

MICROMACH® SpaceWire links

IMPEDANCE ADAPTED CONNECTOR FOR SPACEWIRE LINKS

No connectors on the market reached the requirements of the SpaceWire protocol ECSS-E-ST-50-12C. The best option until now has been the ESCC3401/029 9 pin Micro-D connector. ESA launched in 2015 a Technology Research Project (TRP) to develop a more adapted connector and Axon' was selected in consortium with STAR-Dundee.

The objectives of the new connector to be developed were:

- ↪ Compact (as close as possible as 9 pin micro-D)
- ↪ 100 ohms matched impedance connection
- ↪ Improved cable screen terminations to connector (for 360° protection)
- ↪ Higher data rate performance (at least 400Mb/s)
- ↪ Low crosstalk between ways

A few years later MICROMACH® was born.

9 pin Micro-D connector versus MICROMACH®



MICROMACH® range of product covers cable mount connectors adapted to SpaceWire cable (AWG26 and AWG28) and to Low Mass SpaceWire, and PCB connectors.

SUCCESSFUL EXTENSIVE EVALUATION OF MICROMACH

With support of ESA, **MICROMACH® solution (cable assembly and PCB connectors) successfully passed an extensive evaluation following ESCC requirements** (vibrations, endurance, thermal cycles...). MICROMACH® links fulfill the requirements of the cable assembly type B described in the SpaceWire ECSS standard.



NEW ESCC STANDARDS IN PROGRESS

Following extensive evaluation of connectors and cables assemblies, Axon' worked on a new set of ESCC detail specifications dedicated to the MicroMach range of product: MicroMach cable assemblies and compatible equipment connectors. This new set of ESCC Detail Specification will be under review soon and official publication is expected early 2020.

EQUIPMENT CONNECTOR	CABLE ASSEMBLY
<ul style="list-style-type: none"> ▪ Edge PCB SMT ▪ Wired PCB ▪ Flex PCB 	Cable mount connector + SpaceWire or Low Mass SpaceWire cable
ESCC Generic Specification no. 3401	ESCC Generic Specification no. 3409
ESCC Detail Specification no. 3401-xxx *	ESCC Detail Specification no. 3409-00x *

* ... at the time of publication the specification numbers of the new set of MicroMach ESCC Detail Specification is not assigned yet.

EUROPEAN PREFERRED PART LIST SOON

Based on the new set of ESCC Detail Specifications for MicroMach and following the **extensive evaluation supported by ESA**, MicroMach cable assemblies and PCB connectors will entry **EPPL2 list in 2020**.

MICROMACH® PROCUREMENT

At the time of publication the new set of MicroMach ESCC Detail Specification is in progress and not published yet. Customers may request quotations using references specified herein. To get any additional information on MICROMACH® solutions and procurement, contact sales@axon-cable.com.

On the following pages MICROMACH® solutions are described in detail.

CABLE MOUNT CONNECTORS

EMI seals: conductive silicone based rubber

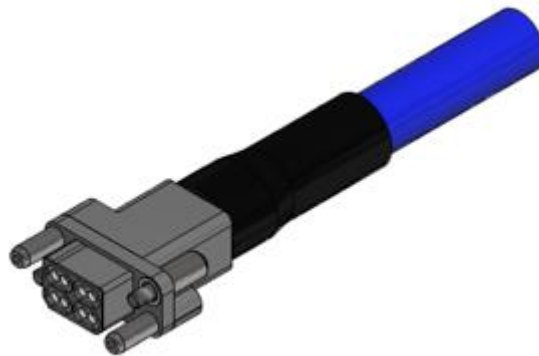
Shrinkable strain relief: fluoro-polymer.

Materials:

- Body shell and shield cross: 25.4µm minimum high phosphorus nickel plating on aluminium alloy
- Insert: PEEK
- Contact: 1.27µm gold over 1.27µm nickel plating on copper alloy

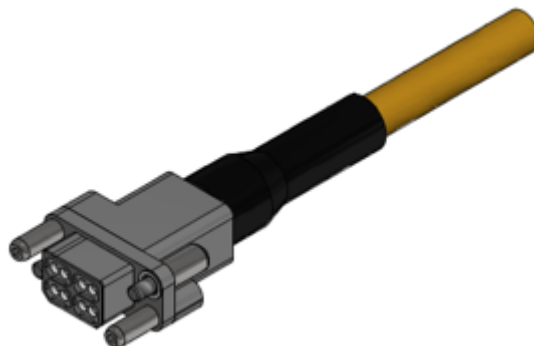
MicroMach, AWG26, Male, In-line Plug

P564171 – ESCC 3409-00x Connector code 01



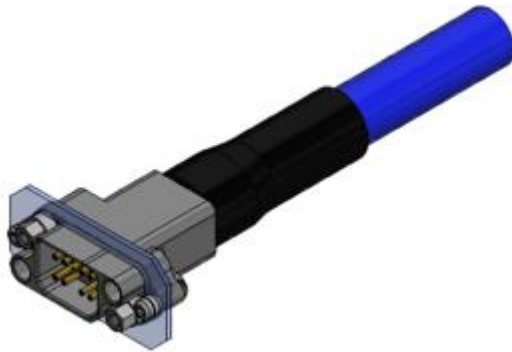
MicroMach, AWG28, Male, In-line Plug

P564172 – ESCC 3409-00x Connector code 02



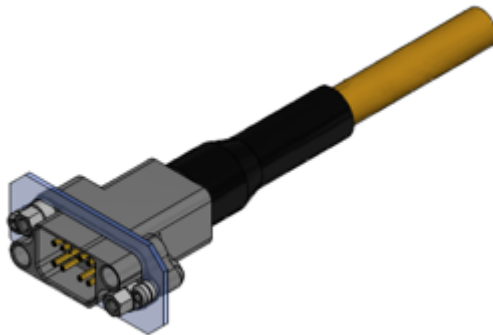
MicroMach, AWG26, Panel Mount Jack

P564173 – ESCC 3409-00x Connector code 03



MicroMach, AWG28, Panel Mount Jack

P564174 – ESCC 3409-00x Connector code 04



PANEL MOUNT CONNECTORS

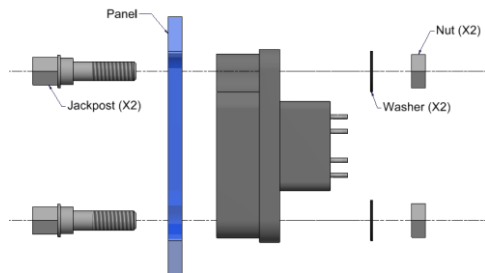
Materials:

- Body: 25.4µm minimum high phosphorus nickel plating on aluminum alloy
- Insert: PEEK
- Contact: 1.27µm gold over 1.27µm nickel plating on copper alloy

Mechanical:

- Torque screw-nut: 0.35 N.m
- Nuts and washers are included
- Jackpost diameter: 2-56-UNC-2B

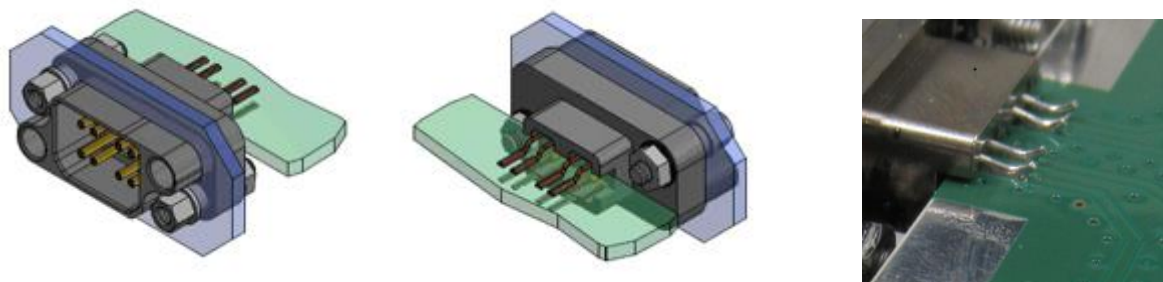
Jackpost to select following panel thickness:



Panel thickness (mm) Tolerance: (-0.0 +0.2) mm	0.8	1.2	1.6	2.0	2.4
Jackpost	P1	P2	P3	P4	P5

MicroMach, Female, Edge PCB SMT Panel Mount

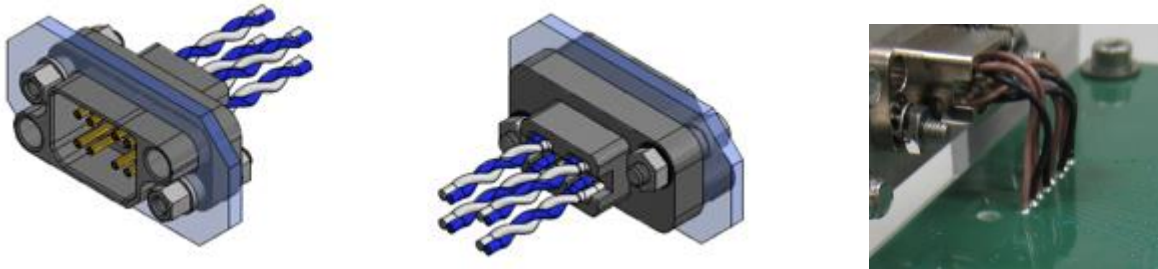
P564175 – ESCC 3401-xxx Variant 01 (compatible with ESCC 3409-00x Connector codes 01 & 02)



PCB Terminations: Copper alloy, silver plated 2 µm minimum

MicroMach, Female, Wired PCB Panel Mount

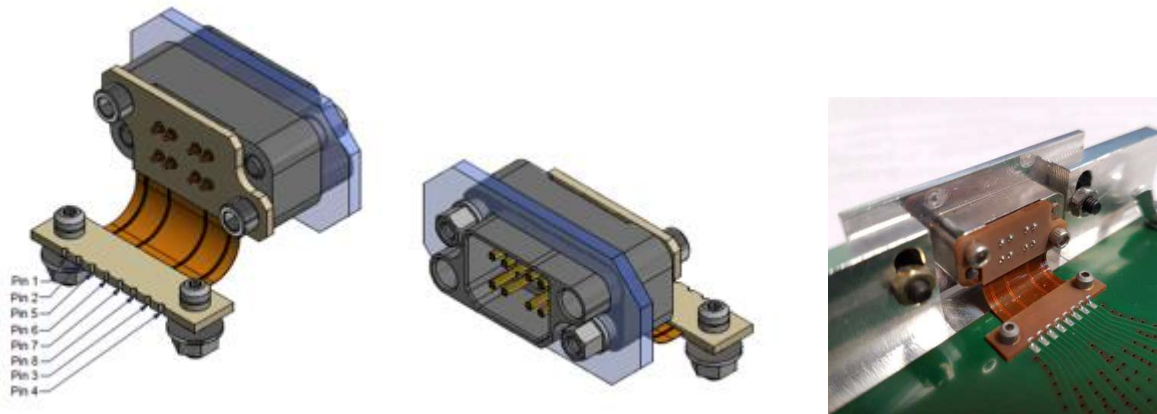
P564176 – ESCC 3401-xxx Variant 02 (compatible with ESCC 3409-00x Connector codes 01 & 02)



PCB Terminations: unshielded twisted pair, 100Ω with PTFE dielectric core and silver plated annealed copper center conductor

MicroMach, Female, Flex PCB Panel Mount

P564177 – ESCC 3401-xxx Variant 03 (compatible with ESCC 3409-00x Connector codes 01 & 02)

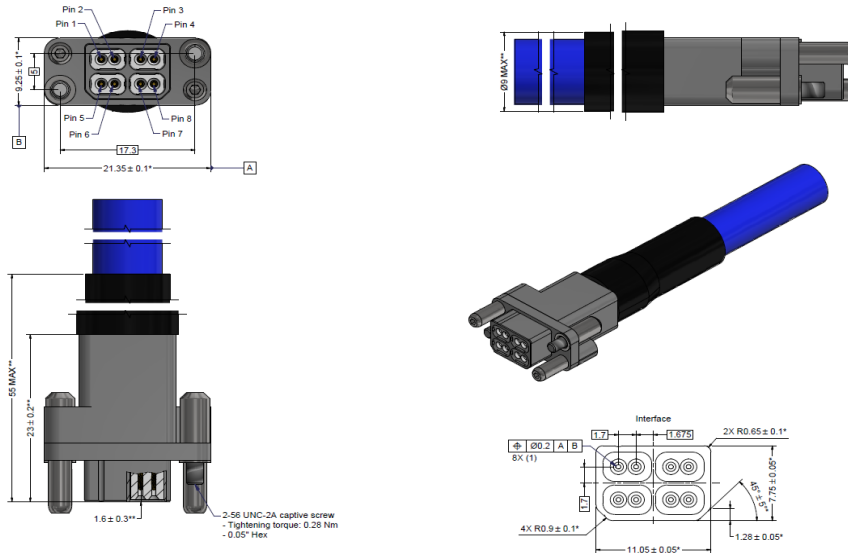


PCB Terminations: flexible PCB with Copper / Polyimide coverlays (2 layers with metalized holes) and full ground plane

DETAILED CONNECTOR SPECIFICATIONS

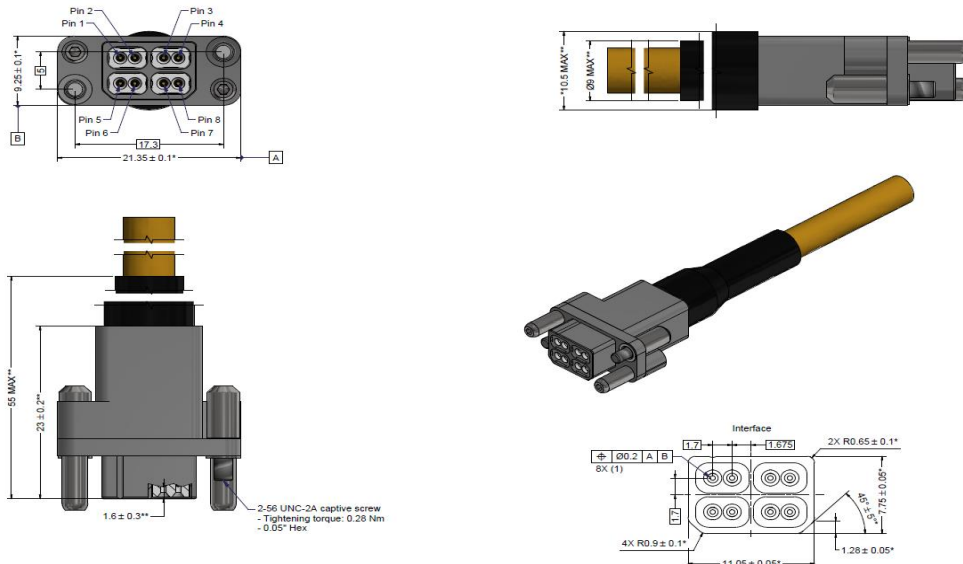
MicroMach, AWG26, Male, In-line Plug

P564171 – ESCC 3409-00x Connector code 01



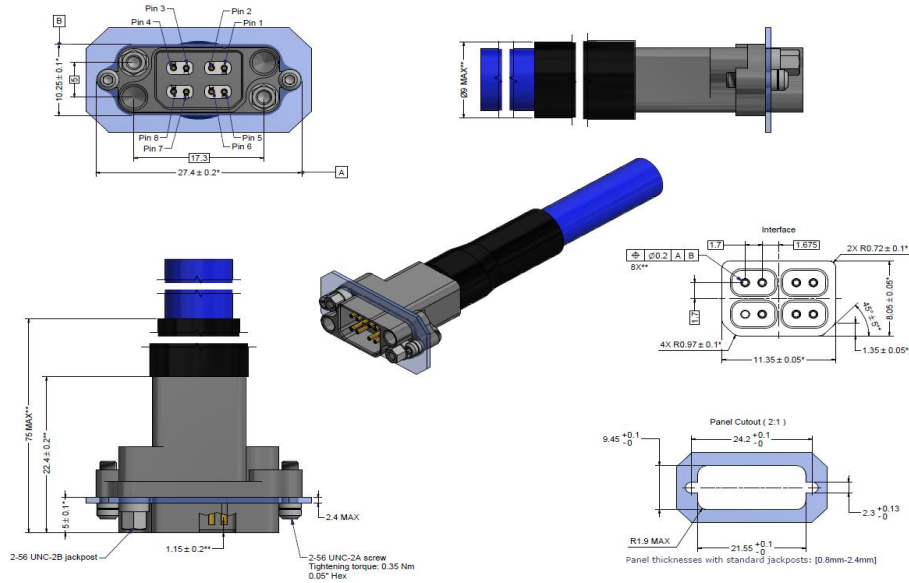
MicroMach, AWG28, Male, In-line Plug

P564172 – ESCC 3409-00x Connector code 02



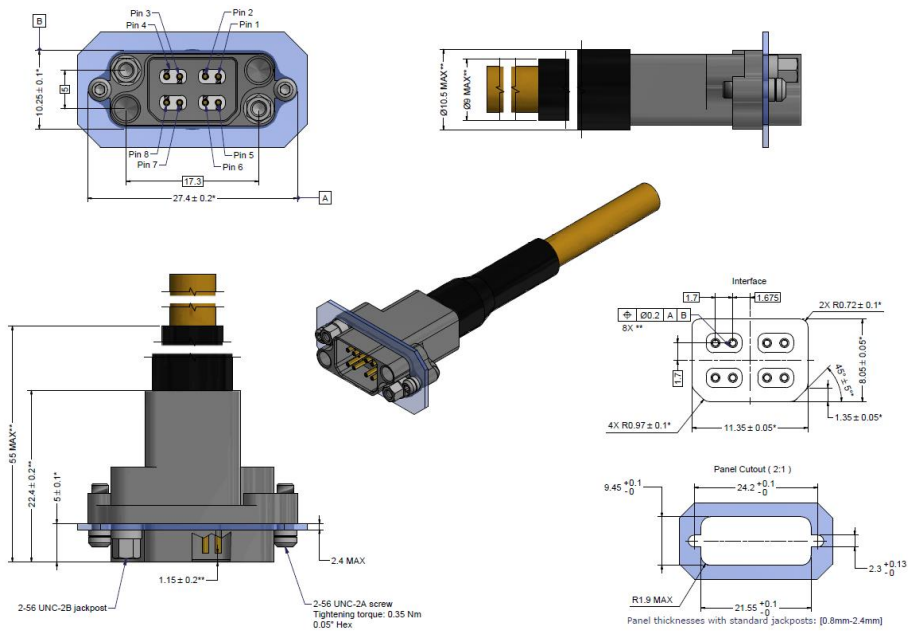
MicroMach, AWG26, Panel Mount Jack

P564173 – ESCC 3409-00x Connector code 03



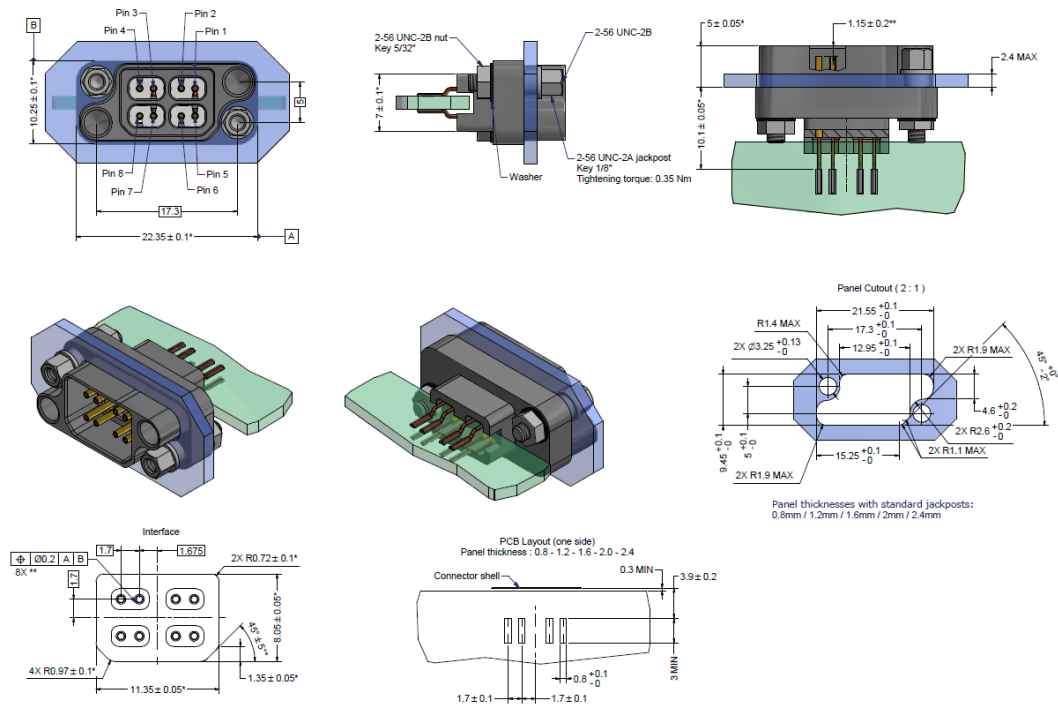
MicroMach, AWG28, Panel Mount Jack

P564174 – ESCC 3409-00x Connector code 04



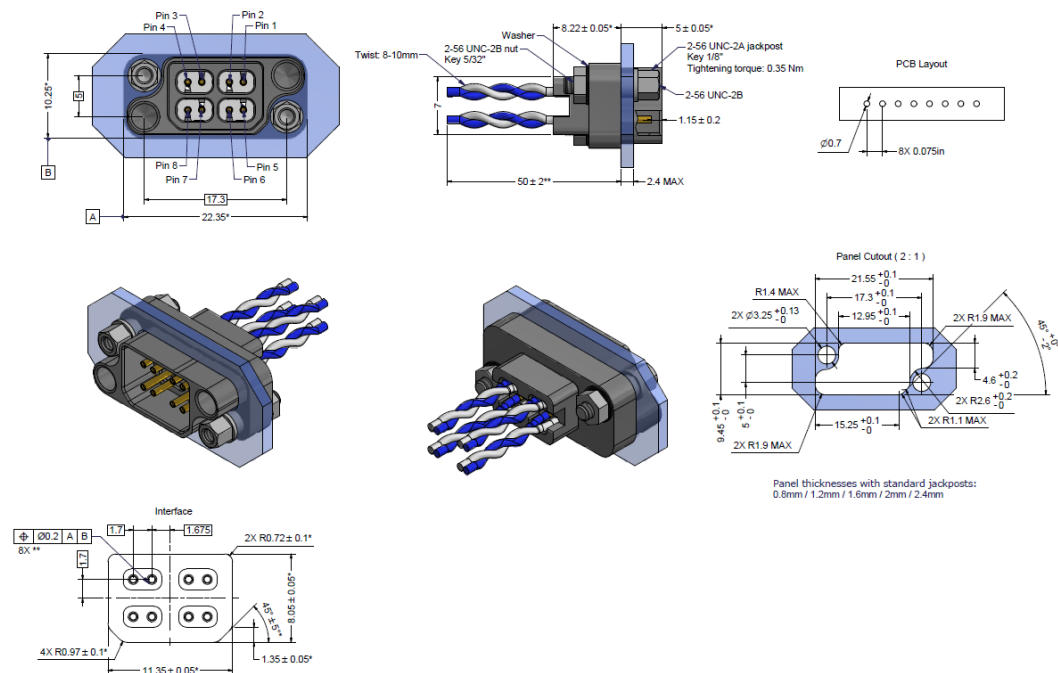
MicroMach, Female, Edge PCB SMT Panel Mount

P564175 – ESCC 3401-xxx Variant 01 (compatible with ESCC 3409-00x Connector codes 01 & 02)



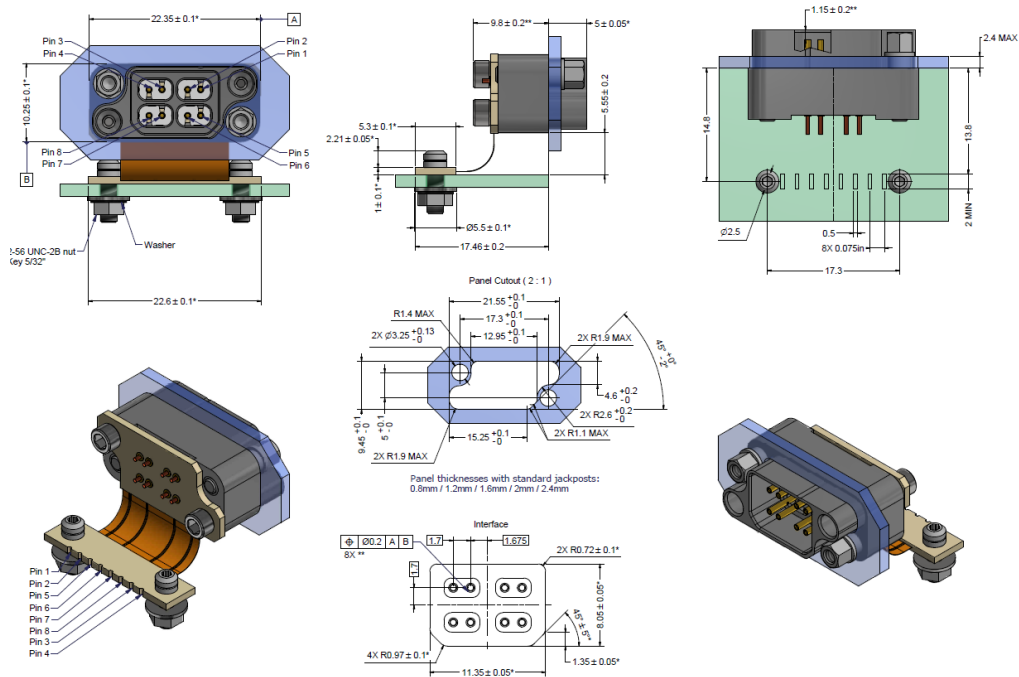
MicroMach, Female, Wired PCB Panel Mount

P564176 – ESCC 3401-xxx Variant 02 (compatible with ESCC 3409-00x Connector codes 01 & 02)



MicroMach, Female, Flex PCB Panel Mount

P564177 – ESCC 3401-xxx Variant 03 (compatible with ESCC 3409-00x Connector codes 01 & 02)



WIRING

When ordering a MicroMach assembly, **indirect wiring** should be chosen. Typically, this is most likely to be with a male to male link.

INDIRECT WIRING

Variant	Connector	Pin numbers							
ESCC 3409-00x codes 01 or 02	1 st connector, e.g. code 01 or 02 (male)	1	2	3	4	5	6	7	8
	2 nd connector, e.g. code 01 or 02 (male)	3	4	1	2	7	8	5	6

However, if ordering a MicroMach extension cable, to extend the length of an existing MicroMach cable, for example, when entering a TVAC chamber, **direct wiring** should be chosen. Typically, this may be with a female to male link.

DIRECT WIRING

Variant	Connector	Pin numbers							
ESCC 3409-00x codes 01 & 03 or 02 & 04	1 st connector, e.g. code 03 or 04 (female)	1	2	3	4	5	6	7	8
	2 nd connector, e.g. code 01 or 02 (male)	1	2	3	4	5	6	7	8

ELECTRICAL CHARACTERISTICS

Maximum rating for a 1 meter SpaceWire link terminated with cable mount connectors at room temperature:

Characteristic		Limits		
Max. Operating Data Rate		3 Gb/s		
Mating/Unmating Forces		MF < 25N 3N < UF < 25N		
Shield Resistance		11 mΩ/m + 10 mΩ per couple of connectors		
Mated shell conductivity		5 mΩ		
Characteristic Impedance		95Ω < ZC < 115Ω		
Crosstalk FEXT and NEXT		< -50dB up to 1 GHz		
Shielding Effectiveness		< -80dB up to 1 GHz		
		3902/003 SpaceWire AWG26 AWG28		3902/004 Low Mass SpaceWire
Intra-pair Skew		Max. 80 ps/m		Max. 50 ps/m
Inter-pair Skew		Max. 130 ps/m		Max. 100 ps/m
Insertion Losses	Up to 1.5 GHz	-2.25 dB	-2.95 dB	-2.95 dB
	Up to 3 GHz	-3.70 dB	-4.90 dB	-4.90 dB
	Up to 4.5 GHz	-5.00 dB	-6.65 dB	-6.65 dB

MECHANICAL CHARACTERISTICS

CHARACTERISTICS	VALUE
Maximum cable weight <ul style="list-style-type: none"> SpaceWire, AWG26 (ESCC 390200302) SpaceWire, AWG28 (ESCC 390200301) Low Mass SpaceWire, AWG28 (ESCC 390200401) 	<ul style="list-style-type: none"> 85 g/m max 100 g/m max 42 g/m max
Mating force	< 25 N
Demating force	3 N < demating force < 25 N
Operating and storage temperature	-55°C to +125°C

ESCC Standard	Connector Code or Variant	Nom. Connector weight (g)
Cable mount connectors		
3409-00x	01 & 02	9.5 g
	03 & 04	9 g
PCB connectors		
3401-xxx	01	4.5 g
	02	5 g
	03	5.5 g