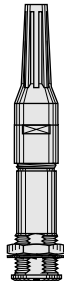
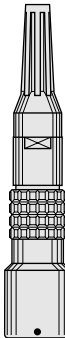
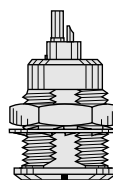
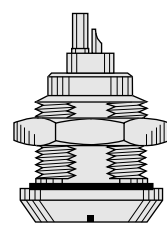
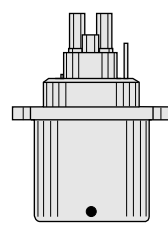
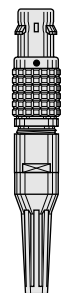
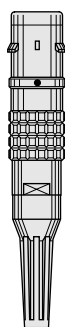
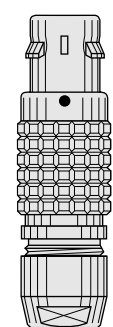
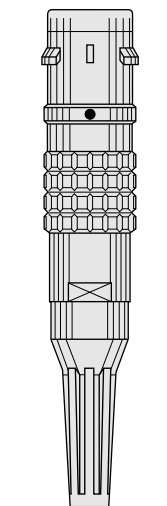
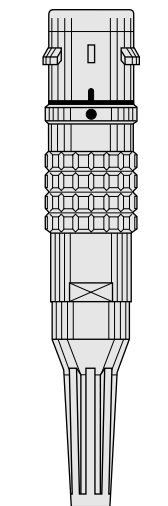


Fibre Optic Connectors Production Program

The production program is divided into 12 series of connectors. Their main characteristics and applications are shown below.

						
						
Series	00	0B	0K	2B to 5B	2K to 5K	3K.93C
Latching	Push-Pull					With «W» key-way
Shell	Metal			Metal or plastic	Metal	
Feature	Miniature		Watertight to IP68		Watertight to IP68	Watertight to IP68
Cable Construction	Single fibre			Multi fibre or Mixed optical/electrical		Mixed HDTV optical/electrical
Contact Type	F4	F3	F2	F1	F2	F2
Fibre Type	Single-mode or Multi-mode fibres ≤ 100/140µm	Multi-mode fibres ≥ 100/140µm	Single-mode or Multi-mode fibres ≤ 100/140µm	Multi-mode fibres ≥ 100/140µm	Single-mode or Multi-mode fibres ≤ 100/140µm	Single-mode or Multi-mode fibres ≤ 100/140µm
Mean insertion loss	0.10 dB (s/m) 0.25 dB (m/m)	1.13 dB	0.10 dB (s/m) 0.25 dB (m/m)	1.13 dB	0.10 dB (s/m) 0.25 dB (m/m)	0.10 dB (s/m) 0.25 dB (m/m)
Ferrule Material	Ceramic	Ceramic or metal	Ceramic	Ceramic or metal	Ceramic	Ceramic
Interface Type	Spherical with physical contact of the fibre end face (PC)	Spherical, non-contact with controlled gap of the fibre end face	Spherical with physical contact of the fibre end face (PC)	Spherical, non-contact with controlled gap of the fibre end face	Spherical with physical contact of the fibre end face (PC)	Spherical with physical contact of the fibre end face (PC)
Page	11 to 18	19 to 26	27 to 34	35 to 46	47 to 54	63 to 76

Introduction

This catalog gives the complete description of LEMO fibre optic connectors. Our manufacturing program has been extended to 12 series with specific mating and environmental characteristics.

Each series includes a wide variety of plugs, sockets or housings for electro-optic devices available in a large choice of combinations of fibre optic and electrical contacts within the same housing. Shells are adapted to all round cables to a maximum diameter of 25 mm.

LEMO connectors feature ceramic or metal ferrules for the fibre optic contacts to provide alignment for both single-mode and multi-mode fibres.

They are manufactured to the highest precision in order to ensure optimum optical performances even in the most severe applications.

Numerous accessories as well as a complete range of tools for fibre optic termination, are available.

The 00 Series

The characteristic feature of this connector series is the small size requiring minimum mounting space requirement.

Connectors are suitable for use with single fibre cables fitted with single-mode or multi-mode fibres.

The 0B Series

A simple and proven construction with ceramic or metallic ferrules in a fibre optic contact primarily intended for use with large size multi-mode fibres ranging from 140 to 1500 micron external diameters.

The 0K Series

This series is watertight (IEC 60529/IP 66-IP 68) and is ideal for use in harsh environments.

It uses the standard LEMO F2 fibre optic contact which has undergone extensive mechanical, optical and environmental testing.

Connectors are suitable for use with single fibre cables fitted with single-mode or multi-mode fibres.

The 2B to 5B Series

These connectors series range from 2B to 5B, and have been designed to work with LEMO F1 or F2 type fibre optic contacts. They are suitable for use with multi fibre or mixed fibre optical/electrical cables fitted with single-mode or multi-mode fibres up to 1500 micron in diameter. The connectors offer a variety of features:

- alignment key preventing all errors in alignment;
- polarized keying system, the various keying alternatives prevent unwanted cross mating of otherwise similar connectors;
- higher contact density; and
- possible use of crimp contacts to reduce cable assembly time.

The 2K to 5K Series

This product family includes the 2K to 5K series, and are watertight (IEC 60529/IP 66-IP 68) available in the same types as the 2B to 5B series. The connectors are ideal for use in harsh environments.

The video HDTV 3K.93C Series

This new range of high performance fibre optic camera connectors has been developed to meet the needs of the new generation of digital TV cameras. Contact configuration includes 2 fibre optic contacts for single-mode fibres, 2 electrical contacts for power and 2 electrical contacts for signal. This series conforms to the Japanese ARIB technical report BTA S-1005B, to the ANSI/SMPTE 304 M-1998 and 311M-1998 standards and to the European EBU Technical Recommendation R100-1999.

Connectors are qualified for use in UL approved equipment such as those specified in UL 1419 «Professional Video and Audio Equipment»

CE marking

CE marking  means that the appliance or equipment bearing it complies with the protection requirements of one or several European safety directives.

CE marking  applies to complete products or equipment, but not to optical/electromechanical components, such as connectors.

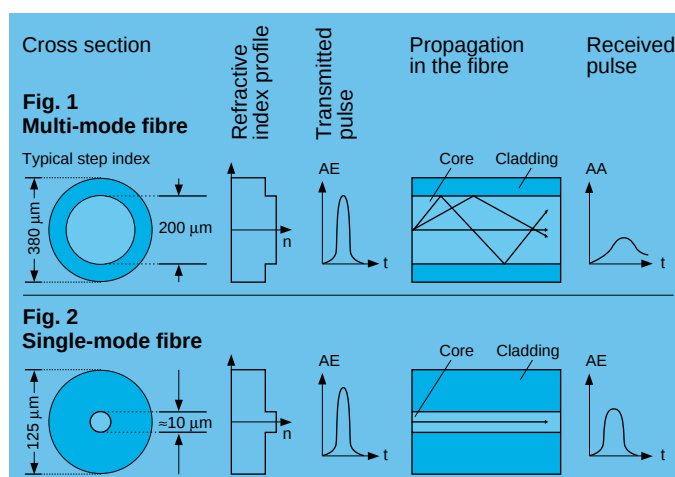
Propagation of Light and Fibre Type

The diagrams show the typical transmission characteristic of single-mode and multi-mode fibres.

In multi-mode fibres, the effect of modal dispersion causes a spread in the received pulse and therefore limits the bandwidth of the transmission system (Fig. 1).

If the fibre core is $< 10 \mu\text{m}$ and the wavelength is $\geq 1300 \text{ nm}$, then only the fundamental mode is transmitted in the single-mode fibre (Fig. 2).

The dispersion effects of single-mode fibres are very small and consequently they offer higher bandwidths when compared with multi-mode fibres. However, multi-mode fibres are usually ideal for short distance applications because they require less input optical power and can be driven by simple low cost LEDs.



General Characteristics

Selection of the LEMO Fibre Optic Contacts

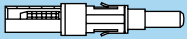
In order to ensure the highest technical performance and to provide the optimum solution for a diversity of applications, LEMO has developed four types of fibre optic contacts; designated **F1**, **F2**, **F3**, and **F4**. These contacts are designed to operate with single fibre, multi fibre, and mixed fibre optical/electrical cable constructions and cater to single and multi-mode fibres from 9/125 to 1500 μm diameter.

The choice of fibre optic contacts depends upon the following criteria:

- Cable construction (single fibre, multi fibre, mixed optical/electrical)
- Fibre type (single-mode or multi-mode).

The table below shows the suitability of each contact type with different fibres and cables.

Note that the multi fibre cable can contain many types of optic fibres or a group of fibres and electrical cables leading to mixed optical/electrical connectors.

	Contact type	Cable Structure		Fibre Types and dimensions		
						
		single fibre	multi fibre or mixed	single-mode	$\leq 100/140\mu\text{m}$	$\geq 100/140\mu\text{m}$
	F1					
	F2					
	F3					
	F4					

Series and contact configurations

Single and Multi F.O.

Number of F.O. contacts	Series						
	00	0B	0K	2B-2K	3B-3K	4B-4K	5B-5K
1	●	●	●				
2					●		
4						●	
10							●
14							●

Note: ● = available contact configuration

Mixed F.O. + L.V.

Number of F.O. contacts	Number of L.V. electrical contacts	Series						
		00	0B	0K	2B-2K	3B-3K	4B-4K	5B-5K
1	2, 4, 6 or 10				●			
1	22					●		
2	4, 6, 10 or 16					●		
2	6, 7, 12, 16 or 18						●	
3	6 or 12						●	
3	10							●
4	5 or 9						●	
9	3							●

Mixed F.O. + L.V. + H.V.

Number of F.O. contacts	Number of L.V. electrical contacts	Number of H.V. electrical contacts	Series						
			00	0B	0K	2B-2K	3B-3K	4B-4K	5B-5K
2	2	2							●
6	2	4							●
12	1	2							●

Mixed F.O. + L.V. + Coax

Number of F.O. contacts	Number of L.V. electrical contacts	Number of coax electrical contacts	Series						
			00	0B	0K	2B-2K	3B-3K	4B-4K	5B-5K
1	6	1					●		
1	16	1					●		
2	–	2						●	
2	6	1						●	

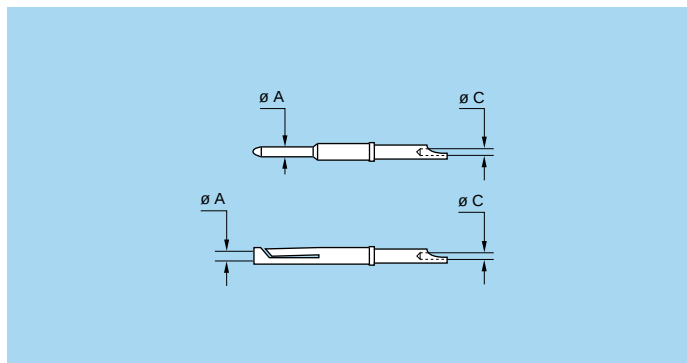
Acceptable cable diameter

Cable $\varnothing$ (mm)	Series											
	00	0B	0K	2B	3B	4B	5B	3K.93C	2K	3K	4K	5K
min	0.25	2.5	2.5	1.5	4.1	5.1	9.6	8.3	3.6	3.6	3.6	3.6
max	3.00	4.4	3.0	9.7	11.7	16.0	25.0	16.5	6.5	9.0	13.5	23.5

Selection of electrical contact types

Solder contacts

The conductor bucket of these contacts is machined at an angle to form a cup into which the solder can flow.

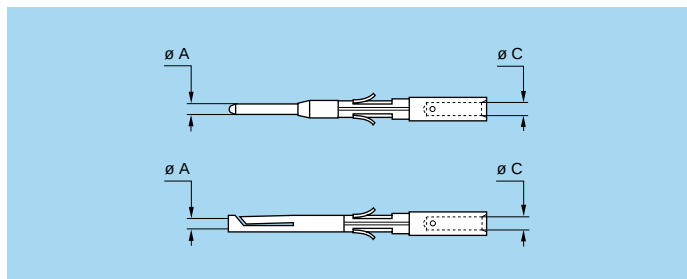


Contact		Conductor			
$\varnothing A$ (mm)	$\varnothing C$ (mm)	Solid		Stranded	
		AWG max.	Section max (mm ²)	AWG max.	Section max (mm ²)
0.7	0.80	22	0.34	22 ¹⁾	0.34
0.9	0.80	22	0.34	22 ¹⁾	0.34
1.3	1.00	20	0.50	20 ¹⁾	0.50
2.0	1.80	14	1.50	16	1.50
4.0	3.70	10	6.00	10	6.00

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 $\varnothing C$.

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.



Contact		Conductor stranded				F _r (N)
ø A (mm)	ø C (mm)	AWG stranded		Section (mm ²)		
		min.	max.	min.	max.	
0.7	0.80	26	22 ¹⁾	0.140	0.34	22
0.9	1.10	24	20	0.250	0.50	30
1.3	1.40	20	18	0.500	1.00	40
	1.90 ²⁾	18	14	1.000	1.50	
1.6	1.90	18	14 ¹⁾	1.000	1.50	50
2.0	2.40	16	12 ¹⁾	1.500	2.50	65

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 $\varnothing C$.

²⁾ These contacts are special with an oversized crimp bucket and can be used only with the series 3K.93C.

Note: F_r = mean contact retention force in the insulator (according to IEC 60512-8 test 15a).

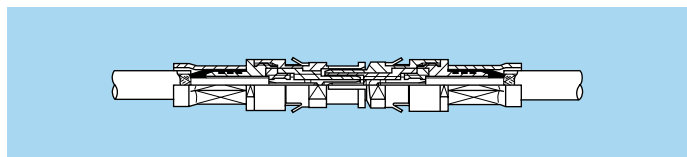
Crimp contacts can also be supplied with a reduced crimp barrel. Please consult factory or our Unipole/Multipole catalog.

A detailed range of conductor dimensions that can be crimped into LEMO contacts is given in the table above. See also the section on tooling (pages 97 to 106).

Coaxial contacts

The type C coaxial contact is removable and fixed in place by clips. Cable attachment is made by crimping. The square form is used to captivate center conductor and hexagonal crimping method for the cable shield.

A detailed range of coaxial cable that can be installed into our type C coaxial contact is given in the table below.



Group	Type
1	RG.174A/U, RG.188A/U, RG.316/U
2	RG.178B/U, RG.196A/U
3	RG.179B/U, RG.187A/U

Preferred fibre optic cable types

The preferred and very common cable construction for use with LEMO connectors are shown below.

- Simplex semi-tight jacket cables between 2 and 3 mm in diameter and have straight lay Kevlar® reinforcement (see fig. 1).
- 900 micron plastic buffered fibres (see fig. 2).
- Multiway «break-out» cables which have additionnal overall straight lay Kevlar® to provide cable pull resistance (see fig. 3).
- Multiway «premise» cables with 900 micron plastic buffered fibres and additionnal overall straight lay Kevlar® to provide cable pull resistance (see fig. 4).

Fig. 1



Fig. 2



Fig. 3

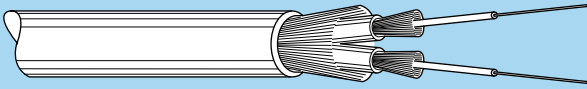
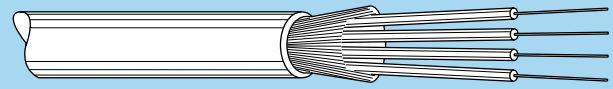


Fig. 4



For other cable construction it is recommended that you contact us directly for advice on their suitability for termination onto LEMO connectors.