insert get a grip on inserts







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.



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.



The perfect solution. In many combinations.

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.

into reality.

ENGEL insert V		sinale	sinale	sinale	sinale	single	sinale	rotary	shuttle	60V	200V	330V	500V	650V	860V	1060V
		0.1.910	l	Shattio	15 18 20	22 25 30	30 35 40	35 40 45	40 45 50	45 50 55	50 55 60					
	kN	US tons														
insert V 35 xs	350	40														
insert V 45 xs	450	50														
insert V 40	400	50														
insert V 60	600	70														
insert V 80	800	90														
insert V 100	1000	110														
insert V 130	1300	150														
insert V 160	1600	180														
insert V 200	2000	220														
insert V 250	2500	270														

			- to - to			60H	200H	330H	500H	650H	750H	860H	1060H	1560H	2460H	3660H
ENGEL INSE	ΠΗ		single	rotary	Shuttle	15 18 20	22 25 30	30 35 40	35 40 45	40 45 50	45 50 55	45 50 55	50 55 60	55 60 70	60 70 80	70 80 90
	kN	US tons														
insert H 30	300	40														
insert H 40	400	50														
insert H 60	600	70														
insert H 80	800	90														
insert H 100	1000	110														
insert H 130	1300	150														
insert H 160	1600	180														
insert H 200	2000	230														
insert H 250	2500	280														
insert H 300	3000	340														
insert H 400	4000	450														

ENCEL a incort \/					50V	170V	310V	440V							50V	170V	310V	440V		
ENGEL 8-INS	sert v		single	rotary	snutte	15 18 20	22 25 30	30 35 40	35 40 45		ENGEL e-Insert H		single	rotary	snutte	15 18 20	22 25 30	30 35 40	35 40 45	
	kN	US tons										kN	US tons							
e-insert V 40	400	50									e-insert H 40	400	50	•						
e-insert V 60	600	70								-	e-insert H 60	600	70	•						
e-insert V 80	800	90								-	e-insert H 80	800	90							
e-insert V 100	1000	110								-	e-insert H 100	1000	110							

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

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

insert_7

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 synchro- nous movement			
Limited option pool			
	insert V single	insert V rotary	insert V shuttle
Stationary mould fixing platen	insert V single ■	insert V rotary	insert V shuttle
Stationary mould fixing platen Hydraulic rotary table	insert V single ■	insert V rotary	insert V shuttle
Stationary mould fixing platen Hydraulic rotary table Hydraulic sliding table	insert V single ■	insert V rotary ■	insert V shuttle
Stationary mould fixing platen Hydraulic rotary table Hydraulic sliding table Small footprint	insert V single	insert V rotary	insert V shuttle
Stationary mould fixing platenHydraulic rotary tableHydraulic sliding tableSmall footprintOutstanding performance data	insert V single	insert V rotary	insert V shuttle
Stationary mould fixing platenHydraulic rotary tableHydraulic sliding tableSmall footprintOutstanding performance dataTwo-circuit hydraulics for synchronous movement	insert V single	insert V rotary	insert V shuttle

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 synchro- nous movement			•
Comprehensive range of options, including customised solutions			
			Ctondord

. . .









StandardOptional









ENGEL e-insert V

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

Electric, precise, energy efficient.

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/ed
Open/close mould	
Rotary/sliding table	
Ejection	
Injection	
Plasticising	
Building up contact force	



ENGEL e-insert H

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

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

codrive	electrical
	■ Standard □ Optional

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 simultane- Since the rotation axis of ENGEL rotary tables is ously in another bottom mould half. This concept has invariably tie-bar-less, electric cables, water pipes the potential to raise productivity by a high per- and hydraulic pipes can easily be routed from becentage, even compared with horizontal injection moulding machines.



ENGEL insert			Rotar	y table	
		900	1200	1600	2000
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				
ENGEL insert V 200 rotary	230 US				
ENGEL insert V 250 rotary	280 US				
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				



cation is a much more important factor in successful parts production than is the case in other machine

- Ideal ergonomic working height
- Easy accessibility
- Simple setting of mould sequences

- single
- shuttle

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

low to the moulds. Additional temperature control circuits can be installed from above in the case of technically demanding applications.



■ Standard □ Option

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

Safeguarding against hot material

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

North America

the mould area is greater. In addition to the ver- ed on the movable mould mounting platen to safetical light curtain elements, shorter horizontal el- guard the parting line against purging of hot melt





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 330 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.



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

ENGEL: leading the way

Now ENGEL has taken another critical step forward These machines operate according to a hydraulic with the new servohydraulic ENGEL ecodrive, which concept that places a very low energy requirement combines the benefits of hydraulics and servo drives. on the central hydraulic system. The hydraulic drive It all adds up to even better control accuracy and units have always set the standard for the sector impressive energy efficiency. in terms of energy efficiency and control quality. After all, it was more than 20 years ago when ENGEL replaced PQ hydraulics - conventional at the time with modern, energy saving EHV hydraulics.







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 lated. However, the required pressure is hydraulically injection units that provide injection speeds of up to maintained where practical, thereby holding clamping 450 mm/s. This is only available in combination with the force and nozzle contact force. This reduces the energy ENGEL ecodrive, however; otherwise no-load power for keeping these forces to zero. As cycle times increlosses in hydraulic pumps operating in parallel would ase, energy savings also rise to significant levels. offset the energy savings of the electric injection unit.

N₂ holding force thanks to 'lock-in' closing pressure

It goes without saying that all speeds and pressures of the individual hydraulic machine movements are regu-



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 innovative 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 When idle, the ENGEL ecodrive saves the flushing or system comprises a servomotor with fixed displace- idling energy consumed by conventional hydraulic sysment pump (instead of a permanently running asyn- tems. An idle pump consumes no energy. This is chronous motor with variable capacity pump). Energy effectively supported by the energy efficient machine efficiency derives from several criteria, but two main concept (e.g. 'lock-in' closing pressure). 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.



- Ideal for clean room applications
- ,On board' hydraulics for operating core-pulls

Standard in ENGEL insert, optional in ENGEL e-insert

ecodrive inside

Drive downtime when idle



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



ENGEL CC300

The ENGEL CC300 is based on a simple operator interface and groundbreaking process integration. With this smart control in fully integrated production systems, the machine as well as peripherals such as the infra-red oven, the dosage machine, or the robot, can be steered through the production process as easily as though you were just using your smartphone. Ergonomic design, individual configurability and modern operator control logic make controlling and monitoring highly integrated, automated systems much simpler, safer and easier.

higher productivity

start without a reference run perfectly synchronised movement progressions

intuitive operation

uniform, clear and logical operation targeted information with no screen changes, customisation possible colour guide system to differentiate between machine and robot control

simple adjustment of sequences

Conduct adjustment tasks independently thanks to menu-guided sequence programming individual assignment of tasks and roles

variable handling

direct, safe and stepless control of all movements with e-move, on the panel or using the ergonomic, lightweight C70 handheld unit

increased safety

perfect, common data management of machine and robot sign-in by chip card for individual assignment of user roles and tasks

ergonomic design

individually adjustable, functional and robust hardware with revamped and simplified user interface individual settings are loaded upon sign-in with chip card

best readability

generous display with excellent contrast in all light conditions and from any angle

smart operation of machine and peripherals



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 automatic 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 more than 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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