

Explosion-proof actuators according to Atex

Electrical connection with plug and socket enables quick actuator replacement

From July, 1, 2003 only explosion-proof devices which conform to the new Atex Directive may be introduced to the market. Auma has already qualified its electric actuators for the automation of industrial valves in accordance with the new regulations. In addition, Auma has taken this opportunity to improve the design.

Three components are required for an explosion: a flammable substance, be it gas or dust, oxygen and a source of ignition taking the form of an ignition spark or a hot surface. Explosion protection means eliminating one of the three above-mentioned elements from the plant. If this is successful, no explosion will occur. Electrical equipment is a potential source of ignition. Hot surfaces occur by heating up during operation. Electric voltages and currents can cause ignition sparks. The design of explosion-proof electrical equipment prevents the occurrence of high temperatures on the surface and of ignition sparks during operation.

Explosion parameters

Potentially explosive gases and vapours are classified according to their minimum ignition energy or their maximum experimental safety gap width into explosion groups A, B, or C, and according to their ignition temperature into temperature classes T1 to T6. This classification forms the basis for design requirements, e.g. the maximum permissible gap widths and minimum gap lengths on different sections of the housing for housings with the "flameproof enclosure" type of protection. The newly certified Auma actuators are approved for safety category 2, explosion group IIC and temperature class T4 (maximum surface temperature 135 °C). This covers almost all common gases.

Fig. 1 SAExC 07.5 electric multi-turn actuator with Auma Matic AMExC actuator control on wall bracket



There are a number of possibilities when it comes to designing electrical equipment for use in potentially explosive atmospheres. The "flameproof enclosure" and "increased safety" types of protection are of major importance for actuators. The "flameproof enclosure" type of protection permits an explosion inside the electrical equipment. The joints between the housing parts are however designed in such a way that a flame or flammable particles cannot reach the outside. This is achieved by adequate sizing of the gap widths and lengths on the different sections of the housing. The housing has a rigid design, so that it can withstand the pressure which develops during an internal explosion without damage.

For the "increased safety" type of protection, suitable measures have to be taken to prevent the formation of ignition sparks, electric arcs or impermissibly high temperatures. Only explosion-proof components with their own test certificate are allowed to be used in a compartment with increased safety. For actuators in accordance with the Atex directive, the "increased safety" type of protection applies to the area around the electrical connection. The terminals themselves are explosion-proof. All terminals are sized in such a way that no impermissibly hot surfaces or sparks can occur.



Fig. 2 Plug connector/terminal board with screw-type terminals (left), plug-in terminal connection with cage clamps (right)

Separate mounting

Auma has been manufacturing explosion-proof multi-turn and part-turn actuators for more than 20 years. For this reason the re-certification of the modified devices, i.e. the SA(R)Ex 07.1 to SA(R)Ex 16.1 series of multi-turn actuators and the SGEx 05 to SGEx 12 series of part-turn actuators, at the Physikalisch Technische Bundesanstalt (PTB) in Braunschweig was achieved without any problems. In the course of implementing the requirements of the Atex directive, a few details of the design were improved. All modified actuators and controls have now been approved without any restrictions for explosion group IIC. The housing compartments for all explosion-proof actuators are designed with the "flameproof enclosure" type of protection. The devices have equipped with new electrical connections with a plug and socket. The actuator controls can be mounted separately from the actuator on a wall bracket (Fig. 1). This is an advantage, for example, if the actuator has been mounted in an inaccessible place. The controls can then be installed so that on-site operation is possible without any problems. If used with heavily vibrating pipelines, the electronics can thus also be protected against

the vibrations. The devices are now approved for an ambient temperature range from -50 to +60 °C. As an option, the devices may be equipped with a fire-proof housing of the kind which is occasionally required in the oil and gas industry. Even in case of fire the valve can still be closed within a defined time. On request, the manufacturer offers various protection concepts to ensure reliable functioning of the actuator for at least 30 min at up to 1,100 °C.

Electrical connection with plug and socket

Auma has been using a plug-and-socket connector to connect the control and supply cables of weather-proof actuators for more than 20 years now. The advantage of this design: once connected, the wiring is no longer disturbed. If the actuator has to be removed from the valve, e.g. for maintenance purposes, the wires do not need to be disconnected one at a time. For re-installation, the electrical connection is simply connected and then screwed to the housing. In case of fault, the actuator can be quickly replaced by a spare actuator. In the past, this has not been possible with explosion-proof actuators.

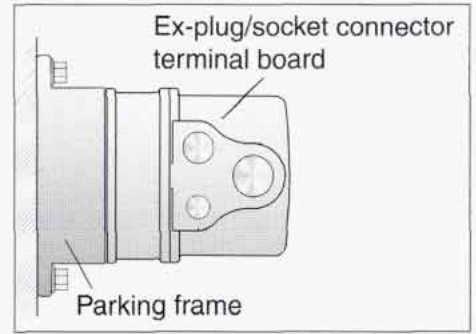


Fig. 3 Retaining frame for the removed electrical connection

Two electrical connections with a plug and sockets which offer the above-mentioned advantage were developed during the modification project. Furthermore, these connections are designed to be double-sealed, i.e. even if the cover of the terminal compartment is opened or the cable glands leak, the housing compartment remains hermetically sealed and protected against the ingress of dust and moisture. Once removed, the electrical connection can be sealed by means of a special retaining frame (Fig. 3), so that the plant can still be operated without any restriction of the explosion protection.

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