



CABLE MOUNT FEMALE AXOMACH® CONNECTOR

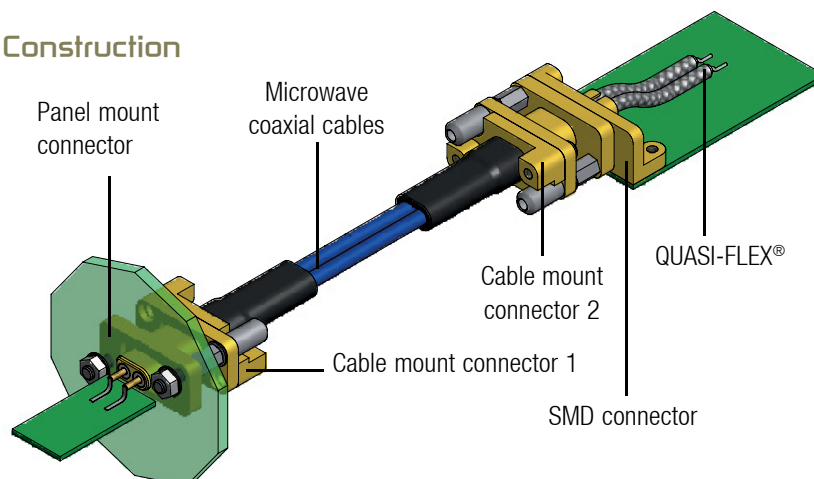
High data rate links for faster data transmission

AXON' proposes AXOMACH®, a range of high data rate links composed of low loss microwave coaxial cables and different connector types: AXOMACH® Micro-D based cable mount, panel mount, SMD or saver connectors as well as SMA panel mount connectors.

Aimed, for example, at the interconnection of high definition imagery sensors in satellites these links present the following main advantages:

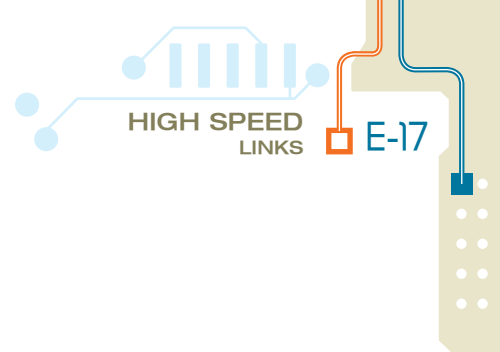
- Transmission of high data rates: 10 Gb/s up to 40 Gb/s,
- Signal integrity: skew < 10 ps per mated pair,
- Low mismatching: differential characteristic impedance 100 Ω ($\pm 10 \Omega$),
- Low crosstalk < -35 dB at 10 GHz,
- Improved EMC behavior: shielding effectiveness for 1 m link < -60 dB up to 10 GHz,
- Space saving: about half the width of a standard SMA connector for the same number of contacts.

Construction



A procurement specification is available on request. This document following ESCC format details the rating, physical and electrical characteristics, test & inspection data for AXON' space grade high data rate AXOMACH® series connectors and links.

On the following pages each component of this high data rate link will be described in detail.



Microwave coaxial cable

AXOWAVE 2.4

AXON' part number: P840563

Cable terminated with Micro-D based cable mount connectors, PCB connectors, SMA connectors.

CONDUCTOR

- Silver plated copper (Ag 2 μ m).
- AWG 2401.
- Area 0.205 mm².
- Resistance: 10 Ω /100 m.

DIELECTRIC

- Extruded CELLOFLON® (expanded PTFE).
- Colour: natural.
- Nominal diameter: 1.51 mm.

SHIELDING

Silver plated copper tape.

SEPARATING TAPE

Polyimide.

SHIELDING

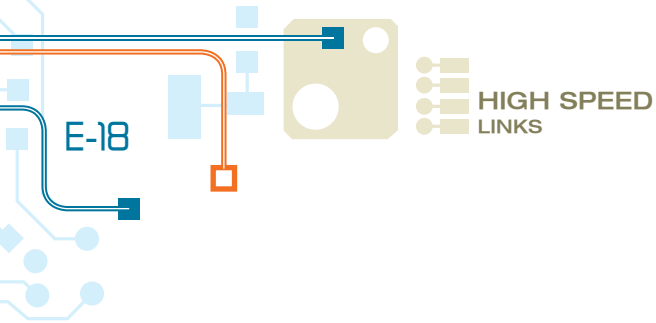
Silver plated copper braid (Ag 2 μ m), nominal diameter over braid: 1.92 mm.

JACKET

- PFA.
- Colour: blue.

MAIN CHARACTERISTICS

- Nominal outer diameter: 2.40 mm.
- Approximate weight: 16 g/m.
- Nominal impedance: 50 Ω .
- Nominal capacitance: 87 pF/m.
- Temperature rating: -65°C to +150°C.
- Maximum attenuation:
 - 0.70 dB/m at 1 GHz.
 - 1.55 dB/m at 5 GHz.
 - 2.20 dB/m at 10 GHz.
 - 3.05 dB/m at 18 GHz.
- Velocity of propagation: > 76%.



QUASI-FLEX® hand-formable semi-rigid substitute

QFX086S

AXON' part number: P540264

Cable connected to a PCB connector on one side and welded to the equipment PCB on the other side.

CONDUCTOR

- Solid conductor.
- Silver plated copper clad steel (Ag 2 μ m).
- Nominal diameter: 0.51 mm.

DIELECTRIC

- Extruded PTFE.
- Nominal diameter: 1.65 mm.

SHIELDING

Tin soaked silver plated copper braid (space quality defined by ECSS-Q-10-71 A).

MAIN CHARACTERISTICS

- Nominal outer diameter: 2.15 mm.
- Approximate weight: 17 g/m.
- Impedance: 50 Ω (\pm 2 Ω).
- Nominal capacitance: 97 pF/m.
- Temperature rating: -55°C to +125°C.
- Maximum attenuation:
 - 0.70 dB/m at 1 GHz.
 - 1.30 dB/m at 3 GHz.
 - 1.85 dB/m at 6 GHz.
 - 2.45 dB/m at 10 GHz.
 - 3.55 dB/m at 18 GHz.
- Velocity of propagation: > 69%.

AXOMACH®

panel mount connectors

Materials:

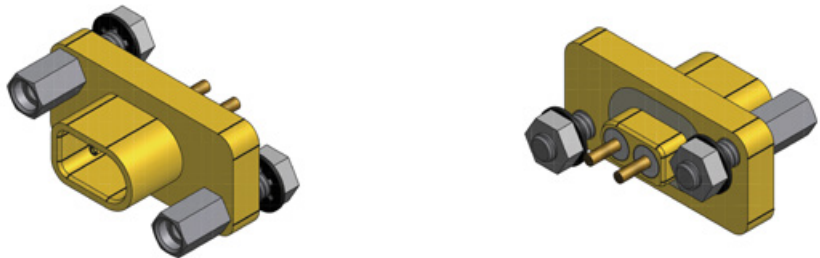
- Body: 2.5 µm gold on aluminium alloy
- Dielectric: PTFE
- Rear contact: 1.2 µm gold on copper alloy
- Mated contact: 1.2 µm gold on copper alloy

Mechanical:

- Torque screw-nut: 0.35 N.m
- Nut thickness: 1.6 mm
- Washer dimensions (e x D): 0.3 x Ø4.7 mm
- Nuts and washers are included

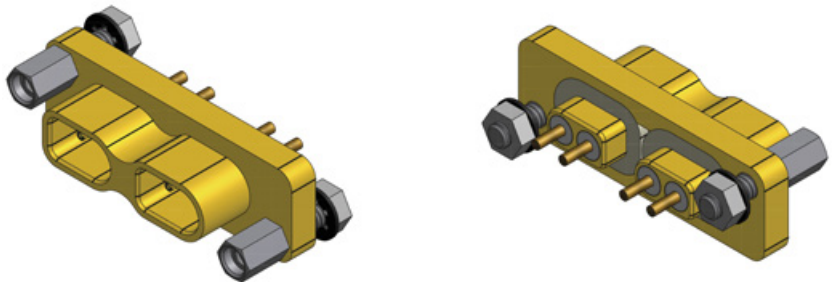
Single way female panel mount connector

VARIANT 01 (see details page E-23)



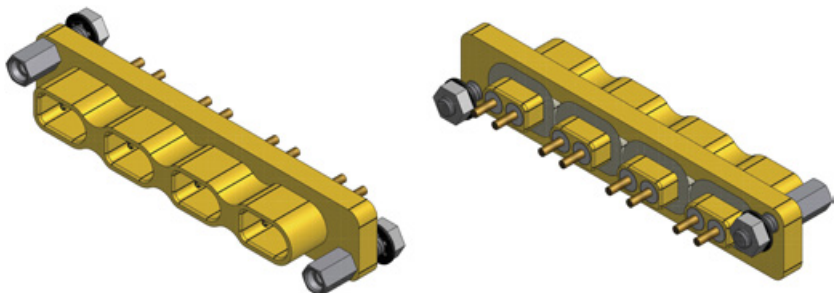
Two way female panel mount connector

VARIANT 02 (see details page E-23)



Four way female panel mount connector

VARIANT 03 (see details page E-24)



AXOMACH® cable mount connectors

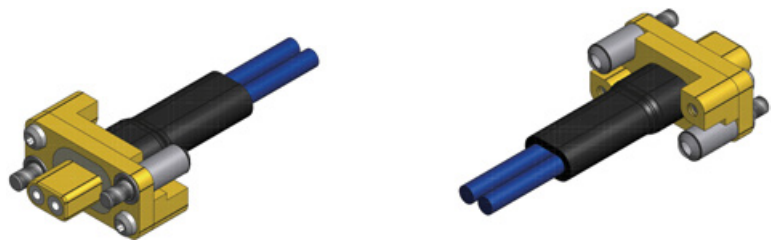
- Special 100 Ω insert for the transmission line
- Interfacial seal / connector to backshell interface seals: conductive silicone base rubber
- Shrinkable strain relief: fluoropolymer

Materials:

- Body: 2.5 μm gold on aluminium alloy
- Dielectric: PTFE
- Pin contact: 1.2 μm gold on copper alloy

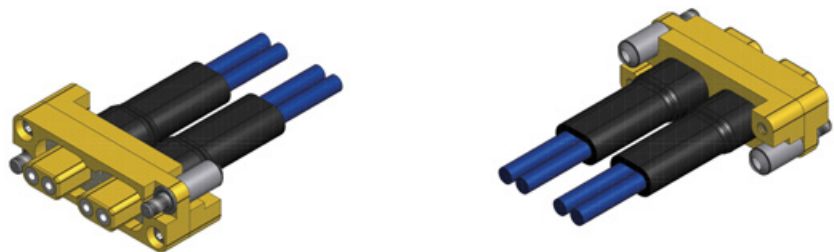
Single way male cable mount connector

VARIANT 04 (see details page E-24)



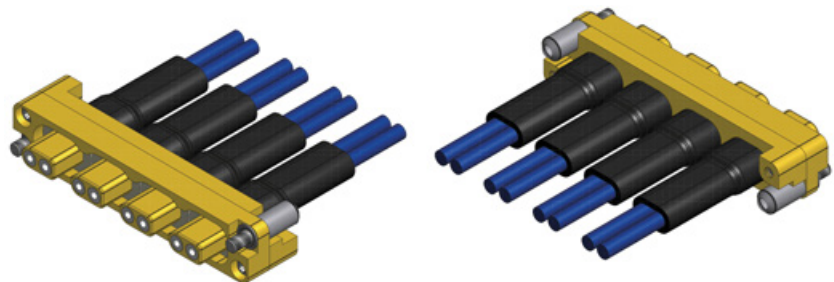
Two way male cable mount connector

VARIANT 05 (see details page E-25)



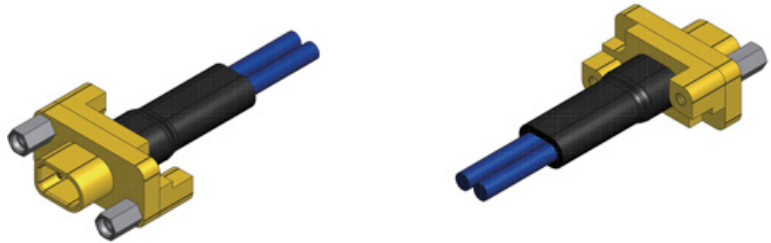
Four way male cable mount connector

VARIANT 06 (see details page E-25)



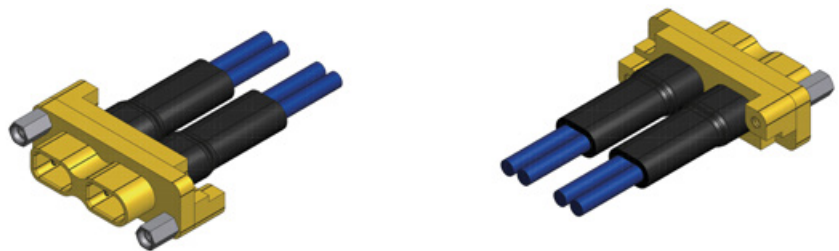
Single way female cable mount connector

VARIANT 07 (see details page E-26)



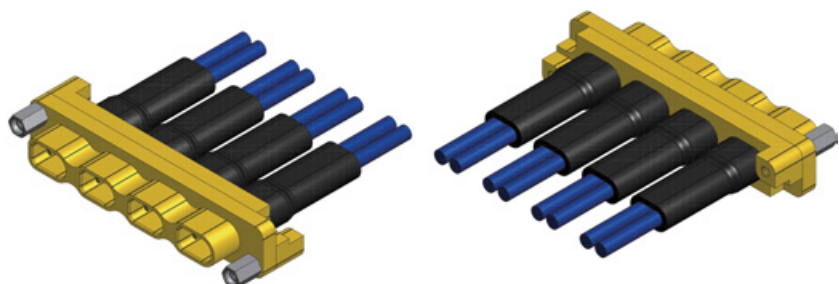
Two way female cable mount connector

VARIANT 08 (see details page E-26)



Four way female cable mount connector

VARIANT 09 (see details page E-27)



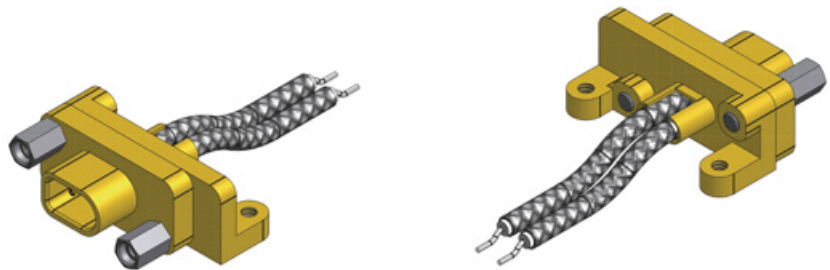
AXOMACH® SMD connectors

Materials:

- Body: 2.5 µm gold on aluminium alloy
- Dielectric: PTFE
- Mated contact: 1.2 µm gold on copper alloy

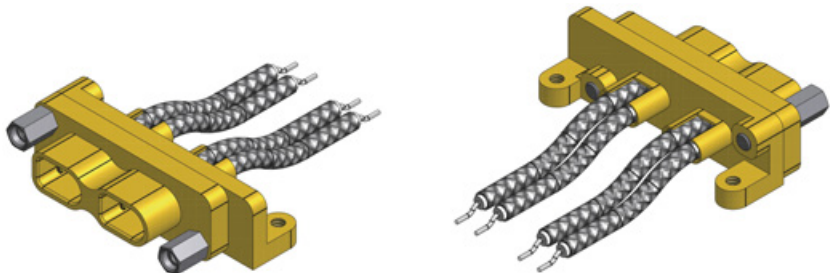
Single way female SMD connector

VARIANT 10 (see details page E-27)



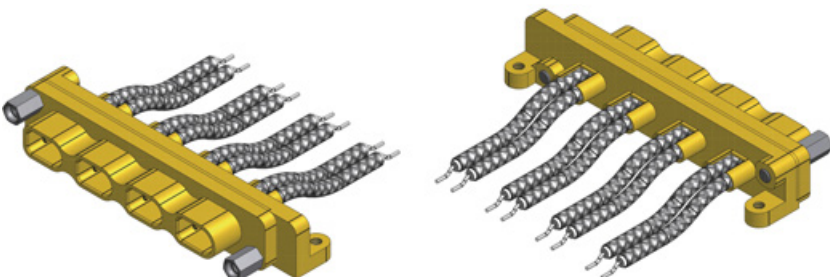
Two way female SMD connector

VARIANT 11 (see details page E-28)



Four way female SMD connector

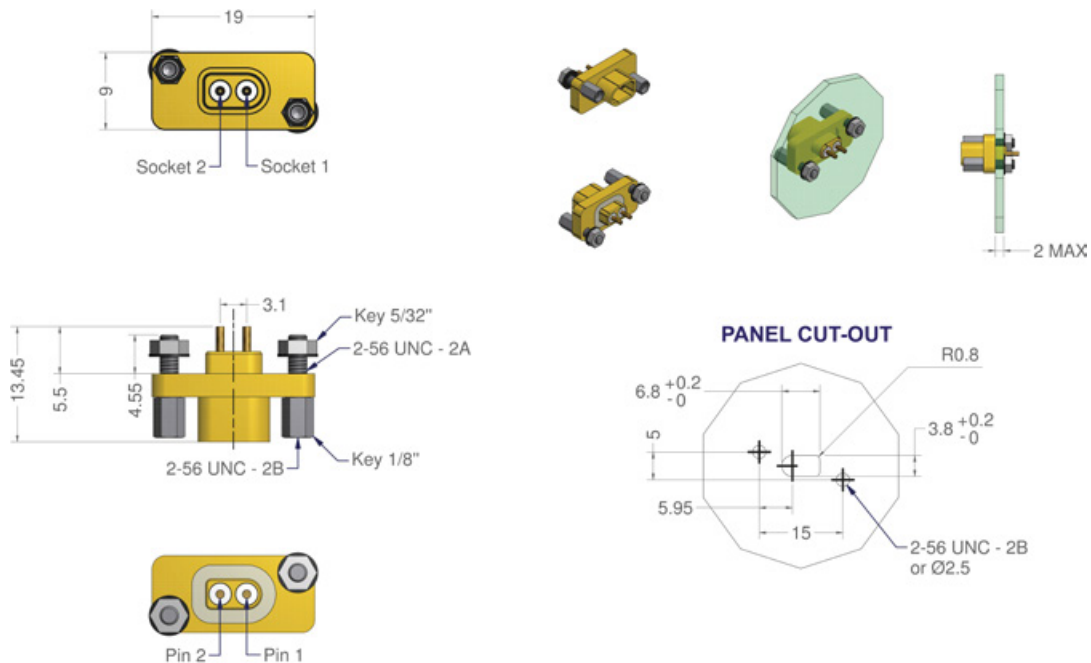
VARIANT 12 (see details page E-28)



Detailed AXOMACH® connector specifications

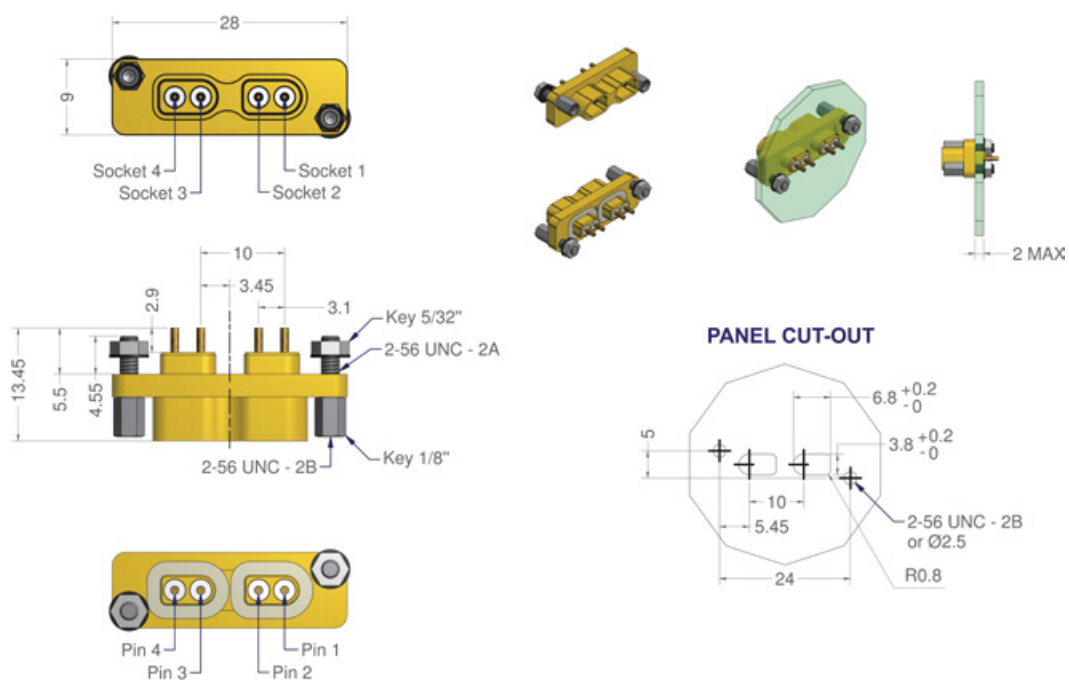
Single way female panel mount connector

VARIANT 01



Two way female panel mount connector

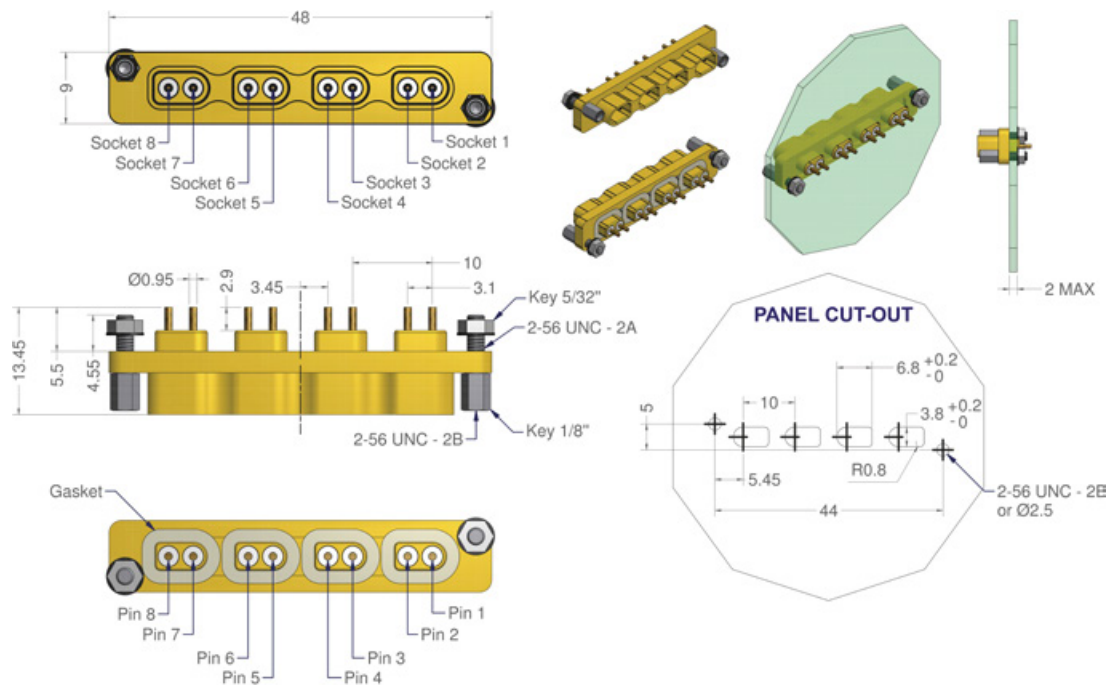
VARIANT 02



Please contact us to have the whole AXOMACH® specification.

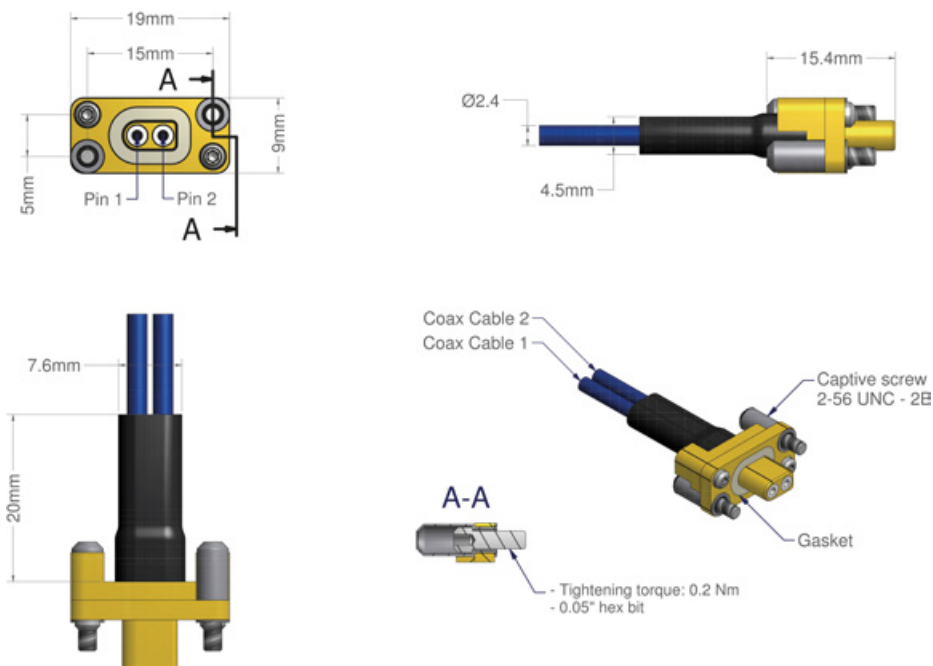
Four way female panel mount connector

VARIANT 03



Single way male cable mount connector

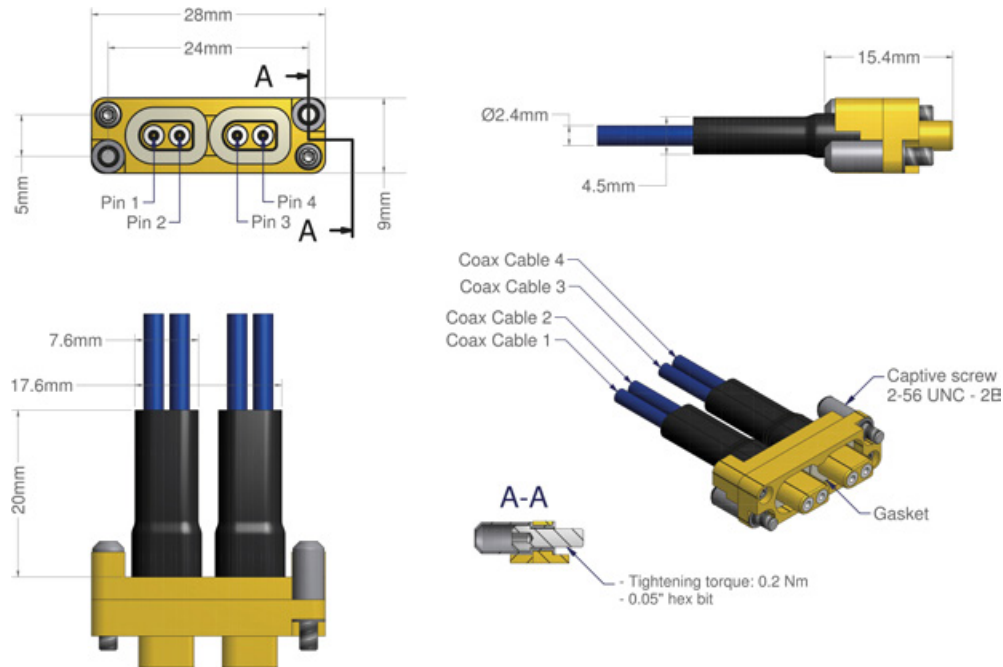
VARIANT 04



Please contact us to have the whole AXOMACH® specification.

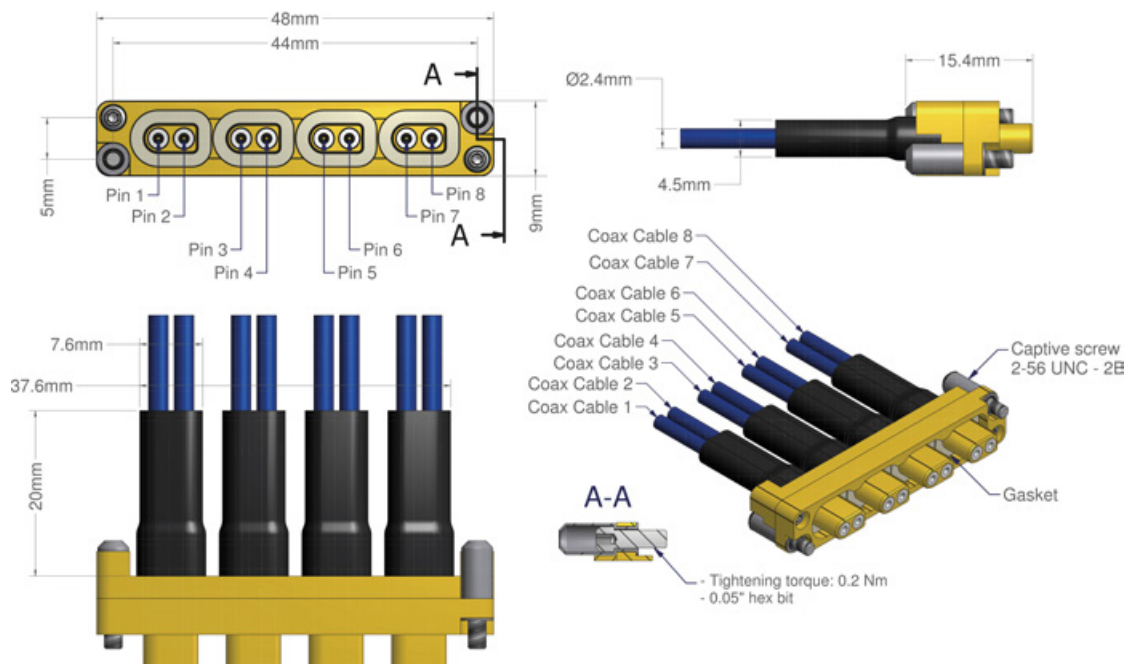
Two way male cable mount connector

VARIANT 05



Four way male cable mount connector

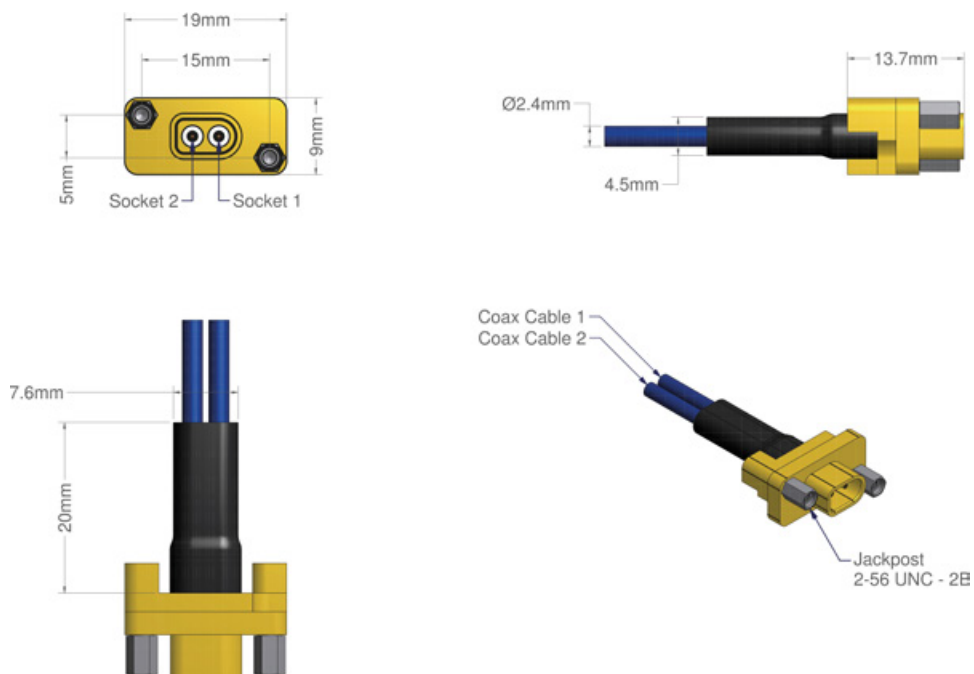
VARIANT 06



Please contact us to have the whole AXOMACH® specification.

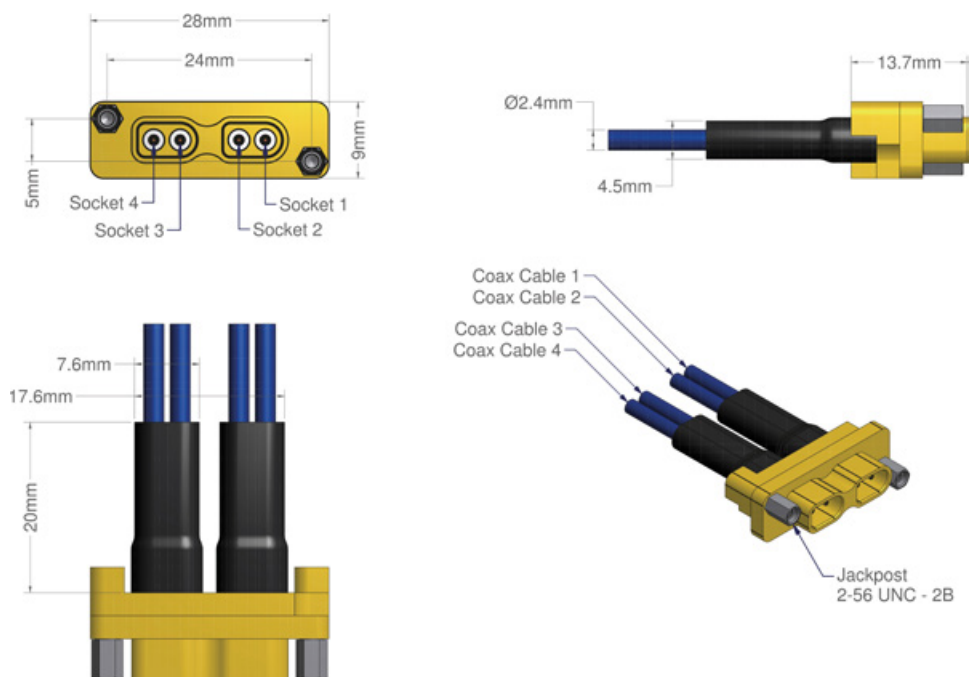
Single way female cable mount connector

VARIANT 07



Two way female cable mount connector

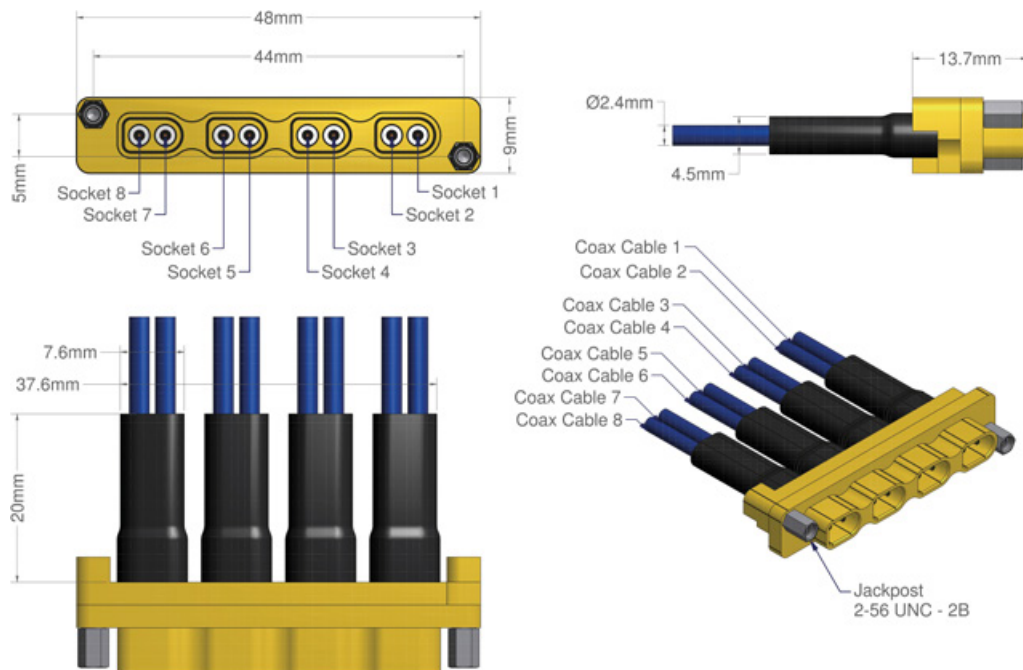
VARIANT 08



Please contact us to have the whole AXOMACH® specification.

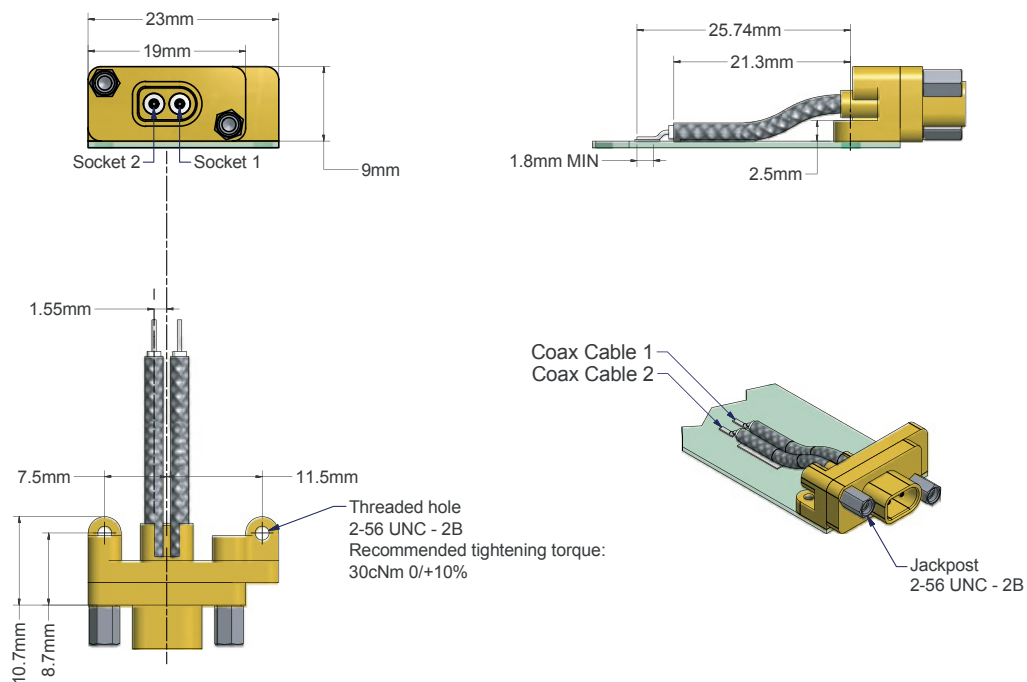
Four way female cable mount connector

VARIANT 09



Single way female SMD connector

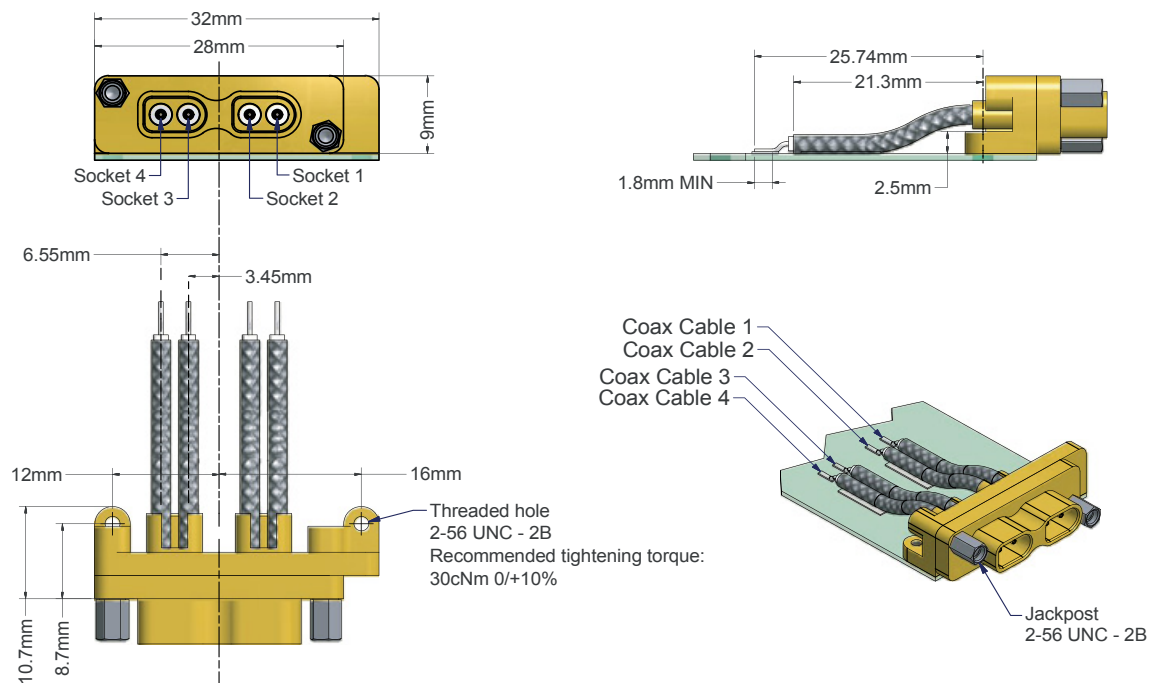
VARIANT 10



Please contact us to have the whole AXOMACH® specification.

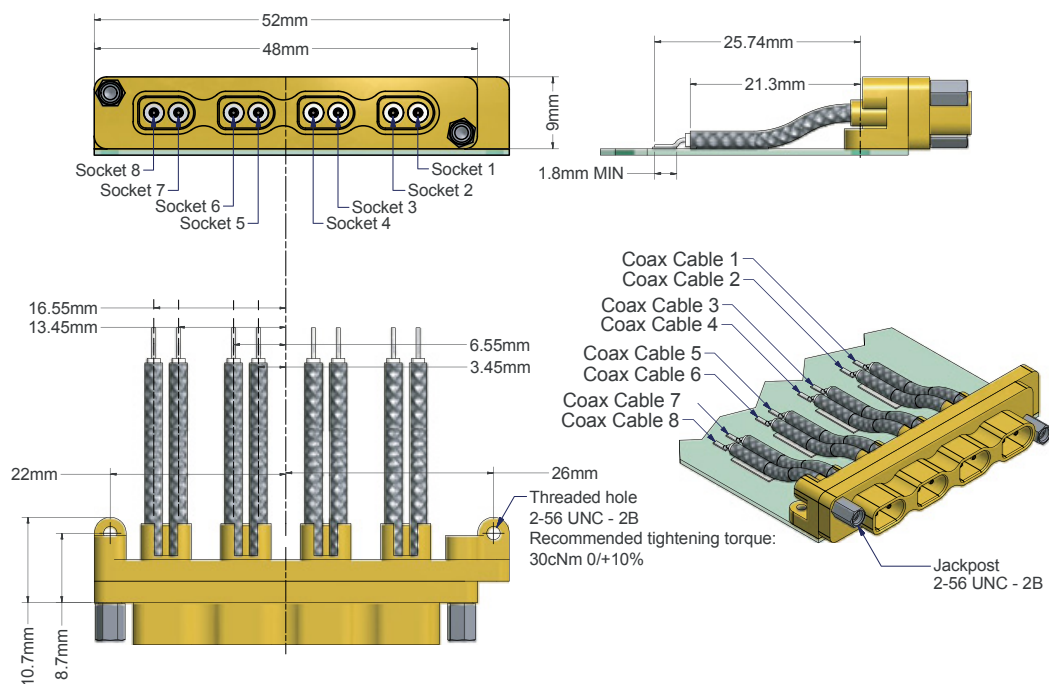
Two way female SMD connector

VARIANT 11



Four way female SMD connector

VARIANT 12



Please contact us to have the whole AXOMACH® specification.

SMA connectors (ESCC3402 QPL)

To connect AXOMACH® links to your devices equipped with SMA plugs or to create panel feedthroughs, AXON' proposes the following ESA qualified SMA connectors:

ESCC VARIANT	TECHNICAL CONFIGURATION
ESCC3402/001 variant 01	Straight plug, solder type, for semi-rigid cable Ø 2.2 mm.
ESCC3402/001 variant 09	Right angle plug, solder type, for semi-rigid cable Ø 2.2 mm.
ESCC3402/002 variant 01	Straight jack, solder type, for semi-rigid cable Ø 2.2 mm.
ESCC3402/002 variant 09	Straight jack, solder type, rear mounting, 2 holes, flange mounted, for semi-rigid cable Ø 2.2 mm.
ESCC3402/002 variant 68	Straight jack, solder type, rear mounting, flange mounted, for semi-rigid cable Ø 2.2 mm.
ESCC3402/003 variant 07	Hermetic adaptor, female-female.
ESCC3402/003 variant 14	Straight bulkhead adaptor, female-female.

This list is non exhaustive.

Termination of the connectors

AXOMACH® panel mount connectors (variants 01 to 03)

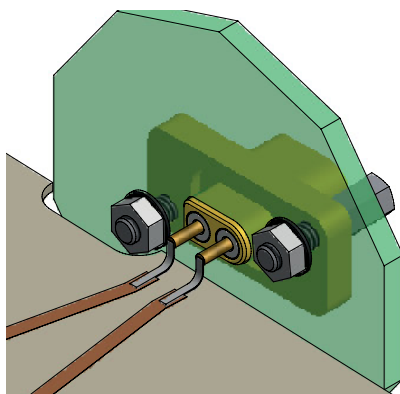
This connector can be terminated to a PCB using flat flexible conductors in order to be mechanically decoupled between the PCB and the panel where the connector is mounted. One end of the flat conductor is soldered to the connector lead using high temperature solder or a parallel gap weld procedure. The other end is soldered on PCB tracks by using standard soldering.

This termination must be validated and approved depending on the mission environment.

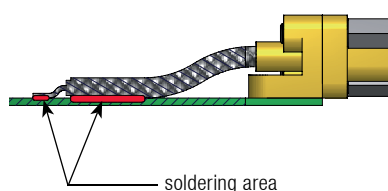
AXOMACH® cable mount connectors (variants 04 to 09) and surface mount connectors (variants 10 to 12)

- Inner conductor is crimped to gold plated copper alloy contacts.
- Cable shield is soldered into the backshell using soft soldering.
- X-Ray inspection is performed on all link terminations.

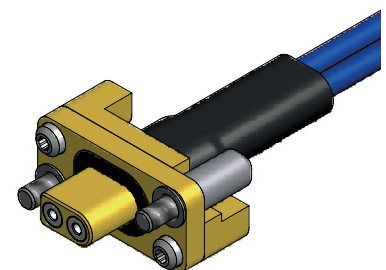
Transmission measurements are performed on 100% of manufactured links up to 10 Gb/s. The manufacturing and control procedures are maintained in a PID followed by CNES/ESA and reviewed every two years.



AXOMACH® PANEL CONNECTOR



AXOMACH® SMD CONNECTOR



AXOMACH® CABLE MOUNT CONNECTOR

Direct / indirect wiring

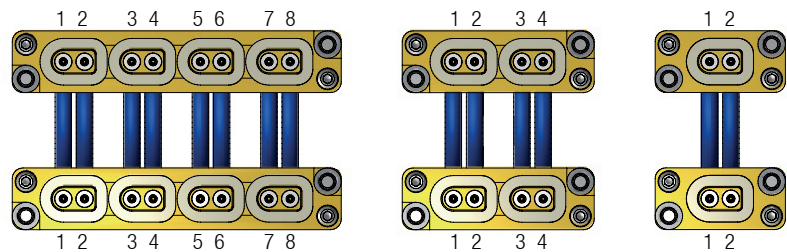
There are two ways to wire AXON's AXOMACH® links: direct wiring and indirect wiring. Direct wiring being the standard way, indirect wiring is used to meet customers' specific requirements.

The type of wiring appears in the identification code of AXOMACH® links.

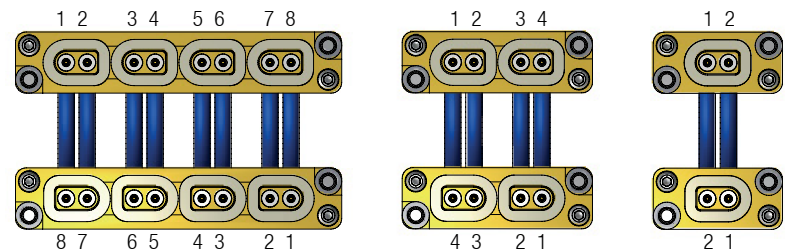
AXOMACH 05 **D** 300 05 L3 = Direct wiring

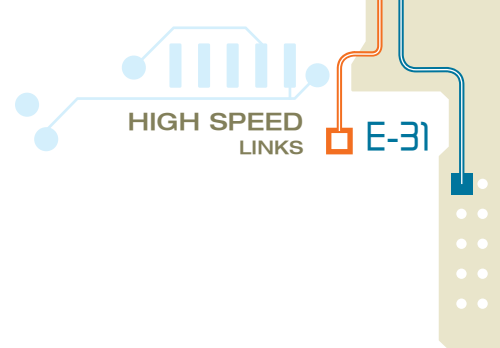
AXOMACH 05 **I** 300 05 L3 = Indirect wiring

Direct wiring



Indirect wiring





AXOMACH links®

IDENTIFICATION CODE AXOMACH 05 D 300 05 L3

SERIES

AXOMACH®: Space High Data Rate assembly

CONNECTOR 1 VARIANT

- 04: 1 way male connector
- 05: 2 way male connector
- 06: 4 way male connector
- 07: 1 way female connector
- 08: 2 way female connector
- 09: 4 way female connector

20: ESCC3402 SMA connector (specify the type of SMA connector when ordering)*

WIRING

D: Direct wiring

I: Indirect wiring (see page E-30)

LENGTH OF CABLE

XXX: Length in mm

- >100 mm for 1 way: variants 04 & 07
- >200 mm for 2 ways: variants 05 & 08
- >500 mm for 4 ways: variants 06 & 09

CONNECTOR 2 VARIANT**

- 04: 1 way male connector
- 05: 2 way male connector
- 06: 4 way male connector
- 07: 1 way female connector
- 08: 2 way female connector
- 09: 4 way female connector

20: ESCC3402 SMA connector (specify the type of SMA connector when ordering)*

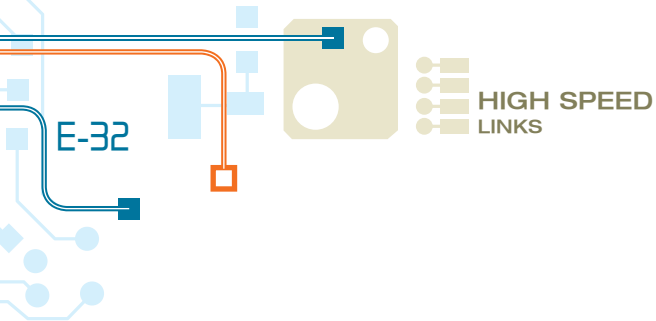
TESTING LEVEL***

- L1: LAT1 (ESCC3401-chart V)
- L2: LAT2 (ESCC3401-chart V)
- L3: LAT3 (ESCC3401-chart V)

*: Please refer to page E-29 for a non exhaustive list

**: If connector 2 is not specified, the assembly is a pigtail.

***: Please see page 10 of the Micro-D chapter



AXOMACH® panel & SMD connectors

IDENTIFICATION CODE AXOMACH 10 L3

SERIES

AXOMACH®: Space High Data Rate assembly

CONNECTOR

- 01: 1 way female PCB connector set up on panel
- 02: 2 way female PCB connector set up on panel
- 03: 4 way female PCB connector set up on panel
- 10: 1 way female PCB connector set up on PCB, SMD mount
- 11: 2 way female PCB connector set up on PCB, SMD mount
- 12: 4 way female PCB connector set up on PCB, SMD mount

TESTING LEVEL*

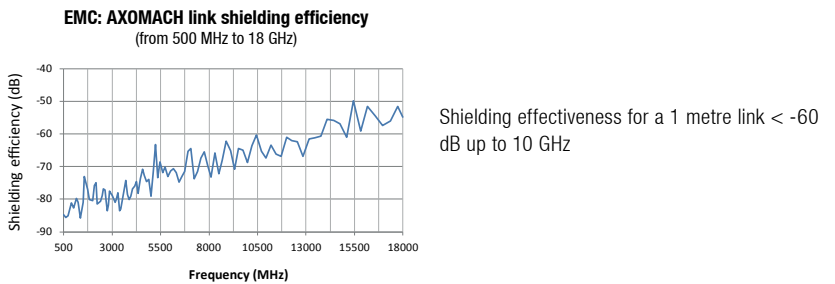
- L1: LAT1 (ESCC3401-chart V)
- L2: LAT2 (ESCC3401-chart V)
- L3: LAT3 (ESCC3401-chart V)

*: Please see page 10 of the Micro-D chapter

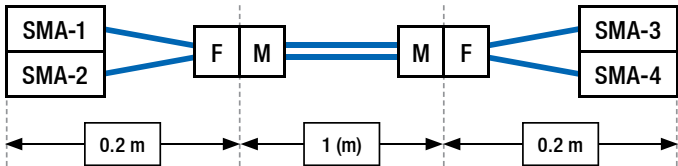
Electrical characteristics

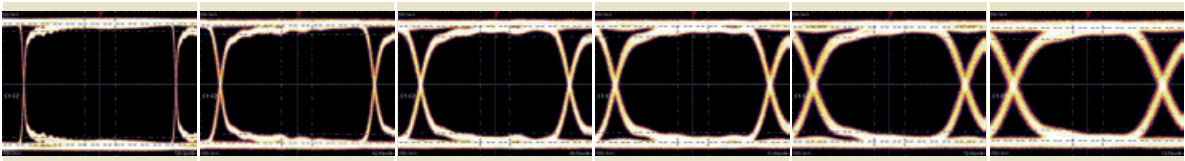
Maximum rating for a 1 metre link terminated with two single way cable mount connectors.

CHARACTERISTICS	VALUE	
Characteristic impedance (Zc)	90 Ω < Zc < 100 Ω	
Jitter PP (at 1, 3, 5, 6, 8 and 10 Gb/s)	Maximum 20 ps	
Jitter RMS (at 1, 3, 5, 6, 8 and 10 Gb/s)	Maximum 5 ps	
Quality factor (Qf)	At 1 Gb/s	minimum 20
	At 3 Gb/s	minimum 15
	At 5,6,8 and 10 Gb/s	minimum 10
Skew (Sk) between coaxial cables	Maximum 20 ps	
Insertion Loss (IL)	0 to 5 GHz	maximum -1 dB
	0 to 10 GHz	maximum -2 dB
Return Loss (RL)	0 to 5 GHz	maximum -12 dB
	0 to 10 GHz	maximum -9 dB
Crosstalk far end (xTf - 0 to 5 GHz)	Maximum -45 dB	
Crosstalk near end (xTn - 0 to 10 GHz)	Maximum -35 dB	
Time analysis (jitter and quality factor) at room temperature	See table below	



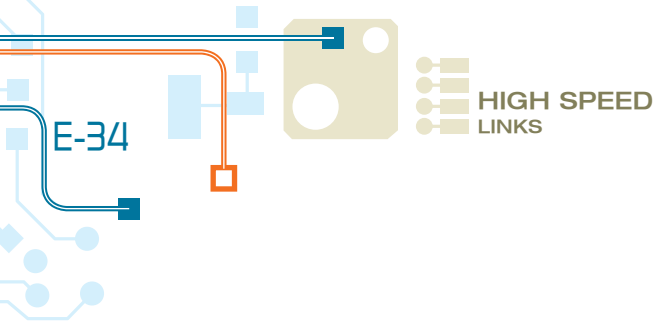
Time analysis (jitter & quality factor) at room temperature for a 1 metre link with 0.2 m test jig



DATA RATE	1 GHz	3 GHz	5 GHz	6 GHz	8 GHz	10 GHz
Jitter PP	< 20 ps	< 20 ps	< 20 ps	< 20 ps	< 20 ps	< 20 ps
Jitter RMS	< 5 ps	< 5 ps	< 5 ps	< 5 ps	< 5 ps	< 5 ps
Quality factor	> 20	> 15	> 10	> 10	> 10	> 10
Eye pattern						
Skew (between coaxial cables)	< 20 ps	< 20 ps	< 20 ps	< 20 ps	< 20 ps	< 20 ps

More information available on request.

 Generator output signal: 2⁷⁻¹ PRBS pattern with 1V_{PP} differential amplitude.



Mechanical characteristics

CHARACTERISTICS	VALUE
Maximum cable weight	15 g/m per cable 30 g/m per way
Mating force	< 5.6 N (2.8 N per contact)
Demating force	1 N < demating force < 5.6 N
Operating and storage temperature	-55°C to +125°C
Total Mass Loss (TML)	< 1%
Collected Volatile Condensable Material (CVCM)	< 0.1 %
Recovered Mass Loss (RML)	< 1%

VARIANT	NOM. CONNECTOR WEIGHT (g)
PCB / panel mount connectors	
01	3 g
02	4 g
03	5 g
Male cable mount connectors	
04	13 g* / 5 g without cable
05	23 g* / 7 g without cable
06	47 g* / 15 g without cable
Female cable mount connectors	
07	14 g* / 6 g without cable
08	24 g* / 8 g without cable
09	49 g* / 16 g without cable
PCB surface mount connectors	
10	5 g
11	8 g
12	14 g

*: Value specified for a ax2.4S cable length of 300 mm

Manufacturing

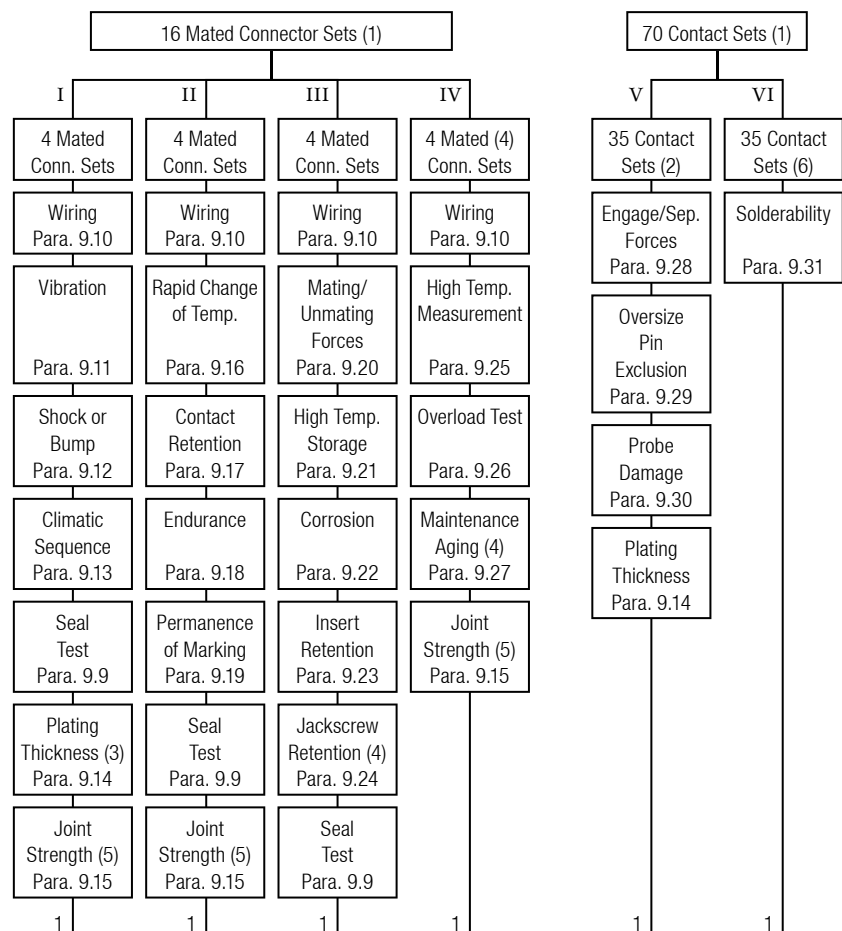
AXOMACH® components are manufactured and tested in clean room conditions.
Cleanliness level: Class ISO 8 = Class 100 000 following FED STD 209E.

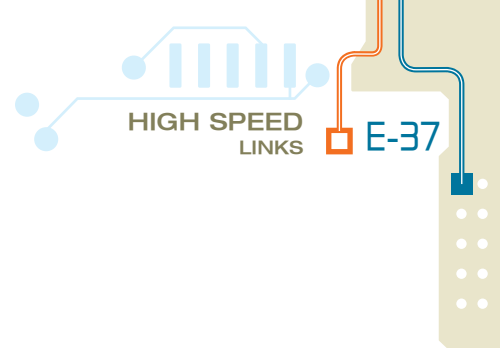
AXON' operators are certified by international space agencies on soldering and crimping process according to ECSS-Q-ST-70-08 & ECSS-Q-ST-70-26.

AXON' is monitored by CNES (French space agency) for AXOMACH® connectors and links manufacturing and controlled according to PID (Know How agreement in progress).

Qualification

Environmental, mechanical and endurance testing are performed according to ESCC3401 chart IV.





AXOMACH® Links

AXON' REFERENCES	WEIGHT (g)
Cables	
AXOWAVE 2.4 (Microwave coaxial cable)	12 g/m (24 g/m per way)
QFX086S (QUASIFLEX hand-formable semi-rigid substitute)	17 g/m (34 g/m per way)
PCB / panel mount connectors	
Variant 01	3 g
Variant 02	4 g
Variant 03	5 g
Male cable mount connectors	
Variant 04	5 g
Variant 05	7 g
Variant 06	15 g
Female cable mount connectors	
Variant 07	6 g
Variant 08	8 g
Variant 09	16 g
PCB surface mount connectors	
Variant 10	5 g
Variant 11	8 g
Variant 12	14 g