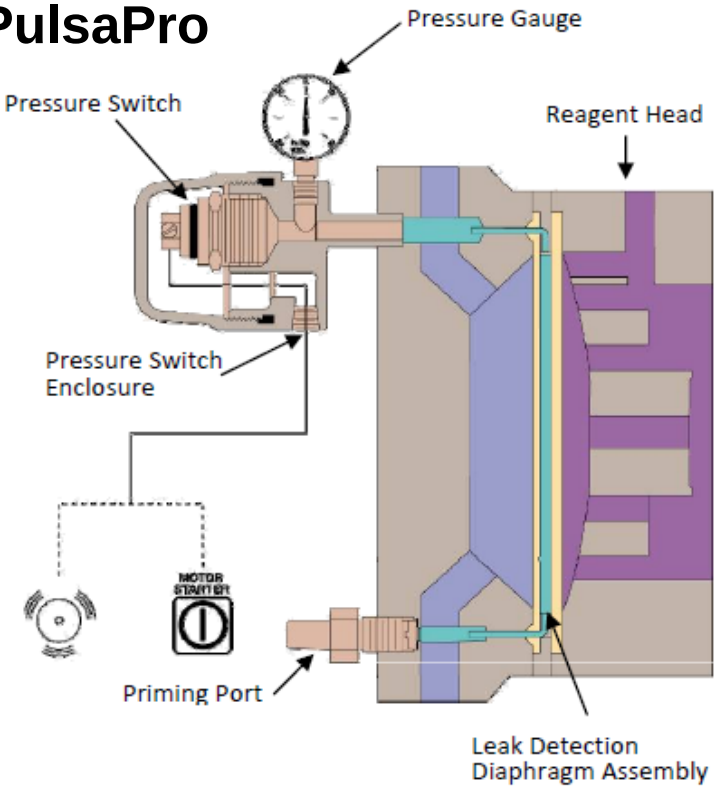
PULSAFEEDER®
ENGINEERED PRODUCTS

Installation, Operation & Maintenance Instruction

Models: Pulsa, Pulsar, PulsaPro



DEMKO 12 ATEX 1204081X
II 2 G Ex d IIB T5 Gb
II 2 D Ex tb IIIC T100°C Db IP66

IECEx UL 14.0118X
Ex d IIB T5 Gb
Ex tb IIIC T100°C Db IP66

PULSAlarm®
LEAK DETECTION

Bulletin: IOM-PUL-1007 Rev E

THIS DOCUMENT CONTAINS CHARACTERISTICS CONTROLLED BY U.L. FILE # E186527; CHANGES REQUIRE AGENCY APPROVAL.

Pulsafeeder Factory Service Policy

Should you experience a problem with your Pulsafeeder pump, first consult the troubleshooting guide in your pump operation and maintenance manual. If the problem is not covered or cannot be solved, please contact your local Pulsafeeder Sales Representative or Pulsafeeder Technical Service Department for further assistance.

Trained individuals are available to diagnose your problem and arrange a solution. Solutions may include purchasing a replacement unit or returning the *PULSAlarm* to the factory for inspection and repair.

All returns require a Return Material Authorization (R.M.A.) number to be issued by Pulsafeeder. Parts purchased to correct a warranty issue may be credited after examination of the original parts by Pulsafeeder personnel. Parts returned for warranty considerations which are good will be sent back freight collect.

Any field modifications will void the warranty. Out-of-warranty repairs will be subject to Pulsafeeder's standard bench fees and testing costs associated with replacement components.

This document describes product features controlled by IECEx / *ATEX* requirements. Those features, and this document, cannot be changed without notification or approval of the appropriate agency.

Safety Considerations:

- Read and understand all related instructions and documentation before attempting to install or maintain this equipment
- Observe all special instructions, notes, and cautions.
- Act with care and exercise good common sense and judgment during all installation, adjustment, and maintenance procedures.
- Ensure that all safety and work procedures and standards that are applicable to your company and facility are followed during the installation, maintenance, and operation of this equipment.

Notice

Information and specifications in this document are subject to change without notice.

Trademarks

Pulsa Series® and PULSAlarm® are registered trademarks of Pulsafeeder, Inc.

Revision History

Revision	***Implemented By***	***Revision Date***	***Approved By***	***Approval Date***	***Reason***
B	Engineering	04/27/2007	Technical Service	04/27/2007	Material reference to “PTFE”
C	Engineering, Quality, Compliance	04/07/2015	Technical Service	04/07/2015	Remove references to PULSAlarm® Vacuum offering. Add ATEX and IECEx information, general updates.
D	Engineering	03/03/2016	Technical Service	03/03/2016	Modify temperature and code information on front and back cover only
E	Technical Service	05/31/2017	Aftermarket Manager	06/02/2017	Modify switch trip point settings and remove paragraph 7.4 for vacuum system priming.

Table of Contents

Contents

1.0 Conventions

For the remainder of this bulletin, the following conventions are in effect.

A WARNING DEFINES A CONDITION THAT COULD CAUSE DAMAGE TO BOTH THE EQUIPMENT AND THE PERSONNEL OPERATING IT. THIS MANUAL MUST BE CONSULTED IN ALL CASES WHERE THE WARNING SYMBOL IS MARKED IN ORDER TO FIND OUT THE NATURE OF THE POTENTIAL HAZARDS AND ANY ACTIONS WHICH HAVE TO BE TAKEN TO AVOID THEM.

CAUTION, POSSIBILITY OF ELECTRIC SHOCK

Notes are general information meant to make operating the equipment easier. For information on overall pump operation and maintenance, refer to the Installation, Operation, and Maintenance manual specific to the model of pump in question. The information in this bulletin pertains only to the PULSAlarm® ® leak detection system supplied as an option on Pulsafeeder PULSA/PULSAR Series pumps

Tips have been included within this bulletin to help the operator run the equipment in the most efficient manner possible. These "Tips" are drawn from the knowledge and experience of our staff engineers, and input from the field.

2.0 Introduction

The *PULSAlarm*® ® is a microprocessor based stroke length control device for use with the *PULSA* diaphragm-metering pump. It has been designed to operate in a variety of industrial environments.

3.0 Foreword

The pumps to which these “instructions” refer to are **designed for use in industrial areas** and therefore cannot be treated as retail products. The present documentation gives instructions to be used by qualified personnel only. **It must be used in compliance with the regulations, laws and technical standards in force** and cannot, under any circumstances, take the place of plant standard or additional regulations, including any which are not legally enforceable, which have been issued with the scope of ensuring safety.

Equipment with special manufacturing or constructive variances may differ in details with respect to this description.

In case of any difficulty, please contact PULSAFEEDER, INC. Technical Service.

The PULSAlarm® is rated for NEMA 7 locations as identified on the nameplate.
The PULSAlarm® complies with both ATEX and IEC IECEx standards.

The following standards apply to this product:

IEC 60079-0 6th Edition
IEC 60079-1 6th Edition
IEC 60079-31 1st Edition

EN 60079-0:2012+A11:2013
EN 60079-1:2007
EN 60079-31:2009

4.0 ATEX / IECEx Nameplate and Marking

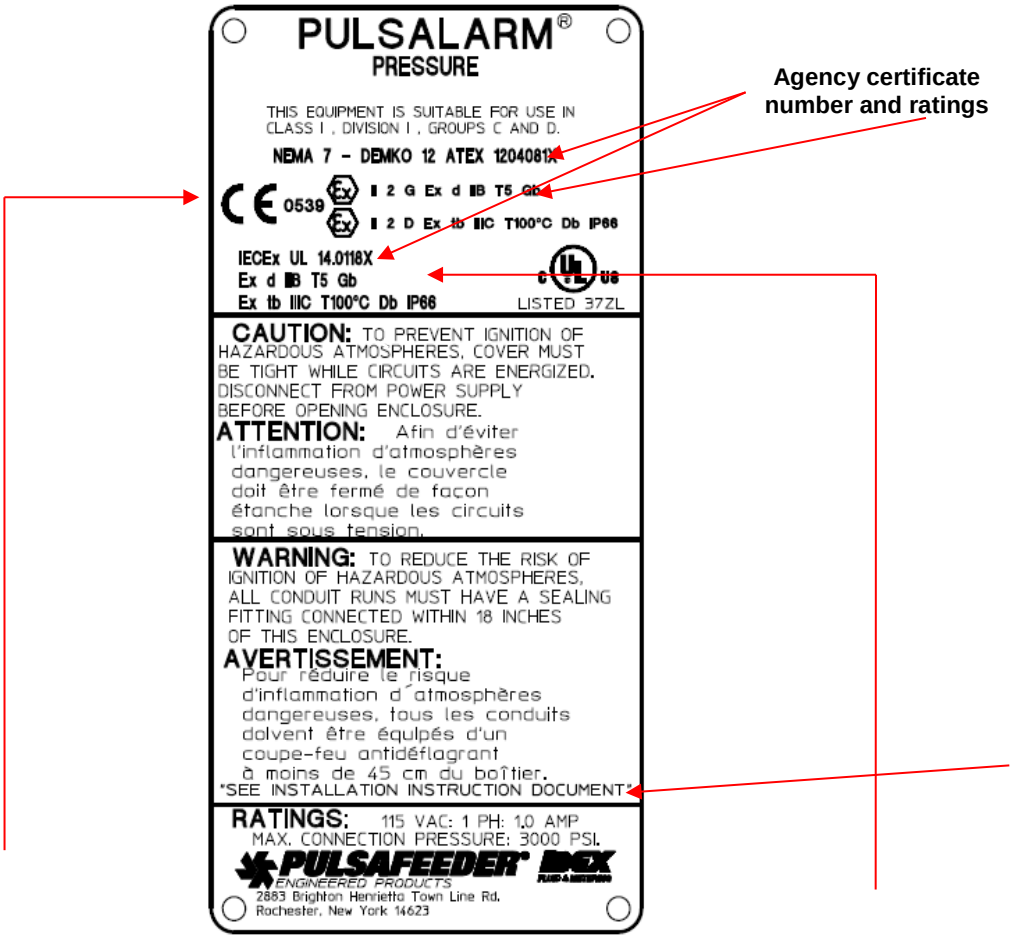
All pumps bear a standard rating nameplate on which it is possible to read, apart from functional data, all data required for universal identification.

Conduit connections

Conduit connections can carry fluids and vapors into the PULSAlarm® causing damage and void the warranty. Care should be taken when installing conduit to protect against fluid/vapor entry. In accordance with any applicable codes provide sealed entries and conduit drains near the point of entry as required. For installation purposes, the conduit glands on the PULSAlarm® are .50-14 NPT.

To reduce the risk of ignition of hazardous atmospheres, conduit runs must have a sealing fitting connected within 18 inches of the enclosure for Division applications. For Zone applications, a seal shall be installed within 50 mm of the enclosure.

The PULSAlarm® is provided with a nameplate with specific markings of data required by the directive:



ATEX Marking	IECEx Marking
Prefix 0539 Ex II 2 D Ex tb IIIC T120°C Db I II III IV V VI VII VIII IX X	Ex d IIC T6 Gb I II III IV V
I – Notified body for Quality System	I – Explosive atmosphere
II – Explosive Protection	II – Protection Methods – flameproof enclosure
	III – Gas Group
IV – Equipment Category	IV – Temperature Code or Temperature Rating (max surface temp = T85°)
V – Combustible Dust Environment	V – Equipment Protection Level – Equipment suitable for Zones 1,2
VI – Explosive Atmosphere	
VII – Protection Method	
VIII– Combustible Dust Group	
IX – Temperature Class – max surface temp	
X – Equipment Protection Level	

Key to nameplate data – See additional information below:

⚠ ***Design ambient temperature range "Ta"***
Unless differently agreed with the customer, can be:
-20°C ≤ Ta ≤ +40°C: STD temperature range for all type of pumps

5.0 Description and Theory of Operation

The PULSAlarm® leak detection system utilizes a two-layer PTFE diaphragm, coupled to a pressure switch.

The system is initially primed by filling the void within the detection assembly and between the diaphragm layers with a barrier fluid. The setup process then bleeds excess fluid from between the diaphragm layers until they are in close contact. The system operates as follows:

During normal pump operation, the two layers of the PTFE diaphragm bear directly against one another, and there is no pressure generated between the two layers. The sensing system monitors the space between the layers, which will remain at zero pressure as long as the diaphragm layers remain undamaged.

In the event of a failure of either layer of the diaphragm, liquid will enter the space between the two layers. This liquid will be either the hydraulic oil (if the rear layer fails) or the pumped fluid (if the front layer fails). As the pump operates, this liquid will generate pressure between the layers of the diaphragm that will then be transferred outwards by the barrier fluid. This fluid will create pressure against the pressure switch. This switch has a trip point of 20 psi (1.37 bar). When this pressure is reached the switch will operate. The pressure system requires a more complex setup procedure, however once operational it should require no further maintenance or operator interaction.

The output of the switch on either system (both normally closed and normally open connections are available) can then signal the failure of the diaphragm. It is recommended that the pump be stopped in the event a leak is detected. Immediate attention to the problem, followed by cleanup and appropriate maintenance, will avoid further damage to the pump.

The barrier fluid used with the pressure-based system should be chosen for compatibility with the process and environmental conditions. The fluid chosen should have as low a viscosity as possible to aid in priming the system. Water can be used, and ethylene or propylene glycol can be added for corrosion and temperature protection. Thin oils such as silicone oil or mineral oil can also be used. Liquids of higher viscosity will extend the time required to properly prime the system. Thinner liquids will allow for faster setup.

NOTE: Pulsafeeder supplies as standard low viscosity silicone oil.

System identification is noted on the switch cover nameplate, and also on your Pulsa Series pump nameplate.

5.1 PULSAlarm® Reagent Head

The PULSAlarm® leak detection reagent head assembly consists of reagent head, leak detection diaphragm, suction and discharge check valves, bleed port, and optional switch and gauge. The reagent head, diaphragm, suction and discharge check valves are the only parts of the pump to contact the process liquid; consequently, maintenance is critical to pump performance

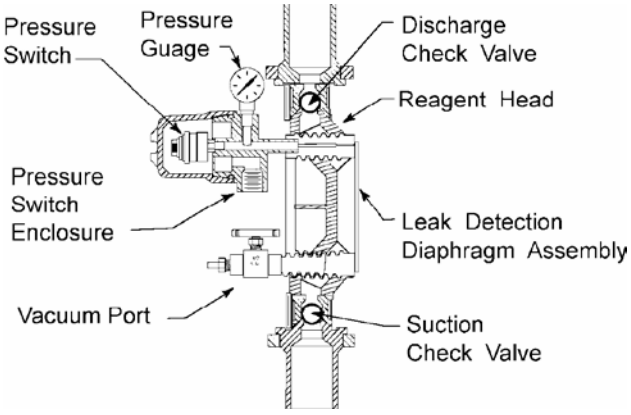


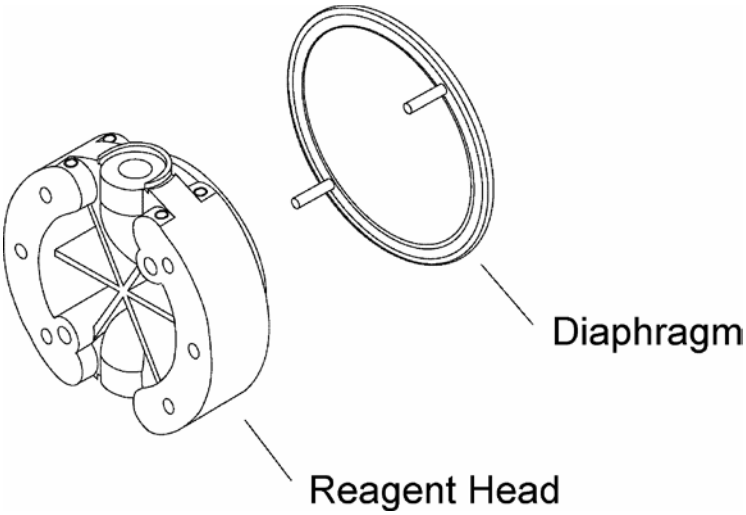
Figure 1 – reagent head

5.2 PULSAlarm® Leak Detection Diaphragm

Double, or sandwiched, PTFE diaphragms are sealed at their peripheries to an intermediate metal spacer ring. The space between the diaphragms is sealed so that the diaphragm functions as does a standard single diaphragm. For the pressure system, the space between the diaphragms is filled with a small amount of fluid. This space is connected to an adjustable electrical switch (optional) that actuates in response to loss of vacuum or buildup of pressure resulting from rupture of either or both diaphragms. Switch operation can be used to perform any external function, typically to signal an alarm or turn off the pump. Refer to *Figures 1 and 2.*

NOTE **During installation, ensure that adequate space is available at the front of the reagent head assembly to allow for service of both the pressure switch and the diaphragm assembly.**

5.3 Diaphragm Construction



NOTE **The adhesive rings aid in assembly and are not present for sealing purposes.**

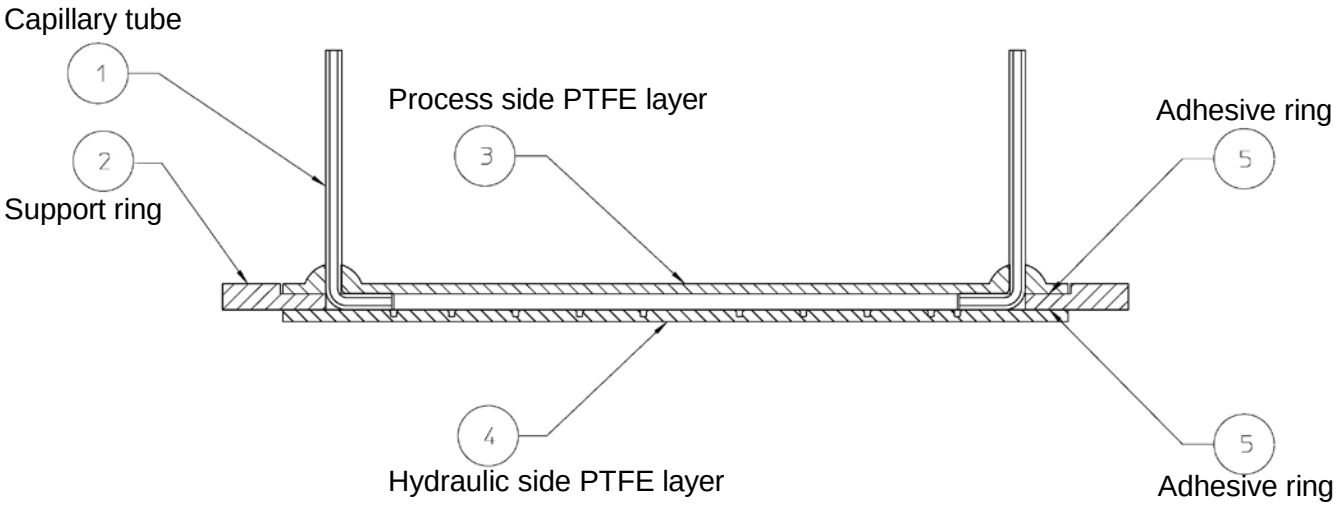


Figure 2 – diaphragm construction

6.0 Electrical

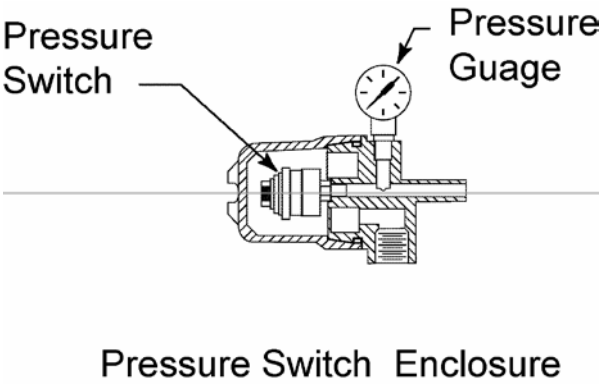


Figure 3 – switch and housing

If equipped with an optional pressure switch, install electrical wiring and conduit in accordance with local electrical codes.

The switch is rated as follows:

30 VDC or 125 VAC 1 Ampere Resistive.

WARNING

Electrical Connections

Do not make any electrical connections (high or low voltage) without adequately grounding the PULSAlarm® and the worker to eliminate any electrostatic charge between the two. A conductive wrist strap worn by the worker and attached to the PULSAlarm® enclosure is adequate to satisfy this requirement.

The switch is the SPDT (single pole, double throw) type and can therefore be connected to either open or to close upon detection of diaphragm leak condition. Contacts or wires are identified as follows:

Normally Open (NO)	wire color WHITE
Normally Closed (NC)	wire color RED
Common (Com)	wire color BLACK

WARNING

THE ENCLOSURE IS LABELED WITH APPLICABLE SAFETY AGENCY RATINGS FOR HAZARDOUS AREA INSTALLATION. SINCE THE SWITCH IS OF THE MECHANICAL CONTACT TYPE, IT CAN NEVER QUALIFY AS NON-SPARKING (NON-INCENDIVE, OR "M") FOR OCCASIONAL AND SHORT-TERM HAZARDOUS AREA USE. PROTECTION MUST BE PROVIDED BY THE ENCLOSURE.

7.0 Setup for Pressure

Pumps incorporating pressure leak detection are shipped from the factory with the system fully set up to work at full pump pressure. No further setup is required. The standard factory barrier fluid is silicone oil, if any other customer-specified media is used it must be compatible with construction materials. The system will require proper setup after maintenance or repairs see the following page for the proper procedure.

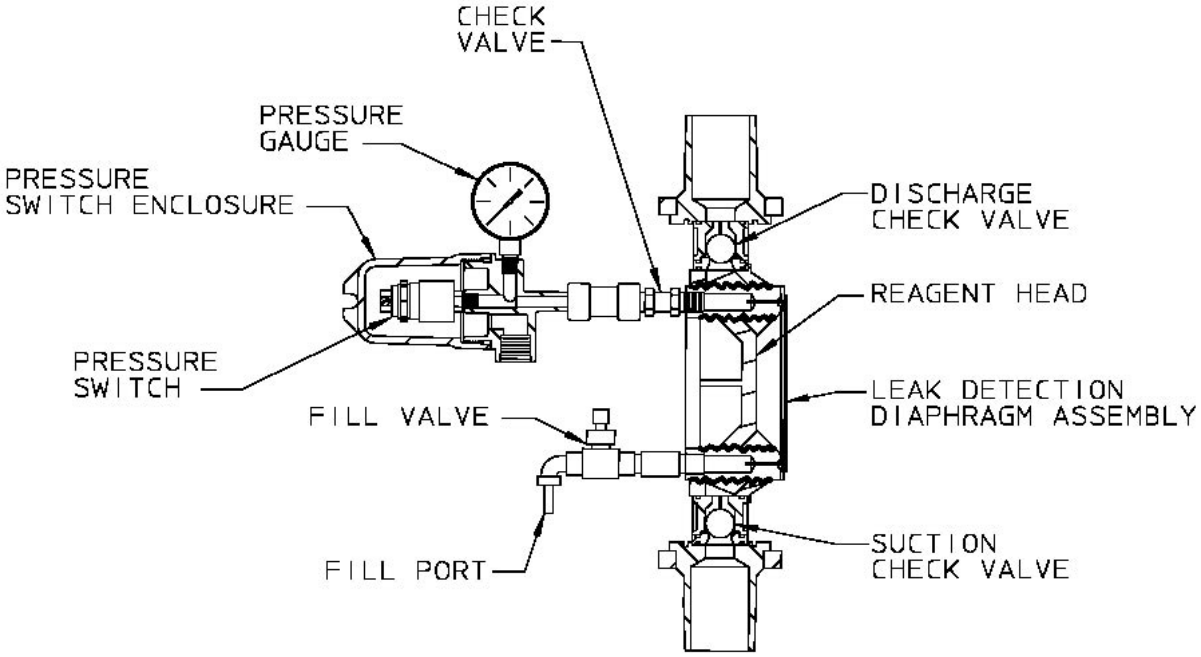


Figure 5 – pressure system

WARNING

THE BARRIER FLUID USED TO PRIME THE SYSTEM WILL VARY WITH THE APPLICATION. THE FLUID SELECTED MUST BE COMPATIBLE WITH THE MATERIALS OF CONSTRUCTION USED IN THE DIAPHRAGM AND DETECTION ASSEMBLY. IT SHOULD ALSO BE COMPATIBLE WITH THE PROCESS FLUID AND THE PROCESS CONDITIONS

7.1 Complete re-assembly of the diaphragm, reagent head, and external components if they were taken apart. Ensure that reagent head and tie-bar bolts are tightened according to the appropriate torque specifications

7.2 Remove the pressure gauge from the housing body and replace it with a straight tubing adaptor fitting. This will be referred to in this document as the "outlet side"

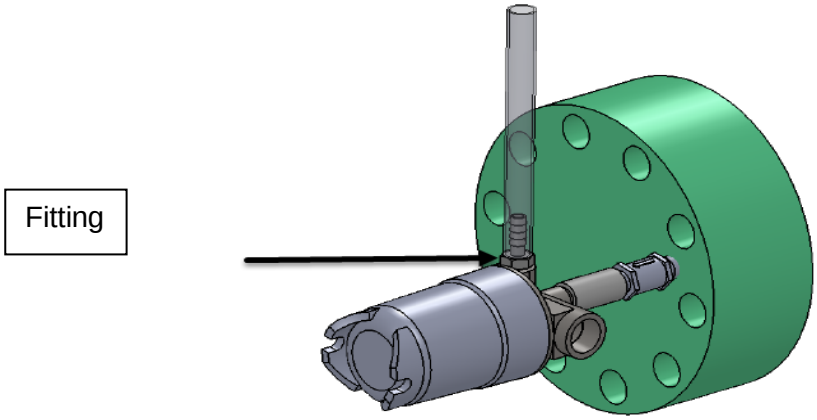


Figure 6 – fitting for priming "outlet side"

7.3 Remove the plug from the inlet side needle valve on the front of the reagent head, and install a hose adaptor fitting. This will be referred to in this document as the "inlet side".

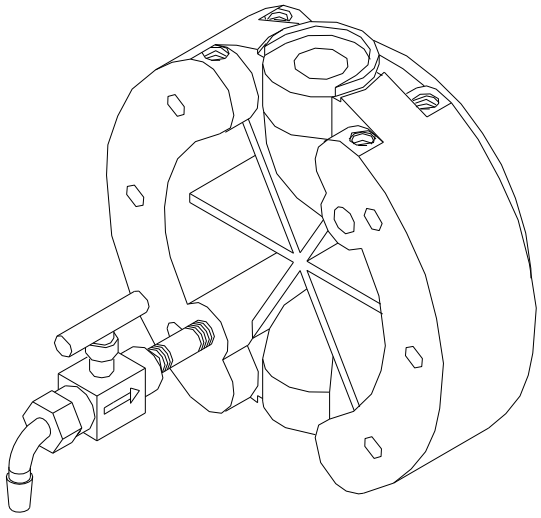


Figure 7 – "inlet side"

7.4 Connect a hand pump to the fitting on the outlet side of the system, and apply vacuum, which serves to pull the barrier fluid through the system.

7.5 Attach the incoming barrier fluid supply under pressure to the inlet side and verify that the needle valve is open.

7.6 WAIT…. The process will take time. **Higher pressure will not help and may cause damage to the diaphragm**. Maintain pressure on the inlet side and vacuum on the outlet side to move the fluid through the system.

7.7 Observe the fluid at the outlet (vacuum pump) side. When clear, air free fluid is observed, close the inlet side needle valve and remove the pressure source.

7.8 Replace the plug into the needle valve to seal the system inlet.

7.9 Allow vacuum to remain on the outlet side of the system for approx. 2-3 minutes, this will aid in the evacuation of excess fluid. Once complete, release the vacuum and remove the hand pump.

7.10 Attach a short section of tubing to the fitting on the outlet side to catch excess fluid as the system setup is completed in the next steps.

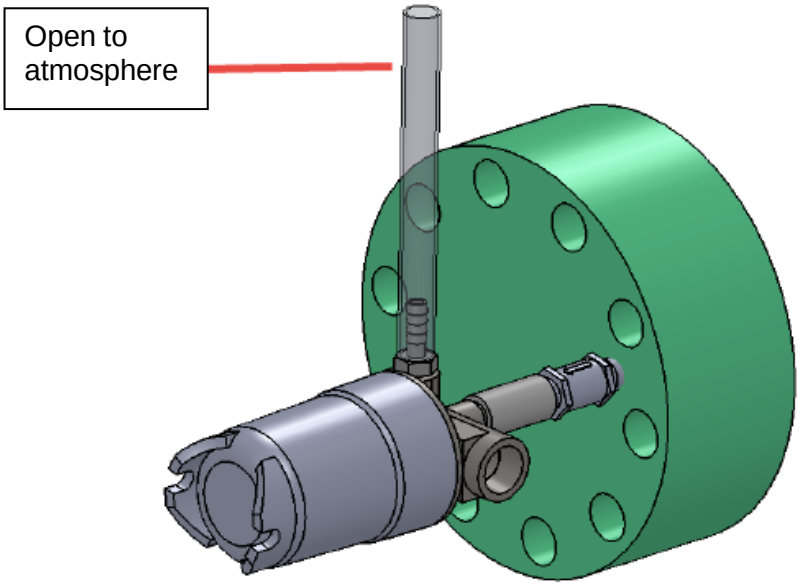


Figure 8 – bleed tubing

7.11 Ensure that the eccentric box of the pump has been filled to the appropriate level with the correct hydraulic fluid.

7.12 **If the pump is not already hydraulically primed**, re-prime it now using the appropriate procedure for a standard Pulsa Series flat diaphragm pump. If the diaphragm was never removed, this step should not be necessary. If a new diaphragm is being installed, the pump will need to be re-primed.

7.13 In order to fully balance and evacuate the leak detection system, the pump must now run at normal discharge pressure for a period of about 30 minutes to one hour. This ensures that excess barrier fluid is fully evacuated from the system.

7.14 Supply either process fluid, or test fluid (i.e. water) to the suction fitting and ensure that the discharge system is configured for safe operation. The pump can be started with minimal discharge pressure and then slowly brought up to full pressure, if the system allows for this.

7.15 Apply power and start the pump.

7.16 Slowly increase the discharge pressure to full operating pressure, and continue to run the pump.

7.17 During this time, excess barrier fluid will be displaced from the system into the length of tubing attached to the outlet side, balancing the system for proper operation. A small pen mark on the tube can assist in observing this process visually. Once the liquid in the tube no longer rises, the evacuation should be complete.

7.18 After the startup period, remove the tubing and connection from the housing body and reinstall the pressure gauge. Use thread sealing tape as required.

7.19 Verify the connections to the alarm switch if they were disturbed during maintenance.

The pump and pressure leak-detection system are now properly prepared and ready for normal service**. During normal operation, the gauge should indicate 0 (zero) pressure.**

Under certain circumstances, the system may not completely evacuate excess barrier fluid during the procedure as outlined above. In these cases, after several days run time, a small amount of pressure may build in the system. If this occurs, simply loosen the pressure gauge from the switch housing and relieve a small amount of barrier fluid, returning the system to a zero-pressure state.

Once this startup procedure is completed, the pressure leak detection system should require no further maintenance.

8.0 Pressure fill chamber

Under certain conditions, when barrier fluids other than water are used, a pressure chamber can be fabricated from readily available fittings that allow the barrier fluid to be fed under pressure to the inlet of the system. Users may wish to fabricate a device based upon this sketch which will aid in the setup of the pressure-based system.

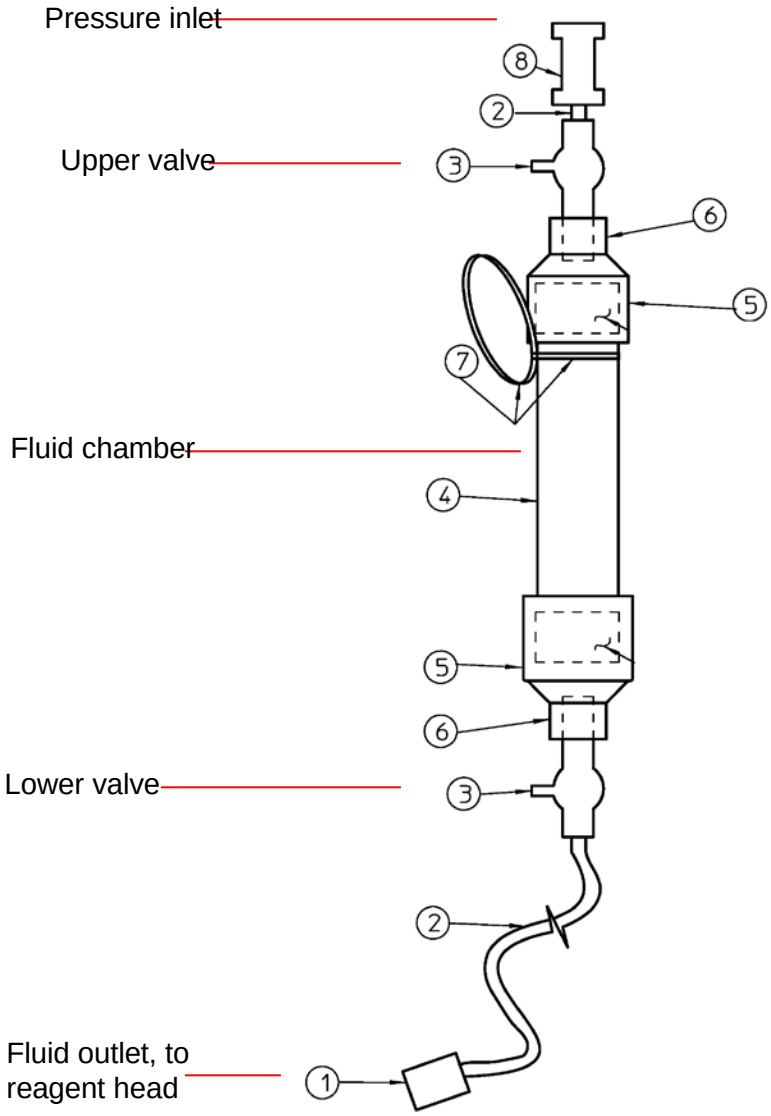


Figure 9 – optional fill chamber

- Connect a vacuum pump to the top fitting of the fluid fill device. Open BOTH valves on the device.
- Place the lower fill tube into the container of the barrier fluid
- Using the vacuum function, use the hand pump to draw several ounces of fluid up into the fill device.
- Close both valves on the fill device
- Remove the hose and fitting from the container, and connect the fluid fill device to the inlet fitting on the pump head (the fitting with the needle valve).
- Open the fill valve (needle valve) on the pump, and then open the two plastic valves on the fluid fill device.
- Switch the hand pump to the pressure function, and apply a maximum of 15 psi of pressure to the fluid in the chamber. Once pressure is achieved, close the TOP valve and disconnect the hand pump. There is now pressure pushing the barrier fluid into the leak detection system.
- Move the hand pump to the outlet side of the system, switch it to the vacuum function, and continue with the filling process as outlined in the main document.

9.0 Maintenance

9.1 Switch Setpoint Adjustment

If the optional switch is purchased, the standard pressure switch is set to actuate at 20 psig.

Use the following procedure to perform a pressure setpoint adjustment:

1. Disconnect the alarm circuit from the vacuum switch.
2. Remove the switch enclosure cover and loosen the knurled locking ring on the switch.
3. Rotate the hex adjusting ring counterclockwise to increase or clockwise to decrease the setpoint.
4. Verify the new setpoint (refer to the next section).
5. Repeat steps (3) and (4) above until the required setpoint as attained.
6. Tighten the switch locking ring and replace the switch enclosure cover.
7. Reconnect the alarm circuit to the switch.

Use the following procedure to perform a setpoint adjustment test

8. Remove the switch cover and connect ohmmeter leads across the common terminal and the other terminal used in operation (NO or NC).
9. Record the status of the switch (open or closed).
10. Pressure: remove the pressure gauge, and install a hand pump or other means of producing a small amount of pressure in the system.
11. Observe the ohmmeter to detect actuation.

The setpoint can be observed by reading the pressure gauge upon actuation.

10.0 PULSAlarm® Diaphragm Maintenance

WARNING

After diaphragm failure, pressurized process fluid can be present in any part of the PULSAlarm® ® leak detection vacuum system. Take appropriate precautions and handle with care.

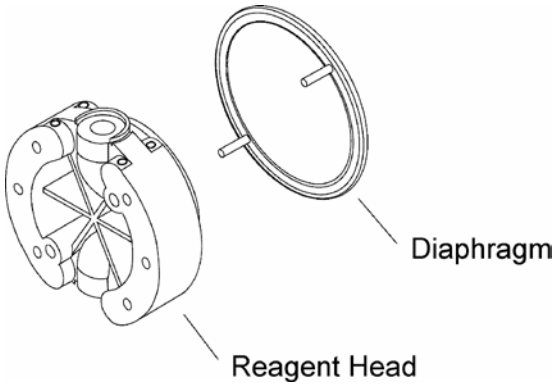


Figure 10 – diaphragm and head orientation

11.0 PULSAlarm® Diaphragm Removal

Use the following procedure to remove the Leak Detection Diaphragm:

1. Disconnect the power source to the drive motor.
2. Relieve all pressure from the piping system, and close the inlet and outlet shutoff valves
3. Take all precautions to prevent environmental and personnel exposure to hazardous materials.
4. Place a suitable container underneath the pump head to catch any liquid leakage.
5. Disconnect process piping and drain any process liquid, following material safety precautions.
6. Remove all but one top reagent head bolt. Oil will leak out between the pump head and reagent head as the bolts are loosened.
7. Tilt the head and pour out any liquids retained by the check valves into a suitable container, continuing to follow safety precautions as appropriate.
8. Remove the alarm switch assembly or pressure gauge from the reagent head.
9. Remove the bleed valve assembly and flat gasket from the reagent head.
10. Rinse or clean the reagent head with an appropriate material.
11. Remove the diaphragm by running a blunt blade along the periphery and prying it out.

12.0 Inspection

Remove and inspect the diaphragm assembly. It may have taken a permanent convex/concave set as a result of normal flexure and conformance to the dish-plate. This condition is normal and is not cause for replacement. The diaphragm must be replaced if it is deformed, dimpled, or obviously damaged.

If the diaphragms have been removed from the spacer ring, the entire assembly should be replaced to ensure proper sealing of its components.

12.1 PULSAlarm® Diaphragm Reinstallation

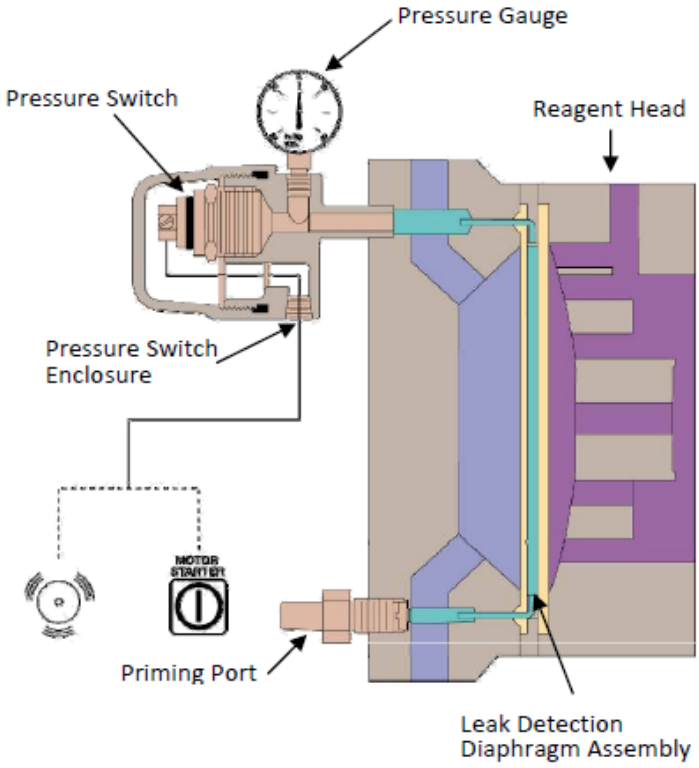
1. Ensure that the critical sealing areas of diaphragm assembly, reagent head, and pump head are clean and free from debris. Align the diaphragm assembly capillary tubes with mating holes in the seal groove in the reagent head and position it in place against the reagent head. Ensure seating of the diaphragm sealing ring into the mating groove in the reagent head.
2. Install the reagent head bolts and tighten in an alternating pattern to ensure an even seating force. Torque to the values recommended in the Installation, Operation, and Maintenance manual appropriate to the pump.
3. Apply sealing compound to the gauge/pressure switch assembly and reinstall to the upper port on the reagent head.
4. Apply sealing compound to the fill valve assembly and reinstall to the lower port on the reagent head.
5. Open the needle valve
6. Connect a hand-held vacuum pump or other vacuum source to the vacuum port, which fits 6 mm (1/4 in.) I.D. tubing.

Diaphragm damage or decreased flow will occur if a vacuum is not drawn before the pump is returned to service.

- Re-prime the pump head hydraulic system
- If required, test pressure system operation.
- After diaphragm set-up and priming, the pump is ready to be returned to service.

12.2 Leak Detection system conversion

Leak detection system conversion information can be found in Bulletin CV-LD-0203 (vacuum to pressure system). For further conversion information and kits, please contact your local Pulsafeeder sales representative.



PULSAlarm®
LEAK DETECTION

PULSAFEEDER® ENGINEERED PRODUCTS

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