



## OVERVIEW



**OIL & GAS**  
D I V I S I O N

# ABOUT SEIM

SERIES

OIL & GAS DIVISION



- ESTABLISHED IN 1975 NEXT TO MILAN (IT)
- MORE THAN 2.000.000 twin and triple rotor screw pumps produced
- ISO9001:2000 CERTIFICATION SINCE 1995
- WORLDWIDE PRESENCE WITH BRANCHES AND DISTRIBUTORS

## OUR MISSION

To manufacture reliable top performing products, suitable for the most extreme applications, thanks to:

- Synergic partnerships with suppliers and clients
- Continuous research
- Constant development of new solutions



- A) HEAD OFFICE**
- B) PRODUCTION AREA**
- C) QUALITY CONTROL AREA**
- D) WAREHOUSE AND LOGISTIC AREA**
- E) ENGINEERED PRODUCTS AREA**

# STANDARDS

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Depending on the country of installation, End User standard requirements, ambient or process conditions there are different regulations that must be taken into consideration. Seim products are compliant to general design norms (like API,VDMA), material selection guidelines (ex. NACE), quality requirements (ex. ASME, DNV), European Union standards (Machine Directive, ATEX Directive) import/export regulations (ex. CUTR).

Below are listed some of those standards that are applicable to screw pumps. Seim internal procedures are constantly updated with latest editions/revisions of any regulation, and new procedures are frequently added for satisfying new requests worldwide.

## APPLICABLE STANDARDS

<b>API676</b>	Positive Displacement Pumps - Rotary
<b>API682</b>	Pumps – Shaft Sealing Systems for Centrifugal and Rotary pumps
<b>API614</b>	Lubrication, Shaft-sealing and Oil-control System and Auxiliaries
<b>API686</b>	Recommended Practice for Machinery Installation and Design
<b>NORSOK</b>	Various Norsok standards
<b>DNV-OS-E201</b>	Oil&Gas Processing Systems
<b>SHELL DEP</b>	DEP 31.29.02.11 - Gen + others
<b>VDMA24284</b>	Testing of Displacement Pumps
<b>ASME VIII&amp;IX</b>	Requirements applicable to the design, welding, fabrication, inspection, testing
<b>NACE MR1075</b>	Materials suitable for H <sub>2</sub> S - containing fluids
<b>ATEX</b>	Directive 94 /9/EC _ Ex II2G IIA - IIB T3/T4
<b>CE</b>	Machinery Directive 2006/42/EC
<b>CUTR</b>	010/2011 and 012/2011
<b>ABS</b>	Steel Vessel Rules Ed. 2010 1 - 1 - 4/7.7, 4 - 6 - 1/7.3.2

# MFR. & TESTING PROCESS

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## RAW MATERIAL CONTROLS:

All incoming materials and components go through quality control before warehouse book-in.

## MANUFACTURING PROCESS:

Milling, Grinding, Cleaning, Kitting, Assembling.

## TESTING PHASE

100% of SEIM products go through factory acceptance test according to VDMA, API or customer specification.

**SHIPPING / STORAGE  
INSTALLATION AND COMMISSIONING  
WORLDWIDE AFTER-SALES ASSISTANCES**

## SEIM STANDARD INSPECTION AND TEST PLAN INCLUDES:

- 100% Visual and Dimensional Inspection of critical raw materials, with mill certificate analysis
- Automatic dimensional control of all screw sets during manufacturing process
- Components cleaning before kitting
- 100% VDMA Performance and Seal Leakage Test
- 100% Hydrostatic Test or Air Leakage Control Test
- 100% API676 Performance Test of API compliant units
- 100% API676 Hydrostatic Test of API compliant units
- 100% Visual & Dimensional Check before shipment
- 100% Main components 3.1 material certificate

## OPTIONAL TESTS & CERTIFICATES AVAILABLE ON REQUEST:

- Meccanical Running Test compliant to API676 or purchaser specification
- Vibration Test compliant to VDMA 24284 or purchaser specification
- Sound Pressure Test
- Cleanliness inspection report before kitting
- Third part inspection report
- Others



# ABOUT OIL&GAS

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Since the very beginning SEIM has been constantly focused on research and development, willing to propose to all customers more and more advanced solutions and product customization for specific applications. **Seim Oil&Gas** division was born in 2004 from the necessity to merge technical and commercial activities and concentrate them on customized products, dedicated to Petrochemical and Power demanding markets.

The result is a wide range of pumps including several models compliant to the most recent standards of this sector.

Upstream (Onshore and Offshore), Midstream, Downstream as well as Power Generation services are more and more sensitive to efficiency, special materials, reliability, repeatability of performances with variable operating conditions, safety. For this reason screw pump technology is preferred to centrifugal or gear pumps.

Together with pumps Seim is able to supply a complete range of:

## ACCESSORIES:

common baseplates, couplings, coupling guards, strainers, bell housings, check/foot valves, sensors, starting valves.

## DRIVERS:

electric motors AC (stand alone or with inverters/soft start), electric motors DC, diesel engines, steam turbines.

## PANELS:

electric start/stop/emergency units, engine control panels, turbine monitoring systems, control panels with process parameters monitoring (pressure, temperature, flow, vibrations) and suitable for direct connection to the SCADA supervision system of the plant (DCS).

The installation is possible in safe area as well as in classified area with all required certifications.



# 10 REASONS TO CHOOSE A SCREW PUMP



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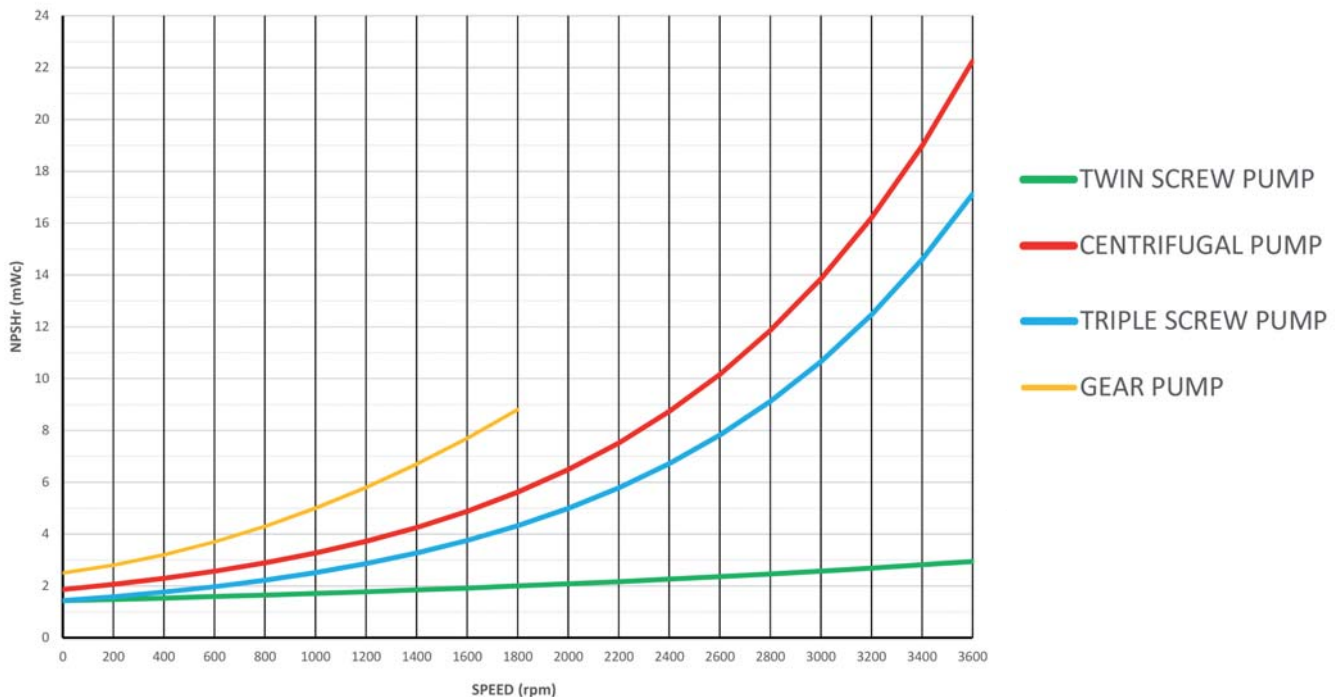
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## HIGH SELF PRIMING CAPABILITY:

In case of low NPSH available (low inlet pressure) screw pumps can guarantee a smooth running without cavitation risks, even at start up phase with long empty suction lines. With high flow capacity twin screw pumps become the only choice available, with NPSH required much lower than any alternative pump technology.

### NPSHr comparison \_ TWIN vs. TRIPLE vs. CENTRIFUGAL PUMPS

*datas are related to a pump with flow 1.500 lpm @ 50 cSt*



## COMPATIBILITY WITH A WIDE RANGE OF FLUIDS:

The process fluid must carefully be analyzed, before selecting the correct pump type and model; very low or very high viscosity, solid content with or without abrasive properties (like sand or carbon particles), chemical composition (ex. -SO<sub>4</sub> content) can be critical parameters for centrifugal or gear pumps. But not for screw pumps, that are suitable for a wide range of process fluids, including Crude Oil (mixture of oil, water, sand), Clean Crude Oil, Heavy to Light Fuel Oils, Marine Oils, Mazut, Asphalt, Bitumen, Additives, Naphta, Petrol, Bunker Oil.

## HIGH EFFICIENCY:

IE4 is the most recent certification available for electric motors in Europe. But high efficiency motors are useless unless installed with low power consumption equipment. This is one of main advantages of screw technology, and becomes a must with Seim screw pumps. Assembly precision, multi-layer grinding, strict dimensional tolerances and a 100% dimensional check on critical components are Seim keys for reducing internal recirculation and avoiding undesired frictions.

## LOW AND EASY MAINTENANCE:

All Seim screw pumps are long life equipment designed for continuous or intermittent services. This is possible thanks to a careful selection of all components and materials of construction, as well as opposite flow design (twin screw pumps) which minimizes thrust wear (self balanced design). In addition to this Seim pumps always are suitable for an easy inspection or replacement of all components object of wear. The result is a reliable equipment that requires only quick and cheap maintenance activities.

## LOW VIBRATION:

Vibrations are caused by non perfectly balanced equipment, non precise motor-pump alignment, undesired frictions, non-correct assembly, cavitation. Screw pumps are less affected then other technologies, like reciprocating pumps, thanks to the self-balanced type of construction and to the low NPSH required. Vibration level of Seim pumps is even lower than other brands, thanks to the precision of construction and to the 100% dimensional check on screw sets during and after each milling and grinding phase.

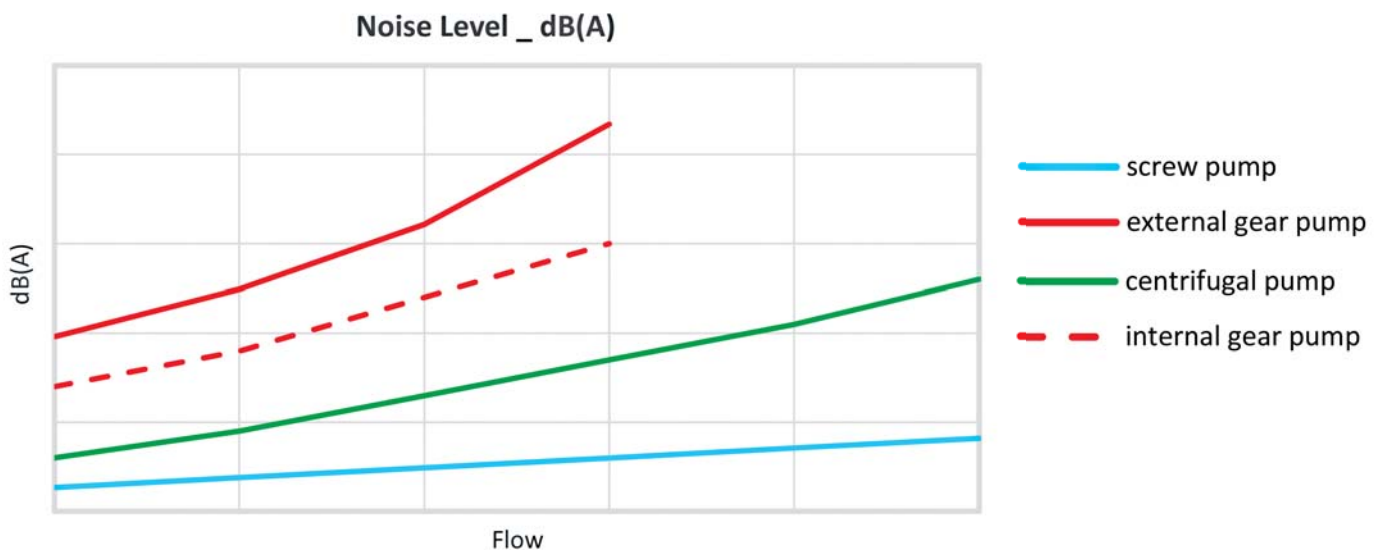
# 10 REASONS TO CHOOSE A SCREW PUMP

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## LOW NOISE:

Noise limits on site depend on design standards (ex. API676) as well as local regulations. Sound pressure of screw pumps is lower than centrifugal, gear, sliding vane or alternative pump technologies. In addition to this Seim pumps are supplied with precise noise emission calculation and can be provided with noise test report (optional) anytime this is requested. You don't need to be concerned about noise level limits, make your life easier!



## LOW PULSATION:

The performances and life length of various Oil&Gas / Power Generation machines highly depend on the performances of auxiliary systems (Lubrication Systems, Fuel Feeding/Boosting devices, Hydraulic Systems, Flushing Systems). An undesired pressure pulsation or flow fluctuation has a negative impact on control systems and machine efficiency causing longer and harder commissioning phase as well as more expensive maintenance. Seim screw pumps can guarantee a constant outlet pressure, without pulsations also in the worse operating conditions, so that your System can run smoothly and safely.

## CONSTANT PERFORMANCE:

Inlet pressure, outlet pressure, fluid specification, operating temperature. These are only few of the parameters that must be considered during a pump selection. But on site all these parameters can be different than design conditions, or could vary during normal operations. Fluid composition is not always constant (ex. Crude oil coming out from wells), operating temperature can vary (ex. Day/night difference on outdoor applications or cold start phases), inlet pressure can have fluctuations. In addition to this the same pump unit could be used for different fluids (ex. loading/unloading transfer services). SEIM Screw pumps win this challenge every day, in hundreds of different services and plants in the world.

## DRY RUNNING:

All most severe applications could have periods of dry running service. Some of the reasons can be a long empty suction line before start-up phase, high suction height or a 100% gas transient of multiphase pumping systems during normal operations. Seim twin screw pumps, available with manufacturer standard or API compliant design, can come with separate bearings lubrication, mechanical seals pressurized or unpressurized lubrication (depending on operating conditions and process fluid) and no mechanical rotor to rotor contacts or rotors to stator contacts. This allows to go through temporary or critical dry running conditions without damages.

## CUSTOMIZATION:

Dedicated inlet/outlet connections, special materials for main components, project based mechanical seals and flushing plans selection, application based screw set design and manufacturing, instrumentation and control systems. These are only few of the possibilities that Seim can offer to the most demanding customers; every pump is the result of a dedicated detailed design that is based on customer requests. For Seim engineers every pump is special.

# APPLICATIONS

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**SEIM ENGINEERS ARE ABLE TO SUGGEST THE BEST TECHNICAL SOLUTION, CHOSEN WITHIN A WIDE RANGE OF PRODUCTS AND CUSTOMIZATION ALTERNATIVES AND SUITABLE FOR ALL THE BELOW APPLICATIONS:**

## **Upstream: Oil&Gas extraction**

Oil or bitumen extraction is a complex activity. The fluid normally includes both gas and liquid phases and it contains water and solids. Chemical composition and physical properties could be very different, not only from well to well but also in the same well. In addition to this some transformation steps could be necessary locally and immediately after extraction, and before transferring the fluid through a pipeline. The main example is viscosity reduction of Bitumen, through special additives that allow an easier transfer at ambient temperature to the closest plant or terminal. Transfer service to local stocking facility or through shipping pipeline, as well as additives service, can be carried on by twin screw pumps. They are the most flexible and reliable solution, whenever there is solids or gas presence in the process fluid, and they could become a complete multiphase robotic pumping station if equipped with buffer tank, oil/gas separator, instrumentation kit, valves with electrical actuators and a complete control system.

## **Midstream: Fluids Transfer**

After extraction Crude Oil or Bitumen must be transferred to terminals or refineries/transforming plants. In addition to that, after these processes, Oil and Bitumen products must be transferred to stocking facilities or distribution network and delivered in the market. On this purpose, for most of Midstream applications, high flow pumps are necessary. They normally are driven by low/medium voltage electric motors or diesel engines, sometimes feeded by the process fluid itself. Loading and Unloading services are included in this category, and they could be critical because of long empty suction line and large suction height. Dry running capability and low NPSH available are a main requirement for these pumps, that must also be suitable for handling multiple different fluids with intermittent service and very high flow capacity.

## **Downstream: Refining and Transforming**

Reliability is a must for all process pumps. They may need to run with extreme operating conditions (ex. High temperature, Aggressive Fluid composition, High pressure, low NPSH available) and must guarantee top performances for a long time. For this reason they are the most advanced models and they come with a complete package of add-ons like on-board instrumentation, control panels, special materials of construction.

At the beginning of refining/transforming process the pumps must be suitable for handling Crude Oil or Bitumen; step by step these fluids are transformed into Heavy to Light Fuel Oils, Asphalt, Naphta, Gasoil, Diesel Oil and others. Additives are used for changing the chemical composition or the phisical properties of the fluid, during refining and transforming of Oil and Oil derivate, and condensate or vacuum residue need to go through a dedicated treatment. In addition to them Mazut can be used for feeding a boiler at the end of the process.

For all the above mentioned fluids screw pumps are preferred, because of very high or very low viscosity (ex. Bitumen, HFO, LFO), very low NPSH available (ex. Condensate), aggressive composition (ex. Additives).

Downstream pumps usually are API676 compliant units, driven by electric motors or steam turbines and connected to DCS.





# APPLICATIONS

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## Lubrication: Rotary Machines Auxiliary Systems

Most of Main rotary machines, like Steam or Gas Turbines, Gear Boxes, Air or Gas Centrifugal Compressors, and high flow Centrifugal Pumps, always include an auxiliary lubrication system for cooling the bearings. One of the most critical aspects of this service is oil pressure; too low or too high pressure are the most common causes of bearing and rotor damages. Operating pressure of positive displacement pumps only depends on the resistance to flow of discharge line; screw pumps make lube oil system design easier and reduces the risk of failures. For this reason screw technology is more and more preferred to centrifugal for bearing lubrication service. Screw pumps don't need pressure control valves and long complicate commissioning as operating pressure and flow are fixed during design phase. They are suitable for continuous service (Main Oil Pump) as well as for intermittent (Auxiliary Oil Pump or Emergency Oil Pump). In addition to this Emergency screw pumps can guarantee a fast response with quick start whenever necessary, avoiding undesired and dangerous pressure drops into your system while the Main machine is running.

## Jacking:

Gas turbines, Steam turbines, Hydro turbines need to be «lifted» from their bearing before start-up and during operations. Jacking oil pumps must be positive displacement type, so that the operating pressure only depends on discharge line resistance to flow. Before turbine start-up the resistance to flow is very high so starting pressure can be up to 190 barg or above. Jacking oil pressure becomes lower and lower while the turbine is lifted by the oil itself. High pressure triple screw pumps are used for this service, and they are critical for avoiding damages of turbine rotor.

## High Pressure Close Circuit Lubrication:

Whenever a high pressure lubrication is necessary a closed pressurized system is suggested. Turbo Expanders, Screw Compressors, Cryogenic Compressors are some of the machines that require this type of lubrication. Pump inlet pressure could be up to 100 barg, and pumping unit (motor-pump) could be external but also installed inside the oil circuit, submerged into the lube oil. Screw pumps are the only solution used for this service, that can become even harder whenever the lube oil may contain cryogenic gas traces.

## Fuel Supply:

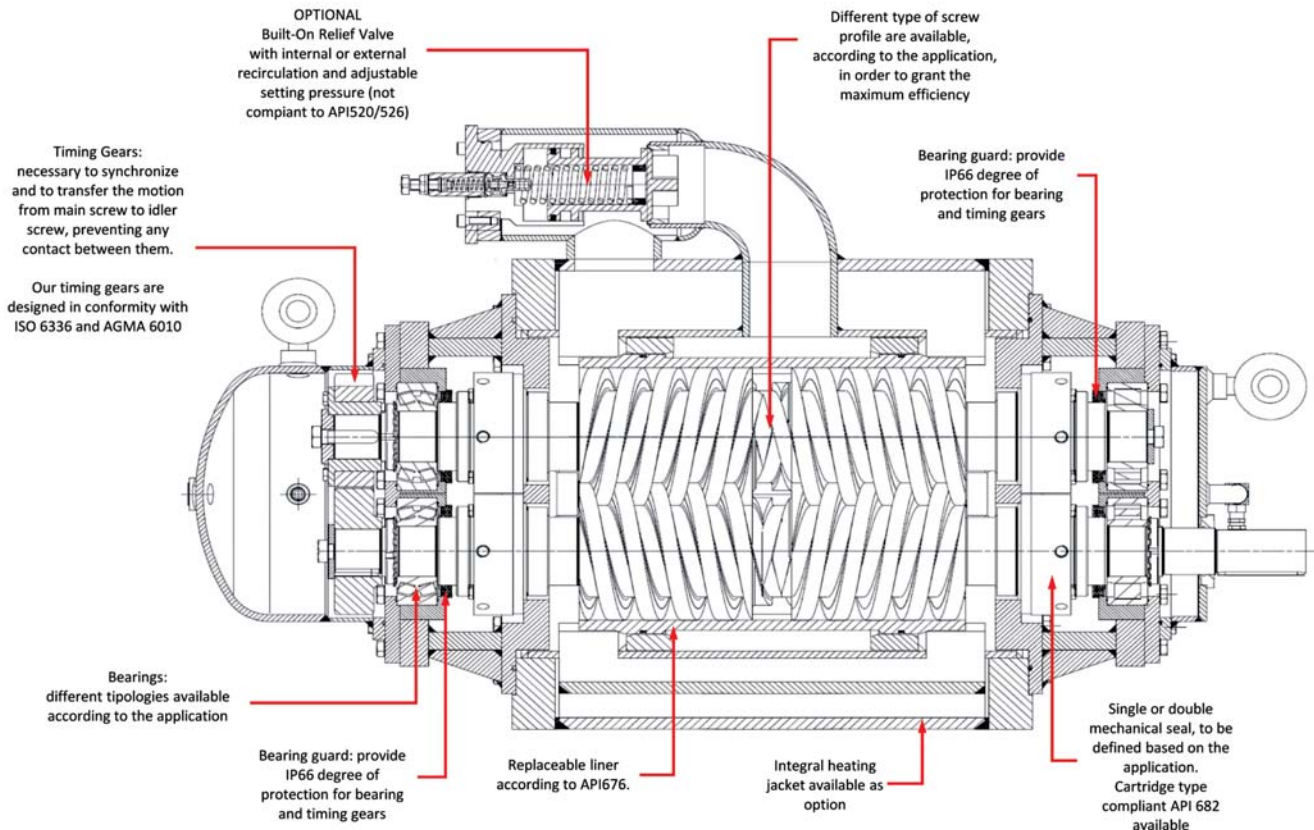
Boilers, Generators, Diesel Engines as well as Gas Turbines are in need of a fuel feeding/boosting unit. These pumps usually operate at higher pressure, from 40 to 100-110 barg, and must be suitable for low viscosity service. Because of these two requirements centrifugal pumps and gear pumps cannot be used, so a screw pump unit becomes mandatory. Very frequently these pumps must be able to run with alternative fluids, within a defined range, as the fuel available can vary from time to time, depending on the source.



# OUR PUMPS

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## PCX 2SP

Is the most complete twin screw pump model available into Seim product range. It includes external bearings (self lubricated or with separate lubrication system), Nr. 4 mechanical seals (with or without flushing plan), timing gears between the two screws (in a dedicated gearbox), external fabricated case, totally removable and replaceable liner. This pump can be highly customized, selecting the preferred layout and materials, as well as the necessary mechanical seal model and performances depending on process fluid and service. PCX 2SP design is compliant to API676 latest edition and it is ATEX certified for zone 1.

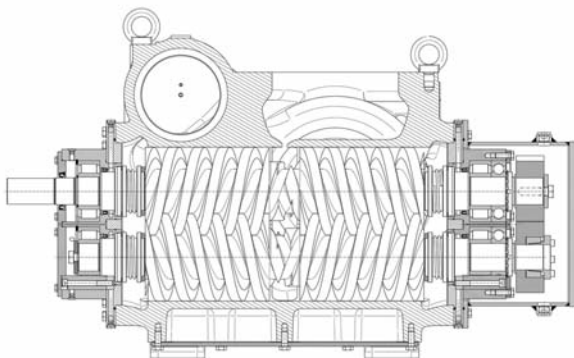
# OUR PUMPS

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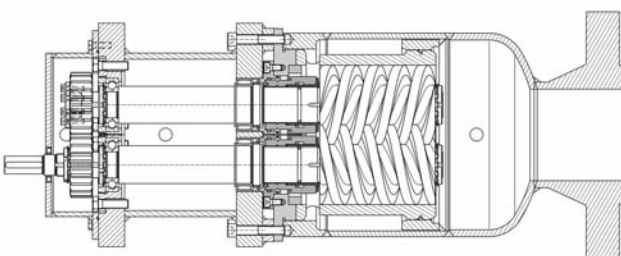
**2SP**



- 2SP is a heavy duty twin screw standard solution suitable for medium to high flow.
- External bearings and timing gears guarantee the same performances of PCX 2SP series, with a simpler design whenever pump customization is not necessary.

SERIES

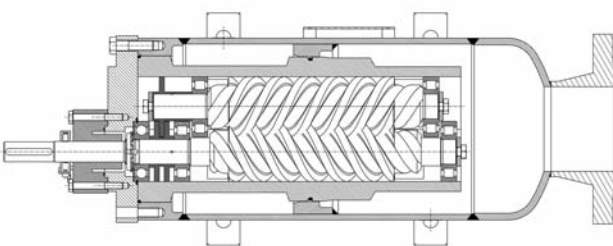
**PCX 2SP LS**



- PCX 2SP LS is same as PCX 2SP in short version.
- This pump is suitable for operating pressure up to 16 barg and 50% of PCX 2SP flow capacity.
- Typical application is condensate or vacuum residual, when flow capacity required is low but pump customization is required and NPSH available is very limited.

SERIES

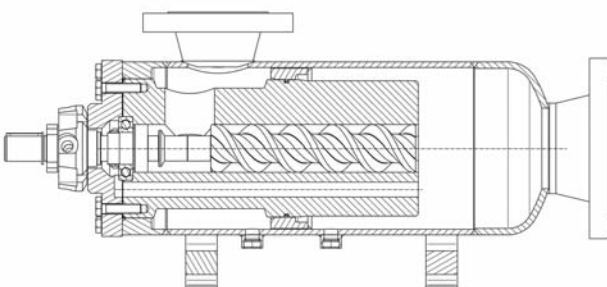
**PCX WTG**



- PCX WTG is the simplest twin screw pump solution available.
- It comes with internal bearings and one single mechanical seal, without timing gears.
- This pump is normally used for high flow lubrication or in full Stainless Steel execution, whenever process fluid is able to lubricate the bearings and the rotors.

SERIES

**PCXA**

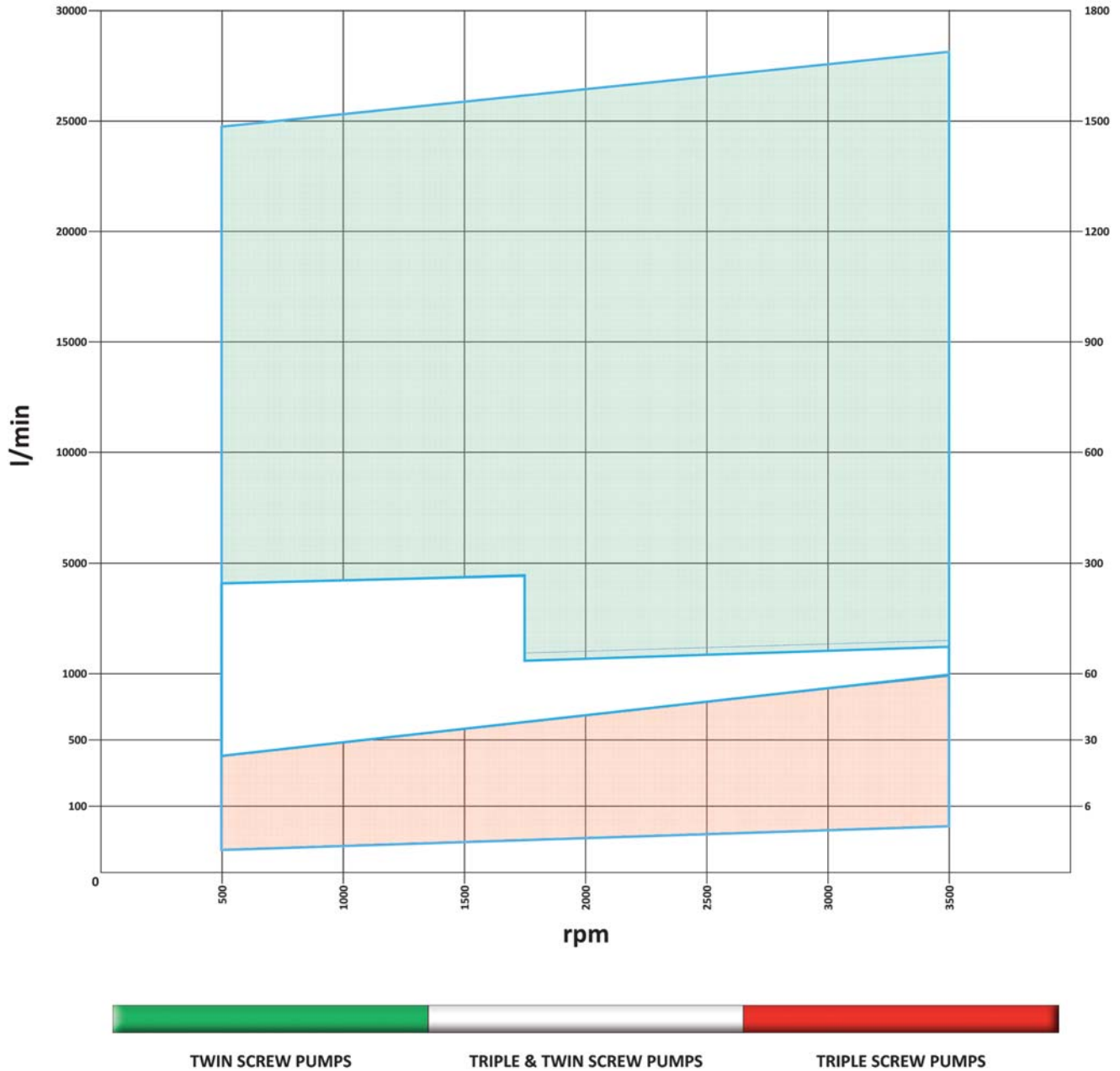


- PCXA is the main API676 compliant triple screw pump model.
- This pump is suitable for lubrication or fuel service and comes with removable liner.
- Internal or external bearing is available, depending on the service and process fluid.

# PERFORMANCES

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Screw pumps can operate in a wide range of flow capacity.

More into details triple screw pumps are able to handle low (blu area) and intermediate (white area) flows.

Twin screw pumps have a lower NPSH required so pump size can be larger. Thanks to this, and to a different screw profile, twin screw pumps can deliver a higher flow capacity (green area).



MATERIALS CHART TRIPLE SCREW PUMPS

		Pump casing and flanges	Casing insert		Drive and Idler screws
		1	1	2	1
PCX (all series)	A	welded steel (A105 or equivalent)	A48 Gr.35 (EN-GJL-250)	A105 (EN 1.0460)	hardened c. steel (SAE5115 or equivalent)
	B	low temp welded steel (A333 Gr.6 or equivalent)	A48 Gr.35 (EN-GJL-250)	A105 (EN 1.0460)	hardened c. steel (SAE5115 or equivalent)
	C	AISI316L (EN 1.4404)	A48 Gr.35 (EN-GJL-250)	A105 (EN 1.0460)	hardened c. steel (SAE5115 or equivalent)
PXF	A	A48 Gr.35 (EN-GJL-250)	---	---	hardened c. steel (SAE5115 or equivalent)
PXC	A	A105 (EN 1.0460)	---	---	hardened c. steel (SAE5115 or equivalent)
	B	A350 LF2 (EN S355J2)	---	---	hardened c. steel (SAE5115 or equivalent)
PZ	A	A48 Gr.35 (EN-GJL-250)	---	---	hardened c. steel (SAE5115 or equivalent)
	B	A536 60-40-15 (EN-GJS-400-15)	---	---	hardened c. steel (SAE5115 or equivalent)
PO	A	A48 Gr.35 (EN-GJL-250)	---	---	hardened c. steel (SAE5115 or equivalent)
	B	A350 LF2 (EN S355J2)	---	---	hardened c. steel (SAE5115 or equivalent)

Example with PCX: **A1** welded steel casing, GG25 casing insert, hardened CS screws  
**C2** AISI316L casing, hardened CS casing insert, hardened CS screws



MATERIALS CHART TWIN SCREW PUMPS

		Pump casing and flanges	Casing insert		Drive and Idler screws	
		1	1	2	1	2
2SP	A	A48 Gr.35 (EN-GJL-250)	---	---	hardened c. steel (SAE5115 or equivalent)	ASTM A276 AISI410 or equivalent
	B	A536 60-40-15 (EN-GJS-400-15)	---	---	hardened c. steel (SAE5115 or equivalent)	ASTM A276 AISI410 or equivalent
	C	A217 CA15	---	---	hardened c. steel (SAE5115 or equivalent)	ASTM A276 AISI410 or equivalent
PCX-2SP	A	welded steel (A105 or equivalent)	A48 Gr.35 (EN-GJL-250)	A105 (EN 1.0460)	hardened c. steel (SAE5115 or equivalent)	ASTM A276 AISI410 or equivalent
	B	low temp welded steel (A333 Gr.6 or equivalent)	A48 Gr.35 (EN-GJL-250)	A105 (EN 1.0460)	hardened c. steel (SAE5115 or equivalent)	ASTM A276 AISI410 or equivalent
	C	AISI316L (EN 1.4404)	A48 Gr.35 (EN-GJL-250)	AISI316L (EN 1.4404)	hardened c. steel (SAE5115 or equivalent)	ASTM A276 AISI410 or equivalent
PCX-WTG	A	welded steel (A105 or equivalent)	A48 Gr.35 (EN-GJL-250)	A105 (EN 1.0460)	hardened c. steel (SAE5115 or equivalent)	ASTM A276 AISI410 or equivalent
	B	low temp welded steel (A333 Gr.6 or equivalent)	A48 Gr.35 (EN-GJL-250)	A105 (EN 1.0460)	hardened c. steel (SAE5115 or equivalent)	ASTM A276 AISI410 or equivalent
	B	AISI316L (EN 1.4404)	A48 Gr.35 (EN-GJL-250)	AISI316L (EN 1.4404)	hardened c. steel (SAE5115 or equivalent)	ASTM A276 AISI410 or equivalent

Example with 2SP: **A111** casted cast iron casing, NO casing insert, hardened CS screws  
**C122** stainless steel casted casing, NO casing insert, stainless steel screws

# CONSTRUCTION

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Seim pumps are suitable for different applications and services; a wide range of solutions is available and some of the models can be highly customized in order to meet process requirements and customer needs.

Most critical components are:

- **PUMP BODY**
- **PUMP CASE (IF ANY)**
- **SCREW SET**
- **MECHANICAL SEAL/S**
- **TIMING GEARS (IF ANY)**
- **BEARINGS**



Every single component can be modified during pre-design phase, with selecting the proper materials (ex. Stainless steel construction), the preferred component manufacturer and design (ex. mechanical seal, bearings), the geometry (ex. pump case thickness and/or screw set profile angles depending on operating pressure).

In addition to bare-shaft pump design, selection and manufacturing Seim is able to support all customers with a complete assistance, providing ready solutions as well as commissioning and after-sales services.

Some of the most common solutions are:

## **HORIZONTAL PUMP WITH DRIVER ON COMMON BASEPLATE:**

This is the most frequent type of installation and includes a bare-shaft pump, driver (electric motor, steam turbine, diesel engine), direct coupling, coupling guard and common baseplate. Most of the time the driver is an electric motor, and can be provided with soft start or inverter, as well as complete control panel and side instrumentation.

This solution may be a stand alone equipment including a side instrumentation kit (ex. Crude Oil or Fuel Transfer service) or part of a larger package (ex. Gas Compressor auxiliary oil pump).

## **VERTICAL MOTOR-PUMP:**

Very similar to the horizontal version, this solution is frequently used whenever space available is limited. This is very frequent on terminals, as well as FPSO or Offshore platforms.

In this case the pump comes with installation feet suitable for vertical pump position, bell housing, coupling and electric motor on the top.

## **VERTICAL SUBMERGED OR SEMI-SUBMERGED:**

This solution is typical in lubrication services, depending on oil tank depth; the pump is installed in vertical position, completely or partially inside the lube oil tank.

The pump can be provided with an installation plate, separate or integral with pump case (depending if pump is completely submerged or not); the installation plate must match with a dedicated flange on tank cover, so that it becomes part of it. Vertical pumps may come with suction strainer, suction line check valve, relief valve and they always need a bell housing, coupling and electric motor on top.

# ADD-ONS

## RETROFITTING / REFURBISHING

During revamping projects or special maintenance services the necessity to replace old pumps is very frequent. Normally original specification is not available or it is obsolete, and sometimes original pump manufacturer is not in the market anymore.

Seim is able to support EPC contractors and end users with dedicated support on pump selection, on site inspection and technical evaluation, competitive quotations.

**We help you to finalize your contract**

**We make your project possible**

## MECHANICAL SEALS FLUSHING SYSTEMS

Very high operating temperature, dangerous or aggressive process fluids, presence of solid particles are some of the reasons for requiring a mechanical seal flushing system.

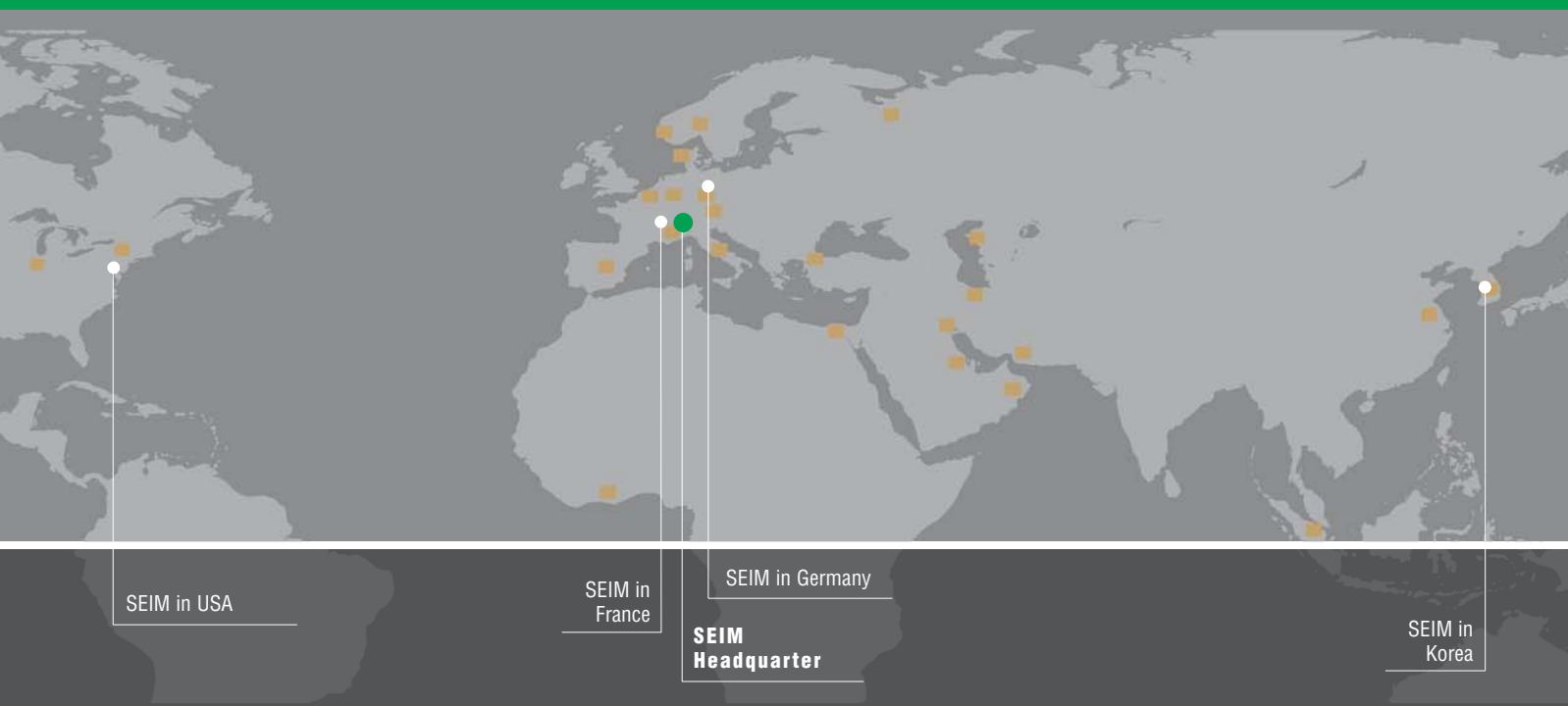
Seim is able to provide the correct API plan:

- with project based dedicated design.
- compliant to API682 whenever required.
- typically supplied by the same manufacturer of mechanical seals, with full compatibility and performance warranty.



## OTHER PRODUCTS





■ SEIM Agent, Distributor, Service Point



**SEIM Germany: Sales, After Sales, Warehouse**



**SEIM France: Sales, After Sales, Warehouse, local Test Bench**



**SEIM Korea: Sales, After Sales, Warehouse, local Test Bench**



**SEIM USA: Sales, After Sales, Warehouse, local Test Bench**



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