

SINGLE SEALING PLANS

SINGLE FLUIDS, Lubrication

Various parameters exist that determine the durability of a mechanical seal. Temperature, pressure, speed, fluid type (sticky, laden with particles, etc.) which all have a decisive effect on wear and damage of the mechanical seal materials.

To reduce these effects and improve the seal durability, API plans can be used. Below are some of the ones applicable to our products.

PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 01	Fluid recirculation from the pump discharge. This is applied as a flushing/washing operation on the seal chamber.	To ensure the lubrication of the seal and reduce the temperature in the seal chamber.	In general for clean fluids that do not polymerise at moderate temperatures. Particle-laden fluids may block the flushing/washing connection.

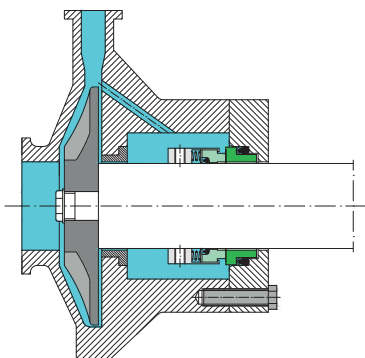
PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 11	Circulation of the fluid from the pump discharge to the seal chamber, passing through a flow rate controller.	To ensure the lubrication of the seal and control the temperature.	In general for clean fluids that do not polymerise at moderate temperatures.

PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 12	Circulation of the fluids from the discharge to the seal chamber, passing through a filter/cyclone and through a flow rate controller.	To ensure the lubrication of the seal and prevent the mechanical seal from abrasion by particles.	Clean liquids which may contain particles. The filters may become blocked and so it is best to use cyclones in the presence of solids.

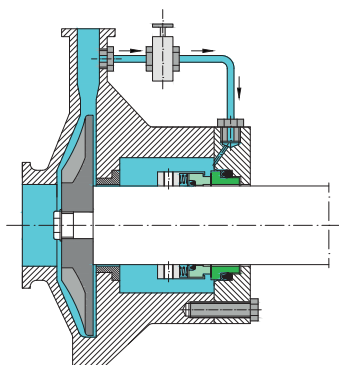
PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 13	Circulation from the seal chamber to the suction area, passing through a flow rate controller.	<p>To guarantee the fluid circulation.</p> <p>To ventilate the seal cavity in vertical pumps.</p> <p>To reduce the seal cavity pressure.</p>	<p>Vertical pumps.</p> <p>Clean fluids in vertical pumps.</p>

PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 14	Circulation from the pump discharge zone to the seal chamber, passing through a flow rate controller and from the seal chamber to the suction area.	<p>To ventilate the seal cavity in vertical pumps.</p> <p>-To control the temperature.</p> <p>To provide the appropriate pressure in the seal chamber, thereby preventing fluid vaporisation.</p>	vertical pumps.

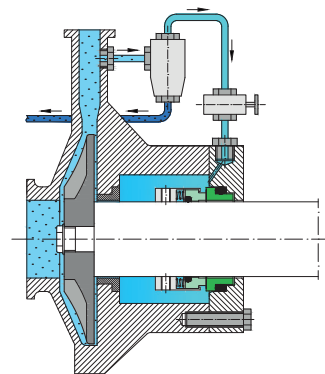
DRAWING



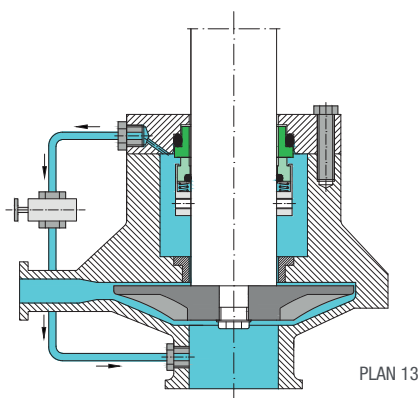
PLAN 01



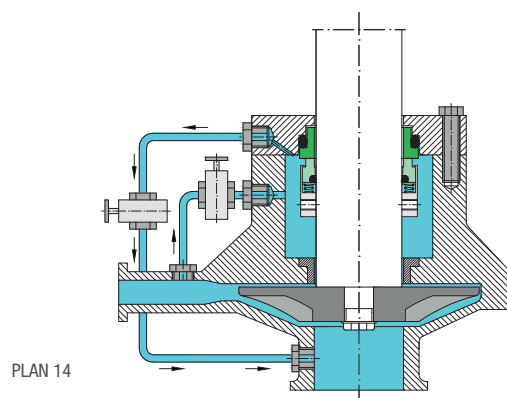
PLAN 11



PLAN 12



PLAN 13



PLAN 14

SINGLE SEALING PLANS

HOT FLUIDS, COOLING

Fluids at high temperatures tend to evaporate when they reach the seal contact surfaces, provoking a lack of lubrication that causes damage to the seal. To reduce these effects the following API plans can be applied:

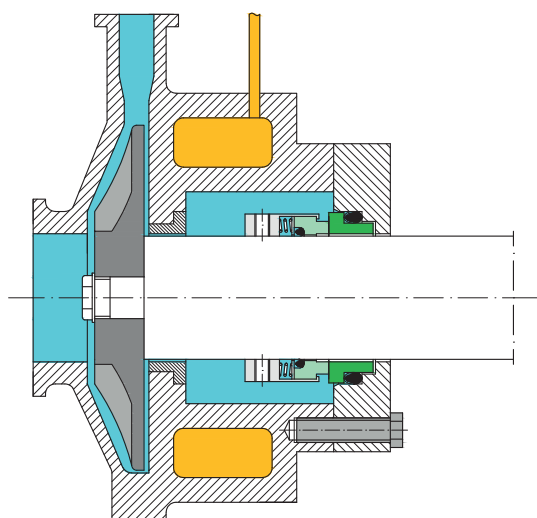
PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 02	Closed chamber, with no external fluid circulation. Cooling or heating chamber. There is no direct flow entry or exit in the seal chamber.	To reduce or increase the seal chamber temperature, depending on the nature of the fluid.	Horizontal pumps (not recommended in vertical pumps). For fluids that solidify when the temperature is reduced or to control high fluids temperatures.

PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 21	Circulation of pumped fluids from the discharge to the seal chamber, passing through a flow rate controller and a heat exchanger.	To control the fluid temperature in the seal chamber. This prevents the vaporisation of the fluid between the seal faces.	Horizontal pumps. Clean fluids at high temperatures. Sticky products may block the connections and pipes. In such cases, use Plan 23.

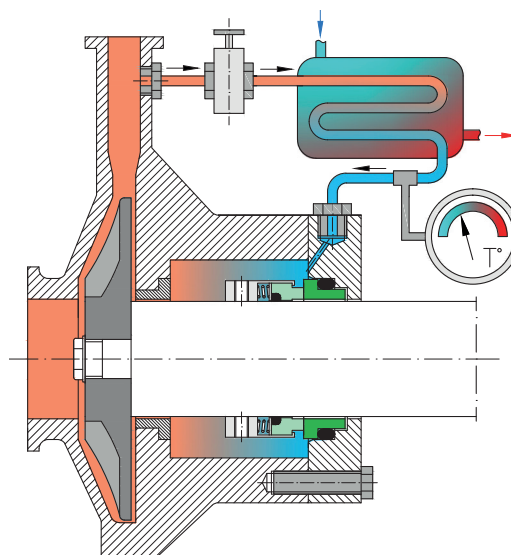
PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 22	Circulation of pumped fluids from the discharge to the seal chamber, passing through a flow rate controller, a filter/cyclone and a heat exchanger.	To control the seal chamber temperature and prevent the mechanical seal from abrasion by particles.	Horizontal pumps. Clean fluids at high temperatures that may be laden with particles.

PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 23	Circulation of pumped fluids from the discharge to the seal flush connection, passing through a flow rate controller and a heat exchanger.	To control the fluid temperature in the seal chamber. This prevents the vaporisation of the fluid between the seal faces.	Horizontal or vertical pumps. Clean fluids at high temperatures. Hot water, boiler food products. Hot oils.

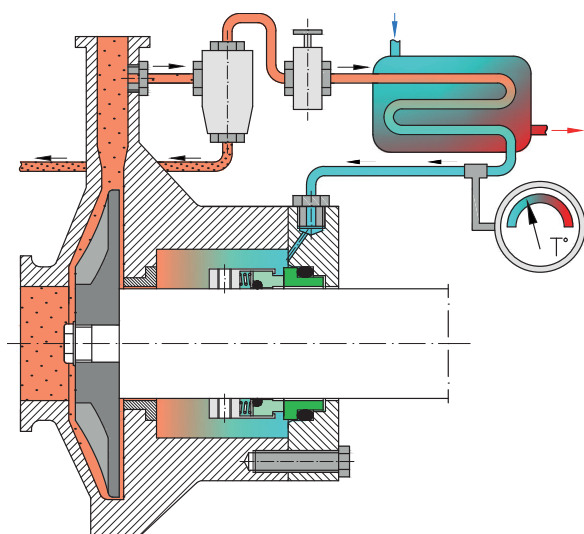
DRAWING



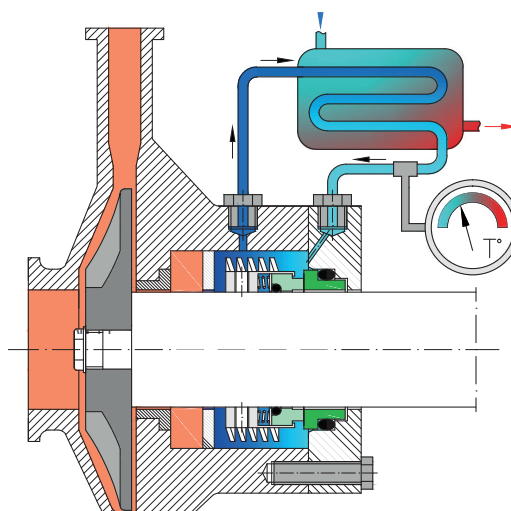
PLAN 02



PLAN 21



PLAN 22



PLAN 23

SINGLE SEALING PLANS

ABRASIVE FLUIDS OR FLUIDS WITH SUSPENDED SOLIDS

Fluids laden with particles that accelerate wear in mechanical seal materials. To reduce this effect the following API plans can be applied:

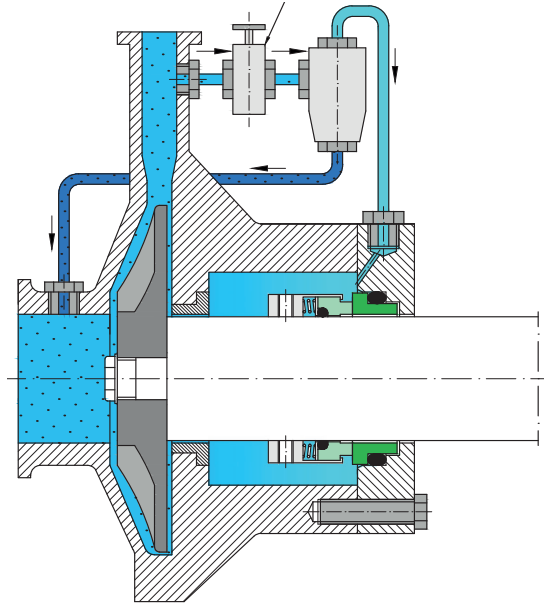
PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 31	Circulation of the pumped fluid from the pump discharge to the seal chamber, passing through a cyclone. Fluids with solids are returned to the suction area.	To prevent the abrasion of the mechanical seal by particles.	Horizontal or vertical pumps. Fluids with suspended solids whose specific gravity is twice that of the fluid. In vertical pumps, a shaft bushing must be included at the base of the compartment.

PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 32	External injection of clean fluid to the mechanical seal chamber. The fluid must have a pressure 2 bar higher than that of the seal chamber and be compatible with the pumped product.	To reduce the heat in the seal chamber. To eliminate deposits from the chamber. To increase the margin between the seal chamber pressure and the fluid vapour pressure. To reduce the formation of air bubbles between the seal faces.	Horizontal or vertical pumps. Dirty, contaminated fluids or fluids that could crystallise on the air side of the seal when there is a leak. Environments with little lubricating properties.

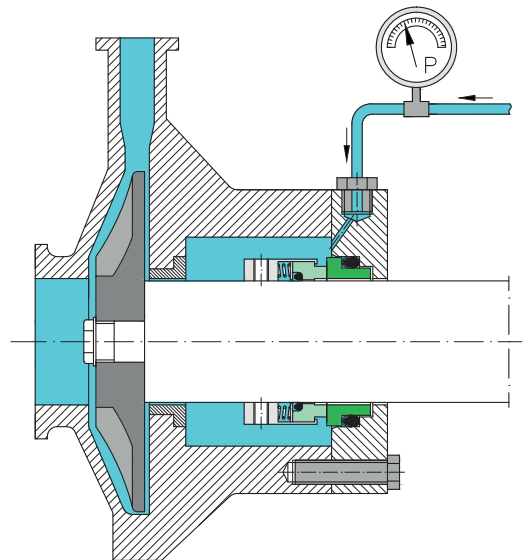
PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 41	Circulation of the pumped fluid from the pump discharge to the seal chamber, passing through a cyclone and sending the clean fluid to a heat exchanger. There must be a difference in pressure between the pump discharge and suction area (at least 1 bar and no more than 11 bar).	To control the seal chamber temperature and improve the mechanical seal lubrication.	Horizontal or vertical pumps. Fluids with suspended solids whose specific gravity is twice that of the fluid.

DRAWING

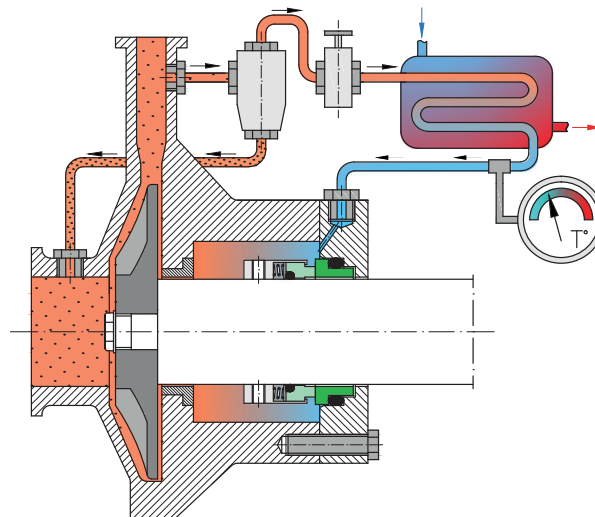
PLAN 31



PLAN 32



PLAN 41



SINGLE AND DOUBLE SEALING PLANS

DAINGEROUS FLUIDS

Dangerous fluids are those which, because of their characteristics, may cause harm to elements and/or people in the event of a leak.

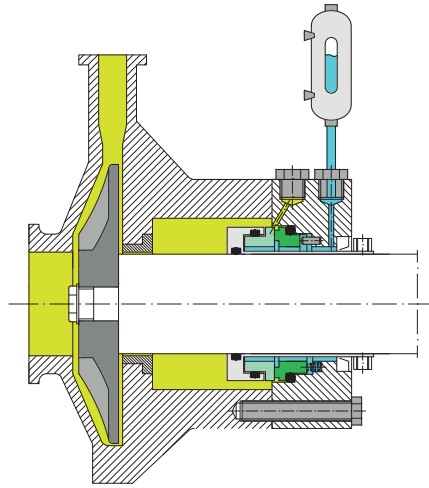
PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 51	Static column of non-pressurised fluid inside a tank, through the quench connection.	To prevent potential leaks from being emitted into the atmosphere.	Horizontal or vertical pumps. Fluids that crystallise when in contact with the atmosphere. Dangerous fluids with low concentrations.

PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 52	Forced circulation of an external non-pressurised fluid used as a barrier fluid. This fluid is circulated through a pumping ring due to the thermo-siphon effect.	To prevent atmospheric contamination in the event of leaks, using the external seal (atmospheric side) as a safety seal. Zero or very low emissions.	Horizontal or vertical pumps. Non-pressurised, double seal layout (tandem). Fluids that crystallise or vaporise when in contact with the atmosphere. Dangerous fluids with low concentrations, explosive or flammable fluids.

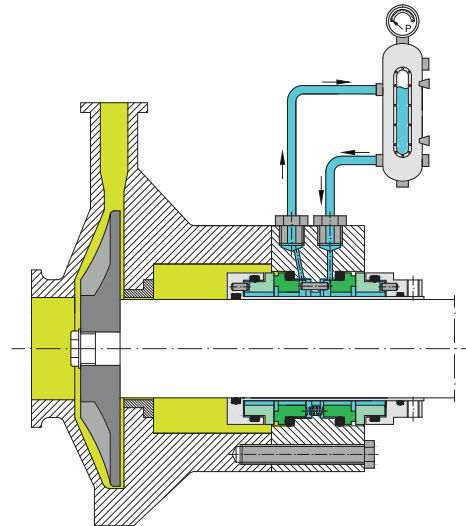
PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 54	Injection of a pressurised barrier fluid from an external source (pressure of 2 bar above the seal chamber).	To prevent atmospheric contamination in the event of leaks, using the external seal (atmospheric side) as a safety seal. Zero or very low emissions.	Horizontal or vertical pumps. Pressurised double seal layout at a high pressure. Fluids that crystallise or vaporise when in contact with the atmosphere. Dangerous fluids with high concentrations. Explosive or flammable fluids.

DRAWING

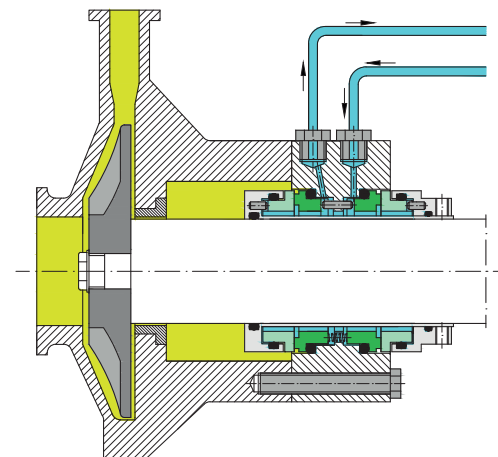
PLAN 51



PLAN 52



PLAN 54



DOUBLE SEALING PLANS

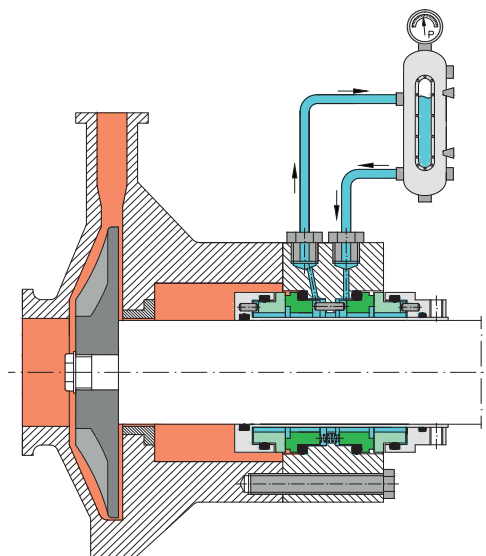
DAINGEROUS FLUIDS

Dangerous fluids are those which, because of their characteristics, may cause harm to elements and/or people in the event of a leak. API plans can be used to reduce such risks:

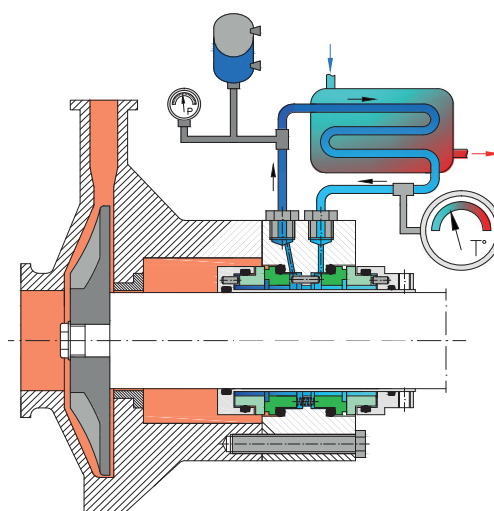
PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 53 A	Forced circulation through a pumping ring of a barrier fluid in a pressurised tank with a pressure that is 2 bar higher than the product fluid. For pressures	To prevent atmospheric contamination in the event of leaks, using the external seal (atmospheric side) as a safety seal. Zero or very low emissions.	Horizontal or vertical pumps. Fluids that crystallise or vaporise when in contact with the atmosphere. Dangerous fluids with high concentrations, explosive or flammable fluids.
PLAN 53 B	Forced circulation through a pumping ring of a barrier fluid in a closed pressurised circuit. A storage tank provides and maintains the pressure in the circulation system. The heat is eliminated through a heat exchanger.	To prevent atmospheric contamination in the event of leaks, using the external seal (atmospheric side) as a safety seal. Zero or very low emissions, maintaining a constant pressure difference with respect to the process. Same as Plan 53A. It prevents the entry of pressurised gas. It provides additional cooling, by air or water, depending on the heat load.	Horizontal or vertical pumps. Double pressurised seal layout (back to back or face to face). The barrier fluid must be 2 bar above the product fluid. Fluids that crystallise or vaporise when in contact with the atmosphere. Dangerous fluids with high concentrations, explosive or flammable fluids.
PLAN 53 C	Forced circulation through a pumping ring of a barrier fluid in a closed pressurised circuit. A piston storage tank provides and adjusts the pressure in the circulation system, comparing it with the seal cavity pressure. The heat is eliminated through a heat exchanger, cooled by air or water.	To prevent atmospheric contamination in the event of leaks, using the external seal (atmospheric side) as a safety seal. Zero or very low emissions.	Horizontal or vertical pumps. Installation of pressurised double seals (back to back or face to face) with a variable barrier pressure greater than 10 bar. Fluids that crystallise or vaporise when in contact with the atmosphere. Dangerous fluids with low concentrations. Explosive or flammable fluids. The same as with Plan 53A, but for higher pressures, preventing reverse pressures and providing additional seal stability.

DRAWING

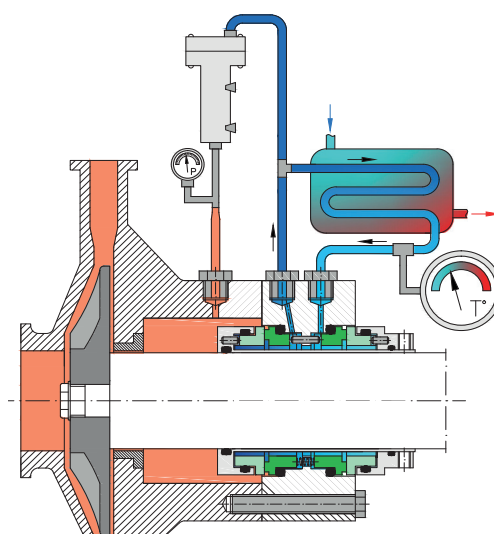
PLAN 53A



PLAN 53B



PLAN 53C



SINGLE SEALING PLANS

FLUIDS IN GENERAL

The following API plans are used in conjunction with other plans.

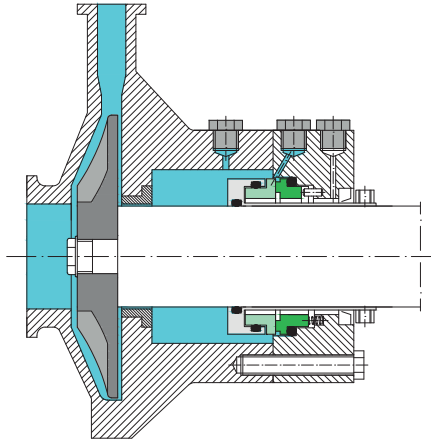
PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 61	Blocked vent and drainage connections, for use as needed.	To ensure that these connections are available in the event of need and also to prevent particles passing through to the seal chamber.	Horizontal or vertical pumps. Single seal layout.

PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 62	Injection of an external fluid to be used for quenching and flushing/washing. The quench lubricates the seal contact surfaces on the air side, with vapour or water. The flushing/washing operation has a lubricating function.	To guarantee seal lubrication, reducing the formation of particles between the contact surfaces due to carbonisation, oxidation or crystallisation.	Horizontal or vertical pumps. Single seal layout. Fluids that crystallise when in contact with the atmosphere or generate solid deposit that block or stick to the seal faces.

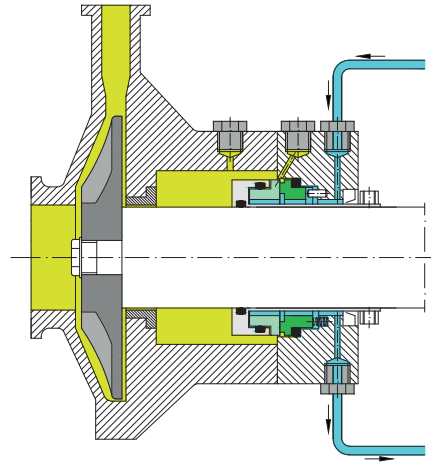
PLAN	DESCRIPTION	OBJETIVE	APLICATIONS
PLAN 65	Leak collector plan for single seals, used for the automatic detection of leaks through a level switch that triggers an alarm when a leak occurs. It has a bypass around the opening to prevent the build-up of pressure.	To have a safe system for controlling and detecting leaks, while also having a drainage system for them in fluids that may condensate.	Horizontal or vertical pumps. Single seal layout. Systems in which an excessive leak indication is required without the need for a physical inspection. Remote sites or sites that are difficult to access. Systems in which it is necessary to stop the equipment automatically in the event of a massive leak.

DRAWING

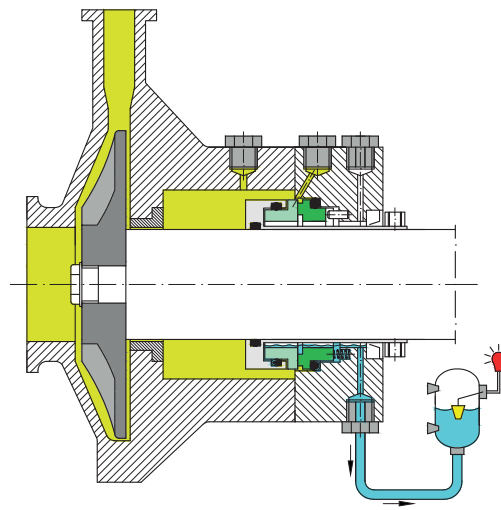
PLAN 61



PLAN 62



PLAN 65



SUMMARY

FLUIDS IN GENERAL

The following API plans are used in conjunction with other plans.

PUMPED FLUID	ACTION REQUIRED	API PLANS
CLEAN FLUIDS	CIRCULATION (LUBRICATION)	PLAN 01 PLAN 11 PLAN 12 PLAN 13 PLAN 14
HOT FLUIDS	COOLING	PLAN 02 PLAN 21 PLAN 22 PLAN 23
ABRASIVE FLUIDS OR FLUIDS WITH SUSPENDED SOLIDS	LUBRICATION	PLAN 31 PLAN 32
ABRASIVE FLUIDS AT HIGH TEMPERA- TURES	COOLING AND LUBRICATION	PLAN 41
DANGEROUS FLUIDS	SAFETY	PLAN 51 PLAN 53 PLAN 52 PLAN 54
FLUIDS IN GENERAL	EMISSIONS CONTROL	PLAN 61 PLAN 62 PLAN 65

TYPE MECHANICAL SEALS	RECOMENDADED API PLANS
SINGLE MECHANICAL SEALS	01,02,11,12,13,14,21,22,23,31,32,41
DOUBLE MECHANICAL SEALS	52,53A,53B,53C,54
QUENCH MECHANICAL SEALS SEALS	51,61,62