

# Harsh environment ruggedised custom fibre optic cable assembly service

European leader in advanced technology solutions





**Acal BFi offer a unique fibre optic / hybrid fibre optic and copper cable assembly service for commercial, industrial and harsh environments.**

We have over 20 years experience in the design and manufacture of both fibre only and hybrid fibre / copper cables. We have designed, produced and installed cable assemblies for many diverse environments, including nuclear submarines, oil exploration vessels, trains, open cast mines and roadside traffic gantries.

Although all very different, the one thing all of these applications have in common is the need for a tailor made solution capable of operating in a harsh environment with the need for strict quality standards.

With an in-house, purpose-built, ISO9001-accredited, custom-assembly centre, established capability and long-standing partnerships with leading suppliers, we have the resources and expertise to provide a solution to meet your needs.

### Our cutting-edge solutions and expertise cover the following:

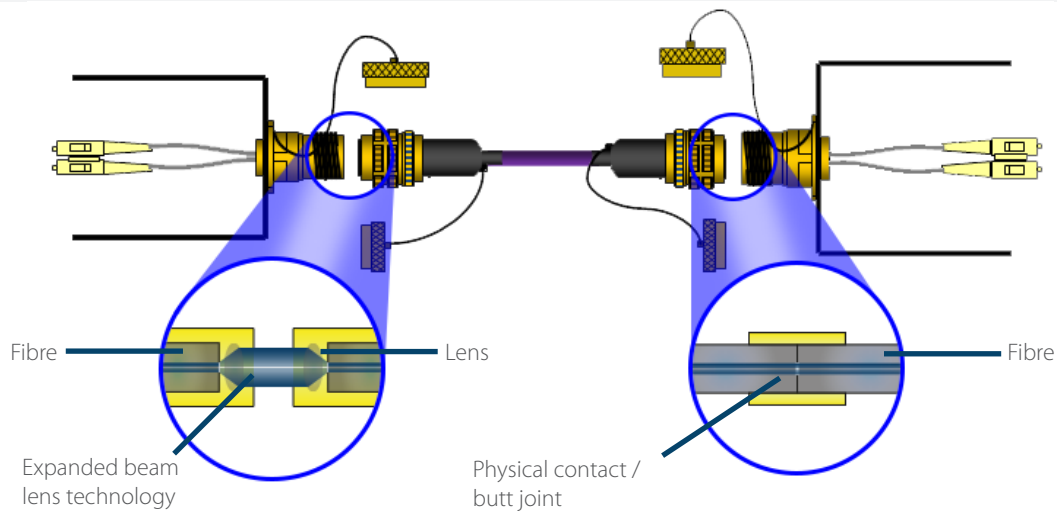
**Specialist product knowledge** – You can leverage our engineering expertise to be assured of the most cost-effective solution.

**Wide choice of connector solutions** – Our connector systems cover both single-mode and multi-mode systems with butt joint or expanded beam connectors.

**Wide choice of fibre types** – Our expertise covers multiple fibre types with options to suit data and telecom, industrial, high bandwidth, medical, aerospace, defence, transport and applications in harsh environments.

**Copper / fibre hybrid** – When using 38999 style connectors we are able to combine fibre, copper and co-ax cables into one connectorised assembly.

# Ruggedised / harsh environment fibre assemblies



## Plug-to-plug connector technology options

### Physical contact / butt joint technology

- Available in single-mode and multi-mode
- Available with 1, 2, 4, 6, 12, 24, 48, 64 and 72 channels
- Circular MIL-38999 connector option with multiple planforms
- Hermaphroditic options

### Expanded beam technology

- Available in single-mode and multi-mode
- Available in 1, 2 and 4 channels

### Connector plating options

- Nickel aluminium bronze (high salt spray resistance)
- Black zinc anodised
- Black zinc nickel
- Stainless steel
- ARCAP (for corrosion resistance)
- Electroless nickel
- Olive drab cadmium
- Olive drab zinc cobalt

### Cable options

- User specified, typically ruggedised / MIL tactical cable with / without armour cladding

## Bulk-head connector / receptacle-to-flying lead options

### Fibre terminations

- Fibre terminated as pig-tail with commercial connectivity
  - Bare fibre
  - ST
  - LC, LC duplex
  - SC, SC duplex
  - SMA
  - MTRJ
- Fitted with appropriate strain relief
- Pig-tail fibre -user specified, typically commercial ZIP style cable

## Application considerations

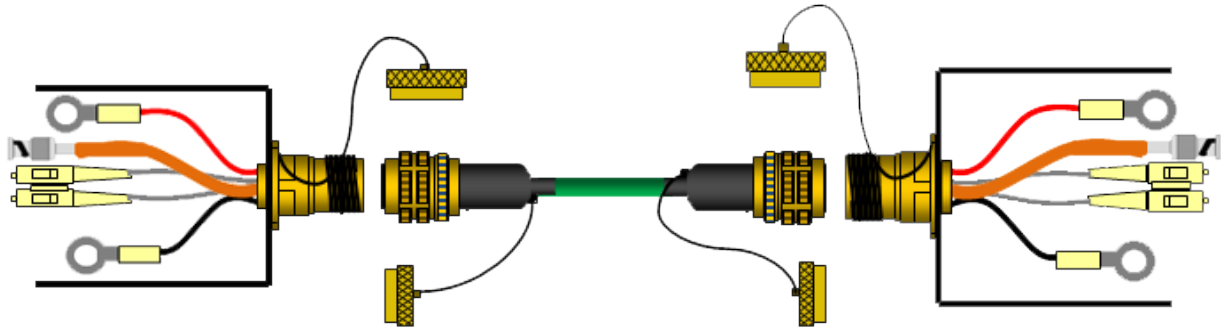
### Physical contact / butt joint

- Suitable for use in harsh environments
- Most suitable technology for fixed installations
- Lowest insertion loss technology
- Requires 'clean' environment during mating cycle

### Expanded beam

- Suitable for use in harsh environments
- Best performance in extreme weather
- Ideal for frequent deployments
- Mating cycle does not need 'clean' environment

# Ruggedised / harsh environment hybrid fibre / copper assemblies



## Plug-to-plug connector technology options

### Housing

- Typically MIL-38999 circular connector using appropriate shell size and planform

### Copper termination

- Power contacts up to size of 8
- Co-ax, tri-ax options for RF
- ARINC and SMPTE (Broadcast) options available

### Fibre termination

- Size 16 fibre optic terminii
- Available in single-mode and multi-mode
- Up to 20 fibre terminii in hybrid planforms

### Connector plating options

- Nickel aluminium bronze (high salt spray resistance)
- Black zinc anodised
- Black zinc nickel
- Stainles steel
- ARCAP (for corrosion resistance)
- Electroless nickel
- Olive drab cadmium
- Olive drab zinc cobalt

### Cable options

- User specified, typically assembly is constructed of multiple cable types in appropriately specified conduit

## Bulk-head connector / receptacle-to-flying lead options

### Fibre terminations

- Typically terminated as pig-tail with commercial connectivity
  - Bare fibre
  - ST
  - LC, LC duplex
  - SC, SC duplex
  - SMA
  - MTRJ
- Fitted with appropriate strain relief
- Pig-tail fibre-user specified, typically commercial ZIP style cable

### Copper terminations

- Typically terminated with commercial connectivity
- Cut / stripped ends
- Ring terminals / power connectors
- Coax connectors (SMA, SMB, BNC, etc)

### Application considerations

- Suitable for use in harsh environments
- Excellent for outside broadcast and rail applications
- Suitable for frequent deployment

## Fibre optics put to the test for Airbus A400M chargers

As the new super airlifter for the 21st century, the A400M has been designed to fulfill multiple operational goals and to set new benchmarks for performance expectations. In its role as a dual airlifter and tactical fuel tanker for in-flight re-fuelling, verifying the accuracy and reliability of the fuel management system is critical. That is why, as specialists in fibre-optic connectors and cables for harsh environments, Acal BFi were asked to adapt and re-work the custom Airbus test rigs after a critical connector in the fuel system was upgraded.



### Airbus A400M – Airlifter for the 21st century

For strategic missions the A400M must achieve a high cruise speed for long-range flights: During tactical missions, however, the A400M must operate effectively at low speed and low level, despite rough, short or soft-field conditions. An in-flight re-fuelling capability also gives the A400M the ability to operate as a tactical tanker, giving an additional dimension to its multi-function role.



### Computerised fuel management system

Accurate monitoring of fuel levels is crucial to support the A400M in both long-range and short-range operations, as well as whilst dispensing or receiving fuel during in-flight re-fuelling. The A400M's fuel load is contained in a main fuel tank, and also in two, optional cargo-hold fuel tanks (CHTs), which connect into the aircraft's computer-controlled centralised fuel-management system. The fuel quantity management system (FQMS) uses fibre-optic connectors for reliable transmission of crucial information on fuel levels in the on-board tanks and on the air-to-air re-fuelling pods.

The A400M's FQMS harnesses connect to the wing route end and power all six tank-wall processors. In-tank harnesses attached to each processor are fitted with probes that monitor data on capacitance, resistance, humidity and density, which is fed back to the wing data recorder via fibre-optic cables.

Regular testing, using custom manufactured test rigs, is essential to ensure that the computerised fuel management system continues to function correctly by measuring the return loss, insertion loss and signal integrity of fibre-optic networks in the wings.

So, when Airbus changed the connector on the wing route end of the fuel system, they asked Acal BFi to re-work the custom test rigs with a new, compatible connector. This, in turn, required replacement fibre-optic cabling which would be compatible with the new connector. Acal BFi adapted the existing test rigs using ruggedised fibre-optic connectors, linked via 62.5/125µm multimode cable, to ensure a high optical performance.

Acal BFi's expertise in fibre-optic technologies for harsh environment and mission-critical applications, allowed them to suggest a suitable combination of connector and cabling, whilst their fully equipped cable-assembly production facility allowed in-house re-working of the existing test rigs.

### Conclusion

Designed to fulfill a demanding double role as an air transporter and air-to-air re-fuelling aircraft, the A400M relies on fibre-optic cabling and connectors to monitor fuel levels during flight and in-flight re-fuelling. By adapting the existing custom test rigs with new fibre-optic connectors and cabling, and re-working the rigs in-house, Acal BFi help to ensure robust reliability for these mission-critical systems.



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