MacroPower Series – The new benchmark for large machines

Technology working for you.

MacroPower 400 – 1100 t
MacroPower Series – The new benchmark for large machines

The new, powerful large machine model of the PowerSeries with clamping forces ranging from 400 to 1,100 t.

The promise: compact, modular, precise. Newly developed in the 400 to 1,100 t clamping force range, the MacroPower stands for ultimate precision, shortest footprint, high speed and modularity. With a comprehensive package of options and configuration variants, the MacroPower lends itself to a great variety of applications. The new MacroPower shows true greatness.

Clamping system
Diagonally positioned high-speed traveling cylinders and 4 pressure boxes on the fixed platen provide quick, even clamping force build-up. High rigidity and stability is achieved by short tie bars and FEM-optimized platen design.

Linear guides
Thanks to moving platen support via precise, smooth-running linear guides, no adjustments are necessary for heavy molds and highly sensitive mold protection is ensured. Lubrication expense is minimized.

Constant L/D ratio
22 : 1 and 2,000 bar injection pressure with medium screw diameter optimize melt homogeneity. High plasticizing performance is reached through a direct screw drive via hydro motors, or servo motors as an option.

Locking system
“Quick Lock”
The locking of the bolts is integrated into the strike plate. As a result the bolts are shorter. Synchronous activation foster short locking times. Opening of the locking system takes place during cooling time.
Energy-efficient DFEE drive
The flexible drive concept, based on electrically adjustable DFEE delivery pumps, enables dynamic movements and short cycle times. Parallel movements and higher injection performance can easily be achieved with an optional twin pump system.

Flexible safety gate
At the rear, the top side of the safety guard has been lowered to the upper edge of the tie bar to facilitate parts removal by a robot. The extremely generous opening way of the rearward safety gate is a further facilitation to insert the mold. This enable molds to be mounted from the side via the bolt-free area.

ServoPower
The optional use of an electrically adjustable pump with a speed-controlled servo motor drive permits operation which saves a great deal of energy.
The outstanding features of the new MacroPower:

- Extremely short footprint.
- High rigidity and stability thanks to short tie bars and FEM-optimized platens.
- Synchronized locking of tie bar nuts completely integrated in moving platen.
- Low-maintenance linear guides to support moving platen.
- Clean mold space.
- Precise platen parallelism over the entire stroke.
- High opening and closing speeds through differential control system.
- Short dry cycle times.
- Easy mold insertion and high mold weights.
- Sensitive mold safety system thanks to extremely smooth-running platen guides.
- Mold protection through minimization of platen deflection.
- Low-maintenance and service-friendly design of all components.
- Low energy consumption.

Mold insertion

Thanks to the short tie bars, it is possible to insert large molds from the rear even in halls with low ceilings. The free space between the end of the tie bars and the moving platen, and a safety gate with a wide opening make this possible.
Plasticizing systems for injection molding machines must fulfill many different requirements. By applying a universal L/D ratio of 22 : 1 and an injection pressure of 2,000 bar with medium-diameter screws, the processing window has been optimized to meet rising quality standards.

**A concept for improved parts quality**
- Optimized melt homogeneity thanks to a uniform L/D ratio of 22 : 1 and an injection pressure of 2,000 bar with medium-diameter screws.
- Linear guide systems ensure precise axial movements of the injection unit.
- Carriage cylinders positioned opposite each other provide momentum-free nozzle carriage.

**Ultimate precision and repeatability**
- Compact design with integrated hydraulic block and easy access to all components.
- Direct screw drive via low-speed hydraulic motor with optimal adaptation to individual plasticizing demands.
- Ultimate repeatability thanks to controlled servo-valve.

**Injection units for more flexibility**
- Short footprint with two pulling cylinders.
- High injection rates.
- Universal compatibility of barrels with different injection units.

**High-performance plasticizing systems**

Plasticizing systems for injection molding machines must fulfill many different requirements. By applying a universal L/D ratio of 22 : 1 to the three screw sizes available for each injection unit, the processing window has been optimized to meet rising quality standards.
The UNILOG B6 control system generation

UNILOG B6 is the name of the new control system generation that is setting benchmarks in user-friendliness, speed and precision. It is used across the entire product portfolio. A powerful system concept optimally geared to the requirements of hydraulics / sensor technology ensures fast, accurate movements along all axes of the machine. Precise analysis of all important process parameters provides the user with the control required for demanding applications.

- 15" TFT color screen with unlimited touch screen functionality for operation and display.
- 2 rows of soft keys to select machine functions.
- Manual operating panel with 48 membrane keys to operate the machine's axes and optional equipment.
- Space for 7 additional optional mechanical switches/keys.
- 10 membrane keys with luminous rings are available for the basic machine functions (drive, operation modes, heaters).
- The complete machine documentation including all operation manuals, spare parts drawings and parts lists can also be retrieved. In addition, users can integrate their own PDF files and make them available to machine operators.
- USB interfaces are available on the operating unit to connect peripheral equipment such as a printer, keyboard or USB stick, or they may be used as an access control system in combination with the integrated password system. An Ethernet interface is installed in the control cabinet at the rear.
Quality monitoring

With up to four envelope curves, the monitoring parameters are optimally adapted to the individual process.

An ideal curve serves as monitoring reference within the tolerance margin. Whenever the tolerance margin is exceeded, an alarm is triggered and the faulty part automatically sorted out.

Every parameter can be visualized via the quality table and evaluated by means of an SPC chart.

Trend diagrams

Various functions can be clearly and concisely visualized. All data processing and monitoring functions are covered by a single control system.

Open interfaces facilitate access, simplify operation and integration in customers’ networks.

Status display clamping system

Locking system:
The status of the locking system is displayed. The locking systems of tie bars 1/3 and 2/4 are interconnected mechanically and ensure a synchronic and extremely short locking time.

Pressure box:
The current position of the four pressure boxes is displayed and monitored.

Cycle time analysis

The purpose of cycle time analysis is to record and optimize all movements. It is a fast and simple method of defining the optimal cycle.

The ideal cycle is stored as part of the mold data set and can be retrieved for the next production run of the mold. This enables quick recognition and correction of any process deviations.
Integration and communication

Webcam

A webcam is integrated in the injection molding machine to visualize production monitoring. This makes it possible to display areas on the B6 control system that are normally not open to view, such as robot-assisted part deposition or the mold area.

The integrated webcam is used in particular also for Web-Service 24/7. Intelligible pictures of the problem situation on site can be transmitted to the global WITTMANN BATTENFELD support center to enable effective analysis.

Robot control

WITTMANN robots are operated simply and flexibly via the machine's monitor screen, no switch-over is necessary between machine and robot control.

The total overview is given on one screen. The control system of the robot itself is still placed directly on the robot.

Communication takes place via a CAN bus system, the EUROMAP interface remains free.

Process data acquisition via K4

WITTMANN BATTENFELD offers BATTENFELD K4, a process data acquisition software that provides access to a central database. Centralized data administration runs on a server and is also directly integrated in the UNILOG B6. Thus the plant's entire machinery can be monitored and all machine data accessed via every machine control system.

K4 provides a unique scope of functions. It not only offers machine parameter settings and quality assurance, but also maintenance records, preliminary and final costing, order-related staff work time logging and hall layout, as well as innumerable evaluation options including open item management, everything covered by and available from a single system.

Web-Service 24/7

WITTMANN BATTENFELD meets the plastics industry's demand for 24/7 availability with a global network of experts.

With the help of the web service center, experienced service engineers establish a direct link to the customer's injection molding machine via the Internet.

In this way, actual service tasks on the machines are performed quickly and flexibly, which ensures optimal productivity and conservation of value.
Large machine manufacturing has a long tradition at WITTMANN BATTENFELD. Ever since the foundation of BATTENFELD Spritzgießtechnik in 1948, large machines have been a major concern in the company’s product development. The new MacroPower series is setting new benchmarks in terms of functionality, compact design and fast mold change.

The MacroPower series offers a great number of variation options. Extremely short cycle times can be achieved with these machines, thanks to minimal locking and pressure build-up times.

Applications such as motor cycle seats or various automotive parts meet extremely stringent demands and can be manufactured with high precision to premium quality standards.

Rigid clamping plates and above all an even distribution of clamping forces are indispensable for the production of cable ties – up to 100 units per cycle are manufactured within an extremely short cycle time and in top quality.

The MacroPower series ensures precise, energy- and cost-efficient manufacturing of large, flat components, especially in the white goods industry.

The MacroPower features modular design and lends itself to a great number of customized applications with or without integrated automation technology.
Flexible drive concepts which provide maximum energy efficiency for injection molding systems: ServoPower technology enables savings of up to 35 percent to be achieved for hydraulic machines compared with conventional drives with asynchronous DC motors. Many advantages can be obtained from ServoPower technology for the user, a high level of cost effectiveness is guaranteed, and the use of this technology has practically no upper limit and is consequently extremely interesting for small and large machines.

High degree of functionality through a technically sophisticated design

In ServoPower technology the machine is driven by a highly dynamic, speed-controlled, air-cooled servo motor combined with a fixed displacement pump instead of a conventional DC motor with a constant motor speed and variable capacity pump. For larger drives (MacroPower 650 and higher) a water-cooled, speed-controlled servo motor is used in conjunction with DFEE variable capacity pumps. Under the control of the motor rotation speed, the variable capacity pumps are always operated with maximum efficiency here, or in conjunction with the pumps’ displacement volume are operated with maximum energy efficiency. During the idle times the system is shut down or completely switched off. This ideally harmonized technology permits significant energy savings of up to 35 percent compared to conventional drives.

Energy efficiency given highest priority

ServoPower = reducing energy consumption to a minimum. Not only the optimum consumption level but other advantages with regard to energy efficiency also play a role: The low energy input results in the hydraulic oil being heated less. This reduces the consumption of cooling water and consequently the associated energy consumption. At the same time less of a load is placed on the hydraulic oil, which significantly increases its service life. The noise emissions are also significantly decreased by the use of the ServoPower drive. And last but not least, decreasing the idle power because of the greater efficiency of the servo motor through its 20% enhanced power factor further reduces electricity costs.

Advantages

- Reduces the power consumption by up to 35 percent.
- Longer service life of the hydraulic oil.
- Lower noise emissions.
- Cutting of the energy costs by reducing the idle power.
- Lower consumption of cooling water.
- Less maintenance effort.
### Possible combinations of clamping units / injection units

<table>
<thead>
<tr>
<th>Clamping unit</th>
<th>Injection Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2250</td>
</tr>
<tr>
<td>t</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>✗</td>
</tr>
<tr>
<td>450</td>
<td>✗</td>
</tr>
<tr>
<td>XL 450</td>
<td>✗</td>
</tr>
<tr>
<td>500</td>
<td>✗</td>
</tr>
<tr>
<td>550</td>
<td>✗</td>
</tr>
<tr>
<td>XL 550</td>
<td>✗</td>
</tr>
<tr>
<td>650</td>
<td>✗</td>
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<tr>
<td>700</td>
<td>✗</td>
</tr>
<tr>
<td>XL 700</td>
<td>✗</td>
</tr>
<tr>
<td>800</td>
<td>✗</td>
</tr>
<tr>
<td>850</td>
<td>✗</td>
</tr>
<tr>
<td>XL 850</td>
<td>✗</td>
</tr>
<tr>
<td>1000</td>
<td>✗</td>
</tr>
<tr>
<td>1100</td>
<td>✗</td>
</tr>
</tbody>
</table>

- ✗: standard combination
- ✗: special combination on request
1. Overview mold weights

The MacroPower series is laid out for the following maximum mold weights and/or mold torques. If the maximum weight or maximum torque is exceeded, an additional mold support will be necessary. Whenever the values are exceeded, WITTMAN BATTENFELD must be consulted.

<table>
<thead>
<tr>
<th>Clamping unit</th>
<th>max. mold weight</th>
<th>max. mold height</th>
<th>max. weight</th>
<th>max. torque</th>
<th>max. weight</th>
<th>max. torque</th>
<th>max. weight</th>
<th>max. total weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W (t)</td>
<td>(mm)</td>
<td>Wm (t)</td>
<td>Tm (t)</td>
<td>Wf (t)</td>
<td>Tf (t)</td>
<td>Wc (t)</td>
<td>Wmax (t)</td>
</tr>
<tr>
<td>400/450</td>
<td>6.5</td>
<td>850</td>
<td>4.3</td>
<td>1.2</td>
<td>3.3</td>
<td>0.7</td>
<td>2.6</td>
<td>9.1</td>
</tr>
<tr>
<td>XL 400/500/550</td>
<td>8</td>
<td>900</td>
<td>5.3</td>
<td>1.6</td>
<td>4.0</td>
<td>0.9</td>
<td>3.2</td>
<td>11.2</td>
</tr>
<tr>
<td>XL 550/650/700</td>
<td>10</td>
<td>950</td>
<td>6.7</td>
<td>2.1</td>
<td>5.0</td>
<td>1.2</td>
<td>4.0</td>
<td>14.0</td>
</tr>
<tr>
<td>XL 700/800/850</td>
<td>12</td>
<td>1,000</td>
<td>8.0</td>
<td>2.7</td>
<td>6.0</td>
<td>1.5</td>
<td>4.8</td>
<td>16.8</td>
</tr>
<tr>
<td>XL 850/1000/1100</td>
<td>19</td>
<td>1,200</td>
<td>12.7</td>
<td>5.1</td>
<td>9.5</td>
<td>2.9</td>
<td>7.6</td>
<td>26.6</td>
</tr>
</tbody>
</table>

\[
W_m = \frac{2}{3} \times W \\
T_m = W_m \times \text{max. mold height}/3 \\
W_f = \frac{1}{2} \times W \\
T_f = W_f \times \text{max. mold height}/4 \\
W_c = \frac{2}{5} \times W \\
W_{\text{max.}} = W + W_c
\]

1.1 Mold torque calculation examples

**MacroPower 800 t clamping force, mold weight W = 11 t**
- mold weight clamping side \( W_m = 7 \) t, distance to center of gravity \( x_m = 0.3 \) m
- mold weight on fixed platen side \( W_f = 4 \) t, distance to center of gravity \( x_f = 0.2 \) m
- \( T_m = 7 \times 0.3 = 2.1 \) tm, \( T_f = 4 \times 0.2 = 0.8 \) tm
- Conclusion: all values within specifications, no additional support required

**MacroPower 800 t clamping force, mold weight W = 11 t**
- mold weight clamping side \( W_m = 8 \) t, distance to center of gravity \( x_m = 0.4 \) m
- mold weight on fixed platen side \( W_f = 3 \) t, distance to center of gravity \( x_f = 0.2 \) m
- \( T_m = 8 \times 0.4 = 3.2 \) tm, \( T_f = 3 \times 0.2 = 0.6 \) tm
- Conclusion: value \( T_m \) exceeds specification, additional support required
2. Reductions in clamping force for smaller molds

The *MacroPower* machine series is laid out for minimum mold dimensions as indicated in the technical specifications. Down to the minimum mold size specified, the machine's clamping force can be fully utilized. When smaller molds are used, the clamping force must be reduced, depending on the mold dimensions, according to the overview below. The mold size used must not fall below the minimum mold dimensions specified in the chart.

![Reduction in clamping force for small molds MacroPower](image)

2.1 Example of reduction in clamping force (chart)

MacroPower 800 t clamping force, mold dimensions 700 mm x 800 mm (smaller dimension is relevant)
A mold dimension of 700 mm leads to a reduced maximum clamping force of 740 t

3. Mold parallelism

The *MacroPower* is equipped with high-precision linear guides on the moving platen and therefore guided with extreme accuracy and parallelism across the entire stroke. Its platen parallelism is within half of EUROMAP 9 tolerance. For correct operation, the maximum parallelism of 0.2 mm with minimum mold dimensions must not be exceeded.

PLEASE NOTE: The molds must be inserted symmetrically to both axes of the clamping platens!
### Electrical components
- Operating voltage: 230/400 V-3PH, 50 Hz
- Non-contact stroke transducers
- Clamp force display and supervision
- Software for operating hours counter
- Closing/opening – 5 profile steps
- Ejection forward/back – 3 profile steps
- Nozzle forward/back – 3 profile steps
- Injection/holding pressure – 10 profile steps
- Screw speed/back pressure – 6 profile steps
- Purging program
- Stroke zero offset settings
- Start-up program
- Adjustable injection pressure limitation
- Switchover to holding pressure MASTER / SLAVE by injection time, screw stroke/injection volume and injection pressure
- Self-teaching temperature controller
- Display of temperature inside electrical cabinet
- Seven-day timer
- Access authorization via USB stick
- Access protected via password system
- Freely configurable status bar
- Physical, process-related units
- 15” TFT color screen – touchscreen
- Membrane operating keyboard
- Automatic dimming
- Logbook with filter function
- User programming system "APS"
- Cycle time analysis
- 4 freely configurable network connections
- Freely configurable screen pages "user page"
- Notepad function
- Hardcopy function
- Internal data storage via USB connection or network
- Online language selection
- Online selection of imperial or metric units
- Operator manual incl. hydr., mech. and el. schedules online
- Time monitoring
- Quality table, 10,000 storage depth
- Trend diagram
- SPC charts
- Events protocol (logbook) for 10,000 events
- Actual value graphics with 16 curves
- 4 envelope curves monitorings
- Injection integral supervision
- Metering integral supervision
- Alarm message via Email
- USB – 2 x operating unit
- 1 Ethernet interface
- Printer via USB connection or network

### Paint
- RAL 7047 telegrey 4/RAL 5002 ultramarine blue

### Hydraulic
- Hydraulic unit with variable pressure and speed axial piston pump
- Oil filtration by fine flow filter with electrical clogging indicator
- Oil level indicator with alarm
- Closed-loop oil temperature control with oil pre-heating
- Oil temperature monitoring
- Lock-up valve with supervision for suction pipe
- Oil tank with connections for external oil filtration
- Separate hand keys for core pulls
- Hydraulic pressure displayed

### Clamping unit
- Clamping force adjustable via touchscreen
- Closing and opening speed adjustable
- Closing and opening force adjustable
- Mold safety program
- Moving platen supported by positioned linear guides
- Platen drillings and register rings according to EUROMAP
- Fixing holes for robot on top of the fixed platen according to EUROMAP/VDMA
- Hydraulic mold close inhibit, electrically monitored
- Central hydraulic multi-stroke ejector, adjustable

### Injection unit
- Servo closed loop controlled
- Screw L/D=22 with check valve, wear resistant screw and barrel AK+
- Thermocouple failure monitor
- Maximum temperature supervision
- Defined nozzle carriage pressure
- Plug-in ceramic heater bands
- Temperature control of feed throat integrated
- Open nozzle
- Purge guard electrically monitored
- Slide device without hopper prepared for WITTmann material handling device
- Selectable barrel stand-by temperature
- Physical units – bar, ccm, mm/s etc.
- Screw protection
- Linear bearings for the injection unit

### Safety gate
- Monitored safety gate operator side and rear side, CE-confirmed
- Maintenance-free safety gate locked by electromagnet
- Safety gate free for mold change and handling by robot
- Safety gate rear side lowered at the top of the upper tie bar
Optional Features MacroPower UNILOG B6

**Hydraulic**
- Speed controlled servo motor (ServoPower) for hydraulic pump to increase the energy efficiency
- Hydraulic accumulator for fast injection incl. loading pump and parallel ejector movement and core pull movement via double pump
- Extra large oil cooler
- Core pull movement and parallel ejection with double pump
- Core pull movement and parallel ejection incl. fast injection with double pump
- Injection parallel to clamp force build-up
- Hydraulic core pulls. Limit switch function according to EUROMAP 13. Pressure and speeds adjustable
- Pneumatic core pull
- Pneumatic manifold for moldmaster nozzle (controlled 1 nozzle or more parallel or sequential in the mold)
- Hydraulic manifold for moldmaster nozzle (controlling 1 nozzle or more parallel or sequential in the mold)
- Ejector servo controlled
- Filter in water inlet of oil cooler
- Adapter with ball valve on the oil tank for oil maintenance

**Clamping unit**
- Non-standard mold height after customer request
- Non-standard opening stroke after customer request
- T-slots in mold platens
- SPI bolt pattern
- Ejector cross in clamping platens as per EUROMAP/SPI
- Maximum ejector force increased
- Ejector plate safety device
- Hydro mechanical mould safety mechanism
- Air valve, action initiated (ON) and timer (OFF)
- Tie bar retract device for upper tie bar at non operator side
- Quick mold clamping system magnet. or hydr.
- Mounting of fast-stroking cylinder exchanged diagonally
- Support for middle plate or heavy moulds (new)

**Injection unit**
- Grooves in the feeding zone
- High torque hydraulic screw motor in lieu of standard
- High temperature heater bands (max. 450° C)
- Screw drive with a c. servo-motor
- Ball type screw tip
- Needle type shut off nozzle with spring, pneumatic operated or hydraulic operated
- Melt temperature- or pressure sensor in cylinder head up to size 8,800
- Pneumatic cross-bolt type shut off nozzle
- Open AIRMOULD®-nozzle, pressure controlled
- Barrel insulation
- Screw with mixing section or barrier section
- Injection unit equipped for rigid PVC
- Hopper in stainless steel – 50 l
- High wear and corrosion resistant screw and barrel, in lieu of standard

**Safety gate**
- Front side gate safety system for manual part removal
- Electrical safety gate at the operator side
- Safety gate clearance operator side/rear side extended

**Cooling and conditioning**
- Additional flow controller with temperature gauges
- Shut-off valve for cooling water battery
- Blow out valve for cooling water battery
- Hosting of cooling circuits on the fixed platen for the moving platen

**Electrical components**
- Temperature control zone for hot runner (4-way-grid)
- Special voltage
- Control cabinet cooler
- Additional socket combination boxes
- Fuse protection for sockets
- Power factor correction and active power optimization
- Energy consumption analysis
- Switch over to holding pressure by cavity or melt pressure
- Switch over to holding pressure by external signal
- Injection compression program/venting program
- Purging program through the open mold
- Melt cushion control
- Audible alarm
- Analog temperature control interface
- Temperature control interface digital, serial 20mA TTY protocol
- CAN-Bus-interface for mold conditioner as per EUROMAP 66-2
- Interface for AIRMOULD® mobile as per EUROMAP 62
- Interface for robots as per EUROMAP 67
- Adapter from EUROMAP 67 to EUROMAP 12
- Interface for conveyor belt
- Host computer interface/PDA (EUROMAP 63)
- Relays contact parallel to plasticizing
- Machine fault (potential-free contact)
- BNC connectors for injection process analysis
- Interface fully integration of robot incl. Ethernet switch
- Interface for vacuum pump
- Second injection data setting for automatic start up
- Web- and remote service
- Control button BATTENFELD K4 incl. interface EUROMAP 63 – K4

**Packages**
- CELLMOULD® Package
- Tandemmould Package
- Inline Thermography

**Accessories**
- Special paint and/or touch-up paint
- Levelling pads
- USB stick for data storage
- Webcam
- Access to material hopper via ladder and platform on operator side
- Lighting in mold space
- Plinth for standard Wittmann robot (new)