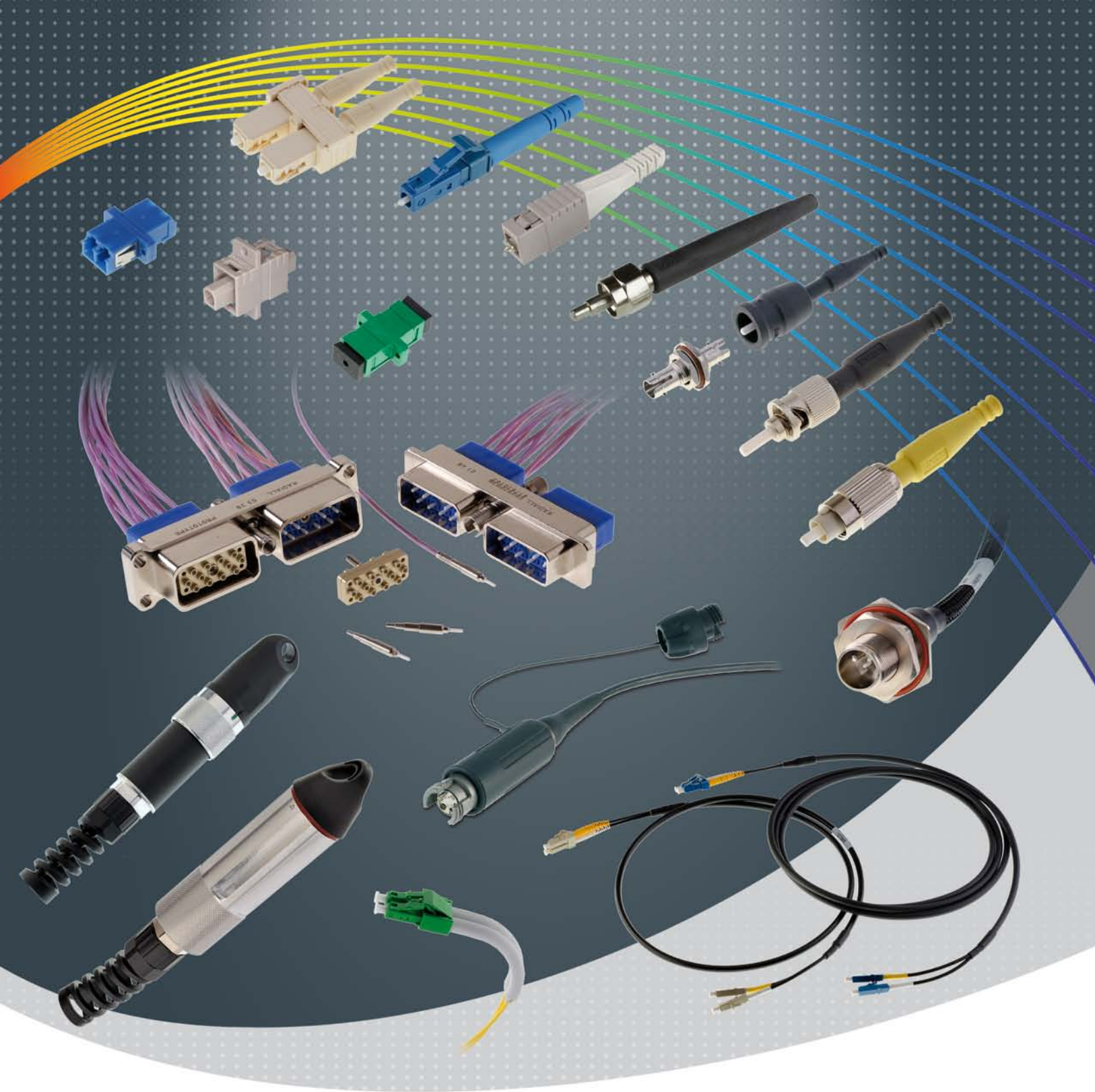


FIBER OPTIC PRODUCTS

Full Line Catalog

RADIALL

The next conneXion

COMPANY PROFILE

*Technical information and sales contacts are available at : **www.radiall.com***

Simply Your Best Connection

Radiall is a global leader in the design, development and manufacturing of leading edge interconnect solutions. Dedicated to understanding its customers' needs since 1952, Radiall has earned the reputation of being "the best of the best" in engineering ingenuity by providing a constant flow of creative system solutions serving the telecommunications, aerospace, defense, instrumentation, automotive, industrial, medical and broadcast markets.

The Best End-to-End Interconnect Solutions

We offer an extensive range of solutions that supports the most demanding signal transmission applications. 4G wireless infrastructure, active array radars, IED's detection, electrical wiring in aircrafts, soldier tactical radios, in-vehicle communications networks, and magnetic resonance imaging systems are just a few of the complex applications that we support.

- RF coaxial connectors
- Fiber optic connectors and transceivers
- Coaxial and fiber optic cable assemblies and harnesses
- High frequency microwave components
- Coaxial switches, including the smallest and most reliable SPDT relay
- Multipin rectangular connectors
- Rack and panel connectors
- Antennas for tactical networks, aerospace and instrumentation

Best Value-added Services

- **Collaboration:** We work closely with your engineers to understand your business, your technical needs, and your budgetary issues;
- **Wide Product Range:** We manage our product lines thru the entire lifecycle in order to offer you a wide selection of standard products at an affordable cost;
- **Custom Products:** We can tailor products to specific equipment and application needs;
- **Global Presence:** We're everywhere you need us, with worldwide sales, engineering support, R&D in North America, Europe, and Asia, and manufacturing facilities strategically located in the United States, Mexico, France, India, and China;
- **Responsive Support and Service:** From the design stage, planning to post-installation support, we're with you at every step, whether you need sales support or engineering expertise;
- **On-time Delivery:** We support your logistical needs so you get the products when and where you need them;
- **Warranty:** We proudly stand behind our products.

ISO 9001 Certified
AS/EN/JISQ9100-ISOTS 16949-ISO-14001

RoHS COMPLIANT

Certifications and Environmental

Radiall is ISO 9001: 2008 certified and dedicated to continuous improvement programs that have resulted in also being AS9100, TS16949 and ISO 14001 certified. In addition, Radiall is committed to investing in its people, future technologies and the environment, such as being RoHS (Restriction of Hazardous Substances) and REACH (Registration, Evaluation, Authorization and Restriction of Chemical substances) compliant.

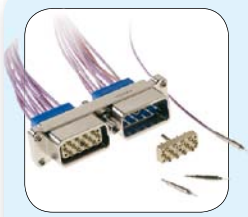
A global range
To meet your needs

ANTENNAS

RADIALL specializes in antennas from 27 MHz to 6 GHz for military applications.
- Technologies used: wire, patch, printed, wire-plate, PIFA
- Numerous types of antennas: single pole, dipole, network, passive or active (with LNA), adaptable and intelligent, outdoor or integrated.

AEP CONNECTORS

AEP RF connectors are designed and manufactured in USA for the demanding requirements of military field radio and avionics systems:
- Coaxial waterproof connectors with a unique system of sealing.
- MIL-PRF-39012 QPL connectors
- SSMB and SSMC superior connectors
- SLB Self Aligning connector system.



FIBER OPTIC CONNECTORS

Wide range of interconnect solutions, including standard connector interfaces for MultiMode and SingleMode fiber (LC, SC, FC, ST...) as well as connectors and termini contacts (MIL-T-29504, ARINC 801) for harsh environment applications (aeronautic, military, naval, medical, railway...). Great flexibility for custom design.

HARNESSES

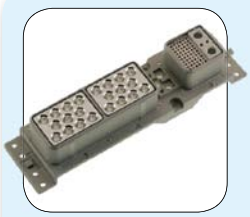
The combination of design and manufacturing of RF and microwave cables as well as multipin connectors (EPX, ARINC 404 and 600) allows Radiall to be a specialist of harnesses for onboard (aeronautic, navy...) or land (railways, remote antenna...) equipment or communications systems.
All types of contacts can be used and mixed such as signal, power, RF, quadrax, fiber optic...

RF & MICROWAVE SWITCHES

Wide range of coaxial switching products for commercial, military and instrumentation applications. Available with a large choice of interfaces (SMA, QMA, N, ...), from DC to 40 GHz. Main products:
- Standard RAMSES series.
- PLATINUM series with high repeatability (0.03dB) on insertion loss during 10 million actuations.
- Subminiature SPnT up to 26.5 GHz.
- SMT high power micro-SPDT.

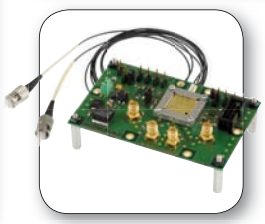
MICROWAVE COMPONENTS

Wide range of coaxial terminations and attenuators using standard interfaces (SMA, QMA, N, QN...) from low (1W) to high power (100W). Cable load solution, chip terminations up to 18 GHz, hybrid or directional SMT couplers, connectorized couplers, lightning protectors, detectors, rotary joints, phase shifters, DCBlocks...



MULTIPIN CONNECTORS

The range includes rack and panel connectors (Arinc 404 & MIL-C-81659B DSX, Arinc 600 NSX & SW280WS1 BPX, EN3682/ MIL-C-83527 MPX JN1123 TCX), modular connector (EPX A & B), compatible with a large variety of contacts: signal, power, RF, data bus, fiber optic, quadrax and twinax.
A range of wire to wire and wire to board is also available: B & MCSR duty connectors, M, MM, MB, MBC rectangular miniature series, MMC.



FIBER OPTIC TRANSCEIVERS

Our multi-channel transceiver modules in smallest available packages are fully qualified for harsh environments and avionics applications.
- Bit rate up to 10 Gbps
- Up to 12 channels per module
- Various packages with footprint as small as 12x13mm²

RF & MICROWAVE CABLE ASSEMBLIES

Wide range of cable assemblies using all types of coaxial connectors and cables.
- RG, LMR, conformable, semi-rigid, corrugated, etc.
- Cable diameter 0.8mm up to 1 5/8"
- SHF wrapped cable manufactured in house for appplications at 40GHz and above
- TestPro range dedicated to test benches
- Lightweight range designed for airframe installation
- Phase matching available for radar and other applications

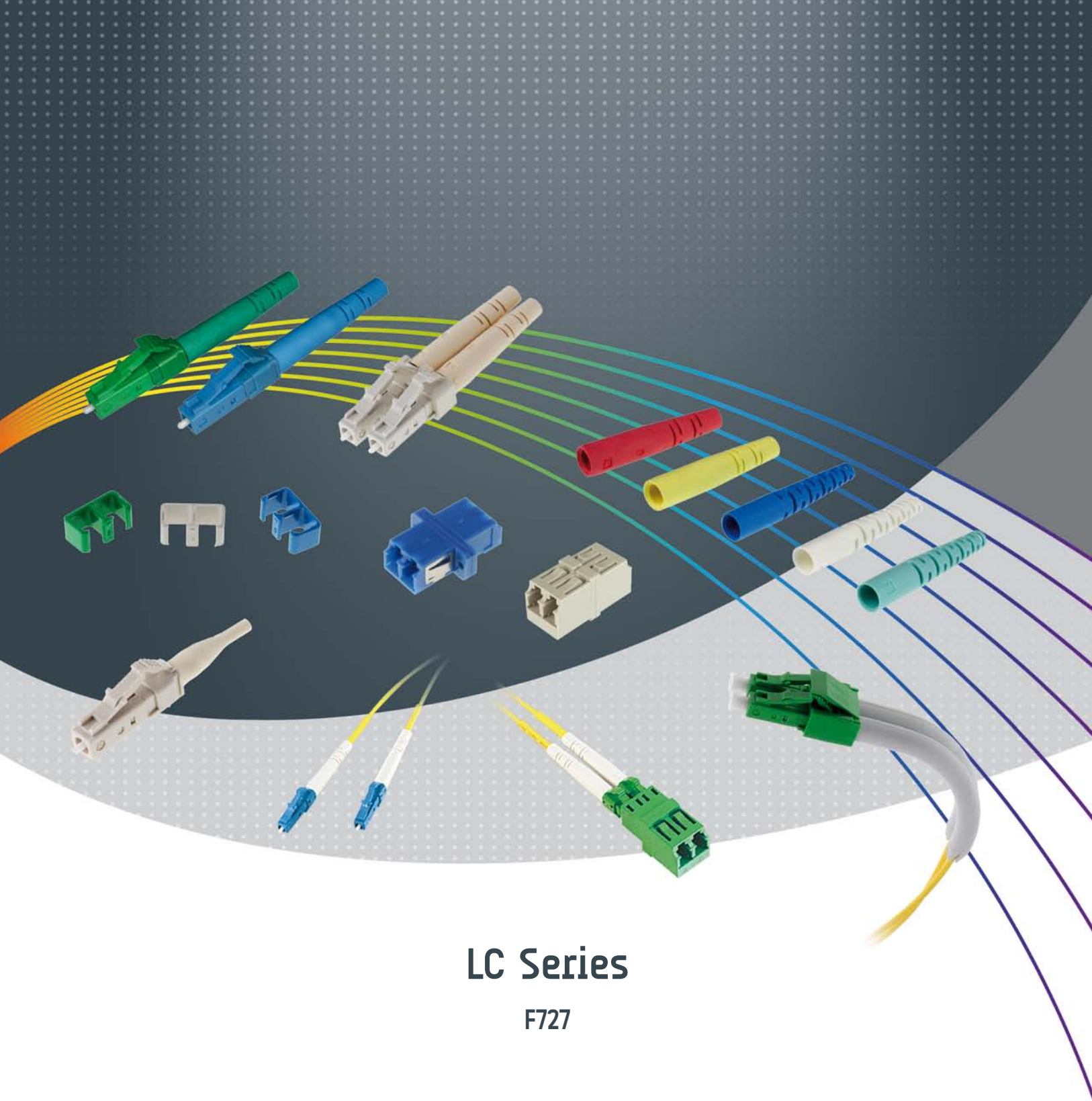
RF COAXIAL CONNECTORS

The widest range of coaxial connectors in the world from microminiature (UMP) to standard connectors (7/16) covering the frequency range of DC to 65 GHz mixing standardized and custom interfaces (UMP, IMP, MMS, MMT, QMA, QN, MMBX).

FINDER GUIDE

	Series	LC	SC	FC	ST	EC	F-SMA	29504 Termini	LUXCIS	PROBEAM	ODC	R2CT	OSIS
													
	P/N PREFIX	F727	F728	F729	F709	F715	F707 - F708	F722 - F724	F725	F739	F760 - F792	R2CT	OSIS
Application fields	Telecom/Datacom	•	•	•	•	•					•	•	•
	Industry/Mining	•	•	•		•	•			•	•	•	•
	MILAero	•	•	•	•		•	•	•	•			
	Broadcast	•	•	•						•			
	Medical	•			•	•	•						
	Instrumentation			•	•	•	•						
Connector technology	Physical contact	•	•	•	•			•	•		•	•	•
	Expanded Beam									•			
	Matching membrane					•							
	Air gap						•						
Coupling system	Push-pull		•			•							•
	Latched push-pull	•											
	Screw-in			•			•			•	•		
	Bayonet				•							•	
	Contact for multipin connectors							•	•				
Fiber type	SingleMode 125 µm	•	•	•	•	•		•	•	•	•	•	•
	MultiMode 128 µm	•	•	•	•	•	•	•	•	•	•	•	•
	Large core fiber				•	•	•	•	•				
	POF (Plastic optical fiber)				•	•	•	•	•				
Number of contacts / connectors	Connector (simplex/ duplex)	•	•	•	•	•	•	•	•		•	•	•
	Multi contact interconnect							•	•	•			
Mechanical characteristics	100 mating cycles											•	•
	200 mating cycles						•				•		
	500 mating cycles	•	•	•	•			•	•				
	> 1000 mating cycles					•				•			
Operating Temperature	-25°C/+70°C					•							
	-40°C/+70°C			•	•								
	-40°C/ +85°C	•	•							•	•	•	•
	-55°C/ +85°C						•						
	-55°C/+125°C	•	•	•	•			•	•				
Other	Tuneable		•	•									
	Flexible configuration with level 0	•	•	•	•								

Contents



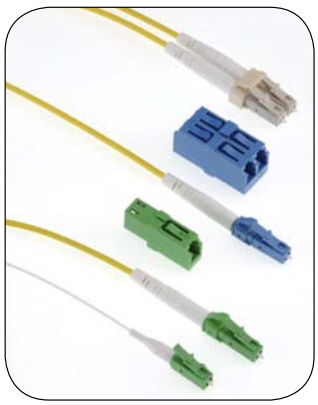
LC Series

F727

RADIALL
The next conneXion

Pages

INTRODUCTION



Radiall **LC connector** is the Small Form Factor (SFF) solution for high density applications and features the familiar latching mechanism of the RJ-45 modular plug.
The LC connector is ideal to guarantee very high performances while saving space.
It benefits from the most advanced of Radiall's technologies, such as the secured bonding and crimping reliability to provide a secure connexion and very fast assembly.
Radiall's LC series is available in 2 configurations depending on the application:
- Standard range for Telecom applications: tested according to GR-326-CORE Telcordia and IEC 60874 specifications
- Aerospace range: specific LC designed to perform with aerospace cables in harsh environment conditions

Radiall's LC product range is manufactured under a worldwide license from OFS, formerly known as Lucent Technologies.

BENEFITS & FEATURES

- **Easy mounting and installation**
  - Small Form Factor for higher density (half size of SC connector)
  - Radiall has a proprietary secure bonding to protect the floating mechanism during the resin injection process
  - Latched push-pull system for quick insertion and removal even on very dense circuitry
  - APC 8° pre-angled version is available to accelerate installation on the field
  - Color coding
- **High performance**
  - Facilitate high-speed applications with lower power requirements due to low insertion loss (0.1 dB typical) and high return loss (>60 dB SingleMode APC)
  - High precision alignment with proven 1.25 mm zirconia ferrule
  - Tested according to GR-326-CORE Telcordia and IEC 60874 specifications
- **Secure Connexion**
  - Pull-proof design
  - Radiall has improved the crimping reliability thanks to a mini metallic tube protecting the fiber while reducing stress and ensuring excellent cable retention
  - Different protection boots available with exclusive shape to tighten the cable and maintain optical performances even when the cable is bent or pulled
- **Flexible**
  - 2 configurations: Radiall LC is available in a standard configuration and in an aerospace grade for extended temperature range and increased mechanical performances
  - Available for MultiMode, SingleMode, PC, UPC and APC terminations
  - Can be assembled in duplex configuration with a removable clip
  - Duplex adapters are available in RJ-45 or SC cut-out

APPLICATIONS

- **Telecommunication:**
  Telecommunication networks, Fiber channel (SAN), Local Area Networks (LAN), FTTH
- **Broadcast:**
  Broadcast TV program, transport high speed data flow by computer through CATV
- **Industrial:**
  Video surveillance, fiber optic sensor for industrial process (measuring and control)
- **Biomedical industry**
- **Military, Navy and aerospace**

INTERNATIONAL STANDARD DOCUMENTS COMPLIANCE

- GR-326-CORE Telcordia specification
- IEC 61754-20 Fiber optic connector interfaces (LC connector family)
- IEC 61300 Fiber optic interconnecting devices and passive components - Basic test and measurement procedures

STANDARD RANGE FOR TELECOM APPLICATION

OPTICAL CHARACTERISTICS

	SingleMode PC		SingleMode APC		MultiMode PC	
	Random	Against a reference patchcord	Random	Against a reference patchcord	Random	Against a reference patchcord
Wave length	1310-1550 nm		1310-1550 nm		850-1310 nm	
Insertion Loss Mean Standard deviation	 0.10 dB 0.07 dB	 0.10 dB 0.05 dB	 0.15 dB 0.12 dB	 0.15 dB 0.10 dB	 0.10 dB 0.07 dB	 0.10 dB 0.05 dB
Return Loss	PC > 30 dB UPC > 50 dB		APC > 60 dB		PC > 20 dB	

Insertion Loss random: IEC 61300-3-34
Insertion Loss against a reference patchcord: IEC 61300-3-4 Method B
Return Loss: IEC 61300-3-6
Note: The optical performances also depend on the fiber and/or cable construction.

MECHANICAL CHARACTERISTICS

	Cable diameter 0.9 mm	Cable diameter 2 & 3 mm
Cable retention	7N	68N
Mechanical endurance	200 matings	

ENVIRONMENTAL CHARACTERISTICS

Operating temperature	-40°C / +85°C
Storage temperature	-40°C / +85°C

MATERIALS

Moulded plastic parts	V0 (UL 94)
Optical ferrule (connector)	Zirconia
Alignment sleeve (adapter)	Zirconia

STANDARD RANGE FOR TELECOM APPLICATION

SIMPLEX LC CONNECTORS

The simplex connectors are delivered with straight boots, dust caps and crimping accessories, except for the “level 0” categories which enable users to configure their connectors according to the application.

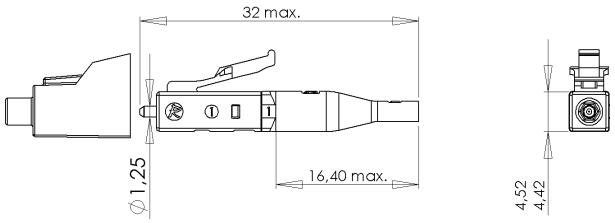


Fig. 1

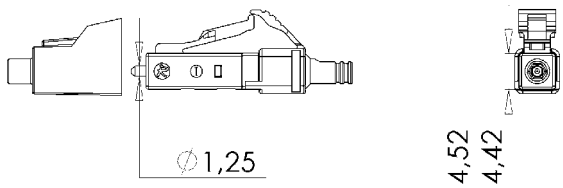


Fig. 2

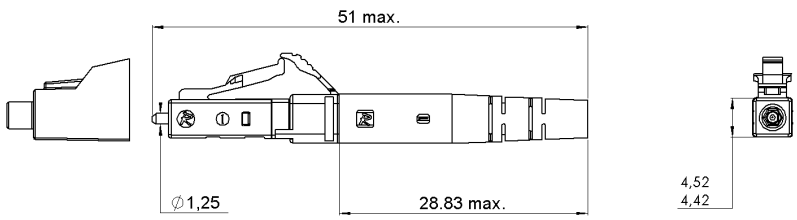


Fig. 3

Cable diameter	Figure	SingleMode PC 126µm - Blue	SingleMode APC 126µm - Green	MultiMode PC 128µm - Beige	MultiMode PC 128µm - Aqua	Packaging
0.9 mm	Fig 1	**F727 102 100**	**F727 152 100**	**F727 103 100**	**F727 103 110**	100
Level «0» [1] for 2 or 3 mm	Fig 2	**F727 102 000**	**F727 152 000**	**F727 103 000**	**-**	100
2 mm	Fig 3	**F727 102 500**	**F727 152 500**	**F727 103 500**	**F727 103 510**	100
3 mm		**F727 102 700**	**F727 152 700**	**F727 103 700**	**F727 103 710**	100

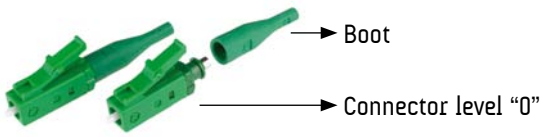
[1] The level “0” is supplied without boots or crimp sleeves. To complete your connector assembly kit, please refer to the “accessories” section.

Level “0” is available for cables 0.9mm on demand.

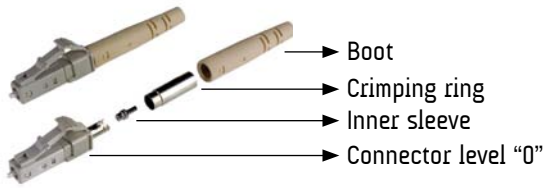
For other cable diameters, please consult the Radiall sales team.

Flexible configuration of simplex connector using level 0 part numbers

For 0.9 mm cable diameter



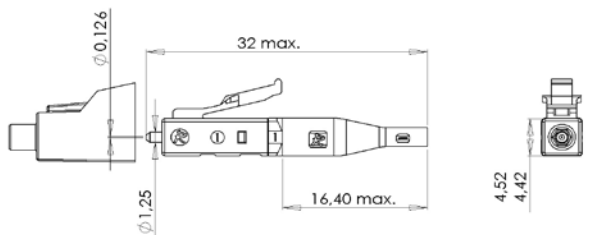
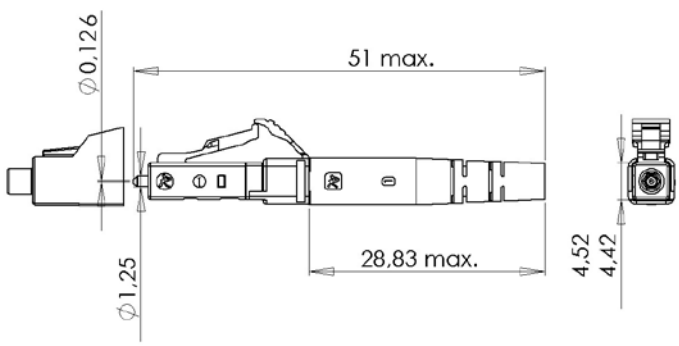
For 2 or 3 mm cable diameter



To get more information on how to find the corresponding part numbers and connector kit combination, please refer to the LC kit configurator section.

APC 8° PRE-ANGLED SIMPLEX CONNECTORS

The APC version of the LC connector is also proposed in a pre-angled end face version for a quick polishing in the field and ultra-low back reflexion.

Cable diameter	Figure	SingleMode APC Pre-angled 126µm - Green	Packaging
0.9 mm		**F727 132 100**	100
2 mm		**F727 132 500**	100

STANDARD RANGE FOR TELECOM APPLICATION

DUPLEX LC CONNECTORS

- **Flexible configuration with a removable duplex clip:**

  Thanks to Radiall's LC removable duplex clip, a simplex connector can be changed at any time to a duplex connector.

  Select 2 Simplex LC connectors and a duplex removable clip to create your duplex LC connector.

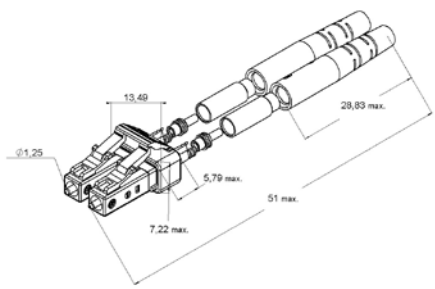
  The duplex clip needs to be ordered separately. To select a clip, please refer to the "accessories" section.

- **Duplex LC with non removable clip:**

Radiall also offers a range of "complete LC duplex" connectors.

These "complete LC duplex" connectors present the advantage to be slightly smaller than the ones with the removable clip. They are especially adapted to be mounted into transceivers.

Note: the brace is not removable.

Cable diameter	Figure	SingleMode PC 126µm - Blue	SingleMode APC 126µm - Green	MultiMode PC 128µm - Beige	Packaging
2 mm		**F727 402 500**	**F727 452 500**	**F727 403 500**	1
		F727 502 500	**F727 552 500**	**F727 503 500**	100
3 mm		**F727 402 700**	**F727 452 700**	**F727 403 700**	1
		-	**-**	**F727 503 700**	100

OPTICAL CHARACTERISTICS

	SingleMode UPC	SingleMode APC	MultiMode PC
Wave length	1300 - 1550 nm		850 - 1300 nm
Insertion loss Mean Standard deviation	 0.10 dB 0.05 dB	 0.15 dB 0.10 dB	 0.10 dB 0.05 dB
Return loss	> 50 dB	> 60 dB	> 20 dB

Insertion Loss against a reference patchcord: IEC 61300-3-4 Method B
Return loss: IEC 61300-3-6 (Maximum loss variation)
Note: the optical performances also depend on the fiber or cable construction.

MECHANICAL CHARACTERISTICS

	Cable diameter : 1.8 – 2 mm
Cable retention	68 N
Mechanical endurance	500 matings
Vibration (EN 2591-403)	27.7 grms
Mechanical shocks (EN2591-402)	50 g, 11 ms

ENVIRONMENTAL CHARACTERISTICS

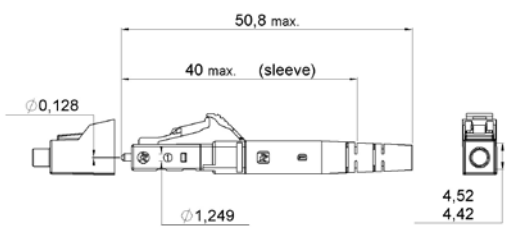
Storage & operating temperature Thermal shocks (EN 2591-305)	-55°C/+125°C

Note: These are minimum performances. If requested, Radiall can perform additional tests to show the performance of the aerospace grade LC beyond the values indicated in the tables.

MATERIALS

Moulded plastic parts	V0 (UL 94)
Optical ferrule (connector)	Zirconia
Alignment sleeve (adapter)	Zirconia

LC CONNECTORS

Cable diameter	Figure	SingleMode PC	MultiMode PC	Packaging
1.8 - 2 mm Loose structure*		**F727 002 500Y**	**F727 003 500Y**	1
1.8 - 2 mm Tight structure*		**F727 002 520Y**	**F727 003 520Y**	1

*See cable structure definition in the glossary or in ARINC 802 document.

For other cable diameters and APC configurations, please consult the Radiall sales team.

ADAPTERS

SIMPLEX ADAPTERS

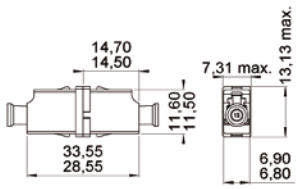


Fig. 1

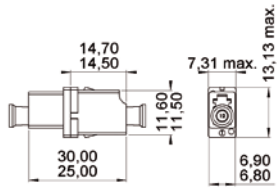


Fig. 2

Figure	SingleMode PC Blue	SingleMode APC Green	MultiMode PC Beige	MultiMode PC Aqua	Adapter type	Alignment sleeve	Packaging
Fig 1	F727 710 000	F727 710 100	F727 710 700	F727 710 710	LC cut-out Snap-in mounting	Zirconia	100
Fig 2	F727 711 000	F727 711 100	F727 711 700	F727 711 710	LC and low profile cut-out Snap-in mounting		

DUPLEX ADAPTERS

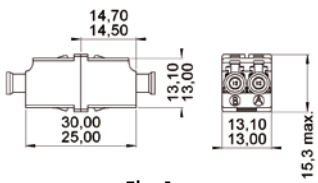


Fig. 1

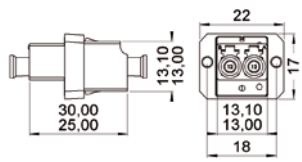


Fig. 2

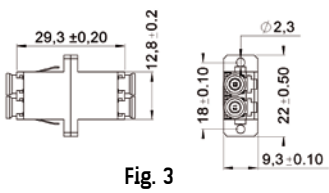


Fig. 3

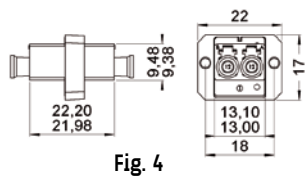
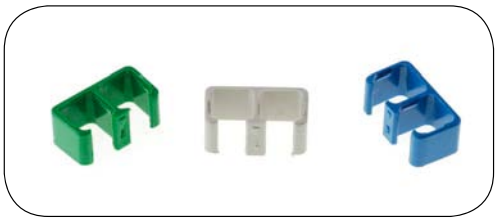
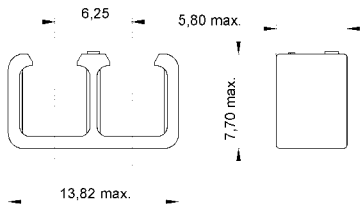


Fig. 4

Figure	SingleMode PC Blue	SingleMode APC Green	MultiMode PC Beige	MultiMode PC Aqua	Adapter type	Alignment sleeve	Packaging
Fig 1	F727 750 000	F727 750 100	F727 750 700	-	RJ-45 cut-out Snap-in mounting	Zirconia	100
	-	-	F727 750 800	-		PH/BR	100
Fig 2	F727 751 000	F727 751 100	F727 751 700	-	RJ-45 and low profile cut-out	Zirconia	100
Fig 3	F727 752 000	F727 752 100	-	F727 752 710	SC cut-out with panel clip	Zirconia	100
	-	-	F727 752 800	F727 752 810		PH/BR	100
Fig 4	F727 754 000	F727 754 100	F727 754 700	F727 754 710	SC RJ-45 cut-out with panel clip	Zirconia	100

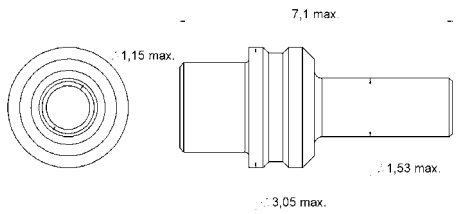
DUPLEX REMOVABLE CLIPS





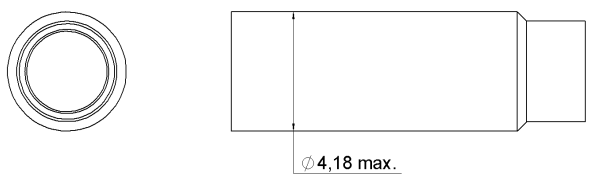
Color	Part number	Packaging
Black	**F718 197 200**	100
Blue (Singlemode PC)	**F718 197 201**	
Green (Singlemode APC)	**F718 197 205**	
Beige (MultiMode)	**F718 197 206**	

INNER SLEEVES



Cable dia.	Part number	Packaging
2 & 3 mm	**F718 158 200**	100

CRIMPING RINGS



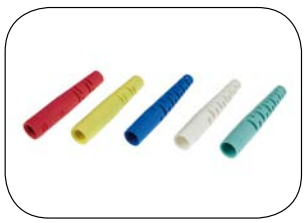
Cable dia.	Part number	Packaging
2 mm	**F718 160 200**	100
3 mm	**F718 170 200**	100

CONNECTOR CAPS

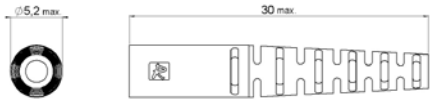
Description	Part number	Packaging
Clipped Plastic dust cap	**F718 183 204**	100

ACCESSORIES

SUPER FLEXIBLE BOOTS



The super flexible boots are especially recommended where space is limited and a small bending radius is required (min radius R= 20 mm). The use of these boots prevents any damage of the fiber even with a low bend radius. These boots are available in many colors.

Figure	Color	Flexible boots	Cable dia.	Packaging
	Black	F718 207 200	2 mm	100
	Blue	F718 207 201		
	Yellow	F718 207 202		
	Red	F718 207 203		
	White	F718 207 204		
	Green	F718 207 205		
	Aqua	F718 207 209		

STRAIGHT BOOTS

Boots are available in different colors and different dimensions depending on the requirements.

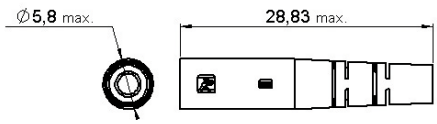


Fig. 1

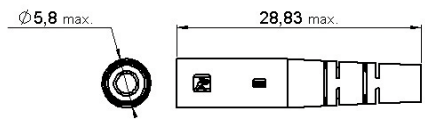


Fig. 2

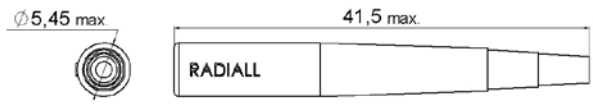
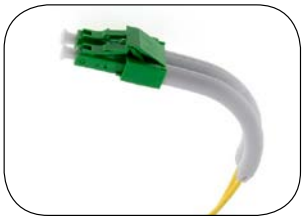


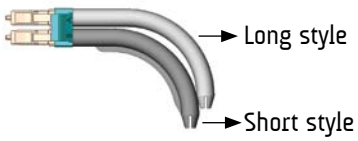
Fig. 3

Color	Cable diameter				Packaging
	0.9 mm Fig 1	2 mm Fig 2	3 mm Fig 2	Universal boot for 2/3 mm Fig 3	
Black	F718 166 200	F718 162 200	F718 193 200	F718 169 200	100
Blue	F718 166 201	F718 162 201	F718 193 201	F718 169 201	
Yellow	F718 166 202	F718 162 202	-	F718 169 202	
Red	F718 166 203	F718 162 203	F718 193 203	F718 169 203	
White	F718 166 204	F718 162 204	F718 193 204	F718 169 204	
Green	F718 166 205	F718 162 205	F718 193 205	F718 169 205	
Beige	F718 166 206	F718 162 206	F718 193 206	F718 169 206	
Aqua	F718 166 209	F718 162 209	F718 193 209	-	

ANGLED BOOTS



Angled boots are especially designed to adapt to environments where access is limited.
There are short and long boots available which can be mounted in a stackable position when operating in dense circuitry.
They can be combined to be used in duplex applications.



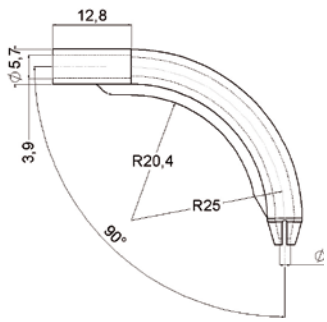


Fig. 1

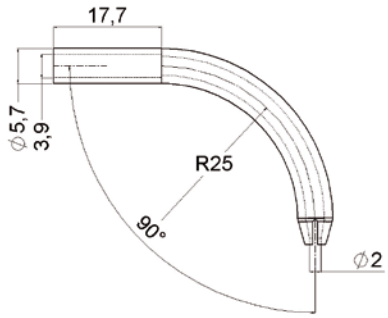
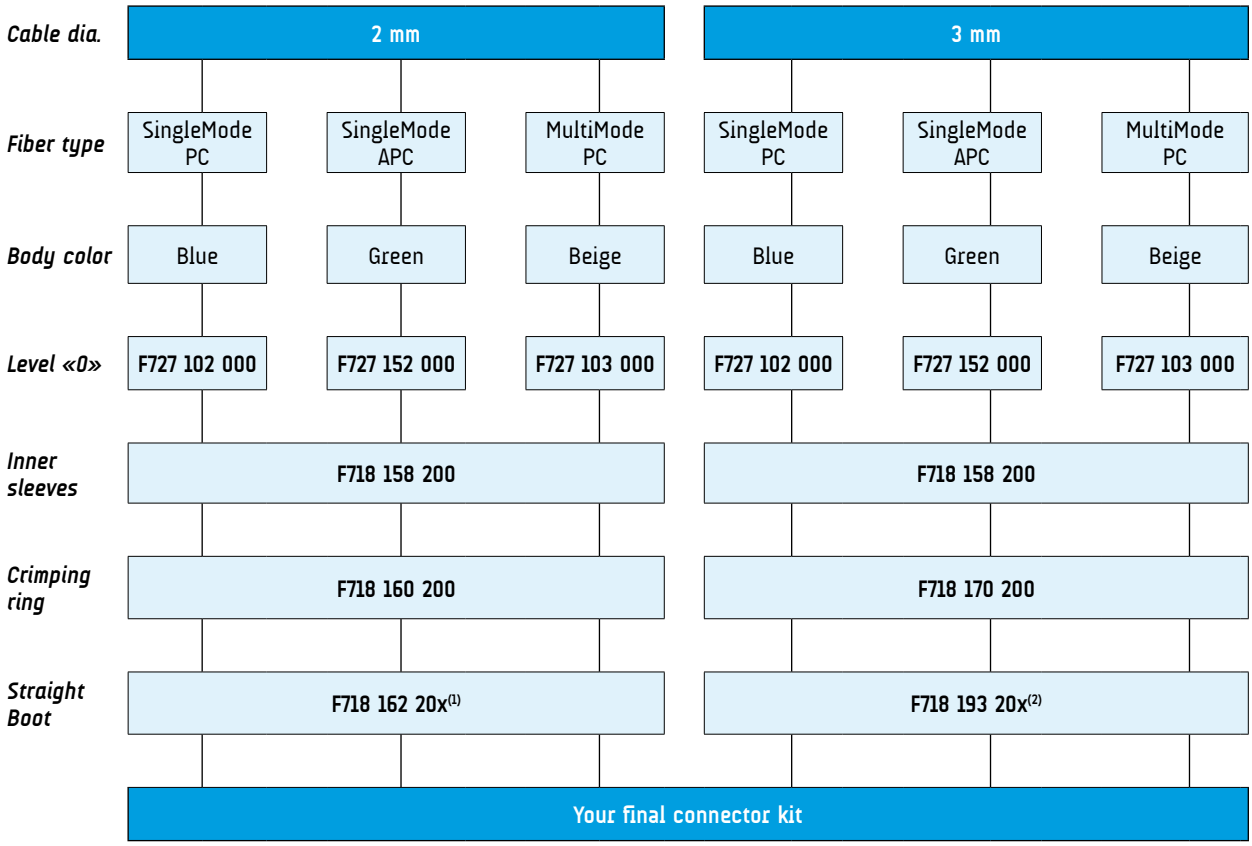


Fig. 2

Cable dia.	Figure	Part number	Description	Packaging
2 mm	Fig 1	**F718 185 200**	90° short style, grey color	100
	Fig 2	**F718 186 200**	90° long style, grey color	100

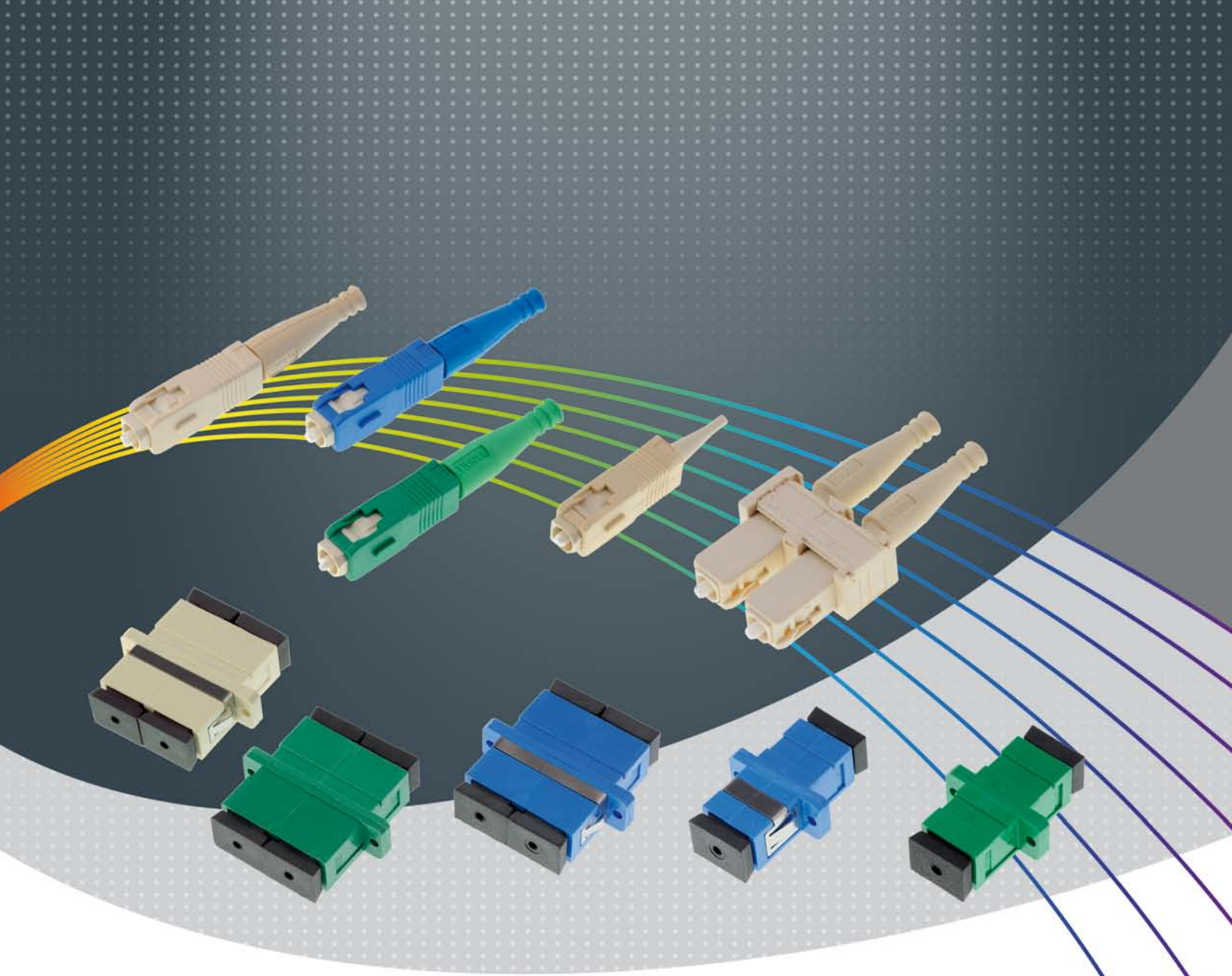
LC KIT CONFIGURATOR

You can refer to this table and complete your connector by combining different accessories with level “0”.



Replace x by the following digit for your color reference:
(1) : x = **0**: black; **1**: blue; **2**: yellow; **3**: red; **4**: white; **5**: green; **6**: beige; **9**: aqua
(2) : x = **0**: black; **1**: blue; **3**: red; **4**: white; **5**: green; **6**: beige; **9**: aqua

Notes:
Refer to previous pages for angled or super flexible boot selection.
Level “0” is available for cables 0.9 mm on demand. Please consult the Radiall salesTeam.



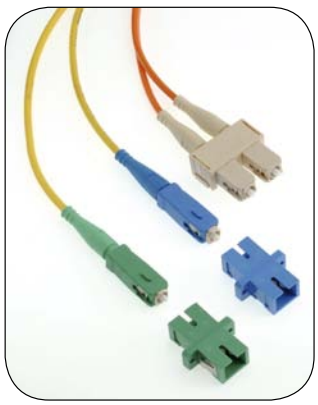
SC Series

F728

RADIALL
The next conneXion

CONTENTS

INTRODUCTION



The SC connector is a fiber optic connector with a push-pull latching mechanism which provides quick insertion and removal, while ensuring a robust connection, thanks to its "pull-proof" concept.
The SC connector is frequently used in datacom or telecom applications, especially for FTTH applications.
The SC connector range is available in PC and APC polishing. A duplex configuration is also available by using a fully removable duplex brace. The identification of the optical channel (A or B) can be easily changed by reversing the clip cover.
The RADIALL SC connector has something more than the competitors: it can be tuned to 1 of 6 positions to optimise the insertion loss for random connections (the tuning technique consists of rotating the optical ferrule to reduce the offset between fiber cores, IEC 61300-2-41)

BENEFITS & FEATURES

- **Easy mounting and installation**
  - Radiall has a proprietary secure bonding to protect the floating mechanism during the resin injection process
  - APC 8° pre-angled version is available to accelerate installation on the field
  - Latched push-pull system for quick insertion and removal
  - Color coding
- **High performance**
  - High precision alignment with proven 2.5 mm zirconia ferrule
  - Tested according to GR-326-CORE Telcordia and IEC 60874 specifications
  - One-piece tuneable connector® to optimise fiber's cores alignment when connecting (6 positions)
- **Secure Connexion**
  - Pull-proof design
  - Radiall has improved the crimping reliability thanks to a mini metallic tube protecting the fiber while reducing stress and ensuring excellent cable retention
  - Different protection boots available with exclusive shapes to tighten the cable and maintain optical performances even when the cable is bent or pulled
- **Flexible**
  - Available for MultiMode, single mode, PC, UPC and APC terminations
  - Can be assembled in duplex configuration with a removable clip

APPLICATIONS

- **Telecommunication networks (FTTA, Ethernet, Sonet/ATM, fiber channel, FTTH)**
- **Broadband subscriber networks**
- **CATV**
- **Fiber management systems**
- **Active device termination**
- **Datacom LAN**

OPTICAL CHARACTERISTICS

	SingleMode PC	SingleMode PC «tuned»	SingleMode APC	SingleMode APC «tuned»	MultiMode PC
Wave length	1310-1550 nm				850-1310 nm
Insertion Loss (against a reference patchcord) Mean Standard deviation	< 0.20 dB 0.14 dB	< 0.20 dB 0.14 dB	< 0.20 dB 0.15 dB	< 0.20 dB 0.15 dB	< 0.20 dB 0.08 dB
Insertion Loss (Random) Peak	< 0.8 dB, 97%	< 0.6 dB, 99%	< 0.8 dB, 97%	< 0.6 dB, 99%	-
Average	0.25 dB	0.13 dB	0.25 dB	0.15 dB	-
Return Loss	PC > 30 dB UPC > 50 dB		APC > 60 dB		PC > 20 dB

Insertion Loss Against a reference patchcord: IEC 61300-3-4 Method B
Insertion Loss Random: IEC 61300-3-34
Return Loss: IEC 61300-3-6

Note: The optical performances also depend on the fiber and/or cable construction.

MECHANICAL CHARACTERISTICS

	Cable diameter 0.9 mm	Cable diameter 2 & 3 mm
Cable retention	7N	100N
Mechanical endurance	500 matings	

ENVIRONMENTAL CHARACTERISTICS

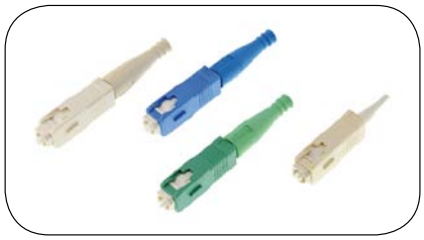
Operating temperature	-40°C / + 85°C
Storage temperature	-40°C / +85°C

INTERNATIONAL STANDARD DOCUMENTS COMPLIANCE

- GR-326-CORE Telcordia specification
- IEC 61754-4 Fiber optic connector interfaces (SC connector family)
- IEC 61300 Fiber optic interconnecting devices and passive components - Basic test and measurement procedures

SC CONNECTORS PRODUCT RANGE

SIMPLEX SC CONNECTORS



The simplex connectors are delivered with straight boots, dust caps and crimping accessories, except for the level "0" categories which enable users to configure their connectors according to the application.

Polishing PC

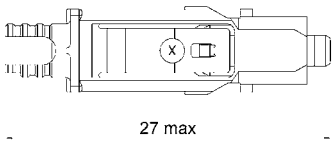


Fig. 1

Polishing APC

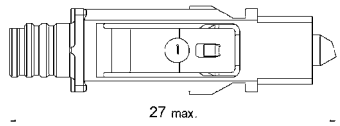


Fig. 2

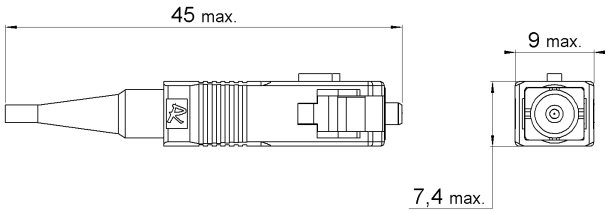


Fig. 3

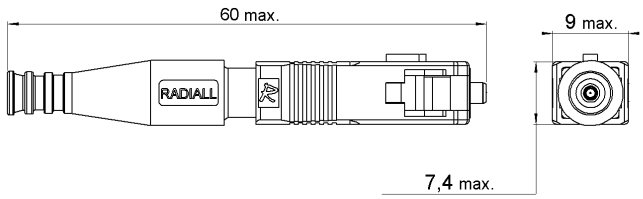


Fig. 4

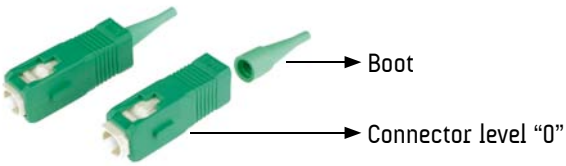
Cable diameter	Figure	SingleMode PC 126µm - Blue	SingleMode APC 126µm - Green	MultiMode PC 126µm - Beige	MultiMode PC 128µm - Aqua	Packaging
Level «0» [1]	Fig 1 & Fig 2	**F728 102 000**	**F728 112 000**	**F728 103 000**	-	100
0.9 mm	Fig 3	**F728 002 100**	**F728 012 100**	**F728 003 100**	-	1
		F728 102 100	**F728 112 100**	**F728 103 100**	**F728 103 101**	100
2 mm	Fig 4	**F728 002 500**	**F728 012 500**	**F728 003 500**	-	1
		F728 102 500	**F728 112 500**	**F728 103 500**	**F728 103 501**	100
3 mm		**F728 002 700**	**F728 012 700**	**F728 003 700**	-	1
		F728 102 700	**F728 112 700**	**F728 103 700**	**F728 103 702**	100

[1] The level "0" is supplied without boots or crimp sleeves. To complete your connector assembly kit, please refer to the "accessories" section.

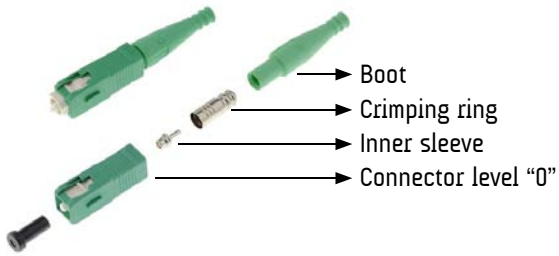
For other cable diameters, please consult the Radiall sales team.

Flexible configuration of simplex connector using level 0 part numbers

For 0.9 mm cable diameter



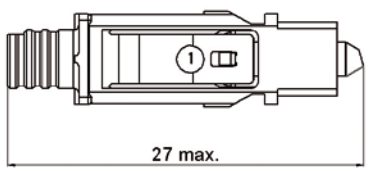
For 2 or 3 mm cable diameter



To get more information on how to find the corresponding part numbers and connector kit combination, please refer to the SC kit configurator section.

APC 8° PRE-ANGLED SIMPLEX CONNECTORS

The APC version of the SC connector is also proposed in a pre-angled end face version for a quick polishing in the field and ultra-low back reflexion.

Cable diameter	Figure	SingleMode APC Pre-angled 126µm - Green	Packaging
0.9 mm		**F728 132 100**	100
3 mm		**F728 132 700**	100

DUPLEX SC CONNECTORS

Thanks to Radiall's SC removable duplex clip, a simplex connector can be changed at any time to a duplex connector. The clip is fitted after cabling.
Select 2 Simplex SC connectors and a duplex removable clip to create your duplex SC connector.
The identification of the optical channel (A or B) can be easily changed by reversing the clip cover.

To select a clip, please refer to the "accessories" section.

ADAPTERS

The SC adapters are available for snap-in or flange screw-in mounting.
Color coding remains the same as the connector coding:

- SingleMode PC: *Blue*
- SingleMode APC: *Green*
- MultiMode PC: *Beige*
- MultiMode Pc with OM3 fiber: *Aqua*

SIMPLEX ADAPTERS

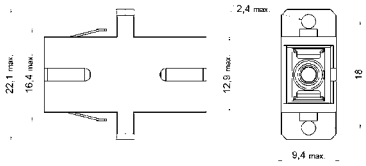


Fig. 1

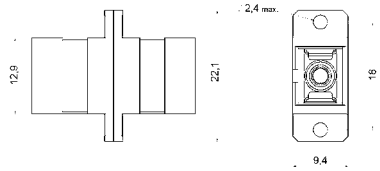
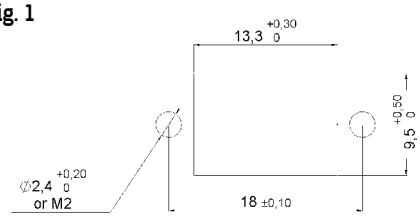


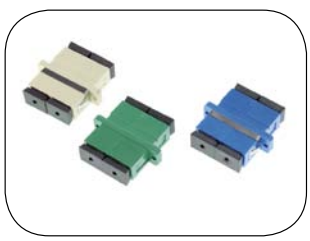
Fig. 2



Panel piercing

Figure	PC SingleMode *Blue*	APC SingleMode *Green*	MultiMode *Beige*	MultiMode *Aqua*	Alignment sleeve	Adapter type	Packaging
Fig 1	F728 703 000	F728 703 100	F728 703 700	-	Zirconia ceramic	Snap in	1
	F728 713 000	F728 713 100	F728 713 700	F728 713 701			100
Fig 2	F728 700 000	F728 700 100	F728 700 700	-	Zirconia ceramic	Screw in	1
	F728 710 000	F728 710 100	F728 710 700	-			100

DUPLEX ADAPTERS



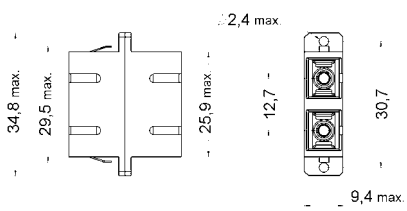


Fig. 1

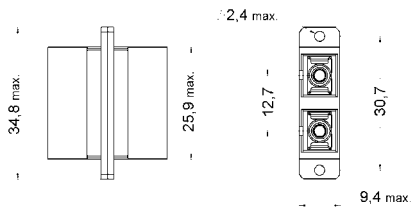
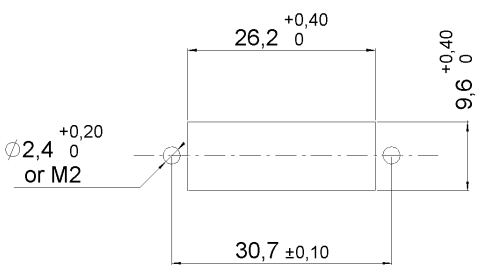


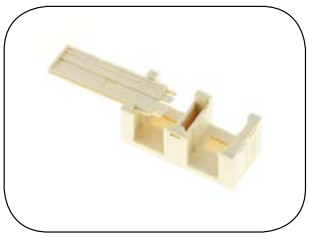
Fig. 2

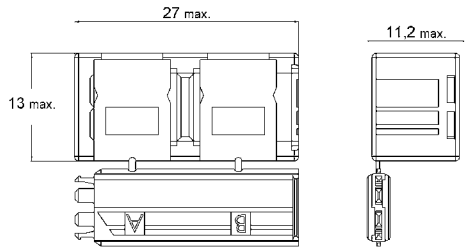


Panel piercing

Figure	PC SingleMode *Blue*	APC SingleMode *Green*	PC MultiMode *Beige*	PC MultiMode *Aqua*	Alignment sleeve	Adapter type	Packaging
Fig 1	F728 743 000	F728 743 100	F728 743 700	-	Zirconia ceramic	Snap in	1
	F728 753 000	F728 753 100	F728 753 700	F728 753 701			100
Fig 2	-	F728 750 100	F728 750 700	-	Zirconia ceramic	Screw in	100

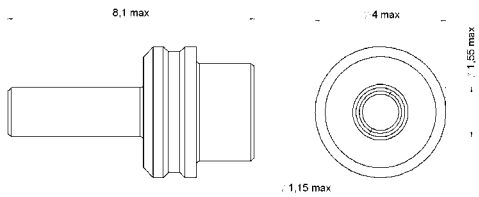
DUPLEX REMOVABLE CLIPS





Fiber type	Color	Part number	Packaging
MultiMode	Beige	**F718 100 000**	100
Single mode PC	Blue	**F718 101 000**	
Single mode APC	Green	**F718 102 000**	

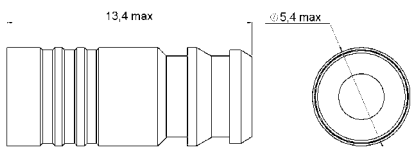
INNER SLEEVES



Cable dia.	Part number	Packaging
1.6 mm to 3 mm	**F718 106 200**(1)	100

(1) This reference applies to SC and FC connectors

CRIMPING RINGS

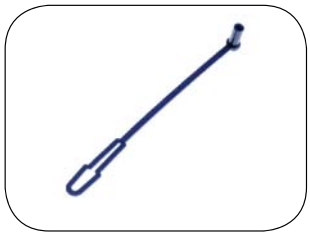


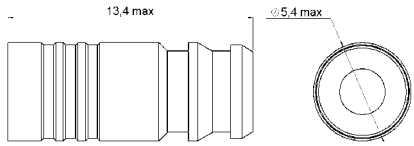
Cable dia.	Part number	Packaging
2 mm	**F718 109 200**(1)	100
2.4 mm	**F718 108 200**(1)	
2.7/3 mm	**F718 107 200**(1)	

(1) These references apply to SC and FC connectors

ACCESSORIES

CONNECTOR CAPS





Series	Part number	Description	Packaging
For all 2.5 mm optical ferrule	**F718 111 220**[1]	Universal, plastic dust cap	20

(1) This reference applies to SC, ST and FC connectors

BOOTS

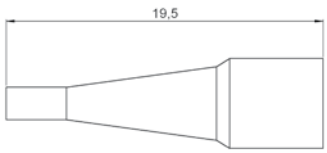


Fig. 1

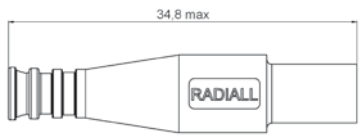
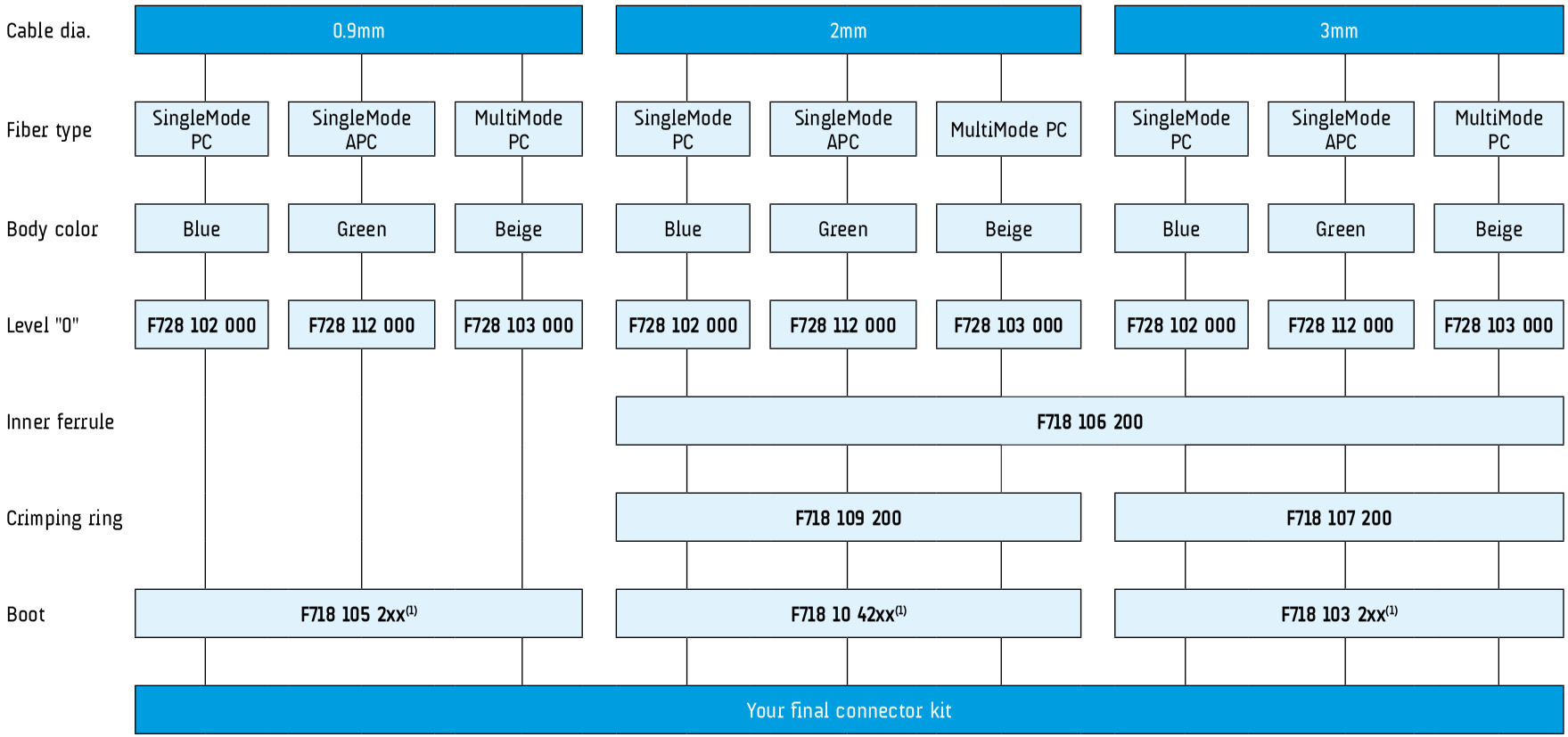


Fig. 2

Color	Cable diameter			Packaging
	0.9 [1] mm Fig 1	2 to 2.4 [2] mm Fig 2	2.7 to 3 [2] mm Fig 2	
Black	**F718 105 200**	**F718 104 200**	**F718 103 200**	100
Blue	**F718 105 201**	**F718 104 201**	**F718 103 201**	
Yellow	**F718 105 202**	**F718 104 202**	**F718 103 202**	
Red	**F718 105 203**	**F718 104 203**	**F718 103 203**	
Green	**F718 105 205**	**F718 104 205**	**F718 103 205**	
Beige	**F718 105 206**	**F718 104 206**	**F718 103 206**	
Aqua	**F718 105 210**	**F718 104 210**	**F718 103 210**	

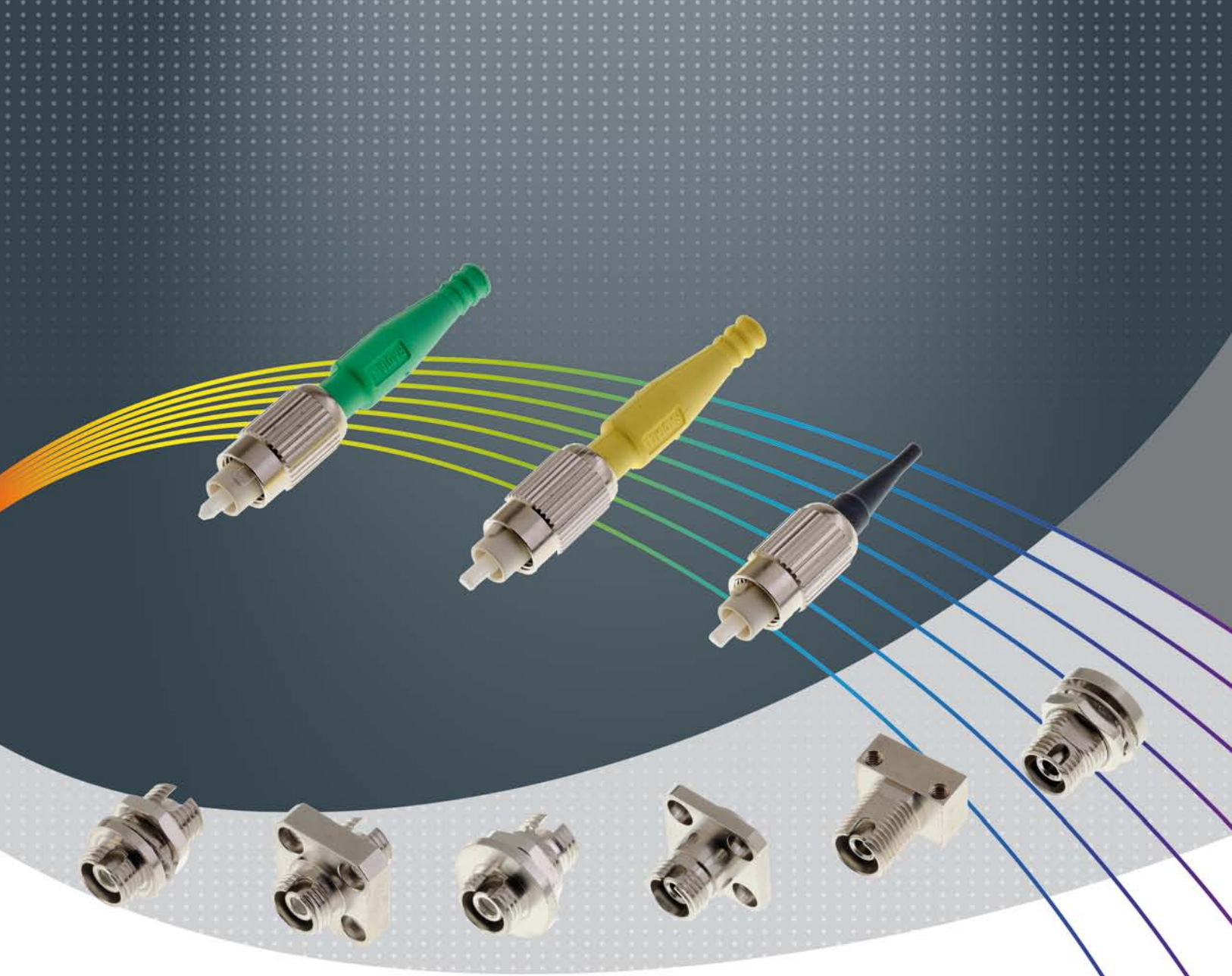
(1) These references apply to SC and FC connectors
(2) These references apply to SC, FC and ST connectors

You can refer to this table and complete your connector by combining different accessories with level "0".



(1) Replace x by the following digit for your color reference: **00:** black; **01:** blue; **02:** yellow; **03:** red; **05:** green; **06:** beige; **10:** aqua

NOTES



FC Series

F729

RADIALL
The next conneXion

Pages

INTRODUCTION

The FC connector is a fiber optic connector with a screw thread locking mechanism to withstand high-vibration environments
Radiall's FC connector is composed of a plated nickel housing and a 2.5 mm ceramic ferrule and is compliant with the CEI 61754-13 standard.
Radiall's FC connector offers a high precision of positioning which maintains very high optical performances.
The RADIALL FC connector has something more than the competitors: it can be tuned to 1 of 6 positions to optimise the insertion loss (the tuning technique consists of rotating the optical ferrule to reduce the off-set between fiber cores, IEC 61300-2-41).

BENEFITS & FEATURES

- **Easy mounting and installation**
  - Radiall has a proprietary secure bonding to protect the floating mechanism during the resin injection process
  - Type-N key
  - Color Coding
- **High performance**
  - High precision alignment with proven 2.5 mm zirconia ferrule
  - Tested according to GR-326-CORE Telcordia and IEC 60874 specifications
  - One-piece tuneable connector® to optimise the fibers' cores alignment when connecting (6 positions)
- **Secure connexion**
  - Pull-proof design with screw thread coupling
  - Radiall has improved the crimping reliability thanks to a mini metallic tube protecting the fiber while reducing stress and ensuring excellent cable retention
- **Flexible**
  - Available for MultiMode, SingleMode, PC and APC terminations

APPLICATIONS

- **Instrumentation**
- **Telecom / Datacom**
- **Broadband subscriber networks**
- **Fiber management systems**
- **Active device termination**
- **Broadcast**

OPTICAL CHARACTERISTICS

	SingleMode PC	SingleMode PC «tuned»	SingleMode APC	SingleMode APC «tuned»	MultiMode PC
Wave length	1310-1550 nm				850-1310 nm
Insertion loss (against a reference patchcord) Mean	< 0.20 dB				
Standard deviation	0.14 dB	0.14 dB	0.15 dB	0.15 dB	0.08 dB
Insertion loss (Random) Peak	< 0.8 dB, 97%	< 0.6 dB, 99%	< 0.8 dB, 97%	< 0.6 dB, 99%	
Average	0.25 dB	0.13 dB	0.25 dB	0.15 dB	
Return loss	PC > 30 dB UPC > 50 dB		APC > 60 dB		PC > 20 dB

Insertion Loss Against a reference patchcord: IEC 61300-3-4 Method B
Insertion Loss Random: IEC 61300-3-34
Return loss: IEC 61300-3-6

Note: The optical performances also depend on the fiber and/or cable construction.

MECHANICAL CHARACTERISTICS

	Cable diameter 0.9 mm	Cable diameter 2 & 3 mm
Cable retention	7N	100N
Mechanical endurance	500 matings	

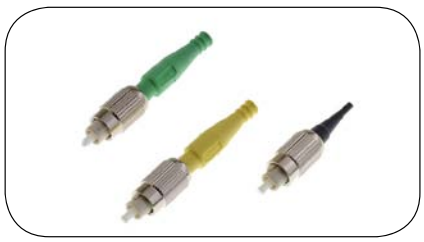
ENVIRONMENTAL CHARACTERISTICS

Operating temperature	-40°C / +70°C
Storage temperature	-40°C / +85°C

INTERNATIONAL STANDARD DOCUMENTS COMPLIANCE

- GR-326-CORE Telcordia specification
- IEC 61754-13 Fiber optic connector interfaces (FC connector family)
- IEC 61300 Fiber optic interconnecting devices and passive components - Basic test and measurement procedures

FC CONNECTORS



The FC connectors are delivered with straight boots, dust caps and crimping accessories, except for the “level 0”categories which enable users to configure their connectors according to the application.

Note: FC connector type “N” can only be inserted into type “N” adapters.

Polishing PC

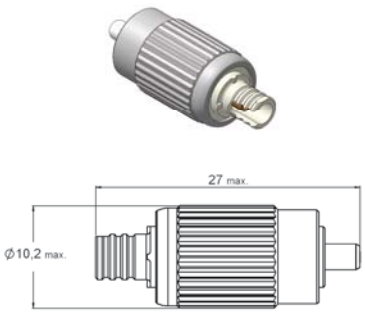


Fig. 1

Polishing APC

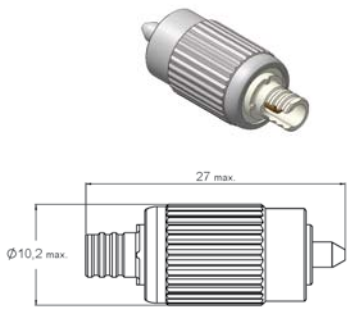


Fig. 2

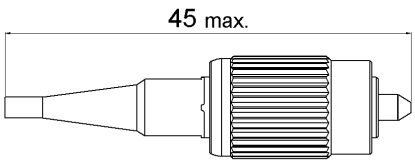


Fig. 3

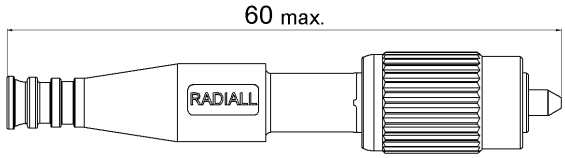


Fig. 4

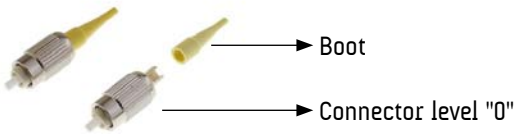
Cable diameter	Figure	SingleMode PC 126µm (yellow boot)	SingleMode APC 126µm (green boot)	MultiMode PC 128µm (black boot)	Packaging
Level «0» [1]	Fig 1 & Fig 2	**F729 102 000**	**F729 112 000**	**F729 103 000**	100
0.9 mm (buffer)	Fig 3	**F729 002 100**	**F729 012 100**	**F729 003 100**	1
		F729 102 100	**F729 112 100**	**F729 103 100**	100
2 mm	Fig 4	**F729 002 500**	**F729 012 500**	**F729 003 500**	1
		F729 102 500	**F729 112 500**	**F729 103 500**	100
3 mm		**F729 002 700**	**F729 012 700**	**F729 003 700**	1
		F729 102 700	**F729 112 700**	**F729 103 700**	100

[1] The level “0” is supplied without boots or crimp sleeves. To complete your connector assembly kit, please refer to the “accessories” section.

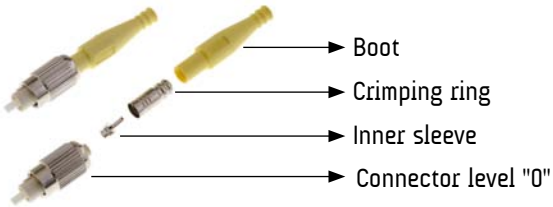
For other cable diameters, please consult the Radiall sales team.

Flexible configuration of simplex connector using level “0” part numbers:

For 0.9 mm cable diameter



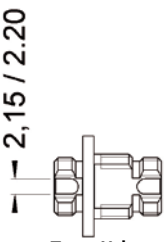
For 2 or 3 mm cable diameter



To get more information on how to find the corresponding part numbers and connector kit combination, please refer to the FC kit configurator section.

ADAPTERS

FC adapters with screw threaded coupling system are available in Type N key.
They are compatible with PC and APC polishing.



Type N key

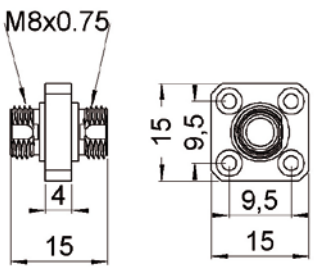


Fig. 1

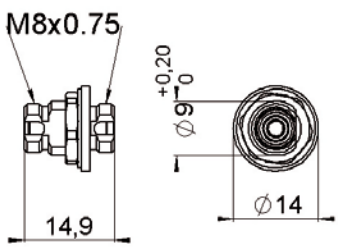


Fig. 2

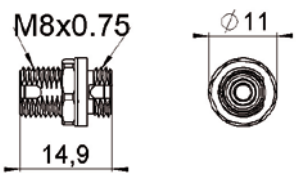


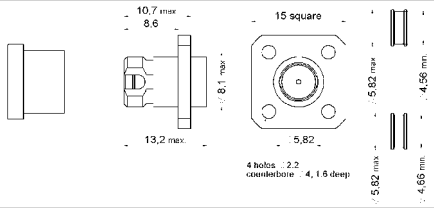
Fig. 3

Part number	Figure	Description	Alignment sleeve	Panel piercing	Packaging
F729 701 000	Fig. 1	Square flange	Zirconia ceramic	P01	1
F729 711 000					100
F729 708 000	Fig. 2	«D» hole standard 9 mm (supplied with lock washer and nut for panel mounting)		P02	1
F729 718 000					100
F729 702 000	Fig. 3	«D» hole compact 8 mm (supplied with lock washer and nut for panel mounting)		P03	1
F729 712 000					100

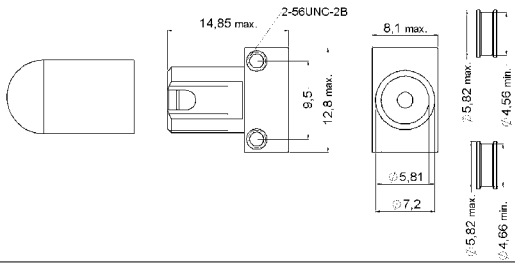
RECEPTACLES

Receptacles have a metal body and are available in square flange or screw thread coupling. They are supplied with 2 centering rings.

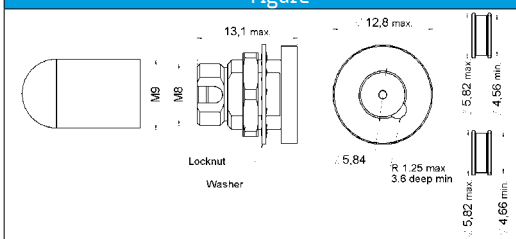
SQUARE FLANGE – PANEL MOUNTING

	Figure	Part number	Panel piercing
		F711 200 000	P04

PCB AND BULKHEAD MOUNTING

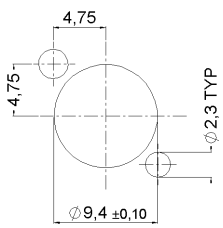
	Figure	Part number	Panel piercing
		F711 400 000	P05

PANEL MOUNTING

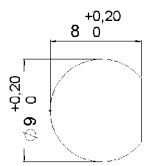
	Figure	Part number	Panel piercing
		F711 401 000	P06

PANEL PIERCING

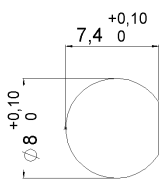
P01



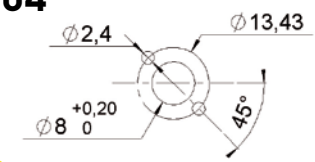
P02



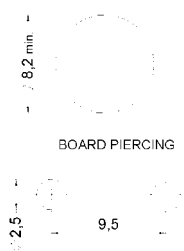
P03



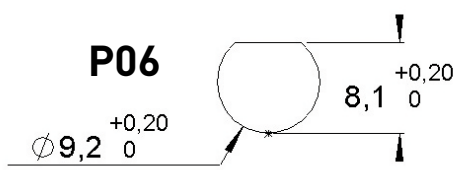
P04



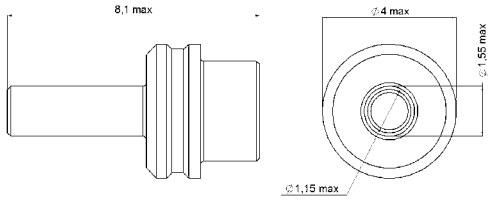
P05



P06



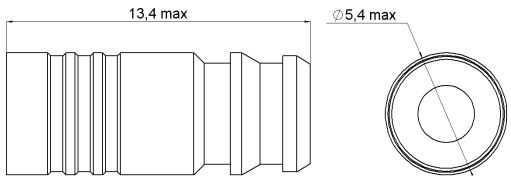
INNER SLEEVES



Cable dia.	Part number	Packaging
1.6 mm to 3 mm	**F718 106 200**(1)	100

(1) This reference applies to SC and FC connectors

CRIMPING RINGS



Cable dia.	Part number	Packaging
2 mm	**F718 109 200**(1)	100
2.4 mm	**F718 108 200**(1)	
2.7/3 mm	**F718 107 200**(1)	

(1) These references apply to SC and FC connectors

CONNECTOR CAPS

Pic 1

Pic 2

Pic 3

Description	Picture	Series	Part number	Packaging
Metal dust cap	Pic. 1	FC adapters	**F729 802 000**	1
Safety plastic cap	Pic. 2	FC and ST connectors	**F718 044 000**	20
Universal, plastic dust cap	Pic. 3	FC, SC and ST connectors and all connectors with 2.5 mm optical ferrule	**F718 111 220**	20

ACCESSORIES

BOOTS

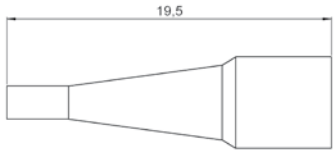


Fig. 1

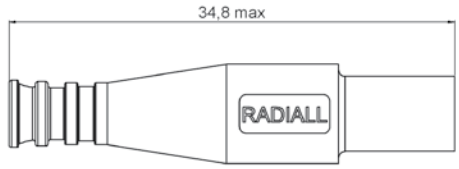


Fig. 2

Color	Cable diameter			Packaging
	0.9 mm [1] Fig. 1	2 to 2.4 mm [2] Fig. 2	2.7 to 3 mm [2] Fig. 2	
Black	**F718 105 200**	**F718 104 200**	**F718 103 200**	100
Blue	**F718 105 201**	**F718 104 201**	**F718 103 201**	
Yellow	**F718 105 202**	**F718 104 202**	**F718 103 202**	
Red	**F718 105 203**	**F718 104 203**	**F718 103 203**	
Green	**F718 105 205**	**F718 104 205**	**F718 103 205**	
Beige	**F718 105 206**	**F718 104 206**	**F718 103 206**	
Aqua	**F718 105 210**	**F718 104 210**	**F718 103 210**	

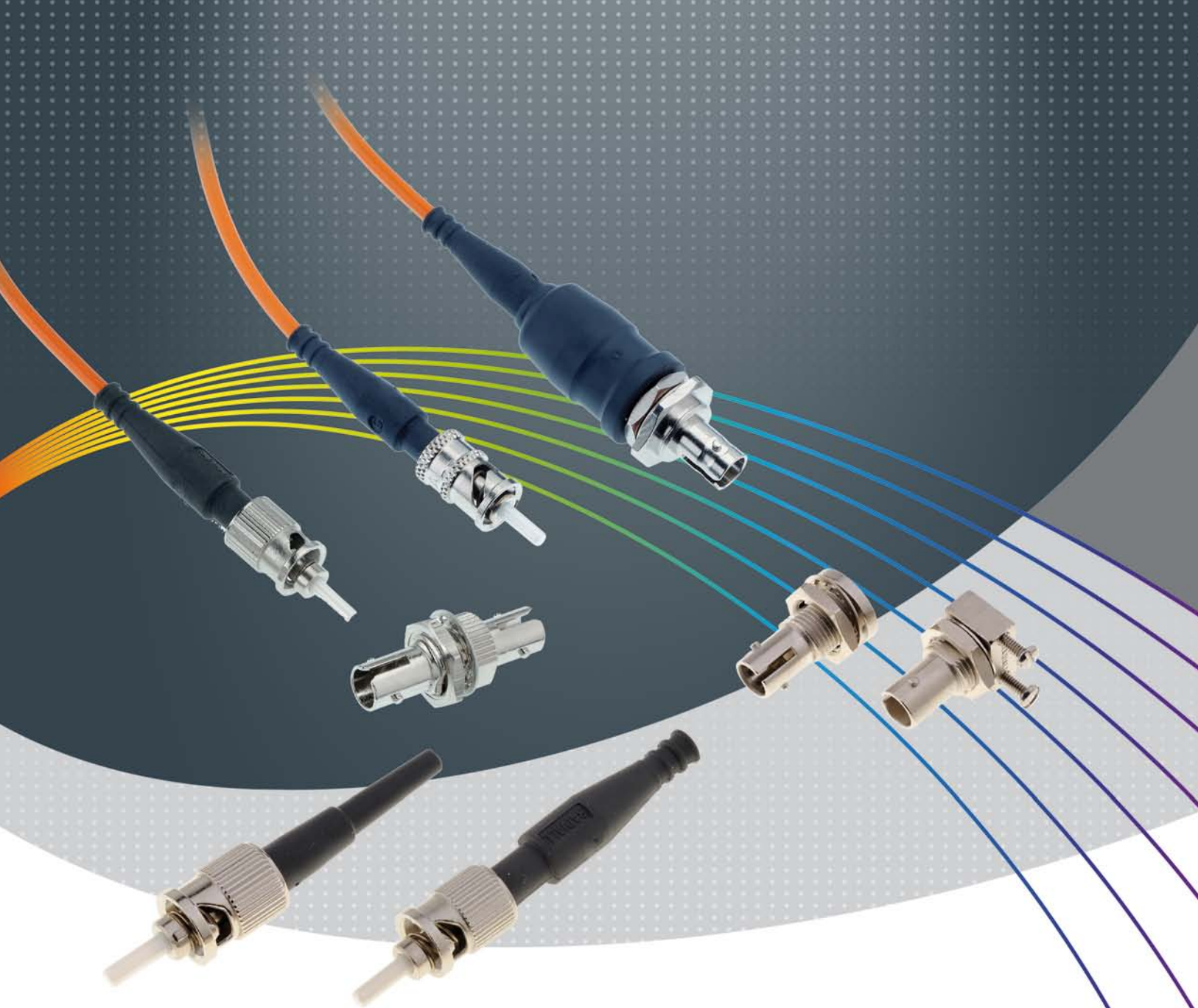
[1] These references apply to SC and FC connectors
[2] These references apply to SC, FC and ST connectors

FC KIT CONFIGURATOR

You can refer to this table and complete your connector by combining different accessories with level "0".

Cable dia.	0.9 mm			2 mm			3 mm		
Fiber type	SingleMode PC	SingleMode APC	MultiMode PC	SingleMode PC	SingleMode APC	MultiMode PC	SingleMode PC	SingleMode APC	MultiMode PC
Level «0»	**F729 102 000**	**F729 112 000**	**F729 103 000**	**F729 102 000**	**F729 112 000**	**F729 103 000**	**F729 102 000**	**F729 112 000**	**F729 103 000**
Inner ferrule				**F718 106 200**					
Crimping ring				**F718 109 200**			**F718 107 200**		
Boot	**F718 105 2xx**[1]			**F718 104 2xx**[1]			**F718 103 2xx**[1]		
Your final connector kit									

[1] Replace x by the following digit for your color reference:
00 black; **01**: blue; **02**: yellow; **03**: red; **05**: green; **06**: beige; **10**: aqua



ST Series

F709

RADIALL
The next conneXion

Pages

INTRODUCTION

The ST connector is a fiber optic connector using a bayonet locking system making the installation quick and easy. It is made of a nickel plated housing and 2.5 mm ceramic ferule.
The spring loaded mechanism provides a tight connexion with precise alignment between contact points.
High optical performances are maintained thanks to the ST's key which prevents rotation of the ceramic ferrule.
The ST series is produced according to the IEC 60874-10 standard and is available in MultiMode and SingleMode version.

BENEFITS & FEATURES

- **Easy and fast installation**
  - Bayonet locking system
  - Pre-radius (20mm) zirconia ceramic ferrule
- **Secure Connexion**
  - Standard or secure crimping (double ferrule)
  - Bayonet locking system
  - Available in a totally sealed version for use in harsh environment (IP64)
- **High performance**
  - Using Physical Contact technology
  - Tested according to GR-326-CORE Telcordia and IEC 60874 specifications
- **Flexible**
  - All cable diameters covered from 0.9 to 3 mm
  - Available for SingleMode fibers and different sizes of MultiMode fibers

APPLICATIONS

- **Telecommunication**
- **Data processing network**
- **Fiber management system**
- **Instrumentation**
- **Medical**

OPTICAL CHARACTERISTICS

	SingleMode PC	MultiMode PC
Wave length	1310-1550 nm	850 nm
Insertion loss (against a reference patchcord) Mean	< 0.25 dB	< 0.25 dB
Standard deviation	0.11 dB	0.11 dB
Return loss	PC > 30 dB UPC > 50 dB	PC > 20 dB

Insertion Loss Against a reference patchcord: IEC 61300-3-4 Method B
Return loss: IEC 61300-3-6
Note: The optical performances also depend on the fiber and/or cable construction.

MECHANICAL CHARACTERISTICS

	Cable diameter 0.9 mm	Cable diameter 2 & 3 mm
Cable retention	7N	100N
Jacket retention for secure crimping version	-	10N
Mechanical endurance	500 matings	

ENVIRONMENTAL CHARACTERISTICS

Operating temperature	-40°C / +70°C
Storage temperature	-40°C / +85°C

INTERNATIONAL STANDARD DOCUMENTS COMPLIANCE

- GR-326-CORE Telcordia specification
- IEC 61754-2 Fiber optic connector interfaces
- IEC 61300 Fiber optic interconnecting devices and passive components - Basic test and measurement procedures

ST STANDARD RANGE

The ST connectors are delivered with straight black boots, dust caps and crimping accessories, except for the level "0" categories which enable users to configure their connectors according to the application.

The series proposes a version with the secure crimping concept. This concept enables a simultaneous holding of the aramid strength members and the outer jacket of the fiber. The fiber is well protected against the crimping stress.

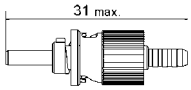


Fig. 1

Standard crimping

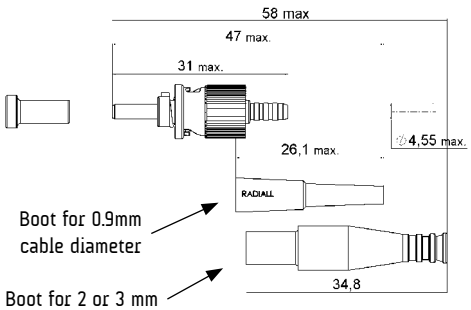


Fig. 2

Secure Crimping

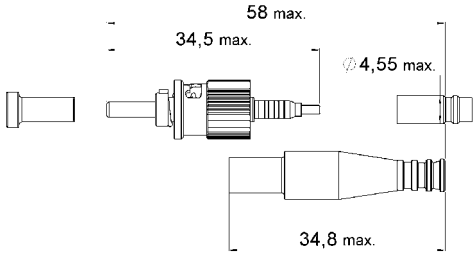


Fig. 3

Cable diameter	Figure	Standard crimping				Secure crimping		Packaging
		SingleMode PC 126µm	MultiMode PC 128µm	MultiMode PC 140µm	MultiMode PC 230µm	SingleMode PC 126µm	MultiMode PC 128µm	
Level «0» [1]	Fig 1	**F709 036 200**	**F709 025 200**	-	-	-	-	100
0.9 mm	Fig 2 and Fig 3	**F709 034 706**[2]	**F709 022 000**	**F709 090 000**[2]	-	-	-	1
		F709 034 200[2]	**F709 022 200**	-	-	-	-	100
2 mm		-	-	-	-	-	**F709 097 200**	100
3 mm		**F709 034 706**[2]	**F709 024 000**[2]	**F709 090 000**[2]	**F709 038 000**	-	-	1
		F709 034 200[2]	**F709 024 200**[2]	-	-	**F709 096 200**	**F709 098 200**	100

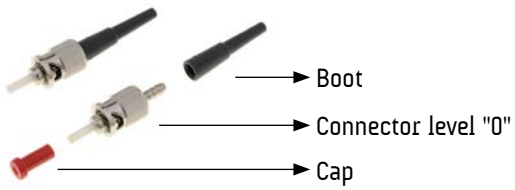
[1] The level "0" is supplied without boots or crimp sleeves. To complete your connector assembly kit, please refer to the "accessories" section.

[2] 2 Boots are delivered with this PN

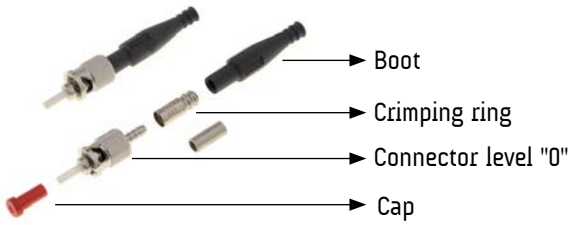
For other cable diameters, please consult the Radiall sales team.

Flexible configuration using level "0" part numbers:

For 0.9 mm cable diameter



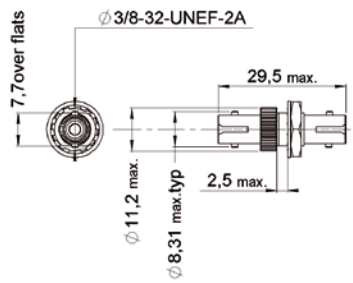
For 2 or 3 mm cable diameter



To get more information on how to find the corresponding part numbers and connector kit combination, please refer to the ST kit configurator section.

ADAPTERS

The ST adapter features a bayonet coupling system to secure the connexion with the ST connectors. The alignment sleeve is available in zirconia ceramic or phosphore bronze and works for single or MultiMode fibers.



Part number	Alignment sleeve	Panel piercing	Packaging
F709 730 000	Zirconia ceramic		1
F709 730 200			100
F709 722 000	Phosphor bronze		1
F709 722 200			100

RECEPTACLES

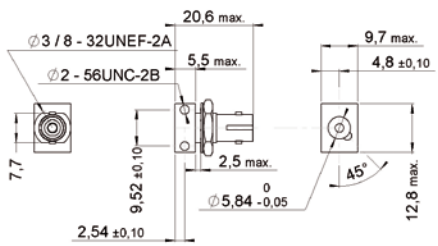


Fig. 1

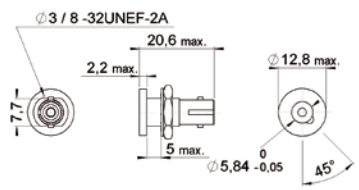
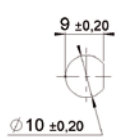


Fig. 2

Part number	Figure	Description	Note	Panel piercing	Packaging
F709 400 000	Fig 1	Bulkhead or PCB mounting	Metal body, supplied with 2 centering rings		1
F709 401 000	Fig 2	Bulkhead mounting			1

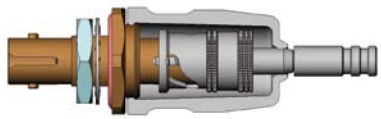
ST SEALED CONNEXION FOR OUTSIDE APPLICATION

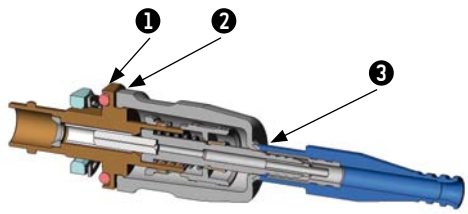
Radiall also offers a specific configuration of the ST connector that keeps the connexion robust when working in harsh environment. By combining the sealed connector and adapter, you'll get a full sealed IP64 connexion for operation in all weather condition (rain, snow... except immersion).

BENEFITS & FEATURES

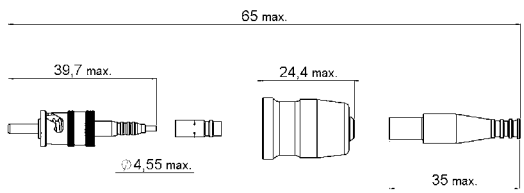
- **Effective protection in hash environment**
- **Bayonet locking system**
- **Pre-radius MultiMode zirconia ceramic ferrule**
- **Secure crimping**
- **Outside boot providing the sealing of the complete connexion**

By adding an internal gasket on the bulkhead adapter and an outside boot, the sealing is guaranteed on 3 points of the connexion:
1. Panel / adapter
2. Connector / adapter
3. Connector / cable



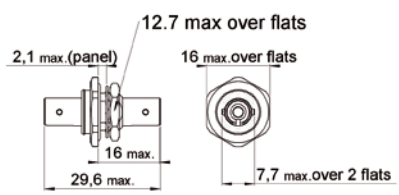


ST SEALED CONNECTORS

	Figure	MultiMode PC 128µm	Cable dia.	Packaging
		**F709 089 000**	2.7 to 3 mm	1

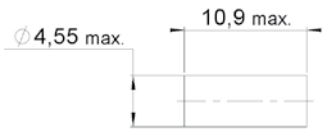
ST SEALED ADAPTER

The sealed adapter has been designed to be used with the sealed connector F709 089 000 to guaranty a totally sealed connexion.

	Figure	Part number	Alignment sleeve	Packaging
		**F709 724 000**	Phosphor bronze	1

Note: the sealed connector and adapter cannot be combined with non-sealed version.

CRIMPING RINGS

	Figure	Part number	Cable dia.	Packaging
		**F718 069 000**	2 mm to 3 mm	100

CONNECTOR CAPS

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Part number	Figure	Series	Description	Packaging
F709 760 000	Fig 1	ST adapters and receptacles	Metal protective cap	1
F718 044 000	Fig 2	ST and FC connectors	Safety plastic cap	20
F709 750 000	Fig 3	ST connectors	Metal dust cap	20
F718 111 220	Fig 4	ST, SC and FC connectors and all connectors with 2.5 mm optical ferrule	Universal, plastic dust cap	20

BOOTS

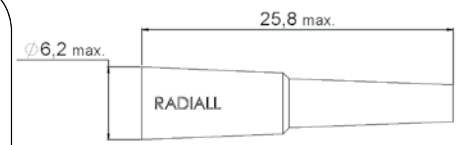


Fig. 1

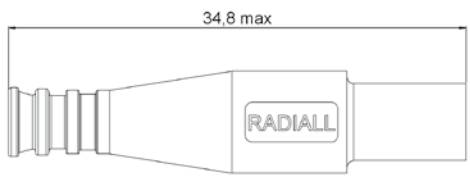


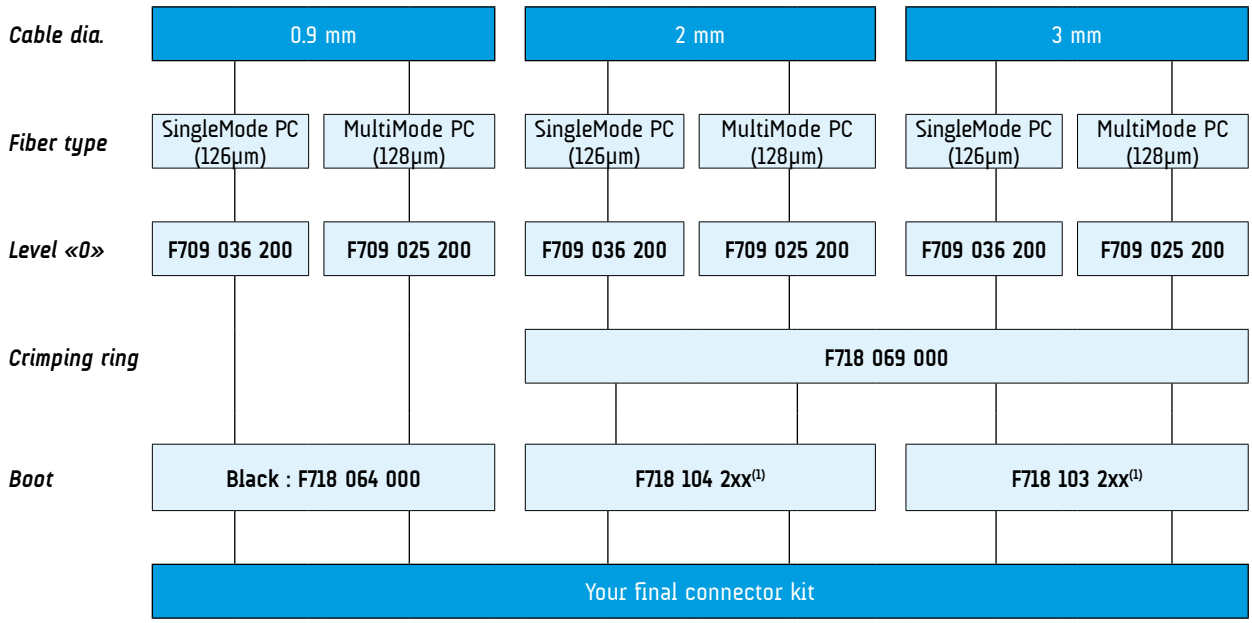
Fig. 2

Color	Cable diameter			Packaging
	0.9 mm Fig.1	2 to 2.4 [1] mm Fig.2	2.7 to 3 [1] mm Fig.2	
Black	**F718 064 000**	**F718 104 200**	**F718 103 200**	100
Blue	-	**F718 104 201**	**F718 103 201**	
Yellow	-	**F718 104 202**	**F718 103 202**	
Red	-	**F718 104 203**	**F718 103 203**	
Green	-	**F718 104 205**	**F718 103 205**	
Beige	-	**F718 104 206**	**F718 103 206**	
Aqua	-	**F718 104 210**	**F718 103 210**	

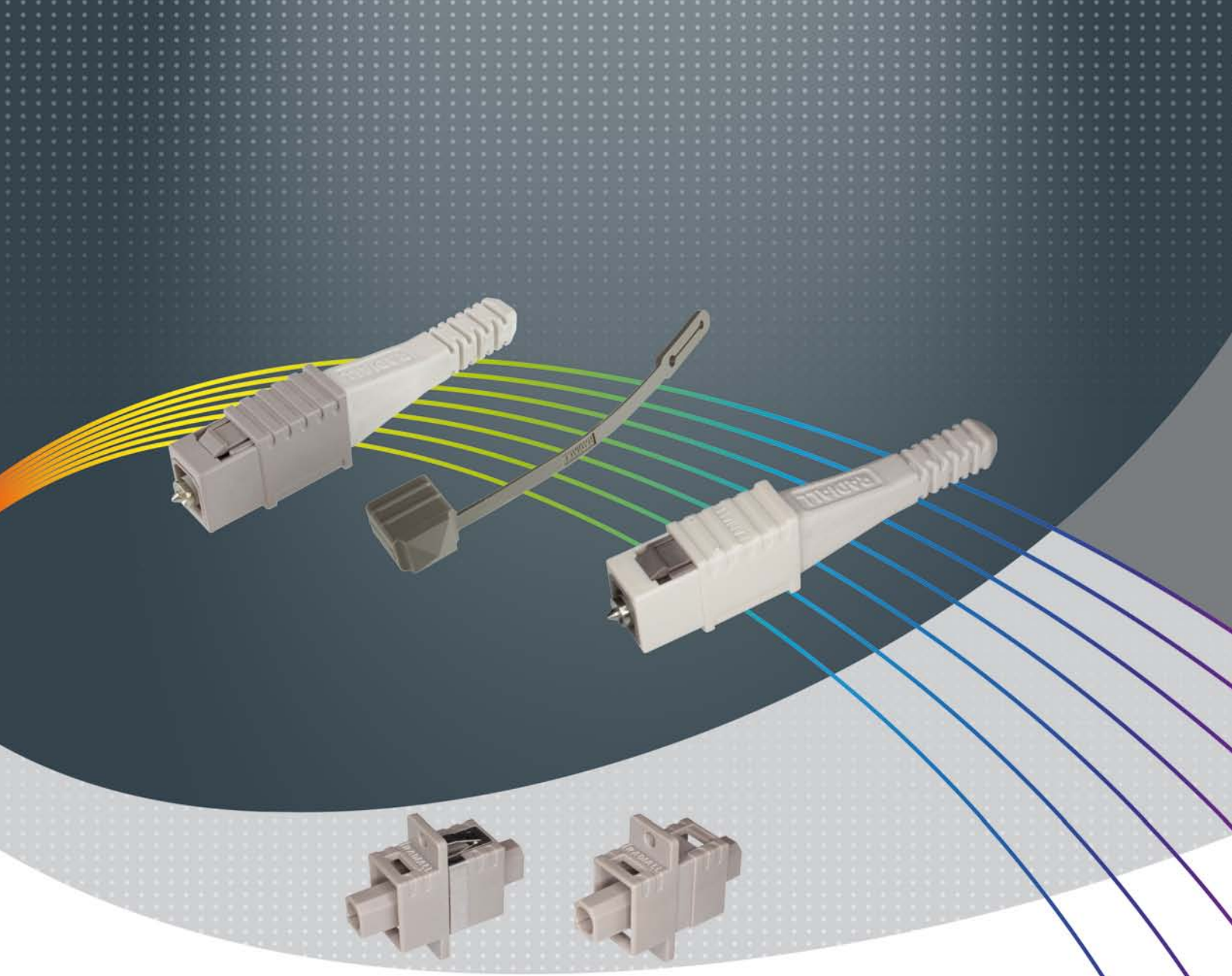
[1] These references apply to SC, FC and ST connectors

ST KIT CONFIGURATOR

You can refer to this table and complete your connector by combining different accessories with level “0”.



(1) Replace x by the following digit for your color reference: **00** black; **01**: blue; **02**: yellow; **03**: red; **05**: green; **06**: beige; **10**: aqua



EC Series

F715

RADIALL
The next conneXion

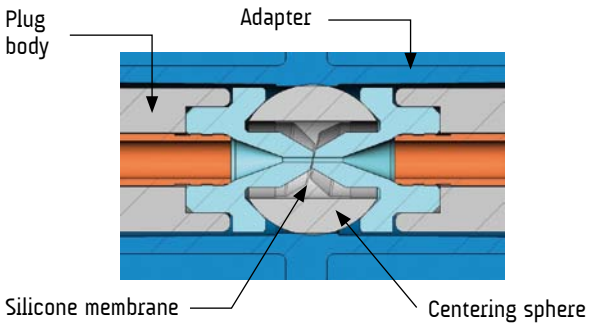
Pages

INTRODUCTION

Radiall's proprietary EC product range is a revolutionary solution providing very high performances and easy to use connectors.
Combining the advantages of angled, polished fibers and membrane usage (providing a non-physical contact), the EC connector has a very low reflection rate and is able to accommodate up to 1000 cycles.
Its ergonomic housing with the push-pull system facilitates the mounting even on very dense applications.
Its unique technology makes it ideal for very high speed and long distance connections.

TECHNOLOGY of the Cone/Sphere alignment for an efficient and simple connection:

Fibers are mechanically aligned and the surface contact are immerged in a silicone membrane when connected, ensuring no physical contact and very high number of cycles.



The conical shape of the top surface of the EC connector acts as a mechanical reference for the sphere situated inside the connection. Once clicked into the adapter, the plugs position themselves on the sphere and allow the two fibers to be aligned.

BENEFITS & FEATURES

- **Easy to use and to implement**
  - Click and Push-pull design: the EC connector is simply clicked into place to facilitate the mounting
  - The "push-pull system" makes it easy to remove even in difficult to access environments
  - The rectangular shape allows the connector to be placed side by side and provide higher density
  - No convex polishing is required to fasten the mounting
- **High performances**
  - The very low reflection rate is ensured by the optical faces and the membrane being inclined at 12°
  - The silicone membrane ensures optical continuity between fibers' surfaces, making the estimated losses identical at 1310 and 1550 nm
- **High mechanical endurance**
  - Thanks to the silicone membrane, placed inside the sphere, the fibers are not physically in contact. This advanced technology improves the mechanical endurance and allows the connector to work up to 1000 cycles
- **Safe and reliable**
  - A metal floating ferrule provides high robustness and maintains connectivity independently on the traction on the cable

APPLICATIONS

- **High speed, long distance transmission**
- **Subscriber networks, distribution**
- **Instrumentation**
- **Medical**

OPTICAL CHARACTERISTICS

	SingleMode		Multimode	
	Random	Against a reference patchcord	Random	Against a reference patchcord
Wave length	1300/1550 nm		850 nm	
Insertion loss Mean	0.4 dB	0.25 dB	0.3 dB	0.15 dB
Standard deviation	0.18 dB	0.10 dB	0.12 dB	0.09 dB
Return loss	> 60 dB		> 50 dB	

Insertion Loss Random: IEC 61300-3-34
Insertion Loss Against a reference patchcord: IEC 61300-3-4 Method B
Return loss: IEC 61300-3-6 (Maximum loss variation)

Note: The optical performances also depend on the fiber and/or cable construction.

MECHANICAL CHARACTERISTICS

	Cable diameter 0.9 mm	Cable diameter 2 & 3 mm
Cable retention	7N	100N
Mechanical endurance	1000 matings	

ENVIRONMENTAL CHARACTERISTICS

Operating temperature	- 25°C / +70°C
Storage temperature	-40°C / +85°C
Salt spray	96 hours

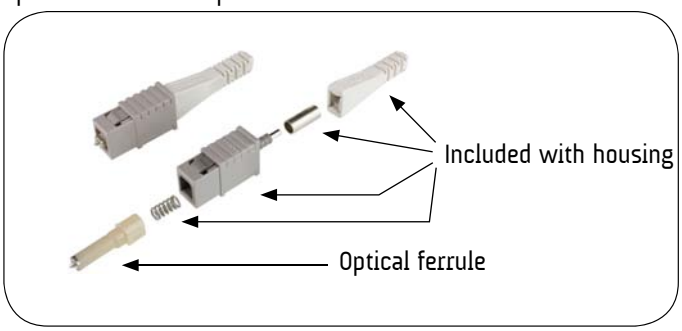
INTERNATIONAL STANDARD DOCUMENTS COMPLIANCE

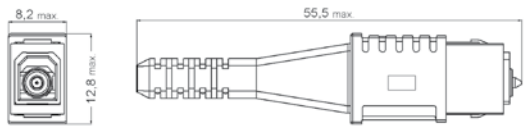
- IEC 61300 Fiber optic interconnecting devices and passive components - Basic test and measurement procedures.

EC CONNECTORS

EC CONNECTORS FOR SINGLEMODE FIBERS

For greater flexibility and optimized performances, EC plug housings need to be associated with the corresponding optical ferrule. The optical ferrules are available in different sizes and need to be ordered separately.



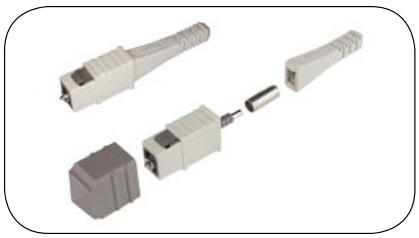


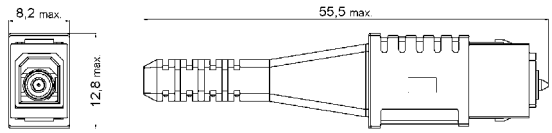
	Cable diameter 0.9 mm, 2 mm, 3 mm		
	SM fibre diameter	Part number	Packaging
Housing		**F715 050 000**	1
Optical ferrule To be ordered separately	125µm (+1/+0.5)	**F715 001 703**	10
	126µm (+1/0)	**F715 001 706**	10

EC CONNECTORS

EC CONNECTORS FOR MULTIMODE FIBERS

EC MultiMode connectors are delivered equipped with an optical ferrule





Cable diameter 0.9 mm, 2 mm, 3 mm		
MM fiber diameter	Part number	Packaging
128µm	**F715 100 000**	1
140µm	**F715 102 000**	100

Note: EC connectors are also available for connecting HSC 200, 400 and 600 µm multimode fibers. Please consult the Radiall sales team for more information.

ADAPTERS

EC adapters are equipped with a silicone membrane. They can be fixed by clipping or screwing.

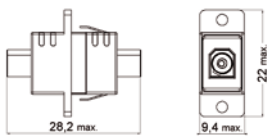


Fig. 1

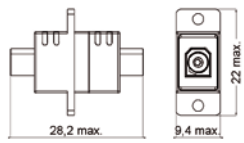
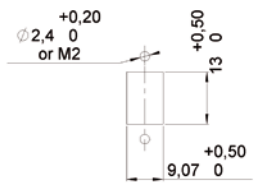


Fig. 2



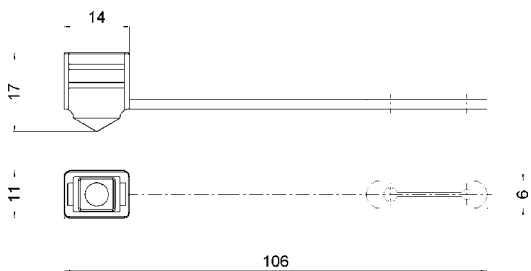
Panel Piercing

Part number	Figure	Description	Packaging
F715 700 000	Fig 1	Adapter with mounting holes and panel clip	1
F715 704 000	Fig 2	Adapter with mounting holes	

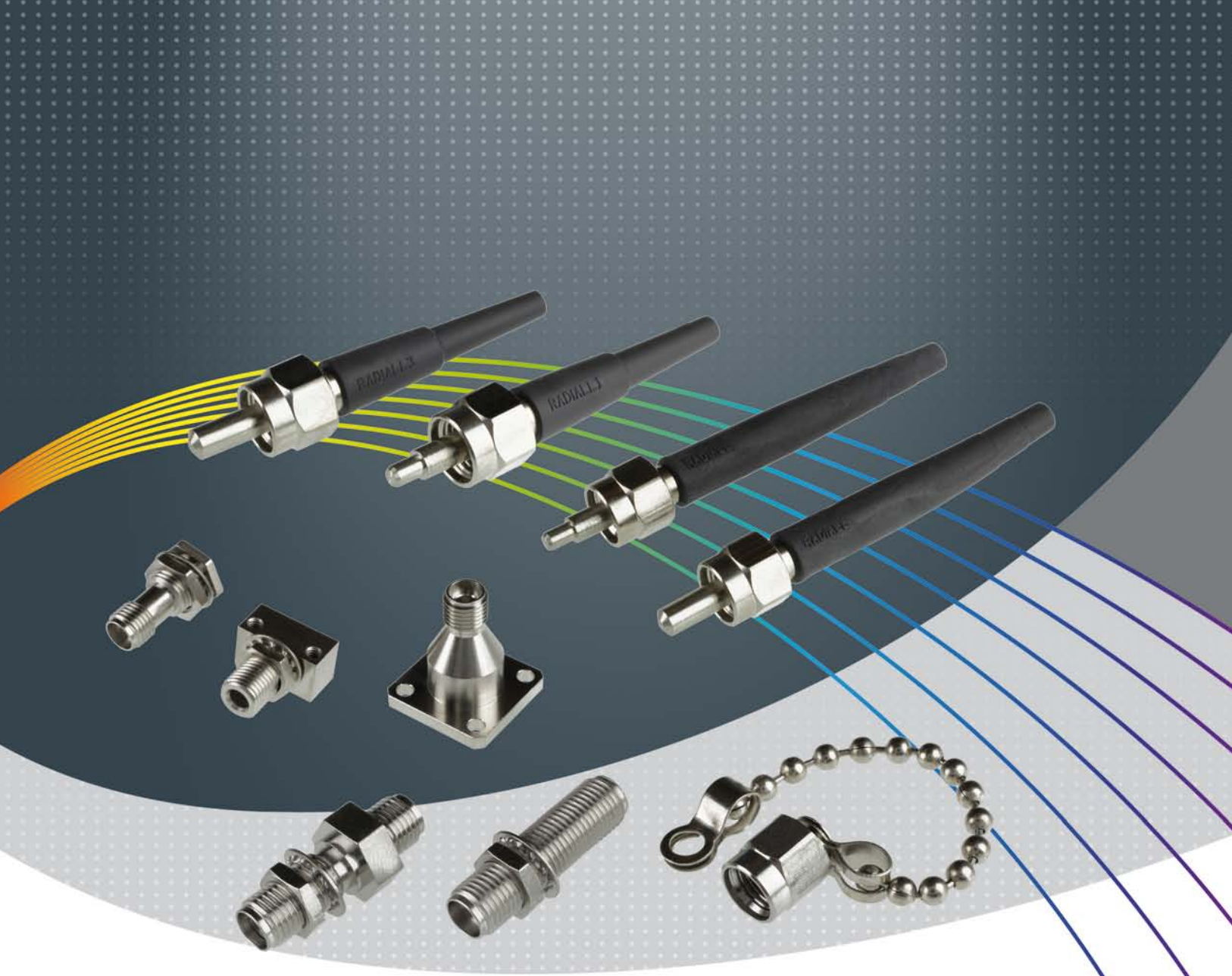
Note: The adapters can be used either with multimode or SingleMode connectors.

ACCESSORIES

CONNECTOR CAPS



Part number	Description	Packaging
F715 750 000	Safety caps (grey) for plugs	20



F-SMA Series

F707 - F708

RADIALL
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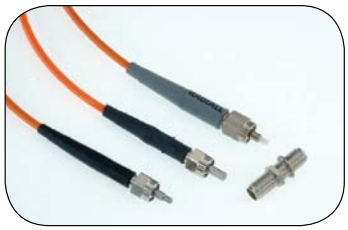
INTRODUCTION



F-SMA is one of the first generations of fiber optic connectors. Established as a standard in the industry, it is now used in many applications, such as industrial and medical, in which the connector can be adapted with a large range of MultiMode fibers.
They are designed for systems requiring reliable performances over short and medium ranges.

BENEFITS & FEATURES

- **Easy to use connector**
  - Screw coupling nut
  - Metal body with cylindrical alignment and accurate air gap
- **Flexible**
  - Metal or ceramic optical ferrule allowing different fiber diameters
  - Two series available: F-SMA 5 (straight barrel) and F-SMA 6 (step down barrel) to adapt to customer need
  - Cable range: 0.9 mm, 2 mm and 3 mm
  - Compliant with IEC 61754-22 and MIL-C-83522

APPLICATIONS

- **Industry**
- **Medical**
- **Instrumentation**
- **Military**

OPTICAL CHARACTERISTICS

	MultiMode Silica fiber size		MultiMode HCS type fiber size
	50/125 µm	100/140 µm	200/280 µm
Wavelength	850 nm – 1310 nm		
Mean Insertion Loss	1.5 dB	1.2 dB	1 dB
Standard deviation	0.5 dB		

Insertion Loss random: IEC 61300-3-34

Note: the optical performances also depend on the fiber or cable construction.

MECHANICAL CHARACTERISTICS

	Cable diameter 0.9 mm	Cable diameter 2 & 3 mm
Cable retention	7N	100N
Mechanical endurance	250 matings	
Recommended coupling torque	40 to 45 cmN (use torque wrench F780 020 000)	

ENVIRONMENTAL CHARACTERISTICS

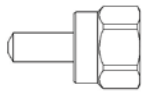
Temperature range	- 55°C / + 85°C
Vibration	10 – 2000 Hz, 20 g

INTERNATIONAL STANDARD DOCUMENTS COMPLIANCE

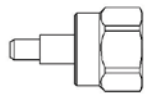
- IEC 61754-22 Fiber optic connector interfaces (F-SMA connector family)
- IEC 61300 Fiber optic interconnecting devices and passive components - Basic test and measurement procedures

CONNECTORS

F-SMA connectors are available in 2 different ended shapes: F-SMA 5 and F-SMA 6:



F-SMA 5 Straight barrel (F707)



F-SMA 6 Step-down barrel (F708)

Each F-SMA 6 connector is delivered with two plastic alignment sleeves.

- **HALF LENGTH alignment sleeve:** in order to precisely align a F-SMA 6 in a receptacle device.
  Application: Slide the sleeve over the barrel of the F-SMA 6 connector up to its shoulder, before fitting the connector into the receptacle.
- **FULL LENGTH alignment sleeve:** in order to optimize the alignment of two F-SMA 6 connectors in an F-SMA adapter.

Application: Slide the alignment sleeve over one of the F-SMA 6 connectors before inserting them in the adapter. Knowing that when unmated, the alignment sleeve will remain on the connector fitted at end 2

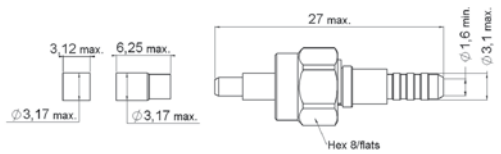


Figure 1

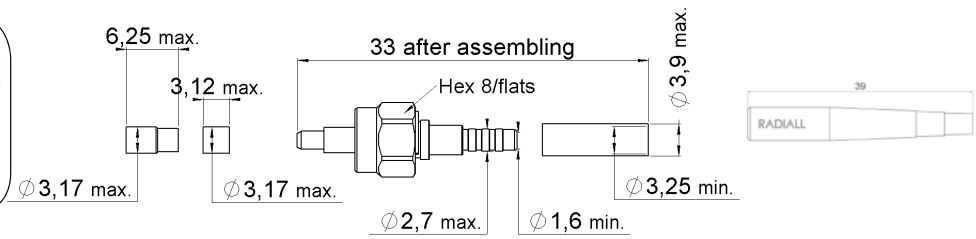


Figure 2

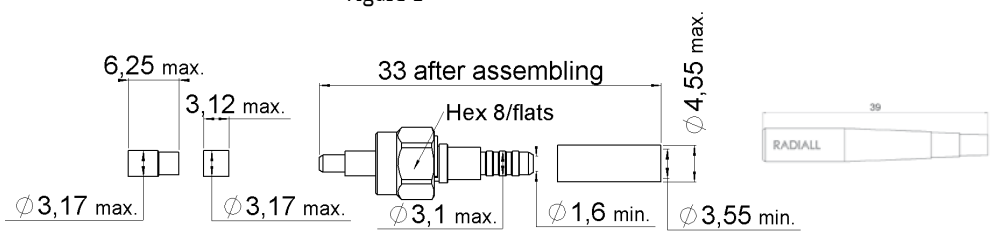
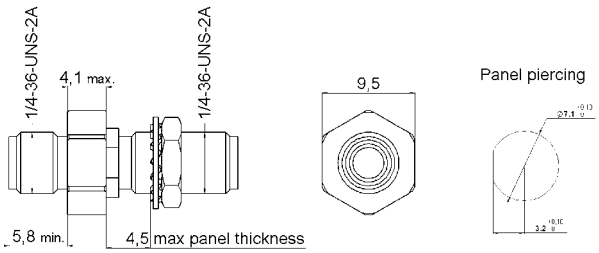
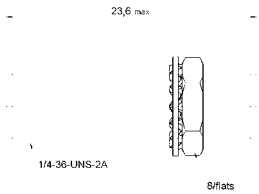


Figure 3

Note: F-SMA 5 only differs from these figurines on the ended shape.

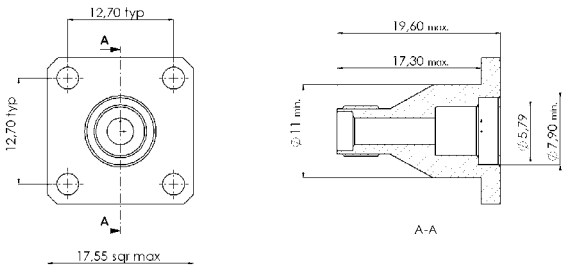
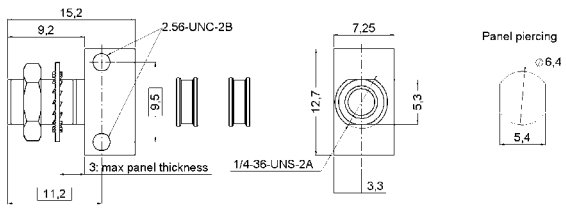
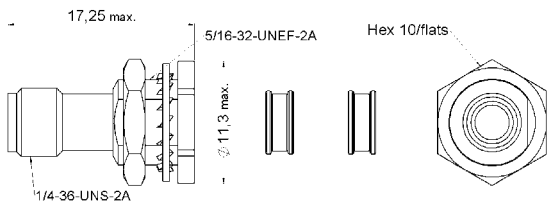
Cable dia. Tight or loose structure cable	Figure	End shape	MultiMode Fiber type					Packaging
			Silica fibers			HCS fibers	POF fibers	
			128 µm	140 µm	280 µm	200/230 µm	1000 µm	
0.9 mm	Fig 1	F-SMA 5	**F707 024 000**	**F707 025 000**	-	-	-	1
		F-SMA 6	**F708 016 000**	**F708 017 000**	-	-	-	
2 mm	Fig 2	F-SMA 5	**F707 031 000**	**F707 032 000**	-	**F707 047 000**	**F707 040 000**	
		F-SMA 6	**F708 024 000**	**F708 025 000**	**F708 026 000**	-	-	
3 mm	Fig 3	F-SMA 5	**F707 027 000**	**F707 028 000**	**F707 029 000**	**F707 049 000**	-	
		F-SMA 6	**F708 019 000**	**F708 020 000**	**F708 021 000**	-	-	

For other cable or fiber diameters, please consult the Radiall sales team.

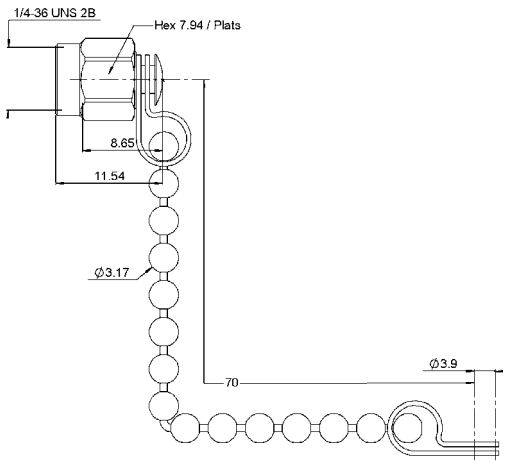
	Part number	Figure	Adapter type	Packaging
	**F708 720 000**		Bulkhead feedthrough adapter	1
	**F708 721 000**		Straight adapter	

RECEPTACLES

Receptacles have a metal body and are available in square flange or screw thread coupling. They are supplied with 2 centering rings.

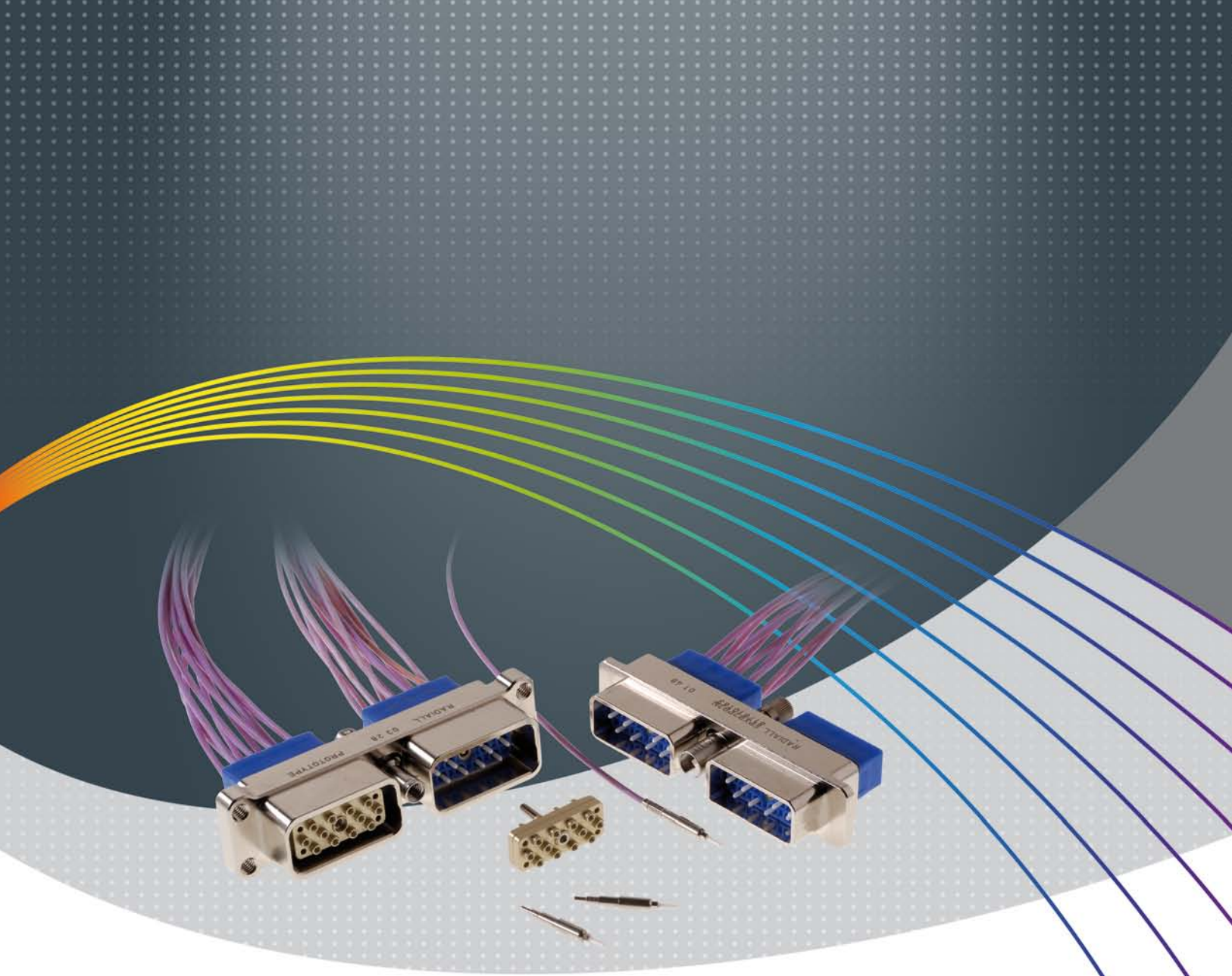
	Part number	Figure	Receptacles types	Packaging
	**F708 200 000**		Square flange	1
	**F708 400 000**		Rectangular type, screw mount or bulkhead mount	
	**F708 402 000**		Hexagonal type, bulkhead mount	

CONNECTOR CAPS



Part number	Description	Packaging
R125 812 001	Metal cap with chain for adapter or receptacle	100
R125 812 001W		1

NOTES



LuxCis® fiber optic interconnect solutions

ARINC 801, EN4639-4640-4645

F725 Series

RADIALL

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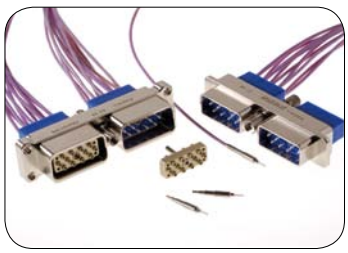


The LuxCis® product range is a proven flexible and always expanding fiber optic interconnect solution for MultiMode and SingleMode applications in aerospace and other harsh environments.

Radiall is recognized in the aerospace industry for its high quality and extensive product lines as well as its expertise in fiber optic interconnect for the telecommunication market. The new LuxCis® interconnect solution combines Radiall know how in multipin and fiber optics.

LuxCis® product range is manufactured according to EN/AS/JISQ 9100.

LUXCIS® KEY FEATURES AND ADVANTAGES

- Design based on the LC mating solution (physical contact), proven high optical performance interconnect in the telecommunication market, within a ruggedized contact to meet harsh environment requirements
- Industry standard 1.25 mm ferrule for a high density solution
- Includes industry standard parts from the LC connectors for cost efficiency
- One contact fits in all connectors of the LuxCis® product range, whether a plug or a receptacle. There is no pin and socket configuration
- Specific inserts to secure the superior optical performance of the LC in multipin connectors for harsh environment requirements
- Removable sleeve holder for a better ferrule cleaning or inspection process
- Use of a standard size 16 tool for insertion and extraction
- Main connectors: EN4644 (EPX) connector range, ARINC 600, MIL-DTL-38999 type connectors, board connectors, LxC-R® single-channel ruggedized connectors
- LuxCis® contacts can be used for MultiMode as well as SingleMode APC applications, thanks to its orientation key
- LuxCis® can be used on most of the existing cables
- Full pull proof when used with a loose structure cable

APPLICATIONS

- **RF over fiber** (remote antennas, phase array radars, military radio networking and all radio signal conversion over fiber in severe environments)
- **Sensors** (performance or structural)
- **In-Flight Entertainment**
- **Avionics data transmission**
- **High speed data networking, including wavelength multiplexing**

LuxCis® has been qualified for military and commercial aerospace programs and is being or may be used on many applications in the naval, oil research, transportation, or any industry with harsh environmental requirements.

STANDARDIZATION

- **ARINC 801:** LuxCis® is the design voted to be the ARINC 801 FO interconnect solutions for aerospace applications per the AEEC. ARINC 801 describes the contacts and the specific inserts used in MIL-DTL-38999 shells and EPX based connectors ARINC 600 inserts are described in the ARINC 600 document.

- **EN standard:**
  - EN4639-0xx: describing the LuxCis® inserts for the EN4644 (EPX) connectors
  - EN4639-101: describing the LuxCis® contact
  - EN4640: describing the LuxCis® configurations for ARINC 600 connectors
  - EN4645: describing the LuxCis® configurations for MIL-DTL-38999 based connectors

The LuxCis® interconnect solution has been qualified per ARINC 801 and EN standards. Please refer to these documents for detailed information. Main results and performance information are shown in the following tables.

OPTICAL CHARACTERISTICS

	MultiMode (PC) 850 / 1300 nm	SingleMode (UPC) 1310 / 1550 nm	SingleMode (APC) 1310 / 1550 nm
Insertion Loss (IL) Mean	0.1 dB	0.15 dB	0.2 dB
Return Loss (RL)	> 20 dB	> 50 dB	> 60 dB

Insertion Loss against a reference patchcord: IEC 61300-3-4 Method B

Return Loss: IEC 61300-3-6

MECHANICAL AND ENVIRONMENTAL CHARACTERISTICS

Test	Standard	LuxCis® in EN4644 (EPX) connectors	LuxCis® in Mil-DTL-38999 connectors	LuxCis® in ARINC 600 connectors	LuxCis® in LxC-R® connectors
Thermal cycling	SAE AS 13441 method 1003.1	-55°C/+125°C (cable dependant)			
Temperature endurance	TIA/EIA 455-20	1000 h @ 125°C (cable dependant)			
Vibration	TIA/EIA 455-11	27 Grms	43 Grms	16.4 Grms	50 Grms
Shocks	TIA/EIA 455-14	50 G, 11 ms	300 G, 3 ms	50G, 11 ms	300 G, 3 ms
Durability	TIA / EIA 364-09	100 cycles	500 cycles	500 cycles	500 cycles
Maintenance aging	SAE AS 13441 method 2002.1	10 cycles			
Cable retention 1.8 mm diameter 900 µm diameter	SAE AS 13441 method 2009.1	68 N 7 N			
Humidity	TIA EIA 455-5	10 cycles / 24 h - 90% RH - -25°C / +65°C			

Note: The LuxCis® product range has passed many qualifications, including customer driven qualifications. Not all the tests performed on LuxCis® products are described in the table above. The values mentioned in the table do not also represent maximum achievable values, they represent tested values. Request for information on a test not mentioned in the table or harsher conditions shall be addressed to your local Radiall representative.

LUXCIS® CONTACTS

Part numbering system

F725 0 03 419

F725: LuxCis® series

Ferrule type:
00: PC ferrule for SingleMode fiber
03: PC ferrule for 50/125 or 62.5/125 µm MultiMode fiber
04: PC ferrule for 100/40 µm MultiMode fiber
05: PC ferrule for 200/230 µm MultiMode fiber
50: APC ferrule for SingleMode fiber

Cable type and diameter:
118: 900 µm cable
318: 1.2 mm cable with strengthening members, tight structure
419: 1.6 to 2.2 mm cable, loose structure
519: 1.6 to 2.2 mm cable, tight structure

As shown in the part numbering system, the choice of a LuxCis® contact is a function of the cable structure. While the outside dimension of the contact does not change (see the drawings on the following page), the inside of the contact is adapted to the structure of the cable.
The structure of a cable is defined per ARINC 802:

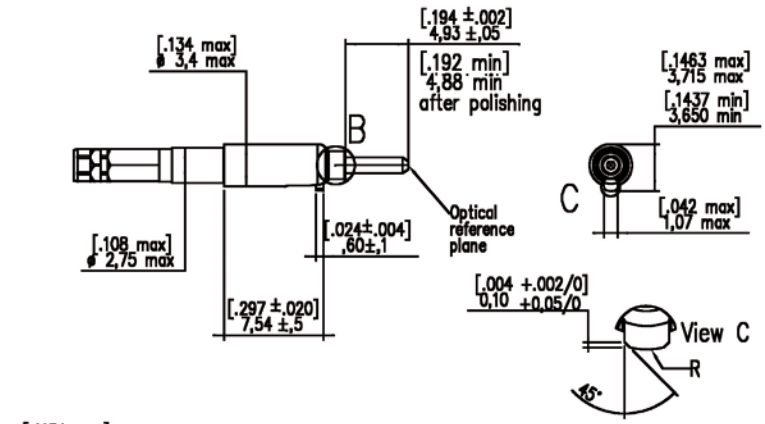
- Loose structure: a fiber optic cable structure that allows limited movement of the buffered fiber (usually the 900 µm) with respect to the outer jacket and strength member
- Tight structure: a fiber optic cable structure that allows no movement of the buffered fiber with respect to the outer jacket and strength member

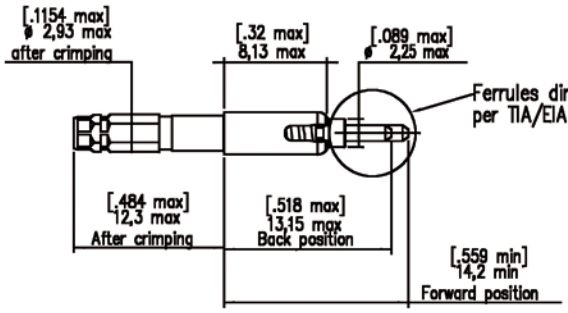
The LuxCis® contact range can accommodate virtually all the cables used for aerospace and military application (ARINC, SAE, EN, FONDA, MIL). Please contact your sales representative for other configurations or for specific requirements.

ARINC 801 equivalent

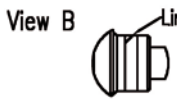
Part number	ARINC 801 equivalent
F725 003 419	LM
F725 000 419	LS
F725 050 419	LSA
F725 003 519	TM
F725 000 519	TS
F725 050 519	TSA

PC CONTACTS



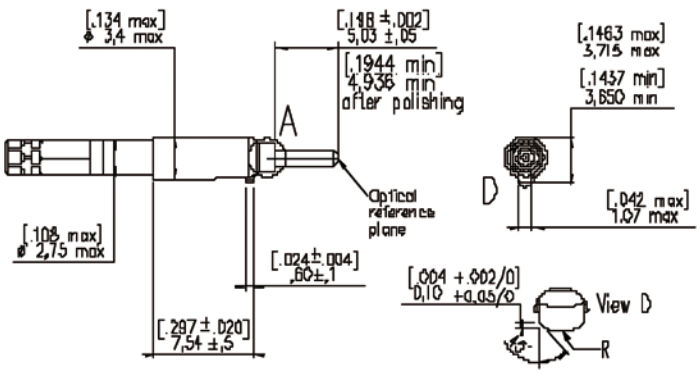


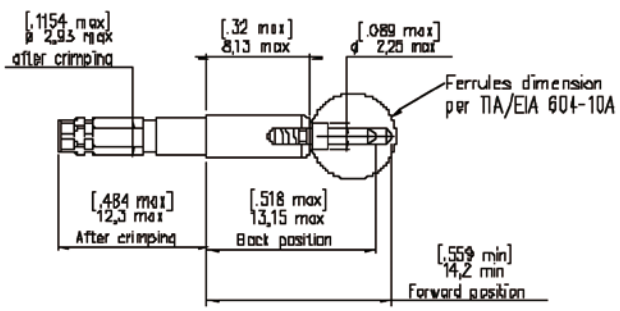
- L• and T• Termini contacts may have same external dimensions
- L• contacts are designed for loose structure cable, these contacts are pull proof.
- T• contacts are designed for tight structure cable, these contacts are not pull proof.



For multimode = No line of colour
For singlemode PC = Line blue
For singlemode APC = Line green

APC CONTACTS





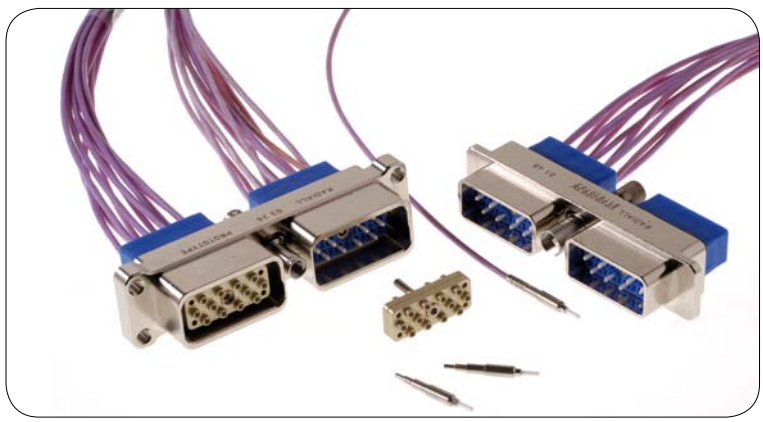
EN4644 (EPX) INSERTS FOR LUXCIS® CONTACTS

The Radiall EPX® product range includes rectangular modular connectors that provide more flexibility, improved performance and higher density compared to standard circular MIL-spec connectors.

The EPX® series offer a wide range of solutions based on two insert sizes with a large variety of shells sizes and contacts. It provides an excellent trade-off between the number of available contacts and the space actually used. EPXA inserts are a good option for small wire bundles while EPXB inserts offer twice the capacity. Moreover, the solution is completely modular and expandable.

The EPX® inserts can also be used in the Radiall QM connectors that have been designed for use with in-line disconnect applications on commercial airplanes.

For detailed information on the EPX® series, please refer to our latest catalog available on the Radiall website or from your local Radiall representative.



Part numbers for LuxCis® inserts in EN4644 (EPX) connectors

LuxCis® in EPX® requires standard EPX® shells and dedicated LuxCis® inserts. The following table lists the part numbers for the LuxCis® inserts for the EPX connectors.

Description	p/n for cavity A	p/n for cavity B
Pin insert (no sleeve holder), 12 LuxCis® contacts for EPXB	**EPXBEF12CPA**	**EPXBEF12CPB**
Socket insert (with sleeve holder), 12 LuxCis® contacts for EPXB	**EPXBEF12CSA**	**EPXBEF12CSB**
Pin insert (no sleeve holder), hybrid, 6 LuxCis® contacts and 6 electrical contacts, for EPXB	**EPXBE12F6PA**	**EPXBE12F6PB**
Socket insert (with sleeve holder), hybrid, 6 LuxCis® contacts and 6 electrical contacts, for EPXB	**EPXBE12F6SA**	**EPXBE12F6SB**
Pin insert (no sleeve holder), 6 LuxCis® contacts for EPXA	**EPXAEF6PA**	
Socket insert (with sleeve holder), 6 LuxCis® contacts for EPXA	**EPXAEF6SA**	

Socket inserts are always supplied with a sleeve holder.
Pin and socket inserts can be installed in plug or receptacle shells.
Please refer to the EPX® series catalog for more details on the receptacles and plug shells.
100% fiber optic inserts are also described in the ARINC 801 or EN4639 documents.
Please contact your sales representative for other configurations or for specific requirements
Note: that Radiall can support you with your cable and harness assemblies. Please contact your sales representative.

ARINC 600 INSERTS FOR LUXCIS® CONTACT

The ARINC 600 (NSX) series includes multipin rack and panel connectors used on high performance aerospace equipment. Radiall NSX series conforms to the ARINC 600 avionics standard.

Dedicated inserts allow the installation of up to 36 LuxCis® contacts in a cavity A or B. A wide range of inserts allows mixing of electrical and fiber optic channels in the same connector. Quadrax cavities can also accommodate LuxCis® contacts with a dedicated adapter.

PRODUCT RANGE

Part numbers for LuxCis® inserts in Arinc 600/NSX connectors

Insert type	Shell size	Cavity	Number of LuxCis® contacts	Number of quadrax contacts	Other contacts	Picture
12F5C2	2 or 3	C	C	-	1 contact # 16 4 contacts # 12 2 contacts #5	
12F12	1	C	12	-	-	
17F12Q2	2 or 3	C	12	2	3 contacts #16	
20F12Q8	2 or 3	A or B	12	8	-	
20Q8F12	2 or 3	A or B	12	8		
62F12	2 or 3	C	12	-	50 contacts #22	
24F24	2 or 3	C	14	-	-	
36F36	2 or 3	A or B	36	-	-	
118Q2	2 or 3	A or B	-	2	118 contacts #22	
Q6	2 or 3	C	-	6	-	

Q11	2 or 3	A or B	-	11	-	
11Q2	2 or 3	C	-	2	4 contacts #20 3 contacts #16 4 contacts #12	
11WQ2	2 or 3	C	-	2	4 contacts #20 3 contacts #16 4 contacts #12	
15T6Q2	2 or 3	C	-	2	4 contacts #20 3 contacts #16 4 contacts #12	
20Q4	2 or 3	C	-	4	20 contacts #20	
46Q2	2 or 3	C	-	2	4 contacts #20 3 contacts #16 4 contacts #12	
62Q2	2 or 3	C	-	2	60 contacts #22 2 contacts #16	
68Q2	2 or 3	C	-	2	68 contacts #22	
68Q4	2 or 3	A or B	-	4	68 contacts #22	

PRODUCT RANGE

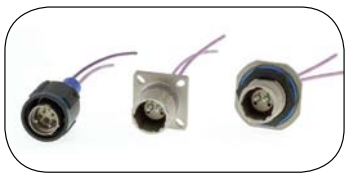
The sleeve holder is delivered already installed on the LuxCis® inserts 17F12Q2, 20F12Q8, 12F5C2, 62F12, 20Q8F12 and 36F36 on the receptacle side. Adaptors for quadrax cavities have to be ordered separately using the following part numbers.

Description	Part number	Picture
Pin quadrax adapter for LuxCis® contact in quadrax FR type cavity with sleeveholder	**620 946 001**	
Pin quadrax adapter for LuxCis® contact in quadrax RR type cavity with sleeveholder	**620 946 002**	
Socket quadrax adapter for LuxCis® contact in quadrax RR type cavity	**620 946 003**	
Sleeve holder for pin quadrax adapter	**620 946 004**	

Please refer to the ARINC 600 (NSX) series catalog for more details on the receptacles and plug shells.
Please contact your Radiall representative for other configurations or for specific requirements.
Technical datasheets are available upon request at your Radiall representative or on the Radiall website.
Note: Radiall can support you with your cable and harness assemblies. Please contact your Radiall representative.

MIL-DTL-38999 TYPE CONNECTORS FOR LUXCIS® CONTACT

The LuxCis® product range also includes MIL-DTL-38999 type connectors

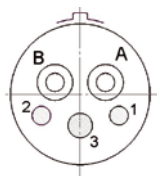


Size 11 MIL-DTL-38999 type connectors

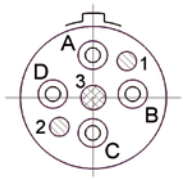
Size 25 MIL-DTL-38999 type connectors

Removable sleeveholder

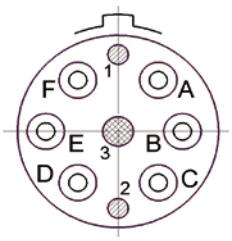
Shells arrangement



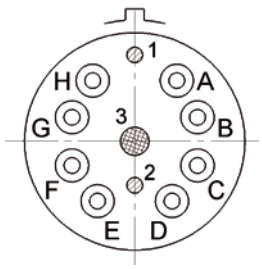
Size 11, 2 LuxCis®



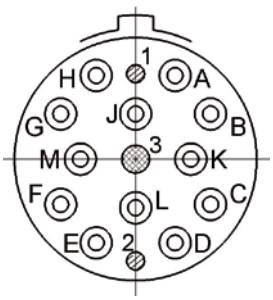
Size 13, 4 LuxCis®



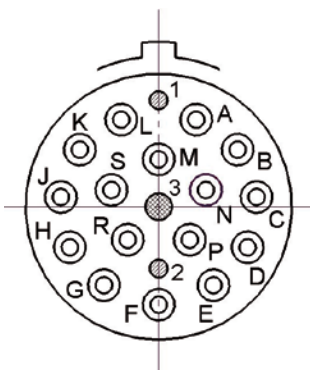
Size 15, 6 LuxCis®



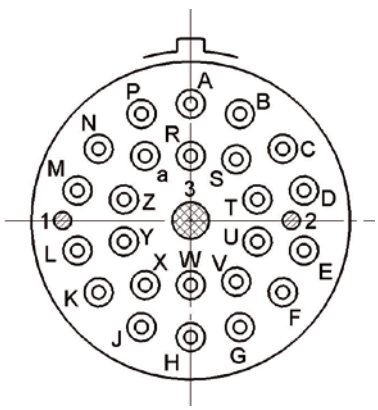
Size 17, 8 LuxCis®



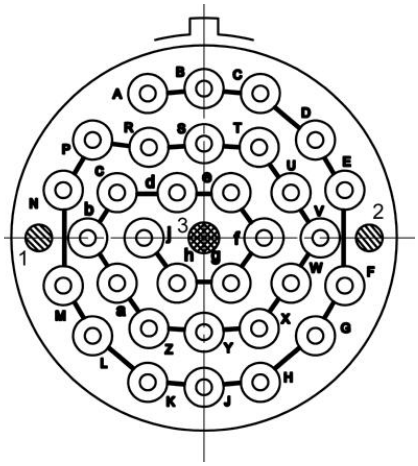
Size 19, 12 LuxCis®



Size 21, 16 LuxCis®



Size 23, 24 LuxCis®



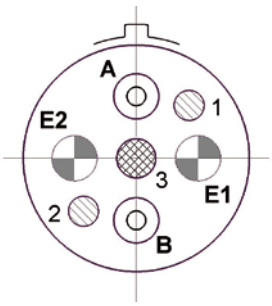
Size 25, 32 LuxCis®

1 & 2: Alignment pins
All views show the front face of a plug.

3: Sleeve-holder screw

A, B, ...: Optical cavities

The LuxCis® product range also includes hybrid connectors, mixing electrical and LuxCis® cavities.



Size 13 connector with 2 electrical and 2 LuxCis® cavities

Hybrid connectors are available in all sizes; please see your local Radiall representative for more details.

www.radiall.com

PRODUCT RANGE

Part numbers for LuxCis® MIL-DTL-38999 type connectors

R8 W 15 O 6FO S A N

R8: LuxCis® MIL-DTL-38999 series

Shell type:
W: Plug
R: Square flange receptacle
N: Jam nut receptacle

Shell size:
11-13-15-17-19-21-23-25

Shell material and finish:
O: Aluminium olive drab cadmium
N: Nickel plated Aluminium
M: Nickel plated composite
G: Nickel aluminium bronze

Contact layout:
2FO: 2 LuxCis® contacts (shell size 11)
2FO2E: 2 LuxCis® + 2 electrical contacts (shell size 13)
4FO: 4 LuxCis® contacts (shell size 13)
6FO: 6 LuxCis® contacts (shell size 15)
8FO: 8 LuxCis® contacts (shell size 17)
12FO: 12 LuxCis® contacts (shell size 19)
16FO: 16 LuxCis® contacts (shell size 21)
24FO: 24 LuxCis® contacts (shell size 23)
32FO: 32 LuxCis® contacts (shell size 25)

Insert type:
S: sealed insert for plug (R8W)
P: sealed insert for receptacle (R8R or R8N)

Insert material:
A: Anodized aluminium
C: Non metalized composite

Polarization:
N-A-B-C-D-E

Electrical contacts shall be ordered separately.
Anodized aluminum inserts are recommended when specific EMI protection requirement
All connectors are supplied with a plastic cap
Accessories such as backshell or metalized caps are available only through Radiall manufactured harness assemblies.
Please refer to the cable assembly section for more information
Please contact your sales representative for other plating configurations or for specific requirements
Technical datasheets are available upon request at your sales representative or on the Radiall website.

SQUARE FLANGE AND JAM NUT RECEPTACLES

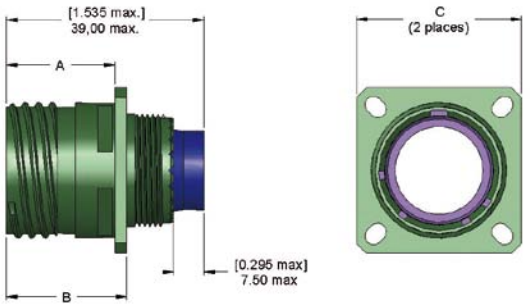


Fig. 1 Square flange receptacles

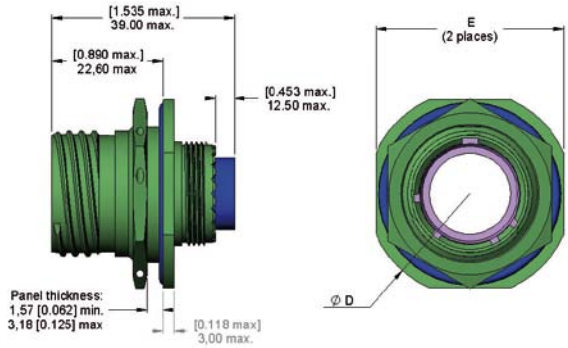
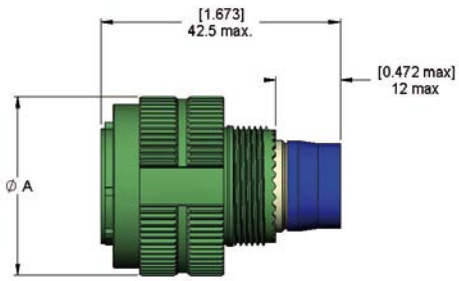


Fig. 2 Jam nut receptacles

Shell size	Figure 1					Figure 2	
	A max. mm (inch)		B max. mm (inch)		C max. mm (inch)	Dia. D max.	E max.
	Metallic shell	Composite shell	Metallic shell	Composite shell		mm (inch)	mm (inch)
11	20.83 (0.820)	19.69 (0.775)	23.15 (0.911)	23.19 (0.913)	26.50 (1.043)	35.20 (1.386)	32.20 (1.268)
13					28.90 (1.137)	38.40 (1.512)	35.30 (1.390)
15					31.30 (1.232)	41.60 (1.638)	38.50 (1.516)
17					33.70 (1.323)	44.80 (1.764)	41.70 (1.642)
19					36.90 (1.449)	49.50 (1.949)	46.40 (1.827)
21	20.07 (0.790)	18.92 (0.745)		23.14 (0.911)	40.10 (1.575)	52.70 (2.075)	49.60 (1.953)
23					43.30 (1.701)	55.90 (2.200)	52.80 (2.079)
25					46.40 (1.823)	59.00 (2.323)	56.00 (2.205)

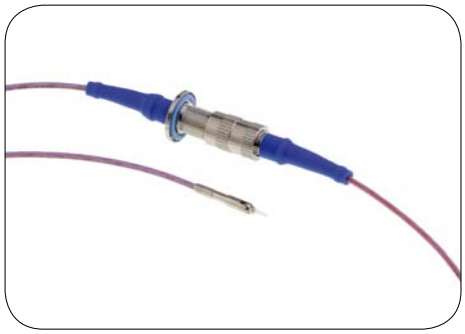
PLUGS



Shell size	Dia. A max. mm (inch)
11	25.00 (0.984)
13	29.40 (1.157)
15	32.50 (1.280)
17	35.70 (1.405)
19	38.50 (1.516)
21	41.70 (1.642)
23	44.90 (1.768)
25	48.00 (1.890)

PRODUCT RANGE

LXC-R® CONNECTORS FOR LUXCIS® CONTACTS



The LuxCis® product range also includes the LxC-R®, a multi purpose single channel fiber optic connector for harsh environments.

Miniature and robust, this single channel connector is ideally suited for applications requiring single channel transmission in extreme environmental conditions, such as aerospace and military equipment or anywhere a robust fiber optic link is required.

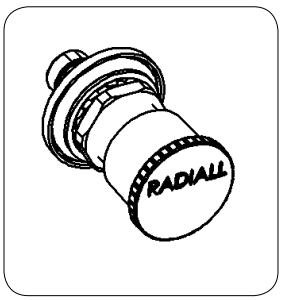
The LxC-R® is qualified to withstand a high level of vibration and shock. Specifically designed to be compatible with the industry standard LuxCis® Arinc 801 fiber optic contact, the LxC-R® is exceptionally reliable in terms of mechanical, environmental and optical performances. The flexibility of the LuxCis® termini allows the use of either MultiMode or SingleMode fiber for both PC and APC terminations.

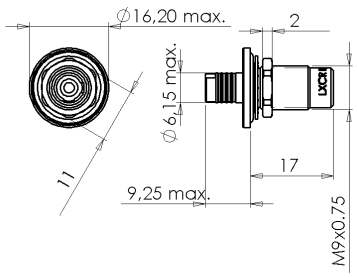
The range includes plugs, square flange and jam nut receptacles, as well as hermetic connectors.

BENEFITS & FEATURES:

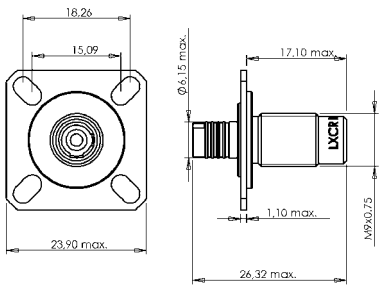
- **Easy to install: simple jam nut coupling**
- **No specific tool required**
- **Excellent optical performance**
- **Compatible with Arinc 801 LuxCis® APC termini**
- **Protection even when unmated**
- **Interfacial gasket: shell to shell sealing (IP67)**
- **Sealing boot: environmental grommet, also guiding the fiber at the rear of the connector**
- **D-Hole receptacle with o-ring: for panel sealing**
- **Two polarization keys: 90° or 120°**

JAM NUT RECEPTACLE

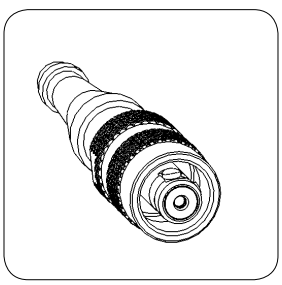


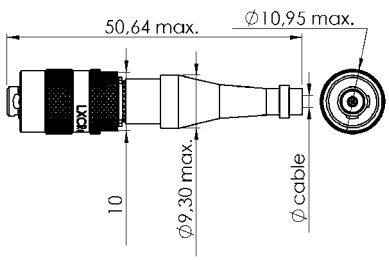


SQUARE FLANGE



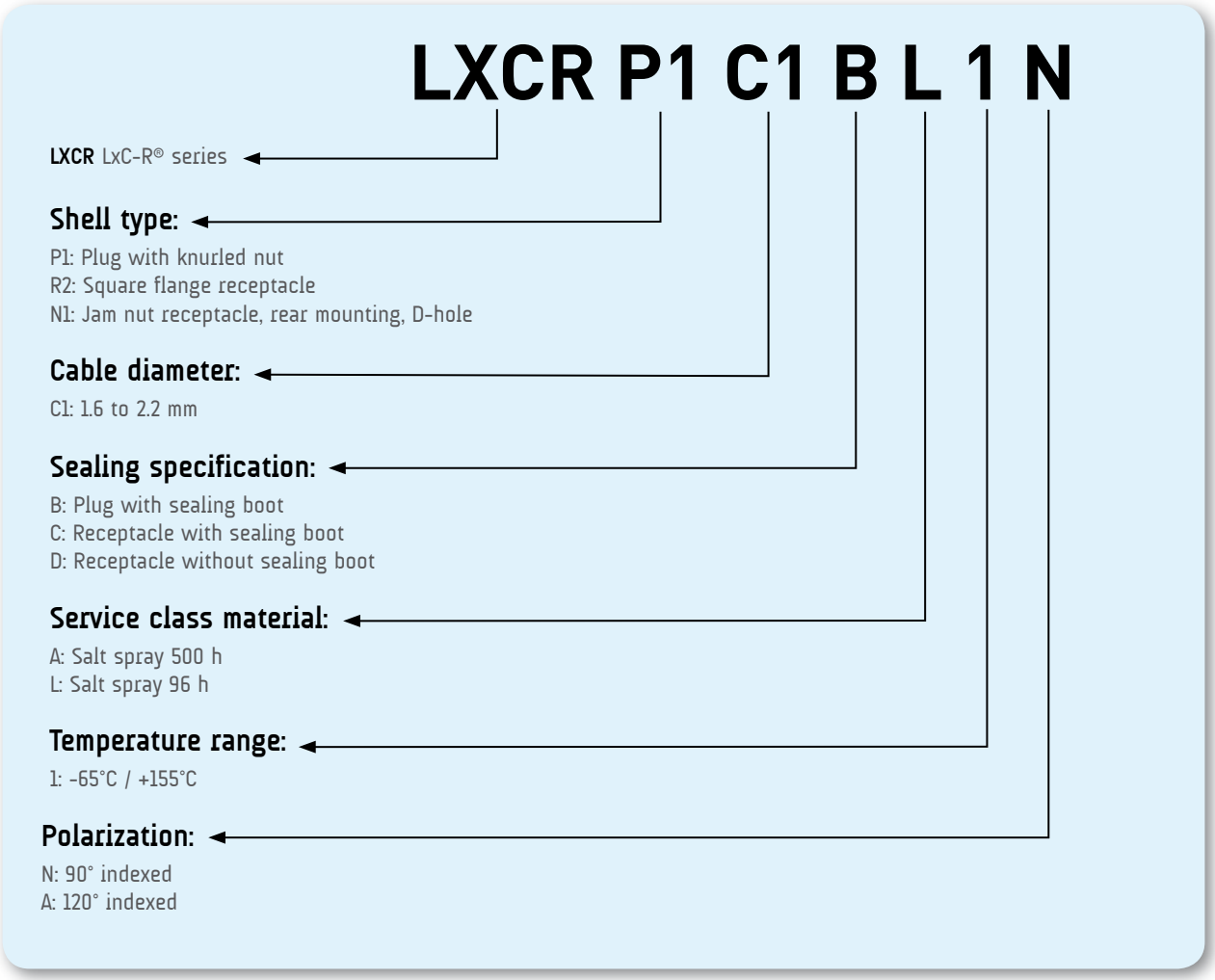
PLUG





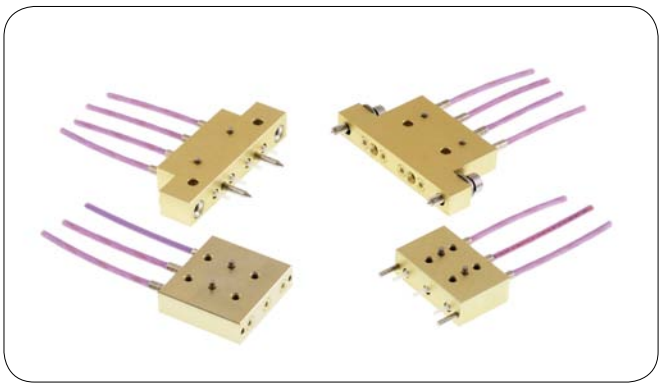
PRODUCT RANGE

Part numbers for LXCR



Please contact your sales representative for accessories, other configurations or for specific requirements.
Technical datasheets are available upon request at your sales representative or on the Radiall website.
Note: Radiall can support you with your cable and harness assemblies. Please refer to the "Cable assemblies" section or contact your sales representative

CUSTOM DESIGN CONNECTORS FOR LUXCIS® CONTACT



Radiall has been also designing LuxCis® connectors to meet the customer's footprint and space on the board, in the box or at the box interface.
Each connector integrates a number of LuxCis® cavities and the locking mechanism depends on the application and the environment required by the customer.

Please contact your sales representative for a LuxCis® connector built to your print.
Note that Radiall can support you with your cable and harness assemblies. Please contact your sales representative.

ACCESSORIES AND TOOLS

ACCESSORIES

- Dust caps: **F718 176 104** (packaging 10 pieces) and **F718 176 204** (packaging 100 pieces)
- Filler plug for unused cavity: **616 912**
- Assembling kit

TOOLS

F725 700 100

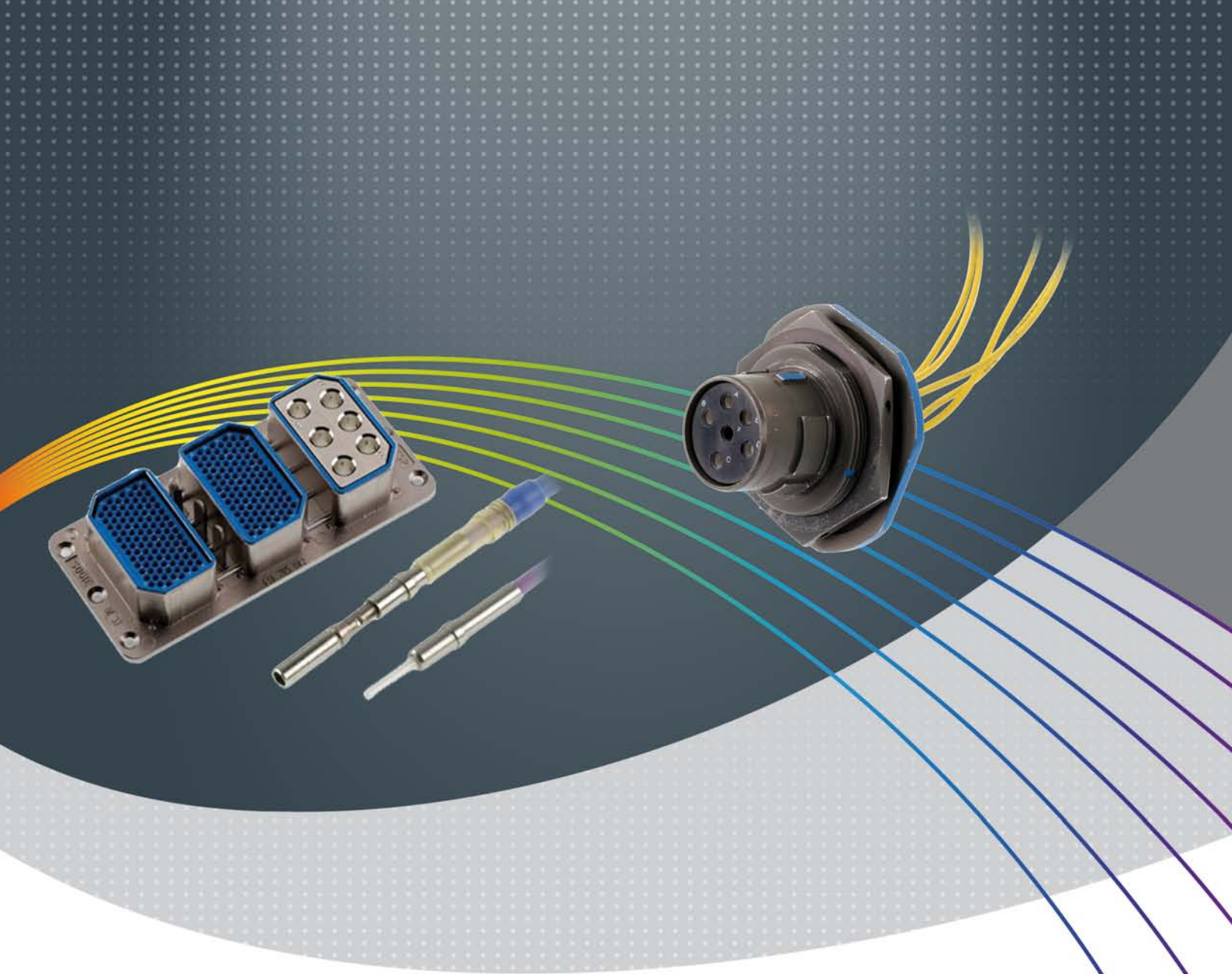
F719 060 000

F719 058 010

Description	Part number
LuxCis® to LuxCis®adapter, simplex bulkhead feedthrough	**F725 701 100**
LuxCis® to LuxCis®adapter, simplex straight	**F725 700 100**
LuxCis® to LC adapter, simplex LC panel cutout	**F719 060 000**
LuxCis® to LC adapter, duplex LC panel cutout	**F719 058 010**
LuxCis® to LC adapter, duplex MIL-DTL-38999 panel cutout	**F719 058 000**
LuxCis® to LuxCis® adapter, quick release	**F780 799 001**
LuxCis® to LC adapter, quick release	**F780 799 000**
Plastic extraction tool, size 16, *(MIL-PRF-81969/14-03)*	**282 515**
Dynamometric key for sleeve holder removal and installation	**F780 638 000**
Hexagonal key 5/64 inch (2 mm) flats for sleeve holder removal and installation	**F780 855 000**
Key for quadrax sleeve holder removal	**F780 858 000**
Extraction tool for quadrax adapter RR type (MIL-PRF-81969/28-03)	**282 549 001**
Extraction tool for quadrax adapter FR type	**282 549 009**

All LuxCis® adapters have zirconia ceramic alignment sleeves.
Radiall also proposes termination or maintenance kits. For insertion loss measurements, Radiall offers aerospace quality measurement jumpers compliant to ARINC 805.

Please contact your sales representative for technical datasheets or visit Radiall website.



MIL-PRF-29504 type fiber optic termini

F722 - F724

RADIALL
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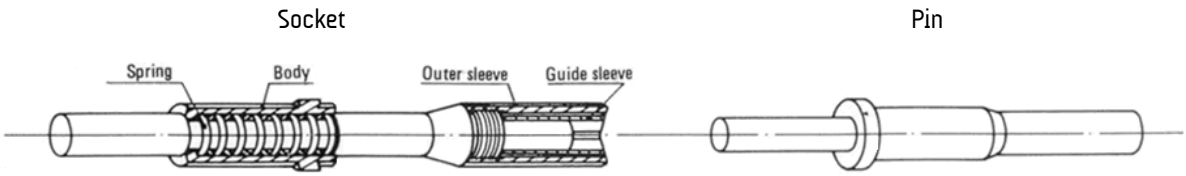
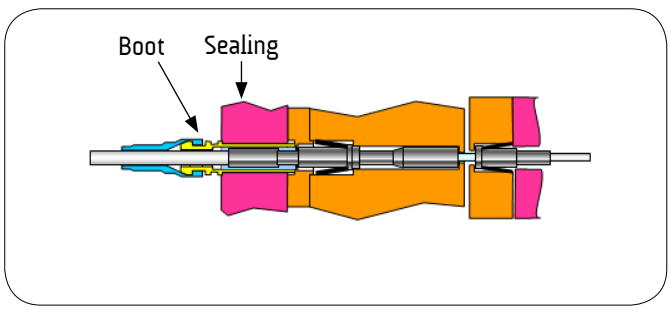
INTRODUCTION

MIL-PRF-29504 fiber optic termini were developed several decades ago and are described into several MIL standard documents. They have been designed to fit into standard electrical cavities within circular or rectangular multipin connectors and do not require specific inserts. However, standard electrical connectors are not optimized for optical connection with small core fibers and MIL-PRF-29504 fiber optic termini show lower optical performances than more recent designs, such as the LuxCis®.

Each connector has a different design for its cavities and therefore requires a different design for the termini. Like electrical contacts, MIL-PRF-29504 termini are pin or sockets. Multiple terminus configurations are thus needed to cover all connectors available.

Radiall has developed its own design and has added several features to improve the terminus.





KEY DESIGN FEATURES:

- Compatible with size 16 or size 12 standard electrical cavities.
- Pin and socket termini.
- Spring loaded on the socket side. For the Radiall design, the spring is protected within the body of the terminus, avoiding potential jamming during insertion.
- Sleeve integrated in the socket terminus.
- Ruggedized fiber optical terminus (temperature, vibration).
- Radiall unique releasing boot holder. During mating sequence, the spring loaded socket is pushed back by the pin, providing a good physical contact between optical faces. The boot holder allows the push of the fiber through the grommet while maintaining an efficient sealing.
- Use with multi mode fibers.

CHARACTERISTICS AND PERFORMANCE

Radiall MIL-PRF-29504 type fiber optic termini have been validated by internal or customer qualifications. Main results and performance information are shown below.

Insertion loss	0.8 dB typical
Durability	up to 500 mating cycles
Thermal cycling	-65°C /+125°C (cable dependent)
Vibration / shock	connector dependent

PRODUCT RANGE

Two terminus sizes are available. They fit either in a size 16 or a size 12 cavity:

- Size 16 optical terminus has a ferrule diameter specified at 1.585 mm
- Size 12 optical terminus has a ferrule diameter specified at 2.38 mm

Termini will have either metallic or ceramic sleeve depending on the fiber diameter and the application. A ceramic ferrule will accommodate fibers with a diameter up to 280 µm while metallic ferrule can go up to 1000 µm.

Radiall has been designing over 100 part numbers. Below are the main part numbers. Please contact your Radiall representative for configurations not described in the catalogue.

TERMINI FOR ARINC 404 – DSX CONNECTORS

(CAN REPLACE MIL-PRF-29504/10 PIN AND MIL-PRF-29504/11 SOCKET TERMINI)

Pin contact part number	Socket contact part number	Contact size	Fiber diameter (µm)	Cable diameter (mm)	Ferrule material
F724 005 000	**F724 104 000**	16	125	1.5	Ceramic
F724 011 000	**F724 111 000**	16	125	1.8	Ceramic
F724 009 000	**F724 109 000**	16	125	2	Ceramic
F724 002 000	**F724 101 000**	16	140	1.5	Ceramic
F724 041 000	**F724 140 000**	16	230	2	Metallic
F724 007 000	**F724 107 000**	16	280	1.6	Ceramic

PRODUCT RANGE

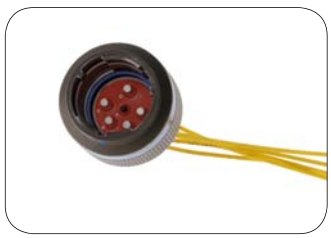
TERMINI FOR ARINC 600 – NSX AND MIL-C-83527 – MPX CONNECTORS

(CAN REPLACE MIL-PRF-29504/6 PIN AND MIL-PRF-29504/7 SOCKET TERMINI)

Pin contact part number	Socket contact part number	Contact size	Fiber diameter (µm)	Cable diameter (mm)	Ferrule material
F724 004 000	**F724 104 000**	16	125	1.5	Ceramic
F724 012 000	**F724 111 000**	16	125	1.8	Ceramic
F724 010 000	**F724 109 000**	16	125	2	Ceramic
F724 001 000	**F724 101 000**	16	140	1.5	Ceramic
F724 040 000	**F724 140 000**	16	230	2	Metallic
F724 204 000	**F724 304 000**	12	125	1.5	Ceramic
F724 242 000	**F724 342 000**	12	125	1.8	Ceramic
F724 203 000	**F724 303 000**	12	140	1.5	Ceramic

TERMINI FOR CIRCULAR MIL-DTL-38999 CONNECTORS

(CAN REPLACE MIL-PRF-29504/4 PIN AND MIL-PRF-29504/5 SOCKET TERMINI)

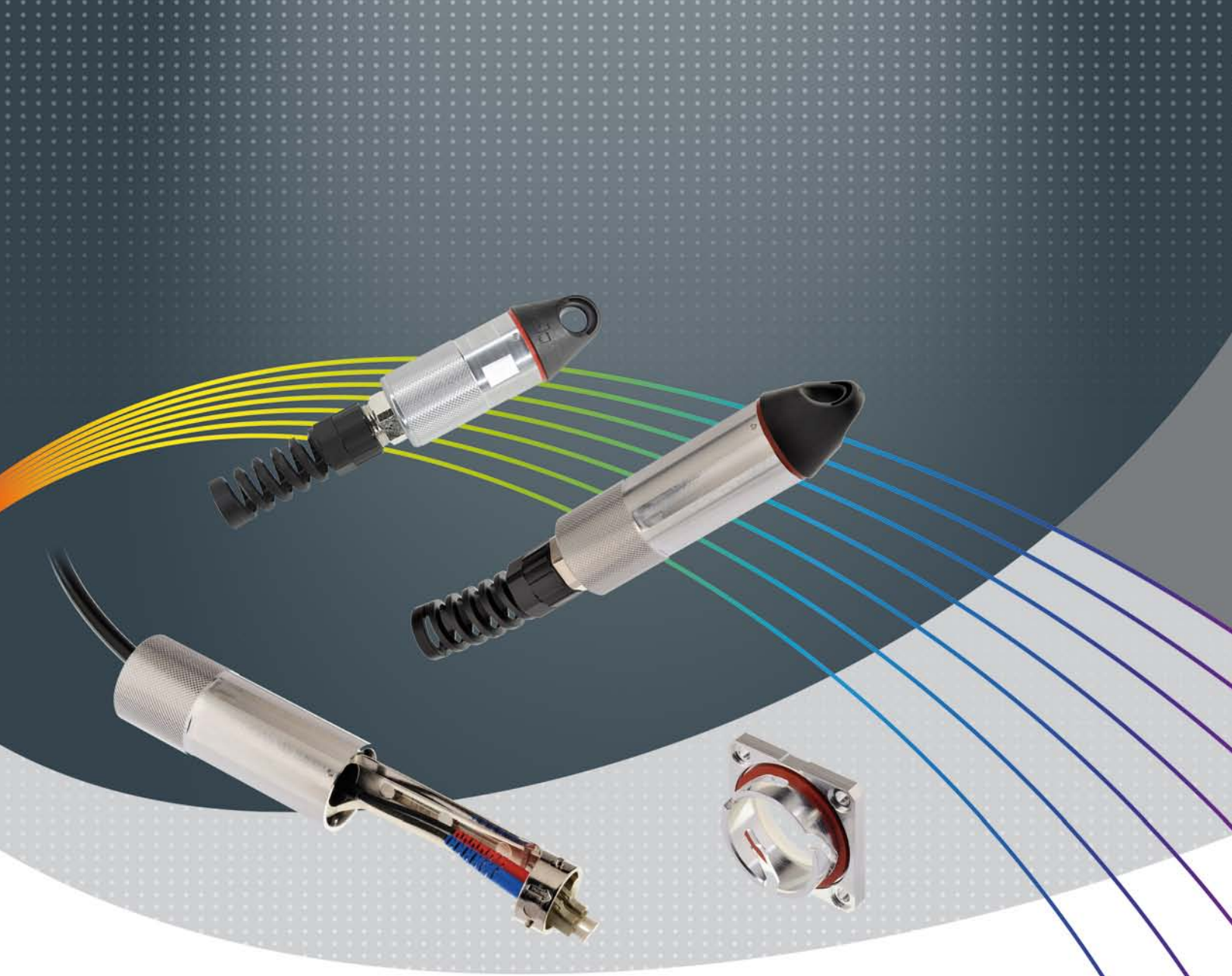


Pin contact part number	Socket contact part number	Contact size	Fiber diameter (µm)	Cable diameter (mm)	Ferrule material
F722 003 000	**F722 103 000**	16	125	1.5	Ceramic
F722 013 000	**F722 113 000**	16	125	1.8	Ceramic
F722 008 000	**F722 108 000**	16	125	2	Ceramic
F722 002 000	**F722 102 000**	16	140	1.5	Ceramic
F722 006 200	**F722 106 200**	16	140	1.8	Ceramic
F722 009 000	**F722 109 000**	16	140	2	Ceramic
F722 048 000	**F722 148 000**	16	230	2	Metallic
F722 010 000	**F722 110 000**	16	280	1.6	Ceramic
F722 200 000	**F722 300 000**	12	125	1.5	Ceramic
F722 202 000	**F722 302 000**	12	140	1.5	Ceramic
F722 240 000	**F722 340 000**	12	230	2.5	Metallic

TERMINI FOR HE510 - EPX CONNECTORS

Pin contact part number	Socket contact part number	Contact size	Fiber diameter (µm)	Cable diameter (mm)	Ferrule material
F724 006 000	**F724 106 000**	16	125	1.5	Ceramic
F724 003 000	**F724 103 000**	16	140	1.5	Ceramic
F724 042 000	**F724 142 000**	16	230	2	Metallic
F724 201 000	**F724 301 000**	12	140	1.5	Ceramic

Note that Radiall can support you with your cable and harness assemblies. Please refer to cable assemblies section or contact your sales representative.



R2CT™ Series

R2CT

RADIALL
The next conneXion

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INTRODUCTION

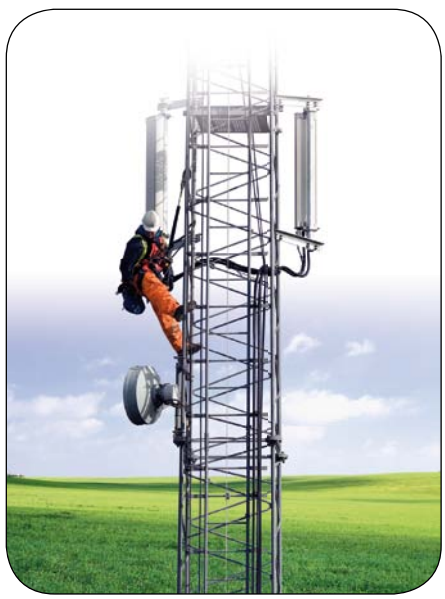
R2CT™: RADIALL 2 CONNECTORS TO TRANSCEIVER

« The most flexible outdoor interconnection solution »

The R2CT™ (Trademark of Radiall) connection system is the most flexible outdoor interconnection solution that meets the needs of telecommunication OEMs and operators for fiber-to-the-antenna (FTTA) and similar multisignal applications in the field conditions. At the panel front of the Remote Radio Head (RRH) and Unit (RRU) equipment, the R2CT™ provides a simple and protected low-cost waterproof and sealed connection.
Designed firstly for optical links using SFP transceivers and duplex LC-terminated fiber-optic cable, this very flexible connector is also useful for electrical links.

BENEFITS & FEATURES

- **Flexible and Modular**
  - Kit assembles in the field over existing optical patch cords
  - Compatible with any standard optical LC field cable assembly
  - Compatible with any standard SFP transceiver
  - Reusable allowing cables and transceivers to be easily changed in the field, including front-panel swapping of transceivers
  - R2CT™ connection system can easily be used for other Ethernet and multisignal applications: compatible with RJ45 patch cords and USB connections
- **Robust and Easy to Install**
  - Double bayonet locking system ensures mechanical connection, allowing a toolless hand-tightened connection - *Patent pending*
  - Kit assembles without tools
  - Designed to withstand climatic working conditions of outdoor field applications
  - Plug assembly includes a protection cap that can be used for pulling cable
- **Mechanical and Environmental Protection**
  - Waterproof
  - Dustproof
  - Important tensile strength
- **Low Cost**



APPLICATIONS

- **Fiber To The Antenna**
- **Outdoor telecom**
- **Harsh environments connection**
- **Industrial connection**

R2CT™ connector has been designed to fulfill the qualification requirements of IEC 61300 standard (for fiber optic interconnection devices)

MECHANICAL CHARACTERISTICS

Cable retention	200N
Mating endurance	100 mating cycles minimum

ENVIRONMENTAL CHARACTERISTICS

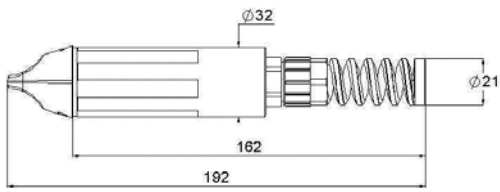
Ingress Protection class	IP65 or IP67 optionally (*)
Operating temperature	-40°C / +85°C
Storage temperature	-40°C / +85°C
Salt mist	IEC 61300-2-26 passed
Vibrations	IEC 61300-2-1 passed

(*): IP65 for full assembly by kit in the field over existing patch cords.

PRODUCT RANGE

R2CT™ solution is available as a component (Plug Kit) to fit in the field on any conventional LC optical connector or as a complete cable assembly.
For electrical links such as RJ45 connections, a short version of the R2CT™ Plug Kit has been developed with reduced overall dimensions.

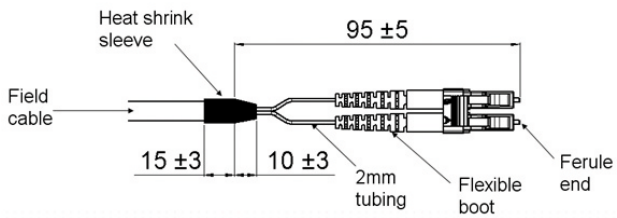
R2CT™ STANDARD PLUG KIT



Part number	Description	Packaging
R2CT 115 000	Plug connector only; no patch cord	unitary in plastic bag with assembly note

The R2CT™ Plug Kit is adapted to all types of optical cable assemblies with simplex or duplex LC connectors and 5 to 7 mm diameter MultiMode or SingleMode field cable – other diameters are available on request.

To guarantee proper operation when the R2CT™ Plug Kit is assembled over existing optical patch cords, the following fan-out dimensions should be observed:

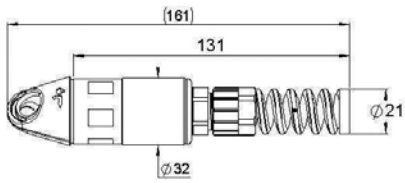


R2CT™ MINI SHORT PLUG KIT - *DEDICATED TO ELECTRICAL LINKS (RJ45)*

The R2CT™ mini short Plug Kit can fit with any type of electrical or Ethernet RJ45 cables with diameters from 5 to 7 mm – (for other diameters please contact your Radiall sales team).

R2CT™ mini short Plug Kit connector exists in IP67 version or in IP65 version with split gasket for full assembly in the field.

It is delivered with a pulling nose which protects the connector interface and can include a disconnection clip to disconnect the RJ45 connector of its socket.



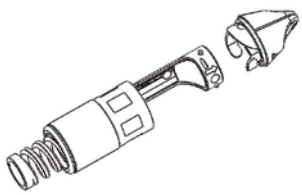


Figure 1

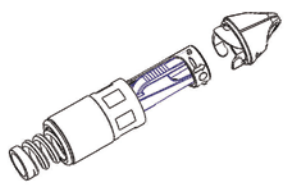
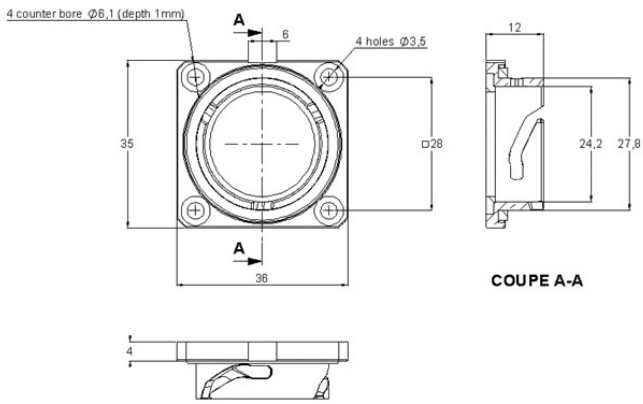


Figure 2

Part Number	Figure	Description	Packaging
R2CT 127 000	1	Kit IP67 protection Plug connector only; no patch cord	unitary in plastic bag with assembly note
R2CT 127 001	2	Kit IP67 protection with disconnection clip Plug connector only; no patch cord	
R2CT 125 000		Kit IP65 protection with disconnection clip Plug connector only; no patch cord	

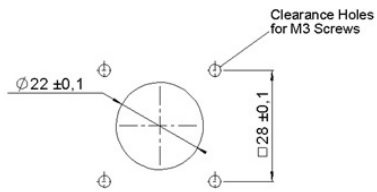
R2CT™ STANDARD RECEPTACLE

Fixed to the panel of the equipment by four screws, the R2CT™ standard receptacle allows an easy access to connect the signal: to SFP transceivers for optical links or to RJ45 socket for Ethernet links.



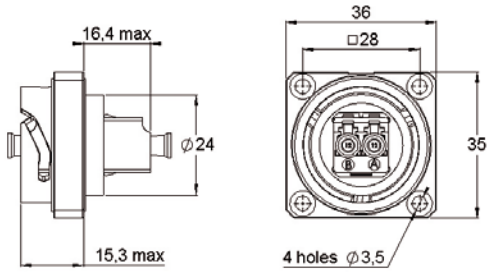
The R2CT™ receptacle is supplied with the protection cap installed.

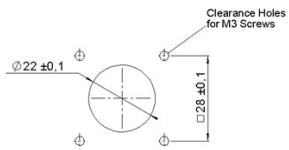
Two possible configurations: red vinyl cap (protection IP65) or aluminium protection cap (IP67).

	Part Number	Description	Panel cut out
	**R2CT 105 000**	Receptacle with Red Vinyl Protection Cap	
	**R2CT 107 000**	Receptacle with Metal Protection Cap	

R2CT™ RECEPTACLE WITH LC ADAPTOR

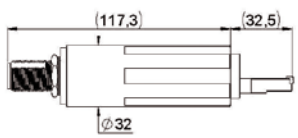
A variation of the R2CT™ receptacle has been developed to include a LC adaptor SingleMode version to allow the R2CT™ interface to be used for RRU and RRH of first generation with SFP transceiver inside the equipment.



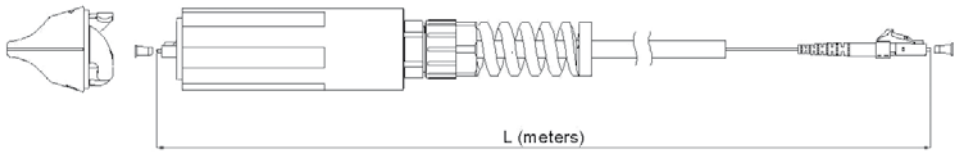
Part Number	Panel cut out
R2CT 107 200	

R2CT™ ADAPTOR N-RJ45

For needs of measurement and control of the RRU and RRH equipments in FTTA applications, a specific version of R2CT™ has been developed to adapt RJ45 connection signal to a coaxial signal with N interface.

Picture	Figure	Part Number
		**R2CT 135 000**

R2CT™ PRE-MOUNTED OPTICAL CABLE ASSEMBLIES



Any configuration for a cable assembly with R2CT™ is available on demand:

- Field cables with diameters of 5 to 7 mm on standard – other cable sizes on request
- Standard LC connectors (R2CT™ side)
- Any possibility of optical connectors on the opposite side (LC, SC, FC, ST, etc...)
- Simplex or duplex connectors
- MultiMode (50/125 or 62.5/125 on request) or SingleMode (9/125) cable
- Polishing/finishing: PC or APC

OPTICAL CHARACTERISTICS

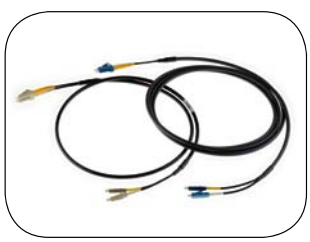
Insertion Loss (mated with reference plug) (@1310 & 1550 nm)	0.5 dB max (method 6)
Return Loss (@1310 & 1550 nm)	RL > 45 dB (method 7)

For more detailed information: please refer to the “Cable assemblies” section of this catalogue.

R2CT™ PRE-MOUNTED ON RJ45 CABLE ASSEMBLIES

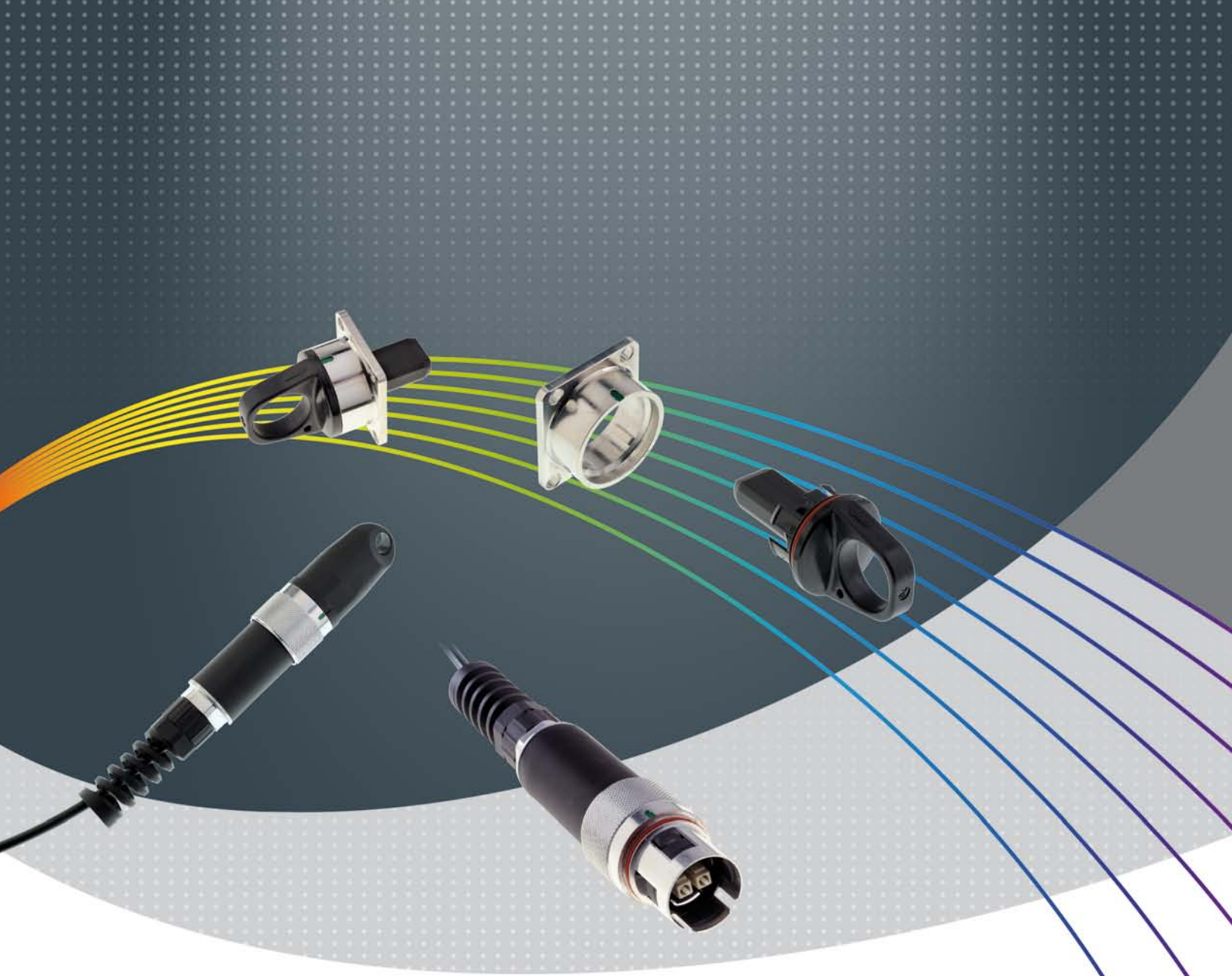
R2CT™ cable assemblies with RJ45 connectors on 5 to 7 mm diameter cable are available in any length on demand. Other cable diameters are available on request.

PATCH CORDS



Radiall can also provide any configuration of LC optical patch cords or RJ45 patch cords for use with the R2CT™ Plug Kit.

For more detailed information: please refer to the “Cable assemblies” section of this catalogue.



OSIS™ Series

OSIS

RADIALL
The next conneXion

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INTRODUCTION

OSIS™: The One Step Interconnection Solution

OSIS by Radiall™ connector (Trademark of Radiall) is a new fast connection system dedicated to outdoor telecom FTTA applications in new generation of flexible base stations.
Designed for insuring waterproof connection for optical links in field conditions, this very flexible push-pull connector allows a connection by the operator in only one click:
"the quickest outdoor interconnection solution"

OSIS™ is available as a component (Plug Kit) to fit on any conventional LC connector or as a complete cable assembly.

BENEFITS & FEATURES

- **Easy to install**
  - Quick lock Push-Pull connection system in One Step – *Patent Pending*
  - Direct Plug into SFP module
  - Compensation of the transceiver position tolerances in X, Y and Z axis

- **Robust and safe**
  - LC connectors always protected
  - Waterproof and dustproof
  - Important tensile strength

- **Flexible and modular**
  - Kit assembled in the field without tools over existing optical patch cords
  - Compatible with a large range of standard LC connectors and standard SFP transceivers

- **High density**
  - Stackable

APPLICATIONS

- **Fiber To The Antenna**
- **Outdoor telecom**
- **Industrial connections**

OSIS™ connector has been designed to fulfill the qualification requirements of IEC 61300 standard (for fiber optic interconnection devices)

MECHANICAL CHARACTERISTICS

Cable retention	200 N
Mating endurance	100 mating cycles minimum

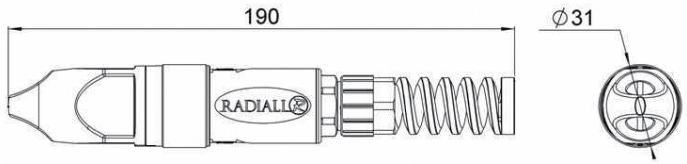
ENVIRONMENTAL CHARACTERISTICS

Ingress Protection class	IP65 or IP67 optionally (*)
Operating temperature	-40°C / +85°C
Storage temperature	-40°C / +85°C
Salt mist	IEC 61300-2-26 passed
Vibrations	IEC 61300-2-1 passed

(*): IP65 for full assembly by kit in the field over existing patch cords

PRODUCT RANGE

OSIS™ PLUG KIT

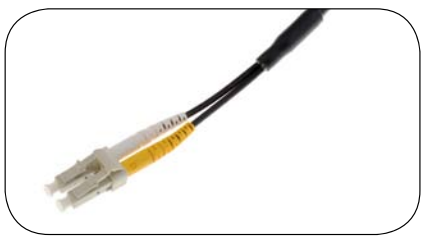


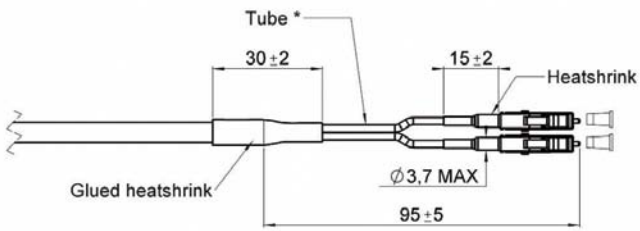
Part number	Note	Packaging
OSIS 115 000	Plug connector only: no patch cord	unitary in plastic bag with assembly note

The OSIS™ Plug Kit is adapted to all types of optical cable assemblies with simplex or duplex standard LC connectors and 5 to 7 mm diameter MultiMode or SingleMode field cable – other diameters on request.

To guarantee proper operation when the OSIS™ Plug Kit is assembled over existing optical patch cords, the following fan-out definition is recommended:

FIBER STRIPPING AND TUBING RECOMMENDATIONS:





* Tube must be flexible enough to guarantee an even bending radius of the fiber.

RADIALL recommends the use of **OSIS 990 000** retubing kit.

OSIS™ RECEPTACLES

The standard OSIS™ receptacle is IP67 waterproof.
The receptacle is delivered with the protection cap mounted on the body.
It includes a center pin which has to be inserted into the transceiver cage to center the receptacle in X and Y axis before to fix it on the panel with screws.

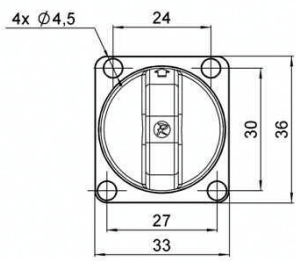


Figure 1

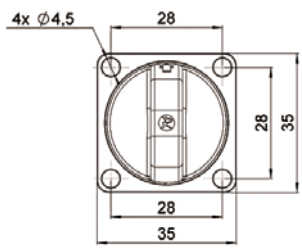
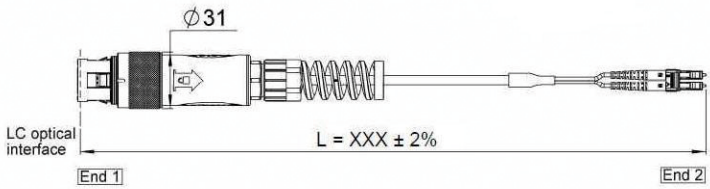


Figure 2

Part number	Figure	Description
OSIS 107 000	1	Receptacle with Trapezoidal fixture holes (foot print 24 / 27 x 30 mm)
OSIS 107 001		Receptacle with Trapezoidal fixture holes (foot print 24 / 27 x 30 mm) with cord
OSIS 107 002	2	Receptacle with Square fixture holes (foot print 28 x 28 mm)

OSIS™ PRE-MOUNTED OPTICAL CABLE ASSEMBLIES



Any configuration of pre-mounted optical cable assembly with OSIS™ is available on demand:

- Field cables with diameters of 5 to 7 mm on standard – other cable sizes on request
- Standard LC connectors (OSIS side)
- Any possibility of optical connectors on the opposite side (LC, SC, FC, ST, ...)
- Simplex or duplex connectors
- MultiMode (50/125 or 62.5/125 on request) or SingleMode (9/125) field cable
- Polishing/finishing: PC or APC

OPTICAL CHARACTERISTICS

According to IEC 61300-3-4 and IEC 61300-3-6

MultiMode field cable

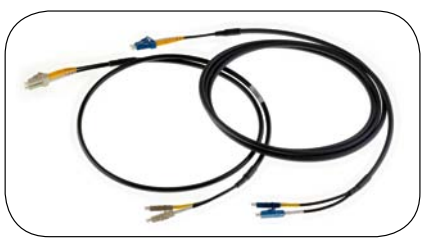
Insertion Loss (mated with reference plug) (@850 nm)	≤ 1.2 dB + 2.5 dB/Km

SingleMode field cable

Insertion Loss (mated with reference plug) (@1310 & 1550 nm)	≤ 1.2 dB
Return Loss (@1310 & 1550 nm)	RL > 45 dB

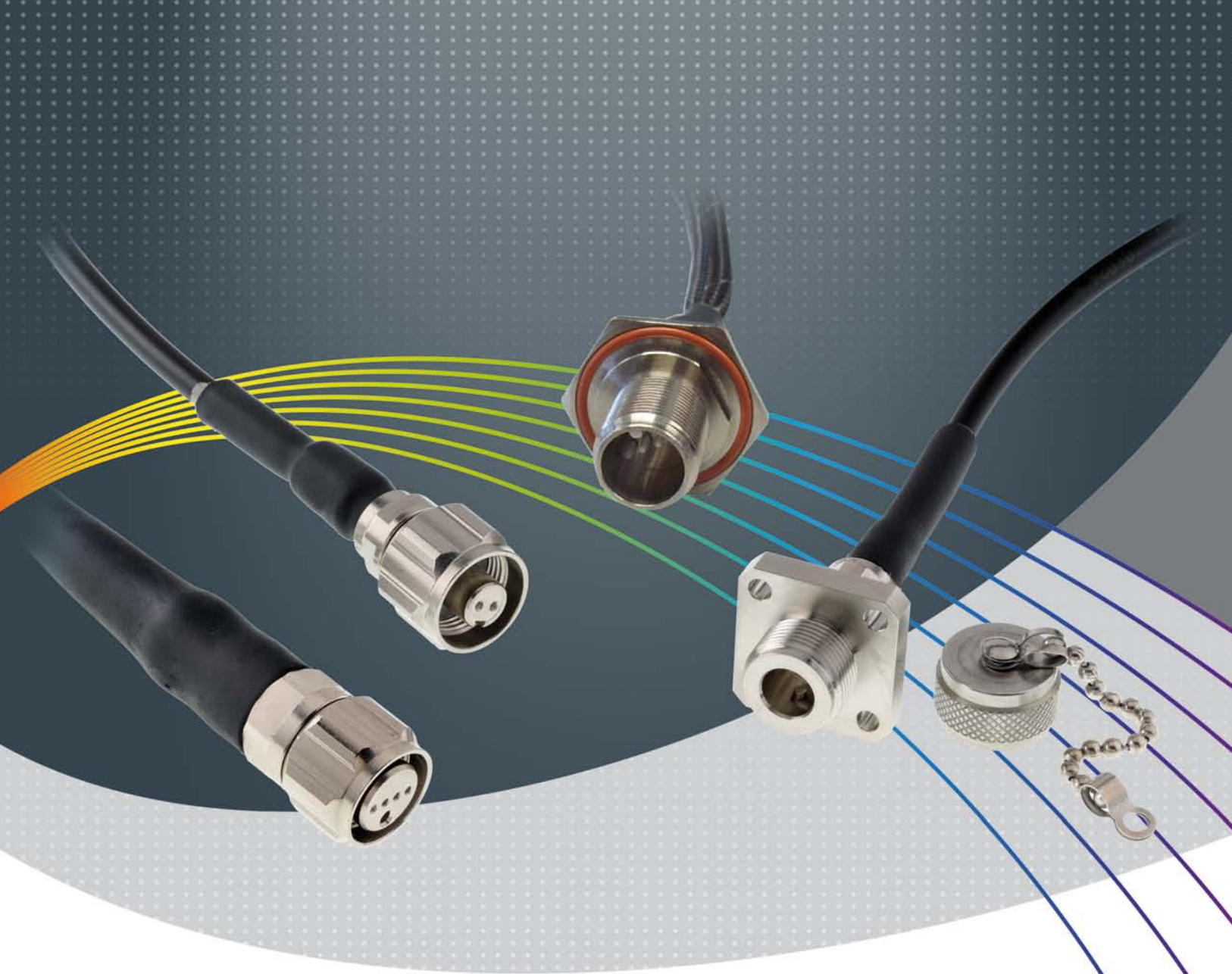
LC PATCH CORDS

Radiall can also provide any configuration of LC optical patch cords for use with the OSIS™ Plug Kit.



For more detailed information: please refer to the “Cable assemblies” section of this catalogue.

NOTES



ODC® Series

F760 - F792

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Pages

INTRODUCTION

ODC® CONNECTOR: OUTDOOR CONNECTOR

Dedicated to outdoor optical connections, ODC® connectors are available with MultiMode or SingleMode simplex or outdoor field cables.
A quick-locking design with IP67 sealing and low loss insertion allows this connector to be used in harsh environments.
ODC® is a registered trademark of Huber&Suhner.

BENEFITS & FEATURES

- **Robust connection**
  - Fully protected ceramic ferrules and alignment sleeves: no risk to damage the optical faces during mounting/ dismounting operations
- **Easy installation**
  - Standard interface: N type connector size
  - Screwed locking mechanism: easy to install (U-19mm wrench / 1 N.m torque)
  - Fast and easy connection: blind mate coupling
- **Resistant in harsh environment, adapted for outdoor use**
  - Waterproof connection
  - Dust proof
  - Corrosion resistant / EMI immunity
  - High tensile strength

CHARACTERISTICS

OPTICAL CHARACTERISTICS

Insertion loss (IEC 61300-3-4)	MultiMode	typ ≤ 0.2 dB (max ≤ 0.5dB)
	SingleMode	typ ≤ 0.2 dB (max ≤ 0.7 dB)
Return loss	SingleMode	≥ 50dB

MECHANICAL CHARACTERISTICS

Tensile resistance	ODC® plug	≤ 800 N tensile strength (with field cable)
	ODC® socket	≤ 30 N tensile strength (with simplex cable)
Mating endurance	IEC 61300-2-2	200 cycles minimum

ENVIRONMENTAL CHARACTERISTICS

Operating temperature range	IEC 61300-2-22	-40°C/ +85°C (depending on the cable type)
Salt mist	IEC 61300-2-26	passed
Vibration	IEC 61300-2-1	passed
Ingress Protection class	IP 67 (with cap or when coupled)	

MATERIAL

Housing	Brass
Plating	Nickel-silver (for EMP best protection)

ODC® PLUGS

ODC2 P 	MultiMode	Standard type
	SingleMode	
ODC4 P 	MultiMode	Standard type
	SingleMode(*)	

ODC® SOCKETS

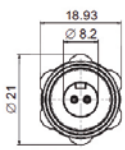
ODC2 S 	MultiMode	Square flange SMALL size 25.4x25.4 mm
	SingleMode	
ODC2 S 	MultiMode	Square flange LARGE size 32x32 mm
	SingleMode	
ODC2 S 	MultiMode	Hexagonal flange (30mm on flats)
	SingleMode(*)	
ODC4 S 	MultiMode	Square flange SMALL size 25.4x25.4 mm
	SingleMode(*)	
ODC4 S 	MultiMode	Hexagonal flange (30mm on flats)
	SingleMode(*)	

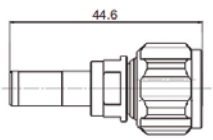
(*) SingleMode version available on request

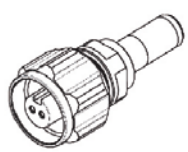
DIMENSIONS

ODC® PLUGS

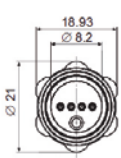
ODC2 Plug

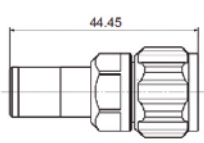


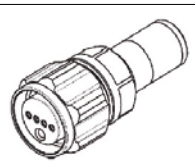



3D view

ODC4 Plug



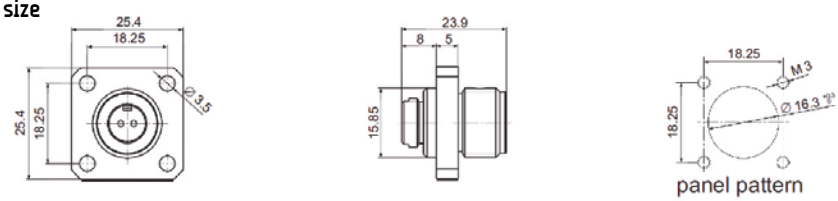



3D view

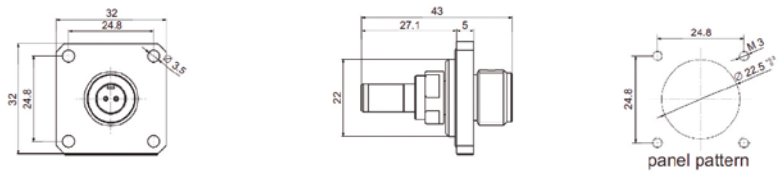
PRODUCT RANGE

ODC® SOCKETS

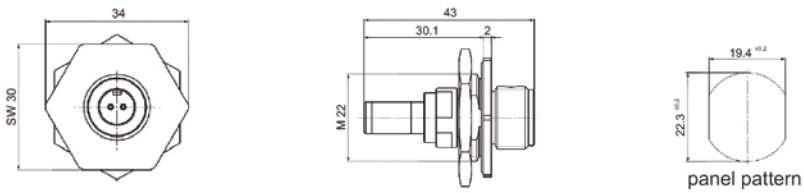
ODC2 Socket square flange small size



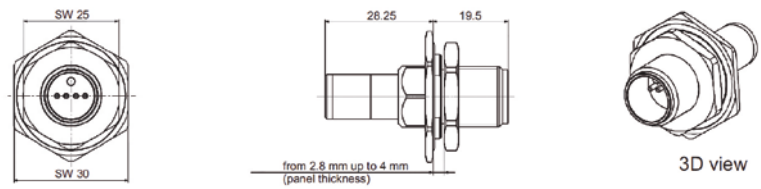
ODC2 Socket square flange large size



ODC2 Socket hexagonal flange



ODC4 Socket hexagonal flange



ACCESSORIES

Metallic cap

Plastic cap

Vinyl cap

ODC® CABLE ASSEMBLIES

Please refer to the “Cable Assemblies” section of this catalogue.

PRO BEAM® Series

PRO BEAM® expanded beam field deployable interconnect
F739

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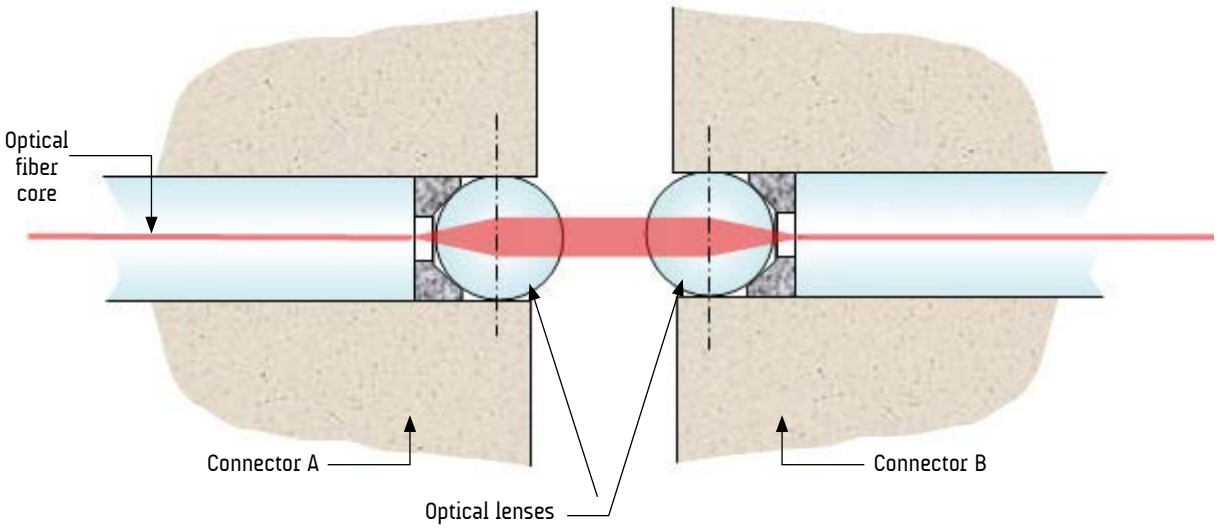
CONTENTS

Pages

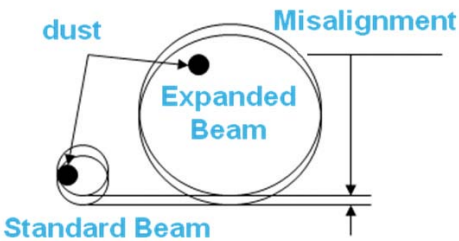
INTRODUCTION

The PRO BEAM® is a fiber optic interconnect solution based on the expanded beam technology.
Description of the expanded beam technology:

- Light beam from fiber A is expanded and then collimated through lens A and transmitted to connector B through an air gap
- Light is then refocused onto the core of fiber B through lens B and travels within fiber B



BENEFITS



- **Advantages of the expanded beam technology**
  - The beam is expanded: the connection will be less sensitive to dust pollution. It is also less sensitive to alignment variations due to environmental conditions
  - This is a contactless connection: there is less risk of degradation of the optical interfaces

KEY FEATURES

With the PRO BEAM® connector range, Radiall provides a field proven interconnect solution for harsh environment applications. Among main features and benefits, PRO BEAM® shows:

- A unique modular system with inserts that can be used in various connector types, with MultiMode or SingleMode fibers and various cable diameters
- A ruggedized hermaphroditic construction, allowing easy connection and great flexibility for cable assembly management on the field
- Inserts that are designed to be optimal at the operating wavelength (common 850nm / 1300nm dual wavelengths, 1310nm or 1550nm wavelengths)
- Inserts that are designed to ensure alignment and low loss repeatable performance
- Inserts that can have 2 or 4 channels
- Very high mating capability due to its ruggedized construction and the absence of contact between the 2 optical interfaces
- Easy maintenance: insensitivity to particular pollution and ease of cleaning because of the protective coating on the lenses

APPLICATIONS

- **Field deployable Army and Navy communication systems**
- **Avionics**
- **Broadcast**
- **Oil research**
- **Transportation**
- **Any other application in harsh environment requiring durability, easay maintenance and reliable performance with multiple connection cycles**

STANDARDIZATION

The PRO BEAM® connectors are described in MIL-PRF-83526/20 and MIL-PRF-83526/21.

CHARACTERISTICS AND PERFORMANCE

OPTICAL CHARACTERISTICS

	MultiMode	SingleMode
Insertion loss (typical)	0.7 dB (1300 nm)	0.7 dB (1310 nm)
Insertion loss (Maximum)	1.5 dB	2 dB
Return loss		> 34 dB (1310 or 1550 nm)

MECHANICAL CHARACTERISTICS

Vibration, sinusoidal	10 – 500 Hz, 3 directions, 0.75 mm amplitude, 10 g acceleration
Bumps	4000 bumps, 3 directions, 40 g acceleration
Free fall on concrete, severity 1.2 m	500 falls
Mating endurance	3000 mating cycles

ENVIRONMENTAL CHARACTERISTICS

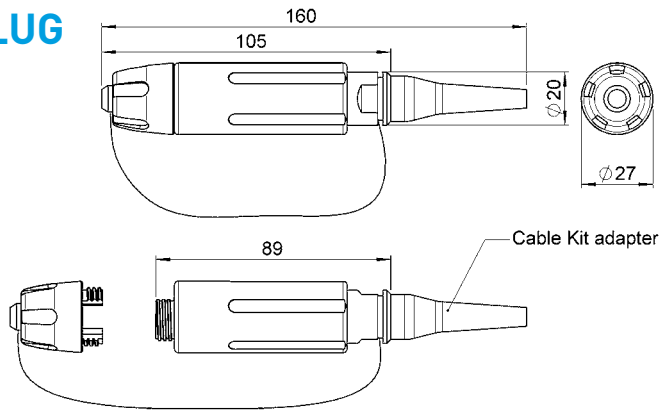
Operating temperature	-40°C / +85°C
Storage temperature	-55°C / +85°C
Humidity (damp heat)	95% HR
Immersion	15 m depth

MATERIAL

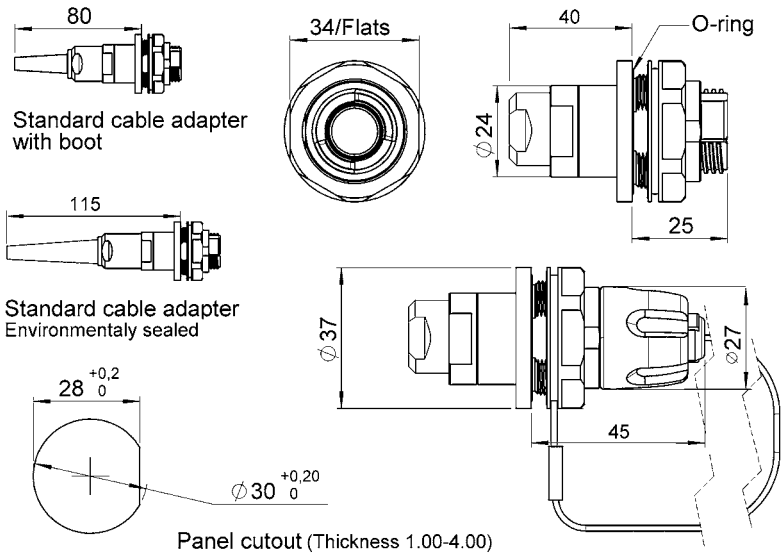
Shell	Aluminum
Plating	Clear hard anodized
Plug boot	EPDM rubber (high resistance to tearing an damage, ideal for outdoor exposure) or fluorosilicone (to be used when direct contact with petrochemicals)

For other materials such as Nickel Aluminum Bronze connectors for naval applications, please contact your local Radiall representative.

STRAIGHT PLUG

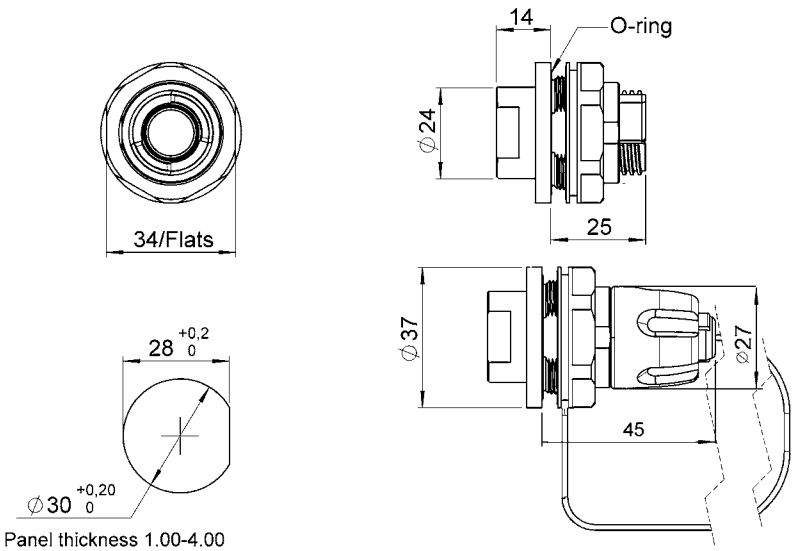


BULKHEAD RECEPTACLE D-HOLE SHAPE, FOR MULTI FIBER CABLE



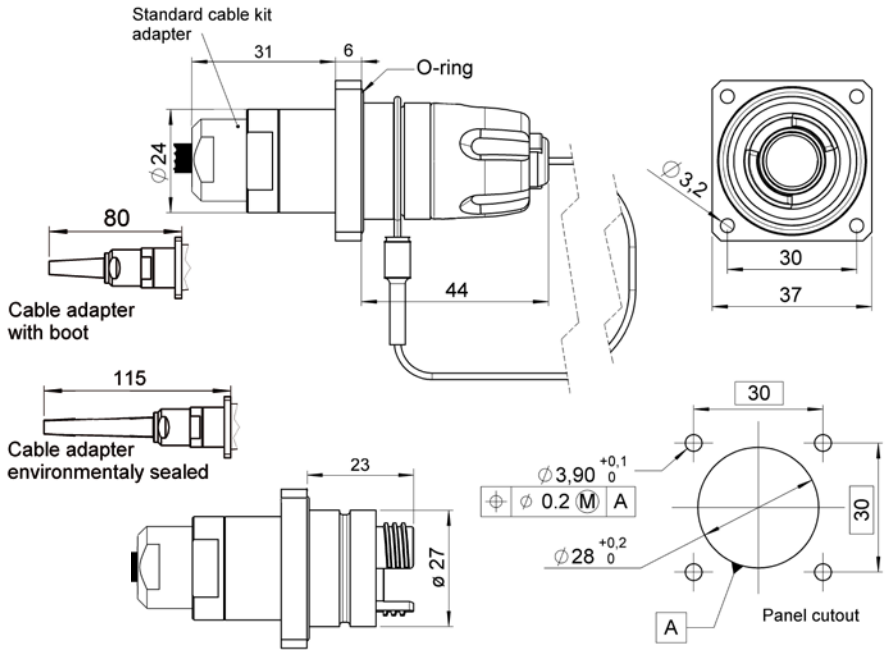
BULKHEAD RECEPTACLE WITH D-SHAPE, LOW PROFILE

To be assembled with up to 4 cables, maximum diameter 1.6 mm



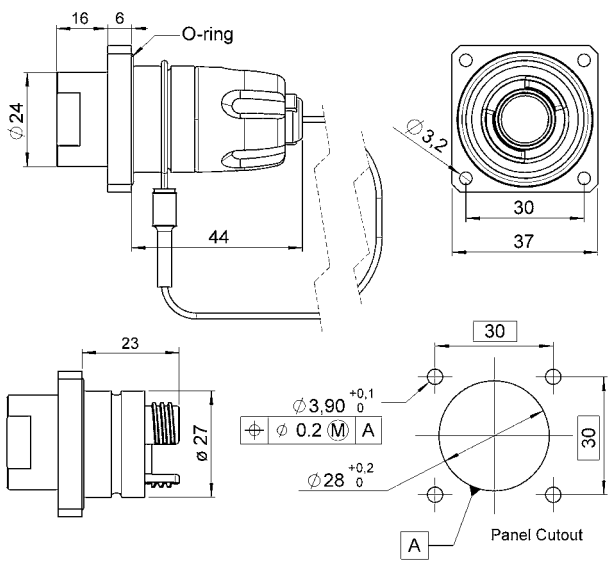
PRO BEAM® JUNIOR PRODUCT RANGE

BULKHEAD RECEPTACLE WITH SQUARE FLANGE FOR MULTI FIBER CABLE



BULKHEAD RECEPTACLE WITH SQUARE FLANGE, LOW PROFILE

To be assembled with up to 4 cables, maximum diameter 1.6 mm



Technical datasheets are available on the Radiall website or via your local Radiall representative

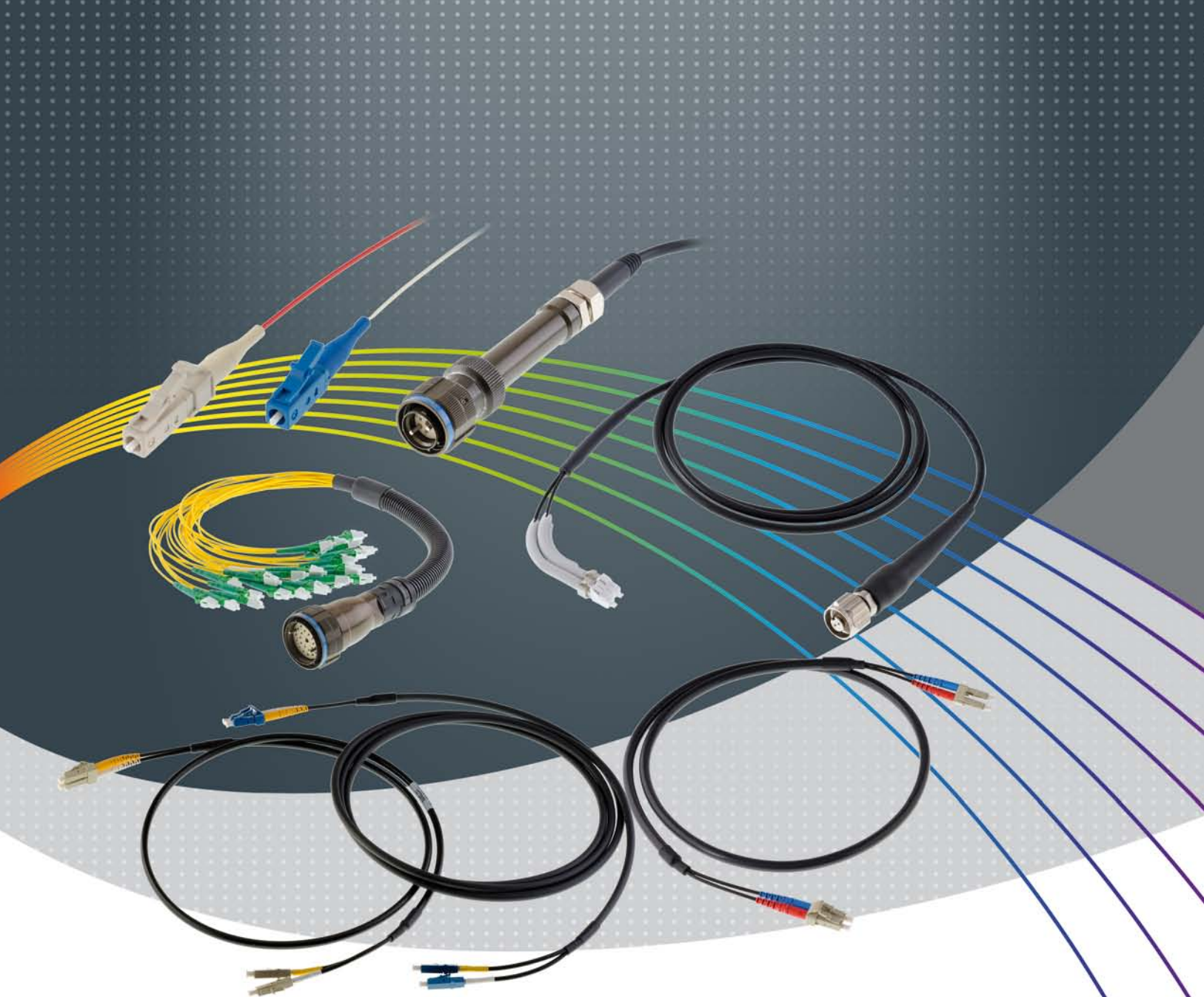
PRO BEAM® JUNIOR PRODUCT RANGE

Radiall offers the PRO BEAM® Junior product range along with other products with the same design but with different sizes, like the PRO BEAM® Mini. These tactical connectors are only available through cable assemblies, with a wide range of field orientated accessories. Refer to the cable assembly section for part numbers for PRO BEAM® cable assemblies.

Radiall also offers expanded beam interconnect solutions using the Mini expanded beam insert in other connector packaging.

For more information on these products, please contact your local Radiall representative.

NOTES



Cable assemblies

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CONTENTS

INTRODUCTION

Radiall offers a full range of cable assemblies covering all the different needs for indoor, outdoor and harsh environment applications.

Thanks to its expertise and manufacturing capabilities, Radiall provides its customers a complete solution for interconnect fiber optics systems: including patch cords, pigtails and multi-fiber assemblies and harnesses.

• Radiall manufacturing capabilities

Radiall has a great capability to assemble, manufacture and test its cable assemblies in its factories worldwide. Radiall offers its customers the proximity needed to provide the best quality, service and delivery performance. Our facilities feature state of the art equipments and are at least certified ISO9001-V2008.

• Flexible configurations

In order to cover all kind of applications, Radiall offers a very wide range of cables assemblies combining various types of optical fibers, cables and connectors.

Some common configurations are described in the following sections. For other configuration, please contact your local Radiall representative with your specifications.

• Wide range of optical fibers

Radiall is able to supply cable assemblies equipped with SingleMode, bend insensitive SingleMode and all kinds of MultiMode Fibers:

- OS1 SM
- OS2 SM
- OM1 MM 62.5/125
- OM2 MM 50/125
- OM3 MM 50/125 Optimized for 850nm
- OM4 MM 50/125
- Larger core MultiMode fibers

• Wide range of cable types

Many cable types are available in Radiall for cable assembly manufacturing:

- Simplex, duplex and multi fiber cable
- Indoor (-20° / +70°C)
- Outdoor (-40° / +85°C)
- Harsh environment (-55°/ +125°C).

The following table gives an example of the most popular cables used for either indoor or outdoor applications.

Application	Diameter, in mm	Fiber type	Nb of fibers	T°min, in °C	T°max, in °C
indoor	0,9	SM 9/125 G652	1	-20	70
indoor	0,9	MM 62,5/125	1	-20	70
indoor	0,9	MM 50/125 OM2	1	-20	70
indoor	2	SM 9/125 G652	1	-20	70
indoor	2	MM 50/125 OM2	1	-20	70
indoor	2	MM 62,5/125	1	-20	70
indoor	2	MM 50/125 OM2	1	-40	85
indoor	2	SM 9/125 G652	1	-40	85
indoor	3	SM 9/125 G652	1	-20	70
indoor	3	MM 62,5/ 125	1	-20	70
indoor	3	MM 50/125 OM2	1	-20	70
indoor	2x2	SM 9/125 G652	2	-20	70
indoor	2x2	MM 62,5/125	2	-20	70
indoor	2x2	MM 50/125 OM2	2	-20	70
indoor	2x2	MM 50/125 OM3	2	-20	70
indoor	2x3	SM 9/125 G652	2	-20	70
indoor	2x3	MM 62,5/125	2	-20	70
indoor	2x3	MM 50/125 OM2	2	-20	70
outdoor	5	SM 9/125 G652	2	-40	85
outdoor	5	MM 50/125 OM2	2	-40	85
outdoor	5	SM 9/125 G657a	2	-40	85
outdoor	5	MM 50/125 OM2	4	-40	85
outdoor	7	SM 9/125 G652	2	-40	85
outdoor	7	MM 50/125 OM2	2	-40	85
outdoor	7	SM 9/125 G657a	2	-40	85
outdoor	10,5	SM 9/125 G652	12	-40	70
outdoor	10,5	SM 9/125 G652	24	-40	70

Harsh environment cables are described in section 4.

- **Flexibility in cable labelling**

Cable labelling can be specified by the customer: color, position, text can be specified during cable configuration.

INTRODUCTION

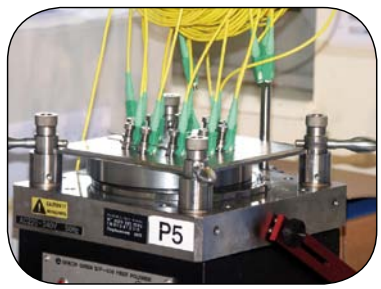
• Wide range of Connectors with different polishing techniques

Radiall's benefits from its core competencies to manufacture and deliver high quality cable assemblies equipped with best in class connectors.

Depending on the customer's needs, the following process can be used:

- PC: Physical Contact for MultiMode or SingleMode connection
- UPC: Ultra Physical Contact for SingleMode or MultiMode, giving higher performance than PC as the final polishing step uses a finer grain size polishing paper.
- APC 8° & 9°: Angled Physical Contact for SingleMode only, giving very high performance for return loss due to the angle made on the fiber end face.

Please refer to each individual connector section of this catalogue for the detailed specifications.



• Test and quality insurances

All our cable assemblies are 100% tested for insertion loss and optical face visual inspection.
They are tested following the IEC 61300 standards.
Aerospace and military cable assemblies are tested following ARINC or SAE standards.

We can deliver test measurement sheets with detailed reporting of the performances of the cable assemblies.

INDOOR CABLE ASSEMBLIES

With the increasing demand on high speed communication, indoor cable assemblies are more and more required to be installed.

Available in simplex and duplex configuration as well as in multi-channels harnesses, the indoor series offers all the performances to apply to different applications.

Radiall's indoor cable assemblies are declined in 2 series:

- an ECO range: a cost-effective solution for most applications
- a customer specific assemblies series

Radiall is flexible enough to provide customized cable assemblies, please contact the Radiall sales team with your specific requirements.

ECO RANGE

Radiall has developed its Eco Range to comply with market requirements regarding pricing and availability.

Eco Range cable assemblies are recommended as a cost efficient solution for equipment links in standard environments, with pre-defined configurations.

They are available as pigtails, patch cords, simplex or duplex, SingleMode or MultiMode.

They are delivered with a wide variety of industry-standard connectors, including LC, SC and ST styles.

CHARACTERISTICS

OPTICAL, ENVIRONMENTAL AND MECHANICAL PERFORMANCE

Insertion loss (mated with reference plug according to IEC61300-3-4)	0.5 dB		
Return losses	MultiMode PC > 20 dB	SingleMode UPC > 50 dB	SingleMode APC > 60 dB
Temperature range (storage and operating)	- 20°C / +70°C		
Cable retention	Buffer : 7N	2mm cable : 68N	3mm cable : 100N

GENERAL

	SC	LC	ST
Connector standard	IEC 61754-4	IEC 61754-20	IEC 1754-2
Duplex clip	Removable	Removable	-
Mechanical endurance	200 matings	200 matings	500 matings

CABLE STRUCTURE

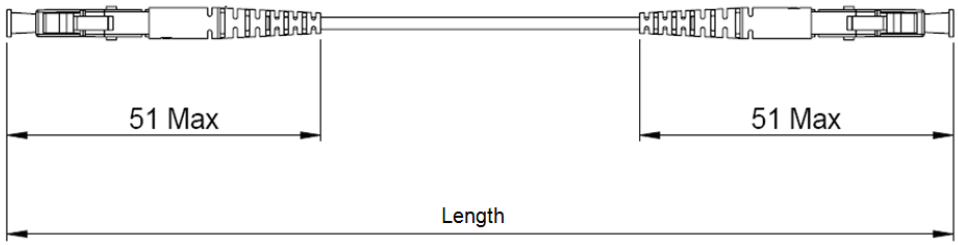
Cable diameter	Cable structure
2 mm / 3 mm	Tight
900 µm buffer	Loose

COLOR CODE

		Simplex			Duplex		
		MM	SM UPC	SM APC 8°	MM	SM UPC	SM APC 8°
LC	body color	beige	blue	green	beige	blue	green
	boot color	beige	blue	green	black & red	black & blue	black & green
SC	body color	beige	blue	green	beige	blue	green
	boot color	beige	blue	green	black & red	black & blue	black & green
ST	body color	metal	metal	-	metal	metal	-
	boot color	black	blue	-	black & red	black & blue	-

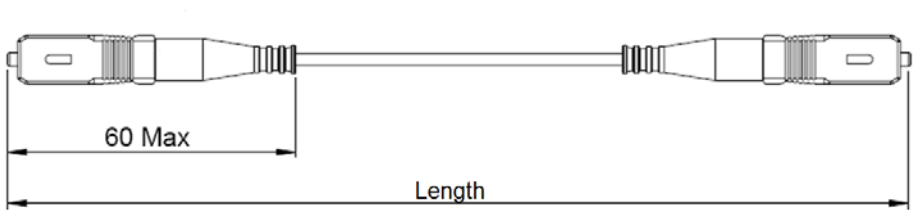
SIMPLEX PATCHCORDS

• **LC – LC Simplex** Cable diameter 2mm



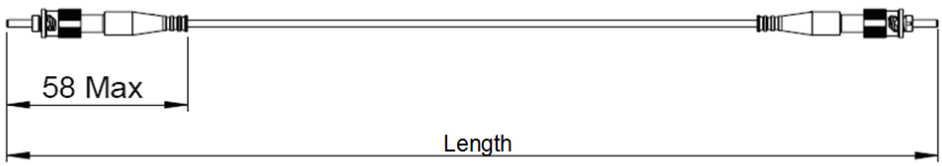
Connector	Length (meters)	LC / LC SIMPLEX MultiMode 50/125	LC / LC SIMPLEX MultiMode 62.5/125	LCUPC / LCUPC SIMPLEX SingleMode 9/125	LCAPC / LCAPC SIMPLEX SingleMode 9/125
LC to LC	1	ELC50LCC2S1M	ELC62LCC2S1M	ELC9LCC2S1M	ELCA9LCAC2S1M
	2	ELC50LCC2S2M	ELC62LCC2S2M	ELC9LCC2S2M	ELCA9LCAC2S2M
	3	ELC50LCC2S3M	ELC62LCC2S3M	ELC9LCC2S3M	ELCA9LCAC2S3M
	5	ELC50LCC2S5M	ELC62LCC2S5M	ELC9LCC2S5M	ELCA9LCAC2S5M
	10	ELC50LCC2S10M	ELC62LCC2S10M	ELC9LCC2S10M	ELCA9LCAC2S10M
	15	ELC50LCC2S15M	ELC62LCC2S15M	ELC9LCC2S15M	ELCA9LCAC2S15M

• **SC – SC Simplex** Cable diameter 3mm



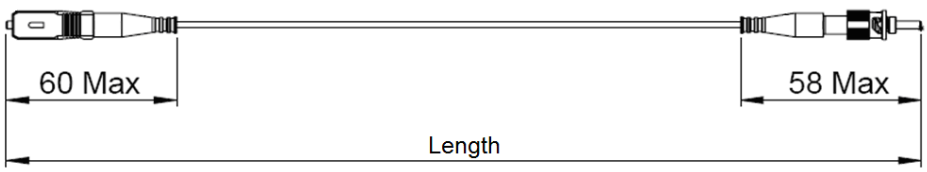
Connector	Length (meters)	SC / SC SIMPLEX MultiMode 50/125	SC / SC SIMPLEX MultiMode 62.5/125	SCUPC / SCUPC SIMPLEX SingleMode 9/125	SCAPC / SCAPC SIMPLEX SingleMode 9/125	SCUPC / SC APC SIMPLEX Singlemode 9/125
SC to SC	1	ESC50SCC3S1M	ESC62SCC3S1M	ESC9SCC3S1M	ESCA9SCAC3S1M	ESC9SCA3CS1M
	2	ESC50SCC3S2M	ESC62SCC3S2M	ESC9SCC3S2M	ESCA9SCAC3S2M	ESC9SCA3CS2M
	3	ESC50SCC3S3M	ESC62SCC3S3M	ESC9SCC3S3M	ESCA9SCAC3S3M	ESC9SCA3CS3M
	5	ESC50SCC3S5M	ESC62SCC3S5M	ESC9SCC3S5M	ESCA9SCAC3S5M	ESC9SCA3CS5M
	10	ESC50SCC3S10M	ESC62SCC3S10M	ESC9SCC3S10M	ESCA9SCAC3S10M	ESC9SCA3CS10M
	15	ESC50SCC3S15M	ESC62SCC3S15M	ESC9SCC3S15M	ESCA9SCAC3S15M	ESC9SCA3CS15M

• **ST – ST Simplex** Cable diameter 3mm



Connector	Length (meters)	ST / ST SIMPLEX MultiMode 50/125	ST / ST SIMPLEX MultiMode 62.5/125	ST / ST SIMPLEX SingleMode 9/125
ST to ST	1	EST50STC3S1M	EST62STC3S1M	EST9STC3S1M
	2	EST50STC3S2M	EST62STC3S2M	EST9STC3S2M
	3	EST50STC3S3M	EST62STC3S3M	EST9STC3S3M
	5	EST50STC3S5M	EST62STC3S5M	EST9STC3S5M
	10	EST50STC3S10M	EST62STC3S10M	EST9STC3S10M
	15	EST50STC3S15M	EST62STC3S15M	EST9STC3S15M

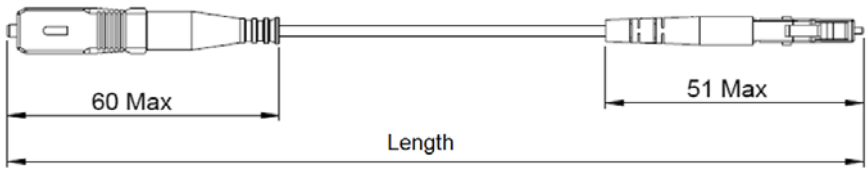
• **SC – ST Simplex** Cable diameter 3mm



Connector	Length (meters)	SC / ST SIMPLEX MultiMode 50/125	SC / ST SIMPLEX MultiMode 62.5/125	SCUPC / ST SIMPLEX SingleMode 9/125	SCUPC / SC APC SIMPLEX SingleMode 9/125
SC to ST	1	ESC50STC3S1M	ESC62STC3S1M	ESC9STC3S1M	ESC9SCA3CS1M
	2	ESC50STC3S2M	ESC62STC3S2M	ESC9STC3S2M	ESC9SCA3CS2M
	3	ESC50STC3S3M	ESC62STC3S3M	ESC9STC3S3M	ESC9SCA3CS3M
	5	ESC50STC3S5M	ESC62STC3S5M	ESC9STC3S5M	ESC9SCA3CS5M
	10	ESC50STC3S10M	ESC62STC3S10M	ESC9STC3S10M	ESC9SCA3CS10M
	15	ESC50STC3S15M	ESC62STC3S15M	ESC9STC3S15M	ESC9SCA3CS15M

ECO RANGE

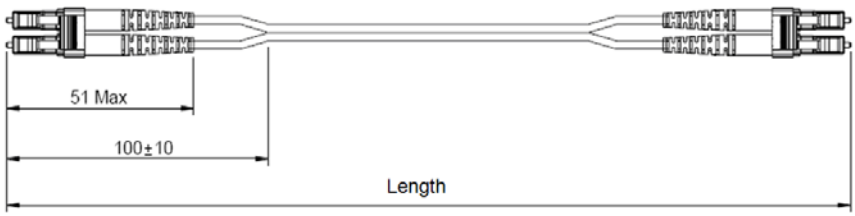
- **SC – LC Simplex** Cable diameter 2mm



Connector	Length (meters)	SC / LC SIMPLEX MultiMode 50/125	SC / LC SIMPLEX MultiMode 62.5/125	SCUPC / LCUPC SIMPLEX SingleMode 9/125
SC to LC	1	ESC50LCC2S1M	ESC62LCC2S1M	ESC9LCC2S1M
	2	ESC50LCC2S2M	ESC62LCC2S2M	ESC9LCC2S2M
	3	ESC50LCC2S3M	ESC62LCC2S3M	ESC9LCC2S3M
	5	ESC50LCC2S5M	ESC62LCC2S5M	ESC9LCC2S5M
	10	ESC50LCC2S10M	ESC62LCC2S10M	ESC9LCC2S10M
	15	ESC50LCC2S15M	ESC62LCC2S15M	ESC9LCC2S15M

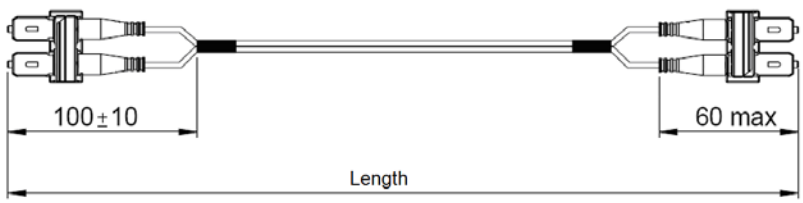
DUPLEX PATCHCORDS

• **LC – LC Duplex** Cable diameter 2x2 mm



Connector	Length (meters)	LC / LC DUPLEX MultiMode 50/125	LC / LC DUPLEX MultiMode 62.5/125	LCUPC / LCUPC DUPLEX SingleMode 9/125	LCAPC / LCAPC DUPLEX SingleMode 9/125
LC to LC	1	ELC50LCC2D1M	ELC62LCC2D1M	ELC9LCC2D1M	ELCA9LCAC2D1M
	2	ELC50LCC2D2M	ELC62LCC2D2M	ELC9LCC2D2M	ELCA9LCAC2D2M
	3	ELC50LCC2D3M	ELC62LCC2D3M	ELC9LCC2D3M	ELCA9LCAC2D3M
	5	ELC50LCC2D5M	ELC62LCC2D5M	ELC9LCC2D5M	ELCA9LCAC2D5M
	10	ELC50LCC2D10M	ELC62LCC2D10M	ELC9LCC2D10M	ELCA9LCAC2D10M
	15	ELC50LCC2D15M	ELC62LCC2D15M	ELC9LCC2D15M	ELCA9LCAC2D15M

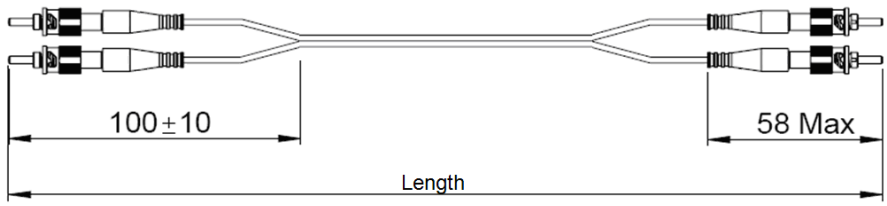
• **SC – SC Duplex** Cable diameter 2x3 mm



Connector	Length (meters)	SC / SC DUPLEX MultiMode 50/125	SC / SC DUPLEX MultiMode 62.5/125	SCUPC / SCUPC DUPLEX SingleMode 9/125	SCAPC / SCAPC DUPLEX SingleMode 9/125	SCUPC / SCAPC DUPLEX SingleMode 9/125
SC to SC	1	ESC50SCC3D1M	ESC62SCC3D1M	ESC9SCC3D1M	ESCA9SCAC3D1M	ESC9SCA3CD1M
	2	ESC50SCC3D2M	ESC62SCC3D2M	ESC9SCC3D2M	ESCA9SCAC3D2M	ESC9SCA3CD2M
	3	ESC50SCC3D3M	ESC62SCC3D3M	ESC9SCC3D3M	ESCA9SCAC3D3M	ESC9SCA3CD3M
	5	ESC50SCC3D5M	ESC62SCC3D5M	ESC9SCC3D5M	ESCA9SCAC3D5M	ESC9SCA3CD5M
	10	ESC50SCC3D10M	ESC62SCC3D10M	ESC9SCC3D10M	ESCA9SCAC3D10M	ESC9SCA3CD10M
	15	ESC50SCC3D15M	ESC62SCC3D15M	ESC9SCC3D15M	ESCA9SCAC3D15M	ESC9SCA3CD15M

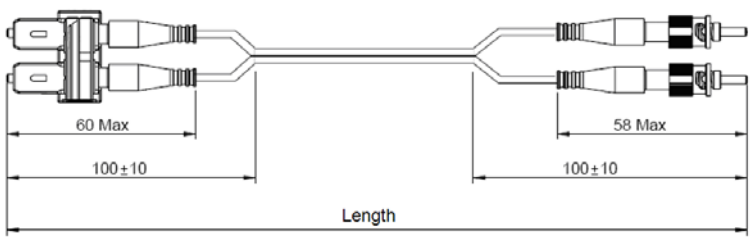
ECO RANGE

• **ST – ST Duplex** Cable diameter 2x3 mm



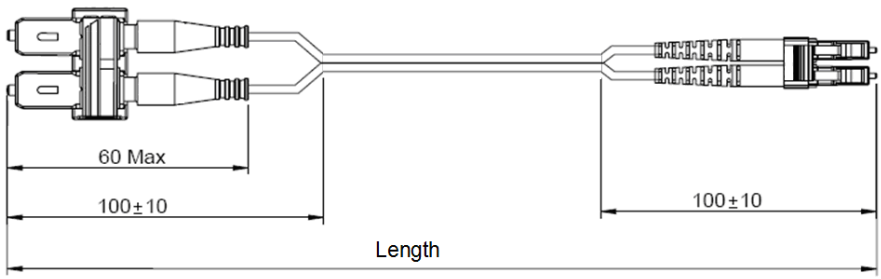
Connector	Length (meters)	ST / ST DUPLEX MultiMode 50/125	ST / ST DUPLEX MultiMode 62.5/125	ST / ST DUPLEX SingleMode 9/125
ST to ST	1	EST50STC3D1M	EST62STC3D1M	EST9STC3D1M
	2	EST50STC3D2M	EST62STC3D2M	EST9STC3D2M
	3	EST50STC3D3M	EST62STC3D3M	EST9STC3D3M
	5	EST50STC3D5M	EST62STC3D5M	EST9STC3D5M
	10	EST50STC3D10M	EST62STC3D10M	EST9STC3D10M
	15	EST50STC3D15M	EST62STC3D15M	EST9STC3D15M

• **SC – ST Duplex** Cable diameter 2x3 mm



Connector	Length (meters)	SC / ST DUPLEX MultiMode 50/125	SC / ST DUPLEX MultiMode 62.5/125	SCUPC / ST DUPLEX SingleMode 9/125
SC to ST	1	ESC50STC3D1M	ESC62STC3D1M	ESC9STC3D1M
	2	ESC50STC3D2M	ESC62STC3D2M	ESC9STC3D2M
	3	ESC50STC3D3M	ESC62STC3D3M	ESC9STC3D3M
	5	ESC50STC3D5M	ESC62STC3D5M	ESC9STC3D5M
	10	ESC50STC3D10M	ESC62STC3D10M	ESC9STC3D10M
	15	ESC50STC3D15M	ESC62STC3D15M	ESC9STC3D15M

• **SC – LC Duplex** Cable diameter 2x2 mm



Connector	Length (meters)	SC / LC DUPLEX MultiMode 50/125	SC / LC DUPLEX MultiMode 62.5/125	SCUPC / LCUPC DUPLEX SingleMode 9/125
SC to LC	1	ESC50LCC2D1M	ESC62LCC2D1M	ESC9LCC2D1M
	2	ESC50LCC2D2M	ESC62LCC2D2M	ESC9LCC2D2M
	3	ESC50LCC2D3M	ESC62LCC2D3M	ESC9LCC2D3M
	5	ESC50LCC2D5M	ESC62LCC2D5M	ESC9LCC2D5M
	10	ESC50LCC2D10M	ESC62LCC2D10M	ESC9LCC2D10M
	15	ESC50LCC2D15M	ESC62LCC2D15M	ESC9LCC2D15M

ECO RANGE

PIGTAILS

Set of 12 colored pigtails / 900 µm / 2 meters length
Color buffer: RED / GREEN / BLUE / YELLOW / WHITE / GREY / BROWN / PURPLE / AQUA / BLACK / ORANGE / PINK

Connector	Fiber type	Part Number
SCUPC	SingleMode 9/125	**ESC9X12C09S2M**
SCAPC	SingleMode 9/125	**ESCA9X12C09S2M**
SC	MultiMode 50/125	**ESC50X12C09S2M**
SC	MultiMode 62.5/125	**ESC62X12C09S2M**
LCUPC	SingleMode 9/125	**ELC9X12C09S2M**
LCAPC	SingleMode 9/125	**ELCA9X12C09S2M**
LC	MultiMode 50/125	**ELC50X12C09S2M**
LC	MultiMode 62.5/125	**ELC62X12C09S2M**

Unit pigtail / 900 µm / 2 meters length

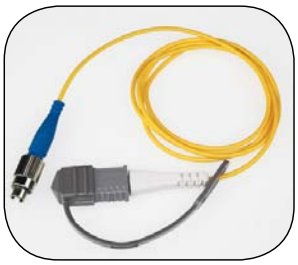
Connector	Color buffer	Fiber type	Part Number
LC	green	MultiMode 50/125	**ELC50XC092M**
LC	blue	MultiMode 62.5/125	**ELC62XC092M**
LCUPC	yellow	SingleMode 9/125	**ELC9XC092M**
LCAPC	yellow	SingleMode 9/125	**ELCA9XC092M**
SC	green	MultiMode 50/125	**ESC50XC092M**
SC	blue	MultiMode 62.5/125	**ESC62XC092M**
SCUPC	yellow	SingleMode 9/125	**ESC9XC092M**
SCAPC	yellow	SingleMode 9/125	**ESCA9XC092M**
ST	green	MultiMode 50/125	**EST50XC092M**
ST	blue	MultiMode 62.5/125	**EST62XC092M**
ST	yellow	SingleMode 9/125	**EST9XC092M**

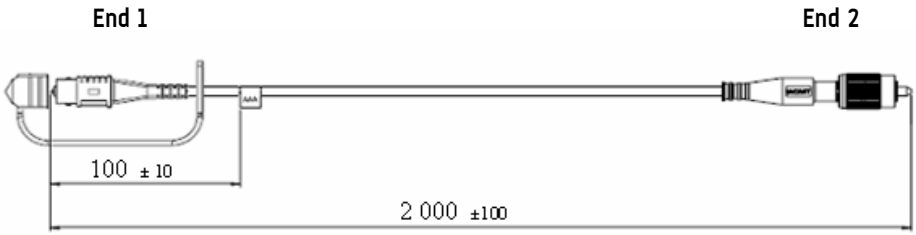
CUSTOMER SPECIFIC ASSEMBLIES SERIES

Based on customer's requests, Radiall manufactures and delivers cable assemblies of any length, with many types of cables and connectors.

These are some examples:

EC - FC APC Simplex SM L = 2m





	End 1	End 2
Type	EN 186 210 Type CF08 with straight boot SingleMode Optical ferrule Keyed Push Pull Latching System with Sphere/Cone Alignment. With protective cap	IEC 61754-13 type FC APC SingleMode zirconia ceramic ferrule Thread coupling type Floating ferrule Straight boot, Plastic protective cap
Cable	SM 9/125, ∅2.8mm Duplex cable.	
Identification	1 Self-laminated label, 3 lines text: RADIALL / F760 431 400 / MO nb	

OPTICAL CHARACTERISTICS

	End 1 (EC)	End 2 (FC APC)
Insertion Loss (@ 1310 nm)	0.8 dB max (method 6)	
Return Loss (@ 1310 nm) acc. to IEC 61300-3-4	RL > 60dB (method 7)	

MECHANICAL CHARACTERISTICS

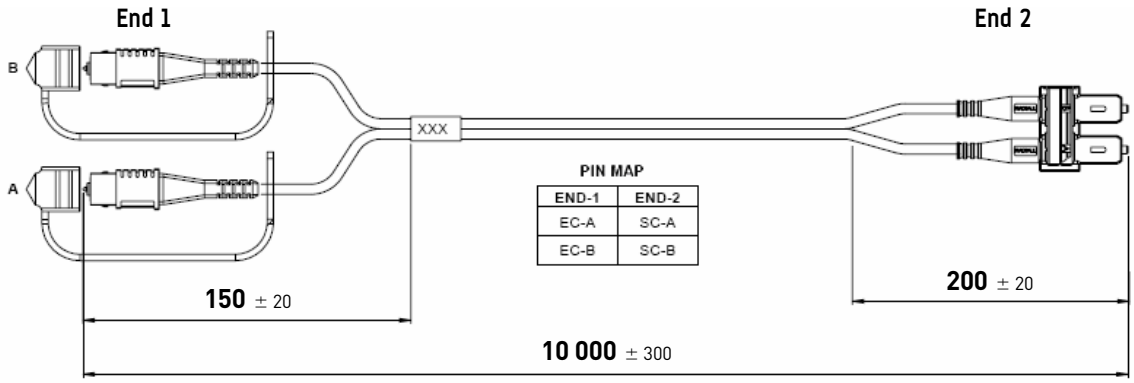
Endurance	1000 mating cycles	500 mating cycles
Tensile load	100 N	100 N
Vibration	10/500 Hz, 10g max.	10-55Hz, 1.5 mm, 2Hr./axe

ENVIRONMENTAL CHARACTERISTICS

Operating temperature	-20°C to + 70°C

CUSTOMER SPECIFIC ASSEMBLIES SERIES

EC – SC PC Duplex SM L=10m



	End 1	End 2
Type	2xEN 186 210 Type CF08 with straight boot SingleMode Optical ferrule Keyed Push Pull Latching System with Sphere/Cone Alignment. With protective cap	IEC 61754-4 type SC-PC SingleMode zirconia ceramic ferrule Push Pull Latching connector system Duplex with removable brace Straight boot, Plastic protective cap
Cable	SM 9/125, ∅3mm Duplex cable	
Identification	1 Self-laminated label, 3 lines text: RADIALL / F760 410 400 / MO nb	

OPTICAL CHARACTERISTICS

	End 1 (EC)	End 2 (SC-PC)
Insertion Loss (@ 1310 nm)	0.8 dB max (method 6)	
Return Loss (@ 1310 nm) acc. to IEC 61300-3-4	RL > 60dB (method 7)	RL > 45dB (method 7)

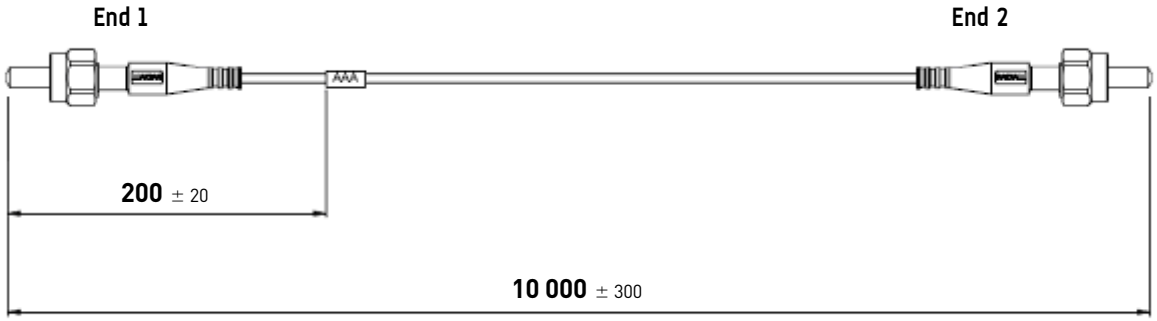
MECHANICAL CHARACTERISTICS

Endurance	1000 mating cycles	200 mating cycles
Tensile load	100 N	100 N
Vibration	10/500 Hz, 10g max.	10-55Hz, 1.5 mm, 2Hr./axe

ENVIRONMENTAL CHARACTERISTICS

Operating temperature	-25°C to + 70°C

FSMA – FSMA Simplex MM L= 10m



	End 1	End 2
Type	IEC 874-2 type FSMA5, connector with metallic ferrule, screw thread coupling device Straight boot, with Plastic protective cap	
Cable	MM 50/125 Simplex cable dia 4.5mm	
Identification	1 Self-laminated label, RADIALL / TBD / MO nb. Or according to customer Specification	

OPTICAL CHARACTERISTICS

	End 1 (FSMA)	End 2 (FSMA)
Insertion Loss (@ 850 nm) acc. to IEC 61300-3-4	2.50 dB max (method 6)	

MECHANICAL CHARACTERISTICS

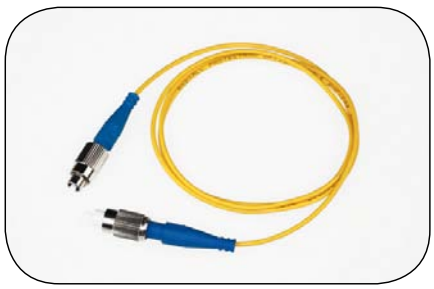
Endurance	250 mating cycles
Tensile load	100 N

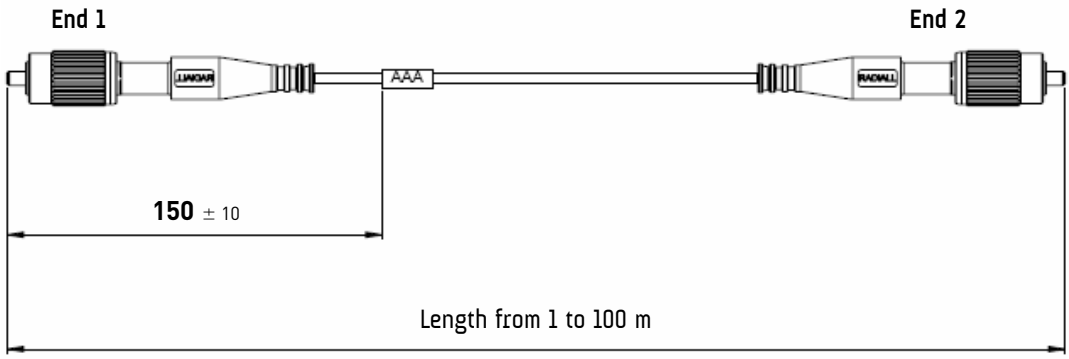
ENVIRONMENTAL CHARACTERISTICS

Operating temperature	-40°C to + 85°C

CUSTOMER SPECIFIC ASSEMBLIES SERIES

FC – FC Simplex SM L=1 to 100m





	End 1	End 2
Type	IEC 61754-13 type FC PC - SingleMode zirconia ceramic ferrule Thread coupling type Floating ferrule - Straight boot, Plastic protective cap	
Cable	SM 9/125 /2.0 mm simplex cable	
Identification	1 Self-laminated label, 3-lines text: RADIALL / F760 330 910-XXX (XXX = length in meters) / MO nb	
Standard Lengths	1, 2, 3, 5, 7, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100m	

OPTICAL CHARACTERISTICS

	End 1 (FC PC)	End 2 (FC PC)
Insertion Loss (@ 1310 nm)	1.0 dB max (method 6)	
Return Loss (@ 1310 nm) acc. to IEC 61300-3-4	RL > 45dB (method 7)	

MECHANICAL CHARACTERISTICS

Endurance	200 mating cycles
Tensile load	100 N
Vibration	10-55Hz, 1.5 mm, 2Hr./axe

ENVIRONMENTAL CHARACTERISTICS

Operating temperature	-20°C to + 70°C

OUTDOOR CABLE ASSEMBLIES

Industrial or telecom applications often require outdoor optical cable assemblies able to stand bad weather and wide range of temperature working range. These assemblies need also to be robust against crushing, UV damages and tensile strength. Radiall carefully selects the best cables available on the market for that demanding range of applications to provide its customer the utmost performances in the field of outdoor optical link.

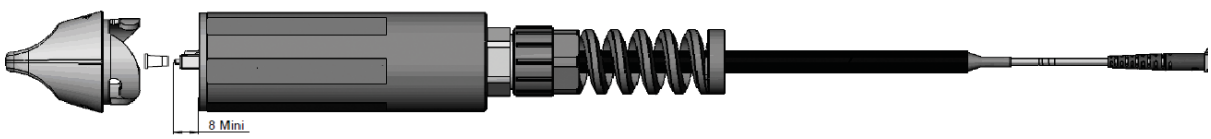
Some standard references are available among the wide variety of manufacturable assemblies as connector type, cable type, length and lead to a very high number of possible combinations.

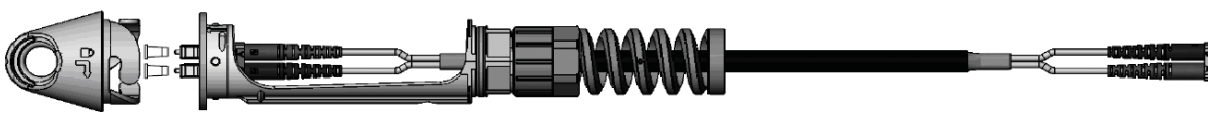
For other request, do not hesitate to contact us as we can provide a wide range of cable assemblies configurations including high number of channels as well as specific technical requirements (temperature range, crushing resistance, armoured configuration, exotic fiber, etc...).

We can provide simplex and duplex cable assemblies as well as complex harnesses using all the standard connectors' interfaces. Moreover optical cable assemblies equipped with R2CT or OSIS plug are available to watertight LC or SC assemblies.

For any other lengths or cable needs, contact us. RADIALL is able to manufacture long lengths assemblies (100m, 500m, etc...) and related spooling and logistic.

R2CT CABLE ASSEMBLIES





Temperature range	-40°C / +85 °C
Insertion Loss (mated with reference plug) (@1310 & 1550 nm)	0.5 dB max (method 6)
Return Loss (@1310 & 1550 nm)	RL > 45 dB (method 7)

Fiber type	Part Number	Description	Length
SingleMode			
SM 9/125 G657a	**R2CTC 855 700-01**	R2CT to LC Duplex – cable 2SM ∅7mm	L=1m
SM 9/125 G657a	**R2CTC 855 700-02**	R2CT to LC Duplex – cable 2SM ∅7mm	L=2m
SM 9/125 G657a	**R2CTC 855 700-03**	R2CT to LC Duplex – cable 2SM ∅7mm	L=3m
MultiMode, OM2			
MM 50/125 OM2	**R2CTC 858 700-01**	R2CT to LC Duplex – cable 2MM ∅7mm	L=1m
MM 50/125 OM2	**R2CTC 858 700-02**	R2CT to LC Duplex – cable 2MM ∅7mm	L=2m
MM 50/125 OM2	**R2CTC 858 700-03**	R2CT to LC Duplex – cable 2MM ∅7mm	L=3m

Note: other fibers are available upon request.

OSIS™ CABLE ASSEMBLIES

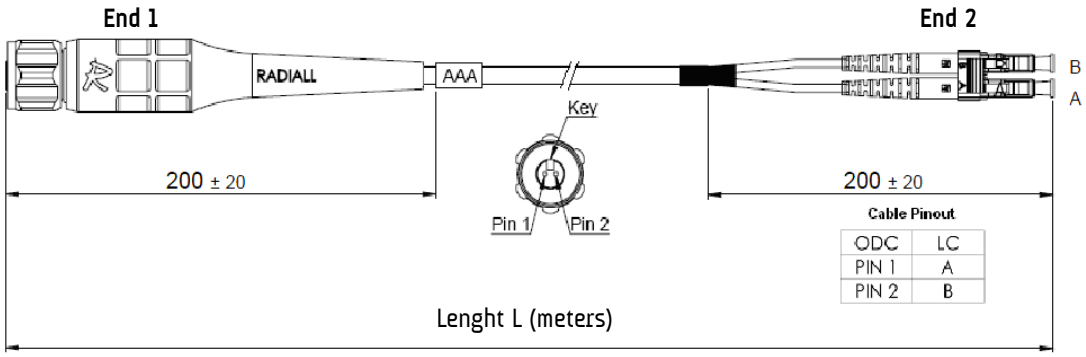
Fiber type (1)	Part Number	Description	Length
SingleMode			
SM 9/125 G657a	**OSISC 855 500-01**	OSIS to LC Duplex – cable 2SM ∅5mm	L=1m
SM 9/125 G657a	**OSISC 855 500-02**	OSIS to LC Duplex – cable 2SM ∅5mm	L=2m
SM 9/125 G657a	**OSISC 855 500-03**	OSIS to LC Duplex – cable 2SM ∅5mm	L=3m
MultiMode, OM2			
MM 50/125 OM2	**OSISC 858 500-01**	OSIS to LC Duplex – cable 2MM ∅5mm	L=1m
MM 50/125 OM2	**OSISC 858 500-02**	OSIS to LC Duplex – cable 2MM ∅5mm	L=2m
MM 50/125 OM2	**OSISC 858 500-03**	OSIS to LC Duplex – cable 2MM ∅5mm	L=3m

Note: other fibers are available upon request.

ODC® CABLE ASSEMBLIES

Temperature range	-40°C / +85°C
Insertion Loss (mated with reference plug) (@1310 & 1550 nm)	0.5 dB max (method 6)
Return Loss (@1310 & 1550 nm)	RL > 50 dB (method 7)

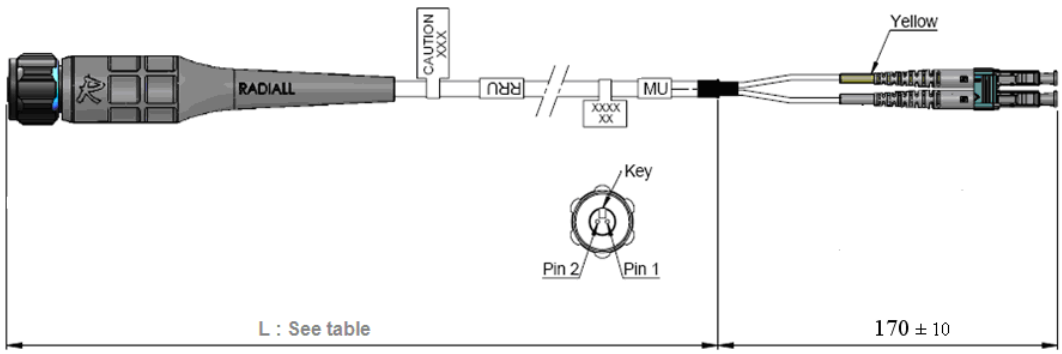
ODC® PLUG TO LC DUPLEX PATCHCORD (2 CHANNELS ODC) FAN-OUT TYPE A



Fiber type	Part Number	Description	Length
SM 9/125 G652	**F792 855 620-005**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L = 5m
SM 9/125 G652	**F792 855 620-050**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L = 50m
SM 9/125 G652	**F792 885 620-005**	ODC2-P to ODC2-P – cable 2SM ∅5mm	L = 5m
SM 9/125 G652	**F792 885 620-050**	ODC2-P to ODC2-P – cable 2SM ∅5mm	L = 50m
MM 50/125 OM2	**F792 858 620-005**	ODC2-P to LC Duplex – cable 2MM ∅5mm	L = 5m
MM 50/125 OM2	**F792 858 620-050**	ODC2-P to LC Duplex – cable 2MM ∅5mm	L = 50m
MM 50/125 OM2	**F792 888 620-005**	ODC2-P to ODC2-P – cable 2MM ∅5mm	L = 5m
MM 50/125 OM2	**F792 888 620-050**	ODC2-P to ODC2-P – cable 2MM ∅5mm	L = 50m

Note: other lengths are available upon request.

ODC® PLUG TO LC DUPLEX PATCHCORD- FAN-OUT TYPE B

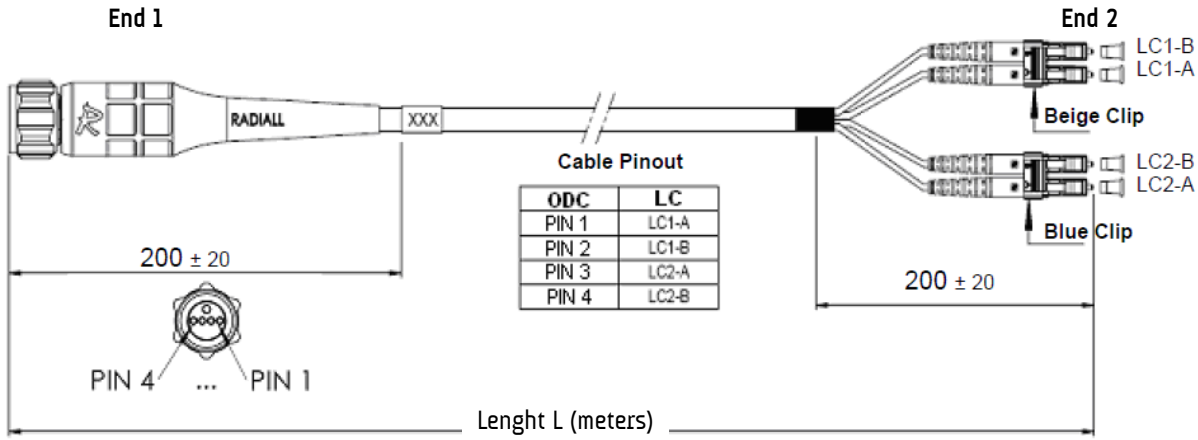


Fiber type	Part Number	Description	Length
SM 9/125 G652	**F760 855 607-005**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=5m
SM 9/125 G652	**F760 855 607-010**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=10m
SM 9/125 G652	**F760 855 607-015**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=15m
SM 9/125 G652	**F760 855 607-020**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=20m
SM 9/125 G652	**F760 855 607-030**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=30m
SM 9/125 G652	**F760 855 607-040**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=40m
SM 9/125 G652	**F760 855 607-050**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=50m
SM 9/125 G652	**F760 855 607-060**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=60m
SM 9/125 G652	**F760 855 607-070**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=70m
SM 9/125 G652	**F760 855 607-080**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=80m
SM 9/125 G652	**F760 855 607-090**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=90m
SM 9/125 G652	**F760 855 607-100**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=100m
SM 9/125 G652	**F760 855 607-125**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=125m
SM 9/125 G652	**F760 855 607-150**	ODC2-P to LC Duplex – cable 2SM ∅5mm	L=150m

Note: other lengths or fiber types are available upon request

ODC® CABLE ASSEMBLIES

ODC® PLUG TO LC DUPLEX PATCHCORD (4 CHANNELS ODC)

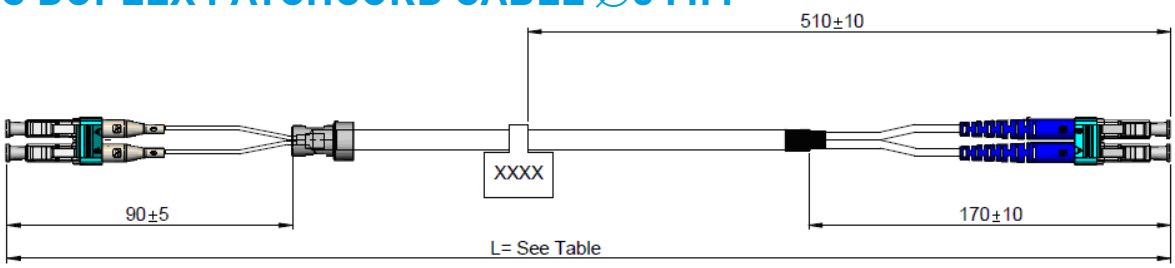


Transmission	Part Numner	Description	Longueur
MM	**F792 858 640-005**	ODC4-P to 2 x LC Duplex – cable 4MM ∅5mm	L = 5m
MM	**F792 858 640-050**	ODC4-P to 2 x LC Duplex – cable 4MM ∅5mm	L = 50m
MM	**F792 888 640-005**	ODC4-P to ODC4-P – cable 4MM ∅5mm	L = 5m
MM	**F792 888 640-050**	ODC4-P to ODC4-P – cable 4MM ∅5mm	L = 50m

Note: other lengths or fiber types are available upon request.

LC DUPLEX CABLE ASSEMBLIES

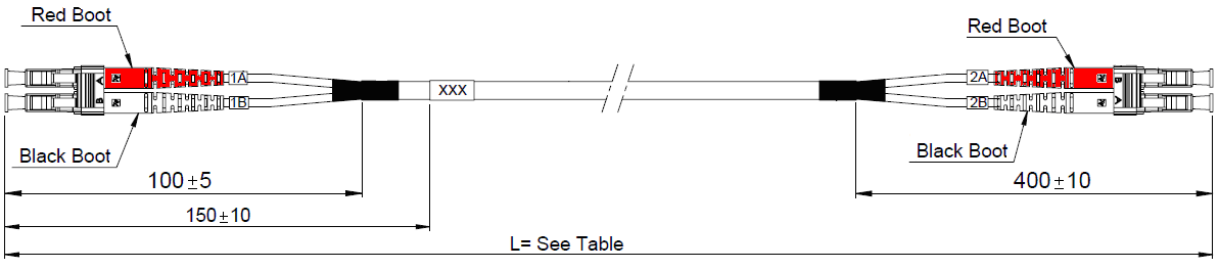
LC DUPLEX PATCHCORD CABLE ∅5 MM



Fiber type	Part Number	Description	Longueur
SM 9/125 G652	**F760 555 650-005**	LC Duplex / LC Duplex SM ∅5mm	L= 5 m
SM 9/125 G652	**F760 555 650-010**	LC Duplex / LC Duplex SM ∅5mm	L= 10 m
SM 9/125 G652	**F760 555 650-015**	LC Duplex / LC Duplex SM ∅5mm	L= 15 m
SM 9/125 G652	**F760 555 650-020**	LC Duplex / LC Duplex SM ∅5mm	L= 20 m
SM 9/125 G652	**F760 555 650-030**	LC Duplex / LC Duplex SM ∅5mm	L= 30 m
SM 9/125 G652	**F760 555 650-040**	LC Duplex / LC Duplex SM ∅5mm	L= 40 m
SM 9/125 G652	**F760 555 650-050**	LC Duplex / LC Duplex SM ∅5mm	L= 50 m
SM 9/125 G652	**F760 555 650-060**	LC Duplex / LC Duplex SM ∅5mm	L= 60 m
SM 9/125 G652	**F760 555 650-070**	LC Duplex / LC Duplex SM ∅5mm	L= 70 m
SM 9/125 G652	**F760 555 650-080**	LC Duplex / LC Duplex SM ∅5mm	L= 80 m
SM 9/125 G652	**F760 555 650-090**	LC Duplex / LC Duplex SM ∅5mm	L= 90 m
SM 9/125 G652	**F760 555 650-100**	LC Duplex / LC Duplex SM ∅5mm	L= 100 m
SM 9/125 G652	**F760 555 650-125**	LC Duplex / LC Duplex SM ∅5mm	L= 125 m
SM 9/125 G652	**F760 555 650-150**	LC Duplex / LC Duplex SM ∅5mm	L= 150 m

Note: other lengths or fiber types are available upon request.

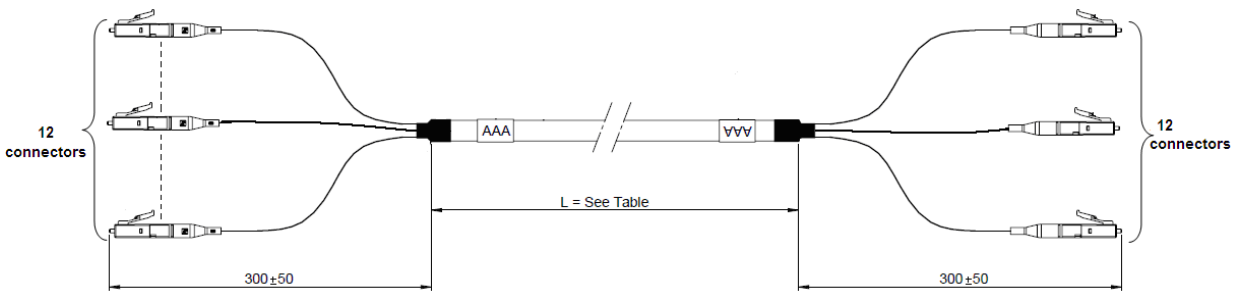
LC DUPLEX PATCHCORD CABLE ∅7 MM



Fiber type	Part Number	Description	Length
SM 9/125 G652	**F760 555 670-005**	LC Duplex / LC Duplex SM ∅7mm	L=5m
SM 9/125 G652	**F760 555 670-010**	LC Duplex / LC Duplex SM ∅7mm	L=10m
SM 9/125 G652	**F760 555 670-015**	LC Duplex / LC Duplex SM ∅7mm	L=15m
SM 9/125 G652	**F760 555 670-020**	LC Duplex / LC Duplex SM ∅7mm	L=20m
SM 9/125 G652	**F760 555 670-030**	LC Duplex / LC Duplex SM ∅7mm	L=30m
SM 9/125 G652	**F760 555 670-040**	LC Duplex / LC Duplex SM ∅7mm	L=40m
SM 9/125 G652	**F760 555 670-050**	LC Duplex / LC Duplex SM ∅7mm	L=50m
SM 9/125 G652	**F760 555 670-060**	LC Duplex / LC Duplex SM ∅7mm	L=60m
SM 9/125 G652	**F760 555 670-070**	LC Duplex / LC Duplex SM ∅7mm	L=70m
SM 9/125 G652	**F760 555 670-080**	LC Duplex / LC Duplex SM ∅7mm	L=80m
SM 9/125 G652	**F760 555 670-090**	LC Duplex / LC Duplex SM ∅7mm	L=90m
SM 9/125 G652	**F760 555 670-100**	LC Duplex / LC Duplex SM ∅7mm	L=100m
SM 9/125 G652	**F760 555 670-125**	LC Duplex / LC Duplex SM ∅7mm	L=125m
SM 9/125 G652	**F760 555 670-150**	LC Duplex / LC Duplex SM ∅7mm	L=150m

Note: other lengths or fiber types are available upon request

12 LC DUPLEX CABLE ∅8 MM

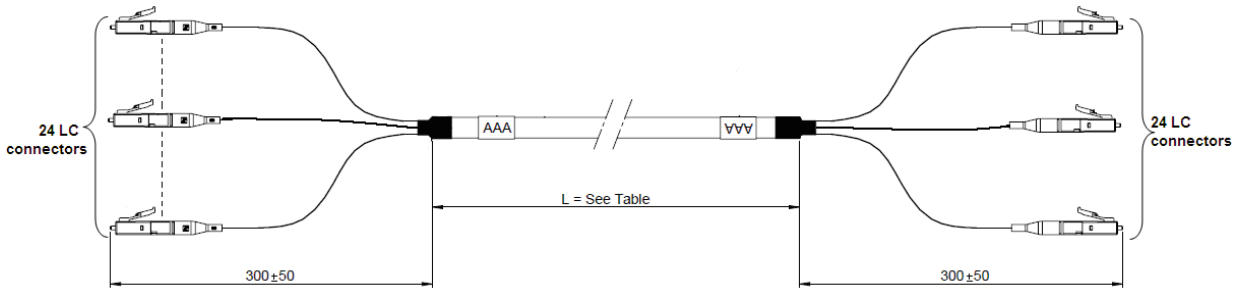


Fiber type	Part Number	Description	Length
SM 9/125 G652	**F760 555 612-020**	12xLC to 12xLC SM Patchcord	L=20m
SM 9/125 G652	**F760 555 612-030**	12xLC to 12xLC SM Patchcord	L=30m
SM 9/125 G652	**F760 555 612-040**	12xLC to 12xLC SM Patchcord	L=40m
SM 9/125 G652	**F760 555 612-050**	12xLC to 12xLC SM Patchcord	L=50m
SM 9/125 G652	**F760 555 612-070**	12xLC to 12xLC SM Patchcord	L=70m
SM 9/125 G652	**F760 555 612-100**	12xLC to 12xLC SM Patchcord	L=100m
SM 9/125 G652	**F760 555 612-200**	12xLC to 12xLC SM Patchcord	L=200m

Note: other lengths or fiber types are available upon request

LC DUPLEX CABLE ASSEMBLIES

24 LC DUPLEX CABLE ∅8 MM



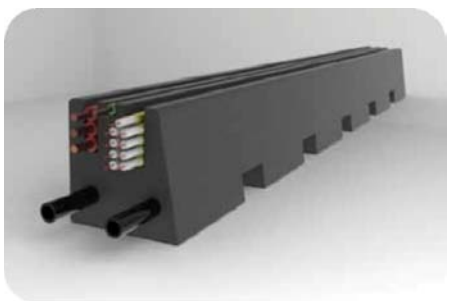
Fiber type	Part Number	Description	Length
SM 9/125 G652	**F760 555 624-020**	24xLC to 24xLC SM Patchcord	L=20m
SM 9/125 G652	**F760 555 624-030**	24xLC to 24xLC SM Patchcord	L=30m
SM 9/125 G652	**F760 555 624-040**	24xLC to 24xLC SM Patchcord	L=40m
SM 9/125 G652	**F760 555 624-050**	24xLC to 24xLC SM Patchcord	L=50m
SM 9/125 G652	**F760 555 624-070**	24xLC to 24xLC SM Patchcord	L=70m
SM 9/125 G652	**F760 555 624-100**	24xLC to 24xLC SM Patchcord	L=100m
SM 9/125 G652	**F760 555 624-200**	24xLC to 24xLC SM Patchcord	L=200m

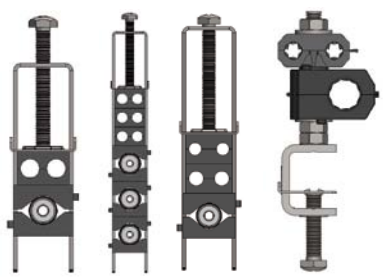
Note: other lengths or fiber types are available upon request

ACCESSORIES

RADIALL offers a wide range of cable clamps and clamp saddles for the outdoor cable assemblies' field installation.

Few types of the available references are shown below; a dedicated catalogue "RF and FTTA site solution" presents the full range of accessories and dedicated tools for outdoor optical installations. Please contact the Radiall's sales team for more information.





Radiall can support his customers with high quality and high performance cables and harness assemblies, either designed by Radiall to meet the customer's requirement or built to customer print. Each assembly is visually inspected and tested per the criteria from industry standards (ARINC, EN, SAE, IEC). All products for aerospace applications are manufactured in AS9100 certified assembly lines.

CABLE ASSEMBLIES FOR AEROSPACE OR HARSH ENVIRONMENT APPLICATIONS

Radiall can assemble many aerospace grade cables and connectors including:

- **Cables**
  - Aerospace grade cable, loose structure, type ARINC 802, BMS 13-71 or tight structure, type ARINC 802, ABS0963, (temperature range -55°C/+125°C)
  - Commercial grade cable, "Not for flight" for ground test application
  - MIL cables
  - Ruggedized telecom cables for outdoor applications

Cables are using either MultiMode fibers (50/125 µm, 62.5/125 µm or larger core fiber) or SingleMode fiber.

Radiall will work with any cable as required by the customer. The structure of the cable is a key parameter in the choice of the connector or the contact. A termination test as well as basic environmental tests may have to be done to validate the combination connector / cable.

- **Connectors / contacts**

- LuxCis® ARINC 801, including the single channel LxCR
- Size 12 and 16 optical contacts (MIL-PRF-29504 compatible)
- Ruggedized LC, SC, ST, FC
- MT based connectors
- EN 4531 contacts

Some connectors or contacts can be polished with an APC process. Please refer to the connector section.
Radiall can terminate many other connectors or contacts. Please contact your local Radiall representative for more information.

CABLE ASSEMBLIES FOR AEROSPACE

Part numbers for standard aerospace cable assemblies

LuxCis MM 52 LC L100

End 1:
LuxCisMM: LuxCis® MultiMode
LuxCisSM50: LuxCis® SingleMode UPC
LuxCisSM8: LuxCis® SingleMode APC
LC: LC MultiMode
LC50: LC SingleMode UPC
LC8: LC SingleMode APC
SC: SC MultiMode
FC: FC MultiMode
FC8: FC SingleMode APC
ST: ST MultiMode

Cable:
11: 900 µm, 62.5/125 µm fiber, commercial grade
14: 900 µm, 62.5/125 µm fiber, aerospace grade
10: 900 µm, 50/125 µm fiber, commercial grade
16: 900 µm, 50/125 µm fiber, aerospace grade
60: 900 µm, 9/125 µm, commercial grade
23: 1.8-2 mm, loose structure, 62.5/125 µm fiber, commercial grade
52: 1.8-2 mm, loose structure, 62.5/125 µm fiber, aerospace grade
53: 1.8-2 mm, tight structure, 62.5/125 µm fiber, aerospace grade
27: 1.8-2 mm, loose structure, 50/125 µm fiber, commercial grade
55: 1.8-2 mm, loose structure, 50/125 µm fiber, aerospace grade
78: 1.8-2 mm, tight structure, 50/125 µm fiber, aerospace grade
73: 1.8-2 mm, loose structure, 9/125 µm fiber, commercial grade
92: 1.8-2 mm, loose structure, 9/125 µm fiber, aerospace grade

Add D for a duplex configuration

End 2: see end 1

Length of the cable in centimeter

Technical datasheets with standard length tolerance and labelling information are available. Specific requirement (additional test, specific labeling, and additional protection of the cable) or any other cable assembly configuration can be accommodated. Please contact your local Radiall representative.

HARNESS ASSEMBLIES

Radiall manufactures high quality high performance optical harness assemblies for military and aerospace applications, based on customer print or as designed by Radiall based on the customer's requirement or environment.

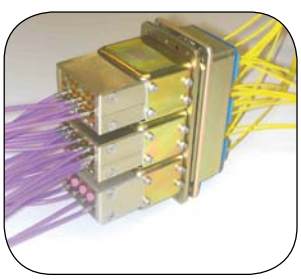
Some examples of the configurations that Radiall can provide:

- Cable assemblies as described in the previous section or using multifiber cables for harsh environment applications or outdoor applications
- Connectors
  - Rectangular connectors EPX, ARINC 600 et 404
  - Circular connectors – MIL-DTL-38999 based
  - Board connectors
  - Custom designed connectors

Radiall will provide backshell and cable protection as required by the customer or as required by the cable and connector choice and / or the harness assembly application environment. Radiall will develop custom solution if no commercially available solution meets the requirement. As an example, Radiall has been developing a range of backshells for the Radiall rectangular connector product ranges or for circular connectors with higher strain relief performance.

For more information about your harness assembly configuration and how Radiall can support you, please contact your local Radiall representative.

Some examples of fiber optic backshells developed for Radiall built harnesses



CABLE ASSEMBLIES FOR TACTICAL COMMUNICATION

Radiall also produces high quality high performance cable assemblies for ground tactical applications combining various cables and connectors including.

- **Cables:**
  - Military tactical multi fiber cables including anti-rodent, high crush resistance or armored cables
  - Outdoor multi fiber cables
  - Various cable diameters can be accommodated

Cables are using either MultiMode fibers (50/125 µm, 62.5/125 µm or larger core fiber) or SingleMode fiber.

Any other request or for specific cable requirement, please contact your local Radiall representative.

- **Connectors / contacts:**
  - Probeam® expanded beam connectors
  - LuxCis® ARINC 801 MIL-DTL-38999 based connectors
  - If a fan out configuration:
    - LuxCis® ARINC 801, including the single channel LxCR
    - Size 12 and 16 optical contacts (MIL-PRF-29504 cavity compatible)
    - Ruggedized LC, SC, ST, FC connectors
    - EN 4531 contacts

Some connectors can be polished with an APC process. Please refer to the connector section
Radiall can terminate many other connectors or contacts. Please contact Radiall for more information.

Part numbers for standard tactical cable assemblies including PRO BEAM® connectors

F739 0 0 4 2 1 1 M 100

F739: PRO BEAM® series

End 1:
0: Plug with EPDM rubber boot
1: Plug with fluorosilicone boot
2: Receptacle D-Hole fan out type
3: Receptacle D-Hole standard type
4: Receptacle D-Hole sealed type
5: Receptacle square flange fan out type
6: Receptacle square flange standard type
7: Receptacle square flange sealed type

End 2:
0: Plug with EPDM rubber boot
1: Plug with fluorosilicone boot
2: No termination
3: LC PC connector
4: LC APC connector
5: ST PC connector
6: SC PC connector
7: LuxCis® APC contact
8: FC PC connector
9: LuxCis® PC contact

Number of channels 2 or 4

Optimal wavelength
2: 1310 nm SingleMode
3: 1550 nm SingleMode
5: 850 and 1300 nm, MultiMode 50/125 µm fiber
6: 850 and 1300 nm, MultiMode 62.5/125 µm fiber

Cable type
1: Multifiber cable, 5.5 mm diameter
2: Multifiber cable, 5 mm diameter
3: Multifiber cable, 6.1 mm diameter
5: Simplex cable, 1.6 to 2 mm diameter

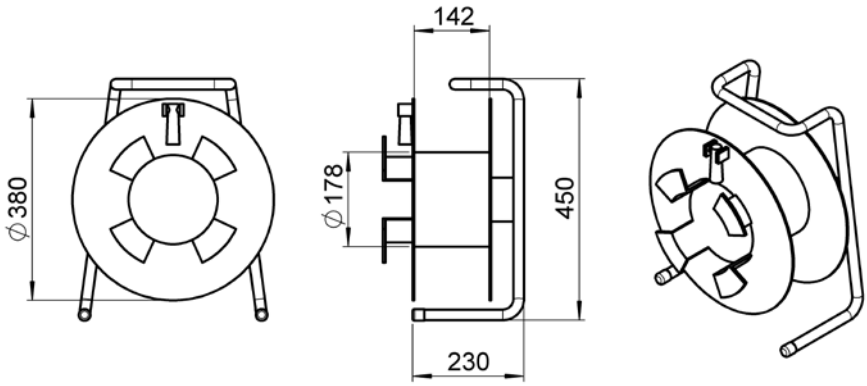
Reel
0: No reel (up to 20 m long cable assemblies)
1: Field deployable reel
5: Reel for backpack
6: Disposable reel

Length of the cable (3 digits)
C for centimeter
M for meter

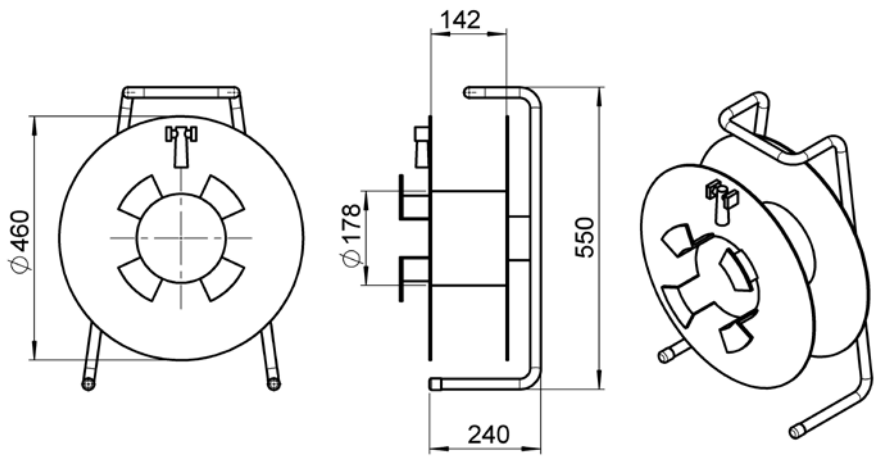
ACCESSORIES

Radiall provides cable assemblies with various field orientated accessories such as reels and backpack:

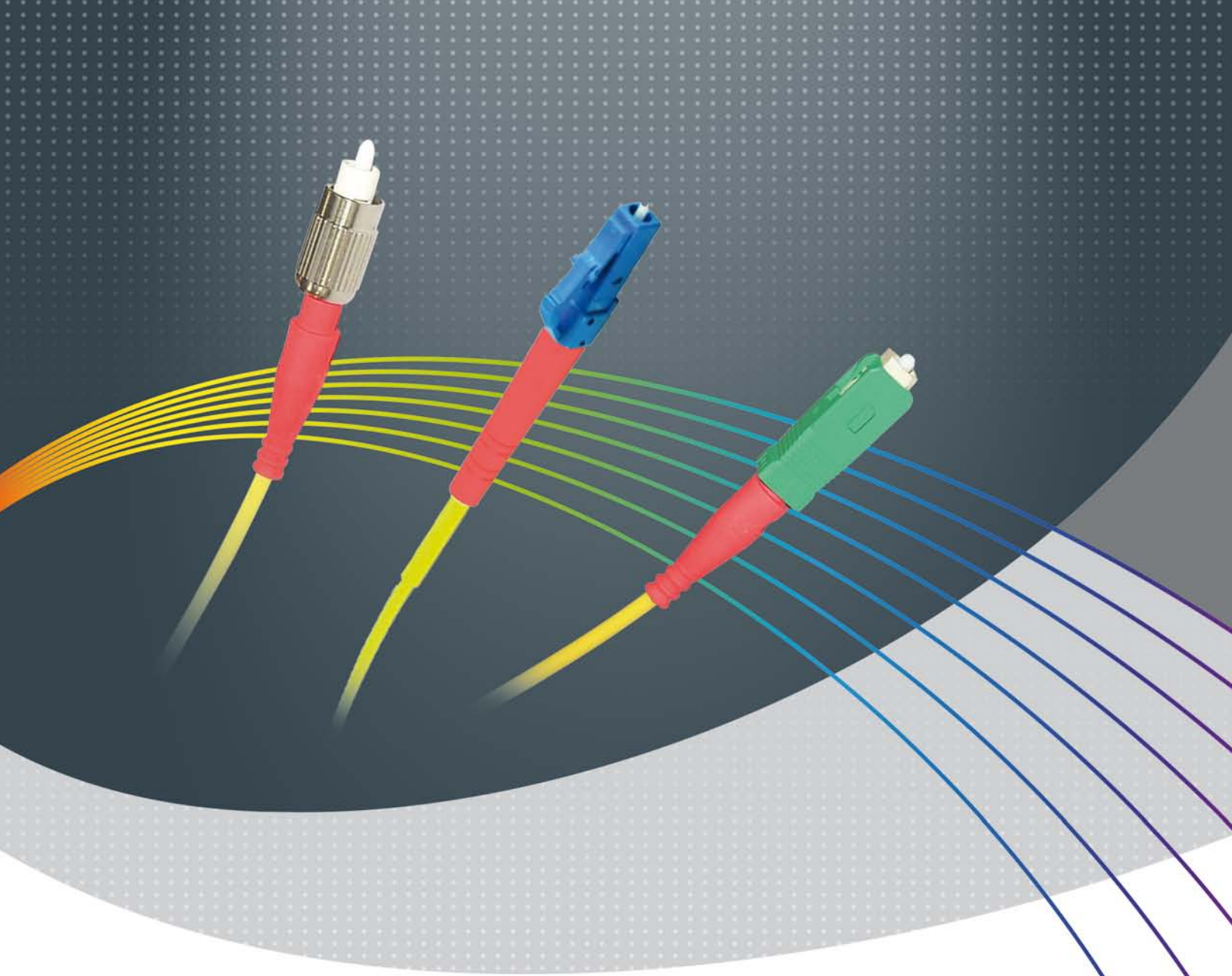
Gantry reel – size A



Gantry reel – size B



Technical datasheets with standard length tolerance and labelling information are available. For any other cable assembly configuration or specific requirement (additional test, specific labeling, additional protection of the cable, type of cable), please contact your local Radiall representative.



Reference Patchcords

F792

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INTRODUCTION

Radiall offers a broad range of high performances REFERENCE PATCHCORDS (patchcords and pigtails) which are manufactured and tested using the latest high technology process.
Including reference connectors, they are used as reference for repeatable IL and RL measurements of assemblies and connexions.

BENEFITS & FEATURES

- 100% optically tested
- Master terminations available in UPC and APC
- Wide variety of standardized connectors (SC, LC, FC)
- Easy identification thanks to a red boot on the master connector
- Standard length : 5 meters (other lengths available upon request)
- Singlemode fiber (multimode fiber available upon request)
- Zirconia ceramic ferrule

All the Reference Patchcords are delivered with measurement sheet and product traceability information.

OPTICAL PERFORMANCES*

- Insertion loss: **< 0.15 dB** (IEC 61300, 3-4 Method B - mated with reference plug)
- Return loss: **> 50 dB** for UPC / **> 60 dB** for APC (IEC 61300, 3-6)

END FACE GEOMETRY*

- Eccentricity between fiber core and ceramic outer diameter: 0.3 µm
- Eccentricity of spherical polished end face (apex offset): < 30 µm (IEC 61300, 2-40)

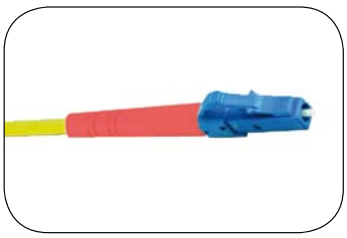
MECHANICAL & ENVIRONMENTAL CHARACTERISTICS

- Depend on the connector interfaces. Please refer to the relative section of this catalogue (SC, FC, LC).

Please contact Radiall Sales team with your specific requirements for any other configuration.

*EN 50377-X-Y, Annex A: reference plugs details.

LC REFERENCE PATCHCORDS



Patchcords (5m length)

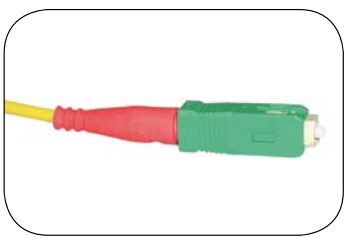
Master Termination		Standard Termination		Part Number
LC	UPC 50 dB	FC	APC 8° «R»	**F792 530 801**
	UPC 50 dB	SC	UPC 50 dB	**F792 510 800**

Note: FC APC 8° "R": 2 mm key

Pigtails (5m length)

Master Termination		Part Number
LC	UPC 50 dB	**F792 500 800**

SC REFERENCE PATCHCORDS



Patchcords (5m length)

Master Termination		Standard Termination		Part Number
SC	UPC 50 dB	FC	UPC 50 dB	**F792 130 800**
	UPC 50 dB	FC	APC 8° «R»	**F792 130 801**
	UPC 50 dB	SC	UPC 50 dB	**F792 110 800**
	APC 8°	SC	UPC 50 dB	**F792 111 800**
	APC 8°	SC	APC 8°	**F792 111 801**
	APC 8°	FC	UPC 50 dB	**F792 131 800**
	APC 8°	FC	APC 8° «R»	**F792 131 801**

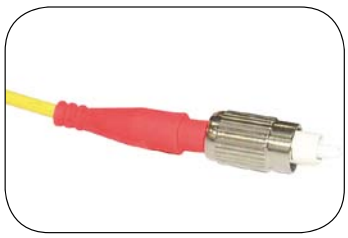
Note: FC APC 8° "R": 2 mm key
FC UPC 50 dB: 2.14 mm key

Pigtails (5m length)

Master Termination		Part Number
SC	UPC 50 dB	**F792 100 800**
	APC 8°	**F792 101 800**
	APC 9°	**F792 102 800**

PRODUCT RANGE

FC REFERENCE PATCHCORDS



Patchcords (5m length)

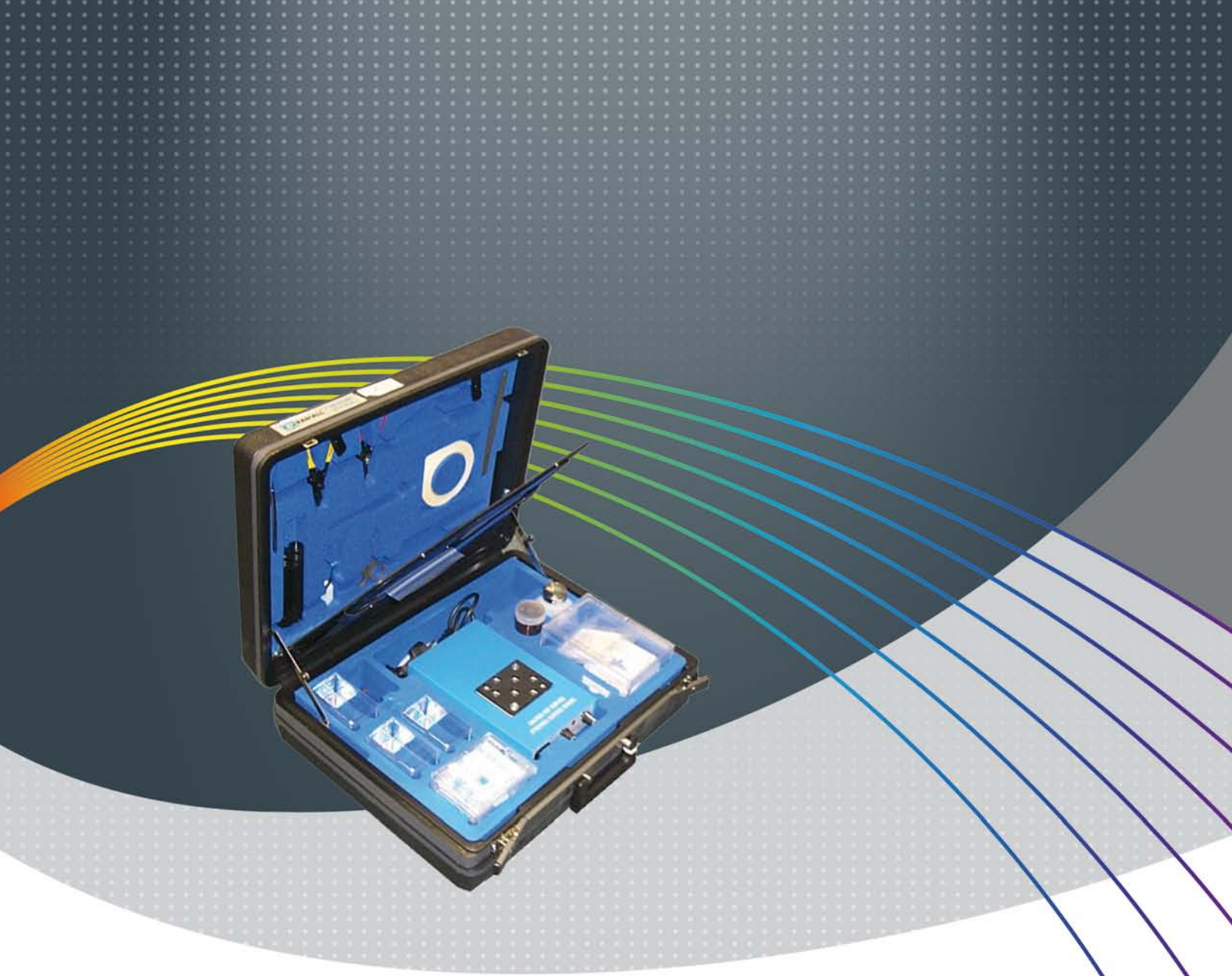
Master Termination		Standard Termination		Part Number
FC	UPC 50 dB	SC	UPC 50 dB	**F792 310 800**
	UPC 50 dB	FC	UPC 50 dB	**F792 330 800**
	APC 8° «R»	FC	UPC 50 dB	**F792 331 800**

Note: FC APC 8° «R» = 2.00 mm key
FC UPC = 2.14 mm key

Pigtails (5m length)

Master Termination		Part Number
FC	UPC 50 dB	**F792 300 800**
	APC 8° «R»	**F792 301 800**
	APC 9° «R»	**F792 302 800**

Note: FC APC 8° «R»: 2 mm key
FC UPC 50 dB: 2.14 mm key



Tooling

F780

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CONTENTS

ASSEMBLY KITS

The assembly kits contain all the tools required to assemble the corresponding series. They are supplied with a clear assembly procedure.

Series	Part Number
LC	**F780 850 000**
SC / FC / ST	**F780 844 000**
FSMA	**F780 454 000**

LC ASSEMBLY KIT: F780 850 000

The kit contains all the required tools to assemble LC connectors.

Kit content:

Tool	Part Number	Quantity
Curing oven (220V)	**F780 483 000**	1
Manual polishing tool (PC straight polishing)	**F780 633 000**	1
Crimp tool (print 3.4mm)	**F780 057 000**	1
Inner sleeve insertion tool	**F780 290 000**	1
Cable stripping tool	**F780 033 000**	1
"Miller" primary stripper (for 900 µm coating)	**F780 025 000**	1
Soft rubber polishing base	**F780 812 000**	1
Ceramic scoring blade	**F780 136 000**	1
Microscope X100 (LC fitted)	**F780 652 000**	1
Ceramic scissors	**F780 039 000**	1
Solvent dispenser	**F780 809 000**	1
Set of cleaning paper	**F780 527 000**	6
Waste container	**F780 811 000**	1
Bag of 10 polishing 0.3 µm films *	**F780 827 000**	1
Bag of 10 polishing 1 µm films *	**F780 826 000**	2
Bag of 10 polishing 3 µm films *	**F780 825 000**	1
Bag of 10 abrasive strips 12 µm *	**F780 508 000**	1
6 bags of epoxy resin OE184 *	**F780 242 000**	1
Bag of 5 syringes *	**F780 217 000**	1

** Consumables*

Other items included in the kit: Ruler, tweezers, adhesive paper, containers for resin preparation, thermometer.

SC / FC / ST ASSEMBLY KIT: F780 844 000

The kit contains the common tools to assemble SC, FC or ST connectors.
Kit content:

Tool	Part Number	Quantity
Curing oven (220V)	**F780 463 000**	1
"No-Nik" buffer stripper (for 250µm)	**F780 026 000**	1
"X-Cellite" outer jacket stripper (for 2.8mm cable)	**F780 037 000**	1
"Miller" primary stripper (for 900µm coating)	**F780 025 000**	1
Soft rubber polishing base	**F780 812 000**	1
Ceramic scoring blade	**F780 136 000**	1
Microscope X100	**F780 233 000**	1
Ceramic scissors	**F780 039 000**	1
Solvent dispenser	**F780 809 000**	1
Waste container	**F780 811 000**	1
Set of cleaning papers *	**F780 527 000**	1
Set of 50 cleaning tips *	**F780 584 000**	1
Bag of 10 polishing 0.3 µm films *	**F780 827 000**	1
Bag of 10 polishing 1 µm films *	**F780 826 000**	2
Bag of 10 polishing 3 µm films *	**F780 825 000**	1
Bag of 10 abrasive strips 12 µm *	**F780 508 000**	1
Bottle of abrasive solution *	**F780 318 000**	1
6 bags of epoxy resin OE184 *	**F780 242 000**	1
Bag of 5 syringes for ST connector *	**F780 243 000**	1
Bag of 5 syringes for FC / SC connectors *	**F780 219 000**	1

** Consumables*

Other items included in the kit: Ruler, tweezers, adhesive paper, containers for resin preparation, cable / fiber preparation template, thermometer.

FSMA ASSEMBLY KIT: F780 454 000

The kit contains the required tools to assemble F-SMA connectors.
Kit content:

Tool	Part Number	Quantity
Adjustment plug	**F708 900 000**	1
Polishing gauge	**F780 003 000**	1
Torque wrench	**F780 020 000**	1
10 Lapping disks 9µm	**F780 127 000**	1
10 Lapping disks 0.3µm	**F780 129 000**	1
Resin applicator	**F780 132 000**	1

CLEANING KITS

The cleaning kits are designed for cable assembly and adaptor users. They include the cleaning procedure.

Series	Part number	Content
SC/FC/ST	**F780 585 000**	50 cleaning tips, cleaning paper, adhesive roll and bottle for alcohol.
EC	**F780 532 000**	50 cleaning tips, cleaning paper, adhesive roll and bottle for alcohol.

MAINTENANCE KIT

This kit includes all the cleaning and inspection accessories required to maintain EC installations.
It includes the cleaning procedure.

Series	Part number	Content
EC	**F780 531 000**	100x microscope, 10x microscope, 3 EC adapters, dust caps for plugs and adapters, 50 cleaning tips, cleaning paper, adhesive roll and bottle for alcohol.

TUNING KIT for SC / FC series

The tuning kit contains all the required tools to "Tune" SC and FC connectors and a user friendly procedure.

The tuning technique optimizes the insertion loss by allowing the fiber cores to be very well aligned.
The tuning consists in rotating the optical ferrule to locate the core in a pre-determined permanent sector, thus reducing the off-set between fiber cores (IEC 61300-2-41).

- Reduces operating time thanks to Radiall's user-friendly tuning tools
- Reliable fiber alignment thanks to 6 locking points already adjusted and secured in the factory.
- No risks for fiber as the optical faces are separated during the tuning operation.
- PC and APC connectors can be tuned.
- The tuning kit includes an adjustment patchcord terminated with a FC connector.
- A zirconia sleeve mounted on the adjustment plug ensures that the optical ferrules are correctly aligned within the tool. This sleeve is mobile and can be easily replaced by the user.

Series	Part number	Content
SC FC	**F780 600 000** **F780 601 000**	• 1 tuning tool • 2 adjustment patchcords **(F780 610 000)** • 2 bags of 6 Zirconia alignment sleeves **(F718 113 206)** • 50 cleaning tips **(F780 584 000)** • 1 book of 6 cleaning paper **(F780 527 000)** • 1 SC housing removal tool (only in SC kit) **(F780 582 000)**

Please refer to the "technical data" section of this catalogue, for more details on the tuning technique.

CLEANER FOR CONNECTORS

Description	Series	Part number	Packaging
Set of cleaning papers	All	**F780 527 000**	6 bags
Box of cleaning papers KIMWIPES	All	**F780 552 000**	1
Set of cleaning tips	Termini	**F780 424 000**	50
Set of cleaning tips	EC	**F780 525 000**	
Set of cleaning tips	ST / FC / SC	**F780 584 000**	

GLUEING PRODUCTS

Description	Series	Part number	Packaging
Bag of epoxy OE 184	All	**F780 242 000**	6 bags
Bag of epoxy 353ND	All	**F780 242 010**	
Syringes (pink)	SC / FC	**F780 219 000**	5
Syringes (green)	ST	**F780 243 000**	
Syringes (pink)	LC	**F780 217 000**	
Resin injector	EC / LuxCis	**F780 504 000**	1
Needles	SC / FC	**F780 581 000**	10

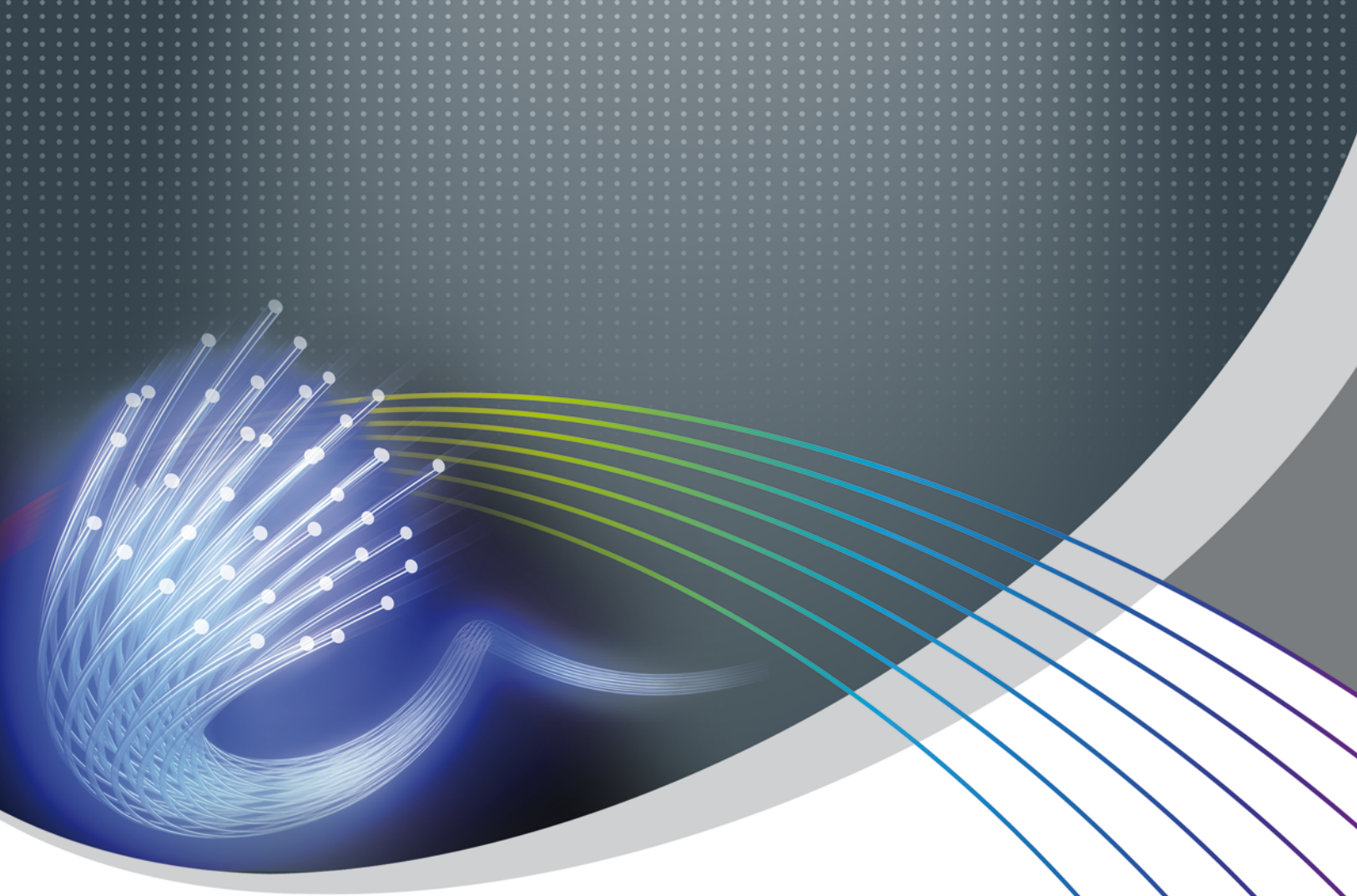
MISCELLANEOUS TOOLS

Description	Part number	Packaging
Ceramic scissors	**F780 039 000**	1
Bottle of index matching gel	**F780 134 000**	
Ceramic scoring blade	**F780 136 000**	
Solvent dispenser	**F780 809 000**	

Please consult Radiall for information on jigs for polishing machines, accessories, consumables and procedures.

NOTES

NOTES



Technical Information and Glossary of terms

RADIALL
The next conneXion

CONTENTS

OPTICAL FIBERS

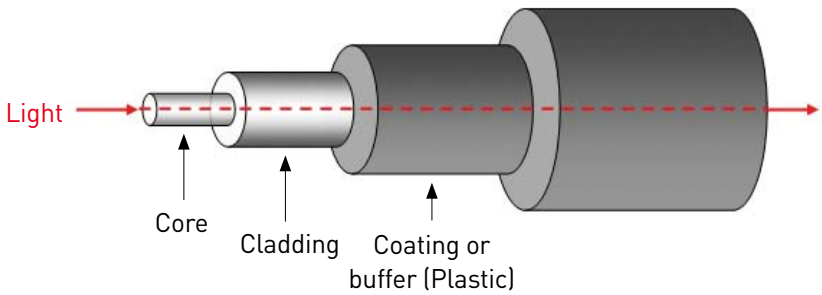
DEFINITION

Optical fiber is a “light pipe” carrying pulses of light generated by lasers or other optical sources to a receiving sensor.

Optical fibers are widely used in communications as they permit transmission over longer distances and at higher bandwidths (data rates) than other forms of communication. Fibers are used instead of metal wires because signals travel along them with less loss and are also immune to electromagnetic interference.
Most of the fibers are manufactured from high purity silica glass-like rods drawn into fine hair-like strands and covered with a thin protective plastic coating.

An optical fiber consists of:

- A transparent core in which the light propagates
- A transparent optical cladding that confines light in the core
- An outer coating (plastic buffer) acts as a protection and allows the glass rod to be curved.



Then, fibers are subsequently packaged in various cable configurations (Jacket) before installation in the external or internal networks.

LIGHT PROPAGATION

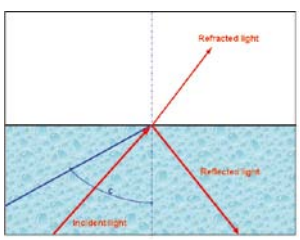
Light pulses are launched into the core region. The surrounding cladding layer keeps the light traveling down the core and prevents light from leaking out. This phenomenon is called: Total internal Reflection.

When light crosses a boundary between 2 mediums with different refractive index (n1 & n2), the light beam is partially refracted and partially reflected. This depends on the incidence angle and the refractive index of each medium.

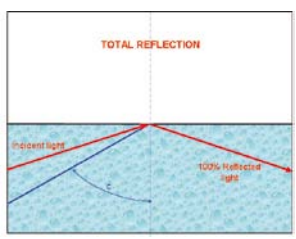
If light comes from a more optical dense medium (n1) and with an angle bigger than the “critical angle”, then all the light is reflected.

Let's take an example: reflection of the light at the surface of water – light is coming from the water:

air n2 = 1
water n1 = 1.3
n1>n2



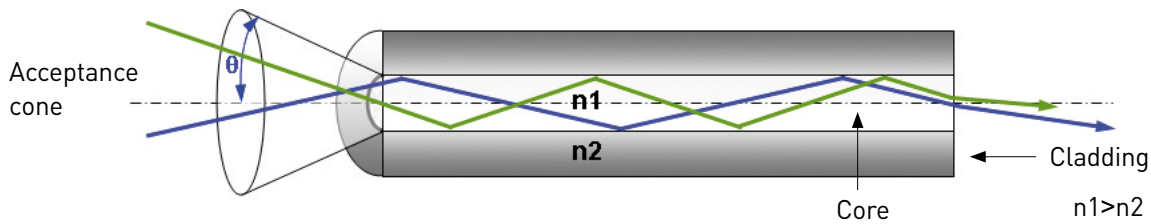
Light is partially reflected
and partially refracted because
its angle of incidence is < c (critical angle)



Light is totally reflected because
its angle of incidence is > c (critical angle)

The light rays are totally reflected by the interface between the air and the water (different refractive index n1>n2) if the incident angle is larger than the critical angle (c) with respect to the normal to the surface.

In an optical fiber, the light travels through the core (n1 high index of refraction) by constantly reflecting from the cladding (n2, lower index of refraction) because the angle of the light is always greater than the critical angle.



The light rays are totally reflected by the cylindrical surface between the core and the cladding because of their different refractive index: To confine the light (the optical signal) into the core, the **refractive index** of the cladding must be lower than that of the core: **n1 > n2**.

Light travels along the fiber bouncing back and forth off of the boundary. Because the light must strike the boundary with an angle bigger than the critical angle, only light that enters the fiber within a certain range of angles can travel down the fiber without leaking out. This range of angles is called the acceptance cone of the fiber. The size of this **acceptance cone** is a function of the refractive index difference between the fiber's core and cladding.

In simpler terms, there is a **maximum angle** from the fiber axis at which light may enter the fiber so that it will propagate in the core of the fiber. The sine of this maximum angle is the **Numerical Aperture** (NA) of the fiber. Fiber with a larger NA requires less precision to splice and work with than fiber with a smaller NA. *(SingleMode fiber has a small NA)*.

REFRACTIVE INDEX

The refractive index (n) describes the way light travels into a substance. It is expressed as a ratio of the speed of light in vacuum relative to that in the considered substance.

$$n = \text{velocity of light in a vacuum / velocity of light in medium}$$

For example, the refractive index of water is 1.33, meaning that light travels 1.33 times as fast in a vacuum as it does in water.

Typical refractive index:

refractive index of vacuum : n = 1 (reference/minimum value that cannot be improved)
refractive index of air : n = 1.0003 (value very close to the vacuum)
refractive index of glass : n ≈ 1.5

DISPERSION

This is the main cause of bandwidth limitations in a fiber. Dispersion causes a broadening of input pulses along the length of the fiber.

Three major types are:

- modal dispersion caused by differential optical path lengths in a MultiMode fiber
- material dispersion caused by a differential delay of various wavelengths of light in a waveguide material
- waveguide dispersion caused by light travelling in both the core and cladding materials in SingleMode fibers
- As a result of the dispersion, the light pulses spread out over time and thereby restrict the bit rate and/or the length of efficient optical link.

OPTICAL FIBERS

MAIN FIBER TYPES

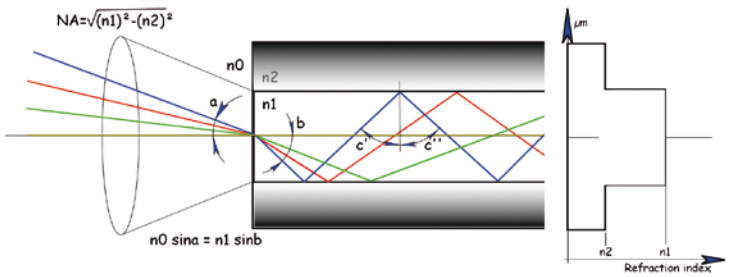
There are 2 types of optical fibers:

- MultiMode (MM) fibers where the fiber core can receive several light rays (or several propagation modes). 2 technologies exist for MultiMode fibers: Step index and graded index fibers.
- SingleMode (SM) fibers with only one propagation mode

Step-index MultiMode fiber

In a step-index MultiMode fiber, many rays of light are guided along the fiber core by total internal reflection. Rays that meet the core-cladding boundary at a high angle, bigger than the critical angle for this boundary, are completely reflected. The critical angle (minimum angle for total internal reflection) is determined by the difference in refractive index between the core and cladding materials. Rays that meet the boundary at a low angle are refracted from the core into the cladding, and do not convey light and thus information along the fiber.

The critical angle determines the acceptance angle of the fiber, often reported as the Numerical Aperture. A high numerical aperture allows light to propagate down the fiber in rays both close to the axis and at various angles, allowing efficient coupling of light into the fiber. However, this high numerical aperture increases the amount of dispersion as rays, at different angles, have different path lengths and therefore take different times to traverse the fiber.



" step " index profile:
speed light is constant
inside the fiber core

Shorter path (thus shorter propagation time)

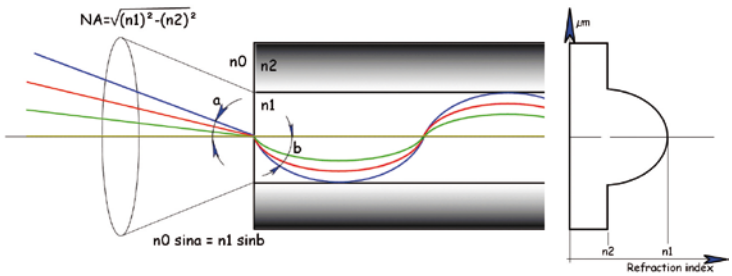
Longer path (thus longer propagation time)

In short:

- Different light pathways (modes)
- Light rays arrive separately at a receiving point
- Space between pulses to prevent overlapping limits bandwidth
- Best suited for transmission over short distance
- Widely used, low cost
- High numerical aperture adapted to wide optical source (LED)

Graded index MultiMode fiber

A graded-index MultiMode fiber contains a core in which the refractive index decreases gradually from the center axis out toward the cladding. The higher refractive index at the center makes the light rays moving down the axis advance more slowly than those near the cladding. Also, rather than zigzagging off the cladding, light in the core curves helically because of the graded index, reducing its travel distance. The shortened path and the higher speed allow light at the periphery to arrive at a receiver at about the same time as the slow but straight rays in the core axis. As a result: the light rays suffer less dispersion.



" gradient " index profile: speed light changes from center to edge inside the fiber core (speed higher for longer ways)

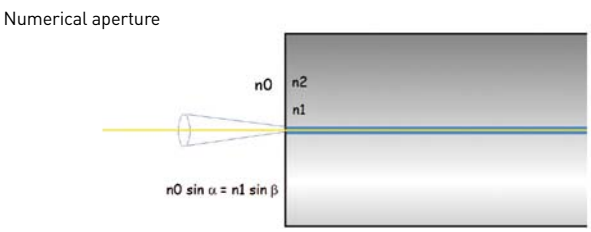
In short:

- Different light pathways (modes)
- Arriving at the same time at a receiving point
- Digital pulse is affected by less dispersion. Offers hundred of times more bandwidth than step index fibers.
- Best suited for transmission over medium short distance
- More expensive than step index fiber
- High numerical aperture adapted to wide optical source (LED)

SingleMode fiber

SingleMode fiber only supports one light ray (one mode of light propagation), because of the reduced dimension of the core.

For instance, the core diameter is 9 µm for a SingleMode propagation of wavelength from 1300 nm to 1550 nm. For such a core size, only one propagation mode is possible in the fiber, removing modal dispersion and giving higher transmission rate.

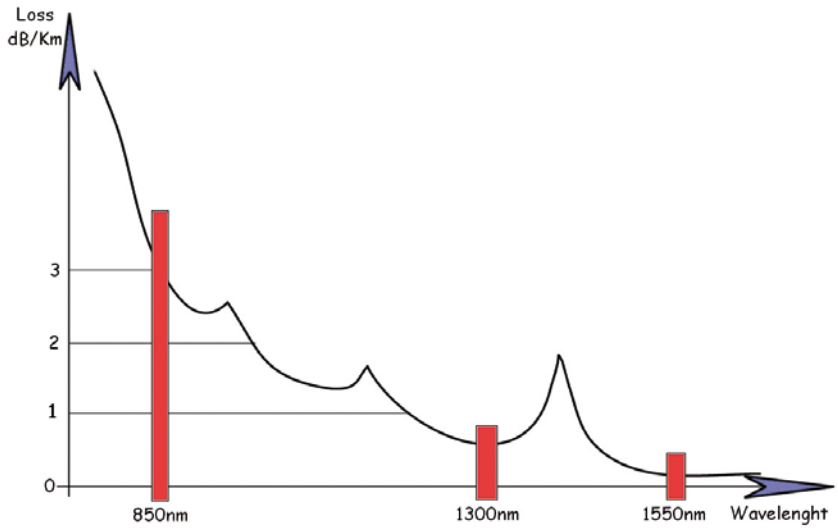


Core is so small that the light has only one way to propagate into the fiber

In short:

- 1 light pathway (mode) parallel to the axis
- Very limited pulse dispersion
- Adapted for long distance transmission
- Very widely used, not expansive for telecom wavelengths expensive
- Small numerical aperture adapted to high coherence optical source (Laser)

TYPICAL TRANSMISSION PROPERTIES OF GLASS FIBERS



For Telecommunication and for glass optical fibers, we use light in the infrared region, typically around 850, 1300 and 1550 nm due to low attenuation of the glass fiber at those wavelengths.

Glass fiber are the most common fibers used for telecom applications.

The ISO/IEC11801 specification describes the data rate and reach of optical fiber grades referred to as OS1, OS2, OM1, OM2, OM3 and OM4. The MultiMode fibers are prefixed with "OM" and the SingleMode mode "OS".

The related performances of existing fibers at the standard telecom used wavelength are summarized below:

				Minimum modal bandwidth MHz x km		
		Maximum attenuation dB/km		Overfilled launch bandwidth (LED source)		Effective Laser Launch bandwidth
Optical fiber type	Core diameter µm	850 nm	1300 nm	850 nm	1300 nm	850 nm
OM1	62.5	3.5	1.5	200	500	-
OM2	50	3.5	1.5	500	500	-
OM3	50	3.5	1.5	1 500	500	2 000
OM4	50	2.5	0.8	3 500	500	4 700

		Maximum attenuation dB/km	
Optical fiber type	Core diameter µm	1 310 nm	1 550 nm
OS1	9	1	1
OS2	9	0.4	0.4

The distance capability of the fibers is expressed below according to the different Gigabit Ethernet standards:

	1000BASE-SX 1 Gbit/s	10GBASE-S 10 GBit/s	40GBASE-SR4 40 Gbit/s	100GBASE-SR10 100 GBit/s
OM1	275 m	33 m	-	-
OM2	550 m	82 m	-	-
OM3	-	300 m	100 m	100 m
OM4	-	550 m	150 m	150 m
OS2	-	-	10 km	10 km

Multi-mode fiber has higher "light-gathering" capacity than SingleMode optical fiber. In practical terms, the larger core size simplifies connections and also allows the use of lower-cost electronics which operate at the 850 nm and 1300 nm wavelength (SingleMode fibers used in telecommunications operate at 1310 or 1550 nm and require more expensive laser sources).

Losses caused by bend:

Bending a fiber leads to some leakages of the high-order modes out of the fiber. The smaller the bending radius is the greater the losses are. Fibers with a low numerical aperture (as SingleMode fibers) are more sensitive to the bending than fibers with a high N.A. A minimum bending radius is specified for each type of fiber. Some fibers, like the G657 SingleMode fiber are optimized to decrease the sensitivity of performances to bends.

The minimum bending radius will vary with different cable designs. The manufacturer specifies the minimum radius to which the cable may safely be bent during installation, and for the long term. The former is somewhat shorter than the latter. The minimum bend radius is in general also a function of tensile stresses, e.g., during installation, while being bent around a sheave while the fiber or cable is under tension. If no minimum bend radius is specified, one is usually safe in assuming a minimum long-term low-stress radius not less than 10 times overall diameter for MultiMode cables, and 20 times overall diameter for SingleMode cables.

Beside mechanical destruction, another reason why one should avoid excessive bending of fiber-optic cables is to minimize microbending and macrobending losses. Microbending causes light attenuation induced by deformation of the fiber while macrobending causes the leakage of light through the fiber cladding and this is more likely to happen where the fiber is excessively bent.

CONNECTORS

According to Telcordia Generic Requirements for SingleMode Optical Connectors and Jumper Assemblies, optical fiber connectors are used to join optical fibers where a connect/disconnect capability is required.

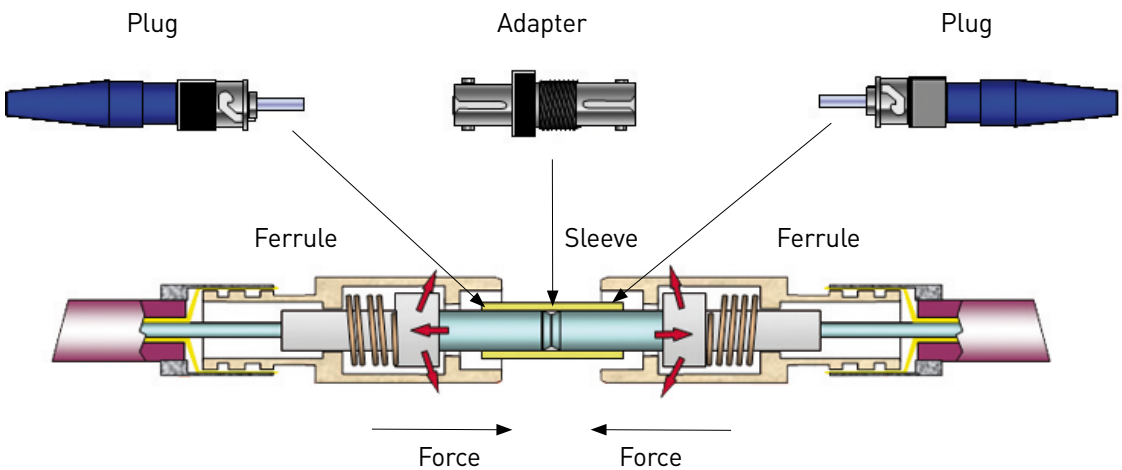
ALIGNMENT TECHNOLOGIES

There are several alignment technologies to connect the cores of fibers so that light can pass:

- Physical Contact: Fibers are core to core mechanically contacted
- Expanded beam: Beams are shaped by lens ; no contact
- Matching membrane: Fibers are mechanically aligned and fibers ends are immerged in optical index adaptation medium ; no contact
- Air gap : Fibers are not in contact. Light goes through air.

Physical contact (PC, UPC and APC): e.g. LC, SC, FC, ST, ODC, R2CT, OSIS series and LuxCis

For that technology, a connector assembly consists of an adapter and two connector plugs.
Fibers are core to core mechanically contacted. The ferrule of the plugs are aligned into a guiding sleeve belonging to the adapter. Optical losses depend on the quality of the optical interface and the accuracy of the alignment between the 2 ferrules.

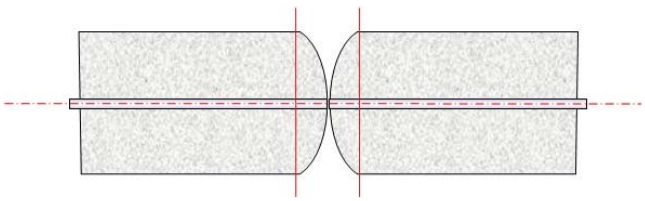


End face polishing techniques:

The fiber is glued into the ferule and the end faces of ferrule and fiber are polished.
3 types of polishing are available: PC, UPC and APC providing different performances levels.

- PC and UPC polishing:

Available for all types of fibers, SingleMode or MultiMode, the PC (Physical Contact) is a curved polishing, centered on the optical axis.

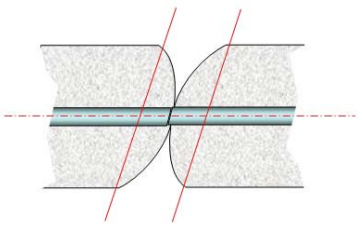


PC: RL > 30 dB

UPC: RL > 50 dB

The UPC (Ultra Physical Contact) polishing may be required for SingleMode fibers: the geometry is the same as PC and leads to the same level of insertion losses but the quality of polishing is higher and provides Return Losses of 50 dB (compared to 30 dB in PC).

- APC polishing:

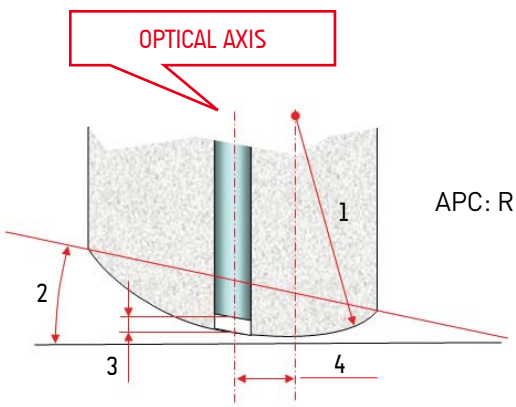


APC (Angled Physical Contact) is a tilted curved polishing required for SingleMode fibers.

This type of technology achieves excellent Return Losses (60 dB), useful to protect sensitive light sources like laser diode from optical feedback.

The polishing angle enables to reject the part of the return losses generated by the optical face reflection (Fresnel loss).

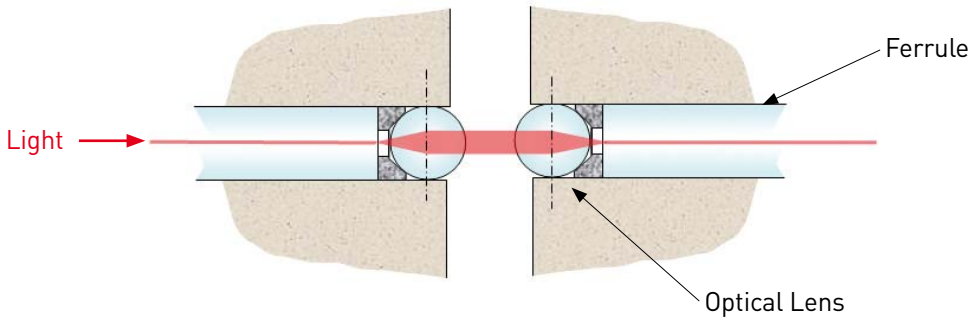
1/ End face Radius 5≤R≤ 12mm
2/ Polishing Angle 8° or 9°
3/ Fiber Extension ± 0.1µm
4/ Apex Offset < 50µm



APC: RL > 60 dB

Expanded beam: e.g. Probeam series

In that technology, light is expanded at the output of the fiber thanks to a ball lens, collimated and transmitted across an air gap.
By using a symmetric system for the opposite plug, the light can be refocused back down to the core of the receiving fiber.

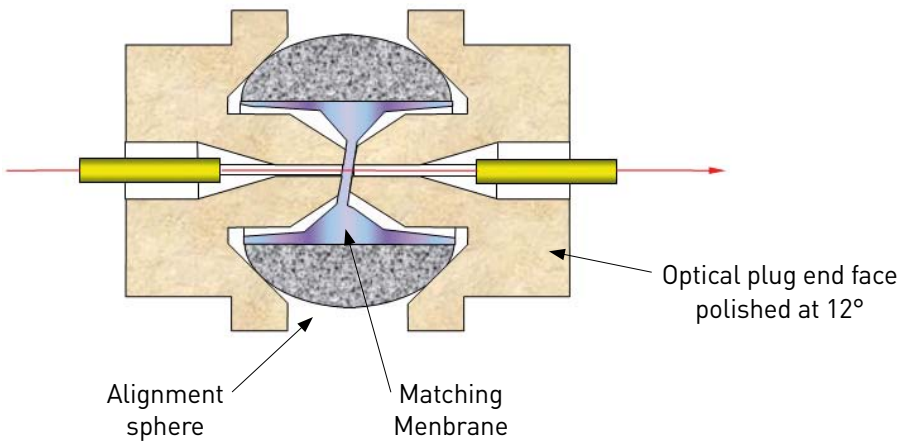


Most of the time, no adaptor is required for that type of assembly: the plugs are able to connect to each other.

Thanks to the beam expansion, the optical connection is less sensitive to dust and lateral misalignment.
As the optical ends are not in physical contact, there is no damage to the fiber even after repeated matings: These optical connectors allow a high number of mating.
Optical losses are mainly due to air gap (Fresnel loss). They also depend on the accuracy of the positioning of the ferrule to the lens (focal distance).

Matching membrane: e.g. EC series

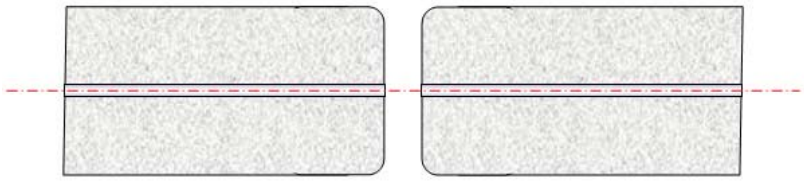
For that type of connection, the plugs are pushed one to each other inside a sleeve of an adaptor but are not in physical contact. An index matching medium is set between the fibers' ends, ensuring optical continuity for the light traveling from the first fiber to the second one. This matching element acts as a light bridge transferring light without significant losses.



Because the optical fiber ends are not in physical contact, there is no damage to the fiber end. This technology offers a high number of mating with no degradation of optical performance.

Air gap: e.g. F-SMA series

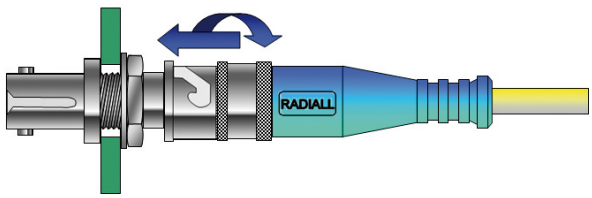
Air gap technology was used in early connectors. Because they didn't have keyed ferrules and could rotate in mating adapters, they needed an air gap, between the connectors, to prevent them rotating and grinding scratches into the optical faces of the fibers.



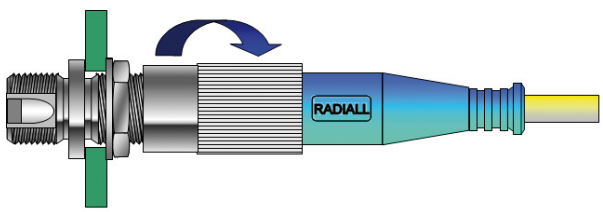
LOCKING TECHNOLOGIES

There are numerous types of plugs and sockets to connect optical fibers, using threaded, bayonet, push-pull and snap-lock connections.

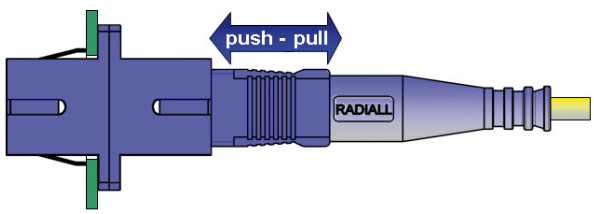
Bayonets: e.g. ST series



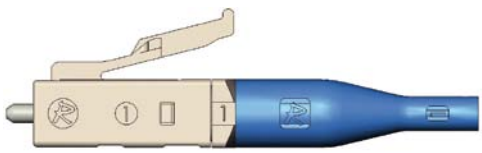
Screw-in: e.g. FC, ODC series



Push-pull snap-in: e.g. SC, EC series



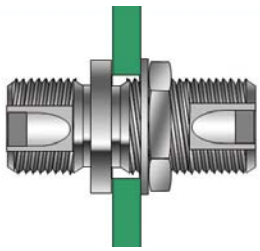
Push pull latched: e.g. LC series



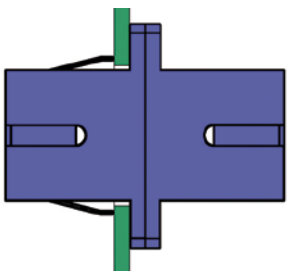
CONNECTORS

PANEL MOUNTS TECHNOLOGIES

Bulkhead: screw and nut feed through technology



Snap-in: elastic spring technology

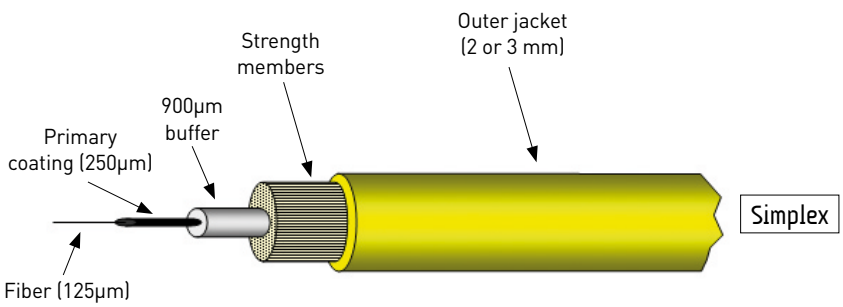


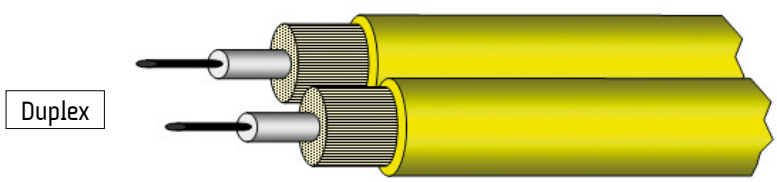
CABLES

In order to cope with any stress (tensile, bending, torsion...) or environmental conditions (weather, abrasion, chemical, thermal...), fiber optics need to be protected by a suitable cable structure.

TYPICAL INDOOR CABLES

For inside buildings, houses, equipments. Typical temperature range: -20°C / +70°C





For indoor cables, there are 2 basic designs of cable structures: loose and tight. Both contain some strength members, such as aramid yarn or glass fibers.

Loose structure cables

- The optical fiber (250µm) is inside a plastic protective tube that allows limited movements of the fiber
- Usually contains a water resistant gel surrounding the fiber
- Usually dedicated to pigtails

Tight structure cables:

- The fiber is strictly immobilized inside the jacket. This structure allows no movement of the buffered fiber with respect to the outer jacket and strength members
- Good behavior with temperature changes
- More robust than loose-tube cables, they are best suited for moderate length LAN or WAN connections, long indoor runs, direct burial and for underwater use.

Simplex

Sindex

Duplex

Multiples fibers

Indoor Fiber Optic Cable Fire prevention:

Fire prevention standards are not the same for European and US markets.

For European market, communications cables must typically comply with IEC 60332-3 (EN 50266) or IEC 60332-1 (UL VW1) fire tests depending on application. In most of the countries LSZH (Low Smoke Zero Halogen) material are mandatory. LSZH (low smoke zero halogen) cable jackets are composed of fire retardant materials that reduces the amount of smoke emitted when combusted. A feature in LSZH is that they contain zero halogen during combustion. They have been cited as an ideal cable jacket in high risk areas of fire or crowded public locations.

For the US market, communication cables must comply with the National Electrical Code (NEC) requirements. There are three types of indoor spaces identified by NEC: plenums, risers and general purpose areas.

- What is a plenum area and plenum rated fiber optic cable?
  Plenum is an air-handling, air flowing and air distribution system space such as that found above drop ceiling tiles or heating and ventilation ducts. Plenum rated cables must meet UL-910 specification and their outer jacket are made of materials that retard the spread of flame, produce little smoke and protect electronic equipment from damage in fires.
- What is a riser area and riser rated fiber optic cable?
  Riser is a pathway such as floor opening, shaft or duct that runs vertically through floors. Riser rated cables can be run through building vertical shafts (risers) or from one floor to another floor. Riser rated cables must meet UL-1666 fire-resistance specification and cannot be installed in plenum area. However plenum rated cables can be used as a substitute for it and installed in riser spaces.
- What is a general purpose area?
  Any space on the same floor which is not plenum or rise is identified as general purpose area.

CABLES

Based on NEC code, indoor fiber optic cables can be categorized as six types. You can see their designation and respective UL test below:

NEC Code	Description	Cable Application	UL Test	Possible Substitute
OFNP	Optical Fiber Nonconductive Plenum Cable	Plenum, overhead, fiber only	UL - 910	
OFCP	Optical Fiber Conductive Plenum Cable	Plenum, overhead, hybrid (fiber/wire)	UL - 910	
OFNR	Optical Fiber Nonconductive Rise Cable	Riser, backbone, fiber only	UL - 1666	OFNP
OFCR	Optical Fiber Conductive Rise Cable	Riser, backbone, hybrid	UL - 1666	OFCP
OFN	Optical Fiber Nonconductive	General purpose, horizontal, fiber only	UL - 1581	OFNP, OFNR
OFC	Optical Fiber Conductive	General purpose, horizontal, hybrid	UL - 1581	OFCP, OFCR

TYPICAL OUTDOOR CABLES OR AEROSPACE

Cable structure definition per ARINC 802:

- Loose structure: a fiber optic cable structure that allows limited movement of the buffered fiber (usually the 900 µm) with respect to the outer jacket and strength member.
- Tight structure: a fiber optic cable structure that allows no movement of the buffered fiber with respect to the outer jacket and strength member.

For communication uses:

- Distribution fiber cables: this compact building cable consist of individual 900 microns buffered fiber. For connectors mounting the fibers ends are generally re-tubed with a 2 mm buffer.
- Breakout fiber cables: breakout cables are also called fanout cables. In tight buffered cables each fiber is only a 900um tight buffered fiber, but in breakout cables every fiber is a subcable by itself. Each fiber has a 2~3mm jacket, then outer jacket covers these subcables, aramid yarn and ripcord inside. This design allows users to divide the cable to serve users with individual fibers, without the need for patch panel. Breakout cable enables the quick installation of connectors onto 2+mm robust jacketed fiber.

For aerospace application, fiber optic cables are ruggedized to withstand harsher environment conditions, such as temperature range, abrasions resistance. Flammability and toxicity are also major requirements.

COLOR CODING

The buffer or jacket on indoor patchcord is often color-coded to indicate the type of fiber used:

Buffer / jacket color	Designation
Yellow	SingleMode optical fiber
Orange	MultiMode optical fiber
Aqua	MultiMode OM3 optical fiber (optimised for 850nm)
Purple	For aerospace cables

Outdoor patchcords are most of the time, black.

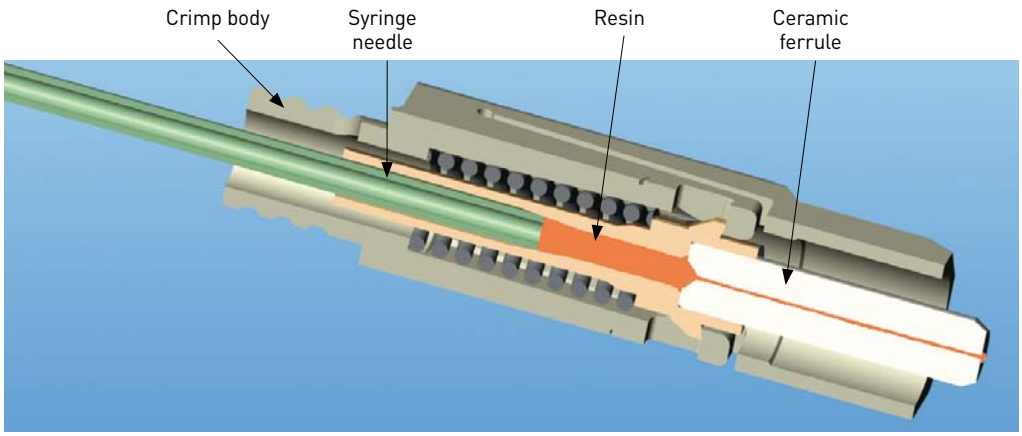
TERMINATION PROCESS AND RADIALL TECHNOLOGIES

Different technologies to terminate connectors on optical fibers exist. In all the cases, the connector mounting should be performed following supplier's instructions.

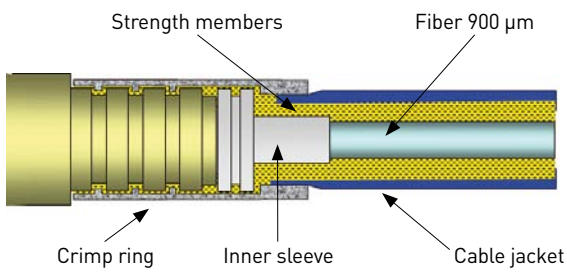
There are different criteria that should be considered for these different techniques: connector performance, mounting time, connector price, mounting easiness, yield, and required tooling...

Steps to terminate connectors onto fibers:

- Stripping: remove the protective polymer coating around the optical fiber itself
- Gluing: glue the fiber inside the ferule
- **Secure bonding®:** an exclusive RADIALL patented system protects the floating mechanism during the resin-injection process. A slot on the crimping body allows removing the syringe freely without the needle touching any sensitive inner surface.
  This system avoids calibrating the volume with a dispenser. The resin will be injected inside the cavity, with no risk of excess or insufficient volume, thus guarantying proper fiber retention.
  (Too much resin can break the fiber during the connection while not enough resin does not properly maintain the fiber).



- Crimping: secure the fiber position inside the connector
  Crimping reliability® (RADIALL patent): Only one crimp operation is required for both strength members and jacket retention. A mini metallic tube (inner sleeve) is inserted between the fiber and the cable jacket to protect the fiber and avoid any stress. The shape of the crimping ring is adapted to ensure excellent cable retention.



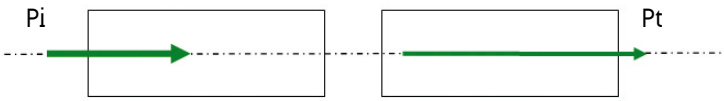
CONNECTOR MOUNTING

- Polymerization: cure the fiber/ferule assembly. Polymerization is most of the time made with hot process, but can be done also with cold one, for field installation for instance.
- Polishing: Different techniques for different performance: PC, UPC or APC.
  PC Polishing can be manual, whereas it is recommended to use automatic polishing machines for UPC and APC.
  RADIALL proposes pre-angled connectors (LC & SC series) with a 8° pre-polishing of the ferule for faster fiber termination process.
  Inspection: Visual inspection of the fiber end face to detect any crack or dust that would impact the connection.

IL AND RL MEASUREMENTS

In order to qualify how efficiently light is transmitted in a connection, we measure two key characteristics:

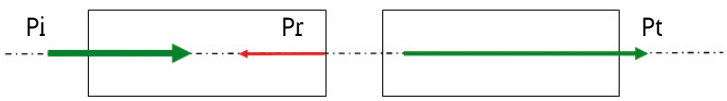
- Insertion Loss (IL or attenuation) refers to the loss of signal power (light) resulting from the insertion of a device (for example a connector) in a transmission line or optical fiber. Insertion loss can result from absorption, misalignment or air gap between the fiber optic components. The smaller the Il, the better.



IL= - 10log (Pt/Pi)

Pi: incident Power
Pt: transferred Power

- Return loss (RL) is the ratio of the reflected optical power to the incident power. When light is transmitted into a connector, a portion of light is reflected back from the fiber end face. It is desirable for this figure to be as high as possible (meaning to have as little reflected light as possible) to avoid problems with transmission lasers.



RL (dB) = -10 log (Pr/Pi)

Pi: incident Power
Pt: transferred Power
Pr: reflected Power

IL and RL measurement methods are described in IEC 61300 standards (Fiber optic interconnecting devices and passive components – Basic test and measurement procedures).

Specifically:

- IEC 61300-3-4: Examinations and measurements - Attenuation
- IEC 61300-3-34: Examinations and measurements - Attenuation of random mated connectors
- IEC 61300-3-6: Examinations and measurements - Return loss

Radiall connectors are tested according to these methods:

- IEC 61300-3-4 method B: This method describes the procedure to the insertion loss due to one cabled end (or attenuation) based on a master reference.

This measurement is based on the use of an optical power meter. The power meter consists of an optical detector and associated electronics for processing the signal.

2 measurements of power are required for each measurement of attenuation, A:

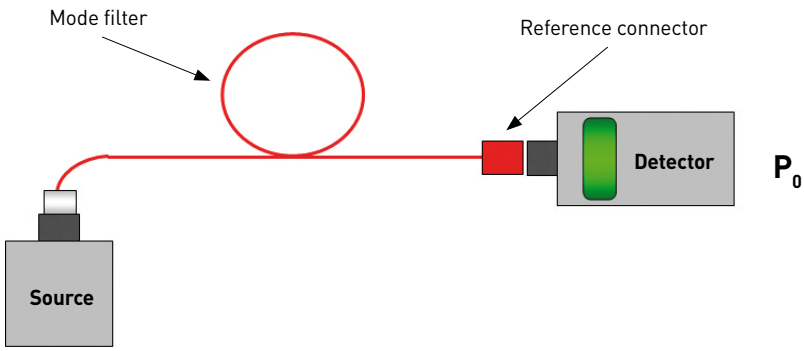
$$A = -10 \log (P_1/P_0) \text{ dB}$$

Where P_1 is the measurement of power with the Device Under Test (DUT) in the circuit

Where P_0 is the measurement of power without the DUT in the circuit

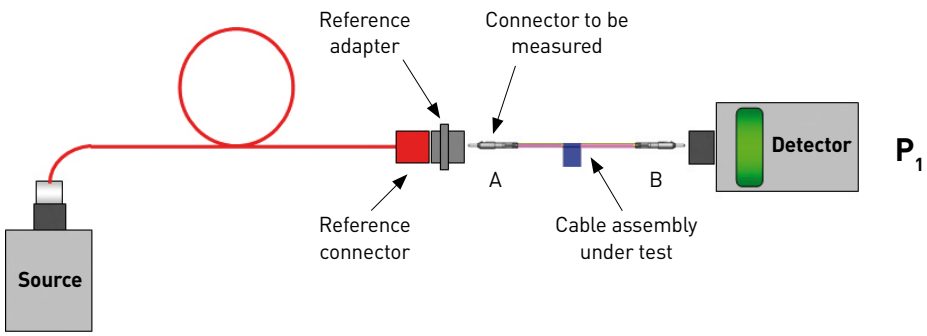
1st step: Measure of P_0 - calibration of the measurement tools

- Connect the reference connector on the Detector
- Measure P_0 power



2nd step: Measure

- Insert the cable assembly between the reference connector and the detector
- Measure P_1 to get the connector extremity A insertion loss
- Turn the cable assembly and measure P_1 to get the connector extremity B insertion loss



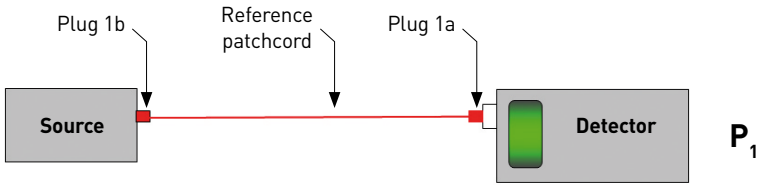
This measurement only includes the plug on the source end of the DUT in the measurement. To measure both ends of the DUT the measurement shall be repeated with the patchcord reversed.

- IEC 61300-3-34: This method describes the procedure to measure the statistical distribution and mean attenuation for random mated optical connectors.

This method is based on the use of random patchcords and adaptors. All the connectors are sequentially used as "reference" plugs and all the remaining are tested against them.

CONNECTOR MOUNTING

1st step: Measure of P_1



2nd step: Measure

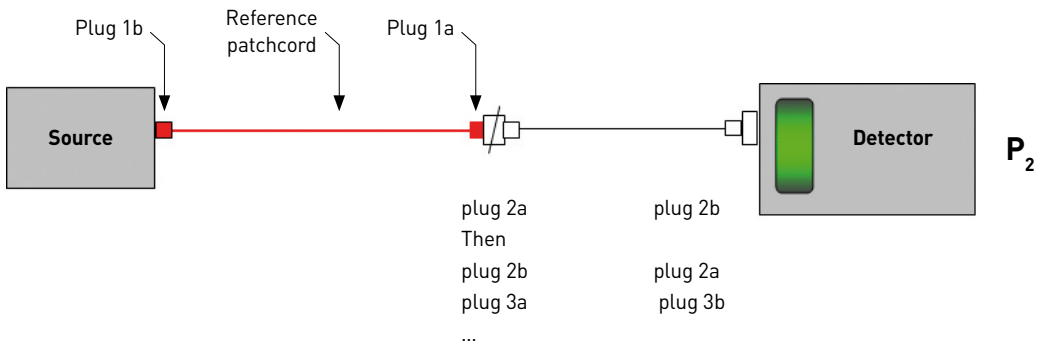
The loss of each mated connector pair (1a/2a, 1a/2b, 1a/3a, ... 1b/2a, ..., 2a/3a, ...) is calculated with the following equation:

A = -10 log (P1/P2) dB – (AxL) dB

Where A is the fiber attenuation per kilometre

L is the length of fiber in km

Note: the product (AxL) may be ignored when patchcord length is ‹10 m

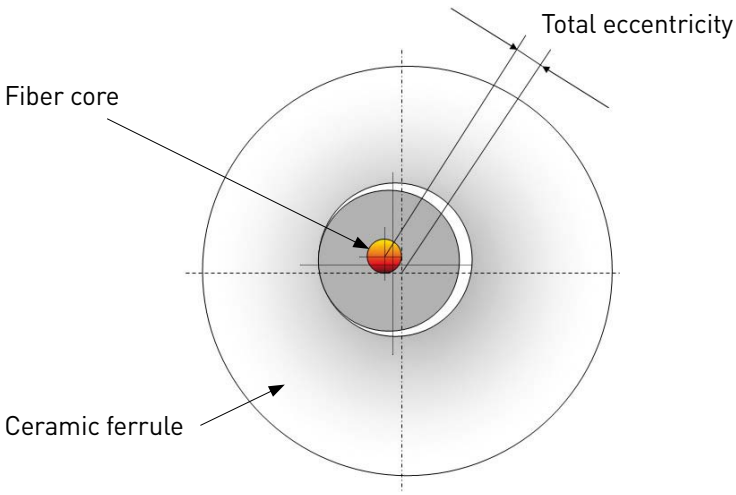


TUNING OF CONNECTORS TO MINIMIZE RANDOM IL

Radiall **SC and FC series** can be tuned to optimise fibers' core alignment and thus highly reduce Insertion Loss on random connections.

This competitive advantage is based on providing one-piece tuneable connectors®, a radiall exclusivity, which can be tuned to 1 of 6 angular positions.

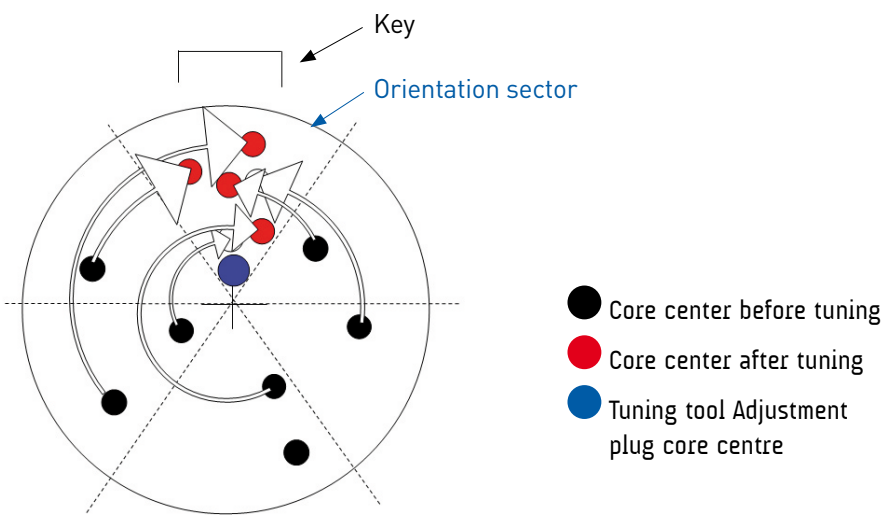
In standard connectors, the fiber core is randomly positioned around the ferrule axis.



The tuning technique consists of rotating the optical ferrule, after cabling, in order to locate the core in a pre-determined permanent sector, thus reducing the offset between fiber core (IEC 61300-2-41 definition).

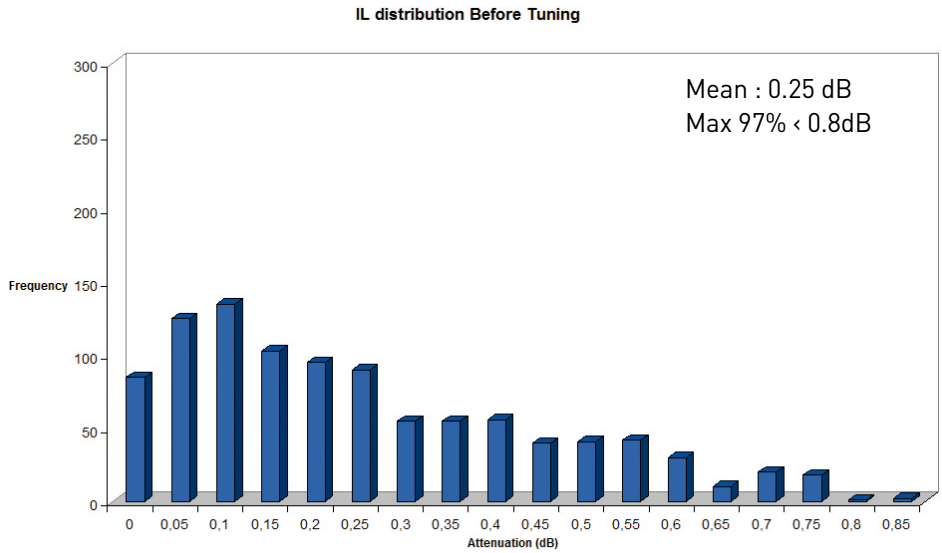
6 angular positions are available to locate the core of the fiber in a reduced sector range. The offset between the connected fibers is then reduced and the attenuation of 2 connectors is statistically divided by 2.

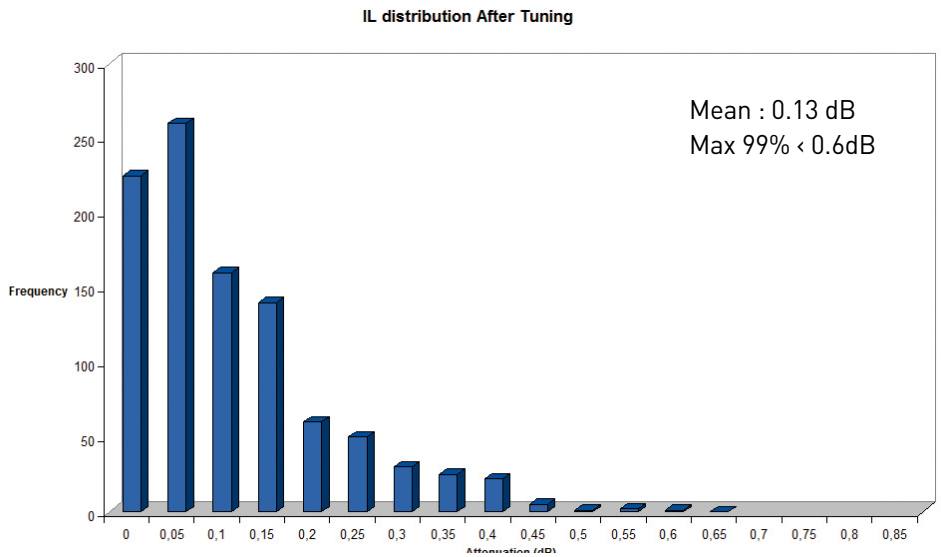
The misalignment between the different optical cores is reduced after tuning each connector:



CONNECTOR MOUNTING

These graphs show the typical statistical distribution of SingleMode SC connector before and after tuning:





PC and APC connectors can be tuned.

To enable its customers to benefits from the tuning technique, Radiall also provides a precision and user friendly tuning tool with short operating time. There is no risk to the fiber as the optical faces are not in contact during the tuning operation.

Please, refer to “Tooling” section for more detail on this tuning kit.

GLOSSARY OF TERMS

APC connector: Angled Physical Contact connector with the end-face polished at 8° (or 9° in some cases). This polishing profile provides very low back reflection (RL>60 dB).

Attenuation: Reduction in the optical signal power in a fiber (expressed in dB at a specific wavelength) due to scattering, absorption, mode conversion or at a coupling point (connector, splice).

Bending radius: Maximum radius of bending for a fiber without breaking and not exceeding a predetermined attenuation value.

Bonding: Gluing technology to immobilize the fiber inside the optical ferrule.

Buffer coating: A protective layer, such as an acrylic polymer, applied over the fiber cladding.

Bulkhead panel mounting: Panel attachment of a connector using a screw and nut feed through technology.

Cladding: The outer concentric layer that surrounds the fiber core and has a lower index of refraction such that light at sufficiently large angles of incidence is totally reflected back into the core.
In other words: the entire, optically transparent material of a fiber, except the core.

Core: The central area of an optical fiber which serves as a waveguide.
It has a refractive index higher than the surrounding cladding.

dB: Decibels. Unit of measurement of optical power.

Duplex connector: Consists of two simplex connectors.

Ferrule: A cylindrical part, usually ceramic, which holds and aligns the fiber in a connector.

Fiber buffer: Consists of one or more materials that is used for protecting the individual fibers from damage and provides mechanical isolation and/or mechanical protection.

Flange mount: Panel connector screwed into the wall and requiring several holes (5 holes for square flange, 3 holes for rectangular flange).

Graded-index fiber: An optical fiber where the core has a non-uniform refractive index. The core is composed of the glass where the refractive index decreases from the center axis with a predetermined profile. The purpose is to reduce modal dispersion and thereby increase fiber bandwidth.

HCS fiber: Hard-Clad Silica fiber. Fiber with a silica/silica or plastic core and hard polymer cladding, which is tightly bonded to the core.

IEC: International Electro technical Commission.

Insertion Loss: The loss of power that results from inserting a component, such as a connector or splice, into a previously continuous path.

Jacket: Outer part of the buffer. A protective covering over a fiber optic cable, usually the very outermost layer of the cable.

GLOSSARY OF TERMS

Key : A feature of a terminus that prevents the terminus from rotating when it is installed in a connector. This ensures proper alignment of tuned termini and termini that use an APC polish. The key also prevents torsion stress from being applied to the portion of the fiber that is within the terminus.

Loose structure cable : A fiber optic cable structure that allows limited movement of the fiber with respect to the outer jacket and strength member.

Mechanical ferrule / crimp ferrule : Immobilization technology used to secure the connector at the extremity of the fiber.

Mode : In guided-wave propagation, such as through a waveguide or optical fiber, a distribution of electromagnetic energy that satisfies Maxwell's equations and boundary conditions. Loosely, a possible path followed by light rays.

Optical ferrule : Guide pin for fiber connectors in which the fiber is secured (generally ceramics).

PC connector : Physical Contact connector. A specific ferrule end finish profile in which a plane that is tangent to the end face at the center of the fiber core is normal to the axis of the fiber.

PCF : Polymer Cladded Fiber.

POF : Plastic/Polymer Optical Fiber. Usually a large core (1mm) MultiMode fiber.

Pull-proof : A fiber optic cable and connector construction such that a pull applied to a single fiber behind the connector will not move or separate the ferrule end-faces.

Refraction : The change in direction experienced by a ray (wave) when it passes between different materials having different refractive indices.

Refractive index : The ratio of the velocity of light in free space to the velocity of light in a given material.

Removable duplex brace : Used to attach 2 simplex connectors in a duplex one.

Snap-in mounting : Panel attachment of a connector using an elastic spring feed through technology.

Screw-in mounting : Type of fastener characterized by a helical ridge, known as a thread, wrapped around a cylinder.

Step-index : An optical fiber core that has a uniform refractive index. This construction has a large modal dispersion as compared to graded-index fiber. This leads to pulse widening and limits the bandwidth as the pulses blur into one another.

Tight structure cable : A fiber optic cable structure that allows no movement of the fiber with respect to the outer jacket.

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RADIALL PART NUMBERS

ST

EC

F-SMA

LuxCis®

MIL-PRF-29504

R2CT™

OSIS™

Cable assemblies

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Reference patchcords

Tooling

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