General Information

AXON', manufacturer of cables and interconnect solutions for advanced technologies, offers a complete range of flat cables and assemblies :

› FFC-Flat Flexible Cables AXOJUMP®,

› Flat Cables with round pins AXOSTRIP®,

› Bulk Flat Flexible Cables FLEXLINK®,

› FDC-Flat Display Connections AXOLINK®.

From standard flat cables to custom designed assemblies, AXON' optimises its expertise to meet its customers requirements.

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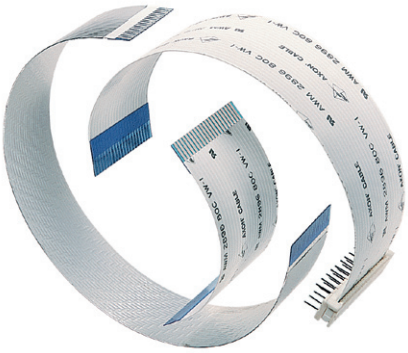
FFC- Flat Flexible Cables: AXOJUMP®

Designed for board-to-board interconnections, AXOJUMP® standard Flat Flexible Cables are made up of flat conductors insulated with Polyester or Polyimide tapes (from 0.30 mm to 2.54 mm pitch).

AXON' has developed a wide range of custom designed Flat Flexible Cables incorporating folds, shields, notches, punching, slitting, marking or special mounting methods.

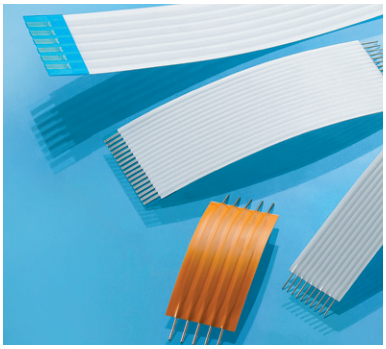
The termination of Flat Flexible Cables is made:
- either with ZIF (Zero Insertion Force) / LIF (Low Insertion Force) connectors: the cables are equipped with reinforcement tape to strengthen the ends,
- by soldering,
- or with crimped contacts.



FLAT FLEXIBLE CABLES WITH LIF CONNECTOR

Flat Cables with round pins: AXOSTRIP®

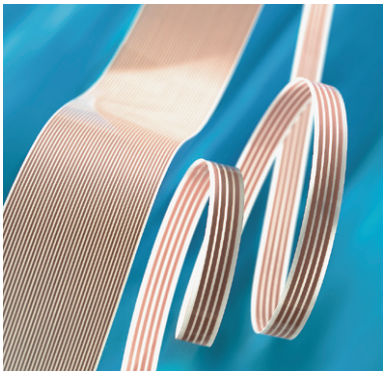
AXOSTRIP® - Flat Cables with round pins can be soldered or inserted to achieve board-to-board interconnections.



FLAT CABLES WITH ROUND PINS

Bulk Flat Flexible Cables: FLEXLINK®

FLEXLINK®-Bulk Flat Flexible Cables are made with flat conductors insulated with Polyester film. They are used for any application where space reduction and flexibility are the most important criteria.

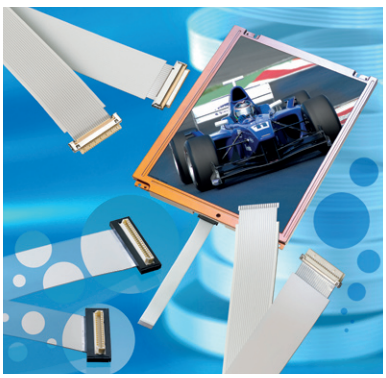


BULK FLAT FLEXIBLE CABLES

FDC- Flat Display Connections: AXOLINK®

AXOLINK® FDC-Flat Display Connections have been designed for board to display interconnections. They consist of AXOJUMP® standard Flat Flexible Cables and connectors such as: DF-9, DF-19, FI-SE, FI-X at one or both ends.

A special range called FDC 100®-AXOLINK® has also been developed for connecting full HD displays with LVDS (Low Voltage Differential Signaling). This assembly consists of a 41 or 51 way 0.50 mm pitch shielded flat cable, terminated with a unique solution to mate the FI-R connectors soldered to the boards.



FDC-FLAT DISPLAY CONNECTIONS

Applications

AXON' flat cables and assemblies can be used in numerous application areas:

- **IT equipment**
  notebooks, scanners, printers.
- **Consumer electronics**
  CD and DVD players, TV, LCD displays, hi-fi systems, satellite receivers and decoders.
- **Telecommunications**
  telephones, fax machines.
- **Automotive industry**
  car radios, GPS systems, switch rotary connectors, headliners, door panels.
- **Household equipment**
  glass-ceramic cooking plates, refrigerators, dishwashers.
- **Military electronics**
  missiles, weapon systems.
- **Robotic applications**
- **Medical applications**

Advantages

AXON' flat cables and assemblies offer many advantages:

- Extremely small dimensions:
  low profile - narrow width - fine pitch,
- Simple and fast installation:
  time saving - cost reduction,
- Compatible with ZIF/LIF connectors,
- Excellent flexibility and flex life,
- Standardised lengths offered
  for quicker service.

CAR RADIO

FDC 100® - FFC LVDS ASSEMBLY

Production

AXOJUMP® Flat Flexible Cables are manufactured in AXON's production sites in Europe, America and Asia, using state-of-the-art manufacturing equipment.

AXON' specialises in FFC manufacturing ranging from wire drawing, plating and rolling of conductors to insulation, final cutting and shielding.

Conductor manufacturing

AXON' manufactures its own flat conductors. The main materials used are:

- Bare copper,

- Tin alloy plated copper,

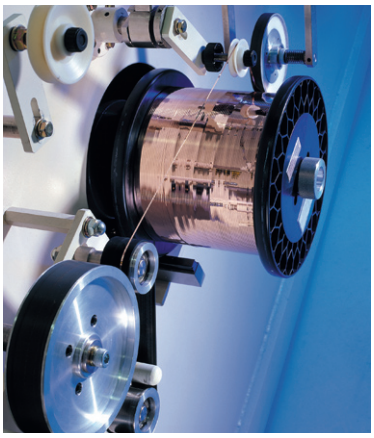
- Gold plated copper.

All these conductors are lead free.
AXON's expertise in conductors allows for a wide range of flat cables with different levels of flexibility.

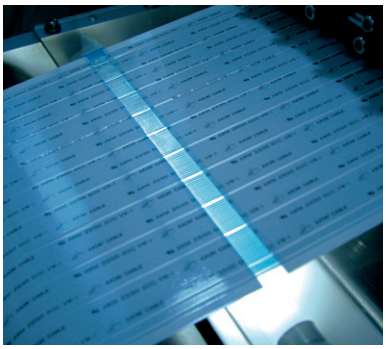
The modern manufacturing equipment allows perfect dimensional precision, electrical resistance control and production of long continuous lengths.

Cable insulation

AXON' insulates the conductors with laminated Polyester or Polyimide tapes. Depending on the requested type of connection - non-removable, removable or a mixture - the cables are prepared with reinforcements and/or stripping (See page 12 "connection schemes").



FLAT COPPER CONDUCTOR



FLAT CABLE INSULATION

FLAT CABLE WORKSHOP

Quality assurance

AXON' is accredited to:

- **ISO 9001,**
- **ISO TS 16949,**
- **ISO 14001,**
- **EN 9100,**
- **OHSAS 18001.**

AXON's continuous improvement plan called "SOLON" is based on the EFQM model (European Foundation for Quality Management).

In addition to in-line controls throughout the manufacturing area, AXON' applies "Statistical Process Control" methods (SPC) as well as standard problem solving and continuous improvement methods. TPM (Total Productive Maintenance) is applied in order to improve productivity.

AXON' conforms to the latest RoHS European Directives and REACH regulation. Please consult our website for the latest information:
www.axon-cable.com/Customer Area/
RoHS and EU directives.

In addition, AXON's products have been recorded in the IMDS database (International Material Data System) since 2003, in which the make-up of product is indicated.

Design, Research, Innovation and Development

At the company's headquarters, as well as in each country where AXON' has a subsidiary - Germany, Great Britain, USA, Latvia, Hungary, China, Mexico - engineering teams provide local technical support.

The Research and Development Department located in France concentrates on the following areas:

Metal technologies

- Metal plating of the conductors,
- Drawing - Laminating - Annealing.

Plastics technology

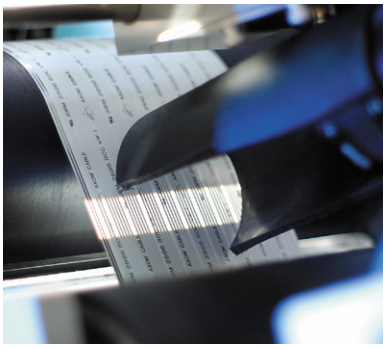
- Insulation - Jacketing,
- Moulding - Overmoulding.

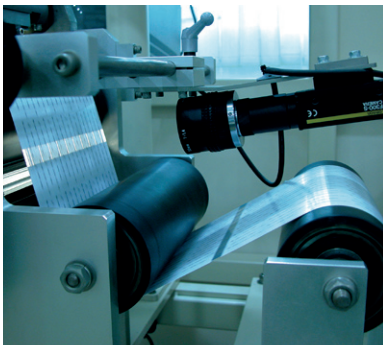
Electronics

- EMI/EMC,
- RF and high speed data.

Interconnection technology

- Soldering,
- Welding,
- Contact crimping.





IN-LINE CONTROLS

ENGINEERING DEPARTMENT

Connection

Connection with connectors

AXON' flat cables are designed for LIF (Low Insertion Force) or ZIF (Zero Insertion Force) connectors from most connector manufacturers (for example: KYOCERA ELCO/FCI/ HIROSE/JAE/JST/MOLEX/TYCO/...).

Connection with crimped contacts

1.27 and 2.54 mm pitch FFC's can be terminated with crimped contacts or provided ready for crimping.

Connection with soldering

Reflow soldering is suited for termination of flat cables to printed circuit boards.

AXON' uses a semi-automatic process for hot bar soldering to manufacture FFC/PCB connections. The two parts are assembled using a thermode.

› Recommended PCB configuration

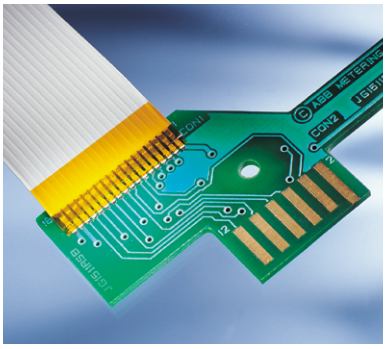
- Tin thickness on the soldering pads:
  5 to 8 µm for 0.5 and 0.8 mm pitch FFC.
  10 to 15 µm for 1.00 and 2.54 mm pitch FFC.
- Tinning material: tin-copper alloy.

› Possible FFC types

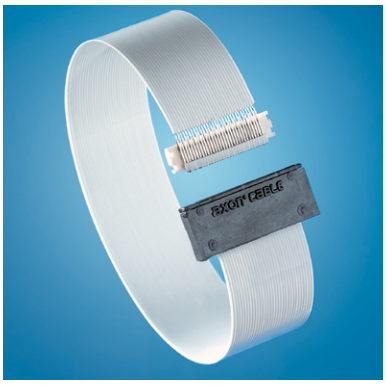
This process can be used for the following types of FFC:

- Standard, flexible (50 µm) or extra flexible (35 µm) conductors,
- Bus bar or stripped version, Polyimide insulation or reinforcement.

AXON' also uses these connection techniques to manufacture AXOLINK® FDC-Flat Display Connections made of Flat Flexible Cables and DF9 type connectors.

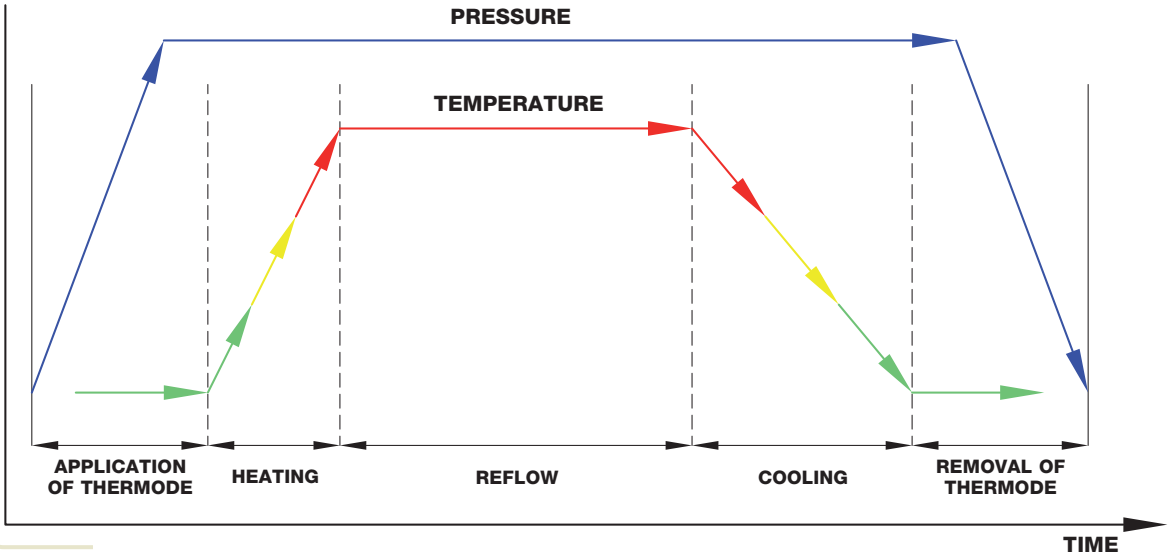


CONNECTION BY SOLDERING



FLAT DISPLAY CONNECTION

The hot bar soldering process



Shielding expertise

AXON' offers two types of shielded flat cables:

- Cables shielded with aluminium tape,
- Cables shielded by a conductive silver paint and a protective varnish.

AXON' is able to ground one or several conductors to the shield irrespective of the type of shielding: aluminium foil or conductive paint (same voltage level and EMI performance).

To characterise the shielding of flat or round cables, AXON' uses the "Transfer Impedance Z_T" parameter given in ohms/m. As this notion depends on the type of product, rather than on the application, it is better suited than the alternative notion of "shielding efficiency", given in dB, to define shield specifications accurately.

AXON' is equipped with comprehensive test benches to characterise transfer impedance of round and flat cables as well as terminated harnesses. The flat cables are generally measured using a microstrip or strip line.

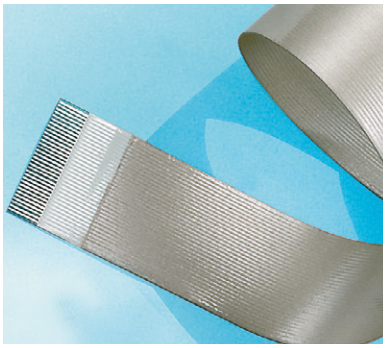
In order to propose the shielding solution best suited to each application, AXON' has compared the shielding resistance of cables shielded with aluminium foil to those shielded with conductive paint.

Measurement of the shield resistance

Shield efficiency is measured on a network analyser using the microstrip method.

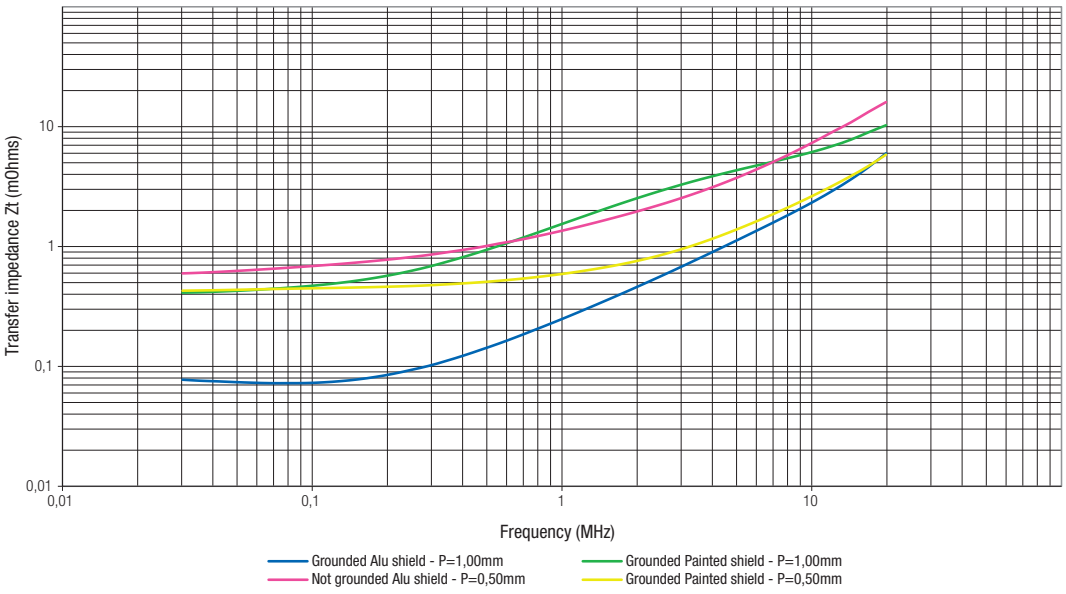
The connection between the flat cable and the coaxial cable of the network analyser is made possible with an interface PCB which links the flat cable's ZIF connectors to the coaxial connectors.

AXON's standard shielded FFC's are usually used for static applications. For dynamic applications, please contact us for more details.



SHIELDING WITH CONDUCTIVE SILVER PAINT

MICROSTRIP INJECTION TEST BENCH TO CONTROL TRANSFER IMPEDANCE



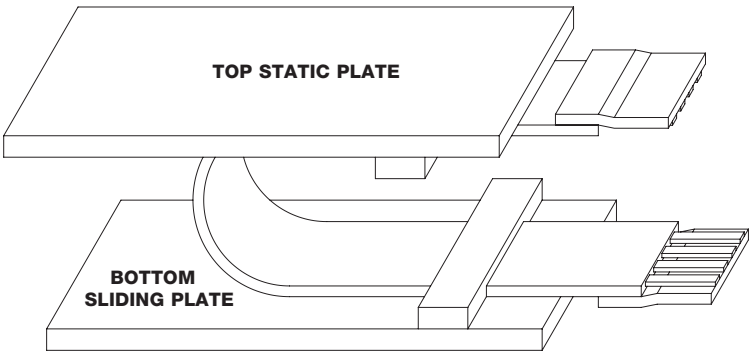
This graph shows the quality of shielding of four different cables in terms of transfer impedance. The lower the transfer impedance (Z_T) the more efficient the shielding.

Flex life

The flex life of AXON' FFC's depends on the choice of conductor/ insulation tape combination.

To meet the different requirements of flex life in dynamic applications, AXON' offers a range of FFC's to withstand an increasing number of flex cycles. The following table summarises flex tests which have been carried out on a 1.00 mm pitch FFC sample with a bend radius of 10 mm.

The sample is fitted between two plates. The bottom plate moves and the top one remains still. The cycle is repeated until the first conductor breaks.



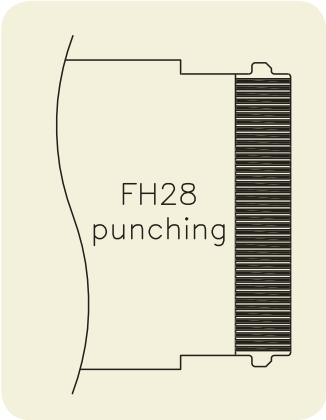
FLEX LIFE TEST

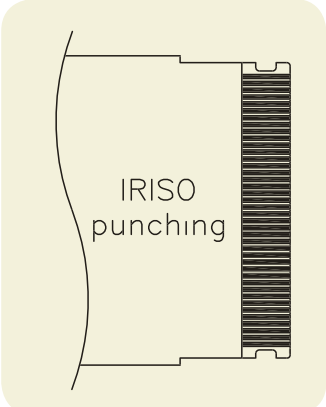
Type of FFC	Conductor thickness µm	Type of tape	Minimum number of cycles bend radius 10 mm
Standard version	50	K	1 000
Standard version	100	S	10 000
Standard version	100	L	10 000
Standard version (2.54 mm pitch only)	76	S	150 000
Flexible version	50	S	1 500 000
Extra-flexible version	35	E	2 500 000
Ultra-flexible version	25	E	more than 70 000 000

Punching

AXON' offers punched Flat Flexible Cables for certain types of connectors (For example: Hirose FH28, FH41, AVX 6288 Serie, Iriso, ZIF). Punching facilitates:

- positionning of the cable in the equipment,
- polarisation.





Our punching process is camera-driven for the highest precision.
We can develop specific punching to your needs.

Gold plated Flat Flexible Cables

AXON' offers flat cables with a fine gold coating over nickel on the stripped ends. Gold coating guarantees the absence of tin whiskers. *Whiskers are filaments or knots which can grow from metal such as tin after several months, with the risk of producing short circuits between fine pitch conductors.* AXON' can offer stripped gold plated flat cables in different pitches compatible with a large range of gold contact connectors.

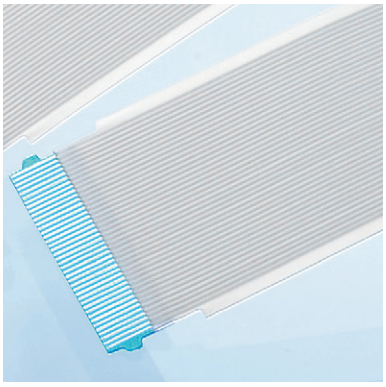
These gold plated cables have been designed for board to board interconnections in miniaturised electronic products, which require fine pitch flat cables.
Gold Plated stripped ends are coated with:

- nickel, 0.3µm min.
- and gold, 0.05µm min.

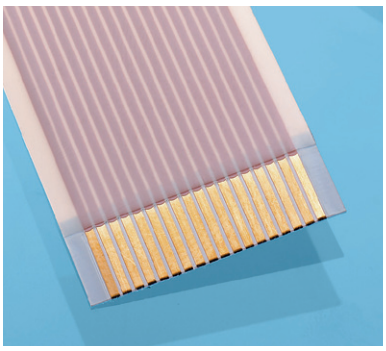
The nickel coating is a barrier to avoid the migration of gold into the copper. It also improves the protection of the conductors against corrosion.

Thanks to a flexible manufacturing process, AXON' can offer different thicknesses of nickel and gold plating depending on the application.

AXON' gold plated cables successfully withstand salt spray testing.



PUNCHED CABLE



GOLD PLATING AT EXPOSED ENDS