

SPACE MICRO-D CONNECTORS

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EXPERTISE IN SPACE

Lightweight, miniature, reliable and highly resistant to cosmic radiation and high temperatures: these are the qualities of wires, cables, cable assemblies, wire harnesses and connectors offered by AXON' for space applications. The scope of products and services offered by the company is extensive:

- ESA wires for spacecraft cabling
- Cable assemblies & harnesses terminated with various connector styles
- MIL-STD-1553 bus harnesses for data transmission
- High data rate assemblies including SpaceWire and very high speed links up to 10 Gb/s
- Microwave coaxial assemblies up to 50 GHz
- Bur bars for power distribution in spacecraft
- Numerous accessories including halorings, EMC banding adaptors and backshells
- Bespoke interconnect solutions
- Cable and interconnect engineering services

In addition to this large range of products, AXON' CABLE has developed miniature Micro-D connectors and Nano-D connectors designed to meet the most severe challenges of space:

- Miniature Micro-D connectors
 - 1.27 mm (0.050") contact spacing,
 - Weight and space saving solution,
 - ESCC 3401/029 EPPL 2,
 - Custom design.
- Miniature Nano-D connectors
 - 0.635 mm (0.025") contact spacing,
 - Extreme miniaturization,
 - ESCC 3401/086 EPPL2.

► Flight heritage

Involved in numerous space projects in orbit and beyond for over 20 years, AXON' CABLE has a wealth of experience in designing and manufacturing interconnect solutions able to withstand the stresses of launch and the harsh space environment. Rocket launchers, ISS, Mars rovers, LEO and GEO satellites, manned and unmanned flights, thrusters, space research and experimental equipment are just a few examples.

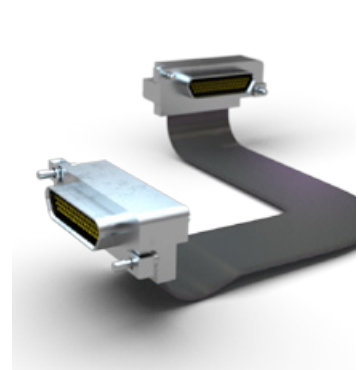
Space programmes with AXON' on-board include Ariane, Alphabus, Curiosity, Bepi Colombo, Corot, Eurostar, Exomars, Gaia, Galileo, Globalstar, Insight, Iridium, Mangalayyan, Maven, O3B, Sentinel, Spacebus, Vega.



▲ SPACEWIRE LINK TERMINATED WITH MICRO-D CONNECTORS



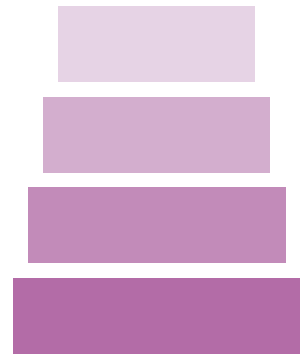
▲ MANUFACTURE IN ISO 7 AND ISO 8 CLEAN ROOMS



▲ ASSEMBLY FOR CURIOSITY ROVER

MICRO-D FOR SPACE APPLICATIONS

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MICRO-D FOR SPACE APPLICATIONS

Space Micro-D & Nano-D connectors

MDSA RANGE

► Micro-D connectors and assemblies for space applications

AXON' has drawn upon long experience in the highly challenging environment of space electronics to develop Micro-D connectors and assemblies suitable for this demanding area. Marrying the Micro-D design with the need to be able to reliably transmit signals, power and high speed data, AXON' has developed custom solutions for a wide variety of applications in space.

AXON' space products are assembled to the highest standards, meeting the ECSS-Q-ST-70-08C and ECSS-Q-ST-70-26C requirements, and all such products are built in one of our humidity controlled, class 100,000 (ISO 8) clean rooms.

AXON' has been approved to ESCC 3401/029 EPPL2 since 2006.



▲ GOLD PLATED MICRO-D CONNECTOR

GENERAL CHARACTERISTICS

► Electrical & mechanical characteristics

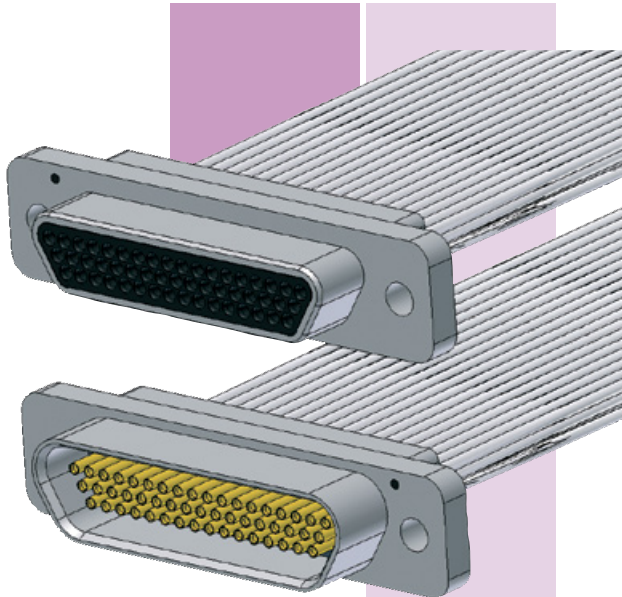
CHARACTERISTIC	SPECIFICATION	TEST METHOD
CURRENT RATING	2.5 A max for AWG26 & uninsulated wires* 1.5 A max for AWG28 wires*	
CONTACT RESISTANCE	5 mΩ @ current rating 6 mΩ @ low level current	Para 9.1.1.3 OF ESCC 3401
INSULATION RESISTANCE	5000 MΩ min @ 500 V _{DC}	Para 9.1.1.1 OF ESCC 3401
DIELECTRIC WITHSTANDING VOLTAGE	600 V _{RMS} / 2 mA (leakage current)	Para 9.1.1.2 OF ESCC 3401
WORKING VOLTAGE		
- Sea level 0m	150 V _{RMS}	Para 9.13.5 OF ESCC 3401
- Altitude 33km	100 V _{RMS}	
CONTACT ENGAGING & SEPARATION FORCE	1.667 N maximum 0.137 N minimum	Para 4.3.9 OF ESCC 3401/029
CONNECTOR MATING & DE-MATING FORCES	Mating: 20 N (9 ways) to 113 N (51 ways) max De-mating: 20 N max / 1.3 N min (9 ways) to 113 N max / 7.1 N min (51 ways)	Para 9.20 OF ESCC 3401
CONTACT RETENTION	22.25 N for female contacts	Para 9.17 OF ESCC 3401
DURABILITY	500 Mating cycles minimum	Para 9.18 OF ESCC 3401
TEMPERATURE RANGE	-55°C / +125°C	
VIBRATION	20g's - no discontinuity > 1μs	Para 9.11 OF ESCC 3401
SHOCK	50g's - no discontinuity > 1μs	Para 9.12 OF ESCC 3401
SALT SPRAY	48 hours	Para 9.22 OF ESCC 3401

*: For a single contact. Please refer to derating rule of ESCC 3401/029.

► Materials & Finish

COMPONENT	MATERIAL	FINISH
MALE CONTACT (TWIST PIN)	COPPER AND BERYLLIUM COPPER	GOLD PLATING IN ACCORDANCE WITH ASTM-B488, TYPE II, CLASS 1 (1.27 μM (0.050") MIN), CODE C OVER NICKEL UNDERPLATE IN ACCORDANCE WITH SAE-AMS-QQ-N-290 CLASS 2 (1.27 μM (0.050") TO 3.81 μM (0.150"))
FEMALE CONTACT	COPPER ALLOY	
METAL SHELL	ALUMINIUM ALLOY, TYPE 6061	HIGH-PHOSPHOROUS ELECTROLESS NICKEL PLATING – 25.4 μM MIN. 2.54 μM GOLD PLATING OVER NICKEL UNDERPLATING
PLASTIC INSERT / PCB TRAY	LIQUID CRYSTAL POLYMER, 30% LOADED GLASS FIBRE POLYESTER, 94VO, IN ACCORDANCE WITH MIL-M-24519 (200°C)	
INTERFACIAL SEAL	FLUOROSILICONE RUBBER	HEAT-CURED TO MEET ECSS-Q-70-71 A OUTGASSING REQUIREMENTS
HARDWARE	STAINLESS STEEL, 300 SERIES	PASSIVATION IN ACCORDANCE WITH SAE-AMS-2700
ENCAPSULANT	SPACE GRADE EPOXY RESIN	
INSULATED WIRE	- POLYIMIDE INSULATED WIRES IN ACCORDANCE WITH ESCC 3901/002 - PTFE INSULATED WIRES IN ACCORDANCE WITH ESCC 3901/013 - ETFE INSULATED SILVER PLATED COPPER IN ACCORDANCE WITH SAE-AS22759/33	
UNINSULATED WIRE	SOLID COPPER WIRES IN ACCORDANCE WITH QQ-W-343 TYPE 'S' GOLD PLATED ACCORDING TO MIL-G-45204, CLASS 2 GRADE C OR D	

Pigtail connectors



METAL SHELL

- Nickel or gold plated shells for space applications.
- Supplied pre-wired and fully potted.

IDENTIFICATION CODE

MDSA

2

15

P

V01301

F

46

M

SERIES

MDSA: Micro-D Space AXON' connectors.

PLATING

- 2:** Nickel plated.
- 5:** Gold plated.

NUMBER OF CONTACTS

9, 15, 21, 25, 31, 37, 51.

See pages 26 & 27 for contact arrangements.

GENDER

- P:** Male crimped contacts.
- S:** Female crimped contacts.

WIRE TYPE

V01301: Single wire ESCC 3901/013 - Variant 01 (AWG28).

V01302: Single wire ESCC 3901/013 - Variant 02 (AWG26).

V00261: Single wire ESCC 3901/002 - Variant 61 (AWG28).

V00256: Single wire ESCC 3901/002 - Variant 56 (AWG26).

G: Uninsulated wires: gold plated AWG2501.

E: Single wire M22759/33-26 (recommended for space application by MIL-DTL-83513).

NB: Other wires upon request.

WIRE COLOUR

Wire code **E**

F: Yellow.

L: White.

W: 10 Colours code per MIL-STD-681, as required by MIL-DTL-83513.

Uninsulated wires or ESCC wires

BLANK (see wire descriptions and wire colours page 298).

WIRE LENGTH (in cm)

XXX = length in cm.

HARDWARE

B: Fixed mounting holes (no hardware).

C: U-clips with low profile hex socket head jackscrews (removable).

D: U-clips with low profile slot head jackscrews (removable).

M: Low profile Allen head jackscrews (removable).

N: High profile Allen head jackscrews (removable).

S: Low profile slot head jackscrews (removable).

T: High profile slot head jackscrews (removable).

P: Jackpost (removable).

K: High profile slot head jackscrews (non-removable).

L: Low profile Allen head jackscrews (non-removable).

F: Floating mount (non-removable).

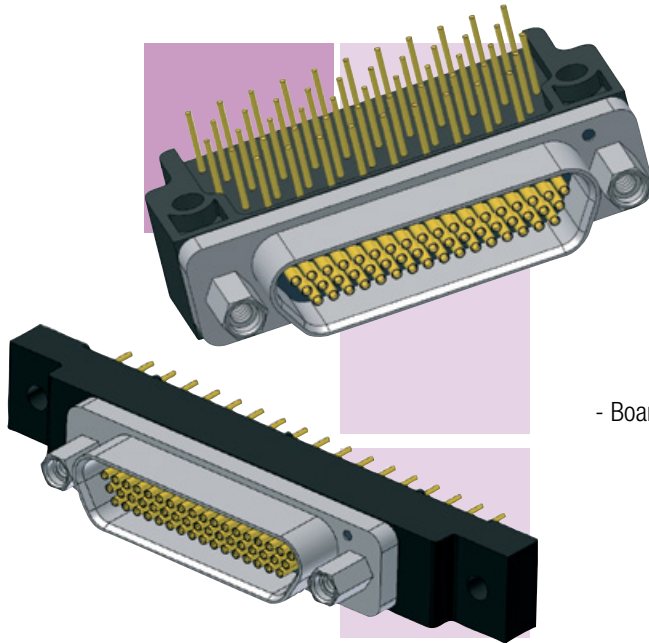
See page 190 to 200 for hardware description.

L in cm (inches)	L ≤ 10 L ≤ 3.940	10 < L ≤ 100 3.940 < L ≤ 39.40	L > 100 L > 39.40
TOLERANCE in cm (inches)	-0 / +0.5 -0 / +0.200	-0 / +3 -0 / +1.180	-0 / +5 -0 / +1.970

PCB connectors

METAL SHELL

- Nickel or gold plated shells for space applications.
- Board right angle or straight to accomodate all configurations.
- To be used with flexible and rigid printed circuit boards.
- Several tail lengths available.



IDENTIFICATION CODE

MDSA

2

25

P

CBR

P

G

1

SERIES

MDSA: Micro-D Space AXON' connectors.

PLATING

2: Nickel plated.
5: Gold plated.

NUMBER OF CONTACTS

9, 15, 21, 25, 31, 37, 51.

See pages 26 & 27 for contact arrangements.

GENDER

P: Male crimped contacts.
S: Female crimped contacts.

TERMINATION TYPE

BS: Board Straight version.
BR: Board Right Angle version.
CBR: Condensed Board Right Angle version.

HARDWARE

B: No jackpost, no threaded PCB mounting hole.
P: Jackposts installed, no threaded PCB mounting hole.
T: Threaded PCB mounting holes only.
W: Jackposts installed and threaded PCB mounting hole.
See page 190 to 200 for hardware description.

CONDUCTOR TYPE

G: Uninsulated ESCC wire AWG2501 gold plated.

TAIL LENGTH

1: 2.80 mm - 0.109".
2: 3.80 mm - 0.150".
3: 4.80 mm - 0.190".
4: 6.35 mm - 0.250".

Tolerance: ± 0.38 mm (0.015").
NB: Other wires upon request.

MICRO-D FOR SPACE
APPLICATIONS

Space Micro-D &
Nano-D connectors

WIRE DESCRIPTIONS

► **Insulated wire AWG28, in accordance with ESCC 3901/013 Variant 01 (V01301)**

Conductor	Max Ø: 0.42 mm Nominal cross-section: 0.089 mm ²
Insulation	Max Ø: 0.82 mm Max weight: 1.8 g/m Colour: Natural

► **Insulated wire AWG26, in accordance with ESCC 3901/013 Variant 02 (V01302)**

Conductor	Max Ø: 0.50 mm Nominal cross-section: 0.14 mm ²
Insulation	Max Ø: 0.89 mm Max weight: 2.3 g/m Colour: Natural

► **Insulated wire AWG28, in accordance with ESCC 3901/002 Variant 61 (V00261)**

Conductor	Max Ø: 0.43 mm Nominal cross-section: 0.10 mm ²
Insulation	Max Ø: 0.68 mm Max weight: 1.23 g/m Colour: Brown

► **Insulated wire AWG26, in accordance with ESCC 3901/002 Variant 56 (V00256)**

Conductor	Max Ø: 0.53 mm Nominal cross-section: 0.15 mm ²
Insulation	Max Ø: 0.78 mm Max weight: 1.93 g/m Colour: Black

► **Uninsulated solid wire AWG2501, in accordance with QQ-W-343 type "S" (G)**

Gold plated per MIL-G-45204, Class 2 grade C or D
Conductor Ø: 0.455 ± 0.005 mm
Min gold plating thickness: 0.5 µm
Max weight: 1.6 g/m

► **Insulated wire M22759/33-26 (E)**

Conductor	Nom Ø: 0.483 mm Nominal cross-section: 0.154 mm ²
Insulation	Nom Ø: 0.81 mm Max weight: 2.1 g/m

► LAT Levels

The required level of Lot Acceptance Testing is to be specified when ordering.
The sample size of the three Lot Acceptance Tests are shown in the diagram below.
All components assigned to a subgroup shall be subjected to all the tests of that subgroup in the table test sequence.
AXON' Space Micro-D connectors are tested according to ESCC 3401.

Lot Acceptance "level 3":

No additional tests or inspections are required for this level.

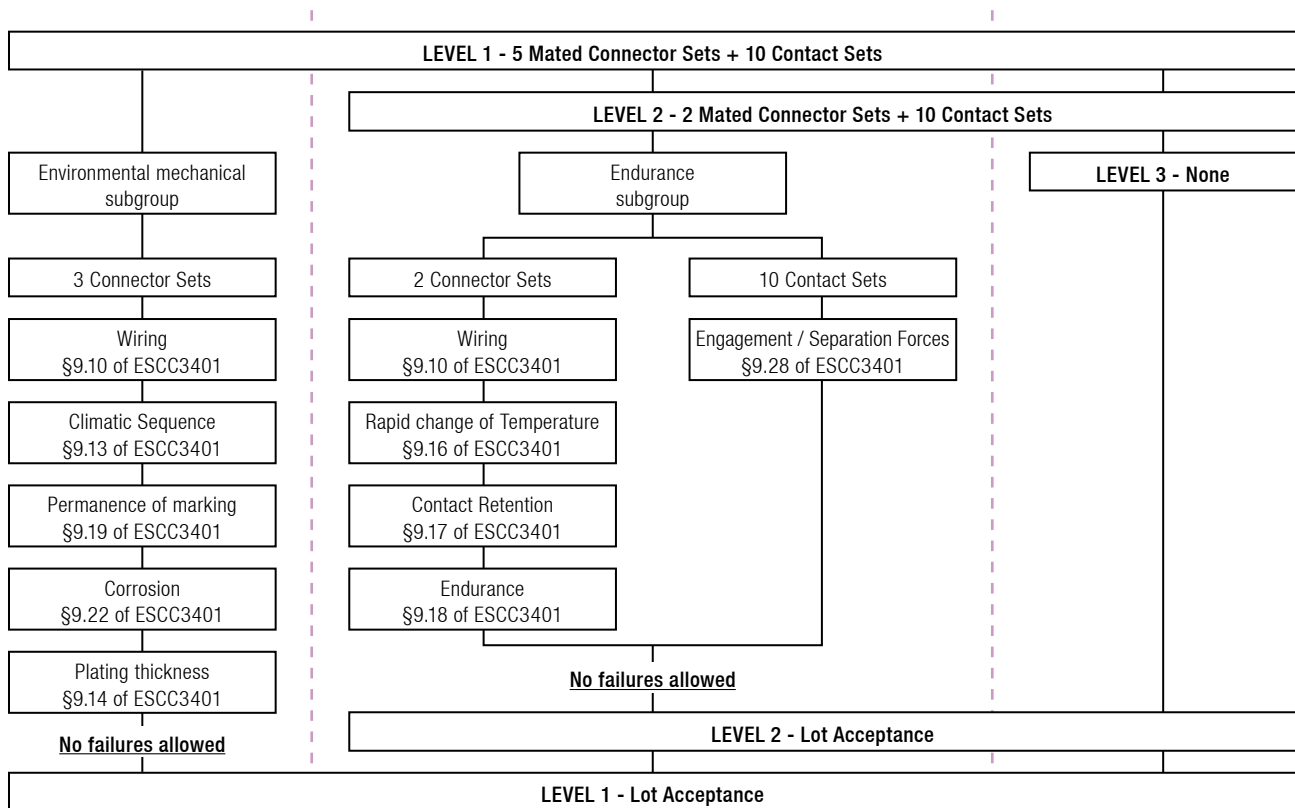
Lot Acceptance "level 2":

This level includes the electrical and endurance subgroup.

Lot Acceptance "level 1":

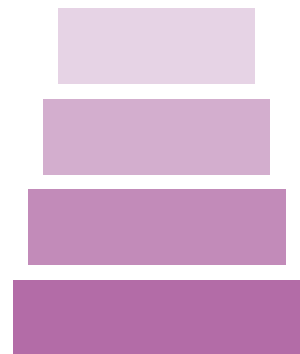
This level includes everything in level 2 plus environmental and mechanical subgroups.

► SAMPLE SIZES ACCORDING TO REQUIRED LAT LEVEL



120 WAY MICRO-D CONNECTORS

- 120 way Micro-D connectors 302
- 120 way connectors for cable and harnesses 305
- Surface mount PCB card edge connectors 306
- BS connectors. 307
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120 WAY MICRO-D
CONNECTORS

Space Micro-D &
Nano-D connectors

120 WAY MICRO-D CONNECTORS

An enduring trend in the electronics industry is the continuing drive towards miniaturisation. This leads in turn to ever greater cabling densities with an ever larger number of signals required within limited space constraints. In answer to these challenges, AXON' CABLE has developed a range of 120 way Micro-D connectors. They are available as pigtailed or within assemblies but can equally be supplied as PCB connectors in either surface mount or through hole format. Connector savers are part of the range.

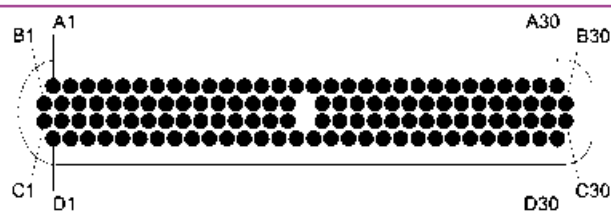
These connectors have been developed and tested for the challenging requirements of space electronics, and can be used for any applications where severe environmental conditions and high density cabling are critical. Keying hardware is an option.

AXON' can offer specific numbers of contacts for custom designed applications. Specific designs are not contained within the MIL specification but AXON's solutions remain fully compatible with the MIL-DTL-83513 standard as far as performance and construction are concerned.

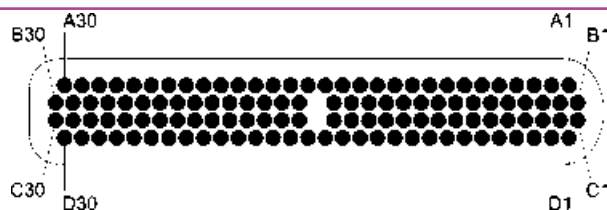


▲ 120 WAY MICRO-D CARD
EDGE CONNECTOR

► Contact arrangements



MATING FACE OF THE 120 WAY MALE CONNECTOR



MATING FACE OF THE 120 WAY FEMALE CONNECTOR

1.27 mm (.050") contact spacing.

1.27 mm (.050") spacing between two rows.

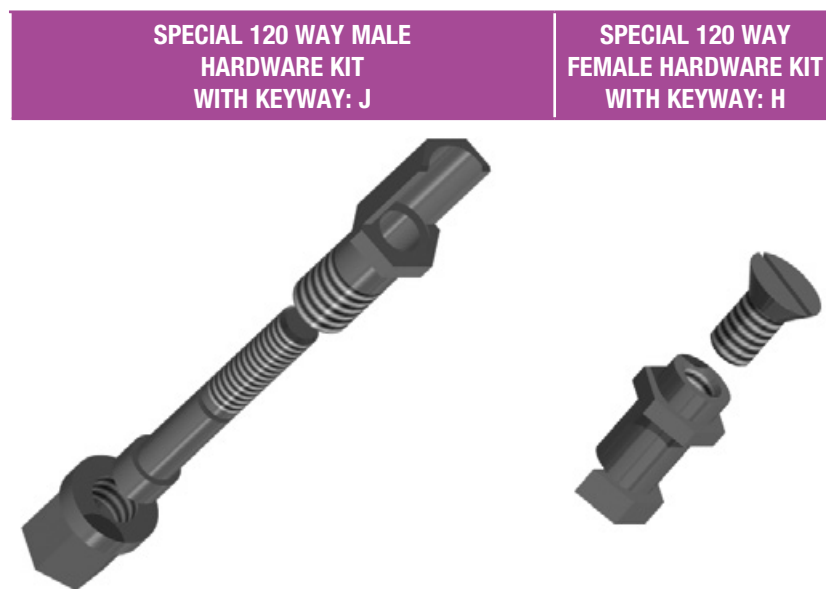
► References

DESIGNATION	REFERENCE	COMMENTS	PAGE
120 WAY PLUG CONNECTOR FOR CABLE OR ASSEMBLY	P562630	Wire, length and colour type to be defined	305
120 WAY SOCKET CONNECTOR FOR CABLE OR ASSEMBLY	P562631	Wire, length and colour type to be defined	305
120 WAY SOCKET SURFACE MOUNT PCB CONNECTOR	P562632	Can only be mated with pigtail plug	306
120 WAY PLUG BOARD STRAIGHT PCB CONNECTOR	P562633		307
120 WAY CONNECTOR SAVER	P562634		307

The AXON' 120 way Micro-D connector can be ordered with standard wires and colours (see pages 29 & 30).

For more AXON' 120 way Micro-D connectors references, please ask for our *Cables & harnesses for space applications* catalog.

► Keying Hardware



120 WAY MICRO-D
CONNECTORS

Space Micro-D &
Nano-D connectors

► Electrical & mechanical characteristics

FEATURES	SPECIFICATIONS	TEST METHODS
CURRENT RATING	2.5 A max @ 23°C	EIA-364-70
CONTACT RESISTANCE	8 mΩ max.	EIA-364-06
INSULATION RESISTANCE	5000 MΩ min. @ 500 Vdc	EIA-364-21
DIELECTRIC WITHSTANDING VOLTAGE - SEA LEVEL 0 M - ALTITUDE 21 KM (70,000 FT)	250 V _{AC} 100 V _{AC}	EIA-364-20
CONTACT ENGAGING AND SEPARATION FORCE	170 g max. (6 oz) / 14 g min. (0.5 oz)	EIA-364-37
CONNECTOR MATING AND DE-MATING FORCE	283 g (10 oz) X 120	EIA-364-13
CONTACT RETENTION	2.26 kg (5 lbs) for 5 seconds min.	EIA-364-29
DURABILITY	500 mating cycles min.	EIA-364-09
TEMPERATURE RANGE	-55°C / +150°C	
VIBRATION	20 g's - No discontinuity >1μs	EIA-364-28 TEST CONDITION IV
SHOCK	50 g's - No discontinuity >1μs	EIA-364-27 TEST CONDITION E
SALT SPRAY	48 hours	EIA-364-26 TEST CONDITION B
HUMIDITY	Insulation resistance > 1MΩ	EIA-364-31 TEST METHOD IV

► Materials & finish

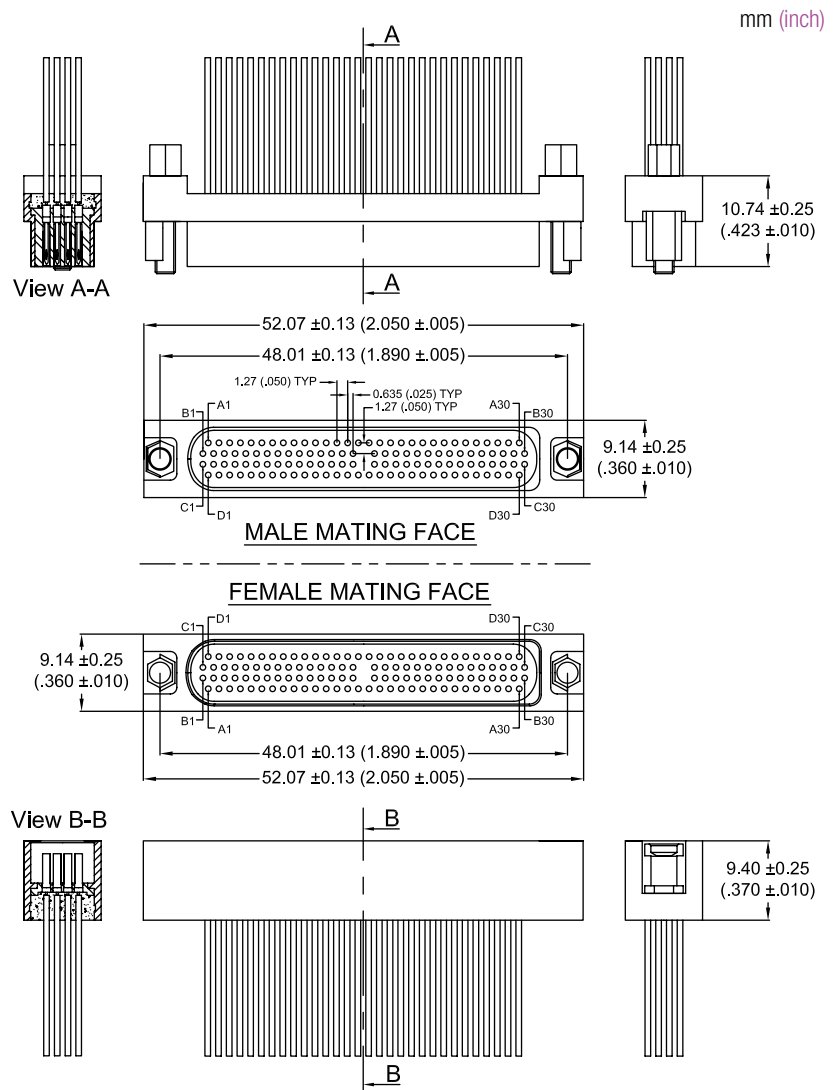
COMPONENTS	MATERIAL	FINISH
MALE CONTACT (TWIST PIN)	COPPER AND BERYLLIUM COPPER	GOLD PLATING IN ACCORDANCE WITH ASTM-B488, TYPE II, CLASS 1 (1.27μM (0.050") MIN), CODE C OVER NICKEL UNDERPLATE IN ACCORDANCE WITH SAE-AMS-QQ-N-290 CLASS 2 (1.27μM (0.050") TO 3.81μM (0.150"))
FEMALE CONTACT	COPPER ALLOY	
METAL SHELL	ALUMINIUM ALLOY, TYPE 6061	ELECTROLESS NICKEL PLATING IN ACCORDANCE WITH SAE-AMS2404, CLASS 4, .0005 INCH MIN.
INSERTS	LIQUID CRYSTAL POLYMER, 30% LOADED GLASS FIBRE POLYESTER, 94VO, IN ACCORDANCE WITH MIL-M-24519 (200°C)	
HARDWARE	STAINLESS STEEL, 300 SERIES	PASSIVATION IN ACCORDANCE WITH SAE-AMS2700
ENCAPSULANT	SPACE GRADE EPOXY RESIN	
UNINSULATED WIRE	AWG 2801 SOLID COPPER WIRE	GOLD PLATED IN ACCORDANCE WITH A-A-59551

► 120 way male and female connectors for cable and harnesses

Both male and female connectors can be assembled with various wire sizes in shielded and unshielded forms. High speed variants can also be produced, using controlled impedance shielded twisted pairs which allow data rates of up to 880 Mbps. For space applications, these connectors are assembled in a class 100,000 clean room, and can be terminated with ESA ESCC (European Space Agency) approved wires.



P562630
P562631



120 WAY MICRO-D
CONNECTORS

Space Micro-D &
Nano-D connectors

► Surface Mount PCB Card Edge Connectors

Surface Mount (SMT) connectors have two rows of 28 AWG gold plated leads at 0.635 mm (.025") pitch spacing to terminate to PCB's by soldering. Lugs on either side of the connector allow for mechanical clamping onto the PCB.

► AVAILABLE VERSIONS

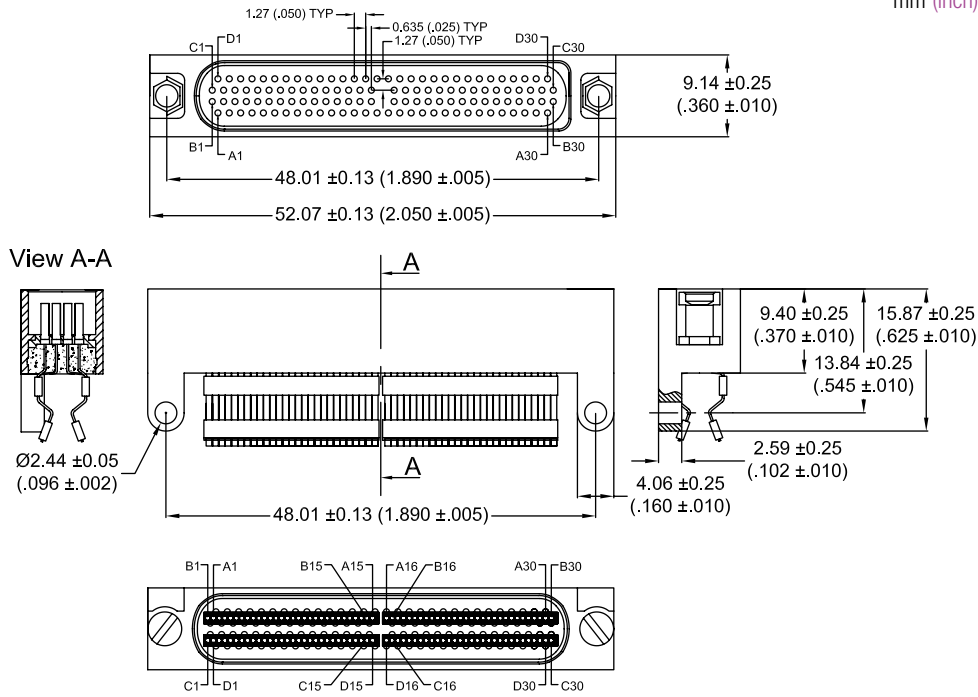
- Female style to mate with a male pigtail or assembly connector.
- Male and female styles to mate together (this option has a longer shell to retain the keying hardware system).
- Female style for panel mount.

► FEMALE SMT

to mate to a male cable connector.

P562632

mm (inch)

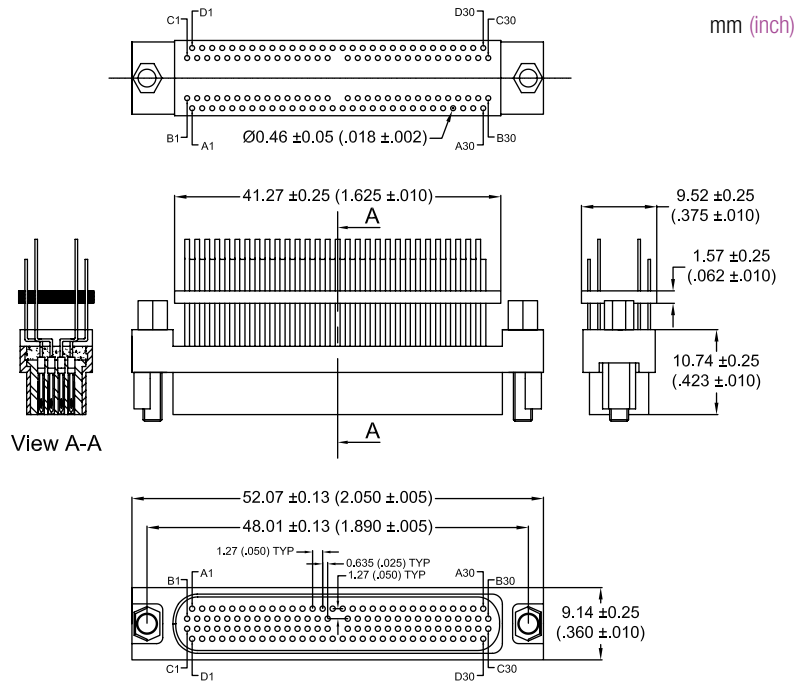


SEE CONTACT LAYOUT ON PCB PAGE 308

BS CONNECTOR

The BS version is similar to the straight PCB connector style of the MIL standard. Available in male version only.

P562633

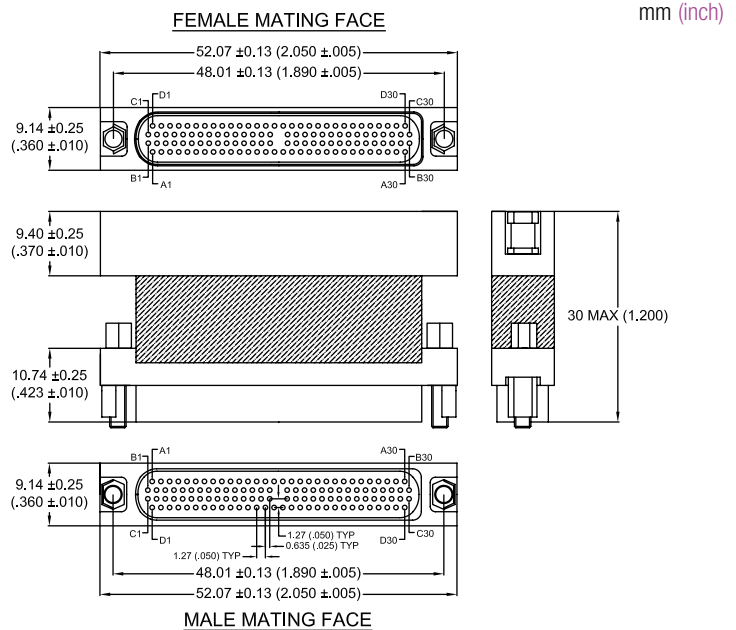


SEE CONTACT LAYOUT ON PCB PAGE 308

CONNECTOR SAVER

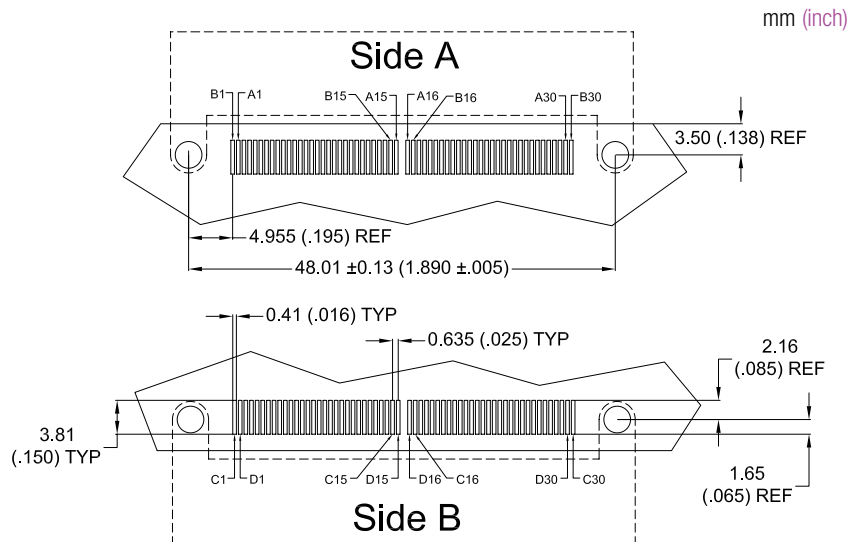
Connector savers have been developed to protect expensive equipment. Typical applications include test equipment and space-grade instruments.

P562634

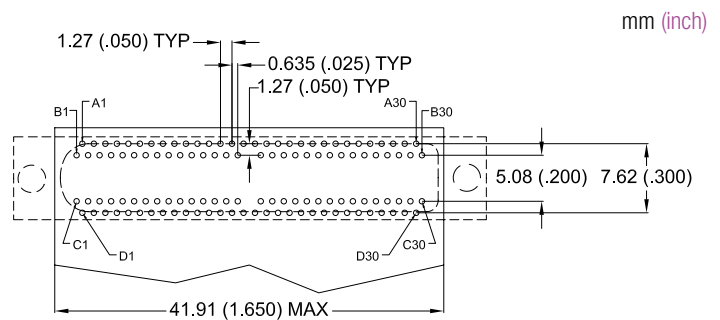


► PCB layout

► FEMALE SMT (SURFACE MOUNT STYLE) CONNECTOR

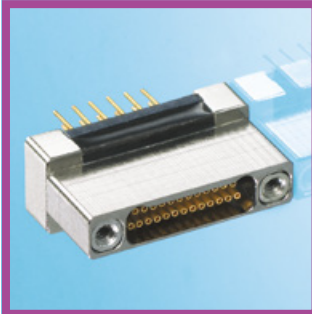
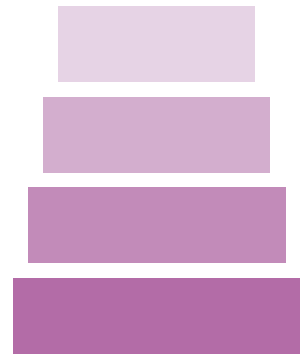


► BS VERSION (MALE ONLY)



NANO-D FOR SPACE APPLICATIONS

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- BS (Board Straight) type 316
- CBR (Condensed Board Right Angle) type 318
- SMV (Surface Mount Vertical) type 320
 - PCB layout for BS 0.050" type 322*
 - PCB layout for CBR 0.050" type 323*
 - PCB layout for SMV 0.025" type 324*



ND2SA RANGE

► Nano-D connectors and assemblies for space applications

0.635 MM (.025") CONTACT SPACING

AXON' has drawn upon long experience in the highly challenging environment of space electronics to develop Nano-D connectors and assemblies suitable for this demanding area. Marrying the Nano-D design with the need to be able to reliably transmit signals, AXON' has developed custom solutions for a wide variety of application in space.

AXON' space products are assembled to the highest standards, meeting the ECSS-Q-ST-70-08C and the ECSS-Q-ST-70-26C requirements, and all such products are built in one of our humidity controlled, class 100.000 (ISO 8) clean rooms.

AXON' has been approved to ESCC 3401/086 EPPL2 since 2014.

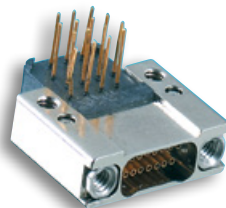
► Different configurations

AXON's range of space Nano-D connectors is available in several different configurations:

- Nano-D rectangular connectors for cables.
- Nano-D rectangular connectors for PCBs.

► Characteristics

- 0.635 mm (.025") contact spacing (double the density of a space Micro-D).
- Number of ways: 9, 15, 21, 25, 31, 37 and 51.
- High reliability twist pin contacts.
- Metal shell construction with captivated hardware.



▲ SPACE NANO-D CONNECTOR

GENERAL CHARACTERISTICS

per ESCC 3401/086*

AXON's range of space Nano-D connectors which is covered by the ESCC 3401/086* standard, is ideally suited to equipment and applications where weight, miniaturisation and long term performance are required. It is available in 7 contact arrangements (9 to 51 contacts) for rectangular Nano-D connectors.

► Electrical & mechanical characteristics

CHARACTERISTIC	SPECIFICATION	TEST METHOD
CURRENT RATING	1 A max.	
CONTACT RESISTANCE	71 mΩ max.	Para 9.1.1.3 OF ESCC 3401
INSULATION RESISTANCE	1000 MΩ min. @ 100 V _{RMS}	Para 9.1.1.1 OF ESCC 3401
DIELECTRIC WITHSTANDING VOLTAGE - SEA LEVEL 0 m - ALTITUDE 21 km (70,000 ft)	250 V _{RMS} 100 V _{RMS}	Para 9.1.1.2 OF ESCC 3401
CONTACT ENGAGING AND SEPARATION FORCE	1.39 N max. 0.11 N min.	Para 4.3.9 OF ESCC 3401/086
CONNECTOR MATING AND DE-MATING FORCE	198 g (7 oz) x number of contacts max.	Para 9.20 OF ESCC 3401
CONTACT RETENTION	2.2 N min.	Para 9.17 OF ESCC 3401
DURABILITY	200 mating cycles min.	Para 9.18 OF ESCC 3401
TEMPERATURE RANGES	-55°C / +150°C	
VIBRATION	20 g's - No discontinuity >1μs	Para 9.11 OF ESCC 3401
SHOCK	50 g's - No discontinuity >1μs	Para 9.12 OF ESCC 3401
SALT SPRAY	48 hours	Para 9.22 OF ESCC 3401

► Material & Finish

COMPONENT	MATERIAL	FINISH
MALE CONTACT (TWIST PIN)	PRECIOUS GOLD ALLOY IN ACCORDANCE WITH ASTM-B-477 OR 541 OR 562	NONE
FEMALE CONTACT	PRECIOUS GOLD ALLOY IN ACCORDANCE WITH ASTM-B-477 OR 541 OR 562	NONE
	LEADED BRASS ALLOY CuZn9Pb2	GOLD PLATING IN ACCORDANCE WITH ASTM-B488, TYPE II, CLASS 1 (1.27 μm MIN. (.050")), CODE C OVER NICKEL UNDERPLATE IN ACCORDANCE WITH SAE-AMS-QQ-N-290, CLASS 2 (1.27 μm (.050") TO 3.81 μm (0.150"))
METAL SHELL	ALUMINIUM ALLOY, TYPE 6061 IN ACCORDANCE WITH SAE-AMS-QQ-A-200/8 OR ASTM-B-209	ELECTROLESS NICKEL PLATING IN ACCORDANCE WITH SAE-AMS-2404, CLASS 4.
INSERT/ PCB TRAY	LIQUID CRYSTAL POLYMER, 30% LOADED GLASS FIBRE POLYESTER 94V0, IN ACCORDANCE WITH MIL-M-24519 (200°C)	
HARDWARE	STAINLESS STEEL, 300 SERIES	PASSIVATION IN ACCORDANCE WITH SAE-AMS2700
ENCAPSULANT	SPACE GRADE EPOXY RESIN	
INSULATED WIRE	CROSSLINKED ETFE INSULATED SILVER PLATED COPPER ALLOY IN ACCORDANCE WITH PARA 4.4 OF ESCC 3901/012	
INTEGRAL TAIL	GOLD PLATED SOLID COPPER BASE ALLOY IN ACCORDANCE WITH ASTM-B-194	

*: ISSUE 1 AT THE TIME OF GOING TO PRESS

RECTANGULAR CONNECTORS FOR CABLES

DUAL ROW PIGTAIL & JUMPER



- Reliability for micro-miniature operating systems.
- High performance metal connector and ETFE crosslinked wire.
- Panel mount available for receptacle connector.
- Operating temperature: -55 / +150°C.
- 7 contact arrangements (9 to 51 contacts).

IDENTIFICATION CODE

ND2SA 25 P P I E W1 9 50 L L

SERIES

ND2SA: Nano-D Space application 2 row AXON*. See below variants included in the ESCC3401/086 specification.

NUMBER OF CONTACTS

09, 15, 21, 25, 31*, 37, 51.

1st CONNECTOR TYPE

S: Receptacle connector*.

M: Panel mount receptacle connector*.

2nd CONNECTOR TYPE

M: Panel mount receptacle connector*.

W: No second connector - free wires*.

CONNECTIONS (see jumper wiring on page 216)

D: Direct pin 1 to pin 1.

I: Indirect (usual for plug-plug jumper).

X: Pigtail*.

EMI FAMILY

E: Shielded pigtails or harnesses, shield soldered to the backshell (see page 314).

X: No shield.

WIRE CODE

W1: Single wire ESCC 3901/012 - Variant 01 (AWG30).

W2: 2 shielded jacketed twisted pairs ESCC 3901/012 - Variant 51 with the remaining wiring being single wire per ESCC 3901/012 - Variant 01.

COLOUR CODE

0: Black. **1:** Brown. **2:** Red. **3:** Orange*. **4:** Yellow*. **5:** Green*.
6: Blue*. **7:** Violet*. **8:** Grey*. **9:** White. **W:** 10 colour repeat*.

For colour code "W" see page 30

WIRE LENGTH (in cm)

Attention! Wire length in centimetres - (1cm = 10 mm = .394").

L	5 ≤ L ≤ 10	10 < L ≤ 100	L > 100
in cm (inches)	1.97 ≤ L ≤ 3.940	3.940 < L ≤ 39.40	39.40
TOLERANCE	-0 / +0.5	-0 / +3	-0 / +5
in cm (inches)	-0 / +0.200	-0 / +1.180	-0 / +1.970

HARDWARE 1st CONNECTOR

P: Threaded hole #0-80 UNF (non removable jackposts, receptacle only).

R: Retractable short hex socket head jackscrews #0-80 UNF (semi-captivated, plug only).

L: Short hex socket head jackscrews #0-80 UNF (captivated, plug only).

V: Retractable short hex socket head jackscrews #0-80 UNF (semi captivated, plug with backshell only).

B: No hardware*.

HARDWARE 2nd CONNECTOR

P: Threaded hole #0-80 UNF (non removable jackposts, receptacle only).

R: Retractable short hex socket head jackscrews #0-80 UNF (semi-captivated, plug only).

L: Short hex socket head jackscrews #0-80 UNF (captivated, plug only).

V: Retractable short hex socket head jackscrews #0-80 UNF (semi captivated, plug with backshell only).

X: Pigtail*.

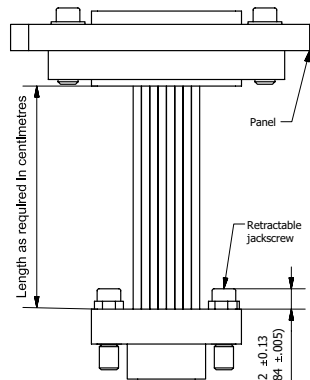
B: No hardware*.

***: not included in ESCC specification**

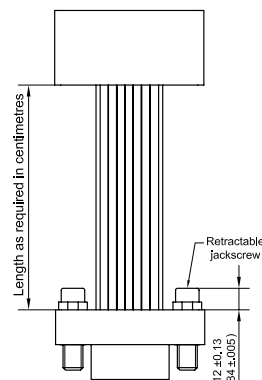
DIMENSIONS

Dimensions are in millimetres (inches).

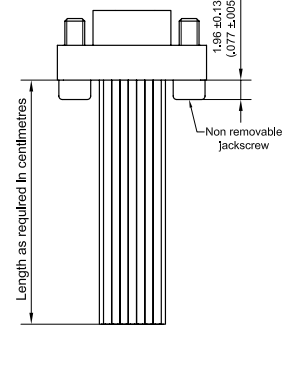
ND2SA 15 P M D X W1 9 20 R P



ND2SA 15 P S D X W1 9 20 R P



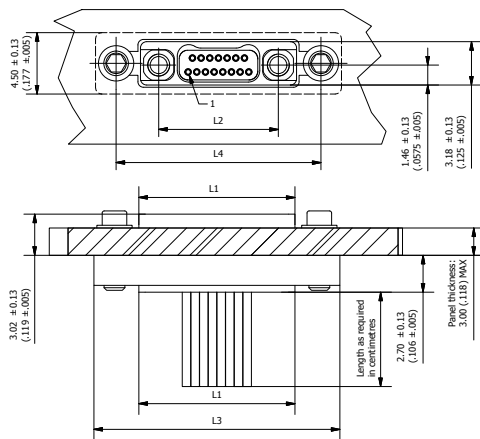
ND2SA 15 P W D X W1 0 20 P X



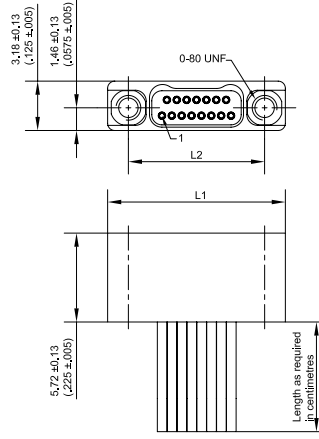
1 centimetre = 10 millimetres = 0.393 inch

1 inch = 25.4 millimetres = 2.54 centimetres

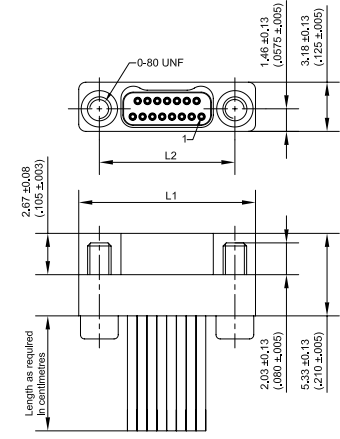
PANEL MOUNT RECEPTACLE



RECEPTACLE



PLUG



SHELL SIZE	L1 ±0.13 (±.005)	L2 ±0.13 (±.005)	L3 ±0.13 (±.005)	L4 ±0.13 (±.005)
9 P / 9 S	9.53 .375	6.86 .270	16.10 .634	13.10 .516
15 P / 15 S	11.43 .450	8.76 .345	18.00 .709	15.00 .591
21 P / 21 S	13.34 .525	10.67 .420	19.91 .784	16.91 .666
25 P / 25 S	14.61 .575	11.94 .470	21.18 .834	18.18 .716
31 P / 31 S*	16.51 .650	13.84 .545	23.09 .909	20.08 .791
37 P / 37 S	18.42 .725	15.75 .620	24.99 .984	21.99 .866
51 P / 51 S	22.86 .900	20.19 .795	29.43 1.159	26.43 1.041

*: not included in ESCC specification

SUMMARY OF CHARACTERISTICS

ELECTRICAL & MECHANICAL PERFORMANCE		MATERIAL & FINISH	
CURRENT RATING	1 A max.	SHELL	Aluminium Alloy 6061 with nickel plating
CONTACT RESISTANCE	71 mΩ max.	MOULDED INSULATOR	Liquid Crystal Polymer (LCP)
INSULATION RESISTANCE	1000 MΩ min. @ 250 VRMS	PIN CONTACT	Precious gold alloy
DIELECTRIC WITHSTANDING VOLTAGE	Sea level: 250 VRMS Altitude 21 km (70,000 ft): 100 VAC	SOCKET CONTACT	Precious gold alloy
CONTACT ENGAGING FORCE	1.39 N max.	ENCAPSULANT	Epoxy resin
CONTACT SEPARATING FORCE	0.11 N min.	HARDWARE	300 series stainless steel, passivated
CONTACT RETENTION	2.2 N min.		
DURABILITY	200 mating cycles min.		
VIBRATION	20g's – No discontinuity > 1 μs		
SHOCK	50g's – No discontinuity > 1 μs		



RECTANGULAR CONNECTORS FOR CABLES

EMI RANGE SHIELDED DUAL ROW PIGTAIL & JUMPER

- Reliability for micro-miniature operating systems.
- High performance metal connector and ETFE crosslinked wire.
- Panel mount available for receptacle connector.
- 360° screen termination.
- Operating temperature: -55°C / +200°C.
- 7 contact arrangements (9 to 51 contacts).

IDENTIFICATION CODE

ND2SA 25 P P I E W1 9 50 L L

SERIES

ND2SA: Nano-D Space application 2 row AXON*.
See below variants included in the ESCC3401/086 specification.

NUMBER OF CONTACTS

09, 15, 21, 25, 31*, 37, 51.

1st CONNECTOR TYPE

P: Plug connector.
S: Receptacle connector*.
M: Panel mount receptacle connector*.

2nd CONNECTOR TYPE

P: Plug connector.
S: Receptacle connector.
M: Panel mount receptacle connector*.
W: No second connector - free wires*.

CONNECTIONS (see jumper wiring on page 216)

D: Direct pin 1 to pin 1.
I: Indirect (usual for plug-plug jumper).
X: Pigtail*.

EMI FAMILY

E: Shielded pigtails or harnesses, shield soldered to the backshell.
X: No shield (see page 312).

WIRE CODE

W1: Single wire ESCC 3901/012 - Variant 01 (AWG30).
W2: 2 shielded jacketed twisted pairs ESCC 3901/012 - Variant 51 with the remaining wiring being single wire per ESCC 3901/012 - Variant 01.

COLOUR CODE

0: Black. **1:** Brown. **2:** Red. **3:** Orange*. **4:** Yellow*. **5:** Green*.
6: Blue*. **7:** Violet*. **8:** Grey*. **9:** White. **W:** 10 colour repeat*.

For colour code "W" see page 30

WIRE LENGTH (in cm)

Attention! Wire length in centimetres - (1cm = 10 mm = .394").

L	5 ≤ L ≤ 10	10 < L ≤ 100	L > 100
in cm (inches)	1.97 ≤ L ≤ 3.940	3.940 < L ≤ 39.40	39.40
TOLERANCE	-0 / +0.5	-0 / +3	-0 / +5
in cm (inches)	-0 / +0.200	-0 / +1.180	-0 / +1.970

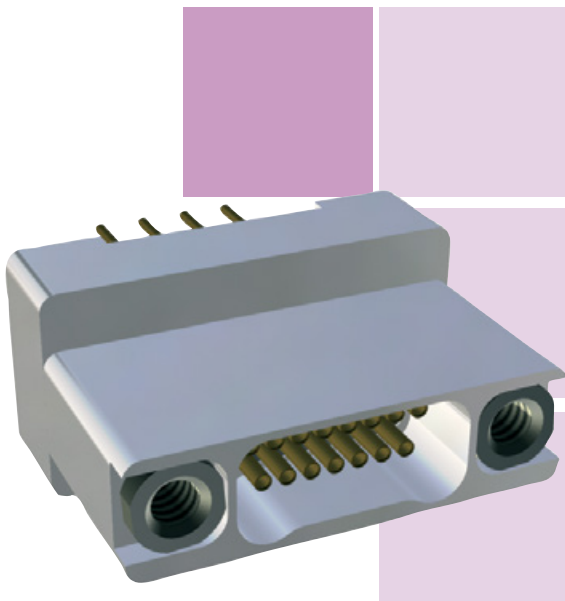
HARDWARE 1st CONNECTOR

P: Threaded hole #0-80 UNF (non removable jackposts, receptacle only).
R: Retractable short hex socket head jackscrews #0-80 UNF (semi-captivated, plug only).
L: Short hex socket head jackscrews #0-80 UNF (captivated, plug only).
V: Retractable short hex socket head jackscrews #0-80 UNF (semi captivated, plug with backshell only).
B: No hardware*.

HARDWARE 2nd CONNECTOR

P: Threaded hole #0-80 UNF (non removable jackposts, receptacle only).
R: Retractable short hex socket head jackscrews #0-80 UNF (semi-captivated, plug only).
L: Short hex socket head jackscrews #0-80 UNF (captivated, plug only).
V: Retractable short hex socket head jackscrews #0-80 UNF (semi captivated, plug with backshell only).
X: Pigtail*.
B: No hardware*.

***: not included in ESCC specification**



PCB RECTANGULAR CONNECTORS

BS TYPE

2 ROW VERTICAL PCB RECEPTACLE

0.050" PITCH

- Reliability for micro-miniature operating systems.
- Several tail lengths available.
- Operating temperature: -55 / +150°C.
- 7 contact arrangements (9 to 51 contacts).

IDENTIFICATION CODE

ND2SA

25

S

BS

P

T

1

SERIES

ND2SA: Nano-D Space application 2 row AXON'.

NUMBER OF CONTACTS

09, 15, 21, 25, 31, 37, 51.

CONNECTOR TYPE

S: Receptacle connector.

FAMILY

BS: AXON' Vertical PCB connector.
Not included in the ESCC 3401/086 specification.

HARDWARE

P: Threaded hole #0-80 UNF (non removable jackposts).

TAIL PLATING

T: Tin lead plated 1µm minimum (63-37 alloy).
G: Gold (not included in the ESCC specification).

TAIL LENGTH

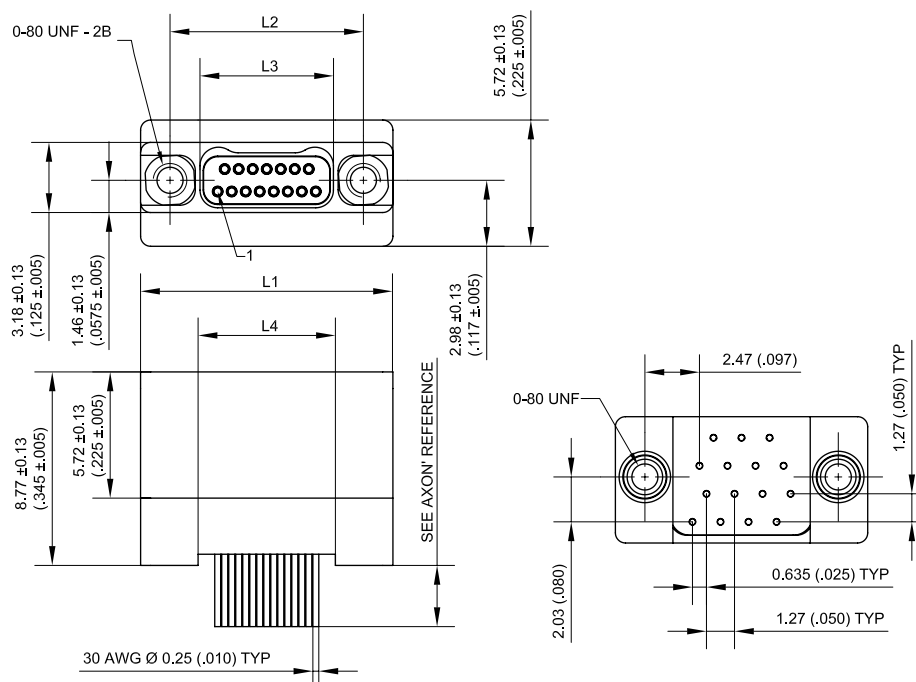
- 1:** 2.77 mm (0.109").
- 2:** 3.56 mm (0.140").
- 3:** 4.37 mm (0.172").
- 4:** 2.29 mm (0.090").

Tolerance ± 0.38 mm (0.015").

Connectors are supplied with
#0-80 UNF screws 1/4" ±0.004" long (for PCB mounting).

DIMENSIONS

Dimensions are in millimetres (inches).



SEE CONTACT LAYOUT ON PCB PAGE 322

SHELL SIZE	L1 ±0.13 (±.005)	L2 ±0.13 (±.005)	L3 ±0.13 (±.005)	L4 ±0.13 (±.005)
9 S	9.53 .375	6.86 .270	4.14 .163	4.32 .170
15 S	11.43 .450	8.76 .345	6.05 .238	6.22 .245
21 S	13.34 .525	10.67 .420	7.95 .313	8.13 .320
25 S	14.61 .575	11.94 .470	9.22 .363	9.40 .370
31 S	16.51 .650	13.84 .545	11.12 .438	11.30 .445
37 S	18.42 .725	15.75 .620	13.03 .513	13.21 .520
51 S	22.86 .900	20.19 .795	17.48 .688	17.65 .695

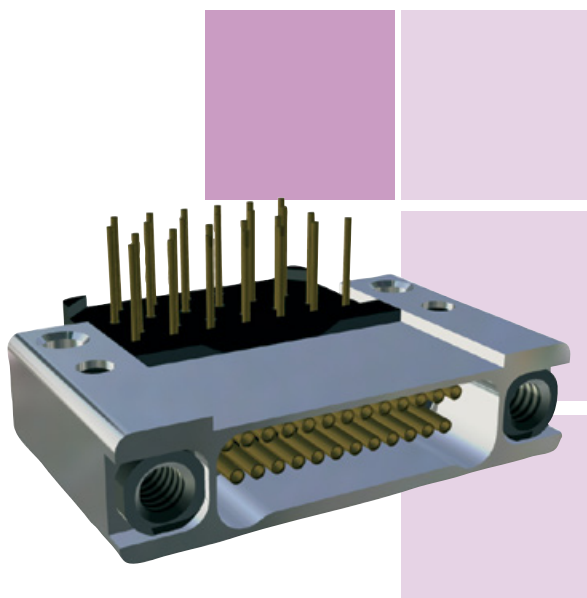
NANO-D FOR SPACE
APPLICATIONS

Space Micro-D &
Nano-D connectors

SUMMARY OF CHARACTERISTICS

ELECTRICAL & MECHANICAL PERFORMANCE		MATERIAL & FINISH	
CURRENT RATING	1 A max.	SHELL	Aluminium alloy 6061 with nickel plating
CONTACT RESISTANCE	71 mΩ max.	MOULDED INSULATOR	Liquid Crystal Polymer (LCP)
INSULATION RESISTANCE	1000 MΩ min. @ 250 VRMS	CONTACT	Copper alloy, gold over nickel plating
DIELECTRIC WITHSTANDING VOLTAGE	Sea level: 250 VRMS Altitude 21 km (70,000 ft): 100 VAC	ENCAPSULANT	Epoxy Resin
CONTACT ENGAGING FORCE	1.39 N max.	PCB TERMINALS	Gold plated solid copper alloy wire
CONTACT SEPARATING FORCE	0.11 N min.	HARDWARE	300 series stainless steel, passivated
CONTACT RETENTION	2.2 N min.		
DURABILITY	200 mating cycles min.		
VIBRATION	20g's - No discontinuity > 1 μs		
SHOCK	50g's - No discontinuity > 1 μs		

SEE PAGE 311 FOR MORE INFORMATION



PCB RECTANGULAR CONNECTORS

CBR TYPE

2 ROW RIGHT ANGLE PCB RECEPTACLE

0.050" PITCH

- Reliability for micro-miniature operating systems.
- Several tail lengths available.
- Operating temperature: -55 / +150°C.
- 7 contact arrangements (9 to 51 contacts).

IDENTIFICATION CODE

ND2SA

25

S

CBR

P

T

1

SERIES

ND2SA: Nano-D Space application 2 row AXON'.
ESCC 3401/086 EPPL2.

NUMBER OF CONTACTS

09, 15, 21, 25, 31*, 37, 51.

CONNECTOR TYPE

S: Receptacle connector.

FAMILY

CBR: AXON' Right Angle PCB connector.

HARDWARE

P: Threaded hole #0-80 UNF (non removable jackposts).

B: None.

Other versions available on request.

TAIL PLATING

T: Tin lead plated 1µm minimum (63-37 alloy).

G*: Gold (not included in the ESCC specification).

TAIL LENGTH

1: 2.77 mm (0.109").

2: 3,56 mm (0,140").

3: 4.37 mm (0.172").

4: 2.29 mm (0.090").

Tolerance $\pm 0.38 \text{ mm (0.015")}$.

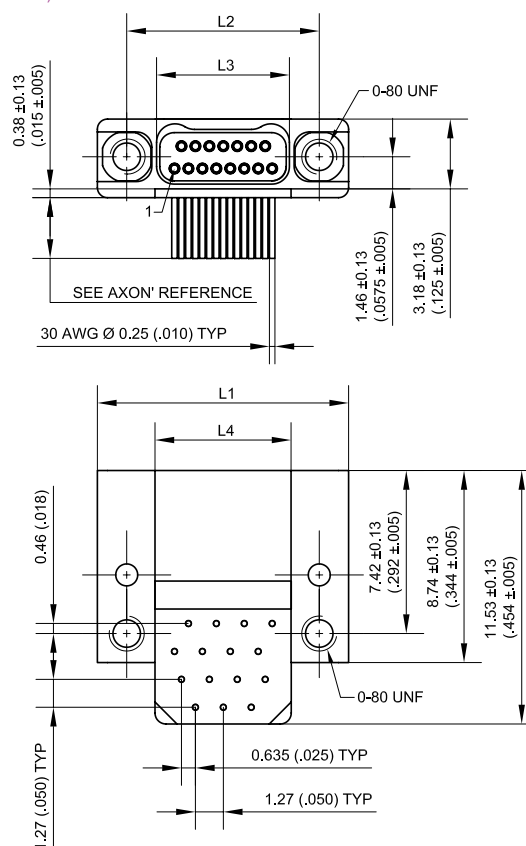
***: not included in ESCC specification**

Connectors are supplied with #0-80 UNF screws 1/4" ± 0.004 " long (for PCB mounting).

IN BOLD: FACTORY STANDARD

DIMENSIONS

Dimensions are in millimetres (inches).



SEE CONTACT LAYOUT ON PCB PAGE 323

SHELL SIZE	L1 ±0.13 (±.005)	L2 ±0.13 (±.005)	L3 ±0.13 (±.005)	L4 ±0.13 (±.005)
9 S	9.53 .375	6.86 .270	4.14 .163	4.32 .170
15 S	11.43 .450	8.76 .345	6.05 .238	6.22 .245
21 S	13.34 .525	10.67 .420	7.95 .313	8.13 .320
25 S	14.61 .575	11.94 .470	9.22 .363	9.40 .370
31 S*	16.51 .650	13.84 .545	11.12 .438	11.30 .445
37 S	18.42 .725	15.75 .620	13.03 .513	13.21 .520
51 S	22.86 .900	20.19 .795	17.48 .688	17.65 .695

*: not included in ESCC specification

SUMMARY OF CHARACTERISTICS

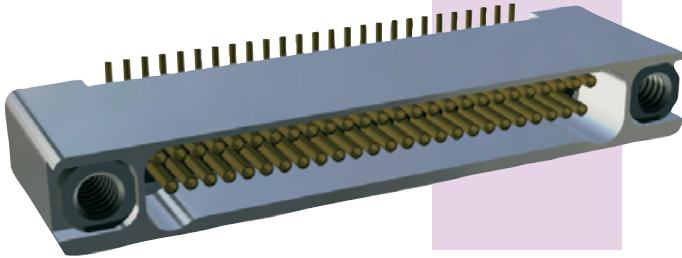
ELECTRICAL & MECHANICAL PERFORMANCE		MATERIAL & FINISH	
CURRENT RATING	1 A max.	SHELL	Aluminium alloy 6061 with nickel plating
CONTACT RESISTANCE	71 mΩ max.	MOULDED INSULATOR	Liquid Crystal Polymer (LCP)
INSULATION RESISTANCE	1000 MΩ min. @ 250 V _{RMS}	CONTACT	Copper alloy, gold over nickel plating
DIELECTRIC WITHSTANDING VOLTAGE	Sea level: 250 V _{RMS}	ENCAPSULANT	Epoxy Resin
	Altitude 21 km (70,000 ft): 100 V _{AC}	PCB TERMINALS	Gold plated solid copper alloy wire
CONTACT ENGAGING FORCE	1.39 N max.	HARDWARE	300 series stainless steel, passivated
CONTACT SEPARATING FORCE	0.11 N min.		
CONTACT RETENTION	2.2 N min.		
DURABILITY	200 mating cycles min.		
VIBRATION	20g's – No discontinuity > 1 μs		
SHOCK	50g's – No discontinuity > 1 μs		

PCB RECTANGULAR CONNECTORS

SMV TYPE

2 ROW VERTICAL SURFACE MOUNT PCB RECEPTACLE

0.025" PITCH



- Reliability for micro-miniature operating systems.
- Surface Mount.
- Several tail lengths available.
- Operating temperature: -55°C or +150°C.
- 7 contact arrangements (9 to 51 contacts).

IDENTIFICATION CODE

ND2SA	25	S	SMV	P	T	1
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SERIES

ND2SA: Nano-D Space application 2 row AXON'.
ESCC 3401/086 EPPL2.

NUMBER OF CONTACTS

09, 15, 21, 25, 31*, 37, 51.

CONNECTOR TYPE

S: Receptacle connector.

FAMILY

SMV: AXON' Vertical surface mount PCB connector.

HARDWARE

P: Threaded hole #0-80 UNF (non removable jackposts).

TAIL PLATING

T: Tin lead plated 1µm minimum (63-37 alloy).
G*: Gold (not included in the ESCC specification).

TAIL LENGTH

- 1:** 2.77 mm (0.109").
- 2:** 3.56 mm (0.140").
- 3:** 4.37 mm (0.172").
- 4:** 2.29 mm (0.090").

Tolerance ± 0.38 mm (0.015").

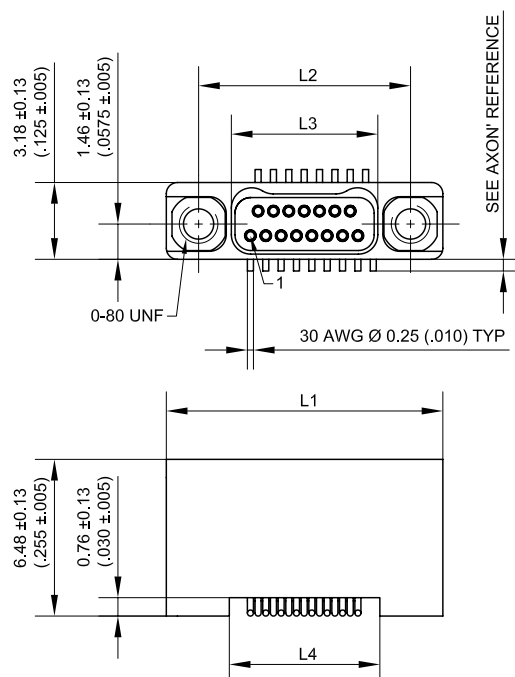
* not included in ESCC specification

Connectors are supplied with
#0-80 UNF screws 1/4" ±0.004" long (for PCB mounting).

IN BOLD: FACTORY STANDARD

DIMENSIONS

Dimensions are in millimetres (inches).



SEE CONTACT LAYOUT ON PCB PAGE 324 & 325

SHELL SIZE	L1 ±0.13 (±.005)	L2 ±0.13 (±.005)	L3 ±0.13 (±.005)	L4 ±0.13 (±.005)
9 S	9.53 .375	6.86 .270	4.14 .163	4.32 .170
15 S	11.43 .450	8.76 .345	6.05 .238	6.22 .245
21 S	13.34 .525	10.67 .420	7.95 .313	8.13 .320
25 S	14.61 .575	11.94 .470	9.22 .363	9.40 .370
31 S*	16.51 .650	13.84 .545	11.12 .438	11.30 .445
37 S	18.42 .725	15.75 .620	13.03 .513	13.21 .520
51 S	22.86 .900	20.19 .795	17.48 .688	17.65 .695

*: not included in ESCC specification

SUMMARY OF CHARACTERISTICS

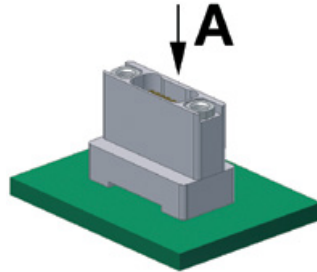
ELECTRICAL & MECHANICAL PERFORMANCE		MATERIAL & FINISH	
CURRENT RATING	1 A max.	SHELL	Aluminium alloy 6061 with nickel plating
CONTACT RESISTANCE	71 mΩ max.	MOULDED INSULATOR	Liquid Crystal Polymer (LCP)
INSULATION RESISTANCE	1000 MΩ min. @ 250 V _{RMS}	CONTACT	Copper alloy, gold over nickel plating
DIELECTRIC WITHSTANDING VOLTAGE	Sea level: 250 V _{RMS} Altitude 21 km (70,000 ft): 100 V _{AC}	ENCAPSULANT	Epoxy Resin
CONTACT ENGAGING FORCE	1.39 N max.	PCB TERMINALS	Gold plated solid copper alloy wire
CONTACT SEPARATING FORCE	0.11 N min.	HARDWARE	300 series stainless steel, passivated
CONTACT RETENTION	2.2 N min.		
DURABILITY	200 mating cycles min.		
VIBRATION	20g's – No discontinuity > 1 μs		
SHOCK	50g's – No discontinuity > 1 μs		

NANO-D FOR SPACE
APPLICATIONS

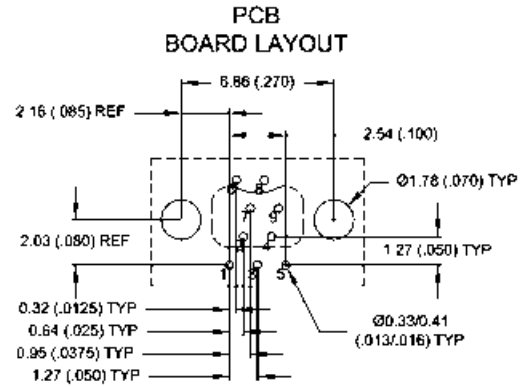
Space Micro-D &
Nano-D connectors

PCB LAYOUT FOR BS TYPE 0.050" PITCH - FEMALE CONNECTORS

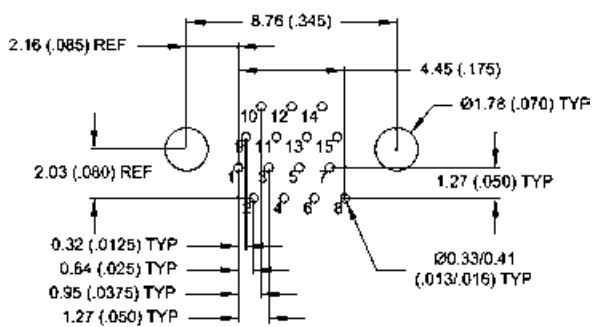
VIEW A



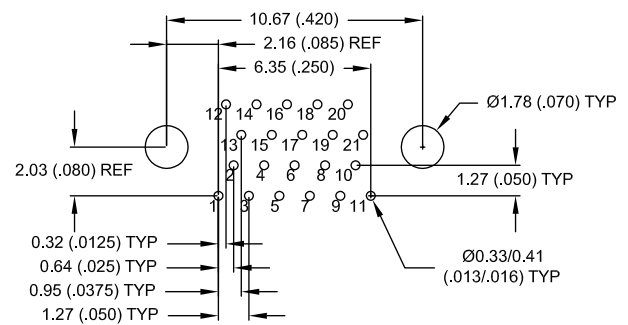
9 CONTACTS - VIEW A



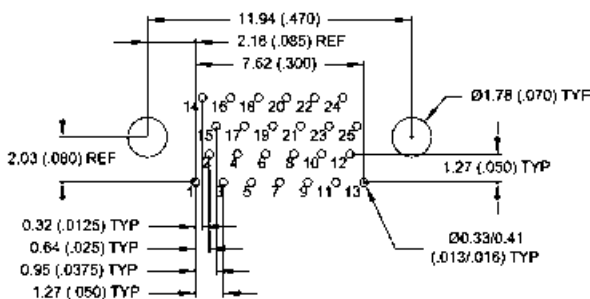
15 CONTACTS - VIEW A



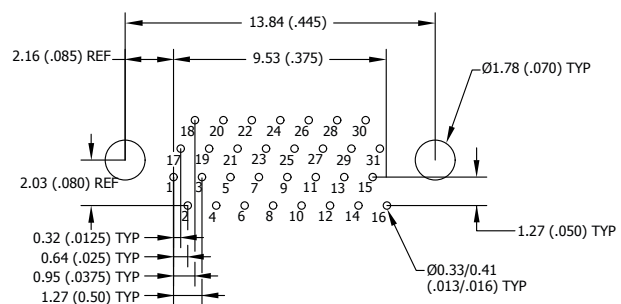
21 CONTACTS - VIEW A



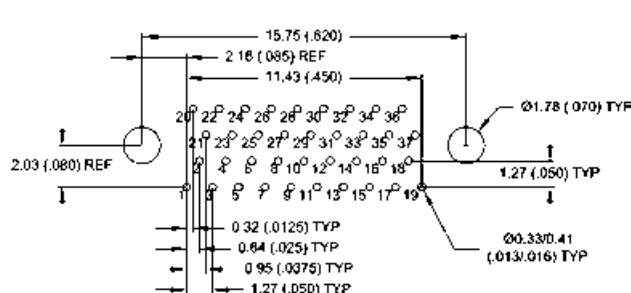
25 CONTACTS - VIEW A



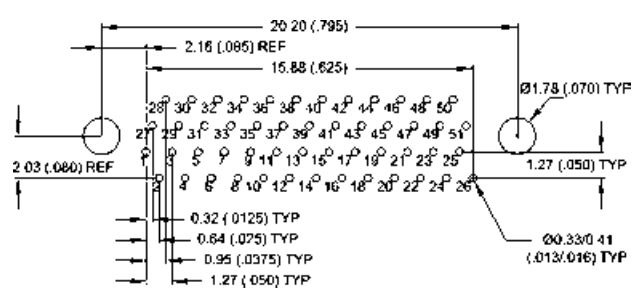
31 CONTACTS - VIEW A



37 CONTACTS - VIEW A



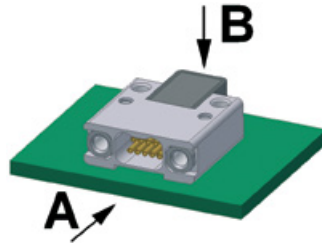
51 CONTACTS - VIEW A



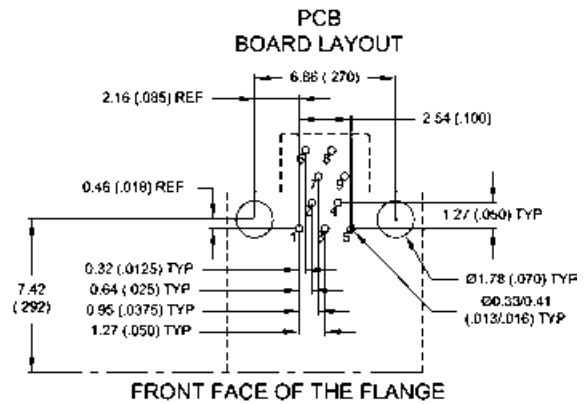
1.27 mm (0.05") contact spacing - 1.27 mm (0.05") spacing between rows - contact diameter: AWG 30

PCB LAYOUT FOR CBR TYPE 0.050" PITCH - FEMALE CONNECTORS

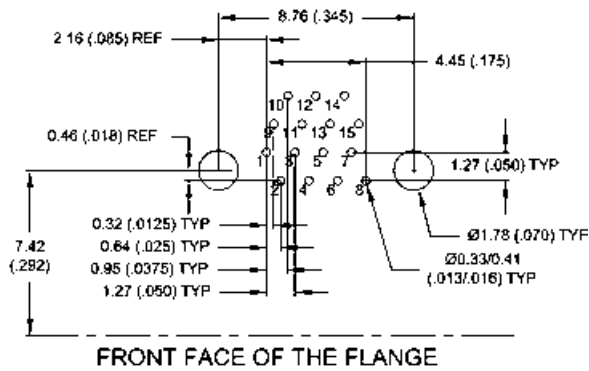
VIEW A



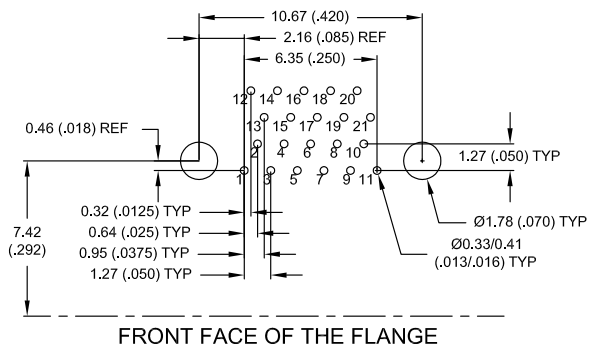
9 CONTACTS - VIEW B



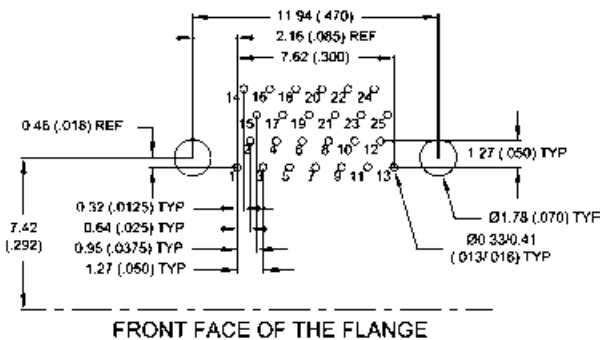
15 CONTACTS - VIEW B



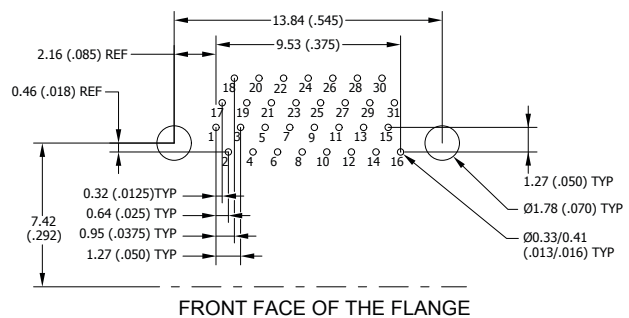
21 CONTACTS - VIEW B



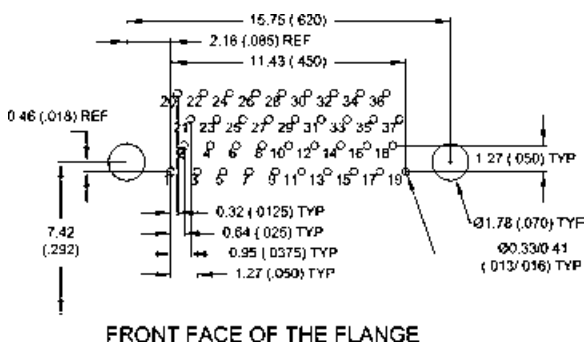
25 CONTACTS - VIEW B



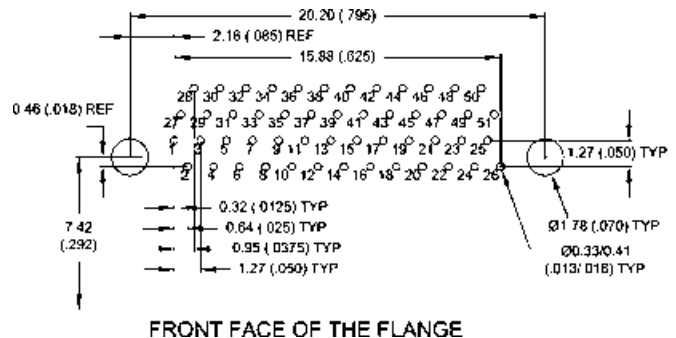
31 CONTACTS - VIEW B



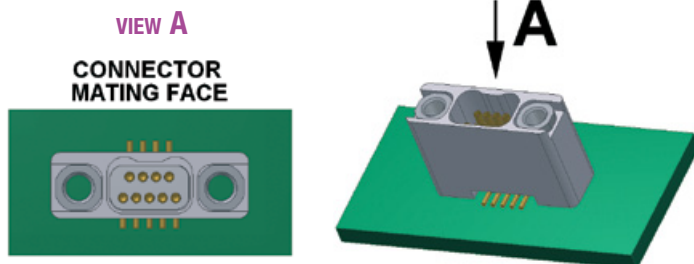
37 CONTACTS - VIEW B



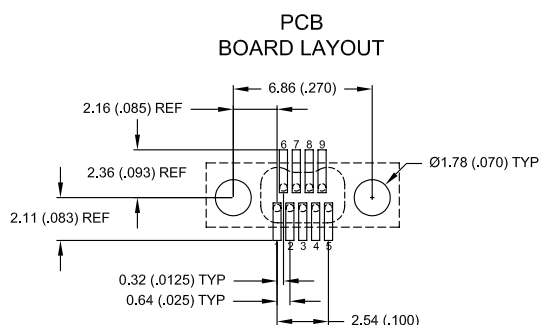
51 CONTACTS - VIEW B



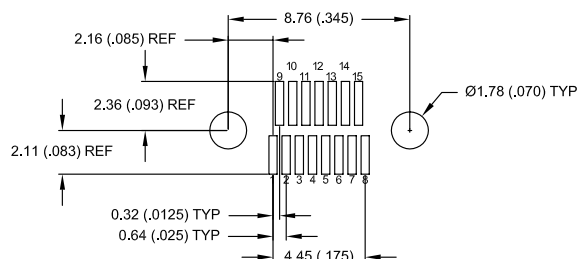
PCB LAYOUT FOR SMV TYPE 0.025" PITCH - FEMALE CONNECTORS



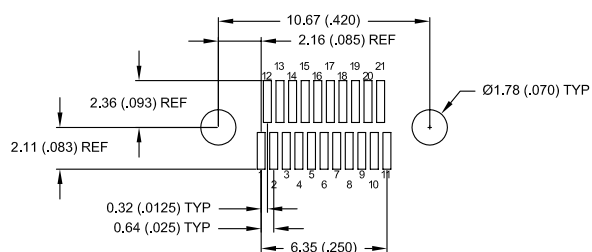
9 CONTACTS - VIEW A



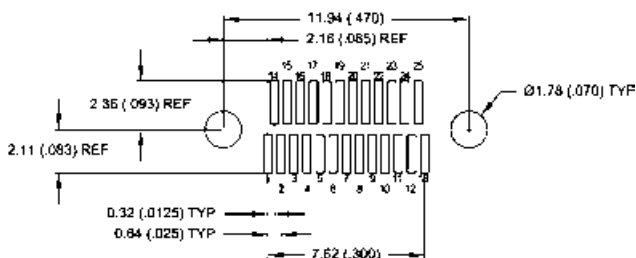
15 CONTACTS - VIEW A



21 CONTACTS - VIEW A



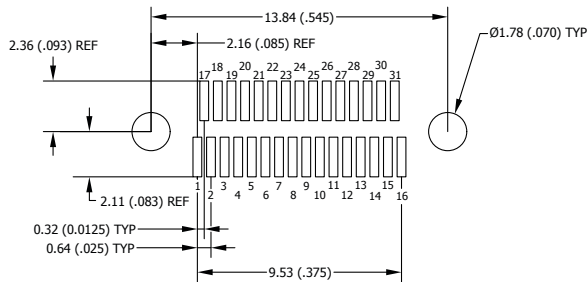
25 CONTACTS - VIEW A



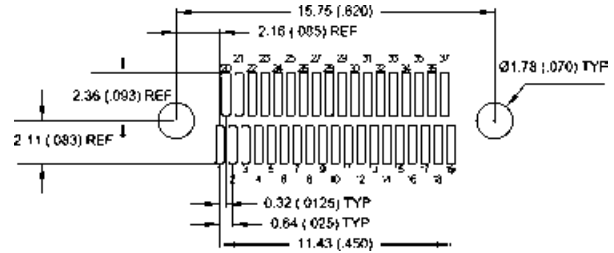
0.635 mm (0.025") pad spacing - contact diameter: AWG 30

PCB LAYOUT FOR SMV TYPE 0.025" PITCH - FEMALE CONNECTORS

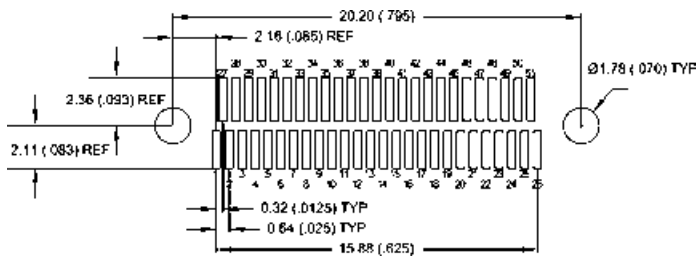
31 CONTACTS - VIEW A



37 CONTACTS - VIEW A

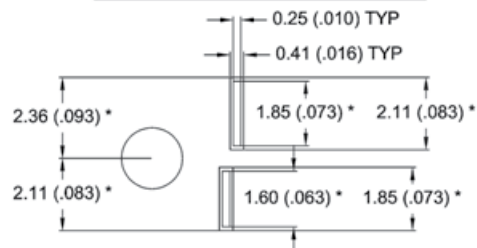


51 CONTACTS - VIEW A



LAYOUT

Suggested PAD configuration



* : For .040" tail length, add .020" to noted dimensions

NANO-D FOR SPACE
APPLICATIONS

Space Micro-D &
Nano-D connectors