Compact relay modules for the Ex area

Safely switching even in challenging ambient conditions

Since its launch in 1996, Phoenix Contact has continually further developed the PLC-Interface product range. The range of Ex-certified relay modules is now supplemented by additional devices and approvals. Numerous industrial areas can benefit from the advantages of the new electromechanical relays with ATEX, IECEx, and Cl.1 Zone 2 (UL) approval, which are available with screw connection and Push-in connection technology, (lead image).

Due to the large variety of versions for standard applications as well as endless special applications, optimum system solutions can be continually implemented with PLC-Interface. The field of applications of the components ranges from production technology, to equipment for machines and control engineering, through to power distribution, building automation, and process engineering. As a plug-in electromechanical relay, PLC-Interface reliably couples the different signal levels. Regardless of whether it is between the higher-level controller or
sensors and actuators in the field: In each case, the trouble-free, interference-free transmission of signals is ensured on both sides for further processing.

**Other approvals**

In industry, potentially explosive environments pose higher requirements on the safety and reliability of the switching components installed than is the case in standard applications. The areas of application of Ex switching devices are not limited to the chemical, oil, and gas industry. Explosive atmospheres may occur in wood, metal or plastic-processing. The same applies to food production, paper making, in gas turbine construction as well as in the textile industry and water management or in painting systems. Here, the use of standard switching components would pose a risk. Since sparks are produced by switching processes, non-encapsulated components are able to cause an explosion.

As such, a high surface temperature may prove a source of ignition for explosive gases from the surrounding atmosphere. With this in mind, Phoenix Contact has extended the existing range of the PLC-Interface series with Ex approvals and added additional approvals. In this way, components can also be used in oil and gas production, refineries as well as in process industry applications.

**Best possible temperature classifications**

As the standard basis for ATEX and IECEx approval, EN 60079-7 and -15 are used in type of protection "ec nC". Certification according to UL Class 1 Zone 2 (hazardous locations) UL ANSI-ISA 12.12. Once the test has been passed, the modules can be installed in Zone 2 applications. In this zone, a hazardous explosive atmosphere is only to be expected occasionally and briefly. In order to safely perform switching processes in such potentially explosive areas and subsequently prevent potential ignition by sparks or electric arcs, all system components must be carefully and thoughtfully selected. In addition to further components,
such as fuses, the focus is placed on switching elements, i.e., the electromechanical relay. The new versions of compact relay modules from the PLC-Interface series fulfill the described requirements and thus ensure safe switching in Ex areas (Figure 1).

Ignition of a potentially explosive atmosphere, which is composed of various gases, can be avoided by the maximum defined surface temperature of the equipment. In the approval-related tests in full load and directly connected installation, the PLC-Interface relay modules achieve the optimum temperature classifications T5 (≤100°C) or T6 (≤85°C). The permitted ambient temperature range of Ex-certified relay modules varies from -40°C to 60°C, depending on the type used.

Coupling relays with one or two changeover contacts, which depending on the design, enable a load of 6 A to 10 A at a nominal voltage of up to 230 V AC, are covered by special approvals. The input voltages vary from 12 V DC to 230 V UC. The narrow 6.2 mm modules satisfy load currents up to 6 A. Relays for a maximum load current of 10 A or 2 x 6 A are available in an overall width of 14 mm (Figure 2).

**Global field of application**

Equipment and systems, which are used in potentially explosive business premises, fall under the guidelines of the ATEX directive in the European Union, while in North America the Class/Division system applies. In order to be able to set up systems for the Ex area on a global scale without any problems, certification is required which is independent of the regulations in individual countries or regions. The IECEx schematic diagram offers a uniform, internationally valid standard. If the product features IECEx approval, no further international approvals must be obtained for the purpose of conformity with standards. With this in mind, the Ex modules from the PLC-Interface product range now correspond with IECEx as well as ATEX and Cl.1 Zone 2, which is fixed to the side of the components so that it is clearly visible. Indeed, nothing stands in the way of its global use.
No corrosion

The electromechanical and solid-state relays from the PLC-Interface series are sealed according to IEC 61810-7 RT III, and are therefore watertight as per the definition. Furthermore, they can be installed according to EN 60664-1 in environments with pollution degree 2, whereby the installation in a control cabinet with at least IP54 protection is presupposed. An independent test institute has also subjected the relay modules to a four component corrosive gas test under laboratory conditions. EN 60068-2-60 serves as the test basis. A corrosive gas concentration specified in standards favors corrosion, in combination with a correspondingly high relative humidity and ambient temperature - in this case, 75 percent relative humidity at 30°C. The requirements of the ISA standards ISA S71.04-1983 G3 have also been fulfilled under these test conditions. Within the scope of the test, the testers have simulated the harsh environmental conditions in a practical manner.

Following the maximum selected test duration of 21 days in line with standards, the relay modules had to perform subsequent functional tests and microscopic examinations. In particular, metallic materials are prone to corrosion. Nevertheless, all the new components of the PLC-Interface product range passed the final check. Neither impairments to the device function nor to the materials, especially the metals, were found. Aggressive gases can therefore not damage the modules. In this case, their functionality has been ensured to the full extent.

Uniform accessories

Similar to other relay modules from the PLC-Interface product range, Phoenix Contact maintains the same look and feel for the new versions intended for the Ex area. This means that the well-known power bridges and signal bridges as well as marking material, partition plates, and power terminals can be used (Figure 3). In this way, wiring in the control cabinet is clear as usual, and in the case of installing several components, time is saved, even if
they have a different overall width. All relay modules continue to be connected directly. The easily accessible connection terminal blocks enable safe electrical connection. At the same time, the user is able to flexibly extend or change the system (Figure 4).

If an electromechanical or solid-state relay fails, a spare one can be ordered separately for all new complete modules. Since the material combinations of the plastics, molding compounds, and additional components used of the single relays are stipulated in approval documentation, only the relay types specified by Phoenix Contact may be used as spares. Otherwise, the stringent stipulations of approval authorities would be violated and the approval would be ineffective.

Figure 4 PLC-Interface allows you to clearly design wiring in the control cabinet
Fast wiring

The modules of the PLC-Interface product range are also available with Push-in connection technology. For this purpose, solid conductors or those assembled with ferrules from a cross section of 0.25 mm² can be easily connected into the conductor shaft without any tools. The contact spring opens automatically and provides the required pressure force against the current bar. A built-in push button allows fully insulated release of the conductor with any high-quality tool. The orange-colored button indicates the actuating element and prevents the relay from being activated accidentally. This enables fast and straightforward wiring.

Potentially explosive areas

In the case of potentially explosive areas, a distinction is made between areas with a danger of gas explosions and a danger of dust explosions. Both are assigned to standardized zones. Previously, these were defined in EN 60079-10 for gases and in EN 61241-10 for dusts. In transferring the EN 61241 series of dust-related standards into the EN 60079 series of standards, the classification into areas with a danger of gas explosions and those with a danger of dust explosions was maintained in EN 60079-10 Part 10-1 and Part 10-2. Zone 0 in areas with a danger of gas explosions means constant, frequent risk over a long period of time, while Zone 1 is occasional risk and in Zone 2 the risk usually does not exist or only briefly.

The European Committee for Standardization has also created standard EN 11271. It contains basic information on explosion protection and provides support for both ATEX Directives (2014/34/EU and 1999/92/EC). The zones are classified based on the frequency of the occurrence of explosive atmospheres. The explosion protection regulations of the German Social Accident Insurance Institution for the raw materials and chemical industry (BG RCI) contain additional support and advice regarding zone classification.

Type of protection n

Type of protection n is as an improved industrial quality that is designed for normal operation. A fault scenario examination, as is performed for intrinsic safety type of protection, for example, is not carried out. Type of protection n can only be applied for equipment group II and the use of electrical equipment in Zone 2.

The manufacturer specifies the technical data for normal operation. In the case of type of protection n, a distinction is made between five different versions, which can be derived in part from the familiar types of protection: increased safety, intrinsic safety, flameproof enclosure, pressurized enclosure, and molded encapsulation. The type of protection n was developed based on the US NonIncendive (NI) type of protection and was introduced in Europe as a standard in 1999. Here the subgroups nA (non-sparking equipment), nC (sparking equipment), and nR (restricted breathing housing) are distinguished. Type of protection nL (energy-limited circuit) is no longer included in edition EN 60079-15:2011-02, as it has been included in standard EN 60079-11 in protection level ic.

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