Valve terminals for the digital enterprise

Valve terminals
Valve terminals are the pneumatic equivalent of distributed I/O in automation engineering. The idea of grouping several pneumatic valves on one plate with a shared air supply to avoid the use of numerous individual hoses and fittings was the brainchild of Festo in Esslingen in the 1980s. Since then, the valve terminals have developed into full-fledged IP65 automation platforms and are now indispensable in automation engineering. Handling systems with electrical and pneumatic axes, Motion Control, clamping technology, and grippers are only a few sample applications. A large percentage of all of the valve terminals that are used around the world bear the Festo logo.

Research and development are given high priority in the family-owned enterprise. In studies with scientists from various disciplines and using trade fair models, Festo demonstrates the innovative potential of pneumatic solutions: The elegant wing beat of a seagull, the intermingling of a swarm of butterflies, or the agility with which a chameleon seizes its prey – all are fascinating evidence of the precision and coordination that can be achieved using pneumatic technology from Festo. Nature also teaches us how to apply forces as efficiently as possible in ways that will benefit production in the future. The findings gained from so-called bionics is incorporated into the product development and ensures competitive advantages. Comparable with the nervous system of a living being, communication plays an essential role in bionics.
In industrial applications, the current requirements of pneumatic drives involve, in addition to precision and dynamics, providing process data for diagnostics and the optimization of processes and resources. For optimal communication performance, Festo equips its valve terminals with Profinet interfaces. Electrical, pneumatic and automation technology are becoming increasing merged and are integrated into the company-wide integrated Ethernet-based communication of digital enterprises in which parallel communication of process data and diagnostic data is becoming more and more important. At the same time, Profinet fulfills the specific requirements of automation engineering.

Profinet, a network for different requirements
Above all, industrial communication should provide flexibility and robustness. Thanks to the supported profiles PROFIsafe, PROFInergy and PROFIdrive, Festo was able to create added value, because functional safety, for example, is an important topic for drives. Machine-builders must comply with strict legal specifications and earn certificates. Festo provides proportional technology for air-controlled positioning with up to 8 bar. They achieve a dynamic that is difficult to obtain electro-mechanically – but set very high safety requirements.

Olaf Westrik, in charge of the development of Netware Devices at Festo: “The capability of being able to send safety-relevant signals via the same bus system without additional expenses is an important customer benefit, which we can provide with Profisafe, the safety profile of Profinet.”

Pneumatic drives are often operated together with more complex Motion Control systems in a machine or plant. Profinet proves its worth in this case too. The increased requirements of the Motion Control systems are satisfied by Profidrive, the drive protocol of Profinet. The integration in communication is retained. Uniform diagnostics ensure the greatest possible transparency and facilitate the on-site maintenance and remote maintenance.

Since compressed air is one of the most expensive forms of energy when not laid out correctly, Festo is making it a high priority to integrate measures for increasing the energy efficiency over the entire production lifecycle of its products. A modular range of valve terminals with different volumetric flow rates allows the optimal dimensioning of the solution. The pressure flow in the individual branches can be recorded via additional flow meters to determine whether the applied pressure is really needed or even whether losses occur and maintenance is needed.

Olaf Westrik: “This is where Profinet comes into play: The compressed air supply is often laid out in such a way that the maximum value is permanently maintained in the entire network, although this pressure is not needed everywhere and is only needed during shift work. With Profienergy, it is possible to activate compressors depending on actual need. There is often a potential for savings here and we support our customers in making use of it.”

Bundled competency
The practical procedure is described using a Simatic controller as an example for users who integrate a Festo valve terminal into their automation solution. Only a very small number of users might be aware that Festo also cooperates with Siemens to implement Profinet communication and that Festo uses the Siemens ERTEC 200 ASIC on its modules. The ASICs of the ERTEC family are Ethernet controllers on the basis of ARM 9 processors with an integrated IRT switch.

Olaf Westrik: “With the ERTEC controllers and the associated firmware from Siemens, we are using a certified solution that has proven itself thousands of times in SIMATIC with innovation cycles that ensure future security for our customers. As a chip solution, ERTEC has sufficient power for application and communication, and it can be easily implemented thanks to its pre-configured development environment. We only needed a development time of one year to reach series production. We follow the recommendations from Siemens very closely. Thus, our customers get a solution in which our application know-how is combined with that of Siemens.”

Support during commissioning
One important argument for Profinet is, from Festo’s point of view, the availability of tools which facilitate the mechanical and plant engineers efforts to integrate the devices into industrial networks.

In increasingly complex solutions with many network nodes, it is important to know the respective network load to be able to adapt the configuration or topology if necessary.
To simplify commissioning, the Profinet network topology can be automatically read in with Proneta. Thus, a quick and convenient check and documentation of the wiring of a plant is already possible during assembly. IP addresses and Profinet names can be set without an additional engineering environment, modules can be identified and faults can be simulated.

Furthermore, Sinetplan has recently become available, a tool from Siemens which calculates and simulates the network utilization in a Profinet network and shows critical points where the network load is too high. To do this, it simulates the network load of the entire network which is caused by the Profinet communication and the increasingly important TCP/IP communication.

Thus, network resources can be utilized to the maximum extent or reserves can be planned, thus avoiding problems from occurring during commissioning or even later during operation and endangering the availability and operational safety.

**Innovations expand the area of application**

Currently, Festo uses the ERTEC 200 for the valve terminals. The ERTEC 200P is being tested in pilot projects to be prepared for future requirements. Extremely short cycles of 31.25 µs can be achieved with the ERTEC 200P. Due to the smaller enclosure, the communication boards can be even more compact in design. With further innovations of the ERTEC 200P, an important requirement of the process engineering can be fulfilled, which is of particular interest to pneumatics due to its explosion-safety.

Olaf Westrik: “For us, it is important enter the market with mature, tried and tested solutions to provide our customers with the highest degree of future orientation. This applies to both the production industry and the process industry. For communication, we rely on ERTEC Asics from Siemens. In many plants, our components work together with such components from Siemens – the customers benefit from the greatest possible integration.”

They, just as the simultaneous communication of TCP/IP and deterministic data are the prerequisite for Industry 4.0 or the digital enterprise – the future scenario, which has the highest priority for both companies.