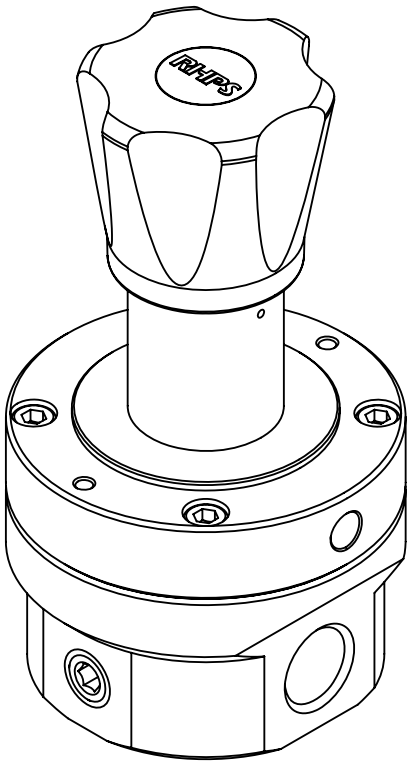
LRS(H)4

USER MANUAL

Read the complete manual before installing and using the regulator.



WARNING

INCORRECT OR IMPROPER USE OF THIS PRODUCT CAN CAUSE SERIOUS PERSONAL INJURY AND PROPERTY DAMAGE.

Due to the variety of operating conditions and applications for this product, the user is solely responsible for making the final proper decisions concerning the correct assembly and functioning of the product and assuring that all the performance, safety and warning requirements are met.

- Users must be trained and equipped for the handling, use and servicing of (high) pressure products and systems.
- Users must contact their gas or liquid supplier for specific safety precautions and instructions.
- Gaseous media should be free of excessive moisture to prevent icing at high flow.
- Always wear the appropriate protective clothing, including safety glasses, gloves etc. if required.
- Follow the applicable safety and maintenance procedures.
- Obey specific local regulations.
- Do not exceed the maximum inlet and outlet pressure of the product or its accessories.
- Operate within the temperature limits and other conditions specified for the product.
- Do not drop or damage the product in any other way. This may negatively effect the performance of the product which can cause the product to malfunction.
- Venting fluids and gases can be dangerous. Vent to a safe environment away from people. Ensure adequate ventilation.
- This product is not oxygen clean and therefore not suitable for oxygen service.

If there are questions or problems regarding the installation, operation and maintenance these should be directed to the proper authority on site before continuing.

CONTENTS

1 Introduction

1.1 Detailed description

This regulator is a diaphragm sensing springloaded pressure regulator, designed for low- and high inlet pressure. It is ideal for highly accurate control of pressure because of it's large effective sensing area. Combined with the "low torque-no wear" stem, the regulator is ideal for use in frequent readjustment type applications.
The regulator comprises a body and spring housing bolted together and has a removable seat and valve or a cartridge.
The product is designed to be used between -20 °C and +80 °C, whether ambient temperature or media temperature.

The LRS4 is for low inlet pressure and comes standard with a rubber seat for leaktight shut-off in zero-flow conditions.
The LRSH4 is for high inlet pressure and comes standard with a soft seat for leaktight shut-off in zero-flow conditions. It also features an easy to replace cartridge, which contains the seat, the optional filter element and the unbalanced valve.

The maximum in- and outlet pressure for the models are:

- Threaded models LRS4 : Inlet 35 bar Outlet 35 bar
- Threaded models LRSH4 : Inlet 400 bar Outlet 35 bar*

⚠ *** When using the LRSH4 with an inlet-pressure higher than 35 bar, a safety-valve must be installed in the outlet-line, because the outlet pressure may not exceed 35 bar.**

⚠ **Check the assembly drawing or regulator for the specific pressure limits of the supplied regulator.**

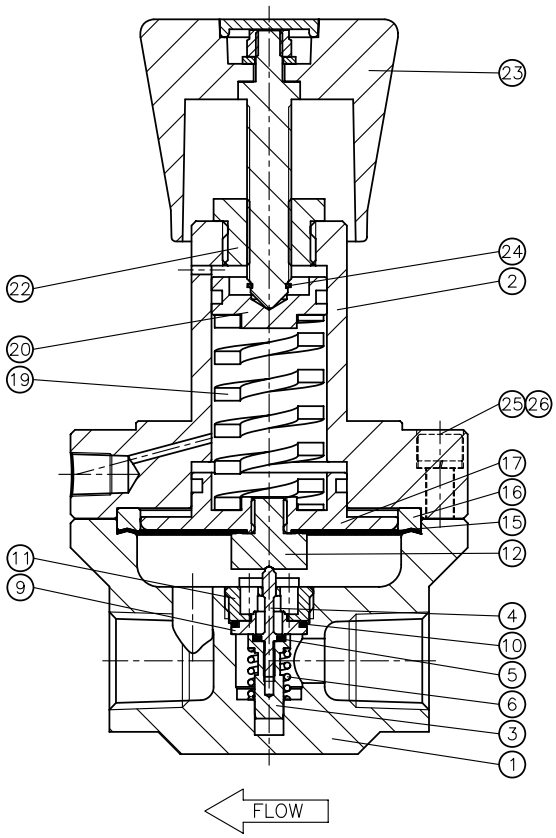
Standard features:
- ss 316L throughout
- diaphragm sensing
- bubble tight shut-off
- 3 outlet ranges
- bottom mounting

1.2 Special features and options

The regulator is available with a lot of different options.
- panel mounting
- external feedback
- self-venting with captured venting below the panel
- filter
- ss 316L diaphragm (only for 0-9 bar)

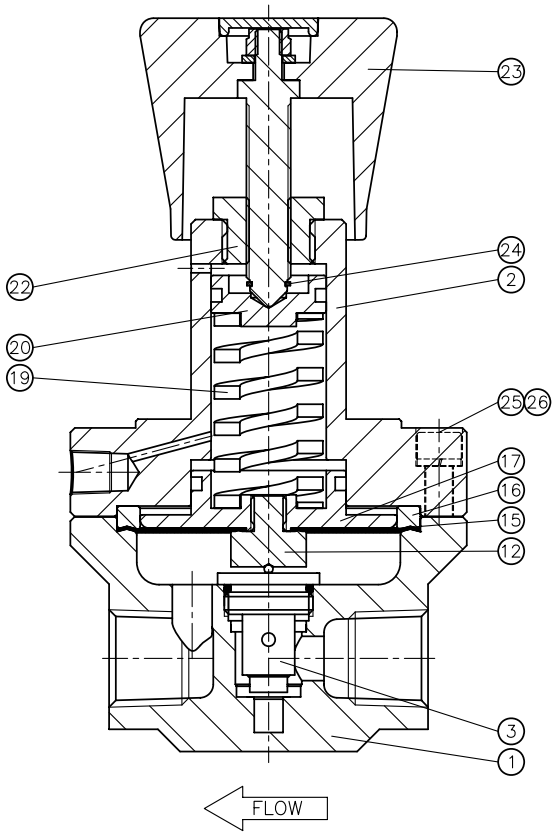
⚠ *** When using the LRS(H)4 with external feedback, option –EF, make sure that the outlet pressure is fed back to the external feedback connection before applying pressure to the regulator. Failing to do so may lead to damage and non-functioning of the regulator as the inlet pressure will be put straight through to the outlet.**

1.3 Typical picture of the standard LRS4 and its components



1 = body
2 = springhousing
3 = valve case
4 = valve stem
5 = o-ring
6 = valvespring
9 = seat
10 = o-ring
11 = seat retainer
12 = diaphragm screw
15 = diaphragm
16 = clampring
17 = bottom springguide
19 = set spring
20 = springguide
22 = springhousing cover
23 = knob assembly
24 = retaining ring
25 = socket head cap screw
26 = ring

1.4 Typical picture of the standard LRSH4 and its components



1 = body
2 = springhousing
3 = cartridge
12 = diaphragm screw
15 = diaphragm
16 = clampring
17 = bottom springguide
19 = set spring
20 = springguide
22 = springhousing cover
23 = knob assembly
24 = retaining ring
25 = socket head cap screw
26 = ring

2 Installation

WARNING

A PRESSURE REGULATOR IS NOT A SHUT-OFF VALVE AND SHOULD NOT BE USED AS SUCH.

2.1 Points of attention before installation

This regulator can be equipped with different options and connections.
Before installing the regulator you should fully understand the options and the suitability of your particular regulator and its suitability for the application.

- The preferred mounting position of the regulator is horizontal with the adjustment knob facing upwards.
  It may be necessary to remove the regulator from the system during maintenance or service. Make sure that this is possible, especially if mounted in a different position.
- The regulator is suitable for gases and liquids. Check if the materials on the assembly drawing, which came with the regulator, are compatible with the used media.
- If you have a self-venting version, option -S, **NEVER** plug off the ⅛" NPT female relief connection at the side of the spring housing.
- SWAGELOK B.V. recommends not to use a self-venting version, option –S, with hazardous or toxic media.
  If required take the necessary safety precautions to ensure a safe workspace and your personal safety. Vent to a safe environment away from people and ensure adequate ventilation.
- Avoid sealing compounds which harden, be careful with anaerobic (loctite type) compounds. Particles of these compounds can run into the regulator and lock moving parts.
- Frequent assembly and disassembly of the in- and outlet fittings can damage the in- and outlet thread of the regulator. Damaged threads can cause serious injury.
- The product is designed to be used between -20 °C and +80 °C, whether ambient temperature or media temperature. In all other cases consult SWAGELOK B.V..
- The regulator is standard not oxygen clean. Although all regulators are ultrasonically cleaned, this does not make them suitable for oxygen use.

2.2 Oxygen service

- Specification of materials in regulators for oxygen service is the user's responsibility. SWAGELOK B.V. can perform cleaning for Oxygen service based on ASTM-G93LevelC/CGA4.1 at additional cost.

2.3 Installation instructions

- Verify that the regulator, the connections and its accessories are undamaged.
- Verify that the regulator and its accessories are suitable for the system operating pressure and have the proper connections.
- Carefully clean all pipes and connections. **Any swarf, lint, wire etc. may cause seat leakage.**
- Verify the flow direction of the system and mount the regulator accordingly.
- The standard connection of the LRS(H)4 is ½" NPT female.
  To get a proper sealing across the thread, SWAGELOK B.V. recommends using teflon tape.
- Securely make the appropriate connections to the regulator in accordance with the procedures recommended by the manufacturer of the connections.
- Verify that the regulator is mounted in the system without stress on the connections.
  Stress on the connections can result in faulty connections and dangerous situations.
- Check if the in- and outlet fittings are fitted far enough into the regulator and check for leakage across the fitting.
- Use a safety-valve in the outlet-line when the inlet pressure is more than 35 bar.
- Shut-off valves should be mounted in the system for service or maintenance.
- At the time of delivery the gauge connections are plugged with ¼" NPT blind fittings.
  Remove these and connect gauges if desired.
- If earthing is required, connect an earth wire under a spring housing bolt or in a bottom-mounting hole.

3 Operation

3.1 Required tools for operation

For changing the set pressure on a standard regulator, no tools are required.

3.2 Points of attention before operation

- The adjustment knob is provided with an anti-turnout locking ring, don't force it.
- The product can be hot or cold, depending on the environment temperature and the used media temperature. Take the necessary precautions before operating or touching the product.
- If the regulator is a non-venting type, then a shut-off valve on the outlet side must be opened to relief the pressure on the outlet side.
- SWAGELOK B.V. recommends not to use a self-venting version, option –S, with hazardous or toxic media.
  If required take the necessary safety precautions to ensure a safe workspace and your personal safety. Vent to a safe environment away from people and ensure adequate ventilation.
- If the shut-off valve on the downstream 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.

3.3 Changing the set pressure

- Check the supply of medium at the inlet side.
- 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.
- Turn the adjustment knob clockwise to increase the set pressure.
- Turn the adjustment knob counterclockwise to decrease the set pressure.
- Open the shut-off valve at the outlet side fully to allow full flow during operation.

If the regulator is a non-venting type, then a shut-off valve on the outlet side must be opened to relief the pressure on the outlet side.
If the regulator is a self-venting version, the excess pressure will leave the regulator through the ⅛" NPT female relief connection at the side of the spring housing. Self-venting is an option.

4 Maintenance

WARNING

INCORRECT OR IMPROPER REPAIR OR SERVICING OF THIS PRODUCT CAN CAUSE SERIOUS PERSONAL INJURY AND PROPERTY DAMAGE.

SWAGELOK B.V. recommends the product to be removed from the system and to be shipped to SWAGELOK B.V. for service or maintenance as all regulators must pass rigid acceptance tests before leaving the factory.
All repairs and servicing of this product must be performed by factory certified personnel and tested for operation and leakage.
If this procedure is not followed for any reason, or if any customer changes are made to the product, SWAGELOK B.V. cannot assume responsibility for the performance or safety of a customer repaired product or for any damage resulting from failure of the product.

The product should be checked periodically for proper and safe operation.
It is the users sole responsibility to determine the frequency of maintenance based on the application.

RECOMMENDATION

SWAGELOK B.V. RECOMMENDS TO HAVE SPARE-PART KITS READILY AVAILABLE ON SITE.

All regulators require maintenance at scheduled intervals. Annual maintenance is recommended under normal use.
From experience SWAGELOK B.V. can tell that especially during the start-up of a system, the demand for spare-part kits is high.
This is despite all the effort taken to assure a clean system, there is usually some debris left in the system, which damages the regulator.
Having spare-part kits on site will save time and money, as the downtime of the system will be reduced to a minimum, whether during start-up or normal operation.

4.1 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
- a torque wrench
- a torque wrench hexagon head key 5
- a torque wrench socket 23
- a “seat retainer” removing tool. (OT-1478-02)
- media and temperature compatible lubricant for reassembling threaded parts
- media and temperature compatible lubricant for o-rings
- soapy water for leak-testing

4.2 Points of attention before removal from the system

- SWAGELOK B.V. recommends removing the regulator from the installation.
- Make sure that a spare-part kit is present.
- The adjustment knob is provided with an anti-turnout locking ring, don't force it.
- Check if the used media is hazardous or toxic.
  If required take the necessary safety precautions to ensure a safe workspace and your personal safety.
  Vent to a safe environment away from people and ensure adequate ventilation.
- Follow your system safety, maintenance or special local procedures when removing the regulator.
- The product can be hot or cold, depending on the environment temperature and the used media temperature. Take the necessary precautions before operating or touching the product.

4.3 Removal from the system

- Isolate the regulator from all pressure sources by closing the appropriate valves.
- Turn the adjustment knob counterclockwise to decrease the set pressure.
  If the regulator is a non-venting type, then a shut-off valve on the outlet side must be opened to relief the pressure on the outlet side.
  If the regulator is a self-venting version, the excess pressure will leave the regulator through the 1/8" NPT female relief connection at the side of the spring housing. Self-venting is an option.
- Make sure that the inlet and outlet pressure are both reduced to zero and that the adjustment knob is turned counterclockwise until it blocks, so that there is no more pressure in the regulator and no more spring force on the spring housing.

4.4 Disassembly instructions

- Loosen the hexagon socket head screws and remove the spring housing, spring and bottom spring guide.
- Remove the upper spring guide from the spring housing to replace the o-ring, if one is mounted.
- The cartridge in a LRSH4 can now be removed.
  Loosen the seat retainer on the LRS4 to remove the valve, seat, valve spring and the optional filter and filter ring.

4.5 Inspection of disassembled parts

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

4.6 Points of attention before assembly

- All parts must be clean and undamaged before starting assembly.
- SWAGELOK B.V. recommends replacing all o-rings and the diaphragm before assembly.
- All threaded parts must be lubricated a little before assembly, this to avoid galling of threads.
- All o-rings need to be lubricated a little to improve the lifetime of the o-ring and the performance of the regulator.

4.7 Assembly

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

4.8 Recommended torques

⚠ **Only tighten the bolts or parts if the regulator is completely pressure less.**

-	Hexagon socket head screws M6	10 Nm
-	Diaphragm screw (rubber / ss316L diaphragm)	5 / 10 Nm
-	Seat retainer	5 Nm
-	Cartridge	30 Nm

4.9 Testing

Check the LRS(H)4 for leakage across the seat, with low- and high inlet pressure.
Check the LRS(H)4 for leakage across the diaphragm, with low- and high outlet pressure.
Check the required outlet pressure range.

A well performing LRS(H)4 is 100% bubble tight.
If there is a leakage across the seat or the diaphragm, the damaged parts must be replaced.

5 Trouble shooting

Problem:	The outlet pressure creeps up, without turning the adjustment knob.
Cause:	A damaged valve and/or seat.
Solution:	LRS4: Replace the valve and/or the seat. LRSH4: Replace the cartridge.

Problem:	Controlled pressure drops off sharply even when the flow is within regulator capabilities.
Cause:	The filter element is clogged.
Solution:	LRS4: Replace the filter and the filterring. LRSH4: Replace the cartridge.

Problem:	Constant leak through the relief hole at the side of the spring housing.
Cause:	A damaged relief seat or diaphragm or the regulator is mounted in the wrong position. Also a damaged valve and/or seat may cause the outlet pressure to rise and as a result of this the self-venting regulator will start to vent through the relief hole.
Solution:	Assemble a new relief seat or diaphragm. Mount the regulator in the correct position. LRS4: Check the valve and/or the seat and replace if necessary. LRSH4: Check the cartridge and replace if necessary.

Problem:	The required outlet pressure can not be reached.
Cause:	The inlet pressure is not high enough.
Solution:	Make sure that the inlet pressure 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:	Check the specific application data with the flow curves in our documentation. A regulator with external feedback will solve or improve this problem.

Problem:	The outlet pressure does not drop if the adjustment knob is turned counterclockwise.
Cause:	The regulator is standard 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 turning the adjustment knob.
Cause:	Changes to the inlet pressure will result in changes to 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.