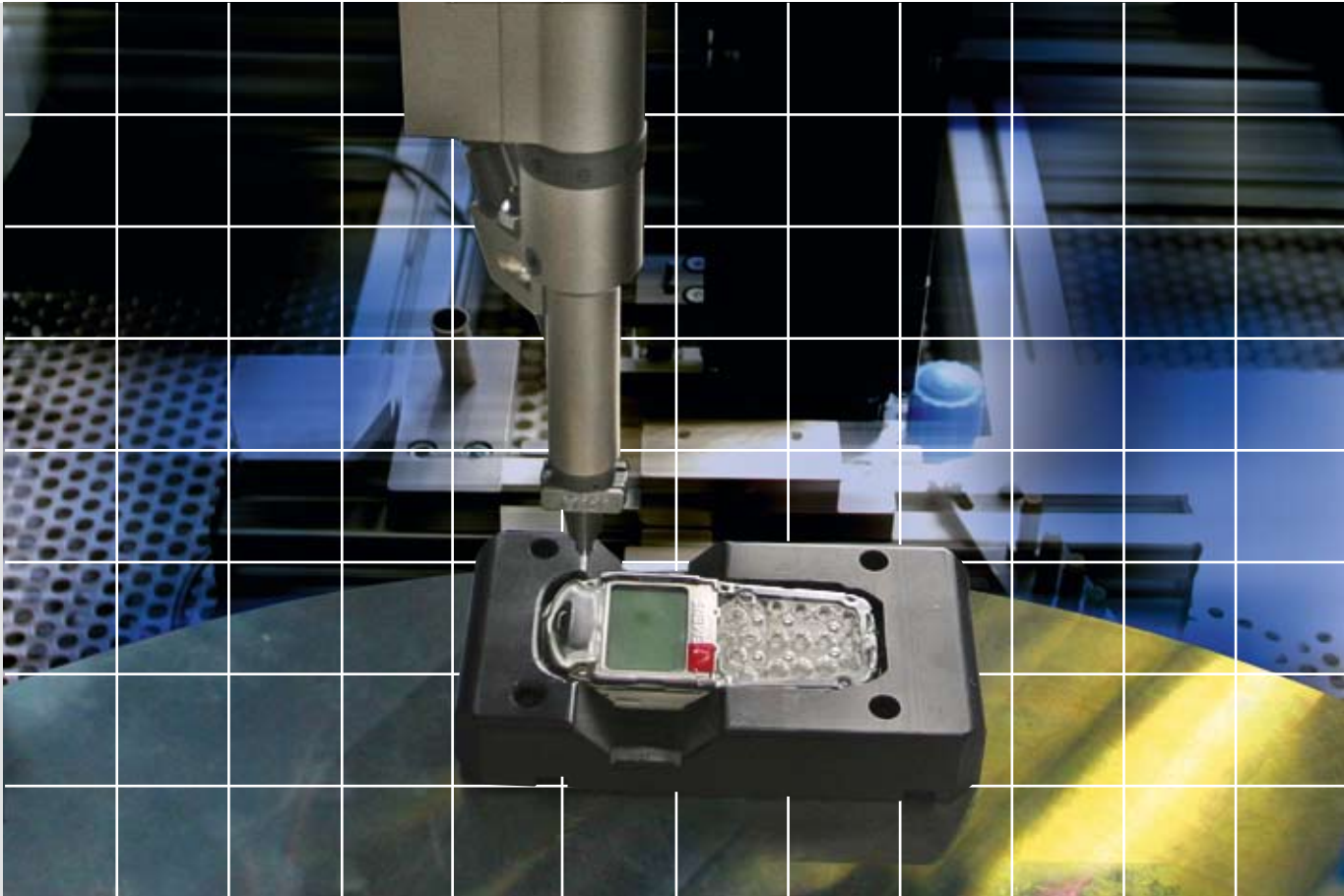




Technology that connects



Electronically controlled screwdriving systems

Programmed intelligence

Screwdriving technology

for highest demands

Electronically controlled screwdriving systems by WEBER are used wherever special requirements are made on quality, reliability, process control and documentation.

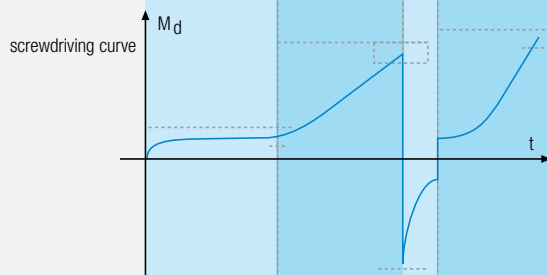
That means:

- _ Process security combined with a definite OK/Not-OK evaluation that allows errors in the assembly process itself to be recognised
- _ Optimum organisation of the screwdriving process with regard to cycle time, repeat accuracy, utilisation of material and many more aspects
- _ Quick, flexible alteration or adaptation of the screwdriving process, e.g. production of a mix of variants
- _ Detailed display, documentation, evaluation and archiving of screwdriving data for quality assurance during and after assembly
- _ Capability to handle screwdriving in special cases



Screwdriving curve: Loosening/tightening processes

step	1.	2.	3.	4.
description	driving	tightening	loosening	tightening
target parameters	depth	torque	↔	torque
controlled	torque	↔	torque	depth



Modular programming by means of staged screwdriving

In the modular concept, each screwdriving program consists of several steps in sequence. The steps can be selected and sequenced – like the elements in a construction-kit system.

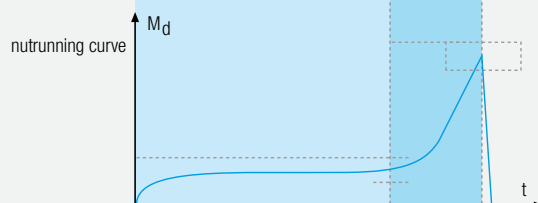
For each step, you define what is to be done (screwdriving process) and with which parameter values.

The screwdriving process can be selected from a wide range of standard screwdriving processes: there are run-up steps and seat-in steps, screw-in processes, tightening processes and loosening processes, and special processes for Not-OK handling, jump commands, data transfer and PLC commands.

Various torques, angles of rotation, screw-in depths, revs, times, motor-current values, etc. are defined as the initial, threshold, cut-off or monitoring values of the parameters.

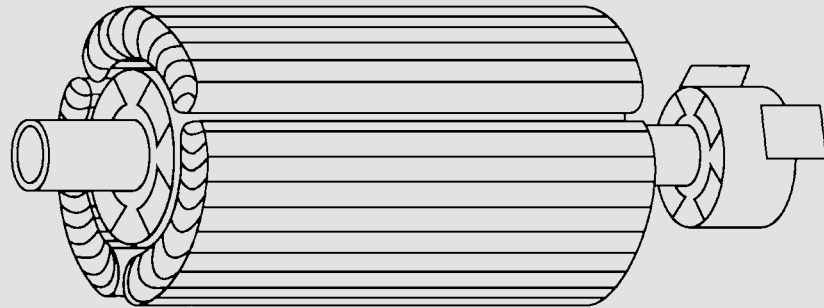
Screwdriving curve: Screwing in a stop nut

step	1.	2.
description	driving	tightening
target parameters	depth	torque
monitored	torque	torque ↔



Screwdriving technology

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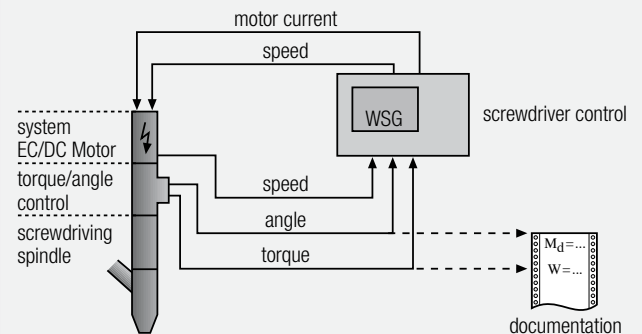


Electronically controlled screwdriving system with torque/angle measuring equipment

The screwdriving spindle is fitted with a highly dynamic electric servo drive (EC). The most important screwdriving parameters of torque, angle of rotation and screw-in depth are continuously registered by the measurement transducer during the screwdriving process, and passed to the screwdriving controls. These measurement values are used to control the screwdriving process.

This technology results in high cut-off precision. Measurement data are available for quality assessment in the documentation.

Screwdriving system with torque/rotation-angle measuring equipment, WSG 100 / WSG 11M

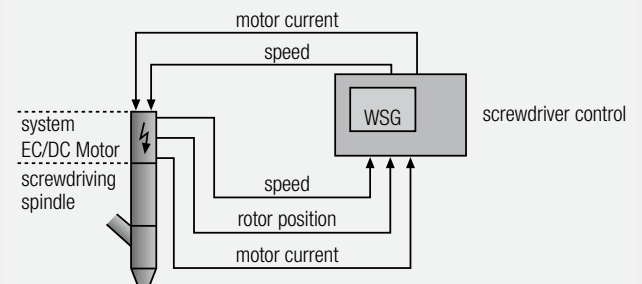


Electronically controlled screwdriving system with current control

The screwdriving spindle is fitted with a highly dynamic electric servo drive (EC). During the screwdriving process, the current consumption of the motor and the position of the anchor of the EC drive are registered continuously and passed to the controls. The controls use these measured values to control and cut off the screwdriving process. This is a cost-effective way to gain the capability of flexible process control without elaborate measurement transducers.

Compared with actual torque and rotation-angle control, the repeat accuracy is not as good. For purposes of data documentation and quality assessment, only indirect control values are available, not measured data.

Screwdriving system with current control, WSG 11S



Series WSG

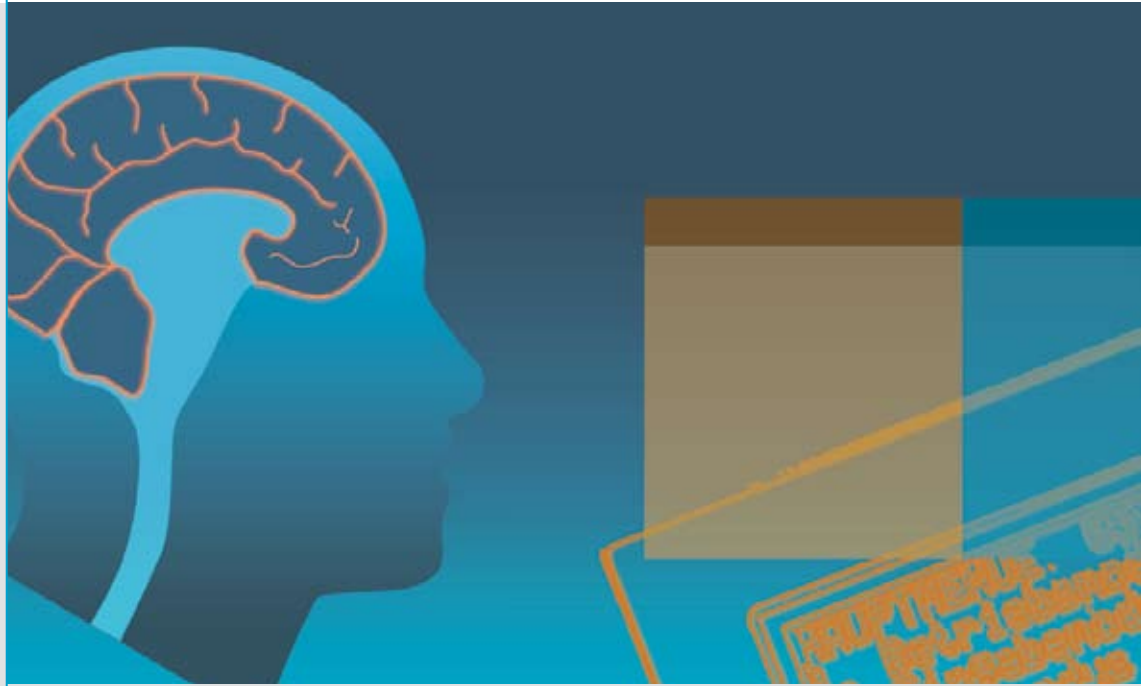
Programmable intelligence

Functions of the series

WEBER screwdriving controls in the WSG series have the following functions:

- _ Control and monitoring of the rotation of the screwdriving spindle
- _ Control and monitoring of the advance movement of the screwdriver *
- _ Control and monitoring of the feed system for the connection elements *
- _ OK or Not-OK evaluation with initiation of subsequent steps where appropriate
- _ Display, documentation of screwdriving data and transfer to a higher-level PLC, PC or printer (not WSG 11S)
- _ Communication with the periphery (PLC)

* WSG11: These functions require an additional PLC



Summary of Weber controllers	WSG 11S / WSG 11M	WSG 100
Number of channels	1	1-4
Number of screwdriving programs	15	50 freely programmable operation,
Display	4-line display	
Access protection by password,	4-stage	
Screwdriving data: Documentation	not WSG 11S	display, printer, PC, internal & external
PLC functions for feed & periphery	–	integrated
Feeder vibration controller	–	integrated



Series WSG

Programmable intelligence



WSG 11S / WSG 11M – The compact controller

The WSG11 is a cost-effective solution for an electronically controlled drive with current cut-off.

The motor current, which is proportional to the torque, and the revs are used to control the screwdriving process. Up to 15 different screwdriving programs can be deposited in the controls. For this purpose there are 8 different screwdriving diagrams, i.e. screwdriving processes, available, that can be programmed individually. By means of appropriate depth transducers, the screw-in depth can be used as a switching or monitoring parameter. For starting and for evaluation of the OK signal, WEBER control units or a higher-level PLC can be used. A PLC of this kind is also built into the WEBER ZSU feed and control unit.

Possible screwdriving processes:

- Tightening to torque with angle monitoring and ensuing relaxation, if necessary.
- Tightening to angle with torque monitoring and ensuing relaxation, if necessary.
- Screwing in to external signal with torque and angle monitoring
- Torque maintenance with angle monitoring

Optional preparatory steps are available for the various screwdriving processes. This applies in the case of screwing in until a depth transducer is triggered, for instance, or continued screwing through a defined angle. The revs can be specified for each step. The time taken for screwing can be used as a further monitoring parameter.

WSG 100 – The universal control generation

The WSG100 multi-channel screwdriver controller is modular, and thus suitable for use with a wide variety of EC drives, including hand-held screwdrivers. Emphasis is on performance, ease of operation and simplicity of programming.

The modularity of the basic concept allows any screwdriving process – however complex – to be divided into meaningful screwdriving steps, any number of which can be put together in any sequence, depending on the application. A wide range of possible screwdriving processes covers all application requirements. The modular concept also includes the greatly enhanced PLC functionality of the WSG 100, which allows the screw-in depth parameter and automatic screw



and nut feed systems to be used. This makes the WSG 100 the screwdriver controller with the most comprehensive functionality on the market.

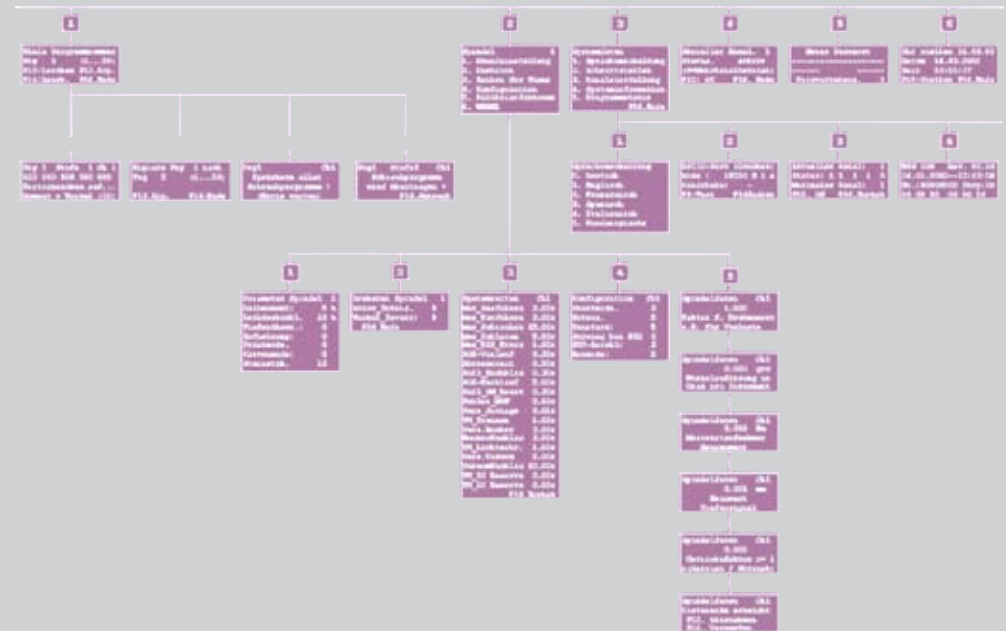
- Modular basic concept
- Simple operation and convenient programming
- Four-line display for status, error messages and screwdriving results
- Comprehensive statistical functions for evaluation of the screwdriving data
- Interface for transfer of data to PC, printer or PLC
- Integrated test functions
- Language switching.

WSG 100

Technology info and menu structure

WSG 100 Programming

All the traditional screwdriving processes, such as torque/rotation-angle control or yield-point control, are simple to implement, as are any special processes, for example for loosening/tightening or for self-cutting screws. 50 screwdriving processes, each with a maximum of 50 screwdriving steps, can be programmed and managed. 16 of these are in storage for immediate selection. Further programs can be managed and stored on a PC with the help of a software package.



WSG 100 Test Functions

Comprehensive test functions are used to monitor or test the screwdriving system either continuously or on demand. These apply to communication and to the functions of the operator panel, the controls and the transducer. Additional tests can be started for spindle friction (friction offset test), interface function and the digital inputs and outputs.

Multi-channel Capability

The structure of the WSG100 is multi-channel, i.e. several screwdriving spindles can be managed, programmed and operated with one controller. The standard versions are available as 1, 2, 3 or 4 channel variants. Because an internal CAN bus is used, an existing installation can be extended.

Screwdriving Data Evaluation

- Integrated, comprehensive PLC for online generation and evaluation of statistical process data, interface for transfer of data to PC/printer.
- Interfaces for online transfer of screwdriving data to PC/connection to common statistical software tools.



Internal Statistics Functions

- Online evaluation of tightening torque and tightening angle
 - 2 Database variants: a) Accumulation (all values after a defined point in time) b) Random sample (the last 100 values)
 - 6 Statistics screens: 1. Total number/number OK/total number Not-OK and torque/angle window
 - 2. Min./max. values for torque and angle
 - 3. Range, Sigma, %Sigma
 - 4. Sigma surroundings x Sigma, upper and lower limits
 - 5. Set-point, machine capability Cm/Cmk
 - 6. Sigma surroundings Cm, Cmk-, Cmk+
- Output on RS232 interface (PC, printer): Values and complete statistics

Transducers and Drives

Transducers MDW Servo Drives

Registration of Torque and Angle of Rotation

To register torque and angle of rotation, WEBER use combined torque/rotation-angle transducer modules of the MDW series. In the case of torque measurement, a dynamic-measurement action transducer is used, i.e. the measurement is made directly at the rotating shaft, using the resilient measuring strip technique. The signal is transmitted digitally and contact-free. The measurement precision is $\pm 0.15\%$ of the final value.

The incremental rotation-angle measurement is carried out on 2 tracks with 360 pulses per revolution.



The WEBER Type MDW transducers are available in various sizes, and with measurement ranges between 0.1 and 120 Nm (special ranges on request).

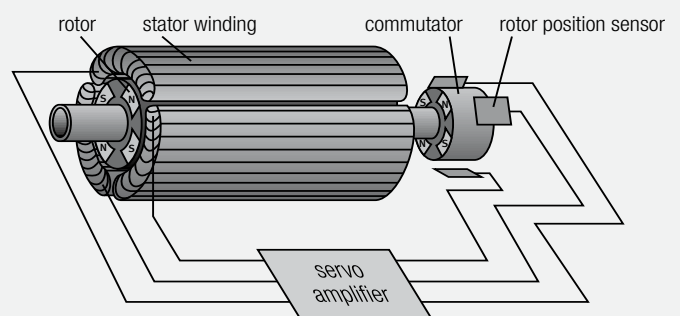
A calibration report is supplied with each transducer.

Servo Drives

The drives that WEBER use for electronically controlled screwdriving systems are electronically commutated, brushless DC drives (EC). Because of the unusually low mass of their anchors, these motor are very suitable for conditions in screwdriving technology, where quick, precise stopping and switching in the shortest time are required. The brushless signal transmission makes this drive absolutely maintenance-free. A few requirements of the screwdriving application must be taken into consideration when designing

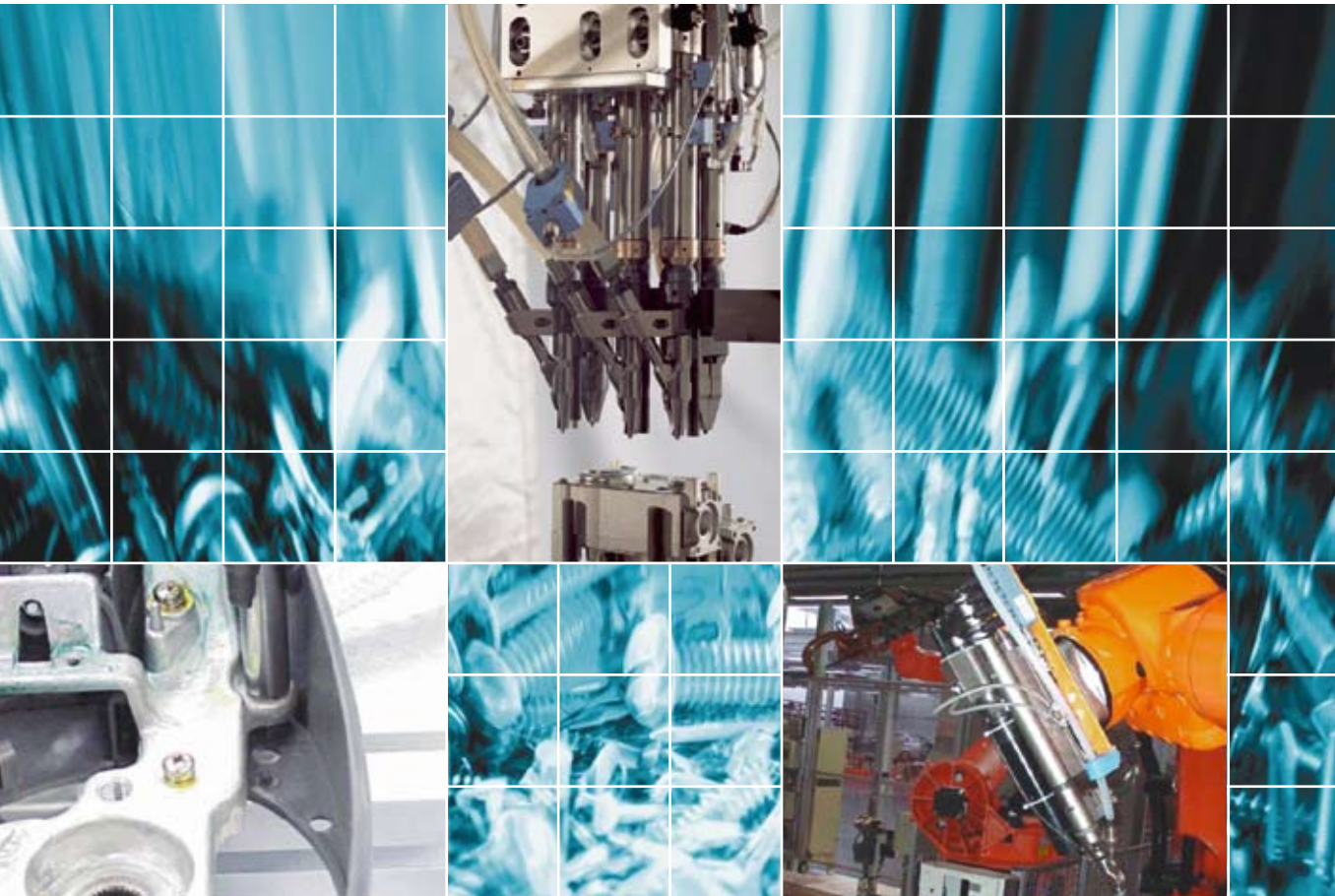
the drive concept. In addition to the typical characteristic curves of drive and controller, the heating up of the motor in the case of self-cutting screwdriving applications, for example, is also taken into account, because there are higher power demands on the motor during the cutting phase.

Schematic view of a brushless EC motor





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