Pushing Performance

People | Power | Partnership

Modular or Monobloc Connectors

HARTING's Guide to Industrial Connectors

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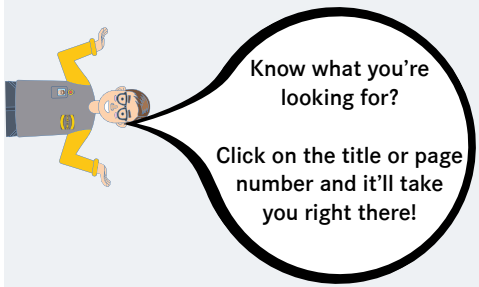

Introduction

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Did you know? Many of the combination connectors available on the market today were developed by HARTING. Other connector manufacturers have adopted these designs introduced by us. As a result, a standard was created.

You may have noticed our connectors have been named in a particular way, here's why:

Click here!

Series (combination)

Number of signal contacts

Contacts for low currents and voltage

Han® K 6/12

Industrial Connectors Han®

Number of power contacts

Contacts for high currents and voltage

At HARTING we offer two types of connectors you need to be aware of.

Monobloc Connectors

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A monobloc is a single insert connector that provides connectivity such as power or signal. Because of this, the monobloc is able to provide a high density of contacts under one housing which enables interfaces and systems to be standardised.

Click here!

Han-Eco® B: Monobloc

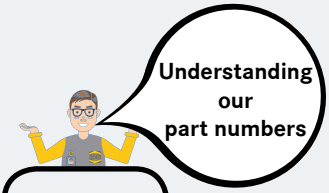
Contact Loading

Inserts are loaded with contacts whose size & termination type match the insert construction. The number of poles is also determined by the insert design. A standard evolved based on established designs, which makes it easier to obtain replacement parts.

Combined Monobloc

In order to meet the requirements for connectors in a simpler and more economical fashion, manufacturers have developed inserts with different types of contacts. For example, some applications use cables with cores having differing cross-sections. As a result, conductors for different circuits, voltages and currents share a cable and connector.

Monobloc Connectors



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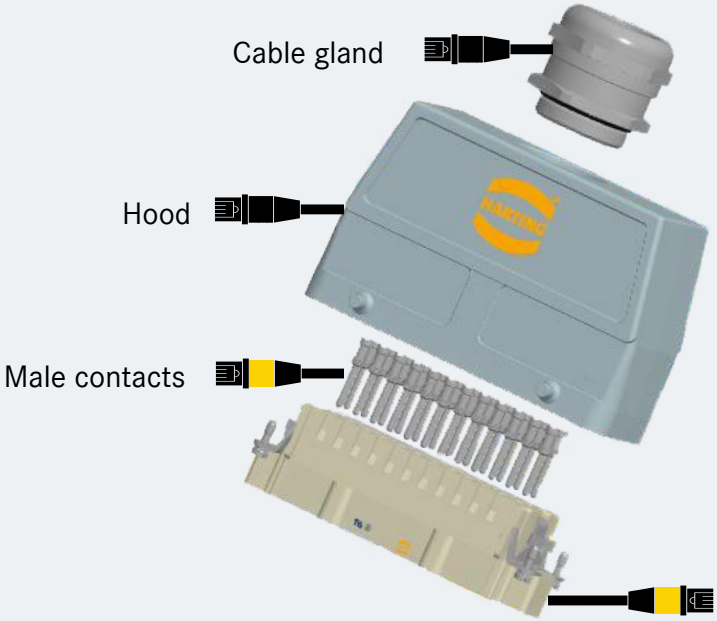

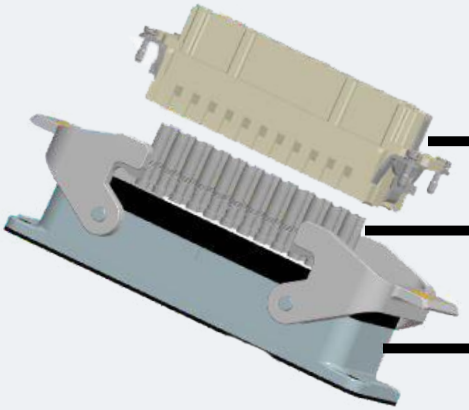

09 — **Product group** (Connectors)

33 — **Series** (Han E®)

024 — **Number of contacts** (i.e 6, 10, 16, 24)

2602 — **Part of connector assembly** (hoods/housings, inserts)

Try me!

- Criteria and properties cannot be reconfigured
- **Inserts** are designed for a specific size of hoods and housings.

Modular Connectors

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A modular connector is a multi-purpose connector that can simultaneously provide multiple sources of connectivity. Data, signal, power, pneumatics, fibre optics and high voltage can be provided in one housing due to the ability to combine various modules to create a unique interface.

Han-Eco® : Modular

- Designed for combining different transmission media in one connector.
- Multifaceted system of inserts, contacts, frames, hoods, housings and accessories fulfils individual customer requirements.
- More than 100 modules can be chosen - suitable for different transmission media and covering various termination techniques.
- Future-proof design due to easy extensions.

Modular Connectors

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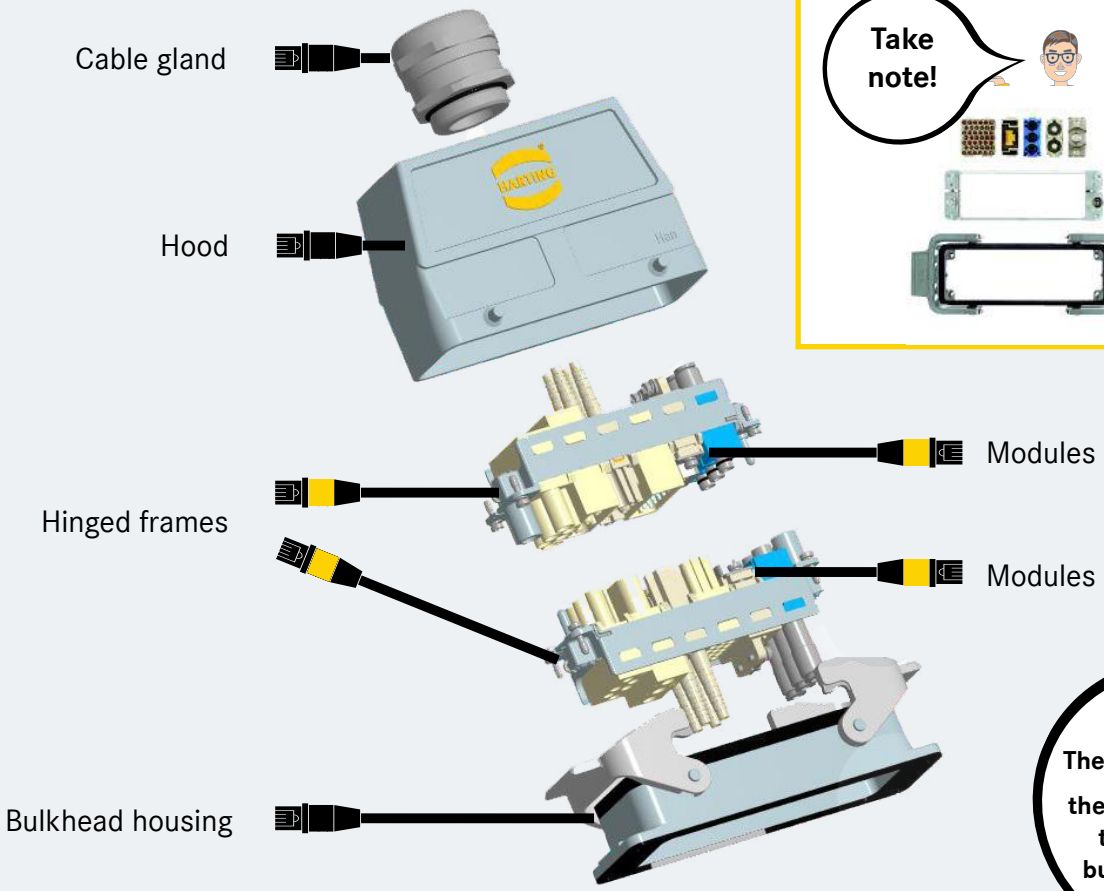
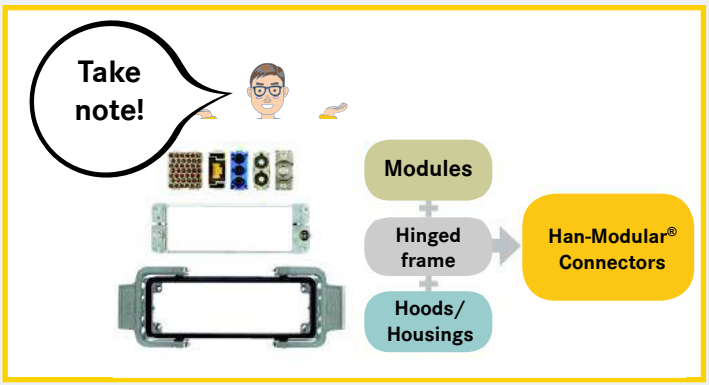
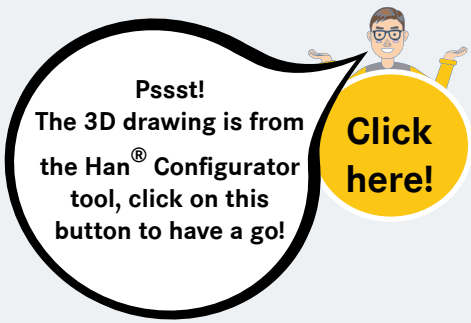
The Modular system has been on the market since 1994. The system allows you to tailor the connector to suit your application by selecting from a range of modules.







Modular Connectors

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As you can see from the diagram the system consists of frames, modules, hoods and housings.

Mechanical Structure

Module frames are available in **three** different versions.

1. Hinged frame plus

Did you know? We have traditional hinged frames for HMC (High Mating Cycles). Click here!

- Additional stainless steel spring keeps the frame fixed in open and closed positions.
- Highly visible lettering makes all module positions evident at first glance.
- Additional marking with black triangle indicates orientation of correct insertion of the modules into the frame.

Hinged Frame Plus

2. Docking frames.

We have two types:
- Plastic
- Metal

Click here!

- Docking connector for drawer systems.
- Robust leading guide pins and bushes.
- Compatible with HMC - Up to 10K mating cycles.

3. Frame for one module

This frame is a two piece zinc die cast part. The module is latched onto the frame by coded tabs.

Browse our range here!

Our frames come in multiple sizes!

Modular Connectors

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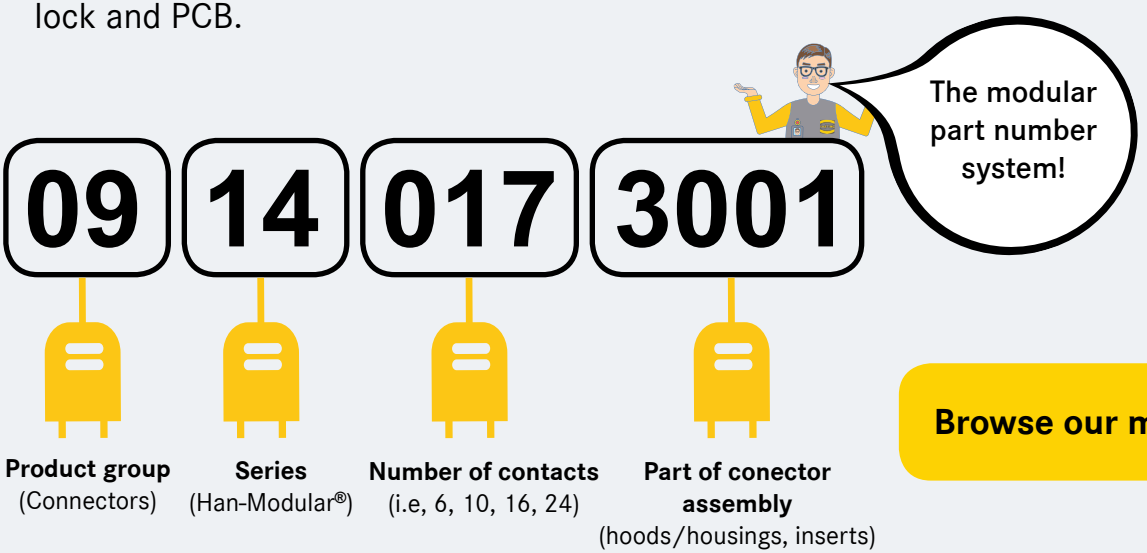
Modules

- HARTING has developed many different modules for a wide range of applications.
- All of them use contacts from the HARTING industrial connector range.
- All electrical modules are polarised. Therefore, incorrect mating is technically impossible, even with a single module.
- Contacts are inserted into moulded modules. These are either single or double modules depending on the dimensions and number of contacts. The size designation relates to the number of module positions.
- Different termination technologies are available: Crimp, screw, axial, cage clamp, quick lock and PCB.



Browse our modules here!

Tools, Tools, Tools!

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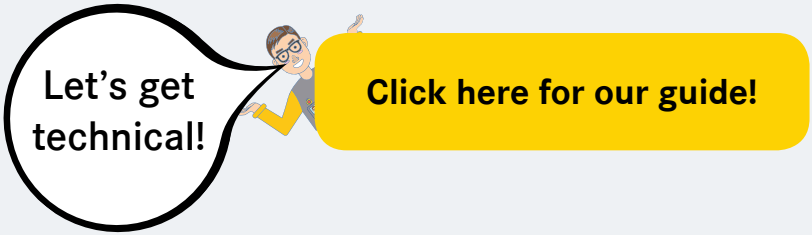
Both modular and monobloc connectors require tools, so because of this, we offer a comprehensive portfolio of tools for all relevant termination techniques and assembly steps. Tools for monobloc connectors can be used for the modular connectors as well. The portfolio ranges from simple assembly and dissassembly tools, manual and semi-automatic hand tools to fully automated machines - for an efficient processing of contacts and connectors.



Criteria for Selecting Connectors

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There are numerous factors you need to consider when choosing the perfect connector for your application. You have probably seen us mention the Han® Configurator? The reason for this is because this tool is the perfect assistant when configuring your connector. All you need to do is type in the voltage, current and number of contacts you need and you'll be able to choose the connector solution you feel is best suited for your application...and guess what? You and your team can still edit the chosen solution because as we know, things change!

How can the Han® Configurator help you?

- Smart assistant: Prevents you from designing a connector that's not viable.
- File downloads: CAD models and drawings, Bill of Materials (BoM) and datasheets of indivdiual components in your connector solution.
- You can save and share your connector solution with colleagues.
- We're always looking to update the tool with our latest products and improvements.
- Interactive 3D model (Some of the images used in this guide are from the tool).
- Quickly find your solution from thousands of products in the Han® portfolio.

Explore the Han®Configurator by clicking here!

Click here to watch our "how to" video!

Criteria for Selecting Connectors

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Electrical Criteria

Number of Contacts

The number of contacts (Pole number) is an important consideration when selecting a connector for a certain application.

Note:
Protective Contacts (PE) should be counted separately.

Click here!

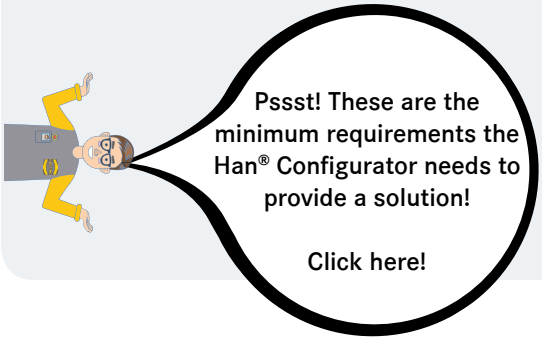
Current

The rated current (Current-carrying capacity) is another selection criterion. The manufacturer's specification relates to the current which all connector contacts can carry simultaneously.

Voltage

The rated voltage must also be taken into account. This value is specified by the manufacturer in accordance with DIN EN 61984 or DIN EN 60 664-1. Creepage and clearance distances must be considered.

Let's get technical!



Criteria for Selecting Connectors

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Mechanical Criteria

Conductor cross-section

The conductor cross-section is selected for a defined current flow without exceeding a given voltage drop. The connector should be dimensioned for this cross-section.

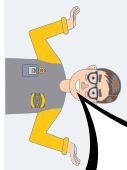
Termination method

We have a range of termination methods available. Click the buttons below for a “how to” video of each method! Each termination method requires a stripping tool.

Crimp Termination

Screw Termination

Cage Clamp



Let’s get **REALLY** technical!

Click here

Han Quick Lock®

Axial Screw Termination

Criteria for Selecting Connectors

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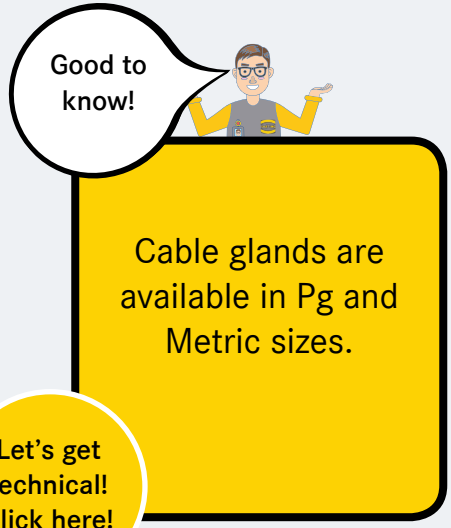
Mechanical Criteria

Cable glands (Cable size)

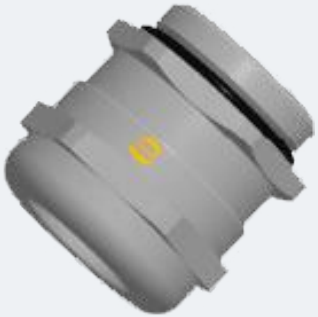
When connectors are used, the size of the cable entry must be taken into consideration. A cable gland matching the cable diameter is required for a tight seal and for cable strain relief.

For cable glands, tubing and housings, the change is based on the international metric standard DIN EN 60423.

Browse our range!



Let's get technical! Click here!



Now... Hoods & Housings

Criteria for Selecting Connectors

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Hoods & Housings

Many hood and housing options, sizes, designs, cable entries etc are made to be the perfect fit to your application.

Material: Plastic

Housings manufactured in thermal plastic (Plastomer) materials can be used where the mechanical stress and environmental conditions permit.

Why plastic housings?

- Corrosion resistance
- Finishing not required
- Weight reduction
- UV resistance: For outdoor use
- Full insulation: The housing doesn't need to be connected to the PE conductor.

Han-Eco® Modular

Han-Eco® B

Browse our range!

Criteria for Selecting Connectors

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Hoods & Housings

Material: Metal

Metal is the most commonly used housing material for industrial connectors. Aluminium alloys are most commonly employed. In most cases, housing components are produced in a die cast process.

Finish

Metal connectors are usually supplied with a protective coating. Various types of finishing methods are opted for, depending on the function of the housing and where it will be used. The most common finishes are detailed below:

Powder Coating:

This electrostatic method applies plastic power to the surface of the housing. After it hardens in a drying zone, a layer of uniform thickness is formed on the work piece. All of the excess powder can be re-used by the system. This coating offers excellent protection and is highly resistant to mechanical stress.

Varnishing:

A primer is sprayed onto the prepared parts. A varnish layer is then subsequently applied in a second spray process.

Criteria for Selecting Connectors

Back to contents!

Hoods & Housings

Material: Metal

Nickel:

If good **Electro-Magnetic Compability (EMC)** is key, the surface of the housings must be electrically conductive. The surface of small zinc die-cast housings is finished with nickel coating, this creates a highly robust electrically conductive layer.

Criteria for Selecting Connectors

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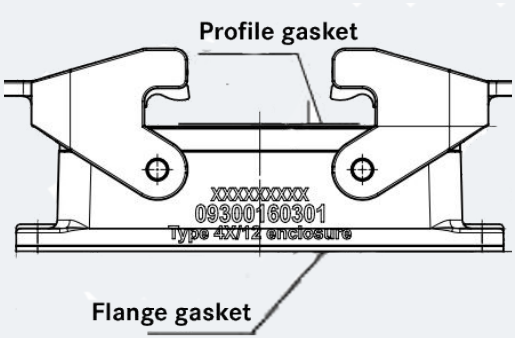
Hoods & Housings

Sealings

Connectors always consist of two or more parts and therefore must be sealed accordingly. The type of seal is chosen based on the required **degree of protection.**

There are two types of sealants:

- Profile gasket (seal): This sits between the bulkhead and the panel.
- Flange gasket (seal): This is between the two mating connectors.



Degree of Protection (IP)

DIN EN 60 529 classifies the degree of protection for housings used in electrical devices with rated voltages up to 72.5kV (IP designation).

The degree of protection relates to:

- Protecting humans from contact with hazardous parts in the housing.
- Protecting the interior of the housing from ingress of solid foreign matter.
- Protecting the interior of the housing from harm caused by water entering the housing.

IP Rating Guide!

Criteria for Selecting Connectors

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Hoods & Housings

Locking Lever System

The main function of a connector is to enable fast, easy and reliable connection and disconnection of cables. An important detail as well as the electrical contact being flawless, is an easy to operate ergonomic lever system. Naturally, all the respective demands required of the component must be fully satisfied.

The main criteria are as follows:

- **Good handling**
- **Good seal ensured**
- **Compact design**
- **Vibration and shock-proof**
- **Protected from unintentional opening**
- **Corrosion-resistant (depends on application)**

Different kinds of lever systems are available, as no single means of locking is capable of meeting all of these demands.

Let’s get into it shall we!

Criteria for Selecting Connectors

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Hoods & Housings

Locking Lever System: Locking Levers

The most common type of lock is the locking lever. There are two methods available:

1. Locking lever without spring loading

The elasticity of the seal provides the tension required for locking and unlocking. The seal is not permanently deformed since it is only briefly over-stretched. Due to housing tolerances and deviations of the shore hardness of the seal, the required operating forces may vary.

2. Easy Lock®

A spring in the locking lever provides most of the required tension.

Main advantages:

- Steadier operating forces.
- Reduces shock stress on the seal.

- **Single Locking Lever**

  Housing is locked mostly length ways with locking lever.

- **Double Locking Lever**

  This is mounted on the sides of the housing. Two locking levers are required per housing. The locking levers can be mounted on the housing (most common version) or, if required, on the hood.

Typical Applications

- Carriage-to-carriage connections (subways, commuter trains and street cars)
- Connections for exchange parts on robot arms and industrial robots

- **Central Locking Lever**

  A Central Locking Lever is used for applications demanding quick, compact and simple locking and unlocking. The lever is always mounted on the housing.

Criteria for Selecting Connectors

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Hoods & Housings

Locking Lever System: Screw Locking

Housings exposed to very harsh environmental conditions are equipped with screw locking to increase the safety of the connection. The type of stresses can vary, for example:

- Severe vibrations and shocks
- Effects of liquids when a housing is under pressure or submerged
- Strain on the cable of the hood
- Vandalism

Housings with screw locking usually handle these factors. A tool is required to open the locking and unplug the connector. So it is virtually impossible to sever the connection unintentionally or without authorisation.

Locking Lever System: Toggle or Bayonet Locking

Instead of screws, toggles are used which, lock into place when rotated 90 degrees.
A toggle is firmly held in place by means of a disc spring and has a clearly defined locked and unlocked position. In contrast with screw locking, the locking force depends on the applied torque.

Click here for examples of our locking systems

Criteria for Selecting Connectors

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Hoods & Housings

Design

There are many different housing designs available for the various kinds of interfaces that must be powered by a connector. In this section we will demonstrate our most popular designs.

A housing combination always consists of **two** parts:

1. The upper part of the housing (hood) is also known as a loose connector (DIN EN 61 984 defines a loose connector as connected to the loose end of a cord or cable). We have various hoods you can choose from: **top entry** and **side entry**.

2. The lower part of the housing (bulkhead mounted housing, surface mount housing and panel feed through), also known as fixed connectors (DIN EN 61 984 defines a fixed connector as a connector mounted on a frame, rack, machine or panel).

Click here!

Click here!

3D Visual from the Han® Configurator

Click here!

3D Visual from the Han® Configurator

There are also cable-to-cable hoods. This is a second hood that is connected to the loose end of a cord or cable. This configuration creates a cable-to-cable connection. Neither the hood and or housing are fastened to the machine or system.

Criteria for Selecting Connectors

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Hoods & Housings

Design: Housings of the Han® A series

The housing of the Han® A series are narrow and rectangular (Except for the Han® 1A and Han® 3A). The square housings is also known as “Design A”. The first angular industrial connectors were introduced to the market around 50 years ago. They were given the brand name “Han®” which is an acronym for **HA**RTING **N**orm (HARTING standard) e.g. Han® 10A, Han® 3A, etc.

Click here

Han® 10A

Click here

Han® 3A

Click here

Han® 1A

Criteria for Selecting Connectors

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Hoods & Housings

Design: Housings of the Han® A series

Han® 10A and Han® 16A

Two of the Han® A housing series are defined in a standard (Han® 10A and Han® 16A). These housings have a variety of compatible inserts. Therefore, a wide range of contacts can be used due to the availability of inserts for this housing. Depending on the number of contacts used, the connector can be rated up to **16 amps** with the Han® 10 - 16A series.

Note: Single modules can be added in the Han® 10A using the frame for one module, this housing can now be rated up to 100 amps.

Han® 1A

The Han® 1A is the smallest housing we currently have in our portfolio. The assembly of a connector using this housing can be done in seconds due to the easy mate and click design. This housing has a variety of inserts. Therefore, a wide range of contacts can be used due to the availability of inserts for this housing. Depending on the number of contacts used, the connector can be rated up to **16 amps** with the Han® 1A series.

Click here for more information on Han® 1A

Criteria for Selecting Connectors

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Hoods & Housings

Design: Housings of the Han® A series

Han® 3A

The Han® 3A design is one of the smallest of the Han® industrial connectors. This housing has a square-like profile. The compact design of the Han® 3A makes it ideal for space saving requirements. The housing has a variety of compatible inserts, therefore, a wide range of contacts can be used due to the availability of inserts for this housing. Depending on the number of contacts used, the connector can be rated up to **100 amps** with the Han® 3A series.

Design: Housings of the Han® B series

Han® B housings were developed some years after the design A series. They are available in various sizes, some examples would be 6B, 10B, 16B, 24B etc. The housing has a variety of compatible inserts, therefore, a wide range of contacts can be used due to the availability of inserts for this housing. Depending on the number of contacts used, the connector can be rated up to **650 amps** with the Han® B series.

Click here!

Han® 16B

3D Visualisation from Han Configurator

Click here for more information on our designs!

Criteria for Selecting Connectors

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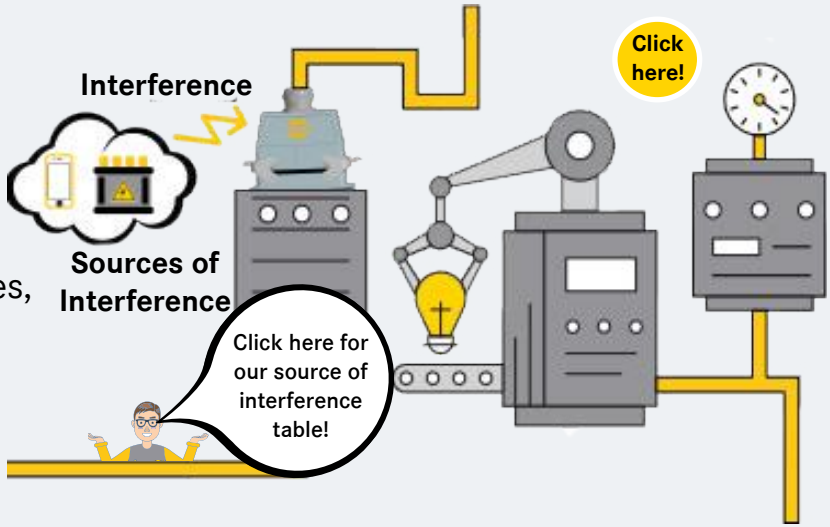
Hoods & Housings

Electro-Magnetic Compatibility (EMC)

According to the Directive 2014/30/EU, EMC is considered to be the ability of an electrical device to operate satisfactorily in its electromagnetic environment, without influencing this environment, to which other units may belong in an undue way. Therefore, an electrical installation is compatible, when it has tolerable emissions (being a source of interference) and (being a receptor) shows a tolerable immunity against interference, which means it has a sufficient shielding capacity.

What is Electro-Magnetic Interference?

Electro-Magnetic interference is considered to be Electro-Magnetic phenomena that can impair the performance of a component, device or system. Electro-Magnetic interference includes electro-magnetic pulses, spurious signals or spontaneous changes of the propagation medium. These electrical signals are superimposed on the desired signal.



Electro-Magnetic Interference Sources

Sources of electro-magnetic influences are evident throughout the entire frequency spectrum, from low frequencies (Hz range) to high frequencies (GHz range). We differentiate between functional (intentional emission) and non-functional sources (unintentional emission).

Criteria for Selecting Connectors

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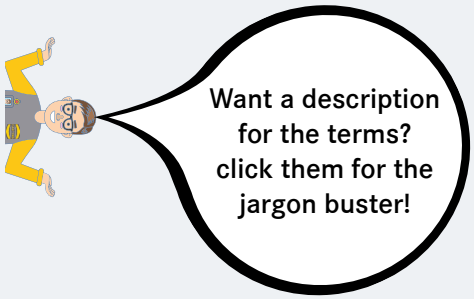
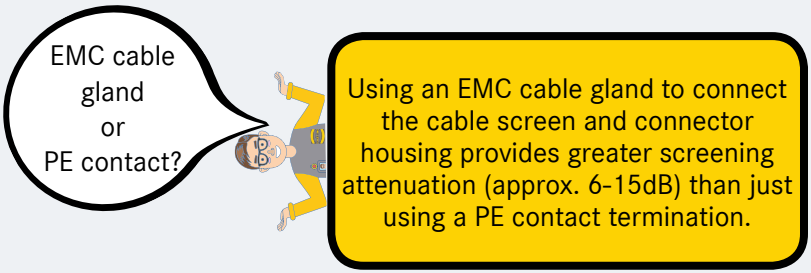
Hoods & Housings

Electro-Magnetic Compatibility (EMC): Transmission Paths

We define the term coupling as the way electro-magnetic interference influences a (pre-assembled) connector. We differentiate between the types of coupling below:

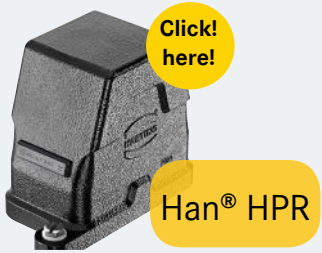
Galvanic coupling | Inductive coupling | Capacitive coupling | Radiation coupling

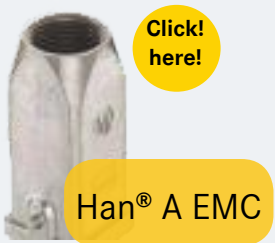




Electro-Magnetic Compatibility (EMC): EMC Hoods & Housings

Two factors contribute to the high screening attenuation values of these EMC housings. Firstly, the well developed labyrinth structure and secondly, the extensive contact between hood and housing (overlapping). You will see our featured EMC hoods and housings below:





Top Tips

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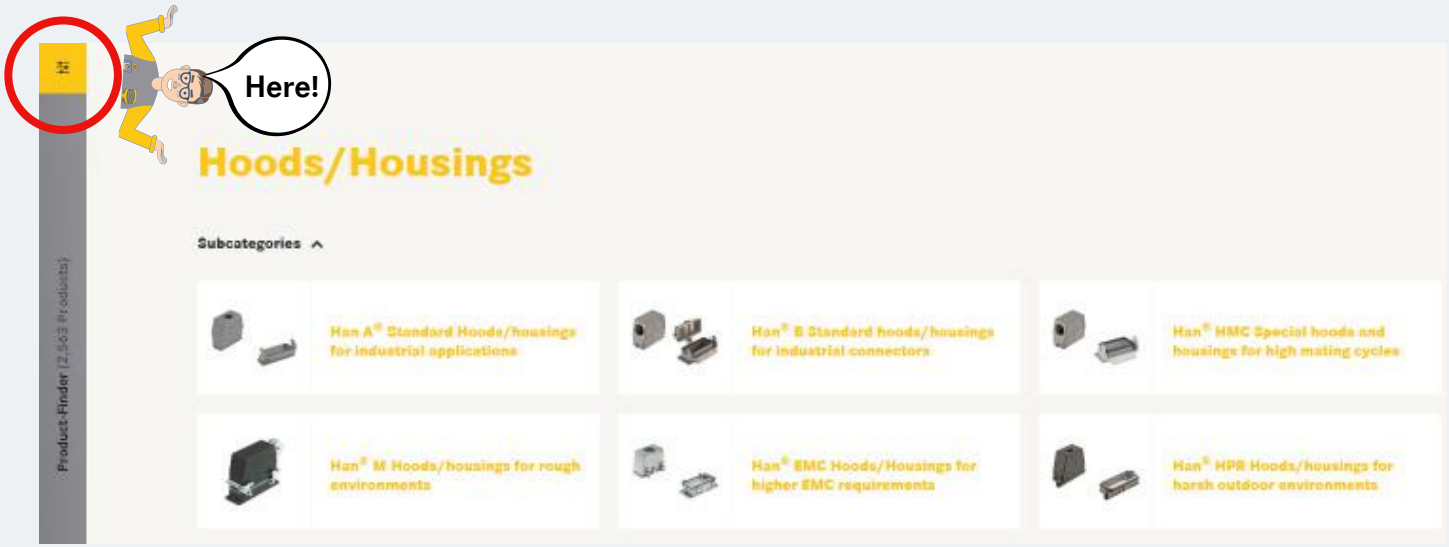
Product Finder

In this guide we have demonstrated there are many factors you need to consider when building your ideal connector.

To help you find the right product quickly use the “Product Finder” tab in our eShop (eCatalogue). This will enable you to filter by key product attributes, making it easier to find the exact product you require.



The Han® Configurator

Now you know what to consider when designing a connector for your application. Try out our Han® Configurator! An online tool that allows you to digitally design your connector.

Han® Configurator

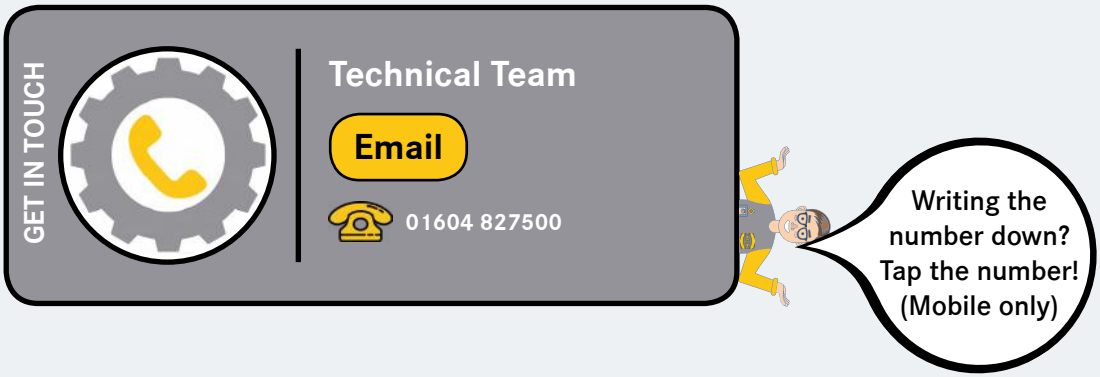
Features and benefits

Thank You!

Back to contents!

Thank you for taking the time to read through our guide!

We hope this guide helped you understand our world of industrial connectors! If you still have questions, require more technical information or would like a personal introduction to the Han Configurator tool, don't hesitate to contact our technical team!



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