

Connectors

TAILORED & OFF-THE-SHELF SOLUTIONS
FOR CHALLENGING MARKETS

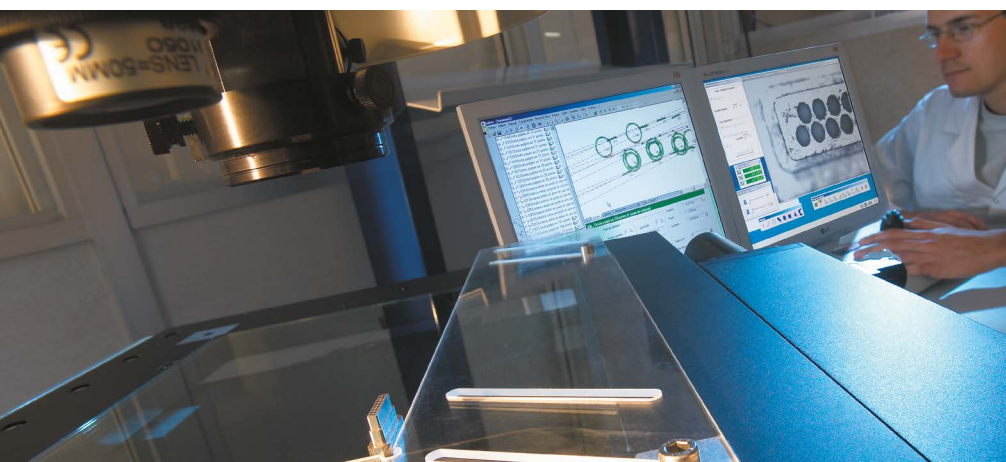
axon'
cable & interconnect



Connectors

TAILORED & OFF-THE-SHELF SOLUTIONS
FOR CHALLENGING MARKETS

Connectors



METROLOGY LABORATORY



HIGH PRECISION IN CLEAN ROOM

Headquartered in France, the Axon' group has significant sales and manufacturing footprints in North America, Europe and Asia. The group has in-house expertise including plating, machining, lathing, electrostriction, assembling, moulding/ overmoulding, mechatronics and cabling, enabling the company to offer connectors for many diverse and challenging applications.



**Axon' is a
worldwide leader
in specialist
interconnect**

WEIGHT &
SPACE
SAVING

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TOUGH
ENVIRON-
MENTS

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FAST
INTEGRATION

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RESTRICTED
SPACE

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ADDITIONAL
INTERCONNECT
SOLUTIONS

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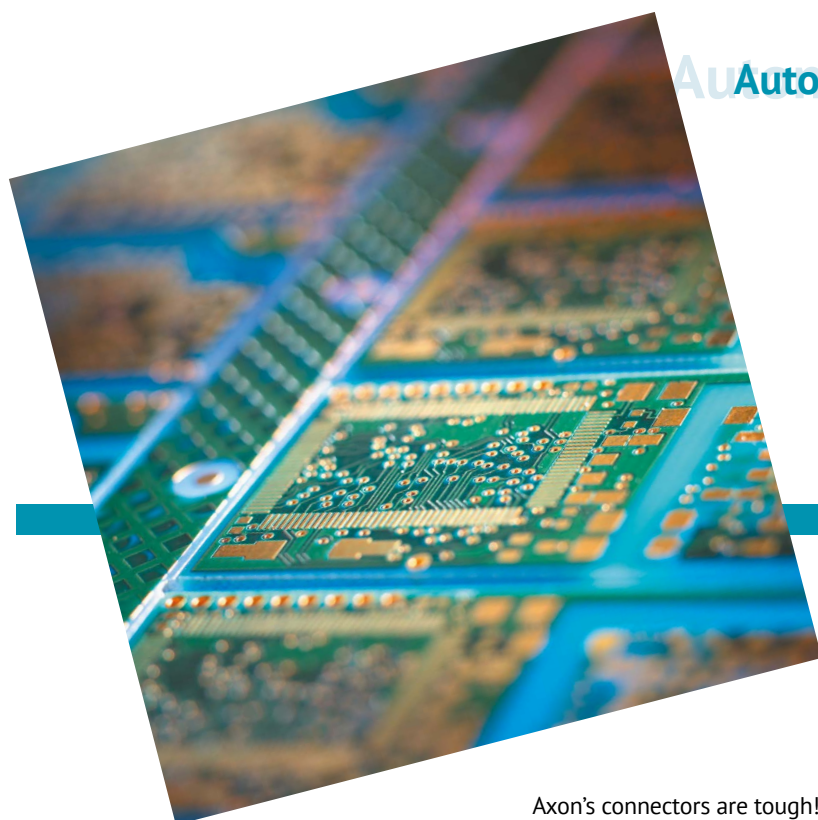
DATA
TRAN-
MISSION

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CONNECTORS

designed for
challenging
markets



Military guidance, communication
or optronic systems,
Oil & gas drilling tools and pipelines,
Aerospace flight command
or in-flight entertainment,
Automotive driving assistance,
infotainment and diverse
sensor systems,
Space launchers,
satellites
and rovers.

DESIGNED TO BE TOUGH

Axon's connectors are tough! They are engineered, as required, to meet a huge range of electrical, mechanical and environmental challenges, which could include:

- Signal, power, data transmission, high frequency, high voltage, high data rate,
- Resistance to shock, vibration, EMI, temperature, radiation, ESD.
 - Hermeticity, waterproofness.
- Miniaturization, weight and space saving.

HIGH SPEED
& SIGNAL
INTEGRITY

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AT THE
SPEED OF
LIGHT!

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INDUSTRIAL
CONNECTORS
& CONTACTS

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CUSTOM
DESIGNED
SOLUTIONS

PAGE **30**

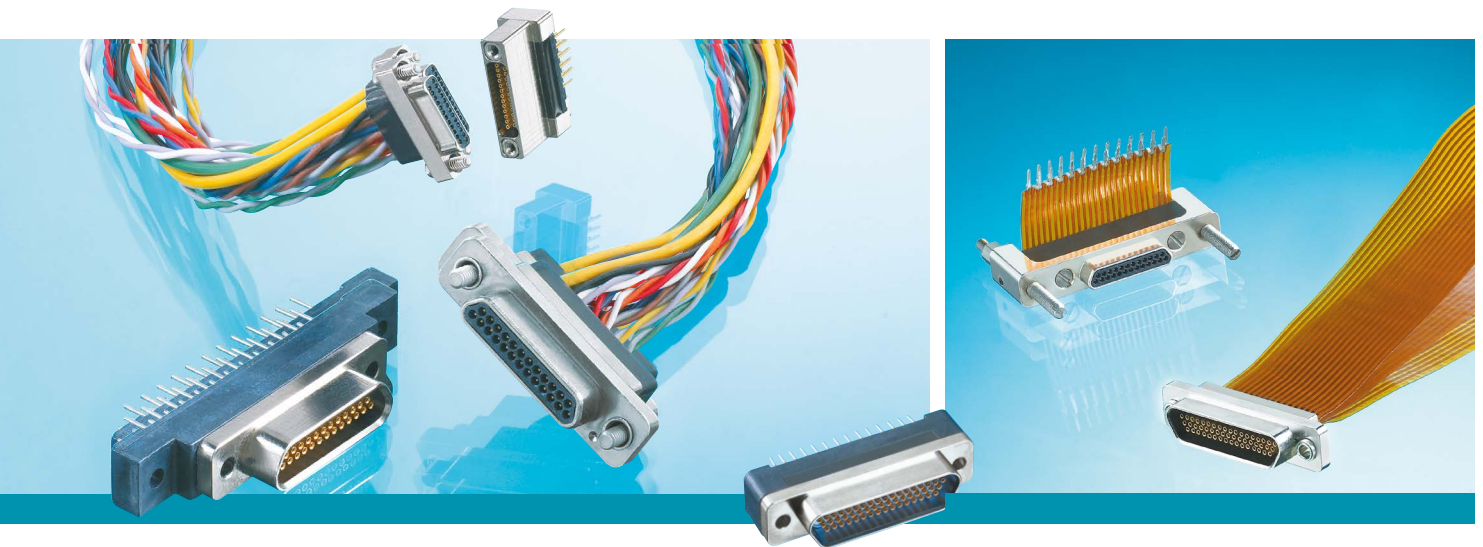
TEST
EQUIPMENT

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Weight & Space saving

THE TINY POWERHOUSE OF RUGGEDIZED CONNECTORS

Micro-D connectors | compact & rugged



- Contact spacing: 1.27 mm (0.050").
- Based on MIL-DTL-83513.
- Based on the highly reliable Twist Pin contact technology.
- Operating temperature: -55°C up to 260°C.
- Resistant to shock & vibration.
- Current rating: 3 A max.

RECTANGULAR CONNECTORS

- Pigtail, solder cup, PCB connectors (CBR, CBP, BR, BS), connector savers, QPL connectors.
- Space grade (including ESA approved) connectors.
- Plastic or metal shells: standard or low profile.

HYBRID MICRO-D CONNECTORS MORE FUNCTIONS

- To route power (20 A per contact), Fibre optics, or RF signals up to 18 GHz through very small connectors.

MICROSTRIP CONNECTORS ... THAT GO STRAIGHT TO THE POINT

- A compact and simple solution for applications where the connection space is very limited.
- Pigtail, solder cups, PCB versions, nanostrip.
- Versions available with a latching system.



Weight & Space saving

ROUNDING OFF ON THE MICRO-D

Circular Micro-D connectors for easy integration



Based on the highly reliable Twist Pin contact technology

- Operating temperature: from -55°C to 200°C.
- Metric thread version for space saving.
- Three lug bayonet version for quick connect/ disconnect.
- Triple start thread (anti-decoupling) version: highly vibration-proof ratchet system.
- Breakaway version for quick connect/disconnect.
- Plastic shells: easy to use, very small and lightweight.
- A large range of panel mount configurations.



Tough environments

SEALED TO HARSH ENVIRONMENTS

Hermetic connectors based on Micro-D connectors |



Hermetic connectors act as pressure or vacuum seals or as a protection against the environment for sensitive equipment. Axon' has different product ranges to fit all of your applications.

| | WATERPROOF ENCAPSULANT | HERMETIC ENCAPSULANT | GLASS TO METAL SEAL | HermAx® | MIL-DTL-83513 |
|--|---|-------------------------|-----------------------------|-----------------------------|-----------------------------|
| HELIUM LEAK RATE (mbar.l/s) MIL-STD-883 A4 | 1.10 ⁻⁵ | 1.10 ⁻⁸ | < 1.10 ⁻⁹ ① | < 1.10 ⁻¹¹ ① | - |
| TEMPERATURE RANGE (°C) | -55/+125 | -30/+125 | -55/+125 ② | -55/+150 ② | -55/+125 |
| CONTACT MATERIAL | COPPER ALLOY | COPPER ALLOY | IRON BASED | COPPER ALLOY | COPPER ALLOY |
| MAXIMUM CURRENT RATING (A) | 3 | 3 | 1 | 3 | - |
| SHELL MATERIAL | ALUMINUM STAINLESS STEEL TITANIUM | ALUMINUM | IRON BASED (ASTM-F15) | STAINLESS STEEL 304L | ALUMINUM STAINLESS STEEL |
| MOUNTING METHOD | O-RING | O-RING | O-RING ③ LASER WELDING ④ | O-RING ③ LASER WELDING ④ | - |

① TESTED AT 10⁻⁹, 10⁻¹⁰, OR 10⁻¹¹ mbar.l/s, DEPENDING ON CUSTOMER REQUEST

② MIL-DTL-83513 REQUIRES ONLY 125°C, SEE CRITICAL TESTING BELOW

③ WITH O-RING : LEAK RATE LIMITED TO 1.10-8mbar.l/s AND TEMPERATURE RANGE LIMITED

④ WITH COMPATIBLE MATERIALS



Tough environments

HermAx® | hermetic connectors



HERMAX® HERMETIC MICRO-D CONNECTORS RANGE

HERMETIC ENCAPSULANT

They mate with standard Micro-D connectors

Electrical & Mechanical performances

| | HERMETIC ENCAPSULANT WITH SILICONE GASKET | HERMETIC ENCAPSULANT WITH FKM GASKET | GLASS-TO-METAL SEAL |
|--------------------|---|--------------------------------------|---------------------------------------|
| TECHNOLOGY CODE | MDH1 | MDH2 | ON REQUEST |
| MAXIMUM LEAK RATE* | 1.10^{-5} mbar.L.s ⁻¹ | 1.10^{-8} mbar.L.s ⁻¹ | $< 1.10^{-11}$ mbar.L.s ⁻¹ |
| TEMPERATURE RANGE | -55°C / +125°C | -30°C / +125°C | -55°C / +200°C** |
| CURRENT RATING | 3 A MAX | 3 A MAX | 3 A MAX |

*: LEAK RATES ARE MEASURED BY HELIUM LEAK DETECTION
 **: TEMPERATURE RANGE CAN BE INCREASED DEPENDING ON APPLICATION. OTHER SEAL TYPES CAN ALSO BE OFFERED.

HermAx® special **glass-ceramic** connectors provide excellent intrinsic electrical & mechanical properties.

- **High conductivity contacts: best performance on the market**
 Axon's contacts are made from a copper alloy, which enables a current of 3A per contact, as specified in MIL-DTL-83513.
- **Low leak rates**
 Helium leak testing is the usual test method to evaluate hermeticity. Axon' follows MIL-STD-883K, method 1014-16, test condition A4 for single connectors. Axon' can guaranty leak rates lower than 10^{-11} mbar.L.s and all Axon' connectors are 100% leak tested before shipping.
- **Harsh environment compatible**
 Axon' connector performances go far beyond military standards, for example for thermal shock tests without leakage. They can withstand temperatures as high as 220°C and as low as -196°C (liquid nitrogen).



Tough environments

FOR WHEN WE JUST DON'T WANT MAGNETIC ATTRACTION...

Non magnetic connectors |



TEST EQUIPMENT

A standard Micro-D connector made to the requirements of MIL-DTL-83513 contains materials such as austenitic stainless steel, which can easily be magnetized.

To avoid interference from interconnects, Axon' has developed a new product range: non-magnetic Micro-D connectors. (3 levels of performance).

These connectors have limited or no influence on magnetic field lines, improving the reliability of magnetic measurements, even down to nanoTesla level, 10^{-4} times lower than the Earth's magnetic field.

Available in PCB and pigtail versions.

GENERAL PERFORMANCES

| | |
|-----------------------------------|--|
| RESIDUAL MAGNETIC LEVEL | NMB*: ≤ 200 nT RESIDUAL MAGNETISM LEVEL |
| | NMC*: ≤ 20 nT RESIDUAL MAGNETISM LEVEL |
| | NMD* ON REQUEST: ≤ 2 nT RESIDUAL MAGNETISM LEVEL |
| OPERATING TEMPERATURE RANGE | -55°C / +200°C |
| CURRENT RATING | 3 A MAX |

*: NMB, NMC & NMD LEVELS ARE DEFINED BY NASA GSFC S-311 FOR NON-MAGNETIC SUBMINIATURE CONNECTORS AND ADAPTED TO THE DIMENSIONS OF MICRO-MINIATURE CONNECTORS.



Tough environments

Micro-D: the hottest connector yet !



260°C MICRO-D CONNECTORS



Axon' is proud to announce a brand new range of Micro-D connectors withstanding temperatures as high as 260°C (150°C for a standard Micro-D) and fully in accordance with the MIL-DTL-83513 standard.

TECHNICAL CHARACTERISTICS

- Continuous operating temperatures up to 260°C for more than 2200 hours in real conditions.
- Nickel plated aluminum, stainless steel or titanium shells.
- High performance composite insert.
- Nickel plated copper conductor insulated with high temperature jacket (PTFE, PEEK, PFA, etc).
- Proprietary resin capable of withstanding differential expansions at temperature with thermal cycles at -55°C and +260°C. (following the MIL-DTL-83513 standard, but with higher temperatures).
- Proprietary Twist Pin contact – engineered alloy fully in compliance with MIL-DTL-83513.
- Available from 9 to 100 ways.



Fast integration

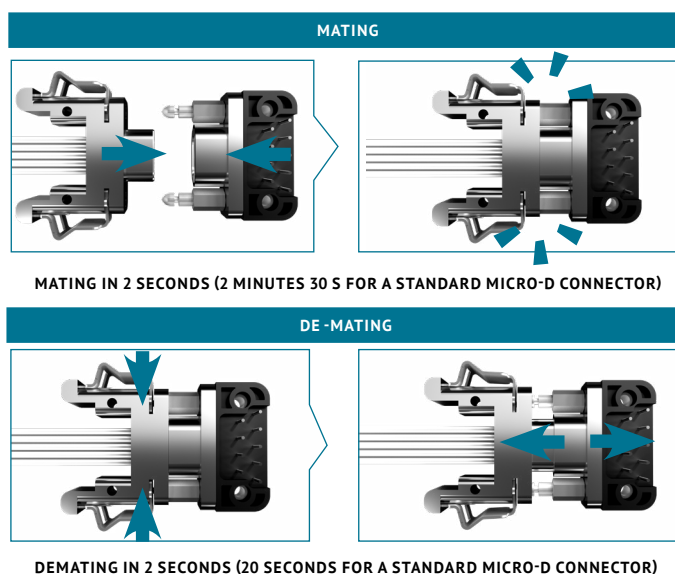
ALL THE BENEFITS OF MICRO-D AND NO TOOLS NEEDED

D-Click® fast locking Micro-D | Mates in a click!



NO TOOLS REQUIRED!

- Contact spacing:
1.27 mm (0.050").
- Based on MIL-DTL-83513.
- Fast integration.
- A large range of available
versions including PCBs,
pigtailed, panel-mounts &
accessories
- Standard PCB and
panel-mount Micro-Ds can
easily be replaced by
D-Click® versions with no
changes to board layout or
panel cut-outs.
- Space grade version
available: ESCC3401/091



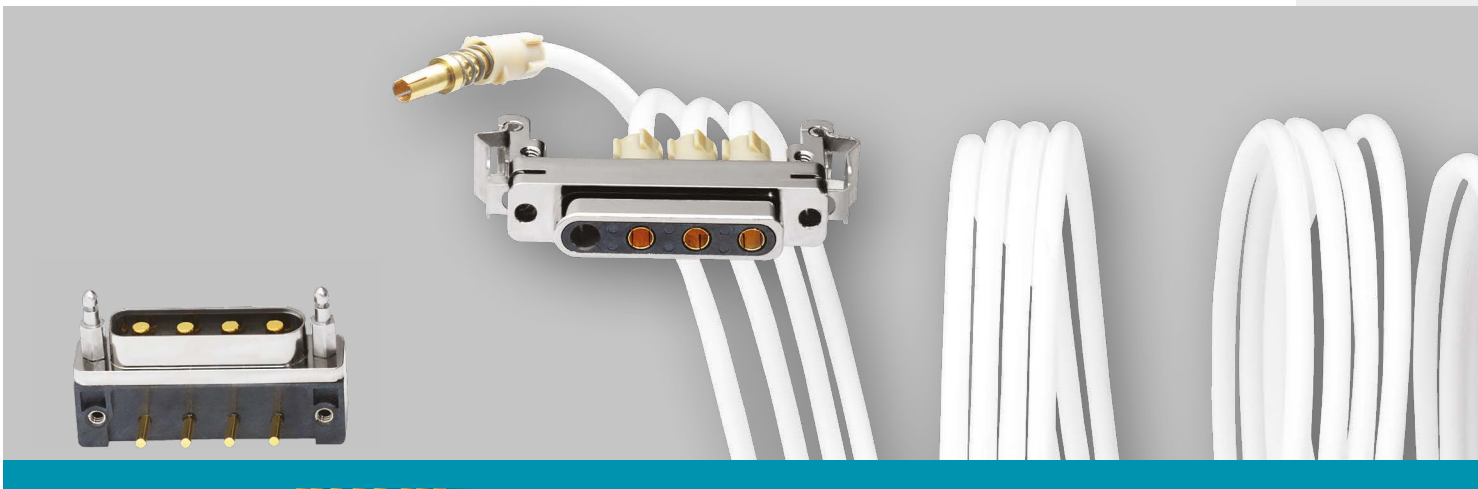
Fast integration

MINIATURIZED POWER / COAX CONNECTOR

Versatys® connectors |

Smaller than a D-Sub| Lighter than a D-Sub| Faster than a D-Sub |

... BETTER THAN A D-SUB !



Based on MIL-DTL-83513 for the shell

- Current rating: 40 A max.
- 33% smaller than a D-Sub (8 ways).
- 40 % lighter than a D-Sub (8 ways).
- Space grade version available: ESCC 3401/092/093/094.
- Time saving during integration as no tooling required with the **D-Click®** fast-locking system.
- Components of the **Versatys®** pigtail include the shell, contacts & wires and can all be ordered in kit form: customers can build their connectors by themselves.
- Easy maintenance: no need to change the whole connector when a line is damaged as the lines are dismountable.
- Coax version on request.



Restricted space

WHEN SMALL IS SOMETHING TO BRAG ABOUT

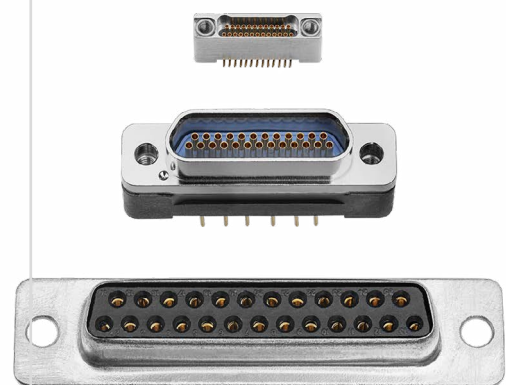
Nano-D connectors | Extreme miniaturization



NANO-D IS 7 TIMES MORE COMPACT THAN MICRO-D

Contact spacing: 0.635 mm (.025") →
7 times more compact than Micro-D connectors.

- Based on MIL-DTL-32139.
- Utilizes the highly reliable Twist Pin contact technology.
- Operating temperature: -55°C up to 200°C.
- Current rating: 1 A max.
- Nano-D pigtail (single end) or jumper (double end) assemblies.
- Nano-D versions for PCBs (through hole and surface mount).
- EMI versions.
- Single or dual row.



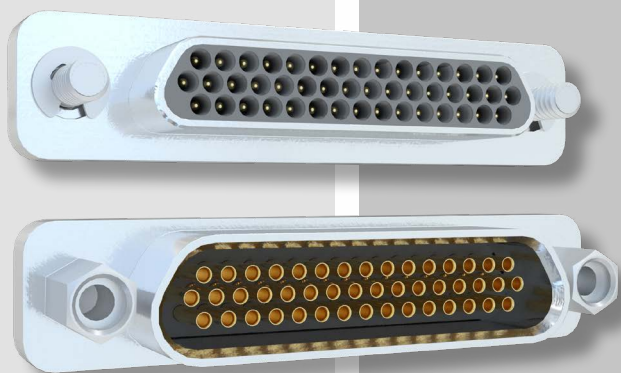
SUB-D, MICRO-D, NANO-D CONNECTORS



Restricted space

SQUEEZING YET MORE OUT OF THE MICRO-D CONNECTOR ...

Maximized pin density with MaxiDens Micro |



MAXIDENS CONNECTORS 40 % MORE CONTACTS

MaxiDens Micro connectors, available in both PCB and pigtail versions, respect all the key Micro-D design rules, maintaining, crucially, the 3A Twist Pin current rating and also the same outer dimensions and hardware positions of the classic Micro-D shell sizes, meaning these connectors can be used in exactly the same space (panel cut-outs, for example), but with a significantly increased pin count in each case. Around 40% contacts more compared to the standard format depending on the contact number.

D-Click® version available on request – see page 10 for this system.

| MAXIDENS CONNECTORS | | | | | | | |
|-----------------------------------|--------|--------|--------|--------|--------|--------|-----------|
| STANDARD SHELL/ PIN COUNT (2 ROW) | 9 PTS | 15 PTS | 21 PTS | 25 PTS | 31 PTS | 37 PTS | 51 PTS DR |
| MAXIDENS® PIN COUNT (3 ROW) | 13 PTS | 22 PTS | 31 PTS | 37 PTS | 46 PTS | 55 PTS | 76 PTS |

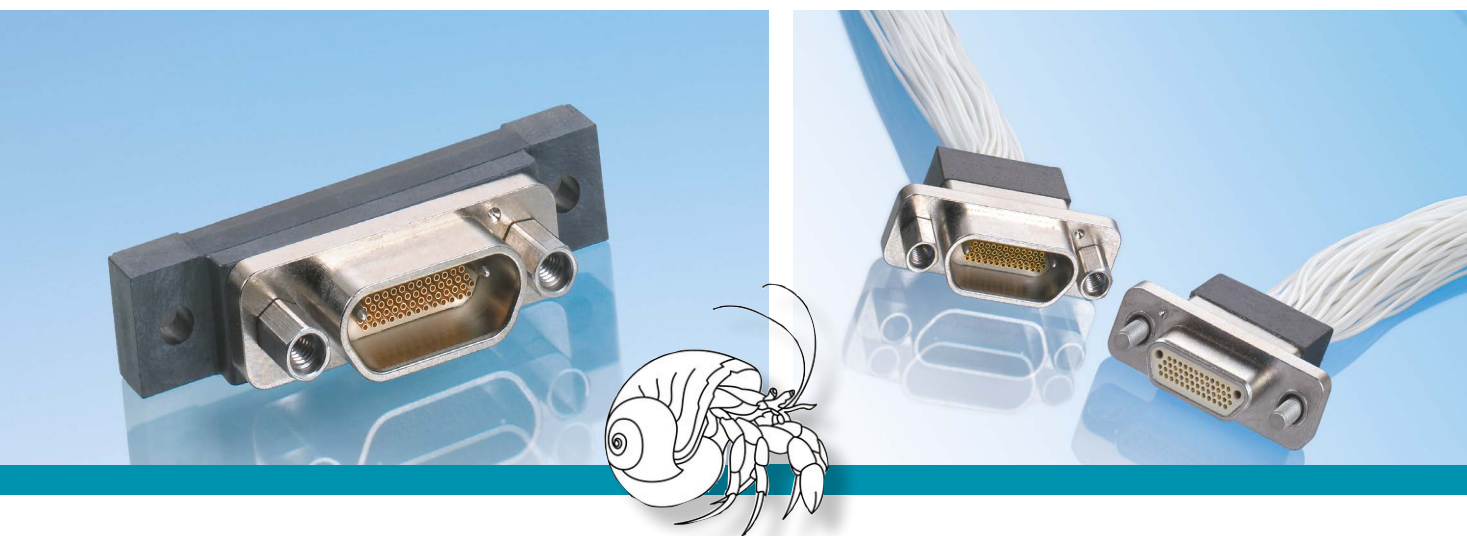
MAXIDENS: THE DESIGN OF THE SHELL AND THE INSERT ALLOWS TO ADD A ROW OF CONTACTS AS DESCRIBED IN THE TABLE



Restricted space

SQUEEZING YET MORE OUT OF THE MICRO-D CONNECTOR ...

Ultra-high pin count with Hermit-Nano |



Just like the famous Hermit Crab, which 'borrows' someone else's shell to protect itself, Axon's novel "Hermit Nano" system encases the tiny, Nano-D contacts within the larger and more robust Micro-D shell and hardware system, thereby delivering all the usability of Micro-D with the ultra-fine pitch of Nano contacts !

HERMIT-NANO: ULTRA HIGH DENSITY CONNECTORS: NANO-D CONTACTS INSIDE A MICRO-D SHELL

- Based on the highly reliable Twist Pin contact technology.
- Rugged connector thanks to the Micro-D shell with Micro-D standard jackscrews.
- Contact spacing: 0.635 mm (.025").
- Current rating: 1 A.
- Massive increase in pin count: for example 51 ways in a 15 way Micro-D shell.

| NUMBER OF CONTACTS IN A MICRO-D SHELL | | | |
|---------------------------------------|----|----|----|
| MICRO-D CONTACTS | 9 | 15 | 25 |
| NANO-D CONTACTS | 28 | 52 | 86 |

OPTIMAL CABLING DENSITY IS ACHIEVED WITH NANO-D CONTACTS AND SPACING INSIDE A STANDARD MICRO-D SHELL SIZE



Additional interconnect solutions

Connector accessories |



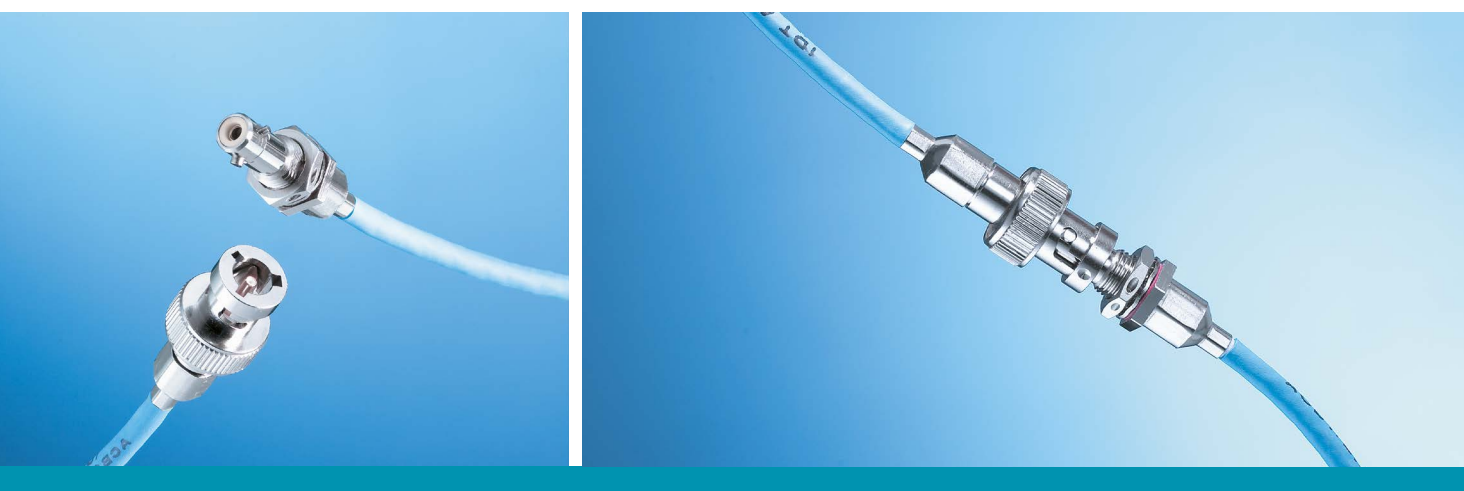
FOR A RELIABLE CONNECTOR, ACCESSORIES & HARDWARE CAN BE REQUIRED

- Micro-D EMI backshell (shell size from 9 to 100).
- **Axoclamp®** EMI band termination: to ensure the continuity of shielding efficiency at the cable/connector junction.
- A large range of hardware including jackscrews, jackposts for pigtailed, PCB connectors and harnesses.
- D-Sub and Micro-D halorings.
- Connector seals.
- Micro-D & Nano-D assembly kits: assembly kits consisting of universal tools for the assembly of rectangular Micro-D & Nano-D connectors and the majority of custom-designed connectors. Dedicated tooling with torque values as defined in the MIL-DTL-83513 & MIL-DTL-32139 standards.



Data transmission

Data-bus contacts & connectors | Based on MIL-STD-1553



A large expertise in MIL-STD-1553 data bus transmission network & an impressive flight heritage since the 1990s

ACB1 TRIAXIAL CONNECTORS

Suitable for any type of 24AWG shielded twisted pair cables.

- Easy assembly: a single crimping tool M22520/5-05 with an Axon' die is required.
ACB1 connectors and mating halves can integrate with either pin or socket contacts.
- Available in both threaded and bayonet versions with 3 and 4 lugs (locking system).
- Scoop proof system to avoid bad mounting (keying).

TRIAxIAL CONTACTS

Axon' Cable is able to design coaxial contacts (8 AWG, 10 AWG, 12 AWG) compatible with connectors including MIL-C-38999 connectors, EN3545 connectors, EN 4165 and EN3645.

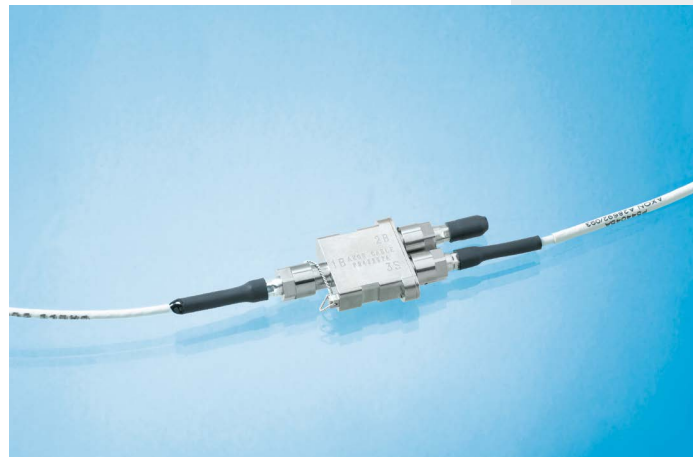
- Designed to MIL-C-39029 and EN3155.
- Operating temperature: 150°/ 200°C.
- Applications : defense (land, air), aeronautics.
- Qualified by a large number of customers.



Data transmission

PERFECT FOR ON-THE-FLY NETWORK CONFIGURATION

Data-bus contacts & connectors | Based on MIL-STD-1553



CRIMP COUPLERS

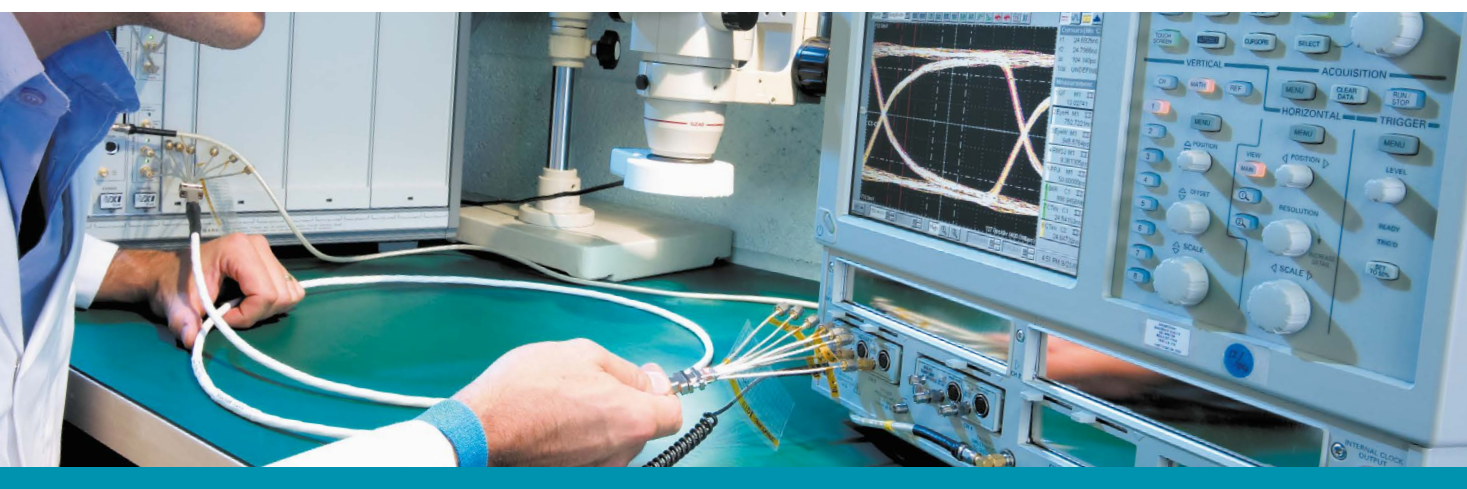
- Dismountable and lightweight.
- Flexible solution for the data bus designer: very easy to modify the network topology.
- Easy assembling.
- Easy to change damaged harness branches.
- The cabling coupler can replace a damaged in-line coupler as both meet the same environmental requirements (EN3567).
- Axon® Crimp Couplers (ACC) are offered as standard off the shelf components that customers can order in kit form (even before the network definition).
- Tested and approved by a large number of customers.



Connectors

for rugged high speed links

Severe environments



Axon' Cable is able to design high speed links based on rugged connectors including:

- D-Sub connectors.
- Rectangular or circular Micro-D connectors (MIL-DTL-83513).
- Nano-D connectors.
- Adapted RJ 45 connectors.
- Coaxial connectors.

for applications where space saving is essential:

- Civil aircraft : flight entertainment.
- Military aircraft.
- Spacecraft.

For various protocols including

- IEEE1394
- Fibre Channel
- Ethernet
- ECSS-E-ST-50-12
- SpaceWire/ LVDS (Low Voltage Differential Signal)
- SpaceFibre (New ESA-ECSS-E-ST-50-11C CML (Current Mode Logic) or VML (Voltage Mode Logic)
- HDMI
- USB.

Examples of high speed links designed by Axon' Cable



WHICH AXON' SOLUTIONS FOR WHICH DATA RATE ?

| DATA RATE PROTOCOL | UP TO 1MB/S | UP TO 400MB/S | UP TO 3GB/S | UP TO 10GB/S |
|--------------------------|--|------------------|----------------|--|
| SPACEWIRE | <ul style="list-style-type: none"> 9-WAY MICRO-D (STANDARD CABLE: ESCC3902 003 VARIANT 01 AND 02) OR LOW MASS CABLE (ESCC3902 004 VARIANT 01) OR MICROMACH® FOR HIGHER ELECTRICAL PERFORMANCES (XTALK/EMI/SIGNAL INTEGRITY) • | | | |
| SPACEFIBRE, WIZARDLINK | | | | <ul style="list-style-type: none"> AXOMACH® & AXOMACH® SPACEFIBRE • |
| TT-ETHERNET (ETHERSPACE) | MICROMACH® (ALSO SUITED TO CAT6A AND BELOW) * | | | |
| RS 422/ RS 485 / CAN | <ul style="list-style-type: none"> D-SUB & MICRO-D CONNECTORS • 120 OHM TWISTED SHIELDED PAIRS • ESCC3902.002 VARIANT 21 TO 30 (100 OR 120 OHMS SHIELDED PAIRS) • | | | |
| BUS 1553 | <ul style="list-style-type: none"> D-SUB & ACB1 CONNECTORS • BUS COUPLERS • ACB1 TRIAXIAL CONNECTORS • | | | |

(*) COMPATIBLE WITH THE FOLLOWING STANDARDS: 10BASE-T/ 1000BASE-T/ 10GBASE-T/ 100BASE-TX/ 2.5GBASE-T/ 100BASE-T4/ 5GBASE-T/ ATM-25/ ATM-51/ ATM-155/ 100VG-ANYLAN/ TR-4/ TR-16 ACTIVE/ TR-16 PASSIVE

High speed & signal integrity

IEEE1394 links with 9- way Micro-D connectors |



IEEE1394 links ensures a reliable transmission between on-board equipment.

The optimized cables are terminated with 9 way Micro-D connectors (direct connection to a PCB connector or a CBR connector).

- Data transmission up to 800 Mb/s.
- Excellent EMI performances.
- Reliable data transmission: low skew, low crosstalk & attenuation.
- Operating temperature: -90°C / + 200°C.
- Rugged version.
- Materials compatible with any environment including aeronautics & space.
- Circular & custom designed versions on request.



High speed & signal integrity

SpaceWire links with 9 way Micro-D connectors |



SPACEWIRE LINKS FOR SIGNAL INTEGRITY

Axon' Cable has developed cables and connectors for SpaceWire interconnects, allowing reliable transmission of data at high speed (between 2 Mb/s and 400 Mb/s) between on-board devices in spacecraft.

Construction

- ESCC 3902/003 qualified cables made with four 100 ohm shielded twisted pairs (26AWG and 28AWG).
- Terminated to ESCC 3401/029 EPPL 2 Micro-D connectors. Type AL cabling according to ESCC-E-ST-50-12C, Rev.1.

Advantages

- Based on LVDS spacecraft communication system to ECSS-E-ST-50-12C Rev.1
- Data transfer up to 400 Mb/s while maintaining a wide working margin.
- Low skew, crosstalk and signal attenuation.
- Robust cable.

LOW MASS SPACEWIRE 50% LIGHTER

Axon' Cable has developed low mass SpaceWire cable specifically for SpW applications, which is uniquely qualified to ESCC3902/004.

Construction

- ESCC 3902/004 qualified cables made with 4 shielded twisted pairs.
- Terminated with ESCC3401/029 EPPL 2 micro-miniature connectors. Type A cabling according to ESCC-E-ST-50-12C, Rev.1.

Advantages

- 50% lighter than the standard version. (40g/m versus 80g/m – approx.)
- Radiation resistance (300 Mrad).
- Improved flexibility.
- All electrical performance characteristics equal to, or better than, classic SpW cable.



High speed & signal integrity

MicroMach® connector |



As data rates and EMI requirements increase, Axon introduces **MicroMach®**, an impedance matched high speed connector, initially developed for optimized SpaceWire performance, but which can also be used for other protocols, such as Space-Fibre, Wizardlink, TT-Ethernet & XAUI.

- Compact.
- Matched 100 ohm impedance pairs: excellent continuity of signal.
- Low crosstalk between ways.
- Enjoys a robust EMC design, providing protection for both the cable and the equipment.
- Is capable of data rates well in excess of typical SpaceWire performance – up to 3 Gb/s.
- EPPL2 listed.

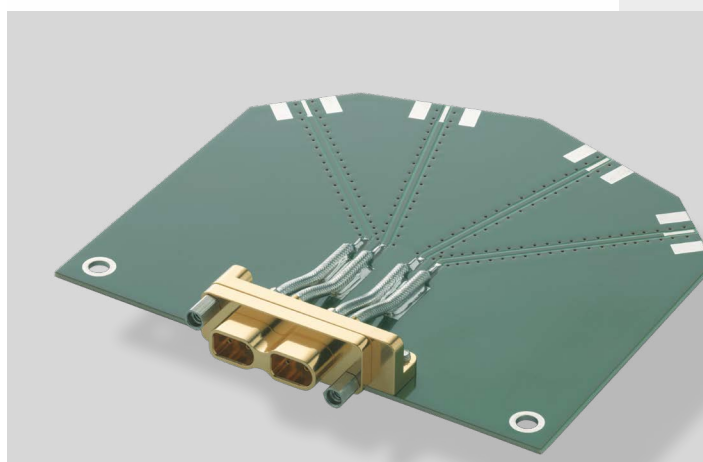
LIST OF ESCC DETAIL SPECIFICATIONS PUBLISHED BY ESA FOR MICROMACH®

| EQUIPMENT CONNECTOR | SAVER & ACCESSORIES | CABLE ASSEMBLY |
|---------------------------------------|------------------------------|---|
| EDGE PCB SMT WIRED PCB FLEX PCB | SAVER | CABLE MOUNT CONNECTOR + SPACEWIRE OR LOW MASS SPACE WIRE CABLES |
| ESCC GENERIC SPECIF. 3401 | ESCC GENERIC SPECIF. 3401 | ESCC GENERIC SPECIF. 3409 |
| ESCC DETAIL SPECIF. 3401-095 | ESCC DETAIL SPECIF. 3401-096 | ESCC DETAIL SPECIF. 3409-002 |



High speed & signal integrity

AxoMach®, high speed links | for faster data transmission

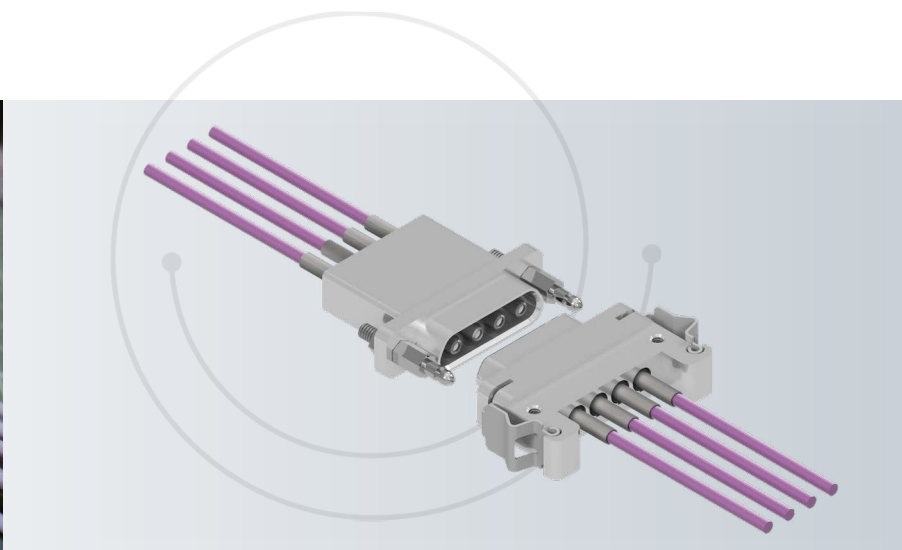
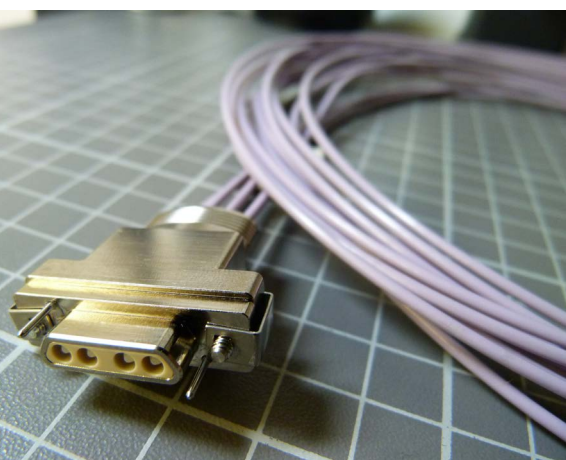


- For even higher data rates Axon' offers **AxoMach®**, a range of very high speed links composed of low loss microwave coaxial cables and different connector types.
- As well as in-line male and female variants, **AxoMach®** connectors are available in panel mount, SMD or saver connectors and can also be terminated with SMA panel mount connectors.
- The data transmission rate on this range is up to 10 Gb/s per lane.
- The new SpaceFibre protocol (ECSS-E-ST-50-11C) is also covered by a special, condensed 2 way **AxoMach® SpaceFibre** variant.
- For protocols: SpaceFibre, Wizardlink, XAUI.



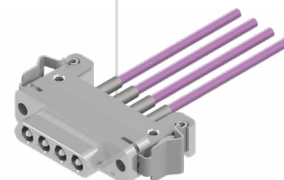
At the speed of light !

AXOPT® optical Micro-D connectors | for challenging environments



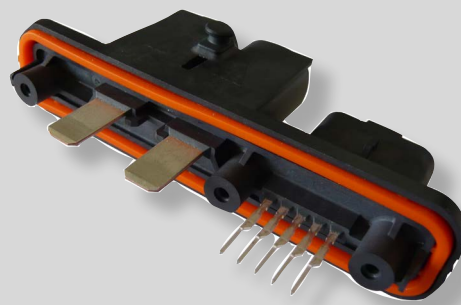
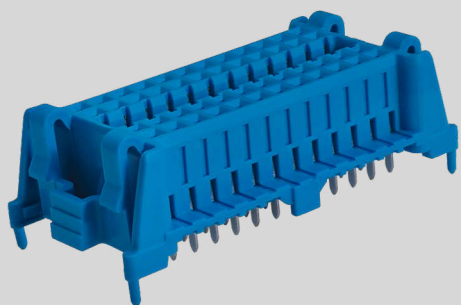
Connected with Axon' **Axopt®** optical cables, **Axopt®** optical Micro-D connectors are an ideal solution for weight saving and reliable high speed connection for challenging applications including aeronautics, defense and space.

- Electromagnetic immunity.
- Lightweight solution.
- Resistance to harsh environments :
 - Vibration (TIA/EIA-364-28E).
 - Thermal and mechanical shock (TIA/EIA 455-14A- test E).
- Resistance to high temperatures:
 - Temperature cycling: -55/+125°C - 50 cycles.
 - Temperature life: +125°C - 1000 hours.
- Resistance to humidity.
- Connector qualification based on MIL-DTL-83513 / ARINC801 & MIL-PRF29504.
- 500 cycles mating/de-mating.
- **D-Click®** Fast-locking system for fast integration.



Industrial connectors & contacts

Electrical connectors | for signal and power applications



The Axon' group through the Mechatronics division is able to provide custom-designed metal plastic components for volume electronic markets including automotive, industrial, consumer, energy and medical.

CONNECTORS WITH TERMINALS

Connectors with stamped terminals round & square wires (inserted or overmoulded).

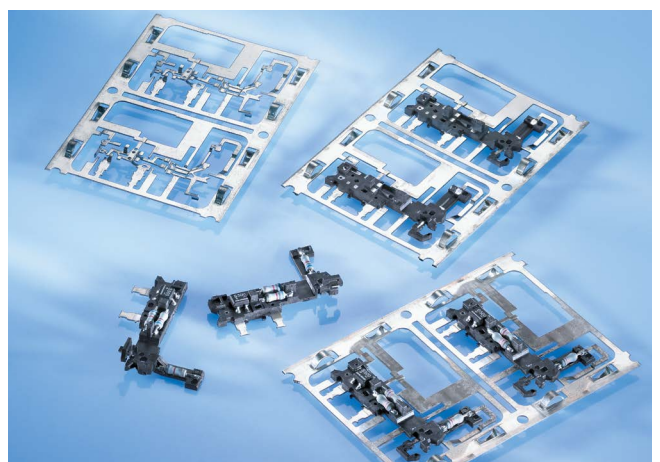
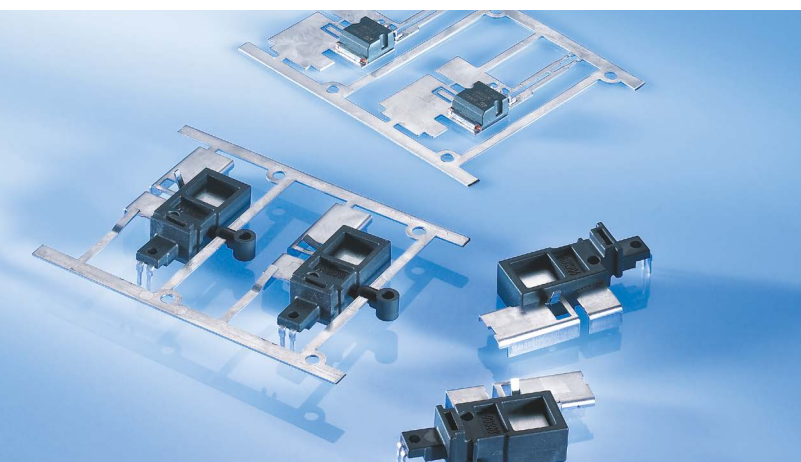
A large range of standard and custom-designed connectors including:

- ECU connectors.
- Connectors for sensors.
- Connectors for FFC and FPC.
- Connectors for PCBA.
- Spring connectors.
- **Watertight** connectors.



Industrial connectors & contacts

Mechatronics objects |

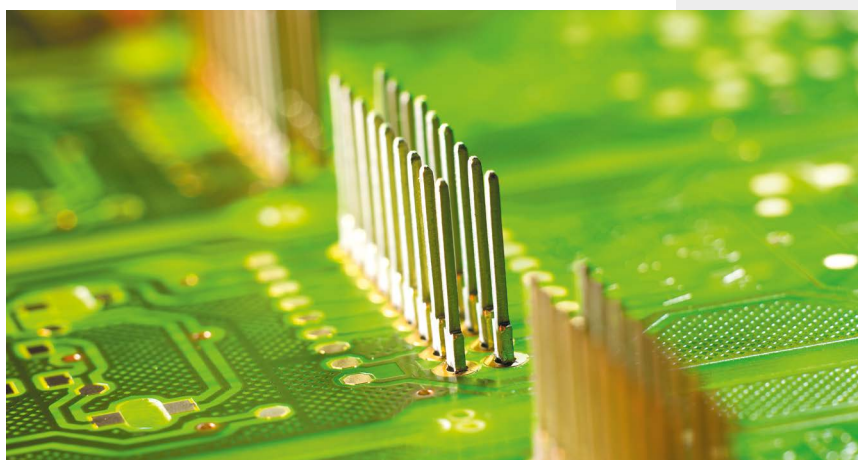
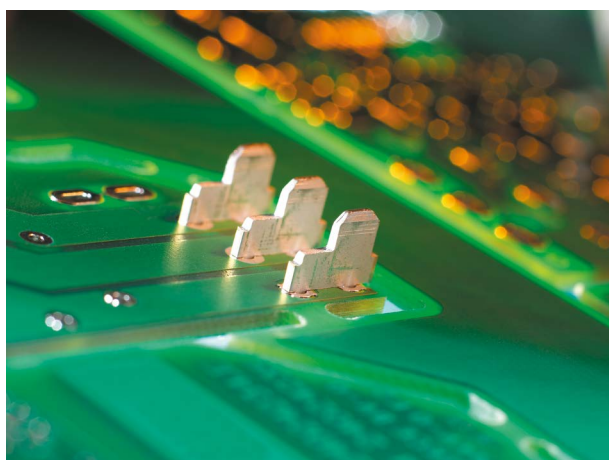


- Functional and Smart objects.
- Combination of mechanical & electronics functions.
- Overmoulded leadframes with Electronic components and PCBAs.
- Packaging of Hall effect sensors.



Industrial connectors & contacts

Pins & contacts | electrical connections



As part of the Axon' group, Axon' Mechatronics has integrated the manufacture of pins and contacts to provide custom-designed solutions.

TABS, PINS & SMD TERMINALS FOR PCBA

Axon' Mechatronics designs and manufactures reeled or loose stamped terminals as per customer specifications.



Industrial connectors & contacts

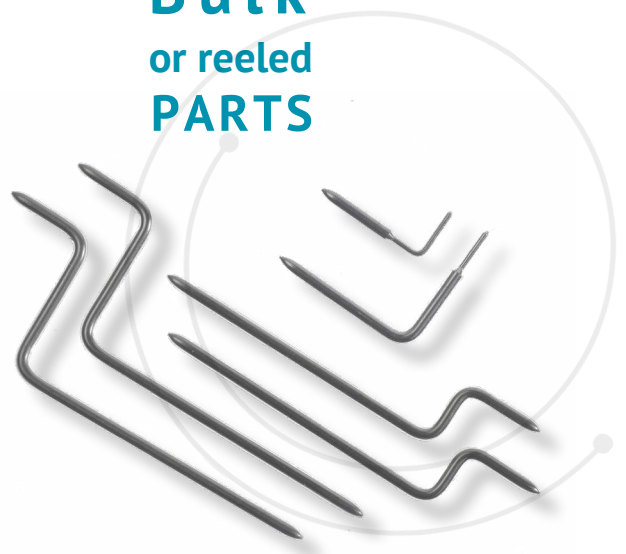
Pins & contacts | electrical connections



WIRE PINS

- Standard and custom-designed wire pins. Expertise in electrostriction: this clever technology allows for the manufacture of contacts with smooth, spherical tips with none of the sharp edges that can cause damage on insertion. No metal chips.
- Contact stamping to manufacture truncated pyramid-form tips.
- Straight or angled contacts from a variety of complex shapes.
- Contact material: copper alloy, phosphorous bronze, brass.
- Selective or full contact plating: gold, silver, nickel, tin.

Bulk or reeled PARTS

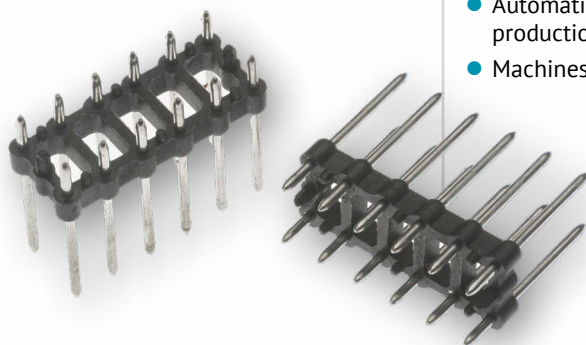


Industrial connectors & contacts

Pins & contacts | electrical connections



Single row,
double row,
straight
or angled
SHAPES

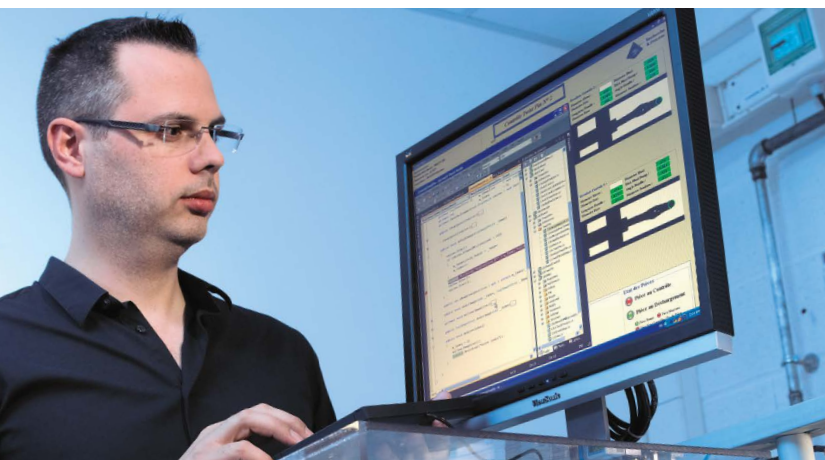


PIN HEADERS

- Standard or custom-designed interconnect pin headers for board-to-board and board-to-cable interconnects.
- Pitches: 2.54 mm (0.100") or 5.08 mm (0.200").
- Contact material: copper alloy, phosphorous bronze or brass with full or selective plating: gold, silver, nickel, tin. Flexible process for small and large scale production volumes.
- Vertical integration of contact manufacturing, injection of insulating material.
- Automatic insertion machines designed for large scale production volumes.
- Machines designed to insert contacts with selective plating.



CUSTOM-DESIGNED SOLUTIONS



VERTICAL INTEGRATION

- Concept
- Co-design
- 3D modelling
- Simulation
- Rapid prototyping

→ **VALIDATION**



- Contacts
- Insulator
- Potting
- Seals
- Connector shells
- Backshells
- Plating

→ **FINISHED CONNECTOR**

- Conductor
- Plating
- Insulation
- Shielding

→ **FLAT OR ROUND CABLE**

- Crimping
- Soldering
- Electric, ultrasonic & Laser welding
- Potting
- Overmoulding

→ **FINISHED HARNESS**

- Automation
- Cutting
- Stripping
- Finishing





As a multi-skilled group, Axon' is able to provide custom-designed connectors & interconnect solutions to meet customers' requirements



THE DESIGN OF TAILOR-MADE PRODUCTS IS BASED ON:

STANDARD PRODUCTS

which have been qualified and adapted to customer's needs.

EXPERTISE

in a number of areas including:

- Metallurgy.
- Plastics technology.
- Electronics.

GREY MATTER

- 10% of the turnover is invested in Research & Development.
- Simulation tools.

CO-ENGINEERING

- Idea and co-design : State-of-the-art design tools.
- Evaluation.
- Validation of materials or components : rapid prototyping (plastic or metal).
- Productionisation : Product/Process studies.
 - Design of production tools.
 - In-house test equipment for validation (electrical characteristics, climatic characteristics, dimensions, mechanical characteristics, etc).
- Industrialisation : pre-series.
- Production : Axon' subsidiaries set up in Europe, the USA, and Asia bring real added value to support customers worldwide.

OPEN INNOVATION

Cross-over from our space or aeronautics technologies towards those of automotive or medical enables Axon' to offer innovations to customers and a rapid development.

Custom-designed solutions

True Vertical Integration | Real Collaborative Engineering |



Once the collaborative design is complete, Axon' has in-house manufacturing and test capability for every single process in cable, connector and harness manufacture.

This allows:

- Full control of the production chain.
- Full control of the quality of parts and deadlines.
- Time saving.
- The rapid development of fully bespoke connector solutions.

Considering connectors, Axon' has vertically integrated several technologies including:

- Plating (see page 33).
- Machining, milling & CNC lathing (see page 34).
- Moulding & overmoulding (see page 35).
- The design of manufacturing tools.

Custom-designed solutions

State of the art In-house Plating |



CONNEC-
TOR
SHELLS

CONTACT
STRIPS

METAL
OR PLAS-
TIC
PARTS

CONDUCTORS

FLAT
FLEXIBLE
CABLES

MAIN PLATING STYLES

- **Electrolytic nickel:** good resistance to salt spray.
- **Electroless nickel:** good resistance to corrosion, non-magnetic.
- **Copper:** decreases contact resistance.
- **Tin:** very good solderability, low contact resistance.
- **Gold:** very good corrosion resistance, low contact resistance, good solderability.
- **Silver:** good solderability, good electrical conductivity.
- **Zinc nickel:** alternative to cadmium, good corrosion resistance.

Comprehensive in-house plating capabilities allow Axon' to design the optimum finish and protection for each application, maintaining full control of the supply chain quality.



Custom-designed solutions

Machining, milling & CNC lathing



The Axon' group has a large expertise in machining techniques including milling and turning which allows the manufacture of shapes which meet custom-designed requirements.

**REEL-TO-REEL
MILLING**

RAW MATERIALS
Brass, Maillechort,
Nickel alloy, Copper
beryllium.

**MILLING :
CNC LATHING**

RAW MATERIALS
Aluminium, Stainless
Steel, Mild Steel, Brass,
Titanium, Copper
beryllium.

MACHINING

for standard &
custom-designed
connectors,
metal & plastic parts.

RAW MATERIALS
Aluminium, Stainless
Steel, Copper, Brass,
Plastics, PEEK.

Custom-designed solutions

Moulding & Overmoulding



A large expertise in plastic injection, moulding & overmoulding in the Axon' group with different kinds of materials:

- **Elastomer parts** (for example seals for connectors).
- **Compression moulding**
 - transfer moulding.
 - injection moulding.
- **Plastic injection** including micro-miniature parts: ABS/PC, PA, PBT, PPS, LCP, PPS, PEEK, PSU, POM.
- **Expertise in different technologies**: hot melt, low pressure, high pressure.
- **Moulding & overmoulding of metal, plastic & composite parts** including micro-miniature parts.

Test equipment

In-house test capabilities



Because connectors and interconnect solutions often have a hard life, Axon' uses a wide variety of in-house equipment to ensure our products stand up to the most challenging of environments.

For very specific requirements, our Process Development teams are also able to design bespoke equipment and test benches in partnership with our customers.

PHYSICAL CHARACTERISTICS

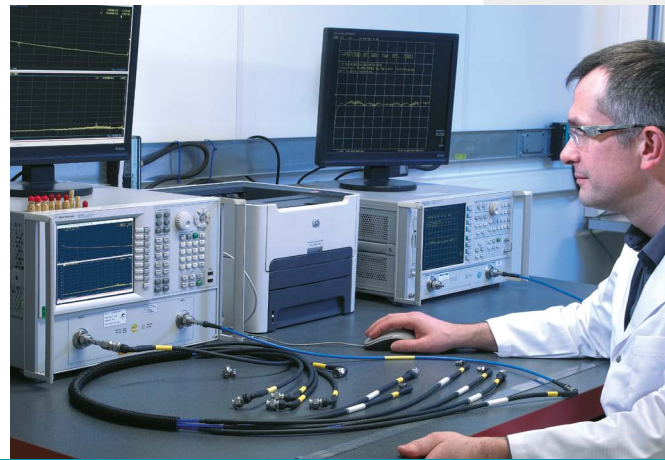
- Meniscograph (IEC 38-2-69) to check solderability of cables and components.
- Scanning Electron Microscope (SEM)
- Differential Scanning Calorimeter (DSC): measurement of heat flux under temperature variations.
- X-Ray Radiography, with Computed Tomography if needed.
- Magneticity test.
- Fourier Transform Infra-Red Spectrometry (FTIR)
- Dynamic Mechanical Analysis (DMA)

MECHANICAL CHARACTERISTICS

- Resistance to shock, combined flex/torsion, folding, winding, unwinding.
- Resistance to flexlife.
- Vibration equipment and combined vibration/ climatic "shake and bake" tests.
- Tensile strength.

Test equipment

In-house test capabilities



CHEMICAL CHARACTERISTICS

- Resistance to oils, decontaminants, sterilization, solvents.

ELECTRICAL CHARACTERISTICS

- Test benches to check continuity, insulation resistance, dielectric strength, capacitance, linear resistance, capacitance, inductance, attenuation, VSWR, crosstalk, intermodulation, filtering performance.
- Test benches for MIL-STD-1553 data bus products.
- Transfer impedance test benches
- Network analyzer to check insertion loss, return loss, phase matching.
- High voltage tests.

- Mode stirred chamber.
- Eye pattern test bench
- Bit error rate tester.
- Sampling scope/TDR up to 50 GHz band width.
- Power supply up to 1000A.
- Partial Discharge tester for high voltage testing.

ENVIRONMENTAL CHARACTERISTICS

- Resistance to salt spray, thermal shock, autoclaving, accelerated ageing, humidity.
- Resistance to flame.
- Hermeticity test for hermetic connectors and seals.
- 500 bars high pressure water test bench.
- Thermal infrared cameras.

A worldwide presence



**The Axon' Group
has developed and
manufactured cables
& interconnect
solutions for high
tech electronics
for 50 years**

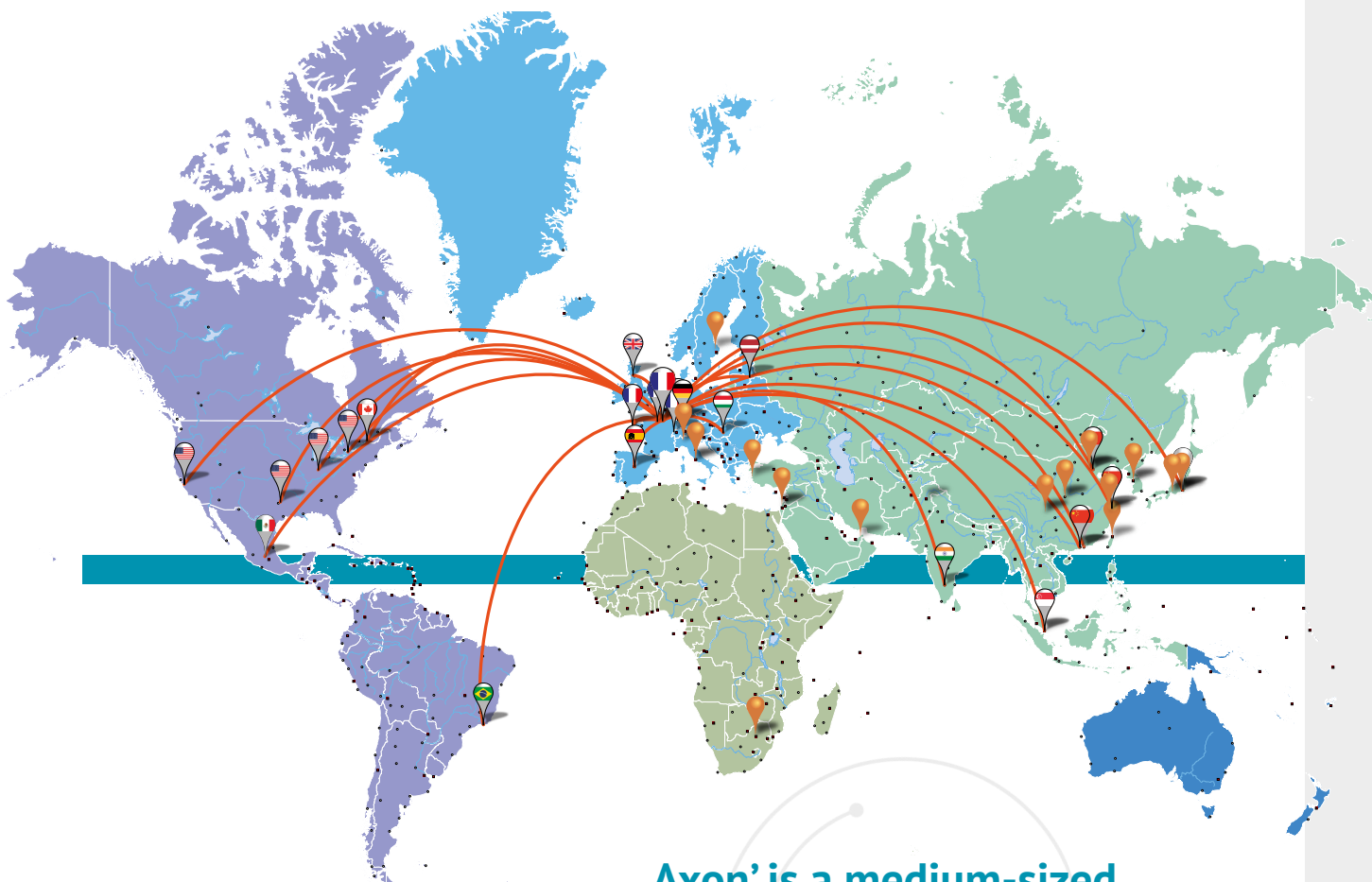
At the very beginning, Axon' Cable manufactured high temperature insulated wires. Since then, the group has greatly enlarged its areas of expertise to offer complete solutions to customers:

- Design and manufacture of wires, cable assemblies, custom-designed connectors with **Axon' Cable**.
- Design and manufacture of metal-plastic parts and components with **Axon' Mechatronics** and **Axon' Nanotec**.
- Design and manufacture of elastomeric components with **Addix**.





**AXON' IS CLOSER
THAN YOU THINK !**



Axon' is a medium-sized
group with
20 subsidiaries
worldwide



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