NECTOR M-line 5, 6, 7 positions
Pin and Socket connectors, machined contacts crimp & connector assembly procedure

NOTE

All dimensions are millimeters.
Figures and illustrations are for identification only and are not drawn to scale.

1 Introduction

This specification contains the regulations to crimp machined contacts used on NECTOR M-line Pin and Socket connectors

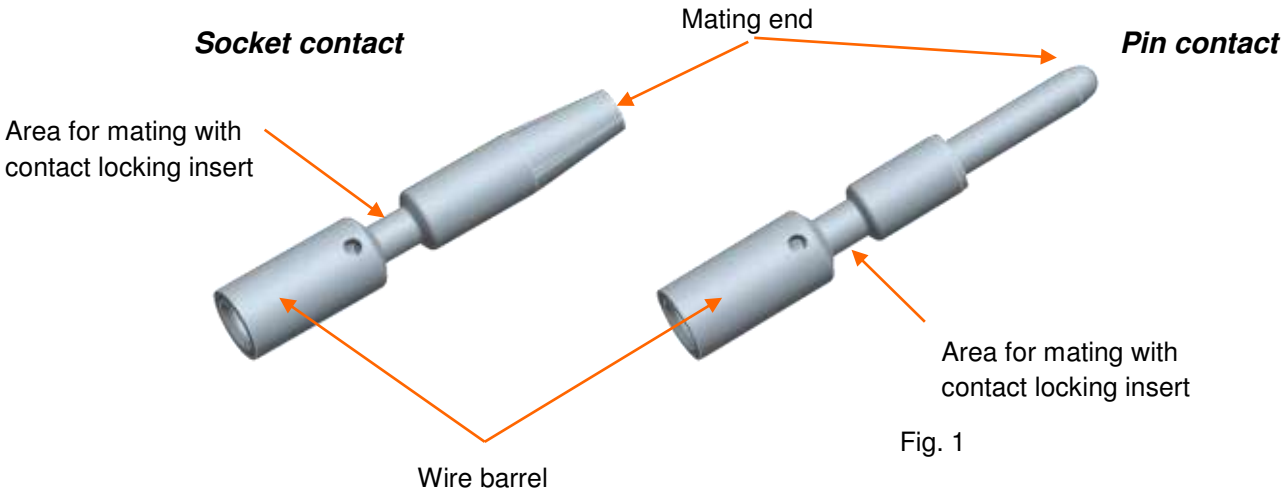


Fig. 1

TE Contact P/N	Description
293476-2	Pin contact for 1.5 mm² wire
1-293476-2	Pin contact for 2.5 mm² wire
293475-2	Socket contact for 1.5 mm² wire
1-293475-2	Socket contact for 2.5 mm² wire

2 Drawings

Customer Drawings for product part numbers will be available from the service network.

If there is a conflict between the information contained in the Customer Drawings and this specification or with any other technical documentation supplied, calls the Product Information Center.

3 Specifications

Design Objective 108-20324 provides expected product performance and test information.
Standard Norm for reference is IEC 61535: Installation couplers intended for permanent connection in fixed installations.

*Trademark
Indicates change

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4 Requirements

4.1 Storage

A. Ultraviolet Light
Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the contacts.

B. Shelf Life
The contacts should remain in the shipping containers until ready for use to prevent deformation to the contacts and/or damage to the housings. The contacts should be used on a first in, first out basis to avoid storage contamination that could adversely affect signal transmissions.

C. Chemical Exposure
Do not store contacts near any chemicals listed below, as they may cause stress corrosion cracking in the contacts:

Alkalies, Ammonia, Citrates, Phosphates Citrates, Sulfur Compounds, Amines, Carbonates, Nitrites, Sulfur Nitrites, Tartrates.

4.2 Materials
The pin and socket contacts are made of copper alloy with tin plating.

4.3 Wire Size and Preparation (see item 6 - connector assembly procedure - for more details)

The contacts will accept a wire size range from 1.5mm² to 2.5 mm² and have to be terminated to stranded wire
See Figure 2.

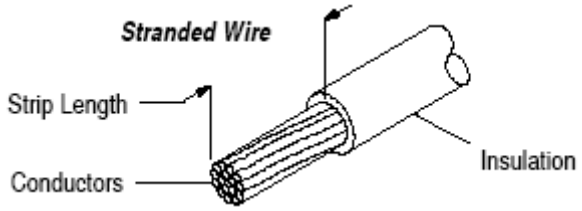


Fig. 2

The conductor section area and outer diameter of the wire must be in according to the terminal drawing.
The insulation must be cut uniform and torn off the conductor.
No remainders of the insulation are allowed on the stripped conductor; single strands of the conductor may neither be cut nor damaged nor pulled during stripping operation.
After pull off the insulation sleeve the single strands of the conductor may not split open. Separated single strands are not allowed.
The strands of the conductor are not allowed to be twisted.
If the stripped wire isn't crimped immediately, the stripped conductor end is to be protected against dirt splitting off of the single strands, for example by partial pull off the insulation sleeve.
Any protruding wire strands must not impede the mating and basic function of the contact.

4.4 Crimp contacts (hand tool AF8 P/N 601967-1; pneumatic tool WA27F P/N 2031846-1)

Choose wire size with the selector placed on the frame; selector position according to below table

For the hand tool: the handles must be fully opened when changing the positioner selector setting.

Wire size (mm²)	Wire selector (sel no.)
1.5	7
2.5	7

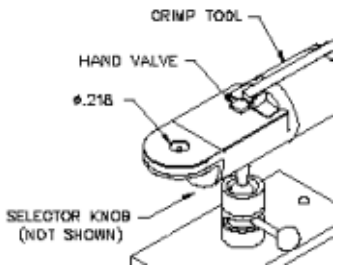
Align and insert the mating end of the contact into the indenter from the front of the tool until the contact bottoms.

For the hand tool:

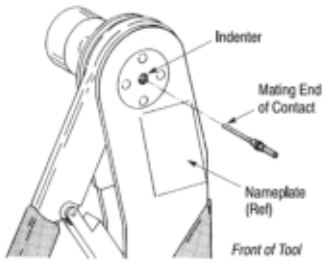
- The ratchet ensures proper crimping of the contacts.

- Once engaged, the ratchet will not release until the tool handles are fully closed.

Pneumatic tool



Hand tool



Insert the prepared wire into contact barrel, taking care not to bend or to damage the wire strands and then crimp

For Hand tool: while holding the wire in place, squeeze the tool handles until the ratchet releases. Allow the handles to open.

Remove the crimped contact from the tool.

4.5 Wire Crimp

The crimp height is the overriding quality characteristic of a crimp connection. The measurement allows a non destructive verification and a continuous production control.
The crimp height including its relevant tolerance ensures a sufficient compression of the conductor and an acceptable pull out force, irrespective of the tolerance of the crimp barrel and the cross sectional area tolerance of the conductor.

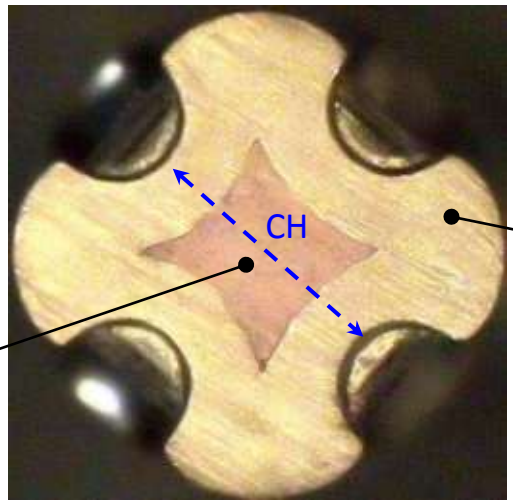
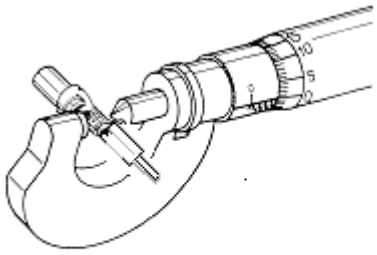


Fig. 3

Wire size [mm²]	Wire Barrel Crimp Height [mm] ± 0.05
1.5	1.80
2.5	1.80

Crimp measurements are to be carried out in the middle of the conductor crimp, using for example a crimp height micrometer.



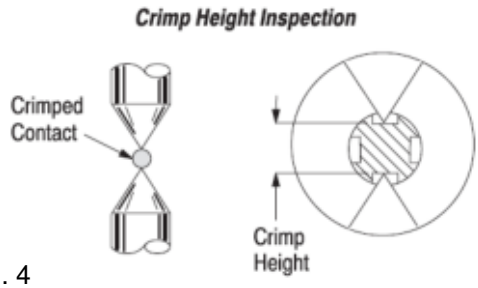


Fig. 4

The crimp height can also be measured in a microsection, but mechanical measurement takes precedence.
The crimp height has to be checked continual in the production.

For each batch or crimp tool or its settings, the crimp height has to be controlled.

4.6 Microsectioning

For evaluating the crimp quality achieved with the crimp tool, beginning with the first crimp, microsections cross the wire crimp have to be made regularly.
The microsection must be made in the middle of the conductor crimp.

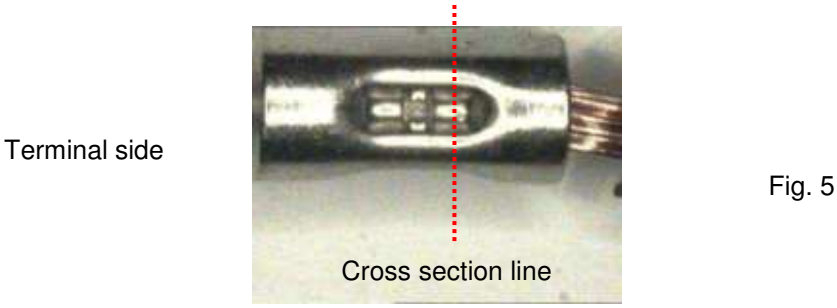


Fig. 5

To avoid any changes inside of the crimp the sample preferentially has to be infused into synthetic resin.
The cutting and grinding direction needs to be against the opening direction of the crimp.
For good judgeability after the cutting of the crimp it is necessary to grind and etch the surface.

4.7 Other requirements

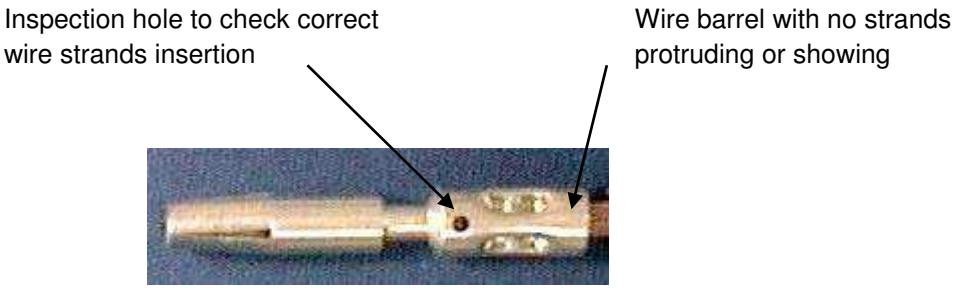


Fig. 6

(Socket ctc shown for ref only)

- Under no circumstances the insulation material may be within the wire crimp barrel;

- All existing wire strands are enclosed within the wire barrel. Any stranding outside the crimp barrel or broken strands outside the wire crimp are not permissible;

4.8 Wire Pull Out Forces

The measuring of the wire pull out forces from the wire crimp is carried out as a supporting manufacturing control.

Adjust tensile testing machine for head travel of 25.4mm/min

Wire size [mm²]	Crimp Tensile [N]; min values
1.5	200
2.5	400

5 Cables

The connector is designed for PVC and Low Smoke Halogen Free cables, within the specified cable outer diameters as listed below (paragraph 5.1 to 5.3) and in the relevant Customer Drawing.
Description of the cables tested for product qualification is report below. For other cables non PVC or non Low Smoke Halogen Free cables please contact TE Connectivity.

5.1 Cable RZ1-LSF-OH

- Conductor: flexible copper conductor class 5 CEI 20-29
- Insulation: XLPE
- Max operating temperature: 90°C
- Typical conductor resistance DC @ 20 °C [Ω/km]:
  - 1.5 mm²: 12.1
  - 2.5 mm²: 7.41

6G poles Cable / Wire size used	Insulation medium thickness [mm]	Approx cable outer diameter [mm]
6G / 1.5 mm²	0.55	9.6 – 9.8
6G / 2.5 mm²	0.60	11.0 – 11.2

5.2 Cable H05VV5-F

- Conductor: flexible copper conductor class 5 CEI 20-29
- Insulation: PVC
- Max operating temperature: 70°C

5G and 7G poles Cable / Wire size used	Insulation medium thickness [mm]	Approx cable outer diameter [mm]
5G / 1.5 mm²	0.9	9.6 – 11.1
5G / 2.5 mm²	0.9	11.8 – 13.3
7G / 1.5 mm²	0.8	11.8 – 13.3
7G / 2.5 mm²	0.8	13.9 – 15.4

5.3 Cable BMM

- Conductor: flexible copper conductor class 5
- Insulation: PVC
- Max conductor resistance DC @ 20 °C [Ω/km]:
  - 1.5 mm²: BMM5707: 13.6
    BMM530025: 13.3
  - 2.5 mm²: BMM57067: 7.41
    BMM550025: 8.0

5G poles Cable / Wire size used	Insulation medium thickness [mm]	Approx cable outer diameter [mm]
BMM5705 5G / 1.5 mm²	0.6	9.8 – 10.5
BMM530025 5G / 1.5 mm²	0.6	9.8 – 10.5
BMM57067 5G / 2.5 mm²	0.7	12.0 – 12.6
BMM550025 5G / 2.5 mm²	0.7	12.0 – 12.6

6 Connector assembly

6.1 Free hanging version – installation pin

Installation couplers are intended for connection and disconnection without load.
Dangerous compatibility between different installation systems is not automatically prevented by compliance with IEC 61535.
No dangerous interchangeability with systems specified in Standard sheets of IEC 60309, IEC 6032, IEC 60906 and with the declared national domestic plug and socket outlet system.
This installation system is not a replacement for national domestic plug and socket outlet system.

Assembly procedure:

a) Cable outside jacket – removal length (mm): 20.0 ± 0.5

b) Strip PE conductor for a length of 5.0mm; strip other conductors wires to 7.0mm and trim length at 5.0mm

c) Insert plastic nut P/N 293660-X (according to proper wire size) as shown

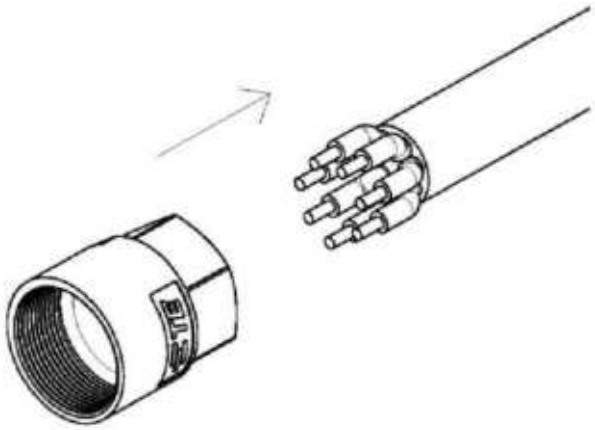


Fig. 7

d) crimp pin contacts according to proper wire size

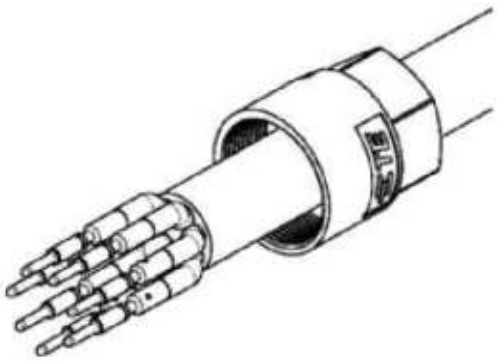


Fig. 8

e) align and insert contact locking P/N 293658-1 as shown in the next page

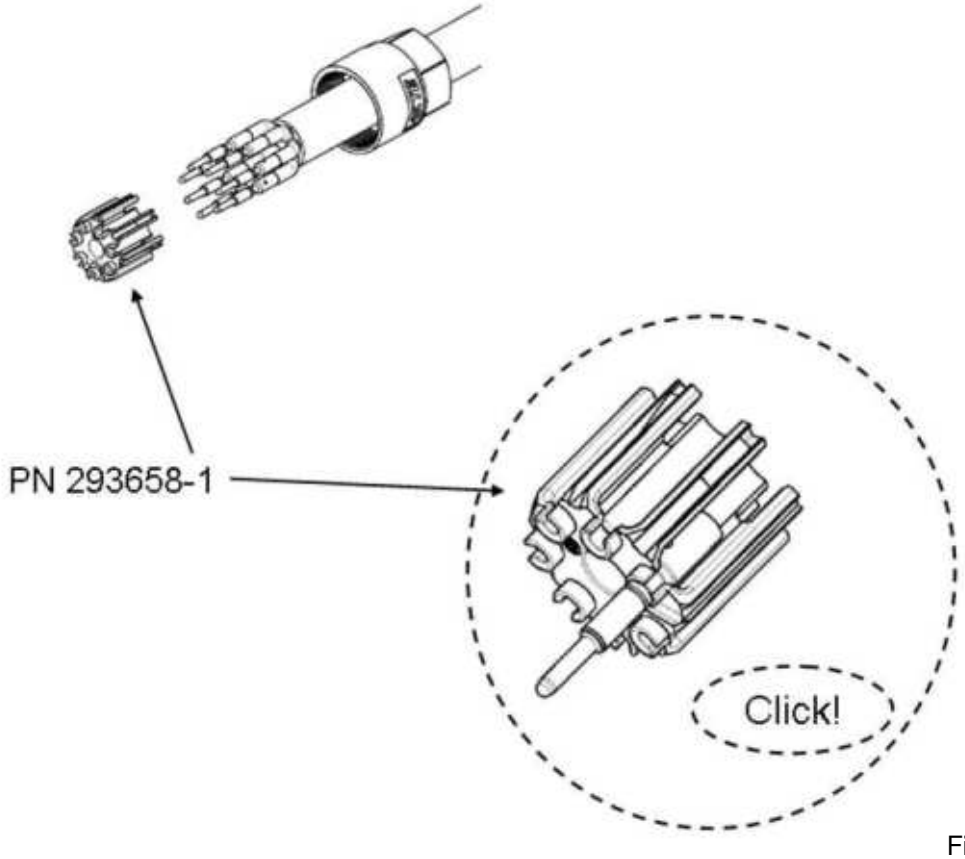


Fig. 9

f) Align and insert pin housing PN 293657-X as shown (see ways ID code on hsg)

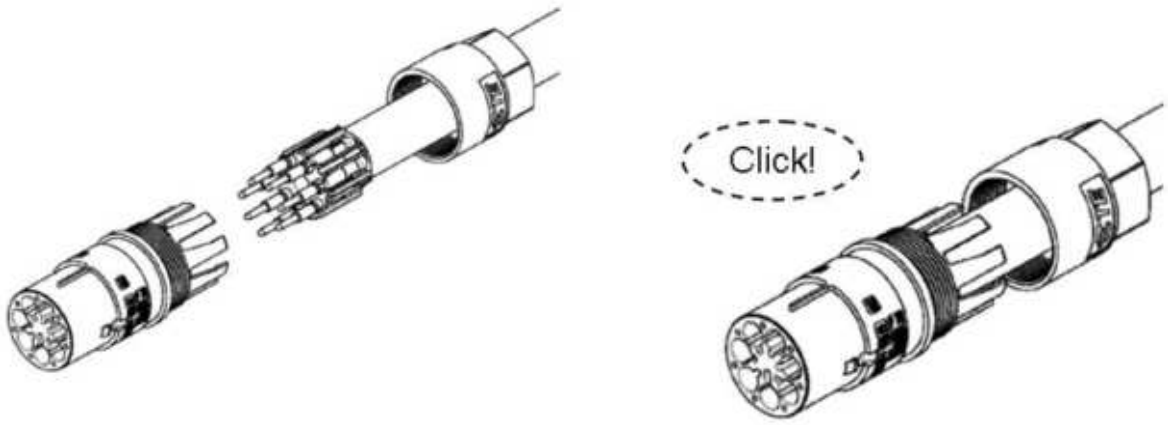


Fig. 10

g) Apply LOCTITE glue type “401” all around thread (qty: ~ 0.05g) before screwing the nut (torque 1.5Nm – 1.8Nm); screw plastic nut until it reaches its stop; the assembly is completed

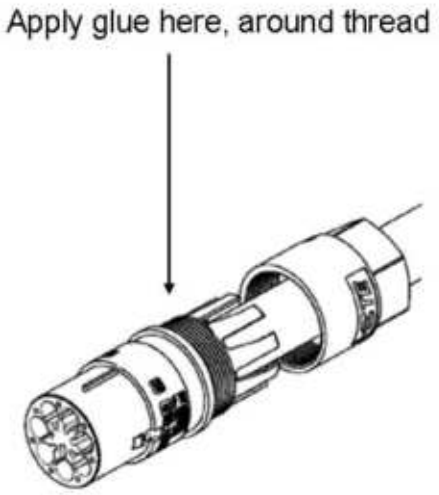


Fig. 11

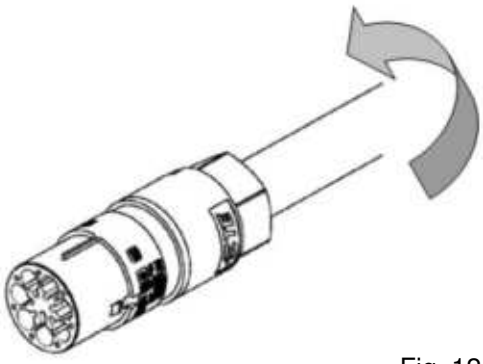


Fig. 12

6.2 Free hanging version – installation socket

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No dangerous interchangeability with systems specified in Standard sheets of IEC 60309, IEC 6032, IEC 60906 and with the declared national domestic plug and socket outlet system.
This installation system is not a replacement for national domestic plug and socket outlet system.

Assembly procedure:

a) Cable outside jacket – removal length (mm): 20.0 ± 0.5

b) Strip PE conductor for a length of 5.0mm; strip other conductors wires to 7.0mm and trim length at 5.0mm

c) Insert plastic nut P/N 293660-X (according to proper wire size) as shown

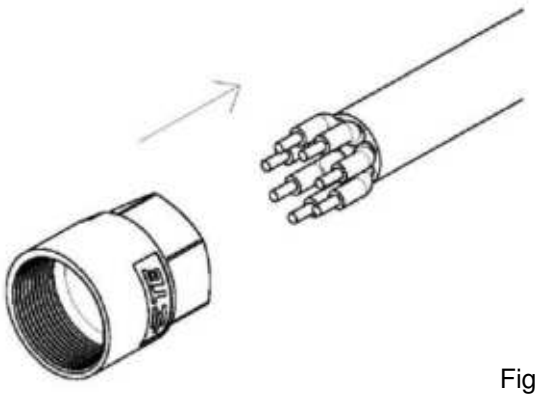


Fig. 13

d) Crimp socket contacts according to proper wire size

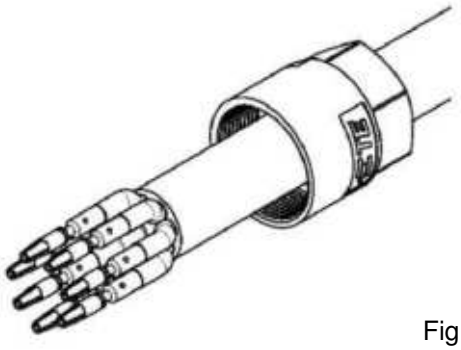


Fig. 14

e) Align and insert contact locking P/N 293658-1 as shown

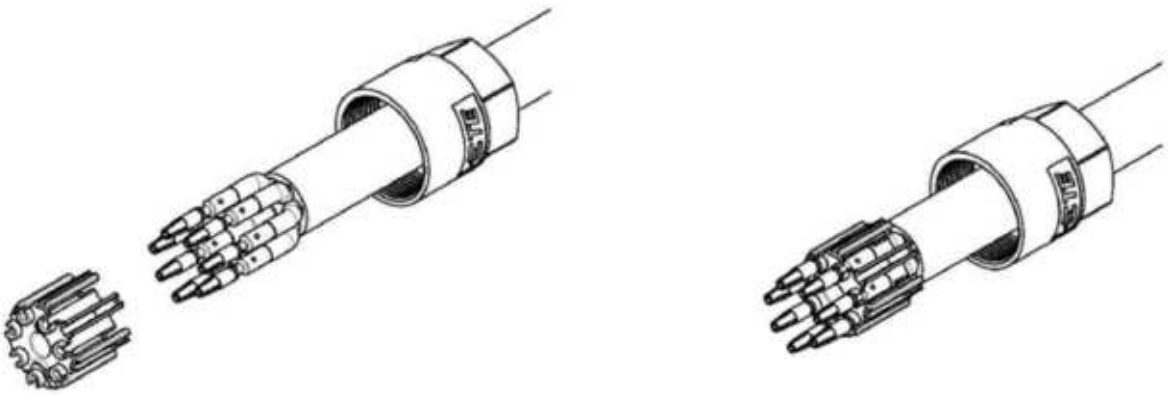


Fig. 15

f) align and insert socket housing 293656-X as shown (see ways ID code on hsg). Socket cap 293682-1 can be additionally assembled to get IP40 degree of protection

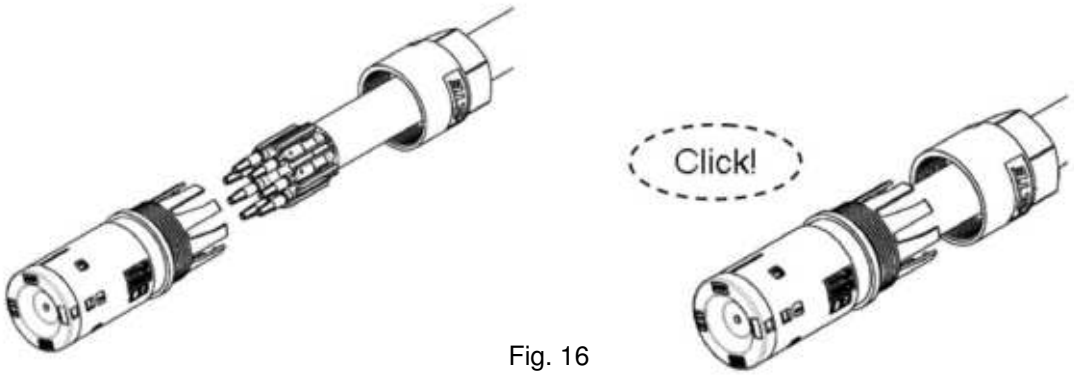


Fig. 16

g) Apply LOCTITE glue type “401” all around thread (qty: ~ 0.05g) before screwing the nut; screw plastic nut until it reaches its stop (torque 1.5Nm – 1.8Nm); the assembly is completed

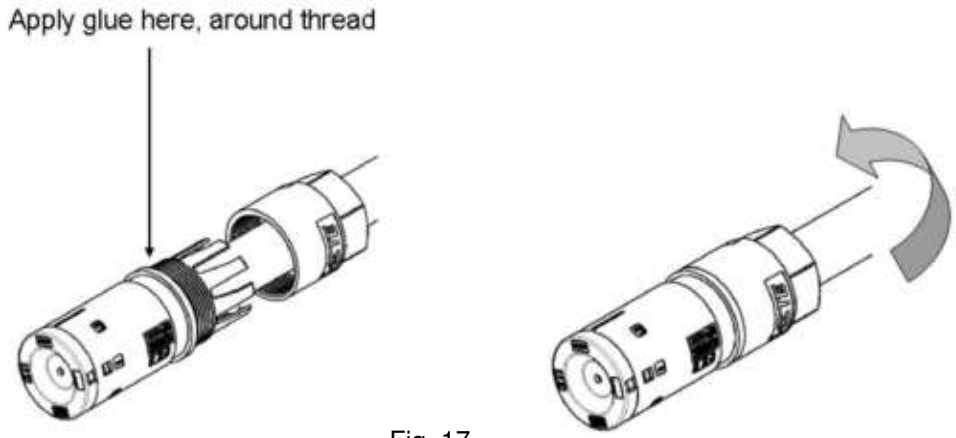


Fig. 17

6.3 Panel mount version – installation pin

Installation couplers are intended for connection and disconnection without load.
Dangerous compatibility between different installation systems is not automatically prevented by compliance with IEC 61535.
No dangerous interchangeability with systems specified in Standard sheets of IEC 60309, IEC 6032, IEC 60906 and with the declared national domestic plug and socket outlet system.
This installation system is not a replacement for national domestic plug and socket outlet system.

Assembly procedure:

a) Cable outside jacket – removal length (mm): 20.0 ± 0.5

b) Strip PE conductor for a length of 5.0mm, strip other conductors wires to 7.0mm and trim length at 5.0mm

c) crimp pin contacts according to proper wire size

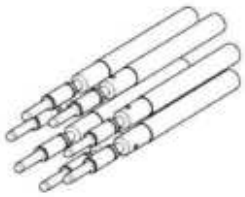


Fig. 18

d) Align and insert contact locking P/N 293658-1 as shown

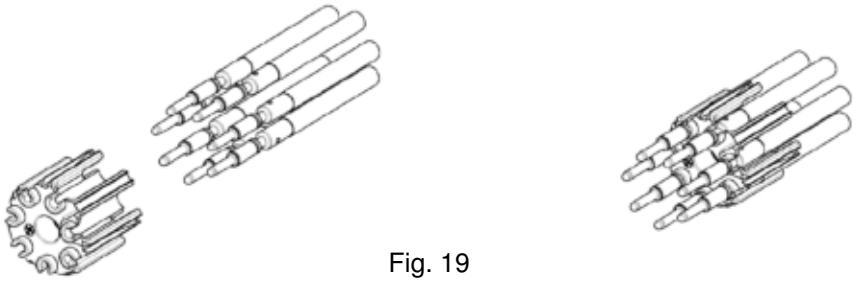


Fig. 19

e) Align and insert pin housing 293774-X as shown (see ways ID code on hsg)

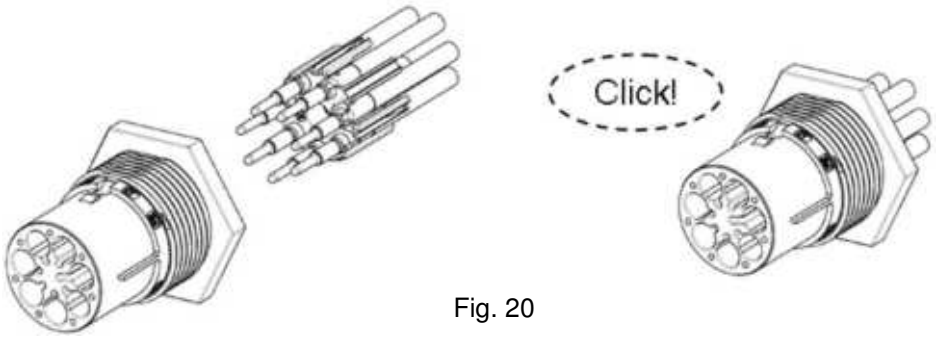


Fig. 20

f) Apply LOCTITE glue type “401” on the 3 retention latches avoiding to fill glue unto crimped contacts

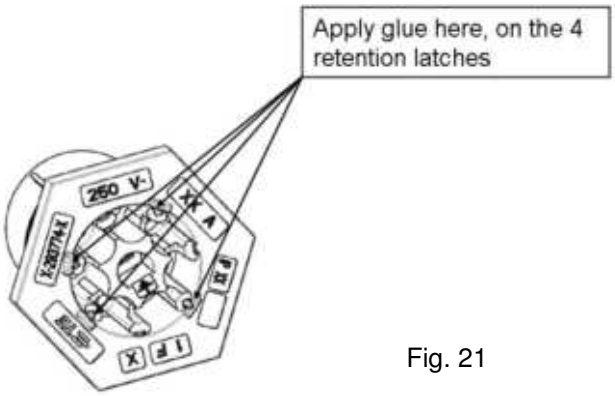


Fig. 21

g) Insert the properly positioned connector in the hole of the panel/wall and screw the plastic nut until it reaches its stop (torque 3.5Nm – 3.8Nm); the assembly is completed

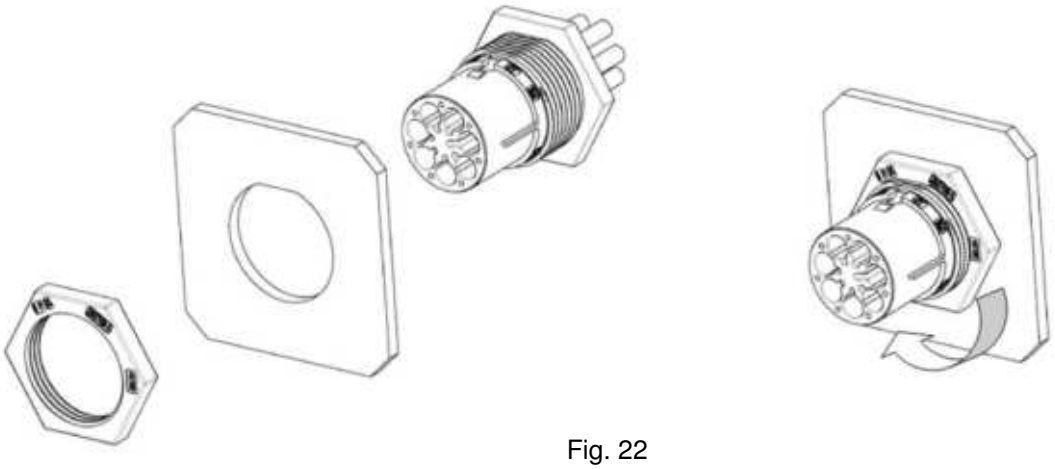


Fig. 22

6.4 Panel mount version – installation socket

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No dangerous interchangeability with systems specified in Standard sheets of IEC 60309, IEC 6032, IEC 60906 and with the declared national domestic plug and socket outlet system.
This installation system is not a replacement for national domestic plug and socket outlet system.

Assembly procedure:

a) Cable outside jacket – removal length (mm): 20.0 ± 0.5

b) Strip PE conductor for a length of 5.0mm, strip other conductors wires to 7.0mm and trim length at 5.0mm

c) Crimp socket contacts according to proper wire size

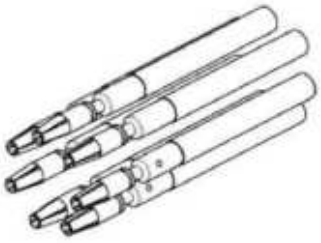


Fig. 23

d) Align and insert contact locking P/N 293658-1 as shown

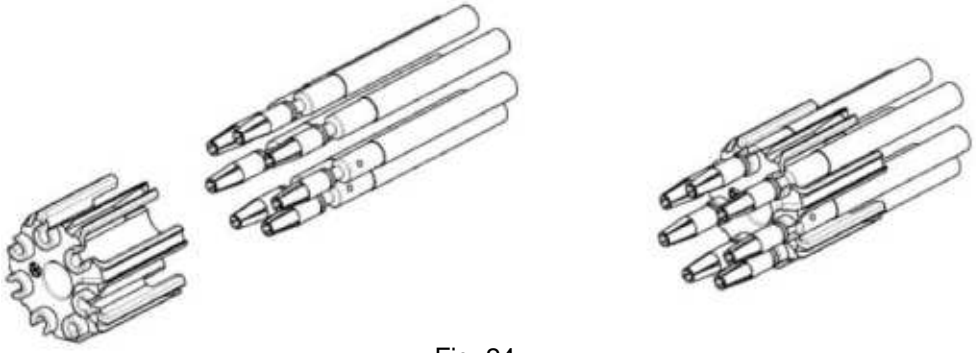


Fig. 24

e) Align and insert socket housing 293673-X as shown (see ways ID code on hsg). Socket cap 293682-1 can be additionally assembled to get IP40 degree of protection

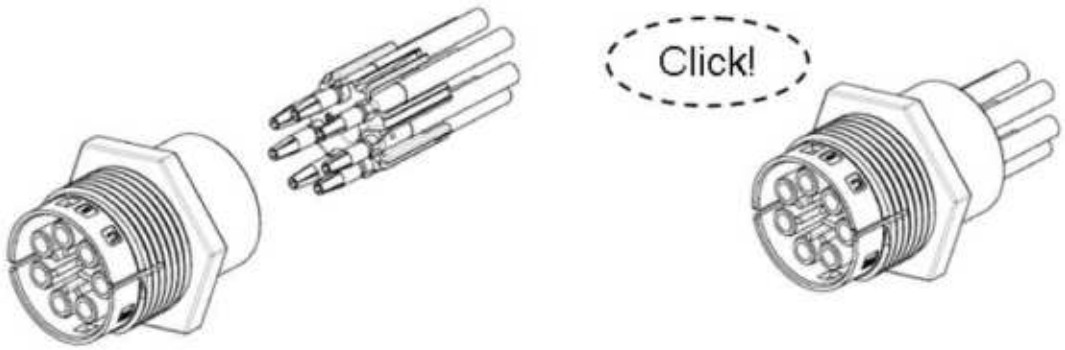


Fig. 25

f) Apply LOCTITE glue type “401” on the 3 retention latches avoiding to fill glue unto crimped contacts

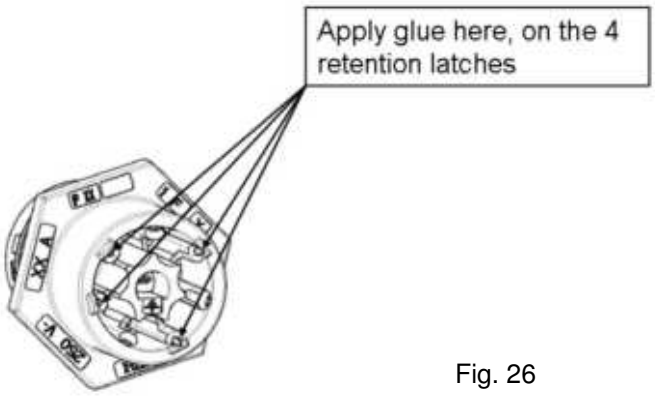


Fig. 26

g) Insert the properly positioned connector in the hole of the panel/wall and screw the plastic nut until it reaches its stop (torque 3.5Nm – 3.8Nm); the assembly is completed

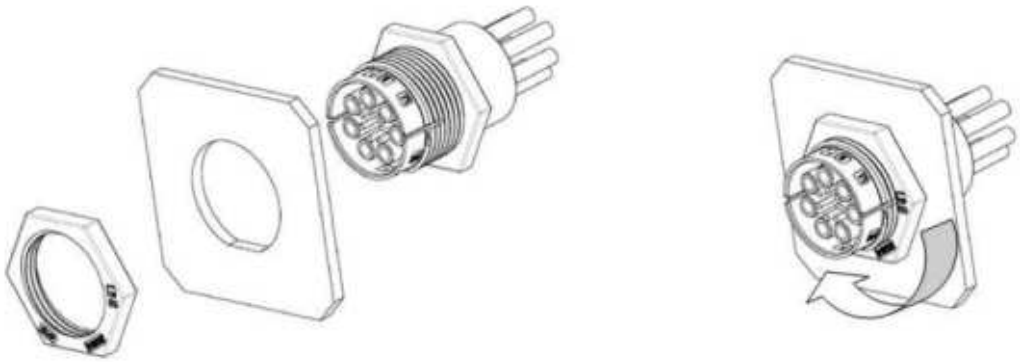


Fig. 27

6.5 PCB version – installation pin

Installation couplers are intended for connection and disconnection without load.
Dangerous compatibility between different installation systems is not automatically prevented by compliance with IEC 61535.
No dangerous interchangeability with systems specified in Standard sheets of IEC 60309, IEC 6032, IEC 60906 and with the declared national domestic plug and socket outlet system.
This installation system is not a replacement for national domestic plug and socket outlet system.
Do refer to customer drawings 293672 and 293695 for further details and suggested PCB layouts.

Assembly procedure:

a) Align and insert pin connector P/N 293672-X or 2193695-X on PCB

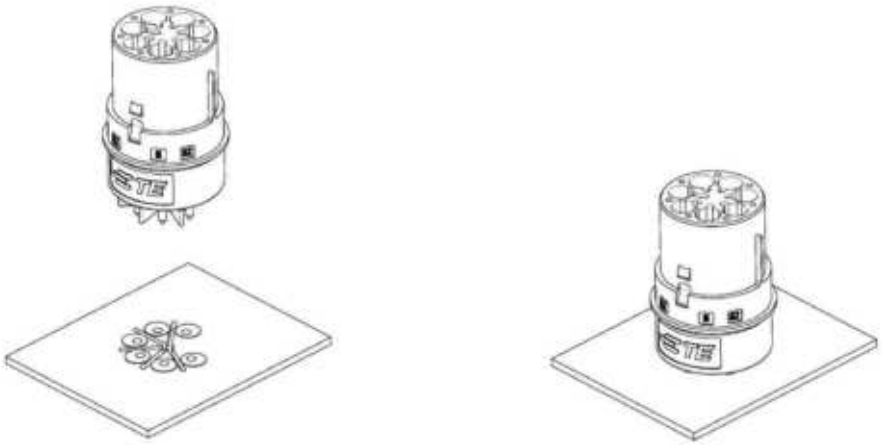


Fig. 28

6.6 PCB version – installation socket

Installation couplers are intended for connection and disconnection without load.
Dangerous compatibility between different installation systems is not automatically prevented by compliance with IEC 61535.
No dangerous interchangeability with systems specified in Standard sheets of IEC 60309, IEC 6032, IEC 60906 and with the declared national domestic plug and socket outlet system.
This installation system is not a replacement for national domestic plug and socket outlet system.
Do refer to customer drawings 293671 and 293696 for further details and suggested PCB layouts.

Assembly procedure:

a) Align and insert pin connector P/N 293671-X or 2193696-X on PCB

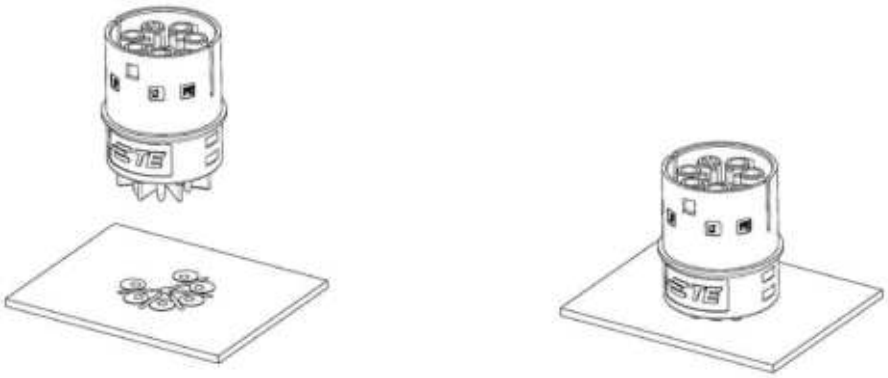


Fig. 29

6.7 5 poles T-splitter version and 5+1 poles T-splitter version

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No dangerous interchangeability with systems specified in Standard sheets of IEC 60309, IEC 6032, IEC 60906 and with the declared national domestic plug and socket outlet system.
This installation system is not a replacement for national domestic plug and socket outlet system.

Assembly procedure:

a) Socket cap 293682-1 can be additionally assembled to get IP40 degree of protection

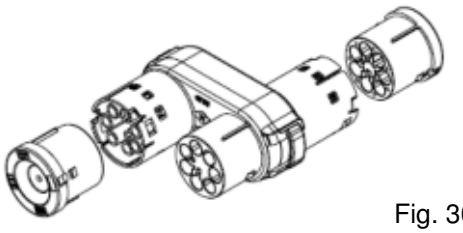


Fig. 30

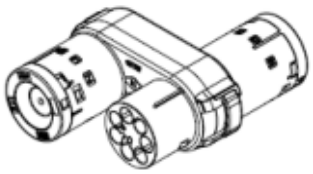


Fig. 31

b) Installation configurations:

Configuration no. 1

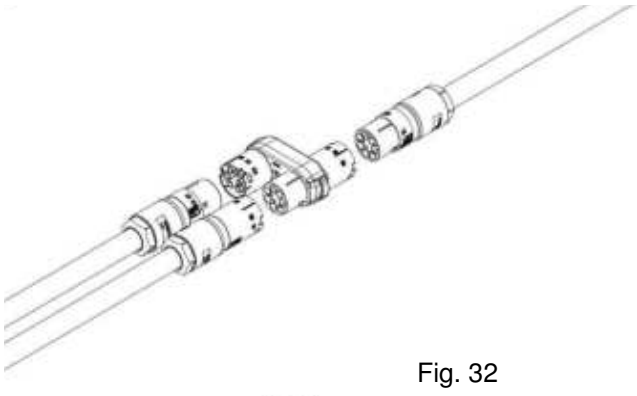


Fig. 32



Configuration no. 2

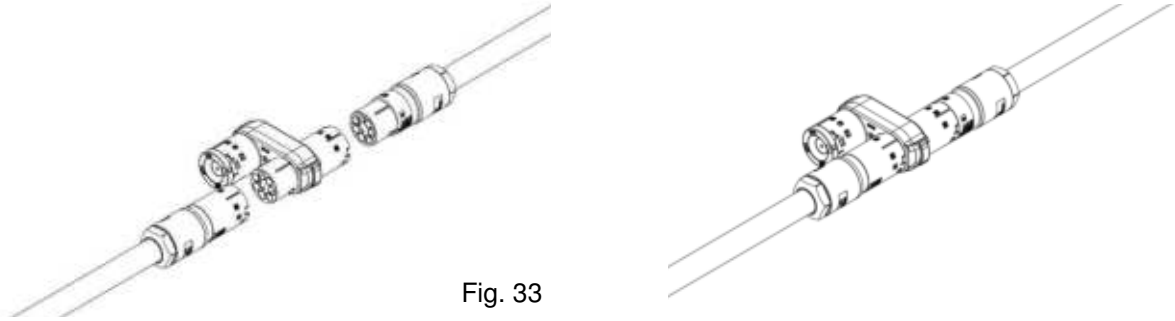


Fig. 33

Configuration no. 3

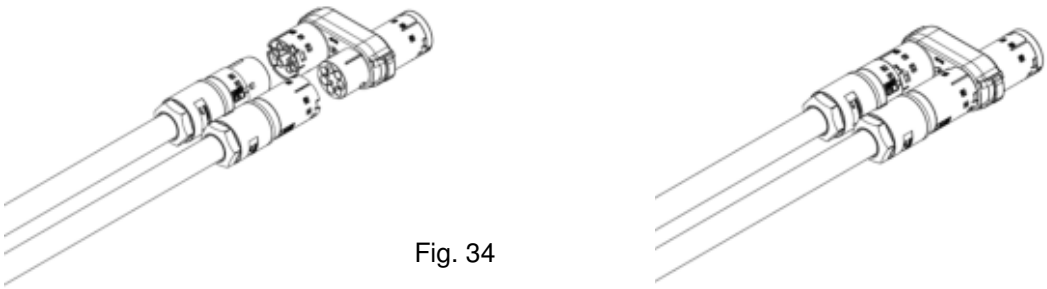


Fig. 34

Schematic of the circuitry

a) M-line 5 poles T-splitter connector:

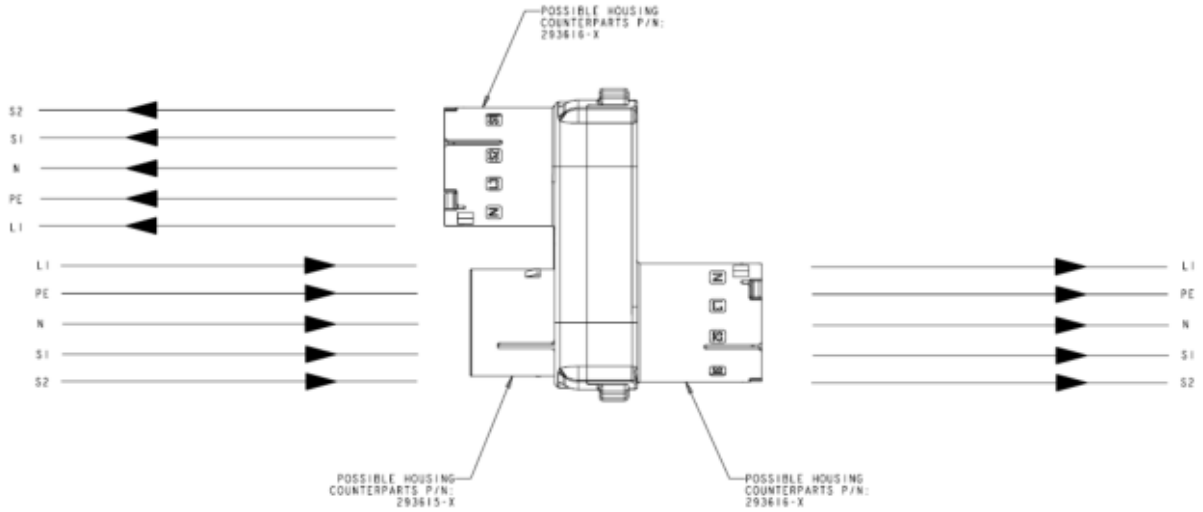


Fig. 35

b) M-line 5+1 poles T-splitter connector:

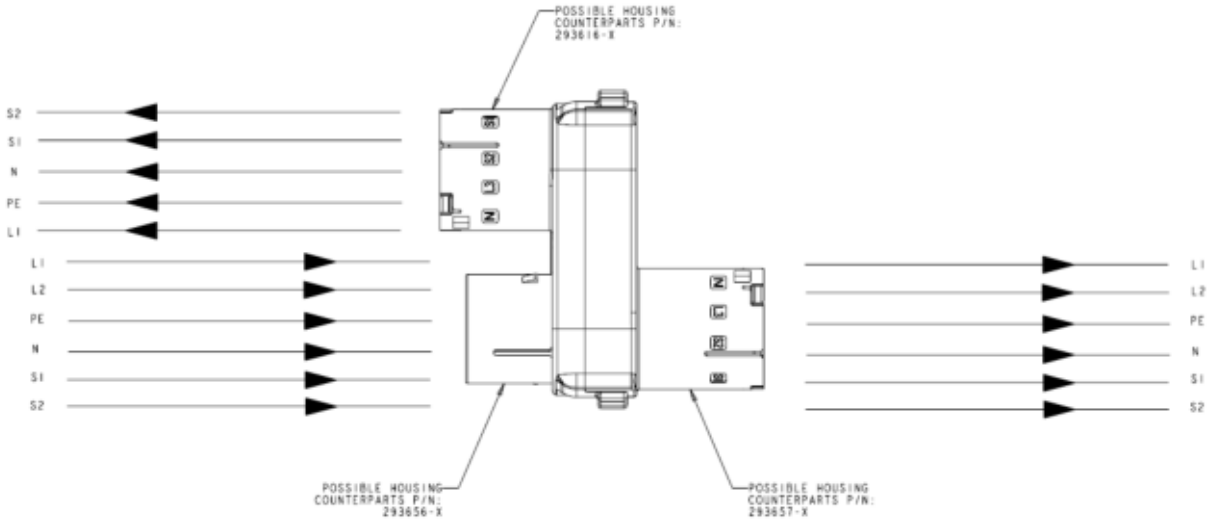


Fig. 36

Schematic of the application

a) M-line 5 poles T-splitter connector:

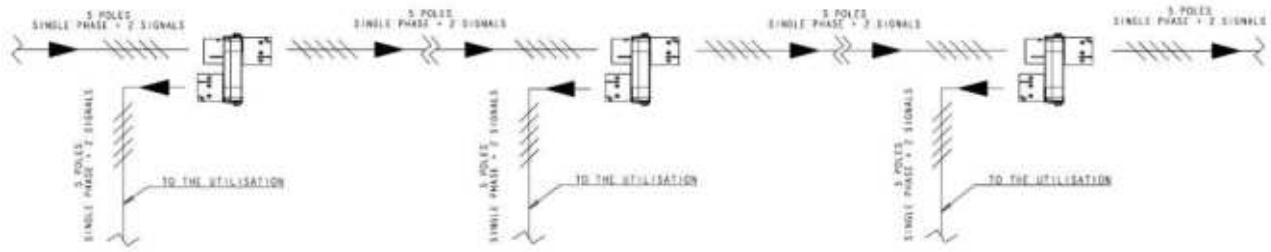


Fig. 37

b) M-line 5+1 poles T-splitter connector:

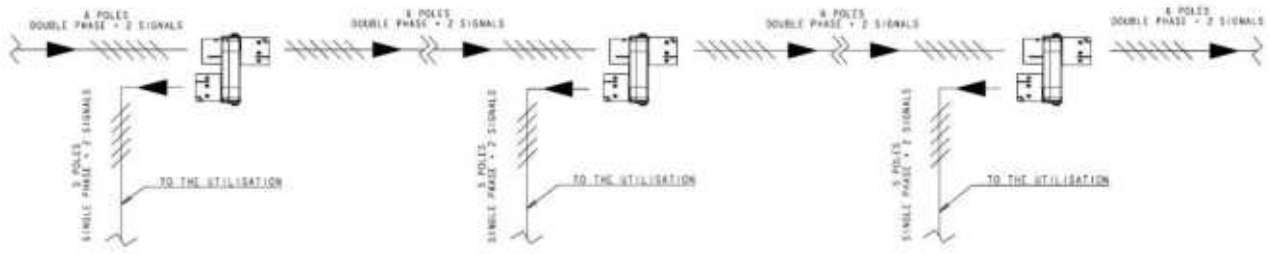


Fig. 38

7 DELATCHING CONNECTOR ASSEMBLIES

7.1 Introduction

De-latching tool 2176802-1 and 2176802-2 has been designed to aid with disconnecting the Nector M-Line 5 6 7 position unsealed connector system. The de-latching tool in straight and formed shape is shown in Image 1 and image 2 below:



Image 1: 2176802-1

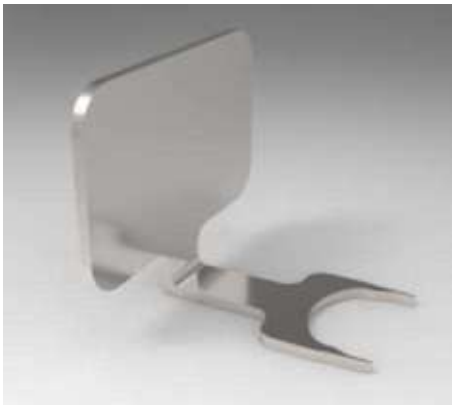


Image 2: 2176802-2

7.2 Description

De-latching tool 2176802-1 to be made from D2 tool steel. De-latching tool 2176802-2 I is made by forming part 2176802-1 to create a right angle. The part has a specially formed ends to allow the following M-Line 5 6 7 unsealed connector types to be taken apart after latching.
Free hanging connector series.
PCB mounted connector series (straight and right angle).
Panel mounted connector series.



The de-latching tool prongs are pointed and should be kept clear of eyes. Only use tool for intended application.

7.3 De-latching Procedure

Example 1) free hanging 7 Pos connector series in un-latched and latched state (Image 3 and 4).



Image 3

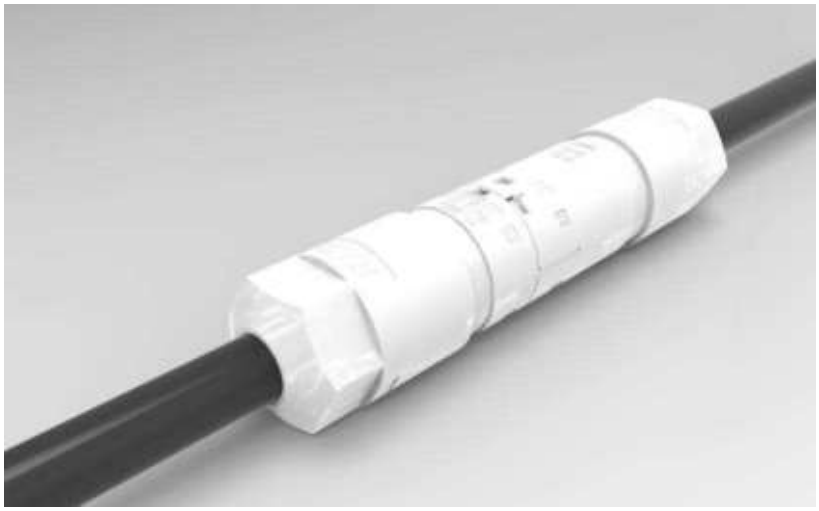


Image 4

Bring the de-latching tool 2176802-1 at right angle to the mated connectors with the tool prongs level with the connector latching points (Image 5)

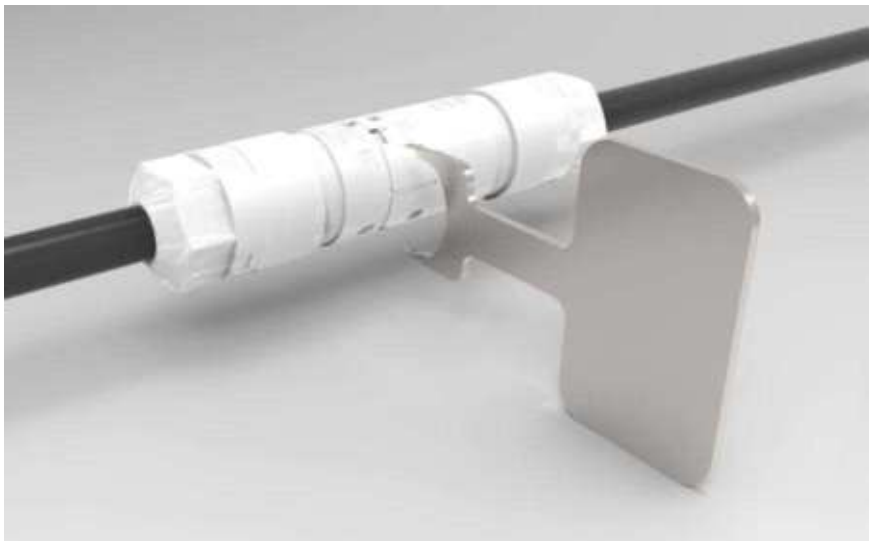


Image 5

Insert the prongs of the de-latching tool as shown in the images below. Note image 6 shows the bottom half of a connector assembly only showing one tool prong aligned to the part (Image 6):

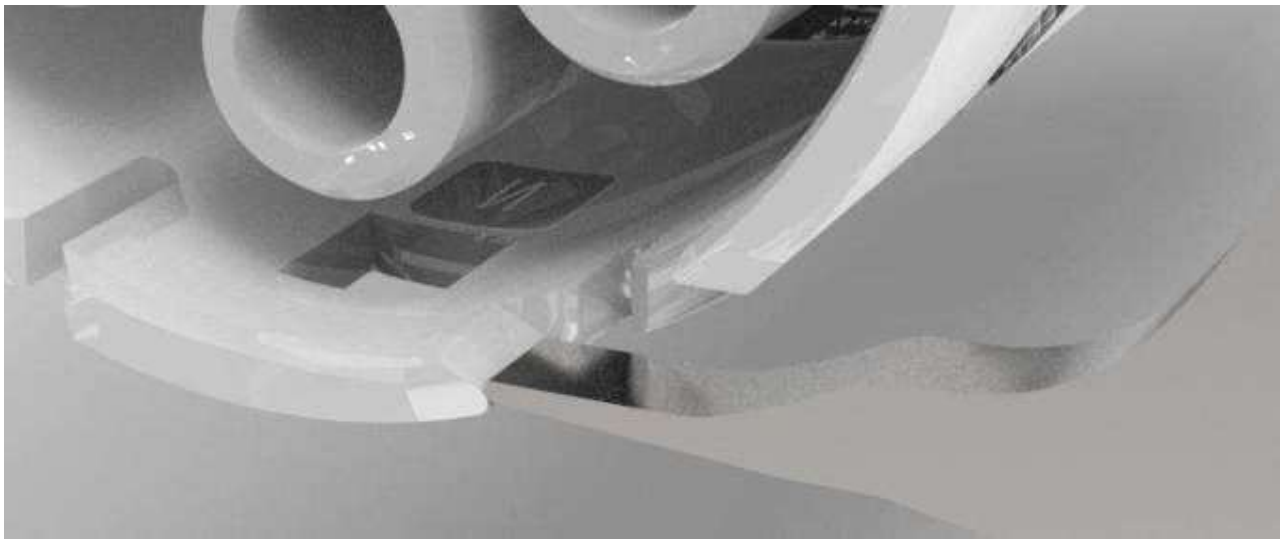


Image 6

Carefully apply force whilst holding the connector assembly. By inserting the tool it will force the latched connector tabs away by ~0.6mm. This is enough movement to allow the connector latches to move outwards from under the latches disengaging the two parts. Remove the de-latching tool and pull the assembly fully apart by hand (Image 7):

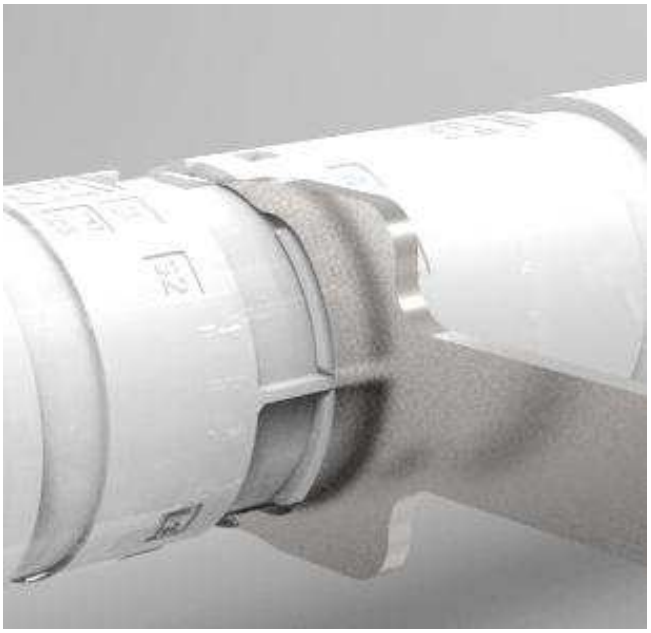


Image 7

Use the straight de-latching tool 2176802-1 to de-latch the following 5 6 7 connector types and part numbers (Image 8):



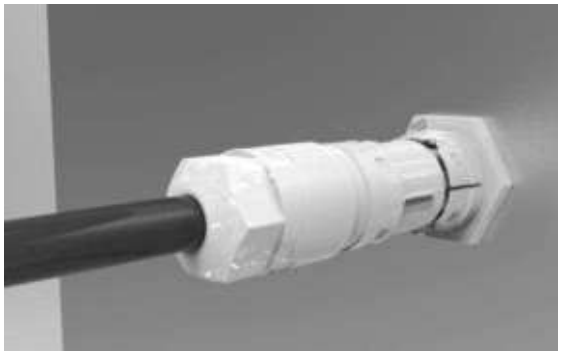
Image 8

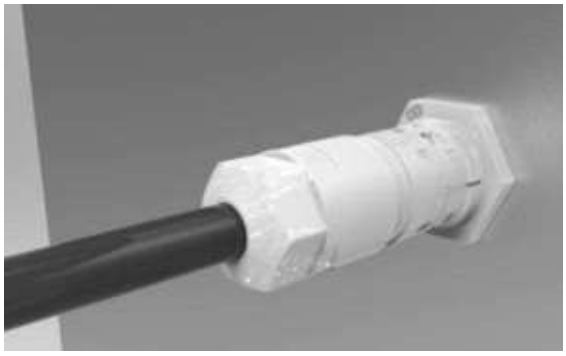
M-LINE 5 POS CONNECTOR
Socket housing free hanging 293615-x and pin housing free hanging 293616-x
T-Splitter connector 1879995-x and pin socket free hanging 293616-x and socket housing free hanging 293615-x

M-LINE 6 POS CONNECTOR
Socket housing free hanging 293656-x and pin housing free hanging 293657-x

M-LINE 7 POS CONNECTOR
Socket housing free hanging 293721-x and pin housing free hanging 293722-x

Example 2) socket housing panel mount and pin housing free hanging connector series in un-latched and latched state (Image 9 and 10).


Image 9


Image 10

Bring the de-latching tool 2176802-2 to the mated connectors and insert the tool prongs into the connector latching points (Image 11 and 12)

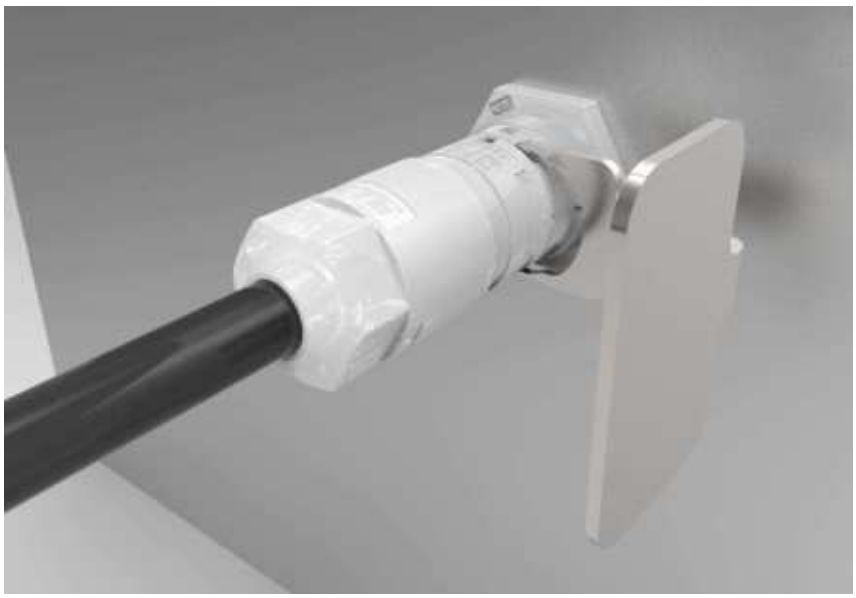

Image 11


Image 12

Hold the de-latching tool and apply a lateral force in a direction towards the panel. Apply a pull force on the free hanging side housing assembly. The assembly will pop apart approximately 2mm. The connectors are de-latched. Remove the de-latching tool and pull the assembly fully apart by hand (Image 13):

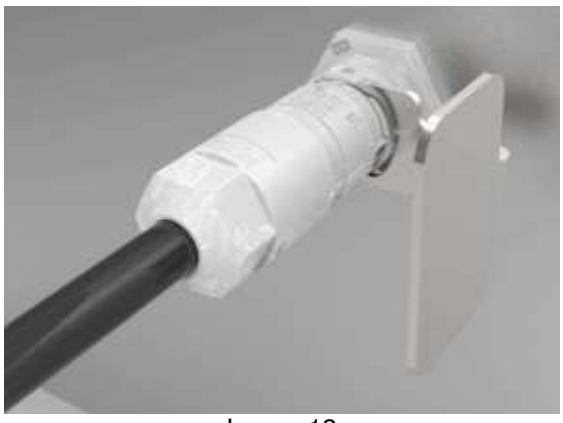


Image 13

Use this end of the formed de-latching tool 2176802-2 to de-latch the following connector types and part numbers (Image 14):



Image 14

M-LINE 5 POS CONNECTOR
Socket housing panel mount 293687-x and pin housing free hanging 293616-x
Socket housing free hanging 293615-x and pin housing panel mount 293688-x
Socket housing free hanging 293616-x and pin connector PCB 293695-x

M-LINE 6 POS CONNECTOR
Socket housing panel mount 293673-x and pin housing free hanging 293657-x
Socket housing free hanging 293656-x and pin housing panel mount 293674-x
Socket connector PCB 293671-x and pin housing free hanging 293656-x
Socket housing free hanging 293656-x and pin connector PCB 293672-x

M-LINE 7 POS CONNECTOR
Socket housing panel mount 293773-x and pin housing free hanging 293722-x
Socket housing free hanging 293721-x and pin hosing panel mount 293774-x

7.4 Maintenance and Inspection

Inspect the De-latching tool 2176802-1 and formed De-latching tool 2176802-2 for damage to the two prong protrusions. Replace whole tool if damaged.

7.5 Replacement and Repair

Replacement De-latching tools can be manufactured referring to drawing C2176802 or CVM model 2176802-1 and 2176802-2. The tool is to be cut from UNS T30402 tool steel (ANSI Type D2) or similar material. The de-latching tool has no individual parts and if damaged should be disposed of in a safe and environmental manner.