MANNESMANN REXROTH

Brueninghaus Hydromatik

Fixed Displacement Pump A4FO

Series 10
Axial Piston Unit, Swashplate Design

Sizes 71…500 | Nominal pressure 350 bar | Peak pressure 400 bar

RE 91455/01.94

Replaces 07.88

Other fixed displacement pumps:

A2FO fixed displacment pump
Size 10…200
RE 91401
Size 250…1000
RE 91425

KFA fixed displacement pump
Size 45…107
RE 91500

A4FO axial piston fixed displacement pumps of swashplate design are used for hydraulic drives in open loop circuits.

Flow is proportional to the drive speed and to the displacement.

– Good suction characteristic

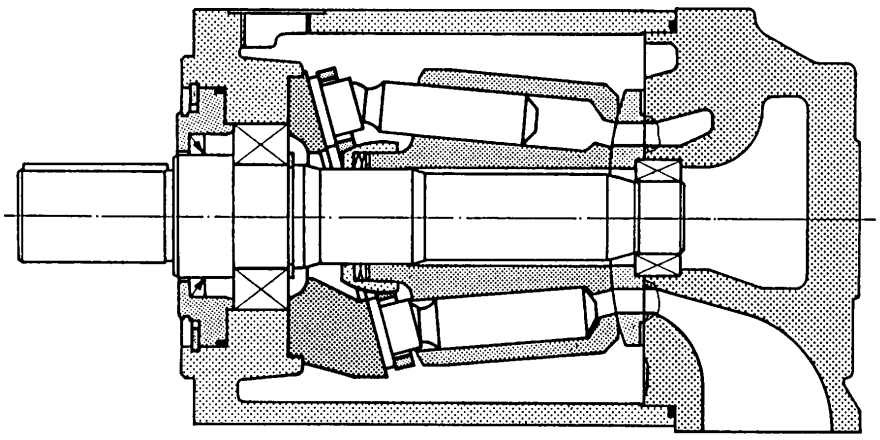
– Low noise level

– Long service life

– Pump combinations possible

– Through drive of 100 % torque

– HF operation possible with reduced data



Code

	A4F	O		/	10		–			B	13	

Fluid

Mineral oil (no short code)	
HFC fluid	E–

Axial piston unit

Swashplate design, fixed displacement	A4F

Operating type

Pump, open loop circuit	O

Size

≙ displacement $V_{g\,max}$ (cm^3)	71	125	250	500

Series

	10

Direction of rotation

View on drive shaft	Clockwise	R
	Anti-clockwise	L

Seals

NBR - Nitril caoutchouc DIN ISO 1629 (Buna N) / Shaft sealing ring: FPM	P
FPM - Fluor caoutchouc DIN ISO 1629	V

Shaft ends

Parallel with key	DIN 6885	P
External spline	DIN 5480	Z

Mounting flange

ISO 4 hole	B
ISO 8 hole	H

Connection to working lines

Pressure port B Suction port S	Side SAE rotated by 90° Metric fixing thread	13

Through drive

				71	125	250	500	
Without through drive				●	●	●	●	N00
With through drive for mounting axial piston unit								
Flange	Hub/Shaft	For mounting of:						
ISO 140, 4 hole	40x2x18x9g spline	A4FSO	71	●	●	●	❍	K33
ISO 160, 4 hole	50x2x24x9g spline	A4FSO	125		●	●	❍	K34
ISO 224, 4 hole	60x2x28x9g spline	A4FSO	250			●	❍	K35
ISO 315, 8 hole	80x3x25x9g spline	A4FSO	500				❍	K43
ISO 100, 2 hole	22 dia. key	A10VSO	28	●	●	●	❍	K25
ISO 100, 2 hole	25 dia. key	A10VSO	45	●	●	●	❍	K26
ISO 125, 2 hole	32 dia. key	A10VSO	71	●	●	●	❍	K27
ISO 125, 2 hole	40 dia. key	A10VSO	100		●	●	❍	K37

● = available
❍ = in preparation

Fluid

Mineral oil or HF fluids

Before designing your system please consult our data sheets RE 90220 (mineral oil), RE 90221 (eccologically acceptable fluids) and RE 90223 (HF fluids) for comprehensive information on the choice of fluids and conditions of application. If HF fluids are used, limitations in the technical data need to be taken into account. If necessary, please consult us.

Operating viscosity range

We recommend that an operating viscosity (at operating temperature) in the optimum range for efficiency and idle time with respect to tank temperature (open loop circuit) of

ν_{opt} = opt. operating viscosity 16...36 mm²/s

is used.

Viscosity limit range

The following values are valid for limiting conditions:

ν_{min} = 10 mm²/s
briefly at max. permissible leakage oil temperature of 90° C.

ν_{max} = 1000 mm²/s
briefly at cold start.

Temperature range (cf. selection diagram)
t_{min} = – 25° C
t_{max} = + 90° C

Fluid selection

In order to select the correct fluid, the operating temperature in the tank (open loop circuit), dependent on the ambient temperature, needs to be known.

The fluid selected should be such that in the operating temperature range the operating viscosity is within the optimum range (ν_{opt}). This is the shaded area on the selection diagram. We recommend that the higher viscosity class is chosen.

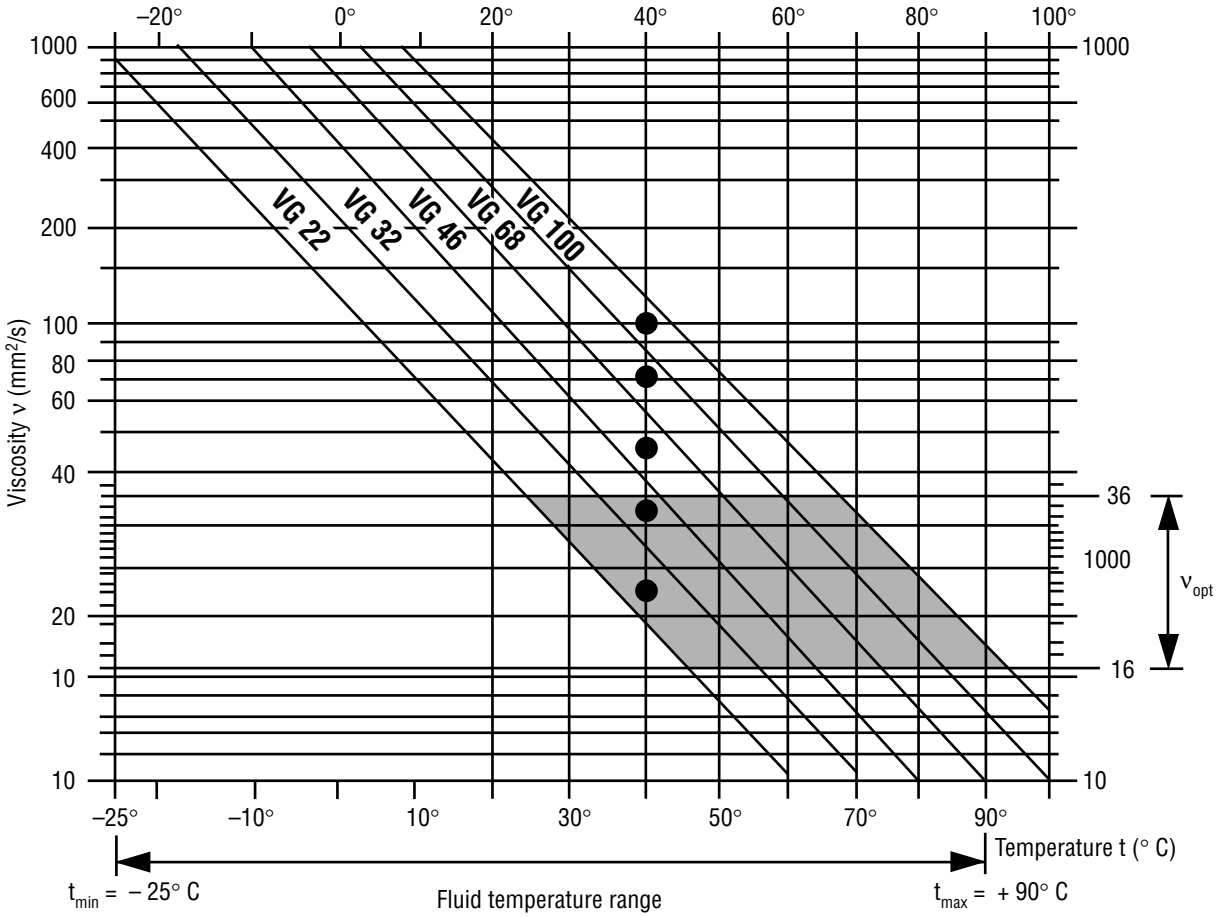
Example: At an ambient temperature of X° C an operating temperature of 60° C occurs in the tank. The optimum operating viscosity range (ν_{opt}; shaded area) corresponds to viscosity classes VG 46 and VG 68. Select VG 68.
Note: The leakage oil temperature, effected by pressure and speed, is usually higher than the tank temperature. However the temperature must not exceed 90° C at any point in the system. If the above requirements cannot be met at extreme operating parameters or due to a high ambient temperature, please consult us.

Fluid filtration (axial piston unit)

At least fluid cleanliness class
9 to NAS 1638 or
6 to SAE; ASTM, AIA must be maintained for the fluid in order to ensure reliable functioning of the system.
This is possible by using, e.g. filter elements,
type ... D 020 ... (see RE 31278).
The following degree of separation is obtained

$\beta_{20} \geq 100$.

Selection diagram



Technical data

(Valid for operation using mineral oil. See RE 90223 for fluids containing water)

Input operating pressure range

Absolute pressure at port S (suction port)

$p_{abs\ min}$ — 0,8 bar

$p_{abs\ max}$ — 30 bar

Output operating pressure range

Pressure at port B

Nominal pressure p_N — 350 bar

Peak pressure p_{max} — 400 bar

(Pressure data to DIN 24312)

Direction of flow:

S to B.

Leakage pressure

The max. permissible leakage pressure (housing pressure) is dependent on speed (see diagram). The pressure in the housing must be equal to or greater than the external pressure on the shaft sealing ring.

Max. leakage pressure (housing pressure)

p_{max} — 4 bar abs.

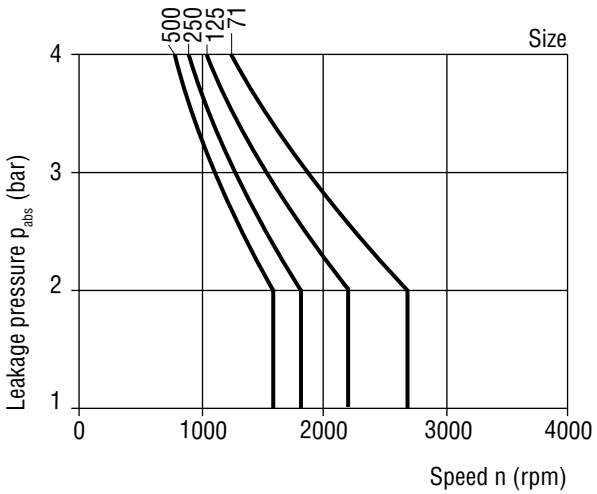


Table of values

Theoretical and rounded values, without taking into account η_{mh} and η_v

Size				71	125	250	500
Displacement		$V_{g\ max}$	cm^3	71	125	250	500
Max. speed at input pressure p_{abs} 1 bar at port "S"		$n_{o\ max}$	rpm	2200	1800	1500	1320
Max. permissible speed (speed limit) with increase in input pressure p_{abs} = 1,7 bar		$n_{o\ max.}$	rpm	2700	2200	1800	1600
Max. flow	at $n_{o\ max}$	Q_{max}	L/min	156	225	375	660
	at n_E = 1500 rpm		L/min	107	186	375	581
Max. power (Δp = 350 bar)	at $n_{o\ max}$	$P_{o\ max}$	kW	91	131	219	385
	at n_E = 1500 rpm		kW	62	109	219	339
Max. torque (Δp = 350 bar)		M_{max}	Nm	395	696	1391	2783
Torque (Δp = 100 bar)		M	Nm	113	199	398	795
Moment of inertia at drive axis		J	kgm^2	0,0121	0,03	0,0959	0,3325
Capacity			l	2,0	3,0	7,0	11,0
Approx. weight (pump with pressure controller)		m	kg	34	61	120	220
Max. axial force at housing pressure p_{max} 1 bar abs.		$\pm F_{ax\ max}$	N	1400	1900	3000	4000
Max. axial force at housing pressure p_{max} 4 bar abs.		$+ F_{ax\ max}$	N	810	1050	1850	2500
		$- F_{ax\ max}$	N	1990	2750	4150	5500
Max. shearing force		$F_{q\ max}$	N	1700	2500	4000	5000

Determination of size

Flow $Q = \dfrac{V_g \cdot n \cdot \eta_v}{1000}$ (L/min)

Torque $M = \dfrac{1{,}59 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}}$ (Nm)

Drive power $P = \dfrac{2\pi \cdot M \cdot n}{60000} = \dfrac{M \cdot n}{9549} = \dfrac{Q \cdot \Delta p}{600 \cdot \eta_t}$ (kW)

V_g = geometric displacement (cm^3) per revolution

Δp = Pressure drop (bar)

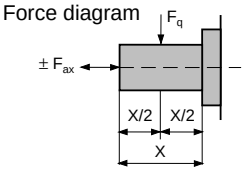
n = Speed (rpm)

η_v = Volumetric efficiency

η_{mh} = Mechanical-hydraulical efficiency

η_t = Total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

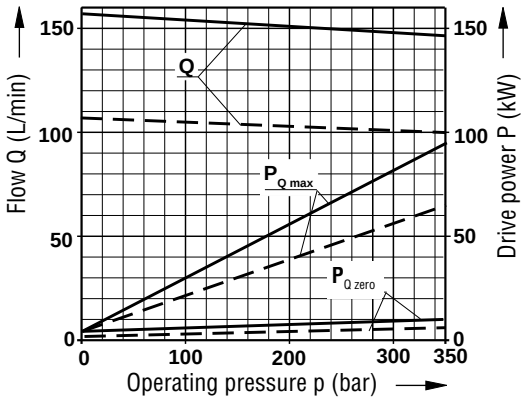
Force diagram



Drive power and flow

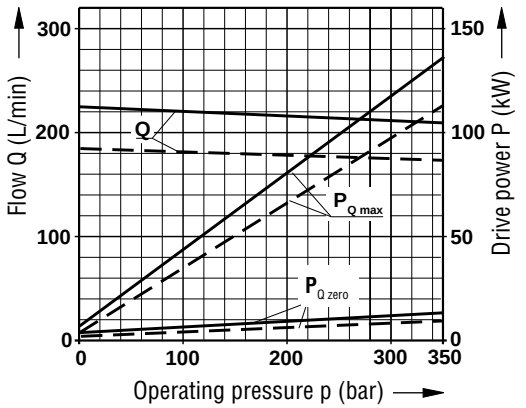
(Fluid: hydraulic oil ISO VG 46 DIN 51519, t = 50°C)

Size 71



n = 2200 rpm
n = 1500 rpm

Size 125

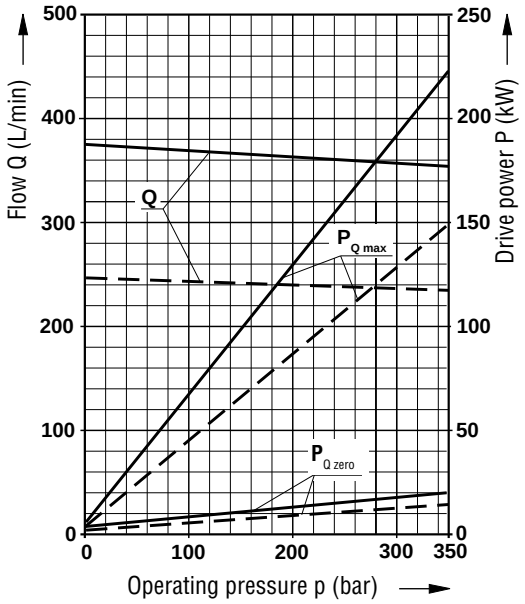


n = 1800 rpm
n = 1500 rpm

Total efficiency: $\eta_t = \dfrac{Q \bullet p}{P_{Q\,max} \bullet 600}$

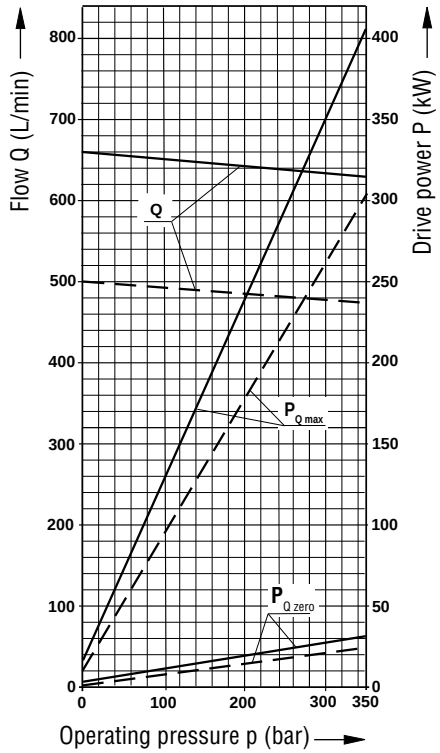
Volumetric efficiency: $\eta_v = \dfrac{Q}{Q_{theor}}$

Size 250



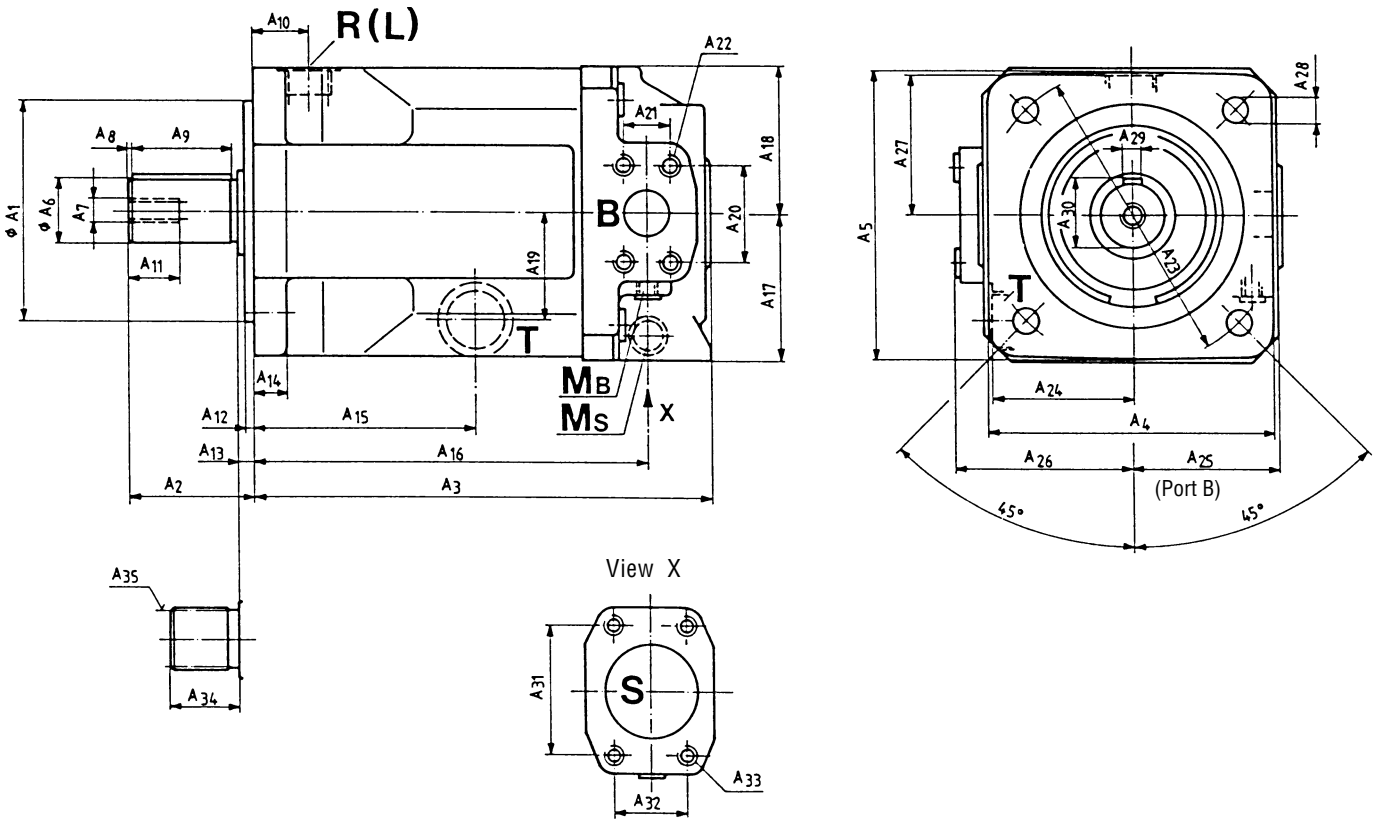
n = 1500 rpm
n = 1000 rpm

Size 500



n = 1320 rpm
n = 1000 rpm

Unit dimensions



Ports

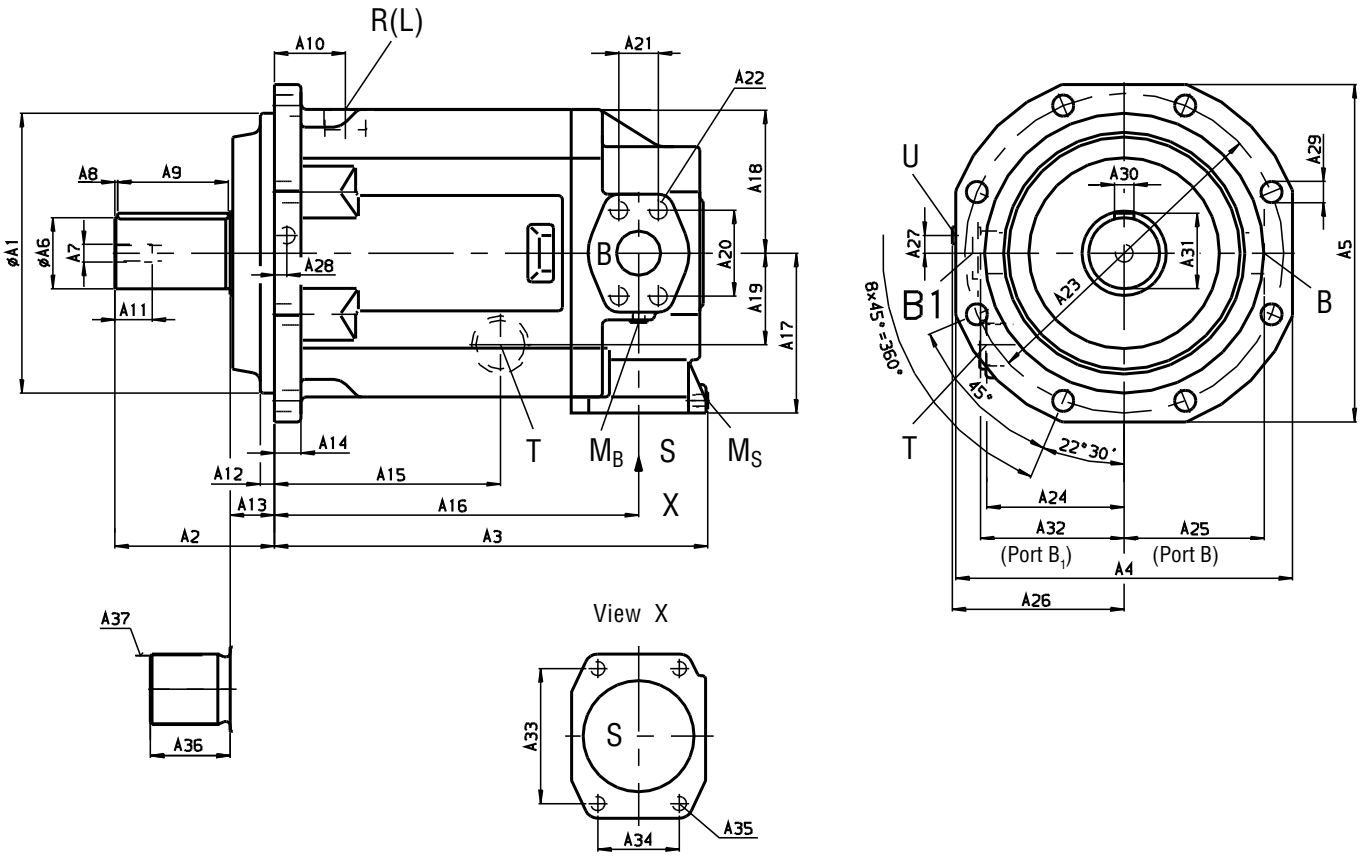
B	Pressure port (high pressure series), on request available on the left (enter in clear text)
S	Suction port (standard pressure series)
R (L)	Oil filler and breather
T	Oil drain (closed)
M_B	Operating pressure measuring point (closed)
M_S	Suction pressure measuring point (closed)

Size	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}	A_{12}	A_{13}	A_{14}	A_{15}	A_{16}	A_{17}
71	140_{h8}	80	276	170	170	40_{k6}	M12	1,5	68	34	28	8	10	20	132	232	87
125	160_{h8}	92	321	200	200	50_{k6}	M16	1,5	80	36	36	8	10	24	156	276	102
250	224_{h8}	115	405	260	265	60_{m6}	M20	3,0	100	48	42	8	10	30	203	346	138

Size	A_{18}	A_{19}	A_{20}	A_{21}	A_{22}	A_{23}	A_{24}	A_{25}	A_{26}	A_{27}	A_{28}	A_{29}	A_{30}	A_{31}
71	85	61	57,2	27,8	M12; 17 deep	180	83,5	85	106	83,5	15	12_{h9}	43	77,8
125	102	74	66,7	31,8	M14; 19 deep	200	98,5	102	124	98,5	20	14_{h9}	53,5	88,9
250	130	91	79,4	36,5	M16; 24 deep	280	124,5	130	158	131	24	18_{h9}	64	106,4

				Ports				
Size	A_{32}	A_{33}	A_{34}	A_{35} **(DIN 5480)**	**B**	**S**	**R (L), T**	M_B, M_S
71	42,9	M12; 20 deep	45	W40x2x18x9g	1" SAE	2" SAE	M27x2	M14x1,5
125	50,8	M12; 17 deep	54	W50x2x24x9g	1 1/4" SAE	2 1/2" SAE	M33x2	M14x1,5
250	61,9	M16; 24 deep	70	W60x2x28x9g	1 1/2" SAE	3" SAE	M42x2	M14x1,5

Unit dimensions



Ports

B	Pressure port (high pressure series), on request available on the left (enter in clear text)
S	Suction port (standard pressure series)
R (L)	Oil filler and breather
T	Oil drain (closed)
M_B	Operating pressure measuring point (closed)
M_S	Suction pressure measuring point (closed)
U	Flushing port (bearing flushing)

Size	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}	A_{12}	A_{13}	A_{14}	A_{15}	A_{16}	A_{17}
500	315_{h8}	180	489	380	380	80_{m6}	M20	3,0	125	80	42	16	50	30	255	411	180

Size	A_{18}	A_{19}	A_{20}	A_{21}	A_{22}	A_{23}	A_{24}	A_{25}	A_{26}	A_{27}	A_{28}	A_{29}	A_{30}	A_{31}	A_{32}	A_{33}
500	161	103	96,8	44,5	M20; 24 deep	360	155	158	194	20	14	24	22_{h9}	85	161	152,4

				Ports						
Size	A_{34}	A_{35}	A_{36}	A_{37} (DIN 5480)	B	B_1	S	R (L), T	M_B, M_S	U
500	92,1	M16; 23 deep	90	W80x3x25x9g	2" SAE	M48x2	5" SAE	M48x2	M14x1,5	M14x1,5