



DC Motor

EC Motor
(BLDC Motor)

Cearhead

Spindle
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

Contact
information

maxon RE-max

- High-performance at low cost
- Equipped with NdFeB magnets
- High and consistent quality thanks to mastery and monitoring of the processes
- Same part platform – compatible with the A-max
- Automated manufacturing process
- Open for customer-oriented modifications

Standard Specification No. 100	60
Explanation of the DC motors	64

DCX Program	66-87
DC-max Program	90-95
RE Program	98-134
A-max Program	137-162
RE-max Program	165-172

maxon RE-max program

The high-power range DC motor, with top performance and convincing quality.



Same design as the innovative and award-winning A-max range. Consistent implementation of the same part platform.



Motor housing made of steel laminate, minimizing waste. The strong field of the neodymium magnets is absorbed by an additional sleeve.



Hybrid process forms the stator by assembling motor housing, magnet and end cap in one step using injection molding of PPA plastic. Customers can select either sleeve or ball bearings.



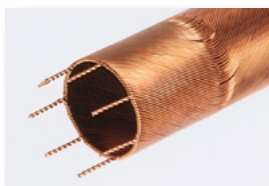
Elimination of a C-Clip groove results in higher torsional stability and greater cross-sectional strength.



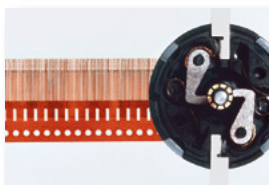
Reduced-diameter commutator, employing more segments. The newly developed CLL concept (Capacitor Long Life) significantly increases the service life of the RE-max motors.



High and consistent quality thanks to process monitoring and production on the most modern assembly lines.

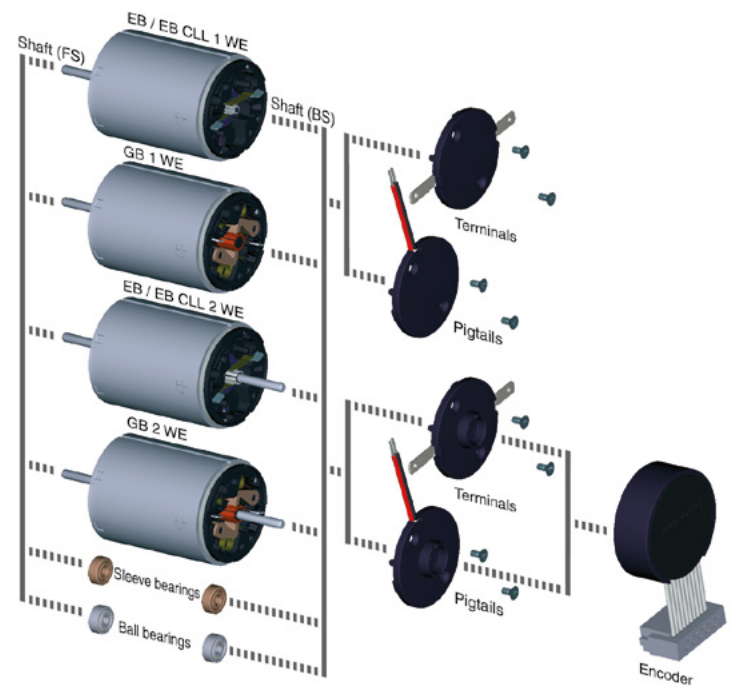


The "heart" of our motors is the ironless winding System maxon. This means – physically dependent – advantages like an efficiency of up to 90%, the best regulating dynamics and small dimensions.



Graphite brushes for hard use with the highest peak loads. Precious metal brushes for fine rotational movements.

Modular construction of the RE-max program

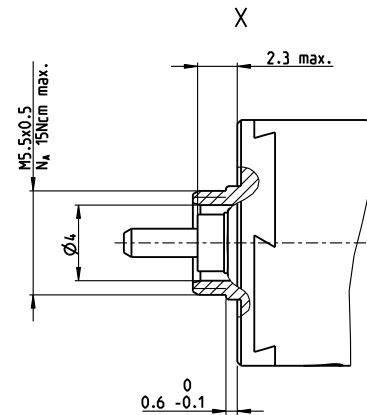
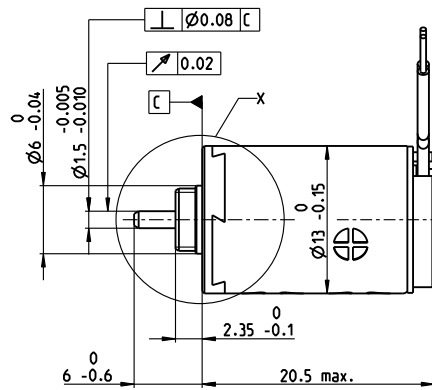
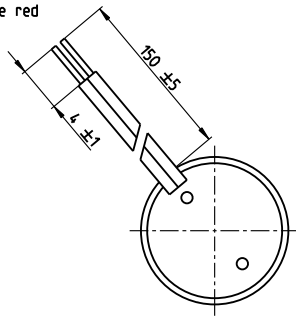


	WE = Shaft end	RE-max 13 1 WE	RE-max 13 2 WE	RE-max 21 1 WE	RE-max 21 2 WE
X = Standard X = Option					
Precious Metal Brushes (EB)		X	X	X	X
Precious Metal Brushes (EB) and CLL		X	X	X	X
Graphite Brushes (GB)				X	X
Sleeve Bearings		X	X	X	X
Ball Bearings				X	X
Terminals				X	X
Pigtails		X	X	X	X
Shaft flange side (FS)	min.	4.5	4.5	5.0	5.0
	max.	15.0	15.0	27.4	27.4
Shaft brush side (BS)	min.		2.6		2.6
	max.		10.0		16.6

RE-max 13 Ø13 mm, Precious Metal Brushes CLL, 1.2 Watt

Kabel AWG 28/7
cable UL Style 1061

⊕ Kabel rot
cable red



M 3:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers

201352 | 203881 | 203882 | 203883 | 203884 | 203885 | 203886 | 203887 | 203888 | 203889 | 203890 | 203891 | 203892 | 203893 | 203894

Motor Data		201352	203881	203882	203883	203884	203885	203886	203887	203888	203889	203890	203891	203892	203893	203894
Values at nominal voltage																
1 Nominal voltage	V	1	1.2	1.5	1.8	2.4	3	3.6	4.2	5	6	8	9	10	12	15
2 No load speed	rpm	11700	11400	11200	11100	11400	11700	12200	11600	11400	11100	11800	10700	11200	11300	10800
3 No load current	mA	68	55	42.8	35.1	27.5	22.7	20.3	16.1	13.2	10.4	8.69	6.65	6.36	5.43	4.02
4 Nominal speed	rpm	10200	9350	8720	7950	7350	6920	7070	6300	6020	5670	6440	5250	5630	5860	5240
5 Nominal torque (max. continuous torque)	mNm	0.334	0.422	0.552	0.682	0.898	1.11	1.28	1.31	1.29	1.3	1.28	1.27	1.26	1.27	1.26
6 Nominal current (max. continuous current)	A	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.4	0.325	0.263	0.209	0.167	0.155	0.132	0.0997
7 Stall torque	mNm	2.36	2.14	2.33	2.32	2.47	2.7	3.02	2.87	2.74	2.68	2.83	2.51	2.56	2.64	2.47
8 Stall current	A	2.94	2.18	1.87	1.53	1.26	1.12	1.09	0.846	0.668	0.527	0.447	0.321	0.306	0.267	0.19
9 Max. efficiency	%	73	72	73	73	73	74	75	75	75	75	75	74	74	74	74
Characteristics																
10 Terminal resistance	Ω	0.34	0.55	0.802	1.17	1.91	2.67	3.29	4.96	7.48	11.4	17.9	28.1	32.7	44.9	78.9
11 Terminal inductance	mH	0.0056	0.0083	0.0135	0.0199	0.0333	0.0501	0.0661	0.0993	0.145	0.223	0.346	0.532	0.607	0.847	1.47
12 Torque constant	mNm/A	0.802	0.98	1.25	1.51	1.96	2.41	2.76	3.39	4.1	5.08	6.33	7.84	8.38	9.89	13
13 Speed constant	rpm/V	11900	9740	7650	6300	4870	3970	3460	2820	2330	1880	1510	1220	1140	965	734
14 Speed / torque gradient	rpm/mNm	5050	5470	4920	4880	4740	4400	4110	4130	4250	4210	4270	4360	4450	4380	4450
15 Mechanical time constant	ms	19	16.7	15.4	14.8	14.3	14	13.7	13.6	13.6	13.6	13.6	13.7	13.7	13.6	13.7
16 Rotor inertia	gcm ²	0.358	0.291	0.299	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.294

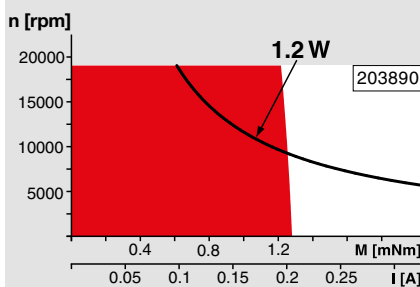
Specifications

Thermal data	
17 Thermal resistance housing-ambient	47.5 K/W
18 Thermal resistance winding-housing	14 K/W
19 Thermal time constant winding	5.11 s
20 Thermal time constant motor	186 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C

Mechanical data (sleeve bearings)	
23 Max. speed	19000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static)	35 N
28 Max. radial load, 5 mm from flange	1.4 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	15 g
CLL = Capacitor Long Life Alignment of the electronic connections not specified	
Values listed in the table are nominal. Explanation of the figures on page 64.	

Operating Range



Comments

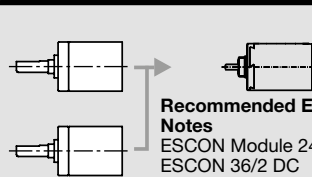
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power rating**

maxon Modular System

Overview on page 28-36

Planetary Gearhead
Ø13 mm
0.05 - 0.15 Nm
Page 314

Planetary Gearhead
Ø13 mm
0.2 - 0.35 Nm
Page 315

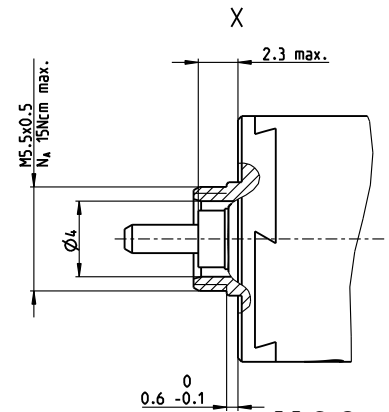
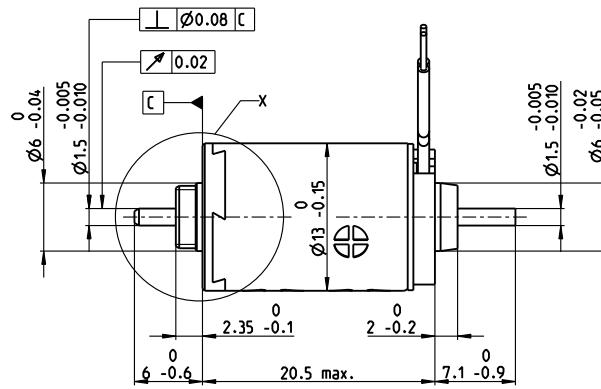
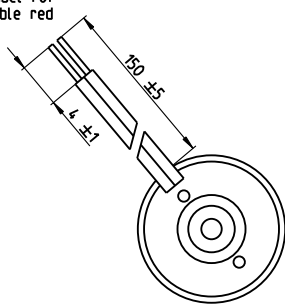


Recommended Electronics:
Notes Page 30
ESCON Module 24/2 426
ESCON 36/2 DC 426

RE-max 13 Ø13 mm, Precious Metal Brushes, 0.75 Watt

Kabel AWG 28/7
cable UL Style 1061

⊕ Kabel rot
cable red



- Stock program
- Standard program
- Special program (on request)

Part Numbers

268336|268337|268338|268339|268340|268341|268342|268343|268344|268345|268346|268347|268348|268349|268350

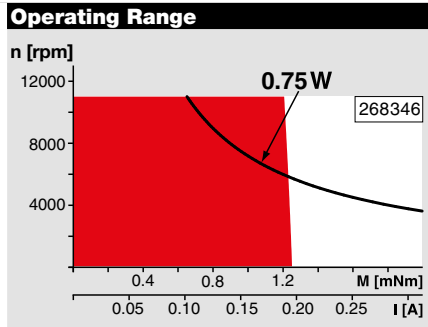
Motor Data		Part Numbers															
Values at nominal voltage		268336	268337	268338	268339	268340	268341	268342	268343	268344	268345	268346	268347	268348	268349	268350	
1 Nominal voltage	V	0.6	0.72	0.9	1.2	1.5	1.8	1.8	2.4	3	3.6	4.8	6	6	7.2	10	
2 No load speed	rpm	6870	6700	6600	7260	7010	6870	5980	6510	6720	6510	6970	7030	6560	6680	7050	
3 No load current	mA	79	64	50	42.8	32.6	26.3	21.8	18.3	15.3	12.2	10.1	8.16	7.43	6.34	4.92	
4 Nominal speed	rpm	5490	4680	4130	4160	2960	2150	849	1340	1350	1140	1580	1580	1050	1250	1550	
5 Nominal torque (max. continuous torque)	mNm	0.327	0.415	0.545	0.674	0.892	1.11	1.28	1.28	1.29	1.3	1.29	1.27	1.26	1.26	1.26	
6 Nominal current (max. continuous current)	A	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.392	0.326	0.264	0.21	0.168	0.156	0.132	0.1	
7 Stall torque	mNm	1.41	1.28	1.4	1.55	1.54	1.62	1.51	1.64	1.64	1.61	1.7	1.68	1.54	1.59	1.65	
8 Stall current	A	1.76	1.31	1.12	1.02	0.786	0.674	0.547	0.484	0.401	0.316	0.268	0.214	0.184	0.16	0.127	
9 Max. efficiency	%	63	62	63	64	64	65	65	66	65	65	66	66	64	65	65	
Characteristics																	
10 Terminal resistance	Ω	0.34	0.55	0.802	1.17	1.91	2.67	3.29	4.96	7.48	11.4	17.9	28.1	32.7	44.9	78.9	
11 Terminal inductance	mH	0.006	0.008	0.014	0.02	0.033	0.05	0.066	0.099	0.145	0.223	0.346	0.532	0.606	0.847	1.47	
12 Torque constant	mNm/A	0.802	0.98	1.25	1.51	1.96	2.41	2.76	3.39	4.1	5.08	6.33	7.84	8.38	9.89	13	
13 Speed constant	rpm/V	11900	9740	7650	6300	4870	3970	3460	2820	2330	1880	1510	1220	1140	965	734	
14 Speed / torque gradient	rpm/mNm	5050	5470	4920	4880	4740	4400	4110	4130	4250	4210	4270	4360	4450	4380	4450	
15 Mechanical time constant	ms	19.2	17	15.7	15.1	14.6	14.2	13.9	13.9	13.9	13.8	13.8	13.9	13.9	13.9	13.9	
16 Rotor inertia	gcm ²	0.363	0.296	0.304	0.295	0.293	0.308	0.323	0.32	0.311	0.313	0.309	0.305	0.298	0.302	0.299	

Specifications

Thermal data	
17 Thermal resistance housing-ambient	47.5 K/W
18 Thermal resistance winding-housing	14 K/W
19 Thermal time constant winding	5.11 s
20 Thermal time constant motor	186 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. speed	11 000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static) (static, shaft supported)	35 N
28 Max. radial load, 5 mm from flange	240 N
1.4 N	

Other specifications

29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	15 g
Alignment of the electronic connections not specified	
Values listed in the table are nominal.	
Explanation of the figures on page 64.	



Comments

- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power rating**

maxon Modular System

Planetary Gearhead
Ø13 mm
0.05 - 0.15 Nm
Page 314

Planetary Gearhead
Ø13 mm
0.2 - 0.35 Nm
Page 315

Recommended Electronics:
Notes Page 30

ESCON Module 24/2	426
ESCON 36/2 DC	426
EPOS2 24/2	434
EPOS2 Module 36/2	434
EPOS4 Mod./CB 24/1.5	441
MAXPOS 50/5	447

Encoder MR
16 CPT,
2 channels
Page 397

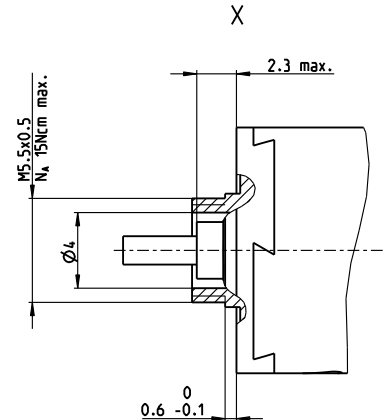
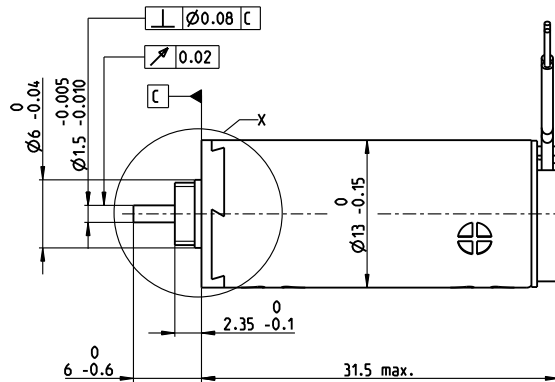
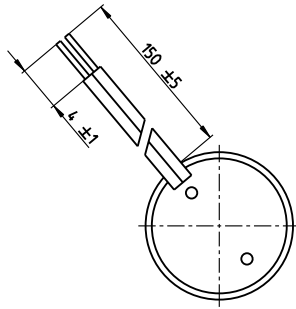
Encoder MR
64 - 256 CPT,
2 channels
Page 398/399

Overview on page 28-36

RE-max 13 Ø13 mm, Precious Metal Brushes CLL, 2.5 Watt

Kabel AWG 28/7
cable UL Style 1061

⊕ Kabel rot
cable red



M 3:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers

201353 | 203937 | 203938 | 203939 | 203940 | 203941 | 203942 | 203943 | 203944 | 203945 | 203946 | 203947 | 203948 | 203949 | 203950

Motor Data		201353	203937	203938	203939	203940	203941	203942	203943	203944	203945	203946	203947	203948	203949	203950
Values at nominal voltage																
1 Nominal voltage	V	2.4	3	3	3.6	4.8	4.8	6	7.2	8	10	12	15	15	18	24
2 No load speed	rpm	10600	12300	10800	10900	11500	10200	11500	11500	10900	11500	11100	11200	10400	10600	11600
3 No load current	mA	30.6	31.5	25.1	21.3	17.5	14.3	14	11.7	9.67	8.4	6.62	5.35	4.72	4.11	3.55
4 Nominal speed	rpm	9550	11000	9180	8940	9050	7440	8320	7990	7580	8060	7670	7750	6910	7210	8080
5 Nominal torque (max. continuous torque)	mNm	0.969	1.04	1.21	1.45	1.84	2.09	2.32	2.67	2.78	2.72	2.71	2.72	2.7	2.72	2.66
6 Nominal current (max. continuous current)	A	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.458	0.408	0.336	0.27	0.218	0.201	0.173	0.138
7 Stall torque	mNm	8.91	9.4	7.84	7.9	8.56	7.61	8.35	8.72	9	9.08	8.73	8.86	8.1	8.42	8.85
8 Stall current	A	4.15	4.06	2.97	2.52	2.16	1.71	1.69	1.47	1.3	1.1	0.852	0.697	0.591	0.526	0.45
9 Max. efficiency	%	84	84	83	83	83	83	83	83	84	84	84	84	83	84	84
Characteristics																
10 Terminal resistance	Ω	0.578	0.738	1.01	1.43	2.22	2.81	3.56	4.91	6.16	9.09	14.1	21.5	25.4	34.3	53.3
11 Terminal inductance	mH	0.016	0.018	0.024	0.033	0.053	0.068	0.083	0.12	0.163	0.232	0.356	0.549	0.638	0.872	1.31
12 Torque constant	mNm/A	2.15	2.31	2.64	3.14	3.96	4.46	4.95	5.94	6.94	8.26	10.2	12.7	13.7	16	19.6
13 Speed constant	rpm/V	4450	4130	3610	3040	2410	2140	1930	1610	1380	1160	933	751	697	596	486
14 Speed / torque gradient	rpm/mNm	1200	1320	1380	1390	1350	1350	1380	1330	1220	1270	1280	1270	1290	1270	1320
15 Mechanical time constant	ms	8.55	8.23	7.94	7.71	7.5	7.44	7.42	7.33	7.25	7.26	7.26	7.24	7.25	7.25	7.3
16 Rotor inertia	gcm ²	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications

Thermal data	
17 Thermal resistance housing-ambient	37 K/W
18 Thermal resistance winding-housing	10 K/W
19 Thermal time constant winding	6.97 s
20 Thermal time constant motor	277 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C

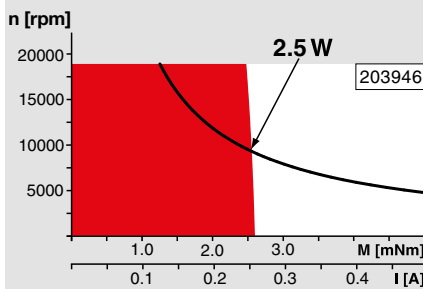
Mechanical data (sleeve bearings)	
23 Max. speed	19000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static)	35 N
28 Max. radial load, 5 mm from flange	1.4 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	24 g

CLL = Capacitor Long Life
Alignment of the electronic connections not specified

Values listed in the table are nominal.
Explanation of the figures on page 64.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

— Assigned power rating

maxon Modular System

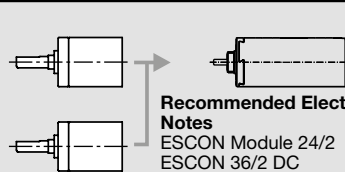
Overview on page 28-36

Planetary Gearhead

Ø13 mm
0.05 - 0.15 Nm
Page 314

Planetary Gearhead

Ø13 mm
0.2 - 0.35 Nm
Page 315



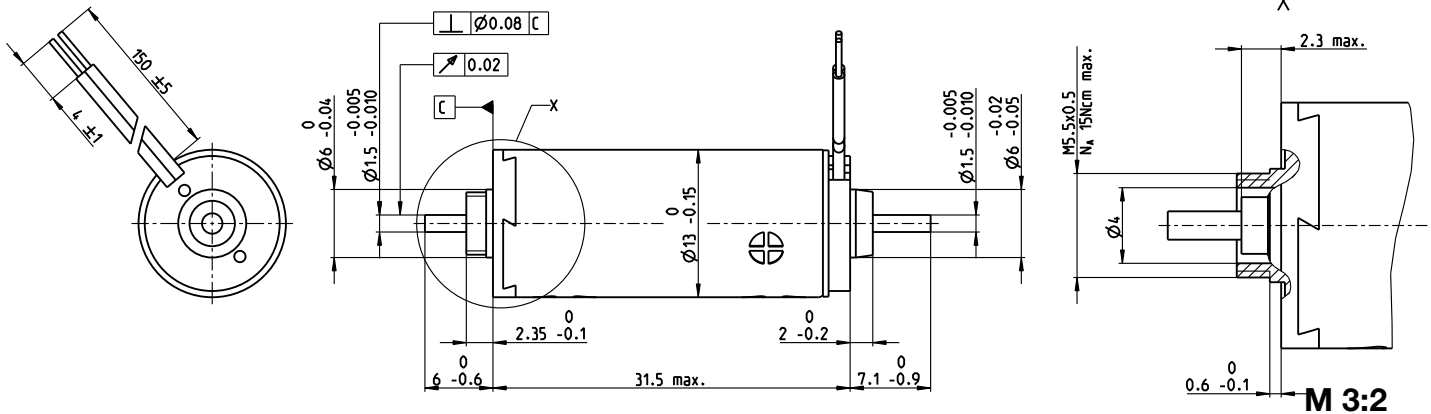
Recommended Electronics:

Notes Page 30
ESCON Module 24/2 426
ESCON 36/2 DC 426

RE-max 13 Ø13 mm, Precious Metal Brushes CLL, 2 Watt

Kabel AWG 28/7
cable UL Style 1061

⊕ Kabel rot
cable red



- Stock program
- Standard program
- Special program (on request)

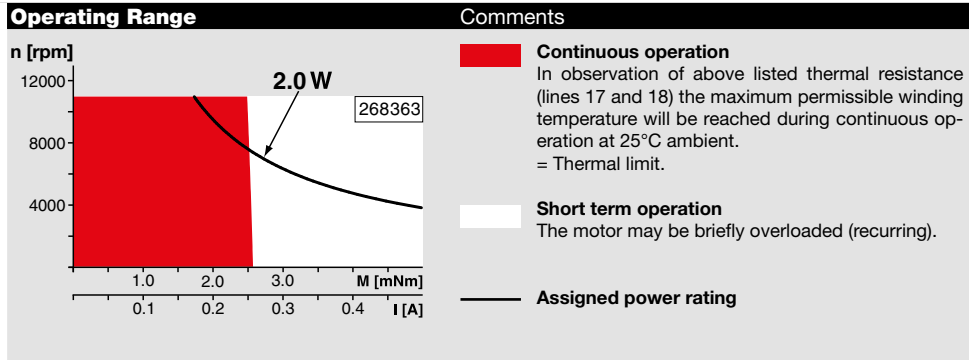
Part Numbers

268351	268353	268355	268356	268357	268358	268359	268360	268361	268362	268363	268364	268365	268366	268367
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data																
Values at nominal voltage																
1 Nominal voltage	V	1.5	1.5	1.8	2.4	3	3	3.6	4.2	4.8	6	7.2	9	10	12	15
2 No load speed	rpm	6570	6080	6380	7180	7100	6300	6810	6620	6500	6820	6600	6640	6840	7030	7160
3 No load current	mA	43.8	39.8	35.3	30.8	24.3	20.9	19.2	15.9	13.5	11.5	9.2	7.42	6.95	5.99	4.91
4 Nominal speed	rpm	5550	4830	4840	5290	4720	3590	3690	3150	3160	3420	3180	3230	3420	3630	3700
5 Nominal torque (max. continuous torque)	mNm	0.941	1.02	1.18	1.42	1.82	2.06	2.3	2.66	2.76	2.7	2.69	2.7	2.68	2.69	2.64
6 Nominal current (max. continuous current)	A	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.46	0.41	0.337	0.271	0.219	0.201	0.173	0.139
7 Stall torque	mNm	5.57	4.7	4.71	5.26	5.35	4.76	5.01	5.09	5.4	5.45	5.24	5.32	5.4	5.61	5.53
8 Stall current	A	2.59	2.03	1.78	1.68	1.35	1.07	1.01	0.856	0.779	0.66	0.511	0.418	0.394	0.35	0.281
9 Max. efficiency	%	76	74	74	75	75	74	75	75	76	76	75	75	76	76	76
Characteristics																
10 Terminal resistance	Ω	0.578	0.738	1.01	1.43	2.22	2.81	3.56	4.91	6.16	9.09	14.1	21.5	25.4	34.3	53.3
11 Terminal inductance	mH	0.0157	0.0182	0.0237	0.0334	0.0534	0.0675	0.0834	0.12	0.163	0.232	0.356	0.549	0.638	0.872	1.31
12 Torque constant	mNm/A	2.15	2.31	2.64	3.14	3.96	4.46	4.95	5.94	6.94	8.26	10.2	12.7	13.7	16	19.6
13 Speed constant	rpm/V	4450	4130	3610	3040	2410	2140	1930	1610	1380	1160	933	751	697	596	486
14 Speed / torque gradient	rpm/mNm	1200	1320	1380	1390	1350	1350	1380	1330	1220	1270	1280	1270	1290	1270	1320
15 Mechanical time constant	ms	8.61	8.3	8.01	7.78	7.57	7.51	7.49	7.4	7.31	7.33	7.33	7.31	7.31	7.32	7.37
16 Rotor inertia	gcm ²	0.686	0.601	0.553	0.535	0.535	0.531	0.517	0.533	0.57	0.55	0.546	0.549	0.541	0.548	0.534

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	37 K/W
18 Thermal resistance winding-housing	10 K/W
19 Thermal time constant winding	6.97 s
20 Thermal time constant motor	277 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. speed	11 000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static) (static, shaft supported)	35 N
28 Max. radial load, 5 mm from flange	140 N

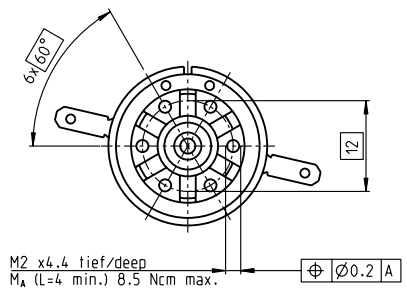
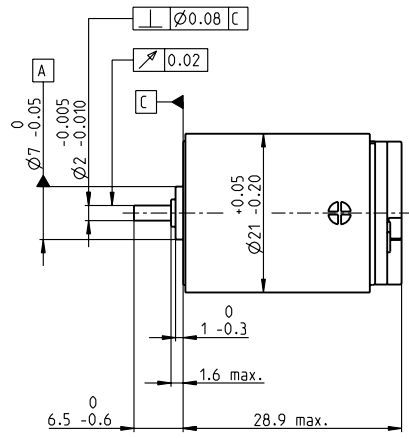
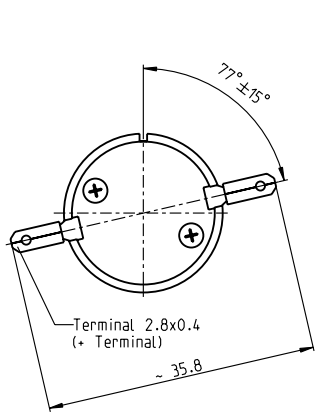
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	24 g
CLL = Capacitor Long Life	
Alignment of the electronic connections not specified	
Values listed in the table are nominal.	
Explanation of the figures on page 64.	



maxon Modular System		Overview on page 28-36												
<p>Planetary Gearhead Ø13 mm 0.05 - 0.15 Nm Page 314</p> <p>Planetary Gearhead Ø13 mm 0.2 - 0.35 Nm Page 315</p>		<p>Encoder MR 16 CPT, 2 channels Page 397</p> <p>Encoder MR 64 - 256 CPT, 2 channels Page 398/399</p>												
<p>Recommended Electronics: Page 30</p> <table style="width: 100%;"> <tr> <td>ESCON Module 24/2,</td> <td style="text-align: right;">426</td> </tr> <tr> <td>ESCON 36/2 DC</td> <td style="text-align: right;">426</td> </tr> <tr> <td>EPOS2 24/2</td> <td style="text-align: right;">434</td> </tr> <tr> <td>EPOS2 Module 36/2</td> <td style="text-align: right;">434</td> </tr> <tr> <td>EPOS4 Mod./CB 24/1.5</td> <td style="text-align: right;">441</td> </tr> <tr> <td>MAXPOS 50/5</td> <td style="text-align: right;">447</td> </tr> </table>			ESCON Module 24/2,	426	ESCON 36/2 DC	426	EPOS2 24/2	434	EPOS2 Module 36/2	434	EPOS4 Mod./CB 24/1.5	441	MAXPOS 50/5	447
ESCON Module 24/2,	426													
ESCON 36/2 DC	426													
EPOS2 24/2	434													
EPOS2 Module 36/2	434													
EPOS4 Mod./CB 24/1.5	441													
MAXPOS 50/5	447													

RE-max 21 Ø21 mm, Precious Metal Brushes CLL, 5 Watt

maxon RE-max



M 1:1

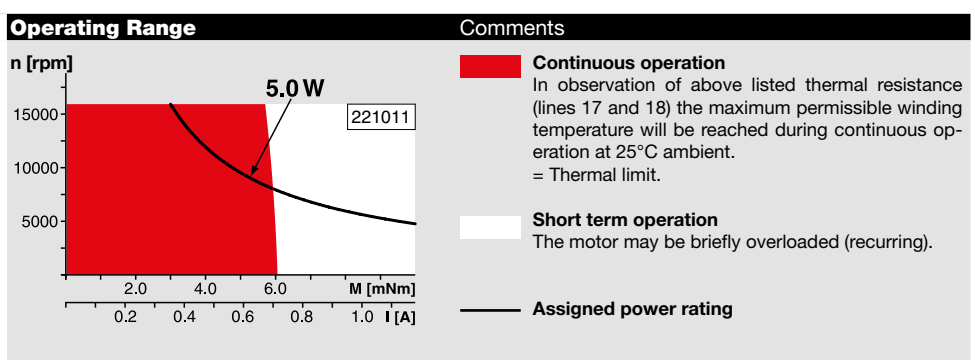
- Stock program
- Standard program
- Special program (on request)

Part Numbers

221009	221010	221011	221012	221013	221015	221016	221017	221019
--------	--------	--------	--------	--------	--------	--------	--------	--------

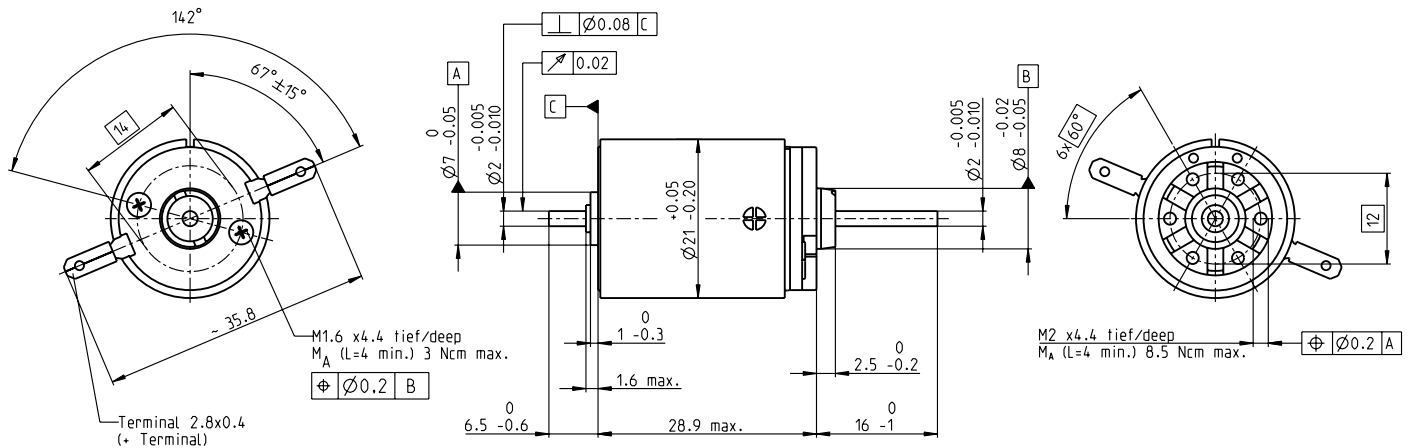
Motor Data		221009	221010	221011	221012	221013	221015	221016	221017	221019
Values at nominal voltage										
1 Nominal voltage	V	3	6	9	12	18	21	24	36	48
2 No load speed	rpm	8420	9440	9880	8160	9660	9450	8620	9750	9290
3 No load current	mA	176	101	70.7	42.5	34.5	28.8	22.7	17.4	12.4
4 Nominal speed	rpm	7870	8090	8280	6500	8050	7800	6950	8070	7580
5 Nominal torque (max. continuous torque)	mNm	2.23	4.41	5.59	5.66	5.56	5.45	5.51	5.28	5.26
6 Nominal current (max. continuous current)	A	0.84	0.84	0.722	0.452	0.352	0.29	0.234	0.17	0.121
7 Stall torque	mNm	29.7	30	34.3	28.1	33.7	31.6	28.8	31.1	29.1
8 Stall current	A	8.87	5.03	4.01	2.04	1.93	1.52	1.11	0.9	0.602
9 Max. efficiency	%	74	74	75	73	75	74	74	74	74
Characteristics										
10 Terminal resistance	Ω	0.338	1.19	2.24	5.88	9.34	13.8	21.7	40	79.7
11 Terminal inductance	mH	0.013	0.041	0.085	0.22	0.354	0.503	0.786	1.39	2.71
12 Torque constant	mNm/A	3.35	5.95	8.55	13.8	17.5	20.8	26	34.6	48.3
13 Speed constant	rpm/V	2850	1600	1120	694	546	459	367	276	198
14 Speed / torque gradient	rpm/mNm	288	322	293	297	292	305	305	319	326
15 Mechanical time constant	ms	7.67	6.98	6.69	6.65	6.62	6.66	6.68	6.88	6.77
16 Rotor inertia	gcm ²	2.54	2.07	2.18	2.14	2.16	2.09	2.09	2.06	1.99

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	28 K/W
18 Thermal resistance winding-housing	8.0 K/W
19 Thermal time constant winding	10.5 s
20 Thermal time constant motor	502 s
21 Ambient temperature	-30...+65°C
22 Max. winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	1 N
27 Max. force for press fits (static)	80 N
28 Max. radial load, 5 mm from flange	2.7 N
Mechanical data (ball bearings)	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	3.3 N
27 Max. force for press fits (static)	45 N
28 Max. radial load, 5 mm from flange	11.9 N
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	42 g
CLL = Capacitor Long Life	
Values listed in the table are nominal. Explanation of the figures on page 64.	
Option	
Ball bearings in place of sleeve bearings	
Pigtails in place of terminals	
Without CLL	



maxon Modular System		Overview on page 28-36
<p>Planetary Gearhead Ø22 mm 0.5 - 1.0 Nm Page 325</p> <p>Planetary Gearhead Ø22 mm 0.5 - 2.0 Nm Page 327</p> <p>Spur Gearhead Ø38 mm 0.1 - 0.6 Nm Page 344</p> <p>Spindle Drive Ø22 mm Page 364/365</p>		<p>Recommended Electronics: Notes Page 30</p> <p>ESCON Module 24/2 426</p> <p>ESCON 36/2 DC 426</p> <p>ESCON Module 50/5 427</p> <p>ESCON 50/5 428</p>

RE-max 21 Ø21 mm, Precious Metal Brushes CLL, 3.5 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

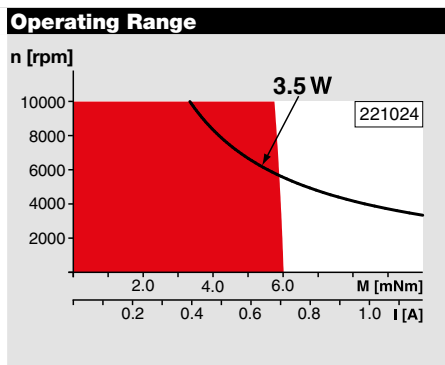
Part Numbers

221020	221023	221024	221025	221026	221028	221030	221031	221032
--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data		221020	221023	221024	221025	221026	221028	221030	221031	221032
Values at nominal voltage										
1 Nominal voltage	V	2	3.6	5	8.4	10	12	15	21	30
2 No load speed	rpm	5890	5950	5760	6010	5630	5670	5670	5970	6100
3 No load current	mA	54.5	30.8	21.1	13.4	10.2	8.61	6.88	5.31	3.84
4 Nominal speed	rpm	5220	4410	3830	4060	3690	3680	3680	3940	4050
5 Nominal torque (max. continuous torque)	mNm	2.54	4.65	6.25	6.16	6.21	6.07	6.06	5.91	5.85
6 Nominal current (max. continuous current)	A	0.84	0.84	0.778	0.477	0.378	0.311	0.248	0.182	0.129
7 Stall torque	mNm	19	17.3	18.3	18.9	18	17.3	17.3	17.4	17.5
8 Stall current	A	5.91	3.02	2.23	1.43	1.07	0.867	0.692	0.525	0.376
9 Max. efficiency	%	82	81	82	82	82	81	81	81	81
Characteristics										
10 Terminal resistance	Ω	0.338	1.19	2.24	5.88	9.34	13.8	21.7	40	79.7
11 Terminal inductance	mH	0.013	0.041	0.0846	0.219	0.353	0.502	0.784	1.38	2.7
12 Torque constant	mNm/A	3.22	5.72	8.22	13.2	16.8	20	25	33.2	46.5
13 Speed constant	rpm/V	2970	1670	1160	722	569	477	382	287	206
14 Speed / torque gradient	rpm/mNm	312	348	317	321	316	330	331	346	353
15 Mechanical time constant	ms	8.32	7.57	7.25	7.22	7.18	7.23	7.25	7.46	7.35
16 Rotor inertia	gcm ²	2.54	2.08	2.18	2.15	2.17	2.09	2.09	2.06	1.99

Specifications

Thermal data	
17 Thermal resistance housing-ambient	28 K/W
18 Thermal resistance winding-housing	8.0 K/W
19 Thermal time constant winding	8.83 s
20 Thermal time constant motor	502 s
21 Ambient temperature	-30...+65°C
22 Max. winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. speed	10000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1 N
27 Max. force for press fits (static) (static, shaft supported)	80 N / 480 N
28 Max. radial load, 5 mm from flange	2.7 N



Comments

■ **Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

— **Assigned power rating**

Mechanical data (ball bearings)	
23 Max. speed	10000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	3.3 N
27 Max. force for press fits (static) (static, shaft supported)	45 N / 480 N
28 Max. radial load, 5 mm from flange	11.9 N
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	43 g
CLL = Capacitor Long Life	
Values listed in the table are nominal. Explanation of the figures on page 64.	
Option	
Ball bearings in place of sleeve bearings	
Pigtails in place of terminals	
Without CLL	

maxon Modular System

Planetary Gearhead
Ø22 mm
0.5 - 1.0 Nm
Page 325

Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
Page 327

Spur Gearhead
Ø38 mm
0.1 - 0.6 Nm
Page 344

Spindle Drive
Ø22 mm
Page 364/365

Encoder MR
32 CPT,
2 / 3 channels
Page 401

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 403

Recommended Electronics:
Notes Page 30

ESCON Module 24/2 426

ESCON 36/2 DC 426

ESCON Module 50/5 427

ESCON 50/5 428

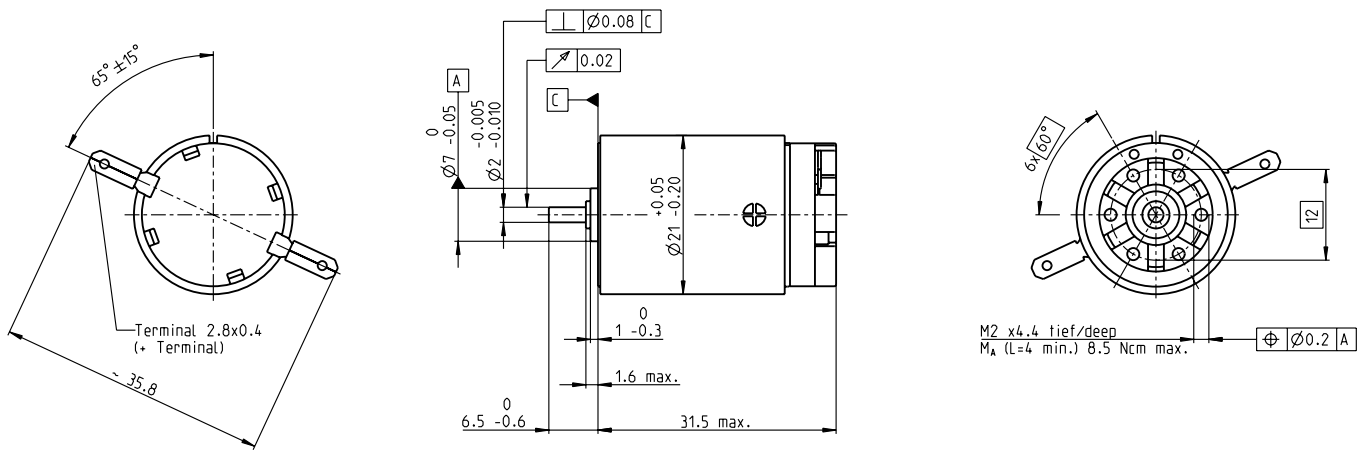
EPOS2 24/2 434

EPOS2 Module 36/2 434

EPOS4 Mod./CB 24/1.5 441

MAXPOS 50/5 447

RE-max 21 Ø21 mm, Graphite Brushes, 6 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

250000|250001|**250002**|250003|250004|250005|250006|250007|250008

Motor Data

Values at nominal voltage		4	6	9	15	18	21	24	36	48	
1	Nominal voltage	V	4	6	9	15	18	21	24	36	48
2	No load speed	rpm	11200	9440	9880	10200	9680	9470	8650	9780	9320
3	No load current	mA	150	81	56.9	35.7	27.7	23.2	18.2	14	9.95
4	Nominal speed	rpm	10700	8230	8230	8140	7580	7320	6480	7580	7090
5	Nominal torque (max. continuous torque)	mNm	1.91	3.81	5.69	7.13	7.23	7.09	7.14	6.9	6.86
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.552	0.44	0.362	0.292	0.213	0.151
7	Stall torque	mNm	45.4	30.9	34.8	35.2	33.7	31.6	28.8	31.1	29.1
8	Stall current	A	13.6	5.19	4.07	2.56	1.93	1.52	1.11	0.9	0.602
9	Max. efficiency	%	79	76	78	78	78	77	76	77	76
Characteristics											
10	Terminal resistance	Ω	0.295	1.16	2.21	5.86	9.32	13.8	21.7	40	79.7
11	Terminal inductance	mH	0.013	0.041	0.085	0.22	0.354	0.503	0.786	1.39	2.71
12	Torque constant	mNm/A	3.35	5.95	8.55	13.8	17.5	20.8	26	34.6	48.3
13	Speed constant	rpm/V	2850	1600	1120	694	546	459	367	276	198
14	Speed / torque gradient	rpm/mNm	252	312	289	295	291	305	305	319	326
15	Mechanical time constant	ms	6.77	6.87	6.68	6.72	6.7	6.76	6.78	6.98	6.88
16	Rotor inertia	gcm ²	2.57	2.1	2.21	2.17	2.2	2.12	2.12	2.09	2.02

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 28 K/W
 - 18 Thermal resistance winding-housing 8.0 K/W
 - 19 Thermal time constant winding 8.75 s
 - 20 Thermal time constant motor 501 s
 - 21 Ambient temperature -30...+85°C
 - 22 Max. winding temperature +125°C
- Mechanical data (sleeve bearings)**
- 23 Max. speed 12000 rpm
 - 24 Axial play 0.05 - 0.15 mm
 - 25 Radial play 0.012 mm
 - 26 Max. axial load (dynamic) 1 N
 - 27 Max. force for press fits (static) 80 N
 - 28 Max. radial load, 5 mm from flange 2.7 N

- Mechanical data (ball bearings)**
- 23 Max. speed 12000 rpm
 - 24 Axial play 0.05 - 0.15 mm
 - 25 Radial play 0.025 mm
 - 26 Max. axial load (dynamic) 3.3 N
 - 27 Max. force for press fits (static) 45 N
 - 28 Max. radial load, 5 mm from flange 11.9 N

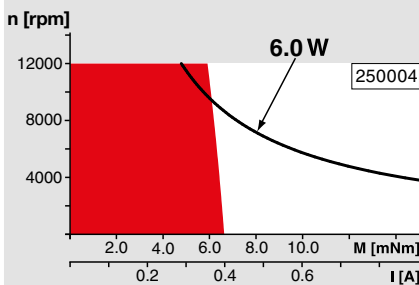
- Other specifications**
- 29 Number of pole pairs 1
 - 30 Number of commutator segments 9
 - 31 Weight of motor 42 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

Option

- Ball bearings in place of sleeve bearings
- Pigtails in place of terminals

Operating Range



Comments

- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power rating**

maxon Modular System

Overview on page 28-36

Planetary Gearhead

Ø22 mm
0.5 - 1.0 Nm
Page 325

Planetary Gearhead

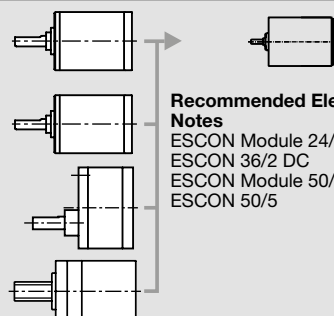
Ø22 mm
0.5 - 2.0 Nm
Page 327

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 344

Spindle Drive

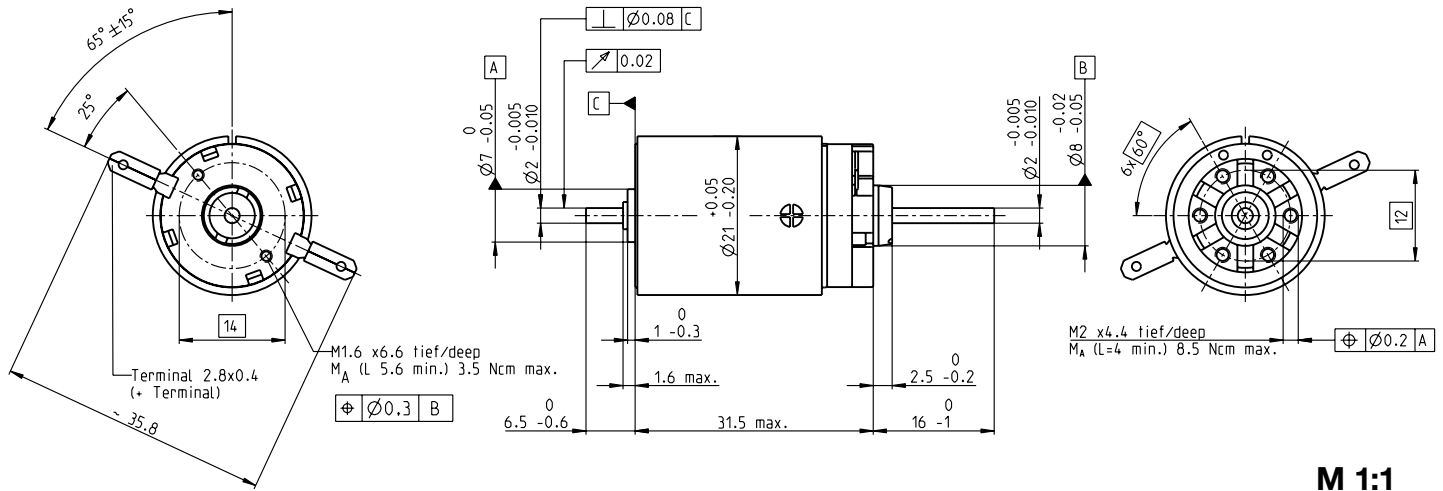
Ø22 mm
Page 364/365



Recommended Electronics:

- | | |
|-------------------|---------|
| Notes | Page 30 |
| ESCON Module 24/2 | 426 |
| ESCON 36/2 DC | 426 |
| ESCON Module 50/5 | 427 |
| ESCON 50/5 | 428 |

RE-max 21 Ø21 mm, Graphite Brushes, 6 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

250020	250021	250022	250023	250024	250025	250026	250027	250028
--------	--------	--------	--------	--------	--------	--------	--------	--------

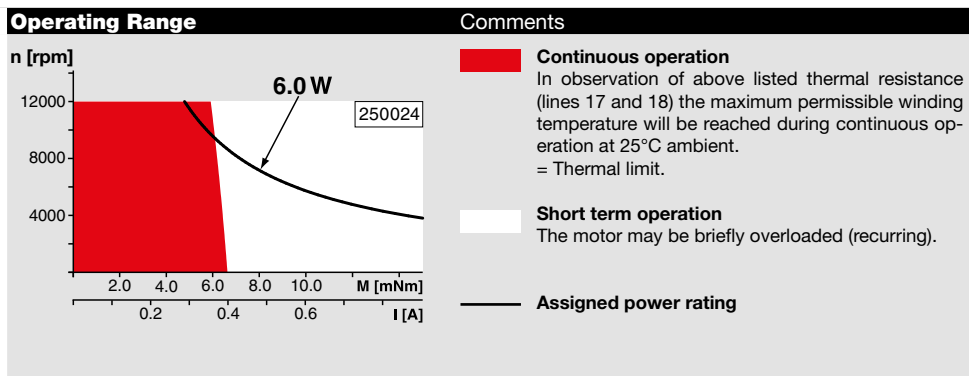
Motor Data		250020	250021	250022	250023	250024	250025	250026	250027	250028
Values at nominal voltage										
1 Nominal voltage	V	4	6	9	15	18	21	24	36	48
2 No load speed	rpm	11200	9440	9880	10200	9680	9470	8650	9780	9320
3 No load current	mA	150	81	56.9	35.7	27.7	23.2	18.2	14	9.95
4 Nominal speed	rpm	10700	8230	8230	8140	7580	7320	6480	7580	7090
5 Nominal torque (max. continuous torque)	mNm	1.91	3.81	5.69	7.13	7.23	7.09	7.14	6.9	6.86
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.552	0.44	0.362	0.292	0.213	0.151
7 Stall torque	mNm	45.4	30.9	34.8	35.2	33.7	31.6	28.8	31.1	29.1
8 Stall current	A	13.6	5.19	4.07	2.56	1.93	1.52	1.11	0.9	0.602
9 Max. efficiency	%	79	76	78	78	78	77	76	77	76
Characteristics										
10 Terminal resistance	Ω	0.295	1.16	2.21	5.86	9.32	13.8	21.7	40	79.7
11 Terminal inductance	mH	0.013	0.041	0.085	0.22	0.354	0.503	0.786	1.39	2.71
12 Torque constant	mNm/A	3.35	5.95	8.55	13.8	17.5	20.8	26	34.6	48.3
13 Speed constant	rpm/V	2850	1600	1120	694	546	459	367	276	198
14 Speed / torque gradient	rpm/mNm	252	312	289	295	291	305	305	319	326
15 Mechanical time constant	ms	6.69	6.77	6.59	6.62	6.6	6.66	6.68	6.88	6.77
16 Rotor inertia	gcm ²	2.54	2.07	2.18	2.14	2.16	2.09	2.09	2.06	1.99

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	28 K/W
18 Thermal resistance winding-housing	8.0 K/W
19 Thermal time constant winding	8.75 s
20 Thermal time constant motor	502 s
21 Ambient temperature	-30...+85°C
22 Max. winding temperature	+125°C
Mechanical data (sleeve bearings)	
23 Max. speed	12000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1 N
27 Max. force for press fits (static) (static, shaft supported)	80 N / 420 N
28 Max. radial load, 5 mm from flange	2.7 N
Mechanical data (ball bearings)	
23 Max. speed	12000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	3.3 N
27 Max. force for press fits (static) (static, shaft supported)	45 N / 420 N
28 Max. radial load, 5 mm from flange	11.9 N
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	42 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

Option

- Ball bearings in place of sleeve bearings
- Pigtails in place of terminals



maxon Modular System		Overview on page 28–36
<p>Planetary Gearhead Ø22 mm 0.5 - 1.0 Nm Page 325</p> <p>Planetary Gearhead Ø22 mm 0.5 - 2.0 Nm Page 327</p> <p>Spur Gearhead Ø38 mm 0.1 - 0.6 Nm Page 344</p> <p>Spindle Drive Ø22 mm Page 364/365</p>		<p>Encoder MR 32 CPT, 2 / 3 channels Page 401</p> <p>Encoder MR 128 / 256 / 512 CPT, 2 / 3 channels Page 403</p> <p>Recommended Electronics: Page 30</p> <p>ESCON Module 24/2 426</p> <p>ESCON 36/2 DC 426</p> <p>ESCON Module 50/5 427</p> <p>ESCON 50/5 428</p> <p>EPOS2 24/2 434</p> <p>EPOS2 Module 36/2 434</p> <p>EPOS2 50/5 435</p> <p>EPOS4 Mod./CB 24/1.5 441</p> <p>EPOS4 Module/CB 50/5 442</p> <p>MAXPOS 50/5 447</p>

Brushless DC motors (BLDC) with ironless or iron core windings.

Standard Specification No. 101	60
Explanation	174
ECX Program (can be configured online)	176–201
ECX SPEED 8 M Ø26 mm, brushless, 2 Watt	176
ECX SPEED 8 M HP Ø8 mm, brushless, 3 Watt	177
ECX SPEED 13 M Ø13 mm, steril., 25 Watt	NEW 178
ECX SPEED 13 M Ø13 mm, steril., ceramic, 25 W	NEW 179
ECX SPEED 13 L Ø13 mm, steril., 50 W	NEW 180
ECX SPEED 13 L Ø13 mm, steril., ceramic, 50 W	NEW 181
ECX SPEED 16 M Ø16 mm, 20 Watt	NEW 182
ECX SPEED 16 M HP Ø16 mm, 40 Watt	NEW 183
ECX SPEED 16 M Ø16 mm, steril., 40 Watt	184
ECX SPEED 16 M Ø16 mm, steril., ceramic, 40 W	185
ECX SPEED 16 L Ø16 mm, 40 Watt	NEW 186
ECX SPEED 16 L HP Ø16 mm, 80 Watt	NEW 187
ECX SPEED 16 L Ø16 mm, steril., 80 Watt	188
ECX SPEED 16 L Ø16 mm, steril., ceramic, 80 W	189
ECX SPEED 19 M Ø19 mm, steril., 60 Watt	190
ECX SPEED 19 M Ø19 mm, steril., ceramic, 60 W	191
ECX SPEED 19 L Ø19 mm, steril., 120 W	192
ECX SPEED 19 L Ø19 mm, steril., ceramic, 120 W	193
ECX SPEED 22 M Ø22 mm, 40 Watt	194
ECX SPEED 22 M HP Ø22 mm, 80 Watt	195
ECX SPEED 22 M Ø22 mm, steril., 80 W	196
ECX SPEED 22 M Ø22 mm, steril., ceramic, 80 W	197
ECX SPEED 22 L Ø22 mm, 80 Watt	198
ECX SPEED 22 L HP Ø22 mm, 120 Watt	199
ECX SPEED 22 L Ø22 mm, steril., 120 Watt	200
ECX SPEED 22 L Ø22 mm, steril., ceramic, 233 W	201
EC Program	204–222
EC 4 Ø4 mm, brushless, 0.5/1 Watt	204–205
EC 6 Ø6 mm, brushless, 1.5/2 Watt	206–207
EC 8 Ø8 mm, brushless, 2 Watt	208
EC 10 Ø10 mm, brushless, 8 Watt	209
EC 13 Ø13 mm, brushless, 6/12 Watt	210–211
EC 16 Ø16 mm, brushless, 30/60 Watt	212–213
EC 22 Ø22 mm, brushless, 40/100 Watt	214–215
EC 22 Ø22 mm, brushless, 80/240 Watt	216–217
EC 32 Ø32 mm, brushless, 80 Watt	218
EC 40 Ø40 mm, brushless, 170 Watt	219
EC 45 Ø45 mm, brushless, 150/250 Watt	220–221
EC 60 Ø60 mm, brushless, 400 Watt	222

EC-max Program	225–233
EC-max 16 Ø16 mm, brushless, 5/8 Watt	225–227
EC-max 22 Ø22 mm, brushless, 12/25 Watt	228–229
EC-max 30 Ø30 mm, brushless, 40/60 Watt	230–231
EC-max 40 Ø40 mm, brushless, 70/120 Watt	232–233


EC-4pole Program	237–243
22 Ø22 mm, brushless, 90 Watt	237
22 Ø22 mm, brushless, 120 Watt	238
30 Ø30 mm, brushless, 100 Watt	239
30 Ø30 mm, brushless, 150 Watt	sterilizable 240
30 Ø30 mm, brushless, 200 Watt	241
32 Ø32 mm, brushless, 220 Watt	HD 242
32 Ø32 mm, brushless, 480 Watt	HD 243

EC-i Program	247–252
EC-i 40 Ø40 mm, brushless, 50 Watt	247
EC-i 40 Ø40 mm, brushless, 50 Watt High Torque	248
EC-i 40 Ø40 mm, brushless, 70 Watt	249
EC-i 40 Ø40 mm, brushless, 70 Watt High Torque	250
EC-i 40 Ø40 mm, brushless, 100 Watt High Torque	251
EC-i 52 Ø52 mm, brushless, 180 Watt High Torque	252

EC flat Program	254–271
EC 9.2 flat Ø10 mm, brushless, 0.5 Watt	254
EC 10 flat Ø10 mm, brushless, 0.2 Watt	255
EC 14 flat Ø13.6 mm, brushless, 1.5 Watt	256
EC 20 flat Ø20 mm, brushless, 3/5 Watt	257–258
EC 20 flat Ø20 mm, brushless, 2/5 Watt	IE 259–260
EC 32 flat Ø32 mm, brushless, 6/15 Watt	261–262
EC 32 flat Ø32 mm, brushless, 15 Watt	IE 263
EC 45 flat Ø42.8 mm, brushless, 12 Watt	264
EC 45 flat Ø42.9 mm, brushless, 30 Watt	265
EC 45 flat Ø42.8 mm, brushless, 50 Watt	266
EC 45 flat Ø42.8 mm, brushless, 70 Watt	267
EC 45 flat Ø45 mm, brushless, 30/50 Watt	IE 268–269
EC 60 flat Ø60 mm, brushless, 100 Watt	270
EC 90 flat Ø90 mm, brushless, 90 Watt	271

Explanation of maxon EC motor terminology

Dimensional drawings

Presentation of the views according to the projection method E (ISO).  All dimensions in [mm].

Motor Data

The values in lines 2–15 are valid when using block commutation.

1 Nominal voltage U_N [V]

is the applied voltage between two powered phases in block commutation. See page 40 for the timing diagram of the voltage in the three phases. All nominal data (lines 2–9) refer to this voltage. Lower and higher voltages are permissible, provided that limits are not exceeded.

2 No load speed n_0 [rpm] $\pm 10\%$

is the speed at which the unloaded motor runs with the nominal voltage applied. It is approximately proportional to the applied voltage.

3 No load current I_0 [mA] $\pm 50\%$

This is the typical current that the unloaded motor draws when operating at nominal voltage. It increases with rising speed owing to bearing friction and iron losses. No load friction depends heavily on temperature. It decreases in extended operation and increases at lower temperatures.

4 Nominal speed n_N [rpm]

is the speed set for operation at nominal voltage and nominal torque at a motor temperature of 25°C.

5 Nominal torque M_N [mNm]

is the torque generated for operation at nominal voltage and nominal current at a motor temperature of 25°C. It is at the limit of the motor's continuous operation range. Higher torques heat up the winding too much.

6 Nominal current I_N [A]

is the current in the active phase in block commutation that generates the nominal torque at the given nominal speed (= max. permissible continuous load current). The maximum winding temperature is reached at 25°C ambient temperature in continuous operation with I_N . I_N decreases as speed increases due to additional losses in the lamination. For the EC 10 flat motor the nominal operating point is given varying at half no load speed, as the thermal limit is not reached at nominal voltage.

7 Stall torque M_H [mNm]

is the torque produced by the motor when at standstill. Rising motor temperatures reduce stall torque.

8 Stall current I_A [A]

is the quotient from nominal voltage and the motor's terminal resistance. Stall current is equivalent to stall torque. With larger motors, I_A cannot often be reached due to the amplifier's current limits.

9 Max. efficiency η_{max} [%]

is the calculated load torque that brings the shaft to standstill at nominal voltage. It also doesn't always denote the optimal operating point.

10 Terminal resistance phase to phase R [Ω]

is determined by the resistance at 25 °C between two connections of the standard resolution.

11 Terminal inductance phase to phase L [mH]

is the winding inductance between two connections. It is measured at 1 kHz, sinusoidal.

12 Torque constant k_M [mNm/A]

This may also be referred to as «specific torque» and represents the quotient from generated torque and applicable current.

13 Speed constant k_n [rpm/V]

indicates the theoretical no load speed per volt of applied voltage, disregarding friction losses.

14 Speed/torque gradient

$$\Delta_n/\Delta_M \text{ [rpm/mNm]}$$

The speed/torque gradient is an indicator of the motor's performance. The smaller the value, the more powerful the motor and consequently the less motor speed varies with load variations. It is based on the quotient of ideal no load speed and ideal stall torque (tolerance $\pm 20\%$).

The real characteristic curve depends on the speed for EC motors with slotted winding (EC flat and EC-i); it is steeper at high speeds and flatter at slow speeds. The real gradient at nominal voltage can be approximated by a straight line between no load speed and the nominal operating point (see page 53).

15 Mechanical time constant τ_m [ms]

is the time required for the rotor to accelerate from standstill to 63% of its no load speed.

16 Rotor moment of inertia J_R [gcm²]

is the mass moment of inertia of the rotor, based on the axis of rotation.

17 Thermal resistance housing-ambient R_{h2} [K/W]

and

18 Thermal resistance winding-housing R_{h1} [K/W]

Characteristic values of thermal contact resistance without additional heat sinking. Lines 17 and 18 combined define the maximum heating at a given power loss (load). Thermal resistance R_{h2} on motors with metal flanges can decrease by up to 80% if the motor is coupled directly to a good heat-conducting (e.g. metallic) mounting rather than a plastic panel.

19 Thermal time constant winding τ_w [s]

and

20 Thermal time constant motor τ_s [s]

These are the typical reaction times for a temperature change of winding and motor. It can be seen that the motor reacts much more sluggishly in thermal terms than the winding. The values are calculated from the product of thermal capacity and given heat resistances.

21 Ambient temperature [°C]

Operating temperature range. This derives from the heat reliability of the materials used and viscosity of bearing lubrication.

22 Max. winding temperature [°C]

Maximum permissible winding temperature.

23 Max. speed n_{max} [rpm]

is the maximum recommended speed based on thermal and mechanical perspectives. A reduced service life can be expected at higher speeds.

24 Axial play [mm]

On motors that are not preloaded, these are the tolerance limits for the bearing play. A preload cancels out the axial play up to the specified axial force. When load is applied in the direction of the preload force (away from the flange), the axial play is always zero. The length tolerance of the shaft includes the maximum axial play.

25 Radial play [mm]

Radial play is the bearing's radial movement. A spring is utilized to preload the motor's bearings, eliminating radial play up to a given axial load.

26/27 Max. axial load [N]

Dynamically: axial loading permissible in operation. If different values apply for traction and thrust, the smaller value is given.

Statically: maximum axial force applying to the shaft at standstill where no residual damage occurs.

Shaft supported: maximum axial force applying to the shaft at standstill if the force is not input at the other shaft end. This is not possible for motors with only one shaft end.

28 Max. radial load [N]

The value is given for a typical clearance from the flange; this value falls the greater the clearance.

29 Number of pole pairs

Number of north poles of the permanent magnet. The phase streams and commutation signals pass through per revolution p cycles. Servo-controllers require the correct details of the number of pole pairs.

30 Number of phases

All maxon EC motors have three phases.

31 Weight of motor [g]

32 Typical noise level [dBA]

is that statistical average of the noise level measured according to maxon standard (10 cm distance radially to the drive, no load operation at a speed of 6,000 or 50,000 rpm. The drive lies freely on a plastic foam mat in the noise chamber).

The acoustic noise level depends on a number of factors, such as component tolerances, and it is greatly influenced by the overall system in which the drive is installed. When the drive is installed in an unfavorable constellation, the noise level may be significantly higher than the noise level of the drive alone.

The acoustic noise level is measured and determined during product qualification. In manufacturing, a structure-borne noise test is performed with defined limits. Impermissible deviations can thus be identified.

33 Max. torque M_{max} [mNm]

Maximum torque the motor can briefly deliver. It is limited by the overload protection of the electronics.

34 Max. current I_{max} [A]

Surge current with which the peak torque is generated at nominal voltage. With an active speed controller, surge current is not proportionate to the torque, but also depends on the supply voltage. As a result, this value only applies at nominal voltage.

35 Type of control

«Speed» means that the drive is fitted with an integral speed controller. «Controlled» means that the drive is fitted with true commutation electronics.

36 Supply voltage $+V_{CC}$ [V]

Range of supply voltages measured in respect of GND at which the drive functions.

37 Speed set value input U_C [V]

Range of analog voltage for set speed value measured in respect of GND. For 2 wire solutions, the supply voltage acts as speed setting at the same time.

38 Scaling Set speed value input k_c [rpm/V]

Set speed value n_c is based on the product $n_c = k_c \cdot U_c$.

39 Speed range

Achievable speeds in the controlled range.

40 Max. acceleration

The set speed value follows a sudden set point change with a ramp. This value indicates the increase in the ramp.