maxon

Power at the press of a button. Compact drive with integrated positioning controller.

Explanation of maxon IDX drives terminology

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

Drive data
The values were determined for sinusoidal commutation and a drive without additional attachments, such as a brake or gearhead. Additional attachments may change the performance data of the system.

1 **Nominal power supply voltage** U_N [Volt]
is the supply voltage at which the nominal values of the drive are achieved. The nominal values (lines 2-7) are based on this voltage. The supply voltage may vary within the range of the nominal operating voltage (line 12).

2 **Nominal speed** n_0 [rpm]
is the speed for which the drive is rated. For torques up to the nominal torque, the integrated motor controller is capable of regulating to this speed.

3 **Nominal torque at 25°C (max. continuous torque)** [mNm]
and
4 **Nominal torque at 40 °C (max. continuous torque)** [mNm]
is the torque generated during operation with the nominal supply voltage and nominal supply current at 25 °C/40 °C. It is at the limit of the drive's continuous operation range. To prevent the winding from heating up too much, higher torques are only possible for brief periods. The integrated motor controller monitors the winding with a temperature sensor.

5 **Nominal supply current at 25 °C** [A]
and
6 **Nominal supply current at 40 °C** [A]
is the supply current required to reach the nominal torque with the nominal supply voltage at 25 °C/40 °C.

7 **Maximum speed with nominal supply voltage** [rpm]
is the maximum speed the drive can achieve at the nominal supply voltage.

8 **Maximum permissible drive speed** η_{max} [rpm]
is the maximum speed the drive can achieve. The maximum speed can only be achieved if a sufficiently high supply voltage is available. Higher speeds are not permitted.

9 **Maximum torque (short-term)** M_{max} [mNm]
is the torque that the drive can output for short periods of time. The duration depends on the installation and is monitored by the integrated motor controller using temperature sensors.

10 **Maximum supply current (short term)** I_{max} [A]
is the maximum current. The supply current is not proportional to the torque, but instead depends on the supply voltage and the operating point.

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

12 **Nominal operating voltage** $+V_{CC}$ [V]
shows the permitted range for the supply voltage relative to GND. If the actual voltage is lower than the nominal supply voltage, then the nominal torque and speed cannot be guaranteed. If a brake is attached, then the supply voltage of the brake is considered to be the lower limit (see feature chart).

13 **Ramp-up time to maximum speed** [ms]
is the time required to accelerate rotor to the maximum speed under no load. This time only applies if there is an adequate supply voltage, without brake and without gearhead.

14 **Thermal resistance housing-ambient** R_{th2} [K/W]
and
15 **Thermal resistance winding-housing** R_{th1} [K/W]
Characteristic values of thermal contact resistance without additional heat sinking. Lines 14 and 15 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.

16 **Thermal time constant of winding** τ_w [s]
and
17 **Thermal time constant of drive** τ_w [s]
These are the typical response times for temperature changes of the winding and drive. It is noticeable that the drive has a much slower thermal response than the winding. The values have been calculated from the product of the thermal capacity and the given heat resistances. The integrated motor controller monitors the temperatures with temperature sensors.

18 **Ambient temperature** [°C]
Operating temperature range. This derives from the heat reliability of the materials used and viscosity of bearing lubrication.

19 **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.

20 **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.

21/22 **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.

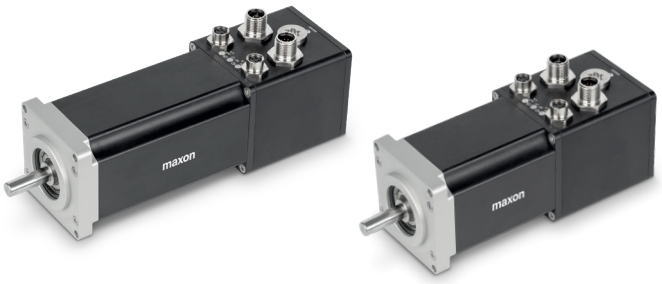
23 **Weight of motor** [g]

24 **Typical noise level** [dBA]
is the statistical average of the noise level measured in accordance with the maxon standard (10 cm distance radially to the drive, no-load operation at the given speed.) 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.

EtherCAT

CANopen

I/O



IP65

Compact

Easy to use

High functionality and performance

Design of the drive

maxon IDX drives consist of a motor based on EC-i technology, a magnetic absolute encoder (single-turn), and an EPOS4 positioning controller with integrated field-oriented commutation (FOC). The high-quality design complies with the IP 65 protection class; only the output shaft has to be sealed by the customer. The integrated temperature sensors on the winding and controller are evaluated directly in the drive and enable optimal use of the operating range.

Functionality of the positioning controller

IDX drives are equipped with configurable digital and analog inputs and outputs. These are matched optimally to the various functions and operating modes of the CiA-402 device profile. In addition to the intuitive commissioning software, libraries are available free of charge for integration in a wide variety of master systems.

Command

The drive can be commanded via EtherCAT or CANopen. In the I/O version, no fieldbus is available to the user; commands are given via the I/Os. In this case, only current or speed control is supported (no position control).

Gearheads

The gearheads developed specifically for the IDX optimally supplement the drive. For selection of the toothing, strength and smooth running characteristics were important criteria. In the standard version (A), the planets are equipped with needle bearings. This increases the service life. In the low-noise version (LN), the first gear stage is beveled and made completely of steel. In the ultra-performance version (UP), the gearbox has been optimized for very high torques.

Brakes

The drive can be combined with an optional holding brake; this increases the length of the drive minimally. It is important to note that this slightly changes not only the overall length but also the performance data. Additionally, the minimum permissible supply voltage and the operating temperature range changes. The brake is active when disconnected from power. It is a holding brake, which is not suitable for deceleration. The brake is controlled by the integrated controller. The electrical characteristics, dimensional drawings, and CAD data of the drive with brake are available online.

Drive selections

maxon IDX drives are integrated systems that cannot be viewed and specified like separate motor-controller combinations. In the IDX, motor and controller are thermally coupled. Also, the supply current and supply voltage are not the currents and voltages that are present at the motor. For this reason, the data sheet does not specify device characteristics, such as torque or speed constant. Such values can be found on the feature chart, if needed. For specification in an application, the nominal torque, the maximum torque (short-term), the nominal speed, as well as the maximum drive speed have to be referenced from the data sheet. For the IDX, the information on the nominal operating point applies to use at altitudes up to 1000 m above sea level.

Commissioning

maxon preconfigures IDX drives before delivery. Motor, encoder, and brake parameters are stored on the positioning controller at the factory. For commissioning at the customer site, maxon provides the auto tuning function via EPOS Studio. This reduces the installation time to a minimum.

Cables

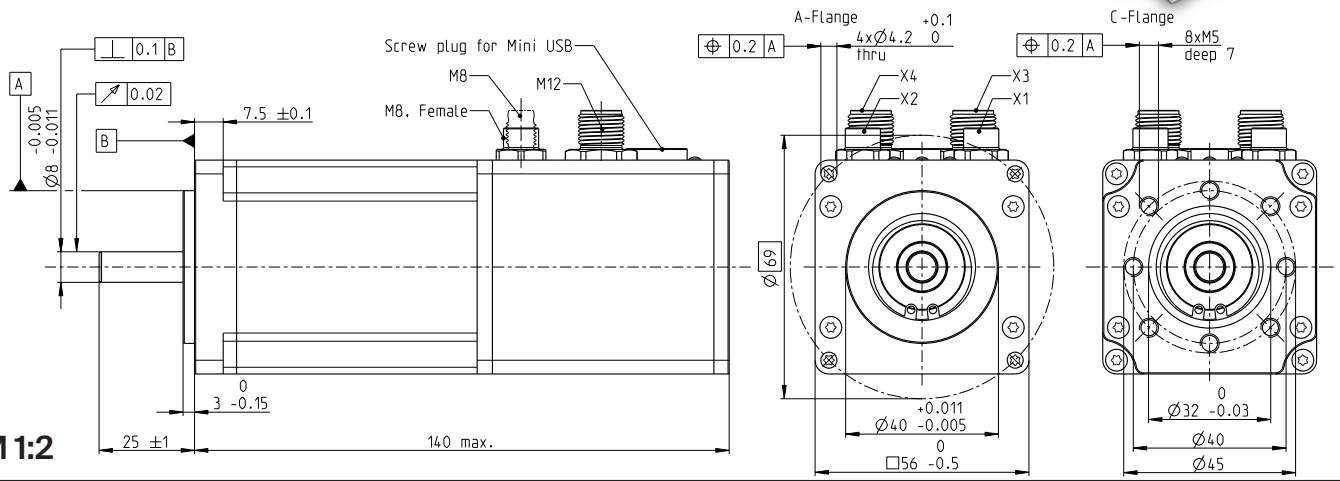
Only minimal work is needed for cabling the IDX drive, as only the power supply, command cabling and, if necessary, the I/Os have to be connected. In the online shop, maxon offers a selection of cables that simplifies commissioning of the drive and are kept available in stock.

IDX 56 M with integrated electronics

I/O ⇔ | EtherCAT ⇌ | CANopen | NEW

Drive with Positioning/Speed Controller

Key Data: 233/256 W, 516 mNm, 6000 rpm



M 1:2

	Drive data (provisional)			
1_	Nominal power supply voltage	V	24	48
2_	Nominal speed	rpm	4500	4500
3_	Nominal torque at 25°C (max. continuous torque)	mNm	417	516
4_	Nominal torque at 40°C (max. continuous torque)	mNm	370	458
5_	Nominal supply current at 25°C	A	9.8	5.8
6_	Nominal supply current at 40°C	A	8.7	5.2
7_	Maximum speed at nominal voltage	rpm	5105	6000
8_	Maximum permissible drive speed	rpm	6000	6000
9_	Maximum torque (short-time)	mNm	888	1498
10_	Maximum supply current (short-time)	A	24	24
11_	Rotor inertia of the drive	gcm²	170	170
12_	Nominal supply voltage + V_{CC}	V	12..48	12..48
13_	Run-up time to maximum speed	ms	9.8	7.1

	Thermal data		
14_	Thermal resistance housing-ambient	K/W	2.47
15_	Thermal resistance winding-housing	K/W	1.16
16_	Thermal time constant winding	s	18.9
17_	Thermal time constant drive	s	1320
18_	Ambient temperature	°C	-20...+85
	Mechanical data		
19_	Axial play	mm	0.14
	Preload	N	21
	Direction of force		Pull
20_	Radial play		preloaded
21_	Max. axial load (dynamic)	N	12
22_	Max. force for press fits (static)	N	150
23_	Max. radial load [mm from flange]	N	110 [5]

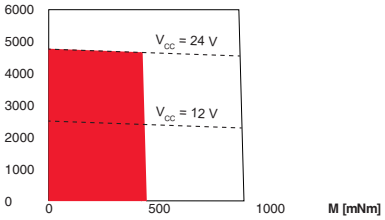
	Other specifications		
24_	Weight of the drive	g	1070
25_	Typical noise level [rpm]	dBA	54 [4000]
	Encoder: Steps per turn		4096

Supply*	M12 connector, male, 5 poles, L-coded
I/O's*	M12 connector, male, 12 poles, A-coded
CANopen Input*	M8 connector, male, 5 poles, B-coded
CANopen Output*	M8 connector, female, 5 poles, B-coded
EtherCAT Input*	M8 connector, female, 4 poles, A-coded
EtherCAT Output*	M8 connector, female, 4 poles, A-coded

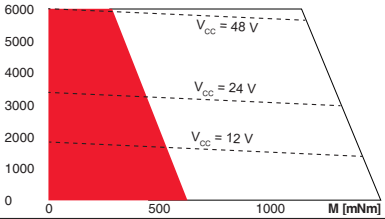
*Matching cable available

Operating Range

n [rpm] 24-V-system



n [rpm] 48-V-system



Continuous operation
Short term operation

maxon Modular System

maxon gear	stages [opt.]
GPX 52	1–3

Interfaces: CANopen / EtherCAT
Brake

Configuration

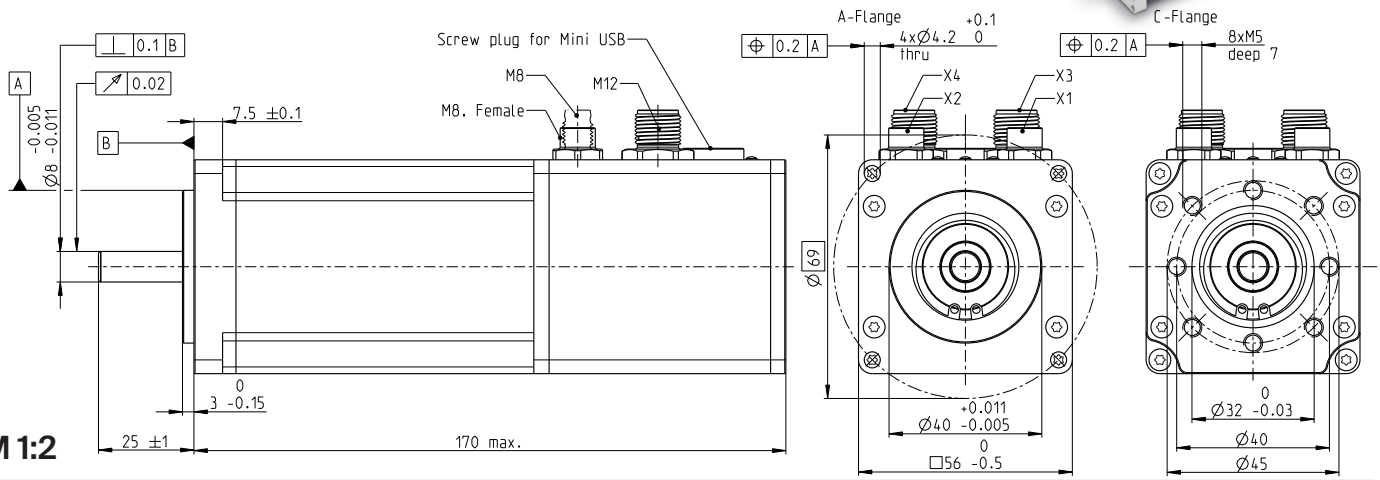
Flange front: A-Flange/C-Flange

IDX 56 L with integrated electronics

Drive with Positioning/Speed Controller

I/O ⇔ | EtherCAT | CANopen | NEW

Key Data: 283/308 W, 794 mNm, 6000 rpm



M 1:2

Drive data (provisional)				
1_	Nominal power supply voltage	V	24	48
2_	Nominal speed	rpm	2750	3500
3_	Nominal torque at 25°C (max. continuous torque)	mNm	794	779
4_	Nominal torque at 40°C (max. continuous torque)	mNm	704	690
5_	Nominal supply current at 25°C	A	11.2	6.0
6_	Nominal supply current at 40°C	A	10	6.7
7_	Maximum speed at nominal voltage	rpm	3090	4915
8_	Maximum permissible drive speed	rpm	6000	5000
9_	Maximum torque (short-time)	mNm	1596	1997
10_	Maximum supply current (short-time)	A	24	24
11_	Rotor inertia of the drive	gcm²	265	265
12_	Nominal supply voltage + V_{CC}	V	12..48	12..48
13_	Run-up time to maximum speed	ms	5.4	6.9

Thermal data			
14_	Thermal resistance housing-ambient	K/W	2.01
15_	Thermal resistance winding-housing	K/W	0.76
16_	Thermal time constant winding	s	20.1
17_	Thermal time constant drive	s	1450
18_	Ambient temperature	°C	-20...+85
Mechanical data			
19_	Axial play	mm	0.14
	Preload	N	21
	Direction of force		Pull
20_	Radial play		preloaded
21_	Max. axial load (dynamic)	N	12
22_	Max. force for press fits (static)	N	150
23_	Max. radial load [mm from flange]	N	110 [5]

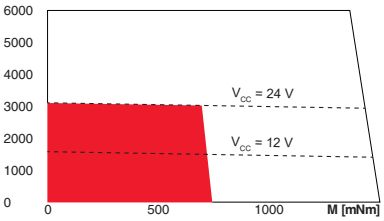
Other specifications			
24_	Weight of the drive	g	1445
25_	Typical noise level [rpm]	dBA	58 [4000]
	Encoder: Steps per turn		4096

Supply*	M12 connector, male, 5 poles, L-coded
I/O's*	M12 connector, 12 male, poles, A-coded
CANopen Input*	M8 connector, 5 male, poles, B-coded
CANopen Output*	M8 connector, 5 female, poles, B-coded
EtherCAT Input*	M8 connector, 4 female, poles, A-coded
EtherCAT Output*	M8 connector, 4 female, poles, A-coded

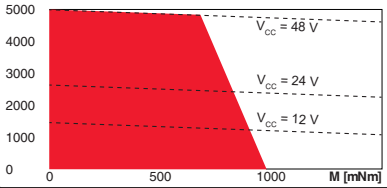
*Matching cable available

Operating Range

n [rpm] 24-V-system



n [rpm] 48-V-system



Continuous operation
Short term operation

maxon Modular System

maxon gear	stages [opt.]
GPX 52	1–3

Interfaces: CANopen / EtherCAT
Brake

Configuration

Flange front: A-Flange/C-Flange

GPX 52
Planetary Gearhead Ø52 mm
Configurable

GPX

NEW

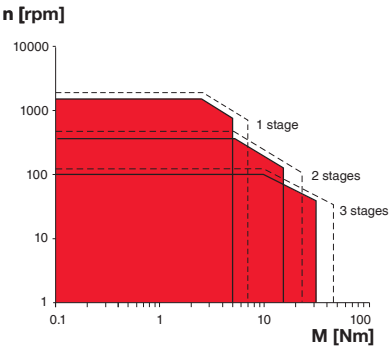
Key Data		A Standard Version	UP Ultra Performance
Max. transmittable power	W	400	600
Max. continuous torque	Nm	30.0	45.0
Max. continuous input speed	rpm	6000	6000
Ambient temperature	°C	-40...+100	-40...+100
Bearing at output		Ball bearing	

Operating Range (output shaft)

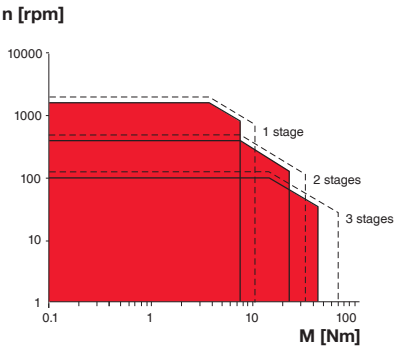
Continuous operation

Intermittent operation

A Standard Version



UP Ultra Performance



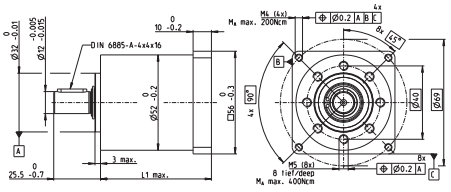
Specifications		A Standard Version			UP Ultra Performance		
Number of stages		1	2	3	1	2	3
Max. transmittable power (continuous)	W	400	200	100	600	300	150
Max. transmittable power (intermittent)	W	500	250	125	750	375	188
Max. continuous torque	Nm	5.0	15.0	30.0	7.5	22.5	45.0
Max. intermittent torque	Nm	7.0	23.0	45.0	10.5	34.5	67.5
Max. continuous input speed	rpm	6000	6000	6000	6000	6000	6000
Max. intermittent input speed	rpm	7500	7500	7500	7500	7500	7500
Max. efficiency	%	95.0	92.0	89.0	95	92	89
Average backlash no load	°	0.5	0.6	0.8	0.30	0.40	0.50
Max. axial load (dynamic)	N	200	200	200	200	200	200
Max. permissible radial load, 10 mm from flange	N	420	630	900	420	630	900
Gearhead length L1[1]	mm	44	61	78	44	61	78
Weight	g	687	855	1080	694	861	1086

Configuration	A Standard Version			UP Ultra Performance		
Number of stages	1	2	3	1	2	3
Reduction	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231, 287	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231, 287
Version	Standard/noise reduced/ultra performance					
Flange	Standard flange					
Shaft						

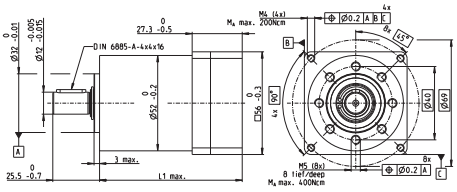
maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
maxon EC motor	№ of stages [opt.]	
maxon IDX drive	№ of stages [opt.]	
IDX 52 M	1–3	
IDX 52 L	1–3	

Dimensions M 1:4

1–2 stages



3 stages



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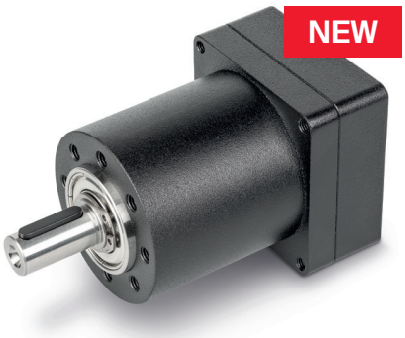
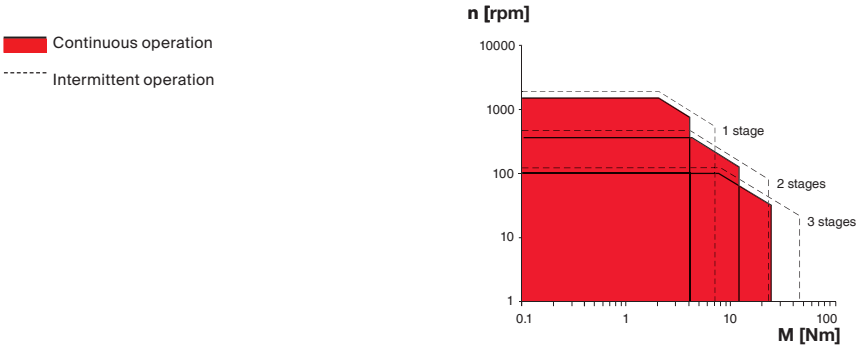
GPX 52
Planetary Gearhead Ø52 mm
Configurable



Key Data		C Ceramic Version
Max. transmittable power	W	320
Max. continuous torque	Nm	24.0
Max. continuous input speed	rpm	6000
Ambient temperature	°C	-40...+100
Bearing at output		Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration

Operating Range (output shaft) — C Ceramic Version

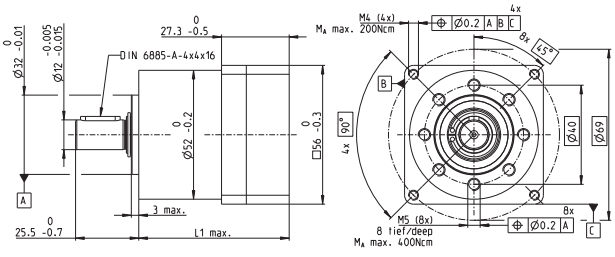


Specifications		C Ceramic Version		
Number of stages		1	2	3
Max. transmittable power (continuous)	W	320	160	80
Max. transmittable power (intermittent)	W	400	200	100
Max. continuous torque	Nm	4.0	12.0	24.0
Max. intermittent torque	Nm	7.0	23.0	45.0
Max. continuous input speed	rpm	6000	6000	6000
Max. intermittent input speed	rpm	7500	7500	7500
Max. efficiency	%	90	83	78
Average backlash no load	°	0.50	0.60	0.80
Max. axial load (dynamic)	N	200	200	200
Max. permissible radial load, 10 mm from flange	N	420	630	900
Gearhead length L1[1]	mm	44	61	78
Weight	g	687	861	1143

Configuration	C Ceramic Version		
Number of stages	1	2	3
Reduction	3.9, 5.3, 6.6, 9	16, 21, 26, 28, 35, 36, 44, 48, 59	62, 83, 103, 111, 138, 150, 172, 186, 231,254, 287, 315, 392
Version	Standard/noise reduced/ultra performance		
Flange	Standard flange		
Shaft			

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
maxon EC motor	№ of stages [opt.]	
maxon IDX drive	№ of stages [opt.]	
IDX 52 M	1–3	
IDX 52 L	1–3	

Dimensions M 1:3



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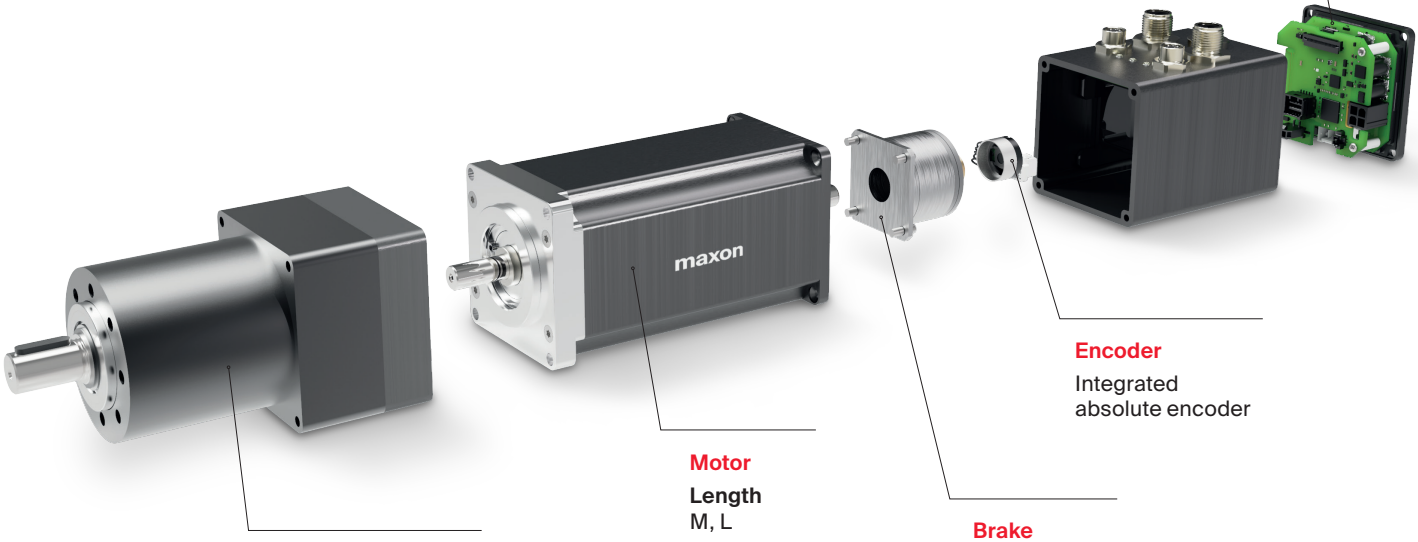
The new IDX 56 with up to 2 Nm (0.8 Nm continuous)

- → High continuous torque
- → High power density
- → IP65 protected design
- → Ready for Industry 4.0
- → Configurable

Available from November 2019



Electronics

Integrated electronics with positioning/speed controller

Commanding
EtherCAT
CANopen
I/O

Encoder

Integrated absolute encoder

Brake

Optional

Motor

Length
M, L

Winding
24 V, 48 V

Flange
A-Flange
C-Flange

Gear

Stages
1–3

Versions
Standard
Noise reduced
Ultra performance

November 2019 edition / Subject to change