

SmartPower COMBIMOULD

60 – 350 t

Flexible multi-component technology

world of innovation



SmartPower COMBIMOULD

Highly versatile multi-component injection molding

SmartPower stands for the WITTMANN BATTENFELD injection molding machines with small to medium clamping force sizes (25 to 250 t), featuring a highly efficient servo-hydraulic drive system combined with a compact hydraulic clamping unit and lean injection units in the international standard sizes of 60 to 3400.

COMBIMOULD stands for the WITTMANN BATTENFELD multi-component technology which enables the combination of plastic materials in different colors and/or with different attributes into one composite part. This material composite technology can be used to manufacture individual parts as well as for injection molding assembly of individual parts to form integrated components.

SmartPower COMBIMOULD from 60 to 350 t stands for the combination of *SmartPower* machines with one or several additional plasticizing/injection aggregates in various configurations.

For technical details of standard *SmartPower* machines see the *SmartPower* brochure.





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SmartPower COMBIMOULD Applications

The COMBIMOULD principle

COMBIMOULD is a sequential injection molding process, in which, in a cyclical process sequence, a base part is produced in the injection molding station, to which plastic materials of different colors or types are added in one or several additional injection stations. This requires a variety of different processes, depending on the part geometry (for details, see the next two pages).

» Back molding

Simple back molding of two or three plastic layers on a base part or certain areas thereof is the most frequent application. Examples are decorations or anti-wear protection layers.

» Assembly injection molding

By targeted use of the differences in attributes of the plastic materials combined with each other, assemblies can be produced with individual movable or detachable parts. Examples are flexible toy figures, chain links, switch rockers or spout closures with resealing caps.

» Hard-soft composites

An important field of application for assembly injection molding is seal installation. In this process, sealing lips made of silicone or thermoplastic elastomers can be molded directly onto housing bodies or technical parts in a second injection molding step.

» Overmolding

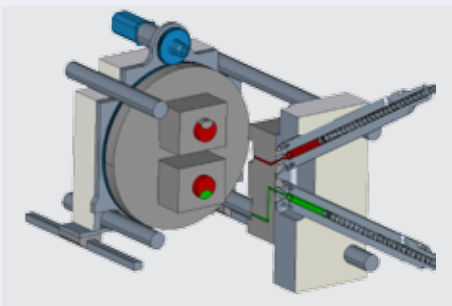
"Overmolding" is a special form of hard-soft combination, where soft, skid-resistant surfaces are created on housing parts or appliance handles with elastomer layers.

» Sandwich

Sandwich injection molding is a process variant of multi-component injection molding. It serves to produce components with a complete outer shell and a core made of different thermoplastic materials. The core and the outer layer are firmly bonded together.

COMBIMOULD PROCESS TECHNOLOGY

Optimally coordinated solution

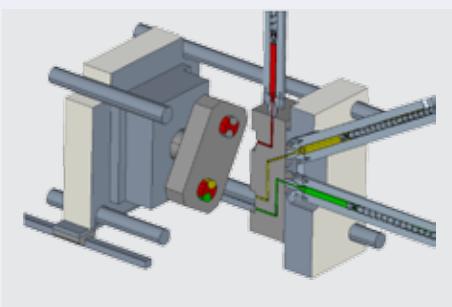


» Rotary unit process

The standard process

Rotary unit technology is the most frequently used COMBIMOULD variant. It is used both for overmolding and back molding. Here, the ejector half of an X + X-cavity mold is mounted on a rotary unit. The rotary unit can be designed for alternating rotation movements of +/- 180 degrees (2 stations), 120 degrees (3 stations) or 90 degrees (4 stations).

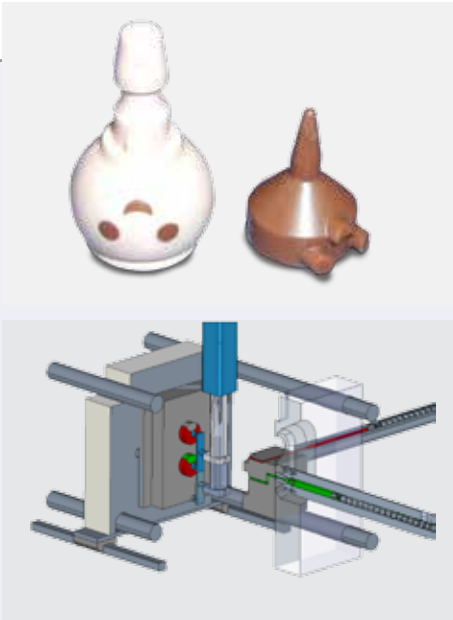
Following the injection molding process in station 1, the base part produced there is transferred to the overmolding station by opening and rotating the mold half on the ejector side. Parallel to molding the additional components in the subsequent stations, the next base part is produced in station 1. The finished part is removed from the last station.



» Index plate process

For complex part design

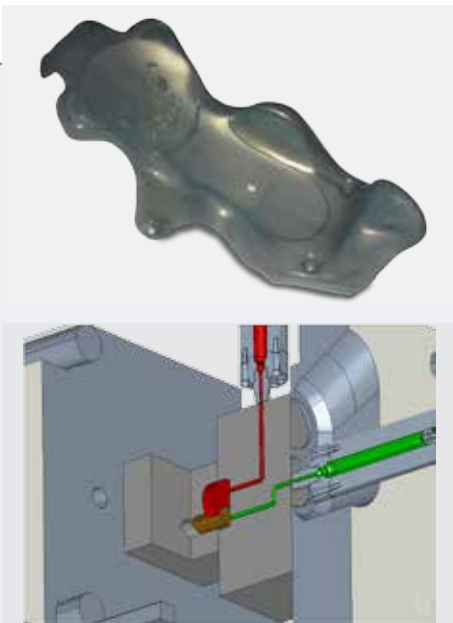
In index plate technology, the rotation and transfer mechanism is an integral part of the mold. This process must be applied if the second component is to be added on both sides of the part. To this end, the preform must be transferred to a station to receive a modified shape on both sides. This is carried out with the help of an intermediate plate inside the mold, also known as index plate, by which the parts are lifted out of station 1, turned and then re-inserted into station 2. The drive system for the index plate is either integrated in the mold or may be connected to the machine with a servo-electric drive. Rotations of +/- 180 degrees (2 stations), 120 degrees (3 stations) or 90 degrees (4 stations) are possible. The index plate system offers the maximum possible flexibility for molded parts engineering.



» **Transfer process**

For special cases and small series projects

This process is used as an alternative to the index plate process where the molded part No. 1, due to its geometry, has an insufficient contact area on the index plate for being transported by the index plate between the injection molding stations. Other types of applications are combinations of bulky inserts (such as screwdrivers or knife blades) with plastic components, or a low-cost production alternative for small series.



» **Valve gate retraction process**

To add flat components without parts transfer

In valve gate technology, the second component is added without prior mold opening and rotation. The different geometry required inside the cavity is produced by a hydraulic valve gate which, when retracted, provides the space for adding the second component.

In spite of a longer cycle time due to serial production steps, the valve gate process may be of interest economically in mold technology for small numbers of units because of the lower cost of mold technology. In some cases, the compact mold design even allows the use of smaller machines. However, a possible use strongly depends on the design of the molded part and on flat geometries of the additions.

CLAMPING UNIT

Versatile, powerful, proven

» **Sensitive and precise**

In the *SmartPower* clamping system, the exclusive function of the tie-bars is to provide the force bond between the external platens. The moving platen travels without tie-bar contact on the linear bearings, virtually free of friction. The tie-bars and the machine frame can be supplied with a greater length as an option.

» **Fast movements**

The moving platen is driven by two traveling cylinders mounted in a diagonal position. The combination of these traveling cylinders with a hydraulic differential gear system enables fast movements. The traveling cylinders are dimensioned for high mold opening forces.

» **Ample space and symmetrical force distribution**

Generously dimensioned mold platens and a clamping system with evenly distributed central hydraulic force transmission offer the optimal environment for all types of molds. The free space between the tie-bars and the machine frame provides ample space for lateral media supply connections and keeps the ejection chute free.

» **Flexible in the mold space**

The *SmartPower* clamping system is designed according to a modular concept and can be easily adapted to larger opening strokes or mold heights, which is often necessary to accommodate multi-component molds.

» **Tie-bar removal device available as standard**

For the insertion of bulky or extra-large molds, one of the tie-bars can be retracted and subsequently returned to its original position in just a few steps.



SERVO-ELECTRIC ROTARY UNIT

Fast and precise

Wittmann

Battenfeld

For *SmartPower* COMBIMOULD machines, rotary units with a servo-electric drive and ranging from 600 to 1090 mm in diameter are available as an option.

» **Specific technical data**

- Short rotation cycle times thanks to servo-electric drive
- All rotary units are laid out for rotary feed-through of the connected media – for up to 12 media circuits (temperature control, pneumatics, hydraulics) as well as power circuits and sensors.
- All rotary units are available for 2-, 3- and 4-station operation.
- Available for both reversing and round-loop cycles
- Accurate positioning with electronic rotation angle measurement
- End position dampening
- Indexing device
- Rotation parallel to machine and robot movements possible
- Rotation module can be deactivated via control system
- Easy, flexible installation and removal possible

» **Extension options**

- Extended number of media circuits
- Customized ejector positions
- Installation of magnetic mold platens
- Data transfer modules



INJECTION UNIT

The right combination for every application

In addition to the (horizontal) aggregate included in series production, *SmartPower* COMBIMOULD machines can be fitted with additional aggregates in V (vertical), L (horizontal at the rear of the machine), S (diagonal or "piggy-back") or H-H (horizontal, parallel side-by-side) configurations. The hydraulic drive modules are all located inside the machine frame and are activated via independent amplifier systems. Simultaneous, parallel operation of all injection units is possible as standard. All process variants can be set individually.

» V configuration

Injection from above, also into the mold parting line

- Generously dimensioned adjustment range
- Slide device with linear guides
- Simple horizontal adjustment
- V aggregate completely retractable to the rear to provide an absolutely free mold space
- Nozzle position stroke measurement incl. display in the control system

» S configuration

Positioned diagonally above horizontal injection unit

- Compact machine design
- Small footprint
- S and H aggregates movable independently
- Individually adjustable, moment-free nozzle contact force
- Excellent nozzle accessibility

» L configuration

Injection from the non-operator side, even into the mold parting line

- Slide device free on the rear of the fixed platen
- Injection unit supported on linear guides
- Large adjustment range
- Access to the nozzles and to the mold from the rear via large operator safety gate
- Fixed platen free for standard linear robot
- Nozzle position stroke measurement incl. display in control system

» H-H configuration

Two parallel horizontal aggregates

- Both aggregates movable independently of each other
- Good thermal separation of the aggregates
- Compact configuration
- Easy barrel change
- Brief material testing

H-H combination and other configurations and more than 2 injection units upon request



DRIVE TECHNOLOGY

Efficient through drive-on-demand

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Fast response, precise, economical

Drive-on-demand is the innovative combination of a fast-response, speed-controlled, air-cooled servo motor with a fixed displacement pump. This drive unit is only activated when required for movements and pressure generation. During cooling periods or cycle breaks for parts handling, the servo drive is switched off and consumes no energy. When in operation, drive-on-demand is the basis for highly dynamic, controlled machine movements and short cycle times.

In the *SmartPower* machine series, the drive-on-demand system is standard. In this way, it already complies today with the EU Energy Efficiency Directive 2020.

Parallel operation of all injection aggregates possible

In the COMBIMOULD machines, every plasticizing/injection unit is driven by its own pump aggregate. The additional aggregate for the second injection unit is integrated in the oil tank up to aggregate size 350, from injection unit size 525 upwards as a second hydraulic module beside the standard aggregate. This concept allows unrestricted parallel operation of all injection units including ejector and core pulls parallel to the clamping stroke.

Since all motors and pumps come with a sound-insulated enclosure, the operating noise level is kept below 65 dbA. It is thus just as low as that of the *SmartPower* single-component machines.

UNILOG B8

Complex matters simplified

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 appliances
 - 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

COMBINATION OPTIONS

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SmartPower COMBIMOULD 60 / 80 / 90

Injection unit	60 H	130 H	210 H	350 H	525 H
60	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
130	V-L	V-L-S	V-L-S	V-L-S	V-L-S
210	V-L	V-L	V-L-S	V-L-S	-

SmartPower COMBIMOULD 110 / 120

Injection unit	130 H	210 H	350 H	525 H	750 H
60	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
130	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
210	V-L	V-L-S	V-L-S	V-L-S	-
350	V-L	V-L	V-L-S	V-L-S	-

SmartPower COMBIMOULD 160 / 180

Injection unit	210 H	350 H	525 H	750 H	1000 H
60	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
130	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
210	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
350	V-L	V-L-S	V-L-S	V-L-S	V-L-S
525	V-L	V-L	V-L-S	V-L-S	V-L-S

SmartPower COMBIMOULD 210 / 240

Injection unit	350 H	525 H	750 H	1000 H	1330 H
60	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
130	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
210	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
350	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
525	V-L	V-L-S	V-L-S	V-L-S	V-L-S
750	V-L	V-L	V-L-S	V-L-S	V-L-S

SmartPower COMBIMOULD 300 / 350

Injection unit	525 H	750 H	1000 H	1330 H	2250 H
60	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
130	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
210	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
350	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
525	V-L-S	V-L-S	V-L-S	V-L-S	V-L-S
750	V-L	V-L-S	V-L-S	V-L-S	V-L-S

H	horizontal
V	vertical

S	slanted from above
L	horizontal from rear

Bonding of hard-soft material combinations

	TPE based on polyamide	TPE-polyester-elastomers	TPE based on polyolefin	TPE based on styrene	TPE thermoplastic polyurethane	TPE types with modified adhesive properties
ABS	■	□	■	■	▲	△
ASA		▲			▲	
CA						▲
PA 6	△		■	■	▲	△
PA 6.6	△			■	▲	△
PA-Blend	△		□	□		△
PBTP	■	□		▲	■	△
PC	■	□	■	□	▲	△
PC/ABS	■	□	■	□	▲	△
PC/PBT	■	□	■	□	▲	△
PC/PET	■	□	■	□	▲	△
PE	■		□	□		▲
PETP	■					▲
PMMA				□	□	▲
POM	■				▲	▲
PP	■	■		▲		△
PPO	■					▲
PS	■	■	■			△
PAN	■				▲	△

Due to the great variety of TPE types, the bonding strength must be checked in each individual case.

The bonding strength also depends on the part geometry, process conditions and processes involved.

Bonding of thermoplastic materials in multi-component injection molding

	ABS	ASA	CA	PA 6	PA 6.6	PA-Blend	PBTP	PC	PC/ABS	PC/PBT	PC/PET	PE	PETP	PMMA	POM	PP	PPO	PS	SAN	TPE/TPU
ABS	△	▲	▲	▲	▲		▲	▲	▲	▲	▲	□	▲	▲	■		■		□	□
ASA	▲	△	▲		▲		▲	▲	▲	▲	▲	■	▲	▲	■	■	■	■	▲	□
CA	▲	▲	△				▲					■			■	■	■			
PA 6	▲			△	△	▲	▲	□	▲	▲	▲	□			■	□	■	■		□
PA 6.6	▲	▲		△	△	▲	□		▲	▲	▲	□			■	□	■	■		□
PA-Blend				▲	▲	△									□	□	■			□
PBTP	▲	▲	▲	▲	□		△	▲	▲	▲	▲	□	▲	□	□	□		□	▲	□
PC	▲	▲			▲		▲	△	▲	▲	▲	■	▲		□	■		■	▲	□
PC/ABS	▲	▲		▲	▲		▲	▲	△	▲		■			□	■		■		□
PC/PBT	▲	▲		▲	▲		▲	▲	△	▲	▲	■	▲	▲	□	■		■		□
PC/PET	▲	▲		▲	▲		▲	▲	▲	△	▲	■	▲	▲	□	■		■		□
PE	□	■	■	□	□		□					△				▲			□	▲
PETP	▲	▲					▲	▲		▲	▲	■	△							□
PMMA	▲	▲					□			▲	▲	■		△		■	■	■	▲	□
POM	□	■	■	■	■	□	□	□	□	□	□	■			△					□
PP		■	■	□	□	□	□	■	■	■	■			■		△	□			□
PPO	■	■	■	■	■	■								■		□	△			□
PS	■	■		■	■		□	■	■	■	■			■				▲	△	□
SAN	□	▲	▲				▲	▲	□	□	□	□		▲			■	□	△	▲
TPE/TPU	□	□		□	□	□	□	□	□	□	□	▲	□	□	□	△	□	□	▲	△

In some cases, particularly where modified materials are involved, tests must be carried out to check the bonding strength.

- limited bonding
- no bonding
- ▲ good bonding
- △ excellent bonding



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