

# NIKKISO Non-Seal<sup>®</sup> Pump

Centrifugal canned motor pumps.





## NIKKISO Non-Seal® Pumps.

NIKKISO began with the production of centrifugal canned motor pumps in 1956, making it one of the first companies in the world to produce these pumps commercially, and it continues to do so today. Originally developed for the nuclear industry, the centrifugal canned motor pump has been developed further over the years and adapted to a wide range of industrial applications. NIKKISO has taken a pioneering role in these developments since its founding. For example, the E-Monitor is the most advanced system of its kind for the monitoring of bearing condition.

# NIKKISO Non-Seal Pumps.

## The advantages at a glance.

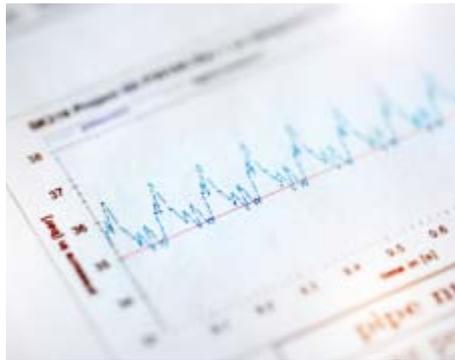
1



### Safe

No gaskets – no leakages. Through a double safety enclosure, consisting of an internal stator lining and an external pressure-resistant stator housing, leakages and thus harmful impacts to the environment are avoided. This minimizes both immediate and long-term risks for personnel.

2



### Quiet and low-vibration

A fully encapsulated system without motor fan or exposed bearings enables low-noise and low-vibration operation.

3



### E-Monitor

Monitoring of bearing condition during pump operation for the highest safety.

4



### Small, compact and low space requirements

The integration of pump and motor make for an especially efficient use of space. With minimal foundation space requirements, set-up costs are reduced. As no coupling is present, an alignment is not necessary.

5



### Low routine maintenance

No shimming or clearance setting is required. Simply by design, only a few parts are needed.

6



### Simple installation and maintenance

Compact design combined with a low number of required components enables simple installation and maintenance. Spacer discs or clearance settings are also no longer necessary.

# Markets.



## Chemical industry

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NIKKISO is one of the leading manufacturers in the sealless pump industry for conveying hot oil. Non-Seal pumps are often used as transfer pumps for chemical fluids or for unloading rail vehicles.



## Refineries

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The applications for refineries include the conveying of catalysts for alkylation (sulfuric or hydrofluoric acid), natural gas condensates, benzene, acidic water, volatile hydrocarbons or Liquefied Natural Gas (LNG).



## Energy utilities

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In the energy sector, NIKKISO centrifugal canned motor pumps are used as seal water pumps, in high-pressure condensate applications or for nitrogen oxide suppression.



# Reference Applications for NIKKISO Non-Seal Pumps.



**Industry:** Chemicals  
**Application:**  
 The production of liquid natural gas as a cooling medium  
**NIKKISO solution:**  
 – Pumps with liquid recirculation  
 – Vertical design, 75 kW motor power



**Industry:** Chemicals  
**Application:**  
 High temperature  
**NIKKISO solution:**  
 – Pump with cooling jacket



**Industry:** Chemicals  
**Application:** Unloading from tanks and rail vehicles in paint factories  
**NIKKISO solution:**  
 – Pump with self-priming




**Industry:** Chemicals  
**Application:**  
 Conveying liquids with a high melting point  
**NIKKISO solution:**  
 – Pump with heating jacket around the pump and motor housing



**Industry:** Chemicals  
**Application:**  
 Water treatment  
**NIKKISO solution:**  
 – Standard version pump with special material (titanium) for housing and impeller



**Industry:** Chemicals  
**Application:**  
 Conveying chemicals  
**NIKKISO solution:**  
 – Pump in standard version



# NIKKISO centrifugal canned motor pump.

## In accordance with API 685.

NIKKISO centrifugal canned motor pumps have been developed for the highest-pressure applications in refineries and the petrochemical sector in accordance with API 685\* and ATEX\*\*.

\* API 685: Sealless Centrifugal Pumps for Petroleum, Heavy Duty Chemical and Gas Industry

\*\* ATEX: ATEX guideline (2014/34/EU)

### E-Monitor

The LED display of the E-Monitor displays the axial and radial rotor position during pump operation. Available as a local or remote display. LED directional display for simplified startup.

### Integrated thermostats

Temperature monitoring for stator winding. Insulation class C enables uncooled operation at fluid temperatures up to 180 °C.

### Temperature monitoring unit

for process medium

### Additional temperature monitoring (optional)

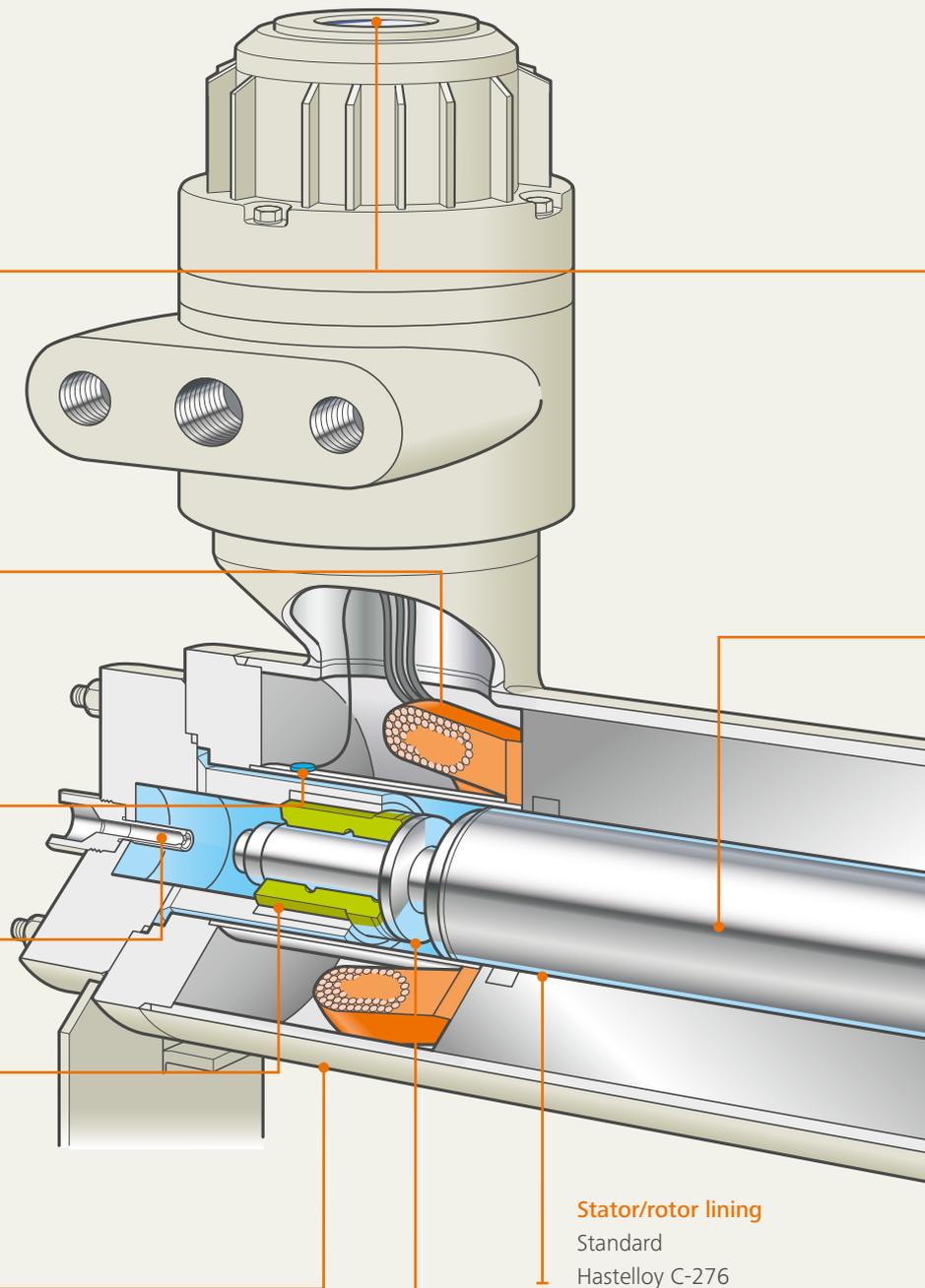
**Bearing** available in various materials for customized adaptation to the respective process fluid. CG93-silicon carbide bearings fulfill the API requirements for bearing service life.

### Second safety shell

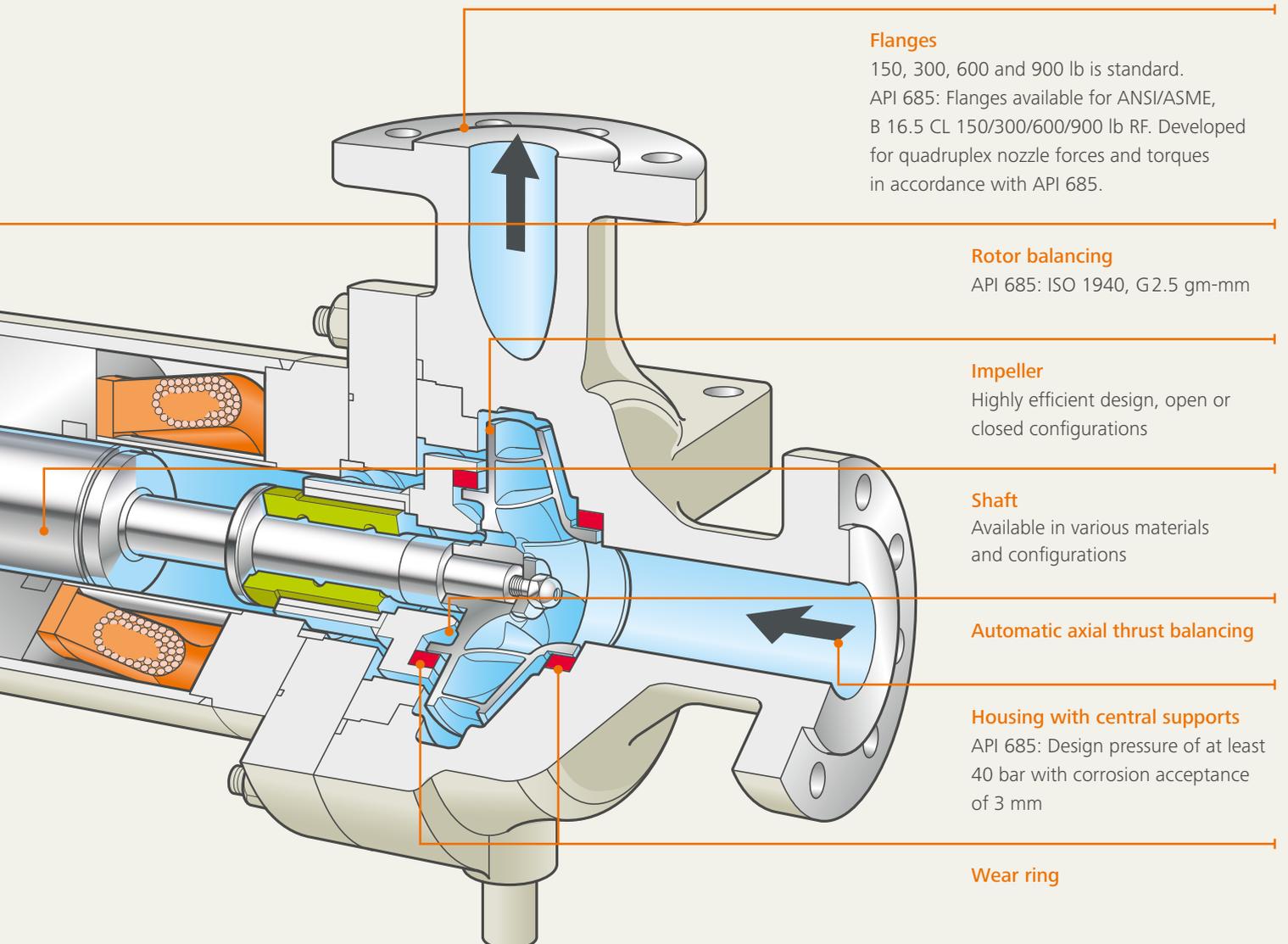
Standard pressure resistance to 40 bar  
Option: Available with pressure monitoring of the stator space

### Shaft protection sleeves and axial thrust washers

Shaft protection sleeves available in a wide variety of different surface treatments for individualized customization for the respective liquid application. Replace in the case of bearing change for the purposes of new wear layer and wear play. The thrust washers dampen a high axial thrust under disruptive conditions and provide support for the hydraulic axial thrust balancing.



**Stator/rotor lining**  
Standard  
Hastelloy C-276



#### Flanges

150, 300, 600 and 900 lb is standard.  
API 685: Flanges available for ANSI/ASME, B 16.5 CL 150/300/600/900 lb RF. Developed for quadruplex nozzle forces and torques in accordance with API 685.

#### Rotor balancing

API 685: ISO 1940, G2.5 gm-mm

#### Impeller

Highly efficient design, open or closed configurations

#### Shaft

Available in various materials and configurations

#### Automatic axial thrust balancing

#### Housing with central supports

API 685: Design pressure of at least 40 bar with corrosion acceptance of 3 mm

#### Wear ring

# The most important components for reliability and safety.

## E-Monitor

The NIKKISO E-Monitor has been developed to determine the condition of the hermetically sealed pump bearings during pump operation. The position of the rotor is monitored while the pump is operating. Furthermore, the technically state-of-the-art monitor can be used for preventive maintenance relating to bearing wear.

### Display:

- Separate wear display for axial and radial bearings
- Uneven wear of the front or rear bearings
- Pump “ON”
- Directional monitoring

### Advantages:

- The directional display indicates whether the pump is rotating in the wrong direction and makes measurements of the phase rotation during commissioning unnecessary.
- Since the E-Monitor receives its power supply by means of the motor's terminal box, external wiring is omitted.
- The unit is attached to the pump and is ready for use after the pump is commissioned.

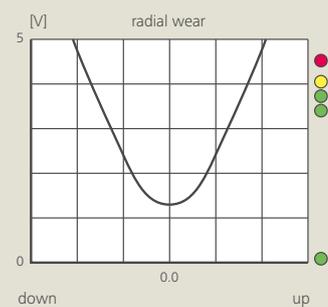
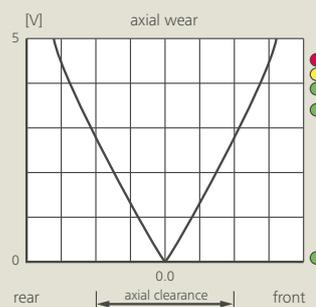
## E-Monitor operating principle

Sensors integrated into the stator transmit the measurement data to the monitoring unit. The rotor assembly is moved along the radial or axial position in the case of bearing wear. As soon as the rotor leaves its operationally safe position, this

is registered by the sensors. Any change in the status of the pump bearings is displayed to the operating personnel by means of a simple and clearly arranged LED display. An LED that is illuminated in green indicates a good state of the

bearings. An LED illuminated in yellow indicates to the operator that the pump should be checked at the next regular system shutdown. If the LED lights up in red, the pump should be immediately put out of operation and checked.

Display



## Bearings-modular system

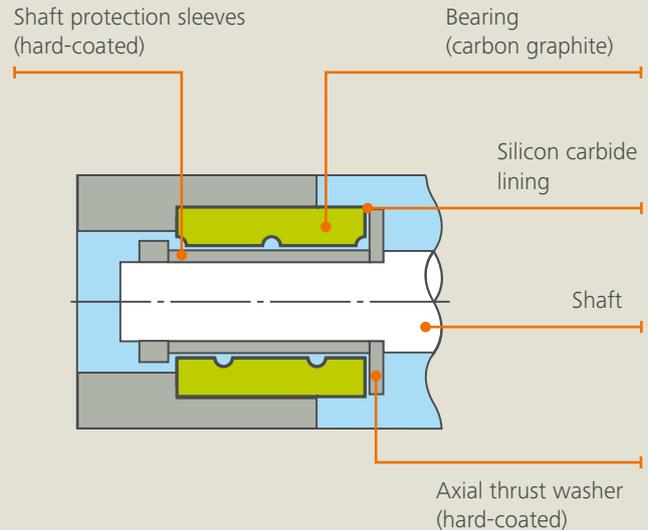
NIKKISO bearings are slide bearings. The materials used range from various carbon graphites through polytetrafluorethylene (PTFE) to silicon carbide. The use of CG93, a mixture of carbon and silicon carbide, enables increased protection against wear without any brittleness.

The bearings are liquid-lubricated and designed with a groove for an improved supply of lubricant.

Depending on application, the shaft protection sleeves are either plated with chromium or finished with a hardened material.

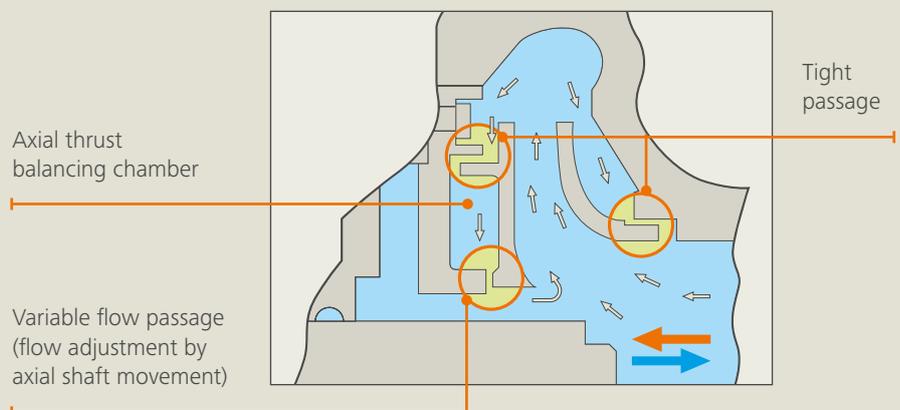
The axial thrust washers (made of hardened material or chromium-plated) limit the movement of the shafts under disruptive conditions to reduce the risk of damage to the pump.

For a simplified installation process, the front and rear bearings are identical, shaft protection sleeves are identical and thrust washers are also identical to one another.



## Automatic axial thrust balancing

The hydrodynamic operating principle of a set of fixed and variable passages enable an automatic axial thrust balancing to center the shaft between the axial thrust bearings. Thus, wear to the axial thrust bearings during normal operation is avoided. The interchangeable axial thrust washers and the thrust side of the carbon bearings come into contact with one another only during startup and under disruptive conditions, for example if the suction flow cuts out. By controlling the axial thrust on the impeller, the motor cooling flow is not influenced by the position of the shafts.



# Motors.

## Reliable motors

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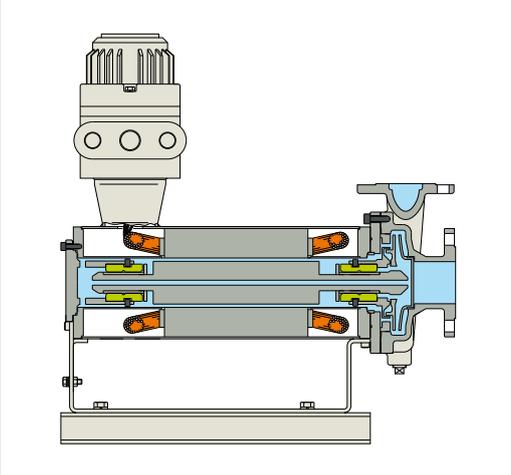
- Protection against leakages through seal-welded and 100% leakage-proof corrosion-resistant linings. They ensure that the supplied medium does not come into contact with the stator windings or the core of the rotor.
- The complete outer side of the motor is encapsulated in a second leak-proof protective shell.
- Increased operating reliability through the absence of dynamic seals.
- Motor cooling and bearing lubrication through the supplied medium that is circulated in the area between the rotor and stator lining.
- Motor windings and insulation are specially designed and used as an integrated pump component. Thus, a design service lifetime is achieved which corresponds to at least that of conventional air-cooled motors.
- Integrated thermostats at the overheating points of the windings switch off the motor in case of overheating. Control of the winding temperature mainly through fluid temperature as well as through the use of a cooling jacket.
- Direct integration of the motor into the centrifugal canned pump ensures not only environmental protection, but also safety at the plant.
- All parts of the pump are designed for easy and fast maintenance. Therefore, expensive downtimes can be minimized.





# For a wide variety of requirements. The NIKKISO Non-Seal Pump Types.

## Standard applications

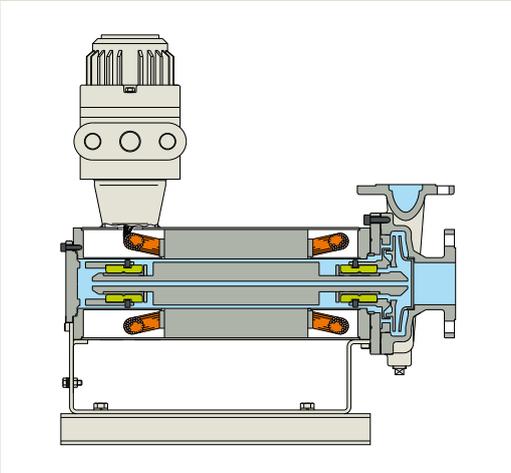


### Type HN

#### Standard version

Suitable for a wide variety of clean, non-volatile liquids with moderate temperature.

Flow rate up to 780 m<sup>3</sup>/h  
Head up to 210 m (300 m at 60 Hz)  
Motor power up to 132 kW (200 kW without explosion protection)  
Temperature -60 to +200 °C  
Viscosity up to 80 cP

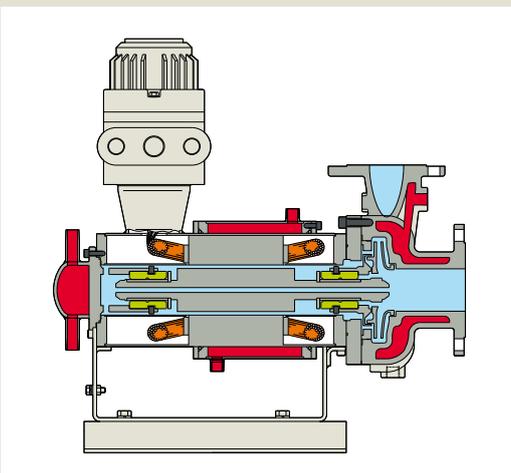


### Type HV

#### High-viscosity liquids

The pump type HV is for the use of liquids with a viscosity of > 80 cP to 200 cP.

Flow rate up to 180 m<sup>3</sup>/h  
Head up to 200 m  
Motor power up to 44 kW  
Temperature -60 to +200 °C  
Viscosity up to 200 cP



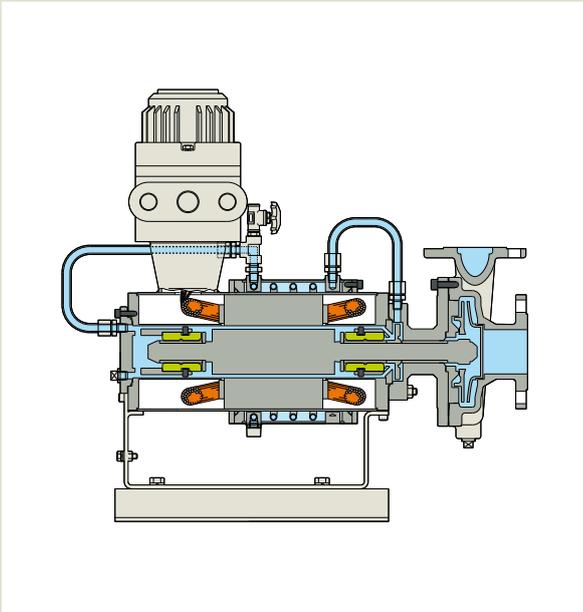
### Type HB

#### Jacketed casing for liquids with a high melting point

The HB type pump is equipped with a heating jacket around the pump housing, the motor stator and the rear bearing housing in order to regulate the temperature during the production of liquids with a melting point of up to 140 °C.

Flow rate up to 160 m<sup>3</sup>/h  
Head up to 200 m  
Motor power up to 22 kW  
Temperature -60 to +200 °C  
Viscosity up to 200 cP

## Fluids with high temperatures

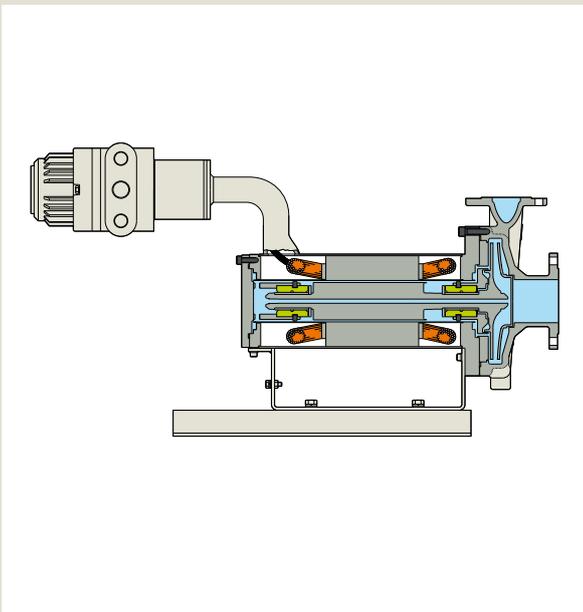


### Type HT

#### High temperatures with cooling

Developed for the production of hot liquids. The process liquid in the rotor compartment is circulated through the use of an auxiliary impeller. An integrated tube bundle heat exchanger as well as a spacer for thermal decoupling serve to keep the medium temperature in the motor constantly cool and thus maintain a suitable winding temperature.

Flow rate up to 780 m<sup>3</sup>/h  
 Head up to 210 m (300 m at 60 Hz)  
 Motor power up to 132 kW  
 Temperatures up to +400 °C  
 Viscosity up to 200 cP



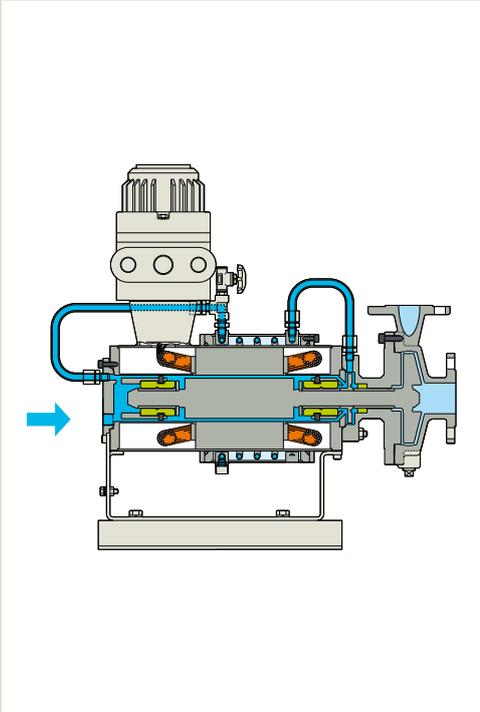
### Type HX

#### High temperatures, without requiring cooling

Specially developed for heat transfer applications. A special all-ceramic motor insulation is used with the HX pump type. For maximum system heat efficiency, an external heat insulation can be used, by which the pump will be ideally suited for conveying thermal oils. Through the use of an optional heating jacket in combination with the ceramic motor insulation, the HX type works well for the production of liquids with a high melting point (above 140 °C), which would exceed the upper temperature limits of the normal organically insulated materials of motors.

Flow rate up to 200 m<sup>3</sup>/h  
 Head up to 200 m  
 Motor power up to 55 kW  
 Temperatures up to +350 °C  
 Viscosity up to 200 cP

## Pumps for slurry handling



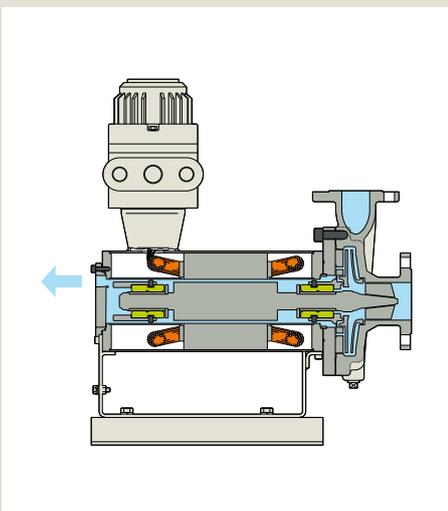
### Types HM (mechanical seal) and HS (throttling bush)

#### Slurry handling pump

The supply of a clean irrigation fluid that is compatible with the pumped fluid is required. This is constantly circulated in the motor section for cooling and bearing lubrication as well as for preventing the intrusion of solids or liquids with high vapor pressure into the motor chamber. Recirculation takes place by means of an auxiliary impeller. An integrated heat exchanger dissipates the heat, created by friction or current heat losses. In order to minimize the entry of the flush fluid into the process medium, as well as to minimize their loss, the clearances are designed to be very narrow between the motor and the pump. Despite the required flush fluid (similar to conventional pumps with double seal), there is no shaft protrusion to be sealed and no gaskets. The type HM is available with a shaft seal for reduced rinsing rates. The type HS is equipped with a throttling bushing.

Flow rate up to 780 m<sup>3</sup>/h  
 Head up to 300 m  
 Motor power up to 200 kW  
 Temperatures up to +400 °C  
 Viscosity up to 500 cP

## Further designs



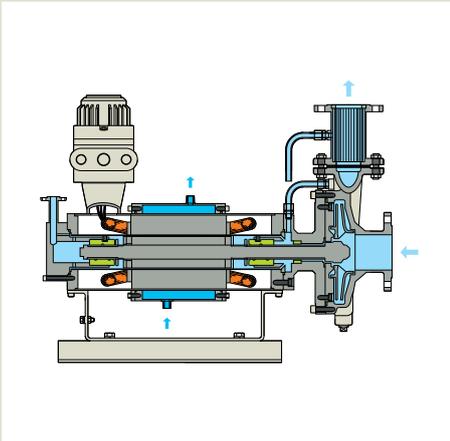
### Type HQ

#### Liquid recirculation

For liquids developed with steep steam pressure curves, which would evaporate after the absorption of engine heat upon recirculation into the eye of the impeller. With the Type HQ, the circulating fluid is channeled through the motor into the vapor zone of the suction tank. The recirculation conduit is throttled so that the pressure fluid remains in the motor. It also serves as a vent conduit which is normally installed for fluids of this type.

Flow rate up to 180 m<sup>3</sup>/h  
 Head up to 200 m  
 Motor power up to 44 kW  
 Temperature -60 to +185 °C  
 Viscosity up to 200 cP

## Further designs

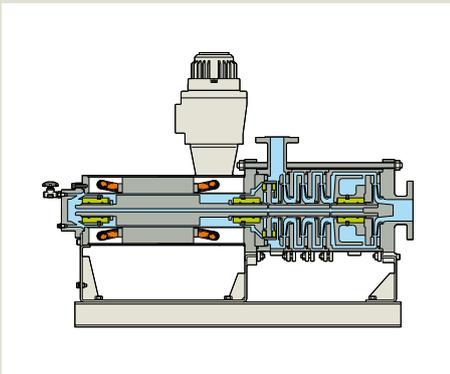


### Type HR

#### Liquid recirculation

Designed for fluids with extremely steep steam pressure curves. For the Type HR, the flow is channeled directly to the bearings. The return conduit is throttled so that the liquid that is pressurized remains in the engine and serves as a vent conduit for it, which is normally installed for fluids of this type.

Flow rate up to 780 m<sup>3</sup>/h  
 Head up to 210 m  
 Motor power up to 132 kW  
 Temperature -60 to +185 °C  
 Viscosity up to 200 cP

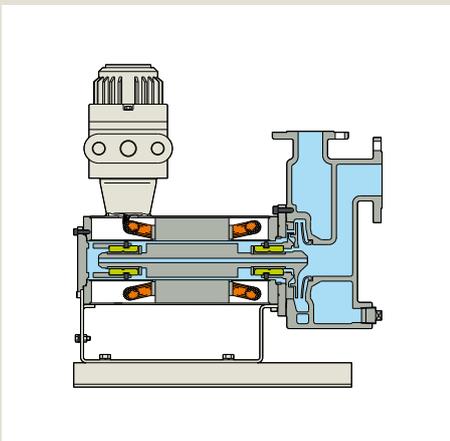


### Multistage

#### Pumps with large head

Pumps for high pressure applications through multistage impeller design

Flow rate up to 120 m<sup>3</sup>/h  
 Head up to 500 m  
 Motor power up to 132 kW  
 Temperature -30 to +150 °C  
 Viscosity up to 140 cP



### Type DN

#### Self-priming pump

Problems due to blockage are reduced through a self-priming diffuser chamber without foot valve.

Flow rate up to 180 m<sup>3</sup>/h  
 Head up to 70 m  
 Motor power up to 45 kW  
 Temperatures up to +170 °C  
 Viscosity up to 200 cP

Self-priming head (water +20 °C) up to 7 m

# Accessories.



## Remote display

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These accessories make it possible for operators to read out E-Monitor display values even in areas that are difficult to access.



## Dry-run protection (SAO relay)

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A relay with load detection protects the pump against dry-run in the case of truck or tank car unloading. It detects low load due to dry run and shuts down the motor.



## Sealing system

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For pump type HM, you can order a sealing system that provides flush liquid for the mechanical seal.



## Inducer

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For the reduction of a min. required net positive suction head (NPSHr)



## Mechanical bearing monitoring

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There is a contact tip located at the end of the monitoring unit which is fitted within a cavity in the end nut on the rotor shaft. The clearances between the contact tip and the end nut corresponds to the maximum permissible bearing wear. If the maximum permissible bearing wear is reached, contact will be made and the tip will break. In addition, the monitoring unit serves to detect corrosion of the stator lining and rotor sleeve because the contact tip has similar metallurgical properties and is half as thick as these components.

# NIKKISO Non-Seal Pumps offer the highest quality. As demonstrated by our certifications.

<p><b>API:</b></p>  <p>NIKKISO pumps in accordance with API 685 are optionally available.</p>	<p><b>ATEX 2014/34/EU:</b></p>  <p>The pumps fulfill the guidelines for devices and protection systems for intended use in areas where there is a risk of explosion.</p>	<p><b>CE:</b></p>  <p>Certification in accordance with CE ("Conformité Européenne") marking is standard for European customers; it is also available for non-European customers upon request.</p>
<p><b>ISO9001:2015:</b></p>  <p>Our quality management is certified in accordance with ISO9001:2015.</p>	<p><b>TR-CU and TR-CU-Ex:</b></p>  <p>The pumps are certified for the Eurasian Economic Union (EAEU).</p>	
<p><b>EN 80079-36 and 37:</b></p> <p>The pumps correspond to the European standards for non-electrical devices for use in areas where there is a risk of explosion.</p>	<p><b>EMC Directive 2004/108/EG:</b></p> <p>The pumps fulfill the requirements of the EMC Directive on the electromagnetic compatibility of electrically operated devices.</p>	<p><b>EN 60079-0/1/7 i:</b></p> <p>The pumps correspond to the European standards for explosion protection.</p>
<p><b>EN 60529:</b></p> <p>The pumps are protected by housing of the protection class IP 65.</p>	<p><b>Machinery Directive 2006/42/EG:</b></p> <p>The pumps fulfill the uniform level of protection defined in the Machinery Directive for the prevention of accidents for machines and partly completed machinery.</p>	<p><b>German Technical Instructions on Air Quality Control (TA-Luft):</b></p> <p>The pumps fulfill the requirements of TA-Luft.</p>

# At a glance.

## Technical data.

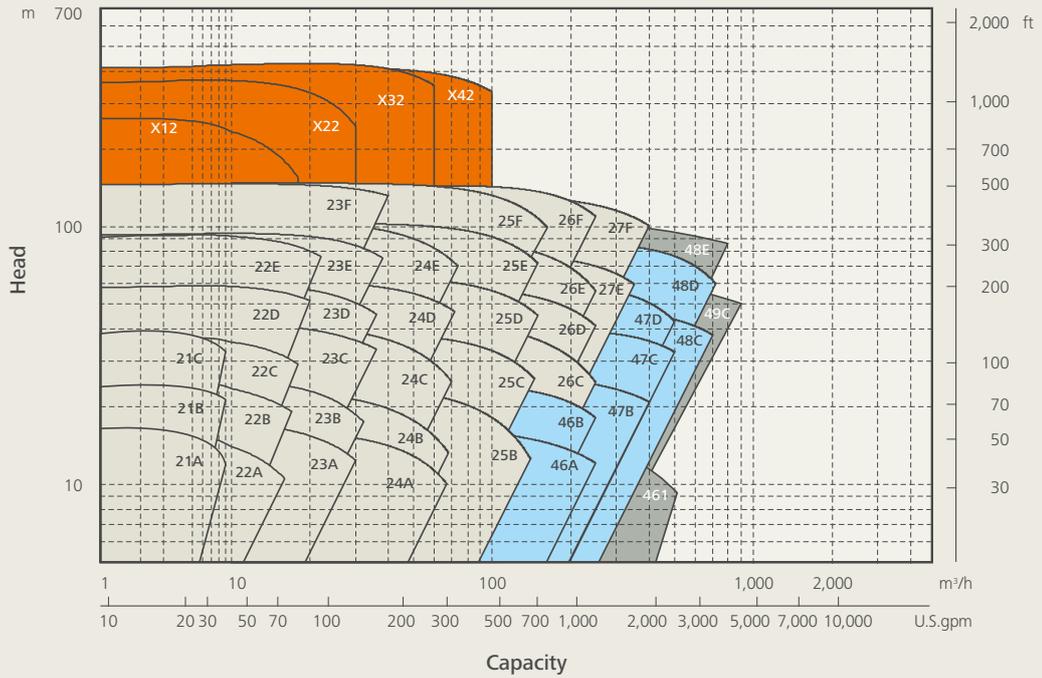
### Technical data

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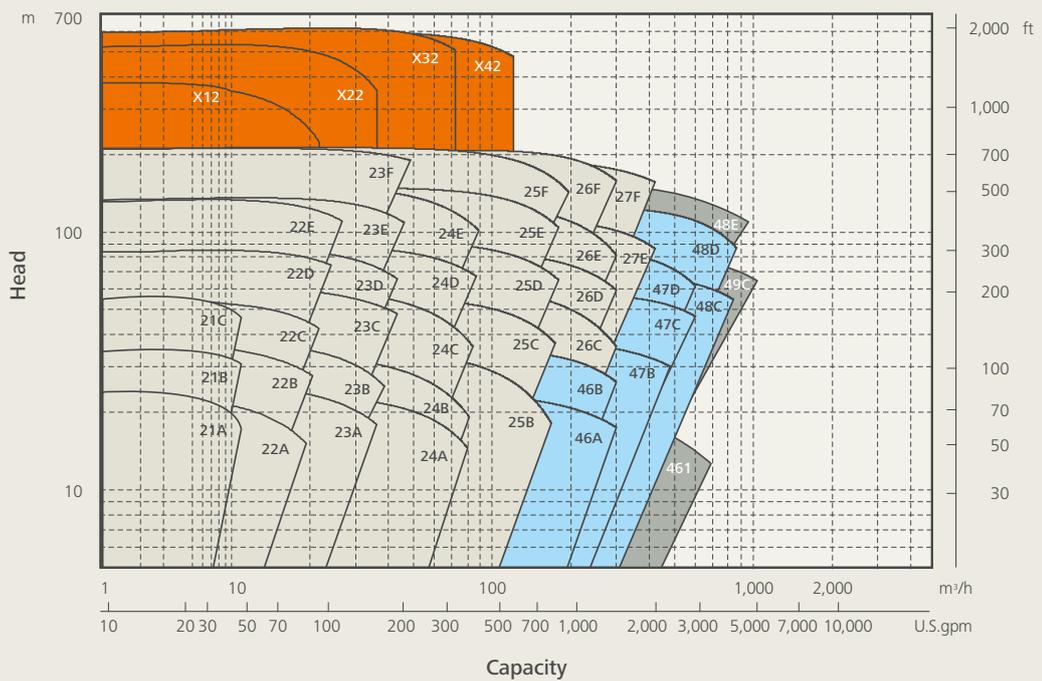
	Standard	Engineered
Max. flow rate:	780 m <sup>3</sup> /h	1200 m <sup>3</sup> /h
Max. head	210 m single-stage, 500 m multistage	600 m
Fluid temperature range	-60 to +400 °C	-200 to +450 °C
Max. viscosity	200 cP	500 cP
Design pressure	Max. 40 bar (4 MPa)	Max. 800 bar (80 MPa)
Motor power range	0.4 to 132 kW	200 to 250 kW
Liquid end material	316SS, 304SS, other materials are available upon demand	Alloy 20, Hastelloy C/B, Titanium, Zirconium, etc.

## Head-flow rate curves

### 50 Hz



### 60 Hz



# Creating Fluid Solutions. For more value created.



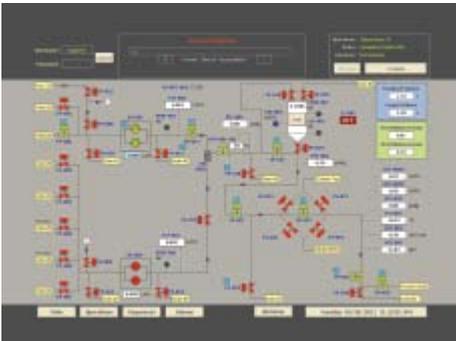
Technical consulting



Fluid and process engineering tests



Lifecycle concepts and energy optimization



Process automation



Pulsation studies and pipeline calculations



System layout and integration



Creative development and refinements



Commissioning and maintenance service



Spare part and service concepts

## Creating Fluid Solutions.

Driven by our commitment, our trendsetting products and innovative technologies have set benchmarks for diaphragm pumps and metering systems for over 60 years. We solve complex tasks from a single source. That ranges from custom pump design, basic and system engineering, global project management, and pretesting to commissioning and maintenance on site. Our consistent drive always to develop the best solutions for the customer provides you with a competitive advantage and visible added value.

Your local representative:



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