The whiz kid machine

Demag Plastics Group

Systec

Systec – the new Demag Standard

The Systec's capabilities and functionality are exclusively oriented to the users' requirements.

Individually upgradable

- Comprehensive modular system for bespoke-tailored, practical solutions
- Available in four levels of sophistication: from the extensively equipped basic version through to the complete production cell
- Attractively priced function packages
- Modular options for injection unit, screw and drive
- Electrical screw drive (optional)
- Retrofits/upgrades possible to address new tasks
- Integration capability for external peripherals

Robust and economical

- Task-oriented configuration saves costs
- Heavy-duty, compact machine construction
- Very low mould wear reduces maintenance expense
- Short changeover times
- No extensive spares inventory needed

Precise and safe

- High-precision clamping unit
- Non-contact ultrasonic sensors for all movement axes
- High-precision linear guidance for moving platen
- Active, highly sensitive mould protection system activeQ
- Automatic screw identification and calculation of set-up data
- Constant L/D ratio for screws for flexible application and optimum melt quality

Ergonomical

- NC5 controller with state-of-the-art computer technology
- Operator-friendly layout of components
- Unified operator interface for all modules
- Comprehensive support of user in machine presetting by Ergostart-Software
- Switch-on and switch-off program
- Change protocol, process data acquisition, documentation, alarm management and optional cycle time analysis
- Operation by NC5 touchscreen or, alternatively, keyboard

"Invest not in machines, but in the future."

Bernd Tröger, Head of Mechanical Development,
Demag Plastics Group

Modern production "Made by Demag"
Production of injection moulding machines at Demag Plastic Group's two German locations in Schwaig and Wiehe is based on the concept of progressive assembly. This concept provides for assembly of the machines to proceed along defined steps. Analogous to final assembly in the automobile industry, operators at each station add defined components, such as the clamping unit, injection unit, hydraulic system, switchgear and controller according to the given specification. Components are delivered to each workstation along the assembly line on a just-in-sequence basis. The Systec machine range benefits from progressive assembly in terms of short lead times, a high degree of schedule effectiveness, very short order cycle time from finalising the machine specification, and high product quality.

Product of the future

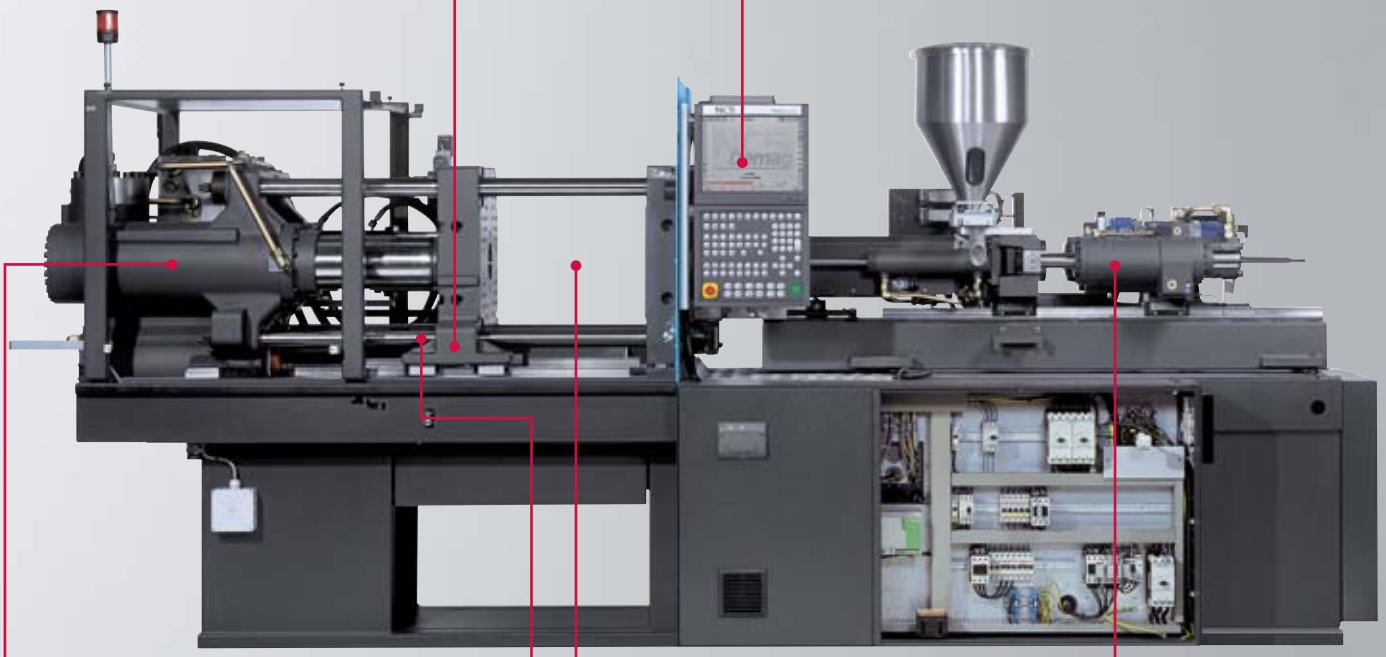
Demag Plastics Group caters for customers in all major markets of the world with efficient, economical and reliable injection moulding technology. Its spectrum ranges from injection moulding machines and systems through automation solutions and project planning to comprehensive service and technical support. The central focus of its operations is invariably the customers' requirements. With Systec, Demag Plastics Group has created a transparent, modular platform providing our customers with comprehensive assistance in selecting the machine that meets their specific requirements. Systematically graded and modular throughout, the Systec range enables the optimum machine specification to be quickly formulated and provides the user with extended capabilities to cope with all the market and customer requirements.

Compact and readily expandable
Featuring multiple levels of technology, the Systec range offers a reliable application tailored solution for every job: providing extreme economy for standard jobs and absolute flexibility for changing jobs through to cutting edge performance on high-end applications. In addition, Demag's popular expansion packages enable the machines capabilities to be expanded to closely match the users' needs.
Systec is equipped with an enhanced machine control system using state-of-the-art computer technology coupled with ergonomic operation, developed from our successful NC4. This enhances economy, reduces maintenance costs, setup times and spare parts stock, and makes operation more efficient and productive. This advanced concept enables users to address new challenges of whatever they may be with confidence.

TOTALLY MODULAR

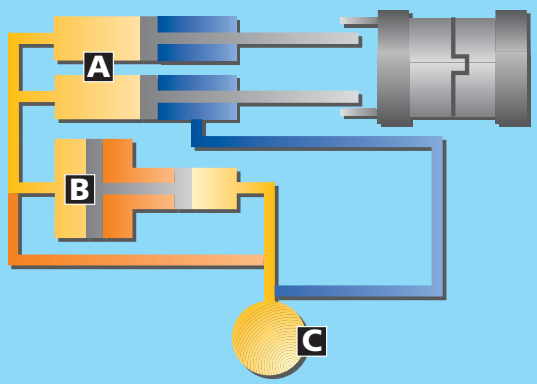
Linear guidance is standard
on all machines to ensure extreme precision of mould movement and reduced cycle times

The new NC5 control system
reflects the consistent onward development of the NC4 philosophy with convenient machine pre-setting using Ergostart software, integrated process data acquisition, flexible movement patterns and alarm management



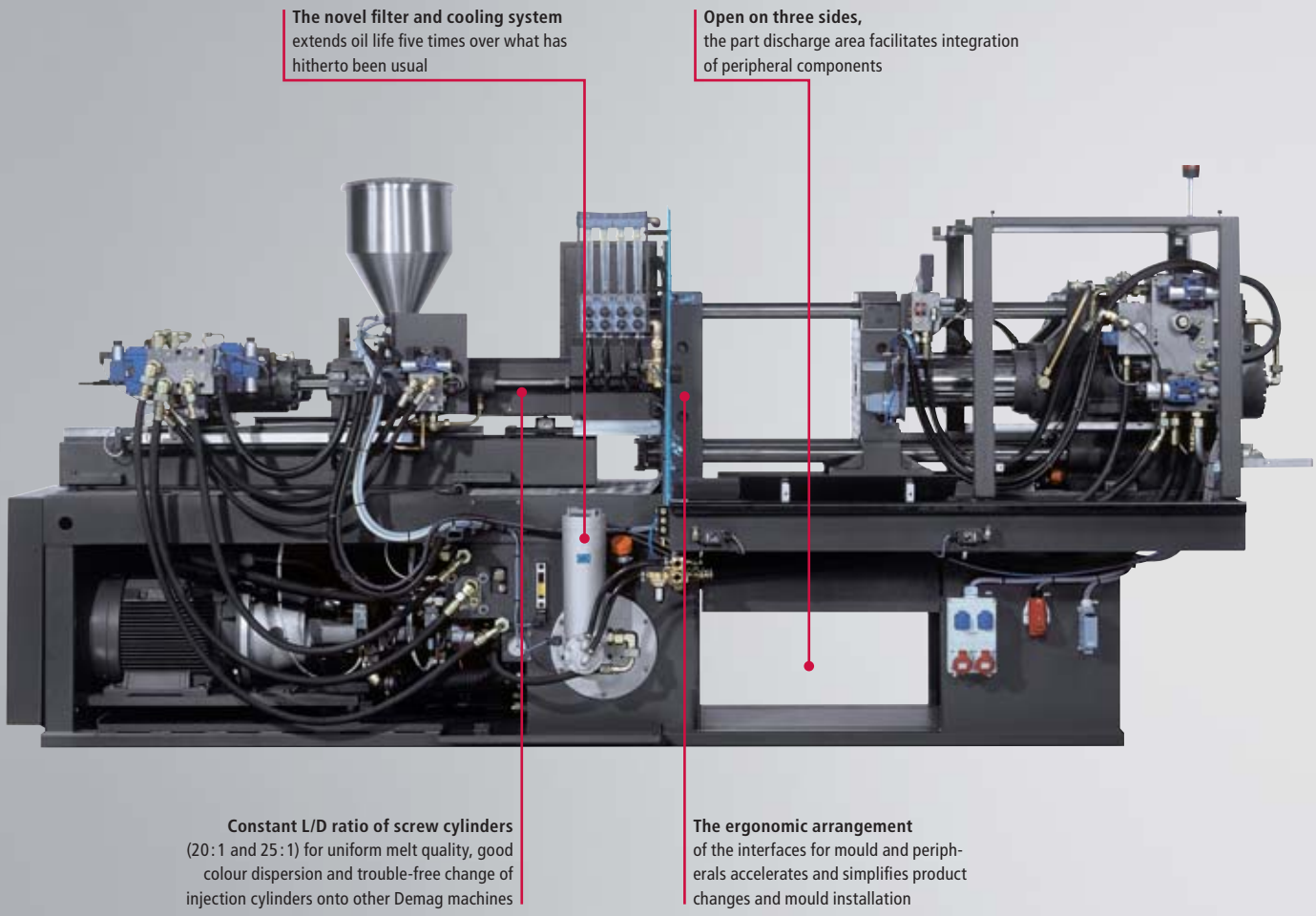
The sensitive, active mould protection system
is designed to detect any deviations over the full opening and closing path of the clamping unit and does not extend cycle time. Active braking of the clamping unit reduces response time compared to conventional systems

Four different expansion levels
cover all requirements, from strictly serial movements through to parallel movements of all axes



Two short-stroke clamping cylinders (A) ensure optimum clamp force transmission. A non-return valve provides positive locking and the flow intensifier (B), as well as, the optimally matched variable-volume pump (C) generate high-speed, precision movements.

The use of stiff clamping platens and supporting the moving platen on the machine base via linear guides on the machine base reduce mould wear and provide smooth and parallel movements.



Powerful hydraulics

The Systec range of injection moulding machines provides total modularity that is open and freely extended to address new jobs. The variant with a full hydraulic clamping unit and 250 to 1,200 kN clamping force has a host of functions incorporated in the standard design.
The full hydraulic clamping unit of the Systec is perfectly matched to the requirements of a small machine: of short length and with a wide tiebar distance, it will accommodate large and heavy moulds.
Modular injection units for a wide variety of plasticising tasks make the Systec machines a flexible tool for a wide variety of jobs.

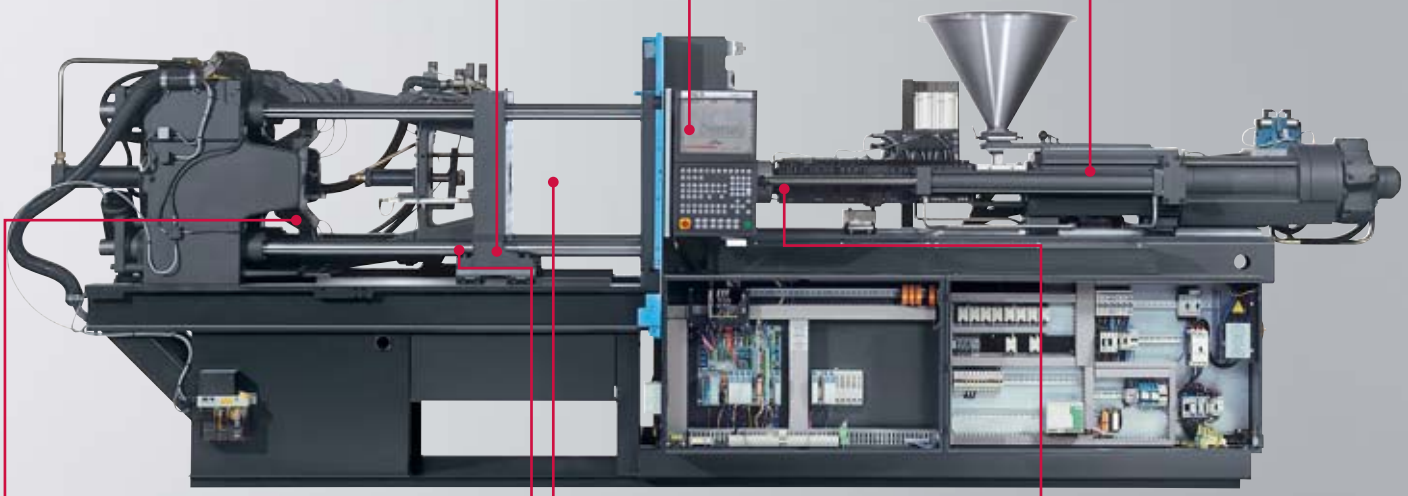
All Systec machines come equipped with the completely new NC5 control system.
In addition, sensitive active mould protection is incorporated for additional safety of the machine and mould.
The compact, rugged machine structure with solid, welded machine base warrants uniform force transmission and significantly reduces mould wear – even where heavy moulds are used.

TOTALLY MODULAR

Linear guidance
is standard on all machines to ensure highest precision and shorter cycle times

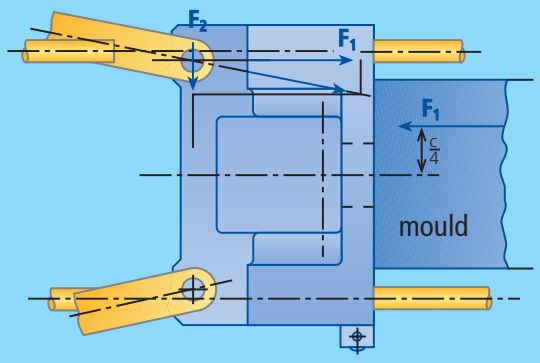
The new NC5 controller
reflects the consistent onward development of the NC4 philosophy with convenient machine presetting using Ergostart software, integrated process data acquisition, cycle time analysis, flexible movement sequences, event logging, and alarm management

Four different expansion levels
cover all requirements from plain serial movements through to parallel movements of all axes



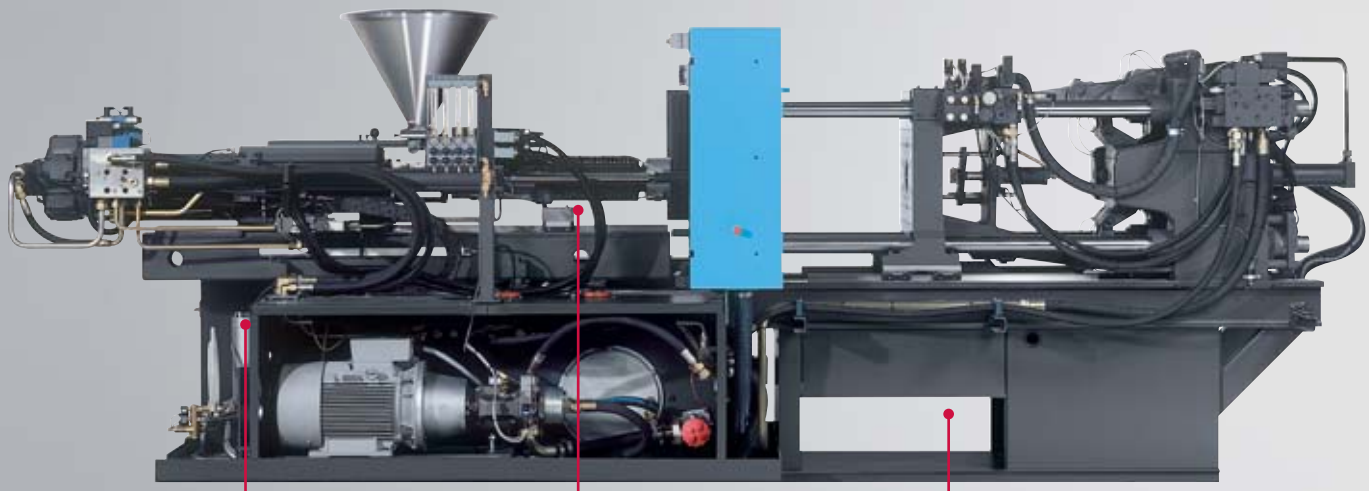
The sensitive, active mould protection system
is designed to detect any deviations over the full opening and closing paths of the clamp without extending cycle time. Active braking of the clamping unit reduces response time compared to conventional systems

Constant L/D ratio of screw cylinders
(20 : 1 and 25 : 1) warrants uniform melt quality, good colour dispersion, and unproblematic changing of injection cylinders to other Demag machines



Schematic diagram showing how forces are transmitted by the toggle

The compact, rugged construction of the machine with a solid, welded machine base and linear guidance of the moving platen – which is standard – ensures uniform transmission of forces and significantly reduces mould wear, even where heavy moulds are used.



The novel filter and cooling system extends oil life five times over what has hitherto been usual

Guidance of injection unit by linear bearings ensures high degree of precision

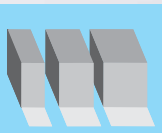
Open on three sides, the part drop area permits straight-forward integration of peripheral components

Reliable toggle

Rugged and compact construction, a powerful, high-precision clamping system featuring a five-point double toggle, and modular injection units for widely different plasticising tasks make the Systec machines – which are available with clamping forces from 1,300 to 4,200 kN – a flexible tool for a wide variety of jobs.
The high-precision Demag clamping unit with the 5-point double toggle and integrated, short-length clamping cylinders provides ample daylight for large moulds. The powerful kinematics of the double toggle provide short locking times and high opening forces. In the end position, in particular, the large movement of the toggle is translated into a relatively small movement of the clamping platen permitting very sensitive control of closing and opening with minimal stressing of the mould.

All Systec machines come equipped with the completely new NC5 control system. In addition, sensitive active mould protection is incorporated for safe operation of the machine and mould.

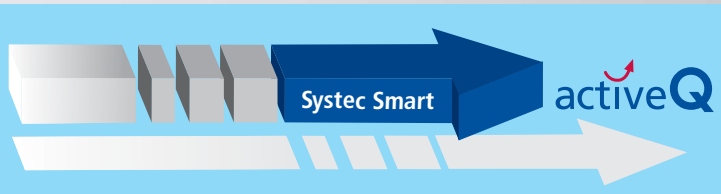
MULTIPLE LEVEL EXPANSION



Basic variant for convenient operation – Simple solution for standard jobs

The standard version of the Systec is equipped with a powerful hydraulic system. On all machines of the Systec line, the noise-reduced hydraulic power pack ensures very quiet running of the machine. Moreover, the choice of power ratings permits initial and operating costs to be reduced. In its standard version, the Systec incorporates the following additional features:

- Four-way coolant flow controller with temperature indication
- Speed-controlled injection with smart pump
- Process data acquisition with 100 % inspection and statistics functions up to 1,000 shots
- Separate water connections for mould and oil cooling
- Closed loop control of all axes



Systec Smart – Parallel working saves time

The Smart line of the Systec features a heavy-duty variable-delivery pump at the powerful heart of the machine. Also incorporated is a highly dynamic control valve with integrated electronics for parallel movements of the ejector and nozzle. The control electronics are mounted directly on this proportional valve and readily accessible. Its location close to the load shortens the control circuit and reduces maintenance costs. Every machine of this line comes equipped with a speed and position-controlled ejector that can move forward and back in parallel as the mould is opening. Thus, the operator need not wait until the mould has reached the "open" position for the moulded part to be ejected. This cuts cycle time and significantly increases moulded part output.

Customised and efficient

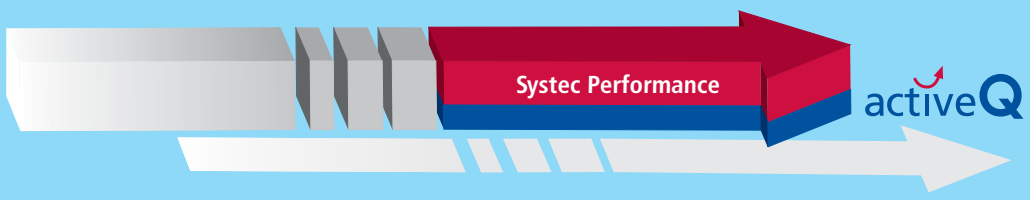
The Systec range encompasses four levels of sophistication. From the basic version through to the high-performance variant with parallel movement of all axis, the Systec offers an optimum solution for every application. Performance ability and scope of the Systec levels are orientated exclusively to users' practical requirements.

An outstanding feature of the Systec is its high degree of movement performance. Standard linear guides reduce movement resistance and so not only save force and energy but also permit higher speeds and, consequently, faster cycle times. Linear guides also provide higher precision with respect to platen parallelism. This also goes to improve process consistency. Optionally, an additional hydraulic accumulator is available which provides a higher injection speed and, consequently, reduces cycle time. Starting from the Smart line, the Systec also comes with active mould protection. The highly sensitive "activeQ" responds to minimal deviations from the reference curve. Deviations may be caused by moulded parts that remain in the cavity, by mould wear, or malfunctions of cores and ejectors. This means there is active protection for high-cost moulds which increases their useful life (see page 10).

Easy accessibility is provided by the open and modular design of the injection unit. For special plasticising tasks, there are a range of different screw geometries available which can be changed quickly and with ease.

In addition, the standard equipment includes such items as:

- Clamping force control
- Programmable nozzle contact force
- PDE statistics
- Ergostart machine presetting
- Startup and shutdown program
- Change log
- Maintenance alert



Systec Performance – More performance for complex jobs

Machines of the Performance line are equipped with a twin-pump system. A control valve is also provided for parallel movements of the nozzle and ejector and for flexibly controlling the parallel ejector movement. It is possible to set any desired pressure/flow characteristic.
Since pressure and flow are always delivered according to actual needs, the Systec Performance machines also need less energy and cooling water. The dual-circuit hydraulic system with two variable-delivery pumps drives independent, parallel-running main and secondary movements of the machine. The second variable-delivery pump handling ejectors and cores is cut in as required for metering and injection. Control of pressure and flow volume enables ejector force and speed to be graduated. With both pumps cut in, the injection rate is significantly increased.

Systec Elite – Dynamic control for supreme quality

The Systec Elite line features a powerful dual-circuit hydraulic system with two variable-delivery pumps and a control valve to permit parallel movements of the ejector and nozzle. In addition, it is equipped with a rapid-response servo valve for highly dynamic control of injection and holding pressure. The computer-optimised deceleration and acceleration profiles on the clamping unit provide sensitive control of the powerful, fast movements with minimal stressing of the mould. The functions and features of the Elite line ensure complete process transparency and are the basis of high-precision production of high-end parts in consistent quality. The integrated, rapid-response servo valve of the Elite line enables highly dynamic injection control with such benefits as constant flow-front velocity even where relatively large variations exist in wall sections.

FUNCTIONAL RELIABILITY

activeQ – guaranteed reliability

Process stability and reliability are enhanced in all machines upwards of the Systec Smart level with a comprehensive monitoring package, dubbed the "activeQ". The sensitive, active mould protection system protects both the machine and mould. An electronic sensor determines the force required at the toggle, or the hydraulic pressure, depending on the particular design, during a normal cycle that is necessary for the movement of the mould and stores it as a master curve in the machine controller. During every cycle, the controller compares the variation of the force against the master curve. If the current values deviate, the clamping unit is actively stopped. The mould protection system responds even when highly dynamic movements occur, monitoring the machine actively over the complete cycle and without extending the cycle time.

Application-oriented and a perfect fit

Flexibility with a price advantage

The modularity throughout the Systec range permits application-oriented and pin-point configuration of every machine. All expansion packages are provided both for the full hydraulic and toggle machines.

For each level of the Systec line, the field proved Demag expansion packages provide users with a cost-effective and comprehensive possibility to customise a machine to suit their specific application. This enables users to respond flexibly to the needs of the market and their customers and to expand the performance spectrum of their Systec with pin-point precision.

Systec – optimally expandable with expansion packages

Expansion package A

- Hold pressure transfer control
- Process data acquisition with 100 % inspection including statistics with graphical recording and storage of process parameters
- Event log
- Integrated printer with printer program

Expansion package B

- Switched plug socket combination, controlled by switch-off matrix (2x Schuko 230 V / 10 A, 2x IECEE 400 V / 16 A or 2x Schuko 230 V / 10 A, 2x IECEE 230 V / 16 A)
- Freely programmable, pneumatic valve on moving platen
- Start-up and shut-down program (enhanced)
- Three programmable inputs and outputs each
- Interface for second nozzle heating band

Expansion package C

- All functions as in expansion package B
- One core puller

Expansion package D

- All functions as in expansion package B
- Two core pullers

Expansion package E

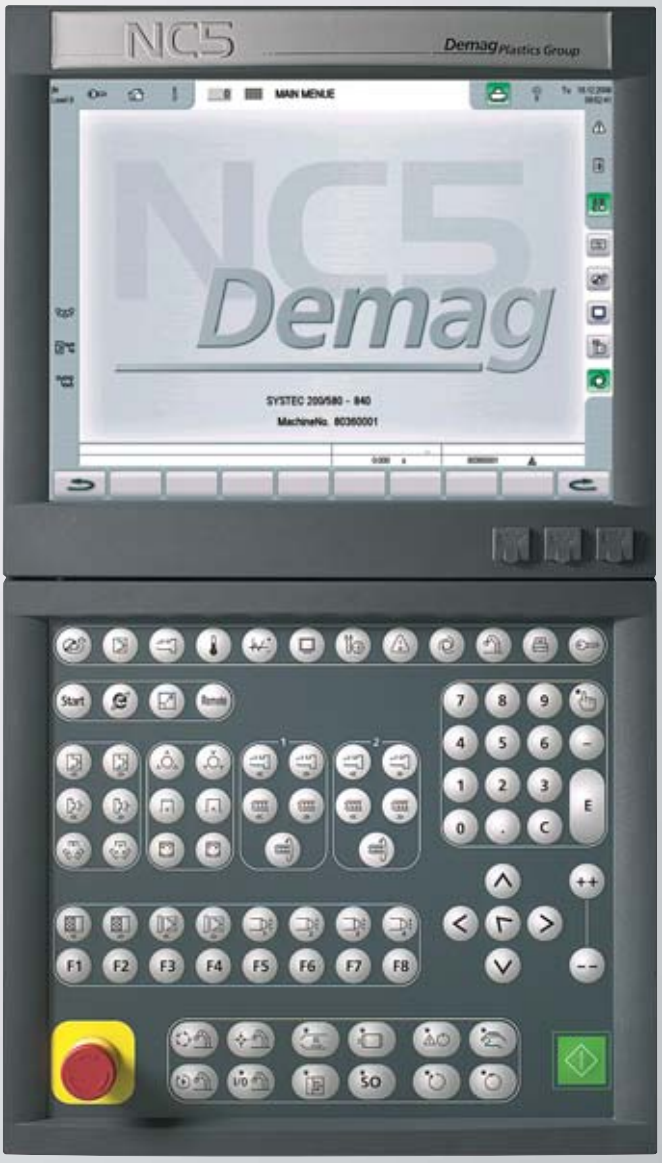
- Interface for PHE
- Interface for dosing/metering unit
- Country-specific plug socket, switched off via main switch
- Plug socket IECEE 400 V / 16 A switched off via machine main switch or plug socket IECEE 400 V / 32 A switched off via machine main switch

Clamping force [kN]	Distance between tie bars [mm]	Injection units	Pump set [kW]	
			single circuit	dual circuit
250	320 x 320	35 / 80 / 120	7.5 / 11	15
350	320 x 320	35 / 80 / 120 / 200	7.5 / 11	15
500	370 x 370	80 / 120 / 200 / 310	11 / 15	18.5
600/800	420 x 420	120 / 200 / 310 / 430	15 / 18.5	22
1000	420 x 420	200 / 310 / 430 / 600	18.5 / 22	30
1200	470 x 470	200 / 310 / 430 / 600	22 / 30	30
1300	475 x 475	200 / 310 / 430 / 600	22 / 30	30
1600	520 x 520	310 / 430 / 600 / 840	22 / 30	30
2100	580 x 580	430 / 600 / 840 / 1450	30 / 37	37
2800	630 x 630	600 / 840 / 1450 / 2300	37 / 45	45
3500	720 x 720	600 / 840 / 1450 / 2300	45 / 55	55
4200	820 x 820	840 / 1450 / 2300	45 / 55	55
4200	820 x 820	3300	55 / 75	75

Variable for the future

The modular Demag building block system enables the user to configure what will be the most efficient machine for his purposes with regard to diameter and geometry of the screw and the power rating through to the software for specialised control tasks. This means the user will be investing only in the components that he needs now – and remain open for future expansion or conversion of the machine for the integration of few peripheral devices, new tasks and applications.
In order to be able to flexibly respond to each application, Demag Plastics Group manufactures all screws in house. This strategy warrants availability at all times: The high capacity and flexibility of the Demag production facilities ensure shortest delivery times not only for standard items, but also for off-standard screws and special geometries.

NC5 CONTROL



- **Logically organised touch colour screen**
  The extra large colour screen provides a clear picture of machine conditions at a glance. The screen is designed as a touch screen enabling the operator to make entries directly on the screen. Alternatively, entries can be made by the keyboard. All data can be displayed in metric or alternatively, imperial units of measurement.

- **USB interfaces for fast data exchange**
  Via the three USB interfaces, the operator logs on at a defined access level and can also use them to store data and screen pages.

- **Faster through hot keys and symbol buttons**
  Hot keys and the internationally understood symbol keys enable further screens to be selected in all process phases that connect logically or application-oriented to the previous programming step.

- **Two components, one operator interface**
  For two-component injection moulding, the NC5 control system incorporates a complete second function keypad for the second injection unit. Additional screens are also provided by the NC5 in the familiar operating philosophy for specialised processes, such as gas injection moulding, decorating backing injection, and other specialised processes.

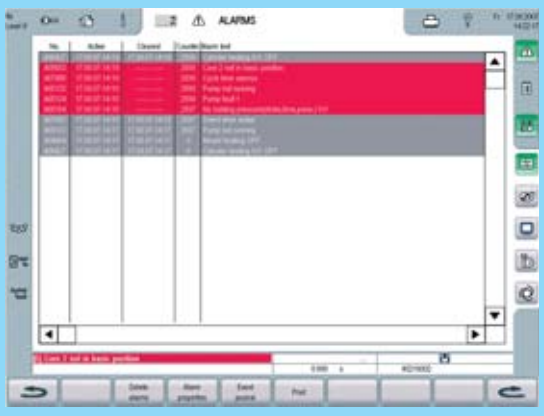
- **Documenting and printing**
  The integrated thermal printer makes it possible for the operator to have selected statistical process parameters or even complete screen content documented after a defined period of time or number of shots.

Evolution instead of revolution

The machine control system, too, reflects the modular principle of the Systec range: All Systec machines come equipped with the ergonomic Demag NC5 control. This flexible control system represents the consistent onward development of the field-proved NC4 and benefits from all advances in hardware that have changed the computer world in recent years. Typically, these include increased storage capacity and USB interfaces for fast data transmission. The integration into the PC world, moreover, facilitates manipulation of the control system and enhances functional variety.
The new operator environment enables the user to choose between entry via touch screen or the familiar terminal. The operating philosophy and screen architecture of the NC5 control system duplicate that of the NC4 system.

The operator is conveniently and logically guided during all steps from setting up and process optimisation through to production and documentation. Intelligent modules of the control system provide valuable application-orientated assistance in setting up the machine and starting the system, matched to the individual needs and skill level of the operator.

The NC5 control can also handle all necessary settings for specialised techniques and complex injection moulding processes. It is also possible to integrate the control of peripheral devices, such as hot runner control, temperature control and automation devices. This makes it a powerful control centre that enables the operator to evaluate all machine and peripheral functions and obtain information on current cycle, past production and actual conditions of the machine at a glance. And it also provides logical documentation of all essential process and machine data required to monitor product quality and process consistency.
Physically, the NC5 operating terminal is arranged between the injection and clamping units where it permits an unobstructed view of both the mould area and the injection end.



Extended alarm functions

Apart from listing alarms, additional information is provided on possible causes of malfunctions. In respect of certain alarm groups, the operator can define in what way the alarm should be output. Using the history setting of the alarms, he can define which area messages are to be recorded with the alarm.

Connecting additional peripherals

A new technology has made it possible for the first time in a machine control system to operate any kind of peripheral devices. All that is necessary is to connect the control of the peripheral device to the NC5 control.

Important process phases at a glance

The new page for machine settings provides a summary of important process phases and the specific parameters on one screen page. Any critical settings can be checked at a glance. Small graphic icons make it possible to transfer to the associated graphic operating screens.

Documenting, printing, storing

The NC5 permits convenient management of machine settings, mould data and storage via USB interface on to any data carrier, for instance, mould and automation data, as well as, the complete setting of the machine. Where frequent product changes occur, this will save time and money. Of course, it is also possible to store all quality-relevant process parameters locally or to transmit them to a central computer.

DEMAG AUTOMATION

Automation solutions from a single source

Increasing quality requirements imposed by the end users, as well as, the competitive advantage of location in a globalised world, will tolerate no compromise in terms of moulded part quality or profitability. Rational automation in injection moulding is designed to

- Improve productivity and efficiency
- Increase process transparency
- Control sources of defects, and
- Reduce inspection and quality assurance effort.

Production cell for medical devices: a 6-axes robot is suspended in the cleanroom housing from a cantilever at the side of the Demag machine. This compact layout offers small masses to be moved and ensures short paths from the point of part removal to the stacking station.

A car maker's fully automatic plant: four 4,200 kN machines producing hybrid bars as metal-plastic composites. Demag linear robots place the metal inserts in the moving half of the mould and remove the finished parts from the fixed half.

Fully automatic production cell operated by a manufacturer of mobile phone displays: 6-axes robots remove the IMD mouldings from the Demag IM machine, delivering them to cleaning stations, inspection systems (in background) and workpiece carriers (in foreground).

For unsophisticated automation applications, Demag Plastics Group offers parts handling systems, reject segregation units, and sprue pickers. The **Demag sprue picker**, which fits mechanically into the safety enclosure of the Systec is pneumatically driven with low air consumption. It is integrated into the NC5 controller with a separate screen page, automatically separating sprues from moulded parts. The **Demag segregation unit** integrated in the Systec's discharge chute separates accepted parts from rejects in a simple and cost-effective way, or takes random samples for quality inspection at defined intervals.

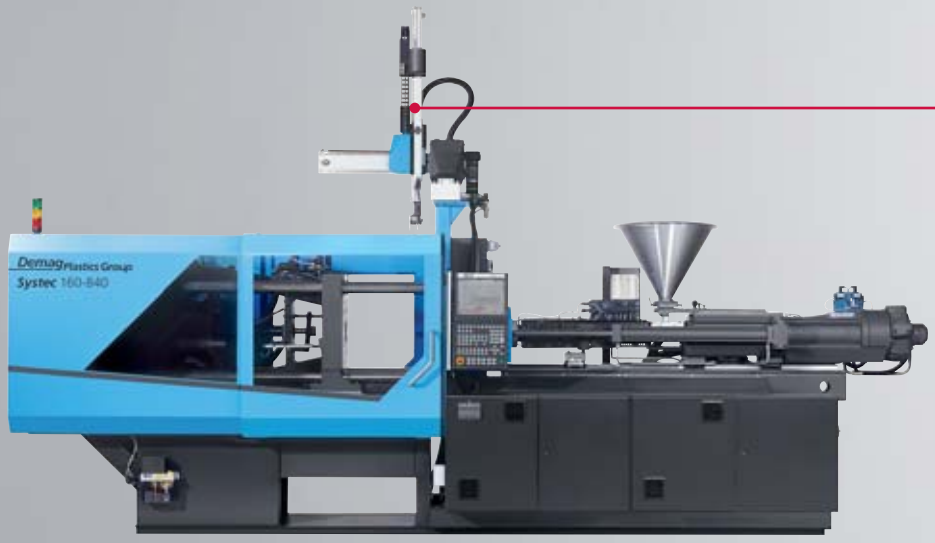
Holistic approach is key to success

The success of an automation system lies not only in the capabilities of the machine, mould, robots, and peripherals, but primarily on their efficient integration. Therefore, it is a good plan to call in specialists at an early stage, whether one is planning automation for a single machine or for a complex multiple machine production plant. We believe in the engineering concept of total design where machine, process and automation technologies are combined for optimum performance.

Demag Plastic Group's specialists will analyse the tasks of insert placement, parts removal, the injection moulding process, feeding of the material, and separating or timing part flow, subsequent inspection, assembly, or finishing. They will assist the user in deciding on whether to go for a linear robot or an articulated 6-axes robot. And they may recommend the right robot from Demag's portfolio or integrate the offering of specialised service providers.

Last but not least, Demag's project engineers and application specialists will focus on the economics of the automation solution. In addition to the technical solution, Demag's offering for its customers includes streamlined project management from the first planning step through to commissioning and comprehensive training of the operating personnel.

Integrated into a production cell with multiple assembly, decoration and inspection functions – shown here in a moulding shop producing stackable plastic containers – the Demag robot separates sprues and feeds the moulded parts one at a time to the downstream finishing stations.



The lineartype Demag robot – shown here on a Systec 160 injection moulding machine – is available in various sizes and load classes with a variety of functions and open interfaces to handle all insert placement, removal and feed tasks occurring in injection moulding.

The Demag robot serves as an automation module on the Systec – both for individual machines and for customised production cells centred on the injection moulding machine and complemented by a wide variety of peripheral equipment.

Automation for Systec IM machines

Incorporated in the Systec injection moulding machine series and with a hazard-area enclosure, Demag linear robots form complete and economical production systems. Linear type robots come from the factory equipped ready for use.

Rail guides on all main axes (X, Y, Z) fitted with backlash-free, high-performance bearings capable of carrying heavy loads in conjunction with the largest possible bearing spans, provide high supporting forces and result in minimal vibration. The drive of the main axes is designed for high rates of acceleration and deceleration. Thanks to their high drive power and low moving masses, Demag robots offer fast acceleration and high working speeds.

The grippers incorporate quick-clamping systems for connection to the flange of the linear robot in minimum time. The systems available range from straightforward mechanical quick-connect couplings to automatically coupling gripper changing heads that also incorporate the media supply.

Functionality and ease of operation

Demag robots are designed to communicate with the Systec machine via the integrated data interface. In addition to the signals of the E12/E67 interface, the robot is connected to the injection moulding machine through a CAN data bus. The robot setting data are stored with the associated machine setting program. Furthermore, all important functions of the complete production cell encountered in everyday production are controlled from the NC5 of the Systec. These include the switching on and switching off of the robot or automation system, referencing, clear text error display, manual movement of individual axes of the robot, to name a few.

Greater safety around the machine

The Demag robot permits safety zones to be defined around the machine and its hazard-area enclosure. Access of the Demag robot to the stroke measurement of the ejector and clamping unit enhances safety and a common alarm protocol simplifies fault location.

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