

Chesterton Seal Support Systems Type BSS & PSS

Installation, Operation and Maintenance Instructions



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1.0 EXPLANATION OF SYMBOLS

You will find the following symbols with all occupational safety warnings in these operating instructions, where there is a potential risk to life and limb. Please adhere to these warnings and act with special care in these cases. Inform other users of all these occupational safety warnings. In addition to the warnings in these operating instructions, the generally valid safety and accident prevention regulations must be taken into account.



ATTENTION:

A note on appropriate assembly and operation of the sealing support systems. Non-adherence may result in malfunctions or damage to the sealing support system.



WARNING:

Warnings when not adhered to, may result in damage, injury or the loss of the type approval permit.



DANGER:

Electrical warnings which, when not adhered to, may result in damage, injury or the loss of the type approval permit.

These warnings are provided within these operating instructions where special attention should be given to ensure that the directives, regulations, warnings and the correct work procedures are adhered to, so that damage or destruction of the machine and other system components can be prevented. These warnings are to be fully adhered to.

2.0 SAFETY INSTRUCTIONS



These operating instructions contain basic information to be taken into account during set-up, operation and maintenance.

They must therefore be carefully read by the technician and other technical staff / operators before assembly and commissioning and should be made permanently available at the place of installation of the system.

Not only the general safety instructions listed in this chapter, but also the special safety warnings inserted under the main points must be taken into account. In addition, all safety warnings in the attached operating instructions for individual sub-systems must be adhered to along with those of the manufacturer of any optional components installed.

- Read all instructions.
- Keep these operating instructions as a reference document.
- The sealing system and tank may only be removed or fitted when the equipment is in a fully shutdown and safe condition, with careful adherence to the safety, accident and environmental regulations of the operator and local laws as they apply to the relevant system component.
- The use of this system under conditions other than those specified on the tank label and the technical data sheet is not permitted. The risk is accepted by the operator.
- Any operation under different conditions is to be clarified with the manufacturer in advance.
- The tank is provided without the required safety equipment. Suitable equipment complying with operator regulations and local law is to be fitted before commissioning the system.
- Before commissioning the system, the required tests are to be carried out on the equipped tank, in accordance with the operator regulations and local law.
- The customer or operator must ensure that the persons entrusted with the handling, assembly and operation of the sealing system are also familiar with the design and function of the sealing system and the associated mechanical seal.
- It must be ensured that the seal and seal tank has been completely filled and bled. The mechanical seal must never be started up dry.

3.0 RISK



Work with tanks may pose a risk of poisoning or asphyxiation.

Work may only be carried out with the aid of suitable personal protective measures (e.g. breathing equipment, protective clothing, etc.).

Where there is a risk of an explosive atmosphere being created in the tank, the corresponding steps to prevent the generation of sparks are to be taken. Work in this area may only be carried out by technical staff in accordance with the relevant safety directives.

Care must be taken that the power supply to the drive sub-systems is interrupted and secured to prevent unintentional switching on by third parties.

When handling sealing fluids, it is imperative to take note of the corresponding safety instructions. The required personal protective equipment should be assessed and made available to those working with the tanks.

4.0 EQUIPMENT IDENTIFICATION

Tanks are fitted with a tank certification nameplate and a system certification/product identification nameplate.

Tanks are U stamped and designed in accordance with ASME BPVC Section VIII Division 1.

Tanks are PED certified to 2014/68/EU.

The certification nameplates will have the following information:

EQUIPMENT IDENTIFICATION NAMEPLATES

Tank Certification Nameplate	System Certification/Product Identification Nameplate
Certification markings	System model (reorder number)
Maximum allowable working pressure (MAWP) of tank	System serial number
Maximum design metal temperature (MDMT) of tank	Year built
Serial number	Working capacity
Year built	System pressure (PS)
Capacity	Maximum system temperature (TS MAX)
Test pressure of tank	Test pressure for system
Product category	

5.0 USE AND APPLICATION



The sealing support tank may only be used for tasks as specified in the technical data sheet. Any other use or use exceeding this limitation is not deemed appropriate. The manufacturer cannot be held responsible for any resulting damage. Appropriate use also includes adherence to all operating instructions and the inspection and maintenance intervals.

The operating and design data, corrosion allowance, and support loads may be taken from the product technical data sheet.

General damage includes damage to the sealing support system resulting from pressure peaks, frost, freezing of the media, corrosion or erosion due to short-term operating states or wrong operation of the system, which can no longer be verified; such damage is excluded from the warranty.

See technical data sheet for any deviations from this rule.

6.0 COMPONENTS, TRANSPORT AND STORAGE



- The sealing support system is to be transported and stored in its unopened original packaging.
- Only use suitable equipment or lifting devices to transport the components.
- The storage location must be dry and dust-free. Temperature and radiation influences are to be avoided.
- Weight specifications are according to the product technical data sheet.
- There are no provisions for long-term preservation of the sealing tank.

Description of the sealing support tank

The sealing support tank has been constructed in accordance with the technical data sheet. The tank has connections that can be used for inspection and cleaning. Where necessary, a connection sleeve for a level switch has been provided.

Disassembly state

Sealing support systems are delivered as complete units.

No sealing liquid has been added, nor does it form part of the consignment. Where possible, accessories have been pre-installed.

Possible add-on systems

Depending on the customer requirement, the sealing support tank may be fitted with connections for add-on systems. Other add-on systems can be fitted to some degree, following consultation with the manufacturer. Details of optional accessories can be found in the product documentation.



Functional test

Inspection for damage

Seal tanks are to be visually checked after prolonged storage

Functional check of the additionally fitted monitoring units.

Design

All pressurized weld connections are MAG/TIG welded, either welded through or counter-welded. Design, construction and manufacturing of the tank is according to ASME BPVC Section VIII Division 1 2015 Edition and is PED certified to 2014/68/EU.



Function

Sealing support tanks are used to supply liquid to mechanical seals. They are to be filled with a suitable sealing liquid. The liquid exchange at the mechanical seal takes place through natural circulation in accordance with the thermosiphon principle or through a forced circulation pump or a seal internal pumping ring. Pressurization should only be with water or inert gases depending on the system type. Risks associated with pressurization using other gases are borne by the operator.

Conditions for use

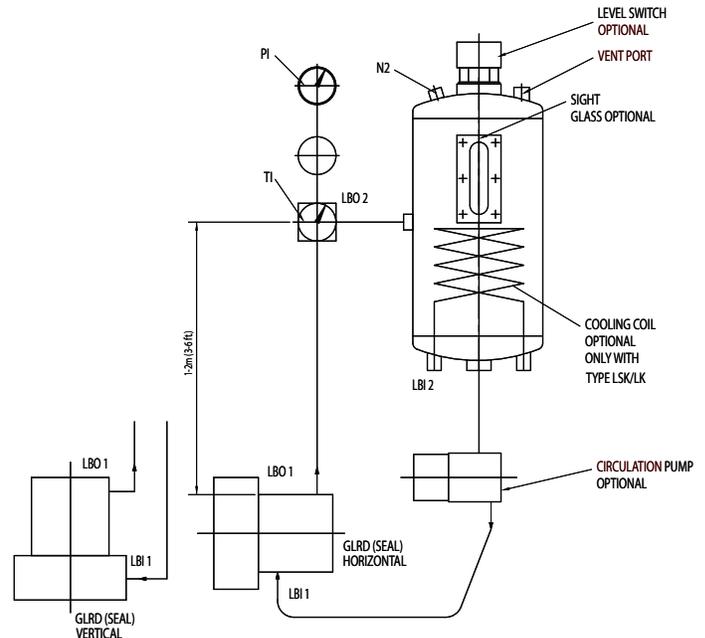
- Viscosity of the sealing liquid at operating temperature should be <10cSt with natural circulation, <20cSt, with forced circulation during operation (even during start-up).
- Only product-compatible, neutral, clean, well lubricating and harmless media may be used as sealing liquid. When using a forced circulation pump, the viscosity information provided by the pump manufacturer should be taken into account, but it should not be greater than the values provided above.
- The arrangement of the tanks in relation to the mechanical seal should be in accordance with the mode of operation (see **Sections 8.1 and 8.2**) and should be agreed upon with the mechanical seal manufacturer.
- Where the sealing circuit contains stop valves (ball valves), they must be open, full bore type providing little or no additional resistance. The use of gate or needle valves is not recommended.
- The liquid level in the tank must always remain above the minimum level of the sight glass (where fitted).
- The temperature of the sealing liquid should remain at least 40°C (72°F) below boiling temperature of the sealing liquid vapor point under the applied pressure.
- Where necessary, the sealing medium may be cooled or heated via the cooling coil, (where installed).
- Any overflow connections / ventilation connections are to be piped and channelled into a suitable slop system under atmospheric pressure, without barriers or reduction in the cross-section of the pipe. The pipes should be regularly checked for blockages.

8.1 According to API-PLAN 52 (BSS/BSSC)

The operating mode should be non-pressurized feeding (from feed tank)

- according to the thermosiphon principle
- with forced circulation (forced circulation pump, pumping screw)

Symbol Norm DIN EN ISO 21049 Plan 52



- Pressurization is not required, mechanical seal operates in the tandem principle. Feeding liquid (quench) at atmospheric pressure.
- Connection point via orifice plate integrated into cover, with pipe to flare stack or slop system.
- Monitoring takes place through a viewing window or with a thermometer, manometer and suitable monitoring equipment such as the "MIN-MAX" level switch or the "MIN-MAX contact", temperature switch and/or a similar device. Optional equipment may be required.
- The filling level must never fall below the "MIN" level during operation. The thermosiphon effect and the circulation of the sealing liquid will be interrupted when the level is not reached and damage to the mechanical seal will occur.
- Please note: exceeding the "MAX" warning is not a risk factor, as the quenching liquid is channelled to a flare stack or slop system. The "MAX" alarm is nevertheless important! It indicates that the inner mechanical seal is defective.
- Where required, the barrier liquid can be cooled and/or heated and the flow rate of the cooling agent should be adjusted according to the sealing liquid temperature specifications.

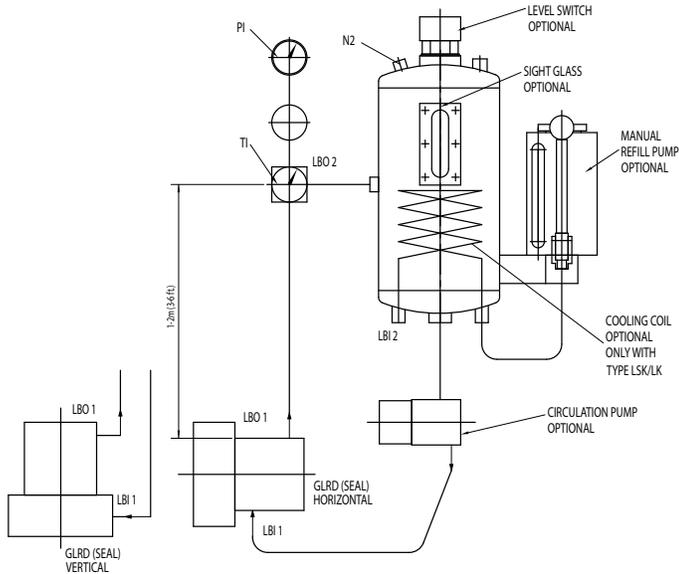
8.0 MODE (cont.)

8.2 According to API-PLAN 53 (PSS/PSSC)

Operation with pressurized circulation (pressurized sealing tank)

- according to the thermosiphon principle
- with forced circulation (forced circulation pump, pumping screw)

Symbol Norm DIN EN ISO 21049 Plan 53



- For the gas pipe: Connect nitrogen to connection Air/N₂.
- A reversible pressure regulator is to be fitted for pressure control purposes. A non-return valve must be installed between the gas supply and the pressure regulator.
- Set a constant sealing pressure of 1 to 2 bar (15 – 30 psi) above the maximum possible pressure on the mechanical seal. Any pressure fluctuations that may occur must be taken into account.
- Monitoring takes place through a viewing window or with a thermometer, manometer, or other optional monitoring equipment such as the "MIN-MAX" level switch, or the "MIN-MAX" contact, temperature switch and/or a similar device.
- The fluid level must never fall below the "MIN" level during operation. The thermosiphon effect and the circulation of the sealing liquid will be interrupted when the level is not reached and damage to the mechanical seal will occur.
- Fluid losses (leakage) can be compensated with a manual refill pump under pressure. Do not open the fill valve when the system is pressurized.
- Where required, the barrier liquid may be cooled and/or heated and the flow rate of the cooling agent should be adjusted according to the sealing liquid temperature specifications.

9.0 ASSEMBLY



This is based on the tank drawing. Assembly must take place in such a way that no major additional forces act on the tank, such as vibration or bolting stresses caused by mounting. It is recommended to use a stand, anchored to the floor.

Assembly of the sealing support system

The tank may only be mounted using the attached bracket. Assembly must be such that no vibration acts on the sealing support system. Where necessary, rubber isolating bushings are to be used for assembly. No welding or other physical modification may be carried out on the tank.



Electrical assembly

The assembly must be inspected by an expert before commissioning to ensure that the required electrical safety measures are in place. Grounding, nulling, isolating transformer, earth leakage or error voltage safety switches must meet the requirements of the relevant power supplier and local regulations.

The voltage stipulated in optional component specification must be the same as the grid voltage available.

Please ensure that the electrical plug connections are above potential flood lines and are protected from moisture. Power grid connection cables and sockets are to be checked for damage before use.

The connection ends must not be immersed in water, as this may result in water penetrating into the motor connection zone.

Motor safety switches and switch boxes must never be installed in areas in which there is a risk of explosions.

The electrical connection must be in accordance with the local regulations. The supply voltage and frequency are to be taken from the pump label and the label of the electrical device. Care must be taken that the data provided on the labels are in accordance with the existing power supply.

- The switch device should be set up in the immediate vicinity of the pumping station. The maximum lengths of the power supply cables and level-measuring system cables are to be taken into account.
- The installation site may not be within the "EX" risk zone (even for "EX"-protected pumps).

9.0 ASSEMBLY (cont.)

- Assess the provision of cable conduits.
- Assess the provision of voltage supply.
- Pull the power supply cable and control lines through the cable pipe and connect the controls in accordance with the operating instructions and the terminal plan for the switch box.
- Carry out the required grounding work.
- In addition, the operating instructions for the pump and sensors apply.

Pipe assembly

The information below must be taken into account when assembling the pipe system.

- The pipe cross-section should be as large as possible. Connections should be of the screw type, or clamped for sterile applications.
- Pipes should be ascending, without narrowing or kinks, from the mechanical seal to the tank. Where shut-off devices are required, ball valves should be used.
- Pipes should be fitted in arcs of at most 90° (45° to be preferred) and with a radius >80 mm (>3 inches); >100 mm (>4 inches) to be preferred.
- The layout must take into account any changes in the length of the pipes caused by thermal expansion or vibrations.
- Pipes should be attached with clamps at regular intervals. Screw connections and fittings should not be subjected to mechanical load.
- The tank should be at least 0.3 m (1 foot) and at most 2 m (6 feet) above the mechanical seal to ensure that the thermosiphon effect can be initiated. Where a circulation pump is used, a shorter distance is possible.
- The return pipe from the mechanical seal must lead to the lateral connection of the tank.
- Overflow and bleeding connections must be connected according to **Section 7**.

Cooling water pipe

The maximum permissible pressure is to be checked and corrected where necessary. It must be possible to adjust the cooling water flow. (For values, consult the seal manufacturer)

Insulation

The sealing support system is usually delivered from the manufacturer without any insulation. The operator should check whether insulation or other protection is necessary according to the statutory regulations. Insulation should be provided by the customer. When insulating the heat exchanger (when equipped), care should be taken that the cleaning openings are provided with easily removable insulation caps.



Cleaning the supply systems

Pipes and screw connections should be cleaned before final assembly (e.g. with compressed air or suitable benzene or alcohol). The cleaning medium must be disposed of in accordance with the specifications.

10.0 INITIAL OPERATION



A flushing process is required before installation and commissioning so that any existing debris and storage is removed from the tank.

Pumps should never be left to run dry (risk of overheating).

Any valves should be opened before commissioning the system.

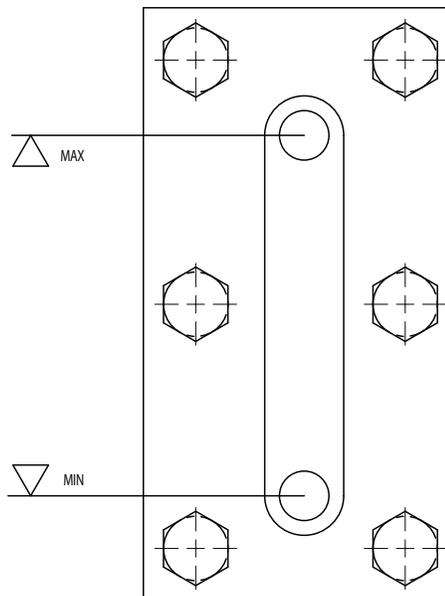
Where three-phase current equipment is used, care must be taken that the current flow direction has been set.

The flushing medium must be compatible with the sealing liquid.

To ensure ongoing operation, the operator should carry out regular inspections with the aid of the monitoring devices. The intervals are to be defined by the operator. Where the system is being recommissioned after disassembly for maintenance or cleaning purposes, new seals must always be used.

Plan 53A and Plan 52

1. Install the System on a place which is free from vibrations, not more than 2 m (6 feet) above and 1 m (3 feet) away from the mechanical seal. If your seal tank has a cooling coil, see **Cooling coil option** information at the end of **Section 10** for more information to start up.
2. Connect the seal tank by using the hose to the seal supply connection (50) and back from the seal return connection (51). Ensure that all pipework is rising, there must be no sags, and that bends are $< 45^\circ$ and have a radius greater than 100 mm (4 Inches). For additional information on assembly of the finned tubing (22), see **Finned tubing option** at the end of **Section 10**.
3. To remove air from the seal during filling, disconnect the seal return hose back to the tank (13) from the inlet on the tank (11). The air in the seal can be removed now and the fill time is reduced. When the fluid reaches the top of the seal return hose, reconnect it and continue to the next step.
4. Open the fill port (N3) and fill the tank with the necessary buffer fluid (Oil or Water).
5. Fill the seal tank until the level can be seen. It is recommended to fill below the maximum fill line (2).



Plan 53A

6. Connect the gas supply (isolate the supply pipe and use inert gas) to the check valve (9) before the pressure regulator (8). The pressure regulator has a maximum inlet pressure of 20 bar (290 psi), and depending on the pressure regulator option provided, the regulated outlet pressure can range from 9 bar (125 psi) to 17 bar (250 psi).
7. Close the pressure regulator by turning the knob clockwise.

Adjustment of the system operating pressure

8. Open the nitrogen supply and adjust the pressure with the pressure regulator (8). Turning the cap clockwise increases the pressure; turning the cap counter clockwise reduces the pressure. When the required pressure is set by the regulator, it can be locked by pushing down the cap or locking nut.
9. The gas supply must remain connected.
10. At the first start up please check the flow direction of the buffer fluid. The pipe which becomes warm must be connected to the return port of the tank. If not, the thermosiphon effect will stop. If there are problems with the circulation, change the pipes at the seal tank.

Cooling coil option

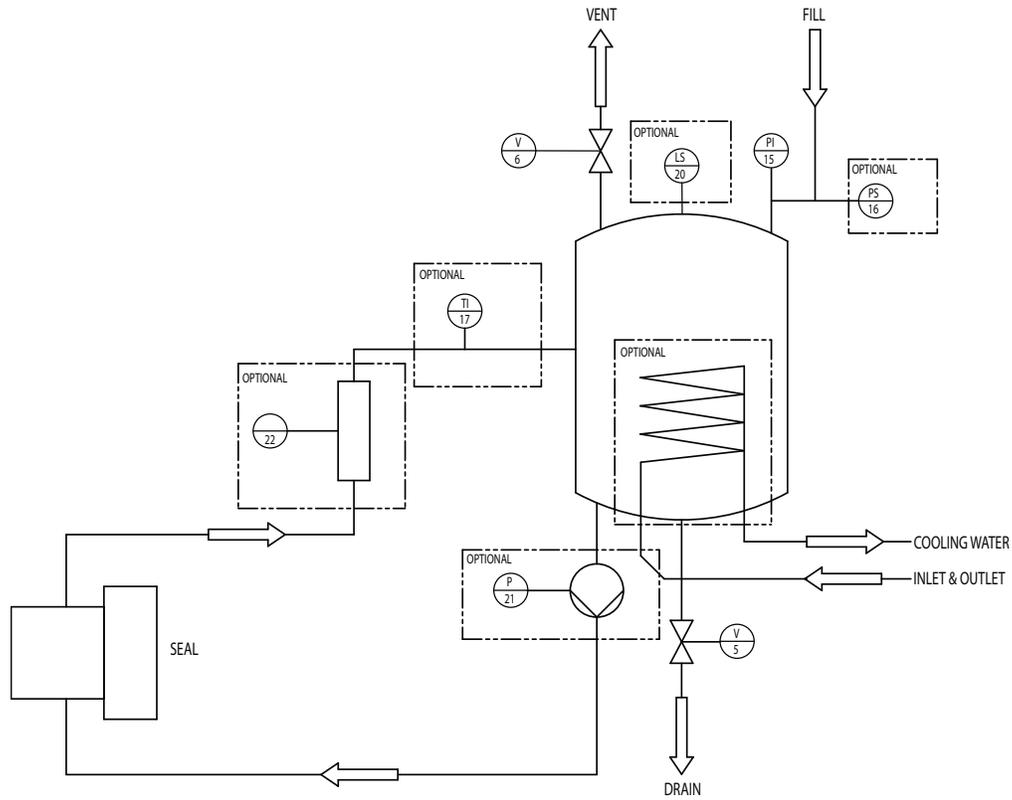
1. Connect the cooling water supply to the cooling coil inlet (N9) on the seal tank and the cooling coil outlet (N8) to a suitable drainage.
2. Open the cooling water supply.

Finned tube option

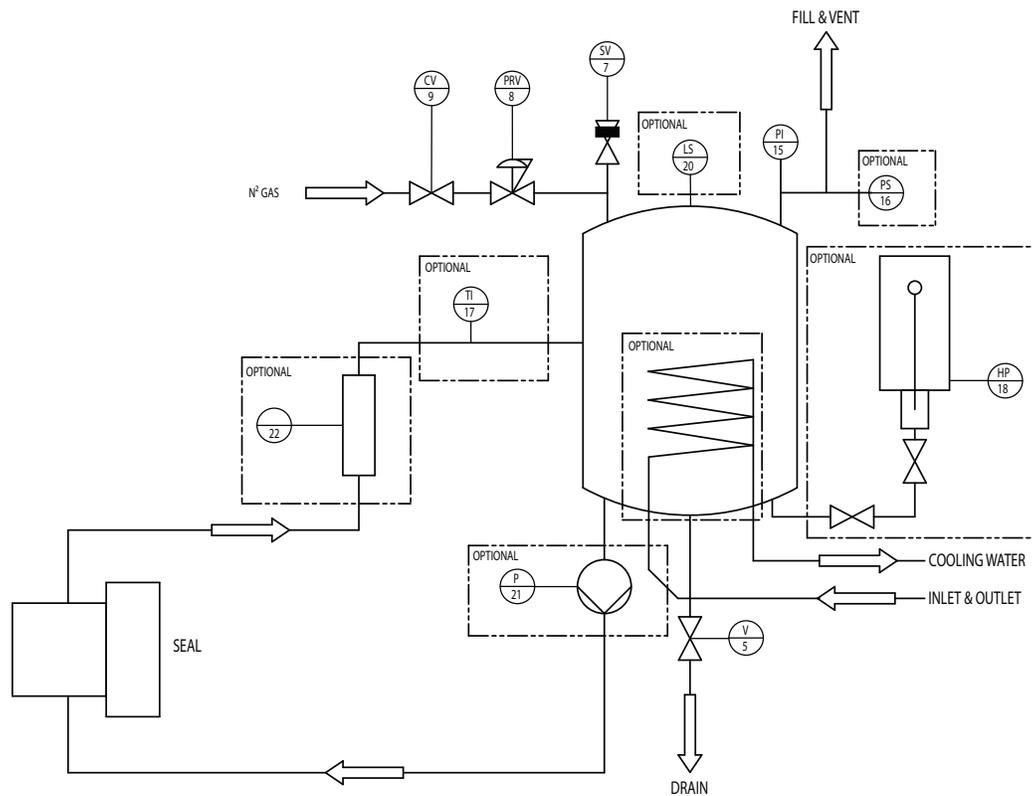
1. Install the finned tube (when equipped) at the seal return (51).
2. The end user provides the pipe and excludes it from the seal to the finned tube (22).

10.0 INITIAL OPERATION (cont.)

BSS/C Installation scheme Plan 52



PSS/C Installation scheme Plan 53A



11.0 SWITCHING OFF



Before switching off the circulation pump (where equipped), care should be taken that supply of the tank is discontinued by switching off. Care should be taken that the stopping time of the pump is sufficiently long, as due to the hot wall materials used there may be some delayed heating, posing a risk of steam bubble formation and destruction of the equipment!

To prevent pressure peaks valves should always be gradually opened and closed.

Open the tank after it has cooled down and is depressurized. This applies to all sealing elements to which the tank has been fitted.



Note:

Depending on the medium used, there is a risk of freezing when temperatures drop below 5°C (41°F). In such cases the sealing liquid tank must be completely drained via the draining connections provided (N5) before being decommissioned. This is to prevent frost damage.

Drain valves may only be removed in a depressurized state and when the medium has reached a safe temperature. An adequate cooling time must be ensured.

Open the drain valves and allow medium to drain via the drainage connection (5).

Collect the medium in accordance with operator and local regulations and risk warnings and dispose of it in an appropriate way.

Completely empty the heat exchanger.



Attention:

When opening pressurized components there is a risk that the lock screw may be ejected away with force as well as a risk of sustaining burns where temperatures are high.

12.0 MAINTENANCE AND DISPOSAL

Standards, norms and local regulations should be adhered to.

Correctly installed and operated sealing liquid systems require practically no maintenance. Sealing or barrier liquid should always be available in adequate amounts.

Maintenance intervals

Daily

- Check and note the system pressure
- Look for signs of leaks from the seal, system and pipes.
- Check the sealing liquid filling level / temperature and adjust when required.
- Check the temperature and the flow rate of the cooling medium.
- Check all alarm signals. Take action as necessary.

Monthly

- All filters (where present), should be inspected and replaced when they are dirty or blocked.
- Any discoloration of the sealing liquid or filter contamination can be signs of a leak of the inner mechanical seal and should be investigated without delay.

After 5 years

- It is recommended that a complete internal and external inspection of the tank and all system components should be carried out at 5-year intervals.

Cleaning

The cleaning intervals of the sealing liquid system depend on the system location and the medium used.

Cleaning may be carried out

- Mechanically by brushing with a nylon brush.
- High-pressure cleaning of each individual pipe using special nozzles and water
- Chemical cleaning of the entire space on the pipe side. The liquid used must be chloride-free. It is recommended that chemical cleaning be carried out by a specialized company.

When rinsing the tank, the rinsing liquid must be properly disposed of. The rinsing medium must be compatible with the sealing medium. External cleaning is not absolutely necessary but is good maintenance practice.

When using sealing liquid systems in sterile areas, the necessary sterilization temperatures and times are to be adhered to. These are determined by the operator.

12.0 MAINTENANCE AND DISPOSAL (cont.)



Note:

A nylon or stainless steel brush is to be used for cleaning stainless steel tanks and pipes. The use of a normal steel brush will result in corrosion.

Breakdown

After any breakdown, the tank and the monitoring equipment should be checked. Faulty components and those that are no longer functional are to be removed, repaired or replaced.



Repairs

Repairs may only be carried out by specialized staff. Original spares should be used to ensure correct operation.

Welding on the tank or heating of the tank for other reasons, as well as all work that could result in a decrease in wall thickness, is not permitted.

Disposal

The following procedure is to be used for proper disposal:

The sealing liquid system should be taken out of operation.

Liquids are to be drained from the tank, pipes and components are properly disposed of. The same applies to contaminated cleaning cloths and binders.

All cables and switch equipment are to be removed and disposed of as electronic waste.

All plastic parts are to be separately disposed of.

Steel and aluminium materials are usually handed over to a disposal company.

13.0 SYSTEM LEAKAGE

The following procedure is to be followed:

1. Mark the leak
2. Remove the system from operation as detailed in **Section 11**.
3. Tighten the fittings once the system has been depressurized. If the leakage continues, the sealant should be replaced. Once the old sealant has been removed, the threads must be thoroughly cleaned. Inspect the threads for damage and repair or replace in accordance with these instructions.
4. New sealant should be applied to the threads and the threaded connections tightened. Care should be taken that where a connection has several screws they are positioned crosswise and are evenly tightened.

14.0 ATEX



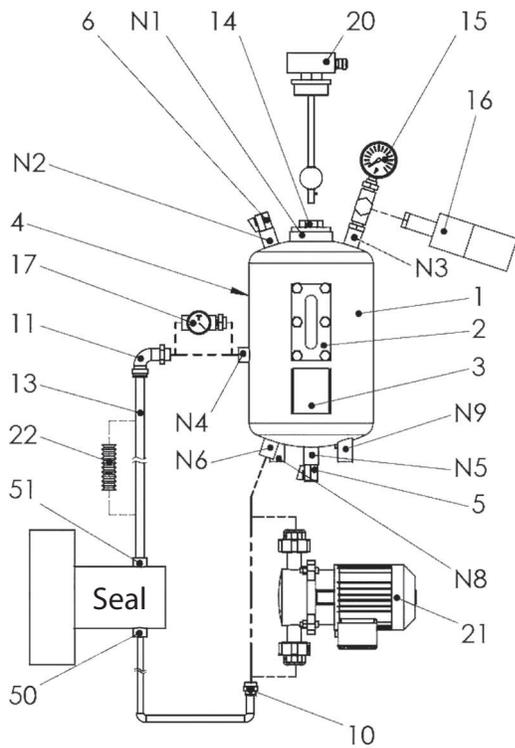
Before commissioning, the operator must check the components used for suitability regarding EX zone, ignition protection type and EPL.

Ensure that the ignition temperature of the sealing liquid or the transfer medium is at least 50°C (90°F) above the maximum permitted surface temperature of the pump.

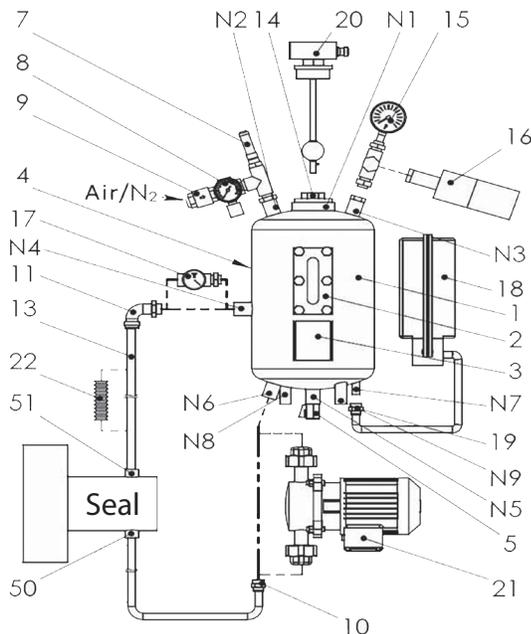
All conductive parts of a device must be connected in such a way that no dangerous differences in potential can occur between them. If there is a possibility that insulated metal components could become charged and thus act as a source of ignition, grounding connections must be provided. The grounding resistance may not exceed 10⁶ Ohm.

15.0 ITEM OVERVIEW AND COMPONENT LIST

BSS Plan 52 with Cooling Coil



PSS Plan 53A with Cooling Coil



Position	Plan 52 BSSC/BSS	Plan 53A PSSC/PSS	Description
1	X	X	Seal Tank
2	X	X	Sight Glass
3	X	X	Name Plate
4	X	X	Mounting Bracket
5	X	X	Drain valve 1/2" NPT
6	X	—	Fill/Vent valve 1/2" NPT
7	—	X	Safety Valve
8	—	X	Pressure Regulator with Pressure Gauge
9	—	X	Check Valve
10	X	X	1/2" NPT Straight Fitting; 1/2" Push In Tube
11	X	X	1/2" NPT Elbow 1/2" Push in Tube
13	X	X	Tube Diameter 1/2"
14	X	X	Plug 2" NPT
15	X	O	Pressure Gauge
16	O	O	Pressure Switch
17	O	O	Temperature Gauge
18	—	O	Hand Pump Unit
19	O	O	Refill Valve in Position 18 Included
20	O	O	Level Switch
21	O	O	Circulation Pump
22	O	O	Finned Tube Kit
50	X	X	1/2" NPT Straight 1/2" Push in Tube
51	X	X	1/2" NPT Straight 1/2" Push in Tube
N1	X	X	Level Switch Nozzle 2" NPT with Plug
N2	X	X	N2 Inlet 1/2" NPT
N3	X	X	Fill/Pressure Indicator Nozzle 1/2" NPT
N4	X	X	Seal Return Connection 1/2" NPT
N5	X	X	Drain 1/2" NPT
N6	X	X	Seal Supply Connection 1/2" NPT
N7	—	X	Refill 1/8" NPT
N8	X	X	Cooling Water Outlet 1/2" NPT
N9	—	X	Cooling Water Inlet 1/2" NPT

X = Standard / O = Optional



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