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Amphenol-Tuchel Electronics GmbH

# eco | mate^m

## Circular Connectors

www.industrial-amphenol.com

## The Company

Amphenol-Tuchel Electronics GmbH is a member of the USA based Amphenol Corporation. With our own global presence we offer our customers exceptional technical support and worldwide service in the areas of development, production and distribution. Amphenol-Tuchel Electronics GmbH has a successful history as a partner to our customers and sets standards for connector technology.

## Quality

From the beginning of the development process, Amphenol-Tuchel Electronics GmbH gives quality considerations the top priority. Meeting customer requirements is the main focus of the product development process.
Interdisciplinary project teams with diverse backgrounds from marketing, product engineering and production guarantee the development and production of robust and reliable connector solutions.
Our quality assessment begins with the initial contact to the customer and extends through the life of the product. A satisfied customer is the measure of our success.
We strive to use environmentally friendly processes that minimize the waste of natural resources and introduction of toxins into the environment.

Certifications: TS 16949
ISO 14001
ISO 9000:2000

## General information

We reserve the right to change the design due to improvement in quality, development or production requirements.

This catalogue must not be used in any form or manner without our prior approval in writing (Copyright Law, Fair Trading Law, Civil Code).

This release replaces all former releases.

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# eco | mate$^{m}$

- New cable screw connection with clamping ring
- Strain relief and mounted gasket all in one component
- Ergonomically shaped handle for a better grip and safer handling
- Fastening for the protective caps on the receptacle housing
- One cable housing for all cable diameters (6 mm - 12,5 mm)

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## Product Description

In design and conception the eco | mate^m program meets the high requirements for applications in industrial technology. Easy operation, reduced dimensions and a more robust design are only a few of the features of the series.

The connector's main area of application is in the fields of plant construction and machine building. The connector is used for measuring and controlling applications as well as for power supply. technology. The series is comprised of a large selection of housings and shapes and offers models with screw, solder and crimp termination.

**Features:**

- Circular Connectors with 3+PE and 6+PE contacts
- Housing components made from premium molding material
- Cable housing straight or angled
- Protection class IP 65/67 in mated condition in accordance with DIN EN 60526
- Clamping ring or internal strain relief

**Advantages:**

- Quick and easy assembly
- Screwed cable gland with clamping ring
- Strain relief and mounted gasket all in one component
- Cable housing, straight or angled, for the cable diameter 6 - 12,5 mm
- Robust thread for the screwed cable gland
- Ergonomically designed product range for safe handling
- Pre-loaded ground contact
- Fastening for the protective caps on the housing of the receptacles
- The eco | mate^m program is compatible with the C16-1 series

**Additional standards:**

- The 6+PE model corresponds to DIN 9684-1 interface to the signal transmission on inside cabin applications for agricultural machines and tractors

| Testhouse | | Characteristics |
|---|---|---|
| VDE | | 3+PE, 400 V, 16 A<br>6+PE, 250 V, 10 A (solder version)<br>6+PE, 250 V, 13 A (crimp version) |
| SEV | | 3+PE, 400 V, 16 A<br>6+PE, 250 V, 10 A (solder version)<br>6+PE, 250 V, 13 A (crimp version) |
| UL [1)] | | 3+PE, 400V, 16A<br>6+PE, 250V, 13A |
| CSA | | 3+PE, 250 V, 12 A<br>6+PE, 250 V, 8 A |

In general approvals refer to versions of the connector series. Test report upon request.

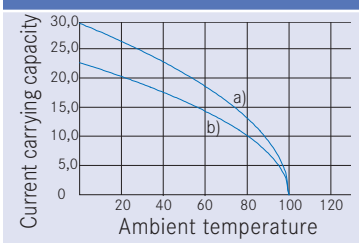
[1)] Please refer to „Conditions of Acceptability"

| General Characteristics | Standard | Characteristics | | |
|---|---|---|---|---|
| Number of contacts | | 3 + PE | 6 + PE | |
| View on male mating side | | | | |
| **Electrical Characteristics** | | screw type | solder type | crimp type |
| Rated voltage | DIN EN 60664-1 [1] | 400 V | 250 V | 250 V |
| Rated impulse withstand voltage | DIN EN 60664-1 [1] | 6000 V | 4000 V | |
| Pollution degree | DIN EN 60664-1 [1] | 3 | 3 | |
| Installation (overvoltage) category | DIN EN 60664-1 [1] | III | III | |
| Material group | DIN EN 60664-1 [1] | II | II | |
| Current carrying capacity | DIN EN 60512-5-2, Test 5b | 16 A / + 55 °C | 12 A/ + 55 °C | 13 A / + 55 °C |
| Insulation resistance | DIN EN 60512-3-1, Test 3a | ≥ $10^8$ Ω | ≥ $10^8$ Ω | |
| Contact resistance | DIN EN 60512, Test 2a | ≤ 5 m Ω | ≤ 5 m Ω | |
| **Climatic Characteristics** | | | | |
| Climatic category | DIN EN 60068-1 | 40 / 100 / 56 | 40 / 125 / 56 | |
| Operating temperature | | -40°C ... +100°C | -40°C ... +125°C | |
| **Mechanical Characteristics** | | | | |
| Degree of protection | DIN EN 60529 | IP 65 / IP 67 | | |
| Insertion and withdrawal force | DIN EN 60512-13-2, Test 13b | ≤ 15 N | ≤ 30 N | |
| Mechanical operation | DIN EN 60512, Test 9a | ≥ 500 mating cycles | | |
| **Materials** | | | | |
| Housing material | | PA 6.6 / PA 6 | | |
| Dielectric material | | PA 6.6 / PA 6 | | |
| Gasket material | | Neopren | | |
| Material lace for protective cap | | TPE | | |
| Contact plating | | silver plated / gold plated | | |
| **Other Characteristics** | | | | |
| Termination technique | | screw | solder | crimp |
| Wire gauge / AWG | | 0,75 - 2,5 mm² AWG 18-14 | max. 0,75 mm² AWG 18 | 0,14 - 1,5 mm² AWG 26 - 16 |
| Flammability | UL 94 | VO | | |
| Locking system | | round thread | | |

[1] DIN EN 60664-1 ≙ VDE 0110-1 ≙ IEC 60664-1

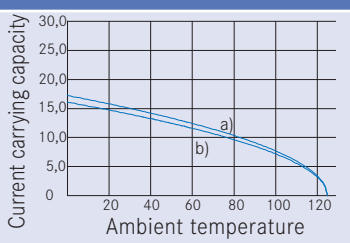
The stated technical values refer to the use as connector without breaking capacity (COC). If these components are used as plug and socket device a reduced current carrying capacity has to be considered. The characteristics have to be requested from the manufacturer.

## Derating Curves




**No. of contacts 3 + PE**

all contacts under load
a) wire gauge 2,5 mm²
b) wire gauge 1,5 mm²



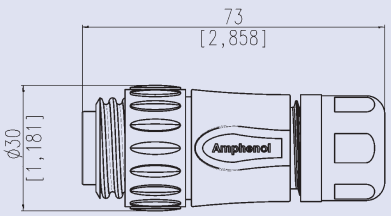

**No. of contacts 6 + PE**

all contacts under load
a) wire gauge 1,5 mm², stamped crimp contacts
b) wire gauge 0,75 mm², stamped solder contacts

Male cable connector straight

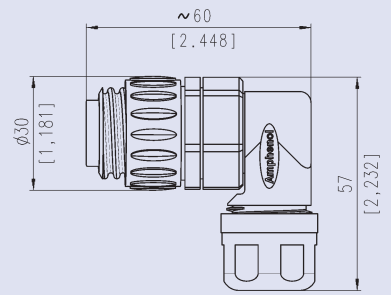
Version strain relief with clamping ring: 6 - 12,5 mm

Version with internal cable clamping and clamping ring: 6 - 10 mm



| No. of contacts | Termination technique | Back shell color | Part number Strain relief with clamping ring Contact plating | | Part number Internal cable clamping + clamping ring Contact plating | |
|---|---|---|---|---|---|---|
| | | | Silver plated | Gold plated | Silver plated | Gold plated |
| 3 + PE | screw | blue | C016 20H003 100 10 | C016 20H003 200 10 | C016 20H003 110 10 | C016 20H003 210 10 |
| 3 + PE | screw | black | C016 20H003 100 12 | C016 20H003 200 12 | C016 20H003 110 12 | C016 20H003 210 12 |
| 6 + PE | solder | blue | C016 30H006 100 10 | C016 30H006 200 10 | C016 30H006 110 10 | C016 30H006 210 10 |
| 6 + PE | solder | black | C016 30H006 100 12 | C016 30H006 200 12 | C016 30H006 110 12 | C016 30H006 210 12 |
| 6 + PE | crimp[1)] | blue | C016 10H006 000 10 | C016 10H006 000 10 | C016 10H006 010 10 | C016 10H006 010 10 |
| 6 + PE | crimp[1)] | black | C016 10H006 000 12 | C016 10H006 000 12 | C016 10H006 010 12 | C016 10H006 010 12 |

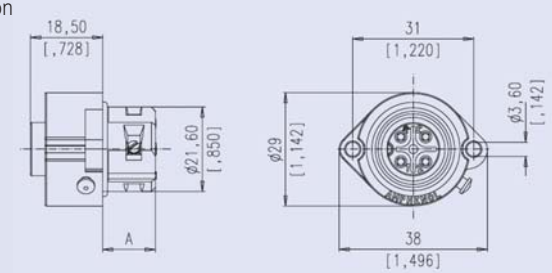
Male cable connector right angled, strain relief with clamping ring cable diameter 6 - 12,5 mm



| No. of contacts | Termination technique | Back shell color | Part number Strain relief with clamping ring Contact plating | |
|---|---|---|---|---|
| | | | Silver plated | Gold plated |
| 3 + PE | screw | blue | C016 20K003 100 10 | C016 20K003 200 10 |
| 3 + PE | screw | black | C016 20K003 100 12 | C016 20K003 200 12 |
| 6 + PE | solder | blue | C016 30K006 100 10 | C016 30K006 200 10 |
| 6 + PE | solder | black | C016 30K006 100 12 | C016 30K006 200 12 |
| 6 + PE | crimp[1)] | blue | C016 10K006 000 10 | C016 10K006 000 10 |
| 6 + PE | crimp[1)] | black | C016 10K006 000 12 | C016 10K006 000 12 |

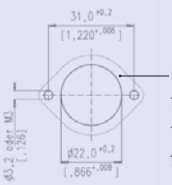
Female receptacle, screw termination (3+PE), solder termination or crimp version (6+PE)

Dimension A
Screw version: 13,5 mm
Solder version: 14,2 mm
Crimp version: 16,5 mm



| No. of contacts | Termination technique | Back shell color | Part number Contact plating | |
|---|---|---|---|---|
| | | | Silver plated | Gold plated |
| 3 + PE | screw | black | C016 20G003 100 12 | C016 20G003 200 12 |
| 6 + PE | solder | black | C016 30G006 100 12 | C016 30G006 200 12 |
| 6 + PE | crimp[1)] | black | C016 10G006 000 12 | C016 10G006 000 12 |

Mounting cut-out[2)]



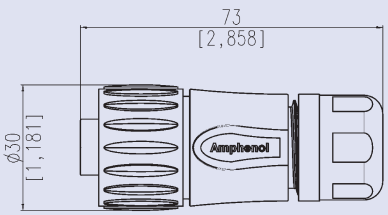
For sealing reason this surface needs to be level and free of burrs.

[1)] Crimp contacts see page 10 / Crimp tooling see catalogue “Tools”.
[2)] Mounting hole Ø 22 without chamfer, suitable sealing for screws is necessary. Tightening torque 0,8Nm.

Female cable connector straight

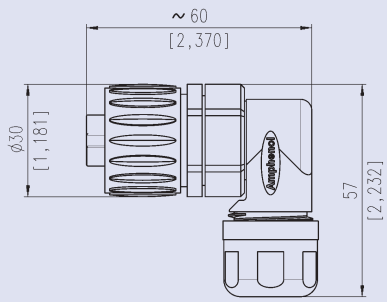
Version strain relief with clamping ring: 6 - 12,5 mm

Version with internal cable clamping and clamping ring: 6 - 10 mm



| No. of contacts | Termination technique | Back shell color | Part number Strain relief with clamping ring Contact plating | | Part number Internal cable clamping + clamping ring Contact plating | |
|---|---|---|---|---|---|---|
| | | | Silver plated | Gold plated | Silver plated | Gold plated |
| 3 + PE | screw | blue | C016 20D003 100 10 | C016 20D003 200 10 | C016 20D003 110 10 | C016 20D003 210 10 |
| 3 + PE | screw | black | C016 20D003 100 12 | C016 20D003 200 12 | C016 20D003 110 12 | C016 20D003 210 12 |
| 6 + PE | solder | blue | C016 30D006 100 10 | C016 30D006 200 10 | C016 30D006 110 10 | C016 30D006 210 10 |
| 6 + PE | solder | black | C016 30D006 100 12 | C016 30D006 200 12 | C016 30D006 110 12 | C016 30D006 210 12 |
| 6 + PE | crimp[1)] | blue | C016 10D006 000 10 | C016 10D006 000 10 | C016 10D006 010 10 | C016 10D006 010 10 |
| 6 + PE | crimp[1)] | black | C016 10D006 000 12 | C016 10D006 000 12 | C016 10D006 010 12 | C016 10D006 010 12 |

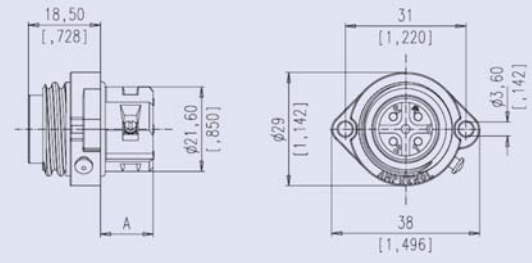
Female cable connector right angled, strain relief with clamping ring cable diameter 6 - 12,5 mm



| No. of contacts | Termination technique | Back shell color | Part number Strain relief with clamping ring Contact plating | |
|---|---|---|---|---|
| | | | Silver plated | Gold plated |
| 3 + PE | screw | blue | C016 20F003 100 10 | C016 20F003 200 10 |
| 3 + PE | screw | black | C016 20F003 100 12 | C016 20F003 200 12 |
| 6 + PE | solder | blue | C016 30F006 100 10 | C016 30F006 200 10 |
| 6 + PE | solder | black | C016 30F006 100 12 | C016 30F006 200 12 |
| 6 + PE | crimp[1)] | blue | C016 10F006 000 10 | C016 10F006 000 10 |
| 6 + PE | crimp[1)] | black | C016 10F006 000 12 | C016 10F006 000 12 |

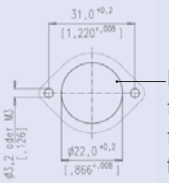
Male receptacle, screw termination (3+PE), solder termination or crimp version (6+PE)

Dimension A
Screw version: 14,0 mm
Solder version: 12,0 mm
Crimp version: 16,5 mm



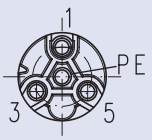
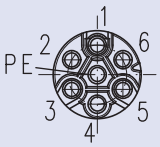
| No. of contacts | Termination technique | Back shell color | Part number Contact plating | |
|---|---|---|---|---|
| | | | Silver plated | Gold plated |
| 3 + PE | screw | black | C016 20C003 100 12 | C016 20C003 200 12 |
| 6 + PE | solder | black | C016 30C006 100 12 | C016 30C006 200 12 |
| 6 + PE | crimp[1)] | black | C016 10C006 000 12 | C016 10C006 000 12 |

Mounting cut-out[2)]




For sealing reason this surface needs to be level and free of burrs.

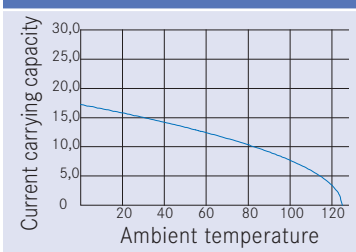
[1)] Crimp contacts see page 10 / Crimp tooling see catalogue “Tools”.
[2)] Mounting hole Ø 22 without chamfer, suitable sealing for screws is necessary. Tightening torque 0,8 Nm.

| General Characteristics | Standard | Characteristics | |
|---|---|---|---|
| Number of contacts | | 3 + PE | 6 + PE |
| View on male mating side | |   |   |
| **Electrical Characteristics** | | crimp type | |
| Rated voltage | DIN EN 60664-1 [1] | 600 V | |
| Rated impulse withstand voltage | DIN EN 60664-1 [1] | 6000 V | |
| Pollution degree | DIN EN 60664-1 [1] | 3 (mated) | |
| Installation (overvoltage) category | DIN EN 60664-1 [1] | III | |
| Material group | DIN EN 60664-1 [1] | II | |
| Current carrying capacity | DIN EN 60512-5-2, Test 5b | 14 A / + 40 °C | |
| Insulation resistance | DIN EN 60512-3-1, Test 3a | ≥ $10^8$ Ω | |
| Contact resistance | DIN EN 60512, Test 2a | ≤ 5 m Ω | |
| **Climatic Characteristics** | | | |
| Climatic category | DIN EN 60068-1 | 40 / 125 / 56 | |
| Operating temperature | | -40°C ... +125°C | |
| **Mechanical Characteristics** | | | |
| Degree of protection | DIN EN 60529 | IP 65 | |
| Insertion and withdrawal force | DIN EN 60512-13-2, Test 13b | ≤ 35 N | |
| Mechanical operation | DIN EN 60512, Test 9a | ≥ 500 mating cycles | |
| **Materials** | | | |
| Housing material | | PA 6.6 / PA 6 | |
| Dielectric material | | PA 6.6 / PA 6 | |
| Gasket material | | Neopren | |
| Contact plating | | silver plated / gold plated | |
| **Other Characteristics** | | | |
| Termination technique | | crimp | |
| Wire gauge / AWG | | 0,14 - 1,5 mm² AWG 26 - 16 | |
| Flammability | UL 94 | VO | |
| Locking system | | round thread | |

[1] DIN EN 60664-1 ≙ VDE 0110-1 ≙ IEC 60664-1

The stated technical values refer to the use as connector without breaking capacity (COC). If these components are used as plug and socket device a reduced current carrying capacity has to be considered. The characteristics have to be requested from the manufacturer.

## Derating Curves




**No. of contacts 6 + PE**

all contacts under load
wire gauge 1,5 mm²,
stamped crimp contacts

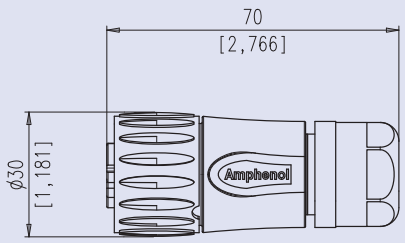
## Testhouse / Characteristics

| Testhouse | Characteristics |
|---|---|
| UL [1] | 3+PE, 600 V, 13 A at AWG 16<br>3+PE, 600 V, 5 A at AWG 26<br>6+PE, 600 V, 13 A at AWG 16<br>6+PE, 600 V, 5 A at AWG 26 |
| CSA | 3+PE, 600 V, 10,5 A at AWG 16<br>6+PE, 600 V, 10,5 A at AWG 16 |

In general approvals refer to versions of the connector series. Test report upon request.

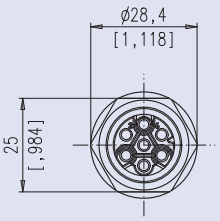
[1] Please refer to „Conditions of Acceptability“

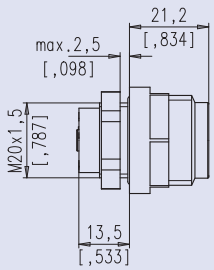
Female cable connector straight,
with clamping ring,
cable diameter 6 - 12,5 mm



| No. of contacts | Termination technique | Back shell color | Part number Strain relief with clamping ring |
|---|---|---|---|
| 3 + PE | crimp[1)] | black | C016 10D003 806 12 |
| 6 + PE | crimp[1)] | black | C016 10D006 806 12 |

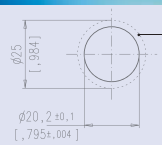
Male receptacle,
crimp version



| No. of contacts | Termination technique | Back shell color | Part number |
|---|---|---|---|
| 3 + PE | crimp[1)] | black | C016 10P003 806 12 |
| 6 + PE | crimp[1)] | black | C016 10P006 806 12 |

Mounting cut-out

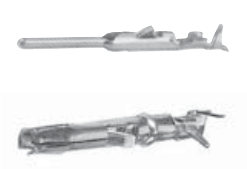



For sealing reason this surface needs to be level and free of burrs.

[1)] Crimp contacts see page 10 / Crimp tooling see catalogue “Tools”.
[2)] Tightening torque 4 -5 Nm.

* standard dust cups don’t fit on high voltage versions special caps upon request
* Thread size M20 x 1,5 [2)]
* If turn protection is required, we recommend to glue receptacles

Stamped single contacts



Stamped contacts on reel
for hand crimping tools
200 pcs.

Stamped contacts on reel for crimping machines
2000 pcs. feeds to the right

2000 pcs. feeds to the left

**Crimp Contacts, Pin for Standard Versions**

| Contact Ø in mm | Insulation Ø in mm | No. of contacts | Wire gauge | Supplied as | Pieces | Part number Contact plating | |
|---|---|---|---|---|---|---|---|
| | | | | | | Silver plated | Gold plated |
| 1,6 | 1,0 - 2,0 | 6 + PE | 0,14 - 0,5 mm² | Single contact | 100 | VN 01 016 0011 (1) | VN 01 016 0011 (2) |
| | | | | Contact on reel | 200 | ZN 01 016 0011 (1) | ZN 01 016 0011 (2) |
| | | | | right | 2000 | HN 01 016 0011 (1) | HN 01 016 0011 (2) |
| | | | | left | 2000 | TN 01 016 0011 (1) | TN 01 016 0011 (2) |
| 1,6 | 1,8 - 2,8 | 6 + PE | 0,5 - 1,5 mm² | Single contact | 100 | VN 01 016 0004 (1) | VN 01 016 0004 (2) |
| | | | | Contact on reel | 200 | ZN 01 016 0004 (1) | ZN 01 016 0004 (2) |
| | | | | right | 2000 | HN 01 016 0004 (1) | HN 01 016 0004 (2) |
| | | | | left | 2000 | TN 01 016 0004 (1) | TN 01 016 0004 (2) |

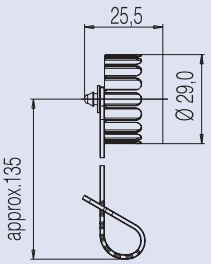
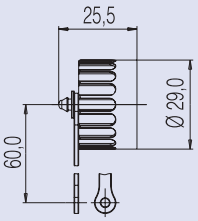
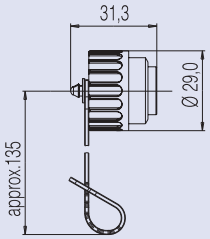
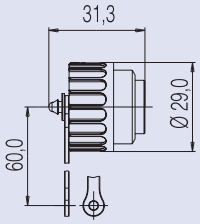
**Crimp Contacts, Pin for High Voltage Versions**

| Contact Ø in mm | Insulation Ø in mm | No. of contacts | Wire gauge | Supplied as | Pieces | Part number Contact plating | |
|---|---|---|---|---|---|---|---|
| | | | | | | Silver plated | Gold plated |
| 1,6 | 1,0 - 2,0 | 6 + PE | 0,14 - 0,5 mm² | Single contact | 100 | VN 01 016 0003 (1) | VN 01 016 0003 (2) |
| | | | | Contact on reel | 200 | ZN 01 016 0003 (1) | ZN 01 016 0003 (2) |
| | | | | right | 2000 | HN 01 016 0003 (1) | HN 01 016 0003 (2) |
| | | | | left | 2000 | TN 01 016 0003 (1) | TN 01 016 0003 (2) |
| 1,6 | 1,8 - 2,8 | 6 + PE | 0,5 - 1,5 mm² | Single contact | 100 | VN 01 016 0002 (1) | VN 01 016 0002 (2) |
| | | | | Contact on reel | 200 | ZN 01 016 0002 (1) | ZN 01 016 0002 (2) |
| | | | | right | 2000 | HN 01 016 0002 (1) | HN 01 016 0002 (2) |
| | | | | left | 2000 | TN 01 016 0002 (1) | TN 01 016 0002 (2) |

**Crimp Contacts, Socket for Standard and High Voltage Version**

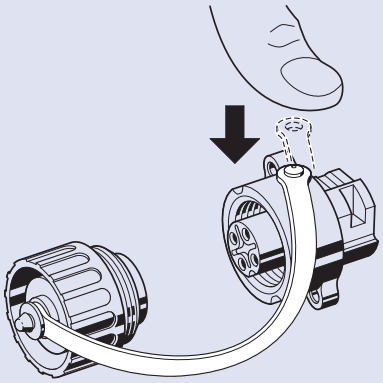
| Contact Ø in mm | Insulation Ø in mm | No. of contacts | Wire gauge | Supplied as | Pieces | Part number Contact plating | |
|---|---|---|---|---|---|---|---|
| | | | | | | Silver plated | Gold plated |
| 1,6 | 1,0 - 2,0 | 6 + PE | 0,14 - 0,5 mm² | Single contact | 100 | VN 02 016 0003 (1) | VN 02 016 0003 (2) |
| | | | | Contact on reel | 200 | ZN 02 016 0003 (1) | ZN 02 016 0003 (2) |
| | | | | right | 2000 | HN 02 016 0003 (1) | HN 02 016 0003 (2) |
| | | | | left | 2000 | TN 02 016 0003 (1) | TN 02 016 0003 (2) |
| 1,6 | 1,8 - 2,8 | 6 + PE | 0,5 - 1,5 mm² | Single contact | 100 | VN 02 016 0002 (1) | VN 02 016 0002 (2) |
| | | | | Contact on reel | 200 | ZN 02 016 0002 (1) | ZN 02 016 0002 (2) |
| | | | | right | 2000 | HN 02 016 0002 (1) | HN 02 016 0002 (2) |
| | | | | left | 2000 | TN 02 016 0002 (1) | TN 02 016 0002 (2) |

Find our tools in the catalogue “Tools”.

| Description | Figure | Part number | Figure | Part number |
|---|---|---|---|---|
| Protecitve cover for male cable connector and male receptacle |  | for male cable connector<br>C016 00U000 010 12 |  | for male receptacle<br>C016 00U000 000 12 |
| Protective cover for female cable connector and female receptacle |  | for female cable connector<br>C016 00V000 010 12 |  | for female receptacle<br>C016 00V000 000 12 |

Protective caps for 600V version upon request

## Mounting of the protective covers on the back shell, male or female receptacles



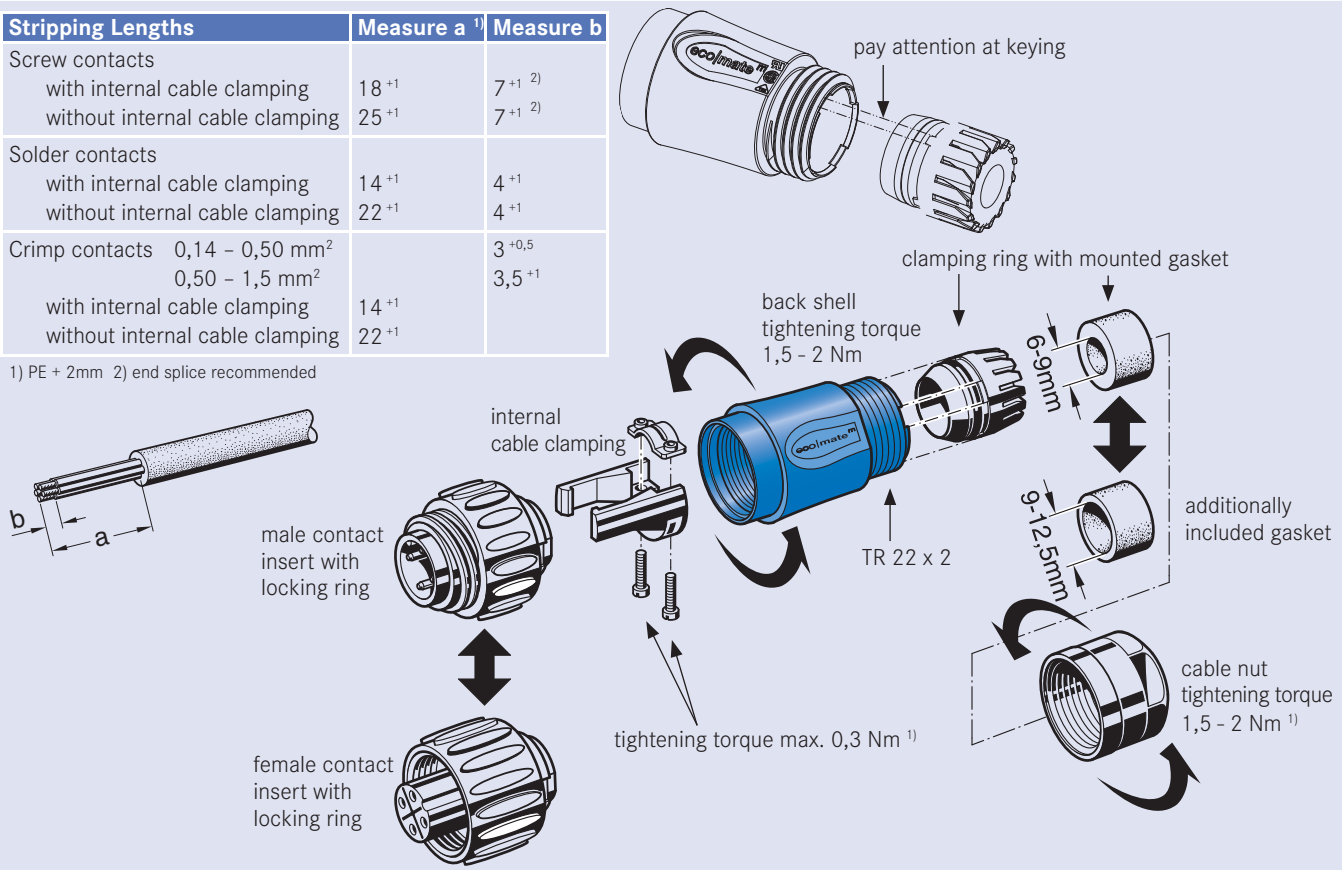
| Description | Figure | Part number |
|---|---|---|
| Back shell,<br>right angled with clamping ring<br>Packaging unit 10 pcs. | | Back shell color:<br>blue: C016 G09 042 G10 X [1]<br>black: C016 G09 041 G10 X [1] |
| Cable clamp<br>for all straight cable connectors,<br>Packaging units 10 pcs. | | Cable clamp diameter<br>Ø 6 - 10 mm<br>N 16 110 2000 X [1] |

[1] X is synonymous for packaging unit 10 pcs.

## Mounting Instruction, straight cable connector

| Stripping Lengths | Measure a [1] | Measure b |
|---|---|---|
| Screw contacts | | |
| with internal cable clamping | 18 +1 | 7 +1 [2] |
| without internal cable clamping | 25 +1 | 7 +1 [2] |
| Solder contacts | | |
| with internal cable clamping | 14 +1 | 4 +1 |
| without internal cable clamping | 22 +1 | 4 +1 |
| Crimp contacts 0,14 – 0,50 mm² | | 3 +0,5 |
| 0,50 – 1,5 mm² | | 3,5 +1 |
| with internal cable clamping | 14 +1 | |
| without internal cable clamping | 22 +1 | |

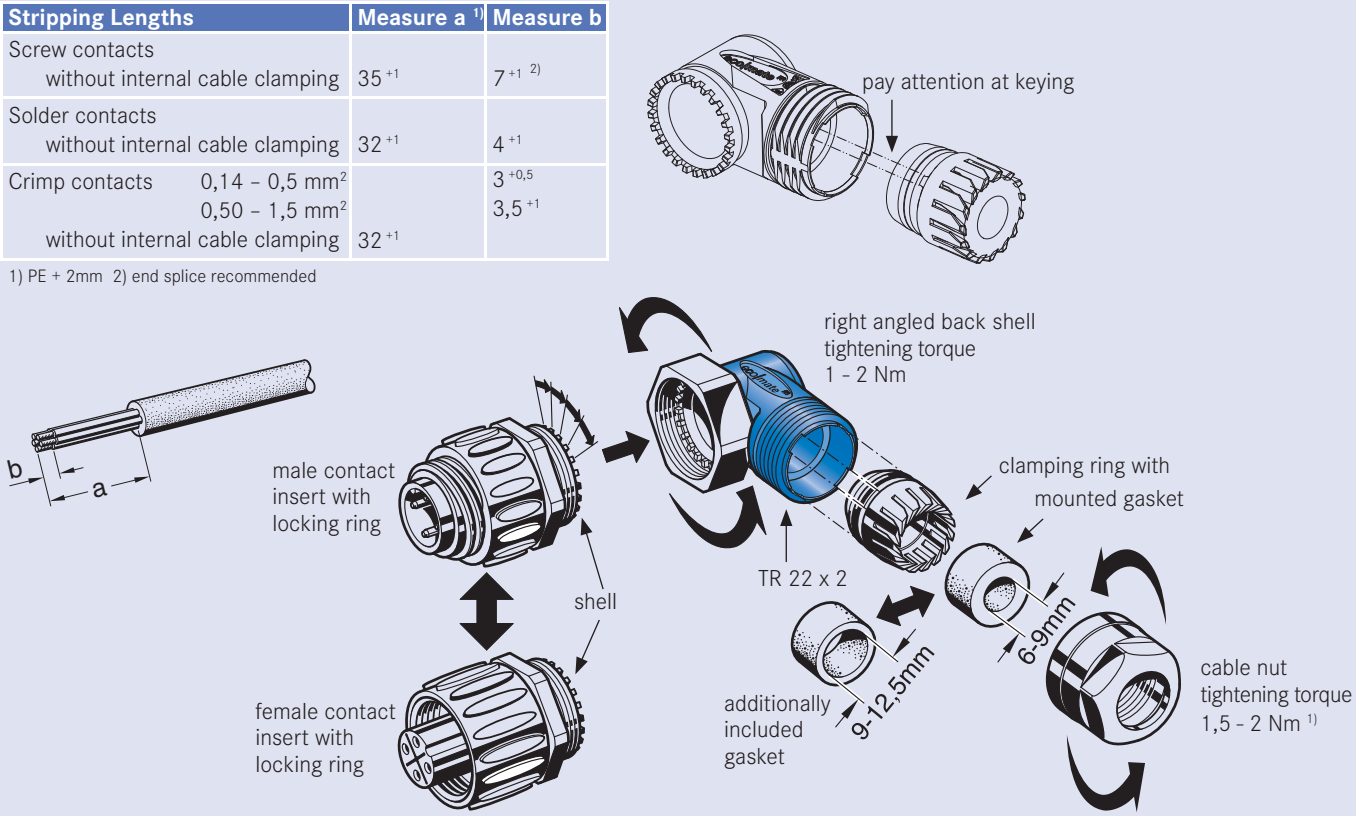
1) PE + 2mm 2) end splice recommended




## Mounting Instruction, right angled cable connector

| Stripping Lengths | Measure a [1] | Measure b |
|---|---|---|
| Screw contacts | | |
| without internal cable clamping | 35 +1 | 7 +1 [2] |
| Solder contacts | | |
| without internal cable clamping | 32 +1 | 4 +1 |
| Crimp contacts 0,14 – 0,5 mm² | | 3 +0,5 |
| 0,50 – 1,5 mm² | | 3,5 +1 |
| without internal cable clamping | 32 +1 | |

1) PE + 2mm 2) end splice recommended




[1] The tightening torque figures can vary depending on the cable you use.

## Order Information

**Color coding**
Backshells of cable connectors are available in different colors upon request. Min order quantity = 1000 pcs. per type.

**Mechanical coding**
Achieved by special coding pins which are inserted into contact cavities. Min. order quantitiy = 1000 pcs. per type.

**Crimp version**
Order number do not include crimp contacts. Please order separately (see page 10).

**Crimp tooling**
Ask for our catalogue “Tools”

## Aufbau der Bestellnummer

C016 – Serie

30 – **Termination Technique**
10 = Crimp (6 + PE)
20 = Screw (3 + PE)
30 = Solder (6 + PE)

D – **Style**
H = Male cable connector
D = Female cable connector
K = Right angled male cable connector
F = Right angled female cable connector
C = Male receptacle
G = Female receptacle
P = Male receptacle

006 – **Number of Poles**
003 = 3 + PE
006 = 6 + PE

1 – **Contact Plating**
1 = silver plated
2 = gold plated
0 = without contacts

00 – **Strain relief**
00 = Receptacle or cable connector with clamping ring
10 = Cable connector with internal cable clamp

10 – **Version**
10 = Cable connector in blue/black
12 = Cable connector or receptacle in black

The example shows a female cable connector 6 + PE.

## Screw Termination

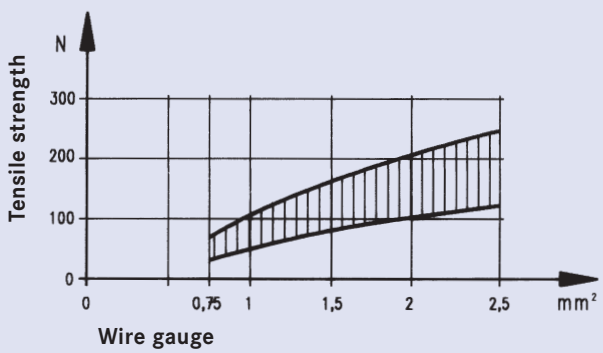
Screw clamps are designed acc. to EN 60999-1/VDE 06095.1. Chart 1 below shows the screw size depending on wire size and the required clamping and testing torque.

**Chart 1**

| Wire size (mm²) | 1,5 | 2,5 |
|---|---|---|
| Screw size | M 3 | M 3 |
| Test torque (Ncm) | max. 50 | max. 50 |

Diagram 1 below shows the range of tensile strength for a screw connection with a clamp screw M3, fastened with a torque of 50 Ncm, depending on the wire size.

**Diagram 1**




This comparison chart allows a cross reference between American Wire Gauge (AWG) and metric wire sizes (mm²).

**Chart 2**

| AWG | Wire composition | Wire diameter | Wire size |
|---|---|---|---|
| 30 | 1 x 0,25<br>7 x 0,10 | 0,25 mm<br>0,36 mm | 0,05 mm²<br>0,06 mm² |
| 28 | 1 x 0,32<br>7 x 0,13 | 0,32 mm<br>0,38 mm | 0,08 mm²<br>0,09 mm² |
| 26 | 1 x 0,40<br>7 x 0,16<br>19 x 0,10 | 0,40 mm<br>0,48 mm<br>0,51 mm | 0,13 mm²<br>0,14 mm²<br>0,15 mm² |
| 24 | 1 x 0,51<br>7 x 0,20<br>19 x 0,13 | 0,51 mm<br>0,61 mm<br>0,64 mm | 0,21 mm²<br>0,23 mm²<br>0,24 mm² |
| 22 | 1 x 0,64<br>7 x 0,25<br>19 x 0,16 | 0,64 mm<br>0,76 mm<br>0,81 mm | 0,33 mm²<br>0,36 mm²<br>0,38 mm² |
| 20 | 1 x 0,81<br>7 x 0,32<br>19 x 0,20 | 0,81 mm<br>0,97 mm<br>1,02 mm | 0,52 mm²<br>0,56 mm²<br>0,62 mm² |
| 18 | 1 x 1,02<br>19 x 0,25 | 1,02 mm<br>1,27 mm | 0,79 mm²<br>0,96 mm² |
| 16 | 19 x 0,29 | 1,44 mm | 1,23 mm² |
| 14 | 19 x 0,36 | 1,80 mm | 1,95 mm² |
| 12 | 19 x 0,46 | 2,29 mm | 3,09 mm² |
| 10 | 37 x 0,40 | 3,10 mm | 4,60 mm² |
| 8 | 133 x 0,29 | 4,0 mm | 8,80 mm² |
| 6 | 133 x 0,36 | 5,5 mm | 13,5 mm² |

It is to be noted that wires of the same AWG number but with different composition have slightly different mm².

## Crimp Termination

A crimp connection is a non-detachable electrical connection between a wire and a crimp contact produced with the crimp technology.
Precise crimping dies which are matched to the crimp barrel and the wire size and a defined deformation result in a reliable electrical connection.
There are open crimp barrels (stamped contacts) and closed crimp barrels (turned contacts).

The main advantages of crimp connections are:
- Efficient termination of contacts
- Reproducible terminations achieve consistent electrical and mechanical results

The requirements for crimp connections are defined in IEC 60352 Part 2 / DIN EN 60352 Part 2.

An important point of the quality of a crimp connection is the achieved tensile strength of the termination.
Easily measured, the tensile strength is a practible means for quality control purposes.
Diagram 2 below shows the required minimum tensile strength for open and closed barrels depending on the wire size.

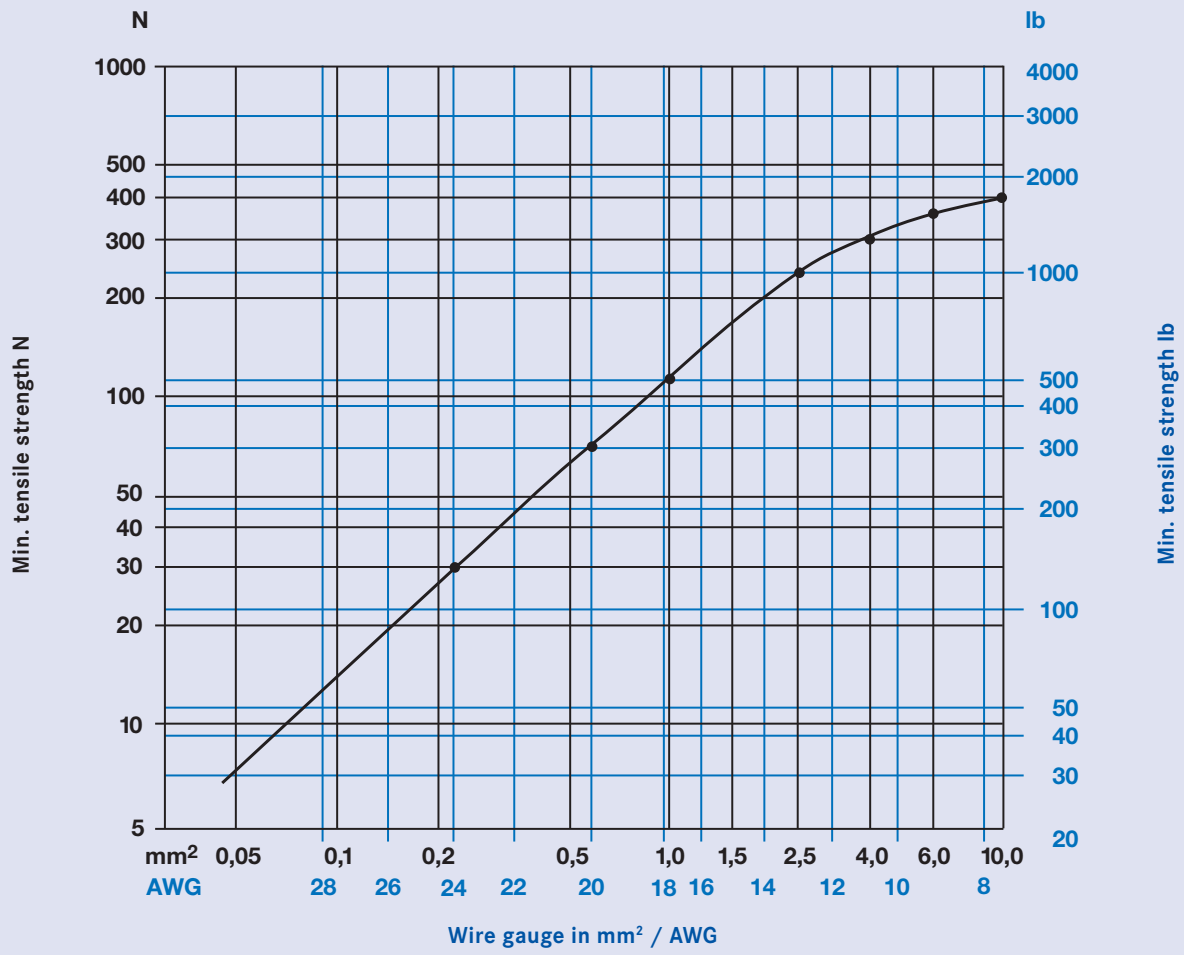
**Assembly instructions**
For crimp contacts use the released crimp tool.

The insertion and extraction of crimp contacts shall only be approved with the corresponding insertion/extraction tool.

**A detailed description of the crimp technology can be found in our crimp tooling catalogues.**

**Crimp contacts are in this catalogue on page 10.**

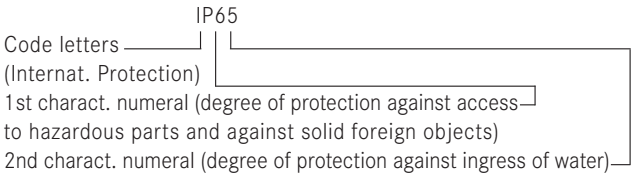
**Diagram 2**



## Degree of Protection

Electrical devices to which connectors belong to have to be protected for safety reasons from outside influences like dust, foreign objects, direct contact, moisture and water. This protection is provided on industrial connectors by its housings with their latching devices and sealed cable entries. The degree of protection can be selected depending on the type of intended use. The standard IEC 60529 and/or DIN EN 60529/VDE 0470 Part 1 has specified the degree of protection and divided into several classes.

The degree of protection is indicated in the following way:




The following charts 4 an 5 give an overview about all protection degrees.

**Chart 4**

| 1st charact. numeral | Brief description | Definition |
|---|---|---|
| 0 | Non-protected | – |
| 1 | Protected against access to hazardous parts with the back of a hand. Protected against solid foreign objects of ≥ 50mm Ø. | The probe, sphere of 50mm Ø, shall not fully penetrate and shall have adequate clearance from hazardous parts. |
| 2 | Protected against access to hazardous parts with a finger. Protected against solid foreign objects of ≥ 12,5mm Ø. | The jointed test finger of 12mm Ø, 80mm length, shall have adequate clearance from hazardous parts. The probe, sphere of 12,5mm Ø, shall not fully penetrate. |
| 3 | Protected against access to hazardous parts with a tool. Protected against solid foreign objects of ≥ 2,5mm Ø. | The probe of 2,5mm Ø shall not penetrate at all. |
| 4 | Protected against access to hazardous parts with a wire. Protected against solid foreign objects of ≥ 1mm Ø. | The probe of 1mm Ø shall not penetrate at all. |
| 5 | Protected against access to hazardous parts with a wire. Dust-protected. | The probe of 1mm Ø shall not penetrate. Intrusion of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the device or to impair safety. |
| 6 | Protected against access to hazardous parts with a wire Dust-tight. | The probe of 1mm Ø shall not penetrate. No intrussion of dust. |

**Chart 5**

| 2nd charact. numeral | Brief description | Definition |
|---|---|---|
| 0 | Non-protected | – |
| 1 | Protected against vertically falling water drops | Vertically falling drops shall have no harmful effects. |
| 2 | Protected against vertically falling water drops when enclosure tilted up to 15° | Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angel up to 15° on either side of the vertical. |
| 3 | Protected against spraying water | Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects. |
| 4 | Protected against splashing water | Water splashed against the enclosure from any direction shall have no harmful effects. |
| 5 | Protected against water jets | Water projected in jets against the enclosure from any direction shall have no harmful effects. |
| 6 | Protected against powerful water jets | Water projected in powerful jets against the enclosure from any direction shall have no harmful effects. |
| 7 | Protected against the effects of temporary immersion in water | Intrusion of water in quantities causing harmful effects shall not be possible when the enclosure is temporalily immersed in water for 30 min. in 1m depth. |
| 8 | Protected against the effects of continous immersion in water | Intrusion of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7. |
| 9K [1)] | Protected against water during high pressure/steam jet cleaning | Water projected in powerful jets with high pressure against the enclosure from any direction shall have no harmful effects. |

[1)] Remark: Numeral acc. to DIN 40050 part 9, vehicles IP code.

# Remarks / Safety Classification

**1. General Remarks**

These connectors are designed and produced in conformity with the low voltage directive (73/23/EWG) respectively Gerätesicherheitsgesetz (German law) and are especially in accordance with the standards DIN EN 61984 / IEC 61984 (VDE0627); IEC 60664-1 (VDE 0110-1) and IEC 60529.
The connectors may be used only within the technical ratings.
All technical data refer to mated connectors under live conditions.
The safety of the connector system depends on the correct selection of products, proper assembly of the connector device and a precise fit of the connectors.

**2. Application Remarks**

Connectors with / without breaking capacity must be used according to specified technical ratings.
The technical data represents the initial value of mated parts under predetermined conditions and length of time.These values could change with different test parameters or product requirements.
The connectors of the eco | mate^m series are designed for the areas of application including the construction and installation of controlling and electrical devices.
The product has been tested for the intended purposes only. If the connection is used other than originally intended, or in another manner that we have not previously tested, the consumer assumes full responsibility.

All rated data for the connectors listed in this catalogue are based on over-voltage category III and pollution degree 3 for electronic applications if not stated differently. Connectors were completely mated according to their respective safety locking mechanism. Selection and testing of connectors with / without breaking capacity to meet specific product or industrial requirements such as rated voltage and the related clearances and creepage distances are the responsibility of the user.

**3. Assembling Remarks**

Protection against electrical shock of the termination of the connectors shall be secured by correct mounting. Connectors of the same or different series being mounted side by side may be protected against incorrect mating by the use of coding options. Care must be taken to ensure the parts are correctly mated and screws are tightened with the proper torque.

**4. Termination Remarks**

Cable connectors are effectively secured when using the strain relief (internal clamping ring). All cable properties or specifications must becompatible with the connector design and materials.
Please make sure that the usability of the cable in conjunction with the clamping ring is given.
Designated wire conductors must be terminated to the correct poles in the connector.
Crimp contacts must be fully inserted into the plastic housing and strain relief assured with a slight tug on the wire.
Wire should be stripped correctly according to printed specifications to insure no electrical contact can be made between the conductors. There should be no nicked or cut strains during the stripping action.

| Part No. | Page | Part No. | Page | Part No. | Page | Part No. | Page |
|---|---|---|---|---|---|---|---|
| C016 00U000 000 12 | 11 | C016 20F003 100 12 | 7 | C016 30H006 100 10 | 6 | TN 01 016 0011 (1) | 10 |
| C016 00U000 010 12 | 11 | C016 20F003 200 10 | 7 | C016 30H006 100 12 | 6 | TN 01 016 0011 (2) | 10 |
| C016 00V000 000 12 | 11 | C016 20F003 200 12 | 7 | C016 30H006 110 10 | 6 | TN 02 016 0002 (1) | 10 |
| C016 00V000 010 12 | 11 | C016 20G003 100 12 | 6 | C016 30H006 110 12 | 6 | TN 02 016 0002 (2) | 10 |
| C016 10C006 000 12 | 7 | C016 20G003 200 12 | 6 | C016 30H006 200 10 | 6 | TN 02 016 0003 (1) | 10 |
| C016 10D003 806 12 | 9 | C016 20H003 100 10 | 6 | C016 30H006 200 12 | 6 | TN 02 016 0003 (2) | 10 |
| C016 10D006 000 10 | 7 | C016 20H003 100 12 | 6 | C016 30H006 210 10 | 6 | VN 01 016 0002 (1) | 10 |
| C016 10D006 000 12 | 7 | C016 20H003 110 10 | 6 | C016 30H006 210 12 | 6 | VN 01 016 0002 (2) | 10 |
| C016 10D006 010 10 | 7 | C016 20H003 110 12 | 6 | C016 30K006 100 10 | 6 | VN 01 016 0003 (1) | 10 |
| C016 10D006 010 12 | 7 | C016 20H003 200 10 | 6 | C016 30K006 100 12 | 6 | VN 01 016 0003 (2) | 10 |
| C016 10D006 806 12 | 9 | C016 20H003 200 12 | 6 | C016 30K006 200 10 | 6 | VN 01 016 0004 (1) | 10 |
| C016 10F006 000 10 | 7 | C016 20H003 210 10 | 6 | C016 30K006 200 12 | 6 | VN 01 016 0004 (2) | 10 |
| C016 10F006 000 12 | 7 | C016 20H003 210 12 | 6 | C016 G09 041 G10 X | 11 | VN 01 016 0011 (1) | 10 |
| C016 10G006 000 12 | 6 | C016 20K003 100 10 | 6 | C016 G09 042 G10 X | 11 | VN 01 016 0011 (2) | 10 |
| C016 10H006 000 10 | 6 | C016 20K003 100 12 | 6 | HHN 01 016 0002 (1) | 10 | VN 02 016 0002 (1) | 10 |
| C016 10H006 000 12 | 6 | C016 20K003 200 10 | 6 | HN 01 016 0002 (2) | 10 | VN 02 016 0002 (2) | 10 |
| C016 10H006 010 10 | 6 | C016 20K003 200 12 | 6 | HN 01 016 0003 (1) | 10 | VN 02 016 0003 (1) | 10 |
| C016 10H006 010 12 | 6 | C016 30C006 100 12 | 7 | HN 01 016 0003 (2) | 10 | VN 02 016 0003 (2) | 10 |
| C016 10K006 000 10 | 6 | C016 30C006 200 12 | 7 | HN 01 016 0004 (1) | 10 | ZN 01 016 0002 (1) | 10 |
| C016 10K006 000 12 | 6 | C016 30D006 100 10 | 7 | HN 01 016 0004 (2) | 10 | ZN 01 016 0002 (2) | 10 |
| C016 10P003 806 12 | 9 | C016 30D006 100 12 | 7 | HN 01 016 0011 (1) | 10 | ZN 01 016 0003 (1) | 10 |
| C016 10P006 806 12 | 9 | C016 30D006 110 10 | 7 | HN 01 016 0011 (2) | 10 | ZN 01 016 0003 (2) | 10 |
| C016 20C003 100 12 | 7 | C016 30D006 110 12 | 7 | HN 02 016 0002 (1) | 10 | ZN 01 016 0004 (1) | 10 |
| C016 20C003 200 12 | 7 | C016 30D006 200 10 | 7 | HN 02 016 0002 (2) | 10 | ZN 01 016 0004 (2) | 10 |
| C016 20D003 100 10 | 7 | C016 30D006 200 12 | 7 | HN 02 016 0003 (1) | 10 | ZN 01 016 0011 (1) | 10 |
| C016 20D003 100 12 | 7 | C016 30D006 210 10 | 7 | HN 02 016 0003 (2) | 10 | ZN 01 016 0011 (2) | 10 |
| C016 20D003 110 10 | 7 | C016 30D006 210 12 | 7 | N 16 110 2000 X | 11 | ZN 02 016 0002 (1) | 10 |
| C016 20D003 110 12 | 7 | C016 30F006 100 10 | 7 | TN 01 016 0002 (1) | 10 | ZN 02 016 0002 (2) | 10 |
| C016 20D003 200 10 | 7 | C016 30F006 100 12 | 7 | TN 01 016 0002 (2) | 10 | ZN 02 016 0003 (1) | 10 |
| C016 20D003 200 12 | 7 | C016 30F006 200 10 | 7 | TN 01 016 0003 (1) | 10 | ZN 02 016 0003 (2) | 10 |
| C016 20D003 210 10 | 7 | C016 30F006 200 12 | 7 | TN 01 016 0003 (2) | 10 | | |
| C016 20D003 210 12 | 7 | C016 30G006 100 12 | 6 | TN 01 016 0004 (1) | 10 | | |
| C016 20F003 100 10 | 7 | C016 30G006 200 12 | 6 | TN 01 016 0004 (2) | 10 | | |

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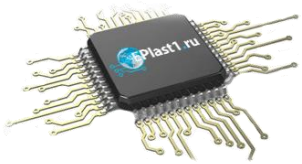


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