Get a grip on **inserts.**

ENGEL **insert**

ENGEL
be the first.

The right combination. ENGEL insert.

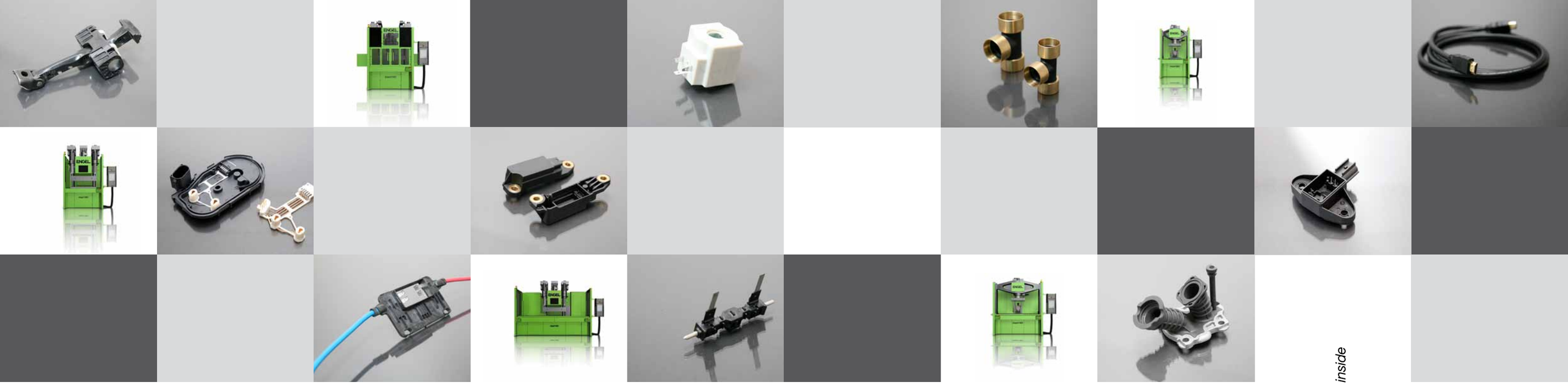
In many challenges, teamwork is the key to success. This is the case where a number of people are working towards a common goal – and the same applies where a number of different materials are combined.

1 + 1 = more than 2

In many cases, technical parts only gain their required functions and mechanical properties through an intelligent combination of differing materials. **In short, material synergy must be utilised consistently.**

Overmoulding with plastic fuses **metal parts, glass, plastic components, electronic modules** and prefabricated assemblies into finished parts with strong product characteristics.

Not only do ENGEL insert machines perform this task with **maximum efficiency and security**, they offer a whole series of ergonomic advantages.



ecodrive inside

Metal and plastic **composite parts**

Efficient, reliable, ergonomic production

More **productivity**

- Significant time savings and no delays, even with complex insertion and demoulding procedures. In machines with a rotary or sliding table, **the next injection process step is performed in parallel with parts handling** at another mould station.

Efficient **automation**

- Simple **and precision insertion and holding of parts** in cavities thanks to the horizontal mould parting line.
- **Ease of integration in complex manufacturing cells** – the mould area is highly accessible from all angles.

Ergonomic **operation**

- **Table height offers ultimate ergonomics** for manual parts handling; no platform is required for the user.

Outstanding **energy efficiency**

- **Low energy consumption** thanks to low friction, closing pressure lock-in and electrohydraulic variable capacity pump.
- **Intelligent ENGEL ecodrive servo hydraulics** takes energy efficiency to a level only achieved until now by all-electric machines (ecodrive is optional, or standard with the e-insert).

Shorter **handling times**

- **Secure and time-saving:** highly secure access to mould area thanks to a light curtain. No two-handed operation required to move the clamping unit and ejector.
- Moreover, **no wait times** for opening and closing the safety gate that would normally be needed.

ENGEL insert V			single	rotary	shuttle	80V			200V			330V			500V			650V			750V			1050V		
						18	22	25	25	30	35	30	35	40	35	40	45	40	45	50	45	50	55	50	55	60
insert V 35 xs	40 US	350 kN	■	■	■																					
insert V 45 xs	50 US	450 kN	■	■	■																					
insert V 40	50 US	400 kN	■	■	■																					
insert V 60	70 US	600 kN	■	■	■																					
insert V 80	90 US	800 kN	■	■	■																					
insert V 100	110 US	1000 kN	■	■	■																					
insert V 130	150 US	1300 kN	■	■	■																					
insert V 160	180 US	1600 kN	■	■	■																					

ENGEL insert H			single	rotary	shuttle	80H			200H			330H			500H			650H			750H			1050H			1350H			1800H		
						18	22	25	25	30	35	30	35	40	35	40	45	40	45	50	45	50	55	50	55	60	55	60	70	60	70	80
insert H 30	40 US	300 kN	■	■	■																											
insert H 40	50 US	400 kN	■	■	■																											
insert H 60	70 US	600 kN	■	■	■																											
insert H 80	90 US	800 kN	■	■	■																											
insert H 100	110 US	1000 kN	■	■	■																											
insert H 130	150 US	1300 kN	■	■																												
insert H 160	180 US	1600 kN	■	■																												
insert H 200	230 US	2000 kN	■	■																												
insert H 250	280 US	2500 kN	■	■																												
insert H 300	340 US	3000 kN	■	■																												
insert H 400	440 US	4000 kN	■	■																												

ENGEL e-insert V			single	rotary	shuttle	80V			200V			310V			440V		
						18	22	25	25	30	35	30	35	40	35	40	45
e-insert V 40	50 US	400 kN	■	■	■												
e-insert V 60	70 US	600 kN	■	■	■												
e-insert V 80	90 US	800 kN	■	■	■												
e-insert V 100	110 US	1000 kN	■	■	■												

ENGEL e-insert H			single	rotary	shuttle	80H			200H			310H			440H		
						18	22	25	25	30	35	30	35	40	35	40	45
e-insert H 40	50 US	400 kN	■	■	■												
e-insert H 60	70 US	600 kN	■	■	■												
e-insert H 80	90 US	800 kN	■	■	■												
e-insert H 100	110 US	1000 kN	■	■	■												

Subject to change!

The perfect solution.
In many combinations.

The wide ENGEL insert machine programme means the right solution
for your specific insert application – every time

Are you looking for a complete, economically viable injection moulding solution for your insert application? One that meets all your needs as regards productivity, precision, operational safety, utilisation of space and energy efficiency? With the ENGEL insert machine range, **you're in safe hands. After all, the range is comprehensive.**

Whether hydraulic or electric, vertical or horizontal injection unit; whether deploying a rotary table, sliding table or stationary platen – the sheer diversity of variants means the right answer to virtually all insert applications. From a single machine without automation to a **complex, highly integrated production cell** where several machines, linear robots, industrial robots and other systems (such as camera inspection technology) turn your product ideas into reality.

ENGEL insert | **Because diversity matters.**

ENGEL insert V – with vertical injection unit

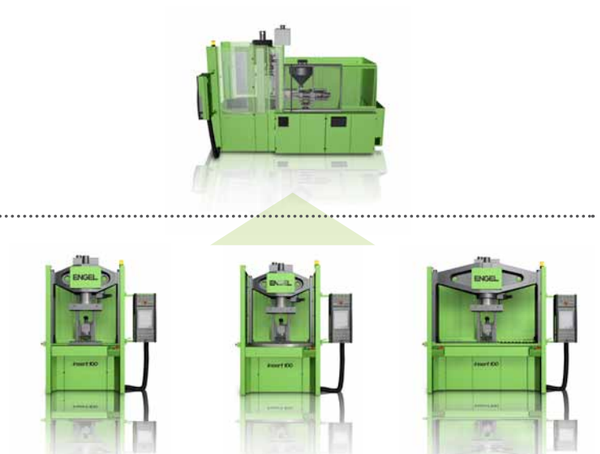
- Clamping unit: hydraulic, vertical, closing from the top
- Hydraulic, vertical injection unit
- High injection performance, excellent process stability
- Outstanding injection process control
- EHV hydraulics
  (alternatively: energy efficient ENGEL ecodrive drive technology)
- Compact design
- Ideal ergonomic working height
- Light curtain to safeguard mould area

	insert V **single-xs** (xs = extra small)	insert V **rotary-xs** (xs = extra small)	insert V **shuttle-xs** (xs = extra small)
Stationary mould fixing platen	■		
Hydraulic rotary table		■	
Hydraulic sliding table			■
Very small footprint	■	■	■
Corresponding performance data	■	■	■
Two-circuit hydraulics for synchronous movement	□	□	□
Limited option pool	■	■	■

	insert V **single**	insert V **rotary**	insert V **shuttle**
Stationary mould fixing platen	■		
Hydraulic rotary table		■	
Hydraulic sliding table			■
Small footprint	■	■	■
Outstanding performance data	■	■	■
Two-circuit hydraulics for synchronous movement	□	■	■
Comprehensive range of options, including customised solutions	■	■	■

ENGEL insert H – with horizontal injection unit

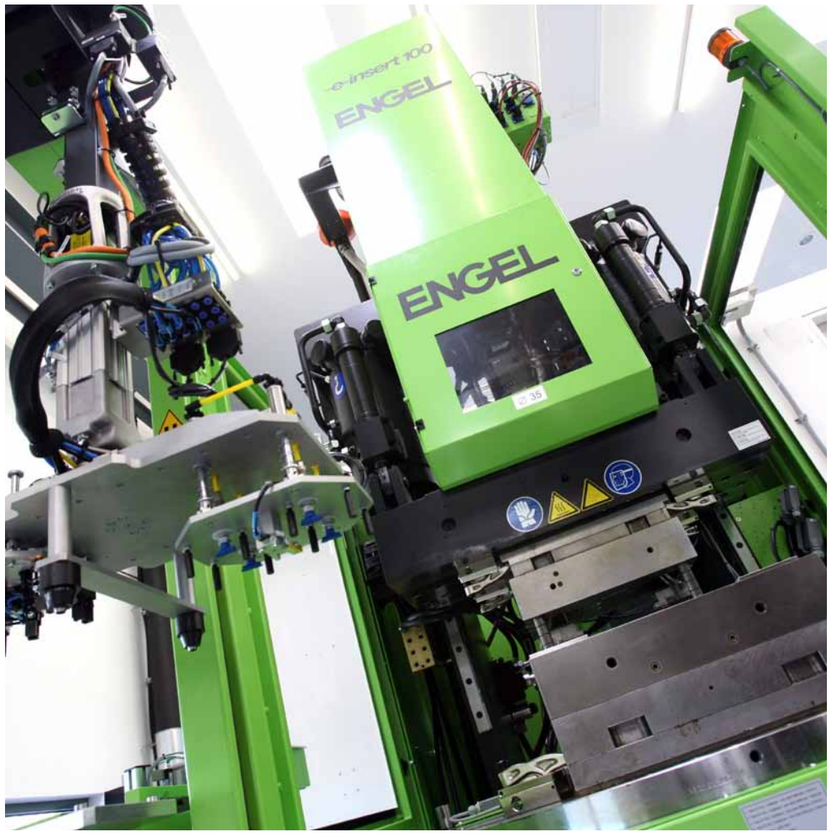
- Clamping unit: hydraulic, vertical, closing from the top
- Hydraulic, horizontal injection unit
- High injection performance, excellent process stability
- Outstanding injection process control
- EHV hydraulics
  (alternatively: energy efficient ENGEL ecodrive drive technology)
- Ergonomic working height
- Light curtain to safeguard mould area



	insert H **single**	insert H **rotary**	insert H **shuttle**
Stationary mould fixing platen	■		
Hydraulic rotary table		■	
Hydraulic sliding table			■
Outstanding performance data	■	■	■
Two-circuit hydraulics for synchronous movement	□	■	■
Comprehensive range of options, including customised solutions	■	■	■

■ Standard
□ Optional

ENGEL **e-insert** with electric injection unit



ENGEL **e-insert V**

- ENGEL e-insert V single
- ENGEL e-insert V rotary
- ENGEL e-insert V shuttle

ENGEL **e-insert H**

- ENGEL e-insert H single
- ENGEL e-insert H rotary
- ENGEL e-insert H shuttle

Electric, precise, energy efficient.

Electric meets hydraulic. The ENGEL e-insert brings together the best of both worlds. The machine combines the unbeatable precision of a servo-electric injection unit with the efficiency of a vertical, hydraulic clamping unit.

The result is injection moulded parts of **outstanding quality and precision**, produced with incredibly low energy consumption. Intelligent ENGEL ecodrive servo hydraulics, installed as standard in the e-insert, makes a big difference to energy savings.

The **excellent process stability** of the ENGEL e-insert meets the highest standards in the production of technical parts.

	hydraulic/ecodrive	electrical
Open/close mould	■	
Rotary/sliding table		■
Ejection	■	□
Injection		■
Plasticising		■
Building up contact force	■	

■ Standard
□ Optional

The **clamping unit** | Focus on flexibility and ergonomics

Requirements on the design of the mould area can differ greatly, especially in the area of vertical injection moulding machines. Here, flexibility of machine specification is a much more **important factor in successful parts production** than is the case in other machine series. Thanks to the company's decades of experience, the mould area of ENGEL insert machines offers many advantages:

- Ideal **ergonomic** working height
- **Easy accessibility** through safeguarding with light curtain
- **Simple setting of mould sequences** (even with multiple workstations) thanks to user-programmable sequence control

Three basic designs are available for the mould area:

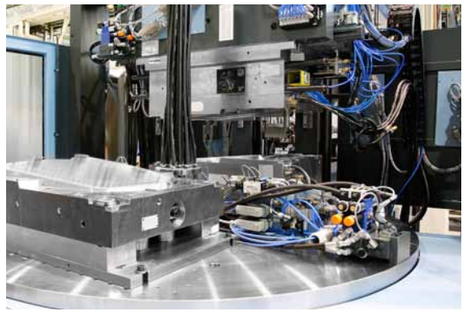
- **rotary**
- **single**
- **shuttle**

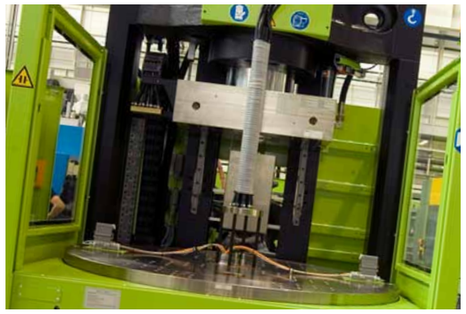
ENGEL insert rotary | Rotary table

For most vertical machine applications, the rotary table version is the most cost-efficient: during the time-consuming insertion and demoulding procedure, the next parts are already being injected simultaneously in another bottom mould half. This concept has the potential to **raise productivity by a high percentage**, even compared with horizontal injection moulding machines.

Mould temperature control: benefits of tie-bar-less clamping unit

Since the rotation axis of ENGEL rotary tables is invariably tie-bar-less, electric cables, water pipes and hydraulic pipes can **easily be routed from below to the moulds**. Additional temperature control circuits can be installed from above in the case of technically demanding applications.





ENGEL insert		Rotary table			
		900	1200	1600	2000
ENGEL insert **H 30 rotary**	40 US		■		
ENGEL insert **H 40 rotary**	50 US		■		
ENGEL insert **H 60 rotary**	70 US		■		
ENGEL insert **H 80 rotary**	90 US		■		
ENGEL insert **H 100 rotary**	110 US		■		
ENGEL insert **H 130 rotary**	150 US		■	□	
ENGEL insert **H 160 rotary**	180 US		■	□	
ENGEL insert **H 200 rotary**	230 US			■	□
ENGEL insert **H 250 rotary**	280 US			■	□
ENGEL insert **H 300 rotary**	340 US			■	□
ENGEL insert **H 400 rotary**	440 US				■
ENGEL insert **V 35 rotary-xs**	40 US	■			
ENGEL insert **V 45 rotary-xs**	50 US	■			
ENGEL insert **V 40 rotary**	50 US		■		
ENGEL insert **V 60 rotary**	70 US		■		
ENGEL insert **V 80 rotary**	90 US		■	□	
ENGEL insert **V 100 rotary**	110 US		■	□	
ENGEL insert **V 130 rotary**	150 US		■	□	
ENGEL insert **V 160 rotary**	180 US		■	□	

■ Standard □ Optional

ENGEL insert single | Stationary platen

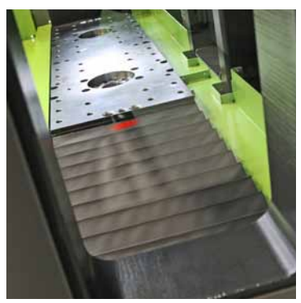
The single version is **specifically designed for production with just one bottom mould half**. One major advantage is the very small footprint, especially with the single-xs version.

This machine is ideally suited to small batches and the overmoulding of bulky inserts. It offers particular benefits in the production of parts on metal bands subsequently separated outside the machine. **Very short insertion and removal times** are possible thanks to belt feed units integrated into the mould.

ENGEL insert shuttle | Sliding table

The concept is particularly beneficial where a rotary table is not viable due to the quality of inserts and where inserting and removing parts is relatively time-consuming.

The ENGEL insert shuttle has a **sliding table** with stations alternately to the left or right of the injection station for the purposes of parts handling. Each station is fitted with an ejector.



High **operating safety**

Safeguarding against unauthorised access in the mould area

The mould area is **safeguarded by a light curtain**. Where an unauthorised intervention into the mould area is made, all machine movements shut down immediately and securely. As an option, the light curtain in front of the mould area can be extended to the side workstations of the rotary table.

Safeguarding against hot material

Horizontal injection units are secured by a swivel-type splash guard, which provides **optimum protection against outflows of hot melt when the mould is open**. The mould manufacturer or the operator of the mould must secure the parting line of closed moulds with a protective cover or suitable immersion edge. This means there is no need for an extra safety shield in front of the mould, while the full freedom of the mould area is retained. If required, however, an appropriate safety shield on the movable mould mounting platen is optionally available (national regulation in North America).

North America

Owing to safety requirements, the version for North America (for the ENGEL insert US) differs in two key respects:

1. The distance between the light curtain and the mould area is greater. In addition to the vertical light curtain elements, shorter horizontal elements are also integrated to safeguard the area close to the mould.

2. A height-adjustable splash guard is mounted on the movable mould mounting platen to safeguard the parting line against purging of hot melt. After mounting the mould, the operator must adjust the guard in such a way that the parting line is securely covered when the mould is closed.

The **injection unit** | hydraulic or electric

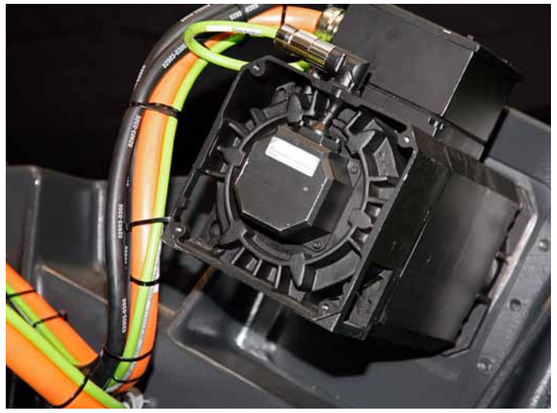
ENGEL injection unit | **Hydraulic**

High performance, excellent process stability

Excellent injection process control

The hydraulic ENGEL injection units score extra points with reliable control of the injection moulding process. Compared to conventional injection controllers, the 'clamped system' of injection plungers included in the standard version with the highly sensitive electronic controllers reacts extremely quickly to disturbing influences and any process-related changes. This ensures **excellent quality injection moulded parts and high reproducibility**. Moreover, the electrohydraulic variable capacity pumps installed as standard in the ENGEL insert enhance control accuracy.

A **servo valve is also optionally available** for optimisation at very low injection speeds (comes as standard in the ENGEL ecodrive).



ENGEL injection unit | **Electric**

The guarantee of perfect product quality

High-precision injection process control

Electric ENGEL injection units combine high-precision movement in the injection process with very high reproducibility. This significantly raises quality in products with minimal wall thicknesses in particular. Very high process stability ensures a very low number of rejects, thereby **cutting costs further and increasing productivity**.

High-performance injection: with precision and energy efficiency

The thinner the walls of the injection moulded part, the greater the advantage of precision with electric injection units – and the higher the injection performance that is needed. So far, high-performance injection has only been possible via hydraulic storage batteries, which entails very high energy loss. Now the ENGEL e-insert electric injection units offer **injection speeds of up to 450 mm/s** in several power stages, and greater precision comes as standard.

Plasticising unit

A range of barrel and screw configurations is available for optimum tuning of plasticising to the application. The barrel is mounted on the injection unit by means of a quick coupling. The plasticising unit is pressed torque-free against the mould, whereby **the required force is set on the machine control unit**.

ENGEL **technology modules**

Ideal add-ons for the ENGEL insert and ENGEL e-insert: Special process technologies or applications also call for special equipment on injection moulding machines.

rubber | Screw injection unit adapted to rubber processing through process technology.

LIM | Equipment package for liquid silicone processing, with screw or plunger injection unit according to the application.

HTV | Plasticising unit and process software for processing solid silicone. Stuffing device optionally available.

HART-PVC | Equipment package and plasticising unit for processing hard PVC.

duroplast | Plasticising unit and process software for processing duroplast.

ecodrive inside

Focus on energy

With servohydraulic ENGEL ecodrive and more.

When it comes to saving energy, **overall efficiency counts**

Saving energy means cutting costs. To ensure an injection moulding machine can achieve its full energy saving potential, though, it's not enough to restrict individual components (such as hydraulic pumps or their drive motors) to low energy consumption: the right overall concept must be applied.

In particular, the underlying hydraulic concept must deliver high levels of energy efficiency. This critical basis is supplemented by drive components that also operate energy-efficiently. **In the ENGEL insert and e-insert, the two factors are perfectly harmonised.**

High efficiency in the machine's basic hydraulic concept

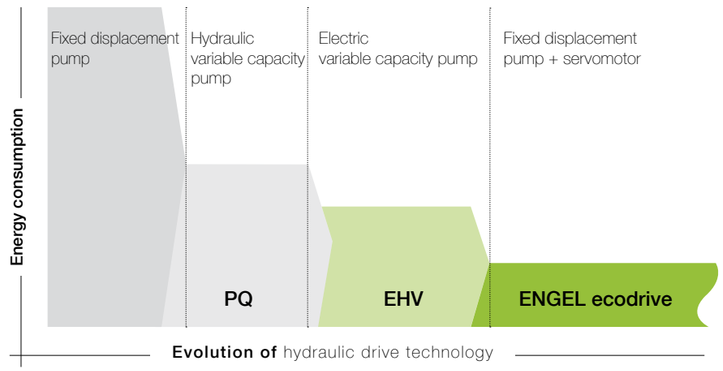
+

High efficiency of individual hydraulic drive and control components

ENGEL: leading the way

These machines operate according to a hydraulic concept that places a very low energy requirement on the central hydraulic system. The hydraulic drive units have always **set the standard for the sector in terms of energy efficiency and control quality**. After all, it was more than 15 years ago when ENGEL replaced PQ hydraulics – conventional at the time – with modern, energy saving EHV hydraulics.

Now ENGEL has taken another critical step forward with the new servohydraulic ENGEL ecodrive, which combines the benefits of hydraulics and servo drives. **It all adds up to even better control accuracy and impressive energy efficiency.**

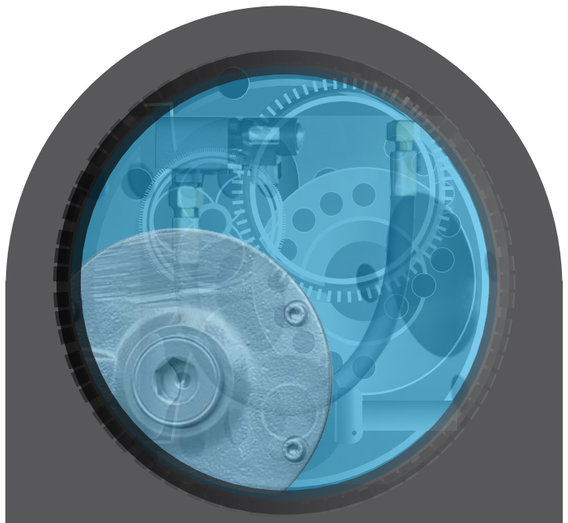


Perfect combination: electric injection unit and ENGEL ecodrive

Where hydraulic accumulators with relatively high energy consumption were once used, **ENGEL now offers high-performance yet energy-efficient electric injection units** that provide injection speeds of up to 450 mm/s. This is only available in combination with the ENGEL ecodrive, however; otherwise no-load power losses in hydraulic pumps operating in parallel would offset the energy savings of the electric injection unit.

No holding force thanks to 'lock-in' closing pressure

It goes without saying that all speeds and pressures of the individual hydraulic machine movements are regulated. However, the required pressure is hydraulically maintained where practical, thereby holding clamping force and nozzle contact force. This reduces the energy for keeping these forces to zero. **As cycle times increase, energy savings also rise to significant levels.**



ecodrive inside

ENGEL ecodrive – the revolutionary hydraulic concept with major advantages:

- Outstanding **energy efficiency**
- Much less **cooling water needed**
- Very low **noise level**
- Ideal for **clean room applications**
- **'On board' hydraulics** for operating core-pulls

Standard in ENGEL insert, optional in ENGEL e-insert

ENGEL ecodrive | **Intelligent hydraulics**

ENGEL ecodrive means serious energy savings. Compared to conventional hydraulic machines, **the intelligent servohydraulic system enables customers to make energy savings of up to 70 percent**. How is this achieved? The drive is only active during movement; virtually zero energy is consumed when idle (during cooling times, for instance). When the servohydraulic machine does move, it does so with extreme efficiency – thanks in part to a patented pressure regulation system.

Another advantage lies in the fact that the hydraulic system is 'on board': this makes the ecodrive ideal for moulds with hydraulic components, such as core-pulls. The machine runs very quietly thanks to the servo hydraulics, and its thirst for cooling water is drastically reduced – **in most cases it requires none at all.**

How the ENGEL ecodrive works

In the ENGEL insert and ENGEL e-insert, the ecodrive system comprises a servomotor with fixed displacement pump (instead of a permanently running asynchronous motor with variable capacity pump). Energy efficiency derives from several criteria, but two main points in particular:

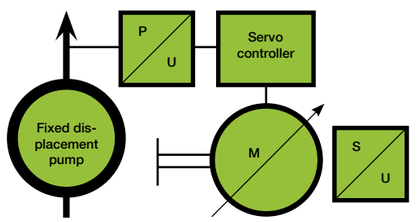
No control valves in the central drive unit for speed and pressure regulation system

In conventional systems, control valves invariably cause energy loss because of the pressure difference. By contrast, the ENGEL ecodrive regulates speed and pressure without control valves. **This results in considerable efficiency gains.**

Speed is regulated via the rotational speed of the fixed displacement pump, with no additional losses in pressure and energy. The patented pressure regulation system is unique: instead of using a pressure control valve, it utilises **newly developed control algorithms** directly via the rotational speed of the pump.

Drive downtime when idle

When idle, the ENGEL ecodrive saves the flushing or idling energy consumed by conventional hydraulic systems. **An idle pump consumes no energy.** This is effectively supported by the energy efficient machine concept (e.g. 'lock-in' closing pressure).



Cooling water savings of up to 100%

The ENGEL ecodrive raises energy efficiency by **drastically reducing the energy losses** sustained by conventional hydraulic machines.

- **Conventional hydraulic machines:**
  The supplied electrical energy that is not utilised for the various machine movements in the form of kinetic energy is converted into heat energy. Most of this heat energy is supplied to the hydraulic oil and then transferred to the external cooling water treatment plant via the usual oil cooler.

- With the exception of high-performance applications, the **ENGEL ecodrive** reduces energy losses to such an extent that only slight warming of the hydraulic oil takes place. Consumption of coolant in oil coolers is reduced to very low volumes (and to zero in many cases).

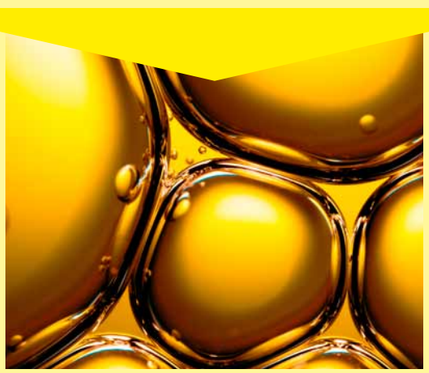
The 'noiseless' machine

The ENGEL ecodrive is not only energy efficient in the extreme, it also runs quietly. In the absence of permanently running hydraulic pumps, noise levels are significantly reduced.

'On board' hydraulics

The ENGEL ecodrive meets every requirement for energy efficient, space saving production with hydraulic core-pulls. The ecodrive also provides two fully independent drive units for synchronous movement of the ejector, core-pulls and nozzle (standard in the rotary and shuttle versions).

Oil temperature: indicator of **energy efficiency**
in hydraulic machines



The control unit | Everything under control
with the ENGEL **CC 200**

A modern control unit must **take control of ever more complex processes** while providing for quick and simple programming. The ENGEL CC 200, the control unit for ENGEL insert machines, is ideally equipped for the purpose – and provides an efficient and secure human/machine interface thanks to clear and ergonomic operating elements.

Machine and robot sequence at a glance

The freely configurable machine sequence supports simple, individual configuration of sequences throughout the injection moulding cycle. Even complex cycle sequences including the robot can be easily and reliably created, visualised and modified using graphical tools. This means machine settings are greatly simplified, especially in the case of vertical machines: separate, independent sequences can be created for the injection station and the insert-placing and take-off stations.

The machine sequence can be set up **in advance on the PC with the supplied 'virtual machine'.** Faster mould changing, less risk of mould damage and ideal training opportunities for operators are the decisive benefits.

Quality monitoring

A wide range of modules for monitoring the quality of injection moulded parts are available in standard versions and as optional extras. Both the direct graphic monitoring of all key parameters of the injection moulding process and the recording and statistical evaluation of the same are displayed in a simple and clear manner.

This data can also be **centrally collated and evaluated** via an interface to external production planning and monitoring systems.

Energy efficiency with ENGEL ecograph

The ENGEL insert control unit comes with an ENGEL ecograph energy analysis tool as standard. The tool enables users to check the machine's energy consumption and optimise injection moulding processes in terms of energy efficiency.

Wholly **efficient system** | Machine + robot

Focus on automation

The injection moulding machine is in many cases only one element of the overall, often complex production cell. Robots and automation components **perform a wide range of tasks**. These ranges from insert-placing and take-off actions at the injection mould, including mounting and checking operations, to packaging of the finished product.

The aspect of cost-effectiveness is usually founded in the overall concept and not its individual components. This is precisely where the vertical ENGEL insert delivers **significant benefits to the overall concept** through its multi-station layout.

More flexibility

The **mould area on the ENGEL insert is easily accessible from all sides**. A robot can easily move in and out of the mould, and the benefit of the standard light curtain is retained in the case of side-on insertion and retraction. Where mould maintenance is necessary, operators can also be sure of fast and secure access.

More productivity.

Very often, loading a mould with inserts takes a relatively long time. In the case of the ENGEL insert, the next injection cycle cannot be held up. Therefore, as it overmoulds the next parts, the robot is able to place and remove inserts – **without delaying the cycle**.

The number of vertical machines with automation is continuing to rise – and no wonder, as an auto**matic insertion process guarantees the secure and proper positioning of parts** in the mould. This minimises interruptions to production and the number of rejects.

60 years | Experience with vertical machines

ENGEL has been making vertical machines for 60 years. **That's a lot of experience** in highly sophisticated vertical machines such as those in the ENGEL insert range.

The list of ENGEL insert customers reads like a Who's Who of the industry. The intelligent machine concept promises advantages across a wide range of sectors in the form of **technical parts, automobile and electronic components and special applications for medical engineering**. Major global businesses and innovative SMEs alike depend on the efficiency of ENGEL insert. Worldwide.

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ENGEL insert

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