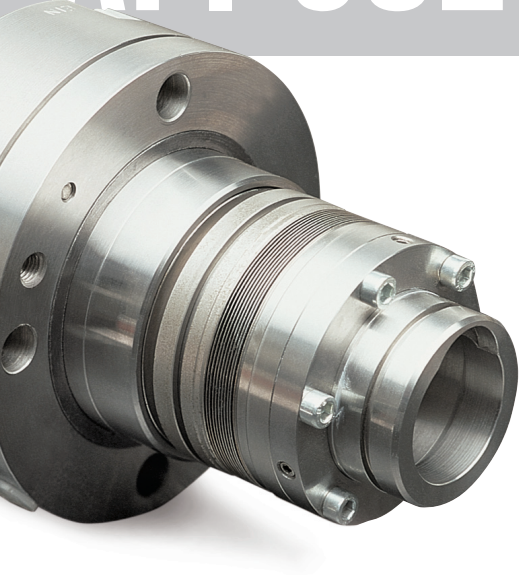
EagleBurgmann®

API 682



API 682 Short Guide

Most common plans and operational information.

API 682
has emerged to become a worldwide accepted standard in today`s refinery and hydrocarbon related applications. EagleBurgmann offers a wide range of high quality mechanical seals and supply systems which fully comply with this standard.

From expert consulting and engineering up to modular TotalSealCare® service solutions for entire plants – EagleBurgmann is your reliable partner for sealing technology.

Please ask also for our API poster, our detailed brochure 58E and the API 682 seal selection software on CD.

Find your nearest contact at
www.eagleburgmann.com/world.

Important Note
Operating manuals and plant guidelines must be strictly observed and are always to be followed prior to the information given in this short guide. Before carrying out any regular inspection or repair work, shut down system and make sure the system is completely pressureless! Do not touch hot surfaces! Use adequate temperature measuring device. Strictly follow safety regulations!

Terms used in this short guide
Start-up procedures: assume that pump is reinstalled and put into operation after overhaul.
Shut-down procedures: assume a stopping of the pump and keeping the pump in standby mode.
Regular inspections are conducted on the normal operator tours.
Trouble-shooting describes the most common failures at mechanical seals and supply systems and how to cure them.
Other causes, not mentioned in this guide, may be present – however these must be evaluated by consulting EagleBurgmann.
Subject to change.

Connection codes on seal gland acc. to API 682, 3rd edition

F	=	Flush
FI	=	Flush IN (only plan 23)
FO	=	Flush OUT (only plan 23)
D	=	Drain
Q	=	Quench
V	=	Vent
BI	=	Buffer/Barrier IN
BO	=	Buffer/Barrier OUT
LBI	=	Liquid Buffer/Barrier IN
LBO	=	Liquid Buffer/Barrier OUT
GBI	=	Gas Buffer/Barrier IN
GBO	=	Gas Buffer/Barrier OUT
CSD	=	Containment Seal Drain
CSV	=	Containment Seal Vent

Most common PID codes for supply system instrumentation

PI	=	Pressure Indicator
TI	=	Temperature Indicator
LS	=	Level Switch
PS	=	Pressure Switch
LG	=	Level Gauge
PT/PIT	=	Pressure Transmitter/ Pressure Indicator Transmitter
TT	=	Temperature Transmitter
PCV	=	Pressure Control Valve
PSV	=	Pressure Safety Valve
	=	Valve normally open (NO)
	=	Valve normally closed (NC)
	=	Orifice
	=	Strainer

Plan 02

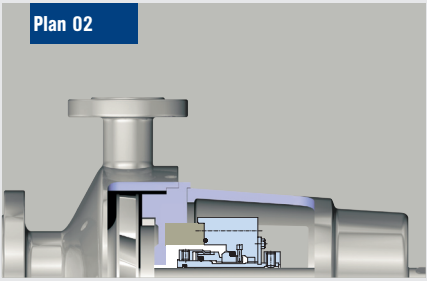
Seal chamber cooling or heating and neck bush are necessary, unless otherwise specified. Dead end seal chamber with no circulation. Plugged connections for possible future circulation and quench.

Media characteristics
Clean media is pumped at high temperature.
Flushing is not desired or necessary.

Start-up procedure
No special procedures need to be followed.

Shut-down procedure
No special procedures need to be followed.

Regular inspection
No special procedures need to be followed.



Troubleshooting

No special procedures need to be followed.

Plan 11

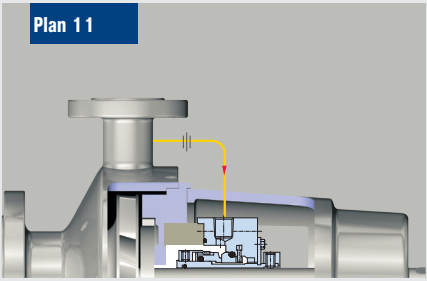
For general applications.
Product pumped clean, good lubricating properties and heat removal from the mechanical seal.
Recirculation from pump discharge through flow control orifice to the seal.

Media characteristics
For any moderatly clean and warm media.

Start-up procedure
The seal chamber must be filled with pumped media. If the seal chamber is not self-venting chambers, trapped gas must be removed by venting. Check that piping and the appropriate orifice is installed correctly. If valves are installed in the flush piping, they must be open at all times and false operation (e.g. accidental closing) must be excluded.

Shut-down procedure
No special procedures need to be followed.

Regular inspection
Check for any leakage and abnormal temperature gradient on the flush line (e.g. a healthy flow will display nearly equal temperature distribution on the total piping).



Troubleshooting

- Problem: Abnormal temperature gradient on the flush piping.
  Cause: Interrupted flow of flush stream (valve is closed or piping/orifice is clogged).
  Solution: Open valves and secure against accidental closing. Shut down pump and check piping/orifice for clogging.

Plan 13

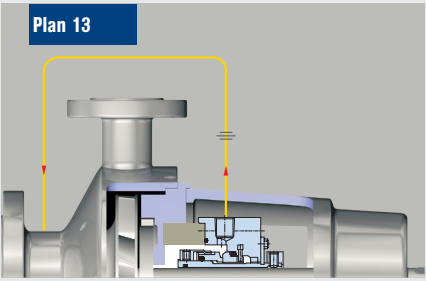
Used where the seal chamber pressure is at discharge pressure (mainly vertical pumps).
Recirculation from pump seal chamber through a flow control orifice and back to the seal.

Media characteristics
For any moderatly clean and warm media.

Start-up procedure
The seal chamber must be filled with pumped media. Trapped gas must be removed by thoroughly venting the seal housing. On vertical pumps a vent connection shall be supplied at the highest point of the seal chamber or seal housing. Check that piping and the appropriate orifice is installed correctly. If valves are installed in the flush piping, they must be open at all times and false operation (e.g. accidental closing) must be excluded.

Shut-down procedure
No special procedures need to be followed.

Regular inspection
Check for any leakage and abnormal temperature gradient on the flush line (e.g. a healthy flow will display nearly equal temperature distribution on the total piping).



Troubleshooting

- Problem: Abnormal temperature gradient on the flush piping.
  Cause: Interrupted flow of flush stream (valve is closed or piping/ orifice is clogged or gas is trapped in the seal chamber of vertical pumps).
  Solution: Open valves and secure against accidental closing. Shut down pump, remove clogging from piping or orifice. Vent seal chamber thoroughly in vertical pumps.

Plan 21 (22)

Used for hot applications or where the temperature and pressure in the seal chamber is close to the vapour curve of the product. Recirculation from pump discharge through a flow control orifice and cooler into the seal chamber.

Plan 21 = without strainer, Plan 22 = with strainer.

Media characteristics

The media is near to its vapourisation point. Media is pumped at high temperature.

Start-up procedure

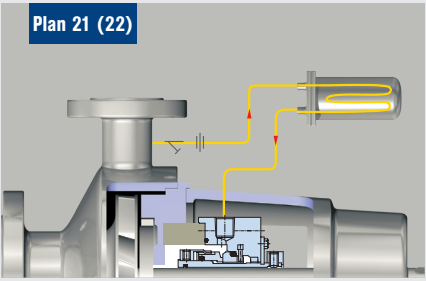
The seal chamber must be filled with pumped media. Trapped gas must be removed by thoroughly venting the seal housing. Check that piping and the appropriate orifice is installed correctly. The strainer must be clean (plan 22). If valves are installed in the flush piping, they must be open at all times and false operation (e.g. accidental closing) must be excluded. The cooling water supply must be connected, thoroughly vented and operative.

Shut-down procedure

Keep cooling water supply open at high temperatures.

Regular inspection

Check for any leakage and abnormal temperature gradient on the flush line (e.g. a healthy flow will display nearly equal temperature distribution on the total piping). Check cooling water temperature. Clean strainer (plan 22) at regular intervals.



Troubleshooting

- Problem: Abnormal temperature gradient on the flush piping.
  Cause: Interrupted flow of flush stream.
  The valve is closed or piping/orifice is clogged.
  The strainer is loaded with deposits.
  Solution: Open valves and secure against accidental closing. Shut down pump, remove clogging from piping or orifice. Clean strainer.

- Problem: Abnormal temperature rise in the cooling water supply.
  Cause: Cooling water stream is interrupted.
  Solution: Open cooling water supply. Check if cooling water piping is clogged, remove clogging.
  Consider changing to plan 23 if possible.

Plan 23

Used for hot liquid applications or where the temperature and pressure in the seal chamber is close to the vapour curve of the product. Recirculation by means of a pumping ring in seal chamber through a cooler and back to seal chamber.

Media characteristics

The media is near to its vapourisation point. Media is pumped at high temperature.

Start-up procedure

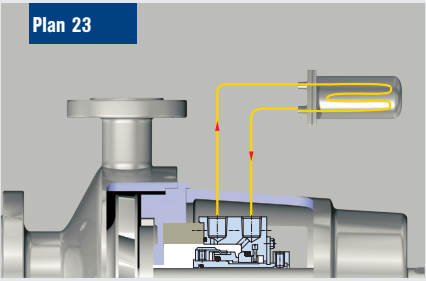
The seal chamber must be filled with pumped media. Trapped gas must be removed by thoroughly venting the seal housing. Piping shall be inclining upward and self venting (no gas traps). Piping shall be arranged to provide lowest possible flow resistance (direct lines, avoid bends if possible, required bends with large radius) If valves are installed in the flush piping, they must be open at all times and false operation (e.g. accidental closing) must be excluded. The cooling water supply must be connected, thoroughly vented and operative.

Shut-down procedure

Keep cooling water supply open at high temperatures.

Regular inspection

Check for any leakage and abnormal temperature gradient on the flush line (e.g. a healthy flow will display nearly equal temperature distribution on the total piping). Check cooling water temperature.



Troubleshooting

- Problem: Abnormal temperature gradient on the flush piping.
  Cause: Interrupted flow of flush stream.
  The valve is closed or piping is clogged.
  Solution: Open valves and secure against accidental closing. Shut down pump, remove clogging from piping. If pumped media is heavily loaded with solids, consider using alternative API plan.

- Problem: Abnormal temperature rise in the cooling water supply.
  Cause: Cooling water stream is interrupted.
  Solution: Open cooling water supply. Check if cooling water piping is clogged, remove clogging.

Plan 31

Used in applications with suspended solids where the SG of the particles are 2x that of the liquid.

Recirculation from pump discharge through a cyclone separator, clean fluid to seal chamber, contaminated fluid to suction.

Media characteristics

Media contains suspended solids. For optimum performance, the density of solid particle shall be more than twice that of the liquid.

Start-up procedure

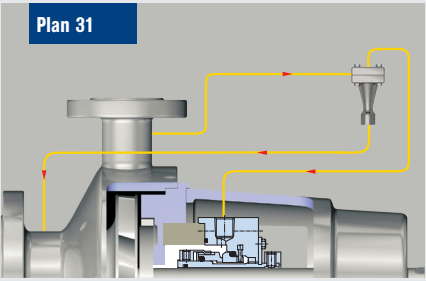
The seal chamber must be filled with pumped media. Trapped gas must be removed by thoroughly venting the seal housing. Check that piping and the cyclone separator is installed correctly. If valves are installed in the flush piping, they must be open at all times and false operation (e.g. accidental closing) must be excluded. Eventual orifices or obstacles in any of the flow lines shall be removed as solid particle will accumulate here or reduce the efficiency of the cyclone separator.

Shut-down procedure

No special procedures need to be followed.

Regular inspection

Check for any leakage and abnormal temperature gradient on the flush line (e.g. a healthy flow will display nearly equal temperature distribution on the total piping).



Troubleshooting

- Problem: Abnormal temperature gradient on the flush piping.
  Cause: Interrupted flow of flush stream. The valve is closed, piping or cyclone separator is clogged.
  Solution: Open valves and secure against accidental closing. Shut down pump, remove clogging from piping or cyclone separator. If an orifice is in the line it is highly recommended to remove it. If the particle density is less than twice that of the liquid or if the piping gets clogged repeatedly, consider using an alternative API plan.

Plan 32

Used when the product being pumped does not have good lubrication properties, is dirty or hazardous. Flush injection of clean fluid into the seal chamber from an external source.

Media characteristics

Media contains suspended solids. Media has poor lubricity. Media is pumped at high temperature. Media is hazardous and/or harmful. Direct contact of the media with the seal is not desired.

Start-up procedure

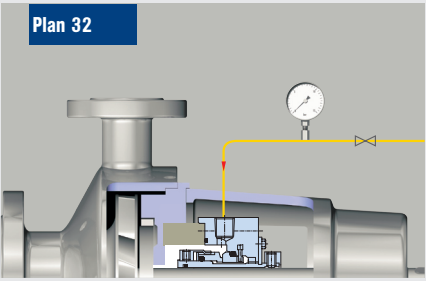
Check that piping, instrumentation and strainer or orifice (if installed) is installed correctly. If installed, the strainer or orifice must be clean. Open main valve for external source of flushing liquid. The seal chamber must be filled with flushing liquid. Adjust flow rate by means of flow indicator and flow control valve as per instructions. Secure main valve and flow control valve from false operation (e.g. accidental closing).

Shut-down procedure

Shut down pump. Close main valve only after pump has completely stopped, keep flow control valve open.

Regular inspection

Check for any visible leakage.
Check for temperature rise in the flush line at point of entry into the seal.
Clean strainer when pump is shut-down.



Troubleshooting

- Problem: Temperature rise in the flush line near seal.
  Cause: The flush stream is interrupted, heat generated by the seal radiates into the flush line.
  Solution: Open main valve, check flow rate indicator, adjust flow rate with flow control valve. If this does not cure the problem shut down pump and check flush line for clogging. Clean strainer or orifice.

Plan 52

Used where the pumped product is harmful / hazardous and / or buffer fluid may not contaminate the product. External reservoir at pressure below seal chamber pressure providing buffer liquid forced circulation.

Media characteristics

Media is pumped at high temperature.
Media is hazardous and/or harmful.
Media may not be contaminated with barrier fluid.
Media may not contain suspended solids and should have good lubricating properties.

Start-up procedure

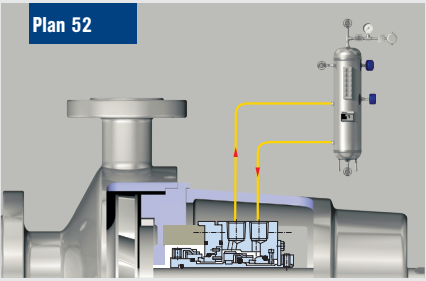
Check that piping and the appropriate instrumentation is installed correctly. Piping shall be inclining upward and self venting (no gas traps). The TS vessel must be at highest point. Piping shall be arranged to provide lowest possible flow resistance (direct lines, avoid bends if possible, required bends with large radius). Fill the TS Vessel with fresh buffer fluid to be above MIN, but well below MAX mark. Type and quality of the buffer fluid shall be in accordance to the operation manual. Trapped gas must be removed by thoroughly venting the seal housing. Valves in the piping must be open at all times and false operation (e.g. accidental closing) must be excluded. Valve to flare or safe vent line must be open. Do not pressurise the system.

Shut-down procedure

No special procedures need to be followed.
Keep cooling water supply open at high temperature.

Regular inspection

Check the correct fill level of the TS vessel (between MIN and MAX mark). Exchange the buffer fluid at regular intervals, as indicated in operation manual. A change of buffer fluid colour is normal and does not in itself indicate a seal failure. Check for any visible leakage and abnormal temperature rise. The TI shall display the specified temperature range. The PI shall display a pressureless condition.



Troubleshooting

- Problem: Abnormal rise of fluid level and increase of pressure in TS Vessel.
  Cause: The product side seal is having an increased leakage.
  Solution: Shut-down pump and have mechanical seal inspected.

- Problem: Abnormal fall of fluid level in TS Vessel.
  Cause: The atmospheric side seal is having an increased leakage.
  Solution: Shut down pump and have mechanical seal inspected.

- Problem: The temperature indicator shows abnormal rise of temperature in the buffer system.
  Cause 1: The seal is overheating due to dry running or increased friction.
  Solution: Shut down pump and have mechanical seal inspected. Make sure seal is lubricated sufficiently by pump media. If this cannot be assured, consider changing to a system with pressurised barrier fluid.
  Cause 2: Insufficient cooling by the water cooler in the TS vessel.
  Solution: Check cooling water supply.

- Problem: Temperature rise between buffer fluid out at TS vessel and buffer fluid in at seal gland connection.
  Cause: Circulation of buffer fluid is interrupted, heat generated by seal radiates into buffer fluid line.
  Solution: Vent the buffer fluid system acc. to instructions. Check circulation of buffer fluid.

Plan 53A

Used for hot applications or where products have low pressure and are harmful/ hazardous. External reservoir pressurized above seal chamber pressure providing barrier fluid to mechanical seals. Forced circulation.

Media characteristics

Media contains suspended solids. Media has poor lubricity. Media is pumped at high temperature. Media is hazardous and/or harmful. Leakage of media to atmospheric side is not desired. The media is near to its vapourisation point.

Start-up procedure

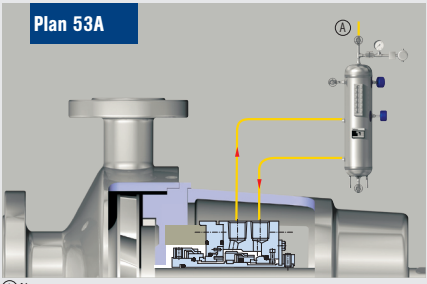
Fill the TS Vessel with fresh barrier fluid up to max. fill level mark. The barrier fluid shall be in accordance to the operation manual. Trapped gas must be removed by thoroughly venting the seal housing. Check that piping and the appropriate instrumentation is installed correctly. Piping shall be installed in an upward inclined way, and self venting. Piping shall be arranged to provide lowest possible flow resistance (direct lines, avoid bends as far as possible, required bends with large radius). Valves in the piping must be open at all times and false operation (e.g. accidental closing) must be excluded. Apply barrier pressure at the specified value (usually 2 bar or min 10% above stuffing box pressure). Start-up pump.

Shut-down procedure

Shut off pump. Keep TS vessel pressurised. Keep cooling water supply open at high temperatures.

Regular inspection

Check the correct fill level of the TS vessel (between MIN and MAX mark). Check correct barrier pressure. The PI shall display the specified value. Check for any leakage and abnormal temperature rise. The TI shall display the specified value. Check for abnormal temperature gradient in circulation line.



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Troubleshooting

- Problem: Abnormal fall of fluid level in TS Vessel.
  Cause: Either the product side or the atmospheric side seal is having an increased leakage.
  Solution: Shut-down pump and have mechanical seal inspected.

- Problem: The temperature indicator shows abnormal rise of temperature in the barrier system.
  Cause 1: The seal is generating excessive heat due to dry running or increased friction.
  Solution: Shut-down pump and have mechanical seal inspected. Make sure seal is lubricated sufficiently by barrier fluid.
  Cause 2: Insufficient cooling of the TS vessel. Improve cooling capacity, or ensure cooling water circulation.
  Solution: Check cooling water supply.

- Problem: Temperature rise between barrier out at TS vessel and barrier in at seal gland connection.
  Cause: Circulation of barrier fluid is interrupted, heat generated by seal radiates into barrier line.
  Solution: Vent the barrier fluid system acc. to instructions. Check circulation of barrier fluid.

- Problem: Rise of barrier fluid level and simultaneous drop of indicated pressure.
  Cause: The barrier pressure has broken down.
  Solution: Check barrier pressure supply line. Ensure supply of sufficient barrier pressure.

Plan 53B

Used for applications where products have high pressure and are harmful/hazardous. Pre-pressurized bladder accumulator provides pressure to circulation system. Heat removed by air/water heat exchanger. Forced circulation.

Media characteristics

Media contains suspended solids. Media has poor lubricity. Media is pumped at high temperature. Media is hazardous and/or harmful. Leakage of media to atmospheric side is not desired. The media is near to its vapourisation point.

Start-up procedure

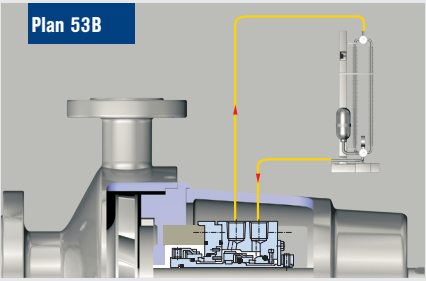
Pre charge accumulator to the specified pressure. Fill up circulation line acc. to instructions until barrier fluid exits at the vent. Trapped gas must be removed from the system by venting at highest point of the system. Check that piping and the appropriate instrumentation is installed correctly. Piping shall be installed in an upward inclined way. Cooler must be higher than seal. Piping shall be arranged to provide lowest possible flow resistance (direct lines, avoid bends as far as possible, required bends with large radius). Valves in the piping must be open at all times and false operation (e.g. accidental closing) must be excluded. Open valve of accumulator to apply barrier pressure. Start-up pump.

Shut-down procedure

Shut off pump. No special procedures need to be followed.

Regular inspection

Check correct barrier pressure. The PI shall be within the specified value. Check for any leakage and abnormal temperature rise or gradient. The TI shall be within the specified value. If low pressure is indicated, refill system acc. to instructions.



Troubleshooting

- Problem: Low pressure is indicated by PI.
  Cause: Barrier fluid level has dropped due to normal leakage.
  Solution: Refill barrier fluid acc. to instructions until correct pressure is indicated.

- Problem: After refilling barrier fluid, pressure cannot be maintained.
  Cause: Abnormal leakage of mechanical seal.
  Solution: Shut down pump and have mechanical seal inspected.

- Problem: Temperature rise in barrier system.
  Cause: The seal is generating excessive heat or increased friction due to dry running.
  Solution: Achieve correct barrier fluid pressure by maintaining the correct barried fluid volume.

  Cause 2: Insufficient cooling at air/water coolers.
  Solution: Ensure that cooling is sufficient by installing larger coolers, ensure cooling water circulation (water cooler) or make sure that air coolers are in a shaded area and free of dust in hot climate.

- Problem: Temperature rise between barrier out at cooler and barrier in at seal gland connection.
  Cause: Circulation of barrier fluid is interrupted, heat generated by seal radiates into barrier line.
  Solution: Vent the barrier fluid system acc. to instructions.

Plan 53C

Used for applications where products have high pressure and are harmful/ hazardous. Pressurization by reference line from seal chamber to a piston pressure booster provides pressurized barrier fluid to circulation system. Forced circulation.

Media characteristics

Media has poor lubricity. Media is pumped at high temperature. Media is hazardous and/or harmful. Leakage of media to atmospheric side is not desired. The media is near to its vapourisation point.

Start-up procedure

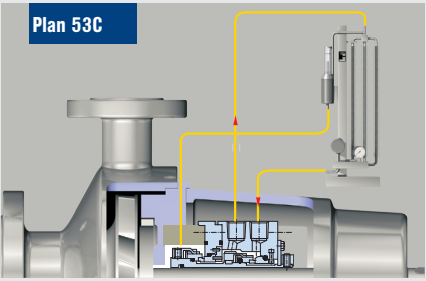
Fill up piston transmitter with fresh barrier fluid so that fill indicator is between specified MIN and MAX marks. Important: piston may not be below MAX mark ("on block") to avoid excessive pressure build-up. Trapped gas must be removed by venting at highest point of the system. Check that piping and the appropriate instrumentation is installed correctly. Piping shall be installed in an upward inclined way. Cooler must be higher than seal. Piping shall be arranged to provide lowest possible flow resistance (direct lines, avoid bends as far as possible, required bends with large radius). Valves in the piping must be open at all times and false operation (e.g. accidental closing) must be excluded. Start-up pump. The reference line from the seal chamber will be self-filling after start-up. Remaining air bubbles can be tolerated.

Shut-down procedure

Shut off pump. No special procedures need to be followed. When water cooler is used, keep cooling water supply open at high temperatures.

Regular inspection

Check correct fill level of the barrier fluid. If piston reaches the TOP mark, then fill level is LOW and vice versa. Check for any leakage and abnormal temperature rise or gradient. The TI shall be within the specified value. If a strainer is installed in the reference line, keep clean.



Troubleshooting

- Problem: The sight gauge shows that the piston is at top position.
  Cause: Barrier fluid level is low, allowing the reference pressure to move the piston upward.
  Solution: Refill barrier fluid acc. to instructions until piston is between MIN and MAX mark.

- Problem: Sudden rise of the piston over MIN mark. After refilling, the level cannot be maintained, piston rises again.
  Cause: Abnormal leakage of mechanical seal.
  Solution: Shut off pump and have mechanical seal inspected. Refill barrier fluid.

- Problem: Piston is below MAX mark and is pressed "on block".
  Cause: After long pressureless standstill period, the piston may drop due to gravity. The piston transmitter has been overfilled with barrier fluid.
  Caution: This is a critical operation condition! Pressure is trapped! Due to thermal expansion critical pressures can be reached causing seal and/or supply system destruction.
  Solution: Open vent valve at supply system and allow pressure/barrier fluid to escape. Piston will rise to a normal value. Take caution when opening vent valve and observe safety instructions!

- Problem: Abnormal temperature rise in barrier system.
  Cause: Insufficient cooling at air fin/water coolers.
  Solution: Ensure that cooling is sufficient by installing larger coolers, ensure cooling water circulation (water cooler) or make sure that air fin coolers are free of dust and are installed in a shaded area and in hot climate regions.

- Problem: Temperature rise between barrier out at cooler and barrier in at seal gland connection, while the cooler itself is cool.
  Cause: Circulation of barrier fluid is interrupted, heat generated by seal radiates into barrier line.
  Solution: Vent the barrier fluid system acc. to instructions or check barrier fluid piping for clogging.

Plan 54

Used in harmful/hazardous applications. Pressurized clean barrier fluid from an external system. Fluid circulation by an external pump or pressure system.

Media characteristics

Media contains suspended solids. Media has poor lubricity. Media is pumped at high temperature. Media is hazardous and/or harmful. The media is near to its vapourisation point. Leakage of media to atmospheric side is not desired.

Start-up procedure

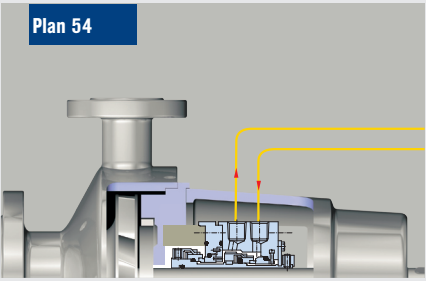
Fill up barrier fluid tank with fresh barrier fluid acc. to instructions. Check that piping and the appropriate instrumentation is installed correctly. Piping shall be installed in an upward inclined way. Piping shall be arranged to provide lowest possible flow resistance (direct lines, avoid bends as far as possible, required bends with large radius). Valves in the piping must be open at all times and false operation (e.g. accidental closing) must be excluded. Start-up barrier fluid system and adjust barrier pressure acc. to instructions. Start-up pump.

Shut-down procedure

Shut off pump.

Regular inspection

Correct fill level of the barrier fluid is surveyed by alarm protection. Check filters and strainers at the barrier fluid system acc. to instruction. Check bladder accumulator acc. to instructions. Check for any leakage and abnormal temperature rise or gradient. The TI shall be within the specified value.



Troubleshooting

- Problem: Barrier fluid level is at MIN value.
  Cause: Barrier fluid level is low.
  Solution: Refill barrier fluid acc. to instructions.

- Problem: After refilling, the level cannot be maintained. Barrier fluid level drops rapidly.
  Cause: Abnormal leakage of mechanical seal.
  Solution: Shut off pump and have mechanical seal inspected. Refill barrier fluid.

- Problem: Abnormal temperature rise at seal.
  Cause: Circulation of barrier fluid is interrupted, heat generated by seal radiates into barrier line.
  Solution: Ensure that barrier fluid can circulated. Inspect strainers and filters at barrier fluid system.

Plan 62

Used to keep atmospheric side of seal clean. External source providing a flow-through quench to atmospheric side.

Media characteristics

Media is pumped at high temperature. Leakage of media on atmospheric side may form deposits, crystallise or oxidize.

Start-up procedure

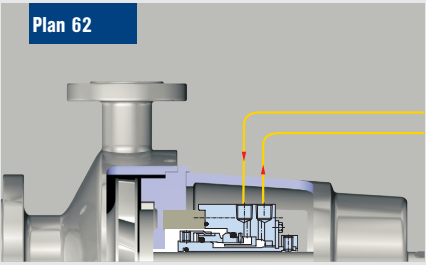
Open valves for the nitrogen, steam, water or whatever quench media is used. If valves are installed in the quench piping, they must be open at all times and false operation (e.g. accidental closing) must be excluded. Adjust the desired flow of quench media (hint: usually low flow rates are sufficient).

Shut-down procedure

No special procedures need to be followed.

Regular inspection

Check for abnormal leakage on atmospheric side of seal.



Troubleshooting

- Problem: Seal is showing increased leakage of pumped media on atmospheric side.
  Cause: Abnormal leakage of the seal.
  Solution: Shut off pump and have mechanical seal inspected.

- Problem: Seal is showing increased leakage of quench media on atmospheric side.
  Cause: Atmospheric seal ring (throttle bushing or lip seal) is leaking.
  Solution: Shut off pump and check seal ring for excessive wear.

Plan 65

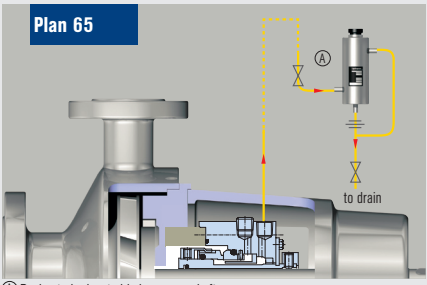
Used for leakage detection on single seal. Atmospheric side leakage collection and monitoring in external vessel.

Media characteristics
Can be used with any media which form a liquid leakage (non-evaporating).

Start-up procedure
If valves are installed in the piping, they must be open at all times and false operation (e.g. accidental closing) must be excluded.

Shut-down procedure
No special procedures need to be followed.

Regular inspection
No special procedures need to be followed.



Ⓐ Device to be located below pump shaft

Troubleshooting

- Problem: Level-high alarm has been activated.
  Cause: Abnormal leakage of the mechanical seal.
  Solution: Shut off pump and have mechanical seal inspected.

- Problem: Level-high alarm has been activated but seal is o.k.
  Cause: The drain pipe of the system is clogged or drain valve closed.
  Solution: Remove clogging from piping, clean orifice or open drain valve.

Plan 72

Applicable with hydrocarbons, normally used in conjunction with plan 75 or plan 76.
Externally supplied gas buffer (pressure lower than seal pressure). Buffer gas used to dilute seal leakage.

Media characteristics

Media vapors are hazardous and/or harmful. Media vapors are purged to avoid combustable mixtures.

Start-up procedure

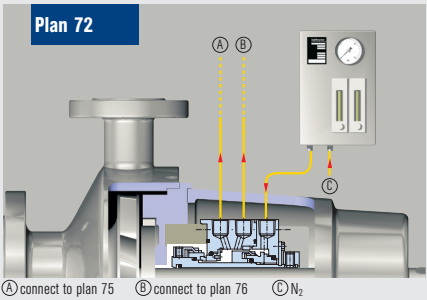
If specified, leakage collection systems plan 75 or 76 may be installed in connection with plan 72. If valves are installed in the piping, they must be open at all times and false operation (e.g. accidental closing) must be excluded. Check that piping and electrical equipment of the gas panel is installed correctly. Make sure that rotation direction of pump corresponds to rotation direction of gas seal (at unidirectional gas seal). Open main valve of buffer gas line. Adjust gas flow acc. to instructions. Check pressure indicator: pressure shall remain near 0 bar [g] if pressure builds up, a valve is still closed. Start-up pump.

Shut-down procedure

Shut off pump.
Gas buffer supply may be shut off, if required.

Regular inspection

Check for abnormal gas consumption: flow indicator shall display specified value. Check buffer gas pressure: it should be near 0 bar [g]. Check filter and replace filter elements at regular intervals (acc. to instructions).



Ⓐ connect to plan 75 Ⓑ connect to plan 76 Ⓒ N_2

Troubleshooting

- Problem: High level alarm of leakage collection system plan 75.
  Cause: High liquid leakage of product side mechanical seal.
  Solution: Shut off pump and have mechanical seal inspected.

- Problem: High pressure alarm of vapour recovery system plan 76.
  Cause: High gas leakage on product side mechanical seal.
  Solution: Shut off pump and have mechanical seal inspected.

- Problem: After start-up the pump runs in reverse mode.
  Cause: After installation, the pump has been connected in reversed polarity.
  Solution: Connect pump in correct polarity. In case of unidirectional seal, have seal inspected for damage.

- Problem: Pressure indicator in gas supply system shows pressure increase.
  Cause: The valve to the flare line is closed or orifice is clogged.
  Solution: Open valve to flare line, make sure the orifice is clean.

Plan 74

Used in applications where the product is harmful/ hazardous. Externally supplied barrier gas used to positively prevent process fluid from leaking to atmosphere.

Media characteristics

Media has poor lubricity. The media is near to its vapourisation point. Media is hazardous and/or harmful. Media shall be free of solids.

Start-up procedure

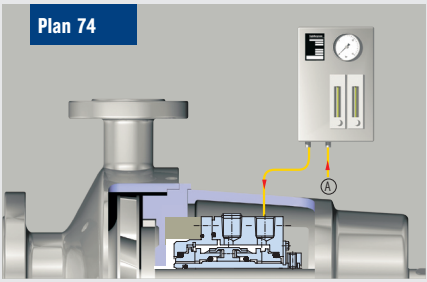
If valves are installed in the piping, they must be open at all times and false operation (e.g. accidental closing) must be excluded. Check that piping and electrical equipment of the gas panel is installed correctly. Make sure that rotation direction of pump corresponds to rotation direction of gas seal (at unidirectional gas seal). Open main valve of barrier gas line. Set optimum barrier pressure to be above product pressure acc. to instructions. Adjust the set points of instruments acc. to instructions. Start-up pump.

Shut-down procedure

Shut off pump. Keep barrier gas supply open.

Regular inspection

Check for any abnormal gas leakage in piping (use adequate gas leak detecting device such as bubble spray etc.). Check for abnormal gas consumption: flow indicator shall display specified value. Check barrier pressure: PI shall display specified value. Check filter and replace filter elements at regular intervals (acc. to instructions).



Ⓐ N_2

Troubleshooting

- Problem: Abnormally high gas consumption.
  Cause: High leakage of mechanical seal or leaking piping.
  Solution: Shut off pump and inspect the seal, check piping.

- Problem: Abnormally low gas consumption.
  Cause 1: Barrier gas supply is insufficient.
  Solution: Check barrier gas supply source. Ensure all valves are fully open. Check filter and replace filter element if necessary.
  Cause 2: Seal faces are running in contact.
  Solution: Have gas seal inspected.

- Problem: After start-up the pump runs in reverse mode.
  Cause: After installation, the pump has been connected in reversed polarity.
  Solution: Connect pump in correct polarity. In case of unidirectional seal, have seal inspected for damage.

Plan 75

Application when pump fluid condenses at ambient temperatures. Containment seal chamber drain for condensing leakage.

Media characteristics

Media is hazardous and/or harmful. Media leakage of product side seal is liquid.

Start-up procedure

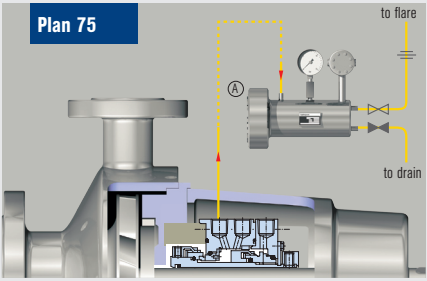
The plan 75 is commonly used in connection with plan 72, where leakage of the seal is liquid. Check that piping is installed correctly. Open valve of the flare line. Close valve of the liquid drain line. Start-up pump.

Shut-down procedure

Shut off pump. Keep flare line open and drain line closed.

Regular inspection

Check liquid level through sight glass or level indicator. The level shall be between MIN and MAX mark. Check position of valves. Flare line must be open, liquid drain must be closed. If high level alarm is triggered, drain the system by opening liquid drain line. Close valve afterwards.



Ⓐ Device to be located below pump shaft

Troubleshooting

- Problem: After drain, the liquid leakage collection system refills quickly. Alarm is triggered after a short interval.
  Cause: Abnormal leakage of mechanical seal
  Solution: Shut off pump and inspect the seal.

- Problem: Liquid leakage at atmospheric side containment seal.
  Cause 1: Both valves to flare and drain are closed. Liquid leakage has filled entire seal and leakage collection system.
  Cause 2: The product side seal has increased leakage.
  Solution: Have mechanical seal inspected, make sure valves are in correct position.

Plan 76

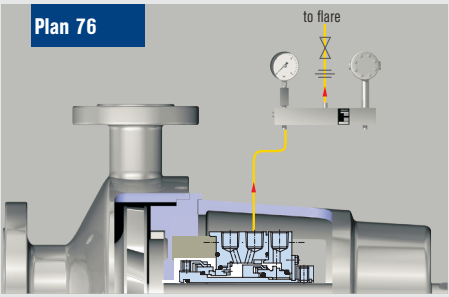
Application where pump fluid does not condense at ambient temperature.
Containment seal chamber drain for non-condensing leakage.

Media characteristics
Media is hazardous and/or harmful. Media leakage of product side seal is evaporated.

Start-up procedure
The plan 76 is commonly used in connection with plan 72, where leakage of the seal is vapour. Check that piping is installed correctly. Open valve of the flare line. Start-up pump.

Shut-down procedure
Shut off pump.
Keep flare line open if possible.

Regular inspection
The drain valve of the leakage collection system can be opened occasionally to check for any liquid condensate. The system does not require regular maintenance.



Troubleshooting

- Problem: The high pressure alarm is triggered.
  Cause: Abnormal leakage of mechanical seal.
  Solution: Shut off pump and have mechanical seal inspected.

API 682

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