Made in Germany

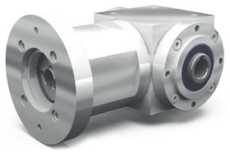
ATEK

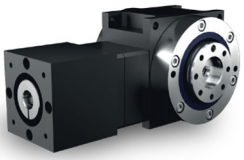
ANTRIEBSTECHNIK

Das Winkelgetriebe

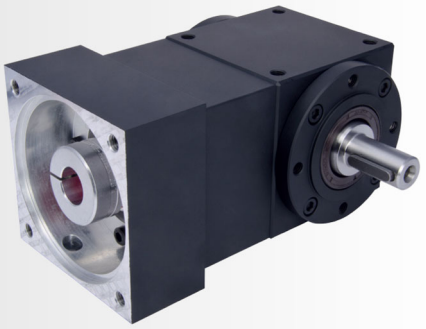
Servo gearboxes (precision gearboxes)

Type: LC, VC, HC, SC

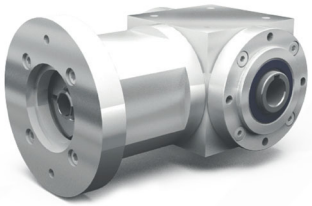




11 Servo gearboxes (precision gearboxes)



11.1 Type overview

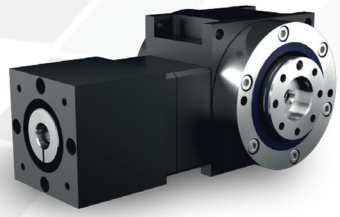


Type LC – Servo miniatur bevel gearboxes

Gear ratios: i = 1:1 to 4:1
Maximum output torque: 16 Nm
2 gearbox sizes with edge lengths of 035 to 45 mm
Suitable for fitting IEC standard motors
Low-backlash construction < 10 angular minutes possible
Housing made of aluminium

Type VC – Servo bevel gearboxes

Gear ratios: i = 1:1 to 6:1
Maximum acceleration torque on output: 700 Nm
6 gearbox sizes with edge lengths of 065 to 200 mm
Minimised circumferential backlash (optional)
Housing made of grey cast iron
Bevel gearboxes suitable for fitting servo-motors
Non-positive connection between motor and gearbox



Type HC – Servo hypoid gearboxes

Gear ratios: i = 3:1 to 15:1
Maximum acceleration torque on output: 2160 Nm
6 gearbox sizes; centre-to-centre distance: 090 to 260 mm
Minimised circumferential backlash (optional)
Housing made of aluminium
Hypoid gearboxes suitable for fitting servo-motors
Non-positive connection between motor and gearbox

Type SC – Servo worm gearboxes

Gear ratios: i = 5:1 to 26:1 (i > 26 upon request)
Maximum acceleration torque on output: 1100 Nm
5 gearbox sizes; centre-to-centre distance: 040 to 100 mm
Minimised circumferential backlash (optional)
Housing made of grey cast iron
Worm gearboxes suitable for fitting servo-motors
Non-positive connection between motor and gearbox

11.1.1 General

Special servo gearboxes have been developed for the requirements of highly dynamic servo-motors. The proven ATEK bevel gearbox and worm gearbox series form the basis for them. The combination of a large number of motor flanges and an insertable, zero-play clamp coupling enables the adaptation to the most servo-motors.

Due to the modular system, a later replacement of the motor flange and the coupling half on the motor side is very easy.

11.5.1 General construction

The SC AdServo gearboxes are based on the proven worm gearboxes of the S-type series. In worm gearboxes, both shafts intersect in a defined distance (A). This centre-to-centre distance is reflected in the specification of the gearbox size. (Example: S 100 – centre-to-centre distance 100 mm)

11.5.2 Toothing

A gear set consists of worm shaft and worm gear.
The worm shaft made of carburised steel is hardened, the toothing is ground. The worm gear consists of a high-quality bronze alloy, the toothing is milled.

11.5.3 Models

Due to the modular system, different gearbox Models can be configured. The variants differ in the type of the shafts, the rotational direction of the shafts, and the support by bearings.

11.5.4 Threaded mounting holes

All sides of the gearboxes are machined. The housing surface on the side 1 and the flange surfaces on the sides 5 and 6 may be used as mounting surfaces. All flanges always have threaded mounting holes.
You have the following available ordering options:

Gearbox size	Ordering options	Threaded mounting holes are in the housing surfaces on the gearbox side	Threaded mounting holes are in the flanges on the gearbox side
040-100	1	1	5, 6
040-100	2	1, 2	5, 6
040-100	3	1, 3	5, 6
040-100	4	1, 4	5, 6
040-100	5	1, 5	5, 6
040-100	6	1, 6	5, 6

Table **11.5.4-1**

The standard version has the order code 2.
Order code example: SC 050 5:1 B0 -1.2-600/0000
Please enquire other mounting options.

11.5.5 Installation position

The installation position is defined by the gearbox side directed downwards during operation and will be indicated by the corresponding numeral. The following is an order code example with the numeral 2. Order code example: SC 050 5:1 B0 -1.2-600/0000
Principally, the gearboxes can be used in all installation positions. The technically most favourable and thus recommended installation position is the installation position 1, in which the worm shaft is horizontal and located at the bottom.
For an optimal technical design of the gearboxes, we always ask to specify the installation position.
The performance data and torques listed in the selection tables are only valid if the gearboxes are used in the installation positions 1, 5 or 6.
The values must be reduced by 10%, if the worm shaft is vertical or located at the top (installation position 3, 4 or 2).

11.5.6 Shaft designation – allocation to the gearbox sides

The worm shaft is the fast-rotating shaft.
It has the speed $\mathbf{n_1}$ and is identified by $\mathbf{N_1}$.
The slowly rotating shaft has the speed $\mathbf{n_2}$ and is identified by $\mathbf{N_2}$.
The worm gear is located on this shaft.
The gearbox sides are identified by the numerals 1 to 6.
For the allocation to the gearbox sides, please refer to the following figure and the Figure 4.3.1-1 Gearbox sides.

11.5.7 Rotational direction and gear ratio

As standard, the worm gearboxes are delivered with right-handed worm gear sets. This results in the rotational directions according to Figure 11.5.6-1. In the special design, delivery with left-handed gear teeth is also possible. Please enquire this.
For the possible gear ratios, please refer to the performance tables. Principally, the actual gear ratio I_{ist} must be taken into account for the layout. In some cases, this deviates from the nominal gear ratio i.

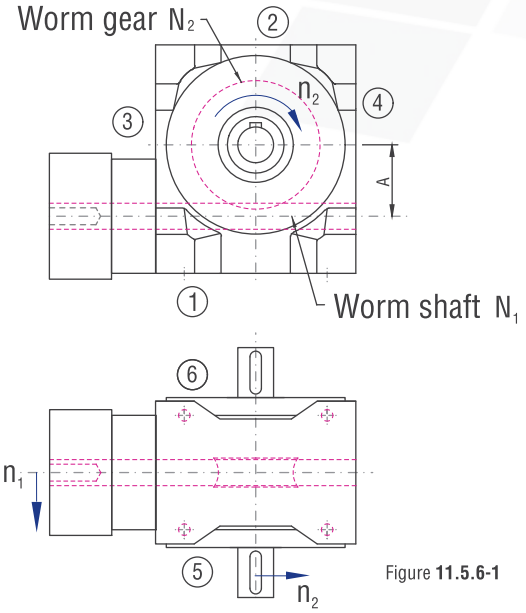


Figure **11.5.6-1**

11.5.8 Efficiency

The achievable efficiency depends on rotational speed, torque, installation position, sealing, and lubricant type.

Starting efficiency

The efficiency is always lower during the starting phase and in the cold operating state of the worm gearbox since the lubricating film is not formed until the sliding motion has started. Therefore a higher torque is needed. The starting efficiencies listed below are guidance values and valid for run-in gearboxes. These starting efficiencies must be taken into account for the layout.

Number of threads	Gear ratio range	Starting efficiency	Lead angle
2	26 – 15	0.56 – 0.65	10° – 12°
4	13 – 7.5	0.68 – 0.75	19° – 23°
6	5	0.74 – 0.82	28° – 32°

Table **11.5.8-1**

Operating efficiency

The tooth flanks of worm gearboxes in the as-delivered condition are not yet fully smoothed. This influence is even increased with high gear ratios. Therefore the gearboxes should be run in with approx. 50% of the nominal data, if possible, before they are operated under load. The efficiencies specified in the performance tables relate to the permissible nominal data and are guidance values for run-in gearboxes with standard sealing that have operating temperature.

11.5.9 Lubrication

Different conditions for the lubrication of the toothing and the roller bearings will arise depending on gearbox size, installation position, rotational speed and on-period. In order to ensure these optimally, different oil quantities and viscosities are used. These will be defined by ATEK based on your ordering details (rotational speed, on-period, and ambient temperature). They will be reflected in the abbreviation code of the type designation.
Example: SC 125 10:1 C0 -9.1- 200/A1

/A1 means:

	Abbreviation	Explanation	Reference
Letter	A	Oil viscosity 460	Table 11.5.9-1
Numeral	1	with venting	Table 11.5.9-2

The ATEK worm gearboxes are factory-filled with synthetic polyglycol oil and are normally maintenance-free.
Oil viscosity and venting option are dependent on the rotational speed

Operating mode: cyclic operation S1

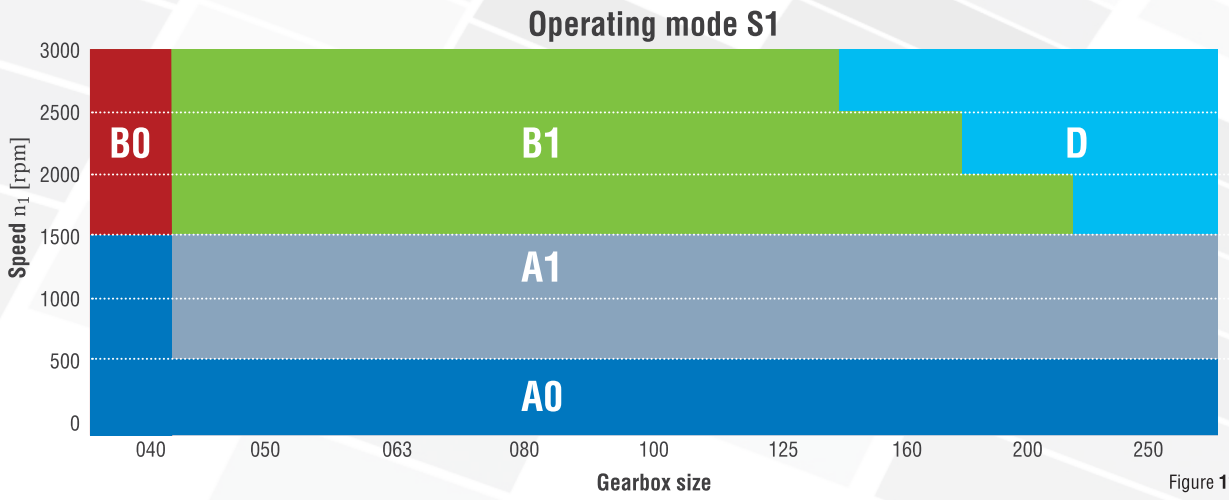


Figure **11.5.9-1**

For the meaning of the abbreviations A through E and 0, 1, please refer to the following tables.
Oil viscosity table

Letter	Viscosity
A	460
B	220
C	not available
D	Injection lubrication
F	Fluid grease

Table 11.5.9-1

Injection lubrication may be necessary in case of high rotational speeds and large gearboxes. In case of very low rotational speeds, lubrication by fluid grease is also possible. At operating temperatures over 50°C, high pressure will develop through air expansion in the gearbox. Then a permanent pressure compensation must be ensured. To this end, the use of a vent filter is prescribed.

Numeral	Vent filter
0	No
1	Yes

Table 11.5.9-2

11.5.10 Vent filter

If venting is required the gearboxes will be delivered with a vent filter. The vent bores will be equipped with screw plugs for transport. The vent filter will be enclosed as a separate item and must be mounted in the intended position prior to commissioning. An elbow may be required. The position will be specified in the order documents. Please refer to the table below for the position of the filter.
Here, E4, for example, means: Venting on side 4.

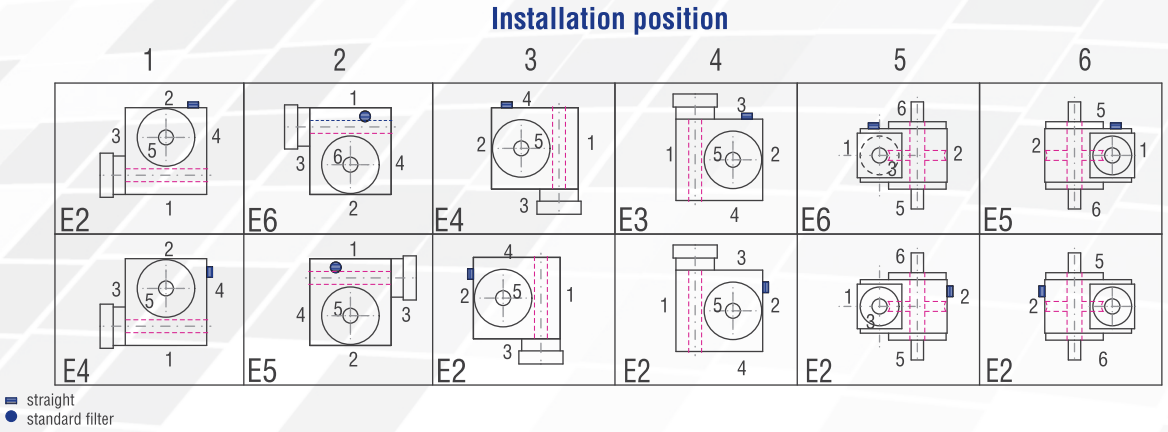


Figure 11.5.10-1

11.5.11 Low-backlash construction

For optimal running, the tooth space in the gear set is manufactured larger than the tooth. When the direction of rotation is changed, this results in a rotation angle until the counter-rotating tooth flanks contact each other. This rotation angle is called circumferential backlash.

Circumferential backlash, measuring method

The circumferential backlash is measured after the drive shaft (N_1) has been fixed. A force of around 2% of the nominal torque is applied to the output shaft (N_2) in both rotational directions. A tooth backlash will result between the two final positions. This can be measured as rotation angle and is indicated in minutes of arc [arcmin].

Circumferential backlash, type

All ATEK worm gearboxes can be delivered as low-backlash types. The following values can be set with standard gear sets for the different gearbox sizes:

Ordering option	Gear set	040 – 125
/0000	Standard	<=30 arcmin
/S2	Standard	<=10 arcmin
/S1	Standard	<=6 arcmin
/S0	Special gear set	<=3–6 arcmin

Table 11.5.11-1

Abbreviation: u.r. – upon request

11.5.12 Connection of drive shaft to coupling

For torque transmission, a zero-play coupling is located on the drive shaft.

11.5.13 Coupling

Two congruent coupling halves are positively connected by means of a plastic toothed ring under pretensioning. In case of extreme peak tensions and impact loads (emergency shut-off), a damping action is achieved through a slight distortion in the elastic range. The coupling is axially insertable and compensates angle errors as well as misalignments in the radial and axial direction. A later changeover to another motor is easily possible. The motor-side coupling hub is available in the following variants:

KN	KNN	SN
Clamping hub	Clamping hub with groove	Tension ring hub
For motor shafts without parallel key	For motor shafts with parallel key	For motor shafts without parallel key

Depending on the variant KN or KNN/SN, different torques can be transmitted.

Design of the coupling

Due to the dynamic characteristics of the servo-motors, the permissible acceleration torque and the emergency-stop torque must be considered when designing the servo gearboxes. The correct coupling hub can be selected by means of the table below on the basis of the maximum permissible torques on the motor shaft, acceleration torques (T_{1B}) and emergency-stop torques (T_{1Not}).

Coupling Size	Hub	Coupling torques allowed [Nm]	Motor shaft diameter [mm]										
			9	11	14	16	19	24	28	32	38	42	45
K14	KN	T_{1B} [Nm]	5.3	5.6	6.1	6.5							
		T_{1NOT} [Nm]	7	9	13	15							
	KNN/SN	T_{1B} [Nm]	10	10	10	10							
		T_{1NOT} [Nm]	22	25	25	25							
K 19	KN	T_{1B} [Nm]	17	17	17	17	17	17					
		T_{1NOT} [Nm]	30	30	32	32	34	34					
	KNN/SN	T_{1B} [Nm]		17	17	17	17						
		T_{1NOT} [Nm]		30	32	34	34						
K 24	KN	T_{1B} [Nm]		35	36	39	39	43	46				
		T_{1NOT} [Nm]		45	45	50	60	65	70				
	KNN/SN	T_{1B} [Nm]		48	48	48	48	48	48				
		T_{1NOT} [Nm]			80	100	120	120	120				
K 28	KN	T_{1B} [Nm]			80	81	85	91	97	102	109		
		T_{1NOT} [Nm]			80	100	130	140	148	156	167		
	KNN/SN	T_{1B} [Nm]				128	128	128	128	128	128		
		T_{1NOT} [Nm]				140	240	240	240	240	240		
K 38	KN	T_{1B} [Nm]				94	98	104	109	113	122	126	130
		T_{1NOT} [Nm]				120	125	130	136	142	152	158	164
	KNN/SN	T_{1B} [Nm]						260	260	260	260	260	260
		T_{1NOT} [Nm]						500	500	500	500	500	500

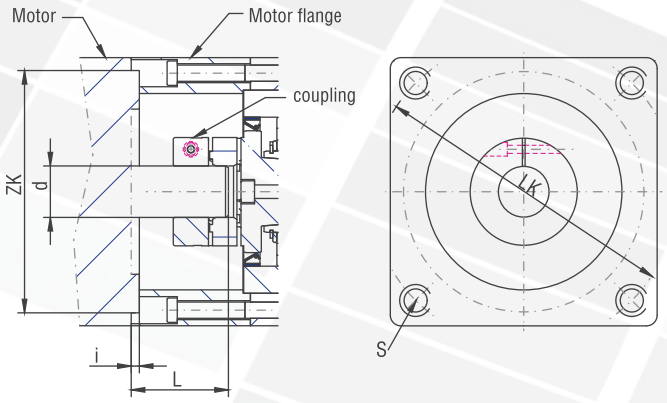
Table **11.5.13-1**

11.5.14 Motor mounting

The servo-motor will be bolted to the motor flange of the gearbox on side 3. The flange number of the motor flange for the respective gearbox size is to be determined in Table 11.5.14-1.

Motor flange

ZK: Diameter of centring circle
LK: Diameter of pitch circles
L: Length of motor shaft
d: Diameter of motor shaft
i: Centring height
s: Thread



The values for the centring height (i) and the thread sizes (s) can be found on the respective pages.

The values for the centring height (i) and the thread sizes (s) can be found on the respective pages.
Fitting dimensions of the servo-motor – gearbox size/flange no. (selection)

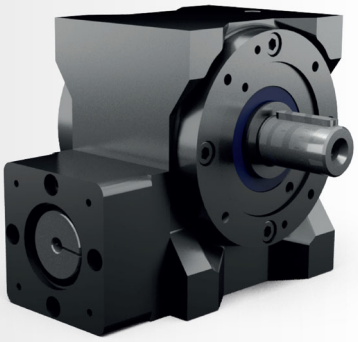
d [mm] less than or equal to	L [mm]	LK [mm]	ZK [mm]	Gearbox size	Flange no.
11	23	63	40	040	002
	23	63	40	040	001
	23	75	60	040	102
	23	90	60	040	202
14	30	75	60	040	104
	30	95	50	040	301
	30	90	60	040	201
	30	75	60	040	103
	30	115	95	040	501
	30	100	80	040	401
19	40	165	110	040	802
	40	130	95	040	601
	40	130	110	040	611
	40	145	110	040	701
	40	165	110	050	802
	40	130	95	050	601
	40	95	50	050	301
	40	130	110	050	611
	40	90	60	050	201
	40	75	60	050	103
	40	115	95	050	501
	40	145	110	050	701
	40	100	80	050	401
	40	165	110	063	802
	40	130	95	063	601
	40	95	50	063	301
	40	130	110	063	611
	40	90	60	063	201
	40	75	60	063	103
	40	115	95	063	501
	40	145	110	063	701
	40	100	80	063	401
24	50	165	130	050	811
	50	165	130	063	811
	50	165	110	080	802
	50	165	130	080	811
	50	130	95	080	601
	50	95	50	080	301
	50	130	110	080	611
	50	90	60	080	201
	50	75	60	080	103
	50	115	95	080	501
	50	145	110	080	701
	50	100	80	080	401
32	60	100	80	080	403
	60	130	110	080	616
	60	215	130	080	902
	60	115	95	080	502
	60	215	180	080	911
	60	165	110	100	802
	60	165	130	100	811
	60	130	95	100	601
	60	130	110	100	611
	60	145	110	100	701
	60	100	80	100	403
	60	130	110	100	616
	60	215	130	100	902
	60	115	95	100	502
	60	215	180	100	911
38	80	215	180	080	932

Table **11.5.14-1**

11.5 Type SC – Servo worm gearboxes

11.5.15 Features

Gear ratios: i = 5:1 to 26:1 (i > 26 upon request)
Maximum acceleration torques up to T_{2B} = 1100 Nm
5 gearbox sizes with 040 to 100 mm centre-to-centre distance
Optimised efficiency
Minimised circumferential backlash (optional)
Worm gearboxes with square flange, suitable for fitting servo-motors
Zero-play three-piece claw coupling



11.5.15.1 Models

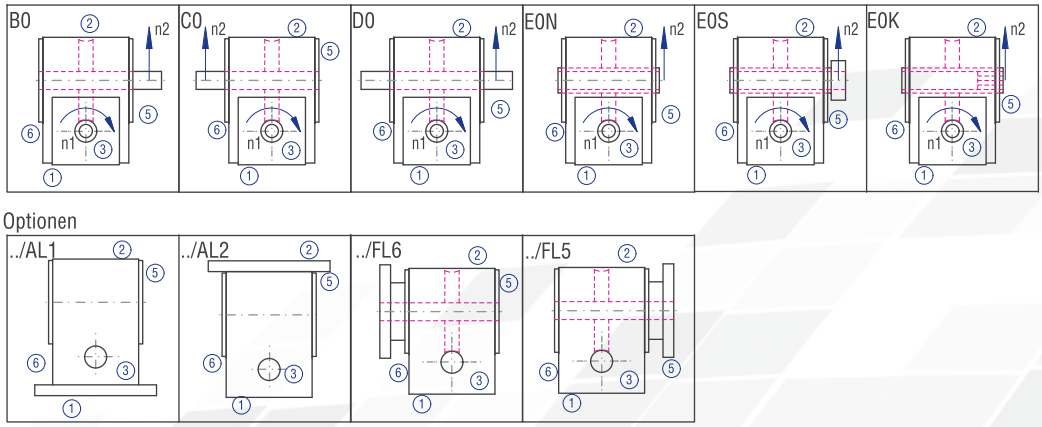


Figure **11.5.15-1; Models**

11.5.15.2 Gearbox sides

The example shows the Model B0

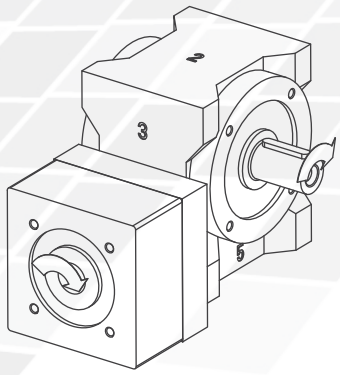


Figure **11.5.15-3; Gearbox sides**

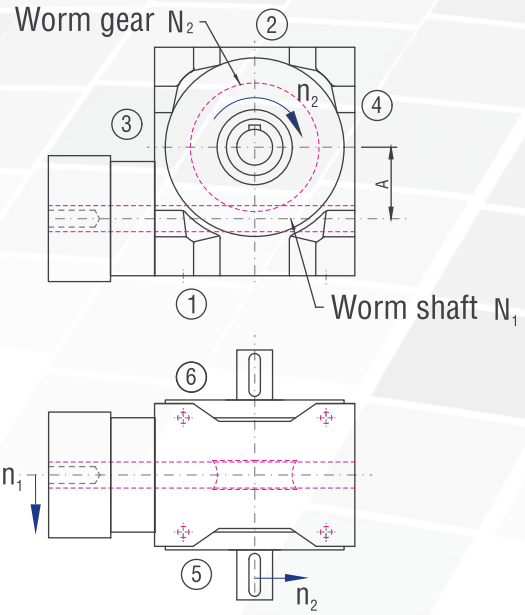


Figure **11.5.15-2; Shaft designations**

11.5.15.3 Order code

The order code reflects the customer specifications. Example:

Type	Size	Gear ratio	Model	Fixing side	Installation position	Speed n_2	Design
SC	050	5:1	B0-	1.	1-	600	/0000
Description	Size; Table 11.5.15-1	Table 11.5.15-1	Figure 11.5.15-1	Side on which fixing is made; Table 11.5.4-1	Side directed downwards; Figure 4.3.1-1 Gearbox sides	Slowly rotating shaft Table 11.5.15-1	Will be determined by ATEK
	V080-		/	14 x 30	No. 301		KN
	Flange			Motor shaft Ø x length	Flange no.		See chapter “Coupling”

11.5.15.4 Overview of performance data

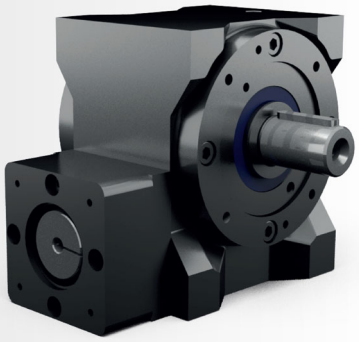
The performance data and torques listed in the selection tables are only valid if the gearboxes are used in the installation positions 1, 5 or 6. If the worm shaft is vertical or located at the top (installation position 3, 4 or 2), 90% of the values specified must be expected.
Please enquire other gear ratios.

				040	050	063	080	100
i[-]	n_1 [1/min]	i_{ist}	n_2 [1/min]	T_{2N} [Nm]	T_{2N} [Nm]	T_{2N} [Nm]	T_{2N} [Nm]	T_{2N} [Nm]
5:1	4000	29:6	828	23,0	48,0	69,0		
		30:6	800				96,0	127,0
	3000	29:6	621	28,0	60,0	89,0		
		30:6	600				132,0	173,0
	2400	29:6	497	33,0	72,0	109,0		
		30:6	480				168,0	218,0
	1500	29:6	310	37,0	83,0	129,0		
		30:6	300				204,0	263,0
7.5:1	4000	29:4	552	27,0	59,0	83,0		
		30:4	533				111,0	153,0
	3000	29:4	414	32,0	71,0	104,0		
		30:4	400				152,0	206,0
	2400	29:4	331	37,0	82,0	125,0		
		30:4	320				192,0	258,0
	1500	29:4	207	41,0	94,0	146,0		
		30:4	200				233,0	311,0
10:1	4000	38:4	421		70,0			
		39:4	410	32,0		101,0		
		40:4	400				132,0	195,0
	3000	38:4	316		83,0			
		39:4	308	37,0		124,0		
		40:4	300				177,0	257,0
	2400	38:4	253		97,0			
		39:4	246	42,0		148,0		
		40:4	240				222,0	318,0
	1500	38:4	158		110,0			
		39:4	154	48,0		171,0		
		40:4	150				267,0	380,0
13:1	4000	51:4	314		54,0	123,0		
		52:4	308	30,0				237,0
		53:4	302				163,0	
	3000	51:4	235		56,0	128,0		
		52:4	231	31,0				304,0
		53:4	226				170,0	
	2400	51:4	188		58,0	133,0		
		52:4	185	32,0				371,0
		53:4	181				177,0	
	1500	51:4	118		60,0	138,0		
		52:4	115	33,0				438,0
		53:4	113				184,0	
15:1	4000	29:2	276	30,0	62,0	96,0		
		30:2	267				130,0	186,0
	3000	29:2	207	35,0	76,0	119,0		
		30:2	200				175,0	248,0
	2400	29:2	166	40,0	91,0	142,0		
		30:2	160				221,0	309,0
	1500	29:2	103	44,0	105,0	166,0		
		30:2	100				266,0	371,0
20:1	4000	38:2	211		72,0			
		39:2	205	36,0		116,0		
		40:2	200				153,0	236,0
	3000	38:2	158		85,0			
		39:2	154	41,0		141,0		
		40:2	150				203,0	308,0
	2400	38:2	126		98,0			
		39:2	123	46,0		166,0		
		40:2	120				253,0	380,0
	1500	38:2	79		111,0			
		39:2	77	51,0		190,0		
		40:2	75				303,0	452,0
26:1	4000	51:2	157		70,0	115,0		
		52:2	154	36,0				286,0
		53:2	151				191,0	
	3000	51:2	118		73,0	135,0		
		52:2	115	37,0				361,0
		53:2	113				207,0	
	2400	51:2	94		75,0	155,0		
		52:2	92	38,0				436,0
		53:2	91				233,0	
	1500	51:2	59		77,0	175,0		
		52:2	58	39,0				511,0
		53:2	57				239,0	

	040	050	063	080	100
T_{2B} (S5) [Nm]	53	125	198	360	850
T_{2Not} (S5) [Nm]	73	150	295	610	1190
N_1 max [U/min]	6000	5000	4500	4000	3000
T_{2B} (S5) [Nm]	50	112	216	408	1006
T_{2Not} (S5) [Nm]	77	152	306	625	1090
N_1 max [U/min]	6000	5500	5000	4500	3200
T_{2B} (S5) [Nm]	39	66	151	210	523
T_{2Not} (S5) [Nm]	59	100	222	321	736
N_1 max [U/min]	6000	5800	5300	4800	3500
T_{2B} (S5) [Nm]	63	145	266	530	1025
T_{2Not} (S5) [Nm]	97	195	395	826	1610
N_1 max [U/min]	6000	5000	4500	4000	3000
T_{2B} (S5) [Nm]	58	133	259	498	1112
T_{2Not} (S5) [Nm]	90	179	355	725	1440
N_1 max [U/min]	6500	5500	5000	4500	3200
T_{2B} (S5) [Nm]	45	86	195	275	683
T_{2Not} (S5) [Nm]	77	137	295	432	980
N_1 max [U/min]	6800	5800	5300	4800	3500
T_{2B} (S5) [Nm]	58	125	223	439	932
T_{2Not} (S5) [Nm]	83	167	334	695	1360
N_1 max [U/min]	6000	5000	4500	4000	3000

Table 11.5.15-1

11.5.16 Type SC 040 – Servo worm gearboxes



Characteristics

Characteristic	Standard	Option
Toothing	Hardened and ground worm shaft / bronze worm gear	See chapter 11.5.2
Gear ratio	5:1 to 26:1	
Housing / Flanges	Grey cast iron / aluminium	
Threaded mounting holes	On gearbox side 1 and on the flanges	See chapter 11.5.4
Shaft	Material 1 C45, shaft ends greased Fit with ISO j6 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.2
Hollow shaft	Material 1 C45, shafts greased Fit with ISO H7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
Radial shaft seal ring	NBR, form A	See chapter 4.8
Ambient temperature	- 10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
Circumferential backlash	< 20 arcmin	See chapter 11.5.11
Protection class	IP 54	See chapter 4.5
Corrosion protection	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
Bearing life L10h	more than 15,000h	See chapter 4.9.1
Oil change intervals	Not required if the oil temperature is kept < 90°C The lifetime of the bearings can be increased by the factor 1.5 if the oil is changed after the first 500 service hours and then every 5000 service hours.	See chapter 11.5.9
Lubricants	Synthetic lubricants	See chapter 11.5.9
Motor flange	Aluminium	See chapter 11.5.14
Coupling	Insertable, flexible claw coupling, suitable for servo-motors For smooth motor shafts clamping hub KN For smooth motor shafts tension ring hub SN For motor shafts with parallel key clamping hub with groove KNN	See chapter 11.5.13

Torques in operating mode S1

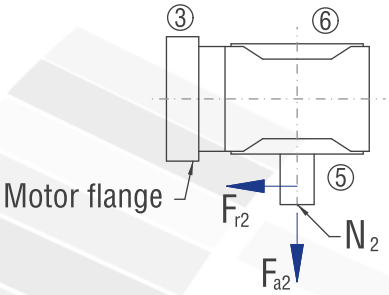
i rated	5:1		7.5:1		10:1		13:1		15:1		20:1		26:1	
i ist	29:6		29:4		39:4		52:4		29:2		39:2		52:2	
	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]
4000	828	23	552	27	410	32	308	30	276	30	205	36	154	36
3000	621	28	414	32	308	37	231	31	207	35	154	41	115	37
2400	497	33	331	37	246	42	185	32	166	40	123	46	92	38
1500	310	37	207	41	154	48	115	33	103	44	77	51	58	39

Torques in operating mode S5

	i rated	5:1		7.5:1		10:1		13:1		15:1		20:1		26:1	
	T_{2N} [Nm]	41		45		43		32		48		50		38	
	n_{1max} [rpm]	6000		6000		6000		6000		6000		6500		6800	
Coupling size	d [mm]	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN
K14	9	T_{2B} [Nm]	25.6	48.3	38.4	58.0	50.0	50.0	39.0	39.0	63.0	63.0	58.0	58.0	45.0	45.0
		T_{2NOT} [Nm]	33.8	73.0	50.8	83.0	68.3	77.0	59.0	59.0	97.0	97.0	90.0	90.0	77.0	77.0
	11	T_{2B} [Nm]	27.1	48.3	40.6	58.0	50.0	50.0	39.0	39.0	63.0	63.0	58.0	58.0	45.0	45.0
		T_{2NOT} [Nm]	43.5	73.0	65.3	83.0	77.0	77.0	59.0	59.0	97.0	97.0	90.0	90.0	77.0	77.0
	14	T_{2B} [Nm]	29.5	48.3	44.2	58.0	50.0	50.0	39.0	39.0	63.0	63.0	58.0	58.0	45.0	45.0
		T_{2NOT} [Nm]	62.8	73.0	83.0	83.0	77.0	77.0	59.0	59.0	97.0	97.0	90.0	90.0	77.0	77.0
	16	T_{2B} [Nm]	31.4	48.3	47.1	58.0	50.0	50.0	39.0	39.0	63.0	63.0	58.0	58.0	45.0	45.0
		T_{2NOT} [Nm]	72.5	73.0	83.0	83.0	77.0	77.0	59.0	59.0	97.0	97.0	90.0	90.0	77.0	77.0
K19	9	T_{2B} [Nm]	53.0		58.0		50.0		39.0		63.0		58.0		45.0	
		T_{2NOT} [Nm]	73.0		83.0		77.0		59.0		97.0		90.0		77.0	
	11	T_{2B} [Nm]	53.0	53.0	58.0	58.0	50.0	50.0	39.0	39.0	63.0	63.0	58.0	58.0	45.0	45.0
		T_{2NOT} [Nm]	73.0	73.0	83.0	83.0	77.0	77.0	59.0	59.0	97.0	97.0	90.0	90.0	77.0	77.0
	14	T_{2B} [Nm]	53.0	53.0	58.0	58.0	50.0	50.0	39.0	39.0	63.0	63.0	58.0	58.0	45.0	45.0
		T_{2NOT} [Nm]	73.0	73.0	83.0	83.0	77.0	77.0	59.0	59.0	97.0	97.0	90.0	90.0	77.0	77.0
	16	T_{2B} [Nm]	53.0	53.0	58.0	58.0	50.0	50.0	39.0	39.0	63.0	63.0	58.0	58.0	45.0	45.0
		T_{2NOT} [Nm]	73.0	73.0	83.0	83.0	77.0	77.0	59.0	59.0	97.0	97.0	90.0	90.0	77.0	77.0
	19	T_{2B} [Nm]	53.0	53.0	58.0	58.0	50.0	50.0	39.0	39.0	63.0	63.0	58.0	58.0	45.0	45.0
		T_{2NOT} [Nm]	73.0	73.0	83.0	83.0	77.0	77.0	59.0	59.0	97.0	97.0	90.0	90.0	77.0	77.0
	24	T_{2B} [Nm]	53.0		58.0		50.0		39.0		63.0		58.0		45.0	
		T_{2NOT} [Nm]	73.0		83.0		77.0		59.0		97.0		90.0		77.0	

Permissible radial force F_{r2} and axial force F_{a2} on shaft N_2

n_2 [rpm]	200		125		75		50		30		10	
T_2 [Nm]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]
		0		0		0		0		0		0
< 80	970	485	1250	625	1380	690	1600	800	1800	900	2500	1250



Gearbox inertia moments/mass

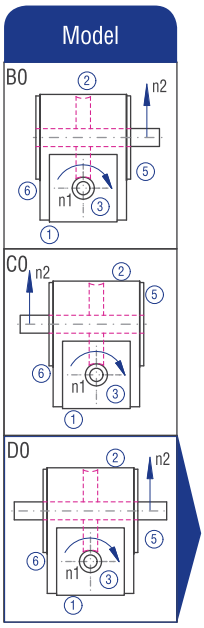
Inertia moment J_1 related to the fast-rotating shaft (N_1)

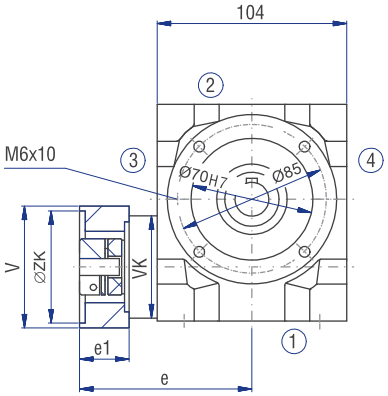
Inertia moment [kgcm²]							Mass
i rated [-]	5:1	7.5:1	10:1	13:1	15:1	20:1	26:1	ca. [kg]
J [kgcm²]	0.3307	0.2454	0.1801	0.1458	0.1943	0.1476	0.1268	7

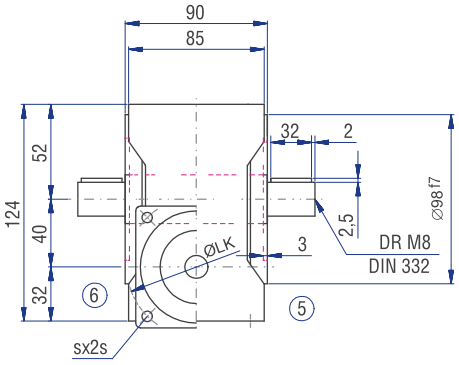
The mass of the gearbox may deviate depending on the flange size and the gear ratio.

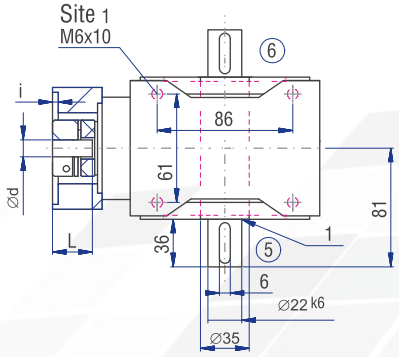
Inertia moment Coupling J

	KN	KNN	SN
	J [kgcm²]	J [kgcm²]	J [kgcm²]
K14	0.0606	0.0606	0.1446
K19	0.4229	0.4229	0.6349

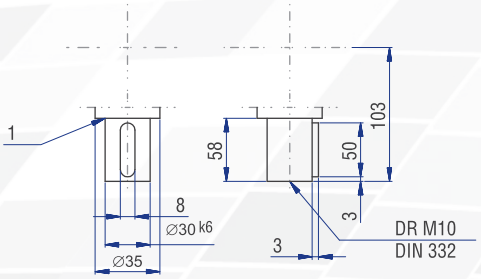


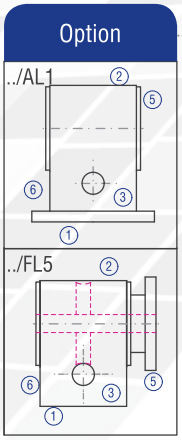


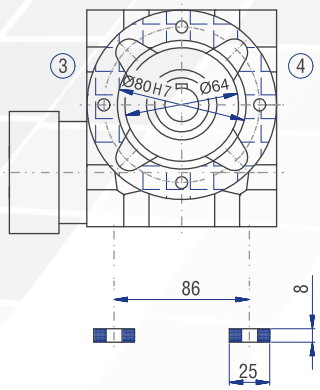


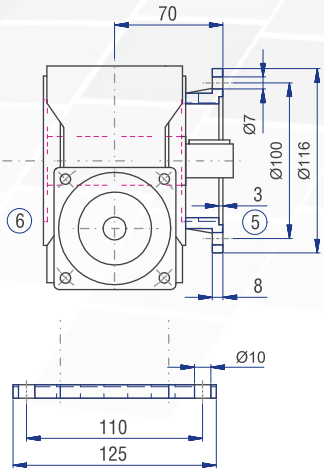


Implementation VV









Motor dimensions

Flange no.	Motor shaft (d*l)	Thread (s)	V [mm]	ZK [mm]	LK [mm]	i [mm]	e [mm]	e1 [mm]
001	11*23	M4	65	40	63	3	93.0	30.0
002	11*23	M5	65	40	63	3	93.0	30.0
102	11*23	M5	65	60	75	3	90.0	26.5
202	11*23	M5	65	60	90	4	90.0	26.5
103	14*30	M6	65	60	75	3	108.5	45.0
104	14*30	M5	65	60	75	3	108.5	45.0
201	14*30	M5	65	60	90	4	108.5	45.0
301	14*30	M6	65	50	95	4	108.5	45.0
401	14*30	M6	65	80	100	4	108.5	45.0
501	14*30	M8	65	95	115	4	108.5	45.0
601	19*40	M8	90	95	130	4	121.0	45.0
611	19*40	M8	90	110	130	5	121.0	45.0
701	19*40	M8	90	110	145	5	121.0	45.0
802	19*40	M10	90	110	165	5	121.0	45.0

The dimensions e and e1 will change for the coupling type “clamping hub with groove” (KNN). Please contact us for consultation!

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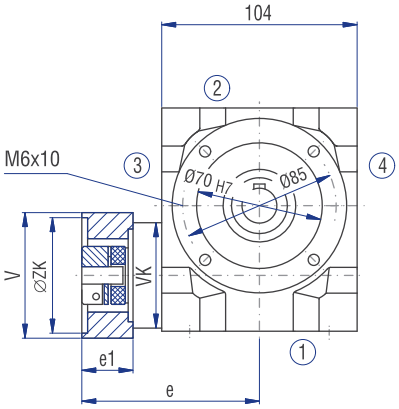
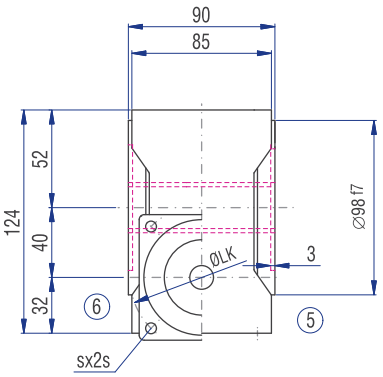
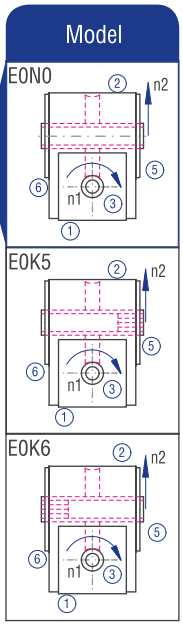
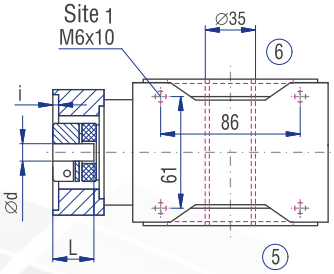
The dimensions of the Models not shown can be figured by mirroring available dimensions.

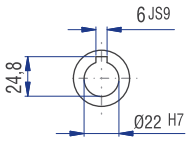




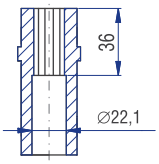


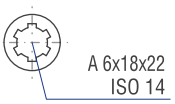


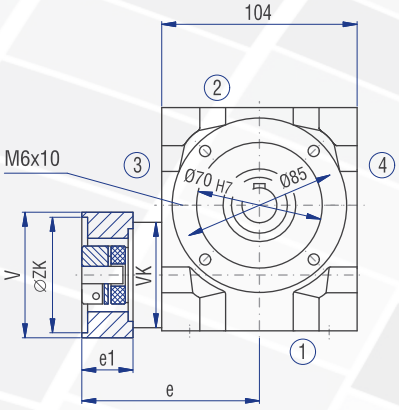
EON0

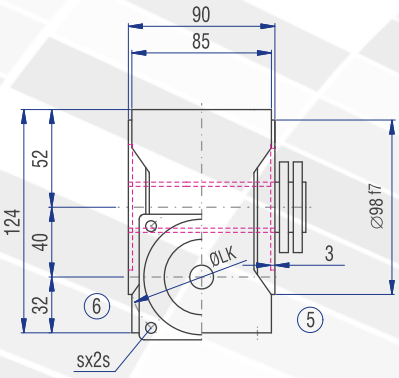


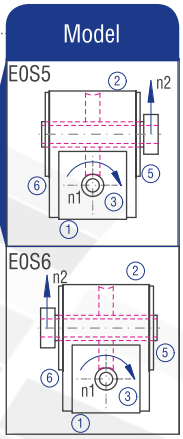
EOK5 / EOK6

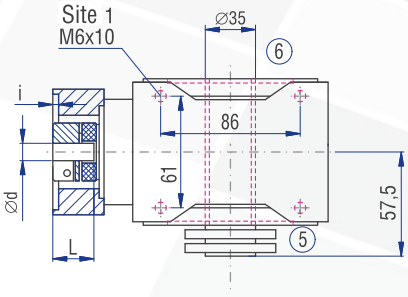


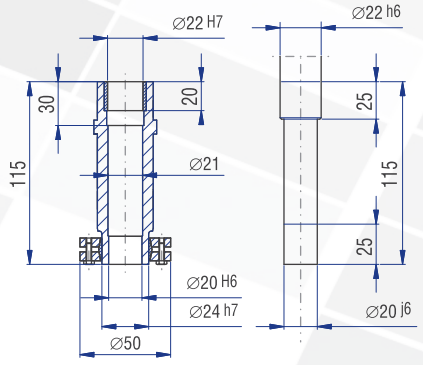




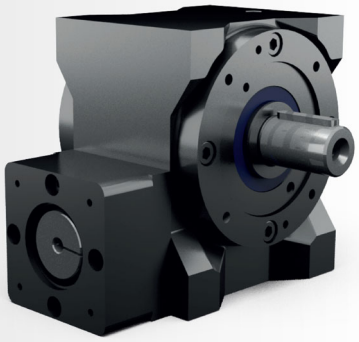








11.5.17 Type SC 050 – Servo worm gearboxes



Characteristics

Characteristic	Standard	Option
Toothing	Hardened and ground worm shaft / bronze worm gear	See chapter 11.5.2
Gear ratio	5:1 to 26:1	
Housing / Flanges	Grey cast iron / aluminium	
Threaded mounting holes	On gearbox side 1 and on the flanges	See chapter 11.5.4
Shaft	Material 1 C45, shaft ends greased Fit with ISO j6 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.2
Hollow shaft	Material 1 C45, shafts greased Fit with ISO H7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
Radial shaft seal ring	NBR, form A	See chapter 4.8
Ambient temperature	- 10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
Circumferential backlash	< 20 arcmin	See chapter 11.5.11
Protection class	IP 54	See chapter 4.5
Corrosion protection	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
Bearing life L10h	more than 15,000h	See chapter 4.9.1
Oil change intervals	Not required if the oil temperature is kept < 90°C The lifetime of the bearings can be increased by the factor 1.5 if the oil is changed after the first 500 service hours and then every 5000 service hours.	See chapter 11.5.9
Lubricants	Synthetic lubricants	See chapter 11.5.9
Motor flange	Aluminium	See chapter 11.5.14
Coupling	Insertable, flexible claw coupling, suitable for servo-motors For smooth motor shafts clamping hub KN For smooth motor shafts tension ring hub SN For motor shafts with parallel key clamping hub with groove KNN	See chapter 11.5.13

Torques in operating mode S1

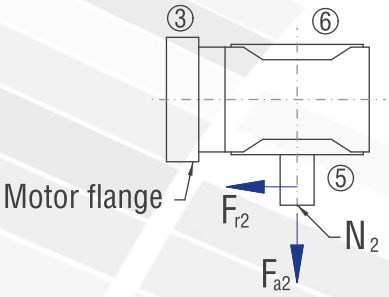
I rated I ist	5:1 29:6		7.5:1 29:4		10:1 39:4		13:1 52:4		15:1 29:2		20:1 39:2		26:1 52:2	
	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]
4000	828	48	552	59	421	70	314	54	276	62	211	72	157	70
3000	621	60	414	71	316	83	235	56	207	76	158	85	118	73
2400	497	72	331	82	253	97	188	58	166	91	126	98	94	75
1500	310	83	207	94	158	110	118	60	103	105	79	111	59	77

Torques in operating mode S5

I rated T_{2N} [Nm] n_{1max} [rpm]			5:1 96 5000		7.5:1 104 5000		10:1 91 5500		13:1 59 5800		15:1 106 5000		20:1 106 5500		26:1 76 5800	
Coupling size	**d [mm]**		**KN**	**KNN/SN**	**KN**	**KNN/SN**	**KN**	**KNN/SN**	**KN**	**KNN/SN**	**KN**	**KNN/SN**	**KN**	**KNN/SN**	**KN**	**KNN/SN**
K19	9	T_{2B} [Nm]	82.2		123.3		112.0		66.0		145.0		133.0		86.0	
		T_{2NOT} [Nm]	145.0		167.0		152.0		100.0		195.0		179.0		137.0	
	11	T_{2B} [Nm]	82.2	82.2	123.3	123.3	112.0	112.0	66.0	66.0	145.0	145.0	133.0	133.0	86.0	86.0
		T_{2NOT} [Nm]	145.0	145.0	167.0	167.0	152.0	152.0	100.0	100.0	195.0	195.0	179.0	179.0	137.0	137.0
	14	T_{2B} [Nm]	82.2	82.2	123.3	123.3	112.0	112.0	66.0	66.0	145.0	145.0	133.0	133.0	86.0	86.0
		T_{2NOT} [Nm]	150.0	150.0	167.0	167.0	152.0	152.0	100.0	100.0	195.0	195.0	179.0	179.0	137.0	137.0
	16	T_{2B} [Nm]	82.2	82.2	123.3	123.3	112.0	112.0	66.0	66.0	145.0	145.0	133.0	133.0	86.0	86.0
		T_{2NOT} [Nm]	150.0	150.0	167.0	167.0	152.0	152.0	100.0	100.0	195.0	195.0	179.0	179.0	137.0	137.0
	19	T_{2B} [Nm]	82.2	82.2	123.3	123.3	112.0	112.0	66.0	66.0	145.0	145.0	133.0	133.0	86.0	86.0
		T_{2NOT} [Nm]	150.0	150.0	167.0	167.0	152.0	152.0	100.0	100.0	195.0	195.0	179.0	179.0	137.0	137.0
	24	T_{2B} [Nm]	82.2		123.3		112.0		66.0		145.0		133.0		86.0	
		T_{2NOT} [Nm]	150.0		167.0		152.0		100.0		195.0		179.0		137.0	
K24	11	T_{2B} [Nm]	125.0	125.0	125.0	125.0	112.0	112.0	66.0	66.0	145.0	145.0	133.0	133.0	86.0	86.0
		T_{2NOT} [Nm]	150.0	0.0	167.0	0.0	152.0	0.0	100.0	0.0	195.0	0.0	179.0	0.0	137.0	0.0
	14	T_{2B} [Nm]	125.0	125.0	125.0	125.0	112.0	112.0	66.0	66.0	145.0	145.0	133.0	133.0	86.0	86.0
		T_{2NOT} [Nm]	150.0	150.0	167.0	167.0	152.0	152.0	100.0	100.0	195.0	195.0	179.0	179.0	137.0	137.0
	16	T_{2B} [Nm]	125.0	125.0	125.0	125.0	112.0	112.0	66.0	66.0	145.0	145.0	133.0	133.0	86.0	86.0
		T_{2NOT} [Nm]	150.0	150.0	167.0	167.0	152.0	152.0	100.0	100.0	195.0	195.0	179.0	179.0	137.0	137.0
	19	T_{2B} [Nm]	125.0	125.0	125.0	125.0	112.0	112.0	66.0	66.0	145.0	145.0	133.0	133.0	86.0	86.0
		T_{2NOT} [Nm]	150.0	150.0	167.0	167.0	152.0	152.0	100.0	100.0	195.0	195.0	179.0	179.0	137.0	137.0
	24	T_{2B} [Nm]	125.0	125.0	125.0	125.0	112.0	112.0	66.0	66.0	145.0	145.0	133.0	133.0	86.0	86.0
		T_{2NOT} [Nm]	150.0	150.0	167.0	167.0	152.0	152.0	100.0	100.0	195.0	195.0	179.0	179.0	137.0	137.0
	28	T_{2B} [Nm]	125.0	125.0	125.0	125.0	112.0	112.0	66.0	66.0	145.0	145.0	133.0	133.0	86.0	86.0
		T_{2NOT} [Nm]	150.0	150.0	167.0	167.0	152.0	152.0	100.0	100.0	195.0	195.0	179.0	179.0	137.0	137.0

Permissible radial force F_{r2} and axial force F_{a2} on shaft N_2

n_2 [rpm]	200		125		75		50		30		10	
T_2 [Nm]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]
< 120	2000	1000	2400	1200	2850	1425	3350	1675	4000	2000	4800	2400
> 120	1540	770	1850	925	2190	1095	2580	1290	3080	1540	3700	1850



Gearbox inertia moments/mass

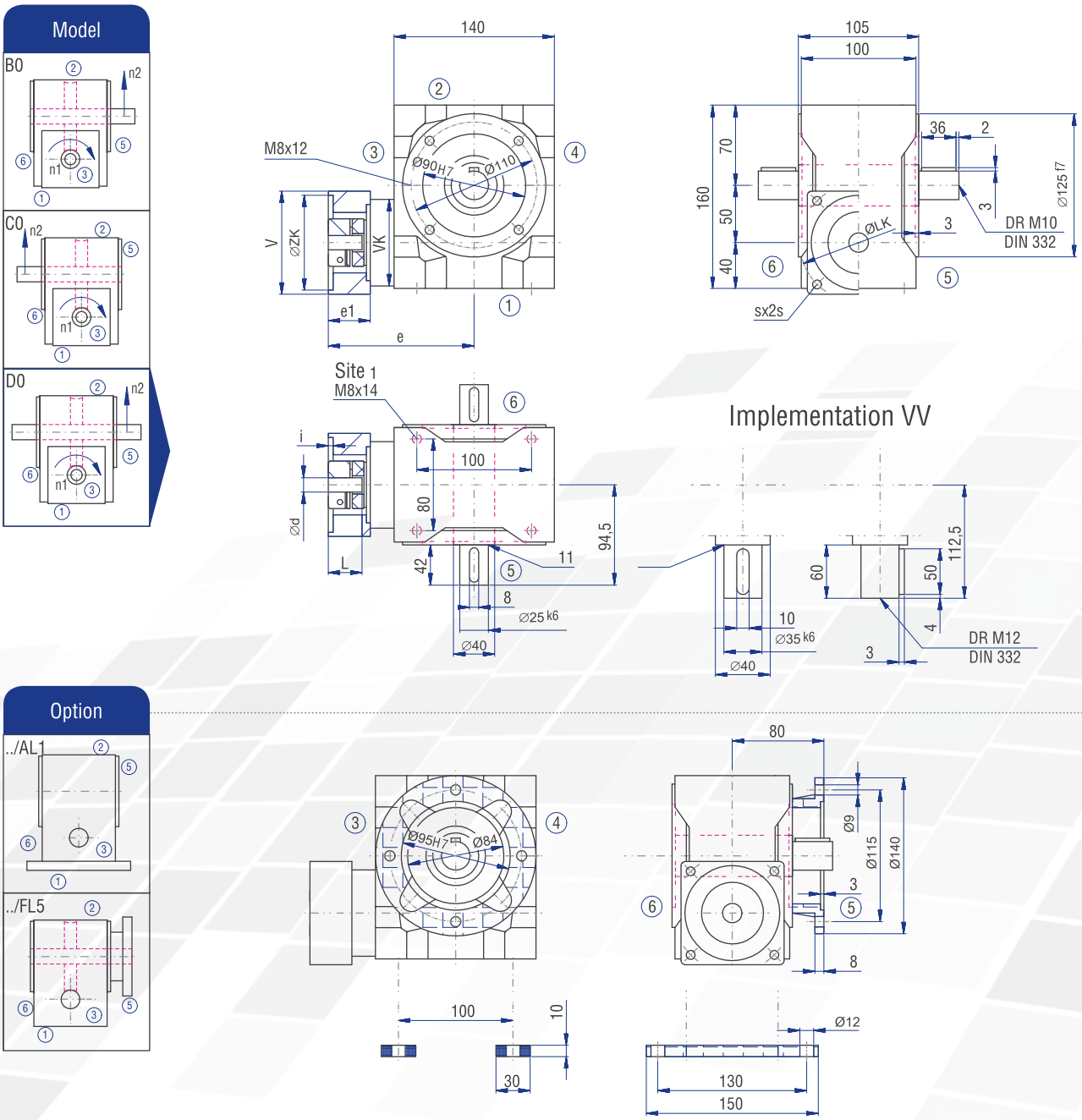
Inertia moment J_1 related to the fast-rotating shaft (N_1)

Inertia moment [kgcm²]							Mass
i rated [-]	5:1	7.5:1	10:1	13:1	15:1	20:1	26:1	ca. [kg]
J [kgcm²]	0.9509	0.7327	0.5820	0.4876	0.6017	0.4996	0.4375	13

The mass of the gearbox may deviate depending on the flange size and the gear ratio.

Inertia moments Coupling J

	KN	KNN	SN
	J [kgcm²]	J [kgcm²]	J [kgcm²]
K19	0.4229	0.4229	0.6349
K24	1.0910	1.0910	2.7750

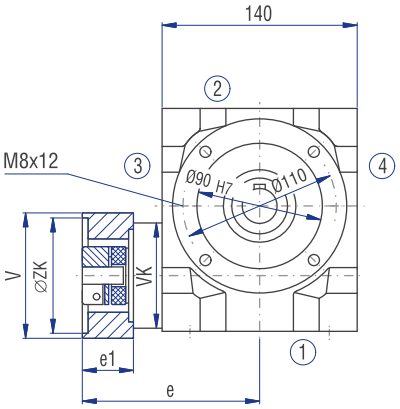


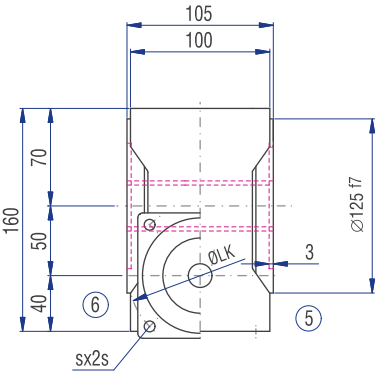
Motor dimensions

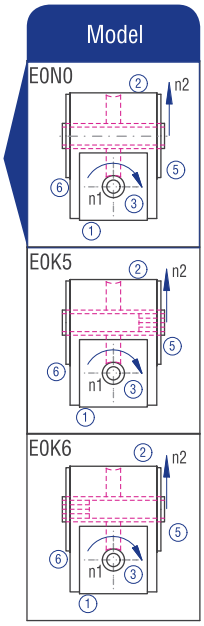
Flange no.	Motor shaft (d*l)	Thread (s)	V [mm]	ZK [mm]	LK [mm]	i [mm]	e [mm]	e1 [mm]
103	19*40	M6	90	60	75	3	141.0	45.0
201	19*40	M5	90	60	90	3	141.0	45.0
301	19*40	M6	90	50	95	4	141.0	45.0
401	19*40	M6	90	80	100	4	141.0	45.0
501	19*40	M8	90	95	115	4	141.0	45.0
601	19*40	M8	90	95	130	4	141.0	45.0
611	19*40	M8	90	110	130	5	141.0	45.0
701	19*40	M8	90	110	145	5	141.0	45.0
802	19*40	M10	90	110	165	5	141.0	45.0
811	24*50	M10	120	130	165	5	155.0	54.0

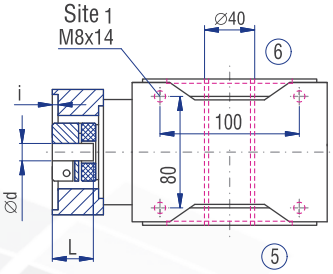
The dimensions e and e1 will change for the coupling type “clamping hub with groove” (KNN). Please contact us for consultation!

The dimensions of the Models not shown can be figured by mirroring available dimensions.



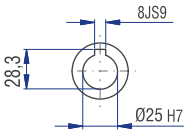


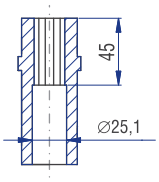


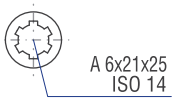


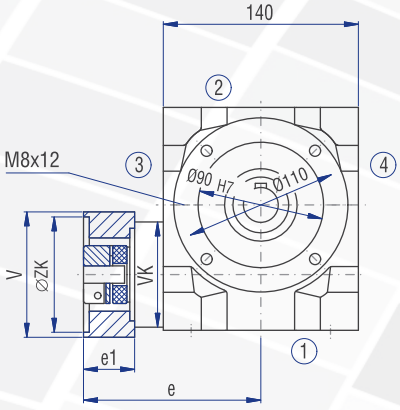
E0N0

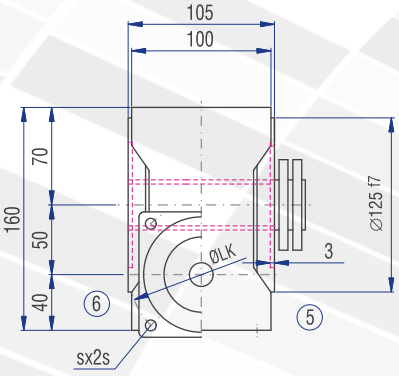
E0K5 / E0K6

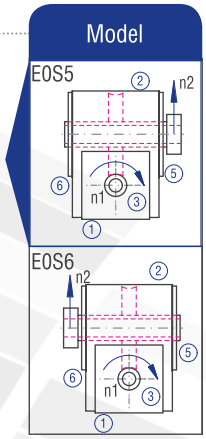


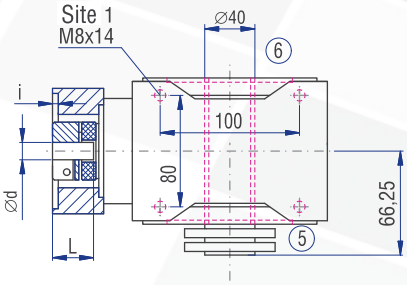


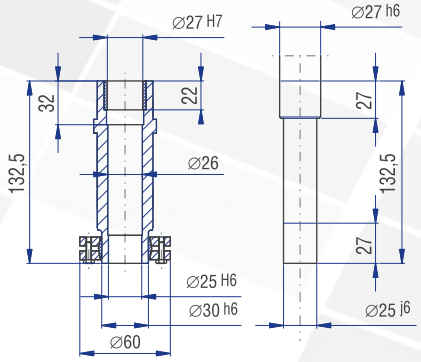




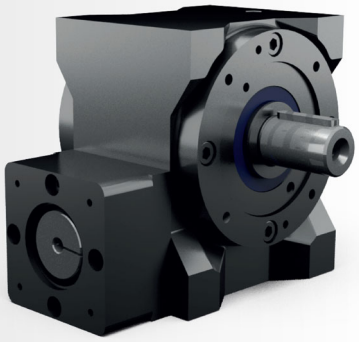








11.5.18 Type SC 063 – Servo worm gearboxes



Characteristics

Characteristic	Standard	Option
Toothing	Hardened and ground worm shaft / bronze worm gear	See chapter 11.5.2
Gear ratio	5:1 to 26:1	
Housing / Flanges	Grey cast iron / aluminium	
Threaded mounting holes	On gearbox side 1 and on the flanges	See chapter 11.5.4
Shaft	Material 1 C45, shaft ends greased Fit with ISO j6 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.2
Hollow shaft	Material 1 C45, shafts greased Fit with ISO H7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
Radial shaft seal ring	NBR, form A	See chapter 4.8
Ambient temperature	- 10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
Circumferential backlash	< 20 arcmin	See chapter 11.5.11
Protection class	IP 54	See chapter 4.5
Corrosion protection	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
Bearing life L10h	more than 15,000h	See chapter 4.9.1
Oil change intervals	Not required if the oil temperature is kept < 90°C The lifetime of the bearings can be increased by the factor 1.5 if the oil is changed after the first 500 service hours and then every 5000 service hours.	See chapter 11.5.9
Lubricants	Synthetic lubricants	See chapter 11.5.9
Motor flange	Aluminium	See chapter 11.5.14
Coupling	Insertable, flexible claw coupling, suitable for servo-motors For smooth motor shafts clamping hub KN For smooth motor shafts tension ring hub SN For motor shafts with parallel key clamping hub with groove KNN	See chapter 11.5.13

Table 9-13

Torques in operating mode S1

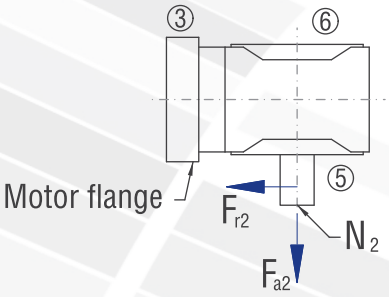
I rated I ist	5:1 29:6		7.5:1 29:4		10:1 39:4		13:1 52:4		15:1 29:2		20:1 39:2		26:1 52:2	
	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]
4000	828	69	552	83	410	101	314	123	276	96	205	116	157	115
3000	621	89	414	104	308	124	235	128	207	119	154	141	118	135
2400	497	109	331	125	246	148	188	133	166	142	123	166	94	155
1500	310	129	207	146	154	171	118	138	103	166	77	190	59	175

Torques in operating mode S5

I rated T_{2N} [Nm] n_{1max} [rpm]			5:1 145 4500		7.5:1 157 4500		10:1 170 5000		13:1 135 5300		15:1 183 4500		20:1 186 5000		26:1 173 5300	
Coupling size	**d [mm]**		**KN**	**KNN/SN**	**KN**	**KNN/SN**	**KN**	**KNN/SN**	**KN**	**KNN/SN**	**KN**	**KNN/SN**	**KN**	**KNN/SN**	**KN**	**KNN/SN**
K19	9	T_{2B} [Nm]	82.2		123.3		165.8		151.0		246.5		259.0		195.0	
		T_{2NOT} [Nm]	145.0		217.5		292.5		222.0		395.0		355.0		295.0	
	11	T_{2B} [Nm]	82.2	82.2	123.3	123.3	165.8	165.8	151.0	151.0	246.5	246.5	259.0	259.0	195.0	195.0
		T_{2NOT} [Nm]	145.0	145.0	217.5	217.5	292.5	292.5	222.0	222.0	395.0	395.0	355.0	355.0	295.0	295.0
	14	T_{2B} [Nm]	82.2	82.2	123.3	123.3	165.8	165.8	151.0	151.0	246.5	246.5	259.0	259.0	195.0	195.0
		T_{2NOT} [Nm]	154.7	154.7	232.0	232.0	306.0	306.0	222.0	222.0	395.0	395.0	355.0	355.0	295.0	295.0
	16	T_{2B} [Nm]	82.2	82.2	123.3	123.3	165.8	165.8	151.0	151.0	246.5	246.5	259.0	259.0	195.0	195.0
		T_{2NOT} [Nm]	154.7	164.3	232.0	246.5	306.0	306.0	222.0	222.0	395.0	395.0	355.0	355.0	295.0	295.0
	19	T_{2B} [Nm]	82.2	82.2	123.3	123.3	165.8	165.8	151.0	151.0	246.5	246.5	259.0	259.0	195.0	195.0
		T_{2NOT} [Nm]	164.3	164.3	246.5	246.5	306.0	306.0	222.0	222.0	395.0	395.0	355.0	355.0	295.0	295.0
	24	T_{2B} [Nm]	82.2		123.3		165.8		151.0		246.5		259.0		195.0	
		T_{2NOT} [Nm]	164.3		246.5		306.0		222.0		395.0		355.0		295.0	
K24	11	T_{2B} [Nm]	169.2	198.0	223.0	223.0	216.0	216.0	151.0	151.0	266.0	266.0	259.0	259.0	195.0	195.0
		T_{2NOT} [Nm]	217.5	0.0	326.3	0.0	306.0	0.0	222.0	0.0	395.0	0.0	355.0	0.0	295.0	0.0
	14	T_{2B} [Nm]	174.0	198.0	223.0	223.0	216.0	216.0	151.0	151.0	266.0	266.0	259.0	259.0	195.0	195.0
		T_{2NOT} [Nm]	217.5	295.0	326.3	334.0	306.0	306.0	222.0	222.0	395.0	395.0	355.0	355.0	295.0	295.0
	16	T_{2B} [Nm]	188.5	198.0	223.0	223.0	216.0	216.0	151.0	151.0	266.0	266.0	259.0	259.0	195.0	195.0
		T_{2NOT} [Nm]	241.7	295.0	334.0	334.0	306.0	306.0	222.0	222.0	395.0	395.0	355.0	355.0	295.0	295.0
	19	T_{2B} [Nm]	188.5	198.0	223.0	223.0	216.0	216.0	151.0	151.0	266.0	266.0	259.0	259.0	195.0	195.0
		T_{2NOT} [Nm]	290.0	295.0	334.0	334.0	306.0	306.0	222.0	222.0	395.0	395.0	355.0	355.0	295.0	295.0
	24	T_{2B} [Nm]	198.0	198.0	223.0	223.0	216.0	216.0	151.0	151.0	266.0	266.0	259.0	259.0	195.0	195.0
		T_{2NOT} [Nm]	295.0	295.0	334.0	334.0	306.0	306.0	222.0	222.0	395.0	395.0	355.0	355.0	295.0	295.0
	28	T_{2B} [Nm]	198.0	198.0	223.0	223.0	216.0	216.0	151.0	151.0	266.0	266.0	259.0	259.0	195.0	195.0
		T_{2NOT} [Nm]	295.0	295.0	334.0	334.0	306.0	306.0	222.0	222.0	395.0	395.0	355.0	355.0	295.0	295.0

Permissible radial force F_{r2} and axial force F_{a2} on shaft N_2

n_2 [rpm]	200		125		75		50		30		10	
T_2 [Nm]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]
< 220	2700	1350	3150	1575	3800	1900	4500	2250	5200	2600	5200	2600
> 220	2080	1040	2420	1210	2920	1460	3460	1730	4000	2000	4000	2000



Gearbox inertia moments/mass

Inertia moment J_1 related to the fast-rotating shaft (N_1)

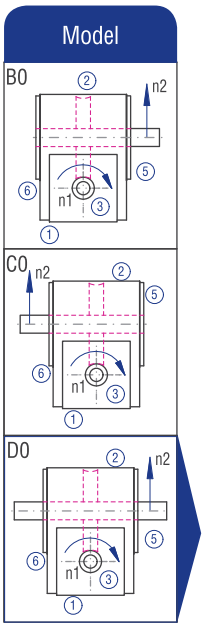
Inertia moment [kgcm²]							
i rated [-]	**5:1**	**7.5:1**	**10:1**	**13:1**	**15:1**	**20:1**	**26:1**
J [kgcm²]	2.1678	1.6423	1.1366	0.9368	1.3270	0.9445	0.8175

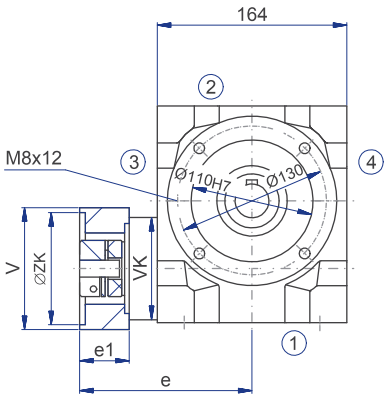
Mass ca. [kg]
20

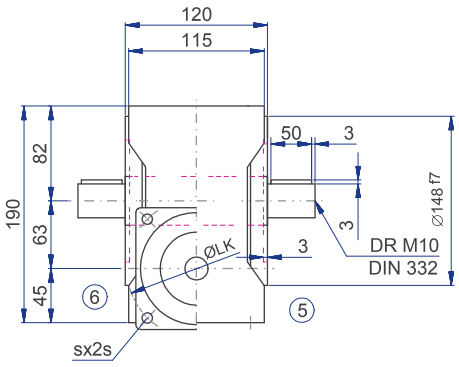
The mass of the gearbox may deviate depending on the flange size and the gear ratio.

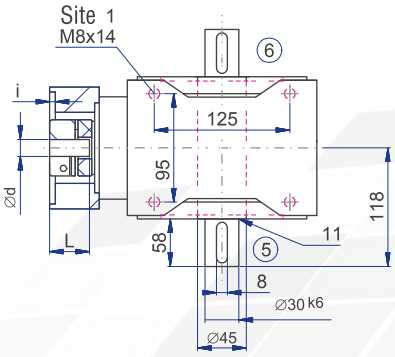
Inertia moments Coupling J

	KN	KNN	SN
	J [kgcm²]	J [kgcm²]	J [kgcm²]
K19	0.4229	0.4229	0.6349
K24	1.0910	1.0910	2.7750

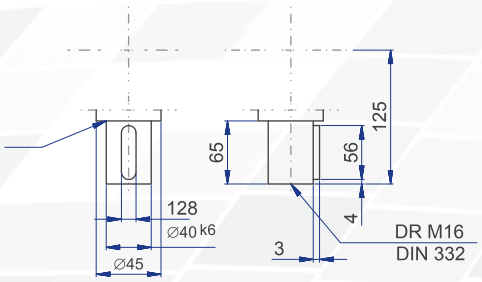


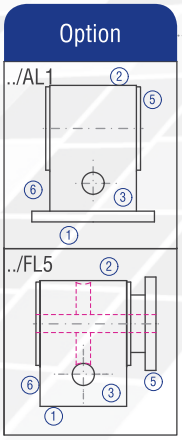


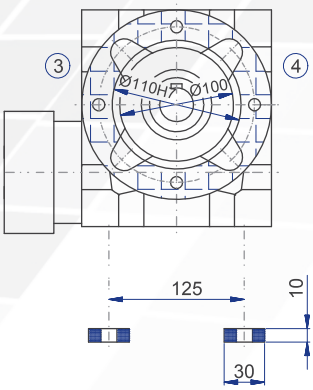


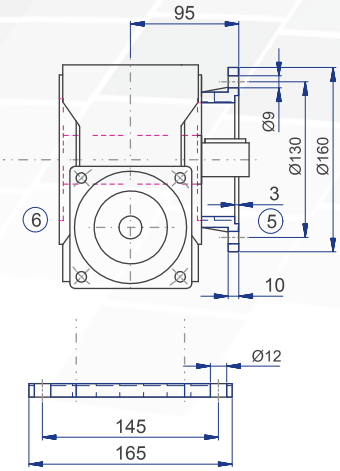


Implementation VV









Motor dimensions

Flange no.	Motor shaft (d*l)	Thread (s)	V [mm]	ZK [mm]	LK [mm]	i [mm]	e [mm]	e1 [mm]
103	19*40	M6	90	60	75	3	154.0	45.0
201	19*40	M5	90	60	90	3	154.0	45.0
301	19*40	M6	90	50	95	4	154.0	45.0
401	19*40	M6	90	80	100	4	154.0	45.0
501	19*40	M8	90	95	115	4	154.0	45.0
601	19*40	M8	90	95	130	4	154.0	45.0
611	19*40	M8	90	110	130	5	154.0	45.0
701	19*40	M8	90	110	145	5	154.0	45.0
802	19*40	M10	90	110	165	5	154.0	45.0
811	24*50	M10	120	130	165	5	177.0	54.0

The dimensions e and e1 will change for the coupling type “clamping hub with groove” (KNN). Please contact us for consultation!

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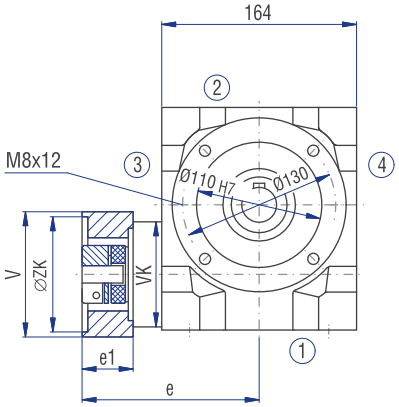
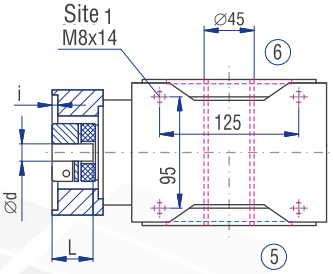
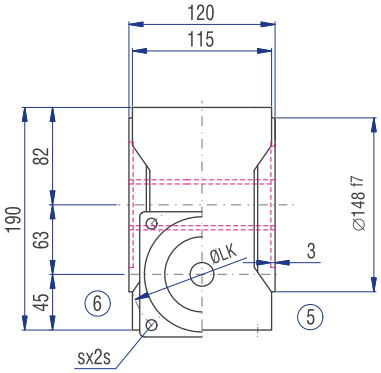
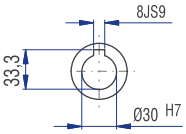
The dimensions of the Models not shown can be figured by mirroring available dimensions.



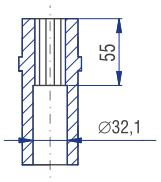


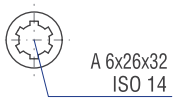


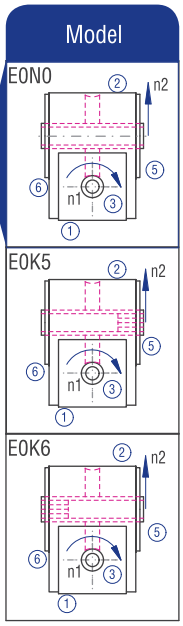
E0N0

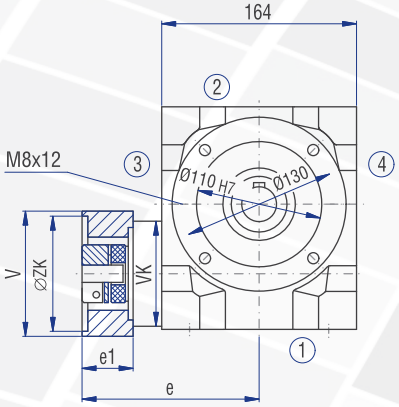


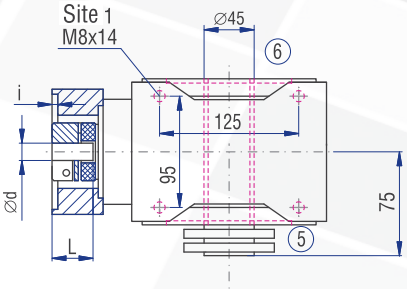
E0K5 / E0K6

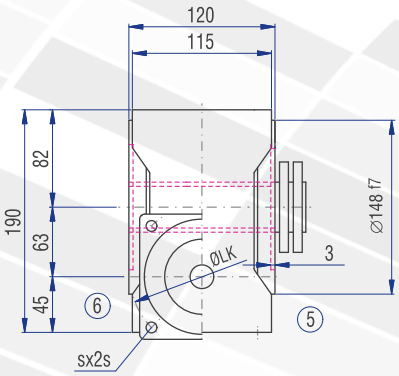


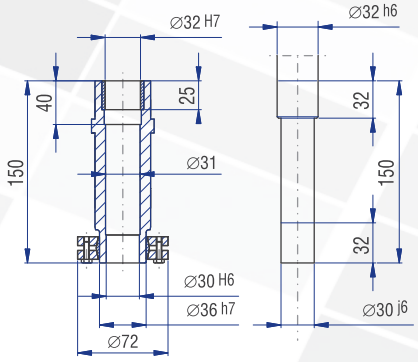


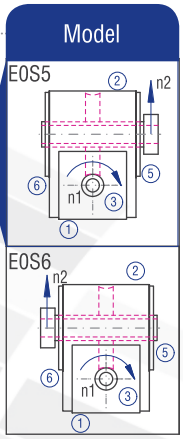




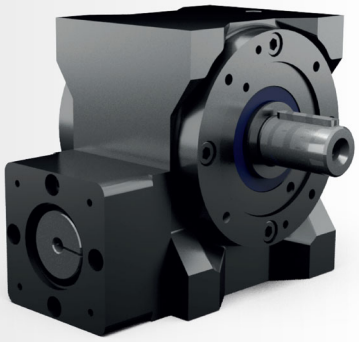








11.5.19 Type SC 080 – Servo worm gearboxes



Characteristics

Characteristic	Standard	Option
Toothing	Hardened and ground worm shaft / bronze worm gear	See chapter 11.5.2
Gear ratio	5:1 to 26:1	
Housing / Flanges	Grey cast iron / aluminium	
Threaded mounting holes	On gearbox side 1 and on the flanges	See chapter 11.5.4
Shaft	Material 1 C45, shaft ends greased Fit with ISO j6 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.2
Hollow shaft	Material 1 C45, shafts greased Fit with ISO H7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
Radial shaft seal ring	NBR, form A	See chapter 4.8
Ambient temperature	- 10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
Circumferential backlash	< 20 arcmin	See chapter 11.5.11
Protection class	IP 54	See chapter 4.5
Corrosion protection	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
Bearing life L10h	more than 15,000h	See chapter 4.9.1
Oil change intervals	Not required if the oil temperature is kept < 90°C The lifetime of the bearings can be increased by the factor 1.5 if the oil is changed after the first 500 service hours and then every 5000 service hours.	See chapter 11.5.9
Lubricants	Synthetic lubricants	See chapter 11.5.9
Motor flange	Aluminium	See chapter 11.5.14
Coupling	Insertable, flexible claw coupling, suitable for servo-motors For smooth motor shafts clamping hub KN For smooth motor shafts tension ring hub SN For motor shafts with parallel key clamping hub with groove KNN	See chapter 11.5.13

Torques in operating mode S1

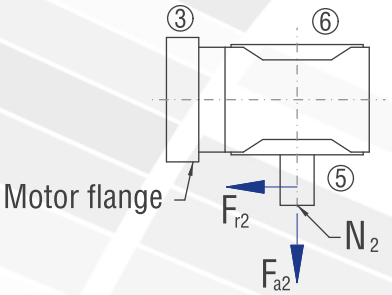
I rated / I ist	5:1 29:6		7.5:1 29:4		10:1 39:4		13:1 52:4		15:1 29:2		20:1 39:2		26:1 52:2	
	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]
4000	800	96	533	111	400	132	302	163	267	130	200	153	151	191
3000	600	132	400	152	300	177	226	170	200	175	150	203	113	207
2400	480	168	320	192	240	222	181	177	160	221	120	253	91	233
1500	300	204	200	233	150	267	113	184	100	266	75	303	57	239

Torques in operating mode S5

I rated			5:1		7.5:1		10:1		13:1		15:1		20:1		26:1	
T_{2N} [Nm]			250		289		297		187		352		344		245	
n_{1max} [rpm]			4000		4000		4500		4800		4000		4500		4800	
Coupling size	d [mm]		KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN
K24	11	T_{2B} [Nm]	175.0	240.0	262.5	360.0	350.0	408.0	210.0	210.0	525.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	225.0	0.0	337.5	0.0	450.0	0.0	321.0	0.0	675.0	0.0	725.0	0.0	432.0	0.0
	14	T_{2B} [Nm]	180.0	240.0	270.0	360.0	360.0	408.0	210.0	210.0	530.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	225.0	400.0	337.5	600.0	450.0	625.0	321.0	321.0	675.0	826.0	725.0	725.0	432.0	432.0
	16	T_{2B} [Nm]	195.0	240.0	292.5	360.0	390.0	408.0	210.0	210.0	530.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	250.0	500.0	375.0	695.0	500.0	625.0	321.0	321.0	750.0	826.0	725.0	725.0	432.0	432.0
	19	T_{2B} [Nm]	195.0	240.0	292.5	360.0	390.0	408.0	210.0	210.0	530.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	300.0	600.0	450.0	695.0	600.0	625.0	321.0	321.0	826.0	826.0	725.0	725.0	432.0	432.0
	24	T_{2B} [Nm]	215.0	240.0	322.5	360.0	408.0	408.0	210.0	210.0	530.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	325.0	600.0	487.5	695.0	625.0	625.0	321.0	321.0	826.0	826.0	725.0	725.0	432.0	432.0
	28	T_{2B} [Nm]	230.0	240.0	345.0	360.0	408.0	408.0	210.0	210.0	530.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	350.0	600.0	525.0	695.0	625.0	625.0	321.0	321.0	826.0	826.0	725.0	725.0	432.0	432.0
K28	14	T_{2B} [Nm]	360.0		439.0		408.0		210.0		530.0		498.0		275.0	
		T_{2NOT} [Nm]	400.0		600.0		625.0		321.0		826.0		725.0		432.0	
	16	T_{2B} [Nm]	360.0	360.0	439.0	439.0	408.0	408.0	210.0	210.0	530.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	500.0	610.0	695.0	695.0	625.0	625.0	321.0	321.0	826.0	826.0	725.0	725.0	432.0	432.0
	19	T_{2B} [Nm]	360.0	360.0	439.0	439.0	408.0	408.0	210.0	210.0	530.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	610.0	610.0	695.0	695.0	625.0	625.0	321.0	321.0	826.0	826.0	725.0	725.0	432.0	432.0
	24	T_{2B} [Nm]	360.0	360.0	439.0	439.0	408.0	408.0	210.0	210.0	530.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	610.0	610.0	695.0	695.0	625.0	625.0	321.0	321.0	826.0	826.0	725.0	725.0	432.0	432.0
	28	T_{2B} [Nm]	360.0	360.0	439.0	439.0	408.0	408.0	210.0	210.0	530.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	610.0	610.0	695.0	695.0	625.0	625.0	321.0	321.0	826.0	826.0	725.0	725.0	432.0	432.0
	32	T_{2B} [Nm]	360.0	360.0	439.0	439.0	408.0	408.0	210.0	210.0	530.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	610.0	610.0	695.0	695.0	625.0	625.0	321.0	321.0	826.0	826.0	725.0	725.0	432.0	432.0
	38	T_{2B} [Nm]	360.0	360.0	439.0	439.0	408.0	408.0	210.0	210.0	530.0	530.0	498.0	498.0	275.0	275.0
		T_{2NOT} [Nm]	610.0	0.0	695.0	0.0	625.0	0.0	321.0	0.0	826.0	0.0	725.0	0.0	432.0	0.0

Permissible radial force F_{r2} and axial force F_{a2} on shaft N_2

n_2 [rpm]	200		125		75		50		30		10	
T_2 [Nm]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]
< 430	3300	1650	3750	1875	4500	2250	5300	2650	6300	3150	7600	3800
> 430	2640	1320	3000	1500	3600	1800	4240	2120	5040	2520	6080	3040



Gearbox inertia moments/mass

Inertia moment J_1 related to the fast-rotating shaft (N_1)

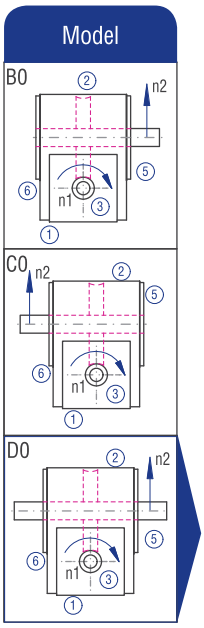
	Inertia moment [kgcm²]						
i rated [-]	5:1	7.5:1	10:1	13:1	15:1	20:1	26:1
J [kgcm²]	5.8195	4.2167	2.9560	2.2634	3.2550	2.3977	1.9066

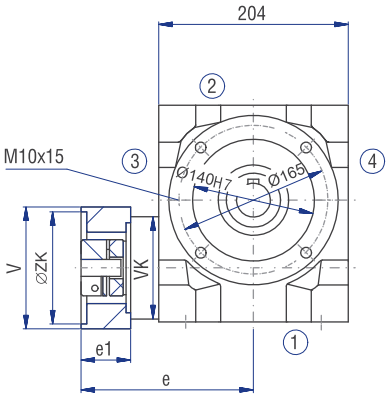
Mass ca. [kg]
30

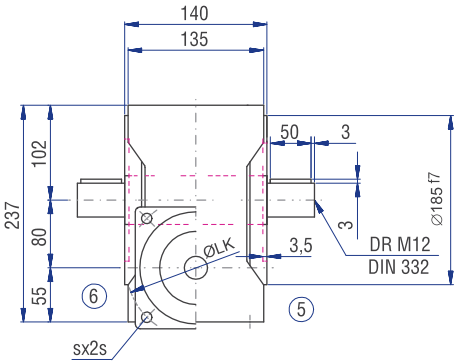
The mass of the gearbox may deviate depending on the flange size and the gear ratio.

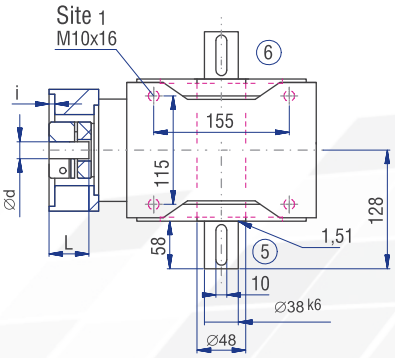
Inertia moments Coupling J

	KN	KNN	SN
	J [kgcm²]	J [kgcm²]	J [kgcm²]
K24	1.0910	1.0910	2.7750
K28	4.1710	4.1710	6.4250

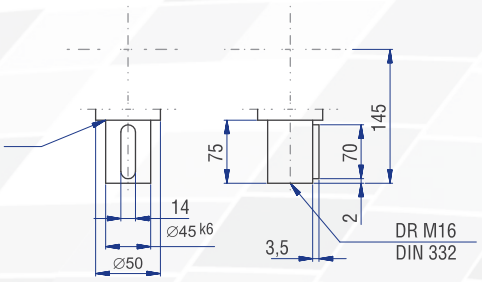


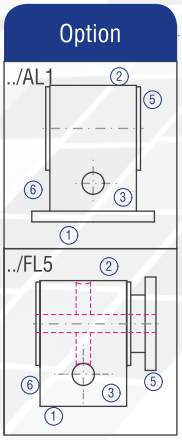


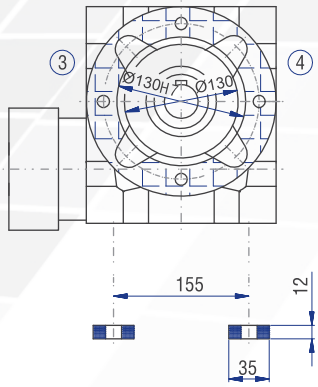


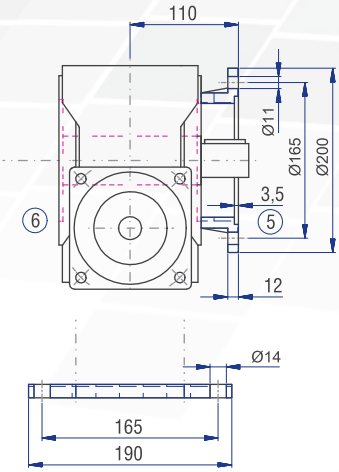


Implementation VV









Motor dimensions

Flange no.	Motor shaft (d*l)	Thread (s)	V [mm]	ZK [mm]	LK [mm]	i [mm]	e [mm]	e1 [mm]
103	24*50	M6	120	60	75	3	192.5	54.0
201	24*50	M5	120	60	90	3	192.5	54.0
301	24*50	M6	120	50	95	4	192.5	54.0
401	24*50	M6	120	80	100	4	192.5	54.0
501	24*50	M8	120	95	115	4	192.5	54.0
601	24*50	M8	120	95	130	4	192.5	54.0
611	24*50	M8	120	110	130	5	192.5	54.0
701	24*50	M8	120	110	145	5	192.5	54.0
802	24*50	M10	120	110	165	5	192.5	54.0
811	24*50	M10	120	130	165	5	192.5	54.0
403	32*60	M6	140	80	100	4	202.5	61.0
502	32*60	M8	140	95	115	4	202.5	61.0
616	32*60	M10	140	110	130	5	202.5	61.0
902	32*60	M12	140	130	215	6	202.5	61.0
911	32*60	M12	140	180	215	6	202.5	61.0
932	38*80	M12	160	180	215	6	241.0	99.5

The dimensions e and e1 will change for the coupling type “clamping hub with groove” (KNN). Please contact us for consultation!

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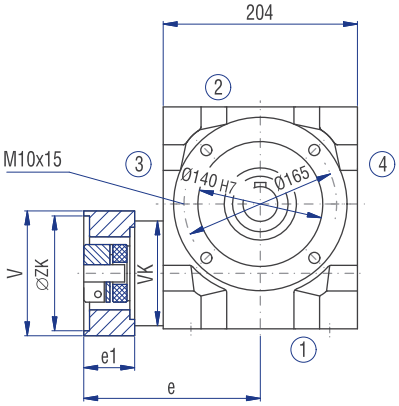
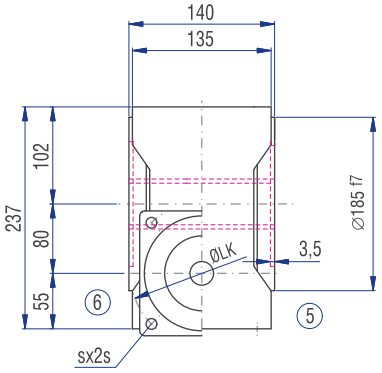
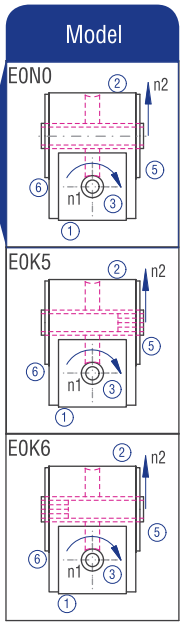
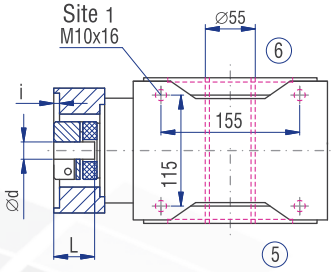
The dimensions of the Models not shown can be figured by mirroring available dimensions.



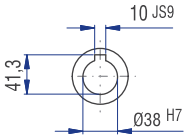


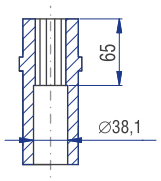


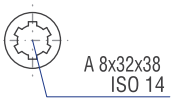


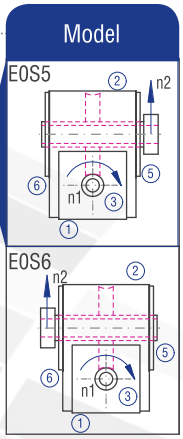
E0N0

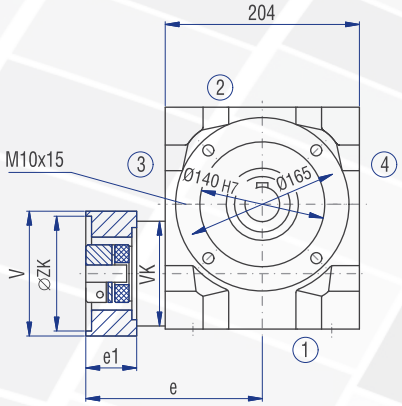
E0K5 / E0K6

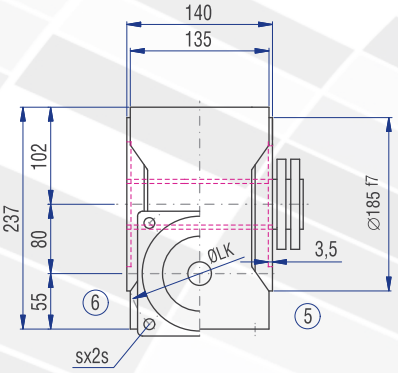


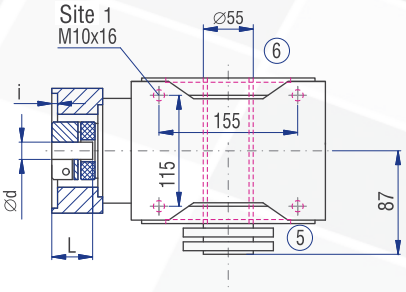


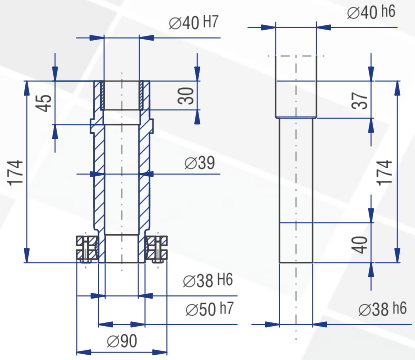




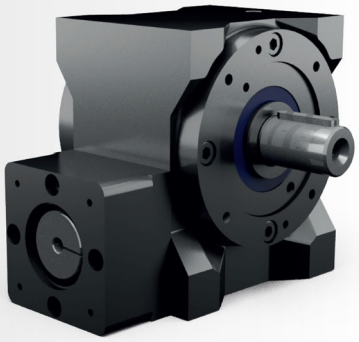








11.5.20 Type SC 100 – Servo worm gearboxes



Characteristics

Characteristic	Standard	Option
Toothing	Hardened and ground worm shaft / bronze worm gear	See chapter 11.5.2
Gear ratio	5:1 to 26:1	
Housing / Flanges	Grey cast iron / aluminium	
Threaded mounting holes	On gearbox side 1 and on the flanges	See chapter 11.5.4
Shaft	Material 1 C45, shaft ends greased Fit with ISO j6 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.2
Hollow shaft	Material 1 C45, shafts greased Fit with ISO H7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
Radial shaft seal ring	NBR, form A	See chapter 4.8
Ambient temperature	- 10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
Circumferential backlash	< 20 arcmin	See chapter 11.5.11
Protection class	IP 54	See chapter 4.5
Corrosion protection	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
Bearing life L10h	more than 15,000h	See chapter 4.9.1
Oil change intervals	Not required if the oil temperature is kept < 90°C The lifetime of the bearings can be increased by the factor 1.5 if the oil is changed after the first 500 service hours and then every 5000 service hours.	See chapter 11.5.9
Lubricants	Synthetic lubricants	See chapter 11.5.9
Motor flange	Aluminium	See chapter 11.5.14
Coupling	Insertable, flexible claw coupling, suitable for servo-motors For smooth motor shafts clamping hub KN For smooth motor shafts tension ring hub SN For motor shafts with parallel key clamping hub with groove KNN	See chapter 11.5.13

Torques in operating mode S1

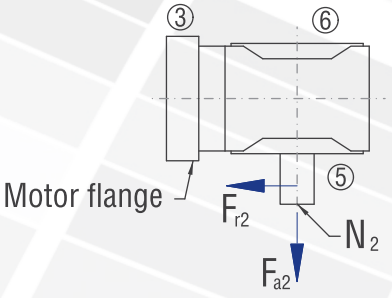
I rated / I ist	5:1 29:6		7.5:1 29:4		10:1 39:4		13:1 52:4		15:1 29:2		20:1 39:2		26:1 52:2	
	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]	n_2 [rpm]	T_{2N} [Nm]
4000	800	96	533	111	400	132	302	163	267	130	200	153	151	191
3000	600	132	400	152	300	177	226	170	200	175	150	203	113	207
2400	480	168	320	192	240	222	181	177	160	221	120	253	91	233
1500	300	204	200	233	150	267	113	184	100	266	75	303	57	239

Torques in operating mode S5

I rated			5:1		7.5:1		10:1		13:1		15:1		20:1		26:1	
T_{2N} [Nm]			590		650		703		464		715		778		605	
n_{1max} [rpm]			3000		3000		3200		3500		3000		3200		3500	
Coupling size	d [mm]		KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN	KN	KNN/SN
K28	14	T_{2B} [Nm]	400.0		600.0		800.0		523.0		1025.0		1112.0		683.0	
		T_{2NOT} [Nm]	400.0		600.0		800.0		736.0		1200.0		1440.0		980.0	
	16	T_{2B} [Nm]	405.0	640.0	607.5	932.0	810.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	500.0	700.0	750.0	1050.0	1000.0	1090.0	736.0	736.0	1500.0	1610.0	1440.0	1440.0	980.0	980.0
	19	T_{2B} [Nm]	425.0	640.0	637.5	932.0	850.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	650.0	1190.0	975.0	1360.0	1090.0	1090.0	736.0	736.0	1610.0	1610.0	1440.0	1440.0	980.0	980.0
	24	T_{2B} [Nm]	455.0	640.0	682.5	932.0	910.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	700.0	1190.0	1050.0	1360.0	1090.0	1090.0	736.0	736.0	1610.0	1610.0	1440.0	1440.0	980.0	980.0
	28	T_{2B} [Nm]	485.0	640.0	727.5	932.0	970.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	740.0	1190.0	1110.0	1360.0	1090.0	1090.0	736.0	736.0	1610.0	1610.0	1440.0	1440.0	980.0	980.0
	32	T_{2B} [Nm]	510.0	640.0	765.0	932.0	1006.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	780.0	1190.0	1170.0	1360.0	1090.0	1090.0	736.0	736.0	1610.0	1610.0	1440.0	1440.0	980.0	980.0
	38	T_{2B} [Nm]	545.0	640.0	817.5	932.0	1006.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	835.0	0.0	1252.5	0.0	1090.0	0.0	736.0	0.0	1610.0	0.0	1440.0	0.0	980.0	0.0
K38	16	T_{2B} [Nm]	470.0		705.0		940.0		523.0		1025.0		1112.0		683.0	
		T_{2NOT} [Nm]	600.0		900.0		1090.0		736.0		1610.0		1440.0		980.0	
	19	T_{2B} [Nm]	490.0		735.0		980.0		523.0		1025.0		1112.0		683.0	
		T_{2NOT} [Nm]	625.0		937.5		1090.0		736.0		1610.0		1440.0		980.0	
	24	T_{2B} [Nm]	520.0	850.0	780.0	932.0	1006.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	650.0	1190.0	975.0	1360.0	1090.0	1090.0	736.0	736.0	1610.0	1610.0	1440.0	1440.0	980.0	980.0
	28	T_{2B} [Nm]	545.0	850.0	817.5	932.0	1006.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	680.0	1190.0	1020.0	1360.0	1090.0	1090.0	736.0	736.0	1610.0	1610.0	1440.0	1440.0	980.0	980.0
	32	T_{2B} [Nm]	565.0	850.0	847.5	932.0	1006.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	710.0	1190.0	1065.0	1360.0	1090.0	1090.0	736.0	736.0	1610.0	1610.0	1440.0	1440.0	980.0	980.0
	38	T_{2B} [Nm]	610.0	850.0	915.0	932.0	1006.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	760.0	1190.0	1140.0	1360.0	1090.0	1090.0	736.0	736.0	1610.0	1610.0	1440.0	1440.0	980.0	980.0
	42	T_{2B} [Nm]	630.0	850.0	932.0	932.0	1006.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	790.0	1190.0	1185.0	1360.0	1090.0	1090.0	736.0	736.0	1610.0	1610.0	1440.0	1440.0	980.0	980.0
	45	T_{2B} [Nm]	650.0	850.0	932.0	932.0	1006.0	1006.0	523.0	523.0	1025.0	1025.0	1112.0	1112.0	683.0	683.0
		T_{2NOT} [Nm]	820.0	1190.0	1230.0	1360.0	1090.0	1090.0	736.0	736.0	1610.0	1610.0	1440.0	1440.0	980.0	980.0

Permissible radial force F_{r2} and axial force F_{a2} on shaft N_2

n_2 [rpm]	200		125		75		50		30		10	
T_2 [Nm]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]	F_r [N]	F_a [N]
< 800	3650	1825	4000	2000	4750	2375	5600	2800	6700	3350	9500	4750
> 800	2920	1460	3200	1600	3800	1900	4480	2240	5360	2680	7600	3800



Gearbox inertia moments/mass

Inertia moment J_1 related to the fast-rotating shaft (N_1)

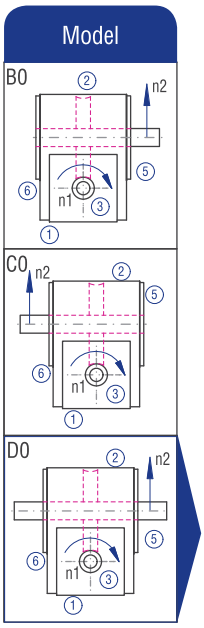
Inertia moment [kgcm²]							
i rated [-]	5:1	7.5:1	10:1	13:1	15:1	20:1	26:1
J [kgcm²]	22.3780	17.8750	14.0300	12.2840	15.1730	12.3740	11.3360

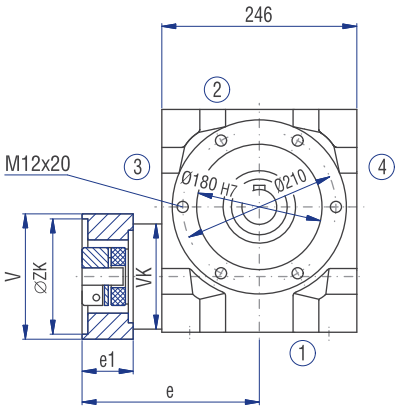
Mass ca. [kg]
53

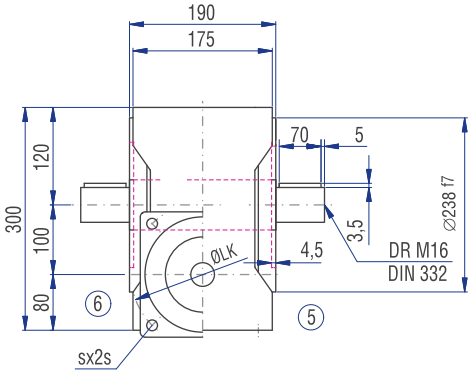
The mass of the gearbox may deviate depending on the flange size and the gear ratio.

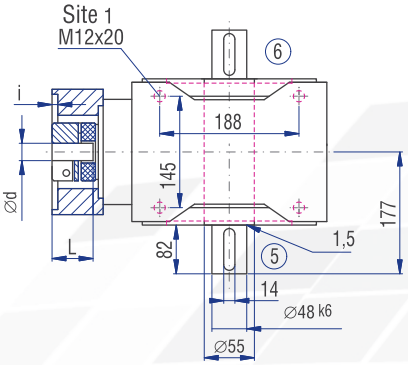
Inertia moments Coupling J

	KN	KNN	SN
	J [kgcm²]	J [kgcm²]	J [kgcm²]
	4.1710	4.1710	6.4250
K38	8.4580	8.4580	19.6460

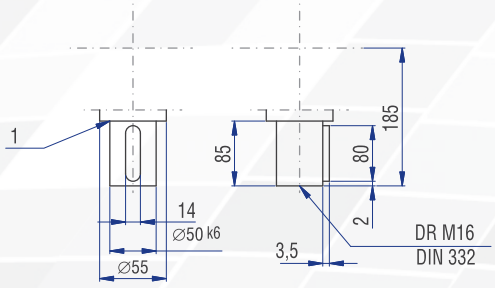


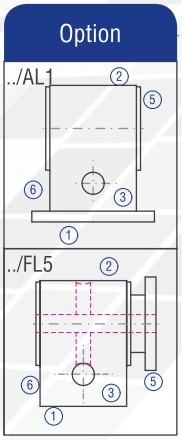


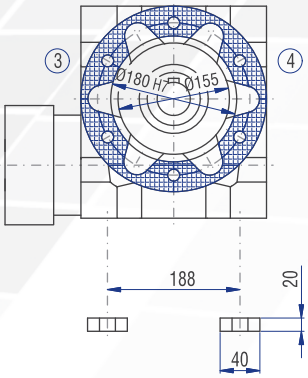


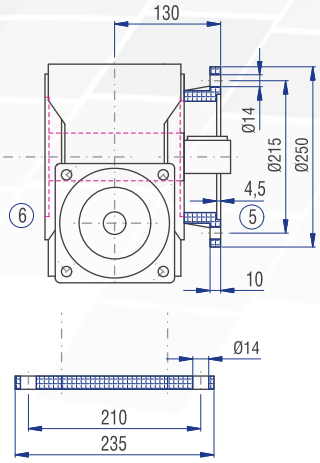


Implementation VV







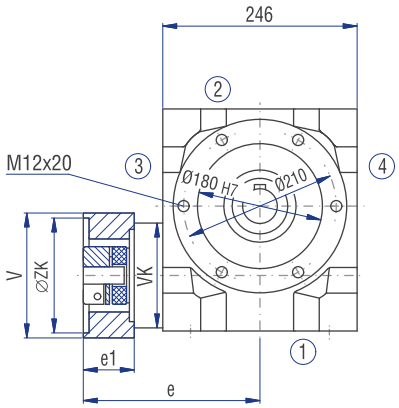


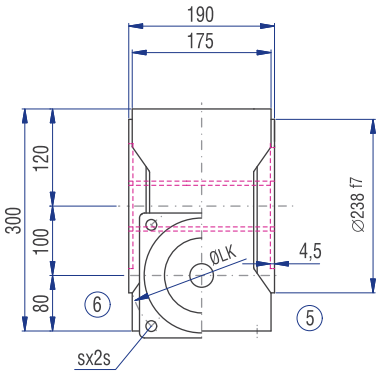
Motor dimensions

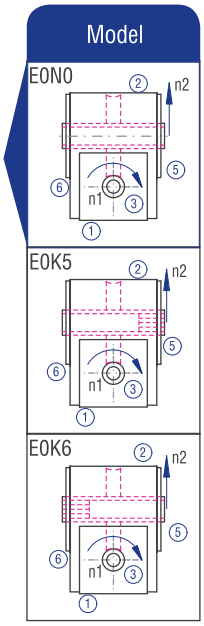
Flange no.	Motor shaft (d*l)	Thread (s)	V [mm]	ZK [mm]	LK [mm]	i [mm]	e [mm]	e1 [mm]
601	32*60	M8	160	95	130	4	242.0	62.0
611	32*60	M8	160	110	130	5	242.0	62.0
701	32*60	M8	160	110	145	5	242.0	62.0
802	32*60	M10	160	110	165	5	242.0	62.0
811	32*60	M10	160	130	165	5	242.0	62.0
403	32*60	M6	160	80	100	4	242.0	62.0
502	32*60	M8	160	95	115	4	242.0	62.0
616	32*60	M10	160	110	130	5	242.0	62.0
902	32*60	M12	160	130	215	6	242.0	62.0
911	32*60	M12	160	180	215	6	242.0	62.0

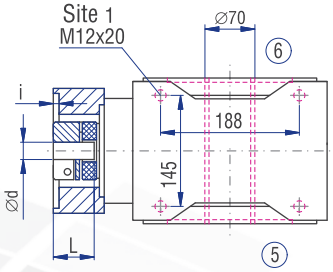
The dimensions e and e1 will change for the coupling type “clamping hub with groove” (KNN). Please contact us for consultation!

The dimensions of the Models not shown can be figured by mirroring available dimensions.









E0N0

E0K5 / E0K6