Pressure Reducing Regulators VGBF

Technical Information

T-Product 2005 April

- Optimum dimensioning allows high throughput performance
- Regulator for gaseous media, to be installed on multiple types of gas consuming equipment
- Design incorporating inlet pressure compensation ensures high regulating precision
- Available in a wide variety of threaded and flanged connections
- Inlet pressures to 60 psig (4 bar)
- Internal safety diaphragm
- Wide selection of outlet pressure ranges
- Inlet pressure compensation and zero shut-off

krom schroder

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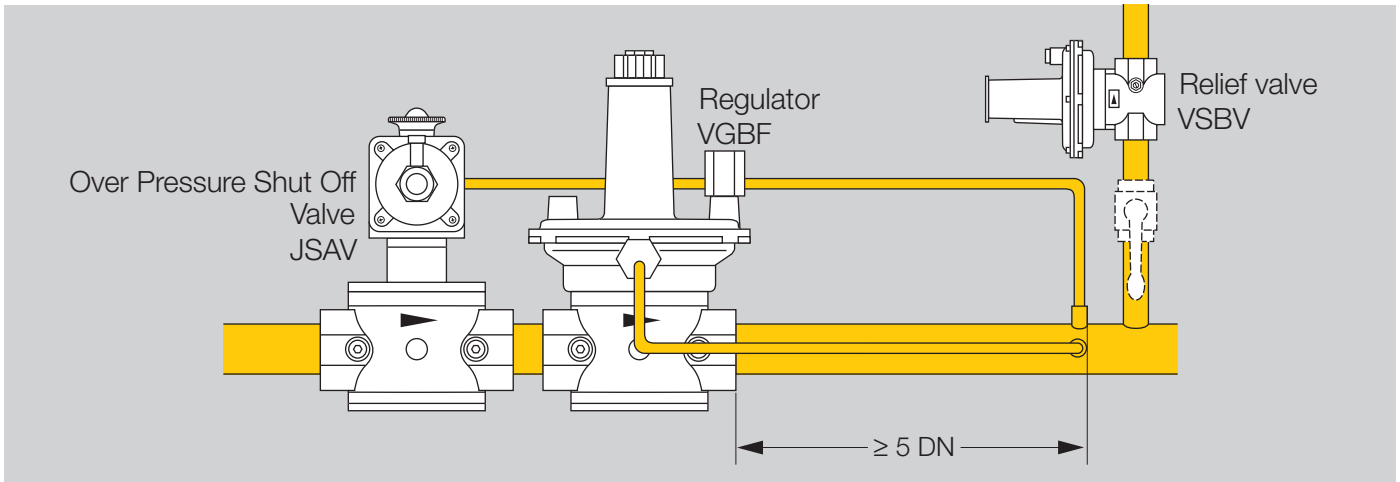
▼ = To be continued



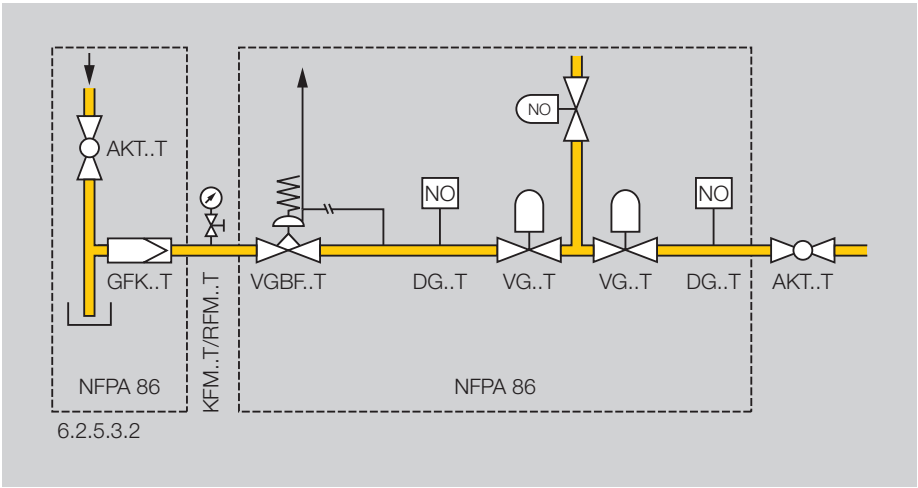
Application

VGBF regulators are general-purpose regulators for controlling gas pressure to furnaces, ovens and other gas consuming equipment. They are suitable for natural, LP and clean biogas at inlet pressure up to 60 psig (4 bar). Springs are available to allow for a wide choice of outlet pressures.

NFPA 86-6.2.5.4.4

If normal inlet pressure to the fuel pressure regulator immediately upstream from the valve exceeds the valve's pressure rating, a relief valve shall be provided and it shall be vented to a safe location.

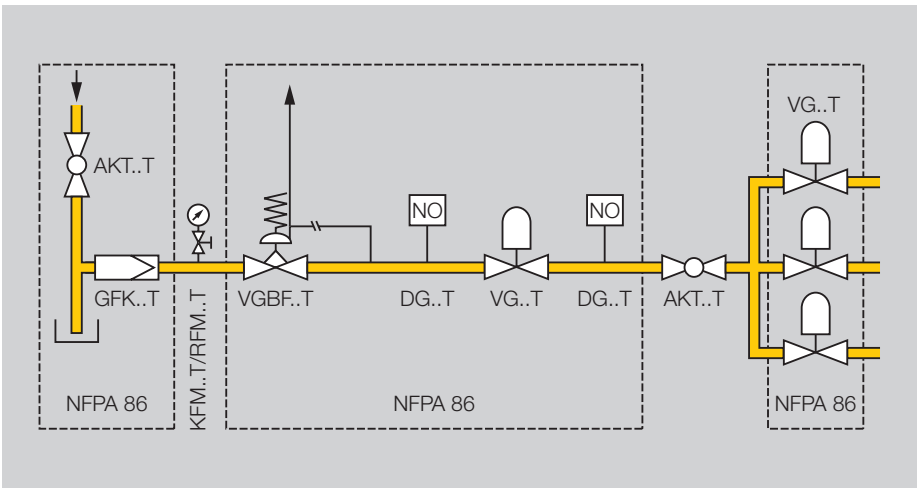
*** Note: A fuel gas regulator may not be required to be vented if an automatic device shuts off gas upstream of the fuel gas regulator as a result of system over pressue. (See drawing above)**



Single burner application

Note:

1. Visual indication shall be provided for capacities greater than 150,000 BTU/Hr.
2. In Systems in excess of 400,000 BTU/Hr, at least one of the safety shut-off valves shall be proved closed and interlocked with pre-ignition purge. Interlock can be:
   1. Proof of closure switch
   2. Valve proofing system



Multiple burner application

AKT..T = Ball Valve
GFK..T = Gas Filter
KFM..T = Pressure Gauge
VGBF..T = Pressure Reducing Regulator
DG..T = Pressure Switch

Specifications

Operating Limits

Type of gas: Natural, LPG, clean coke oven gas and clean biogas
Ambient temperature range: 5° F to 140° F (-15° C to 60° C)
Maximum inlet pressure: 15 psig (1 bar) and 60 psig (4 bar) versions are available
Outlet pressure factory setting: 1.85 psig (130 mbar)

Mechanical Data

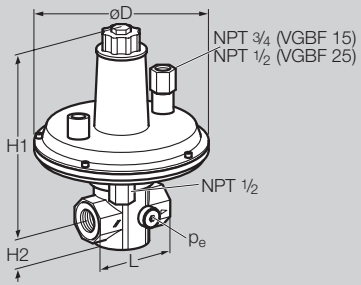
Available pipe sizes: NPT-threaded: ½" to 2"
ANSI flanged: 2" to 4"

Regulator size (NPT)	½"	1"	1½"	2"	3"	4"
Vent connection (NPT)	¾"	½"	½"	½"	¾"	¾"
External impulse line (NPT)	½"	½"	½"	½"	½"	½"

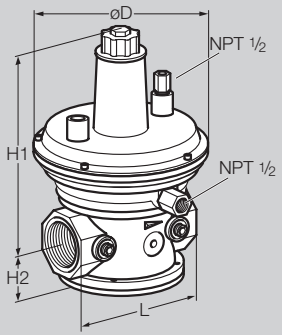
Materials of Construction

VGBF Regulators have pressure die-cast or sand cast aluminium alloy bodies and diaphragm housings. Diaphragms are nitrile rubber. Valve discs have vulcanized nitrile rubber seals

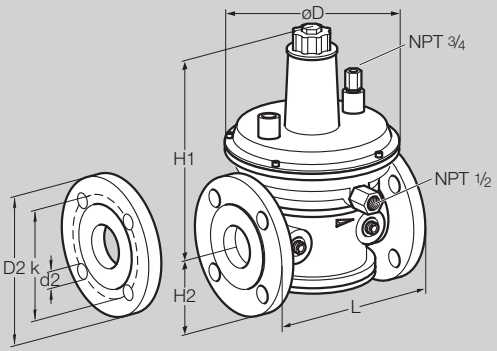
Dimensions and Weights



VGBF 15–25TN



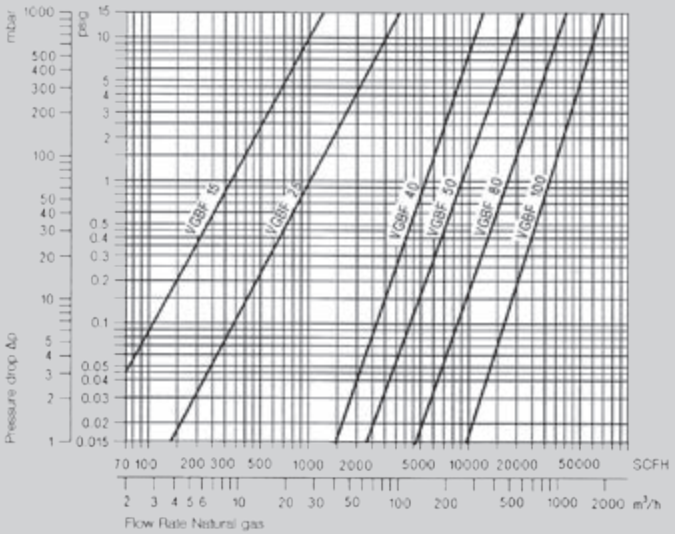
VGBF 40–50TN



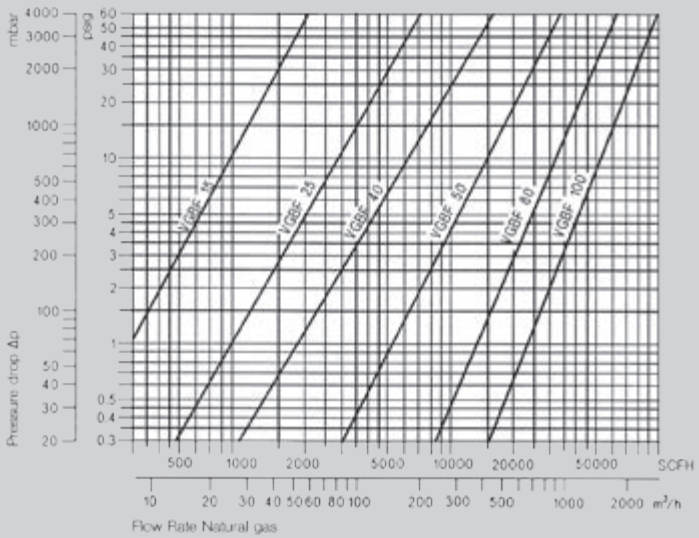
VGBF 80–100TA

Type	Connection	Dimensions								Flange				Drilling		No.	Weight	
		L		D		H1		H2		D2		k		d2				
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm		LBS	kg
VGBF 15TN	NPT ½"	2.76	70	5.20	132	5.91	150	0.94	24	–	–	–	–	–	–	–	2.0	0.9
VGBF 25TN	NPT 1"	3.54	90	7.48	190	9.84	250	1.30	33	–	–	–	–	–	–	–	4.2	1.9
VGBF 40TN	NPT 1½"	5.91	150	7.48	190	10.24	260	2.20	56	–	–	–	–	–	–	–	6.4	2.9
VGBF 50TN	NPT 2"	7.17	182	9.45	240	12.44	316	2.72	69	–	–	–	–	–	–	–	12.6	5.7
VGBF 50TA	ANSI 2"	9.06	230	9.45	240	12.44	316	3.01	77	6.02	153.0	4.75	120.6	0.75	19	4	17.0	7.7
VGBF 80TA	ANSI 3"	12.20	310	12.20	310	17.56	446	3.78	96	7.50	190.5	6.00	152.4	0.75	19	4	35.5	16.1
VGBF 100TA	ANSI 4"	13.78	350	15.59	396	19.72	501	4.53	115	9.02	229.0	7.50	190.5	0.75	19	8	57.3	26.1

Flow rate 15 psig (1 bar)



Flow rate 60 psig (4 bar)



Sizing charts

Flows in diagram above are based on 1 psig, 60° F at sea level (14.7 psia) and natural gas with a specific gravity of 0.62. Flows will change if the ambient temperature or altitude increase and if the specific gravity increases. To correct for conditions other than the ones used in table muliply the flows by the factors calculated with below equation.

$$\text{Flow factor} = \sqrt{\frac{0.62}{\text{S.G.}} \times \frac{520}{460 + {}^{\circ}\text{F}} \times \frac{\text{PSIA+PSIG}}{15.7}}$$

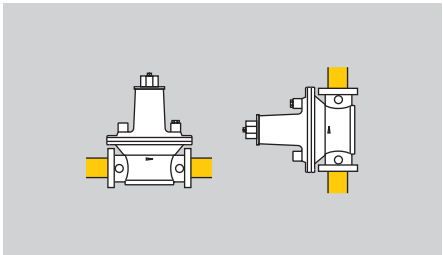
Where
°F = Gas temperature through regulator
S.G. = Specific gravity of gas – air (1.0 s.g.), propane (1.56 s.g.), butane (2.0 s.g.)
PSIA = Barometric pressure
PSIG = Supply pressure to regulator

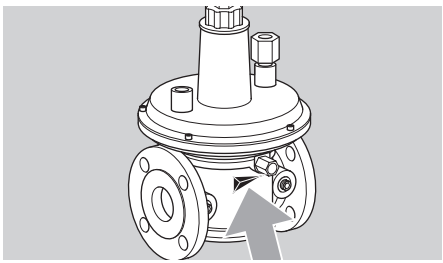
Estimate barometric pressure at various altitudes:

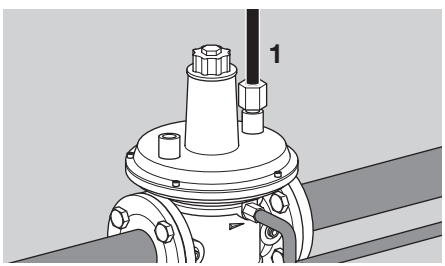
Sea level	14.7 psia
1000 ft	14.2 psia
2000 ft	13.7 psia
3000 ft	13.2 psia
4000 ft	12.7 psia
5000 ft	12.2 psia
6000 ft	11.8 psia
7000 ft	11.3 psia

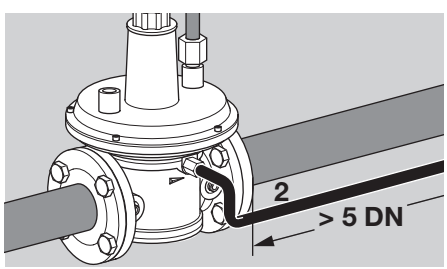
To estimate flows for other medias across the regulator, divide figures in the table above by these factors:

Medium	Air	Propane	Butane
Flow Factor	1.27	1.61	1.83









Installation

WARNING: Improper installation, adjustment, modification, operation or maintenance could lead to injury or damage. All adjustments must be made by a qualified technician.

Wiring must comply with local codes and National Electrical Codes. To prevent the possibility of property damage, turn off electrical power, depressurize installation, vent fluid to safe area before servicing.

We recommend installing a gas filter in the main gas train of each system. Make sure pipes are free of any foreign matter before assembling the filter. Apply thread seal carefully, avoid getting access to the housing.

– Remove thread / flange protector
– Observe direction of flow: arrow on housing
– Valve spring housing can be located in any position in vertical piping. In horizontal piping spring housing can not be located below horizontal.
– The housing must have clearance of ¾" from any vertical surface.
  Allow access for spring adjustment at the top of the housing.
– Use suitable sealant, apply sparingly, only to outer threads.
– Connect purge line by using approved joint compound and vent outdoors **1**.
– Connection for external impulse line should be a distance of minimum 5 x the nominal pipe diameter **2**.
– Check for gas leaks. Apply pressure to regulator (do not exceed name plate rating).
– Soap pipe joints and check for leaks.

Operation

Outlet pressure:

Standard factory outlet pressure is 1.88 psig (130 mbar)

The outlet pressure is changeable by inserting different springs (see table)

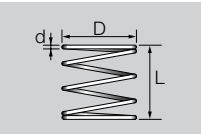
Spring table

Outlet pressure range in WC	mbar	Spring Marking	VGBF 15	VGBF 25, VGBF 40	VGBF 50	VGBF 80	VGBF 100
2–5	5–2.5	none	75421911	75421961	75422031	75426230	75426310
4–12	10–30	red	75421921	75421971	75422041	75426240	75426320
10–18	25–45	yellow	75421931	75421980	75422051	75426250	75426330
16–24	40–60	green	75421941	75421990	75422061	75426260	75426340
22–30	55–75	blue	75421951	75422000	75422071	75426270	75426350
27.1–35.3	70–90	black	75442046	75422010	75422081	75426280	75426360
32.6–40.7	85–105	white	75442047	75422020	75422091	75426290	75426370
38–62.5*	100–160*	black/red*	75442048	75438978	75438981	75438984	75438987
59.7–89.6	150–230	black/yellow	75442049	75438979	75438982	75438985	75438988
86.9–135.8	220–350	black/green	75442050	75438980	75438983**	75438986	75438989

* Standard spring

** Spring assembly consists of 2 springs

Spring dimensions



Type	Color	D		d		L		Coils
		inch	mm	inch	mm	inch	mm	
VGBF 15	none	1.18	30.00	0.06	1.50	3.41	86.50	10.00
	red	1.18	30.00	0.08	2.00	3.41	86.50	12.50
	yellow	1.18	30.00	0.08	2.00	4.29	109.00	12.50
	green	1.18	30.00	0.08	2.00	4.49	114.00	10.00
	blue	1.18	30.00	0.09	2.25	4.21	107.00	11.50
	black	1.18	30.00	0.09	2.25	4.25	108.00	9.00
	white	1.18	30.00	0.10	2.50	3.94	100.00	9.00
	black/red	1.18	30.00	0.10	2.50	4.11	104.50	8.00
	black/yellow	1.18	30.00	0.11	2.80	3.88	98.50	7.50
	black/yellow	1.18	30.00	0.12	3.00	3.70	94.00	6.50
VGBF 25	none	1.50	38.00	0.09	2.20	3.74	95.00	12.00
VGBF40	red	1.50	38.00	0.10	2.50	4.21	107.00	9.50
	yellow	1.50	38.00	0.12	3.00	4.84	123.00	12.00
	green	1.50	38.00	0.12	3.00	5.04	128.00	11.50
	blue	1.50	38.00	0.12	3.00	5.20	132.00	10.50
	black	1.50	38.00	0.13	3.20	5.51	140.00	12.00
	white	1.50	38.00	0.13	3.20	5.83	148.00	11.00
	black/red	1.52	38.50	0.13	3.20	6.48	164.50	8.50
	black/yellow	1.44	36.50	0.14	3.60	5.94	151.00	9.00
	blck/green	1.48	37.70	0.16	4.00	5.43	138.00	7.50

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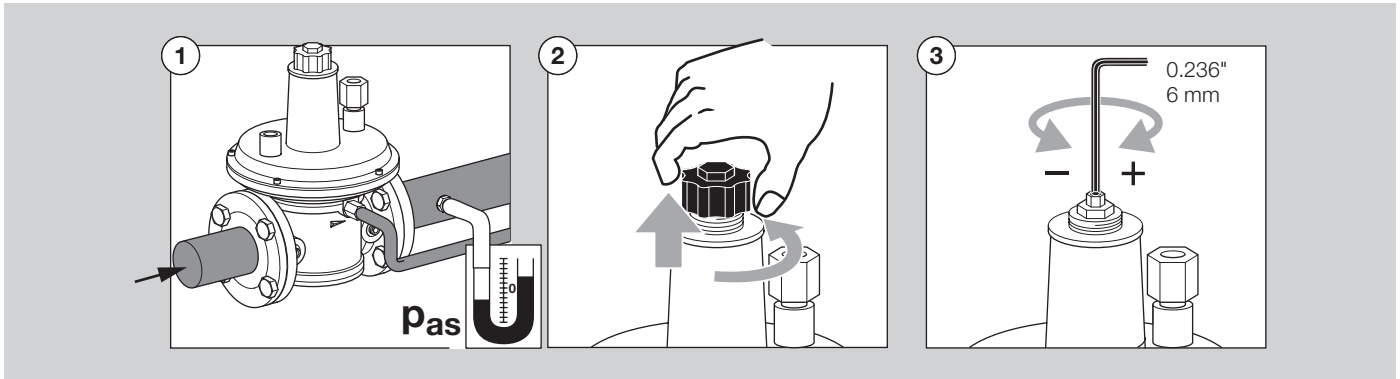
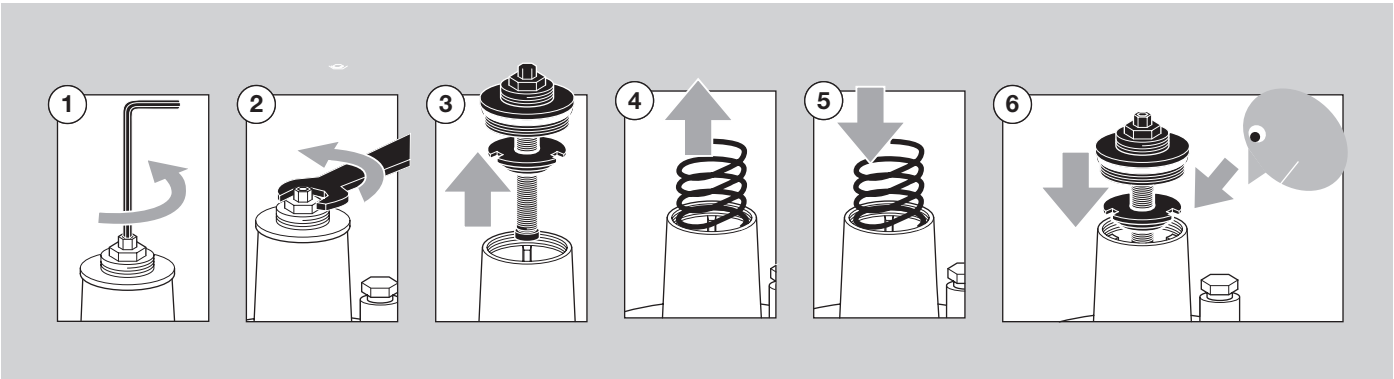
VGBF 50	none	1.10	28.00	0.09	2.25	5.26	133.50	12.00
	red	1.50	38.00	0.11	2.80	5.37	136.50	11.00
	yellow	1.50	38.00	0.12	3.00	5.89	149.50	11.00
	green	1.52	38.50	0.13	3.20	6.02	153.00	11.00
	blue	1.52	38.50	0.13	3.20	6.34	161.00	9.50
	black	1.52	38.50	0.13	3.20	6.48	164.50	8.50
	white	1.52	38.50	0.14	3.50	6.50	165.00	10.00
	black/red	1.50	38.00	0.14	3.60	6.69	170.00	8.00
	black/yellow	1.46	37.00	0.16	4.00	7.32	186.00	10.00
	black/green	1.46	37.00	0.16	4.00	7.32	186.00	10.00
	black/green	1.06	27.00	0.11	2.80	6.89	175.00	12.00
VGBF 80	none	2.76	70.00	0.12	3.00	8.46	215.00	6.50
	red	2.76	70.00	0.16	4.00	9.25	235.00	9.00
	yellow	2.76	70.00	0.16	4.00	11.22	285.00	7.00
	green	2.83	72.00	0.20	5.00	10.83	275.00	12.00
	blue	2.83	72.00	0.20	5.00	10.91	277.00	10.00
	black	2.83	72.00	0.20	5.00	10.83	275.00	8.00
	white	2.83	72.00	0.20	5.00	10.83	275.00	7.00
	black/red	2.76	70.00	0.25	6.30	10.43	265.00	10.00
	black/yellow	2.83	72.00	0.28	7.00	10.24	260.00	9.00
	black/green	2.83	72.00	0.30	7.50	10.43	265.00	9.00
VGBF 100	none	2.76	70.00	0.14	3.50	9.65	245.00	11.00
	red	2.76	70.00	0.16	4.00	9.80	249.00	7.00
	yellow	2.83	72.00	0.20	5.00	10.83	275.00	12.00
	green	2.83	72.00	0.20	5.00	12.32	313.00	11.00
	blue	2.83	72.00	0.20	5.00	13.58	345.00	9.00
	black	2.83	72.00	0.20	5.00	12.13	308.00	7.00
	white	2.80	71.00	0.22	5.50	12.48	317.00	9.00
	black/red	2.83	72.00	0.28	7.00	10.24	260.00	9.00
	black/yellow	2.83	72.00	0.30	7.50	10.43	265.00	9.00
	black/green	2.83	72.00	0.31	8.00	10.63	270.00	8.00



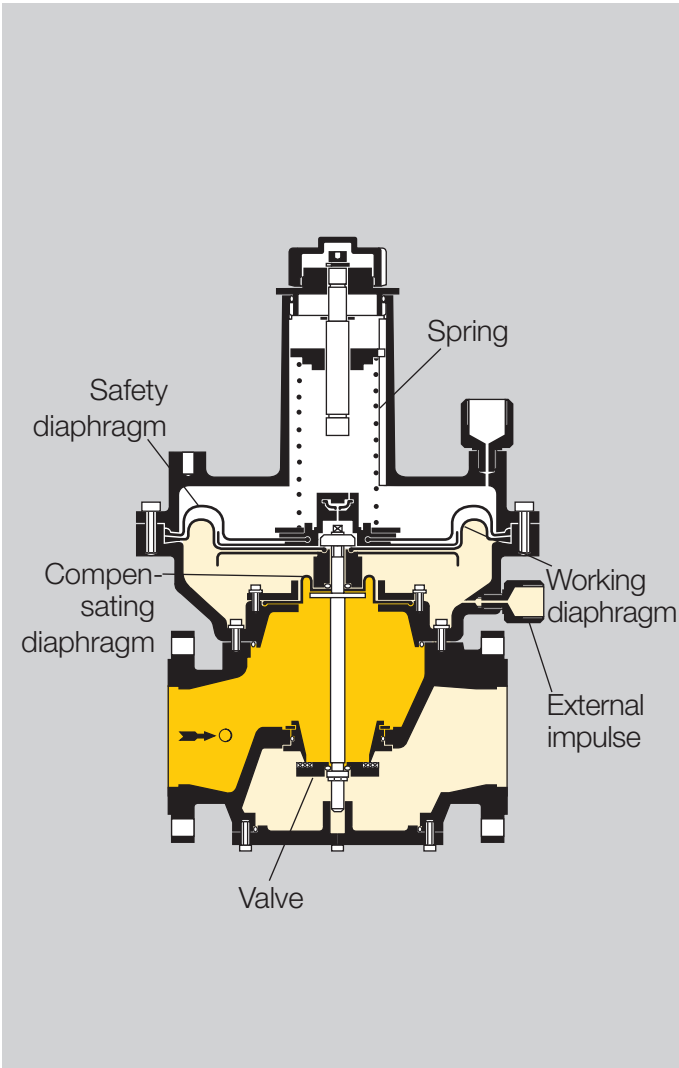
Change the outlet pressure

- Measure the outlet pressure
- Unscrew top cover
- Turn set point adjuster
  – Clockwise: pressure increases
  – Counter-Clockwise: pressure decreases
- Cleary mark the adjusted value of the outlet pressure on the regulator
- Screw top cap tightly



Change the spring

- Risk of injury. Turn back approximately 5x to relax the spring pressure.
- Remove the spring assembly.
- Replace the spring.
- Using the spring adjustment assembly, push spring into housing and secure assembly to housing.
- Caution the guide grooves and bars must engage in each other.
- Set the desired outlet pressure as above.
- Replace cap.



Function

The VGBF has 4 basic elements that allow it to operate. These are:

1 Restricting element (Valve)

This is a valve seat or orifice through which the gas supply will flow. This has a disc that can close against the seat to limit the flow of gas. By moving the disc, the outlet flow and pressure can be altered from fully open to fully closed. The position of the disc will determine the flow and the pressure at the outlet of the regulator.

2 Measuring Element (External impulse)

The external impulse senses the outlet pressure. The diaphragm is linked to the valve stem. A change in the sensed pressure below the diaphragm will cause the diaphragm to move, in turn causing the restricting element to alter its position.

3 Loading element (Spring)

A spring is positioned to act against the force of the measuring element. When a state of equilibrium is achieved between the measuring element and the loading element the resulting position of the restricting element, will determine the outlet pressure. By adjusting the force exerted by the loading element (spring), we can set the outlet pressure of the regulator.

4 Compensating diaphragm

A secondary diaphragm is used in compensated regulators. This diaphragm has the same area as the valve, so compensates the effect of varying inlet pressures on the valve.

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Special features

Safety diaphragm

In event of a major malfunction, the diaphragm will limit the amount of gas that can escape to the atmosphere. During normal operation, the hole in the safety diaphragm allows air to pass freely in and out of the top cover, through the vent opening. If there a sudden surge of pressure, due to equipment failure, a small hole in the safety diaphragm limits the amount of gas. Maximum flow through the safety diaphragm is 2.5 SCFH.

VGBF 15–25T

VGBF 40–100T

Order Information

VGBF	pressure reducing regulator
½" to 4" (DN 15 to 100)	nominal diameter
T	T-product
N	NPT-internal thread
A	ANSI flange
10	max. inlet pressure 15 psig (1000 mbar)
40	max. inlet pressure 60 psig (4000 mbar)
-2	screw plug at the outlet
-3	screw plug at the inlet and outlet

Designation	Order no.
p_e max. 15 psig (1 bar), with NPT internal thread	
VGBF 15TN10-2	86044700
VGBF 25TN10-2	86046700
VGBF 40TN10-3	86047700
VGBF 50TN10-3	86048700
pe max. 15 psig (1 bar), with ANSI flanged connection	
VGBF 50TA10-3	86048600
VGBF 80TA10-3	86050700
VGBF 100TA10-3	86051700
pe max. 60 psig (4 bar), with NPT internal thread	
VGBF 15TN40-2	86044900
VGBF 25TN40-2	86046900
VGBF 40TN40-3	86047900
VGBF 50TN40-3	86048900

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pe max. 60 psig (4 bar), with ANSI flanged connection	
VGBF 50TA40-3	86048800
VGBF 80TA40-3	86050900
VGBF 100TA40-3	86051900

Setting at factory of other outlet pressures: on request

Trouble Shooting

Troubleshooting is a term used to indicate a systematic approach to locate regulator malfunction. As with installation and maintenance, successful regulator troubleshooting depends on careful analysis and planning before taking action.

Regulators are relatively simple devices and are subject to comparatively few faults. The most common faults are:

Gas escaping from the breather hole vent connection?

This generally indicates a ruptured diaphragm. It might mean that the valve spindle has become loose and gas is passing through the central hole, but this is not a common occurrence and usually the escape is due to a split or punctured diaphragm. The cause is generally due to the age of the diaphragm (brittle), attack from a corrosive atmosphere and in extreme case, over pressure. The only remedy is regular maintenance and the replacement of the defective diaphragm.

Pressure too high?

The valve is not shutting down onto it's seating. This is probably due to dirt on the valve or seating but also faulty diaphragm or the valve spindle becoming loose.

Pressure too low?

A blocked breather hole vent connection due to exessive length of vent line will prevent the diaphragm from moving either up or down so the regulator pressure will be either high or low depending on the inlet pressure or the flow rate prevailing. Another reason could be blockage in the regulator body or the pipe, restricting the valve from opening. A restriction effectively means the regulator is the wrong size for the application, hence check the orifice size has not changed during a maintenance overhaul.

Regulator not responding?

A blocked breather hole vent connection due to exessive length of vent line will prevent the diaphragm from moving either up or down so the regulator will not respond.

Chattering?

This is a noise vibration caused by rapid movement of the valve and diaphragm. The chattering starts when the diaphragm responds quickly to surge of pressure. The movement causes the valve to hit the seat and bounce off again, therefore it creates another pressure surge, which repeats the process. What causes this "chattering", "buzzing" or "cycling"? Every regulator has a natural frequency at which it's mass vibrates. If this frequency is matched by the process fluid gas, for example, the two reinforce one another, and the resulting natural harmonic produces the sustained cycling of the regulator. All regulators are designed with a breather hole, which is large enough to allow the regulator to operate satisfactorily but small enough to act as a cushioning effect when there is a sudden pressure surge. The air cushion is designed to act as a damping device to absorb the regulators tendency to cycle. Special vents are designed to increase the regulators response time but close when there is a sudden surge in pressure.

Hunting?

Hunting is a condition very similar to chattering where the outlet pressure fluctuates up and down, swinging above and below the set pressure. It is confined to larger installations and occurs due to the following:

- Pipe size and length help to determine a process fluids natural frequency. For certain velocities, the pressure wave that moves upstream against the gas flow may match the natural frequency of the regulator and cause hunting. An extremely short run of pipe from the regulator to an appliance can cause instability by demanding a response time difficult for the regulator to match. Also, piping that has many bends and elbows in close proximity to one another will cause turbulence in the flowstream. This turbulence if near the sense line will result in cycling.
- Rotary meters can cause instability. This happens when the meters pumping action matches the natural frequency of the regulator. Bypassing the meter will indicate if this is causing the cycling.
- Over sizing a regulator. If a regulator is mostly at a very low flow, the valve wil remain very close to the seat. The regulator will be outside its ideal flow range and therefore, will not be regulating; the valve may bounce against the seat and cause cycling.
- Less frequently encountered is regulator instability due to very high loads. Instability may result from turbulence created by the gas velocity rushing back through the regulator and on down stream. Similarly, if the response time between switching of loads is high, then cycling will appear.

Maintenance

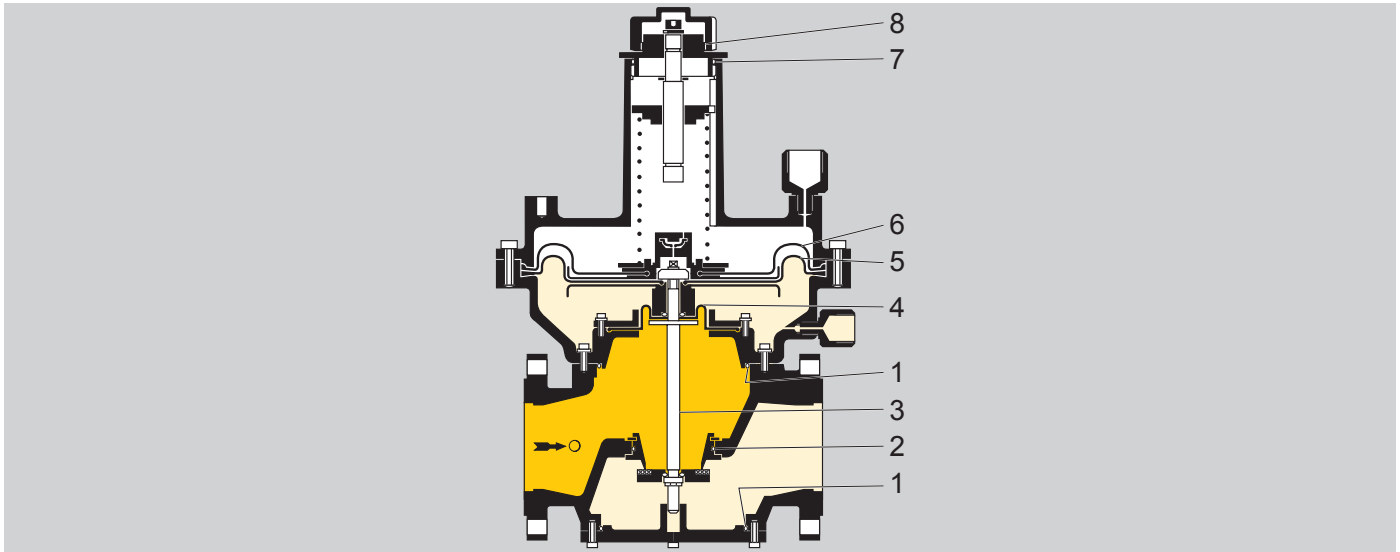
All regulators which control the systems pressure are subject to periodic servicing by authorized personnel.

By carrying out a regular maintenance schedule, you can prevent problems from occurring. The regulator type and its service conditions will help you determine how often to conduct inspections. The more severe the working conditions, the more frequently you should examine the regulator.

Generally, small, modern regulators can operate for considerable periods without attention, minimizing the need for periodic maintenance.

When a regulator is serviced, the following general procedure should be carried out.

1 Check that a shut off valve is located upstream of the regulator.
2 Try to ensure that there is a clear working area, and that you have somewhere to put the regulator components, once removed, so they will not be lost or damaged.
3 Always use the correct tools, in the proper sizes, to dismantle the regulator. Rough treatment can damage an otherwise useable component.
4 In case of a large regulator which can be isolated by valves, turn off the inlet and outlet valves and vent the regulator to atmosphere. On small regulators, turn off the appliances and any valve or cock on the regulator inlet.
5 If available, follow the maintenance instructions issued by the manufacturer of the regulator.
6 Make careful note of the position of each component before removal to aid reassembly.
7 Unless the maintenance instructions say otherwise, take off the top cover and remove the loading spring.
8 Dismantle the regulator, removing the diaphragm(s) and valve.
9 Clean all parts of the body and casings.
10 Check the diaphragms and replace if necessary.
11 Clean the regulator valve.
12 Examine the orifice or valve seating. Check for burrs and replace if damaged or worn. Avoid the use of abrasives on valve or seats.
13 Check and clear the breather hole. This acts as a damping device and its size is critical. **Never enlarge the hole.**
14 Reassemble the parts in reverse order.
15 When reassembling a ring of screws or bolts, tighten gradually and in opposing pairs.
16 Check the regulator for leakage.
17 Reset outlet pressure of the regulator.
18 Update maintenance records for the unit.



Spare parts
VGBF 15 psig (1 bar)

Pos	Description	VGBF 15	VGBF 25	VGBF 40	VGBF 50	VGBF 80	VGBF 100
1	O-ring	03110051 03109218	03110310 03110079	03109274 03109274	03109275 03109275	03109277 03109277	03109277 03109277
2	O-ring	03109301	03109341			03109170	03109232
3	Valve train	74960306	74960308	74960016	74960312	74960024	74960316
4	Compensating diaphragm	35440964	35440889	35438014	35438347	34328850	35442690
5	Working diaphragm	34326533	34326148	34326148	34331203	34328856	34212875
6	Safety diaphragm	74328192	74326918	74326918	74326919	74326920	74212422
7	O-ring	34454050	03109505	03109505	03109505	03109170	03109170
8	O-ring		03109520	03109520	03109520	03109159	03109159

VGBF 60 psig (4 bar)

Pos.	Description	VGBF 15	VGBF 25	VGBF 40	VGBF 50	VGBF 80	VGBF 100
1	O-ring	03110051 03109218	03110310 03100079	03109274 03109274	03109275 03109275	03109277 03109277	03109277 03109277
2	O-ring	03109301	03109341	03110009	03109147	03109170	03109232
3	Valve train	74960305	74960307	74960309	74960311	74960313	74960315
4	Compensating diaphragm + O-rings	75441012 03110006	75440854 03110368 03110305	75437296 03110334 03110305	75437322 03110343 03110305	75437700 03110383 03110306	75438155 03110363 03110351
5	Working diaphragm	34326533	34326148	34326148	34331203	34328856	34212875
6	Safety diaphragm	74328192	74326918	74326918	74326919	74326920	74212422
7	O-ring	34454050	03109505	03109505	03109505	03109170	03109170
8	O-ring		03109505	03109520	03109520	03109159	03109159

Warning
Situations dangerous to personnel and property can result from the misapplication and incorrect operation of combustion equipment.
Kromschroder advises compliance with the National Fire Protection Association standards that apply for related equipment and Insurance Underwriters recommendation, and care of operation.

We reserve the right to make technical changes designed to improve our products without prior notice.
For current product information, visit our website at www.kromschroder.com.

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