Pumps.

KRAL

# Screw Pumps for Power Generation.

Efficient and reliable over many years.

# Welcome to KRAL.

**About us.**
With headquarters in Austria, KRAL GmbH was founded in 1950 and has been an independent family enterprise ever since. We therefore think and invest long-term so that we can remain a stable and reliable business partner for our customers.

KRAL develops and produces screw pumps and flow measurement technology. In addition, we offer customer-specific solutions for systems, from the initial engineering process through to commissioning. And of course our After Sales Service is available to help you after purchase. Our primary business sectors include marine, power generation, oil and gas, mechanical engineering, and chemicals. Our customers include local businesses as well as global industrial concerns.

**What you can expect from us.**
Since the company was founded, KRAL has established itself as a manufacturer of quality products with a fair price/performance ratio. In order to live up to our standard, we continuously invest in our employees, our manufacturing processes, and our methodological expertise. A commitment to Total Quality Management (TQM) is a key component of our company philosophy. Furthermore, we are increasing the levels of automation and digitization in our company. Our customers claim that we can meet special needs. What's more, KRAL is greatly appreciated for its reliable partnerships and the fact that working together with us is professional and very straightforward. This makes us quite proud. We will continue to strengthen these values in the future. That's why we continuously invest in innovations, both for products as well as methodology and processes.

A key component in our approach to customer-orientation is that you can rely on excellent care from our Customer Center as well as our After Sales Service. This includes both expertise and reaction speed.

We have summarized what you can expect as a KRAL customer in our company vision:

**"KRAL is quality, innovation and quick response, anytime and anywhere around the world."**

Check out our services and see for yourself.
We will be happy to help you.

Otmar Kräutler

**DI Otmar Kräutler**
**CEO**

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6 Pumped-storage power plants.

**K** 1 | 2 | 3 | 4 | 5 | 6 | 7

- 5 to 2,900 l/min.
- - 20 °C to +180 °C.
- 16 bar.

**L** 1 | 2 | 7

- 5 to 200 l/min.
- - 20 °C to +180 °C.
- 63 bar.

**C** 1 | 2 | 3 | 4 | 5 | 6 | 7

- 5 to 3,550 l/min.
- - 20 °C to +180 °C.
- 100 bar.

**W** 1 | 2 | 4 | 5 | 6

- 15 to 290 l/min.
- - 20 °C to +180 °C.
- 120 bar.

KRAL

## Wind Energy.

**7** Wind power plants.

## Other Forms of Energy.

Combustion of biomass and waste.

Biomass gasification.

Heat recovery.

Transformer stations.

Tidal power plants.

Special projects.

**Z** **1 | 2 | 3**

- 330 to 17,660 l/min.
- - 40 °C to +300 °C.
- 25 bar.

**K** **L** **Single station.**

- 5 to 280 l/min.
- - 20 °C to +180 °C.
- 40 bar.

**K** **L** **C** **W** **With magnetic coupling.**

- 5 to 3,500 l/min.
- - 20 °C to +300 °C.
- 120 bar.

**K** **L** **Double station.**

- 5 to 280 l/min.
- - 20 °C to +180 °C.
- 40 bar.

**4** **6**

**2** **5**

# Thermal Energy.

## Steam power plants.

When generating energy in fossil-fired thermal power plants, the potential efficiency of the plant is often not optimally exploited. This is where KRAL screw pumps come in. Compared to other pump solutions, KRAL screw pumps for steam power plants offer the advantage of optimum efficiency for a wide range of viscosities, even with fluctuating pressures. Compared to competing products, they can even pump low-viscosity liquids up to 1.1 mm²/s (cSt). We will be happy to advise you on the details.

**For steam power plants in particular, we recommend the following solutions, which of course can be adapted to suit your system requirements.**

- **Stripping and transfer pumps.**

For unloading fuel oil of various viscosities from tank trucks, railway wagons, and ships as well as for subsequent transfer and loading tasks, we recommend the KRAL Z series two screw pumps. Their advantages include high dry-running capability, excellent suction performance, low-pulsation delivery, and maximum connection flexibility thanks to unlimited variable connection arrangements. In contrast to other solutions, the delivery direction can also be easily changed for a short time.

- **Transfer and feed pumps, sealing oil pumps, main, auxiliary, and emergency pumps.**

It is not for nothing that the extremely compact KRAL K series screw pumps are the company's best-selling solution. They are cost-effective, offer many innovative details, and are highly flexible in application. In steam power plants, the KRAL K series screw pumps are suitable for pumping heating oil through various bearings and filters.

- **Injection pumps, hydraulic pumps, jacking pump.**

The KRAL C series screw pumps are easy to install, inexpensive, and designed for large delivery rates and high pressures. They can withstand high differential pressures, for example when injecting heating oil into the burners. The pump solutions from the C series are very versatile. As a hydraulic pump for medium pressures, the L series is also a robust, low-wear, and cost-effective solution. For particularly high differential pressures, we recommend the W series.


**K series.**

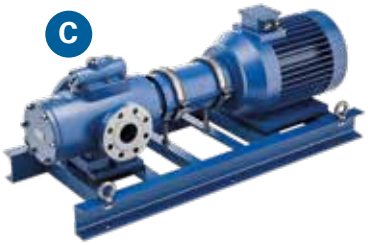
- 5 to 2,900 l/min.
- - 20 °C to +180 °C.
- 16 bar.

Injection pump, feed pump, lubricating oil pump, sealing oil pump, pump for reduction gear, control oil pump.


**L series.**

- 5 to 200 l/min.
- - 20 °C to +180 °C.
- 63 bar.

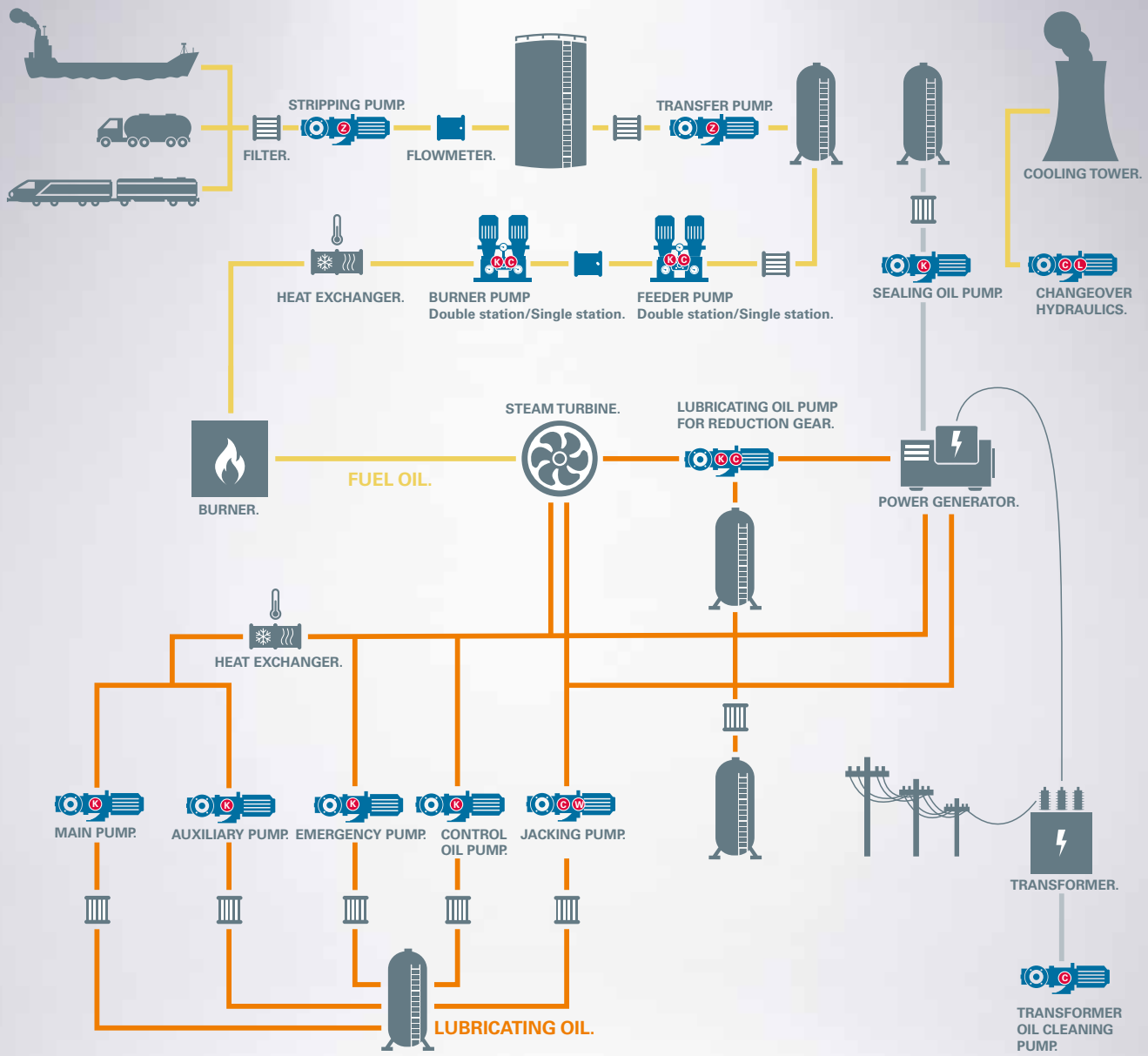
Hydraulic pump.




**C series.**

- 5 to 3,550 l/min.
- - 20 °C to +180 °C.
- 100 bar.

Injection pump, feed pump, burner pump, jacking pump, transformer oil cleaning pump, hydraulic pump, pump for reduction gear.




**W series.**

- 15 to 290 l/min.
- - 20 °C to +180 °C.
- 120 bar.

Jacking pump.

**Z series.**

- 330 to 17,660 l/min.
- - 40 °C to +300 °C.
- 25 bar.

Stripping pump, transfer pump.

**Optional designs.**

- ☑ Single station.
- ☑ Double station.
- ☑ With magnetic coupling.

# Thermal Energy.

## Gas turbine power plants.

Gas turbines will play an important role in the electricity supply of the future, which is increasingly based on renewable energies. Gas turbines can produce full power within a short time, meaning they contribute to covering peak loads and strong fluctuations (for example, in calm and weak solar radiation). For this to function smoothly, operators must be able to rely on reliable, efficient pump solutions. KRAL screw pumps provide you with a durable and robust solution at the highest technical level, which is also supported by an exceptionally fast service in comparison to the rest of the industry.

**Some examples of KRAL pump solutions in gas turbine power plants.**

- **Jacking, control oil, injection, main, auxiliary, and emergency pumps.**

Gas turbines require constant and correct lubrication in all areas to ensure smooth operation of the various circulations. Depending on the system design, the KRAL K, L, C, or W series three screw pumps are used for this purpose. These can be supplied in submerged in-tank or outside tank dry mount as required.

- **Lubricating oil pumps for reduction gears.**

For the lubrication of reduction gears, which are required to adjust the speed between gas turbines and generators, we especially recommend the KRAL K (for low pressures), L (for medium pressures), or C (for high pressures) series three screw pumps.

- **Sealing oil pumps.**

Sealing oil for the rotating shafts of hydrogen-cooled generators is best and most reliably supplied by KRAL three screw pumps. Depending on the system requirements, we recommend the K, L, or C series. All solutions are characterized by safe start-up, minimized wear and tear, and extremely easy maintenance.

Our employees are always at your disposal for these and all other applications.


**K series.**

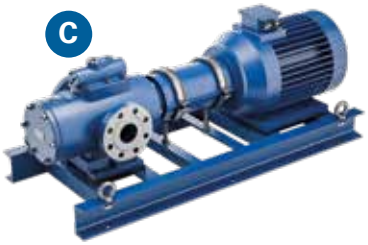
- 5 to 2,900 l/min.
- - 20 °C to +180 °C.
- 16 bar.

Sealing oil pump, feed pump, injection pump, pump for reduction gears, control oil pump, lubricating oil pump.


**L series.**

- 5 to 200 l/min.
- - 20 °C to +180 °C.
- 63 bar.

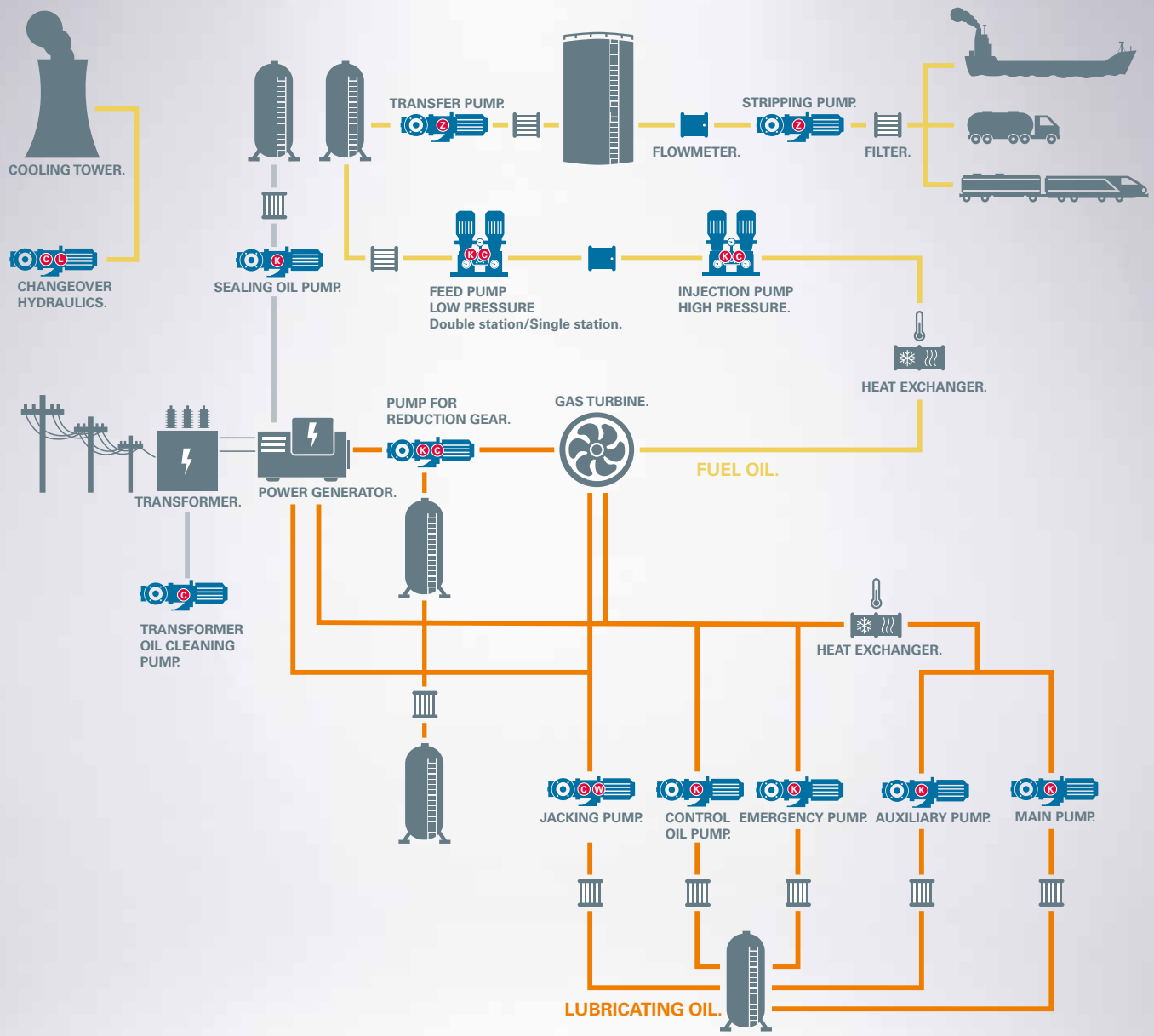
Hydraulic pump.




**C series.**

- 5 to 3,550 l/min.
- - 20 °C to +180 °C.
- 100 bar.

High-pressure injection pump, feed pump low pressure, pump for reduction gears, jacking pump, transformer oil cleaning pump.




W

Z

**W series.**

- 15 to 290 l/min.
- - 20 °C to +180 °C.
- 120 bar.

Jacking pump.

**Z series.**

- 330 to 17,660 l/min.
- - 40 °C to +300 °C.
- 25 bar.

Stripping pump, transfer pump.

**Optional designs.**

- ☑ Single station.
- ☑ Double station.
- ☑ With magnetic coupling.

# Thermal Energy.

## Engine power plants – fuel supply systems.

Operators of engine power plants for heat and power generation require reliable pump systems to constantly and correctly supply fuel to the systems. KRAL screw pumps from the Z and K series are a demonstrably efficient solution that is optimal in terms of price and technology and has proven itself over many years. In combination with our fast reaction and delivery times worldwide, you are in safe hands with KRAL.

**Common applications for KRAL screw pumps in fuel supply systems.**

**Loading and unloading pumps for fuel oil.**
KRAL screw pumps from all series are suitable for unloading heating oil and diesel from tankers, railway wagons, and ships. However, we particularly recommend the KRAL two screw pumps from the Z series. Their advantages include: High dry-running capability, excellent suction performance, low-pulsation delivery, and maximum connection flexibility thanks to unlimited variable connection arrangements. In contrast to other solutions, the delivery direction can also be easily changed for a short time.

**Transfer and supply pumps.**
For transfer tasks and as pumps for supplying separators, boilers, and booster modules with heating oil and diesel, we recommend the three screw pumps from KRAL's K series. The K series is cost-effective, highly compact, and ideally suited for operation at a pressure of up to 16 bar. It also offers many detail possibilities and can be delivered within a short time to suit any system.

**Feed and booster pumps for heating oil modules.**
KRAL K series three screw pumps are also the preferred choice for use as feed and booster pumps for heating oil supply modules. Our pumps from the K series are designed for a temperature range up to +180 °C. For liquids with temperatures up to +300 °C, the version with magnetic coupling is used. KRAL magnetic couplings are hermetically sealed and require no maintenance. The pumps can also be supplied as single or double stations.

KRAL screw pumps are an efficient solution for many applications. We would be happy to discuss with you how our pumps can best meet your needs.

K

**K series.**
- 5 to 2,900 l/min.
- - 20 °C to +180 °C.
- 16 bar.

Separator supply pump, transfer pump, boiler supply pump, booster pump, supply pump.

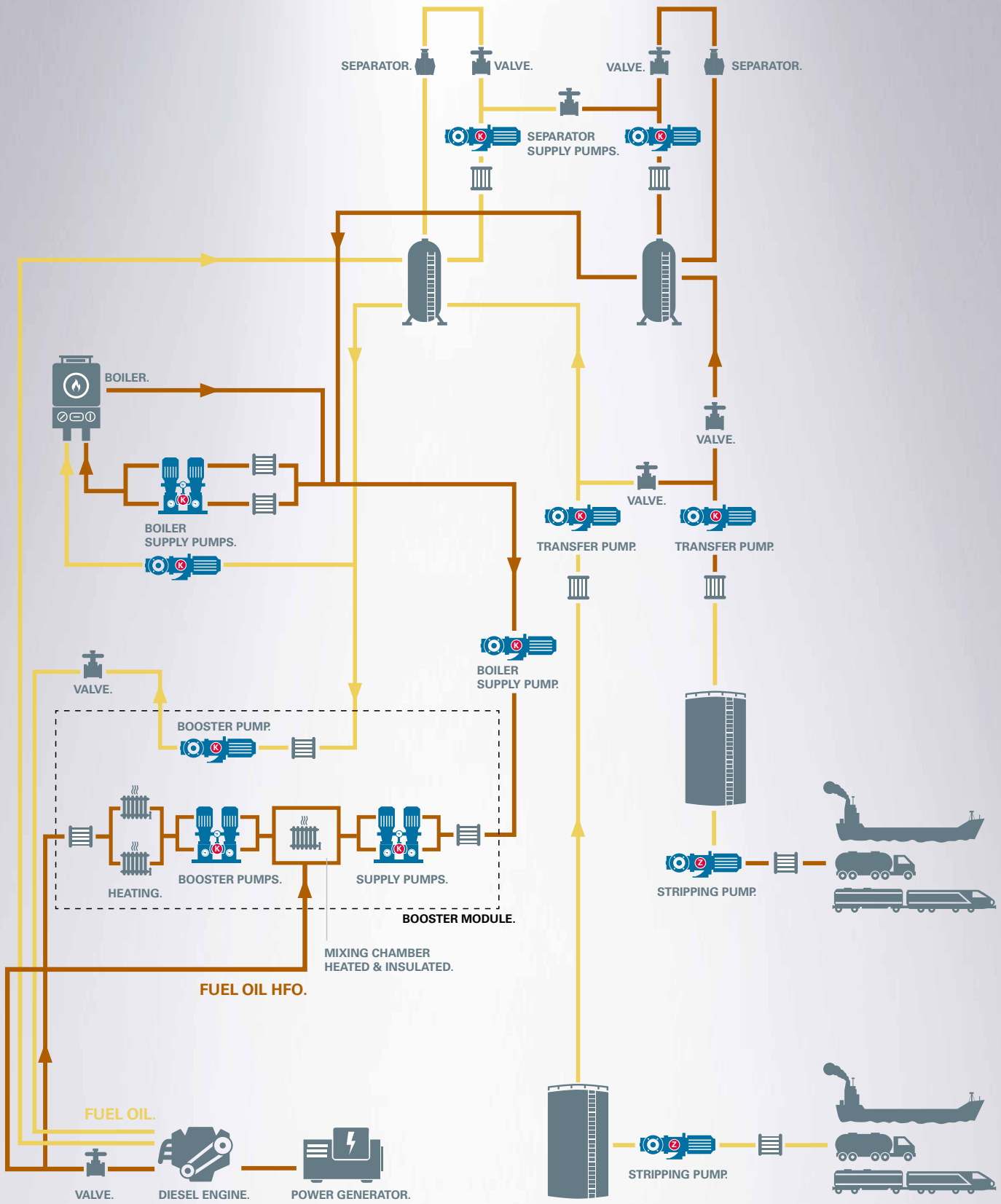
Z

**Z series.**
- 330 to 17,660 l/min.
- - 40 °C to +300 °C.
- 25 bar.

Stripping pump.

**Optional designs.**

- ☑ Single station.
- ☑ Double station.
- ☑ With magnetic coupling.


SEPARATOR.
VALVE.
VALVE.
SEPARATOR.
SEPARATOR SUPPLY PUMPS.
BOILER.
BOILER SUPPLY PUMPS.
VALVE.
VALVE.
TRANSFER PUMP.
TRANSFER PUMP.
BOILER SUPPLY PUMP.
VALVE.
BOOSTER PUMP.
HEATING.
BOOSTER PUMPS.
SUPPLY PUMPS.
BOOSTER MODULE.
MIXING CHAMBER HEATED & INSULATED.
FUEL OIL HFO.
STRIPPING PUMP.
FUEL OIL.
VALVE.
DIESEL ENGINE.
POWER GENERATOR.
STRIPPING PUMP.

# Thermal Energy.

## Engine power plants – lubricating oil supply systems.

Oil circulation lubrication systems in engine power plants must not only ensure constant and reliable lubrication, but also stabilize the temperature at the lubrication points at the correct level, remove wear particles from the friction points and filter them out, prevent corrosion damage, and remove condensation water. These are diverse tasks that require an efficient, reliable solution. We recommend the KRAL K series screw pumps for this purpose. They are space-saving, compact, cost-effective, offer many innovative details, and cover a wide area of applications thanks to many adaptation options. We will be happy to advise you on the details.

**Examples of some common applications for KRAL screw pumps in lubricating oil supply systems.**

- **Lubricating oil transfer pumps and separator supply pumps.**

For transfilling and supplying separators with lubricating oil in the motor area, we recommend the KRAL K series three screw pumps. They can be supplied in various versions for horizontal or vertical installation. Their various seal designs make them suitable for all types of lubricating oil.

- **Main and pre-lubrication pumps.**

As lubricating oil pumps (main or pre-lubricating oil pumps), we recommend KRAL screw pumps from the K, C, or Z series according to the respective requirements. Choose between (vertical) in-tank mounted versions for installation inside the tank or dry mount versions for horizontal or vertical installation outside the reservoir.

K

**K series.**

- 5 to 2,900 l/min.
- - 20 °C to +180 °C.
- 16 bar.

Separator supply pump, transfer pump, cylinder oil transfer pump, lubricating oil pump.

C

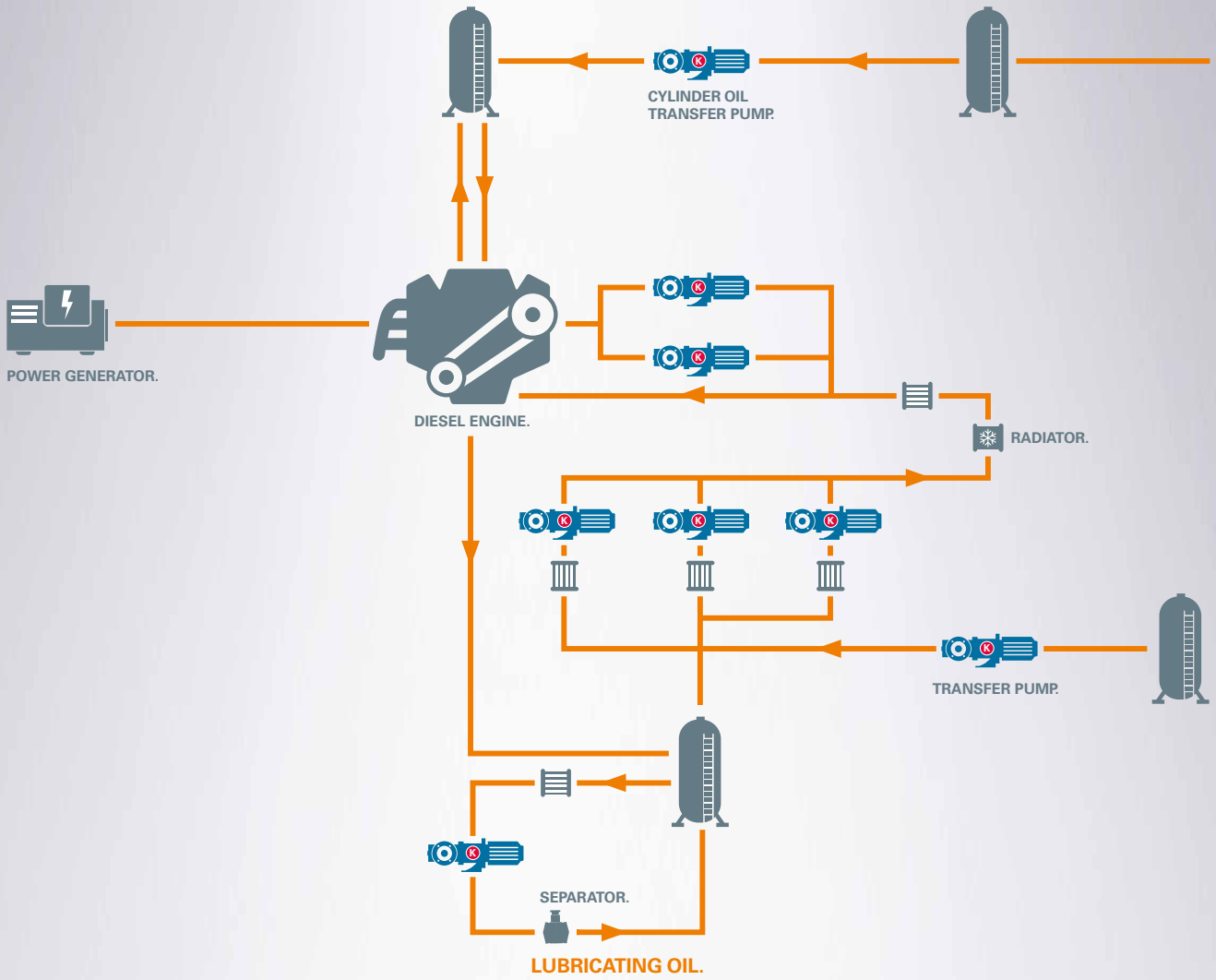
**C series.**

- 5 to 3,550 l/min.
- - 20 °C to +180 °C.
- 100 bar.

Submerged in-tank mounted pump.

**Optional designs.**

☑ With magnetic coupling.


CYLINDER OIL
TRANSFER PUMP.
POWER GENERATOR.
DIESEL ENGINE.
RADIATOR.
TRANSFER PUMP.
SEPARATOR.
LUBRICATING OIL.

# Hydropower.

## Run-of-river power plants, storage power plants, pumped-storage power plants.

Today, hydropower is an important component in the sustainable supply of electricity. Apart from biomass, of all renewable energy sources, only hydropower supplies the base load electricity, which is available around the clock. The power of water can not only be used in large run-of-river, storage, and pumped storage power plants, but is also useful on a small scale.

With KRAL as their partner, power plant operators are in the best of hands: Our screw pumps are designed for reliability and efficiency over many years thanks to high development and production quality, and our professional all-round service is known worldwide as being especially highly-skilled and responsive. We will be happy to find the best solution for your needs together with you - please contact us!

**Some examples of how KRAL screw pumps are used in hydropower plants.**

- **Hydraulic pumps.**

The KRAL three screw pumps from the C series (as high-pressure pumps up to 100 bar) or the W series (for particularly high differential pressures) are particularly suitable as pump systems for supplying the hydraulics that control water turbine guide wheels under a wide variety of flow conditions.

- **Jacking pumps.**

KRAL W series three screw pumps are also a reliable solution for lifting the rotor and generator shafts when starting a turbine. They allow a fast pressure increase up to 120 bar. The pumps can be supplied in submerged in-tank or outside tank dry mount as required.

- **Fuel lubricating oil pumps for bearings of generators/water turbines.**

As main and emergency pumps for lubricating the bearings of turbines and generators, we recommend KRAL screw pumps from the K series. These are cost-effective, very compact, and ideally suited for operation at pressures of up to 16 bar.

K

**K series.**

- 5 to 2,900 l/min.
- - 20 °C to +180 °C.
- 16 bar.

Hydraulic pump.

C

**C series.**

- 5 to 3,550 l/min.
- - 20 °C to +180 °C.
- 100 bar.

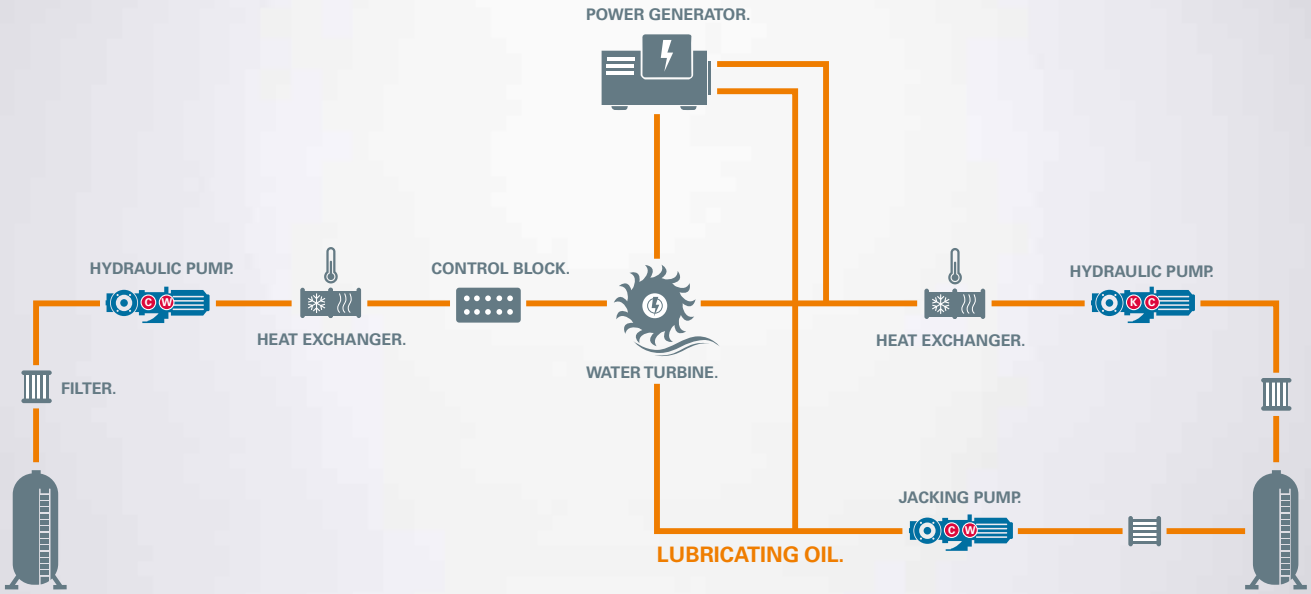
Hydraulic pump, jacking pump.

W

**W series.**

- 15 to 290 l/min.
- - 20 °C to +180 °C.
- 120 bar.

Hydraulic pump, jacking pump.




**Optional designs.**

☑ With magnetic coupling.

# Wind Energy.

## Wind power plants.

As one of the world market leaders for screw pumps, KRAL is the ideal partner for planners, plant constructors, and operators of wind turbines. KRAL screw pumps can be specially designed to meet the requirements of your system, for example for the reliable operation of cooling circuits, pressure boosting systems, cleaning systems, and tank fillings for many years to come. KRAL meets all the requirements that wind power plants place on their products, from planning and production through to installation, commissioning, maintenance, and repair. With KRAL pumps and pump modules, your wind turbine is optimally equipped. We will be happy to advise you on the details.

**You can discover some applications here.**

- **Fuel modules for transformer platforms.**

In the area of offshore wind farm transformer platforms, KRAL designs and manufactures modules for diesel generator fuels and lubricants, as well as for refueling of helicopters. Low weight, minimum installation space, and easy accessibility are important qualities for equipment on offshore platforms. KRAL adapts all modules according to customer specifications in order to guarantee optimum solutions in each case. In addition, complete accessibility from as few sides as possible is ensured.

- **Gear lubrication pumps for wind turbines.**

Operating conditions with different combinations of speed and torque place high demands on gears during wind power generation. Special materials, innovative coating processes, and smooth lubrication ensure optimum operation, even at extremely high pressures and very low speeds. KRAL screw pumps from the K series ensure perfect lubrication for wind turbines.

- **Adjustment pumps for wind turbines.**

To increase generator efficiency in various weather scenarios, depending on the system requirements, we recommend the KRAL L or C series three screw pumps for hydraulic adjustment of wind turbine rotors.

K

**K series.**

- 5 to 2,900 l/min.
- - 20 °C to +180 °C.
- 16 bar.

Lubricating oil pump, fuel pump for helicopter refueling.

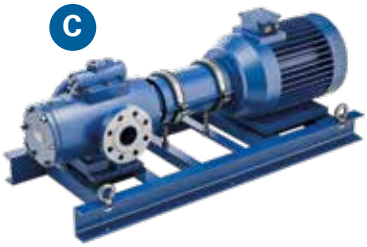
L

**L series.**

- 5 to 200 l/min.
- - 20 °C to +180 °C.
- 63 bar.

Hydraulic pump, jacking pump.

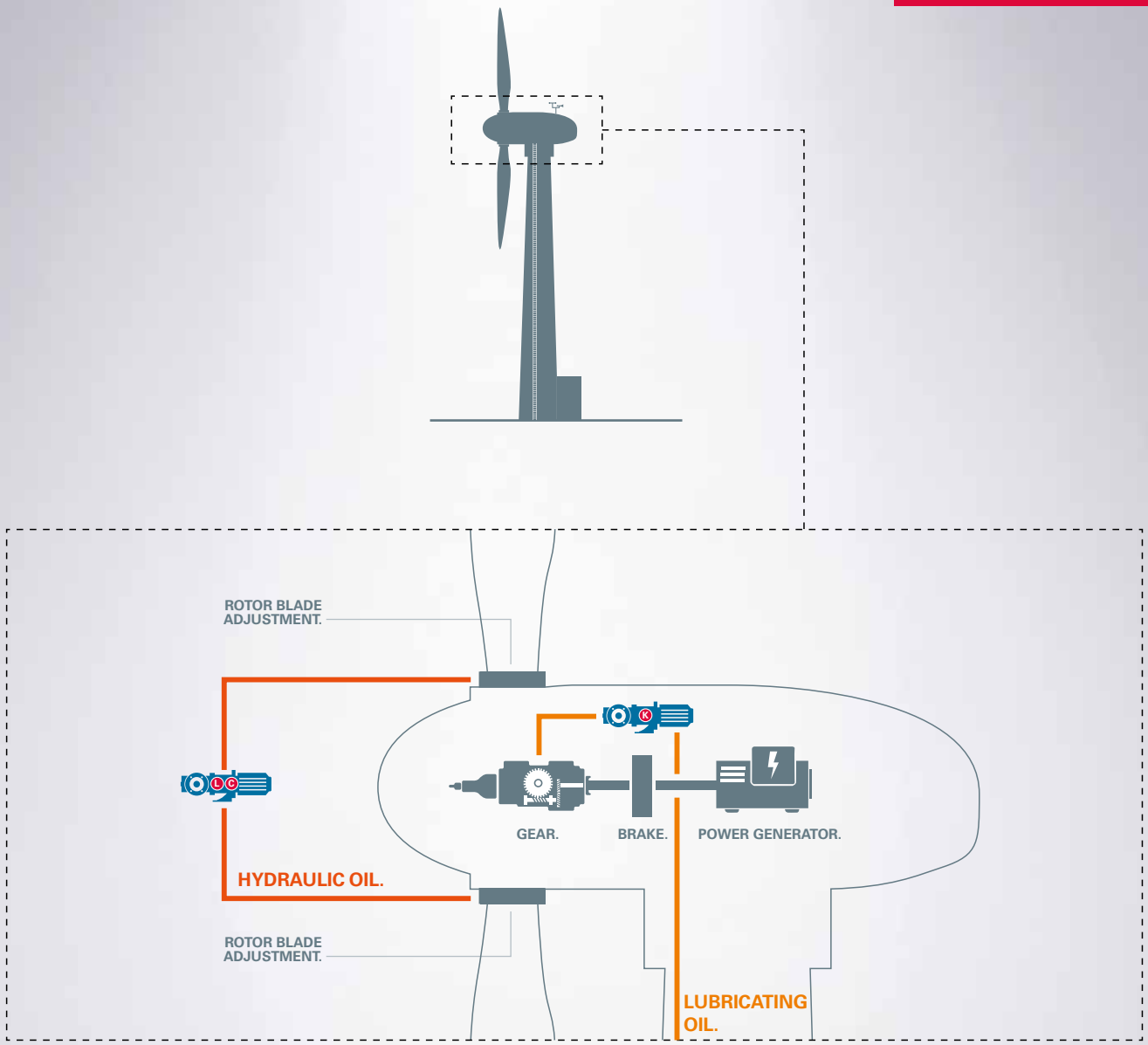
C



**C series.**

- 5 to 3,550 l/min.
- - 20 °C to +180 °C.
- 100 bar.

Hydraulic pump, jacking pump.




**Optional designs.**

☑ With magnetic coupling.

# Other Forms of Energy.

## KRAL screw pumps are an efficient solution for many other applications in power generation.

KRAL screw pumps are valued worldwide for their efficiency and reliability. In addition, they are very versatile and are flexible in use. Take advantage of the efficiency and versatility of screw pumps in applications where you haven't considered using them before. Some examples can be found below. In addition, we will be happy to advise you if your special requirements are not listed here.

**Combustion of biomass and waste.**
Biomass (bark, wood chips, sawdust, waste) is a renewable energy source and therefore of particular interest in terms of energy policy. In the classic steam turbine process, steam generated during the combustion of biomass drives a generator to generate electricity. In addition, the heat generated in a biomass power plant can be used as process or district heating.

**Biomass gasification.**
Thermochemical biomass gasification converts biomass into an almost completely combustible gas. The regular impurities of the resulting product gas must be removed before further use. The purified product gas can then be converted into energy and heat, the high exhaust gas temperatures of the combustion can be used for district heating.

**Heat recovery.**
Heat recovery is used in many areas. In this process, mechanical energy is converted into electricity and usable thermal is used for heating purposes or production processes. Combined heat and power generation enables fuel savings of up to one third of primary energy compared with the separate generation of electricity and heat. This form of energy generation is also becoming increasingly important for smaller plants. KRAL itself uses heat recovery in operation and has thus achieved a reduction in $CO^2$ emissions of over 300 tons per year.

**Transformer stations.**

KRAL screw pumps are a preferred solution for the treatment of transformer oil in, for example, transformer stations. Application examples: With a specially sealed and frequency-controlled pump solution from our C series, the oil is discharged from the treatment plant via the fine filters after degassing and dewatering. High-quality, reliable pumps are indispensable in such systems. KRAL screw pumps meet all requirements: Very compact, highly efficient, reliable start-up, low wear. Operation is reliable and requires as little effort as possible.

**Tidal power plants.**

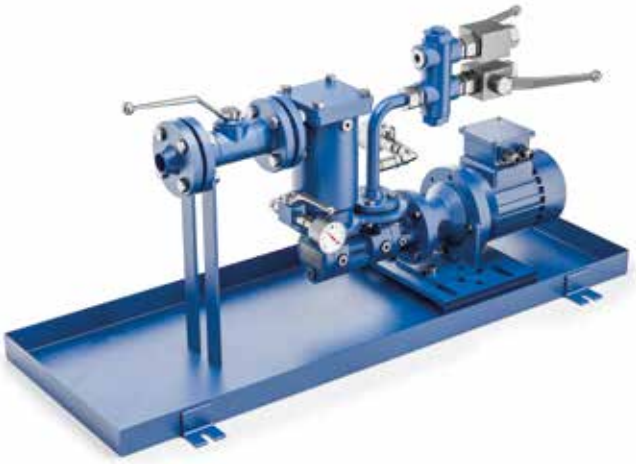
A tidal power plant converts kinetic energy from the tidal range of the ocean into electricity. Previously, tidal power plants were mostly built as dams, but nowadays the trend is increasingly towards in-flow power plants for ecological reasons. Possible exploitation of this form of power generation has future potential and is far from exhausted. Thanks to its experience, KRAL can support technological development and use as an expert, reliable, and responsive partner.

**Special projects – additional services for your safety.**

Thanks to our decades of experience, we can also take over the planning, design, and manufacture of auxiliary aggregates for power generation on your behalf. Benefit from our expertise in the construction of fuel systems and lubricating oil systems for diesel engines, turbines, burners, and much more. To ensure perfect operation, the individual components of such complex systems should not be viewed in isolation. A view and the understanding of the whole system are absolutely necessary for safe function. Our experience provides you with security.

# Optional Designs.

Single stations, double stations, hermetically sealed pumps with magnetic coupling, and special projects.



**Single stations.**

**Oil burner supply stations.**
The oil burner pumps from the K and L series can be individually extended with the following functions.

- Pressure regulation.
- Degassing.
- Quantity measurement.
- Filters.
- Gas/air separators.

**Double stations.**

**Two pumps, more than twice the advantages.**
There are critical applications in which a second screw pump is mandatory for safety reasons.

- Standby pump offers maximum safety.
- Two pumps on one block.
- All functions in the smallest space.
- Alternating operation of two liquids with added liquid switching.

**Pumps with magnetic coupling.**

**Leakage-free and clean.**
KRAL magnetic couplings offer many advantages.

- No maintenance.
- Hermetically sealed.
- Can be used up to +300 °C.
- Extended ball bearing life.

**Special projects.**

**Innovative system solutions.**
As pump specialists, we manufacture the core products of our pump modules ourselves. This knowledge clearly distinguishes KRAL from plant engineers who only make the piping and do not consider the effect of the pumps on the plant or the influences of the plant on the pumps.

- Customer-driven solutions.
- Fast response and delivery times.

# Service From a Single Source.

Short reaction times. Fast and competent.

**Installation and commissioning.**
We can help you install and commission your KRAL products upon request. Professional installation and optimal deployment of the pumps are prerequisites for error-free operation. Our technicians not only know our products; they also know how the system affects the pump and can configure the latter accordingly for optimal performance. As a customer, you benefit from our wealth of experience, because we've commissioned large numbers of KRAL pumps at our customers' premises.

**Training.**
KRAL training provides you with in-depth knowledge on installing, commissioning, and maintaining your KRAL product. You receive expert information from the manufacturer on how to install and commission your KRAL product properly, and you learn about various applications and utilization limits. You also learn to identify and rectify faults based on actual damage profiles. We lead you through a professional maintenance routine and show how you can reduce your product's operating costs. The training can be held either at our headquarters in Lustenau or at your premises, upon request.


**Maintenance and repair.**
Downtime can generate substantial costs. Increase the operational safety and minimize the life-cycle costs of your KRAL product through the preventative maintenance services provided by our competent service team. When a breakdown occurs, our service technicians react quickly and arrive at your premises in no time. When you make a repair shipment, confirmation of receipt is sent to you as soon as the shipment arrives. Each time a repair is made, we send you a comprehensive technical report together with detailed images. We perform maintenance work and repairs at our headquarters in Lustenau or at your premises, upon request. And the genuine KRAL parts we use guarantee the highest standards of quality.

**Spare parts.**
KRAL pumps meet the highest quality standards. To ensure those standards are maintained, you should only use genuine KRAL parts as spare parts. They guarantee that your pumps maintain a high level of quality, continue to operate smoothly, and last a long time.

Pumps.

KRAL

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