

## INDEX

### 1.0 SCOPE

### 2.0 APPLICABLE DOCUMENTS

### 3.0 COMPONENTS

### 4.0 APPLICATION TOOLS

### 5.0 CONTROL PARAMETERS

#### 5.1 VISUAL EXAMINATION

#### 5.2 CONTROL DIMENSIONS

#### 5.3 WIRE TERMINATION INTO THE IDC SLOT

#### 5.4 ACCEPTANCE CRITERIA OF THE WIRES INTO THE IDC SLOT

#### 5.5 ACCEPTANCE CRITERIA FOR COVER CLOSING OPERATION

#### 5.6 ACCEPTANCE CRITERIA FOR WIRES CUT-OFF

#### 5.7 ACCEPTANCE CRITERIA FOR POLARIZATION CUT-OFF

### 6.0 INSPECTION OF THE WIRE STRANDS INTO IDC SLOTS

### 7.0 APPLICABLE WIRES

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**1. SCOPE:**

**1.1** This specification covers the requirement for applications of Mono-Shape Mark II - 5mm Pitch I.D.C Connectors. These requirements are applicable to TE Connectivity connectors when terminated by TE Connectivity Application tools and machines. The point 5 of this document defines in detail which are the control parameters to be verified on the IDC harness. Harnesses manufactured with these connectors family are used on appliance equipment.

**2.0 APPLICABLE DOCUMENTS**

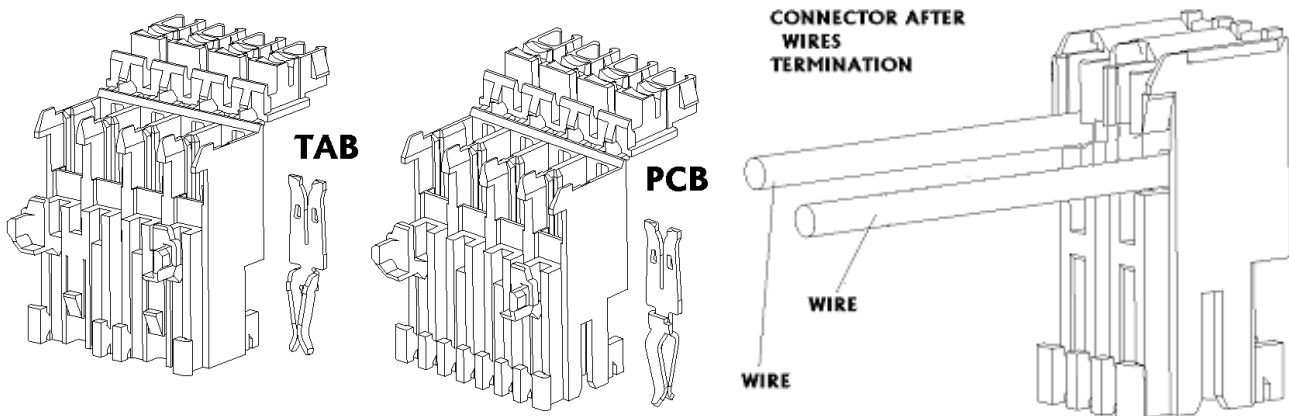
**2.1** The following documents have to be considered as integral part of this specification:  
 TE Product Drawings (284471 and 284482)  
 Product Spec. 108-20213 and 108-20214  
 TE Harnesses Machine technical specification.

**3.0 COMPONENTS**

The list below is referred to IDC connectors assembly used to manufacture the IDC harness

description	PN's
From 1 to 10 pos. IDC connector 5.00 mm pitch for TAB RAST 5 applications	From 284471 to 284480
From 2 to 12 pos. IDC connector 5.00 mm pitch for PCB	From 284482 to 284492

Wires for these components have to be applied also in accordance with the limits defined on product spec. 108-20213 and 108-20214.



this image is showing a typical product configurations (for reference only).

#### 4.0 APPLICATION TOOLS

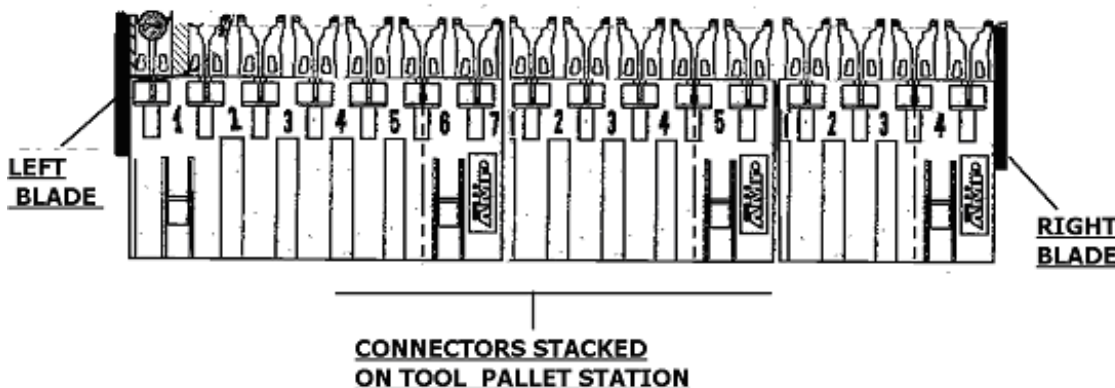
The Application tools used to apply the IDC connectors on proper wires to make the harness shall be able to guarantee the requirements of this specification. TE application tools are capable to process the product with a fully automatic production cycle with the following sequence :

- to load and feed connectors in the right configuration needed to produce the relevant harness
- to load the wire with the right section (in a range from 0.5 to 1.5 mm<sup>2</sup> -(for special application wire sect. of 0.35 is allowed previous TE Engineering Approval ),
- to make the wire termination on the IDC Contact (one by one or multiple way termination is possible)
- to fix the cover on to the housing,
- to cut the polarization: product could be specialized using a polarization keys system according to RAST 5 rules,
- to make a complete electrical continuity check.

#### 4.1 WIRE INSERTION OPERATION – DETAIL WHEN TOOL OPERATE ON EXTERNAL WAYS OF STACKED CONNECTORS

For a reliable IDC termination, the insertion of the wires must be done using pliers, supports or similar features to contrast the connectors during the wire termination, the pliers must act on the two side of the connector .(see Fig. 1).

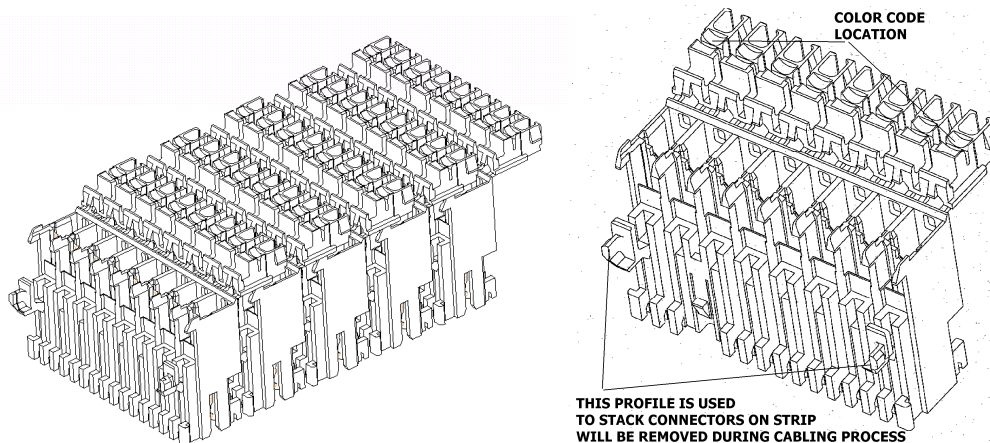
**FIG.1**



## 5.0 CONTROL PARAMETERS

### 5.1 VISUAL EXAMINATION

Shipped connectors, supplied in strip on tray (Fig.2) must be positioned in the connector loading station in the right position looking at the number of position and configuration. A color code stripe, located on the cover as shown on attached Fig.2, provide to help the operator to verify if the connector strip is a PCB or a TAB or a BRIDGE version. See relevant product drawing, document number 284482 and 284471 for color coding.



**Fig.2 Connectors strip as shipped**

### 5.2 AUTOMATIC CONTROL

A Computer station with a proper software shall provide to acquire data to manage the cable specialization, like connector components, electrical layout of the connection, wire length of each connection point and polarization cut-off. In any case, when the production of a harness starts, at least the first one produced must be measured and checked, in order to verify the correct wire length from one termination point to the other and the correct polarization cut-off.

### 5.3 WIRE TERMINATION INTO THE IDC SLOT

A “V” shaped slot in the contact (item 1 on attached sketch) provides the electrical connection throughout the displacement of the wire insulation material (IDC technique see Fig. 3 Page 5).

The termination made by Fully automatic TE Tooling machine are 100% checked during the cabling process to verify the electrical continuity.

In any case a periodical visual examination of the product shall be done to verify:

- 1- Wire insertion depth . (Dimension of the wire referred to the Connector as per Fig. 3 Page 5)
- 2- Cover closed in the correct position (see Fig.5 and Fig.6 Page 6)
- 3- No physical damage (Connector cracks, peeled wire and so on)
- 4- Wire cut-off
- 5- Contact position in the Housing after termination. Wire termination is correct when the requirements shown in Fig.4 on Page 5 are met.

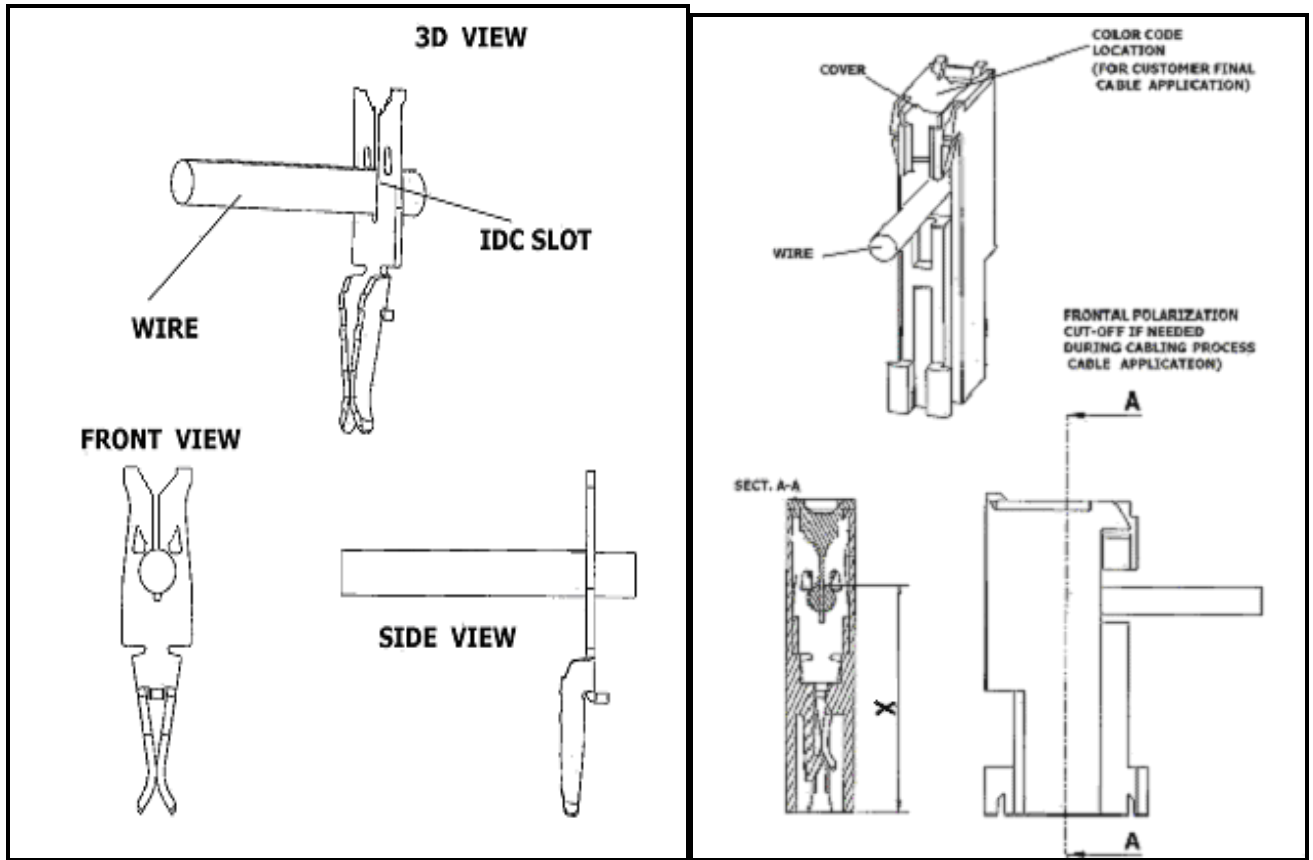


Fig.3

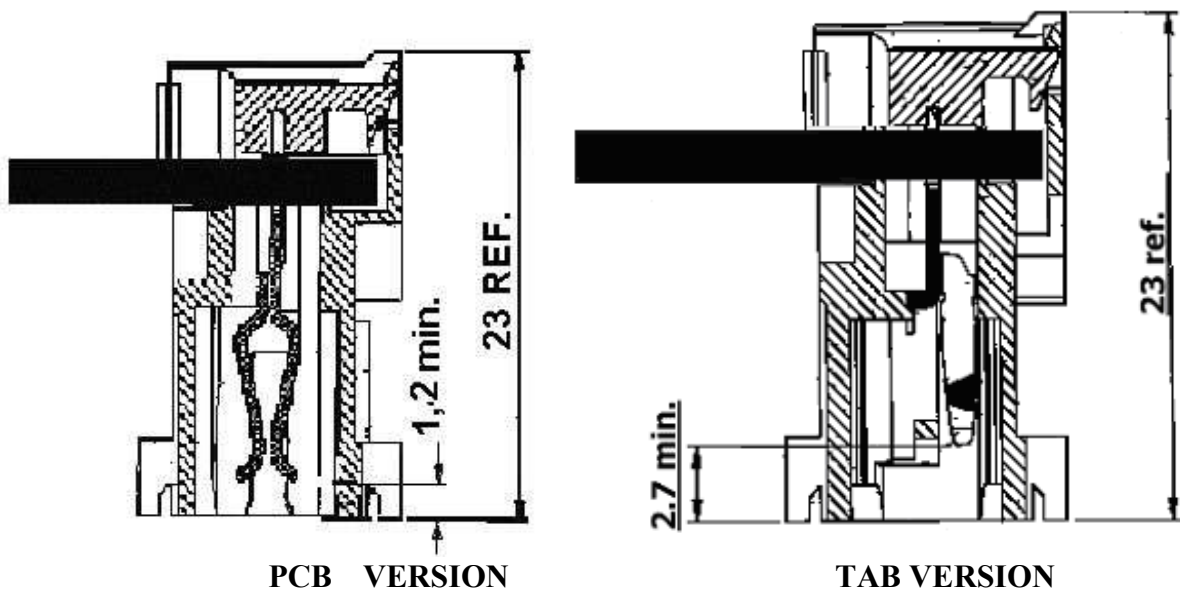


Fig. 4

#### 5.4 ACCEPTANCE CRITERIA OF THE WIRE INTO THE IDC SLOT

5.4.1 For the wire in a range from 0.5 to 1.5 mm<sup>2</sup> of section, the wire position (dim. X in Fig.3 pag.5) should be checked before cover closing operation; wire position dimension must be according to following table:

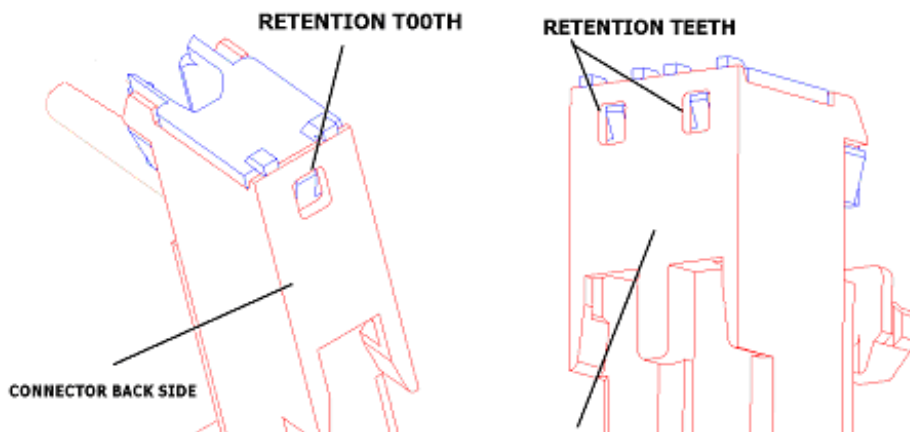
wire section (mm <sup>2</sup> )	X Min (mm)	X Max (mm)
From 0.5 to 1.5	18.2	18.6

#### 5.5 ACCEPTANCE CRITERIA FOR COVER CLOSING OPERATION.

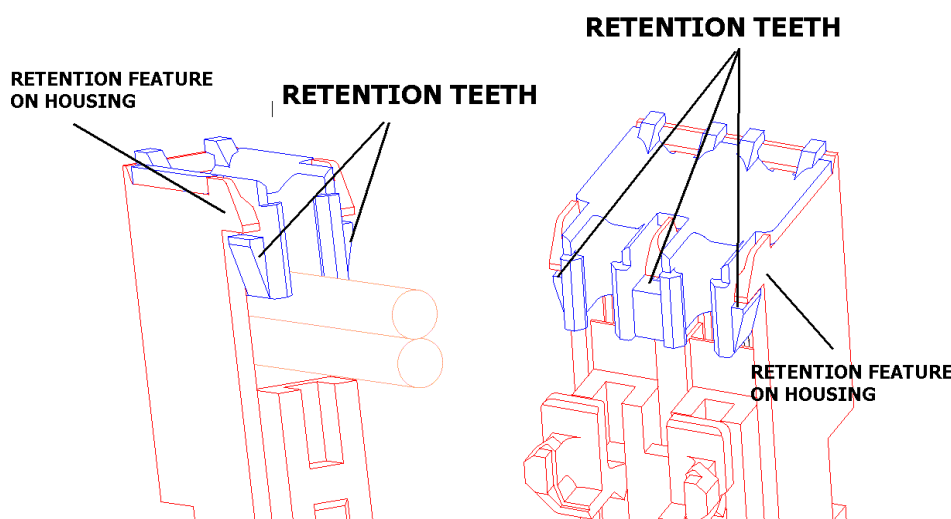
This operation is done by a station of the machine during the cabling process.

To check the correct operation, a periodical visual inspection shall be done to verify that:

- a) The cover in operating position is securely hooked up to the connector housing and the retention tooth/teeth on the back (Fig.5) is released in their seat as shown.
- b) The frontal retention teeth is released in the proper seats as shown on Fig.6



**Fig.5**



**Fig.6**

- c) The wire insertion stop is provided by a thin plastic wall in the front of the connector (see Fig.7). A deformation of this geometry is acceptable and should be more evident using a big wires size. (see attached photo 1). This deformation/incision is also visible on the wire PVC insulator after the wire termination as shown also in the photos 4 and 5. It's also visible on the opposite side of the wire due to Cover geometry and relevant interference with the wire PVC as shown in the photos 2-3. Those visual deformation are acceptable because do not affect the mechanical and electrical performances of the crimped connector .

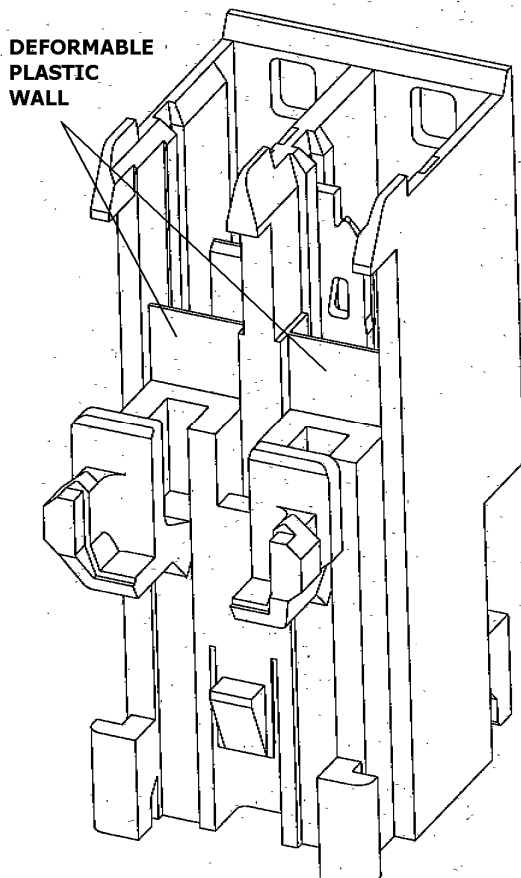


Fig.7

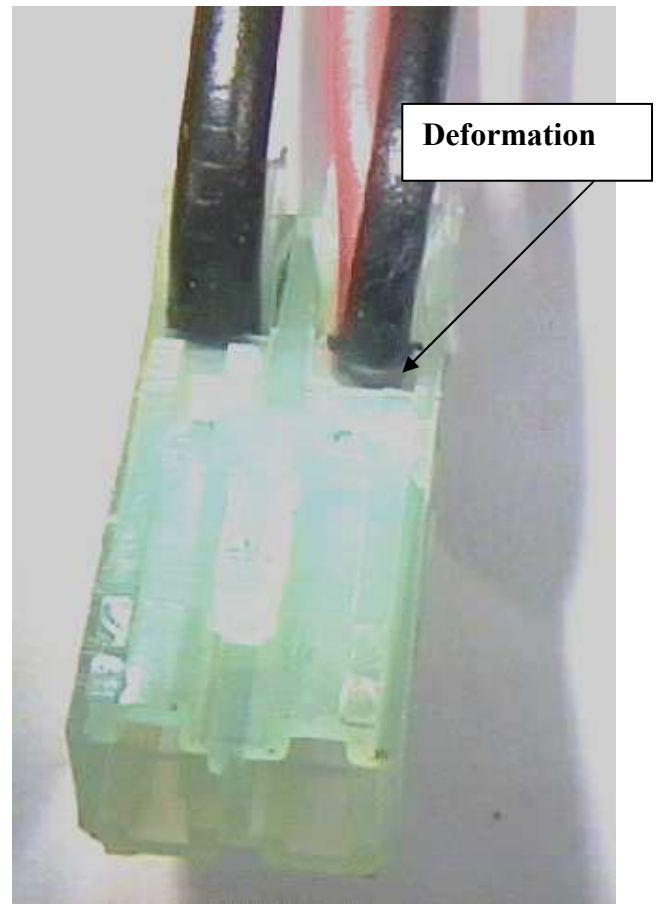
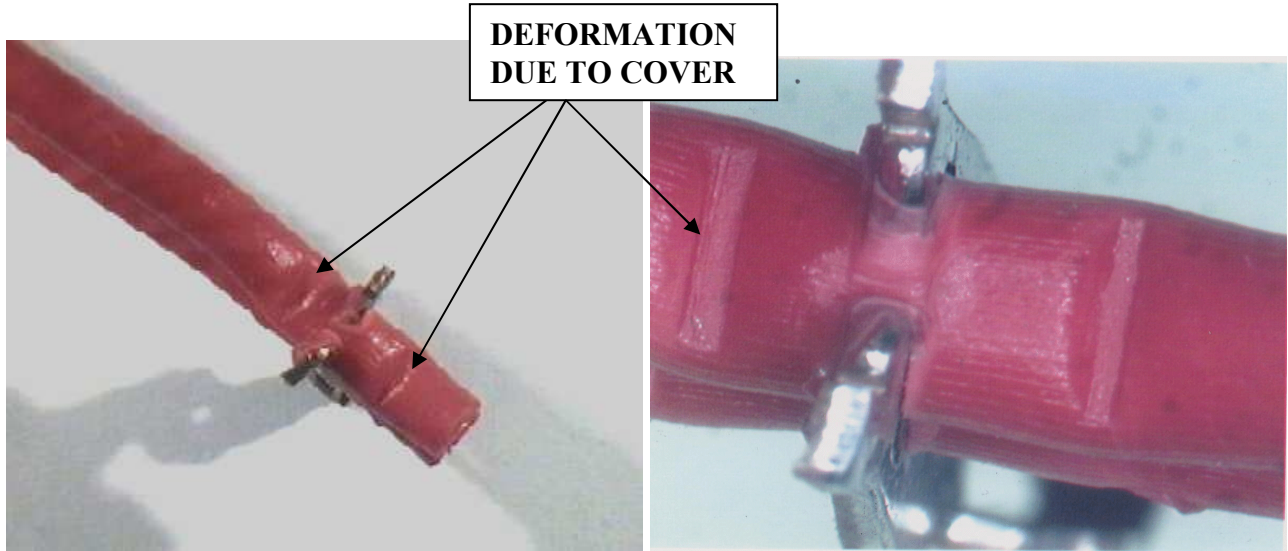
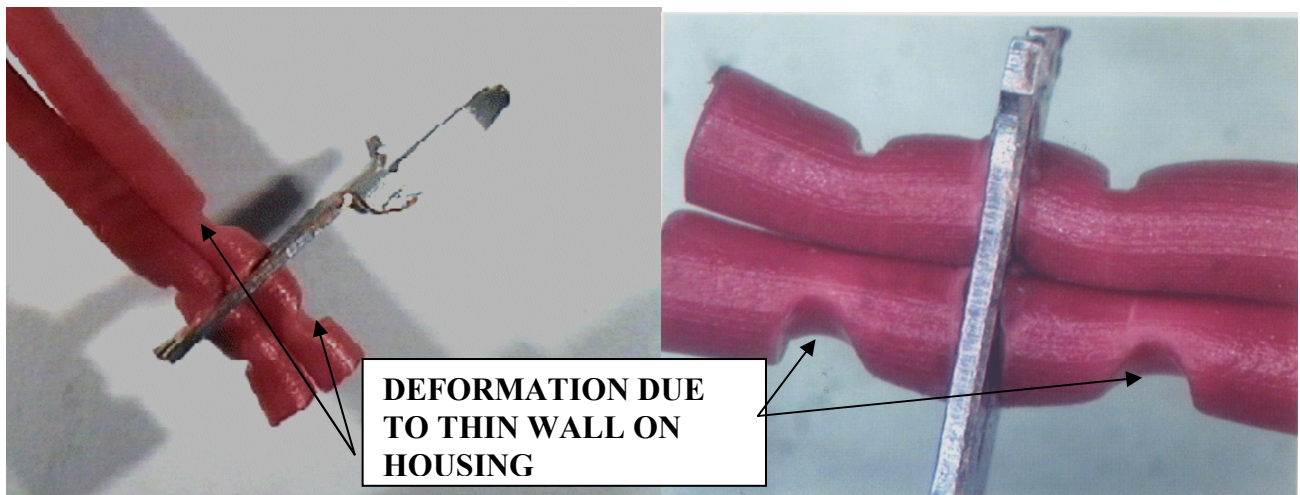


Photo 1



Photos 2 & 3 (Incision on PVC wire due do Cover Interference).



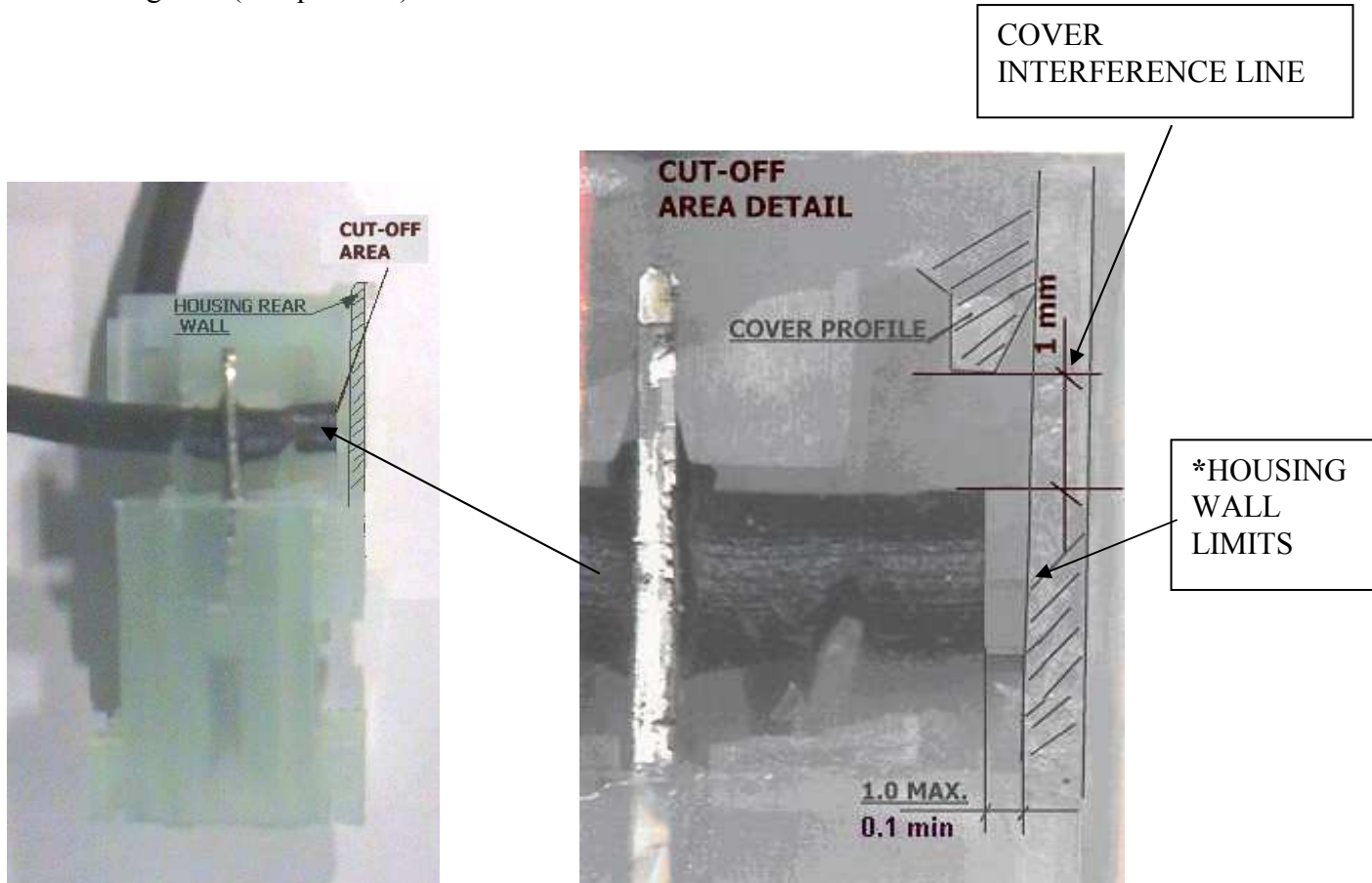
Photos 4 & 5 (Incision on PVC wire due do Thin Plastic Wall and Cover Interference).



### 5.6 ACCEPTANCE CRITERIA FOR WIRES CUT-OFF

A cutting tool provides to cut the surplus of wire before the termination.

The wire cut-off must be clear and perpendicular to the wire axe and the wire must not touch the rear housing wall ( see photo 6 ) .



**Photo 6**

A non clear cut-off could cause an excess of wire which could interfere with the cover or with the rear wall of the housing, avoiding a correct cover fastening and a good IDC connection. (see Photo 6 for ref.).

\*As shown on Photo 6 a 1,0 mm max. and 0,1 min. of clearance between wire cut-off and housing wall must be respected and, at the same time, the wire must not touch the housing wall.

**5.7 ACCEPTANCE CRITERIA FOR OVERALL DIMENSION AFTER WIRE TERMINATION**  
**TERMINATION**

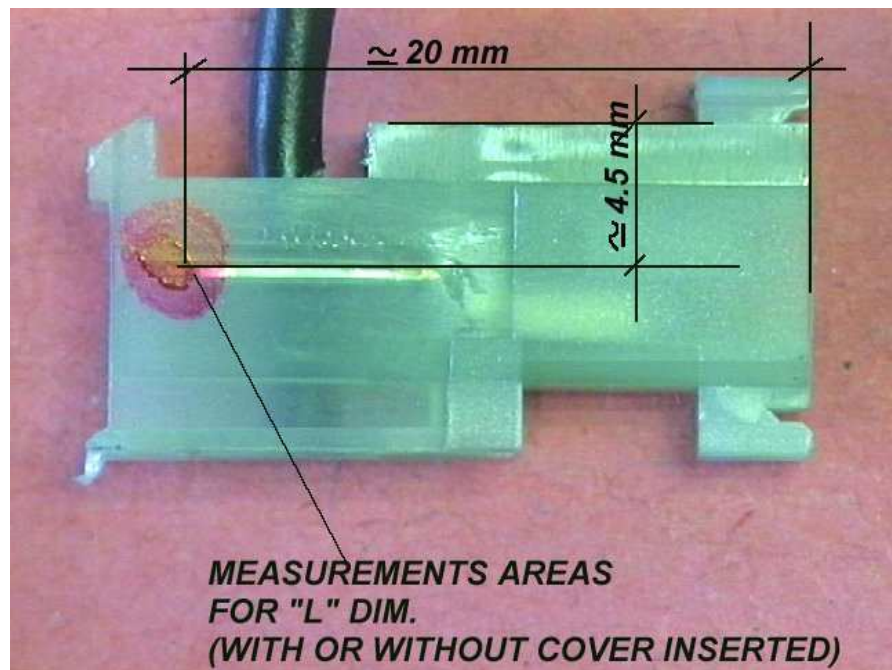
During the wire termination the Machine Design provide to contrast and support the contact. On the first and last way if contacts are not properly supported during termination (see Par. 4.2 for detail), it's possible to have a poor insulation displacement of the terminated wire and, consequently, an unstable electrical connection.

Figure 8 shows the area where the total length of the crimped connector ( Dim. L ) has to be inspected. When lower wire size is used (0.5 mm<sup>2</sup>) the max. dimension allowed cannot exceed of 0.1 mm the dim. "L" indicated on Fig. 10 Page 11 and reported on the following TABLE "A" and 0.3 mm for the maximum wire size(1.5 mm<sup>2</sup>) .

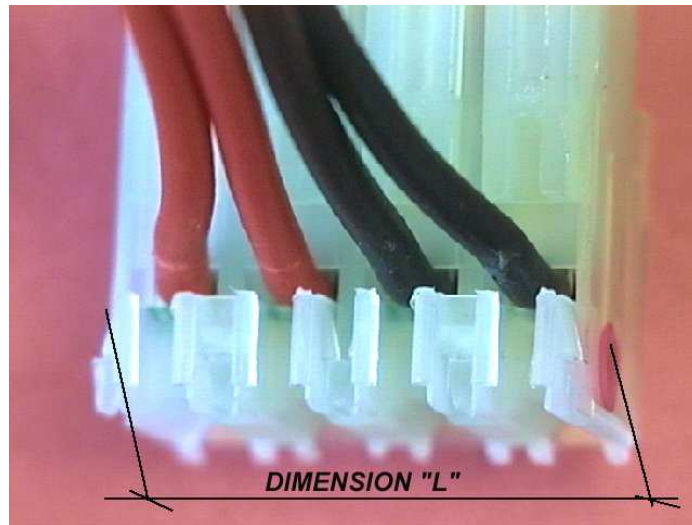
Especially when 1.5mm<sup>2</sup> wire size is applied on external ways, a dimension exceeding values in Table A indicates a non correct contrast during the termination causing abnormal contact displacement and consequently a bad wire insulation displacement. Dimensional check shall be done after cover insertion.

Table A (nominal Dim.)

No. OF POS	DIM. "L"
1	5.0
2	10.0
3	15.0
4	20.0
5	25.0
6	30.0
7	35.0
8	40.0
9	45.0
10	50.0
11	55.0
12	60.0



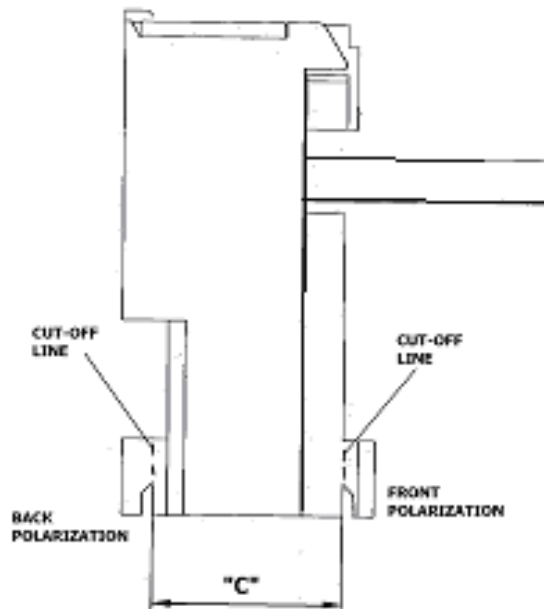
*Fig. 8*



**FIG.10**

**5.8 ACCEPTANCE CRITERIA FOR POLARIZATION CUT-OFF**

The polarization cut-off is used to specialize the connector according to RAST 5 Norm. The Fig. 11 shows detail of a typical Polarization. After the polarization cut-off, the dim "C" must be  $9^{+0.5/-0.2}$  mm. Sinking, burrs or flash on relevant surfaces due to cut-off operation, are accepted if not affecting the tolerance limits of "C" dimension.



**FIG.11**

## 5.9 INSPECTION OF THE WIRE STRANDS INTO IDC SLOTS

Inspection of the wire strands into the IDC slots, is a means to be confident that production we are manufacturing will fully meet the requirements of a good connection in terms of electro-mechanical performances.

This control should be made each time that “external factors” occur on the product or on the application tools or on the IDC harness process.

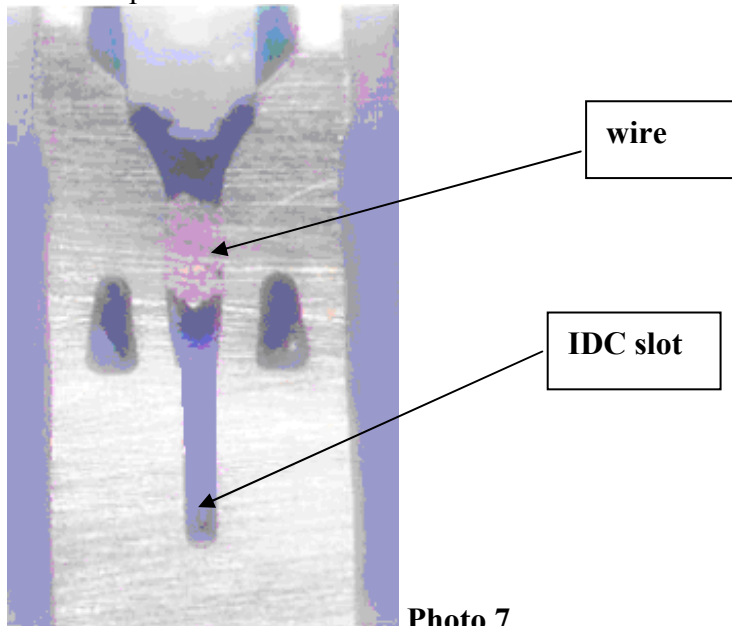
For external factors we mean those variables not mentioned in the specifications, but that could be added by the operators such as, bad use of the application tools, environment, dust etc.

### How to inspect wire strands

The method we suggest for examining the strands into their own IDC slots, is well known as Cross section. method

The method is destructive of the samples used for the exam and consists in preparing a test connector sample straining cold resin in a special plastic shell ( in which the connector sample has been properly fixed ) using a resin added with a hardening component ( max temp. increasing during hardening process 40°C e.g. . resin type CYBA- GEIGY “ ARALDIT D + HY 956 ) . When the resin is completely hardened ( it takes about six hours ) it's possible make cross section and polishing the surface to be examined.

An example of cross section realized using an IDC connector with this technique is shown on attached photo 7.



ACCEPTANCE CRITERIA of the WIRE STRANDS into the IDC SLOT (*Cross section. Exams*)

The attached photo “A” shows a typical cross section of a correct termination. As we can see the wire strands are compressed in to the V slot of the IDC contact and more or less the 40% of the strands are in touch with the slot blade and the PVC is separate from the copper wire in the slot. This situation reflect a good and stable electrical connection. The photo “B” is the opposite situation; the wire strands are not enough compressed and not well in touch with the slot blade. The wire is not completely inserted into the slot and the PVC separation is incomplete. This situation reflect a non stable and a poor electrical connection.

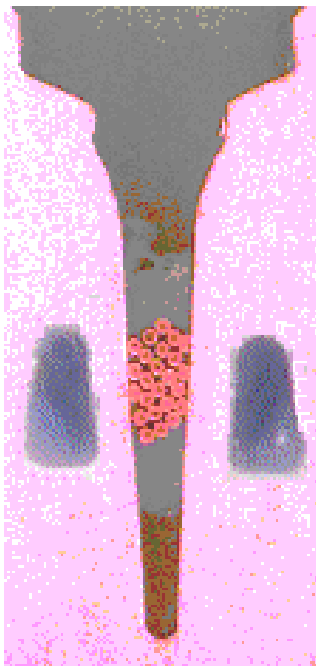


Photo A

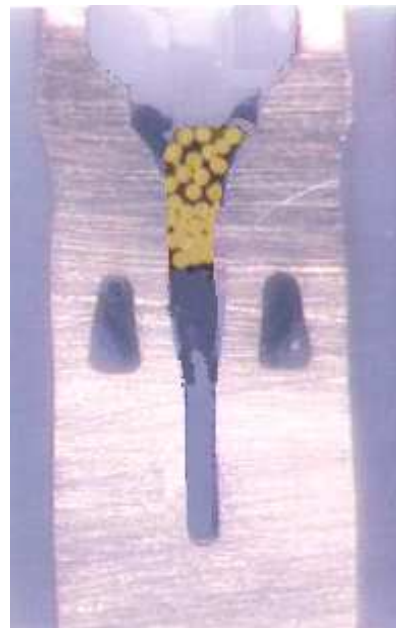


Photo B

**6.0 APPLICABLE WIRES**

Following listed are TE single-pole wire types suitable for Mono Shape Products termination in order to satisfy product performances.

**6.1 Wire Insulation material**

Shore hardness for Insulation Material is requested to be **A92** tolerance +5 and -3

**6.2 Conductor requirements from 0.5 to 1.5 mm<sup>2</sup>**

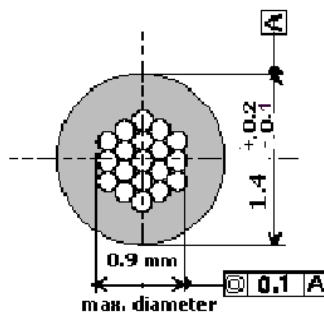
*(0.35 wire sect. For special application see also par. 4.0)*

**Wire type (according to CEI 20-20/3 – 20/7):**

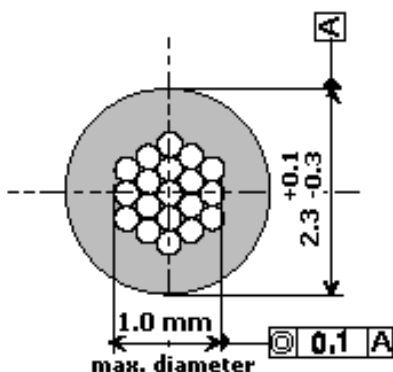
H 05 V-K, H 05 V2-K for section 1.0 - 0.75 and 0.5 mm<sup>2</sup>

H 07 V-K, H 07 V2-K for section of 1.5 mm<sup>2</sup>

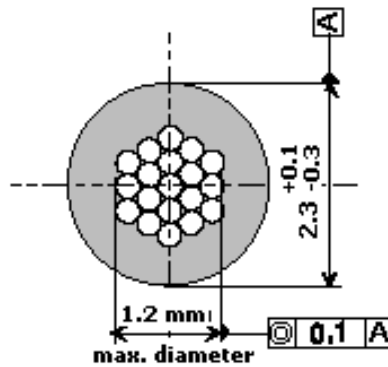
Stranded conductor of the wire suitable for a proper termination must be in according to following drawing requirements



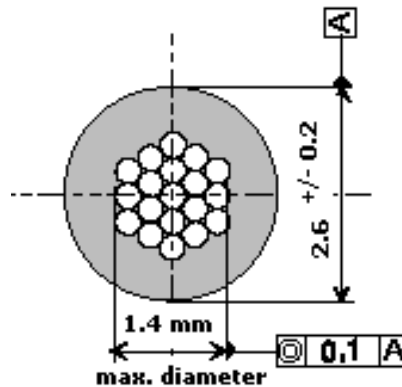
Multiple Strands (7x0.25 mm DIA. Or 11x0.20mm DIA). Wire range 0.35 mm<sup>2</sup>  
 Turning Length 12-20 mm  
 (Special Application see also par. 4)



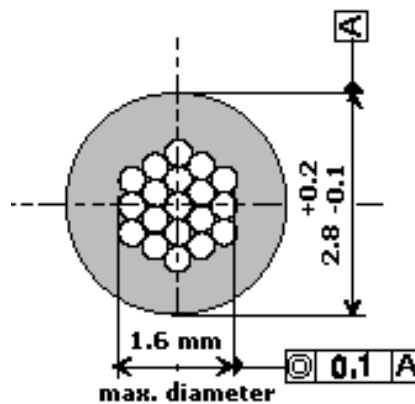
Multiple Strands (16x0.20 mm DIA. )  
 Wire range 0.5 mm<sup>2</sup>  
 Turning Length 20-30 mm



Multiple Strands (24x0.20mm DIA).  
 Wire range 0.75 mm<sup>2</sup>  
 Turning Length 20-30 mm



Multiple Strands. (32x0.20mm DIA).  
 Wire range 1.0 mm<sup>2</sup>  
 Turning Length 20-30 mm



Multiple Strands. (30x0.25mm DIA).  
 Wire range 1.5 mm<sup>2</sup>  
 Turning Length 20-30 mm

UL Cable 20-16 AWG Style 1015/CSA TEW can also be used on V0 connectors for special application.

Other type of wire shall not be used without the TE Engineering Department approval.