

From smart components to Industry 4.0

For a few years now we've been coming across the term Industry 4.0 more frequently and in various situations, including informative articles in technical publications, stands at international trade fairs, coloured banners on web pages, and advertising boards dotted around our towns and cities. There doesn't seem to be an event or technical round table or social gathering where this buzzword isn't mentioned.

Some time on from its launch, what started in Germany as a general set of technical-organisational guidelines is taking shape in a multitude of tangible products and applications in various formats. Manufacturers of capital assets and IT application developers are working to make products that increasingly consider Industry 4.0 principles, both in terms of smarter physical components, and in organisational and structural terms, with the development of IT hardware and software architecture to meet new requirements.

The context outlined by the guidelines, i.e. production automation by combining various technological disciplines such as IT and mechatronics, is so extensive and ambitious that there are no limits to the development of new applications.

As an Italian company that has been producing pneumatic and electric components for industrial

automation for almost 50 years, Metal Work has long since started research and development into products and processes in line with this new trend. Different projects have been launched to make new, innovative products and implement them using automated manufacturing based on [Industry 4.0](#) principles.

The first such product developed is the [EB80 electro-pneumatic valve](#). This is a complete, innovative system built around a standard product i.e. the latest pneumatic valves that can be controlled with multipolar systems or by field bus. In addition to having various analogue and digital inputs/outputs, the EB80 system enables advanced functionality to send diagnostic data of particular interest to the control system, including number of cycles completed, the status of individual valves, and any local faults.

These latter features are of particular interest for integration with an Industry 4.0 design, which has integrated diagnostics as a key principle.

At the moment the diagnostics feature has already been developed in the electronic boards in the valve bases, and the implementation of specific interface drives is underway thanks to the cutting-edge series processors fitted.

With the implementation of this appealing characteristic, not only can the EB80 valve set send



Figure 1: EB80 valve islands with field bus and I/O modules.

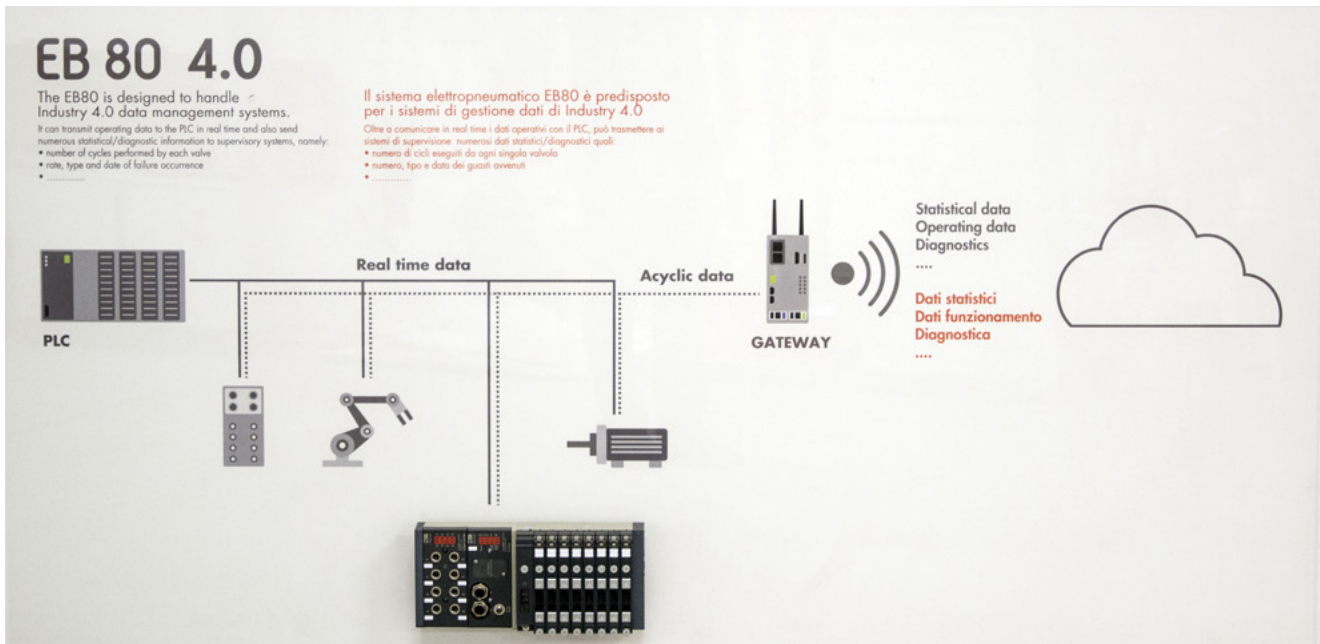


Figure 2: Layout for using EB80 according to Industry 4.0 criteria.

the usual electro-pneumatic system data required for normal operation to the process controller (PLC or similar) in real time, it can also gather statistical data on its operation and send it to the control module in an acyclic manner. This data can then be processed and stored in suitable company storage systems or remotely in a cloud server.

A second product that Metal Work is developing in partnership with a leading sensor company, is a smart linear position transducer that can process data gathered and send it to a processing system using Industry 4.0 protocols.

This product is made from a magnetic linear transducer which, when fitted to a pneumatic cylinder, normally supplies a voltage signal proportional to the position of the cylinder piston rod. Development for Industry 4.0 involves incorporating a microprocessor within the transducer, which processes the signal measured and provides complex data such as translational speed, number of cycles and the distance travelled by the cylinder on which it is fitted.

As a result, the control system, which receives the data gathered, can predict if and when to carry out preventative maintenance, such as replacing seals on the pneumatic cylinder.

With regard to assembly automation, Metal Work is also working with a major producer of collaborative robots, i.e. the latest industrial robots designed to interact with people in complete safety. This type of robot integrates perfectly with the [V-Lock](#) handling robots developed by Metal Work, which are extremely easy to assemble, dismantle and reconfigure.

This is a complete handling system, with components equipped with a standardised dovetail interface to facilitate assembly and reconfigure kinematic chains quickly and conveniently. Every component is connected to the previous/subsequent component with V-brackets that lock on to the dovetail arrangement on the component itself. The brackets are secured with two easily accessible side screws using a standard Allen key.

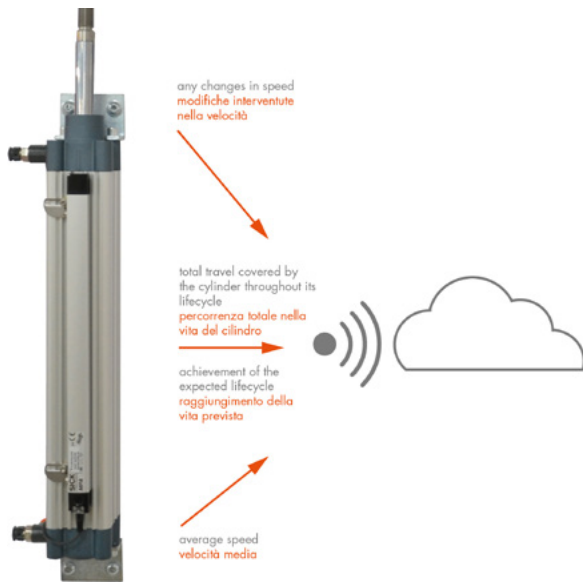


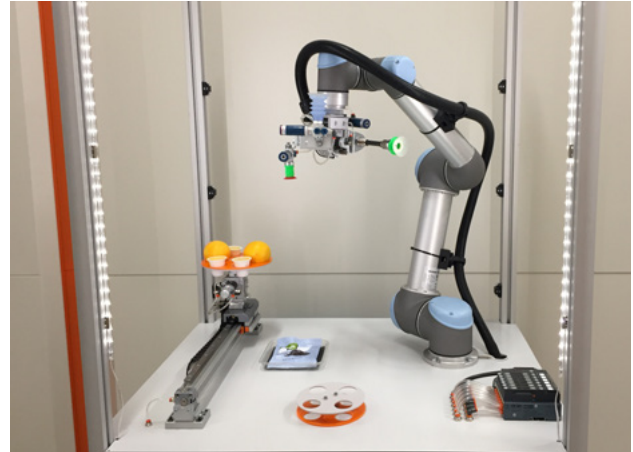
Figure 3: Industry 4.0 position transducer.

It is therefore intuitive how a system of components as easy to manually fit and reconfigure as V-Lock fully capitalises on the potential of a collaborative robot that can interact with people, enabling operators to quickly and easily change different ensembles of clamps, rotating and linear actuators. Furthermore, using universal adaptors called V-Lock Transformers, components from other manufacturers such as suction grip systems can be incorporated into this family.

However, Metal Work is not just developing smart components for incorporating into Industry 4.0 applications. The company is also creating the conditions to verify their actual usability, and is working with a group of Italian manufacturers on creating a mini production site for testing various technological solutions aimed at implementing the ideas that underpin the Industry 4.0 concept.

Metal Work is contributing with its latest components (smart solenoid valve sets, smart sensors, flexible, easily reconfigurable handling systems), whereas the other company teams are bringing their production, business and IT solutions to the table.

As a result, a complex simulator will be created at one production facility, for implementing and testing



Figures 4 and 5: The V-Lock system used with a collaborative robot.

different technologies, mechatronics and IT solutions applied to cutting-edge products that will interact together, gathering production data and processing it appropriately in line with specially developed algorithms, then collecting it in futuristic data storage structures.

All in perfect Industry 4.0 style!

Metal Work S.p.A.

via Segni, 5/7/9 - UL Magazzino: Via Borsellino, 25/27/29 - 25062 Concesio (Brescia) - Italy
Tel +39 030 218711 - metalwork@metalwork.it - www.metalwork.it