IMPLEMENTATION AND WIRING PROCEDURE OF M12 RAIL ECONOMICAL VERSION

PRJ-19-000901531

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LTR	Revision record				Date	Author
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1. INTRODUCTION

This specification contains the regulation to assemble the M12 Rail connectors.

All units noted in this specification are by default in millimeters, grams, Newton and Newton Meter.

2. CAUTION

Do not connect or disconnect the connector under electrical load.

The use of lubricants or oils during mounting unless specified are prohibited.

Any kind of pollution (dust, humidity, etc…) during the assembly process can degrade contact and connector performance. This applies in particular to the seal and the crimping of the contacts.

Failure to follow all instructions in Application Specification including using only approved TE tooling (if applicable) can result in improper installation and/or crimping which is dangerous and may cause or contribute to electrical fires.

3. GENERAL INSTRUCTIONS (HANDLING AND SAFETY)

Personal Protective Equipment (PPE) is mandatory and must be worn when carrying out hazardous tasks.

Ensure your safety and the safety of others.

Environment

TE Connectivity and its subsidiaries, affiliates, and operating units (collectively, the “Company”) are committed to protecting the environment. Always act responsibly and follow local guidelines and recycling policies to help protect the environment.

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	Thoroughly read and understand this document before proceeding with any of the listed procedures.
	Competence Only trained and qualified service personnel are allowed to install or replace TE equipment.
	Safety with electricity Always ensure that the electricity has been isolated and that it is safe to work in proximity of the High Voltage cables.
	Solvents Only use solvents in well-ventilated environment. Always follow the manufacturer's handling instructions.

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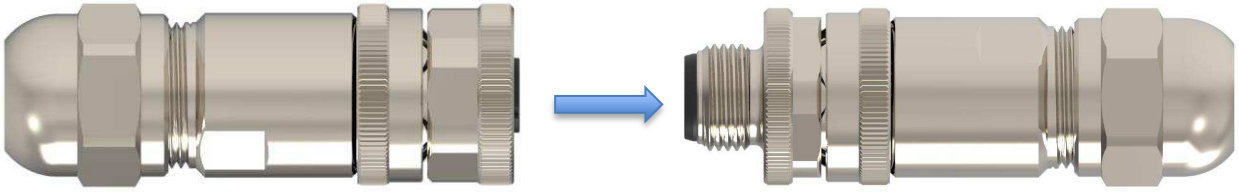
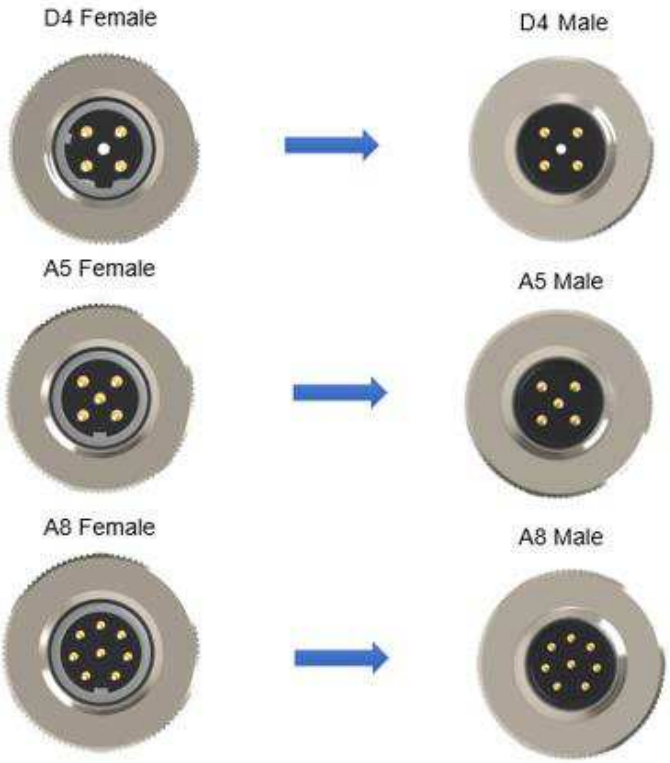
4. SYNOPTIC OF THE M12 RAIL CONNECTOR

This synoptic aim to show the possible configurations of connection between M12 male and female connectors. M12 male connectors can mate with M12 female connectors with respective codes. For example, M12 male D4 code connector can mate with M12 female D4 code connector. The mated connectors meet an ingress protection rating of IP67.

M12 Female connector

M12 Male connector





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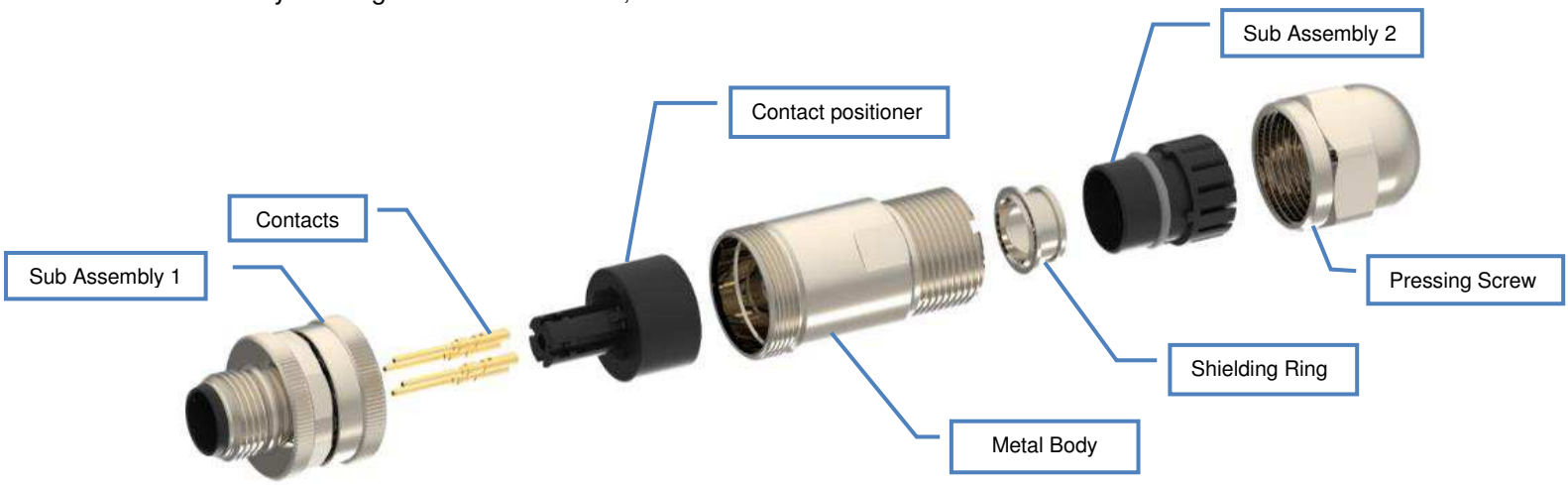
5. CONNECTORS GENERAL DESCRIPTION

5.1. M12 Male connector

Assembly drawing reference: 2351378, 2351414 & 2351415



*Contacts are packaged inside the connector as loose piece.

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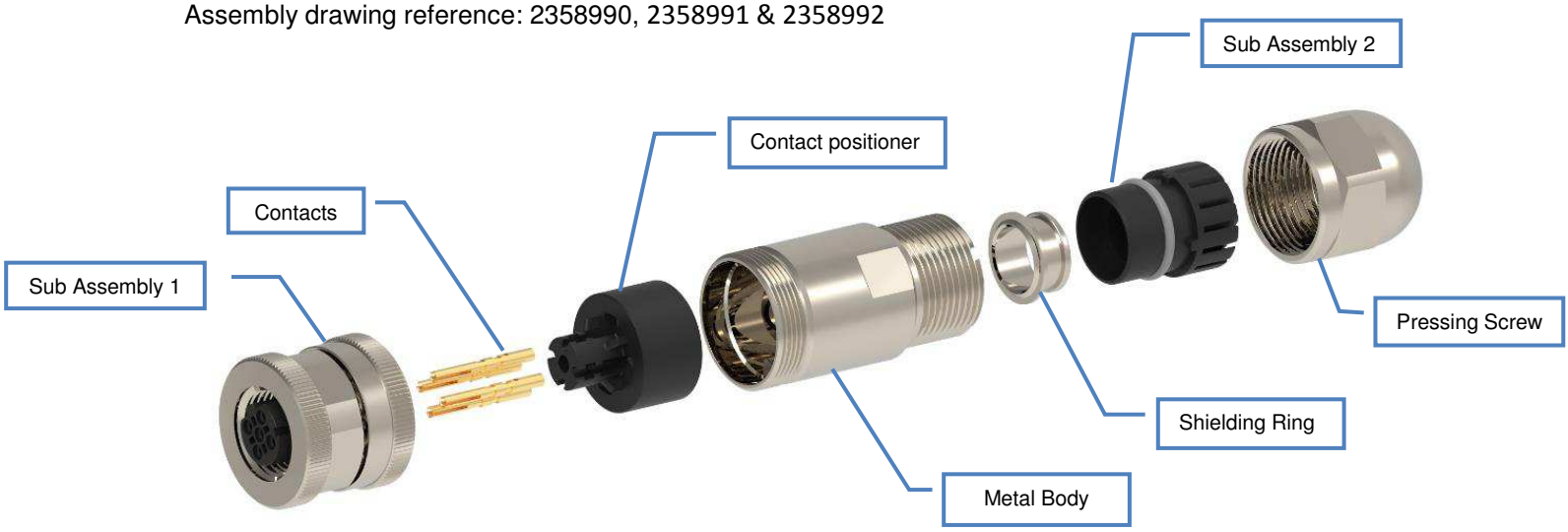
5.2. M12 Female connector

Assembly drawing reference: 2358990, 2358991 & 2358992



*Contacts are packaged inside the connector as loose piece.

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6. REFERENCES OF THE ADMISSIBLE CONTACTS

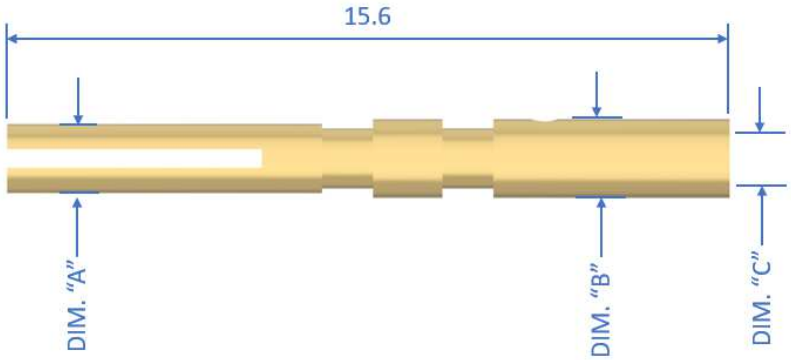
6.1. M12 Male contact

Drawing reference: 2351768 & 2351769

Part Number	Description	Code	DIM. "A"	DIM. "B"	DIM. "C"
2351768-1	Male Contact For AWG 22-26	D4, A4 & A5	Ø1.0	Ø1.7	Ø0.9
2351768-2	Male Contact For AWG 18-20	D4, A4 & A5	Ø1.0	Ø1.7	Ø1.1
2351769-1	Male Contact For AWG 22-26	A8	Ø0.8	Ø1.7	Ø0.9
2351769-2	Male Contact For AWG 18-20	A8	Ø0.8	Ø1.7	Ø1.1

6.2. M12 Female contact

Drawing reference: 2358996 & 2358997



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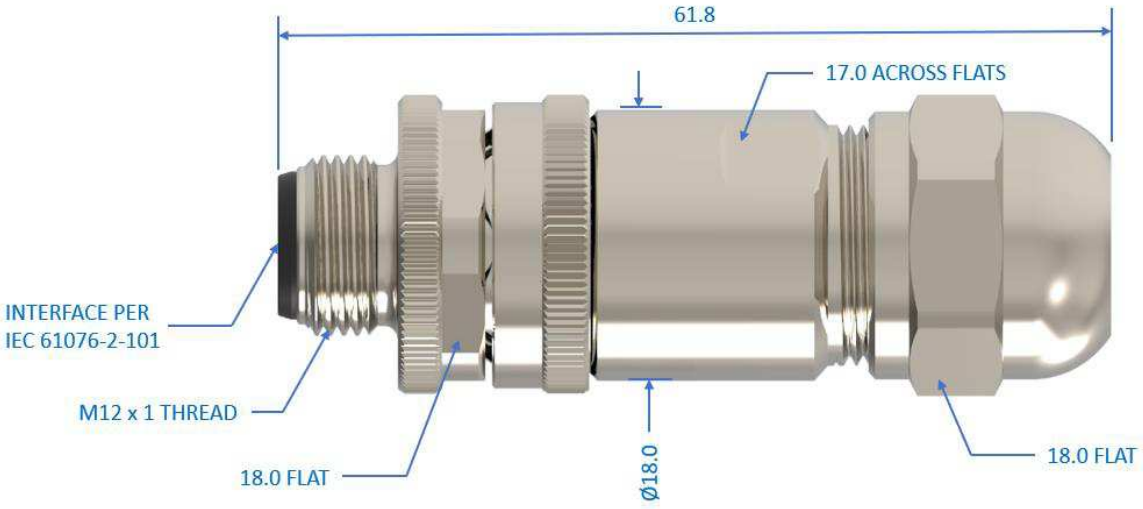
Part Number	Description	Code	DIM. "A"	DIM. "B"	DIM. "C"
2358996-1	Female Contact For AWG 22-26	D4, A4 & A5	Ø1.5	Ø1.7	Ø0.9
2358996-2	Female Contact For AWG 18-20	D4, A4 & A5	Ø1.5	Ø1.7	Ø1.1
2358997-1	Female Contact For AWG 22-26	A8	Ø1.3	Ø1.7	Ø0.9
2358997-2	Female Contact For AWG 18-20	A8	Ø1.3	Ø1.7	Ø1.1

7. OVERALL DIMENSIONS

7.1. M12 Male connector



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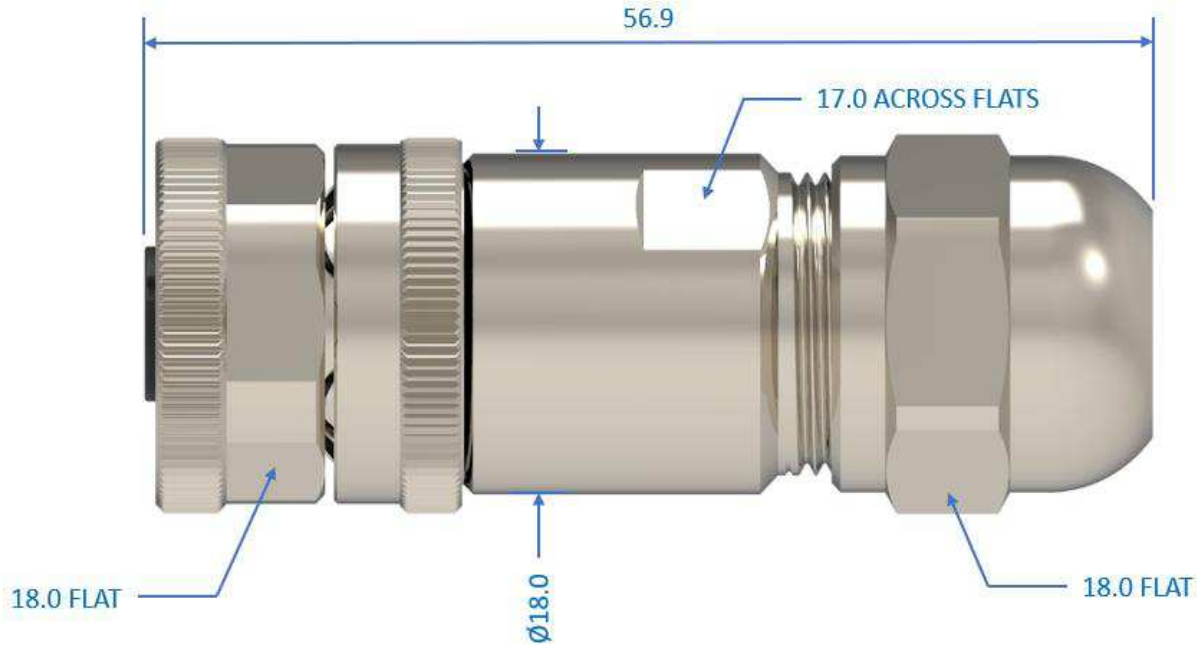
7.2. M12 Female connector



8. CONNECTOR ASSEMBLY AT CUSTOMER PLACE

8.1. M12 Male & Female connector

This assembly procedure is valid for the references below:

-	2351378-1	- 2351378-2	-2351378-3	-2351378-4
-	2351414-1	- 2351414-2	-2351414-3	- 2351414-4
-	2351415-1	- 2351415-2	-2351415-3	- 2351415-4
-	2358990-1	-2358990-2	-2358990-3	-2358990-4
-	2358991-1	-2358991-2	-2358991-3	-2358991-4
-	2358992-1	-2358992-2	-2358992-3	-2358992-4

STEP 1 ➡ Slide press screw and pinch ring sub assembly over cable. (see paragraph 9.1)

STEP 2 ➡ Strip the cable jacket by stripping tool. (see paragraph 9.2)

STEP 3 ➡ Peel the cable braid and slide the shielding ring over the cable. (see paragraph 9.3)

STEP 4 ➡ Cut the foil as mentioned length only to ensure the wire twisting in the cable. (see paragraph 9.4)

STEP 5 ➡ Strip the wires as mentioned length to crimp the contacts. (see paragraph 9.5)

STEP 6 ➡ Slide metal body over the cable. (see paragraph 9.6)

STEP 7 ➡ Assemble the pressing screw with the metal body. (see paragraph 9.7)

STEP 8 ➡ Insert the contacts into contact positioner. (see paragraph 9.8)

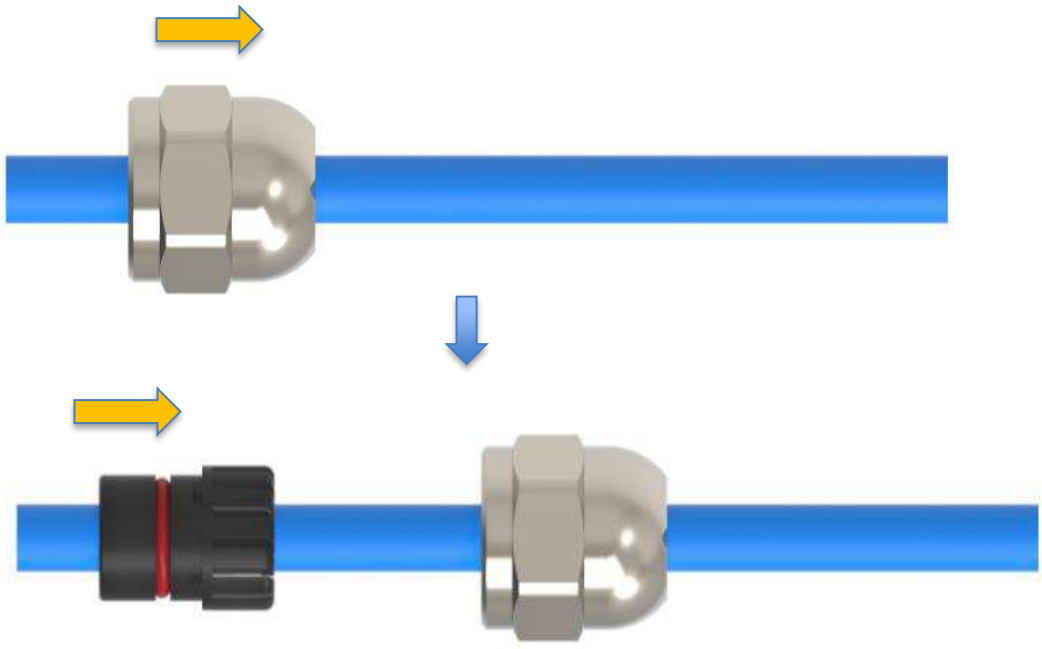
STEP 9 ➡ Insert the contact positioner into insulator. (see paragraph 9.9)

STEP 10 ➡ Assemble the metal body with metal connect nut. (see paragraph 9.10)

9. MOUNTING SPECIFICATION

9.1. Slide press screw and pinch ring sub assembly over cable

Slide press screw and pinch ring sub assembly over cable.



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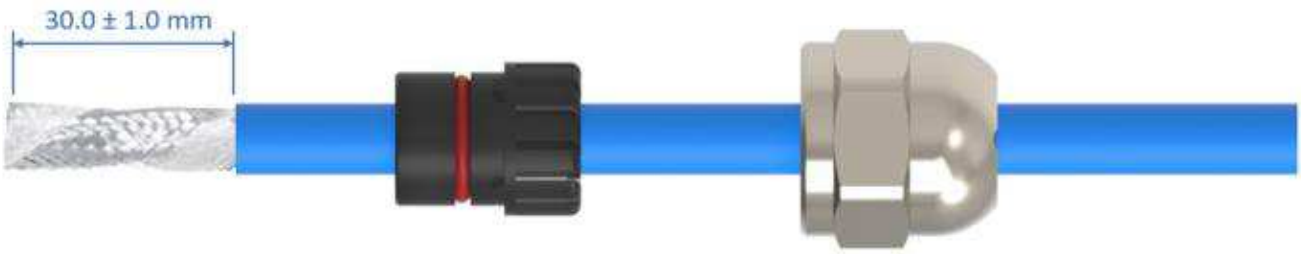
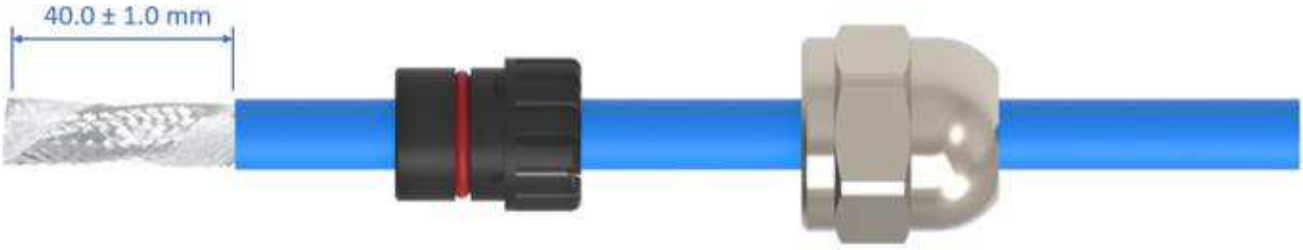
9.2. Strip the cable jacket by stripping tool

Trim cable jacket by stripping tool (PN: 2119000-1) to the mentioned length.

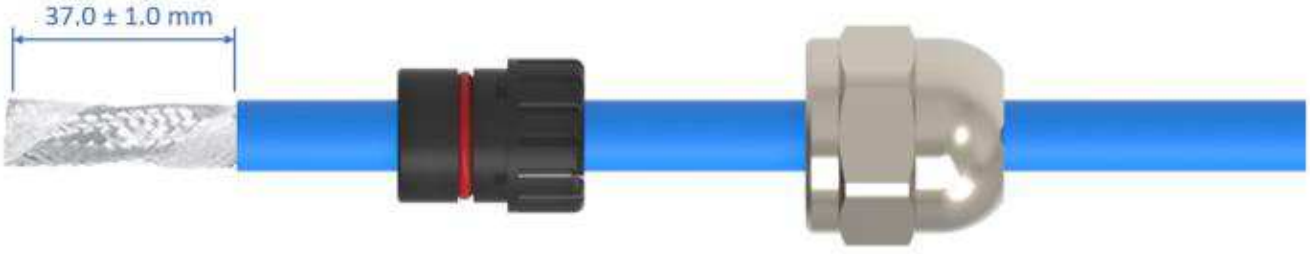


For M12 D4 code Male



For M12 A5 & A8 code Male

For M12 D4 code Female



For M12 A5 & A8 code Female

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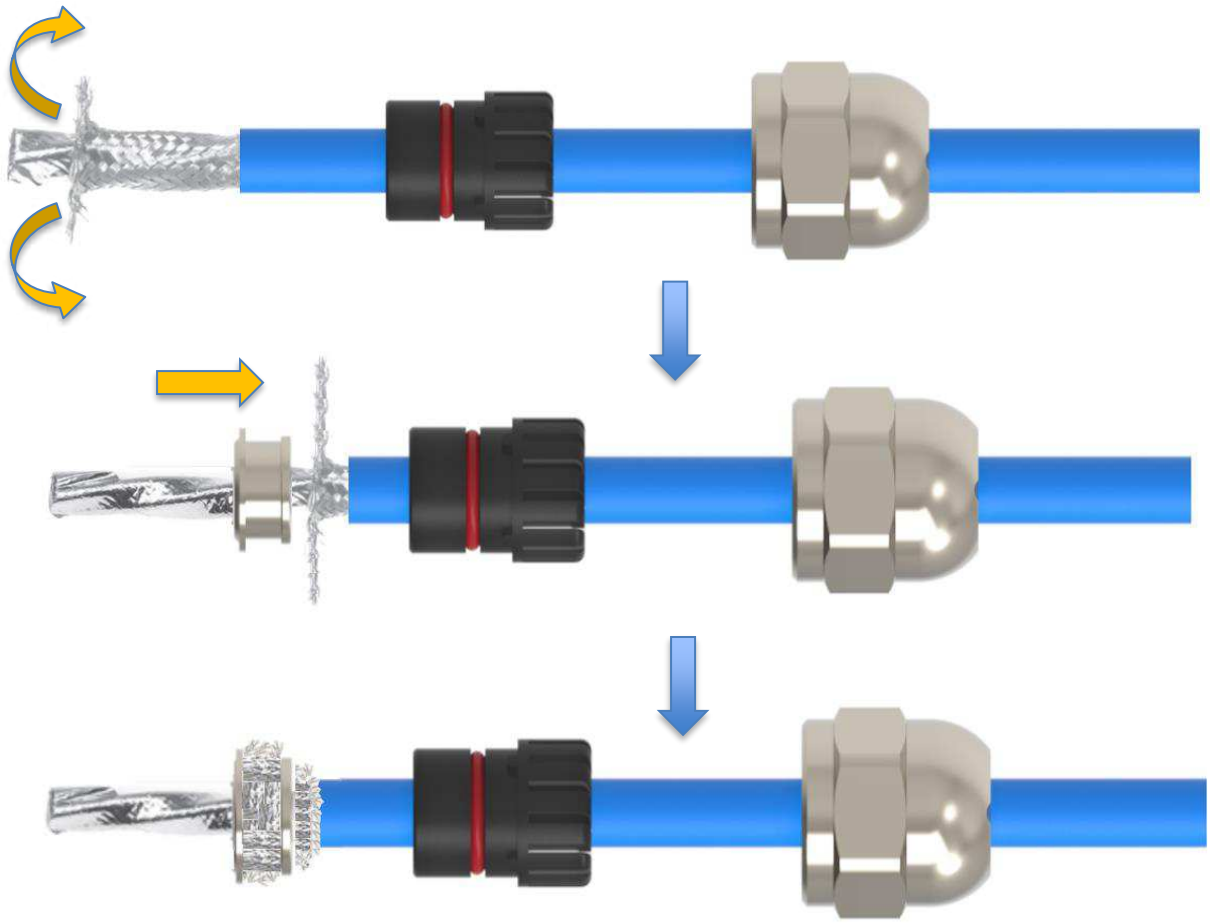
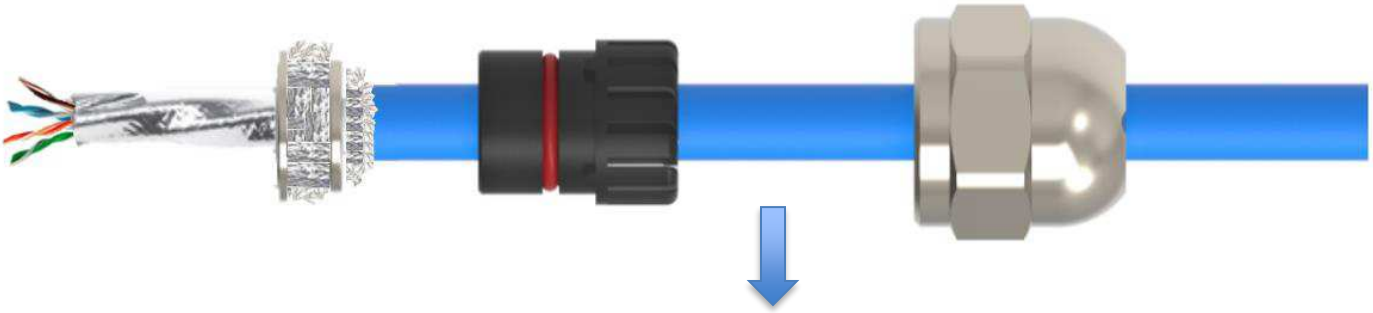
9.3. Peel the cable braid and slide the shielding ring over the cable

Peel the cable braid and slide the shielding ring over cable. Ensure the shielding ring is tightly inserted over the braid. For small diameter cables, wrap the braid over shielding ring to ensure good shielding.



9.4. Cut the foil as mentioned length only to ensure the wire twisting in the cable

Cut the foil as mentioned length only to ensure the wire twisting in the cable. Strictly don't remove excess foil, the cutting length should be followed as per recommended cable stripping dimensions only.



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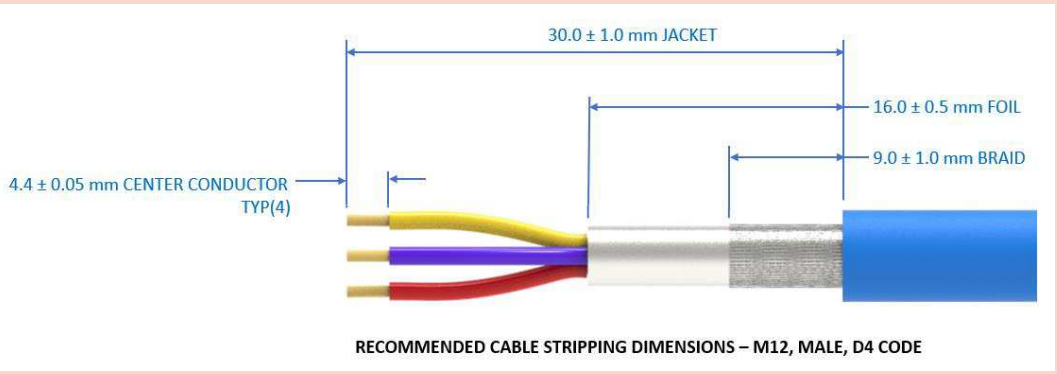
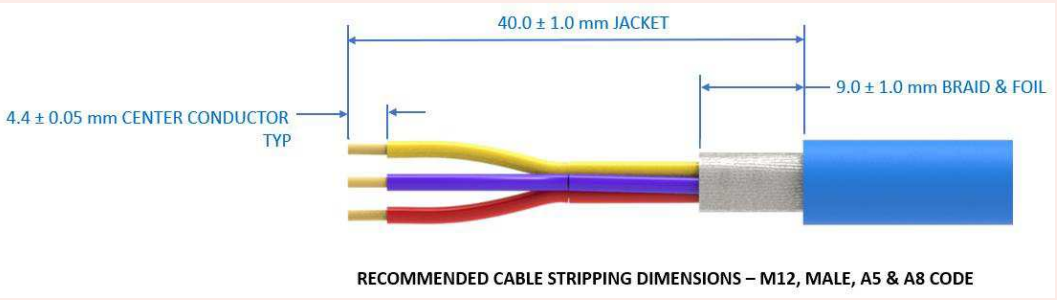
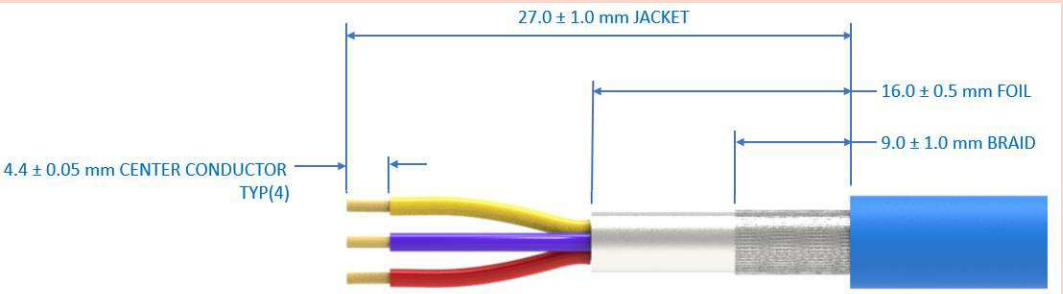
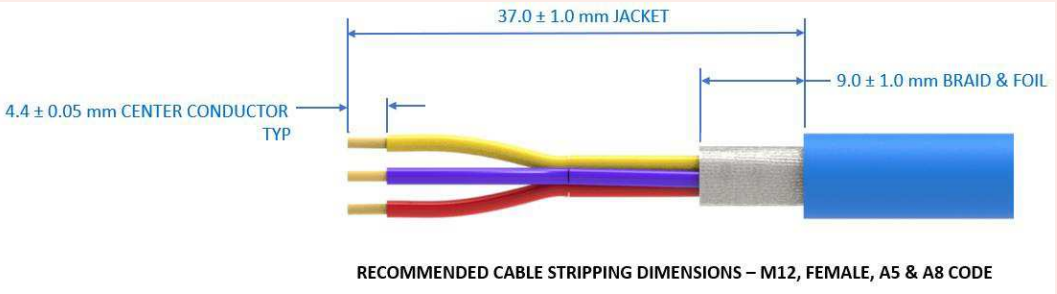
M12 VARIENTS	RECOMMEDED CABLE STRIPPING DIMENSIONS
M12, MALE, D4 CODE	 RECOMMENDED CABLE STRIPPING DIMENSIONS – M12, MALE, D4 CODE
M12, MALE, A5 & A8 CODE	 RECOMMENDED CABLE STRIPPING DIMENSIONS – M12, MALE, A5 & A8 CODE
M12, FEMALE, D4 CODE	 RECOMMENDED CABLE STRIPPING DIMENSIONS – M12, FEMALE, D4 CODE
M12, MALE, A5 & A8 CODE	 RECOMMENDED CABLE STRIPPING DIMENSIONS – M12, FEMALE, A5 & A8 CODE

***Strictly maintain the recommended cable stripping dimensions for better performance.**

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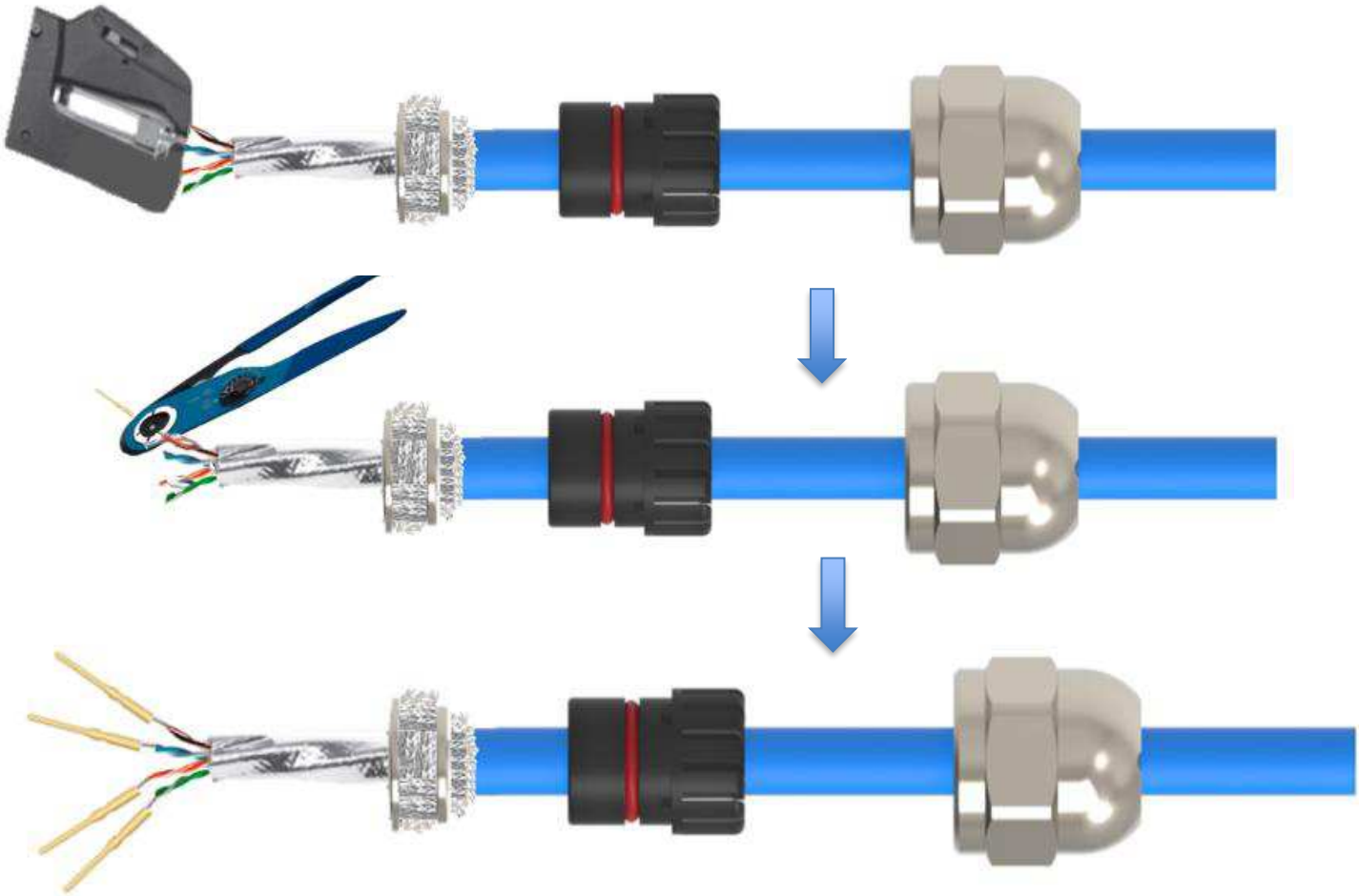
9.5. Crimp the contacts

Crimp the contacts over cable center conductor by crimping tool and per below crimping tool settings.

Wire size	Crimping Tool PN	Positioner	Selector No.
AWG 22-26	601966-1	09 99 000 0501	7
AWG 18-20	601966-1	09 99 000 0501	8



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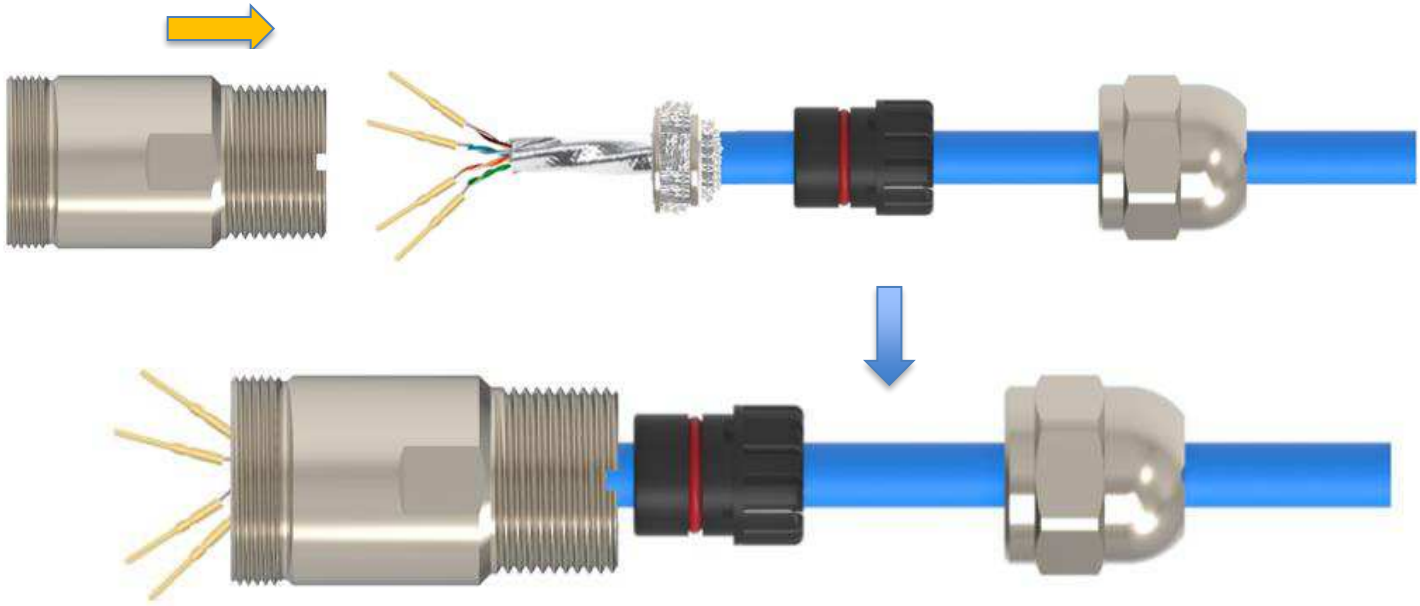
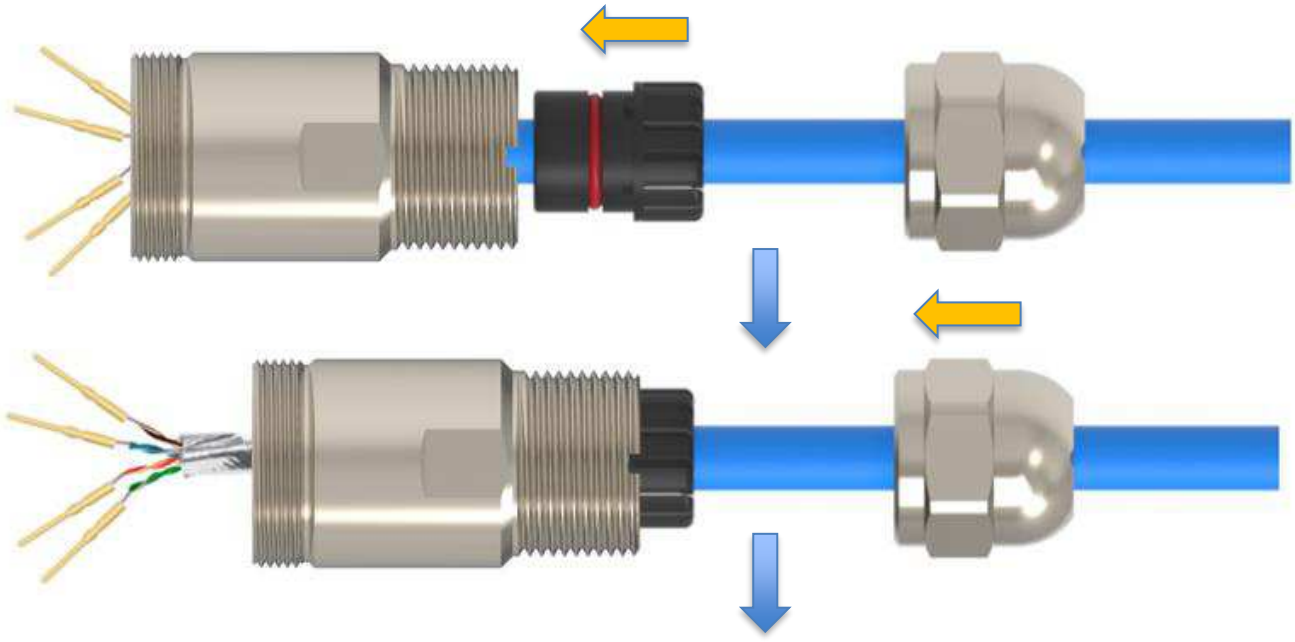
9.6. Slide metal body over the cable

Then slide metal body over the cable.



9.7. Assemble the pressing screw with the metal body

Insert pinch ring sub assembly into metal body. Then slide pressing screw and tighten with metal body. The tightening torque of the pressing screw is 1 Nm.



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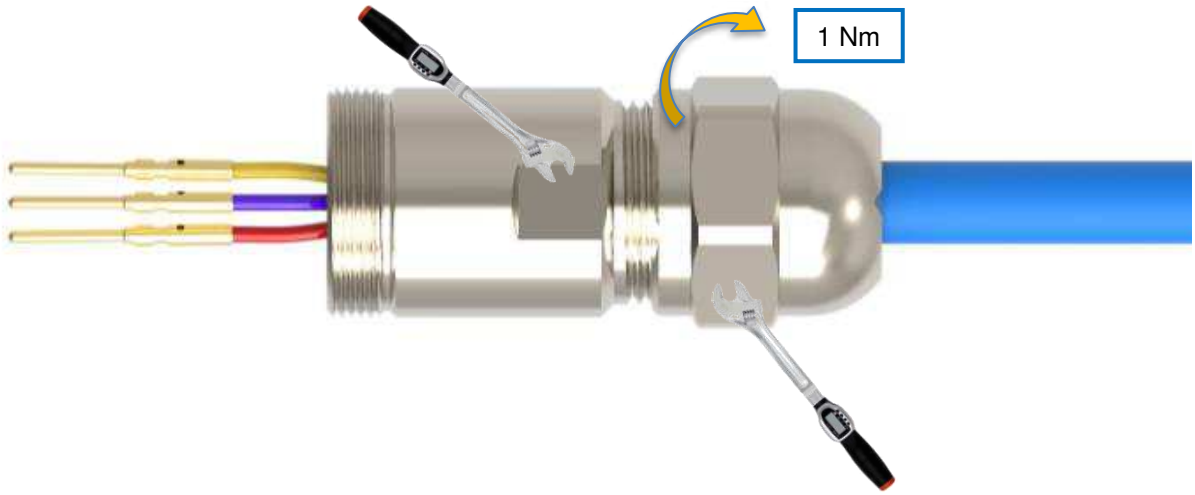


9.8. Insert the contacts into contact positioner

For D4 code, If 2 pair (4 wire) cable used, twist the wires together White & Blue and Orange & Yellow. If other cable used {4 pair (8 wire) cable}, keep only White orange, Orange, White green and Green wires and twist the wires together White orange & Orange and White green & Green and remaining wires cut it down.

*Similar for A8 code, but no need to cut any wires. The twisting of wire pairs should be White Blue & Blue, White Brown & Brown, White Orange & Orange and White Green & Green. Once contacts crimped with wires, twist the wire pairs as mentioned before inserting into contact positioner.

*For A5 code, keep only White orange, Orange, White green, Green and Brown and remaining wires cut it down. Twist the wires together White orange & Orange and White green & Green. Connect Brown wire directly to center contact.

Insert the contacts into contact positioner and place the contacts into provision given in contact positioner. For center contact, insert into center hole and pull the contact from front side of the hole of contact positioner.

For pin configuration, refer below table

D4 code

Pin Number	Cable colour
	TE cable or 2 pair (4 wire) cable
Pin 1	YELLOW
Pin 2	WHITE
Pin 3	ORANGE
Pin 4	BLUE

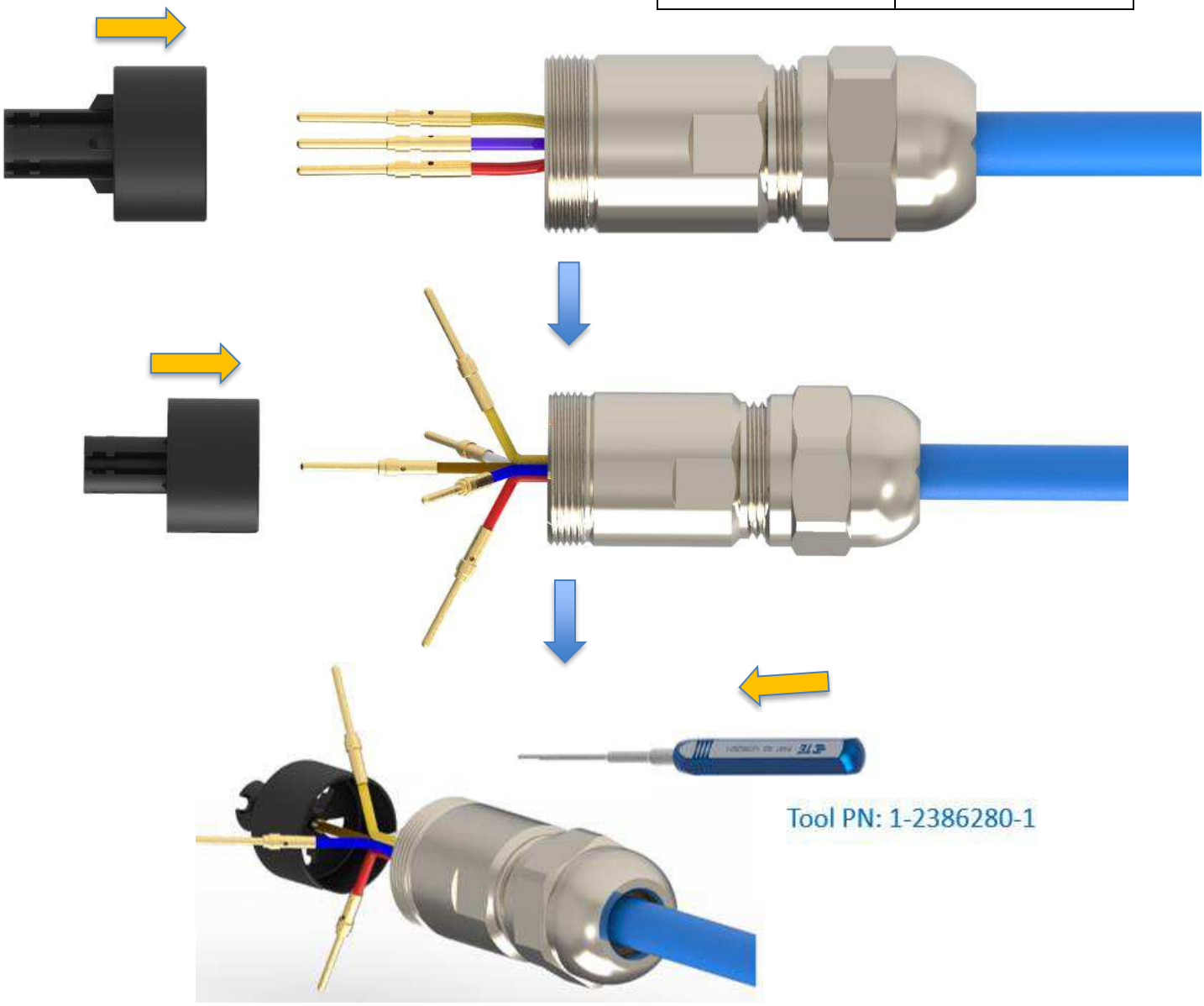
| Indicates Change

A5 code

Pin Number	Cable colour
Pin 1	WHITE ORANGE
Pin 2	WHITE GREEN
Pin 3	ORANGE
Pin 4	GREEN
Pin 5	BROWN

A8 code

Pin Number	Cable colour
Pin 1	BROWN
Pin 2	WHITE BLUE
Pin 3	BLUE
Pin 4	ORANGE
Pin 5	GREEN
Pin 6	WHITE ORANGE
Pin 7	WHITE BROWN
Pin 8	WHITE GREEN



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Application specification

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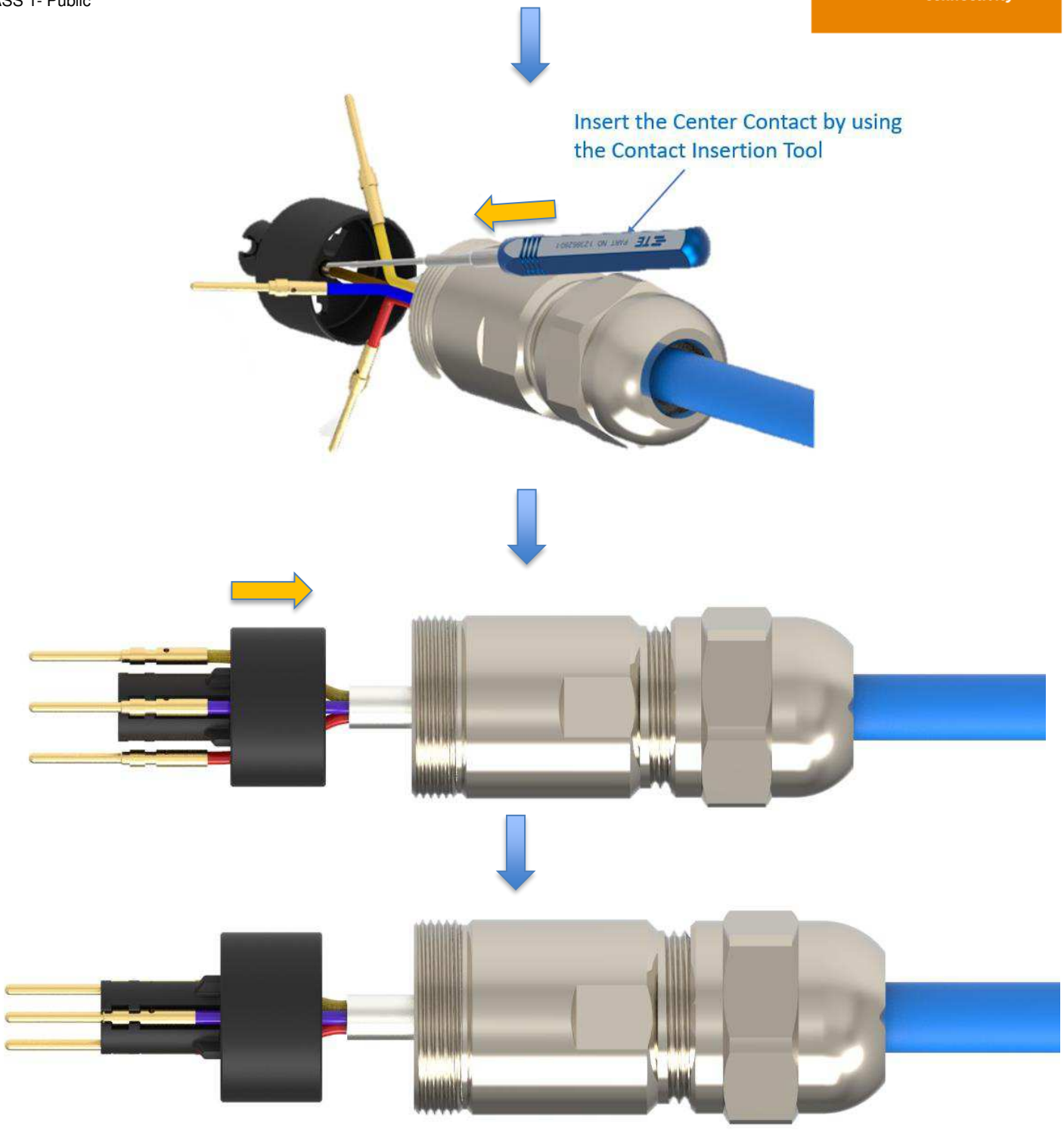

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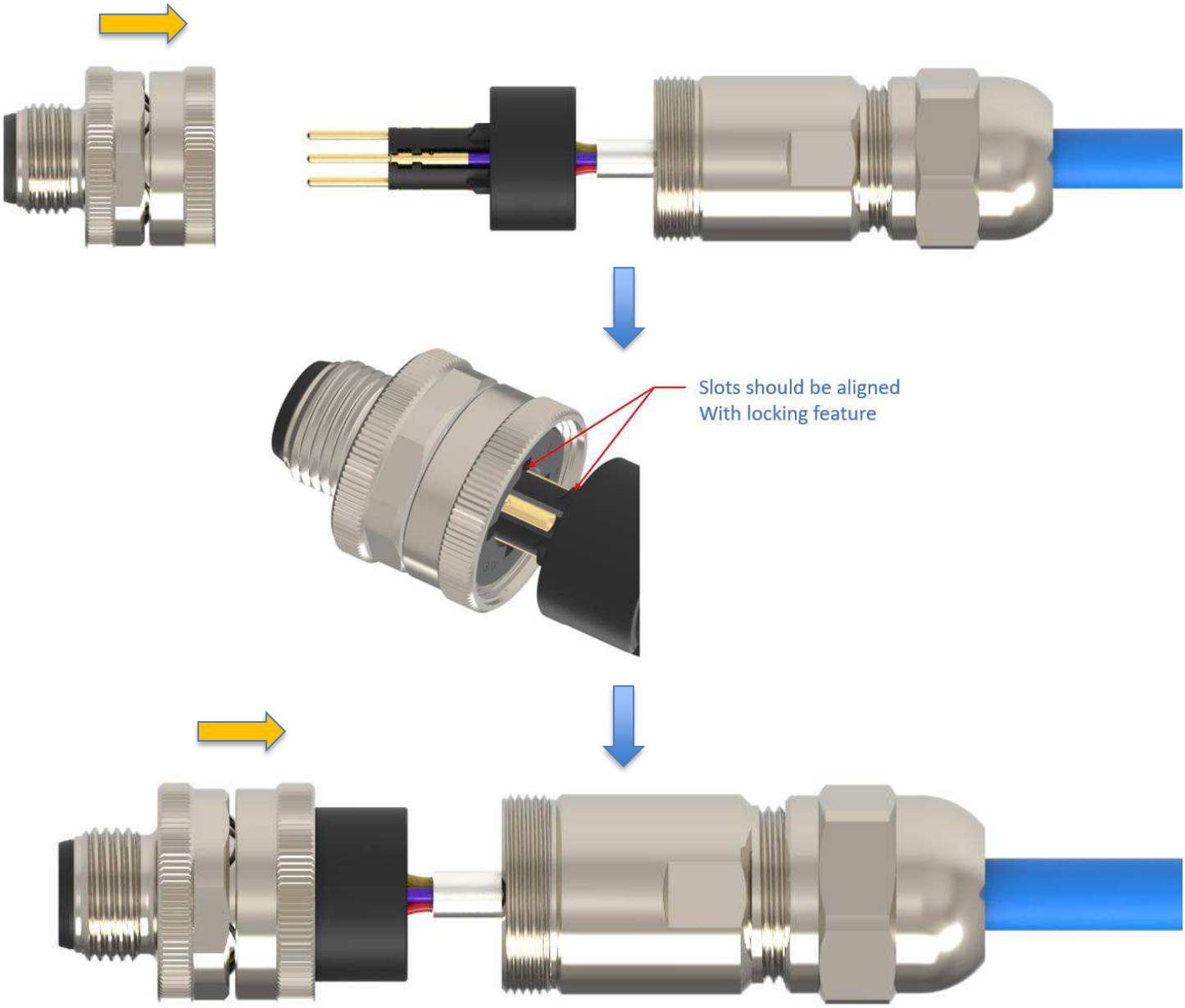
9.9. Insert the contact positioner into insulator

Insert the contact positioner into insulator and align to locking slot given in insulator to avoid rotation.



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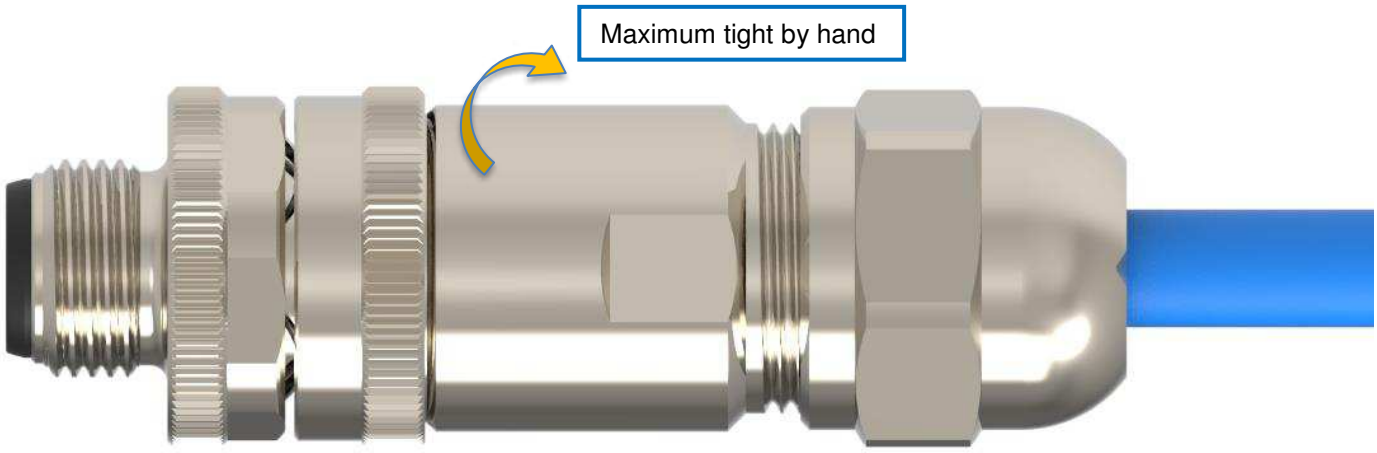
9.10. Assemble the metal body with metal connect nut

Align the contact positioner slot with groove inside the metal body to avoid rotation of contact positioner and insert the sub assembly. Tighten the metal body with metal connect nut. Tighten the metal body with maximum possible force by hand.



*Similar procedure for Female connectors

10. MATING AND UN-MATING

DANGER

To avoid personal injury, these connectors and cable assemblies must not be mated or unmated under live conditions (electrical load).

The recommended torque for mating the connectors is:

M12 connectors: 0.6 Nm

11. REPLACEMENT AND REPAIR

These cable assemblies and connectors are not repairable. Damaged or defective components must not be used. Connectors must not be re-used by removing the cable.

Fitting and servicing should only be performed by qualified personnel in accordance with all guidelines and standards.

| Indicates Change

12. ADDITIONAL DOCUMENTS

12.1. Product specification

- 108-157015

12.2. Packaging specification

- 107-157015

12.3. Customer Drawings

Connectors :

- C-2351378 - M12 Male, D4 code, str shielded connector
- C-2351414 - M12 Male, A5 code, str shielded connector
- C-2351415 - M12 Male, A8 code, str shielded connector
- C-2358990 - M12 Female, D4, str shielded connector
- C-2358991 - M12 Female, A5, str shielded connector
- C-2358992 - M12 Female, A8, str shielded connector

12.4. Other download document

www.te.com/documentation

12.5. Standards

- IEC60512-1-1 & IEC60512-1-2 – Visual & dimensional examination
- IEC60512-2-1 – Contact resistance test (voltage drop test)
- IEC60512-3-1 - Insulation resistance test
- IEC60352-2 - Cable pull test
- IEC 60512-9 - Mating cycle test
- IEC 60512-14-7 - Degree of protection test
- IEC60512-4-1 - Voltage proof test
- IEC60512-13-2 - Insertion and withdrawal forces test
- IEC60512-11-4 - Rapid change of temperature test
- IEC60512-11-9 - Dry heat test
- IEC60512-11-12 - Damp heat, cyclic
- IEC60512-11-10 - Cold test
- IEC60512-9-2 - Electrical load and temperature test
- IEC60512-19-3 - Resistance to fluids test
- EN61373 cat 1, class B - Railway Applications – Rolling Stock Equipment – Shock & Vibrations tests

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- EN45545-2 HL2 R22/R23 - Railway Applications – Fire Protection on Railway Vehicles – Part 2: Requirements for fire behavior of materials and components
- IEC60512-13-5 – Polarizing test
- IEC60352-2 – Solderless connection test
- IEC 60512-11-7 – Mixed flowing gas test
- IEC61076-2-101 - M12 spec
- IEC11801-1- Data transmission

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