Radial Piston Motors
with fixed displacement
KM 11 - RM 250N series
V_g = 11 ccm/rev - 250 ccm/rev
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### Have a close look at our motors ...

- long service life on account of mature design
- shaft end able to support large radial and axial forces
- small number of components in drive
- extremely low moment of inertia
- measuring shaft can be fitted as a standard option
- low leakage thanks to play self-adjustment design feature
- translationally operating control valve with play adjustment control
- resistant to temperature shocks
- suitable for use with liquids with low combustion properties
- maintenance free
- quiet running
- wide speed range
- with SAE flange connections
- 100 % torque throughout the entire speed range
- uniform running properties even at extremely low speed
- immediately reversible
- high starting torque
- no counterpressure required for motor operation
- can be used as pump if feed is available
- very suitable for applications as a control
- feed and discharge control possible
- may be operated in series
- total efficiency of up to 96%
- direct valve construction available as a standard option

### Fixed displacement motor (constant hydraulic displacement)

<table>
<thead>
<tr>
<th>Motor Typ</th>
<th>Displacement Vg cm³/rev</th>
<th>Torque Tspec. av. Nm/bar</th>
<th>Tmax Nm</th>
<th>Speed nmin rpm</th>
<th>nmax rpm</th>
<th>Cont. operating pressure Pcont bar</th>
<th>Maximum operating pressure Pmax bar</th>
<th>Peak pressure ppeak bar</th>
<th>Output Pcont kW</th>
<th>Pintermit. kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>KM 11</td>
<td>RM 11</td>
<td>0,15</td>
<td>31,5</td>
<td>10</td>
<td>3000</td>
<td>140</td>
<td>210</td>
<td>250</td>
<td>3,5</td>
<td>4,3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0,15</td>
<td>37,5</td>
<td>5</td>
<td>3600</td>
<td>160</td>
<td>250</td>
<td>315</td>
<td>4,7</td>
<td>5,8</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>0,31</td>
<td>77,9</td>
<td>10</td>
<td>2250</td>
<td>160</td>
<td>250</td>
<td>315</td>
<td>6,0</td>
<td>7,5</td>
</tr>
<tr>
<td>22</td>
<td>22</td>
<td>0,47</td>
<td>118</td>
<td>10</td>
<td>1500</td>
<td>160</td>
<td>250</td>
<td>315</td>
<td>6,0</td>
<td>7,5</td>
</tr>
<tr>
<td>32</td>
<td>33</td>
<td>0,62</td>
<td>156</td>
<td>5</td>
<td>1800</td>
<td>160</td>
<td>250</td>
<td>315</td>
<td>9,5</td>
<td>11</td>
</tr>
<tr>
<td>45</td>
<td>44</td>
<td>0,95</td>
<td>236</td>
<td>5</td>
<td>1200</td>
<td>160</td>
<td>250</td>
<td>315</td>
<td>9,5</td>
<td>11</td>
</tr>
<tr>
<td>63</td>
<td>66</td>
<td>1,27</td>
<td>267</td>
<td>5</td>
<td>900</td>
<td>140</td>
<td>210</td>
<td>250</td>
<td>8,5</td>
<td>10</td>
</tr>
<tr>
<td>90</td>
<td>89</td>
<td>1,59</td>
<td>333</td>
<td>5</td>
<td>750</td>
<td>140</td>
<td>210</td>
<td>250</td>
<td>8,5</td>
<td>10</td>
</tr>
<tr>
<td>110</td>
<td>110</td>
<td>1,15</td>
<td>363</td>
<td>5</td>
<td>800</td>
<td>250</td>
<td>315</td>
<td>400</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>125N</td>
<td>126</td>
<td>1,80</td>
<td>567</td>
<td>5</td>
<td>600</td>
<td>200</td>
<td>315</td>
<td>350</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>160N</td>
<td>160</td>
<td>2,36</td>
<td>742</td>
<td>5</td>
<td>800</td>
<td>250</td>
<td>315</td>
<td>400</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>250N</td>
<td>251</td>
<td>3,68</td>
<td>1159</td>
<td>5</td>
<td>600</td>
<td>200</td>
<td>315</td>
<td>350</td>
<td>24</td>
<td>30</td>
</tr>
</tbody>
</table>

* extremely low speeds of below 1 rpm can be reached using built-on servo-valves.

p cont if limited to Pcont

p max if limited to Pintermit. operating for a maximum duration of 10 % in every hour

p peak highest pressure at which the components will remain functional

P cont continuous output (at a return pressure of 10 bar); if this output is constantly exceeded, the drive must be flushed

P intermit. output with which the motor can be run intermittently (for an operating time of max 10 % in every hour)
### Connections

<table>
<thead>
<tr>
<th>Type</th>
<th>Designation</th>
<th>NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threaded connection, radial</td>
<td>G 1/2 DIN ISO 228-1</td>
<td>A1</td>
</tr>
<tr>
<td>Threaded connection, radial</td>
<td>G 1 DIN ISO 228-1</td>
<td>A</td>
</tr>
<tr>
<td>Flange connection, radial</td>
<td>DIN 5480</td>
<td>A</td>
</tr>
<tr>
<td>Flange connection, radial</td>
<td>DIN 5480</td>
<td>A1</td>
</tr>
<tr>
<td>Threaded connection, axial</td>
<td>G 1/2 DIN ISO 228-1</td>
<td>A</td>
</tr>
</tbody>
</table>

**Sealing material**

<table>
<thead>
<tr>
<th>Type</th>
<th>Designation</th>
<th>NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBR seals, suitable for HLP mineral oils according to DIN 51524 part 2</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>FPM (Viton) seals, suitable for ester of phosphoric acid (HFD)</td>
<td>A</td>
<td></td>
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</tbody>
</table>

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**Displacement Rated Size NG**

<table>
<thead>
<tr>
<th>NG</th>
<th>Displacement</th>
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<tbody>
<tr>
<td>11</td>
<td>11 cm³/rev</td>
</tr>
<tr>
<td>22</td>
<td>22 cm³/rev</td>
</tr>
<tr>
<td>33</td>
<td>33 cm³/rev</td>
</tr>
<tr>
<td>44</td>
<td>44 cm³/rev</td>
</tr>
<tr>
<td>66</td>
<td>66 cm³/rev</td>
</tr>
<tr>
<td>81</td>
<td>81 cm³/rev</td>
</tr>
<tr>
<td>89</td>
<td>89 cm³/rev</td>
</tr>
<tr>
<td>110</td>
<td>110 cm³/rev</td>
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<tr>
<td>126</td>
<td>126 cm³/rev</td>
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<tr>
<td>161</td>
<td>161 cm³/rev</td>
</tr>
<tr>
<td>251</td>
<td>251 cm³/rev</td>
</tr>
</tbody>
</table>

---

**Drive Shaft**

<table>
<thead>
<tr>
<th>Keyway</th>
<th>Designation</th>
<th>NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylindrical</td>
<td>Z</td>
<td>11</td>
</tr>
<tr>
<td>Male involute splined</td>
<td>K</td>
<td>22</td>
</tr>
<tr>
<td>Female involute splined</td>
<td>H</td>
<td>32</td>
</tr>
</tbody>
</table>

---

**Flange dimensions**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Attachment to the face</th>
<th>NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>F3</td>
<td>NG 22, 32, 45, 63, 90, 110</td>
<td>S = ø120 K = ø140</td>
</tr>
<tr>
<td>F</td>
<td>NG 22, 32, 45, 63, 90, 110</td>
<td>S = ø125 K = ø160</td>
</tr>
<tr>
<td>F</td>
<td>NG 22, 32, 45, 63, 90, 110</td>
<td>S = ø125 K = ø160</td>
</tr>
</tbody>
</table>

---

**Sealing material**

<table>
<thead>
<tr>
<th>Designation</th>
<th>NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>A5</td>
<td>B5</td>
</tr>
<tr>
<td>A10</td>
<td>B5</td>
</tr>
<tr>
<td>A10</td>
<td>B5</td>
</tr>
</tbody>
</table>

---

* No information given in the type key number.
1. **General properties and features**
   Design: hydrostatic radial piston motor

   Purpose: transformation of hydraulic power to drive power.
   High efficiency, also suitable for very low speeds, low moment of inertia, rapidly reversible, capable of supporting high total loads, four-quadrant operation possible, very suitable for applications as a control, extremely quiet operation.

2. **Structure and function**
   2.1 **Drive unit**
      Design: Internal piston support
      Method of functioning: Seven radial pistons (14.1) load the crankshaft via a heptagon ring with a needle bearing cage.
      Drive details
      Seven radial pistons (14.1) load the crankshaft via a heptagon ring with a needle bearing cage.
      Crankshaft bearing: cylinder roller bearing (17,18) partially balanced crankshaft.
      Transmission of force between the pistons (14.1) and the crankshaft (7):
      Low frictional losses, very long service life, relatively insensitive to dirt, also suitable for extremely high pressure and speed, high starting torque, no stick-slip effect at low speeds, only minor leakage (necessary for the lubrication and cooling of the drive), high efficiency.

2.2 **Control RM 11**
   Design: Planar translational distribution valve with play adjustment
   Purpose: Distribution of the volume feed to the 7 cylinders, collection of the return volume flow
   Method of functioning:
   Control rings (6/15) with the external ring (10) and with the eccentric (38) form an external and an internal ring space.
   By moving the control rings (6/15) between the motor housing (4) and the end cover (8) by means of the eccentric (38) which is fixed to the crankshaft (7), the internal and the external ring spaces are connected to the cylinders in turn. The ring spaces themselves are connected to the outside through pressure connections to the motor.
   Control details
   Roller bearing between the control rings (6/15) and the eccentric (38)
   The control rings mainly move translationally, however, rotation is possible (2 degrees of freedom) – this means small frictional losses at the control rings (6/15) and a cleaning effect in the sealing gap, approximately equal relative speeds of the sealing faces, sinusoidal opening function for the control openings – this means smooth running even at low speeds and quiet running at high speeds, large volume flow diameters between the rollers (27) in the roller bearing.
   Adjustment of the play on the control rings (6/15) and the flats on the eccentric:
   Hydrostatic, low control ring (6/15) force against the flats, spring-supported pressure by means of spring washers (for zero pressure and low pressure situations), hydrostatic re-adjustment of the eccentric flats by means of a pressure thrust piece (26) supported by a helical spring.
   Very low leakage and small frictional losses, automatic compensation for pressure and temperature influences (temperature shocks among others), relatively insensitive to dirt.

2.3 **Control KM 11**
   The control corresponds to series KM 22 to KM 110.
Functional description
of Radial Piston Motors
KM 22 - KM 110

1. General properties and features

Design:
Hydrostatic radial piston motor.

Purpose:
transformation of hydraulic power to drive power.

High efficiency, also suitable for very low speeds, low moment of inertia, rapidly reversible, capable of supporting high total loads, four-quadrant operation possible, very suitable for applications as a control, extremely quiet operation.

2. Structure and function

2.1 Drive unit

Design:
Internal piston support

Method of functioning:
Seven, fourteen or twenty-one radial pistons (14) load the crankshaft (7) via heptagon rings (15) with needle bearing cages (4).

Drive details
Crankshaft bearing: Pre-loaded, large taper roller bearings (17,18), in X arrangement.
Precise guidance, therefore quiet running, high radial and axial loading capacity (e.g. if a gear wheel is mounted at the shaft end). Transmission of force between the pistons (14) and the crankshaft (7): via heptagon ring (15) with needle bearing cage (4).
Low frictional losses, very long service life, relatively insensitive to dirt, also suitable for extremely high pressure and speed, high starting torque, no stick-slip effect at low speeds, only minor leakage (necessary for the lubrication and cooling of the drive), high efficiency.

2.2 Control

Design:
Planar translationally moving distributor with clearance seal to prevent internal leakage and with play self-adjusting seal to prevent leakage to the outside.

Purpose:
Distribution of the volume feed to the cylinders, collection of the return volume flow

Method of functioning:
The control disc (6) has an integrated internal ring space and forms an external ring space in conjunction with ring (10). By moving the control disc (6) between the motor housing (1) and the end cover (8) by means of the eccentric (5) which is fixed to the crankshaft (7), the internal and the external ring spaces are connected to the cylinders in turn. The ring spaces themselves are connected to the outside through pressure connections to the motor.

Control details
Needle bearing cage (27) between control disc (6) and eccentric (5):
The control disc (6) mainly moves translationally, however, rotation is possible (2 degrees of freedom) – this means small frictional losses at the control disc (6) and a cleaning effect in the sealing gap, approximately equal relative speeds of the sealing faces, sinusoidal opening function for the control openings – this means smooth running even at low speeds and quiet running at high speeds, large volume flow diameters between the rollers (27) in the roller bearing.

Play self-adjusting seal against leakage to the outside:
Low hydrostatic force of the thrust piece (24) against the control disc (6) supported by the spring washer (35).
Reduction in the leakage to the outside at only low frictional losses, automatic compensation for pressure or temperature influences, relatively insensitive to dirt.
### Hydraulic characteristic values

<table>
<thead>
<tr>
<th></th>
<th>KM</th>
<th>RM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geom. displacement [cm³/rev]</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Theor. spec. torque [Nm/bar]</td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td>Average spec. torque [Nm/bar]</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Peak pressure [bar]</td>
<td>250</td>
<td>315</td>
</tr>
<tr>
<td>Max. operating pressure [bar]</td>
<td>210</td>
<td>250</td>
</tr>
<tr>
<td>Continuous pressure [Nm]</td>
<td>140</td>
<td>160</td>
</tr>
<tr>
<td>Max. operating torque [Nm]</td>
<td>31.5</td>
<td>37.5</td>
</tr>
<tr>
<td>Continuous torque [Nm]</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>Drain line pressure [bar]</td>
<td>max. 1</td>
<td></td>
</tr>
<tr>
<td>Hydraulic fluid temperature range [°C]</td>
<td>243 - 363</td>
<td>- 30 + 90</td>
</tr>
<tr>
<td>Viscosity range [mm²/s]</td>
<td>20 - 150</td>
<td>(max. 1000 mm²/s at start)</td>
</tr>
</tbody>
</table>

**Pressure fluids:**
- HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
- Mineral oil H-LP in conformity with DIN 51524 part 2.
- Bio-degradable fluids available on request.

*Definition according to DIN 24 312.*

**Peak pressure** = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.

**If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.**

### Filtering
- Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
- We recommend filters with a minimum retention rate of β₁₀ ≥ 100.
- For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of β₅ ≥ 100.

### Characteristic values according to VDI 3278

- **Weight:** 12.0 [kg]
- **Mounting position:** as required
- **Direction of rotation, if viewed at the shaft end clockwise:** flow from connection 2 to connection 1
- **anti-clockwise:** flow from connection 1 to connection 2
- **Operating speed range:** [rpm] 10 - 3000
- **Moment of inertia:** [kgm²] 0.000263
- **Continuous power:** [kW] 3.5
- **Intermittent power:** [kW] 4.3

### End cover A (radial ports)

<table>
<thead>
<tr>
<th>Type number key for radial piston motor KM 11 ; RM 11</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Radial</strong></td>
</tr>
<tr>
<td><strong>Piston Motor</strong></td>
</tr>
<tr>
<td><strong>Shaft end</strong></td>
</tr>
<tr>
<td><strong>End cover</strong></td>
</tr>
<tr>
<td><strong>Seal</strong></td>
</tr>
<tr>
<td><strong>Instrument shaft</strong></td>
</tr>
<tr>
<td><strong>Flange</strong></td>
</tr>
</tbody>
</table>

**KM** = motor control with clearance seal

**RM** = play self-adjusting motor control (the motor is 10mm longer, dimension 82 becomes 92)
Service life of the roller bearings

Strength of the shaft

Example:
Given: \( F_r = 2000 \text{ N} \) [674 lbf] \( x = 10 \text{ mm} \) [0.394 in]
Required: Shaft strength
Make a vertical line of \( (\delta ) F_r = 2000 \text{ N} \) [674 lbf] to the distance \( x = 10 \text{ mm} \) [0.394 in]
Less the point of intersection in the diagram so the shaft is constantly strong. Admissible axial forces calculate the works on request.
Hydraulic characteristic values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometric displacement [cm³/rev]</td>
<td>22</td>
</tr>
<tr>
<td>Theoretical spec. torque [Nm/bar]</td>
<td>0.35</td>
</tr>
<tr>
<td>Average spec. torque [Nm/bar]</td>
<td>0.32</td>
</tr>
<tr>
<td>Peak pressure [bar]</td>
<td>315</td>
</tr>
<tr>
<td>Max. operating pressure [bar]</td>
<td>250</td>
</tr>
<tr>
<td>Continuous pressure [bar]</td>
<td>160</td>
</tr>
<tr>
<td>Max. operating torque [Nm]</td>
<td>78</td>
</tr>
<tr>
<td>Continuous torque [Nm]</td>
<td>50</td>
</tr>
<tr>
<td>Drain line pressure [bar]</td>
<td>max. 1</td>
</tr>
<tr>
<td>Hydraulic fluid temperature range</td>
<td>[K] 243 - 363</td>
</tr>
<tr>
<td>Viscosity range</td>
<td>[mm²/s] 20 - 150</td>
</tr>
</tbody>
</table>

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil-based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$.
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.

Characteristic values according to VDI 3278

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight [kg]</td>
<td>17.4</td>
</tr>
<tr>
<td>Mounting position</td>
<td>as required</td>
</tr>
<tr>
<td>Direction of rotation</td>
<td>clockwise: flow from connection 2 to connection 1</td>
</tr>
<tr>
<td></td>
<td>anti-clockwise: flow from connection 1 to connection 2</td>
</tr>
<tr>
<td>Operating speed range</td>
<td>[rpm] 10 ÷ 2250</td>
</tr>
<tr>
<td>Moment of inertia</td>
<td>[kgm²] 0.00028</td>
</tr>
<tr>
<td>Continuous power</td>
<td>[kW] 6.0</td>
</tr>
<tr>
<td>Intermittent power</td>
<td>[kW] 7.5</td>
</tr>
</tbody>
</table>

HFC: Reduce HFC pressure to 70 %
Definition to CETOP RP 77 H
HFD: Viton seals are required

End cover A

Inch measurements in brackets

Type number key for radial piston motor KM 22

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Size</th>
<th>Shaft end</th>
<th>End cover</th>
<th>Seal</th>
<th>Second shaft 1</th>
<th>Flange</th>
<th>additional specs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radial Piston Motor</td>
<td>22</td>
<td>K</td>
<td>Z</td>
<td>A</td>
<td>B1</td>
<td>M</td>
<td>ISO 3019/2 F</td>
</tr>
</tbody>
</table>

1) With end cover version B5 a 2nd shaft is not possible.
Radial Piston Motor
KM 22

Characteristics

Service life of the roller bearings

Strength of the shaft

Example:
Given values: \( F_r = 3000 \text{ N} [674 \text{ lbf}] \) \( x = 20 \text{ mm} [0.787 \text{ in}] \)
Required value: Shaft strength
Draw a vertical line from \( F_r = 3000 \text{ N} [674 \text{ lbf}] \) to distance \( x = 20 \text{ mm} [0.787 \text{ in}] \) and a straight horizontal line from there. If the intersection \( 0 \) of the horizontal with the vertical line of \( \Delta p = 100 \text{ bar} [1450 \text{ psi}] \) is below the shaft has sufficient fatigue strength. Allowable axial forces will be provided on request.
Hydraulic characteristic values

Geometrical displacement [cm³/rev] 33
Theoretical spec. torque [Nm/bar] 0,52
Average spec. torque [Nm/bar] 0,48
Peak pressure [bar] 315
Max. operating pressure [bar] 250
Continuous pressure [bar] 160
Max. operating torque [Nm] 120
Continuous torque [Nm] 76,8

Drain line pressure [bar] max. 1
Hydraulic fluid temperature range [°C] 243 - 363
Viscosity range [mm²/s] 20 - 150

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of β₁₀ ≥ 100
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of β₅ ≥ 100.

Characteristic values according to VDI 3278

Weight: [kg] 17,4
Mounting position: as required
Direction of rotation, if viewed at the shaft end clockwise: flow from connection 2 to connection 1
anti-clockwise: flow from connection 1 to connection 2
Operating speed range: [rpm] 10 ÷ 1500
Moment of inertia: [kgm²] 0,00028
Continuous power: [kW] 6,0
Intermittent power: [kW] 7,5

Hydraulic characteristic values

Radial Piston Motor
KM 32
Technical data

Catalogue
HM1 - 014EN
Seite 10
Edition 2016.07/08

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Subject to change without notice
Radial Piston Motor

Characteristics

Service life of the roller bearings

Strength of the shaft

Example:
Given values: \( F_x = 3000 \text{ N} \) (674 lbf), \( x = 20 \text{ mm} \) (787 in)
\( \Delta p = 100 \text{ bar} \) (1450 psi)

Required value: Shaft strength

Draw a vertical line from \( F_x = 3000 \text{ N} \) (674 lbf) to distance \( x = 20 \text{ mm} \) (787 in) and a straight horizontal line from there. If the intersection of the horizontal with the vertical line of \( \Delta p = 100 \text{ bar} \) (1450 psi) is below curve the shaft has sufficient fatigue strength.

Allowable axial forces will be provided on request.
Hydraulic characteristic values

- Geomtr. displacement: 44 [cm³/rev]
- Theor. spec. torque: 0.70 [Nm/bar]
- Average spec. torque: 0.63 [Nm/bar]
- Peak pressure*: 315 [bar]
- Max. operating pressure**: 250 [bar]
- Continuous pressure: 160 [bar]
- Max. operating torque: 157 [Nm]
- Continuous torque: 100 [Nm]
- Drain line pressure: Max. 1 [bar]
- Hydraulic fluid temperature range: 243 - 363 [K]
- Viscosity range: 30 - 90 [mm²/s]

Pressure fluids: HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of \( \beta_{10} \geq 100 \).
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of \( \beta_5 \geq 100 \).

Characteristic values according to VDI 3278

- Weight: 18.8 [kg]
- Mounting position: as required
- Direction of rotation, if viewed at the shaft end
  - clockwise: flow from connection 2 to connection 1
  - anti-clockwise: flow from connection 1 to connection 2
- Operating speed range: 5 - 1800 [rpm]
- Moment of inertia: 0.00033 [kgm²]
- Continuous power: 9.5 [kW]
- Intermittent power: 11.0 [kW]

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

** Definition to CETOP RP 77 H
ISO/DIS 6071
Viton seals are required.

Type number key for radial piston motor KM 45

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Size</th>
<th>Shaft end</th>
<th>End cover</th>
<th>Seal</th>
<th>Second shaft</th>
<th>Flange</th>
<th>additional specs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radial Piston Motor</td>
<td>45</td>
<td>Z</td>
<td>A</td>
<td>NBR</td>
<td>without Instrument Driving</td>
<td>M</td>
<td>ISO 3019/2</td>
</tr>
</tbody>
</table>

1) With end cover version B5 a 2nd shaft is not possible.
Radial Piston Motor

KM 45

Characteristics

Characteristic performance functions according to ISO

Overall Efficiency

- Operating temperature: \( T = 50^\circ C \)
- Viscosity: \( \nu = 56 \text{ mm}^2/\text{s} \) (36 cSt)

Outlet pressure: \( P_o = 0 \text{ bar} \)

Drain line pressure: \( P_d = 0 \text{ bar} \)

Strength of the shaft

Example:

Given values: \( F_T = 4500 \text{ N} \) (1012 lbf), \( x = 20 \text{ mm} \) (0.787 in)

Required value: Shaft strength

Draw a vertical line from \( F_T = 4500 \text{ N} \) (1012 lbf) to the intersection of the line from the given value and a straight horizontal line from there. If the intersection is below the curve, the shaft has sufficient fatigue strength. Allowable axial forces will be provided on request.
### Hydraulic characteristic values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geomtr. displacement [cm³/rev]</td>
<td>66</td>
</tr>
<tr>
<td>Theor. spec. torque [Nm/bar]</td>
<td>1.05</td>
</tr>
<tr>
<td>Average spec. torque [Nm/bar]</td>
<td>0.95</td>
</tr>
<tr>
<td>Peak pressure [bar]</td>
<td>315</td>
</tr>
<tr>
<td>Max. operating pressure [bar]</td>
<td>250</td>
</tr>
<tr>
<td>Continuous pressure [Nm]</td>
<td>160</td>
</tr>
<tr>
<td>Max. operating torque [Nm]</td>
<td>237</td>
</tr>
<tr>
<td>Continuous torque [Nm]</td>
<td>152</td>
</tr>
<tr>
<td>Drain line pressure [bar]</td>
<td>max. 1</td>
</tr>
<tr>
<td>Hydraulic fluid temperature range [°C]</td>
<td>243 - 363</td>
</tr>
<tr>
<td>Viscosity range [mm²/s]</td>
<td>20 - 150</td>
</tr>
<tr>
<td>Filter precision of fluid [β₁₀]</td>
<td>≥ 100</td>
</tr>
</tbody>
</table>

### Filtering

Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.

We recommend filters with a minimum retention rate of β₁₀ ≥ 100.

For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of β₁₀ ≥ 100.

### Characteristic values according to VDI 3278

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight [kg]</td>
<td>18.8</td>
</tr>
<tr>
<td>Mounting position:</td>
<td>as required</td>
</tr>
<tr>
<td>Direction of rotation, if viewed at the shaft end clockwise:</td>
<td>flow from connection 2 to connection 1</td>
</tr>
<tr>
<td>anti-clockwise:</td>
<td>flow from connection 1 to connection 2</td>
</tr>
<tr>
<td>Operating speed range [rpm]</td>
<td>5 - 1200</td>
</tr>
<tr>
<td>Moment of inertia [kgm²]</td>
<td>0.00033</td>
</tr>
<tr>
<td>Continuous power [kW]</td>
<td>9.5</td>
</tr>
<tr>
<td>Intermittent power [kW]</td>
<td>11.0</td>
</tr>
</tbody>
</table>

### Hydraulic Characteristic Values

**Radial Piston Motor KM 63**

#### Geometr. displacement [cm³/rev]

66

#### Theor. spec. torque [Nm/bar]

1.05

#### Average spec. torque [Nm/bar]

0.95

#### Peak pressure [bar]

315

#### Max. operating pressure [bar]

250

#### Continuous pressure [Nm]

160

#### Max. operating torque [Nm]

237

#### Continuous torque [Nm]

152

#### Drain line pressure [bar]

max. 1

#### Hydraulic fluid temperature range [°C]

243 - 363

#### Viscosity range [mm²/s] (max. 1000 mm²/s at start)

20 - 150

#### Pressure fluids:


* Definition according to DIN 24 312.

** Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.

** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

#### HFC

Reduce HFC pressure to 70 %

Definition to CETOP RP 77 H

HFD

Viton seals are required

#### Filtering

Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.

For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of β₁₀ ≥ 100.

#### Operating speed range [rpm]

5 - 1200

#### Moment of inertia [kgm²]

0.00033

#### Continuous power [kW]

9.5

#### Intermittent power [kW]

11.0

#### Weight [kg]

18.8

#### Mounting position: as required

#### Direction of rotation, if viewed at the shaft end

**clockwise:** flow from connection 2 to connection 1

**anti-clockwise:** flow from connection 1 to connection 2

#### Operating speed range [rpm]

5 - 1200

#### Moment of inertia [kgm²]

0.00033

#### Continuous power [kW]

9.5

#### Intermittent power [kW]

11.0

### Type number key for radial piston motor KM 63

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Size</th>
<th>Shaft end</th>
<th>End cover</th>
<th>Seal</th>
<th>Second shaft</th>
<th>Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radial</td>
<td>63</td>
<td>Keyway</td>
<td>Z</td>
<td>NBR</td>
<td>A1</td>
<td>F</td>
</tr>
<tr>
<td>Piston</td>
<td></td>
<td>Valve face</td>
<td>K</td>
<td>Viton</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Motor type</td>
<td></td>
<td>Axial ports</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) With end cover version B5 a 2nd shaft is not possible.

---

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Subject to change without notice
### Strength of the shaft

**Example:**

**Given values:** $F_v = 4500 \text{ N} [1012 \text{ lbf}]$, $x = 20 \text{ mm} [0.787 \text{ in}]$  
$\sigma_p = 100 \text{ bar} [1450 \text{ psi}]$

**Required value:** Shaft strength  

1. Draw a vertical line from $F_v = 4500 \text{ N} [1012 \text{ lbf}]$ to the distance $x = 20 \text{ mm} [0.787 \text{ in}]$ and a straight horizontal line from there.  
2. If the intersection is below the horizontal with the vertical line of $\sigma_p = 100 \text{ bar} [1450 \text{ psi}]$ in the graph, the shaft has sufficient fatigue strength.  
3. Allowable axial forces will be provided on request.

---

**Radial Piston Motor**  
**KM 63**  
**Characteristics**

- Operating fluid: HM 46  
- Operating temperature: $\theta = 50^\circ \text{ C}[122^\circ \text{ F}]$  
- Viscosity: $\nu = 36 \text{ mm}^2/\text{s} [36 \text{ cSt}]$

**Service life of the roller bearings**

- Given:
  - Safety factor: $S = 1.5$  
  - Operating temperature: $\theta = 50^\circ \text{ C}$  
  - Speed: $n = 2500 \text{ min}^{-1} [21.08 \text{ f.p.m.}]$  
- Required:
  - Safety factor: $S = 1.5$  
  - Operating temperature: $\theta = 50^\circ \text{ C}$  
- Diagram B:  
  - Calculate the life of the bearing using the data provided.

---

**Overall Efficiency**

- Operating temperature: $\theta = 50^\circ \text{ C}$  
- Viscosity: $\nu = 36 \text{ mm}^2/\text{s} [36 \text{ cSt}]$

---

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Subject to change without notice
Hydraulic characteristic values

Geometr. displacement [cm³/rev]: 89
Theor. spec. torque [Nm/bar]: 1.41
Average spec. torque [Nm/bar]: 1.27
Peak pressure [bar]: 250
Max. operating pressure**: [bar]: 210
Continuous pressure [bar]: 140
Max. operating torque [Nm]: 266
Continuous torque [Nm]: 178
Drain line pressure [bar]: max. 1
Hydraulic fluid temperature range [K]: 243 – 363
[°C]: - 30 – + 90
Viscosity range [mm²/s]: (max. 1000 mm²/s at start)

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at
which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please
consult the manufacturer.

Filtering
Max. permissible degree of contamination of the pressure fluid according to
NAS 1638 class 9.
We recommend filters with a minimum retention rate of

Parameter: "β 10 "
Value: "≥ 100"

For a long service life we recommend filtering acc. to NAS 1638
class 8 and filters with a minimum retention rate of

Parameter: "β 5 "
Value: "≥ 100"

Characteristic values according to VDI 3278

Weight: [kg]: 21.4

Mounting position: as required
Direction of rotation, if viewed at the shaft end
clockwise: flow from connection 2 to connection 1
anti-clockwise: flow from connection 1 to connection 2

Operating speed range: [rpm]: 5 – 900
Moment of inertia: [kgm²]: 0.00039
Continuous power: [kW]: 8.5
Intermittent power: [kW]: 10.0

End cover A

Type number key for radial piston motor KM 90

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Size</th>
<th>Shaft end</th>
<th>End cover</th>
<th>Seal</th>
<th>Second shaft</th>
<th>Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radial Piston Motor</td>
<td>90</td>
<td>Keyway</td>
<td>Z</td>
<td>A</td>
<td>NBR Viton</td>
<td>Without Instrument Driving</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Radial ports</td>
<td>Valve face</td>
<td>Axial ports</td>
<td></td>
<td>ISO 3019/2</td>
</tr>
</tbody>
</table>

1) With end cover version B5 a 2nd shaft is not possible.
Radial Piston Motor

KM 90

Characteristics

Characteristic performance functions according to ISO

Overall Efficiency
Operating temperature: \( T \) = 50°C

Viscosity: \( \eta = 26 \text{ mm}^2/\text{s} \) (36 cSt)

Outlet pressure: \( P_2 = 0 \text{ bar} \)

Drain line pressure: \( P_a = 0 \text{ bar} \)

---

Service life of the roller bearings

**A**

Front bearing

**B**

Rear bearing

Strength of the shaft

Example:

Given values: \( F_r = 2000 \text{ N} \) (450 lbf) \( x = 20 \text{ mm} \) (0.787 in)

Required value: Shaft strength

Draw a vertical line from \( F_r = 2000 \text{ N} \) (450 lbf) to distance \( x = 20 \text{ mm} \) (0.787 in) and a straight horizontal line from there.

If the intersection of the horizontal with the vertical line of \( \Delta p = 100 \text{ bar} \) (1450 psi) is below curve the shaft has sufficient fatigue strength.

Allowable axial forces will be provided on request.
Hydraulic characteristic values

- Geom. displacement: 110 [cm³/rev]
- Theor. spec. torque: 1.75 [Nm/bar]
- Average spec. torque: 1.59 [Nm/bar]
- Peak pressure**: 250 [bar]
- Max. operating pressure**: 210 [bar]
- Continuous pressure: 140 [bar]
- Max. operating torque: 334 [Nm]
- Continuous torque: 223 [Nm]
- Drain line pressure: max. 1 [bar]
- Hydraulic fluid temperature range: 243 - 363 [°C]
- Viscosity range: 30 - 90 [mm²/s]

**HFC
Reduce HFC pressure to 70% Definition to CETOP RP 77 H
Check the bearing service life
HFD Viton seals are required Definition to CETOP RP 77 H ISO/DIS 6071

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of \( \beta_{10} \geq 100 \).
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of \( \beta_{5} \geq 100 \).

Characteristic values according to VDI 3278

- Weight: 21.4 [kg]
- Mounting position: as required
- Direction of rotation, if viewed at the shaft end clockwise: flow from connection 2 to connection 1
- anti-clockwise: flow from connection 1 to connection 2
- Operating speed range: 5 - 750 [rpm]
- Moment of inertia: 0.00041 [kgm²]
- Continuous power: 8.5 [kW]
- Intermittent power: 10.0 [kW]

Pressure fluids:
- HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
- Mineral oil H-LP in conformity with DIN 51524 part 2.
- Bio-degradable fluids available on request.

- Definition according to DIN 24 312.
- Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
- ** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

HFC
Reduce HFC pressure to 70% Definition to CETOP RP 77 H
Check the bearing service life
HFD Viton seals are required Definition to CETOP RP 77 H ISO/DIS 6071

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of \( \beta_{10} \geq 100 \).
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of \( \beta_{5} \geq 100 \).

Characteristic values according to VDI 3278

- Weight: 21.4 [kg]
- Mounting position: as required
- Direction of rotation, if viewed at the shaft end clockwise: flow from connection 2 to connection 1
- anti-clockwise: flow from connection 1 to connection 2
- Operating speed range: 5 - 750 [rpm]
- Moment of inertia: 0.00041 [kgm²]
- Continuous power: 8.5 [kW]
- Intermittent power: 10.0 [kW]

Pressure fluids:
- HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
- Mineral oil H-LP in conformity with DIN 51524 part 2.
- Bio-degradable fluids available on request.

- Definition according to DIN 24 312.
- Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
- ** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

Specifications

- Standard Design
- Mounting Flange ISO 3019/2
- End cover A

Type number key for radial piston motor KM 110

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Size</th>
<th>Shaft end</th>
<th>End cover</th>
<th>Seal</th>
<th>Second shaft</th>
<th>Flange</th>
<th>additional specs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radial Piston Motor</td>
<td>110</td>
<td>Keyway Z</td>
<td>A1</td>
<td>A1</td>
<td>NBR</td>
<td>without Instrument Driving</td>
<td>normal ISO 3019/2</td>
</tr>
</tbody>
</table>

1) With end cover version B5 a 2nd shaft is not possible.
Radial Piston Motor
KM 110

Characteristics

Characteristic performance functions according to ISO

Overall Efficiency
- Operating temperature: \( t = 50^\circ \text{C} \) [\( 122^\circ \text{F} \)]
- Viscosity: \( \nu = 36 \text{ mm}^2/\text{s} \) [\( 36 \text{ cSt} \)]
- Outlet pressure: \( P_o = 0 \text{ bar} \) [\( 0 \text{ psi} \)]
- Drain line pressure: \( P_d = 0 \text{ bar} \) [\( 0 \text{ psi} \)]

Service life of the roller bearings

Strength of the shaft

Example:
- Given values: \( F_R = 2000 \text{ N} \) (\( 450 \text{ lbf} \)), \( x = 20 \text{ mm} \) (\( 0.787 \text{ in} \))
- \( \sigma_p = 100 \text{ bar} \) (\( 1450 \text{ psi} \))

Required value: Shaft strength
- Draw a vertical line from \( F_R = 2000 \text{ N} \) (\( 450 \text{ lbf} \)) to \( x = 20 \text{ mm} \) (\( 0.787 \text{ in} \)) and a straight horizontal line from there.
- If the intersection \( F_R \) of the horizontal with the vertical line of \( \sigma_p = 100 \text{ bar} \) (\( 1450 \text{ psi} \)) is below curve the shaft has sufficient fatigue strength.
- Allowable axial forces will be provided on request.

Subject to change without notice
1. General properties and features

Design:
hydrostatic radial piston motor
Purpose:
transformation of hydraulic power to drive power.
High efficiency, also suitable for very low speeds, low moment of inertia, rapidly reversible, capable of supporting high total loads, four-quadrant operation possible, very suitable for applications as a control, extremely quiet operation.

2. Structure and function

2.1 Drive unit

Design:
Internal piston support

Method of functioning:
Five or ten radial pistons (14.1) load the crankshaft via pentagon ring(s) with needle bearing cages (14.5)
Functional description
of Radial Piston Motors
RM 80N, RM 125N, RM 160N, RM 250N

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Drives Details
Crankshaft bearing:
Pre-loaded, large taper roller bearings (17,18), in X arrangement

Precise guidance, therefore quiet running, high radial and axial loading capacity (e.g. if a gear wheel is mounted at the shaft end).

Force transmission: Piston (14.1) – crankshaft (7) via the pentagon ring (14.2) with needle bearing cage (14.5).

Low frictional losses, very long service life, relatively insensitive to dirt, also suitable for extremely high pressure and speed, high starting torque, no stick-slip effect at low speeds, only minor leakage (necessary for the lubrication and cooling of the drive), high efficiency, self-adjusting play to compensate for wear, temperature shock resistant, damping properties of the hydrostatic strain release reduce noise.

Design:
Planar translational distribution valve with play self-adjustment

2.2 Drive unit

Design:
Planar translational distribution valve with play self-adjustment

Purpose:
Distribution of the volume feed to the 5 or 10 cylinders, collection of the return volume flow.

Method of functioning:
Control rings (6/15) with the external ring (1) and with the eccentric (38) form an external and an internal ring space. By moving the control rings (6/15) between the control plate (4) and the liner (20) by means of the eccentric (38) which is fixed to the crankshaft (5), the internal and the external ring spaces are connected to the cylinders in turn. The ring spaces themselves are connected to the outside through pressure connections on the motor.

Control details
Roller bearing between the control rings (6/15) and the eccentric (38)

The control rings mainly move translationally, however, rotation is possible (2 degrees of freedom) – this means small frictional losses at the control rings (6/15) and a cleaning effect in the sealing gap, approximately equal relative speeds of the sealing faces, sinusoidal opening function for the control openings – this means smooth running even at low speeds and quiet running at high speeds, large volume flow diameters between the rollers (27) in the roller bearing.

Adjustment of the play on the control rings (6/15) and the flats on the eccentric:
Hydrostatic, low control ring (6/15) force against the flats, pressure supported by spring washers (for zero and low pressure situations), hydrostatic play self-adjustment on the eccentric flats by means of a thrust piece (26) supported by a helical spring.

Very low leakage and small frictional losses, automatic compensation for pressure and temperature influences (temperature shocks among others), relatively insensitive to dirt.

Miniature shuttle valve (35,36):
The effect is that in the ring space between the control rings (6,15), the higher pressure connected to the motor is always effective.

Reliable play self-adjustment even at high reversion frequencies.
**Hydraulic characteristic values**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometr. displacement</td>
<td>81 [cm²/rev]</td>
</tr>
<tr>
<td>Theor. spec. torque</td>
<td>1.29 [Nm/bar]</td>
</tr>
<tr>
<td>Average spec. torque</td>
<td>1.15 [Nm/bar]</td>
</tr>
<tr>
<td>Peak pressure*</td>
<td>400 [bar]</td>
</tr>
<tr>
<td>Max. operating pressure**</td>
<td>315 [bar]</td>
</tr>
<tr>
<td>Continuous pressure</td>
<td>250 [Nm]</td>
</tr>
<tr>
<td>Max. operating torque</td>
<td>365 [Nm]</td>
</tr>
<tr>
<td>Continuous torque</td>
<td>290 [Nm]</td>
</tr>
<tr>
<td>Drain line pressure</td>
<td>max. 1 [bar]</td>
</tr>
<tr>
<td>Hydraulic fluid temperature range</td>
<td>243 - 363 [°C]</td>
</tr>
<tr>
<td>Viscosity range</td>
<td>30 - + 90 [mm²/s]</td>
</tr>
<tr>
<td>(max. 1000 mm²/s at start)</td>
<td></td>
</tr>
</tbody>
</table>

**Pressure fluids:**
- HFC: Reduce HFC pressure to 70 %
- Check the bearing service life
- HFD: Viton seals are required

**Filtering**
- Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9
- We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
- For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_{5} \geq 100$

**Characteristic values according to VDI 3278**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>40.0 [kg]</td>
</tr>
<tr>
<td>Mounting position</td>
<td>as required</td>
</tr>
<tr>
<td>Direction of rotation, if viewed at the shaft end</td>
<td></td>
</tr>
<tr>
<td>clockwise: flow from connection 2 to connection 1</td>
<td></td>
</tr>
<tr>
<td>anti-clockwise: flow from connection 1 to connection 2</td>
<td></td>
</tr>
<tr>
<td>Operating speed range</td>
<td>5 - 800 [rpm]</td>
</tr>
<tr>
<td>Moment of inertia</td>
<td>0.0017 [kgm²]</td>
</tr>
<tr>
<td>Continuous power</td>
<td>12.0 [kW]</td>
</tr>
<tr>
<td>Intermittent power</td>
<td>15.0 [kW]</td>
</tr>
</tbody>
</table>

**Type number key for radial piston motor RM 80 N**

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Motor type key</th>
<th>End cover</th>
<th>Seal</th>
<th>Second shaft</th>
<th>Flange additional specs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM 80N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Spline shaft**

- Leakage port G is 14 deep [561] for connections 1 + 2
- Counterbore φ 28 [1.102] 1.5 deep [0.059]

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Radial Piston Motor
RM 80N

Characteristics

Overall Efficiency

- Operating temperature: \(\theta = 50^\circ\text{C}\)
- Viscosity: \(\nu = 36 \text{ mm}^2 / \text{s} = 36 \text{ cSt}\)
- Outlet pressure: \(P_0 = 0\) bar
- Drain line pressure: \(P_D = 0\) bar

Service life of the roller bearings

Characteristics

Strength of the shaft

Example:
Given values: \(F_x = 15000\) N, \(x = 20\) mm, \(787\) in

Required value: Shaft strength

Draw a vertical line from \(F_x = 15000\) N to distance \(x = 20\) mm, \(787\) in and a straight horizontal line from there. If the intersection of the horizontal with the vertical line of \(P_0 = 210\) bar \([3046\) psi] is below curve the shaft has sufficient fatigue strength.

For shaft design, \(K_x\) and \(J_x\), at a higher duration of life.

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Subject to change without notice
Hydraulic characteristic values

<table>
<thead>
<tr>
<th>Geometr. displacement</th>
<th>[cm³/rev]</th>
<th>126</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theor. spec. torque</td>
<td>[Nm/bar]</td>
<td>2.0</td>
</tr>
<tr>
<td>Average spec. torque</td>
<td>[Nm/bar]</td>
<td>1.8</td>
</tr>
<tr>
<td>Peak pressure*</td>
<td>[bar]</td>
<td>350</td>
</tr>
<tr>
<td>Max. operating pressure**</td>
<td>[bar]</td>
<td>315</td>
</tr>
<tr>
<td>Continuous pressure</td>
<td>[bar]</td>
<td>200</td>
</tr>
<tr>
<td>Max. operating torque</td>
<td>[Nm]</td>
<td>567</td>
</tr>
<tr>
<td>Continuous torque</td>
<td>[Nm]</td>
<td>360</td>
</tr>
<tr>
<td>Drain line pressure</td>
<td>[bar]</td>
<td>max. 1</td>
</tr>
<tr>
<td>Hydraulic fluid temperature range</td>
<td>[°C]</td>
<td>243 - 363</td>
</tr>
<tr>
<td></td>
<td>[mm²/s]</td>
<td>30 - 90</td>
</tr>
<tr>
<td>Viscosity range</td>
<td>(max. 1000 mm²/s at start)</td>
<td></td>
</tr>
</tbody>
</table>

Pressure fluids:
- HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
- Mineral oil H-LP in conformity with DIN 51524 part 2.
- Bio-degradable fluids available on request.
  - Definition according to DIN 24 312.
  - Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
  - ** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

Bio-degradable fluids available on request.

Filtering
- Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
- We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$.
- For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_{5} \geq 100$.

Characteristic values according to VDI 3278

Weight: [kg] 40.0
Mounting position: as required
Direction of rotation, if viewed at the shaft end clockwise: flow from connection 2 to connection 1
Direction of rotation, if viewed at the shaft end anti-clockwise: flow from connection 1 to connection 2

Operating speed range: [rpm] 5 – 600
Moment of inertia: [kgm²] 0.0017
Continuous power: [kW] 12.0
Intermittent power: [kW] 15.0

Type number key for radial piston motor RM 125 N

Motor type: Radial Piston Motor
Size: 125 N
Shaft end: Spline Hollow Keyway
End cover: NBR without Instrument Driving
Seal: NBR Viton
Second shaft: normal ISO 3019/2
Flange: M ISO 3019/3
          Inch measurements in brackets

Additional specs.
- DIN ISO 3019/3
- Normal ISO 3019/2
Service life of the roller bearings

Strength of the shaft

Example:
Given values: \( F_x = 15000 \text{ N} [3372 \text{ lbf}] \) and \( x = 20 \text{ mm} [0.787 \text{ in}] \)
Required value: shaft strength

Draw a vertical line from \( F_x = 15000 \text{ N} [3372 \text{ lbf}] \) to a distance \( x = 20 \text{ mm} [0.787 \text{ in}] \) and a straight horizontal line from there. If the intersection of the horizontal with the vertical line of \( \Delta p = 210 \text{ bar} [3046 \text{ psi}] \) is below the curve, the shaft has sufficient fatigue strength. Allowable axial forces will be provided on request.
### Hydraulic characteristic values

<table>
<thead>
<tr>
<th>Geometr. displacement</th>
<th>[cm³/rev]</th>
<th>161</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theor. spec. torque</td>
<td>[N·m/bar]</td>
<td>2.56</td>
</tr>
<tr>
<td>Average spec. torque</td>
<td>[N·m/bar]</td>
<td>2.36</td>
</tr>
<tr>
<td>Peak pressure*</td>
<td>[bar]</td>
<td>400</td>
</tr>
<tr>
<td>Max. operating pressure**</td>
<td>[bar]</td>
<td>315</td>
</tr>
<tr>
<td>Continuous pressure</td>
<td>[bar]</td>
<td>250</td>
</tr>
<tr>
<td>Max. operating torque</td>
<td>[N·m]</td>
<td>750</td>
</tr>
<tr>
<td>Continuous torque</td>
<td>[N·m]</td>
<td>595</td>
</tr>
<tr>
<td>Drain line pressure</td>
<td>[bar]</td>
<td>max. 1</td>
</tr>
<tr>
<td>Hydraulic fluid temperature range</td>
<td>[°C]</td>
<td>243 - 363</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-30 - +90</td>
</tr>
<tr>
<td>Viscosity range</td>
<td></td>
<td>(max. 1000 mm²/s at start)</td>
</tr>
</tbody>
</table>

### Pressure fluids:

- HFC: Reduce HFC pressure to 70%  
- Definition to CETOP RP 77 H (mineral oil based fluids).
- HFD: Viton seals are required  
- Definition to CETOP RP 77 H ISO/DIS 6071

### Filtering

Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.

We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$.

For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_{10} \geq 100$.

### Characteristic values according to VDI 3278

| Weight | [kg] | 58.0 |
| Mounting position | as required |
| Direction of rotation, if viewed at the shaft end | clockwise: flow from connection 2 to connection 1  
anti-clockwise: flow from connection 1 to connection 2 |
| Operating speed range | [rpm] | 5 - 800 |
| Moment of inertia | [kg·m²] | 0.0023 |
| Continuous power | [kW] | 24.0 |
| Intermittent power | [kW] | 30.0 |

### Type number key for radial piston motor RM 160 N

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Size</th>
<th>Shaft end</th>
<th>End cover</th>
<th>Seal</th>
<th>Second shaft</th>
<th>Flange</th>
<th>additional specs</th>
</tr>
</thead>
</table>

### Inch measurements in brackets

Leakage port G = 1/4 deep (.551) for connections 1-1/2 displayed by 7/8"  
Counterbore ø 38 (1.500) 15 deep (.650)  
For clamps DIN 479
Radial Piston Motor
RM 160N

Characteristics

Operational Fluid
HM 46
Operating Temperature
50° C 

Characteristics

Overall Efficiency

Viscosity

Outlet Pressure

Drainline Pressure

Subject to change without notice

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Service life of the roller bearings

Strength of the shaft

Example:

Given values: \( F_y = 15000 \text{ N} \) [3372 lbf], \( x = 20 \text{ mm} \) [0.787 in]

```
\[
\begin{align*}
\Delta p & = 160 \text{ bar} [2321 \text{ psig}] \\
\phi & = 150 \text{ deg} [150 \text{ deg}]
\end{align*}
\]
```

Required value: Shaft strength

Draw a vertical line from \( F_y = 15000 \text{ N} \) [3372 lbf] to distance \( x = 20 \text{ mm} \) [0.787 in] and a straight horizontal line from there.

The intersection of the horizontal with the vertical line of \( \Delta p = 160 \text{ bar} [2321 \text{ psig}] \) below the curve has sufficient fatigue strength. Allowable axial forces will be provided on request.

Subject to change without notice
**Hydraulic characteristic values**

<table>
<thead>
<tr>
<th>Geometr. displacement [cm³/rev]</th>
<th>251</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theor. spec. torque [Nm/bar]</td>
<td>4.0</td>
</tr>
<tr>
<td>Average spec. torque [Nm/bar]</td>
<td>3.7</td>
</tr>
<tr>
<td>Peak pressure* [bar]</td>
<td>350</td>
</tr>
<tr>
<td>Max. operating pressure**</td>
<td>315</td>
</tr>
<tr>
<td>Continuous pressure [bar]</td>
<td>200</td>
</tr>
<tr>
<td>Max. operating torque [Nm]</td>
<td>1165</td>
</tr>
<tr>
<td>Continuous torque [Nm]</td>
<td>740</td>
</tr>
<tr>
<td>Drain line pressure [bar]</td>
<td>max. 1</td>
</tr>
<tr>
<td>Hydraulic fluid temperature range [°C]</td>
<td>-30 - +90</td>
</tr>
<tr>
<td>Viscosity range [mm²/s]</td>
<td>(max. 1000 mm²/s at start)</td>
</tr>
</tbody>
</table>

**Pressure fluids:**
- HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
- Mineral oil H-LP in conformity with DIN 51524 part 2.
- Bio-degradable fluids available on request.

* Definition according to DIN 24 312. Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

**Filtering**
- Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
- We recommend filters with a minimum retention rate of β₁₀ ≥ 100.
- For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of β₅ ≥ 100.

**Characteristic values according to VDI 3278**

- Weight: 58.0 [kg]
- Mounting position: as required
- Direction of rotation, if viewed at the shaft end: clockwise: flow from connection 2 to connection 1, anti-clockwise: flow from connection 1 to connection 2
- Operating speed range: [rpm] 5 - 600
- Moment of inertia: [kgm²] 0.0023
- Continuous power: [kW] 24.0
- Intermittent power: [kW] 30.0

**Type number key for radial piston motor RM 250 N**

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Size</th>
<th>Shaft end</th>
<th>End cover</th>
<th>Seal</th>
<th>Second shaft</th>
<th>Flange</th>
<th>additional specs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM 250 N</td>
<td></td>
<td>Spline</td>
<td>Keyway</td>
<td>NBR</td>
<td>without</td>
<td>M</td>
<td>ISO 3019/2</td>
</tr>
</tbody>
</table>

**RM 250 NZA1**

- **Filtering**
  - Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
  - We recommend filters with a minimum retention rate of β₁₀ ≥ 100.
- For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of β₅ ≥ 100.

**Characteristic values according to VDI 3278**

- Weight: 58.0 [kg]
- Mounting position: as required
- Direction of rotation, if viewed at the shaft end: clockwise: flow from connection 2 to connection 1, anti-clockwise: flow from connection 1 to connection 2
- Operating speed range: [rpm] 5 - 600
- Moment of inertia: [kgm²] 0.0023
- Continuous power: [kW] 24.0
- Intermittent power: [kW] 30.0

**Type number key for radial piston motor RM 250 N**

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Size</th>
<th>Shaft end</th>
<th>End cover</th>
<th>Seal</th>
<th>Second shaft</th>
<th>Flange</th>
<th>additional specs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM 250 N</td>
<td></td>
<td>Spline</td>
<td>Keyway</td>
<td>NBR</td>
<td>without</td>
<td>M</td>
<td>ISO 3019/2</td>
</tr>
</tbody>
</table>

**RM 250 NZA1**

- **Filtering**
  - Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
  - We recommend filters with a minimum retention rate of β₁₀ ≥ 100.
- For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of β₅ ≥ 100.

**Characteristic values according to VDI 3278**

- Weight: 58.0 [kg]
- Mounting position: as required
- Direction of rotation, if viewed at the shaft end: clockwise: flow from connection 2 to connection 1, anti-clockwise: flow from connection 1 to connection 2
- Operating speed range: [rpm] 5 - 600
- Moment of inertia: [kgm²] 0.0023
- Continuous power: [kW] 24.0
- Intermittent power: [kW] 30.0

**Type number key for radial piston motor RM 250 N**

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Size</th>
<th>Shaft end</th>
<th>End cover</th>
<th>Seal</th>
<th>Second shaft</th>
<th>Flange</th>
<th>additional specs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM 250 N</td>
<td></td>
<td>Spline</td>
<td>Keyway</td>
<td>NBR</td>
<td>without</td>
<td>M</td>
<td>ISO 3019/2</td>
</tr>
</tbody>
</table>
Radial Piston Motor

Service life of the roller bearings

Strength of the shaft

Example:

Given values: $F_r = 15000 \text{ N [3372 lbf]}$, $x = 20 \text{ mm [7.87 in]}$

- $P = 160 \text{ bar [2321 psi]}$

Required value: Shaft strength

Draw a vertical line from $F_r = 15000 \text{ N [3372 lbf]}$ to $x = 20 \text{ mm [7.87 in]}$ and a straight horizontal line from there. If the intersection of the horizontal with the vertical line of $P = 160 \text{ bar [2321 psi]}$ is below curve the shaft has sufficient fatigue strength. Allowable axial forces will be provided on request.
Radial Piston Motor
KM 11 - M 110
Measuring shaft, 2nd. shaft M10

Measuring shaft design: M
Radial piston motors Type Km 11 - KM 110 with the type key "M" are equipped with a measuring shaft to determine the motor speed. The measuring shaft is rigidly connected to the motor-driven shaft and transmits a maximum torque of 5 Nm. If you require a higher torque, please approach the manufacturer or distributor. Please request the documentation on the mounting of the encoder, pulse transmitter and AC transmitters.

Motors with continuous driven shaft: M10 (only for KM 22 to KM 110)
These radial piston motors can be supplied with a one-piece driven shaft, type designation M10, for the transmission of the full motor torque. Cylindrical shaft design available on request.

Splined shaft and hub connection
DIN 5480
W 28 x 1.25 x 21 x 7h

Centre hole DS M8 x 19 deep DIN 332
4 threaded holes M6 x 8 deep on reference circle ø63

KM 45ZAM
KM 63ZAM

KM 45ZAM10
KM 63ZAM10

4 threaded holes M6 x 8 deep on reference circle ø63

Subject to change without notice
Radial Piston Motor
KM 22 - KM 110
Shaft design K, Face attachment F3

Shaft design : K
Splined shaft and hub connection
W30x1.25x22x7h
DIN 5480

Centre hole DS M8 x 19 deep DIN 332

Face attachment : F3
7 additional attachment holes M8 x 11 deep on reference circle φ140
Measuring shaft design: M
Radial piston motors Type RM 80N - RM 250N with the type key "M" are equipped with a measuring shaft to determine the motor speed. The measuring shaft is rigidly connected to the motor-driven shaft and transmits a maximum torque of 5 Nm. If you require a higher torque, please approach the manufacturer or distributor. Please request the documentation on the mounting of the encoder, pulse transmitter and AC transmitters.

4 threaded holes M6x10 deep on screw hole circle diameter 63
DÜSTERLOH has been developing fluid technology products for more than 100 years. The drives, controls and hydraulic power units from Hattingen are appreciated throughout the world for their complete reliability; including under extreme conditions. The owner-managed company’s own development and construction department and the wide range of products cater for distinctive flexibility and customer-orientation.

**Products**

- Hydraulic radial piston motors
- Hydraulic axial piston motors
- Pneumatic motors
- Pneumatic starters
- Hydraulic and pneumatic controls
- Hydraulic power units

Designing controls and hydraulic power units specific to the customer is our company’s major strength. Vast product diversity is also available for standardised products.

**Industrial areas of application**

- Machine tools
- Smelting and rolling mill equipment
- Foundry machines
- Testing machines
- Shipbuilding (diesel engines)
- Offshore technology
- Printing and paper technology
- Vehicle construction
- Manipulators
- Environmental technology
- Mining equipment
- Materials handling equipment