

Positioners and special control units for automated applications in technological processes

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Operating conditions on-site considerably influence the operating condition and functionality of technological processing plant. In addition to the process-related eventual formation of deposits or contamination, accessibility and available space are important criteria when considering the meaning of maintenance-friendly. The solution to this problem is a new generation of control units. Instead of external attachments, you have an integrated air supply adapter as exactly fitting supplement to the pneumatic pivoting actuator actubar®, presenting a pneumatic interface on the upper side of the actuator. Plant construction and operation is much less liable to register malfunctions, simply because all types of external piping or hose conduit are just not needed any more.

Furthermore, thanks to special air-supply adapters, these advantages can be put to use even for positioners from other known manufacturers. Based on the same system and equipped with the same advantages, additional decentralised controls with integrated pressure measurement were developed: a control for valves with inflatable seals and a control for actuators, which guarantee safe and energy-efficient operation between compressor and compressed air supply.

INTEGRATED AIR SUPPLY ENABLES DIRECT MOUNTING OF CONTROL UNITS ONTO PNEUMATIC ACTUATORS

Pneumatic actuators have proved their worth in automation of rotating valves in industry for a long time now. Control and regulation of valves in whatever form needs, apart from the driving force itself, further components such as pilot valves, positioners or end position feedback systems.

Up till now these components were connected to the actuator by means of a standard interface. An excessive amount of effort has always been associated with the connection of all relevant components with the pneumatic actuator, which apart from an installation bridge, also consists of electrical and pneumatic control and supply leads. This inevitably results in cable loops and altogether a com-

plicated set of pipework or air hoses which has to be individually fitted to every actuator. This type of construction demands even more locations to be sealed and thereby a weak-point in the so-called automated solution. And not forgetting the already mentioned interfaces acc. to VDI/VDE 3845, Part 1 which demand a certain amount of available space in the plant which has to be taken into consideration. Another important aspect; accessibility to the actuating unit from a minimum of at least two sides has to be guaranteed.

bar GmbH has recognised the necessity for integration and reduction of interfaces and now offers appropriate solutions with the system family bar-vacotrol.

With the patented series of actuator known as actubar®, prerequisites for direct mounting of com-

ponents for position feedback, positioning control via positioner and further decentralised controls are created. The key role here is played by an additional pneumatic interface on the upper side of the actuator. Thereby, the pneumatics and the positioner indication are located in one level (**Figure 1**).

The specially developed new generation of controlling components (**Table 1**) can serve both interfaces in one unit.

Advantages of the integrated air supply layout compared to an external pipe-based or hose-based supply:

- compact design
- fewer parts
- accessibility only needed for one level, the actuator top side
- considerable reduction in installation times
- no leads or cables as danger sources, dirt and dust cannot settle (less area)
- problem-free change or replacement- no need to adapt piping to fit
- modular system
- reliable and re-usable seal similar to the Namur interface for solenoid valves
- minimises number of seals down to one

- short air-routes and minimising of dead volumes in the pipework
- less sensitivity to vibration
- integrated pressure measurement possible

COMBINATIONS WITH MARKET STANDARD CONTROL UNITS USING AIR-SUPPLY ADAPTERS

In some branches of technology, positioners from other well-known manufacturers are specified exclusively. Here we are dealing with brand-name products which have been on the market for some time now, which are suitable for automation by means of pivoting actuators and also linear ones.

In order to expand the field of operation and bring the advantages of the bar-vacotrol system into play, a new adaption system was developed for the Ex-zone to make suitable positioners usable. Here, we are dealing with flat air-supply adapters, with which these positioners can be likewise connected with the pneumatic actuator actubar without piping or hose leads (**Figure 2**).

The modular combination possibilities of the bar-vacotrol system were implemented with this solution, even for foreign units.

Table 1: The control units for all applications in one overview – form follows function

| characteristics | bar-positrion [®] | bar-valve&switch | bar-positurn2 | bar-positrol [®] |
|--|---|---|---|---|
| |  |  |  |  |
| end position feedback | • | • | • | • |
| analogue position feedback | | | • | • |
| positioner | | | • | • |
| 3-Position Regulation | | | • | • |
| optical position indicator | • | • | • | • |
| self-setting | • | • | • | • |
| direct mounting | • | • | • | • |
| stable Aluminium housing | • | • | • | • |
| valves inside the housing | | • | | • |
| scalable air-flow | | | • | |
| alternative on conventional actuator mountable | • | • | • | • |

These products have proved their worth in connection with pivoting actuator actubar through a harmonious and coordinated design.

In the case of control units bar-valve&switch and bar-positrol, the valves are especially protected through installation in the housing under the environmental aspect for the plant. The classical interface for the solenoid valve becomes absolutely obsolete. The air pressure supply is connected directly and centrally to the housing.

The positioner variations bar-positurn and bar-positrol have already proved themselves in the standard version through their extraordinary wide spectrum of function. Apart from digital feedback for the end positions, the intermediate position is issued analogue. It is also possible to switch between signals 4-20 mA, 0-20mA, 0-10V and 2-10V. The Initialisation sequence runs automatically and starts by simply pressing the button automatisch und startet einfach per Knopfdruck.



Figure 1: Automated valve with directly-mounted control unit bar-positrol®

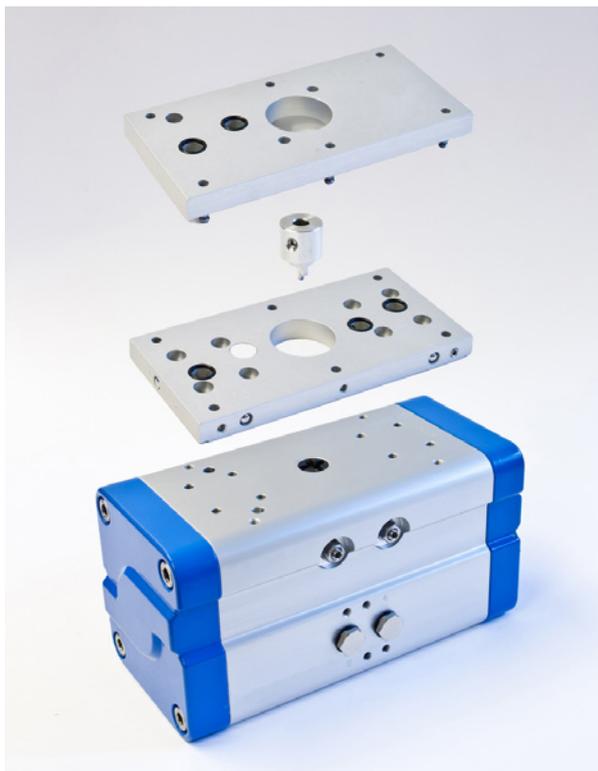


Figure 2: Pneumatic actuator actubar® with air-supply adapters for direct mounting onto a positioner

SPECIAL CONTROL FOR COMPRESSED AIR SUPPLIES AND COMPRESSED AIR SERVICING UNITS

The interface between a compressor station and the neighbouring compressed air supply is in most cases an automatic valve. This serves the purpose of isolating the compressed air supply as soon as there is no demand at times such as at the weekends. The state of air-pressure in the supply after isolation from the compressor station is not definable in most cases, because in a long and complex network there are one or two leakages somewhere. The result is that many networks lose their pressure.

Then when the automatic valve is opened to bring the network back up to pressure, new compressed air rushes into the system at alarmingly high speeds. This then leads to overloading of the compressed air system. If and when this does happen, the refrigeration dryer runs over and above its capacity limits and can sometimes become destroyed. And finally uncontrollable amounts of condensed water get into the network.

Up till now the problem was solved by slowly turning the automatic valve via heavily-throttled pneumatic actuator. By using this method, it is possible to avoid the sudden increase of pressure in the network. The problem is such a delay in the capacity as

a whole, more often than not, this is not sufficient for a large network. Even with such a normal demand in operation, when the network is not expired, the correspondingly selected and engaged valve similarly opens slowly, which in this case is neither wanted nor necessary.

The control unit bar-PCS (**Figure 3**) was developed even further for this special type of use; that is for direct mounting. By far the greatest advantage against the standard lies in the fact that the bar-PCS can be driven depending on the prevailing pressure ratio.

The electro-pneumatic control coordinates the functional sequence of the OPEN/CLOSE movement of the shut-off valve in relation to the infeed pressure of the compressed air servicing unit in the compressed air supply.

The system is optimally adapted to the individual unit by means of a digital pressure switch with freely-programmable parameters. Thereby pressure range, as well as pressure switch hysteresis are freely selectable and can be read-off via digital display. Additionally, in case of excessive pressure, the display colour changes from GREEN to RED.

If the valve moves into the open position, then the control will immediately register a resulting drop in pressure in the supply and starts to return the valve



Figure 3: Automated ball valve with control system bar-PCS acc. to the English name Pressure Control Unit

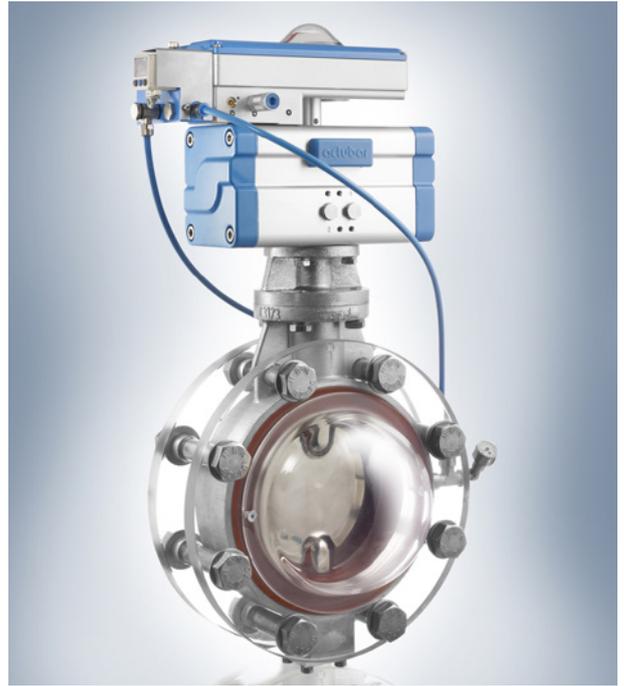


Figure 4: Control for valves with inflatable seal bar-ICS (Inflate Control System)

back to the closed position. After the pressure on the side of the compressor rises above the preset value, the valve will start to open again. This sequence is repeated as often as needed, until the preset pressure for the control unit in the plant has been reached and maintained. This process ensures that the network is gently and continually filled by means of compressed air input and pressure compensation, without the possibility of damage to components. If the network side pressure rises above the lower hysteresis mark for the pressure switch, then the valve opens permanently.

The electronics allow various operating modes and settings so that an individual setting of the circumstances in the compressed air system can be harmonised.

APPLICATION EXAMPLE WITH SPECIAL CONTROL UNIT FOR VALVES WITH INFLATABLE SEALS

Shut-off valves are used in transport equipment for bulk powder and granulate, whose shut-off mechanism (ball-valve, butterfly or knight-gate valve) is fitted with an inflatable seal. Automation is also achieved by means of a pneumatic actuator in this field of technological processing application. In the CLOSED position, an optimum sealing effect is achieved through an inflatable seal between the

valve body and the disc, calotte or knife.

Up till now, to achieve this function, valves had to be fitted with a whole range of add-ons such as solenoid valves, pressure switches, limit switches etc. between actuator and control. These can very easily lead to damage and leakages in the system. This is exactly where the advantage of direct mounting without external additions comes into its own, as already mentioned at the start of this article.

It was for this very reason that the directly-mountable and very compact electro-pneumatic control bar-ICS was conceived (**Figure 4**). The control coordinates the functional sequence of the OPEN/CLOSE movement of this special shut-off valve in conjunction with the sealing pressure.

An additional advantage in deploying the bar-ICS is that this control unit needs only the OPEN/CLOSE signal and the whole sequence is initiated and carried out by itself. This in turn relieves the load on the plant control system and also guarantees operational safety for exchanging parts and retrofitting.

A digital pressure switch with freely-selectable hysteresis enables separate setting of the sealing pressure for inflating or deflating the seal.

The pressure switch is fitted with two switching points, so that the valve seam can also be checked-over for leakages during plant running operations.

This control can be used not only for pneumatic

pivoting actuators but also for linear actuators. The equipment operator can even select the ideal combination in the automation of his valves for the production process.

Making use of freely selectable delay times, the control can be optimally adapted to the individual application case in hand.

The change in colour on the pressure switch signals the appearance of a leakage actually during operation, so that the process can be influenced directly before checking and maintenance.

Various potential-free LED message signals for monitoring the response times and sealing pressure for the valve round-off the remarkable range of functions of this control.

SIGNIFICANCE FOR DEPLOYMENT IN FURTHER PLANT PROCESSES

On the basis of integrated air movement between pneumatic pivoting actuator and control unit, a number of deployable product solutions from an end position feedback all the way to special controls for complex plant engineering processes have been put forward here.

Due to the reduction in potential leakage points and the conception as a closed-in system, these automation solutions would seem to stand out against the leakage-prone add-ons with external elements. Outside influences lead much less often to damage and down-times. In addition, the harmonised and space-saving design lends the impression of a standardised arrangement of the equipment.

Such integral parts of the bar-vacotrol system, comprising control units and pivoting actuators can be installed not only below each other as illustrated but also in arbitrary combinations. Even with conventional market-standard actuators and positioners, these modules can still be adapted individually. System components can be deployed for adapting to already existing components in the equipment. This versatility in variation and the multi-faceted combination of possibilities presents a very favourable advantage for the plant operator in the storage of spare parts. In particular, there is the possibility of implementing the component retrofitting process free from problems and carry it out in one smooth transition.

The variable and adaptable character of control units from the bar-vacotrol system show the way forward for further individual developments above and beyond already existing process conditions.

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The Company

Since 1979, with the development, production and world-wide distribution of valves, pneumatic quarter-turn and electric actuators, as well as all sorts of accessories, German based bar GmbH has been a major and dependable partner for many well-known industrial companies.

bar GmbH is one of the technological pioneers in the area of valve automation. Continually adapting products to the latest standards and to customer requirements is a demand which the company constantly works on to achieve product innovation for plant construction and process technology.

The particular competence of bar GmbH is the development of customer-specific systems and specialized solutions which are implemented using the company's cross-industry experience while never losing the focus on high efficiency.

Planners, constructors and operators of plants in the following fields of process engineering make use products by bar GmbH in manifold applications such as: water and waste-water, power stations, paper and pulp, waste disposal, bulk material, chemicals and petrochemicals, shipyards, pharmaceuticals, foodstuffs. Continuous quality-control of the products and the internal company flows has already been carried out for many years using a certified quality management system which actually is ISO 9001:2008. Moreover, the product portfolio is Gost-R certified.

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