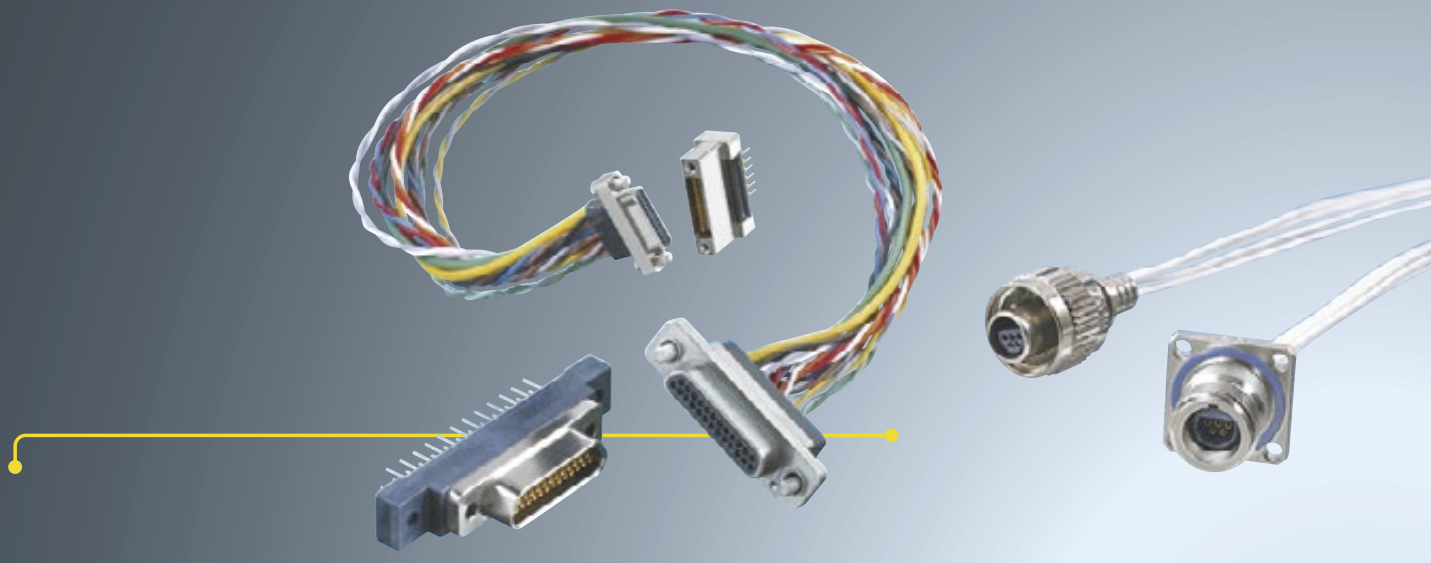
Miniature high performance twist pin connectors

Micro-D & Nano-D, Rectangular & Circular



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NON-MAGNETIC CONNECTORS

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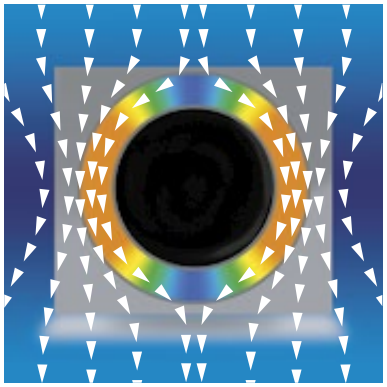
NON-MAGNETIC MICRO-D INTERCONNECT SOLUTIONS

▲ **FIGURE 1**: Location of magnetic test facility (30m away from possible interference)

▲ **FIGURE 2**: This item's initial magnetic state is being measured using a three-axis probe, whilst protected by the magnetic shield



▲ **FIGURE 3**: Diagram showing the effect of the magnetic shield on the Earth's magnetic field. In white, the magnetic field lines. In color, the intensity of the magnetic field within the shield, red for high intensity and blue for low intensity. The black area in the center is the area used to measure the initial magnetic state of the item.

Interest in powerful magnetic fields and accurate magnetic sensors has significantly increased in high-tech industries over the past decades. Various applications (MRI, low magnetic field detection systems, etc…) now use these complex phenomena, but accurately measuring a magnetic field is challenging. The difficulty comes mainly from interference caused by any ferromagnetic material surrounding the probes.
At the same time, systems using such magnetic fields are spreading and components tend to be closer to each other, further increasing magnetic interference.

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.

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. AXON's non-magnetic Micro-D connectors have been designed using new materials and surface treatments, avoiding ferromagnetic materials. The manufacturing process has also been developed to keep them "as clean as possible" magnetically.

MAGNETIC TESTING

In order to further enhance and test its non-magnetic product range, AXON' has developed its own test equipment and procedure, based on recognized standards, to characterize and quantify the magnetic influence of connectors on their environment.

The first step is to measure the initial magnetic state of the Unit Under Test (UUT) using a three-axis probe. Then a high magnetic field of 0.5T (Earth's magnetic field is about 50µT in Europe), is applied to the UUT.
Finally, the intensity of the field is gradually decreased to nil, and the residual magnetism level of the UUT is measured with the three-axis probe. As a result of this procedure, the influence of a strong magnetic field on the UUT is known.

To minimize the possibility of magnetic interference from the surrounding area, the tests are carried out in a specially-constructed facility (see figure 1) which is made from magnetically neutral materials. Additionally a magnetic shield is used to shield the item tested from the Earth's magnetic field (see figures 2 & 3).

NON-MAGNETIC MICRO-D INTERCONNECT SOLUTIONS

For a material studied in a magnetostatic state, a link between the physical quantities of the Maxwell's equations can be simplified to:

$B = \mu_0 (H+M)$

Where B is the magnetic flux density generated by the material in Tesla (T),
μ_0 is the magnetic permeability of vacuum in Henry per meter (H/m),
H is the magnetic field intensity generated by the environment in Ampere per meter (A/m),
M is the sum of the magnetic moments of the material or magnetization in Ampere per meter (A/m).

If the item is perfectly non-magnetic, M = 0. So if the magnetic field generated by the environment is also nil (H = 0), the measured magnetic flux density B is also nil.

Relationship between physical quantities commonly used:

$1 \text{ Oersted} = \left(\frac{10^3}{4\pi}\right) \text{A/m}$

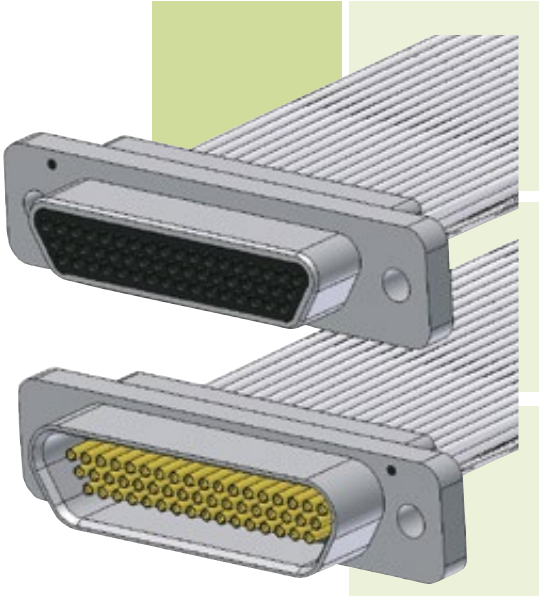
$1\,T = 10^4 \text{ Gauss} = 10^9 \text{ Gamma}$

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 microminiature connectors.

MATERIAL & FINISH	
SHELL	Aluminium alloy 6061 with custom non-magnetic plating or titanium
MOULDED INSULATOR	Liquid Crystal Polymer (LCP)
INTERFACIAL SEAL	Fluorosilicone rubber
PIN CONTACT	Copper and beryllium copper, gold over nickel plating (custom non-magnetic plating)
SOCKET CONTACT	Copper alloy, gold over nickel plating (custom non-magnetic plating)
ENCAPSULANT	Epoxy resin
HARDWARE	Titanium TA6V and beryllium copper
SOLID UNINSULATED WIRES & PCB TERMINALS	AWG 25 Silver Plated Copper

LOWER MAGNETISM LEVEL: Please contact us for a 2 nT residual magnetism level or for other magnetic requirements



NON-MAGNETIC CONNECTOR

METAL SHELL

- For strong magnetic field environments.
- Minimal magnetic disturbance.
- High performance metal connector and PTFE wire.
- Environmentally sealed.
- Operating temperature: 125 or 200°C.
- 9 to 100 contacts.

IDENTIFICATION CODE

MDN	1A	51	S	4	L	050	B

SERIES
MDN: Micro-D Non-magnetic series.

CONNECTOR TYPE
1A: < 200 nT - Nickel aluminium shell + potting 125°C.
1B: < 200 nT - Nickel aluminium shell + potting 200°C.
2A: < 20 nT - Titanium shell + potting 125°C.
2B: < 20 nT - Titanium shell + potting 200°C.
Contact us for < 2 nT connectors.

NUMBER OF CONTACTS
09, **15**, **21**, **25**, **31**, **37**, **51DR**, **51**, **69**, **100**.
See pages 26 & 27 for contact arrangements.

CONNECTOR GENDER
P: Male (pin contacts).
S: Female (socket contacts).

TERMINATION TYPE
For colour codes F, L, W
1: E 2607, AWG 26, 7 strands, 600V.
4: E 2619, AWG 26, 19 strands, 600V.
6: E 2807, AWG 28, 7 strands, 600V.
8: E 3007, AWG 30, 7 strands, 600V.
A: E 2407, AWG 24, 7 strands, 600V.
C: E 2419, AWG 24, 19 strands, 600V.
E: M22759/33, AWG 26, 19 strands, 600V.

For colour code V only
3: M22759/11, AWG26, 19 strands, 600V.
F: E2607, AWG26, 7 strands, 600V.

Solid uninsulated wires
S: AWG 25 silver plated.

FS: Solder cup.
See page 29 for wire types.

COLOUR CODE
F: All yellow.
L: All white.
BLANK: If wire type is S or FS.
W: 10 colour repeat.
V: MIL-STD-681 striped (only for wire types 3 and F).
See page 30 for colour code.

WIRE LENGTH (in cm)
Attention! Wire length in centimetres - (1cm = 10mm = 0.394").
BLANK: If termination type is FS.

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

HARDWARE
B: No hardware.
P: Titanium jackposts (removable).
M: Titanium non-magnetic low profile hex socket head jackscrews (removable).
N: Titanium non-magnetic high profile hex socket head jackscrews (removable).
Px (x: 1 to 5): Titanium panel mount jackposts.
See pages 190 to 200 for hardware description.

NON-MAGNETIC CONNECTOR

LOW PROFILE METAL SHELL

- For strong magnetic field environments.
- Minimal magnetic disturbance.
- High performance metal connector and PTFE wire.
- Environmentally sealed.
- Operating temperature: 125 or 200°C.
- 9 to 51 contacts.

IDENTIFICATION CODE

MDN	1A	L51	S	4	L	050	B

SERIES
MDN: Micro-D Non-magnetic series.

CONNECTOR TYPE
1A: < 200 nT - Nickel aluminium shell + potting 125°C.
1B: < 200 nT - Nickel aluminium shell + potting 200°C.
2A: < 20 nT - Titanium shell + potting 125°C.
2B: < 20 nT - Titanium shell + potting 200°C.
Contact us for < 2 nT connectors.

NUMBER OF CONTACTS
L09, **L15**, **L21**, **L25**, **L31**, **L37**, **L51**.
See pages 26 & 27 for contact arrangements.

CONNECTOR GENDER
P: Male (pin contacts).
S: Female (socket contacts).

TERMINATION TYPE
For colour codes F, L, W
1: E 2607, AWG 26, 7 strands, 600V.
4: E 2619, AWG 26, 19 strands, 600V.
6: E 2807, AWG 28, 7 strands, 600V.
8: E 3007, AWG 30, 7 strands, 600V.
A: E 2407, AWG 24, 7 strands, 600V.
C: E 2419, AWG 24, 19 strands, 600V.
E: M22759/33, AWG 26, 19 strands, 600V.

For colour code V only
3: M22759/11, AWG26, 19 strands, 600V.
F: E2607, AWG26, 7 strands, 600V.

Solid uninsulated wires
S: AWG 25 silver plated.

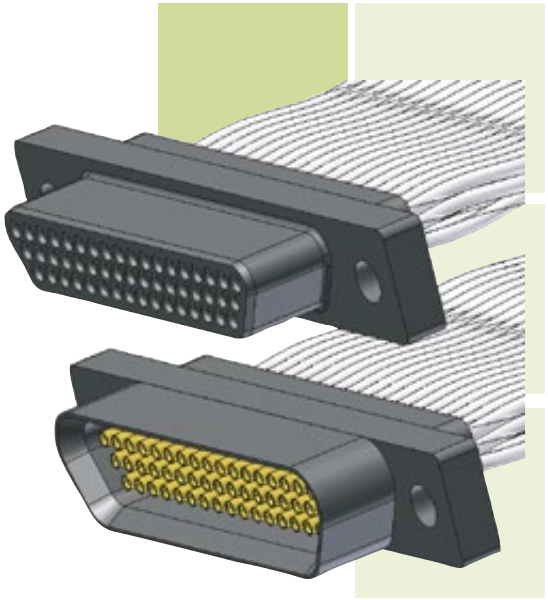
FS: Solder cup.
See page 29 for wire types.

COLOUR CODE
F: All yellow.
L: All white.
BLANK: If wire type is S or FS.
W: 10 colour repeat.
V: MIL-STD-681 striped (only for wire types 3 and F).
See page 30 for colour code.

WIRE LENGTH (in cm)
Attention! Wire length in centimetres - (1cm = 10mm = 0.394").
BLANK: If termination type is FS.

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)

HARDWARE
B: No hardware.
P: Titanium jackposts (removable).
M: Titanium non-magnetic low profile hex socket head jackscrews (removable).
N: Titanium non-magnetic high profile hex socket head jackscrews (removable).
Px (x: 1 to 5): Titanium panel mount jackposts.
See pages 190 to 200 for hardware description.



NON-MAGNETIC CONNECTOR

PLASTIC SHELL

- For strong magnetic field environments.
- Minimal magnetic disturbance.
- High performance plastic connector and PTFE wire.
- Environmentally sealed.
- Operating temperature: 125 or 200°C.
- 9 to 51 contacts.

IDENTIFICATION CODE

MDN	P	51	S	4	L	050	B

SERIES
MDN: Micro-D Non-magnetic series.

CONNECTOR TYPE
P: < 20 nT - Plastic shell + potting 125°C.
L: < 20 nT - Plastic shell + potting 200°C.

NUMBER OF CONTACTS
09, **15**, **21**, **25**, **31**, **37**, **51**.
See pages 26 & 27 for contact arrangements.

CONNECTOR GENDER
P: Male (pin contacts).
S: Female (socket contacts).

TERMINATION TYPE
For colour codes F, L, W
1: E 2607, AWG 26, 7 strands, 600V.
4: E 2619, AWG 26, 19 strands, 600V.
6: E 2807, AWG 28, 7 strands, 600V.
8: E 3007, AWG 30, 7 strands, 600V.
A: E 2407, AWG 24, 7 strands, 600V.
C: E 2419, AWG 24, 19 strands, 600V.
E: M22759/33, AWG 26, 19 strands, 600V.

For colour code V only
3: M22759/11, AWG26, 19 strands, 600V.
F: E2607, AWG26, 7 strands, 600V.

Solid uninsulated wires
S: AWG 25 silver plated.

FS: Solder cup.
See page 29 for wire types.

COLOUR CODE
F: All yellow.
L: All white.
BLANK: If wire type is S or FS.
W: 10 colour repeat.
V: MIL-STD-681 striped (only for wire types 3 and F).
See page 30 for colour code.

WIRE LENGTH (in cm)
Attention! Wire length in centimetres - (1cm = 10mm = 0.394").
BLANK: If termination is FS.

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)

HARDWARE
B: No hardware.
P: Titanium jackposts (removable).
M: Titanium non-magnetic low profile hex socket head jackscrews (removable).
N: Titanium non-magnetic high profile hex socket head jackscrews (removable).
Px (x: 1 to 5): Titanium panel mount jackposts.
See pages 190 to 200 for hardware description.

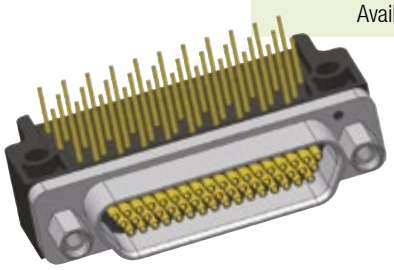
PCB CONNECTORS OVERVIEW

AXON' Micro-D Printed Circuit Board connectors are designed for interconnection of PCB's inside-the-box to external cables.
AXON' Micro-D PCB connectors are available in two layouts (0.100" pitch and 0.075" pitch) and in two configurations (vertical mount and right angle mount connectors) for flexible and rigid printed circuit boards.

NOTE: typically, the PCB connector tends to be female, however male versions are equally available.

NON–MAGNETIC PCB CONNECTORS 0.100" PITCH

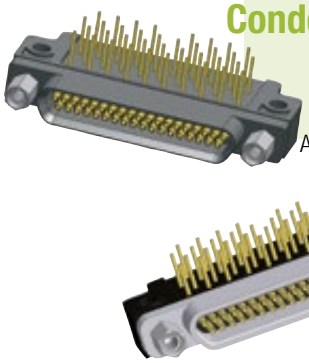
CBR 0.100" Condensed Right Angle mount



Available from 9 to 100 ways
Available in metal shell
PCB code: **CBR**

See pages 78 to 85*.

CBP 0.100" Condensed Right Angle mount low profile



Available from 9 to 51 ways
Available in metal and plastic shell
PCB code: **CBP**

See pages 86 to 91*.

NON–MAGNETIC PCB CONNECTORS 0.075" PITCH

BS 0.075" Vertical mount

Available from 9 to 100 ways
Available in metal and plastic shell
PCB code: **75SB**

See pages 116 to 125*.

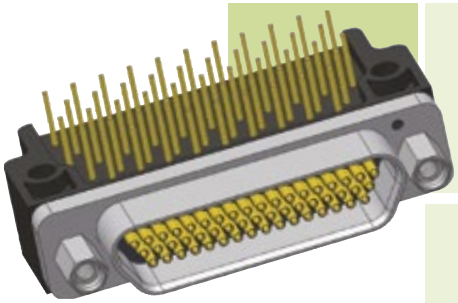
CBR 0.075" Condensed Right Angle mount

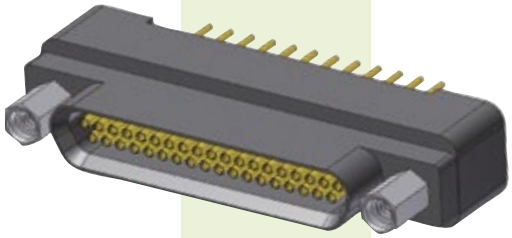
Available from 9 to 100 ways
Available in metal shell
PCB code: **75RB**

See pages 106 to 111*.

*: Non-magnetic PCB connectors have the same dimensions and PCB layouts as standard PCB connectors.
Construction of the references on the next page.

NON-MAGNETIC PCB CONNECTOR





- For strong magnetic field environments.
- Minimal magnetic disturbance.
- Condensed board right angle connector for flexible and rigid printed circuit boards.
- Operating temperature: 125 or 200°C.
- Several tail lengths available.
- 9 to 100 contacts (up to 51 for plastic connectors).

IDENTIFICATION CODE

MDN	1A	51	S	CBR	P	S	3

SERIES
MDN: Micro-D Non-magnetic series.

CONNECTOR TYPE
1A: < 200 nT - Nickel aluminium shell + potting 125°C.
1B: < 200 nT - Nickel aluminium shell + potting 200°C.
2A: < 20 nT - Titanium + potting 125°C.
2B: < 20 nT - Titanium + potting 200°C.
P: < 20 nT - Plastic shell + potting 125°C.
L: < 20 nT - Plastic shell + potting 200°C.
Contact us for < 2 nT connectors.

NUMBER OF CONTACTS
09, **15**, **21**, **25**, **31**, **37**, **51DR***, **51**, **69***, **100***.
L09*, **L15***, **L21***, **L25***, **L31***, **L37***, **L51***.
See pages 26 & 27 for contact arrangements.

CONNECTOR GENDER
P: Male (pin contacts).
S: Female (socket contacts).

PCB VERSION
CBR: 0.100" Condensed Board Right Angle**.
CBP: 0.100" Condensed Right Angle Low Profile***.
75RB: 0.075" Condensed Board Right Angle**.
75SB: 0.075" Board Straight.

HARDWARE
B: No hardware.
P: Titanium jackposts (removable).
Px (x: 1 to 5): Titanium panel mount jackposts.
See pages 190 to 200 for hardware description.

CONDUCTOR TYPE
S: Silver plated solid conductor AWG 25.

TAIL LENGTH
1: 2.80 mm (0.110").
2: 3.80 mm (0.150").
3: 4.80 mm (0.190").
4: 6.35 mm (0.250").
5: 3.25 mm (0.127").
6: 3.56 mm (0.140").
7: 4.37 mm (0.172").

Tolerance: ± 0.38 mm (0.015").
Other lengths available on request.

*: not for plastic shell connectors.
**: only for standard profile metal shells.
***: only for plastic and low profile metal shells.

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