



Pushing Performance



People | Power | Partnership

## **HARTING Han-Ex®**

Connectors for explosion-hazardous environments

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# General information

## Field of application

HARTING Industrial Connectors are applicable in a wide variety of electronic and electrical applications. The degree of protection of all hoods and housings is in accordance with international standard IEC 60 529 / EN 60 529.

- Power Utilities
- Industrial Instrumentation
- Robotics
- Conveyor Equipment
- Chemical Plants
- Transportation
- Machine Tool Controls
- Injection Moulding
- ...and many more.



Certified according to EN ISO 9001 in design/development, production, installation and servicing

## Specifications:

VDE 0110

Table concerning clearance and creepage distances

VDE 0627

Connectors and plug devices

Standards:

DIN EN 175301-801, DIN EN 61 984

## Note:

Connectors should not be coupled and decoupled under electrical load. Connectors of the same or different series being mounted side by side may be protected against incorrect mating by the use of coding options.

## General information:

It is the user's responsibility to check whether the components illustrated in this catalogue comply with different regulations from those stated in special fields of application which we are unable to foresee. We reserve the right to modify designs in order to improve quality, keep pace with technological advancement or meet particular requirements in production.

## Imprint

© 2019, Editorial date 11/19, HARTING

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# Basics of explosion protection

## Causes of explosions

To set up an exothermic reaction like an explosion the following three components have to interact:

- Fuel: flammable vapors, liquids or gases or flammable dusts and fibres
- Oxidizer: generally air or oxygen
- Ignition energy: electrical or thermal

Each corner of the so-called ignition triangle (refer to drawing) represents an indispensable component of such an explosion. Once an exothermic reaction is ignited, the results depending on the energy released can be controlled combustion, flame waves, or explosion.

Today, all protection methods are based on the elimination of one or more factors within the triangle – in order to minimise the potential impacts of the explosion.

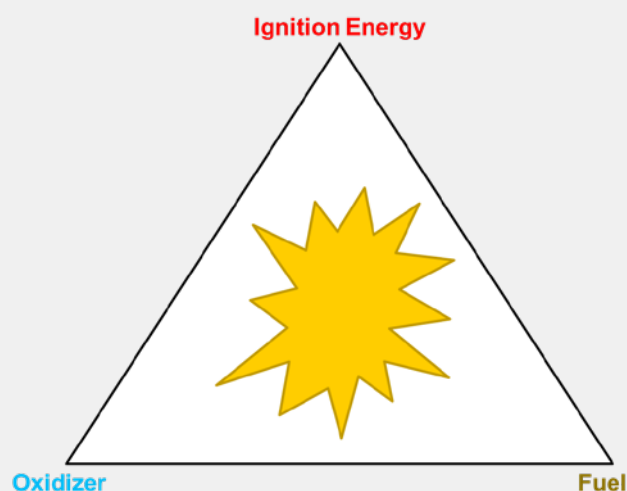


Table 1: Effective ignition sources

| Source                                                                                  | Possible Causes                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sparks                                                                                  | Mechanically generated sparks (e.g. by friction, impact or removal processes), electrical sparks                                                                                                                                            |
| Electric arc                                                                            | Short-circuit, switching operations                                                                                                                                                                                                         |
| Hot surfaces                                                                            | Radiators, machining, heating in operation                                                                                                                                                                                                  |
| Open flame, welding arc                                                                 | Combustion reactions, flying sparks during welding work                                                                                                                                                                                     |
| Electric arc                                                                            | Opening/closing of contacts, loose contacts, safety extra-low voltages ( $U < 50V$ ) are not considered as explosion protection measures. Even at low voltages, sufficient energy can still be generated to ignite an explosive atmosphere. |
| Static electricity                                                                      | Discharge of charged, insulated conductive parts like e.g. many plastics                                                                                                                                                                    |
| Electrical compensation currents, cathodic corrosion protection                         | Return currents from generators, ground/earth fault in the event of faults, induction                                                                                                                                                       |
| Electromagnetic waves in the range $3 \times 10^{11} \dots 3 \times 10^{15} \text{ Hz}$ | Laser beam for distance measurement, especially during focusing                                                                                                                                                                             |
| High frequency $10^4 \dots 3 \times 10^{12} \text{ Hz}$                                 | Radio signals, industrial high frequency generators for heating, drying or cutting                                                                                                                                                          |
| Lightning strike                                                                        | Atmospheric weather disturbances                                                                                                                                                                                                            |
| Ionising radiation                                                                      | X-ray apparatus, radioactive material, absorption of energy leads to heating                                                                                                                                                                |
| Ultra sound                                                                             | Absorption of energy in solids/liquids leads to heating                                                                                                                                                                                     |
| Adiabatic compression and shock waves                                                   | Sudden opening of valves                                                                                                                                                                                                                    |
| Exothermic reactions                                                                    | Chemical reaction leading to heating                                                                                                                                                                                                        |

# Overview on international standards

Table 2: International standards for electrical equipment in explosive gas atmospheres

| Ignition protection category                  | US standard                 |                  | Principle                                                                                       | European standard (EN) | IEC Norm     | FM (USA)                          | UL (USA, Div.)            | UL (USA, Zone) | CSA (Canada)  |
|-----------------------------------------------|-----------------------------|------------------|-------------------------------------------------------------------------------------------------|------------------------|--------------|-----------------------------------|---------------------------|----------------|---------------|
| General provisions                            |                             |                  | Ignition protection type                                                                        | EN 60079-0             | IEC 60079-0  | FM 3600 (ISA 12.00.01)            |                           |                | CSA E60079-0  |
| Intrinsic safety                              | Ex i<br>AEx i<br>(IS)       | NEC505           | Energy limitation                                                                               | EN 60079-11            | IEC 60079-11 | FM 3610                           | UL 913                    | UL 60079-11    | CSA E60079-11 |
| Increased safety                              | Ex e<br>AEx e               | NEC505           | Constructional measures (no arcs, sparks or hot surfaces)                                       | EN 60079-7             | IEC 60079-7  | FM 3600 (ISA 12.16.01)            | UL2279 Pt.7               | UL 60079-7     | CSA E60079-7  |
| Protection by enclosure                       | tD                          | NEC505           | Exclusion of explosive atmosphere                                                               |                        |              | FM 3615 C22.2 No. 30              | e.g.hood/housing: UL 1203 |                |               |
| Flameproof enclosure                          | Ex d<br>AEx d               | NEC505           | Constructional measures (enclosing flammable parts of equipment)                                | EN 60079-1             | IEC 60079-1  | FM 3600 (ISA 12.22.01)            | UL2279 Pt.1               | UL 60079-1     | CSA E60079-1  |
| Cast enclosure                                | Ex m<br>AEx m               | NEC505           | Exclusion of potentially explosive atmosphere                                                   | EN 60 079-18           | IEC 60079-18 | FM 3600 (ISA 12.23.01)            | UL2279 Pt.18              | UL 60079-18    | CSA E60079-18 |
| Oil immersion                                 | Ex o<br>AEx o               | NEC505           | Exclusion of potentially explosive atmosphere                                                   | EN 60079-6             | IEC 60079-6  | FM 3600 (ISA 12.16.01)            | UL2279 Pt.6               | UL 60079-6     | CSA E60079-6  |
| Powder filling                                | Ex q<br>AEx q               | NEC505           | Exclusion of potentially explosive atmosphere                                                   | EN 60079-5             | IEC 60079-5  | FM 3622<br>FM 3600 (ISA 12.25.01) | UL2279 Pt.5               | UL 60079-5     | CSA E60079-5  |
| Pressurised                                   | Ex p<br>AExp<br>Typ X, Y, Z | NEC505<br>NEC500 | Exclusion of potentially explosive atmosphere                                                   | EN 60079-2             | IEC 60079-2  |                                   |                           |                |               |
| Ignition protection type "n"                  | Ex n<br>AEx n               | NEC505           | Improved industrial quality                                                                     | EN 60079-15            | IEC 60079-15 | FM 3600 (ISA 12.12.02)            | UL2279 Pt.15              | UL 60079-15    | CSA E60079-15 |
| Intrinsically safe electrical systems „i-Sys“ | Ex i                        |                  | Restriction of electrical energy within equipment and of wiring exposed to explosive atmosphere | EN 60079-25            | IEC 60079-25 |                                   |                           |                |               |
| Intrinsically safe Fieldbus systems           | Ex i                        |                  | Energy limitation                                                                               | EN 60079-27            | IEC 60079-27 |                                   |                           |                |               |
| Optical radiation                             | Ex op                       |                  | Limitation or containment of radiation intensity                                                | EN 60079-28            | IEC 60079-28 |                                   |                           |                |               |

# Zone classification in Europe

Table 3: Assignment of equipment group and category

| Equipment group | Category | Degree of protection    | Protection guarantee                                                                                                                                                                              | Operating conditions                                                                                                                                                                       |
|-----------------|----------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I               | M1       | Very high safety degree | If one installation protection measure fails, a second protection measure must guarantee the necessary safety. Even if two independent errors occur, a very high safety level remains guaranteed. | For reasons of safety, it must be possible to continue operating a product even if the atmosphere is potentially explosive.                                                                |
| I               | M2       | High safety degree      | Equipment will switch off, if a potentially explosive atmosphere occurs.                                                                                                                          | In normal operation, the protective measures must still guarantee the required safety even in difficult conditions, or if equipment is treated roughly or ambient influences have changed. |
| II              | 1        | Very high               | Two independent protective measures guarantee safety, if two faults occur independently of one another.                                                                                           | Equipment can still be used in zones 0, 1, 2(G) and 20, 21, 22 (D) and continue to be operated.                                                                                            |
| II              | 2        | High                    | Safety is guaranteed under normal operating conditions, even if common faults occur.                                                                                                              | Equipment can be used in zones 1, 2(G) and 21, 22 (D) and continues to be operational.                                                                                                     |
| II              | 3        | Normal                  | Safety is guaranteed under normal operating conditions.                                                                                                                                           | Equipment can still be used in zones 2(G) and 22 (D) and continues to be operational.                                                                                                      |

## Equipment group and categories

*Equipment group I:* Equipment intended for use in underground parts and surface installations of mines which is exposed to explosion risks from mine gases and/or combustible dusts. The assigned categories M1 and M2 are defined in the directive 94/9/EC.

*Equipment group II:* Equipment for use in all the other areas that might be endangered by an explosive atmosphere. Three subcategories – 1, 2 and 3 – are defined within this group.

## Zone classification

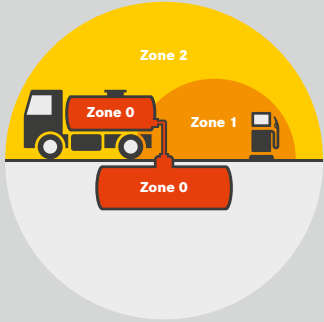
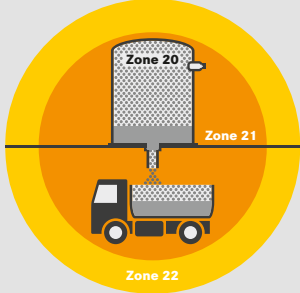
Hazardous areas are classified into zones to facilitate the selection of appropriate electrical equipment as well as the design of suitable electrical installations – in order to minimise explosion risks. In Germany, dusts

were previously divided into Zones 10 and 11. Following an EC directive, the dual classification system was transferred to a three-zone-scheme, differentiating on the basis of more detailed criteria. As an example, the allocation to a particular zone is now depending on the conductivity of the relevant dust. Conductive dust (with specific electrical resistance  $R > 103 \Omega m$ ) in Zone 22 is allocated to equipment category 2D. In such environments, only apparatus certified for the relevant category (2D) must be used. Devices for non-conductive dusts ( $R > 103 \Omega m$ ) are allocated to category 3D. For these devices, a Manufacturer's Declaration of Conformity is sufficient. In both zones, 0 and 1, only electrical equipment with a Certificate of Conformity complies with the standard –or an EC-Type Examina-

tion Certificate must be present. In addition, equipment for Zone 0 must be explicitly approved for this kind of application. In Zone 2, electrical apparatuses that may concern the basic health and safety requirements of the 94/9/EC Directive are only permitted if the manufacturer declares their compliance with the requirements of the ATEX Directive. Obviously, the equipment certified for use in Zones 0 and 1 can also be used in Zone 2.

Table 4 (refer to provides an overview on the zones of explosive gas atmospheres and the allocation of equipment for the relevant zones. The correlation between category and zones (according to the operator directive 1999/92/EC) is also shown.

**Table 4: Definitions of Zones (acc. to EN 60079-10-1)**

| Substance       | Zone                                                                                                                         | Equipment  | Illustration                                                                        |
|-----------------|------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------|
| Gases<br>Vapors | Zone 0<br><br>Areas where dangerous concentrations of flammable gases/vapors are continuously or long-term present           | 1G         |  |
|                 | Zone 1<br><br>Areas where dangerous concentrations of flammable gases/vapors are occasionally present                        | 2G, 1G     |                                                                                     |
|                 | Zone 2<br><br>Areas where dangerous concentrations of flammable gases/vapors are rarely and – in case only – briefly present | 3G, 2G, 1G |                                                                                     |
| Dust            | Zone 20<br><br>Areas where dangerous concentrations of flammable dusts occur continuously or for a long term                 | 1D         |  |
|                 | Zone 21<br><br>Areas where dangerous concentrations of flammable dusts occasionally occur                                    | 2D, 1D     |                                                                                     |
|                 | Zone 22<br><br>Areas where dangerous concentrations of flammable dusts rarely occur and, in case, only briefly               | 3D, 2D, 1D |                                                                                     |

### Type of protection

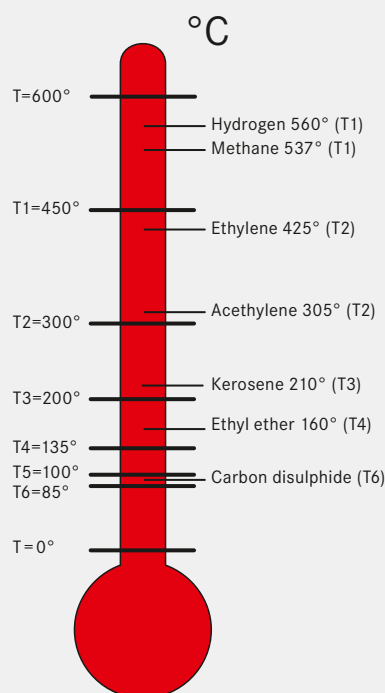
The type of protection describes various safety concepts for different applications to prevent the ignition of a potential explosive atmosphere according to European IEC EN 60079 standards. The standards of this series can be applied to equipment individually or in combination. The above spreadsheet shows the allocation of protection types to zones. Protection methods are adapted to the normative standards concerning surface temperature, clearance and creepage distances, to the identification of electrical operating equipment, the assignment of the electrical operating equipment, to the area of application and the degree of protection. For all areas with requirements going beyond basics, the respective protection methods are defined. The IEC EN 60079-0 describes general requirements for the design of electrical equipment used in explosive atmospheres. These requirements are supplemented by individual standards concerning the

types of protection such as IEC EN 60079-6 ff.

### Temperature classes

With regard to ignition protection, the surface temperature-classes of the equipment groups I and II are different (refer to Figure 1: Temperature classes [°C] of equipment group II). Temperature limits with dust  
In the case of potential dust-explosive areas, the maximum surface temperature is given as a temperature value [°C]. There is no classification into groups. Generally, the permissible temperatures for each type of dust have to be determined by experiments. The maximum surface temperature is different for a dust cloud and a dust layer. With regard to a dust cloud a safety factor has to be considered. The surface temperature of the apparatus must not exceed 2/3 of the minimum ignition temperature of the dust cloud. Deposited dust ignites earlier than a dust cloud. To provide this, a safety factor of 75 K has to be taken in account. This factor refers to the

minimal ignition temperature of a 5 mm dust layer.



**Figure 1: Temperature classes [°C] of equipment group II, according to European standards and ignition temperatures of relevant substances.**

# Gas explosion groups – European standards

Previously, all chemical gases or vapours used by the industry were classified by assigning them to two different explosion groups (I, II). Meanwhile, the former second explosion group was split in two, thus generating a third group that contains conductive and non-conductive dusts as well as flammable fibres/lint. From the explosion group, the maximum surface temperature can

be derived for electrical equipment that is used in the relevant area or atmosphere.  
Group I comprises gases creating potentially explosive atmospheres in mines (firedamp).  
In Group II, different gases, vapors and mists are considered that may create an explosive atmosphere.  
Group II is again divided into three subgroups (EN 60079-0:2009).

The classification of the subgroups depends on the substance's minimal ignition energy.

**Table 5: Gas explosion group I**

| Explosion subgroup | Gases                              | Ignition energy                                                                |
|--------------------|------------------------------------|--------------------------------------------------------------------------------|
| I                  | Firedamp (methane from coal mines) | Maximum permissible temperature depends on deposits of carbon dust in the area |

**Table 6: Gas explosion group II**

| Explosion subgroup | Gases                       | Ignition energy           |
|--------------------|-----------------------------|---------------------------|
| IIA                | Propane, acetylene          | $\approx 300\mu\text{Ws}$ |
| IIB                | Ethylene, ethanol           | $\approx 150\mu\text{Ws}$ |
| IIC                | Hydrogen, carbon disulphide | $\leq 50\mu\text{Ws}$     |

**Table 7: Gas explosion group III**

| Explosion subgroup | Gases                                                                       |
|--------------------|-----------------------------------------------------------------------------|
| IIIA               | Combustible substances (fibres)                                             |
| IIIB               | Not conductible flammable dust, specific electric resistance $> 10^3\Omega$ |
| IIIC               | Conductible flammable dust, specific electric resistance $\leq 10^3\Omega$  |

# Hazardous area classification – North America

## Definition of hazardous area

Explosion-hazardous areas are most frequently found in places where emissions of flammable gas or dust occur. In such areas, gases, vapours, mists and dusts can form explosive atmospheres in combination with air while an equipment is under normal operation or responding to an event of fault, e.g., due to wear and tear of seals or other components. Hazardous atmospheres containing inflammable gases or dusts are designated as risks to machinery and operators.

## Differences to European standards

Concerning standards, we have differences between the European IEC system and the North American electrical codes (CEC, NEC). Inter alia, differences derive from the categorisation of hazardous areas, the

design-in of equipment, and different installation standards.

The categorisation of hazardous areas in North America is derived from the National Electrical Code's (NEC/NFPA) definition of material groups in article 500. There, explosion relevant materials are divided into the following groups:

*Class I – Locations containing flammable gases, flammable liquid-produced vapors, or combustible liquid produced vapors*

*Class II – Locations containing combustible dusts*

*Class III – Locations containing fibres and flyings*

According to the NEC, the differentiation into two divisions – refer to table 8 below – gives the opportunity to determine the probability that a

material is reacting with other materials in the atmosphere.

The North American standards further categorize hazardous areas into groups depending on the properties of the combustible gases or vapors involved (refer to table 9).

**Table 8: Division of materials according to US National Electric Code (NEC)**

|            | <b>Class I<br/>Gases and vapors<br/>NEC 500.5</b>                                                                                             | <b>Class II<br/>Flammable dust and powder<br/>NEC 500.6</b>                                                                   | <b>Class III<br/>Flammable fibres or suspended<br/>particles<br/>NEC 500.7</b>                                                                        |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Division 1 | Areas containing dangerous concentrations of flammable gases, vapors or mist – continuously or occasionally under normal operating conditions | Areas containing dangerous concentrations of flammable dusts – continuously or occasionally under normal operating conditions | Areas containing dangerous concentrations of flammable fibres or suspended particles – continuously or occasionally under normal operating conditions |
| Division 2 | Areas probably not containing dangerous concentrations of flammable gases, vapors or mist – under normal operating conditions                 | Areas probably not containing dangerous concentrations of flammable dusts – under normal operating conditions                 | Areas probably not containing dangerous concentrations of flammable fibres or suspended particles – under normal operating conditions                 |



# Hazardous area classification – North America

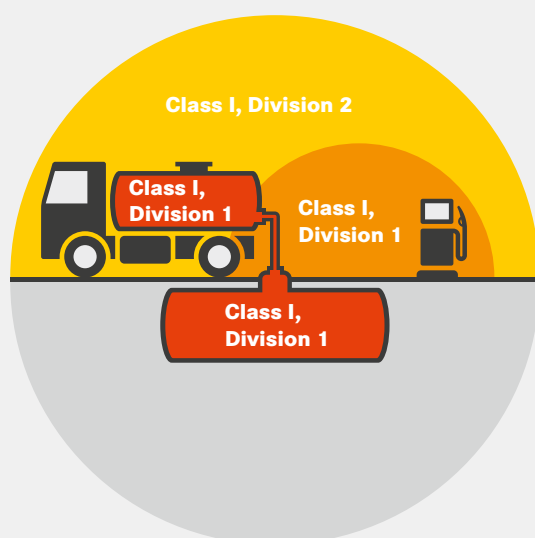
**Table 9: Subgroups of hazardous area classification**

|           |         |                                                                                                                                                                                                                                                                         |
|-----------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Class I   | Group A | Atmospheres containing acetylene                                                                                                                                                                                                                                        |
|           | Group B | Atmospheres containing hydrogen and flammable process gases with more than 30% of hydrogen in volume, or gases and vapors posing a level of risk comparable to butadiene and ethylene oxide                                                                             |
|           | Group C | Atmospheres containing ether, ethylene or gases and vapors posing the same level of risk                                                                                                                                                                                |
|           | Group D | Atmospheres containing acetone, ammonia, benzene, butane, cyclopropane, ethanol, gasoline, hexane methanol, methane, natural gas, naphtha, propane or gases and vapors posing the same level of risk                                                                    |
| Class II  | Group E | Atmospheres containing combustible metal dusts, including aluminum, magnesium and their commercial alloys, or other combustible dusts which – due to particle size, abrasiveness and conductivity – present a similar threat to the use of electrical equipment         |
|           | Group F | Atmospheres containing combustible carbonaceous dusts including carbon black, charcoal, coal, or coke dusts and consisting by more than 8 percent of total entrapped volatiles, or dusts that have been sensitized by other materials, thus causing an explosion hazard |
|           | Group G | Atmospheres containing combustible dusts not included in group E or group F, including fluorine, grain, wood, plastic and other chemicals                                                                                                                               |
| Class III |         | Atmospheres containing easily ignitable fibres and flyings, which will normally not be in suspensions in the air leading to quantities sufficient to produce explosive or ignitable mixtures                                                                            |

The illustration below (Figures 2) shows the different categorizations of classes and divisions of NEC 500 using the example of a gas station.

Since 1996, an additional section has been added to the NEC 500 standard. The new section NEC 505 is based on the IEC model, dividing the

flammable category with regard to gases and dusts into three zones (0, 1 and 2, refer to Figure 3, next page).



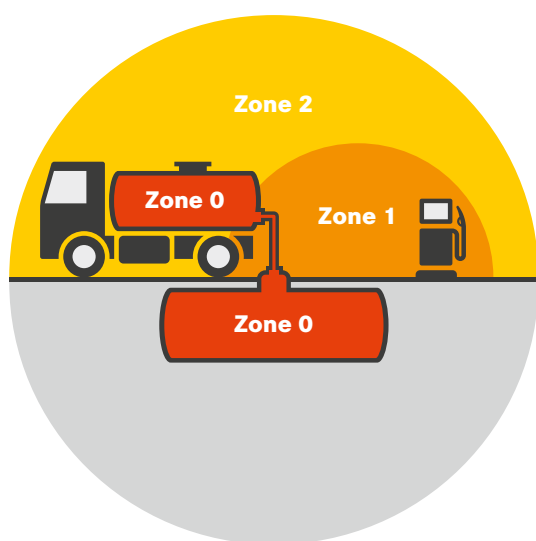
**Figure 2: Classes and divisions using the example of a gas station acc. to NEC 505**

# Hazardous area classification – Europe

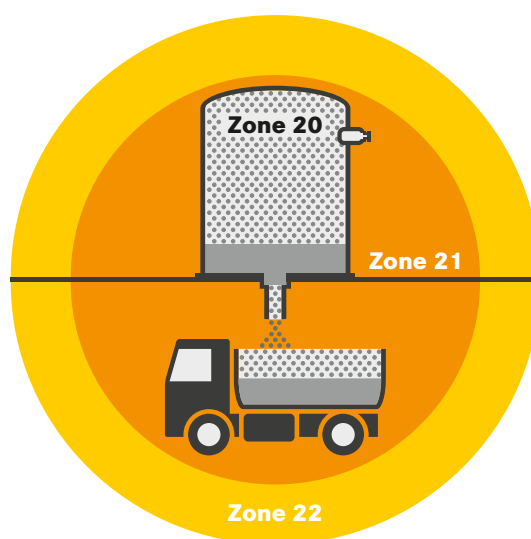
The European standard IEC/EN describes the probability of inflammable gases and dusts in three different zones.

Figure 3 describes the different gas zones by the example of a gas station.

Figure 4, refer to illustration below, explains the dust zone classification on the example of a bulk container.



**Zoneneinteilung des explosionsgefährdeten Bereichs bei Gasen, laut IEC/EN 60 079**



**Zoneneinteilung des explosionsgefährdeten Bereichs bei brennbaren Stäuben, laut IEC/EN 60 079**

**Table 10: Hazardous area zones for mixtures of air with flammable substances (acc. to IEC/EN 60 079)**

|               |                                                                                                                                                                                                     |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Zone 0</b> | Areas, where explosive atmospheres consisting of mixtures of air with flammable substances in the form of gas, vapor or mist are present continuously, for long periods of time or frequently       |
| <b>Zone 1</b> | Areas, where explosive atmospheres consisting of mixtures of air with flammable substances in the form of gas, vapor or mist under normal operation conditions are likely to occur occasionally     |
| <b>Zone 2</b> | Areas, where explosive atmospheres consisting of mixtures of air with flammable substances in the form of gas, vapor or mist under normal operation conditions are not likely to occur occasionally |

**Table 11: Hazardous area zones for combustible dusts (acc. to IEC/EN 60 079)**

|                |                                                                                                                                                                                                                        |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Zone 20</b> | Areas, where ignitable atmospheres in the form of clouds of combustible dusts in the air are present continuously, for long periods of time or frequently                                                              |
| <b>Zone 21</b> | Areas, where ignitable atmospheres in the form of clouds of combustible dust in the air under normal operational conditions are likely to occur occasionally                                                           |
| <b>Zone 22</b> | Areas, where ignitable atmospheres in the form of clouds of combustible dust in air are not likely to occur under normal operation conditions. If they occur anyway, they will persist for a short period of time only |

# Maximum surface temperatures for equipment

The European standard IEC/EN 60079-0 offers a classification for equipment used in explosion hazard areas to three different groups (refer to table 12).

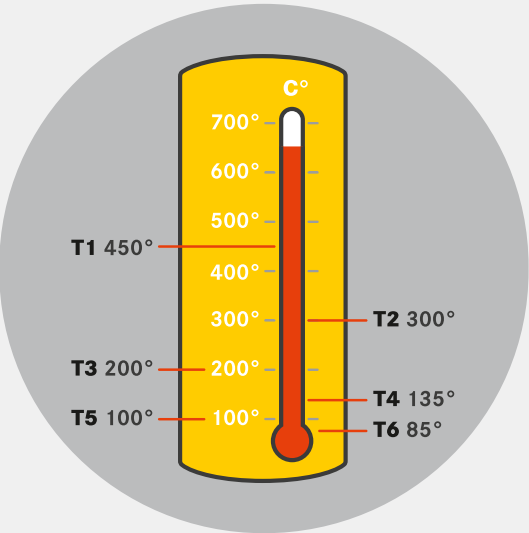
### Categorization of surface temperatures for equipment

Regarding the surface temperature of equipment, the European standard offers six different classes. The categories are defined by the maximum surface temperature for the equipment to remain functional. Figure 5 forms the categories by temperature. The temperature classes are defined

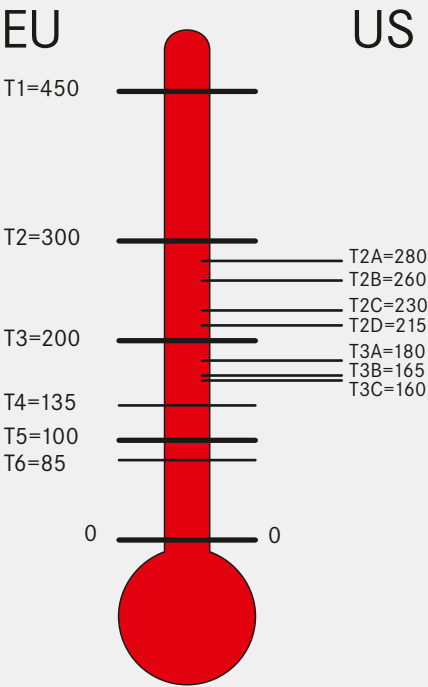
**Table 12: Equipment classification to zones acc. to IEC/EN 60 079-0**

|                  |                                                                                        |
|------------------|----------------------------------------------------------------------------------------|
| <b>Group I</b>   | Equipment used in mining where methan and coal dusts occur in the atmosphere           |
| <b>Group II</b>  | Equipment used in industrial environment where explosive gases occur in the atmosphere |
| <b>Group III</b> | Equipment used in industrial environment where explosive dusts occur in the atmosphere |

in relation to a standard environment of 40°C. If an equipment needs a different ambient temperature to be functional, this must be visibly documented on the equipment.



**Figure 5: European classification of maximum surface temperatures for equipment in explosion hazard zones**



**Figure 6: Equipment groups and maximum surface temperatures acc. to European and North American standards**

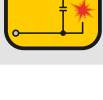
# Ignition protection types

Depending on equipment and environment the standards offer different protection principles. Table 13 shows a selection of protection types and principles from an overall of 13

protection methods, defined by the relevant IEC/EN standards. Each type of protection implies various safety concepts for different applications to prevent from the

ignition of a potential explosive atmosphere. The different categories can be applied individually or in combination. The basic standard is IEC/EN 60079-0 ff.

**Table 13: Ignition protection types in potentially explosive gas atmospheres**

| Protection types                                                                             | Basic of protection     | CENELEC     | IEC          | UL          | Zone, Class              | Protection principle              |
|----------------------------------------------------------------------------------------------|-------------------------|-------------|--------------|-------------|--------------------------|-----------------------------------|
| Ex d<br>    | Flameproof              | EN 60079 -1 | IEC 60079 -1 | UL 60079-1  | Class 1, Zone 2          | Explosion prevention              |
| Ex e<br>  | Increased safe          | EN 60079 -7 | IEC 60079-7  | UL 60079-7  | Class 1, Zone 2          | Prevention of sparks              |
| Ex m<br>  | Encapsulation           | EN 60079-18 | IEC 60079-18 | UL 60079-18 | Class 1, Zones 0 and 1   | Exclusion of explosion atmosphere |
| Ex q<br>  | Powder filling          | EN 60079-5  | IEC 60079-5  | UL 60079-5  | Class 1, Zones           | Prevention of sparks              |
| Ex tD<br> | Protection by enclosure | EN 60079-31 | IEC 60079-31 | ISA 61241-1 | Class 2, Zones 21 and 22 | Exclusion of explosion atmosphere |
| Ex p<br>  | Pressurized             | EN 60079-2  | IEC 60079-2  | UL 60079-2  | Class 1, Zone 1          | Exclusion of explosion atmosphere |
| Ex o<br>  | Oil immersion           | EN 60079-6  | IEC 60079-6  | UL 60079-6  | Class 1, Zone 1          | Exclusion of explosion atmosphere |
| Ex i<br>  | Intrinsic safe          | EN 60079-11 | IEC 60079-11 | UL 60079-11 | Class 1, Zones 0 and 1   | Energy limitation                 |

# Connecting Ex and Non-Ex areas

Han® Ex connectors are designed to meet the intrinsic safety requirements for ignition protection in explosion-hazard areas zoned 1 and 2. In intrinsically safe circuits, a limit is set to energy so that even a spark would not ignite an explosive environment. With the Han® Ex series, HARTING offers a comprehensive and well-matched connection systems consisting of hoods/housings, inserts and cable glands. Hoods and housings are made from an alloy that

can safely be used in a methane-coal atmosphere. In addition, hoods and housings offer protection IP65 (in mated position). Furthermore, the hood's/housing's blue colour indicates that an intrinsically safe circuit is present. The inserts compatible with Han® Ex allow for high-density contact arrangements, meeting the standards of the category *intrinsically safe* even in the tightest of spaces. Han® Ex connectors are designed especially for the named explosion

protection method. The intrinsic safety protection technique is based on the limitation of energy supply, thus ensuring a safe operation of electrical equipment in hazardous areas. The limitations may relate to current, voltage, capacitance and/or inductivity. Finally, a Han® Ex connector is always part of a comprehensive supply system for devices in the field, including current transfers between Ex and Non-ex areas, which is explained by Figure 7.

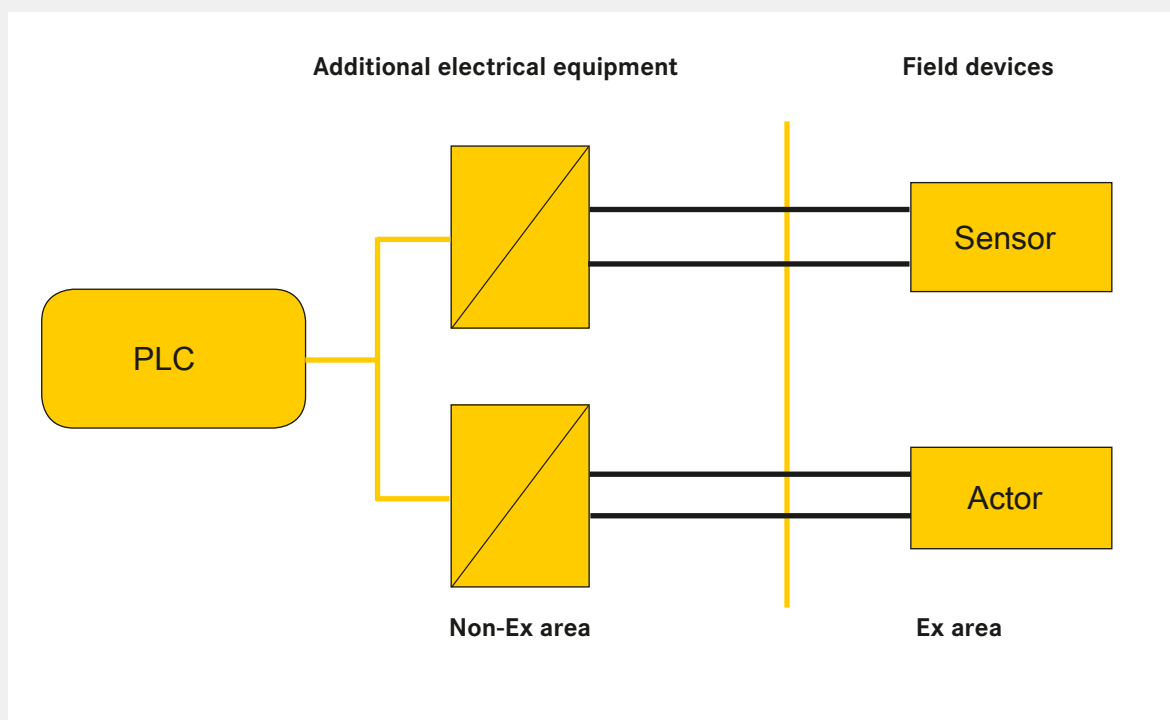


Figure 7: Han® Ex is a comprehensive connector system allowing for the safe transmission of power, signal and data between Non-Ex and Ex areas.



## Connector sets for explosion-hazardous environments

### Features

- Connector sets especially for explosion-hazardous applications
- Suitable for zone 1 and zone 2
- Hoods, housings and inserts in one set
- Inserts with compact design and a high number of connections
- Available with innovative Han-Quick Lock® termination technology

**NOTICE** Industrial connectors of the Han® Ex series are designed exclusively for the use in intrinsically safe electrical circuits of categories "ia", "ib" and "ic"!

- ▶ The explosion group is defined by the corresponding intrinsically safe equipment.
- ▶ Temperature class according to DIN EN 60079-11

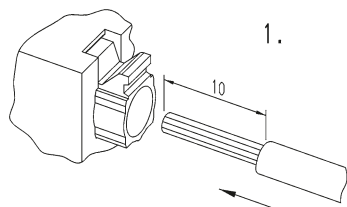
### Technical characteristics

|                                                            |                                                            |
|------------------------------------------------------------|------------------------------------------------------------|
| Specifications                                             | DIN EN 60 079-0<br>DIN EN 60 079-11                        |
| Hoods/housings                                             |                                                            |
| Material                                                   | Zinc die cast                                              |
| Colour                                                     | RAL 5015 (blue)                                            |
| Surface                                                    | Powder coated                                              |
| Locking element                                            | Stainless steel                                            |
| Lever type                                                 | Netal lever                                                |
| Seal                                                       | NBR                                                        |
| Limiting temperatures                                      | -20 °C ... +40 °C                                          |
| Protection degree acc. to DIN EN 60 529 in locked position | IP65 / IP67<br>is achieved with seal screw and cable gland |
| Inserts                                                    |                                                            |
| Number of contacts                                         | 4, 7, 8, 12                                                |
| Pollution degree                                           | 3                                                          |
| Insulation resistance                                      | ≥ 10 <sup>10</sup> Ω                                       |
| Material                                                   | Polycarbonat                                               |
| Limiting temperatures                                      | -20 °C ... +40 °C                                          |
| Mechan. working life - mating cycles                       | ≥ 500                                                      |
| Contacts                                                   |                                                            |
| Material                                                   | Copper alloy                                               |
| Surface - hard-silver plated                               | 3 µm Ag                                                    |
| Contact resistance                                         | ≤ 1 mΩ                                                     |
| Crimp termination                                          | 0.14 ... 2.5 mm <sup>2</sup><br>AWG 26 ... 14              |
| Han-Quick Lock® termination                                | 0.5 ... 2.5 mm <sup>2</sup><br>AWG 20 ... 14               |
| Max. insulation diameter                                   | 3.6 mm                                                     |

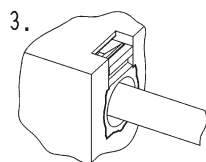
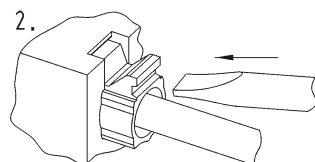
| Identification                       | Part number    | Size | Drawing | Dimensions in mm                                  |
|--------------------------------------|----------------|------|---------|---------------------------------------------------|
| <b>Han® Ex 4A Quick Lock Set</b><br> | 10 36 004 0003 | 3 A  |         | <p>Contact arrangement view: termination side</p> |
| <b>Han® Ex 8D Quick Lock Set</b><br> | 10 36 008 0007 | 3 A  |         |                                                   |

## Assembly manual

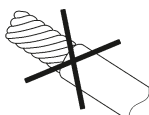
Remove cable jacket and strip the fine stranded wires.



Push the fine stranded wires into the Han-Quick Lock® contact and push the blue slide with a screw driver<sup>1)</sup> until it comes to a stop.

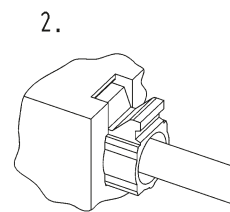
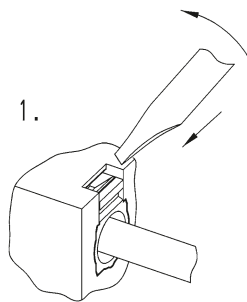


Do not twist the fine stranded wires!

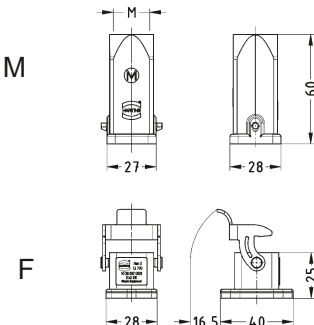
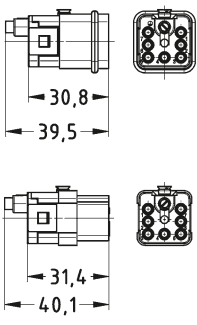
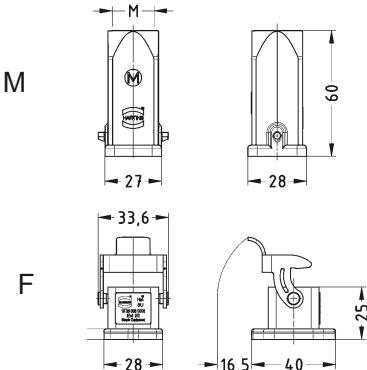
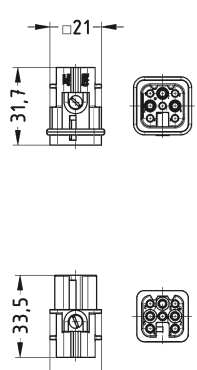
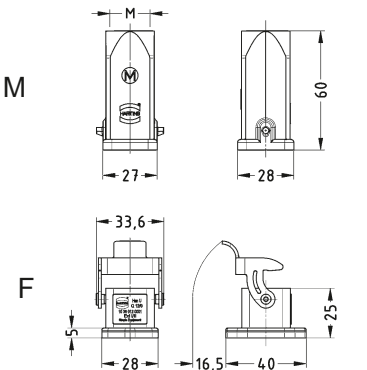
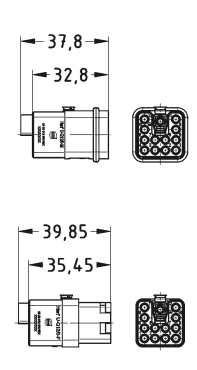


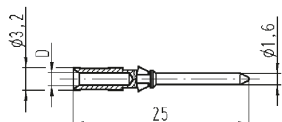
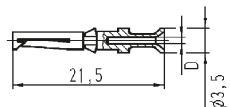
## Removal manual

Insert the screw driver<sup>1)</sup> at an angle of 45° into the opening and lever the blue slide out.



<sup>1)</sup> Screw driver: 0.4 x 2.5 mm

| Identification                                                                                                                                    | Part number    | Size | Drawing                                                                                                               | Dimensions in mm                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Han® Ex Q7 Set</b><br>Order crimp contacts separately!<br>    | 10 36 007 0001 | 3 A  |  <p>Panel cut out: 22 x 22 mm</p>   |  <p>Contact arrangement view: termination side</p> |
| <b>Han® Ex 8D Set</b><br>Order crimp contacts separately!<br>   | 10 36 008 0006 | 3 A  |  <p>Panel cut out: 22 x 22 mm</p>  |                                                   |
| <b>Han® Ex Q12 Set</b><br>Order crimp contacts separately!<br> | 10 36 012 0001 | 3 A  |  <p>Panel cut out: 22 x 22 mm</p> |                                                  |

| Identification                                                                                                                       | Wire gauge<br>mm <sup>2</sup>                 | Part number<br>Male contactFemale contact                                                                |                                                                                                          | Drawing                                                                              | Dimensions in mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |  |         |                  |                           |           |     |      |                     |        |     |      |                      |        |     |      |                     |        |      |      |                     |        |      |      |                     |        |      |      |
|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--|---------|------------------|---------------------------|-----------|-----|------|---------------------|--------|-----|------|----------------------|--------|-----|------|---------------------|--------|------|------|---------------------|--------|------|------|---------------------|--------|------|------|
| <b>Crimp contact</b><br><br>silver plated<br><br> | 0.14-0.37<br>0.5<br>0.75<br>1.0<br>1.5<br>2.5 | 09 15 000 6104<br>09 15 000 6103<br>09 15 000 6105<br>09 15 000 6102<br>09 15 000 6101<br>09 15 000 6106 | 09 15 000 6204<br>09 15 000 6203<br>09 15 000 6205<br>09 15 000 6202<br>09 15 000 6201<br>09 15 000 6206 |  |  <table><tr><th colspan="2">Wire gauge</th><th>Ø<br/>mm</th><th>Stripping length</th></tr><tr><td>0.14-0.37 mm<sup>2</sup></td><td>AWG 26-22</td><td>0.9</td><td>8 mm</td></tr><tr><td>0.5 mm<sup>2</sup></td><td>AWG 20</td><td>1.1</td><td>8 mm</td></tr><tr><td>0.75 mm<sup>2</sup></td><td>AWG 18</td><td>1.3</td><td>8 mm</td></tr><tr><td>1.0 mm<sup>2</sup></td><td>AWG 18</td><td>1.45</td><td>8 mm</td></tr><tr><td>1.5 mm<sup>2</sup></td><td>AWG 16</td><td>1.75</td><td>8 mm</td></tr><tr><td>2.5 mm<sup>2</sup></td><td>AWG 14</td><td>2.25</td><td>6 mm</td></tr></table> | Wire gauge |  | Ø<br>mm | Stripping length | 0.14-0.37 mm <sup>2</sup> | AWG 26-22 | 0.9 | 8 mm | 0.5 mm <sup>2</sup> | AWG 20 | 1.1 | 8 mm | 0.75 mm <sup>2</sup> | AWG 18 | 1.3 | 8 mm | 1.0 mm <sup>2</sup> | AWG 18 | 1.45 | 8 mm | 1.5 mm <sup>2</sup> | AWG 16 | 1.75 | 8 mm | 2.5 mm <sup>2</sup> | AWG 14 | 2.25 | 6 mm |
| Wire gauge                                                                                                                           |                                               | Ø<br>mm                                                                                                  | Stripping length                                                                                         |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |  |         |                  |                           |           |     |      |                     |        |     |      |                      |        |     |      |                     |        |      |      |                     |        |      |      |                     |        |      |      |
| 0.14-0.37 mm <sup>2</sup>                                                                                                            | AWG 26-22                                     | 0.9                                                                                                      | 8 mm                                                                                                     |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |  |         |                  |                           |           |     |      |                     |        |     |      |                      |        |     |      |                     |        |      |      |                     |        |      |      |                     |        |      |      |
| 0.5 mm <sup>2</sup>                                                                                                                  | AWG 20                                        | 1.1                                                                                                      | 8 mm                                                                                                     |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |  |         |                  |                           |           |     |      |                     |        |     |      |                      |        |     |      |                     |        |      |      |                     |        |      |      |                     |        |      |      |
| 0.75 mm <sup>2</sup>                                                                                                                 | AWG 18                                        | 1.3                                                                                                      | 8 mm                                                                                                     |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |  |         |                  |                           |           |     |      |                     |        |     |      |                      |        |     |      |                     |        |      |      |                     |        |      |      |                     |        |      |      |
| 1.0 mm <sup>2</sup>                                                                                                                  | AWG 18                                        | 1.45                                                                                                     | 8 mm                                                                                                     |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |  |         |                  |                           |           |     |      |                     |        |     |      |                      |        |     |      |                     |        |      |      |                     |        |      |      |                     |        |      |      |
| 1.5 mm <sup>2</sup>                                                                                                                  | AWG 16                                        | 1.75                                                                                                     | 8 mm                                                                                                     |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |  |         |                  |                           |           |     |      |                     |        |     |      |                      |        |     |      |                     |        |      |      |                     |        |      |      |                     |        |      |      |
| 2.5 mm <sup>2</sup>                                                                                                                  | AWG 14                                        | 2.25                                                                                                     | 6 mm                                                                                                     |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |  |         |                  |                           |           |     |      |                     |        |     |      |                      |        |     |      |                     |        |      |      |                     |        |      |      |                     |        |      |      |





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