

SMS  **group**

Direct electrically driven screw presses

Type SPE



Progressive by tradition



Hasenclever, Berrenberg, Eumuco - these are brand names positively associated with screw presses. By their innovative approaches these companies have had a determining influence on the direction in which today's screw press technology has developed. By adding further improvements still to a technology that has been successful in the past, they have continuously refined their products over recent decades and, in this way, been able to create today's efficient forging units. The tradition has been carried on under SMS group's corporate umbrella.

There is a wide variety of screw press designs and drive systems to choose from for greatly varying applications.



Today's screw presses must not only be able to operate highly productively and economically. Increased energy efficiency and improved flexibility with regard to new automation solutions are becoming increasingly important. Under these premises, SMS group has subjected the tried-and-tested SPE series to an extensive re-engineering. The technical highlight of the new SPE screw press series is the optimized drive concept with an energy-efficient synchronous drive, which is ideally suited to set new standards in terms of productivity and energy efficiency.

Benefits of the new SPE screw press:

- Increased production capacity due to superior reliability and improved performance
- Large working capacity/safeguarding by means of mechanical overload protection
- Large, more easily accessible die space for improved integration of automation systems
- Exact adjustment and maximum repeat accuracy of the energy output
- Wide range of stroke control options
- Optimized, exact ram guidance
- Reduced noise emission



Direct electrically driven screw press SPE

Structure and function

1 Frame

Frame of multi-part cast construction of 4-tie rod design. The side sections have large windows to the die space and offer room for automation expansions.

2 Ram

Ram of high-quality cast steel.

3 Ram guide

The upper section of the ram guide is designed as a telescopic round guide and thus very long in the bottom dead centre position to increase the resistance to tilting under eccentric loads, and at the same time offers protection against soiling from the outside, thus increasing the service life of the spindle drive and the closed-centre oil lubrication system.

In the lower section the guide is arranged diagonally and designed to be heat-neutral.

Adjustable steel guide ledges with wear-resistant, hardened surfaces.

4 Screw

Screw of forged high-alloy quenched and tempered steel. The screw bearing in the machine frame is a spherical flanged bearing.

5 Screw nut

Screw nut of special bronze alloy, fixed in the ram. The thread geometry in the screw drive with optimised sawtooth profile has already proved to be durable and tough in the past.

6 Mechanical overload protection

The flywheel as energy accumulator has automatic mechanical overload protection in the form of a slip clutch. The flywheel is open on the upper side for ease of maintenance of the assembly.

7 Flywheel bearing

The flywheel bearing on the machine frame is designed as a standard roller bearing.

8 Brake

A regenerative brake with energy recovery to brake the flywheel after the press stroke is effected by the main drive and frequency converter so that a separate service brake is not required. A spring-loaded safety brake prevents uncontrolled lowering of the ram after the machine has been switched off.

Central circulating oil lubrication system

Automatic lubrication of the function groups screw bearing, screw/screw nut and ram guide with electronic monitoring and warning indicator.

9 Drive concept

A major role in the advantageous characteristics of the SPE is played by the integrated 4-quadrant frequency converter that in conjunction with the synchronous torque motor of the screw drive forms the electric heart of the SPE. In addition to the very high repeat accuracy, it is the efficiency that is of particular note with this drive concept, and that in numerous respects:

- Energy-efficient acceleration with high efficiency thanks to the permanently excited synchronous torque motor
- Immediate availability of the maximum torque from standstill
- Recovery of the braking energy from the torque motor in regenerative mode
- Recovery of the braking energy via the feeder/energy recovery unit in 4-quadrant mode
- Maintenance-free, permanently excited drive without sliding contacts
- High efficiency of the drive motor with heating occurring only in the stator. The permanently excited rotor does not undergo any heating.

The implemented design is very simple. The stator forms part of the machine frame and houses the winding and the water cooling system so that costly and space-intensive external ventilation can be eliminated. The rotor forms part of the flywheel and consists mere-

ly of a steel ring with permanent magnets attached to its outside diameter. The synchronous torque motor is sturdy and has proved itself time and again under rugged forging shop conditions.

Ejector

The machine is equipped as standard with a hydraulically actuated central ejector in the table for ejecting the forgings out of the die. In addition, an optional ram ejector can also be installed. The ejectors can be controlled individually.

Pneumatic system

No consumption-intensive pneumatic components are installed on the machine up to press size SPE-25. All small drives have decentralised electro-hydraulic units.

Monitoring

With the contact-free stroke measuring system, the SPE offers as standard the possibility of monitoring, controlling and displaying the ram movements.

The press force measuring system serves both to display the prevailing press forces on the operator panel and to monitor and protect the machine. Thanks to the individual force measurement on the 4 frame pillars, both 4 single forces and the total force can be measured and displayed so that asymmetric forging loads can be detected.

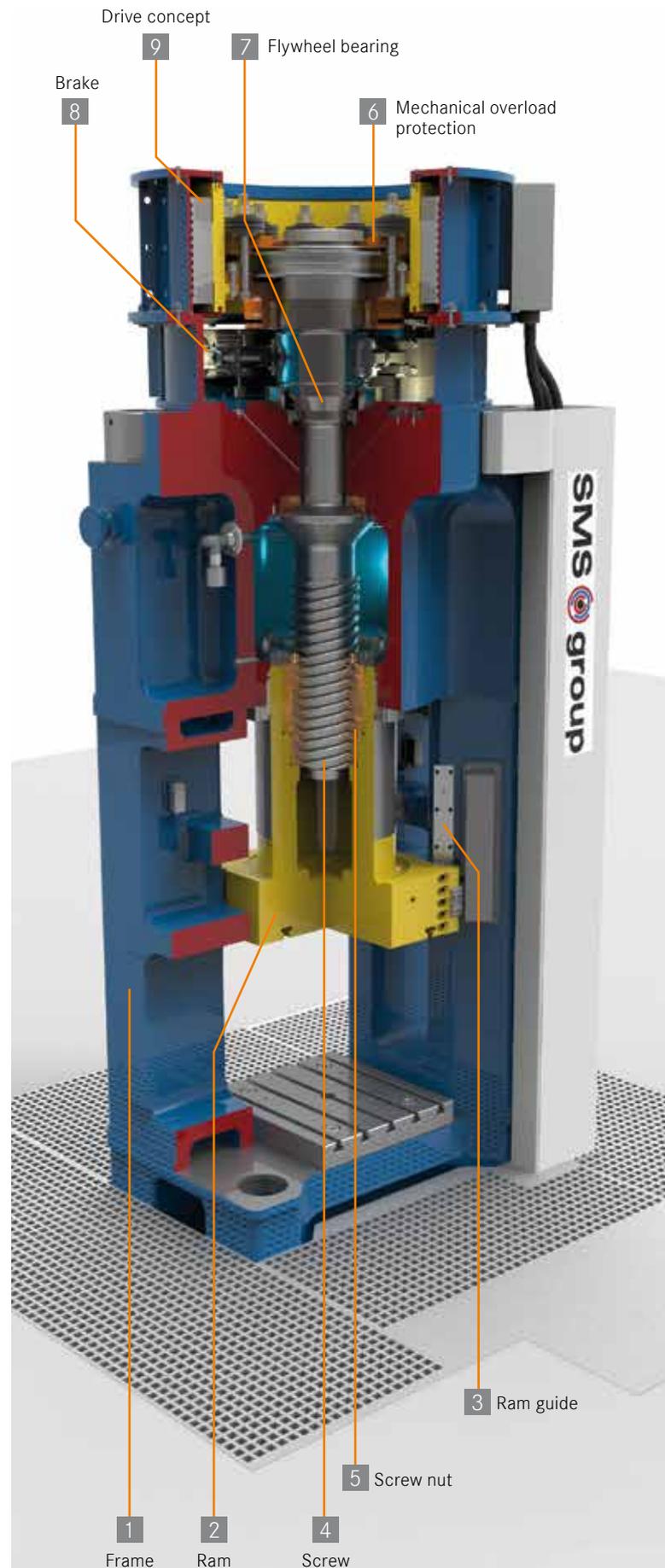
Slip angle measurement of the mechanical overload protection system after each stroke with displayed on the operator panel helps the machine operator to assess the wear condition of the friction pads in the overload system.

(Slip angle measurement is being tested and evaluated on this press with the existing sensors and then a decision will be taken as to whether this tool can be employed permanently)

Safety concept

The converter/motor system employed for the drive has a double safety concept. In setup mode, both the setup speed and the safe stop are monitored via the integrated safety functions SLS (Safely Limited Speed) and SOS (Safe Operation Stop). These functions actively monitor motor both in jog mode and in the event of a stop of the machine ready for operation, and in the event of a fault the motor is safely switched off.

In addition, the converter is switched to a safe torque-free condition via the STO (Safe Torque Off) function and brought safely to a standstill in conjunction with the 2-channel electrically monitored and controlled brake.



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The safety functions are complemented by a two-hand operating facility for setup mode and foot pedal operation for forging mode. An (optional) safety fence for automatic mode can also be safety monitored in the press safety control system.

For safe working in the die space, the ram is held in the raised position by a ram locking unit to prevent accidental lowering.

Function of the drive during a working stroke

When the stroke is triggered, the screw is accelerated in anti-clockwise direction by direct drive and drives the ram in downward direction via the screw nut.

When the preselected speed or energy is reached, the speed is held constant. When the workpiece height is reached, the drive is switched torque-free so that the subsequent forging is performed purely with the energy stored in the drivetrain.

After forming, the direct drive is accelerated in clockwise direction to bring the ram back to the top dead centre position.

The return speed is also controlled and, in the event of the calculated braking point being overrun, is braked to standstill in the top dead centre position along a ramp.

On reaching the top dead centre position, the machine is immediately ready for the next stroke to be triggered.



Screw presses with direct electric drive differ from other flywheel-driven screw presses in that the driven machine is connected directly to the drive motor without intermediate gearboxes or other mechanisms.

The key components of the SPE ensure the precise transmission of the mechanical power:

The press frame is of sturdy design with extreme longitudinal and transverse rigidity.

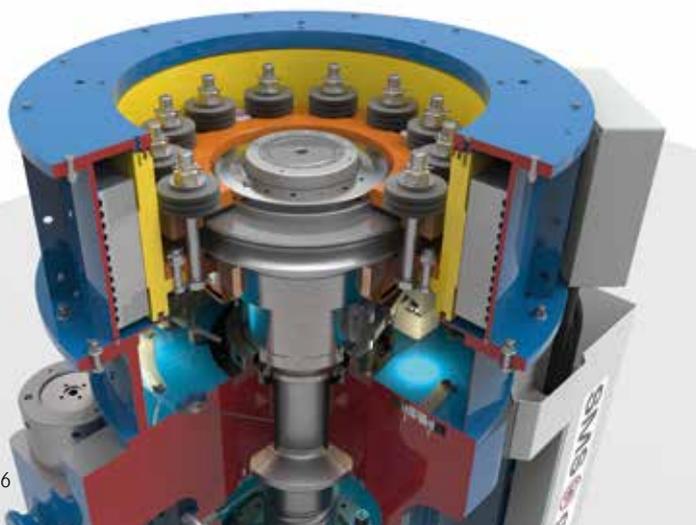
This results in a high resistance to tilting of the ram and hence a high eccentric loading capacity for screw presses.

The large side windows in the press frame make the die space easily accessible from all four sides and allow a high degree of automation.

Screw and flywheel are positively locked together.

Forgings are produced precisely and with sharp contours, and the spring-back of the ram from the die is positively influenced. This results in short pressure dwell times. The user benefits from improved service lives of the dies.

Encapsulated installation spaces of the screws protect spindles and lubricating oil against soiling and ensure that the maximum volume of lubricating oil is supplied.



Things to know at a glance

SPE Series from 6.3 MN to 50 MN with screw diameters from 200 mm to 560 mm

- Multi-part frame of 4-tie rod design with large side windows
- Synchronous torque motor
- Variable frequency drive
- Power recovery to system
- No pneumatics up to size SPE-25
- Mechanical overload protection
- Safety holding brake
- Hydraulic table ejector
- Ram guide with nitrided ledges (self-lubricating guide ledges – no external oil lubrication necessary – test in prototype)
- Circulating oil lubrication system
- Ram securing facility
- Press force measuring system
- Ram stroke and speed measuring system
- Slip angle measuring system (test in prototype)

Extended options

- Hydraulic ram ejector and plate ejector in the table
- Closed-centre motor coolant circuit with heat exchanger
- Die and die design
- Die holder concept with swivelling table or turntable
- Die and/or die holder quick clamping system
- Die holder changing systems with change arm or carriage
- Die maintenance and spraying unit
- Turnover device
- Fume extraction equipment
- Safety installations for die space or forging cell
- Automation system such as workpiece handling equipment, robots and loaders
- Interface incorporated into the controller of the press periphery





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