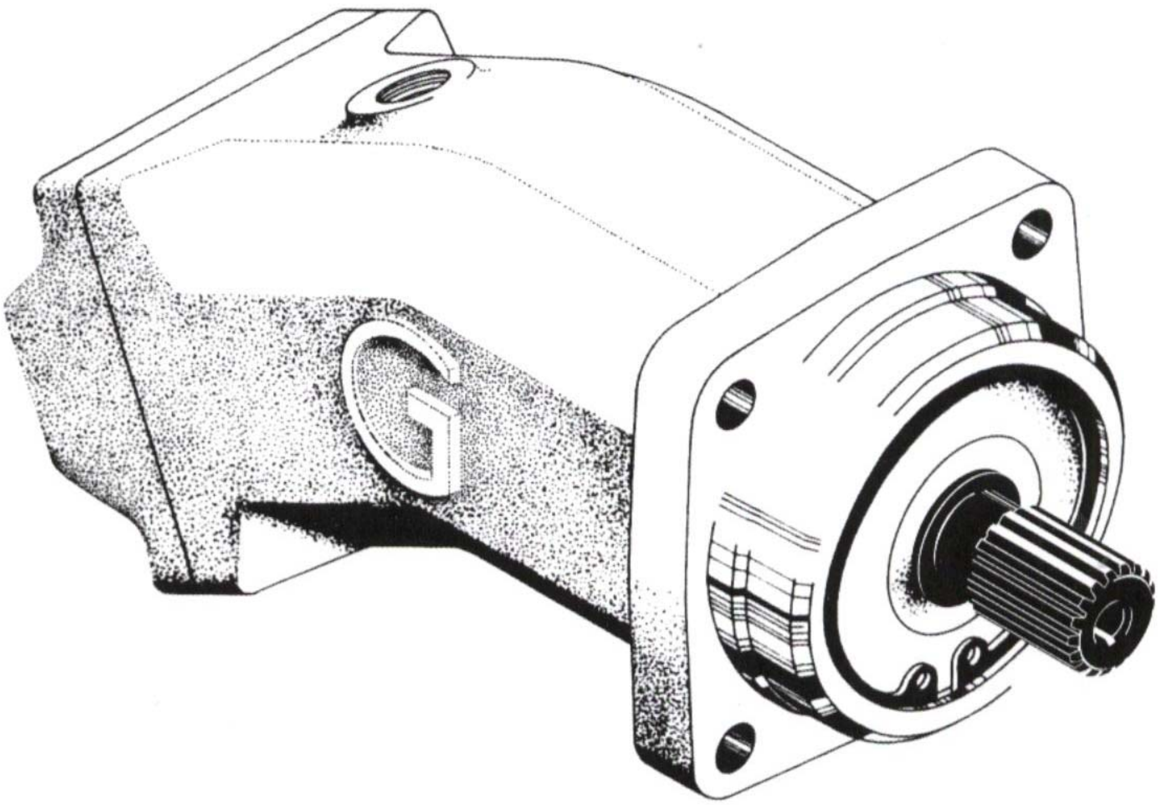
Axial Piston Hydraulic Motors HM



Function and description

Hydraulic motors HM are axial piston units of bent axis type. They have fixed displacement and are designed for hydrostatic systems of mobile and stationary machines. They can operate both in open and closed circuits.

Pressures:

Operating pressure:	nominal		25 MPa
	Maximum		35 MPa
	Peak		40 MPa

The sum of pressures acting simultaneously in both ports must not exceed 45 MPa

Permissible case pressure:

	for standard type	max.	150 kPa
	to special order		350 kPa

Technical data

Bent axis angle of standard motors is 25° or 27°. Main technical data are stated in Table1.

Table 1

Parameter		Unit	HM12	HM16	HM28	HM56	HM105
Displacement		$m^3 . 10^{-6}$	12.5	16	28.5	56	105
Specific torque		$Nm.MPa^{-1}$	1.99	2.55	4.54	8,91	16,71
Inertia moment at drive axis		$Kg. m^2.10^{-3}$	0.456	0.688	1.80	5,54	15,8
Speed:	nominal	s^{-1}	32			25	
			100	100	80	60	50
Torque:	nominal	Nm	47	60	108	209	397
			65	85	149	293	550
Port dimension:	outlet	mm	13	13	16	20	25
			13	13	16	20	25
			8	10			
Mass		kg	6.5	10.1	12.5	23,5	42,5

Operating conditions

Fluid: It is recommended to use special mineral oils for hydraulic circuits, i.e. oils of HM and HV classes. Suitable oils of local and foreign origin are listed in Table 2.

Table 2 - RECOMMENDED WORKING FLUIDS BASED ON MINERAL OILS

Manufacturer			Benzina	Shell	Mobil	BP	Esso	OMV	Castrol	Valvoline	Texaco	Agip	ELF
Operation													
cold	25-45°C	HM	OH-HM32	Tellus 32	DTE 24	Energol HLP32	NUTO H32	HLP32	HYSPIN AWS32	ETC25	Rando HDA32	OSO 32	Elfolna 32
		HV	OH-HV32	TellusT32	DTE 1 3 M	Bartran HV32	UNIVISH HP32	HLP-M 32	HYSPIN AWH32		Rando HD AŽ 32		Hydrelf DS32
normal	35-55°C	HM	OH-HM46	Tellus 46	DTE 25	Energol HLP46	NUTO H46	HLP46	HYSPIN AWS46	ETC30	Rando HDB46	OSO 46	Elfolna 46
		HV	OH-HV46	TellusT46	DTE 1 5 M	Bartran HV46	UNIVISH P46	HLP-M 46	HYSPIN AWH46				Hydrelf DS46
warm	45-65°C	HM	OH-HM68	Tellus 68	DTE 26	Energol HLP68	NUTO H68	HLP68	HYSPIN AWS68	ETC35	Rando HDC68	OSO 68	Elfolna 68
		HV	OH-HV 68	Tellus T68	DTE 1 6 M	Bartran HV68			HYSPIN AWH68		Rando HD CZ 68		Hydrelf DS68

From the point of view of non-flammable fluids, the standard units may operate with HFA fluids when maximum pressure and speed are partially limited (consultation with the manufacturer is recommended). HFC and HFD fluids have to be used with adequate sealing materials.

Viscosity: The recommended optimum viscosity range is $25 \div 60.10^{-6}$ $m^2.s^{-1}$, i.e. the fluid should be selected so that within the operating temperature range the viscosity lies within the optimum range. The maximum viscosity of 1000.10^{-6} $m^2.s^{-1}$ is permitted for a short period upon cold start, the minimum viscosity being 10.10^{-6} $m^2.s^{-1}$ for a short-time increase of fluid temperature. In open circuits the fluid temperature means the fluid temperature in the tank, in closed circuits it means the main circuit temperature. If an option between fluids of two adjoining viscosity grades is possible, the fluid with higher viscosity is preferred.

The leakage fluid temperature is always higher than the average fluid temperature in the circuit. If the leakage fluid temperature is coming up to or exceeds 90° C, it is necessary to flush the pump case with a cooler fluid.

Filtration: The recommended fluid purity class is 16/13, for less demanding operation and pressures lower than 25 MPa up to 18/15 according to the standards of CETOP RP 76 H and ISO 4406 respectively. In open circuits the filtering of full flow 40 µm in return line should be supplemented by 10 µm by-pass filtration of at least 10% of total flow. In closed circuits 10 µm boost flow filtration is suitable.

Speed: The maximum pump speed in dependence on its size is stated in technical parameters. The highest value holds for pumps operating in closed hydraulic circuits or for the supercharged ones. Maximum speed in the open circuit requires the maximum inlet underpressure of 10 kPa, possibly, in case of short-time cold start, 25 kPa are permissible. Minimum recommended speed is 7 s^{-1}; operation below this value is permissible, it is however necessary to realise that lower speed causes greater pulsations of output flow.

Mounting

Pump mounting position is arbitrary. Alignment of the driven shaft and the pump shaft and the perpendicularity of the mounting flance face is given in CSN 01 4405, Tables 4 and 5, Accuracy Class 7, i.e. relative misalignment of the shafts max. 12,5 µm, total face run-out of mounting flange max. 25 µm.

Before starting the operation, the pump case must be entirely filled with fluid. The fluid inside the pump serves for lubricating the bearings and other interacting parts. To prevent spontaneous outflow of the fluid from the pump case, the leakage line must be connected with the upper leakage port. End of the leakage line in the tank ought to be under the minimum oil level.

The maximum pressure within the case is stated in technical parameters and is determined particularly with respect to pressure load on the shaft seal. The pressure in the case should be always higher than the pressure on the oustide of this seal. Therefore, in applications where the pressure on the outside of the shaft seal is higher than the atmospheric pressure (e.g. mounting the pump to a gearbox etc.), the data of leakage pressure hold as a pressure difference.

Dimensioning of the antifriction shaft support allows the effect of external radial force of the value current in standard operating conditions. Recommended limitations of the shaft radial loading in dependence on the force direction are indicated in Fig.1 . Position of force application is supposed to be at the half of the shaft end length. Percentage change of permissible radial force in case of acting in other position is in Fig. 2.

Permissible axial load is a function of outlet pressure p [MPa] and can be derived from the relations stated in Table 3. Maximum axial force acting inwards during the assembly, is equal to the stationary axial force.

Table 3

Size	Axial load acting inwards when in operation [kN]	Axial force acting inwards when at rest [kN]	Axial force acting outwards [kN]
HM 12; 16	Fa = 0.2 + 0.13 p	0.2	0.8
HM 28	Fa = 0.3 + 0.23 p	0.3	1.2
HM 56	Fa = 0,4 + 0,30 p	0,4	2,0
HM 105	Fa = 0,5 ÷ 0,52 p	0,5	2,5

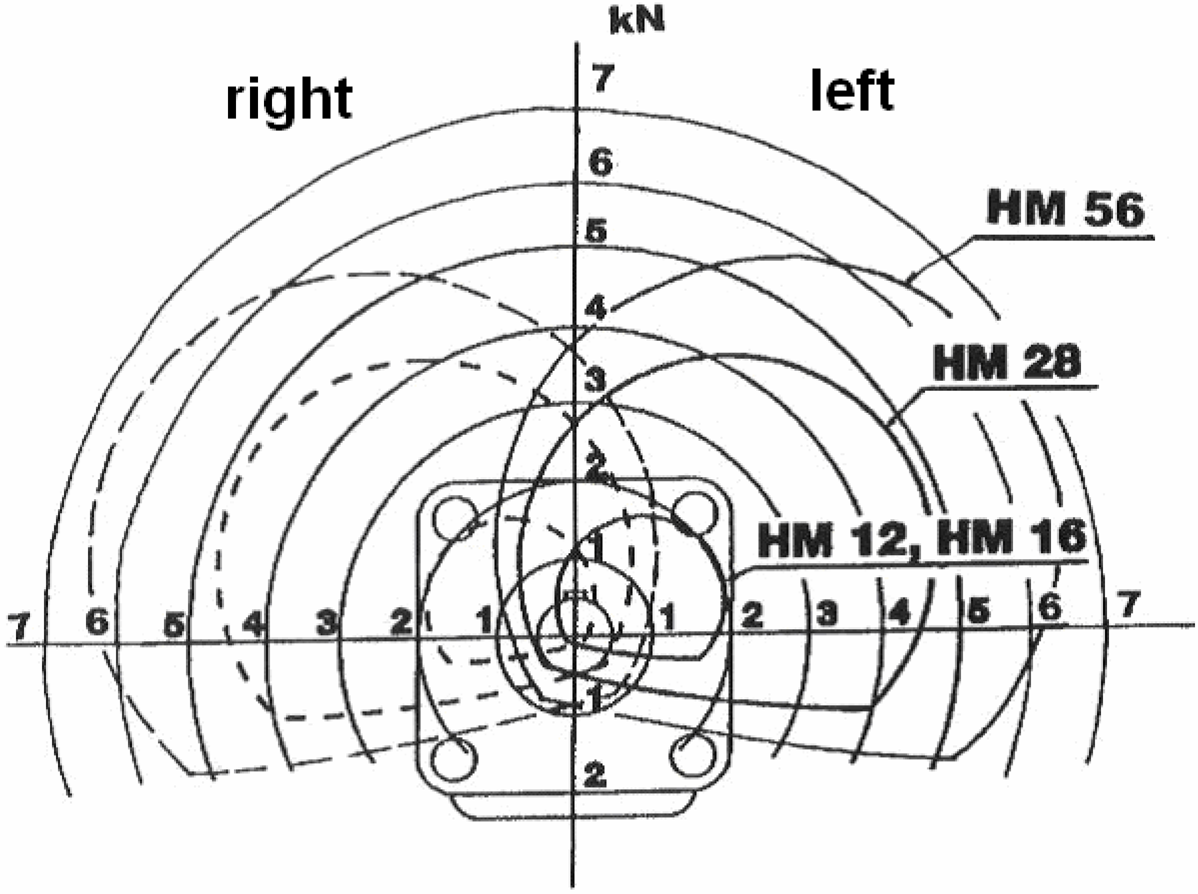

kN
right
left
7
6
5
4
3
2
1
HM 56
HM 28
HM 12, HM 16
7 6 5 4 3 2 1 1 2 3 4 5 6 7
1
2

Fig. 1

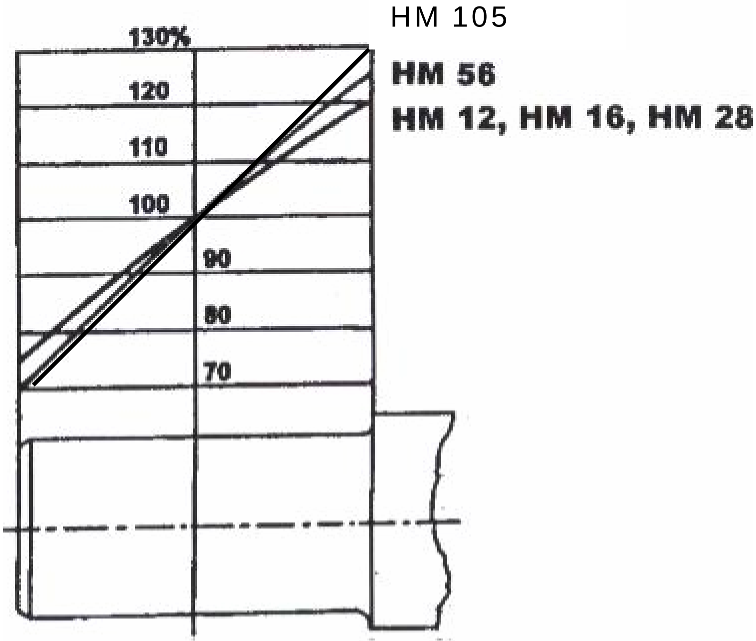
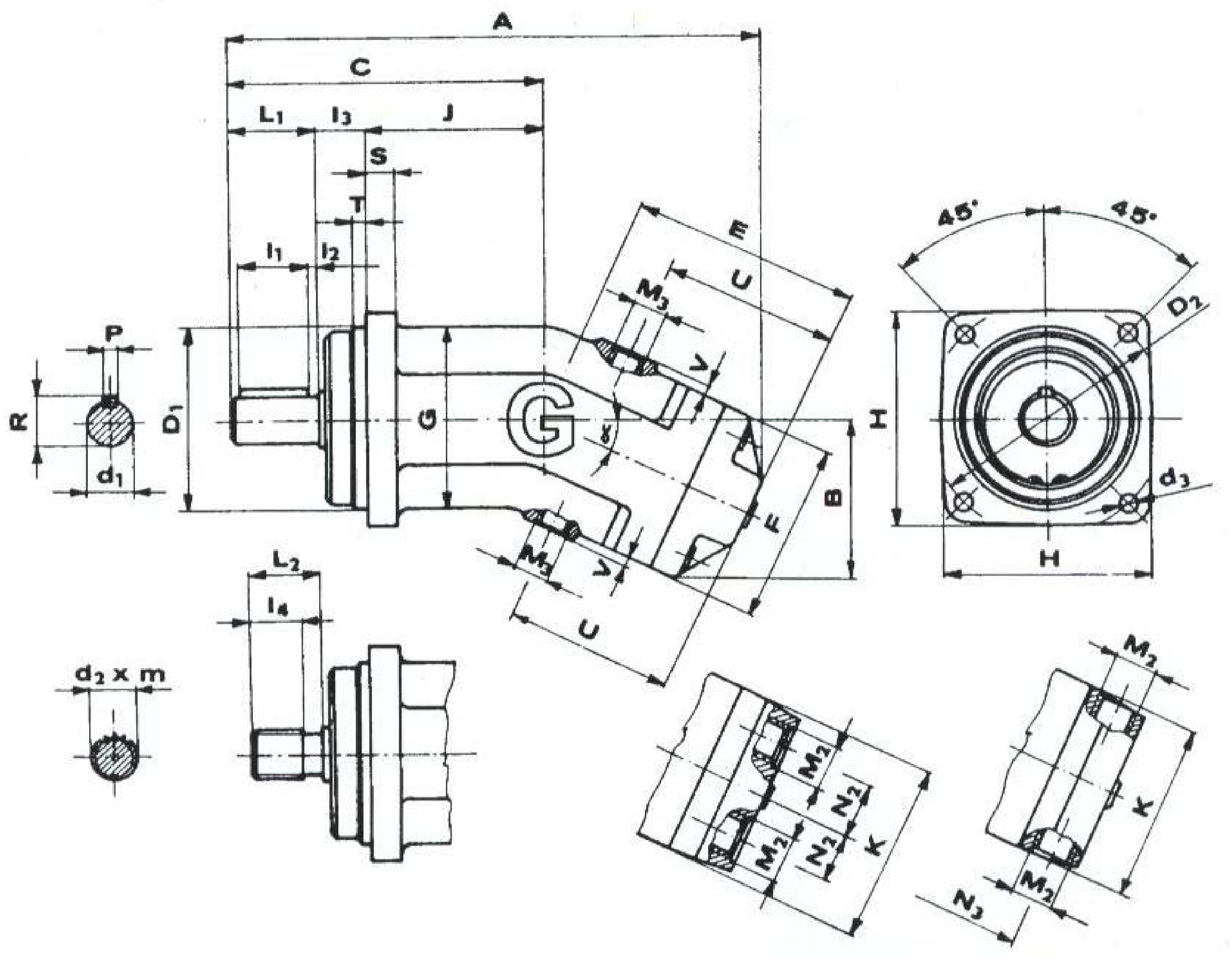

HM 105
HM 56
HM 12, HM 16, HM 28
130%
120
110
100
90
80
70

Fig. 2

Dimensioned sketch



Model E Model A Model B

Special models by agreement with the manufacturer

Table 4

Size	A	B	C	ØD₁f8	ØD₂ ±0,2	Ød₁h6	Ød2m.9 g ČSN 01 4953	Ød₃	E	F	G	H	J	K
HM 12	250	75	135	80	103	20	20x1,25	9	105	80	80	95	79	80
HM 16	280	90	150	100	125	20	20x1,25	11	122	82	90	115	89	82
HM 28	300	90	160	100	125	25	25x1,25	11	133	95	95	118	93	95
HM 56	356	113	198	125	160	32	30x2,00	14	163	125	125	150	108	125
HM105	437	139	242	160	200	40	40x2,00	18	196	150	150	180	120	150

L_1	L_2	l_1	l_2	l_3	L_4	M_2	M_3	N_2	Ph9	R	S	T	U	V
36	34	28	3	20	22	M 22x1,5	M 14x1,5	24	6	22,5	14	7	82	3
36	34	30	3	25	22	M 22x1,5	M 16x1,5	24	6	22,5	14	9	102	3
42	42	36	2,5	25	30	M 22x1,5	M 16x1,5	27	8	27,9	17	9	105	3
58	35	50	4	32	27,5	M 27x2,0	M 16x1,5	39	10	35,3	20	9	125	3
82	45	70	6	40	37,5	M 33x2,0	M 16x1,5	44	12	43,1	23	9	158	3

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