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The responsibility to ensure that everything runs smoothly

Many moulders today operate three shifts, some on 365 days of the year – this calls for a maximum of availability of the machines, spare parts, and service support.

Backed by highly skilled service teams, advanced spare parts logistics, and multiple service levels to address a customer's specific needs, we provide total support world-wide: from straightforward inspections through comprehensive maintenance, and extended warranties for high capacity utilisation levels to emergency hotline support, and training of your personnel.

Full documentation and a digital catalogue ensure that spare parts are delivered to you in a minimum of time, usually within a few hours. Users of older machines can have them upgraded by our retrofit service at fair prices, for instance, by state-of-the-art control software or for specialised injection-moulding processes. In short, the Sumitomo (SHI) Demag Service provides you with whatever support you need to complete your jobs efficiently and to schedule.



The racing machine



 **Sumitomo**
SHI **DEMAG**

El-Exis



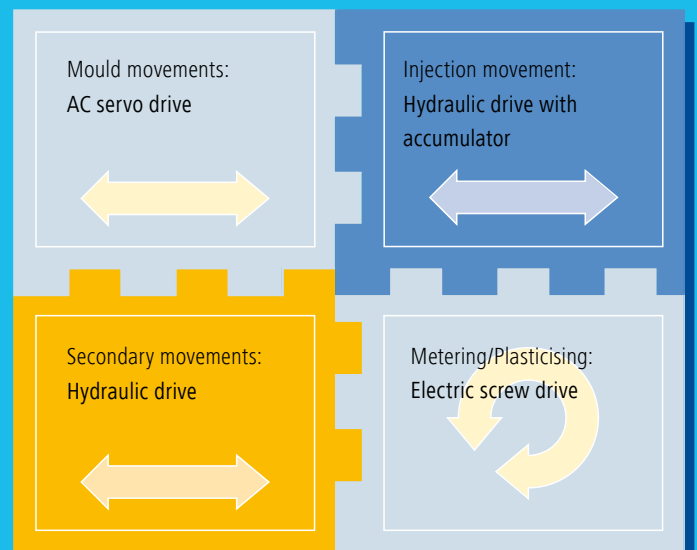
The El-Exis at a glance

- **dynamic:** shorter injection times with extremely high injection rate through hydraulic accumulator
- **powerful:** higher plasticising capacity and homogeneity of the melt through independent electric screw drive
- **fast:** faster, more sensitive opening and closing of mould via independent electric drive of clamping unit
- **safe:** active mould protection system with piezoelectric sensors
- **precise:** high-resolution stroke measuring system on the injection unit combined with rapid-response servo-valve for accurate process control
- **flexible:** modular system for all fast-cycling, thin-wall and precision applications
- **energy-saving:** up to 40 % lower energy requirements through parallel drives and practically loss-free power transmission; stand-by operation
- **low maintenance:** through wear-resistant force-transmitting components
- **quiet:** through compact, noise-dampened drive units

“A convincing concept with which we enhance your competitiveness.”

Andreas Kübel, Manager Drive Technology, Sumitomo (SHI) Demag

The racing machine El-Exis



El-Exis drive matrix



Energy review of different movements of an injection-moulding machine

Movement/ Load	Energy consumption hydraulic IMM %	Ideal drive	Advantages of drive	Energy savings with EL-EXIS S
Mould movement	20 %	electrical with hydrostatic transmission	rapid response, sensitivity, energy savings	60 %
Ejector and core pull	1 %	hydraulic*	high force and precision	–
Injection	11 %	hydraulic*	rapid response, high speed	–
Plasticising	55 %	electrical	energy savings, parallel movements, cycle time reduction	30 %
Carriage movement	1 %	hydraulic*	high contact force, high speed	–
(Heater bands)	12 %	electrical	–	–
Total	100 %			20 % – 40 %

Reduced energy consumption through small pump size
(even at no load, each pump uses 15 – 20 % of its rated power)

*with accumulator

Reduced energy consumption

	Weight [g]	Cycle [s]	hydraulic fast-cycling machine [kWh/kg]	El-Exis [kWh/kg]	dE [%]
Flower pot	33.5	2.97	1.17	0.67	43
Razor handle	138	6.59	0.57	0.36	37
Bowle	68.7	6.03	0.99	0.54	45
Razor	39.2	6.98	0.72	0.34	47
Drinking cup	61.2	3.47	0.68	0.43	37

New Benchmark in High-Performance Fast-Cycling

Short-lived trends in the field of packaging products 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 approaches.

The El-Exis is a case in point. Its innovative concept combines the advantages of all-electric machines with those of hydraulic fast-cycling designs. The concept features independent drives running in parallel for each movement of the machine which has set new standards: shorter cycles, optimal dynamics, and energy savings. Additional modular options for the clamping and injection units provide accurate solutions for nearly every fast-cycling and

precision part in a clamping force range from 1,000 to 7,000 kN.

The unique El-Exis concept is our answer to increasing requirements in fast-cycling and precision injection moulding. The growing number of El-Exis users proves that we are on the right course.



The Power of Parallel Drives

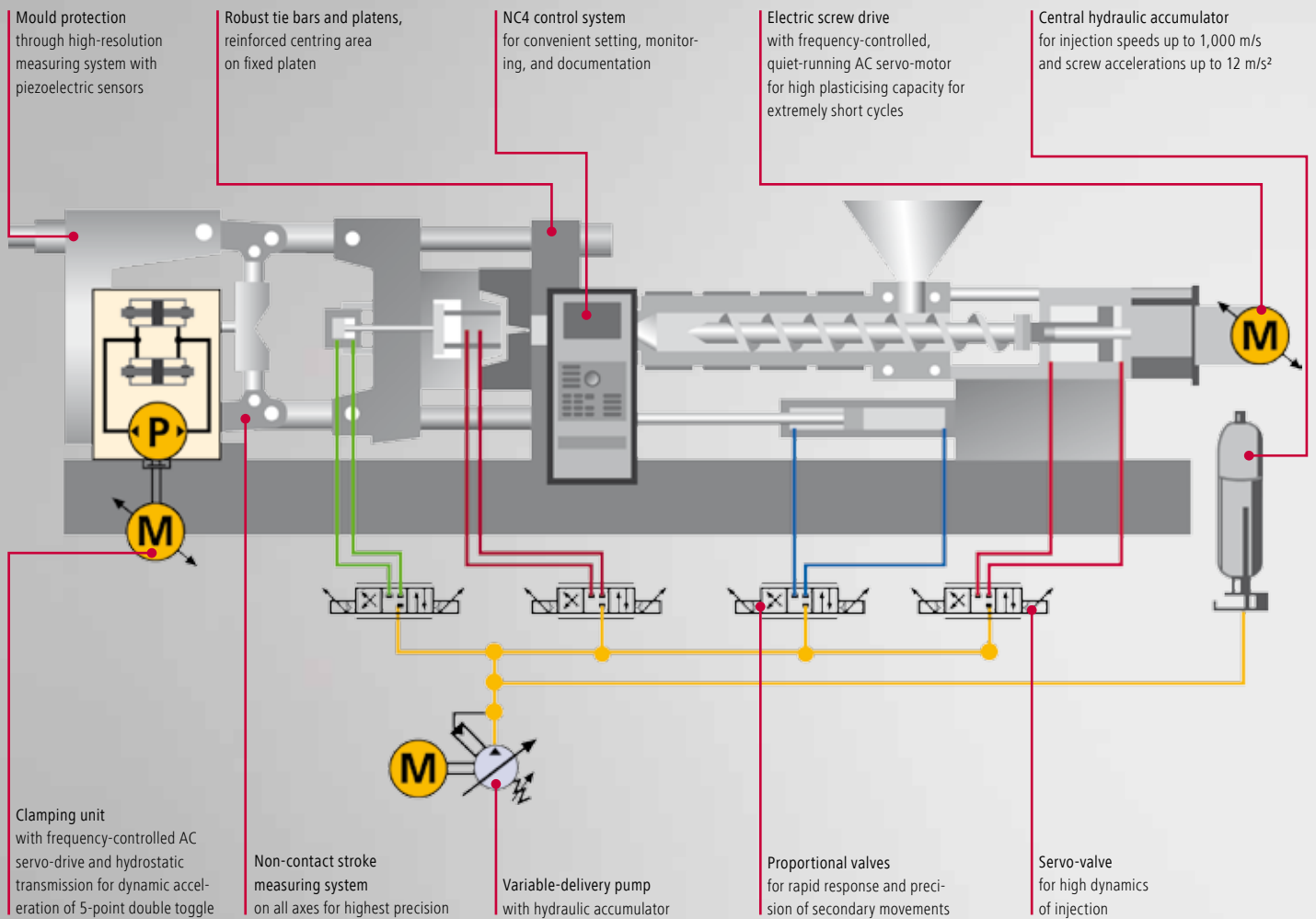
The EL-Exis sets tomorrow's standards of precision and speed. Extremely fast travel and injection cycles are easily achieved without sacrificing in precision and safety. For thin-walled and packaging parts with minimum tolerances, as well as, for fast-cycling and precision applications employing high injection pressures, and in each clamping force range from 1,000 to 7,000 kN. Integral to achieving this is the unique combination of electric and hydraulic drives. Independent control loops operating in parallel for the clamping unit, injection unit and secondary movements, allow the EL-Exis to realise extremely fast, harmonic and consistent movement cycles.

High-speed plasticising and injection

The speed and response required for high-precision, fast-cycling parts during plasticising and injection are generated by the EL-Exis at two levels. Firstly, the frequency-controlled electrical screw drive is the

energy source with a high stored energy driving the rotary movements of the screw. The AC-servomotor transmits power practically loss-free to the screw. This design minimises maintenance requirements while ensuring quiet and energy-efficient operation. Its decisive advantage: plasticising is possible over almost the entire machine cycle, cycle time is shortened, and output, melt homogeneity, and quality of colour dispersion are higher.

Secondly, high speed of injection is achieved by a hydraulic accumulator and a servo-valve. The result: the dynamic response of the linear movement is not compromised, neither during acceleration nor in applying the force by mechanical transmission elements. In effect, with injection speeds of up to 1,000 mm/s and a screw acceleration of up to 12 m/s² the machine achieves absolute maximum values.

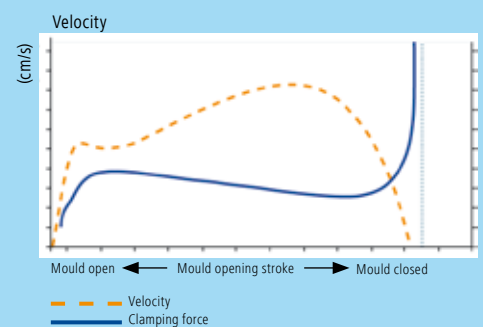


Improved acceleration and deceleration

While the injection unit design is innovative, so is the independent clamping unit drive. The electric servo-motor drive equipped with a hydrostatic transmission providing nearly loss-free power transmission to the five-point double toggle – the dynamic response of the clamping movement results in a significantly shorter dry cycle time compared to straight hydraulic machines. The high-precision Sumitomo (SHI) Demag clamping unit with 5 point double toggle and integrated, short-length clamping cylinders in conjunction with variable tie bar distances provides ample space for large moulds. The powerful kinematics of the double toggle ensure short locking times and high mould opening forces. Especially in the end positions, the large movement of the toggle is contrasted by a relatively small movement of the clamping platen permitting extremely sensitive

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

Force and velocity profiles of the 5-point double toggle



Computer-optimised deceleration and acceleration profiles provide sensitive and mould-friendly control of the high-speed movements of the 5-point double toggle

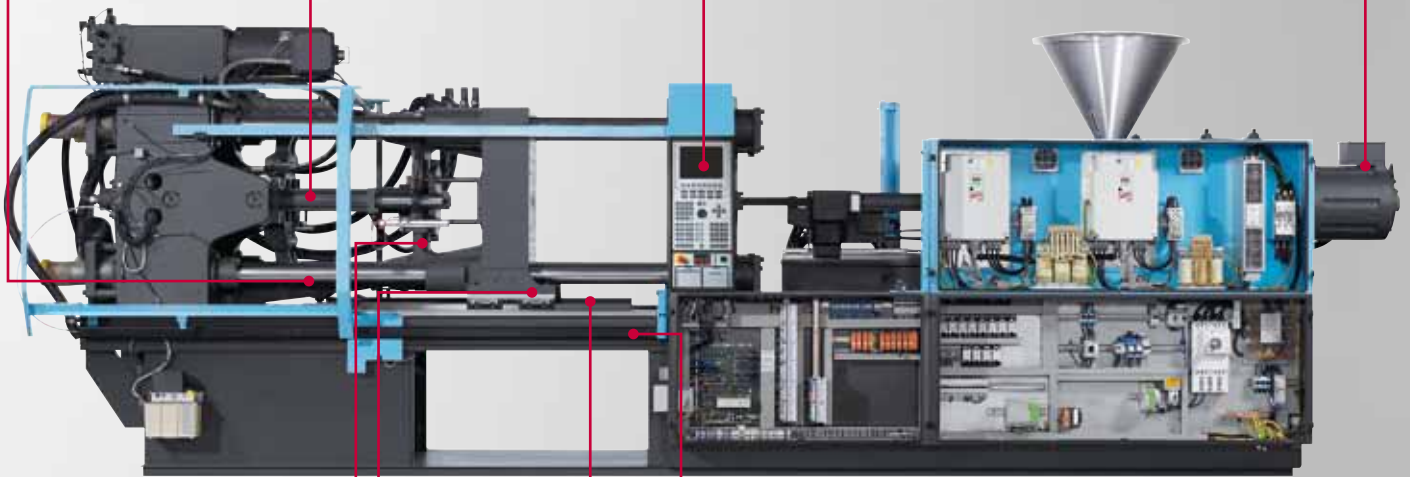
HIGH PRECISION

Mould protection through high-resolution measuring system with piezoelectric sensors

Non-contact ultrasonic stroke measuring system for extremely high precision of injection, opening, closing and ejection

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

High-torque direct drive for high metering capacity



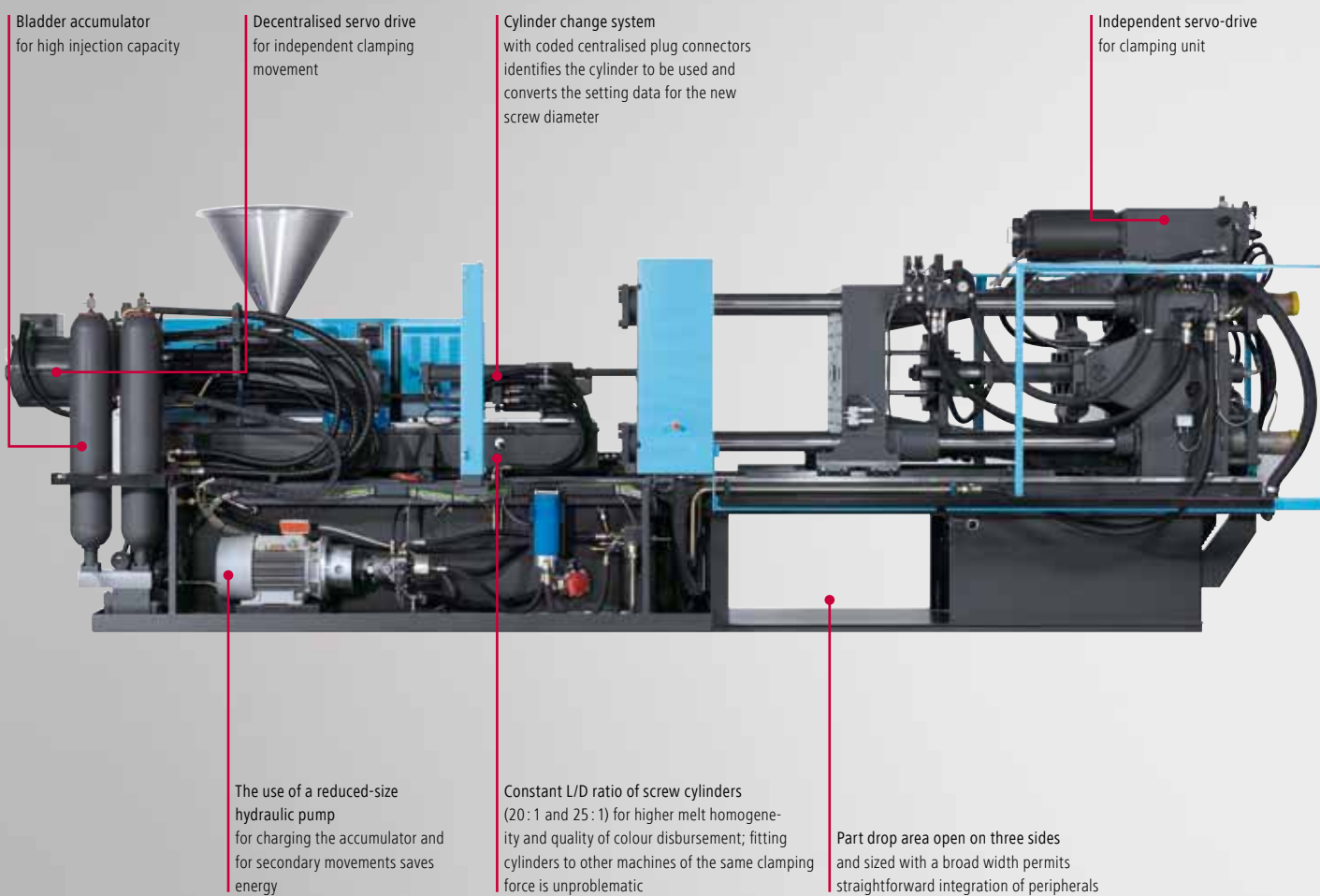
5-point double toggle with computer-optimised deceleration and acceleration profiles

Moving platen supported by linear guidance system (recirculating roller bearings)

Stiffened machine base



Supporting the moving platen on the machine base in a high-precision, low-friction, linear guidance system is designed to accommodate heavy loads, ensures easy movements of the mould, and reduces susceptibility to mould wear.



Accuracy in Machine Design

The combination of servo valves, the high-resolution ultra-sonic stroke measuring system, and the NC4 controller warrants extremely high process consistency – thanks to exact change-over from injection pressure to holding pressure, high consistency of the residual melt cushion, and exact duplication of metering stop position.

Extreme precision is indispensable for many fast-cycling parts. The electrical drives of the EI-Exis provide high positioning accuracy of the moving platen – for minimal mould wear during closing of the mould and positive pick-up of the moulded parts by parts handling systems at the end point of the opening movement. Should any irregularities occur in demoulding, the active mould protection system of the EI-Exis will intervene, stopping the machine within milliseconds and protecting expensive moulds reliably from damage (see page 8 on

the subject of mould protection).

Structurally, the machine is carefully designed for precise movements and high, dynamic loads. The machine base of the EI-Exis is dimensioned for high stiffness. So too are the platens which have been optimised by means of finite element analysis. In addition, we have reinforced the stationary platen in the centring area in order to enhance stability at the mould centre. 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 EI-Exis quickly and economically for new jobs, there are a host of modules available from the Sumitomo (SHI) Demag modular range – for single-component and multiple-component parts in each clamping force range from 1,000 to 7,000 kN.

In short, for thin-walled applications where ex-

tremely close tolerances are specified, and also for complex mouldings involving long flow distances, the EI-Exis overcomes existing limits of practicability, thanks to superior injection capacity and precision.

Top Performance in Every Detail

Whether it is the dynamic-response injection unit or the innovative mould protection system, or the multiple component fast-cycling machine, the high performance of the EL-Exis is the result of the interaction of numerous intelligent individual components. These innovations are backed by extensive experience accumulated over many decades in the progressive 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.

1 + 2 Moulds perfectly protected

A new system for optimising mould protection during high-speed travel of the clamping unit has been designed into the EL-Exis. This innovative and truly unique mould protection system incorporates a piezoelectric sensor which 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 stopped within a fraction of a second.

The advantages

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

3 Cycle time systematically minimised

Whether mould-specific cycle optimisation, programming of hot runner nozzle, simultaneous injection during locking or total cycle time

analysis – the control of the EL-Exis incorporates a host of intelligent software features which enable machine cycles to be systematically analysed and distinctly optimised.

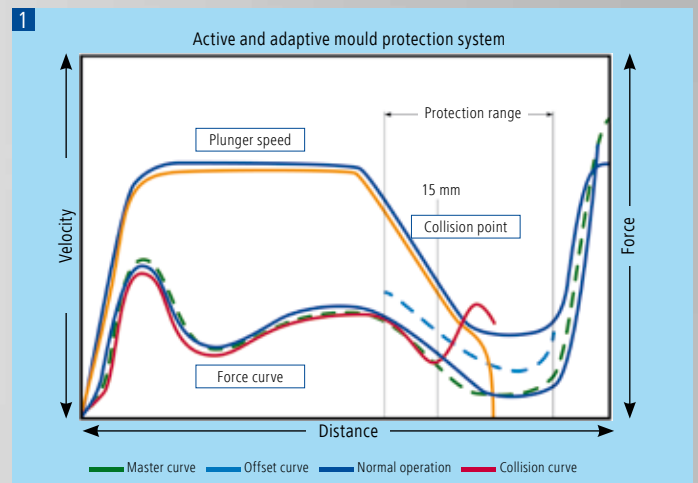
Unlimited parallel movements

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 from a hydraulic accumulator – separate from the main drives. This solution permits parallel machine movements without power losses – saving both cycle time and costs. Superior precision plus rapid response are ensured by the use of control servo-valve technology and ultrasonic stroke-measuring systems.

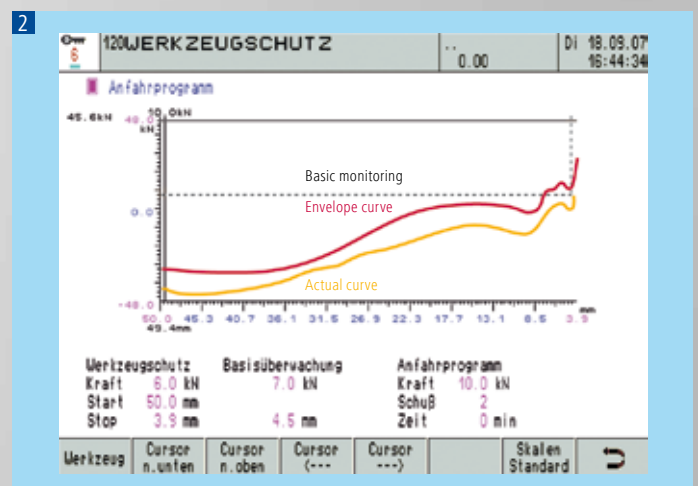
4 Faster acceleration, dynamic response of injection

Injecting the melt for fast-cycling and thinwalled mouldings requires accelerating the screw at rates of up to 1,000 mm/s. In order to achieve such high acceleration rates, it is necessary to have high capacities on call – quickly and independently of other movements.

Because high-speed applications typically use small shot volumes or short screw strokes, it is important for an injection unit to respond quickly. This is the only way to obtain high injection rates and, consequently, very short cycle times. Since electric drives are limited to a fraction of the required capability, injection on the EL-EXIS S is effected through a hydraulic accumulator which has a substantially higher power density.

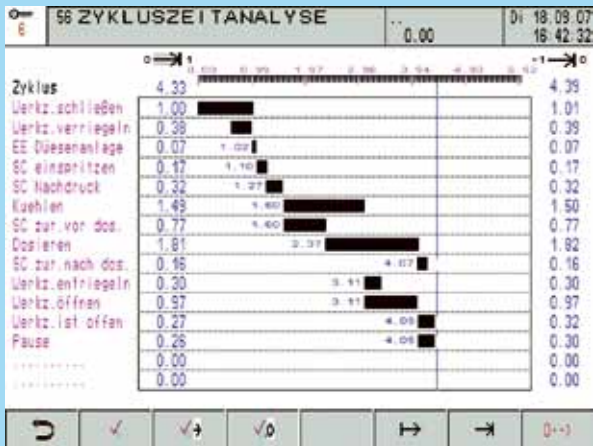


The mould protection system can be conveniently set on the Ergocontrol operator terminal. Matching it up to the mould is automatic, the graphic display facilitating operation and defect analysis.



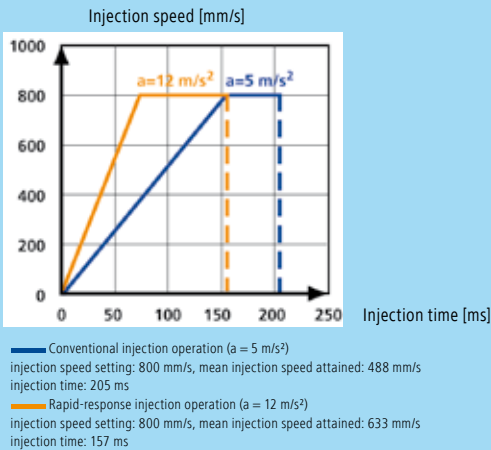
The protective function is conveniently set via the Ergocontrol operator panel. It is automatically optimised for the mould in use. Visualisation facilitates operation and trouble-shooting.

3



The cycle time analysis permits all process phases to be plotted, time reserves to be utilised, and sequences to be optimised.

4



The stored energy of the El-Exis accumulator-assisted hydraulics provide extremely high injection speeds and shortest cycle times, even on short stroke applications.

El-Exis Multi with second injection unit

Energy saved on drive and cooling

Another key advantage over conventional fast-cycling machines is the El-Exis 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 an EL-EXIS S with 2,000 kN, for example, cooling power savings are 40%.

Multiple component parts from fast-cycling

El-Exis Multi

Entirely new perspectives have been opened up by the El-Exis Multi for multi-component parts: Aside from all advantages of the single-component, fast-cycling machine, the “Multi” permits the second component to be injected by a second injection unit mounted piggyback fashion (R-position or L-position). Key benefit: The El-Exis Multi comes custom-configured to meet users’ specifications.

DEMANDING APPLICATIONS

Here are a few examples of commercial El-Exis projects:

PACKAGING



CUPS AND DISHES – Thin-walled packaging articles:

Thin-walled containers, cups and lids call for a high injection speed and rapid injection response in order to positively fill the thin walls over long flow distances and to neatly pack the sealing edges at the end of the flow path. The El-Exis with its accumulator-backed hydraulic system provides the force and dynamics required to meet these requirements.

PACKAGING



Thin-walled drinking cups from multi-cavity moulds:

As an ubiquitous mass-produced article, drinking cups primarily call for economical high-volume production – which means fastest cycle times. As a production system, the highly dynamic El-Exis attains exceptionally short cycle times – the 1,250 kN model being on record to reduce cycle time to less than 2 seconds. Ever new production systems are being created in combination with high-speed parts handling systems and in close cooperation with mould makers for a wide variety of drinking cups.

Solutions for every Moulded Part

From mould technology, thin-wall, in-mould labelling (IML) or multi-component machine configuration to the 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.

10 Points in Favour of El-Exis Machines

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

PACKAGING



Containers decorated with in-mould labelling (IML):

Many food packaging articles are no longer being decorated by means of adhesive labels. Modern in-mould labelling (IML) provides for prepunched labels to be fully automatically fed to and placed in the mould to be welded to the moulded part on ejection. Its rapid response and high positioning accuracy of mould movements make the El-Exis an ideal candidate where harmonic interaction is required with feed systems for the IML foil and with parts removal robots and stackers.

PACKAGING



Closures – Dispensing top for vacuum beverage packaging:

Large-volume production on El-Exis machines includes customised closures, such as flip tops, sport closures (push pulls), closure systems for carton packaging, as well as, PE bag closures. In addition to very high precision, reproducibility and consistency, the El-Exis excels in these applications by short cycle times and a 40% lower power consumption compared to competitors' machines.

PACKAGING



SCREW CAPS – Premier performance for screw cap production

The El-Exis is perfectly suitable for the production of standard screw closures in multi-cavity and stack moulds – with short cycle times of distinctly less than 4 s (dependent on product). Electrical screw drive, hydraulic high-performance injection, independent electrical drive for the clamping unit, and ejector movement independent of the former constitute the most modern drive concept among the injection moulding machines for packaging articles. And, last but not least, the El-Exis offers very low energy consumption.

MEDICAL



Syringe cylinders and plungers:

Medical disposable products are another instance of high-volume production for a highly competitive market where the El-Exis high-performance machine has become moulders' first choice as a production system. Manufacturers of syringe cylinders and plungers rate the El-Exis highly for such features as the three-platen clamping unit with five-point double toggle, its high load-carrying capacity for heavy stack moulds, linear guidance for the clamping platens and centre plates of multi-daylight moulds.

ELECTRICAL



Technical precision parts – Connectors, mobile phone shells and mass-produced parts:

Where electrical components involve extremely long flow distances, where only a few tenths of a millimetre wall thickness exist between cores, or where thin mobile phone shells are to be moulded within extremely short cycle times, processors' option is frequently for of an El-Exis. Poor-flow materials, such as PC/ABS are no problem: its plasticising unit with high torque and parallel metering movements of the electrical screw motor provides gentle treatment and reliable production of a homogenous melt.