

HIGH SPEED

Van Dorn EL-EXIS S

66 - 460

DemagPlastics Group
VAN DORN

VAN DORN EL-EXIS S

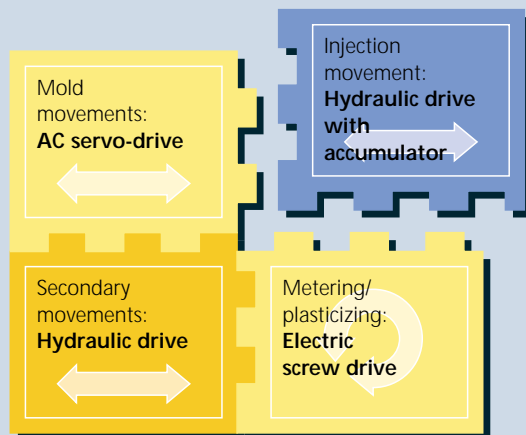
HIGH SPEED

New Benchmark in High-Performance Fast-Cycling

Short-lived trends set the pace in fast cycling. Whether food or technical packaging, closures or technical precision components, parts are becoming more demanding and more complex all the time as product life cycles grow ever shorter. To meet tomorrow's requirements for precision and repeatability in terms of both quality and economics, machine builders have to use new technologies.

The Van Dorn EL-EXIS S is a case in point. Its innovative concept combines the advantages of all-electric machines with those of hydraulic fast-cycling machine designs. The concept features independent drives running in parallel for each motion of the machine which has set new standards: shorter cycles, optimal dynamics, and energy savings. Additional modular options for the clamp and injection unit provide accurate solutions for nearly every fast-cycling and precision part in a clamping force range from 66 to 460 tons.

The unique Van Dorn EL-EXIS S is our answer to increasing requirements in fast cycling and precision injection molding. The growing number of EL-EXIS S users proves that we are on the right course.



Van Dorn EL-EXIS S drive matrix

The EL-EXIS S at a glance

- **fast:** short cycles with up to 5 times higher injection rates through a central hydraulic accumulator
- **powerful:** higher plasticizing capacity and homogeneity of the melt through independent electric screw drive
- **dynamic:** faster, more sensitive opening and closing of the mold via independent electric drive of clamping unit
- **safe:** mold protection system with piezoelectric sensors
- **precise:** high-resolution stroke measuring systems for positional accuracy of moving platen
- **flexible:** modular system for all fast-cycling, thin-wall and precision applications
- **energy-saving:** up to 40% lower energy requirements through parallel running drives and practically loss-free power transmission; stand-by function
- **low maintenance:** through-hardened, durable components
- **quiet:** through compact, noise-dampened drive units

EL-EXIS S

Energy review of different motions of an injection molding machine

Movement/ Load	Energy consumption hydraulic IMM %	Ideal drive	Advantages of drive	Energy savings vs. hydraulic IMM
Mold movement	20%	electrical	rapid response, sensitivity, energy savings	60%
Ejector and core pull	1%	hydraulic	high power, lower cost	-
Injection	11%	hydraulic*	rapid response, high speed	-
Plasticizing	55%	electrical	energy savings, melt quality, parallel movement, cycle time savings	30%
Carriage movement	1%	hydraulic	high speed, high contact force	-
Heater bands	12%	electrical	-	-
Total	100%			20% - 40%

*with accumulator



HIGH TECHNOLOGY

The Power of Parallel Drives

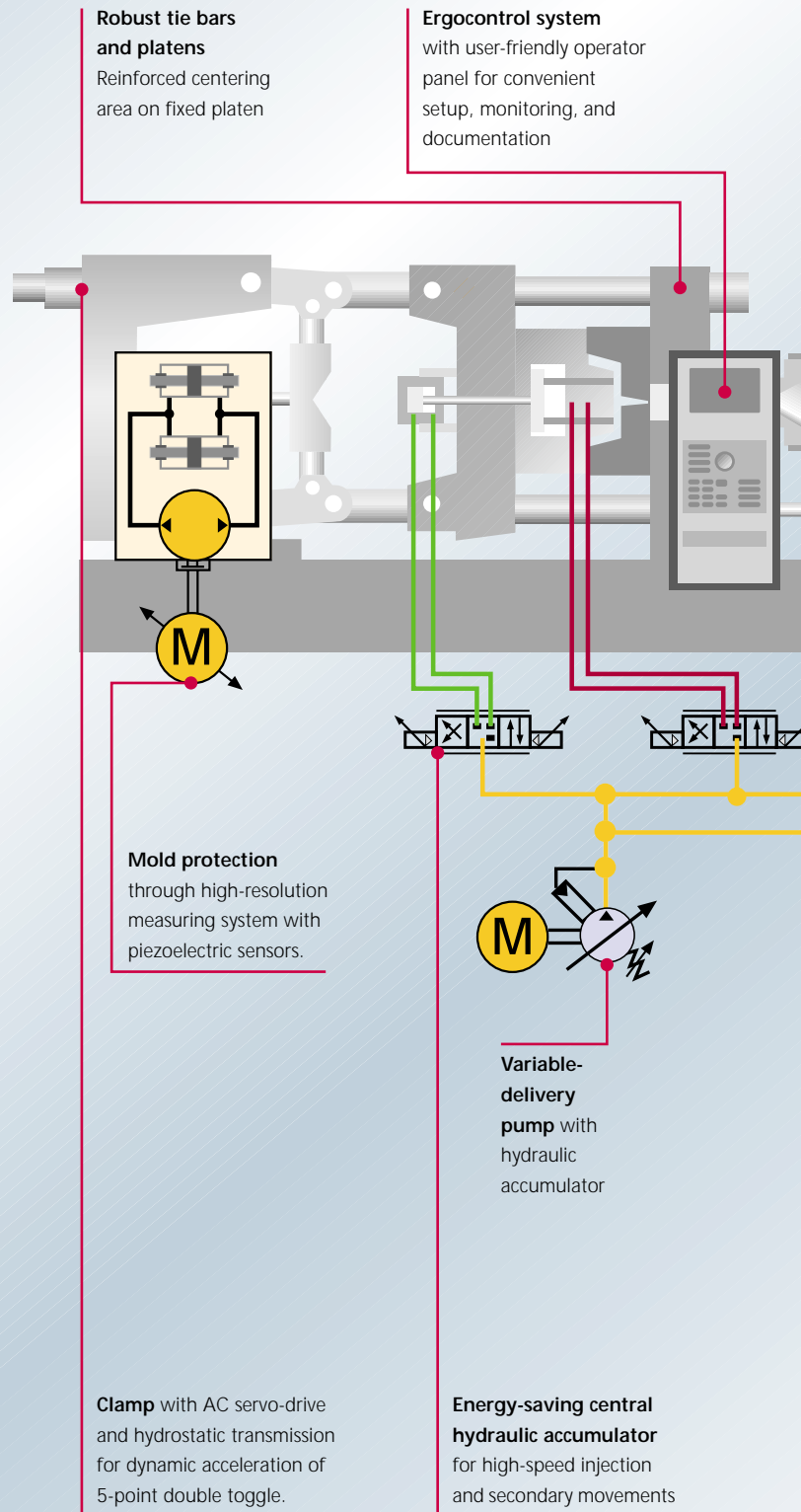
The Van Dorn EL-EXIS S sets tomorrow's standards of precision and speed. Fast travel and injection speeds are easily achieved without any sacrifices in precision and safety. For thin-walled and packaging parts these sets of opposites are a must. These parts must be molded quickly while maintaining tight tolerances and protecting the mold – a high cost investment. All of this can be achieved on all of the Van Dorn EL-EXIS S machines, from 66 to 460 tons.

Integral to achieving this performance is the unique combination of electric and hydraulic drives. Independent parallel-acting control loops for the clamp, injection unit and secondary motions allow the Van Dorn EL EXIS S to realize fast, harmonic and consistent motion cycles.

High-speed plasticizing and injection

The speed and response required for high-precision, fast-cycling parts during plasticizing and injection are generated by the Van Dorn EL-EXIS S on two levels. First, the frequency-controlled electric screw drive is the energy source, with high stored energy driving the rotary motions of the screw. The AC-driven motor transmits power practically loss-free to the screw. This design minimizes maintenance requirements while ensuring quiet and energy-efficient operation. Its decisive advantage: plasticizing is possible over almost the entire machine cycle, cycle time is shortened proportionately, and output, melt homogeneity, and quality of color disbursement are proportionately higher.

Secondly, high-speed injection is achieved by a central hydraulic accumulator and a servo-valve. The result: dynamic response of the linear injection motion is not compromised, neither during acceleration nor in applying the force by mechanical transmission elements. In effect, with injection speeds of up to 39.3 in./s (1000 mm/s) and a screw acceleration of up to 39.3 ft./s² (12 m/s²) the machine achieves absolute maximum values.

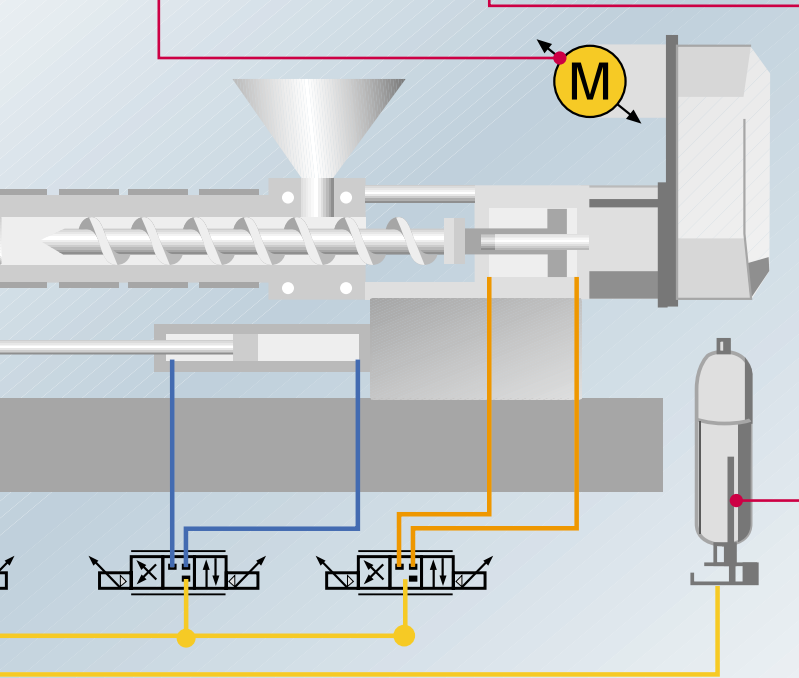


Electric screw drive

with a frequency-controlled, quiet-running AC servo-motor for high plasticizing capacity and short cycles.

Central hydraulic accumulator

for injection speed up to 39.3 in./s (1000 mm/s) and screw accelerations up to 39.3 ft./s² (12 m/s²)



Improved acceleration and deceleration

While the injection unit design is innovative, so is the independent clamp drive. The electric servo-motor is activated by a hydrostatic drive and provides nearly loss-free power transmission to the 5-point double toggle – the dynamic response of the clamping unit results in a significantly shorter dry cycle time compared to other hydraulic machines.

High drive dynamics, extremely fast and precise injection as well as accelerated mold open and parts removal – all these factors make for distinctly shorter machine cycles and energy savings of up to 40% or more when compared to conventional fast-cycling machines.



HIGH PRECISION

Accuracy in Machine Design

Precision and process consistency are indispensable for many fast-cycling parts. The combination of the independent drives with high-resolution, ultrasonic stroke measuring systems, the Van Dorn EL-EXIS S achieves a positional accuracy of the moving platen that is many times higher than conventional solutions – a substantial advantage in the removal of molded parts which are picked by grippers at precise datum points.

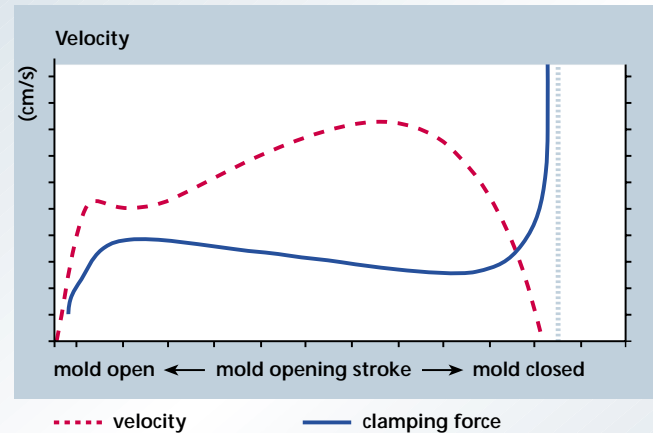
Another advantage is during mold close. Not only is mold wear reduced but if any irregularity should arise during mold close, the piezoelectric sensors will stop the machine within milliseconds. This unique system reliably protects expensive molds from damage (for Van Dorn EL-EXIS S mold protection system, see page 8).

Structurally, the machine was carefully designed for precise movements and high, dynamic loads. The machine base of the Van Dorn EL-EXIS S is designed to remain rigid under high loads. So too are the platens which have been optimized by means of finite element analysis. In addition, we have reinforced the stationary platen in the centering area in order to enhance stability at the mold center. High platen parallelism is ensured by stable, non-warping guidance of the moving platen on the tie bars of the clamping system.

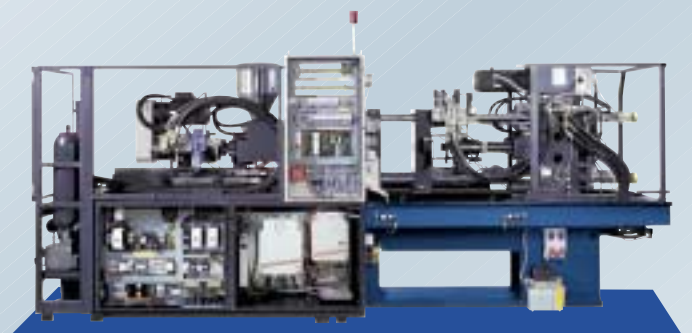
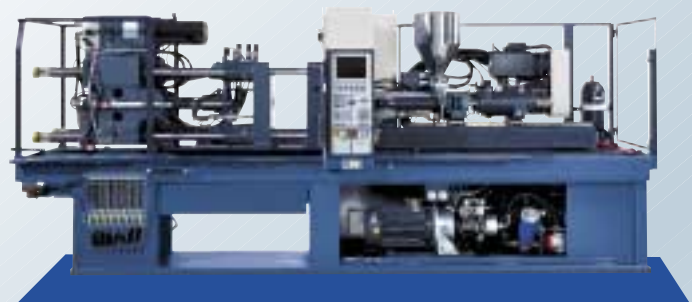
In order to equip your Van Dorn EL-EXIS S quickly and economically for new jobs, there are a host of modules available from the Van Dorn modular range – for single-component and multiple-component parts in each clamping force range between 66 to 460 tons.

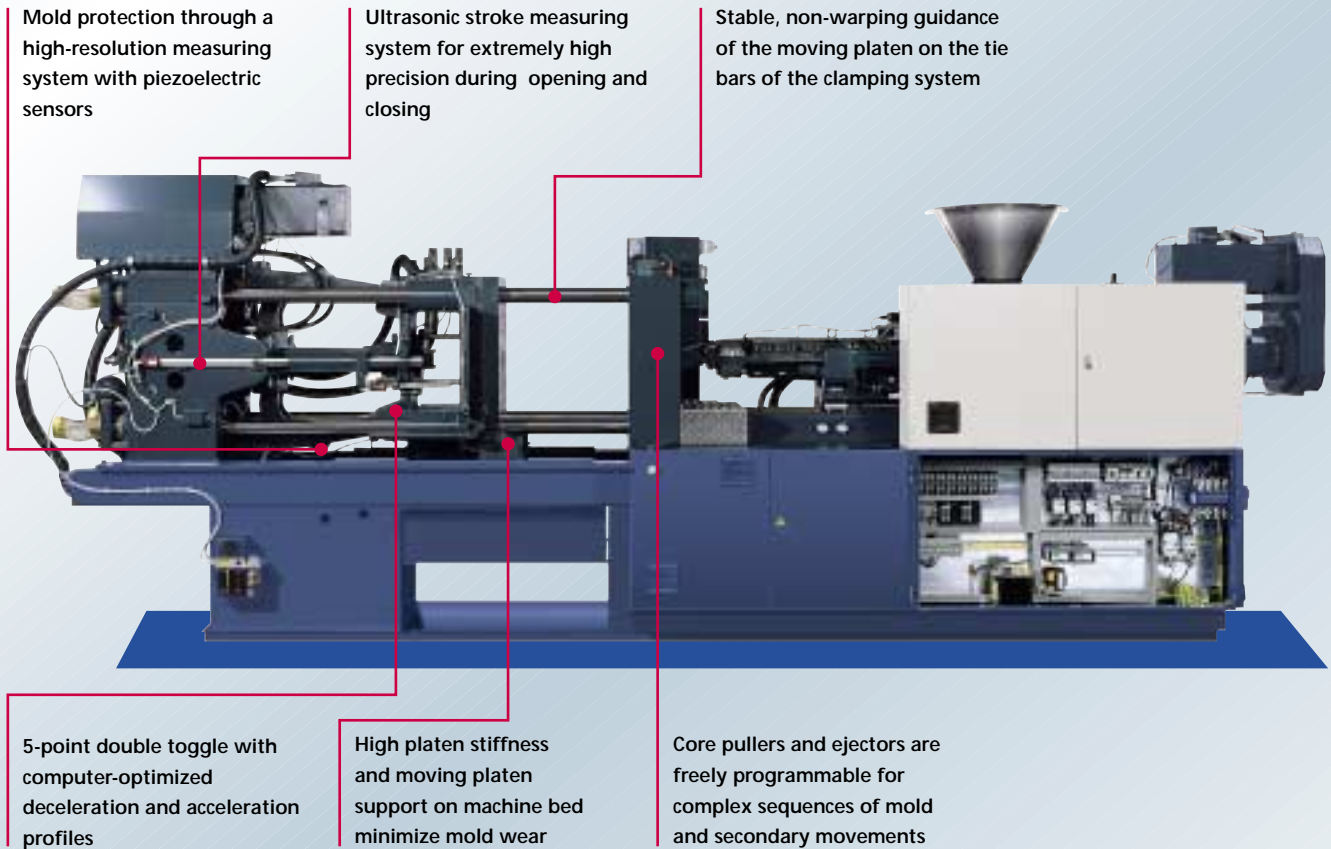
In short, for thin-walled applications where extremely close tolerances are specified, and also for complex moldings involving long flow distances, the EL-EXIS S overcomes existing limits of practicality, thanks to superior injection capacity and precision.

Force and velocity profiles of the 5-point double toggle



Computer-optimized deceleration and acceleration profiles provide sensitive and mold-friendly control of the high-speed movements of the 5-point double toggle.





Mold protection through a high-resolution measuring system with piezoelectric sensors

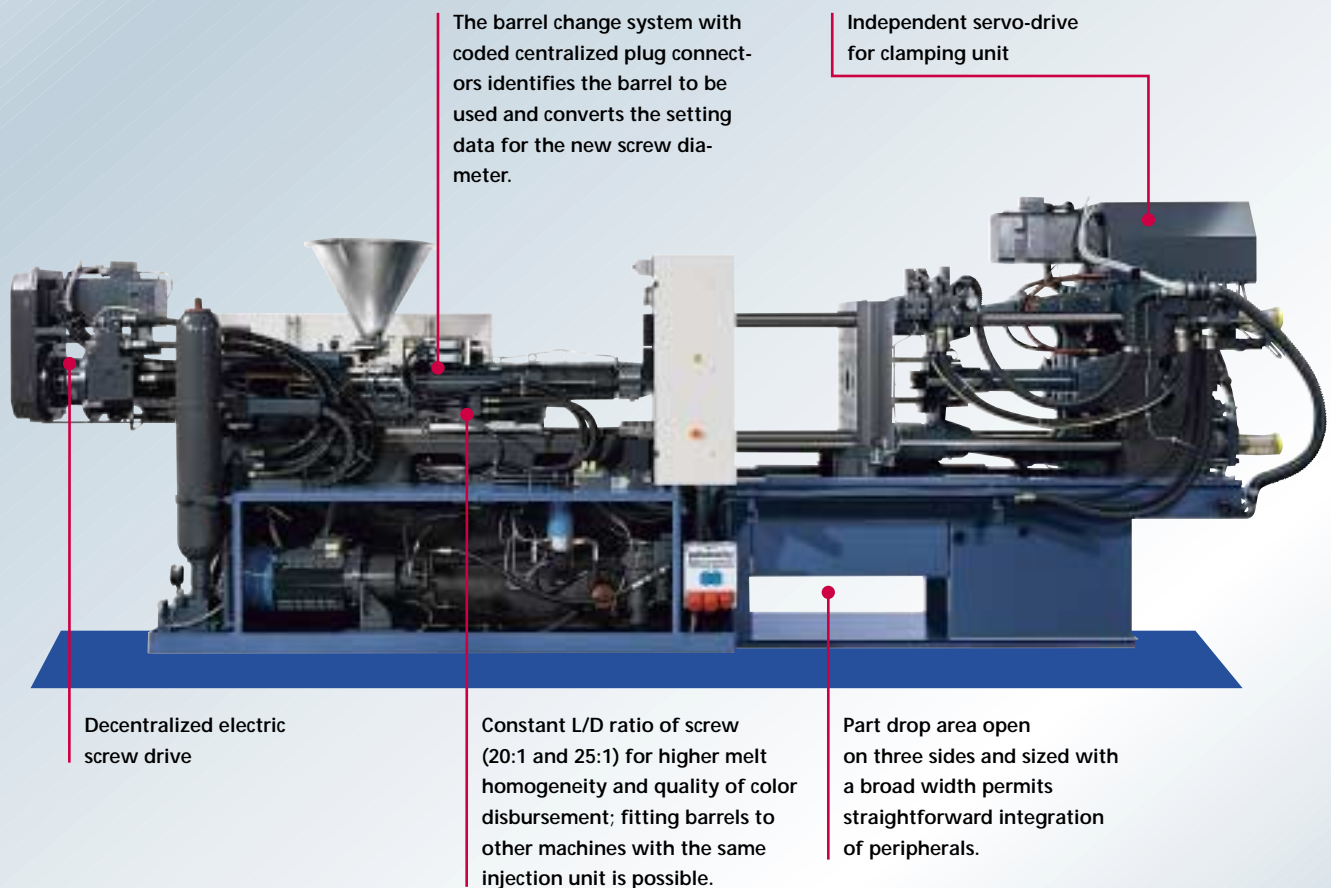
Ultrasonic stroke measuring system for extremely high precision during opening and closing

Stable, non-warping guidance of the moving platen on the tie bars of the clamping system

5-point double toggle with computer-optimized deceleration and acceleration profiles

High platen stiffness and moving platen support on machine bed minimize mold wear

Core pullers and ejectors are freely programmable for complex sequences of mold and secondary movements



The barrel change system with coded centralized plug connectors identifies the barrel to be used and converts the setting data for the new screw diameter.

Independent servo-drive for clamping unit

Decentralized electric screw drive

Constant L/D ratio of screw (20:1 and 25:1) for higher melt homogeneity and quality of color disbursement; fitting barrels to other machines with the same injection unit is possible.

Part drop area open on three sides and sized with a broad width permits straightforward integration of peripherals.

HIGH PERFORMANCE

Top Performance in Every Detail

Whether it is the dynamic response of the injection unit or the innovative mold protection system, the high performance of the Van Dorn EL-EXIS S is a result of the interaction of numerous intelligent individual components. These innovations are backed by extensive experience accumulated over many decades in the development of innovative toggle technology and advanced drive systems – and our proactive introduction of new technologies providing economical solutions to meet the industry's upcoming needs.

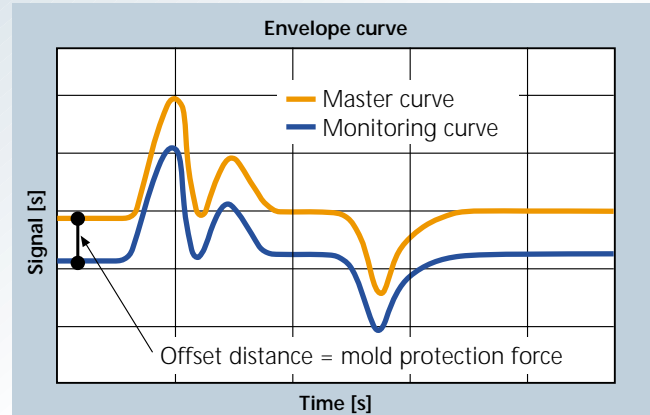
Molds perfectly protected

A new system for optimizing mold protection during high-speed clamp travel has been designed into the Van Dorn EL-EXIS S. This innovative and truly unique mold protection system incorporates a piezoelectric sensor mounted on the operator side bottom link behind the movable platen. The piezoelectric sensor ascertains the force required over a normal cycle to move the clamp and stores it as a master curve in the machine controller. In every cycle, the controller compares the force variation against the master curve. If the actual values deviate, the clamp is actively stopped within a fraction of a second.

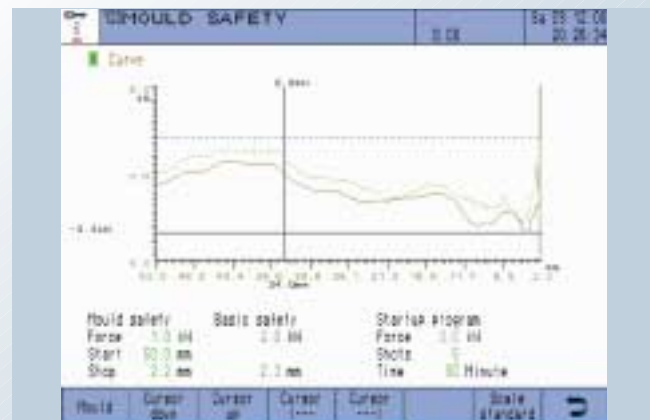
- The high-resolution sensor will detect any minimal deviations from the master curve.
- The system will detect deviations over the full opening and closing stroke of the clamping unit so the system is effective before the immediate approach range – a short distance before the mold halves touch.
- The clamping unit is *actively* braked – with a correspondingly shorter reaction time.
- The system *does not* extend the cycle time which makes it well suited for fast-cycling applications.

Cycle time systematically minimized

Whether mold-specific cycle optimization, programming of hot runner nozzles, simultaneous injection during locking or total cycle time analysis – the control of the Van Dorn EL-EXIS S incorporates a host of intelligent software features which enable machine cycles to be systematically analyzed and distinctly optimized. (see graph)

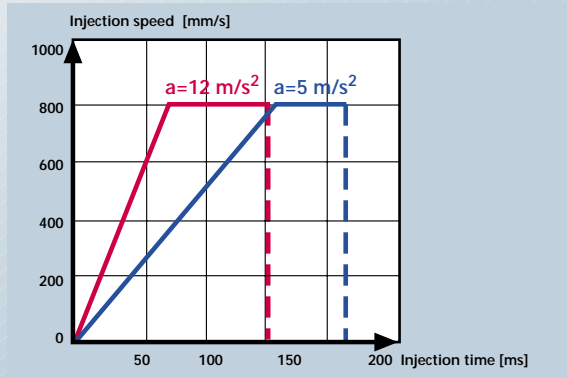


The mold protection system can be conveniently set on the operator terminal. Matching it up to the mold is automatic, the graphic display facilitating operation and defect analysis.



The "Cycle Time Analysis" menu permits all process phases to be exactly displayed, time reserves to be identified and systematically reduced.

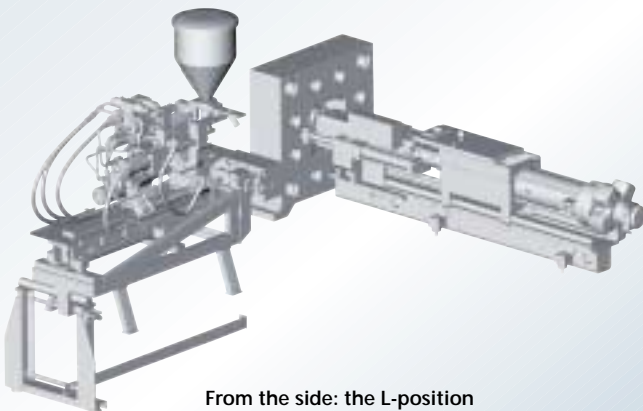
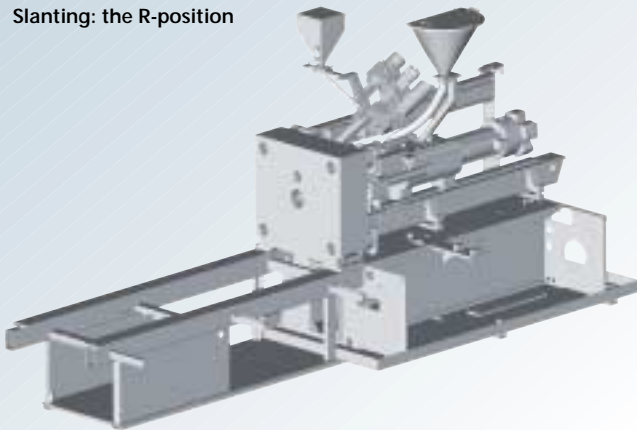
The stored energy of the Van Dorn EL-EXIS S accumulator-assisted hydraulics provide extremely high injection speeds and shortest cycles times, even on short stroke applications.



■ conventional injection operation 16.4 ft./s² ($a = 5 \text{ m/s}^2$)
injection speed setting: 31.49 in./sec. (800 mm/sec)
mean injection speed attained 19.21 in./sec. (488 mm/sec)
injection time: 205 ms

■ rapid response injection operation 39.3 ft./s² ($a = 12 \text{ m/s}^2$)
injection speed setting: 31.49 in./sec. (800 mm/sec)
mean injection speed attained 24.92 in./sec. (633 mm/sec)
injection time: 157 ms

Slanting: the R-position



From the side: the L-position

Unlimited parallel movements

The secondary movements for core pull, ejectors and nozzle contact are linear movements which have no significant impact on the machine's energy consumption. Therefore, their energy supply is decentralized – separate from the main drives – via a hydraulic accumulator. This solution permits parallel machine movements without power losses – saving both cycle time and costs.

Faster acceleration, dynamic response of injection

Injecting the melt for fast-cycling and thin-walled moldings requires accelerating the screw at rates of up to 39.3 in./s (1000 mm/s) to the necessary speed of advance. In order to achieve such high acceleration rates, it is necessary to have high capacities of oil on call – quickly and independently of other machine movements. Because high-speed applications typically use small shot volumes or short screw strokes it is important for one injection unit to respond quickly. This is the only way to obtain fast injection times in order to realize short cycle times. Since electric drives are limited to a fraction of the required capability, injection on the Van Dorn EL-EXIS S is affected through a hydraulic accumulator which has substantially higher stored energy (see graph).

Energy saved on drive and cooling

Another key advantage over conventional fast-cycling machines is the Van Dorn EL-EXIS S's low energy consumption. On average, it will save as much as 40% compared to a hydraulic fast-cycling machine with an electric screw drive. Compared to conventional hydraulic machines, energy savings even amount to some 50%. And because electrical drives convert less energy into heat than hydraulic drives, cooling requirements are also less than those of an equally large conventional machine – in the case of a Van Dorn EL-EXIS S 220 tons, for example, cooling savings are 40%.

Multiple component parts from fast-cycling:

Van Dorn EL-EXIS S Multi

Entirely new perspectives have been opened up by the Van Dorn EL-EXIS S Multi for multi-component parts. Aside from all the advantages of the single-component, fast-cycling machine, the Multi permits the second component to be injected by a second injection unit mounted in piggy-back fashion (R-position) or L-position. Key benefit: The Van Dorn EL-EXIS S Multi is custom-configured to meet the user's specifications.

DEMANDING APPLICATIONS

Solutions for Every Molded Part

From mold technology, thin-wall, In-Mold Labeling (IML), multi-component machine configuration or engineering of production cells and complete plants, we have the know-how. And we will provide you with comprehensive and seamless support from the idea to the commercial product. Our guiding principle is that "a chain is only as strong as its weakest link", meaning that we will consider each component uniquely and will configure it to suit your specifications for top performance. Here are a few examples of commercial Van Dorn EL-EXIS S projects:

PACKAGING PRODUCTS

Thin-walled drinking cups produced in a 6+6-cavity mold:

In cooperation with a prestigious mold-making firm, we developed a complete Van Dorn EL-EXIS S-production plant for thin-walled polystyrene drinking cups with 4.44 oz. (126 g) shot weight and a flow-distance/wall-thickness ratio of 200 : 1. The heart of the plant – a 6+6-cavity stack mold – doubled the plant's output, albeit with a slightly longer cycle.



Thin-walled yogurt-container production with parts-handling equipment:

This system using a 2-cavity mold was molded in a Van Dorn EL-EXIS S 110 ton. The PP-container, 0.50 oz. (14 g) shot weight, has a flow-distance/wall-thickness ratio of 200 : 1. An interesting feature of this plant is the parts-handling equipment (PHE) which includes a stacking device. The PHE is mechanically interlocked with the travel motion of the clamping unit, so there is no possibility of the gripper colliding with the mold on entry.



8.6 liter pail featuring in-mold labeling (IML):

The plant including the mold, IML foil feed system, unloading system and stacking device with integrated handle insertion device was built under a total-project contract placed by a leading European manufacturer of packaging products. Centered on a Van Dorn EL-EXIS S 385 ton, the pre-punched labels are inserted and placed in position into the open mold automatically, and are bonded to the molded part as plastic is injected.



10 key benefits of Van Dorn EL-EXIS S production cells

- independent parallel movements
- fast dry cycling rates
- precise movements reducing mold stresses
- high process consistency
- pinpoint positioning accuracy, e. g. for parts-handling systems
- dynamic-response injection
- up to 50% less energy for drives, up to 40% less for cooling
- active mold protection over full stroke
- smooth and quiet running
- turn-key contracts accepted for complete production cells and plants



CLOSURES

Dispensing fitment for vacuum beverage packaging:

"CheerPack" is a beverage packaging system consisting of a multi-layer foil pouch and an injection-molded top with a valve inserted. Marketed worldwide, the European licensee produces "CheerPacks" on an EL-EXIS S cell at a rate of some 100 million per year. Apart from providing high precision and consistency of mold and machine, the Van Dorn EL-EXIS S outperformed competitors with a 17% reduction in cycle time.



TECHNICAL PACKAGING

Mobile phone cell – 8 thin-walled shells produced every 4 seconds:

Working with partners in mold-making and automation, we developed a mobile phone production cell with an integrated unloading system for a leading electronics group. Just a few highlights of the Van Dorn EL-EXIS S cell: The dynamic-response hydraulic accumulator causes poor-flow PC/ABS to pack the mold in less than 0.2 s. The positioning accuracy of the clamping unit ensures safe and trouble-free unloading by the parts-handling equipment.



TECHNICAL PRECISION PARTS

An electrical connector "close to the impossible":

Modern electrical parts frequently involve extremely long flow paths and wall thicknesses of only a few tenths of a millimeter between the cores described as a challenge or "close to the impossible" by a leading automotive supplier who produces some 550 million plug connectors on a Van Dorn EL-EXIS S series machine. Key factors in his decision for choosing the Van Dorn EL-EXIS S were the exceptionally high process consistency, the 10% shorter cycle time, and the smooth movements of the machine reducing stress levels in the mold.

MOLDER ACTION NETWORK

Our commitment to 100 percent customer satisfaction is part of the Van Dorn experience. That is why we created the Molder Action Network – total support with one call. Contact us at (866) 491-1045 or visit www.molderactionnetwork.com.



REPLACEMENT PARTS

Van Dorn maintains an extensive, computerized inventory of replacement parts to assure customers of quick delivery.



TECHNICAL SERVICE

The Molder Action Network's Technical Service Department is standing by with a wide range of services – installation and start-up, troubleshooting, field service and preventive maintenance.



TRAINING

We offer classes at three different customer training centers located in Strongsville, Ohio; Greenville, South Carolina; and Roselle, Illinois. Training, tailored to meet your needs, can also be arranged at your facility.



PROCESS SOLUTIONS CENTER

This center, available to customers before and after a sale, is a state-of-the-art lab facility for mold trials, machine run-offs prior to delivery or troubleshooting processes in the field.

ENERGY SAVINGS

Sky-rocketing energy costs have changed the economics of the injection molding business. The Molder Action Network can help you cut your power bills down to size.

ONLINE STORE

Order parts from our new online store where convenience and ease are our main priority. We can accept payment via credit cards or purchase orders.

Van Dorn Demag Corporation
11792 Alameda Drive
Strongsville, Ohio 44149 USA
tel: 440/876.8960, fax: 440/876.4383
web: www.vandorndemag.com
e-mail: susan.mann@dpg.com

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