sensia
Rockwell Automation + Schlumberger

+ MEASUREMENT

CLIF MOCK™

+ LGS-1 Liquid and Gas Sample Pump

Installation, Operation & Maintenance Manual

MODEL: LGS-1

INTELLIGENT ACTION

Manual No. 9A-99104500147, Rev. 02

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Important Safety Information

Terms Used in This Manual

Caution	**Caution, risk of electric shock**
Attention	**Attention, risque d'électrocution**

WARNING	**A warning identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.**
AVERTISSEMENT	**Un avertissement identifie des informations sur des pratiques ou des circonstances pouvant entraîner des blessures corporelles ou la mort, des dommages matériels ou des pertes économiques.**

Caution	Caution statements Indicate actions or procedures which, if not performed correctly, may lead to personal injury or incorrect function of the instrument or connected equipment.
Attention	Indiquez les actions ou les procédures qui, si elles ne sont pas effectuées correctement, peuvent entraîner des blessures ou un mauvais fonctionnement de l'instrument ou de l'équipement connecté.

Note	Indicates additional information about specific conditions or circumstances that may affect instrument operation.
Remarque	Indique des informations supplémentaires sur des conditions ou des circonstances spécifiques pouvant affecter le fonctionnement de l'instrument.

REVISION HISTORY

REVISION:	DESCRIPTION OF CHANGE:	ISSUER:	APPROVER:	DATE:
1	Initial Release	AK	TMM	January 2011
2	Branding Update	AK	TMM	September 2020

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GENERAL

WARNING!

To avoid the risk of electric shock and fire, the following safety instructions must be observed and the guidelines followed.

The specifications must not be exceeded, and the device must only be applied as described in the following.

Prior to the installation and commissioning of the unit, the installation guide must be examined carefully.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

GENERAL

AVERTISSEMENT!

Pour éviter tout risque de choc électrique et d'incendie, les consignes de sécurité de ce manuel doivent être observées, et les instructions suivies.

Les spécifications ne doivent pas être dépassées, et l'unité ne doit être appliquée que comme décrit dans le texte suivant.

Ce manuel doit être examiné avec soin, avant l'installation et la mise en service de l'unité.

Si l'équipement est utilisé d'une manière non spécifiée par le fabricant, la protection assurée par l'équipement peut être altérée.

INSTALLATION

WARNING!

Installation may only be carried out by electrically skilled and instructed personnel in accordance with national legislation, including the relevant standards.

All technical data on the instrument is to be observed.

Changes to the design and modifications to the equipment are not permitted.

The equipment shall only be operated as intended and only in undamaged and perfect condition.

Sufficient segregation must exist between different cables and wires carrying different types of signal or power and all other circuits.

All wires must be terminated, complete with crimping lugs. Unused cores should be terminated to the earth bus bar.

INSTALLATION

AVERTISSEMENT!

L’installation ne peut être effectuée que par un électricien qualifié, conformément à la législation nationale, y compris les normes pertinentes.

Toutes les données techniques sur l'instrument doivent être observées.

Modifications de l'équipement ne sont pas autorisés.

L'équipement ne doit être utilisé comme prévu par le fabriquant et uniquement si il est en parfait état.

Une séparation suffisante doit exister entre les différents câbles et les fils transportant différents types de signaux ou de puissance et tous les autres circuits.

Tous les fils doivent être terminés, avec pattes de sertissage. Les noyaux non-utilisés doivent être terminés au jeu de barres de la terre.

Section 1: LGS-1 Sample Pump Overview

DESCRIPTION

The LGS-1 Sample Pump is a pneumatically operated positive displacement pump designed to transfer samples of liquid or gas into a vented sample receiver or into a pressurized cylinder.

The sampling cycle begins with a signal being sent from the controller circuitry to the solenoid which diverts instrument or plant air to the sample pump drive piston. When the piston is actuated, pipeline pressure opens the inlet check valve, allowing pipeline fluid to enter through the inlet of the sample pump and collect in the sample chamber until the sample chamber attains pipeline pressure. Once pipeline pressure is reached inside the sample chamber, the inlet check valve closes, sealing the sample chamber from the pipeline. The fluid sample remains contained inside the sample chamber until the sample pump is cycled. When the sample pump cycles, the fluid contained in the sample chamber is evacuated through the outlet valve into the sample receiver. Upon completion of one full sampling cycle, the pipeline fluid is once again allowed to enter the sample chamber, thus the process repeats itself.

When the pump piston is in the retracted position, the inlet check valve is held open by pipeline pressure. The outlet check valve is held closed. This condition prevents the sample pump from filling the sample receiver while the sample chamber fills with the next sample volume.

Section 2: Specifications

SAMPLE SPECIFICATION

SAMPLE MEDIA	
Fluid Viscosity Range	100 centistokes maximum
Fluid Temperature Range	-15° to 375°F (-26° to 190°C)
Maximum Particulate Size	0.005 in.
Fluid Flowing Pressure	30 to 1500 psi with 125 psi feed pressure

SAMPLE PUMP	
Maximum Supply Pressure to Sample Pump	150 psi
Minimum Operational Cycle Time	5 seconds
Liquid Sample Size Range	0.25 cc to 1.25 cc
Gas Sample Size Range	0.05 cc to 1.00 cc

SAMPLE SIZE

The sample size is set by adjusting the knob on top of the pump See “Setting the Sample Size” section, for step-by-step instructions.

The sample pump is adjustable for sample volumes ranging from .05 cc to 1.00 cc for gas applications and 0.25 cc to 1.25 cc for liquid applications. The default factory setting for sample size is 0.5 cc at 300 psi using gas. Calibration is available when operating conditions are supplied by the customer. If an application requires sample volumes outside the standard ranges, contact Sensia.

Section 3: LGS-1 Sample Pump Installation

AIR SUPPLY

The LGS-1 sample pump is actuated by an air supply. In gas applications, the line pressure is often sufficient to actuate the pump. But in liquid applications and some low-pressure gas applications, air must be supplied externally. The pipeline pressure of the fluid to be sampled determines the minimum air pressure required to actuate the pump. It is the customer's responsibility to provide an air supply that is powerful enough to meet this requirement for any given application.

The chart in Figure 1 can be used to determine the air pressure requirement for a broad range of pipeline pressures.

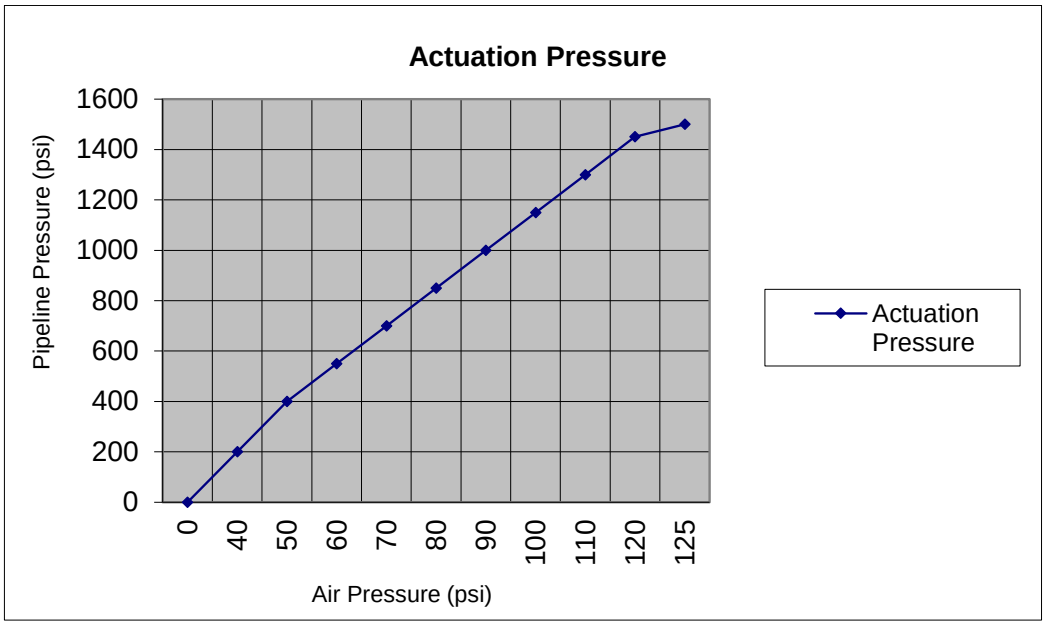

Figure 1: Pump actuation (air) pressure chart

INLINE FILTER

Use of an in-line filter between the probe and sample pump is recommended for optimum sampling performance. The purge valve manifold at the bottom of the sample pump, see Figure 2, is designed with a recess to accept a ½-in. OD basket filter. A 40-micron filter is supplied as standard; other sizes are available upon request. To install a filter, insert it in the bottom inlet of the purge valve manifold before connecting the sample probe to the sample pump.

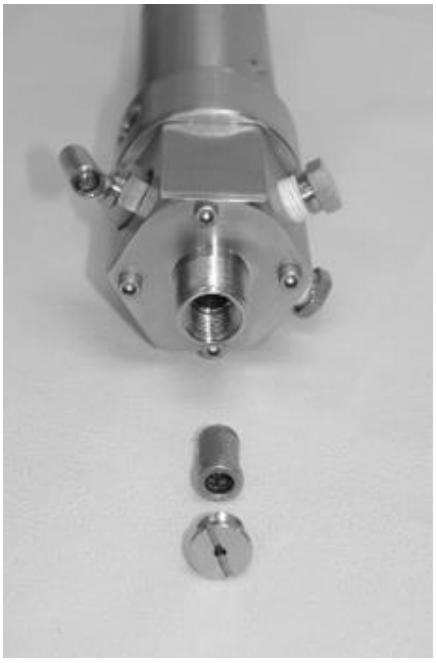

Figure 2: Pump actuation (air) pressure chart

TUBING CONNECTIONS

Tubing arrangements will vary, depending on the product sampled (gas or liquid). At a minimum, ¼-in. stainless steel tubing will be required to connect the air supply from the controller to the sample pump.

A ¼-in. capped port is provided on the sample discharge outlet for connecting sample flow to a receiver.

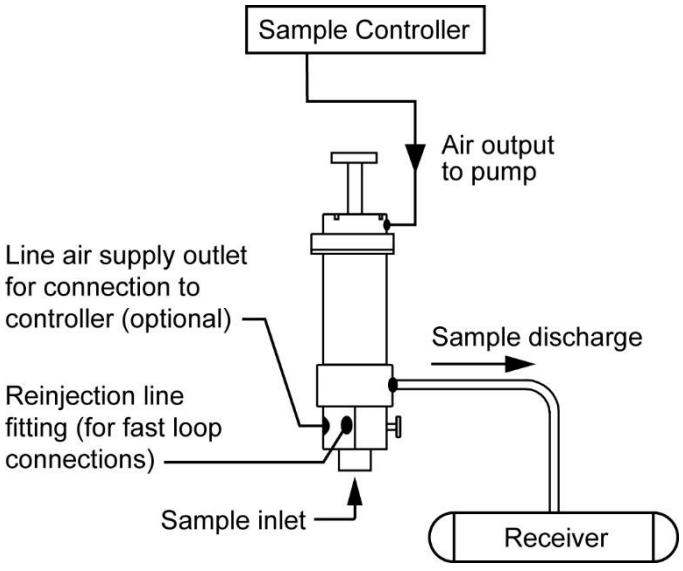

Figure 3: Pump actuation (air) pressure chart

REMOTE MOUNT CONSIDERATIONS

In remote-mount installations, tubing is required for connecting the sample probe to the purge valve manifold on the sample pump. When the controller is pipe-mounted, tubing should be sloped between the sample probe and the sample pump to prevent a water trap. The tubing between the sample probe and the sample pump should be as short as possible and should be insulated if extreme weather conditions exist.

FAST LOOP CONSIDERATIONS

Under some flow conditions, a fast loop plumbing arrangement may be preferred to ensure that only fresh liquid flow is sampled. This configuration requires an orifice plate, flow straightener, or other flow obstruction in the pipeline to cause a small differential pressure to ensure that the sample probe collects fresh fluid with each sample grab. The fast loop should be as short as possible and should be constructed with ¼-in. stainless steel tubing. The fast loop itself cannot have any device or obstruction which could cause significant pressure to drop. The fast loop should be insulated if extreme weather conditions exist.

SAMPLE PUMP CONNECTIONS

Install tubing to make the following connections to the sample pump, using Figure 4 for reference.

1. Connect the sample probe to the sample inlet (if sampler is mounted remotely mounted from sample probe).

2. Connect the sample outlet to the sample receiver.

3. Connect the air output to the actuation pressure port of the pump. This supplies air pressure to actuate the pump.

4. If a fast loop piping configuration will be used, connect the reinjection line fitting in the side of the purge valve manifold, see Figure 4, to the low-pressure side of the orifice fitting in the pipeline.

5. Cover the vent hole in the side of the pump with 1/16-17 NPT screen, if necessary, to prevent build-up of debris in the hole.

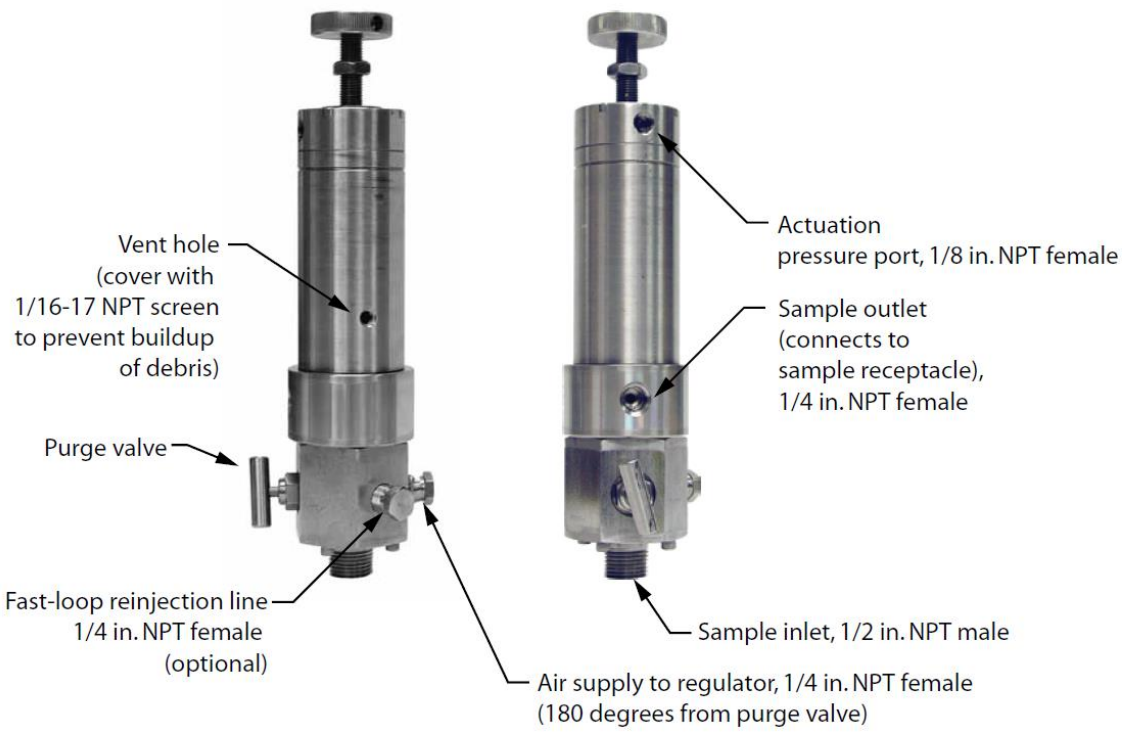

Figure 4: Pump tubing connections; note the orientation of the images above with reference to the shutoff valve (the photo at right is rotated 90 degrees clockwise from position shown on left)

Section 4: Setting Sample Size

Sample size is set by adjusting the knob at the top of the sample pump to a predetermined height (“h”) above the flat surface of the pump. The height measurement required directly corresponds to the sample size desired. Charts for determining corresponding height measurements for liquid and gas samples are provided on a laminated Sample Setting card that is stored inside the controller enclosure. The laminated card, shown in Figure 5, also includes a ruler for measuring the adjustment height.

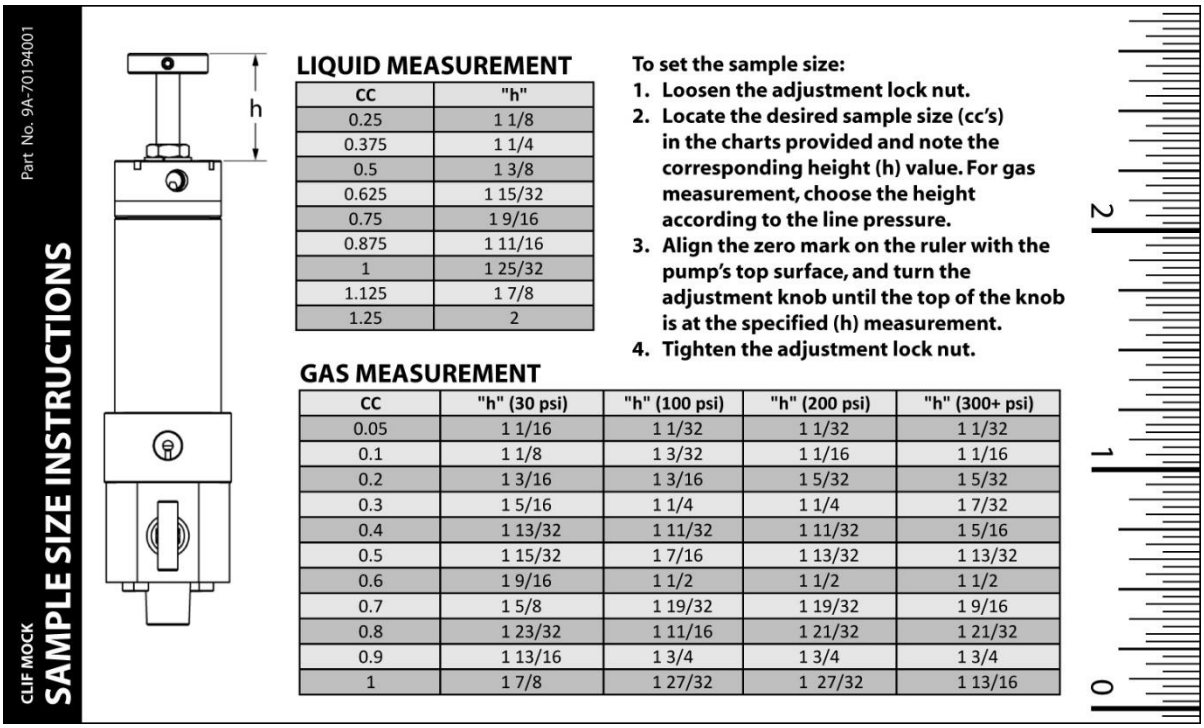

Figure 5: Laminated sample size card for adjusting sample size in the field

LIQUID SERVICE

To set the sample size for liquid sampling, perform the following steps:

1. Use the laminated Sample Setting card, see Figure 5, come with the sample controller and locate the appropriate chart for liquid or gas sample size.

2. Loosen the adjustment lock nut.

3. Locate the desired sample size in the “CC” column of the Liquid Measurement chart and note the corresponding height (h) value.

4. Hold the card so that the zero point aligns with the flat surface of the pump and turn the adjustment knob until its top is in line with the height measurement determined in step 3.

5. Tighten the adjustment lock nut.

GAS SERVICE

To set the sample size for gas sampling, perform the following steps:

1. Loosen the adjustment lock nut.

2. Locate the desired line pressure in the chart “CC” column of the Gas Measurement chart and note the corresponding height (h) value. Find the value (h) that corresponds to the desired sample size and line pressure.

3. Turn the adjustment knob until the desired height (h) is obtained.

4. Tighten the adjustment lock nut.

Due to the compressible nature of gas, slight adjustments may be required after initial installation to fine tune the sample pump based on the sampling requirements.

Section 5: LGS-1 Sample Pump Maintenance

SAMPLE PUMP COMPONENTS

Refer to Figures 6 and 7 as well as Tables 1 and 2 when performing the procedures in this section.

The pump is essentially maintenance-free. Change O-rings annually under routine operating conditions. If operating in a severe environment, inspect O-rings more frequently and replace, as necessary.

Caution	O-rings are a very fragile and integral part of the assembly. Always handle O-rings with extreme care to avoid slicing, extruding (force), tearing, or rolling an O-ring. Any damage to the O-ring will result in a loss of its sealing ability.

TROUBLESHOOTING

Leaks are the most common cause of pump failure. If sample pressure fails to build during operation, disassemble the pump and visually observe the inner components. Replace O-rings, and if other components show signs of excessive wear, consider overhauling the pump. See the Spare Parts list in Section 6, for kits that contain all necessary replacement parts.

COMPONENTS

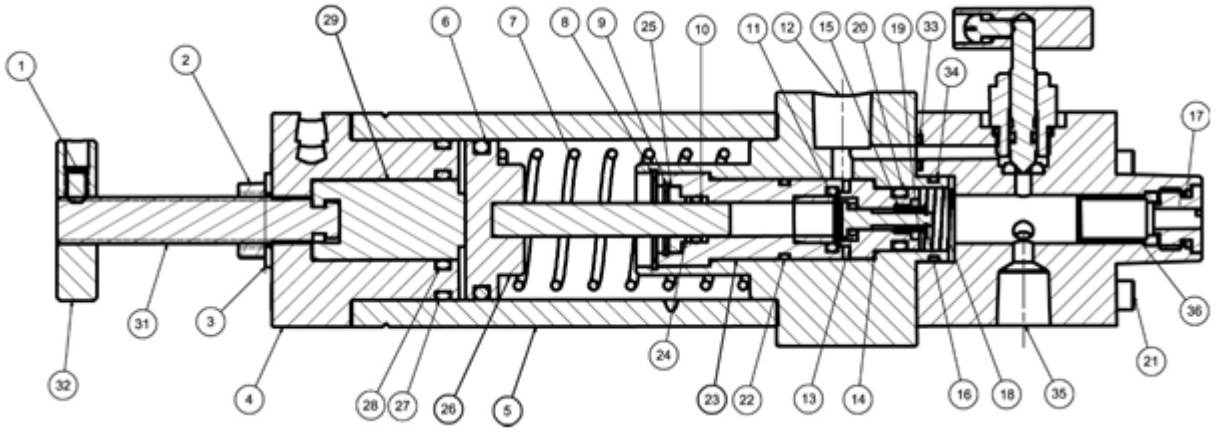

Figure 6: Sample pump components

Table 1: Sample Pump Components

Item	*Description*	*Qty.*
1	#10-32NF x 1/4" SOC SET SCREW	1
2	NUT, JAM, 7/16-20NC STD. SS	1
3	WASHER, FLAT, 7/16 STD. SS	1
4	END CAP, LGS-1	1
5	HOUSING LGS-1	1
6*	O-RING #218 VITON (REF: PISTON)	1
7**	SPRING, COMPRESSION, LGS-1	1
8	RETAINING RING, INTERNAL	1

9	RING, RETAINING K-2 300-62-SS2	1
10*	O-RING #011 VITON	1
11	POPPET, CHECK, LGS-1	1
12	BODY INLET, LGS-1	1
13*	O-RING, VITON, #008	1
14	SEAT, LGS-1	1
15**	SPRING, COMPRESSION CHECK, LGS-1	1
16	RETAINING RING, EXTERNAL	1
17	RETAINER, FILTER BASKET	1
18**	SPRING, SEAT, COMPRESSION, LGS-1	1
19	GUIDE, CHECK SPRING	1
20*	O-RING, VITON, #110	1
21	#8-32NCx3.5" LG. SHCS, SST	4
22**	O-RING, VITON, #016	1
23**	SAMPLE CHAMBER ASSY, LGS-1	1
24*	RING, BACK-UP, TELFON, #011	2
25	RETAINER, O-RING, SAMPLE CHAMBER	1
26	PISTON ROD ASSY, LGS-1	1
27*	O-RING, #125, VITON	1
28*	O-RING #116 VITON	1
29	PISTON, STROKE ADJUSTMENT	1
30	SCREW, SOCKET HD CAP 8-32 X 1 SS	4
31	SCREW, ADJUSTING LGS-1	1
32	KNOB, ADJUSTMENT LGS-1	1
33*	O-RING, VITON, #007	1
34*	O-RING, BUNA-N, #017	1
35	VALVE, PURGE LGS-1	1
36	FILTER, (OPTIONAL)	1

* These items are contained in the Seal Kit listed in the Spare Parts list.

** These items plus the Seal Kit items are contained in the Overhaul Kit listed in the Spare Parts list.

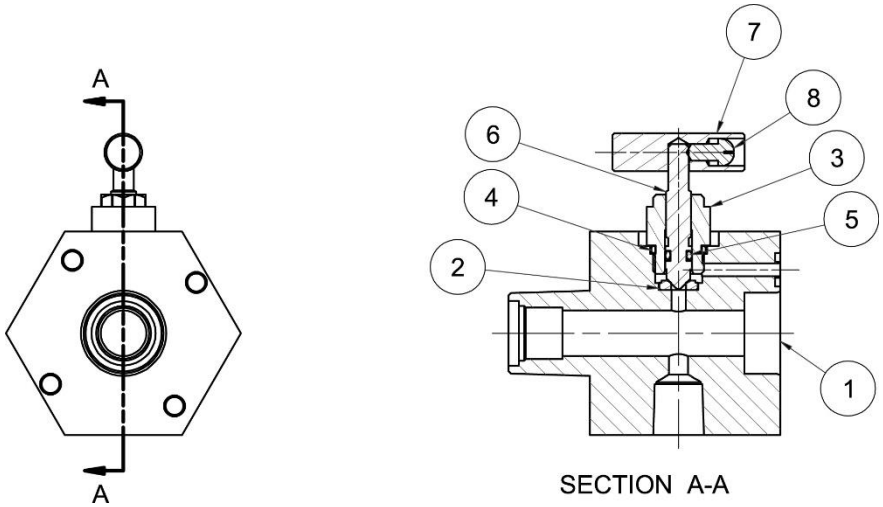

Figure 7: Purge valve manifold components

Table 2: Purge Valve Assembly Components

Item	*Description*	*Qty.*
1	VALVE, PURGE	1
2	SEAT, VALVE LGS MANIFOLD	1
3	NUT, BONNET LGS MANIFOLD	1
4*	O-RING, BUNA-N #013	1
5*	O-RING, VITON #007	1
6	STEM, VALVE LGS MANIFOLD	1
7	HANDLE, VALVE LGS MANIFOLD	1
8	SCREW, FILISTER HD SLT 8-32 X 5/16 SS	1

* These items are contained in the Seal Kit listed in the Spare Parts list.

SAMPLE PUMP DISASSEMBLY

Caution	Prior to disassembling the sample pump, remove pipeline pressure from the pump and cycle the pump several times to evacuate any gases that may be trapped in the sample chamber. Attempts to disassemble the pump without venting the sample chamber can result in bodily injury.

The following instructions reference item numbers that correspond to the numbers displayed in Figures 6 and 7 as well as Tables 1 and 2. Reference these cutaway illustrations and tables frequently during sample pump disassembly.

REQUIRED TOOLS

The LGS-1 pump can be completely disassembled with a few simple hand tools. An Allen wrench, snap ring pliers, a small adjustable wrench (for removing the valve body on the purge valve), a flat punch, and a flat screwdriver are recommended.

SAMPLE PUMP DISASSEMBLY

Prior to total disassembly of the pump, perform the following steps:

1. Loosen the nut (item #2) and back the adjustment screw (item #31) all the way out till it stops. This will reduce the spring return load to minimum.

2. Loosen the four (4) screws (item #21) 2 complete turns (do not over-loosen the screws). After the screws are loosened, the housing (item #5), the inlet body (item #12), and the purge valve (item #35) will separate slightly due to spring load.

3. Using your hands, grasp the housing and inlet body and push them together. There should only be a slight resistance of approximately 4 to 5 pounds required to bring the housing and inlet body in contact again.

Caution	If you cannot bring the two parts in contact using minimal hand force, the sample chamber could contain trapped gases; retighten the four screws hand-tight and recycle the pump several times again, then repeat the procedure above. Never—under any circumstance—continue to disassemble the pump if pressure is retained in the sample chamber.

	Bodily injury could result. If you cannot evacuate the sample chamber gases after repeated attempts, contact Sensia for further instruction.

HOUSING DISASSEMBLY

1. To continue disassembly of the pump, remove the four (4) screws (item #21) from the purge valve (item #35). Hand pressure should be applied to the inlet body and the purge valve to hold them in place as the screws are removed to offset the force created by the compression spring (item #7) so the pump does not suddenly burst apart.

2. Slide the inlet body and purge valve straight off the piston rod and remove the compression spring (item #7). Do not remove the piston assembly (item #26) from the inlet body (item #12) side of the housing (item #5). Removal from this direction would require passing the piston O-ring over the vent hole in the housing which could cut the O-ring.

3. Remove the four (4) screws (item #30) from the end cap (item #4) and slide the end cap out of the housing.

4. Remove the piston assembly (item #26) from the end cap side of the housing. Do not remove the piston assembly from the inlet body side of the housing. Removal from this direction could cut the piston O-ring as it passes over the vent hole in the housing.

5. Remove the O-ring (item #6) from the piston assembly.

END CAP DISASSEMBLY

1. Remove O-ring (item #27) from the end cap.

2. To remove the stroke adjustment (item #29) requires removal of the nut (item #2) and washer (item #3).

   a. Remove the set screw (item #1).
   b. Remove the adjustment knob (item #32).
   c. Remove the nut and washer.
   d. Replace the adjustment knob on the adjustment screw.
   e. Replace the set screw and retighten.

3. Rotate the adjustment knob clockwise until the stroke adjustment completely extends beyond the end cap.

4. Remove the stroke adjustment from the adjustment screw.

5. Remove the adjustment screw from the end cap.

6. Remove the O-ring (item #28) located inside the end cap.

7. Remove the set screw from the adjustment knob.

8. Remove the adjustment knob from the adjustment screw.

INLET BODY DISASSEMBLY

1. Remove O-ring (item #34).

2. Remove O-ring (item #33).

3. Remove the internal retaining ring (item #8).

4. Carefully remove the sample chamber assembly (item #23) and the seat assembly from the inlet body.

    a. To accomplish this, use a flat punch and gently apply pressure to the check poppet (item #11) stem.
    b. Slowly push the two assemblies through the inlet body until the O-ring (item #22) clears the bore.
    c. Once the O-ring clears the bore the two assemblies can be easily removed from the inlet body by gently dumping them in your hand.

5. Remove the internal retaining ring (item #9) from the sample chamber assembly.

6. To remove the O-ring retainer (item #25) from the sample chamber assembly, hold the sample chamber assembly so the O-ring retainer is facing down and very gently tap the sample chamber assembly against a hard-clean surface.

7. Remove the back-up ring (item #24) and O-ring (item #10) from the sample chamber assembly.

8. Remove O-ring (item #22).

9. Disassemble the seat assembly as follows:

    a. Carefully remove the external retaining ring (item #16) from the check poppet (item #11).
    b. Remove the compression spring (item #15).
    c. Remove the check poppet.
    d. Remove O-ring (item #13) from the check poppet.
    e. Remove O-ring (item #20) from the seat (item #14).

10. Disassembly of the sample pump is complete.

PURGE VALVE DISASSEMBLY

1. Remove the purge valve assembly (item #35) from the inlet body (item #12).

2. Remove the compression spring (item #18).

3. Remove the filter basket retainer (item #17) from the purge valve assembly (item #35).

4. Remove the bonnet nut (item #3*) from the purge valve (item #1*).

5. Remove the seat (item #2*) from the purge valve (item #1*).

6. Remove the screw (item #8*) and the handle (item #7*) from the stem (item #6*).

7. Remove the stem (item #6*) from the bonnet nut (item #3*).

8. Remove O-rings (item #4* & item #5*).

SAMPLE PUMP ASSEMBLY

The following instructions reference item numbers that correspond to the numbers displayed in Figure 6 and 7 as well as Tables 1 and 2. Reference these cutaway illustrations and tables frequently during sample pump assembly.

PURGE VALVE ASSEMBLY

1. Place O-ring (item #5*) on the stem (item #6).

2. Place O-ring (item #4*) on the bonnet nut (item #3*).

3. Install stem (item #6*) into the bonnet nut (item #3*).

4. Install the seat (item #2*) into the purge valve (item #1*).
5. Install the bonnet nut (item #3*) into the purge valve (item #1*).
6. Install the handle (item #7*) and the screw (item #8*) to the stem (item #6*).
7. Install the filter (item #36**) into the purge valve assembly (item #36).
8. Install the retainer (item #17) into the purge valve assembly (item #36).

***** See Purge Valve diagram for these item numbers.

******Optional.

INLET BODY ASSEMBLY

1. Place O-ring (item #20) on the seat (item #14).
2. Place O-ring (item #13) on the check poppet (item #11).
3. Place the check poppet in the seat.
4. Install the compression spring (item #15) over the stem of the check poppet.
5. Carefully replace the external retaining ring (item #16) over the check poppet (item #11).
6. Install O-ring (item #22) onto the sample chamber (item #23).
7. Insert the O-ring (item #10) and back-up ring (item #24) into the sample chamber assembly.
8. Replace the O-ring retainer (item #25) in the sample chamber assembly.
9. Install the internal retaining ring (item #9) in the sample chamber assembly.
10. Replace the seat assembly and sample chamber assembly into the inlet body.
    a. First, place the seat assembly into the inlet body and use your finger to gently push it all the way in until it bottoms inside the body.
    b. Insert the sample chamber assembly into the inlet body until it bottoms.
11. Install the internal retaining ring (item #8).
12. Install O-ring (item #34).

END CAP ASSEMBLY

1. Install the O-ring (item #28) located inside the end cap.
2. Install the adjustment knob (item #32) on to the adjustment screw (item #31).
3. Install the setscrew (item #1) in the adjustment knob.
4. Install the adjustment screw in the end cap and thread all the way in until the groove end of the adjustment screw clears the opposite end of the end cap.
5. Install the stroke adjustment (item #29) on the adjustment screw.
6. Rotate the adjustment knob counterclockwise until the stroke adjustment is completely retracted inside the end cap.

7. Remove the set screw and adjustment knob to place the washer (item #3) and nut (item #2) on the adjustment screw. Replace the set screw and adjustment knob on to the adjustment screw.

8. Install O-ring (item #27) on to the end cap.

HOUSING ASSEMBLY

1. Install the O-ring (item #6) on the piston assembly.

2. Install the piston assembly (item #26) from the end cap side (grooved end) of the housing (item #5). Do not install the piston assembly from the inlet body side of the housing. Installation from this direction could cut the piston O-ring as it passes over the vent hole in the housing.

3. Slide the end cap inside the housing and install the four (4) screws (item #30). **Hand-tighten only.**

4. Install the compression spring (item #7) onto the piston assembly. Slide the inlet body straight on to the piston rod. Be careful not to cut the piston rod O-ring (item #10) located inside the sample chamber assembly.

5. Install the compression spring (item #18) between the inlet body (item #12) and the purge valve (item #35).

6. Install the O-ring (item #33).

7. Install the four (4) screws (item #21) on to the purge valve (item #35), through the inlet body (item #12), and into the housing, such that the purge valve's (item #35) handle is in line with the sample out port on the inlet body (item #12). **Hand-tighten the screws only. DO NOT OVERTIGHTEN THE SCREWS.**

Section 6: Spare Parts List

A seal kit and an overhaul kit provide all the parts required for maintenance of the LGS-1 sample pump. See the table below for part numbers.

Table 3: LGS-1 Pump Spare Parts

Part Number	***Description***
9A-50142150715	Overhaul Kit (contains O-rings and springs for full overhaul of the LGS-1 pump)
9A-50142150708	Seal Kit (contains O-rings for the LGS-1 pump and purge valve manifold)
9A-50142200643	Filter, LGS-1, 40-micron

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Appendix A: **Publisher Notes**

SUPPORT

For further support, contact:

Sensia LLC

TEL + 1 844 226 6327
EMAIL ms-service@sensiaglobal.com

WEB https://sensiaglobal.com/Measurement

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