# COMPACT MULTIPOLE CONNECTORS

F SERIES

LEMO

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# General Production Programme

**Connectors**

Unipole from 2 to 150 Amps
Coaxial 50 and 75 Ω
Coaxial 50 Ω (NIM-CAMAC)
Coaxial 50 Ω for frequency → 12 GHz
Multicoaxial 50 and 75 Ω
- Multipole from 2 to 68 contacts

Multipole up to 106 contacts
High Voltage 3, 5, 8, 10, 15, 30 and 50 kV cc
Multi High Voltage 3, 5, and 10 kV cc
Triaxial 50 and 75 Ω
Quadrax
Mixed: High Voltage (HV) + Low Voltage (LV)
Mixed: Coax + LV and Triax + LV
Thermocouple and multithermocouple
Fibre optic singlemode and multimode
- Multi Fibre optic
- Mixed: fibre optic + LV

Mixed: fibre optic + HV + LV
Fluidic and Multifluidic
Mixed: fluidic + LV
Subminiature
- Miniature
- Sockets for printed circuit board

Remote handling shell
- Watertight socket

Hermaphroditic shell
Rectangular connectors
Sealed (pressure and/or vacuum) socket
Plastic shell
- With aluminium outer shell

With stainless steel outer shell
With microswitch

**Patch Panels** All audio-video and HDTV applications

**Adaptors** For BNC, C, UHF, N, CINCH, GEN-RADIO connectors
For TNC, SMA connectors

**Accessories**

Insulator for crimp contacts
- Crimp contacts

Coaxial contacts
Triaxial contacts
- Fibre optic contacts

Fluidic contactss
- Caps

Bend relief
- Heatshrink boot
- Washers
- Nuts

**Tooling**

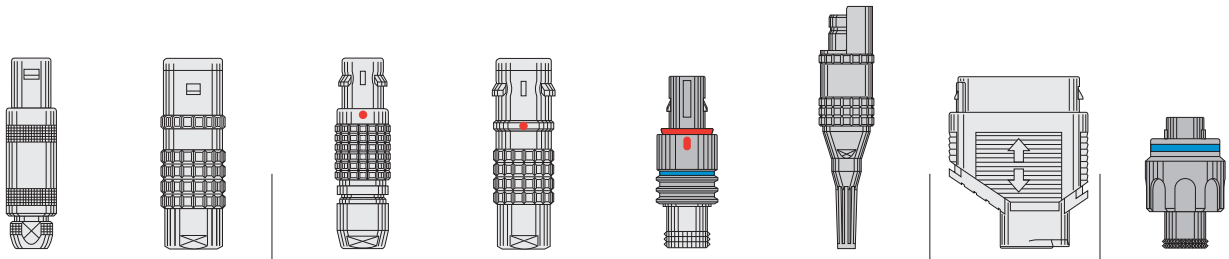
Assembly tool
- Crimping tools
- Positioners
- Extractors
- Banding tool
- Fibre optic termination workstation and tools

**On request**

Connectors with special housing
Special mixed configuration
Custom design
Assembly onto cable

- Connectors, accessories and tools found in this catalogue.

# Main Characteristics and Types



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Series** | **Standard** | **Watertight** | **Keyed** | **Keyed Watertight** | **Compact keyed** | **Hermaphroditic** | **Rectangular** | **Screw** |
| | 01 / 00 (unipole)<br>00 (NIM-CAMAC)<br>05 / R0 / 1D<br>0S to 6S<br>0A / 4A / 2C<br>1Y-3Y-6Y | 0E to 6E<br>3T<br>4M | 00 (multipole)<br>0B to 5B<br>2G / 5G | 0K to 5K<br>2N to 5N | FF to 5F | SH / MH | RR / 0R / 1R | 03<br>0V to 5V<br>0W to 5W<br>2U to 5U<br>0M-1M-2M |
| **Latching** | Push-Pull | | | | | | | Screw |
| **Key** | Stepped insert | | Key (G) or other key-way code | | Key (N) or other key-way code | Hermaphroditic shell | Key G or A | Key or stepped insert |
| **Shell** | Metal or plastic | Metal | Metal or plastic | Metal | | | Plastic | Metal |
| **Insert** | Stepped insert or cylindrical | | Cylindrical | | | Stepped insert | Rectangular | Stepped insert or cylindrical |
| **Contact termination** | Solder or print | | Solder, crimp or print | | Crimp or print | Solder, crimp or print | Crimp or print | Solder crimp or print |
| **Contact type** | Coaxial, triaxial, unipole, multipole HV, quadrax, fluidic, thermocouple | | Multipole, fibre optic, HV, fluidic, thermocouple | | Multipole, fibre optic | | Multipole, HV, coaxial, fluidic | Multipole, coaxial, triaxial |
| **Mixed config.** | LV + coax, LV + HV | | LV + coax, LV + triax, LV + HV, LV + FO, LV + fluidic | | LV + FO | | LV + coax, LV + HV, LV + fluidic | LV + coax, LV + triax, LV + FO, LV + fluidic |

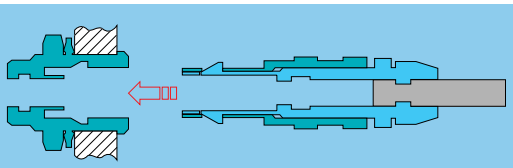
## Series and Types

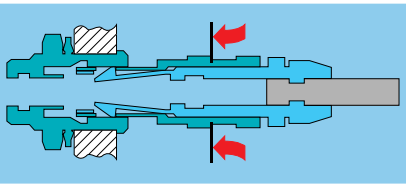
| | Series | Types | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Unipole | Coaxial 50 Ω | Coaxial 75 Ω | Multipole | High Voltage | Triaxial 50 Ω | Triaxial 75 Ω | Quadrax | Multi HV | Multi Coaxial | Mixed HV+LV | Mixed Coax+LV | Mixed Triax+LV | Fibre Optic | Multi Fibre Optic | Mixed FO+LV | Fluidic | Multi fluidic | Mixed fluidic+LV | Thermocouple |
| **Standard** | 01 | | ● | | | | | | | | | | | | | | | | | | |
| | 00 | ● | ● | | | | ● | | | | | | | | | | | ● | | | |
| | 05 | | | | | ● | | | | | | | | | | | | | | | |
| | R0 | | ● | | | | | | | | | | | | | | | | | | |
| | 0A | | ● | ● | | | | | | | | | | | | | | | | | |
| | 0S | ● | ● | | ● | ● | ● | | | | | | | | | | | | | | ● |
| | 1S | ● | ● | ● | ● | ● | ● | | | | | | | | | | | | | | ● |
| | 2S | ● | ● | ● | ● | ● | ● | ● | | | | ● | | | | | | | | | ● |
| | 3S | ● | ● | ● | ● | ● | ● | ● | | ● | | ● | ● | | | | | | | | |
| | 4S | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | | | | | | | | |
| | 5S | ● | ● | ● | ● | | | | | ● | ● | ● | ● | | | | | | | | |
| | 6S | | | | ● | | | | | | ● | | ● | | | | | | | | |
| | 1D | | | | | | | | ● | | | | | | | | | | | | |
| | 2C | | ● | | ● | | | | | | | | | | | | | | | | |
| | 4A | | | | | | | ● | | | | | | | | | | | | | |
| | 1Y-3Y-6Y | | | | | ● | | | | | | | | | | | | | | | |
| **Watertight** | 0E | ● | ● | | ● | ● | ● | | | | | | | | | | | | | | ● |
| | 1E | ● | ● | ● | ● | ● | ● | | | | | | | | | | | | | | ● |
| | 2E | ● | ● | ● | ● | ● | ● | ● | | | | ● | | | | | | | | | ● |
| | 3E | ● | ● | ● | ● | ● | ● | ● | | ● | | ● | ● | | | | | | | | |
| | 4E | ● | ● | ● | ● | | ● | ● | | | | ● | ● | | | | | | | | |
| | 5E | ● | | | ● | | | | | ● | ● | ● | ● | | | | | | | | |
| | 6E | | | | ● | | | | | | ● | | ● | | | | | | | | |
| | 3T | | | ● | | | | ● | | | | | | | | | | | | | |
| | 4M | | | | | | ● | ● | | | | | | | | | | | | | |
| **Keyed** | 00 | | | | ● | | | | | | | | | | ● | | | | | | ● |
| | 0B | | | | ● | | | | | | | | | | ● | | | ● | | | ● |
| | 1B | | | | ● | | | | | | | ● | ● | | | | ● | | | | ● |
| | XB | | | | ● | | | | | | | | | | | | | | | | |
| | 2B | | | | ● | | | | | ● | ● | ● | ● | ● | | ● | ● | | | ● | ● |
| | 3B | | | | ● | | | | | | ● | ● | ● | ● | | ● | ● | | ● | ● | |
| | 4B | | | | ● | | | | | ● | ● | ● | ● | ● | | ● | ● | | | ● | |
| | 5B | | | | ● | | | | | ● | ● | ● | ● | ● | | ● | ● | | | | |
| | 2G | | | | ● | | | | | | | | | | | | | | | | |
| | 5G | | | | | | | | | ● | | | | | | | | | | | |
| **Keyed watertight** | 0K | | | | ● | | | | | | | | | | ● | | | | | | ● |
| | 1K | | | | ● | | | | | | | ● | ● | | | | ● | | | | ● |
| | 2K | | | ● | ● | | | | | ● | ● | ● | ● | ● | | ● | ● | | | ● | ● |
| | 3K | | | ● | ● | | | | | | ● | ● | ● | ● | | ● | ● | | ● | ● | |
| | 4K | | | | ● | | | | | ● | ● | ● | ● | ● | | ● | ● | | | ● | |
| | 5K | | | | ● | | | | | ● | ● | ● | ● | ● | | ● | ● | | | | |
| | 2N to 5N | ● | ● | ● | ● | | ● | ● | | | ● | | ● | ● | | ● | ● | | ● | ● | ● |
| **Compact keyed** | FF | | | | ● | | | | | | | | | | | | | | | | |
| | 0F | | | | ● | | | | | | | | | | | | | | | | |
| | 1F | | | | ● | | | | | | | | | | | | | | | | |
| | 2F | | | | ● | | | | | | | | | | | ● | ● | | | | |
| | 3F | | | | ● | | | | | | | | | | | | | | | | |
| | 4F | | | | ● | | | | | | | | | | | | | | | | |
| | LF | | | | ● | | | | | | | | | | | | | | | | |
| | 5F | | | | ● | | | | | | | | | | | | | | | | |
| **Hermaphroditic** | SH-MH | | | | ● | | | | | | | | | | | ● | ● | | | | |
| **Rectangular** | RR | | | | ● | | | | | | | | | | | | | | | | |
| | 0R | | | | ● | | | | | | | ● | ● | | | | | | | ● | |
| | 1R | | | | ● | | | | | | | ● | ● | | | | | | | ● | |
| **Screw** | 03 | | ● | | ● | | | | | | | | | | | | | | | | |
| | 0V to 5V | ● | ● | ● | ● | | ● | ● | | | | | ● | | | | | | | | |
| | 0W to 5W | | | | ● | | | | | | ● | | ● | ● | | ● | ● | | | ● | ● |
| | 2U to 5U | | | | ● | | | | | | ● | | ● | ● | | ● | ● | | | | |
| | 0M-1M-2M | | | | ● | | | | | | | | | | | | | | | | |

**Note:** ● = included in this catalogue, ● = available but not included in this catalogue.

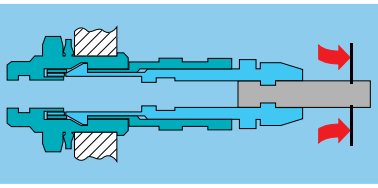
## LEMO's Push-Pull Self-Latching Connection System

This self-latching system is renowned worldwide for its easy and quick mating and unmating features. It provides absolute security against vibration, shock or pull on the cable, and facilitates operation in a very limited space.

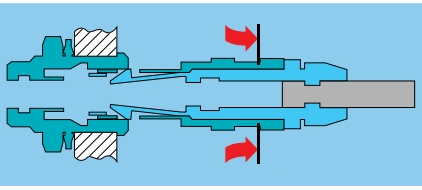




The LEMO self-latching system allows the connector to be mated by simply pushing the plug axially into socket.

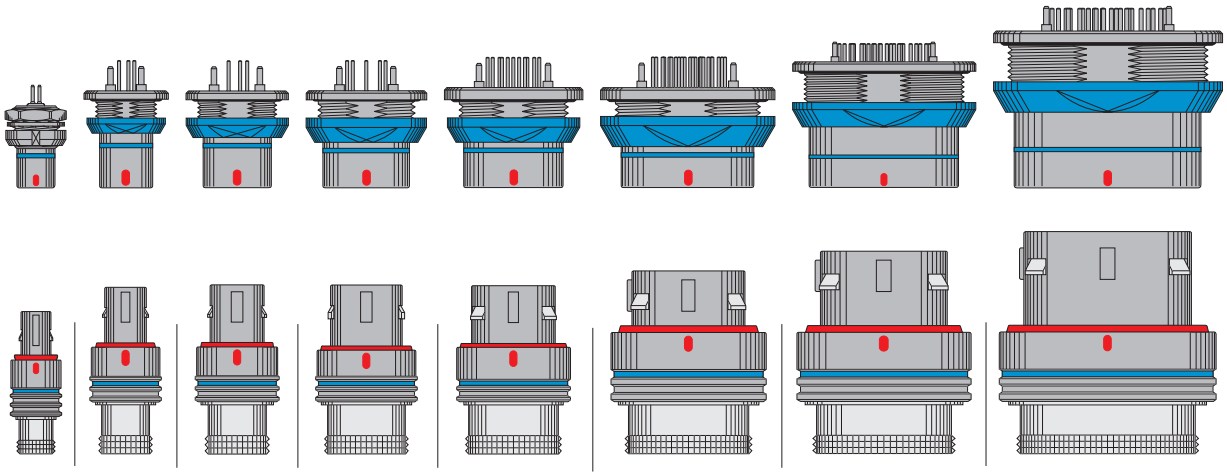


Once firmly latched, connection cannot be broken by pulling on the cable or any other component part other than the outer release sleeve.



When required, the connector is disengaged by a single axial pull on the outer release sleeve. This first disengages the latches and then withdraws the plug from the socket.

## F Series Production Programme



| Series | | FF | 0F | 1F | 2F | 3F | 4F | LF | 5F |
|---|---|---|---|---|---|---|---|---|---|
| Cable Ø range (mm) | min. | 2.2 | 3.8 | 3.8 | 3.8 | 3.8 | 5.3 | 6.3 | 7.4 |
| | max. | 9 | 11 | 13 | 16 | 18 | 25 | 27 | 34 |
| Number of LV contacts | | 3, 4 | 2, 3, 4, 5 | 3, 5, 7, 8 | 8, 10, 12, 19 | 22, 30 | 40 | 68 | 50, 55, 64, 66 |
| Nr of FO contacts [1] | multi | – | – | – | 2 | – | – | – | – |
| | mixed | | | | 2 + 4 LV | | | | |

**Note:** [1] For cable ranging from 3.6 to 6.5 mm in diameter.

# General Characteristics

## Selection of shell materials

### Aluminium alloy

The aluminium alloy outer shells find numerous applications where light weight is a predominant factor; such as in the aeronautics and space industries, and for portable and mobile equipment.
Shells are made of high mechanical strength alloy (Aluminium alloy). Connector shells are protected by a conductive anthracite grey coloured nickel finish.
As a standard latch sleeve are made of special bronze or brass, this material offer excellent performances for most of the applications.
For very demanding vibrating situation we recommand the use of special latch sleeve in beryllium copper alloy. These parts have an electrolytic nickel plating.
As a standard gaskets are made of fluororubber FPM/FKM. This material has excellent resistance to hydrocarbons.

### Sealing resin

An epoxy resin is used to seal both watertight and vacuumtight socket and coupler models.

### Brass

The brass outer shells have a chrome nickel-plated surface which ensures very good protection against industrial atmosphere, salt air and most corrosive agents.
In case of brass shell standard latch sleeves are made of special bronze or brass.
Here standard gaskets are made of silicone rubber MQ/MVQ. This material has excellent weather resistance and a wide temperature range.

### Other metallic components

In general, most metallic components are manufactured in brass. However, bronze or beryllium copper are used where good elasticity is required (for example: earthing crown). Depending on the application, these parts have electrolytic nickel plating.

## Degrees of protection (IP code)

IEC 60529 outlines an international classification system for the sealing effectiveness of enclosures of electrical equipment against the intrusion into the equipment of foreign bodies (i.e., tools, dust, fingers) and moisture. This classification system utilizes the letters «IP» (Ingress Protection) followed by two digits.

**Example: IP 64 = IP 6 4**

IP letter code
1st digit
2nd digit

### Degrees of protection - First digit

The first digit of the IP code indicates the degree that persons are protected against contact with moving parts and the degree that equipment is protected against solid foreign bodies intruding into an enclosure.

0 No special protection
1 Protection from a large part of the body such as hand or from solid objects greater than 50 mm in diameter
2 Protection against objects not greater than 80 mm in length and 12 mm in diameter
3 Protection from entry by tools, wires, etc., with a diameter or thickness greater than 2.5 mm
4 Protection from entry by solid objects with a diameter or thickness greater than 1.0 mm
5 Protection from the amount of dust that would interfere with the operation of the equipment
6 Dust-tight

### Degrees of protection - Second digit

Second digit indicates the degree of protection of the equipment inside the enclosure against the harmful entry of various forms of moisture (e.g. dripping, spraying, submersion, etc.)

0 No special protection
1 Protection from vertically dripping water
2 Protection from dripping water when tilted up to 15°
3 Protection from sprayed water
4 Protection from splashed water
5 Protection from water projected from a nozzle
6 Protection against heavy seas, or powerful jets of water
7 Protection against temporary immersion
8 Protection against complete continuous submersion in water

## UL Recognition

LEMO connectors are recognized by the Underwriters Laboratories (UL). The approval of the complete system (LEMO connector, cable and your equipment) will be easier because LEMO connectors are approved.

## RoHS

LEMO connector specifications exceed the requirements of the RoHS directives (2002/95/EC) of the European Parliament and the latest amendments. This directive specifies the restrictions of the use of hazardous substances in electrical and electronic equipment marketed in Europe. LEMO guarantees that its connectors are free of mercury, cadmium, lead, hexavalent chromium and polybromide biphenyl (PBB), polybromide diphenyl ether (PBDE), or DecaBDE.

# Selection of contact types

## Crimp contacts

The crimp contacts are designed to be crimped with the standard four indent method according to MIL-C-22520F, class 1, type 1.

Fig. 1

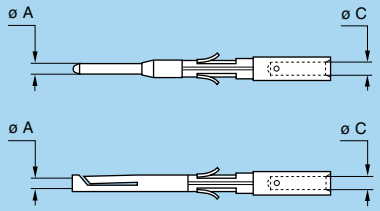
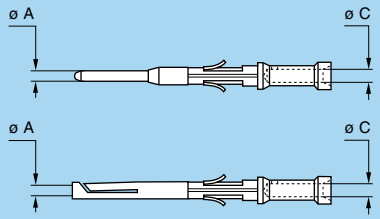



Fig. 2




A detailed range of conductor dimensions that can be crimped into our contacts is given on the table at right. See also the section on tooling (pages 30 to 33).

Contacts are provided in two forms: with a standard crimp barrel for large conductors (see fig. 1), or with a reduced crimp barrel for smaller conductors (see fig. 2).

| Contact | | | Conductor stranded | | | | $F_r$ (N) |
|---|---|---|---|---|---|---|---|
| | | | AWG stranded | | Section (mm²) | | |
| ø A (mm) | ø C (mm) | Form per fig. | min. | max. | min. | max. | |
| 0.5 | 0.42 | 1 | 32 | 28[1)] | 0.035 | 0.09 | 12 |
| 0.7 | 0.80 | 1 | 26 | 22[1)] | 0.140 | 0.34 | 22 |
| 0.9 | 1.10 | 1 | 24 | 20 | 0.250 | 0.50 | 30 |
| 1.3 | 1.40 | 1 | 20 | 18 | 0.500 | 1.00 | 40 |

| Contact | | | Conductor stranded | | | | $F_r$ (N) |
|---|---|---|---|---|---|---|---|
| | | | AWG stranded | | Section (mm²) | | |
| ø A (mm) | ø C (mm) | Form per fig. | min. | max. | min. | max. | |
| 0.7 | 0.45 | 2 | 32 | 28 | 0.035 | 0.09 | 22 |
| 0.9 | 0.80 | 2 | 26 | 22[1)] | 0.140 | 0.34 | 30 |
| | 0.45 | 2 | 32 | 28 | 0.035 | 0.09 | |
| 1.3 | 1.10 | 2 | 24 | 20 | 0.250 | 0.50 | 40 |

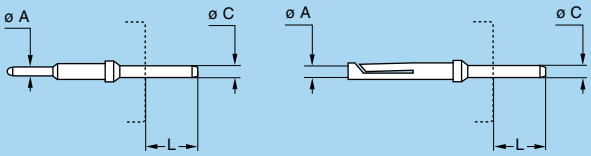
**Note:** Fr = mean contact retention force in the insulator (according to IEC 60512-8 test 15a).
**Note:** [1)] for a given AWG, the diameter of some stranded conductor designs is larger than the solder cup diameter. Make sure that the maximum conductor diameter is smaller than ø C.

## Print contacts

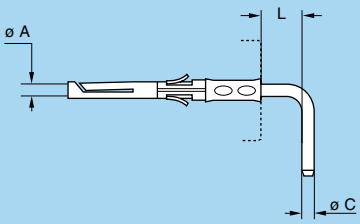
Print contacts are available in straight or elbow versions for certain connector types. Connection is possible by soldering on flexible or rigid printed circuit boards.
Straight print contacts are gold-plated which guarantees optimum soldering, even after longterm storage.

Print elbow contacts include a tinned copper wire crimped into a contact.
L dimensions and C ø are detailed in the section on model description (elbow: L = 2 mm).

straight




elbow

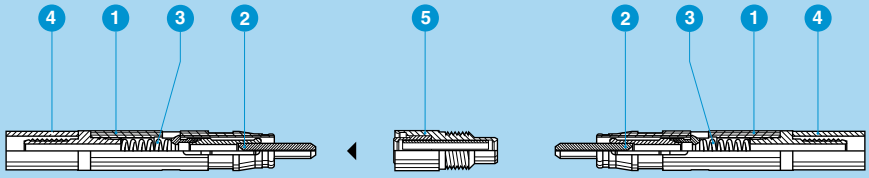



## Fibre Optic contacts

The new miniature F7 fibre optic contact is available for use with single-mode or multi-mode fibres of the following sizes; 9/125, 50/125 and 62.5/125 microns.
Contacts are designed with the IEC standard 1.25 mm diameter ceramic ferrules. After mounting on the cable, the contact is very easily installed in the connector insulator, the particular shape of the contact body retains it in the insulator. The alignment tube can be easily removed in order to clean the fibre end face.

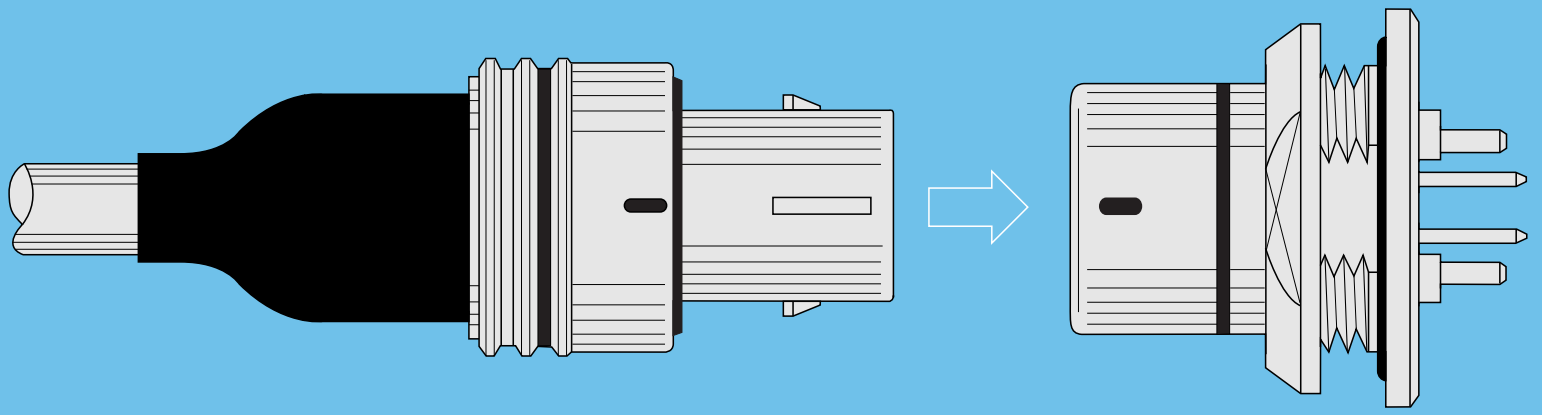
**Female contact**

1. body with holder
2. ferrule with holder
3. spring
4. crimp ferrule
5. alignment tube with support




**Male contact**

1. body with holder
2. ferrule with holder
3. spring
4. crimp ferrule



F SERIES

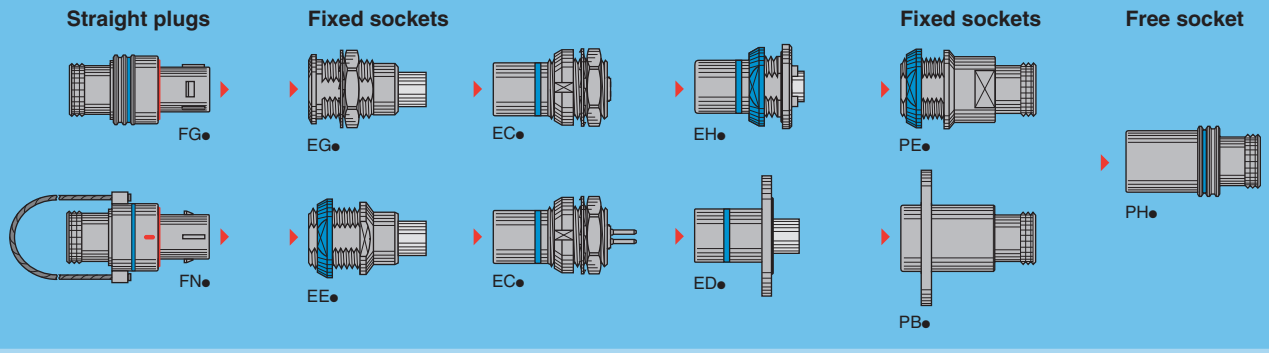
# F Series

The F series connectors have been specially developed to meet the most demanding requirements in terms of dimensions, weight and watertightness. Our manufacturing programme includes now 8 series. This series provides customers with many features and benefits including:
– push-pull self-latching system for safe connection
– sealed to IP67 for environmental protection when mated according to IEC 60529
– compact scoop-proof design and use of aluminium alloy
– high shock and vibration resistance
– multipole types with 2 to 68 contacts or multifibre optic or mixed FO + LV in 2F series
– crimp or print contacts (straight or elbow)
– keys ensuring ease of blind mating
– colour coded key options for system security.

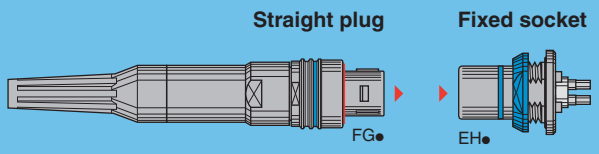
The F series connectors are available in 3 different materials:
– for high shock and vibration resistance, LEMO recommends using Y code material (with beryllium copper latch sleeve).
– for environmental resistance and latching cycle endurance, LEMO recommends using the C code material (brass outershell).
– for lightweight and latching cycle endurance, LEMO recommends using X code material (aluminium shell).

Each series includes several models of plugs and sockets available in contact configurations adapted to all round cables, including up to 68 conductors, and a maximum diameter of 34 mm. Since LEMO connectors are perfectly screened and designed to guarantee very low resistance to shell electrical continuity, they are particularly adapted to applications where electromagnetic compatibility (EMC) is important. A large number of accessories as well as tooling for cable assembly are available.

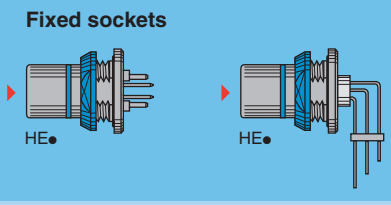
**Metal housing models** (page 11)



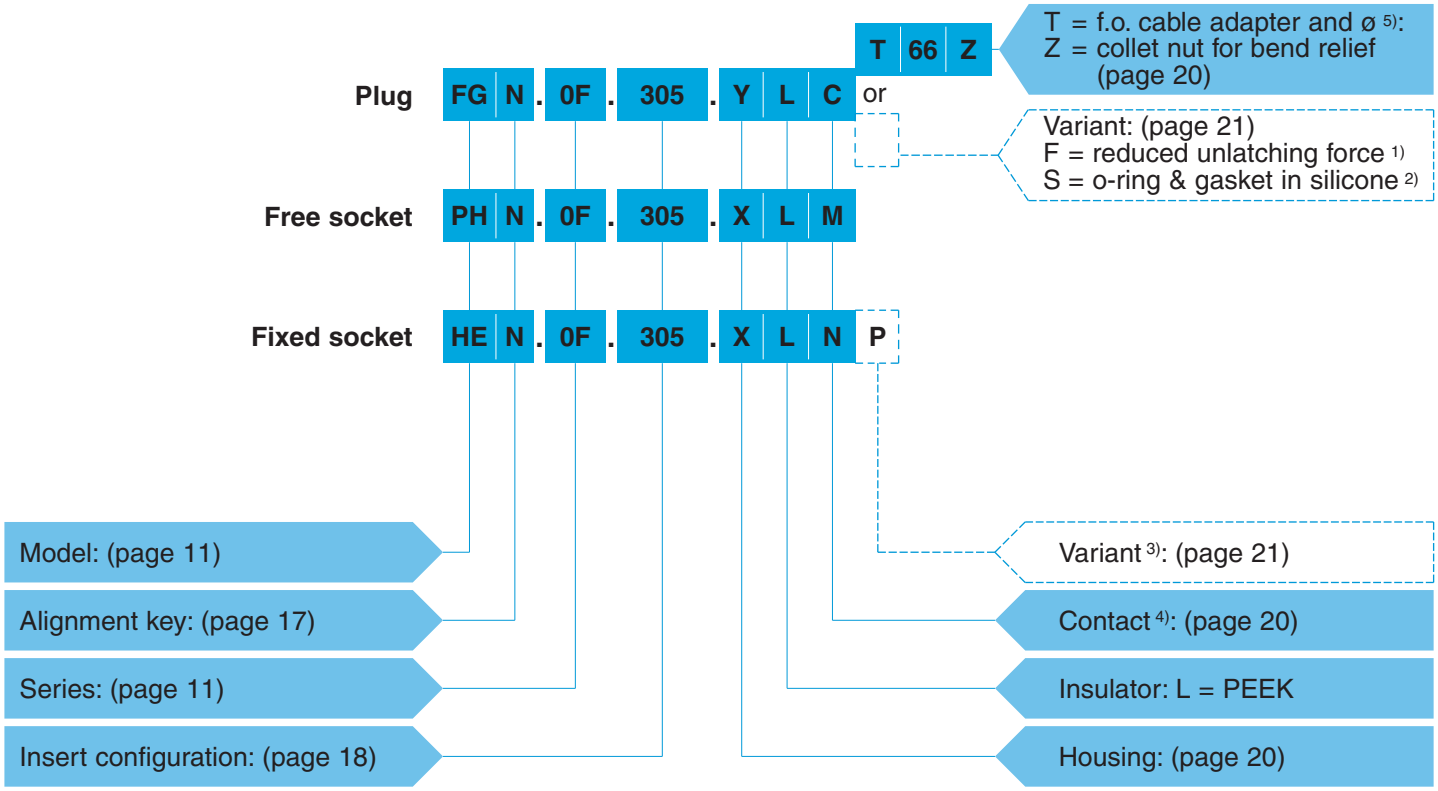

**Models for fibre optic** (page 16)




**Watertight models** (page 15)



## Part Numbering System




## Part Number Example

**Straight plug:**
**FGN.0F.305.YLC** = straight plug with key (N), 0F series, multipole type with 5 contacts, outer shell in anthracite nickel-plated aluminium alloy, beryllium copper latch sleeve, PEEK insulator, male crimp contacts.

**Free socket:**
**PHN.0F.305.XLM** = free socket with key (N), 0F series, multipole type with 5 contacts, outer shell in anthracite nickel-plated aluminium alloy, PEEK insulator, female crimp contacts.

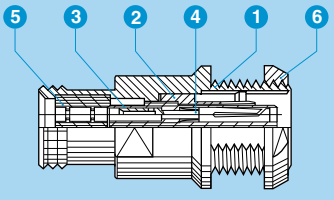
**Fixed socket:**
**HEN.0F.305.XLNP** = fixed socket, nut fixing, with key (N), 0F series, multipole type with 5 contacts, outer shell in anthracite nickel-plated aluminium alloy, PEEK insulator, female print contacts, watertight.

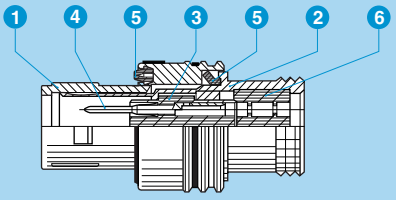
**Note:** 1) for straight plug only. 2) with shell material code X or Y. 3) potting for HE● only. 4) HE● available only with print contacts (straight or elbow).
5) **connectors for fibre-optic are delivered without the fibre optic contacts, they must be ordered separately (see page 25).**

## Part Section Showing Internal Components

**Straight socket**

1. outer shell
2. earthing crown
3. insulator
4. female contact
5. rear seal
6. front nut




**Straight plug**

1. outer shell
2. latch sleeve
3. insulator
4. male contact
5. gasket
6. rear seal

# Technical Characteristics

## Materials and Treatments

| Component | Shell material code X | Shell material code Y | Shell material code C | Material (Standard) | Surface treatment (µm) chrome Cu | chrome Ni | chrome Cr | nickel Cu | nickel Ni | gold Cu | gold Ni | gold Au | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outer shell | | | ■ | Brass (UNS C 38500) | 0.5 | 3 | 0.3 | – | – | – | – | – | |
| | ■ | ■ | | Aluminium alloy (AA 6262A or AA 6023) | – | – | – | – | 5 | – | – | – | 1) 4) 5) |
| Conical nut | | | ■ | Brass (UNS C 38500) | 0.5 | 3 | 0.3 | – | – | – | – | – | |
| | ■ | ■ | | Aluminium alloy (AA 6262A or AA 6023) | anodized various colour | | | | | | | | 2) |
| Notched nut | | | ■ | Brass (UNS C 38500) | 0.5 | 3 | 0.3 | – | – | – | – | – | 3) |
| | ■ | ■ | | Aluminium alloy (AA 6262A or AA 6023) | – | – | – | – | 5 | – | – | – | 1) 3) |
| Earthing crown | ■ | ■ | ■ | Bronze (UNS C 54400) or special brass | – | – | – | 0.5 | 3 | – | – | – | |
| Latch sleeve | ■ | | ■ | Special bronze/brass | – | – | – | 0.5 | 3 | – | – | – | |
| | | ■ | | Beryllium Copper (UNS C 17300) | – | – | – | 0.5 | 3 | – | – | – | |
| Locking washer | ■ | ■ | ■ | Bronze (UNS C 52100) | – | – | – | 0.5 | 3 | – | – | – | |
| Hexagonal nut | | | ■ | Brass (UNS C 38500) | – | – | – | 0.5 | 3 | – | – | – | |
| | ■ | ■ | | Aluminium alloy (AA 6262A or AA 6023) | anodized natural | | | | | | | | |
| Other metallic components | ■ | ■ | ■ | Brass (UNS C 38500) | – | – | – | 0.5 | 3 | – | – | – | |
| Male crimp contact | ■ | ■ | ■ | Brass (UNS C 34500) | – | – | – | – | – | 0.5 | 3 | 1.0 | |
| Female crimp contact | ■ | ■ | ■ | Bronze (UNS C 54400) | – | – | – | – | – | 0.5 | 3 | 1.5 | |
| Clips | ■ | ■ | ■ | Cu-Be or special steel | without treatment | | | | | | | | |
| Insulator | ■ | ■ | ■ | PEEK | – | | | | | | | | |
| O-ring and gaskets | ■ | ■ | | FPM/FKM (Viton®) | – | | | | | | | | |
| | | | ■ | Silicone MQ/MVQ | – | | | | | | | | 6) |
| Sealing resin | ■ | ■ | ■ | Epoxy (Araldite® or Stycast®) | – | | | | | | | | |
| Cable rear seal | ■ | ■ | ■ | Fluorosilicone | – | | | | | | | | |

**Notes:** standards for surface treatment are as follows: chrome-plated FS QQ-C-320B; nickel-plated FS QQ-N-290A or MIL-C-26074C; gold-plated ISO 4523. 1) anthracite colour. 2) the colour match the colour code of the key (see page 17). 3) for the FF series only. 4) FF series available only with material code Y. 5) LF and 5F series available only with material code X. 6) Silicone gasket are available as a variant for code material X and Y.

## Mechanical and Climatical

| Characteristics | Value | Standard | Series / Shell material |
|---|---|---|---|
| Endurance | 1000 cycles | IEC 60512-5 test 9a | All; code X |
| Endurance | 300 cycles (FF and 0F); 500 cycles (1F to 3F) | IEC 60512-5 test 9a | All; code Y |
| Endurance | 5000 cycles | IEC 60512-5 test 9a | All; code C |
| Humidity | up to 95% at 60° C | | All |
| Operating temperature | -15° C, +200° C | | All; code X or Y |
| Operating temperature | -55° C, +200° C | | All; code C |
| Vibration resistance | 10-2000 Hz, 15 g | IEC 60512-4 test 6d | All |
| Vibration (Gunfire test) | pass | MIL-standard 810 F | 4F, LF and 5F; all materials |
| Vibration (Gunfire test) | pass | MIL-standard 810 F | FF, 0F, 1F, 2F, 3F; code Y |
| Vibration (ECU profile) | pass | See diagram below | FF, 0F, 1F, 2F; code Y |
| Shock resistance | 100 g, 6 ms | IEC 60512-4 test 6c | All |
| Salt spray corrosion test | 24 h | IEC 60512-6 test 11f | All; code X or Y |
| Salt spray corrosion test | 144 h | IEC 60512-6 test 11f | All; code C |
| Protection index (mated) | IP67 | IEC 60529 | All |
| Climatical category | 15/200/21 | IEC 60068-1 | All; code X or Y |
| Climatical category | 50/175/21 | IEC 60068-1 | All; code C |

## Electrical

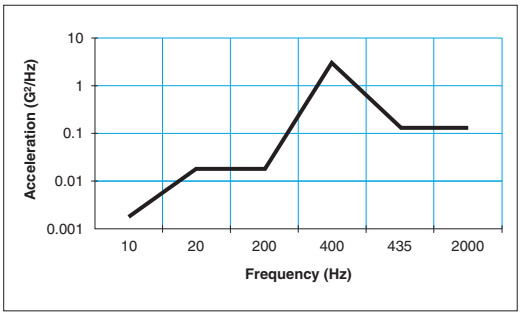
| Insulation resistance IEC 60512-2 test 3a | | Value |
|---|---|---|
| new | 1) | |
| $> 10^{12}$ | $> 10^{10}$ | Ω |

| Shell electrical continuity IEC 60512-2 test 2f | | | | | | Value |
|---|---|---|---|---|---|---|
| FF-0F | 1F | 2F-3F | 4F | LF | 5F | |
| 5.0 | 3.0 | 2.5 | 2.0 | 1.5 | 1.5 | mΩ |

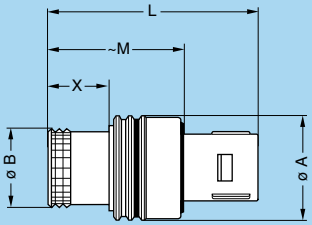
| Contact resistance 2) IEC 60512-2 test 2a | | | | Value |
|---|---|---|---|---|
| 0.5 | 0.7 | 0.9 | 1.3 | ø A (mm) |
| ≤ 8.7 | ≤ 6.1 | ≤ 4.8 | ≤ 3.6 | mΩ |

**Notes:**
1) after humidity test: 21 days at 95% RH according to IEC 60068-2.
2) after 5000 mating cycles and the salt spray test according to IEC 60512-6 test 11 f.

## Vibration (ECU profile)



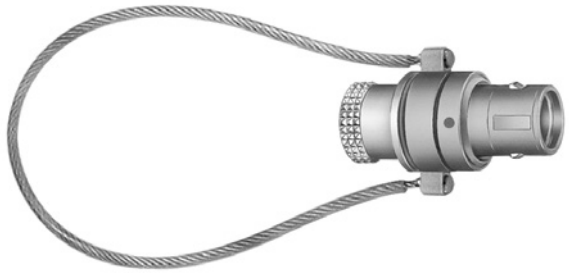
# Models

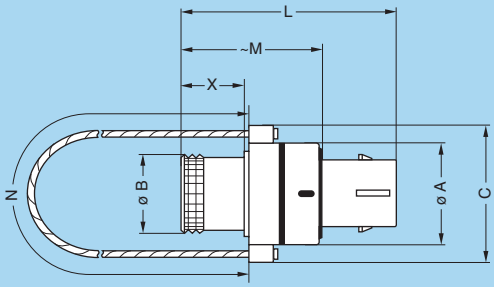



## FG● Straight plug, key (N) or keys (P, S, T, W and X)

| Reference | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|
| Model | Series | A | B | L | M | X |
| FG● | FF | 8.5 | 6.3 | 21.6 | 13.8 | 5.7 |
| FG● | 0F | 12.0 | 9.0 | 27.5 | 17.8 | 8.0 |
| FG● | 1F | 14.0 | 10.7 | 27.8 | 17.9 | 8.0 |
| FG● | 2F | 17.0 | 14.0 | 27.8 | 17.9 | 8.0 |
| FG● | 3F | 19.0 | 16.0 | 27.8 | 17.9 | 8.0 |
| FGW | 4F | 26.0 | 21.2 | 30.3 | 20.4 | 8.0 |
| FGX | 4F | 26.0 | 21.2 | 30.7 | 20.4 | 8.0 |
| FGW | LF | 29.0 | 24.2 | 34.7 | 20.4 | 8.0 |
| FGX | LF | 29.0 | 24.2 | 34.7 | 20.4 | 8.0 |
| FG● | 5F | 36.1 | 30.2 | 36.7 | 20.4 | 8.0 |

**Note:** this plug can also be supplied with a reduced unlatching force (see page 9).

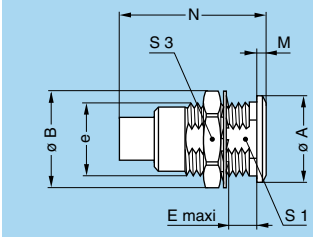





## FN● Straight plug, key (N) or keys (P and S) and lanyard release

| Reference | | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | C | L | M | N | X |
| FN● | 0F | 12.0 | 9.0 | 18.0 | 27.5 | 17.8 | 140 | 8.0 |
| FN● | 1F | 14.0 | 10.7 | 20.0 | 27.8 | 17.9 | 140 | 8.0 |
| FN● | 2F | 17.0 | 14.0 | 23.0 | 27.8 | 17.9 | 160 | 8.0 |
| FN● | 3F | 19.0 | 16.0 | 25.0 | 27.8 | 17.9 | 190 | 8.0 |

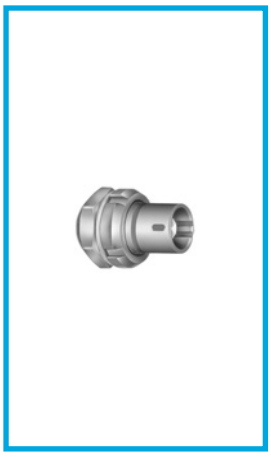
**Note:** cable material: stainless steel with protective sheath

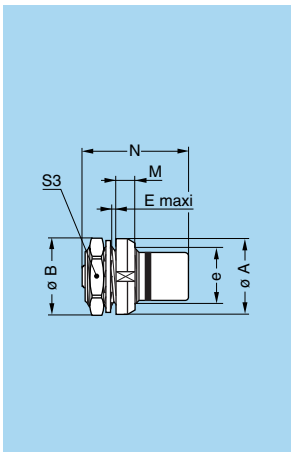



## EG● Fixed socket, nut fixing, key (N) or keys (P, S and T)

| Reference | | Dimensions (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | e | E | M | N | S1 | S3 |
| EG● | 0F | 10 | 12.4 | M9x0.6 | 7.0 | 1.2 | 19.0 | 8.2 | 11 |
| EG● | 1F | 14 | 15.8 | M12x1.0 | 6.5 | 1.5 | 19.0 | 10.5 | 14 |
| EG● | 2F | 18 | 19.2 | M15x1.0 | 6.5 | 1.8 | 19.0 | 13.5 | 17 |
| EGN | 3F | 22 | 25.0 | M18x1.0 | 5.5 | 2.0 | 19.0 | 16.5 | 22 |
| EGP | 3F | 22 | 25.0 | M18x1.0 | 5.5 | 2.0 | 19.0 | 16.5 | 22 |
| EGS | 3F | 22 | 25.0 | M18x1.0 | 5.5 | 2.0 | 20.5 | 16.5 | 22 |
| EGT | 3F | 22 | 25.0 | M18x1.0 | 5.5 | 2.0 | 20.5 | 16.5 | 22 |

Panel cut-out (page 33)



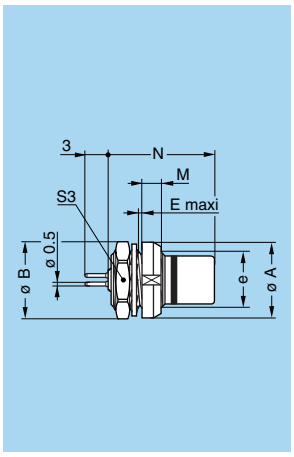



## EC● Fixed socket with 2 nuts, key (N) or key (S), protruding shell (back panel mounting)

| Reference | | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | e | E | M | N | S3 |
| EC● | FF | 10 | 10.2 | M7x0.5 | 1.5 | 2.5 | 13.9 | 9 |

Panel cut-out (page 33)

**Note:** this socket can be used without the hexagonal nut. It can be directly fastened into the device, the notched nut is used as a tightening nut.

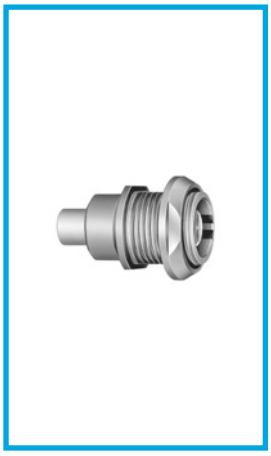


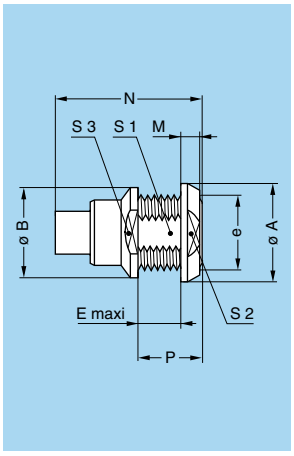

## EC● Fixed socket with 2 nuts, key (N) or key (S), protruding shell, print contacts (back panel mounting)

| Reference | | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | e | E | M | N | S3 |
| EC● | FF | 10 | 10.2 | M7x0.5 | 1.5 | 2.5 | 13.9 | 9 |

Panel cut-out (page 33)

**Note:** this socket can be used without the hexagonal nut. It can be directly fastened into the device, the notched nut is used as a tightening nut.

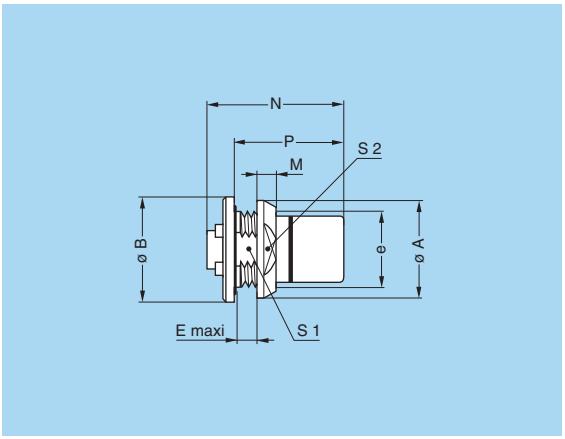





## EE● Fixed socket, nut fixing, key (N) or keys (P, S and T), (back panel mounting)

| Reference | | Dimensions (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | e | E | M | N | P | S1 | S2 | S3 |
| EE● | 0F | 13 | 12 | M10x0.75 | 6.0 | 2.5 | 19.0 | 8.5 | 9.0 | 11 | 10.5 |
| EE● | 1F | 17 | 15 | M13x0.75 | 6.2 | 3.2 | 19.0 | 9.4 | 11.5 | 14 | 14.0 |
| EE● | 2F | 20 | 19 | M16x1.00 | 6.4 | 4.0 | 19.0 | 10.4 | 14.5 | 17 | 16.0 |
| EEN | 3F | 22 | 22 | M18x1.00 | 6.4 | 4.0 | 19.0 | 10.4 | 16.5 | 19 | 20.0 |
| EEP | 3F | 22 | 22 | M18x1.00 | 6.4 | 4.0 | 19.0 | 10.4 | 16.5 | 19 | 20.0 |
| EES | 3F | 22 | 22 | M18x1.00 | 6.4 | 4.0 | 20.5 | 10.4 | 16.5 | 19 | 20.0 |
| EET | 3F | 22 | 22 | M18x1.00 | 6.4 | 4.0 | 20.5 | 10.4 | 16.5 | 19 | 20.0 |

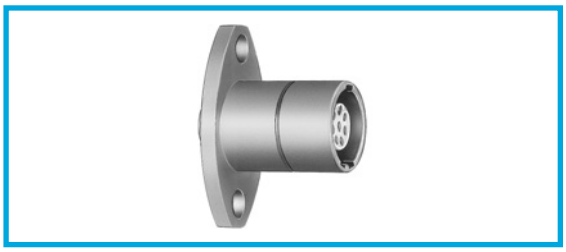
Panel cut-out (page 33)

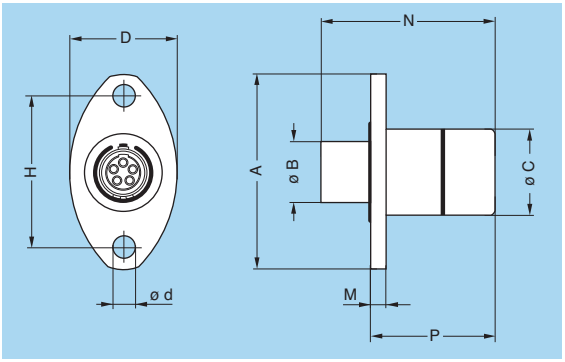



## EH● Fixed socket, nut fixing, key (N) or keys (P, S, T, W and X), (back panel mounting)

| Reference | | Dimensions (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | e | E | M | N | P | S1 | S2 |
| EH● | FF | 10 | 11 | M7x0.50 | 3.0 | 2.5 | 15.0 | 12.0 | 6.4 | 8 |
| EH● | 0F | 13 | 14 | M10x0.75 | 3.0 | 2.5 | 19.0 | 14.5 | 9.0 | 11 |
| EH● | 1F | 17 | 17 | M13x0.75 | 3.0 | 3.2 | 19.0 | 14.5 | 11.5 | 14 |
| EH● | 2F | 20 | 20 | M16x1.00 | 3.0 | 4.0 | 19.0 | 14.5 | 14.5 | 17 |
| EHN | 3F | 22 | 23 | M18x1.00 | 3.0 | 4.0 | 19.0 | 14.5 | 16.5 | 19 |
| EHP | 3F | 22 | 23 | M18x1.00 | 3.0 | 4.0 | 19.0 | 14.5 | 16.5 | 19 |
| EHS | 3F | 22 | 23 | M18x1.00 | 3.0 | 4.0 | 20.5 | 16.0 | 16.5 | 19 |
| EHT | 3F | 22 | 23 | M18x1.00 | 3.0 | 4.0 | 20.5 | 16.0 | 16.5 | 19 |
| EHW | 4F | 29 | 29 | M24x1.00 | 3.0 | 5.0 | 19.0 | 14.5 | 22.0 | 25 |
| EHX | 4F | 29 | 29 | M24x1.00 | 3.0 | 5.0 | 21.0 | 16.5 | 22.0 | 25 |
| EHW | LF | 32 | 32 | M27x1.00 | 6.4 | 5.0 | 24.3 | 20.0 | 25.0 | 28 |
| EHX | LF | 32 | 32 | M27x1.00 | 6.4 | 5.0 | 24.3 | 20.0 | 25.0 | 28 |
| EH● | 5F | 38 | 38 | M33x1.00 | 6.4 | 5.0 | 28.4 | 24.0 | 31.0 | 34 |

Panel cut-out (page 33)

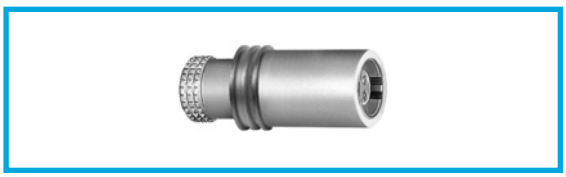


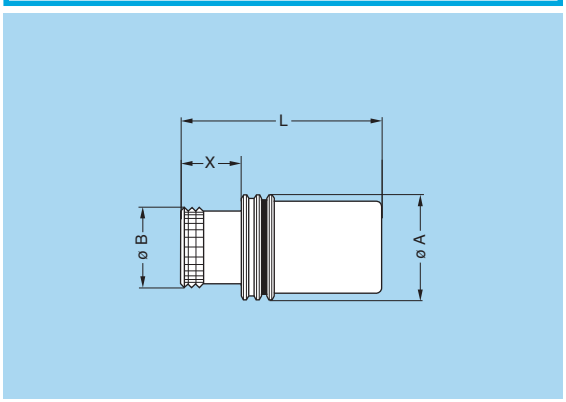



## ED● Fixed socket with flange, key (N) or keys (P and S), 2 holes fixing, protruding shell

| Reference | | Dimensions (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | C | d | D | H | M | N | P |
| ED● | 1F | 25.4 | 5.9 | 11.5 | 3.5 | 14 | 19.3 | 2 | 19 | 16.5 |

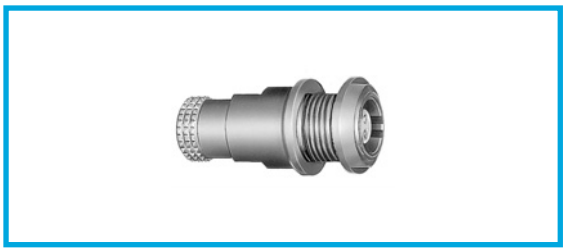
Panel cut-out (page 33)

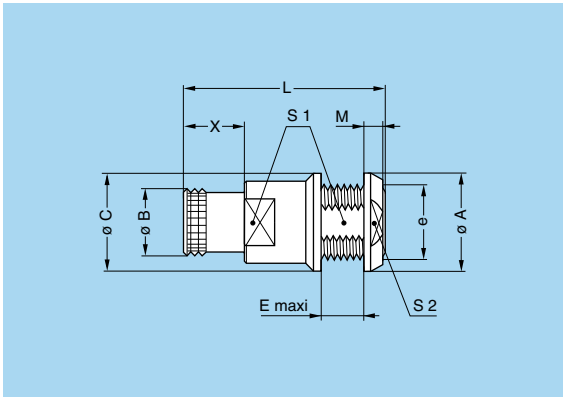





## PH● Free socket, key (N) or keys (P, S, T, W and X)

| Reference | | Dimensions (mm) | | | |
|---|---|---|---|---|---|
| Model | Series | A | B | L | X |
| PH● | FF | 8.5 | 6.3 | 20.7 | 5.7 |
| PH● | 0F | 12.0 | 9.0 | 26.7 | 8.0 |
| PH● | 1F | 14.0 | 10.7 | 26.7 | 8.0 |
| PH● | 2F | 17.0 | 14.0 | 26.7 | 8.0 |
| PHN | 3F | 19.0 | 16.0 | 26.7 | 8.0 |
| PHP | 3F | 19.0 | 16.0 | 26.7 | 8.0 |
| PHS | 3F | 19.0 | 16.0 | 28.2 | 8.0 |
| PHT | 3F | 19.0 | 16.0 | 28.2 | 8.0 |
| PHW | 4F | 26.0 | 21.2 | 26.7 | 8.0 |
| PHX | 4F | 26.0 | 21.2 | 28.7 | 8.0 |
| PHW | LF | 29.0 | 24.2 | 32.2 | 8.0 |
| PHX | LF | 29.0 | 24.2 | 32.2 | 8.0 |
| PH● | 5F | 35.0 | 30.2 | 37.2 | 8.0 |



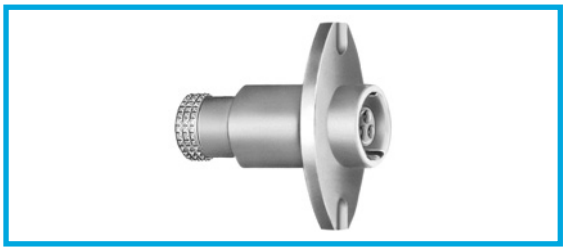


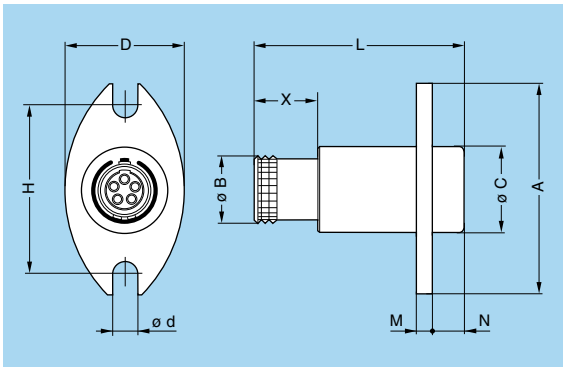

## PE● Fixed socket, nut fixing, key (N) or keys (P, S, T, W and X), (back panel mounting)

| Reference | | Dimensions (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | C | e | E | L | M | S1 | S2 | X |
| PE● | FF [1] | 10 | 6.3 | 11 | M7x0.50 | 6.0 | 20.7 | 2.5 | 6.4 | – | 5.7 |
| PE● | 0F | 13 | 9.0 | 13 | M10x0.75 | 6.0 | 26.7 | 2.5 | 9.0 | 11 | 8.0 |
| PE● | 1F | 17 | 10.7 | 17 | M13x0.75 | 6.2 | 26.7 | 3.2 | 11.5 | 14 | 8.0 |
| PE● | 2F | 20 | 14.0 | 20 | M16x1.00 | 6.4 | 26.7 | 4.0 | 14.5 | 17 | 8.0 |
| PEN | 3F | 22 | 16.0 | 22 | M18x1.00 | 6.4 | 26.7 | 4.0 | 16.5 | 19 | 8.0 |
| PEP | 3F | 22 | 16.0 | 22 | M18x1.00 | 6.4 | 26.7 | 4.0 | 16.5 | 19 | 8.0 |
| PES | 3F | 22 | 16.0 | 22 | M18x1.00 | 6.4 | 28.2 | 4.0 | 16.5 | 19 | 8.0 |
| PET | 3F | 22 | 16.0 | 22 | M18x1.00 | 6.4 | 28.2 | 4.0 | 16.5 | 19 | 8.0 |
| PEW | 4F | 29 | 21.2 | 29 | M24x1.00 | 6.4 | 26.7 | 5.0 | 22.0 | 25 | 8.0 |
| PEX | 4F | 29 | 21.2 | 29 | M24x1.00 | 6.4 | 28.7 | 5.0 | 22.0 | 25 | 8.0 |
| PEW | LF | 32 | 24.2 | 32 | M27x1.00 | 6.4 | 32.2 | 5.0 | 25.0 | 28 | 8.0 |
| PEX | LF | 32 | 24.2 | 32 | M27x1.00 | 6.4 | 32.2 | 5.0 | 25.0 | 28 | 8.0 |
| PE● | 5F | 38 | 30.2 | 38 | M33x1.00 | 6.4 | 37.2 | 5.0 | 31.0 | 34 | 8.0 |

Panel cut-out (page 33)

**Note:** [1] fitted with notched nut GEG.






## PB● Fixed socket with flange, key (N) or keys (P, S, T, W and X), 2 holes fixing

| Reference | | Dimensions (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | C | d | D | H | L | M | N | X |
| PB● | 0F | 27 | 9.0 | 11.0 | 3.2 | 15 | 21.4 | 26.7 | 2 | 4 | 8 |
| PB● | 1F | 27 | 10.7 | 13.0 | 3.2 | 15 | 21.4 | 26.7 | 2 | 4 | 8 |
| PB● | 2F | 31 | 14.0 | 16.0 | 3.2 | 18 | 25.9 | 26.7 | 2 | 4 | 8 |
| PBN | 3F | 38 | 16.0 | 17.5 | 3.2 | 20 | 29.0 | 26.7 | 2 | 4 | 8 |
| PBP | 3F | 38 | 16.0 | 17.5 | 3.2 | 20 | 29.0 | 26.7 | 2 | 4 | 8 |
| PBS | 3F | 38 | 16.0 | 17.5 | 3.2 | 20 | 29.0 | 28.2 | 2 | 4 | 8 |
| PBT | 3F | 38 | 16.0 | 17.5 | 3.2 | 20 | 29.0 | 28.2 | 2 | 4 | 8 |
| PBW | 4F | 41 | 21.2 | 23.0 | 3.2 | 26 | 32.0 | 26.7 | 2 | 4 | 8 |
| PBX | 4F | 41 | 21.2 | 23.0 | 3.2 | 26 | 32.0 | 28.7 | 2 | 4 | 8 |
| PB● | 5F | 44 | 30.2 | 32.0 | 3.2 | 33 | 38.2 | 37.2 | 2 | 4 | 8 |

Panel cut-out (page 33)

# Watertight PCB models

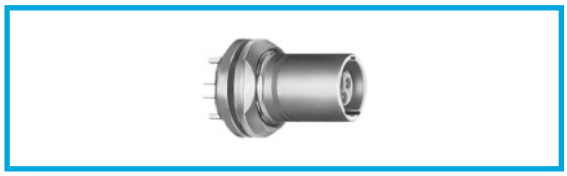
HEN fixed sockets allow the device on which they are fitted to reach a protection index of IP68 as per IEC 60529 (unmated). These models are identified by a letter «P» at the end of the reference. Epoxy resin is used to seal these models. They can be mated with all plugs of the same series to achieve an IP67 protection index between the plug and socket.

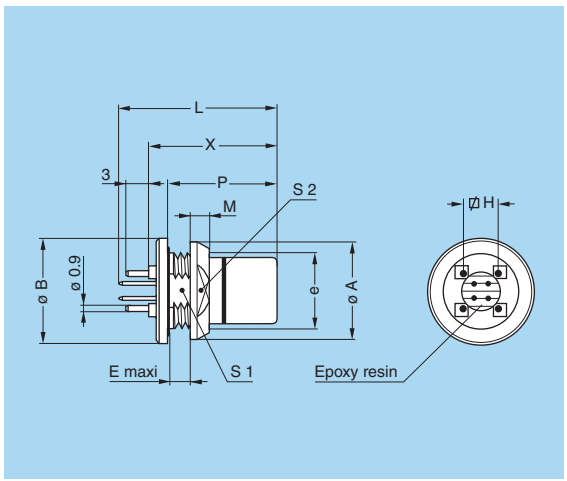
## Technical Characteristics

### Mechanical and Climatical

| Characteristics [1] | Value | Standard | Series / Shell material |
|---|---|---|---|
| Temperature range | -15° C, +100° C | | All; code X or Y |
| Temperature range | -50° C, +150° C | | All; code C or variant with silicone gasket final code (S) |
| Protection index unmated | IP68 | IEC 60529 | All |
| Maximum operating pressure [2] | 5 bars | IEC 60512-7 test 14d | All |

**Note:** [1] see also page 10. [2] this value corresponds to the maximum allowed pressure difference for the assembled socket.



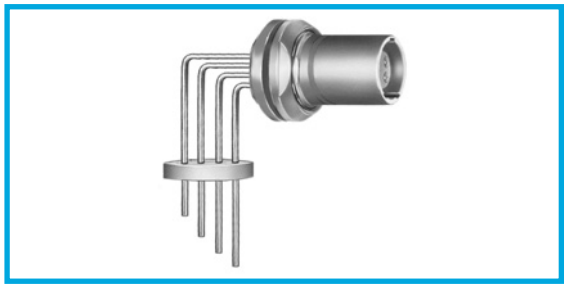


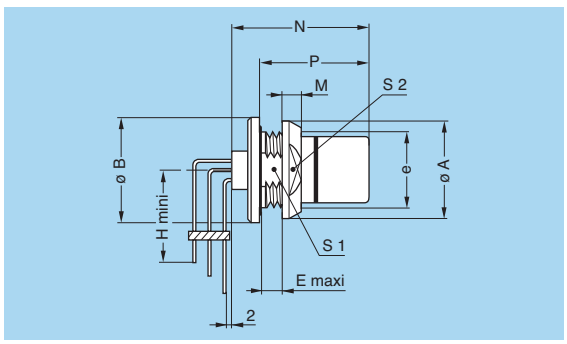

### HE● Fixed socket, nut fixing, key (N) or keys (P, S, T, W and X), for printed circuit, (back panel mounting)

| Reference | | Dimensions (mm) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | e | E | H | L | M | P | S1 | S2 | X |
| HE● | FF [1] | 10 | 11 | M7x0.50 | 3.0 | 5.08 | 18.2 | 2.5 | 12.0 | 6.4 | 8.2 | 15.0 |
| HE● | 0F | 13 | 14 | M10x0.75 | 3.0 | 5.08 | 21.5 | 2.5 | 14.5 | 9.0 | 11.0 | 17.5 |
| HE● | 1F | 17 | 17 | M13x0.75 | 3.0 | 7.62 | 21.5 | 3.2 | 14.5 | 11.5 | 14.0 | 17.5 |
| HE● | 2F | 20 | 20 | M16x1.00 | 3.0 | 8.89 | 21.5 | 4.0 | 14.5 | 14.5 | 17.0 | 17.5 |
| HEN | 3F | 22 | 23 | M18x1.00 | 3.0 | 11.43 | 21.5 | 4.0 | 14.5 | 16.5 | 19.0 | 17.5 |
| HEP | 3F | 22 | 23 | M18x1.00 | 3.0 | 11.43 | 21.5 | 4.0 | 14.5 | 16.5 | 19.0 | 17.5 |
| HES | 3F | 22 | 23 | M18x1.00 | 3.0 | 11.43 | 23.0 | 4.0 | 16.0 | 16.5 | 19.0 | 19.0 |
| HET | 3F | 22 | 23 | M18x1.00 | 3.0 | 11.43 | 23.0 | 4.0 | 16.0 | 16.5 | 19.0 | 19.0 |
| HEW | 4F | 29 | 29 | M24x1.00 | 3.0 | 15.24 | 21.5 | 5.0 | 14.5 | 22.0 | 25.0 | 17.5 |
| HEX | 4F | 29 | 29 | M24x1.00 | 3.0 | 15.24 | 23.5 | 5.0 | 16.5 | 22.0 | 25.0 | 19.5 |
| HEW | LF | 32 | 32 | M27x1.00 | 6.4 | 16.51 | 26.3 | 5.0 | 20.0 | 25.0 | 28.0 | 23.5 |
| HEX | LF | 32 | 32 | M27x1.00 | 6.4 | 16.51 | 26.3 | 5.0 | 20.0 | 25.0 | 28.0 | 23.5 |
| HE● | 5F | 38 | 38 | M33x1.00 | 6.4 | 20.32 | 32.2 | 5.0 | 24.0 | 31.0 | 34.0 | 27.4 |

Panel cut-out (page 33) PCB drilling pattern (page 34)

**Note:** [1] fitted with notched nut GEG.






### HE● Fixed socket, nut fixing, key (N) or key (P), with elbow (90°) contacts for printed circuit, (back panel mounting)

| Reference | | Dimensions (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | e | E | H | M | N | P | S1 | S2 |
| HE● | 0F | 13 | 14 | M10x0.75 | 3.0 | 20 | 2.5 | 18.5 | 14.5 | 9.0 | 11 |
| HE● | 1F | 17 | 17 | M13x0.75 | 3.0 | 20 | 3.2 | 18.5 | 14.5 | 11.5 | 14 |
| HE● | 2F | 20 | 20 | M16x1.00 | 3.0 | 20 | 4.0 | 18.5 | 14.5 | 14.5 | 17 |

Panel cut-out (page 33) PCB drilling pattern (page 35)

# Models for Fibre Optic

The 2F series has also been designed to allow fibre optic transmissions. This compact connector uses our F7 fibre optic contact but requires a specific plug with extended shell (T-adapter). The main features are:
– Multi fibre option with 2 optical contacts
– Mixed option with 2 FO + 2 LV contacts
– Optical contact with ceramic ferrules diametre 1.25 mm

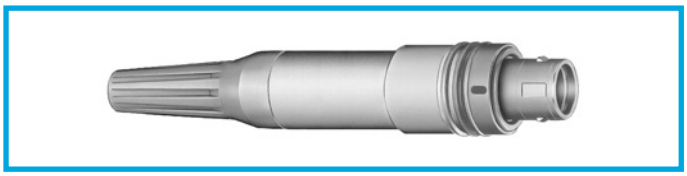
## Technical Characteristics of optical contacts

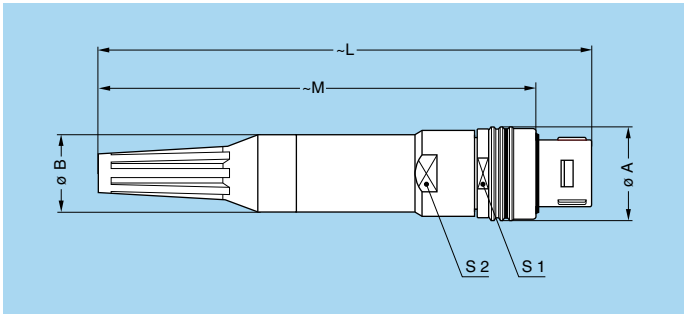
### Mechanical and Climatical

| Characteristic | Value | Standard |
|---|---|---|
| Mating durability | > 1000 cycles | IEC 61300-02-02 |
| Damp heat steady state | up to 93 % RH at 40°C | IEC 61300-02-19 |
| High temperature | +85°C | IEC 61300-02-18 |
| Low temperature | -40°C | IEC 61300-02-17 |
| Cable retention | 100 N | IEC 61300-02-04 |
| Vibration (3 axes) | 100 to 2000 Hz, 2 hrs | – |
| Change of temperature | -40 to +75°C | IEC 61300-02-22 |
| Temperature/humidity | -10 to +65°C at 93 % RH | IEC 61300-02-21 |

### Optical

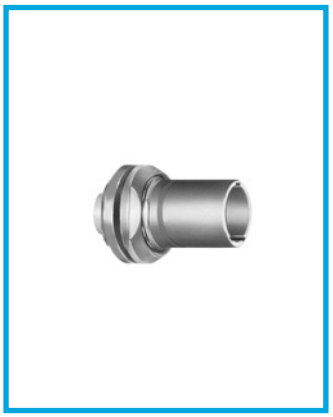
| Characteristic | Value | Standard | Method |
|---|---|---|---|
| Average insertion loss fibre 9/125 µm | 0.18 dB | IEC 61300-03-34 | Method 2 |
| Average insertion loss fibre 50/125 µm | 0.25 dB | IEC 61300-03-34 | Method 2 |
| Return loss fibre 9/125 µm (UPC) | ≥45 dB | IEC 61300-03-06 | Coupler Method |
| Return loss fibre 9/125 µm (Hand polish) | >25 dB | IEC 61300-03-06 | Coupler Method |

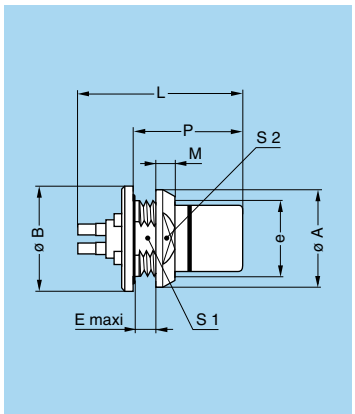





### FG● Straight plug, key (N) or keys (P and S)

| Reference | | Dimensions (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| Model | Series | A | B | L | M | S1 | S2 |
| FG● | 2F | 17.0 | 14.0 | 89.5 | 79.5 | 15.0 | 14.0 |






### EH● Fixed socket, nut fixing, key (N) or keys (P and S), (back panel mounting)

| Reference | | Dimensions (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model | Series | A | B | e | E | L | M | P | S1 | S2 |
| EH● | 2F | 20 | 20 | M16x1 | 3 | 21.8 | 4 | 14.5 | 14.5 | 17 |

Panel cut-out (page 33)

**Note:** Other models of socket can be made available.

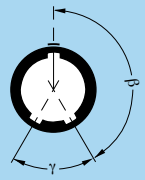
**Connectors for fibre-optic are delivered without the fibre optic contacts, they must be ordered separately (see page 25). For T-type cable adapter see page 20.**

# Alignment Key

## Alignment Key and Polarized Keying System

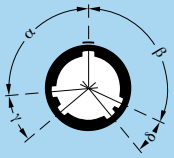
F series connector model part numbers are composed of three letters. The LAST LETTER indicates the keys corresponding to a particular contact type. For example, straight plugs with N, P or W keys, are fitted with male contacts; whereas with S, T or X keys, plugs are fitted with female contacts. Sockets with N, P or W keys, are fitted with female contacts; whereas with S, T or X keys, sockets are fitted with male contacts.

Front view of a socket




| Model | Nb of keys | Series FF | | Series 0F to 2F | | Series 3F | | Colour code | Contact type Electrical or Optical | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Angles | | | | | | | Plug | Socket | |
| | | β | γ | β | γ | β | γ | | | | |
| ●●N | 3 | 165° | 30° | 165° | 30° | 150° | 60° | blue | male | female | ● |
| ●●P | | – | – | 150° | 60° | 145° | 70° | yellow | male | female | ○ |
| ●●S | | 155° | 50° | 155° | 50° | 140° | 80° | red | female | male | ● |
| ●●T | | – | – | – | – | 135° | 90° | green | female | male | ○ |

Front view of a socket

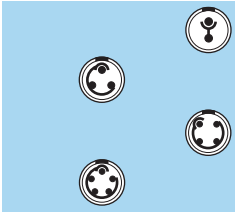
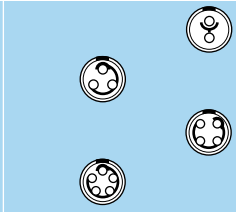
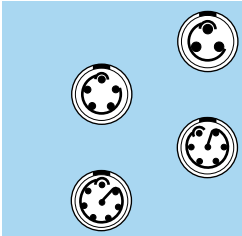
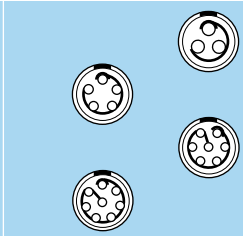
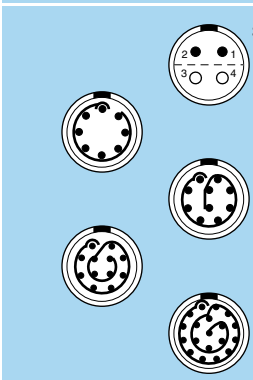
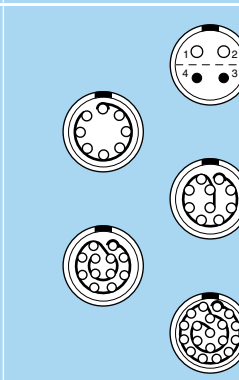
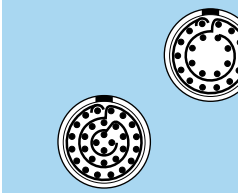
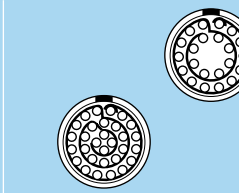
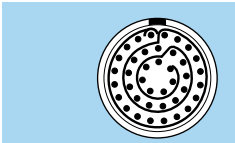
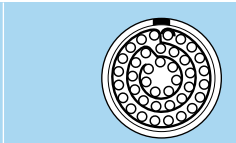



| Model | Nb of keys | Series 4F-LF-5F | | | | Colour code | Contact type | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Angles | | | | | Plug | Socket | |
| | | α | β | γ | δ | | | | |
| ●●W | 5 | 95° | 115° | 35° | 25° | blue | male | female | ● |
| ●● X | | 100° | 125° | 40° | 20° | red | female | male | ○ |

● First choice alternative ○ Special order alternative

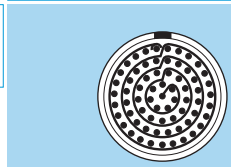
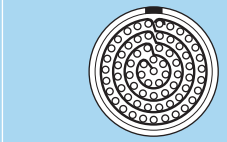
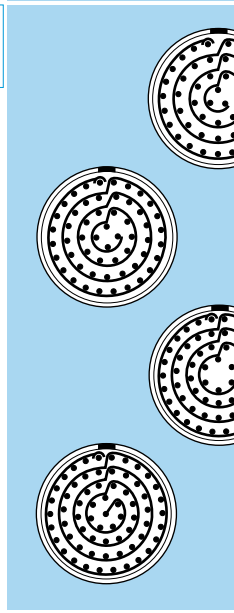
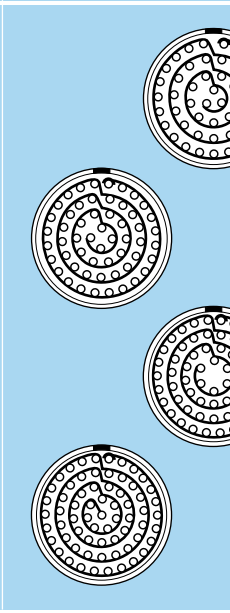
# Insert configuration

## Multipole

| | Male crimp contacts | Female crimp contacts | Reference | Number of contacts | ø A (mm) | Contact type: Crimp | Contact type: Print (straight) | Contact type: Print (elbow) | AWG[2] | Test voltage (kV rms)[1] Contact-contact | Test voltage (kV rms)[1] Contact-shell | Rated current (A)[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FF | | | 303 | 3 | 0.5 | ● | ● | – | 28-30-32 | 1.35 | 1.10 | 3.0 |
| | | | 304 | 4 | 0.5 | ● | ● | – | 28-30-32 | 1.05 | 1.05 | 2.0 |
| 0F |  |  | 302 | 2 | 0.9 | ● | ● | ● | 20-22-24 | 1.45 | 1.20 | 10.0 |
| | | | 303 | 3 | 0.9 | ● | ● | ● | 20-22-24 | 1.70 | 1.60 | 8.0 |
| | | | 304 | 4 | 0.7 | ● | ● | ● | 22-24-26 | 1.35 | 1.10 | 7.0 |
| | | | 305 | 5 | 0.7 | ● | ● | ● | 22-24-26 | 1.25 | 1.20 | 6.5 |
| 1F |  |  | 303 | 3 | 1.3 | ● | ● | ● | 18-20 | 1.60 | 1.85 | 12.0 |
| | | | 305 | 5 | 0.9 | ● | ● | ● | 20-22-24 | 1.30 | 1.55 | 9.0 |
| | | | 307 | 7 | 0.7 | ● | ● | ● | 22-24-26 | 1.45 | 1.45 | 7.0 |
| | | | 308 | 8 | 0.7 | ● | ● | ● | 22-24-26 | 1.30 | 1.30 | 5.0 |
| 2F |  3) |  4) | 304 | 4 | 1.3 | ● | – | – | 18-20 | 2.70 | 1.85 | 15.0 |
| | | | 308 | 8 | 0.9 | ● | ● | ● | 20-22-24 | 1.95 | 1.95 | 10.0 |
| | | | 310 | 10 | 0.9 | ● | ● | ● | 20-22-24 | 1.80 | 2.10 | 8.0 |
| | | | 312 | 12 | 0.7 | ● | ● | ● | 22-24-26 | 1.65 | 2.00 | 7.0 |
| | | | 319 | 19 | 0.7 | ● | ● | ● | 22-24-26 | 1.55 | 1.65 | 5.0 |
| 3F |  |  | 322 | 22 | 0.7 | ● | ● | – | 22-24-26 | 1.70 | 1.45 | 5.5 |
| | | | 330 | 30 | 0.7 | ● | ● | – | 22-24-26 | 1.35 | 1.20 | 3.5 |
| 4F |  |  | 340 | 40 | 0.7 | ● | ● | – | 22-24-26 | 1.35 | 1.30 | 2.0 |

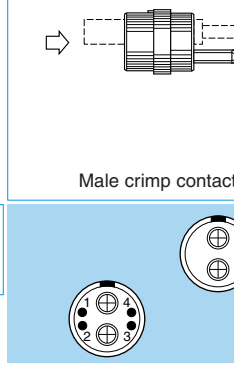
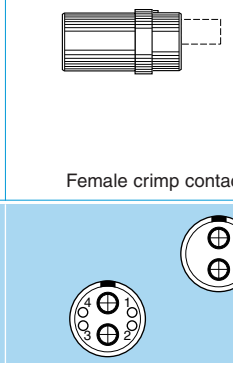
**Note:** Other types available on request, based on existing contact configurations of the B series.
**[1] see calculation method, caution and suggested standard on pages 39 and 40.**
[2] the mentioned AWG range apply to the standard crimp contact of fig.1. Contacts with reduced crimp barrel are available for smaller conductor. See page 20 for explanation and availability.
[3] view for EHS socket.
[4] view for FGS plug.

## Multipole

| | Male crimp contacts | Female crimp contacts | Reference | Number of contacts | ø A (mm) | Contact type: Crimp | Contact type: Print (straight) | Contact type: Print (elbow) | AWG[2] | Test voltage (kV rms)[1] Contact-contact | Test voltage (kV rms)[1] Contact-shell | Rated current (A)[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LF |  |  | 368 | 68 | 0.7 | ● | ● | – | 22-24-26 | 1.5 | 1.5 | 2.5 |
| 5F |  |  | 350 | 50 | 0.9 | ● | ● | – | 20-22-24 | 1.20 | 1.45 | 6.0 |
| | | | 355 | 55 | 0.9 | ● | ● | – | 20-22-24 | 2.00 | 2.10 | 5.0 |
| | | | 364 | 64 | 0.9 | ● | ● | – | 20-22-24 | 1.35 | 1.85 | 3.0 |
| | | | 366 | 66 | 0.9 | ● | ● | – | 20-22-24 | 1.30 | 1.80 | 3.0 |

**Note:** Other types available on request, based on existing contact configurations of the B series.
**[1] see calculation method, caution and suggested standard on pages 39 and 40.**
[2] the mentioned AWG range apply to the standard crimp contact of fig.1. Contacts with reduced crimp barrel are available for smaller conductor. See page 20 for explanation and availability.

## Multi fibre and Mixed fibre optic + LV

| | Male crimp contacts | Female crimp contacts | Reference | Fibre optic No | Low Voltage contact: Contact No | Low Voltage contact: ø A (mm) | Low Voltage contact: Contact type: Crimp | Low Voltage contact: Crimp contact: Test voltage (kV rms)[1] Contact-contact | Low Voltage contact: Crimp contact: Test voltage (kV rms)[1] Contact-shell | Low Voltage contact: Rated current (A) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2F |  |  | 03A | 2 | – | – | – | – | – | – |
| | | | 93B | 2 | 4 | 0.7 | ● | 0.85 | 1.25 | 6.0 |

**Note:** Other types available on request, based on existing contact configurations of the B series.
**[1] see calculation method, caution and suggested standard on pages 39 and 40.**
[2] the mentioned AWG range apply to the standard crimp contact of fig.1. Contacts with reduced crimp barrel are available for smaller conductor. See page 20 for explanation and availability.

# Housings

| Ref. | Availability | | | | | | | | | | | | | | | | Outer shell | | Latch sleeve | | Gaskets |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | for plug | | | | | | | | for sockets | | | | | | | | Material | Surface treatment | Material | Surface treatment | |
| | FF | 0F | 1F | 2F | 3F | 4F | LF | 5F | FF | 0F | 1F | 2F | 3F | 4F | LF | 5F | | | | | |
| X | – | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | Aluminium alloy | Nickel[1)] | Special bronze/brass | Nickel | FPM/FKM |
| Y | ● | ● | ● | ● | ● | ● | – | – | – | – | – | – | – | – | – | – | Aluminium alloy | Nickel[1)] | Beryllium copper | Nickel | FPM/FKM |
| C | – | ○ | ○ | ○ | ○ | – | – | – | – | ○ | ○ | ○ | ○ | – | – | – | Brass | Chrome | Special bronze/brass | Nickel | Silicone MQ/MVQ |

**Note:** [1)] anthracite colour. See page 10 for detail on Material and Treatments. ● First choice alternative ○ Special order alternative

# Contacts

## Crimp contacts for plugs, free or fixed sockets

There are 2 forms of crimp barrels:
– per fig. 1, the standard design
– per fig. 2, with reduced crimp barrel for small conductors.

Fig. 1

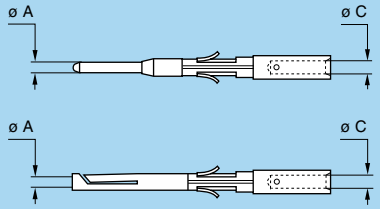
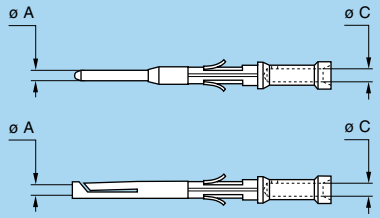



Fig. 2




| Ref. | Contact type |
|---|---|
| C | Male crimp (fig. 1) |
| B | Male crimp (fig. 2) |
| G | Male crimp (fig. 2) |
| D | Male straight print |
| Z | No contact (for multi FO) |

| Ref. | Contact type |
|---|---|
| M | Female crimp (fig. 1) |
| P | Female crimp (fig. 2) |
| U | Female crimp (fig. 2) |
| N | Female straight print |
| V | Male or female elbow print |

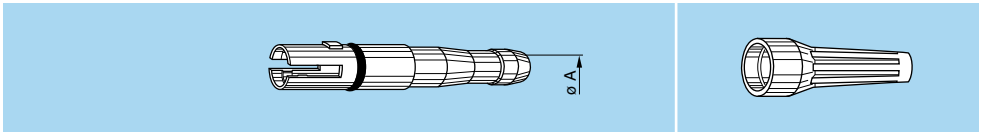
## Dimension of crimp barrels

| Contact | | | Ref. contact type | | Conductor | | | |
|---|---|---|---|---|---|---|---|---|
| ø A (mm) | ø C (mm) | Form per fig. | Male | Female | AWG min. | AWG max. | Section (mm²) min. | Section (mm²) max. |
| 0.5 | 0.42 | 1 | C | M | 32 | 28[1)] | 0.035 | 0.09 |
| 0.7 | 0.80 | 1 | C | M | 26 | 22 | 0.140 | 0.34 |
| | 0.45 | 2 | B | P | 32 | 28 | 0.035 | 0.09 |
| 0.9 | 1.10 | 1 | C | M | 24 | 20 | 0.250 | 0.50 |
| | 0.80 | 2 | B | P | 26 | 22 | 0.140 | 0.34 |
| | 0.45 | 2 | G | U | 32 | 28 | 0.035 | 0.09 |
| 1.3 | 1.40 | 1 | C | M | 20 | 18 | 0.500 | 1.00 |

**Note:** [1)] for a given AWG, the diameter of some stranded conductor designs is larger than the solder cup diameter. Make sure that the maximum conductor diameter is smaller than ø C.

# Cable Fixing

## T type cable adapter




| | Reference | Adapter ø A | Cable ø max. | Cable ø min. | Adapter with gasket part number | Bend relief to be used [1)] |
|---|---|---|---|---|---|---|
| 2F | T46Z | 4.6 | 4.5 | 3.6 | FGG.2F.846.TNV | GMA.2B.040.D● |
| | T56Z | 5.6 | 5.5 | 4.6 | FGG.2F.856.TNV | GMA.2B.050.D● |
| | T66Z | 6.6 | 6.5 | 5.6 | FGG.2F.866.TNV | GMA.2B.060.D● |

**Note:** [1)] to order separately.

# Variant

Some options are available, they are identify with specific letters in the variant position.
– F apply to plug with a reduced unlatching force, such option allows disconnection if the cable is pulled accidentally.
– Connectors with code material X or Y are delivered with FPM/FKM gasket as a standard.
As an option they can be delivered with Silicone gasket. Add the «S» in the variant position.
– P indicated that the watertight models HE● are potted with epoxy resin.

| Model | Reference | | | |
|---|---|---|---|---|
| | Reduced unlatching force | Silicone gasket | Potted | Potted and silicone gasket |
| FG● | F | S | – | – |
| E●● | – | S | – | – |
| HE● | – | – | P | PS |

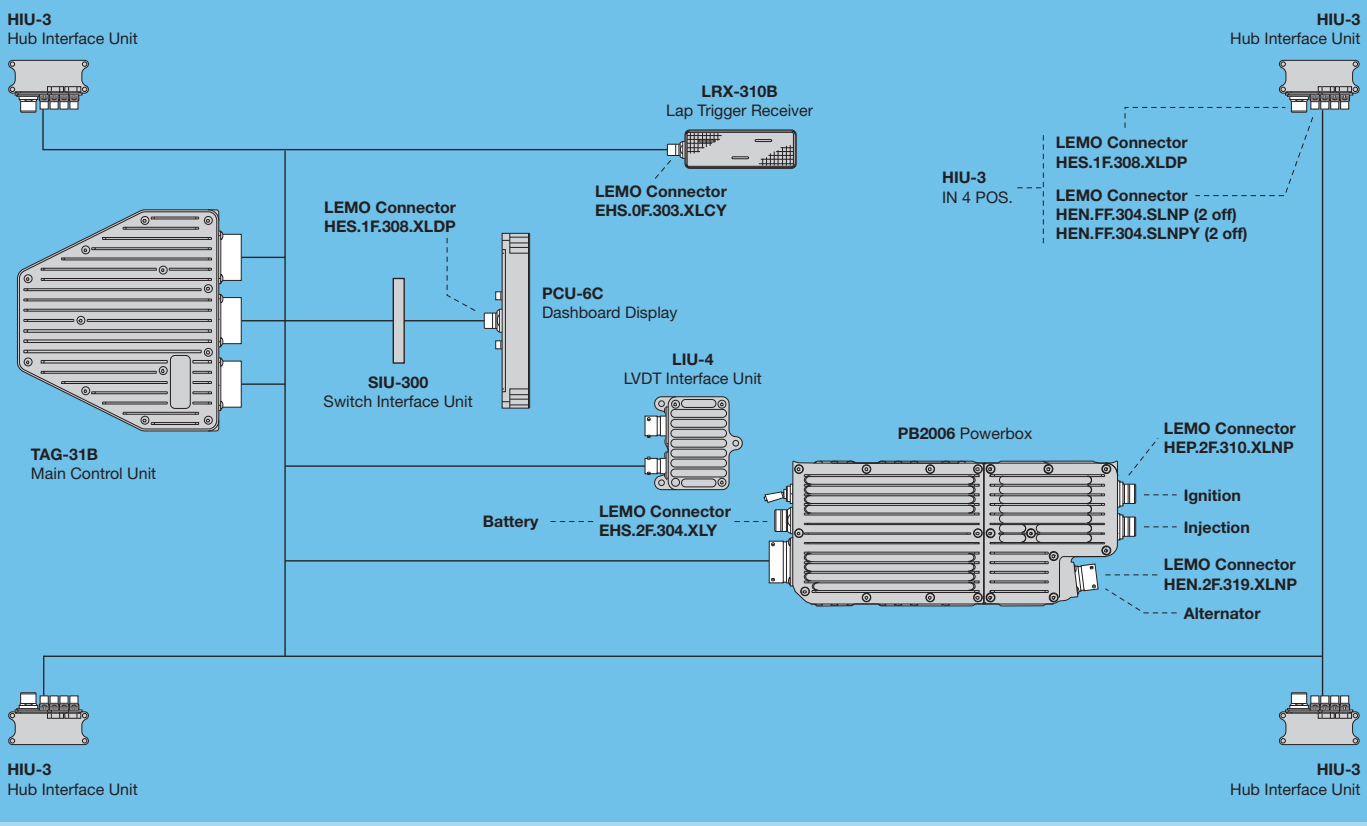
# LEMO F1 ECU systems connectors

LEMO F Series connectors feature on the new ECU being provided by Microsoft® and McLaren Electronic Systems® for the FIA Formula One World Championship in 2008, 2009 and 2010.
The applications include the hub interface unit, lap trigger receiver, powerbox and display connections. To assist users, information on corresponding LEMO connectors that are required to connect to the system are described here below giving full part numbers and application.

LEMO connectors can also be idealy used for HIL setups (hardware in the loop), for vehicle electronic development, crash test setups, for ECU calibration and test, and also in battery status diagnosis.
LEMO connectors have full EMC screening and offer secure push-pull connections for Flexray, CAN bus or USB protocol, PWM (pulse width modulation), digital I/O and power supply.

**F1 ECU SYSTEM**

Based on diagram courtesy of McLaren Electronic Systems Ltd




## HIU (1, 2, 3 & 4) Hub Interface Unit

| Unit connectors | Interface connectors | Spare contacts |
|---|---|---|
| HES.1F.308.XLDP | FGS.1F.308.YLM | EGG.0B.655.ZZM |
| HEN.FF.304.SLNP 1) | FGN.FF.304.YLC | FGG.00.554.ZZC |
| HEN.FF.304.SLNPY 1) | FGN.FF.304.YLC | FGG.00.554.ZZC |

**Notes:** 1) outershell in stainless steel (AISI 303, 304).

## LRX 310B Lap Trigger Receiver

| Unit connector | Interface connector | Spare contact |
|---|---|---|
| EHS.0F.303.XLCY | FGS.0F.303.YLM | EGG.0B.660.ZZM |

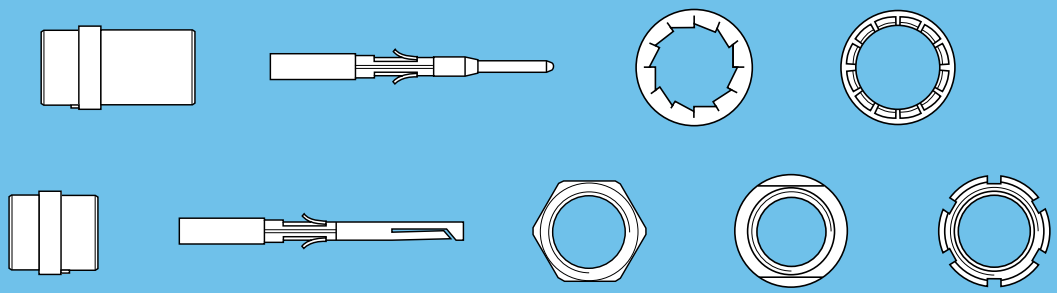
## PB2006 Powerbox

| Unit connectors | Interface connectors | Spare contacts |
|---|---|---|
| EHS.2F.304.XLY | FGS.2F.304.YLY | FGN.1F.565.ZZC 1)<br>EGN.1F.665.ZZM 2) |
| HEP.2F.310.XLNP | FGP.2F.310.YLC | FGG.0B.560.ZZC |
| HEN.2F.319.XLNP | FGN.2F.319.YLC | FGG.0B.555.ZZC |

**Notes:** 1) male contact. 2) female contact.

## PCU-6C Dashboard display

| Unit connector | Interface connector | Spare contact |
|---|---|---|
| HES.1F.308.XLDP | FGS.1F.308.YLM | EGG.0B.655.ZZM |

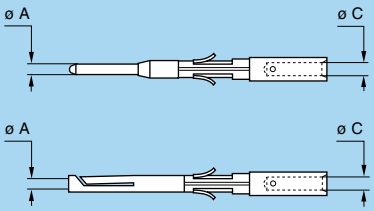


# SPARE PARTS

# Spare parts

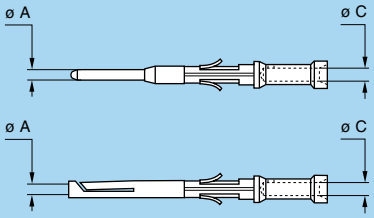
## FGG-EGG Crimp contacts

Fig. 1

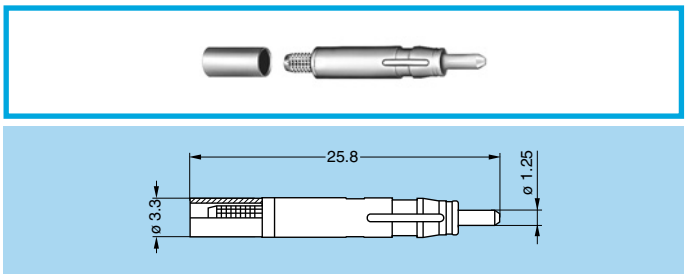



| | Contact (mm) | | Contact part number | | | |
|---|---|---|---|---|---|---|
| | ø A | ø C | male for plug | female for socket | male for socket | female for plug |
| FF | 0.5 | 0.42 | FGG.00.554.ZZC | EGG.00.654.ZZM | FGG.00.554.ZZC | EGG.00.654.ZZM |
| 0F | 0.9 | 1.10 | FGG.0B.560.ZZC | EGG.0B.660.ZZM | FGG.0B.560.ZZC | EGG.0B.660.ZZM |
| | 0.7 | 0.80 | FGG.0B.555.ZZC | EGG.0B.655.ZZM | FGG.0B.555.ZZC | EGG.0B.655.ZZM |
| 1F | 1.3 | 1.40 | FGN.1F.565.ZZC | EGN.1F.665.ZZM | FGN.1F.565.ZZC | EGN.1F.665.ZZM |
| | 0.9 | 1.10 | FGG.0B.560.ZZC | EGG.0B.660.ZZM | FGG.0B.560.ZZC | EGG.0B.660.ZZM |
| | 0.7 | 0.80 | FGG.0B.555.ZZC | EGG.0B.655.ZZM | FGG.0B.555.ZZC | EGG.0B.655.ZZM |
| 2F | 0.9 | 1.10 | FGG.0B.560.ZZC | EGG.0B.660.ZZM | FGG.0B.560.ZZC | EGG.0B.660.ZZM |
| | 0.7 | 0.80 | FGG.0B.555.ZZC | EGG.0B.655.ZZM | FGG.0B.555.ZZC | EGG.0B.655.ZZM |
| 3F | 0.7 | 0.80 | FGG.0B.555.ZZC | EGG.0B.655.ZZM | FGG.0B.555.ZZC | EGN.3F.655.ZZM |
| 4F | 0.7 | 0.80 | FGG.2B.555.ZZC | EGG.0B.655.ZZM | FGG.0B.555.ZZC | EGG.2B.655.ZZM |
| LF | 0.7 | 0.80 | FGG.3B.555.ZZC | EGG.2B.655.ZZM | FGG.0B.555.ZZC | EGG.3B.655.ZZM |
| 5F | 0.9 | 1.10 | FGG.3B.560.ZZC | EGG.3B.660.ZZM | FGG.3B.560.ZZC | EGG.3B.660.ZZM |

Fig. 2

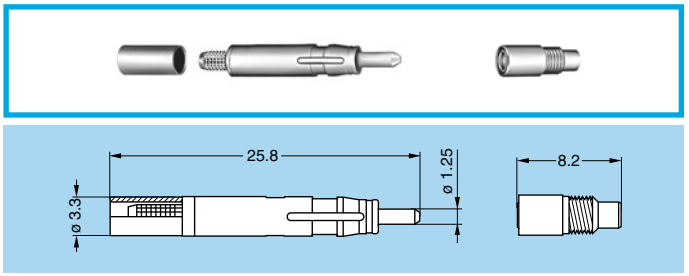



| | Contact (mm) | | Contact part number | | | |
|---|---|---|---|---|---|---|
| | ø A | ø C | male for plug | female for socket | male for socket | female for plug |
| 0F | 0.9 | 0.80 | FGG.0B.561.ZZC | EGG.0B.661.ZZM | FGG.0B.561.ZZC | EGG.0B.661.ZZM |
| | | 0.45 | FGG.0B.562.ZZC | EGG.0B.662.ZZM | FGG.0B.562.ZZC | EGG.0B.662.ZZM |
| | 0.7 | 0.45 | FGG.0B.556.ZZC | EGG.0B.656.ZZM | FGG.0B.556.ZZC | EGG.0B.656.ZZM |
| 1F | 0.9 | 0.80 | FGG.0B.561.ZZC | EGG.0B.661.ZZM | FGG.0B.561.ZZC | EGG.0B.661.ZZM |
| | | 0.45 | FGG.0B.562.ZZC | EGG.0B.662.ZZM | FGG.0B.562.ZZC | EGG.0B.662.ZZM |
| | 0.7 | 0.45 | FGG.0B.556.ZZC | EGG.0B.656.ZZM | FGG.0B.556.ZZC | EGG.0B.656.ZZM |
| 2F | 0.9 | 0.80 | FGG.0B.561.ZZC | EGG.0B.661.ZZM | FGG.0B.561.ZZC | EGG.0B.661.ZZM |
| | | 0.45 | FGG.0B.562.ZZC | EGG.0B.662.ZZM | FGG.0B.562.ZZC | EGG.0B.662.ZZM |
| | 0.7 | 0.45 | FGG.0B.556.ZZC | EGG.0B.656.ZZM | FGG.0B.556.ZZC | EGG.0B.656.ZZM |
| 3F | 0.7 | 0.45 | FGG.0B.556.ZZC | EGG.0B.656.ZZM | FGG.0B.556.ZZC | EGN.3F.656.ZZM |
| 4F | 0.7 | 0.45 | FGG.2B.556.ZZC | EGG.0B.656.ZZM | FGG.0B.556.ZZC | EGG.2B.656.ZZM |
| LF | 0.7 | 0.45 | FGG.3B.556.ZZC | EGG.2B.656.ZZM | FGG.0B.556.ZZC | EGG.3B.656.ZZM |
| 5F | 0.9 | 0.80 | FGG.3B.561.ZZC | EGG.3B.661.ZZM | FGG.3B.561.ZZC | EGG.3B.661.ZZM |




## FFS.F7 Male F7 Fibre Optic Contact

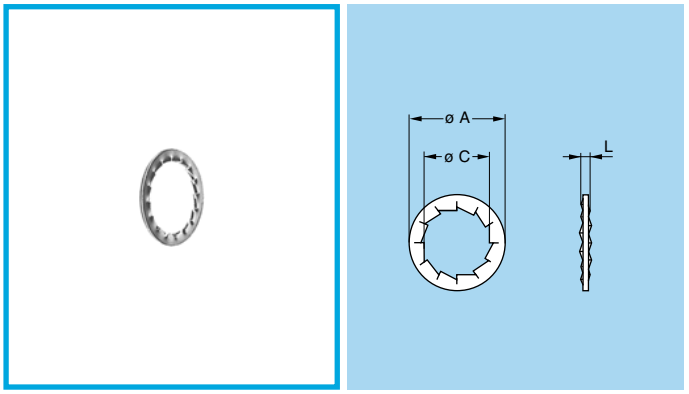
| Part number | Ferrule hole ø (µm) | Fibre ø core/cladding (µm) | Note |
|---|---|---|---|
| FFS.F7.125.LCE23 | 125 | 9/125<br>50/125<br>62.5/125 | ● |
| FFS.F7.126.LCE23 | 126 | | ● |
| FFS.F7.128.LCE23 | 128 | | ○ |




## PSS.F7 Female F7 Fibre Optic Contact

| Part number | Ferrule hole ø (µm) | Fibre ø core/cladding (µm) | Note |
|---|---|---|---|
| PSS.F7.125.LCE23 | 125 | 9/125<br>50/125<br>62.5/125 | ● |
| PSS.F7.126.LCE23 | 126 | | ● |
| PSS.F7.128.LCE23 | 128 | | ○ |

**Note:** alignment device part number: PSS.F7.290.NZZ

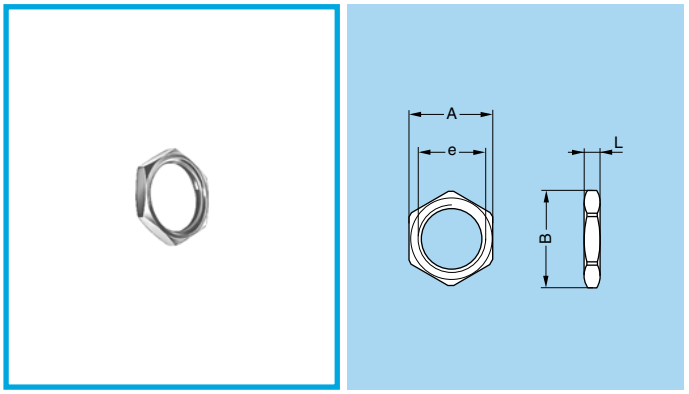



## GBA Locking washers

| Part number | Series | Dimensions (mm) | | | For models |
|---|---|---|---|---|---|
| | | A | C | L | |
| GBA.00.250.FN | FF | 9.5 | 7.1 | 1.0 | EC● |
| GBA.0S.250.FN | 0F | 12.5 | 9.1 | 1.0 | EG● |
| GBA.1S.250.FN | 1F | 16.0 | 12.1 | 1.0 | EG● |
| GBA.2S.250.FN | 2F | 19.5 | 15.1 | 1.2 | EG● |
| GBA.3S.250.FN | 3F | 25.0 | 18.1 | 1.4 | EG●, PE●, EE●, EH● |

**Note:** to order this accessory separately, use the above part numbers.

● Material: Nickel-plated bronze (3 µm)

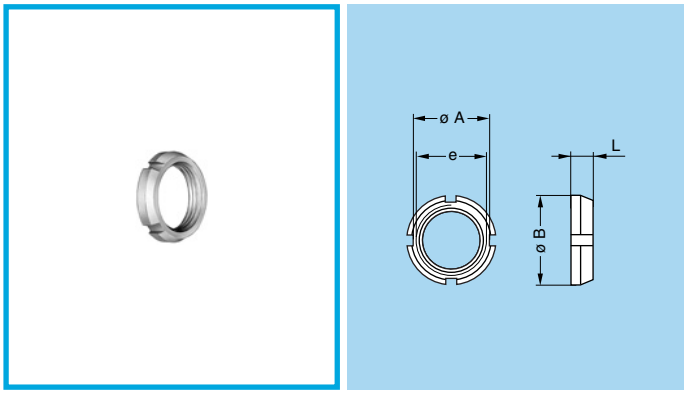



## GEA Hexagonal nuts

| Part number | Series | Dimensions (mm) | | | | For models |
|---|---|---|---|---|---|---|
| | | A | B | e | L | |
| GEA.00.240.LN | FF | 9 | 10.2 | M7x0.50 | 2.0 | EC● |
| GEA.0S.240.LN | 0F | 11 | 12.4 | M9x0.60 | 2.0 | EG● |
| GEA.1S.240.LN | 1F | 14 | 15.8 | M12x1.00 | 2.5 | EG● |
| GEA.2S.240.LN | 2F | 17 | 19.2 | M15x1.00 | 2.7 | EG● |
| GEA.3S.240.LN | 3F | 22 | 25.0 | M18x1.00 | 3.0 | EG● |

**Note:** to order this part separately use the above part numbers.

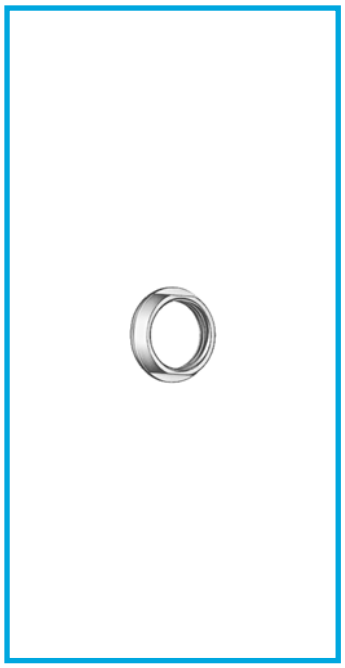
● Material: Nickel-plated brass (3 µm)

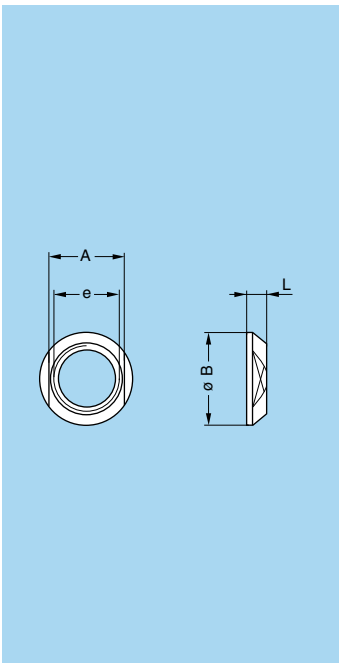



## GEG Notched nut

| Part number | Series | Dimensions (mm) | | | | For models |
|---|---|---|---|---|---|---|
| | | A | B | e | L | |
| GEG.00.240.RN | FF | 8.7 | 10 | M7x0.50 | 2.5 | HE●, EC●, PE● |

● Material: Nickel-anthracite aluminium alloy






## GEC Conical nut

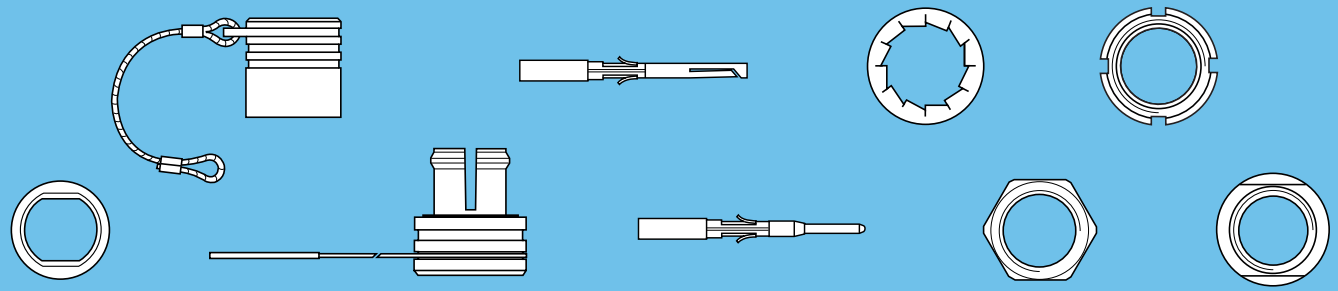
| Part number | Series | Dimensions (mm) | | | | For models |
|---|---|---|---|---|---|---|
| | | A | B | e | L | |
| GEC.FF.240.P● | FF | 8 | 10 | M7x0.50 | 2.5 | PE●, EH●, HE● |
| GEC.0F.240.P● | 0F | 11 | 13 | M10x0.75 | 2.5 | PE●, EE●, EH●, HE● |
| GEC.1F.240.P● | 1F | 14 | 17 | M13x0.75 | 3.2 | PE●, EE●, EH●, HE● |
| GEC.2F.240.P● | 2F | 17 | 20 | M16x1.00 | 4.0 | PE●, EE●, EH●, HE● |
| GEC.3F.240.P● | 3F | 19 | 22 | M18x1.00 | 4.0 | PE●, EE●, EH●, HE● |
| GEC.4F.240.P● | 4F | 25 | 29 | M24x1.00 | 5.0 | PE●, EH●, HE● |
| GEC.LF.240.P● | LF | 28 | 32 | M27x1.00 | 5.0 | PE●, EH●, HE● |
| GEC.5F.240.P● | 5F | 34 | 38 | M33x1.00 | 5.0 | PE●, EH●, HE● |

| Ref. | Colour | Keying |
|---|---|---|
| A | blue | N or W |
| J | yellow | P |

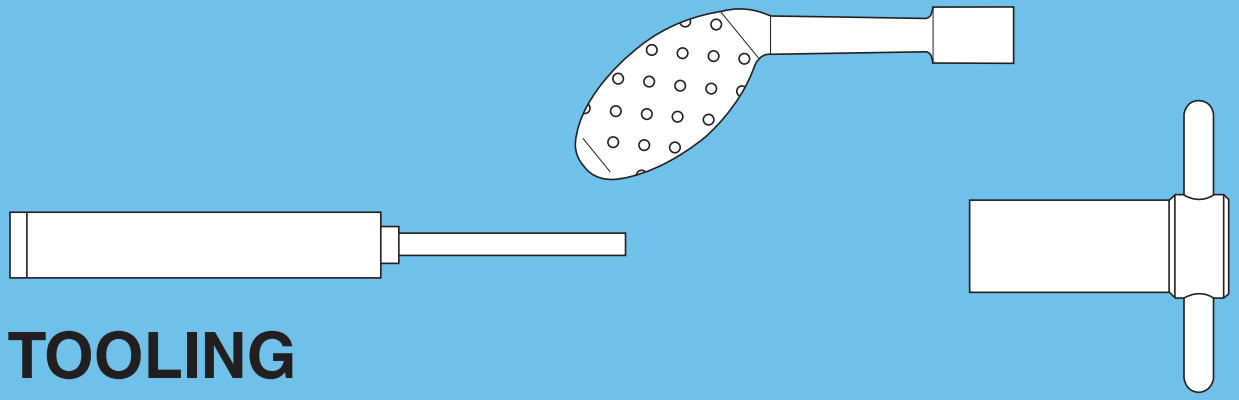
| Ref. | Colour | Keying |
|---|---|---|
| R | red | S or X |
| V | green | T |

**Note:** the last position "●" of the part number indicates the colour. To obtain the required colour, refer to the above table and change the position "●" of the part number to the corresponding letter.

● Material: Anodized aluminium alloy

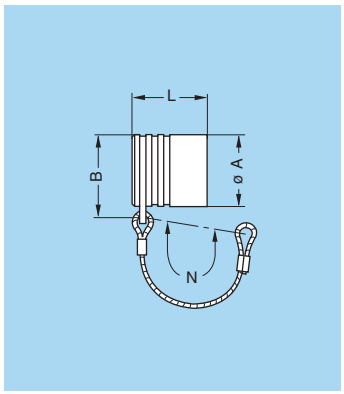


## ACCESSORIES



## TOOLING

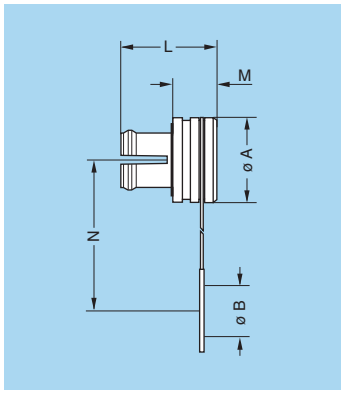
# Accessories




## BF● Plug caps, with keys (N or P)

| Part number | Series | Dimensions (mm) | | | |
|---|---|---|---|---|---|
| | | A | B | L | N |
| BF●.1F.100 PCSG | 1F | 12.0 | 13.3 | 12.6 | 62 |
| BF●.2F.100.PCSG | 2F | 15.0 | 16.4 | 12.8 | 75 |

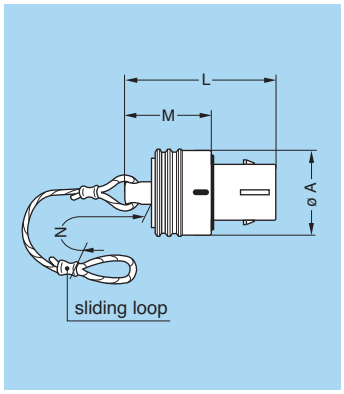
- Body material: PA6.6 grey
- Cord material: Polyamide 6
- Maximum operating temperature: 100°C
- Protection index: IP51 according to IEC 60529




## BRA Blanking caps for fixed sockets

| Part number | Series | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|
| | | A | B | L | M | N |
| BRA.1F.200.PZSG | 1F | 14.0 | 13.7 | 12.1 | 5.3 | 65.5 |
| BRA.2F.200.PZSG | 2F | 18.0 | 16.5 | 12.0 | 5.6 | 65.5 |

- Body material: PA6.6 grey
- Band: PET
- Maximum operating temperature: 100°C
- Protection index: IP51 according to IEC 60529



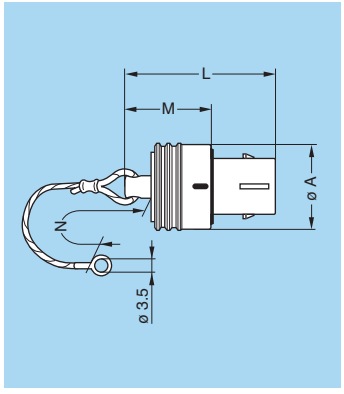

- Lanyard material: Stainless steel
- Crimp ferrule material: Nickel-plated brass + polyolefin

## BRF Blanking caps, with latching for free sockets

| Part number | Series | Dimensions (mm) | | | |
|---|---|---|---|---|---|
| | | A | L | M | N |
| BRF.FF.200.YAV | FF | 8.5 | 20.0 | 12.0 | 60 |
| BRF.0F.200.XAV | 0F | 12.0 | 25.5 | 15.6 | 85 |
| BRF.1F.200.XAV | 1F | 14.0 | 25.8 | 15.7 | 85 |
| BRF.2F.200.XAV | 2F | 17.0 | 25.8 | 15.6 | 85 |
| BRF.3F.200.XAV | 3F | 19.0 | 27.8 | 17.6 | 120 |
| BRF.4F.200.XAV | 4F | 26.0 | 30.3 | 20.1 | 120 |
| BRF.LF.200.XAV | LF | 29.0 | 34.7 | 20.1 | 120 |

**Note:** this cap is suitable for use with any alignment key configuration.

- Maximum operating temperature: 135°C
- Watertightness: IP67 according to IEC 60529



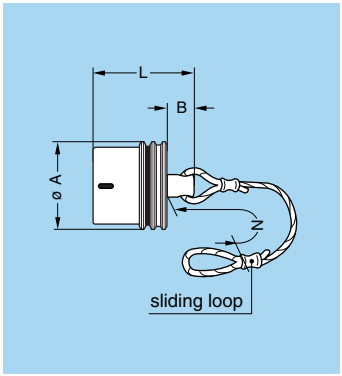

- Lanyard material: Stainless steel
- Crimp ferrule material: Nickel-plated brass + polyolefin

## BRE Blanking caps, with latching for fixed sockets

| Part number | Series | Dimensions (mm) | | | |
|---|---|---|---|---|---|
| | | A | L | M | N |
| BRE.FF.200.YAV | FF | 8.5 | 20.0 | 12.0 | 60 |
| BRE.0F.200.XAV | 0F | 12.0 | 25.5 | 15.6 | 85 |
| BRE.1F.200.XAV | 1F | 14.0 | 25.8 | 15.7 | 85 |
| BRE.2F.200.XAV | 2F | 17.0 | 25.8 | 15.6 | 85 |
| BRE.3F.200.XAV | 3F | 19.0 | 27.8 | 17.6 | 120 |
| BRE.4F.200.XAV | 4F | 26.0 | 30.3 | 20.1 | 120 |
| BRE.LF.200.XAV | LF | 29.0 | 34.7 | 20.1 | 120 |

**Note:** this cap is suitable for use with any alignment key configuration.
The BRE.0F cap has no keying and can be therefore used with any socket.

- Maximum operating temperature: 135°C
- Watertightness: IP67 according to IEC 60529



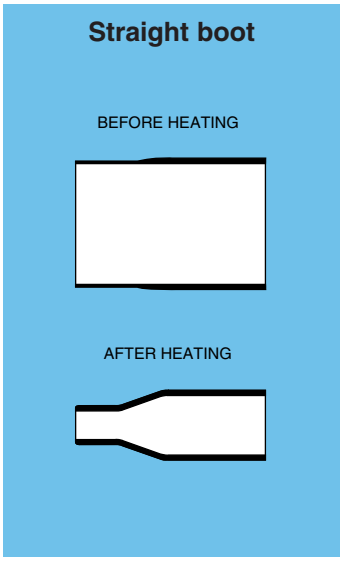

- Lanyard material: Stainless steel
- Crimp ferrule material: Nickel-plated brass + polyolefin

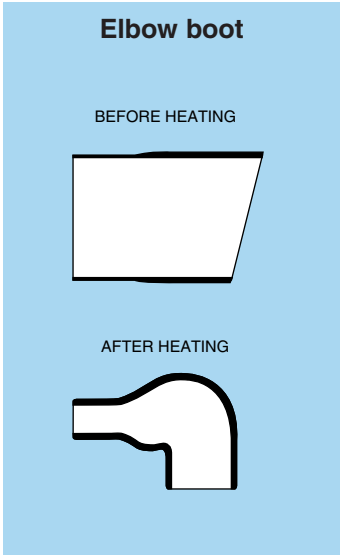
## BFG Plug caps

| Part number | Series | Dimensions (mm) | | | |
|---|---|---|---|---|---|
| | | A | B | L | N |
| BFG.FF.100.XAZ | FF | 8.5 | 4 | 14 | 60 |
| BFG.0F.100.XAZ | 0F | 12.0 | 6 | 18 | 85 |
| BFG.1F.100.XAZ | 1F | 14.0 | 6 | 18 | 85 |
| BFG.2F.100.XAZ | 2F | 17.0 | 6 | 18 | 85 |
| BFG.3F.100.XAZ | 3F | 19.0 | 8 | 20 | 120 |
| BFG.4F.100.XAZ | 4F | 26.0 | 8 | 20 | 120 |
| BFG.LF.100.XAZ | LF | 30.0 | 8 | 24 | 120 |

**Note:** this cap is suitable for use with any alignment key configuration.

- Maximum operating temperature: 135°C
- Watertightness: IP67 according to IEC 60529

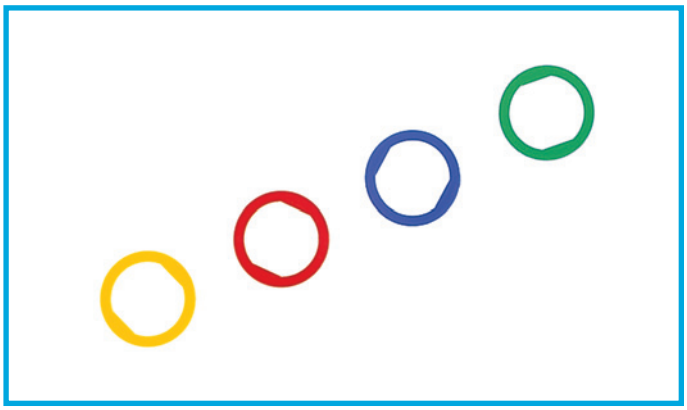



## Heatshrink boot

| Supplier | Series | Part number | | Note | cable ø min. (mm) |
|---|---|---|---|---|---|
| | | Straight | Elbow 90° | | |
| LEMO | FF | GMA.10.290.DN | GHA.10.210.DN | 2) | 2.2 |
| Raychem® | 0F-1F-2F-3F | 202 A 111-25/86 | 222 A 111-25/86 | 1) | 3.8 |
| | | 202 A 111-25 | 222 A 111-25 | 2) | 3.8 |
| | 1F-2F-3F-4F | 202 A 121-25/86 | 222 A 121-25/86 | 1) | 5.3 |
| | | 202 A 121-25 | 222 A 121-25 | 2) | 5.3 |
| | 4F-LF-5F | 202 A 142-25/86 | 222 A 142-25/86 | 1) | 7.4 |
| | 4F-5F | 202 A 142-25 | 222 A 142-25 | 2) | 7.4 |
| Hellermann® | 0F-1F-2F-3F | 104-1-G | 1108-1-G | 2) | 3.8 |
| | 1F-2F-3F-4F | 105-1-G | 1106-1-G | 2) | 5.6 |
| | 4F-5F | 101-1-G | 1104-2-G | 2) | 7.1 |

**Note:**
1) modified elastomer resistant to fluids with hot melt sealant.
2) elastomer resistant to fluids. We recommend a thermosetting sealant with this type of boot.



## GRA Insulating washers

| Part number | Series | Dimensions (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | E | L | M | T |
| GRA.0F.269.G● | 0F | 15 | 12.0 | 4 | 1.8 | 1.0 | 11 |
| GRA.1F.269.G● | 1F | 19 | 15.0 | 4 | 2.0 | 1.1 | 14 |
| GRA.2F.269.G● | 2F | 22 | 18.5 | 4 | 2.2 | 1.2 | 17 |
| GRA.3F.269.G● | 3F | 24 | 20.5 | 4 | 2.2 | 1.2 | 19 |
| GRA.4F.269.G● | 4F | 31 | 27.5 | 4 | 2.2 | 1.2 | 25 |
| GRA.5F.269.G● | 5F | 40 | 36.5 | 4 | 2.2 | 1.2 | 34 |

For EG● sockets with a particular thread dimension, use B series insulating washers (see below).

| Part number | Series | Dimensions (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | E | L | M | T |
| GRA.0S.269.G● | 0F | 12.0 | 10.8 | 6.0 | 1.8 | 1.0 | 9.9 |
| GRA.1S.269.G● | 1F | 16.0 | 13.8 | 6.5 | 1.8 | 1.0 | 12.2 |
| GRA.2S.269.G● | 2F | 21.1 | 17.9 | 7.3 | 2.3 | 1.3 | 16.2 |
| GRA.3S.269.G● | 3F | 25.0 | 21.8 | 10.3 | 2.2 | 1.2 | 20.2 |

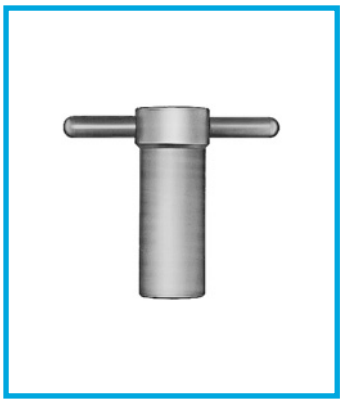
**Note:** the last position "●" of the part number indicates the colour. To obtain the required colour, refer to the above table and change position "●" of the part number to the corresponding letter.

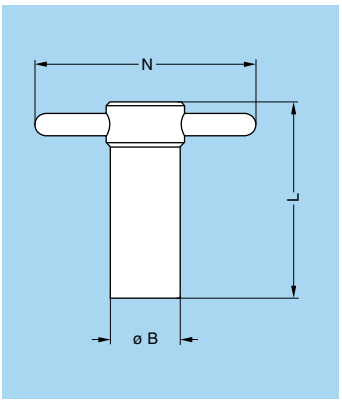
| Ref. | Colour | Keying |
|---|---|---|
| A | blue | N or W |
| J | yellow | P |

| Ref. | Colour | Keying |
|---|---|---|
| R | red | S or X |
| V | green | T |

- Material: Polyamide

# Tooling

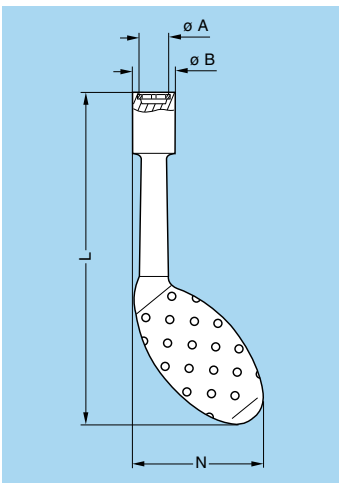





## DCG Spanners for hexagonal nuts

| Part number | Dimensions (mm) | | | Part number of the nut |
|---|---|---|---|---|
| | B | L | N | |
| DCG.91.149.0TN | 14 | 40 | 50 | GEA.00.240.LN |
| DCG.91.161.1TN | 16 | 45 | 52 | GEA.0S.240.LN |
| DCG.91.201.4TN | 20 | 52 | 65 | GEA.1S.240.LN |
| DCG.91.231.7TN | 23 | 62 | 68 | GEA.2S.240.LN |
| DCG.91.282.2TN | 28 | 76 | 73 | GEA.3S.240.LN |

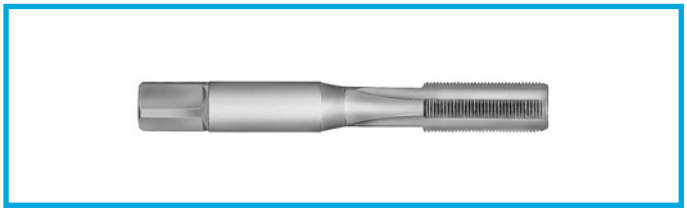
- Material: blackened steel




## DCH Spanners for notched nut

| Part number | Dimensions (mm) | | | | Part number of the nut |
|---|---|---|---|---|---|
| | A | B | L | N | |
| DCH.91.101.PA | 10.1 | 12.8 | 124 | 48.3 | GEG.00.240.RN |

- Material: Blue polyurethane



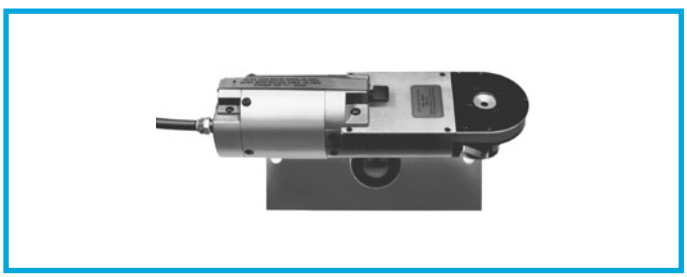
## DTA Taps

| Part number | Series | Thread |
|---|---|---|
| DTA.99.700.5Z | 00 | M7 x 0.5 |
| DTA.99.900.6Z | 0S-0B | M9 x 0.6 |

## DPC Manual crimping tool

| Part number |
|---|
| DPC.91.701.V |

According to specification MIL-C-22520/7-01.
For LEMO contacts ø 0.5-0.7-0.9-1.3 mm



## Pneumatic crimping tools

| Supplier | Part number |
|---|---|
| LEMO | DPC.91.701.C |
| BALMAR | 85230 |
| BUCHANAN | 621101 |

According to specification MIL-C-22520/7-01.
For LEMO contacts ø 0.5-0.7-0.9-1.3 mm

## DCE Positioners for crimp contacts ø 0.5-0.7-0.9 and 1.3 mm

male

female

## DCF Extractor for crimp contact ø 0.5-0.7-0.9 and 1.3 mm

These positioners are suitable for use with both manual and pneumatic crimping tools according to the MIL-C-22520/7-01 standard.

| | Connector + Contact | | | | | Positioners part number | | | | Extractors part number |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | ø A | ø C | Fig. | Conductor AWG | For male contacts into plug | For female contacts into socket | For male contacts into socket | For female contacts into plug | |
| FF | 303 304 | 0.5 | 0.42 | 1 | 28-30-32 | DCE.91.050.0VC | DCE.91.050.0VM | DCE.91.050.0VC | DCE.91.050.0VM | DCF.91.050.2LT |
| 0F | 302 303 | 0.9 | 1.10 | 1 | 20-22-24 | DCE.91.090.BVC | DCE.91.090.BVM | DCE.91.090.BVC | DCE.91.090.BVM | DCF.93.090.4LT |
| | | 0.9 | 0.80 | 2 | 22-24-26 | | | | | |
| | | 0.9 | 0.45 | 2 | 28-30-32 | DCE.91.090.AVC | DCE.91.090.AVM | DCE.91.090.AVC | DCE.91.090.AVM | DCF.93.090.4LT |
| | 304 305 | 0.7 | 0.80 | 1 | 22-24-26 | DCE.91.070.BVC | DCE.91.070.BVM | DCE.91.070.BVC | DCE.91.070.BVM | DCF.93.070.4LT |
| | | 0.7 | 0.45 | 2 | 28-30-32 | | | | | |
| 1F | 303 | 1.3 | 1.40 | 1 | 18-20 | DCE.91.131.FVC | DCE.91.131.FVM | DCE.91.131.FVC | DCE.91.131.FVM | DCF.93.131.4LT |
| | 305 | 0.9 | 1.10 | 1 | 20-22-24 | DCE.91.090.BVC | DCE.91.090.BVM | DCE.91.090.BVC | DCE.91.090.BVM | DCF.93.090.4LT |
| | | 0.9 | 0.80 | 2 | 22-24-26 | | | | | |
| | | 0.9 | 0.45 | 2 | 28-30-32 | DCE.91.090.AVC | DCE.91.090.AVM | DCE.91.090.AVC | DCE.91.090.AVM | DCF.93.090.4LT |
| | 307/308 | 0.7 | 0.80 | 1 | 22-24-26 | DCE.91.070.BVC | DCE.91.070.BVM | DCE.91.070.BVC | DCE.91.070.BVM | DCF.93.070.4LT |
| | | 0.7 | 0.45 | 2 | 28-30-32 | | | | | |
| 2F | 308 310 | 0.9 | 1.10 | 1 | 20-22-24 | DCE.91.090.BVC | DCE.91.090.BVM | DCE.91.090.BVC | DCE.91.090.BVM | DCF.93.090.4LT |
| | | 0.9 | 0.80 | 2 | 22-24-26 | | | | | |
| | | 0.9 | 0.45 | 2 | 28-30-32 | DCE.91.090.AVC | DCE.91.090.AVM | DCE.91.090.AVC | DCE.91.090.AVM | DCF.93.090.4LT |
| | 312 319 | 0.7 | 0.80 | 1 | 22-24-26 | DCE.91.070.BVC | DCE.91.070.BVM | DCE.91.070.BVC | DCE.91.070.BVM | DCF.93.070.4LT |
| | | 0.7 | 0.45 | 2 | 28-30-32 | | | | | |
| 3F | 322 330 | 0.7 | 0.80 | 1 | 22-24-26 | DCE.91.070.BVC | DCE.91.070.BVM | DCE.91.070.BVC | DCE.91.071.FVM | DCF.93.070.4LT |
| | | 0.7 | 0.45 | 2 | 28-30-32 | | | | | |
| 4F | 340 | 0.7 | 0.80 | 1 | 22-24-26 | DCE.91.072.BVC | DCE.91.070.BVM | DCE.91.070.BVC | DCE.91.072.BVM | DCF.93.070.4LT |
| | | 0.7 | 0.45 | 2 | 28-30-32 | | | | | |
| LF | 368 | 0.7 | 0.80 | 1 | 22-24-26 | DCE.91.073.BVC | DCE.91.072.BVM | DCE.91.070.BVC | DCE.91.073.BVM | DCF.93.070.4LT |
| | | 0.7 | 0.45 | 2 | 28-30-32 | | | | | |
| 5F | 350/354 355/364 366 | 0.9 | 1.10 | 1 | 20-22-24 | DCE.91.093.BVC | DCE.91.093.BVM | DCE.91.093.BVC | DCE.91.093.BVM | DCF.91.093.5LT |
| | | 0.9 | 0.80 | 2 | 22-24-26 | | | | | |

**Note:** see table on page 20 for connector selection and the table on page 24 for contact selection.
A wide variation of strand number and diameter combinations are quoted as being AWG, some of which do not have a large enough cross section to guarantee a crimp as per either MIL-C-22520/1-01 or /7-01. Our technical department is at your disposal to study and propose a solution to all your applications.

Fig. 1

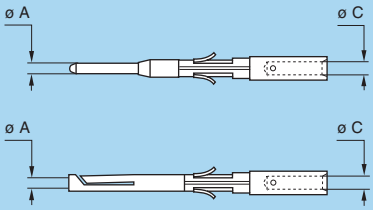
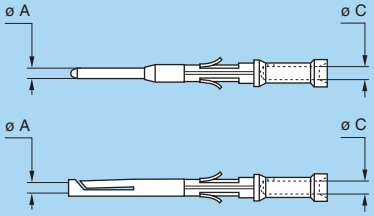
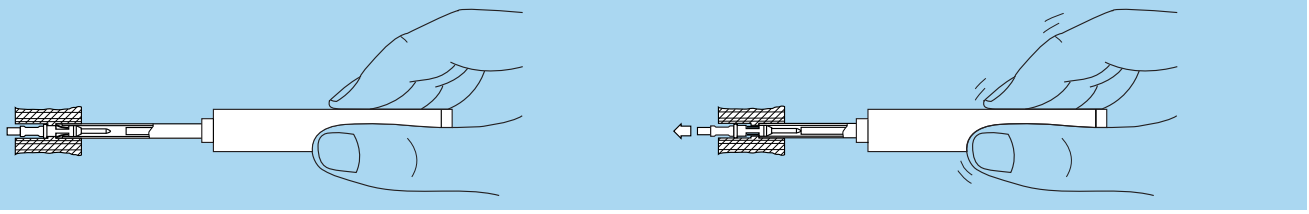



Fig. 2

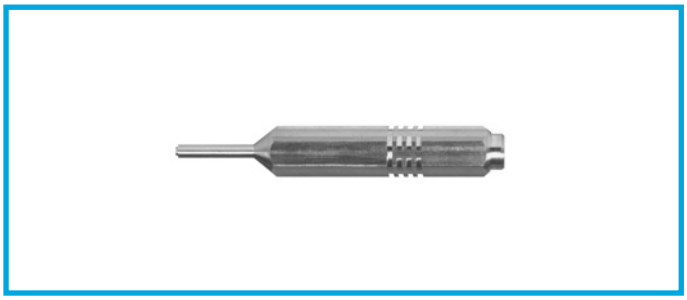


## Banding tool

| | Part number | | |
|---|---|---|---|
| | GLEN-AIR® | TIE-DEX® | AXON® |
| Banding tool | 600-061 | A30199 | ACDBS100 |
| Tie wrap | 600-057 | A31189 | AXCL0Z |

**Note:** the banding tool is to be used with screened cables to ensure a good ground contact.



## DCK Retention testing tools for crimp contacts 0.5-0.7-0.9 and 1.3 mm diameter

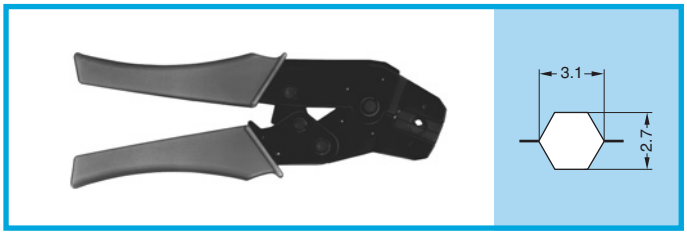
| Contact ø A | Test force (N) | Testing tool part number | |
|---|---|---|---|
| | | For male contact | For female contact |
| 0.5 | 8 | DCK.91.050.8LRC | DCK.91.050.8LRM |
| 0.7 | 10 | DCK.91.071.0LRC | DCK.91.071.0LRM |
| 0.9 | 14 | DCK.91.091.4LRC | DCK.91.091.4LRM |
| 1.3 | 25 | DCK.91.132.5LRC | DCK.91.132.5LRM |

## DRV Complete workstation for F7 fibre optic contact

### Description
Comprehensive range of tools for terminating both single-mode and multi-mode fibres. Includes specific tools for F7 fibre optic contacts. Detachable termination case lid for use as polishing platform during field termination.
Rugged but aesthetically pleasing termination case which is ideal for field use or in-house terminations. Curing oven and inspection microscope should be ordered separately.

| Part number |
|---|
| DRV.91.CF7.PN |

**Note:** See details in F7 catalogue.




## DPE Crimping tool for F7 fibre optic contact

### Description
Crimping tool for capturing KEVLAR® strand on contact body.

| Part number |
|---|
| DPE.99.003.1K [1] |

**Note:** [1] Included in the LEMO F7 workstation.

## WST Epoxy curing oven

### Description
Oven for assisting in curing epoxy.

| Part number | Voltage |
|---|---|
| WST.FR.220.VA | 220 volts |
| WST.FR.110.VA | 110 volts |

## DCS Polishing tool for fibre optic contacts

### Description
Precision tool for polishing terminated fibre optic contacts with 1.25 mm ferrule.

| Part number |
|---|
| DCS.91.D01.LC [1] |

**Note:** [1] Included in the LEMO F7 workstation.

## WST Fibre Inspection Microscope

**Description**
Microscope to assist in viewing termination operations and verifying fibre end finish. Zoom with 200 → 400 x magnification. See adaptor on page 33.

| Part number |
|---|
| WST.FB.G00.301 |

## DCS Microscope adaptor for fibre optic contacts

**Description**
Adaptor for final inspection of fibre optic contacts with 1.25 mm ferrule.
To be used with microscope WST.FB.G00.301.

| Part number |
|---|
| DCS.91.G90.6E125 [1] |

**Note:** [1] Included in the LEMO F7 workstation.

## DCS F7 contact alignment device tool

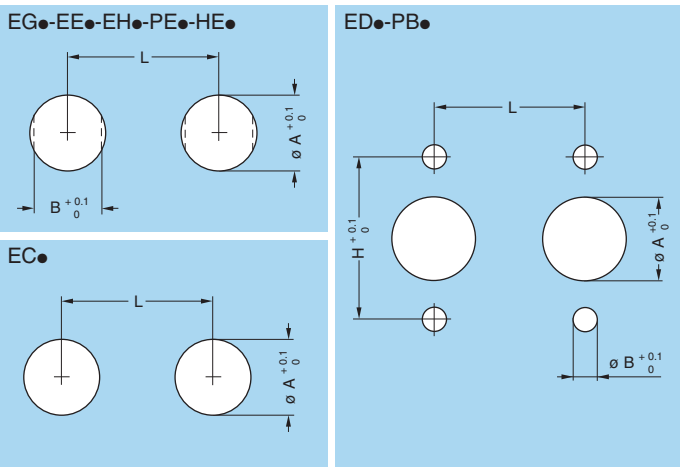
**Description**
Simple tool with two threaded end for installation/extraction of the F7 contact alignment device.

| Part number |
|---|
| DCS.F7.035.PN [1] |

**Note:** [1] Included in the LEMO F7 workstation.

# Panel Cut-out

### Panel cut-outs




### Mounting nut torque

| Series | Torque (Nm) |
|---|---|
| FF | 0.25 |
| 0F | 1.00 |
| 1F | 1.50 |
| 2F | 2.00 |

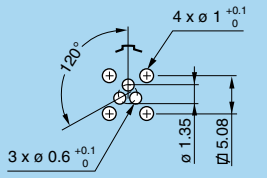
| Series | Torque (Nm) |
|---|---|
| 3F | 2.50 |
| 4F | 5.00 |
| LF | 6.00 |
| 5F | 8.00 |

| Models | | | | Series | Dimensions (mm) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | A | B | L | H |
| EC● | | | | FF | 7.1 | – | 11.5 | – |
| – | EH● | HE● | PE● | FF | 7.1 | 6.5 | 11.5 | – |
| EE● | EH● | HE● | PE● | 0F | 10.1 | 9.1 | 16.0 | – |
| EE● | EH● | HE● | PE● | 1F | 13.1 | 11.6 | 20.0 | – |
| EE● | EH● | HE● | PE● | 2F | 16.1 | 14.6 | 23.0 | – |
| EE● | EH● | HE● | PE● | 3F | 18.2 | 16.6 | 25.0 | – |
| – | EH● | HE● | PE● | 4F | 24.2 | 22.2 | 32.0 | – |
| – | EH● | HE● | PE● | LF | 27.2 | 25.1 | 35.0 | – |
| – | EH● | HE● | PE● | 5F | 33.2 | 31.2 | 41.0 | – |
| EG● | | | | 0F | 9.1 | 8.3 | 13.5 | – |
| EG● | | | | 1F | 12.1 | 10.6 | 17.0 | – |
| EG● | | | | 2F | 15.1 | 13.6 | 21.5 | – |
| EG● | | | | 3F | 18.1 | 16.6 | 27.0 | – |
| ED● | | | | 1F | 6.2 | 3.5 | 15.0 | 19.3 |
| PB● | | | | 0F | 11.1 | 3.2 | 16.0 | 21.4 |
| PB● | | | | 1F | 13.1 | 3.2 | 16.0 | 21.4 |
| PB● | | | | 2F | 16.1 | 3.2 | 19.0 | 25.9 |
| PB● | | | | 3F | 17.6 | 3.2 | 21.0 | 29.0 |
| PB● | | | | 4F | 23.2 | 3.2 | 27.0 | 32.0 |
| PB● | | | | 5F | 32.3 | 3.2 | 34.0 | 38.2 |

## PCB drilling pattern

## Fixed socket with straight print contact

FF.303

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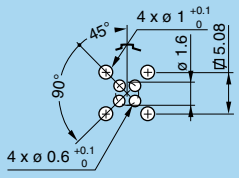


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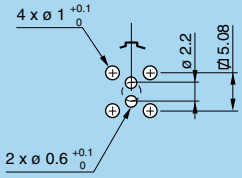


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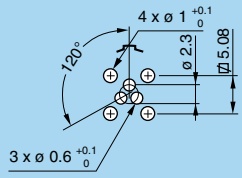


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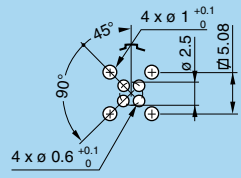


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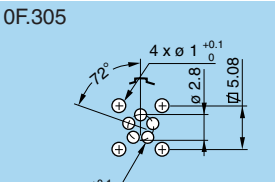


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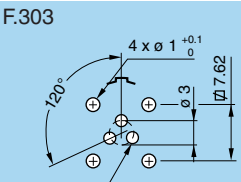


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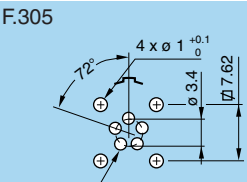


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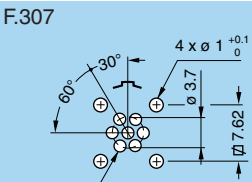


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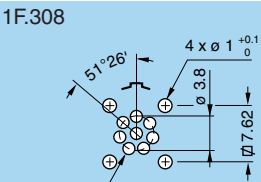


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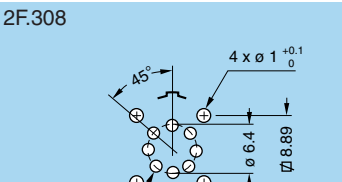


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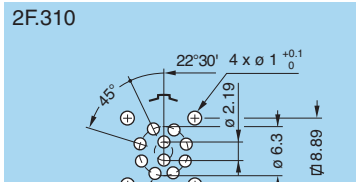


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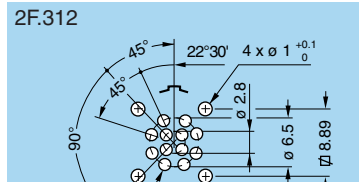


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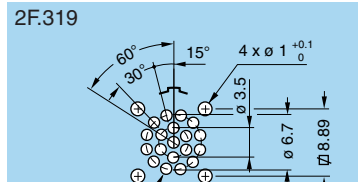


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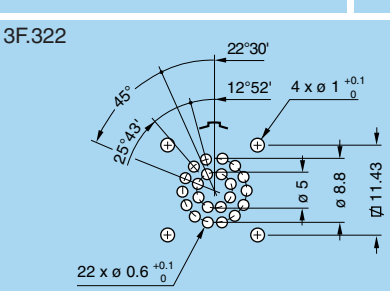


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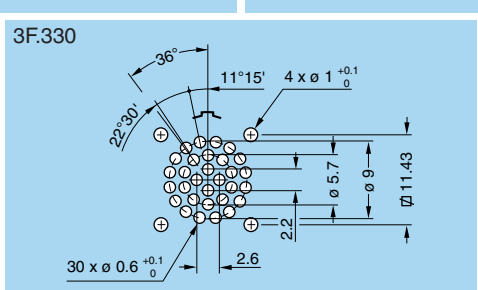


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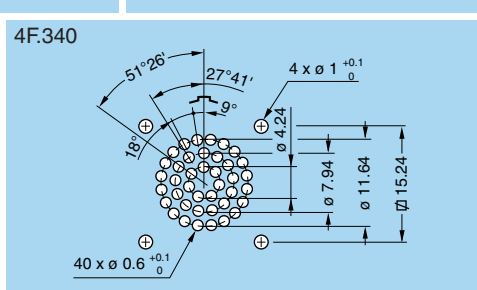


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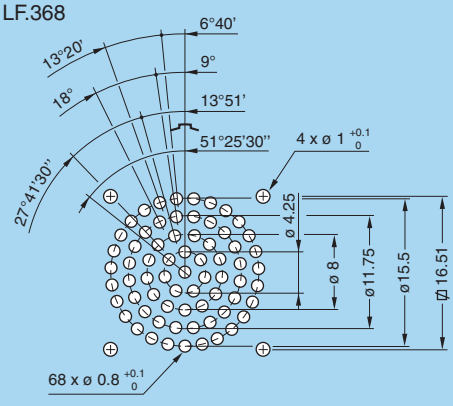


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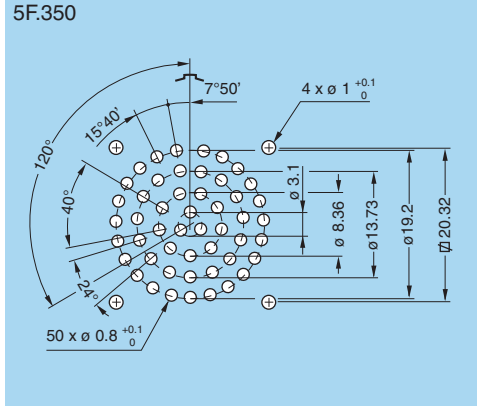


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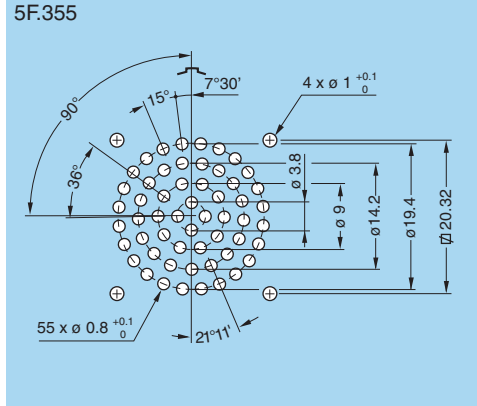


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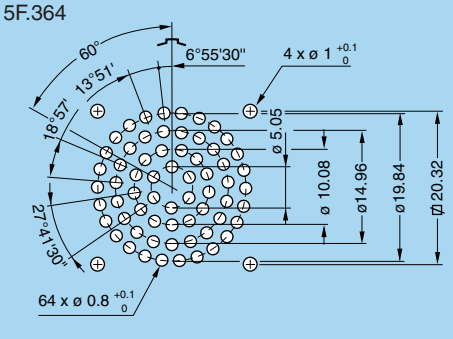


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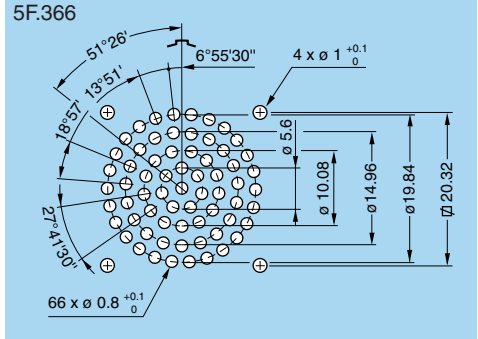
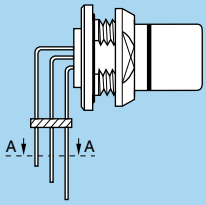


## Fixed socket with elbow print contact

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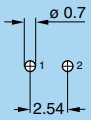


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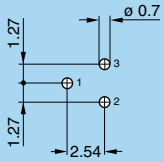


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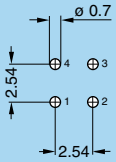


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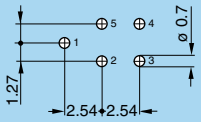


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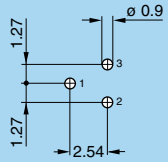


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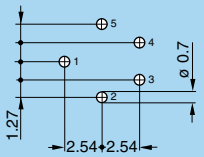


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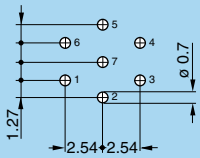


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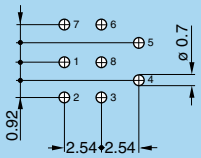
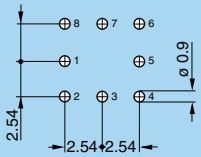



2F.308

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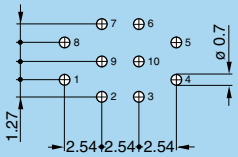


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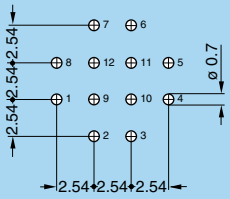


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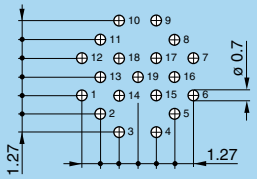
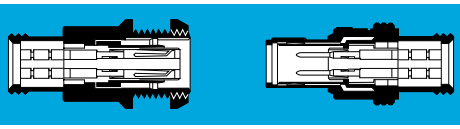
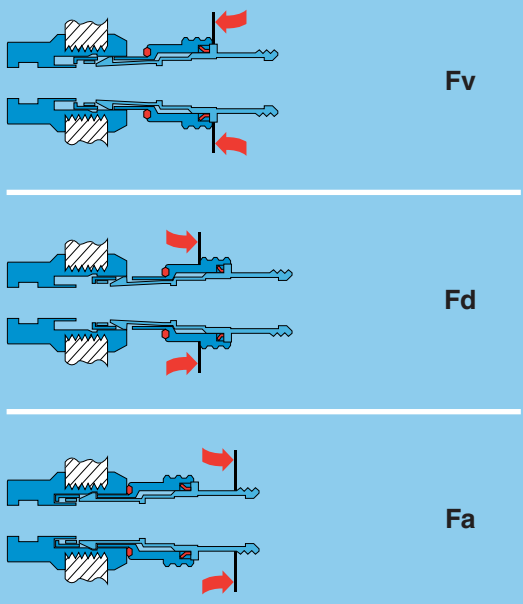


# Technical characteristics



## Outer shell

### Mechanical latching characteristics




### Latch sleeve in special bronze/brass

| Force (N) | Series | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0F | 1F | 2F | 3F | 4F | LF | 5F |
| Fv | 10 | 11 | 20 | 18 | 23 | 40 | 50 |
| Fd | 11 | 13 | 29 | 20 | 25 | 40 | 55 |
| Fa | 160 | 120 | 170 | 210 | 180 | 250 | 400 |

### Latch sleeve in Beryllium copper

| Force (N) | Series | | | | |
|---|---|---|---|---|---|
| | FF | 0F | 1F | 2F | 3F |
| Fv | 16 | 22 | 21 | 29 | 34 |
| Fd | 20 | 21 | 23 | 33 | 17 |
| Fa | 110 | 300 | 250 | 420 | 400 |

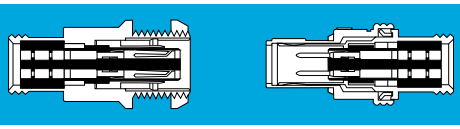
**Notes:** forces were measured on outer shells **not fitted with contacts**.

1N = 0.102 kg.
1N = 0.2248 pounds force

$F_V$: average latching force.

$F_d$: average unmating force with axial pull on the outer shell.

$F_a$: average pull-out force with axial pull on the back shell.



## Insulator

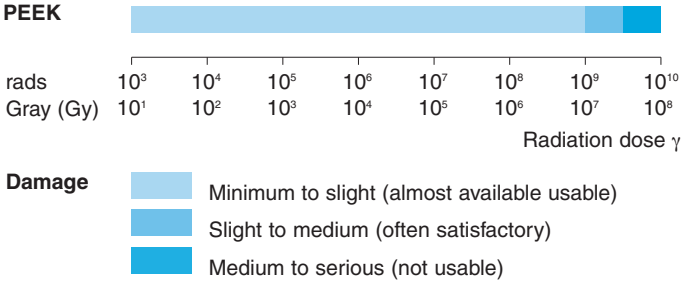
Plastic material used by LEMO for manufacturing insulators is selected according to the electric and thermal properties required for the various connector types. Characteristics examined for the two connector types are:
– Dielectric strength
– Comparative tracking index
– Surface and volume resistivity
– Continuous service temperature
– Water absorption
– Radiation resistance
– Flammability rating
– Resistance to hydrocarbon.

### Mechanical and electrical properties

Mechanical characteristics of thermoplastics, such as PEEK, are improved by the addition of glass fibres. By adding glass fibres in the resin the performance of this material (mechanical strength and radiation resistance) is enhanced and water absorption rate is reduced. From an electric point of view, the addition of glass fibres improves dielectric strength.

PEEK is selected as it provides all the required characteristics for multipole connectors.

### Radiation resistance



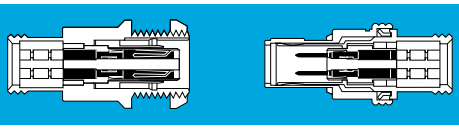

**Note:** technical data in this chapter provide general information on plastics used by LEMO as electrical insulators. LEMO reserves the right to propose new materials with better technical characteristics, and to withdraw, without notice, any material mentioned in the present catalogue or any other publications edited by LEMO S.A. and/or its subsidiaries. LEMO SA and its subsidiaries use only plastic granules, powder or bars supplied by specialized companies, and thus cannot in any case take responsibility with regard to this material.

## Technical characteristics of plastic materials

| Type | Norme | Units | PEEK | Silicone | FPM/FKM | Epoxy |
|---|---|---|---|---|---|---|
| Density | ASTM D 792 | – | 1.3-1.4 | ~1.2 | ~1.9 | 1.58 |
| Tensile strength (at 23°C) | ASTM D 638/ ISO R527 | MPa | 92-142 | > 9 | > 12 | 16 |
| Flexurale strength (at 23°C) | ASTM D 790/ ISO R178 | MPA | 170 | – | – | 24 |
| Dielectric strength | ASTM D 149/IEC 60243 | kV/mm | 19-25 | 18-30 | – | 15 |
| Volume resistivity at 50% HR and 23°C | ASTM D 257/IEC 60093 | Ω • cm | $10^{16}$ | $10^{14}$ | – | $10^{14}$ |
| Surface resistivity | ASTM D 257 | Ω | $10^{15}$ | – | – | – |
| Thermal conductivity | ASTM C 177 | W/K • m | 0.25 | – | – | 0.8 |
| Comparative tracking index | IEC 60112 | V | CTI 150 | – | – | CTI>600 |
| Dielectric constant ($10^6$ Hz) | ASTM D 150/IEC 60250 | – | 3.2-3.5 | – | – | – |
| Dissipation factor ($10^6$ Hz) | ASTM D 150/IEC 60250 | – | < 0.005 | – | – | – |
| Maximum continuous service temperature | UL 746 | °C | 250 | 200 | 200 | 80 |
| Minimum continuous service temperature | UL 746 | °C | -50 | -50 | -20 | -20 |
| Maximum short-time service temperature | – | °C | 300 | > 250 | 300 | 120 |
| Water absorption in 24h at 23°C | ASTM D 570/ISO R62A | % | < 0.3 | – | – | 0.25 |
| Radiation resistance | – | Gy[1)] | $10^7$ | $10^5$ | $8x10^4$ | $2x10^6$ |
| Flammability rating | ASTM D 635/UL 94 | – | V-0/3.2 | – | – | V-0/4 |

**Notes:** [1)] 1 Gy (Gray) = 100 rad

ASTM = American Society for Testing Material
ISO = International Standards Organisation
UL = Underwriters Laboratories
IEC = International Electrotechnical Commission

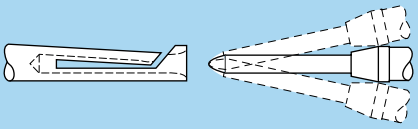


# Electrical contact

## Technical description

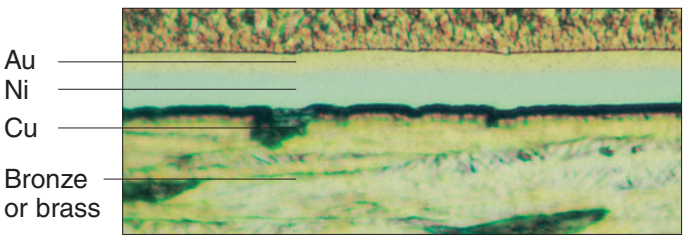
The secure reliable electromechanical connection achieved with LEMO female cylindrical contacts is mainly due to two important design features:

1. *Prod proof entry* on the mating side which ensures perfect concentric mating even with carelessly handled connectors.
2. *The pressure spring*, with good elasticity, maintains a constant even force on the male contact when mated. The leading edge of the pressure spring preserves the surface treatment (gold-plated) and prevents undue wear.



## Contact material and treatment

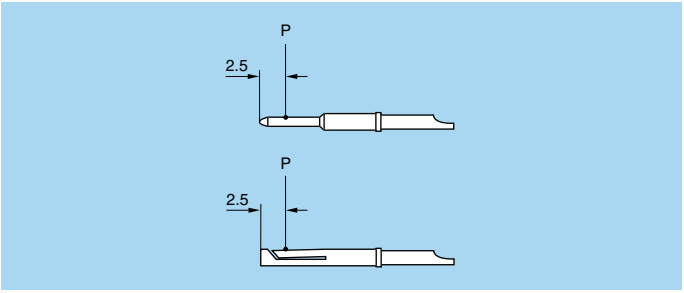
LEMO female contacts are made of bronze beryllium (QQ-C-530) or bronze (UNS C 54400). These materials are chosen because of their high modulus of elasticity, their excellent electrical conductivity and a high mechanical strength. LEMO male print contacts are made of brass (UNS C 38500). Male crimp contacts are made of brass (UNS C 34500) or annealed brass (UNS C 38500) with optimum hardness (HV) for crimping onto the wire.




| Type | Material (standard) | Surf. treatment (µm) | | |
|---|---|---|---|---|
| | | Cu | Ni | Au[1)] |
| Male crimp | Brass (UNS C 34500) | 0.5 | 3 | 1.0 |
| | Brass (UNS C 38500) | | | |
| Male print | Brass (UNS C 38500) | | | |
| Femalle crimp | Bronze (UNS C 54400) Cu-Be (FS QQ-C-530) | 0.5 | 3 | 1.5 |
| Female print | | | | |
| Clips | Cu-Be (FS QQ-C-530) | – | – | – |
| | Stainless steel | | | |
| Wire[2)] | Brass | – | 3[3)] | – |

**Notes:** the standard surface treatment are as follows:
– nickel: FS QQ-N-290A or MIL-C-26074C
– gold: ISO 4523.
[1)] minimum value
[2)] for elbow print contacts
[3)] treatment completed by 6 µm Sn-Pb tin-plating

## Thickness comparison between the outside and the inside of female contacts




| Contact ø A (mm) | Gold thickness | | |
|---|---|---|---|
| | male (µm) | female | |
| | | outside (µm) | inside (%) |
| 0.5 | 1.0 | 1.5 | 65 |
| 0.7 | 1.0 | 1.5 | 70 |
| 0.9 | 1.0 | 1.5 | 75 |
| 1.3 | 1.0 | 1.5 | 75 |

**Note:** P = inspection point

## Crimp contacts

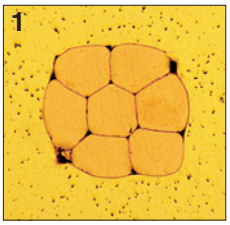
The square form crimp method is used (MIL-C-22520F, class I, type 2) photo 1 for unipole contacts.

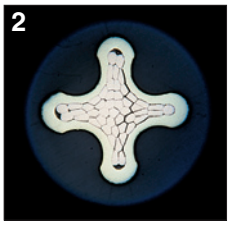
For multipole contacts the standard four identer crimp method is used, (MIL-C-22520F, class I, type 1), photo 2.
The crimp method requires a controlled compression to obtain a symmetrical deformation of the conductor strand and of the contact material. The radial hole in the side of the contact makes it possible to check whether the conductor is correctly positioned within the contact. A good crimping is characterized by only slightly reduced conductor section and practically no gap.
For optimum crimping of bronze or brass contacts they are annealed to relieve internal stress and reduce material hardening during the crimping process.
Only the crimping zone is annealed with the help of an induction heating machine designed by the LEMO Research and Development Department (see photo 3).

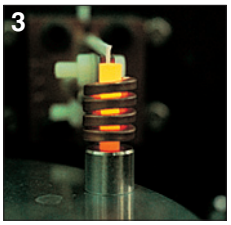
## Advantages of crimping

- practical, quick contact fixing outside the insulator
- possible use at high temperature
- no risk of heating the insulator during the conductor-contact fixing
- high tensile strength

Crimp contacts are available in standard version (form 1) for mounting maximum size conductors.
For some dimensions, these crimp contacts can be produced with reduced crimp barrels (form 2) for mounting reduced size conductors.








## Test voltage

Test voltage (Ue):
(measured according to the IEC 60512-2 test 4a standard)

It corresponds to 75% of the mean breakdown voltage.
Test voltage is applied at 500 V/s and the test duration is 1 minute.

This test has been carried out with a mated plug and socket, with power supply only on the plug end.

Operating voltage (Us):
It is proposed according to the following ratio: $Us = \frac{Ue}{3}$

**Caution:**
**For a number of applications, safety requirements for electrical appliances are more severe with regard to operating voltage.**
**In such cases operating voltage is defined according to creepage distance and air clearance) between live parts.**
**Please consult us for the choice of a connector by indicating the safety standard to be met by the product.**

Voltage values are given in the table on insulator types for each series.
They correspond with values measured at sea level. They are adapted to all applications up to an altitude of 2000 m.

In case a device is used at a higher altitude, air clearance between live parts has to be multiplied by the following coefficients.
It means also that test voltage has to be divided by this coefficient.

| altitude (m) | coefficient |
|---|---|
| 2000 | 1.00 |
| 3000 | 1.14 |
| 4000 | 1.29 |
| 5000 | 1.48 |

## Rated current

(measured according to IEC 60512-3 test 5a)

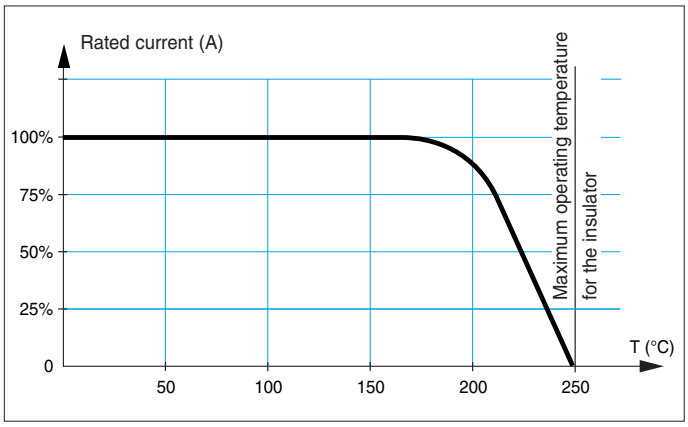
The specified rated current can be applied simultaneously to all the contacts.
It corresponds with an average temperature rise of 40°C of the connector.

The current values are indicated in the table of insulator types in each series.
For use at higher temperatures acceptable rated current will be lower. It tends towards zero as the material is used at the maximum operating temperature accepted for the insulator.

In most case the current depend on the conductor dimension (see table on page 43) or on the printed circuit dimension.

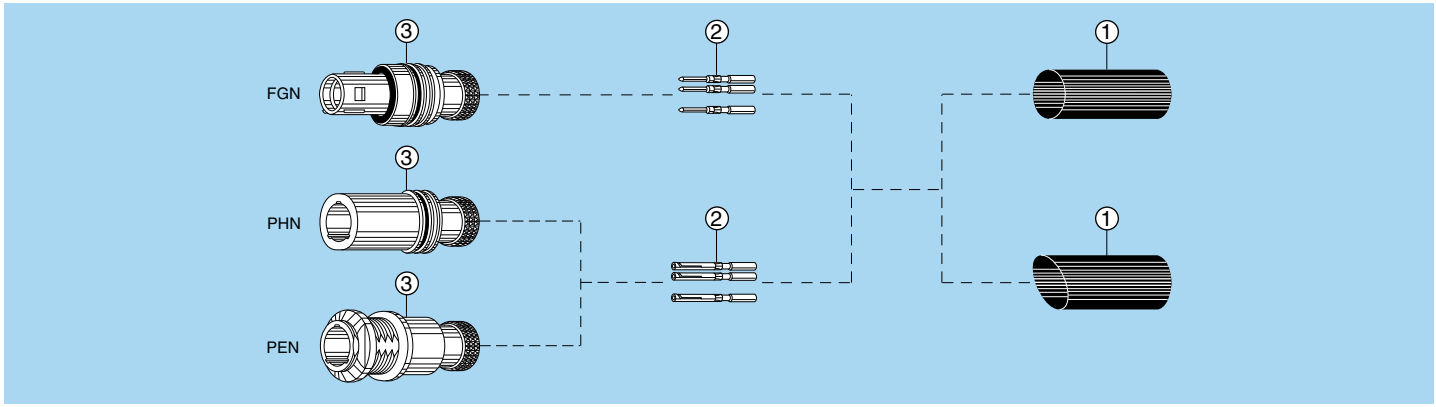
**Caution: In general, connectors should not be unmated while live.**

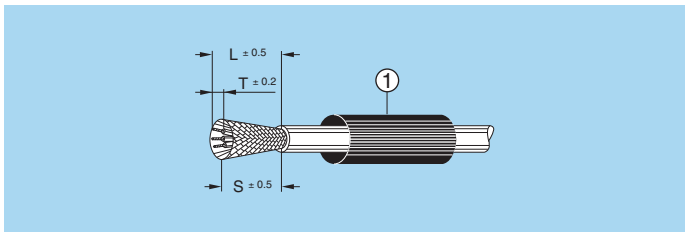
For connectors with PEEK insulator, maximum admissible current will follow the curve below depending on the operating temperature T.



# Assembly instructions

## Assembly instructions for plugs and sockets

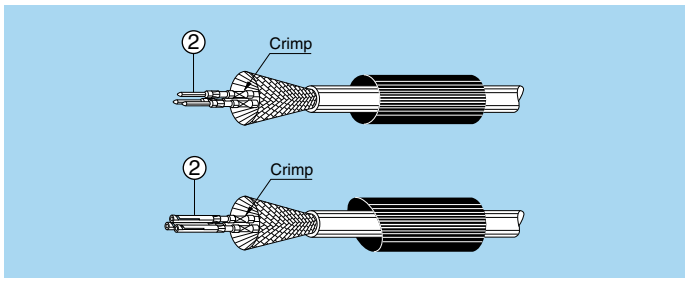



**1. Cable preparation**

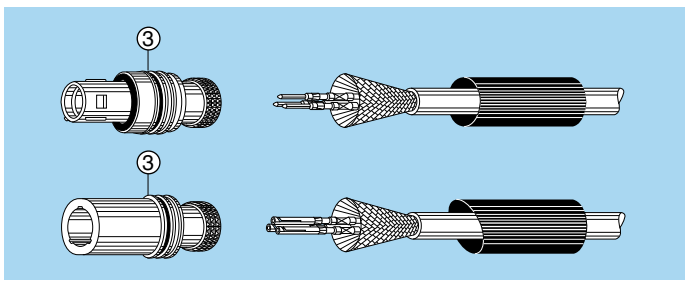
First place the heatshrink boot ① over the cable. Strip the cable according to dimensions of the table, then widen the shield.

| Series | L | S | T |
|---|---|---|---|
| FF | 14 | 9 | 3 |
| 0F-5F | 20 | 15 | 4 |

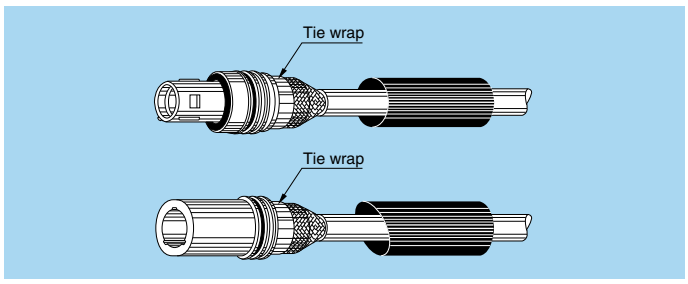



**2. Cable termination**

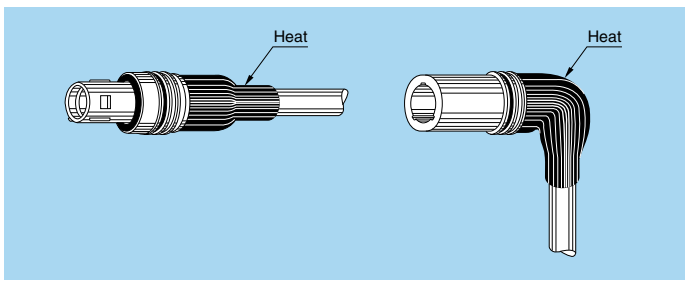
**2.1** With shielded cables, widen and pull the shield all the way to the back. Fix the appropriate positioner onto the crimping tool and set the selector to the number corresponding to the AWG of the conductor used as indicated on the positioner label. Fit the conductor into the contact ②; make sure it is visible through the contact's inspection hole.
Slide the conductor-contact assembly into the open crimping tool; make sure that the contact is pushed fully into the positioner.
Close the tool.
Remove from crimping tool and check that conductor is secure in contact and shows in inspection hole.




**2.2** Arrange the conductor-contact assemblies according to the markings, into the rear cable seal. Push them deeply into the insulator, using tweezers if necessary; check that all the contacts are correctly located in the insulator: 1) by verifying the alignment of the contacts at the front of the insulator and 2) by gently pulling on each conductor. Verification should also be made using the appropriate retention testing tool.
With FF series the rear cable seal can be replaced with a silicone RTV compound that is filled on the rear of the connector once the contacts are correctly installed.




**2.3** Bring the shield around the rear of connector. Secure it with a band-it tie-wrap (not furnished) to fix the shield in place.
Cut off the possible shield surplus.




**2.4** Put the heatshrink boot in place and heat gently until it retracts.

# Technical tables

## Table of American Wire Gauge

| AWG | Construction | | ø wire max | | Wire section | |
|---|---|---|---|---|---|---|
| | Strand nb | AWG/ strand | (mm) | (in) | ($mm^2$) | (sq in) |
| 4 | 133 | 25 | 6.9596 | 0.274 | 21.5925 | 0.0335 |
| 6 | 133 | 27 | 5.5118 | 0.217 | 13.5885 | 0.0211 |
| 8 | 168 | 30 | 4.4450 | 0.175 | 8.5127 | 0.0132 |
| 8 | 133 | 29 | 4.3942 | 0.173 | 8.6053 | 0.0133 |
| 10 | 105 | 30 | 3.3020 | 0.13 | 5.3204 | 0.0082 |
| 10 | 37 | 26 | 2.9210 | 0.115 | 4.7397 | 0.0073 |
| 10 | 1 | 10 | 2.6162 | 0.103 | 5.2614 | 0.0082 |
| 12 | 65 | 30 | 2.5146 | 0.099 | 3.2936 | 0.0051 |
| 12 | 37 | 28 | 2.3114 | 0.091 | 2.9765 | 0.0046 |
| 12 | 19 | 25 | 2.3622 | 0.093 | 3.0847 | 0.0048 |
| 12 [1)] | 7 | 20 | 2.5400 | 0.1 | 3.6321 | 0.0056 |
| 12 | 1 | 12 | 2.0828 | 0.082 | 3.3081 | 0.0051 |
| 14 | 41 | 30 | 2.0574 | 0.081 | 2.0775 | 0.0032 |
| 14 | 19 | 27 | 1.8542 | 0.073 | 1.9413 | 0.0030 |
| 14 [1)] | 7 | 22 | 2.0828 | 0.082 | 2.2704 | 0.0035 |
| 14 | 1 | 14 | 1.6510 | 0.065 | 2.0820 | 0.0032 |
| 16 [1)] | 65 | 34 | 1.5748 | 0.062 | 1.3072 | 0.0020 |
| 16 | 26 | 30 | 1.5748 | 0.062 | 1.3174 | 0.0020 |
| 16 | 19 | 29 | 1.4986 | 0.059 | 1.2293 | 0.0019 |
| 16 [1)] | 7 | 24 | 1.5494 | 0.061 | 1.4330 | 0.0022 |
| 16 | 1 | 16 | 1.3208 | 0.052 | 1.3076 | 0.0020 |
| 18 [1)] | 65 | 36 | 1.2700 | 0.05 | 0.8234 | 0.0013 |
| 18 [1)] | 42 | 34 | 1.2700 | 0.05 | 0.8447 | 0.0013 |
| 18 | 19 | 30 | 1.3208 | 0.052 | 0.9627 | 0.0015 |
| 18 | 16 | 30 | 1.2954 | 0.051 | 0.8107 | 0.0013 |
| 18 | 7 | 26 | 1.2700 | 0.05 | 0.8967 | 0.0014 |
| 18 | 1 | 18 | 1.0414 | 0.041 | 0.8229 | 0.0013 |
| 20 [1)] | 42 | 36 | 1.0160 | 0.04 | 0.5320 | $8.2x10^{-4}$ |
| 20 | 19 | 32 | 1.0414 | 0.041 | 0.6162 | 0.0010 |
| 20 | 10 | 30 | 1.0160 | 0.04 | 0.5067 | $7.9x10^{-4}$ |
| 20 | 7 | 28 | 0.9906 | 0.039 | 0.5631 | $8.7x10^{-4}$ |
| 20 | 1 | 20 | 0.8382 | 0.033 | 0.5189 | $8.0x10^{-4}$ |
| 22 | 19 | 34 | 0.8382 | 0.033 | 0.3821 | $5.9x10^{-4}$ |
| 22 | 7 | 30 | 0.7874 | 0.031 | 0.3547 | $5.5x10^{-4}$ |
| 22 | 1 | 22 | 0.6604 | 0.026 | 0.3243 | $5.0x10^{-4}$ |
| 24 [1)] | 42 | 40 | 0.6604 | 0.026 | 0.2045 | $3.2x10^{-4}$ |
| 24 | 19 | 36 | 0.6858 | 0.027 | 0.2407 | $3.7x10^{-4}$ |
| 24 | 7 | 32 | 0.6350 | 0.025 | 0.2270 | $3.5x10^{-4}$ |
| 24 | 1 | 24 | 0.5588 | 0.022 | 0.2047 | $3.2x10^{-4}$ |
| 26 | 19 | 38 | 0.5588 | 0.022 | 0.1540 | $2.4x10^{-4}$ |
| 26 | 7 | 34 | 0.5080 | 0.02 | 0.1408 | $2.2x10^{-4}$ |
| 26 | 1 | 26 | 0.4318 | 0.017 | 0.1281 | $2.0x10^{-4}$ |
| 28 [1)] | 19 | 40 | 0.4318 | 0.017 | 0.0925 | $1.4x10^{-4}$ |
| 28 | 7 | 36 | 0.4064 | 0.016 | 0.0887 | $1.4x10^{-4}$ |
| 28 | 1 | 28 | 0.3302 | 0.013 | 0.0804 | $1.2x10^{-4}$ |
| 30 | 7 | 38 | 0.3302 | 0.013 | 0.0568 | $8.8x10^{-5}$ |
| 30 | 1 | 30 | 0.2794 | 0.011 | 0.0507 | $7.9x10^{-5}$ |
| 32 | 7 | 40 | 0.2794 | 0.011 | 0.0341 | $5.3x10^{-5}$ |
| 32 | 1 | 32 | 0.2286 | 0.009 | 0.0324 | $5.0x10^{-5}$ |
| 34 | 1 | 34 | 0.1693 | 0.007 | 0.0201 | $3.1x10^{-5}$ |
| 36 | 1 | 36 | 0.127 | 0.005 | 0.0127 | $2.0x10^{-5}$ |
| 38 | 1 | 38 | 0.1016 | 0.004 | 0.0081 | $1.3x10^{-5}$ |
| 40 | 1 | 40 | 0.078 | 0.003 | 0.0049 | $7.5x10^{-6}$ |

**Note:** [1)] not included in the standard

## Table of wire gauges according to IEC-228 standard

| Conductor no x Ø (mm) | Max Ø (mm) | Max Ø (in) | Section ($mm^2$) | Section (sq in) |
|---|---|---|---|---|
| 196x0.40 | 7.50 | 0.295 | 25.00 | 0.0387 |
| 7x2.14 | 6.10 | 0.240 | 25.00 | 0.0387 |
| 125x0.40 | 6.00 | 0.236 | 16.00 | 0.0248 |
| 7x1.72 | 4.90 | 0.192 | 16.00 | 0.0248 |
| 1x4.50 | 4.50 | 0.177 | 16.00 | 0.0248 |
| 80x0.40 | 4.70 | 0.155 | 10.00 | 0.0155 |
| 7x1.38 | 3.95 | 0.155 | 10.00 | 0.0155 |
| 1x3.60 | 3.60 | 0.141 | 10.00 | 0.0155 |
| 84x0.30 | 3.70 | 0.145 | 6.00 | 0.0093 |
| 7x1.50 | 3.15 | 0.124 | 6.00 | 0.0093 |
| 1x2.76 | 2.76 | 0.108 | 6.00 | 0.0093 |
| 56x0.30 | 2.80 | 0.110 | 4.00 | 0.0062 |
| 7x0.86 | 2.58 | 0.098 | 4.00 | 0.0062 |
| 1x2.25 | 2.25 | 0.082 | 4.00 | 0.0062 |
| 50x0.25 | 2.15 | 0.084 | 2.50 | 0.0038 |
| 7x0.68 | 2.04 | 0.080 | 2.50 | 0.0038 |
| 1x1.78 | 1.78 | 0.070 | 2.50 | 0.0038 |
| 30x0.25 | 1.60 | 0.062 | 1.50 | 0.0023 |
| 7x0.52 | 1.56 | 0.061 | 1.50 | 0.0023 |
| 1x1.4 | 1.40 | 0.055 | 1.50 | 0.0023 |
| 32x0.20 | 1.35 | 0.053 | 1.00 | 0.0015 |
| 7x0.43 | 1.29 | 0.050 | 1.00 | 0.0015 |
| 1x1.15 | 1.15 | 0.045 | 1.00 | 0.0015 |
| 42x0.15 | 1.20 | 0.047 | 0.75 | 0.0011 |
| 28x0.20 | 1.15 | 0.045 | 0.75 | 0.0011 |
| 1x1.0 | 1.00 | 0.039 | 0.75 | 0.0011 |
| 28x0.15 | 0.95 | 0.037 | 0.50 | $7.7x10^{-4}$ |
| 16x0.20 | 0.90 | 0.035 | 0.50 | $7.7x10^{-4}$ |
| 1x0.80 | 0.80 | 0.031 | 0.50 | $7.7x10^{-4}$ |
| 7x0.25 | 0.75 | 0.029 | 0.34 | $5.2x10^{-4}$ |
| 1x0.60 | 0.60 | 0.023 | 0.28 | $4.3x10^{-4}$ |
| 14x0.15 | 0.75 | 0.029 | 0.25 | $3.8x10^{-4}$ |
| 7x0.20 | 0.65 | 0.023 | 0.22 | $3.4x10^{-4}$ |
| 18x0.10 | 0.50 | 0.019 | 0.14 | $2.1x10^{-4}$ |
| 14x0.10 | 0.40 | 0.015 | 0.11 | $1.7x10^{-4}$ |
| 21x0.07 | 0.40 | 0.015 | 0.09 | $1.3x10^{-4}$ |
| 14x0.10 | 0.40 | 0.015 | 0.09 | $1.3x10^{-4}$ |

## Maximum current rating for conductor

Maximum current on insulated conductors up to an ambiant temperature of 30° C (from VDE 0100, parts 430 and 532 as well as other VDE regulations).

| Nominal section $mm^2$ | Group 2 Intens. max. A | Group 3 Intens. max. A |
|---|---|---|
| 0.08 | 1.0 | 1.5 |
| 0.14 | 2.0 | 3.0 |
| 0.25 | 4.0 | 5.0 |
| 0.34 | 6.0 | 8.0 |
| 0.50 | 9.0 | 12.0 |
| 0.75 | 12.0 | 15.0 |
| 1.00 | 15.0 | 19.0 |
| 1.50 | 18.0 | 24.0 |
| 2.50 | 26.0 | 32.0 |

Group 2 Multi-conductor, e. g. solid cable under sheath, shielded cable, lead-sheath cables, …
Group 3 Single conductor and single conductor cable laid on open air in a way to leave at least a space between them equal to their diameter

## Conversion of some units:

| | |
|---|---|
| millimeters into inches: | 1 mm = 0.0394 in |
| inches into millimeters: | 1 in = 25.4 mm |
| centimeters into feet: | 1 cm = 0.0328 ft |
| feet (12 in) into centimeters: | 1 ft = 30.48 cm |
| square centimeters into square inches: | 1 $cm^2$ = 0.155 sq in |
| square inches into square centimeters: | 1 sq in = 6.4516 $cm^2$ |
| bar into pounds per square inch: | 1 bar = 14.51 psi |
| bar into Pascal: | 1 bar = $10^5$ Pa |
| °C into °F: | °F = °C•1.8 + 32 |
| newtonmeter (Nm) into inch pound (in•lb) | 1 Nm = 8.85 in•lb |
| mbar•l•$s^{-1}$ into Torr•l•$s^{-1}$ | 1 mbar•l•$s^{-1}$ = 1.33 Torr•l•$s^{-1}$ |

# Product safety notice

**PLEASE READ AND FOLLOW ALL INSTUCTIONS CAREFULLY AND CONSULT ALL RELEVENT NATIONAL AND INTERNATIONAL SAFETY REGULATIONS FOR YOUR APPLICATION.**
**IMPROPER HANDLING, CABLE ASSEMBLY, OR WRONG USE OF CONNECTORS CAN RESULT IN HAZARDOUS SITUATIONS.**

1. **SHOCK AND FIRE HAZARD**
   Incorrect wiring, the use of damaged components, presence of foreign objects (such as metal debris), and / or residue (such as cleaning fluids), can result in short circuits, overheating, and / or risk of electric shock.
   Mated components should never be disconnected while live as this may result in an exposed electric arc and local overheating, resulting in possible damage to components.

2. **HANDLING**
   Connectors and their components should be visually inspected for damage prior to installation and assembly. Suspect components should be rejected or returned to the factory for verification.
   Connector assembly and installation should only be carried out by properly trained personnel. Proper tools must be used during installation and / or assembly in order to obtain safe and reliable performance.

3. **USE**
   Connectors with exposed contacts should never be live (or on the current supply side of a circuit). Under general conditions voltages above 30 VAC and 42 VDC are considered hazardous and proper measures should be taken to eliminate all risk of transmission of such voltages to any exposed metal part of the connector.

4. **TEST AND OPERATING VOLTAGES**
   The maximum admissible operating voltage depends upon the national or international standards in force for the application in question. Air and creepage distances impact the operating voltage; reference values are indicated in the catalog however these may be influenced by PC board design and / or wiring harnesses.
   The test voltage indicated in the catalog is 75% of the mean breakdown voltage; the test is applied at 500 V/s and the test duration is 1 minute.

5. **CE MARKING** CE
   CE marking CE means that the appliance or equipment bearing it complies with the protection requirements of one or several European safety directives.
   CE marking CE applies to complete products or equipment, **but not to electromechanical components, such as connectors**.

6. **PRODUCT IMPROVEMENTS**
   The LEMO Group reserves the right to modify and improve to our products or specifications without providing prior notification.

# LEMO complete product range

| | B | S | K | E | F | 00 | 01 | 0A | 3T | 4A | 4M | 3K. 93C | 1D | Y | 05 | 5G | 2G | 2C | L | H | R | N | 03 | V | W | U | F | P | D | K/S | 01 | DIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unipole | | ■ | | ■ | | ■ | | | | | | | | | | | | | | | | ■ | | ■ | | | | | | | | |
| Multipole | ■ | ■ | ■ | ■ | • | ■ | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | |
| Coaxial 50 Ω | | ■ | | ■ | | ■ | ■ | ■ | | | | | | | | | | ■ | | | | ■ | ■ | ■ | | | | | | | | ■ |
| Coaxial 75 Ω | | ■ | ■ | ■ | | | | ■ | ■ | | | | | | | | | | | | | ■ | | ■ | | | | | | | | ■ |
| Multi Coaxial | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | ■ | | | ■ | ■ | | | | | | |
| Mixed Coax + LV | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | ■ | ■ | | ■ | ■ | ■ | | ■ | | | | |
| Triaxial 50 Ω | | ■ | | ■ | | ■ | | | | | ■ | | | | | | | | | | | ■ | | ■ | | | | | | | | |
| Triaxial 75 Ω | | ■ | | ■ | | | | | ■ | ■ | ■ | | | | | | | | | | | ■ | | ■ | | | ■ | | | | | |
| Mixed Triax + LV | ■ | | ■ | | | | | | | | | | | | | | | | | | | ■ | | | ■ | ■ | | | | | | |
| Quadrax | | | | | | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | |
| High Voltage | | ■ | | ■ | | | | | | | | | | ■ | ■ | | | | | | | | | | | | | | | | | |
| Multi High Voltage | ■ | ■ | ■ | ■ | | | | | | | | | | | | ■ | | | | | | | | | | | | | | ■ | | |
| Mixed HV + LV | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | ■ | | | | | | | ■ | | | | |
| Fibre Optic | ■ | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | ■ | | ■ | |
| Multi Fibre Optic | ■ | | ■ | | • | | | | | | | | | | | | | | | ■ | | ■ | | | ■ | ■ | | | | | | |
| Mixed FO + LV | ■ | | ■ | | • | | | | | | | ■ | | | | | | | | ■ | | ■ | | | ■ | ■ | | ■ | | | | |
| Thermocouple | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | ■ | | | ■ | | | | | | | | | | |
| Fluidic | ■ | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | ■ | | | | |
| Multi Fluidic | ■ | | ■ | | | | | | | | | | | | | | | | | | | ■ | | | | | | | | | | |
| Mixed Fluidic + LV | ■ | | ■ | | | | | | | | | | | | | | | | | | ■ | ■ | | | ■ | | | | | | | |

**Most frequently used in darker colour**

• included in this catalogue

**B Series** Keyed

**S Series**

**K Series** Keyed

**E Series**

**F Series** Keyed

**00 Series**

**01 Series**

**0A Series**

**3T Series**

**4A Series** Keyed

**4M Series** Keyed

**3K.93C Series** Keyed

**1D Series**

**Y Series**

**05 Series**

**5G Series** Keyed

**2G Series** Keyed

**2C Series**

**L Series** Keyed

**H Series**

**R Series** Keyed

**N Series** Keyed

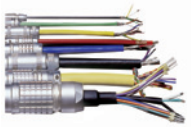
**03 Series** Keyed

**V Series**

**W Series** Keyed

**U Series** Keyed

**Cable assembly**



**K/S Series** Keyed

**REDEL F Series**

**REDEL P Series** Keyed

**REDEL D Series**

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**SAA Series**

**TAA Series**

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