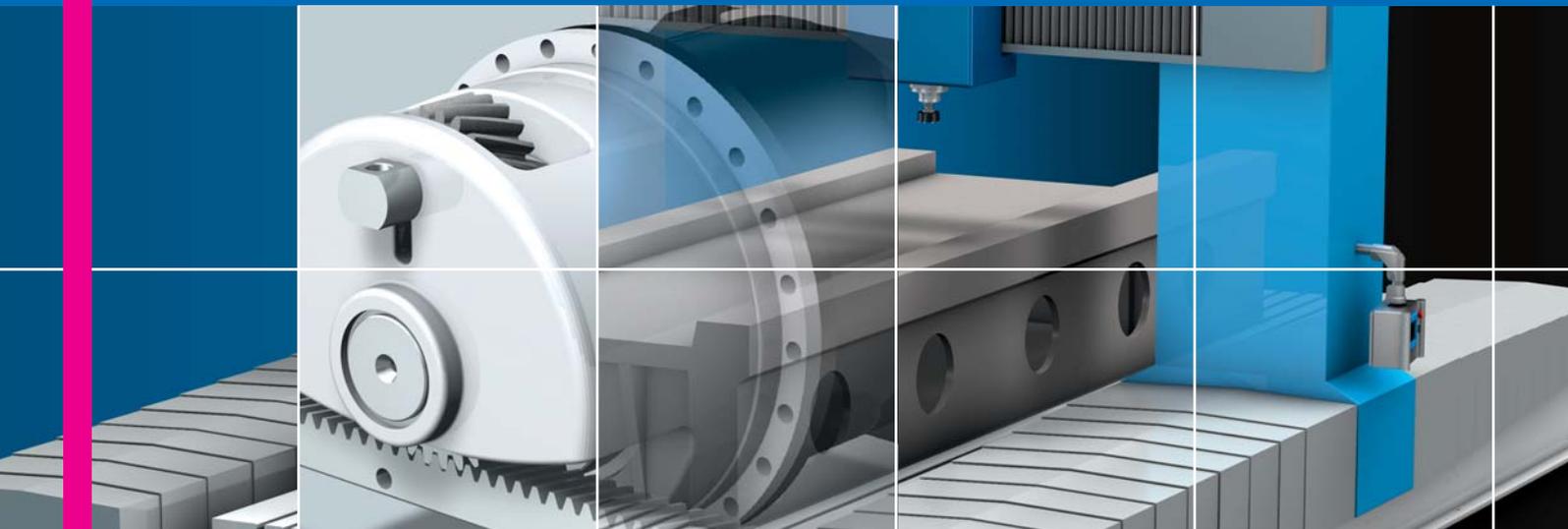


Precision for machine tool drives



The complete product range

- Precision gear units
- Ball screw motors
- Rack and pinion drives



STÖBER

Gear engineering for machine tools

Only the best for machine tools

Precision metal-cutting machine tools become ever more productive and precise from machine generation to machine generation. High-speed cutting and heavy-duty machines make very heavy demands on the drive axes.

The gear units from STÖBER provide the right answer with new standards of drive engineering for these modern machine tool manufacturing requirements.

Dynamic rapid traverse, continuous jerk free movements with instantaneous responses with variable loads are typical of the requirements for the metal cutting machine tools.

STÖBER is a very high profile global supplier of top quality, helical planetary servo gear units.

Whereas costly special gear units often used to be required to meet customer requirements, the STÖBER

planetary gear units now offer a cost-effective alternative without sacrificing any of the machine performance.

Current issues play a part, such as energy efficiency and noise emissions which for a gear unit always have to be considered in combination with the gearing quality. Planetary gear units from STÖBER naturally come with the highest specifications based on continuously

optimised in-house manufacturing standards.

STÖBER is one of the pioneers of helical planetary gear units and as market leader confirms its position over and over again as a developer and innovator of these units in machine tool manufacture.



Column boring mill



Vertical lathe

Head start through innovation

The practicality of STÖBER's innovative developments is based on everyday proximity to machine tool customers.

This brochure for machine tool manufacturers combines tried and tested and new, innovative gear unit series, rack and pinion drives and ball screw drives to give an overview.

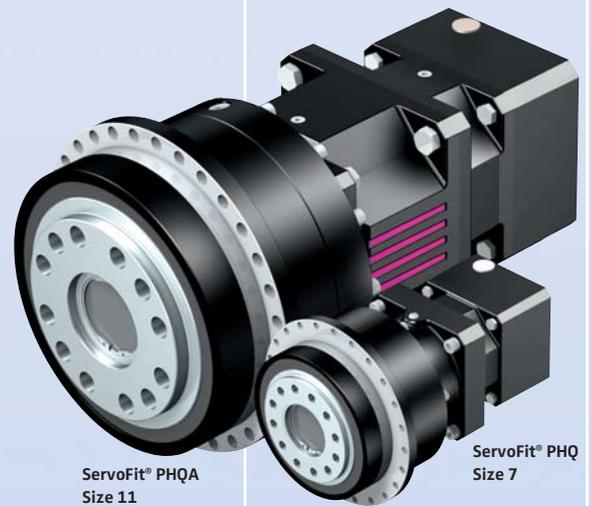
The potential offered by the new STÖBER drive standards can best be discussed in a conversation between experts.

Contact and advice:
machinetools@stoerber.de

Gear ratios of up to $i = 600:1$ can be achieved with three-stage ServoFit® planetary gear units

These high gear ratios or reductions enable the torque requirement to be obtained with smaller size motors.

So designers of heavy metal-cutting machines can adjust the moment of inertia to perfection.



Gantry machining centre



Boring and milling machining centre

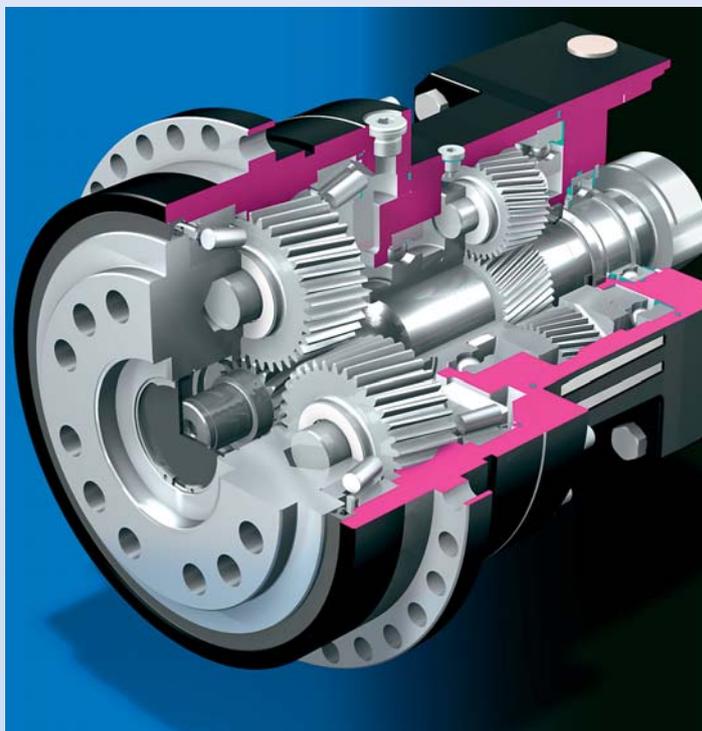
ServoFit® planetary gear units – for quality results

Quality for high-end machine manufacture

ServoFit® planetary gear units are suitable for very high and maximum feed axis quality standards.

Due to the extremely rigid construction and high STÖBER manufacturing quality level of the ServoFit® helical planetary gear units, they have earned a special place in machine tool manufacture. They stand out for their:

- Jerk-free operation even at very low feed rates
- High positioning accuracy even at fine adjustment moves
- High efficiency
- Low noise development
- Maximum dynamics (high-speed cutting)
- Torsional rigidity (top quality of surface finish)



ServoFit® PHQ 10 planetary gear unit, 2-stage Quattro system with ME motor adapter and EasyAdapt® motor coupling

Cross-sectional view: The output stage has 4 planet gears (Quattro system). The input stage has the standard 3 planets

Helical planetary gear units with extremely robust housings

The PH/PHA/PHQ/PHQA series differ mainly by their backlash and accelerating torque limits.

The modular STÖBER system offers these products in right angle-solutions as PH(Q)K and PH(Q)KX.

The option of multi-stage gear configurations means that very high gear ratios and corresponding accelerating torques can be achieved. The configuration options available allow designers of heavy metal-cutting machines to adjust the moments of inertia to perfection.

The drives can be installed in any position – all gear units are maintenance-free and filled with high quality synthetic oil.

Motor adapter system

Motor installation takes barely a minute with the ME motor adapter. Mounting errors are prevented by the precise centring of the servo motor. Friction locking with the integral EasyAdapt® coupling is produced by a single clamping screw.



ME motor adapter with EasyAdapt® coupling

Optimised flange shaft for maximum power density

The flange shaft has external and internal centring. The number of holes on the housing flange and in the flange shaft is designed for transmission of the emergency stop torque.



With right angle planetary gear units, extreme gear ratios of up to $i = 591:1$ can be achieved

Uncompromised solutions from an extensive range

ServoFit®

PH(A) planetary gear unit

Designed for high and very high machine tool manufacturing requirements such as reliability and torsional and tilting rigidity.

Gear unit sizes:

PH(A)3 – PH(A)10

Gear ratio: 4 – 100

Accelerating torque:

50 – 7,500 Nm

Backlash PH: $\leq 3 - 4$ arcmin

Backlash PHA: $\leq 1 - 2$ arcmin

ServoFit®

PHQ(A) planetary gear unit Quattro system

These gear units have four planets. This gives an increase in torque of up to 35% for the same size. Combined with the lowest possible backlash – even at extreme gear ratios – these mount-on gear units are unique.

Gear unit sizes:

PHQ(A)7 – PHQ(A)10 – PHQ11

Gear ratio: 18 – 600

Accelerating torque:

950 – 22,000 Nm

Backlash PHQ: ≤ 3 arcmin

Backlash PHQA: $\leq 1 - 1.5$ arcmin

ServoFit®

PH(Q)K right-angle planetary gear unit

Highly rigid drive unit consisting of an SMS bevel gear unit at the input and a PH planetary gear unit with a robust bearing system for high tilting and torsional rigidity at the output.

Gear unit sizes:

PH5K1 – PH10K6

PHQ7K2 – PHQ11K8

Gear ratio: 16 – 561 (22 – 591)

Accelerating torque:

320 – 7,500 Nm (451 – 22,000 Nm)

Backlash PHK: $\leq 3.5 - 4.5$ arcmin

Backlash PHQK: $\leq 3.5 - 4$ arcmin

ServoFit®

PHKX right-angle planetary gear unit

Drive unit consisting of a compact KX right-angle gear unit at the input and a PH planetary gear unit with a robust bearing system at the output. Extremely torsionally rigid and precise for small spaces.

Gear unit sizes:

PH3KX3 – PH10KX8

Gear ratio: 4 – 300

Accelerating torque:

50 – 7,500 Nm

Backlash: $\leq 3 - 6$ arcmin



Size 4

Size 5

Size 7

Size 8

Size 9

Size 10

Size 11

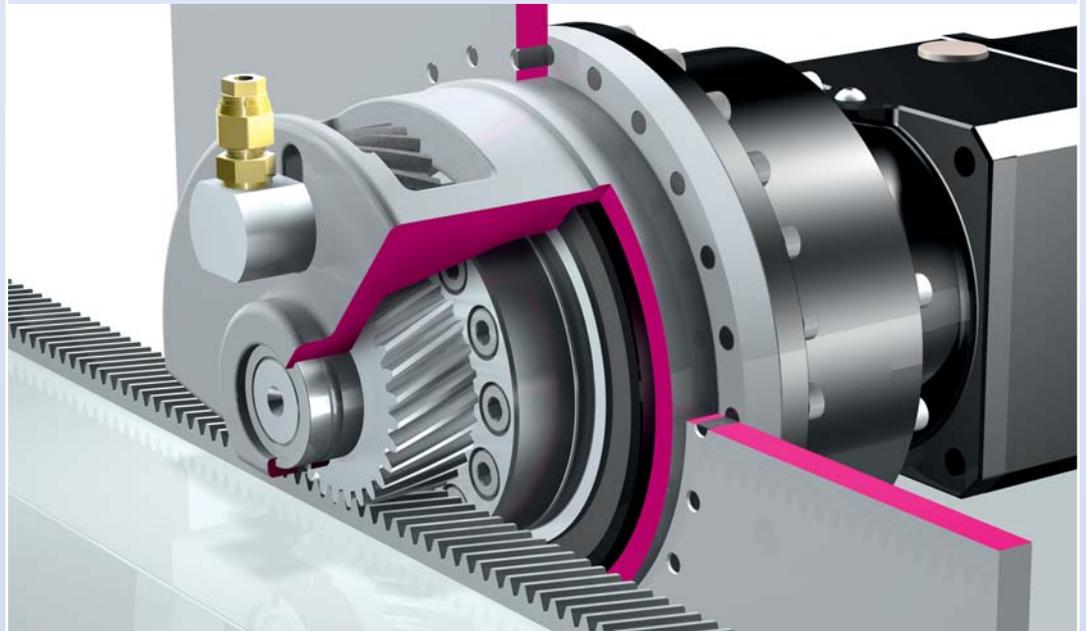
STÖBER rack and pinion drives – the new benchmark

The new output bearing housing puts an end to oversized drives

With the new output bearing housing and the new pinion/gear/flange interface configuration, all specification sizes have been significantly improved.

The feed force was previously limited by the maximum permissible tilting moment of the gear unit bearings.

The new output bearing housing lightens the load on the output bearings in the planetary gear unit. The lower tilting moment enables a smaller gear unit size to be used and a smaller motor to be fitted. The choice can now be made based on rated and accelerating torque requirements.



With optional lubricating device (felt gear)

HighForce ZTRS PH (PHA)
Output bearing housing and pinion are bolted to the gear unit housing or shaft flange

The output bearing housing increases the linear stiffness

The outboard support of the output bearing housing increases the linear stiffness of the drive as a whole by a factor of 1.5 to 2.5. With this system to protect against high-frequency process vibration, HighForce ZTRS drives are ideal for increasing the feed force and processing quality of high-performance machine tools.

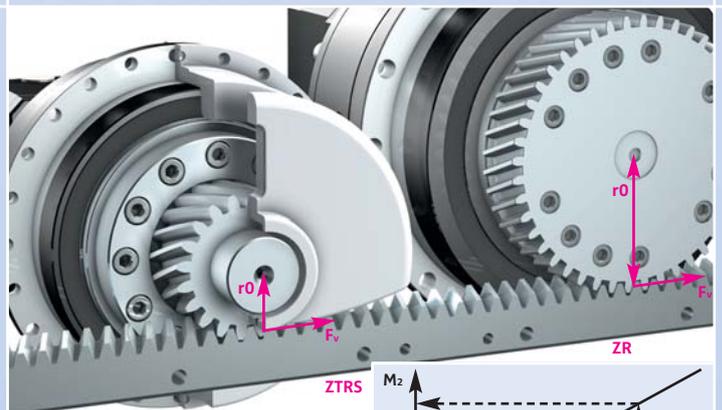
The innovative flanged pinion – less torque – more precision

Due to the special shape of the pinion with integral flange, the number of teeth can be determined independently of the flange shaft on the gear unit.

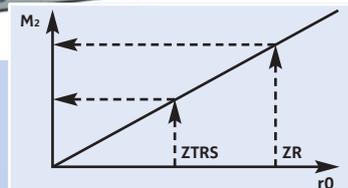
The smaller pinion generates less torque.

The shorter lever reduces linear backlash.

The pinion concentricity can be set at $< 10 \mu\text{m}$.



Reduction in torque due to the smaller pinion



$$M_2 = F_v \cdot r_0$$

$$M_{2ZTRS} < M_{2ZR}$$

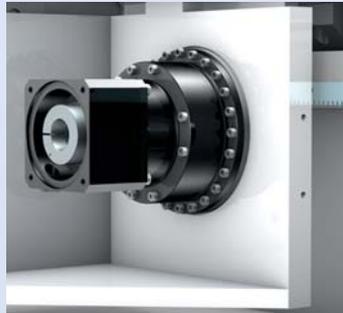
(F_v constant)

Machine feed force up to 124 kN

From two specialists – for a perfect solution

Supply as a complete gear unit/pinion/rack system

STÖBER supplies the complete mechanical solution with motor adapter and coupling (type depends on gear unit) for connection to all common makes of servo motors for machine tool manufacture.



ME motor adapter with EasyAdapt® coupling

Precision racks from ATLANTA

With two rack classes (UHPR and UHP), STÖBER offers a complete ATLANTA rack range for very high specifications in machine tool manufacture. In addition to the helical-toothed racks, straight-cut racks are also available.



ATLANTA precision racks

The top professional range for machine tool manufacture

HighForce ZTRS PH(A) rack and pinion drives come in four sizes with gear ratios of $i = 4:1$ to $i = 600:1$. Pinion models without support pins for a one-sided bearing arrangement are also available.

The feed force ranges from 14.5 to 124 kN.



Configuration for high end requirements with electrically preloaded gear units (master – slave)



HighForce ZTRS with up to 3 gear stages in sizes PH(A) 7 / 8 / 9 / 10



Flanged pinions hardened and ground to quality level 5 according to DIN3960/3961
Helical geared and straight-cut flanged pinions for use without or with output bearing housing



ZTR model without output bearing housing – with straight-cut flanged pinion. Helical-toothed flanged pinions are also available for this model

Super compact ball screw motors from STÖBER

For spindles of your choice

The universal, super compact STÖBER ball screw motors are designed for universal mounting to spindles from many different manufacturers.

For individual solutions

The STÖBER EZS and EZM ball screw motors in 2 sizes (5 and 7) and 3 lengths (power stages) offer a broadly based range for standard applications.

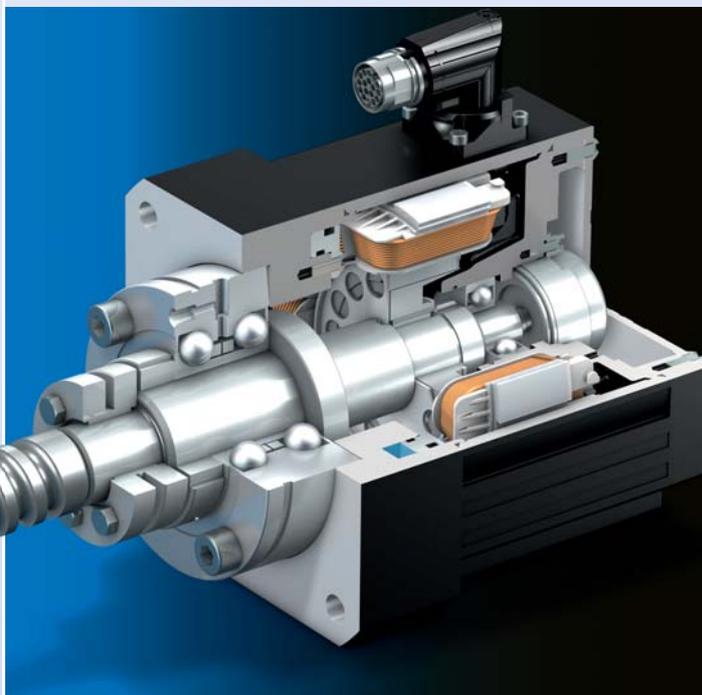
All the models are also available as brake motors.

The options are further increased by a fully integrated liquid cooling system – without changing the dimensions. Forced cooling fans are also available for the EZS ball screw motors.

Direct drive for rotating spindle shafts

The STÖBER EZS ball screw motor has been specially developed for ball screw drives with a rotating spindle shaft.

The motor shaft is in the form of a blind hole hollow shaft. The spindle rod and motor shaft can be connected with a clamping set.



STÖBER EZS 501 ball screw motor with axial angular contact ball bearings to absorb the high axial forces from the ball screw drive

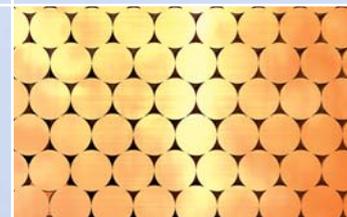
High-efficiency motor engineering

The super compact STÖBER ball screw motors offer an extremely high volume output.

The basis is the industrial application of an orthocyclic tooth winding system.

This new system enables the stator teeth winding to be produced with the maximum possible copper fill factor. This is the basis of the compact, weight-saving construction.

The motor power is about 80% higher than with a conventional winding.



Microsection of an orthocyclically wound motor coil



From left: STÖBER ball screw motors EZS 501, EZS 701 without clamping set, EZS 703 with brake

The motor dynamics can be modified if required

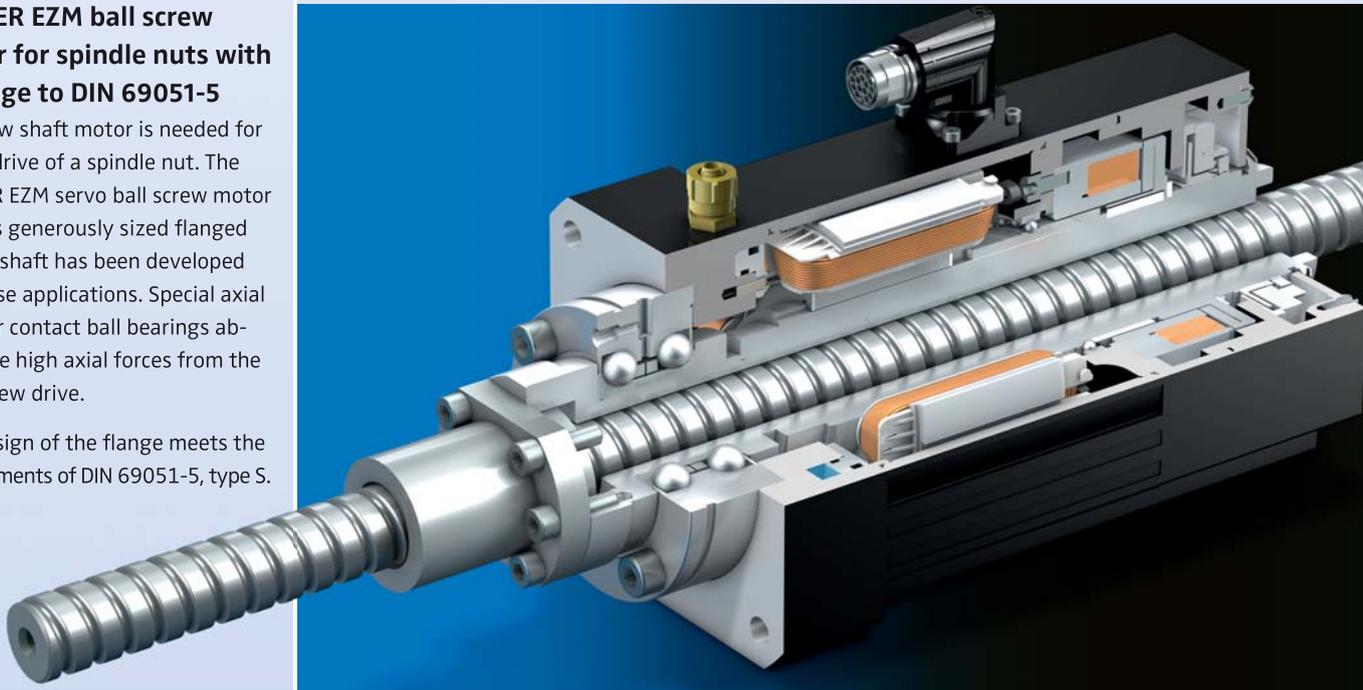
This new motor design provides a balance between powerful torque, high dynamics and precise synchronism. The dynamic behaviour can be modified on the EZS 502/503 and 702/703 models if required.

Also for direct drive of the spindle nut

STÖBER EZM ball screw motor for spindle nuts with a flange to DIN 69051-5

A hollow shaft motor is needed for direct drive of a spindle nut. The STÖBER EZM servo ball screw motor with its generously sized flanged hollow shaft has been developed for these applications. Special axial angular contact ball bearings absorb the high axial forces from the ball screw drive.

The design of the flange meets the requirements of DIN 69051-5, type S.



As an alternative to the type S version, the flange nut can be mounted on the flanged shaft of the motor through adapter sleeves.

STÖBER EZM 502 ball screw motor with liquid cooling, Brake and EnDat® single turn absolute encoder feedback system

With axial angular contact ball bearing to absorb the high axial forces from the ball screw drive. Flanged hollow shafts for different nut designs on request



From left: STÖBER ball screw motors EZM 501, EZM 501 rear view, EZM 502 with brake, EZM 701 with brake



Cross-section: View of the B side of the EZM ball screw motor with EnDat® single-turn absolute encoder digital feedback system

ServoStop gear brake

Simplifies assembly and servicing

Using the ServoStop gear brake, it is quite easy to remove or replace the motor on a vertical axis without any extra precautions.

Fail-safe spring-loaded brake

The holding brake integrated in a motor adapter is an electrically operated spring applied brake which is actuated automatically by spring force in a voltage drop or emergency stop situation (fail-safe spring-loaded brake).



Motor adapter for all common makes of motors.
With integral ServoStop gear brake

Plug connector for easy removal of the motor with braked axis in any position (crash protection)

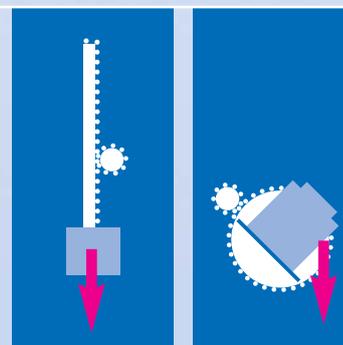
Cyclic brake test

The holding torque of the brake system can be automatically tested when necessary (cyclic brake test). The brake lining is refreshed by several automatic "grinding" operations.

These brake management functions are carried out by the master control system.



The ServoStop gear brake secures the axis while the motor is removed



Vertical rack and pinion drive

Vertical sprocket gear drive

Quality from in-house production

Quality is also a question of use of resources

For reliable and durable use in metal-cutting machine tools, planetary gear units must be highly rigid in design and flawless in manufacture.

STÖBER is at the forefront world-wide for the manufacture of planetary gear units in this category.

The reason for its leader position is mainly its in-depth experience over many decades in the manufacture of gear units with high-precision helical gearing.



Example: ServoFit® PHQA planetary gear unit.
Top gearing quality gives a backlash of $< 1 - 1.5$ arcmin



Manufacture of the ring gearing



Fully automated gearwheel manufacture



100% mechatronic inspection of the ring gearing



Assembly of the planetary gear units

Quality is the result of in-house manufacture

The manufacture of high-quality gear units demands full control of all the production processes. Hence all the STÖBER units are made at its headquarters in Pforzheim. From cutting of all the components to assembly and 100% inspection.

Made in Germany



As a system manufacturer, STÖBER offers complete and customized solutions

Through the width and depth of its product ranges, STÖBER can offer uncompromising, individually customized single source solutions.

Note on the design of axes and drives

For optimum axis design, it makes sense to focus primarily on the gear units.

For an overall approach, use the specific expertise of the STÖBER application consultants.

Contact and advice:
machinetools@stoerber.de

Service

The STÖBER service system comprises 38 expert partners in Germany and more than 80 companies in the STÖBER SERVICE NETWORK worldwide.

This service concept guarantees local expertise and availability when needed.

The concept is supplemented by the remote maintenance concept for the servo inverters in the POSIDYN® SDS 5000 series.

In general, the service specialists in the Pforzheim factory can be reached at any time via a 24/7 service hotline.

When necessary, a problem can be addressed immediately.

**24/7 service hotline
+49 (0)180 5 786323**

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