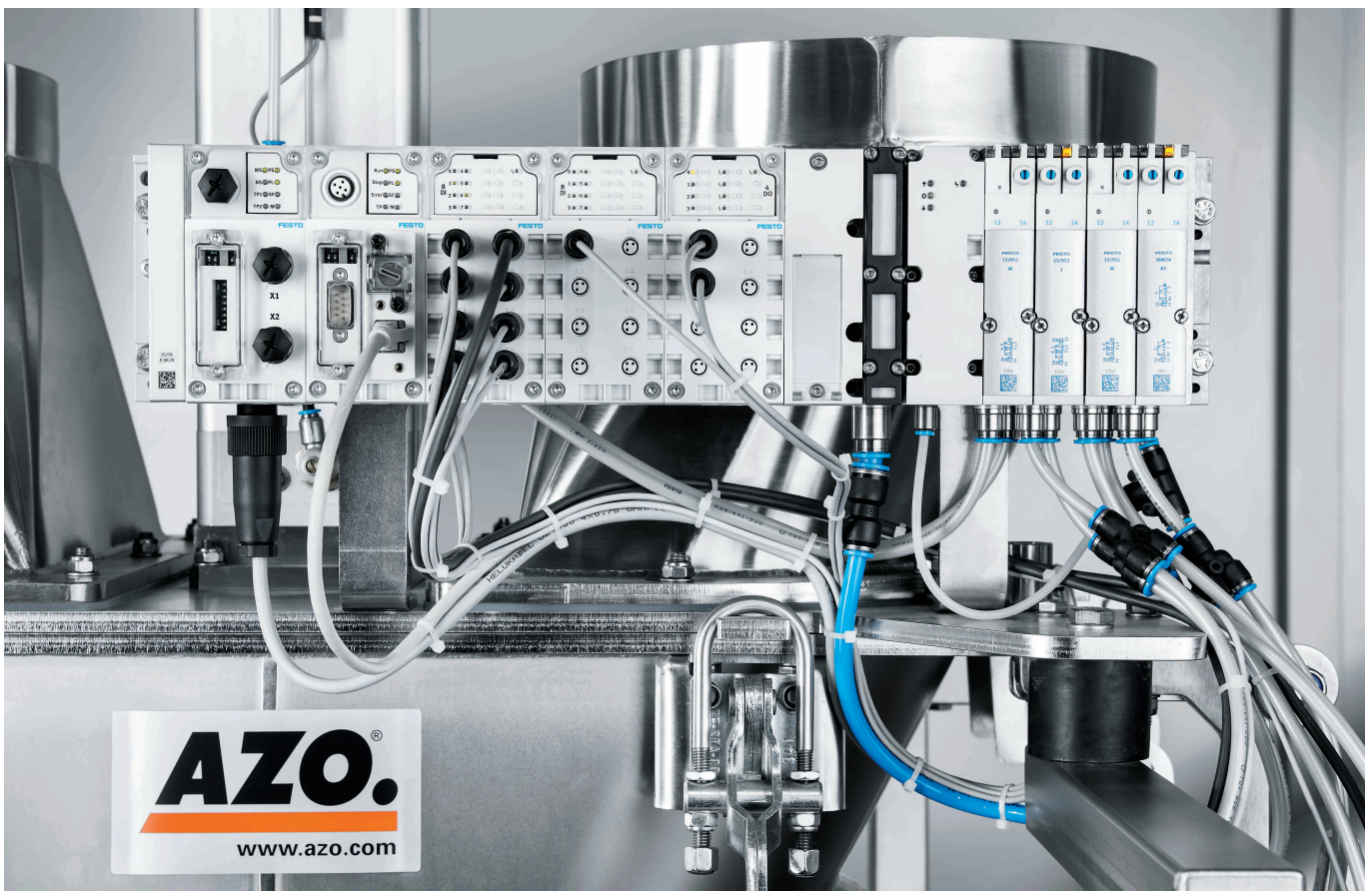


The dock “thinks” for itself.

The world of bulk material handling seems easy at first glance: moving, filling, delivering. The art of dealing with a variety of different materials, however, lies in the details, such as the docking and undocking of containers at weighing stations. In the process, cross-contaminations and the release of dusts can occur. AZO CleanDock prevents this problem. Its latest generation can do even more: it “thinks” for itself. Directly attached to the dock, the integrated controller CEC of the modular electrical terminal CPX from Festo ensures additional process security and shortened commissioning times.



The modular, electrical terminal CPX with integrated, decentral control CEC and valve terminal MPA is the "brain" of the CleanDock.



Linear actuators from Festo securely clamp the passive and active sections.

The container glides into places virtually soundlessly, approaching its destination with even motion: the CleanDock. Stainless steel elegance. Clean, sovereign and safe. Then it comes to a stop. The pneumatic gripping system of the active section extends from above, grips the container closure of the passive section and lifts it. Two to three air blasts indicate that the dosing element and target container are seamlessly joined. The flexible compensator of the passive section makes it possible to tare the scale positioned under the container precisely – independently of which product quantity it already holds. Then the filling of the bulk material begins. Once this process has come to an end, the active and passive sections detach from each other elegantly and cleanly and the container moves to the next filling station. What no one sees from the outside: almost the entire filling process has been controlled by CleanDock itself in a decentralised manner.

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“The decentralised control of CleanDock accelerates the commissioning of a system and lowers the risk of errors. The process control system only sends docking and undocking commands. All detailed processes are performed by CleanDock itself. Programmers no longer have to deal with these detailed processes when performing commissioning tasks on site.”



Frank Pahl, Director Development, AZO

A pioneering step

“Our systems transport and dose all conceivable types of bulk materials,” says Frank Pahl, Head of Development of AZO GmbH + Co. KG in Osterburken, “This ranges from powdered milk and baby food ingredients, pharmaceuticals and detergents, to various plastics and pigments, for example, for the manufacturing of wet paints and varnishes. We could report on the variety of implemented applications from our four areas of business Food, Vital, Chem and Poly for days.” With more than 1,000 employees worldwide, AZO has been making its technological mark in the field of bulk material handling for 70 years. One of the currently pioneering innovations is the latest generation of CleanDock. With this system, AZO is taking an important step towards fast commissioning, error reduction and increased safety in the filling of bulk materials together with its long-term partner and automation expert Festo. In this context, CleanDock itself has been conferred intelligence, decentralised control and autonomy in processes. Whilst

the process control system takes care of the big picture in terms of control engineering, the modular electrical terminal CPX from Festo assumes the detailed processes of the docking and undocking procedures with its integrated controller CEC and valve terminal MPA.

Safety has highest priority

“Bulk material handling is an art in itself that requires a lot of experience,” says Frank Pahl. “A handful of flour contains more particles than gravel on an entire lorry. In the handling of plastics, the infamous angel hair can arise; higher grinding degrees and finer powders with smaller particles in cosmetics and pharmaceuticals present us with new challenges daily. Bulk materials and bulk material technology are in motion. Our systems must handle these tasks without a problem – and they do. We are proud of that.” Two of the greatest challenges of the bulk materials industry remain the prevention of cross-contamination and the unwanted release of dust.

On the one hand, the objective is product purity and, on the other, employee protection. Pharmaceutical and food industries, in particular, but also the chemical industry in the past few years have increasingly put their focus on these topics. During the handling of bulk materials, dusts from allergenic foods, for example, can lead to health impairments in operating personnel. In addition, explosion prevention and protection play a large role. The high number of different containers for the transport and handling of raw materials, as well as intermediate and finished products, make things no easier for the designers of bulk material systems. Amongst other things, this includes FIBCs, drums, sacks and portable containers. As in other areas of industry, the factor of flexibility gains importance in bulk material handling.

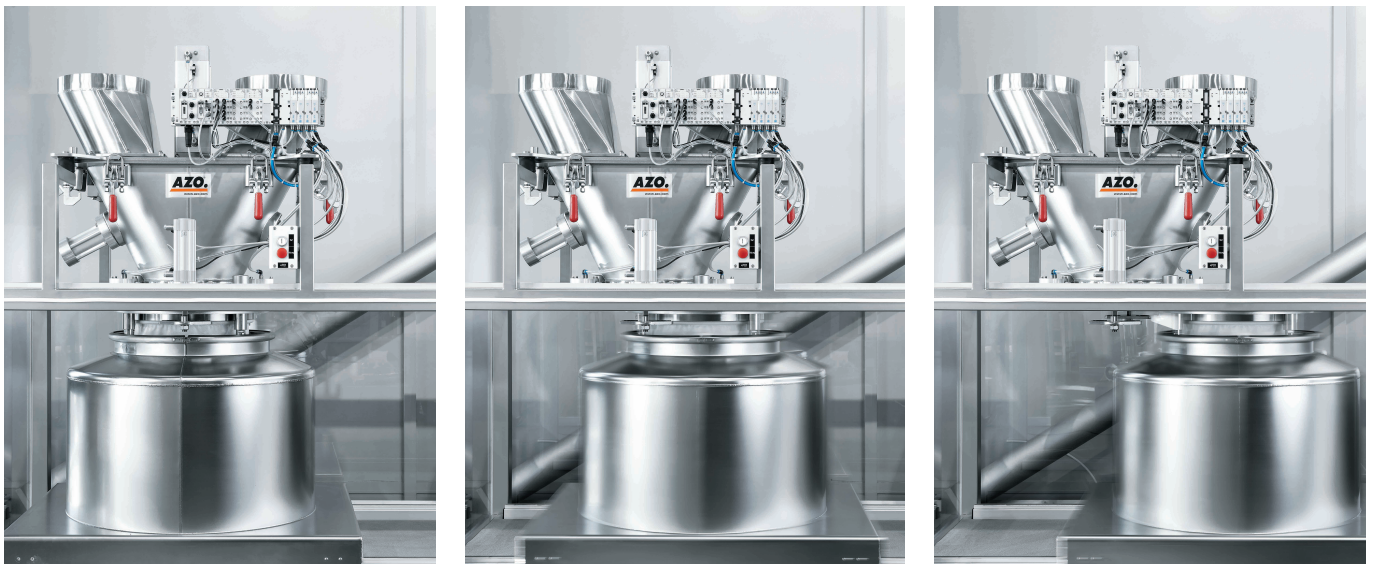
No dust in the ambient air

“In order for the product to remain where it belongs, i.e., in target containers and dosing elements, these containers and dosing elements must be closed before docking. Sounds easy – but it isn't. As is often the case, the devil lies in the details. “Before docking and after uncoupling, no adhering products must fall out of the downpipe of the dosing element and contaminate the floor or release dust to the ambient air.” AZO achieves this objective using CleanDock. Before and after filling, the dosing elements and containers remain hermetically sealed. “Whilst some of the double cone systems available on the

market do not consistently maintain freedom from abduction, this is always guaranteed in the case of CleanDock due to the components involved in the sealing procedure being in contact with the line” Pahl says. With the technology used in CleanDock, AZO consciously places itself between classic docking systems and the containment systems known in the pharmaceutical industry, such as split valves.

Time and effort reduced in a decentralised controlled manner

The passive section is docked to the active section using the pneumatic linear actuators from Festo, just like the opening and closing of the cone closure in the active section to fill the target container, as well as the interlocking and clamping of the active and passive sections. A pneumatic rapper is used to loosen possible bulk material residue stuck in the dosing element. The pneumatic drives are controlled by the modular, electrical terminal CPX with integrated controller CEC and valve terminal MPA. Whilst the valve terminal CPV centrally controlled by the process control system is used in the predecessor version of CleanDock, the decentralised controller of CPX-CEC implements the control sequences directly on the dock. This especially reduces commissioning time. “Bulk material systems store 80 raw materials and more in silos,” Frank Pahl says. “The highest number of CleanDocks that we have installed in one system until now is about 60 units.” With such a large number of filling stations, the programming and commissioning effort has been



The CleanDock system in action. Docking and undocking is controlled in a decentral and self-sufficient manner by CPX-CEC from Festo.



Successful partnership: Frank Pahl, Head of Development (AZO; right) and Thomas Stumpf, Sales Engineer Process Industries (Festo) are happy about this pioneering step.

relatively high until now. The error probability also rose with the increasing number of units controlled by the process control system. “The decentralised control of CleanDock accelerates the commissioning of a system and lowers the risk of errors,” says Pahl. “The process control system only sends docking and undocking commands. All detailed processes are performed by CleanDock itself. Programmers no longer have to deal with these detailed processes when performing commissioning tasks on site.”

Modular, flexible, future-looking

The modular, electrical terminal CPX from Festo with integrated controller CEC and valve terminal MPA forms a uniform interface for decentralised intelligence and enables the complete control of machines or complex subsystems. As an automation platform for electrical systems and pneumatics, it integrates pneumatic and electrical control chains into various automation systems and company-specific standards easily, quickly and flexibly. The complete system is programmed simply using CODESYS. Interfaces are reduced, engineering and handling are simplified and the reliability of machines and systems are increased.

Added to this is an essential aspect that is gaining significance worldwide for the future of systems: modularity. Automation functions are increasingly distributed across individual modules. The process management level merely sets the pace. The key to higher flexibility and simplified handling lies in the integrated, decentral intelligence. Whilst the process control system calls a function, it does not need to

recognize the process steps stored for this purpose in detail. Intelligent modules, such as the CPX-CEC with valve terminal MPA, assume this task.

Together towards a modular future

What AZO has already successfully implemented here together with Festo corresponds with the objective currently being intensively discussed and worked out amongst NAMUR/ZVEI (Association of German Electrical and Electronic Manufacturers), plant builders and operators and research facilities for the automation of modular production plants. Due to the decentralised, complete automation of the individual modules, complexity is reduced and the time-to-market is shortened for system operators. Single modules can also be produced in stock and adapted with manageable effort. Plants can be expanded simply with additional modules. In this way, plant builders can react even more flexibly to the changing requirements of worldwide markets. As an automation expert, Festo is actively involved in the design of concepts and standards that drive and simplify the automation of modular plants today and in future.

**About Festo:**

Festo AG is a global player and an independent family-owned company with headquarters in Esslingen am Neckar, Germany. The company supplies pneumatic and electrical automation technology to 300,000 customers of factory and process automation in over 35 industries. The products and services are available in 176 countries.

With about 21,200 employees in over 250 branch offices in 61 countries worldwide, Festo achieved a turnover of around €3.2 billion in 2018. Each year around 8 % of this turnover is invested in research and development. In this learning company, 1.5 % of turnover is invested in basic and further training. Yet training services are not only provided for Festo's own staff – Festo Didactic SE also supplies basic and further training programmes in the field of automation technology for customers, students and trainees.