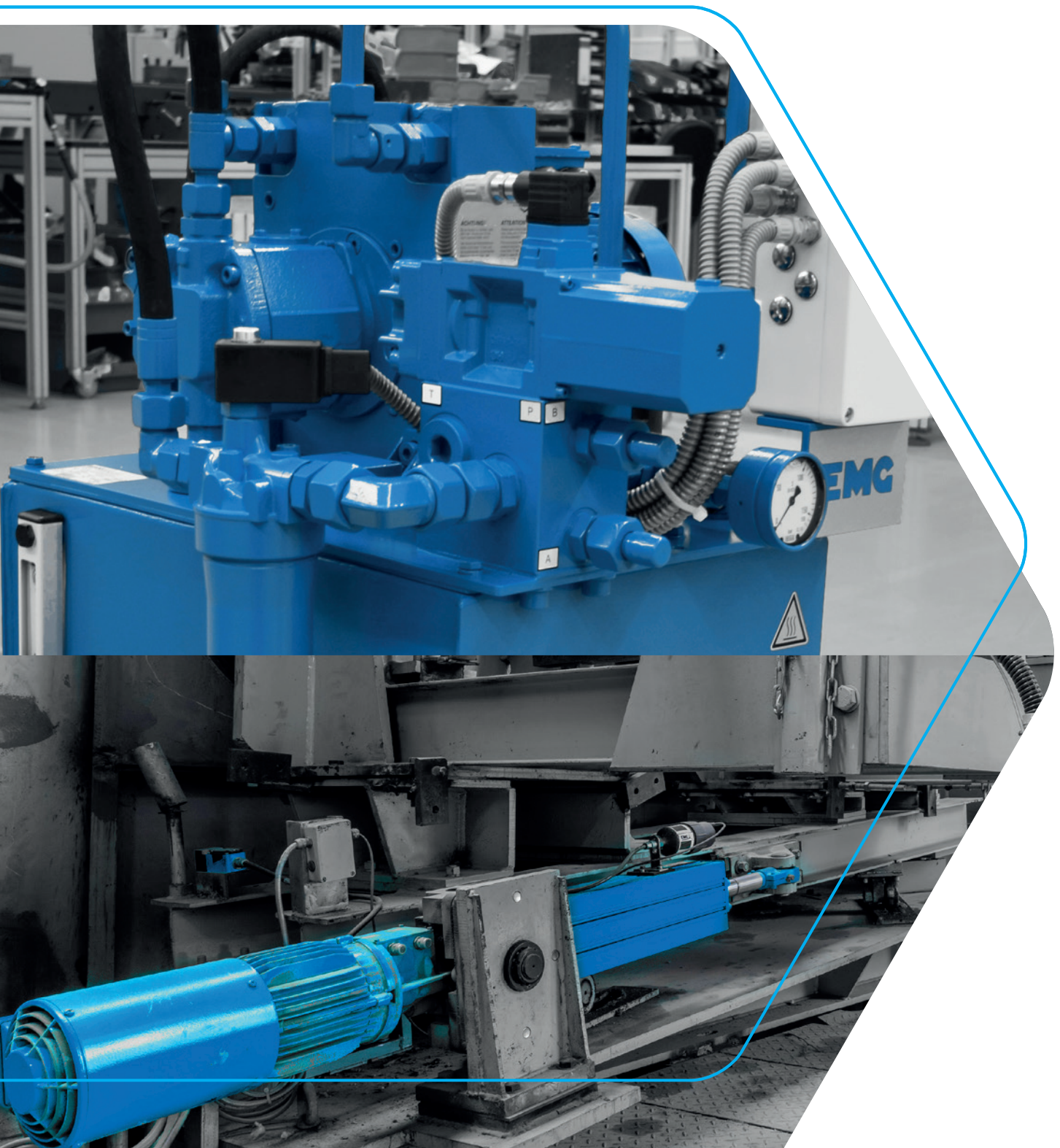


For a perfect strip guiding
EMG Actuators





Customer benefits HR/HA:

- » hydraulic energy for any power range
- » high level of reliability in all areas of application
- » power units can be tailor-made for coilers that require extreme capacities
- » monitoring device (level, temperature, pressure) integrated
- » protection of the components from contaminations in the hydraulic oil is guaranteed via special filters
- » customer specific design and optimization



EMG Actuators

High reliability in all applications

The EMG Automation GmbH has long-time experience and expertise in the development and application of reliable hydraulic components. The know-how of EMG's Business Unit Metals covers the whole range of modern actuators, including our own product development as well as the competent application consulting for the customer.

With hydraulic controls HST, hydraulic power units HR/HA, servo valves SV and electric servo cylinders ESZ, we ensure optimum strip guiding individually tailored to your requirements.



EMG Actuators

Hydraulic control HR/HA

Design & functional principle:

The hydraulic control unit HR and the hydraulic power unit HA reliably generate hydraulic energy for any power range. A hydraulic control unit HR is a hydraulic power unit HA with a proportional valve that controls the volume flow of the fluid.

For strip guiding systems, hydraulic power units with a rating of between 0.55 and 18.5 kW are normally used.

Standard hydraulic power units basically consist of an oil tank, a motor/pump assembly and a filter. Pressure-regulated pumps with variable flow rates are used.

The hydraulic control unit as a component of the electro-hydraulic control circuit converts the electronic control

signals into movement of the hydraulic cylinder.

The motor/pump combination converts electrical energy into hydraulic energy. The operating pressure is maintained at a constant level by the pressure regulator on the variable flow rate pump.

The oil pump delivers a volume flow of oil to the electro-hydraulic proportional valve (e. g. 4-way-servo valve).

In the event of a continuously increasing modulation of the proportional valve, an increasing quantity of oil flows to the actuator (e.g. hydraulic cylinder) after exceeding the dead zone. The actuator converts this oil flow into movement and the pressure medium displaced at the outlet side is

fed to the storage tank via the proportional valve in a depressurised state.

The filters (10 µm pressure filter and air filter) provide protection for the hydraulic components and prevent contaminants entering the hydraulic oil.

The operating pressure and maximum flow rate are factory-fixed settings depending on the model. The signals of the monitoring equipment can be found in the terminal box.

Accessories for HR/HA (optional):

- » standby motor/pump assembly
- » oil tank and piping in stainless steel
- » heater

If cooling is required, either air or water cooling is available.

EMG Actuators

Hydraulic component servo valve SV

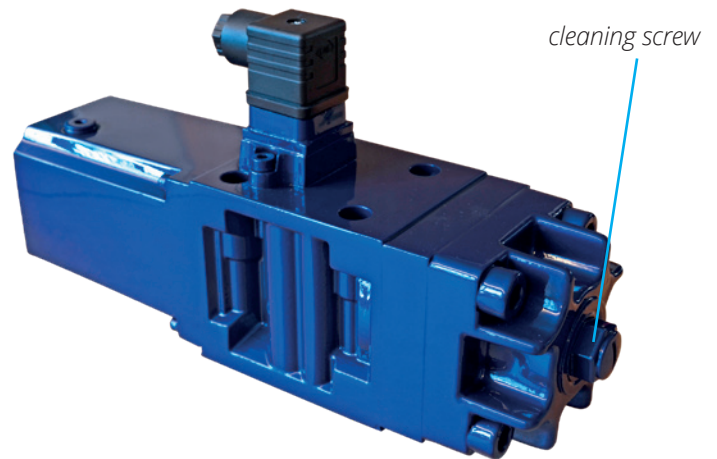
Servo valves are the most important components in any electro-hydraulic control system. Our rotary slide design with gap adjustment ensures minimum friction loss, high repetition accuracy and a wide power range for single-stage valves.

Based on our extensive experience with industrial applications and control hydraulics, we decided to equip the valves with a manual operating mechanism for functional control and setting procedures.

An additional feature that is focused on practical application is the ability to conduct a cleaning flush during operation without any oil escaping.

EMG servo valves are characterised by an especially high degree of reliability and ease of service.

Servo valve SV1-10 (single-stage)

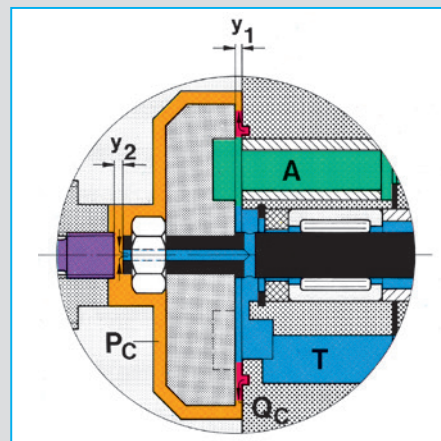


Functional principle - servo valve:

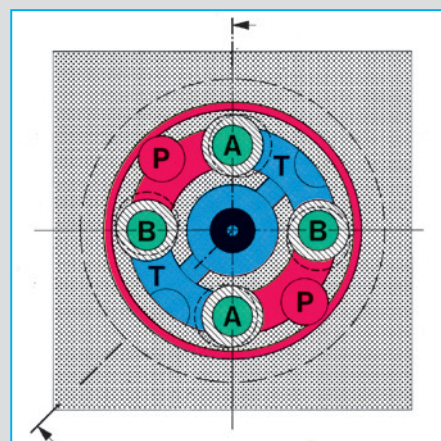
Typ ESV1-10:

A torque is produced at the armature by a direct control current in the exciter windings. The size and direction of this torque are proportional to the control current and turn the armature, against the force of the centring springs, from its neutral position. As a result, the rotary slide fixed on the same shaft is also rotated; the blind holes in it create a continuously increasing connecting area between circular duct sections and consumer connections.

The rotary slide, enclosed by its sealing cover, floats at a defined leak gap Y_1 on an oil film, above the leading edge sealing surface (graphic top right).

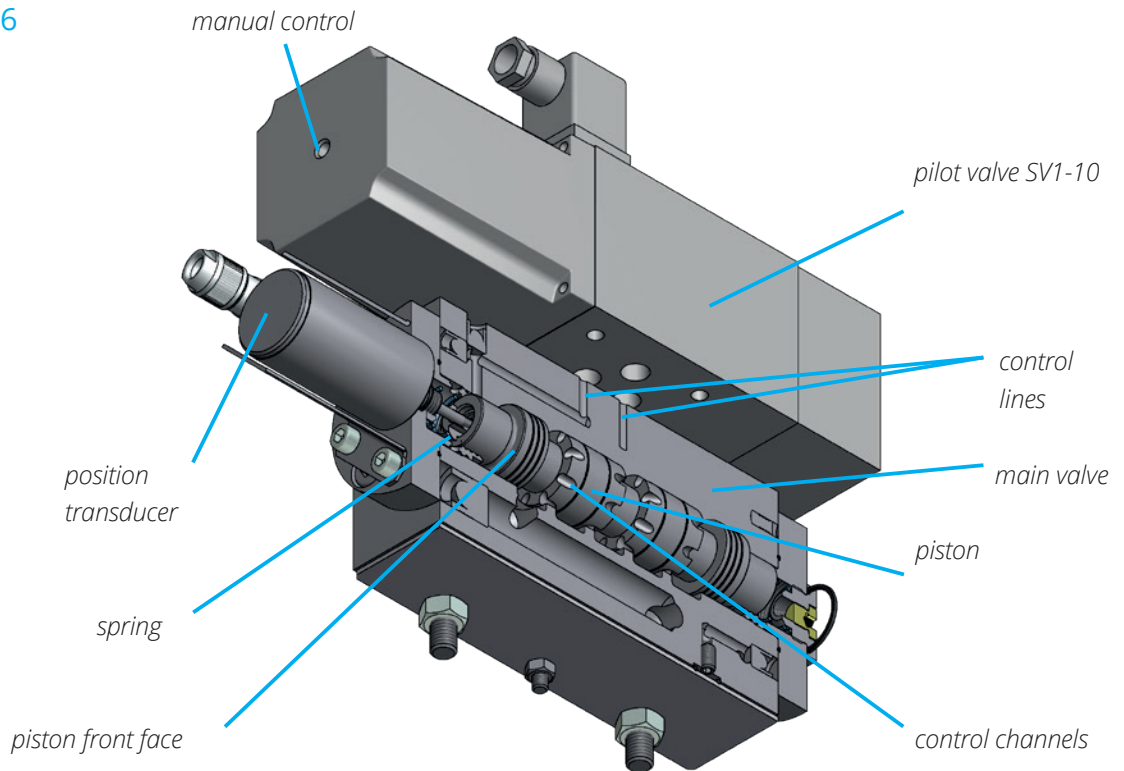


View of rotary slide with standard leak gaps Y_1 and Y_2



Frontal view of hydraulic block

Servo valve SV2-16 (double-stage)



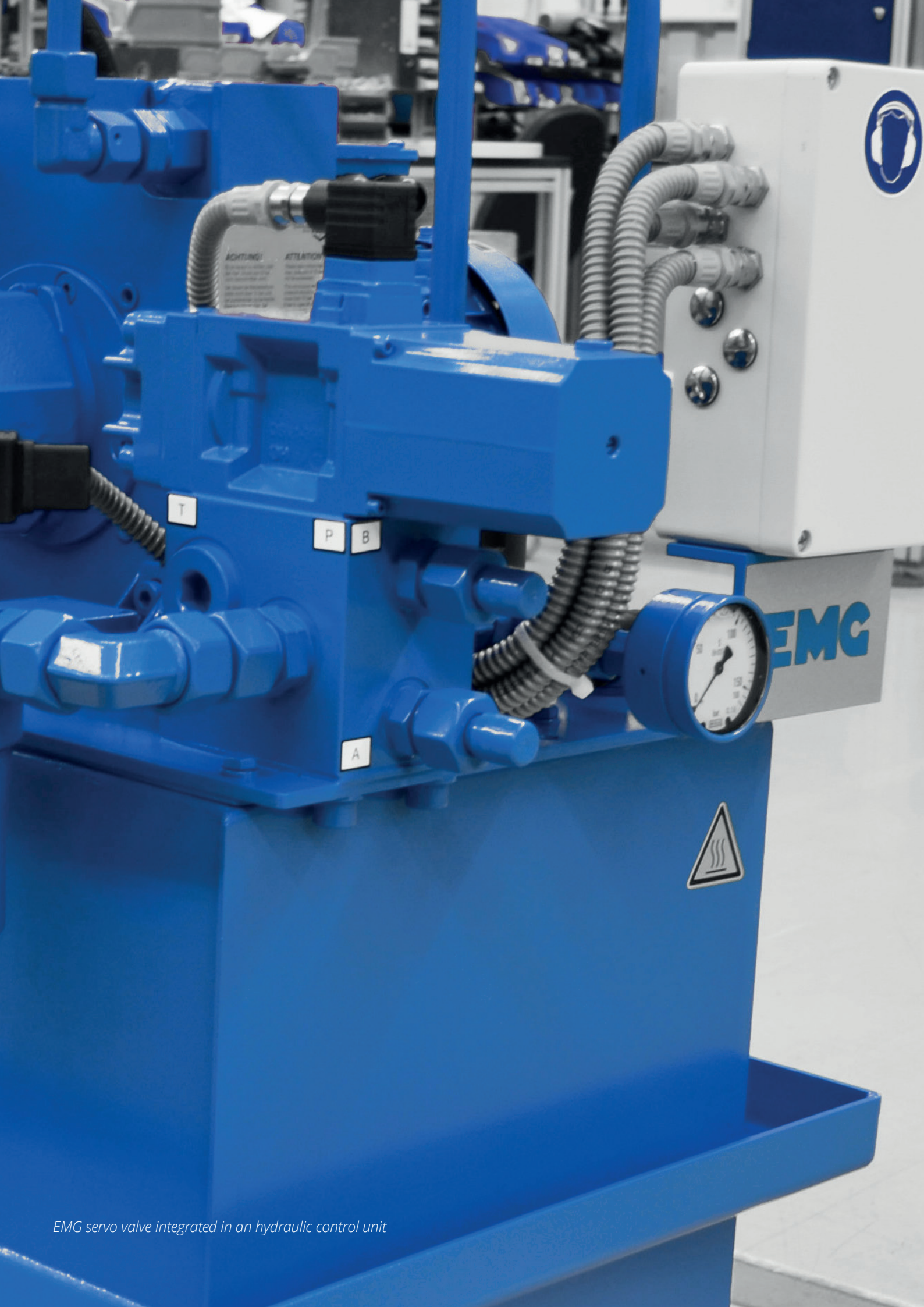
Functional principle - servo valve:

Type SV2-16:

A pilot valve SV1-10, which is suitable for pressure control, is placed on a valve block. Together with the main valve, which contains a piston slide valve, an inductive position transducer as well as a control amplifier, a closed control system is realized.

Via the internal lines of the pilot valve the piston slide valve is pushed with pressure against the spring force. By this the hydraulic fluid is led to the operating lines A or B. The inductive position transducer meanwhile monitors the position of the main control piston. The volume flow is determined by the position of the piston slide valve and is proportional to the input current of the control amplifier.

The piston is held in the middle position by two pressure springs, e. g. in case of power breakdown.



EMG servo valve integrated in an hydraulic control unit

Hydraulic component servo valve SV

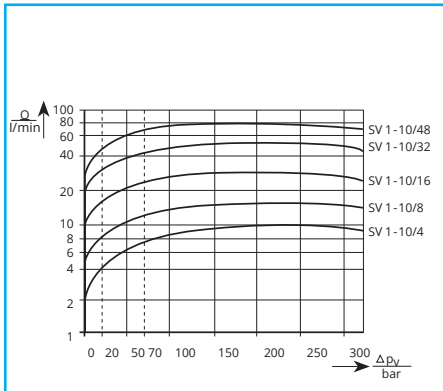
Technical features:

- » temperature- and pressure-independent zero point stability
- » mostly constant dynamics (almost independent of pressure and drive)
- » large control distances, long service life, low leakage flow
- » mechanical manual/emergency control and external performance monitoring
- » spring-centred rotary slide (zero position in the event of an electrical power failure)
- » standard connections, standard plug

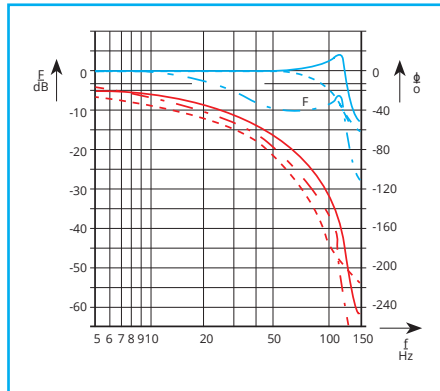
Customer benefits SV:

- » cleaning flush of the valve during operation
- » also suitable for low pressure levels
- » single- and double-stage construction depending on the needed volume flow (SV1-.../SV2-...)
- » guaranteed minimum friction losses
- » high repetition accuracy
- » huge range of performance for single- and double-stage valves
- » high level of reliability
- » extremely easy to service

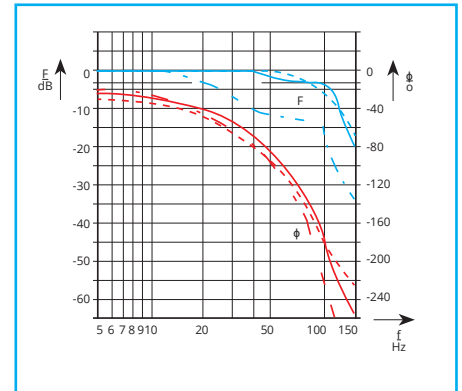
Technical characteristics (e. g. SV1-10):



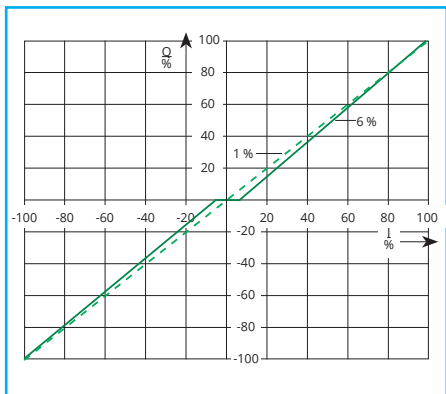
Relationship of flow rate to valve pressure drop at rated motion



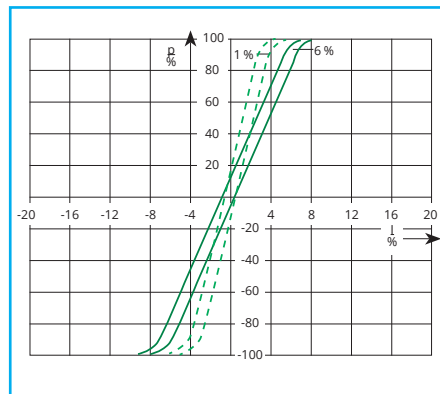
Frequency response $pS = 200 \text{ bar}$
I / IN = 10 % - - - - ; 30 % — — — ; 100 % · · · ·



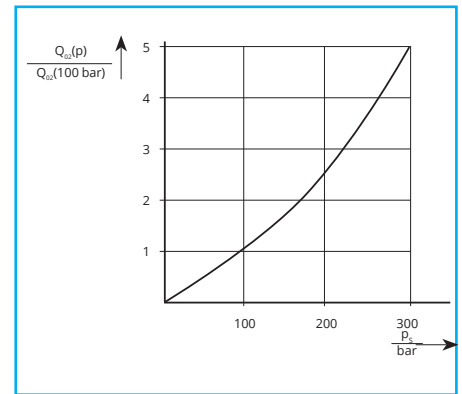
Frequency response $pS = 20 \text{ bar}$
I / IN = 10 % - - - - ; 30 % — — — ; 100 % · · · ·



Flow rate curve
(Overlap 1 % resp. 6 %)



Pressure curve
(Overlap 1 % resp. 6 %)



Relationship of leakage flow rate to operating pressure

Technical characteristics of other types on request/see data sheet.



EMG Actuators

Hydraulic control system HST

Design/functional principle of HST:

Additional proportional valves can be provided depending on the application of the HST hydraulic control system within a strip guiding system, e.g. for controlling a pressure roll and/or an immersion roll.

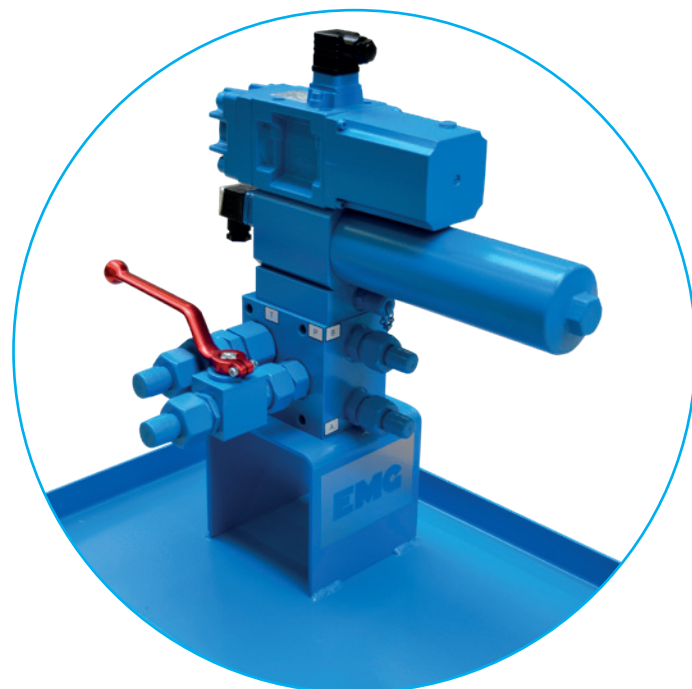
In contrast to the HR hydraulic control unit, the HST hydraulic control system is not equipped with its own oil pump. Instead, the flow rate of oil is generated via the existing central hydraulic system or an additional HA hydraulic power unit.

Compact hydraulic control system:

An HST hydraulic control system is used wherever installation space is at a minimum. Therefore it can even be used in close proximity to the hydraulic cylinder. The HST system is then supplied by the central hydraulic unit or a hydraulic power unit (HA).

The main component of the hydraulic control system is the EMG servo valve. A wide variety of expansion options enable customized solutions (e. g. emergency and block valve „block and bleed“).

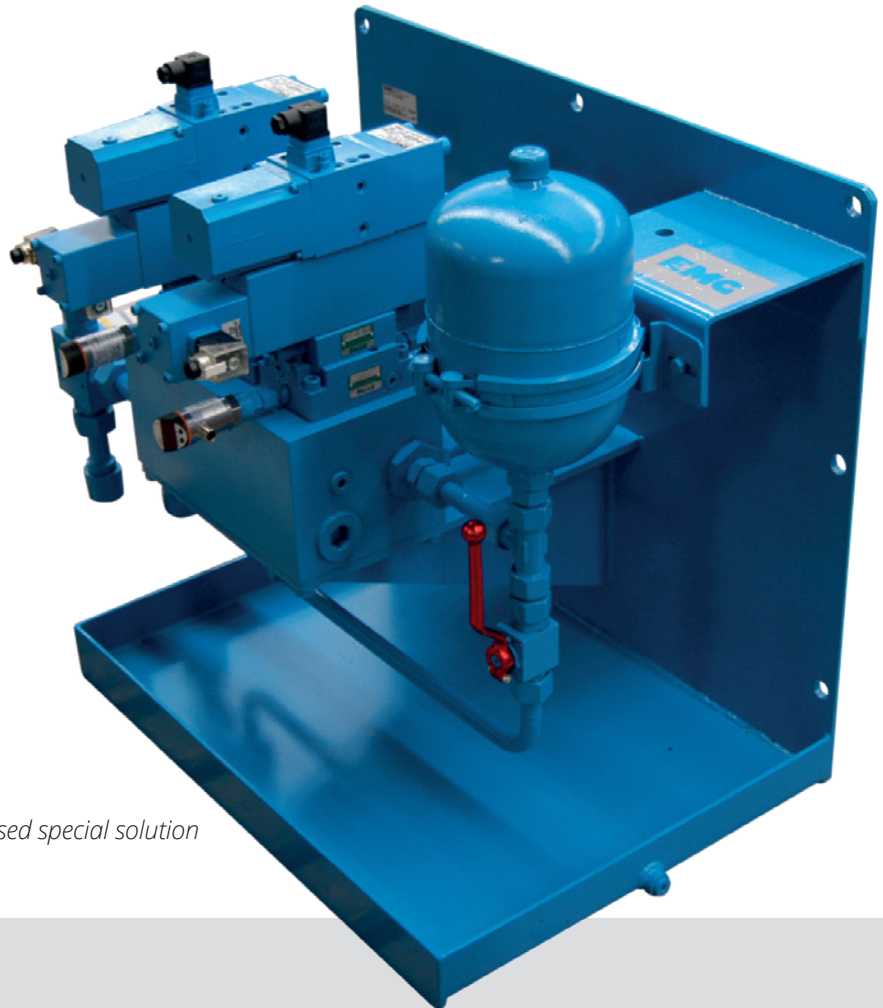
Also at the hydraulic control system an increasing quantity of oil flows to the actuator after exceeding the dead zone, in the event of continuously increasing modulation of the proportional valve. The actuator converts this oil flow rate into movement and the pressure medium displaced at the outlet side is fed to the storage tank via the proportional valve.



Ideal for minimum installation space

Customer benefits of HST:

- » compact hydraulic control
- » low space requirement
- » use in close proximity to the hydraulic cylinder
- » customer specific design and optimisation
- » high level of reliability in all areas of application
- » protection of the components from contaminants in the hydraulic oil via special filters is guaranteed



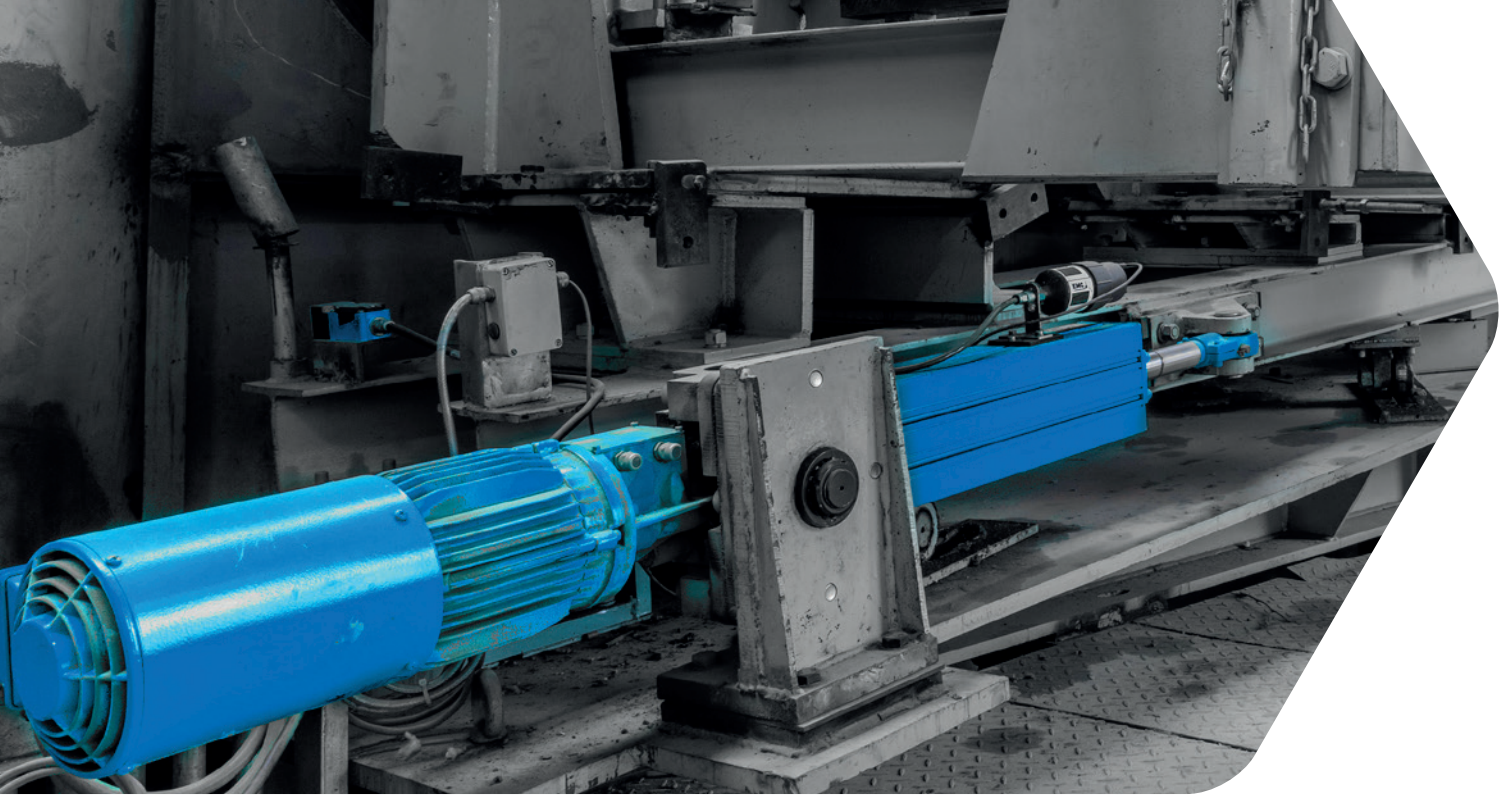
Customised special solution

Facilities HST:

- » intermediate measuring plate with Minimes connection
- » drip oil collecting pan

Accessories for HST (optional):

- » pressure filter as intermediate plate filter or integrated in the piping
- » interlocking valves
- » manometer
- » terminal box
- » shut-off valves in the lines
- » pressure switch
- » emergency and block valve „block and bleed“
- » connections according to customer (e. g. flanges)
- » reservoir
- » pressure control valve



EMG Actuators

Electro-Servo-Cylinder ESZ

The Electro-Servo-Cylinder developed by EMG is used as a control and positioning cylinder. It converts by means of a Planetary Gear Thread (PGT) the rotation generated by a three-phase current motor into a linear movement.

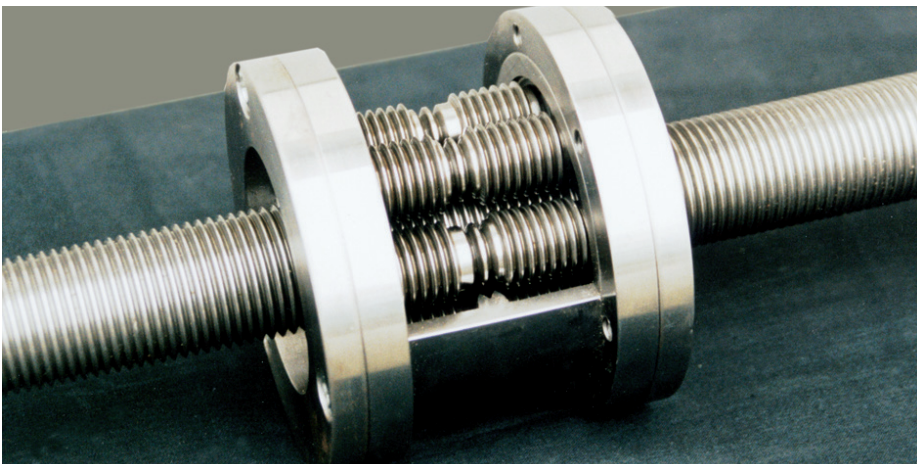
The function principle is based on a rolling motion at low friction and consequently low wear.

The standard model of the Electro-Servo-Cylinder consists of the following components:

- » three-phase asynchronous motor
- » spindle with planetary gear thread, thrust housing and piston rod with knuckle
- » rotating lock of piston rod
- » housing with pivot

Application areas:

- » used as control or position actuator with high demands on resolution and repeatability
- » alternative to hydraulic or pneumatic cylinders
- » exact positioning of parts
- » precise adjustment of butterfly valves, nozzles and rotors etc.
- » bigger handling systems
- » steering rolls for strip guiding, especially in thermal processing lines
- » coiler with medium weights
- » all kinds of linear movements



Planetary gear thread

Technical data:

- » max. force (no nominal force): 25 and 50 kN
- » protection class: IP 54
- » ambient temperature: 0 ... +50 °C; ...70 °C with separate cooling fan
- » nominal stroke: 100 ... 700 mm (longer version on request)
- » nominal speed: 30 mm/s, controlled by frequency converter

Lubrication and maintenance:

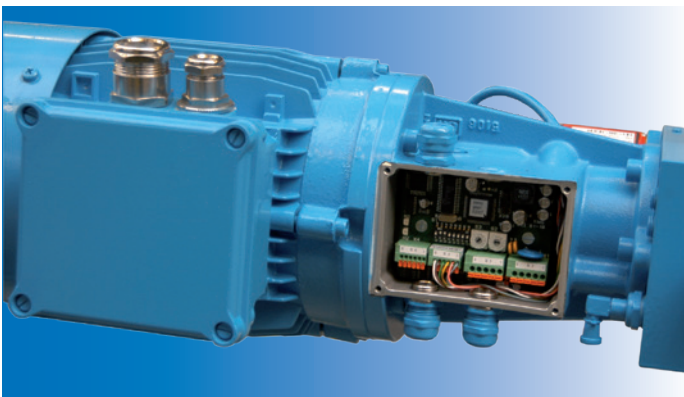
- » recommended lubrication of the planetary gear thread with 10-20 cm³ after approx. 5000 operating hours
- » option: automatic control of lubrication of the ESZ via overlaid counter of operating hours with an adjustable lubrication of the cylinder of up to three years ("automatic lubrication")

Options:

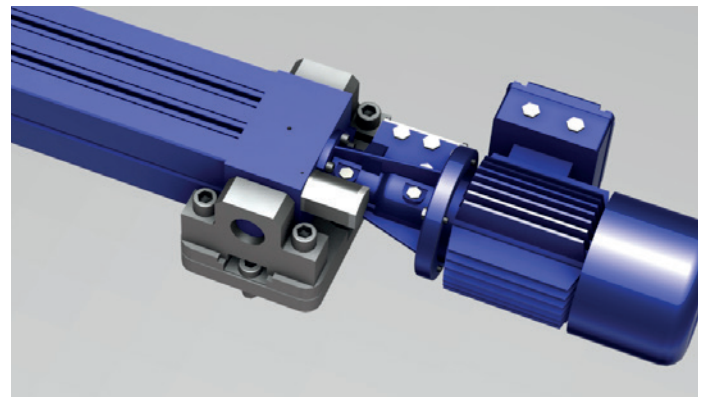
- » folded bellows to protect the pushrod from dirt
- » external position indication switches, mechanically positioned during on-site installation
- » electrical locking brake, optionally releasable at loss of voltage
- » cardanic mounting to avoid critical lateral forces on the piston rod of the electro-servo-cylinder
- » activation and positioning of the actuator via frequency converter with overlaid control via EMG's control amplifier
- » separate ventilation motor for enduring motor cooling in difficult ambient environment
- » alternative types of mounting on request
- » battery controlled automatic lubrication with precise lubricant allocation over one operating year. Battery and lubricant available as one device.

Customer's benefit ESZ:

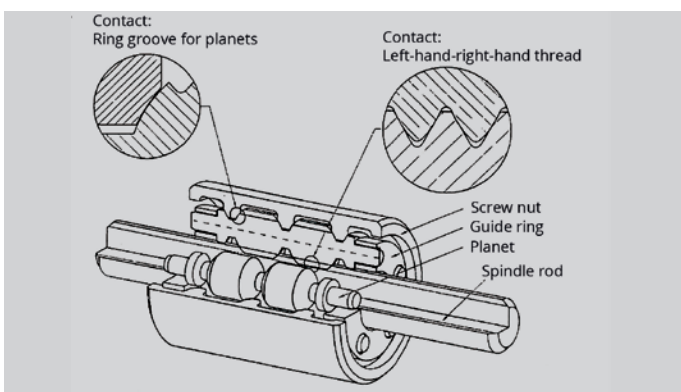
- » compact design without gear
- » high drive speed, small motor torque
- » high positioning accuracy
- » low friction, robust and reliable
- » clean and environmentally friendly
- » requiring little maintenance
- » long service life
- » easy replacement of hydraulic or pneumatic cylinders
- » compact design at high power transmission
- » integration of position transducer and limit switch
- » operation without inflammable media



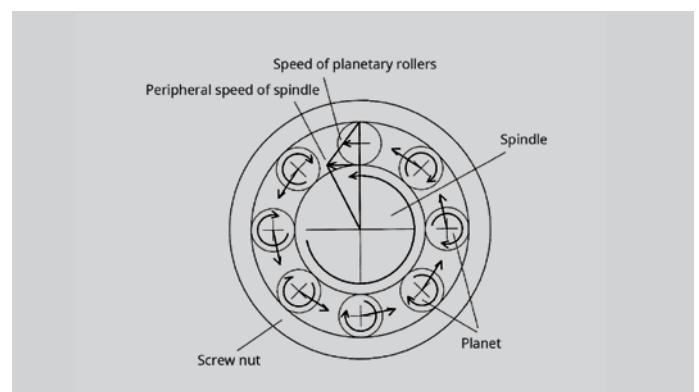
Electronics with DIP switch for easy set up



ESZ with cardanic mounting



Interior view of spindle



Cross-section of spindle

The logo for EMG, consisting of the letters 'EMG' in a bold, white, sans-serif font. The background of the entire page is a blue-tinted photograph of industrial machinery, specifically large rollers or actuators, with a white line graphic that starts horizontally and then curves downwards and to the right.

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