

- Connection from a facility/automation island to IT → use **installation cable**
- Outdoor installations → use **HARTING outdoor cable**
- Installation in/on train → use **HARTING EtherRAIL® cable**
- Installation in bus or tram → use **HARTING cable in accordance with ISO 6722:2006** (UN ECE-R 118 Rev.1 + Amdm.1:2013-11)

#### 4. Which connectors or terminating technique will you be using?

The use of certain connector types, if not already specified, is mainly determined by the application. HARTING offers all of the necessary connector types; they are listed in this catalogue according to their applications.

#### 5. What additional requirements must the cabling meet?

If there are additional specific requirements, these need to be checked with the specifications for the cable being used. All of the primary requirements for data cables for special applications are already covered by HARTING's Ethernet cable product portfolio. HARTING's portfolio naturally meets requirements for oil resistance, crush resistance and a wide temperature range for industrial-grade cables. But there may be other crucial requirements which are not covered by our standard designs and must be requested separately, such as resistance to welding beads, special hybrid constructions, etc.

#### Cable materials

Copper data cables consist of the core material (copper wires or strands, tinned or non-tinned), the core insulation (foamed or non-foamed plastics such as PVC or PE) foils and copper braids for shielding, possibly liners or inner shells (for PROFINET cable), fillers or tension elements, additional foils or layers, and the outer sheath.

All of these cable materials determine the electrical parameters (such as the category), as well as the mechanical, chemical and EMC characteristics.

Unlike connectors, cable may introduce a significant amount of material into a facility or cabling installation. This affects the flammability characteristics and fire loads.

Thus, the materials chosen for the core insulation and the sheath are very important.

The key characteristics of the cable sheath and its material are:

- PVC (polyvinyl chloride): lightweight, highly flexible (soft) material that can be processed well. Very resistant to oils and fats; prevalent in the industrial environment. PVC has a very high flame resistance. If a PVC soot material is added, this makes an excellent sheathing material for outer cable. The addition of soot inevitably leads to black colour and provides the necessary UV resistance for the cable.

PVC is not halogen-free. The disadvantage is that it releases toxic gases during a fire and forms hydrochloric acid when combined with (extinguishing) water which can cause further damage.

- PUR (polyurethane): is a very robust material with excellent characteristics for industrial and industry-related applications. It is halogen-free and has outstanding oil resistance, chemical resistance and abrasion resistance. It also has good flame resistance and is suitable for non-stationary applications.
- PE (polyethylene): has many characteristics similar to PUR, but worse oil resistance and chemical resistance. It is extremely anti-hygroscopic (limited absorption with surrounding water) and safe for use in food processing applications, so it is well suited for HARTING's F+B portfolio.

Elastomer materials (which are similar to PE) have been developed for use in HARTING EtherRail® cables. The elastomer is irradiated, which provides the cable with its excellent temperature and fire characteristics.

- FRNC (Flame Retardant Non-Corrosive) thermoplastic polyolefine: a halogen-free material with excellent flame resistance. FRNC cables can be readily processed and are widely used in structured building cabling (fixed routing, installation cables). For industrial applications, however, FRNC cables are rarely used because of their insufficient resistance to oil and chemicals.

The general term LSZH (Low Smoke Zero Halogen) is often used to describe cables for building installation and structured cabling. LSZH actually describes the properties of the cable sheath and not the real material composition.

#### Copper wires in data cables

The size, cross section and construction of the copper wire in data cables determine the electrical and hence also the transmission characteristics.

A distinction is made between hard core and stranded wires. Hard core wires are normally used