High-Pressure Gear Pumps

KP .../434
Description

The KP.../434 high-pressure gear pumps are suitable for non-abrasive fluids. Examples of such fluids are, e.g., silicates (sodium silicate), isocyanates and polyols without fillers such as are used in PUR technology.

The gear is supported in multicomponent plain bearings, is case hardened and is super-finished. The sliding plates are made of high-strength material with special surface hardness. Depending on the pumping medium, at drive speeds of 1500 1/min working pressures of up to 150 bar are feasible.

The main application area for these high-pressure gear pumps are mainly multi-component systems in PUR technology without fillers.

The double seal with quench tank reliably prevents crystallisation on the seal to the pumping medium.

Construction KP 2 / KP 3

Construction KP 5
High Pressure Gear Pumps

The KP…/434 high-pressure gear pumps are suitable for non-abrasive fluids. Examples of such fluids are, e.g., silicates (sodium silicate), isocyanates and polyols without fillers such as are used in PUR technology. The gear is supported in multicomponent plain bearings, is case hardened and is super-finished. The sliding plates are made of high-strength material with special surface hardness. Depending on the pumping medium, at drive speeds of 1500 1/min working pressures of up to 150 bar are feasible. The main application area for these high-pressure gear pumps are mainly multi-component systems in PUR technology without fillers. The double seal with quench tank reliably prevents crystallisation on the seal to the pumping medium.

### Description

#### Construction KP 2 / KP 3
- 10 Housing
- 20 Flange cover
- 30 Driving Shaft
- 40 Driven Shaft
- 50 Sliding plate
- 60 Bearing bush
- 150 O-ring
- 230 Quench tank
- 250 Special seal
- 290 Rotary shaft seal

#### Construction KP 5
- 10 Housing
- 20 Flange cover
- 40 Driving Shaft
- 50 Driven Shaft
- 60 Gear
- 70 Bearing bush
- 80 Sliding plate
- 240 O-ring
- 260 Rotary shaft seal
- 270 Roller bearing
- 360 Rotary shaft seal
- 400 Quench tank

### Materials

<table>
<thead>
<tr>
<th>Component</th>
<th>Material</th>
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<tbody>
<tr>
<td>Housing</td>
<td>EN-GJL-300 (GG 30)</td>
</tr>
<tr>
<td>Flange cover</td>
<td>EN-GJL-300 (GG 30)</td>
</tr>
<tr>
<td>Gear</td>
<td>Steel, case hardened</td>
</tr>
<tr>
<td>Sliding plates</td>
<td>EN-GJS-600-3 nitrocarburized</td>
</tr>
<tr>
<td>Bearing bush</td>
<td>Multicomponent plain bearings</td>
</tr>
<tr>
<td>Shaft seal</td>
<td>Double rotary shaft seal with Quench chamber incl. Quench tank</td>
</tr>
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</table>

### Characteristics

#### Geometrical displacement

<table>
<thead>
<tr>
<th>Model</th>
<th>Geometrical displacement $V_g$</th>
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<tbody>
<tr>
<td>KP 2</td>
<td>$28, 40 \text{ cm}^3/\text{rev}$</td>
</tr>
<tr>
<td>KP 3</td>
<td>$63, 100, 125 \text{ cm}^3/\text{rev}$</td>
</tr>
<tr>
<td>KP 5</td>
<td>$150, 200, 250 \text{ cm}^3/\text{rev}$</td>
</tr>
</tbody>
</table>

#### Mounting position

- Horizontal

#### Fixing type

- KP 2 / KP 3 = flange (4-hole flange, DIN ISO 7653)
- KP 5 = flange (SAE-C-2-hole flange)

#### Inlet port

- SAE 1¼" - 1½" - 2" - 2½"-flange

#### Outlet port

- SAE 1" - 1¼" - 2"-flange

#### Max. working pressure

<table>
<thead>
<tr>
<th>Model</th>
<th>Max. working pressure</th>
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<tr>
<td>KP 2</td>
<td>150 bar = KP 2/28, KP 2/40</td>
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<tr>
<td>KP 3</td>
<td>150 bar = KP 3/63, KP 3/100</td>
</tr>
<tr>
<td></td>
<td>110 bar = KP 3/125</td>
</tr>
<tr>
<td>KP 5</td>
<td>100 bar = KP 5/150, KP 5/200, KP 5/250</td>
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</table>

#### Max. inlet pressure

<table>
<thead>
<tr>
<th>Model</th>
<th>Pressure inlet port bar</th>
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<tbody>
<tr>
<td>KP 2</td>
<td>– 0.4…20, – 0.4…16, – 0.4…11, – 0.4…8, – 0.4…5</td>
</tr>
<tr>
<td>KP 3</td>
<td>– 0.4…9, – 0.4…9, – 0.4…5.5, – 0.4…4.5, – 0.4…3</td>
</tr>
<tr>
<td>KP 5</td>
<td>max. 400, max. 500, max. 750, max. 1000, max. 1500</td>
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</tbody>
</table>

#### Speed 1/min

<table>
<thead>
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<th>Speed 1/min</th>
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<tbody>
<tr>
<td>KP 2</td>
<td>max. 400</td>
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<tr>
<td>KP 3</td>
<td>max. 500</td>
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<td>KP 5</td>
<td>max. 750</td>
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<tr>
<td></td>
<td>max. 1000</td>
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<tr>
<td></td>
<td>max. 1500</td>
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#### Viscosity

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<th>Model</th>
<th>$\nu$</th>
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<tr>
<td></td>
<td>34 up to 50000 mm²/s (higher viscosities on request)</td>
</tr>
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</table>

#### Media temperature

- $\theta_{\text{max}} = 120^\circ\text{C}$

#### Ambient temperature

- $\theta_{\text{u min}} = – 20^\circ\text{C}$
- $\theta_{\text{u max}} = 60^\circ\text{C}$

#### Shaft end

- KP 2 / KP 3 = Cylindrical shaft Ø 24 mm
- KP 5 = Cylindrical shaft Ø 32 mm
Input Power

Diagram: \( n, f_\nu = f(\nu) \)

**Note:**
To determine the power consumption, always take the max. working viscosity at starting state into consideration. The power of the drive motor should be selected 20% higher than the value determined.
Discharge Flow / Input Power

Calculation

\[ P_{Pu} = \text{Pump power consumption (kW)} \]
\[ P = \text{Power consumption} \]
\[ n = \text{Speed (1/min)} \] (Dependent on viscosity! (see chart))
\[ f_v = \text{Viscosity factor} \left[ \frac{\text{kW}}{\text{l/min}} \right] \] (see chart)
\[ Q = \text{Discharge flow (l/min) with} \ Q = \frac{V_g \cdot n}{1000} \]
\[ V_g = \text{Geometrical displacement (cm}^3/\text{rev)} \]

Conversion factors

1 bar = 14.5 [lb in^2] = 14.5 psi
1 \[ \frac{\text{l}}{\text{min}} \] = 0.220 \[ \frac{\text{gal}}{\text{min}} \] [U.K.]
1 \[ \frac{\text{l}}{\text{min}} \] = 0.264 \[ \frac{\text{gal}}{\text{min}} \] [US]

Calculation Formulas for Hydraulic Pumps

Characteristic data, formula signs, units

<table>
<thead>
<tr>
<th>Discharge flow / input flow</th>
<th>( Q )</th>
<th>l/min</th>
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</thead>
<tbody>
<tr>
<td>Pump / motor displacement</td>
<td>( V_g )</td>
<td>cm^3/rev</td>
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<tr>
<td>Pressure</td>
<td>( p )</td>
<td>bar</td>
</tr>
<tr>
<td>Speed of rotation</td>
<td>( n )</td>
<td>1/min</td>
</tr>
<tr>
<td>Torque</td>
<td>( M )</td>
<td>Nm</td>
</tr>
<tr>
<td>Power</td>
<td>( P )</td>
<td>kW</td>
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<tr>
<td>Total efficiency</td>
<td>( \eta_{tot} )</td>
<td>–</td>
</tr>
<tr>
<td>Volumetric efficiency</td>
<td>( \eta_{vol} )</td>
<td>–</td>
</tr>
<tr>
<td>Hydr./mech. efficiency</td>
<td>( \eta_{hm} )</td>
<td>–</td>
</tr>
<tr>
<td>Flow velocity</td>
<td>( v )</td>
<td>m/s</td>
</tr>
<tr>
<td>Pipe diameter</td>
<td>( d )</td>
<td>mm</td>
</tr>
</tbody>
</table>

General

\[ Q_{th} = V_g \cdot n, \; \eta_{tot} = \eta_{vol} \cdot \eta_{hm}, \]
\[ M = 9549 \cdot \frac{P}{n} \cdot v = 21.22 \frac{Q}{d^2}, \; P = \frac{M \cdot n}{9549} \]

Example: Pump type KP 3/63

Viscosity \( \nu = 3000 \text{ mm}^2/\text{s} \)
Working pressure at \( P = 2.89 \text{ kW} \)
\( n = 500 \text{ 1/min} \)
\( f_v = 0.023 \left[ \frac{\text{kW}}{\text{l/min}} \right] \)
\( Q = 28 \text{ l/min} \)

becomes

\[ P_{Pu} = (2.89 + 0.023 \cdot 28) \text{ kW} \]
\[ P_{Pu} = 3.53 \text{ kW} \]

Motorpower output:

Select helical geared motor with \( P = 4 \text{ kW} \)
\( n = 500 \text{ 1/min} \)
Type Key

Ordering example

KP 3/63 X 10 G Y 0 0 6 D L 2/ 434

434 Code for special design

Seal
2 FKM

Type of gearing
L Driving shaft and driven shaft made of case-hardened steel (steel tooth flanks ground and honed)
E KP 5 = Gear made of case-hardening steel, hardened and ground

Code for materials
Housing and bearing execution
D Gray cast iron housing, multicomponent plain bearing

Design serial no.
4 KP 2
6 KP 3
0 KP 5

Adaptor pieces
0 without

Second shaft end
0 without

Shaft end
Y cylindrical shaft Ø 24 (230 Nm max) KP 2 / KP 3
Z cylindrical shaft Ø 32 (550 Nm max) KP 5

Housing side ports
F Inlet port 1 1/4" (Ø 32)
   Outlet port 1" (Ø 25) (Vg 28)
G Inlet port 1 1/2" SAE-connection (Ø 40)
   Outlet port 1 1/4" SAE-connection (Ø 32) (Vg 40...63)
J Inlet port 2" SAE-connection (Ø 50)
   Outlet port 1 1/4" SAE-connection (Ø 32) (Vg 100 and 125)
K Inlet port 2 1/2" SAE-connection (Ø 65)
   Outlet port 2" SAE-connection (Ø 50) (Vg 150...250)

Outboard flanges
0 without

Direction of rotation
1 clockwise
2 anticlockwise

Flange mounting cover
X KP 2 / KP 3 = 4-hole-flange LA = Ø 113, Øz = 80
C KP 5 = SAE-C-2-hole-flange LA = 181, Øz = 127

Nominal displacement
28, 40, 63, 100, 125, 150, 200, 250

Size 2, 3, 5

Produc name

Seal
2 FKM

Type of gearing
L Driving shaft and driven shaft made of case-hardened steel (steel tooth flanks ground and honed)
E KP 5 = Gear made of case-hardening steel, hardened and ground

Code for materials
Housing and bearing execution
D Gray cast iron housing, multicomponent plain bearing

Design serial no.
4 KP 2
6 KP 3
0 KP 5

Adaptor pieces
0 without

Second shaft end
0 without

Shaft end
Y cylindrical shaft Ø 24 (230 Nm max) KP 2 / KP 3
Z cylindrical shaft Ø 32 (550 Nm max) KP 5

Housing side ports
F Inlet port 1 1/4" (Ø 32)
   Outlet port 1" (Ø 25) (Vg 28)
G Inlet port 1 1/2" SAE-connection (Ø 40)
   Outlet port 1 1/4" SAE-connection (Ø 32) (Vg 40...63)
J Inlet port 2" SAE-connection (Ø 50)
   Outlet port 1 1/4" SAE-connection (Ø 32) (Vg 100 and 125)
K Inlet port 2 1/2" SAE-connection (Ø 65)
   Outlet port 2" SAE-connection (Ø 50) (Vg 150...250)

Outboard flanges
0 without

Direction of rotation
1 clockwise
2 anticlockwise

Flange mounting cover
X KP 2 / KP 3 = 4-hole-flange LA = Ø 113, Øz = 80
C KP 5 = SAE-C-2-hole-flange LA = 181, Øz = 127

Nominal displacement
28, 40, 63, 100, 125, 150, 200, 250

Size 2, 3, 5

Produc name
Dimensions KP 2/28.../434

Weight 15 kg

Dimensions KP 2/40.../434

Weight 16 kg
Dimensions KP 3/63…/434

Weight 25 kg

Dimensions KP 3/100…/434

Weight 29 kg

Dimensions in mm
Dimensions KP 3/125…/434

Weight 32 kg

Dimensions in mm

Dimensions KP 5/150…/434

Weight 49 kg

Dimensions in mm
Dimensions KP 5/200.../434

Weight 53 kg

Dimensions in mm

Dimensions KP 5/250.../434

Weight 57 kg

Dimensions in mm
Motor-Pump Assemblies KP 2

All motor dimensions and data refer to AC motors; other motor makes on enquiry. Motor type IMB35.

All pump nominal sizes and motor sizes can be combined with each other.
Motor-Pump Assemblies KP 3

### KP 3

<table>
<thead>
<tr>
<th>Size</th>
<th>Motor 8-pole</th>
<th>Motor 6-pole</th>
<th>Motor 4-pole</th>
<th>Bell housing</th>
<th>Coupling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Power kW</td>
<td>Speed 1/min</td>
<td>Power kW</td>
<td>Speed 1/min</td>
<td></td>
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<tr>
<td>132 S</td>
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<td>960</td>
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<tr>
<td>132 M</td>
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<td>710</td>
<td>5.5</td>
<td>970</td>
<td>7.5</td>
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<tr>
<td>160 M</td>
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<td>970</td>
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<td>970</td>
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<td>970</td>
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<td>200 L</td>
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<td>730</td>
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<td>980</td>
<td>37.0</td>
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<tr>
<td>225 S</td>
<td>22.0</td>
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<td>225 M</td>
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<td>250 M</td>
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<td>– –</td>
<td>980</td>
<td>37.0</td>
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All motor dimensions and date refer to AC motors; other motor makes on enquiry. Motor type IMB35.

### KP 3

<table>
<thead>
<tr>
<th>Size</th>
<th>KP 3/63</th>
<th>KP 3/100</th>
<th>KP 3/125</th>
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<td></td>
<td>L1</td>
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</table>

All pump nominal sizes and motor sizes can be combined with each other.

Dimensions in mm
Motor-Pump Assemblies KP 5

<table>
<thead>
<tr>
<th>Size</th>
<th>Motor 8-pole</th>
<th>Motor 6-pole</th>
<th>Motor 4-pole</th>
<th>Bell housing</th>
<th>Coupling</th>
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<tbody>
<tr>
<td></td>
<td>Power kW</td>
<td>Speed 1/min</td>
<td>Power kW</td>
<td>Speed 1/min</td>
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KP 5

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<th>KP 5/200 L1</th>
<th>KP 5/250 L1</th>
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<th>b</th>
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<td>250</td>
<td>770</td>
<td>608</td>
<td>24</td>
<td>168</td>
</tr>
</tbody>
</table>

All pump nominal sizes and motor sizes can be combined with each other.
I Gear Pumps

Low and high-pressure gear pumps for lubricating oil, hydraulic, process and test bench applications, fuel and metering systems.

I Flow Measurement

Gear, turbine and screw type flow meters and electronics for volume and flow, metering and consumption in the chemical industry, hydraulic, process and test bench technology.

I Hydraulics

Single and multistage high-pressure gear pumps, gear motors and valves for construction machinery, municipal vehicles, agricultural vehicles, special vehicles and truck bodies.

I Valves

Cetop valves for all requirements stationary and mobile applications. Pressure, switching and stop valves with pipe connection for high flow rates. Special valves.