

Position feedback of butterfly- and ball valves Special solutions “off the shelf”

Automation is becoming more established in every industrial field. Asset management systems, for example, are becoming increasingly prevalent in more and more systems. The reliability of these quiet often extremely highly-advanced systems in technological terms, commences at the base of the automation pyramid with the obvious “simple” signal processing tasks, such as binary position feedbacks. For example, the “open” / “closed” signals from butterfly- and ball valves are extremely common.



If butterfly- or ball valves are operated by automated drives, a standardised drive conform to VDI/VDE 3845 (NAMUR) is generally used. Position feedbacks in a separate modular housing (black box) are usually the most common solutions at the present. It is generally a plastic housing which normally features a very complex mechanical construction. In addition to a large diversity of individual components which logically have an effect on the price, a cost-intensive adjustment of the switching points must usually be made.

The introduction of the ATEX guideline in 2003 has made the issue even more complex, as the different components such as the housing, sensors or microswitches including their associated wiring, must be checked separately for their compliance to the standard or a separate approval must be requested, not to mention the effort and expense involved if the reliability in terms of the SIL directive IEC 61508 has also to be determined.

It is therefore appreciable that open solutions utilising dual sensors are more frequently the preferred choice. A compact housing, optimised connection and simple mounting features have proven themselves in practice in diverse systems.

TURCK has had dual sensors from different device series to suit the demands of different markets in its product range for many years. The most well-known being the DSC26 housing style for the food industry and the DSU35 series which is used by almost all leading chemical, petrochemical and pharmaceutical companies.

The **DSC26** is distinguished by:

- extremely compact housing (the external dimensions are just 28 x 42 x 26 mm)
- perfectly sealed housing with high protection degree (the housing is moulded directly void-free around the PCB)
- smooth housing
- excellent resistance to cleaning agents and detergents
- availability of NAMUR or PNP output
- versions with one switch point (just “open” or “closed”)
- housing including plastic connectors
- resistance to fast temperature changes, such as those associated with cleaning processes

The **DSU35** is a little larger in comparison to the housing style above, but is still only half the size of the conventional “black box”. The most important features at a glance:

- compact housing (59 x 60 x 35.4 mm)
- robust and crush-resistant
- most varied electrical versions available, NAMUR, PNP, 2-wire AC/DC, 2-wire DC as well as fieldbus versions for direct connection to AS-Interface V2.1 or even DeviceNet networks
- all common conventional connection variants such as cable, terminal chambers and connectors in M12 or 7/8“
- integrated valve connection feature
- housing and actuation elements in compliance with the EC machinery directive
- extremely high chemical resistance
- suitable for outdoor use without additional covering

For all standard position feedbacks there are different solutions from several manufacturers, but what is when a special solution is required....

The most frequently used are still the position feedbacks with “air to open” drives. About 90% of all drives are of this type. i.e. the drive turns anticlockwise from the “closed” to the “open” position. About 10% off all drives rotate in the clockwise direction as an “air to close” type. Generally both drives are used in systems with respect to the required safety position. This means that either differing actuating elements (pucks) are to be used or the actuating elements must be assembled manually to suit. Both have the corresponding disadvantages and frequently lead to unnecessarily long standstill times.

This can be simply avoided using the standard TURCK puck BTS-DSU35-EB1. A well thought-out solution with 2 actuation pins in the puck, provides a problem-free application for clockwise and anticlockwise turning drives, without having to modify the puck. [Figures 1 & 2] The puck also solves another problem. If for example, the drives have to be fitted “transversely” due to space restrictions, the usual optical position displays are no longer correct. This leads to confusion and makes trouble-shooting more difficult. Here too the standard puck BTS-DSU35-EB1 offers a solution where the position displays are clearly visible from all sides, and where they can be rotated by 90° without the need for tools.



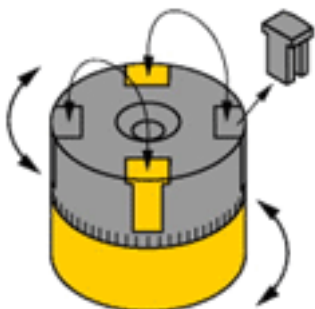
[Figure1 “Closed” position]



[Figure2 “Open” position]

Another “special case” occurs if actuation elements with an undampened end position are required in the system . Generally the reason for this is that normally closed detection is required. Instead of using special version sensors with a normally closed function, it is usually more useful to invert the entire end position detection. Another application reason for “undampened end position” actuation elements is the change of the LED function with NAMUR sensors. The LEDs light up here for functional reasons when the sensor is not actuated. This leads to the “closed LED” lighting up if the ball- or butterfly valve is open. By using the “undampened end position” actuation element BTS-DSU35-EU2 this problem can also be solved with a TURCK standard product. Naturally, this puck also offers the functionality described above for clockwise and anticlockwise rotating drives, as well as the adjustment possibilities for the optical position displays.

Even if the “Open” and “Closed” switch points change for application reasons during the life of the system as is often the case with valves with rubber sealing, TURCK offers a suitable solution with the actuation element BTS-DSU35-EBE1-2. [Figure 3] On this puck the “Open” and “Closed” switching point can be easily set. The LED’s of the dual sensors are reliable adjustment aids.



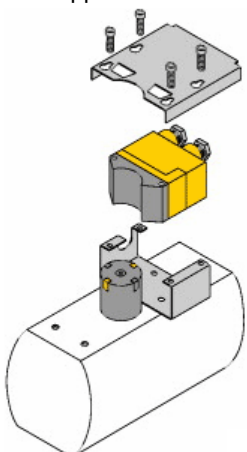
[Figure3]

The above thought-out solutions make the life of service engineers and maintenance personnel much easier with a clever range of practical accessories, and actively assist in the reduction of the down times of the production unit.

These are however all hardware demands, but when the demands are on paper in the form of approvals the differences can be appreciated. One of the hot topics at the moment is without a doubt the IEC 61508 or IEC 61511 (SIL directive). In order to comply with the “Safety Integrity Level” of the systems, more and more position feedbacks conform to IEC 61508 are in demand.

Modular housings usually fail totally due to their mechanical complexity. There are several concepts as open solutions on the market, which are usually difficult in terms of handling due to their manufacturer-specific character, as they do not allow for “second source” suppliers or are only limited to a single type. Here too TURCK has an uncomplicated solution as almost all TURCK NAMUR sensors are suitable for use in safety systems – including SIL2 – conform to IEC 61508. This has been certified by an independent and reputable notified body (TÜV). It involves sensors with a standard NAMUR output which are 100% compatible to all standard NAMUR processor devices or to (safety) PLC systems with NAMUR inputs. These advantages are of course offered by all series of the TURCK dual sensors.

Another complex and confusing issue for many planning engineers are the demands of the ATEX directive regarding “mechanically protected installation”. With sensors of ATEX device category II 1 D which are approved to EN 50281-1-1, one or more hidden notes frequently appear in the operating manual which state that the sensor is to be protected against mechanical damage. How can a mechanical protective device be planned and how can it be approved by the certification authorities? This problem has been recognized by TURCK and the solution is a compact and robust stainless steel protective housing for the DSU35 series. It provides adequate protection for the sensor and simplifies maintenance and trouble shooting with its removable upper section. The visibility of the LED displays remain guaranteed. This housing SG-DSU35TC can also be used if non intrinsically-safe dual sensors of the DSU35 series are to be mechanically protected when applied as EEx nA equipment.



[Figure 4]

TURCK offers a complete range of practical solutions for position feedbacks. The operating costs can be reduced during planning, commissioning as well as during the entire lifetime of the system, because no cost-intensive special solutions have to be constructed. A further advantage is offered by Turck on the Internet, where all documentation, selection aids, approvals and operating manuals are available around the clock for download.

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