MANNESMANN REXROTH	Fixed Displacement Motor A4FP/2A4FP Axial Piston-Swash Plate Design		RE 91125/07.91
Brueninghaus Hydromatik	Sizes 40...750	Nominal pressure 350 bar Peak pressure 400 bar	

High pressure range

This axial piston motor with fixed displacement A4FP (single-motor) respectively 2A4FP (Back to Back-Motor) has been designed for use in open and closed circuits in shipbuilding applications.

Output speed is proportional to input flow and inversely proportional to displacement. Drive torque increases with the pressure drop across the unit. The Back to Back-Motor exists of two identical rotary groups each with displacement according size.

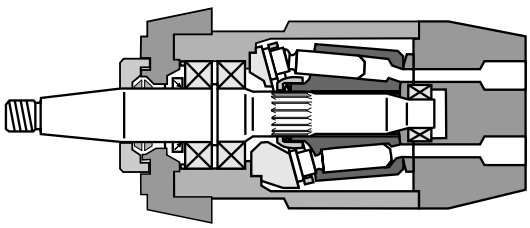
Careful selection of bearing concept facilitate absorbing of high axial and radial loads in case of propeller drive.

Further applications may be: cargo pump drives, bow- thruster drives, van-drives.

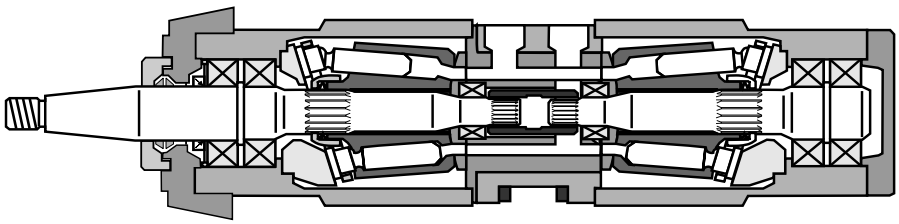
Special features

- long service life
- drive shaft capable of absorbing high axial and radial loads
- robust roller bearing for high shaft speed
- high efficiency
- modular design
- flange variable by customer
- single version or back to back version available
- in-between sizes according code
- allowed market by R.I.N.A. for shipbilding application
- double shaft seal system
- early diagnose system against worn-out shaft seal splined shaft end

Single-Motor A4FP



Back to Back-Motor 2A4FP



Fixed Displacement Motor A4FP/2A4FP for open and closed circuit

Ordering code

	A4F	P		/	10		–				

Fluid

Mineral oil (no short code)	

Special version

Single Motor, one rotary group (no short code)	
Back to Back - motor, two rotary groups (same $V_{g\,max}$)	**2**

Axial piston unit

swash plate-design, fixed displacement	**A4F**

Mode of operation

Motor for shipbuilding application	**P**

Size Single-Motor A4FP

≙ displacement $V_{g\,max}$ (cm^3)	**40**	**71**	**125**	**180**	**250**	**500**	**750**
same external dimensions like main size	32	63	112		224	450	
	-	50	90		200	400	
	●	●	●	❍	●	●	❍

Size Back to Back Motor 2A4FP*

≙ displacement $V_{g\,max}$ (cm^3) each rotary group	**250**	**500**	**750**
(same dimensions as main-size)	224	450	
	200	400	
	●	●	❍

Series

	10

Direction of rotation

viewed on shaft end		
	clockwise	**R**
	anti-clockwise	**L**
	alternating	**W**

Seals

NBR (Nitrile rubber to DIN ISO 1629) at mounting flange M	**P**
Perbunan with teflon - rotary shaft (at mounting flange S)	**T**

Shaft

	P	T	
conical including thread, flat (K = 1 : 30)	●	●	**D**
conical including thread, parallel with key (K 1 : 10)	●	●	**C**
splinded shaft DIN 5480 (only in connection with flange M possible)	●	–	**Z**

Mounting flange

	P	T	
flange for propeller	–	●	**S**
flange for general applications	●	–	**M**

Service line connection

	A4FP	2A4FP	
connections A and B: SAE port plate (metric fixing screws)	●	–	**01**
connections A and B: SAE both same side (metric fixing screws)	–	●	**22**

● = available
❍ = in preparation

Hydraulic fluid

Before undertaking project design, please see our catalogue sheet RE 90220 for detailed information ont the selection of hydraulic mineral oils and their application conditions.

Viscosity range
We recommend that the operating viscosity (at operating temperature), for both efficiency and life of the unit, be chosen within the optimum range of:

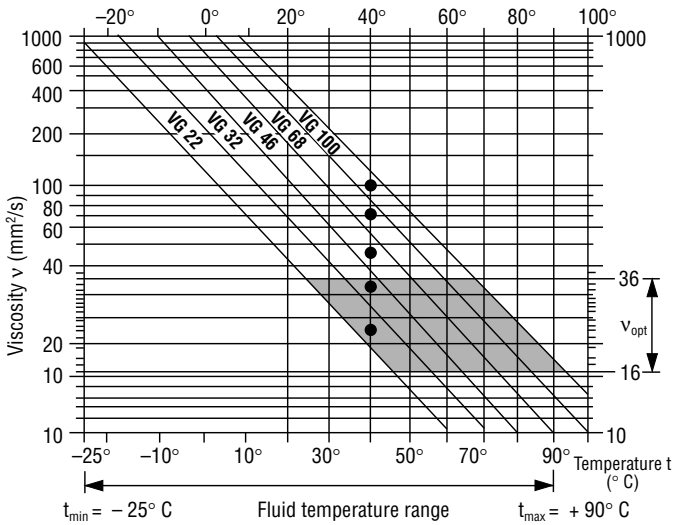
ν_{opt} = optimum operating viscosity 16...36 mm²/s

referred to the closed loop temperature.

Limits of viscosity range
The following limits of viscosity apply:
ν_{min} = 10 mm²/s
short-term at a max. permissible leakage oil temperature of 90° C.
ν_{max} = 1000 mm²/s
short -term on cold start.

Comments on the selection of fluids
A prerequisite for the correct choice of fluid is the knowledge of the operating temperature in the closed loop, together with the relevant ambient temperature.
The selection of fluid must then be made so that, within the operating temperature range, the operating viscosity also lies within the optimum range (ν_{opt}) (see shaded section of the selection diagram). We recommend that the higher viscosity grade is chosen (if two fluids fall within the operating range).
Example: with an ambient temperature of X° C, an operating temperature of 60°C is found within the circuit. From the optimum operating viscosity range (ν_{opt} shaded section), viscosity grades VG 46 or VG 68 may be selected; VG 68 should be selected.
Note: leakage oil temperature, which is dependent upon pressure and speed, is always higher than the closed loop temperature. At no point within a circuit may the temperature be higher than 90°C.
If the above conditions cannot be met due to extreme operating conditions, or with a high ambient temperature please consult us.

Selection diagram

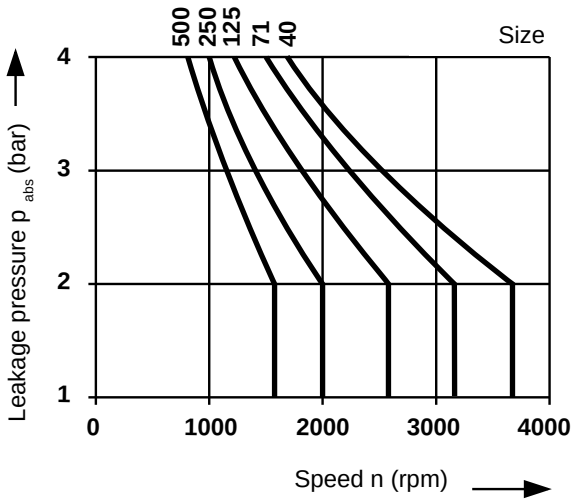


Filtration of fluid (axial piston units)
In order to ensure functiona reliability, it is necessary to maintain the fluid to a cleanliness functional class.
9 to NAS 1638
6 to SAE, ASTM, AIA
18/15 to ISO/DIS 4406 requisite
If above classes cannot be met, please consult us.

Technical data

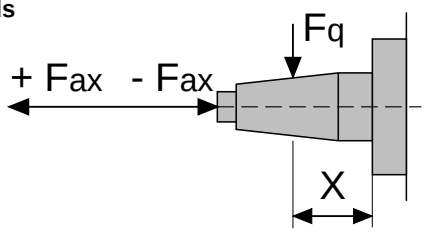
Operating pressure range
pressure at port A or B
nominal pressure p_N _____ 350 bar
peak pressure p_{max} _____ 400 bar
(pressure/data to DIN 24312)

Case drain pressure
Max. case drain pressure (housing pressure)
p_{max} _____ 4 bar
The permissible pressure is, however dependend on speed and shaft seal.
Strengh of housing _____ 20 bar



Minimum permissible pressure of leakage fluid 0,5 bar higher than outlet pressure.

Direction of loads



Mounting postion
Optional, the pumphousing must be filled with fluid both during commisioning, and must remainfull whenever it is operating. Extensive information on installation positions available.

Direction of rotation
pressure at port A = clockwise
pressure at prot B = anti-clockwise

Table of values, Single-Motor-A4FP

Theoretical values, without calculation η_{mh} and η_v, values rounded

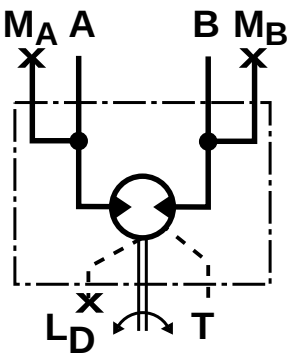
Size			32	40	50	63	71	90	112	125	200	224	250	400	450	500
Displacement	V_g	cm^3	32	40	50	63	71	90	112	125	200	224	250	400	450	500
Max. speed	n_{max}	rpm	3700		3200			2600			2200			1800		
Max. fow n = n_{max}	Q_{max}	L/min	118	148	160	202	227	234	291	325	400	448	500	720	810	900
Max. power n = n_{max} (Δp = 350 bar)	P_{max}	kW	69	86	93	118	132	136	170	190	233	261	291	420	472	525
Torque (Δp = 350 bar)	M_{max}	Nm	178	223	278	351	395	501	623	696	1113	1247	1391	2226	2504	278
Max. moment of inertia about drive axis	J	kgm^2	0,006		0,013			0,033			0,105			0,360		
Filling volume		L	1,0		1,5			2,0			3,0			6,0		
Approx. weight (without filling volume)	m	kg	22		34			61			120			220		
Permanent loads on shaft[1] permissible axial load	$\pm F_{ax\,max}$	kN	2,0		3,0			4,5			6,5			10,0		
Permissible radial load	$F_{q\,max}$	kN	0,7		1,0			1,4			2,2			3,5		
Distance of direction of laod	X	mm	63		80			100			125			160		
Permissible radial load by shock		$F_{q\,max}$	kN		4			6			9			13 20		
Torque of rotation n = 0 min^{-1} (Δp = 350 bar)		Nm	137	181	208	277	320	376	492	564	857	985	1127	1714	1978	2250

[1]) Using increased values please consult us.

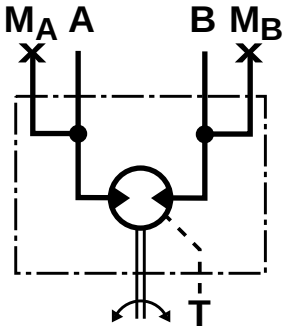
Circuit diagram

Single-Motor A4FP

Flange S



Flange M



Calculation of size refer to one rotary group

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

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

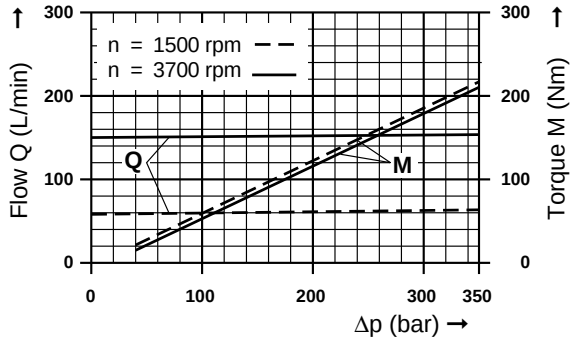
power $P = \dfrac{M \cdot n}{9549} = \dfrac{Q \cdot \Delta p \cdot \eta_t}{600}$ (kW)

speed $n = \dfrac{Q \cdot 1000 \cdot \eta_v}{V_g}$ (rpm)

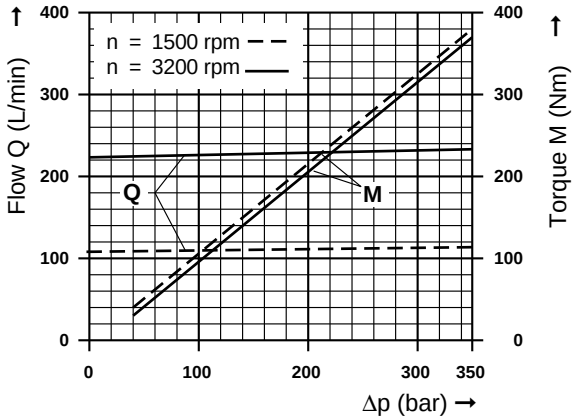
V_g = geom. displacement per rev. (cm^3)
Δp = pressure differntial (bar)
n = speed (min^{-1})
η_v = volumetric efficiency
η_{mh} = mechanical hyd. efficiency
η_t = overall efficiency

Flow and Torque Single-Motor A4FP
(Fluid: Hydraulicoil ISO VG 46 DIN 51519, t = 50°C)

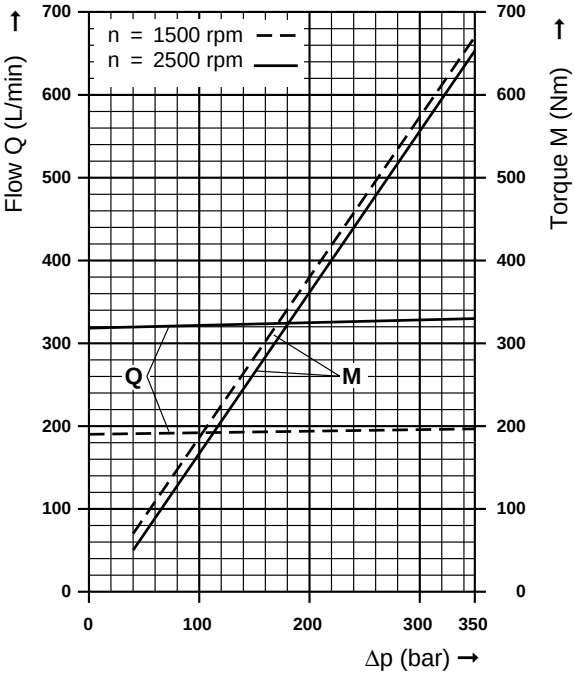
Size 40



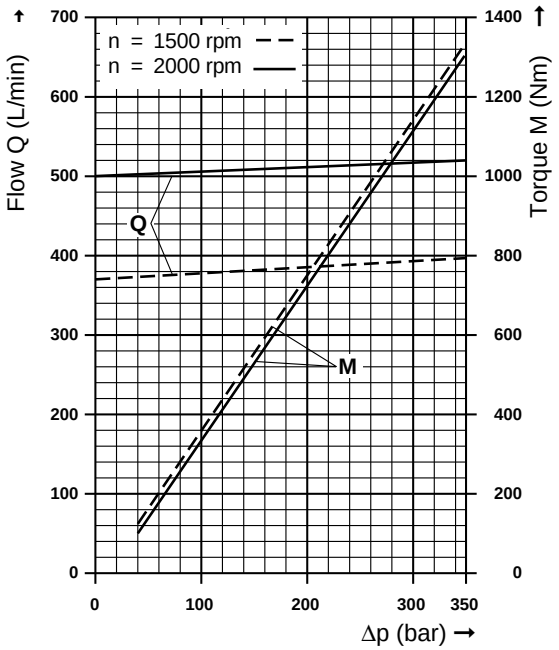
Size 71



Size 125



Size 250



Size 500

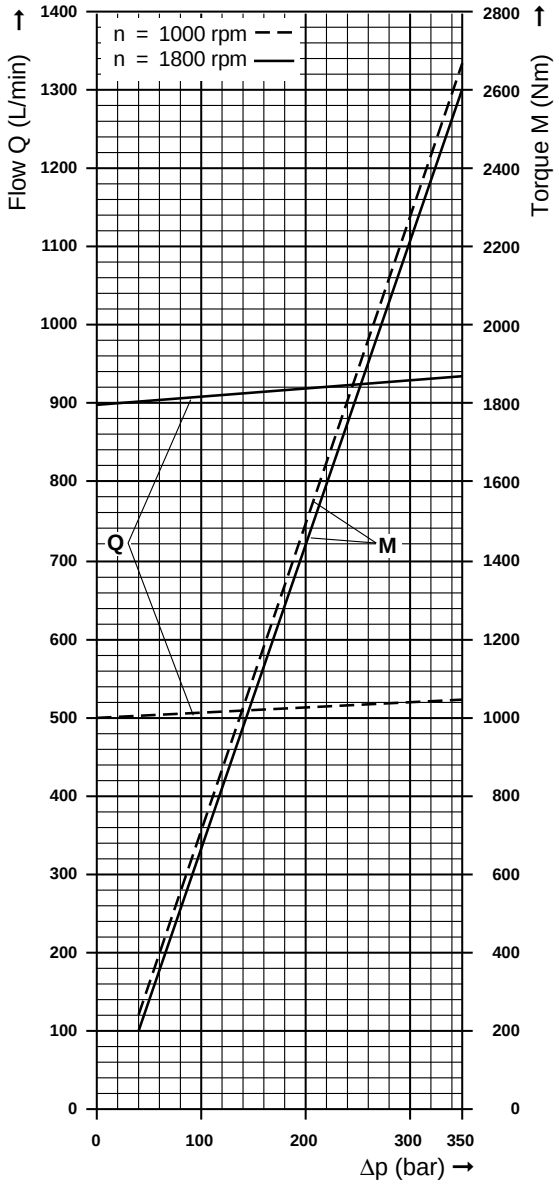


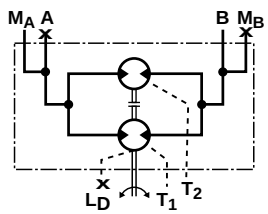
Table of values Back to Back-Motor 2A4FP

Theoretical values, without calculation η_{mh} and η_v; values rounded

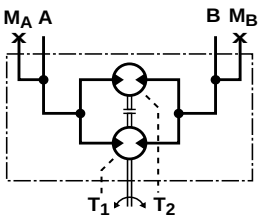
Size				200	224	250	400	450	500
Displacement	V_g	cm^3		400	448	500	800	900	1000
Speed	n_{max}	min^{-1}			2000			1800	
Max. flow n = n_{max}	Q_{max}	L/min		800	896	1000	1440	1620	1800
Max. power n = n_{max} (Δp = 350 bar)	P_{max}	kW		466	522	582	840	944	1050
Torque (Δp = 350 bar)	M_{max}	Nm		2226	2494	2783	4452	5008	5565
Max. moment of inertia about drive axis	J	kgm^2			0,205			0,690	
Filling volume		L			6,0			12,0	
Approx. weight m (without filling volume)		kg			196			400	
Permanent loads on shaft: permissible axial load	$\pm F_{ax\,max}$	kN			6,5			10,0	
permissible radial load	$F_{q\,max}$	kN			2,2			3,5	
distance of direction of load	X	mm			125			160	
permissible radial load by shock	$F_{q\,max}$	kN			13			20	
Torque of rotation n = 0 (Δp = 350 bar)	min^{-1}	Nm		1714	1970	2250	4328	3956	4500

Circuit-diagram
Back to Back-Motor 2A4FP

Flange S

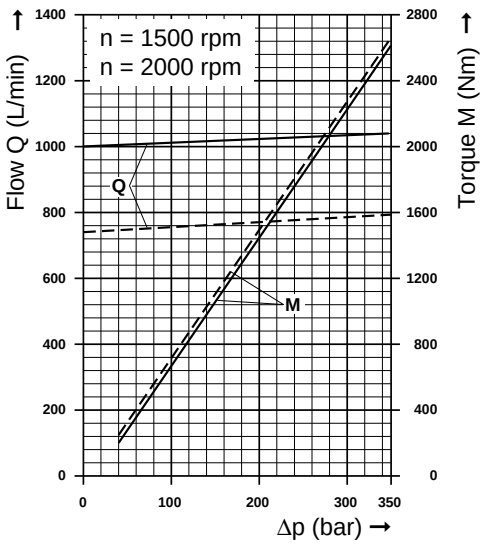


Flange M

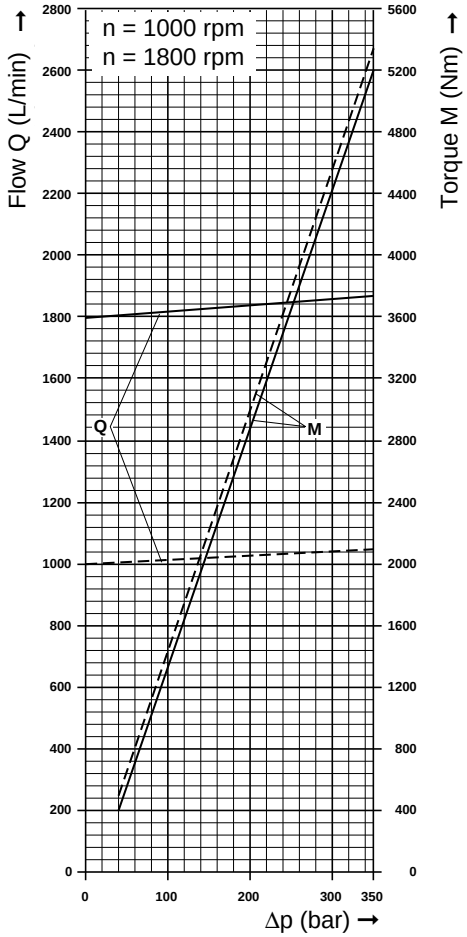


Flow and Torque Single Motor A4FP
(Fluid: Hydraulicoil ISO VG 46 DIN 51519, t = 50°C)

Size 250



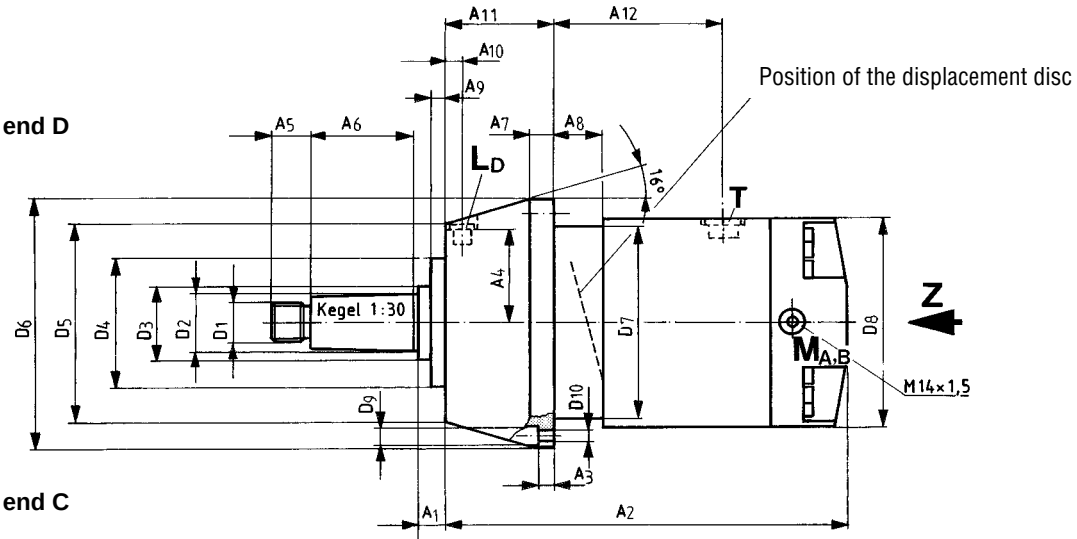
Size 500



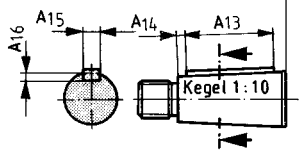
Unit dimensions Single-Motor A4FP

Flange S

Shaft end D

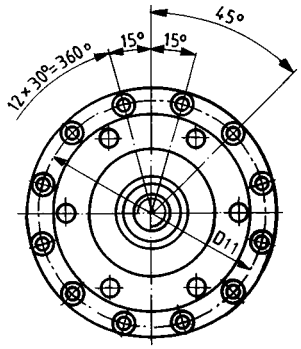


Shaft end C

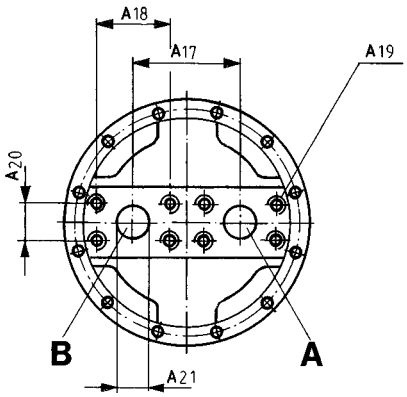


Size	parallel with key
40	AS 10 x 8 x 56
71	AS 14 x 9 x 70
125	AS 16 x 10 x 90
250	AS 18 x 11 x 110
500	AS 22 x 14 x 140

Flange



port plate **Z**



connections

A, B	=	pressure port (high pressure range)	
T	=	oil/drain	- plugged
M_A, M_B	=	test port	- plugged
L_D	=	leakage port early diagnose system	- plugged

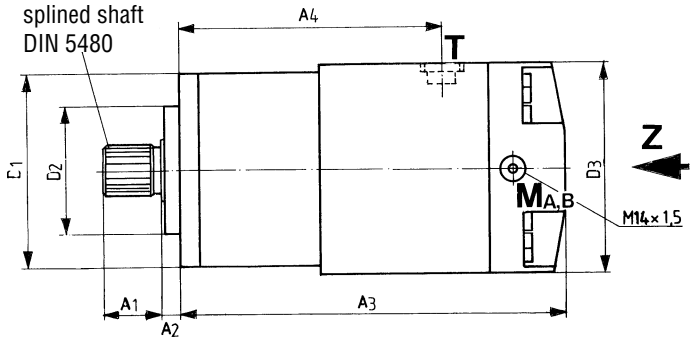
size	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}	A_{12}	A_{13}	A_{14}	A_{15}	A_{16}	A_{17}	A_{18}	A_{19}	A_{20}	A_{21}	D_1
40	21	269	11	61	22	70	13	50	11	11	60	129	56	7	10^{P8}	$5^{+0,2}$	72	50,8	M10;17d.	23,8	19	M22x1,5
71	23	326	12	76	30	82	19	60	12	12	85	135	70	6	14^{P8}	$5,5^{+0,2}$	84	57,2	M12;17d.	27,8	25	M30x2
125	26	371	14	90	36	105	20	80	16	15	98	167	90	7	16^{P8}	$6^{+0,2}$	99	66,7	M14;19d.	31,8	32	M36x3
250	26	465	16	103	42	120	20	111	18	23	132	196	110	7	18^{P8}	$7^{+0,2}$	116	79,4	M16;21d.	36,5	38	M42x3
500	27	586	20	138	60	165	25	120	18	25	160	274	140	12	22^{P8}	$9^{+0,2}$	137	96,8	M20;24d.	44,5	50	M60x2

											connections			
size	D_2	D_3	D_4	D_5	D_6	D_7	D_8	D_9	D_{10}	D_{11}	A, B		T (DIN 3852)	L_D
40	$ø35_{\pm 0,02}$	$ø45_{f7}$	$ø80_{h8}$	ø131	ø158	$ø130_{g6}$	ø143	ø11	ø6,6	145	SAE 3/4"	(High pr. r.)	M18x1,5	M8x1
71	$ø45_{\pm 0,02}$	$ø60_{f7}$	$ø100_{h8}$	ø160	ø198	$ø150_{g6}$	ø166	ø15	ø9	181	SAE 1"	(High pr. r.)	M22x1,5	M14x1,5
125	$ø55_{\pm 0,02}$	$ø70_{f7}$	$ø120_{h8}$	ø189	ø225	$ø184_{g6}$	ø190	ø15	ø9	207	SAE 11/4"	(High pr. r.)	M27x2	M14x1,5
250	$ø65_{\pm 0,02}$	$ø80_{f7}$	$ø160_{h8}$	ø208	ø272	$ø215_{g6}$	ø232	ø18	ø11	252	SAE 11/2"	(High pr. r.)	M33x2	M14x1,5
500	$ø84_{\pm 0,02}$	$ø100_{f7}$	$ø200_{h8}$	ø283	ø360	$ø276_{g6}$	ø300	ø26	ø18	326	SAE 2"	(High pr. r.)	M33x2	M14x1,5

Unit dimensions A4FSP Single-Motor A4FP

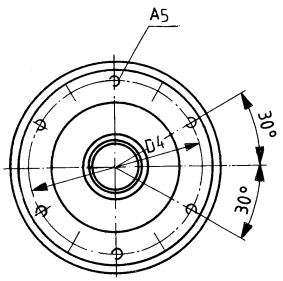
Flange M

shaft end Z

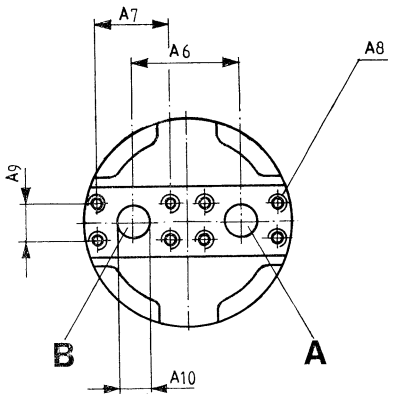


shaft end D and
shaft end C
please consult us

flange



port plate **Z**



connections

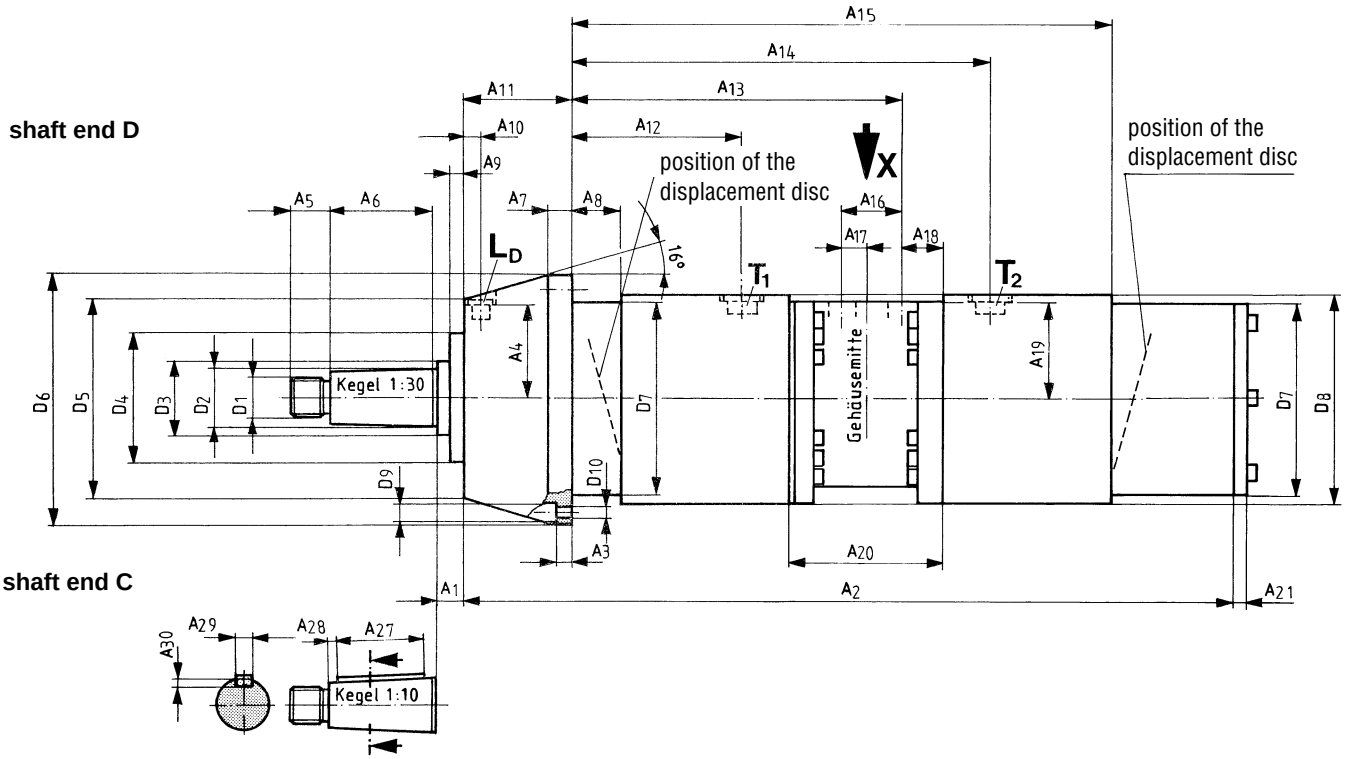
A, B	=	pressure port (high pressure range)	
T	=	oil/drain	- plugged
M_A, M_B	=	test port	- plugged

size	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	D_1
40	36	13	263	183	M8;12t.	72	50,8	M10;17d.	23,8	19	$ø130_{g6}$
71	45	14	312	206	M8;12t.	84	57,2	M12;17d.	27,8	25	$ø150_{g6}$
125	54	18	361	255	M10;15t.	99	66,7	M14;19d.	31,8	32	$ø184_{g6}$
250	70	20	440	303	M10;15t.	116	79,4	M16;21d.	36,5	38	$ø215_{g6}$
500	90	20	570	418	M12;18t.	137	96,8	M20;24d.	44,5	50	$ø276_{g6}$

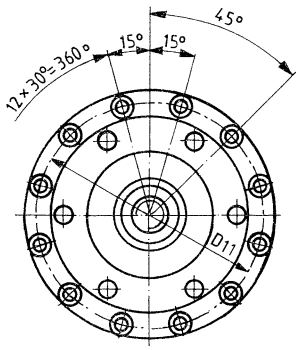
				connections		**shaft end**
size	D_2	D_3	D_4	**A, B**	**T (DIN 3852)**	**splined DIN 5480**
40	$ø80_{h8}$	ø143	ø116	SAE 3/4"	M18 x 1,5	32 x 2 x 14 x 9g
71	$ø100_{h8}$	ø166	ø135	SAE 1"	M22 x 1,5	40 x 2 x 18 x 9g
125	$ø120_{h8}$	ø190	ø167	SAE 11/4"	M27 x 2	50 x 2 x 24 x 9g
250	$ø160_{h8}$	ø232	ø198	SAE 11/2"	M33 x 2	60 x 2 x 28 x 9g
500	$ø200_{h8}$	ø300	ø245	SAE 2"	M33 x 2	80 x 3 x 25 x 9g

Unit dimensions 2A4FP Back to Back-Motor

Flange S

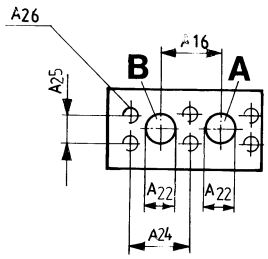


Flange

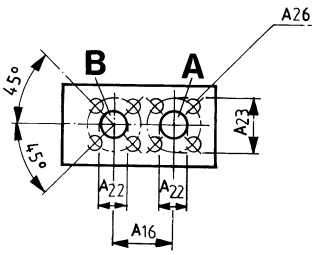


port plate **X**

Size 250



Size 500



connections

A, B	=	pressure port (high pressure range)	
T_1, T_2	=	oil/drain	- plugged
M_A, M_B	=	test port	- plugged
L_D	=	leakage port early diagnose system	- plugged

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}	A_{18}	A_{19}	A_{20}	A_{21}	A_{22}
250	26	880	16	103	42	120	20	111	18	23	132	196	367	496	551	66,7	30,35	48,65	107,5	170	12	32
500	27	1128	20	138	60	165	25	120	18	25	160	274	489	592	728	120	55	57,5	135	245	12	50

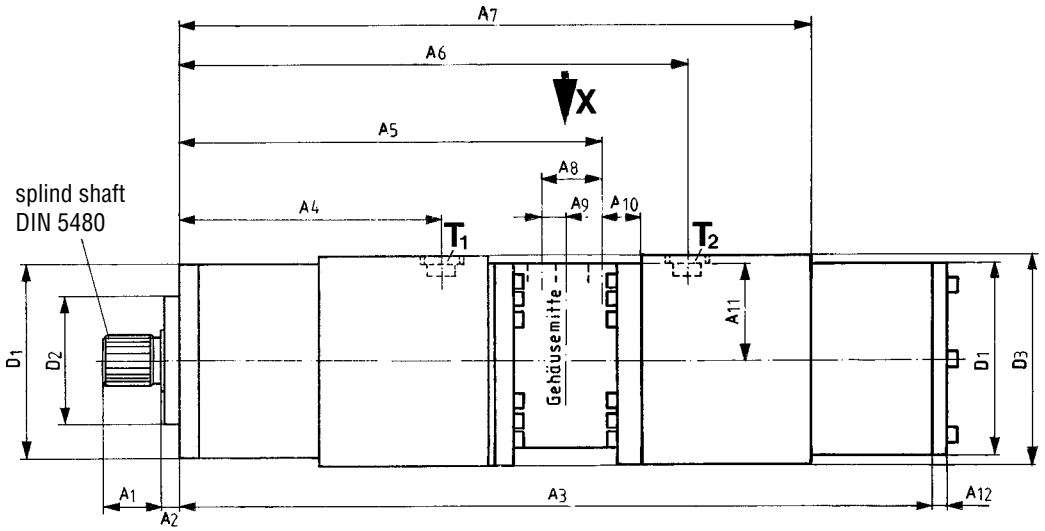
size	A_{23}	A_{24}	A_{25}	A_{26}	A_{27}	A_{28}	A_{29}	A_{30}	D_1	D_2	D_3	D_4	D_5	D_6	D_7
250	–	66,7	31,8	M14;19d.	110	7	18^{P8}	$7^{+0,2}$	M42x3	$ø65_{\pm 0,02}$	$ø80_{f7}$	$ø160_{h8}$	ø208	ø272	$ø215_{g6}$
500	98	–	–	M16;21d.	140	12	22^{P8}	$9^{+0,2}$	M60x2	$ø84_{\pm 0,02}$	$ø100_{f7}$	$ø200_{h8}$	ø283	ø360	$ø276_{g6}$

					connection		shaft end	
size	D_8	D_9	D_{10}	D_{11}	A, B	T_1, T_2(DIN 3852) L_D	parallel with keyed DIN 6885	
250	ø232	ø18	ø11	252	SAE 11/4"	M33x2	M14x1,5	AS 18 x 11 x 110
500	ø300	ø26	ø18	326	□ 2"	M33x2	M14x1,5	AS 22 x 14 x 140

Unit dimensions 2A4FP Back to Back-Motor

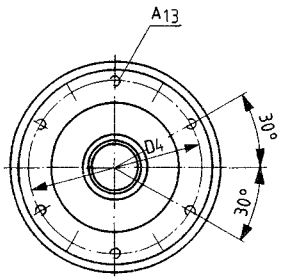
Flange M

shaft end Z



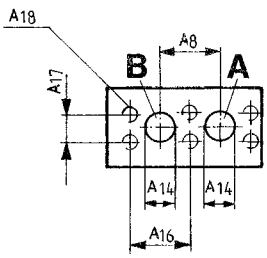
shaft end D and
shaft end C
please consult us

Flange



port plate **X**

size 250



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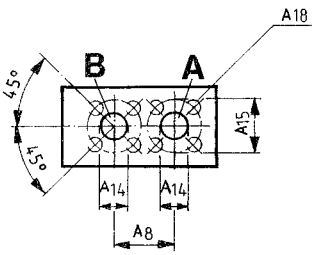


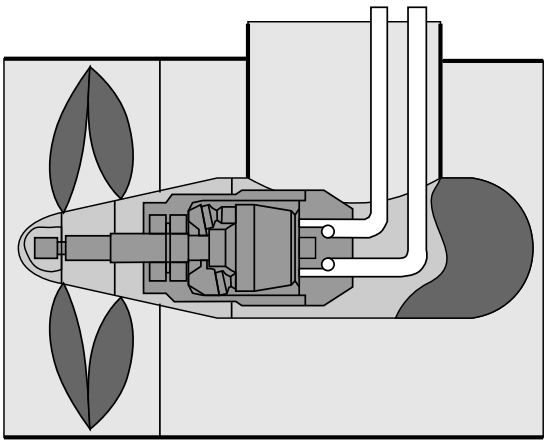
connections

A, B	=	pressure port (high pressure range)		
T_1, T_2	=	oil/drain	-	plugged
M_A, M_B	=	test port	-	plugged

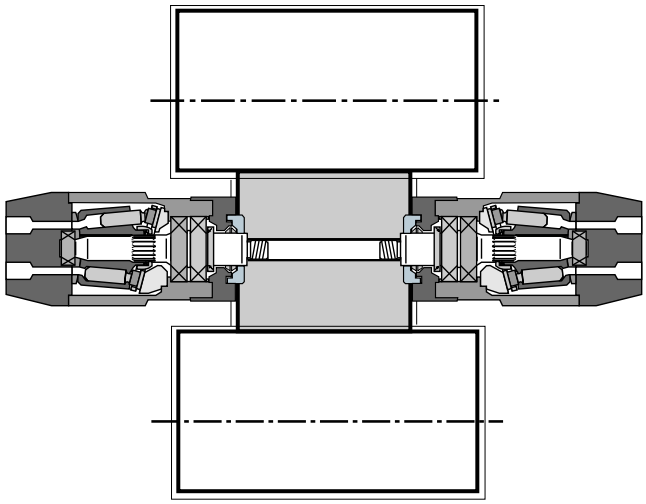
size	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}	A_{12}	A_{13}	A_{14}	A_{15}	A_{16}	A_{17}	A_{18}
250	70	20	855	303	474,35	603	658	66,7	30,35	48,65	107,5	12	M10;15d.	32	–	66,7	31,8	M14;19t.
500	90	20	1112	418	633	736	872	120	55	57,5	135	12	M12;18d.	50	98	–	–	M16;21t.

					connections		**shaft end**
size	D_1	D_2	D_3	D_4	**A, B**	T_1, T_2 **(DIN 3852)**	**splined DIN 5480**
250	$ø215_{g6}$	$ø160_{h8}$	ø232	ø198	SAE 11/4" (High pr. r.)	M33 x 2	60 x 2 x 28 x 9g
500	$ø276_{g6}$	$ø200_{h8}$	ø300	ø245	□2" (High pr. r.)	M33 x 2	80 x 3 x 25 x 9g

Example for Applications

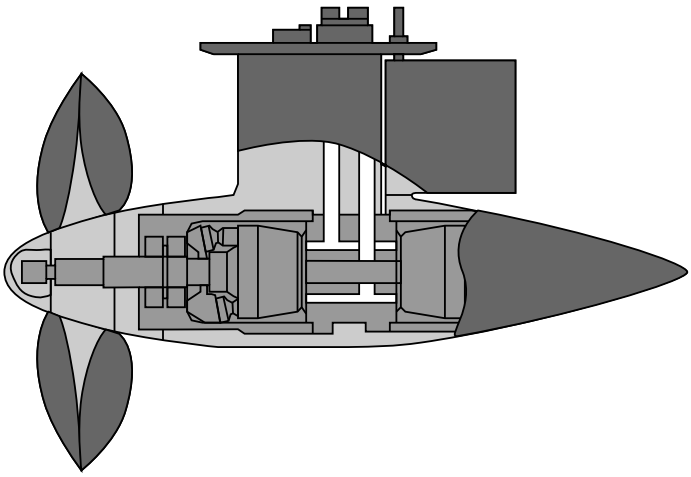


Bow-Thruster

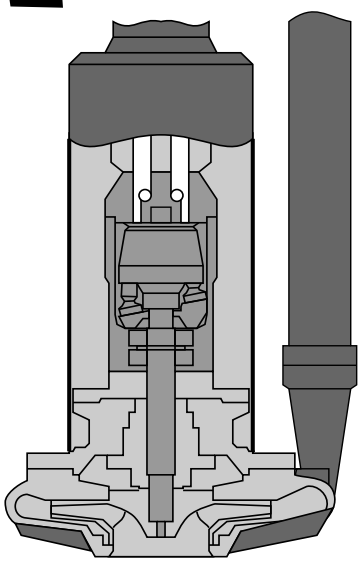


Van

Fixed displacement motor A4FP / 2A4FP



Propeller



Cargo-Pump

Pump Delivery Program High Pressure Range A4

A4VSO
RE 92 050

Size (cm³):
40 71 125 180 250 355 500 750

control devices:

DR	const. pressure control
DP	parallel control
FR	flow control
DFR	pressure/flow control
LR2	constant power control
LR3	remote power control
HM	hydraulic control
HS	hydraulic control by servo valve
EO	electronical control
HD	hydr. control pilot pressure dependent
EM	electromechanical control

A4VSG/H
RE 92 100 / 92 110

Size (cm³):
40 71 125 180 250 355 500 750 1000

control devices:

DR	const. pressure control
DP	parallel control
LR2	constant power control
LR3	remote power control
HM	hydraulic control
HS	hydraulic control by servo valve
EO	electronical control
HD	hydr. control pilot pressure dependent
EM	electromechanical control

A4FO
RE 91 455

Size (cm³):
71 125 250 500