

SMS  **group**

Wedge press

Type KP



A tradition of progress

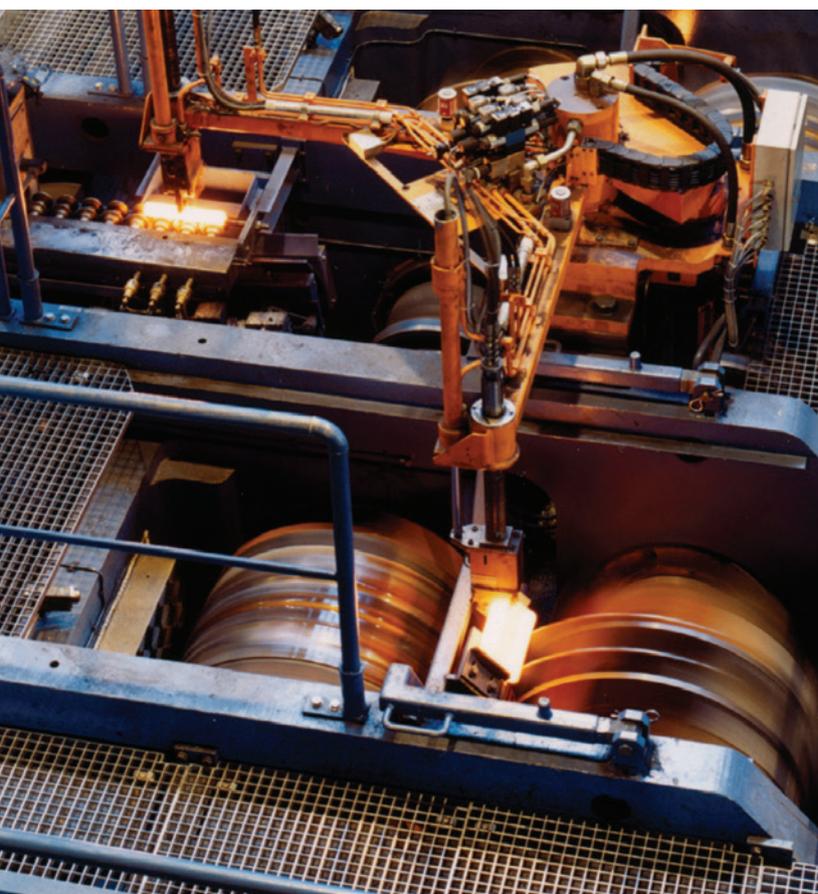


The Closed-Die Forging Product Unit at SMS group has a long tradition in press manufacturing where major steps have led from the classic closed-die forging press to today's automatic forming system.

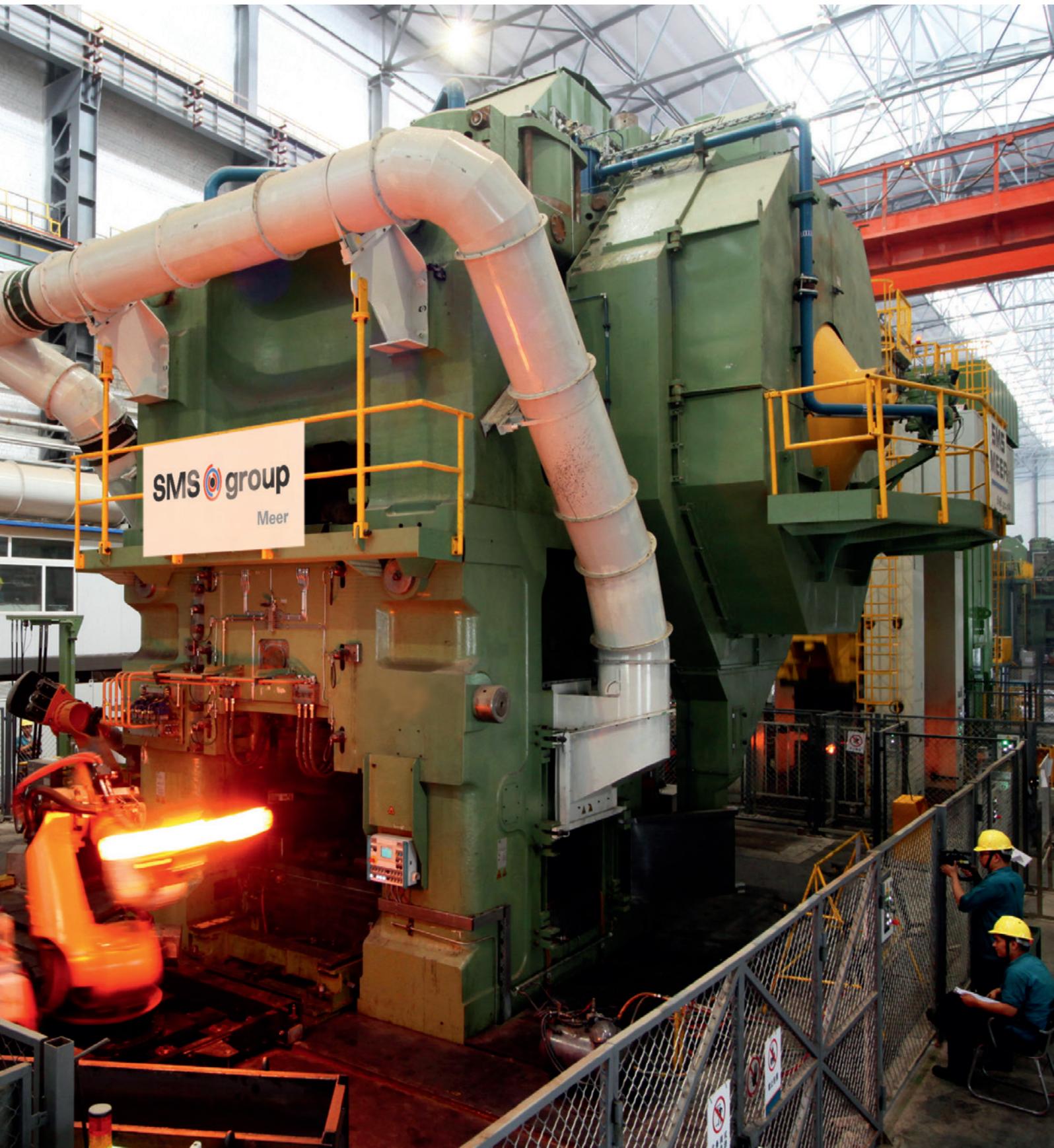
The wedge press is a closed-die forging press offering outstanding operational accuracy. Its key features are an extremely high longitudinal rigidity and tilting rigidity in all directions. A low spring-back of the press results in short pressure dwell times.

Due to their high eccentric load capability and tilting rigidity, wedge presses are advantageously used whenever the parts to be forged are long and close thickness and offset tolerances are required over the entire length. Typical examples include: conrods forged in pairs, truck front axles, crankshafts, precision forgings, etc.

The automated version of the wedge press can be operated in both intermittent and continuous mode depending on the required task definition or the part to be produced.



KP 12.500 with automatic forging line



Structure and function principle

(1) Frame

SMS group attaches particular importance to solid frame construction, which offers considerable advantages over a split design with tie-rods with regard to longitudinal and tilting rigidity. Machine frames of monobloc design are built by SMS group up to press sizes of 4,000 t.

(2) Ram/(3) Wedge/push rod

The ram is driven by a wedge which is moved horizontally between machine frame and ram by crankshaft and pitman push rod. The wedge has a large surface area, thereby establishing a rigid connection between ram and frame and providing unusually wide force distribution. Plane wedge surfaces allow wide die spacing and prevent tilting of the ram within of the guide clearance. The force lines run rectilinearly through ram and wedge into the frame from any eccentric point of loading. The die shut height is adjusted by a corresponding device on the push rod. Adjustment is also possible between two strokes in fully automatic mode.

(4) Ram guide

In designing wedge presses, SMS group pays particular attention to precise guidance of the ram. To take due account of the demand for a machine which is rigid in every respect, the wedge press is equipped with an 8-point guiding system in which all the guide faces are arranged at right angles to one another.

(5) Clutch/brake system

A reliable clutch/brake system ensures short engagement/disengagement times. Clutch and brake system are directly connected to the crankshaft and thus protect the press against overload. The clutch/brake system can be controlled either electro-pneumatically or electro-hydraulically. Both the easy-to-service single-disc block clutch and the brake arranged on the opposite side are fitted with easily

replaceable friction pads. The patented electro-hydraulic clutch/brake system is preferred particularly for fully automatic systems with short cycle times and high output rates. In this multi-disc design, the clutch and brake are arranged together on the right side of the press, and the clutch interacts with the brake. Both elements combined in one unit are arranged on the crankshaft.

(6) Weight counterbalancing equipment

For dynamic balancing, the weights of the up- and down-stroking press components, including die holder and dies, are compensated by varying air pressure generated by two pneumatic cylinders. This minimises the bearing clearance of the components arranged in the force path, thereby positively influencing the impact loading of the press elements directly involved and the precision of the forged parts.

(7) Ram adjustment system

The ram adjustment system allows the shut height of the dies to be adjusted in order to set up the forging dies and to compensate for temperature differences and die wear. The stroke position of the ram is adjusted by means of a motor, with the eccentric bush housing in the pitman being rotated by means of a worm drive. In automatic operation, the patented quick ram adjustment system can be operated between strokes. In case of trend messages signalling changing workpiece weights, forging forces, workpiece dimensions, etc., the stroke position of the ram can be automatically readjusted in a closed-loop control circuit.

(8) Back gear/(9) Herringbone gearing

Wedge presses can be equipped with or without back gear depending on the required machine size. For machines provided with back gear, the drive torque is transmitted by closed herringbone gearing of the main gear. This type of gearing ensures smooth operation.

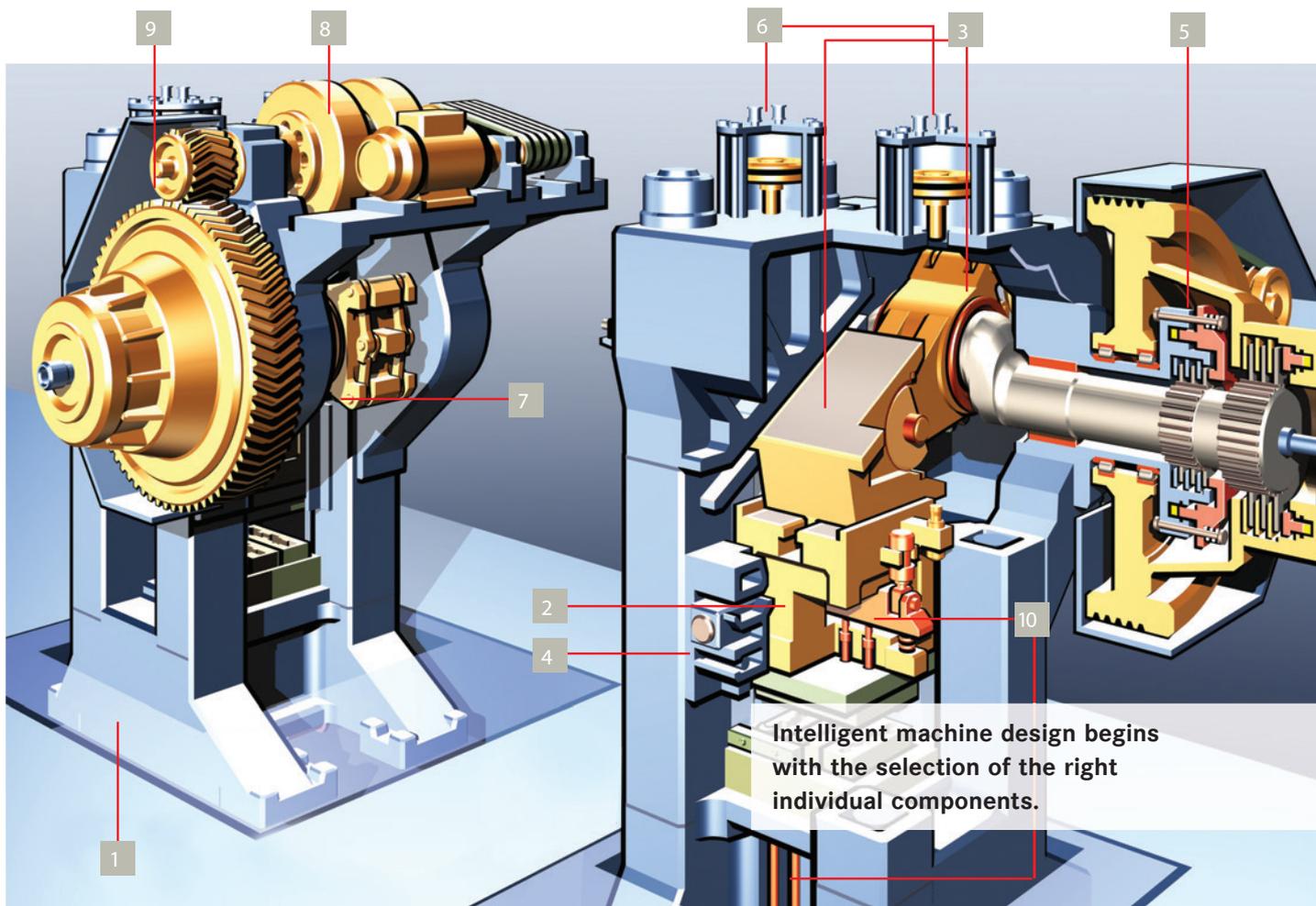
(10) Top and bottom ejector

Wedge presses are equipped with controlled top and bottom ejectors. These systems help considerably to stabilise the process, especially in fully automated forming units. The ejectors must position the workpiece at the precise point and time required for pick-up by the monitored grippers of the automatic walking-beam transfer system. In the process, the standard ram ejector ensures that the formed workpiece remains on the bottom die during the return stroke of the press ram. The ejector movement is synchronised with the ram movement. The main forming stations in the bottom die holder are equipped with individual ejectors which are arranged in the press table. These can be operated either hydro-mechanically or servo-hydraulically. The actual ejector stroke sequence will depend on the type of part and the different forming operations. Strokes lengths and

also start and hold-up times can be set at the control desk of the plant. Depending on the application, various ejector systems are available, to ensure optimal performance to the respective application.

Lubrication

Lubrication is adapted to the requirements of the respective machine, allowing for flexible programming of the amount of lubricant required. The central grease lubrication system is subdivided into function groups, each of which is monitored electrically. In this way, different lubrication cycles and varying lubrication intervals can be developed e.g. for crankshafts and pitman bearing, ram guide and gear wheels. In addition to this, all key bearing points in the machine are fitted with thermal sensors indicating excessive temperatures. Optionally, the machine can also be provided with an oil lubrication system.

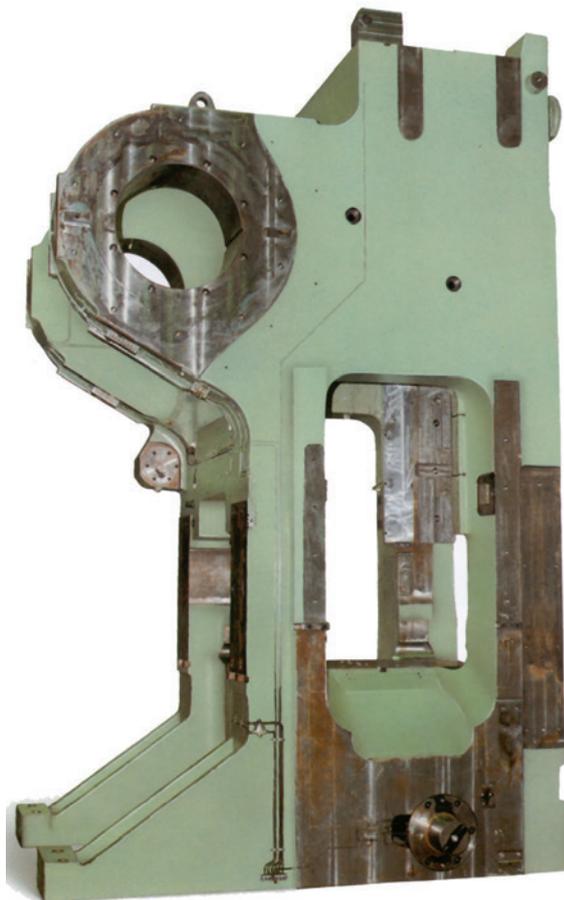


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|---|----------------|---|-----------------------------------|----|------------------------|
| 1 | Frame | 5 | Clutch/brake system | 8 | Back gear |
| 2 | Ram | 6 | Weight counterbalancing equipment | 9 | Herringblone gearing |
| 3 | Wedge/push rod | 7 | Ram adjustment system | 10 | Top and bottom ejector |
| 4 | Ram guide | | | | |

Individual components

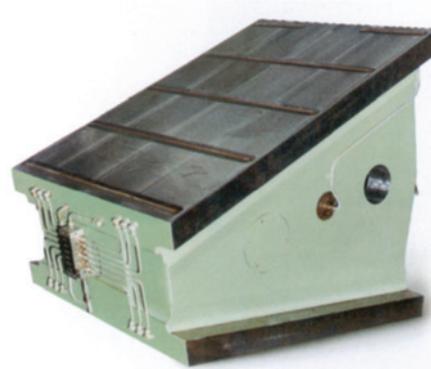
Frame

- Solid monobloc cast steel design on presses up to 4,000t
- Broad, high side windows in all frames allow for the feeding of forging blanks and the removal of the finished part and the flash



Wedge/pitman

- Broad, rigidly connected double pitman made of cast steel
- Wedge with shoulders at top and bottom for form-fit connection to the frame (top) and the ram (bottom), ensuring absorption of pullback forces
- Wedge with hardened top and bottom surfaces, grease lubrication via distributors arranged at the front face



Components

Automatic electric walking-beam transfer system

- Designed for an operating speed of 30 strokes per minute
- Consisting of four single housings with drive unit, attached to the press frame
- With two interchangeable walking beams and dedicated drives operating independently from the press
- 3 motion axes, “transport step”, “lift/lower”, “open/close” each axis driven by a separate servo motor

Spray pattern (Spraying volume distribution)

Comprehensive concepts for machines and processes through

- Safeguarding and optimisation of spraying sequence
- Practice-oriented investigations based on test set-ups such as spraying test station

Hydraulic clutch/brake system

- Oil-immersed
- Fast response times
- Good heat exchange
- Low noise level
- Low wear
- Virtually maintenance-free

Robot handling

- Integration of industrial robots
- Spraying volume distribution



Control System

The complete function control and monitoring of the machine and the supplementary equipment is ensured by the SMS group EPSS 12 press safety control system. This system is designed and accepted in accordance with the latest, legally binding EN guidelines and accident prevention regulations and, therefore, offers maximum safety for the operating personnel.

The configuration is based on proven modular PLC safety controls and thus offers also maximum flexibility e.g. for later automation of the machine. The neces-

Operating statuses

Overview display of readiness for operation

- Control CPU
- Control voltages
- Code selector switch
- Sensors
- Hydraulics
- Main drive
- Motion enabling
- Press safety circuit
- Machine readiness

sary integration of interfaces, visualisation system and guards/safety devices is very flexible through standardised networking with Ethernet-based systems.

Integration of the machine control system into the customer's network as well as an optional teleservice via VPN access is also possible.

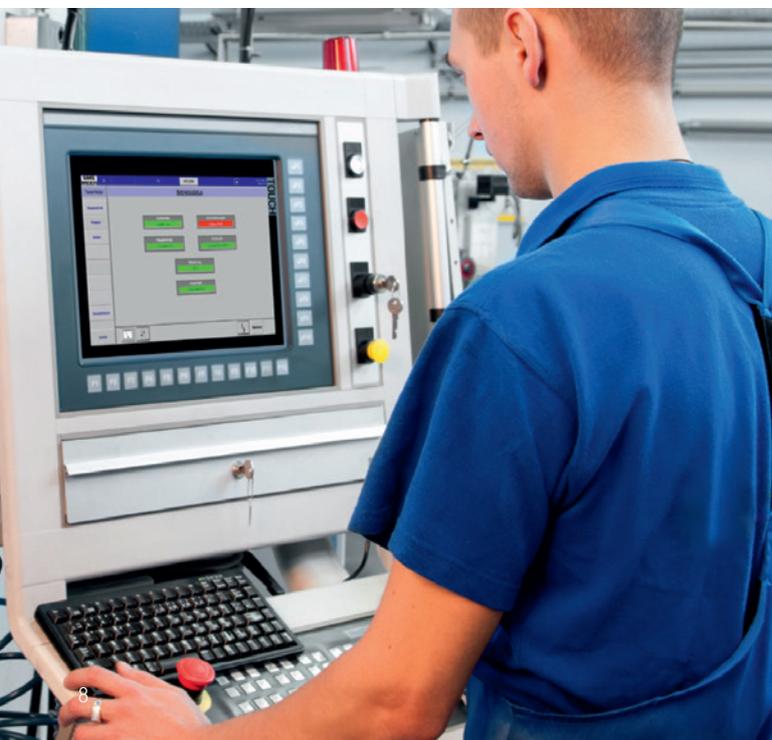
The machine visualisation system is based on operator panels providing the following functionalities in a clear and intuitively operable manner.

Measured values

Graphic display of measured machine values



- Ram position
- Ram adjustment
- Bearing temperatures
 - Individual display, graphic progress display
- Press forces (sum, left, right)
- Position table ejector
- Workpiece counter
- Stroke counter
- Hydraulic temperature and level of oil moisture
- Oil lubrication temperature and level of oil moisture
- Cooling-water volumes
- Main motor
 - Flywheel speed, motor current, motor frequency, torque
- Lubrication
 - Condition lubrication distributor, activation number of strokes, target/actual, manual activation



Machine parameters

Input of machine parameters

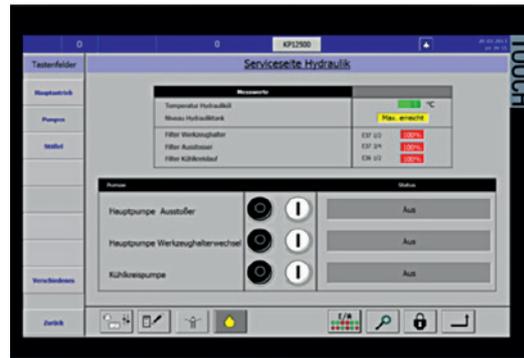


- Crank angle-dependent activation points (cams)
 - Clutch/brake OFF
 - Ram in TDC
 - Ram in BDC
 - Ram outside danger area
 - Ram in locking position
 - Table ejector start
 - Ram in die change position
 - Ram in position "measuring C/B"
- Table ejector path
- Grease lubrication (strokes)
- Redundancy oil distributing system (strokes)
- Gearwheel lubrication (time cycles)
- Spray container
 - Level
 - Refilling quantity
- Spraying system
 - Activation/deactivation for each operation
 - Spray test for each operation
 - Scale blowing time
 - Spraying and blowing times
 - Afterblow period
- Storing of machine parameters as recipes
- Operation at several password level

The press drive is designed as three-phase asynchronous squirrel-cage rotor. The maintenance-free standard motor is available in protection class IP 55 as vibration-proof press installation. The frequency converter is provided as ready-to-install cabinet device in protection class IP54 and is connected to the press

Maintenance functions

Entry and display in protected areas



- Hydraulics
 - Single activation of drives
 - Display of relevant in-/outputs
- Circulating oil lubrication back gear
 - Temperature
 - Level
 - Filter
- Valve test
- Stroke overrun test
- Status display of variables (input/output/flag/data)

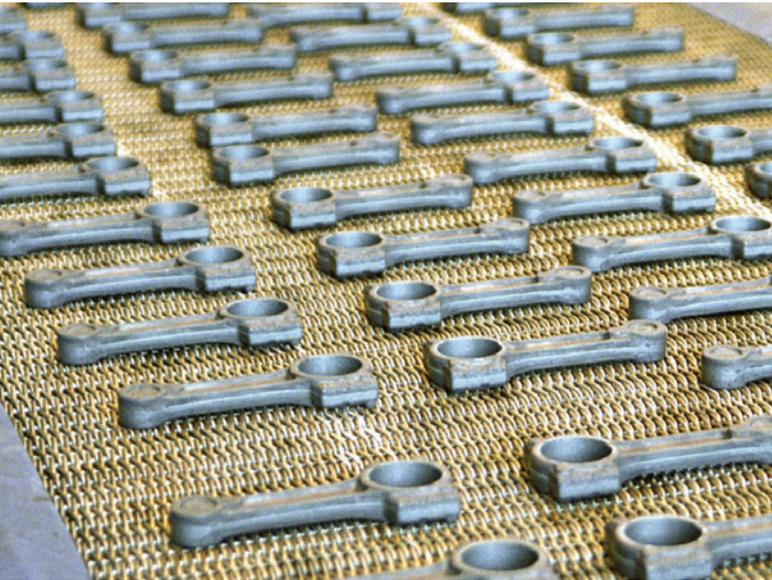
Alarm management

Graphic display of measured machine values

- Display with time and date
 - Information
 - Warnings
 - Alarms
- Alarm buffer
- Alarm database
- Automatic freeze function for alarm analysis
- Graphic status display of operator enable
- Graphic, temporary locking deselection

control via a data interface. For energy recovery, the frequency converter can also be optionally supplied as a four-quadrant unit. The operating speed of the wedge press can be preselected steplessly within a range of 80% to 100% and the set-up speed of approx. 10%.

Forging examples



No matter what the forging task – connecting rods, crankshafts or other precision forgings – the wedge press from SMS group unites traditional forging techniques with automated industrial manufacture – for precise, productive, and cost-effective results. Here are just a few examples from the extensive range of wedge press applications.



Facts about the KP at a glance

Standard basic design

- Monobloc frame up to 4,000 t press size. 4-piece tie-rods/design for larger presses up to 16,000 t
- Ram guides with bronze liners, adjustable
- Motorised ram adjustment
- Pneumatic block-type clutch and brake
- Pneumatic weight balancing system
- Flywheel brake
- Mechanical top ejector for three operations (Optionally more if required)
- Hydro-mechanical bottom ejectors via camlock shaft for three operations (Optionally more if required)
- Sound-proofing hood
- Grease or oil lubrication
- Complete installation
- Electric control system
- Hydraulic unit (for mineral oil)
- Bearing temperature monitoring
- Press force monitor
- Frequency-controlled drive

Options

- Low-wear table and ram make-up welding
- Ram lock
- Ram guides with nitrided liners, adjustable
- Ram quick-adjustment device
- Ram releasing device
- Hydro-electric clutch/brake system
- Additional/hydraulic top ejector
- Bottom ejector, motorised stroke adjustment
- Bottom ejector, individually operated and with motor adjustment
- Fume extraction hood
- Grease refilling device
- Hydraulic unit (for fire-resistant fluid HFC)
- Oil circulation lubrication, closed-circuit

Advanced options

- Tools/dies
- Die holders
- Die and/or die holder quick-clamping system
- Die changing systems
- Die holder change carriage
- Turnover device
- Workpiece handling systems
- Spraying device
- Customized electronic control
- Foundation frame (anti-vibration mounting)
- Assembly platforms, protective grids





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