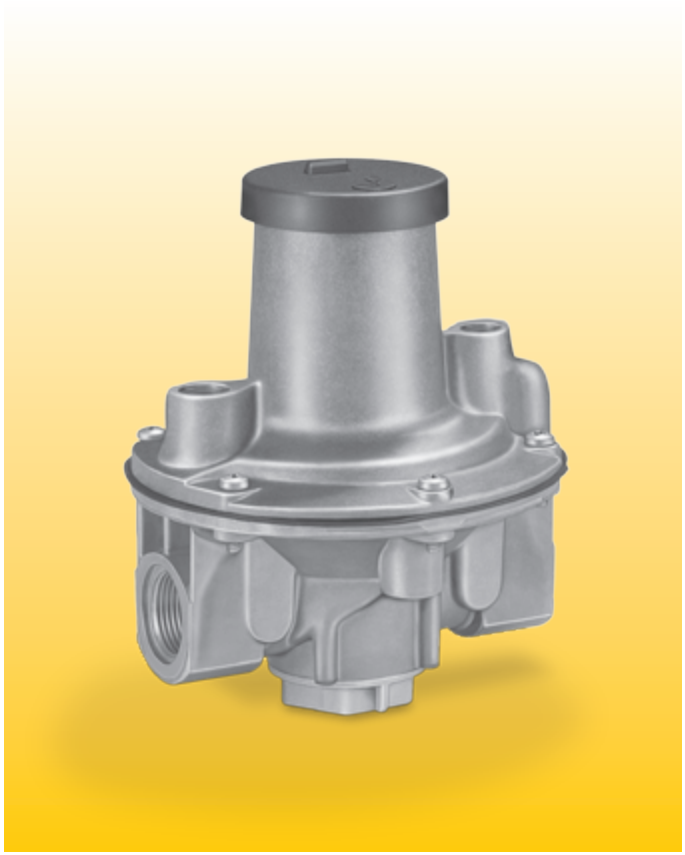
Pressure Reducing Regulators
GDJ

Technical Information

T-Product 2010 August



- Precise pressure regulation over wide turndown ranges
- Compensated for varying inlet pressure
- Inlet pressure to 5.8 psig (400 mbar)
- Internal safety diaphragm
- Wide selection of outlet pressure ranges
- Inlet pressure compensation and zero shut-off
- CE certified models available

krom schroder

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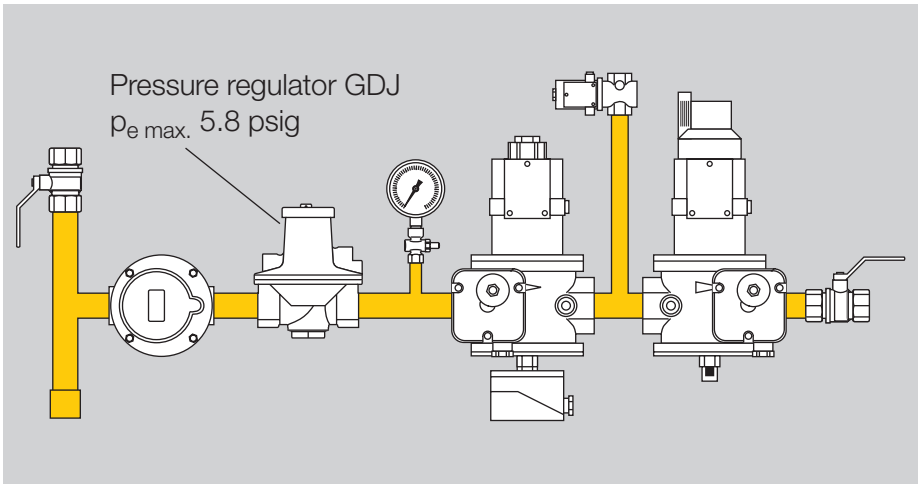
▼ = To be continued

Application

GDJ regulators are general-purpose regulators for controlling gas pressure to furnace ovens and other gas-consuming appliances. They are suitable for natural, LP and clean dry bio-gas at inlet pressures up to 5.8 psig (400 mbar). Special models are available for air.

Application example



Specifications

Operating Limits

Ambient temperature range:
5° F to 140° F (-15° C to 60° C)
Maximum inlet pressure:
5.8 psig (400 mbar)

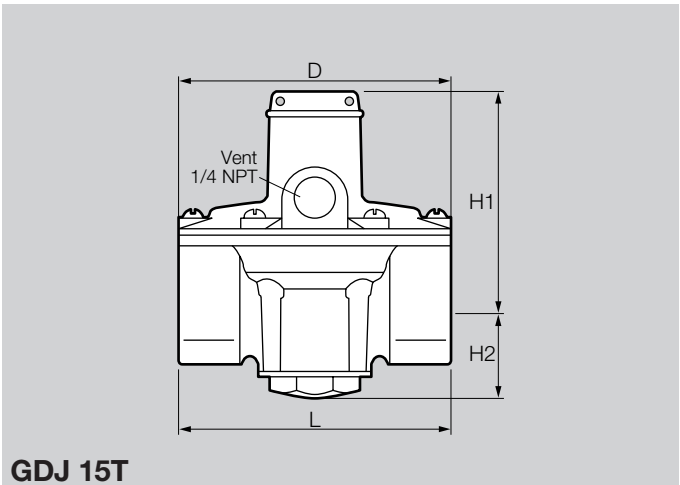
Mechanical Data

Available pipe sizes: NPT-threaded:
½", ¾", 1", 1½", 2"

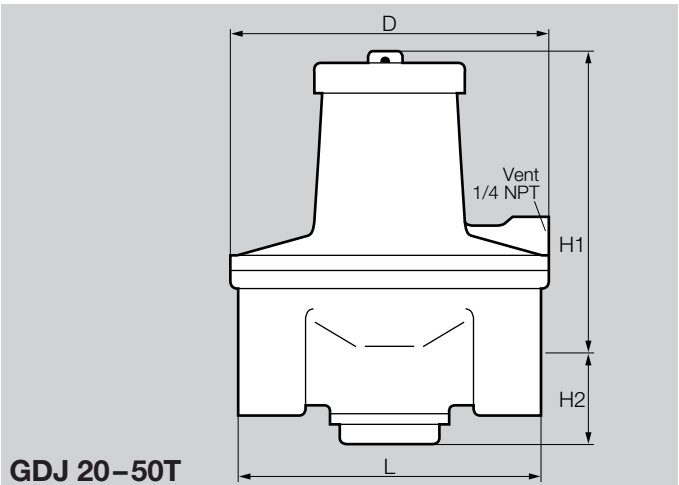
Materials of Construction

GDJ Regulators have pressure die-cast aluminium alloy valve bodies and diaphragm housings. Diaphragms and valve discs are nitrile rubber. Valve stems are precision-molded plastic.

Dimensions and Weights



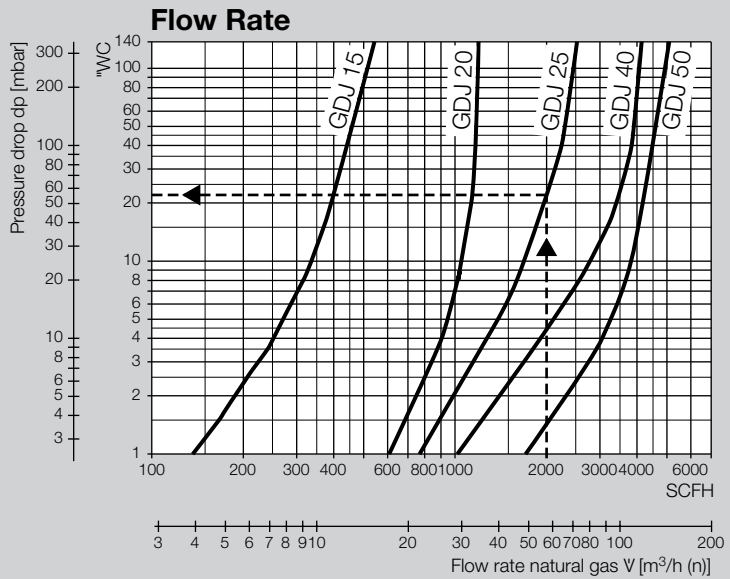
GDJ 15T



GDJ 20–50T

Type	Connection	Dimensions								Weight	
		L		øD		H1		H2			
	NPT	inch	mm	inch	mm	inch	mm	inch	mm	lbs	kg
GDJ 15T	½	3.93	100	3.93	100	3.54	90	1.18	30	1.32	0.6
GDJ 20T	¾	4.92	125	5.28	134	5.20	132	1.34	34	2.20	1.0
GDJ 25T	1	4.92	125	5.28	134	5.20	132	1.34	34	2.20	1.0
GDJ 40T	1½	6.10	155	7.29	185	5.87	149	1.77	45	4.19	1.9
GDJ 50T	2	7.97	200	9.21	234	6.57	167	2.03	52	6.82	3.1

Sizing charts



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

Air	1.27
Propane	1.61
Butane	1.83

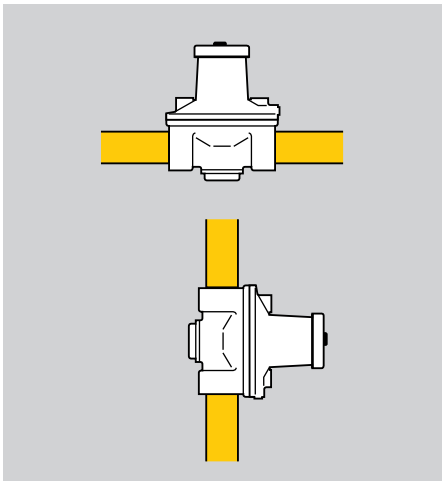
Flows in diagram are based on 1 psig, 60° F at sea level (14.7 psia) and natural gas with a specific gravity of 0.62. Flows will change if the ambient temperature or altitude increase and if the specific gravity increases. To correct for conditions other than the ones used in table multiply the flows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

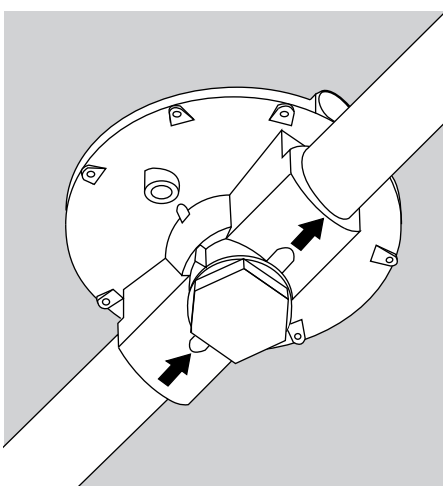
$$\text{Flow factor} = \sqrt{\frac{0.62}{\text{S.G.}} \times \frac{520}{460 + {}^{\circ}\text{F}} \times \frac{\text{PSIA+PSIG}}{15.7}}$$

°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

Estimated 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





Installation

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

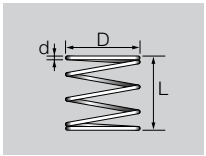
Wiring must comply with local codes and National Electrical Codes. To prevent the possibility of property damage, turn off electrical power, depressurize installation, vent fluid to safe area before servicing.

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 filters. Apply thread seal carefully, avoid getting excess into housing.

- Remove thread protectors
- Observe direction of flow: arrow on housing
- Valve spring housing can be located in any position in vertical piping. In horizontal piping valve spring housing can not be located below horizontal.
- The housing must have clearance of ¾" from any vertical surface. Allow access to spring adjustment at top of housing for spring change, if necessary.
- Use suitable sealant, apply sparingly, only to outer threads.
- Check for gas leaks. Apply pressure to regulator (do not exceed name plate rating) – measured at test point.
- Soap pipe joints and check for leaks.

Operation

Spring table



Outlet pressure:

Standard factory outlet pressure is 20" WC (GDJ 15), 36" WC (GDJ 20 to GDJ 50).

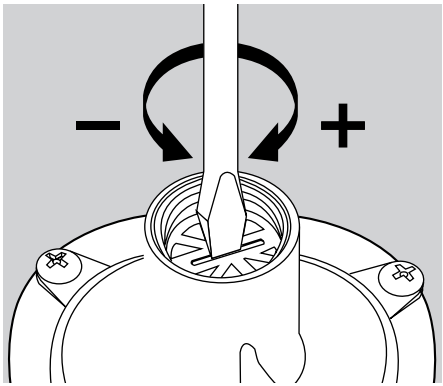
The outlet pressure ranges are changeable by inserting different springs (see table).

Type	Outlet pressure range		Color	D		d		L		Colis	Order-No.
	"w.c.	mbar		inch	mm	inch	mm	inch	mm		
GDJ 15T	0.8–6.4	2.0–16.0	yellow	0.86	21.8	0.047	1.2	1.62	41.1	10.0	03089042
	4.0–8	10.0–20.0	black	0.85	21.6	0.047	1.2	2.09	53.2	11.5	03089043
	6.4 -11.2	16.0–28.0	orange	0.86	21.8	0.047	1.2	2.50	63.5	11.0	03089044
	8.8–16.0	22.0–40.0	brown	0.87	22.0	0.051	1.3	2.56	65.1	10.5	03089045
	16.0–22.0*	40.0–55.0*	lt. green/lt. blue	0.82	20.9	0.055	1.4	1.57	40.0	6.5	03089047
GDJ 20T	2.0–6.0	5.0–15.0	yellow	1.41	35.8	0.071	1.8	2.68	68.0	10.5	03089048
GDJ 25T	5.0–10.0	12.5–25.0	black	1.42	36.0	0.079	2.0	2.99	76.0	11.0	03089049
	9.0–14.0	22.5–35.0	orange	1.41	35.9	0.075	1.9	3.98	101.0	12.0	03089050
	10.0–30.0	25.0–75.0	yellow/black	1.41	35.8	0.091	2.3	2.66	67.5	5.5	03089051
	28.0–40.0*	70.0–100.0*	pink/gold	1.42	36.0	0.098	2.5	3.15	80.0	7.0	03089052
	36.0–64.0	90.0–160.0	yellow/orange	1.43	36.3	0.110	2.8	2.91	74.0	5.25	03089056
GDJ 40T	2.0–6.0	5.0–15.0	red/yellow	1.43	36.2	0.087	2.2	3.31	84.0	12.5	03089053
	5.0–10	12.5–25.0	red/black	1.43	36.3	0.091	2.3	3.50	89.0	10.5	03089054
	9.0–14.0	22.5–35.0	red/orange	1.43	36.3	0.091	2.3	4.69	119.0	12.0	03089055
	10.0–30.0	25.0–75.0	yellow/orange	1.43	36.3	0.110	2.8	2.91	74.0	5.25	03089056
	28.0–40.0*	70.0–100.0*	pink/silver	1.44	36.7	0.110	2.8	3.94	100.0	7.0	03089057
	36.0–64.0	90.0–160.0	grey/gold	1.44	36.5	0.118	3.0	3.86	98.0	5.75	03089062
GDJ 50T	2.0–6.0	5.0–15.0	dark blue/yellow	1.44	36.6	0.102	2.6	3.15	80.0	10.5	03089058
	5.0–10.0	12.5–25.0*	dark blue/black	1.44	36.6	0.102	2.6	3.54	90.0	10.0	03089059
	9.0–14.0	22.5–35.0	dark blue/orange	1.44	36.6	0.102	2.6	4.65	118.0	11.0	03089060
	10.0–30.0	25.0–75.0	yellow/dark green	1.44	36.5	0.118	3.0	3.41	86.5	5.8	03089061
	28.0–40.0*	70.0–100.0*	grey/gold	1.44	36.5	0.118	3.0	3.86	98.0	5.75	03089062

* = Standard spring

Change the outlet pressure

Change outlet pressure GDJ 15

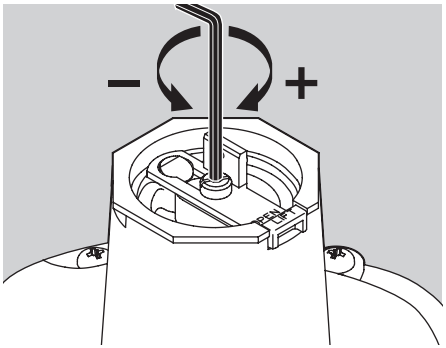


- Measure outlet pressure
- Unscrew top cap
- Turn set point adjuster with a screw driver:
  Clockwise: pressure increases
  Counter-Clockwise: pressure decreases
- Clearly mark the adjusted value of the outlet pressure on the regulator
- Screw top cap tightly

Change the spring GDJ 15, if the required outlet pressure can not be adjusted

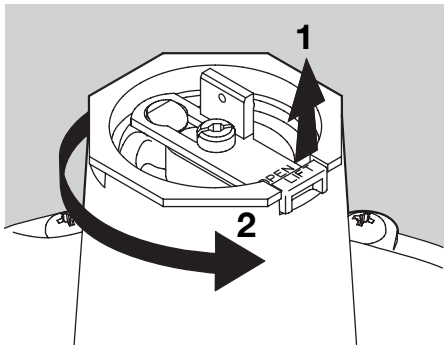
- Choose a spring from the spring table according to the outlet pressure range
- Fully unscrew set-point adjuster
- Remove spring
- **Insert new spring – take label from the bag and stick it below the type plate on the regulator!**
- Screw set-point adjuster back in
- Adjust required outlet pressure as above
- Replace cap

Change outlet pressure GDJ 20 to GDJ 50

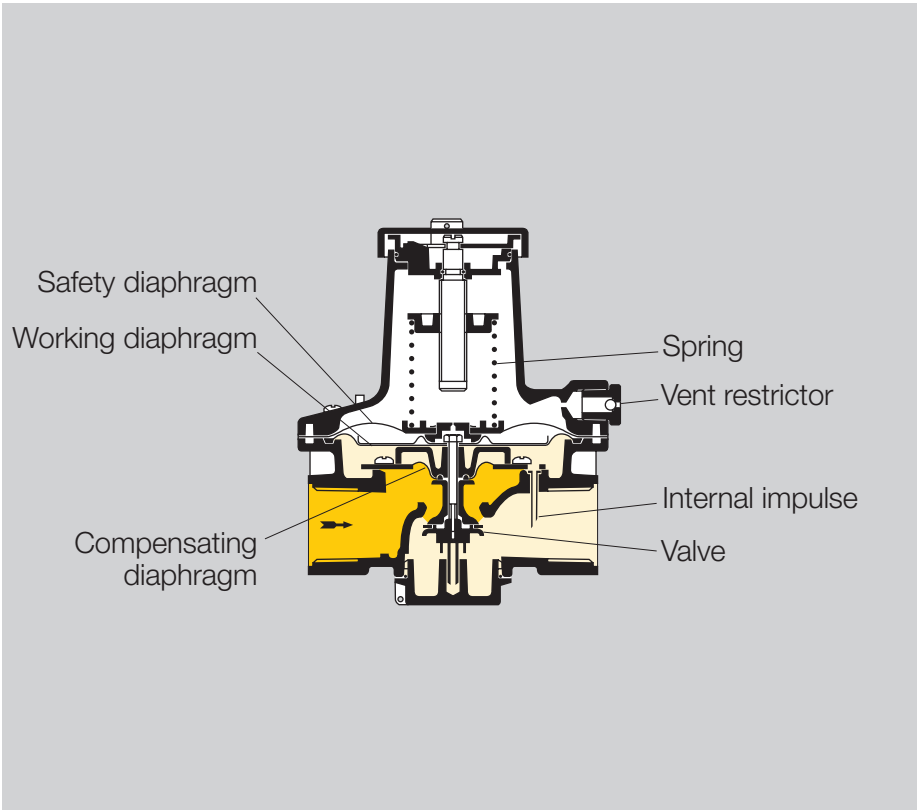


- Measure outlet pressure
- Remove cap
- Turn set-point adjuster with a screwdriver
  Clockwise: pressure increases
  Counter-clockwise: pressure decreases
- Clearly mark adjusted value of the outlet pressure on the regulator!
- Replace cap

Change the spring GDJ 20 to GDJ 50, if the required outlet pressure can not be adjusted



- Choose a spring from the spring table according to the outlet pressure range
- Turn set-point adjuster counter clockwise as far as it will go
- Lift locking lever 1, hold and turn self-aligning bearing 2 counter-clockwise
- Remove self-aligning bearing
- Remove spring
- **Insert new spring – take label from the bag and stick it below the type plate on the regulator!**
- Place self-aligning bearing 2 on spring and press into spring dome as far as it will go
- Turn self-aligning bearing 2 clockwise until locking lever 1 engages again
- Set desired outlet pressure as above
- Replace cap.



Function

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

1 Restricting element

A valve seat or orifice through which the gas supply will flow. This has a disc or plug 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

Usually a tube located on the regulator outlet that 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
A spring 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.

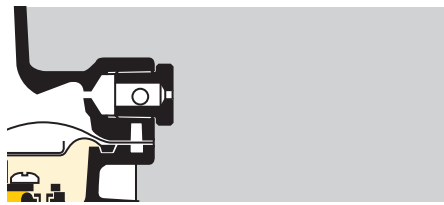
4 Compensating diaphragm
A secondary diaphragm is used in compensated regulators. This diaphragm has the same area as the valve, so compensates the effect of varying inlet pressures on the valve.

Special features

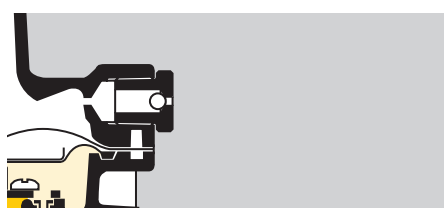
Safety diaphragm

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.

Vent restrictor



A vent restrictor fits into the regulator vent. In the event of a major malfunction it will limit the amount of gas that can escape to atmosphere. Under normal conditions air can pass freely in and out of the top cover, through the vent restrictor.



This is necessary for the regulator to work. In the event of a sudden pressure surge, due to equipment failure, the plastic ball inside the unit is blown to the end of internal hole where it blocks the escaping gas.

The restrictor is built and tested to comply with ANSI Z21.18 1995

Flow rates through restrictor

Pressure		Flow Rate (0.6 sg Gas)	
psig	mbar	ft^3/h	m^3/h
0.5	34.5	0.995	0.028
1.0	69	0.955	0.028
1.5	103	1.085	0.031
2.0	138	1.447	0.041
5.0	345	< 2.0	< 0.56

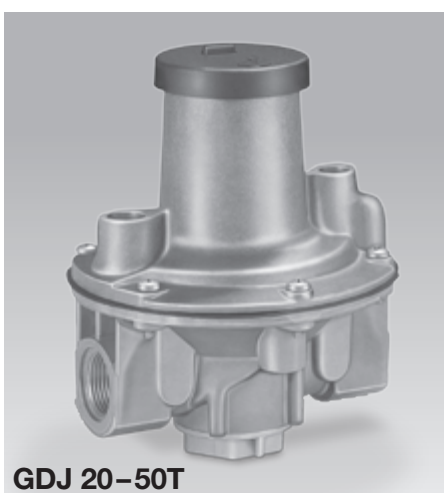
Pressure		Flow Rate (Air)	
psig	mbar	ft^3/h	m^3/h
0.5	34.5	1.284	0.036
1.0	69	1.284	0.036
1.5	103	1.401	0.040
2.0	138	1.869	0.053
5.0	345	< 2.5	0.071

Each vent restrictor is tested to ensure that the flow in the fault conditions is less than 2.5 ft^3/h (0.6 sg gas) and more than 1 ft^3/h (0.6 sg gas). This is to make sure that the device does not slow the regulator response time in normal operation.

System

See Animation GDJ

GDJ 15T



GDJ 20–50T

Order Information

GDJ	pressure reducing regulator
½" to 2" (DN 15 to 50)	nominal diameter
T	T-product
N	NPT-internal thread
04	max inlet pressure 5.8 psig (400 mbar)
-0	without pressure test point
L	only for air

Designation	Order no.
For Gas	
GDJ 15TN04-0	03155081
GDJ 20TN04-0	03155082
GDJ 25TN04-0	03155083
GDJ 40TN04-0	03155084
GDJ 50TN04-0	03155085
For Air	
GDJ 15TN04-0L	03155091
GDJ 20TN04-0L	03155092
GDJ 25TN04-0L	03155093
GDJ 40TN04-0L	03155094
GDJ 50TN04-0L	03155095

Pressure test point at the inlet possible
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:

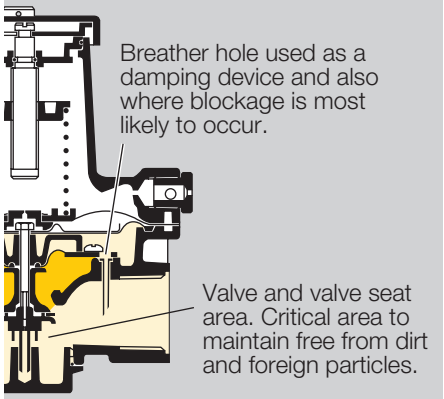
Gas escaping from the breather hole?

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 also a faulty diaphragm or the valve spindle becoming loose on it's spindle could cause it.

Pressure too low?



A blocked breather hole 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 could mean that the regulator is the wrong size for the application.

Regulator not responding?

A blocked breather hole 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. It is 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, swings 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.

Regulator has no flow condition?

It can happen if the regulator has been locked up for a period. The valve becomes stuck to the seating and the force of the spring is insufficient to free it. This is due to sticky deposits on the valve seating, which should be cleaned with suitable solvent.

Maintenance

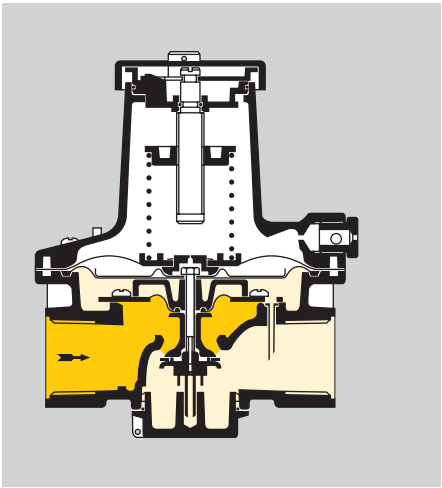
All regulators which control the systems pressure are subject to periodic servicing by authorized personnel.

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 in the area 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. If it has a rubber seat, check and replace if necessary.
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 Valve spindles which run in guides should be lightly greased with a silicone grease (this should not be used when the unit is used on Oxygen). Any levers and fulcrums should work freely.
14 Check and clear the breather hole. This acts as a damping device and its size is critical. **Never enlarge the hole.**
15 Reassemble the parts in reverse order.
16 When reassembling a ring of screws or bolts, tighten gradually and in opposing pairs.
17 Check the regulator for leakage.
18 Reset outlet pressure of the regulator.
19 Update maintenance records for the unit.



Spare parts

Spare part kit (1) contains the diaphragms and o-rings.

Type	For Gas	For Air
GDJ 15	3155081	3155091
GDJ 20	3155082	3155092
GDJ 25	3155083	3155093
GDJ 40	3155084	3155094
GDJ 50	3155085	3155095

Warning
Situations dangerous to personnel and property can result from the misapplication and incorrect operation of combustion equipment.
Elster 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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