

M12 connector / M12 plug-in connector:

Assignment, coding & application for M12 connections

M12 connector / plug-in connector: Assignment, coding & application. All about M12 connectors: Assignment of pins, coding and reliable application of the connector for transmission of electricity and signals of the new industrial standard.

Selecting an M12 connector:

How to find the correct M12 connector and the right coding for your application

M12 connectors combine technical capability with economical advantages and reliability. To select the correct M12 connector, five technical points should be clear:

- **Application**
- **Coding**
- **Number of poles**
- **Degree of protection**
- **Connection type**

Why use an M12 connection?

Round plug-in connectors of the M12 size have been established in many industrial fields as the preferred connection technology for reliable connections as those plug-in connectors offer technical and economical advantages.

Technical advantages

- Safe and low-error set-up
- Pluggable, lockable connections replace time-consuming individual wiring. This reduces assembly mistakes and simplifies maintenance and service calls.
- Standardised interface
- International norms ensure compatibility, interchangeability and long-time availability.
- They are also suitable for high vibration industrial environments and rough operating conditions.

Economical advantages

- Low installation effort: reduced installation costs
- Shorter installation time: less machine downtime
- Future-proof: suitable for industry 4.0 and IIoT architectures

01

Application

What is the M12 connector used for?

M12 connectors are used in industrial automation and automation technology, especially for:

- **Sensors and actuators**
- **Industrial Ethernet**
- **Fieldbus systems**
- **Robotics**
- **IIoT environments**

They are designed for industrial environments that require a high degree of protection and voltage and thus also have high demands for robustness, reliability and lifetime.

02

Overview of the most important M12 codings

Codings



A coding (sensors and actuators)
general signal transmission



B coding (network)
Profibus / fieldbus for data transmission



D coding (network)
Industrial Ethernet – transmission of data of up to 100 Mbit/s



X coding (network)
High speed Ethernet of up to 10 Gbit/s



Y coding
Data + performance are separated

K/L/M/S/T coding (performance)

Those are part of the power connector group. They are designed for capacities of up to 630 volts/12 A AC/DC or 63 V/16 A



K coding



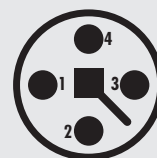
L coding



M coding



S coding



T coding

Coding of the M12 connectors

WHICH ONE IS THE CORRECT ONE?

The various codings of the plug-in connectors are suitable for different requirements. Only identically coded plug-in connectors fit together. Incorrect pluggings thus can be prevented reliably.

The selection of the connector's coding depends on the transmission protocol and the electrical load.

03

How to determine number of poles / assignment

Typical variants

Important

General rule

Number of poles and assignment

The M12 resp. plug assignment depends on the number of required signals.

- **4- or 5-pole M12; standard sensors**
- **8- or 12-pole M12; more complex signal transmission**
- **M12 A coded with 3 up to 17 poles possible**

The pin assignment of M12 plug-in connectors is not standardised. Differences in the pin assignment may occur between different manufacturers. Systems like AIDA define 5-pole variants, however they do not act as an overall standard. The technical data sheets are crucial. The layout of the pins and the cable colour of each pin, however, are standardised.

The more signals or additional functions, the higher the number of poles.

04

Verify degree of protection and ambient conditions

Limits

Degree of protection

Before selecting an M12 plug-in connector, the following points should be verified:

- **Required degree of protection (e.g. IP67, IP68, IP69K)**
- **Mechanical load (vibration, movement)**
- **Spacial conditions**
- **Locking mechanism: Screw connection or push-pull**

M12 connectors are based on norms such as
DIN EN 61076-2-101 / -109 / -111 / -113.

This ensures interchangeability and compatibility.

For very confined spaces or a number of poles above 17 pins, size and costs will rise.

05

Connection type Direct or cable?

Depending on the mounting situation, the following are available:

- **Direct M12 connection on the device**
- **Ready-made cables with M12 plug**
- **Retrofit solutions**

The pluggable M12 systems reduce the wiring effort, shorten the installation time and minimise mistakes during assembly thanks to their harmonised plugs – this is especially relevant for modular machines.

Schlegel

as manufacturer of M12 plug-in connectors

Schlegel offers pushbuttons and switches with direct M12 connection or M12 cable.

Compact design for 22.3 mm panel cut-out, suitable for small mounting spaces – with connection directly on the pushbutton/switch or via cable.

Robust design for 30.5 mm panel cut-out, suitable for big or mobile machines – with connection directly on the pushbutton/switch or via cable.

Big and robust emergency-stop switch with optional signalling via illumination ring.

proboxx®, minibox, SIL M12, S4 stainless steel enclosures & FRT connect for retrofit applications.

Others

FAQ

Which M12 connector is the right one for sensors?

What is the difference between D and X coded M12?

Is the M12 pin assignment standardised?

Which degree of protection should an M12 connection have?

Frequently asked questions

An A coded M12 connector with 4 or 5 poles in general, depending on the number of signals.

D coding is designed for Ethernet of up to 100 Mbit/s, X coding is designed for a reliable data transmission up to 10 Gbit/s.

Partly, yes. The codings are standardised, the concrete pin assignment may vary depending on manufacturer and application. Thanks to the standardisation of plug and jack, an incorrect plugging is prevented.

In industrial applications, a minimum of IP65 / IP67 is common. Higher degrees of protection are useful for rough conditions and additionally depend on the possible degree of protection of the connection cable in use.

Conclusion

Please select reliable M12 plug-in connectors systematically. The selection of an M12 connector follows a structure:

- **Define application**
- **Define coding**
- **Determine number of poles**
- **Check degree of protection**
- **Select connection type**

If you follow these steps, you will get a standard-compliant, robust and maintenance-friendly connection solution for industrial applications as a result.