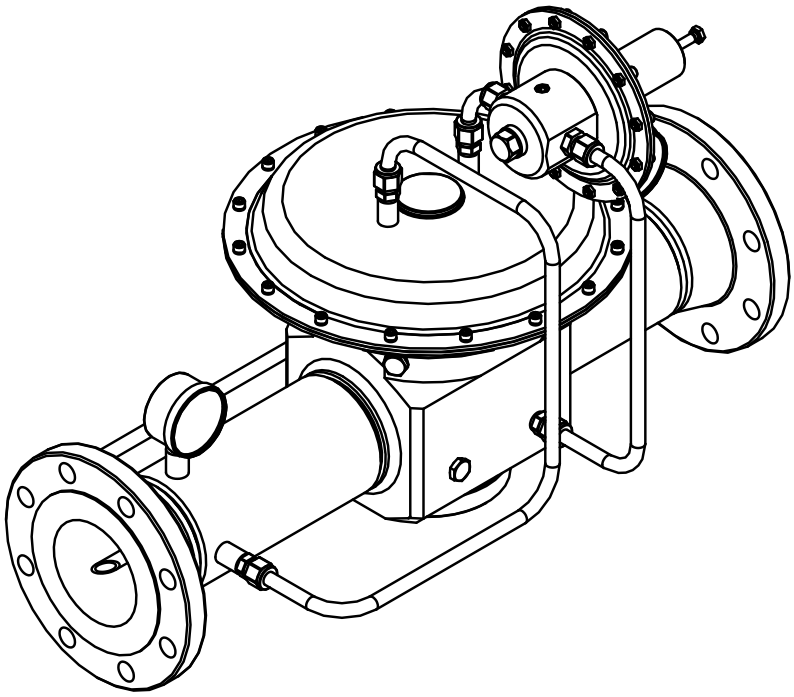
RHPS Series
LPRD20 - 40
User Manual



Read the complete manual before installing and using the regulator.

WARNING

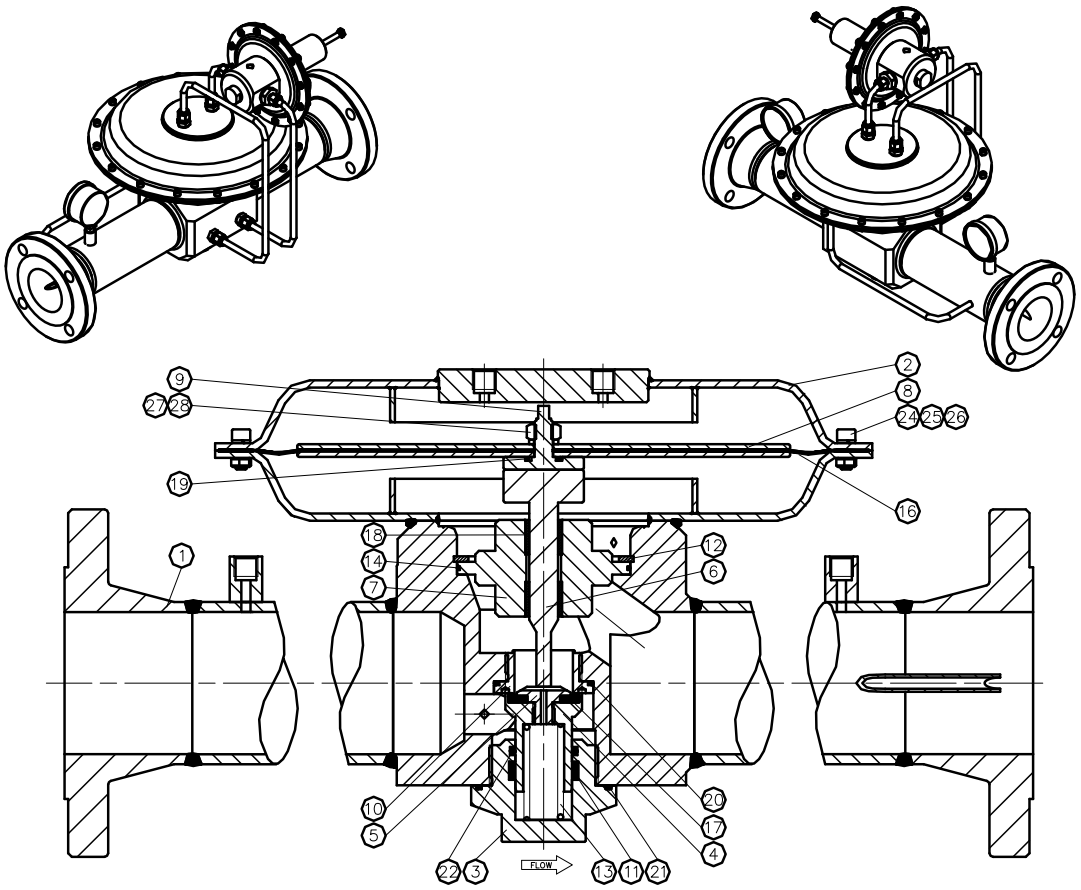
Before removing a regulator from the system for service, you must

- **Depressurize system**
- **Purge the system to remove any residual system media left in the regulator.**

Contents

Introduction

Representative drawing of a standard LPRD25



1	body assembly	11	guide ring	22	O-ring
2	dome cover	12	retaining ring	24	ring
3	body plug	13	valve spring	25	nut
4	valve case	14	O-ring	26	socket head cap screw
5	valve screw	16	diaphragm	27	ring
6	push rod	17	valve insert	28	nut
7	body plate	18	guide bush		
8	diaphragm plate	19	O-ring		
9	diaphragm screw	20	O-ring		
10	seat	21	O-ring		

Installation

WARNING

When installing a Swagelok® self-venting regulator, position the vent connection or line away from operating personnel. Operating personnel must protect themselves from exposure to system fluids.

CAUTION

Do not use the regulators as a shutoff device.

The preferred mounting position of the regulator is horizontal with the dome facing upwards.

If grounding is required, connect a ground wire under a dome bolt.

Filling the dome

The dome can be filled using manual or electronic loading.

Manual loading:
- This can be done by taking the gas pressure from the system and feeding this through a spring loaded pilot regulator into the dome. This is shown in sketch A.
- In liquid systems the gas pressure for manual dome loading can be taken from a cylinder or mains. This is shown in sketch B.

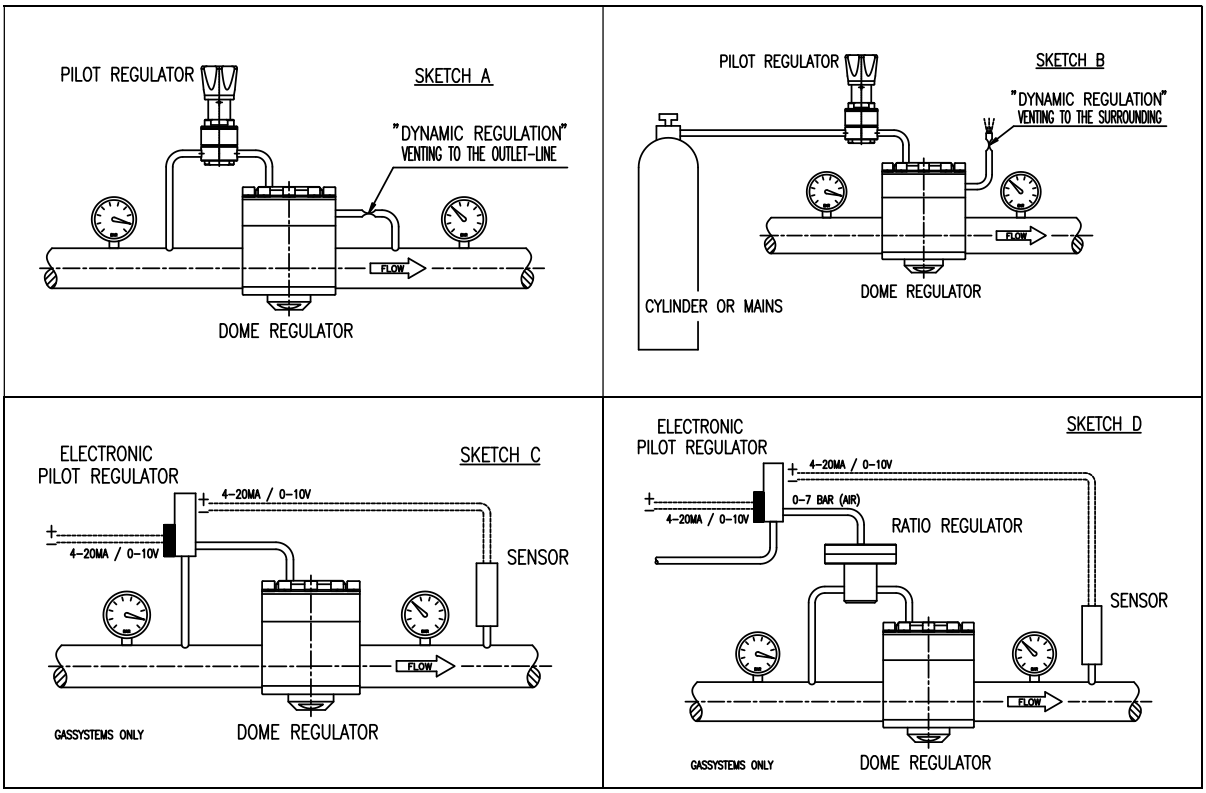
Substituting the spring loaded pilot regulator for a proportional control valve and a pressure sensor, allows you to control the pressure electronically.

Electronic loading:
- This can be done by taking the gas pressure from the system and feeding this through a proportional control valve into the dome. This is shown in sketch C.
- This method can be used for low and medium-pressure systems.
- This can be done by taking the gas pressure from the system and feeding this through a proportional controlled ratio regulator into the dome. This is shown in sketch D.
- This method can be used for high-pressure systems.

The best results will be achieved by allowing a small flow to continuously pass through the pilot regulator. This flow can either be vented or, in gas systems, fed back through an orifice into the downstream piping. This is usually referred to as "**dynamic regulation**".

Notice

It is not recommended to place a gauge on the dome to set or check the outlet pressure. Because of forces in the regulator, the dome pressure will always be higher than the outlet pressure. Place a gauge in the outlet line to set or check the outlet pressure.


PILOT REGULATOR
SKETCH A
"DYNAMIC REGULATION"
VENTING TO THE OUTLET-LINE
FLOW
DOME REGULATOR
PILOT REGULATOR
SKETCH B
"DYNAMIC REGULATION"
VENTING TO THE SURROUNDING
FLOW
DOME REGULATOR
CYLINDER OR MAINS
ELECTRONIC
PILOT REGULATOR
SKETCH C
4-20MA / 0-10V
4-20MA / 0-10V
SENSOR
FLOW
GASSYSTEMS ONLY
DOME REGULATOR
ELECTRONIC
PILOT REGULATOR
SKETCH D
4-20MA / 0-10V
0-7 BAR (AIR)
4-20MA / 0-10V
RATIO REGULATOR
SENSOR
FLOW
GASSYSTEMS ONLY
DOME REGULATOR

External feedback

CAUTION

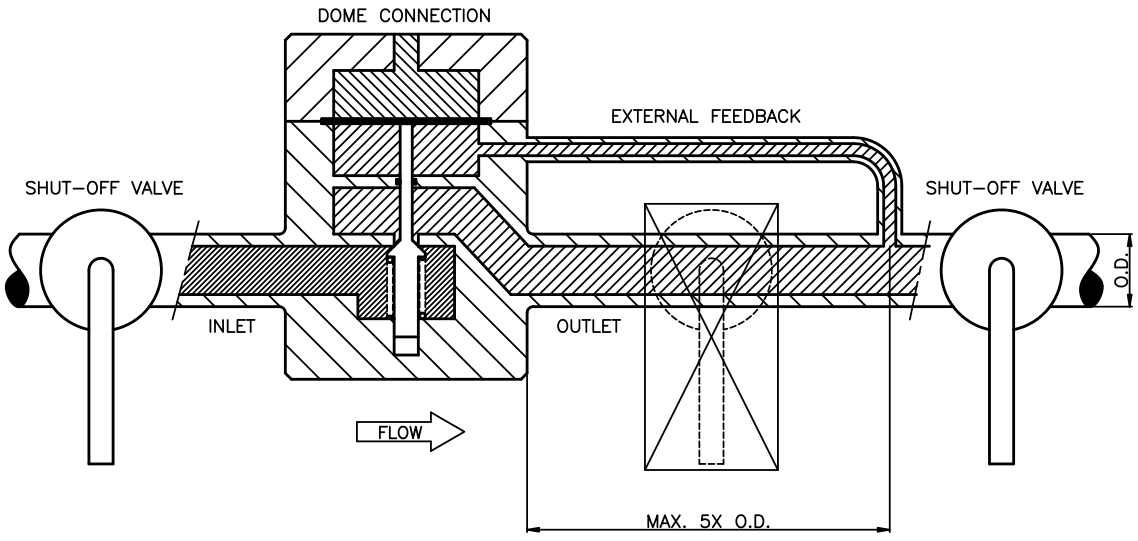
When using the regulator with external feedback, make sure that the outlet pressure can be fed back to the external feedback connection before applying pressure to the regulator. Failing to do so may lead to damage and non-functioning of the regulator as the inlet pressure will be put straight through to the outlet.

The purpose of the external feedback on a pressure regulator is to get a more accurate regulation of the outlet pressure. This can be achieved by sensing the outlet pressure downstream of the regulator and feeding it back to the regulator.

CAUTION

Never connect the external feedback line downstream of a shut-off valve.

Principle sketch of external feedback:



Operation

- Make the final pressure setting in the direction of increasing pressure to obtain the most accurate set points.
- Once fluid is flowing through the system, fine tuning may be required.
- Icing of the regulator at high flow rates or high pressure drops may occur if the gaseous media or atmosphere contains moisture.
- An auxiliary upstream filter is recommended for use in all but the cleanest of media.
- Installation of a downstream pressure relief is recommended for regulator and system protection.
- If the shut-off valve at the outlet side is closed after changing the set pressure, the outlet pressure will rise a little because of the closing force required for bubble-tight closing of the regulator.
  This phenomenon is usually referred to as the "**lock-up**" and does not indicate a problem with the regulator.
- A decrease in the flow will result in a rise of the outlet pressure.
- An increase in the flow will result in a fall of the outlet pressure and is usually referred to as the "**droop**".
  This phenomenon does not indicate a problem with the regulator.
- A decrease of the inlet pressure will result in a rise of the outlet pressure.
- An increase of the inlet pressure will result in a fall of the outlet pressure.
  This phenomenon is usually referred to as the "**dependency**" and does not indicate a problem with the regulator.

Each regulator type has its own dependency, which is related to the ratio between the effective seat area and the sensing area.

Dependency Ratio's LPRD20, 25, 30 & 40

Type		Dependency ratio
LPRD20 + LPRSN4	0.1-1 bar (PR2)	1/920
	0.3-2 bar (PR3)	1/920
LPRD25 + LPRSN4	0.1-1 bar	1/800
	0.3-2 bar	1/800
LPRD30 + LPRSN4	0.1-1 bar	1/420
	0.3-2 bar	1/420
LPRD40 + LPRSN4	0.1-1 bar	1/520
	0.3-2 bar	1/520

The approximate change can be calculated as shown below:

ΔP2 = ratio x ΔP1
A ratio of 1/X means that for every pressure change to P1 of X bar, the P2 pressure will change 1 bar:

Changing the set pressure

- Check the supply of medium at the inlet side.

CAUTION

When using the LPRD20, 25, 30 or LPRD40 with an inlet pressure higher than 2 bar, a safety valve must be installed in the outlet line, because the outlet pressure may not exceed 2 bar.

- Make sure the inlet pressure is higher than the required outlet pressure and that the inlet pressure does not exceed the maximum allowed inlet pressure. Open the shut-off valve at the inlet side.
- Open the shut-off valve at the outlet side slightly to allow a minimal flow.
- Controlled outlet pressure settings are obtained by adjusting the pressure in the dome. Increasing the pressure in the dome raises the outlet pressure while decreasing the pressure in the dome lowers the outlet pressure.

Notice

A shut-off valve on the outlet side must be opened to relief the pressure on the outlet side.

- Final adjustment must be made while increasing the pressure in the dome to obtain the most accurate set point(s).
- Open the shut-off valve at the outlet side to allow full flow during operation.

Maintenance

Required tools for maintenance

- a vice to fasten the regulator
- pincers to take out the O-rings
- a pair of tongs for a retaining ring 95 mm (LPRD20&25 only)
- a pair of tongs for a retaining ring 140 mm (LPRD30&40 only)
- a torque wrench
- a torque wrench hexagon head key 10 mm for the body plug (LPRD30&40 only)
- a torque wrench hexagon head key 5 mm for the dome cover bolts
- a torque wrench “open-end insert tool”, 46 mm for the body plug (LPRD20&25 only)
- open-end spanners 11/16, 3/4 and 7/8 inch(for compression fittings)
- open-end spanners 10 and 17 mm (for dome cover nuts and dome screw)
- media and temperature compatible lubricant for reassembling threaded parts
- media and temperature compatible lubricant for O-rings
- Snoop® liquid leak detector

Notice

A shut-off valve on the outlet side must be opened to relief the pressure on the outlet side.

Disassembly instructions

- Loosen the hexagon socket head screws and remove the dome cover.
- Lift out the diaphragm, along with the diaphragm plates/ -screw
- Loosen the body plug and remove the valve assembly, valve spring and seat.

Inspection of disassembled parts

- Check all parts for abnormal wear. Replace parts in case of doubt.

Points of attention before assembly

- All parts must be clean and undamaged before starting assembly.
- Swagelok recommends replacing all O-rings and the diaphragm before assembly.
- All threaded parts must be lightly lubricated before assembly, this to avoid galling of threads.
- All O-rings need to be lightly lubricated to improve the lifetime of the O-ring and the performance of the regulator.

Assembly instructions

- Follow the points for disassembly in reverse order to assemble the regulator.

Recommended torques

CAUTION

Only tighten the bolts or parts if the regulator is completely depressurized.

Hexagon socket head screws M12 (body plug)	50 N·m (442 in.·lb)	(LPRD30&40 only)
Body plug	50 N·m (442 in.·lb)	(LPRD20&25 only)
Dome cover screws M6	15 N·m (132 in.·lb)	

Testing

Check the regulator for leakage across the seat, with low- and high inlet pressure.
Check the regulator for leakage across the connectors and plugs, with low- and high inlet pressure.
Check the regulator for leakage across the diaphragm, with low- and high outlet pressure.

Notice

When using the LPRD20, 25, 30 or LPRD40 with an inlet pressure higher than 2 bar, a safety valve must be installed in the outlet line, because the outlet pressure may not exceed 2 bar.

A well performing regulator is 100% bubble tight.

Troubleshooting

Problem:	The outlet pressure creeps up, without increasing the dome pressure.
Cause:	A damaged valve and/or seat.
Solution:	Replace the valve and/or the seat.

Problem:	Leakage around the body plug.
Cause:	A damaged O-ring or insufficient torque on the body plug.
Solution:	Replace the O-ring or tighten the body plug according to the torque specifications.

Problem:	Leakage between dome and the dome cover.
Cause:	A damaged diaphragm or insufficient torque on the bolts.
Solution:	Replace the diaphragm or tighten the bolts according to the torque specifications.

Problem:	Controlled pressure drops off sharply even when the flow is within regulator capabilities.
Cause:	The systems filter element is clogged.
Solution:	Replace the system filter element.

Problem:	The required outlet pressure can not be reached.
Cause:	The inlet pressure to the dome regulator or to the pilot regulator is not high enough.
Solution:	Make sure that the inlet pressure to the dome regulator and to the pilot regulator is sufficient.

Problem:	The outlet pressure rises too much when going from a dynamic to a static situation.
Cause:	There is too much flow in the dynamic situation.
Solution:	A larger regulator is required. Check the specific application data with the flow curves in our product literature.

Problem:	The outlet pressure does not drop if the pressure in the dome is lowered.
Cause:	The regulator is non-venting.
Solution:	A shut-off valve in the outlet line must be opened to reduce the outlet pressure.

Problem:	The outlet pressure has changed without adjusting the dome pressure.
Cause:	Changes to the inlet pressure will result in changes to the outlet pressure. A decrease of the inlet pressure will result in a rise of the outlet pressure. An increase of the inlet pressure will result in a fall of the outlet pressure.
Solution:	Maintain a constant inlet pressure to the regulator. See section “operation” about dependency.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty.
For a copy, visit swagelok.com or contact your authorized Swagelok representative.

For additional information, ***see*** ***www.swagelok.com****.*

WARNING:
Do not mix/interchange Swagelok products or components not governed by industrial design standards, including Swagelok tube fitting end connections, with those of other manufacturers.

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