

## Worm Gear Units ZM/I

**General data:** Universal heavy-duty gearboxes.  
4 sizes, centre distance 40, 50, 63 and 80 mm.  
Centre distance 100 - 315 mm available on request.

**Housing:** High-quality grey cast iron, all sides machined and with mounting holes on 5 sides.

**Gearing:** 13 ratios from 5 to 83 : 1; worm shaft hardened and ground. Worm gear made from special centrifugally cast bronze.

**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. Proper running in is a crucial factor influencing the lifetime of the gearbox. The starting efficiency factor ( $\eta_A$ ) is, as the operating efficiency factor (h), depending on the lead angle.

**Self-locking:** Self-locking only occurs in worm gear units, when the unit cannot be driven from the output side. Worms with 4 and 6 threads sometimes permit transmission ratios for gearing up ( $i = 5 : 1$  to  $13.3 : 1$ ). If a gearbox must be implicitly self-locking, or must implicitly not be self-locking, we urge you to contact us.

**The ratios 40:1 and 72:1 optimized for manual operation are static and dynamic self-locking.**

**Bearing system:** All gearbox shafts with generously dimensioned roller bearings.

**Lubrication:** The gearboxes are lubricated for life using synthetic oil. Under normal operating conditions, no maintenance is required. The housing should be checked for leakages at an interval of approx. 2 years.

**Ventilation:** Size (centre distance) 40 is supplied without ventilation. With the other gearboxes, the sealing plug has to be exchanged with the separately packed venting filter.

Version A



Version HL



### Venting Filter (VF)

Size	A mm	B mm	C mm	D mm	E mm	F mm
40*	-	-	-	-	-	-
50	50	20	33	22	58	25
63	62,5	27,5	37	22	67	25
80	77,5	32,5	57	22	82	25

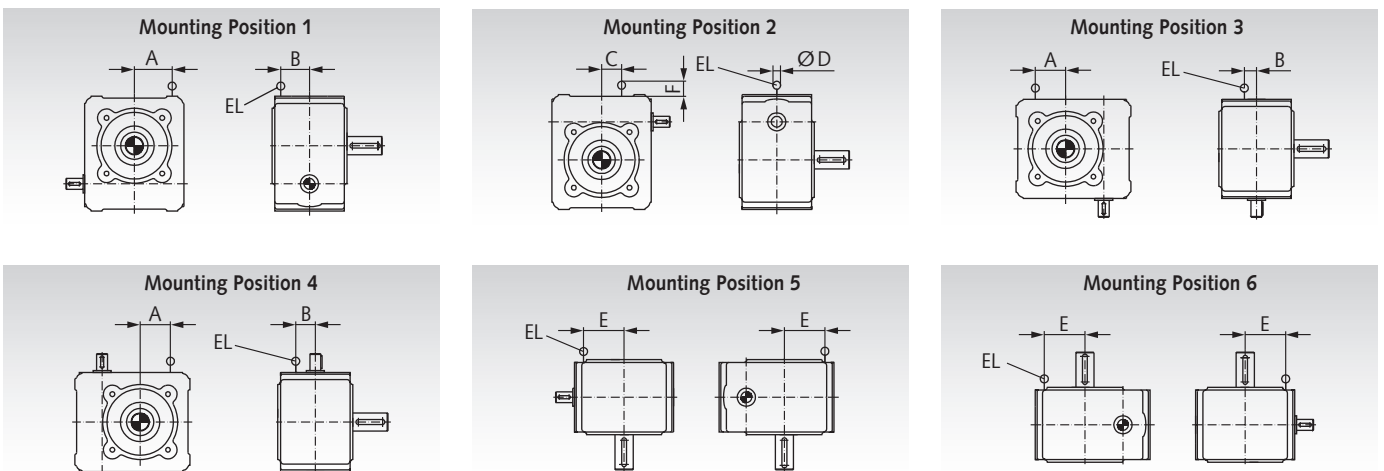
\* Size 40 without Ventilation.

### Lubrication Volume in Litre (dm<sup>3</sup>)

Size	Mounting Position			
	1	2	3 + 4	5 + 6
40	0,20	0,25	0,20	0,20
50	0,30	0,60	0,45	0,45
63	0,50	1,10	0,70	0,80
80	0,90	2,10	1,40	1,60

The standard lubrication volume is calculated for mounting position 2. For other mounting positions and high permanent speeds it might have to be reduced, to avoid oil leakages.

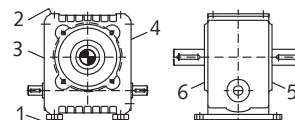
### Position of the Oil Fittings Size 50 - 80



### Mounting Sides

The worm gear units can be mounted in any position and the shaft ends can be positioned to your requirements.

Sizes 40 - 80



## Worm Gear Units ZM/I, Technical Data, Size 50

The input power  $P_{1\text{ perm}}$  and output torques  $T_{2\text{ perm}}$  listed in the selection tables are based on shock-free continuous operation, an operating time of 8 hours/day, 3 starts per hour, operating time (OT) = 100% and 20°C ambient temperature. The maximum output torques  $T_{2\text{ max}}$  may frequently be reached in short-term load peaks but they must not be exceeded. With an operating time under 90%, the permissible gearbox output can usually be increased.

$i_n, i_{\text{ist}}$  = nominal ratio, real ratio.

$n_1, n_2$  [min<sup>-1</sup>] = input speed, output speed.

$P_{1\text{ perm}}$  [kW] = permissible input power.

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

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

$\eta$  = operating efficiency.

**Dimensions Table Page 736.**

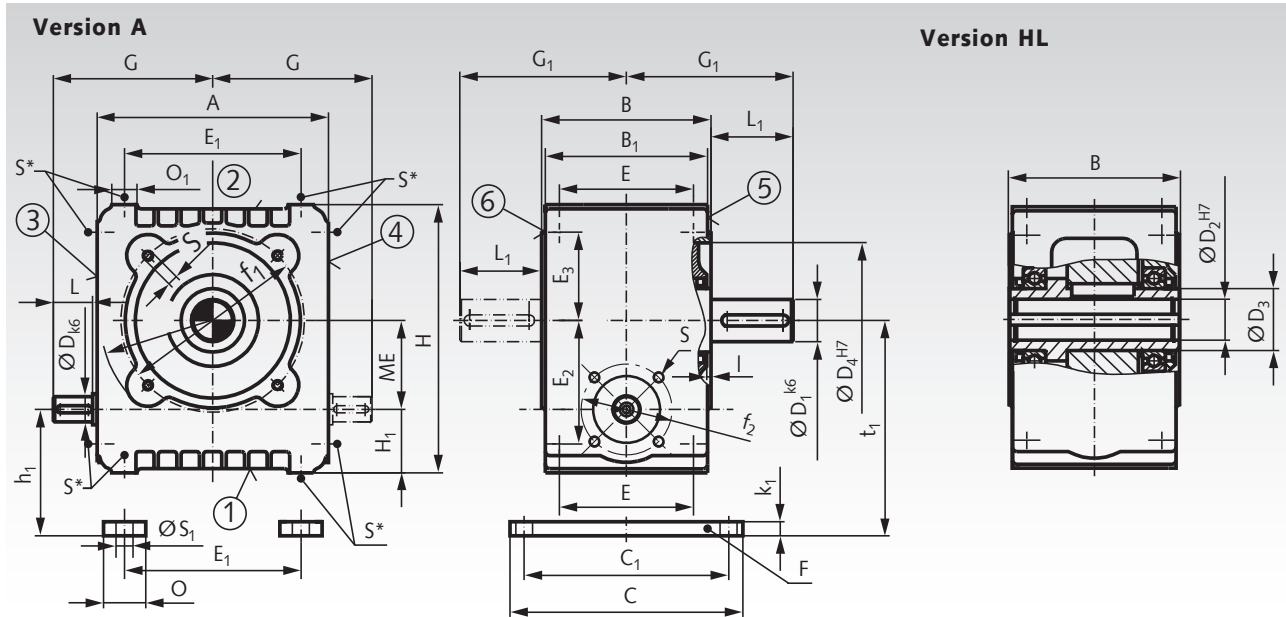
Version with foot mounting brackets or shafts on both sides on request.

Version A Output Side 5 Product No.	Version A Output Side 6 Product No.	Version HL Hollow Shaft Product No.	Ratio i	$n_1$ min <sup>-1</sup>	$n_2 \approx$ min <sup>-1</sup>	$P_{1\text{ perm}}$ KW	$T_{2\text{ perm}}$ Nm	$T_{2\text{ max}}$ Nm	$\eta$
421 011 00	421 011 01	421 013 00	4,83 : 1 *29/6	1500	300	3,71	109	144	0,95
				1000	200	2,58	113	144	0,95
				500	100	1,4	120	144	0,93
				10	2	0,04	144	144	0,86
421 011 02	421 011 03	421 013 01	7,25 : 1 *29/4	1500	200	2,6	113	164	0,94
				1000	133	1,82	117	164	0,93
				500	67	1	125	164	0,90
				10	1,3	0,03	164	164	0,83
421 011 04	421 011 05	421 013 02	9,5 : 1 *38/4	1500	150	1,62	91	150	0,92
				1000	100	1,14	94	150	0,91
				500	50	0,63	102	150	0,88
				10	1	0,02	139	150	0,82
421 011 06	421 011 07	421 013 03	12,75 : 1 *51/4	1500	113	0,82	60	107	0,89
				1000	75	0,58	62	107	0,88
				500	38	0,32	67	107	0,86
				10	0,75	0,01	107	107	0,82
421 011 08	421 011 09	421 013 04	14,5 : 1 *29/2	1500	100	1,57	128	194	0,88
				1000	67	1,13	136	194	0,86
				500	33	0,63	145	194	0,83
				10	0,67	0,02	194	194	0,74
421 011 10	421 011 11	421 013 05	19,0 : 1 *38/2	1500	75	1,02	106	176	0,86
				1000	50	0,72	110	176	0,84
				500	25	0,41	119	176	0,80
				10	0,5	0,01	164	176	0,73
421 011 12	421 011 13	421 013 06	25,5 : 1 *51/2	1500	57	0,57	77	140	0,82
				1000	38	0,41	80	140	0,80
				500	19	0,23	87	140	0,77
				10	0,38	0,01	134	140	0,72
421 011 14	421 011 15	421 013 07	29,0 : 1 *29/1	1500	50	0,87	126	215	0,78
				1000	33	0,7	148	215	0,70
				500	17	0,45	176	215	0,71
				10	0,33	0,01	215	215	0,60
421 011 16	421 011 17	421 013 08	38,0 : 1 *38/1	1500	38	0,76	128	194	0,76
				1000	25	0,51	134	194	0,73
				500	13	0,29	145	194	0,68
				10	0,25	0,01	194	194	0,58
-	-	421 013 14 <sup>1)</sup>	39,0 : 1 *39/1 optimized for manual operation <sup>1)</sup>	1500 50	38 1,28	0,51 0,04	80 108	108	0,64 0,39
421 011 18	421 011 19	421 013 09	51,0 : 1 *51/1	1500	28	0,37	84	156	0,70
				1000	19	0,27	88	156	0,68
				500	9,4	0,15	96	156	0,64
				10	0,19	0,01	154	156	0,58
421 011 20	421 011 21	421 013 10	62,0 : 1 *62/1	1500	24	0,41	105	139	0,65
				1000	16	0,3	109	139	0,62
				500	8,1	0,17	113	139	0,56
				10	0,16	0,004	113	139	0,47
421 011 24	421 011 25	421 013 12	72,0 : 1 *72/1	1500	21	0,32	86	121	0,59
				1000	14	0,22	86	121	0,56
				500	6,9	0,12	86	121	0,50
				10	0,14	0,004	86	121	0,41
421 011 26 <sup>1)</sup>	421 011 27 <sup>1)</sup>	421 013 13 <sup>1)</sup>	72,0 : 1 *72/1 optimized for manual operation <sup>1)</sup>	100	1,38	0,04	86	121	0,46
				50	0,69	0,02	86	121	0,41
421 011 22	421 011 23	421 013 11	83,0 : 1 *83/1	1500	18	0,2	61	114	0,57
				1000	12	0,14	64	114	0,56
				500	6	0,08	69	114	0,52
				10	0,12	0,002	75	114	0,47

\* Example: Worm gear number of teeth 29 / worm shaft 6 threads.

<sup>1)</sup> This implicitly self-locking version is optimized for hand operation.

## Dimensions Table Worm Gear Units ZM/I



The sides 1 to 6 are machined and can be used as mounting surfaces. The foot mounting brackets F can be connected to the sides 1 and 2. The sides 1, 2, 3, 5 and 6 are ex-works always supplied with threaded bores. If side 4 is to be used as mounting surface, the respective surface is supplied with threaded bores. The worm shaft end can be fitted on side 3 or 4 as desired. Shaft end with thread alignment according to DIN 332 sheet 2 see page 863, feather keys and grooves according to DIN 6885/1. Position of the venting filter according to the table on page 731. The gearbox can function in any mounting position.

Version with foot mounting bracket or double-sided output shaft on request.

### Gearbox Dimensions

Size	ME	A	B	B <sub>1</sub>	c	c <sub>1</sub>	D <sub>4</sub>	D x L	D <sub>1</sub> x L <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	E	E <sub>1</sub>	E <sub>2</sub> *	E <sub>3</sub> *	F <sub>1</sub>
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
40	40	104	90	85	125	110	70	14 x 24	22 x 36	22	35	70	70	55	35	53
50	50	140	105	100	150	130	90	16 x 28	25 x 42	25	40	80	100	70	50	65
63	63	164	120	115	165	145	110	18 x 28	30 x 58	30	45	95	125	87,5	62,5	80
80	80	204	140	135	190	165	140	24 x 36	38 x 58	38	55	115	155	107,5	77,5	100

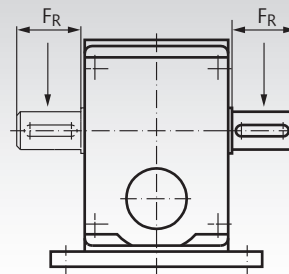
  

Size	f <sub>1</sub>	f <sub>2</sub>	G	G <sub>1</sub>	H <sub>1</sub>	h <sub>1</sub>	H	I	k <sub>1</sub>	O	O <sub>1</sub>	S*	S <sub>1</sub>	t <sub>1</sub>	Weight
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
40	85	50	79	81	32	40	124	3	8	25	14	M6 x 12	10	80	7
50	110	64	100	94,5	40	50	160	3	10	30	18	M8 x 14	12	100	12
63	130	70	113	118	45	55	190	3	10	30	18	M8 x 14	12	118	18
80	165	81	141	128	55	67	237	3	12	35	22	M10 x 17	15	147	28

\* Threaded bores on side 4 at extra charge. Dimensions may be subject to alteration.

### Permissible Radial Loads F<sub>R</sub> [N] for Normal Output Shaft and Bearing System

The perm. radial loads indicated in the table are calculated for the centre of the output shaft end, also calculating in the output speed and the nominal output torque. The values were calculated for the adverse rotational direction. The perm. radial loads only apply to unilateral load. If in your application high radial loads occur in combination with axial loads, we ask you to contact us.



Size	Output Torques Nm	Permiss. Radial Load [N] at Output Speeds n <sub>2</sub> [min <sup>-1</sup> ]																	
		6	8	10	12	16	20	25	32	40	50	63	80	100	125	160	200	250	320
40	0 - 80	2500	2375	2250	2125	2000	1875	1775	1675	1575	1400	1325	1250	1175	1125	1050	925	875	800
	125 - 160	3500	3325	3150	2970	2800	2620	2480	2340	2200	1960	1850	1750	1640	1570	1470	1290	1220	1120
63	0 - 200	5000	4750	4500	4250	4000	3750	3550	3350	3150	2800	2650	2500	2350	2250	2100	1850	1750	1600
	200 - 250	4600	4360	4140	3910	3680	3450	3260	3080	2900	2570	2440	2300	2160	2070	1930	1700	1610	1470
	250 - 320	3500	3325	3150	2975	2800	2625	2485	2345	2205	1960	1855	1750	1645	1575	1470	1295	1225	1120
80	0 - 500	7500	7120	6740	6370	6000	5620	5320	5000	4700	4200	4000	3750	3500	3370	3140	2770	2620	2400