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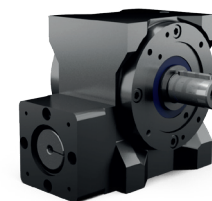
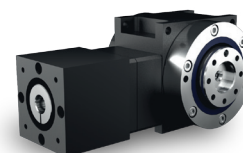
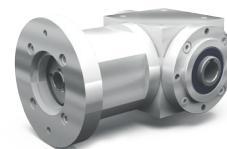
# ATEK

## ANTRIEBSTECHNIK

### Das Winkelgetriebe



**Servo gearboxes  
(precision gearboxes)**  
Type: LC, VC, HC, SC



Miniature  
bevel gearboxes

Bevel  
gearboxes

Hygiene-design  
gearboxes

Hybrid  
gearboxes

Worm  
gearboxes

Gearbox  
motors

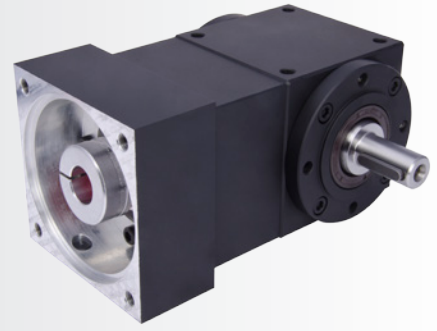
Servo gearboxes  
(precision gearboxes)

Special  
gearboxes

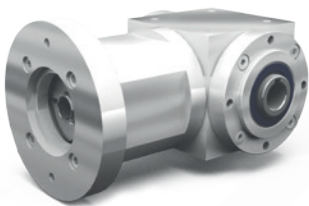
ATEX  
gearboxes

Gear sets

Service



## 11.1 Type overview



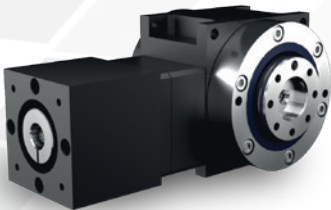
### Type LC – Servo miniatur bevel gearboxes

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:  $i = 10:1$  to  $20:1$  ( $i > 26$  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

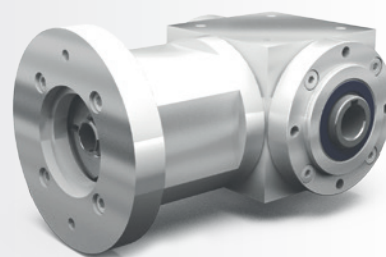
Special servo gearboxes have been developed for the requirements of highly dynamic servo-motors. The proven ATEK bevel gearbox and worm gearbox series form the basis for them. The combination of a large number of motor flanges and an insertable, zero-play clamp coupling enables the adaptation to the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

# 11.2 Type LC – Servo miniatur bevel gearboxes

## 11.2.1 Features

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



The L-series miniature bevel gearboxes can be extended by a flange to attach a motor.

## 11.2.2 Models

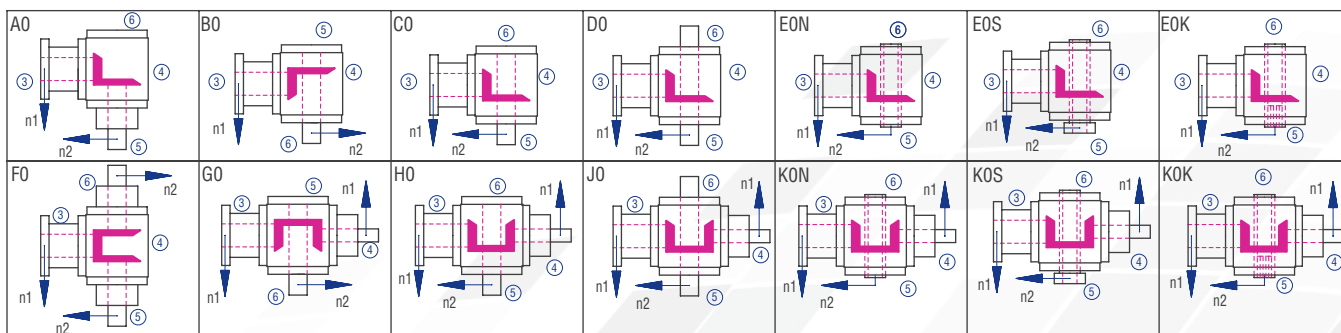


Figure 11.2.2-1; Models

## 11.2.3 Gearbox sides

The example shows the Model C0

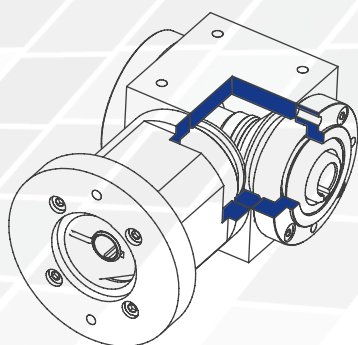


Figure 11.2.3-1; Gearbox sides

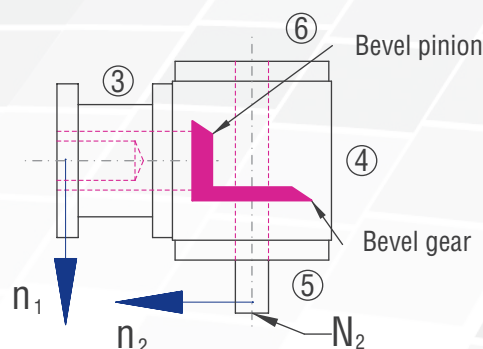


Figure 11.2.3-2; Shaft designations

## 11.2.4 Order code

The order code reflects the customer specifications. Example:

Type	Size	Gear ratio	Model	Fixing side	Installation position	Speed $n_2$	Design
LC	045	1:1	CO-	1.	1-	1500	/0000
Description	Housing edge length;		Figure 5.3.2-1; Models;	Gearbox side on which fixing is made; Figure 4.3.1-1 Gearbox sides	Gearbox side directed downwards; Figure 4.3.1-1 Gearbox sides	Slowly rotating shaft;	Standard

Table 11.2.4-1

## 11.2.5 Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Bevel gear set, spiral-toothed	See chapter 5.2
<b>Housing / Flanges</b>	Aluminium	See chapter 5.2
<b>Threaded mounting holes</b>	On all housing surfaces without flange and on all flanges.	See chapter 5.2.2
<b>Shaft</b>	Drive shaft with clamping hub; fit with ISO 6 tolerance with parallel keyway: according to DIN 6885	See chapter 4.6.2
<b>Hollow shaft</b>	Fit with ISO H7 tolerance with parallel keyway: according to DIN 6885	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 30 arcmin	See chapter 5.2.9
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	-	See chapter 5.2.10
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	Not required	See chapter 5.2.7
<b>Lubricants</b>	Synthetic lubricants	See chapter 5.2.7

## 11.2.6 Dimensions

The dimensions of the gearboxes are identical with those of the L-type gearboxes

The motor-specific adapter flanges are under development. Please enquire gearboxes for your case of application.

## 11.3 Type VC – Servo bevel gearboxes

### 11.3.1 General construction

The VC gearbox type is based on the proven type V bevel gearboxes. The edge length of the housing is reflected in the gearbox size (example: VC 120 – housing edge length 120 mm).

### 11.3.2 Tothing

VC servo gearboxes have gear sets with high-quality spiral tothing made of hardened carburised steel. A gear set comprises one bevel pinion (small number of teeth / small diameter) and one bevel gear (large number of teeth / large diameter). Gear sets with spiral tothing offer the advantage of very favourable engagement factors (high meshing ratio). Therefore they are predestined for usage with high loads, combined with optimal running smoothness and high transmission accuracy.

### 11.3.3 Models

Due to the modular system, different gearbox Models can be configured.

The variants differ in type and number of the shafts, the rotational direction of the shafts and their support by bearings.

### 11.3.4 Threaded mounting holes

All sides of the gearboxes are machined and may be used as mounting surfaces.

All flanges always have threaded mounting holes. You have the following available ordering options:

Order code	Threaded mounting holes are in the housing surfaces on the gearbox side	Threaded mounting holes are in the flanges on the gearbox side
0	-	5, 6
1, 2, 3, 4, 5, 6	1, 2, 4	5, 6
9	1, 2, 4	5, 6

Table 11.3.4-1

The standard version of the mounting / fastening has the order code 9. Please enquire other mounting options.

### 11.3.5 Installation position

The installation position is defined by the gearbox side directed downwards during operation and will be indicated by the corresponding gearbox side. The gearboxes can be used in all installation positions. The technically most favourable and thus recommended installation position is the position in which the shafts are horizontal. These are the installation positions 1 and 2.

### 11.3.6 Shaft designation – allocation to the gearbox sides

The fast-rotating shaft has the speed  $n_1$  and is identified by  $N_1$ . The bevel pinion is located on this shaft.

The slowly rotating shaft has the speed  $n_2$  and is identified by  $N_2$ . The bevel gear is located on this shaft.

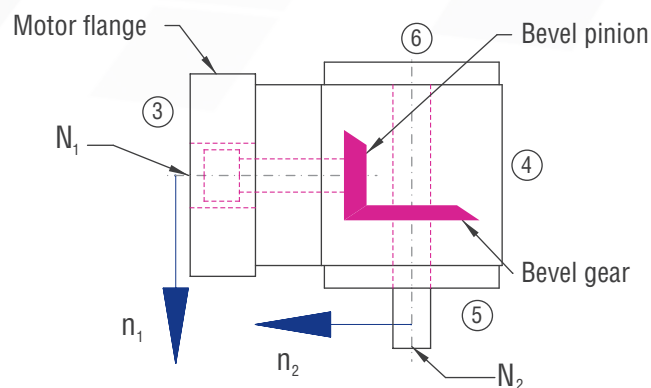


Figure 11.3.6-1

### 11.3.7 Preferred direction of rotation

If the clockwise (CW) direction of rotation (viewing direction from shaft end face of the fast-rotating shaft towards the gearbox centre) is selected, a 1 to 2 dB(A) lower noise level is generated.

### 11.3.8 Efficiency

The achievable efficiency depends on rotational speed, torque, installation position, sealing, and lubricant type. With gearboxes having only one gear set, an efficiency of 97% can be achieved. With gearboxes having several gear meshings, an efficiency of 94% can be achieved. The efficiencies specified in the tables relate to the permissible nominal load and are guidance values for run-in gearboxes at operating temperature with standard sealing.

### 11.3.9 Lubrication (abbreviation code)

(Chapter as in "Bevel gearboxes", chapter 6.2.8) Different conditions for the lubrication of the tothing 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 type designation.

You can find the itemisation in the example: VC 090 1:1 C0 -9.9- 2000/B0

Here, B0 means:

	Abbreviation	Explanation	Reference
Letter	B	Oil viscosity 220	Table 11.3.9-1
Numeral	0	no venting	Table 11.3.9-2

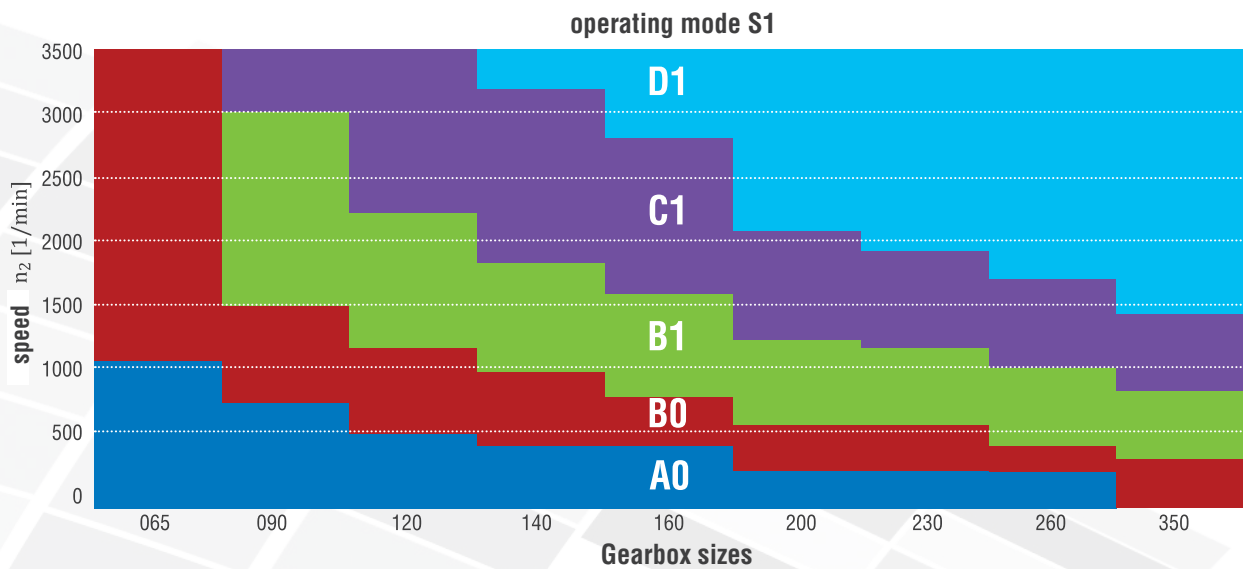


Figure 11.3.9-1

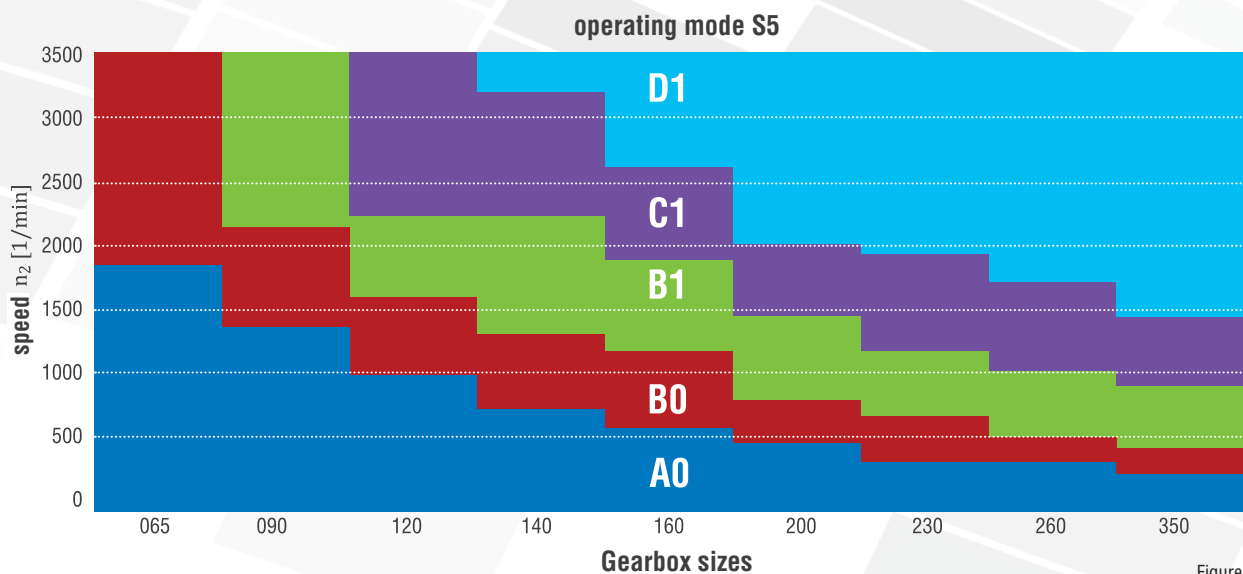


Figure 11.3.9-2

Servo gearboxes  
(precision gearboxes)

## 11.3 Type VC – Servo bevel gearboxes

Numeral 1	Oil viscosity
A	460
B	220
C	68
D	Injection lubrication
F	Fluid grease

Table 11.3.9-1

Depending on the gearbox size, injection lubrication may be necessary in case of high rotational speeds. 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 2	Vent filter
0	No
1	Yes

Table 11.3.9-2

### 11.3.10 Vent filter

If venting is required (B1 or C1) 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 (included in the delivery) may be required. The position will be specified in the order documents. Please refer to the following table for the position of the filter. Here, E4, for example, means: Venting on side 4.

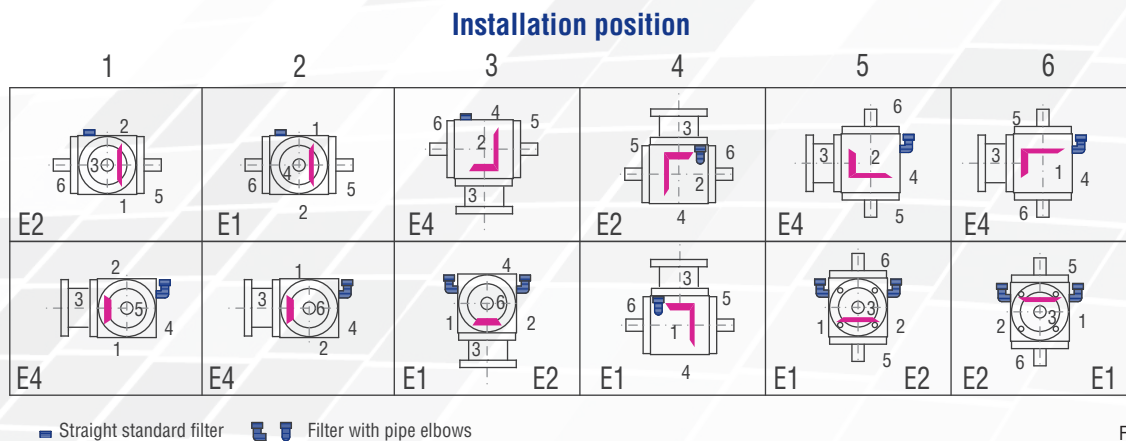


Figure 11.3.10-1

### 11.3.11 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 bevel gearboxes can be delivered as low-backlash types.

Ordering option	Gear set	1:1 2:1	3:1 4:1 5:1 6:1
/0000	Standard	$\leq 20$ arcmin	$\leq 20$ arcmin
/S2	Standard	$\leq 10$ arcmin	$\leq 10$ arcmin
/S1	Standard	$\leq 6$ arcmin	u.r.
/SO	Special gear set	$\leq 4$ arcmin	u.r.

Table 11.3.11-1

Abbreviation: u.r. – upon request



### 11.3.12 Connection of drive shaft to coupling

For torque transmission, a space-saving, zero-play connection in the form of a cone is implemented in the drive shaft. In case of extreme overloads, this non-positive connection is cut, thus preventing damage to the motor-side and gearbox-side elements. After an overload, our service department must be contacted.

### 11.3.13 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	1 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 ( $T_{1Not}$ ). These values must also be permissible on the gearbox!

Coupling Size	Hub	Coupling torques allowed [Nm]	Motor shaft diameter d [mm]											
			9	11	14	16	19	24	28	32	38	42	45	
K 14	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 11.3.13-1

### 11.3.14 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 11.3.14-1.

#### 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

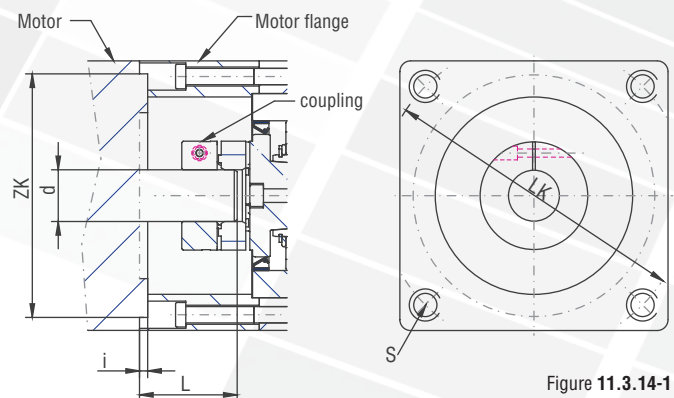


Figure 11.3.14-1

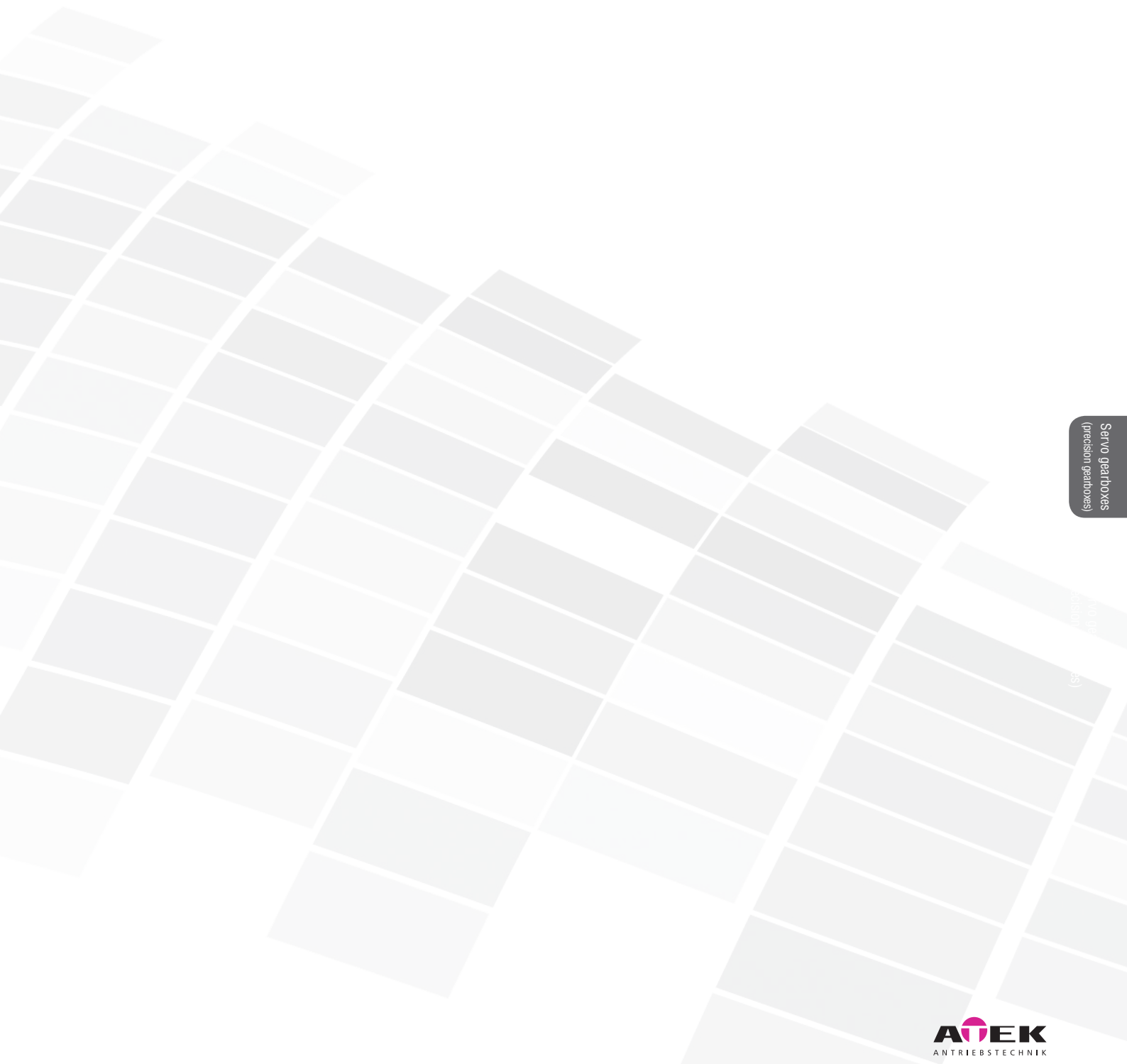
The values for the centring height (i) and the thread sizes (s) can be found on the respective pages. The flange tolerances are dimensioned for servo-motors of tolerance class N.

## 11.3 Type VC – Servo bevel gearboxes

Fitting dimensions of the servo-motor – gearbox size/flange no. (selection)

d [mm] less than or equal to	Gearbox size	Flange no.	L [mm]	LK [mm]	ZK [mm]
11	065	001	23	63	40
	065	002	23	63	40
	065	102	23	75	60
	065	202	23	90	60
14	065	103	30	75	60
	065	104	30	75	60
	065	201	30	90	60
	065	301	30	95	50
	065	401	30	100	80
	065	501	30	115	95
19	090	103	40	75	60
	090	201	40	90	60
	090	301	40	95	50
	090	401	40	100	80
	090	501	40	115	95
	090	601	40	130	95
	090	611	40	130	110
	090	701	40	145	110
24	090	802	40	165	110
	120	103	50	75	60
	120	201	50	90	60
	120	301	50	95	50
	120	401	50	100	80
	120	501	50	115	95
	120	601	50	130	95
	120	611	50	130	110
	120	701	50	145	110
32	120	802	50	165	110
	120	811	50	165	130
	140	403	60	100	80
	140	502	60	115	95
	140	601	60	130	95
	140	611	60	130	110
	140	616	60	130	110
	140	701	60	145	110
	140	802	60	165	110
	140	811	60	165	130
	140	902	60	215	130
	140	911	60	215	180
	160	403	60	100	80
	160	502	60	115	95
	160	601	60	130	95
	160	611	60	130	110
	160	616	60	130	110
	160	701	60	145	110
	160	802	60	165	110
	160	811	60	165	130
160	902	60	215	130	
160	911	60	215	180	
200	614	60	130	110	
200	616	60	130	110	
200	802	60	165	110	
200	811	60	165	130	
200	902	60	215	130	
200	913	60	215	180	
38	140	931	80	215	180
	160	931	80	215	180
	200	915	80	215	180

Table 11.3.14-1



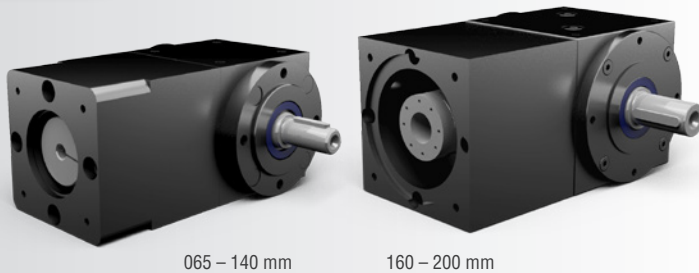
Servo gearboxes  
(precision gearboxes)

100 07  
(SS)

# 11.3 Type VC – Servo bevel gearboxes

## 11.3.15 Features

Gear ratios:  $i = 1:1$  to  $6:1$   
 Maximum acceleration torques up to  $T_{2B} = 700 \text{ Nm}$   
 6 gearbox sizes with edge lengths of 065 to 200 mm  
 High efficiency  
 Minimized circumferential backlash (optional)  
 Bevel gearboxes suitable for fitting servo-motors  
 Zero-play three-piece claw coupling



### 11.3.15.1 Models

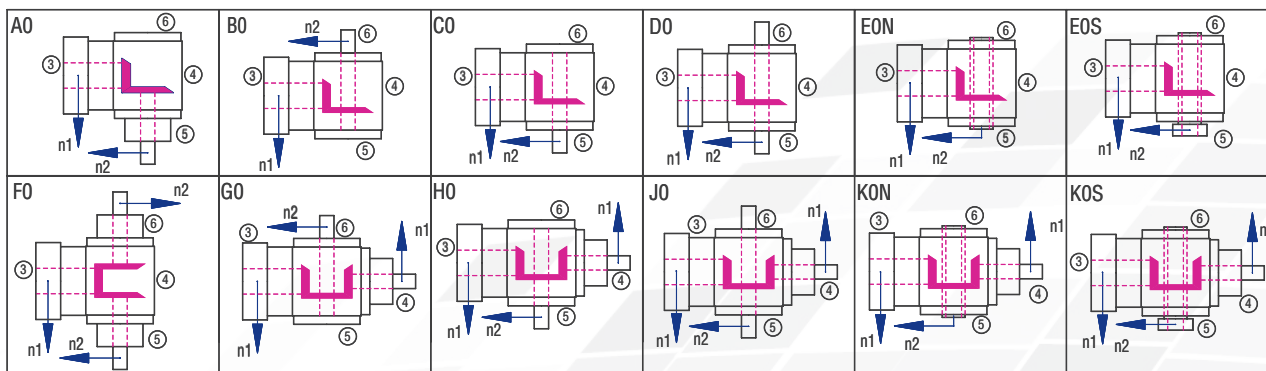


Figure 11.3.15-1; Models

### 11.3.15.2 Gearbox sides

The example shows the Model C0

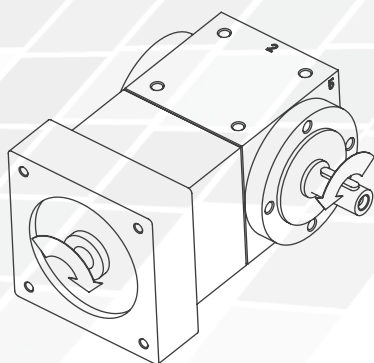


Figure 11.3.15-3; Gearbox sides

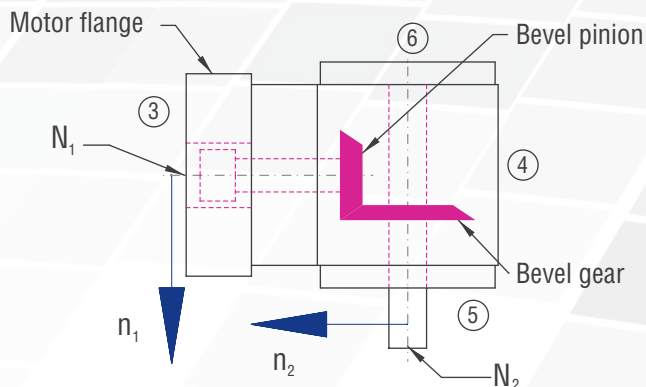


Figure 11.3.15-2; Gearbox sides

### 11.3.15.3 Order code

The order code reflects the customer specifications. Example:

Type	Size	Gear ratio	Model	Fixing side	Installation position	Speed $n_2$	Design
VC	065	2:1	C0-	1.	1-	1500	/KN
Description	Size; Table 11.3.15-1	Table 11.3.15-1	Figure 11.3.15-1, Models	Gearbox side on which fixing is made; Table 11.3.4-1	Side directed downwards; Figure 4.3.1-1 Gearbox sides	Slowly rotating shaft; Table 11.3.15-1	Clamping hub
V080-	/	14 x 30	No. 301				
Flange		Motor shaft $\varnothing$ x length	Flange no.				

### 11.3.15.4 Overview of performance data

Selection table: gearbox size; gear ratio; rotational speed

Depending on the diameter of the motor shaft, lower torques may be possible in the operating mode S5.

Operating mode S1		Gear ratio						
		1:1	1.5:1	2:1	3:1	4:1	5:1	6:1
Gearbox sizes		T <sub>2N</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2N</sub> [Nm]
065	4000	3.6	5.4	7.2	7.2			
	3000	4.8	7.2	9.6	9.6			
	2400	6	9	10	10			
	1500	8	10	10	10			
090	4000	8	12	17	21	21	21	21
	3000	11	17	23	23	23	23	23
	2400	14	21	24	24	25	25	25
	1500	17	25	27	27	27	27	27
120	4000		21	28	42	52	52	45
	3000	18	28	37	56	60	60	54
	2400	23	35	46	63	67	65	59
	1500	37	56	73	74	74	72	64
140	4000		34	45	68	85	90	85
	3000		45	60	90	103	100	95
	2400	37	56	75	113	111	105	102
	1500	60	90	120	130	120	115	108
160	4000				102	136	160	115
	3000		68	90	136	180	180	130
	2400	56	85	113	170	200	198	137
	1500	90	136	181	230	220	215	145
200	4000				177	235	275	190
	3000			157	235	314	300	210
	2400		147	196	294	393	340	225
	1500	157	236	314	472	455	380	240

Operating mode S2		Gear ratio						
		1:1	1.5:1	2:1	3:1	4:1	5:1	6:1
T <sub>2N</sub> [Nm]		8	10	10	8	0	0	0
T <sub>2B</sub> [Nm]		15	17	17	15	0	0	0
T <sub>2Not</sub>		23	25	25	20	0	0	0
N <sub>1max</sub>		4400	6000	6000	6000	0	0	0
T <sub>2N</sub> [Nm]		25	25	25	23	23	23	23
T <sub>2B</sub> [Nm]		40	37	36	36	36	36	31
T <sub>2Not</sub>		50	50	60	60	60	50	45
N <sub>1max</sub>		3200	4800	6000	6000	6000	6000	6000
T <sub>2N</sub> [Nm]		50	61	65	58	60	60	54
T <sub>2B</sub> [Nm]		70	105	98	95	87	92	71
T <sub>2Not</sub>		150	140	140	140	140	120	110
N <sub>1max</sub>		2400	3600	4800	6000	6000	6000	6000
T <sub>2N</sub> [Nm]		120	113	110	110	105	100	95
T <sub>2B</sub> [Nm]		180	200	190	177	162	143	122
T <sub>2Not</sub>		260	280	280	260	260	220	200
N <sub>1max</sub>		2100	3000	4200	5000	6000	6000	6000
T <sub>2N</sub> [Nm]		180	185	185	190	180	180	130
T <sub>2B</sub> [Nm]		350	330	320	280	270	270	200
T <sub>2Not</sub>		480	500	550	400	400	380	350
N <sub>1max</sub>		1800	2500	3200	4500	5000	6000	6000
T <sub>2N</sub> [Nm]		350	330	320	420	350	300	210
T <sub>2B</sub> [Nm]		700	690	600	630	550	505	315
T <sub>2Not</sub>		980	850	800	850	800	800	625
N <sub>1max</sub>		1500	2250	3000	4000	4500	5000	6000

Table 11.3.15-1

	Operating mode	On-period
S1	Continuous operation	10 greater than 60% of the cycle time or longer than 20 minutes
S5	Cyclic operation	less than 60% of the process procedure and less than 20 minutes

Servo gearboxes  
(precision gearboxes)

## 11.3.16 Type VC 065 – Servo bevel gearboxes



### Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.3.2
<b>Gear ratio</b>	1:1 to 3:1	
<b>Housing / Flanges</b>	Grey cast iron / aluminium	
<b>Threaded mounting holes</b>	On all housing surfaces without flange and on all flanges.	See chapter 11.3.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 20 arcmin	See chapter 11.3.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.3.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.3.9
<b>Motor flange</b>	Aluminium	See chapter 11.3.14
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For smooth motor shafts                      clamping hub For smooth motor shafts                      tension ring hub For motor shafts with parallel key          clamping hub with groove	KN SN KNN See chapter 11.3.13

### Torques in operating mode S1

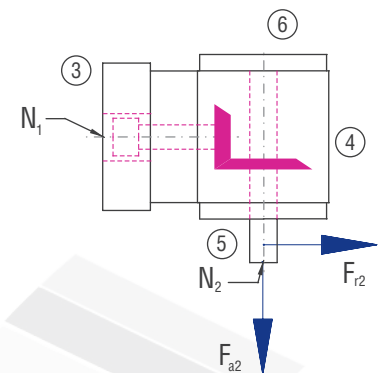
Gear ratio i [-]	1:1		1.5:1		2:1		3:1		4:1		5:1		6:1	
	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]
<b>4000</b>	3.6	4000	5.4	2667	7.2	2000	7.2	1333						
<b>3000</b>	4.8	3000	7.2	2000	9.6	1500	9.6	1000						
<b>2400</b>	6	2400	9	1600	10	1200	10	800						
<b>1500</b>	8	1500	10	1000	10	750	10	500						

## Torques in operating mode S5, dynamic operation

Gear ratio i [-]			1:1	1.5:1	2:1	3:1	4:1	5:1	6:1
T <sub>2N</sub> in S5 [Nm]			8	10	10	8			
n <sub>1max</sub> in S5 [rpm]			4400	6000	6000	6000			
Coupling size	Motor shaft d [mm]	Coupling type	1:1	1.5:1	2:1	3:1	4:1	5:1	6:1
K14	9	KN	T <sub>2B</sub> [Nm]	5.3	8.0	10.6	15.0		
			T <sub>2NOT</sub> [Nm]	7.0	10.5	14.0	20.0		
		KNN	T <sub>2B</sub> [Nm]	10.0	15.0	17.0	15.0		
			T <sub>2NOT</sub> [Nm]	22.0	25.0	25.0	20.0		
		SN	T <sub>2B</sub> [Nm]	10.0	15.0	17.0	15.0		
			T <sub>2NOT</sub> [Nm]	22.0	25.0	25.0	20.0		
	11	KN	T <sub>2B</sub> [Nm]	5.6	8.4	11.2	15.0		
			T <sub>2NOT</sub> [Nm]	9.0	13.5	18.0	20.0		
		KNN	T <sub>2B</sub> [Nm]	10.0	15.0	17.0	15.0		
			T <sub>2NOT</sub> [Nm]	23.0	25.0	25.0	20.0		
		SN	T <sub>2B</sub> [Nm]	10.0	15.0	17.0	15.0		
			T <sub>2NOT</sub> [Nm]	23.0	25.0	25.0	20.0		
	14	KN	T <sub>2B</sub> [Nm]	6.1	9.1	12.2	15.0		
			T <sub>2NOT</sub> [Nm]	13.0	19.5	25.0	20.0		
		KNN	T <sub>2B</sub> [Nm]	10.0	15.0	17.0	15.0		
			T <sub>2NOT</sub> [Nm]	23.0	25.0	25.0	20.0		
		SN	T <sub>2B</sub> [Nm]	10.0	15.0	17.0	15.0		
			T <sub>2NOT</sub> [Nm]	23.0	25.0	25.0	20.0		
	16	KN	T <sub>2B</sub> [Nm]	6.5	9.8	13.0	15.0		
			T <sub>2NOT</sub> [Nm]	15.0	22.5	25.0	20.0		
		KNN	T <sub>2B</sub> [Nm]	10.0	15.0	17.0	15.0		
			T <sub>2NOT</sub> [Nm]	23.0	25.0	25.0	20.0		
		SN	T <sub>2B</sub> [Nm]	10.0	15.0	17.0	15.0		
			T <sub>2NOT</sub> [Nm]	23.0	25.0	25.0	20.0		

## Permissible radial force F<sub>r2</sub> and axial force F<sub>a2</sub> on shaft N<sub>2</sub>

n <sub>2</sub> [rpm]	3000		1000		500		250		100		50	
	T <sub>2</sub> [Nm]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	
< 12	300	150	400	200	500	250	650	325	750	375	900	450
> 12	250	125	330	165	420	210	540	270	630	315	750	375



Servo gearboxes  
(precision gearboxes)

## Gearbox inertia moments/mass

Inertia moment J<sub>1</sub> related to the fast-rotating shaft (N<sub>1</sub>)

Model	Inertia moment [kgcm <sup>2</sup> ]							
	1:1	1.5:1	2:1	3:1	4:1	5:1	6:1	
AO	0.4740	0.2110	0.1830	0.1830				
BO	0.4680	0.3190	0.2590	0.1940				
CO	0.4680	0.3190	0.2590	0.1940				
DO	0.4780	0.3230	0.2620	0.2380				
EON	0.5200	0.3710	0.3110	0.2320				
EOS	0.6460	0.4968	0.4370	0.3570				
FO	0.7080	0.2600	0.2040	0.1910				
GO	0.7540	0.4730	0.3950	0.3200				
HO	0.7540	0.4730	0.3950	0.3200				

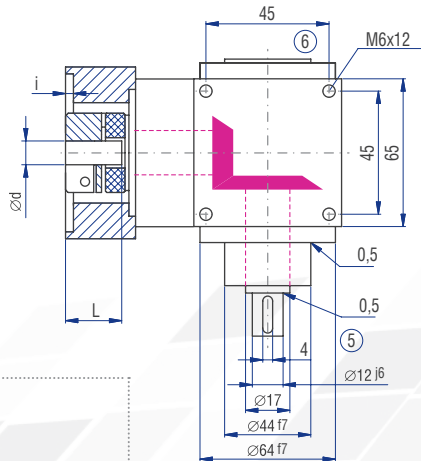
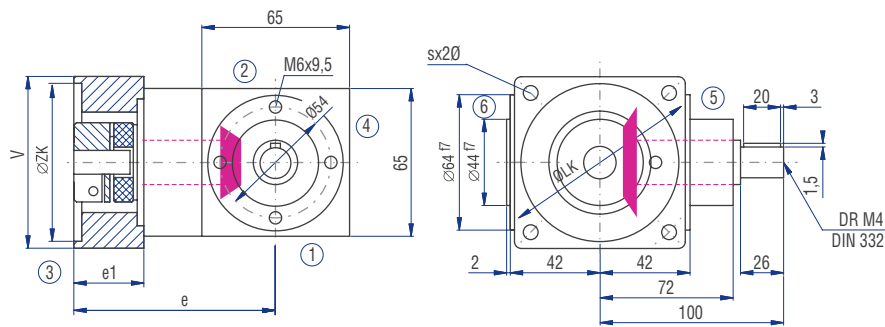
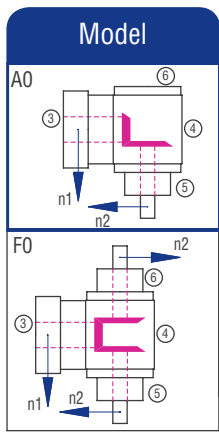
## Inertia moments Coupling J [kgcm<sup>2</sup>]

K14	d [mm]	KN	KNN	SN
		J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]
6	6	0.029	0.000	0.069
9	9	0.029	0.029	0.069
11	11	0.029	0.029	0.067
14	14	0.028	0.028	0.656
16	16	0.000	0.000	0.000

Servo gearboxes  
(precision gearboxes)

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

# 11.3.16 Type VC 065 – Servo bevel gearboxes

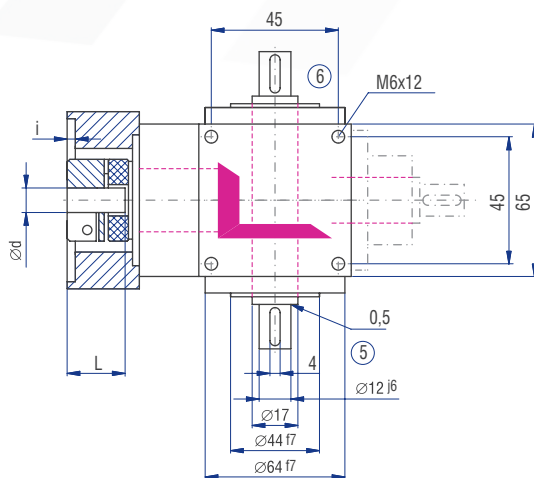
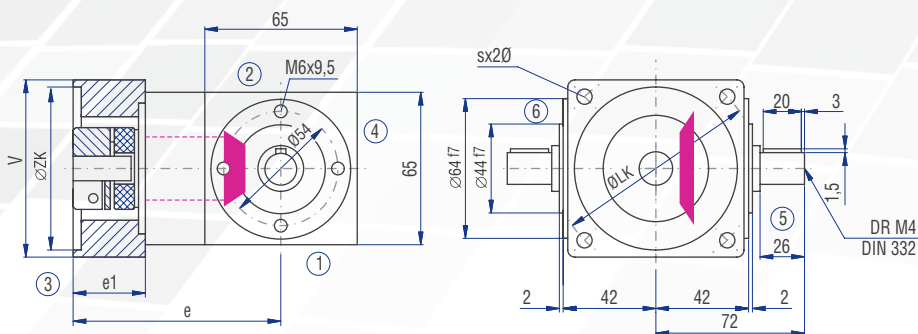
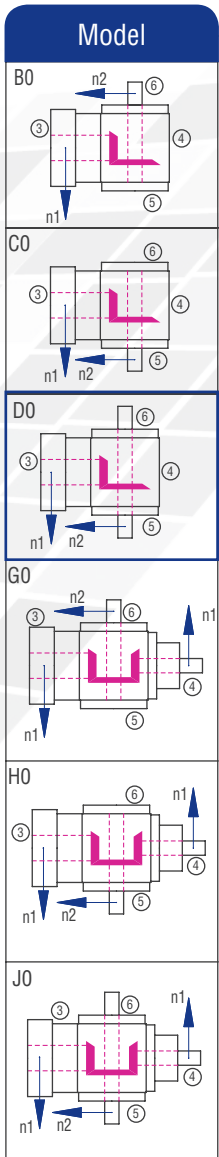


## Motor mounting dimensions

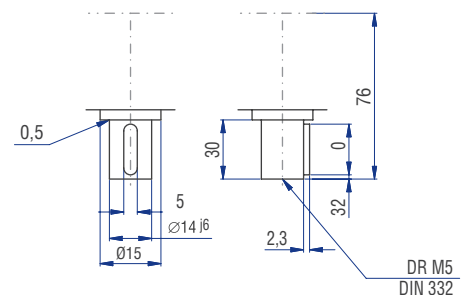
Flange no.	V [mm]	ZK [mm]	Thread	LK [mm]	Shaft dxL [mm]	i [mm]	e [mm]	e1 [mm]
001	65	40	M4	63	11*23	3	104.5	30
002	65	40	M5	63	11*23	3	104.5	30
102	70	60	M5	75	11*23	3	101.0	26.5
103	70	60	M6	90	14*30	3	119.5	45
104	70	60	M5	75	14*30	3	119.5	45
201	80	60	M5	75	14*30	4	119.5	45
202	80	60	M5	90	11*23	4	101.0	26.5
301	80	50	M6	95	14*30	4	119.5	45
401	90	80	M6	100	14*30	4	119.5	45
501	100	95	M8	115	14*30	4	119.5	45

Table 11.3.16-1

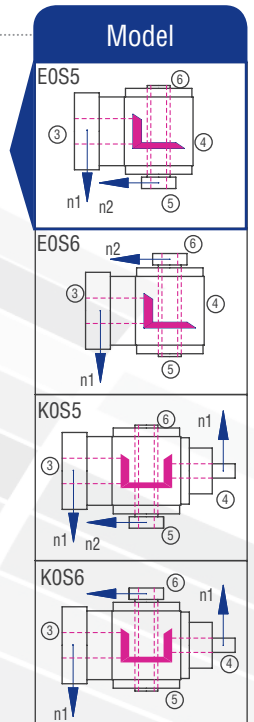
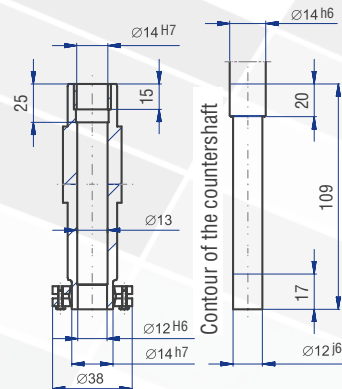
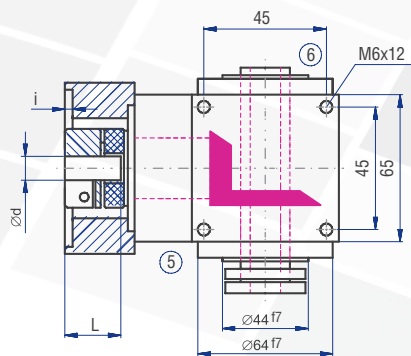
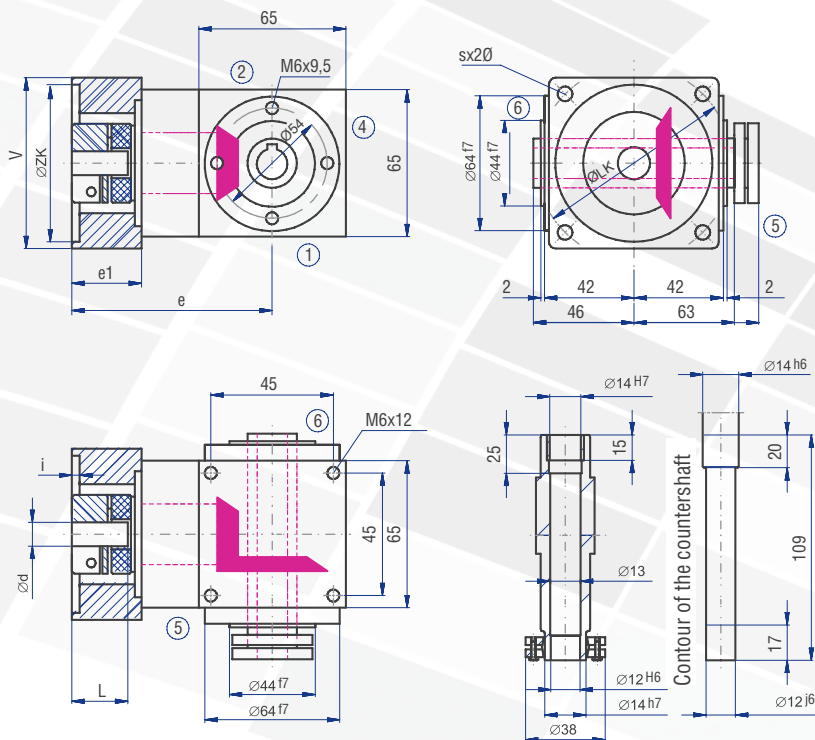
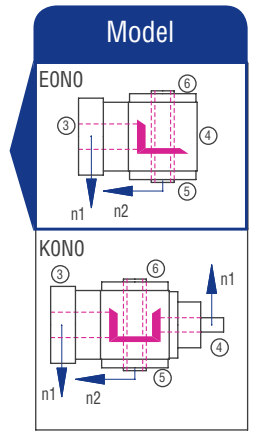
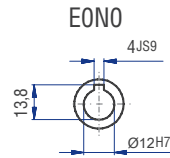
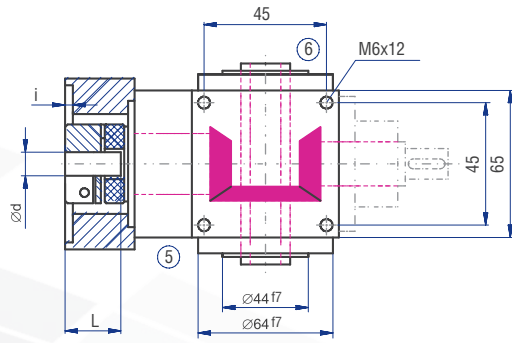
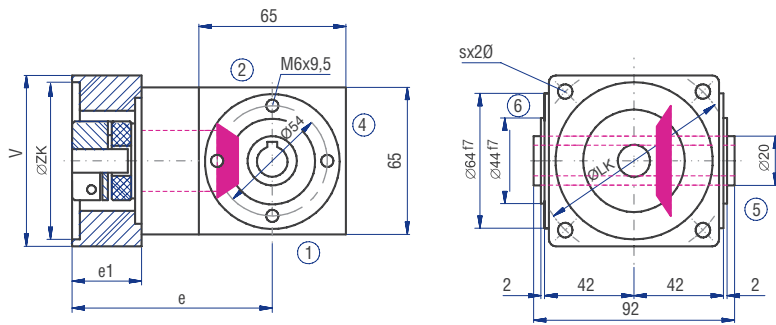
The dimensions e and e1 will change for the coupling type "clamping hub with groove" (KNN). Please contact us for consultation!



## Implementation VV



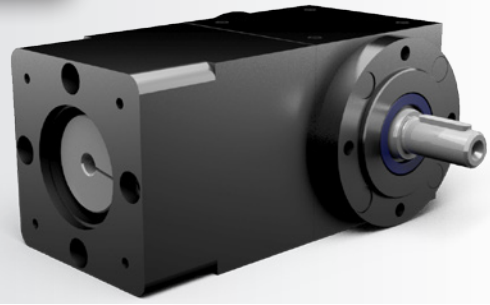




Servo gearboxes  
(precision gearboxes)

ANSI  
ASME  
DIN

## 11.3.17 Type VC 090 – Servo bevel gearboxes



### Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.3.2
<b>Gear ratio</b>	1:1 to 6:1	
<b>Housing / Flanges</b>	Grey cast iron / aluminium	
<b>Threaded mounting holes</b>	On all housing surfaces without flange and on all flanges.	See chapter 11.3.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 20 arcmin	See chapter 11.3.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.3.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.3.9
<b>Motor flange</b>	Aluminium	See chapter 11.3.14
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For smooth motor shafts                      clamping hub For smooth motor shafts                      tension ring hub For motor shafts with parallel key        clamping hub with groove	KN SN KNN See chapter 11.3.13

### Torques in operating mode S1

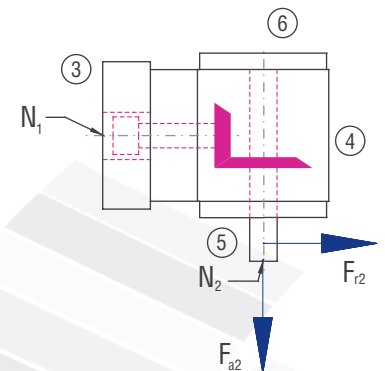
Gear ratio i [-]	1:1		1.5:1		2:1		3:1		4:1		5:1		6:1	
	n <sub>1</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]
<b>4000</b>	8	4000	12	2667	17	2000	21	1333	21	1000	21	800	21	667
<b>3000</b>	11	3000	17	2000	23	1500	23	1000	23	750	23	600	23	500
<b>2400</b>	14	2400	21	1600	24	1200	24	800	25	600	25	480	25	400
<b>1500</b>	17	1500	25	1000	27	750	27	500	27	375	27	300	27	250

## Torques in operating mode S5, dynamic operation

Gear ratio i [-]			1:1	1.5:1	2:1	3:1	4:1	5:1	6:1	
T <sub>2N</sub> in S5 [Nm]			25	25	25	23	23	23	23	
n <sub>1max</sub> in S5 [rpm]			3200	4800	6000	6000	6000	6000	6000	
Coupling size	Motor shaft d [mm]	Coupling type	1:1	1.5:1	2:1	3:1	4:1	5:1	6:1	
K19	9	KN	T <sub>2B</sub> [Nm]	17.0	25.5	34.0	36.0	36.0	36.0	31.0
			T <sub>2NOT</sub> [Nm]	30.0	45.0	60.0	60.0	60.0	50.0	45.0
	11	KN	T <sub>2B</sub> [Nm]	17.0	25.5	34.0	36.0	36.0	36.0	31.0
			T <sub>2NOT</sub> [Nm]	30.0	45.0	60.0	60.0	60.0	50.0	45.0
		KNN	T <sub>2B</sub> [Nm]	17.0	25.5	34.0	36.0	36.0	36.0	31.0
			T <sub>2NOT</sub> [Nm]	30.0	45.0	60.0	60.0	60.0	50.0	45.0
	14	KN	T <sub>2B</sub> [Nm]	17.0	25.5	34.0	36.0	36.0	36.0	31.0
			T <sub>2NOT</sub> [Nm]	32.0	48.0	60.0	60.0	60.0	50.0	45.0
		KNN	T <sub>2B</sub> [Nm]	17.0	25.5	34.0	36.0	36.0	36.0	31.0
			T <sub>2NOT</sub> [Nm]	32.0	48.0	60.0	60.0	60.0	50.0	45.0
	16	KN	T <sub>2B</sub> [Nm]	17.0	25.5	34.0	36.0	36.0	36.0	31.0
			T <sub>2NOT</sub> [Nm]	32.0	48.0	60.0	60.0	60.0	50.0	45.0
		KNN	T <sub>2B</sub> [Nm]	17.0	25.5	34.0	36.0	36.0	36.0	31.0
			T <sub>2NOT</sub> [Nm]	34.0	50.0	60.0	60.0	60.0	50.0	45.0
	19	KN	T <sub>2B</sub> [Nm]	17.0	25.5	34.0	36.0	36.0	36.0	31.0
			T <sub>2NOT</sub> [Nm]	34.0	50.0	60.0	60.0	60.0	50.0	45.0
		KNN	T <sub>2B</sub> [Nm]	17.0	25.5	34.0	36.0	36.0	36.0	31.0
			T <sub>2NOT</sub> [Nm]	34.0	50.0	60.0	60.0	60.0	50.0	45.0
	24	KN	T <sub>2B</sub> [Nm]	17.0	25.5	34.0	36.0	36.0	36.0	31.0
			T <sub>2NOT</sub> [Nm]	34.0	50.0	60.0	60.0	60.0	50.0	45.0

## Permissible radial force F<sub>r2</sub> and axial force F<sub>a2</sub> on shaft N<sub>2</sub>

n <sub>2</sub> [rpm]	3000		1000		500		250		100		50	
	T <sub>2</sub> [Nm]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]
< 30	500	250	660	330	800	400	950	475	1250	625	1500	750
> 30	420	210	550	275	670	335	790	395	1040	520	1250	625



## Gearbox inertia moments/mass

Inertia moment J<sub>1</sub> related to the fast-rotating shaft (N<sub>1</sub>)

Model	Inertia moment [kgcm <sup>2</sup> ]						
	1:1	1.5:1	2:1	3:1	4:1	5:1	6:1
AO	3.0540	2.3340	1.4510	1.2330	1.1450	1.1010	1.0700
BO	3.6690	2.7900	1.6950	1.3410	1.2060	1.1400	1.0970
CO	3.6690	2.7900	1.6950	1.3410	1.2060	1.1401	1.0970
DO	3.6974	2.8023	1.7020	1.3441	1.2075	1.1412	1.0980
EON	3.5654	2.7440	1.6690	1.3294	1.1992	1.1360	1.0940
EOS	4.2360	3.0420	1.8370	1.4040	1.2412	1.1630	1.1130
FO	4.5140	3.1480	1.7490	1.4240	1.2610	1.1820	1.1220
GO	4.9490	3.7030	2.5190	2.0870	1.4890	1.4140	1.3670
HO	4.9490	3.7030	2.5190	2.0870	1.4890	1.4140	1.3670
JO	4.9770	3.7160	2.5260	2.0900	1.4910	1.4150	1.3680
KON	4.8450	3.6570	2.4930	2.0760	1.4820	1.4100	1.3650
KOS	5.5160	3.9550	2.6600	2.1500	1.5240	1.4360	1.3830

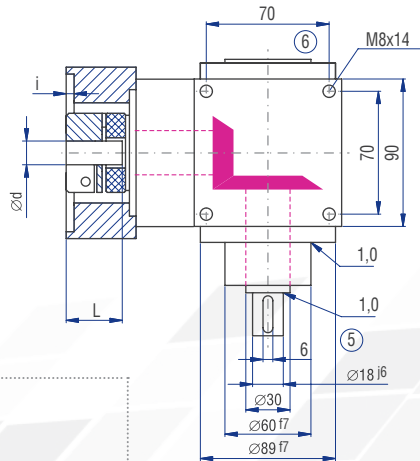
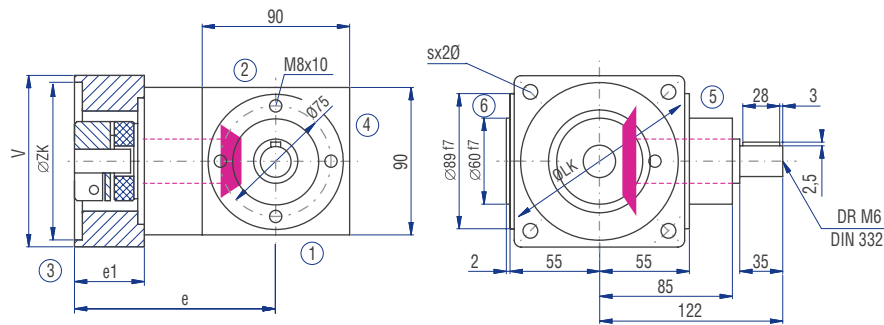
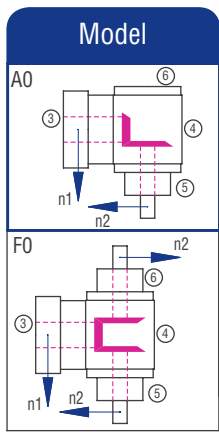
## Inertia moments Coupling J [kgcm<sup>2</sup>]

K19 d [mm]	KN	KNN	SN
	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]
9	0.204	0.204	0.315
11	0.204	0.204	0.314
14	0.202	0.202	0.310
16	0.200	0.200	0.298
19	0.196	0.196	0.293
24	0.000	0.000	0.000

Mass ca. [kg]
6.6
6.9
6.9
7.0
6.5
6.7
7.8
8.4
8.4
8.5
8.0
8.2

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

# 11.3.17 Type VC 090 – Servo bevel gearboxes

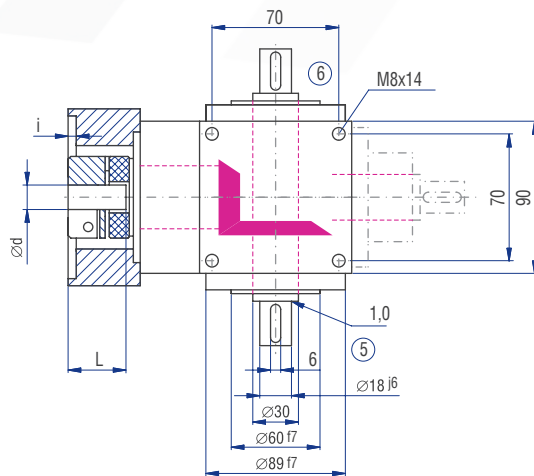
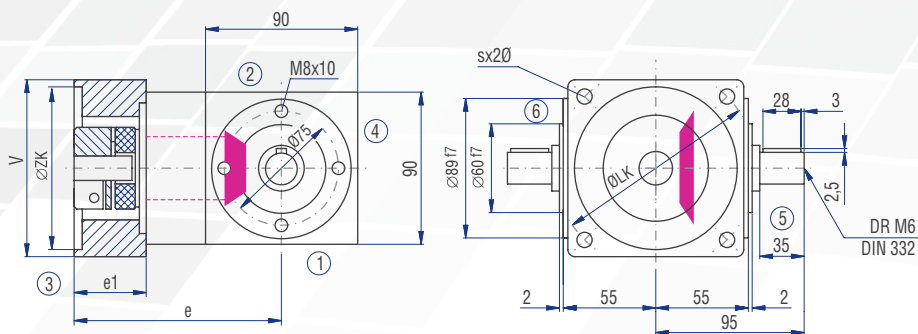
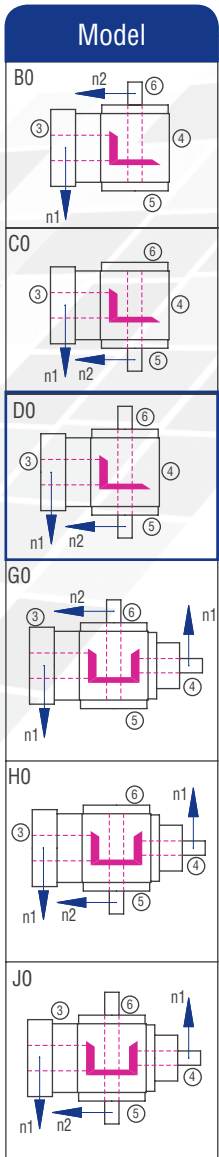


## Motor mounting dimensions

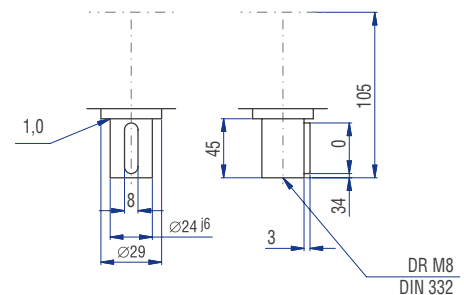
Flange no.	V [mm]	ZK [mm]	Thread	LK [mm]	Shaft dxL [mm]	i [mm]	e [mm]	e1 [mm]
103	90	60	M6	75	19°40	3	140.0	45
201	90	60	M5	90	19°40	3	140.0	45
301	90	50	M6	95	19°40	4	140.0	45
401	90	80	M6	100	19°40	4	140.0	45
501	100	95	M8	115	19°40	4	140.0	45
601	115	95	M8	130	19°40	4	140.0	45
611	115	110	M8	130	19°40	5	140.0	45
701	120	110	M8	145	19°40	5	140.0	45
802	140	110	M10	165	19°40	5		45

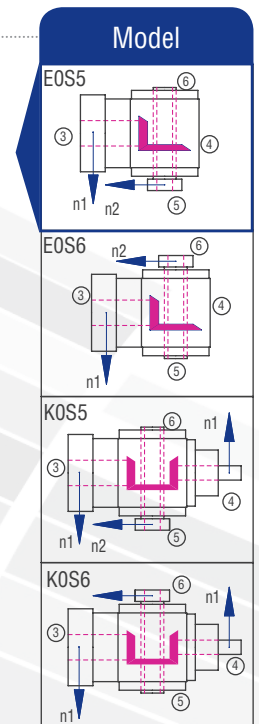
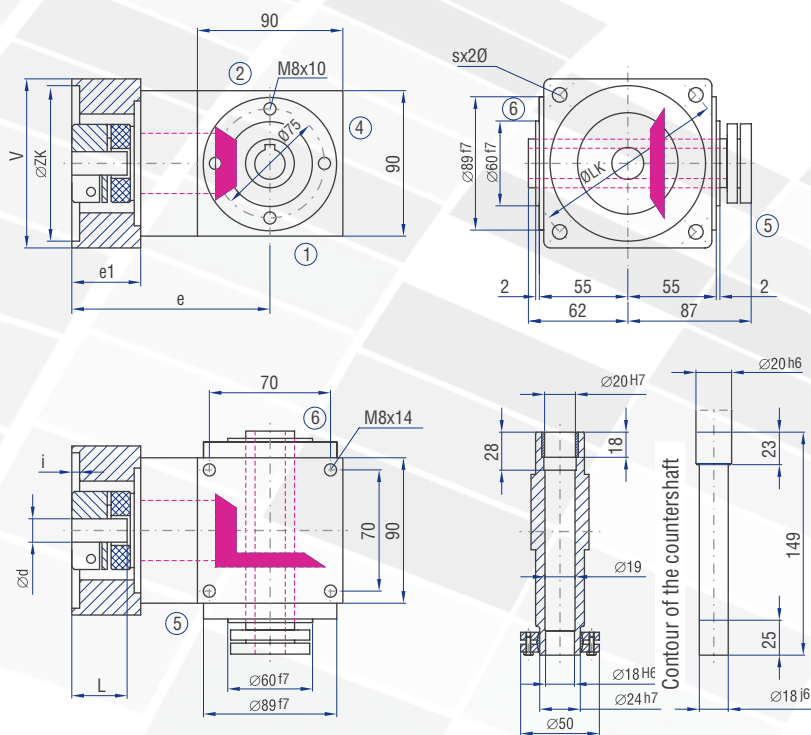
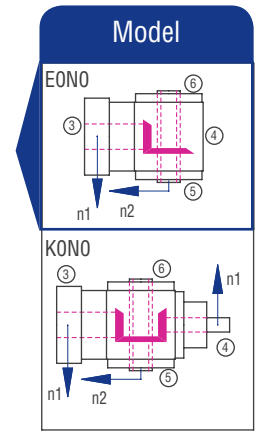
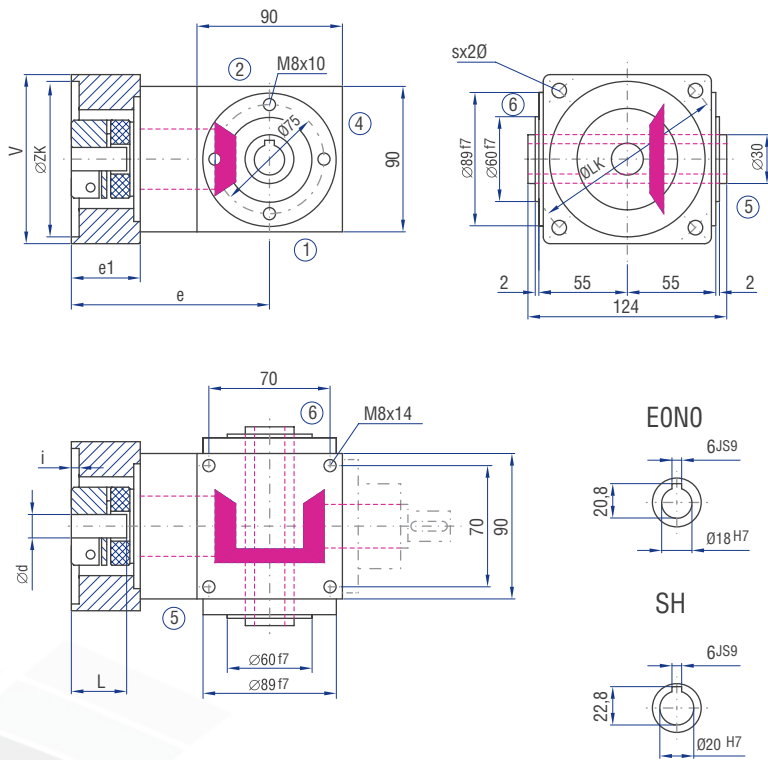
Table 11.3.17-1

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



## Implementation VV





Servo gearboxes  
(precision gearboxes)

## 11.3.18 Type VC 120 – Servo bevel gearboxes



### Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.3.2
<b>Gear ratio</b>	1:1 to 6:1	
<b>Housing / Flanges</b>	Grey cast iron / aluminium	
<b>Threaded mounting holes</b>	On all housing surfaces without flange and on all flanges.	See chapter 11.3.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 20 arcmin	See chapter 11.3.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.3.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.3.9
<b>Motor flange</b>	Aluminium	See chapter 11.3.14
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For smooth motor shafts                      clamping hub For smooth motor shafts                      tension ring hub For motor shafts with parallel key        clamping hub with groove	KN SN KNN See chapter 11.3.13

### Torques in operating mode S1

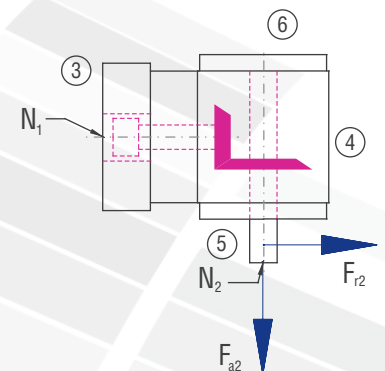
Gear ratio i [-]	1:1		1.5:1		2:1		3:1		4:1		5:1		6:1		
	n1 [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	
<b>4000</b>			4000	21	2667	28	2000	42	1333	52	1000	52	800	45	667
<b>3000</b>	18		3000	28	2000	37	1500	56	1000	60	750	60	600	54	500
<b>2400</b>	23		2400	35	1600	46	1200	63	800	67	600	65	480	59	400
<b>1500</b>	37		1500	56	1000	73	750	74	500	74	375	72	300	64	250

## Torques in operating mode S5, dynamic operation

Gear ratio i [-]			1:1	1.5:1	2:1	3:1	4:1	5:1	6:1	
T <sub>2N</sub> in S5 [Nm]			50	61	65	58	60	60	54	
n <sub>1max</sub> in S5 [rpm]			2400	3600	4800	6000	6000	6000	6000	
Coupling size	Motor shaft d [mm]	Coupling type	1:1	1.5:1	2:1	3:1	4:1	5:1	6:1	
K24	11	KN	T <sub>2B</sub> [Nm]	35.0	52.5	70.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	45.0	67.5	90.0	135.0	140.0	120.0	110.0
		KNN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		SN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	14	KN	T <sub>2B</sub> [Nm]	36.0	54.0	72.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	45.0	67.5	90.0	135.0	140.0	120.0	110.0
		KNN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	80.0	120.0	140.0	140.0	140.0	120.0	110.0
		SN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	80.0	120.0	140.0	140.0	140.0	120.0	110.0
	16	KN	T <sub>2B</sub> [Nm]	39.0	58.5	78.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	50.0	75.0	100.0	140.0	140.0	120.0	110.0
		KNN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	100.0	140.0	140.0	140.0	140.0	120.0	110.0
		SN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	100.0	140.0	140.0	140.0	140.0	120.0	110.0
	19	KN	T <sub>2B</sub> [Nm]	39.0	58.5	78.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	60.0	90.0	120.0	140.0	140.0	120.0	110.0
		KNN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	120.0	140.0	140.0	140.0	140.0	120.0	110.0
		SN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	120.0	140.0	140.0	140.0	140.0	120.0	110.0
	24	KN	T <sub>2B</sub> [Nm]	43.0	64.5	86.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	65.0	97.5	130.0	140.0	140.0	120.0	110.0
		KNN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	120.0	140.0	140.0	140.0	140.0	120.0	110.0
		SN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	120.0	140.0	140.0	140.0	140.0	120.0	110.0
	28	KN	T <sub>2B</sub> [Nm]	46.0	69.0	92.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	70.0	105.0	140.0	140.0	140.0	120.0	110.0
		KNN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	120.0	140.0	140.0	140.0	140.0	120.0	110.0
		SN	T <sub>2B</sub> [Nm]	48.0	72.0	96.0	95.0	87.0	92.0	71.0
			T <sub>2NOT</sub> [Nm]	120.0	140.0	140.0	140.0	140.0	120.0	110.0

## Permissible radial force F<sub>r2</sub> and axial force F<sub>a2</sub> on shaft N<sub>2</sub>

n <sub>2</sub> [rpm]	3000		1000		500		250		100		50	
T <sub>2</sub> [Nm]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]
< 80	750	375	1000	500	1250	625	1500	750	1900	950	2200	1100
> 80	630	315	830	415	1040	520	1250	625	1580	790	1830	915



Servo gearboxes  
(precision gearboxes)

## Gearbox inertia moments/mass

Inertia moment J<sub>1</sub> related to the fast-rotating shaft (N<sub>1</sub>)

Model	Inertia moment [kgcm <sup>2</sup> ]							Mass ca. [kg]
	1:1	1.5:1	2:1	3:1	4:1	5:1	6:1	
AO	12.4450	6.8580	5.7210	4.6470	4.2780	4.0580	3.9250	17.6
BO	16.9680	8.8470	6.7790	5.1170	4.5420	4.2270	4.0430	17.3
CO	16.9680	8.8473	6.7790	5.1172	4.5420	4.2271	4.0430	17.3
DO	17.2660	8.9795	6.8534	5.1502	4.5610	4.2390	4.0511	17.5
EON	16.8600	8.7992	6.7520	5.1051	4.5352	4.2230	4.0400	17.0
EOS	18.6470	9.5940	7.1990	5.3040	4.6470	4.2942	4.0894	17.3
FO	17.9750	9.8050	7.3040	5.4560	4.7980	4.4060	4.1750	20.0
GO	22.2170	11.3550	9.1130	6.8500	5.4300	4.7690	4.5740	19.7
HO	22.2170	11.3550	9.1130	6.8500	5.4300	4.7690	4.5740	19.7
JO	22.5140	11.4880	9.1880	6.8830	5.4490	4.7810	4.5820	19.9
KON	22.1090	11.3070	9.0860	6.8380	5.4240	4.7640	4.5710	19.4
KOS	23.8960	12.1020	9.5330	7.0360	5.5350	4.8360	4.6200	19.7

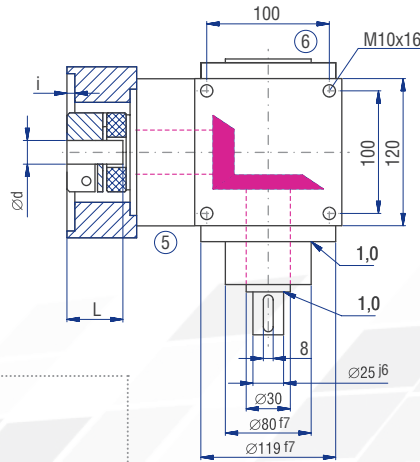
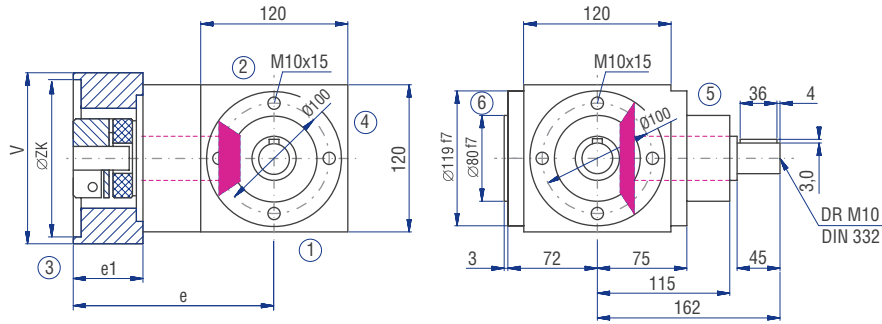
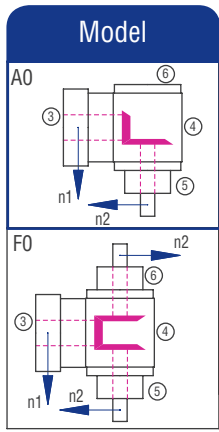
## Inertia moments Coupling J [kgcm<sup>2</sup>]

K24	d [mm]	KN	KNN	SN
		J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]
11		0.812	0.812	1.374
14		0.810	0.810	1.360
16		0.808	0.808	1.350
19		0.803	0.803	1.340
24		0.787	0.787	1.290
28		0.765	0.765	1.274

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

**ATEK**  
ANTRIEBSTECHNIK

# 11.3.18 Type VC 120 – Servo bevel gearboxes

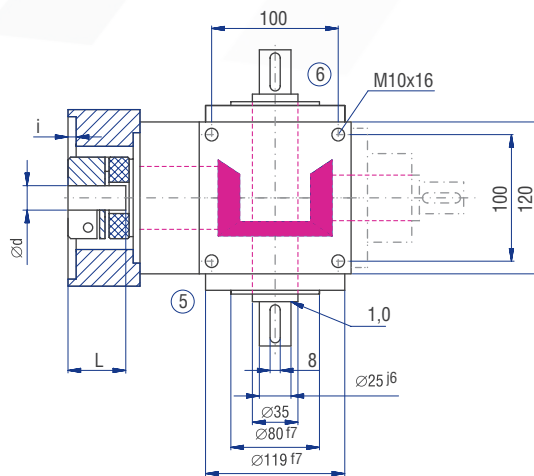
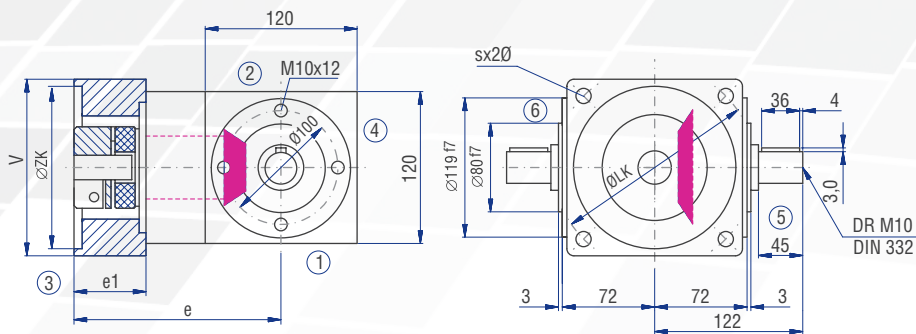
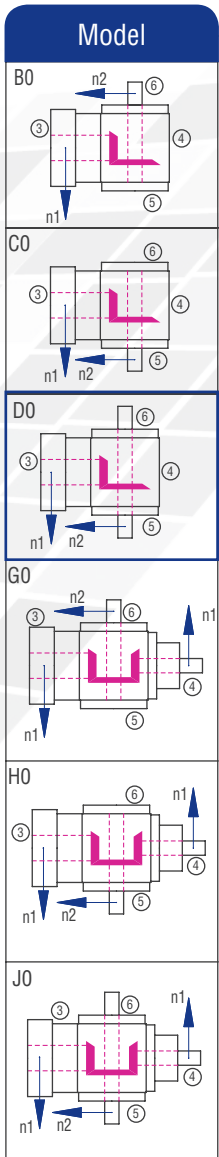


## Motor mounting dimensions

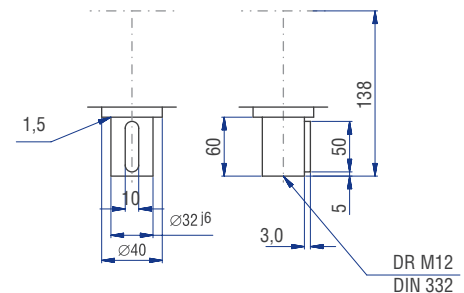
Flange no.	V [mm]	ZK [mm]	Thread	LK [mm]	Shaft dxL [mm]	i [mm]	e [mm]	e1 [mm]
103	120	60	M6	75	24*50	3	170.0	54
201	120	60	M5	90	24*50	3	170.0	54
301	120	50	M6	95	24*50	4	170.0	54
401	120	80	M6	100	24*50	4	170.0	54
501	120	95	M8	115	24*50	4	170.0	54
601	120	95	M8	130	24*50	4	170.0	54
611	120	110	M8	130	24*50	5	170.0	54
701	120	110	M8	145	24*50	5	170.0	54
802	140	110	M10	165	24*50	5	170.0	54
811	140	130	M10	165	24*50	5	170.0	54

Table 11.3.18-1

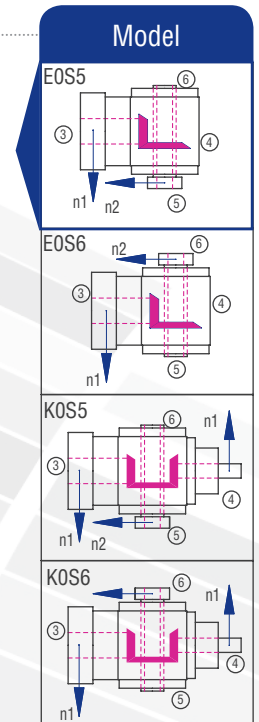
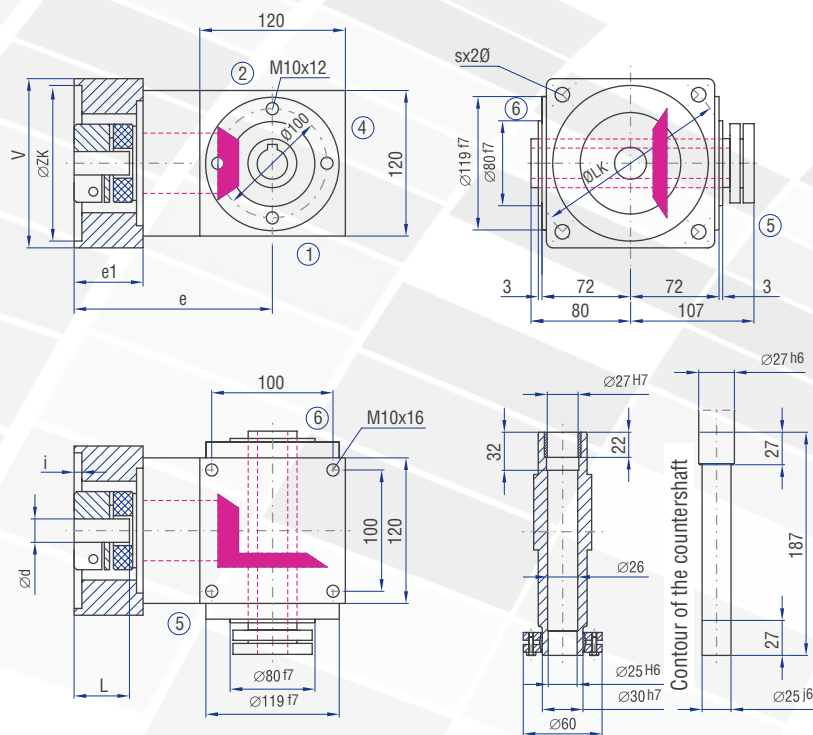
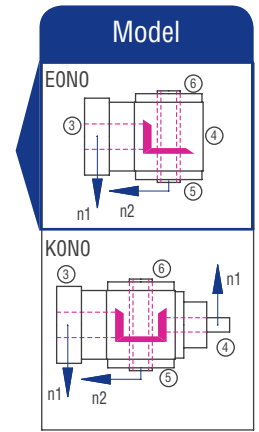
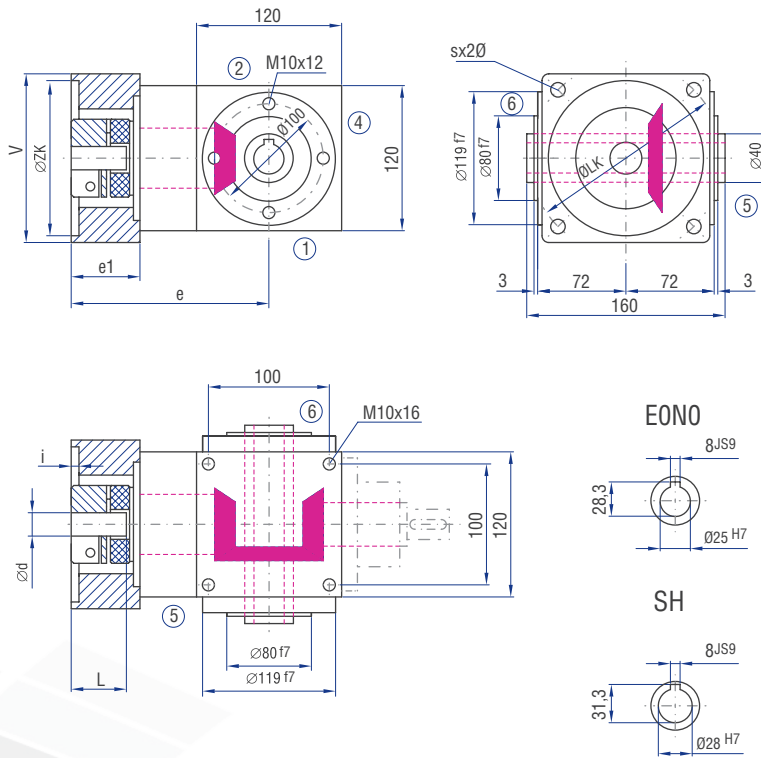
The dimensions e and e1 will change for the coupling type "clamping hub with groove" (KNN). Please contact us for consultation!



## Implementation VV



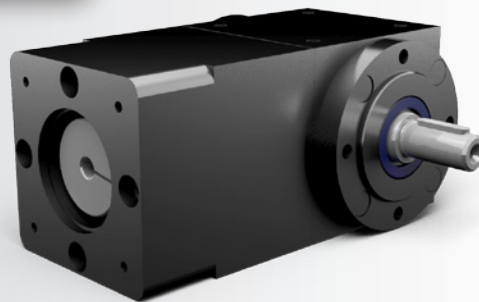




Servo gearboxes  
(precision gearboxes)

ANSI  
ASME

## 11.3.19 Type VC 140 – Servo bevel gearboxes



### Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.3.2
<b>Gear ratio</b>	1:1 to 6:1	
<b>Housing / Flanges</b>	Grey cast iron / aluminium	
<b>Threaded mounting holes</b>	On all housing surfaces without flange and on all flanges.	See chapter 11.3.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 20 arcmin	See chapter 11.3.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.3.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.3.9
<b>Motor flange</b>	Aluminium	See chapter 11.3.14
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For smooth motor shafts      clamping hub For smooth motor shafts      tension ring hub For motor shafts with parallel key      clamping hub with groove	KN SN KNN See chapter 11.3.13

### Torques in operating mode S1

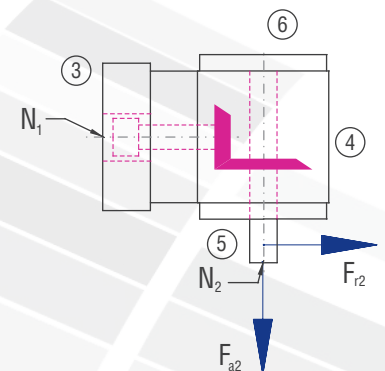
Gear ratio i [-]	1:1		1.5:1		2:1		3:1		4:1		5:1		6:1		
	n <sub>1</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	
<b>4000</b>			4000	34	2667	45	2000	68	1333	85	1000	90	800	85	667
<b>3000</b>			3000	45	2000	60	1500	90	1000	103	750	100	600	95	500
<b>2400</b>	37		2400	56	1600	75	1200	113	800	111	600	105	480	102	400
<b>1500</b>	60		1500	90	1000	120	750	130	500	120	375	115	300	108	250

## Torques in operating mode S5, dynamic operation

Gear ratio i [-]				1:1	1.5:1	2:1	3:1	4:1	5:1	6:1
$T_{2N}$ in S5 [Nm]				120	113	110	110	105	100	95
$n_{1max}$ in S5 [rpm]				2100	3000	4200	5000	6000	6000	6000
Coupling size	Motor shaft d [mm]	Coupling type		1:1	1.5:1	2:1	3:1	4:1	5:1	6:1
K28	14	KN	$T_{2B}$ [Nm]	80.0	120.0	160.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	80.0	120.0	160.0	240.0	260.0	220.0	200.0
	16	KN	$T_{2B}$ [Nm]	81.0	121.5	162.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	100.0	150.0	200.0	260.0	260.0	220.0	200.0
		KNN	$T_{2B}$ [Nm]	128.0	192.0	190.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	140.0	210.0	280.0	260.0	260.0	220.0	200.0
	19	SN	$T_{2B}$ [Nm]	128.0	192.0	190.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	140.0	210.0	280.0	260.0	260.0	220.0	200.0
		KN	$T_{2B}$ [Nm]	85.0	127.5	170.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	130.0	195.0	260.0	260.0	260.0	220.0	200.0
	24	KNN	$T_{2B}$ [Nm]	128.0	192.0	190.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	240.0	280.0	280.0	260.0	260.0	220.0	200.0
		SN	$T_{2B}$ [Nm]	128.0	192.0	190.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	240.0	280.0	280.0	260.0	260.0	220.0	200.0
	28	KN	$T_{2B}$ [Nm]	91.0	136.5	182.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	140.0	210.0	280.0	260.0	260.0	220.0	200.0
		KNN	$T_{2B}$ [Nm]	128.0	192.0	190.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	240.0	280.0	280.0	260.0	260.0	220.0	200.0
	32	SN	$T_{2B}$ [Nm]	128.0	192.0	190.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	240.0	280.0	280.0	260.0	260.0	220.0	200.0
		KN	$T_{2B}$ [Nm]	102.0	153.0	190.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	156.0	234.0	280.0	260.0	260.0	220.0	200.0
	38	KNN	$T_{2B}$ [Nm]	128.0	192.0	190.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	240.0	280.0	280.0	260.0	260.0	220.0	200.0
		SN	$T_{2B}$ [Nm]	128.0	192.0	190.0	177.0	162.0	143.0	122.0
			$T_{2NOT}$ [Nm]	240.0	280.0	280.0	260.0	260.0	220.0	200.0

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

$n_2$ [rpm]	3000		1000		500		250		100		50	
$T_2$ [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]
< 140	1300	650	1700	850	2000	1000	2500	1250	3000	1500	3800	1900
> 140	1082	541	1420	710	1670	835	2080	1040	2500	1250	3170	1585



## Gearbox inertia moments/mass

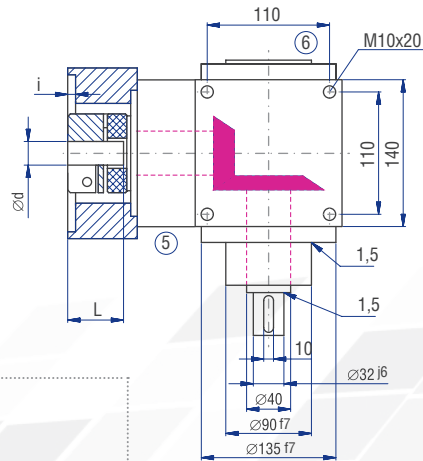
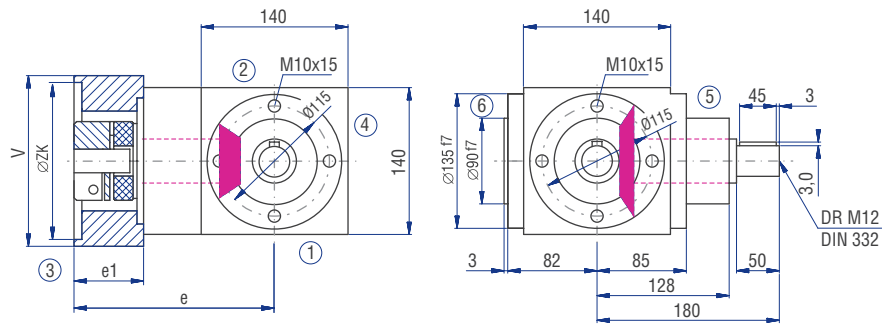
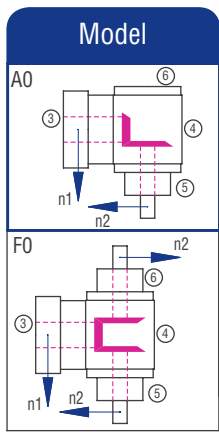
Inertia moment  $J_1$  related to the fast-rotating shaft ( $N_1$ )

Model	Inertia moment [kgcm <sup>2</sup> ]							Mass ca. [kg]
	1:1	1.5:1	2:1	3:1	4:1	5:1	6:1	
AO	29.1040	17.6100	13.2250	10.3390	9.2700	8.8650	8.6550	26.0
BO	40.2700	22.7860	16.3860	11.4390	9.7640	9.2930	8.9250	25.5
CO	40.2700	22.7860	16.3860	11.4390	9.7640	9.2930	8.9250	25.5
DO	41.2520	23.2230	16.6310	11.5480	9.8250	9.3320	8.9520	26.0
EON	36.8340	21.2590	15.5260	11.0570	9.5490	9.1560	8.8300	25.0
EOS	43.2350	24.1040	17.1270	11.7690	9.9490	9.4120	9.0070	25.7
FO	40.9040	25.1660	16.9500	12.2160	10.4510	9.6410	9.2220	30.0
GO	53.4040	28.8060	21.7780	16.4150	10.7860	10.3000	9.9310	29.7
HO	53.4040	28.8060	21.7780	16.4150	10.7860	10.3000	9.9310	29.7
JO	54.3860	29.2430	22.0240	16.5250	10.8480	10.3390	9.9580	30.2
KON	49.9670	27.2790	20.9190	16.0340	10.5720	10.1620	9.8360	29.2
KOS	56.3690	30.1240	22.5200	16.7450	10.9720	10.4180	10.0130	29.9

## Inertia moments Coupling J [kgcm<sup>2</sup>]

K28	KN	KNN	SN
d [mm]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]
14	0.000	0.000	0.000
16	1.827	1.827	3.366
19	1.821	1.821	3.350
24	1.804	1.804	3.270
28	1.779	1.779	3.190
32	1.741	1.741	3.030
38	1.649	1.649	2.898

# 11.3.19 Type VC 140 – Servo bevel gearboxes

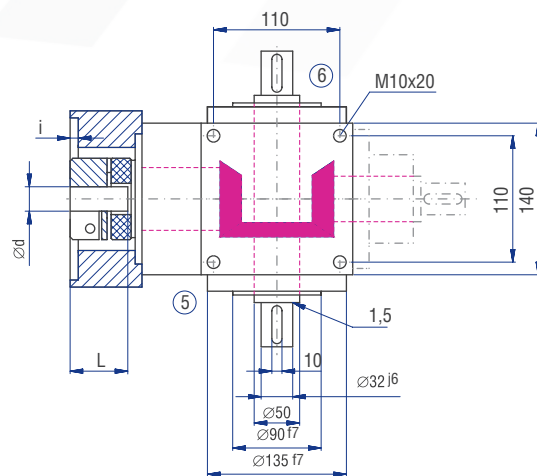
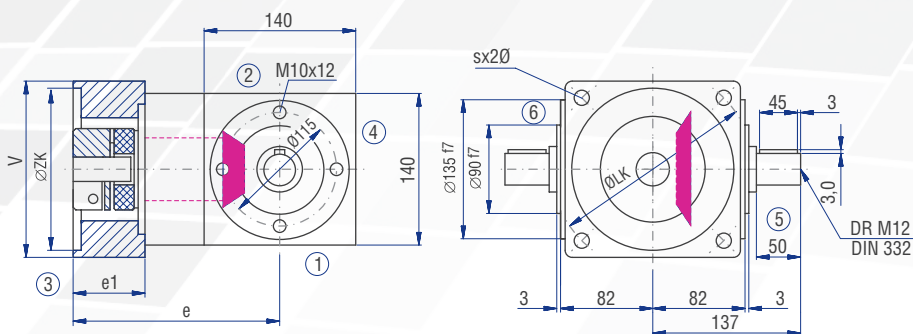
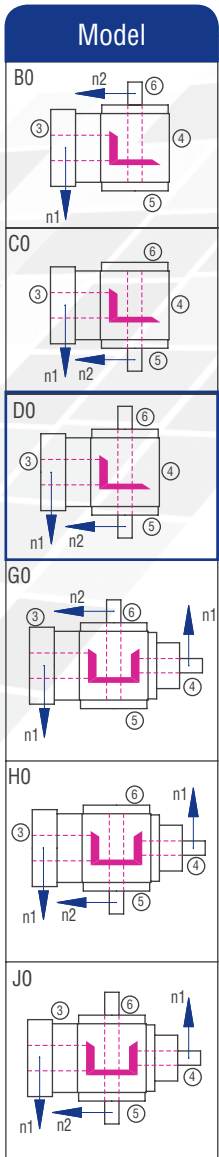


## Motor mounting dimensions

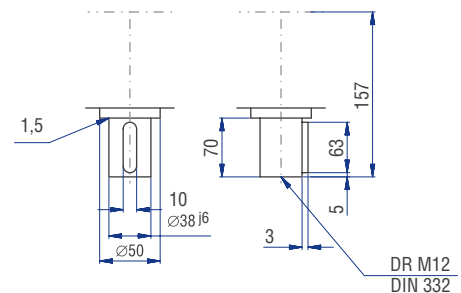
Flange no.	V [mm]	ZK [mm]	Thread	LK [mm]	Shaft dxL [mm]	i [mm]	e [mm]	e1 [mm]
403	140	80	M6	100	32*60	4	196.0	61
502	140	95	M8	115	32*60	4	196.0	61
601	140	95	M8	130	32*60	4	196.0	61
611	140	110	M8	130	32*60	5	196.0	61
616	140	110	M10	130	32*60	5	196.0	61
701	140	110	M8	145	32*60	5	196.0	61
802	140	110	M10	165	32*60	5	196.0	61
811	140	130	M10	165	32*60	5	196.0	61
902	200	130	M12	215	32*60	6	196.0	61
911	200	180	M12	215	32*60	6	196.0	61
931	200	180	M12	215	38*80	6	241.0	107

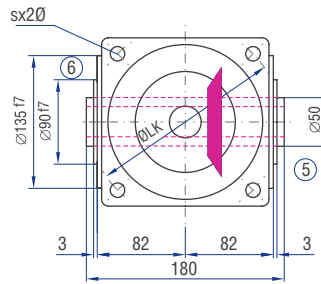
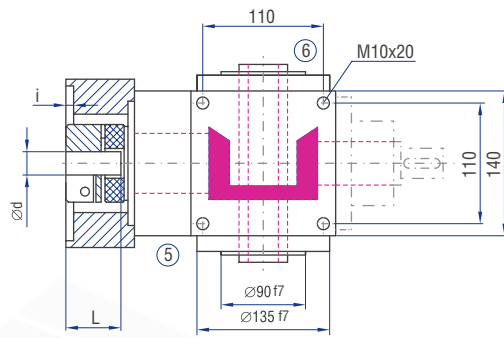
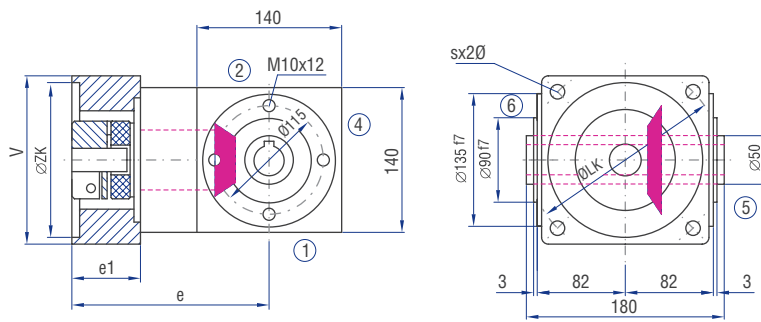
Table 11.3.19-1

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

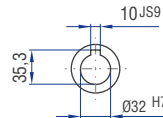


## Implementation VV

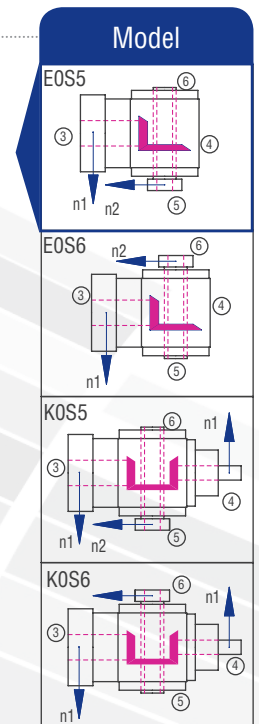
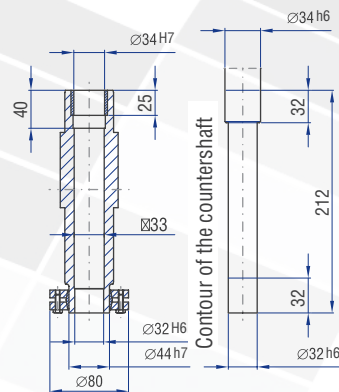
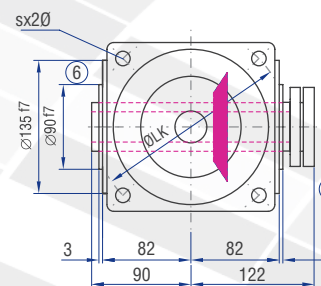
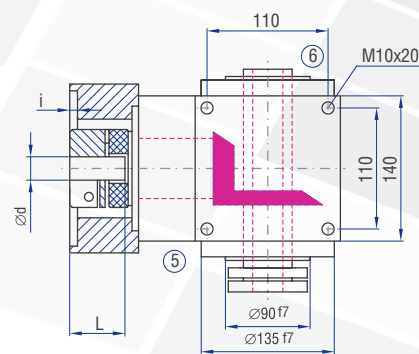
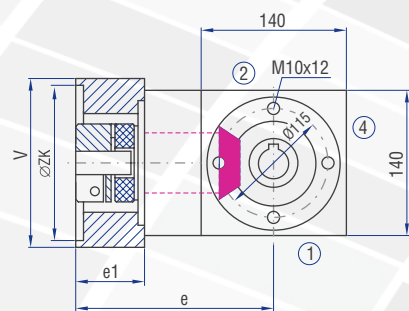
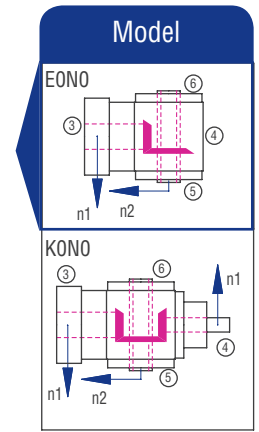
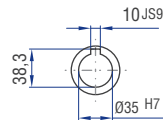




EONO

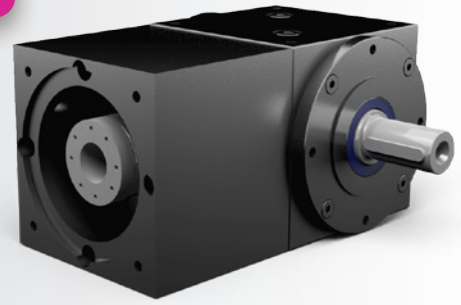


SH



Servo gearboxes  
(precision gearboxes)

## 11.3.20 Type VC 160 – Servo bevel gearboxes



### Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.3.2
<b>Gear ratio</b>	1:1 to 6:1	
<b>Housing / Flanges</b>	Grey cast iron / aluminium	
<b>Threaded mounting holes</b>	On all housing surfaces without flange and on all flanges.	See chapter 11.3.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 20 arcmin	See chapter 11.3.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.3.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.3.9
<b>Motor flange</b>	Aluminium	See chapter 11.3.14
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For smooth motor shafts                      clamping hub For smooth motor shafts                      tension ring hub For motor shafts with parallel key        clamping hub with groove	KN SN KNN See chapter 11.3.13

### Torques in operating mode S1

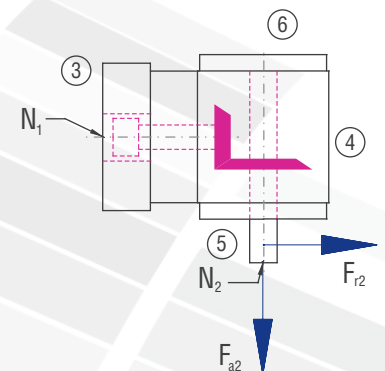
Gear ratio i [-]	1:1		1.5:1		2:1		3:1		4:1		5:1		6:1		
	n1 [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	
<b>4000</b>			4000		2667		2000	102	1333	136	1000	160	800	115	667
<b>3000</b>			3000	68	2000	90	1500	136	1000	180	750	180	600	130	500
<b>2400</b>	56		2400	85	1600	113	1200	170	800	200	600	198	480	137	400
<b>1500</b>	90		1500	136	1000	181	750	230	500	220	375	215	300	145	250

## Torques in operating mode S5, dynamic operation

Gear ratio i [-]				1:1	1.5:1	2:1	3:1	4:1	5:1	6:1
T <sub>2N</sub> in S5 [Nm]				180	185	185	190	180	180	130
n <sub>1max</sub> in S5 [rpm]				1800	2500	3200	4500	5000	6000	6000
Coupling size	Motor shaft d [mm]	Coupling type		1:1	1.5:1	2:1	3:1	4:1	5:1	6:1
K28	14	KN	T <sub>2B</sub> [Nm]	80.0	120.0	160.0	240.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	80.0	120.0	160.0	240.0	320.0	380.0	350.0
	16	KN	T <sub>2B</sub> [Nm]	81.0	121.5	162.0	243.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	100.0	150.0	200.0	300.0	400.0	380.0	350.0
		KNN	T <sub>2B</sub> [Nm]	128.0	192.0	256.0	280.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	140.0	210.0	280.0	400.0	400.0	380.0	350.0
	19	SN	T <sub>2B</sub> [Nm]	128.0	192.0	256.0	280.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	140.0	210.0	280.0	400.0	400.0	380.0	350.0
		KN	T <sub>2B</sub> [Nm]	85.0	127.5	170.0	255.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	130.0	195.0	260.0	390.0	400.0	380.0	350.0
	24	KNN	T <sub>2B</sub> [Nm]	128.0	192.0	256.0	280.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	240.0	360.0	480.0	400.0	400.0	380.0	350.0
		SN	T <sub>2B</sub> [Nm]	128.0	192.0	256.0	280.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	240.0	360.0	480.0	400.0	400.0	380.0	350.0
	28	KN	T <sub>2B</sub> [Nm]	91.0	136.5	182.0	273.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	140.0	210.0	280.0	400.0	400.0	380.0	350.0
		KNN	T <sub>2B</sub> [Nm]	128.0	192.0	256.0	280.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	240.0	360.0	480.0	400.0	400.0	380.0	350.0
	32	SN	T <sub>2B</sub> [Nm]	128.0	192.0	256.0	280.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	240.0	360.0	480.0	400.0	400.0	380.0	350.0
		KN	T <sub>2B</sub> [Nm]	102.0	153.0	204.0	280.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	156.0	234.0	312.0	400.0	400.0	380.0	350.0
	38	KNN	T <sub>2B</sub> [Nm]	128.0	192.0	256.0	280.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	240.0	360.0	480.0	400.0	400.0	380.0	350.0
		SN	T <sub>2B</sub> [Nm]	128.0	192.0	256.0	280.0	270.0	270.0	200.0
			T <sub>2NOT</sub> [Nm]	240.0	360.0	480.0	400.0	400.0	380.0	350.0

## Permissible radial force F<sub>r2</sub> and axial force F<sub>a2</sub> on shaft N<sub>2</sub>

n <sub>2</sub> [rpm]	3000		1000		500		250		100		50	
T <sub>2</sub> [Nm]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]
< 220	2000	1000	2800	1400	3300	1650	4000	2000	5000	2500	6500	3250
> 220	1670	835	2340	1170	2750	1375	3340	1670	4170	2085	5420	2710



Servo gearboxes  
(precision gearboxes)

## Gearbox inertia moments/mass

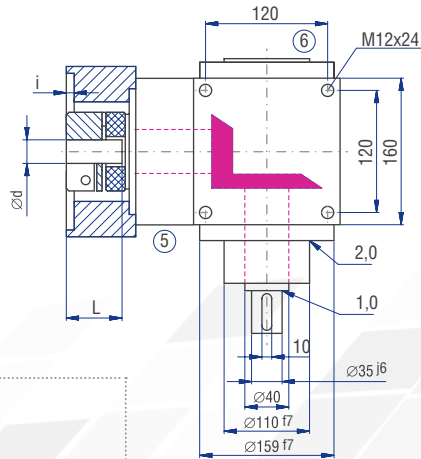
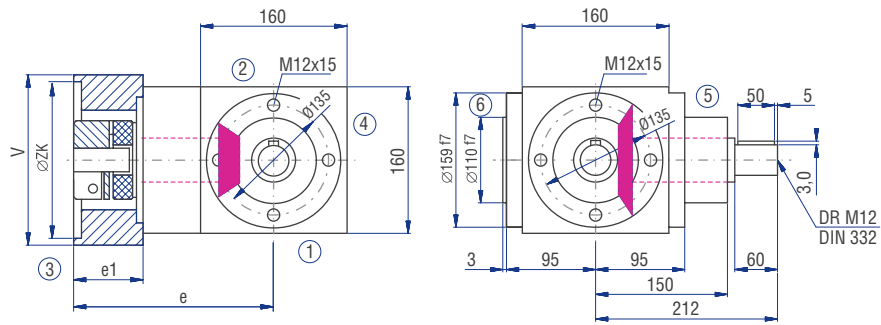
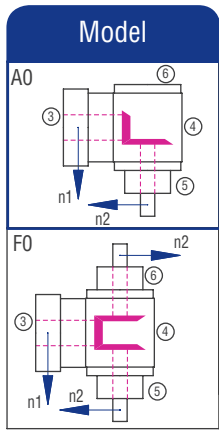
Inertia moment J<sub>1</sub> related to the fast-rotating shaft (N<sub>1</sub>)

Model	Inertia moment [kgcm <sup>2</sup> ]							Mass ca. [kg]
	1:1	1.5:1	2:1	3:1	4:1	5:1	6:1	
AO	35.1340	36.4980	23.1260	16.3090	14.3010	13.6770	12.8680	38.5
BO	37.0520	37.5230	25.4770	17.3860	15.0700	14.1140	13.1640	38.0
CO	37.0520	37.5230	25.4770	17.3860	15.0700	14.1140	13.1640	38.0
DO	38.0810	37.9810	25.7340	17.5000	15.1340	14.1550	13.1930	38.5
EON	39.8840	38.6400	26.0420	17.6370	15.2110	14.2040	13.2290	37.0
EOS	46.1740	41.4360	27.6150	18.3360	15.6040	14.4560	13.4030	37.6
FO	49.9340	54.4540	32.2260	20.0090	16.4450	15.2490	13.8350	45.0
GO	51.8870	50.5670	34.1270	24.6890	20.5770	15.7940	14.8420	44.5
HO	51.8870	50.5670	34.1270	24.6890	20.5770	15.7940	14.8420	44.5
JO	52.9160	51.0240	34.3840	24.8030	20.6420	15.8350	14.8710	45.0
KON	54.7190	51.6840	34.6920	24.9400	20.7190	15.8840	14.9070	44.0
KOS	61.0090	54.4800	36.2650	25.6390	21.1120	16.1360	15.0810	44.5

## Inertia moments Coupling J [kgcm<sup>2</sup>]

K28	KN	KNN	SN
d [mm]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]
14	0.000	0.000	0.000
16	1.827	1.827	3.366
19	1.821	1.821	3.350
24	1.804	1.804	3.270
28	1.779	1.779	3.190
32	1.741	1.741	3.030
38	1.649	1.649	2.898

# 11.3.20 Type VC 160 – Servo bevel gearboxes

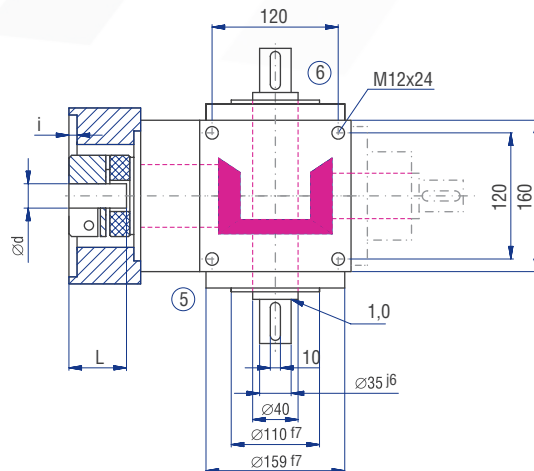
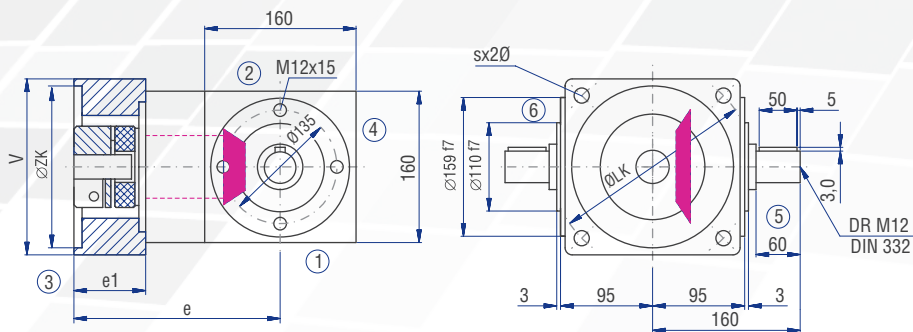
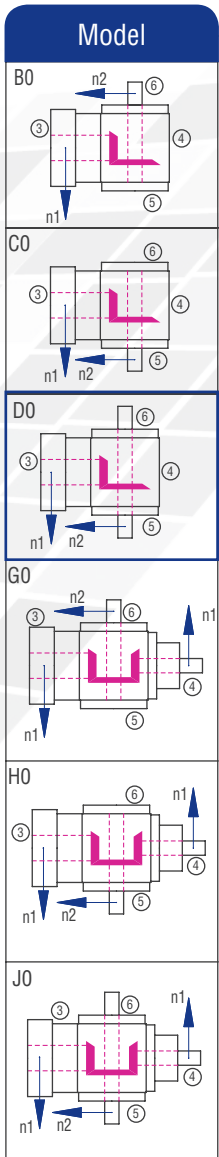


## Motor mounting dimensions

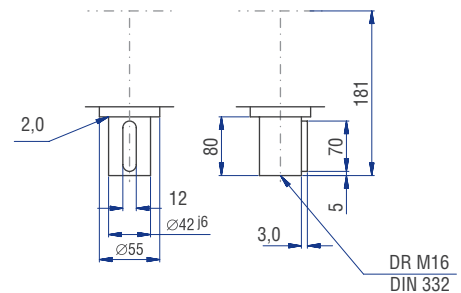
Flange no.	V [mm]	ZK [mm]	Thread	LK [mm]	Shaft dxL [mm]	i [mm]	e [mm]	e1 [mm]
403	160	80	M6	100	32*60	4	215.0	62
502	160	95	M8	115	32*60	4	215.0	62
601	160	95	M8	130	32*60	4	215.0	62
611	160	110	M8	130	32*60	5	215.0	62
616	160	110	M10	130	32*60	5	215.0	62
701	160	110	M8	145	32*60	5	215.0	62
802	160	110	M10	165	32*60	5	215.0	62
811	160	130	M10	165	32*60	5	215.0	62
902	200	130	M12	215	32*60	6	215.0	62
911	200	180	M12	215	32*60	6		62
931	200	180	M12	215	38*80	6	260.0	62

Table 11.3.20-1

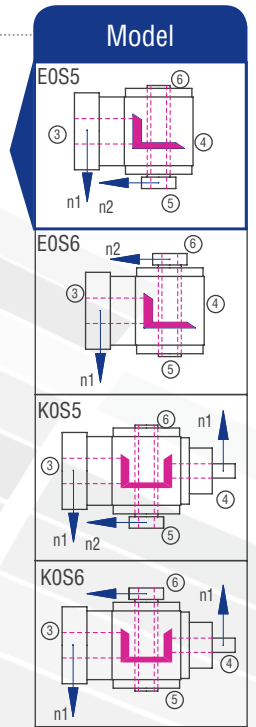
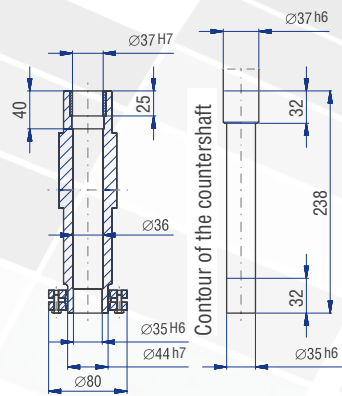
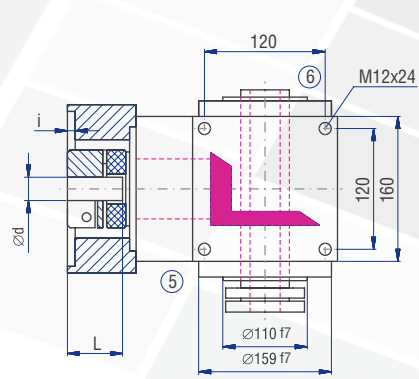
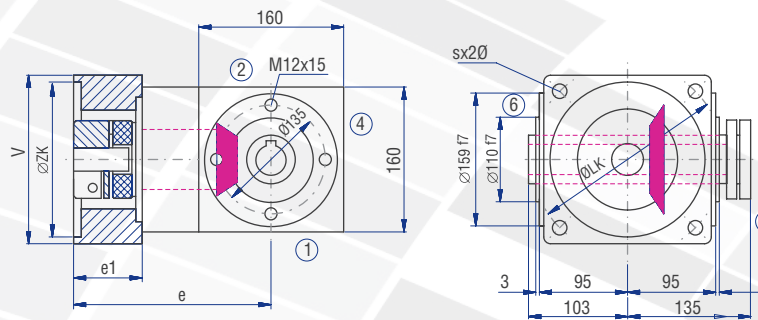
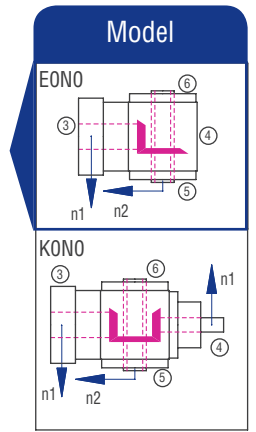
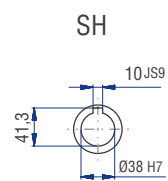
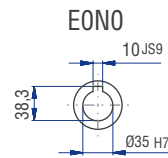
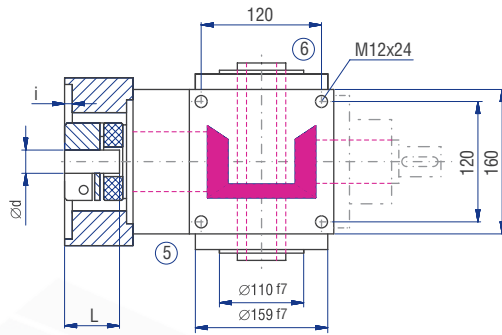
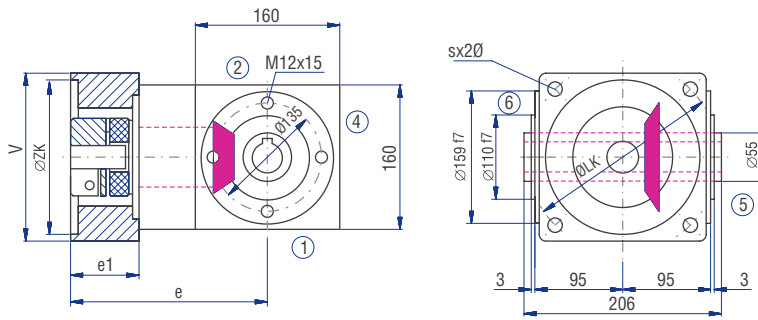
The dimensions e and e1 will change for the coupling type "clamping hub with groove" (KNN). Please contact us for consultation!



## Implementation VV

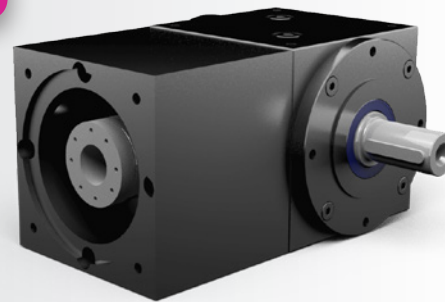






Servo gearboxes  
(precision gearboxes)

## 11.3.21 Type VC 200 – Servo bevel gearboxes



### Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.3.2
<b>Gear ratio</b>	1:1 to 6:1	
<b>Housing / Flanges</b>	Grey cast iron / aluminium	
<b>Threaded mounting holes</b>	On all housing surfaces without flange and on all flanges.	See chapter 11.3.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 20 arcmin	See chapter 11.3.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.3.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.3.9
<b>Motor flange</b>	Aluminium	See chapter 11.3.14
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For smooth motor shafts                      clamping hub For smooth motor shafts                      tension ring hub For motor shafts with parallel key        clamping hub with groove	KN SN KNN See chapter 11.3.13

### Torques in operating mode S1

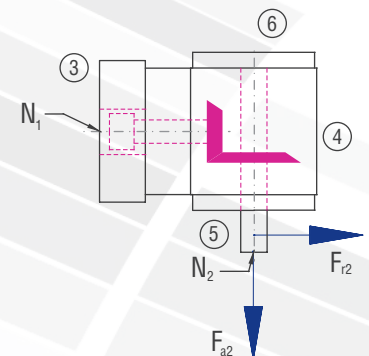
Gear ratio i [-]	1:1		1.5:1		2:1		3:1		4:1		5:1		6:1		
	n1 [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	n <sub>2</sub> [rpm]	T <sub>2N</sub> [Nm]	
<b>4000</b>			4000		2667		2000	177	1333	235	1000	275	800	190	667
<b>3000</b>			3000		2000	157	1500	235	1000	314	750	300	600	210	500
<b>2400</b>			2400	147	1600	196	1200	294	800	393	600	340	480	225	400
<b>1500</b>	157	1500	236	1000	314	750	472	500	455	375	380	300	240	250	

## Torques in operating mode S5, dynamic operation

Gear ratio i [-]			1:1	1.5:1	2:1	3:1	4:1	5:1	6:1	
T <sub>2N</sub> in S5 [Nm]			350	330	320	420	350	300	210	
n <sub>1max</sub> in S5 [rpm]			1500	2250	3000	4000	4500	5000	6000	
Coupling size	Motor shaft d [mm]	Coupling type	1:1	1.5:1	2:1	3:1	4:1	5:1	6:1	
K38	16	KN	T <sub>2B</sub> [Nm]	94.0	141.0	188.0	282.0	376.0	470.0	315.0
			T <sub>2NOT</sub> [Nm]	120.0	180.0	240.0	360.0	480.0	600.0	625.0
	19	KN	T <sub>2B</sub> [Nm]	98.0	147.0	196.0	294.0	392.0	490.0	315.0
			T <sub>2NOT</sub> [Nm]	125.0	187.5	250.0	375.0	500.0	625.0	625.0
	24	KN	T <sub>2B</sub> [Nm]	104.0	156.0	208.0	312.0	416.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	130.0	195.0	260.0	390.0	520.0	650.0
		KNN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0
		SN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0
	28	KN	T <sub>2B</sub> [Nm]	109.0	163.5	218.0	327.0	436.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	136.0	204.0	272.0	408.0	544.0	680.0
		KNN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0
		SN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0
	32	KN	T <sub>2B</sub> [Nm]	113.0	169.5	226.0	339.0	452.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	142.0	213.0	284.0	426.0	568.0	710.0
		KNN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0
		SN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0
	38	KN	T <sub>2B</sub> [Nm]	122.0	183.0	244.0	366.0	488.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	152.0	228.0	304.0	456.0	608.0	760.0
		KNN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0
		SN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0
	42	KN	T <sub>2B</sub> [Nm]	126.0	189.0	252.0	378.0	504.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	158.0	237.0	316.0	474.0	632.0	790.0
		KNN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0
		SN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0
	45	KN	T <sub>2B</sub> [Nm]	130.0	195.0	260.0	390.0	520.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	164.0	246.0	328.0	492.0	656.0	800.0
		KNN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0
		SN	T <sub>2B</sub> [Nm]	260.0	390.0	520.0	630.0	550.0	505.0	315.0
				T <sub>2NOT</sub> [Nm]	500.0	750.0	800.0	850.0	800.0	800.0

## Permissible radial force F<sub>r2</sub> and axial force F<sub>a2</sub> on shaft N<sub>2</sub>

n <sub>2</sub> [rpm]	3000		1000		500		250		100		50		
	T <sub>2</sub> [Nm]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]	F <sub>r</sub> [N]	F <sub>a</sub> [N]
< 500	3200	1600	4300	2150	5000	2500	6500	3250	8000	4000	10000	5000	
> 500	2670	1335	3580	1790	4170	2085	5420	2710	6670	3335	8330	4165	



## Gearbox inertia moments/mass

Inertia moment J<sub>1</sub> related to the fast-rotating shaft (N<sub>1</sub>)

Model	Inertia moment [kgcm <sup>2</sup> ]						
	1:1	1.5:1	2:1	3:1	4:1	5:1	6:1
AO	132.0410	109.2390	82.6690	54.0970	42.2810	38.6590	35.9260
BO	185.5150	119.4940	86.1880	55.8380	43.3230	40.0860	36.8890
CO	185.5200	119.4940	86.1880	55.8380	43.3230	40.0860	36.8890
DO	188.6320	120.8800	86.9670	56.1850	43.5180	40.2110	36.9750
EON	212.2100	124.9400	91.0000	56.8660	43.9640	41.0160	37.5350
EOS	233.2300	134.2820	96.2560	59.2020	45.2780	41.8570	38.1180
FO	192.6410	171.8170	129.6190	74.4520	53.4810	46.3870	41.3200
GO	246.1410	150.2440	107.3410	67.9340	53.7990	43.8080	40.5930
HO	246.1410	150.2440	107.3410	67.9340	53.7990	43.8080	40.5930
JO	249.2580	151.6290	108.1200	68.2810	53.9940	43.9330	40.6790
KON	272.8310	155.6890	112.1530	68.9620	54.4400	44.7380	41.2390
KOS	293.8530	165.0320	117.4090	71.2980	55.7540	45.5790	41.8220

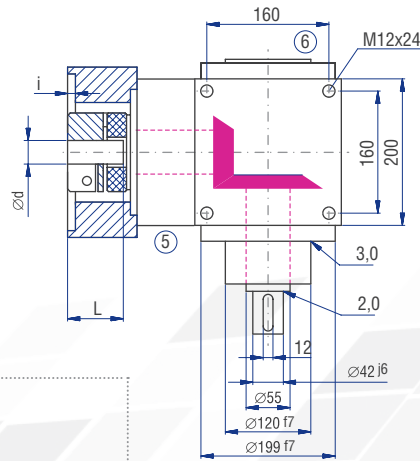
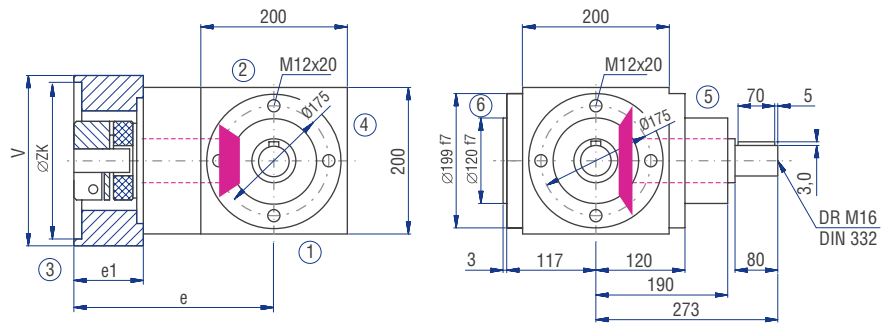
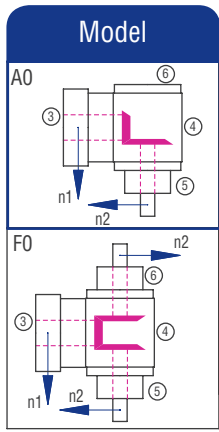
Mass ca. [kg]
64.0
60.0
60.0
62.0
60.0
61.3
72.0
70.0
70.0
72.0
70.0
71.3

## Inertia moments Coupling J [kgcm<sup>2</sup>]

K38	Coupling J [kgcm <sup>2</sup> ]		
	KN	KNN	SN
d [mm]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]
16	0.000	0.000	0.000
19	0.000	0.000	0.000
24	5.267	5.267	10.100
28	5.234	5.234	9.950
32	5.185	5.185	9.730
38	5.066	5.066	9.380
42	4.949	4.949	9.218
45	4.835	4.835	8.731

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

# 11.3.21 Type VC 200 – Servo bevel gearboxes

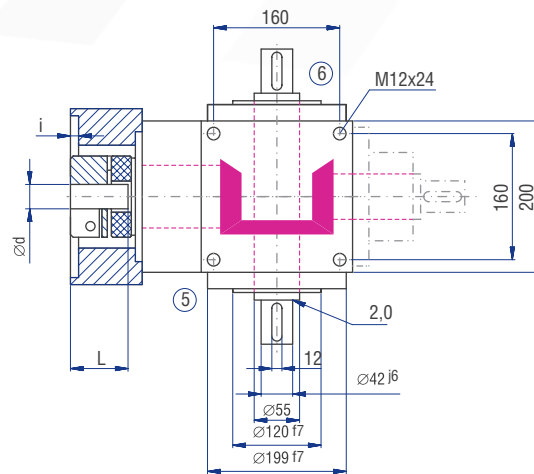
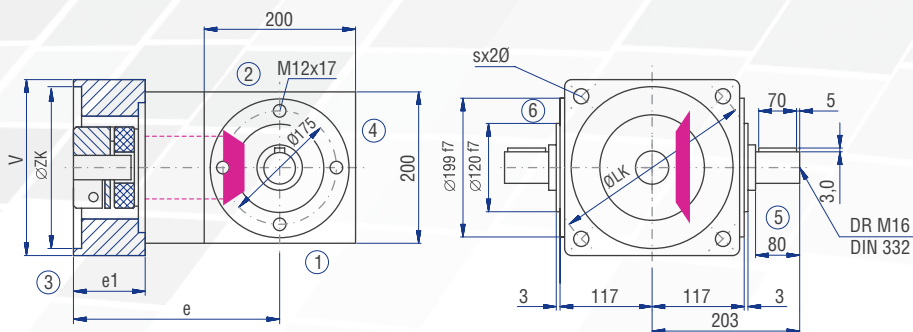
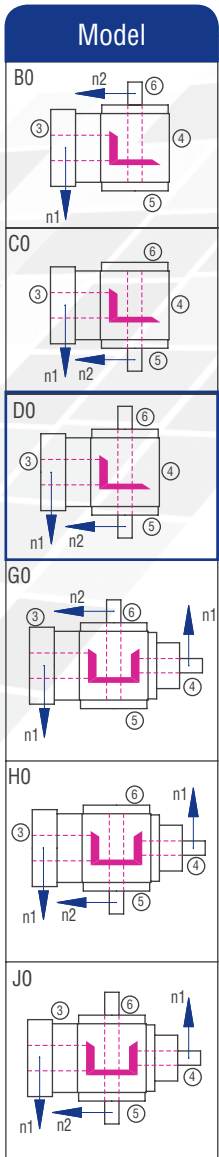


## Motor mounting dimensions

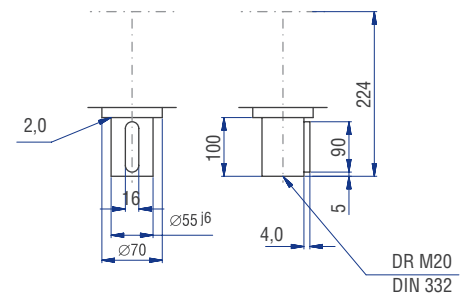
Flange no.	V [mm]	ZK [mm]	Thread	LK [mm]	Shaft dxL [mm]	i [mm]	e [mm]	e1 [mm]
614	200	110	M8	130	32*60	5	262.0	76
616	200	110	M10	130	32*60	5	262.0	76
802	200	110	M10	165	32*60	5	262.0	76
811	200	130	M10	165	32*60	5	262.0	76
902	200	130	M12	215	32*60	6	262.0	76
913	200	180	M12	215	32*60	6	262.0	76
915	200	180	M12	215	38*80	6	274.0	88

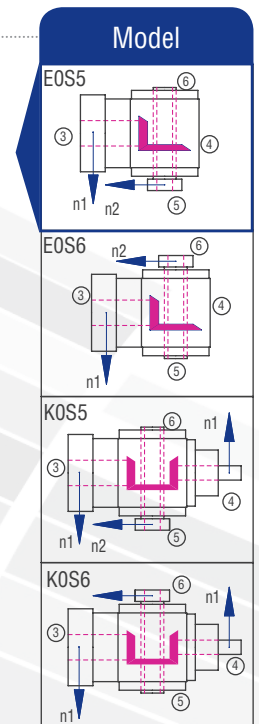
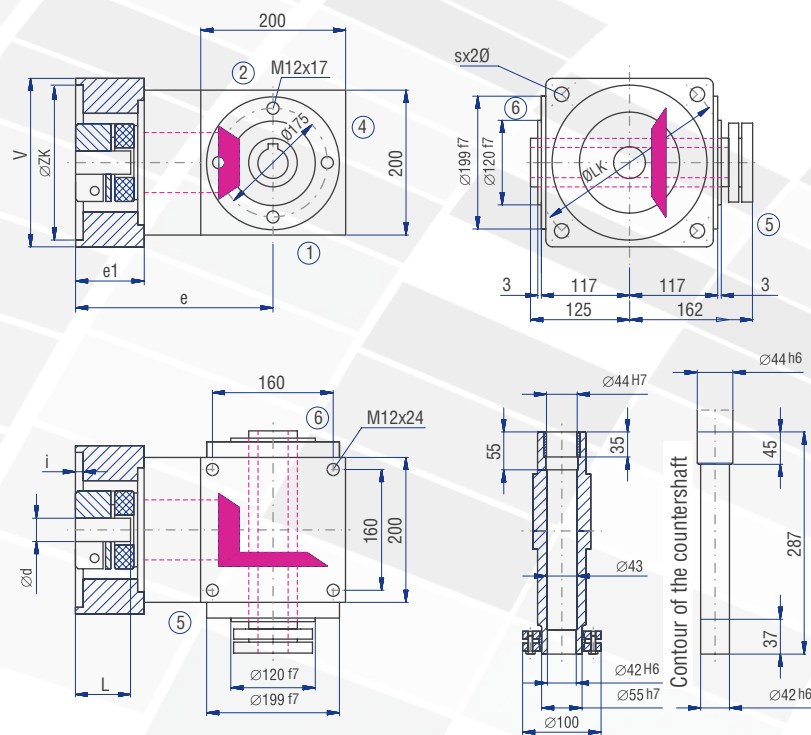
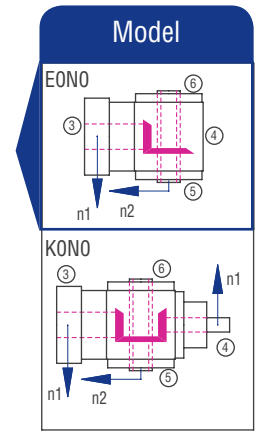
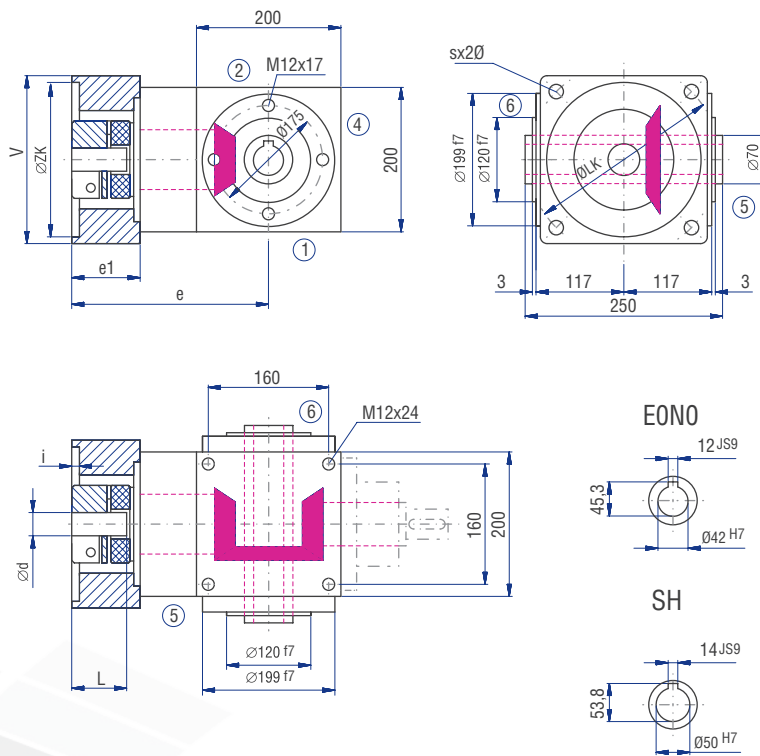
Table 11.3.21-1

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



## Implementation VV





Servo gearboxes  
(precision gearboxes)

# 11.4 Type HC – Servo hypoid gearboxes

## 11.4.1 General construction

The HC gearbox type is based on the proven type H bevel gearboxes. The axles intersect in the gearbox at the distance A in an angle of 90°.

Gearbox size	090	115	140	170	215	260
A [mm]	9	14	18	23	32	42

The edge length of the housing is reflected in the gearbox size (example: HC 090: the housing edge length is 90 mm, with the viewing direction towards the output side of the gearbox). The housings are made of aluminium, the shaft suspension units are made of steel or casting.

## 11.4.2 Tothing

ATEK hypoid gearboxes have gear sets with high-quality hypoid tothing made of hardened carburised steel. A gear set comprises one pinion shaft (small number of teeth / small diameter) and one bevel gear (large number of teeth / large diameter).

Gear sets with spiral tothing offer the advantage of very favourable engagement factors (high meshing ratio). Therefore they are predestined for usage with high loads.

On hypoid gear sets, the axial offset between pinion shaft and gear results in higher sliding motion rates in the tooth contact. This makes it possible to achieve especially great running smoothness and a high transmission accuracy.

## 11.4.3 Models

Due to the modular system, different gearbox Models can be configured.

Model	consists of:
BO through EO	1 gear set

Table 11.4.3-1

The variants differ in the type of the shafts, the rotational direction thereof, and the possibility to use a robot flange interface (BR0 and CR0).

## 11.4.4 Threaded mounting holes

The sides 1 and 2 of the gearboxes are machined and may be used as mounting surfaces. The flange on side 3 has also threaded mounting holes. On the sides 5 and 6, fastening can be made via through bores.

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
040-250	1	1	5.6
040-100	2	1.2	5.6
040-100	4	1.4	5.6
040-100	5	1.5	5.6
040-100	6	1.6	5.6

Table 11.4.4-1

Please enquire other mounting options.  
The standard version of the mounting / fastening has the order code 9.  
Example of order code: HC 090 12:1 D0 9.1

## 11.4.5 Installation position

The gearboxes can be used in all installation positions. The recommended installation position is the position in which the shafts are horizontal.

These are the installation positions 1 and 2. The installation position is defined by the gearbox side directed downwards during operation and will be indicated by the corresponding gearbox side. Example of order code for the installation position 1: HC 090 12:1 D0 9.1

## 11.4.6 Shaft designation – allocation to the gearbox sides

The fast-rotating shaft has the speed  $n_1$  and is identified by  $N_1$ . The hypoid pinion is located on this shaft. The slowly rotating shaft has the speed  $n_2$  and is identified by  $N_2$ . The hypoid gear is located on this shaft. The gearbox sides are identified by the numerals 1 to 6.

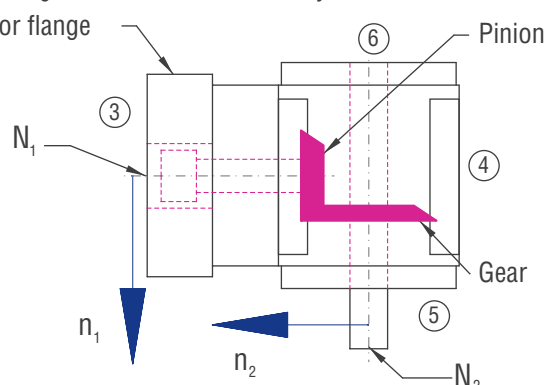


Figure 11.4.6-1; Shaft designations

### 11.4.7 Preferred direction of rotation

If the clockwise (CW) direction of rotation (viewing direction from shaft end face of the fast-rotating shaft towards the gearbox centre) is selected, a lower noise level is generated.

### 11.4.8 Efficiency

The achievable efficiency depends on rotational speed, torque, installation position, sealing, and lubricant type. The efficiency is about 95%. The efficiency specified relates to the permissible nominal load and is a guidance value for run-in gearboxes at operating temperature with standard sealing.

### 11.4.9 Lubrication

The H-series gearboxes have lifetime lubrication.

### 11.4.10 Vent filter

If venting is required (B1 or C1) 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. Please adhere to the operating instructions!

### 11.4.11 Low-backlash construction

For low-friction 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

Ordering option	Gear set	090 – 115	140 – 260
/0000	Standard	<=5 arcmin	<=4 arcmin
/S2	Standard	-	-
/S1	Standard	-	-
/S0	Standard	<=3 arcmin	<=2 arcmin

Table 11.4.11-1

### 11.4.12 Connection of drive shaft to coupling

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

### 11.4.13 Coupling

The coupling compensates angle errors as well as misalignments in the radial and axial direction.

A later changeover to another motor is possible. The motor-side coupling hub is available in the following variants:

BK	BKN
Bellows coupling	Bellows coupling
For motor shafts without parallel key	For motor shafts with parallel key

# 11.4 Type HC – Servo hypoid gearboxes

## Design of the coupling

Torque  $T_1$  [Nm] that can be transmitted by the coupling at a motor shaft diameter  $d$  [mm]

d [mm]	Gearbox size					
	090	115	140	170	215	260
5	7					
6	10					
7	9					
8	10.5	18				
9	12	20				
10	12	22				
11	12	33.1				
12	12	33.8				
13	12					
14	12	35	65			
15	12	35	65			
16	12	35	65			
17	12					
18	12	35	65			
19	12	35	65	150		
20	12	35	65			
21	12					
22	12					
24	12	35	65			
25		35	65		360	360
28		35	65			
30		35	65		360	360
32			65			
35			65		360	360
38			65			
40					360	800
42				150		
45					360	360
50					360	360
55					360	360
60					360	360
75						800

### 11.4.14 Motor mounting

The servo-motor will be bolted to the motor flange of the gearbox.

The flange number of the motor flange for the respective gearbox size is to be determined in Table 11.4.14-1.

#### Motor flange

The motor flange adapts the mounting bores of the servo-motor and gearbox flange. You can find the available flanges in Table 11.4.14-1.

Please contact us for other flanges.

- 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 flange tolerances are dimensioned for servo-motors of tolerance class N.

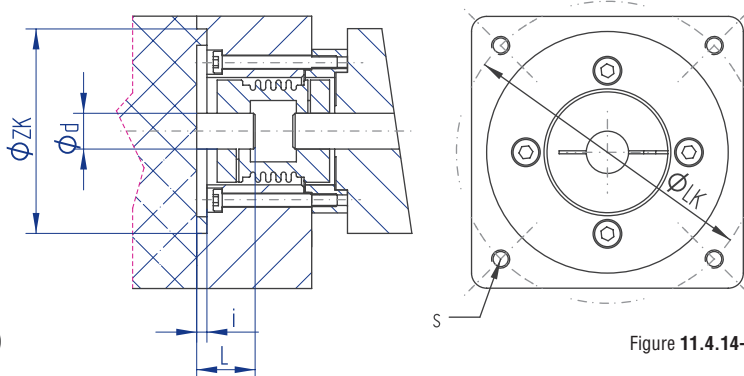


Figure 11.4.14-1



Allocation: Fitting dimensions of the servo-motor – gearbox size/flange no. (selection)

d min [mm]	d max [mm]	L min [mm]	L max [mm]	LK [mm]	ZK [mm]	Gearbox size	Flange no.
3	24	21	38	63	40	090	001
3	24	21	38	63	40	090	002
3	24	21	38	75	60	090	104
5	24	22	50	75	60	090	104
3	24	21	38	90	60	090	201
3	24	21	38	95	50	090	301
5	24	22	50	95	50	090	301
5	24	22	50	100	80	090	401
5	24	22	50	115	95	090	501
5	24	22	50	130	95	090	601
5	24	22	50	130	110	090	611
5	24	22	50	145	110	090	701
5	24	22	50	165	110	090	802
3	24	17.5	34.5	70	40	090	950
3	24	21	38	70	50	090	952
5	24	22	50	90	70	090	954
5	24	37	65	115	95	090	955
5	24	40	68	145	110	090	956
5	24	22	50	90	70	090	959
3	24	21	38	70	50	090	963
3	24	21	38	46	30	090	964
3	24	21	38	100	50	090	967
5	24	37	65	130	95	090	975
5	24	29	57	100	80	090	977
5	24	37	65	130	110	090	980
5	24	37	65	100	80	090	987
8	26	24	53	63	40	115	001
8	26	24	53	75	60	115	104
8	26	24	53	95	50	115	301
10	30	35.5	60	95	50	115	301
8	26	24	53	100	80	115	401
10	30	35.5	60	100	80	115	401
8	26	24	53	115	95	115	502
10	30	35.5	60	115	95	115	502
8	26	24	53	130	95	115	601
10	30	35.5	60	130	95	115	601
8	26	24	53	130	110	115	611
10	30	35.5	60	130	110	115	611
8	28	24	53	145	110	115	701
10	30	35.5	60	145	110	115	701
8	26	24	53	90	70	115	954
8	26	24	53	90	70	115	959
10	30	40.5	65	145	110	115	959
10	30	35.5	60	90	70	115	960
8	26	24	53	70	50	115	964
10	30	40.5	65	130	110	115	967
10	30	40.5	65	130	95	115	971
10	30	42.5	67	100	80	115	972
8	26	24	53	70	50	115	986

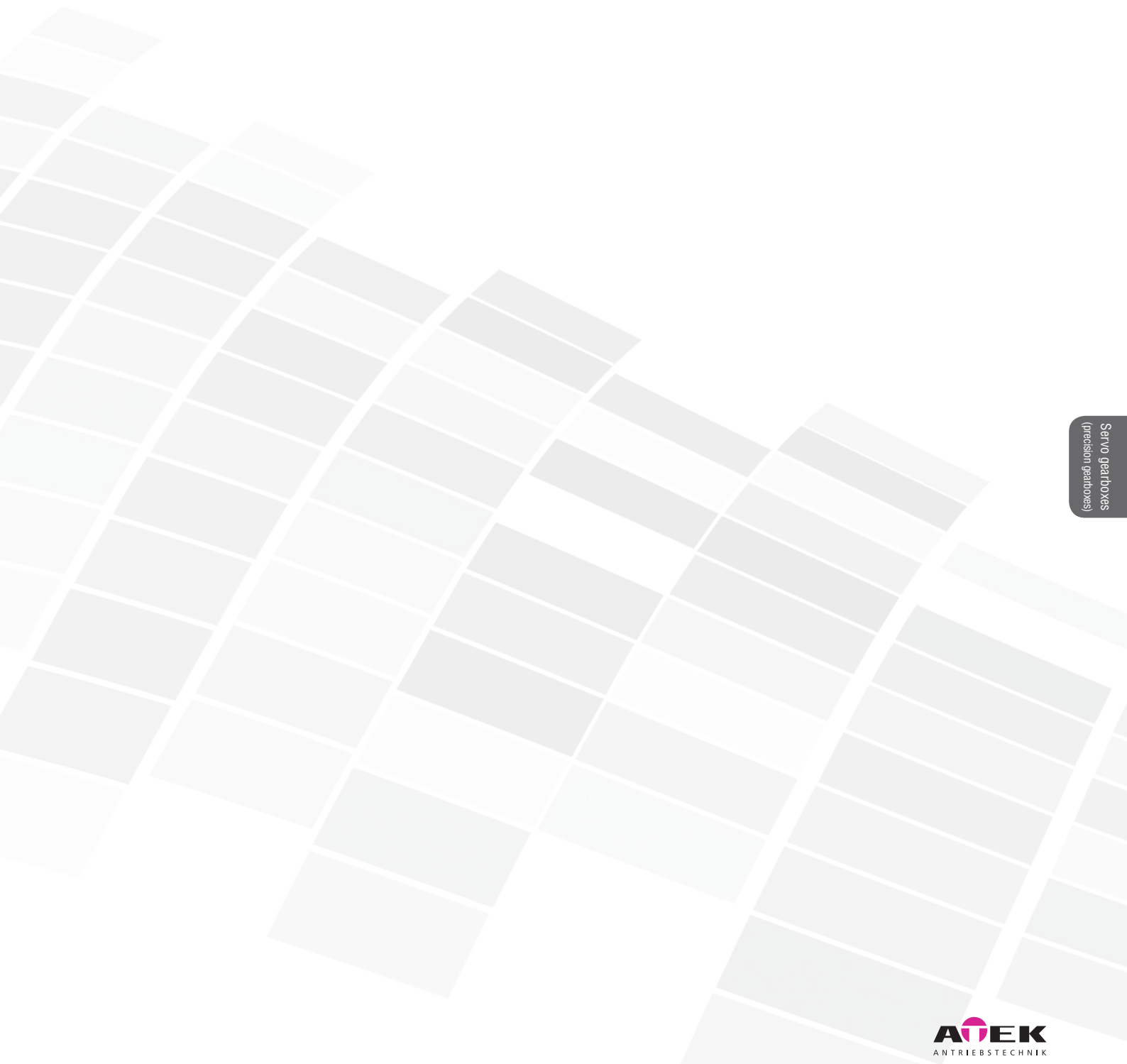
Table 11.4.14-1

Servo gearboxes  
(precision gearboxes)

## 11.4 Type HC – Servo hypoid gearboxes

d min [mm]	d max [mm]	L min [mm]	L max [mm]	LK [mm]	ZK [mm]	Gearbox size	Flange no.
14	38	31.5	60	95	50	140	301
14	38	31.5	60	100	80	140	401
14	38	32	60	115	95	140	502
14	38	31.5	60	115	95	140	502
14	38	32	60	130	95	140	601
14	38	31.5	60	130	95	140	601
14	38	32	60	130	110	140	611
14	38	31.5	60	130	110	140	611
14	38	31.5	60	145	110	140	701
14	38	32	60	165	110	140	802
14	38	31.5	60	165	110	140	802
14	38	32	60	165	130	140	811
14	38	32	60	215	130	140	902
14	38	32	60	215	180	140	911
14	38	52	80	215	180	140	932
14	38	47.5	76	145	110	140	950
14	38	37	66	145	110	140	951
14	38	31.5	60	90	70	140	960
14	38	38.5	67	100	80	140	972
19	42	39	65	115	95	170	502
19	42	39	65	130	95	170	601
19	42	39	65	130	110	170	611
19	42	39	65	165	110	170	802
19	42	39	65	165	130	170	811
19	42	46	80	165	130	170	811
19	42	39	65	215	130	170	902
19	42	46	80	215	130	170	902
19	42	39	65	215	180	170	911
19	42	46	80	215	180	170	912
19	42	84	110	215	180	170	931
19	42	77.5	103	215	180	170	932
19	42	44	70	145	110	170	951
19	42	46	80	200	114.3	170	952
19	42	84	110	200	114.3	170	952
24	60	44.5	82	165	130	215	811
24	60	44.5	82	215	130	215	902
24	60	44.5	82	215	180	215	913
24	60	56.5	94	200	114.3	215	952
24	60	72.5	110	300	250	215	960
24	60	56.5	94	265	230	215	961
24	60	79.5	117	215	180	215	963
24	60	44.5	75	165	130	260	811
24	60	44.5	75	215	130	260	902
24	60	44.5	75	215	180	260	913
40	75	61.5	110	350	300	260	916
24	60	50	87	200	114.3	260	952
24	60	50	87	265	230	260	961
24	60	72.5	103	300	250	260	962
24	60	79.5	110	215	180	260	963

Table 11.4.14-1

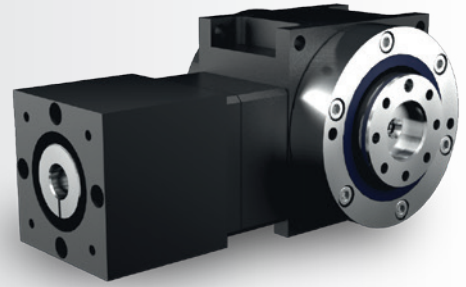


Servo gearboxes  
(precision gearboxes)

# 11.4 Type HC – Servo hypoid gearboxes

## 11.4.15 Features

Gear ratios:  $i = 3:1$  to  $15:1$  (others upon request)  
 Maximum acceleration torque on output: 2160 Nm  
 6 gearbox sizes with edge lengths of 090 to 260 mm  
 Minimised circumferential backlash (optional)  
 Housing made of aluminium  
 Hypoid gearboxes suitable for fitting servo-motors



### 11.4.15.1 Models

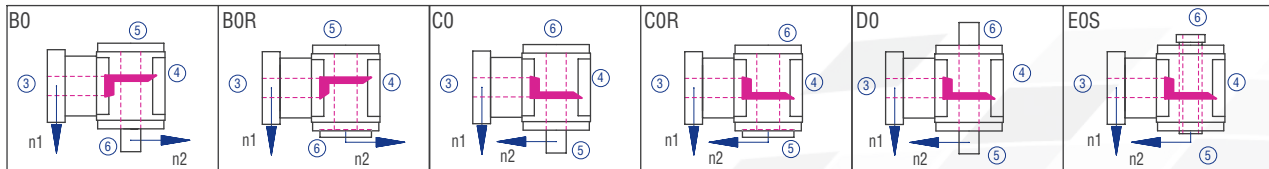


Figure 11.4.15-1; Models

### 11.4.15.2 Gearbox sides

The example shows the Model C0

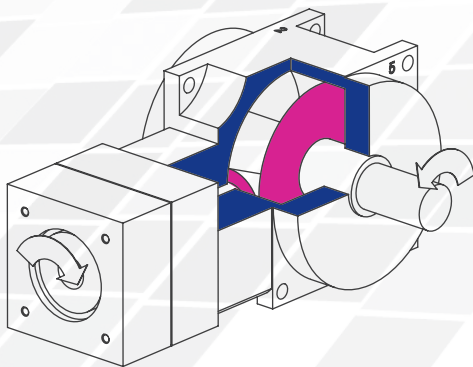


Figure 11.4.15-3; Gearbox sides

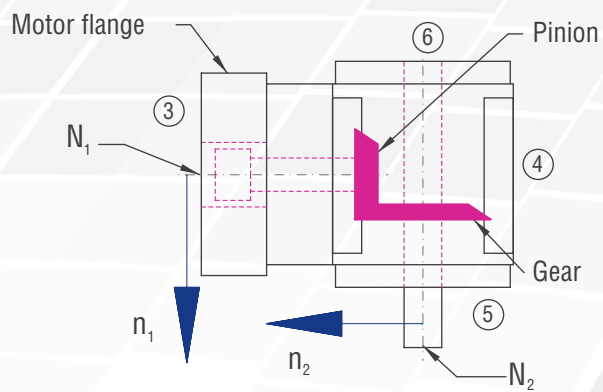


Figure 11.4.15-2; Shaft designations

### 11.4.15.3 Order code

The order code reflects the customer specifications. Example:

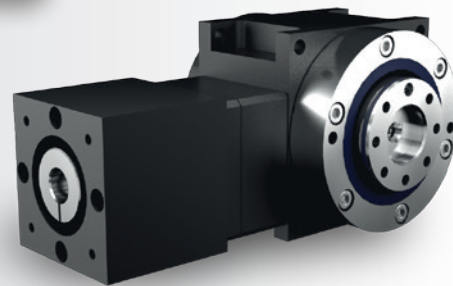
Type	Size	Gear ratio	Model	Fixing side	Installation position	Speed $n_2$	Design
HC	090	12:1	C0-	1.	1-	200	/S1
Description	Size; Table 11.4.15-1	Table 11.4.15-1	Figure 11.4.15-1, Models	Side on which fixing is made; Table 11.4.4-1; Figure 4.3.1-1 Gearbox sides	Side directed downwards; Figure 4.3.1-1 Gearbox sides	Slowly rotating shaft	Low-backlash S1
		V080-	/	14 x 30	No. 301		
		Flange		Motor shaft $\varnothing$ x length	Flange no.		

## 11.4.15.4 Overview of performance data

Selection table: gearbox size; gear ratio; rotational speed

Size	$n_{1MAX}$ [rpm]	$n_1$ [rpm]	8:1			10:1			12:1			15:1		
			$T_{2N}$ [Nm]	$T_{2B}$ [Nm]	$T_{2NOT}$ [Nm]	$T_{2N}$ [Nm]	$T_{2B}$ [Nm]	$T_{2NOT}$ [Nm]	$T_{2N}$ [Nm]	$T_{2B}$ [Nm]	$T_{2NOT}$ [Nm]	$T_{2N}$ [Nm]	$T_{2B}$ [Nm]	$T_{2NOT}$ [Nm]
090	8000	3200	36	54	72	36	54	72						
		3900							26	40	52	25	38	50
115	8000	2700	71	107	143	71	107	143						
		3300							52	79	108	50	75	100
140	7000	2200	142	215	289	143	215	290						
		2800							98	146	195	97	145	194
170	6000	1800	267	398	529	267	398	530						
		2300							188	280	370	182	278	369
215	5000	1200	723	1084	1450	723	1084	1450						
		1600							512	767	1022	512	767	1022
260	4500	1000	1444	2165	2887	1444	2165	2887						
		1300							1023	1533	2044	1023	1533	2044

Table 11.4.15-1

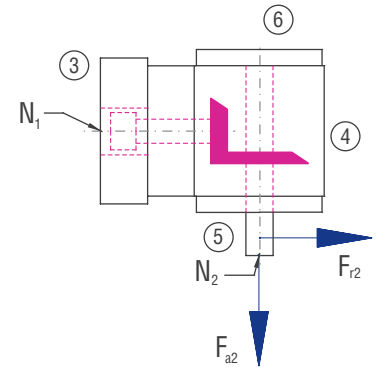


## Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.4.2
<b>Gear ratio</b>	8:1 to 15:1	
<b>Housing / Flanges</b>	Aluminium / steel	
<b>Threaded mounting holes</b>	On the sides 1 and 2 and on the drive flange	See chapter 11.4.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 6 tolerance	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 5 arcmin	See chapter 11.4.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 30,000h in S5 operation	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.4.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.4.9
<b>Motor flange</b>	Aluminium	
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For motor shafts without parallel key    Bellows coupling    BK For motor shafts with parallel key        Bellows coupling    BKN	See chapter 11.4.13

## Performance data

N <sub>1</sub> [rpm]	N <sub>1</sub> MAX [rpm]	3:1			4:1			5:1			6:1			8:1			10:1			12:1			15:1		
		T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]
3900	8000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	39	51	25	39	51
3200	8000	0	0	0	0	0	0	0	0	0	36	54	72	36	54	72	36	54	72	0	0	0	0	0	0
2100	8000	36	54	72	36	54	72	36	54	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



## Permissible radial force $F_{r2}$ and axial force $F_{a2}$ on shaft N<sub>2</sub>

3:1		4:1		5:1		6:1		8:1		10:1		12:1		15:1	
F <sub>r2</sub> [N]	F <sub>a2</sub> [N]	F <sub>r2</sub> [N]	F <sub>a2</sub> [N]	F <sub>r2</sub> [N]	F <sub>a2</sub> [N]	F <sub>r2</sub> [N]	F <sub>a2</sub> [N]	F <sub>r2</sub> [N]	F <sub>a2</sub> [N]	F <sub>r2</sub> [N]	F <sub>a2</sub> [N]	F <sub>r2</sub> [N]	F <sub>a2</sub> [N]	F <sub>r2</sub> [N]	F <sub>a2</sub> [N]
3300	1650	3300	1650	3300	1650	3300	1650	3300	1650	3300	1650	3300	1650	3300	1650

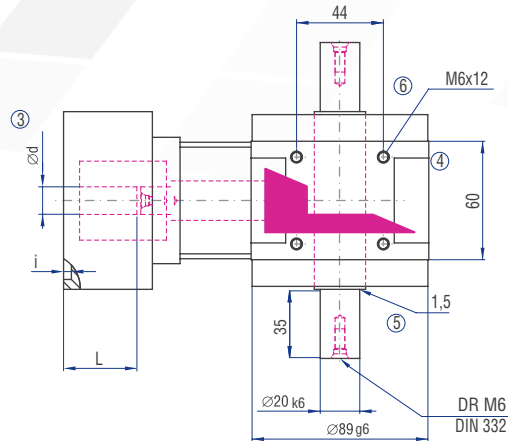
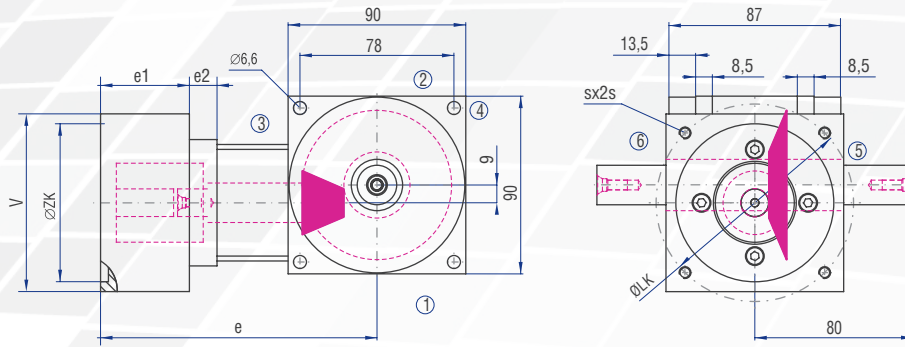
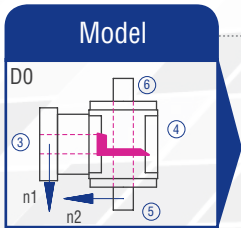
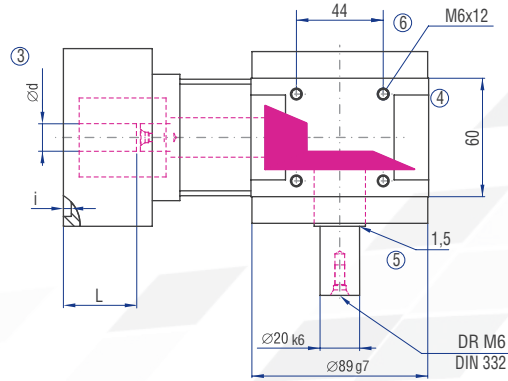
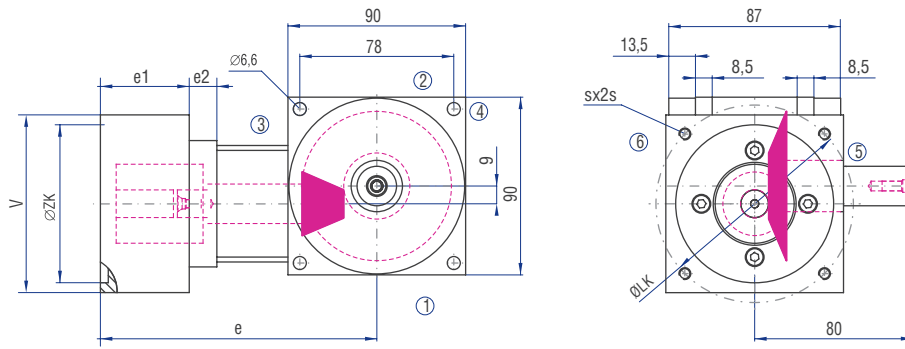
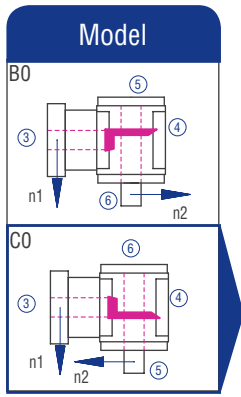
## Gearbox inertia moments/mass

Inertia moment  $J_1$  related to the fast-rotating shaft (N<sub>1</sub>)

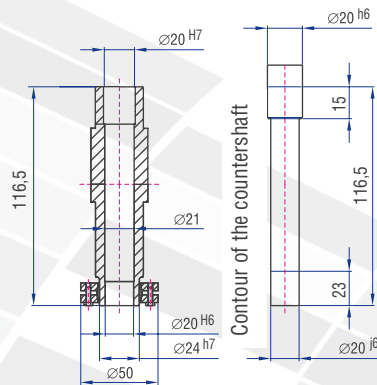
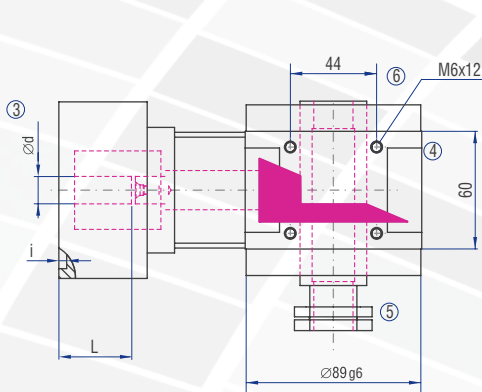
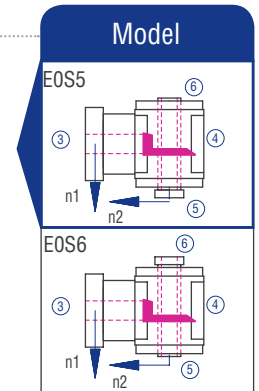
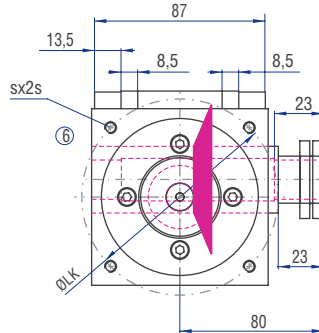
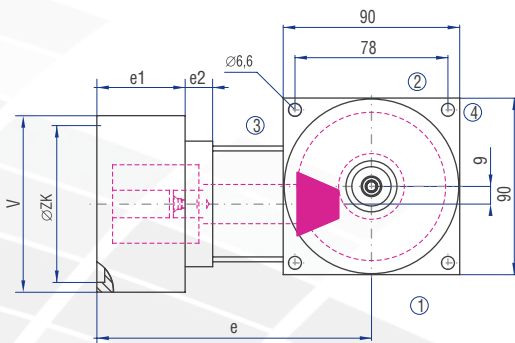
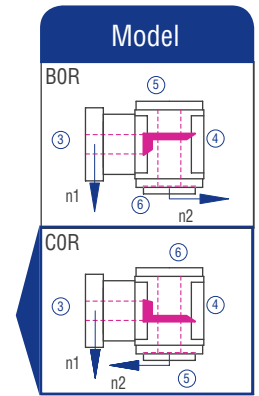
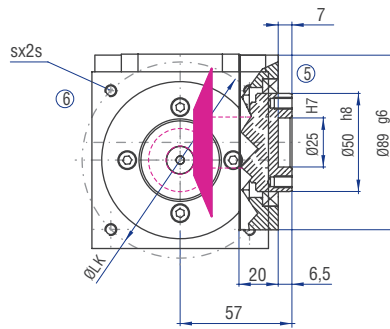
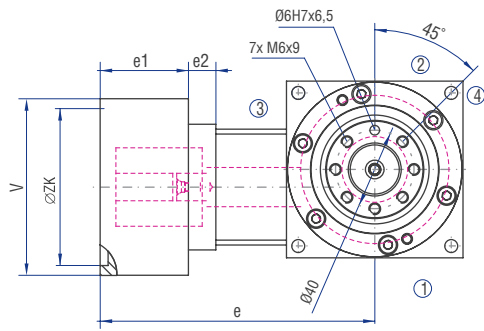
Inertia moment [kgcm <sup>2</sup> ]								Mass ca. [kg]
3:1	4:1	5:1	6:1	8:1	10:1	12:1	15:1	
0,3900	0,3000	0,2300	0,2200	0,1700	0,1500	0,1400	0,1300	3.5

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

# 11.4.16 Type HC 090 – Servo hypoid gearboxes

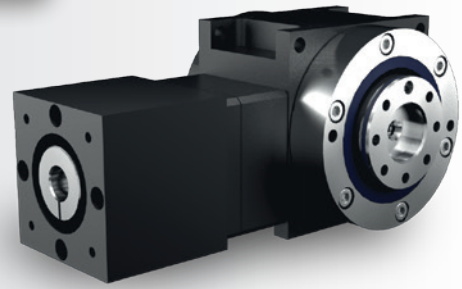






Flange no.	d min [mm]	d max [mm]	L min [mm]	L max [mm]	LK [mm]	ZK [mm]	Thread (s)	□ V [mm]	i [mm]	e [mm]	e1 [mm]	e2 [mm]
001	3	24	21	38	63	40	M4	64	3.5	140	30	29
002	3	24	21	38	63	40	M5	64	3.5	140	30	29
104	3	24	21	38	75	60	M5	70	4	140	45	14
104	5	24	22	50	75	60	M5	88	3.5	152	45	26
201	3	24	21	38	90	60	M5	80	4	140	45	14
301	3	24	21	38	95	50	M6	80	4	140	45	14
301	5	24	22	50	95	50	M6	88	3.5	152	45	26
401	5	24	22	50	100	80	M6	88	4	152	45	26
501	5	24	22	50	115	95	M8	100	4	152	45	26
601	5	24	22	50	130	95	M8	120	4.5	152	45	26
611	5	24	22	50	130	110	M8	115	4.5	152	45	26
701	5	24	22	50	145	110	M8	120	4.5	152	45	26
802	5	24	22	50	165	110	M10	140	5	152	45	26
950	3	24	17.5	34.5	70	40	M4	64	3.5	136.5	26.5	29
952	3	24	21	38	70	50	M5	70	4	140	45	14
954	5	24	22	50	90	70	M5	88	4	152	45	26
955	5	24	37	65	115	95	M8	100	4	167	60	26
956	5	24	40	68	145	110	M8	120	10	170	63	26
959	5	24	22	50	90	70	M6	88	4	152	45	26
963	3	24	21	38	70	50	M4	70	4	140	45	14
964	3	24	21	38	46	30	M4	64	4	140	45	14
967	3	24	21	38	100	50	M6	90	3	140	45	14
975	5	24	37	65	130	95	M8	120	4.5	167	60	26
977	5	24	29	57	100	80	M6	88	6	159	52	26
980	5	24	37	65	130	110	M8	115	4.5	167	60	26
987	5	24	37	65	100	80	M6	88	4	167	60	26

Servo gearboxes  
(precision gearboxes)

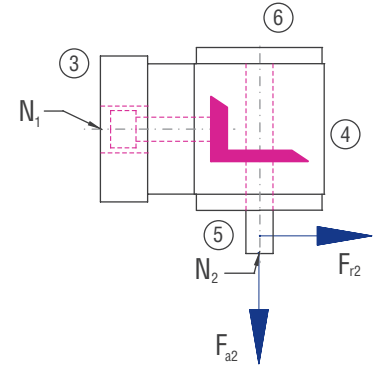


## Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.4.2
<b>Gear ratio</b>	8:1 to 15:1	
<b>Housing / Flanges</b>	Aluminium / steel	
<b>Threaded mounting holes</b>	On the sides 1 and 2 and on the drive flange	See chapter 11.4.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 6 tolerance	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 5 arcmin	See chapter 11.4.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 30,000h in S5 operation	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.4.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.4.9
<b>Motor flange</b>	Aluminium	
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For motor shafts without parallel key    Bellows coupling    BK For motor shafts with parallel key        Bellows coupling    BKN	See chapter 11.4.13

## Performance data

N <sub>1</sub> [rpm]	N <sub>1</sub> MAX [rpm]	3:1			4:1			5:1			6:1			8:1			10:1			12:1			15:1		
		T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]
3300	8000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51	77	102	51	77	102
2700	8000	0	0	0	0	0	0	0	0	0	71	107	143	71	107	143	71	107	143	0	0	0	0	0	0
1800	8000	71	107	143	71	107	143	71	107	143	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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

3:1		4:1		5:1		6:1		8:1		10:1		12:1		15:1	
$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]
4900	2450	4900	2450	4900	2450	4900	2450	4900	2450	4900	2450	4900	2450	4900	2450

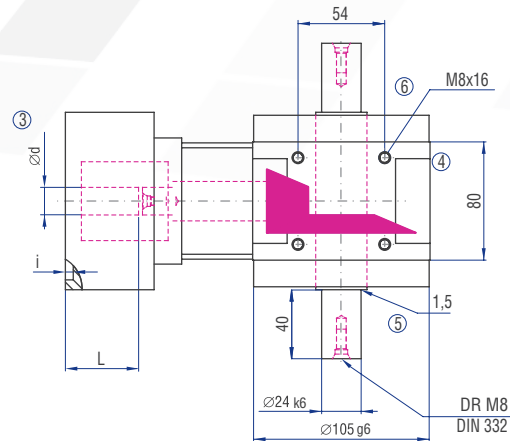
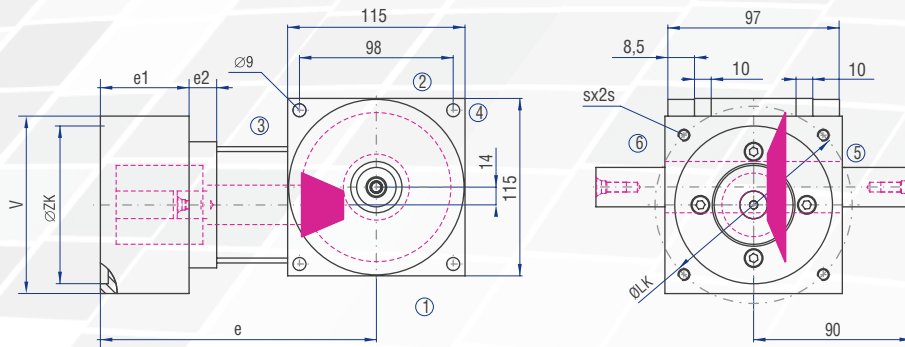
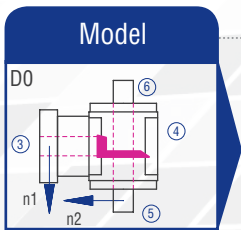
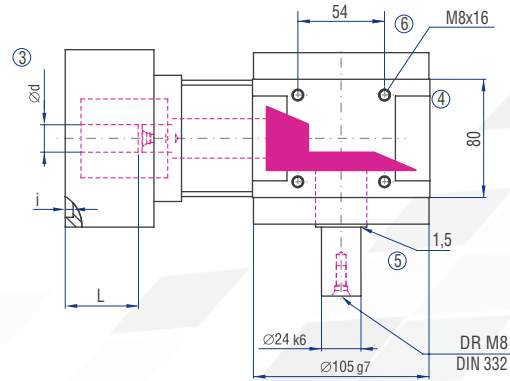
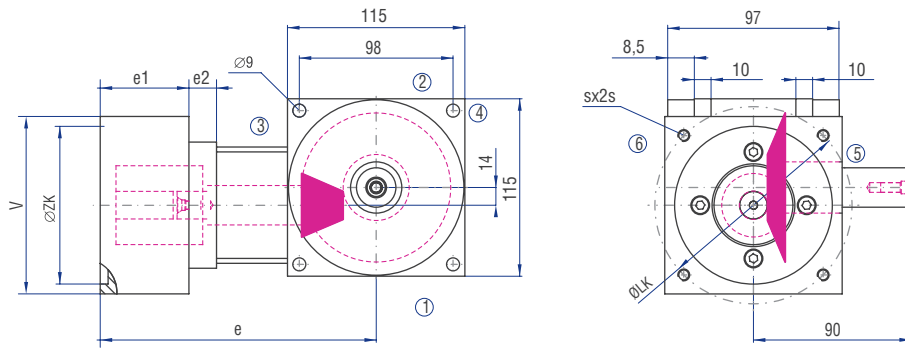
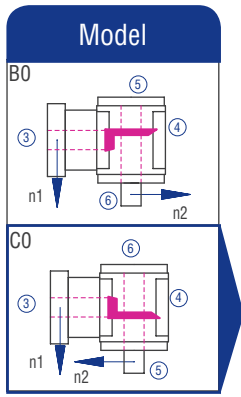
## Gearbox inertia moments/mass

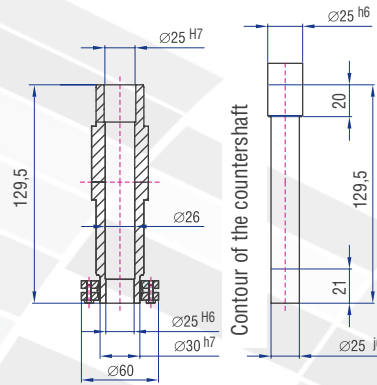
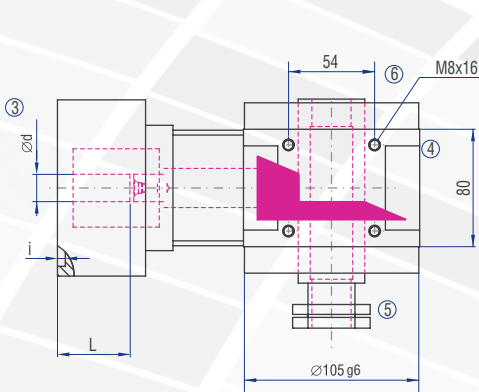
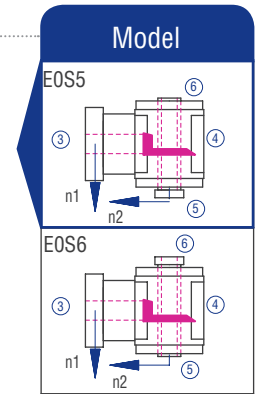
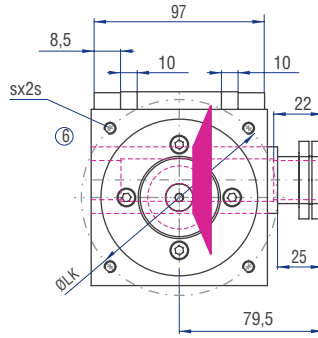
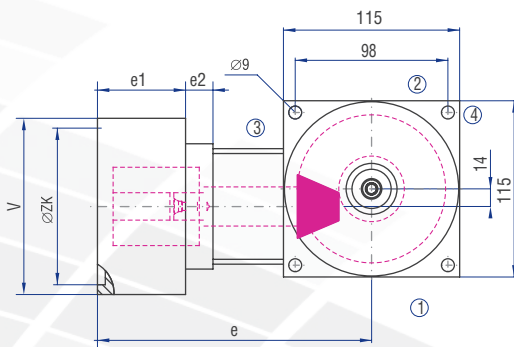
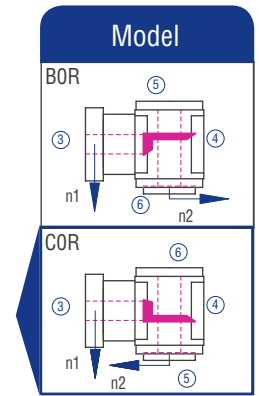
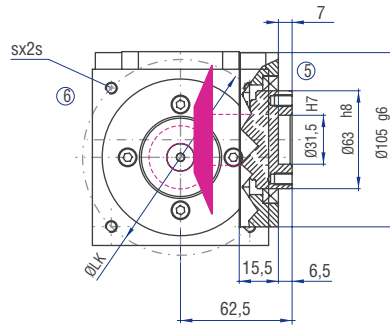
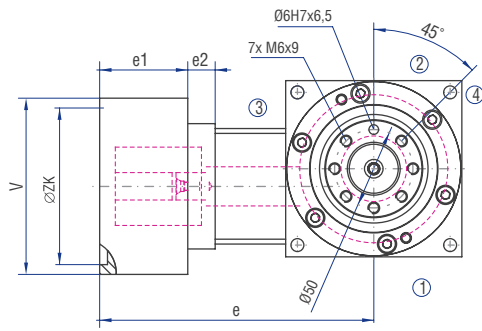
Inertia moment  $J_1$  related to the fast-rotating shaft ( $N_1$ )

Inertia moment [kgcm <sup>2</sup> ]								Mass ca. [kg]
3:1	4:1	5:1	6:1	8:1	10:1	12:1	15:1	
0,9800	0,7300	0,5800	0,5200	0,4300	0,3800	0,3600	0,3400	5.5

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

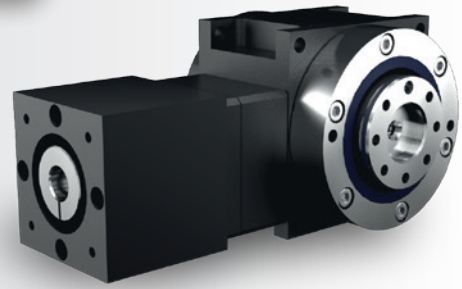
# 11.4.17 Type HC 115 – Servo hypoid gearboxes





Flange no.	d min [mm]	d max [mm]	L min [mm]	L max [mm]	LK [mm]	ZK [mm]	Thread (s)	□ V [mm]	i [mm]	e [mm]	e1 [mm]	e2 [mm]
001	8	26	24	53	63	40	M4	88	3	177.5	45	46
104	8	26	24	53	75	60	M5	88	3.5	177.5	45	46
301	8	26	24	53	95	50	M6	88	3.5	177.5	45	46
301	10	30	35.5	60	95	50	M6	119	3	184.5	54	44
401	8	26	24	53	100	80	M6	88	4	177.5	45	46
401	10	30	35.5	60	100	80	M6	119	5	184.5	54	44
502	8	26	24	53	115	95	M8	100	4	177.5	45	46
502	10	30	35.5	60	115	95	M8	119	27	184.5	54	44
601	8	26	24	53	130	95	M8	120	4.5	177.5	45	46
601	10	30	35.5	60	130	95	M8	119	27	184.5	54	44
611	8	26	24	53	130	110	M8	115	4.5	177.5	45	46
611	10	30	35.5	60	130	110	M8	119	27	184.5	54	44
701	8	28	24	53	145	110	M8	120	4.5	177.5	45	46
701	10	30	35.5	60	145	110	M8	119	27	184.5	54	44
954	8	26	24	53	90	70	M5	88	4	177.5	45	46
959	8	26	24	53	90	70	M6	88	4	177.5	45	46
959	10	30	40.5	65	145	110	M8	119	32	189.5	59	44
960	10	30	35.5	60	90	70	M6	119	8	184.5	54	44
964	8	26	24	53	70	50	M4	88	4	177.5	45	46
967	10	30	40.5	65	130	110	M8	119	32	189.5	59	44
971	10	30	40.5	65	130	95	M8	119	32	189.5	59	44
972	10	30	42.5	67	100	80	M6	119	5	191.5	61	44
986	8	26	24	53	70	50	M5	88	4	177.5	45	46

Servo gearboxes  
(precision gearboxes)

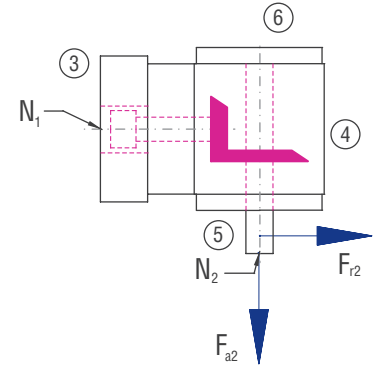


## Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.4.2
<b>Gear ratio</b>	8:1 to 15:1	
<b>Housing / Flanges</b>	Aluminium / steel	
<b>Threaded mounting holes</b>	On the sides 1 and 2 and on the drive flange	See chapter 11.4.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 6 tolerance	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 4 arcmin	See chapter 11.4.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 30,000h in S5 operation	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.4.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.4.9
<b>Motor flange</b>	Aluminium	
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For motor shafts without parallel key    Bellows coupling    BK For motor shafts with parallel key        Bellows coupling    BKN	See chapter 11.4.13

## Performance data

N <sub>1</sub> [rpm]	N <sub>1</sub> MAX [rpm]	3:1			4:1			5:1			6:1			8:1			10:1			12:1			15:1		
		T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]
2800	7000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	145	193	97	145	193
2200	7000	0	0	0	0	0	0	0	0	0	142	215	286	142	215	286	142	215	286	0	0	0	0	0	0
1500	7000	142	215	286	142	215	286	142	215	286	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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

3:1		4:1		5:1		6:1		8:1		10:1		12:1		15:1	
$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]
7200	3600	7200	3600	7200	3600	7200	3600	7200	3600	7200	3600	7200	3600	7200	3600

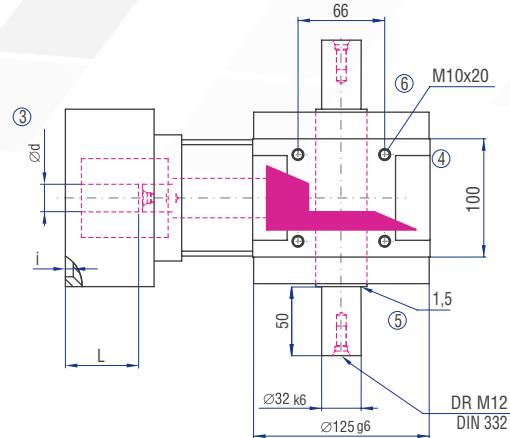
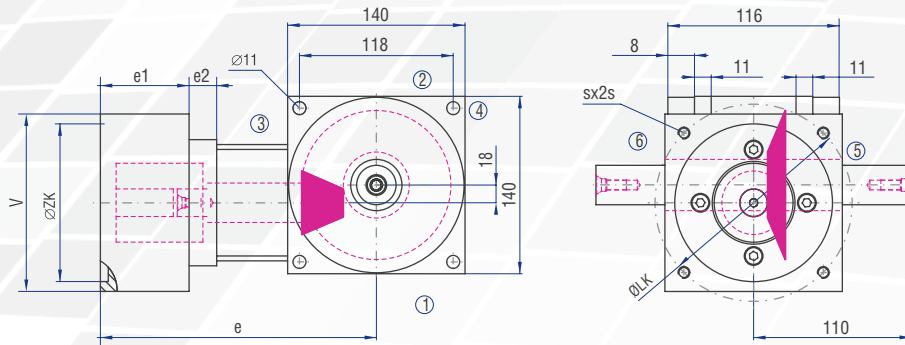
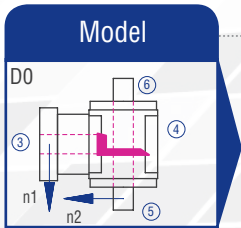
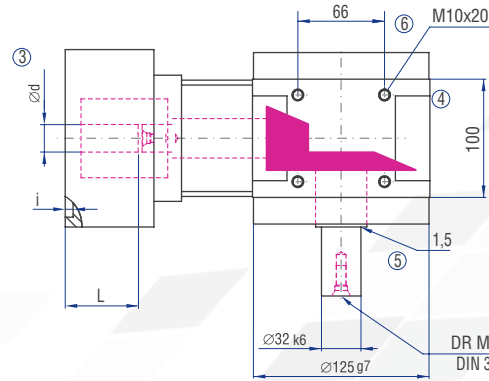
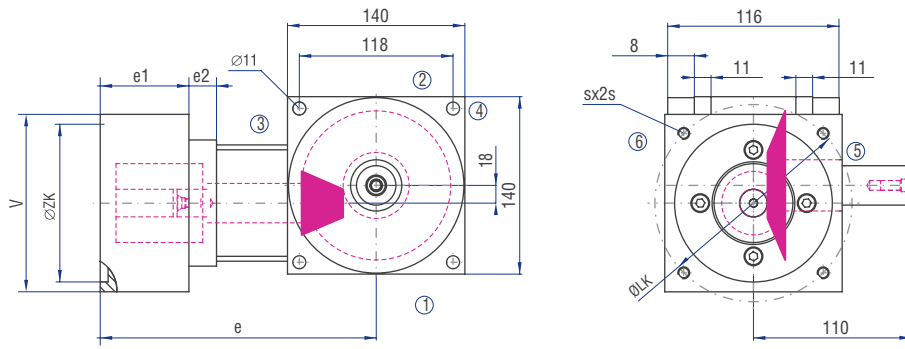
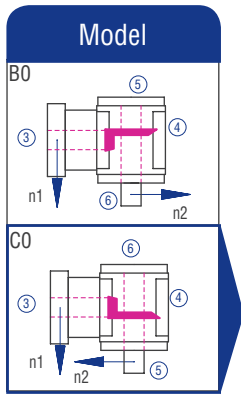
## Gearbox inertia moments/mass

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

Inertia moment [kgcm <sup>2</sup> ]								Mass ca. [kg]
3:1	4:1	5:1	6:1	8:1	10:1	12:1	15:1	
2,4200	1,7700	1,4100	1,4100	1,1200	1,0000	0,8800	0,8100	9.5

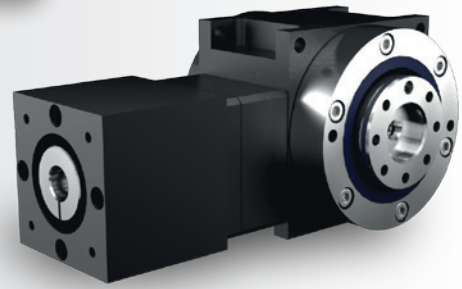
The mass of the gearbox may deviate depending on the type and the gear ratio.

# 11.4.18 Type HC 140 – Servo hypoid gearboxes







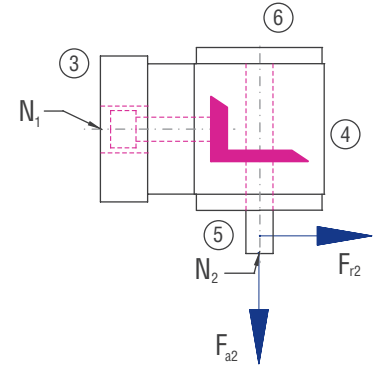


## Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.4.2
<b>Gear ratio</b>	8:1 to 15:1	
<b>Housing / Flanges</b>	Aluminium / steel	
<b>Threaded mounting holes</b>	On the sides 1 and 2 and on the drive flange	See chapter 11.4.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 6 tolerance	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 4 arcmin	See chapter 11.4.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 30,000h in S5 operation	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.4.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.4.9
<b>Motor flange</b>	Aluminium	
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For motor shafts without parallel key    Bellows coupling    BK For motor shafts with parallel key        Bellows coupling    BKN	See chapter 11.4.13

## Performance data

N <sub>1</sub> [rpm]	N <sub>1</sub> MAX [rpm]	3:1			4:1			5:1			6:1			8:1			10:1			12:1			15:1		
		T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]
2300	6000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	182	275	365	182	275	365
1800	6000	0	0	0	0	0	0	0	0	0	266	398	528	266	398	528	266	398	528	0	0	0	0	0	0
1150	6000	266	398	528	266	398	528	266	398	528	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



## Permissible radial force $F_{r2}$ and axial force $F_{a2}$ on shaft N<sub>2</sub>

3:1		4:1		5:1		6:1		8:1		10:1		12:1		15:1	
$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]
10000	5000	10000	5000	10000	5000	10000	5000	10000	5000	10000	5000	10000	5000	10000	5000

## Gearbox inertia moments/mass

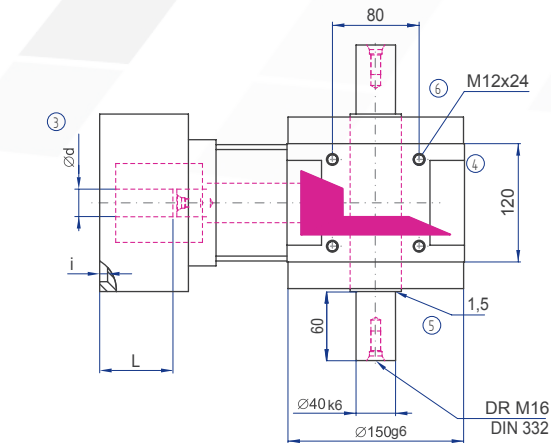
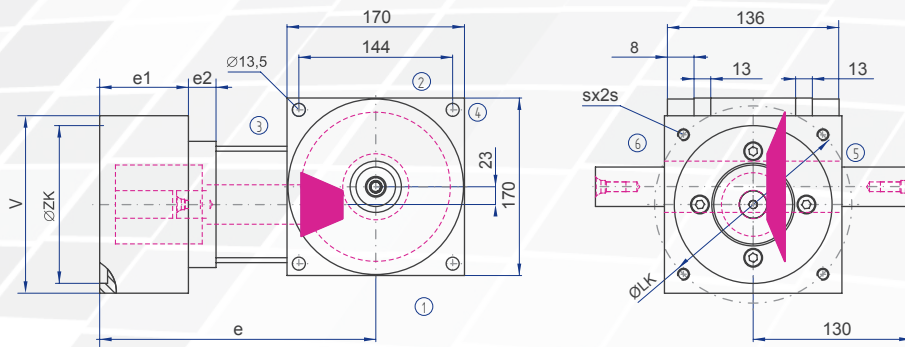
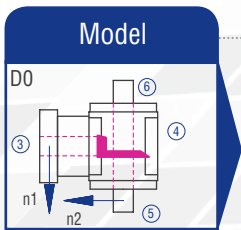
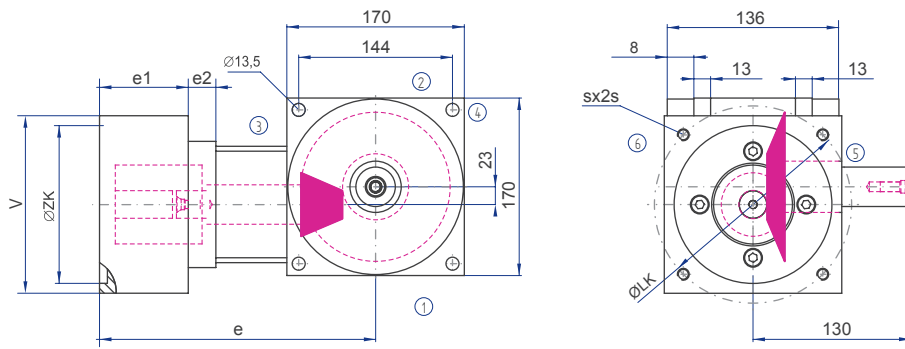
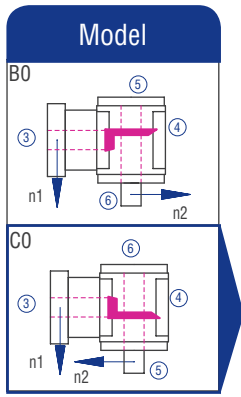
Inertia moment  $J_1$  related to the fast-rotating shaft (N<sub>1</sub>)

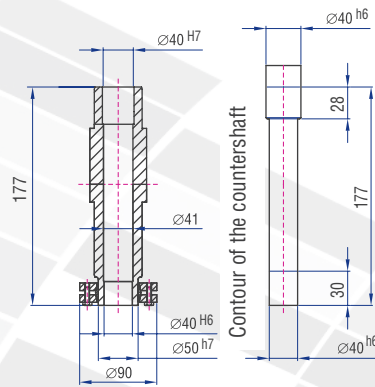
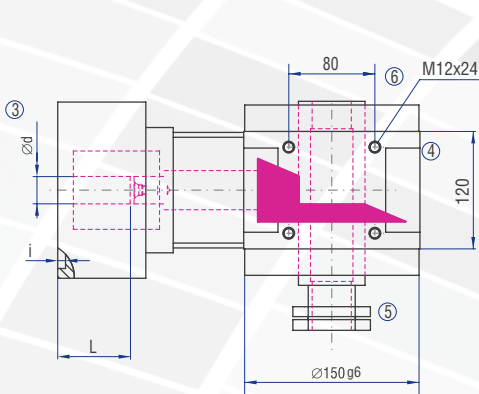
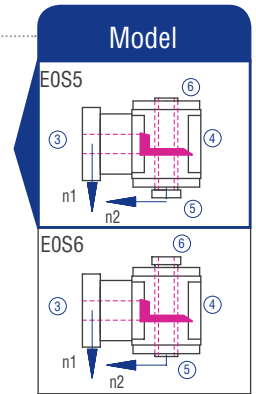
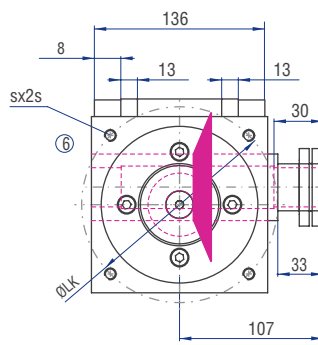
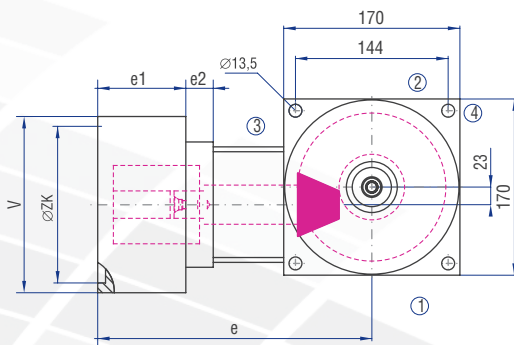
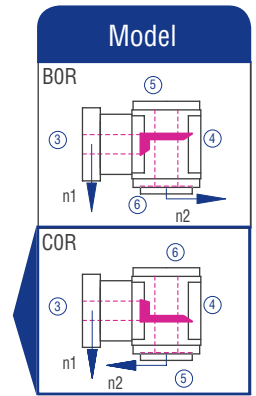
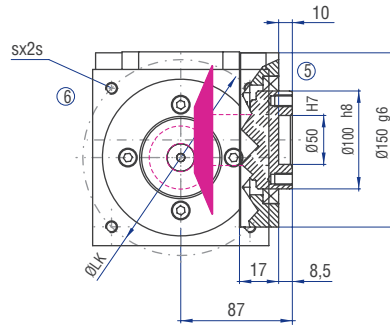
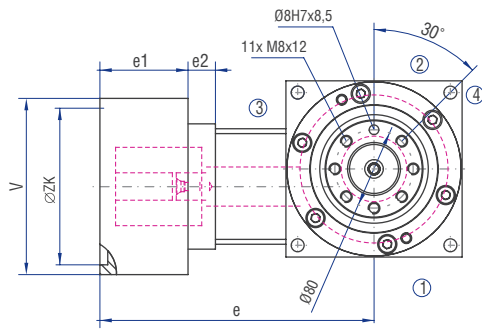
Inertia moment [kgcm <sup>2</sup> ]								Mass ca. [kg]
3:1	4:1	5:1	6:1	8:1	10:1	12:1	15:1	
7,1200	5,0900	4,0000	3,6500	2,8500	2,4600	2,2500	2,0700	15.5

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

Servo gearboxes  
(precision gearboxes)

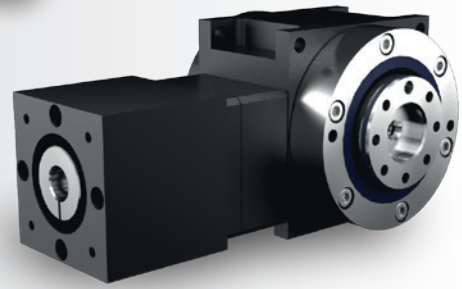
# 11.4.19 Type HC 170 – Servo hypoid gearboxes





Flange no.	d min [mm]	d max [mm]	L min [mm]	L max [mm]	LK [mm]	ZK [mm]	Thread (s)	□ V [mm]	i [mm]	e [mm]	e1 [mm]	e2 [mm]
502	19	42	39	65	115	95	M8	137	6	226.5	61	53.5
601	19	42	39	65	130	95	M8	137	6	226.5	61	53.5
611	19	42	39	65	130	110	M8	137	25	226.5	61	53.5
802	19	42	39	65	165	110	M10	137	5	226.5	61	53.5
811	19	42	39	65	165	130	M10	137	16	226.5	61	53.5
811	19	42	46	80	165	130	M10	157	5	242	62	68
902	19	42	39	65	215	130	M12	200	6	226.5	61	53.5
902	19	42	46	80	215	130	M12	200	5	242	62	68
911	19	42	39	65	215	180	M12	200	5	226.5	61	53.5
912	19	42	46	80	215	180	M12	200	5	242	62	68
931	19	42	84	110	215	180	M12	200	17	271.5	106	53.5
932	19	42	77.5	103	215	180	M12	200	17	265	99.5	53.5
951	19	42	44	70	145	110	M8	137	32	231.5	66	53.5
952	19	42	46	80	200	114.3	M12	200	6	242	62	68
952	19	42	84	110	200	114.3	M12	200	6	271.5	106	53.5

Servo gearboxes  
(precision gearboxes)

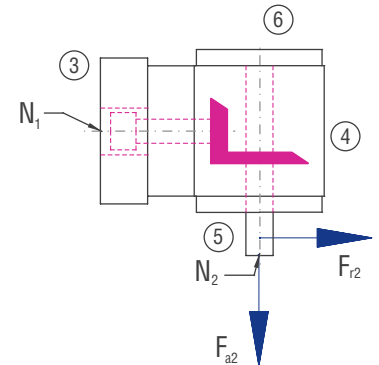


## Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.4.2
<b>Gear ratio</b>	8:1 to 15:1	
<b>Housing / Flanges</b>	Aluminium / steel	
<b>Threaded mounting holes</b>	On the sides 1 and 2 and on the drive flange	See chapter 11.4.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 6 tolerance	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 4 arcmin	See chapter 11.4.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 30,000h in S5 operation	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.4.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.4.9
<b>Motor flange</b>	Aluminium	
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For motor shafts without parallel key    Bellows coupling    BK For motor shafts with parallel key        Bellows coupling    BKN	See chapter 11.4.13

## Performance data

N <sub>1</sub> [rpm]	N <sub>1</sub> MAX [rpm]	3:1			4:1			5:1			6:1			8:1			10:1			12:1			15:1		
		T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]
1600	5000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	512	767	1022	512	767	1022
1200	5000	0	0	0	0	0	0	0	0	0	723	1084	1450	723	1084	1450	723	1084	1450	0	0	0	0	0	0
700	5000	723	1084	1450	723	1084	1450	723	1084	1450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



## Permissible radial force $F_{r2}$ and axial force $F_{a2}$ on shaft N<sub>2</sub>

3:1		4:1		5:1		6:1		8:1		10:1		12:1		15:1	
$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]
15000	7500	15000	7500	15000	7500	15000	7500	15000	7500	15000	7500	15000	7500	15000	7500

## Gearbox inertia moments/mass

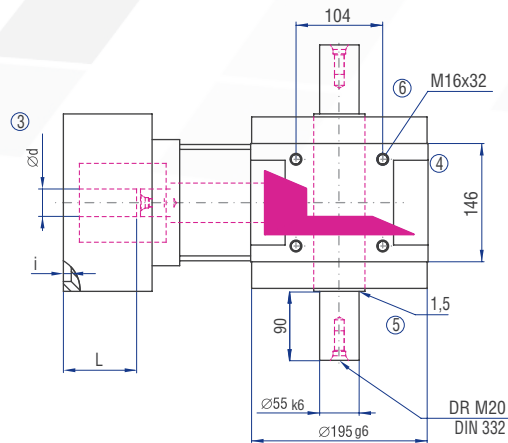
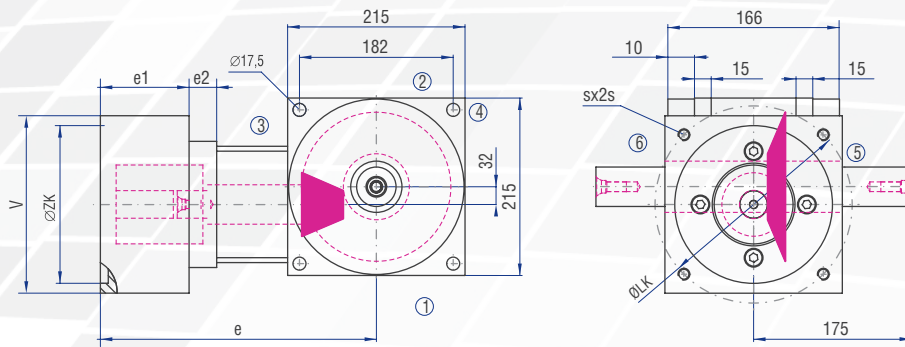
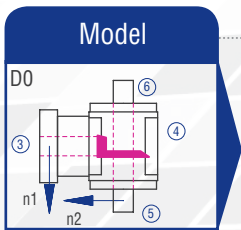
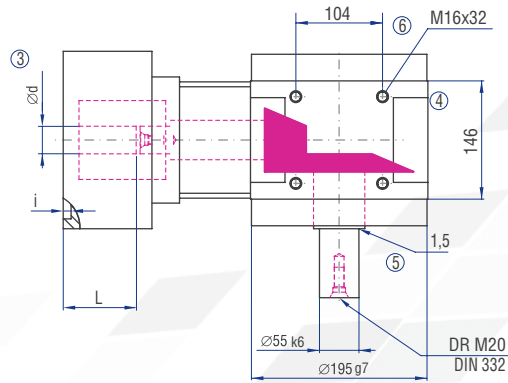
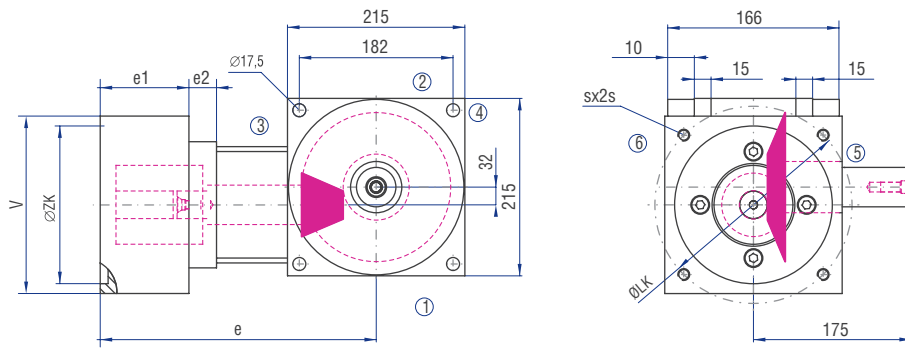
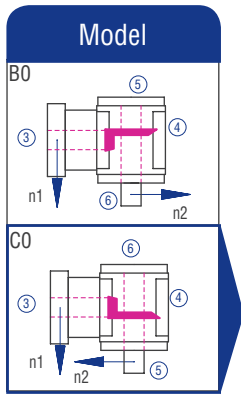
Inertia moment  $J_1$  related to the fast-rotating shaft (N<sub>1</sub>)

Inertia moment [kgcm <sup>2</sup> ]								Mass ca. [kg]
3:1	4:1	5:1	6:1	8:1	10:1	12:1	15:1	
26,9600	17,4400	13,5300	12,2500	8,9500	7,3800	6,4700	5,7600	32.5

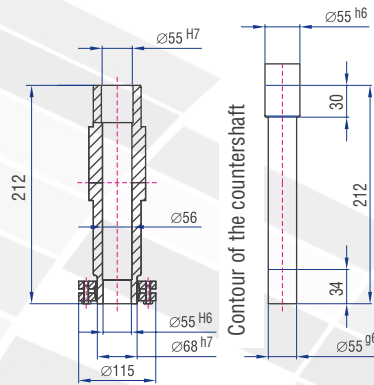
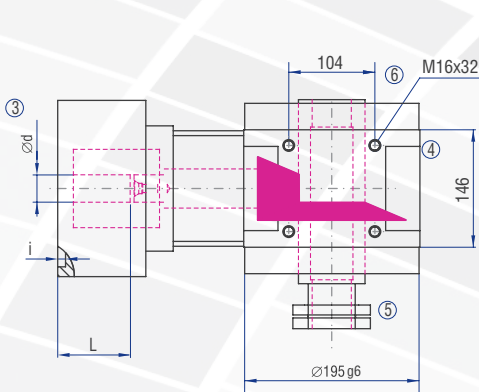
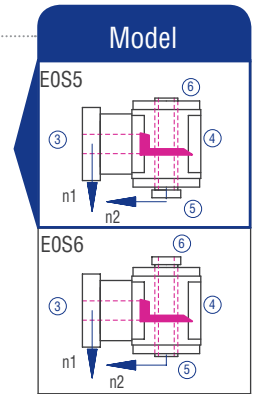
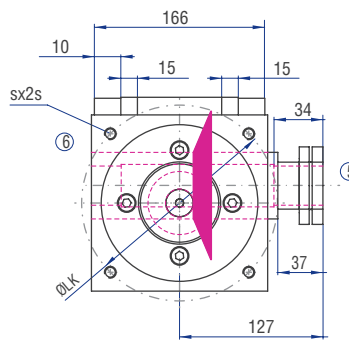
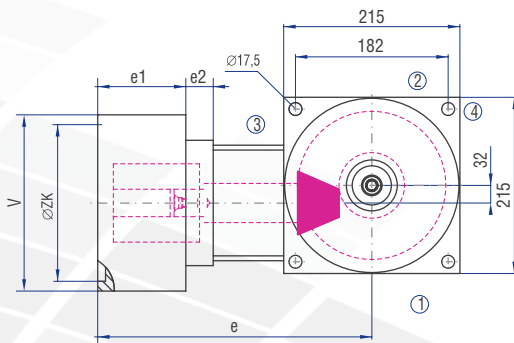
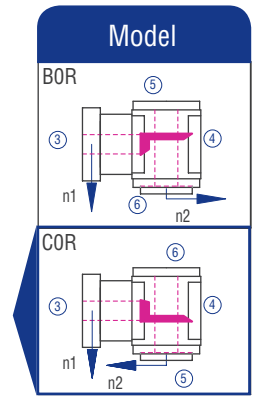
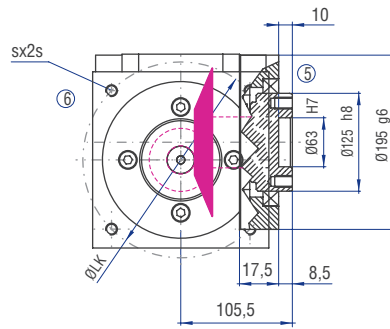
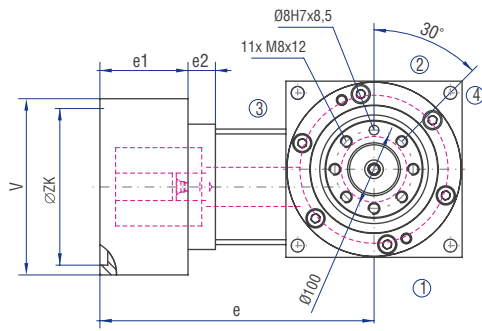
The mass of the gearbox may deviate depending on the type and the gear ratio.

Servo gearboxes  
(precision gearboxes)

# 11.4.20 Type HC 215 – Servo hypoid gearboxes

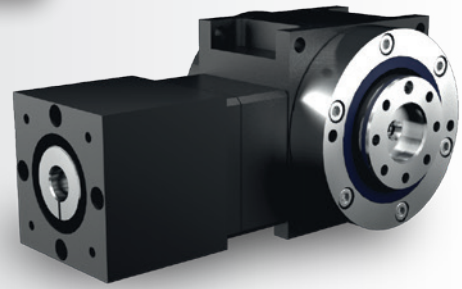






Flange no.	d min [mm]	d max [mm]	L min [mm]	L max [mm]	LK [mm]	ZK [mm]	Thread (s)	□ V [mm]	i [mm]	e [mm]	e1 [mm]	e2 [mm]
811	24	60	44.5	82	165	130	M10	198	5	280.5	76	59
902	24	60	44.5	82	215	130	M12	198	5	280.5	76	59
913	24	60	44.5	82	215	180	M12	198	4.5	280.5	76	59
952	24	60	56.5	94	200	114.3	M12	198	10	292.5	88	59
960	24	60	72.5	110	300	250	M16	264	7	308.5	141	22
961	24	60	56.5	94	265	230	M12	264	6	292.5	88	59
963	24	60	79.5	117	215	180	M12	198	4.5	315.5	111	59

Servo gearboxes  
(precision gearboxes)

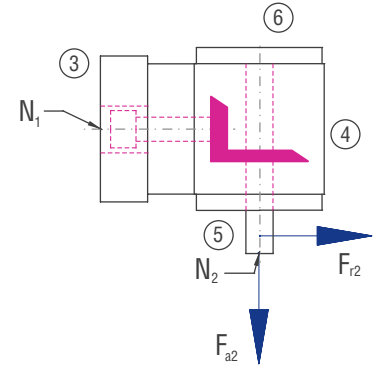


## Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Spiral-toothed, hardened bevel gears	See chapter 11.4.2
<b>Gear ratio</b>	8:1 to 15:1	
<b>Housing / Flanges</b>	Aluminium / steel	
<b>Threaded mounting holes</b>	On the sides 1 and 2 and on the drive flange	See chapter 11.4.4
<b>Shaft</b>	Material 1 C45, shaft ends greased Fit with ISO 6 tolerance	See chapter 4.6.2
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO 6 tolerance	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 4 arcmin	See chapter 11.4.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 30,000h in S5 operation	See chapter 4.9.1
<b>Oil change intervals</b>	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 11.4.9
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.4.9
<b>Motor flange</b>	Aluminium	
<b>Coupling</b>	Insertable, flexible claw coupling, suitable for servo-motors For motor shafts without parallel key    Bellows coupling    BK For motor shafts with parallel key        Bellows coupling    BKN	See chapter 11.4.13

## Performance data

N <sub>1</sub> [rpm]	N <sub>1</sub> MAX [rpm]	3:1			4:1			5:1			6:1			8:1			10:1			12:1			15:1		
		T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2B</sub> [Nm]	T <sub>2NOT</sub> [Nm]
1300	4500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1023	1533	2044	1023	1533	2044
1000	4500	0	0	0	0	0	0	0	0	0	0	1444	2165	2880	1444	2165	2880	1444	2165	2880	0	0	0	0	0
550	4500	1444	2165	2880	1444	2165	2880	1444	2165	2880	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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

3:1		4:1		5:1		6:1		8:1		10:1		12:1		15:1	
$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]	$F_{r2}$ [N]	$F_{a2}$ [N]
22500	11250	22500	11250	22500	11250	22500	11250	22500	11250	22500	11250	22500	11250	22500	11250

## Gearbox inertia moments/mass

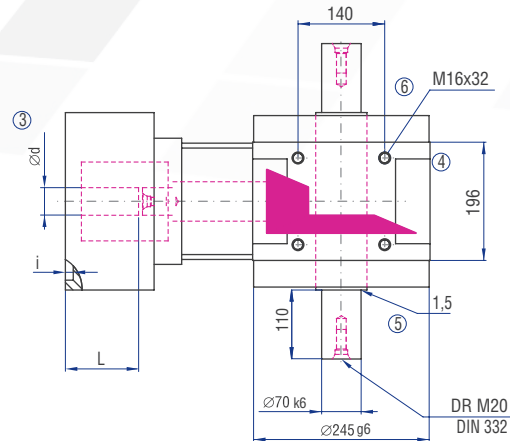
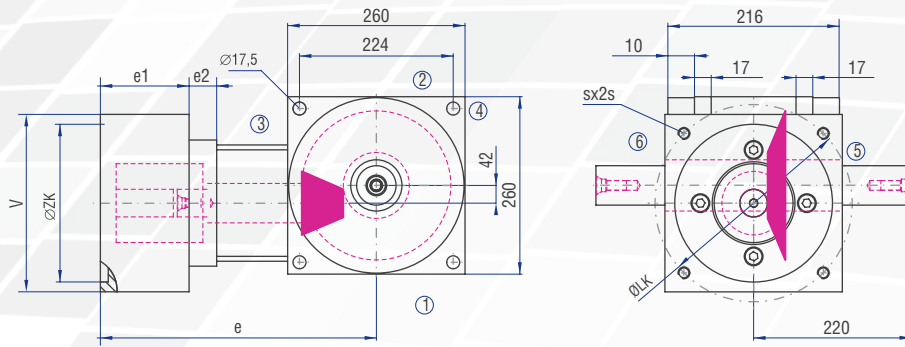
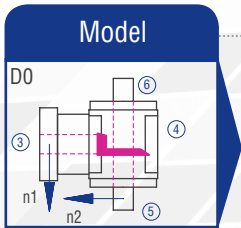
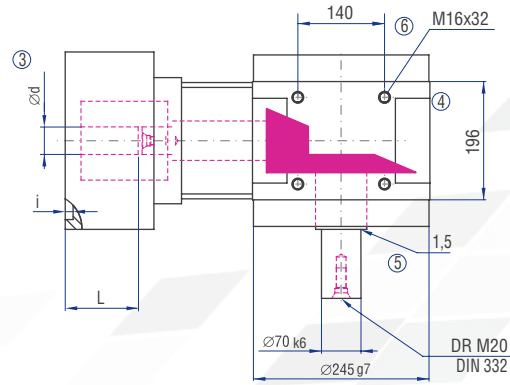
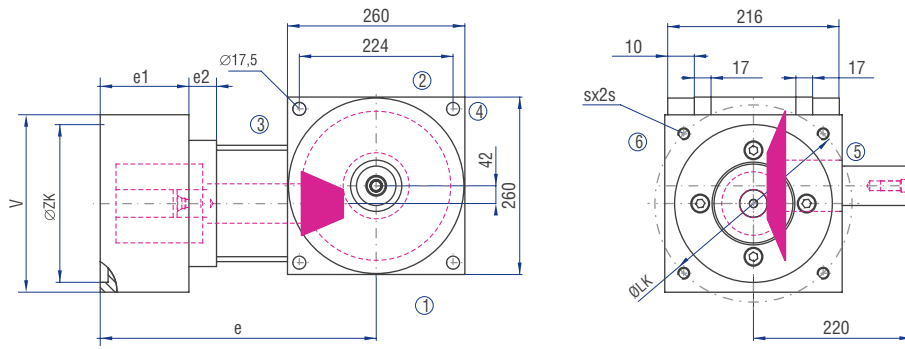
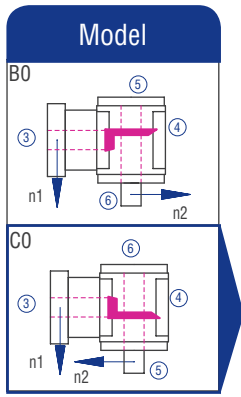
Inertia moment  $J_1$  related to the fast-rotating shaft ( $N_1$ )

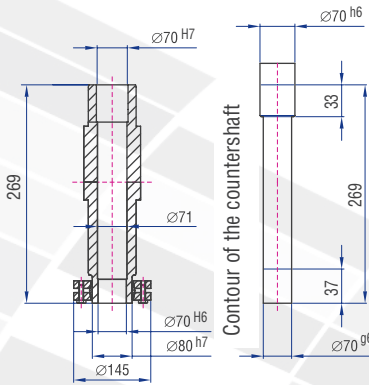
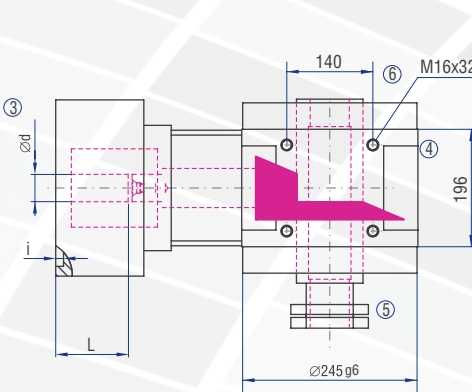
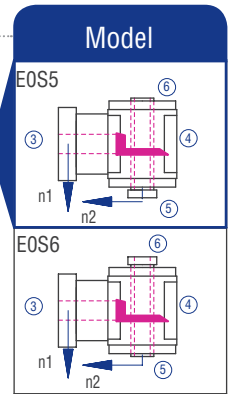
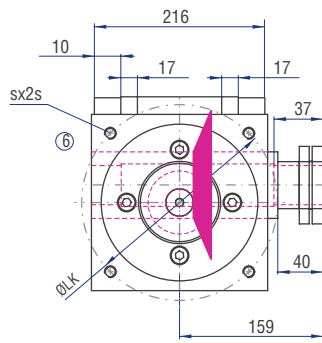
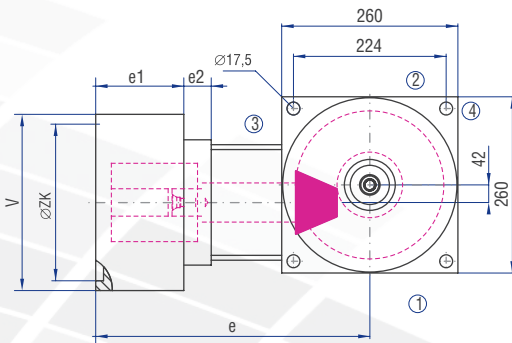
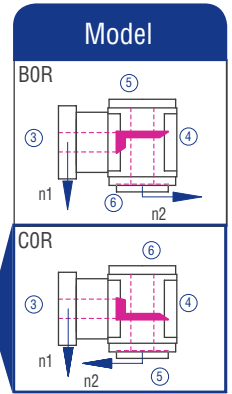
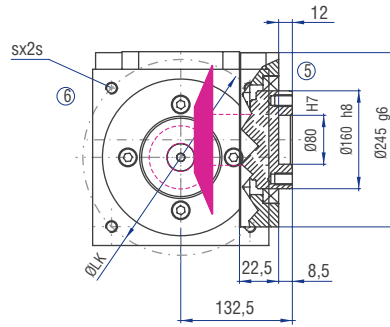
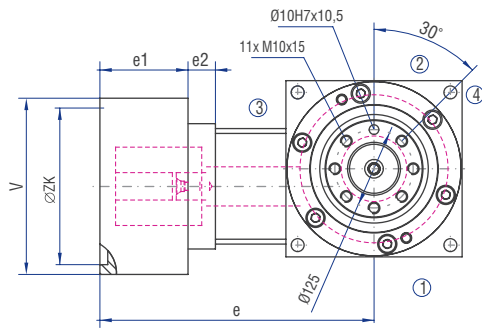
Inertia moment [kgcm <sup>2</sup> ]								Mass ca. [kg]
3:1	4:1	5:1	6:1	8:1	10:1	12:1	15:1	
91,4700	62,4300	44,2900	39,5500	27,0700	21,4300	18,1400	15,5300	60

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

Servo gearboxes  
(precision gearboxes)

# 11.4.21 Type HC 260 – Servo hypoid gearboxes





Contour of the countershaft

Flange no.	d min [mm]	d max [mm]	L min [mm]	L max [mm]	LK [mm]	ZK [mm]	Thread (s)	□ V [mm]	i [mm]	e [mm]	e1 [mm]	e2 [mm]
811	24	60	44.5	75	165	130	M10	198	5	312.5	76	59.5
902	24	60	44.5	75	215	130	M12	198	5	312.5	76	59.5
913	24	60	44.5	75	215	180	M12	198	4.5	312.5	76	59.5
916	40	75	61.5	110	350	300	M16	320	12	347.5	110	60.5
952	24	60	50	87	200	114.3	M12	198	10	324.5	88	59.5
961	24	60	50	87	265	230	M12	264	6	324.5	88	59.5
962	24	60	72.5	103	300	250	M16	264	6	340.5	104	59.5
963	24	60	79.5	110	215	180	M12	198	4.5	347.5	111	59.5

Servo gearboxes  
(precision gearboxes)

# 11.5 Type SC – Servo worm gearboxes

## 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 Tothing

A gear set consists of worm shaft and worm gear.

The worm shaft made of carburised steel is hardened, the tothing is ground. The worm gear consists of a high-quality bronze alloy, the tothing 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 <u>housing surfaces</u> on the gearbox side	Threaded mounting holes are in the <u>flanges</u> 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  $n_1$  and is identified by  $N_1$ .

The slowly rotating shaft has the speed  $n_2$  and is identified by  $N_2$ .

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  $i$ .

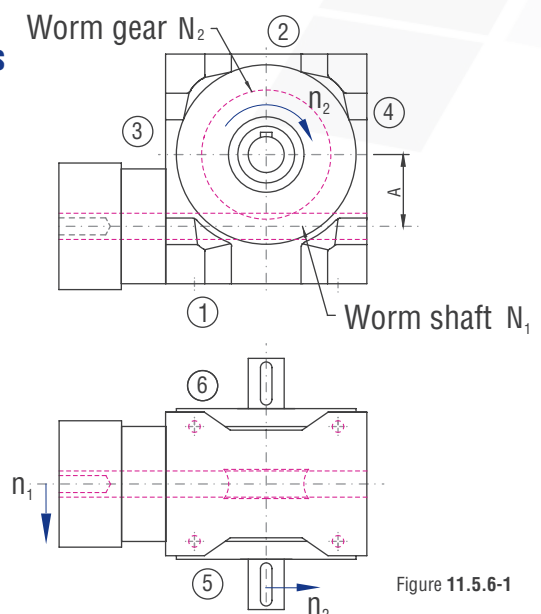


Figure 11.5.6-1

## 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
<b>Letter</b>	A	Oil viscosity 460	Table 11.5.9-1
<b>Numeral</b>	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

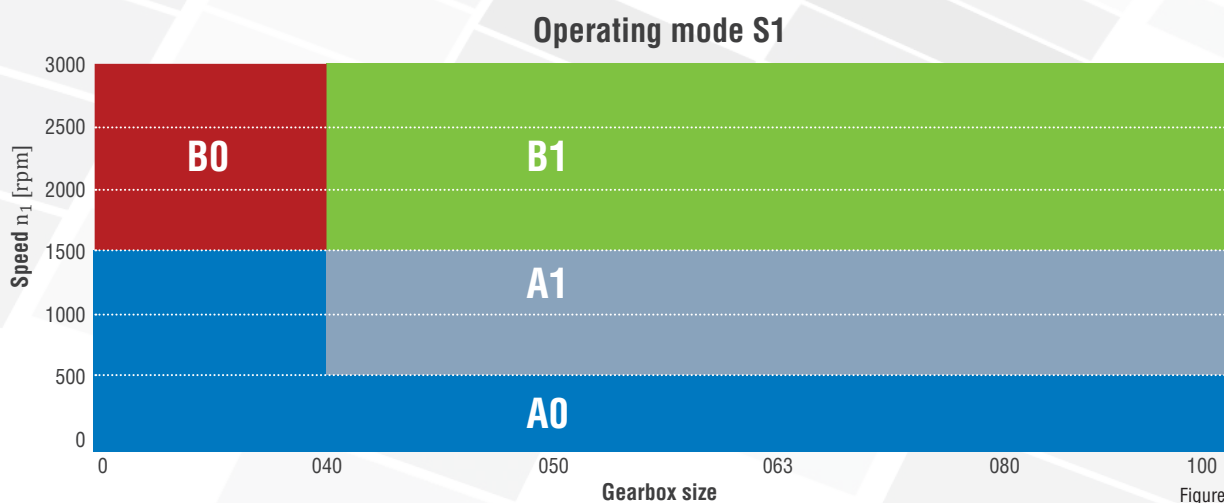


Figure 11.5.9-1

# 11.5 Type SC – Servo worm gearboxes

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.

### Installation position

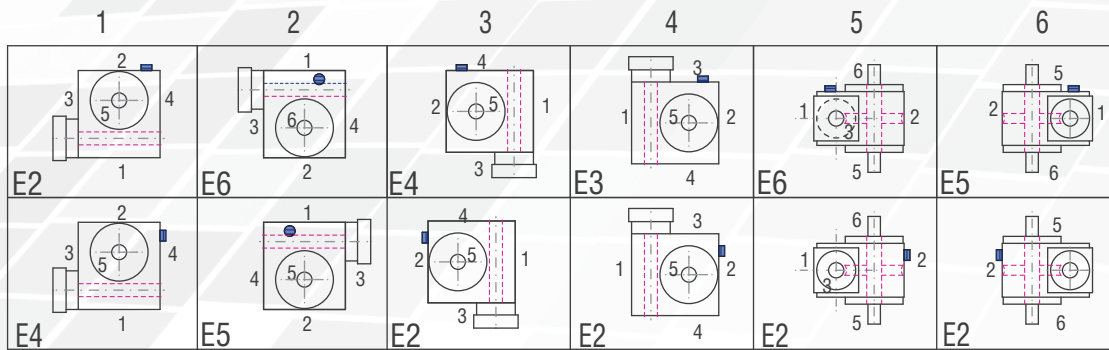


Figure 11.5.10-1

## 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
/O000	Standard	$\leq 30$ arcmin
/S2	Standard	$\leq 10$ arcmin
/S1	Standard	$\leq 6$ arcmin
/S0	Special gear set	$\leq 3-6$ 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								
K19	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							
K24	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					
K28	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			
K38	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	

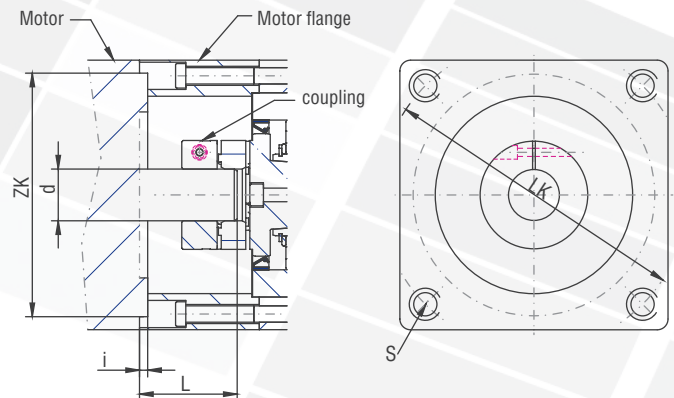
Table 11.5.13-1

## 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



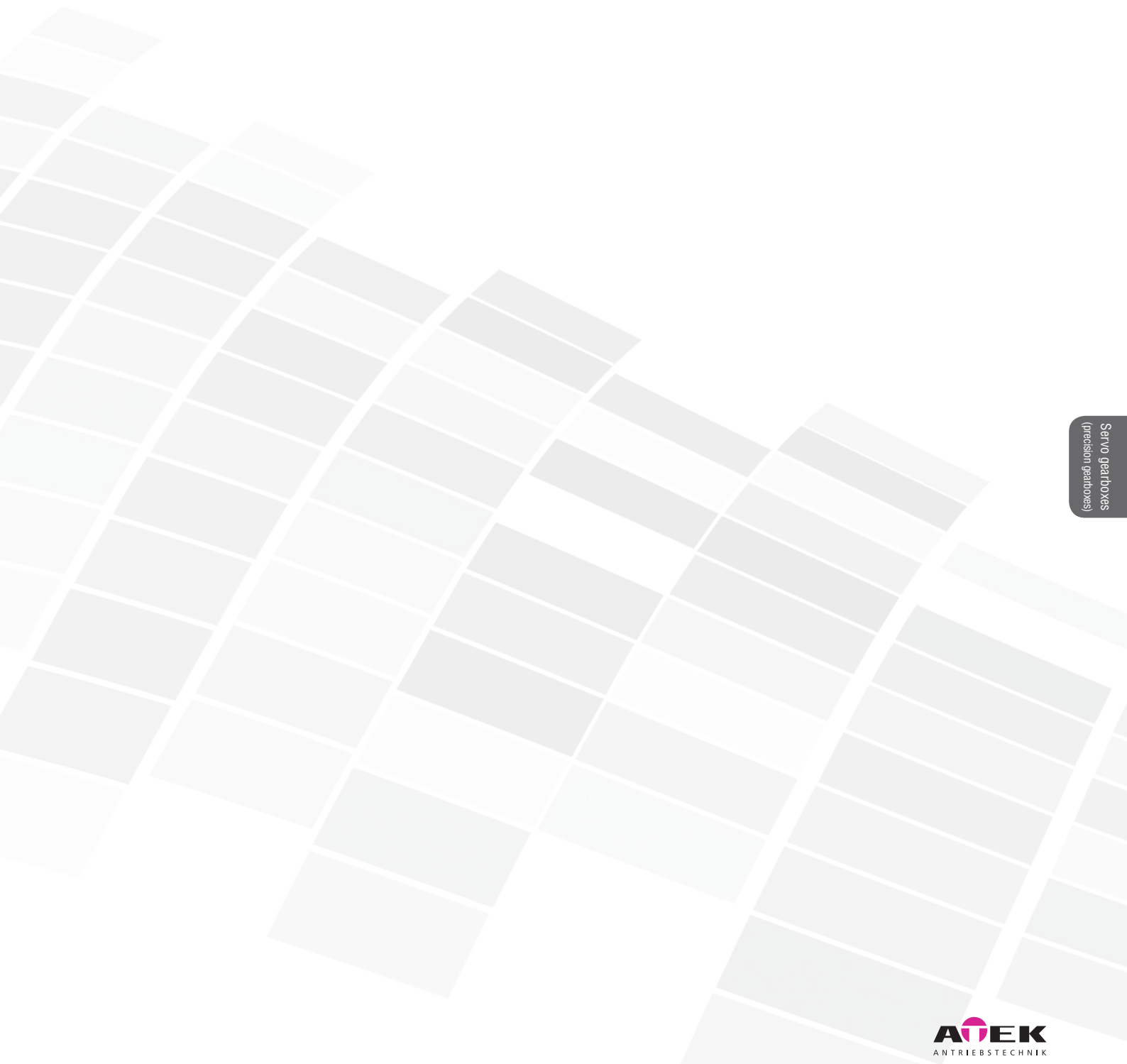
The values for the centring height (i) and the thread sizes (s) can be found on the respective pages. The flange tolerances are dimensioned for servo-motors of tolerance class N.

## 11.5 Type SC – Servo worm gearboxes

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

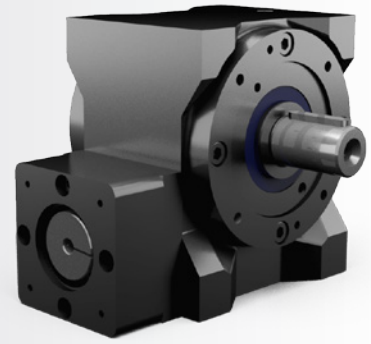


Servo gearboxes  
(precision gearboxes)

# 11.5 Type SC – Servo worm gearboxes

## 11.5.15 Features

- Gear ratios:  $i = 10:1$  to  $20:1$  ( $i > 26$  upon request)
- Maximum acceleration torques up to  $T_{2B} = 1100 \text{ Nm}$
- 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

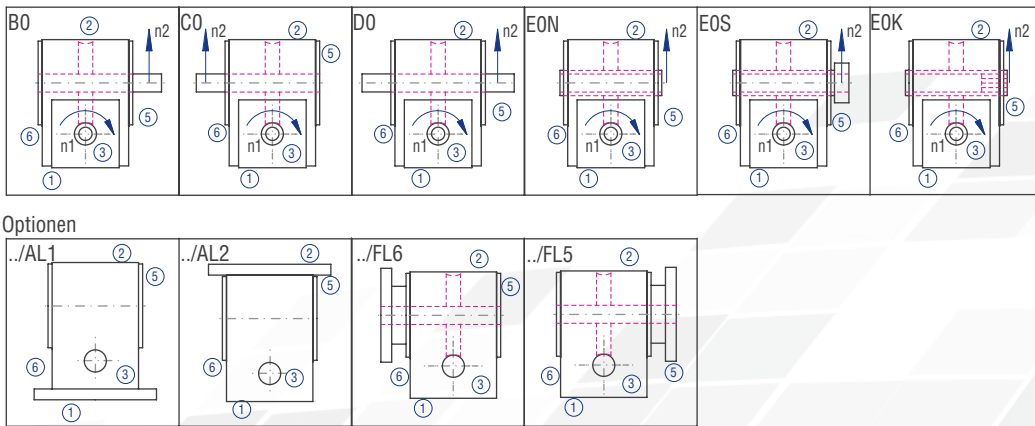


Figure 11.5.15-1; Models

### 11.5.15.2 Gearbox sides

The example shows the Model B0

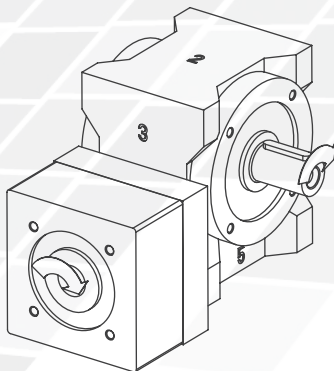


Figure 11.5.15-3; Gearbox sides

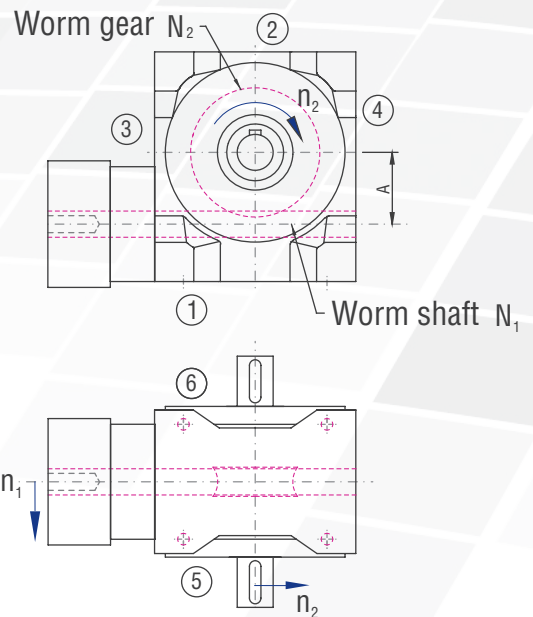


Figure 11.5.15-2; Shaft designs

### 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
<b>Description</b>	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 $\varnothing$ x length	Flange no.		See chapter "Coupling"

## 11.5.15.4 Overview of performance data

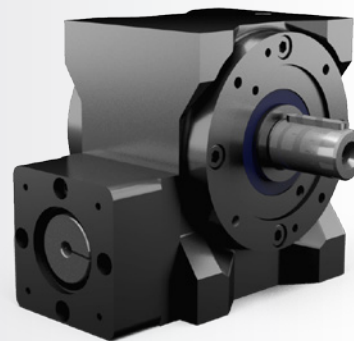
The performance data and torques listed in the selection tables are only valid if the gearboxes are used in the installation positions 1, 5 or 6. If the worm shaft is vertical or located at the top (installation position 3, 4 or 2), 90% of the values specified must be expected.

Please enquire other gear ratios.

i(-)	n <sub>1</sub> [1/min]	i <sub>ist</sub>	n <sub>2</sub> [1/min]	040	050	063	080	100
				T <sub>2N</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2N</sub> [Nm]	T <sub>2N</sub> [Nm]
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	
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	

	040	050	063	080	100
T <sub>2B</sub> (S5) [Nm]	50	112	216	408	1006
T <sub>2Not</sub> (S5) [Nm]	77	152	306	625	1090
N <sub>1 max</sub> [U/min]	6000	5500	5000	4500	3200
T <sub>2B</sub> (S5) [Nm]	58	133	259	498	1112
T <sub>2Not</sub> (S5) [Nm]	90	179	355	725	1440
N <sub>1 max</sub> [U/min]	6500	5500	5000	4500	3200

Table 11.5.15-1



## Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Hardened and ground worm shaft / bronze worm gear	See chapter 11.5.2
<b>Gear ratio</b>	10:1 to 20:1	
<b>Housing / Flanges</b>	Grey cast iron / aluminium	
<b>Threaded mounting holes</b>	On gearbox side 1 and on the flanges	See chapter 11.5.4
<b>Shaft</b>	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
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO H7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 20 arcmin	See chapter 11.5.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	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
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.5.9
<b>Motor flange</b>	Aluminium	See chapter 11.5.14
<b>Coupling</b>	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

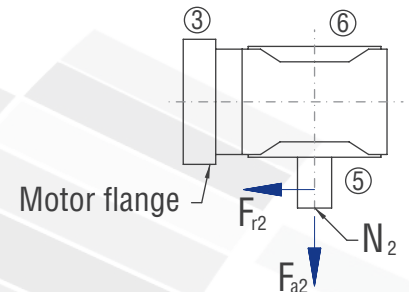
I rated I ist	10:1		20:1	
	$n_2$ [1/min]	$T_{2N}$ [Nm]	$n_2$ [1/min]	$T_{2N}$ [Nm]
4000	410	32	205	36
3000	308	37	154	41
2400	246	42	123	46
1500	154	48	77	51

## Torques in operating mode S5

Coupling size	d [mm]	I rated $T_{2N}$ [Nm] $n_{1max}$ [U/min]	10:1		20:1	
			KN	KNN/SN	KN	KNN/SN
K14	9	$T_{2B}$ [Nm]	50,0	50,0	58,0	58,0
		$T_{2NOT}$ [Nm]	68,3	77,0	90,0	90,0
	11	$T_{2B}$ [Nm]	50,0	50,0	58,0	58,0
		$T_{2NOT}$ [Nm]	77,0	77,0	90,0	90,0
	14	$T_{2B}$ [Nm]	50,0	50,0	58,0	58,0
		$T_{2NOT}$ [Nm]	77,0	77,0	90,0	90,0
16	$T_{2B}$ [Nm]	50,0	50,0	58,0	58,0	
	$T_{2NOT}$ [Nm]	77,0	77,0	90,0	90,0	
K19	9	$T_{2B}$ [Nm]	50,0	50,0	58,0	58,0
		$T_{2NOT}$ [Nm]	77,0	77,0	90,0	90,0
	11	$T_{2B}$ [Nm]	50,0	50,0	58,0	58,0
		$T_{2NOT}$ [Nm]	77,0	77,0	90,0	90,0
	14	$T_{2B}$ [Nm]	50,0	50,0	58,0	58,0
		$T_{2NOT}$ [Nm]	77,0	77,0	90,0	90,0
	16	$T_{2B}$ [Nm]	50,0	50,0	58,0	58,0
		$T_{2NOT}$ [Nm]	77,0	77,0	90,0	90,0
	19	$T_{2B}$ [Nm]	50,0	50,0	58,0	58,0
		$T_{2NOT}$ [Nm]	77,0	77,0	90,0	90,0
	24	$T_{2B}$ [Nm]	50,0	50,0	58,0	58,0
		$T_{2NOT}$ [Nm]	77,0	77,0	90,0	90,0

## 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]
< 80	970	485	1250	625	1380	690	1600	800	1800	900	2500	1250



Servo gearboxes  
(precision gearboxes)

## Gearbox inertia moments/mass

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

i rated [-]	Inertia moment [kgcm <sup>2</sup> ]	
	10:1	20:1
J [kgcm <sup>2</sup> ]	0.1801	0.1476

Mass  
ca. [kg]  
7

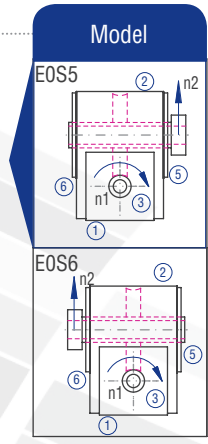
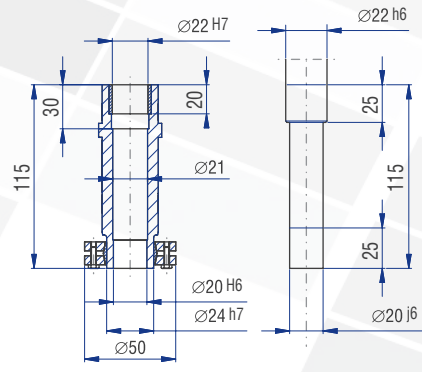
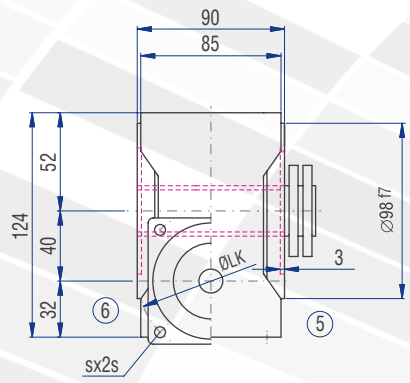
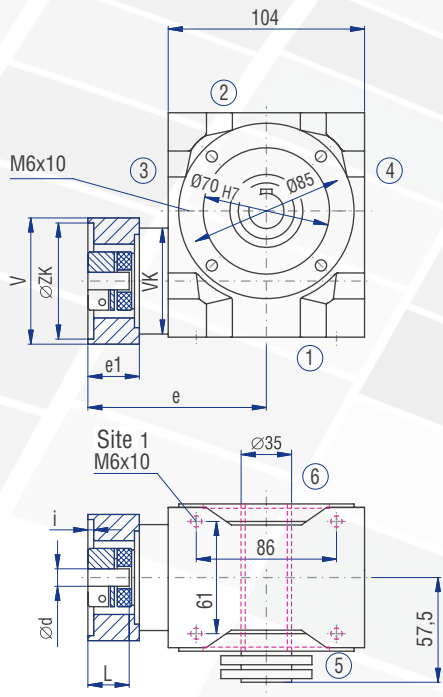
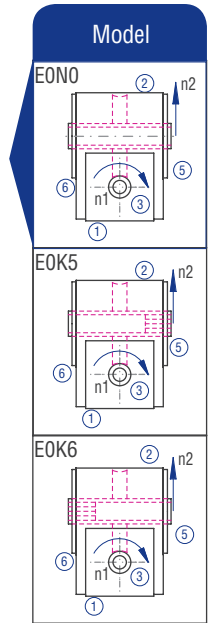
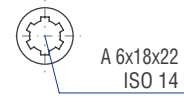
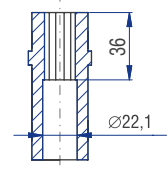
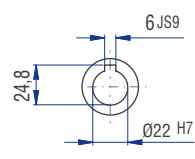
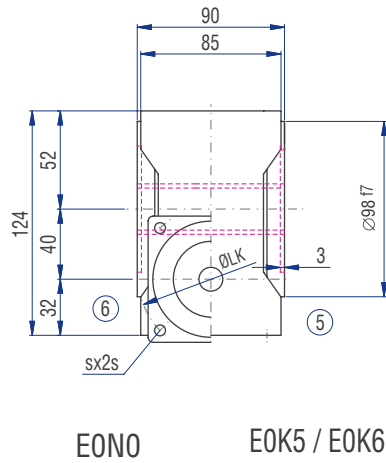
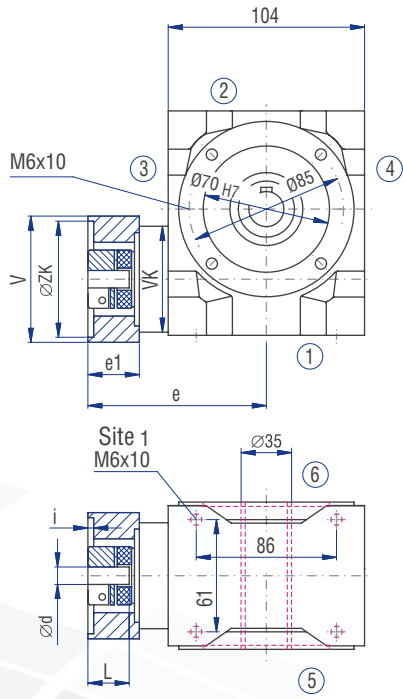
## Inertia moment Coupling J

	KN	KNN	SN
	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]
K14	0.0606	0.0606	0.1446
K19	0.4229	0.4229	0.6349

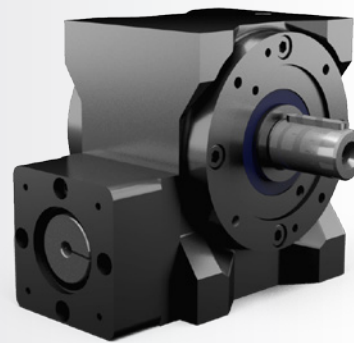
The mass of the gearbox may deviate depending on the flange size and the gear ratio.







Servo gearboxes  
(precision gearboxes)



## Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Hardened and ground worm shaft / bronze worm gear	See chapter 11.5.2
<b>Gear ratio</b>	10:1 to 20:1	
<b>Housing / Flanges</b>	Grey cast iron / aluminium	
<b>Threaded mounting holes</b>	On gearbox side 1 and on the flanges	See chapter 11.5.4
<b>Shaft</b>	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
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO H7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 20 arcmin	See chapter 11.5.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	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
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.5.9
<b>Motor flange</b>	Aluminium	See chapter 11.5.14
<b>Coupling</b>	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	10:1		20:1	
	$n_2$ [1/min]	$T_{2N}$ [Nm]	$n_2$ [1/min]	$T_{2N}$ [Nm]
4000	421	70	211	72
3000	316	83	158	85
2400	253	97	126	98
1500	158	110	79	111

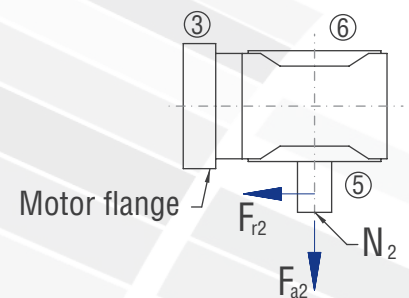
## Torques in operating mode S5

Coupling size	d [mm]	I rated $T_{2N}$ [Nm] $n_{1max}$ [U/min]	10:1		20:1	
			KN	KNN/SN	KN	KNN/SN
K19	9	$T_{2B}$ [Nm]	112,0		133,0	
		$T_{2NOT}$ [Nm]	152,0		179,0	
	11	$T_{2B}$ [Nm]	112,0	112,0	133,0	133,0
		$T_{2NOT}$ [Nm]	152,0	152,0	179,0	179,0
	14	$T_{2B}$ [Nm]	112,0	112,0	133,0	133,0
		$T_{2NOT}$ [Nm]	152,0	152,0	179,0	179,0
	16	$T_{2B}$ [Nm]	112,0	112,0	133,0	133,0
		$T_{2NOT}$ [Nm]	152,0	152,0	179,0	179,0
	19	$T_{2B}$ [Nm]	112,0	112,0	133,0	133,0
		$T_{2NOT}$ [Nm]	152,0	152,0	179,0	179,0
24	$T_{2B}$ [Nm]	112,0		133,0		
	$T_{2NOT}$ [Nm]	152,0		179,0		
K24	11	$T_{2B}$ [Nm]	112,0	112,0	133,0	133,0
		$T_{2NOT}$ [Nm]	152,0	0,0	179,0	0,0
	14	$T_{2B}$ [Nm]	112,0	112,0	133,0	133,0
		$T_{2NOT}$ [Nm]	152,0	152,0	179,0	179,0
	16	$T_{2B}$ [Nm]	112,0	112,0	133,0	133,0
		$T_{2NOT}$ [Nm]	152,0	152,0	179,0	179,0
	19	$T_{2B}$ [Nm]	112,0	112,0	133,0	133,0
		$T_{2NOT}$ [Nm]	152,0	152,0	179,0	179,0
	24	$T_{2B}$ [Nm]	112,0	112,0	133,0	133,0
		$T_{2NOT}$ [Nm]	152,0	152,0	179,0	179,0
28	$T_{2B}$ [Nm]	112,0	112,0	133,0	133,0	
	$T_{2NOT}$ [Nm]	152,0	152,0	179,0	179,0	

Servo gearboxes  
(precision gearboxes)

## 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 ( $N_1$ )

i rated [-]	Inertia moment [kgcm <sup>2</sup> ]	
	10:1	20:1
J [kgcm <sup>2</sup> ]	0.5820	0.4996

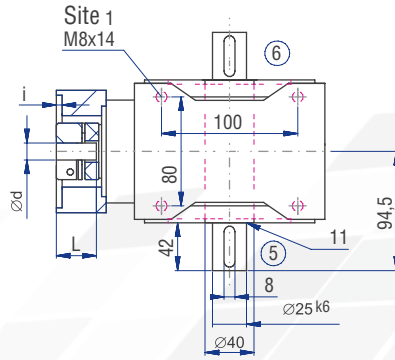
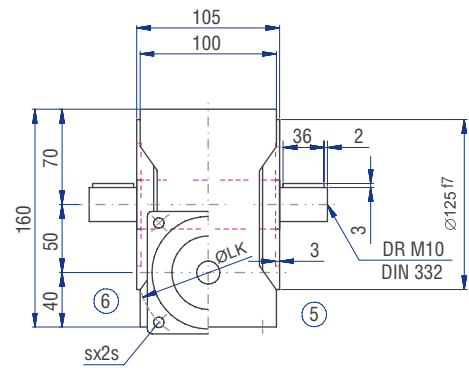
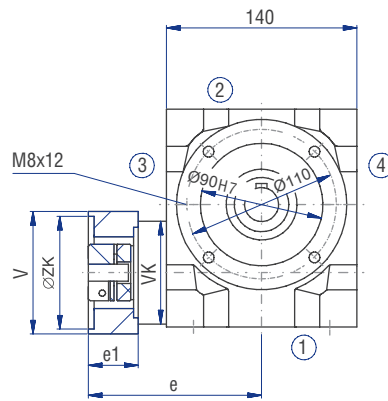
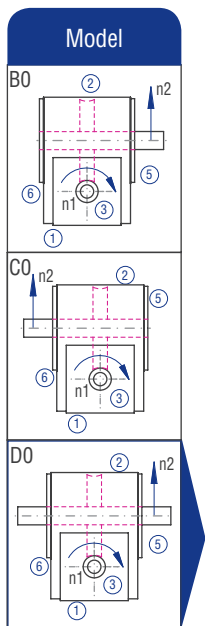
Mass  
ca. [kg]  
13

## Inertia moments Coupling J

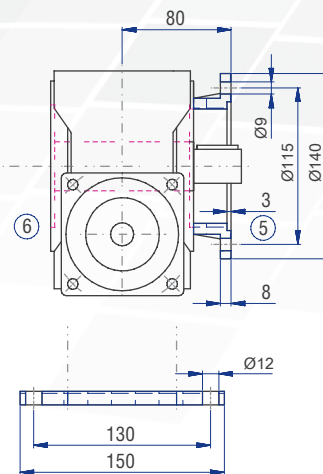
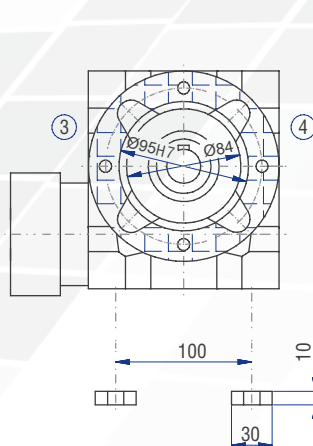
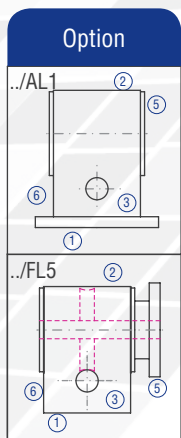
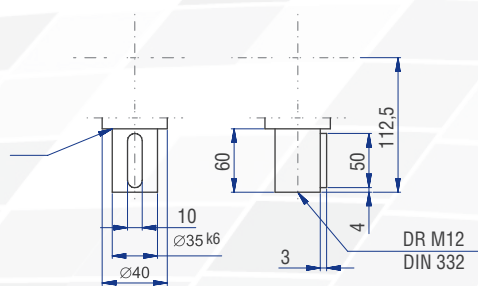
	KN	KNN	SN
	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]
K19	0.4229	0.4229	0.6349
K24	1.0910	1.0910	2.7750

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

# 11.5.17 Type SC 050 – Servo worm gearboxes



## Implementation VV

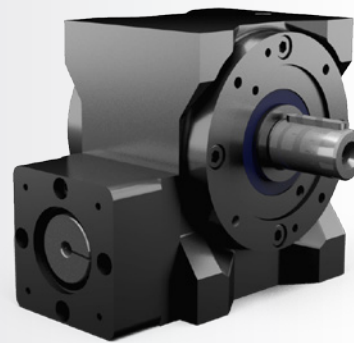


## Motor dimensions

Flange no.	Motor shaft (dxL)	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!





## Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Hardened and ground worm shaft / bronze worm gear	See chapter 11.5.2
<b>Gear ratio</b>	10:1 to 20:1	
<b>Housing / Flanges</b>	Grey cast iron / aluminium	
<b>Threaded mounting holes</b>	On gearbox side 1 and on the flanges	See chapter 11.5.4
<b>Shaft</b>	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
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO H7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 20 arcmin	See chapter 11.5.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	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
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.5.9
<b>Motor flange</b>	Aluminium	See chapter 11.5.14
<b>Coupling</b>	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

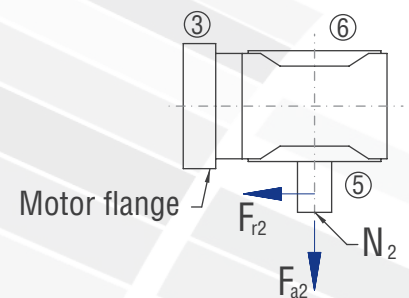
I rated I ist	10:1		20:1	
	$n_2$ [1/min]	$T_{2N}$ [Nm]	$n_2$ [1/min]	$T_{2N}$ [Nm]
4000	410	101	205	116
3000	308	124	154	141
2400	246	148	123	166
1500	154	171	77	190

## Torques in operating mode S5

Coupling size	d [mm]	I rated $T_{2N}$ [Nm] $n_{1max}$ [U/min]	10:1		20:1	
			KN	KNN/SN	KN	KNN/SN
K19	9	$T_{2B}$ [Nm]	165,8		259,0	
		$T_{2NOT}$ [Nm]	292,5		355,0	
	11	$T_{2B}$ [Nm]	165,8	165,8	259,0	259,0
		$T_{2NOT}$ [Nm]	292,5	292,5	355,0	355,0
	14	$T_{2B}$ [Nm]	165,8	165,8	259,0	259,0
		$T_{2NOT}$ [Nm]	306,0	306,0	355,0	355,0
	16	$T_{2B}$ [Nm]	165,8	165,8	259,0	259,0
		$T_{2NOT}$ [Nm]	306,0	306,0	355,0	355,0
	19	$T_{2B}$ [Nm]	165,8	165,8	259,0	259,0
		$T_{2NOT}$ [Nm]	306,0	306,0	355,0	355,0
24	$T_{2B}$ [Nm]	165,8		259,0		
	$T_{2NOT}$ [Nm]	306,0		355,0		
K24	11	$T_{2B}$ [Nm]	216,0	216,0	259,0	259,0
		$T_{2NOT}$ [Nm]	306,0	0,0	355,0	0,0
	14	$T_{2B}$ [Nm]	216,0	216,0	259,0	259,0
		$T_{2NOT}$ [Nm]	306,0	306,0	355,0	355,0
	16	$T_{2B}$ [Nm]	216,0	216,0	259,0	259,0
		$T_{2NOT}$ [Nm]	306,0	306,0	355,0	355,0
	19	$T_{2B}$ [Nm]	216,0	216,0	259,0	259,0
		$T_{2NOT}$ [Nm]	306,0	306,0	355,0	355,0
	24	$T_{2B}$ [Nm]	216,0	216,0	259,0	259,0
		$T_{2NOT}$ [Nm]	306,0	306,0	355,0	355,0
28	$T_{2B}$ [Nm]	216,0	216,0	259,0	259,0	
	$T_{2NOT}$ [Nm]	306,0	306,0	355,0	355,0	

## 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 ( $N_1$ )

i rated [-]	Inertia moment [kgcm <sup>2</sup> ]	
	10:1	20:1
$J$ [kgcm <sup>2</sup> ]	1.1366	0.9445

Mass ca. [kg]
20

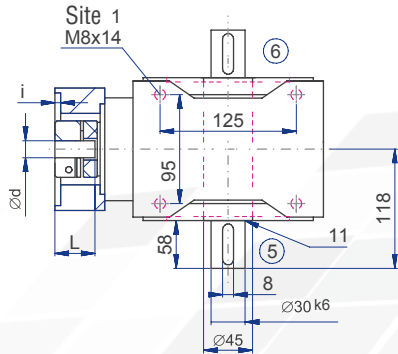
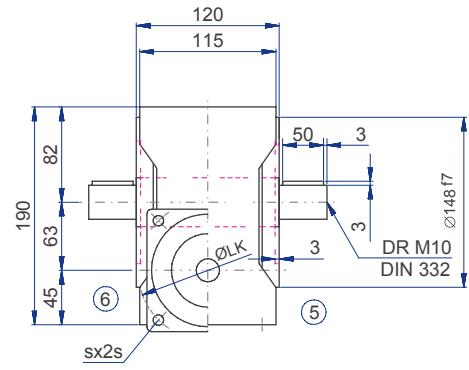
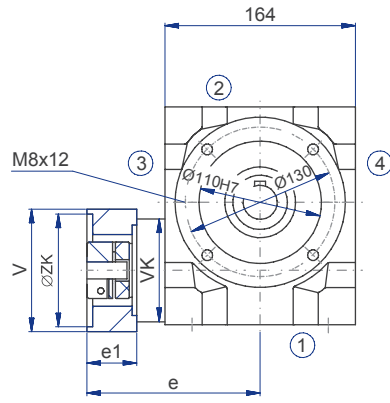
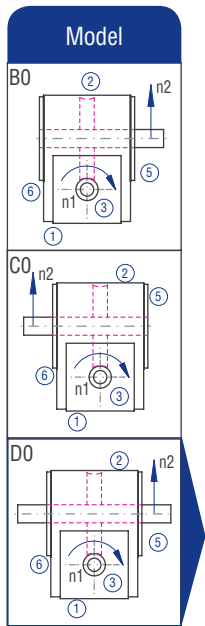
## Inertia moments Coupling J

	KN	KNN	SN
	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]
K19	0.4229	0.4229	0.6349
K24	1.0910	1.0910	2.7750

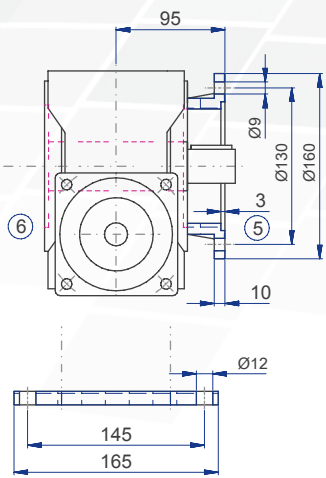
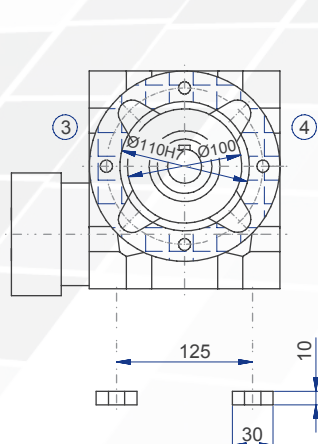
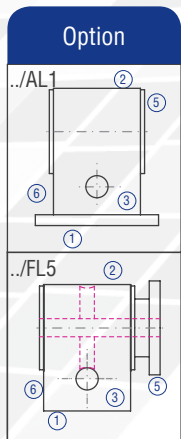
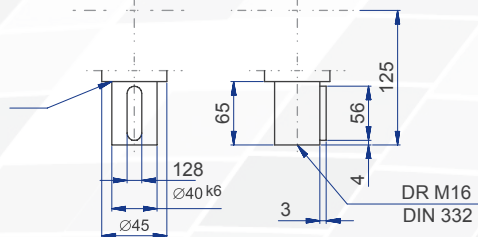
The mass of the gearbox may deviate depending on the flange size and the gear ratio.

Servo gearboxes  
(precision gearboxes)

# 11.5.18 Type SC 063 – Servo worm gearboxes



## Implementation VV

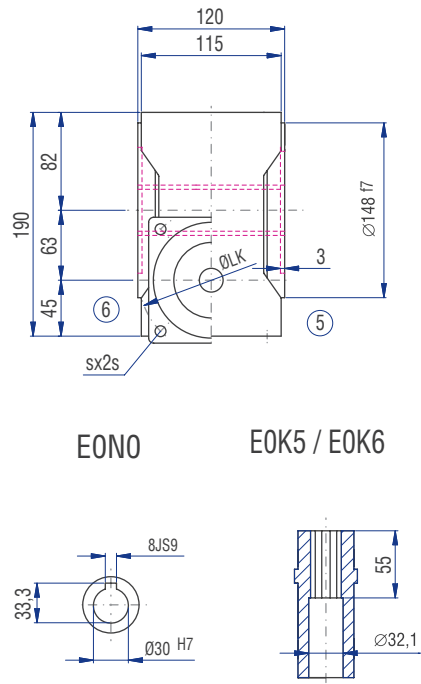
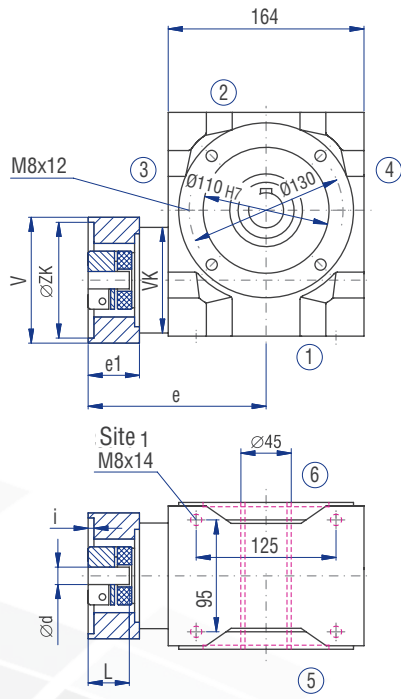


## Motor dimensions

Flange no.	Motor shaft (dxL)	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

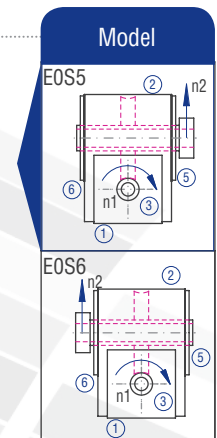
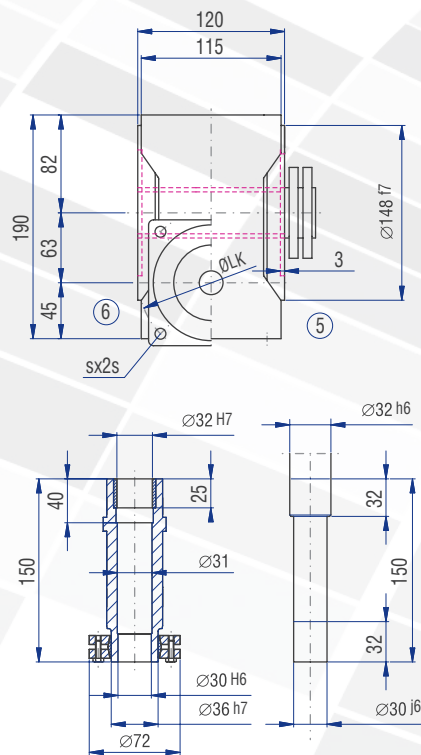
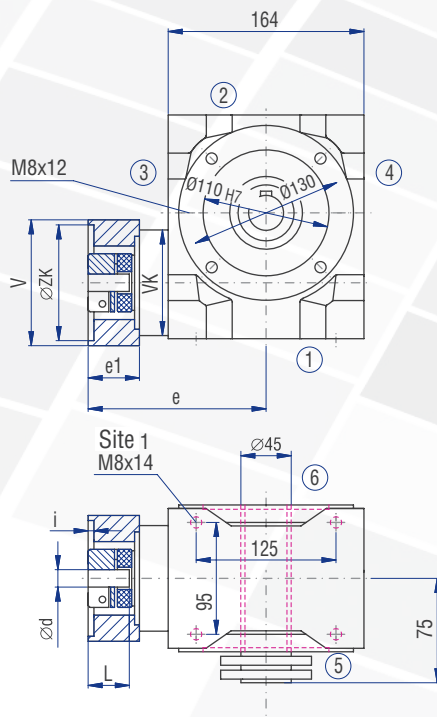
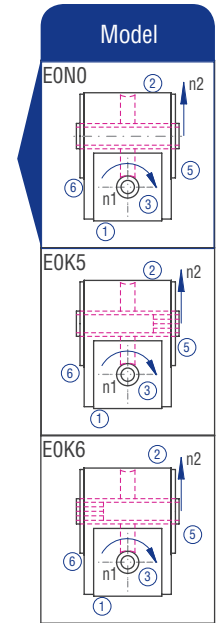
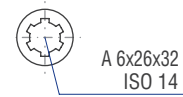
The dimensions e and e1 will change for the coupling type “clamping hub with groove” (KNN). Please contact us for consultation!



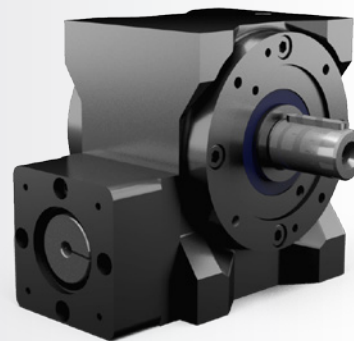


EON0

EOK5 / EOK6



Servo gearboxes  
(precision gearboxes)



## Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Hardened and ground worm shaft / bronze worm gear	See chapter 11.5.2
<b>Gear ratio</b>	10:1 to 20:1	
<b>Housing / Flanges</b>	Grey cast iron / aluminium	
<b>Threaded mounting holes</b>	On gearbox side 1 and on the flanges	See chapter 11.5.4
<b>Shaft</b>	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
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO H7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 20 arcmin	See chapter 11.5.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	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
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.5.9
<b>Motor flange</b>	Aluminium	See chapter 11.5.14
<b>Coupling</b>	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	10:1		20:1	
	$n_2$ [1/min]	$T_{2N}$ [Nm]	$n_2$ [1/min]	$T_{2N}$ [Nm]
4000	400	132	200	153
3000	300	177	150	203
2400	240	222	120	253
1500	150	267	75	303

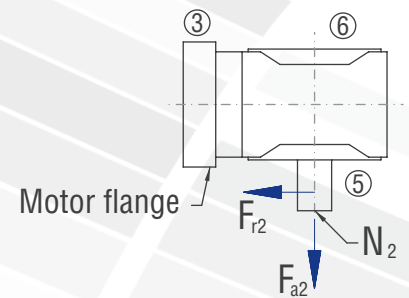
## Torques in operating mode S5

Coupling size	d [mm]	I rated $T_{2N}$ [Nm] $n_{1max}$ [U/min]	10:1		20:1	
			KN	KNN/SN	KN	KNN/SN
K24	11	$T_{2B}$ [Nm]	350,0	408,0	498,0	498,0
		$T_{2NOT}$ [Nm]	450,0	0,0	725,0	0,0
	14	$T_{2B}$ [Nm]	360,0	408,0	498,0	498,0
		$T_{2NOT}$ [Nm]	450,0	625,0	725,0	725,0
	16	$T_{2B}$ [Nm]	390,0	408,0	498,0	498,0
		$T_{2NOT}$ [Nm]	500,0	625,0	725,0	725,0
	19	$T_{2B}$ [Nm]	390,0	408,0	498,0	498,0
		$T_{2NOT}$ [Nm]	600,0	625,0	725,0	725,0
	24	$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0
	28	$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0
K28	14	$T_{2B}$ [Nm]	408,0		498,0	
		$T_{2NOT}$ [Nm]	625,0		725,0	
	16	$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0
	19	$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0
	24	$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0
	28	$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0
	32	$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0
38	$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0	
	$T_{2NOT}$ [Nm]	625,0	0,0	725,0	0,0	

Servo gearboxes  
(precision gearboxes)

## 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 ( $N_1$ )

i rated [-]	Inertia moment [kgcm <sup>2</sup> ]	
	10:1	20:1
J [kgcm <sup>2</sup> ]	2.9560	2.3977

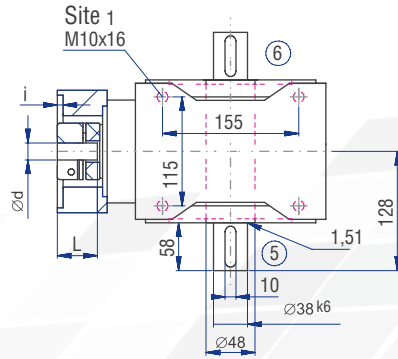
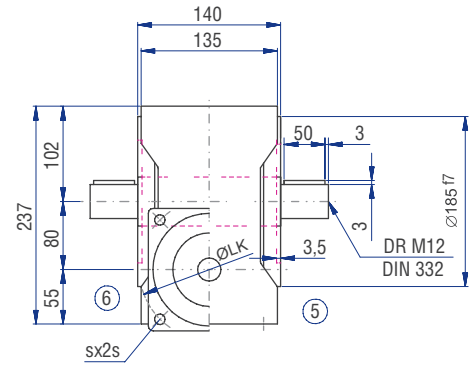
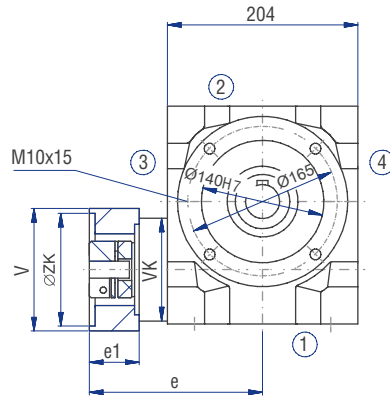
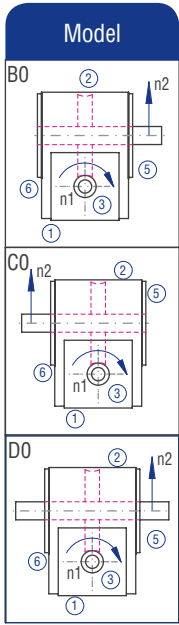
Mass ca. [kg]
30

## Inertia moments Coupling J

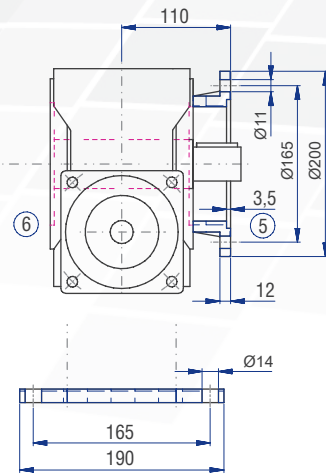
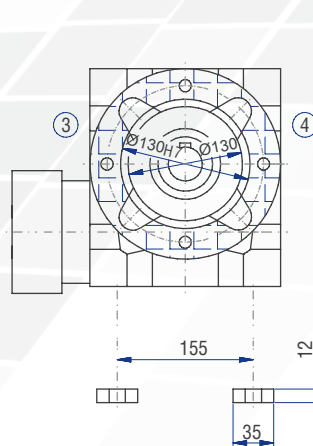
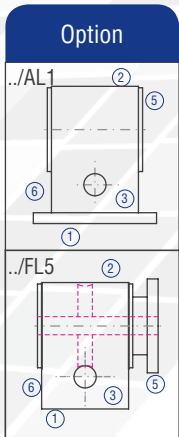
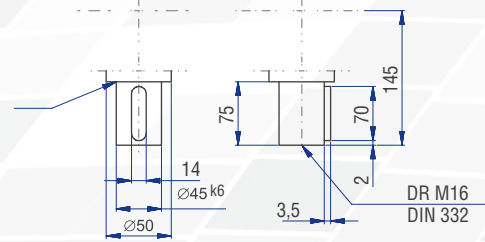
	KN	KNN	SN
	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]
K24	1.0910	1.0910	2.7750
K28	4.1710	4.1710	6.4250

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

# 11.5.19 Type SC 080 – Servo worm gearboxes



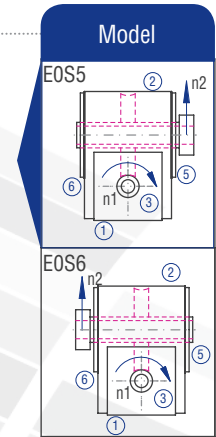
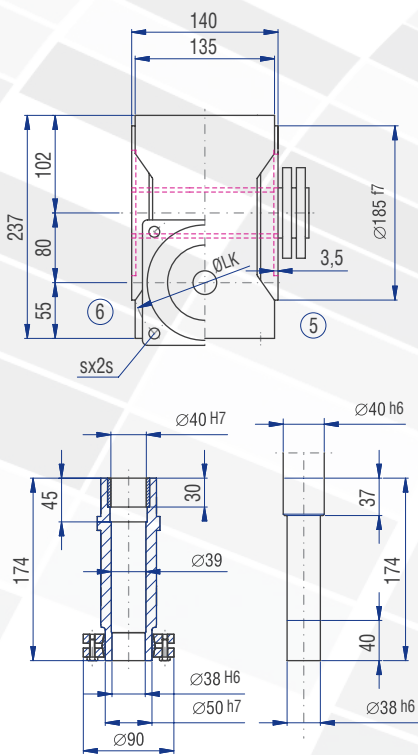
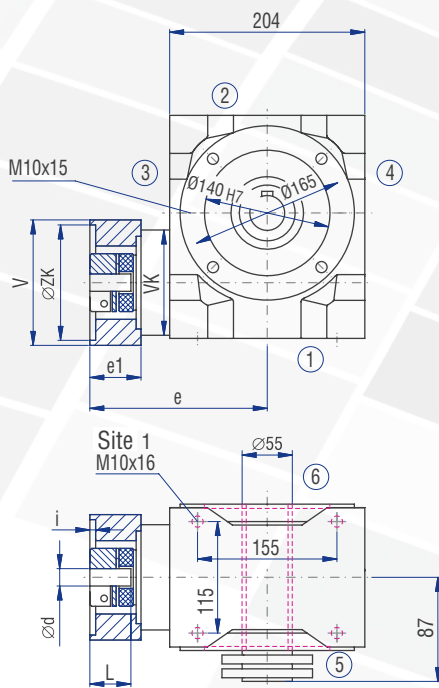
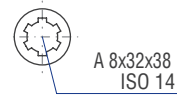
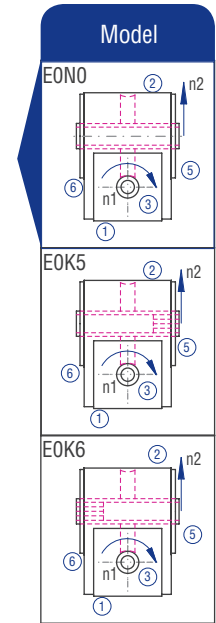
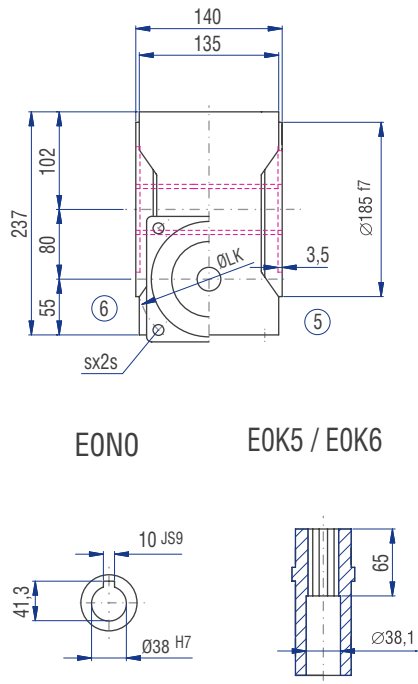
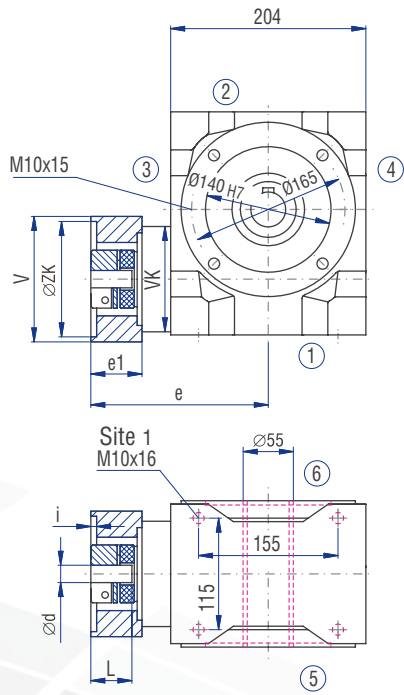
## Implementation VV



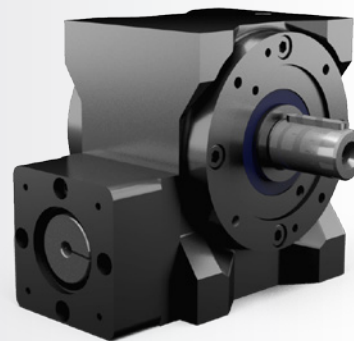
## Motor dimensions

Flange no.	Motor shaft (dxL)	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!



Servo gearboxes  
(precision gearboxes)



## Characteristics

Characteristic	Standard	Option
<b>Toothing</b>	Hardened and ground worm shaft / bronze worm gear	See chapter 11.5.2
<b>Gear ratio</b>	10:1 to 20:1	
<b>Housing / Flanges</b>	Grey cast iron / aluminium	
<b>Threaded mounting holes</b>	On gearbox side 1 and on the flanges	See chapter 11.5.4
<b>Shaft</b>	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
<b>Hollow shaft</b>	Material 1 C45, shafts greased Fit with ISO H7 tolerance with parallel keyway: according to DIN 6885 Sheet 1	See chapter 4.6.3
<b>Radial shaft seal ring</b>	NBR, form A	See chapter 4.8
<b>Ambient temperature</b>	-10°C to +90°C. The values of the performance tables are valid for +20°C	See chapter 4.9.3
<b>Circumferential backlash</b>	< 20 arcmin	See chapter 11.5.11
<b>Protection class</b>	IP 54	See chapter 4.5
<b>Corrosion protection</b>	Prime coat; layer thickness > 40 µm	See chapter 4.4.1
<b>Bearing life L10h</b>	more than 15,000h	See chapter 4.9.1
<b>Oil change intervals</b>	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
<b>Lubricants</b>	Synthetic lubricants	See chapter 11.5.9
<b>Motor flange</b>	Aluminium	See chapter 11.5.14
<b>Coupling</b>	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	10:1		20:1	
	$n_2$ [1/min]	$T_{2N}$ [Nm]	$n_2$ [1/min]	$T_{2N}$ [Nm]
4000	400	132	200	153
3000	300	177	150	203
2400	240	222	120	253
1500	150	267	75	303

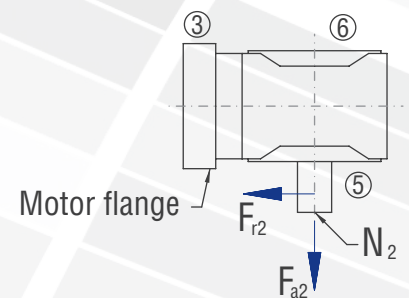
## Torques in operating mode S5

Coupling size	d [mm]	I rated $T_{2N}$ [Nm] $n_{1max}$ [U/min]	10:1		20:1		
			KN	KNN/SN	KN	KNN/SN	
K24	11	$T_{2B}$ [Nm]	350,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	450,0	0,0	725,0	0,0	
	14	$T_{2B}$ [Nm]	360,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	450,0	625,0	725,0	725,0	
	16	$T_{2B}$ [Nm]	390,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	500,0	625,0	725,0	725,0	
	19	$T_{2B}$ [Nm]	390,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	600,0	625,0	725,0	725,0	
	24	$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0	
	28	$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0	
	K28	14	$T_{2B}$ [Nm]	408,0		498,0	
			$T_{2NOT}$ [Nm]	625,0		725,0	
16		$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0	
19		$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0	
24		$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0	
28		$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0	
32		$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	625,0	625,0	725,0	725,0	
38		$T_{2B}$ [Nm]	408,0	408,0	498,0	498,0	
		$T_{2NOT}$ [Nm]	625,0	0,0	725,0	0,0	

Servo gearboxes  
(precision gearboxes)

## 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



Motor flange

## Gearbox inertia moments/mass

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

i rated [-]	Inertia moment [kgcm <sup>2</sup> ]	
	10:1	20:1
$J$ [kgcm <sup>2</sup> ]	14.0300	12.3740

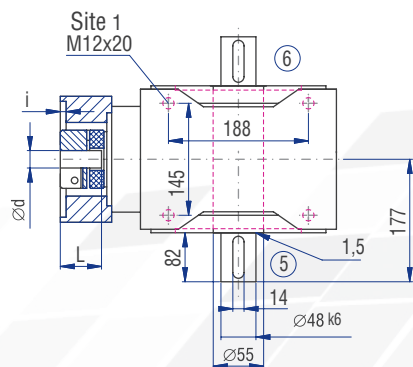
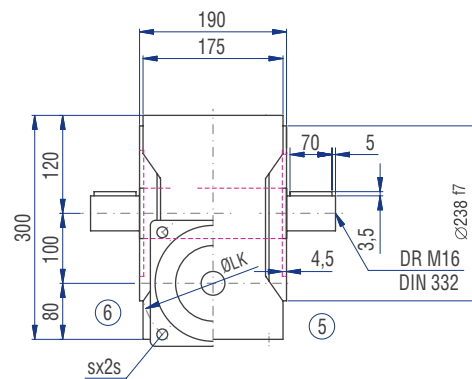
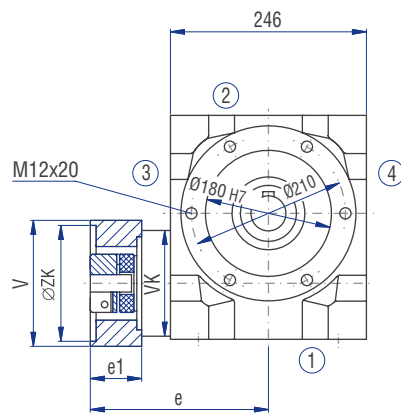
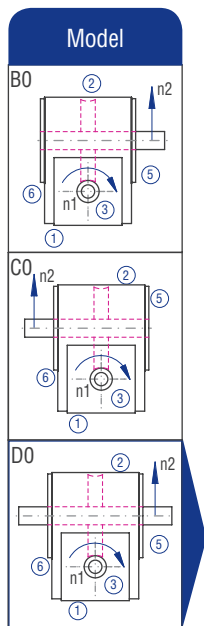
Mass ca. [kg]
53

## Inertia moments Coupling J

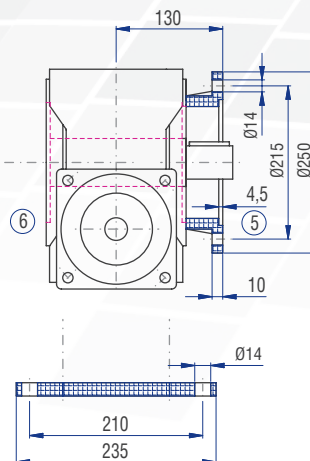
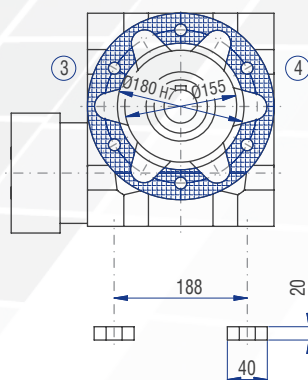
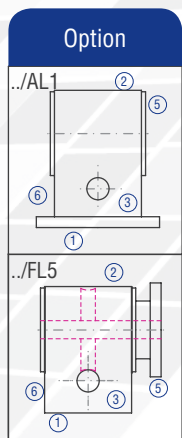
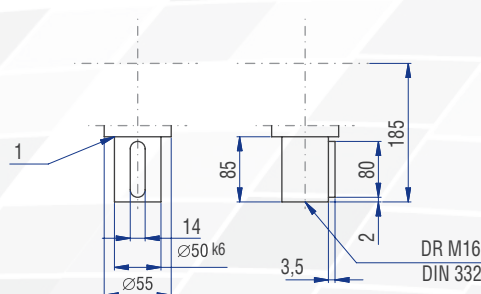
K38	KN	KNN	SN
	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]	J [kgcm <sup>2</sup> ]
	4.1710	4.1710	6.4250
	8.4580	8.4580	19.6460

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

# 11.5.20 Type SC 100 – Servo worm gearboxes



## Implementation VV

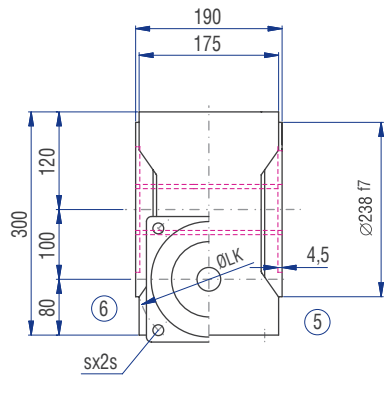
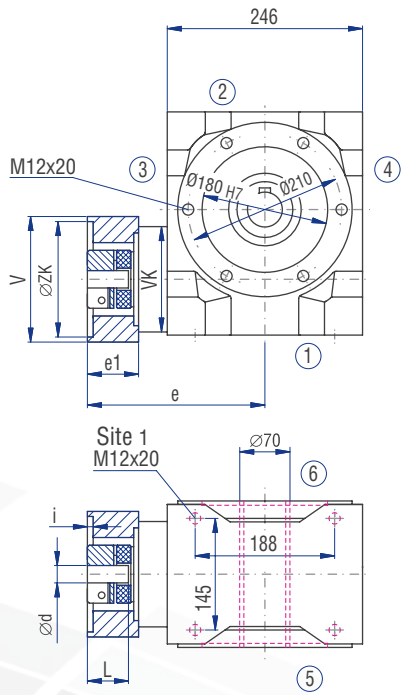


## Motor dimensions

Flange no.	Motor shaft (dxL)	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

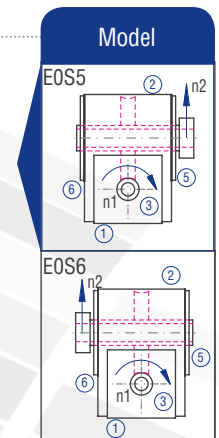
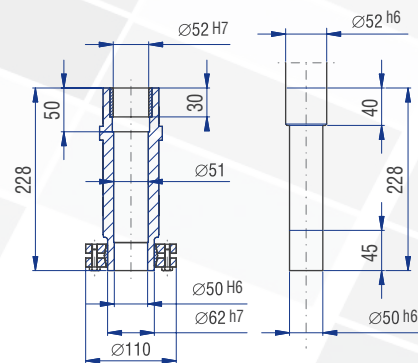
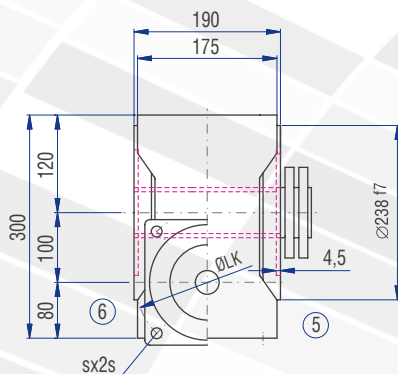
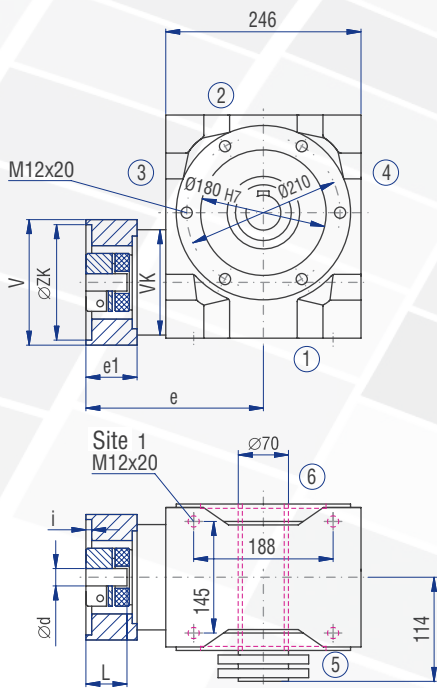
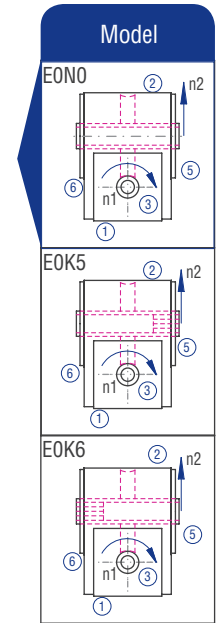
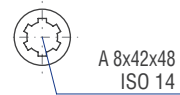
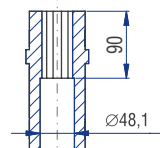
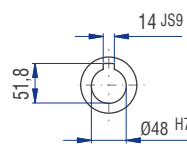
The dimensions e and e1 will change for the coupling type "clamping hub with groove" (KNN). Please contact us for consultation!





EON0

EOK5 / EOK6



Servo gearboxes  
(precision gearboxes)