Standardisation, the key to success

experts from the connector industry, automation technology and the cable industry and have joined forces to develop international standards for this technology. This clearly demonstrates the importance of standardisation, as interoperability, and thus the long-term success of SPE, can only be ensured through international standards.

It goes without saying that many bodies are involved in the international standardisation of such an important technology. At this point, only the key bodies involved are mentioned: The application and the definition of the transfer channel is being processed by the IEEE 802.3 (Institute of Electrical and Electronics Engineers; Ethernet Working Group). ISO/IEC (International Electrotechnical Commission) describes the transfer requirement and its parameters for passive cabling structures in industry, in buildings, smart homes and computing centres. The requirements of mechanical and electrical properties are ultimately defined by IEC SC 48B Electrical connectors and IEC SC 46C Wires and symmetric cables. There are fixed agreements between IEEE 802.3 and ISO/IEC that define the respective tasks.

For the IEEE 802.3cg (SPE 10 Mbit/s) project, connectors and their electrical properties were defined for the first time in the IEEE environment. They are explained under the point on MDI (Medium Dependent Interface). The MDI is the interface to the active components. The passive cabling structure is not described here. The technical properties that a connector or contact point must comply with for this application are described there. In a sub-item, the current version of the IEEE document describes possible connectors that can be, **but do not have to be**, used on the MDI. This is occasionally misrepresented in publications. Though it is crucial for the manufacturer and the user to recognise that this is an option („may be used“) and not a regulation. Other connectors can also be used, if they meet the electrical properties of IEEE 802.3cg.

The connectors for Single Pair Ethernet are defined in the IEC 63171-X series of standards. The general electrical requirements of the interfaces can be found in the basic standard IEC 63171. The design of the mating faces and thus the mechanical requirements of the connectors are described in the subordinate series of standards. The basic standard could perhaps be likened to the engine and the standard series as the different car bodies.

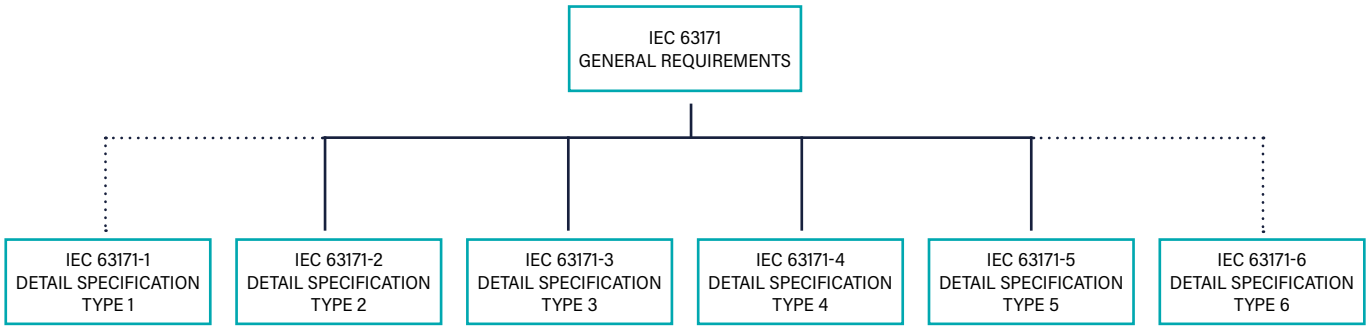

Image 1 outlines the structure of the IEC 63171 series of standards and the normative references to IEC 63171-1 and IEC 63171-6

The connectors defined in the series of standards -1 to -6 have different mating faces, dimensions and mechanical properties. Currently, neither IEC 63171-1 nor IEC 63171-6 refers to the basic standard of IEC 63171. As a result there are different mechanical requirements and different electrical requirements.

For information, the key differences of the standardised connectors are listed in the table below.

Characteristics / Norms	IEC 63171-1	IEC 63171-2	IEC 63171-5	IEC 63171-6
Style	LC-Style	rectangular	M8 / M12	rectangular / D8 / D12
Bandwidth	600 MHz	2.500 MHz	2.500 MHz	600 MHz
Transmission pairs	1	1/4	1/4	1
IP rating	IP20/IP67	IP20	IP67	IP20/IP67
Mating compatibility	No	Yes IEC 63171-5	Yes IEC 63171-2	No
Connector size in comparison	>>>	0	0	>>
Inverted mating face possible	No	Yes	Yes	No

Table 2: Overview of the different connectors in accordance with IEC 63171

The connectors in accordance with IEC 63171-2 and IEC 63171-5 even observe stricter values. For example, they have a dielectric strength up to 2.25 kV DC. Finally it should be mentioned that the use of connectors described as „may be used" in the IEEE 802.3 environment only relate to the 10 Mbit/s application. Applications in the range 100 MBit/s, 1,000 MBit/s and MultiGig are not affected by this. Therefore, the user is obliged to select the right connector for the application.

The ISO/IEC 11801-x series of standards describes the generic cabling structure for different environments. This is also being expanded due to the new SPE applications. It defines the same connectors as in IEEE 802.3cg. A „may be used" connector is defined in the ISO/IEC as a „shall be used" connector at the TO (telecommunication outlet). There is thus a fixed definition of the mating face for the TO.

The following documents are affected by this:
Information technology – General cabling for customer premises:

ISO/IEC 11801-1 AM1 (General requirements)
ISO/IEC 11801-3 AM1 (Industrial premises)
ISO/IEC 11801-6 AM1 (Distributed building services)

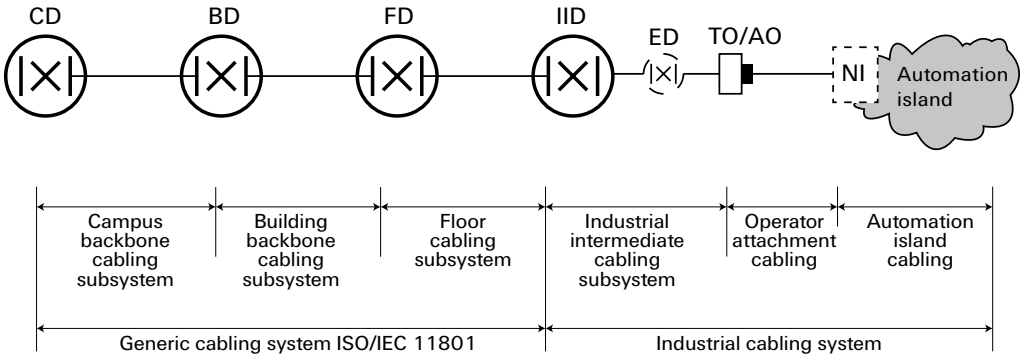

Image 2 shows the ISO/IEC 11801-3 AM1 cabling model (source: ISO IEC 11801-3)

In Figure 2, it is apparent that the TO represents the connection between automation and the factory hall. The specification for the mating face thus refers to applications outside of automation and therefore also to the connection of the automation island with generic cabling. The TO is therefore only described in the generic cabling in accordance with ISO/IEC 11801. Except for generic cabling, a TO is not used in PROFINET environments.

PROFINET and other industrial communication protocols define pure point-to-point cabling in their guidelines. Even the definition of the channel was not taken from generic cabling, instead a channel definition that has been adapted to the industrial environment was derived with the End-to-End link.

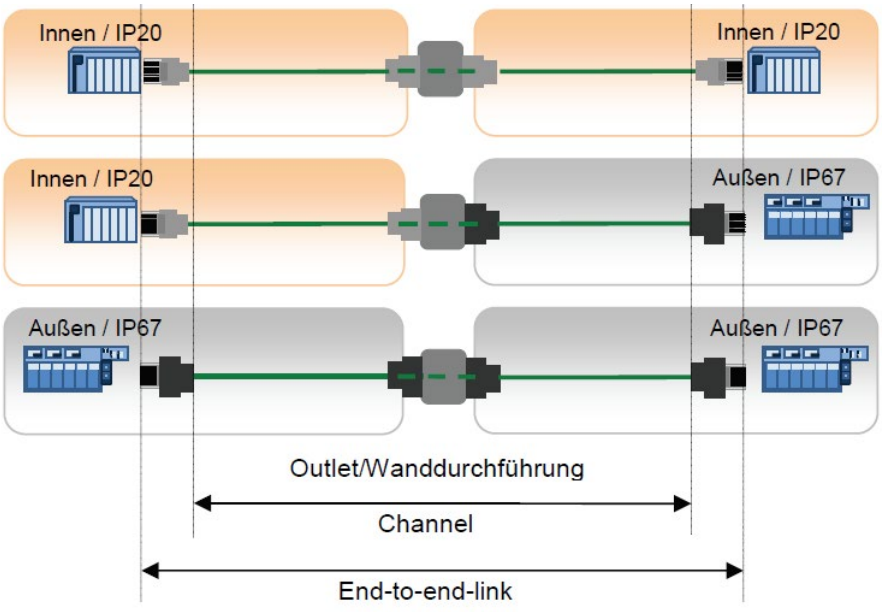

Image 3: Example variants for the End-to-End link in accordance with the PROFINET guidelines.

The normative process is currently underway but has not yet been completed. The claim that the market had already agreed upon a mating face, as was made by some manufacturers and is often mentioned in the trade press, is categorically incorrect. Important and powerful user organisations, such as PROFINET or ODVA, are currently forming their own opinion and will deal with this subject area in the future.