FLOWSERVE

Installation, Operation, & Maintenance Manual
682L Seal Cooler

Experience In Motion

1. INTRODUCTION

1.1 About this Manual

This manual is intended to ensure the safe installation and effective operation of the 682L seal cooler. 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.
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

1.2 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.

1.3 Other Supplied Documentation

The assembly drawing is included with the cooler.

1.4 Conformity with Standards and Directives

The 682L Seal Cooler conforms to the following standards and directives:

- ASME BPVC Section VIII Div. 1
- ASME B31.3
- Pressure Equipment Directive (PED) 2014/68/EU
- API Standard 682

1.5 Use of Alerts and Icons

This manual uses “Notes”, “Cautions”, and “Warnings” to 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 682L Seal Cooler

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:

- Cooling fluid at sufficient flow and pressure is required for efficient heat removal from process or barrier fluid.

	**WARNING** **HIGH PRESSURE:** The cooling fluid section of the cooler 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 cooler 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 Personal Protective Equipment (PPE). Follow all safety regulations and Plant regulations.

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

Note: End of life equipment must be disposed of according to local environment laws and regulations.

4. TRANSPORTATION AND STORAGE REQUIREMENTS

The following requirements apply to the 682L seal cooler and all related equipment:

Transport and storage criteria	Requirements
Transportation	The system must be transported and stored in the unopened, original shipping box.
Suspect damaged during transportation	Inspect coolers 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 cooler 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 682L is a coil type cooler used with single or dual mechanical seal arrangements. The purpose of Flowserve's 682L seal cooler is to lower the temperature of process or barrier fluid passing through the coil while cooling fluid passes through the shell. It is designed for installations close to the seal where space is limited and utilizes optimized flow patterns to enhance cooling efficiency.

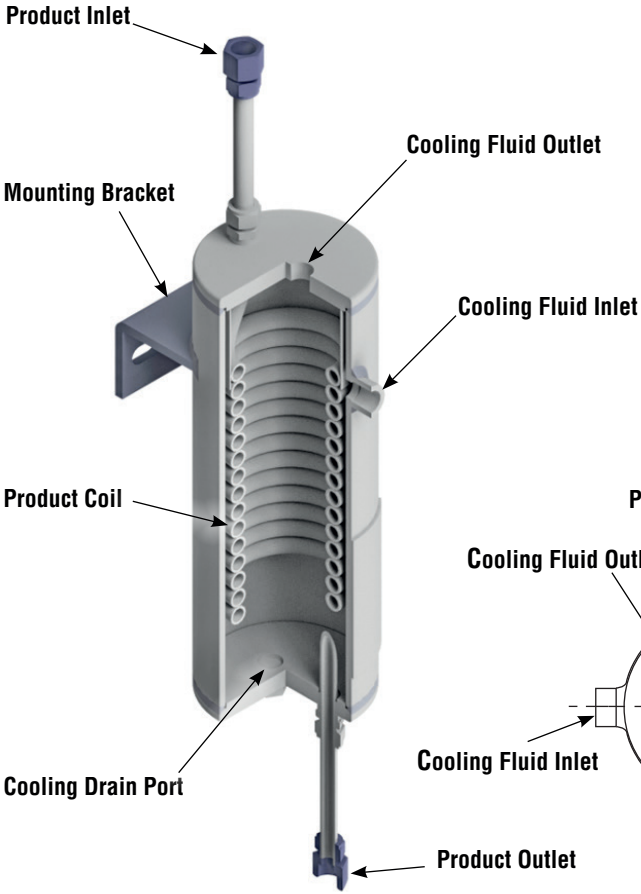

Figure 1: Cooler Sectional View

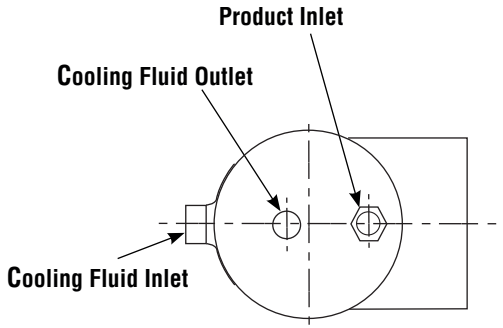

Figure 2: Top View

Note: 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.

6. INSTALLATION

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

Position the 682L seal cooler 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 API Piping Plans

API Plan 21 provides cooling to the seal by flowing pump discharge fluid through a control orifice and into the seal cooler before entering the seal chamber. This piping plan is targeted for clean high temperature fluids and hot water above 176°F (80°C) to improve vapor pressure margin, meet secondary seal element temperature limits, reduce coking, and improve fluid lubricity. Refer to figure 3 in following page.

API Plan 23 cools the seal chamber fluid by using a pumping device to circulate the seal chamber fluid through a seal cooler and back to the seal chamber. The circulated fluid is isolated from the pump impeller area by a throat bushing so that the seal cooler needs to cool a limited volume of fluid in the seal chamber heated by the seal faces and heat soak from the process side. This piping arrangement is the plan of choice for clean hot water services, particularly above 176°F (80°C) where water has low lubricity, and many clean hot hydrocarbons to improve vapor pressure margin. Refer to figure 4 on following page.

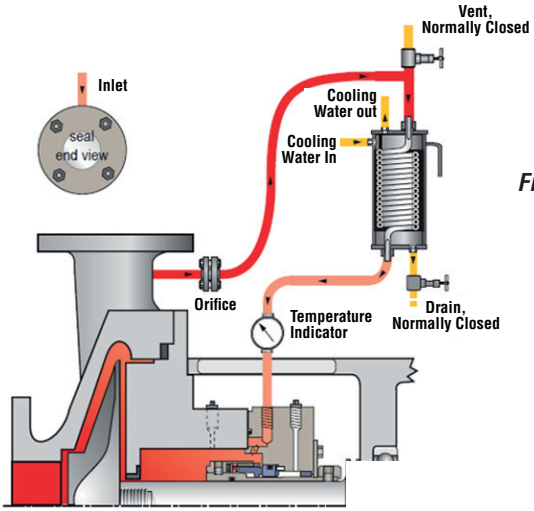

Figure 3: API Plan 21 Configuration

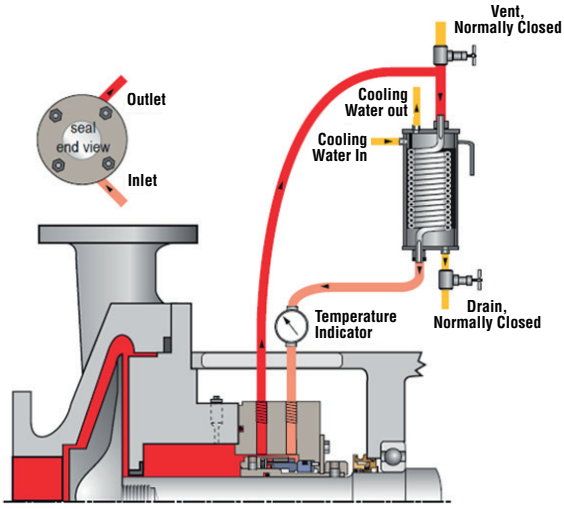

Figure 4: API Plan 23 Configuration

6.2 Mounting Positions

The seal cooler should be mounted as close to the seal as possible. Vertical mounting is recommended for optimal cooling operation.

Horizontal mounting of the cooler is not recommended as it is difficult to vent gas because gasses (including air) can become trapped within the upper turns of the cooling coil. The presence of trapped gas / air is more critical when using a Plan 23 seal flush or any closed loop system. Trapped gasses that are entrained in the sealing fluid can collect in the seal cavity thus impeding flow to the seal cooler. This can ultimately cause the seal to overheat and fail due to a lack of lubrication. Mounting the seal cooler in a vertical position with vent and process fluid inlet connection on top ensures thorough venting and promotes cooling efficiency.

7. OPERATION

Always operate the 682L Seal Cooler within the temperature and pressure limits shown on the assembly drawing / product nameplate

When installing, ensure that the seal cooler, piping, and vent locations provide complete venting of gas (including air) from both the process and coolant sides of the cooler. This requires the vents to be located at the highest point in each system.

Before start-up, ensure that all piping is properly attached to the appropriate connections for both the process and coolant to prevent fluid leaks and achieve expected cooler performance. Ensure that all the gas (including air) is vented from both the coil and shell systems to maximize system efficiency and prevent a vapor lock condition.

At start-up, ensure that the flush fluid flow and coolant fluid flow are set and stabilized at the prescribed flow rates determined for the application.

Do not allow the coolant fluid flow rate to drop below minimum flow rate. Lower flow rates promote fouling which reduces the seal cooler heat transfer capabilities. See table 1 for coolant flow rates.

Table 1: Coolant Flow Rates

Cooler size	**Ø .750" OD Tube**
Minimum Coolant Flow	15 L/m [4 GPM]
Maximum Coolant Flow	38 L/m [10 GPM]

Seal cooler performance should be periodically validated. Baseline temperatures should be gathered soon after equipment commissioning and compared with temperature data collected periodically over the operational life of the cooler.

Changes in temperature differential, unaccompanied by process flow or temperature change can be a sign of tube fouling and should be investigated.

8. MAINTENANCE

The 682L seal cooler may only be disconnected by qualified personnel, in accordance with national 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

Process fluid may remain in tubes, Removal of remaining fluid to adhere to site policy.

WARNING
DANGER CHEMICALS: Dangerous chemical might be released during removal of the system. Wear Personal Protective Equipment (PPE). Follow all safety regulations and Plant regulations.

8.1 Remove the seal cooler from service.
8.2 Fitting ferrules and nuts cannot be removed from the primary lengths of process tube and should remain in place. Do not remove the tube fittings connected to the top and bottom end plates. Be sure to retain all fittings and mark them appropriately, ensuring each fitting is used in same location as it was removed from, during re-installation. This will minimize the likelihood of fitting leaks upon reassembly.
8.3 Keep cooler in a safe location where a waste containment receptacle, with sufficient capacity, is utilized to catch any drained fluids and solids.
8.4 Holding the cooler vertically with drain pointing up, aerosol spray a cleaning solution or use high flow water into the coolant drain port to liberally soak the cooler internals until liquids start to flow out the coolant inlet and outlet onto the waste containment receptacle.
8.5 Let soak and repeat as necessary for several minutes, until cleaning solution flows freely into the waste containment receptacle through the coolant inlet port. Plug the coolant outlet port if required, to force the spray to leave through the coolant inlet.
8.6 With cooler still mounted vertically with drain pointing up, aerosol spray a cleaning solution into the process outlet port to liberally soak the process coil until liquids start to flow out the process inlet into the waste containment receptacle.
8.7 Let soak and repeat as necessary for several minutes, until cleaning solution flows freely into the waste containment receptacle thru the process inlet port.
8.8 Hook up a steam connection to the process outlet port, leaving the inlet port open to the waste containment receptacle.
8.9 Ensure the cooler is solidly secured to prevent movement when pressurized steam is applied.

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

8.10 Flow steam into the outlet at low pressure and flow.
8.11 Observe the inlet port for solids and liquids and run the steam until clean steam/water vapor only exits.
8.12 Remove the steam connection from the process outlet and reconnect to the coolant drain port.
8.13 Repeat steps 8.8 to 8.11 on the coolant side.
8.14 Remove the steam connection from the coolant drain.
8.15 Let the cooler dry as much as possible by gravity by holding it vertically with drain pointing down.
8.16 Apply dry instrument air into the process inlet connection and allow it to flow through the outlet port until all liquids have been eliminated.
8.17 Apply dry instrument air into the coolant outlet connection and allow it to flow through the drain port until all liquids have been eliminated.
8.18 Inspect the cooler. The inspection should include the following hold points as a minimum:
- Visual inspection of the exterior of the system for corrosion, erosion, damages and cracking
- Checking of coating (when applicable)

Maintenance of the seal cooler shall be limited to touch-up of coating (if applicable) and cleaning methods that do not impact the mechanical integrity of the system.

Under no circumstances should the seal cooler 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. APPENDIX A: Seal Cooler 682L Product Offerings

Process Connection	Coolant Connection	Drawing Number	Part Number
¾˝ Tube	¾-14 NPT	682LSTN0000DWG	682LSTN0000
¾-14 NPT	¾-14 NPT	682LSNN0000DWG	682LSNN0000
¾˝ 600# RF Sch. 80	¾-14 NPT	682LSFN0600DWG	682LSFN0600
¾˝ 600# RF Sch. 80	¾˝ 300# RF Sch. 80	682LSFF0600DWG	682LSFF0600

FIS235eng REV 06/19 Printed in USA

To find your local Flowserve representative
and find out more about Flowserve Corporation,
visit www.flowserve.com

USA and Canada
Kalamazoo, Michigan USA
Telephone: 1 269 381 2650
Telefax: 1 269 382 8726

Europe, Middle East, Africa
Etten-Leur, the Netherlands
Telephone: 31 765 028 200
Telefax: 31 765 028 487

Asia Pacific
Singapore
Telephone: 65 6544 6800
Telefax: 65 6214 0541

Latin America
Mexico City
Telephone: 52 55 5567 7170
Telefax: 52 55 5567 4224

flowserve.com