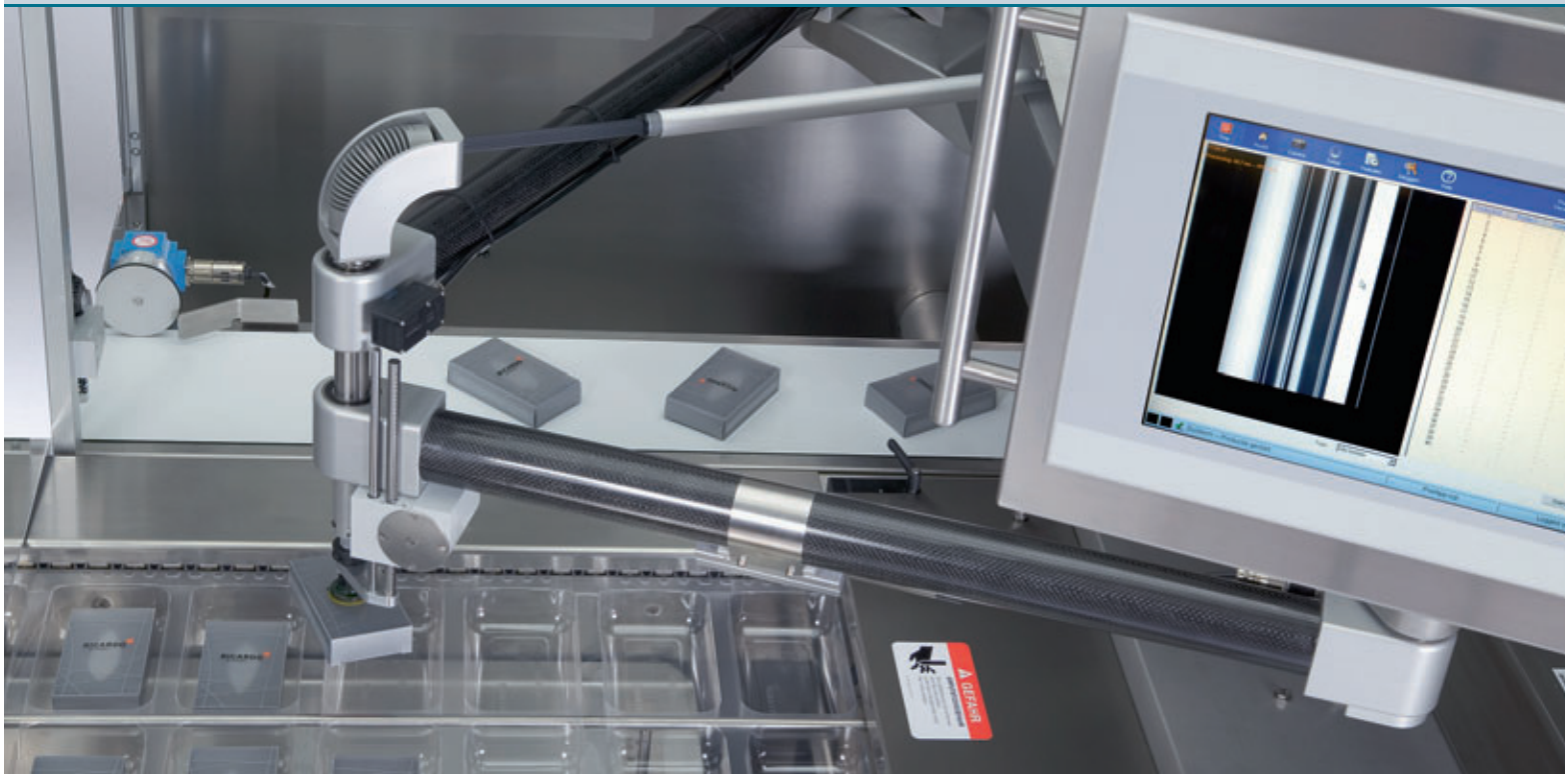


Packaging OEM Pester has developed four types of robots for different forms of applications with packaging machines based on the Elau robot technology, one of which is a modular integratable top loading robot cell.

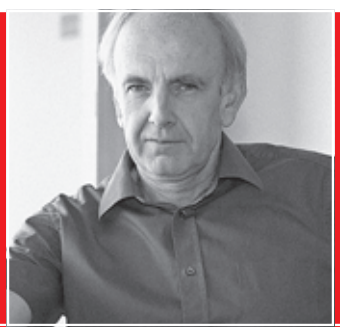
The key to modularity

Standardized hardware and software | By integrating the robot technology into modular and standardized automation structures, open, universally integratable machine modules can be created. The extent of openness has been shown by pester pac automation with the integration of their top loading robot cells in a packaging line with thermoformers.

Machine design requires standards in order to keep engineering costs reasonable. The drive and control technology has made much progress over the last few years in this regard. PLC and motion functionalities are growing closer together, programming standards and PLC open defined basic functionalities simplify software engineering. . Whereas robot manufacturers have continued to move in their own worlds where proprietary control systems were concerned. Such isolated solutions have been limiting the application range of robots in packaging processes to this day: The robot is normally embedded in a machine or peripheral equipment and therefore two control architectures are always required. That causes increased hardware costs and synchronization effort. That in turn raises the costs for hardware and software and technically limits the application of robots at quite an early stage. It is therefore clear: If robots are to have access to a broader range of machine engineering, they must meet the software and hardware standards and enable modular structures.

„Based on the Elau technology, we were able to develop robots that suit our philosophy of a modular machine design."

Hans Haug, Manager of Development at Pester



Hardware and software modularity

Here is where the robot technology of Elau based on the PacDrive control concept is different to previous approaches The company developed a scalable hardware range from controllers and drives as a basis for pre-fabricated software solutions for various machine types. These are made up of so-called equipment modules, which include all logic connections of a machine module in addition to the motion control functionalities. The integration of robots in packaging machines is also based on these modules. Therefore, robots are integral components of an automation concept constructed modularly in hardware and software. Depending on the controller type or performance requirements and based on matching equipment modules, the controllers can con-

The Facts

Scalable hardware

Standardized controller and drive components for packaging machines and robots.

Standardized communication

The robot is integrated in the drive communication.

Standardized programming

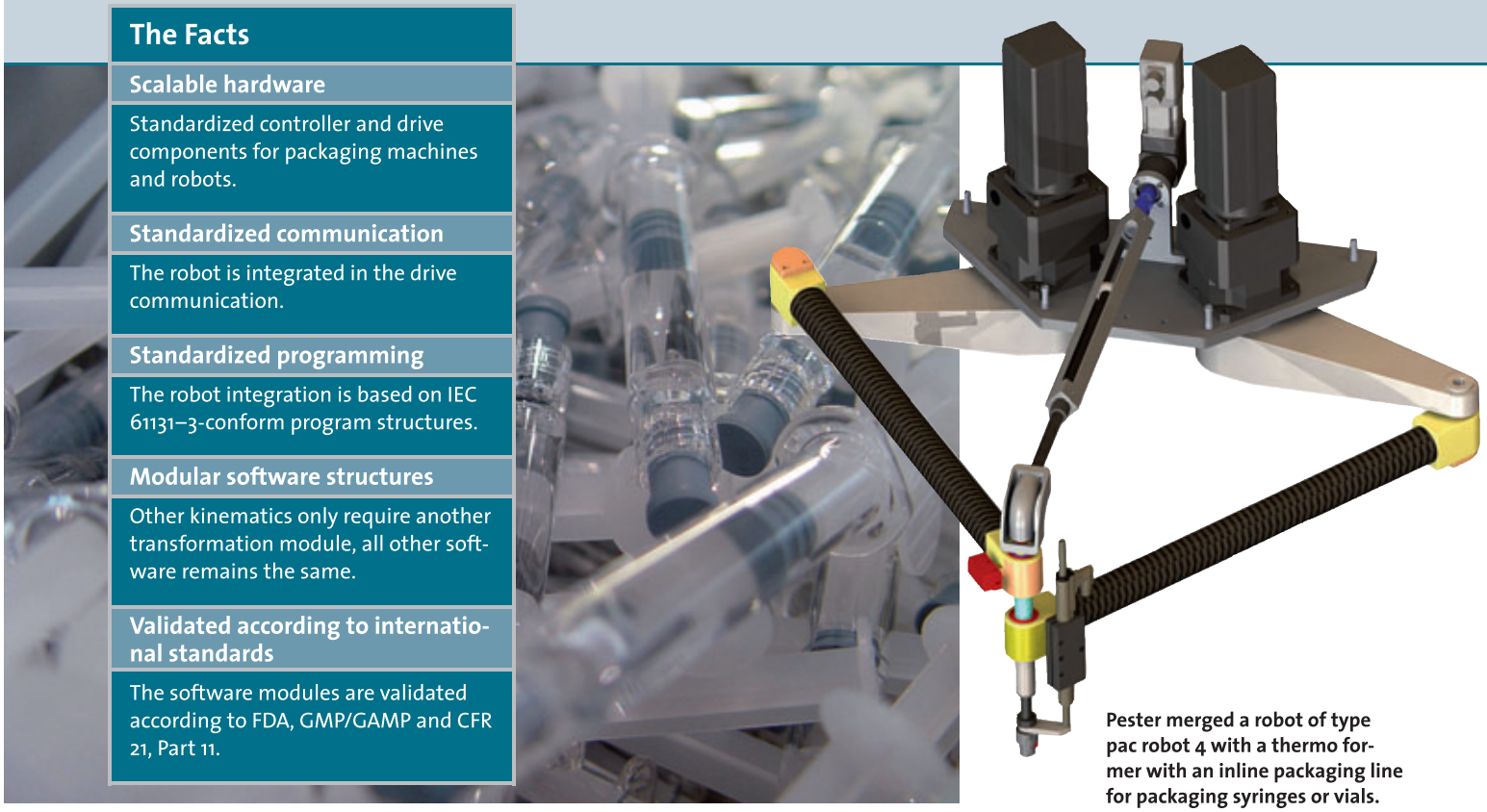
The robot integration is based on IEC 61131–3-conform program structures.

Modular software structures

Other kinematics only require another transformation module, all other software remains the same.

Validated according to international standards

The software modules are validated according to FDA, GMP/GAMP and CFR 21, Part 11.



Pester merged a robot of type pac robot 4 with a thermo former with an inline packaging line for packaging syringes or vials.

trol all functions of a packaging machine, the infeed belts involved as well as other robots .

This results in: No parallel control worlds, no additional interfaces, no extensive synchronization. Packaging machines and robots can be combined in a single operating concept, the communication with the robot behaves according to the drive communication.

IEC 61131–3-based program structure

The robotic equipment module is based on an IEC 61131–3-based program structure (template). The task coordination and the synchronization of several robots respectively is simplified on one hand by the controller architecture and on the other by integrating the programming in a widespread programming standard. The programming for all functionalities according to IEC 61131–3 is done from a single tool and access to all process variables of the machine program is available for engineering and diagnostics. Robot functionalities do not have to be programmed from scratch; a function library offers pre-fabricated solution modules for all standard tasks and motion sequences. The path of the robot only needs to be defined in terms of coordinates in the operation space. The conversion of the Cartesian coordinates into positions of the individual robot axes is carried out by the PacDrive software automatically and in real-time. The robot kinematics can be changed by replacing the kinematics transformation module without any repercussions on the rest of the machine software. The software modules by Elau are validated according to FDA, GMP/GAMP and CFR 21, Part 11. The experiences gained by Elau in implementing robot systems in packaging systems have proved that engineering, commissioning and service efforts are definitely lower compared with standard robots. This is confirmed by OEMs such as pester pac automation. The company has made a technological leap with the Elau systems and is now implementing their own robot systems for various packaging machine concepts based on the robot units pac robot 2, 3 and 4 developed by Pester, whose two to four axes can move loads between 1 and 35 kg in two- and three-dimensional spaces.

Flexibly integrated robot modules

The fact that Pester not only integrates their robots in their own packaging systems but can also run diverse tasks in product handling on machine interfaces demonstrates the extent of conformity that Elau's robot basic technology offers compared with standard automation standards.

Recently, the company presented a new packaging line for packaging syringes in blister packages. The blister packs are produced by a thermo former from a noted manufacturer. In a modular top loading cell, a robot of type 'pac robot 4' then fills the blister packs with syringes in a continuous process. The robot takes the syringes from a hopper and drops them precisely into position in the blister openings. It is guided by an integrated camera which detects the position and orientation of the syringes even in a disorganized formation and passes on the information on position and direction to the integrated Elau controller. The robot can then use suction tools to pick up, turn and position the syringes securely and precisely in the correct configuration in the blister openings. Worth noting: The suction gripper of the robot adapts smoothly to the respective syringe diameter. In the robot module, an acceleration monitor is integrated, which monitors the acceleration on the TCP (Tool Centre Point) and the centrifugal force on the product in the gripper of the robot, online and orientation-dependent. The controller calculates the possible maximum speed and limits each axis to the defined maximum acceleration values. This causes the product gripper to run without any danger of losing the product despite the limited holding force.

The system's modular design principle allows the integration of different devices and machines. Pester development manager Hans Haug views this modularity as the basis for successful variant management in changing markets. Based on standards, the Elau technology provides the necessary basics – right up to robot technology. ■