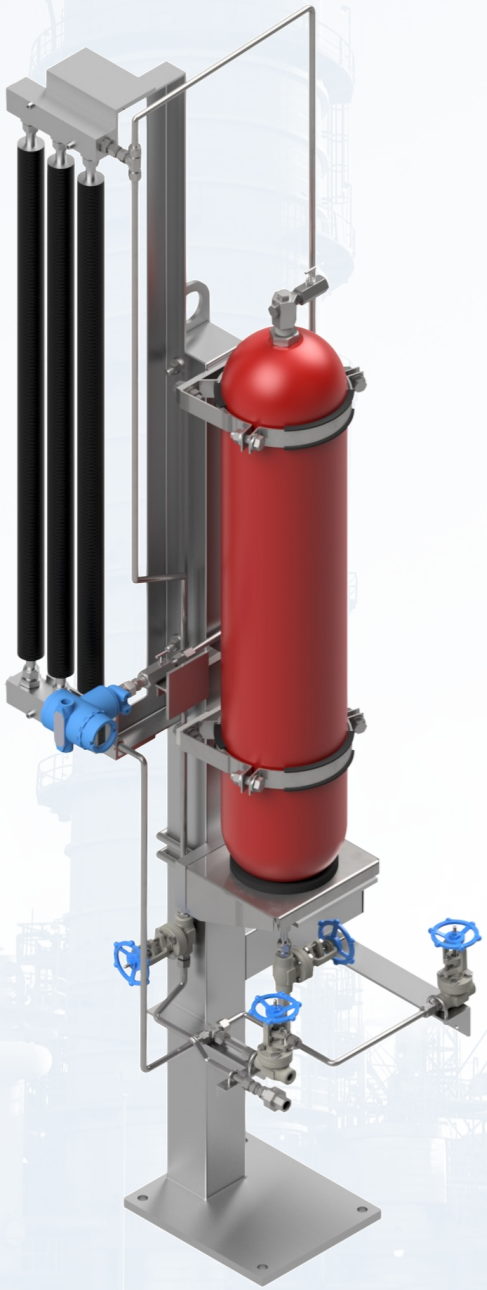
PPC
MECHANICAL SEALS™

Seal Support Systems

Standard and engineered systems for use in API Piping Plans



CREATING SEALING SOLUTIONS THROUGH INNOVATIVE ENGINEERING

MADE IN THE USA

PPC MECHANICAL SEALS™

OVERVIEW

Support Systems

An essential element to the successful operation of mechanical seals is the right application of the appropriate environmental controls. Mechanical seals need to be kept cool, clean, and lubricated, a mantra you will hear at any mechanical seal training seminar. API (American Petroleum Institute) has assembled and organized the plans numerically under its API 682 code for mechanical seals, to ensure that everyone is operating off a standard set of descriptions and nomenclature. The standardized plans may be further altered to each customer's specific preferences (e.g. switches vs. transmitters).

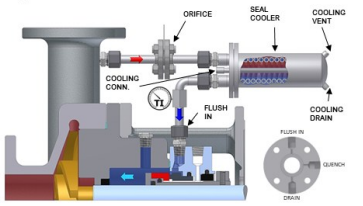
The environmental controls cover a broad range of offerings from simple bypass flushes, to seal reservoirs or forced fluid systems for dual seals, to highly engineered gas panel systems and controls for contacting or non-contacting seals. PPC provides all of the relevant support systems and accessories to optimize the life of your mechanical seals.

Systems include a multitude of configurations and approvals (such as ANSI, API, DIN, U and UM coded vessels, CRN's, etc.) We supply standard systems and will also custom manufacture to your individual specifications.

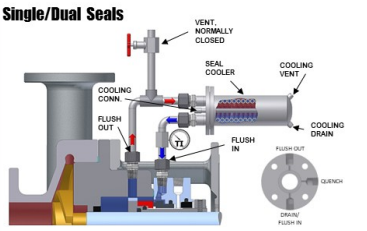
Typical API system plans: **21, 23, 32, 52, 53A, 53B, 54, 55, 65A/B, 66A/B,** 72, 74, 75, 76

PRODUCT/PROCESS

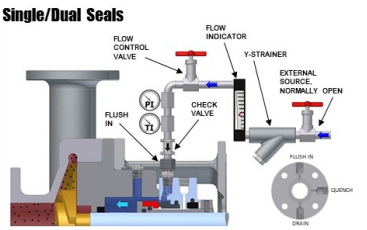
PLAN 21 — Single/Dual Seals



PLAN 23 — Single/Dual Seals

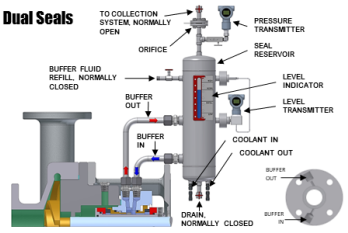


PLAN 32 — Single/Dual Seals

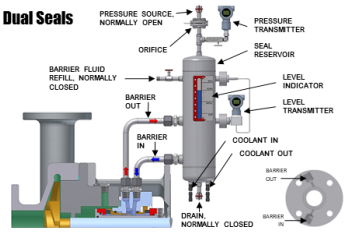


DUAL LIQUID

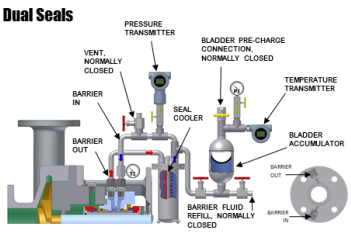
PLAN 52 — Dual Seals



PLAN 53A — Dual Seals

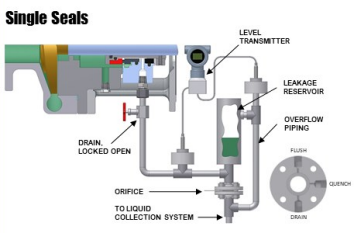


PLAN 53B — Dual Seals

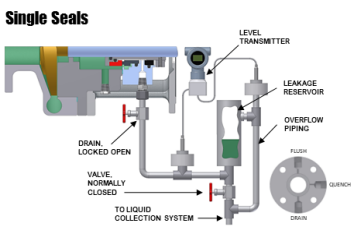


LEAK DETECTION

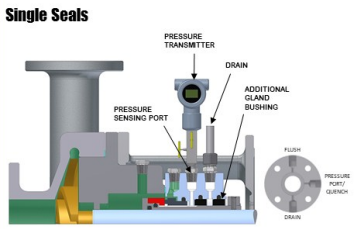
PLAN 65A — Single Seals



PLAN 65B — Single Seals

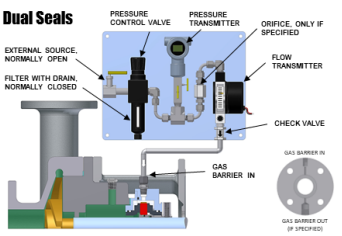


PLAN 66A — Single Seals

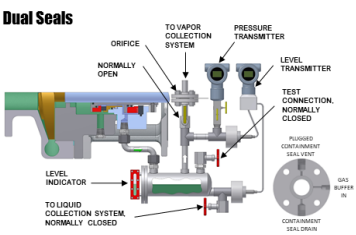


GAS/CONTAINMENT

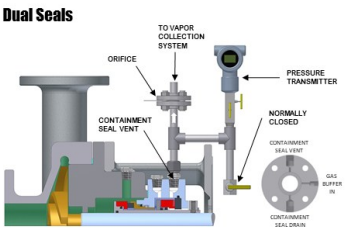
PLAN 74 — Dual Seals



PLAN 75 — Dual Seals



PLAN 76 — Dual Seals



PPC MECHANICAL SEALS™

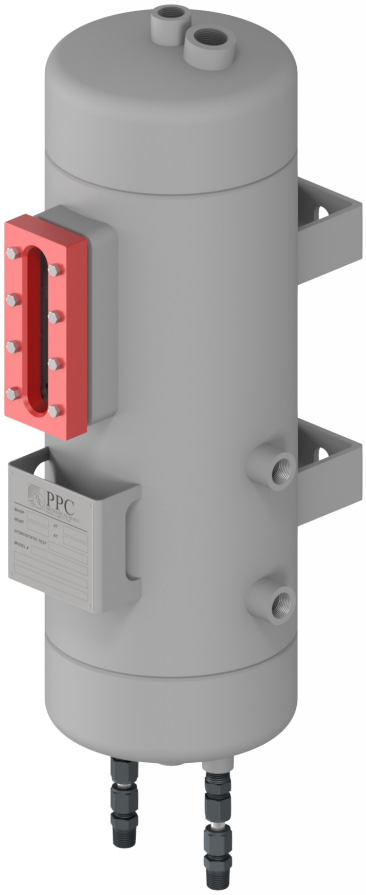
SEAL RESERVOIR SYSTEMS

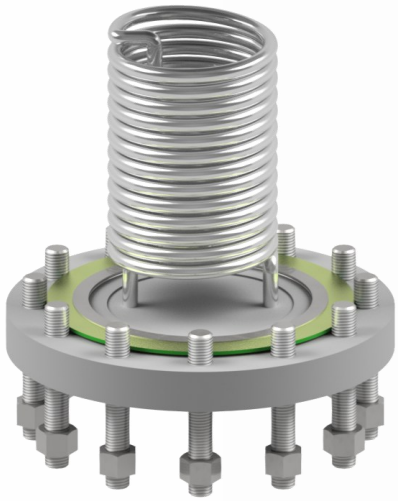
Support Systems

GENERAL PURPOSE SEAL RESERVOIR SYSTEMS

Seal reservoirs are critical components in sealing systems utilizing dual mechanical seals. They are typically seen in Plan 52 and Plan 53A setups. Proper selection and maintenance of the seal reservoir system will lead to greater seal performance and reliability. PPC offers a variety of models to best suit any application and customer needs.

- Standard reservoir and component material is austenitic stainless steel to resist corrosion and avoid costly coating systems.
- Seal reservoirs are provided with reflex-style weld pad level gauges as standard for easy fluid level reading.
- Optional internal cooling coils allow for increased seal performance as heat from the seal is effectively carried away from the system.
- Optional flange-bottom reservoir design allows for easy cleaning of the shell interior and any cooling coil surfaces.
- A variety of instrumentation is available for seal system monitoring, including gauges, switches, and transmitters.





COMMON MODEL OFFERINGS

DESCRIPTION	MAWP
3 Gallon, Dome-Bottom, Schedule 10S, no Cooling Coils	350 psi at 350°F
3 Gallon, Dome-Bottom, Schedule 10S, with Cooling Coils	350 psi at 350°F
3 Gallon, Flange-Bottom, Schedule 40S, with Cooling Coils	515 psi at 400°F
3 Gallon, Dome-Bottom, Schedule 40S, with Cooling Coils	950 psi at 200°F

PPC MECHANICAL SEALS™

SEAL RESERVOIR SYSTEMS

Support Systems

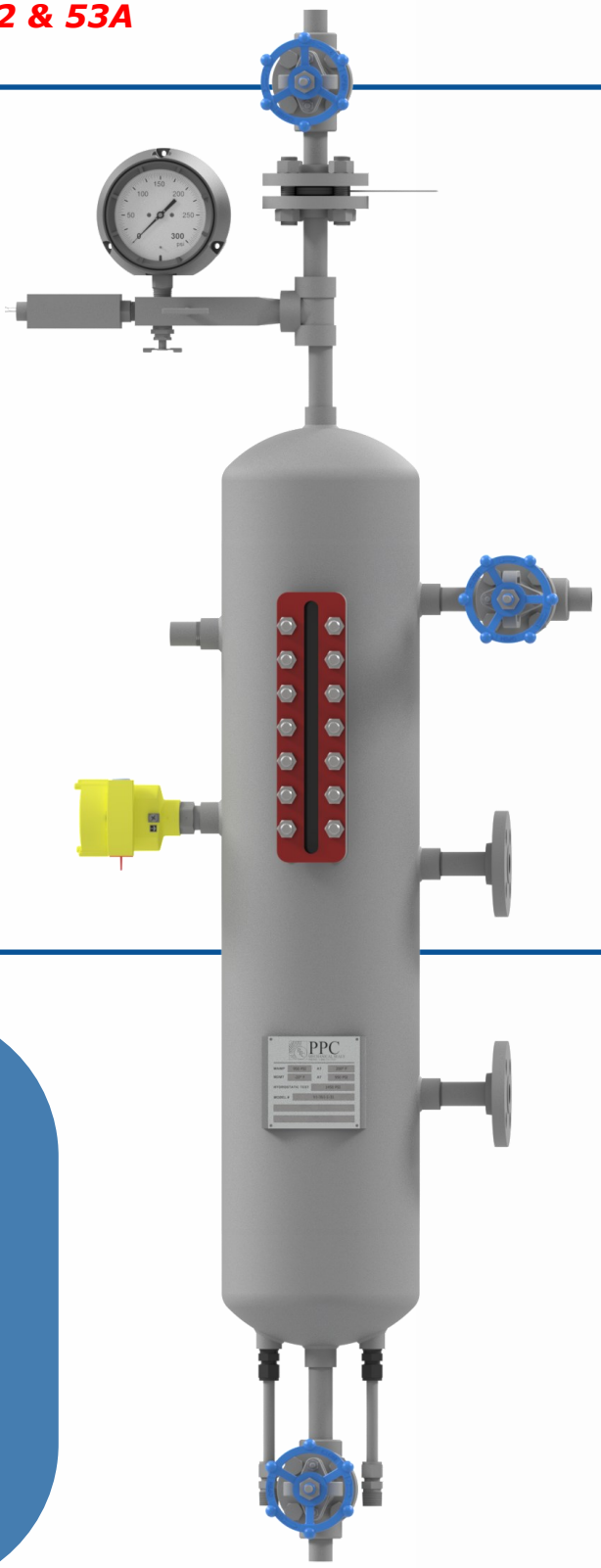
API 682 COMPLIANT SEAL SYSTEMS — PLANS 52 & 53A

API Standard 682 has set up construction requirements to hold all systems to a minimum quality standard. These API compliant systems are routine for PPC and may be specified in many variations.

Vessel size is based on equipment shaft size, and is most commonly offered in 3 and 5 gallon capacities, with larger sizes available. Connections may either be threaded or welded depending on service, and integral cooling coils are standard. While transmitters are standard in the latest edition of API 682, switches are available at the purchaser's discretion for a more economical setup.

The seal pot is offered standard with a welded dome-bottom design with the option of a removable flange-bottom design for easy cleanout of internal surfaces. A large reflex style level gauge allows for an easy visual indicator of liquid level, while high and low connections are provided to be set up for level alarms.

Systems are designed to meet the MAWP of the pump pressure casing as specified by API 682.



COMMON OPTIONS & CONFIGURATIONS

- 3 and 5 gallon reservoirs standard based on recommendations by API 682 related to equipment shaft size
- Pressure gauge & switch with block and bleed, low level switch standard, option for transmitters to meet 4th Edition API 682 compliance
- Reservoir shell and flange classes designed to meet pump pressure casing, with minimum called out by API 682
- Vessels are designed to the ASME Code, 'U' stamps, CRN's, and NB registration are available upon request
- Component MTR and PMI reports available upon request

PPC MECHANICAL SEALS™

LIQUID SUPPLY SYSTEMS & SKIDS

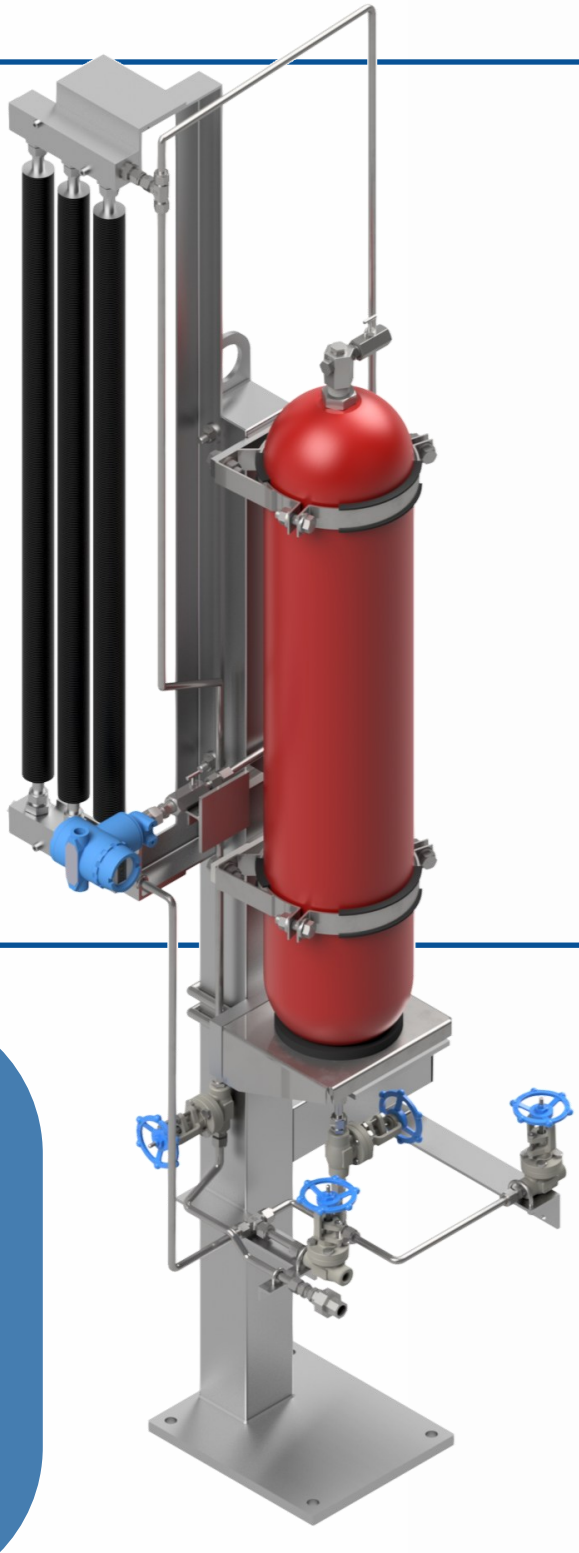
Support Systems

API 682 COMPLIANT SEAL SYSTEMS — PLAN 53B

With a Plan 53B system, greater seal reliability can be achieved on double pressurized seals over seal pots in many applications.

The design is emphasized for greater working pressures with two key components. The bladder accumulator uses a rubber diaphragm to separate the barrier fluid from the working gas, eliminating gas entrainment, an effect that causes detrimental effects at the seal faces. The design also has the benefit of the bladder accumulator maintaining a continuous pressure on the seal without a constant external source. This benefit is highlighted in applications where equipment installation is remote or plant utilities are not available.

In addition, an external heat exchanger (water or air cooled) is typically specified, and can be sized for larger heat loads associated with high pressure seal operation. An air-cooled heat exchanger (natural or forced convection designs available) allows for greater seal performance in setups where cooling water is not available. This is an advantage over many seal pots that are limited in cooling capacity by the size of the pot and available space for internal cooling coils.



COMMON OPTIONS & CONFIGURATIONS

- Accumulators available with coated CS or non-coated SS shells; Buna bladders standard (FKM available), capacity sized for the application (typically 5 or 10 gallon)
- Water-cooled, natural draft air and forced convection air coolers available
- Pressure and temperature transmitters standard, switches and gauges optional
- Single-stage and two-stage built-in hand pumps available with barrier fluid reservoirs
- Constructed to customer specifications, API 682 compliant upon request or lack of specifications.

PPC MECHANICAL SEALS™

LIQUID SUPPLY SYSTEMS & SKIDS

API 682 COMPLIANT SEAL SYSTEMS — PLANS 54 & 55

Plans 54 and 55 can take various shapes, from plant integrated seal water systems to small, portable lube oil carts. At PPC, we can assist in the design and specification of any liquid supply system as well as provide performance tested, ready-to-install skid units.

Such Plan 54 and 55 systems are beneficial in dual seal arrangements as they are designed to provide sufficient fluid flow, pressure, filtration, and heat removal for optimal seal performance. There is no reliance on an internal seal pumping ring and less maintenance compared to a seal reservoir system.

In addition to the above, an engineered system can be designed to service multiple mechanical seals, with a wide variety of available instrumentation for seal and system monitoring. Tank capacity and heat exchangers are sized to the application, generally providing greater performance than a seal reservoir or accumulator system.

COMMON OPTIONS & CONFIGURATIONS

- Single pump/motor systems standard with available backup pump/motor setups for quick changeover in critical processes
- Duplex filtration systems allow filter element change without interruption of skid operation
- Water and air-cooled heat exchangers available, sized for the seal heat load
- Various indicators, switches, and transmitters may be specified, including level, pressure, temperature, and flow

PPC MECHANICAL SEALS™

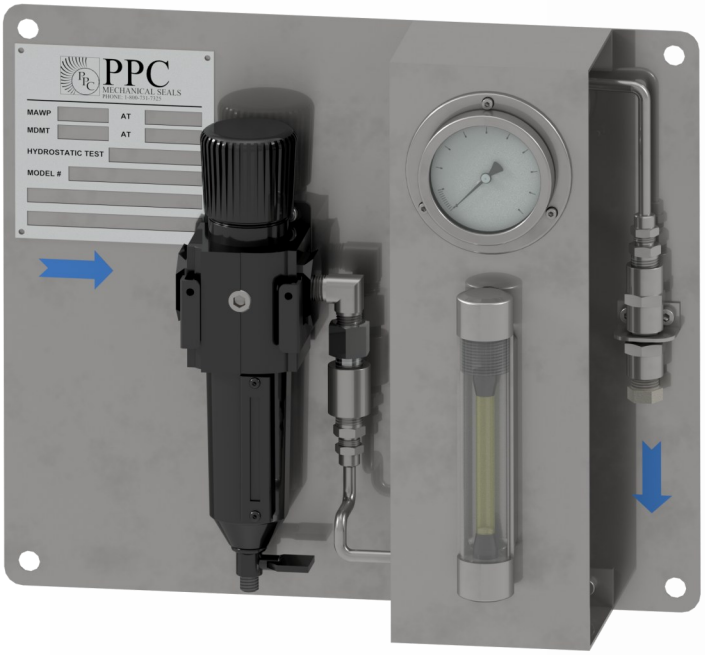
GAS PANELS & CONTAINMENT

Support Systems

API PLANS 72 & 74 PANELS

When filtered and regulated external gas is required, such as in Plans 72 & 74, PPC offers an all-in-one gas panel including all the necessary components for proper gas management, optimizing seal performance.

Our standard offering includes a regulator, filter assembly (with replaceable filter element), flow meter, orifice, pressure gauge, and check valve to protect the panel and upstream source. All components are mounted on a compact, sturdy stainless steel panel with inlet and outlet connections. Custom panels are also available, and may be specified with switches or transmitters.



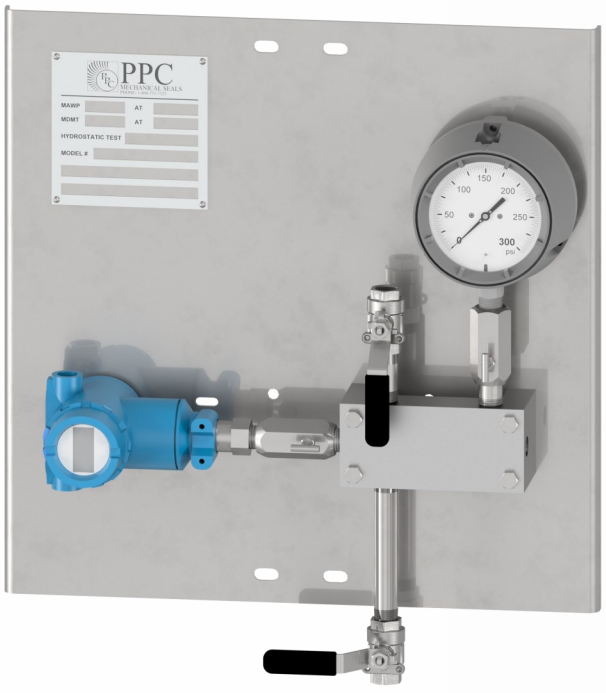
DESCRIPTION	MAX INLET	OUTLET
FCA200-A Panel w/ 0.016" Orifice	250 psig	0-200 psig

API PLANS 75 & 76 SECONDARY CONTAINMENT

PPC offers Plan 75 and Plan 76 assemblies for tandem seal assemblies. These piping plans see benefits over seal pots in applications where maintenance for liquid systems is limited and control of primary seal leakage is needed.

Our Plan 75 assembly is used for condensing process leakage and allows for the safe collection and routing of liquids and vapors. A level gauge and switches are standard with the option of transmitters.

PPC also offers a compact Plan 76 panel for containment of non-condensing leakage. A fabricated manifold with integral orifice coupled with a switch or transmitter allows for vapor routing and alarm signaling in the case of excessive leakage.



COMMON OPTIONS

Plan 76 Panel w/ Pressure Gauge & Transmitter

Plan 76 Panel w/ Pressure Gauge & Switch

PPC MECHANICAL SEALS™

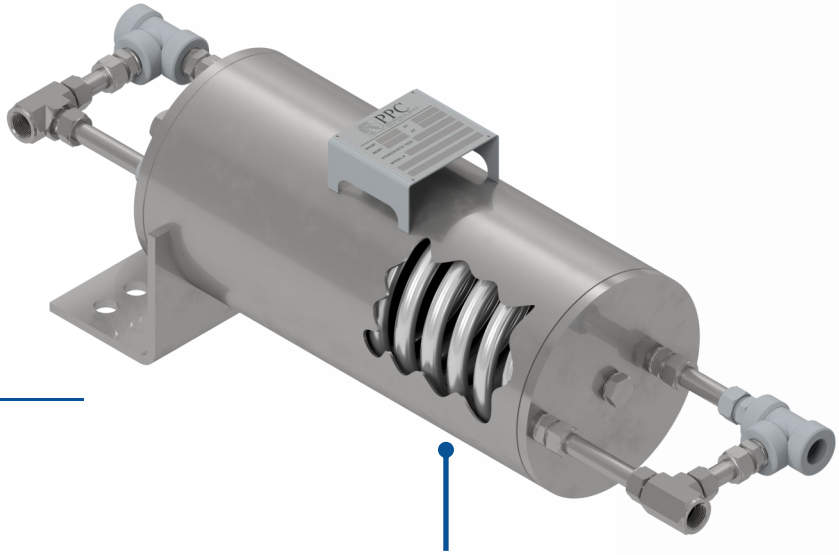
SEAL COOLERS

Support Systems

WATER-COOLED HEAT EXCHANGERS

PPC offers a variety of water-cooled exchangers, including various sizes and materials of construction. Functionally, the cooler uses external water diverted through the shell side over product passing through the inside of the coils.

COOLING COILS	MATERIALS
1/2" OD x .065" wall x 36' long single coil	304SS Shell 316SS Tubing
3/4" OD x .065" wall x 36' long single coil	304SS Shell 316SS Tubing
3/4" OD x .065" wall dual coils	316SS Shell 316SS Tubing



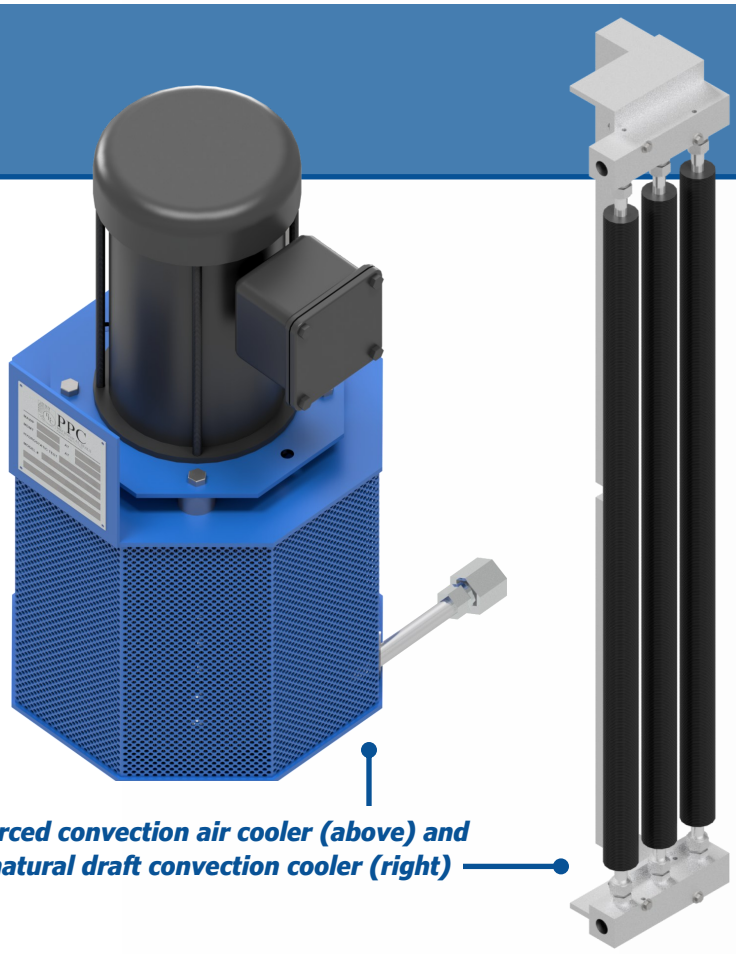
API 682 compliant seal cooler set up for parallel dual coil flow

AIR-COOLED HEAT EXCHANGERS

In the case that a cooling water utility is not available, air-cooled heat exchangers may be provided for seal heat removal. These are found in forced convection and natural draft designs.

With forced convection, an electrical motor powers a blower wheel or fan blades to pass air over the heat exchanging surfaces of the cooler.

In cases where a powered air cooler is not permissible, a natural draft design maximizes surface area exposed to ambient air for convection cooling. It is typical in both designs to utilize fins on the tubing to increase surface area and conduct heat away from the tube wall.



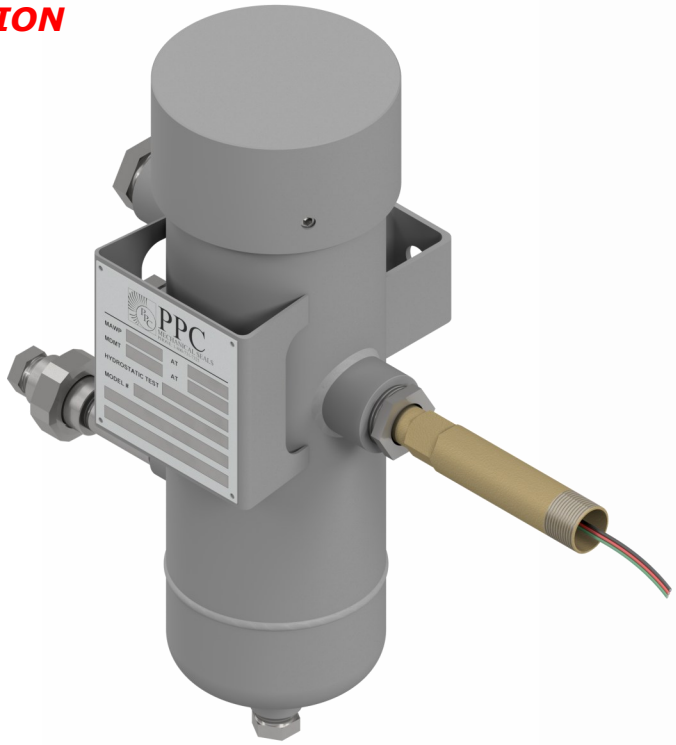
Forced convection air cooler (above) and natural draft convection cooler (right)

PPC MECHANICAL SEALS

LEAKAGE RESERVOIRS & SYSTEMS

Support Systems

API PLANS 65A & 65B LEAKAGE COLLECTION



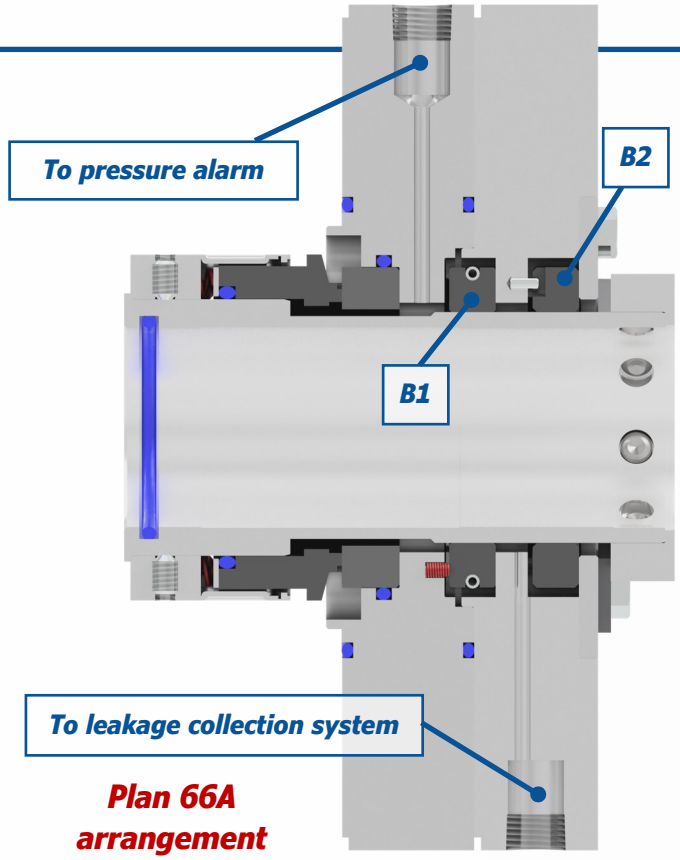
Plan 65 assemblies are popular choices in applications where it is desired to detect and capture liquid leakage. Commonly used on crude oil, refined products, remote installations, and other products; typically where manual inspection is limited.

There are two standard setups available for a Plan 65 system. In a 65A, excessive leakage is detected through the use of a downstream orifice. A minimal amount of liquid is allowed through, but a seal failure will be restricted by the orifice triggering the level alarm.

A 65B uses a closed valve downstream of the collection vessel to allow total liquid leak detection. This minimizes product loss, but does require periodic manual drainage for continuous operation.

PPC offers both variants including any custom or standardized designs. Both level switches and transmitters are available.

API PLANS 66A & 66B LEAKAGE DETECTION



Plan 66A arrangement

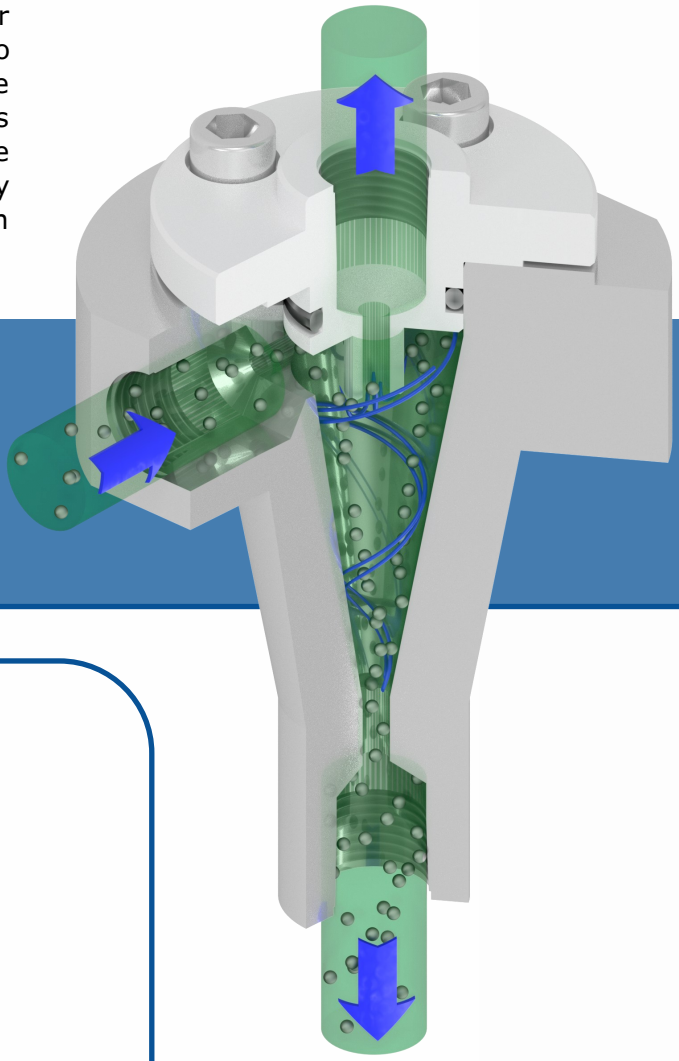
In applications where remote seal monitoring is desired and excessive leakage should trigger an alarm, a Plan 66 is often selected. PPC offers seal designs and the related instrumentation for both 66A and 66B setups.

Plan 66A is standardized for new installations and utilizes two gland bushings in tandem with a pressure switch or transmitter. The bushing closest to the seal (B1) allows for a pressure alarm in case of excessive seal leakage, while the second bushing (B2) restricts atmospheric leakage and directs liquid to the drain port.

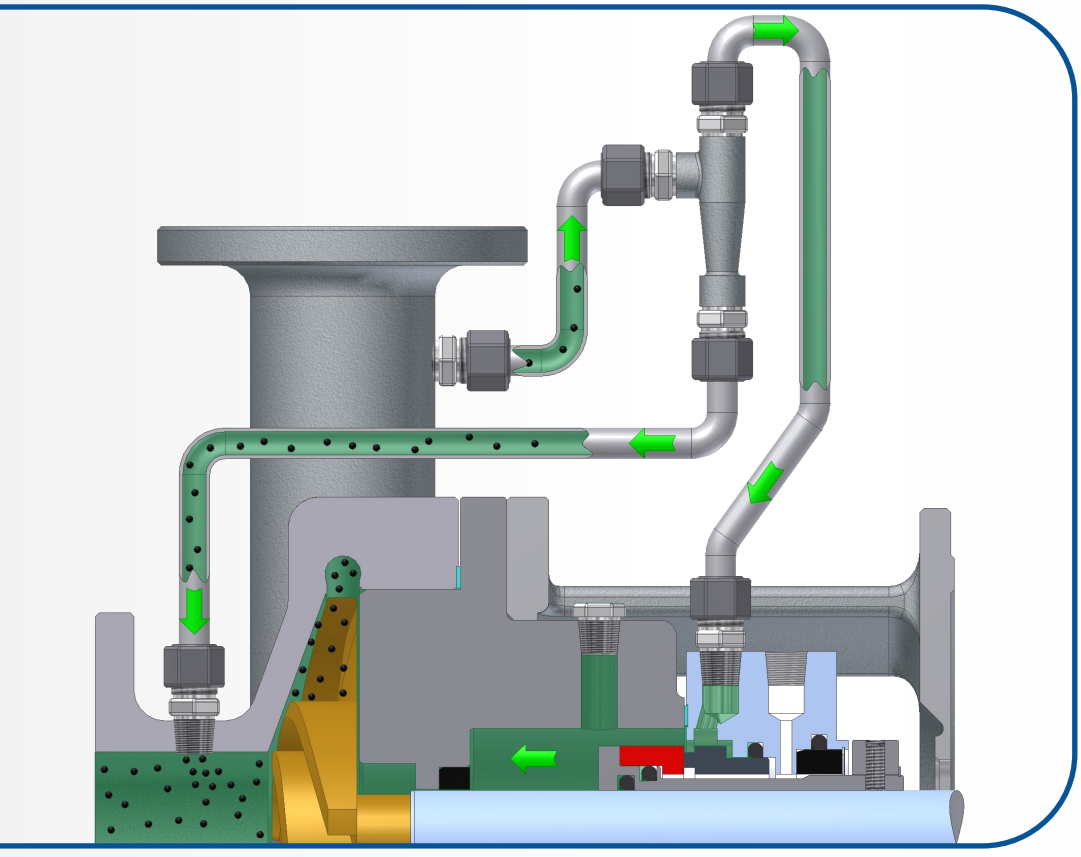
Similar in function to the 66A, the Plan 66B only uses one gland bushing for more traditional or existing seal setups, and implements a plug in the drain port with a drilled orifice to build up pressure for alarm signaling.

API PLAN 31 CYCLONE SEPARATOR

Cyclone Separators can play a major role in the success or failure of a mechanical seal. The separator's function is to remove the abrasive particles from the liquid entering the seal chamber. The cyclonic action of the separator channels the non-abrasive liquid to the mechanical seal and the abrasives back to suction. The cyclone separator is typically used in line off the discharge of a pump, to the flush connection on the gland.



- ***Part #:*** *00-011-1-92*
- ***Materials:*** *316 SS/FKM*
- ***Connections:*** *1/2 NPT*
- ***Pressures:*** *Up to 2000 psi*
- ***Temperatures:*** *Up to 400 °F*



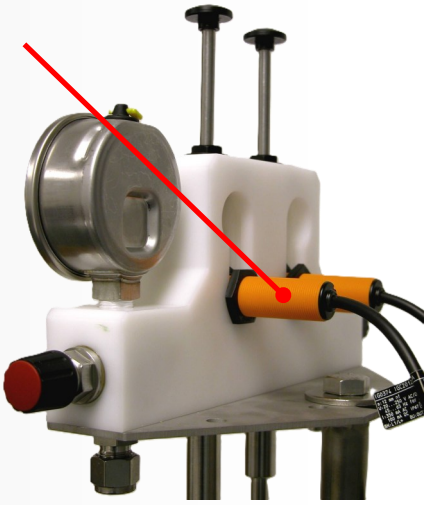
ALL-IN-ONE CONTROLLERS FOR EXTERNAL WATER SUPPLY

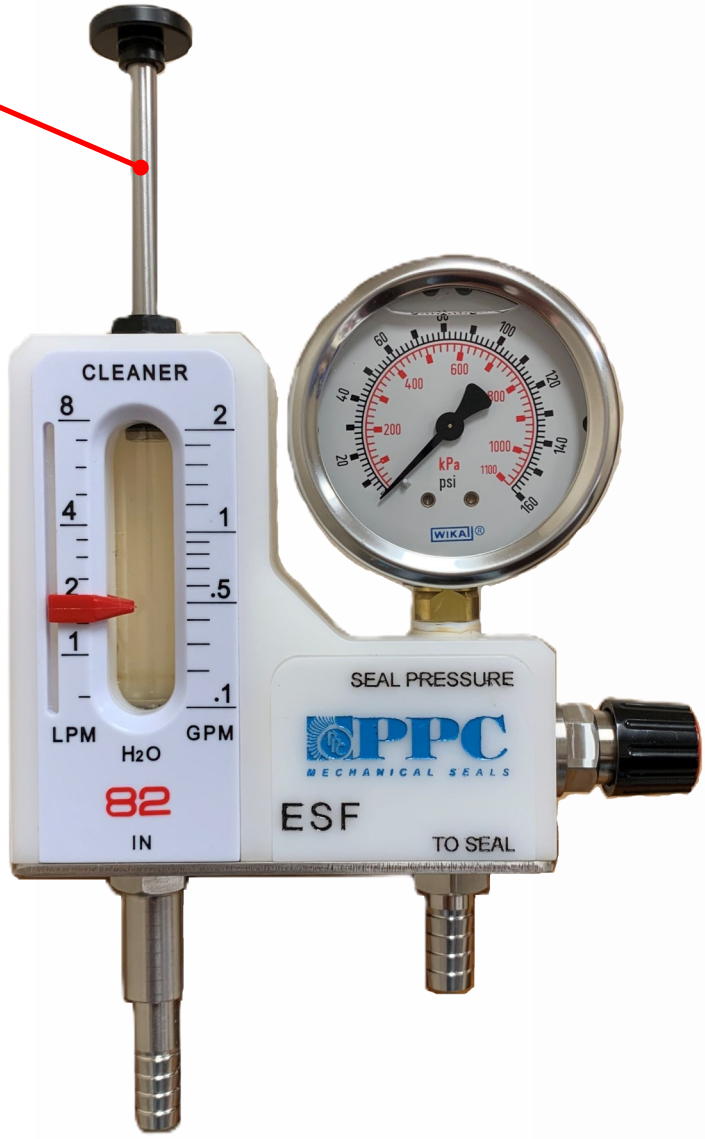
For installations requiring external seal water, PPC offers economical controllers where flow and pressure can be monitored. Flow is adjusted with a clog resistant needle valve, and the unit features a built in plunger for cleaning the meter face. Control over the seal water allows for proper seal operation and water savings, reducing utility and maintenance costs. Single and dual tube models are available, with the latter able to monitor water flow both into and out of the seal for Plan 54/55 dual seal applications.

For additional information, see brochure *B-ACC-3019* on **Seal Water Control**.

FEATURES

- Built-in plunger style **tube cleaner**
- **Detachable metering scale**
- **Clog-resistant** flow control valve
- Multiple material combinations allowing for **excellent corrosion and heat resistance**
- Optional **pressure gauge** available in multiple ranges to suit your application
- Built-in **pressurizing valve** standard for dual tube models and optional for single tube models
- **Mounting bracket** included in design
- **Pressures** up to 435 psi
- **Temperatures** up to 212°F
- **Materials**: POM Body, PSU tube, 316SS metal, FKM elastomers
- **Connections**: Hose barb, compression fitting, or NPT threads
- **Alarm** ready





PPC MECHANICAL SEALS™

Support Systems

MAXIMIZING YOUR SEAL SUPPORT SYSTEMS WITH PPC

Seal support systems are valuable tools for maximizing mechanical seal reliability and minimizing total cost of ownership. These systems help control the environment in and around the seal to optimize product temperatures, maximize face lubrication, minimize leakage, and reduce emissions.

In many cases, it is not possible to install every applicable plan to optimize seal performance. Reality dictates careful consideration of limiting factors including budget constraints, equipment restrictions, process compatibility, available utilities, available maintenance, and conflicting solutions. PPC has well over 50 years of experience tailoring solutions to unique applications.

PPC provides solutions that take into account all of the factors listed and then match them to systems that provide the best value for your dollar. To further increase that value we endeavor to utilize high quality commercial grade instrumentation allowing you to increase your reliability and limit the cost and downtime associated with repair. A PPC representative can assist in maximizing the performance of your mechanical seals at the lowest cost of ownership.

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