MILTON ROY

The force in pump technology

INSTRUCTION MANUAL

FOR INSTALLATION,
OPERATING, AND
MAINTENANCE

PRIMEROYAL® LIQUID END METALLIC DIAPHARGM

Instruction manual

This manual should be made available to the person responsible for installation, operating, and maintenance

DATE: 09/18/2020 *PN: 57228* *REV: 02*

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PART I – DESCRIPTION

I – 1. UNPACKING AND STORAGE

UNPACKING

The packaging must be carefully examined on receipt in order to ensure that the contents have not sustained any obvious damage. Precautions must be taken when opening the packaging to avoid damaging accessories which may be secured inside the packaging. Examine the contents and check them off against the delivery note.

STORAGE PRECAUTIONS

- Storage for less than six months

  Equipment shall preferably be stored in its original packaging and protected from adverse weather conditions.

- Storage for more than six months

  - Grease all visible unpainted sections. Rubber parts (such as semi-flexible couplings) must be protected from sunlight and sudden temperature changes.
  - Store the pump in its original packaging. In addition, packaging in heat-sealing plastic cover and desiccant bags must be provided for. The quantity of desiccant bags should be adapted to the storage period and to the packaging volume.
  - Store protected from adverse weather conditions.

I – 2. DESCRIPTION

The PRIMEROYAL Pump is a compact electro-mechanical metering pump, oil-lubricated with a sealed housing, allowing adjustment of its capacity when stopped or in operation. It is designed for industrial operation in continuous mode. It is made up of the following items:

- a driving device consisting of a motor
- a mechanical assembly
- a liquid end assembly

I – 3. SAFETY AND HEALTH INSTRUCTIONS

The personnel responsible for installing, operating and maintaining this equipment must become acquainted with, assimilate and comply with the contents of this manual in order to:

- avoid any possible risk to themselves or to third parties
- ensure the reliability of the equipment
- avoid any error or pollution due to incorrect operation

Any servicing on this equipment must be carried out when it is stopped. Any accidental start-up must be prevented (either by locking the switch or removing the fuse on the power supply line). A notice must be attached to the location of the switch to warn that servicing is being carried out on the equipment.

During oil changing operations, the waste oil must be collected in a suitable receptacle. Any overflow of oil which may result must be removed using a degreasing agent suitable for the operating conditions.

Soiled cleaning cloths must be stored in suitable receptacles. The oil, degreasing agent and cleaning cloths must be stored in accordance with the rules on pollution.

Switch off the power supply as soon as any fault is detected during operation: abnormal heating or unusual noise.

Special care has to be taken for chemicals used in the process (acids, bases, oxidizing/reducing solutions, etc).

PART II – INSTALLATION

II – 1. HYDRAULIC INSTALLATION

GENERAL

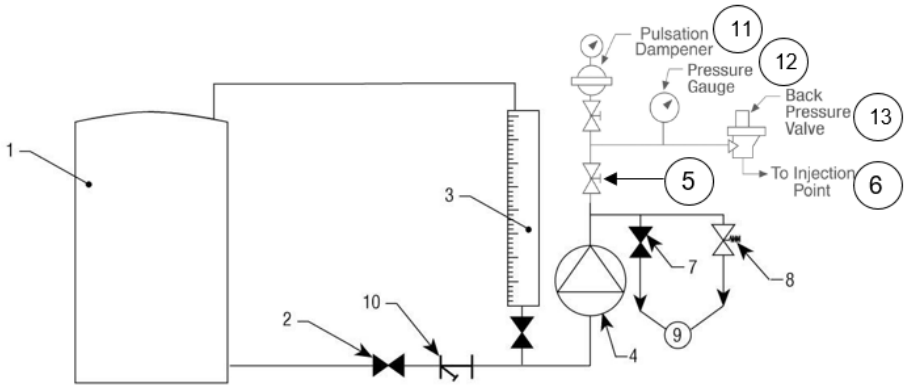
- Piping layout
  - There must be no swan-necks or stagnant volumes which can trap air or gas
  - Stresses due to incorrect alignment of piping with respect to the centerline of valves must be avoided as far as possible
- Remove burrs and clean the piping before fitting
- It is advisable to provide for a calibrating chamber in order to calibrate the pump in service conditions

PIPING ON THE SUCTION CIRCUIT

- Provide for a filter with suitable mesh size upstream of the pump
- Check whether the diameter and length of pipe are compatible with the pump's maximum capacity

PIPING ON THE DISCHARGE CIRCUIT

- Provide for a safety valve on the discharge pipe, designed to protect the installation
- It is advisable to install a priming valve on the discharge circuit in order to make starting and maintenance of the pump easier



1	Tank	7	Priming valve
2	Suction piping isolating valve	8	Safety valve
3	Calibrating chamber	9	Return
4	Pump	10	Filter
5	Discharge piping isolating valve	11	Discharge Pulsation Dampener
6	Utilization	12	Pressure Gauge with diaphragm seal
		13	Backpressure / Anti-siphoning Valve

Fig. 1: Installation example

II – 2. DRIP COLLECTION

- It is recommended to install a drain system to collect the leakage and the drip, especially if the liquid pumped is harmful

PART III – START UP

III – 1. PROCEDURES BEFORE START UP

Special care has to be taken for chemicals product used in the process
(acids, bases, oxidizing / reducing solutions, etc.).

- Check the opening of all isolating valves installed on the suction and discharge circuits. Disconnect discharge circuit (caution to the liquid pumped). This procedure is to verify that there is liquid present (pump is installed in flooded suction), or to prime the pump (pump installed in suction lift)
- Check that the pump capacity is set to "0%" (hand-knob)

III – 2. START UP

- Once all the checks and procedures described in the previous section have been carried out, start up the pump
- Check visually and by listening. (check that there are no suspicious noises)
- Make sure that the hand-knob is unlocked
- Proceed to the degassing (pump with diaphragm liquid end only)
  (Part VI - Servicing the liquid end)
- Adjust the pump capacity gradually from 0 % to 100% and control the liquid output at priming valve
- As soon as the liquid to be pumped flows out of the priming valve, priming on the process side has been achieved. Close the priming valve or reconnect the discharge pipe, as applicable.
- Once the priming is obtained, adjust the pump to the desired capacity.
- Lock the hand-knob with the locking screw

III – 3. FAILURE ON START UP

The flow rate is lower than desired

- The pump capacity is incorrectly adjusted:
  - adjust the capacity to the desired value and lock the hand-knob
- The suction power is insufficient (pipe cross-section too small or pipe too long):
  - replace the pipe with ones that have a larger cross-section or install the pump in flooded suction
- The leak-tightness of suction pipe is unsatisfactory
- The viscosity of the liquid is incompatible with the pump's capabilities

The capacity is greater than desired

- The stroke adjustment of debit of the pump is incorrect
  - to adjust the debit to the wanted value
- A syphoning phenomenon is observed:
  - check if the suction pressure is not superior to the discharge pressure. If so, it is necessary to place a back-pressure valve on the discharge line.

The capacity is variable

- This problem may be due to particles from the piping which interfere with the operation of the valve assemblies
  - clean the piping and the valve assemblies (by checking the assembly sequence of different components

III – 4. SCHEDULE FOR CHECKS AND MAINTENANCE OPERATIONS

The program of checks and maintenance operations depends on the conditions in which the equipment is used. For this reason, the following frequencies are given as an example only. Individual users should adapt these frequencies to their own specific operating conditions.

When?	Check	Maintenance	Reference
After first 2000 hours		Change lubricating oil (mechanical and hydraulic oil)	Chapter IV-1
Every month	Check the oil level of the housing and the spacer -if incorrect →	Trace lubricating oil leak	
Every 3 months	Check the oil temperature if > 167°F (75°C) →	Verify -the date of the last oil change -the oil contamination -the equipment operating conditions	
Every 8 000 hours or 1 year		Change lubricating oil (mechanical and hydraulic) Change the filter	Chapter IV-1
Frequency to be defined according to process	Check conformity of capacity	Check the pump capacity	Chapter IV-2

MAINTENANCE SHEET

Pump Code:

Contract Number:

Liquid Pumped:

Intervention	Date	Functioning hours	Comments

PART IV – ROUTINE MAINTENANCE

IV – 1. OIL CHANGE

To avoid any risk of burning by the hot oil, protective gloves must be used

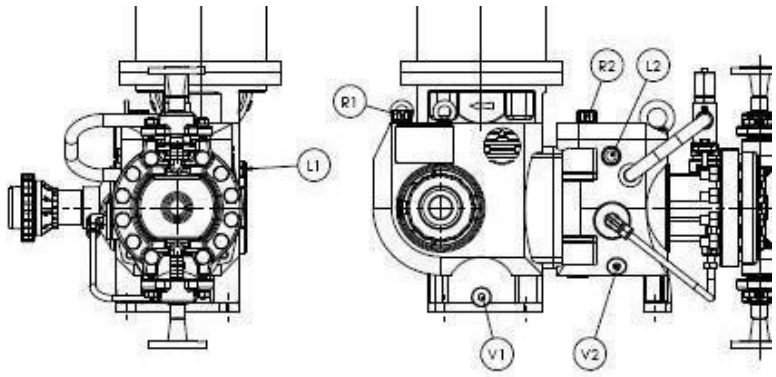
1. Perform the first oil change after 2000 hours of operation. Subsequent oil changes will be carried out every 8000 hours operation or every 1 year
2. Disconnect the pump electrically, check that the equipment cannot be switched on accidentally. Put a notice at the location of the switch

LIQUID END OIL CHANGE

1. Unscrew the plug **[V2]** and drain the oil into a tray.
2. Remove any overflow of oil immediately with a suitable degreasing agent for the operating conditions
3. Replace the filter
4. Degrease and fit the plug **[V2]**
5. Fill up the housing to the middle of the oil level indicator **[L2]** with a hydraulic oil. Fill up the displacement chamber by the safety valve hole

Use hydraulic oil suitable for diaphragm liquid end service conditions.
Quantities listed in the table below

PUMP MODEL	QUANTITY
PK	0.8 Gallons (3 Liters)
PL	2.5 Gallons (9.5 Liters)
PN	5 Gallons (19 Liters)



R1	Mechanical oil level filling plug
R2	Hydraulic oil level filling plug
L3	Mechanical oil level
L2	Hydraulic oil level
V1	Mechanical oil drain plug
V2	Hydraulic oil drain plug

IV – 2. OTHER MAINTENANCE OPERATIONS

CHECKING THE PUMP CAPACITY

This is a question of determining the straight line representing the pump's capacity according to its adjustment. Four measurements are sufficient (adjustment at 100%, 75%, 50% and 25%).
There are two possible methods:

1. **If the pump is installed in pressurizing mode**

   Measure the volume of pumped liquid in a calibrating chamber for a given period.
   It may be necessary to reproduce actual operating conditions (suction pressure).

2. **If the pump is installed in suction mode**

   Measure the volume of discharged liquid. It may be necessary to reduce actual operating conditions (discharge pressure).

The first method is recommended. In addition, this method avoids placing the operator in contact with the liquid, which is important if the pumped liquid is hazardous. For a precise check, it may be necessary to use an electromagnetic flow-meter.

IV – 3. TRACING CAUSES OF FAILURE

THE PUMP PRODUCES NO FLOW

- The pump capacity is adjusted to « 0 % »
  - Adjust the capacity to the desired value and lock the hand-knob.
- Check the leak-tightness of the piping safety valve
- The liquid end is not primed
  - release the pressure on the discharge pipe and prime the liquid end, or check the leak-tightness of the suction circuit
- The balls of the valve assemblies are blocked by particles
  - clean or replace the valve assemblies
    - First, check whether the presence of the particles in the valve assemblies is normal and take corrective action if necessary

If the problem is not solved check the mechanical assembly and liquid end functioning

THE PUMP DOES NOT PROVIDE THE REQUIRED FLOW RATE

- The pump capacity is incorrectly adjusted
  - adjust the capacity to the desired value and lock the hand-knob
- The valve assemblies are blocked by particles
  - clean or replace the valve assemblies
- The suction circuit leak-tightness is unsatisfactory

IV – 4. ORDERING SPARE PARTS

To make it easier to register your order for spare parts and ensure a quick delivery, please provide us the following details:

- Information on the pump: type and contract number. These two items of information are shown on the identification plate mounted on the pump
- Information on the spare part: reference, description and quantity. These items of information are specified in the spare parts list supplied with the pump

PART V – PREVENTATIVE MAINTENANCE

V – 1. GENERALITIES

The preventive maintenance consists in replacing the wear parts included in a "spare parts kit". These kits are available on request from the spare part department

The corresponding action is detailed in the chapter VI: Servicing the liquid end assembly

V – 2. LIQUID END ASSEMBLY PREVENTIVE MAINTENANCE

Renewal	Frequency* (hours)
Plunger and plunger connection	15,000
Diaphragm (for the diaphragm liquid end))	15,000
Check valves	8,000

* Approximate hours number when operating under max performances and normal using conditions

V – 3. HYDRAULIC OIL CHARACTERISTICS

PUMP MODEL	OIL TYPE	REFERENCE	QUANTITY	MOBIL OIL	TEMPERATURE MINIMUM	TEMPERATURE MAXIMUM	EQUIVALENCY
PK	Standard	20040	1qt. (.95L)	SHC-524	-40°F (-40°C)	176°F (80°C)	AEROSHELL FLUID 41
PL / PN		56980	10qt. (9.5L)				
PK	Food Grade	57876	1qt. (.95L)	SCH CIBUS 150			OPTILEB HY 32
PL/PN		57877	10qt. (9.5L)				

PART VI – SERVICING THE LIQUID END ASSEMBLY

VI – 1. GENERAL

REMARKS

- By measure of simplification, the described procedures do not mention the washers fitted with fasteners (such as screws and nuts) and the magnet

  Do not to forget to assemble the washers behind the screw and nuts

- Some parts have been bonded during the workshop assembly. Clean the residual glue before a second assembly
- Replace the seal at each servicing

PRECAUTION

- Special care must be taken for chemicals used in the process
  - acids, bases, oxidizing/reducing solutions, etc.
- Provide for the rinsing of the liquid end, if necessary, and provide for appropriate protective equipment
- Check that there is no pressure and the temperature of components before starting to dismantle. Before all servicing perform the following operations:
  - Adjust the pump capacity at « 0% »
  - Disconnect the electrical power Any accidental start-up must be prevented. position a notice at the switch location to avoid start up.
  - Disconnect the hydraulic power if used
- Drain the oil from the housing (refer to chapter IV-1 oil change)

DEGASSING

Pressurize the displacement chamber

Pressurize the return circuit (if necessary by closing the return circuit valve, to force the safety valve to release any air contained in the displacement chamber). Gradually increase the pump flow until the safety valve begins to clear oil in the lantern.

Degassing the double diaphragm (liquid end with double diaphragm)

Stop the pump (if it is running). Adjust the pump capacity to 10 or 20 %. Open the bleed **[022]**. (refer chapter Assembly/disassembly of the detection). Start the pump. Wait about 15 minutes and adjust the pump to the desired capacity. Close the bleed **[022]** when the required flow rate has been reached (after about 1 hour in operation).

VI – 2. PRINCIPLE OF THE LIQUID END

Liquid end with single diaphragm

During the suction phase, the displacement of the piston creates a partial vacuum in the displacement chamber. The diaphragm is hydraulically coupled to the piston and will suck a set volume (capacity) of fluid through the valve box and into the feed unit body. The other valve box seals off the return circuit.

The process is then inverted and the return phase begins. The piston compresses the hydraulic oil. The oil then exerts pressure on the diaphragm, thus forcing the liquid through the valve box. The other valve box seals off the suction circuit.

Liquid end with double diaphragm

During the suction phase, the displacement of the piston creates a partial vacuum in the displacement chamber. The first diaphragm is hydraulically coupled to the piston; the second diaphragm, being "bound" to the first, will suck a set volume (capacity) of fluid through the valve box and into the feed unit body. The other valve box seals off the return circuit.

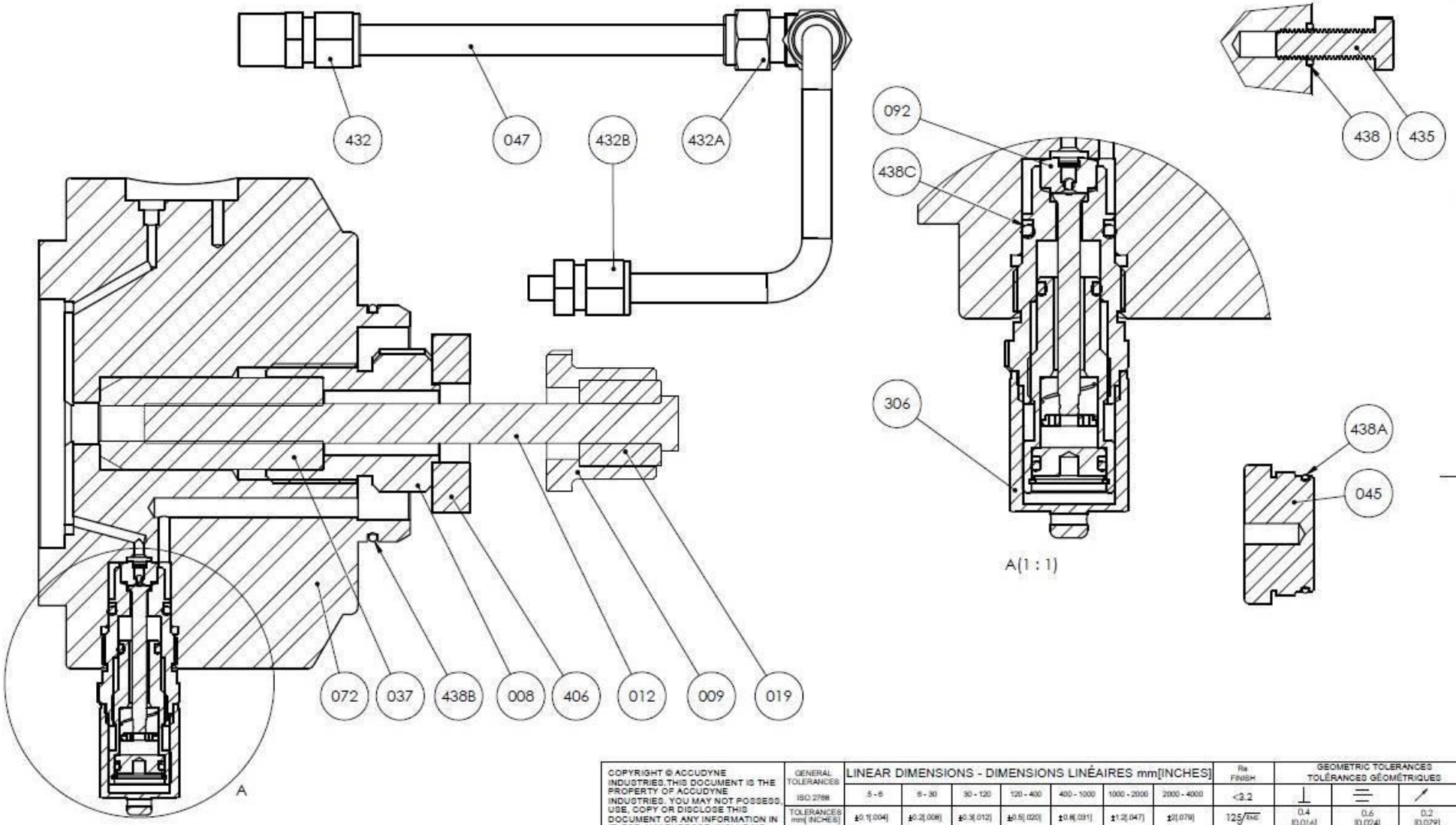
The process is then inverted and the return phase begins. The piston compresses the hydraulic oil. The oil then exerts pressure on the diaphragm pair, thus forcing the liquid through the valve box. The other valve box seals off the suction circuit.

Operating principle of the diaphragm rupture detection:

- When one of the two diaphragms ruptures, pressure is exerted between the two diaphragms and is indicated on the detection system.

Safety valve: over pressure visualization

A translucent indicator allows the pump operator to check the safety valve functionality when it exhaust over pressure.



GENERAL TOLERANCES	LINEAR DIMENSIONS - DIMENSIONS LINÉAIRES mm[INCHES]							Ra FINISH	GEOMETRIC TOLERANCES TOLÉRANCES GÉOMÉTRIQUES		
ISO 2768	5 - 6	6 - 30	30 - 120	120 - 400	400 - 1000	1000 - 2000	2000 - 4000	<3.2	⊥	=	⁄
TOLERANCES mm[INCHES]	±0.1[.004]	±0.2[.008]	±0.3[.012]	±0.5[.020]	±0.8[.031]	±1.2[.047]	±2[.079]	125√RMS	0.4 [0.016]	0.6 [0.024]	0.2 [0.079]

DESCRIPTION

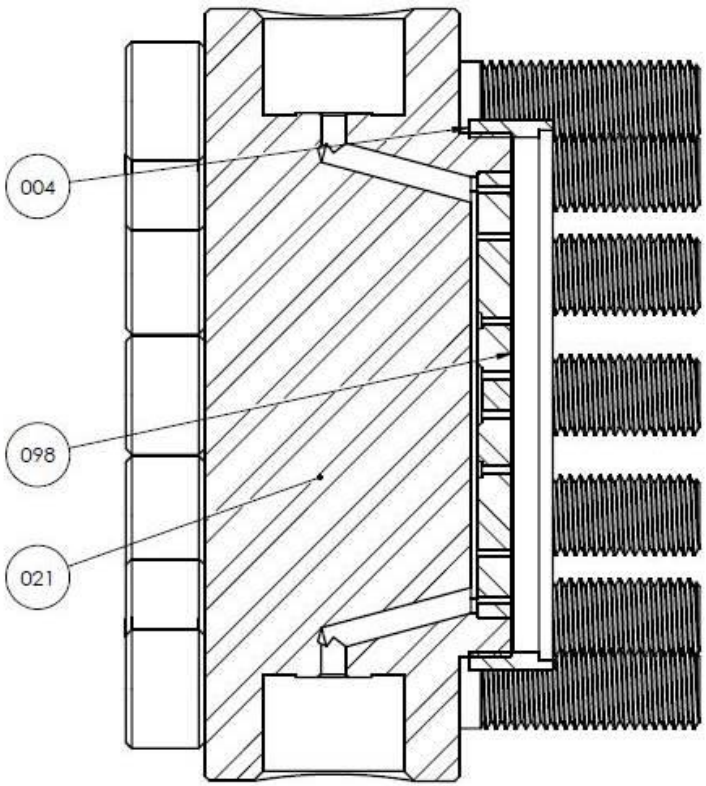
PRIMEROYAL DISPLACEMENT CHAMBER METALLIC DIAPHRAGM

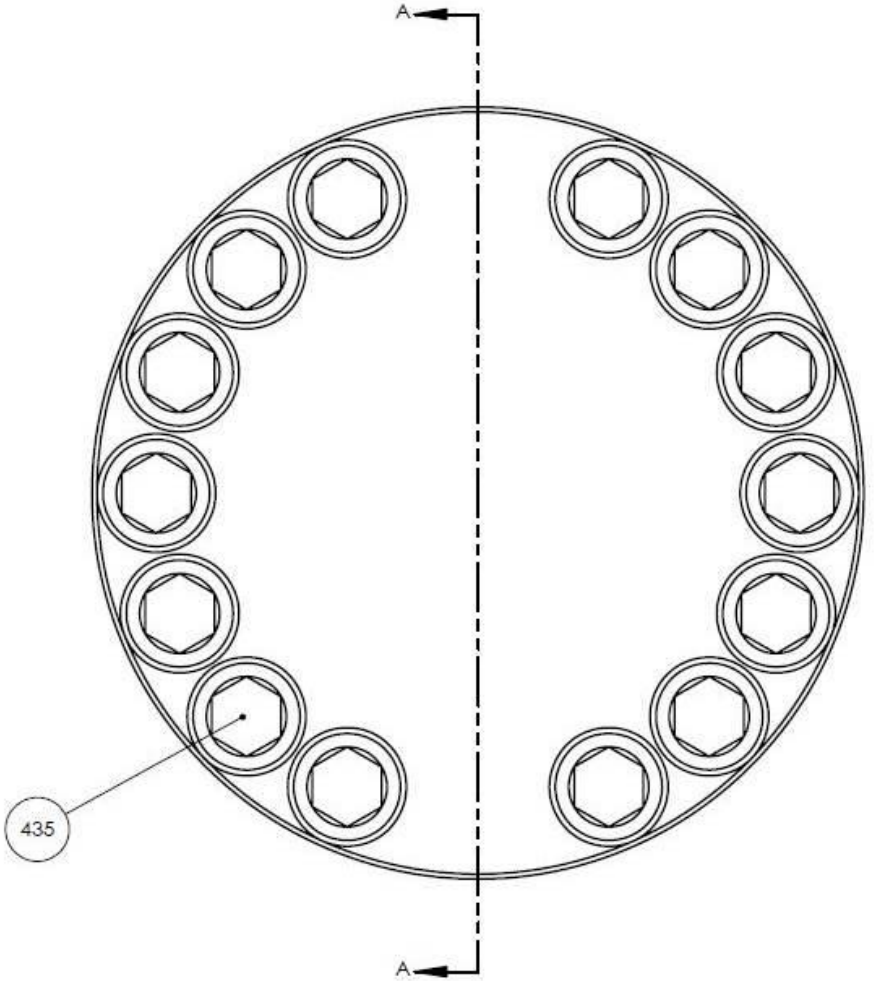
MILTON ROY

FORMAT TAILLE	FIRST ANGLE PROJECTION	SHEET - FEUILLE	SCALE	DRAWING NUMBER - PLAN N°	REV
A3		1 / 1	2:3	777000052-M	00

DATE	ECN	DESCRIPTION	Drawn - Dessiné / Visa	Checked -Vérifié / Visa	REV
11/7/2018	23030	INITIAL RELEASE	DIA	TCK	00

REVISION HISTORY





GENERAL TOLERANCES	LINEAR DIMENSIONS - DIMENSIONS LINÉAIRES mm[INCHES]							Ra FINISH	GEOMETRIC TOLERANCES TOLÉRANCES GÉOMÉTRIQUES		
ISO 2768	.5 - 6	6 - 30	30 - 120	120 - 400	400 - 1000	1000 - 2000	2000 - 4000	<3.2	⊥	=	↗
TOLERANCES mm[INCHES]	±0.1[.004]	±0.2[.008]	±0.3[.012]	±0.5[.020]	±0.8[.031]	±1.2[.047]	±2[.079]	125 RMS	0.4 [0.016]	0.6 [0.024]	0.2 [0.079]

DESCRIPTION

PRIMEROYAL LIQUID END TYPE "M", 316SS CROSS SECTIONAL VIEW

MILTON ROY

FORMAT TAILLE	FIRST ANGLE PROJECTION	SHEET - FEUILLE	DO NOT SCALE DRAWING DESSIN SANS ECHELLE	DRAWING NUMBER - PLAN N°	REV
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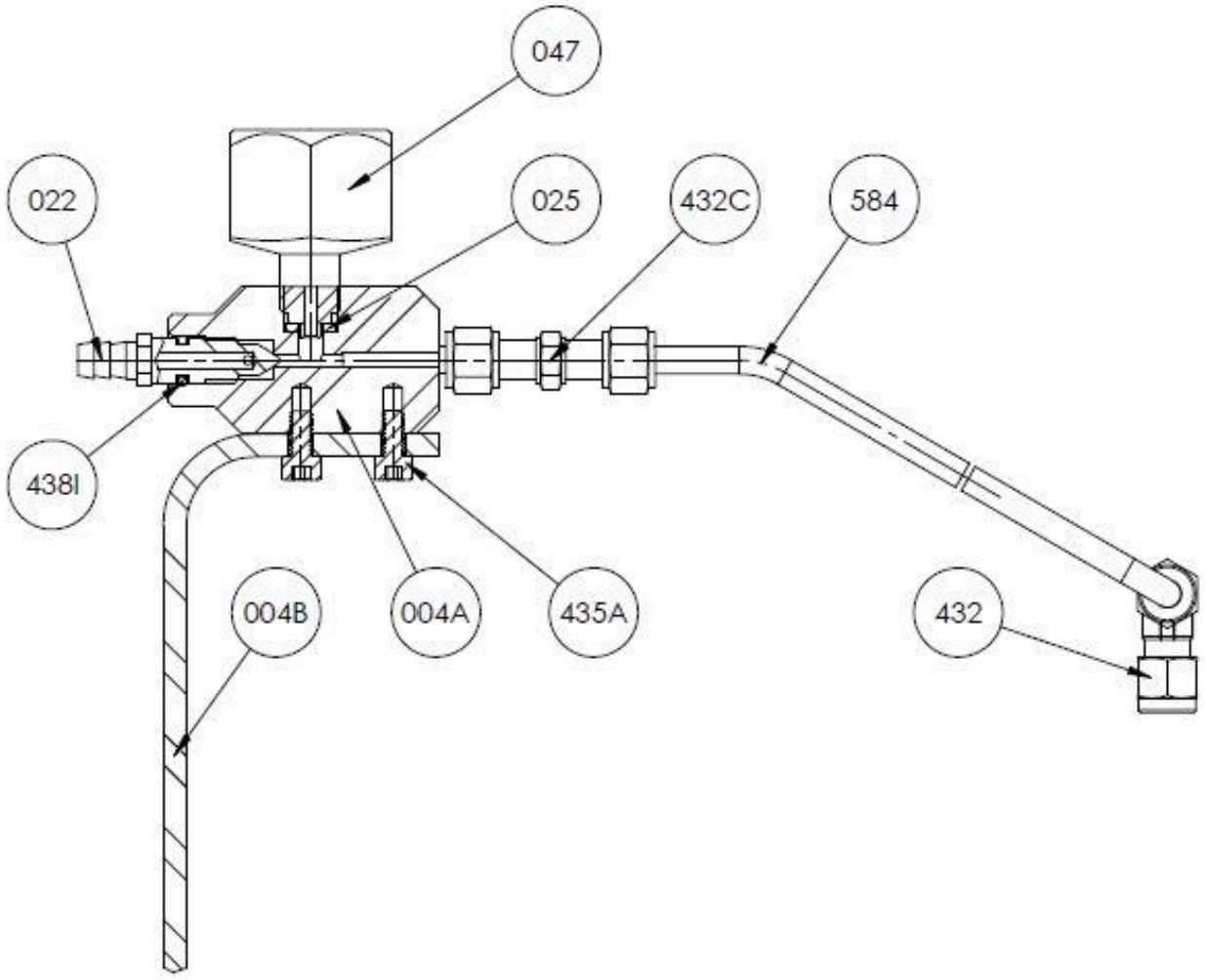

DATE	ECN	DESCRIPTION	Drawn - Dessiné / Visa	Checked -Vérifié / Visa	REV
11/28/2018	23030	INITIAL RELEASE	DIA	CJK	00

REVISION HISTORY

GENERAL TOLERANCE — LINEAR DIMENSIONS - DIMENSIONS LINÉAIRES mm[INCHES]

ISO 2768-MK	0.5 - 6	6 - 30	30 - 120	120 - 400	400 - 1000	1000 - 2000	2000 - 4000
TOLERANCES mm [INCHES]	±0.1[.004]	±0.2[.008]	±0.3[.012]	±0.5[.020]	±0.8[.031]	±1.2[.047]	±2[.079]

Ra FINISH: <3.2 | 125√RMS

GEOMETRIC TOLERANCES TOLÉRANCES GÉOMÉTRIQUES: ⊥ 0.4 [0.015] | = 0.6 [0.024] | ⁄ 0.2 [0.079]

DESCRIPTION

PRIMEROYAL M92/112 PRESSURE SWITCH LEAK DETECTION ASSEMBLY

MILTON ROY

FORMAT TAILLE	FIRST ANGLE PROJECTION	SHEET - FEUILLE	SCALE	DRAWING NUMBER - PLAN N°	REV
A4		1 / 1	2:3	777000027-M	00

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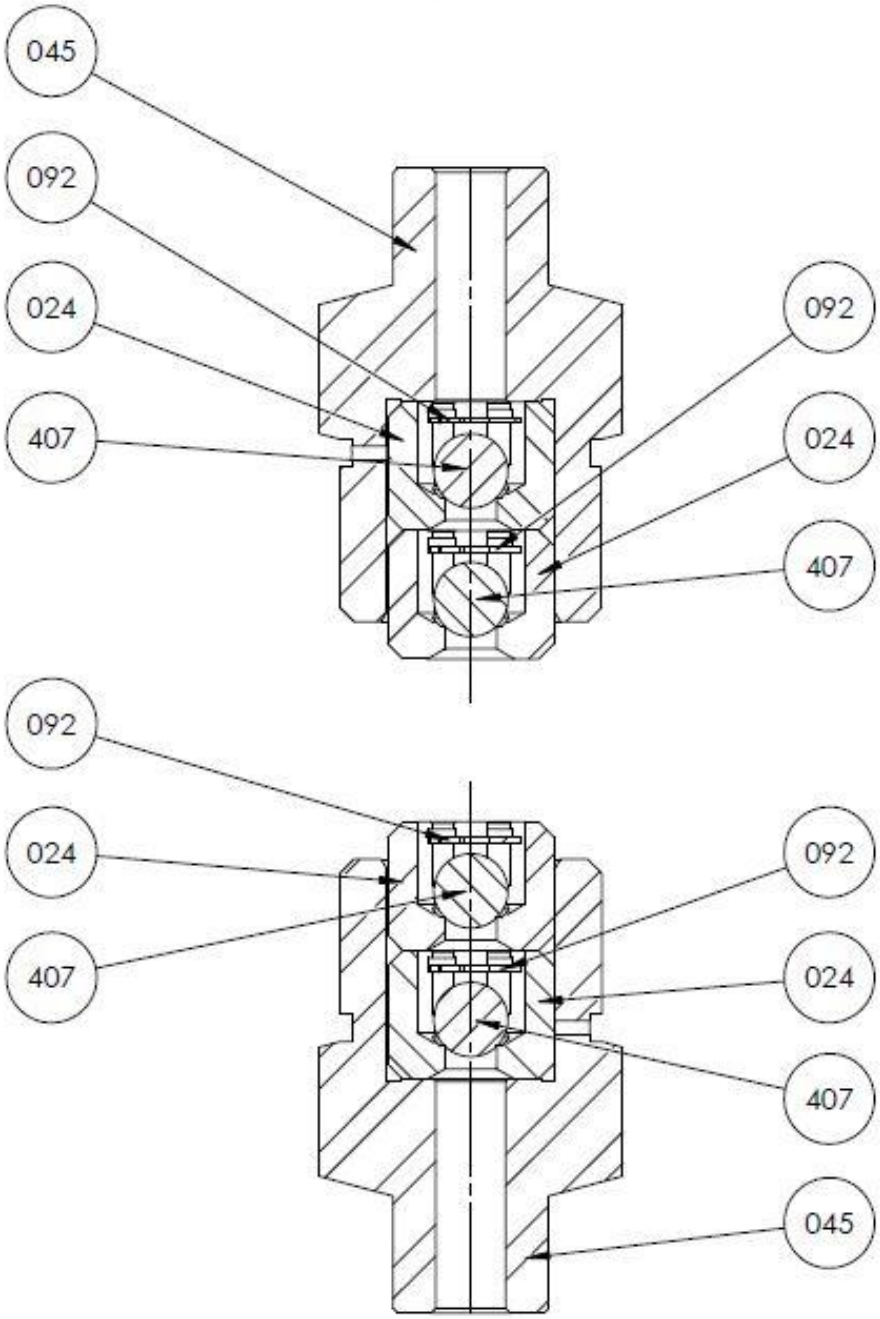

11/29/2018	23030	INITIAL	R.ALLSPACH	T.KUSTURISS	00
DATE	ECN	DESCRIPTION	Drawn - Dessiné / Visa	Checked -Vérifié / Visa	REV

REVISION HISTORY

GENERAL TOLERANCE	LINEAR DIMENSIONS - DIMENSIONS LINÉAIRES mm[INCHES]							Ra FINISH	GEOMETRIC TOLERANCES TOLÉRANCES GÉOMÉTRIQUES		
ISO 2768-MK	0 - 6	6 - 30	30 - 120	120 - 400	400 - 1000	1000 - 2000	2000 - 4000	<3.2	⊥	=	⁄
TOLERANCES mm[INCHES]	±0.1[.004]	±0.2[.008]	±0.3[.012]	±0.5[.020]	±0.8[.031]	±1.2[.047]	±[.079]	$125\sqrt{Ra}$	0.4 [0.015]	0.6 [0.024]	0.2 [0.079]

DESCRIPTION

METALLIC CHECK VALVE
Ø15.9
ASSEMBLY

MILTON ROY

FORMAT TAILLE	FIRST ANGLE PROJECTION	SHEET / FEUILLE	SCALE	DRAWING NUMBER - PLAN N°	REV
A4		1 / 1	2:3	777000102-M	00