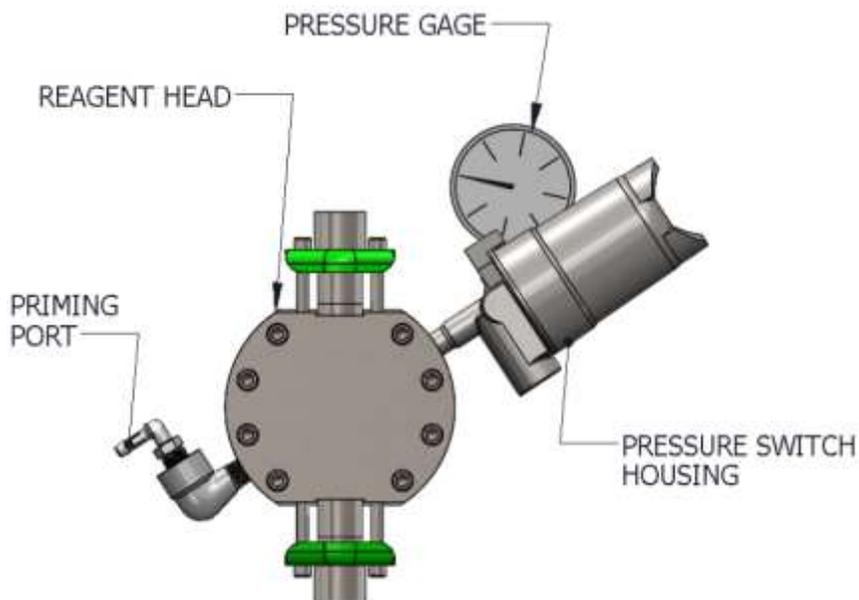


Installation, Operation & Maintenance Instruction

Models: Pulsa Series[®], Pulsar[®], PulsaPro[®]



DEMKO 12 ATEX 1204081X

II 2 G Ex db IIB T5 Gb

II 2 D Ex tb IIIC T100°C Db IP66

IECEX UL 14.0118X

Ex db IIB T5 Gb

Ex tb IIIC T100°C Db IP66

PULSAAlarm[®]
**LEAK DETECTION
SWITCH ASSEMBLY**

Bulletin: IOM-PUL-1007 Rev G

**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 *PULSA*alarm 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.

Refer to Schedule Drawing NP550218 for controlled aspects of this document.

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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[®], PulsaPro[®], and Pulsar[®] 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	AM Manager	06/02/2017	Modify switch trip point settings and remove paragraph 7.4 for vacuum system priming.
F	Engineering	11/15/2019	Product Line Manger	12/15/2019	Corrected wording in Introduction. ATEX and IECEx updates
G	QA	03/15/2022	Engineering (EVB)	03/31/2022	Updated IOM based on added classifications per UL File E186527, Project 97NK17747

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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/PULSAPRO/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 Foreword

The equipment to which these instructions refer is 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 detail with respect to this description.

In case of any difficulty, please contact Pulsafeeder, Inc. Technical Service, email at proservice@idexcorp.com.

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

The following standards apply to this product:

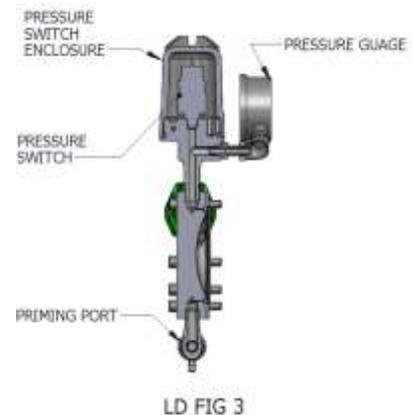
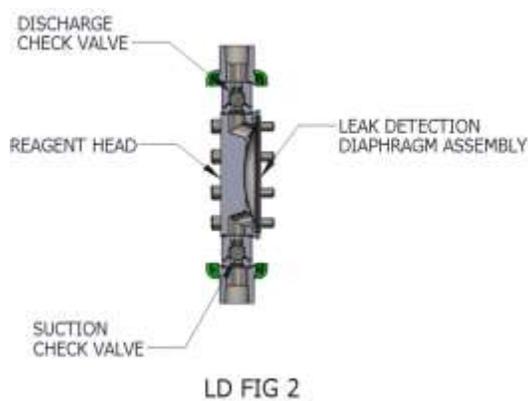
IEC 60079-0 6th Edition
IEC 60079-1 7th Edition
IEC 60079-31 2nd Edition

EN 60079-0:2012+A11:2013
EN 60079-1:2014
EN 60079-31:2014

UL 1203, UL 121201, 9th edition
C22.2 No. 30-M1986, CSA C22.2 No 213-17, 3rd Edition
CSA C22.2 No 14, 13th Edition

3.0 Introduction

Reciprocating diaphragm metering pumps require a flexible diaphragm to separate the fluid that is being pumped from the hydraulic fluid that is moving diaphragm back and forth causing its pumping action. To be certain that the diaphragm is properly sealed the PULSAlarm® Leak Detection System can be included. It uses a special dual layer diaphragm. When one layer of this diaphragm fails, it passes system pressure to an indicating pressure switch known as the *PULSAlarm®* Leak Detection Switch Assembly. It has been designed to operate in a variety of industrial environments including hazardous locations.



4.0 EXPLOSIVE ATMOSPHERE SAFETY



CAUTION: TO PREVENT IGNITION OF HAZARDOUS ATMOSPHERES, COVER MUST BE TIGHT WHILE CIRCUITS ARE ENERGIZED. DISCONNECT FROM POWER SUPPLY CIRCUIT BEFORE OPENING ENCLOSURE



WARNING: When Installing in Class I, Division 1 locations, To Reduce the Risk Of Ignition Of Hazardous Atmospheres, All Conduit Runs Must Have A Sealing Fitting Connected Within 18 Inches Of This Enclosure.



EXPLOSION HAZARD: DO NOT CONNECT OR DISCONNECT WHEN ENERGIZED.

Under expected operating conditions, and with the proper marking, this equipment is suitable for use in:

- CLASS I , DIVISION 1, GROUP C, D
- CLASS I , DIVISION 2, GROUP A, B , C , D
- CLASS II, DIVISION 2, GROUP F, G
- DEMKO 12 ATEX 1204081X
 - II 2 G Ex db IIB T5 Gb
 - II 2 D Ex tb IIIC T100°C Db IP66
- IECEX UL 14.0118X
 - Ex db IIB T5 Gb
 - Ex tb IIIC T100°C Db IP66
- Non-Hazardous Locations

5.0 ATEX / IECEx Nameplate and Marking

PULSAlarm® Leak Detection Switch Assembly has a standard rating nameplate which includes Hazardous Location data, Markings, Ratings, and universal identification information as required by the applied directives.



Agency certificate number and ratings

Manufacturer name and address

ATEX Marking	IECEx Marking
I – Notified body for Quality System	I – Explosive atmosphere
II – Explosive Protection	II – Protection Methods – flameproof enclosure
III – Gas Group	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	



Design ambient temperature range "Ta"

Unless differently agreed with the customer, can be:

-20°C ≤ Ta ≤ +40°C: standard temperature range for all type of pumps

5.0 Theory of Operation

The PULSAlarm® leak detection system utilizes a two-layer PTFE diaphragm, coupled to the PULSAlarm® Leak Detection Switch Assembly by a contained barrier fluid – typically silicone oil.

During normal pump operation, the two layers of the PTFE diaphragm bear directly against one another, and there is no fluid pressure generated between the two layers. The attached pressure gage reads 0 and the pressure switch does not operate.

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 with a failed diaphragm, liquid will be pulled into the space between the diaphragm layers. As the pump continues to operate it will generate a pulsating pressure that will be transferred by the barrier fluid to the gage and PULSAlarm® pressure switch.

When the fluid pressure is greater than 20 psi (1.37 bar) the switch will operate signaling a failure. The output of the switch can signal the failure of the diaphragm - both normally open and normally closed contacts are standard.

It is recommended that the pump be stopped in the event such a leak is detected. Immediate attention to the problem, followed by cleanup and appropriate maintenance, will avoid further damage to the pump.

6.0 Setup – Pump with Leak Detection

Pumps incorporating 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. Installed pressure gages will indicate 0 pressure during normal operation and greater than 1 bar (15 psi) when a failure has occurred. When the PULSAlarm® switch assembly is provided it must be installed and wired properly to comply with its hazardous location ratings. Device shall be wired according to NEC/CEC requirements for area of installation.

7.0 Setup - Switch Assembly



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.



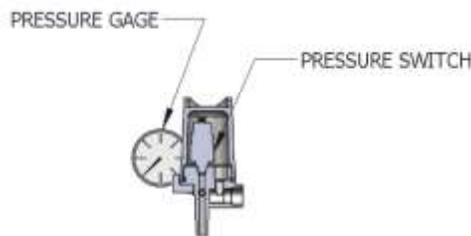
To reduce the risk of ignition of hazardous atmospheres, conduit runs must have a sealing fitting connected within 18 inches of the enclosure for Class I, Division I applications (NEMA 7). For Zone 1,2 applications, a seal shall be installed within 50 mm of the enclosure (IECEx/ATEX).



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.



In North America installations, the external supplemental ground is not to be used. Rigid metal conduit (RMC) will act as the supplementary ground.



LD FIG 4

If equipped with an optional pressure switch (shown in LD FIG 4), install electrical wiring and conduit in accordance with local electrical codes.

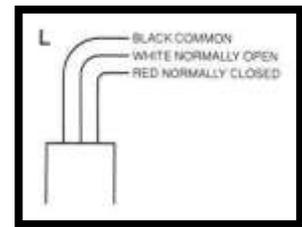
The PULSAlarm® switch is rated as follows:

Voltage	115 VAC
Phase	Single
Load	1.0 Amp (Resistive)
Contacts	NO/NC (SPDT)
Connection	Flying Leads, 20AWG
Max. Press.	3000PSI

Electrical Connections

The switch is the SPDT (single pole, double throw) type and can therefore be setup 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



8.0 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.



9.0 PULSAlarm® Leak Detection Diaphragm

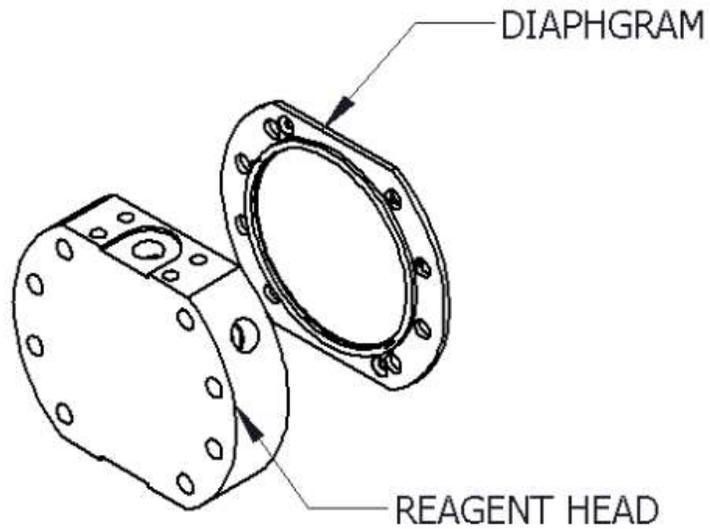
Double, or sandwiched, PTFE diaphragms are sealed at their peripheries to an intermediate metal spacer ring. The space between the diaphragms is sealed so that the diaphragm functions like a standard single diaphragm. The space between the diaphragms is filled with a small amount of fluid. This space is connected to an electrical switch (optional) that actuates in response to a 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.



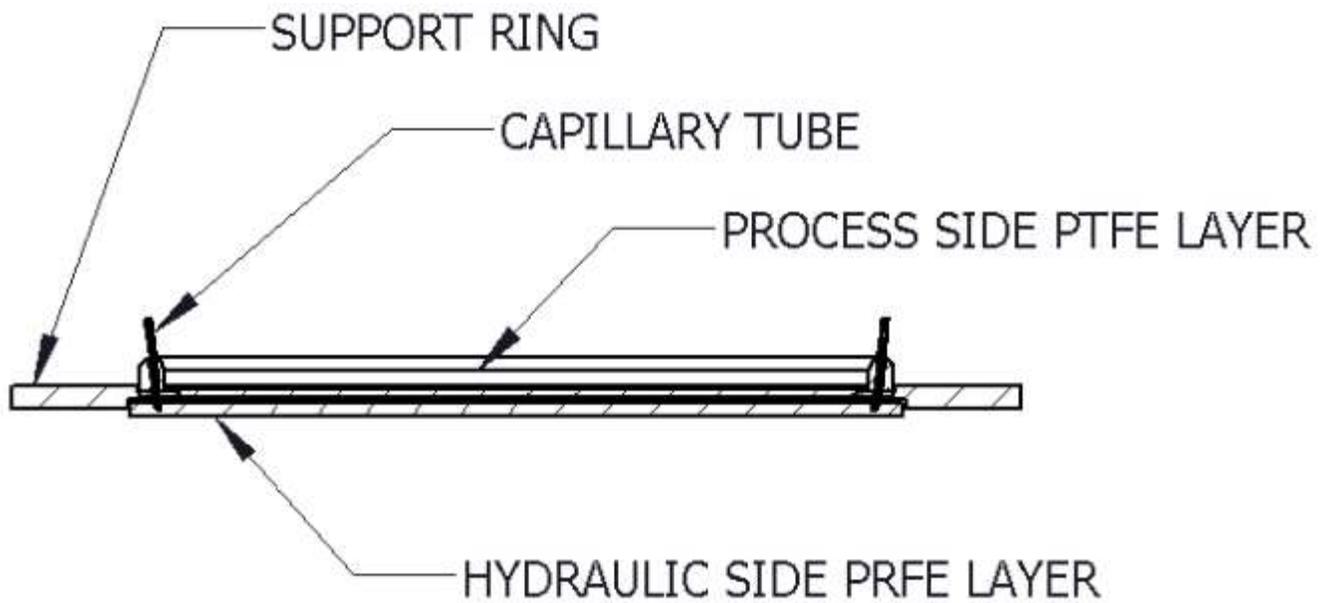
During installation, ensure that adequate space is available around the reagent head assembly to allow for service of both the pressure switch and the diaphragm assembly.

10.0 Diaphragm Construction



NOTE

In some cases, diaphragm components are retained with adhesive. It is not present for sealing purposes.

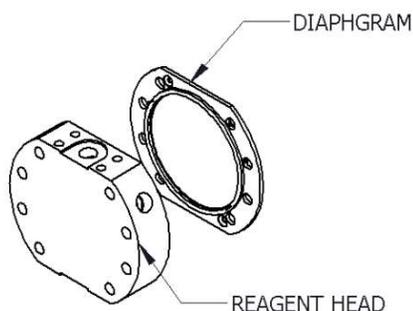


Diaphragm construction

11.0 PULSAlarm® Diaphragm Maintenance



After diaphragm failure, pressurized process fluid can be present in any part of the PULSAlarm® Leak Detection System. Take appropriate precautions and handle with care.



Diaphragm and head orientation

11.1 PULSAlarm® Diaphragm Removal



BE SAFE – FOLLOW ALL APPLICABLE SAFETY PROCEDURES BEFORE MAINTENANCE. ASSURE THE ENVIRONMENT IS SAFE, USE PERSONAL PROTECTIVE EQUIPMENT APPROPRIATE TO THE JOB, RELEASE ANY STORED ENERGY (E.G., PRESSURE IN SYSTEM PIPING AND PUMP HYDRAULICS) AND CONTROL UNINTENDED OPERATION (E.G., APPLY LOCK-OUT/TAG-OUT PROCEDURES

Use the following procedure to remove the Leak Detection Diaphragm:

1. Disconnect the power source to the drive motor (apply all necessary engineering controls – e.g., lockout-tagout).
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. Rinse or clean the reagent head with an appropriate material.
10. Remove the diaphragm by running a blunt blade along the periphery and prying it out.

11.2 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 support ring, the entire assembly should be replaced to ensure proper sealing of its components.

11.3 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 threads and reinstall to the upper port on the reagent head.
4. Apply sealing compound to the fill valve assembly pipe plug and reinstall to the lower port on the reagent head.
5. 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.

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

12.0 Barrier Fluid Setup

The barrier fluid 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.



Pulsafeeder supplies low viscosity silicone oil standardly.

System identification is noted on the switch cover nameplate, and on your Pulsafeeder pump nameplate.

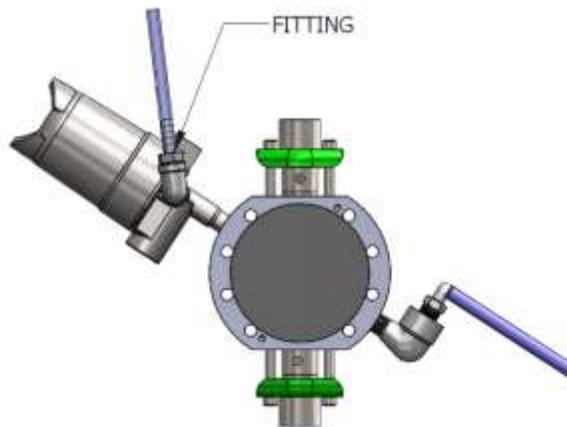


The barrier fluid used to prime the system will vary with the application. The fluid selection must be compatible with the materials of construction used in the diaphragm and detection assembly. It should also be compatible with the process fluid and the process conditions.



BE SAFE – FOLLOW ALL APPLICABLE SAFETY PROCEDURES BEFORE MAINTENANCE. Assure the environment is safe, use personal protective equipment appropriate to the job, relieve any stored energy (e.g., pressure in system piping and pump hydraulics) and control unintended operation (e.g., apply lock-out/tag-out procedures).

1. Assure the equipment is safe to work on by following established rules and using good common sense (e.g., be sure the air surrounding the work is not hazardous, use the proper Personal Protective Equipment, relieve pressure/drain fluid from piping, and lockout the pump motor).
2. Follow complete re-assembly of the diaphragm, reagent head, and external components. Ensure that reagent head and tie-bar bolts are tightened evenly according to the appropriate torque specifications. Refer to the pump operating manual for further information.
3. Remove the pressure gauge from the housing body and replace it with a straight tubing adaptor fitting with a short piece of clear tubing as shown. This will be referred to in this document as the “outlet side”.

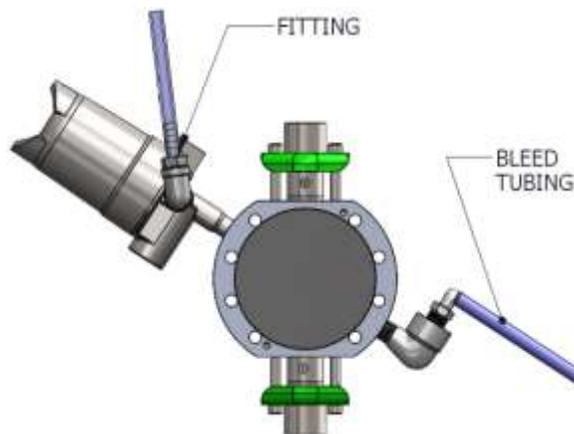


Fitting for priming “outlet side”

4. Remove the plug from the elbow on the front of the reagent head and install a hose adaptor fitting. Attach a length of clear tubing that will be long enough to go to the bottom of the container of barrier fluid. This will be referred to in this document as the “inlet side”.
5. Connect a hand vacuum pump to the tubing on the outlet side. This will be used to pull the barrier fluid into the system.
6. Open the bottle of barrier fluid and run the tubing on the inlet side so the end

near the bottom. **Try to hold the bottle so that the bottom is at the same level as the inlet side fitting.**

7. Squeeze the handle of the vacuum pump several times. You should see the fluid start to move from the bottle through the clear tubing into the inlet fitting. Be patient because the fluid needs to travel through several small capillary tubes in the assembly and past a check valve.
8. Keep working the vacuum pump to keep vacuum on the system until you see the barrier fluid in the tubing on the outlet side.
9. Watch the fluid at the outlet (vacuum pump) side. The fluid may appear to bubble. Large bubbles are usually due to leakage of the fitting you are using to attach the tubing on the outlet side fitting. Small bubbles (foaming) can happen when the vacuum is too high – causing the fluid to boil at room temperature. If bubbles occur, keep pumping the vacuum pump slowly. Stop when you can see a level of fluid in the outlet side tubing (not just bubbles) without any vacuum pressure.
10. Release the vacuum to check for a clear level of fluid in the outlet side tubing. If there is no level restore the vacuum by pumping the pump and return to the previous step.
11. With the vacuum released, remove the fitting with tubing from the inlet side connection.
12. Be sure the elbow on the inlet side won't trap any air bubbles when you put the pipe plug back in the fitting. To be sure you should refill the elbow with barrier fluid by pouring fluid into the fitting opening until it is overflowing. Use another container to catch any fluid that might spill.
13. Apply pipe dope to the pipe plug threads and tighten it into the inlet side elbow. Remove any drips on the fitting with a rag.
14. Squeeze the handle of the vacuum pump again and allow the 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 from the tubing (leaving the outlet side tubing in place).



Bleed tubing placement

15. Check the pump to be sure that all the oil levels show full. Some pumps have more than one type of oil (for example gear oil in one part and hydraulic oil in another). Refer to the Pump manual for further instruction.
16. If the pump is not already hydraulically primed, re-prime it now using the

procedure found in the Pump Operating Manual. 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.

17. In order to fully balance and remove air from 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 and air is fully evacuated from the system.
18. Remake any process connections that were broken to the suction and discharge of the pump. Check that the system is safe for operation.
19. Restore/replace any covers to the pump that may have been removed.
20. In hazardous locations the PULSAlarm cover must be threaded onto the fitting and locked using the lock screw.
21. Remove any safety related engineering controls (lockout/tagout).
22. If possible, adjust any discharge pressure devices to their lowest settings.
23. Adjust the pump stroke length to its 0% setting.
24. Apply power to the pump motor and start the pump.
25. Slowly increase the pump stroke length from 0% to 100%.
26. Slowly increase the discharge pressure to full operating pressure.
27. Continue to run the pump. 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.
28. After 30 minutes of operation, stop the pump motor.
29. Remove the tubing and connection from the housing body and reinstall the pressure gauge. Use thread sealing pipe dope to seal the fitting.
30. Verify the connections to the alarm switch if they were disturbed during maintenance.
31. The pump and pressure leak-detection system are now properly prepared and ready for normal service.



NOTE

During normal operation, the gauge should indicate 0 (zero) pressure.



NOTE

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.



NOTE

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

Bulletin: IOM-PUL-1007 Rev G

PULSAalarm[®]
LEAK DETECTION
SYSTEM



A unit of IDEX Corporation
2883 Brighton Henrietta Town Line Road
Rochester NY 14623
+1 (585) 292-8000
pulsa.com
pulsa@idexcorp.com

IDEX
FLUID & METERING