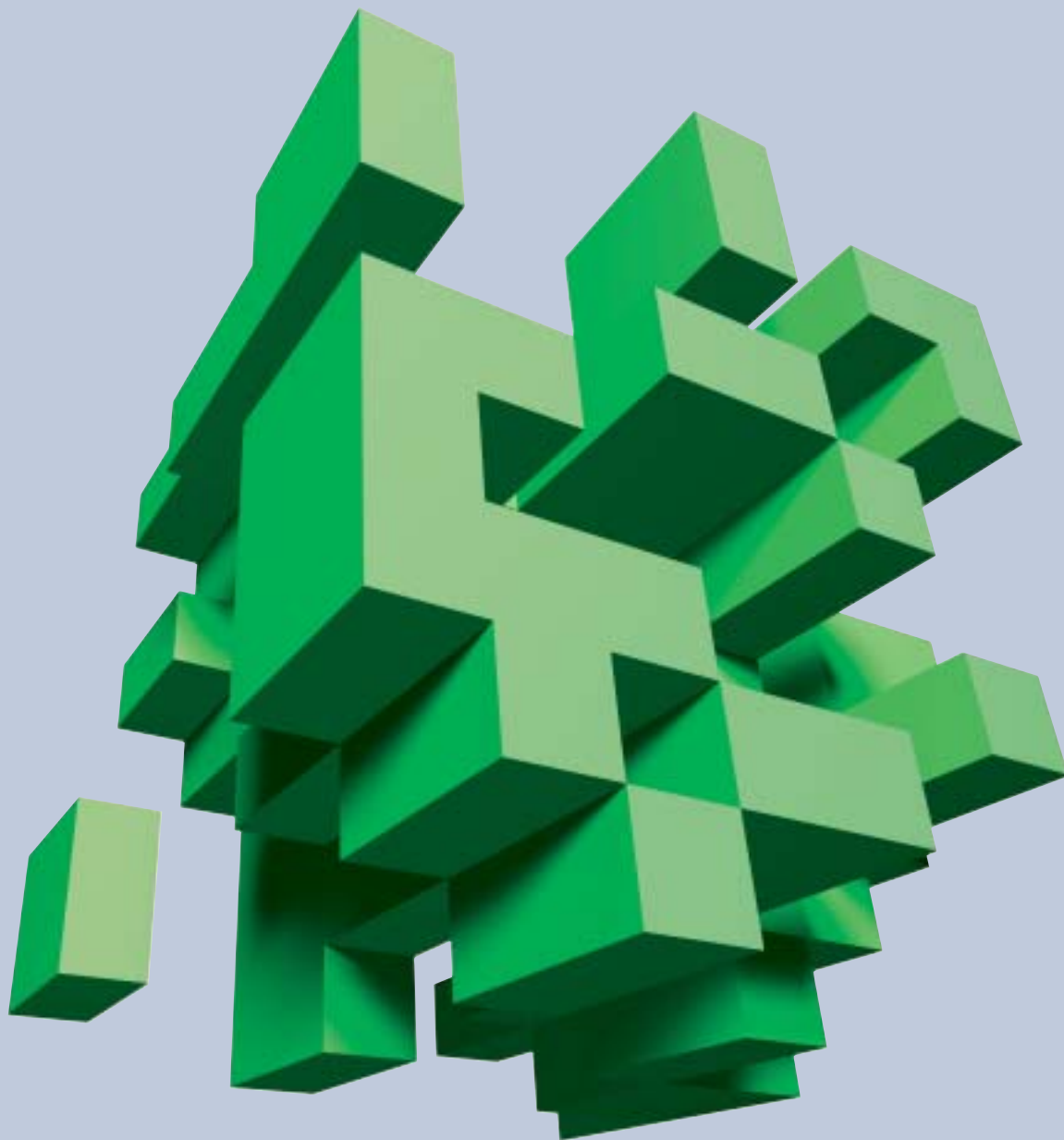


>> I believe in imagination, I believe in innovation.
We need people who dream of things that never
WERE. << John F. Kennedy (35th President of the USA)

be the first.



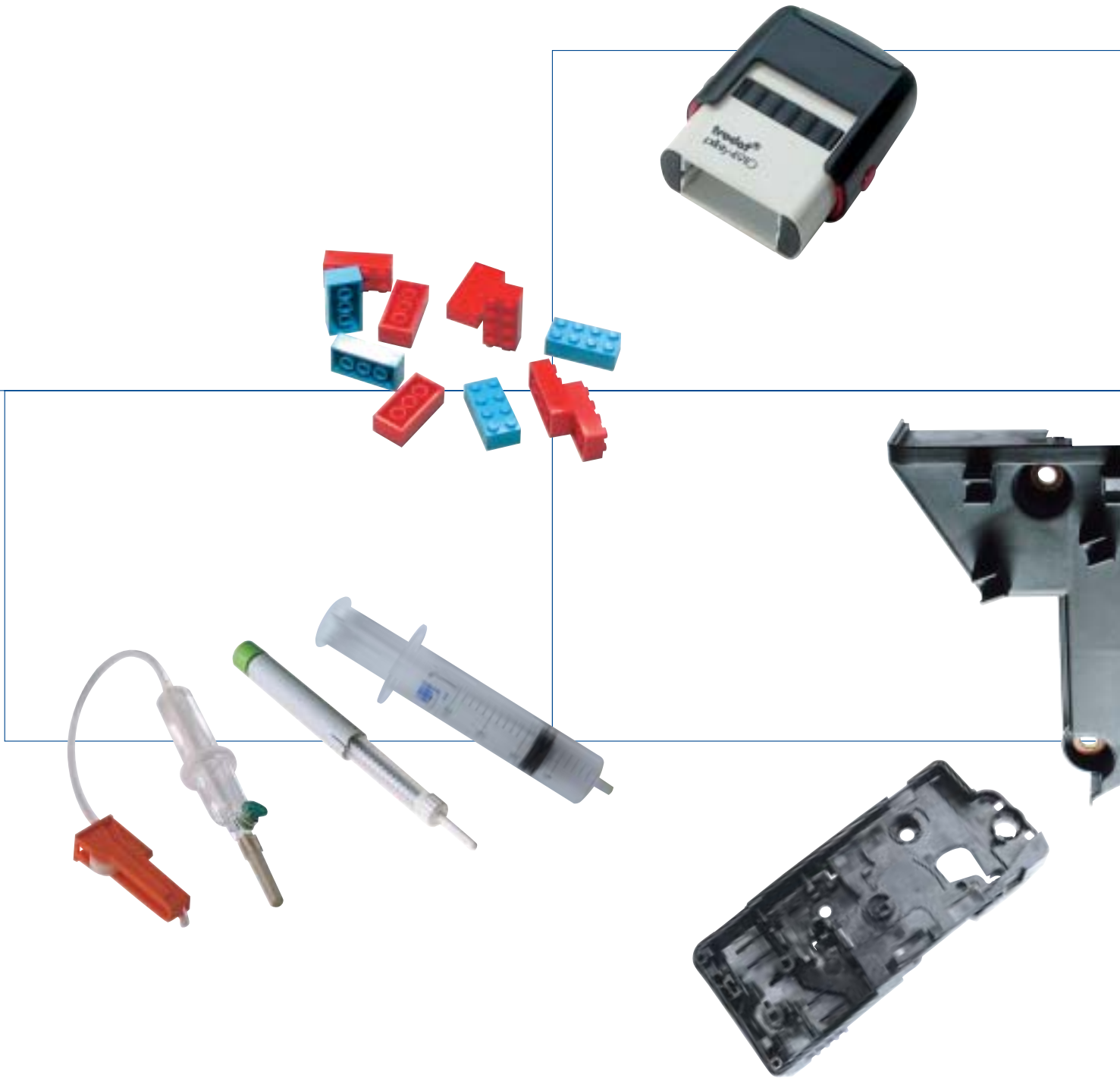
Innovative injection molding technology

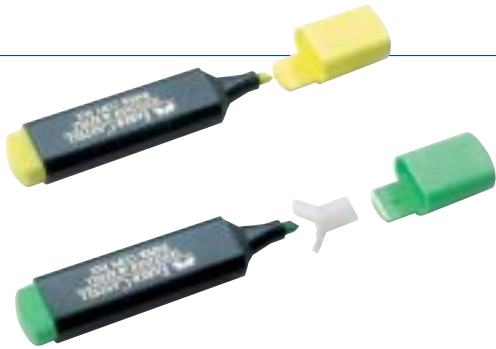
ENGEL
tiebarless

ENGEL TIEBARLESS.

The universal platform for all injection molded products.

2





Tiebarless machines for universal application.

Plastics not only shape the world we live in but also help us to lead our lives as individuals. The demand for individuality opens up ever new possibilities for the manufacturer, especially in the plastics industry. Injection molding makes an essential contribution to the processes of turning raw materials into products that can meet this demand. And since fashions and trends come and go, adaptability is the order of the day.

Engel meets this requirement with its Tiebarless machine systems – a technology platform with as many as 360 modules – which enables the plastics processor to exploit his entire potential for creative part design and flexible production planning.



ENGEL TIEBARLESS.

The system – and its modular combinations.

4

| Engel Machine Line ... / ... | TL | VICTORY TECH US | VICTORY POWER US | VICTORY SPEED US |
|---|----------|--------------------|---------------------|---------------------|
| Clamping unit | | | | |
| Full SPI ejector pattern | s | s | s | s |
| Injection unit | | | | |
| Closed loop feedthroat control | o | o | s | s |
| Electric screw drive | o | o | o | s |
| Quick barrel change | s | s | s | s |
| Plasticizing unit | | | | |
| Barrel | nitrided | nitrided | bi-metallic | bi-metallic |
| Screw | nitrided | nitrided | nitrided | barrier |
| Ceramic heaterbands | s | s | s | s |
| Pneumatic shut-off nozzle | o | o | o | s |
| Hydraulic system / drive | | | | |
| HV 1 Package – Electrohydraulically controlled, variable displacement, single pump for sequential movements and closed loop injection speed and pressure | s | s | - | - |
| HV 2 Package – Electrohydraulically controlled, variable displacement, double pump for independent carriage movement, eject-on-the-fly and closed loop injection speed and pressure | o | o | s | - |
| HV 7 – Package – Parallel motions with increased speed and high speed injection via central accumulator. Servo valve for closed loop injection speed and pressure and independent plasticizing via electric screw drive | o | o | o | s |
| Controls / electrics | | | | |
| Color monitor | s | s | s | s |
| Quick set-up page | s | s | s | s |
| Absolute / relative values | s | s | s | s |
| Automatic calibration of proportional valves | s | s | s | s |
| Maintenance interval indicator | s | s | s | s |
| PD Graphics and Reports | o | o | o | o |
| ENGEL MICROPLAST / ENGEL MICROFLOW | o | o | o | o |
| ENGEL MICROGRAPH | o | o | o | o |
| Mini-Cam expert systems for process parameters | o | o | s | o |
| "Autoprotect" automatic mold protection | o | o | o | o |

s = supplied as standard

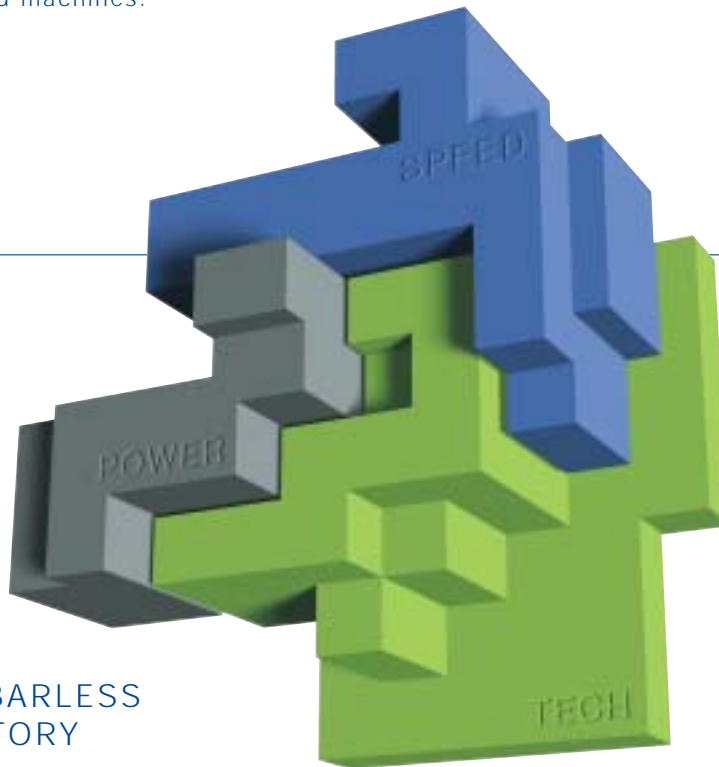
o = optional extra

The system

The system is based on the tiebarless injection molding machine concept which was introduced in 1989. The tiebarless clamping system is available in clamping forces ranging from 28 to 660 US tons, thus covering the entire range of applications for small and medium-sized machines.

The platform

The machine system utilizes the tiebarless concept as the basic technology – or platform – for a modular system for the design of complete, application-oriented machines and extension packages.



 **ENGEL TIEBARLESS
ENGEL VICTORY
TECH**

The economical machine for 80% of all standard applications.

These machine series deliver all the cost and performance advantages of the Engel tiebarless design – larger mold clamping area, simpler and faster mold changes, simplified automation solutions, unsurpassed platen parallelism, reduced platen deflection and shot to shot repeatability.

 **ENGEL VICTORY
POWER**

Perfected technology for precision parts when increased performance counts.

Including all the features and benefits of the TECH / TL machines, with an upgraded abrasion resistant barrel for greater processing flexibility, and enhanced hydraulics for improved cycle times.

 **ENGEL VICTORY
SPEED**

When fast cycle times take priority.

Additional features of the SPEED machine include electric screw drive – providing parallel screw recovery and energy savings, as well as fully accumulator driven hydraulics and barrier screw design for demanding thin-wall and high speed applications.

ENGEL TIEBARLESS.

The versatile system for small to medium-sized machines.

| Injection units * | 80 / ... | 200 / ... | 330 / ... | 500 / ... | 650 / ... | 750 / ... | 1050 / ... | Injection units * | 200 / ... |
|------------------------|---|-----------|-----------|-----------|-----------|-----------|------------|--------------------------------|-----------|
| Clamp units | Available screw diameter in mm per injection unit | | | | | | | Clamp units | |
| *TL 28 US [†] | 25 | | | | | | | *TL 60 US | 25/30/35 |
| *TL 40 US [†] | 25 | | | | | | | *TL 100 US | 25/30/35 |
| *TL 50 US [†] | | 30 | | | | | | *TL 150 US | |
| VC 65 US | 18/22/25 | 25/30/35 | 30/35/40 | | | | | *TL 200 US | |
| VC 75 US | 18/22/25 | 25/30/35 | 30/35/40 | | | | | *TL 220 US | |
| VC 85 US | 18/22/25 | 25/30/35 | 30/35/40 | | | | | *TL 300 US | |
| VC 100 US | | 25/30/35 | 30/35/40 | 35/40/45 | | | | *TL 400 US | |
| VC 120 US | | 25/30/35 | 30/35/40 | 35/40/45 | | | | *TL 440 US | |
| VC 130 US | | 25/30/35 | 30/35/40 | 35/40/45 | | | | *TL 550 US | |
| VC 145 US | | | 30/35/40 | 35/40/45 | 40/45/50 | 45/50/55 | 50/55/60 | *TL 660 US | |
| VC 165 US | | | 30/35/40 | 35/40/45 | 40/45/50 | 45/50/55 | 50/55/60 | *Series conversion from the TL | |

6

ENGEL TIEBARLESS 80 / 28 US

The smallest tiebarless machine



nes.

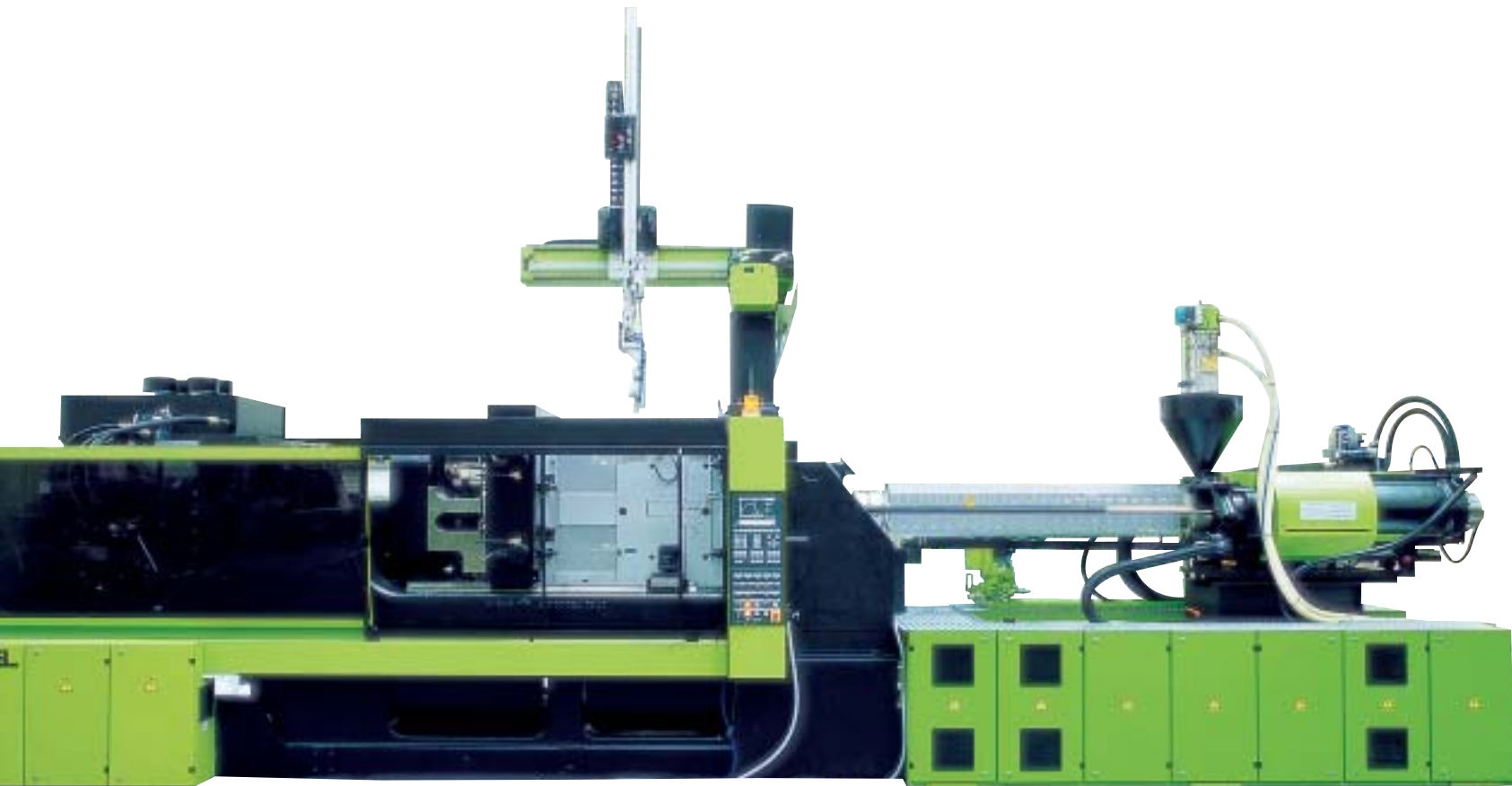
| Units* | 200 / ... | 330 / ... | 500 / ... | 650 / ... | 750 / ... | 1050 / ... | 1350 / ... | 1800 / ... | 2050 / ... | 2550 / ... | 3550 / ... | 4550 / ... | 5550 / ... | 7050 / ... |
|--------|---|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| | Available screw diameter in mm per injection unit | | | | | | | | | | | | | |
| | 25/30/35 | | | | | | | | | | | | | |
| | 25/30/35 | 30/35/40 | 35/40/45 | | | | | | | | | | | |
| | | 30/35/40 | 35/40/45 | 40/45/50 | 45/50/55 | 50/55/60 | | | | | | | | |
| | | | 35/40/45 | 40/45/50 | 45/50/55 | 50/55/60 | 55/60/70 | | | | | | | |
| | | | | 40/45/50 | 45/50/55 | 50/55/60 | 55/60/70 | 60/70/80 | | | | | | |
| | | | | | | 50/55/60 | 55/60/70 | 60/70/80 | 60/70/80 | 70/80/85 | | | | |
| | | | | | | | 55/60/70 | 60/70/80 | 60/70/80 | 70/80/85 | | | | |
| | | | | | | | | | | 70/80/85 | 70/80/90 | | | |
| | | | | | | | | | | | | 80/90/105 | 80/90/105 | |
| | | | | | | | | | | | | | 80/90/105 | 90/105/120 |

Version from the TL system to the ENGEL VICTORY system is taking place continually

[†]Not all options are available on these machine sizes

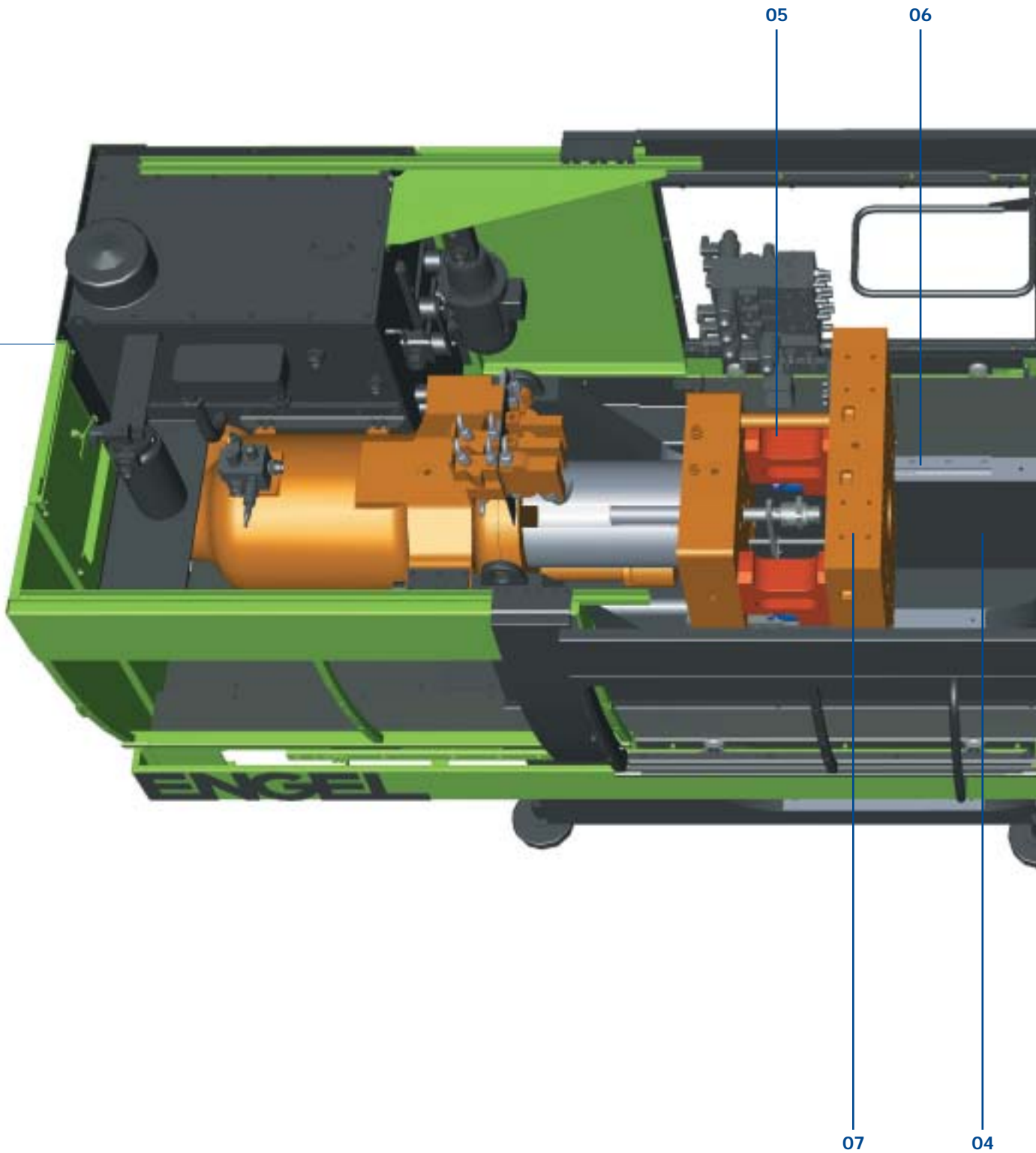
ENGEL TIEBARLESS 4550 / 660 US

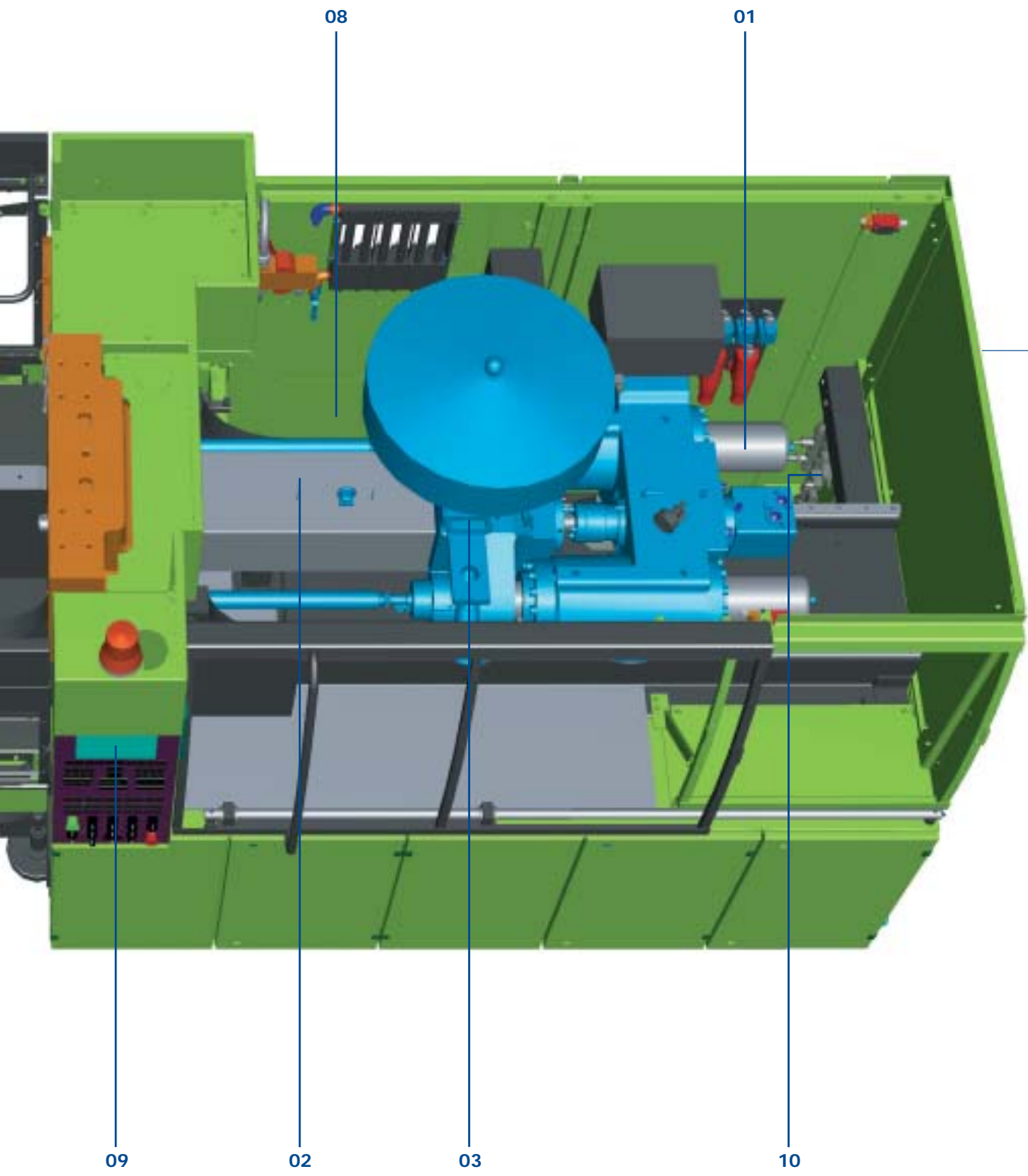
The largest tiebarless machine



ENGEL TIEBARLESS.
Precision technology.

8







01
Engel's innovative twin-cylinder design separates the screw drive from the injection cylinders to give you a more compact and reliable injection unit



02
The quick barrel change system is standard on all machine sizes



03
Swiveling injection unit for improved screw and barrel access



04
With its innovative clamp technology, Engel tiebarless machines can accommodate even large, heavy molds without difficulty

05 Engel's proprietary Flexlink™ mechanical linkage compensates during clamp-up to assure superior parallelism and uniform clamp force distribution between the mold halves

06 Precision linear guides allow low-friction movement of the platen

07 Unique Autoprotect intelligent software provides enhanced mold protection sensitivity, and allows continuous control of pressure and speed during the mold protection phase

08 "Smart" pump hydraulics deliver quick machine response and fast cycle times, with quiet, energy saving operation

09 RISC-based distributed-intelligence machine control offers virtually limitless expandability of the molding cell including machine, robotics, quality control instrumentation, auxiliary equipment, and up and downstream part-handling equipment

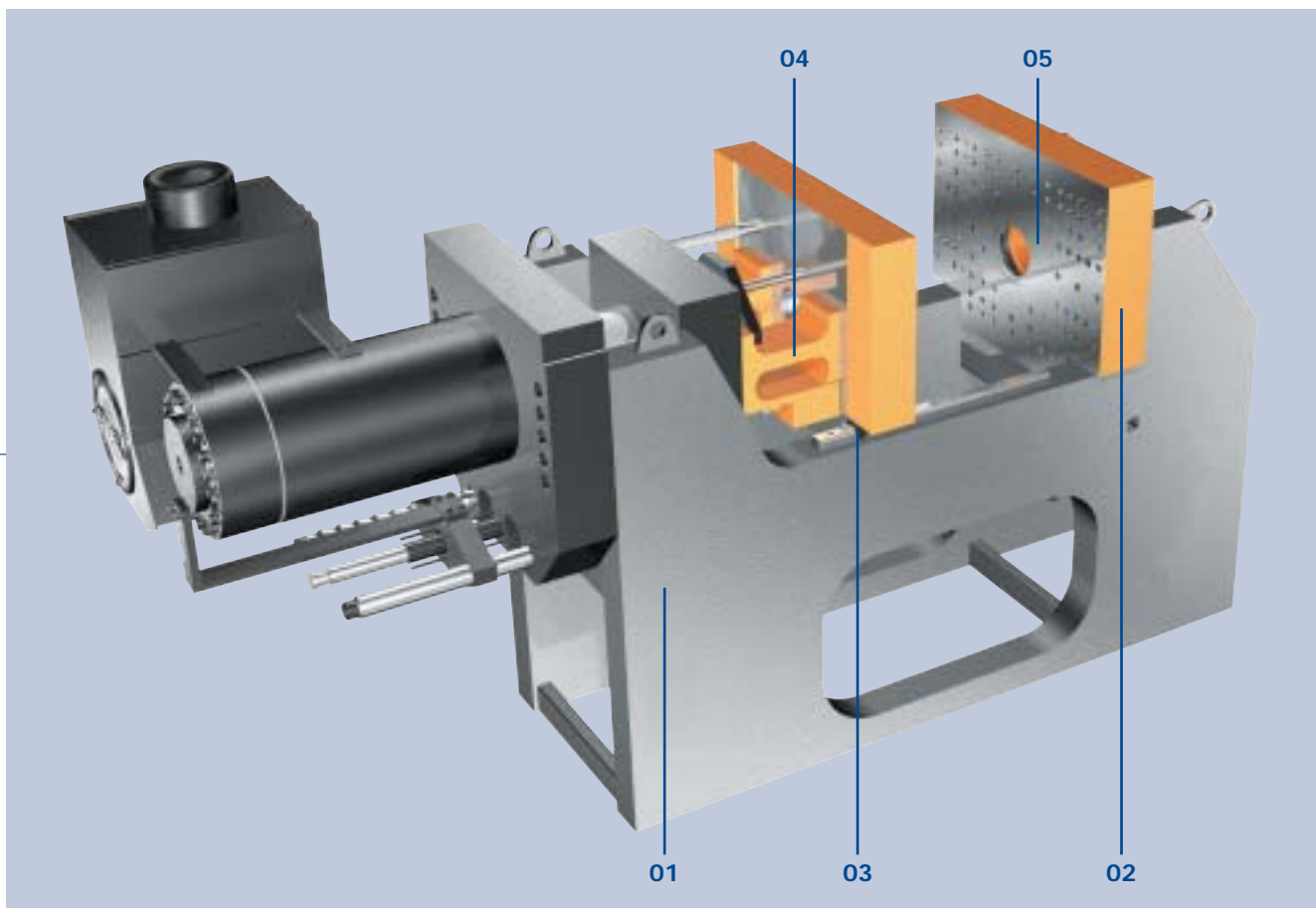
10 Space-saving oil cooler for hydraulic oil

The economical machine system for universal application:

- > ENGEL VICTORY / TL, these machine series are distinguished by their extensive range of standard and optional equipment and optimized price-performance ratio.
- > ENGEL VICTORY TECH / TL – the right machine for 80% of all applications, thanks to an extremely practical range of standard equipment and optional modules.
- > ENGEL VICTORY POWER – when increased performance counts.
- > ENGEL VICTORY SPEED – when short cycle times take priority.
- > ENGEL VICTORY / TL, modular option design for easy expandability to meet your future molding requirements.
- > ENGEL VICTORY / TL, quick delivery globally thanks to standardized production in all of Engel's factories in Europe, North America and Asia.
- > ENGEL VICTORY / TL, well-proven, reliable technology – more than 18,000 tiebarless machines have been delivered since 1989.

ENGEL TIEBARLESS.

Tiebarless technology in detail.



The ENGEL TIEBARLESS clamp unit:
the modern way to build injection molding machines.

The ENGEL TIEBARLESS clamp system is composed of the following main components:

- C-frame
- Stationary platen
- Moving platen
- Flexlink.

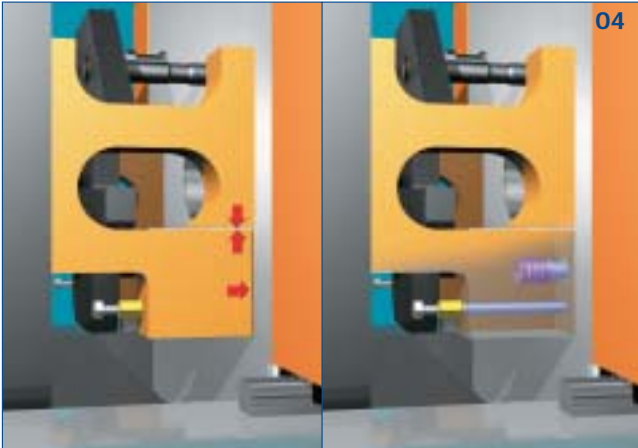
The optimum interaction of these components ensures reliable, low-maintenance operation.

01 C-frame

The system consists of two C-frame elements, the cross-sectional area of which is approximately 10 times larger than that of the tiebars of comparable tiebar machines. Consequently, the system is extremely rigid and does not "flex" during the injection operation.

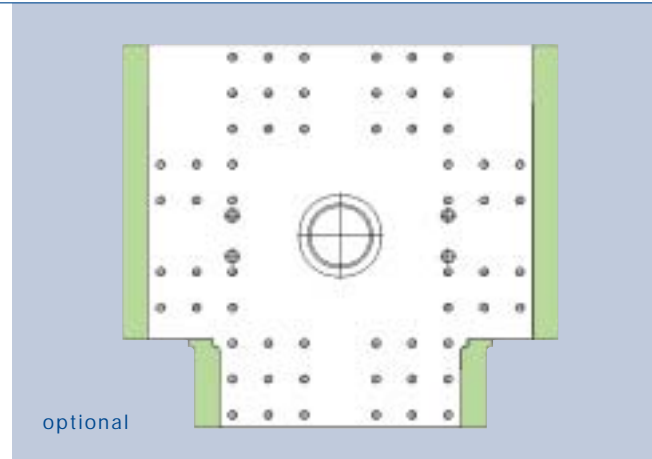
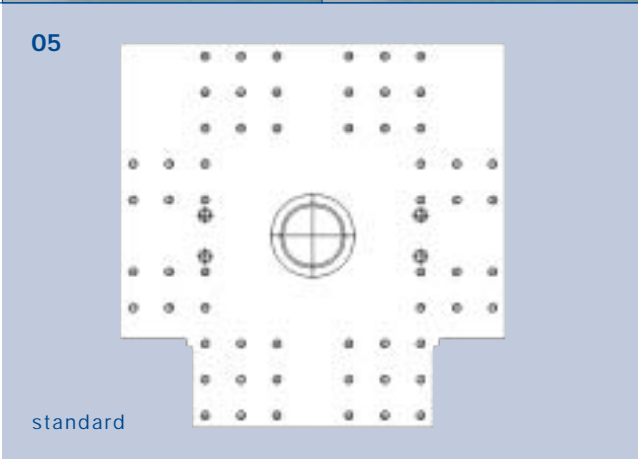
02 Platen support (stationary platen)

The stationary platen is supported by the large-area mounting of the C-frame elements. Compared with the four-point support featured on tiebar machines, this supporting area is much larger and hence better able to counteract platen deflection and, therefore, better able to support the mold.



04 Flexlink

Flexlink is a maintenance-free, flexible element located between the moving platen and the ram of the hydraulic clamping unit. It compensates for frame distortion and ensures optimum parallelism of the stationary and moving platens when clamping pressure is applied. Measurements taken under actual operating conditions show that Flexlink compensates distortion and misalignment to an extent well within industry standard (by up to 30%).



03 Platen support (moving platen)

Due to their rugged construction, the C-frame elements serve as the ideal mounting for the precision linear bearings. These virtually frictionless linear bearings not only guide and support the platens but also carry the full weight of the mold. Consequently, reduced force is required for the mold closing movement, thus contributing to minimum mold wear.

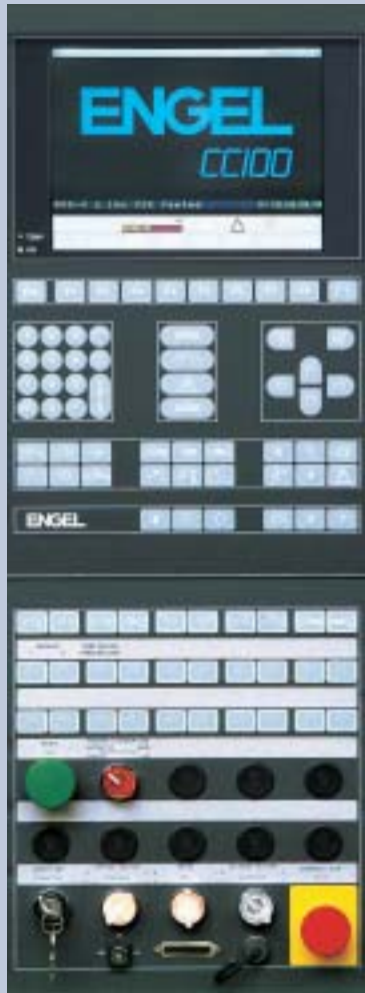
05 Two platen sizes for optimum flexibility:

Optimum utilization of the platen area is made possible by 2 choices of platen size. Besides the standard platen, the customer may choose a horizontally enlarged platen which includes the necessary widening of the machine base.

ENGEL TIEBARLESS.

Comprehensive standards – modular options.

14



EC 100 or CC 100: The interface between man and machine

Easy operation

- Ergonomically designed control panel located near the clamp unit
- Single user interface for machine and robot operation
- Well-proven Engel control logic
- 10.4" color TFT monitor
- Display texts available in 25 languages
- Absolute value input and absolute value calculator
- Operator help system on RAM
- Multiple mold set-up parameters storable via RAM or integrated disk drive

High performance

- Same basic system for EC 100 and CC 100
- System based on 32-bit RISC technology
- Shielded electronic hardware
- Linearization program for the measurement and calibration of valve characteristics
- High-resolution analog modules for analog/digital stroke measurement
- Self-learning temperature control system
- Closed loop injection and holding pressure control
- Maintenance interval indicator and machine diagnostics system

Modular accessories (optional extras)*

- Fully integrated automation packages
- Interfaces for central computer, EMS, auxiliary devices, etc.
- Autoprotect high-precision mold protection and injection monitoring systems
- Process improvement software, e.g. ENGEL MICROFLOW (automatically corrects the change-over point from injection pressure to holding pressure as a function of the deviation from the reference flow rate during the injection process)
- State-of-the-art Internet technology for teliagnostics and telemaintenance
- Automatic notification of operating personnel in cases of breakdown – via telecommunication facilities (EMS)

* Please note:
Further information on machine control systems is contained in our brochure ENGEL CONTROL SYSTEMS

Automation made easy.



Detail view of tiebarless clamp unit

Integrated hydraulic quick-action mold mounting system and quick-action hose couplings.

15



Mold change system via roller assembly.



Integrated automation via ER-TLi robot. With no tiebars to negotiate, the tiebarless machine concept affords the robot arm unrestricted lateral access to the mold. This permits a simplified robot design and a saving of space and cycle time. As the robot and the conveyor can be fully integrated into the machine, within the safety gate, a standard production cell can be supplied complete with robot and conveyor.

ENGEL TIEBARLESS.

The universal machine for all performance levels.

16

ENGEL VICTORY 200 / 120 US

A production cell featuring space-saving automation with the main axis of the robot running parallel to the machine – an example of how space can be optimized in cramped conditions or where full access to the clamping unit is required (mold change system)



ENGEL ERC 42/2-E
linear robot

Safety shield for
operating radius of robot

Conveyor

Car door lock component

example of a precision part manufactured from
engineered thermoplastics.



ENGEL TIEBARLESS 750H / 500W / 300 US Integrated operation with Combimelt machines

Production cell comprising of 2 Combimelt injection molding machines and a common linear robot for insert placing and parts removal. Each machine can process two materials in sequence. In coupled operation, the machines can produce a four-component part.



ENGEL ERC 63/1-C
linear robot

Synchronized conveyor
system for the feeding of
inserts to the machine

Conveyor system for the
post-cooling and transport
of finished parts

17

Car handbrake lever unit

injection molded from a rigid, structural component and a soft component for the outer skin which forms the handgrip – an example of a part manufactured on two machines in coupled operation. The production stages 1 and 2 are linked by means of a transfer robot (Combimelt transfer system).



be the first.



Machines

ENGEL TIEBARLESS

ENGEL DUO

ENGEL CLASSIC

ENGEL E-MOTION

ENGEL INSERT

ENGEL ELAST

ENGEL LIM

Integrative technology

ENGEL ROBOTS

ENGEL CONTROL SYSTEMS

ENGEL PRECISION MOLDS

Technology

ENGEL COMBIMELT

ENGEL FOAMMELT

ENGEL GASMELT / WATERMELT

ENGEL TECOMELT

ENGEL FIBERMELT

ENGEL X-MELT

Services

CUSTOMER SERVICE DIVISION

Language

german

english

french

italian

spanish

ENGEL

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