Fixed Displacement Motor A2FM
open and closed circuits

Sizes 5...1000
Series 6
Nom. Pressure up to 400 bar
Peak Pressure up to 450 bar

Index

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Features
– Fixed displacement motor A2FM of axial piston, bent axis design, suitable for hydrostatic drives in open and closed circuits
– Use in mobile and industrial applications
– Output speed is proportional to input flow and inversely proportional to displacement
– Drive torque increases with the pressure drop across the unit
– Careful selection of the displacements offered, permit sizes to be matched to practically every application
– Favourable power / weight ratio
– Compact design
– Optimum efficiency
– Economical conception
– One piece pistons with piston rings
**Ordering Code / Standard Program**

(Ordering code size 5 see page 8)

**Hydraulic fluid**

- Mineral oil (no code)
- HFB-, HFC-, HFD- sizes 10...200 (no code)
- Hydraulic fluid sizes 250...1000 (only in connection with drive shaft bearings "L")

**Axial piston unit**

- Bent axis design, fixed displacement

**Drive shaft bearings**

- Mechanical bearings
- Long-Life bearings

**Mode of operation**

- Motor (Plug-in motor A2FE see RE 91 008)

**Size**

<table>
<thead>
<tr>
<th>Size</th>
<th>5</th>
<th>10</th>
<th>12</th>
<th>16</th>
<th>23</th>
<th>28</th>
<th>32</th>
<th>45</th>
<th>56</th>
<th>63</th>
<th>80</th>
<th>90</th>
<th>107</th>
<th>125</th>
<th>160</th>
<th>180</th>
<th>200</th>
<th>250</th>
<th>355</th>
<th>500</th>
<th>710</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement Vg (cm³)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Series**

- Sizes 5...200: production Elchingen Plant; Sizes 250...1000: production Horb Plant

**Index**

- sizes 10...180
- size 200
- sizes 250...1000

**Direction of rotation**

- viewed on shaft end
- alternating

**Seals**

- FKM (flour-caoutchouc)

**Shaft end**

- Splined shaft
- DIN 5480
- Parallel shaft with key, DIN 6885

**Mounting flange**

- ISO 4-hole
- ISO 8-hole

- = available
- = not available
- = preferred program (preferred types see page 13)

Brueninghaus Hydromatik
| Service line connections | 10 | 12 | 16 | 23 | 28 | 45 | 56 | 63 | 80 | 90 | 107 | 125 | 160 | 180 | 200 | 250 | 350 | 500 | 710 | 1000 |
|-------------------------|----|----|----|----|----|----|----|----|----|----|------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|
| Ports A and B, SAE, at rear end | 01 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | 010 |
| Ports A and B, SAE, opposite side | 02 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | 020 |
| Ports A and B, threads, at side, opposite side | 03 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | 030 |
| Ports A and B, threads, at side and rear end | 04 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | 040 |
| Ports A and B, SAE, at side, same side | 10 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | 100 |
| port plate with press. relief valve and built-on motion control valve | 18 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | 181 |
| Port plate with integrated pressure relief valves | 19 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | 191 |

<table>
<thead>
<tr>
<th>Valves</th>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>without valves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with pressure relief valves (without pressure sequence range)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with pressure relief valves (with pressure sequence range)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with integrated flushing valve</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with built-on flushing and boost valve</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Speed sensing control</th>
<th>10...16</th>
<th>23...180</th>
<th>200</th>
<th>250...1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>without speed sensing control (no code)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>prepared for speed sensing control</td>
<td>—</td>
<td>●</td>
<td>—</td>
<td>●</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Special design</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>without special design (standard type, no code)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>special design for slew drive applications (standard for port plate 19)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Threads of fixing screws and service lines are metric
2) Ports at rear end are plugged
Technical Data

Fluid
To review the application of A2FM motors with the selected hydraulic fluid, detailed fluid compatibility and application data can be found in data sheets RE 90220 (mineral oil), RE 90221 (environmentally acceptable hydraulic fluids) and RE 90223 (fire resistant fluids, HF).

The fixed motor A2FM is not suitable for operation with HFA. When using HFB-, HFC-, HFD- or environmentally acceptable hydraulic fluids possible limitations for the technical data have to be taken into consideration. If necessary please consult our technical department (please indicate type of the hydraulic fluid used for your application on the order sheet).

Operating viscosity range
In order to obtain optimum efficiency and service life, we recommend that the operating viscosity (at operating temperature) be selected from within the range

\[ \nu_{\text{opt}} = \text{opt. operating viscosity} \ 16...36 \text{ mm}^2/\text{s} \]

referred to the loop temperature (closed circuit) or tank temperature (open circuit).

Viscosity limits
The limiting values for viscosity are as follows:

sizes 5...200
\[ \nu_{\text{min}} = 5 \text{ mm}^2/\text{s}, \text{ short term at a max. permissible temperature of } t_{\text{max}} = 115^\circ \text{C} \]
\[ \nu_{\text{max}} = 1600 \text{ mm}^2/\text{s}, \text{ short term on cold start } (t_{\text{min}} = -40^\circ \text{C}) \]

sizes 250...1000
\[ \nu_{\text{min}} = 10 \text{ mm}^2/\text{s}, \text{ short term at a max. permissible leakage oil temp. of } t_{\text{max}} = 90^\circ \text{C} \]
\[ \nu_{\text{max}} = 1000 \text{ mm}^2/\text{s}, \text{ short term on cold start } (t_{\text{max}} = -25^\circ \text{C}) \]

Please note that the max. fluid temperature is also not exceeded in certain areas (for instance bearing area).

At temperatures of -25°C up to -40°C special measures may be required for certain installation positions. Please contact us for further information.

Selection diagram

Notes on the selection of the hydraulic fluid
In order to select the correct fluid, it is necessary to know the operating temperature in the loop (closed circuit) or the tank temperature (open circuit) in relation to the ambient temperature.

The hydraulic fluid should be selected so that within the operating temperature range, the operating viscosity lies within the optimum range \( \nu_{\text{opt}} \) (see shaded section of the selection diagram). We recommend that the highest possible viscosity range should be chosen in each case.

Example: At an ambient temperature of \( X^\circ \text{C} \) the operating temperature (closed circuit: loop temperature; open circuit: tank temperature) is 60°C. Within the operating viscosity range \( \nu_{\text{opt}} \) (shaded area), this corresponds to viscosity ranges VG 46 or VG 68. VG 68 should be selected.

Important: The leakage oil (case drain oil) temperature is influenced by pressure and motor speed and is always higher than the circuit or tank temperature. However, at no point in the circuit may the temperature exceed 115°C for sizes 5...200 or 90°C for sizes 250...1000.

If it is not possible to comply with the above conditions because of extreme operating parameters or high ambient temperatures please consult us.

Filtration
The finer the filtration the better the achieved purity grade of the pressure fluid and the longer the life of the axial piston unit. To ensure the functioning of the axial piston unit a minimum purity grade of

9 to NAS 1638
18/15 to ISO/DIS 4406 is necessary.

At very high temperatures of the hydraulic fluid (90°C to max. 115°C, not permissible for sizes 250...1000) at least cleanliness class

8 to NAS 1638
17/14 to ISO/DIS 4406 is necessary.

If above mentioned grades cannot be maintained please consult us.
Technical Data

**Working pressure range**

maximum pressure at port A or B (Pressure data to DIN 24312)

<table>
<thead>
<tr>
<th>Size S</th>
<th>Shaft end B</th>
<th>Shaft end C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal pressure $p_{N}$</td>
<td>210 bar</td>
<td>315 bar</td>
</tr>
<tr>
<td>Peak pressure $p_{\text{max}}$</td>
<td>250 bar</td>
<td>350 bar</td>
</tr>
</tbody>
</table>

**Size 10...200**

<table>
<thead>
<tr>
<th>Shaft end A, Z</th>
<th>Shaft end B, P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal pressure $p_{N}$</td>
<td>400 bar</td>
</tr>
<tr>
<td>Peak pressure $p_{\text{max}}$</td>
<td>450 bar</td>
</tr>
</tbody>
</table>

1) Attention: shaft end Z and P with drives of radial force loads at the drive shaft necessitate reduction of the nominal pressure to $p_{N} = 315$ bar.

2) Shaft end Z to size 56: $p_{N} = 350$ bar, $p_{\text{max}} = 400$ bar

**Sizes 250...1000**

| Nominal pressure $p_{N}$ | 350 bar |
| Peak pressure $p_{\text{max}}$ | 400 bar |

With pulsating loads above 315 bar we recommend using the model with splined shaft, standard version A (sizes 10...200) or with splined shaft Z (sizes 250...1000).
The summ of the pressures at ports A and B may not exceed 700 bar (630 bar, A2F 5).

**Direction of flow**

Clockwise rotation Anti-clockwise rotation

A to B B to A

**Speed range**

There is no limitation on minimum speed $n_{\text{min}}$. If uniformity of rotation is required, however, speed $n_{\text{min}}$ should not be allowed to fall below 50 rpm. See table on page 6 for max. permissible speeds.

**Long-Life bearings (L)** (sizes 250...1000)

(for high life expectancy and use of HF-fluids)
The outer dimensions of the axial piston motors are identical to standard design (without long life bearings). The change from standard design to long life bearing system is possible.
We recommend to apply bearing flushing at port U.

**Bearing flushing**

For sizes 250…1000 bearing and housing flushing is possible through port U.

**Flows (recommendation)**

<table>
<thead>
<tr>
<th>Sizes</th>
<th>250</th>
<th>355</th>
<th>500</th>
<th>710</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>$q_{\text{flush}}$ (L/min)</td>
<td>10</td>
<td>16</td>
<td>20</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

**Case drain pressure**

Shaft seal ring FKM (fluor-caoutchouc)
The lower the speed and the case drain pressure the higher the life expectation of the shaft seal ring. The values shown in the diagram are permissible loads of the seal ring and shall not be exceeded.

At stationary pressure loads in the range of the max. admissible leakage pressure a reduction of the life experience of the seal ring will result.

For a short period ($t < 5$ min.) are for the sizes 10...200 pressure loads up to 5 bar independent from rotational speeds are permissible.

**Sizes 10...200**

![Graph showing case drain pressure and speed relation](image)

**Sizes 250...1000**

![Graph showing case drain pressure and speed relation](image)

Note:
- max. permissible motor speeds are given in the table on page 6
- max. perm. housing pressure $p_{\text{abs. max.}} = 10$ bar (sizes 5...200) $p_{\text{abs. max.}} = 6$ bar (sizes 250...1000)
- the pressure in the housing must be the same as or greater than the external pressure on the shaft seal.

**Symbol**

**Connections**

A, B Service line ports
T Drain port
**Technical Data**

**Table of values** (theoretical values, without considering \( \eta_{\text{mh}} \) and \( \eta_{v} \); values rounded)

<table>
<thead>
<tr>
<th>Size</th>
<th>5</th>
<th>10</th>
<th>12</th>
<th>16</th>
<th>23</th>
<th>28</th>
<th>32</th>
<th>45</th>
<th>56</th>
<th>63</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>( V_g ) cm(^3)</td>
<td>4,93</td>
<td>10,3</td>
<td>12</td>
<td>16</td>
<td>22,9</td>
<td>28,1</td>
<td>32</td>
<td>45,6</td>
<td>56,1</td>
<td>63</td>
</tr>
<tr>
<td>Max. Speed</td>
<td>( n_{\text{max}} ) min(^{-1})</td>
<td>10 000</td>
<td>8000</td>
<td>8000</td>
<td>8000</td>
<td>6300</td>
<td>6300</td>
<td>6300</td>
<td>5600</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>( n_{\text{max \text{ intermit.}}} )</td>
<td>11 000</td>
<td>8800</td>
<td>8800</td>
<td>8800</td>
<td>6900</td>
<td>6900</td>
<td>6900</td>
<td>6200</td>
<td>5500</td>
<td>5500</td>
</tr>
<tr>
<td>Max. flow</td>
<td>( q_{v \text{ max}} ) L/min</td>
<td>49</td>
<td>82</td>
<td>96</td>
<td>128</td>
<td>144</td>
<td>176</td>
<td>201</td>
<td>255</td>
<td>280</td>
<td>315</td>
</tr>
<tr>
<td>Torque constants</td>
<td>( T_k ) Nm/bar</td>
<td>0,076</td>
<td>0,164</td>
<td>0,19</td>
<td>0,25</td>
<td>0,36</td>
<td>0,445</td>
<td>0,509</td>
<td>0,725</td>
<td>0,89</td>
<td>1,0</td>
</tr>
<tr>
<td>Torque at ( \Delta p = 350 \text{ bar} )</td>
<td>( T ) Nm</td>
<td>24,7</td>
<td>57</td>
<td>67</td>
<td>88</td>
<td>126</td>
<td>156</td>
<td>178</td>
<td>254</td>
<td>312</td>
<td>350</td>
</tr>
<tr>
<td></td>
<td>( \Delta p = 400 \text{ bar} )</td>
<td>( T ) Nm</td>
<td>–</td>
<td>65</td>
<td>76</td>
<td>100</td>
<td>144</td>
<td>178</td>
<td>204</td>
<td>290</td>
<td>356</td>
</tr>
<tr>
<td>Case volume</td>
<td>L</td>
<td>0,17</td>
<td>0,17</td>
<td>0,17</td>
<td>0,20</td>
<td>0,20</td>
<td>0,20</td>
<td>0,33</td>
<td>0,45</td>
<td>0,45</td>
<td>0,55</td>
</tr>
<tr>
<td>Moment of inertia about drive axis</td>
<td>( J ) kgm(^2)</td>
<td>0,000084</td>
<td>0,0004</td>
<td>0,0004</td>
<td>0,0012</td>
<td>0,0012</td>
<td>0,0012</td>
<td>0,0024</td>
<td>0,0042</td>
<td>0,0042</td>
<td>0,0072</td>
</tr>
<tr>
<td>Weight (approx.)</td>
<td>m</td>
<td>2,5</td>
<td>5,4</td>
<td>5,4</td>
<td>5,4</td>
<td>9,5</td>
<td>9,5</td>
<td>9,5</td>
<td>13,5</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

1) Intermittent max. speed: overspeed at discharge and overtaking travel operations, \( t < 5 \text{ sek.} \) and \( \Delta p < 150 \text{ bar} \)

2) \( \Delta p = 315 \text{ bar} \)

**Calculation of size**

\[
q_{v} = \frac{V_g \cdot n}{1000 \cdot \eta_v} \quad \text{in L/min}
\]

\[
T = \frac{V_g \cdot \Delta p \cdot \eta_{\text{mh}}}{20 \cdot \pi} \quad \text{in Nm}
\]

\[
T = \frac{T_k \cdot \Delta p \cdot \eta_{\text{mh}}}{20 \cdot \pi} \quad \text{or in Nm}
\]

\[
\text{Output power} \quad P = \frac{2 \pi \cdot T \cdot n}{60 000} = \frac{T \cdot n}{9549}
\]

\[
= \frac{q_{v} \cdot \Delta p}{600} \cdot \eta_{t} \quad \text{in kW}
\]
Technical Data

Output drive
Permissible axial and radial loads on drive shaft
The values given are maximum values and do not apply to continuous operation

<table>
<thead>
<tr>
<th>Size</th>
<th>5</th>
<th>10</th>
<th>12</th>
<th>16</th>
<th>23</th>
<th>28</th>
<th>32</th>
<th>45</th>
<th>56</th>
<th>63</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>a (mm)</td>
<td>12</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>F_q max (N)</td>
<td>710</td>
<td>2350</td>
<td>2750</td>
<td>3700</td>
<td>4300</td>
<td>5400</td>
<td>6100</td>
<td>8150</td>
<td>9200</td>
<td>10300</td>
<td>11500</td>
</tr>
<tr>
<td>±F_ax max (N)</td>
<td>180</td>
<td>320</td>
<td>320</td>
<td>320</td>
<td>500</td>
<td>500</td>
<td>630</td>
<td>800</td>
<td>800</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>±F_ax perm./bar N/bar</td>
<td>1,5</td>
<td>3,0</td>
<td>3,0</td>
<td>3,0</td>
<td>5,2</td>
<td>5,2</td>
<td>5,2</td>
<td>7,0</td>
<td>8,7</td>
<td>8,7</td>
<td>10,6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>90</th>
<th>107</th>
<th>125</th>
<th>160</th>
<th>180</th>
<th>200</th>
<th>250</th>
<th>355</th>
<th>500</th>
<th>710</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>a (mm)</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>41</td>
<td>52,5</td>
<td>67,5</td>
<td>67,5</td>
<td></td>
</tr>
<tr>
<td>F_q max (N)</td>
<td>12900</td>
<td>13600</td>
<td>15900</td>
<td>18400</td>
<td>20600</td>
<td>22900</td>
<td>1200</td>
<td>1900</td>
<td>3000</td>
<td>2600</td>
<td></td>
</tr>
<tr>
<td>±F_ax max (N)</td>
<td>1000</td>
<td>1250</td>
<td>1250</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
<td>1200</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>±F_ax perm./bar N/bar</td>
<td>6,2</td>
<td>12,9</td>
<td>12,9</td>
<td>16,7</td>
<td>16,7</td>
<td>16,7</td>
<td>4000</td>
<td>5000</td>
<td>6250</td>
<td>10000</td>
<td>10000</td>
</tr>
</tbody>
</table>

1) Axial piston unit stationary or in bypass operation, please contact us when appearing higher forces!
2) Please contact us!

Code explanation

- a = distance of F_q from shaft shoulder
- F_q max = max. perm. radial force at distance a
  (at intermittent operation)
- ±F_ax max = max. perm. axial force when stationary
  or when axial piston unit is running at zero pressure
- ±F_ax perm./bar = perm. axial force/bar operating pressure

The direction of the max. perm. axial force must be noted by sizes 28...200:

- - F_ax = increases bearing life
- + F_ax = reduces bearing life
  (avoid if possible)

Optimal force direction of F_q (valid for sizes 10...180)
By means of appropriate force directions of F_q the bearing load caused by inside rotary group forces can be reduced. An optimal life expectation of the bearing can be reached.

Minimum inlet pressure at port A (B)
In order to avoid damage of the variable motor a minimum inlet pressure at the inlet zone must be assured. The minimum inlet pressure is related to the rotational speed of the fixed motor.
Axial piston unit
Bent axis design, fixed displacement A2F

Size
- Displacement \( V_g \) (cm\(^3\)) 5

Direction of rotation
viewed on shaft end alternating W

Series
6.0

Shaft end
- Parallel shaft with key DIN 6885 B
- Tapered shaft with spigot and spring washer DIN 6888 C

Service line connections
Threads at side, metric 3

Seals
The fixed motor A2F5 is equipped with NBR- (Nitril-caoutchouc) Seals in standard design.
In case of need FKM- (fluor-caoutchouc) seals please indicate when ordering in clear text: “with FKM-seals”

Unit Dimensions, Size 5
Before finalising your design, please request a certified drawing.

Shaft ends
- B Parallel shaft with key, DIN 6885 A4x4x20, \( p_N = 210 \) bar
- C Tapered shaft with spigot and spring washer 3x5, DIN 6888, \( p_N = 315 \) bar

Connections
- B, (A) Service line ports M 18x1.5
- T Drain port M 10x1, both sides
Unit Dimensions, Sizes 10, 12, 16

Before finalising your design, please request a certified drawing.

Connections
- A, B Service line ports (see port plates)
- T₁, T₂ Drain ports (1 port plugged) M 12x1,5

Port plates
- **03** Threaded ports, at side
- **04** Threaded ports, at side and rear end

Shaft ends
- **Sizes 10, 12, 16**
  - **A** Splined shaft, DIN 5480
    - W 25x1,25x30x18x9g
    - pₙ = 400 bar
  - **Z** Splined shaft, DIN 5480
    - W 20x1,25x30x14x9g
    - pₙ = 400 bar
- **Sizes 10, 12**
  - **B** Parallel shaft with key, DIN 6885, AS 8x7x32
    - pₙ = 350 bar
  - **P** Parallel shaft with key, DIN 6885, AS 6x6x32
    - pₙ = 350 bar

Port plates
- A, B Service line ports M 22x1,5
- A, B, A₁, B₁ Service line ports M 22x1,5
Unit Dimensions, Sizes 23, 28, 32

Before finalising your design, please request a certified drawing.

Connections
A, B  Service line ports (see port plates)
T₁, T₂  Drain ports (1 port plugged)  M 16×1,5

Port plates

01  SAE-ports, at rear end
A, B  Service line ports
420 bar (6000 psi) high pressure series
SAE 1/2"

02  SAE-ports, at side
A, B  Service line ports
420 bar (6000 psi) high pressure series
SAE 1/2"

03  Threaded ports, at side
A, B  Service line ports
M 27×2

04  Threaded ports, at side and rear end
A, B, A₁, B₁  Service line ports
M 27×2
**Unit Dimensions, Sizes 23, 28, 32**

**Port plates**

10 SAE-ports, at side, same side

---

**Shaft ends**

**Sizes 23, 28, 32**

- **A** Splined shaft, DIN 5480
  - W 30x2x30x14x9g
  - \( p_N = 400 \text{ bar} \)

- **Z** Splined shaft, DIN 5480
  - W 25x1,25x30x18x9g
  - \( p_N = 400 \text{ bar} \)

- **B** Parallel shaft with key, DIN 6885, AS 8x7x40
  - \( p_N = 350 \text{ bar} \)

- **P** Parallel shaft with key, DIN 6885, AS 8x7x40
  - \( p_N = 350 \text{ bar} \)

---

Before finalising your design, please request a certified drawing.
Unit Dimensions, Size 45

Before finalising your design, please request a certified drawing.

Connections
- A, B  Service line ports (see port plates)
- T1, T2  Drain ports (1 port plugged)  M 18 x 1.5

Port plates

01  SAE-ports, at rear end

A, B  Service line ports
420 bar (6000 psi) high pressure series  SAE 3/4"

02  SAE-ports, at side

A, B  Service line ports
420 bar (6000 psi) high pressure series  SAE 3/4"

04  Threaded ports, at side and rear end

A, B, A1, B1  Service line ports  M 33 x 2

10  SAE-ports, at side, same side

A, B  Service line ports
420 bar (6000 psi) high pressure series  SAE 3/4"
**Unit Dimensions, Size 45**

**Shaft ends**
- **A** Spline shaft, DIN 5480
  - W 32x2x30x14x9g
  - $p_n = 400$ bar
- **Z** Spline shaft, DIN 5480
  - W 30x2x20x14x9g
  - $p_n = 400$ bar
- **P** Parallel shaft with key,
  - DIN 6885, AS 8x7x50
  - $p_n = 350$ bar

Before finalising your design, please request a certified drawing.

**Preferred types** (please state type and ident-no. when ordering)

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</table>
Unit Dimensions, Sizes 56, 63

Before finalising your design, please request a certified drawing.

Connections
A, B Service line ports (see port plates)
T₁, T₂ Drain ports (1 port plugged)

Port plates

01 SAE-ports, at rear end

A, B Service line ports
420 bar (6000 psi) high pressure series

02 SAE-ports, at side

A, B Service line ports
420 bar (6000 psi) high pressure series

04 Threaded ports, at side and rear end

A, B, A₁, B₁ Service line ports

10 SAE-ports, at side, same side

A, B Service line ports
420 bar (6000 psi) high pressure series

Brueninghaus Hydromatik
Shaft ends

Sizes 56, 63
A  Splined shaft, DIN 5480
   W 35x2x30x16x9g
   $p_N = 400$ bar

Sizes 56, 63
B  Parallel shaft with key,
    DIN 6885, AS 10x8x50
    $p_N = 350$ bar

Sizes 56
Z  Splined shaft, DIN 5480
   W 30x2x30x14x9g
   $p_N = 350$ bar

Sizes 56
P  Parallel shaft with key,
    DIN 6885, AS 8x7x50
    $p_N = 350$ bar

Before finalising your design, please request a certified drawing.
Unit Dimensions, Sizes 80, 90

Connections
A, B Service line ports (see port plates)
T₁, T₂ Drain ports (1 port plugged) M 18x1,5

Port plates
01 SAE-ports, at rear end
02 SAE-ports, at side
10 SAE-ports, at side, same side

Shaft ends
Sizes 80, 90
A Splined shaft, DIN 5480
W 40x2x30x18x9g
pₙ = 400 bar
Z Splined shaft, DIN 5480
W 35x2x30x16x9g
pₙ = 400 bar
B Parallel shaft with key, DIN 6885, AS 12x8x56
pₙ = 350 bar
P Parallel shaft with key, DIN 6885, AS 10x8x56
pₙ = 350 bar

Before finalising your design, please request a certified drawing.
**Unit Dimensions, Sizes 107, 125**

Before finalising your design, please request a certified drawing.

**Connections**
- A, B Service line ports (see port plates)
- T₁, T₂ Drain ports (1 port plugged)

**Port plates**

- **01** SAE-ports, at rear end
  - A, B Service line ports
  - SAE $1\frac{1}{4}"$ (420 bar (6000 psi) high pressure series)

- **02** SAE-ports, at side
  - (Klammermaße für NG 107!)
  - A, B Service line ports
  - SAE $1\frac{1}{4}"$ (420 bar (6000 psi) high pressure series)

- **10** SAE-ports, at side, same side
  - A, B Service line ports
  - SAE $1\frac{1}{4}"$ (420 bar (6000 psi) high pressure series)

**Shaft ends**

- **Sizes 107, 125**
  - **A** Splined shaft, DIN 5480
    - W 45x2x30x21x9g
    - $p_N = 400$ bar
  - **Z** Splined shaft, DIN 5480
    - W 40x2x30x18x9g
    - $p_N = 400$ bar

- **Size 107**
  - **B** Parallel shaft with key,
    - DIN 6885, AS 14x9x63
    - $p_N = 350$ bar

- **Sizes 107, 125**
  - **P** Parallel shaft with key,
    - DIN 6885, AS 12x8x63
    - $p_N = 350$ bar

---

A2FM
17/28
Brueninghaus Hydromatik
Unit Dimensions, Sizes 160, 180

Before finalising your design, please request a certified drawing.

Port plates

01 SAE-ports, at rear end

02 SAE-ports, at side

10 SAE-ports, at side, same side

Shaft ends

Sizes 160, 180
A Splined shaft, DIN 5480
W 50x2x30x24x9g
pN = 400 bar

Z Splined shaft, DIN 5480
W 45x2x30x21x9g
pN = 400 bar

Sizes 160, 180
B Parallel shaft with key,
DIN 6885, AS 14x9x70
pN = 350 bar

Size 160
P Parallel shaft with key,
DIN 6885, AS 14x9x70
pN = 350 bar
Unit Dimensions, Size 200

Connections
A, B Service line ports (see port plates)
T₁, T₂ Drain ports (1 port plugged) M 22x1,5

Port plates
01 SAE-port, at rear end
A, B Service line ports SAE 1 1/4" 420 bar (6000 psi) high pressure series

Shaft ends
A Splined shaft, DIN 5480
W 50x2x30x24x9g
pₙ = 400 bar

B Parallel shaft with key, DIN 6885, AS 14x9x80
pₙ = 350 bar

Before finalising your design, please request a certified drawing.
Unit Dimensions, Size 250

Before finalising your design, please request a certified drawing.

Connections
A, B Service line ports (see port plates) M 22x1,5
T1, T2 Drain ports (1 port plugged) M 22x1,5
U Port for bearing flushing (plugged) M 14x1,5

Port plates

01 SAE-ports, at rear end

A, B Service line ports high pressure series SAE 1⅛"

02 SAE-ports, at side

A, B Service line ports high pressure series SAE 1⅛"

Shaft ends

Z Splined shaft, DIN 5480 W 50x2x30x24x9g
pN = 350 bar

P Parallel shaft with key, DIN 6885, AS 14x9x80
pN = 350 bar
Unit Dimensions, Size 355

Before finalising your design, please request a certified drawing.

Port plate 01

Port plate 10

Connections

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
<th>SAE</th>
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<tr>
<td>A, B</td>
<td>Service line ports</td>
<td>1 1/2&quot;</td>
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<tr>
<td>T</td>
<td>Drain ports (1 port plugged)</td>
<td>33x2</td>
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<td>U</td>
<td>Port for bearing flushing (plugged)</td>
<td>14x1,5</td>
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<tr>
<td>MA, MB</td>
<td>Test ports operating pressure (plugged)</td>
<td>14x1,5</td>
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Shaft ends

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<th>Type</th>
<th>Description</th>
<th>Pressure</th>
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<tr>
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<td>Splined shaft, DIN 5480 W 60x2x30x28x9g</td>
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<tr>
<td>P</td>
<td>Parallel shaft with key, DIN 6885, AS 18x11x100</td>
<td>350 bar</td>
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</table>
Unit Dimensions, Size 500

Before finalising your design, please request a certified drawing.

Connections

A, B  Service line ports  
      high pressure series  
T  Drain ports (1 port plugged)  
U  Port for bearing flushing (plugged)  
Mₘₐ, Mₜ  Test ports operating pressure (plugged)

Shaft ends

Z  Splined shaft, DIN 5480  
W 70x3x30x22x9g  
pₚ = 350 bar

P  Parallel shaft with key,  
DIN 6885, AS 20x12x100  
pₚ = 350 bar
Unit Dimensions, Size 710

Before finalising your design, please request a certified drawing.

Connections

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<td>M 18x1,5</td>
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<td>Mₐ, Mₜ</td>
<td>Test ports operating pressure (plugged)</td>
<td>M 14x1,5</td>
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Shaft ends

Z Splined shaft, DIN 5480
W 90x3x30x28x9g
pₜₐ = 350 bar

P Parallel shaft with key,
DIN 6885, AS 25x14x125
pₜₐ = 350 bar
Unit Dimensions, Size 1000

Connections

A, B  Service line ports  high pressure series  SAE 2"
T  Drain ports (1 port plugged)  M 42x2
U  Port for bearing flushing (plugged)  M 18x1,5
M_A, M_B  Test ports operating pressure (plugged)  M 14x1,5

Shaft ends

Z  Splined shaft, DIN 5480  W 90x3x30x28x9g
p_N = 350 bar

P  Parallel shaft with key,  
DIN 6885, AS 25x14x125  
p_N = 350 bar
### Flushing valves

**Built-on flushing and boost pressure relief valve (7)**

This valve is built on to the fixed displacement motor. It must then be noted that only a port plate with ports at side is then available (port plate 02).

The flushing and boost pressure relief valve has a fixed setting of 16 bar (the setting of the primary boost pressure relief valve must be noted) and is used to safeguard the minimum boost pressure. A fixed flow of fluid is taken via an orifice from the low pressure side of the circuit and fed into the motor housing. This flow is then passed back to tank with the case drain fluid. Fluid thus removed from the closed circuit must be made up by means of the boost pump.

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<th>Size</th>
<th>Flushing flow (at low pressure $\Delta p = 25$ bar) *</th>
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<td>5 L/min Orifice-No.: 419695/503.12.01.01</td>
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<td>8 L/min Orifice-No.: 419696/503.12.01.01</td>
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<td>10 L/min Orifice-No.: 419697/503.12.01.01</td>
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<td>250</td>
<td>10 L/min</td>
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* Standard flushing volumes (for sizes 45…180 flushing volumes of 3,5 - 10 L/min can be supplied. If a flushing volume different from the standard flushing volume is required, please indicate the requested orifice in clear text when ordering).

**Integrated flushing valve (6) (Size 23...90)**

The valve is integrated into the port plate.

- switching pressure $\Delta p \geq 8$ bar (this value is lower than the starting pressure of an unloaded motor).
- closed in centre position ($\Delta p < 8$ bar).

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<td>2,5 L/min</td>
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<td>3,1 L/min</td>
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<td>80, 90</td>
<td>4,1 L/min</td>
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</table>

### Speed sensor

Version A2FM...D ("suitable for fitting speed sensor") includes gearing on the rotary group and in addition the port M or D (M18x1,5), in which a speed sensor is screwed in.

A speed-proportional signal is produced by means of the rotating, splined rotary group which can be picked up by a suitable sensor and fed back for evaluation.

**Sizes 23…180**

<table>
<thead>
<tr>
<th>Sizes</th>
<th>NO. of teath</th>
<th>length of thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>23, 28, 32</td>
<td>38</td>
<td>12,7</td>
</tr>
<tr>
<td>45</td>
<td>11,2</td>
<td>45, 54, 54,5</td>
</tr>
<tr>
<td>56, 63</td>
<td>47</td>
<td>14,7</td>
</tr>
<tr>
<td>80, 90</td>
<td>53</td>
<td>14,7</td>
</tr>
<tr>
<td>107, 125</td>
<td>59</td>
<td>14,7</td>
</tr>
<tr>
<td>160, 180</td>
<td>67</td>
<td>14,7</td>
</tr>
<tr>
<td>250</td>
<td>78</td>
<td>variable</td>
</tr>
<tr>
<td>355</td>
<td>90</td>
<td>variable</td>
</tr>
<tr>
<td>500</td>
<td>99</td>
<td>variable</td>
</tr>
<tr>
<td>710...1000</td>
<td>126</td>
<td>variable</td>
</tr>
</tbody>
</table>

The speed sensor is not included in standard supply. Suitable sensors (order seperately!):
- Induktive impulse detector ID (see RE 95130) (only for sizes 23…180)
- Hall effect speed sensor HD (see RE 95134)
Pressure relief valves  
(for port plate 18 or 19 only)

The pressure relief valves MHDB (as to RE 64642) are protecting the motor against overcharge. As soon as the set opening pressure is reached the oil is flowing from the high pressure side to the low pressure side.

Setting range opening pressure _______________ 50 – 420 bar

At design “with pressure sequence range (2)” a higher pressure setting can be realized by applying an external pilot pressure of 25 – 30 bar at port pSt.

Please indicate in clear when ordering:
- opening pressure of the pressure relief valve
- opening pressure at pilot pressure applied at pSt (for design 2 only)

Connections

<table>
<thead>
<tr>
<th>Sizes</th>
<th>Ports</th>
<th>A, B</th>
<th>S1</th>
<th>MA, MB</th>
<th>pSt</th>
</tr>
</thead>
<tbody>
<tr>
<td>28, 32</td>
<td>SAE 3/4”</td>
<td>M 22x1,5</td>
<td>M 20x1,5</td>
<td>G 1/4</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>SAE 3/4”</td>
<td>M 22x1,5</td>
<td>M 20x1,5</td>
<td>G 1/4</td>
<td></td>
</tr>
<tr>
<td>56, 63</td>
<td>SAE 3/4”</td>
<td>M 26x1,5</td>
<td>M 26x1,5</td>
<td>G 1/4</td>
<td></td>
</tr>
<tr>
<td>80, 90</td>
<td>SAE 1”</td>
<td>M 26x1,5</td>
<td>M 26x1,5</td>
<td>G 1/4</td>
<td></td>
</tr>
<tr>
<td>107, 125</td>
<td>SAE 1 1/4”</td>
<td>M 26x1,5</td>
<td>M 26x1,5</td>
<td>G 1/4</td>
<td></td>
</tr>
<tr>
<td>160, 180</td>
<td>SAE 1 1/4”</td>
<td>M 26x1,5</td>
<td>M 30x1,5</td>
<td>G 1/4</td>
<td></td>
</tr>
</tbody>
</table>

Pressure relief valves MHDB (as to RE 64642) are protecting the motor against overcharge. As soon as the set opening pressure is reached the oil is flowing from the high pressure side to the low pressure side.

Setting range opening pressure _______________ 50 – 420 bar

At design “with pressure sequence range (2)” a higher pressure setting can be realized by applying an external pilot pressure of 25 – 30 bar at port pSt.

Please indicate in clear when ordering:
- opening pressure of the pressure relief valve
- opening pressure at pilot pressure applied at pSt (for design 2 only)

Connections

<table>
<thead>
<tr>
<th>Sizes</th>
<th>Ports</th>
<th>A, B</th>
<th>S1</th>
<th>MA, MB</th>
<th>pSt</th>
</tr>
</thead>
<tbody>
<tr>
<td>28, 32</td>
<td>MHDB.16</td>
<td>209</td>
<td>186</td>
<td>25</td>
<td>63</td>
</tr>
<tr>
<td>45</td>
<td>MHDB.16</td>
<td>222</td>
<td>198</td>
<td>22</td>
<td>60</td>
</tr>
<tr>
<td>56, 63</td>
<td>MHDB.22</td>
<td>250</td>
<td>222</td>
<td>19</td>
<td>57</td>
</tr>
<tr>
<td>80, 90</td>
<td>MHDB.22</td>
<td>271</td>
<td>243,5</td>
<td>17,5</td>
<td>55</td>
</tr>
<tr>
<td>107, 125</td>
<td>MHDB.32</td>
<td>298</td>
<td>267</td>
<td>10</td>
<td>48</td>
</tr>
<tr>
<td>160, 180</td>
<td>MHDB.32</td>
<td>332</td>
<td>301</td>
<td>5</td>
<td>43</td>
</tr>
</tbody>
</table>
Motion Control Valve (for port plate 18 only)

For hydro-motors operating in open loop the motion control valve BVD (as to RE 95522) is avoiding an overspeed and thus a lack of filling. A lack of filling occurs at the hydro-motors as soon as the speed of the drive from external is exceeding the speed corresponding to the added volume flow.

The motion control valve is not included in the type code of the A2FM motor and has to be indicated separately when ordering. At shipment it is fixed at the motor with 2 tacking bolts (do not remove the tacking bolts during fixing of the service lines). At separated shipment of motion control valve and motor the motion control valve has to be fixed in a first step with the added tacking bolts to the cover plate of the motor. The final fixing of the motion control valve at the motor is effected in both cases by fitting the service lines (observe screw-in depth B4 + B12 and B13).

Fixed displacement motor A2FM, motion control valve BVD and integrated pressure relief valve

<table>
<thead>
<tr>
<th>Sizes</th>
<th>ports</th>
<th>A, B</th>
<th>S</th>
<th>M_A, M_B</th>
</tr>
</thead>
<tbody>
<tr>
<td>28, 32</td>
<td>BVD20..16</td>
<td>SAE 3/4&quot;</td>
<td>M 22x1,5</td>
<td>M12x1,5</td>
</tr>
<tr>
<td>45</td>
<td>BVD20..16</td>
<td>SAE 3/4&quot;</td>
<td>M 22x1,5</td>
<td>M12x1,5</td>
</tr>
<tr>
<td>56, 63</td>
<td>BVD20..17</td>
<td>SAE 3/4&quot;</td>
<td>M 22x1,5</td>
<td>M12x1,5</td>
</tr>
<tr>
<td>80, 90</td>
<td>BVD20..27</td>
<td>SAE 1&quot;</td>
<td>M 22x1,5</td>
<td>M12x1,5</td>
</tr>
<tr>
<td>107, 125</td>
<td>BVD25..38</td>
<td>SAE 1 1/4&quot;</td>
<td>M 27x2</td>
<td>M12x1,5</td>
</tr>
<tr>
<td>160, 180</td>
<td>BVD25..38</td>
<td>SAE 1 1/4&quot;</td>
<td>M 27x2</td>
<td>M12x1,5</td>
</tr>
</tbody>
</table>

Connections
A, B Service line ports SAE
S Boosting (plugged)
M_A, M_B Test ports (plugged)

Sizes | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | B10 | B11 | B12 | B13
-----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----
56, 63| 250 | 192 | 208 | 208 | 208 | 208 | 208 | 208 | 208 | 208 | 208 | 208 | 208 |
80, 90| 271 | 202 | 229 | 229 | 229 | 229 | 229 | 229 | 229 | 229 | 229 | 229 | 229 |
107, 125| 298 | 234,5 | 251 | 251 | 251 | 251 | 251 | 251 | 251 | 251 | 251 | 251 | 251 |

1) with adapting plate
Installation and Commissioning Guidelines

**General**

At start-up and during operation the motor housing has imperatively to be filled up with hydraulic fluid (filling of the case chamber). Start-up has to be carried out at low speed and without load till the system is completely bleeded.

At a longer standstill the case may discharge via operating line. At new start-up a sufficient filling of the housing has to be granted.

The leakage oil in the housing has to be discharged to the tank via highest positioned case drain port.

**Installation position**

Optional. At size 10 ... 200 with installation position "shaft to the top" use motor with bleeding port R (indicate in clear when ordering; the port U in the bearing section for bleeding is included in series at size 250 ... 1000).

**Installation below tank level**

Motors below min. oil level in the tank (standard)

➔ Fill up axial piston motor before start-up via highest positioned case drain port

➔ Note for the "shaft on top" installation position: the motor case has to be filled up completely at start-up (bleeding at additional port R (size 10 ... 200) resp. U (size 250 ... 1000). An air pocket in the bearing area is leading to damage of the axial piston unit.

➔ Operate motor at low speed (ignition speed) till motor system is completely filled up

➔ Minimum immersion depth of the suction line or drain line in the tank: 200 mm (relative to the min. oil level in the tank).

**Installation on top of tank level**

Motor on top of min. oil level in the tank

➔ Installation position 1 and 2:

➔ If the motor is left at standstill for a long period, the oil in the housing chamber may fully drain out through the operating lines (air entering via the shaft seal). Consequently, on restarting, the bearings will be insufficiently lubricated. You should therefore refill the axial piston unit via the highest positioned drain port before restarting (Installation position 2: air bleed via port R or U).

➔ Installation position 2 (shaft on top)

In this installation position, the bearings will be insufficiently lubricated even if the housing chamber is only partially drained. To prevent oil draining via the drain port, insert a check valve in the drain line (opening pressure 0.5 bar).

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