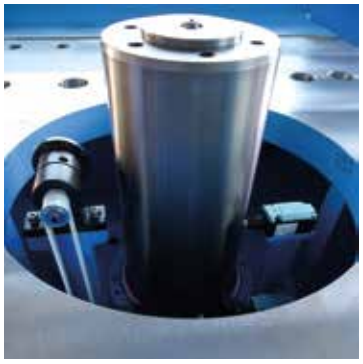
GEORG
Maschinentechnik






MODULAR PRESSES

FOR SHEET METAL AND SOLID FORMING


GEORG

PRESSES IN MOTION

Presses in motion – That is the motto of Georg Maschinentechnik GmbH & Co. KG from Neitersen in the Westerwald. We move our customers' presses with our fast reacting, proficient retrofit and service. We also move ourselves and develop new hydraulic and mechanical presses as well as automation. Our most recent achievement has been a pioneering modular press series with a patented knuckle joint drive. With a tradition dating back to 1925, when founder Karl Georg built his first agricultural trailer, motion has been central to Georg. Situated on the edge of southern Westphalia, one of the economically strongest engineering regions in Germany, metal is at the heart of Georg Maschinentechnik. The innovative heavy duty machinery engineering for the steel industry from the River Sieg to the Ruhr district has made an indelible mark on Georg: our machines are renowned for their durability and suitability for harsh operating environments.

We manufactured our first press in 1959. Since then, innumerable presses and machines around the world have been producing top quality parts with very high plant availability in large groups, family-owned operations and SMEs. Our employees' experience and their long time they work for the company (most of them have been with us for decades) are supplemented by an innovative operating climate and a high trainee ratio. We are often the first in line for state-of-the-art development. We cultivate out-of-the-box thinking and take pleasure in what is new. This includes our participation in Siemens S7 Safety in 2004 or our involvement with Industry 4.0 / Internet of Things IoT since 2014.

We are proud that we as a team are able to implement a very high internal production depth on a hall area of more than 6,300 sqm. Our own employees do great work in particular in case of unplanned machine downtimes and cyclic maintenance during summer or winter standstill, as well as typical peaks in volatile machine building.

Thank you for your interest – join the motion!

MODULAR PRESSES

An impressive installed base of mechanical and hydraulic presses with a pressing force of up to 20,000 kN has been produced since construction of the first press in 1959.

Based on this experience, Georg has developed a modular press series that is characterised by maximum flexibility. Paired with innovative mechanical and hydraulic drive concepts as well as tried and tested modules and design principles, we have created a solution, which permits economic customisation for our customers in sheet metal forming as well as solid forming.


Urkunde

FURTHER DEVELOPMENT OF EXPERIENCE

The advantages of the design of our modular presses as hydraulic presses and knuckle-joint presses are that, within the boundaries of the design, they have the same connection point to the slide. Moreover, the slide is over the length of the table rather flexible, so that both of the standardised table lengths of 2,200 mm and 3,500 mm have, as much as possible, the same components in the kinematics. In presses having a crank arm and with a table length of 3,500 mm, typically used in stamping and forming presses for metal forming or multi-stage solid forming presses, a gear is inserted between the planetary gear of the drive and the eccentric shaft. This retains one feature of Georg drives, i.e. the drive via a short transverse shaft. At the free shaft end, a holding brake is installed depending on the drive type, which can be used as a standstill brake in combination with a servo-torque motor, but is not suitable for recurring start/stop operation. The generously sized hydrodynamic plain bearings are lubricated operationally safely with progressive distributors. We only use longitudinal shafts with double-stage gearing on short tables, in order to minimise the influence of torsion in the case of a single sided drive.

Drive selection is, among others, based on the following criteria:

1 / What is the process profile force vs. path like?

2 / Should the slide stroke of the press often change?

3 / Is reduced energy demand more important than maximum output?

4 / Should the speed of the slide be finely adjusted or should the slide be stopped in the cycle?

ESSENTIAL FEATURES

// **The patented knuckle joint drive** either with flywheel compact drive, hydraulic motor or servo torque motor is at the heart of the modular press series, alternatively the presses of the modular series are available as a classical crank arm press or hydraulic press. The charts on page 10 show the changing superiority of the different mechanical drives depending on priority on automation window or forming speed.

// **Tried and tested Georg pressure points** with hydraulic overload protection and integrated slide adjustment for taking up different die heights, as well as many other carry-over parts across the modules for long-term spare parts strategies ensure high availability for our customers.

// **The slide is designed for optional integration of ejectors.** Implementing different die clamping systems and mapping customer-related T-slots patterns is a matter of course. The slide guide is designed as a V-guide in the hot application and otherwise as an 8-fold guide or roller guide.

// **Frames in joined plate design, alternatively in double-column design or pre-stressed multi-part design, absorb the process forces around the clock.** The plate frame can be pre-stressed as well due to its clever design principle.

PRODUCT KEY

/M	/K	/K	800	-	3,500	X	1,600	-	/Z
Drive principle slide	Drive type	Kinematics	Pressing force in t		Bed width in mm		Bed depth in mm		Frame design

- /M - MECHANICAL
- /H - HYDRAULICS

- /S - SERVO-TORQUE MOTOR (M-PRESS)
- /K - COMPACT DRIVE (M-PRESS)
- /H - HYDRO MOTOR (M-PRESS)
- /V - VALVE TECHNIQUE (H-PRESS)

- /K - KNUCKLE JOINT, SYMMETRIC (M-PRESS)
- /E - ECCENTRIC, LONGITUDINAL SHAFT (M-PRESS)
- /Q - ECCENTRIC, TRANSVERSE SHAFT (M-PRESS)
- /S - ONE CYLINDER (H-PRESS)
- /D - TWO CYLINDERS (H-PRESS)

- /P - PLATE
- /V - PLATE, PRE-STRESSED
- /M - DOUBLE COLUMN, MONOBLOC
- /Z - DOUBLE COLUMN WITH TIE RODS

PRODUCT RANGE

Georg Maschinentechnik offers many different drive versions. This includes the hydraulic servo direct drive and the servo-torque motor. The charts on page 10 illustrate further great energy savings potentials, i.e. the proper choice of kinematics depending on the opposing benefits in cycle time for optimisation either regarding the automation window or the forming speed. The patented knuckle joint drive with a stroke of 400 mm is a flexible compromise here.

MECHANICAL PRESSES

Georg Maschinentechnik has implemented many drive concepts in the past. Single- and two-point presses at a pressing force of less than 4,000 kN, partially equipped with smart C-frames including tie rods, are not part of the modular press series. Among the mechanical presses, we supply two-point presses from 4,000 kN to 25,000 kN pressing force as modular presses.

HYDRAULIC PRESSES

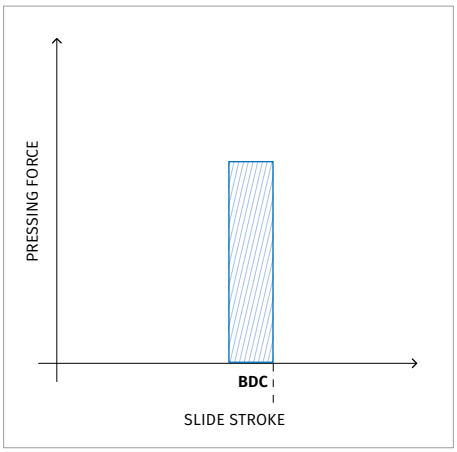
As for the mechanical presses, Georg also has a very broad product range for hydraulic presses. Note that table sizes with depths in excess of 1,800 mm, the border towards a mechanical two-point press, are possible as well. The drive inserted in the headpiece acts as a slide drive in the modular concept with one or two cylinders.

EXCURSION INTO DRIVE TECHNOLOGY

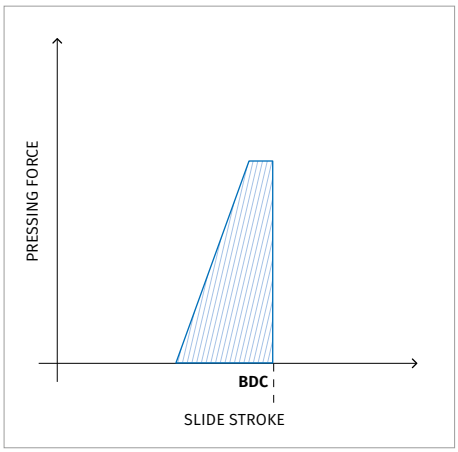
Two essential criteria must be observed when selecting a press:

1/ The required maximum pressing force for production of the product. This pressing force becomes part of the mechanical load capacity of the press, i.e. essentially the frame and the mechanical components of the drive. This is a higher technical effort in mechanical presses than in hydraulic ones, since the entire drive train must counteract the permitted forces in every angle position and all eccentricities.

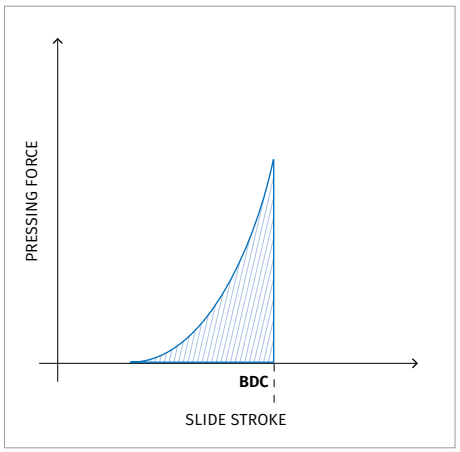
2/ In case of a mechanical press, the required maximum working capacity for production of the product. This work capacity is determined by the start of the force increase, characteristics of the force increase and the start of the maximum force before the bottom dead centre BDC. Hydraulic presses are subject to similar considerations, though this is not referred to as work capacity, but pump capacity, which can be supplemented by a hydraulic accumulator in the sense of a flywheel.



Stamping / cutting / deburring / embossing



Pre-forming / forging



Deep-drawing / stretching / flow-pressing

COMPACT DRIVE MK AT 15 % ROTATING SPEED REDUCTION OF THE FLYWHEEL

Pressing forces		4,000 kN	5,000 kN	6,300 kN	8,000 kN	10,000 kN	12,500 kN	16,000 kN	20,000 kN	25,000 kN
Work capacity	kNm	80	100	126	160	200	250	320	400	500
Connected load MKE	kW	90	110	132	160	200	250	315	355	450
Connected load MKK	kW	75	90	110	132	160	200	250	315	355
Connected load MKQ	kW	55	75	90	110	132	160	200	250	315
At reduced work capacity										
Number of strokes	1/min	80	80	80	80	75	75	75	70	70
At full work capacity										
Number of strokes	1/min	42	40	36	36	36	36	36	30	30

SERVO-TORQUEMOTOR MS

Pressing forces		4,000 kN	5,000 kN	6,300 kN	8,000 kN	10,000 kN	12,500 kN	16,000 kN	20,000 kN	25,000 kN
Work capacity	kNm	80	100	126	160	200	250	320	400	500
Connected load MSE*	kW	235	300	300	300	380	300	-	-	-
Connected load MSK*	kW	235	300	300	380	380	380	380	380	-
Connected load MSQ*	kW	160	235	235	300	300	300	300	300	300
At reduced work capacity										
Number of strokes	1/min	70	65	65	60	46	35	25	24	20
At full work capacity										
Number of strokes	1/min	48	48	48	45	30	21	18	17	13

The complex calculation of servo drives only permits qualitative figures for comparion of systems in above table. Kindly inquire a pinpointed configuration.

* with energy management, at MSQ only in combination with bed width II.

HYDRO MOTOR MH

Pressing forces		4,000 kN	5,000 kN	6,300 kN	8,000 kN	10,000 kN	12,500 kN	16,000 kN	20,000 kN	25,000 kN
Work capacity	kNm	80	100	126	160	200	250	320	400	-
Connected load MHE	kW	155	187	235	275	275	235	215	215	-
Connected load MHK	kW	135	165	207	235	235	207	187	187	-
Connected load MHQ	kW	120	135	165	207	235	235	207	187	-
At short strokes under load										
Number of strokes	1/min	30	28	24	24	18	13	11	8	-

VALVE TECHNIQUE HV

Pressing forces		4,000 kN	5,000 kN	6,300 kN	8,000 kN	10,000 kN	12,500 kN	16,000 kN	20,000 kN	25,000 kN
Connected load HVS/D	kW	90	110	132	160	200	264	320	400	600
With 20 mm stroke under load at reduced slide stroke										
Number of strokes	1/min	20	20	20	20	20	20	20	20	20
With 100 mm stroke under load at 400 mm slide stroke										
Number of strokes	1/min	10	10	10	10	10	10	10	10	10
With 200 mm stroke under load at 400 mm slide stroke										
Number of strokes	1/min	7	7	7	7	7	7	7	7	7

KINEMATICS OF THE MECHANICAL PRESSES M_E, M_Q AND M_K

Pressing forces		4,000 kN	5,000 kN	6,300 kN	8,000 kN	10,000 kN	12,500 kN	16,000 kN	20,000 kN	25,000 kN
Slide adjustment	mm	250	250	250	250	250	250	250	250	250
Slide stroke M_E, M_Q	mm	400	400	400	400	500	500	500	500	500
Slide stroke I M_K	mm	400	400	400	400	400	400	400	400	400
Slide stroke II M_K *	mm	255	255	255	255	255	255	255	255	255

* Through optional stroke adjustment with two staggered strokes.

PATH-SPECIFIC PRESSES

Mechanical presses are path-specific presses, i.e. they take the force from the column elongation and thus always at the same bottom dead centre BDC at fixed slide stroke.

ECCENTRIC MSE, MKE AND MHE

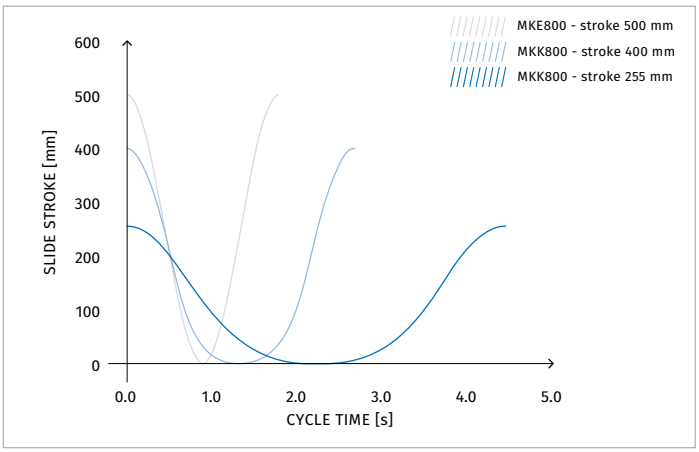
The eccentric press is the classical press for cutting tasks and simple drawing processes with non-critical drawing speed. The kinematics are symmetric and therefore suitable for the pendulum stroke in combination with a servo-torque motor. In modular build, the connection patterns of the single-stage planetary gears are coordinated with each other so that the eccentric piece can be driven either by a compact drive, a servo-torque motor or a hydro motor.

SYMMETRIC KNUCKLE JOINT MSK, MKK AND MHK

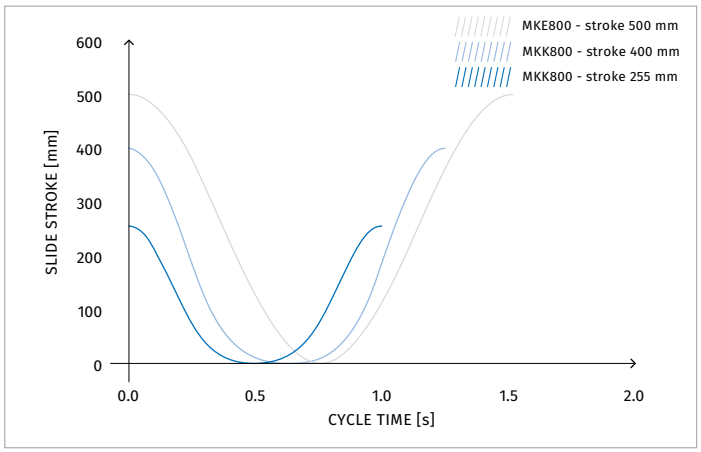
The patented symmetric knuckle joint of the modular presses by Georg Maschinentechnik is an outstanding example of German engineering art. The central eccentric shaft drives two aligned in parallel and running in opposite directions thrust cranks and thus implements a powerful knuckle joint drive that, like the eccentric press for sheet metal applications, has a central transverse shaft. The knuckle joint reduces the required drive torques of the motors as compared to those of the eccentric press. Nevertheless, these drives are reduced to the connection pattern and torque and thus built modularly via the versions of the kinematics. Thus, Georg also delivers a compact drive, a servo-torque motor or a hydro motor in the knuckle joint press.

ENERGY CONSERVATION

Georg Maschinentechnik offers many different drive versions. This includes the hydraulic servo direct drive and the servo-torque motor. The figures illustrate further great energy savings potentials, i.e. the proper choice of kinematics depending on the opposing benefits in cycle time for optimisation either regarding the automation window or the forming speed.



Same automation window



Consistent forming speed

KINEMATICS OF HYDRAULIC PRESSES HVS AND HVD

Pressing forces		4,000 kN	5,000 kN	6,300 kN	8,000 kN	10,000 kN	12,500 kN	16,000 kN	20,000 kN	25,000 kN
Slide stroke nominal	mm	500	500	500	500	600	600	600	600	600

FORCE-BOUND PRESSES

The hydraulic press is a force-bound press, i.e. it builds the required pressing force in every programmable position of the slide stroke. The drawing speed is according to the installed hydraulic capacity of the pumps with the filling valve then closed.

HYDRAULIC KINEMATICS HVS, HVD

The hydraulic press has one unbeatable benefit over the mechanical press: at same dimensions and same pressing force, the cost efficiency of the press is roughly in proportion to it's slower speed.

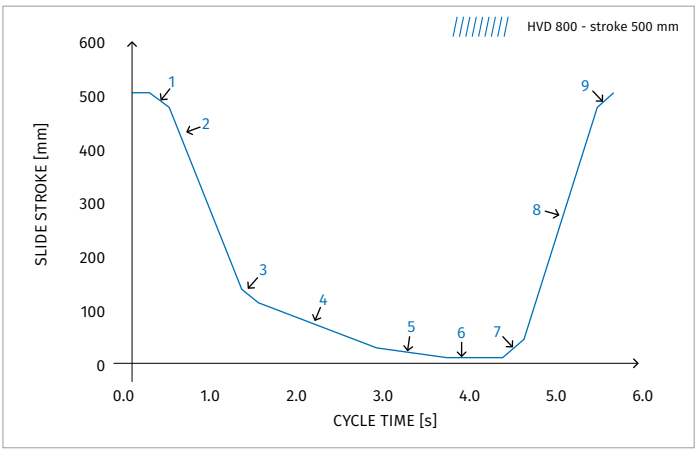
Thus, a hydraulic press is very well suited to customers looking for a flexible press where the focus is neither on a high drawing speed nor on high output, or where the output is not determined by the cycle time of the press.

In the design of modular hydraulic presses, we considered both the experience gained from our own designs and the tasks from the retrofit of third-party brands. This includes design of the cylinder lids, sealing sets and their importance for disassembly of the slide through the column opening. The structured build and accessibility of all hydraulic components is a feature of the presses of Georg Maschinentechnik. Maintenance-compatibility is above the minimal space demand or industrial design.

We use only components from renowned suppliers that also enable global spare parts supply. Minimisation of pipes and the required compliance with safety provisions lead to the preferred design of hydraulic presses with the pump unit on a frame with the press or at the crown of the press.

ENERGY CONSERVATION

Energy saving is a subject that is discussed in particular in connection with hydraulic presses. Hydraulics have seen improvements in or new developments of many elements in the last few decades, such as direct drives via classical pumps and use of cartridge valves. These classical measures are, of course, part of our hydraulic presses. We use the recently developed servo direct drive as an energy-saving version following an individual consultation.



Cycle of a hydraulic press

1 / Acceleration
2 / Fast lowering
3 / Braking
4 / Presses with 25 – 50 % FMAX
5 / Presses with FMAX
6 / Holding / relieving pressure
7 / Acceleration
8 / Reversing
9 / Braking

PLATE DESIGNS P

A classical plate press is characterised by a chain of several steel plates performing a large cross-section surface in the force direction. Therefore, it is not surprising that this design principle is particularly associated with hydraulic presses with high forming forces and/or without any access from the frame side being required.

The plate has also been introduced and tested as front and back sheet in the designs of related machines. We have transferred this design principle to press manufacture and created a smart, multi-part build that combines the benefits of the double column with tie rods with the costs of a monobloc – optimising the column passage for sheet metal application to the maximum range or parts width in build P.

In this design, the plates essentially guide the slide with the forces acting in the direction of the long measurement and prevent bulging of the plate.

PLATE BUILD, PRE-STRESSED V

In particular in solid forming or with parts being narrow proportionate to the table size, or generally if a lateral column passage is not required, the pre-stressed plate press V is even closer to the properties under load of the double column press with tie rods than the build P. Not only does it have multiple parts, it can also be pre-stressed due to the one-piece side sheets.

DOUBLE COLUMN, MONOBLOC M

This classic among press frames still completes the frame designs as a cost-efficient alternative. This frame design is used at up to 10,000 kN pressing force and and up to a height of the frame of 6 m.

DOUBLE COLUMN, TIE RODS Z

The larger the press and the higher the pressing force, the more important are the benefits of the double column press regarding transport and production procedures. This not last affects the size of the required annealing furnaces. All load-bearing welding constructions by Georg are annealed and the annealing charts are part of the documentation and therefore proof of an excellent supply chain.

As an alternative to the energy pillar, the double-column press is supplied with media supply conventionally in the H-columns that will also hold any required slide weight balance cylinders.

Pressing forces		4,000 kN	5,000 kN	6,300 kN	8,000 kN	10,000 kN	12,500 kN	16,000 kN	20,000 kN	25,000 kN
Frame P, M, V, Z										
Bed width I	mm	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200
Column passage I*	mm	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150
Bed width II	mm	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Column passage II*	mm	3,450	3,450	3,450	3,450	3,450	3,450	3,450	3,450	3,450
Bed height above floor	mm	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080
Pess depth below floor	mm	0	0	0	0	200	200	200	350	350
Frame P, M not pre-stressed										
Bed depth**	mm	1,600	1,600	1,600	1,600	1,850	1,850	1,850	2,000	2,000
Lateral column passage	mm	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Frame V, Z pre-stressed										
Bed depth**	mm	1,600	1,600	1,600	1,600	1,850	1,850	1,850	2,000	2,000
Lateral column passage	mm	900	900	900	900	900	900	900	900	900
Frame P, V										
Total width I	mm	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500
Total width II	mm	5,800	5,800	5,800	5,800	5,800	5,800	5,800	5,800	5,800
Bed depth, MK, HV	mm	3,500	3,500	3,600	3,600	3,600	3,600	3,700	3,700	3,700
Bed depth, MS	mm	3,400	3,400	4,350	4,350	4,350	4,350	4,440	4,440	4,440
Bed depth, MH***	mm	2,900	2,900	3,050	3,250	3,250	3,400	3,700	3,850	-
Frame M, Z										
Total width I	mm	3,100	3,100	3,200	3,200	3,300	3,400	3,400	3,600	3,600
Total width II	mm	4,400	4,400	4,500	4,500	4,600	4,700	4,700	4,900	4,900
Bed depth, MK, HV	mm	3,800	3,800	3,900	3,900	3,900	3,900	4,000	4,000	4,000
Bed depth, MS	mm	3,700	3,700	4,650	4,650	4,650	4,650	4,740	4,740	4,740
Bed depth, MH***	mm	3,200	3,200	3,350	3,550	3,550	3,700	4,000	4,150	-
Drive M_K										
Die shut height	mm	880	880	880	880	1,080	1,080	1,080	1,280	1,280
Press height	mm	6,300	6,300	6,300	6,300	6,700	6,700	6,700	7,100	7,100
Drive M_E/Q										
Die shut height	mm	880	880	880	880	1,080	1,080	1,080	1,280	1,280
Press height	mm	6,400	6,400	6,400	6,400	6,800	6,800	6,800	7,200	7,200
Drive H_D										
Die shut height	mm	1,080	1,080	1,080	1,080	1,280	1,280	1,280	1,280	1,280
Press height	mm	6,400	6,400	6,400	6,800	7,800	7,800	8,000	8,200	8,200
Drive H_S										
Die shut height	mm	1,080	1,080	1,080	1,080	1,280	1,280	1,280	1,280	1,280
Press height	mm	6,600	6,600	6,600	7,000	8,000	8,000	8,200	8,400	8,500

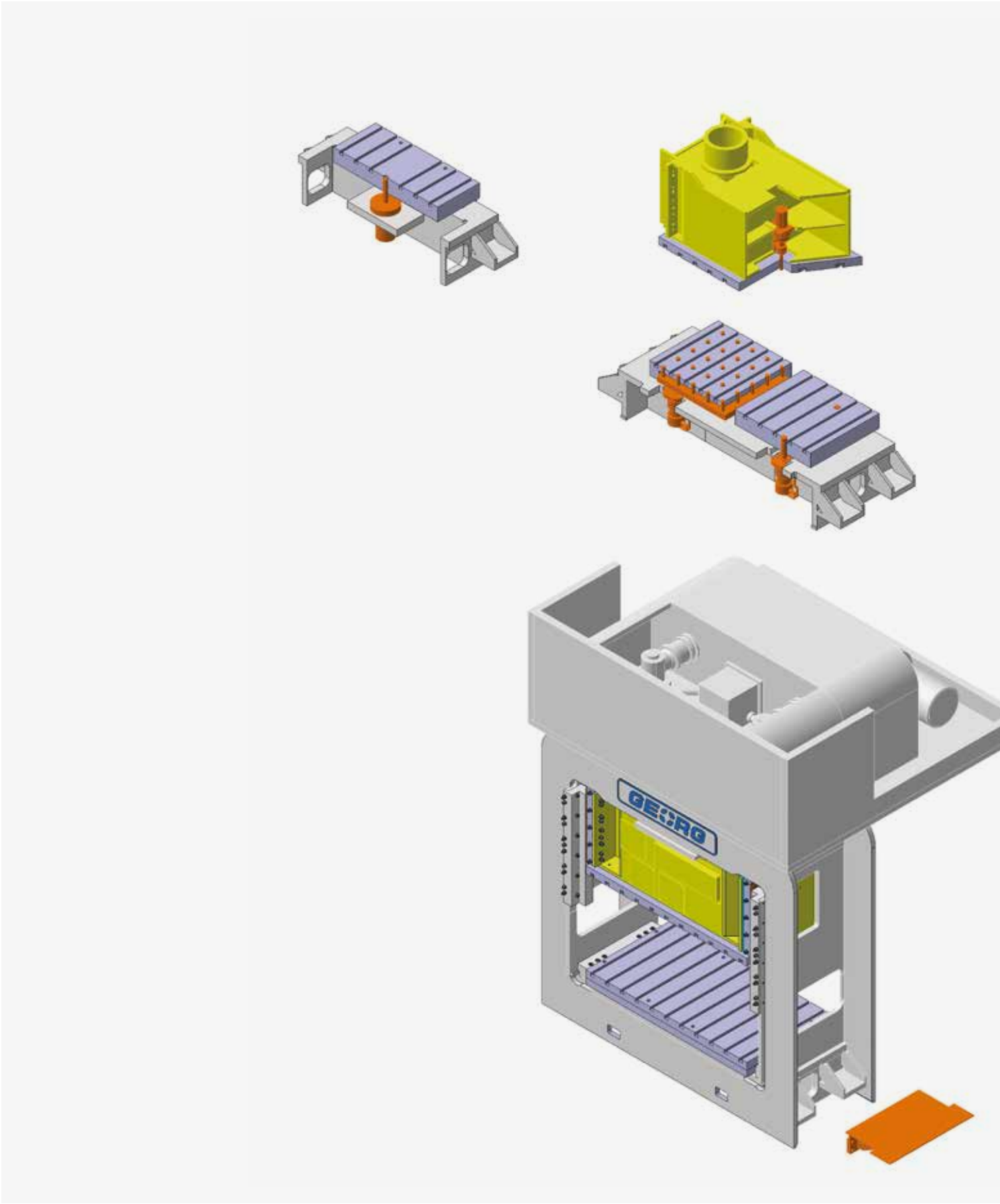
The die shut height of mechanical presses is indicated with slide adjustment up, slide in the bottom dead centre BDC. The design can be adjusted. The press height will then change by the same value.

* Column passage is indicated between the oil trays below the slide guide.

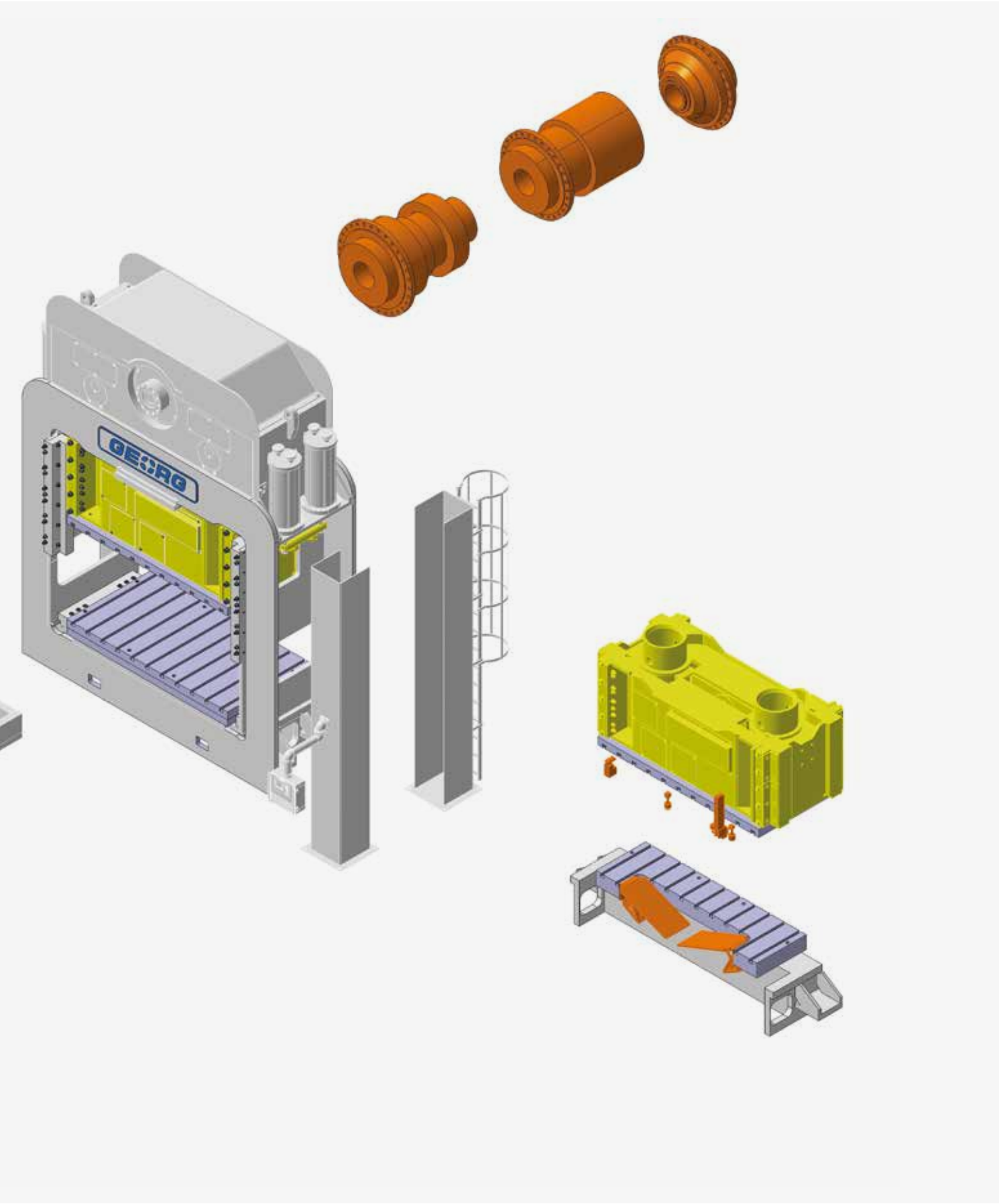
** The bed depth is measured up to the outer edge of the plates.

*** Values excluding the hydraulic unit.

MODULARITY



Not shown: Frame options, die change options, kinematics options, bed width options, slide guide options, positioning options.


GEORG

Because the modules of modular presses can by themselves be rather abstract, we are giving some suggestions for the versions here, in relation to customer products. When we give advice, the customer always takes centre stage and we do not need the advice be influenced by our own interests, because we can offer hydraulic presses as well as mechanical presses, each with the typical options for forming technology.

SHEET METAL FORMING

Use for medium transfer parts: HVD800 – 3,500 × 1,600 – P

A transfer press requires a high stroke, since part transport takes place by means of a transfer that must dive into the die area at every stroke and also leave it again before the slide closes the die. In case of mechanical presses the time is not sufficient to complete automation, the set stroke number must be adjusted to the required duration of the automation. In combination with the desire to be able to stop the process cost-efficiently to perform joining operations or rolling in of threads, a classical hydraulic press is a suitable alternative to the servo press.

Use for progressive die parts: MSK630 – 3,500 × 1,600 – P

Progressive die parts are essentially characterised by comparably low heights and transport of parts being performed by the sheet metal strip. Therefore, these presses have lower slide strokes than transfer presses. We recommend our knuckle joint press for this, which has a symmetric knuckle joint and can thus swing in combination with the servo-torque motor drive. Pendulum operation is the efficient manner of operating a progressive die press, since the best pendulum height can be determined for each part. Alternatively, the MKK with stroke adjustment would be an option worth considering. This press has two fixed slide strokes and a classical flywheel drive as part of a compact drive. This solution is particularly interesting for customers who manufacture either transfer parts or progressive die parts, but cannot fully utilise the maximum efficiency of a servo press.

SOLID FORMING

Use for pre-forming forged parts: HVS800 – 2,200 × 1,600 – M

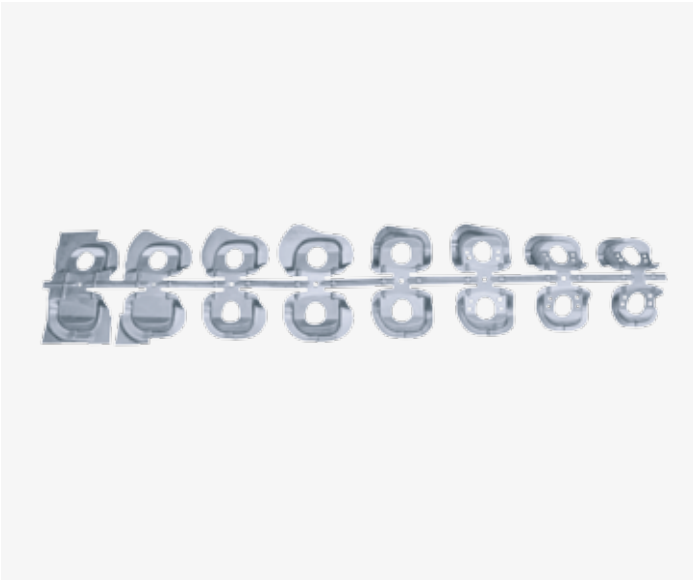
The blank is placed manually by using tongs, or it is automated. In either case, the stroke of a preforming press is comparatively long and the working length as well under load. For that reason, at first glance, our recommendation is to use a hydraulic press. The required slide parallelism is of secondary importance and the table is smaller than usual for sheet metal forming, therefore one cylinder will often be sufficient. The requirements to elongation of the press frame are not much, therefore a monobloc will be suitable for a preforming press. However, a preforming press makes great demands in terms of speed, because the permissible cooling of the workpiece as well as the need for contact to last for as short a time as possible in order to prevent excessive wear of the dies, require high hydraulic installed capacity.

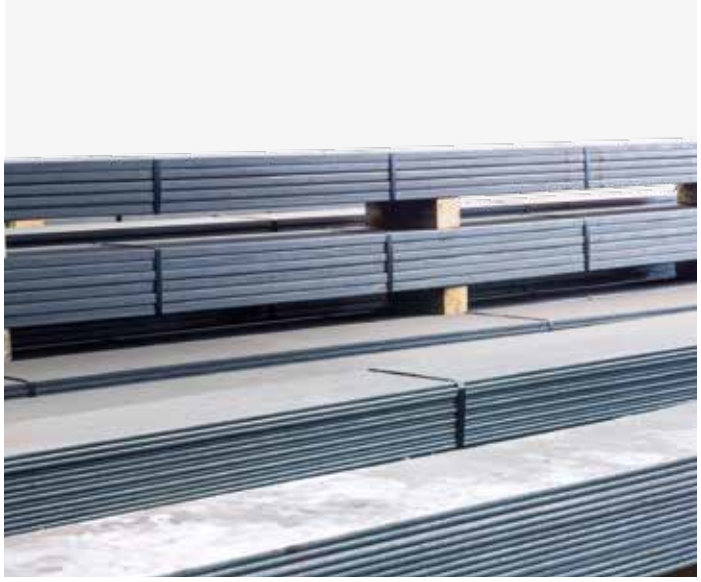
Use for forming forge components: MKE2500 – 2,200 × 2,000 – Z

The work capacity of a drop-forge press is very high. Typically, the application profiles allow for fast, uninterrupted processing, which is why we recommend a compact drive as the main drive in the case of a drop-forge press, in other words, our MKE. The MKE does then often have a multi-part frame with tie rods, because the column passage for pre-stressed plate building is a little narrower, which makes automation through lateral columns harder.

Use for deburring forged parts: MKE630 – 2,200 × 1,600 – Z

The deburring press removes the lateral edge of the workpiece that occurs at the parting line of the die. Typically, it is a crank press. Other than in the case of a preforming press, the requirements in terms of slide parallelism are higher, which is why a deburring press has two pressure points. The process is similar to cutting with a comparatively high working stroke. Because of the cutting shock, pre-stressed build is preferable. Other than what is common when pre-forming, transverse forces occur during deburring, because the forged contours are not necessarily symmetrical. On the other hand, the stroke lengths and the forces are not as large as with pre-forming.





Because it is holding the die, the press table is essentially the interface between press and die. The standardised sagging of the table to permit friction-free moving of the tool is just one of the many aspects. Scrap removal, ejector resp. die cushion as well as the positions of the T-slots and the die clamping do significantly determine the design.

CONSTRUCTIONAL DESIGN OF THE TABLE

The press table by Georg Maschinentechnik is consistently built in a modular fashion. Our engineers have created space for many different options in the press table:

1/ Scrap removal

2/ Ejectors

3/ Die cushions

Within specific limits, the options can be positioned freely without any design changes. As in all considerations, we have paid attention to flexibility in retrofitting as well as accessibility in case of maintenance. All options are installed into the table below the actual table plate from above. Accessibility for small maintenance jobs is via maintenance access points in the subdesign.

Typical options in press manufacture that are set up above the table plate are

1/ cutting impact dampening in case of a mechanical press that is to dampen impact in the kinematics when the material tears off, and

2/ parallel holding device in case of a hydraulic press is to counter inclination of the slide in the bottom dead centre due to tilting in the cylinder seals.

TABLE EJECTOR

The ejector is a classical option that is used for lifting a part into a position where it can be easily removed or transported on. We have designed our ejectors so that they are resilient against dust and scale as found in forges for example.

DIE CUSHION

A die cushion supports the single-acting drawing process from above. The slide pushes elements of the bottom die during the drawing process. Alternatively, the elements are actively pulled back. We also permit the function of active withdrawal in the bottom dead centre that reduces or entirely prevents impact of the part with the upper die due to a springing back of the material when moving up the slide. The modular press by Georg Maschinentechnik permits a maximum cushion force of 1,800 kN with a total of four cylinders. Alternatively, a pressure box at the centre of the table with up to 350 mm width or a pin plate integrated into the table plate with reduced stroke but covering nearly the complete table width for use of drawing pins is possible.

As for the slide, special designs within the range of feasibility are, of course, an important part of our customer-oriented consulting and implementation.

SHEET METAL SCRAP REMOVAL

In the sheet metal field scrap removal from two-point presses typically takes place via:

1 / The centre of the press tables

2 / A scrap slide of the die outwards front or back of the frame

In either case, scrap removal itself away from the press also plays a decisive role in a scrap concept. In case of small scrap volumes, a container placed before or behind the press may be beneficial. Access the protected area of the press for emptying of the container is detrimental. Alternatively, the container can be placed outside of the protected area, which usually requires an intermediate conveyor belt.

Removal of the scrap below the machine is more elegant, but connected to foundation costs. This is particularly sensible in pressing shops with a continuous press pit and where the individual presses are arranged so that a long scrap belt runs below many presses.

If scrap is removed through the table, Georg Maschinentechnik offers optional scrap flaps that can also be loaded when closed by a knuckle joint. This is particularly helpful for die makers and servicing staff if working at the upper die or the slide with the bottom die removed.

One special form of scrap removal in the sheet metal area is the handling of stamping grids. They are usually either

1 / chopped on the outlet side or

2 / coiled on the outlet side.

SOLID SCRAP REMOVAL

In the field of solid forming scrap removal from of two-point presses typically takes place via:

1 / Handling of parts too cold

2 / Handling of parts too warm

3 / Removal of the burr after deburring

Items 1 and 2 take place before inserting the work piece in the press.

For parts handling in the hot area, design of the scrap removal parts, in particular the slopes is important to prevent hot workpieces from sticking.

SLIDE DESIGN

The slide has the task of closing the die and opening it again. The slide is guided at the frame. The slide guide is positioned as far outwards as possible to achieve the smallest tipping angle at the same inclination. The die guide usually takes over accuracy guidance.

For the classical mechanical press, the slide is connected to a slide counter balance that is typically made up of large pneumatic cylinders and designed for a line pressure of 5.5 bar.

The slides of the modular presses of Georg Maschinentechnik are identical for mechanical and hydraulic presses – also with reference to the slide guides, which are available in three versions:

1 / 8-fold guide as the most frequently used guide in forming technology

2 / Prism guide for the hot applications

3 / Roll guide for stamping or cutting operations with a high cut-to-break ratio, e.g. in Tailor Welded Blanks.

SLIDE EJECTOR

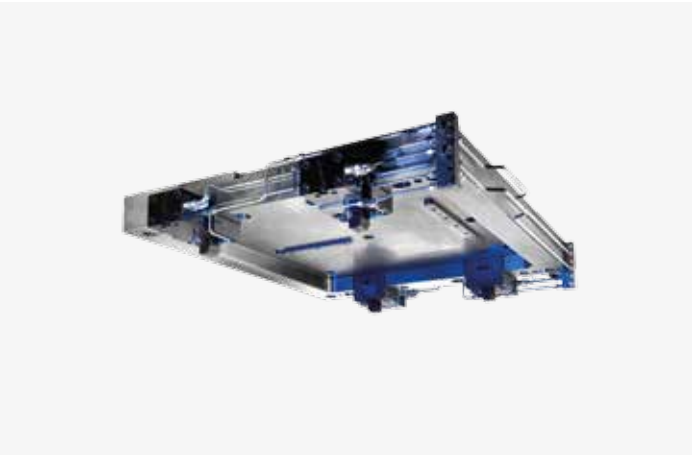
The modular presses by Georg Maschinentechnik consider installation of an optional ejector in the slide.

A slide cushion is not designwise foreseen as an option, but is technically feasible in the scope of a special-purpose design.

SLIDE CLAMPS

Customer-specific slide clamps may also be connected to the usually customer-specific T-slots pattern in the slide plate. They differ as to the type of positioning in the T-slots, as well as regarding the effective principle when clamping.

Therefore, Georg Maschinentechnik flexibly meets all feasible customer requirements with a screwed-on slide plate without any comprehensive adjustment structures.



DIE CLAMP

There are many die clamp systems. They are justified due to the history of a press shop, the personal preferences of the decision-makers and the frequency of die changes. Different degrees of automation of die clamping are often found at the table and the slide, through this is rather the case for presses with a moving bolster, which permit screwing on of the bottom die before starting the die change. The slide clamps are then often automated, since time for clamping is part of the downtime of the press.

The T-slots patterns are similarly diverse. Certain versions have become established as standard:

1 / T-slots at the centre or alternatively to the left or right of the centre – in total with a centre distance of 300 mm. This distance results from the often-required space for drawing pins.

2 / Continuous grooves, or alternatively, offset from the outside up to the minimum width of dies. The latter form is particularly used for scrap openings in the table, or ejectors installed from the table top.

SPECIAL CLAMPING PLATES

Dies also must be centred before clamping. Conventionally, this is done by keys, extensible centring bolts or stops of all kinds. We implement this important interface, which is consistent throughout the customer's factory, together with our customers. The design can even lead to the creation of special plates that comprise the functions of base plate, centering and die clamping.

DIE SET AREA

Since we understand the diversity of table and slide areas, as well as for reasons of maintenance compatibility, the table of the modular press series by Georg Maschinentechnik is supplied with screwed-on table plates. The standard table plate of the presses for sheet metal processing is 260 mm high, that for solid forming is 160 mm high. The height difference can be explained by the guide length of possibly drawing pins used and the protection plate that is often used in solid forming. Therefore, the die shut height is the same in both applications according to the catalogue dimensions. Of course, adjustment of the die shut height to the customer's requirement is possible and easy to implement.

DIE CHANGE

In practica supply and removal of the dies is implemented differently from customer to customer in practice. Historically, but also dependent on the die size and die weight, as well as factory logistics, we differentiate according to:

// Die change consoles

// Die change trolleys

// Moving bolsters (in designs front/back and unilateral T-arrangements)

// Wheeled lifts (operated and driverless)

Together with our customers, we develop the optimal solution for this important logistics interface in the project planning phase.

Moving the parts through the press, essentially by means of “pick and place” automation or through coil lines, determines the mechanical and electric interface to the press base. Customer products on the basis of their geometry and mass mainly determine the automation window and, therefore, usually also the output.

PROJECT PLANNING NOTES

Several things are taken into account when "Pick and Place" automation is connected to the press:

1 / Is it a feeder automation, a robot or a transfer? It is also now common to attach robots upside-down to a gantry in order to clear floor space. It will be exciting to watch whether collaborating robots are used in a wide range at presses.

2 / Is it the only automation at the press, or is, e.g., unwinding alternatively performed from a coil? In this case, permanent fixing to the floor is not possible, unless the coil line can be moved under the gantry.

3 / The combination of coil line and transfer is of practical relevance as well. In such cases, a cut-to-length shear upstream of the press or a shear in station 1 cuts the strip. Therefore, it is not always certain that the standardised attachment of the clamping boxes if transfer units at presses by Georg Maschinentechnik is sufficient. It might require special-purpose designing to achieve the flexible but elaborate combination of coil line and transfer.

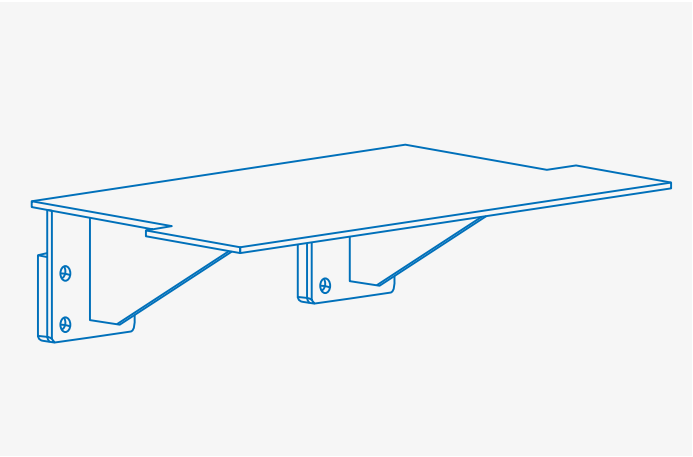
4 / Is additional automation movement conducted, besides part handling, such as lubrication, die temperature reglation or processing of a stamping grid? Eventually at the end of the planning phase all sides of a press may be occupied.

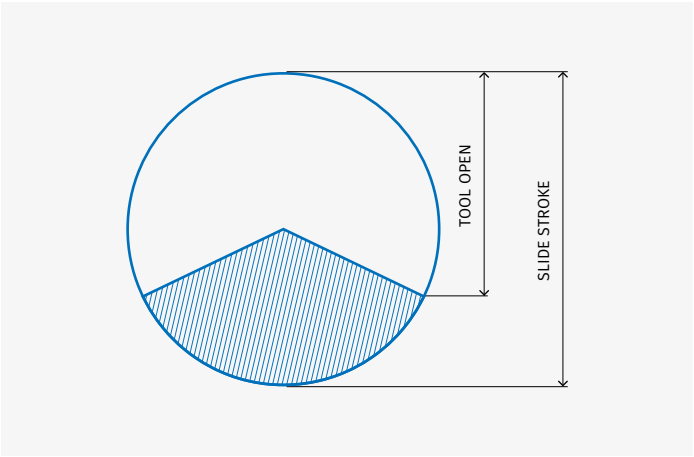
ELECTRICAL INTERFACE

In addition to the mechanical connection of the "Pick and Place" automation, the electrical connection can in practice also can be done in two different ways:

1 / Hardware interface: The automation and the press control exchange emergency signals and fault messages or the corresponding release signals, such as the free crank angle of a mechanical press and "position reached" signals wired to terminal. The press also often forwards the recipe number to the automation, to make changing over to a new product easier. Queries for the die number and gripper number and reconciliation of these with each other then is relevant as well.

2 / Full integration of both control contents in one PLC. This is usually relevant for a supplier when procuring a press and an automation as one new machine in a project. The architecture of these combined control units covers everything from a central operating panel to networked multiple-screen systems at the corresponding length of a production line or complex setup processes, or alternatively single mode by two-hand operation.





PROJECT PLANNING NOTES

Several things are taken into account when a coil line is connected to presses:

1 / Is the roll feed attached to the bottom or to the press by a console? Note that the feed straightening machine is typically not attached to the console for reasons of weight.

2 / Is it the only automation at the press, or is, e.g., the material taken alternatively from a stack? This case basically requires a fixed bolting to the floor.

3 / Are there variable die heights that should be aligned to a uniform height by different plates? If so, the roll feed must be accordingly adjustable in height, but the slide adjustment should also be about twice as high as the height adjustment of the roll feed (assuming a symmetrical separating level of the die).

Typically, a roll feed will be attached to the press table by a console if the press setup is on dampers. The background to this is that search pins, or insertion guides, or cut lengths of a virtually standing band or part may lead to positioning inaccuracies in proportion to swaying of a press, which can influence part quality.

FLEXIBILITY

For reasons of flexibility, the bolt-on surfaces for the console of a roll feed are considered in the standard as well, and prepared for individual attachment after mobile machining.

MECHANICAL INTERFACE

In addition to the mechanical interlink of a coil line, the electrical connection can, in practice, also be done in two different ways:

1 / Hardware interface: the coil line and the press control exchange emergency signals and fault messages or the corresponding release signals, such as the free crank angle of a mechanical press and "position reached" signals wired to terminal. The press also often forwards the recipe number to the coil line, to make change to a new product easier.

2 / Full integration of both control contents in one PLC. This is usually relevant for a supplier when procuring a press and a coil line as one new machine in a project. The architecture of these combined control units covers everything from a central operating panel to networked multiple-screen systems at the corresponding length of a production line or complex setup processes, or alternatively, single stroke by two-hand operation.

FREE CRANK ANGLE

The free crank angle is an important projecting aspect that applies to mechanical presses. Only when the press is "free" automation can dive into the die area without collision. Typical values are 270° for a stamping or cutting process and, e.g., 180° for a deep-drawing process.

Siemens has been the strategic partner of Georg Maschinentechnik for decades. Hardware and software that can be internationally serviced by our customers as well ensure best plant availability and customer satisfaction in an intercultural environment and global time zones.

SYSTEM PLATFORM

Based on the Siemens-S7-1500-TF modules, we implement safe presses and cell solutions. High-performance servo drives with synchronous/asynchronous motors or a torque motor are part of our drive landscape via Profinet and IO-link. Our customers profit from our internal control cabinet manufacturing. This enables us to efficiently adjust to the individual electrical execution provisions of our customers. They include:

- Component selection
- Wiring provisions
- Free spaces in the control cabinet
- Execution of the minor devices

Project planning is implemented with certified safety components that correspond to safety class SIL3 according to EN 62061 or according to EPL e EN ISO 13849-1. PC controlled units are also possible on the customer's requirement. Project planning guideline:

- Creation of the control software in the Siemens TIA Portal, Step 7
- Visualisation in the TIA Portal with WinCC taking efficient and well-structured operation into account
- Programming languages according to IEC 1131-5, Structured Text (ST), function plan (FUP), command list (AWL)
- Connection to master control systems

SAVING ENERGY AND EMC

We look at the energy requirements of a press in project planning in an integrated fashion, i.e. including losses in the interim circuit of a servo press and losses in the secondary flow of a hydraulic press. The strict separation of power lines and signal lines leads to an elaborate but operationally safe cable routing at our machines.

VISUALISATION

The visualisation of Georg Maschinentechnik has a consistent header comprising logo areas for the customer logo and the "O" of Georg, clock and user/alarm field. The screen headline is centred between these.

The middle part typically contains the following objects:

- Step chains
- Status screens
- Process screens
- Error messages

The scripts are displayed in a two-line arrangement at the bottom. In accordance with our general philosophy we do, of course, consider the requirements of our customers.

CONVENTIONAL NON-INTERLINKED AUTOMATION

Georg Maschinentechnik specifically implements complete plants for customers from the ball cage and steel wheel industry, which requires linking of individual process steps. To differentiate from this, the typical solutions in the press shop are marked by automation front and back of the press within an otherwise closed cell.

The formerly separate machine control units near the machine and the master control units outside of the protected area increasingly merge into a single control unit outside the safety area that only performs setup functions at the machines.

This trend is supported by the process know-how of Georg Maschinentechnik that has grown over decades and the possibility of integrating machines wired to terminals outside one's own value creation.

We supply the complete range of automation in a cell solution based on this:

- // Coil lines upstream of progressive die presses
- // Stacking and de-stacking plants at transfer presses
- // Transfer systems for transport in the press
- // Manipulators in the hot area
- // Lubrication systems for dies and parts
- // Gantries for handling in the cell
- // Robot solutions for loading and unloading or for handling in a cell
- // Die change devices

INDUSTRY 4.0 / INTERNET OF THINGS IOT

Where there are existing structures and where an MES in the press shop may be missing, the start into digitisation via a usable function on site ("Edge") may be of benefit. Based on this insight, we have developed the Edge Data Analyzer EDA.

The concept of the solution for digitisation of press shops by Georg Maschinentechnik takes particular account of the durability of top class presses like those produced by Georg Maschinentechnik. Therefore, both analogue and digital signals with different protocols of several generations of control units are the basis for digitisation by Georg.

The largest part of the analysis (static or neuronal) takes place locally and in a fail-safe manner. Communication is the important module of the cyber-physical systems. It takes place, e.g., via XML interfaces that must be adjusted individually for further integration into superordinate systems. The data are displayed as a quick overview at the EDA and as fully functional display in HTML5 format either on the screen of the press (HMI) or on external equipment.

The EDA is not competing with superordinate systems such as SCADA, MES or ERP. The EDA rather prepares the data of any press of any brand or age with specific knowledge programmed by a press manufacturer, develops forecasts already at the machine and displays them. The EDA is particularly beneficial for medium-sized press shop operators who are looking for initial experience and use in the area of Industry 4.0 / Internet of Things IoT.

Since it often happens that the influences of vibrations when operating a press are underestimated, and in order to prevent major alterations in case of machine relocations, our modular presses are designed so that the base of the press table optionally allows for dampening as is common on the market, also this can be retrofitted.

HARD SETUP

The hard setup of a press has the following essential benefits:

1/ Connection of peripherals to the press via the rigid foundation

2/ No outlay for dampening elements is necessary

DAMPENED SETUP

The dampened setup is essentially chosen if the environment requires this, e.g. for reasons of noise protection, if the vibrations influence surrounding machines (e.g. measuring machines or grinding machines) or when setting up the press in a mixed-use neighbourhood, where the residents rights need to be considered.

ENERGY AND MEDIA SUPPLY

The machine setup is not only influenced by the decision of dampened/hard, but also by the consideration of whether there is space around the machine. This may be limited due to:

// Die change

// Part automation

// Hall supports

// Crane shadow

// Factory logistics

// Maintenance accesses

// Media supply in factory

// Removal of large parts from surrounding machines

// Proximity to the control cabinet platform

Specifically the position of the hydraulic units and/or lubrication units should be as flexible as possible. Optionally, Georg Maschinentechnik therefore offers an energy pillar that permits free positioning, in particular in combination with the press frame in plate design.

EN 2016/10

GEORG
Maschinentechnik

Phone: +49 (2681) 804-0
Fax: +49 (2681) 804-150
Email: info@georg-maschinentechnik.de
Web: www.georg-maschinentechnik.de

Georg Maschinentechnik GmbH & Co. KG | Rheinstrasse 18 | 57638 Neitersen | Germany