

Servo Worm Gear Units ZM/S

These servo gearboxes are characterised by high torsional rigidity and very low torsional backlash. This enables high acceleration and precise positioning accuracy in your application.

General data: Universal heavy-duty worm gear boxes. 4 sizes, centre distance 40, 50, 63 and 80 mm. On request with keyway in the hollow shaft and centre distance 100 mm available. Permissible ambient temperature -20°C to $+40^{\circ}\text{C}$.

Housing: High quality aluminium die-casting, all sides machined and with mounting holes on 5 sides.

Gearing: 6 ratios from 4 to 39 : 1. Worm shaft hardened and ground, worm wheel made of high-performance bronze, gear backlash <6 arcmin. On request, at extra cost and depending on size, the backlash can get decreased by the factory <2 arcmin.

Efficiency factor: The efficiency factors stated in the selection tables are guideline values for properly run-in and lubricated gearboxes at operating temperature with nominal load and driving worm shaft.

Self-locking: The servo worm gear unit isn't self-locking.

Bearing Systems: Generously dimensioned ball-bearings for continuous modes. Input side with fixed and loose bearing, output side bearing in eccentric cover. On request available with tapered roller bearings for dynamic operation and high external force.

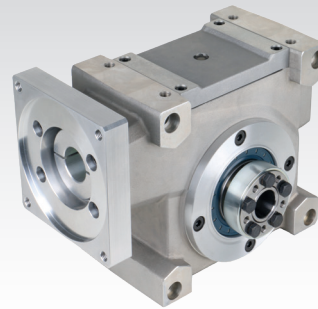
Lubrication: On delivery with food-grad lubricant NSF-H1 filled (FDA approved). On request, the gearbox can be filled with other lubricants at the factory. Under normal operating conditions, no maintenance is required.

Ventilation: No ventilation screw necessary. The venting is effected by hermetic pressure compensation (membran). The membran is independent from the mounting position and in the housing integrated.

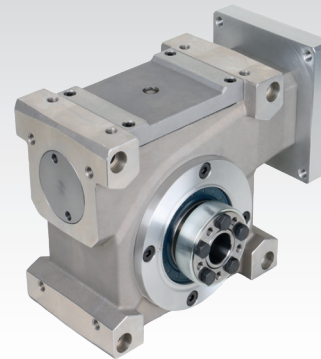
Delivery: 2 products have to be ordered:

- the servo worm gear unit with shrink disc on side 5 or 6
- the motor adaptation with coupling, flange and fixing screws.

Version: Shrink disk at side 6



Version: Shrink disk at side 5



i = transmission ratio.

$n_{1\text{max}}$ [min^{-1}] = maximum Input Speed (short notice).

$T_{2\text{amax}}$ [Nm] = maximum acceleration torque (output).

$T_{1\text{perm}}$ [Nm] = permissible input torque.

$T_{2\text{perm}}$ [Nm] = permissible output torque (permanent).

$T_{2\text{max}}$ [Nm] = maximum output torque (peak / emergency stop).

T_{KW} [Nm] = backlash-constant torque.

c [Nm/arcmin] = torsional stiffness.

η [%] = operating efficiency.

Ordering Details: e.g. Product No. 42104100, Gearbox size 40, $i=4:1$ and Product No. 42109401, motor adaptation size 40, Shaft- Ø 9 x 20 mm

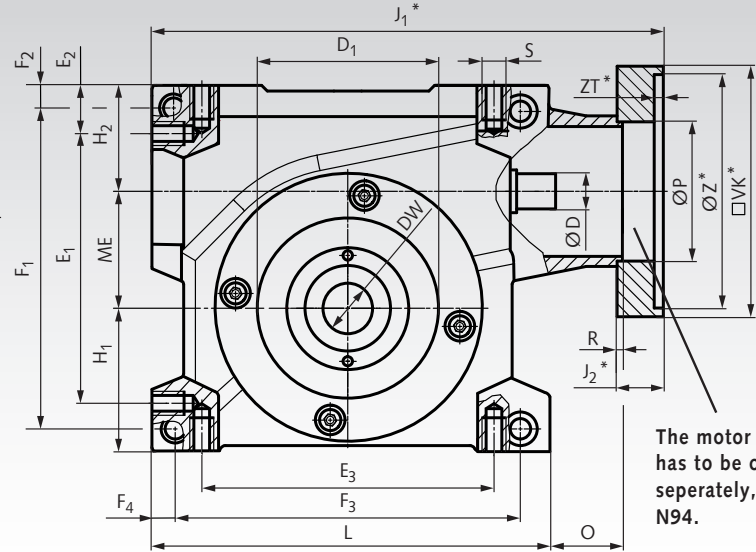
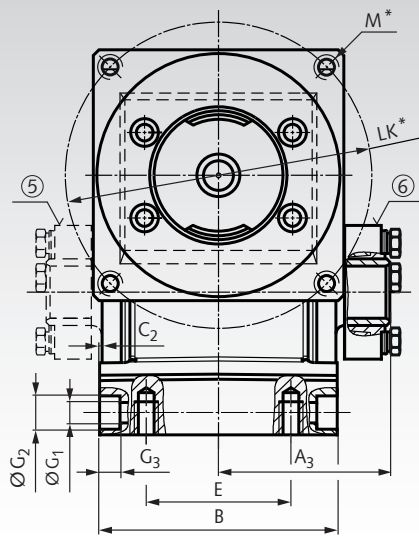
Size	Product No. Side 5	Product No. Side 6	Ratio $i =$	$n_{1\text{max}}$ min^{-1}	$T_{1\text{perm}}$ Nm	$T_{2\text{amax}}$ Nm	$T_{2\text{perm}}$ 1) 3) Nm	$T_{2\text{max}}$ 2) Nm	T_{KW} Nm	c Nm/arcmin	η 3) %
40	421 041 00	421 041 01	4,0 : 1	8000	13,9	59	53	179	37	5	95
40	421 041 02	421 041 03	6,4 : 1	8000	7,9	79	48	195	48	5	94
40	421 041 04	421 041 05	10,0 : 1	8000	5,8	84	53	212	52	5	91
40	421 041 08	421 041 09	16,0 : 1	8000	3,9	81	55	203	53	5	86
40	421 041 12	421 041 13	27,0 : 1	8000	3,4	89	75	238	61	5	80
40	421 041 16	421 041 17	39,0 : 1	8000	2,1	73	61	164	43	5	72
50	421 051 00	421 051 01	4,0 : 1	7000	27,0	166	104	357	110	9	96
50	421 051 02	421 051 03	6,4 : 1	7000	17,1	164	104	374	120	9	95
50	421 051 04	421 051 05	10,0 : 1	7000	12,3	176	114	420	129	9	92
50	421 051 08	421 051 09	16,0 : 1	7000	8,6	171	122	399	125	9	88
50	421 051 12	421 051 13	27,0 : 1	7000	7,2	187	158	471	137	9	81
50	421 051 16	421 051 17	39,0 : 1	7000	4,3	158	129	315	115	9	76
63	421 061 00	421 061 01	4,0 : 1	5500	50,2	336	193	934	257	31	96
63	421 061 02	421 061 03	6,4 : 1	5500	38,2	355	235	999	265	31	96
63	421 061 04	421 061 05	10,0 : 1	5500	29,2	374	272	1014	279	31	93
63	421 061 08	421 061 09	16,0 : 1	5500	19,7	368	285	1014	274	31	90
63	421 061 12	421 061 13	27,0 : 1	5500	13,2	399	301	1014	297	31	84
63	421 061 16	421 061 17	39,0 : 1	5500	10,4	338	323	788	247	31	79
80	421 081 00	421 081 01	4,0 : 1	4500	75,0	708	291	1183	520	86	97
80	421 081 02	421 081 03	6,4 : 1	4500	58,4	707	359	1464	517	86	96
80	421 081 04	421 081 05	10,0 : 1	4500	47,7	758	454	1641	555	86	95
80	421 081 08	421 081 09	16,0 : 1	4500	30,9	740	455	1567	541	86	92
80	421 081 12	421 081 13	27,0 : 1	4500	19,4	810	457	1749	592	86	87
80	421 081 16	421 081 17	39,0 : 1	4500	14,1	676	454	1305	495	86	82

1) Permissible output torque $T_{2\text{perm}}$ under consideration of thermal limits.

2) Maximum output torque $T_{2\text{max}}$ without consideration of the permissible torque of the coupling and the output side shrink disk.

3) At a service life of 12,000 hours and continuous operating S1 with 1.500 min^{-1} .

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The motor adaption has to be ordered separately, see page N94.

* The dimensions M, J₁, J₂, LK, VK, Z^{H8} and ZT depend on the motor adaptation, see page N94.

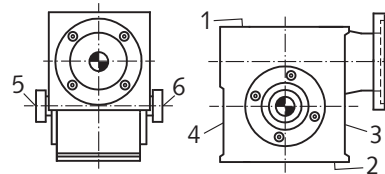
Size	ME	A ₃	B	C ₂	D	D ₁ ^{H8}	DW ^{H6}	E	E ₁	E ₂	E ₃	F ₁	F ₂
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
40	40	76,5	110	1	14	62	20	75	102	19	108	122	9,5
50	50	84,5	122	1	19	68	25	85	121	20	120	142	10
63	63	91,25	128	0,75	24	90	28	80	145	27,5	160	171	14
80	80	109,0	160	1	28	110	36	120	185	23	195	209	12

Size	F ₃	F ₄	G ₁	G ₂	G ₃	H ₁	H ₂	L	O	P	R	S	Weight**
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	approx. kg
40	135	9,5	9	15	10	56	45	157	30	54	3	M6 x 12	5,7
50	152	11,0	9	15	10	61	51	177	48	65	3	M8 x 16	8,5
63	186	12,5	11	18	11	77	57	214	39,5	75	3	M10 x 20	15,2
80	226	11,5	11	18	11	90	62	252	43,5	85	3	M10 x 20	23,5

** The weight specification refers only to the servo worm gear unit without motor adaptation.

Mounting Sides

The servo worm gear units can be mounted in all operating positions. Sides 1, 2, 4, 5 and 6 are machined at the factory and can be used as mounting surfaces. Four threaded holes are provided on each side 1, 2 and 4. The output sides 5 and 6 have four through holes for cylindrical cap screws.



Quick selection of the Gear Unit Sizes

Using the output acceleration torques, you can limit the gear unit size suitable for your application in advance. The table shows the permissible output acceleration torques of each size. For further data, please refer to the performance table on the previous catalogue page.

Size	T _{2a perm.} [Nm]
40	59 - 89
50	158 - 187
63	336 - 399
80	676 - 810

Lubrication Volume in Litre

The oil quantity of the gearbox is independent from the mounting position. The same quantity of lubricant is used for all operating positions.

Size	Lubricat Volume [L]
40	0,25
50	0,35
63	0,70
80	1,25

Permissible Radial Loads F_R [N] and Axial Loads F_A [N]

Size	F _R ; F _A N	at Input Speed n ₁ = 1500 min ⁻¹ and Ratio i					
		i = 4:1	i = 6,4:1	i = 10:1	i = 16:1	i = 27:1	i = 39:1
40	F _R	1400	1750	1850	2150	2300	2800
40	F _A	1350	2200	2600	3500	4000	4900
50	F _R	600	1500	1600	1900	2000	2600
50	F _A	550	1550	2100	3000	3600	4700
63	F _R	2840	3200	3350	3800	4550	4400
63	F _A	2900	3850	4800	6300	8500	9800
80	F _R	4000	4000	3800	3900	4000	4000
80	F _A	4500	5600	7200	10100	13600	15900

The permissible radial and axial forces in the table refer to T_{2 perm.}, operating mode S1 and a service life of 12,000 hours. The position of the point of application of the radial force depends on the size. Distance from force point to the hollow shaft end face: sizes 40 = 15 mm, size 50 = 20 mm, size 63 = 30 mm and size 80 = 45 mm. If the load exceeds this value considerably or if combined loads of F_R and F_A occur - please ask us.

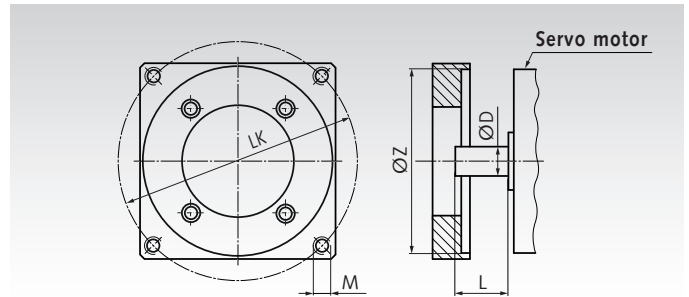
Servo Worm Gear Units ZM/S, Motor Adaptation

Material: Aluminium. Coupling spider from polyurethane. Mounting flange and backlash-free compensating coupling in clamp hub style (without keyway) with Shore hardness 64°D for mounting a motor to the servo worm gearbox ZM/S. A selection of flanges and ready-to-install couplings for various motor sizes and shaft diameters is listed for each gearbox size. The four fastening screws for mounting the flange to the gearbox are included in the scope of delivery. **Other dimensions on request.**

D = Diameter motor shaft.

L = Length of the motor shaft.

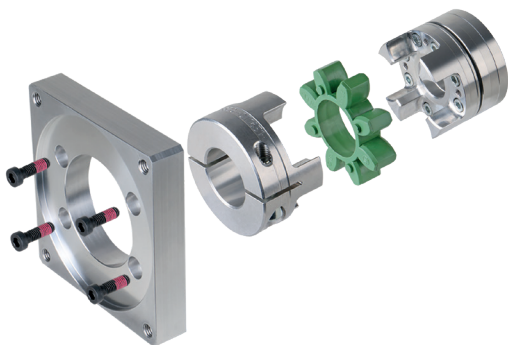
The motor adaption has to be ordered seperately, additional to the gear box unit.



Size	Product No.	ZH8 mm	LK mm	D x L mm	M mm	Coupling Size
40	421 094 01	40	63	9 x 20	M5	GS 14
40	421 094 02	60	75	11 x 23	M5	GS 19
40	421 094 03	60	75	14 x 30	M5	GS 19
40	421 094 04	60	75	14 x 30	M6	GS 19
40	421 094 05	80	100	14 x 30	M6	GS 19
40	421 094 06	80	100	19 x 40	M6	GS 19
40	421 094 07	95	115	19 x 40	M8	GS 19
40	421 094 08	110	130	19 x 40	M8	GS 19
40	421 094 09	110	130	24 x 50	M8	GS 19
40	421 094 10	130	165	24 x 50	M10	GS 19
50	421 095 01	60	75	11 x 23	M5	GS 24
50	421 095 02	60	75	14 x 30	M5	GS 24
50	421 095 03	60	75	14 x 30	M6	GS 24
50	421 095 04	80	100	14 x 30	M6	GS 24
50	421 095 05	80	100	19 x 40	M6	GS 24
50	421 095 06	95	115	19 x 40	M8	GS 24
50	421 095 07	95	115	24 x 50	M8	GS 24
50	421 095 08	110	130	19 x 40	M8	GS 24
50	421 095 09	110	130	24 x 50	M8	GS 24
50	421 095 10	130	165	24 x 50	M10	GS 24
50	421 095 11	130	165	28 x 58	M10	GS 24
50	421 095 12	130	165	32 x 58	M10	GS 24
50	421 095 13	180	215	28 x 58	M12	GS 24
50	421 095 14	180	215	32 x 58	M12	GS 24

Size	Product No.	ZH8 mm	LK mm	D x L mm	M mm	Coupling Size
63	421 096 01	80	100	19 x 40	M6	GS 28
63	421 096 02	95	115	19 x 40	M8	GS 28
63	421 096 03	110	130	24 x 50	M8	GS 28
63	421 096 04	130	165	24 x 50	M10	GS 28
63	421 096 05	130	165	28 x 58	M10	GS 28
63	421 096 06	130	165	32 x 58	M10	GS 28
63	421 096 07	180	215	28 x 58	M12	GS 28
63	421 096 08	180	215	32 x 58	M12	GS 28
63	421 096 09	180	215	38 x 80	M12	GS 28
80	421 098 01	80	100	19 x 40	M6	GS 28
80	421 098 02	95	115	19 x 40	M8	GS 28
80	421 098 03	95	115	24 x 50	M8	GS 28
80	421 098 04	110	130	19 x 40	M8	GS 28
80	421 098 05	110	130	24 x 50	M8	GS 28
80	421 098 06	130	165	24 x 50	M10	GS 28
80	421 098 07	130	165	28 x 58	M10	GS 28
80	421 098 08	130	165	32 x 58	M10	GS 28
80	421 098 09	180	215	24 x 50	M12	GS 28
80	421 098 10	180	215	28 x 58	M12	GS 28
80	421 098 11	180	215	32 x 58	M12	GS 28
80	421 098 12	180	215	38 x 80	M12	GS 28

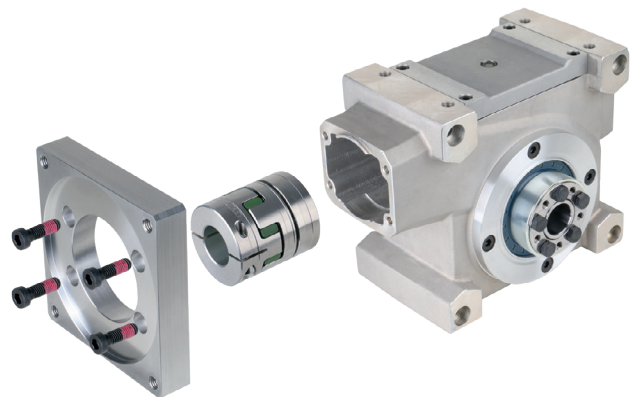
Scope of Delivery of Motor Adaptation



The motor adaption exists from a flange, bolts for mounting the gear box and a backlash-free coupling.

Ordering Details: e.g. Product No. 42104100, Gearbox size 40, i=4:1 and Product No. 42109401, motor adaptation size 40, Shaft-Ø 9 x 20 mm

Components Servo Worm Gear Units ZM/S



The motor adaption and the gear box unit have to be ordered seperately.