Technology working for you.

HM Series 35 – 300 t

High Precision in Injection Molding

Technology working for you.

Battenfeld
world of innovation
Special features and benefits of the HM Series 35 – 300 t

The compact power-packs from a great series, with space-saving, short design 3-platen technology. In the 35 to 300 t clamping force range, these HM models stand for highest precision, shortest footprint, cleanliness, best usability and extensive options. The high-performance control system offers numerous process monitoring and documentation facilities.

Thanks to a wide range of options, the HM is extremely versatile and lends itself to many special processes, such as injection-compression, multi-component technology, AIRMOULD®, CELLMOULD® etc. Put the HM to the test and see for yourself.

35 – 300 t

Injection units with linear movement, traversable
– Standard to injection unit 1330

Easy access to the nozzle without tools and rapid screw removal.
**Clamping unit**
Parallel integrated clamping cylinder with integral fast-stroking cylinder and centrally mounted ejector guarantees a rapid and even build-up of clamping force. This provides further advantages, such as extremely short design and central transmission of force.

**Screws with a uniform L/D ratio**
All screws with a diameter of 22 millimeters or more have an L/D ratio of 22 : 1 and guarantee optimum homogeneity of the liquefied material irrespective of the diameter.

**Linear guides**
Support for the moving platen is provided by high-precision linear guides, which dispenses with the need for special adjustments to accommodate heavy molds. Lubrication is reduced to a minimum and the mold mounting area is extremely clean.

**Energy-saving DFEE drive**
This flexible drive concept based on electrically adjustable (DFEE) delivery pumps promotes short cycle times. A further increase in injection performance through parallel movements can easily be achieved by installing an optional pump system.

**ServoPower**
The optional use of a speed-controlled servo motor with a fixed displacement pump permits operation which saves a great deal of energy.
Clamping unit HM 35 – 300 t

**Special advantages of the HM**

- Design with extremely short footprint.
- Rectangular clamping platens.
- High rigidity and sturdiness.
- Precise platen parallelism maintained during the entire stroke.
- Moving platen support by low-maintenance linear guides.
- Fully hydraulic clamping system.
- High opening and closing speed thanks to differential circuit.

- Central transmission of force when moving and under clamping force.
- Short dry cycle times.
- Flexible parts removal in three directions.
- High repeatability of all parameters.
- Highly sensitive mold protection.
- Optimal mold protection through minimized platen deflection and linear guides.
- All components with excellent serviceability and low maintenance requirements.
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.

**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.

**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. (optional)
UNILOG B6\textsuperscript{\circ} 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.

- **Operating system Windows**
- 15” TFT color screen with unlimited touch screen functionality for operation and display.
- 2 rows of soft keys to select machine functions.
- Freely configurable status bar for all machine operating functions.
- Access authorization via password system and USB flash drive, complete events protocol, quality table, online support system, envelope curves monitoring, cycle time analysis, alarm message via Email and other functions.
- 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 flash drive, or they may be used as an access control system in combination with the integrated password system. Two Ethernet interfaces are installed in the control cabinet at the rear.
- Optional: Manual operating panel with 48 membrane keys to operate the machine’s axes and optional equipment and 10 membrane keys with luminous rings are available for the basic machine functions (drive, operation modes, heaters). Space for 7 additional optional mechanical switches/keys.
- Optional: HiQ package with SPC chart, trend diagram and further recording possibilities.
**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.

**Energy measurement**

Clear visualization of energy consumption is possible with UNILOG B6⃣. Various modes of operation can be displayed as required in terms of cycle time or material consumption.

Consequently, the machine's energy- and cost-efficiency with regard to energy consumption can also be evaluated and calculated by means of accurate process analyses.

Included as standard with EcoPower and MicroPower machines, available as an option for other models.

**Quality monitoring**

With up to four (HiQ package up to 16) 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.

**Actual value graphics**

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.
**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 B6P 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 24/7 Web-Service. 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 B6P. 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.
**Application technology HM 35 – 300 t**

**Standard injection molding technology**
Manufacturing of complex products with highest precision and process reliability. Quick, easy production of both standard parts and high-end technical components.

**Combimould – multi-component injection molding**
Combimould provides a facility to manufacture complex, multi-functional parts from several different materials in a single production step. By way of such combinations, downstream processing steps such as bonding, assembly or screwing can be dispensed with, and there is ample scope for design and functionality. Fields of application are automotive components, power tools or toys.

**LIM – Liquid Injection Molding**
Thanks to its excellent material attributes, liquid silicone rubber offers a wide processing window for producing LSR parts. Typical applications are gaskets and gasket elements, baby pacifiers, membranes or jet formers for shower heads.

**PIM – Powder Injection Molding**
Powder injection molding (PIM) is a manufacturing process for series production of components made of metallic or ceramic materials. PIM is the ideal process for large-scale production of complex, functional parts that have to meet stringent material requirements.
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 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 AC motor with a constant motor speed and variable capacity pump. For larger drives (MacroPower 400 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.
The Insider solution combines the injection molding machine with an automatic parts removal system and a conveyor belt to form a compact, space-saving unit. Custom-built peripheral equipment for preparation and downstream finishing, as well as special equipment such as an integrated light barrier or installation of a second conveyor belt are included in the production program as options. The Insider is available with up to 300 t clamping force as standard and offers processors a number of advantages.

The robust, compact design of the Insider stands the test in a long-term operation through stability and accessibility.

**Space-saving design**

Space requirements are up to 50 per cent below those of conventional automation solutions.

**Improved material flow**

All parts can be removed from the end of the clamping unit. This facilitates the arrangement of several machines in rows.

**Reduced robot cycle times**

Cycle times are reduced by shorter traverse paths and direct depositing of parts on the conveyor belt.

**Easy access in spite of integration**

Thanks to easy removal of the conveyor belt and feeding area, access to the injection molding machine is as comfortable as in machines without automation systems.

**Cost-efficient production**

Thanks to the space-saving design of the Insider, not only the material flow on the injection molding machine is improved, but the convenient movement of molded parts to the end of the clamping unit also allows for more favorable positioning of the machines.

**No separate safety barriers**

Since there is no need for separate safety barriers, costs have been reduced, yet all occupational health and safety regulations are complied with.

**CE mark**

The CE mark for certified safety is granted for every machine with an Insider solution, which saves costs for individual inspections.
Possible combinations of clamping units/injection units

<table>
<thead>
<tr>
<th>Clamping unit</th>
<th>Injection unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>t</td>
<td>60</td>
</tr>
<tr>
<td>35</td>
<td></td>
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<tr>
<td>45</td>
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<tr>
<td>240</td>
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<tr>
<td>300</td>
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</tbody>
</table>

Shot weight conversion table

<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>
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<tr>
<td>POM</td>
<td>1.15</td>
</tr>
<tr>
<td>PP</td>
<td>0.73</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP + 20 % Talcum</td>
<td>0.85</td>
</tr>
<tr>
<td>PP + 40 % Talcum</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-rigid</td>
<td>1.12</td>
</tr>
<tr>
<td>PVC-flexible</td>
<td>1.02</td>
</tr>
<tr>
<td>SAN</td>
<td>0.88</td>
</tr>
<tr>
<td>SB</td>
<td>0.88</td>
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<tr>
<td>PF</td>
<td>1.3</td>
</tr>
<tr>
<td>UP</td>
<td>1.6</td>
</tr>
</tbody>
</table>

The maximum shotweights (g) are calculated by multiplying the theoretical shot volume (cm³) by the above factor.

Dark grey boxes = thermosets
### Standard features HM UNILOG B6⁺

<table>
<thead>
<tr>
<th>Machine in General</th>
<th>Electrical components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paint</strong> RAL 7047 tele grey 4/RAI5002 ultramarine blue</td>
<td>Operating voltage 230/400 V-3PH, 50 Hz</td>
</tr>
<tr>
<td>One-piece machine frame</td>
<td>Fuse protection for sockets</td>
</tr>
<tr>
<td>Built-in control cabinet</td>
<td>Common voltage supply &lt;=HM 160 with 230/400 V</td>
</tr>
<tr>
<td>Parts transport on operator side, rear side or axial</td>
<td>Control Unit UNILOG B6⁺ with touchscreen, operating system Windows XP</td>
</tr>
</tbody>
</table>

#### 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

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 as per EUROMAP 18

Hydraulic mold close inhibit, electrically monitored on operator side

Central hydraulic multi-stroke ejector, adjustable

#### Injection unit

Pump closed loop controlled

Screw L/D=22 with check valve, screw and barrel nitrated

Thermocouple failure monitor

Maximum temperature supervision

Defined nozzle carriage pressure

Plug-in ceramic heater bands

Temperature control of feed throat integrated

Open nozzle

Swiveling injection unit up to 1330 injection unit

Purge guard electrically monitored

Hopper WITTMANN MH206

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 electric controled according CE on front and rear side

Maintenance-free safety gate locked by electromagnet

Safety gate free for mold change and handling by robot

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**Notes:**

- **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**
- **Oil tank with connections for external oil filtration**
- **Separate hand keys for core pulls**
- **Hydraulic pressure displayed**

**Electrical components:**

- **Operating voltage 230/400 V-3PH, 50 Hz**
- **Fuse protection for sockets**
- **Common voltage supply <=HM 160 with 230/400 V**
- **Control Unit UNILOG B6⁺ with touchscreen, operating system Windows XP**
- **Software for operating hours counter**
- **Closing/Openings − 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**
- **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 flash drive**
- **Access protection via password system**
- **Freely configurable status bar**
- **Physical, process-related units**
- **15” TFT color screen**
- **Machine control via touch screen**
- **Automatic dimming**
- **Logbook with filter function**
- **User programming system (APS) Userpage**
- **Note pad function**
- **Cycle time analysis**
- **1 freely configurable network connection**
- **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. shedules online**
- **Time monitoring**
- **Quality table, 1,000 storage depth**
- **Events protocol (logbook) for 1,000 events**
- **Actual value graphics with 5 curves**
- **1 Envelope curves monitoring**
- **Injection integral supervision**
- **Metering integral supervision**
- **Alarm message via Email**
- **USB − 1 x operating unit**
- **2 Ethernet interfaces (switch cabinet)**
- **Printer via USB connection or network**
Optional features HM UNILOG B6°

**Base machine option**
- Non-standard mold height/Opening stroke

**Hydraulic**
- Servo Power drive
- Hydr. accumulator for fast injection incl. loading pump and parallel ejector movement and core pull movement via 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
- Core pull pressure release
- Pneumatic core pull
- Hydraulic or pneumatic manifold for Moldmaster nozzle (controlling 1 nozzle or more parallel in the mold)
- Extra large oil cooler
- Adapter with ball valve on the oil tank for oil maintenance
- Separate bypass filtration unit

**Clamping unit**
- T-Slots in mold platens
- Cooling channels in mold platens
- Nicel plated mold platens
- SPI bolt pattern
- Ejector cross in clamping platens as per EUROMAP/SPI
- Maximum ejector force increased
- Mechanical ejector couple
- Ejector platen safety device
- Mechanical mold safety mechanism
- Unscrewing device with hydro-motor
- Parts chute
- Parts chute for separation of good/bad parts
- Photoelectric ejection check
- Air valve, action initiated (ON) and timer (OFF)
- Manual tie bar retract device
- Quick mold clamping system electromagnet., hyd. or mech.

**Injection unit**
- Closed loop injection
- Grooves in the feeding zone of barrel for improved feeding
- High revolution hydraulic screw drive motor
- High torque screw motor in lieu of standard
- High temperature heaterbands (max. 450° C)
- Barrel insulation
- Screw drive by a.c. servo-motor - for parallel plasticising
- Ball type screw tip
- Check valve with carbide insert
- Needle type shutoff nozzle with spring, pneumatic operated or hydraulic operated
- Hydraulic cross-bolt type shutoff nozzle (up from SPE 2250)
- Melt temperature sensor in cylinder head
- Open AIRMOULD®-nozzle, pressure controlled
- Wear resistant screw and barrel AK++
- High wear and corrosion resistant screw and barrel AK ++
- Corrosion resistant screw and barrel AKCN in chrome nitride or AKTN titan nitride
- Screw with mixing section or barrier section
- Application package processing thermosets
- Injection unit equipped for rigid PVC
- Liquid Silicon unit LIM and 2-component meter mix pump
- Application package processing MIM/CIM
- Material hopper volume 29 l, hopper magnet
- Hopper loader UNIFEED A1 (till SPE 1330)

**Safety gate**
- Front side gate safety system for manual part removal
- Pneumatic safety gate at the operator side
- Initiate next cycle by closing safety gate in semi-auto operation
- Safety gate clearance operator side/ rear side extended
- Safety gate rear side lowered at the top of the upper tie bar

**Cooling and conditioning**
- Flow controller with temperature gauges
- Shut-off valve for cooling water battery
- Blow out valve for cooling water battery
- Distributer of cooling circuits on the fixed platen of the moving platen
- Machine cooling via cooling water distributor with T-pieces

**Electrical components**
- Clamp force display and supervision
- Pressure transducer for melt pressure switch over
- Temperature control zone for hot runner
- Non-contact stroke transducers
- Special voltage
- Control cabinet cooler
- Membrane keyboard for manual movements of UNILOG B6°
- Additional socket
- Emergency stop button on rear side
- 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
- Signal tower with acustic element
- Analog temperature control interface
- Temperature control interface digital, serial 20 mA TTY protocol
- CAN-Bus-interface for mold conditioner as per EUROMAP 66-2
- Interface BFMOLD® via CAN BUS for WITTMANN D-series
- Interface for AIRMOULD® mobile
- Audible alarm
- 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 brushing device
- Interface for vacuum pump
- Second injection data setting for automatic start up
- User specific programmable set value limits
- Web-Service
- Controll button IOS system incl. Interface EUROMAP 63–K4

**Additional equipment**
- HiQ package, Euro package, Insider package
- Inline thermography
- Webcam
- Pillar swivel crane with hoist
- Special paint and/or touch-up paint
- Tool kit
- Levelling pads
- Additional manual on USB flash drive, lighting in mold space