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COMPACT MULTIPOLE CONNECTORS

F SERIES

LEMO

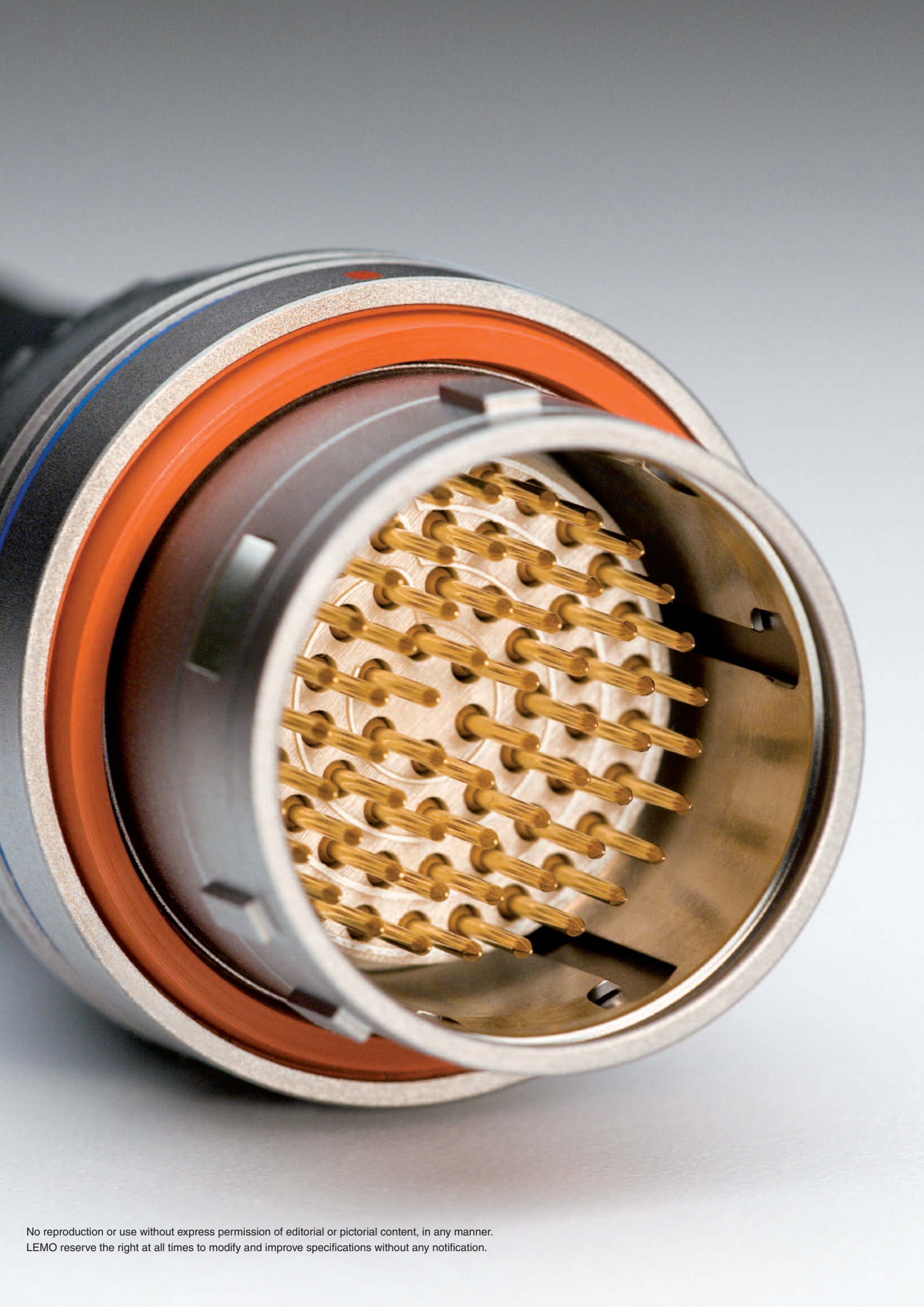


Table of Contents

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

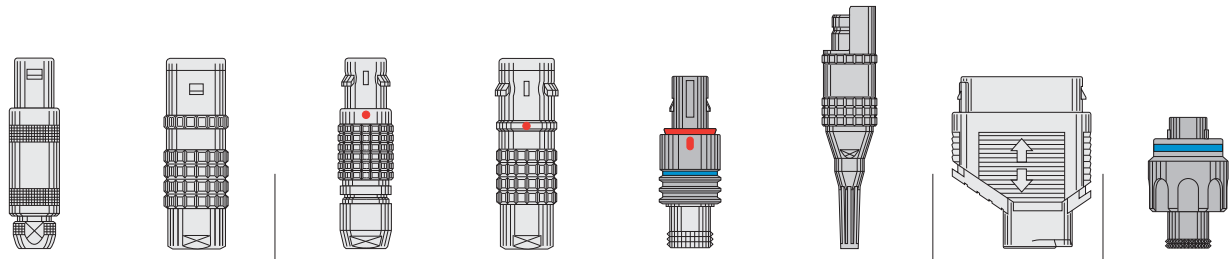
Assembly tool
- Crimping tools
- Positioners
- Extractors
- Banding tool
- Fibre optic termination workstation and tools

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



	Standard	Watertight	Keyed	Keyed Watertight	Compact keyed	Hermaphroditic	Rectangular	Screw
Series	01 / 00 (unipole) 00 (NIM-CAMAC) 05 / R0 / 1D 0S to 6S 0A / 4A / 2C 1Y-3Y-6Y	0E to 6E 3T 4M	00 (multipole) 0B to 5B 2G / 5G	0K to 5K 2N to 5N	FF to 5F	SH / MH	RR / 0R / 1R	03 0V to 5V 0W to 5W 2U to 5U 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

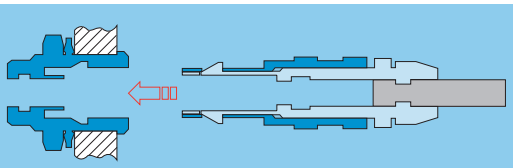
Series and Types

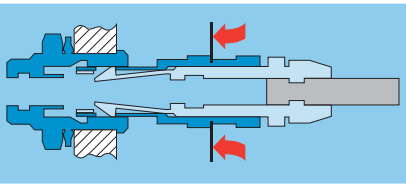
	Series	Types																			
		Unipole	Coaxial 50 Ω	Coaxial 75 Ω	Multipole	High Voltage	Triaxial 50 Ω	Triaxial 75 Ω	Quadrax	Multi HV	Multi Coaxial	Mixed HV+LV	Mixed Coax+LV	Mixed Triax+LV	Fibre Optic	Multi Fibre Optic	Mixed FO+LV	Fluidic	Multi fluidic	Mixed fluidic+LV	Thermocouple
Standard	01		●																		
	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.

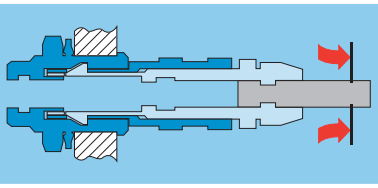
LEMO's Push-Pull Self-Latching Connection System

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.

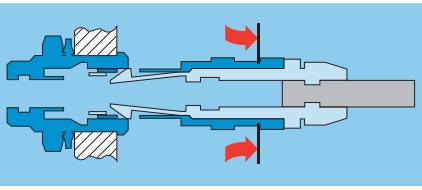




The LEMO self-latching system allows the connector to be mated by simply pushing the plug axially into socket.

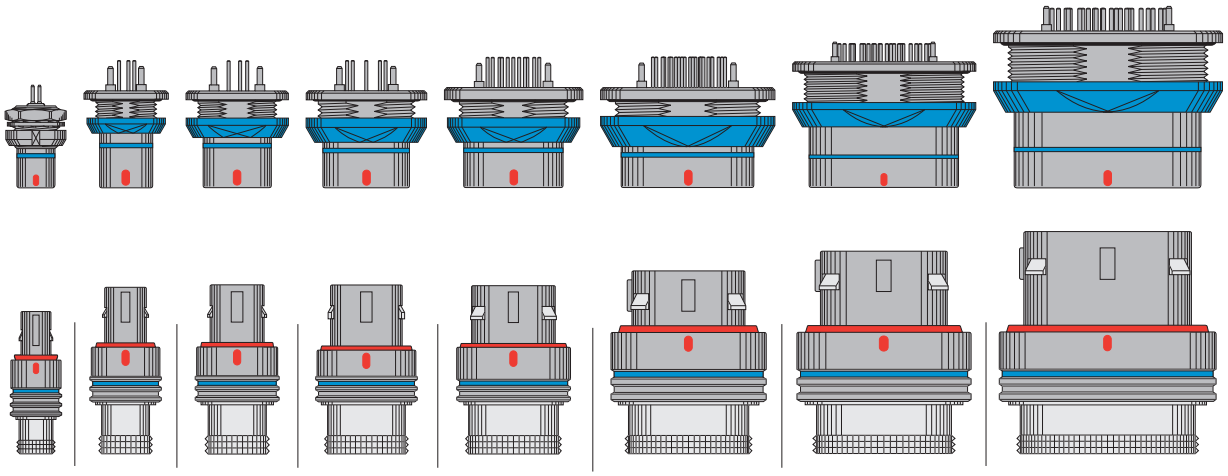


Once firmly latched, connection cannot be broken by pulling on the cable or any other component part other than the outer release sleeve.



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	4, 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 recognized.

RoHS

LEMO connector specifications conforms the requirements of the RoHS directive (2011/65/EU) 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.

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

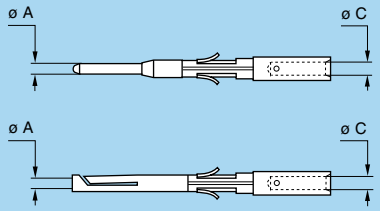
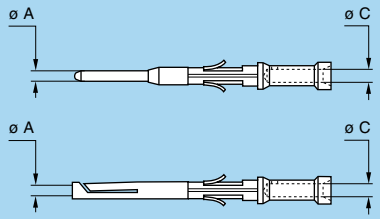


Fig. 2



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

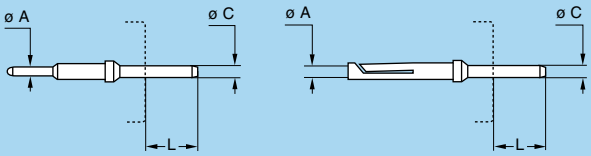
Note: Fr = mean contact retention force in the insulator (according to IEC 60512-8 test 15a).
Note: [1)] for a given AWG, the diameter of some stranded conductor designs is larger than the solder cup diameter. Make sure that the maximum conductor diameter is smaller than ø C.

Print contacts

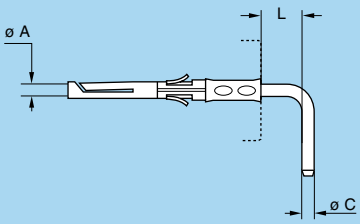
Print contacts are available in straight or elbow versions for certain connector types. Connection is possible by soldering on flexible or rigid printed circuit boards.
Straight print contacts are gold-plated which guarantees optimum soldering, even after longterm storage.

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

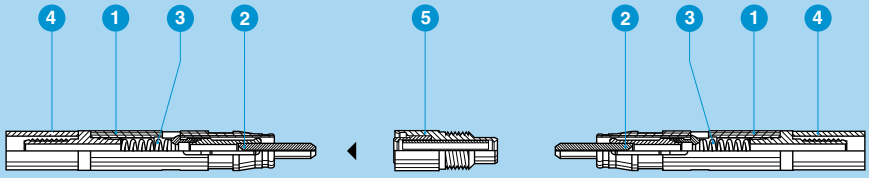


Fibre Optic contacts

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.

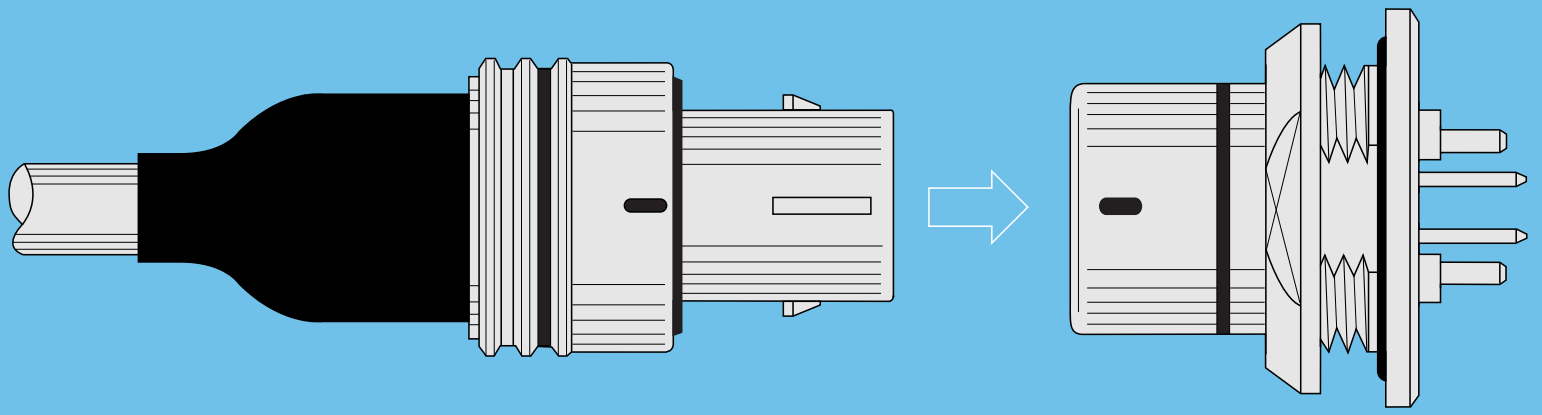
Female contact

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

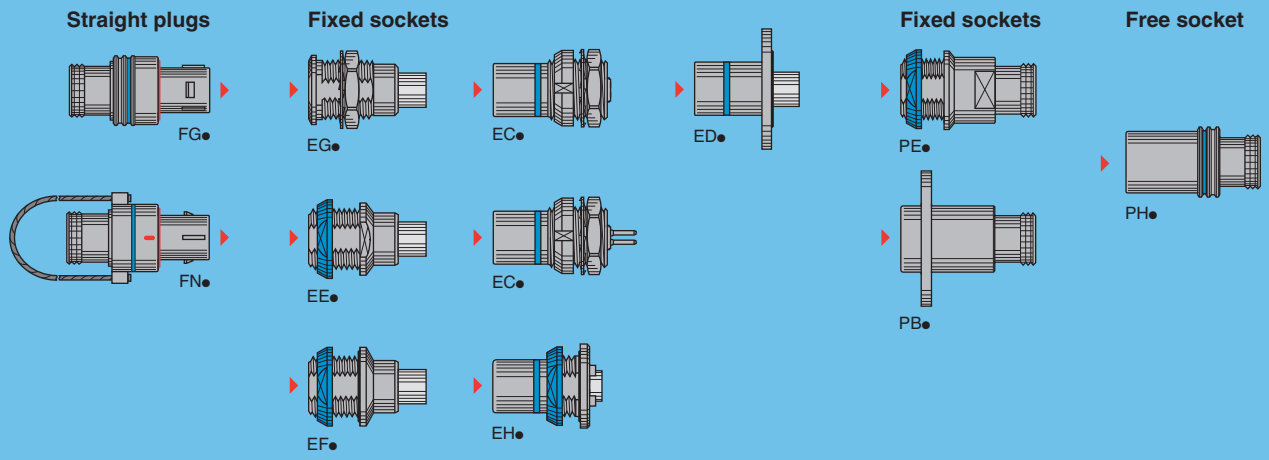
F Series

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.

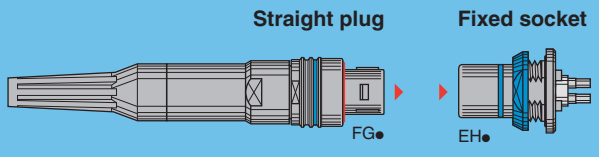
The F series connectors are available in 3 different materials:
– for high shock and vibration resistance, LEMO recommends using Y code material (with beryllium copper latch sleeve).
– for environmental resistance and latching cycle endurance, LEMO recommends using the C code material (brass outershell).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

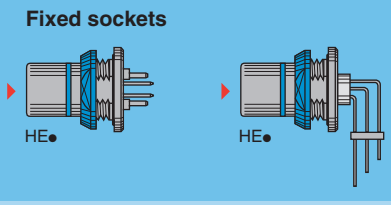
Metal housing models (page 11)



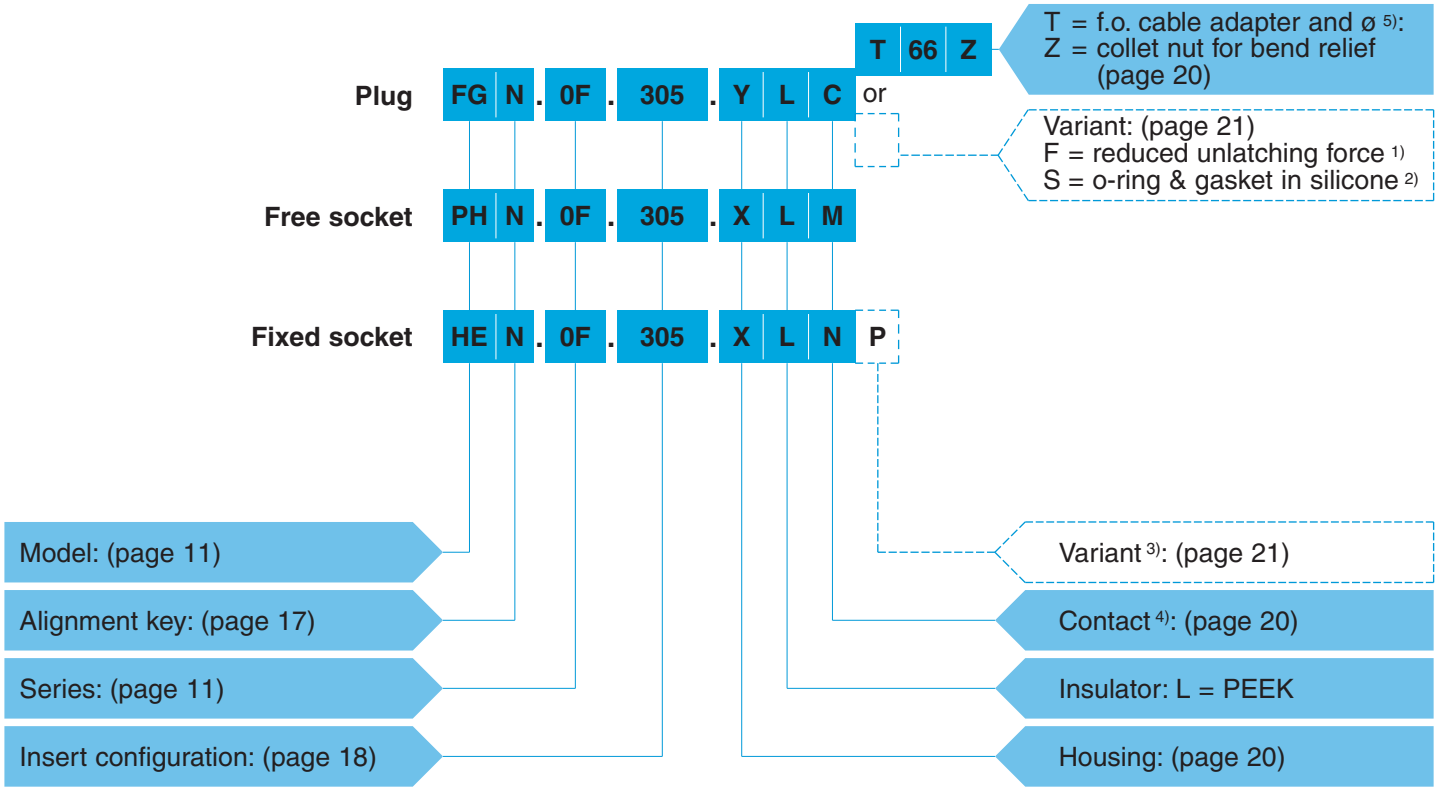
Models for fibre optic (page 16)



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.

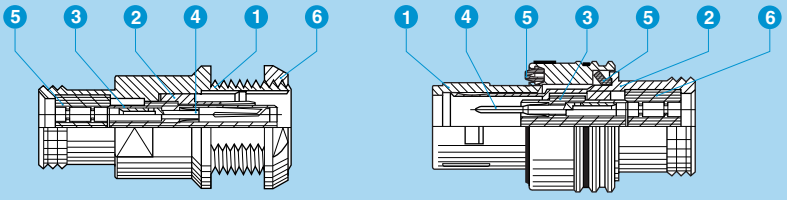
Fixed socket:
HEN.0F.305.XLNP = fixed socket, nut fixing, with key (N), 0F series, multipole type with 5 contacts, outer shell in anthracite nickel-plated aluminium alloy, PEEK insulator, female print contacts, watertight.

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				Material (Standard)	Surface treatment (µm)				Notes
						chrome	nickel		gold	
	I	X	Y	C			I	X		
Outer shell				■	Brass (UNS C 38500)	0.3	–	–	–	
	■	■	■		Aluminium alloy (AA 6262A or AA 6023)	–	14	5	–	1) 4) 5) 6)
Conical nut				■	Brass (UNS C 38500)	0.3	–	–	–	
	■	■	■		Aluminium alloy (AA 6262A or AA 6023)	anodized various colour				2)
Notched nut				■	Brass (UNS C 38500)	0.3	–	–	–	3)
	■	■	■		Aluminium alloy (AA 6262A or AA 6023)	–	14	5	–	1) 3) 6)
Earthing crown	■	■	■	■	Bronze (UNS C 54400) or special brass	–	3	3	–	
Latch sleeve	■	■		■	Special bronze/brass	–	3	3	–	
			■		Beryllium Copper (UNS C 17300)	–	3	3	–	
Locking washer	■	■	■	■	Bronze (UNS C 52100)	–	3	3	–	
Hexagonal nut				■	Brass (UNS C 38500)	–	3	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)	–	–	–	1.0	
Female crimp contact	■	■	■	■	Bronze (UNS C 54400)	–	–	–	1.5	
Clips	■	■	■	■	Cu-Be or special steel	without treatment				
Insulator	■	■	■	■	PEEK	–				
O-ring and gaskets	■	■	■		FPM/FKM (Viton®)	–				
				■	Silicone MQ/MVQ	–				7)
Sealing resin	■	■	■	■	Epoxy (Araldite® or Stycast®)	–				
Cable rear seal	■	■	■	■	Fluorosilicone	–				

Notes: standards for surface treatment are as follows: chrome-plated SAE AMS 2460; nickel-plated SAE AMS QQ N 290 or MIL DTL 32119; gold-plated ISO 27874. 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) Nickel Teflon® - NiCorAl™ treatment (500 hours salt spray corrosion resistant). 7) 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	96 h	IEC 60512-6 test 11f	All; code X or Y
Salt spray corrosion test	500 h	IEC 60512-6 test 11f	All; code I
Salt spray corrosion test	1000 h	IEC 60512-6 test 11f	All; code C
Protection index (mated)	IP67 (select HE● model only for device protection)	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

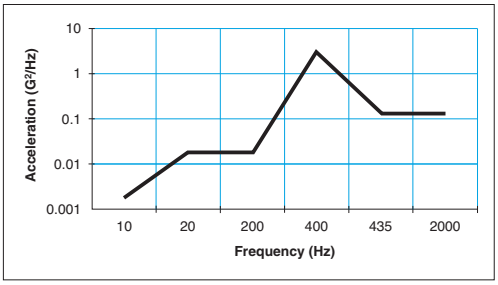
Insulation resistance IEC 60512-2 test 3a		Value
new	1)	
$> 10^{12}$	$> 10^{10}$	Ω

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

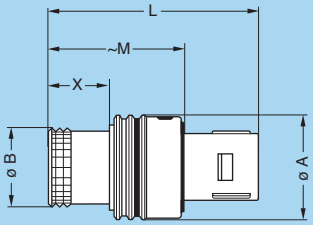
Contact resistance 2) IEC 60512-2 test 2a				Value
0.5	0.7	0.9	1.3	ø A (mm)
≤ 8.7	≤ 6.1	≤ 4.8	≤ 3.6	mΩ

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)



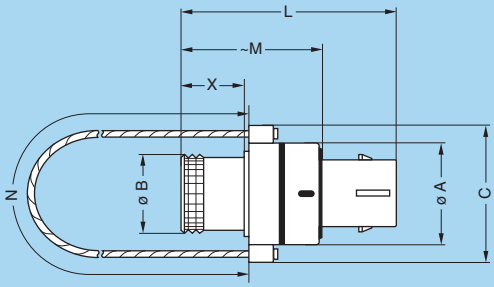
Models



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

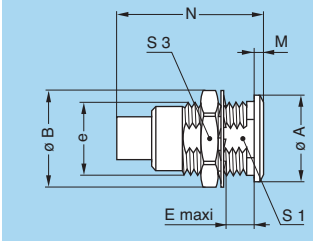
Note: this plug can also be supplied with a reduced unlatching force (see page 9).



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

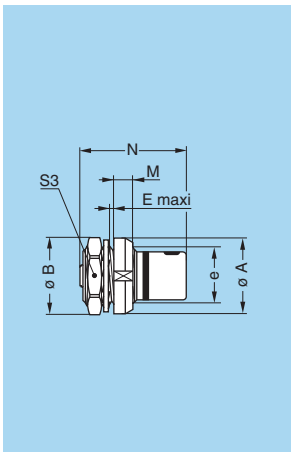
Note: cable material: stainless steel with protective sheath



EG● Fixed socket, nut fixing, key (N) or keys (P, S and T), IP50

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)

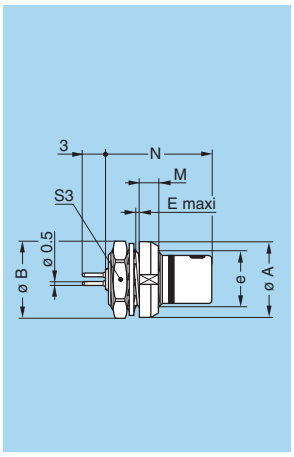


EC● Fixed socket with 2 nuts, key (N) or key (S), protruding shell, IP50 (back panel mounting)

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.

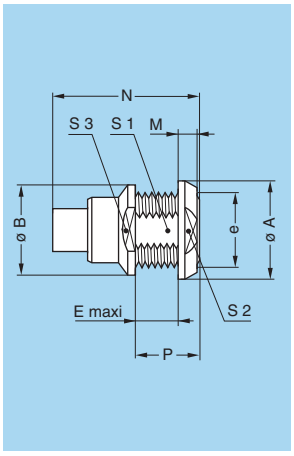


EC● Fixed socket with 2 nuts, key (N) or key (S), protruding shell, print contacts, IP50 (back panel mounting)

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)

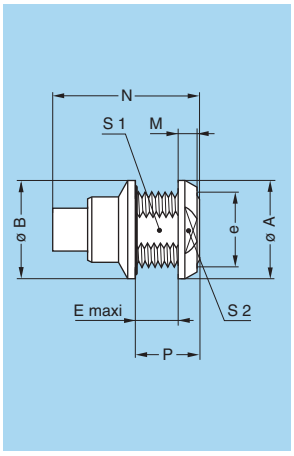
Note: this socket can be used without the hexagonal nut. It can be directly fastened into the device, the notched nut is used as a tightening nut.



EE● Fixed socket, nut fixing, key (N) or keys (P, S and T), IP50 (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

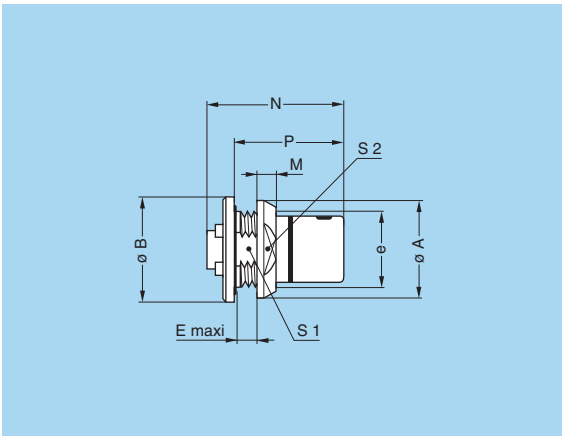
Panel cut-out (page 33)



EF● 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
EF●	1F	17	17	M13x0.75	6.2	3.2	19.0	9.4	11.5	14

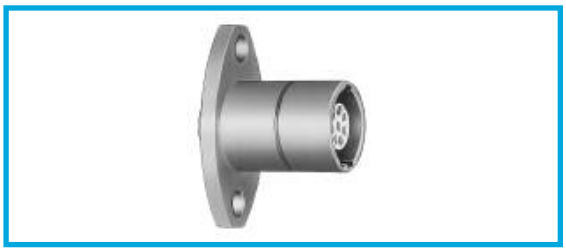
Panel cut-out (page 33)

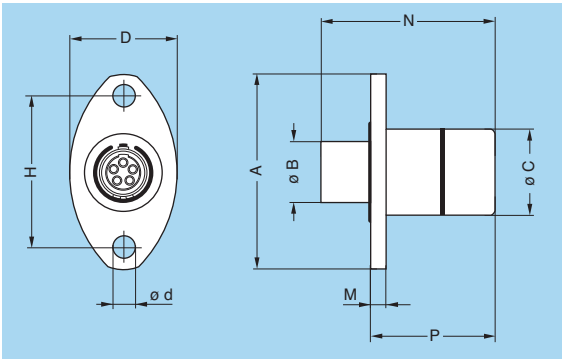


EH● Fixed socket, nut fixing, key (N) or keys (P, S, T, W and X), (back panel mounting)

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)

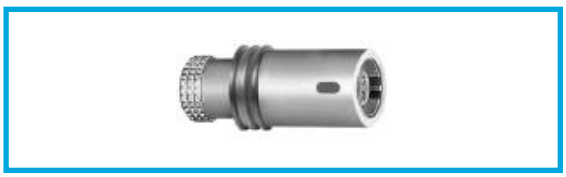


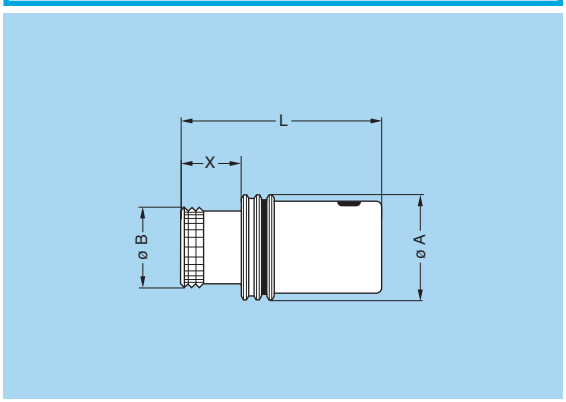


ED● Fixed socket with flange, key (N) or keys (P and S), 2 holes fixing, protruding shell

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

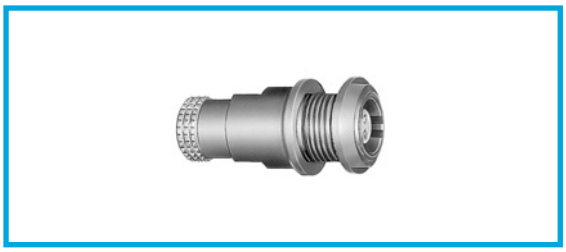
Panel cut-out (page 33)

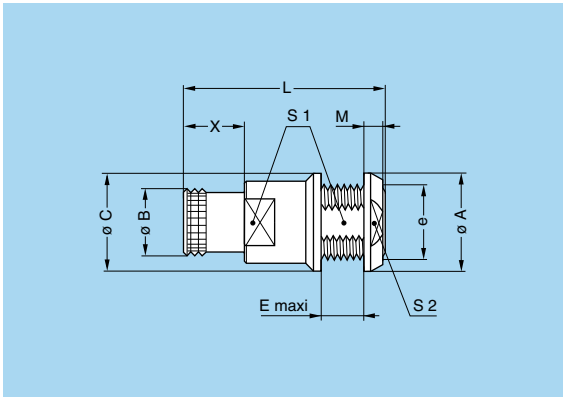




PH● Free socket, key (N) or keys (P, S, T, W and X)

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



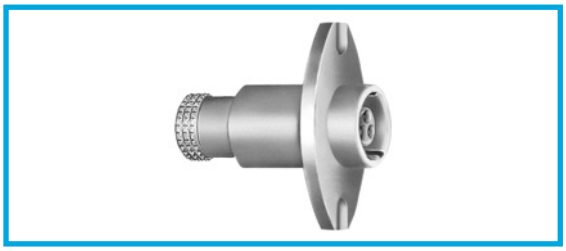


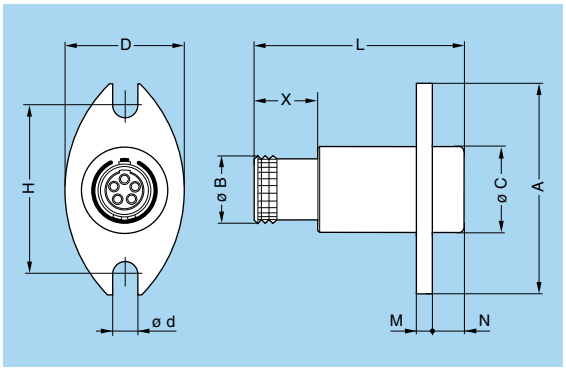
PE● Fixed socket, nut fixing, key (N) or keys (P, S, T, W and X), (back panel mounting)

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

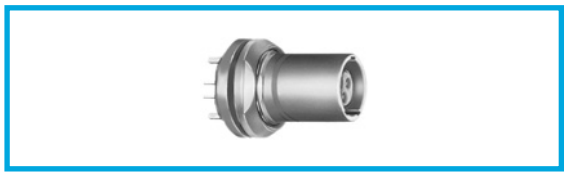
HEN fixed sockets allow the device on which they are fitted to reach a protection index of IP68 as per IEC 60529 (unmated). These models are identified by a letter «P» at the end of the reference. Epoxy resin is used to seal these models. They can be mated with all plugs of the same series to achieve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

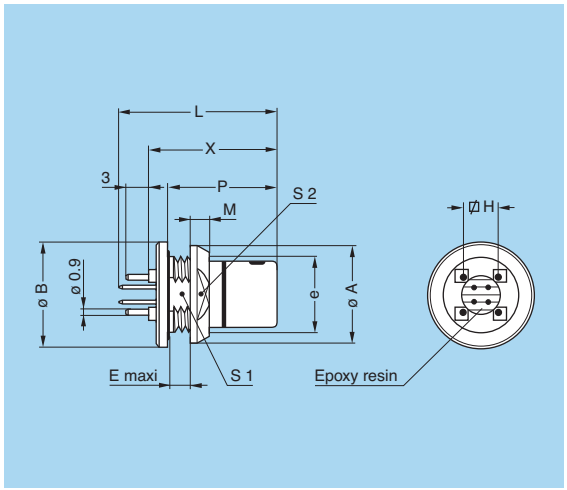
Technical Characteristics

Mechanical and Climatical

Characteristics [1]	Value	Standard	Series / Shell material
Temperature range	-15° C, +100° C		All; code I, 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.



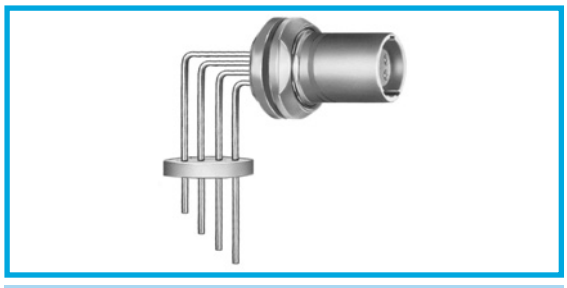


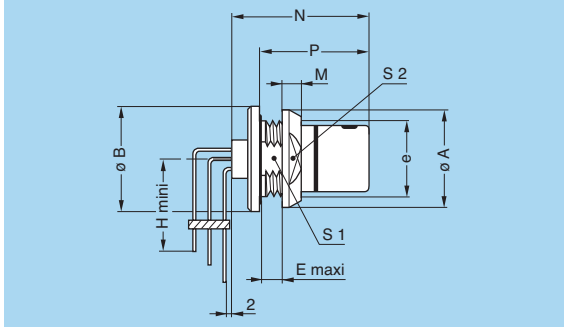
HE● Fixed socket, nut fixing, key (N) or keys (P, S, T, W and X), for printed circuit, (back panel mounting)

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 [2]	22	23	M18x1.00	3.0	11.43	21.5	4.0	14.5	16.5	19.0	17.5
HEP	3F [2]	22	23	M18x1.00	3.0	11.43	21.5	4.0	14.5	16.5	19.0	17.5
HES	3F [2]	22	23	M18x1.00	3.0	11.43	23.0	4.0	16.0	16.5	19.0	19.0
HET	3F [2]	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.
[2] for chrome plated version (material code «C»), A = 24 mm and S2 = 20 mm.





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

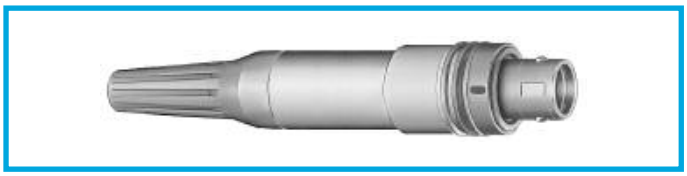
Technical Characteristics of optical contacts

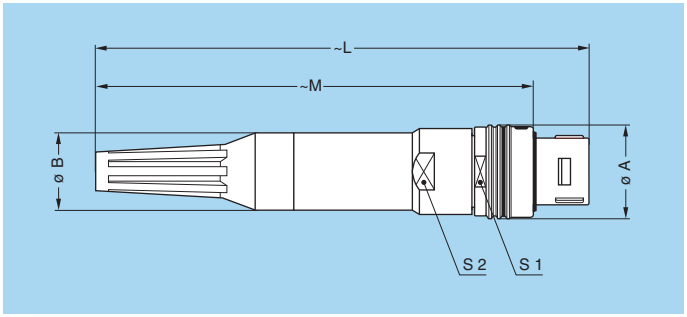
Mechanical and Climatical

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

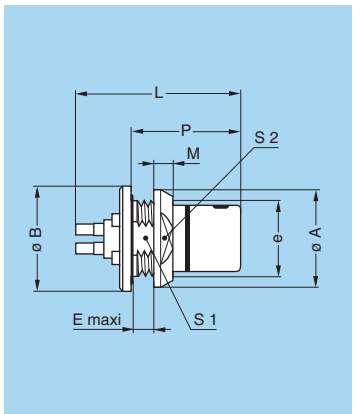
Characteristic	Value	Standard	Method
Average insertion loss fibre 9/125 µm	0.18 dB	IEC 61300-03-34	Method 2
Average insertion loss fibre 50/125 µm	0.25 dB	IEC 61300-03-34	Method 2
Return loss fibre 9/125 µm (UPC)	≥45 dB	IEC 61300-03-06	Coupler Method
Return loss fibre 9/125 µm (Hand polish)	>25 dB	IEC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

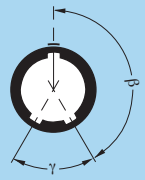
Connectors for fibre-optic are delivered without the fibre optic contacts, they must be ordered separately (see page 25). For T-type cable adapter see page 20.

Alignment Key

Alignment Key and Polarized Keying System

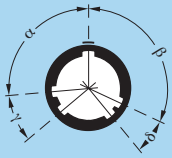
F series connector model part numbers are composed of three letters. The LAST LETTER indicates the keys corresponding to a particular contact type. For example, straight plugs with N, P or W keys, are fitted with male contacts; whereas with S, T or X keys, plugs are fitted with female contacts. Sockets 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		–	–	160°	40°	135°	90°	green	female	male	○

Front view of a socket

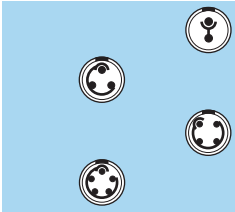
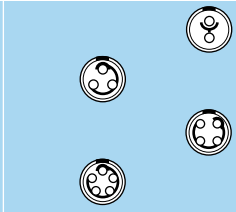
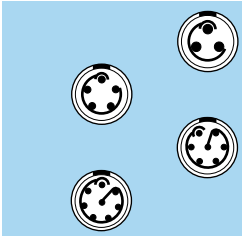
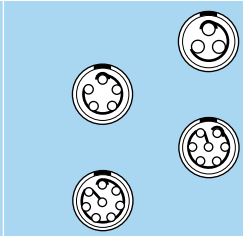
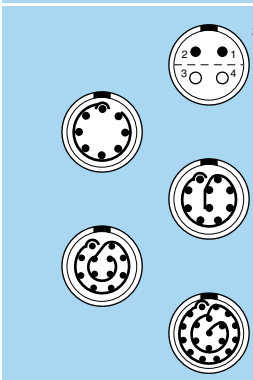
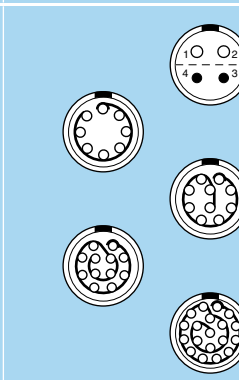
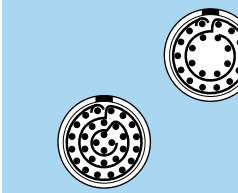
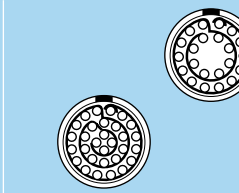
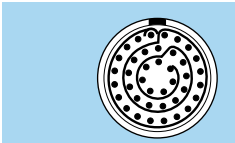
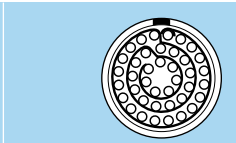


Model	Nb of keys	Series 4F-LF-5F				Colour code	Contact type		Note
		Angles					Plug	Socket	
		α	β	γ	δ				
●●W	5	95°	115°	35°	25°	blue	male	female	●
●● X		100°	125°	40°	20°	red	female	male	○

● First choice alternative ○ Special order alternative

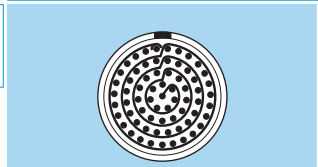
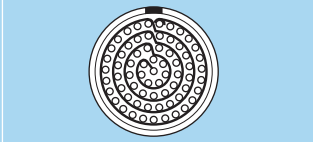
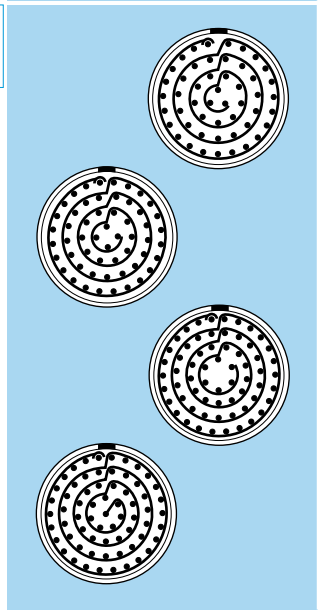
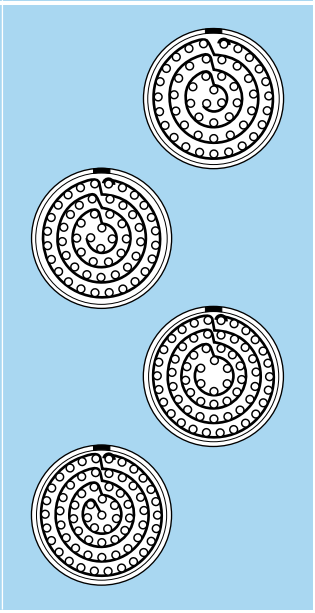
Insert configuration

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

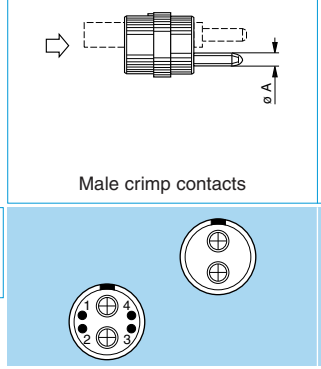
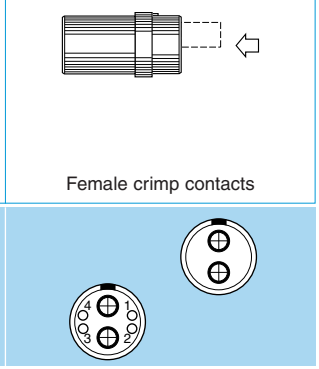
Note: Other types available on request, based on existing contact configurations of the B series.
[1] see calculation method, caution and suggested standard on pages 39 and 40.
[2] the mentioned AWG range apply to the standard crimp contact of fig.1. Contacts with reduced crimp barrel are available for 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					
I	–	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Aluminium alloy	NiCorAl	Special bronze/brass	NiCorAl	FPM/FKM
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

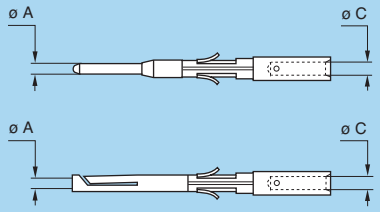
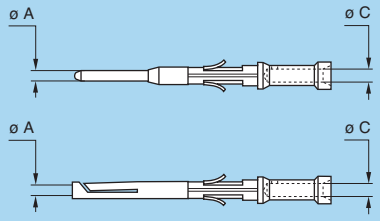


Fig. 2



Ref.	Contact type	Ref.	Contact type
C	Male crimp (fig. 1)	M	Female crimp (fig. 1)
B	Male crimp (fig. 2)	P	Female crimp (fig. 2)
G	Male crimp (fig. 2)	U	Female crimp (fig. 2)
D	Male straight print	N	Female straight print
Z	No contact (for multi FO)	V	Male or female elbow print

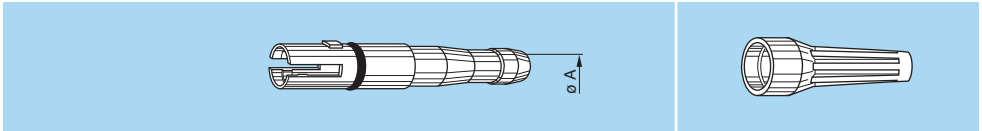
Dimension of crimp barrels

Contact			Ref. contact type		Conductor			
ø A (mm)	ø C (mm)	Form per fig.	Male	Female	AWG min.	AWG max.	Section (mm^2) min.	Section (mm^2) 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

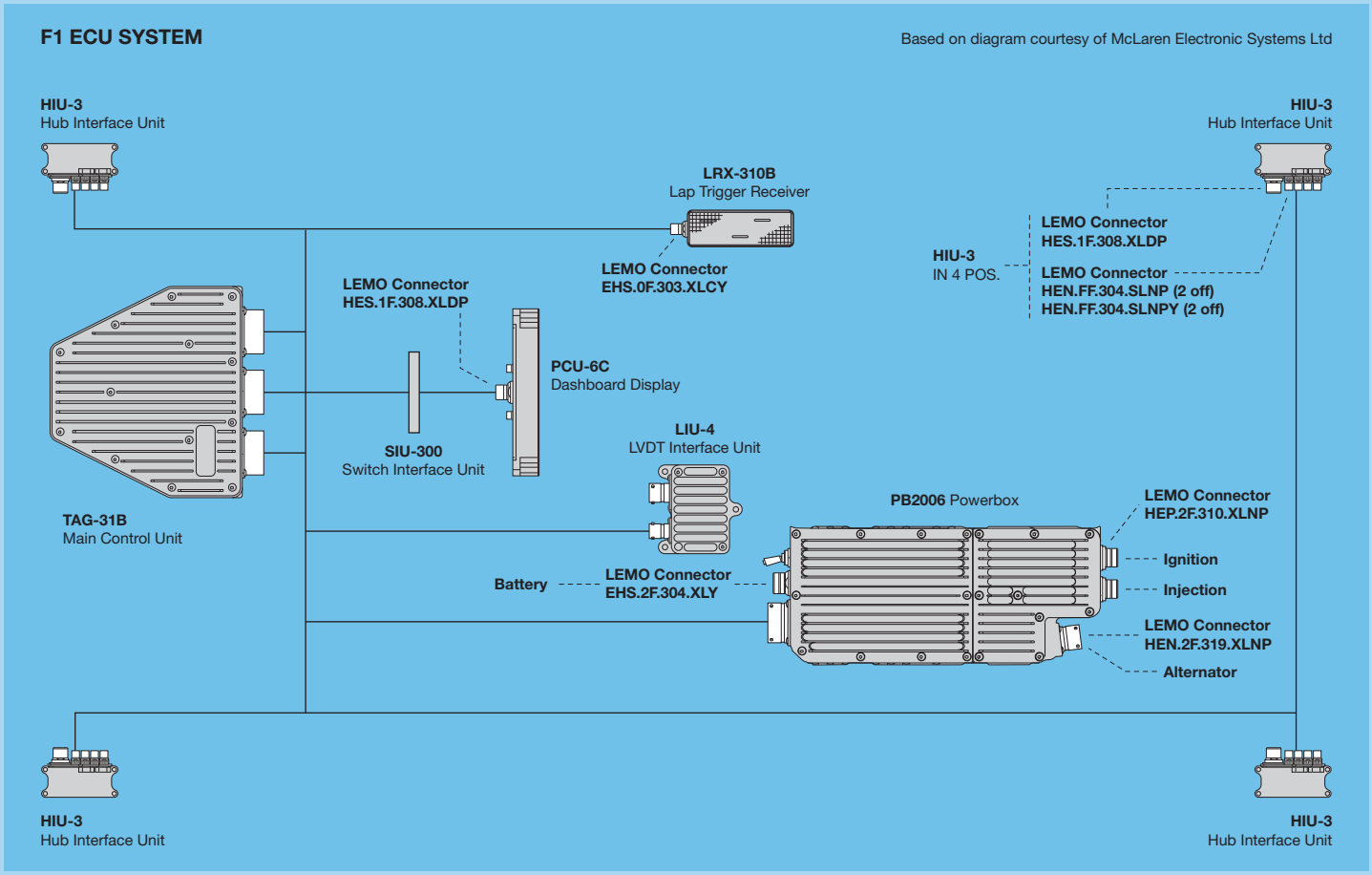
Some options are available, they are identify with specific letters in the variant position.
– F apply to plug with a reduced unlatching force, such option allows disconnection if the cable is pulled accidentally.
– Connectors with code material I, X or Y are delivered with FPM/FKM gasket as a standard.
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.



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

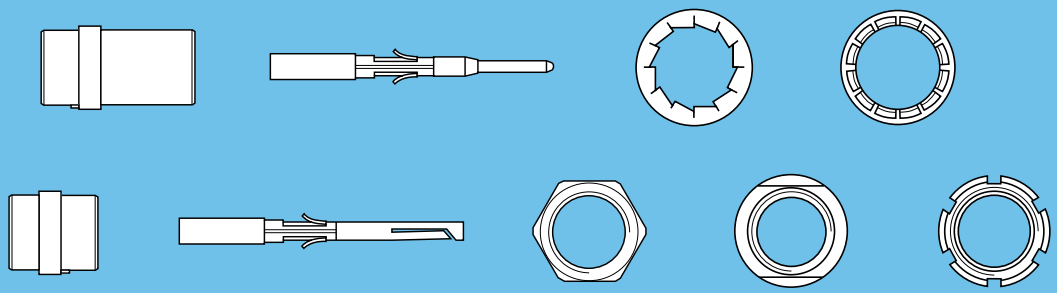
PB2006 Powerbox

Unit connectors	Interface connectors	Spare contacts
EHS.2F.304.XLY	FGS.2F.304.YLY	FGN.1F.565.ZZC 1) 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