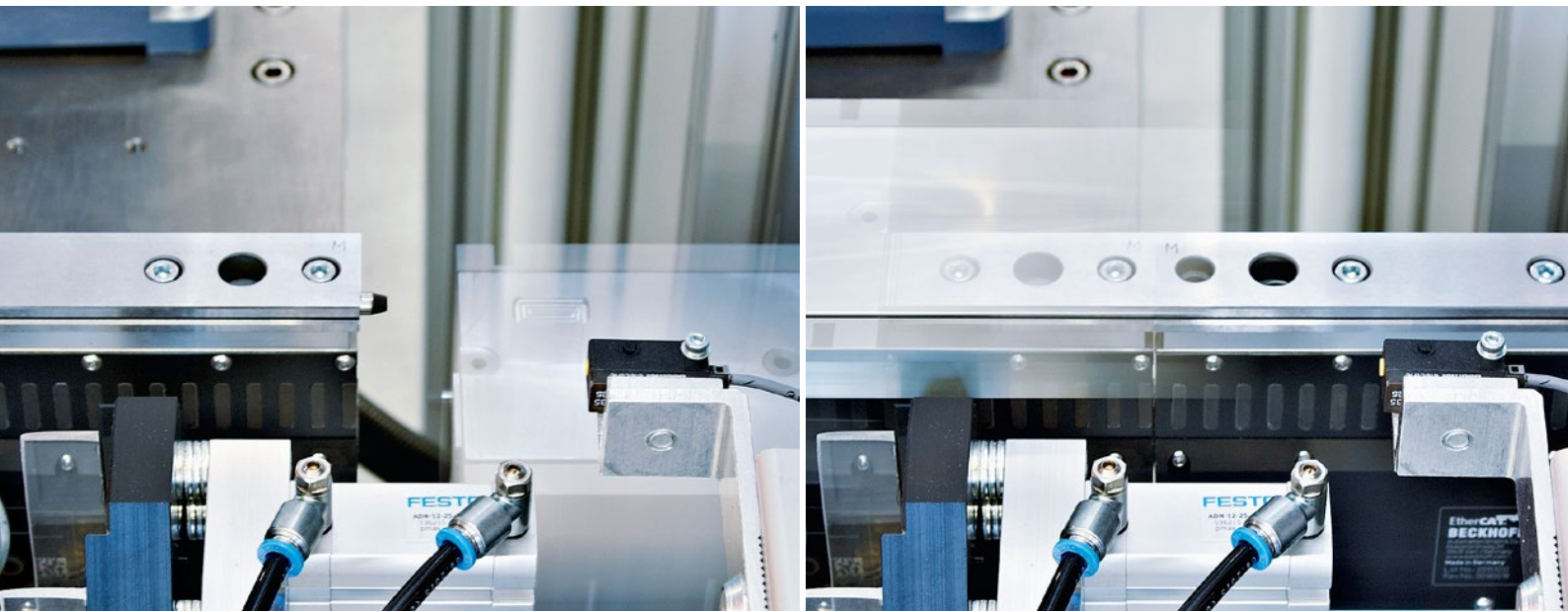


Credimex uses the extremely flexible XTS as a linear transfer system with mover return via a spindle-driven system located underneath.

eXtended Transport System (XTS) with a modular small-part assembly line

XTS connects processing modules to form an Industrie 4.0-ready machine

Industrie 4.0 concepts necessitate highly flexible and thus consistently modularized production machines. A good example of this is the CresaLine small parts assembly line made by the Swiss specialist Credimex, which is extendable by individual process stations in accordance with requirements. The flexibility is made possible by XTS from Beckhoff, which links the various processing modules with extreme variability using software functionality.



The modular automation platform CresaLine made by Credimex AG from Alpnach in Switzerland consists of intelligent process stations and, according to Roger Schelbert, joint owner of Credimex and head of the motion technology department, corresponds to the requirements for production sequences in accordance with Industrie 4.0: "The modularity of the machine gives us the possibility to produce different products efficiently. The big advantage is that one can automate difficult and complex processes that previously had to be carried out manually. The most diverse process stations from the standard range are available for the CresaLine. Handling and pick-and-place processes as well as assembly and test stations can thus be integrated as desired. These stations are linked by XTS from Beckhoff. Workpiece carriers with a length of 250 mm and a maximum width of 70 to 90 mm are mounted on its movers. Products of the same size or several small products can be processed on these workpiece carriers. That makes the system very flexible and interesting for the watchmaking and electronics industries, as well as for motor manufacturing and medical technology. What is particularly advantageous is that batch sizes of one can be produced and retooling for new products is very fast."

In addition to parts handling, the process stations include joining by gluing or welding, laser triangulation for product recognition and image processing for

quality assurance. Further customer-specific stations may be added to these, depending on requirements, and according to Roger Schelbert this clearly demonstrates one of the main advantages of PC-based control technology from Beckhoff: "PC Control with its openness and variety of interfaces as well as XTS with its flexible motion functions offer an ideal platform for integrating any desired components or additional stations. The integration of robotics, for example, is very simple with TwinCAT. In addition, a wide range of components, high-performance EtherCAT communication and, with TwinSAFE, system-integrated safety technology are available."

XTS – flexibility in functionality and layout

The eXtended Transport System of the current CresaLine system, which consists of eight stations, is made up of nine 250-mm long linear motor modules. Nine 250-mm long movers move along this track as workpiece carriers. In the case of the CresaLine Starter, the whole thing is reduced to half the size of the CresaLine, but with the same approach. This shows that XTS provides enormous flexibility in motion control, not just by replacing mechanical components, but also by means of software functionality. In addition, the system configuration is easy to adapt to the user's needs: the application-specific movers use the magnetic plate and the encoder system from XTS on the one hand and the customer's

own guide rail on the other. In addition, Credimex has in this case implemented a linear XTS design instead of a closed one. Roger Schelbert explains: "The special feature here is that the movers in the CresaLine Starter are lowered at the end of the XTS section and returned to the start via a 3-axis linear system. In the large CresaLine the movers are shifted onto the opposite XTS transfer line by means of a cross-transfer system. The return section is thus also used for assembly stations. This way we can design a very compact system and thus meet the market demands for smaller assembly lines."

According to Roger Schelbert it is easy to extend the compact system design: "Thanks to the modularity in hardware and software, other machine layouts can also be realized with XTS with no great effort, simply through configuration. For example, the mover return section under the processing table can be replaced by a cross-transfer or closed XTS system in order to integrate additional populating or processing stations."

Software functionality replaces hardware expenditure

Motion functions that would often necessitate enormous hardware expenditure can be realized with XTS in a simple manner by software means. Roger Schelbert mentions a few examples of this: "The production flow can be adapted to the addition of process stations by software configuration with no hardware changes at all. In addition, the motion and the positioning can be controlled so precisely that hardware components that used to be necessary can be omitted. For instance, with XTS it is no longer necessary to lift the workpiece off a conventional conveyor belt in order to achieve the indispensable positioning accuracy for the processing. As a result, much simpler processing stations with fewer motion axes can be realized."

In particular with the assembly of small parts, many factors play an important role in attaining the desired precision. Even slight vibrations can cause problems here, which Roger Schelbert considers a further advantage of XTS: "The transfer system works completely independently and without a mechanical connection to the individual process stations. This means that no vibrations, for example due to the return movement of a handling robot, can be transmitted to the XTS and thus to other stations. This has a significantly positive effect on the achievable processing accuracy."

The flexibility of the movers also has a positive effect, as Roger Schelbert explains: "For one thing the movers can be designed specifically for the application – shorter or longer, larger or smaller – depending on how much space is available for their movement or how many individual products have to be transported per mover. So far we have been concentrating on the micro-assembly area, which extends from 500 microchips up to three or four large components per workpiece carrier. However, flexibility also means that individual movers can be removed from the transfer system and put back in again as required. One example of this is a special mover with a battery powered camera system which, if necessary, drives through the process, checks the accuracy of the individual process stations and saves the offset corrections again for the highest precision. This is important amongst other things in the case of large temperature differences, for example in the morning or in the middle of the working day."

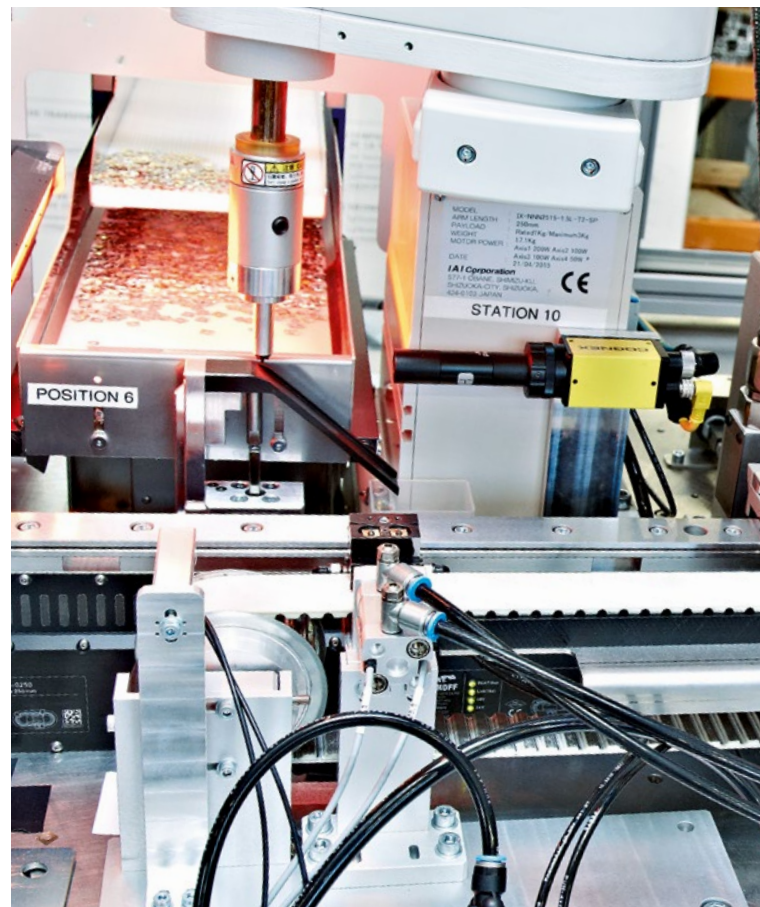
Variability as a prerequisite for Industrie 4.0

Even today the CresaLine already meets the requirements for the realization of modern Industrie 4.0 concepts. For instance, the production efficiency is



The decoupling of transfer system and process stations is particularly important in the assembly of small parts.

XTS is used as a linear transfer system with a mover return section under the processing table.





XTS links five process stations in this CresaLine version



At a glance:

Solutions for assembly technology

Transfer system of a small-parts assembly plant

Customer benefit

XTS provides for high flexibility in modular machine manufacturing

Applied PC Control

- XTS: nine linear motor modules and four movers (CresaLine Starter) or 18 linear motor modules and nine movers (CresaLine)
- C6920 control cabinet PC with CP7903 Control Panel: master IPC for XTS, visualization and superordinate machine functions
- five (CresaLine Starter) or eight (CresaLine) CX5020 Embedded PCs: control of the individual process modules
- TwinCAT 3: universal control and engineering environment
- EtherCAT and TwinSAFE terminals



Roger Schelbert, joint owner of Credimex and head of the motion technology department: "XTS enables us to design particularly compact machines and thus supports the optimum exploitation of the existing production area."

traceable at any time and for each process, since the individual operations are saved in a database with a timestamp. The main requirement, however, is the consistent modular machine approach based on individual intelligent process stations that are linked with high flexibility via XTS. Roger Schelbert comments: "Entirely in keeping with lot size 1 manufacturing, an order-related decision is made for each project as to which process steps are necessary for the manufacturing. On the one hand this is made possible by the linking of the C6920 central control computer and the CX5020 Embedded PCs of the individual process modules to the customer's ERP system. On the other hand a big part is played by the individual controller of every single mover in conjunction with a uniquely assigned product, because in this manner the product to be processed becomes virtually intelligent and can guide itself through the assembly process. A further aspect has to do with the camera mover for the calibration of the entire process chain, which I mentioned before. Its information can be used directly for early corrections of the process sequences before unacceptable quality defects or too many bad parts occur."

Further information:

www.credimex.ch

www.beckhoff.ch

www.beckhoff.com/XTS