Precision Drive Systems

maxon

Product Range 2020/21

Explanations of maxon terminology: DC motor

maxon

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

Mounting in plastic
Screwed connections on motors with plastic flanges require special attention.

M_A **Max. tightening torque** [Ncm]
A torque screw driver may be adjusted to this value.

L **Active depth of screw connection** [mm]
The depth of the screw connection must be less than the usable length of the thread!

Motor Data
The values stated are based on a motor temperature of 25°C (so-called cold data).

1 **Nominal voltage** U_N [Volt]
is the DC voltage on the motor connections on which all nominal data are based (lines 2–9). Lower and higher voltages are permissible, provided set limits are not exceeded.

2 **No load speed** n_0 [rpm] ±10%
This is the speed at which the motor turns at nominal voltage and without load. It is approximately proportional to the applied voltage.

3 **No load current** I_0 [mA] ±50%
This is the typical current that the unloaded motor draws when operating at nominal voltage. It depends on brush friction and friction in the bearings, and also increases with rising speed. No load friction depends heavily on temperature, particularly with precious metal commutation. In extended operation, no load friction decreases 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 that, at 25°C ambient temperature, heats the winding up to the maximum permissible temperature (= max. permissible continuous current). I_N decreases as speed increases due to additional friction losses.

7 **Stall torque** M_H [mNm]
is the calculated load torque that causes the shaft to stop at nominal voltage. 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 can often not be reached due to the amplifier's current limits.

9 **Max. efficiency** η_{max} [%]
is the optimal relationship between input and output power at nominal voltage. It also doesn't always denote the optimal operating point.

10 **Terminal resistance** R [Ω]
is the resistance at the terminals at 25°C and determines the stall current at a given voltage. For graphite brushes, it should be noted that resistance is load-dependent and the value only applies to large currents.

11 **Terminal inductance** L [mH]
is the winding inductance when stationary and 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]
shows the ideal no load speed per 1 volt of applied voltage. Friction losses not taken into account.

14 **Speed / torque gradient**
$\Delta n / \Delta M$ [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.

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 inertia** J_R [gcm^2]
is the mass moment of inertia of the rotor, based on the axis of rotation.

17 **Thermal resistance housing-ambient** R_{th2} [K/W]
and
18 **Thermal resistance winding-housing** R_{th1} [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_{th2} 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 load 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 commutator segments**

31 **Weight of motor** [g]

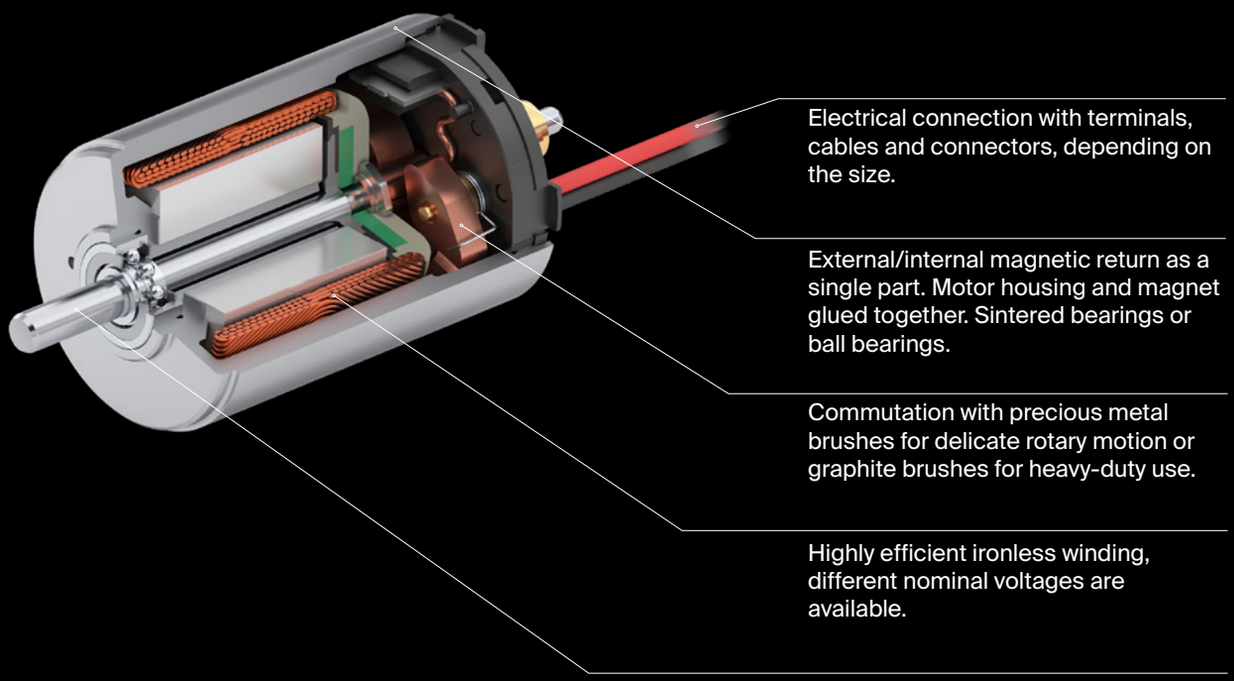
32 **Typical noise level** [dBA]
is that statistical average of the noise level measured according to maxon standard (10 cm distance radially to the drive, no load operation at a speed of 6000 rpm. The drive lies freely on a plastic foam mat in the noise chamber).
The acoustic noise level depends on 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.

maxon DCX

The maxon DCX brushed motors feature unrivaled torque density and quiet running. The robust design and the ironless maxon rotor make the DCX motors a dynamic drive for almost all applications. Choose between graphite and precious metal brushes, sintered and ball bearings, and many other components.

Key data

Motor ∅	6 ... 35 mm
Motor length	15.6 ... 72 mm
Power	0.3 ... 80 W
Nominal torque	up to 138 mNm
Max. permissible speed	up to 18 000 rpm



- → Compact and light design
- → Precious metal brushes guarantee a low, constant contact resistance during the entire service life
- → Easy torque control using the current
- → Low start-up voltage, even after a long period in standstill
- → Easily configured online

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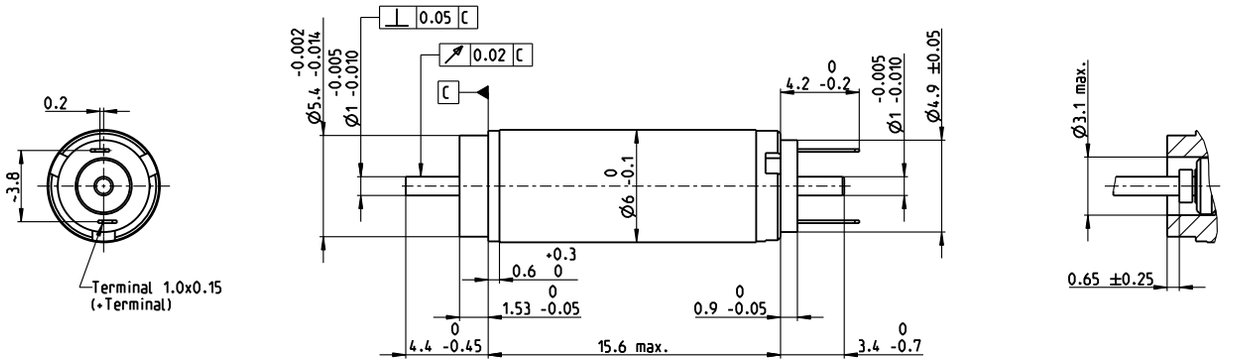
DCX 6 M Precious Metal Brushes
DC motor ∅6 mm

Key Data: 0.3/0.56 W, 0.3 mNm, 17300 rpm

DCX



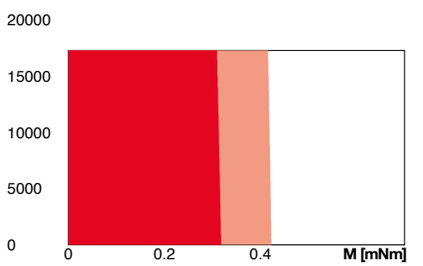
M 5:2

	Motor Data					
1_	Nominal voltage	V	1.5	3	4.5	6
2_	No load speed	rpm	17300	17500	17400	17400
3_	No load current	mA	34.1	17.1	11.4	8.54
4_	Nominal speed	rpm	4950	5940	5730	5690
5_	Nominal torque (max. continuous torque)	mNm	0.309	0.332	0.326	0.325
6_	Nominal current (max. continuous current)	A	0.425	0.228	0.149	0.111
7_	Stall torque	mNm	0.453	0.524	0.507	0.503
8_	Stall current	A	0.581	0.336	0.217	0.161
9_	Max. efficiency	%	58	61	60	60
10_	Terminal resistance	Ω	2.58	9.0	20.8	37.2
11_	Terminal inductance	mH	0.008	0.0316	0.0711	0.126
12_	Torque constant	mNm/A	0.779	1.560	2.34	3.12
13_	Speed constant	rpm/V	12300	6130	4090	3060
14_	Speed/torque gradient	rpm/mNm	40600	35100	36300	36600
15_	Mechanical time constant	ms	7.06	6.74	6.81	6.81
16_	Rotor inertia	gcm²	0.017	0.0183	0.0179	0.018

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	105
18_	Thermal resistance winding-housing	K/W	20
19_	Thermal time constant winding	s	1.71
20_	Thermal time constant motor	s	79
21_	Ambient temperature ball bearings	°C	-30...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	17300
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	100
28_	Max. radial load [mm from flange]	N	0.6 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	17300
24_	Axial play	mm	0.02...0.1
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	100
28_	Max. radial load [mm from flange]	N	0.4 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		5
31_	Weight of motor	g	2.4
32_	Typical noise level	dBA	–

Operating Range

n [rpm] Winding 4.5 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
321_GPX 6 A	1–5	429_ENX 6 MAG	486_ESCON Module 24/2 486_ESCON 36/2 DC 498_EPOS4 Mod./Comp. 24/1.5

Configuration

Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes
Flange front/back: Standard flange
Shaft front/back: Length
Electric connection: Terminals or cables (encoder always with Flex)

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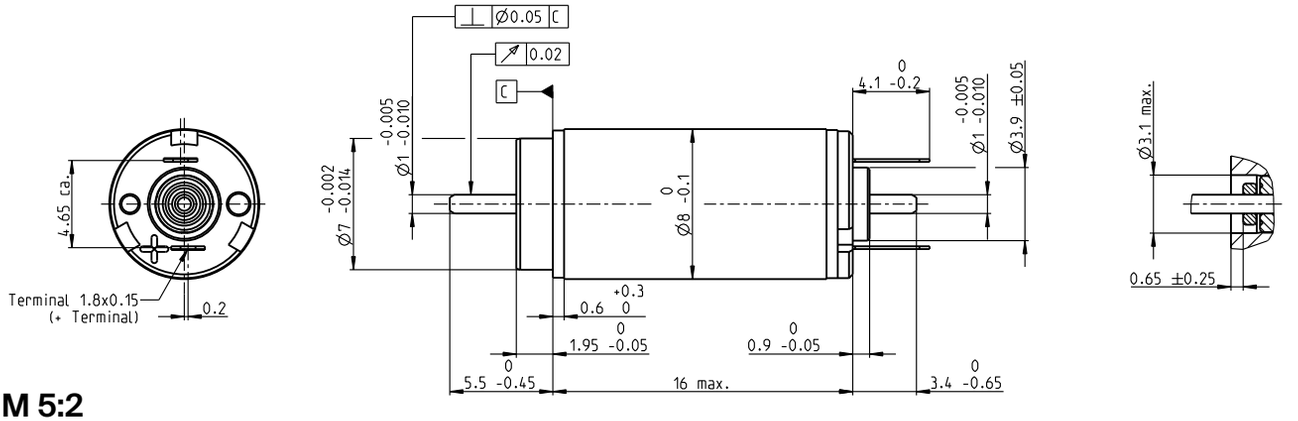
DCX 8 M Precious Metal Brushes
DC motor ∅8 mm

Key Data: 0.5/1.0 W, 0.65 mNm, 17300 rpm

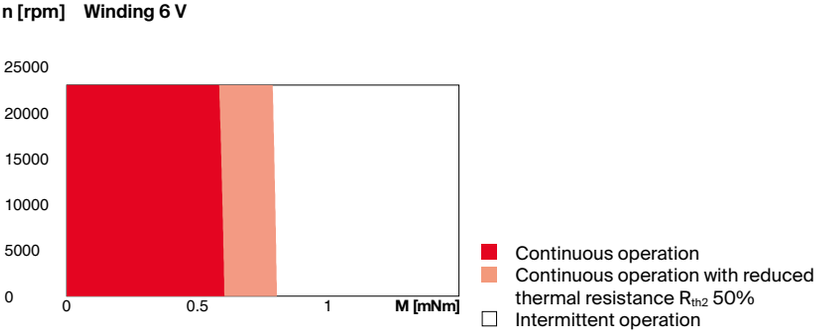


M 5:2

	Motor Data							
1_	Nominal voltage	V	2.4	4.2	6	7.2	9	12
2_	No load speed	rpm	11500	11700	11000	11900	11900	12900
3_	No load current	mA	11.9	6.93	4.51	4.12	3.3	2.74
4_	Nominal speed	rpm	4780	4950	4190	4820	5190	5800
5_	Nominal torque (max. continuous torque)	mNm	0.653	0.649	0.641	0.62	0.652	0.614
6_	Nominal current (max. continuous current)	A	0.345	0.199	0.13	0.113	0.0949	0.0728
7_	Stall torque	mNm	1.13	1.14	1.05	1.06	1.17	1.13
8_	Stall current	A	0.581	0.34	0.207	0.187	0.166	0.13
9_	Max. efficiency	%	74	74	73	73	74	74
10_	Terminal resistance	Ω	4.13	12	29	38.5	54.3	92.2
11_	Terminal inductance	mH	0.014	0.0411	0.0941	0.117	0.183	0.276
12_	Torque constant	mNm/A	1.95	3.360	5.08	5.67	7.07	8.71
13_	Speed constant	rpm/V	4900	2850	1880	1680	1350	1100
14_	Speed/torque gradient	rpm/mNm	10400	10500	10700	11400	10400	11600
15_	Mechanical time constant	ms	4.17	4.15	4.18	4.24	4.15	4.28
16_	Rotor inertia	gcm²	0.038	0.0379	0.0372	0.035	0.038	0.035

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	101
18_	Thermal resistance winding-housing	K/W	16.9
19_	Thermal time constant winding	s	2.31
20_	Thermal time constant motor	s	162
21_	Ambient temperature ball bearings	°C	-30...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	17300
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	100
28_	Max. radial load [mm from flange]	N	0.6 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	17300
24_	Axial play	mm	0.02...0.1
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	100
28_	Max. radial load [mm from flange]	N	0.4 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		5
31_	Weight of motor	g	4.4
32_	Typical noise level	dBA	–

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
322_GPX 8 A	1–5	430_ENX 8 MAG	486_ESCON Module 24/2 486_ESCON 36/2 DC 498_EPOS4 Mod./Comp. 24/1.5

Configuration

Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange
Shaft front/back: Length
Electric connection: Terminals or cables (encoder always with Flex)

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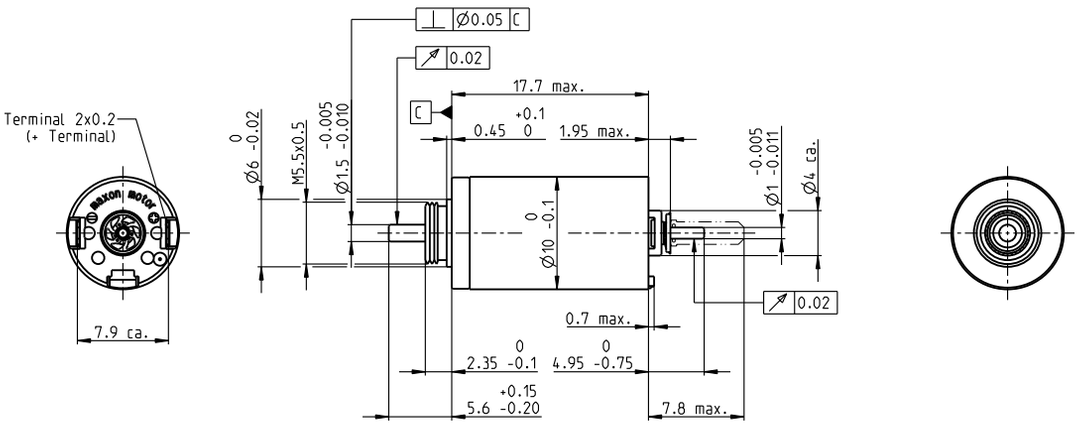
DCX 10 S Precious Metal Brushes
DC motor ∅10 mm

Key Data: 1/1.4 W, 0.9 mNm, 14300 rpm

DCX



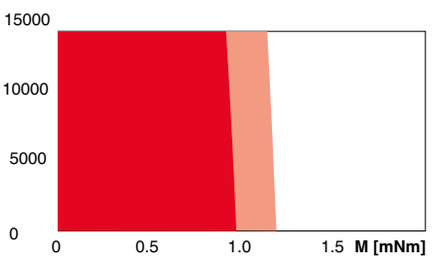
M 3:2

	Motor Data							
1_	Nominal voltage	V	1.5	3	4.5	6	9	12
2_	No load speed	rpm	12600	13000	12600	11400	12600	12500
3_	No load current	mA	84.1	43.8	28	18.2	14	10.5
4_	Nominal speed	rpm	4530	4690	4270	3310	3930	3890
5_	Nominal torque (max. continuous torque)	mNm	0.918	0.948	0.944	0.993	0.909	0.905
6_	Nominal current (max. continuous current)	A	0.924	0.49	0.316	0.223	0.152	0.114
7_	Stall torque	mNm	1.49	1.54	1.48	1.46	1.38	1.37
8_	Stall current	A	1.39	0.742	0.463	0.307	0.215	0.16
9_	Max. efficiency	%	58	58	58	58	56	56
10_	Terminal resistance	Ω	1.08	4.04	9.72	19.5	41.8	74.9
11_	Terminal inductance	mH	0.014	0.051	0.122	0.268	0.488	0.868
12_	Torque constant	mNm/A	1.07	2.07	3.2	4.74	6.4	8.53
13_	Speed constant	rpm/V	8950	4600	2980	2010	1490	1120
14_	Speed/torque gradient	rpm/mNm	9030	8970	9060	8290	9750	9830
15_	Mechanical time constant	ms	7.24	7.19	7.21	7.03	7.27	7.26
16_	Rotor inertia	gcm²	0.077	0.077	0.076	0.081	0.071	0.071

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	37.6
18_	Thermal resistance winding-housing	K/W	22.0
19_	Thermal time constant winding	s	4.69
20_	Thermal time constant motor	s	156
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	14300
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.5
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	1.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	14300
24_	Axial play	mm	0...0.15
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	0.8 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	6.3
32_	Typical noise level	dBA	35

Operating Range

n [rpm] Winding 4.5 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
323_GPX 10 A	1–5	433_ENX 10 EASY	486_ESCON Module 24/2
		433_ENX 10 QUAD	486_ESCON 36/2 DC
		434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5

Configuration

Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange/Flange with thread holes/no flange
Shaft front/back: Length
Electric connection: Terminals or cable/cable length/connector type

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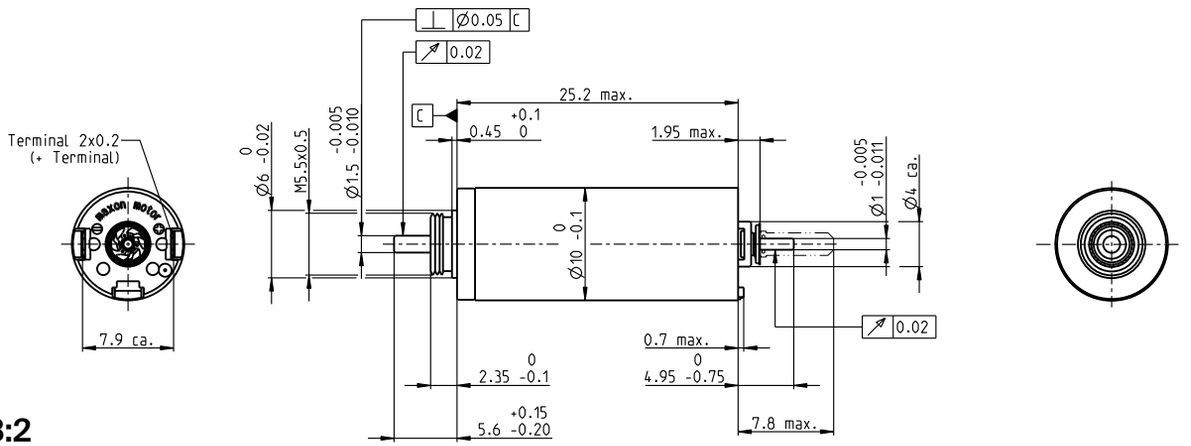
DCX 10 L Precious Metal Brushes
DC motor ∅10 mm

DCX

Key Data: 1.5/3 W, 2.2 mNm, 14 300 rpm



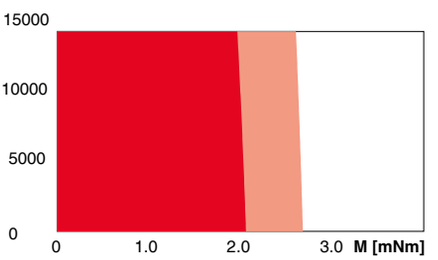
M 3:2

	Motor Data							
1_	Nominal voltage	V	1.5	3	4.5	6	9	12
2_	No load speed	rpm	11600	12200	12000	12200	12000	11300
3_	No load current	mA	72.1	38.7	25.2	19.3	12.6	8.71
4_	Nominal speed	rpm	9230	6930	7110	6640	6780	5980
5_	Nominal torque (max. continuous torque)	mNm	1.04	2.05	2.2	1.94	2.06	2.03
6_	Nominal current (max. continuous current)	A	0.924	0.922	0.648	0.436	0.304	0.211
7_	Stall torque	mNm	5.13	4.81	5.45	4.32	4.8	4.36
8_	Stall current	A	4.23	2.09	1.55	0.937	0.682	0.439
9_	Max. efficiency	%	75	75	77	74	75	74
10_	Terminal resistance	Ω	0.355	1.44	2.9	6.4	13.2	27.3
11_	Terminal inductance	mH	0.005	0.020	0.045	0.078	0.181	0.362
12_	Torque constant	mNm/A	1.21	2.31	3.52	4.61	7.04	10.0
13_	Speed constant	rpm/V	7870	4140	2710	2070	1360	960
14_	Speed/torque gradient	rpm/mNm	2300	2590	2240	2880	2550	2640
15_	Mechanical time constant	ms	3.68	3.57	3.54	3.58	3.56	3.59
16_	Rotor inertia	gcm²	0.153	0.132	0.151	0.119	0.134	0.130

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	36.5
18_	Thermal resistance winding-housing	K/W	10.6
19_	Thermal time constant winding	s	3.94
20_	Thermal time constant motor	s	151
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	14 300
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.5
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	1.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	14 300
24_	Axial play	mm	0...0.15
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	0.8 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	11
32_	Typical noise level	dBA	37

Operating Range

n [rpm] Winding 4.5 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
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		433_ENX 10 QUAD	486_ESCON 36/2 DC
		434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5

Configuration

Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange/Flange with thread holes/no flange
Shaft front/back: Length
Electric connection: Terminals or cable/cable length/connector type

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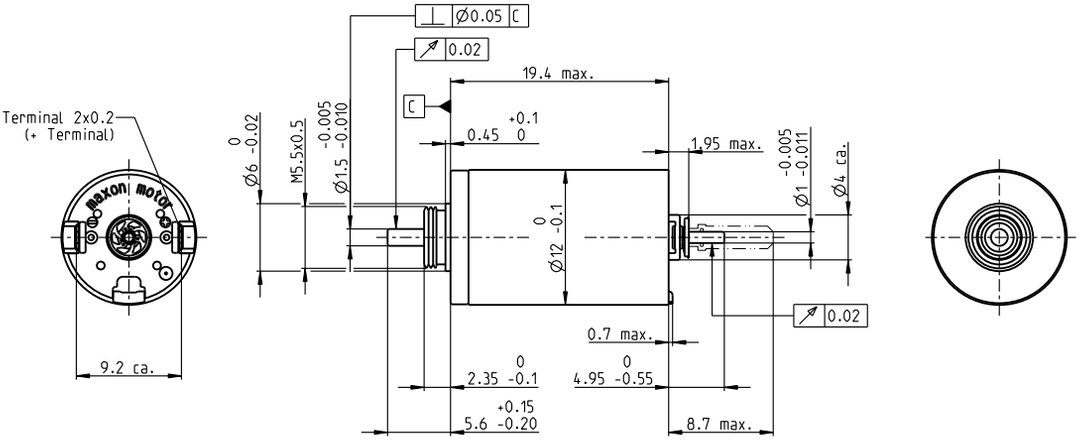
DCX 12 S Precious Metal Brushes
DC motor ∅12 mm

Key Data: 1.6/2 W, 2.0 mNm, 13 000 rpm



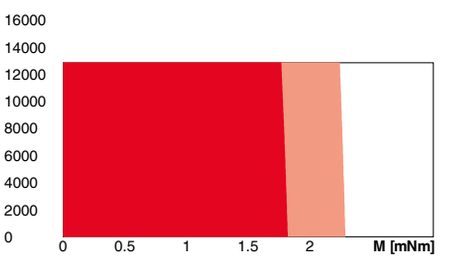
M 3:2

	Motor Data						
1_	Nominal voltage	V	3	4.5	6	9	12
2_	No load speed	rpm	9090	9000	9100	9010	9020
3_	No load current	mA	31.8	20.9	15.9	10.5	7.88
4_	Nominal speed	rpm	3760	3620	3870	3700	3620
5_	Nominal torque (max. continuous torque)	mNm	1.92	1.9	1.95	1.92	1.88
6_	Nominal current (max. continuous current)	A	0.655	0.427	0.332	0.216	0.159
7_	Stall torque	mNm	3.35	3.25	3.46	3.33	3.21
8_	Stall current	A	1.09	0.701	0.566	0.36	0.261
9_	Max. efficiency	%	69	69	70	69	69
10_	Terminal resistance	Ω	2.74	6.42	10.6	25	46
11_	Terminal inductance	mH	0.0724	0.166	0.29	0.664	1.17
12_	Torque constant	mNm/A	3.06	4.63	6.12	9.26	12.3
13_	Speed constant	rpm/V	3120	2060	1560	1030	775
14_	Speed/torque gradient	rpm/mNm	2800	2860	2700	2780	2890
15_	Mechanical time constant	ms	8.37	8.32	8.31	8.33	8.33
16_	Rotor inertia	gcm²	0.286	0.278	0.293	0.286	0.275

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	35
18_	Thermal resistance winding-housing	K/W	14.4
19_	Thermal time constant winding	s	7.18
20_	Thermal time constant motor	s	146
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	13 000
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.5
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	1.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	13 000
24_	Axial play	mm	0...0.15
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	0.8 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	11
32_	Typical noise level	dBA	40

Operating Range

n [rpm] Winding 4.5 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
324_GPX 12 A/C	1–4	433_ENX 10 EASY	486_ESCON Module 24/2
325_GPX 12 LN/LZ	1–4	433_ENX 10 QUAD	486_ESCON 36/2 DC
326_GPX 12 HP	2–4	434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5
328_GPX 14 A/C	3–4		
329_GPX 14 LN/LZ	3–4		
330_GPX 14 HP	4		

Configuration

Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange/Flange with thread holes/no flange
Shaft front/back: Length
Electric connection: Terminals or cable/cable length/connector type

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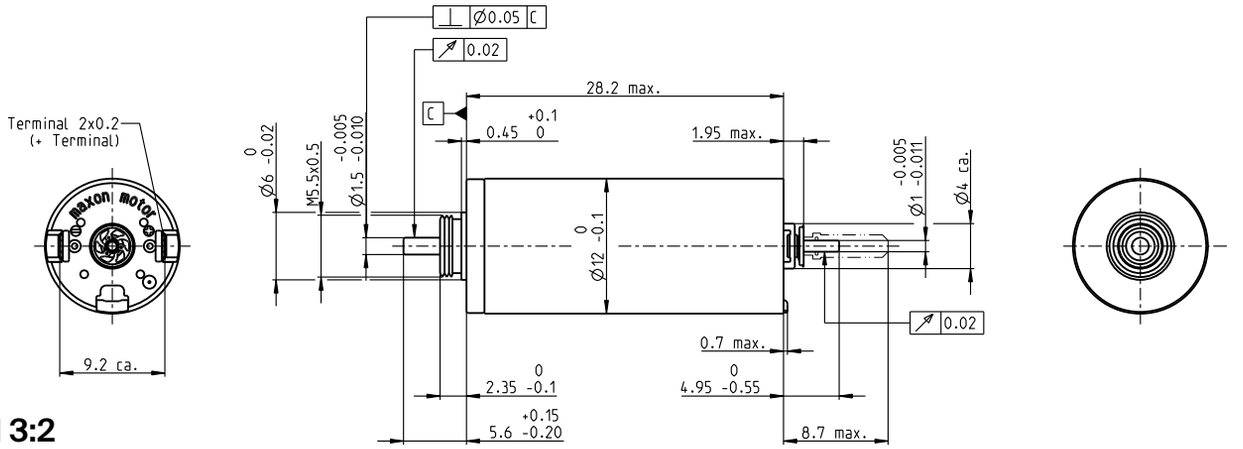
DCX 12 L Precious Metal Brushes
DC motor ∅12 mm

DCX

Key Data: 2.5/4.8 W, 4.2 mNm, 12 000 rpm

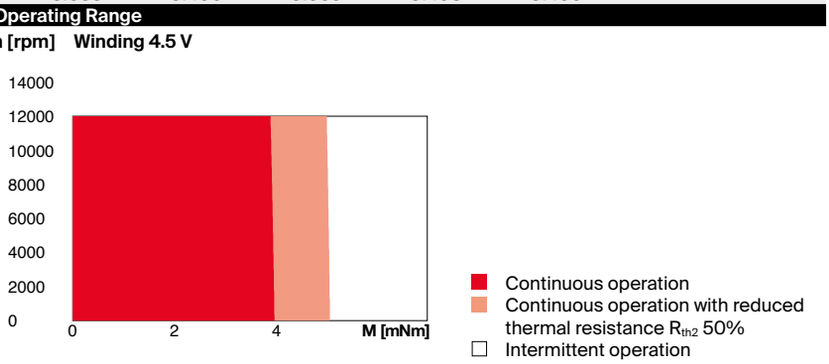


M 3:2

	Motor Data							
1_	Nominal voltage	V	3	4.5	6	9	12	18
2_	No load speed	rpm	8810	8820	8810	8820	8810	8810
3_	No load current	mA	31.3	20.9	15.7	10.4	7.83	5.22
4_	Nominal speed	rpm	6230	5640	5540	5750	5560	5540
5_	Nominal torque (max. continuous torque)	mNm	2.88	4.02	3.88	4.13	3.89	3.87
6_	Nominal current (max. continuous current)	A	0.924	0.851	0.616	0.437	0.309	0.205
7_	Stall torque	mNm	9.9	11.2	10.5	11.9	10.6	10.5
8_	Stall current	A	3.08	2.32	1.63	1.23	0.824	0.543
9_	Max. efficiency	%	81	82	82	83	82	82
10_	Terminal resistance	Ω	0.975	1.94	3.68	7.29	14.6	33.1
11_	Terminal inductance	mH	0.031	0.071	0.125	0.282	0.502	1.13
12_	Torque constant	mNm/A	3.22	4.83	6.44	9.66	12.9	19.3
13_	Speed constant	rpm/V	2970	1980	1480	989	741	494
14_	Speed/torque gradient	rpm/mNm	898	793	846	746	839	848
15_	Mechanical time constant	ms	4.55	4.43	4.4	4.37	4.38	4.39
16_	Rotor inertia	gcm²	0.484	0.533	0.496	0.559	0.498	0.495

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	31
18_	Thermal resistance winding-housing	K/W	10.3
19_	Thermal time constant winding	s	10.1
20_	Thermal time constant motor	s	194
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	12 000
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.5
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	1.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	12 000
24_	Axial play	mm	0...0.15
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	0.8 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	16
32_	Typical noise level	dBA	44

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
324_GPX 12 A/C	1–4	433_ENX 10 EASY	486_ESCON Module 24/2
325_GPX 12 LN/LZ	1–4	433_ENX 10 QUAD	486_ESCON 36/2 DC
326_GPX 12 HP	2–4	434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5
328_GPX 14 A/C	3–4		
329_GPX 14 LN/LZ	3–4		
330_GPX 14 HP	4		

Configuration

Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange/Flange with thread holes/no flange
Shaft front/back: Length
Electric connection: Terminals or cable/cable length/connector type

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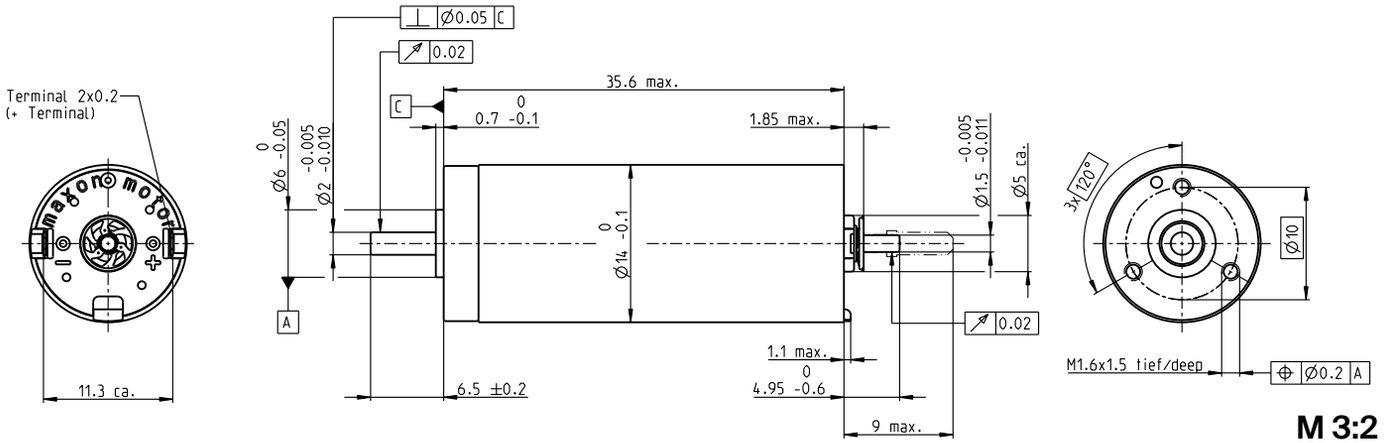
DCX 14 L Precious Metal Brushes
DC motor ∅14 mm

Key Data: 3/5 W, 6.3 mNm, 8680 rpm

DCX



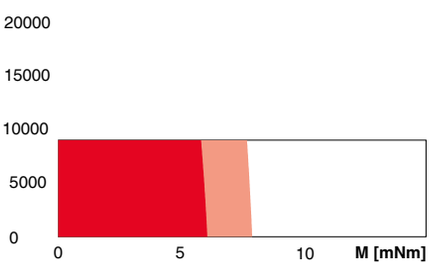
M 3:2

	Motor Data								
1_	Nominal voltage	V	3	4.5	6	9	12	18	24
2_	No load speed	rpm	7720	7740	7740	7740	7740	7730	7740
3_	No load current	mA	73.6	49.1	36.8	24.5	18.4	12.2	9.2
4_	Nominal speed	rpm	5770	5160	5140	5200	5200	5040	5150
5_	Nominal torque (max. continuous torque)	mNm	4.12	6.29	6.23	6.37	6.38	6.01	6.24
6_	Nominal current (max. continuous current)	A	1.2	1.2	0.889	0.605	0.454	0.286	0.223
7_	Stall torque	mNm	16.5	19.1	18.8	19.6	19.7	17.5	18.9
8_	Stall current	A	4.52	3.49	2.57	1.79	1.35	0.799	0.647
9_	Max. efficiency	%	76	77.7	77.6	78	78.1	77	77.7
10_	Terminal resistance	Ω	0.664	1.29	2.33	5.02	8.9	22.5	37.1
11_	Terminal inductance	mH	0.0252	0.0567	0.101	0.227	0.403	0.908	1.61
12_	Torque constant	mNm/A	3.65	5.47	7.3	10.9	14.6	21.9	29.2
13_	Speed constant	rpm/V	2620	1740	1310	872	654	436	327
14_	Speed/torque gradient	rpm/mNm	476	411	418	400	399	449	415
15_	Mechanical time constant	ms	4.14	4.06	4.05	4.04	4.05	4.1	4.09
16_	Rotor inertia	gcm²	0.831	0.942	0.926	0.966	0.97	0.872	0.939

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	22.2
18_	Thermal resistance winding-housing	K/W	8.63
19_	Thermal time constant winding	s	10.3
20_	Thermal time constant motor	s	226
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	26
32_	Typical noise level	dBA	44

Operating Range

n [rpm] Winding 9 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
328_GPX 14 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
329_GPX 14 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
330_GPX 14 HP	2–3 [4]	434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5
331_GPX 16 A/C	3–4		
332_GPX 16 LN/LZ	3–4		
333_GPX 16 HP	4		

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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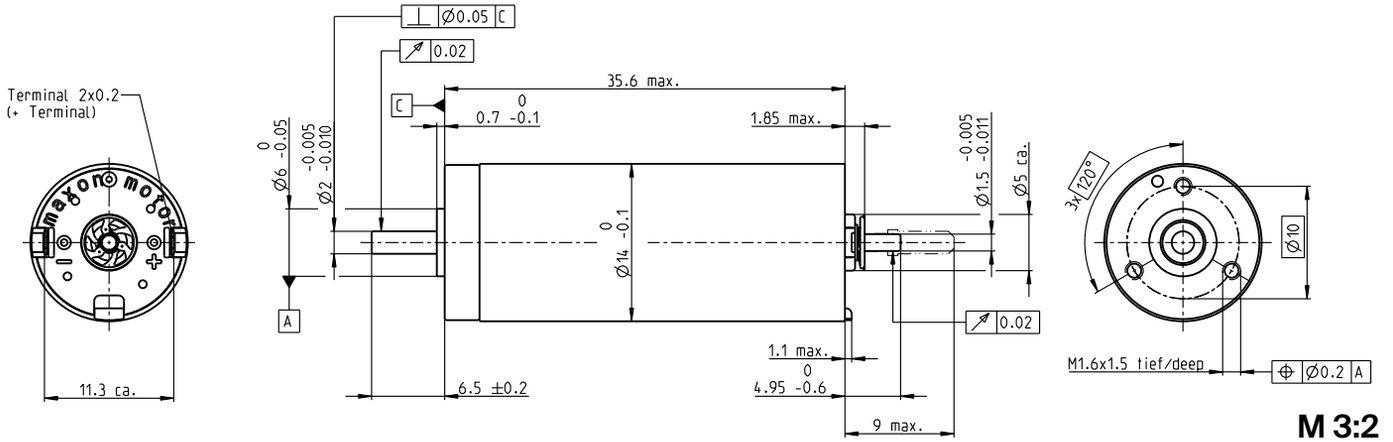
DCX 14 L Graphite Brushes
DC motor ∅14 mm

DCX

Key Data: 6/10 W, 6.9 mNm, 17000 rpm



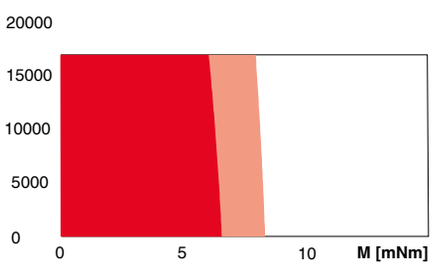
M 3:2

	Motor Data							
1_	Nominal voltage	V	4.5	6	9	12	18	24
2_	No load speed	rpm	11600	10400	11700	10300	11600	10300
3_	No load current	mA	73.9	46.4	37	23.2	18.5	11.6
4_	Nominal speed	rpm	8460	7430	8750	7370	8760	7300
5_	Nominal torque (max. continuous torque)	mNm	6.36	6.96	6.88	6.91	6.94	6.66
6_	Nominal current (max. continuous current)	A	1.81	1.31	0.974	0.651	0.492	0.314
7_	Stall torque	mNm	23.5	24.8	27.8	24.7	28.5	22.9
8_	Stall current	A	6.45	4.53	3.8	2.26	1.95	1.05
9_	Max. efficiency	%	79.5	80.8	81.4	80.1	81.3	80.1
10_	Terminal resistance	Ω	0.698	1.33	2.37	5.31	9.21	22.9
11_	Terminal inductance	mH	0.0252	0.0567	0.101	0.227	0.403	0.908
12_	Torque constant	mNm/A	3.65	5.47	7.3	10.9	14.6	21.9
13_	Speed constant	rpm/V	2620	1740	1310	872	654	436
14_	Speed/torque gradient	rpm/mNm	500	422	424	423	413	456
15_	Mechanical time constant	ms	4.35	4.17	4.11	4.28	4.19	4.17
16_	Rotor inertia	gcm²	0.831	0.942	0.926	0.966	0.97	0.872

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	22.2
18_	Thermal resistance winding-housing	K/W	8.63
19_	Thermal time constant winding	s	10.3
20_	Thermal time constant motor	s	226
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	17000
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	15000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	26
32_	Typical noise level	dBA	40

Operating Range

n [rpm] Winding 12 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
328_GPX 14 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
329_GPX 14 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
330_GPX 14 HP	2–3 [4]	434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5
331_GPX 16 A/C	3–4		
332_GPX 16 LN/LZ	3–4		
333_GPX 16 HP	4		

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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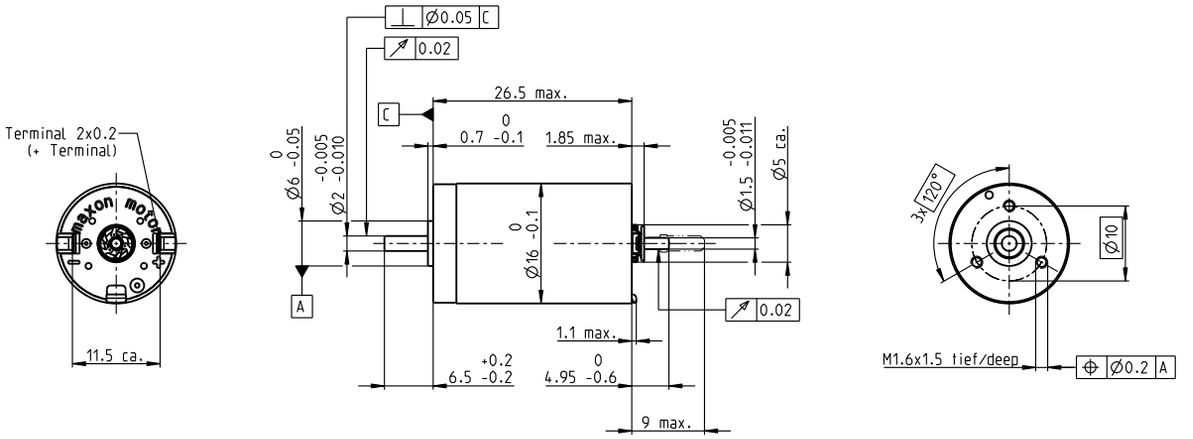
DCX 16 S Precious Metal Brushes
DC motor ∅16 mm

DCX

Key Data: 3/5 W, 5.3 mNm, 8680 rpm



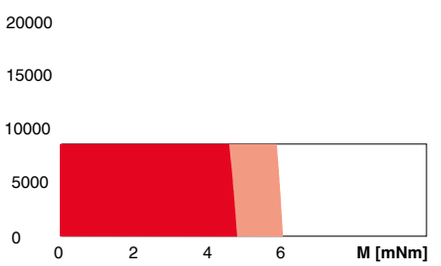
M 1:1

	Motor Data								
1_	Nominal voltage	V	3	4.5	6	9	12	18	24
2_	No load speed	rpm	6320	6320	6610	6320	6260	6340	6250
3_	No load current	mA	44.6	29.7	23.4	14.9	11	7.43	5.51
4_	Nominal speed	rpm	3350	3300	3760	3270	3320	3530	3200
5_	Nominal torque (max. continuous torque)	mNm	5.15	5.05	5.36	5	5.19	5.45	4.99
6_	Nominal current (max. continuous current)	A	1.20	0.784	0.65	0.389	0.299	0.211	0.144
7_	Stall torque	mNm	11.1	10.7	12.6	10.6	11.2	12.5	10.4
8_	Stall current	A	2.49	1.61	1.48	0.791	0.624	0.467	0.289
9_	Max. efficiency	%	75	75	77	75	75	77	74
10_	Terminal resistance	Ω	1.20	2.80	4.06	11.4	19.2	38.6	83.1
11_	Terminal inductance	mH	0.036	0.080	0.131	0.320	0.581	1.28	2.32
12_	Torque constant	mNm/A	4.45	6.67	8.53	13.3	18.0	26.7	36.0
13_	Speed constant	rpm/V	2150	1430	1120	715	531	358	265
14_	Speed/torque gradient	rpm/mNm	580	600	533	610	568	517	613
15_	Mechanical time constant	ms	6.09	6.09	6.05	6.13	6.11	6.08	6.17
16_	Rotor inertia	gcm²	1.00	0.97	1.08	0.959	1.03	1.12	0.960

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	23.5
18_	Thermal resistance winding-housing	K/W	9.9
19_	Thermal time constant winding	s	9.63
20_	Thermal time constant motor	s	227
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	26
32_	Typical noise level	dBA	40

Operating Range

n [rpm] Winding 12 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
332_GPX 16 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
333_GPX 16 HP	2–3 [4]	434_ENX 10 EASY XT	496_EPOS4 Mod. 24/1.5
335_GPX 19 A/C	3–4	436_ENX 16 EASY	498_EPOS4 Comp. 24/1.5
336_GPX 19 LN/LZ	3–4	437_ENX 16 EASY XT	501_EPOS4 50/5
337_GPX 19 HP	4	438_ENX 16 EASY Abs.	
		439_ENX 16 EASY Abs. XT	
		443_ENX 16 RIO	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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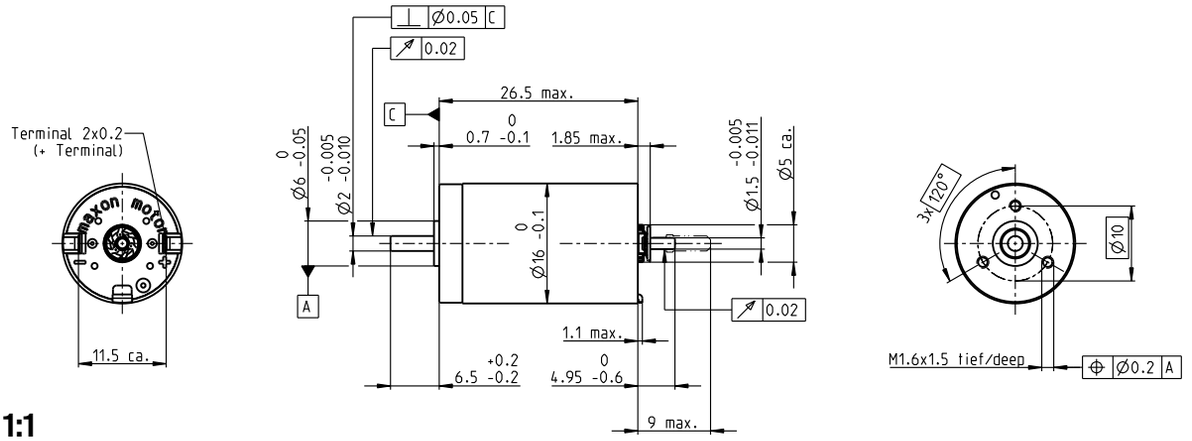
DCX 16 S Graphite Brushes
DC motor ∅16 mm

Key Data: 5/10 W, 5.4 mNm, 17000 rpm



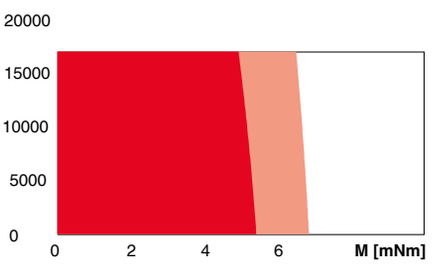
M 1:1

	Motor Data							
1_	Nominal voltage	V	6	9	12	18	24	48
2_	No load speed	rpm	12700	12700	13200	12700	12700	12600
3_	No load current	mA	63.9	42.6	35.4	22.4	16.8	8.28
4_	Nominal speed	rpm	9400	9400	9850	9260	9430	9250
5_	Nominal torque (max. continuous torque)	mNm	5.45	5.4	5.36	5.21	5.43	5.32
6_	Nominal current (max. continuous current)	A	1.28	0.847	0.662	0.411	0.321	0.156
7_	Stall torque	mNm	21.3	21	22.6	20.1	21.7	20.6
8_	Stall current	A	4.79	3.15	2.65	1.51	1.22	0.572
9_	Max. efficiency	%	78	78	76	76	78	77
10_	Terminal resistance	Ω	1.25	2.85	4.53	12	19.7	83.9
11_	Terminal inductance	mH	0.036	0.080	0.131	0.320	0.569	2.32
12_	Torque constant	mNm/A	4.45	6.67	8.53	13.3	17.8	36.0
13_	Speed constant	rpm/V	2150	1430	1120	715	536	265
14_	Speed/torque gradient	rpm/mNm	605	612	594	641	592	620
15_	Mechanical time constant	ms	6.35	6.21	6.74	6.43	6.32	6.23
16_	Rotor inertia	gcm²	1.00	0.970	1.08	0.959	1.02	0.960

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	23.5
18_	Thermal resistance winding-housing	K/W	9.9
19_	Thermal time constant winding	s	9.63
20_	Thermal time constant motor	s	227
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	17000
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	17000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	26
32_	Typical noise level	dBA	38

Operating Range

n [rpm] Winding 12 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
332_GPX 16 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
333_GPX 16 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
335_GPX 19 A/C	3–4	436_ENX 16 EASY	489_ESCON 50/5
336_GPX 19 LN/LZ	3–4	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 50/5
337_GPX 19 HP	4	438_ENX 16 EASY Abs.	498_EPOS4 Mod./Comp. 24/1.5
		439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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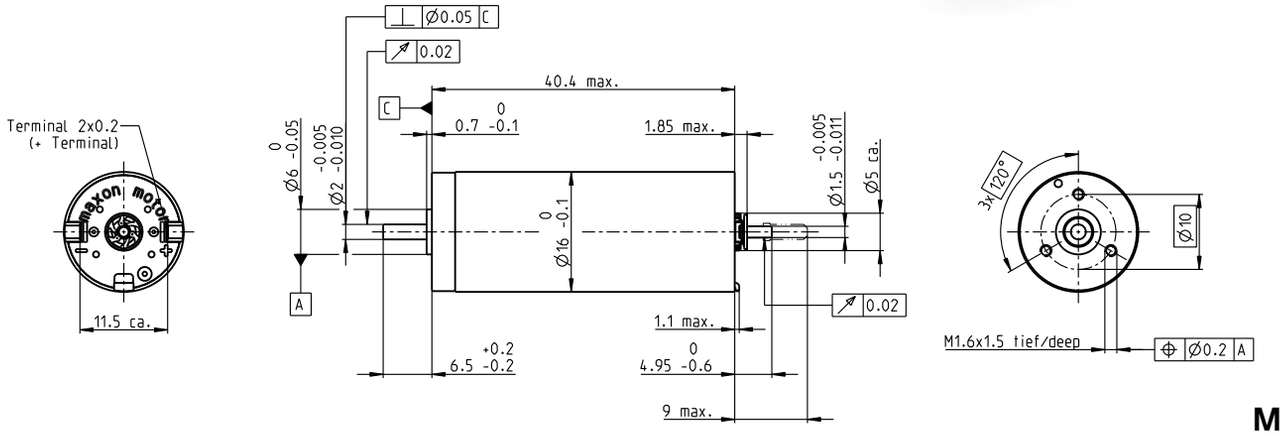
DCX 16 L Precious Metal Brushes
DC motor ∅16 mm

Key Data: 5/10 W, 11.5 mNm, 8680 rpm

DCX

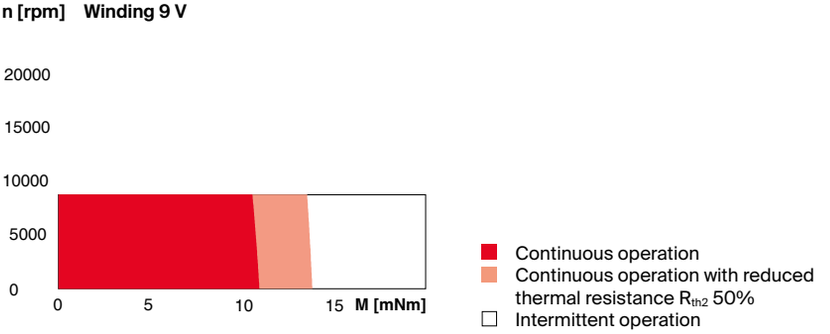


M 1:1

	Motor Data							
1_	Nominal voltage	V	3	6	9	12	18	24
2_	No load speed	rpm	6400	6620	6410	6400	6400	6560
3_	No load current	mA	62.5	32.6	20.8	15.6	10.4	8.05
4_	Nominal speed	rpm	5450	4920	4620	4490	4510	4630
5_	Nominal torque (max. continuous torque)	mNm	5.06	10.0	11.6	10.8	10.9	10.7
6_	Nominal current (max. continuous current)	A	1.20	1.20	0.89	0.625	0.42	0.316
7_	Stall torque	mNm	34.4	39.3	41.8	36.6	37.3	36.6
8_	Stall current	A	7.73	4.57	3.14	2.06	1.40	1.06
9_	Max. efficiency	%	83	84	84	83	84	83
10_	Terminal resistance	Ω	0.388	1.31	2.87	5.82	12.9	22.7
11_	Terminal inductance	mH	0.026	0.096	0.231	0.411	0.925	1.56
12_	Torque constant	mNm/A	4.44	8.59	13.3	17.8	26.7	34.7
13_	Speed constant	rpm/V	2150	1110	716	537	358	276
14_	Speed/torque gradient	rpm/mNm	188	170	154	176	173	181
15_	Mechanical time constant	ms	4.29	4.20	4.18	4.19	4.22	4.23
16_	Rotor inertia	gcm²	2.18	2.36	2.59	2.28	2.33	2.23

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	17.9
18_	Thermal resistance winding-housing	K/W	7.21
19_	Thermal time constant winding	s	21.5
20_	Thermal time constant motor	s	294
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	42
32_	Typical noise level	dBA	44

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
332_GPX 16 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
333_GPX 16 HP	2–3 [4]	434_ENX 10 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
335_GPX 19 A/C	3–4	436_ENX 16 EASY	504_EPOS2 P 24/5
336_GPX 19 LN/LZ	3–4	437_ENX 16 EASY XT	
337_GPX 19 HP	4	438_ENX 16 EASY Abs.	
		439_ENX 16 EASY Abs. XT	
		443_ENX 16 RIO	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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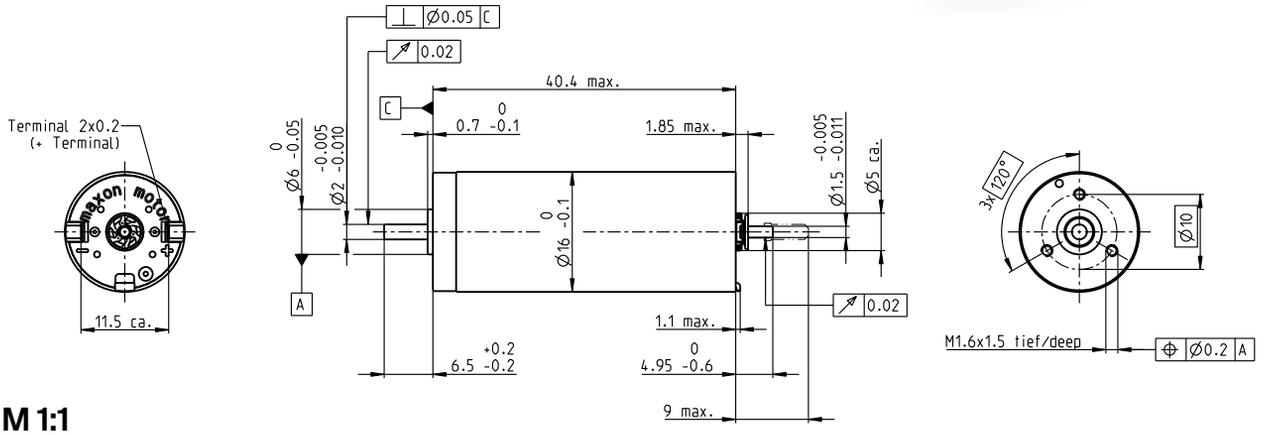
DCX 16 L Graphite Brushes
DC motor ∅16 mm

Key Data: 10/19 W, 11.7 mNm, 17 000 rpm



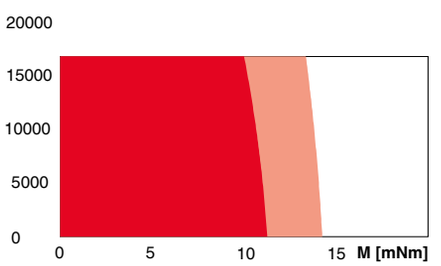
M 1:1

	Motor Data							
1_	Nominal voltage	V	6	9	12	18	24	36
2_	No load speed	rpm	12800	13100	13200	12800	12800	12800
3_	No load current	mA	73.5	50.7	38.6	24.5	18.4	12.3
4_	Nominal speed	rpm	11000	11000	10700	10600	10600	10700
5_	Nominal torque (max. continuous torque)	mNm	8.58	11.8	10.4	11.6	11.3	11.6
6_	Nominal current (max. continuous current)	A	2.00	1.85	1.24	0.896	0.651	0.447
7_	Stall torque	mNm	61.8	74.2	63.3	74.5	68.5	72
8_	Stall current	A	13.9	11.4	7.37	5.59	3.85	2.70
9_	Max. efficiency	%	85	87	83	86	86	87
10_	Terminal resistance	Ω	0.431	0.791	1.63	3.22	6.23	13.3
11_	Terminal inductance	mH	0.026	0.055	0.096	0.231	0.411	0.925
12_	Torque constant	mNm/A	4.44	6.52	8.59	13.3	17.8	26.7
13_	Speed constant	rpm/V	2150	1470	1110	716	537	358
14_	Speed/torque gradient	rpm/mNm	209	178	211	173	188	179
15_	Mechanical time constant	ms	4.77	4.47	5.21	4.70	4.48	4.37
16_	Rotor inertia	gcm²	2.18	2.40	2.36	2.59	2.28	2.33

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	17.9
18_	Thermal resistance winding-housing	K/W	7.21
19_	Thermal time constant winding	s	21.5
20_	Thermal time constant motor	s	294
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	17 000
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	15 000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	42
32_	Typical noise level	dBA	40

Operating Range

n [rpm] Winding 12 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
332_GPX 16 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
333_GPX 16 HP	2–3 [4]	434_ENX 10 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
335_GPX 19 A/C	3–4	436_ENX 16 EASY	496_EPOS4 Mod./Comp. 50/5
336_GPX 19 LN/LZ	3–4	437_ENX 16 EASY XT	501_EPOS4 50/5
337_GPX 19 HP	4	438_ENX 16 EASY Abs.	504_EPOS2 P 24/5
		439_ENX 16 EASY Abs. XT	
		443_ENX 16 RIO	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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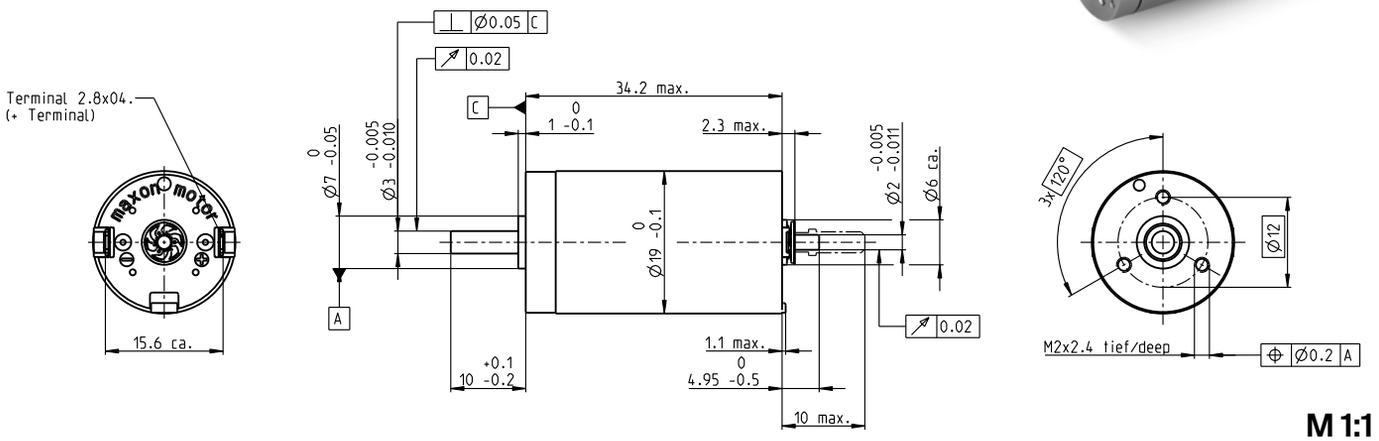
DCX 19 S Precious Metal Brushes
DC motor ∅19 mm

Key Data: 5/8 W, 11.0 mNm, 7500 rpm

DCX



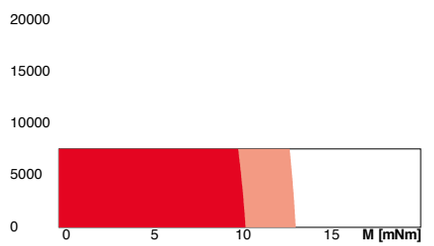
M 1:1

	Motor Data							
1_	Nominal voltage	V	4.5	6	9	12	18	24
2_	No load speed	rpm	6440	6350	6260	6360	6360	6350
3_	No load current	mA	72	53	34.6	26.5	17.7	13.2
4_	Nominal speed	rpm	5080	4540	4350	4490	4490	4480
5_	Nominal torque (max. continuous torque)	mNm	7.46	10.3	10.8	11.0	11.0	10.9
6_	Nominal current (max. continuous current)	A	1.20	1.20	0.829	0.643	0.428	0.319
7_	Stall torque	mNm	35.7	36.3	35.8	38.0	37.8	37.5
8_	Stall current	A	5.42	4.07	2.64	2.13	1.41	1.05
9_	Max. efficiency	%	78	79	79	79	79	79
10_	Terminal resistance	Ω	0.831	1.47	3.40	5.63	12.7	22.8
11_	Terminal inductance	mH	0.045	0.082	0.191	0.329	0.740	1.320
12_	Torque constant	mNm/A	6.58	8.90	13.5	17.8	26.7	35.6
13_	Speed constant	rpm/V	1450	1070	705	536	358	268
14_	Speed/torque gradient	rpm/mNm	183	177	177	170	170	172
15_	Mechanical time constant	ms	5.12	4.99	4.92	4.89	4.89	4.90
16_	Rotor inertia	gcm²	2.67	2.68	2.65	2.75	2.74	2.72

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	17.6
18_	Thermal resistance winding-housing	K/W	6.5
19_	Thermal time constant winding	s	11.6
20_	Thermal time constant motor	s	312
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	7500
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	7500
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	50
32_	Typical noise level	dBA	48

Operating Range

n [rpm] Winding 9 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
335_GPX 19 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
336_GPX 19 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
337_GPX 19 HP	2–3 [4]	434_ENX 10 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
339_GPX 22 A/C	3–4	436_ENX 16 EASY	504_EPOS2 P 24/5
340_GPX 22 LN/LZ	3–4	437_ENX 16 EASY XT	
341_GPX 22 HP	4	438_ENX 16 EASY Abs.	
		439_ENX 16 EASY Abs. XT	
		443_ENX 16 RIO	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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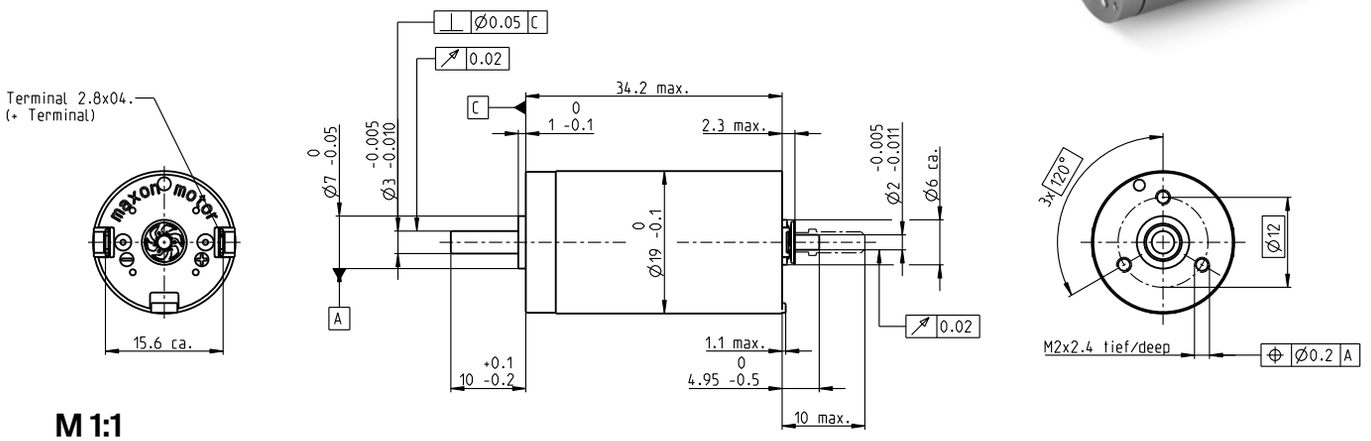
DCX 19 S Graphite Brushes
DC motor ∅19 mm

Key Data: 11/17 W, 11.3 mNm, 16 000 rpm



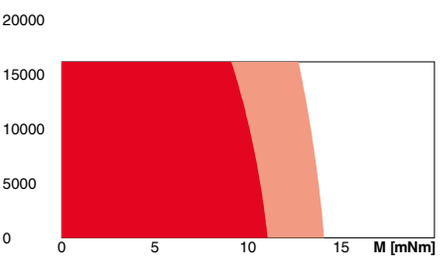
M 1:1

	Motor Data							
1_	Nominal voltage	V	9	12	18	24	36	48
2_	No load speed	rpm	12900	12800	12600	12700	12700	12700
3_	No load current	mA	102	75	48.9	37.4	25	18.7
4_	Nominal speed	rpm	10900	10800	10600	10600	10700	10700
5_	Nominal torque (max. continuous torque)	mNm	11.3	11.4	11.4	11.1	11.3	11.3
6_	Nominal current (max. continuous current)	A	1.81	1.35	0.884	0.657	0.445	0.335
7_	Stall torque	mNm	73.8	73.9	72.2	73.2	73.9	73.8
8_	Stall current	A	11.2	8.30	5.33	4.11	2.77	2.07
9_	Max. efficiency	%	82	82	82	81	82	82
10_	Terminal resistance	Ω	0.802	1.45	3.38	5.84	13.0	23.2
11_	Terminal inductance	mH	0.045	0.082	0.191	0.329	0.740	1.320
12_	Torque constant	mNm/A	6.58	8.90	13.5	17.8	26.7	35.6
13_	Speed constant	rpm/V	1450	1070	705	536	358	268
14_	Speed/torque gradient	rpm/mNm	177	174	176	176	174	174
15_	Mechanical time constant	ms	4.94	4.90	4.88	5.07	5.00	4.97
16_	Rotor inertia	gcm²	2.67	2.68	2.65	2.75	2.74	2.72

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	17.6
18_	Thermal resistance winding-housing	K/W	6.5
19_	Thermal time constant winding	s	11.6
20_	Thermal time constant motor	s	312
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	16 000
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	13 500
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	50
32_	Typical noise level	dBA	40

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
335_GPX 19 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
336_GPX 19 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
337_GPX 19 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
339_GPX 22 A/C	3–4	436_ENX 16 EASY	489_ESCON 50/5
340_GPX 22 LN/LZ	3–4	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
341_GPX 22 HP	4	438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
		439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	504_EPOS2 P 24/5

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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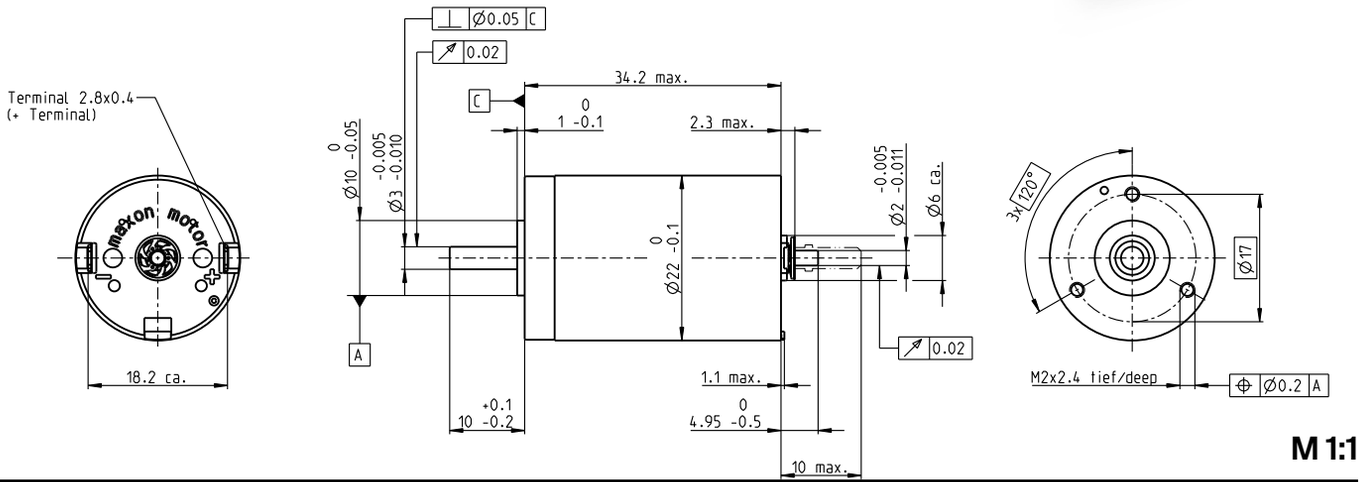
DCX 22 S Precious Metal Brushes
DC motor ∅22 mm

DCX

Key Data: 6/10 W, 14.5 mNm, 7160 rpm



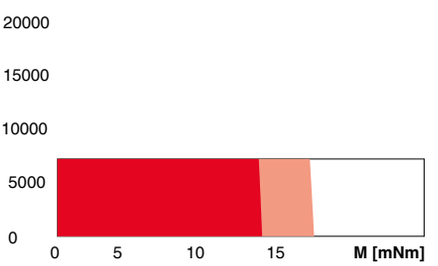
M 1:1

	Motor Data							
1_	Nominal voltage	V	6	12	18	24	36	48
2_	No load speed	rpm	6200	6200	6110	6340	6550	5890
3_	No load current	mA	39.2	19.6	12.8	10.1	7.09	4.55
4_	Nominal speed	rpm	4960	4670	4560	4700	4940	4240
5_	Nominal torque (max. continuous torque)	mNm	10.7	14.7	14.5	13.6	13.8	13.6
6_	Nominal current (max. continuous current)	A	1.20	0.817	0.531	0.388	0.272	0.180
7_	Stall torque	mNm	53.7	59.7	57.5	52.7	56.5	48.6
8_	Stall current	A	5.85	3.25	2.06	1.47	1.08	0.63
9_	Max. efficiency	%	84	85	85	84	85	84
10_	Terminal resistance	Ω	1.02	3.69	8.75	16.3	33.3	76.2
11_	Terminal inductance	mH	0.058	0.231	0.535	0.881	1.86	4.08
12_	Torque constant	mNm/A	9.18	18.4	28.0	35.9	52.2	77.2
13_	Speed constant	rpm/V	1040	520	342	266	183	124
14_	Speed/torque gradient	rpm/mNm	116	104	107	121	117	122
15_	Mechanical time constant	ms	6.14	6.07	6.09	5.93	6.15	6.19
16_	Rotor inertia	gcm²	5.05	5.55	5.44	4.67	5.03	4.84

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16
18_	Thermal resistance winding-housing	K/W	7
19_	Thermal time constant winding	s	20
20_	Thermal time constant motor	s	528
21_	Ambient temperature ball bearings	°C	-40...85
	Ambient temperature sleeve bearings	°C	-30...85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	7160
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	7160
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	66
32_	Typical noise level	dBA	48

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
341_GPX 22 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
342_GPX 22 UP	1–4	436_ENX 16 EASY	489_ESCON 50/5
344_GPX 26 A/C	3	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
345_GPX 26 LN/LZ	3	438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
346_GPX 26 HP	4	439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	504_EPOS2 P 24/5
		470_ENC AEDL 5810	
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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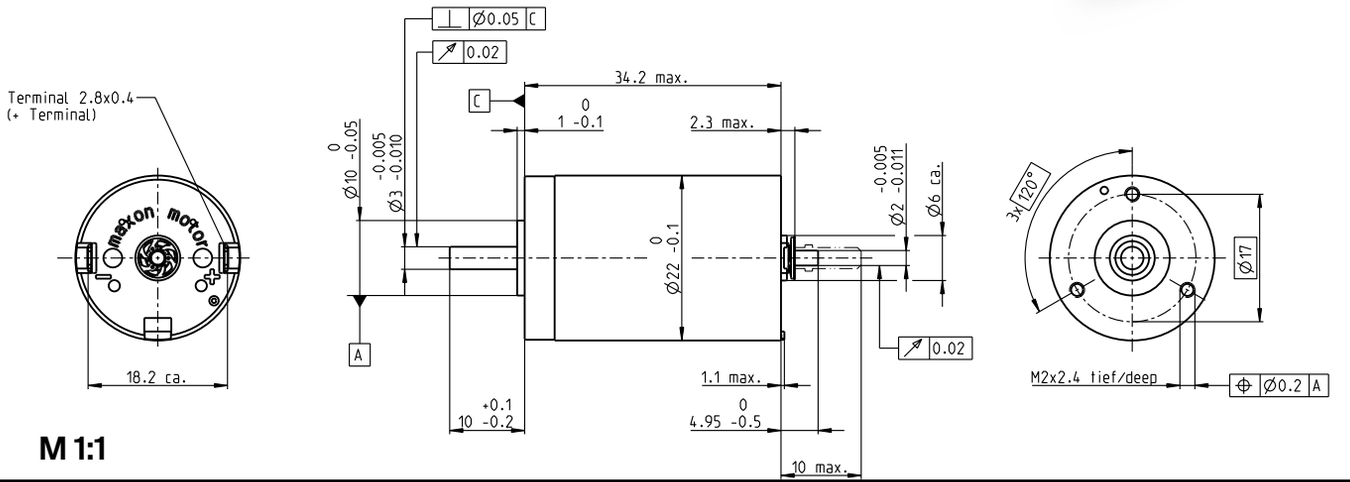
DCX 22 S Graphite Brushes
DC motor ∅22 mm

DCX

Key Data: 14/24 W, 15.3 mNm, 18 000 rpm



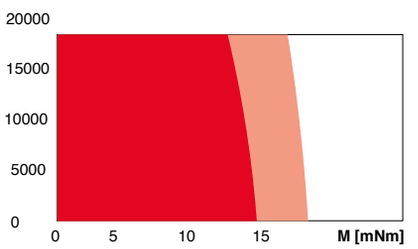
M 1:1

	Motor Data							
1_	Nominal voltage	V	6	12	18	24	36	48
2_	No load speed	rpm	11400	12400	12400	12400	12200	12700
3_	No load current	mA	126	71.7	47.8	35.9	23.4	18.5
4_	Nominal speed	rpm	9700	10700	10800	10800	10500	10900
5_	Nominal torque (max. continuous torque)	mNm	14.4	14.6	14.9	15.3	14.8	14.0
6_	Nominal current (max. continuous current)	A	3.00	1.65	1.12	0.869	0.552	0.406
7_	Stall torque	mNm	101	108	112	120	113	104
8_	Stall current	A	20.2	11.8	8.15	6.51	4.03	2.90
9_	Max. efficiency	%	85	85	85	86	85	84
10_	Terminal resistance	Ω	0.297	1.02	2.21	3.69	8.94	16.6
11_	Terminal inductance	mH	0.017	0.058	0.130	0.231	0.535	0.881
12_	Torque constant	mNm/A	5.01	9.18	13.8	18.4	28.0	35.9
13_	Speed constant	rpm/V	1910	1040	693	520	342	266
14_	Speed/torque gradient	rpm/mNm	113	116	111	104	109	123
15_	Mechanical time constant	ms	6.23	6.12	6.08	6.07	6.22	6.01
16_	Rotor inertia	gcm²	5.27	5.05	5.22	5.55	5.44	4.67

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16
18_	Thermal resistance winding-housing	K/W	7
19_	Thermal time constant winding	s	20
20_	Thermal time constant motor	s	528
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	18 000
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	18 000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	66
32_	Typical noise level	dBA	41

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
341_GPX 22 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
342_GPX 22 UP	1–4	436_ENX 16 EASY	489_ESCON 50/5
344_GPX 26 A/C	3	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
345_GPX 26 LN/LZ	3	438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
346_GPX 26 HP	4	439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	504_EPOS2 P 24/5
		470_ENC AEDL 5810	
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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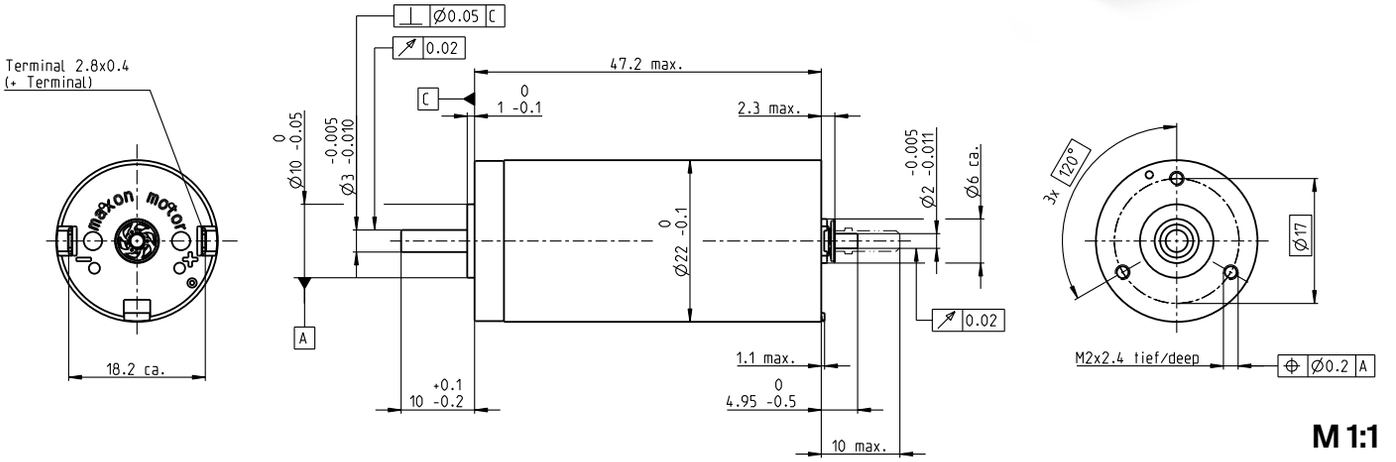
DCX 22 L Precious Metal Brushes
DC motor ∅22 mm

DCX

Key Data: 11/20 W, 29.8 mNm, 7160 rpm



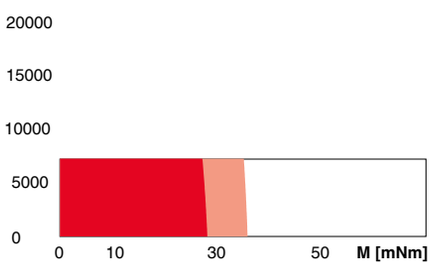
M 1:1

	Motor Data								
1_	Nominal voltage	V	6	9	12	18	24	36	48
2_	No load speed	rpm	5870	5870	4980	5740	5060	6020	5220
3_	No load current	mA	51.0	34	20.0	16.4	10.2	8.82	5.36
4_	Nominal speed	rpm	5380	5210	4000	4780	4070	5040	4180
5_	Nominal torque (max. continuous torque)	mNm	14.1	21.4	29.5	29.8	29.2	29.2	27.8
6_	Nominal current (max. continuous current)	A	1.50	1.50	1.30	1.01	0.655	0.520	0.322
7_	Stall torque	mNm	170	191	150	178	150	180	140
8_	Stall current	A	17.5	13.1	6.54	5.97	3.31	3.16	1.60
9_	Max. efficiency	%	89	90	89	90	89	90	89
10_	Terminal resistance	Ω	0.343	0.687	1.84	3.01	7.25	11.4	29.9
11_	Terminal inductance	mH	0.035	0.078	0.192	0.326	0.746	1.19	2.80
12_	Torque constant	mNm/A	9.73	14.6	22.9	29.9	45.2	57.0	87.6
13_	Speed constant	rpm/V	981	654	416	320	211	168	109
14_	Speed/torque gradient	rpm/mNm	34.6	30.8	33.3	32.2	33.9	33.5	37.3
15_	Mechanical time constant	ms	3.28	3.17	3.14	3.13	3.14	3.14	3.17
16_	Rotor inertia	gcm²	9.06	9.82	9.00	9.26	8.85	8.94	8.12

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	4.57
19_	Thermal time constant winding	s	22
20_	Thermal time constant motor	s	646
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	7160
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	7160
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	95
32_	Typical noise level	dBA	52

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
341_GPX 22 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
342_GPX 22 UP	1–4	436_ENX 16 EASY	489_ESCON 50/5
344_GPX 26 A/C	3	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
345_GPX 26 LN/LZ	3	438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
346_GPX 26 HP	4	439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	504_EPOS2 P 24/5
		470_ENC AEDL 5810	
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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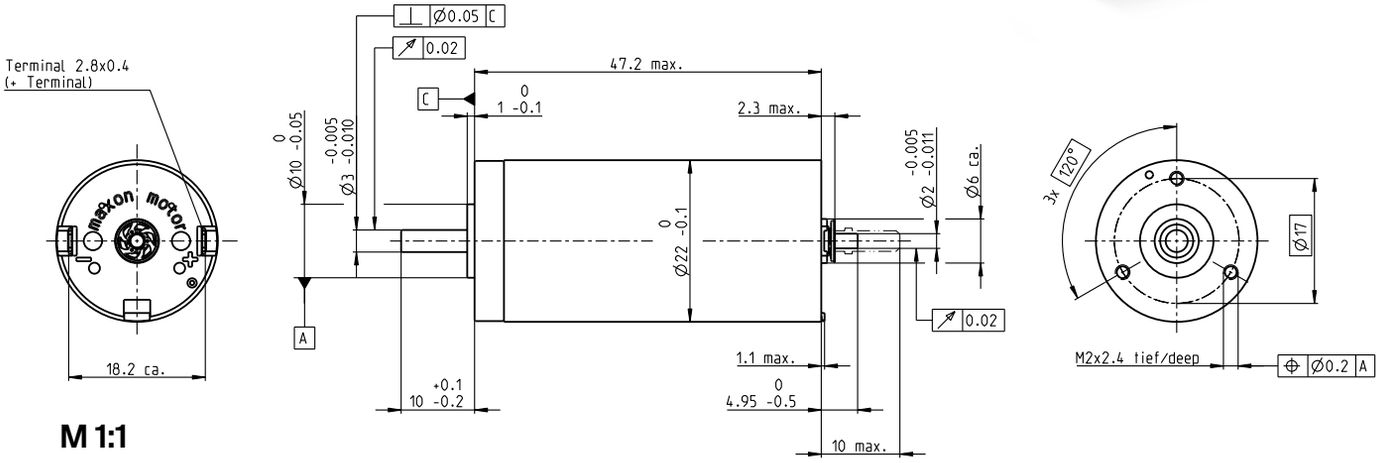
DCX 22 L Graphite Brushes
DC motor ∅22 mm

DCX

Key Data: 20/49 W, 32.2 mNm, 18 000 rpm



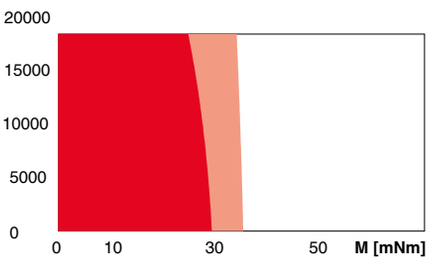
M 1:1

	Motor Data						
1_	Nominal voltage	V	9	12	18	36	48
2_	No load speed	rpm	12300	11700	11800	11400	10100
3_	No load current	mA	118	81.8	54.6	26.3	16.2
4_	Nominal speed	rpm	11400	10700	10800	10400	9020
5_	Nominal torque (max. continuous torque)	mNm	27.0	30.5	32.2	30.0	30.3
6_	Nominal current (max. continuous current)	A	4.00	3.21	2.26	1.03	0.687
7_	Stall torque	mNm	371	348	386	346	294
8_	Stall current	A	53.4	35.8	26.5	11.6	6.50
9_	Max. efficiency	%	90	91	91	90	90
10_	Terminal resistance	Ω	0.168	0.335	0.680	3.11	7.39
11_	Terminal inductance	mH	0.018	0.035	0.078	0.326	0.746
12_	Torque constant	mNm/A	6.95	9.73	14.6	29.9	45.2
13_	Speed constant	rpm/V	1370	981	654	320	211
14_	Speed/torque gradient	rpm/mNm	33.3	33.8	30.5	33.3	34.6
15_	Mechanical time constant	ms	3.27	3.21	3.13	3.23	3.20
16_	Rotor inertia	gcm²	9.37	9.06	9.82	9.26	8.85

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	4.57
19_	Thermal time constant winding	s	22
20_	Thermal time constant motor	s	646
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	18 000
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	18 000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	95
32_	Typical noise level	dBA	44

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
341_GPX 22 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
342_GPX 22 UP	1–4	436_ENX 16 EASY	489_ESCON 50/5
344_GPX 26 A/C	3	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
345_GPX 26 LN/LZ	3	438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
346_GPX 26 HP	4	439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	504_EPOS2 P 24/5
		470_ENC AEDL 5810	
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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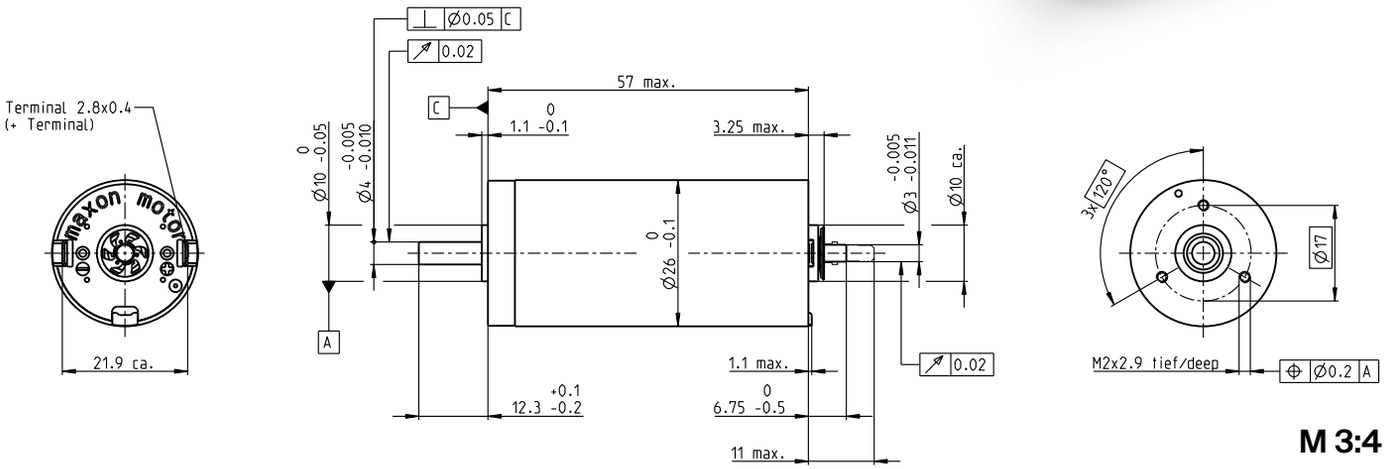
DCX 26 L Precious Metal Brushes
DC motor ∅26 mm

DCX

Key Data: 18/29 W, 52.3 mNm, 5900 rpm



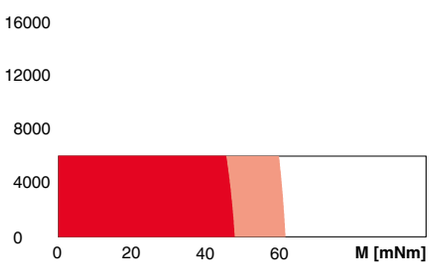
M 3:4

	Motor Data							
1_	Nominal voltage	V	9	12	18	24	36	48
2_	No load speed	rpm	5530	5330	5530	5330	5430	5320
3_	No load current	mA	80.5	56.8	40.2	28.4	19.5	14.2
4_	Nominal speed	rpm	5060	4690	4770	4600	4680	4570
5_	Nominal torque (max. continuous torque)	mNm	32.9	46.1	49.8	52.3	50.8	50.3
6_	Nominal current (max. continuous current)	A	2.2	2.2	1.64	1.25	0.822	0.599
7_	Stall torque	mNm	384	384	362	384	370	355
8_	Stall current	A	24.8	17.9	11.7	8.95	5.86	4.14
9_	Max. efficiency	%	89	89	89	89	89	89
10_	Terminal resistance	Ω	0.363	0.671	1.54	2.68	6.15	11.6
11_	Terminal inductance	mH	0.067	0.129	0.268	0.514	1.11	2.06
12_	Torque constant	mNm/A	15.5	21.4	31	42.9	63.2	85.8
13_	Speed constant	rpm/V	616	445	308	223	151	111
14_	Speed/torque gradient	rpm/mNm	14.4	13.9	15.3	13.9	14.7	15
15_	Mechanical time constant	ms	3.23	3.13	3.11	3.09	3.1	3.11
16_	Rotor inertia	gcm²	21.3	21.4	19.4	21.2	20.1	19.7

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	10.2
18_	Thermal resistance winding-housing	K/W	3.01
19_	Thermal time constant winding	s	24
20_	Thermal time constant motor	s	620
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	5900
24_	Axial play	mm	0...0.1
	Preload	N	5.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	5.5
27_	Max. force for press fits (static)	N	40
	(static, shaft supported)	N	500
28_	Max. radial load [mm from flange]	N	20.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	5900
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	500
28_	Max. radial load [mm from flange]	N	5.5 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		11
31_	Weight of motor	g	170
32_	Typical noise level	dBA	48

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
344_GPX 26 A/C	1–2 [3]	433_ENX 10 EASY	486_ESCON 36/2 DC
345_GPX 26 LN/LZ	1–2 [3]	433_ENX 10 QUAD	487_ESCON Module 50/5
346_GPX 26 HP	2–3 [4]	434_ENX 10 EASY XT	489_ESCON 50/5
347_GPX 32 A/C	3	436_ENX 16 EASY	496_EPOS4 Mod./Comp. 24/1.5
348_GPX 32 LN/LZ	3	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 50/5
349_GPX 32 HP	4	438_ENX 16 EASY Abs.	501_EPOS4 50/5
		439_ENX 16 EASY Abs. XT	504_EPOS2 P 24/5
		443_ENX 16 RIO	
		470_ENC AEDL 5810	
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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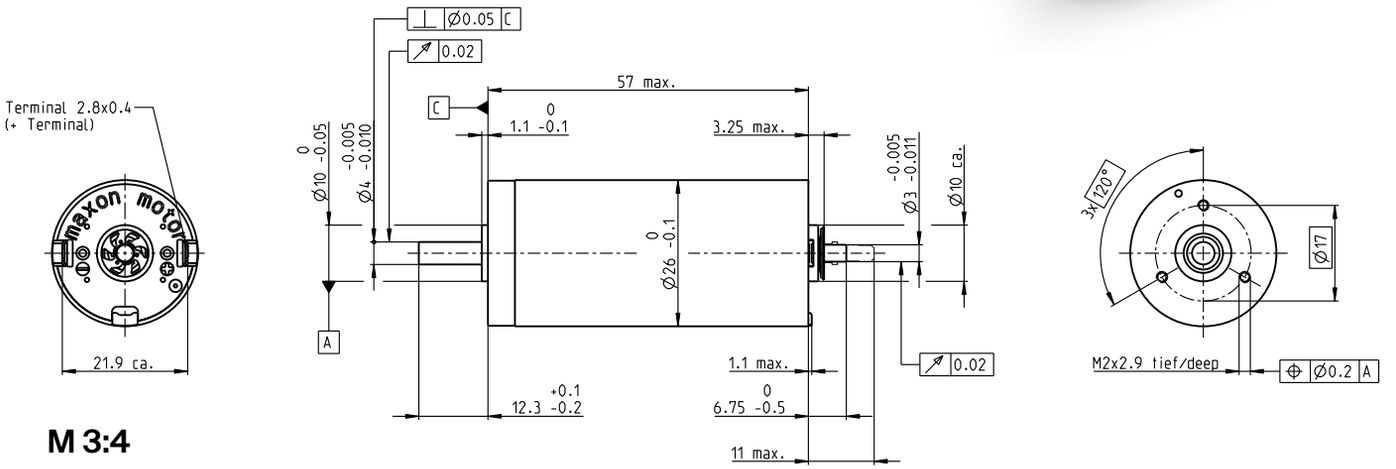
DCX 26 L Graphite Brushes
DC motor ∅26 mm

DCX

Key Data: 40/74 W, 59.8 mNm, 14400 rpm



M 3:4

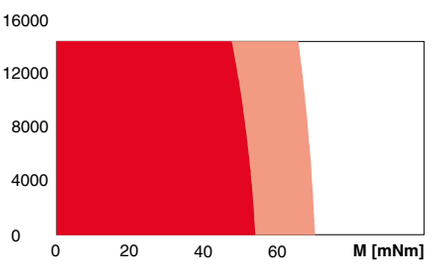
	Motor Data							
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	10600	11100	10700	11100	10700	10900
3_	No load current	mA	131	93	65.7	46.5	32.9	27.3
4_	Nominal speed	rpm	9460	10000	9690	10000	9730	10000
5_	Nominal torque (max. continuous torque)	mNm	46.9	54.3	57.8	54	59.1	59.8
6_	Nominal current (max. continuous current)	A	4.5	3.59	2.76	1.79	1.41	1.17
7_	Stall torque	mNm	532	653	695	639	697	750
8_	Stall current	A	49.7	42.2	32.4	20.6	16.2	14.3
9_	Max. efficiency	%	88	90	91	90	91	91
10_	Terminal resistance	Ω	0.242	0.427	0.74	1.75	2.95	4.19
11_	Terminal inductance	mH	0.032	0.067	0.129	0.268	0.514	0.768
12_	Torque constant	mNm/A	10.7	15.5	21.4	31	42.9	52.4
13_	Speed constant	rpm/V	890	616	445	308	223	182
14_	Speed/torque gradient	rpm/mNm	20.1	17	15.4	17.4	15.3	14.6
15_	Mechanical time constant	ms	4.5	3.79	3.45	3.53	3.4	3.16
16_	Rotor inertia	gcm²	21.4	21.3	21.4	19.4	21.2	20.7

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	10.2
18_	Thermal resistance winding-housing	K/W	3.01
19_	Thermal time constant winding	s	24
20_	Thermal time constant motor	s	620
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	14400
24_	Axial play	mm	0...0.1
	Preload	N	5.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	5.5
27_	Max. force for press fits (static)	N	40
	(static, shaft supported)	N	500
28_	Max. radial load [mm from flange]	N	20.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	8600
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	500
28_	Max. radial load [mm from flange]	N	5.5 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		11
31_	Weight of motor	g	170
32_	Typical noise level	dBA	44

Motor specifications may vary for version with sintered bearing (max. winding temperature 125°C).

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
344_GPX 26 A/C	1–2 [3]	433_ENX 10 EASY	486_ESCON 36/2 DC
345_GPX 26 LN/LZ	1–2 [3]	433_ENX 10 QUAD	487_ESCON Module 50/5
346_GPX 26 HP	2–3 [4]	434_ENX 10 EASY XT	489_ESCON 50/5
347_GPX 32 A/C	3	436_ENX 16 EASY	496_EPOS4 Mod./Comp. 50/5
348_GPX 32 LN/LZ	3	437_ENX 16 EASY XT	501_EPOS4 50/5
349_GPX 32 HP	4	438_ENX 16 EASY Abs.	504_EPOS2 P 24/5
		439_ENX 16 EASY Abs. XT	
		443_ENX 16 RIO	
		470_ENC AEDL 5810	
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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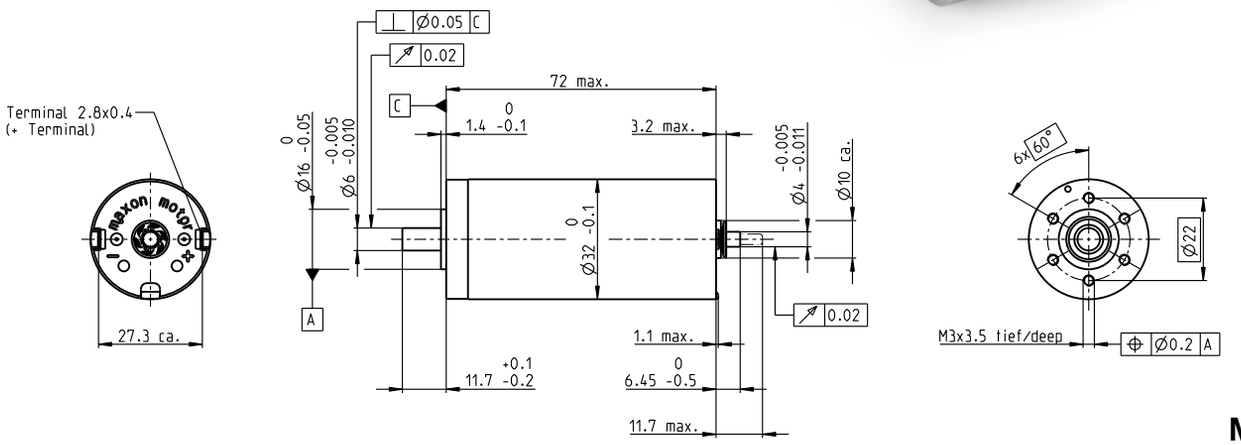
DCX 32 L Graphite Brushes
DC motor ∅32 mm

Key Data: 70/110 W, 128 mNm, 11300 rpm

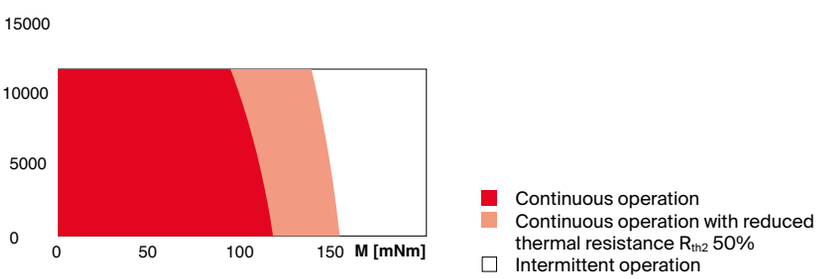


M 1:2

	Motor Data							
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	7120	8630	8270	7940	7780	5840
3_	No load current	mA	274	234	164	103	75.2	41.6
4_	Nominal speed	rpm	6560	8070	7710	7410	7260	5290
5_	Nominal torque (max. continuous torque)	mNm	89.4	101	108	119	123	128
6_	Nominal current (max. continuous current)	A	6.00	5.42	4.12	2.87	2.17	1.35
7_	Stall torque	mNm	1730	2120	1980	2020	2000	1420
8_	Stall current	A	111	109	72.5	47.1	34.2	14.5
9_	Max. efficiency	%	85	88	88	90	90	89
10_	Terminal resistance	Ω	0.108	0.165	0.331	0.764	1.40	4.12
11_	Terminal inductance	mH	0.034	0.053	0.103	0.254	0.473	1.31
12_	Torque constant	mNm/A	15.6	19.5	27.3	42.9	58.5	97.5
13_	Speed constant	rpm/V	612	490	350	223	163	97.9
14_	Speed/torque gradient	rpm/mNm	4.24	4.15	4.24	3.96	3.92	4.14
15_	Mechanical time constant	ms	3.44	3.30	3.24	3.19	3.11	3.11
16_	Rotor inertia	gcm²	77.6	75.9	72.8	76.8	75.9	71.7

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	7.28
18_	Thermal resistance winding-housing	K/W	2.3
19_	Thermal time constant winding	s	42.2
20_	Thermal time constant motor	s	837
21_	Ambient temperature	°C	-40...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	11300
24_	Axial play	mm	0...0.1
	Preload	N	7
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	7
27_	Max. force for press fits (static)	N	22.6
	(static, shaft supported)	N	2510
28_	Max. radial load [mm from flange]	N	65.3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		11
31_	Weight of motor	g	325
32_	Typical noise level	dBA	47

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
347_GPX 32 A/C	1–2 [3]	433_ENX 10 EASY	487_ESCON Module 50/5
348_GPX 32 LN/LZ	1–2 [3]	433_ENX 10 QUAD	488_ESCON Module 50/8 HE
349_GPX 32 HP	2–3 [4]	434_ENX 10 EASY XT	489_ESCON 50/5
350_GPX 32 UP	1–4	436_ENX 16 EASY	489_ESCON 70/10
351_GPX 37 A	3	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 50/5
352_GPX 37 LN/LZ	3	438_ENX 16 EASY Abs.	497_EPOS4 Mod./Comp. 50/8
		439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	501_EPOS4 70/15
		470_ENC AEDL 5810	504_EPOS2 P 24/5
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded
Commutation: Graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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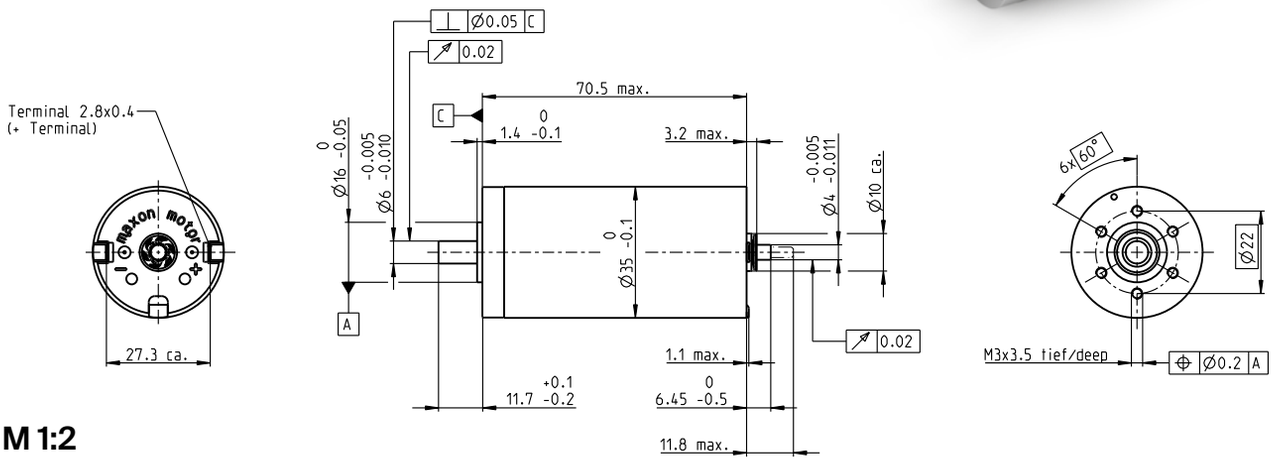
DCX 35 L Graphite Brushes
DC motor ∅35 mm

DCX

Key Data: 80/120 W, 138 mNm, 12300 rpm

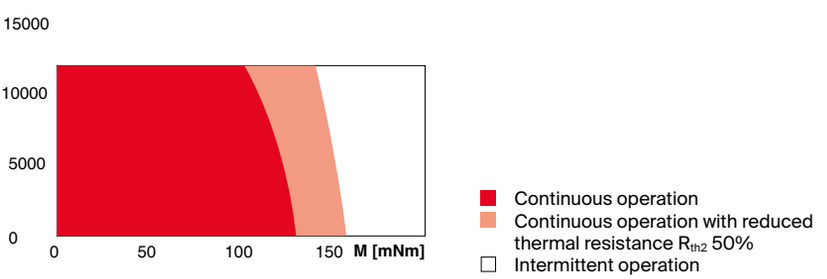


M 1:2

	Motor Data							
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	8130	7200	7720	7940	6670	7690
3_	No load current	mA	320	177	146	101	58.6	57.5
4_	Nominal speed	rpm	7610	6640	7160	7410	6140	7160
5_	Nominal torque (max. continuous torque)	mNm	77.7	120	121	128	138	132
6_	Nominal current (max. continuous current)	A	6.00	5.32	4.26	3.07	2.08	1.84
7_	Stall torque	mNm	2080	1980	2030	2160	1860	2050
8_	Stall current	A	152	84.8	69.3	50.3	27.3	27.7
9_	Max. efficiency	%	85	88	89	90	90	90
10_	Terminal resistance	Ω	0.079	0.212	0.346	0.716	1.76	2.16
11_	Terminal inductance	mH	0.026	0.077	0.121	0.260	0.658	0.776
12_	Torque constant	mNm/A	13.7	23.4	29.3	42.9	68.3	74.1
13_	Speed constant	rpm/V	699	408	326	223	140	129
14_	Speed/torque gradient	rpm/mNm	4.04	3.70	3.86	3.72	3.61	3.76
15_	Mechanical time constant	ms	4.21	3.97	3.91	3.84	3.76	3.75
16_	Rotor inertia	gcm²	99.5	102	96.6	98.7	99.5	95.2

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	6.98
18_	Thermal resistance winding-housing	K/W	2.1
19_	Thermal time constant winding	s	43.9
20_	Thermal time constant motor	s	1030
21_	Ambient temperature	°C	-40...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	12300
24_	Axial play	mm	0...0.1
	Preload	N	7
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	7
27_	Max. force for press fits (static)	N	22.6
	(static, shaft supported)	N	2510
28_	Max. radial load [mm from flange]	N	65.3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		11
31_	Weight of motor	g	385
32_	Typical noise level	dBA	48

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
351_GPX 37 A	1–2	433_ENX 10 EASY	487_ESCON Module 50/5
352_GPX 37 LN/LZ	1–2	433_ENX 10QUAD	488_ESCON Module 50/8 HE
353_GPX 42 C	1–4	434_ENX 10 EASY XT	489_ESCON 50/5
353_GPX 42 UP	1–4	436_ENX 16 EASY	489_ESCON 70/10
		437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 50/5
		438_ENX 16 EASY Abs.	497_EPOS4 Mod./Comp. 50/8
		439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	501_EPOS4 70/15
		470_ENC AEDL 5810	504_EPOS2 P 24/5
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded
Commutation: Graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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