

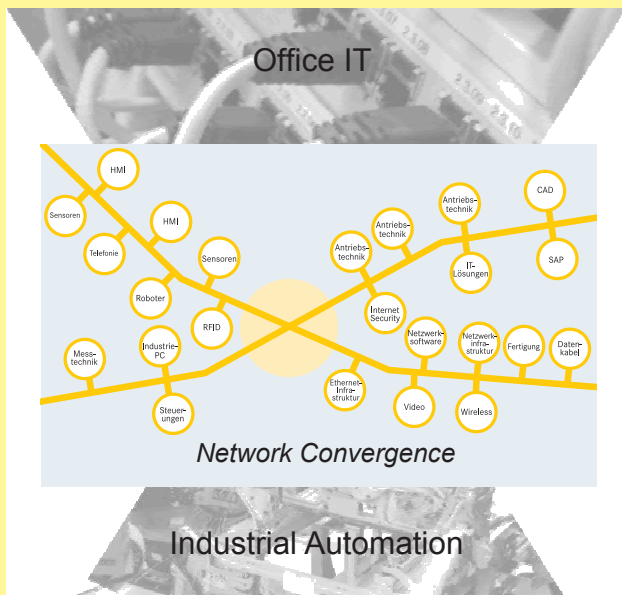
Introduction

## Realise a seamless Ethernet Network – with Automation IT:

In a global market with constantly new, changing market constraints and changeable buyer behaviour, the smooth flow of information between all members of a value-chain is an absolute must.

Even on the most modern production lines, the networks for automation, telephony, data exchange with business systems and further multi-media services are still separate from one another.

Standard Ethernet now provides the remedy, in which the perfect linking up of Automation and IT



Automation IT

into a single network is made possible. Whether industrial control, IP-telephony, video, ERP, Office equipment or sensors – all applications run over an integrated Ethernet network, that is linked up via a cable. In this way, all clients communicate securely and reliably over a single network.

Ethernet facilitates the perfect networking of Automation and IT. At the Hannover Fair 2006 HARTING, together with Cisco Systems, displayed solutions for the modern, scalable, capable and above all reliable network. HARTING stands for the harmonisation of network topologies, compo-

nents and cabling from the office all the way into the toughest environments.

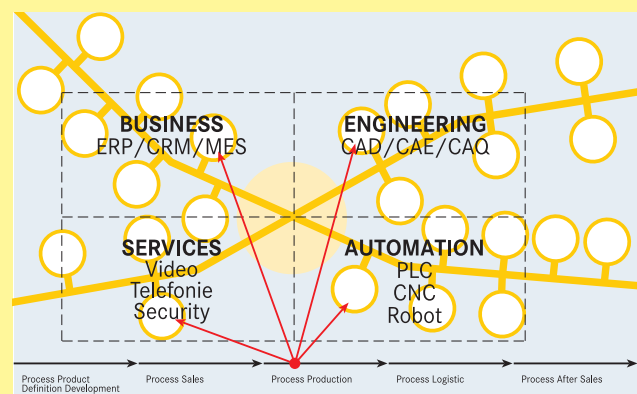
Network performance also ensures the highest availability for time critical processes. Different data streams can be simultaneously recognized and assigned to the appropriate application. The convergence of Automation, Business Systems, Telephony and multi-media services into a single network is in this way guaranteed.

## Automation IT means: Advantage by Convergence

The convergence of Office IT and Automation / Factory networks opens up potential rationalisations in planning, installation and operation that up until now were not achievable.

Where process speed has been previously restricted by the requirement for gateways between Office and Factory applications, today Automation IT can communicate without barriers or wastage.

From each core process, Automation IT makes possible direct access in real time to the complete data of all applications. The networking of all core processes opens up a previously unknown transparency and speed.



Network applications in industry

### Your Advantages at a Glance:

- More transparency for management
- Reduction of installation and operational costs through reduced expenditure for planning, installation and operation

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- More effective business processes through the linking up of sales and production processes
- Highest availability and performance, even in the toughest surroundings
- Communication without barriers in real time between all network clients
- A single network for Automation, Office IT, Telephony and video-monitoring

In just a few steps to a complete network – with the **Selection Guide**:

Simple selection rules for the whole infrastructure support the building up of a seamless network. Of vital importance is the fact that the network components and the cabling are harmonised with one another.

**Ethernet Network Components:**

**Functional Class**

The Functional Class of the active network components is derived from their application. Network components can operate as simple star-couplers as in the eCon range, or take over the more com-

plex tasks of active segment administration embodied by the mCon range. HARTING covers the complete spectrum of industrial applications with eCon, sCon and mCon.

**Installation Class**

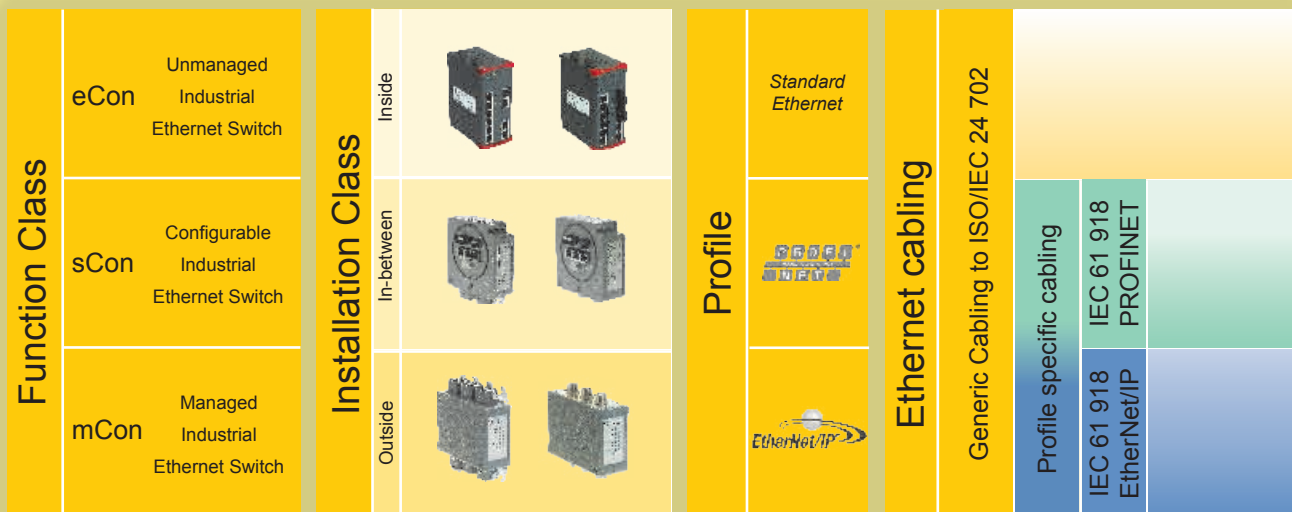
With the Installation Class the installation concept that is appropriate to the application is selected. If, for example, your network components are located in a control cabinet, then the Inside installation class is the right one for you. All HARTING network components are true industrial products, with such well thought-out default properties that they master the toughest environments.

**Profile Specification**

Through the Profile you select whether special automation-specific functions, such as those required by PROFINET, are integrated into the network components.

HARTING presently supports Conformance Class A of the PROFINET profile. Integration of corresponding additional automation-specific PROFINET functions specified in Conformance Classes B and C will follow soon. That means that HARTING network components can be reliably utilised in standard Ethernet, PROFINET and EtherNet/IP environments.

In this way the right network components are determined in only 3 steps.



The way through the Selection Guide

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### Structured Cabling:

Structured cabling follows from the particular application, since the determination of network components and other active devices decides the constraints on the cabling - for example, the selection of connectors. The network cabling results from the simple connection of network clients. There are complete cable sets available as well as cables and connectors that can be made up on site. Products are also available for transitional areas like cabinet walls or between two different installation lines, which seamlessly enhance the network.

With the help of the selection guide, you can follow an easy path to a seamless and secure network solution.

### What do industrial network components look like in detail?

For one thing, an industrial Ethernet component must always have basic functionality such as:

- Wide temperature range capable of meeting industrial application requirements
- High mechanical robustness as well resistance to shock and vibration loads
- EMC characteristics commensurate with the requirements of industrial environments
- Fast Ethernet (100 MBit/s) Switch functionality (IEEE 802.3)
- Store and Forward Switch function with Auto-negotiation and Auto-crossing for easy installation
- Wide application field via electrical and/or optical ports

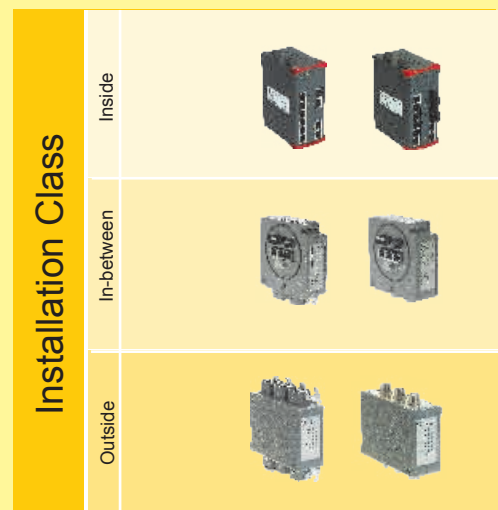
These fundamental functions are the basis of all HARTING network components and are already implemented in the unmanaged eCon product group. The eCon products are not separately set up by the user or administrator, but are rather plug-and-play components. It follows that an application specific parameterisation is not possible. From this the well thought-out segmentation of the network is a pre-requisite for the use of these components. To achieve this, an exact knowledge of the application must already be available in the planning phase. Unmanaged network components are not necessarily usable in convergent networks.

If application specific or later configuration changes are necessary, then an sCon network component is the appropriate solution. The network compo-

nent can be made conformant with the application without the use of special management tools. The parameterisation is carried out over the integrated USB interface.

The mCon network components make possible state-of-the-art administration of a network in the office branch. Here management services such as IGMP Query, QoS, VLAN, RSTP, and 802.1 are ready for use. A web server is integrated for easy setting into service or administration over the web. With mCon Ethernet switches, the network services are available that make possible the convergence of office and automation applications.

Apart from the choice of appropriate functions in industrial environments, the selection of the suitable installation class is of particular importance.



*Installation Class*

Three typical classes can be defined, dependent on the application:

#### 1. Inside:

These network components are used inside a control cabinet to create a star topology, whose clients can be found in the same cabinet. For distribution to the outside of the cabinet, a Patch cable is mostly necessary.

#### 2. In-between:

These network components serve to integrate control cabinets in Ethernet networks as well

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as the distribution in a star topology within individual control cabinets. Decentralised control cabinets can be easily linked together into a line topology.

3. **Outside:**

This class defines network components in a high degree of protection, that are used directly on site for the creation of miscellaneous topologies such as star topology most of whose devices are designed to a high protection class. The low number of ports also allows the implementation of simple line topologies.

With this, network components are defined from the criteria of Standard Ethernet. But characteristics remain open which are essential for use in the field of automation. There are profile specifics, only through which a network component can be qualified for PROFINET or EtherNet/IP applications; that is automation standards, which by compatibility with Standard Ethernet, supply a particular functional or interface requirement.

**What does cabling for industry look like in detail?**

The foundation of industrial network cabling is represented by ISO/IEC 24 702. Apart from generic cabling variants, this standard also supports profile specific cabling for PROFINET and EtherNet/IP. The selected profile also gives the connectors that can be used.

The user's concrete application also defines the optimal solution. Therefore different application specific solutions are made available.

1. The networking of an industrial premise or a widely distributed installation with a large amount of pre-wiring:

This application forms the basis for the ISO/IEC 24 702, which is based on the cabling between automation islands. The only connector approved for generic cabling, variant 4, standardised in the IEC 61 076-3-106 was selected for the connector concept. Generic cabling is particularly important in this case as network usage can be subject to change and as such flexibility is necessary when giving consideration to different network generations.

The M12 connector is often ruled out of this type of application, because its use is limited to Fast Ethernet.

2. Networking of manufacturing facilities with comparatively diverse topologies and applications extending into the automation island:

This application is typical in the production of motor vehicles. In this case, the concept selected should be as flexible as possible and not only meet the technical requirements with regard to data transmission up to Gigabit Ethernet, but also encompass requirements for optical transmission media. As there is little pre-wiring within automation islands (cabling is mostly application-specific), the availability of simple connection techniques for optical and electrical solutions is a pre-condition for the system to be deployed. In addition, immense significance is placed on the plugging compatibility with RJ45 connectors at interface points to the IT network. A concept that fulfils all of these requirements is specified in the IEC Pas 61 076-3-117. Due to its flexibility, this standard has also been taken up for PROFINET.

3. Networking within individual machines:

These machines represent stand-alone applications that are integrated at a central point within a company-wide network. The interface for the integration falls under application 1 and/or 2. The connectors within the machine are to be selected to meet the requirements of the machine builder. Many factors favour the use of the M12 connector due to the fact that is widely used in sensor technology and generally enjoys high levels of acceptance.



Overview of connectors