KRAL Screw Pumps – K Series.

The universal KRAL pump with innovative design for long service life, even in harsh operating conditions.

Areas of application.

KRAL K Series are screw pumps for lubricating, non-abrasive and chemically inert fluids. They are used primarily in industrial applications, such as:

- ☐ Marine, as feed and circulation pumps for fuels and lubricants.
- ☐ Mechanical engineering, as lubricant and coolant pumps for gears, engines, turbines and hydraulic systems.
- ☐ Oil burner technology, as ring line and transfer pumps.
- ☐ Plastics processing, especially polyurethane applications.
- ☐ Filling pumps in tank installations, for example: fuel tank, PUR tank or ink tank installations.

How the K pump fits into the KRAL product program.

The KRAL K Series screw pump is designed for universal use. It is therefore the best-selling KRAL pump. The K Series has a delivery pressure of 232 psi, the casing is made of nodular cast iron and is approved for use on-board ship. It has a sealed, lifetime-lubricated external bearing. The external bearing is not exposed to the pumped medium and is maintenance-free. The K Series is available with DIN flanges in an inline configuration, and the KFT Series is available with DIN flanges at the top. Various installation methods are possible for flange-mounting, pedestal and base pumps.

Operation, materials and accessories.

Delivery rates K:	1.7 to 913 gpm.
Delivery rates KFT:	1.7 to 69 gpm.
Max. discharge pressure:	232 psi.
Temperature range:	-4 °F to 356 °F, magnetic coupling to 482 °F.
Casing:	EN-GJS-400.
Spindles:	Steel, nitration-hardened.
Accepted by:	ABS, BV, CCS, DNV, GL, LRS, MRS, NK, RINA.
ATEX:	Group II, Category 2 ⟨Ex⟩ II 2 GD b/c.
Heating:	Electric, media and steam heating.

Advantages of screw pumps.

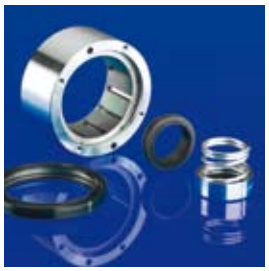
Compared to other types of pumps, KRAL screw pumps offer high capacity without taking up much space. This applies in particular at high differential pressure. The pumps are self-priming, with low pulsation delivery and can be easily regulated. The single pumps, single stations and double stations are extremely compact. All K pumps have an internal safety valve.

Stop coupling damage.

With some liquids, residue can build up, which may cause the pump to fail.

A typical spot for residue to build up is at the mechanical seal. The residue damages the ball bearing, which runs hot, melts the elastomeric ring and damages the coupling.

With the K Series, there is a weep hole next to the mechanical seal, to prevent the fluid from collecting and building up as residue.

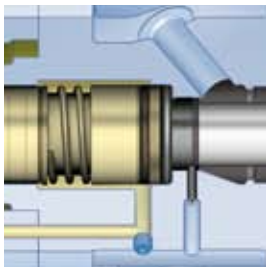


Different types of seal.

As standard the K Series is equipped with a mechanical seal. The optional high-quality SiC mechanical seal can be used at temperatures up to 356 °F. A small leakage flow is required to lubricate the friction faces properly.

If the pump is going to be operated at temperatures up to 482 °F or requires hermetic sealing, then the correct choice is the KRAL magnetic coupling. The fluid cannot escape or react by coming into contact with other materials.

Rotary shaft lip seals can be used for clean pumped media up to 87 psi.



Safety backup for dry running.

The start-up phase of a pump is critical.

If the pump is not properly filled with fluid and vented, it may take some time for the mechanical seal to be immersed in the fluid. If the seal runs dry, it will not take long to reach temperatures in excess of 392 °F. The O-rings and the seal faces will become damaged, resulting in leakage.

KRAL provides high-quality SiC mechanical seals with graphite, which acts as a dry lubricant. The chemically stable O-rings have a high fluorine content and are suitable for use at higher temperatures. These high-quality components offer additional safety.

Low-viscosity media.

Low-viscosity media can damage the pump due to insufficient lubrication. Abrasive media and solid matter can lead to wear and blockages.

When required, KRAL can provide the pump casing with a special surface treatment. This will improve the frictional properties of the spindles in the casing. The increased hardness provided reduces wear.

This will allow fluids with viscosities as low as 2 cSt to be pumped. This also gives a greater safety margin should an unplanned increase in temperature reduce the viscosity.

Low-maintenance operation.

When operated correctly, the KRAL K Series pump is low-maintenance. The lifetime-lubricated external ball bearing is designed for a service life of 30,000 hours. There are two safeguards in place to protect the bearing:

- ☐ There is a weep hole just between the shaft seal and the bearing.
- ☐ The bearing is enclosed.

The ball bearing is not exposed to the fluid and therefore will not be damaged.

The mechanical seal is bathed by the fluid and is thus well lubricated and cooled. It is fitted in such a way that the frictional heat is guaranteed to be dissipated.

Advanced surface treatment.

The option is available to have a special surface treatment applied to the pump casing. This treatment reduces wear and improves the frictional properties when pumping low-viscosity fluids.

Standard mechanical seals.

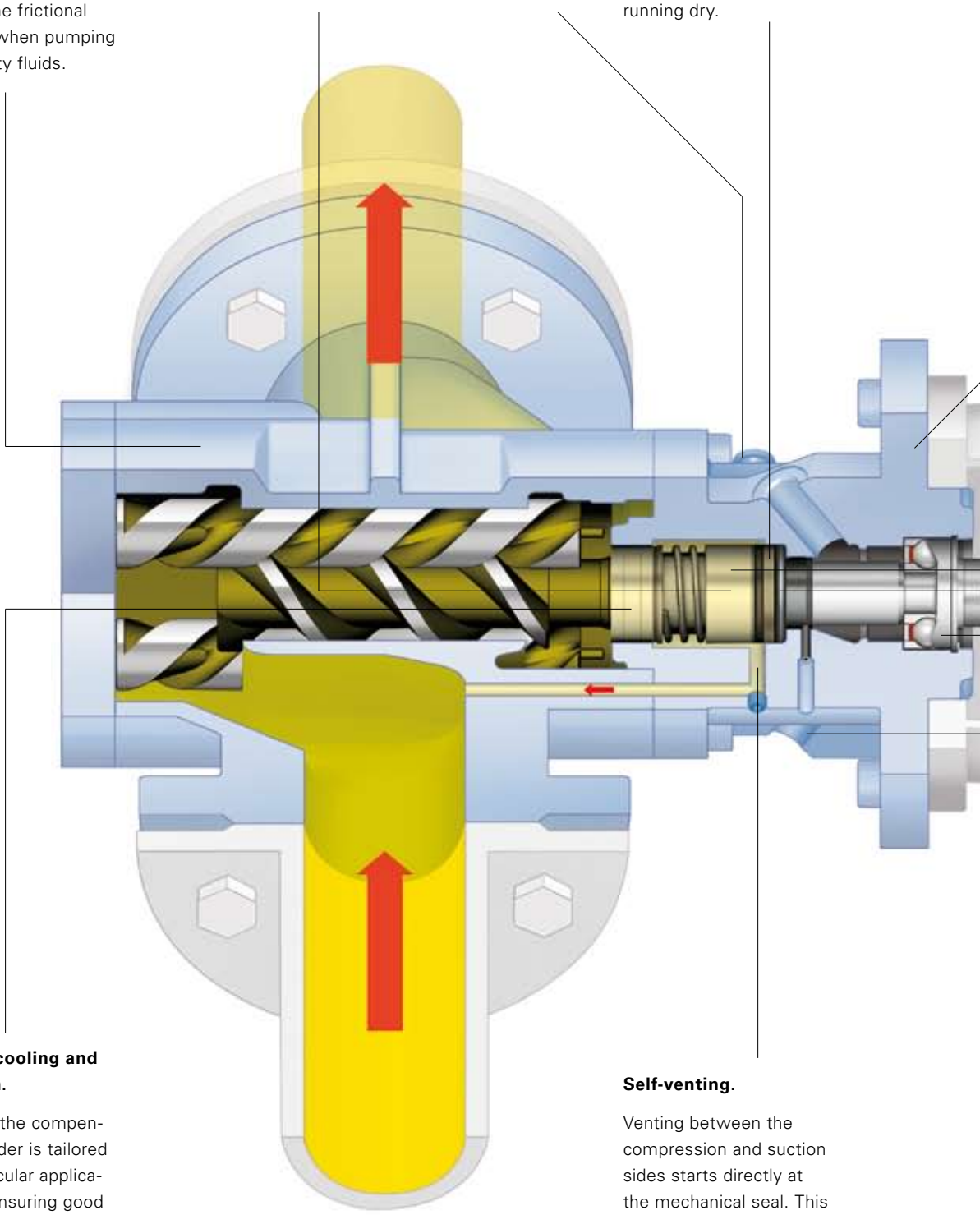
Depending on the operating requirements, there is a choice of mechanical seals in accordance with DIN 24960.

Venting the seal chamber.

The seal chamber has a separate vent hole. This allows the pump to be vented easily and correctly during start-up.

State-of-the-art SiC quality.

The advanced SiC quality of the mechanical seal contains graphite as a dry lubricant. This reduces damaging friction when running dry.



Optimum cooling and lubrication.

The size of the compensating cylinder is tailored to the particular application, thus ensuring good cooling and lubrication of the sealing surfaces of the mechanical seal.

Self-venting.

Venting between the compression and suction sides starts directly at the mechanical seal. This ensures that even if the pump is mounted vertically, the air cushion will be displaced through the fluid into the vent line.

Optimized flange design.

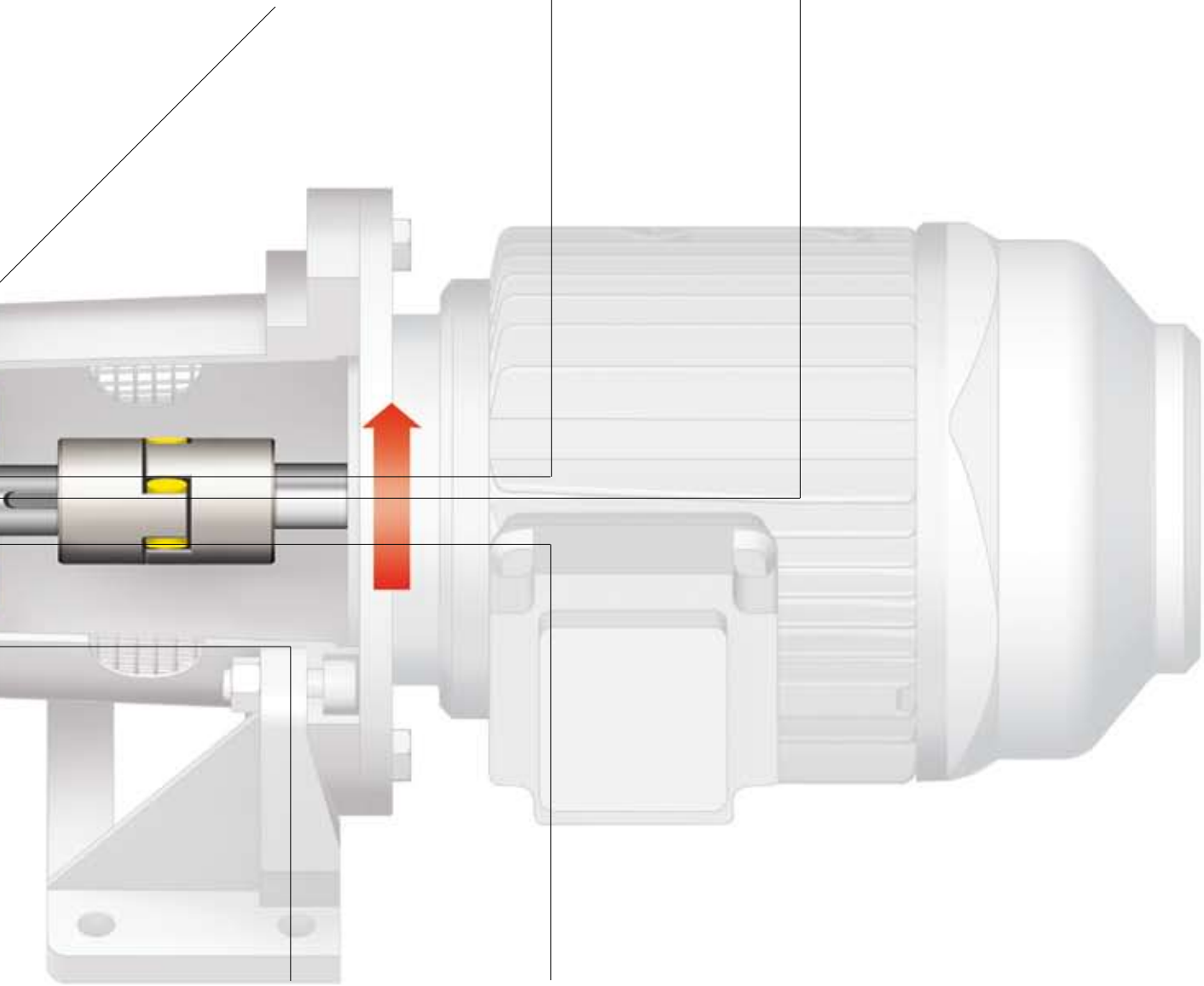
The flange is designed in accordance with ISO 3019. This means that the pump can be connected with normal, standard pump brackets. Thanks to this construction, minimal space is taken up by the magnetic coupling option.

Choice of shaft seals.

The standard fitting is a single mechanical seal in various material configurations. Available as options are a magnetic coupling, a rotary shaft lip seal or a mechanical seal with seal flushing.

Further improved O-rings.

The O-rings of the hard material mechanical seals have a high fluorine content. This material is chemically stable quality and can tolerate high temperatures without lasting deformation.



Residue does not collect.

Any leakage of the mechanical seal is drained through a weep hole immediately after the stationary seal face. Residue which could damage the ball bearing cannot collect unnoticed.

High-quality bearing.

In KRAL K Series pumps, lifetime-lubricated sealed standard bearings are used. This increases the service life and reduces maintenance costs.

Advantages.

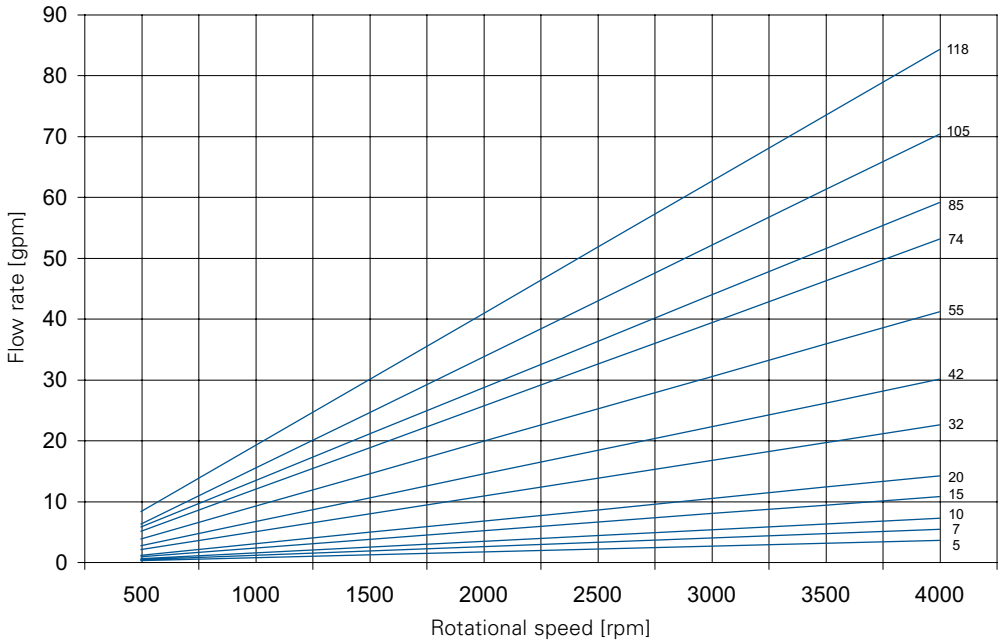
Compared to other types of pump, KRAL screw pumps provide large flow rates in restricted spaces. KRAL pumps are quiet and deliver the fluid with low pulsation.

Short construction.

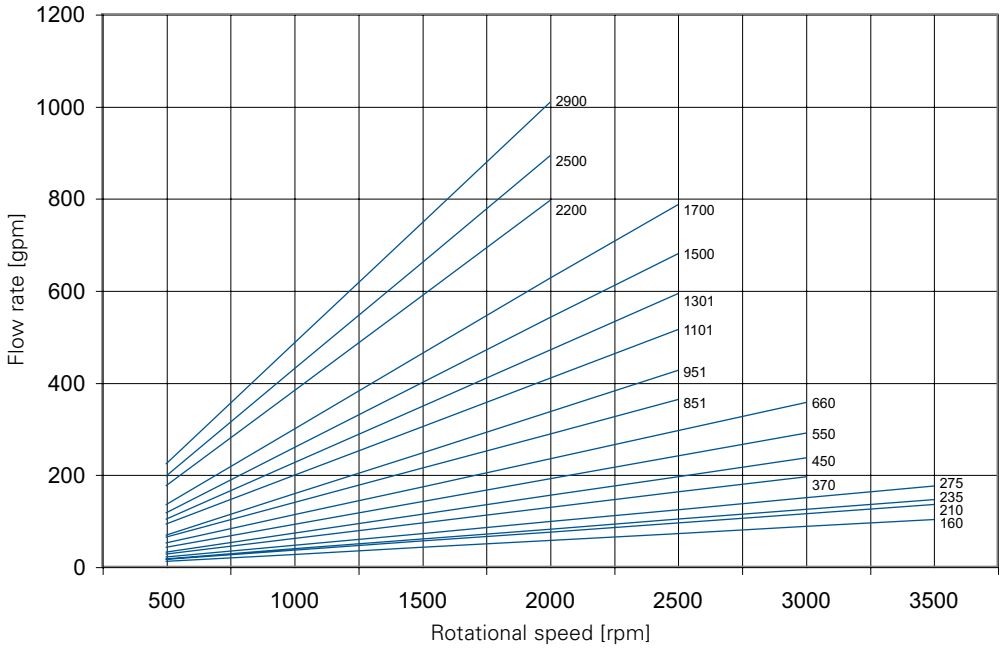
The K Series is known for its short construction. This compact pump is designed for delivery pressures up to 232 psi.

Sizes rising in fine steps, and a linear delivery rate characteristic with fine adjustment.

Size 5 to 118.

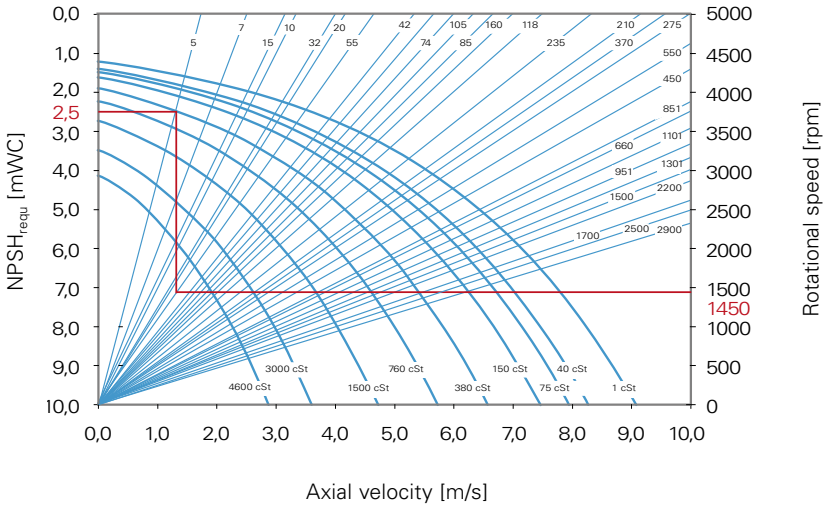


Size 160 to 2900.



KRAL screw pumps are self-priming.

The pump suction head for avoiding cavitation is an important practical consideration. The lower the pressure of the liquid, the earlier the onset of cavitation. The necessary pressure of the liquid rises as the axial speed and rotational speed increase.

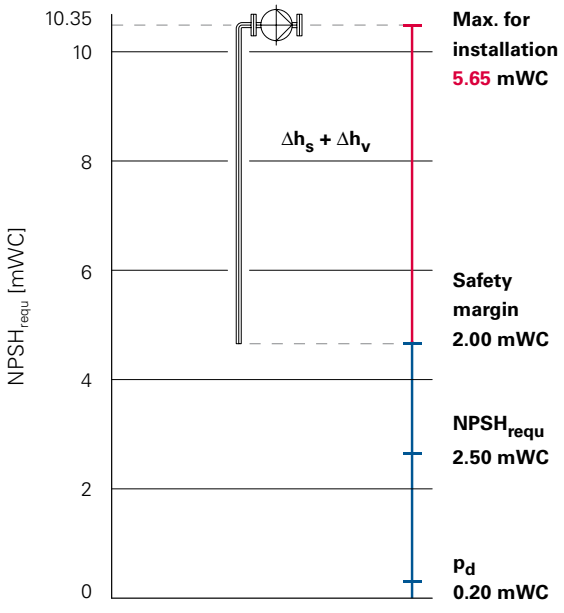


The NPSH-value (Net Positive Suction Head) indicates by how much the total pressure head at the pump inlet has to exceed the vapor pressure head p_d of the liquid to avoid cavitation. The available absolute pressure head is reduced by the suction head Δh_s, the pipe loss Δh_v and a safety margin of 2 mWC.

Example: On a ship, how high above the tank may the HFO 380 heavy oil pump K55 be installed?

Solution: From the nominal speed of 1,450 rpm left, go to size 55. Then up to the 380 cSt curve and then left to the NPSH value, which gives 2.5 mWC.

In the diagram on the right, the vapor pressure head p_d and the safety margin at max. ambient pressure 14,688 mpsi (10.35 mWC) give an installation height of 5.65 mWC.



Overview of models and sizes for the K Series.

Models.

Models.	Pressure [psi]	Inline DIN flanges	DIN flanges at the top (Top-flanges)
K	up to 232	x	
KFT	up to 232		x

Size.

Q_{th} (1,750 rpm)

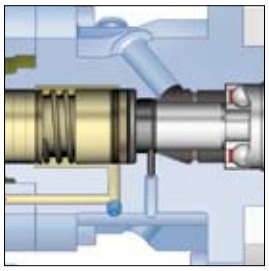
Q_{th} [gpm]	1.7	2.5	3.3	4.9	6.5	10.2	13.6
Size K	5	7	10	15	20	32	42
Size KFT	5	7	10	15	20	32	42

Q_{th} [gpm]	18.6	23.9	26.6	32	37.9	52.8	69.2
Size K	55	74	85	105	118	160	210
Size KFT	55	74	85	105	118	160	210

Q_{th} [gpm]	74.8	89.8	117.1	142.6	173	212.9	259.7
Size K	235	275	370	450	550	660	851

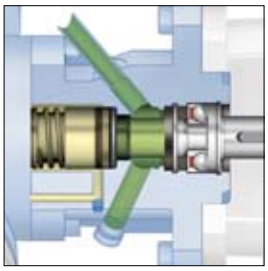
Q_{th} [gpm]	311.7	367.6	427.5	494.2	572.2	720.2	808.1	913.5
Size K	951	1101	1301	1500	1700	2200	2.500	2900

Seal qualities to meet every demand.



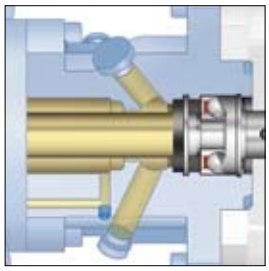
Mechanical seals.

- ☐ Standard: DIN24960, materials as requested, unidirectional, fluids without abrasive content, inlet pressure = 87 psi, T_{max} = 302 °F, viscosity < 500 cSt.
- ☐ Hard material, e.g. SiC, DIN 24960, materials as requested, bi-directional, fluids with abrasive content, inlet pressure = 87 psi, T_{max} = 356 °F, viscosity even above 500 cSt.
- ☐ Balanced: DIN24960, materials as requested, bi-directional, fluids with / without abrasive content, inlet pressure = 232 psi, T_{max} = 302 °F.



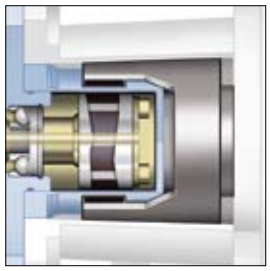
Mechanical seal with flushing (quench).

- ☐ DIN24960, materials and version as requested, fluids with a tendency to harden/ reaction when in contact with surrounding air, inlet pressure = 87 psi, T_{max} = 302 °F.



Rotary shaft lip seals.

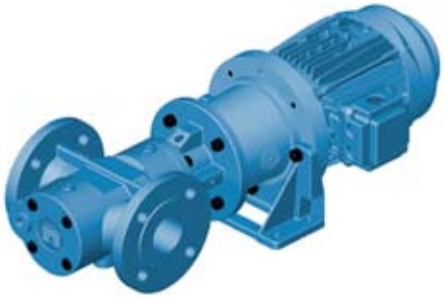
- ☐ Standard: Domsel type AC, NBR, fluids without abrasive content, inlet pressure = 87 psi, T_{max} = 176 °F.
- ☐ High temperature: Domsel type AC, FKM, fluids without abrasive content, inlet pressure = 87 psi, T_{max} = 302 °F.



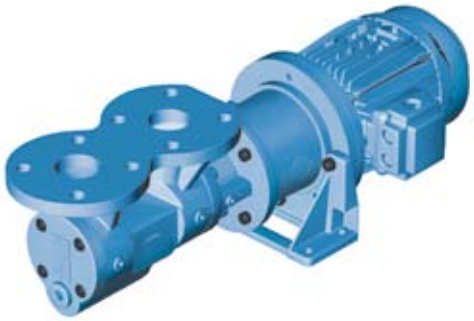
Magnetic coupling.

- ☐ Standard: containment can 1.4301, FKM secondary sealing, inlet pressure = 232 psi, T_{max} = 356 °F.
- ☐ High temperature: containment can 1.4301, secondary sealing on request, inlet pressure = 232 psi, T_{max} = 482 °F.

Numerous installation methods are possible with different KRAL pump models.



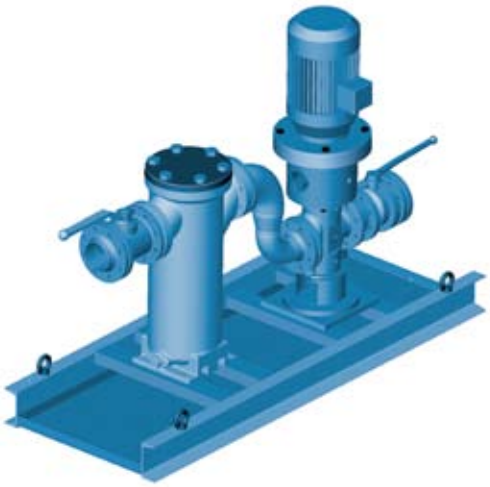
KF flange pump.
The KF flange pump is the universal pump for horizontal installation. Other mounting positions are also possible.



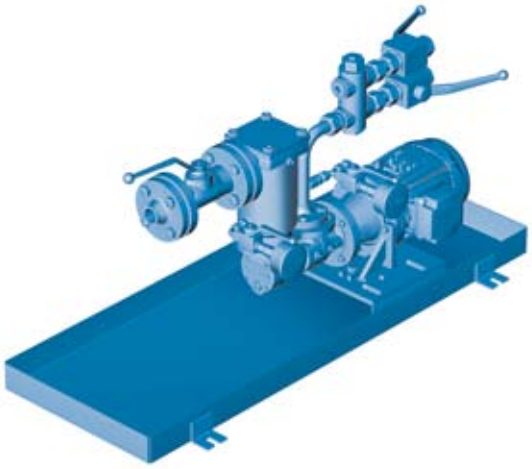
KFT pumps with DIN flanges at the top.
The pump with PN16 DIN flanges at the top for horizontal installation.

KV pedestal pump.
The pedestal pump is the correct choice if there is minimal room at the installation location or if a large, heavy pump is required. Its compact design makes the KV ideally suited for station use.

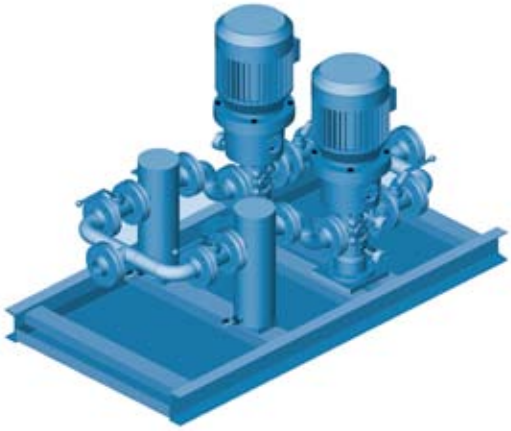
KVT pedestal pumps with DIN flanges at the top.
This space-saving, vertical installation pump is also available with top flanges.



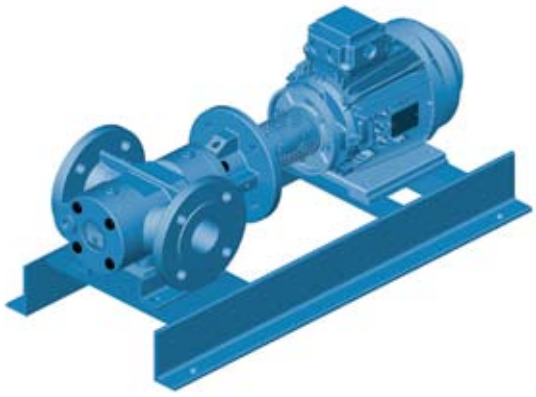
EKL, EKS single station.
KRAL takes on system responsibility with single and double stations. They define the function and the pipework connections. KRAL provides single stations for light and heavy oils.



EKL, EKS single station 11, 12, 13.
Oil burner pump station is available in the standards 11, 12 and 13. Version 11 is the basic module. Model 12 has an additional pressure regulator. Model 13 with an additional pressure regulator and a gas / air separator with integrated commissioning filter.



DKL, DKS double station.
Double stations provide greater safety. The second pump is normally used as a back-up or capacity is split between the two pumps. Then, if one of the pumps is damaged, the system can still operate at half load.

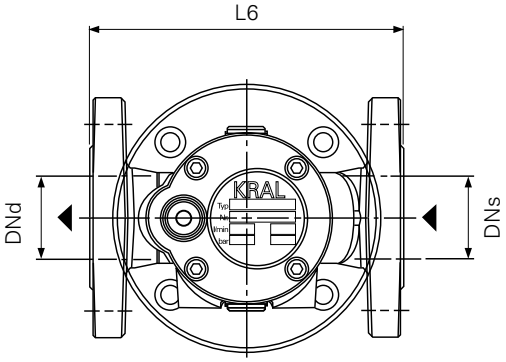


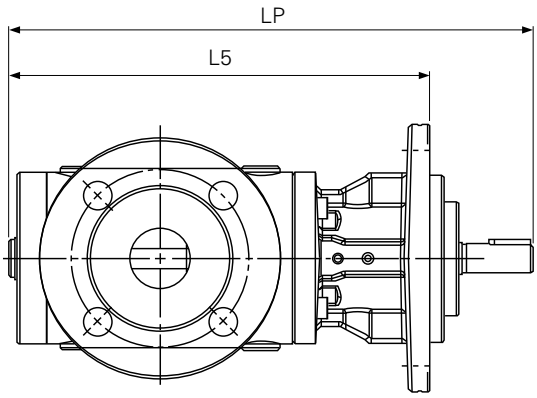
KH base pump.
We also deliver heavy pumps mounted horizontally on a base frame.

Technical Data, Dimensions and Weights

Technical data.		5-42	55-118	160-275	370-450	550-660	851-1301	1500-1700	2200-2900
Q_{th} (1,750 rpm, 0 psi)	gpm	1.5-13	18-38	52-90	117-142	173-213	259-427	494-572	720-913
Max. pressure at pressure flange	psi								
K		232	232	232	232	232	232	232	232
KFT		232	232	232					
Temperature	°F								
with NBR rotary lip seal		176	176	176	176	176	176	176	176
with FKM rotary lip seal		302	302	302	302	302	302	302	302
with standard mechanical seal		302	302	302	302	302	302	302	302
with SIC-SIC mechanical seal		356	356	356	356	356	356	356	356
with magnetic coupling		482	482	482	482	482	482	482	482
Viscosity	cSt								
min.		2	2	2	2	2	2	2	2
max.		10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Max. pressure at suction flange	psi								
with rotary lip seal		87	87	87	87	87	87	87	87
with standard mechanical seal		87	87	87	87	87	87	87	87
with SIC-SIC mechanical seal		87	87	87	87	87	87	87	87
with magnetic coupling		232	232	232	232	232	232	232	232

K-pump with inline flanges.



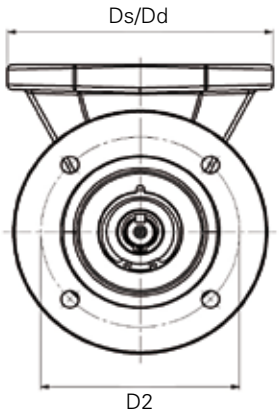


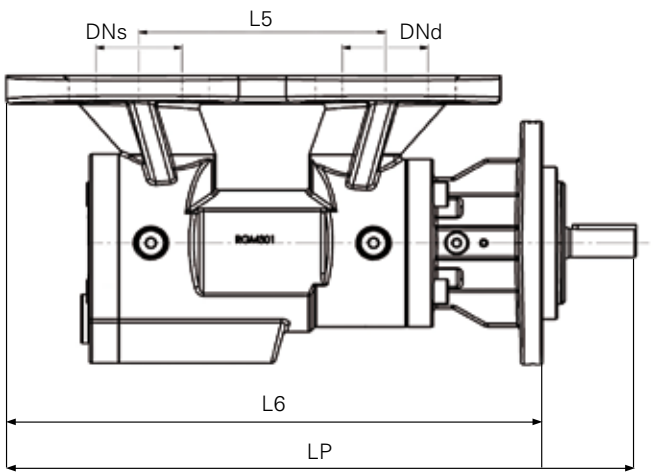
We will be happy to send you brochures about specialized applications on request.

Dimensions and Weights Inline flange in inches.	DNd/ PN 16	DNs/ PN 16	L6	L5	LP	LBS
K 5-20	.98	.98	5.91	7.91	9.88	18
K 32-42	1.26	1.26	6.65	9.61	11.69	24
K 55-118	1.99	1.99	8.66	11.42	13.74	49
K 160-275	3.15	3.15	9.84	14.33	16.46	82
K 370-450	3.94	3.94	10.63	15.59	17.83	110
K 550-660	3.94	4.92	14.17	22.09	24.72	190
K 851-1301	4.92	5.91	17.71	26.81	31.30	340
K 1500-1700	5.91	7.87	20.47	34.13	39.37	684
K 2200-2900	5.91	7.87	23.03	36.46	43.70	948

Dimensions and Weights Top flange in inches.	DNd/ PN 16	DNs/ PN 16	L6	L5	LP	LBS
KFT 5-20	.98	.98	9.02	3.74	10.98	18
KFT 32-42	1.26	1.26	11.02	5	13.15	24
KFT 55-118	1.99	1.99	13.27	6.10	15.59	49
KFT 160-210	2.56	2.56	15.55	7.09	18.03	84

KFT-pump with flanges at the top.





Practical examples.

More safety for the Marine.

Medium:
Heavy fuel oil (HFO).
Delivery rate: 13.2 gpm.
Pressure: Up to 116 psi.
Temperature: Up to 374 °F.
Viscosity: 3 to 760 cSt.

Diesel engines are used on board of offshore ships as the power plant and auxiliary engine. KRAL pumps deliver the fuel in the booster-module, in this example heavy fuel oil.

Our customer, a large European ship owner with global establishments including the USA, has upgraded with the KRAL AG. For this upgrade pumps with mechanical seals have been changed to KRAL pumps with magnetic coupling. The reason for this upgrade was, to avoid the normal leakage of a mechanical seal. The leakage evident from lubricating the sealing faces can be a high fire risk. A magnetic coupling is hermetically sealed and leakage free.

Discharge and transfer pumps for PUR raw materials.

Pump: KF 20 bis KF 550.
Medium: Polyol, isocyanate.
Delivery rate: 74.5 gpm.
Speed: 750 rpm.
Pressure: 145 psi.
Temperature: Ambient.
Viscosity: Polyol to 5,000 cSt, isocyanate to 1,500 cSt.
Seal: Magnetic coupling.

A storage tank depot for polyols and isocyanate is used to supply the raw materials for polyurethane production plants.

Transfer pumps for isocyanate are equipped with magnetic couplings. They prevent the isocyanate from coming into contact with the atmosphere and combining with the water to form abrasive urea crystals. Deposits of these solids can cause mechanical seal leakage.

Lubricating pump series.

Pump: KF 951.
Medium: Lubricating oil ISO VG320.
Delivery rate: 250.9 gpm.
Pressure: 145 psi.
Temperature: 104 °F.
Viscosity: 320 cSt.
Seal: Standard mechanical seal.

A typical customer is a steel works manufacturer. In such an application KRAL pumps deliver the lubricating oil for the rolling contact bearings of the mill trains.

Because of the harsh operating conditions, it is absolutely essential for the pumps to be robust. KRAL KF pumps have a cast-metal casing. The pump is very compact, as it is designed for inline use. This means that the installation does not take up excessive room in the mill train.

Component producer.

Photo: Krauss-Maffei Kunststofftechnik GmbH.

Pump type: KF 118.DCA.
Delivery rate: 5.3 to 29 gpm.
Pressure: Up to 218 psi.
Temperature: up to 356 °F.
Viscosity: 300 to 5,000 cSt.

Mattresses and car seats are made from flexible PUR foams, refrigerator insulation and facade elements from rigid PUR foam. The preparation and precise batching of the liquid components are crucial criteria for component quality and process stability. In special applications, the polyol components can be highly viscous.

KRAL screw pumps work very precisely and reliably. For end-product customers, this means outstanding product quality and high plant availability, even if the materials used are highly viscous.

Engine room booster module and separator pumps on-board ship.

Pump: KF 74.
Medium: HFO, MDO.
Delivery rate: 5.3 to 19.5 gpm.
Pressure: 116 psi.
Temperature: 320 °F.
Viscosity: 2 to 1,000 cSt.
Seal: Magnetic coupling.

In large-scale diesel engines the pressure and the viscosity are set in the booster module. Heavy fuel oils are pre-heated up to 320 °F. This temperature can damage the mechanical seals. When the fuel comes into contact with the atmosphere, residue may form which could destroy the ball bearing. As a result, the pumps could fail and the diesel engine would cut out. The ship would be unable to maneuver.

The magnetic coupling is hermetically sealed and can be operated at up to 482 °F.

Oil pumping stations for motor-driven power plants.

Pump: 2 x K 660 in a double station.
Medium: HFO.
Speed: 1,750 rpm.
Pressure: 72 psi.
Temperature: 122 °F.
Viscosity: 380 cSt.
Seal: SiC mechanical seal.

Power plant constructors and energy suppliers are under constant pressure to deliver the required energy supply. KRAL stations supply the booster modules in fixed or floating diesel-driven power plants with fuel for the motor.

KRAL stations pump heavy oil from the day tanks to the booster modules, where the fuel is conditioned before delivery to the motor's injection pump.

Transfer pumps on support ships.

Pump: KFT 32 - 74.
Medium: Fuel oil, lubricating oil, hydraulic oil.
Delivery rate: 18.5 gpm.
Speed: 3,400 rpm.
Pressure: 29 psi.
Viscosity: 25 to 1,000 cSt.
Seal: Radial shaft lip seal.
Acceptance: DNV.

Support ships transport all the requisite materials to oil rigs and return with the waste. To run the support ship, the fuel and lubricants, as well as the hydraulic oil, are pumped from the storage tank to the day tank. KRAL transfer pumps provide the daily quantities of fuel, lubricating oil and hydraulic oil.

KRAL KFT pumps can be certified by the Acceptance Authorities.

Joint projects.

Our business partners are particularly appreciative of the cooperative collaboration with the KRAL AG. From the best possible support to the successful conclusion of the project, friendly business relations are always the order of the day. We take the time to talk to our customers and collaborate closely with them on technical matters. You can rely on KRAL.

KRAL

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