Explanation of the pages 170–237

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

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

Line 1 Nominal voltage U_N [Volt]
is the applied voltage between two powered phases in block commutation. See page 32 for the timing diagram of the voltage in the three phases. All nominal data (lines 2–9) refer to this voltage. Lower and higher voltages are permissible, provided that limits are not exceeded.

Line 2 No load speed n_0 [rpm] ±10%
is the speed at which the unloaded motor runs with the nominal voltage applied. It is approximately proportional to the applied voltage.

Line 3 No load current I_0 [mA] ±50%
This is the typical current that the unloaded motor draws when operating at nominal voltage. It increases with rising speed owing to bearing friction and iron losses. No load friction depends heavily on temperature. It decreases in extended operation and increases at lower temperatures.

Line 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.

Line 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.

Line 6 Nominal current I_N [A]
is the current in the active phase in block commutation that generates the nominal torque at the given nominal speed (= max. permissible continuous load current). The maximum winding temperature is reached at 25°C ambient temperature in continuous operation with I_N. I_N decreases as speed increases due to additional losses in the lamination. For the EC 10 flat motor the nominal operating point is given varying at half no load speed, as the thermal limit is not reached at nominal voltage.

Line 7 Stall torque M_H [mNm]
is the torque produced by the motor when at standstill. Rising motor temperatures reduce stall torque.

Line 8 Stall current I_A [A]
is the quotient from nominal voltage and the motor's terminal resistance. Stall current is equivalent to starting current. With larger motors, I_A cannot often be reached due to the amplifier's current limits.

Line 9 Maximum 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.

Line 10 Terminal resistance phase to phase R [Ω]
is determined through the resistance at 25°C between two connections.

Line 11 Terminal inductance phase to phase L [mH]
is the winding inductance between two connections. It is measured at 1 kHz, sinusoidal.

Line 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.

Line 13 Speed constant k_n [rpm/V]
indicates the theoretical no load speed per volt of applied voltage, disregarding friction losses.

Line 14 Speed/torque gradient Δ_n/Δ_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 (tolerance ± 20%).
With flat motors, the real gradient depends on speed: at higher speeds, it is steeper, but flatter at lower speeds. The real gradient at nominal voltage can be approximated by a straight line between no load speed and the nominal operating point (see page 45).

Line 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.

Line 16 Rotor moment of inertia J_R [gcm^2]
is the mass moment of inertia of the rotor, based on the axis of rotation.

Line 17 Thermal resistance housing-ambient R_{th2} [K/W]
and
Line 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.

Line 19 Thermal time constant winding τ_w [s]
and
Line 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.

Line 21 Ambient temperature [°C]
Operating temperature range. This derives from the heat reliability of the materials used and viscosity of bearing lubrication.

Line 22 Max. winding temperature [°C]
Maximum permissible winding temperature.

Line 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.

Line 24 Axial play [mm]
For non-preloaded motors, this represents the tolerance limits of the factory-set bearing play. The latter is included in shaft length tolerances. Preloading cancels out axial play up to the given axial loading.

Line 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.

Line 26/27 Max. axial load [N]
Dynamically: axial loading permissible in operation. If different values apply for traction and thrust, the smaller value is given.
Statically: maximum axial force applying to the shaft at standstill where no residual damage occurs.
Shaft supported: maximum axial force applying to the shaft at standstill if the force is not input at the other shaft end. This is not possible for motors with only one shaft end.

Line 28 Max. radial load [N]
The value is given for a typical clearance from the flange; this value falls the greater the clearance.

Line 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.

Line 30 Number of phases
All maxon EC motors have three phases.

Line 31 Weight of motor [g]

Line 33 Max. torque M_{max} [mNm]
Maximum torque the motor can briefly deliver. It is limited by the overload protection of the electronics.

Line 34 Max. current I_{max} [A]
Surge current with which the peak torque is generated at nominal voltage. With an active speed controller, surge current is not proportionate to the torque, but also depends on the supply voltage. As a result, this value only applies at nominal voltage.

Line 35 Type of control
«Speed» means that the drive is fitted with an integral speed controller. «Controlled» means that the drive is fitted with true commutation electronics.

Line 36 Supply voltage $+V_{CC}$ [V]
Range of supply voltages measured in respect of GND at which the drive functions.

Line 37 Speed set value input U_C [V]
Range of analog voltage for set speed value measured in respect of GND. For 2 wire solutions, the supply voltage acts as speed setting at the same time.

Line 38 Scaling Set speed value input k_c [rpm/V]
Set speed value n_c is based on the product $n_c = k_c \cdot U_c$.

Line 39 Speed range
Achievable speeds in the controlled range.

Line 40 Max. acceleration
The set speed value follows a sudden set point change with a ramp. This value indicates the increase in the ramp.