Cycloidal servo gearmotors

ZN.. cycloidal servo gearmotors
with CMP.., CMPZ.. or CM.. servomotors

Precision at its best: the ZN.. series

The new cycloidal servo gearmotors of the ZN.. series offer you a dynamic and compact drive solution with overload capacity. This series was designed specifically for technically sophisticated applications such as portals, rotary tables or layer pad inserters in machine automation systems because these are areas that demand top performance in terms of torque, stiffness and precision.

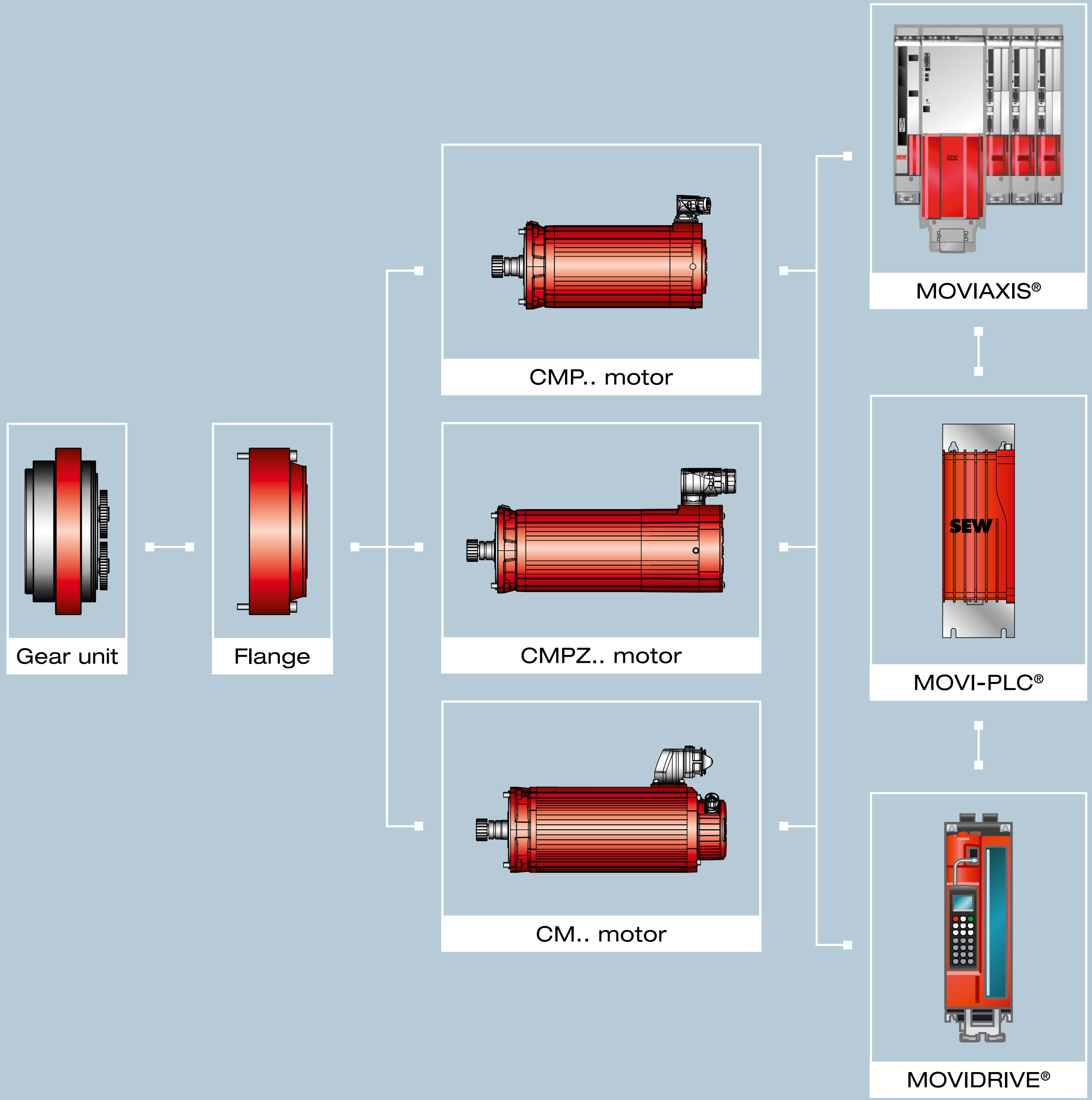
The cycloidal servo gearmotor is made up of a ZN.. 30 – 130 or ZE.. 140 cycloidal gear unit and a synchronous servomotor from either the CMP.., CMPZ.. or CM.. series. The drive components are connected by a flange. Direct mounting makes it possible to transfer high acceleration torques of up to 36.7 kNm, even in extremely small spaces. The gearmotor is shipped with lubrication for life, ready for installation and available in twelve sizes. Gear units and motors can be combined with one another thanks to the successful SEW-EURODRIVE modular concept.

Our ZN.. series of cycloidal servo gearmotors combine power density and dynamics, maximum performance and precision: all from a single source.

The ZN.. series of cycloidal servo gearmotors is made up of a motor, flange, and gear unit.

The concept behind it all is the SEW-EURODRIVE modular system

The ZN.. series of cycloidal servo gearmotors come together with the servomotors and drive electronics as well as the programmable motion and logic controllers to form an extremely powerful range of products for machine and system automation. Thanks to the flexible combination options, they can be optimally tailored to your requirements, resulting in standardized drive solutions that offer you maximum individuality.



Structure and function:
The cycloidal gear unit in detail

ZN.. cycloidal gear units are two-stage servo gearmotors with an input-side helical gear stage and a cycloidal reduction ratio in the second stage. In the first gear ratio stage, the planet gears are positively driven via the sun gear / motor shaft. The planet gears reduce the input speed and distribute the torque evenly onto the eccentric shafts, which are mounted in the carrier package.

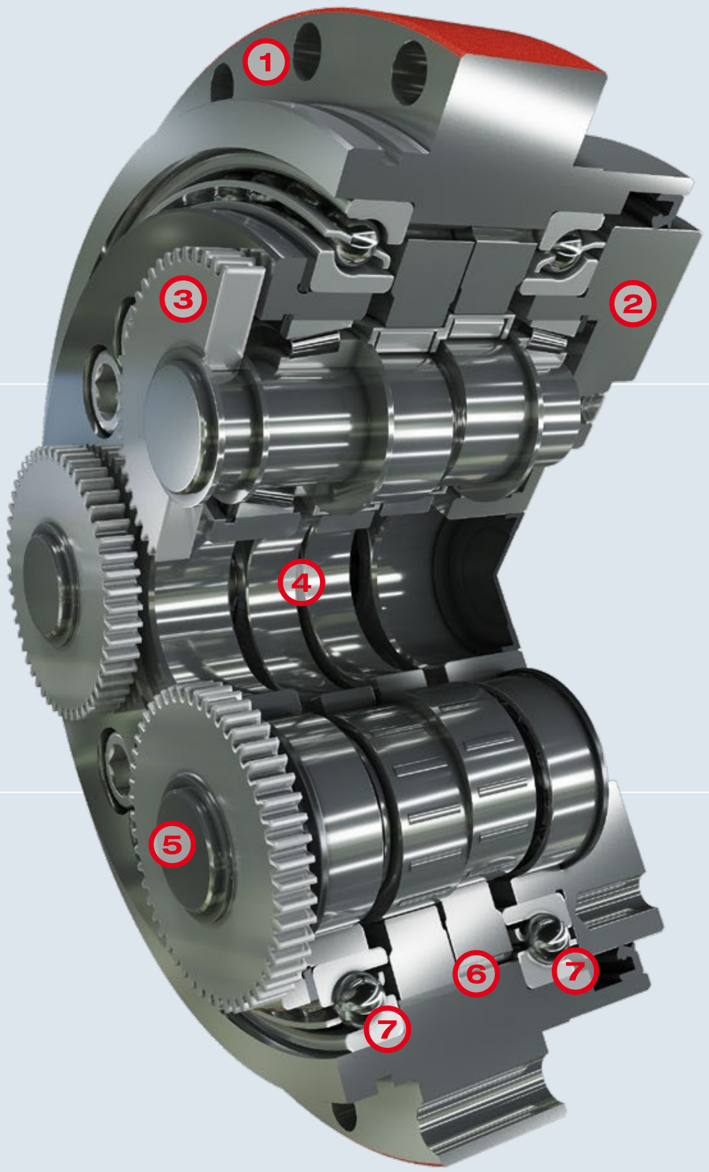
The eccentric stroke causes an orbital movement in the cycloidal cam disk, which is then transferred to the gear unit housing via the bolts. The rotary portion of the cam disc movement is transferred to the carrier / output flange via the bearings of the eccentric shafts in the carrier package. The carrier or output flange moves in the same direction as the motor shaft.

First stage

1 Housing
2 Carrier package/ output flange
3 Planet gear

Second stage

4 Cam disc
5 Eccentric shaft
6 Bolt
7 Main bearing



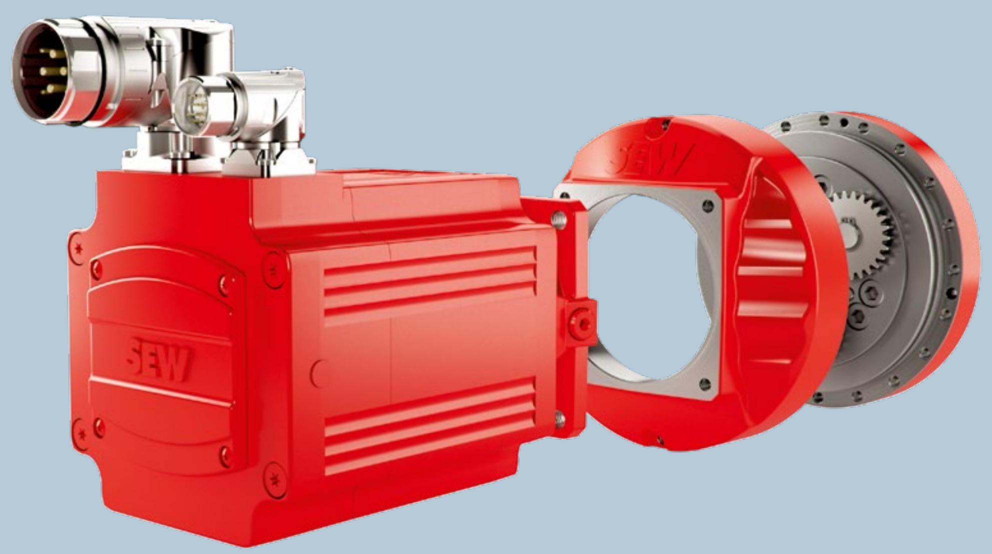
Ultimate performance:
Your advantages at a glance

Extreme precision

The operating principle of the cycloidal gear unit is based on pretensioned gearing contact and optimally adjusted bearings. This reduces lost motion to less than one angular minute at maximum characteristic rigidity values. In combination with an extremely low angular synchronization error, this forms the optimal solution for applications that require maximum precision.

Sturdy bearings

Large integrated angular contact ball bearings result in high permitted axial and radial loads, and allow for a large eccentric force on the flange block, which in turn generates bending moment. This makes it possible for the gear unit to adopt the function of the primary bearing in a large number of applications, making it possible to design significantly more compact machines.



High power density

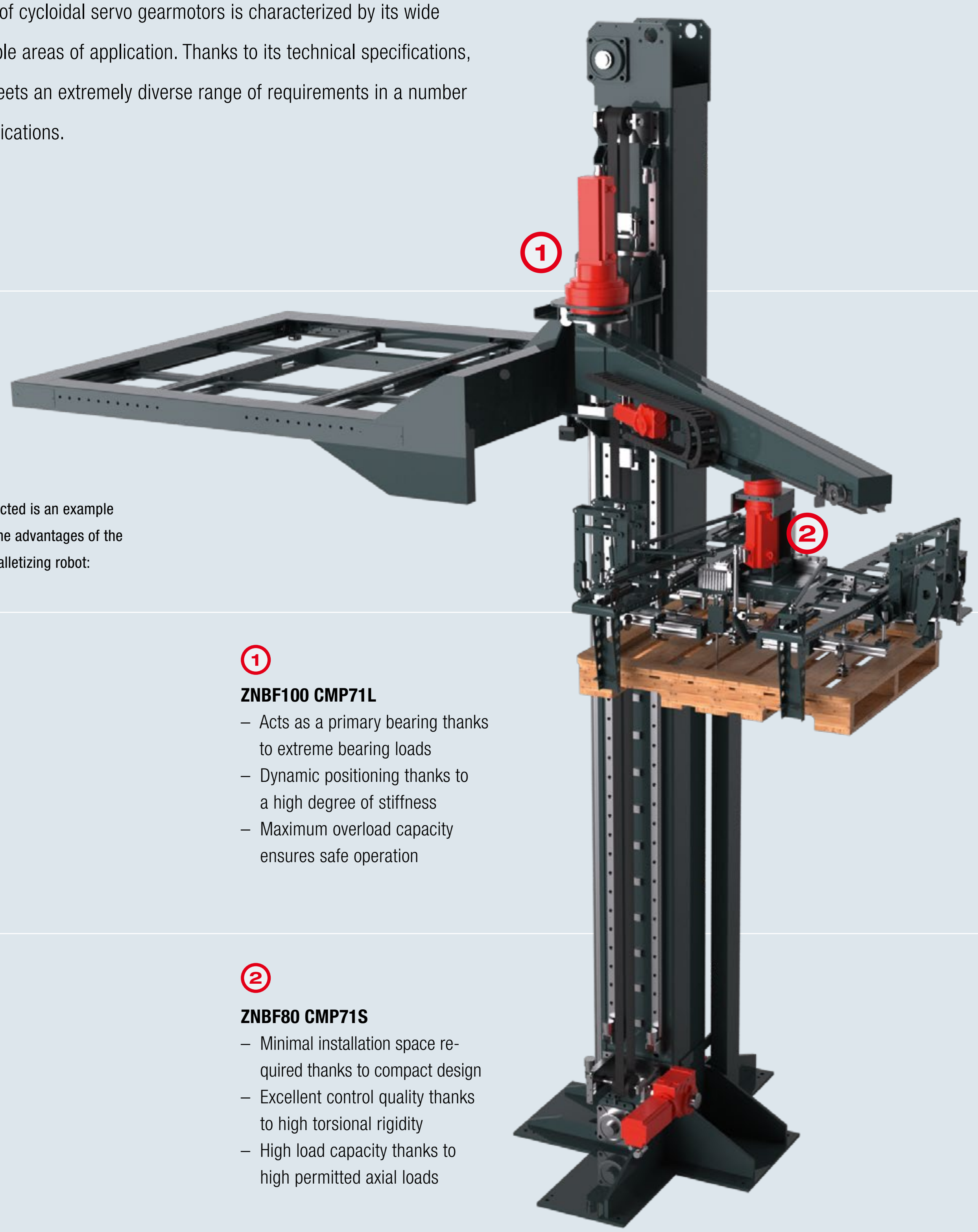
Thanks to their construction, ZN.. cycloidal servo gearmotors are able to transfer high torques in extremely small spaces. The motor and gear unit are directly mounted, making the drive unit extremely compact and resulting in a low mass moment of inertia. Perfect for dynamic acceleration processes in confined spaces.

High overload capacity

The combination of the eccentric shafts, the cam disks and the gearing in the housing results in a large number of contact surfaces on the inside of the gear unit. Forces are distributed evenly, allowing for temporary torques that are much higher than the permitted nominal torque. This ensures safe operation, even in the event of excessive overload.

In action: The ZN.. series of cycloidal servo gearmotors

Our ZN.. series of cycloidal servo gearmotors is characterized by its wide variety of possible areas of application. Thanks to its technical specifications, the gear unit meets an extremely diverse range of requirements in a number of different applications.



The application depicted is an example that demonstrates the advantages of the ZN.. gear unit in a palletizing robot:

1

ZNBF100 CMP71L
- Acts as a primary bearing thanks to extreme bearing loads
- Dynamic positioning thanks to a high degree of stiffness
- Maximum overload capacity ensures safe operation

2

ZNBF80 CMP71S
- Minimal installation space required thanks to compact design
- Excellent control quality thanks to high torsional rigidity
- High load capacity thanks to high permitted axial loads

The perfect drive solution for any challenge

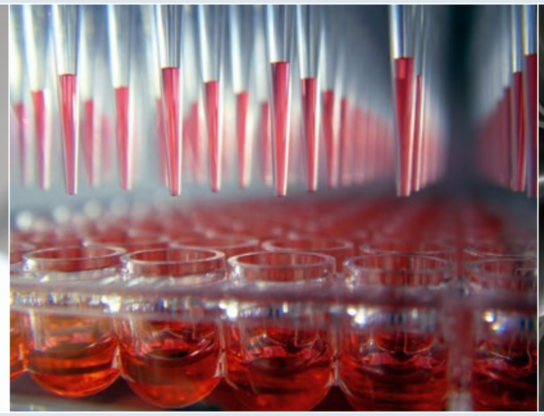
Precise positioning is required in a large number of applications in industries such as packaging, food and beverage, material handling, machine tooling, and medical technology. Whether portals, rotary tables, manipulators, layer pad inserters or SCARA robots:

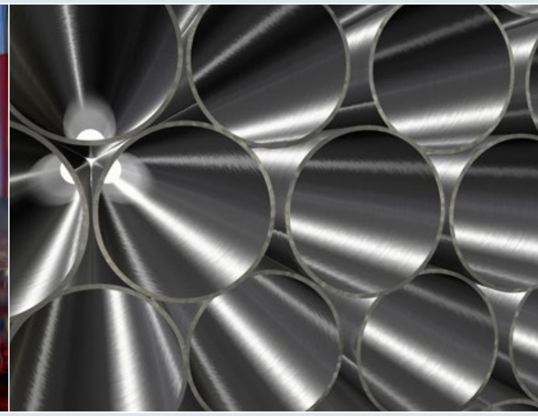
All of these applications require top performance. Torque, bearing loads, stiffness, lack of backlash, dynamics, installation space – all of these aspects must be perfectly coordinated.

For all of these requirements, SEW-EURODRIVE offers the ZN.. series of cycloidal servo gearmotors – the optimal drive solution.

Example applications

Areas of application	Application examples
Robotics industry	Painting, welding, assembly and service robots
Industrial handling technology	Rotary and positioning tables
Food and beverage industry	Palletizer and layer pad inserter
Sheet metal and wood processing	Joinery machines, planing machines, cutter heads, portals, etc.
Packaging technology	Delta and SCARA robots
Medical technology	Imaging processes



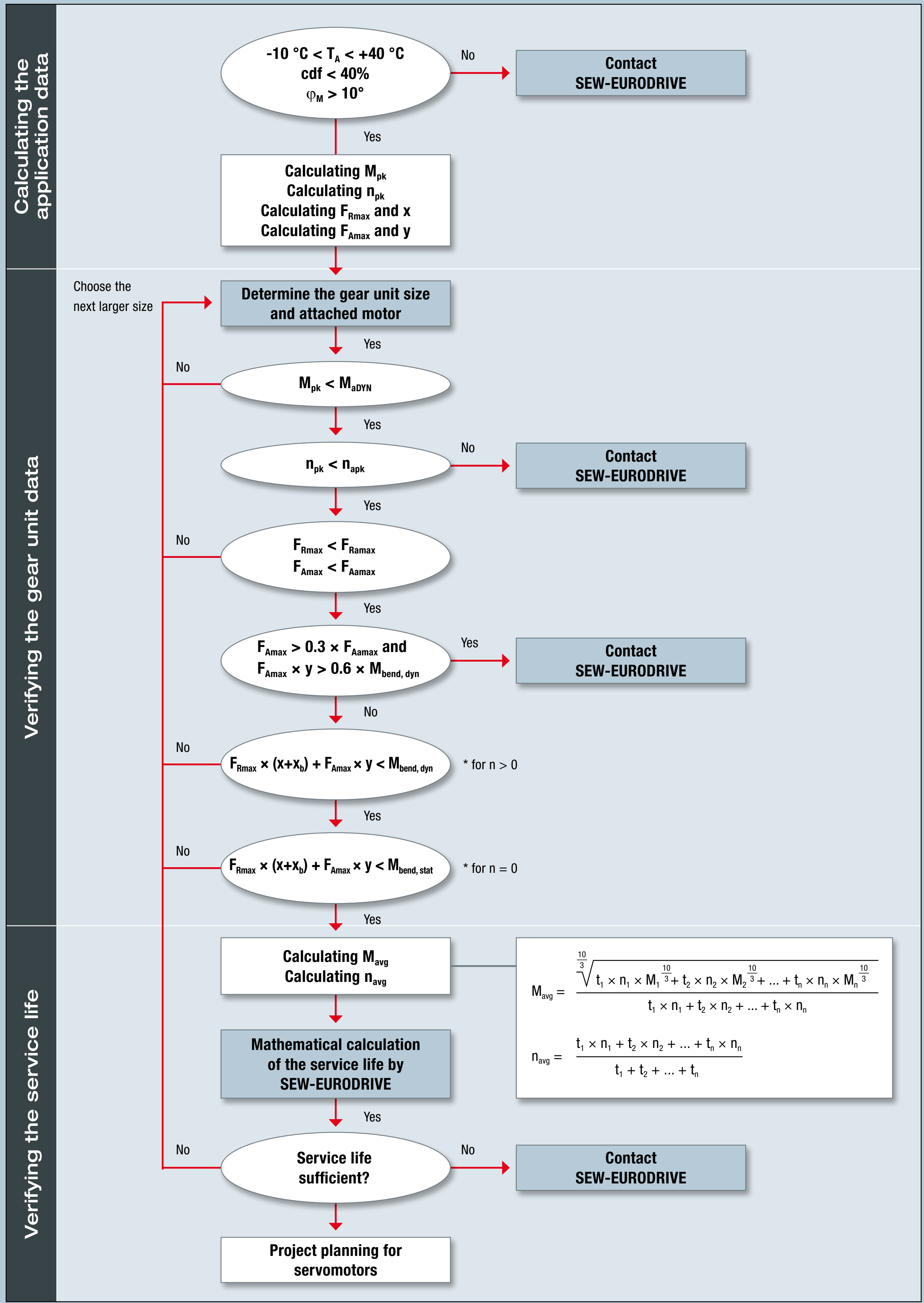


Abbreviation key and project planning guide

Abbreviation key

Designation	Meaning	Unit
c_K	Tilting rigidity on the output flange block shaft	Nm/arcmin
c_T	Torsional rigidity on the output flange block shaft	Nm/arcmin
F_{Aamax}	Maximum permitted axial load on the output flange block shaft	N
F_{Amax}	Maximum occurring axial load (tension and compression) on the output flange block shaft	N
F_{Ramax}	Maximum permitted radial load on the output flange block shaft	N
F_{Rmax}	Maximum occurring overhung load on the output flange block shaft	N
i	Gear unit ratio	1
J_G	Mass moment of inertia of the gear unit	kgm^2
m	Mass of the gear units with lubricant quantity	kg
$M_1 - M_n$	Output torque in time period t_1 to t_n	Nm
M_{aDYN}	Dynamic output torque of the drive to be configured taking η_{Gear_unit} into account	Nm
M_{aN}	Maximum permitted output torque at, e.g. $n_a = 5\ min^{-1}$ at the output flange block shaft	Nm
M_{apk}	Maximum acceleration torque at the output flange block shaft	Nm
$M_{aEmerg.Off}$	Maximum permitted emergency stop torque	Nm
$M_{bend,\ dyn}$	Maximum permitted dynamic bending moment on the output flange block shaft at a speed > 0 min^{-1}	Nm
$M_{bend,\ stat}$	Maximum permitted static bending moment on the output flange block shaft in an idle state	Nm
M_{avg}	Average occurring torque in the application	Nm
M_{pk}	Maximum occurring torque in the application	Nm
n_{apk}	Maximum permitted output speed for intermittent duty	min^{-1}
n_{epk}	Maximum permitted input speed for intermittent duty	min^{-1}
n_{pk}	Maximum occurring speed in the application	min^{-1}
n_{avg}	Average occurring speed in the application	min^{-1}
$n_1 - n_n$	Output speed in time period $t_1 - t_n$	min^{-1}
T_A	Ambient temperature	°C
$t_1 - t_n$	Time period 1 to n	s
φ_M	Movement angle on the output flange block shaft	°
φ_K	Tilting angle on the output flange block shaft	°
x_b	Gear unit constant	mm
x	Distance between overhung load application point and the flange block shaft	mm
y	Distance between the off-center axial load application point and the gear unit axis	mm

Cycloidal servo gearmotor project planning note



Dimension designations and important notes for the selection tables and dimension sheets

Overview of technical data

Gear unit type	Servomotor CMP.. (**Z**)*	Servomotor CM..	i	M_{aN} (5 min⁻¹) Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	Torsional rigidity Nm/ arcmin	Tilting rigidity Nm/ arcmin	Perm. bending moment Nm	External dia-meter mm
ZN..30	50S – 63M		41 – 164.07	341	612	1225	61	530	784	133
ZN..40	50S – 71M	71S – 71L	41 – 164.07	573	1029	2058	113	840	1660	159
ZN..50	50M – 80L	71S – 90L	41 – 161	834	1500	3000	200	1140	2000	183
ZN..60	50M – 80M	71S – 90L	41 – 171	1090	1960	3920	212	1190	2150	189
ZN..70	63M – 80M	71M – 90L	41 – 161	1390	2500	5000	312	1400	2700	208
ZN..80	63L – 80L	71L – 90L	41 – 161	1703	3062	6125	334	1600	3430	221
ZN..90	63L – 112L	71L – 112H	41 – 201	2225	4000	8000	490	2050	4000	238
ZN..100	71L – 112L	90M – 112H	75 – 185	5178	9310	18620	948	5200	7050	295
ZN..110	80L – 112L	112S – 112H	81 – 249	6813	12250	24500	1620	6850	11000	325
ZN..120	80L – 112L	112S – 112H	105 – 203.52	9733	17500	35000	2600	9000	15000	395
ZN..130	80L – 112L	112S – 112H	248	12514	22500	45000	3685	11790	25480	440
ZE..140	80L – 112L	112S – 112H	65 – 236.29	20460	36750	73500	6320	25000	44000	570

* CMPZ.. is available in sizes 71 – 100.

Example type designation

ZNBF90 CMP80M /BP /PK /AK0H /SB1		
Gear unit type	**Z**	Cycloidal gear unit
Gear unit series	**N** E	N series E series (size 140)
Shaft design	**B**	Flange block shaft
Gear unit design/ fastening type	**F**	Flange-mounted design/ flange fastening
Gear unit size	**90**	M_{aN} = 2225 Nm[1]

[1] The torque (M_{aN}) is based on the output speed n = 5 min⁻¹.

Motor series	**CMP..**	CM..: 71 – 112 CMP..: 50 – 112 CMPZ..: 71 – 100
Motor size	**80**	
Motor length	**M**	S, M, L, H*, E* (* only 112)
Brake	**/BP**	/BP = disk brake
Option	**/PK**	/PK = Pt1000 temperature sensor
Option	**/AK0H**	/AK0H = AK0H built-in encoder
Plug connector	**/SB1**	/SB1 = SB1 plug connector

Dimension designations of gearmotors

All dimensions are in mm	
AC	Diameter of motor
AD	Center of motor shaft to top edge of the connector
ADS	Center of brakemotor shaft to top edge of the connector
L	Total length of gearmotor
LS	Total length of gearmotor including brake
LB	Length of motor
LBS	Length of brakemotor
XS	Overhang of the plug connector over the motor housing without HIPERFACE® encoder
L + HIPERFACE®	Total length of the gearmotor with HIPERFACE® encoder
LS + HIPERFACE®	Total length of the gearmotor with brake and HIPERFACE® encoder

M2	Centering cannot be used in the M2 mounting position.

i	**Note on the gear unit ratios**
164.07..	A number ending in “..” is rounded to the second decimal place.
137*	A value marked with “*” indicates finite gear unit ratio.

Note

In fields marked with “>...”, M_{aDYN} must not exceed the maximum permitted torque M_{apk} in short-term duty because the motor may overload the gear unit. The motor current I_{max} must be limited at startup. An efficiency of 80% was used to calculate the output acceleration torque M_{aDYN}.

The dark-gray fields contain preferred combinations.

Light-gray fields: Consult SEW-EURODRIVE.

White fields: Combination not possible.

Dimension sheets and technical data

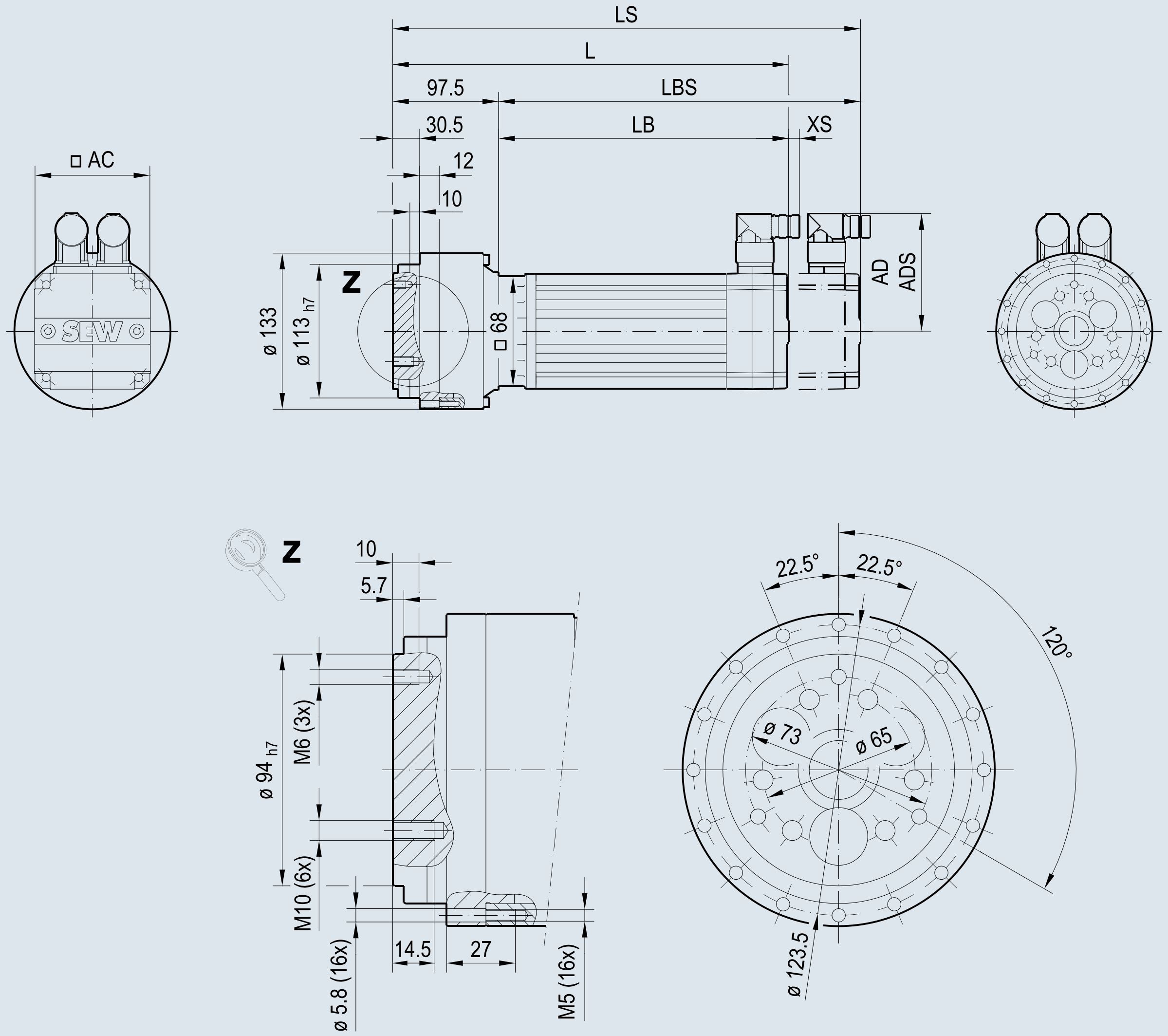
ZNBF30

n_{aN} min^{-1}	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin	i	n_{apk} min^{-1}	J_G kgm^2	x_b mm
5	341									164.07..	37	3.26×10^{-6}	
10	277									137*	44	3.62×10^{-6}	
15	245									126*	48	4.03×10^{-6}	
20	225									107.66..	56	4.91×10^{-6}	90
25	210	612	1225	61	6975	2610	784	1568	530	81*	74	6.79×10^{-6}	
30	199									41*	110	1.71×10^{-5}	
40**	183												
50**	171												
60**	162												

** Maximum possible n_{aN} is based on the gear ratio; please note the n_{apk} for the selected gear ratio.

M_{aDYN} in Nm CMP.. i	50S	50M	50L	63S	63M
164.07..	> 612				
137*		> 612	> 612	> 612	
126*		> 612	> 612	> 612	
107.66..		> 612	> 612	> 612	
81*		> 612	> 612	> 612	
41*					> 612
m (kg)	8.3	9.3	10.1	10.2	11.9

ZNBF30..



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Designations See page 11	CMP50S	CMP50M	CMP50L	CMP63S	CMP63M
AC	73	73	73	88	88
AD	86	86	86	92	92
ADS	86	86	86	92	92
L	249	288	327	284	334
LS	278	317	356	312	362
LB	151	190	229	186	236
LBS	180	219	258	215	265
XS	18	18	18	14	14
L + HIPERFACE®	38	38	38	34	34
LS + HIPERFACE®	38	38	38	34	34

ZNBF40

n_{aN} min^{-1}	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin	i	n_{apk} min^{-1}	J_G kgm^2	x_b mm
5	573									164.07..	37	7.66×10^{-6}	
10	465									141*	43	1.01×10^{-5}	
15	412									126*	48	1.07×10^{-5}	
20	378									105	57	1.42×10^{-5}	102
25	353	1029	2058	113	12662	5220	1660	3320	840	81*	74	1.87×10^{-5}	
30	335									61*	98	2.98×10^{-5}	
40**	307									41*	100	4.43×10^{-5}	
50**	287												
60**	272												

** Maximum possible n_{aN} is based on the gear ratio; please note the n_{apk} for the selected gear ratio.

M_{aDYN} in Nm								
CMP.. **i**	**50S**	**50M**	**50L**	**63S**	**63M**	**63L**	**71S**	**71M**
164.07..		> 1029	> 1029	> 1029				
141*		> 1029	> 1029	> 1029				
126*		> 1029	> 1029	> 1029				
105*		865	> 1029	932	> 1029		> 1029	
81*		667	998	719	> 1029		> 1029	
61*					1044	> 1029	937	> 1029
41*						997		1010
m (kg)	12.7	13.7	14.5	14.2	15.9	17.7	17.1	18.5

M_{aDYN} in Nm		
CM.. **i**	**71S**	**71L**
164.07..	> 1029	
141*	> 1029	
126*	> 1029	
105*	> 1029	
81*	> 1029	
61*		> 1029
41*		> 1029
m (kg)	19	22.5

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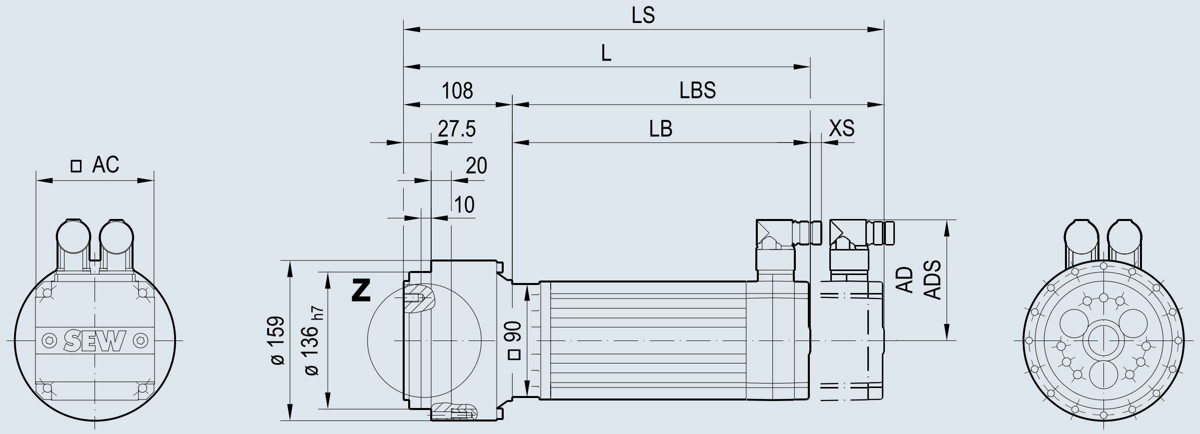

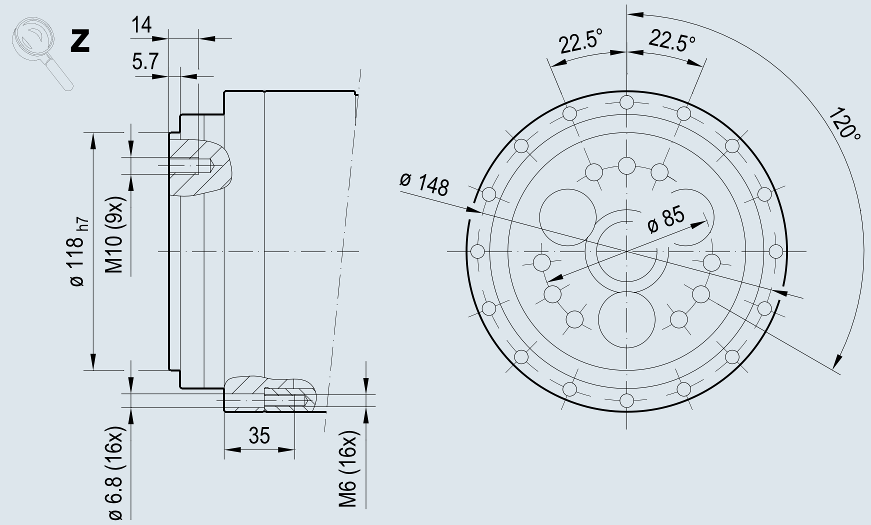

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Designations See page 11	CMP50S	CMP50M	CMP50L	CMP63S	CMP63M	CMP63L	CMP71S	CMP71M
AC	73	73	73	88	88	88	116	116
AD	86	86	86	92	92	92	102	102
ADS	86	86	86	92	92	92	104	104
L	254	293	332	289	339	389	281	306
LS	283	322	361	318	368	418	346	371
LB	146	185	224	181	231	281	173	198
LBS	175	214	253	210	260	310	238	263
XS	18	18	18	14	14	14	11	11
L + HIPERFACE®	38	38	38	34	34	34	24	24
LS + HIPERFACE®	38	38	38	34	34	34	17	17

ZNBF50

n_{aN} min^{-1}	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin	i	n_{apk} min^{-1}	J_G kgm^2	x_b mm
5	834									161*	37	1.61×10^{-5}	112
10	678									145.61..	41	1.84×10^{-5}	
15	600									121*	50	2.33×10^{-5}	
20	550									102.17..	59	2.86×10^{-5}	
25	515	1500	3000	200	13605	5880	2000	4000	1140	81*	74	3.93×10^{-5}	
30	487									41*	97	8.51×10^{-5}	
40**	447												
50**	418												
60**	396												

** Maximum possible n_{aN} is based on the gear ratio; please note the n_{apk} for the selected gear ratio.

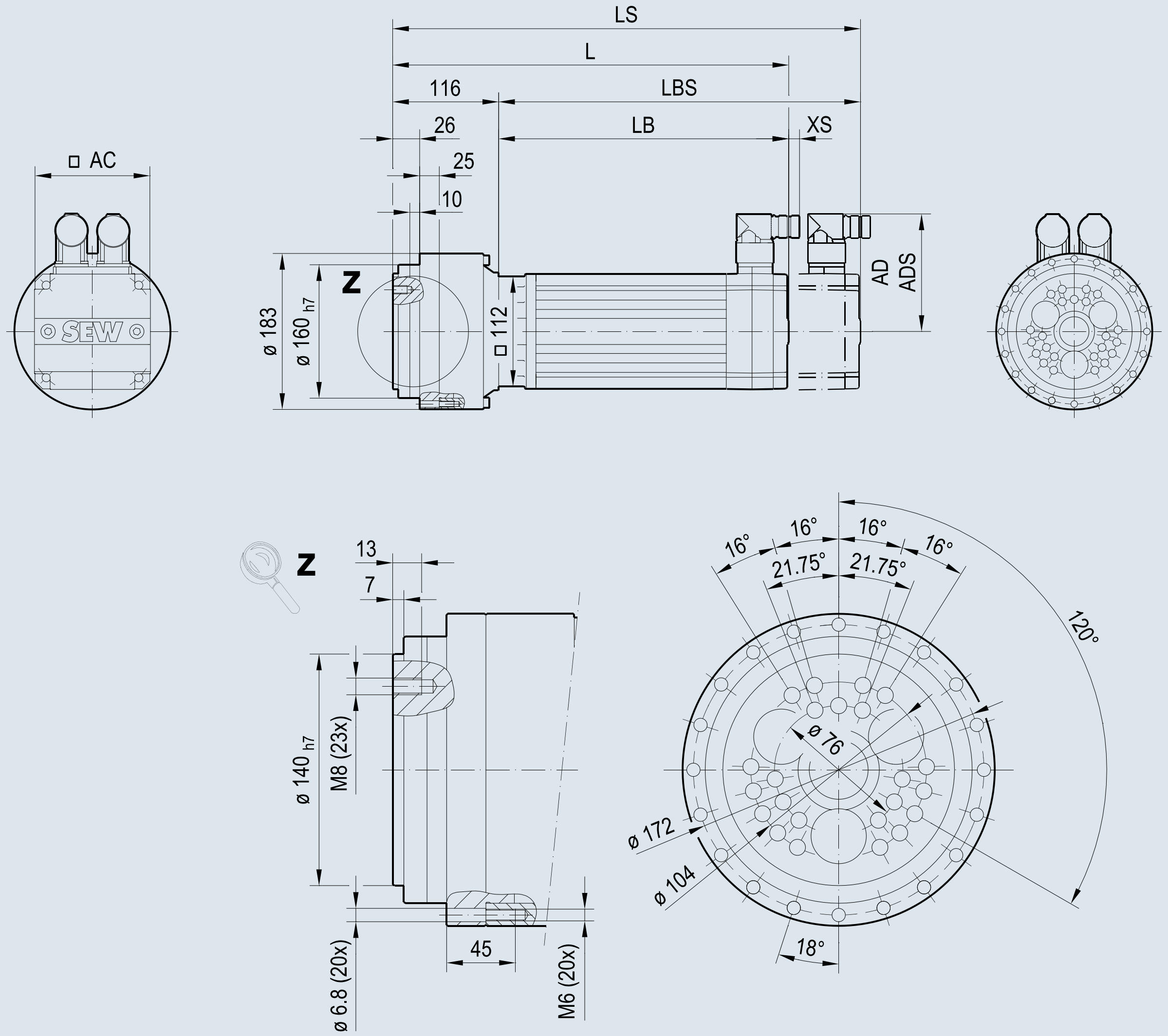
M_{aDYN} in Nm

CMP.. i	50M	50L	63S	63M	63L	71S	71M	71L	80S	80M
161*	1327	> 1500	1430							
145.61..	1200	> 1500	1293							
121*	997	1491	1074							
102.17..				> 1500		> 1500				
81*					> 1500		> 1500			
41*								> 1500	1381	> 1500
m (kg)	18.2	19	19	20.7	22.5	21.8	23.2	26.2	27.6	31.3

M_{aDYN} in Nm

CM.. i	71S	71M	71L	90M	90L
161*	> 1500				
145.61..	> 1500				
121*	> 1500				
102.17..		> 1500			
81*			> 1500		
41*				> 1500	> 1500
m (kg)	23.8	25.1	27.3	31.1	35.2

ZNBF50..



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Designations See page 11	CMP50M	CMP50L	CMP63S	CMP63M	CMP63L	CMP71S	CMP71M	CMP71L	CMP80S	CMP80M
AC	73	73	88	88	88	116	116	116	137	137
AD	86	86	92	92	92	102	102	102	134	134
ADS	86	86	92	92	92	104	104	104	137	137
L	296	335	292	342	392	284	309	359	323	357
LS	325	364	321	371	421	349	374	424	401	435
LB	180	219	176	226	276	168	193	243	207	241
LBS	209	248	205	255	305	233	258	308	285	319
XS	18	18	14	14	14	11	11	11	37	37
L + HIPERFACE®	38	38	34	34	34	24	24	24	24	24
LS + HIPERFACE®	38	38	34	34	34	17	17	17	14	14

ZNBF60

n_{aN} min⁻¹	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin	i	n_{apk} min⁻¹	J_G kgm²	x_b mm
5	1090									171*	35	1.86×10^{-5}	
10	885									141*	43	2.4×10^{-5}	
15	784									129*	47	2.68×10^{-5}	118
20	719									101*	59	3.57×10^{-5}	
25	673	1960	3920	212	14163	6530	2150	4300	1190	81*	74	5.17×10^{-5}	
30	637									41*	88	1.16×10^{-4}	
40**	584												
50**	546												
60**	517												

** Maximum possible n_{aN} is based on the gear ratio; please note the n_{apk} for the selected gear ratio.

M_{aDYN} in Nm

CMP.. i	50M	50L	63S	63M	63L	71S	71M	71L	80S	80M
171*	1409	> 1960	1518							
141*				> 1960		> 1960				
129*				> 1960		> 1960				
101*					> 1960		> 1960			
81*					> 1960		> 1960			
41*								1538	1381	> 1960
m (kg)	19.3	20.1	20.1	21.8	23.6	22.9	24.3	27.3	28.7	32.4

M_{aDYN} in Nm

CM.. i	71S	71M	71L	90S	90M	90L
171*	> 1960					
141*		> 1960				
129*		> 1960				
101*			> 1960	> 1960		
81*			> 1960	> 1960		
41*					1712	> 1960
m (kg)	24.9	26.2	13.1	30	32.1	36.2

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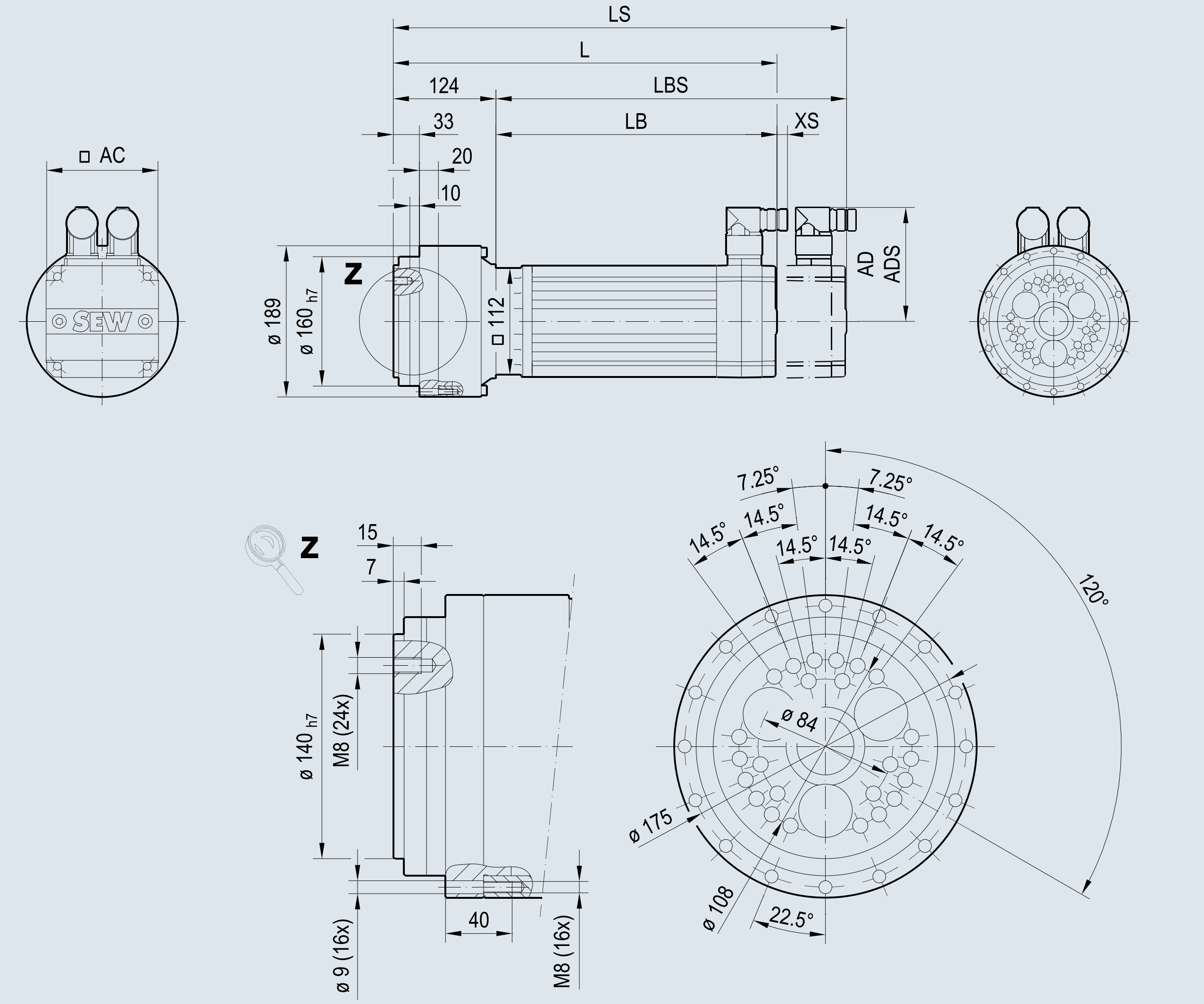

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Designations See page 11	CMP50M	CMP50L	CMP63S	CMP63M	CMP63L	CMP71S	CMP71M	CMP71L	CMP80S	CMP80M
AC	73	73	88	88	88	116	116	116	137	137
AD	86	86	92	92	92	102	102	102	134	134
ADS	86	86	92	92	92	104	104	104	137	137
L	304	343	300	350	400	292	317	367	331	366
LS	333	372	329	379	429	357	382	432	409	444
LB	180	219	176	226	276	168	193	243	207	242
LBS	209	248	205	255	305	233	258	308	285	320
XS	18	18	14	14	14	11	11	11	37	37
L + HIPERFACE®	38	38	34	34	34	24	24	24	24	24
LS + HIPERFACE®	38	38	34	34	34	17	17	17	14	14

ZNBF70

n_{aN} min^{-1}	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin	i	n_{apk} min^{-1}	J_G kgm^2	x_b mm
5	1390									161*	37	3.43×10^{-5}	
10	1129									141*	43	4.05×10^{-5}	
15	1000									121*	50	4.85×10^{-5}	
20	917									102.17..	59	5.82×10^{-5}	130
25	858	2500	5000	312	16052	9000	2700	5400	1400	81*	74	7.3×10^{-5}	
30	812									41*	83	1.58×10^{-4}	
40**	745												
50**	697												
60**	660												

** Maximum possible n_{aN} is based on the gear ratio; please note the n_{apk} for the selected gear ratio.

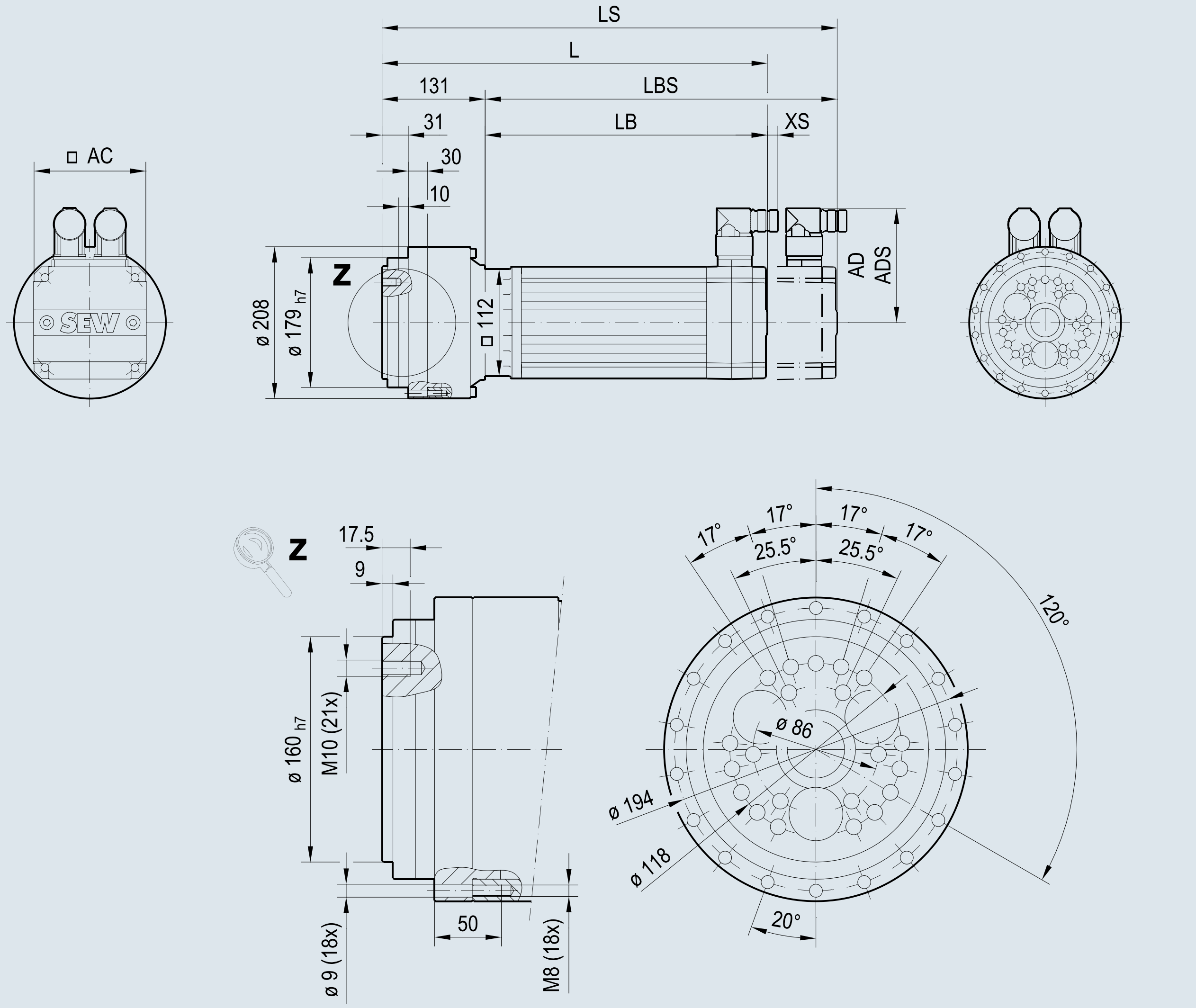
M_{aDYN} in Nm

CMP.. i	50M	50L	63S	63M	63L	71S	71M	71L	80S	80M	80L
161*				> 2500		2473					
141*					> 2500		> 2500				
121*					> 2500		> 2500				
102.17..					2485		> 2500				
81*					1970		1996	> 2500	> 2500	> 2500	
41*								1538	1381	2053	
m (kg)	24.5	25.3	25.3	27	28.8	28.1	29.5	32.5	33.7	37.6	42.5

M_{aDYN} in Nm

CM.. i	71S	71M	71L	90S	90M	90L
161*		> 2500				
141*			> 2500	> 2500		
121*			> 2500	> 2500		
102.17..			> 2500	> 2500		
81*			2035	> 2500		
41*					1712	2480
m (kg)	30.1	31.4	33.6	35.2	37.3	41.4

ZNBF70..



11 009 01 15

Designations See page 11	CMP50M	CMP50L	CMP63S	CMP63M	CMP63L	CMP71S	CMP71M	CMP71L	CMP80S	CMP80M	CMP80L
AC	73	73	88	88	88	116	116	116	137	137	137
AD	86	86	92	92	92	102	102	102	134	134	134
ADS	86	86	92	92	92	104	104	104	137	137	137
L	311	350	307	357	407	299	324	374	338	373	440
LS	340	379	336	386	436	364	389	439	416	451	518
LB	180	219	176	226	276	168	193	243	207	242	309
LBS	209	248	205	255	305	233	258	308	285	320	387
XS	18	18	14	14	14	11	11	11	37	37	37
L + HIPERFACE®	38	38	34	34	34	24	24	24	24	24	24
LS + HIPERFACE®	38	38	34	34	34	17	17	17	14	14	14

ZNBF80

n_{aN} min^{-1}	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin	i	n_{apk} min^{-1}	J_G kgm^2	x_b mm
5	1703									161*	37	4.01×10^{-5}	
10	1383									145.61..	41	4.6×10^{-5}	
15	1225									121*	50	5.88×10^{-5}	132
20	1124									102.17..	59	7.27×10^{-5}	
25	1051	3062	6125	334	19804	13000	3430	6860	1600	81*	74	9.61×10^{-5}	
30	995									41*	79	2.59×10^{-4}	
40**	913												
50**	854												
60**	808												

** Maximum possible n_{aN} is based on the gear ratio; please note the n_{apk} for the selected gear ratio.

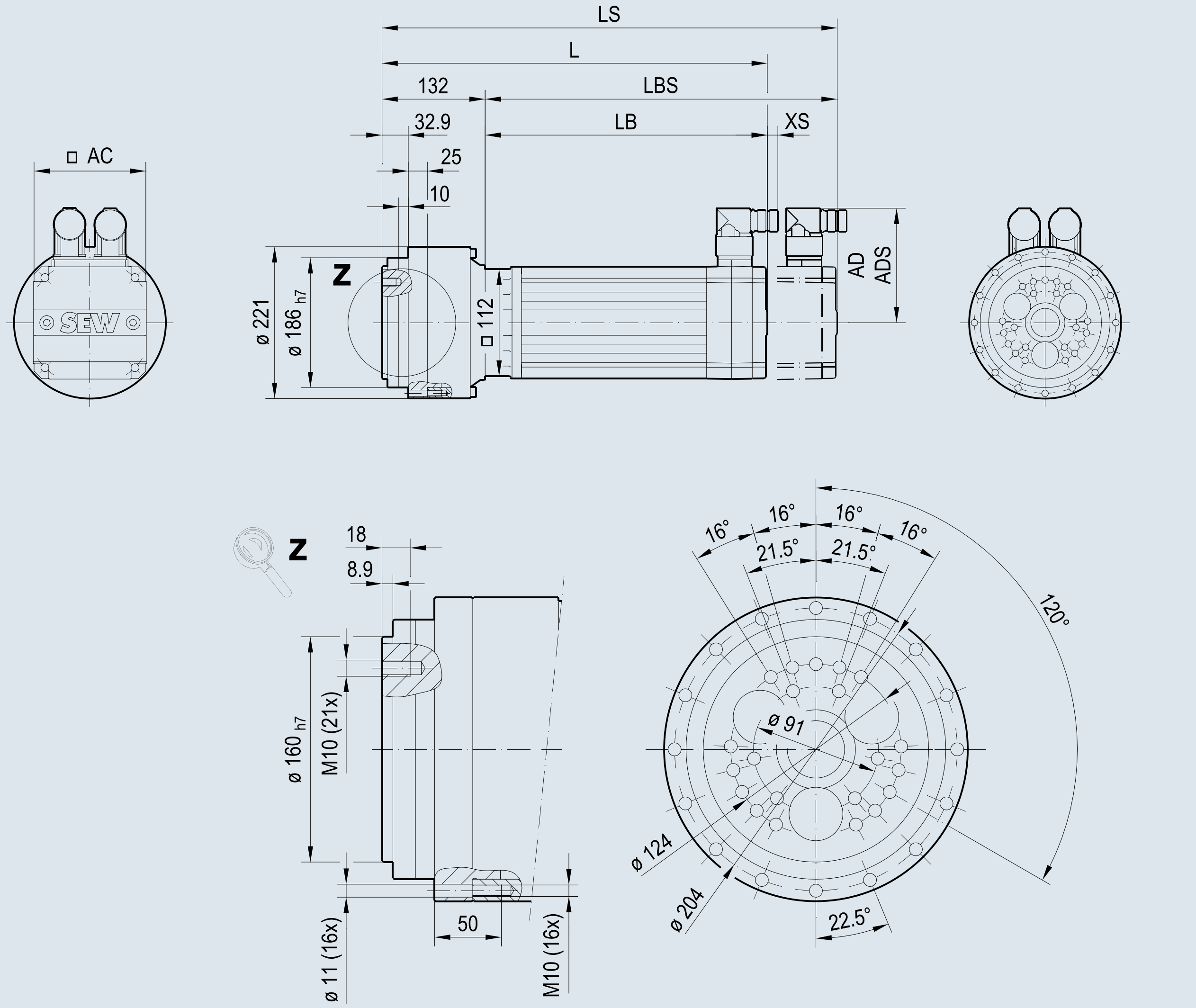
M_{aDYN} in Nm

CMP.. i	63M	63L	71S	71M	71L	80S	80M	80L
161*		> 3062		> 3062				
145.61..		> 3062		> 3062				
121*		2943		2981				
102.17..		2485		2518				
81*					3039	2728	> 3062	
41*								> 3062
m (kg)	32.1	34	33.3	34.7	37.7	39	42.7	47.6

M_{aDYN} in Nm

CM.. i	71M	71L	90S	90M	90L
161*		> 3062	> 3062		
145.61..		> 3062	> 3062		
121*		3040	> 3062		
102.17..		2567	> 3062		
81*				> 3062	> 3062
41*					
m (kg)	36.5	38.7	40.4	42.5	46.6

ZNBF80..



11 010 01 15

Designations See page 11	CMP63M	CMP63L	CMP71S	CMP71M	CMP71L	CMP80S	CMP80M	CMP80L
AC	88	88	116	116	116	137	137	137
AD	92	92	102	102	102	134	134	134
ADS	92	92	104	104	104	137	137	137
L	358	408	300	325	375	339	374	441
LS	386	436	364	389	439	417	452	519
LB	226	276	168	193	243	207	242	309
LBS	255	305	233	258	308	285	320	387
XS	14	14	11	11	11	37	37	37
L + HIPERFACE®	34	34	24	24	24	24	24	24
LS + HIPERFACE®	34	34	17	17	17	14	14	14

ZNBF90

n_{aN} min^{-1}	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin	i	n_{apk} min^{-1}	J_G kgm^2	x_b mm
5	2225									201*	30	4.75×10^{-5}	
10	1807									156*	38	6.75×10^{-5}	
15	1600									125.21..		8.95×10^{-5}	159
20	1468	4000	8000	490	20619	14700	4000	8000	2050	102.81..	48	1.13×10^{-4}	
25	1373									81*		1.54×10^{-4}	
30	1300									41*		3.32×10^{-4}	
40**	1192												

** Maximum possible n_{aN} is based on the gear ratio; please note the n_{apk} for the selected gear ratio.

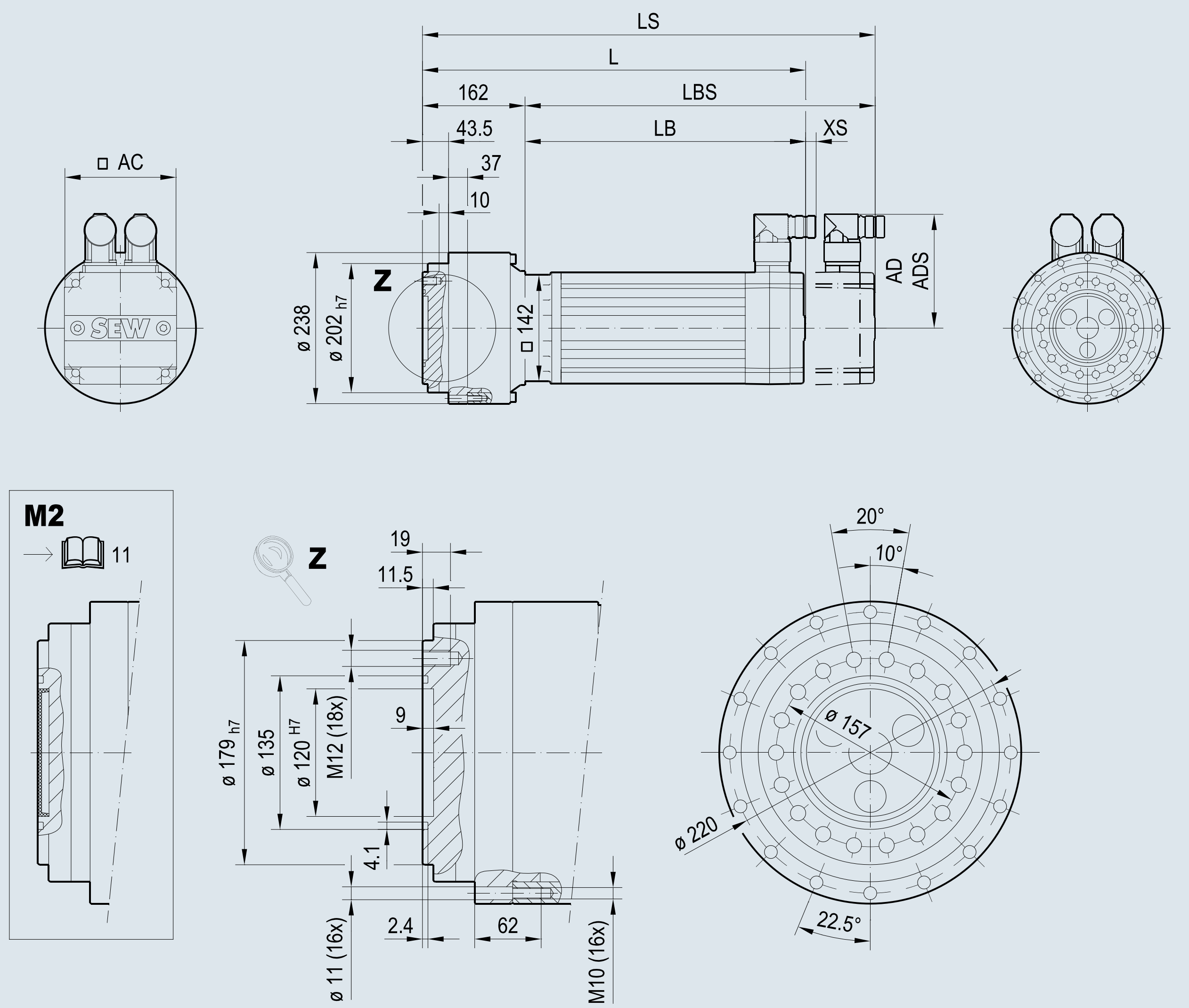
M_{aDYN} in Nm

CMP.. i	63L	71S	71M	71L	80S	80M	80L	100S	100M	100L	112S	112M	112L
201*	> 4000		> 4000										
156*	3794		3844										
125.21..				> 4000	> 4000	> 4000		> 4000					
102.81..				3858	3463	> 4000		> 4000					
81*				3039	2728	> 4000		> 4000					
41*										> 4000		> 4000	> 4000
m (kg)	41.5	40.9	42.3	45.3	46.5	50.2	55.1	53.4	58.4	68.2	70.2	78	94.4

M_{aDYN} in Nm

CM.. i	71M	71L	90S	90M	90L	112S	112M	112L	112H
201*		> 4000	> 4000						
156*		3919	> 4000						
125.21..				> 4000	> 4000				
102.81..				> 4000	> 4000				
81*				3383	> 4000				
41*								> 4000	> 4000
m (kg)	44	46.2	47.8	49.9	54	57.3	61.6	70.4	85.3

ZNBF90..



11 011 03 15

Designations See page 11	CMP 63L	CMP 71S	CMP 71M	CMP 71L	CMP 80S	CMP 80M	CMP 80L	CMP 100S	CMP 100M	CMP 100L	CMP 112S	CMP 112M	CMP 112L
AC	88	116	116	116	137	137	137	162	162	162	205	205	205
AD	92	102	102	102	134	134	134	146	146	146	177	177	213
ADS	92	104	104	104	137	137	137	147	147	147	177	177	213
L	430	322	347	397	361	395	458	393	428	508	501	544	632
LS	459	387	412	462	439	473	536	489	524	604	622	665	753
LB	268	160	185	235	199	233	296	231	266	346	339	382	470
LBS	297	225	250	300	277	311	374	327	362	442	460	503	591
XS	14	11	11	11	37	37	37	37	37	37	32	32	49
L + HIPERFACE®	34	24	24	24	24	24	24	24	24	24	24	24	24
LS + HIPERFACE®	34	17	17	17	14	14	14	–	–	–	–	–	–

ZNBF100

n_{aN} min^{-1}	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin	i	n_{apk} min^{-1}	J_G kgm^2	x_b mm
5	5178									185*		2.64×10^{-4}	
10	4206									162*		3.28×10^{-4}	
15	3724	9310	18620	948	28325	25000	7050	14100	5200	139*		3.84×10^{-4}	
20	3416									117*	27	4.93×10^{-4}	200
25	3195									93*		5.61×10^{-4}	
										75*		7.3×10^{-4}	

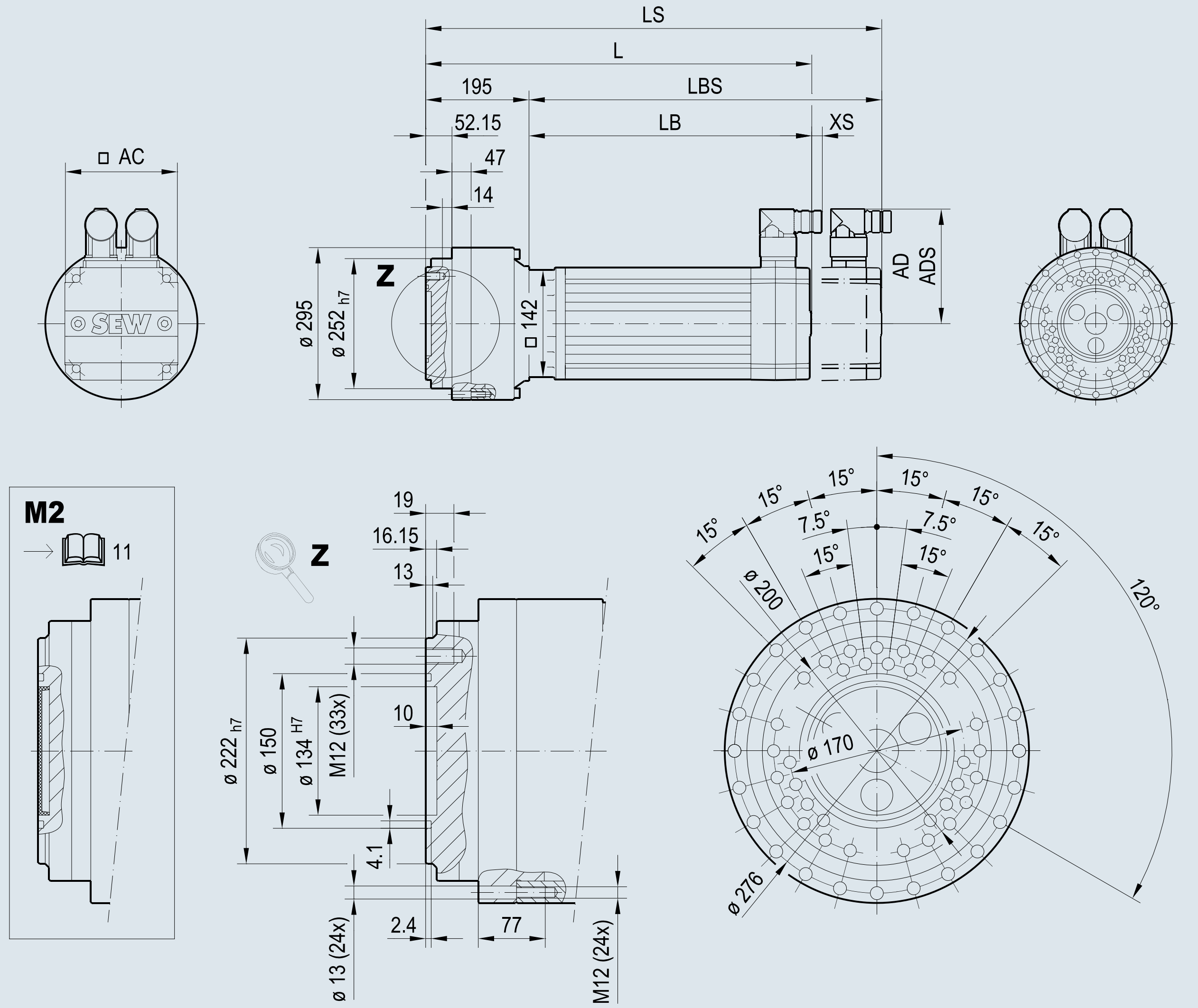
M_{aDYN} in Nm

CMP.. i	71L	80S	80M	80L	100S	100M	100L	112S	112M	112L
185*	6941	6231	9265		> 9310	> 9310		> 9310		
162*	6078	5456	8113		8852					
139*				> 9310		> 9310		> 9310		
117*				> 9310		> 9310		8237		
93*							> 9310		> 9310	> 9310
75*							> 9310		8160	> 9310
m (kg)	74.2	75.4	79.1	84	82.2	87.2	97	99.1	106.9	123.3

M_{aDYN} in Nm

CM.. i	90M	90L	112S	112M	112L	112H
185*	7726	> 9310				
162*	6765	> 9310				
139*			9152	> 9310		
117*			7703	> 9310		
93*					> 9310	> 9310
75*					> 9310	> 9310
m (kg)	78.8	82.9	86.1	90.4	99.2	114.1

ZNBF100..



11 012 03 15

Designations See page 11	CMP71L	CMP80S	CMP80M	CMP80L	CMP100S	CMP100M	CMP100L	CMP112S	CMP112M	CMP112L
AC	116	137	137	137	162	162	162	205	205	205
AD	102	134	134	134	146	146	146	177	177	213
ADS	104	137	137	137	147	147	147	177	177	213
L	429	394	428	491	425	460	540	534	577	665
LS	494	471	505	568	522	557	637	655	698	786
LB	235	199	233	296	231	266	346	339	382	470
LBS	300	277	311	374	327	362	422	460	503	591
XS	11	37	37	37	37	37	37	32	32	49
L + HIPERFACE®	24	24	24	24	24	24	24	24	24	24
LS + HIPERFACE®	17	14	14	14	–	–	–	–	–	–

ZNBF110

n_{aN} min⁻¹	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin	i	n_{apk} min⁻¹	J_G kgm²	x_b mm
5	6813									249		3.01×10^{-4}	
10	5534									192.75*		4.16×10^{-4}	
15	4900	12250	24500	1620	40486	32000	11000	22000	6850	159*		5.62×10^{-4}	
20	4495									144*	25	6.16×10^{-4}	215
25	4204									123*		7.44×10^{-4}	
										105*		9.5×10^{-4}	
										81*		1.35×10^{-3}	

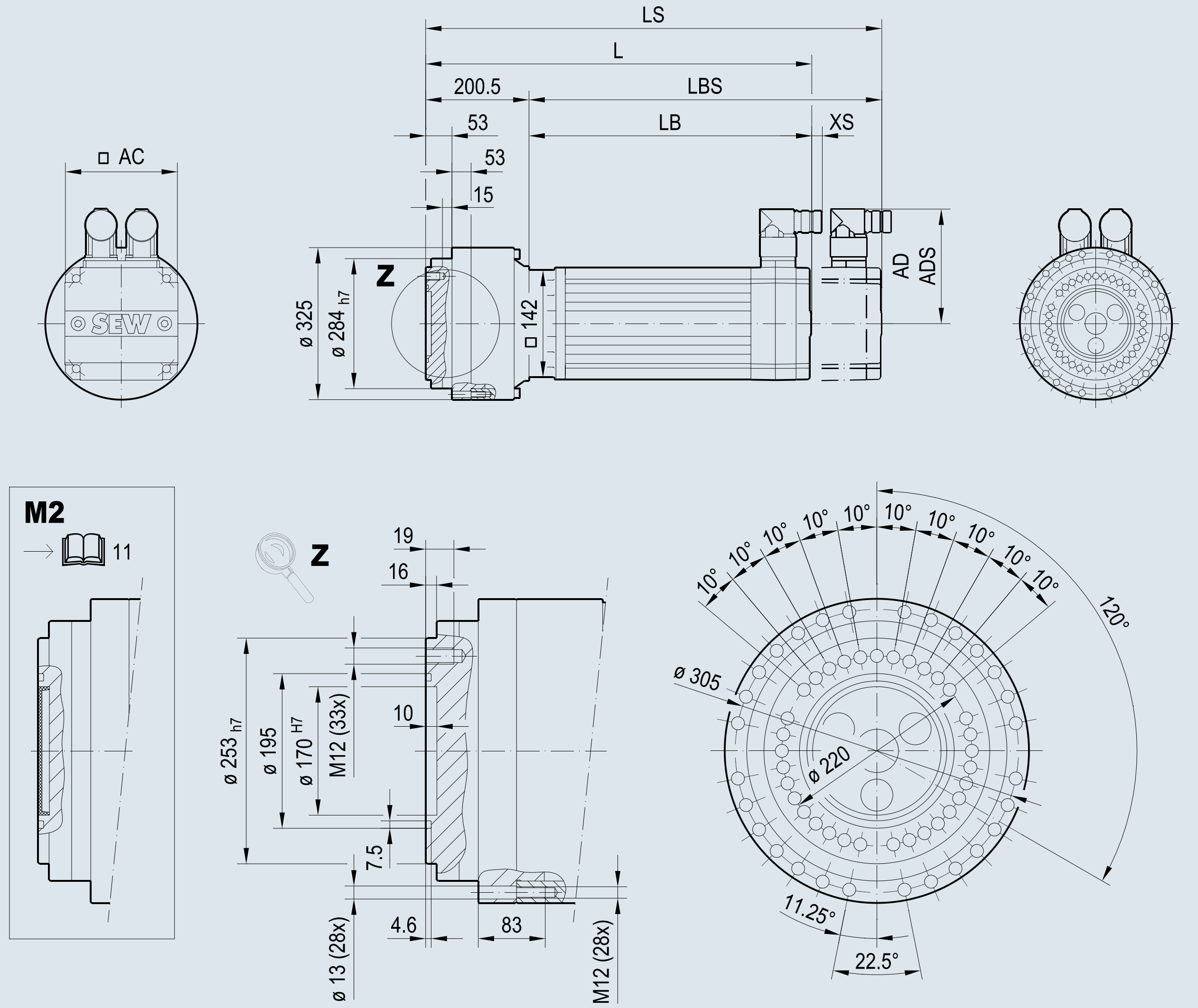
M_{aDYN} in Nm

CMP.. i	71L	80S	80M	80L	100S	100M	100L	112S	112M	112L
249	9343	8387	> 12250							
192.75*				> 12250		> 12250		> 12 250		
159*				> 12250		> 12250		11194		
144*				> 12250		> 12250		10138		
123*							> 12250		> 12 250	> 12250
105*							> 12250		11424	> 12250
81*							11586		8813	> 12250
m (kg)	91.4	92.7	96.4	101.3	99.5	104.5	114.3	116.4	124.2	140.6

M_{aDYN} in Nm

CM.. i	90M	90L	112S	112M	112L	112H
249	10399	> 12250				
192.75*			> 12250	> 12250		
159*			10469	> 12250		
144*			9481	> 12250		
123*					> 12250	> 12250
105*					> 12250	> 12250
81*					10206	> 12250
m (kg)	96.1	100.2	103.4	107.7	116.5	131.4

ZNBF110..



11 013 03 15

Designations See page 11	CMP71L	CMP80S	CMP80M	CMP80L	CMP100S	CMP100M	CMP100L	CMP112S	CMP112M	CMP112L
AC	116	137	137	137	162	162	162	205	205	205
AD	102	134	134	134	146	146	146	177	177	213
ADS	104	137	137	137	147	147	147	177	177	213
L	435	400	434	497	432	466	546	540	583	671
LS	500	477	511	574	527	562	642	661	704	792
LB	235	199	233	296	231	266	346	339	382	470
LBS	300	277	311	374	327	362	442	460	503	591
XS	11	37	37	37	37	37	37	32	32	49
L + HIPERFACE®	24	24	24	24	24	24	24	24	24	24
LS + HIPERFACE®	17	14	14	14	–	–	–	–	–	–

ZNBF120

n_{aN} min⁻¹	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin	i	n_{apk} min⁻¹	J_G kgm²	x_b mm
5	9733									203.52..		7.46×10^{-4}	
10	7905	17500	35000	2600	46368	44000	15000	30000	9000	183*		8.42×10^{-4}	
15	7000									159*		9.11×10^{-4}	
										142.44*	19	1.18×10^{-3}	257
										118*		1.28×10^{-3}	
										105*		1.61×10^{-3}	

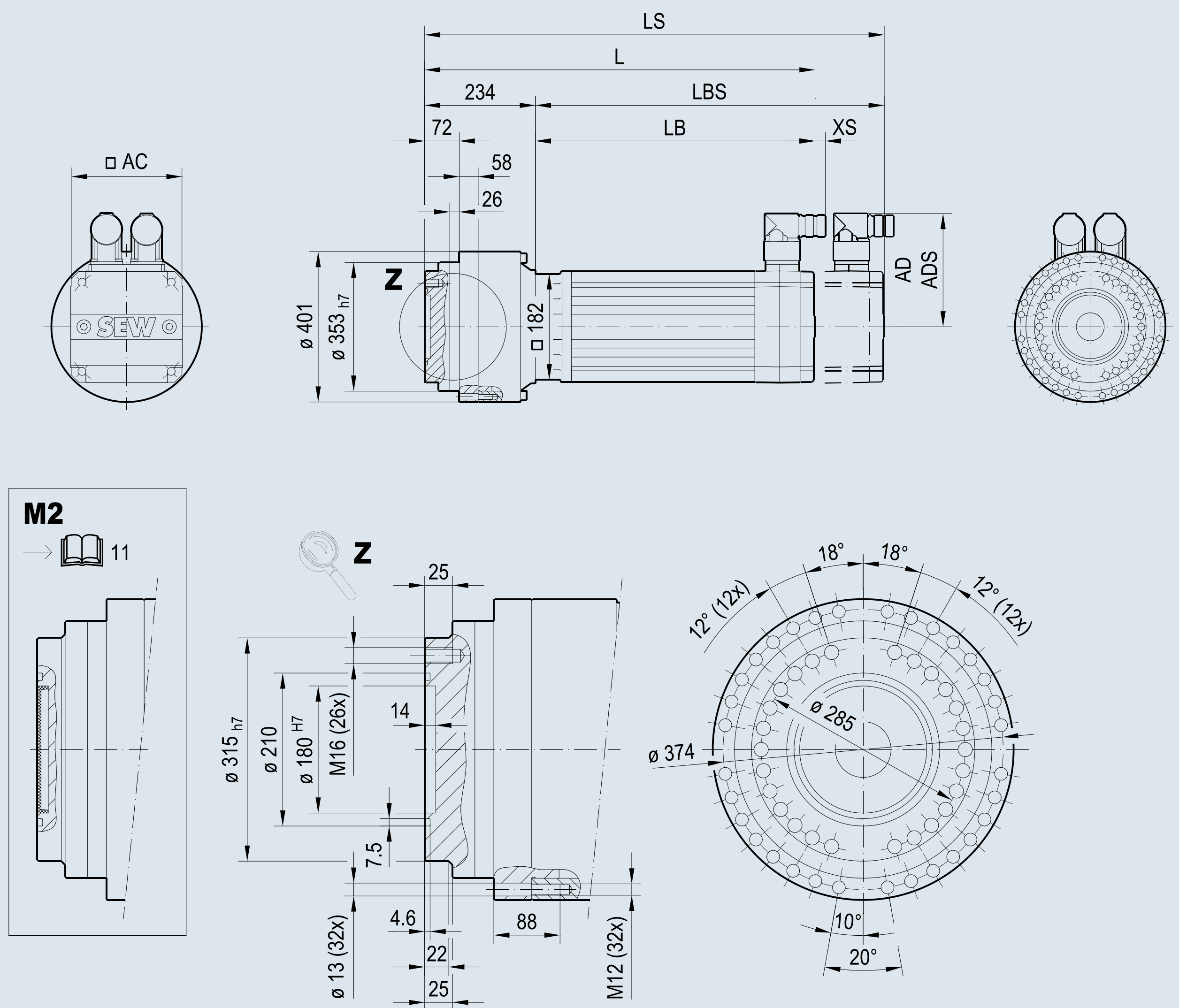
M_{aDYN} in Nm

CMP.. i	80L	100M	100L	112S	112M	112L
203.52..	17422	> 17500		14329		
183*			> 17500		> 17500	> 17500
159*			> 17500		17299	> 17500
142.44*			> 17500		15497	> 17500
118*			16879		12838	> 17500
105*			15019		11424	> 17500
m (kg)	160.3	163.4	173.2	175.9	183.7	200.1

M_{aDYN} in Nm

CM.. i	112S	112M	112L	112H
203.52..	13400	> 17500		
183*			> 17500	> 17500
159*			> 17500	> 17500
142.44*			> 17500	> 17500
118*			14868	> 17500
105*			13230	> 17500
m (kg)	161.7	166	174.8	189.7

ZNBF120..



11 014 03 15

Designations See page 11	CMP80L	CMP100M	CMP100L	CMP112S	CMP112M	CMP112L
AC	137	162	162	205	205	205
AD	134	146	146	177	177	213
ADS	137	147	147	177	177	213
L	526	496	576	569	612	700
LS	604	592	672	690	733	821
LB	292	262	342	335	378	466
LBS	370	358	438	456	499	587
XS	37	37	37	32	32	49
L + HIPERFACE®	24	24	24	24	24	24
LS + HIPERFACE®	14	–	–	–	–	–

ZNBF130

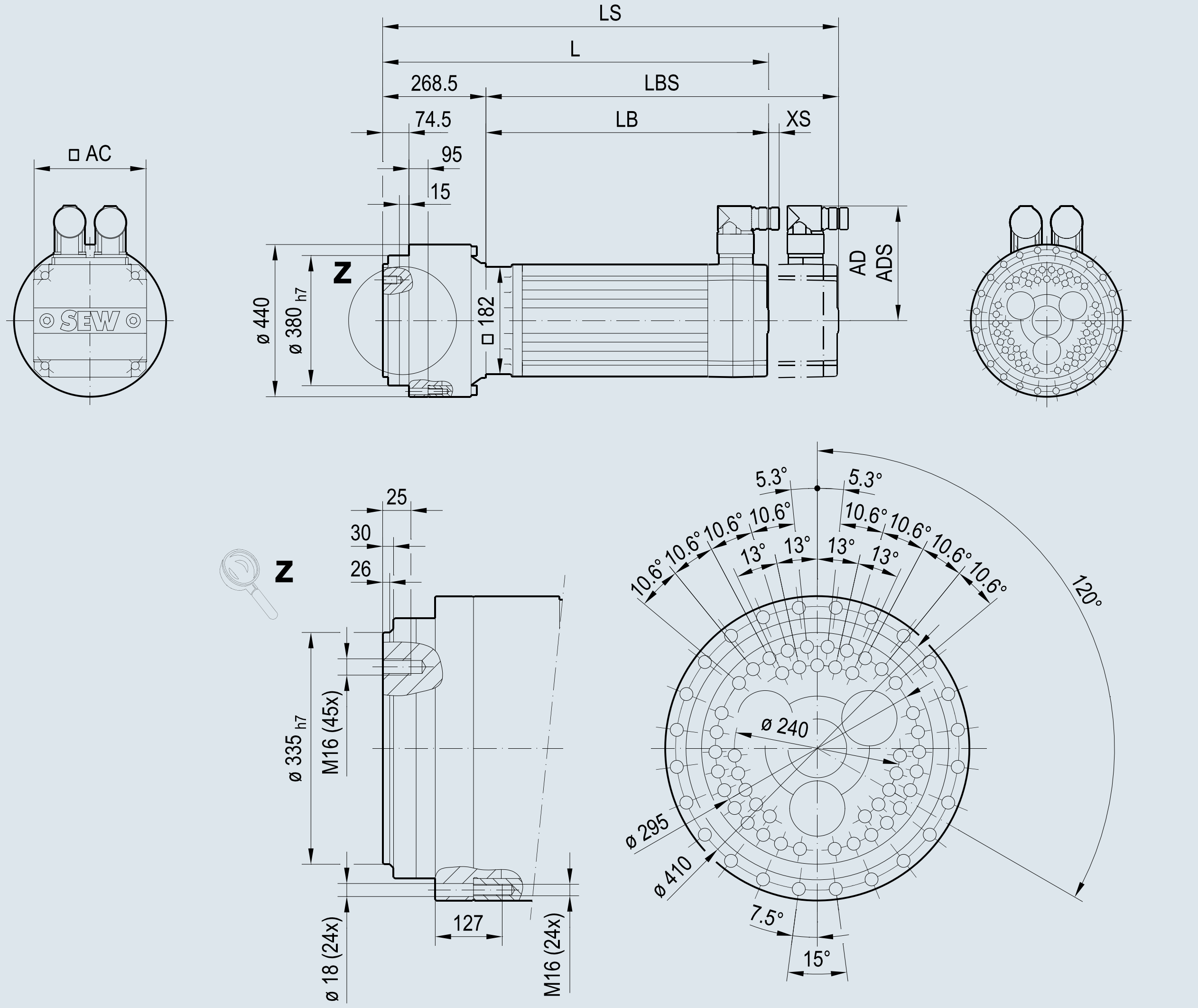
n_{aN} min^{-1}	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin
5	12514	22500	45000	3685	35350	39200	12740	25480	11790
10	10165								
15	9000								
20	8256								

i	n_{apk} min^{-1}	J_G kgm^2	x_b mm
248	23	9.52×10^{-4}	300

M_{aDYN} in Nm CMP.. i	80L	100M	100L	112S	112M	112L
248*			> 22500		> 22500	> 22500
m (kg)	224	227.2	237	240	247.5	263.9

M_{aDYN} in Nm CM.. i	112S	112M	112L	112H
248			> 22500	> 22500
m (kg)	225.5	229.8	238.6	253.5

ZNBF130..



11 001 01 16

Designations See page 11	CMP80L	CMP100M	CMP100L	CMP112S	CMP112M	CMP112L
AC	137	162	162	205	205	205
AD	134	146	146	177	177	213
ADS	137	147	147	177	177	213
L	560	530	610	603	647	735
LS	638	626	706	724	768	856
LB	292	262	342	335	378	466
LBS	370	358	438	456	499	587
XS	37	37	37	32	32	49
L + HIPERFACE®	24	24	24	24	24	24
LS + HIPERFACE®	14	–	–	–	–	–

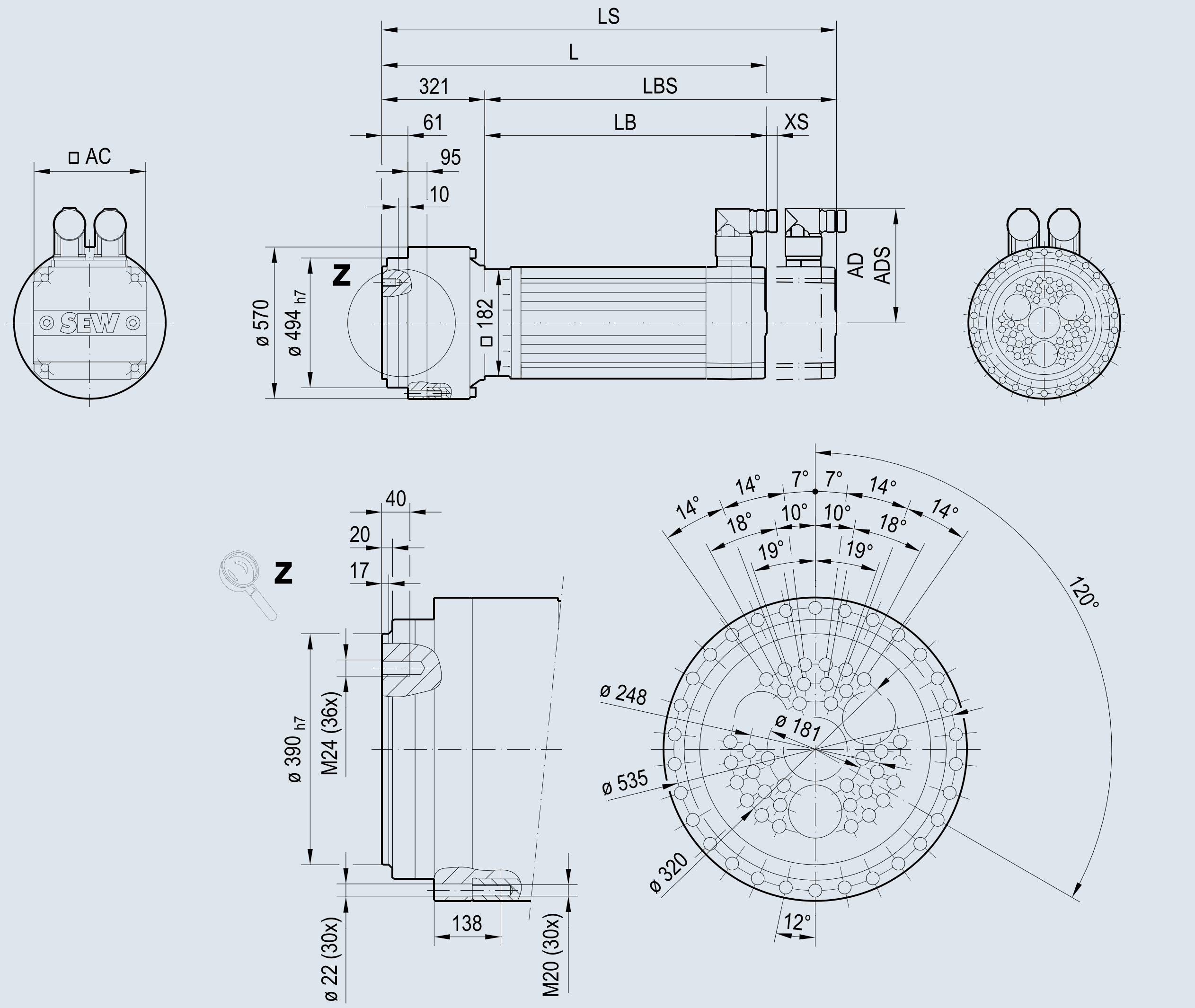
ZEBF140

n_{aN} min^{-1}	M_{aN} Nm	M_{apk} Nm	$M_{aEmerg.Off}$ Nm	C_T Nm/arcmin	F_{Ramax} N	F_{Aamax} N	$M_{bend,dyn}$ Nm	$M_{bend,stat}$ Nm	C_K Nm/arcmin	i	n_{apk} min^{-1}	J_G kgm^2	x_b mm
5	20460	36750	73500	6320	97265	51000	44100	88200	19800	236.29..	20	3.15×10^{-3}	344
10	16619									156*		5.59×10^{-3}	
15	14715									65*		1.41×10^{-2}	
20	13499												

M_{aDYN} (Nm) CMP.. i	100L	112M	112L	112H	112E
236.29..	33837	25708	> 36750		
156*				33696	> 36750
65*				14040	16640
m (kg)	423.6	434	450.4	458.2	466

M_{aDYN} (Nm) CM.. i	112S	112M	112L	112H
236.29..			29773	> 36750
156				
65				
m (kg)	410.5	414.8	423.6	438.5

ZEBF140..



11 002 01 16

Designations See page 11	CMP100L	CMP112M	CMP112L	CMP112H	CMP112E
AC	162	205	205	205	205
AD	146	177	213	213	213
ADS	147	177	213	213	213
L	663	699	787	890	873
LS	759	820	908	951	994
LB	342	378	466	509	552
LBS	438	499	587	630	673
XS	37	32	49	49	49
L + HIPERFACE®	24	24	24	24	24
LS + HIPERFACE®	–	–	–	–	–

Glossar

Axial load (F_{Aa})
Axial load runs coaxially to the rotary axis of the output shaft or the output flange. It can pull or push. If the axial load is exerted off-center, the distance from the force application angle and the shaft or flange angle results in what is referred to as bending moment.
If the axial load is greater than 0.3 × F_{Aamax}, this could result in a reduction of the maximum permitted bending moment, depending on the size. Contact SEW-EURODRIVE.

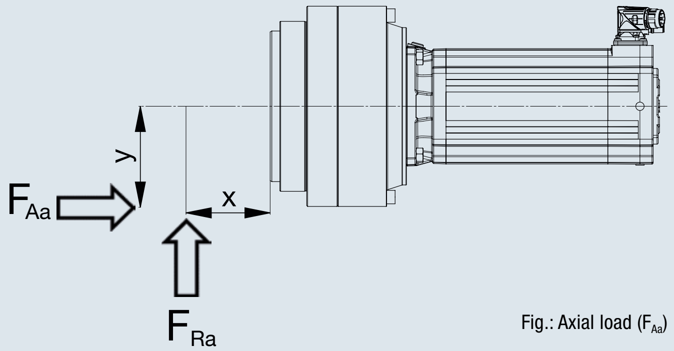


Fig.: Axial load (F_{Aa})

Intermittent duty
Intermittent duty happens when breaks or idling times occur during driving cycle (input rotational speed = 0 min^{-1}). The relative cyclic duration factor is comprised of the ratio of operating time and break time.

Service life
The technical values in the catalog are based on a calculated service life of 6000 hours. The service life is calculated from the sum of the driving cycles in which torque is applied to the gear unit on either the motor- or the load-side. If the capacity utilization of the gear unit is under the nominal value, a significantly longer service life can be anticipated. Dimensioning by SEW-EURODRIVE is required in order to determine an individual, mathematical service life.

Acceleration torque (M_{apk})
The maximum permitted output torque in short-time duty that may not be exceeded in any motion cycle.

Duty types (S1 – S9)
The motion profile – the result of operation and break time in the driving cycle – determines the nominal duty types. In this case, the determination differentiates between continuous duty (S1) and intermittent duty. The nominal duty types are determined in the regulation (IEC 60034-1).

Continuous duty (S1)
Continuous duty occurs at a cyclic duration factor of 100%. Due to the limited service life and the load-dependent heating, continuous duty is only possible at low output speed. Contact SEW-EURODRIVE in such cases.

Direct mounting
The servo gearmotors from SEW-EURODRIVE make it possible to mount servo gear units directly to the synchronous servomotors from SEW-EURODRIVE without an adapter or coupling. This results in a low-inertia, compact servo gearmotor in which all shaft-hub connections are designed to be positive and free of backlash.

Speed (n)
Depending on the size, there are different values for the maximum permitted rotational speed at the output for continuous or intermittent duty. The permitted output speed n_{apk} for intermittent duty must not be exceeded. The maximum permitted input rotational speed n_{epk} is limited to 6000 min^{-1}.

Cyclic duration factor (cdf)
The cyclic duration factor (cdf) designates the maximum permitted operating interval after which a resting phase must occur in order to prevent the drive unit from incurring damage. The cyclic duration factor is generally specified as a percentage – in connection with a usage period in minutes. Unless otherwise specified, this usage period is 10 minutes.

Weight information
The weight information in the catalog is based on the entire drive unit, which is made up of cycloidal gear units, a servomotor and a flange, including lubricant.

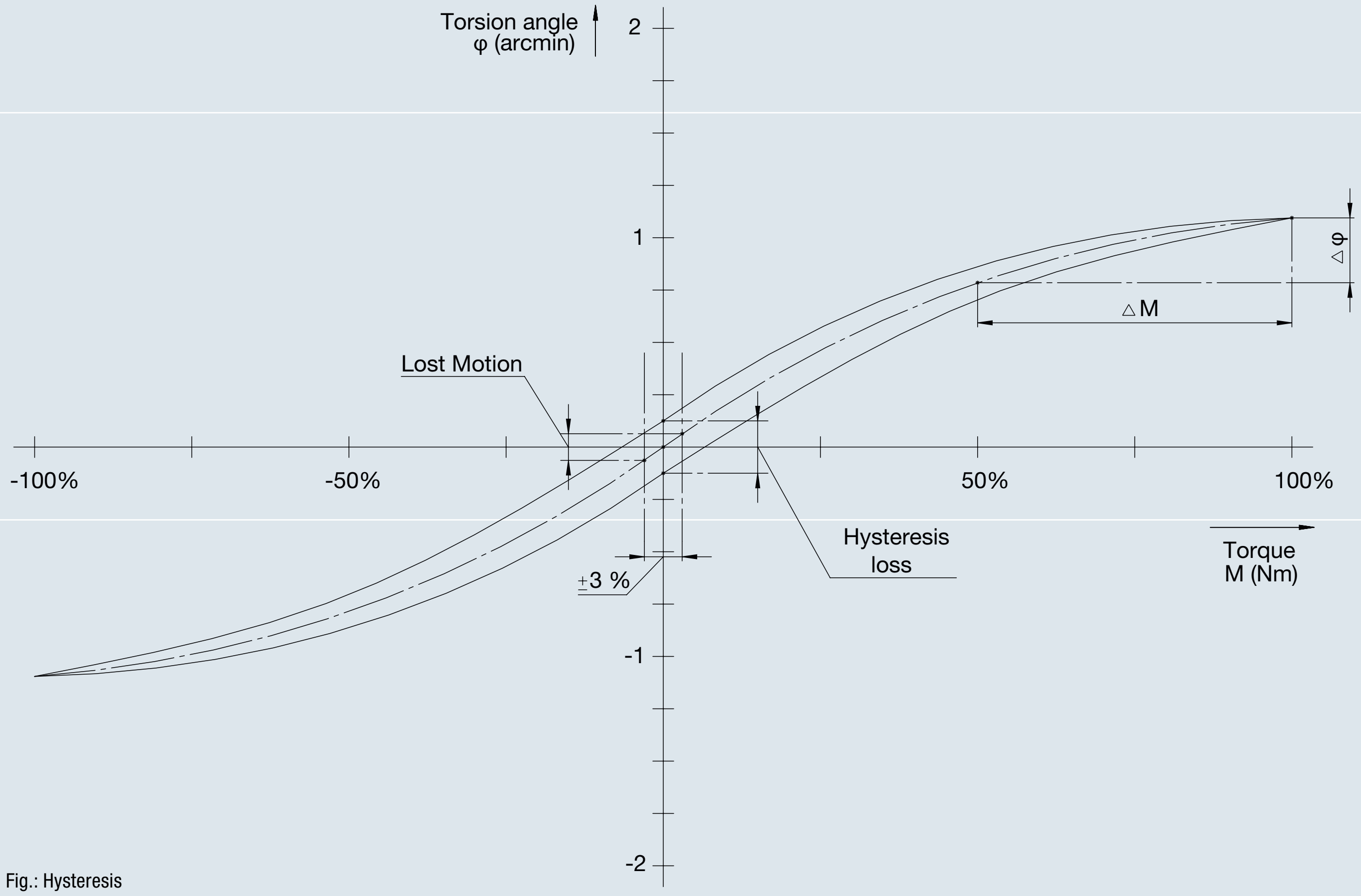


Fig.: Hysteresis

Hysteresis
Hysteresis occurs when a quasi-static torque is applied to the output in both directions of rotation up to the nominal torque (M_{aN}) when the input side is blocked. As a reaction, the output shaft turns depending on the load and the direction of rotation. This results in different sequences depending on the direction of rotation.
Lost motion, the loss of hysteresis, and the torsional rigidity of the precision gear units are parameters that can be determined based on the hysteresis curve.

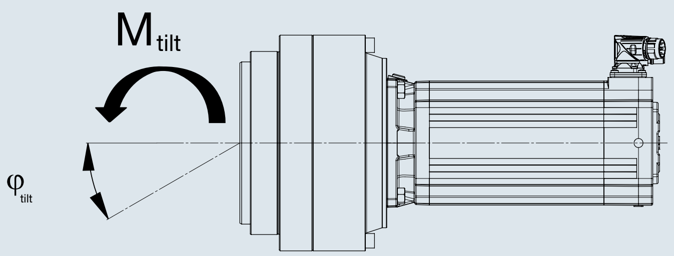


Fig.: Bending moment

Bending moment at n > 0 min^{-1} ($M_{bend,dyn}$)
If an axial load F_{Aa} (distance y) or a radial load F_R (distance x) is exerted off-center, this results in a bending moment on the output shaft or output flange block. If a bending moment greater than 0.6 × $M_{bend,dyn}$ results from the force component F_{Aa}, please contact SEW-EURODRIVE.

Bending moment at n = 0 min^{-1} ($M_{bend,stat}$)
In idle state (output speed = 0 min^{-1}) the permitted bending moment increases.

Tilting rigidity (c_K)
The tilting rigidity describes the flange block shaft's resistance against tilting. The stiffness is actually determined by the bearing type, bearing arrangement, the diameter and the distance of the main bearing. The maximum tilting angle results from the permissible bending moment and the tilting rigidity.

No-load speed
The no-load speed describes losses depending on the rotational speed and temperature. This corresponds to the torque that is required to overcome the inner friction on the mechanical contact points and the churning losses.

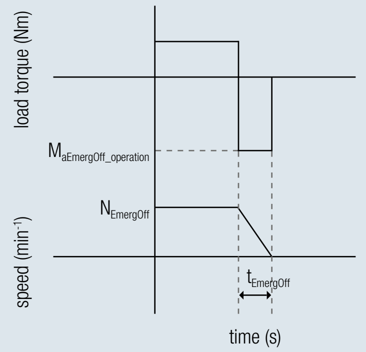
Lost motion
The pre-tensioned pairing of individual components results in a mechanical lack of backlash for the cycloidal gear units. The torsion angle that occurs in the case of small loads is determined by a static friction torque on the contact surfaces. For cycloidal gear units, it is described through lost motion and hysteresis loss. The value for lost motion is calculated using the determined hysteresis at +3%/-3% of the nominal torque at the output when the input shaft is blocked.

Mass moment of inertia (J)
The mass moment of inertia determines the resistance that a rigid body applies when exposed to a change in its motion state. The values specified in the catalog for the gear unit J_G are reduced to the motor shaft. The mass moment of inertia of the corresponding servomotor is not taken into account here.

Nominal torque (M_{aN})
The maximum permitted output torque in nominal operation at $n_a = 5\ min^{-1}$. Different operating points may reduce the permitted torque. The indicated values are based on a nominal service life of 6000 hours.

Emergency stop torque ($M_{aEmergOff}$)
The emergency stop torque defines the maximum torque that may be applied to the gear unit during an emergency off situation without damaging the gear unit. The maximum permissible number of emergency stops for the service life of the gear unit is 1000 or the number calculated according to the formula for $A_{EmergOff}$, if this is lower.

Verify the shock torque at the time of an emergency stop

Setting/verification item	Calculation formula	Selection examples
Required life (years)	Based on the operating conditions	5 years
$A_{EmergOff\_operation}$ – Expected number of emergency stops (times)	Based on the operating conditions	For example, an emergency stop occurs once a month. $A_{EmergOff\_operation} = 1 \times 12 \times$ required life (years) $= 12 \times 5 = 60$ (times)
$M_{aEmergOff\_operation}$ – Shock torque due to an emergency stop (Nm)		For example, $M_{aEmergOff\_operation} = 500$ (Nm)
$N_{EmergOff}$ – Speed at the time of an emergency stop (min^{-1})		For example, $N_{EmergOff} = 15$ (min^{-1})
$t_{EmergOff}$ – Deceleration time at the time of an emergency stop (s)	Shock torque due to an emergency stop $M_{aEmergOff\_operation}$ Set the operating conditions that meet the following requirement: Shock torque due to an emergency stop $M_{aEmergOff\_operation}$ is equal to or less than the momentary maximum permitted torque $M_{aEmergOff}$.	For example, $t_{EmergOff} = 0.05$ (s)
Z – Number of pins for the cycloidal gear unit	Gear unit / Number of pins (Z) ZNBF30 40 ZNBF40 40 ZNBF50 40 ZNBF60 40 ZNBF70 40 ZNBF80 40 ZNBF90 40 ZNBF100 46 ZNBF110 52 ZNBF120 52 ZNBF130 52 ZEBF140 40	Number of pins for ZNBF30: 40
$A_{EmergOff}$ – Permitted number of emergency stops (times)	$A_{EmergOff} = \dfrac{775 \times \left(\dfrac{M_{aEmergOff}}{M_{aEmergOff\_operation}}\right)^{\frac{10}{3}}}{Z \times \dfrac{N_{EmergOff}}{60} \times t_{EmergOff}}$ Note [$M_{aEmergOff}$]: Momentary maximum permitted torque; refer to the rating table on page 10	$A_{EmergOff} = \dfrac{775 \times \left(\dfrac{1225}{500}\right)^{\frac{10}{3}}}{40 \times \dfrac{15}{60} \times 0.05} = 30729$ (times)
Verification of the permitted number of emergency stops for the whole gear unit	Check the following condition: The permitted number of emergency stops for the whole gear unit (= Minimum ($A_{EmergOff}$; 1000)) is equal to or greater than the expected number of emergency stops $A_{EmergOff\_operation}$. If the tentatively selected cycloidal gear unit is outside the specifications, change the cycloidal gear unit size.	Minimum ($A_{EmergOff}$; 1000) $\geq A_{EmergOff\_operation}$ Minimum (30729; 1000) = 1000 $A_{EmergOff\_operation} = 60$ $1000 \geq 60$ According to the above condition, the tentatively selected model gear unit should be in order.

Painting and surface protection (OS)
The cycloidal servo gearmotors are painted RAL9005 (black) as standard. The output-side flange surfaces are unpainted and protected for transport by corrosion inhibitor. Customer-specific colors as well as a stronger surface protection (OS1–OS4) are available as an option.

Positioning accuracy
The positioning accuracy is determined by the hysteresis and the angle transmission error.

Overhung/radial load (F_{Ra})
The radial or overhung load runs at a right angle to the rotary axis of the output shaft or the output flange. If the radial load is exerted at a distance of x to the contact surface of the output shaft or the output flange, this results in a bending moment with lever arm ($x + x_b$). The gear unit constant x_b takes into consideration the individual bearing distances of every gear unit size.

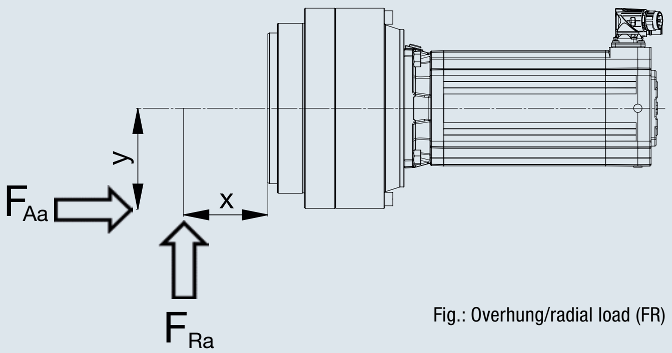


Fig.: Overhung/radial load (FR)

Lubricant
The gear units are already filled with lubricant in the factory. This is a lubrication for life. Food-safe lubrication is also available as an option upon consultation with SEW-EURODRIVE. With the same load data, the service life is reduced by 30% for technical reasons when food-safe lubrication is used.

Degrees of protection (IP)
The IP degrees of protection describe the degree of protection of electric systems against contact, foreign objects, and water. The servomotors are designed in IP54 enclosure protection. This offers complete protection against dust and contact as well as against water jets sprayed from any angle.

Torsional rigidity (C_T)
The torsional rigidity or stiffness is the ratio of the applied output torque to the resulting torsional angle at the output when the input-side is blocked.

Ambient temperature
Servo gear units can be operated at ambient temperatures between -10 °C and +40 °C. It is essential that you contact SEW-EURODRIVE if ambient temperatures exceed this temperature range.

Rotational clearance
The rotational clearance is the maximum possible angle of motion so that the gear unit output shaft can be turned load-free when the input side is blocked (max. 1% of the nominal output torque). As a result of the pre-tensioned cycloidal stage, ZN.. series cycloidal gear units exhibit no mechanical rotational clearance; however the lost motion must be taken into account.

Angle transmission error
The angle transmission error describes the synchronization characteristics of a gear unit and is repressed by the difference between the theoretical and the actual torsion angle of the gear unit output shaft. The angle transmission error is in the range between 20 and 40 angular seconds for the cycloidal gear units.

Efficiency (η)
The efficiency is the ratio of the output power to the drive power. The efficiency of cycloidal gear units is approximately 80%, depending on the function, and is based on the operating point.

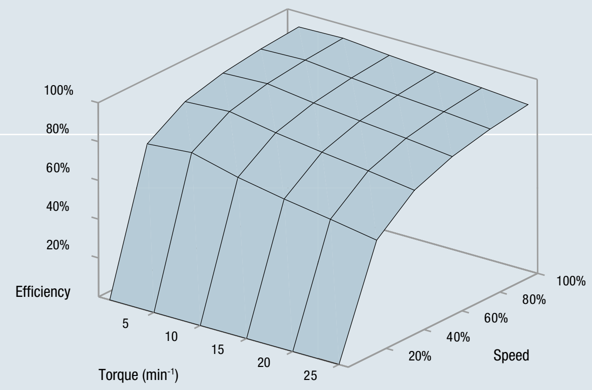


Fig.: Example depiction of the efficiency using the torque and rotational speed on the output

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