

Maximum Dynamics in a Minimal Space

The New Engel e-pic Compact Robot Is an Economical Pick-and-Place Solution

In addition to automation solutions tailored to sophisticated applications, standardized robots for simple pick-and-place tasks are enjoying increased demand. The production of falling parts is becoming ever rarer. Engel's new e-pic robot with innovative kinematics represents an economical solution for that issue.

New approaches to higher product quality, more stable processes and more efficiency, as well as innovative processing technologies – these are the main developments behind the rising level of automation at injection molding companies all around the globe. To simply remove and deposit of small molded

parts, and thus no longer economical, or they have obvious drawbacks in terms of dynamics and repeatability.

To close this gap, Engel Austria celebrated the world premiere of their e-pic at the Fakuma 2014 in Friedrichshafen, Germany. Before going into pre-production in February 2015, the manufacturer al-

ready had a sizeable backlog in its order book. Engel's e-pic is configured to vertically and horizontally remove small parts, separate the sprue, and has a load-bearing capacity of up to 2kg. Its control can deposit the parts, scan, and stack them

on a conveyor belt, or put them in boxes. It can be deployed with a wide number of injection molding machines with clamping forces up to 2200 kN of different designs and brands.

With a view to optimizing costs, the development focused on three topics: kinematics, drive and control technology.



Linear motion in combination with a swivel arm: new kinematics are the key to the high efficiency of Engel's new e-pic robot



Since the e-pic compact robot has a swivel arm instead of a rigid x-axis, very compact manufacturing cells can be realized

A Swivel Arm Makes Compact Manufacturing Cells Possible

Among the most important characteristics of the new robot are its strong dynamics, its compact design and low energy consumption. The key to this lies in its novel kinematics that combines linear motion with a swivel arm.

The swivel arm moves in the direction of the x-axis which entirely disappears, that is to say, it merges with the y-axis. Toward both the injection and the clamping side, Engel's e-pic thus requires decidedly less space than does a linear robot. It can work inside the safety gate of the injection molding machine, thus keeping the overall manufacturing cell compact. Contrary to the x-axis of a linear robot, the swivel arm can circumvent impediments, such as appurtenances on the mold, easily and quickly. This can be selected via a standard option for machines up to 220t of clamping force, and requires neither separate coordination, nor engineering work to process an order.

With its swiveling motion, the robot also adapts automatically to the machine size without requiring separate components to compensate height differences. The z-carrier forms the stand, so that the robot can be transferred from one machine to another and be put into operation immediately. The use of swivel axes offers an additional advantage: they »

parts, the new compact robot developed by Engel Austria GmbH of Schwertberg, Austria, can offer a flexible and powerful solution at an attractive price. Most of the robots available on the market are either too extensively equipped for such appli-

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The robot can operate inside the safety gate of the injection molding machine to save space

are easier to manufacture than linear axes and can be serviced more easily.

Composite Technology for Higher Dynamics

Not only in regard to kinematics is Engel opening a new chapter of robot manufacture. For the first time, composite technologies are being applied that reduce the weight of accelerated masses, thereby enabling notably higher dynamics. At the start of the series, the robot will be equipped at first with an aluminum swivel arm. Following the currently running

endurance tests, production will shift to organosheet-based swivel arms. In the field of automotive light-weight construction, Engel is already among the system suppliers of choice. With this new robot, Engel is expanding its competency in light-weight design.

Especially in the market segment for simple pick-and-place applications, dynamics are one of the most decisive criteria, right after economy. When a process previously configured to falling parts is automated, there must be no overall increase in take-out cycles.

Clearly Reduced Energy Requirement

e-pic's drive technology also contributes to the optimization of accelerated masses. Servomotors are located on a common junction of the x/z-swivel joint and, unlike linear robots, do not have to be moved in the x-direction.

The electronics are completely integrated into the mechanical structure, thus eliminating the need for an external switch cabinet. Including the CPU, the regulators are only as large as conventional I/Os.

Various weight optimizing measures enable not only high dynamics, but also enhance energy efficiency. At a consumption of 120W, Engel's e-pic reduces energy consumption by more than 50% compared with compact robots of comparable size. It runs on 48V low voltage and can be placed in operation from a conventional 230V socket.

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The servomotors are mounted on a common junction point in the x/z swivel joint. That also saves on weight. The motors do not have to be moved as with linear robots



The z-carrier of the e-pic is simultaneously its stand. Thanks to its swivel motion, the robot adapts to the height of the injection molding machine. Additional assembly elements are not required (figures: Engel)

Linear Motion despite Hybrid Kinematics

The fact that this new manufacturing aid makes no strong demands on infrastructure is an important prerequisite for its flexible application. Another one is its simple, intuitive operation via an RC16 control with a Teach Panel and pluggable interfaces developed especially for the robot. No programming experience is required to commission and operate it. Also available with the compact robot are graphic sequence programming and freely assignable in- and outputs.

High performance of the control appears when the rotary movements of its swivel arm are converted into linear motions. Users accustomed to working with linear robots do not need any retraining. Via Euromap 67, the robot can be flexibly connected to injection molding machines from any number of manufacturers. To increase the efficiency of existing

injection molding machines, retooling and retrofitting can be done quickly via this interface.

An additional interface is available for combining with Engel injection molding machines. As with Engel viper linear and Engel easix multi-axis robots, the new compact robot can be integrated into a CC300 machine control and be parametered and operated from it. The robot and injection molding machine then revert to a common data bank, thereby further increasing process stability and efficiency.

The first robots of this new design will be shipped in the early summer of 2015. Thanks to a high level of standardization, Engel's e-pic will be available with very short supply times from that time on. It will be produced in Dietach, Austria, where Engel is already assembling its linear robots. By the way: the company relies on automation in its own operations. Engel uses its viper robots to produce the composite swivel arms. ■