

Double Diaphragm with Pressure-Type Leak Detector

For MILROYAL[®], CENTRAC[™] B And MAXROY[®]

Instruction Manual

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PRECAUTIONS

The following precautions should be taken when working with metering pumps.
Please read this section carefully prior to installation.

Protective Clothing



ALWAYS wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on the solution being pumped. Refer to **Safety Data Sheets** (SDS) for the solution being pumped.

Hearing Protection



It is recommended that hearing protection be used if the pump is in an environment where the time weighted average sound level (TWA) of 85 dbA is exceeded (As measured on the A scale - slow response).

Electrical Safety



- Remove power and ensure that it remains OFF while maintaining pump.
- **DO NOT FORGET TO CONNECT THE PUMP TO EARTH.**
- Electric protection of the motor (Thermal protection or by means of fuses) is to correspond to the rated current indicated on the motor data plate.

Liquid Compatibility



Verify if the materials of construction of the wetted components of your pump are recommended for the solution (chemical) to be pumped.

Pumps Water “Primed”



All pumps are tested with water at the factory. If your process solution is not approved with water, flush the **Pump Head Assembly** with an appropriate solution before introducing the process solution.

Plumbing and Electrical Connections



Always adhere to your local plumbing and electrical codes.

Line Depressurization



To reduce the risk of chemical contact during disassembly or maintenance, the suction and discharge lines should be depressurized before servicing.

Over Pressure Protection



To ensure safe operation of the system it is recommended that some type of safety / pressure-relief valve be installed to protect the piping and other system components from damage due to over-pressure.

Lifting



This manual should be used as a guide only. Follow your company’s recommended lifting procedures. It is not intended to replace or take precedence over recommendations, policies and procedures judged as safe due to the local environment than what is contained herein. Use lifting equipment that is rated for the weight of the equipment to be lifted.



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1.1 DESCRIPTION

The Double Diaphragm with Pressure-Type Leak Detector is an optional feature used with High Performance Diaphragm (HPD) and Diaphragm Liquid Ends. It is used to detect and signal if a tear or hole occurs in one or both diaphragms.

The system consists of two separate diaphragms, a hollow intermediate ring, and a pressure signal receiver (visual pressure gauge or pressure-actuated electrical switch) as functional components. Also included is a check valve and ball valve used only during start-up and for maintenance.

It is completely mounted on the pump, and needs no additional mounting facilities.

1.2 OPERATION

During normal operation, the two diaphragms are pushed tightly against each other by pumping pressure, and are separated only around their outside edge by the intermediate ring. Thus, even if they are operating at a significant pumping pressure (150 psi, for example), no pressure is transmitted through the ring to the pressure detector.

If a tear in one of the diaphragms should occur, only then will pumping pressure be admitted to between the diaphragms and be conducted through the ring to the pressure gauge or switch, causing an "alarm", or diaphragm failure indication. The pressure switch is wired by the user to turn on an alarm light, to shut down the pump motor, or to do any other control function desired.

1.3 START-UP - NEW PUMP

- A. Refer to the pump drive and liquid end instruction manual(s) for their installation and start-up information.
- B. When shipped assembled to a pump from the factory, the Leak Detector has been purged and tested, and is ready to operate. If equipped with an electrical switch, the switch should be wired by the user in accordance with instructions contained inside the switch housing.

SECTION 2 - MAINTENANCE

⚠ CAUTION LOOSENING ANY HYDRAULIC FITTINGS OR OPENING VALVES COULD ALLOW PROCESS (PUMPED) LIQUID TO BE UNEXPECTEDLY RELEASED UNDER PRESSURE. CAREFULLY DISCONNECT THE PUMP AND DIAPHRAGM LEAK DETECTOR FROM ALL ELECTRICAL AND PROCESS SERVICE BEFORE PERFORMING ANY MAINTENANCE.

2.1 DISASSEMBLY (Refer to Figures 1 & 2)

Disassembly is straightforward and direct. However, do not bend the joint where metal tube connects to “4020” Intermediate Ring Assembly! This is a welded joint and the tube will kink if bent.

2.2 ASSEMBLY (Refer to Figures 1 & 2)

1. Clean and dry all parts which may have previously been in contact with process liquid.
2. It is easiest to mount the Leak Detector to the Liquid End with the liquid end removed from the pump drive.
3. Support the “630” Displacement Chamber securely on a clean work surface with the large, open face facing upward.
4. See the HPD Instruction Manual for additional information. Install MARS Valve (on HPD only) and Contour Plate with its O-Ring.
5. Install the Primary Diaphragm (the Teflon-faced-rubber diaphragm) with rubber side toward Contour Plate.
6. Orient it correctly- Lay the “4020” Intermediate Ring Assembly onto the Primary Diaphragm. Make sure that the groove side of the ring is installed down against the raised head of the diaphragm.
7. Push the center of the diaphragm downward to create a shallow dish.
8. Using a lubricating liquid appropriate for the application, fill the shallow dish completely or overflowing. (Too much lubricating liquid is good because most of it will be squeezed out in later assembly steps.)
 - a. Mineral oil is usually used.
 - b. Use an inert lube like a fluorocarbon base lubricant for pumping highly reactive process liquids like hydrogen peroxide.
9. Next, lay the “4030” Auxiliary Ring into the recess in the metal Intermediate Ring.
10. Finally, lay the full Teflon disc, “4010” Auxiliary Diaphragm into the metal ring; on top of the Teflon ring. Add more lubricating liquid.
11. Lay the Diaphragm Head on top of the Auxiliary Diaphragm, and jostle things around a little to make sure everything is piloted into place.
12. Insert and tighten the Diaphragm Head bolts and the Support Bracket.
13. Mount this assembly to the pump housing (see the HPD liquid end instruction manual).
14. Mount, connect, and tighten all tubing, check valve, shut-off valve and fittings. **IMPORTANT:** Install the “4080” Check Valve so its flow direction arrow is pointing away from the diaphragm.
15. Reassembly of the Leak Detector is complete; now the air and oil trapped between the diaphragms must be purged to place it into operating condition.



SECTION 2 - MAINTENANCE

2.3 POST ASSEMBLY START-UP

16. This step will purge air and excess lubricant from between the diaphragms.
17. At this point, the pump should be completely assembled, lubricated, tightened, connected, and ready to operate; ready to pump process liquid at pressure.
18. Remove "5020" PIPE PLUG and open "5010" Valve. (Turn the handle to be in line with the valve body).
19. The next step will be to turn on the pump. When it first turns on, the few ounces of lubricant that was put between the diaphragms will be expelled. Make provisions to catch it if necessary.
20. Start up the pump. Operate the pump at normal operating pressure for about 10 minutes. The in line check valve will allow lubricant to come out, and the diaphragms to be pushed together by pumping pressure, but will block reverse flow, and prevent air from getting between the diaphragms.
21. If no lubricant comes out, check a) pipe plug is removed, b) valve is open, and c) check valve is installed in the proper direction.
22. After 10 minutes of pumping, close the valve and install the pipe plug. The system is ready for normal service.

SECTION 3 - TROUBLESHOOTING



Pump flow rate is low:

If all other troubleshooting has been done as indicated in the pump liquid end manual, low flow is probably being caused by air trapped between the two diaphragms.

To correct this:

1. Tighten all fittings. If loose, air will be drawn in. Disassemble and reassemble per Maintenance 630, 4010 & 4030.
2. Review section Maintenance 4030, Start-up after Assembly. Lubricant must be expelled to insure that air is purged.
3. Pay particular attention to insure that:
 - “5020” Pipe Plug Removed,
 - “4080” Check Valve installed with flow arrow towards “5010” Ball Valve,
 - “5010” Ball Valve Open

Lubricant does not expel during start-up after assembly.

Cause is either:

1. Too little lubricant used during assembly-disassemble and add more lubricant.
2. Check Valve “4080” installed backward. Flow arrow must be towards “5010” Ball Valve.
3. Valve is not open or plug is not removed.

SECTION 4 - PARTS LIST

4.1 PARTS LIST FOR PUMPS MODEL NUMBER: (Refer "106" Diaphragm)

MBH- XXX -16XX-X	Milroyal® B	1" Plunger	MDH - XXX - 20XX-X	Milroyal® D	1 1/4" Plunger
MBH- XXX - 20XX-X	Milroyal® B	1 1/4" Plunger	MDH- XXX- 24XX-X	Milroyal® D	1 1/2" Plunger
MCH- XXX -16XX-X	Milroyal® C	1" Plunger	CBX- XH16X	Centrac™ B	1" Plunger
MDH- XXX -16XX-X	Milroyal® D	1" Plunger	CBX- XH20X	Centrac™ B	1 1/4" Plunger

NOTE: "X" in Model Number above indicates that this parts list applies regardless of the actual model number symbol in this position.

Parts For Version with Pressure Switch (Refer to Figure 1)

Drawing Location Reference	Description	Qty.	Detector Construction
			Stainless Steel
630	Displacement Chamber	1	221-0803-002
4010	Auxiliary Diaphragm (Teflon)	1	298-0094-175
4030	Auxiliary Ring (Teflon)	1	298-0095-175
4020	Intermediate Ring Assembly	1	219-0098-016
4080	Check Valve	1	407-0315-701
5010	Ball Valve	1	407-0314-082
5020	Pipe Plug (1/4" NPT)	1	402-0011-023
5000	Street Tee (1/4" NPT)	1	A2-0121
4090	Male Elbow	1	A1-0092
5080	Pressure Switch (NEMA 4)	1	406-0388-001
	Pressure Switch (NEMA 7)	1	406-0389-001
5090	Mounting Bracket	1	204-0168-015
5070	Pilot Line- Milroyal® B, D, & Centrac™ B, NEMA 4	1	249-0124-116
	Pilot Line- Milroyal® B, D, & Centrac™ B, NEMA 7	1	249-0124-016
	Pilot Line- Milroyal® C, NEMA 4	1	249-0126-116
	Pilot Line- Milroyal® C, NEMA 7	1	249-0126-016
5060	Union 1/8" Tube	1	402-0581-022
5040	Threaded Pipe Bushing	1	402-0001-055

SECTION 4 - PARTS LIST

Parts For Version with Pressure Gauge,
No Pressure Switch (Refer to Figure 2)

Drawing Location Reference	Description	Qty.	Detector Construction
			Stainless Steel
630	Displacement Chamber	1	221-0803-002
4010	Auxiliary Diaphragm (Teflon)	1	298-0094-175
4030	Auxiliary Ring (Teflon)	1	298-0095-175
4020	Intermediate Ring Assembly	1	219-0098-016
4080	Check Valve	1	407-0315-701
5010	Ball Valve	1	407-0314-082
5020	Pipe Plug (1/4" NPT)	1	402-0011-023
5000	Street Tee (1/4" NPT)	1	A2-0121
4090	Male Elbow	1	A1-0092
4060	Pilot Line	1	249-0125-016
4070	Support Bracket	1	204-0172-015
4091	Support Clamp	1	410-0153-000
4050	Union Elbow	1	402-0058-093
5030	Pressure Gauge	1	403-0151-070

SECTION 4 - PARTS LISTS

4.2 PARTS LIST FOR PUMPS MODEL NUMBER: (Refer "166" Diaphragm)

MBH- XXX -24XX-X	Milroyal® B	1 1/2" Plunger	MCH - XXX - 32XX-X	Milroyal® C	2" Plunger
MBH- XXX - 32XX-X	Milroyal® B	2" Plunger	CBX - X - H24X	Centrac™ B	1 1/2" Plunger
MBH- XXX - 40XX-X	Milroyal® B	2 1/2" Plunger	CBX - X - H32X	Centrac™ B	2" Plunger
MCH- XXX -20XX-X	Milroyal® C	1 1/4" Plunger	CBX - X - H40X	Centrac™ B	2 1/2" Plunger
MCH- XXX -24XX-X	Milroyal® C	1 1/2" Plunger			

NOTE: "X" in Model Number above indicates that this parts list applies regardless of the actual model number symbol in this position.

Parts For Version with Pressure Switch (Refer to Figure 1)

Drawing Location Reference	Description	Qty.	Detector Construction
			Stainless Steel
630	Displacement Chamber	1	
4010	Auxiliary Diaphragm (Teflon)	1	
4030	Auxiliary Ring (Teflon)	1	
4020	Intermediate Ring Assembly	1	219-0098-116
4080	Check Valve	1	407-0315-701
5010	Ball Valve	1	407-0314-082
5020	Pipe Plug (1/4" NPT)	1	402-0011-023
5000	Street Tee (1/4" NPT)	1	A2-0121
4090	Male Elbow	1	A1-0092
5080	Pressure Switch (NEMA 4)	1	406-0388-001
	Pressure Switch (NEMA 7)	1	406-0389-001
5090	Mounting Bracket	1	
5070	Pilot Line- Milroyal® B, D, & Centrac™ B, NEMA 4	1	
	Pilot Line- Milroyal® B, D, & Centrac™ B, NEMA 7	1	
	Pilot Line- Milroyal® C, NEMA 4	1	
	Pilot Line- Milroyal® C, NEMA 7	1	
5060	Union 1/8" Tube	1	402-0581-022
5040	Threaded Pipe Bushing	1	402-0001-055

SECTION 4 - PARTS LISTS

Parts For Version with Pressure Gauge,
No Pressure Switch (Refer to Figure 2)

Drawing Location Reference	Description	Qty.	Detector Construction
			Stainless Steel
630	Displacement Chamber	1	
4010	Auxiliary Diaphragm (Teflon)	1	
4030	Auxiliary Ring (Teflon)	1	
4020	Intermediate Ring Assembly	1	219-0098-116
4080	Check Valve	1	407-0315-701
5010	Ball Valve	1	407-0314-082
5020	Pipe Plug (1/4" NPT)	1	402-0011-023
5000	Street Tee (1/4" NPT)	1	A2-0121
4090	Male Elbow	1	A1-0092
4060	Pilot Line	1	
4070	Support Bracket	1	
4091	Support Clamp	1	
4050	Union Elbow	1	402-0058-093
5030	Pressure Gauge	1	403-0151-070

SECTION 4 - PARTS LISTS

4.3 PARTS LIST FOR PUMPS MODEL NUMBER: (Refer "266" Diaphragm)

MBH - XXX - 56XX - X	Milroyal® B	3 1/2" Plunger	MCH - XXX - 56XX - X	Milroyal® C	3 1/2" Plunger
MCH - XXX - 40XX - X	Milroyal® C	2 1/2" Plunger	CBX - XH56X	Centrac™ B	3 1/2" Plunger

NOTE: "X" in Model Number above indicates that this parts list applies regardless of the actual model number symbol in this position.

Parts For Version with Pressure Switch (Refer to Figure 1)

Drawing Location Reference	Description	Qty.	Detector Construction
			Stainless Steel
630	Displacement Chamber	1	221-0804-002
4010	Auxiliary Diaphragm (Teflon)	1	298-0094-375
4030	Auxiliary Ring (Teflon)	1	298-0095-375
4020	Intermediate Ring Assembly	1	219-0098-216
4080	Check Valve	1	407-0315-701
5010	Ball Valve	1	407-0314-082
5020	Pipe Plug (1/4" NPT)	1	402-0011-023
5000	Street Tee (1/4" NPT)	1	A2-0121
4090	Male Elbow	1	A1-0092
5080	Pressure Switch (NEMA 4)	1	406-0388-001
	Pressure Switch (NEMA 7)	1	406-0389-001
5090	Mounting Bracket	1	204-0170-006
5070	Pilot Line, NEMA 4	1	249-0124-516
	Pilot Line, NEMA 7	1	249-0124-416
5060	Union 1/8" Tube	1	402-0581-022
5040	Threaded Pipe Bushing	1	402-0001-055

SECTION 4 - PARTS LISTS

Parts For Version with Pressure Gauge,
No Pressure Switch (Refer to Figure 2)

Drawing Location Reference	Description	Qty.	Detector Construction
			Stainless Steel
630	Displacement Chamber	1	221-0804-002
4010	Auxiliary Diaphragm (Teflon)	1	298-0094-375
4030	Auxiliary Ring (Teflon)	1	298-0095-375
4020	Intermediate Ring Assembly	1	219-0098-216
4080	Check Valve	1	407-0315-701
5010	Ball Valve	1	407-0314-082
5020	Pipe Plug (1/4" NPT)	1	402-0011-023
5000	Street Tee (1/4" NPT)	1	A2-0121
4090	Male Elbow	1	A1-0092
4060	Pilot Line	1	249-0125-216
4070	Support Bracket	1	204-0172-215
4091	Support Clamp	1	410-0153-000
4050	Union Elbow	1	402-0058-093
5030	Pressure Gauge	1	403-0151-070

4.4 PARTS LIST FOR PUMPS MODEL NUMBER: (Refer "366" Diaphragm)

MCH - XXX - 80XX - X	Milroyal® C	5" Plunger
MCH - XXX - 88XX - X	Milroyal® C	5 3/4" Plunger

NOTE: "X" in Model Number above indicates that this parts list applies regardless of the actual model number symbol in this position.

Parts For Version with Pressure Switch (Refer to Figure 1)

Drawing Location Reference	Description	Qty.	Detector Construction
			Stainless Steel
630	Displacement Chamber	1	221-0676-002
4010	Auxiliary Diaphragm (Teflon)	1	298-0094-475
4030	Auxiliary Ring (Teflon)	1	298-0095-475
4020	Intermediate Ring Assembly	1	219-0098-316
4080	Check Valve	1	407-0315-701
5010	Ball Valve	1	407-0314-082
5020	Pipe Plug (1/4" NPT)	1	402-0011-023
5000	Street Tee (1/4" NPT)	1	A2-0121
4090	Male Elbow	1	A1-0092
5080	Pressure Switch (NEMA 4)	1	406-0388-001
	Pressure Switch (NEMA 7)	1	406-0389-001
5090	Mounting Bracket	1	204-0171-006
5070	Pilot Line, NEMA 4	1	249-0124-716
	Pilot Line, NEMA 7	1	249-0124-616
5060	Union 1/8" Tube	1	402-0581-022
5040	Threaded Pipe Bushing	1	402-0001-055

SECTION 4 - PARTS LISTS

Parts For Version with Pressure Gauge,
No Pressure Switch (Refer to Figure 2)

Drawing Location Reference	Description	Qty.	Detector Construction
			Stainless Steel
630	Displacement Chamber	1	221-0676-002
4010	Auxiliary Diaphragm (Teflon)	1	298-0094-475
4030	Auxiliary Ring (Teflon)	1	298-0095-475
4020	Intermediate Ring Assembly	1	219-0098-316
4080	Check Valve	1	407-0315-701
5010	Ball Valve	1	407-0314-082
5020	Pipe Plug (1/4" NPT)	1	402-0011-023
5000	Street Tee (1/4" NPT)	1	A2-0121
4090	Male Elbow	1	A1-0092
4060	Pilot Line	1	249-0125-316
4070	Support Bracket	1	204-0172-215
4091	Support Clamp	1	410-0153-000
4050	Union Elbow	1	402-0058-093
5030	Pressure Gauge	1	403-0151-070

SECTION 4 - PARTS LISTS

4.5 PARTS LIST FOR PUMPS MODEL NUMBER: (Refer MAXROY® B)

YB1-XXOX-XXXX	MAXROY® B
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NOTE: "X" in Model Number above indicates that this parts list applies regardless of the actual model number symbol in this position.

Parts For Version with Pressure Switch (Refer to Figure 3)

Drawing Location Reference	Description	Qty.	Detector Construction
			Stainless Steel
4010	Auxiliary Diaphragm (Teflon)	1	6098-0275-075
4020	Intermediate Ring Assembly	1	219-0092-016
4080	Check Valve	1	407-0315-701
5010	Ball Valve	1	407-0314-082
5020	Pipe Plug (1/4" NPT)	1	402-0011-023
5000	Street Tee (1/4" NPT)	1	A2-0121
4090	Male Elbow	1	A1-0092
5080	Pressure Switch (NEMA 4)	1	406-0388-001
	Pressure Switch (NEMA 7)	1	406-0389-001
5090	Mounting Bracket	1	204-0163-006
5070	Pilot Line, NEMA 4	1	249-0120-016
	Pilot Line, NEMA 7	1	249-0120-116
5060	Union 1/8" Tube	1	402-0058 -091
5040	Threaded Pipe Bushing	1	402-0001-055

Parts For Version with Pressure Gauge, No Pressure Switch (Refer to Figure 4)

Drawing Location Reference	Description	Qty.	Detector Construction
			Stainless Steel
4010	Auxiliary Diaphragm (Teflon)	1	6098-0275-075
4020	Intermediate Ring Assembly	1	219-0092-016
4080	Check Valve	1	407-0315-701
5010	Ball Valve	1	407-0314-082
5020	Pipe Plug (1/4" NPT)	1	402-0011-023
5000	Street Tee (1/4" NPT)	1	A2-0121
4090	Male Elbow	1	A1-0092
4070	Support Bracket	1	204-0156-015
4091	Support Clamp	1	410-0153-000
5030	Pressure Gauge	1	403-0151-070

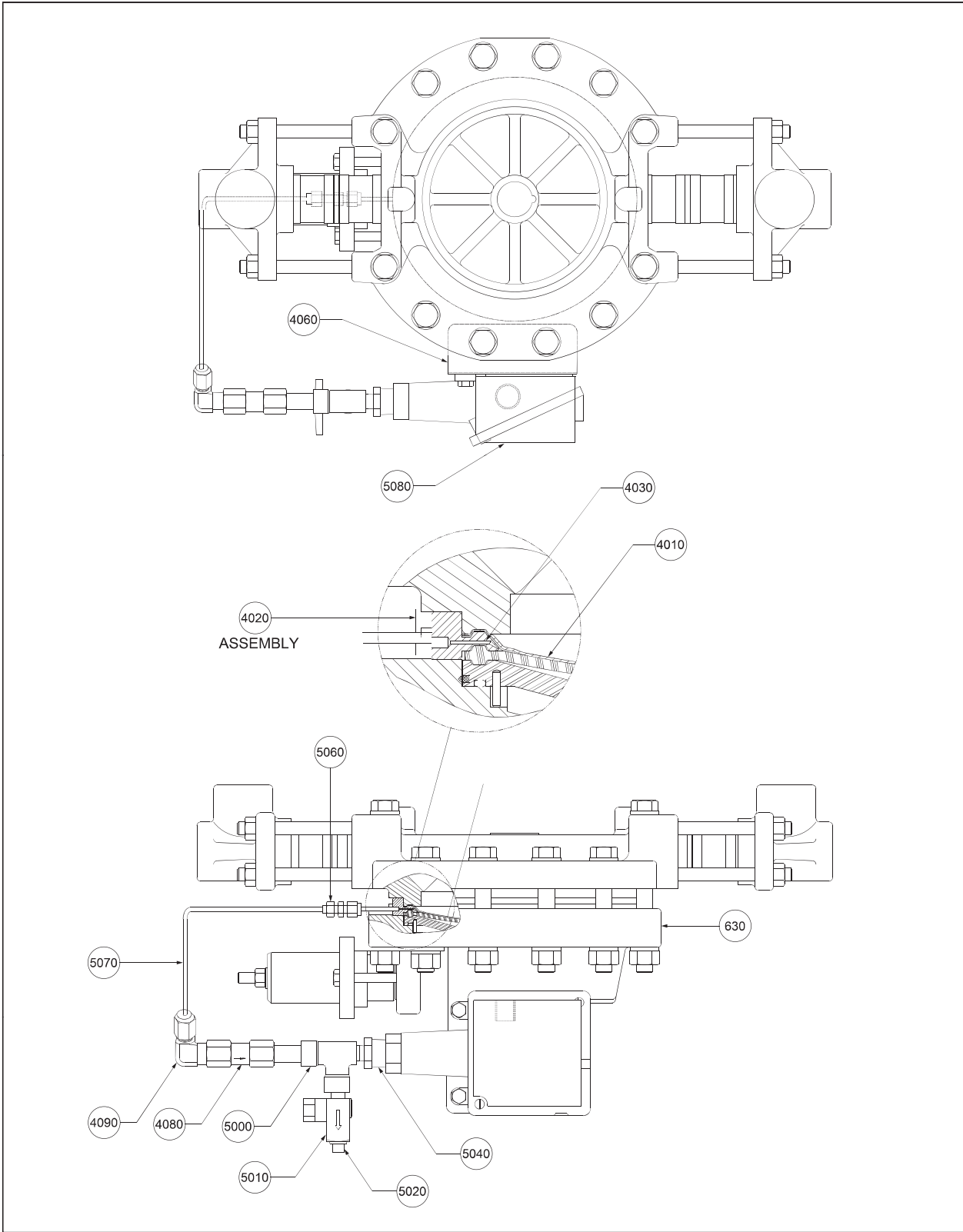


Figure 1. HPD Liquid End Leak Detection System with Pressure Switch

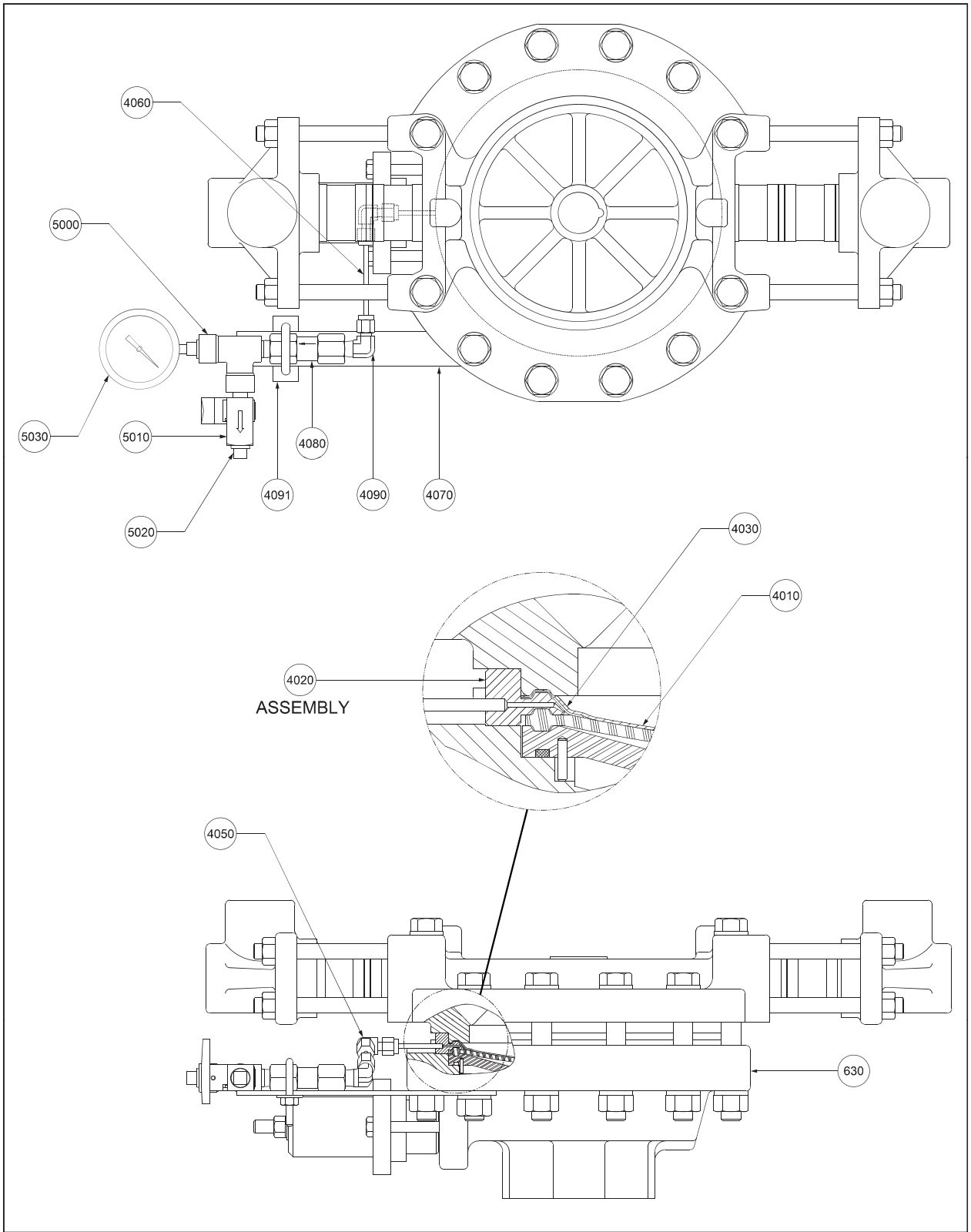


Figure 2. HPD Liquid End Leak Detection System with Pressure Gauge

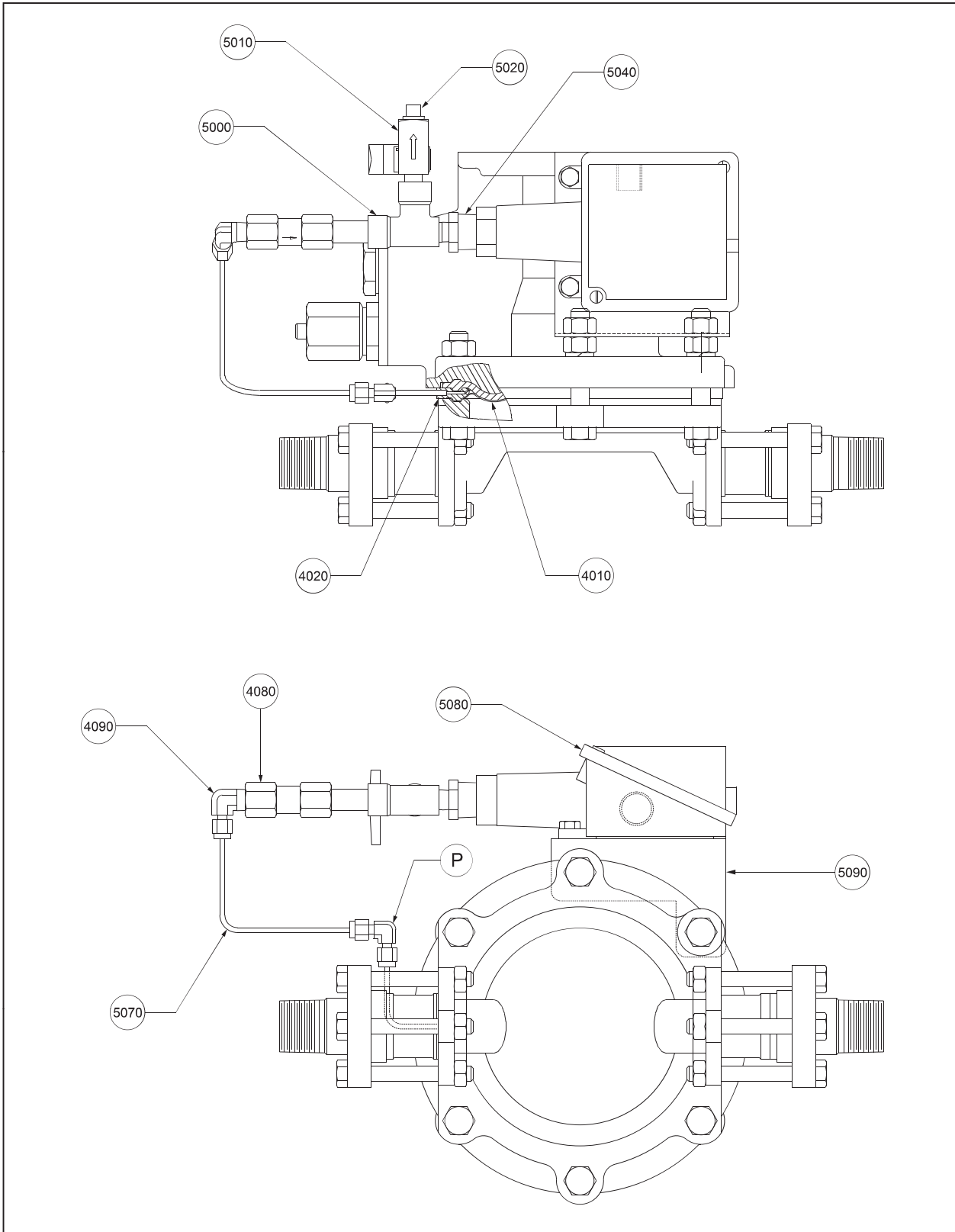


Figure 3. MAXROY® Leak Detection System with Pressure Switch

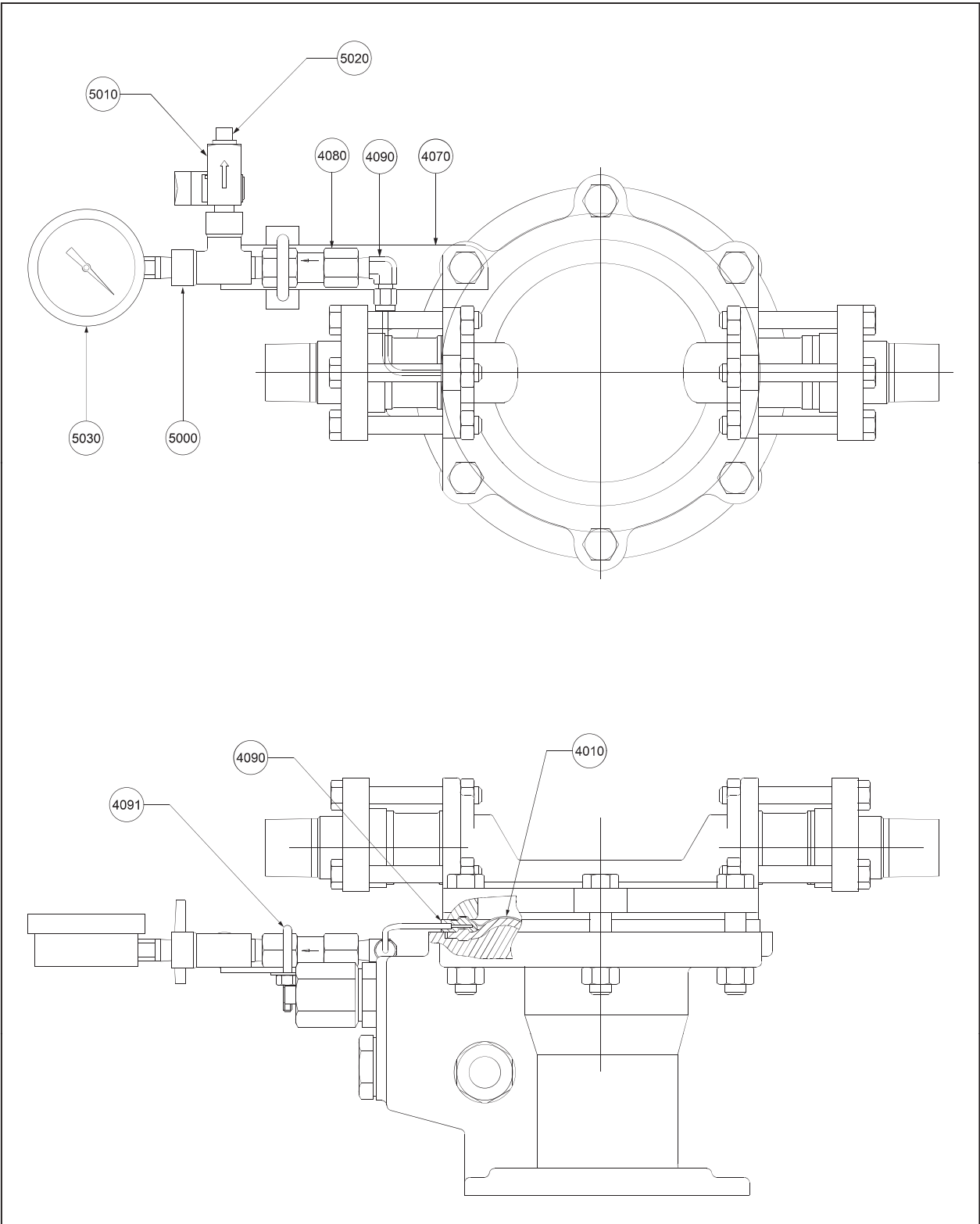


Figure 4. MAXROY® Leak Detection System with Pressure Gauge

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