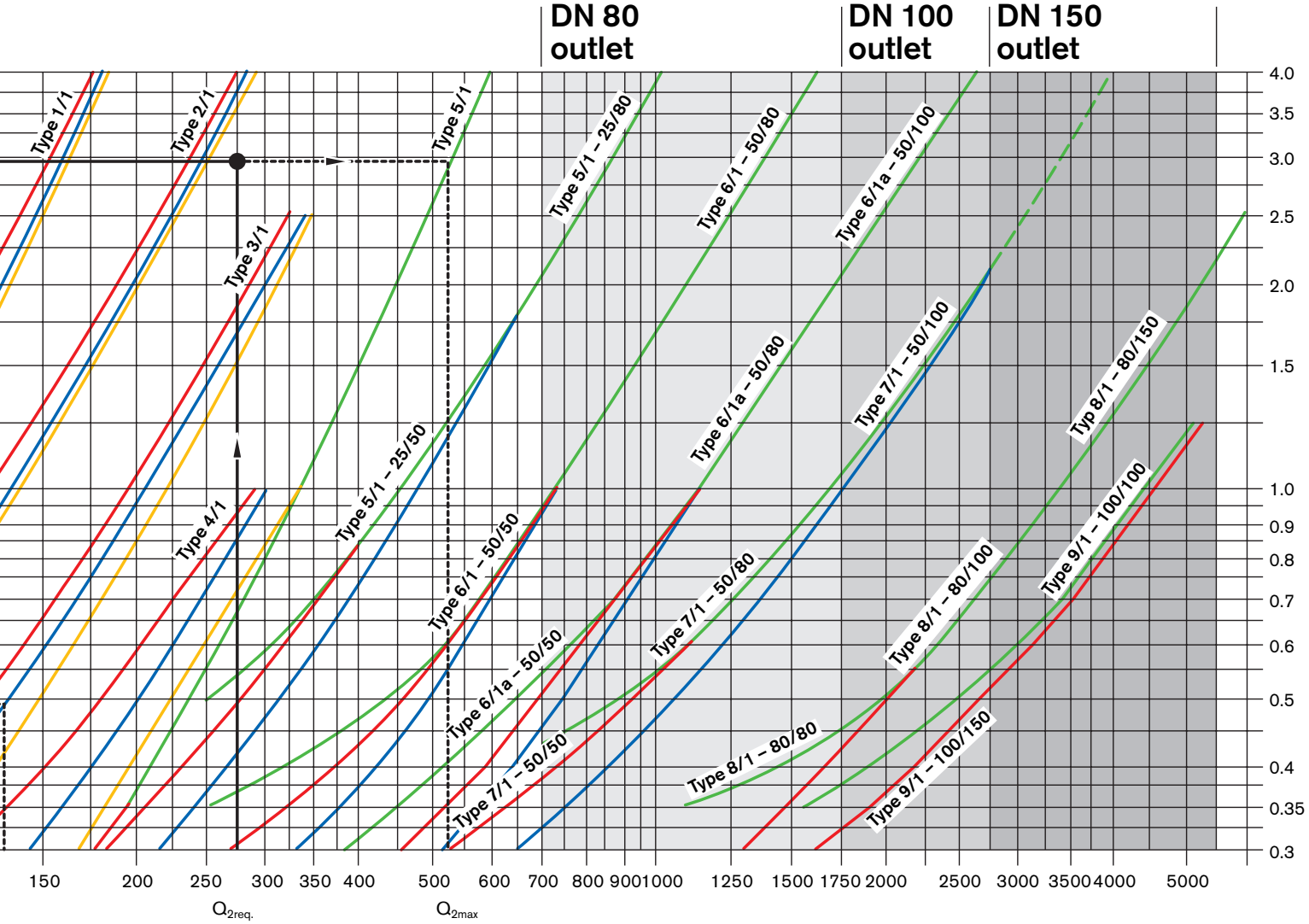
Gas type:	Natural Gas $H_{u,n}$ = 10.35 kWh/m^3_n, d = 0.606
Gas throughput:	90 m^3_n/h
Inlet pressure p_e:	480 mbar
Outlet pressure p_a:	100 mbar (valve train selection)

1. Pressure loss Δp from DN 50 filter and ball valve (see pressure loss chart, page 5) approx.. 1 mbar.
2. Selection chart gives type 3/1.

Selection example 2

Gas type:	LPG, Propane H_u = 25.89 kWh/m^3_n, d = 1.555
Burner rating:	4,556 kW
Gas thro'put V_{Gas}:	176 m^3_n/h
Gas thro'put, rel. to Natural Gas:	275 m^3_n/h (see page 9)
Inlet pressure p_e:	2.9 bar

1. Pressure loss Δp from DN 50 filter and ball valve approx. 1 mbar.
2. Selection chart gives 5/1 (permitted operating pressure of regulator type 3/1 is exceeded).
3. Check: partial load turndown 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 ⇨ turndown1:5.7 < 1:20.
   The selection is therefore OK.



The stabilising section at the outlet must be enlarged in accordance with 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 q_{min}, the outlet pressure p_a rises by 10%, at the maximum throughput q_{max}, the outlet pressure p_a drops by 10%.

The gas pressure regulators are direct operating regulators and have a turndown ration 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 LPG, Town's Gas etc. to equivalent Natural Gas throughputs:

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

Examples:

Gas type	Calorific value H_u kWh/m_n^3	Density kg/m^3	Relative density d	Correction factor f
Propane	25.89	2.011	1.555	1.557
Butane	34.39	2.708	2.094	1.807
Town's Gas 1	4.89	0.513	0.397	0.787
Town's Gas 2	4.30	0.624	0.483	0.868
Town's Gas 3	6.40	1.060	0.820	1.131
Town's 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_n^3/h

Value on Natural Gas axis — $V_{Nat\,Gas}$ = 57.9 x 1.557 = 90.1 m_n^3/h

☐	up to 700 m^3/h _____ DN 50	▒	from1750 to 2700 m^3/h _____ DN 100
▒	from 700 to 1750 m^3/h _____ DN 80	■	from 2700 m^3/h _____ DN 150

Weishaupt pressure regulators Types 5/1 to 9 with safety assemblies

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Technical Data:

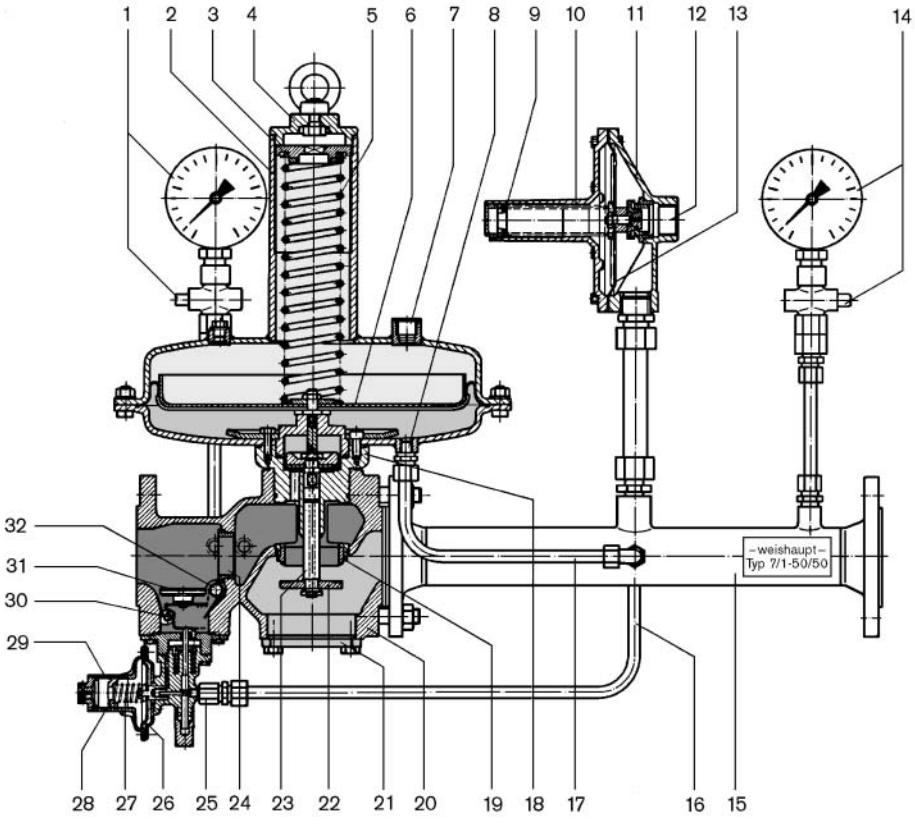
Weishaupt type	Connection DN Inlet	Outlet	Approx. weight kg	Order No.	Gas pressure regulator Type	DN	Orifice Ø mm	max. inlet pressure bar	Outlet pressure mbar	Spring colour	Product ID number
5/1-25/50	25	50	46	151 336 2637/0	RR 16-25-31-8N-033	25	31	5,0	100 – 210	green/white	CE-0085 AQ 1103
5/1-25/80	25	80	58	151 336 2653/0	RR 16-25-31-8N-033	25	31	5,0	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	5,0	100 – 210	green/white	CE-0085 AQ 1103
6/1-50/80	50	80	57	151 336 2639/0	RR 16-50-31-8N-033	50	31	5,0	100 – 210	green/white	CE-0085 AQ 1103
6/1a-50/50	50	50	44	151 336 2663/0	RR 16-50-42-8N-033	50	42	5,0	100 – 210	green/white	CE-0085 AQ 1103
6/1a-50/80	50	80	57	151 336 2664/0	RR 16-50-42-8N-033	50	42	5,0	100 – 210	green/white	CE-0085 AQ 1103
6/1a-50/100	50	100	62	151 336 2665/0	RR 16-50-42-8N-033	50	42	5,0	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	5,0	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	5,0	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	5,0	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	150	120	151 336 2645/0	RR 16-80-82-12N-033	80	82	4,0	100 – 210	black	CE-0085 AQ 1103
9/1-100/100	100	100	136	151 336 2676/0	RBE4020	100	100	4,0	120 – 220	silver	NG-4301 AQ 1554
9/1-100/150	100	150	163	151 336 2677/0	RBE4020	100	100	4,0	120 – 220	silver	NG-4301 AQ 1554

The RR 16... regulator has an integral SAV with safety diaphragm, green spring, setting range 140 - 400 mbar (unit supplied set to 350 mbar)

Scope of delivery:

1 Pressure regulator
1 SAV safety shut off valve
1 SBV safety relief valve
1 Inlet pressure gauge with push button valve
1 Outlet pressure gauge with push button valve
1 Bypass line with ball valve
1 Impulse line (pressure regulator)
1 Impulse line (SAV)
1 Stabilising piece with connections
1 Key for resetting SAV, with screw and gaskets

Unit supplied fully assembled and pressure tested.



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 SBV safety relief valve
12 Vent line connection , $^3/_4$"
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 Orifice (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 SAV safety shut off valve
30 Latch lever
31 SAV valve
32 Reset shaft

Atmosphere
Inlet pressure
Outlet pressure

Types 9/1-100/100 and 9/1-100/150 only

SAV type	DN	Spring colour	Setting range mbar	$P_e$max. bar	Product ID Number
022-1	100	green	100 – 450	4	CE-0085 BN 0059

Types 5… to 9/1

SBV type	DN	Spring colour	Setting range mbar	Product ID Number
275 D	3/4”	black	150 – 500	CE-0085 AQ 1102

Outlet pressure springs and labels

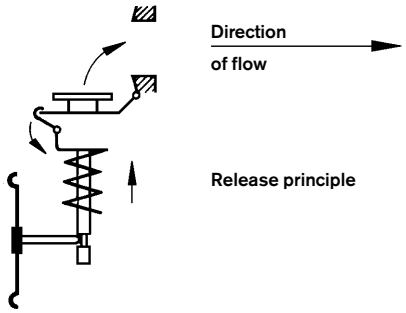
Outlet pressure mbar	Colour	Order No.	Label Order No.	For use with type 5/1-25/50 5/1-25/80	6/1-50/50 6/1-50/80	7/1-50/50 7/1-50/80 7/1-50/100	8/1-80/80 8/1-80/100 8/1-80/150
15 – 35	orange/grey	490 190	2010000811/7	●	●		
15 – 35	yellow/black	490 191	2010000811/7			●	●
30 – 70	yellow/black	490 191	2010000812/7	●	●		
30 – 70	red/blue	490 192	2010000812/7			●	●
70 – 140	red/blue	490 192	2010000814/7	●	●		
70 – 140	blue/green	490 193	2010000814/7			●	●
100 – 210	green/white	490 194	2010000815/7	●	●		
100 – 210	black	490 195	2010000815/7			●	●

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

Function of the SAV safety shut off valve
During normal operation the SAV is open. It automatically shuts off the gas flow if the pressure rises above the set 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 above the maximum p_e of the downstream solenoid valves.



Function of the SBV safety relief valve
During normal operation the SBV is closed. The SBV (11) is adjusted in such a manner that this valve will be the first to respond to an excess outlet pressure. Only then will the SAV (29) become operative. The gas is vented into safe open atmosphere via the vent line (12). With a pressure rise the diaphragm (13) is raised by the valve disc and gas can thus flow through the valve. When the diaphragm drops again following a reduction in pressure, the valve is closed. The appropriate venting pressure level is set via the setting screw (9).

Installation

- In order to avoid damage and operational faults, care must be taken that the connection line and the regulator are free from contamination.
- Install horizontally, with the spring housing of the gas pressure regulator 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 care must be taken to ensure the impulse lines (16 & 17) are not damaged.
- The vent line connection (12) should be connected to the $^3/_4$" breather port and led into a safe, open atmosphere.
- Once the pressure regulating assembly has been installed in the burner's gas valve train, 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, including the closing of the SAV.
- All local legislation and directives must be observed.

Commissioning

- Slowly open the shut off assembly 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 preset 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 can be reopened manually at 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 conditions (gas throughput, gas pressure, set points).

Sequence test

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

Maintenance

The pressure regulators require practically no maintenance. A gas filter must be fitted upstream of the pressure regulator.

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, pipework with many changes in direction etc.).

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

Fluctuations (surges): 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 rectified 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 for 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 a damaged valve seat, or a non-tight orifice.

Note:

All SAV impulse connections are fitted as standard with a ø 1.6 mm orifice. All RR16… regulators are fitted as standard with a ø 3 mm orifice. This should be checked if the equipment does not function correctly.

Connections / Accessories

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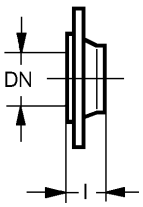
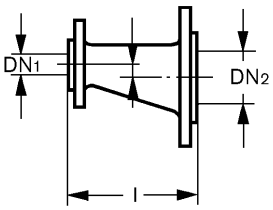


Weldable flange Flange table: DIN 2633 PN 16

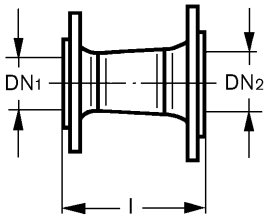
DN	l	Approx. kg	Order No.
20/ 26.9	38	0.9	452 940
25/ 33.7	38	1.1	452 941
40/ 48.3	42	1.8	452 942
50/ 60.3	45	2.5	452 936
65/ 76.1	45	3.0	452 910
80/ 88.9	50	3.7	452 911
100/114.3	52	4.6	452 913
125/139.7	55	6.3	452 914
150/168.3	55	7.7	452 918



Flanged eccentric reducer; aluminium
(Max. operating pressure 3 bar, flange table: DIN 2633 PN 16.
not for installation upstream of the high pressure regulator).

DN_1	DN_2	l	b	Approx. kg*	Order 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

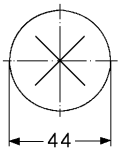
Includes nuts, bolts and gaskets for two break points.



Flanged concentric reducer; steel, grey cast iron or ductile cast iron
(Max. operating pressure 16 bar, flange table DIN 2633 PN 16).

DN_1	DN_2	l	Material	Approx. kg*	Order 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 cast iron	7.2	151 329 2689/2
50	100	200	Ductile cast iron	8.1	151 327 2644/2
65	80	200	Ductile cast iron	8.2	151 330 2608/2
80	100	200	Ductile cast iron	9.3	151 329 2690/2
80	125	200	Ductile cast iron	10.5	151 329 2691/2
80	150	200	Ductile cast iron	12.0	151 330 2622/2
100	125	200	Ductile cast iron	11.4	151 327 2689/2
100	150	200	Ductile cast iron	12.8	151 328 2626/2
125	150	200	Ductile cast iron	14.1	151 330 2623/2

Includes nuts, bolts and gaskets for two break points.



Rubber washer

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

See page 10 for notes and installation.

* the weights given include nuts, bolts and gaskets.
Dimensions are approximate. We reserve the right to make changes in the light of future developments.

Installation examples and notes

–weishaupt–

1 Ball valve
2 Gas filter
3 SAV safety shut off valve
4 Pressure regulator
5 SBV safety relief valve
6 Compensator
7 Reducing flange
8 Pressure gauge with push button valve
9 SBV vent line
10 Pressure regulator breather line

Installation instructions

- In many cases the pressure regulator's inlet and outlet sizes are smaller than those of the gas valve train's other components, particularly with high gas pressures. A range of flanged reducers in all the necessary sizes is available to enable installation to be carried out quickly and correctly (see page 13).
- The distance between the solenoid valves and the pressure regulator can be short, 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 assemblies. If necessary, the regulators should be shielded from heat radiation or excessively 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 move quickly without undue resistance. The line diameters below must be provided for the various lengths of line as shown.

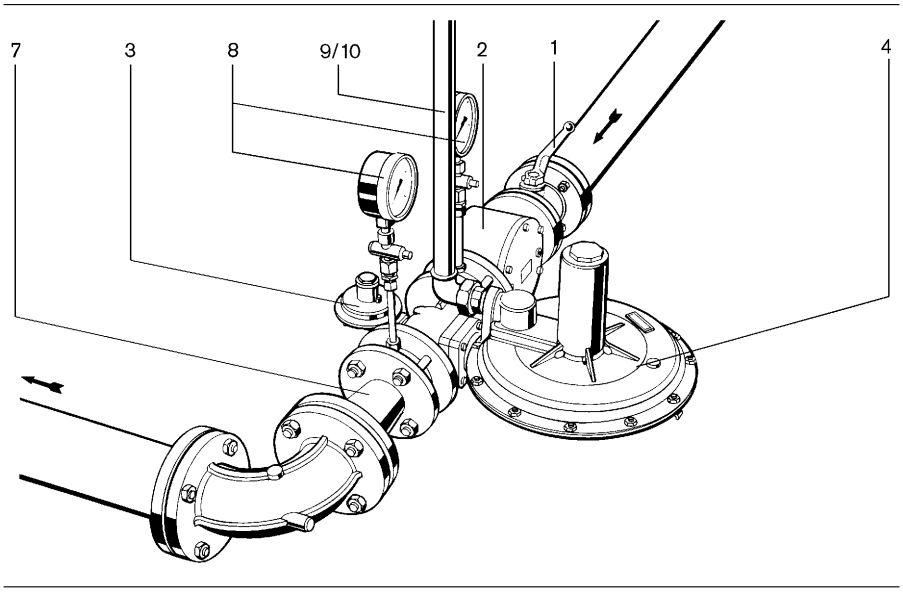
ø mm	length m
15	3
20	5
25	> 5

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

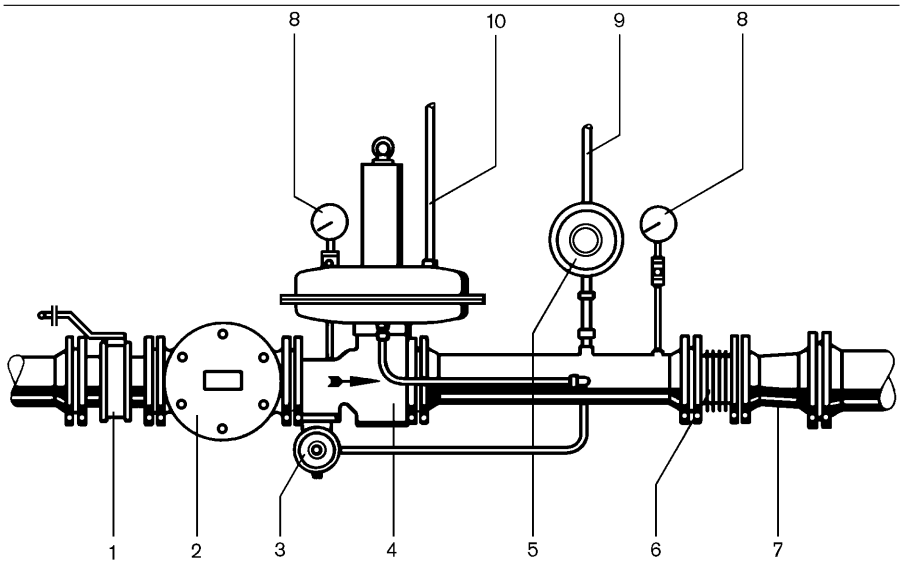
- Due to the SAV shut off cap, which is fitted with a diaphragm, it is not necessary to fit a breather line from the SAV diaphragm housing to atmosphere.
- Multiple breather lines from the gas pressure regulator can be manifolded together or separately over the roof. The common line must be laid with a larger diameter. It should be noted that no mutual interference is caused by this.
- The vent line (9) is the line between the safety relief valve and free atmosphere. This line must be installed separately.

  Connection for types 5/1 to 9 _____ 3/4"
- There is a common breather and vent line (9/10) on pressure regulator types 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:
  Types 08/1 and 09/1 _____ 3/4"
  Types 1/1 to 5/1 _____ 1"
- The termination of the lines must be an adequate distance from sources of ignition (at least 3 metres) and installed so that any outflowing gas cannot enter buildings. The line must also be protected against the entry of rainwater and against blockages.



Example: installation with pressure regulator types 08/1 to 09/1 and 1/1 to 4/1



Example: installation with 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.
- 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 proving of the inlet side see page 15.
- Prior to commissioning, 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

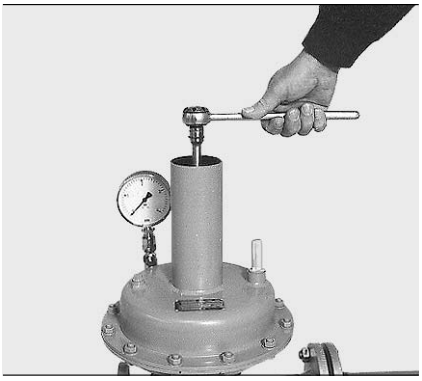


Fig. 1

Adjusting the outlet pressure (Fig. 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 (item 3, page 10) anticlockwise, and increased by turning the screw clockwise.

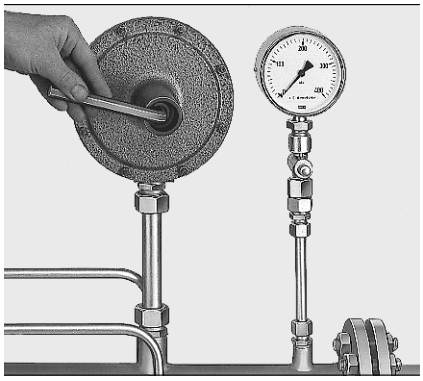


Fig. 2

Adjusting the SBV (Fig. 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 (item 9, page 10) anticlockwise and increased by turning the screw clockwise.
- The relief pressure must be lower than the max. permitted inlet pressure of the solenoid valve.

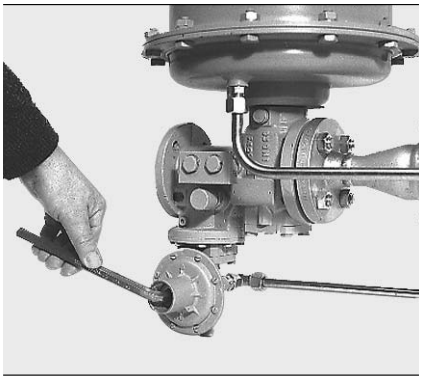


Fig. 3

Adjusting the SAV (Fig. 3)
- The SAV is 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 (item 8, page 10) anticlockwise and increased by turning the screw clockwise.
- The setting pressure may only be as high as the max. permitted setting pressure of the solenoid valves.

The SAV cannot be reset
This occurs if the SBV's vent pressure is set higher than the tripping pressure of the SAV.

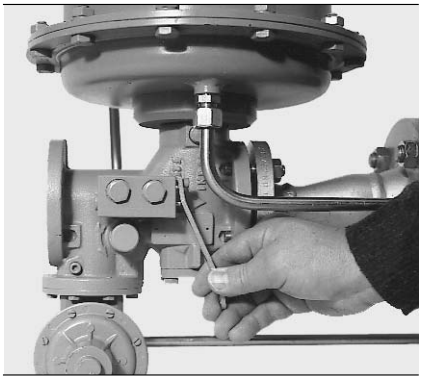


Fig. 4

Resetting the SAV
- Equalise the pressure by opening the bypass valve (Fig. 4).

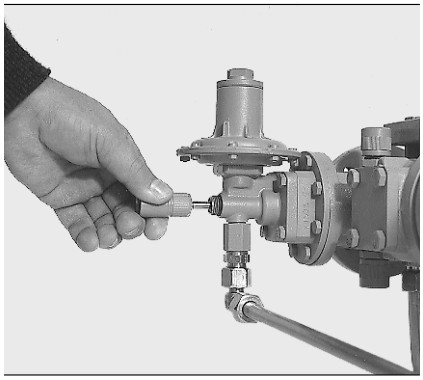


Fig. 5

- Unscrew sealing cap and pull back valve rod until it engages (Fig. 5, only possible if the outlet pressure is less than the SAV release pressure).

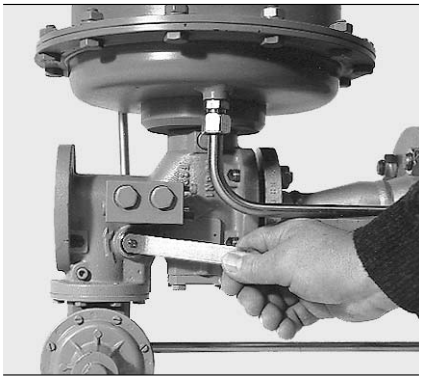


Fig. 6

- Turn reset shaft anticlockwise until the valve disc arm in the release arm engages (Fig. 6).
- Screw on sealing cap.
- Manual bypass valve must be closed.

Soundness test:
Once installed and prior to commissioning, the complete regulator assembly has to be tested for soundness, in accordance with the instructions given in the burner's installation and operating manual (the connection of a filter is possible during the 1st test phase of the soundness test).

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

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

Dimensions

Max Weishaupt GmbH
D-88475 Schwendi
Tel (0 73 53) 8 30, Fax (0 73 53) 8 33 58
www.weishaupt.de

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Neachells Lane, Willenhall, WV13 3RG
Tel (01902) 609841, Fax (01902) 633343
www.weishaupt.co.uk

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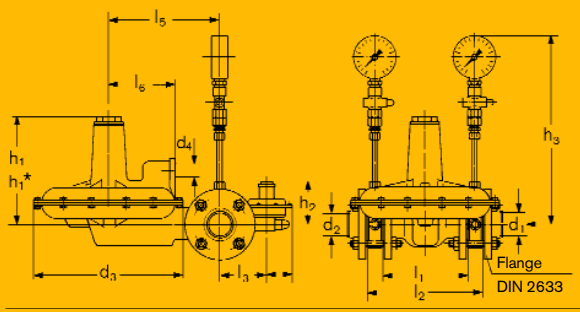
Fig. 1 – Types 06/1 to 09/1 and 1/1 to 4/1



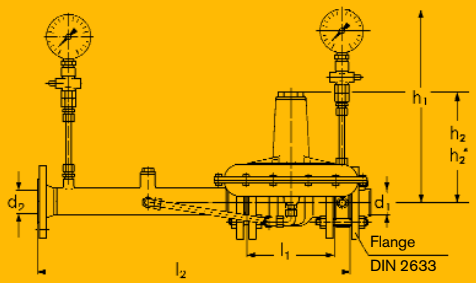
Types	d_1/d_2	d_3	d_4	h_1	h_1*	h_2	h_3
06/1 to 09/1	25	190	3/4"	155	345	100	380
1/1 to 4/1	50	350	1"	250	445	100	490

Types	l_1	l_2	l_3	l_4	l_5	l_6
06/1 to 09/1	160	250	100	60	160	100
1/1 to 4/1	200	290	110	60	260	150

* Dimension for disassembling spring

Dimensions in mm are approximate
(Counterflange not included in delivery, for exact scope of delivery see page 6)

Fig. 2 – Type 5/1 (compact)

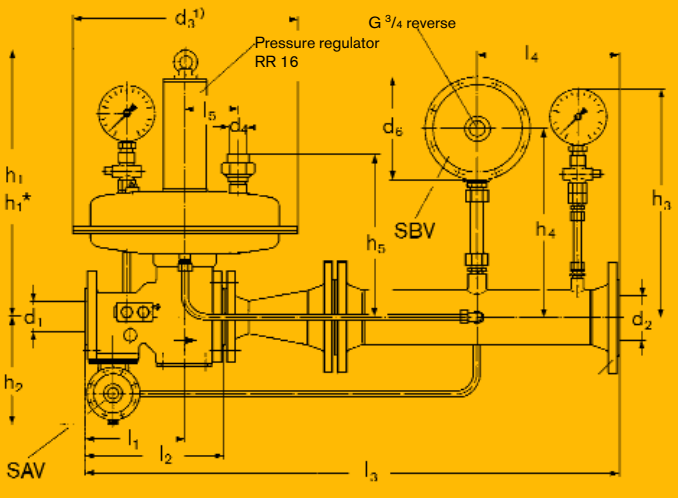


Type	d_1	d_2	l_1	l_2	h_1	h_2	h_2*
5/1	50	50	200	750	490	250	445

* Dimension for disassembling spring

All other dimensions as per types 1/1 to 4/1.

Fig. 3 – Types 5/1 to 8/1



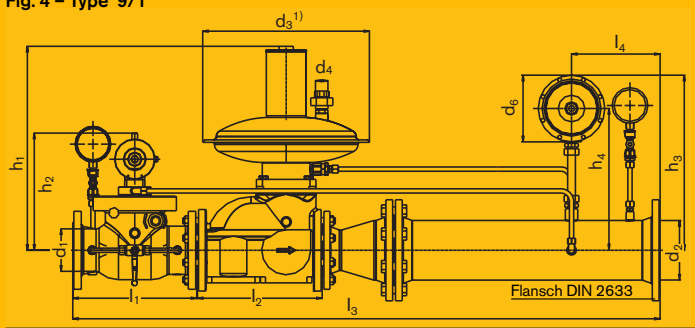
Types	d_1	d_2	d_3 [1]	d_4	d_6	h_1	h_1*	h_2
5/1-25/50	25	50	310	1"	190	470	660	195
5/1-25/80	25	80	310	1"	190	470	660	195
6/1-50/50	50	50	310	1"	190	485	680	195
6/1-50/80	50	80	310	1"	190	485	680	195
6/1a-50/50	50	50	310	1"	190	485	680	195
6/1a-50/80	50	80	310	1"	190	485	680	195
6/1a-50/100	50	100	310	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
6/1a-50/50	430	350	295	179	250	752	250	95
6/1a-50/80	430	350	295	179	250	1104	250	95
6/1a-50/100	460	370	295	179	250	1204	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 disassembling spring

Fig. 4 – Type 9/1



Types	d_1	d_2	d_3 [1]	d_4	d_6	h_1	h_1*
9/1-100/100	100	100	360	3/4"	190	576	770
9/1-100/150	100	150	360	3/4"	190	576	770

Types	h_2	h_3	h_4	l_1	l_2	l_3	l_4
9/1-100/100	400	467	372	350	352	1456	250
9/1-100/150	400	494	400	350	352	1658	250

1) Diaphragm ø and largest width
* Dimension for disassembling spring