**MacroPower E 400 – 1100 t**
Compact large machine with hybrid drive

*world of innovation*
POWERFUL – COMPACT – HIGHLY EFFICIENT
High performance and speed in large machines

The advantages
- Combination of electric injection unit and servo-hydraulic clamping unit
- Short cycle times through parallel operation of injection and clamping unit
- High dynamism and precision through servo-electric injection unit
- Small footprint thanks to compact design
- Generously dimensioned 4 tie-bar/2 platen clamping system
- Long-stroke system to release the tie-bars facilitates mold insertion from the side
- Fast locking through QUICKLOCK®
- User-friendly new UNILOG B8 control system with integrated assistance systems
- With WITTMANN 4.0 perfect integration of machine and peripherals in “plug & produce” system
- Attractive price/performance ratio

The machine series
*MacroPower* E (Electric): 14 clamping force sizes from 400 to 1100 t
*MacroPower* standard: 19 clamping force sizes from 400 to 2000 t
*MacroPower* COMBIMOULD: for multi-component injection molding – from 400 to 2000 t
MacroPower E
The system highlights

» Servo-hydraulic clamping unit
In the standard version of the MacroPower E, the movements of the clamping unit, the ejector and the nozzle system are driven by servo-hydraulics. The combination of an electrically adjustable pump with a speed-controlled servo drive is highly energy efficient, since it invariably runs at the optimal operating point. Parallel movements for core pulls and the ejector are possible with the standard twin pump system.
The MacroPower clamping system is a 4 tie-bar/2 platen system with generously dimensioned clamping areas. The four tie-bars are each combined with a pressure cushion unit and fastened to the fixed platen of the machine. The tie-bars are position-monitored to ensure optimal platen parallelism.

» Maximum energy efficiency through servo-electric injection unit
With the servo-electric injection unit, the injection process is powered by a highly efficient servo motor with a linear rack-and-pinion unit. A highly dynamic injection process is achieved through minimal inertia moments. An integrated force measurement device in front of the screw also ensures maximum precision and repeatability.

» Parallel plasticizing
The servo motor drive of the screw is effected directly via a reduction gearbox, which makes for high plasticizing output. Excellent homogeneity is ensured by the parallel function. The unit’s outstanding degree of efficiency also leads to high energy efficiency. Flexibility is secured by universal compatibility of identical barrels with different injection units for both hydraulic and electric injection aggregates.

» Insertion of the mold made easy
The MacroPower clamping system provides in standard a large gap between the ends of the tie-bars and the moving platen, thanks to its standard large platen stroke and the relatively short length of the tie-bars. This allows for lateral insertion and fastening of the molds from the rear of the machine using a crane.
CLAMPING UNIT
High functionality with ample mold space

- **Large and flexible**
  The extensive MacroPower system kit offers a wide range of combination options from numerous clamping force variants with matching distances between tie-bars, in both standard and XL versions.

- **Sensitive and precise**
  In the MacroPower clamping system, the tie-bars are only used for the force transmission between the mold platens. The moving platen is mounted on a carriage, which travels on high-precision linear bearings along the machine frame. The minimal rolling friction in the linear bearings is the prerequisite for highly sensitive mold protection and high cleanliness.

- **Fast and synchronized**
  The QUICKLOCK® locking system between the tie-bars and the moving platen consists of four synchronized tooth segment nuts, which are integrated in the moving platen to minimize the machine’s footprint.

- **Compact design for minimal footprint**
  The integrated tie-bar nuts and short tie-bars offer two advantages: short footprint and simultaneously free space for lateral mold insertion.

- **Symmetrical and powerful**
  The moving platen is driven by two diagonally positioned traveling cylinders designed for high speed. The traveling drive in combination with a hydraulic differential gear system provides the basic conditions for high speed, precision in movements and power.
SERVO-ELECTRIC INJECTION UNIT
Precise – dynamic – efficient

» Everything for series consistency
  – All screws come with a 22.1 L/D ratio.
  – Direct drive for screw and injection/holding pressure via speed-controlled servo motors
  – Maximum changeover accuracy and series constancy
  – Start of injection parallel to clamp force build-up possible
  – Low sound emission
  – Moment-free nozzle contact through axial positioning of traveling cylinders
  – Quiet running through encapsulated in-line positioning of the injection and plasticizing axes
  – Plasticizing barrels can be mounted to different injection units with identical screw diameters.
  – In combination with the WITTMANN BATTENFELD HiQ software modules (optional), sensitive adjustment systems are available to compensate environmental factors such as fluctuations in temperature and moisture, regrind or masterbatch content.

» Optimal user-friendliness and easy servicing
  – Free access to the injection unit for easy material feeding, machine setting and servicing
  – Low maintenance requirements thanks to permanent lubrication

Anti-wear options
In addition to the premium-quality standard equipment, an extensive range of options is available to provide extra anti-wear and/or anti-corrosion protection. Predefined option packages and a selection matrix facilitate the selection of the right plasticizing unit.
Fast-responding, precise, economical
The plasticizing and injection units of the MacroPower E basically follow the design of the proven aggregates with hydraulic drives. Instead of hydro motors and cylinders, the screw rotation and injection stroke are powered via encapsulated drives and a servo motor. The drive is designed for high dynamism and high injection speeds of up to 450 mm/s and still consumes significantly less primary energy than comparable hydraulic models. For economic reasons, the contact pressure of the nozzle carriage is maintained by servo hydraulic cylinders.

High-end hydraulics – “drive-on-demand” (standard)
A “drive-on-demand” system to cut energy consumption is standard for the clamping unit. Here, a water-cooled, speed-controlled servo motor is combined with electrically adjustable pumps. The advantage of this combination is that the hydraulic system is kept within the range of the system’s optimal degree of efficiency, by adjustment of both the motor speed and the pump’s displacement volume.
WITTMANN BATTENFELD injection molding machines come with a flexibly adjustable basic modular design. From this basis, the machine can be extended with a wide range of automation equipment into a production cell. This includes primarily devices for fast mold change, fast coupling of complex media connections and the automation of finished parts handling.

**MacroPower automation options:**
- **Handling robot automation module** with linear or articulated arm robot and logistics peripherals
- **Mold clamping systems**
  Both hydraulic and magnetic clamping systems are available including all safety monitoring features, if required combined with roller conveyor units for lateral mold transfer.
- **Automatic mold change system** as fixed carriage and pre-heating station or as a flexibly movable carriage system with docking interface
- **Combination with WITTMANN peripheral units via WITTMANN 4.0**
  Temperature control or cooling, material feeding, coloring and drying

Complete installation at Buzek Plastic Poland Sp. z o.o.
The new UNILOG B8 machine control system is the WITTMANN BATTENFELD solution to facilitate the operation of complex processes for human operators. For this purpose, the integrated industrial PC has been equipped with an enlarged intuitive touch screen operator terminal. The visualization screen is the interface to the new Windows® 10 IoT operating system, which offers extensive process control functions. Next to the pivotable monitor screen, a connected panel/handset is mounted on the machine’s central console.

**UNILOG B8**

**Highlights**

- **Operating logic**
  - with a high degree of self-explanation, similar to modern communication devices

- **2 major operating principles**
  - Operating/movement functions via tactile keys
  - Process functions on touch screen (access via RFID, key card or key ring)

- **Process visualization**
  - via 21.5” touch screen display (full HD), pivoting laterally

- **New screen functions**
  - Uniform layout for all WITTMANN units
  - Recognition of gestures (wiping and zooming by finger movements)
  - Container function – split screen for sub-functions and programs

- **Status visualization**
  - uniform signaling system across the entire WITTMANN group
  - Headline on the screen with colored status bars and pop-up menus
  - ambiLED-display on machine

- **Operator assistance**
  - **QuickSetup**: process parameter setting assistant using an integrated material database and a simple query system to retrieve molded part data with machine settings pre-selection
  - Extensive help library integrated
The process in constant view

» **SmartEdit**

*SmartEdit* is a visual, icon-based cycle sequence programming facility, which enables direct addition of special functions (core pulls, air valves, etc.) based on a standard process via touch operation on the control system’s monitor. In this way, a total user-defined sequence can be compiled from a sequence menu. This machine cycle, visualized either horizontally or vertically, can be adjusted simply and flexibly to the process requirements by finger touch with “drag & drop” movements.

**The advantages**

– Icon visualization ensures clarity.
– Clear events sequence through node diagram
– Alterations without consequences through “dry test runs”
– Theoretical process sequence can be quickly implemented in practice.
– Automatic calculation of the automation sequence based on the actual set-up data set without machine movements

» **SmartScreen**

– Partitioning of screen displays to visualize and operate two different functions simultaneously (e.g. machines and peripherals)
– Uniform design of the screen pages within the WITTMANN group
– Max. 3 containers can be addressed simultaneously for the SmartScreen function.
– Adjustments of set values can be effected directly in the set value profile.

Remote communication

» **QuickLook**

Production status check via smartphone – simple and comfortable:

– Production data and statuses of all essential units in a production cell
– Complete overview of the most important production parameters
– Access to production data, error signals and user-defined data
– Facilities for grouping of units and sorting according to status available

» **Global online service network**

– Web-Service 24/7: direct Internet connection to WITTMANN BATTENFELD service
– Web-Training: efficient staff training by means of the virtual training center
WITTMANN 4.0
Communication in and with production cells

With its communication standard WITTMANN 4.0, the WITTMANN group offers a uniform data transfer platform between injection molding machines and peripheral equipment from WITTMANN. For an appliance exchange, the correct operating software is loaded automatically via an update function according to the “plug & produce” principle.

Connection of peripherals via WITTMANN 4.0

- WITTMANN FLOWCON plus water flow regulator, GRAVIMAX blenders and ATON dryers
  - Units directly addressed and controlled via the machine’s control system
  - Joint saving of data in the production cell, the machine and in the network via MES

- WITTMANN robots with R9 control system
  - Operation of robots via the machine’s monitor screen
  - High-speed communication between machine and robot to synchronize movements
  - Important machine movements can be set via the R9 robot control system

- WITTMANN TEMPRO plus D temperature controllers
  - Setting and control of temperatures via the machine’s control system possible
  - All functions can be operated either on the unit or via the machine’s control system

Integration in MES system

The integration of machines and complete production cells in an MES system is a prerequisite for an efficient and transparent production facility according to the Industry 4.0 concept. Depending on the customer’s requirements, small and medium-sized companies are offered a compact MES solution based on TEMI+. For large-scale and globally active companies, our cooperation partner is MPDV Microlab GmbH, a leading MES service provider. Due to the Windows® 10 IoT operating system, it is also possible to have selected status information from all connected machines on the production floor shown under SmartMonitoring on the display screen of every machine.

WITTMANN 4.0 system

With WITTMANN 4.0, a machine and its robots and peripherals are transformed into a uniform technical organism, which communicates externally via a specific IP address. A single point entry increases the cyber security significantly.
OPTIONS
Modular and flexible

MacroPower E
The optional highlights

» High-performance injection unit
With the option of "high-speed injection", injection speeds of up to 450 mm/s can be reached. This enables the production of thin-walled high-precision plastic parts for the packaging and electronics industry. Moreover, high-performance plasticizing systems with a larger L/D ratio of 26:1 with barrier screws are also available for this type of applications.

» Faster ejection
As an alternative to the standard servo-hydraulic drive for the ejector, a more powerful version with a servomechanical drive is available as an option.

» Free space for conveyor belt in the small sizes of large machines as standard
In the machines from 400 to 700 t clamping force, the machine frame comes prepared for the installation of a conveyor belt inside the frame for longitudinal transport of molded parts. An optional elevation of the frame to accommodate a conveyor belt for parts transport to the side can also be supplied.

» Servo-electric mold axis
Control, monitoring and integration into the cycle of a servo-electric drive axis, for example for alternative triggering of a servo-electric core pull or a shut-off nozzle inside the mold.

» WITTMANN peripherals
The comprehensive range of WITTMANN peripheral units offers appropriate solutions for all secondary processes of injection molding, including parts handling, material feeding and drying, sprue recycling, mold cooling and temperature control. Via the optional WITTMANN 4.0 integration package, all additional units can be integrated into the injection molding machine's program sequence according to the "plug & produce" principle.
APPLICATION TECHNOLOGY
Outstanding competence

» IML – In-Mold labeling
High-speed MacroPower E machines combined with the proven WITTMANN BATTENFELD handling technology provide the basis for high-performance in-mold labeling production cells to manufacture directly decorated buckets, containers or bottle crates.

» AIRMOULD® – gas injection process
AIRMOULD® is the gas-assisted injection molding process developed by WITTMANN BATTENFELD. Its two variants are the AIRMOULD® internal gas pressure process and the AIRMOULD® CONTOUR external gas pressure process.

» CELLMOULD® – structured foam technology
The production of structured foam parts through targeted blending of pressurized nitrogen into the plastic melt prior to injection into the mold has been a WITTMANN BATTENFELD core competence based on in-house R & D for more than 30 years.

» High performance plasticizing
The injection dynamism and high precision of the servo-electric injection plasticizing units for large machines offer the necessary prerequisites for manufacturing thin-walled parts with a large surface requiring high standards of dimensional accuracy.
The maximum shotweights (g) are calculated by multiplying the theoretical shot volume (cm³) by the above factor.

<table>
<thead>
<tr>
<th>Clamping unit</th>
<th>Injection unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t E 1100 E 1100+ E 2100 E 2100+ E 3300 E 3300+ E 5000</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>
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<tr>
<td>550</td>
<td>* * * * * * *</td>
</tr>
<tr>
<td>XL 550</td>
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</tr>
<tr>
<td>650</td>
<td>* * * * * * *</td>
</tr>
<tr>
<td>700</td>
<td>* * * * * * *</td>
</tr>
<tr>
<td>XL 700</td>
<td>* * * * * * *</td>
</tr>
<tr>
<td>850</td>
<td>* * * * * * *</td>
</tr>
<tr>
<td>900</td>
<td>* * * * * * *</td>
</tr>
<tr>
<td>XL 900</td>
<td>* * * * * * *</td>
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<tr>
<td>1000</td>
<td>* * * * * * *</td>
</tr>
<tr>
<td>1100</td>
<td>* * * * * * *</td>
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</table>

+ = fast injection

<table>
<thead>
<tr>
<th>Material</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>0.88</td>
</tr>
<tr>
<td>CA</td>
<td>1.02</td>
</tr>
<tr>
<td>CAB</td>
<td>0.97</td>
</tr>
<tr>
<td>PA</td>
<td>0.91</td>
</tr>
<tr>
<td>PC</td>
<td>0.97</td>
</tr>
<tr>
<td>PE</td>
<td>0.71</td>
</tr>
<tr>
<td>PMMA</td>
<td>0.94</td>
</tr>
<tr>
<td>POM</td>
<td>1.15</td>
</tr>
<tr>
<td>PP</td>
<td>0.73</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Material</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP + 20 % Talc</td>
<td>0.85</td>
</tr>
<tr>
<td>PP + 40 % Talc</td>
<td>0.98</td>
</tr>
<tr>
<td>PP + 20 % GF</td>
<td>0.85</td>
</tr>
<tr>
<td>PS</td>
<td>0.91</td>
</tr>
<tr>
<td>PVC hard</td>
<td>1.12</td>
</tr>
<tr>
<td>PVC soft</td>
<td>1.02</td>
</tr>
<tr>
<td>SAN</td>
<td>0.88</td>
</tr>
<tr>
<td>SB</td>
<td>0.88</td>
</tr>
<tr>
<td>PF</td>
<td>1.3</td>
</tr>
<tr>
<td>UP</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Dark grey boxes = thermosets
MOLD DIMENSIONS

» 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, WITTMANN BATTENFELD must be consulted.

<table>
<thead>
<tr>
<th>Clamping Unit</th>
<th>max. mold weight</th>
<th>max. mold height</th>
<th>moveable platen</th>
<th>fixed platen</th>
<th>center platen</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W (t)</td>
<td>(mm)</td>
<td>max. weight</td>
<td>max. torque</td>
<td>max. weight</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>
</tr>
<tr>
<td>XL 450, 500, 550</td>
<td>8</td>
<td>900</td>
<td>5.3</td>
<td>1.6</td>
<td>4.0</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>
</tr>
<tr>
<td>XL 700, 850, 900</td>
<td>12</td>
<td>1000</td>
<td>8.0</td>
<td>2.7</td>
<td>6.0</td>
</tr>
<tr>
<td>XL 900, 1000, 1100</td>
<td>19</td>
<td>1200</td>
<td>12.7</td>
<td>5.1</td>
<td>9.5</td>
</tr>
</tbody>
</table>

Wm = 2/3 x W  
Tm = Ws x max. mold h./3  
Wf = 1/2 x W  
Wmax. = W + Wc

» Mold torque calculation examples

**MacroPower 850 t clamping force**
Mold weight W = 11 t

Mold weight clamping side Wm = 7 t
Distance to center of gravity xm = 0.3 m

Mold weight on fixed platen side Wf = 4 t
Distance to center of gravity xf = 0.2 m

Tm = 7 t x 0.3 m = **2.1 tm**
Tf = 4 t x 0.2 m = 0.8 tm

All values within specifications, no additional support required.

**MacroPower 850 t clamping force**
Mold weight W = 11 t

Mold weight clamping side Wm = 8 t
Distance to center of gravity xm = 0.4 m

Mold weight on fixed platen side Wf = 3 t
Distance to center of gravity xf = 0.2 m

Tm = 8 t x 0.4 m = **3.2 tm**
Tf = 3 t x 0.2 m = 0.6 tm

Value Tm exceeds specification, additional support required.
» **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.

» **Example of clamping force reduction (chart)**

*MacroPower* 850 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 780 t.

» **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!
**Machine in general**

- Paint RAL 7047 tele grey / RAL 5002 ultramarine blue
- Two-piece machine frame, clamping unit / injection unit
- Built-in control cabinet

**Hydraulics**

- Speed controlled servo motor for hydraulic pump to increase the energy efficiency incl. additional pump for core pull movement or parallel ejection
- Injection parallel to clamp force build-up
- Oil filtration by fine flow filter with electrical clogging indicator
- Oil level indicator with alarm
- Closed-loop oil temperature control with oil pre-heating
- 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
- Separate bypass filtration unit

**Clamping unit**

- Clamping force adjustable via touchscreen
- Closing and opening speed adjustable
- Mold safety program
- Moving platen supported by positioned linear guides
- Platen drilling and register rings according to EUROMAP
- Fixing holes for robot on top of the fixed platen as per EUROMAP 18
- Hydraulic mold close inhibit, electrically monitored
- Central hydraulic multi-stroke ejector, adjustable

**Injection unit**

- Servo-electrically controlled injection
- Screw drive by a.c. servomotor – for parallel plasticizing
- Screw L/D = 22 with check valve, wear and corrosions 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 material hopper, prepared for WITTMANN material feeder
- Linear bearings for the injection unit
- Selectable barrel stand-by temperature
- Decompression before and/or after metering
- Physical units – bar, ccm, mm/s etc.
- Screw protection
- Peripheral screw speed indication
- Linear interpolation of holding pressure set values
- Bar chart for barrel temperature with set value and actual value display
- Selectable injection pressure limitation
- Changeover from injection to holding pressure depending on stroke, time and pressure

**Safety gate**

- Monitored safety gate electrically controlled according to CE on front and rear side
- 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
- USB – 1 x operating unit

**Electrical components / Control unit**

- Operating voltage 230 / 400 V-3PH, 50 Hz
- Fuse protection for sockets
- Control system UNILOG B8 – 21.5” multi-touch screen (full HD)
- 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
- Parts counter with good / bad part evaluation
- Purging program through open mold
- Stroke zero offset settings
- Start-up program
- 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 interface, password system and RFID authorization system
- Freely configurable status bar
- Physical, process-related units
- Automatic dimming
- Logbook with filter function
- User programming system (APS)
- Userpage
- Note pad function
- Cycle time analysis
- BASIC Quality Monitoring (1 freely configurable network connection, quality table with 1000 storage depth, events protocol (logbook) for 1000 events, actual value graphics with 5 curves, 1 envelope curves monitoring)
- 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
- Injection integral supervision
- Metering integral supervision
- Alarm message via e-mail
- 1 Ethernet interface (switch cabinet)
- Printer via USB connection or network
- SmartEdit – sequence editor
- QuickSetup – assistance program for initial parameter setting
- ambiLED-status indicator
## Base machine
- Non-standard mold height/opening stroke
- Mounting of fast-stroking cylinder exchanged diagonally
- Machine frame increased

## Hydraulics
- Hydraulic core pulls. Limit switch function according to EUROMAP 13.
- Pressure and speeds adjustable
- Core pull pressure release
- Pneumatic core pull
- Hydraulic manifold for Mouldmaster nozzle (controlling 1 nozzle or more, parallelly or sequentially, in the mold)
- Pneumatic manifold for Mouldmaster nozzle (controlling 1 nozzle or more, parallelly or sequentially, in the mold)
- Ejector pressure/speed controlled by P/Q servo valve
- Extra large oil cooler
- Filter in water inlet of oil cooler
- Adapter with ball valve on the oil tank for oil maintenance

## Clamping unit
- Support for middle plate or heavy molds
- T-slots in mold platens
- SPI bolt pattern
- Ejector cross in clamping platen as per EUROMAP/SPI
- Maximum ejector force increased
- Ejector platen safety device
- Hydromechanical mold safety mechanism
- Air valve, action initiated (ON) and timer (OFF)
- Tie-bar retract device for upper tie-bar
- Quick mold clamping system electromagnetic or hydraulic

## Injection unit
- Grooves in the feeding zone of barrel for improved feeding
- High temperature heater bands (max. 450 °C)
- Barrel insulation
- Fast injection
- Ball type screw tip
- Check valve with carbide insert
- Needle type shut-off nozzle operated with spring, pneumatically or hydraulically
- Pneumatic cross-bolt type shut-off nozzle
- Melt temperature sensor in cylinder head
- Pressure transducer for melt pressure switch over
- Open AIRMOULD®-nozzle, pressure controlled
- Wear resistant screw and barrel AKPA for polyamide
- Corrosion resistant screw and barrel AKCN in chrome nitride or AKTN titan nitride
- High wear and corrosion resistant screw and barrel AK++
- Screw with mixing section or barrier section
- Injection unit equipped for CELLMOULD®
- Slide device with spindle/crank handle adjustment
- Material hopper volume 60 liters
- Hopper magnet
- Access to material hopper via ladder and platform

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

## Cooling and conditioning
- Flow controller with temperature gauges
- Shut-off valve for cooling water battery
- Blow out valve for cooling water battery
- Distributor of cooling circuits on the fixed platen and the moving platen
- Cooling water flow rate integrated into control system via FLOWCON plus

## Electrics
- Temperature control zone for hot runner
- Special voltage
- Control cabinet cooler
- Additional sockets
- Emergency stop button on rear side
- Signal tower with acoustic element
- Temperature control interface digital, serial 20 mA TTY protocol
- CAN-Bus-interface for mold conditioner as per EUROMAP 65-2
- Interface for BFMOLD® via CAN BUS for WITTMANN D series
- Interface for AIRMOULD® mobile
- Interface for robots as per EUROMAP 67
- Interface for conveyor belt
- Interface for dosing pump
- RJG eDart interface
- Master interface for danger zone boundary (DZB)
- Interface for full integration of robot incl. Ethernet switch
- Host computer interface/PDA (EUROMAP 63)
- Relays contact parallel to plasticizing
- Machine fault (potential-free contact)
- BNC connectors for injection process analysis
- Interface for vacuum pump

## Control system
- Energy consumption analysis
- Integrated Tandemmould
- Switch over to holding pressure by cavity pressure
- Switch over to holding pressure by external signal
- Injection compression program/venting program
- Melt cushion control
- Second injection data setting for automatic start up
- User specific programmable set value limits
- Web- and Remote-Service
- HIQ-Cushion – melt cushion control
- HIQ-Flow – injection integral control
- HIQ-Melt – monitoring of material quality
- EXPERT Quality Monitoring (4 freely configurable network connections, quality table with 10000 storage depth, events protocol (logbook) for 10000 events, actual value graphic with 16 curves, 4 envelope curves monitoring, SPC charts, trend diagrams)

## Additional equipment
- Lighting in mold space
- Inline thermography
- Webcam
- Special paint and/or touch-up paint
- Tool kit
- Levelling pads
- Additional manual on USB flash drive