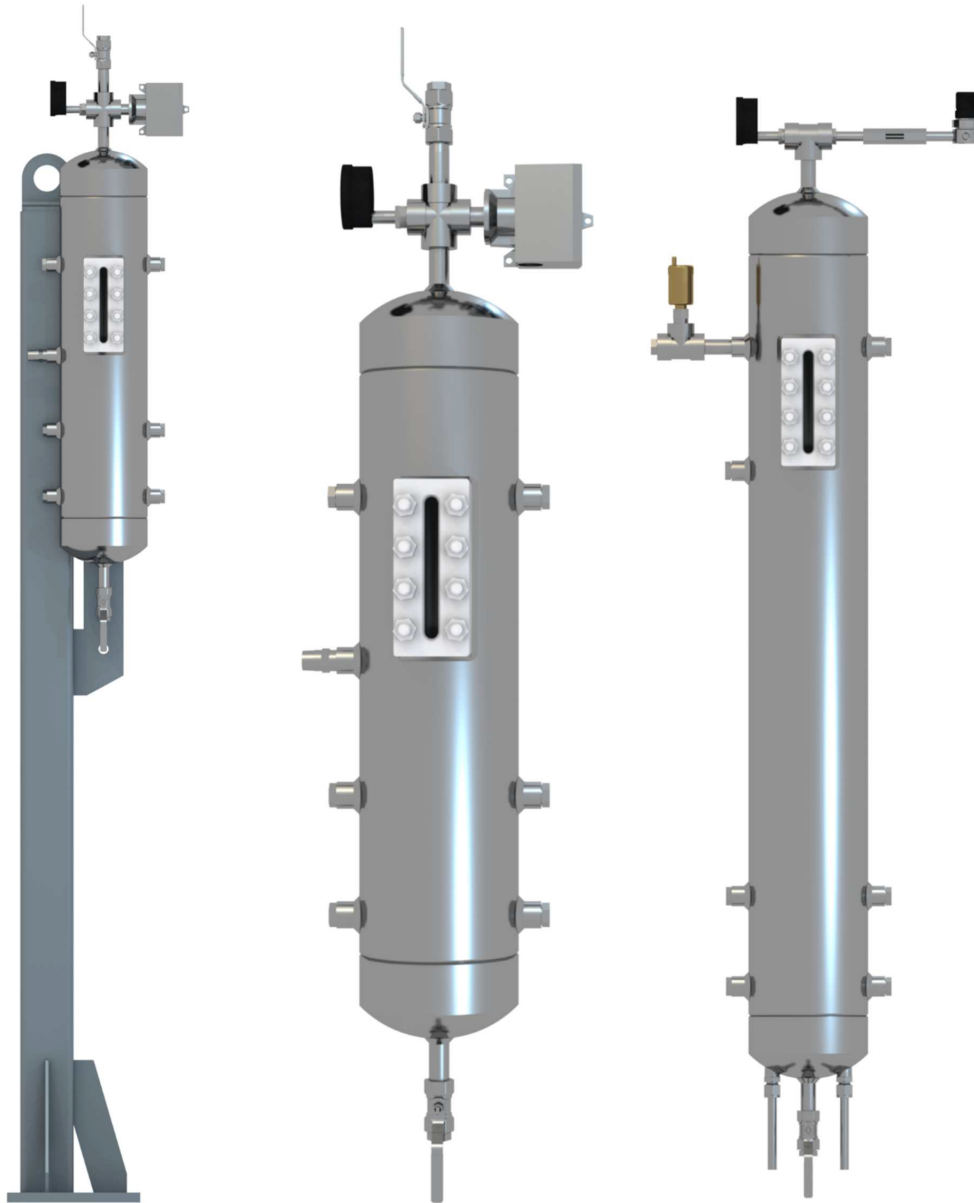


**NR Reservoir**



## Introduction

This manual is intended to ensure the safe installation and effective operation of the NR reservoir. It is highly recommended that all applicable personnel review and follow the guidance provided by this instruction.

**Note:** As hazardous conditions can result from planned as well as unforeseen circumstances, pressurized equipment shall always be operated with caution, per site and local policies.

Before installation, equipment should always be fully inspected including, but not limited to checking for:

- Any possible damage due to transport or storage
- Cleanliness required before operation
- Existence of an affixed nameplate with correct inspection markings and design/test conditions clearly annotated

## INDEX

1. Installation, Operation, & Maintenance of NR Reservoir Correctly
2. Safety
3. Environmental Considerations
4. Transportation and Storage Requirements
5. Design Overview
6. Installation
7. Set-up
8. Start-up and Operation
9. Maintenance Recommendations
10. Appendix

# 1 Installation, Operation, & Maintenance of NR Reservoir Correctly

## 1.1 How to Use this Manual

Only trained and qualified personnel should install or operate the equipment. Refer to section 2.3 for safe product operation. Inexperienced personnel should only work on this system under the supervision of a qualified person.

Before using this manual, make sure you have fully read and understand the safety section. Pay particular attention to section 5, which describes the system in detail.

When system maintenance is performed, ensure that maintenance procedures are followed, paying close attention to the alerts and safety icons.

## 1.2 Other Supplied Documentation

The assembly drawing is included with the reservoir. aspects that may not be readily apparent.


## 1.3 Conformity with Standards and Directives


The NR Reservoir conforms to the following standards and directives:

- ASME BPVC Section VIII Div. 1
- Pressure Equipment Directive (PED) 2014/68/EU
- CSA B51
- DOSH

## 1.4 Use of Alerts and Icons

The manual “Notes”, “Cautions”, and “Warnings” alert you of important information and/or hazardous situations.

 **CAUTION:** *The equipment, product or surrounding area can be damaged if the “caution” is not obeyed.*

 **WARNING:** *Personnel can be (seriously) injured, or the equipment can be seriously damaged if the “warning” is not obeyed.*

More specific icons are also used, depending on the type of hazard.


## 2 Safety

### 2.1 Hazards associated with the NR Reservoir

The following hazards can be present in the system:

- High pressure
- Dangerous or Toxic chemicals
- High Temperatures (hot surfaces)
- Dangerous moving parts (during installation)

**Notes:** When required, cooling fluid at enough flow and pressure is required for efficient heat removal from buffer and barrier fluid.

 **WARNING**  
**HIGH PRESSURE:** *The cooling fluid section of the reservoir is not protected against overpressure. If the supply and return lines are closed, a cooling line could burst.*

**If there is a possibility of the coolant pressure exceeding the reservoir design pressure, a pressure relief valve shall be installed in the cooling line to prevent over pressurization.**

## 2.2 General Safety

When installing, operating and maintaining this system, safety of personnel should be a top priority. As such:

- Obey applicable safety laws and regulations
- Read and understand this manual
- Follow the installation, operation, and maintenance procedures
- Wear Personal Protective Equipment (PPE) as required and applicable
- Take proper precautions and follow all plant requirements for handling hazardous materials


## 2.3 Trained and Qualified Personnel

Qualified personnel are people who have been authorized by those responsible for the safety of the plant to perform the necessary work, and who can recognize and avoid possible dangers. The following aspects determine the qualification of personnel:


- Appropriate training
- Relevant experience
- Knowledge of relevant standards and specifications
- Knowledge of accident prevention techniques and regulations
- Knowledge of plant regulations and operating conditions

## 2.4 Personal Protective Equipment (PPE)

When operating or maintaining this system, make sure you wear the appropriate Personal Protective Equipment (PPE), including: protective clothing, gloves, safety shoes, safety glasses, hearing protection, etc.

 **WARNING**  
**HOT SURFACES: The system and surrounding surfaces might be hot. Take care when touching components. Wear the appropriate Personal Protection Equipment (PPE), according to plant regulations**


## 3 Environmental Considerations


 **CAUTION: You are required by law to dispose of waste products and end of life equipment according to local regulations.**

## 3.1 Disposing of Waste Products

Any waste products resulting from the use or maintenance of the system must be disposed of according to local environment laws and regulations.

## 3.2 End of Life Equipment

 **WARNING**  
**DANGER CHEMICALS: Dangerous chemical might be released during removal of the system. Wear PPE. Follow all safety regulations and plant regulations.**

 **WARNING**  
**HIGH PRESSURE: High pressure might be stored in the system. Before removing or reinstalling the system, make sure the entire system has been de-pressurized (and drained if required).**

Dispose of end of life equipment following local environment laws and regulations.

## 4 Transportation and Storage Requirements

The following requirements apply to the NR Reservoir and all related equipment:

Transport and storage criteria	Requirements
Transportation	The reservoir must be transported and stored in the unopened, original shipping box.
Suspect damaged during transportation	Inspect reservoirs that have been dropped or have been subjected to impacts during transport to confirm that they are operational before installation.
Warehouse requirements	The warehouse must be dry and dust free.
Long-term storage	After a storage period of 1 year, inspect the reservoir before installation.
Preserving installed systems	The preserving medium prevents damage to the installed system or mechanical seal (i.e. preventing fouling or chemical attack). Contact Flowserve if you are unsure which preserving medium to use.

## 5 Design Overview

### 5.1 Description

The NR reservoir is used with dual mechanical seal arrangements (Plan 52, 53A, 53A WM<sup>1</sup>). The purpose of Flowserve's NR reservoir is to improve the reliability and extend the life of the dual mechanical seal by providing a source for clean and cool barrier/buffer fluid, remove heat and control emissions from the mechanical seal.

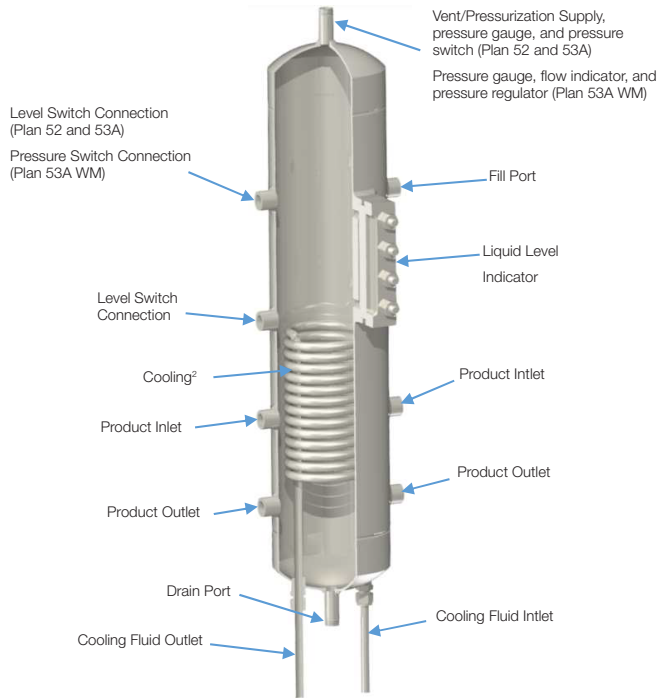


Figure 1: Reservoir Sectional View

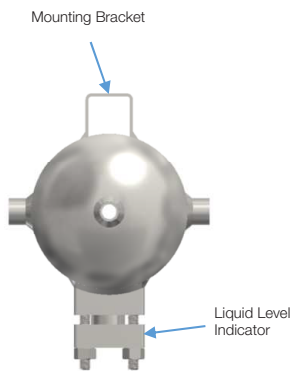


Figure 2: Top View

**Notes:** The images of parts shown in these instructions may differ visually from the actual parts due to manufacturing processes that do not affect the part function or quality. Refer to specific product drawing for connection and dimensional details.

The mechanical seals arrangements used for the NR reservoir are shown in the following figures with its corresponding P&ID

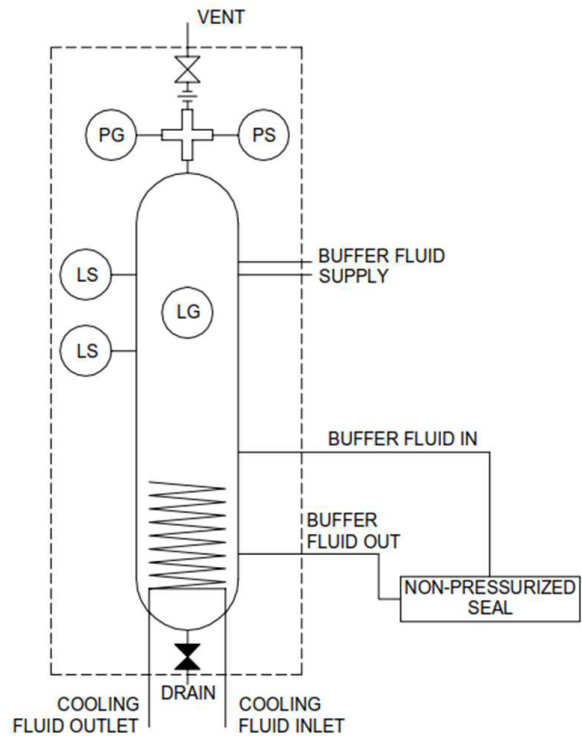


Figure 3: Recommended P&ID Piping Plan 52

<sup>1</sup> WM: Water Management

<sup>2</sup> Cooling: Optional

## NR Reservoir

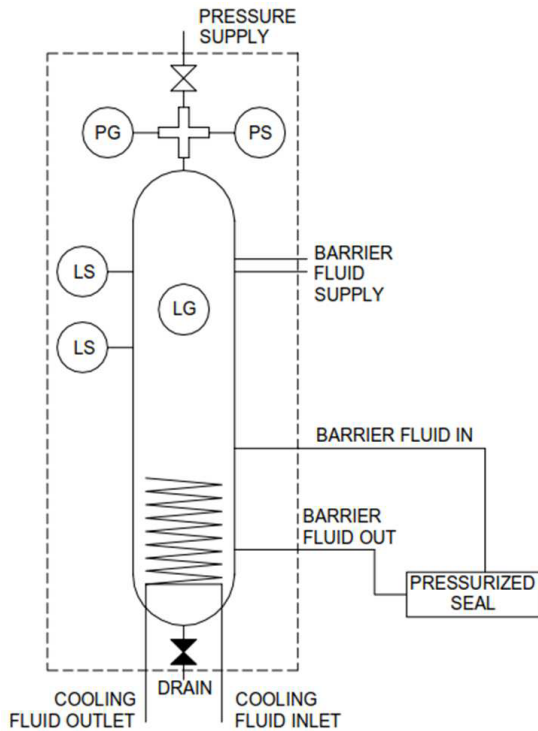


Figure 4: Recommended P&ID Piping Plan 53A

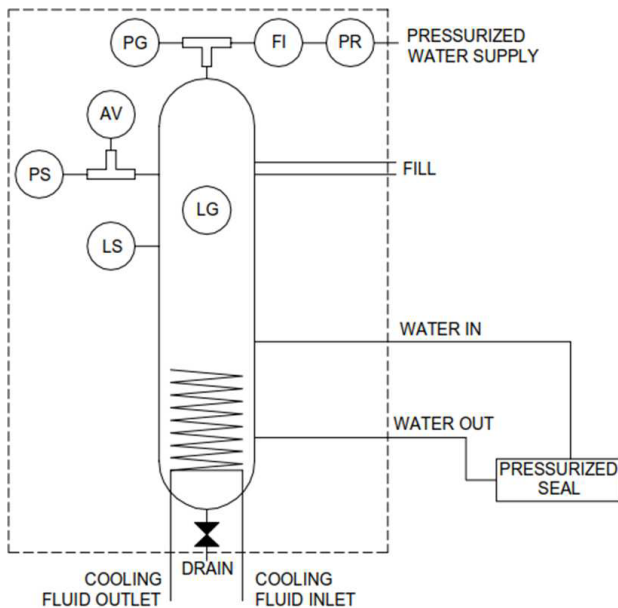


Figure 5: Recommended P&ID Piping Plan 53A WM

PG: Pressure Gauge  
 PS: Pressure Switch / Transmitter  
 LS: Level Switch  
 LG: Level Gauge  
 FI: Flow Indicator  
 PR: Pressure Regulator  
 AV: Air Vent Valve

Consider the P&ID's previously shown (Figures from 3 to 5) have the bare reservoir and all of the components that FLOWSERVE supplies like optional. Check the part 10. APPENDIX A: NR Reservoir Product Offerings, to see the list of all the optional parts.

## 6 Installation

Before installing the reservoir, inspect all components for damage. If any of the components are damaged, you should report this to your local Flowserve representative.

Position the NR Reservoir as close to the seal as possible. Make sure there is sufficient room for:

- Evacuation of the plant in case of an emergency (do not block walkways and emergency exits).
- Safe operation and maintenance of the system.

**WARNING**  
**CRUSH HAZARD: Possible injury and/or trapped limbs. Take care to avoid being trapped or crushed between heavy, moving objects.**

### 6.1 Primary Piping Plans

**Piping Plan 52** is an unpressurized dual seal system which is used in services where no leakage to atmosphere is tolerated. The system consists of dual mechanical seals with a buffer fluid between the seals. The buffer fluid is contained in the seal pot which is vented to a flare, thus maintaining the buffer fluid pressure close to atmosphere. Primary (inboard) seal leakage will be product leakage into the buffer fluid. There will always be some leakage.

Plan 52 relies on fluid circulating from the reservoir to the mechanical seal. Circulation can come from a circulation feature in the mechanical seal and/or a thermosiphon effect with the buffer fluid. When a thermosiphon effect is used, the circulation of liquid occurs due to natural convection; not because of mechanical pumping. The temperature difference between seal and reservoir will cause different density across the loop; hence, thermal expansion. Warmer liquid will float about the cooler, moving the buffer fluid upwards, from the seal towards the reservoir.

## NR Reservoir

In a Piping Plan 52 there is an external reservoir providing buffer liquid for the outer seal of an arrangement 2 seal. The buffer liquid shall be maintained at a pressure less than seal chamber pressure and less than 0.28 MPag (2.8 barg, 40 psig).

Plan 52 works best with clean, non-polymerizing products which have a vapor pressure higher than the buffer fluid pressure.

These products will flash in the supply tank and the vapor can escape to the vent system. If the product has a vapor pressure lower than the buffer fluid or supply tank pressure, the leakage will remain a liquid and will cause the buffer fluid level to rise. Should excessive primary (inboard) seal leakage not be detected early, the heavier process fluid will displace the buffer fluid and can result in increased seal wear. Used with dual unpressurized seals, high vapor pressure fluids, light hydrocarbons, hazardous or toxic fluids, and heat transfer fluids.

Refer to figure 6.

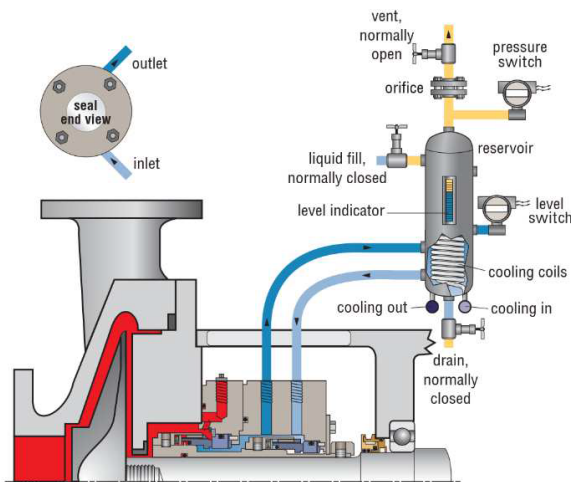


Figure 6: Piping Plan 52 Configuration

**Piping Plan 53A** is a pressurized dual seal system which is used in services where no process leakage to atmosphere is tolerated. The system consists of dual mechanical seals with a barrier fluid between them. The barrier fluid in the supply tank is pressurized to a higher pressure than the seal chamber, at a minimum 20 psig (1.4 barg) over. Primary (inboard) seal leakage will be barrier fluid into the product. A small amount of leakage is customary.

A Plan 53A is usually chosen over a Plan 52 for dirty, abrasive or polymerizing products which would either damage the seal faces or cause problems with the barrier fluid system if a Plan 52 is used. There are two disadvantages to a Plan 53A which must be considered. First, there will always be some leakage of barrier fluid into the product. Normally, this leakage will be minute, and the leakage rate can be monitored via the level gauges or other instrumentation; however, the product must be able to accommodate a small amount of contamination from the barrier fluid. Secondly, a Plan 53A system is dependent on having the supply tank pressure maintained at the proper level. If the supply tank pressure drops, seal leakage direction will be reversed (the seal system will begin to operate like a Piping Plan 52) and the barrier fluid will be contaminated with the process fluid.

Used with high vapor pressure fluids, light hydrocarbons, hazardous or toxic fluids, heat transfer fluids, dirty/abrasive or polymerizing fluids, and mixer or agitators and vacuum services.

Refer to figure 7.

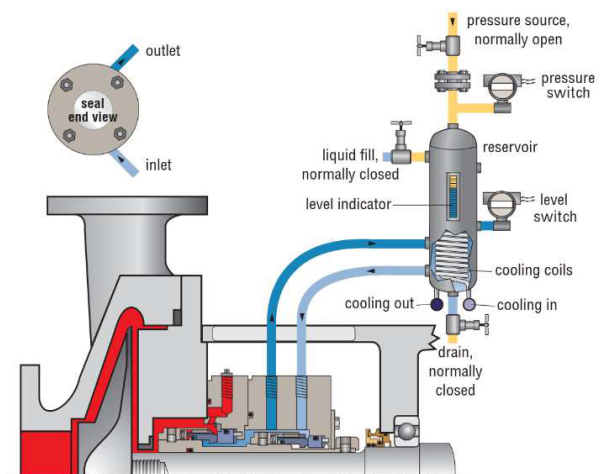


Figure 7: Piping Plan 53A Configuration

**Piping Plan 53A WM.** The water header system provides pressure to the seal when pressurized above operating conditions in a dual pressurized operating mode. Should consumption of barrier water increase the header system will automatically refill the tank. The water regulator on the inlet of the tank determines the point of re-supply. The pressure level at which resupply is accomplished is adjustable to suit the application need.

The condition of the water within the tank should be checked over the entire operating curve of the application. Particular attention should be paid during start up conditions. Water on the seal at the time of start up is a critical condition for longevity of seal life. Also, close care should be taken to ensure water conditions are maintained to avoid pressure reversals contaminating barrier water with process fluids.

- The water should not freeze at the minimum site ambient temperature.
- The water should have an initial boiling point at least 50°F (10°C) above the temperature to which it will be exposed.
- The water should not have a flash point higher than the service temperature.

Refer to figure 8.

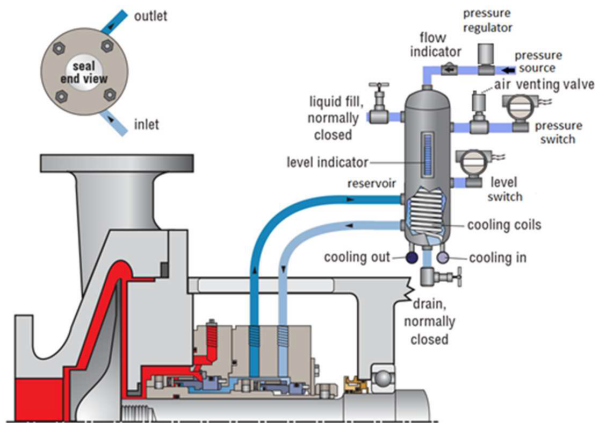


Figure 8: Piping Plan 53A WM Configuration

## 6.2 Mounting

- The optimum mounting height is defined by the viscosity of the fluid, the hydraulic resistance and the pressure head required for proper flow supply. Consider the source of the pressure: A pump ring provides a lower pressure head vs. a recirculation pump.
- Generally, the reservoir shall be mounted such that the normal liquid level (NLL) is a minimum of 0.9 m (3 ft) above the seal centerline, and the reservoir centerline is a maximum of 1.2 m (4 ft) horizontally from the pump centerline as shown in Figure 9.

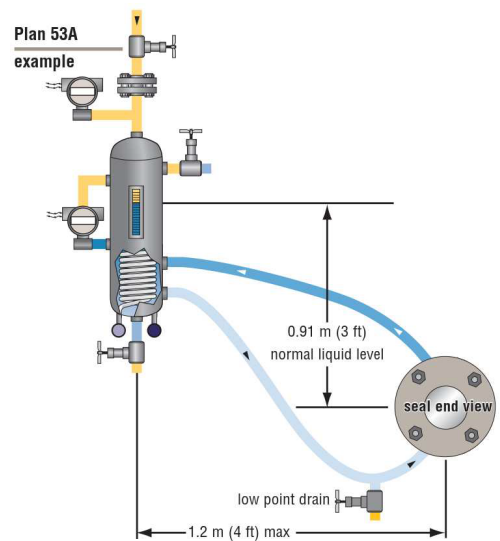


Figure 9: Piping Plan 53A mounting dimensions example

- It is highly recommended that the reservoir be flushed with clean fluid prior to equipment start-up to remove any foreign matter from the system.
- All lines from the seal cavity to the reservoir must slope upward at all points. The upward slope should be a minimum of 1/4 inch per foot with all bends being large radius. The minimum size for tubing should be 1/2-inch diameter. Tubing is recommended.
- Connect the supply connection (lower seal connection on the reservoir) to the bottom (inlet) gland connection (BI - inlet).
- Connect the return connection (upper seal connection on the reservoir) to the upper (outlet) gland connection (BO - outlet).
- If the reservoir is equipped with cooling coils, connect water lines to the coil connections on the bottom of the reservoir.
- Remove all plastic shipping plugs and properly seal or attach piping with metal connections.

## NR Reservoir

- Connect wiring to any instruments included with the system such as a pressure switch/transmitter or level switch/transmitter.
- For the liquid level indicator, the bolts on the cover should be retorqued to 20 ft/lbs. (Tighten in 5 ft/lb. increments starting with the center bolts and working out). In case that a different torque is specified in the liquid level indicator, it should be followed.
- Connect vent connection to flare or vapor recovery system (Plan 52). Do not open vent valve until reservoir has been filled with buffer fluid.
- If using oil as a buffer/barrier fluid (Plan 53A), fill reservoir with barrier/buffer fluid to the middle of the liquid level indicator. Then connect the external pressurization (gas line).
- If using water as a barrier fluid (Plan 53A WM), connect external pressurization (water supply) to reservoir.
- A pressure regulator and check valve are required to maintain a constant pressure on the system. The pressure in the reservoir should be maintained at least 20 psig (1.4 barg) above the seal cavity pressure.

### 6.3 Switch/Transmitter kits

Switches/Transmitters are provided as an option for the Plan 52, Plan 53A, and Plan 53WM piping plans (see section 10 to see the level switch, pressure switches, and pressure transmitter offerings for each plan). In case that switches, or transmitters are requested they will be shipped in a separate package and should be assembled in their corresponding connection. Figures 10, 11, and 12 show the correct location of them.

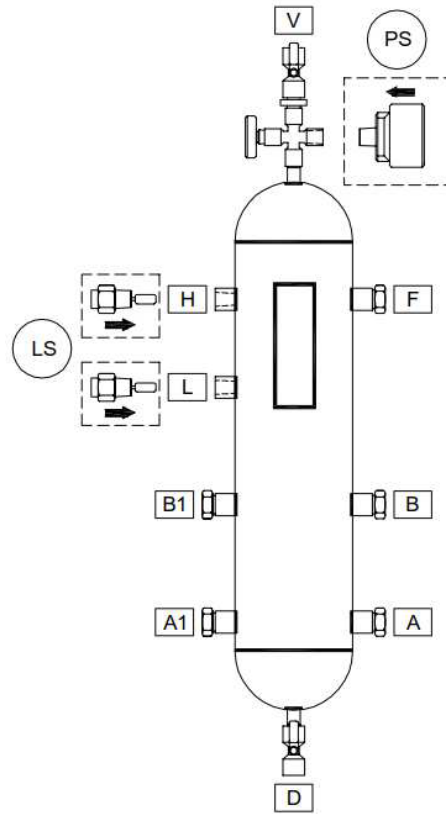


Figure 10: Piping Plan 52 switches mounting



NR Reservoir

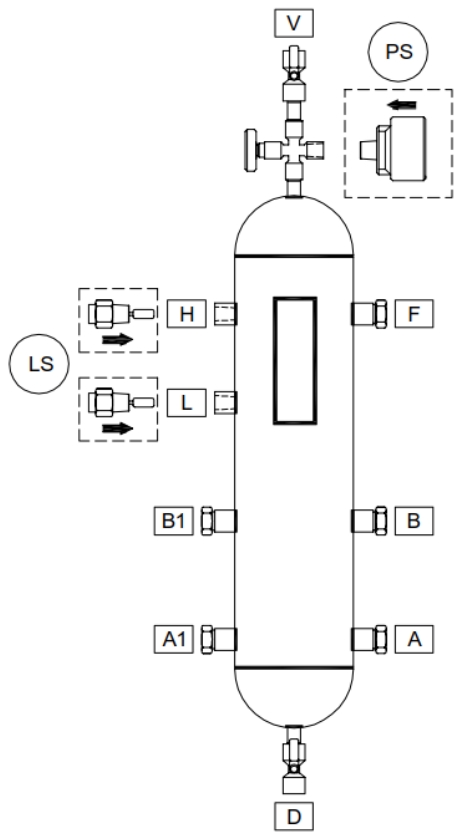


Figure 11: Piping Plan 53A switches mounting

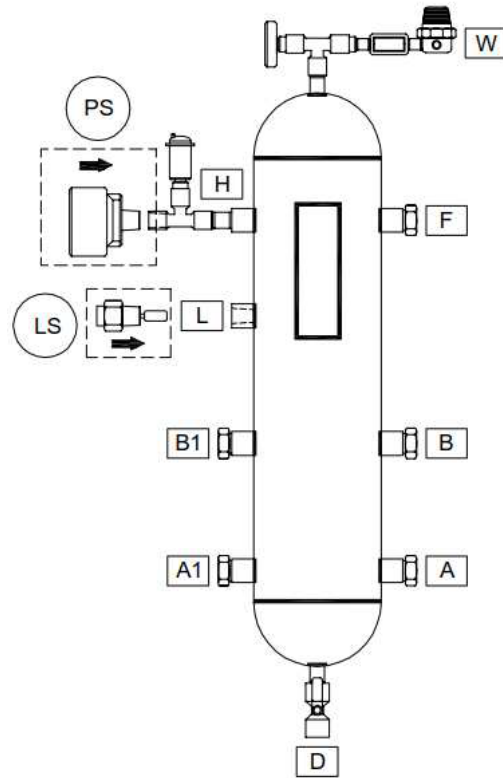


Figure 12: Piping Plan 53A WM switches mounting

- PS: Pressure Switch / Transmitter
- LS: Level Switch
- A, A1: Seal Supply
- B, B1: Seal Return
- D: Drain
- F: Fill
- H: High Level Switch (Plan 52 and 53A), Pressure Switch (Plan 53A WM)
- L: Low Level Switch
- V: Vent/Pressure Source
- W: Water Source

### 6.4 Switch/Transmitter Alarm Set Points

- The instrument alarm setting depends on the purpose of the specific instrument (high alarm for Plan 52 and low alarm for Plan 53A). A high level switch shall be set to normally open (not detecting liquid), while a low level switch shall be set to normally closed (detecting liquid).
- For the Plan 52 the pressure transmitter or pressure switch shall provide a highpressure alarm between 0.3-2.1 bar (5-30 psi). The alarm set point should be below seal chamber pressure, typically less than 2.1 bar (30 psi).
- For the Plan 53A and 53A-WM the pressure transmitter or pressure switch shall provide a low-pressure alarm between 1.6-10.3 bar (24-150 psi). The alarm set point should ensure the reservoir pressure is at least 1.4 bar (20 psi) above seal chamber.
- For additional information on how to install or set alarm points on the instrumentation, refer to the IOM specific to the instrument.

### 6.5 Handpump Kits

- The handpump mounting bracket (item 261) shall be mounted between the reservoir and stand / mounting surface.
- The handpump (Item 372) shall be mounted on the mounting bracket using the bolting (Item 9 & 40).
- The handpump outlet shall be connected to the unused connection A/A1 using items 126, 127, 268, 389, 389.1, 432 as shown in Figure 13.

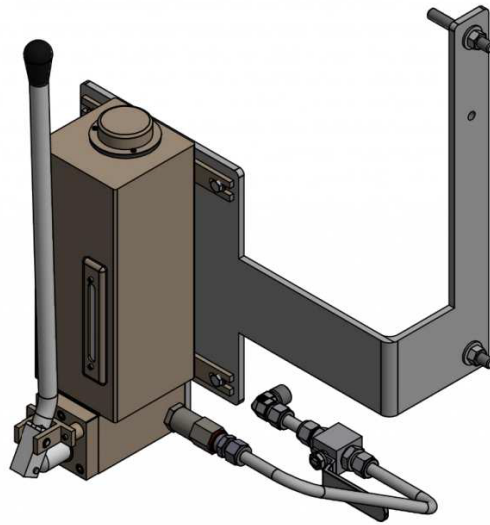


Figure 13: Handpump mounting

BILL OF MATERIAL NO: K0566940				1 SUGGESTED SPARE P/
				2 CODE: BSC[X] / OFF ST
NO	PART CODE	QTY	DESCRIPTION	MATERIAL
9	4N02163DB	4	NUT - M12	316
10	C0404003X961	2	STUD M12 X 90 MM	SA-193 GR B8M CL2 316
127	U3DPU011924	5	TUBING 1/2" X .065 WALL (SMLS) PER FOOT	A269/SA-213 TP316/ 316L SMLS TUBING
192	4R14927DB	4	FLAT WASHER M12	316
261	C0567434X944	1	SUPPORT HANDPUMP, RESERVOIR MOUNTING	SA-240 TY316/316L PLATE
372	C0542826ZZ	1	REFILL HANDPUMP ASSEMBLY 1015 PSI (70 BAR), OIL OR WATER, 316 SS WETTED, 1 GAL (3.7 LT) RESERVOIR	MULTIPLE MATERIALS
389	C0377114ZZ	1	TUBE FITTING - MALE CONNECTOR, 1/2" TUBE X 1/2 MNPT BORE THRU	316 SS
389.1	C0516244ZZ-S01	1	TUBE FITTING MALE ELBOW 1/2 IN TUBE X 1/2 IN MNPT	316/316L SS
432	C0544149ZZ	1	BALL VALVE 1/2 INCH TUBE, 316 SS BODY	MULTIPLE MATERIALS
447	C0563173DB	1	COMPONENT KIT BOLTING FOR HAND PUMP BRACKET	316

## 7 Set-up

- Check whether the block valve in the drain line is closed (if applicable).
- Open the fill line and fill the reservoir with clean buffer/barrier fluid until normal liquid level. Buffer/barrier fluid may be specified on the reservoir assembly drawing. Flowserve can supply information on buffer/barrier fluid, temperature and flow requirements based on product type, seal size and product temperature. Ensure that the buffer/barrier fluid is clean and compatible with the product.
- Check the functionality of the level switch(es) during filling (if applicable).
- Close the block valve in the fill line (if applicable).
- Charge the reservoir with dry nitrogen (or other gas suitable for pressurization) to the operating pressure as given on the system assembly drawing (Piping Plan 53A).
- Check for leakages at fittings and pipe work, rectify when necessary.
- Check functionality of the pressure switch (if applicable).

## 8 Start-up and Operation

- Plan 52 - open the valve to the vent or flare system slowly.
- Plan 53A - slowly open the valve between reservoir and external pressurization source. Slowly increase the pressure to avoid gas ingestion. Check for leaks as unit is being pressurized. Operating pressure is normally 20 psig (1.4 barg) above seal cavity pressure depending on seal design. The pressure gauge on system can be used to monitor system pressure.
- If system is equipped with cooling coils, open the valve to allow water to flow through coils.
- The pump can now be commissioned for start-up per the equipment manufacturer's recommendations and all plant safety and start-up procedures.
- For the barrier fluid, Flowserve offers DuraClear as an option to use. DuraClear oils are formulated for the complex lubrication requirements demanded by mechanical seals. The performance benefits over general duty lubricants have been recognized in lab testing and proven in the field. DuraClear barrier fluid grades 5-F (ISO 5) and 32-F (ISO 32) are the workhorse seal lubricants, capable of covering the majority of barrier and buffer fluid needs within chemical, petrochemical, pipeline, and refinery plants. These DuraClear grades are fully synthetic poly-alpha olefin (PAO) based oils which offer numerous performance advantages over minerals oils.

### 8.1 Refilling without a refill unit

If there is no refill unit available or connected to the system (hand pump) refilling can only be done when the equipment is stopped.

- Stop the equipment in which the seals are installed and de-pressurize.
- Close the valve between the reservoir and the pressure source system (Plan 53A).
- Open a vent valve to de-pressurize the reservoir
- Refill the reservoir with clean buffer/barrier fluid using the fill connection.
- Close the fill connection.
- Close the vent valve.
- Charge the reservoir with dry nitrogen or other gas suitable for pressurization to the operating pressure as given on the system assembly drawing (Plan 53A).
- Follow the instructions as per 8. START-UP AND OPERATION

### 8.2 Refilling with a refill unit

In this case the vessel can be refilled during operation of the equipment and mechanical seal. A refill unit can be a separate system that needs to be connected to the reservoir or it can be a hand pump.

- Open the shutoff valve in the connecting line between refill unit and reservoir.
- Operate the hand lever or operate the motorized refill unit at the same time checking the barrier fluid pressure by means of the pressure indicator.
- The refill procedure causes the gas volume in the reservoir above the liquid level to become compressed, which might result in an increase of the pressure. Vent the reservoir during refilling, keeping the pressure constant.
- Upon completing the refill procedure, close the shutoff valve in the line between the refill unit and the reservoir.

## 9 Maintenance Recommendations

The NR Reservoir may only be disconnected by qualified personnel, in accordance with local regulations, the safety standards of the user and in accordance with the users operating procedures.

Before disconnecting the equipment, verify that:

- The equipment is at ambient temperature
- The equipment is not pressurized
- The equipment is drained

Buffer/barrier fluid may remain in the shell, therefore, site regulations for liquid removal shall be followed.



**WARNING**

**DANGER CHEMICALS: Dangerous chemical might be released during removal of the system. Wear PPE. Follow all safety regulations and plant regulations.**

During planned plant shutdowns, it is recommended maintenance practice that the buffer/barrier fluid be drained, reservoir flushed, and new fluid put in the reservoir. This will ensure the quality of the buffer/barrier fluid used to lubricate the seals and help remove any particles that may have accumulated in the reservoir. When changing or cleaning the glass on armored sight gauges (weld pad level gauge), always install new gaskets and retorque bolts to proper amount. It is also recommended that the bolts be checked and retorqued prior to first operation. They can come loose during shipping and transport.



**WARNING**

**HOT STEAM: The pressurized steam, reservoir and surrounding surfaces might be hot. Take care when touching components. Wear the appropriate Personal Protection Equipment (PPE), according to plant regulations**

Under no circumstances should the reservoir be maintained while it still contains any hazardous materials or when the internal pressure is above atmospheric pressure. The equipment must be brought to atmospheric pressure by venting it to a safe location, before opening.

### 9.1 Repair Kits / Spare Parts

The following repair kits / spare parts are available when needed.

Repair Kit / Spare Part Code	Description
C0507207ZZ	Level gauge repair kit: 1 glass, 2 gaskets

10 Appendix A: NR Reservoir Product Offerings<sup>3</sup>

Plan	Description	Part Number
52	PRESSURE SWITCH 1/2" NPT, 5-30 PSI, SPDT, NEMA 4X, IP66, 15A @ 125/250/480 VAC	C0464199ZZ
	PRESSURE SWITCH 1/2" NPT, 5-30 PSI, SPDT, NEMA 4X, IP66, 15A @ 125/250/480 VAC, ATEX	C0506456ZZ
	PRESSURE TRANSMITTER, WITH LOCAL DISPLAY, COMBINED ATEX APPROVAL, 0-800 PSI(0-55.2 BAR)	C0148438ZZ
	PRESSURE INDICATOR (0-60, 0-160, 0-300 PSI), 2.5" DIAL, 1/4" NPT(M), PSI/BAR	C0491486ZZ, C0491494ZZ, C0491495ZZ <sup>4</sup>
	CROSS FITTING 1/2" NPT 3000# THREADED	C0464191ZZ
	ADAPTER FITTING HEXAGON REDUCING BUSHING, 1/2" NPTM x 1/4" NPTF	P0209045ZZ
	BALL VALVE 1/2"NPT(F), PTFE SEATS	C0486663ZZ
	LIQUID LEVEL SWITCH 1/2" NPT(M), FULL 316	C0487075ZZ
	LIQUID LEVEL SWITCH 3/4" NPT(M), FULL 316, ATEX	C0395674ZZ
	LIQUID LEVEL SWITCH 1/2-14 NPT PROCESS CONNECTION, M12-A 4-PIN ELECTRICAL CONNECTION, ATEX EX ia APPROVAL	C0531304ZZ
	PIPE FITTING NIPPLE ORIFICE 1/8", 1/2" NPT(M), CLASS 300	C0464197ZZ
	COOLING COIL 1/2" X .065 WALL X 20' LG	4R98173X958
	REFILL HANDPUMP ASSEMBLY FOR OILY PRODUCTS	K0559736
	REFILL HANDPUMP ASSEMBLY FOR WATER BASED PRODUCTS	K0558085
	STAND	B0498026
53A	PRESSURE SWITCH 1/2" NPT, 24-200 PSI, SPDT, NEMA 4X, IP66, 15A @ 125/250/480 VAC	C0488251ZZ
	PRESSURE SWITCH 1/2" NPT, 24-200 PSI, SPDT, NEMA 4X, IP66, 15A @ 125/250/480 VAC, ATEX	C0506457ZZ
	PRESSURE TRANSMITTER, WITH LOCAL DISPLAY, COMBINED ATEX APPROVAL, 0-800 PSI(0-55.2 BAR)	C0148438ZZ
	PRESSURE INDICATOR (0-60, 0-160, 0-300 PSI), 2.5" DIAL, 1/4" NPT(M), PSI/BAR	C0491486ZZ, C0491494ZZ, C0491495ZZ Error! Bookmark not defined.
	CROSS FITTING 1/2" NPT 3000# THREADED	C0464191ZZ
	ADAPTER FITTING HEXAGON REDUCING BUSHING, 1/2" NPTM x 1/4" NPTF	P0209045ZZ
	BALL VALVE 1/2"NPT(F), PTFE SEATS	C0486663ZZ
	LIQUID LEVEL SWITCH 1/2" NPT(M), FULL 316	C0487075ZZ
	LIQUID LEVEL SWITCH 3/4" NPT(M), FULL 316, ATEX	C0395674ZZ
	LIQUID LEVEL SWITCH 1/2-14 NPT PROCESS CONNECTION, M12-A 4-PIN ELECTRICAL CONNECTION, ATEX EX ia APPROVAL	C0531304ZZ
	PIPE NIPPLE 1/2" x 2" LG S/40 SMLS TBE	C0280724X951
	COOLING COIL 1/2" X .065 WALL X 20' LG	4R98173X958
	REFILL HANDPUMP ASSEMBLY FOR OILY PRODUCTS	K0559736
	REFILL HANDPUMP ASSEMBLY FOR WATER BASED PRODUCTS	K0558085
	STAND	B0498026

<sup>3</sup> Parts that do not belong to the bare reservoir (not welded to it). They are optional.

<sup>4</sup> Following: 0-60 PSI: C<sup>0491486ZZ</sup>; 0-160 PSI: C<sup>0491494ZZ</sup>; and 0-300 PSI: C<sup>0491495ZZ</sup> For Plan <sup>52</sup> pressure gauge recommended 0-60 PSI: C<sup>0491486ZZ</sup> and <sup>53A</sup> WM pressure gauge recommended 0-160 PSI: C<sup>0491494ZZ</sup>; and for Plan <sup>53A</sup> pressure gauge recommended 0-300 PSI: C<sup>0491495ZZ</sup>.

## NR Reservoir

Plan	Description	Part Number
53A WM	PRESSURE RELIEF VALVE G3/8 10 BAR @ 115°C	C0486190ZZ
	ADAPTER (BUSHING) 1/2"NPT(M) / G3/8"(F)	C0486194ZZ
	FLOW INDICATOR COMPACT, 1/4 NPTF, 435 PSI	C0464324ZZ
	PRESSURE REGULATOR 1/4" CONN., WITHOUT GAUGE, 0 TO 125 PSIG	C0464326ZZ
	PRESSURE SWITCH 1/2" NPT, 24-200 PSI, SPDT, NEMA 4X, IP66, 15A @ 125/250/480 VAC	C0488251ZZ
	PRESSURE SWITCH 1/2" NPT, 24-200 PSI, SPDT, NEMA 4X, IP66, 15A @ 125/250/480 VAC, ATEX	C0506457ZZ
	PRESSURE TRANSMITTER, WITH LOCAL DISPLAY, COMBINED ATEX APPROVAL, 0-800 PSI(0-55.2 BAR)	C0148438ZZ
	PRESSURE INDICATOR (0-60, 0-160, 0-300 PSI), 2.5" DIAL, 1/4" NPT(M), PSI/BAR	C0491486ZZ, C0491494ZZ, C0491495ZZ Error! Bookmark not defined.
	TEE FITTING 1/2" NPT 300#	C0464314ZZ
	PIPE NIPPLE 1/2" x 2" LG S/40 SEAMLESS TBE	C0280724X951
	PIPE NIPPLE 1/4" X 2" S/40 SMLS TBE	C0473008X951
	ADAPTER FITTING HEXAGON REDUCING BUSHING, 1/2" NPTM x 1/4" NPTF	P0209045ZZ
	BALL VALVE 1/2"NPT(F), PTFE SEATS	C0486663ZZ
	LIQUID LEVEL SWITCH 1/2" NPT(M), FULL 316	C0487075ZZ
	LIQUID LEVEL SWITCH 3/4" NPT(M), FULL 316, ATEX	C0395674ZZ
	LIQUID LEVEL SWITCH 1/2-14 NPT PROCESS CONNECTION, M12-A 4-PIN ELECTRICAL CONNECTION, ATEX EX ia APPROVAL	C0531304ZZ
	COOLING COIL 1/2" X .065 WALL X 20' LG	4R98173X958
	REFILL HANDPUMP ASSEMBLY FOR OILY PRODUCTS	K0559736
	REFILL HANDPUMP ASSEMBLY FOR WATER BASED PRODUCTS	K0558085
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## Appendix B: Maximum Allowed Working Pressure (MAWP) and Temperatures (T) for Bare Reservoir and Piping Plans<sup>5</sup>

Description	MAWP (bar) @ T (°C)	MAWP (psi) @ T (°F)
Bare Reservoir	34.5 bar @ 93.3°C	500 psi @ 200°F
Piping Plan 52	34.5 bar @ 93.3°C	500 psi @ 200°F
Piping Plan 53A	34.5 bar @ 93.3°C	500 psi @ 200°F
Piping Plan 53A WM	10.0 bar @ 82.2°C	145 psi @ 180°F

<sup>5</sup> Instrumentation options or Certifications may derate reservoir: see assembly drawing for rating



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