FORMING THE FUTURE



MECHANICAL FORGING PRESSES WITH KNUCKLE-JOINT

SCHULER

Member of the ANDRITZ GROUP

MML/MSL.
MECHANICAL FORGING PRESSES WITH KNUCKLE-JOINT.

From process development and cost-effective line concepts to full production lines.

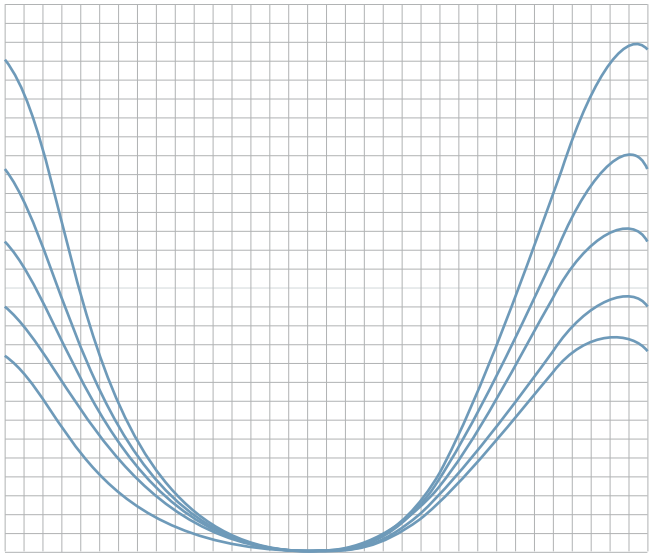


Schuler forging. System solutions from Schuler offer customers all over the world a decisive quality advantage in all temperature ranges:

- Systems for hot forging
- Systems for warm forging
- Systems for cold forging

Schuler mechanical multi-station presses with knuckle-joint are primarily used in cold and warm forging.

Economical manufacturing of parts in large volumes is only possible by optimal coordination of the equipment, process technology know-how, and tool technology. This comprehensive approach and many years of experience combine to create the capabilities that make complete customer solutions possible. In this way, the MML2 press series offers more efficiency for cold forming and special applications in warm forming. This generation of modified link-drive presses is low-maintenance and operator-friendly, achieves optimal part quality and long tool service life, and produces a wide variety of different part geometries with nominal press forces of 5,000 to 25,000 kN.



Motion diagrams of the MML/MSL presses.

PART-SPECIFIC MOTION CHARACTERISTICS.

The link drive system of the MML2 developed by Schuler can be made very flexible during the design of the press. This permits design of the motion characteristics in accordance with the requirements of the parts to be produced and the specific forming process so as to be adaptable to the customer's needs.

Output and tool service life can also be increased in this way. A critical criterion in the determination of stroke length and motion characteristics of the press is part length. As a general rule, a slower slide speed in the working range is desirable in cold forming.



Knuckle-joint press MML2-800.



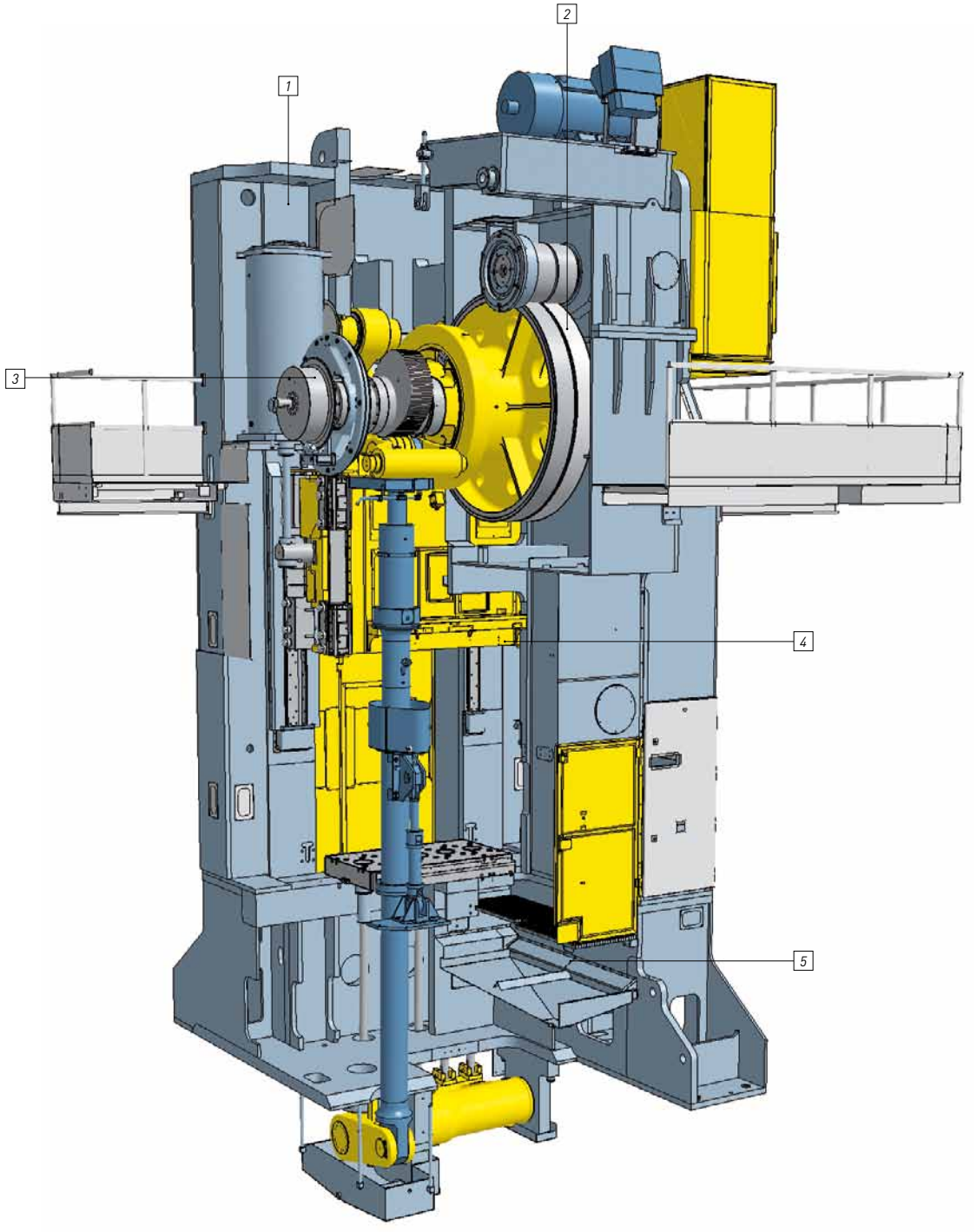
Knuckle-joint press MML2-1000.

The MML2 press models offer a whole series of numerous options that result in greater productivity and flexibility.

Low-maintenance and user-friendly. In its design and control software, the MML2 is extremely operator-friendly. This ensures short start-up and changeover times as well as quick, easy maintenance.

Optimum part quality and long tool service life. The press frame is an extremely rugged, welded design. Its compact design and 2-point slide suspension permit high levels of eccentric loading. This feature, together with the extremely precise Schuler slide guiding, is the ideal way of achieving excellent part quality.

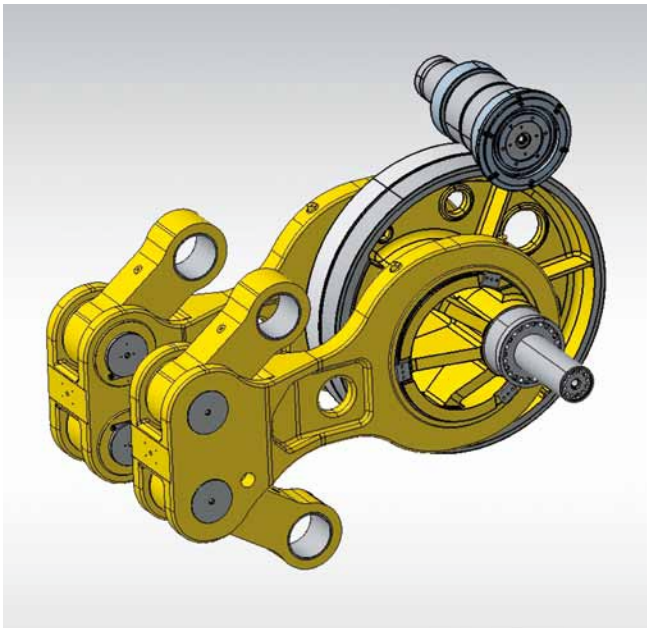
A wide part spectrum and widely variable part geometry. This link drive can handle a wide spectrum of variable strokes. With nominal press forces of 5.000 to 25.000 kN widely varying part geometries can be produced by cold forming. Certain warm-forming applications are also possible. High-performance bed-side and slide-side ejectors offer the ideal conditions for reliable part handling. The generously dimensioned die space is especially designed to accept complex, multi-station dies.



1 *Stiff press frame, pre-tensioned by means of tie rods*
2 *Gear wheels in double helical design for noise reduction*
3 *Motorized cam adjustment of the bed ejector allows a simple and fast changeover*
4 *Sturdy slide with minimal tolerance allows precise forming*
5 *Collecting pans on the bed allow the collection and reuse of excessive die lubricant*

THE MML 2 SERIES DRIVE SYSTEM.
PRECISION FORCE DELIVERED.

The MML 2 press series has been optimized for performance and impresses with extra-ordinary quality for the most demanding challenges.

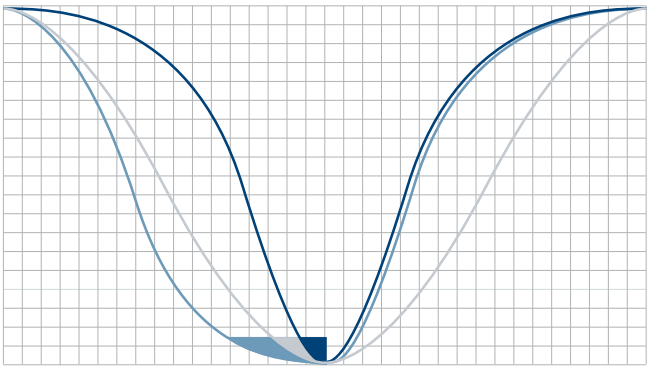


Knuckle joint of the MML / MSL press series.

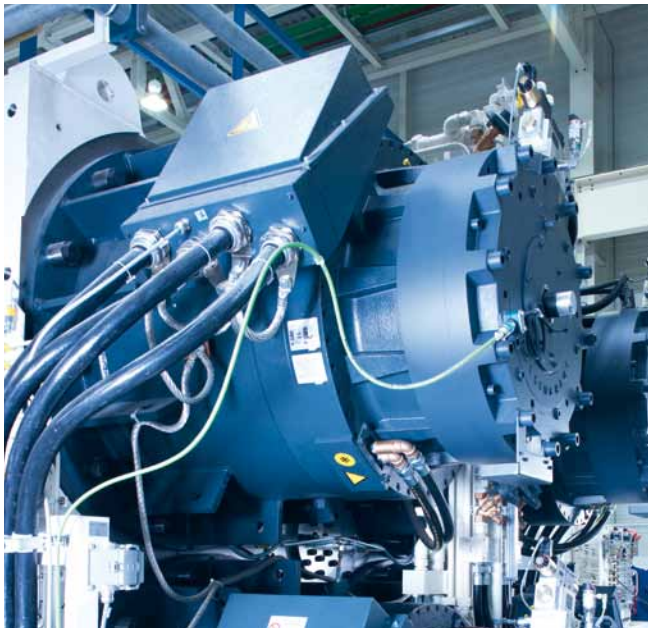
THE DRIVE SYSTEM – FORCE DELIVERED PRECISELY WHERE NEEDED.

For large press forces, the gearbox with drive shaft, compact drive, and main motor is designed as a separate sub-assembly. The use of the compact drive with integrated planetary gearing and a hydraulic combination clutch-brake achieves weight and energy savings in the gearing design by means of the 2-shaft concept.

The hydraulic clutch-brake combination ensures fast response times, hence, short braking angles, very low wear, and non-polluting operation. The drive system of the MML2 offers a wide selection of slide strokes and nominal force travels at relatively small drive torques.



The ServoDirect Technology permits individual programming of the slide motion.

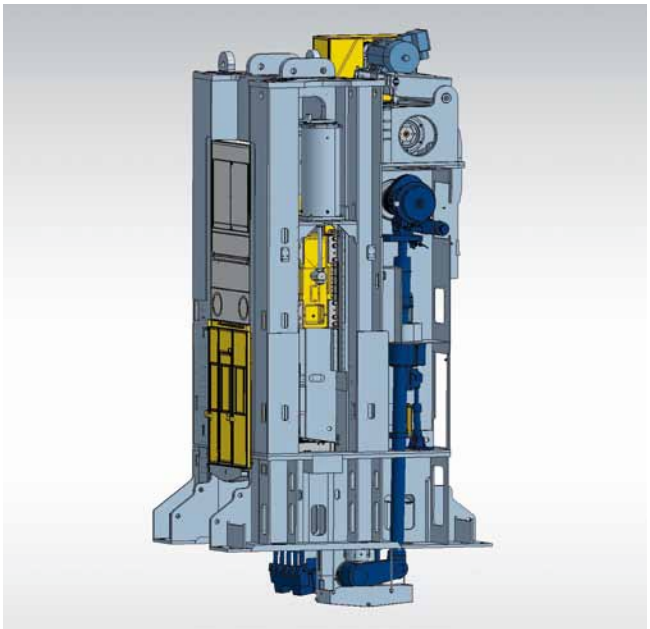


SERVO DRIVE – MSL SERIES.

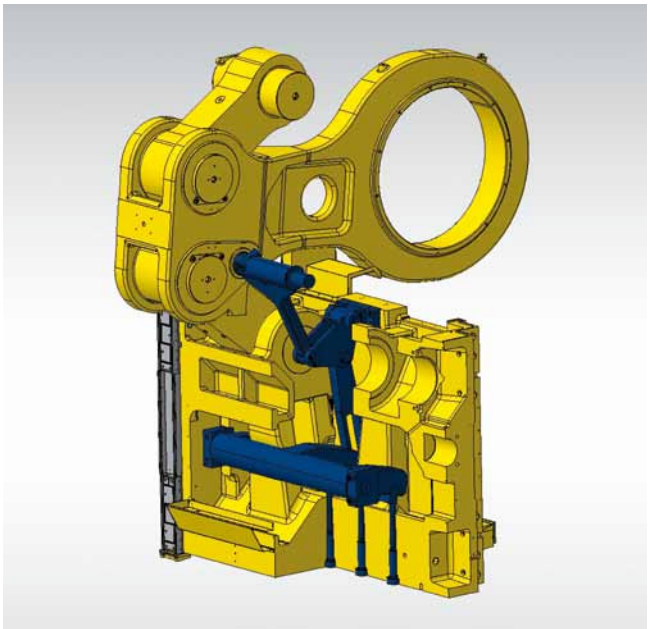
The combination with a servo drive extends the advantages of this drive concept even further – without limiting its possibilities compared to conventional drives. The result: highly flexible production systems with increased output rates.

The advantages of the MSL series:

- Increased output rates
- Individually programmable ram speeds and motion sequences
- Ability to optimize the forging process
- High component quality and long die life
- Ability to adapt slide movement to the transport sequence
- Sensitive tryout operation possible
- Optimized energy consumption



Mechanical bed ejector system.



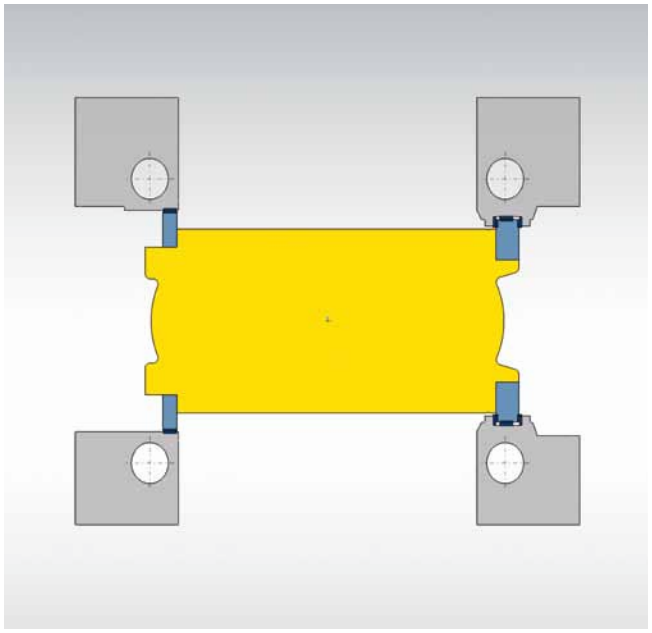
Mechanical slide ejector system.

BED EJECTOR – RELIABLE TRANSPORT.

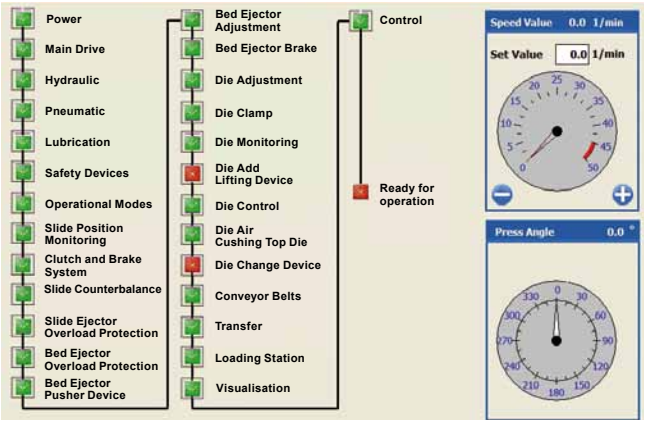
The bed ejector system of the MML/MSL series ensures reliable ejection of parts with longer shafts. In addition to the mechanical stroke, every forming station can be optionally provided with a pneumatic auxiliary stroke. In this case, the ejector pin is lifted by a pneumatic cylinder. To further improve reliable part transport the auxiliary ejectors can also function as part lifting/holding devices while the mechanical ejector is completing its return stroke. A hydraulic cylinder protects the total ejector force against overload. The extraordinary operator-friendliness of the MML/MSL series is also evident in the quick, easy control of the bed ejectors.

SLIDE EJECTOR – RELIABLE EJECTION BY MECHANICAL CONNECTION.

The link system of the slide ejector is integrated into the slide and is mechanically coupled to the connecting rods that provide the ejector actuation. A lever system and a common beam transfer the ejector motion to the individual ejector pins. The design of this system provides absolutely synchronous motion sequences independent of the loading.



Special 8-way slide guiding in T-arrangement.



Schuler Forge Control System.

THE SLIDE GUIDING – PRECISE AND RELIABLE.

The unique Schuler 8-way slide guiding in T-arrangement works with minimal clearances. This, in conjunction with the rigid press frame of the MML/MSL, guarantees optimal part quality and tool service life. This slide guiding concept does not require additional guiding clearance in order to prevent jamming.

SCHULER CONTROL CONCEPT "FORGE CONTROL SYSTEM" (FCS) – MODULAR, OPEN AND EASY TO FOLLOW.

With the "Forge Control System" (FCS) Schuler offers an operator-friendly and versatile software as interface to the press control. FCS provides operation, maintenance and fault diagnostics in the appropriate national language. The collection, analysis and logging of data takes place in real time.

The operator is:

- Informed about the status of the manufacturing process and the line by means of graphic displays, measured values and status reports. In this way, problems in processing can be dealt with early on
- Provided step-by-step guiding or prompts in all operating modes - if needed, a help system provides directions to the menus
- Supported by extensive die data management that permits all die-relevant data

TECHNICAL DATA OF THE MECHANICAL MULTI-STATION PRESSES WITH KNUCKLE-JOINT DRIVE MML/MSL

Model	MSL1 -500	MSL1 -630	MML2/MSL2 -630	MML2/MSL2 -800	MML2/MSL2 -1000		MML2/MSL2 -1200	
Nominal force [kN]	**500**	**630**	**630**	**800**		**10,000**		**12,500**
Nominal force distance BDC [mm]	10	18	32	15	25	36	20	16
Slide stroke [mm]	500	450	400	450	315	400	400	500
Work capacity [kJ]	95	100	95	140	100	250	200	250
Stroke rate, adjustable [1/min]	3–45	3–33	25–50	25–50	21–50	20–40	25–50	21–42
Die height [mm]	1,160	1,300	1,160	1,160	1,140	1,360	1,180	1,360
Slide adjustment [mm]	–	10	20	20		20		15
Bed area Width [mm]	850	850	1,250	1,250		1,250		1,500
Depth [mm]	800	800	800	800		800		800
Bolster plate thickness [mm]	160	160	160	160		160		160
Slide area Width [mm]	850	850	1,250	1,250		1,250		1,500
Depth [mm]	800	800	710	710		800		800
Bed ejector force Total [kN]	250	500	500	500		630		800
Per station [kN]	125	–	200	200		250		320
Bed ejector travel [mm]	150	100	100	100		160		200
Slide ejector force Total [kN]	60	200	125	125		160		260
Per station [kN]	30	–	50	50		63		100
Slide ejector travel [mm]	30	30	69	76	75	83	100	125
Motor capacity [kW]	165	500	90	130	100	200		200

Model	MML2/MSL2 -1250	MML2/MSL2 -1600			MML2/MSL2 -2000			MML2 -2500	
Nominal force [kN]	**12,500**			**16,000**			**20,000**		**25,000**
Nominal force distance BDC [mm]	10			15	10	30	10		15
Slide stroke [mm]	630	500	630	800	500	630	800	630	800
Work capacity [kJ]	200			400	400	600	400		600
Stroke rate, adjustable [1/min]	21–42	20–40	18–36	16–32	20–40		16–36		16–32
Die height [mm]	1,420	1,360	1,420	1,520	1,360	1,420	1,520	1,420	1,520
Slide adjustment [mm]	15			–			–		–
Bed area Width [mm]	1,500			1,800			1,800		2,200
Depth [mm]	1,000			1,000			1,000		1,000
Bolster plate thickness [mm]	160			200			200		250
Slide area Width [mm]	1,500			1,800			1,800		2,000
Depth [mm]	800			1,000			1,000		1,000
Bed ejector force Total [kN]	800			1,250			1,250		2,000
Per station [kN]	320			500			500		800
Bed ejector travel [mm]	200			250			250		300
Slide ejector force Total [kN]	260			380			380		500
Per station [kN]	100			160		160	200		200
Slide ejector travel [mm]	160	125	160	200	125	160	158	160	200
Motor capacity [kW]	200	380	350	315	380	450	315		500

SCHULER **SERVICE.**
STATE-OF-THE-ART SERVICE FOR MORE PERFORMANCE.

Schuler Service offers a tailored portfolio of services covering the entire life cycle of your equipment.

Over 900 service employees worldwide provide expert support 24/7 in close cooperation with you – our partners. Our main priority is always to ensure the maximum productivity and safety of your production equipment in order to secure your company's continued success.

With over 175 years of experience and expertise, we can guarantee the best possible support for the operation of your machines – and not only those supplied by Schuler, but by all other manufacturers. Whatever the situation, Schuler Service has the right solution for your specific needs.



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Schuler Pressen GmbH
Bahnhofstraße 41
73033 Göppingen
Germany
Phone Sales +49 7161 66-307
Phone Service +49 7161 66-628
Fax +49 7161 66-729

forging@schulergroup.com
www.schulergroup.com/forging