

## A6V Series Variable Displacement Motor

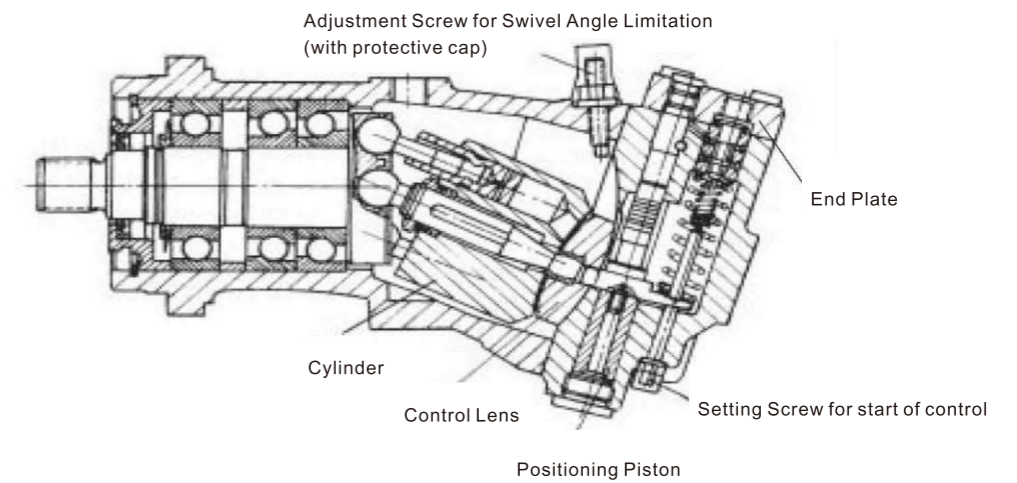


### Description

The variable displacement motor was designed especially for hydrostatic drives with secondary controls. A complete control assembly for a maximum swivel range of  $V_{max}/V_{min}=3.47$  is fitted.

### Special Characteristics

- Large control range with hydrostatic transmissions.
- Secondary control regulation with various control devices.
- Increased maximum output speeds at reduced swivel angle.
- Cost-saving due to the possibility of using smaller pumps.
- Obviates the multispeed ratio gear drives.
- High power density.
- Optional mounting position.
- High efficient.
- Excellent starting characteristics.
- Low inertia.



# Model Code



		A6V	80	HA2	2	F	Z	2	-	039	
Motor Type	Variable displacement motor										
Size	( $V_{gmin} - V_{gmax}$ ) Displacement	A6V									
	8.1 – 28.1 ml/r	28									
	15.8 – 54.8 ml/r	55									
	23 – 80 ml/r	80									
	30.8 – 107 ml/r	107									
	46 – 160 ml/r	160									
	64.8 – 225 ml/r	225									
	137 – 500 ml/r	500									
Control Device											
Hydraulic control, pilot pressure related	$\Delta p=1\text{MPa}$ Pilot pressure increase	HD1									
	$\Delta p=1\text{MPa}$ With pressusre control	HD1D									
	$\Delta p=2.5\text{MPa}$ Pilot pressure increase	HD2									
	$\Delta p=1\text{MPa}$ With pressusre control	HD2D									
Hydraulic 2-speed control pilot pressure related	Start of control 0.2-2MPa	HS1									
	Start of control 0.5-5MPa	HS2									
Automatic control, high pressure related	Constant pressure Without override	HA1									
	With override	HA1H									
	Pressure increase $\Delta p=10\text{MPa}$ Without override	HA2									
	With override	HA2H									
Hydraulic control, speed related	Hydraulic control, speed related	DA									
	Electrical 2-speed control 12V (with switching solenoid)24V	ES1									
	Electrical control 12V (with proportional solenoid)24V	ES2									
	Mooring control	EP1									
	Manual control	EP2									
	Manual control (with handwheel)	MO									
		MA									
		Min. Swept Volume Setting									
		Example. $V_{gmin}=39\text{ml/r}$ 039									
		For crane products -									
		Assembly Type									
		For explanation see description of control device and unit dimensions 1 2									
		Shaft End									
		GB1096-79 Keyed parallel shaft P									
		DIN 5480 Splined shaft Z									
		GB 3478.1-83 Splined shaft S									
		Pipe Connections									
		SAE flange, on side F									
		Metric threads, on side G									
		Series									
		Series 2, sizes 28-225 2									
		Series 1, size 500 1									
Ordering Example A6V80HD12FZ2-039											
Axial piston variable displacement motor A6V, size 80, with hydraulic control, pilot pressure related, $\Delta p=1\text{MPa}$ , series 2, SAE flange connections on side, splined shaft, assembly type 2, min. swept volume setting $V_{gmin}=39\text{ml/r}$											

#### Technical Data

##### Operating Pressure Range

Pressure at port A or B  
 Nominal pressure  $P_n=31.5\text{MPa}$   
 Peak pressure  $P_{max}=35\text{MPa}$   
 The sum of the pressures at ports A and B should not exceed 63MPa.  
 (Individual pressure at either port max.35MPa  
 Leakage oil Pressure:  
 Maximum permissible leakage oil pressure (at Port T)  
 $P_{abs} \leq 0.2\text{MPa}$

##### Fluid Temperature Range

$t_{min} -25^\circ\text{C}$   
 $t_{min} +80^\circ\text{C}$

##### Viscosity Range:

$V_{min} 10\text{mm}^2/\text{s}$   
 $V_{max}$  ( for short periods)  $1000\text{mm}^2/\text{s}$

##### Optimum Operating Viscosity:

$V_{opt} 16 - 36\text{mm}^2/\text{s}$

##### Fluid Recommendation

Operating Recommended  
 Viscosity grade temperature to DIN51519 range ISO(VG)

30-40°C	VG22=22mm <sup>2</sup> /s	at40°C
40-50°C	VG32=32mm <sup>2</sup> /s	at40°C
50-60°C	VG46=46mm <sup>2</sup> /s	at40°C
60-70°C	VG68=68mm <sup>2</sup> /s	at40°C
70-80°C	VG100=100mm <sup>2</sup> /s	at40°C

##### Filtration of Hydraulic Fluid

Recommended filtration 10µm. Coarser filtration of 25 to 40µm is possible, however longer service life is achieved with filtration of 10µm. (reduced wear).

##### Speed Range

No limitation on minimum speed  $n_{min}$ . Where very even speeds are required,  $n_{min}$  should not be less than 50r/min.  
 The maximum flow from the pump and the minimum swept volume of the variable motor together determine the maximum output speed.  
 The min swept volume is limited mechanically by means of an adjustment screw so that the max. permissible speeds (of the variable motor and the driven unit) cannot be exceeded. See date table for max. permissible speeds.

##### Calculation of size

$$\text{Swept Volume } Q = \frac{v\eta_v \cdot n}{1000 \cdot \eta_v} \quad [\text{L/min}]$$

$$\text{Output Speed } n = \frac{Q \cdot 1000 \cdot \eta_v}{V_g} \quad [\text{r/min}]$$

$$\text{Output Torque } M = \frac{V_g \cdot \Delta P_{\eta_{mh}}}{2\pi} \quad [\text{Nm}]$$

$$\text{or } M = \frac{1.59 V_g \cdot \Delta P \cdot \eta_{min}}{10} \quad [\text{Nm}]$$

$$\text{or } M = \frac{K_w \cdot \Delta P_{\eta_{mh}}}{10} \quad [\text{Nm}]$$

$$P = \frac{M \cdot n}{9549} \quad [\text{KW}]$$

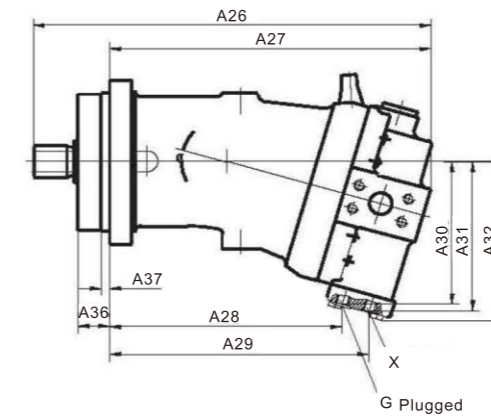
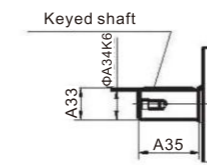
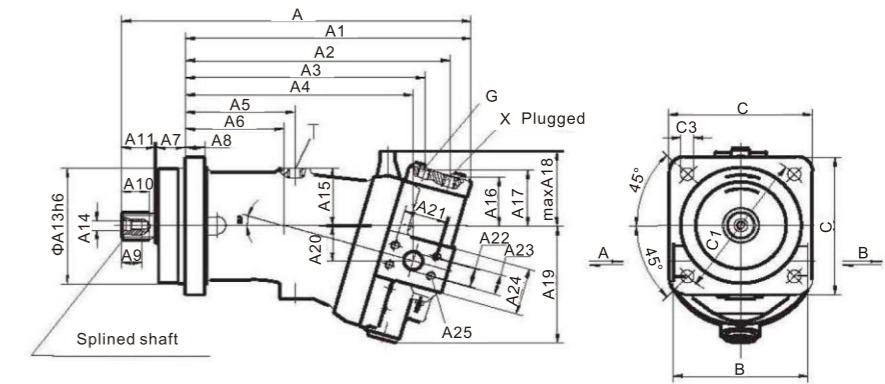
$$= \frac{Q \cdot \Delta P}{60} \cdot \eta_t$$

$V_g = (\text{ml/r})$  max geometry displacement [ml/r]  
 $M = (\text{Nm})$  torque [Nm]  
 $\Delta P = (\text{MPa})$  differential pressure [MPa]  
 $n = (\text{r/min})$  speed [r/min]  
 $\eta_v$  volumetric efficiency  
 $\eta_{mh}$  mechanical-hydraulic efficiency  
 $\eta_t$  overall efficiency

Size	28	55	80	107	160	225	500
Control Device	•	•	•	•	•	•	•
Hydraulic control pilot pressure related	•	•	•	•	•	•	•
Hydraulic control pilot pressure related	•	•	•	•	•	•	•
Hydraulic control (two speed), pilot pressure related	•	•	•	•	•	•	•
Automatic control, high pressure related	•	•	•	•	•	•	•
Hydraulic control, speed related	•	•	•	•	•	•	•
Electric control (two speed)	•	•	•	•	•	•	•
Electric control (proportional)	•	•	•	•	•	•	•
Mooring control	•	•	•	•	•	•	•
Manual control	•	•	•	•	•	•	•
Displacement							
	$V_{gmax}$	ml/r	28.1	54.8	80	107	225
	$V_{gmax}$	ml/r	8.1	15.8	23	30.8	64.8
Max. Permissible. Swept volume	$Q_{gmax}$	L/min	133	206	268	321	424
Max. speeds							
( at $Q_{max}$ )	$n_{max}$ at $V_{gmax}$	r/min	4750	3750	3350	3000	2650
	$n_{max}$ at $V_g < V_{gmax}$	r/min	6250	5000	4500	4000	3500
Torque constants							
	$M_x$ at $V_{gmax}$	Nm/MPa	4.463	8.701	12.75	16.97	25.41
	$M_x$ at $V_{gmax}$	Nm/MPa	1.285	2.511	3.73	4.9	7.35
Max. torque							
( at $\Delta p=35\text{MPa}$ )	$M_{max}$ at $V_{gmin}$	Nm	156	304	446	594	889
	$M_{max}$ at $V_{gmin}$	Nm	45	88	130	171	257
Max. output power (at 35MPa and $Q_{max}$ )		kW	78	120	156	187	247
Moment		kgm <sup>2</sup>	0.0017	0.0052	0.0109	0.0167	0.0322
Weight		kg	18	27	39	52	74

#### Unit Dimensions

Size 28-225 Assembly type 2  
 HD, HS Control



SAE pressure port  
 Threaded pressure port

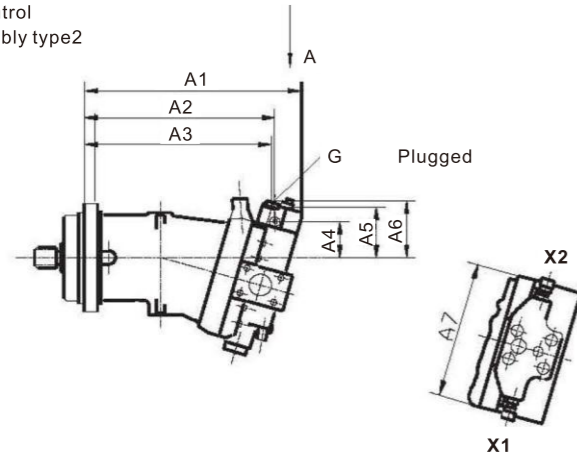
service port  
 port for synchronous control of multiple units and for remote control pressure.  
 pilot pressure  
 case drain

Size	A	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>	A <sub>7</sub>	A <sub>8</sub>	A <sub>9</sub>	A <sub>10</sub>	A <sub>11</sub>	A <sub>12</sub>	A <sub>13</sub>	A <sub>14</sub>	A <sub>15</sub>	A <sub>16</sub>	A <sub>17</sub>	A <sub>18</sub>	A <sub>19</sub>	A <sub>20</sub>	A <sub>21</sub>	A <sub>22</sub>	A <sub>23</sub>	A <sub>24</sub>	A <sub>25</sub>	deep	A <sub>26</sub>	A <sub>27</sub>	A <sub>28</sub>
28	317	249	230	206	189	107	75	25	16	19	28	43	M16×1.5	100	M8	50	57	64	81	110	33	50.8	20	23.8	45	M10	17	298	230	152
55	379	312	291	264	249	123	108	32	20	28	28	35	M18×1.5	125	M12	63	52	60	84	132	40	50.8	20	23.8	53	M10	17	368	301	208
80	440	368	345	316	297	152	137	32	23	28	33	40	M18×1.5	140	M12	71	59	68	99	150	46	57.2	25	27.8	64	M12	18	425	353	252
107	463	378	356	326	301	145	130	40	25	28	37.5	45	M18×1.5	160	M12	80	63	71	104	162	49	57.2	25	27.8	64	M12	18	442	357	259
160	530	440	412	377	354	213	156	40	28	36	42.5	50	M22×1.5	180	M16	88	66	77	108	182	57	66.7	32	31.8	70	M14	19	513	423	302.5
225	573	468	441	405	375	222	162	50	32	36	43.5	55	M22×1.5	200	M16	96	74	85	121	199	61	66.7	32	31.8	70	M14	21	546	441	324

Size	keyed		splined		splined		G	X												
	GB1096-79	DIN 5480	GB3478.1-83																	
28	176	124	131	139	27.9	25	50	23	8	116	M27×2	118	125	12	11	8×50	W25×1.25×18×99	EXT18Z×1.25M×30R×5f	M12×1.5	M14×1.5
55	235	133	141	153	32.9	30	60	29	10	142	M33×2	150	160	16	13.5	8×50	W30×2×14×9g	EXT14Z×2m×30R×5f	M14×1.5	M14×1.5
80	282	152	161	177	38	35	70	29.5	10	172	M42×2	165	180	16	13.5	10×56	W35×2×16×9g	EXT16Z×2m×30R×5f	M14×1.5	M14×1.5
107	288	164	173	188	43.1	40	80	35	10	178	M42×2	190	200	20	17.5	12×63	W40×2×18×9g	EXT18Z×2m×30R×5f	M14×1.5	M14×1.5
160	338	182.5	193	201	48.5	45	90	36.5	11.5	208	M48×2	210	224	20	17.5	14×70	W45×2×21×9g	EXT21Z×2m×30R×5f	M14×1.5	M14×1.5
225	359	201	211	219	53.5	50	100	50	12	226	M48×2	236	250	25	22	14×80	W50×2×24×9g	EXT24Z×2m×30R×5f	M14×1.5	M14×1.5

## Installation dimensions

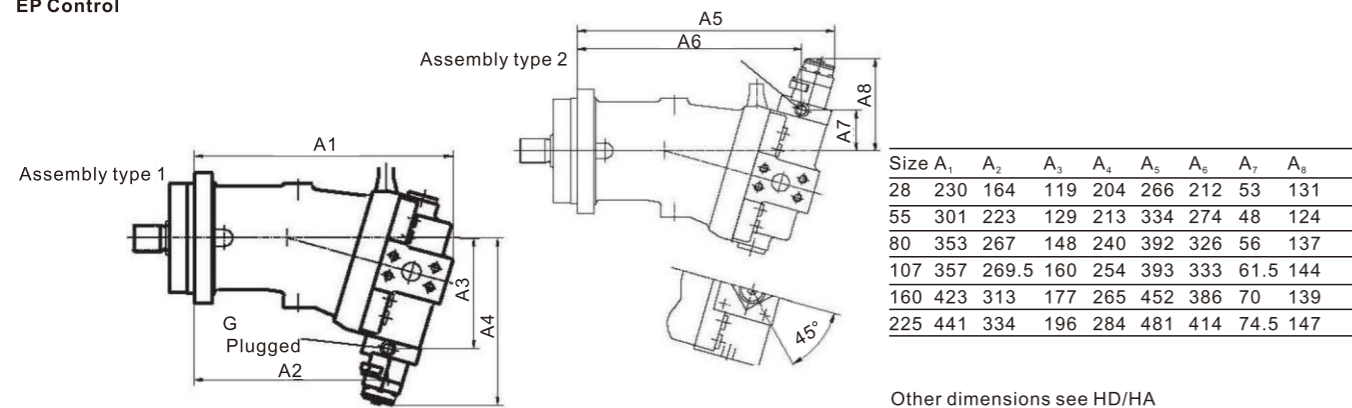
DA Control  
2 Assembly type 2



Size	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>	A <sub>7</sub>	X <sub>1</sub> , X <sub>2</sub>
28	253	212	209	53	73	81	144	M14×1.5
55	317	272	268	49	70	77	146	M14×1.5
80	371	326	322	56	77	83	152	M14×1.5
107	380	336	332	59	81	88	152	M14×1.5
160	442	387	383	65	86	94	158	M14×1.5
225	471	416	411	73	95	103	158	M14×1.5

Other dimensions see HD/HA.

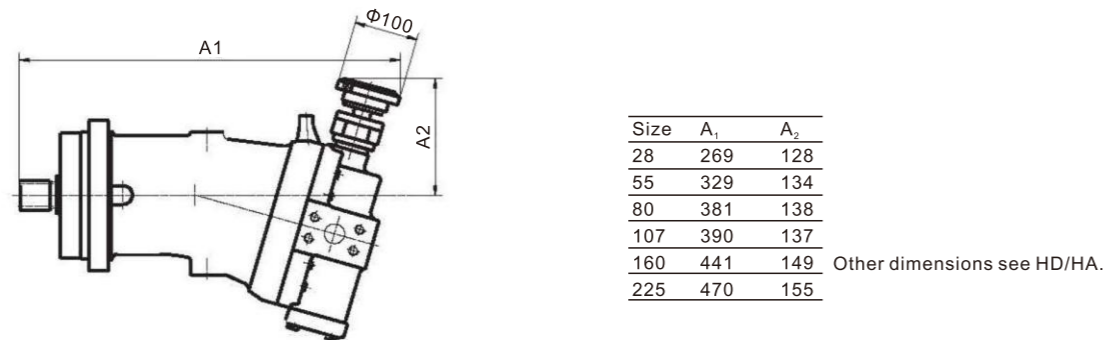
EP Control



Size	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>	A <sub>7</sub>	A <sub>8</sub>
28	230	164	119	204	266	212	53	131
55	301	223	129	213	334	274	48	124
80	353	267	148	240	392	326	56	137
107	357	269.5	160	254	393	333	61.5	144
160	423	313	177	265	452	386	70	139
225	441	334	196	284	481	414	74.5	147

Other dimensions see HD/HA.

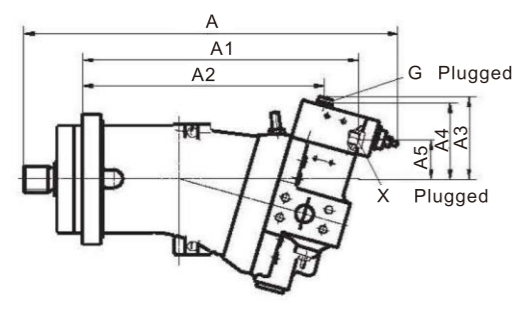
MA Control  
1 Assembly type 1



Size	A <sub>1</sub>	A <sub>2</sub>
28	269	128
55	329	134
80	381	138
107	390	137
160	441	149
225	470	155

Other dimensions see HD/HA.

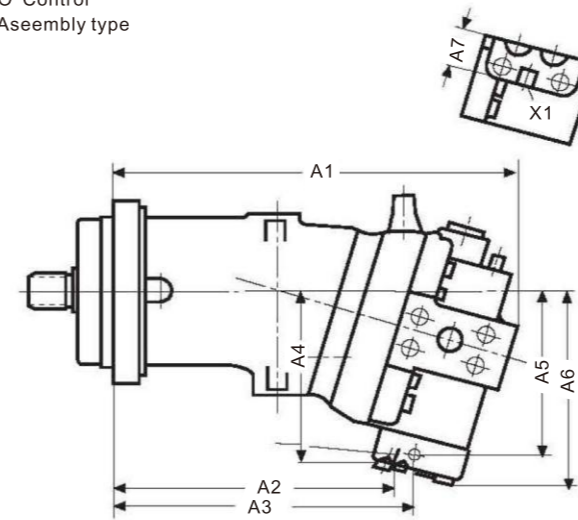
HD1D



Size	A	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>
55	422	311	273	96	89	46
107	496	376.5	335.5	108	100	56

## Installation dimensions

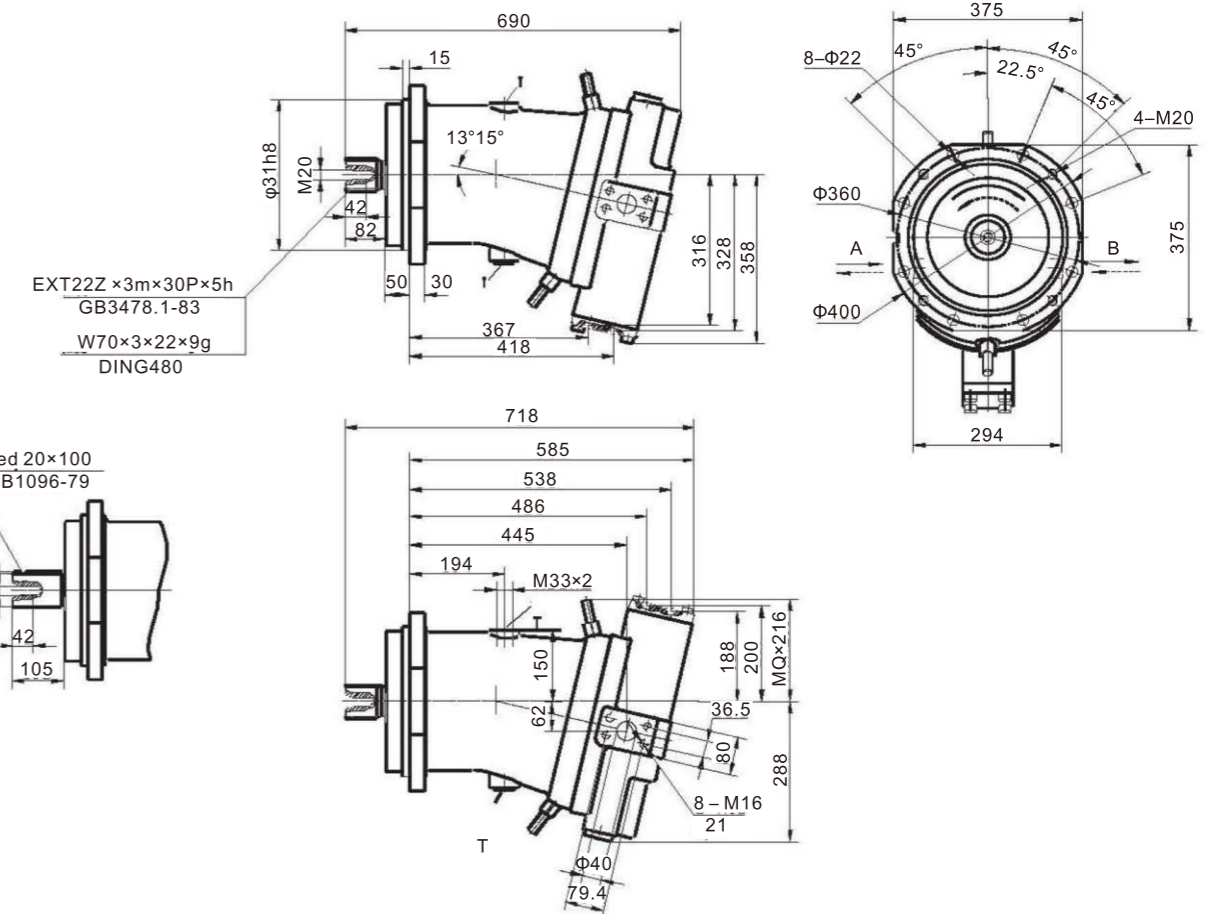
MO Control  
1 Assembly type



Size	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>	A <sub>7</sub>	X <sub>1</sub>
55	301	208	224	138	130	155	30	M14×1.5
80	353	252	268	157	149	177	33	M14×1.5
107	357	257	273	169	161	188	33	M14×1.5
160	423	300	312	187	178	206	34	M14×1.5
225	441	322	334	206	197	225	34	M14×1.5

Other dimensions see HD/HA.

Unit dimensions  
Size 500  
HA Control  
Splined  
W70×3×22×9g  
(DIN 5480)  
1 Assembly



HD Control  
2 Assembly 2