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NANO-D USER GUIDE

Axon'cable

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Author's SUMMARY
This user guide provides to customers the manufacturer's recommendations for nano-D connectors handling.

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1st Issue 1st Revision	23/09/2010		Creation	
1st Issue 2nd Revision	01/04/2011		Para 4.3.2 comments added regarding ECSS-Q-ST-70-08C and degolding. Para 4 and 5 subtitles numbers changed. Para 5.1 number of mating demating changed to 200 cycles Para 6 Axon comments on NASA recommendations added.	
1st Issue 3rd Revision	27/06/2011	Page3 Page 6	Para 5.1 updated sentence. Para 5.3.2 Addition of the maximum duration for the soldering operation.	
1st Issue 4th Revision	11/04/2012	P3 To end	Par 5.2 update setup torque Add of par 5.2.2 for backshell	
This page must be used for all documents. For documents of category 1 this page is used until approval.				

Contents:

1.) Scope

This document describes the rules to be respected during the storage and installing of Axon' nano-D harnesses.

2.) Applicable documents

None.

3.) Reference document

MIL-DTL-32139: CONNECTORS, ELECTRICAL, RECTANGULAR, NANOMINIATURE, POLARIZED SHELL, GENERAL SPECIFICATION

4.) Storage

4-1) Storage conditions

The harnesses are packed in plastic bags to allow visual examination. Then the bags are stored inside a cardboard box. For the space grade issue, the plastic bags should also contain desiccant bags. If the harnesses are taken out of the box, they should be protected against UV radiation.

4-2) Storage temperature

The bags containing the harnesses should be stored in an environment with a temperature range between -10°C to +55°C. There is a risk of degradation of the plastic bag if the temperature exceeds the allowable temperature range.

4-3) Handling

The bags should be handled in such a manner not to damage them.

4-4) Verification before use

Before using the harnesses, check the following points:
• the bags should be free of any leak (holes) as they are filled up with nitrogen for space grade harnesses and contain a vacuum environment for other applications.
• The cables should not present any damage.
• No trace of corrosion on the different connectors and accessories.
• No damage on all pins or sockets of the connectors (remove the protection caps to inspect while avoiding touching the contacts).

5.) Harness Integration

5-1) Connectors

The torque value given by the manufacturer must be strictly respected.

To demate connectors pull back the connector body (or the backshell) and not the cable.

Connectors & backshells for space applications shall be handled with gloves.
The number of mating and demating operations is limited (*), depending on the type of connectors used (200 cycles maximum made without hardware following standard recommendation).
(*) Note: For space-grade connectors, record the number of mating/demating cycles of each connector on the log book provided with the harness. The connectors are delivered with a maximum of 5 mating/demating cycles.

5-2) Nano-D connector mating guide

Torque screwdriver setup

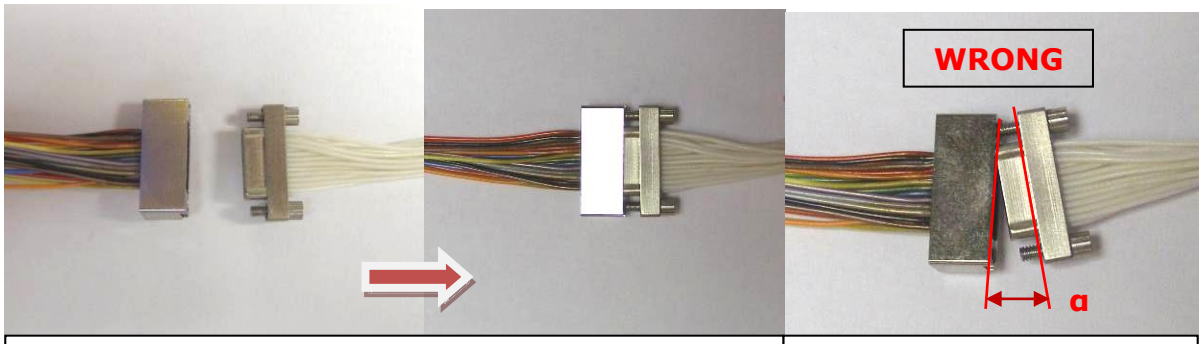
Set up the torque level to:
0.08Nm (0.71 inch-pounds) torque for electrical test purposes
0.10 Nm (0.89 inch-pounds) min to 0.12 Nm (1.06 inch-pounds) max torque for mechanical test or flight purposes*

Insert the 0.050" bit for hex screw into the screwdriver

*min & max value for the torque come from the tolerance of the screw driver (0.11Nm±6%). 0.11 NM is the nominal torque from the standard.

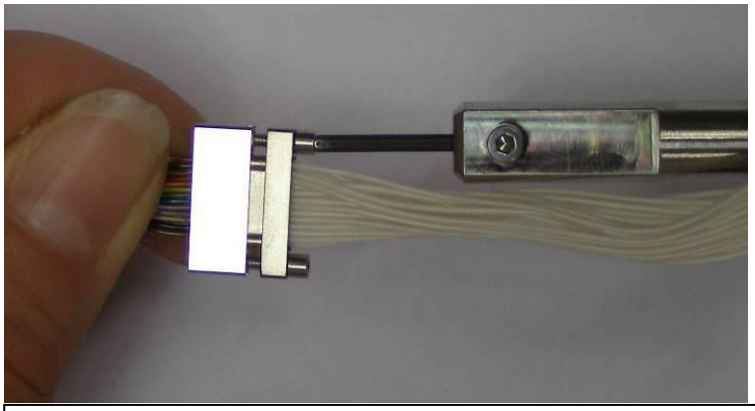
5-2-1) Without backshell

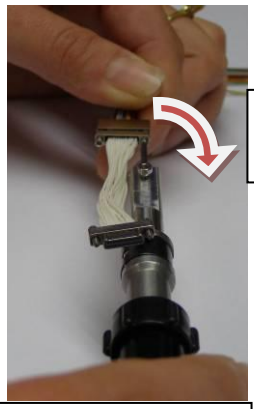
5-2-1-1) Align connector



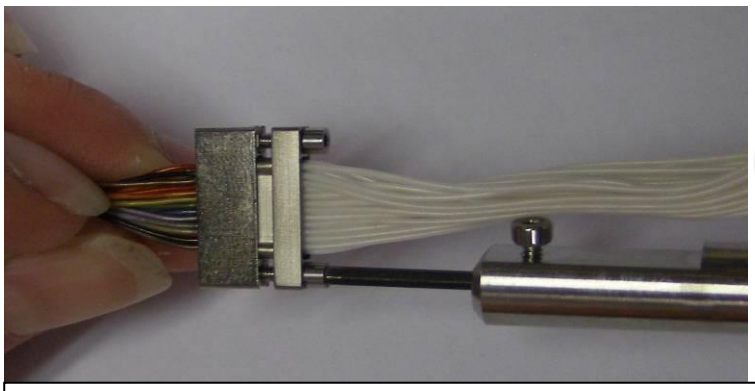
Align both mating connectors and start insertion. Do not use the jackscrews during this operation.	Stay straight during insertion not to damage the contacts

5-2-1-2) Screwdriver using

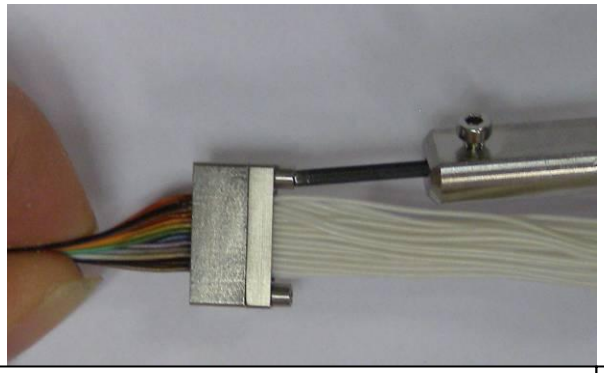




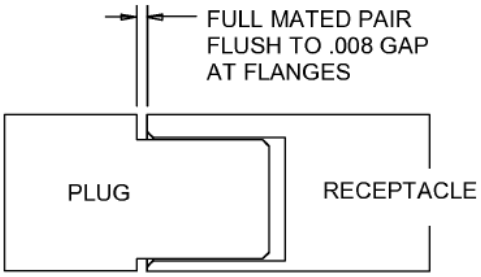
After insertion, you can start tightening one of the jackscrew only by a 90° rotation (clockwise).
Then remove the screw driver and go back to the first one.



After insertion, you can start tightening the second jackscrew by a 90° rotation (clockwise).
Then remove the screw driver and go back to the first one.
Repeat the tightening 90° rotation (clockwise) technique successively to each jackscrew until mating is complete.



The torque break should be reached 3 times for each screw

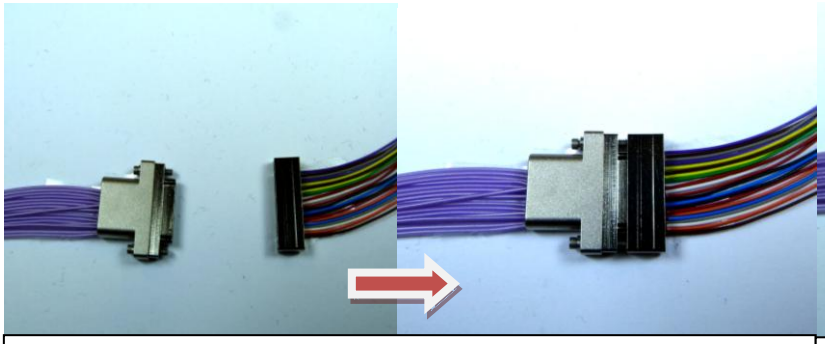


The gap between the two flanges should respect the above drawing

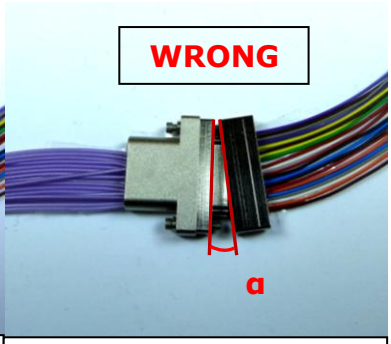
For the demating operation, the connectors follow the same process but in the opposite direction (counter-clockwise) regarding the rotation of the screwdriver; the 90° rotation clockwise rule must be followed as well.

5-2-2) With backshell

5-2-1-1) Align connector

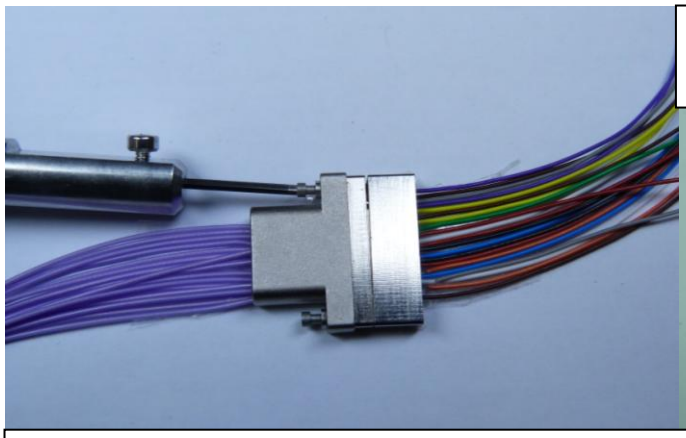


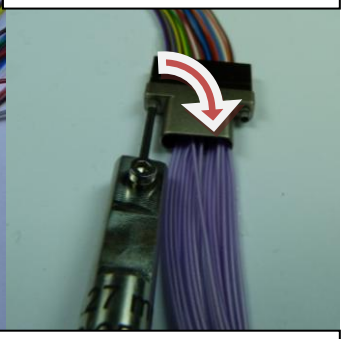
Align both mating connectors and start insertion. Do not use the jackscrews during this operation.



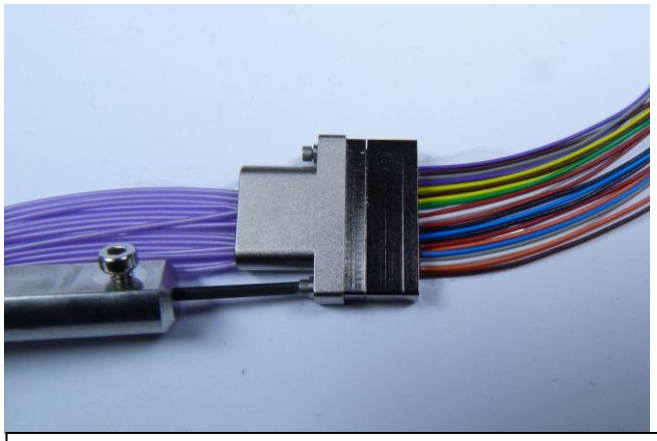
Stay straight during insertion not to damage the contacts insertion.

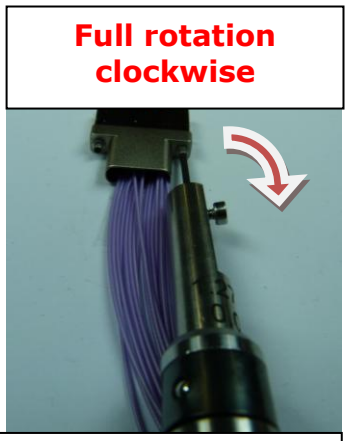
5-2-1-2) Screwdriver using



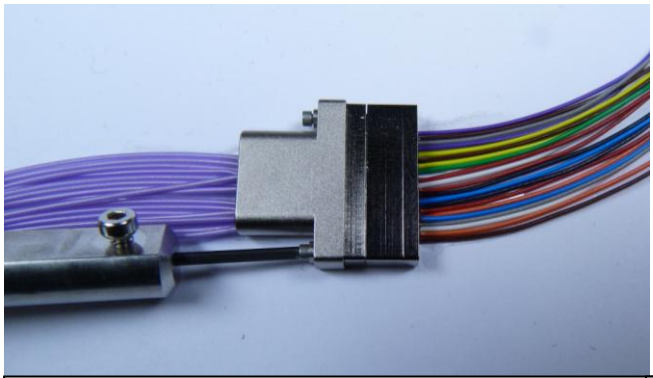


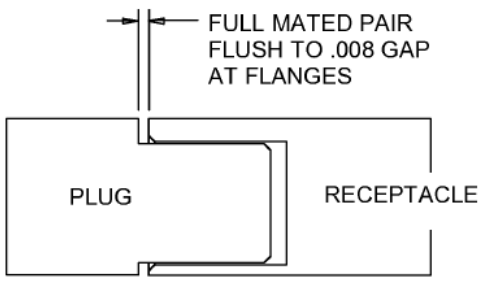
After insertion, you can tighten fully one of the jackscrew. Then remove the screw driver.





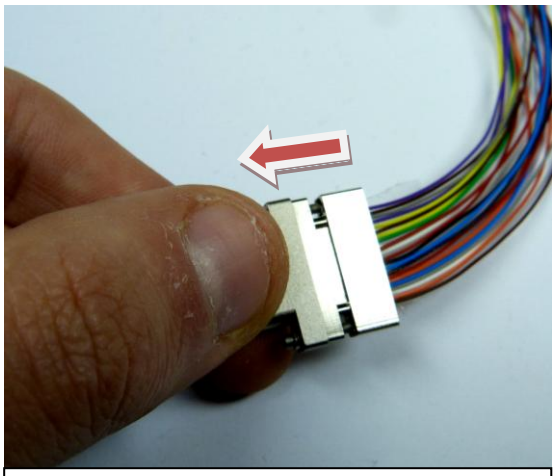
After insertion, you can fully tighten the second jackscrew
The connectors are completely mated



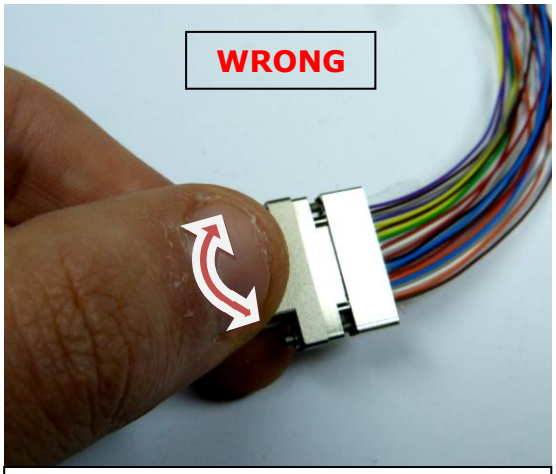


The torque break should be reached 3 times for each screw	The gap between the two flanges should respect the above drawing

For the demating operation, the connectors follow the same process but in the opposite direction (counter-clockwise) regarding the rotation of the screwdriver. Backshell will be used as mechanical reinforcement to pull over the connector in order to avoid damaged wires. You need to pull straight without any movement from left to right.



Use the backshell to pull over the connector



Use the backshell to pull over the connector

5-3) CBR mounting recommendation (PCB mounting)

5-3-1) Torque screwdriver setup:

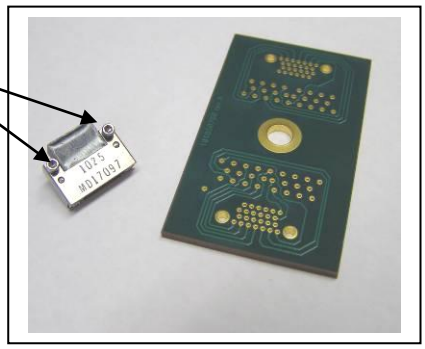
Set up the torque level to:
0.08Nm (0.71 inch-pounds) torque for electrical test purposes
0.10 Nm (0.89 inch-pounds) min to 0.12 Nm (1.06 inch-pounds) max torque for mechanical test or flight purposes*

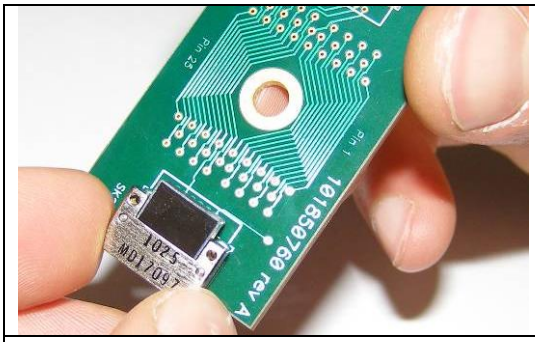
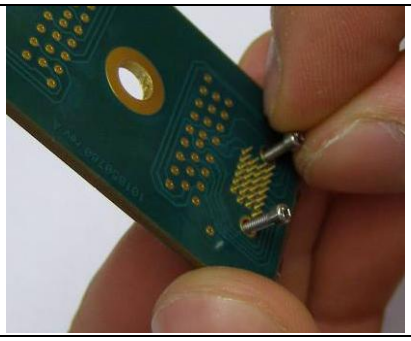
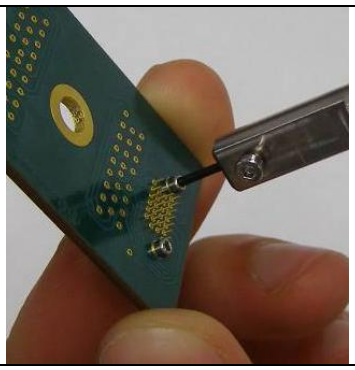
Insert the 0.050" bit for Hex screw into the screwdriver

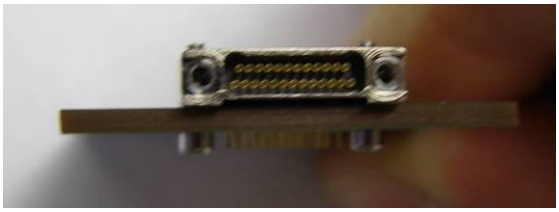
*min & max value for the torque come from the tolerance of the screw driver (0.11Nm±6%). 0.11 NM is the Nominal torque from the standard.

5-3-2) CBR Installation

Remove the two screws
0-80 UNF delivered mounted to
the nano-D CBR connector



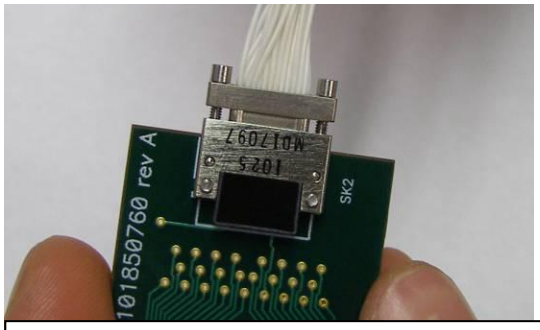
	
Install the CBR on the dedicated area of the PCB. Be careful not to damage any tail during this installation	On the opposite face of the PCB start tightening both jackscrews manually.
	
Apply a slight pressure on the CBR with your finger as shown and complete the tightening each screw with the screwdriver.	Apply the recommended torque value on both screws



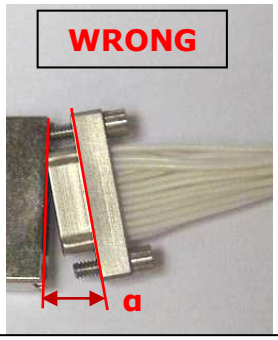
The CBR connector should be parallel to the PCB as much as possible into both axes (XY).
The connector is ready for the soldering operation of the tails onto the PCB.
The ECSS-Q-ST-70-08C does not apply with regards to this type of product.
The following information is only given as a recommendation. The process must be qualified by the user.
The soldering operation shall be performed at a temperature around 316°C for maximum 3 seconds.
Solder as per ECSS-Q-70-71A from Goslar:
For pre-tinning; soft solder, Sn60 (space quality) C.7: 60 % Sn, 40 % Pb (Goslar).
For the assembly of components on printed circuit boards (ECSS-Q-70-08): C.7.2: 63 % Sn, 37 % Pb.
Others: Soft solder, silver-loaded (space quality) C.7.3: 62 % Sn, 2 % Ag, Rem. Pb.
Due to the issue of cleaning the soldering of leads on PCB for CBR & SMV connectors, it is recommended using "clean" flux according to J-STD-004. Use non activated flux made of pure rozin (colophane): Lo (RO), mandatory for CBR.

The connectors are supplied with all tails tin plated. So no visual inspection is needed for the degolding operation.

5-3-2) Mating connector

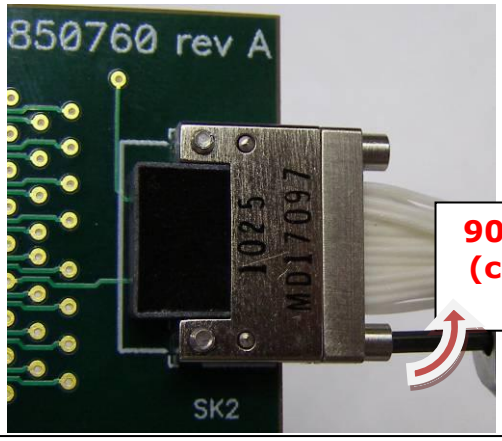


Align both connectors and start inserting the male D-shape into the female one.
Do not use the jackscrew during this operation.



Ensure connectors' alignment during insertion not to damage the contacts

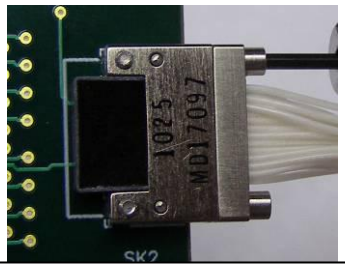
90° rotation (clockwise)

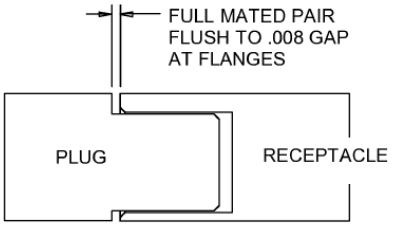


90° rotation (clockwise)

After insertion, you can start tightening one of the jackscrew only by a 90° rotation (clockwise).
Then remove the screw driver and go to the second jackscrew.

After insertion, you can start tightening the second jackscrew only by a 90° rotation (clockwise).
Then remove the screw driver and go back to the first one.
Repeat this operation successively to each jackscrew until complete mating of both connectors.





The torque break should be reached 3 times for each screw	The gap between the two flanges should respect the above drawing

For the demating operation, the connectors follow the same process but in the opposite direction (counter-clockwise) regarding the rotation of the screwdriver; the 90° rotation clockwise rule must be followed as well.

5-4) Tooling

▲ COMPACT AND LIGHTWEIGHT PACKAGE: DIMENSIONS 270X230X80MM (10.6X9X3.1") FOR A WEIGHT OF 750G (1.7LB)

A new Tool box is now available for NanoD connector. It is made of one NanoD screwdriver and 3 hexagonal screws. You can order it under the reference P536692.

In order to ensure the good torque, Axon' recommend to re machined the screw every 150 tightening/loosening cycles.

5-5) Securing the cable

• The cable should not be placed near sharp corners or edges without any additional protection to avoid any damage to the cable jacket.
• The Axon' nano-D cables can be bundled with other cables inside a harness.
• The axon nano-D harnesses can be tied up directly with other electrical harnesses. Otherwise use the cable fastening system type "T&B TC105" or equivalent attached to the wall.
• It is recommended to set cable ties at 150-mm intervals if the cable length allows it.
• The ties can be qualified tie-wraps or lacing cords.
• Heat-shrink boot at rear of backshell of the connector should remain straight not to strain the shield termination.

5-5-1) Minimum cable bending radius

The bending radius value depends on the cable type.
The general calculation rule is:

- 10 times the cable diameter for dynamic application
- 5 times the cable diameter for perfectly static application

5-5-2) Maximum authorized twist to the cable:

The cable shall not be twisted over 100° between each end for cable length of 600 mm or shorter.

5-5-3) Allowable traction force on cable

The pulling force applied to the cable shall not exceed 100 Newtons to preserve the braids integrity of the shield termination.

5-5-4) Clamping the tie-wraps

The tie wrap clamping force used to fix the couplers and the terminators must be applied at 100 N maximum (for a tie-wrap width of 5 mm). A protective tape***** should be added underneath the tie wrap.

Note1: In the case where IEEE1394 cables are mixed with other cables in a harness, the force should be changed to the minimum value of the different cables given by the cable manufacturer.

It is recommended to protect the cable with a protective tape * wrapped underneath the tie wrap or the lane. Scotch79 (3M) or equivalent tape can be used.

* Typical Property of Scotch79 (3M)
High temperature resistance (150° C)
Thickness1 7.0 mils (0.177 mm)
Tensile Strength1 150 lbs/in. (262N/10 mm)
Adhesion to Steel1 30 oz/in. (3.3N/10 mm)
Elongation1 (% at breaking point): 5
Dielectric Strength1 3000 Volts
Insulation Resistance1 2.7 x 102 megohms
Electrolytic Corrosion Factor2 .9
TML=0.54, VCM=0.07 (test reference GSFC5811)
Test Methods: 1ASTM-D-1000, 23M Test Method.

6.) AXON COMMENTS ABOUT NASA RECOMMENDATIONS

The following paragraph is an extract of the NASA document reference EEE-INST-002 concerning recommendations for nano-D addressed by ESTEC:

"Some Microminiature and Nanominiature type connectors have the option of pre terminated crosslinked ETFE (Tefzel TM) insulated wire pigtails. Users are advised that some ETFE insulations are known to outgas trace amounts of corrosive fluorine over time. When this wire is used with nickel coated metal shell connectors and stored in sealed plastic or ESD bags, trapped fluorine can attack exposed metal shells and contacts. The problem appears to be worse for white insulation, and consequently, color coded insulation is preferred.
For connectors with insulated wire terminations, upon receiving new product or pulling product from storage, visual inspection should be performed using a minimum of 10X magnification for corrosive by products indicated by a dull "gun metal" appearance on the nickel coated shell. Corroded gold plated contacts have a flat black appearance. Connectors with normal shells and contacts should be repackaged such that only the connector is protected and the wire is left unpackaged, open to room conditions. Connectors with corroded contacts should be discarded. Dull connectors (with good contacts) can be carefully cleaned and used per the following procedure:
Rinse connector in distilled water for 30 seconds. Remove connector and lightly shake off excess water. Repeat the rinse a second time with fresh distilled water and shake. Rinse connector with isopropyl alcohol. Remove and shake. Repeat the rinse with fresh isopropyl alcohol and shake. Perform a bakeout of 125°C for 24 hours and full or partial vacuum is recommended prior to storage. Repackage only the connector and leave the wire unpacked, open to room conditions."
Axon follows the rule of a bakeout of 125°C for 24 hours as a standard and as per ESA requirement for all their programs. Axon also uses isopropyl alcohol to clean its space products.
The wires colour proposed by Axon' for the nano-D evaluation is white. Axon' also could propose black colour as an alternative for the wires
To take into account this recommendation, Axon can provide a new packaging.
This packaging is meant to protect the connector from tarnishing or corrosion.
The Axon' nano-D metal shell will be wrapped using a TEFLON tape and placed in a ventilated sulpher-free paper envelope.