



## MOLDPRO/2

Dedicated All-Electric  
Injection Molding Machine  
for Thin-Wall Optical Parts

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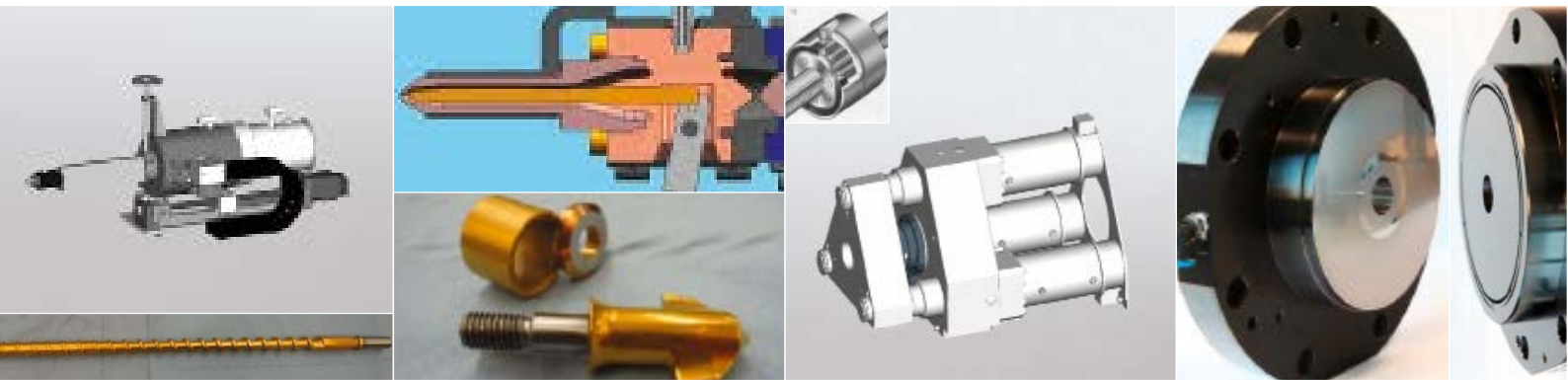
### *Dedicated All-Electric Injection Molding Machine for Blu-ray and Thin-Wall Optical Parts*

With its latest generation of exclusively designed all-electric injection molding machine for optical storage media, SINGULUS TECHNOLOGIES has closed the loop of high efficient Blu-ray mass production. The conjunction of CRYSTALLINE Mastering, MOLDPRO/2 Molding and BLULINE downstream ensures a superior replication chain; stable processes with the highest precision and repeatability at the shortest cycle times.

In molding, the high demands in optical disc production – best mechanical properties, especially with regards to substrate flatness and high replication rates of the tiny pits, the digital content out of a Blu-ray stamper – are fulfilled with the compact machine concept of MOLDPRO/2.

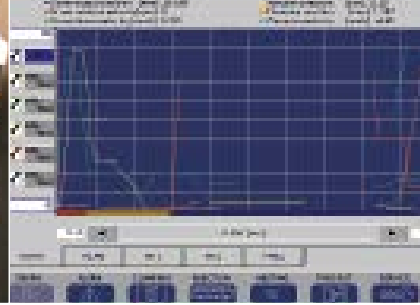
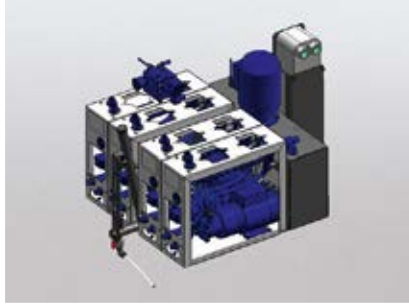
This platform with meanwhile more than 400 installed injection molding machines worldwide for CD, DVD and BD manufacturing in continuous operation (24/7) is also capable for other applications like the field of medical engineering with its clean-room requirements or high precision injection molding of other thin-wall optical polymers.

With the low energy consumption, the short set-up time and software features like the "slow cycle mode" which helps saving raw material in case of an unforeseen production stop, MOLDPRO/2 constitutes an economic disc manufacturing system.



MOLDPRO/2

*All-Electric Injection  
Molding Machine*



## Main Components

### Injection Unit

Inside the hardened barrel, there is a 28 mm plasticizing screw with the non-return valve. Each part is surface-coated with TiN against wear and corrosion as well as for processing technical polymers (PC, PMMA) with best optical characteristics. The barrel is divided into six individually controlled heating zones with an accuracy of  $\pm 0.2$  degrees. The special synchronization software ensures a careful and simultaneous heating of the single zones. The nozzle of the plasticizing unit is actively opened and closed by a pneumatic driven needle shut-off nozzle system for a smooth start-up, and together with the precise metering control a high melt homogeneity and very low shot weight variation are achieved. In production, the nozzle tip is in permanent contact with the sprue bush to minimize wear.

### Clamping Unit

The complete system, particularly the clamping unit, was designed by Finite Elements Analysis guaranteeing long durability and high stiffness. Very fast opening and closing speeds shorten the cycle times considerably. The direct drive system offers precise positioning and high replication rates as a result of the high acceleration movements. Due to the patented E-clamp system, the parallelism of the mold mounting plates can be influenced by motor offset adjustment via Human Machine Interface. This feature enables optimization of substrate thickness distribution caused by uneven stampers.

### Mold

The mold is designed by SINGULUS. Due to the patented E-clamp concept no centering mechanism is needed between the two mold halves, which results in a low weight (one mold half is about 10 kg), an easy access and a fast maintenance. Most of the parts, like the BD mirror with its frosted surface and the "screen printing" option, are produced with a tolerance of three microns for best mechanical characteristics.

### Temperature Control Unit (TCU)

The TCU is a closed DI water circuit added with a Biocide and an anti-corrosion agent independent on factory water. The primary circuit supplies cooling water out of a buffer tank to the high torque servo motors, all amplifiers, the mold mounting platen, the tie-bars and the feeding zone of the barrel. The second circuit is divided into four mold circuits. Each of these circuits can be precisely adjusted between 20 °C and 140 °C. All components are specially selected to ensure long lifetime, like magnetic coupled pumps and parts of either stainless steel or brass.

### Take-Out Robot

The servo driven take-out robot has an integrated mechanical gripper and is connected with a high efficient vacuum pump for a fast and exact removal of disc and sprue. An optical sensor for the sprue detection and analog sensors for a precise disc vacuum monitoring are implemented to the system. The mechanical components and the drive concept of the take-out robot guarantee short cycle times due to fast disc take-out and short mold opening stroke. A long lifespan, mechanical robustness and easy teach functionality complete the take-out system.

### Human Machine Interface (HMI)

The 10 inch coloured LC touch screen enables easy access to the machine operation. The menu is clearly arranged and different languages can be selected. All important parameters can be monitored, either within one cycle to observe the process behaviour, or with the trend graph over 500 shots to judge about process stability. Every parameter change is saved in a log-file. Machine data transfer (e.g. recipe management) can be easily done with USB sticks.

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*The company's core competencies include various processes of coating technology, surface treatment and wet-chemical and thermal production processes.*