

## WHITE PAPER

# FIBRE OPTIC CABLES WITH (SYSTEM) CIRCUIT INTEGRITY CONFORMING TO DIN, EN AND IEC

Electrical cable systems for safety-related installations or equipment have to comply with special fire safety requirements. Many European countries including Germany, Austria, Switzerland, Luxembourg, Belgium, the Czech Republic, Slovakia and Poland consider that circuit integrity is guaranteed only by a system audit conforming (or similar) to DIN 4102-12 – i.e. the testing of cables and installation system in a fire chamber. The FO cables marketed as having “functional integrity” conforming to IEC or EN do not meet these requirements.

Electrical cable systems for safety-related installations and equipment stipulated by the building regulations must be designed or be separated by components in such a way that safety-related installations and equipment remain functional (maintain functional integrity) for an adequate period in the event of fire.

These include fire alarm, voice alarm and building radio-communication systems as well as video surveillance systems, emergency telephones, ventilation damper controls and traffic lights. Fibre optic cables are ideally suited to these safety-related installations, particularly those in large building complexes, campuses and traffic tunnels, as they allow the transmission of additional audio, video and data protocols over large distances and with low attenuation losses.

To avoid having to protect the cables with special fire protection ducts, the entire cable system can be designed with system circuit integrity (functional integrity) in accordance with DIN 4102-12, for example. In such an installation, the cables are directly exposed to flames in the event of a fire.

### Testing standards

International and, more specifically, European standards describe the minimum requirement as a test procedure resulting in what is known as a “PH Classification”. However, this test procedure does not adequately demonstrate the functional integrity of cables, support structure and fastening system (i.e. system circuit integrity).

In Germany the functional integrity of electrical cable systems is defined using a classification conforming to DIN 4102-12, “Fire resistance of electric cable systems; requirements and testing”. The classification differentiates between 30 minutes (E30), 60

minutes (E60) and 90 minutes of functional integrity (E90) for the complete cabling installation including the cables. In the Czech Republic and Slovakia cabling installations are classified as P30 to P90 in accordance with a similar national test procedure.

The test methods mentioned above however, relate only to copper conductors. The failure criteria are “short circuit” or “interruption”. These test methods take no account of transmission characteristics or even attenuation – the most important criteria for fibre optic (FO) cables.

### Fire chamber testing of FO cables

In such tests the fire conditions are very realistically simulated by a uniform temperature time curve (UTTC): after 90 minutes the temperature exceeds 1,000°C. This makes it perfectly possible to demonstrate transmission characteristics in the event of fire.

Since FO cables have many conductors, only a few cables need to be installed on the different support and fastening systems. Reliable figures for attenuation and transmission characteristics

Figure 1: Fire chamber testing in accordance with DIN 4102-12

