Product MaxiBridge - Crimp Snap In

Application Specification
114-94926
27 APR 23 Rev 1

TABLE OF CONTENTS

Change History

Change #	Change Description	Date (DE)
1	Crimp parameters 0,75²	11.10.2019
2	Article numbers of tooling for 0,75²	09.04.2020
3	Explanations regarding tools & crimp parameters, wire utilization	13.11.2020
4	Various improvements incl. change of the document structure; processing parameters and other terminal-specific information moved to separate Attachment I	10.01.2022
5	With this edition the document focuses on contacts C2022 and C2426	10.02.2022
6	Extension of focus on C1820 and explanations about terminal-specific formation of the crimped region and related insights derived from stress tests	22.07.2022

Change #	Change Description	Date (DE)
7	Changed template closer to TE appearance while maintaining CAQ document numbers. Introduced terminals w/ Insulation Grip Feature (IGF). Introduced chapter about engaging and disengaging as well as tool for unlocking mated receptacles. All requirements are maintained w/o changes over previous issue with document # 074718.	13.04.2023

1. INTRODUCTION

This specification covers the requirements for application of “MaxiBridge - Crimp Snap In” connectors used in a great variety of applications and various types of electrical connections. For information about the Product’s portfolio refer to chapter 3.3 Description.

Please note, the scope of this document does not extend to the headers of the MaxiBridge family and their processing, e.g. soldering of such.

This also applies to storage conditions.

When corresponding with TE personnel, use the terminology provided in this specification to facilitate inquiries for information. Figure 1 visualizes the Product in general.

MaxiBridge Receptacle housings
as supplied in package: housing pre-assembled but not yet locked)

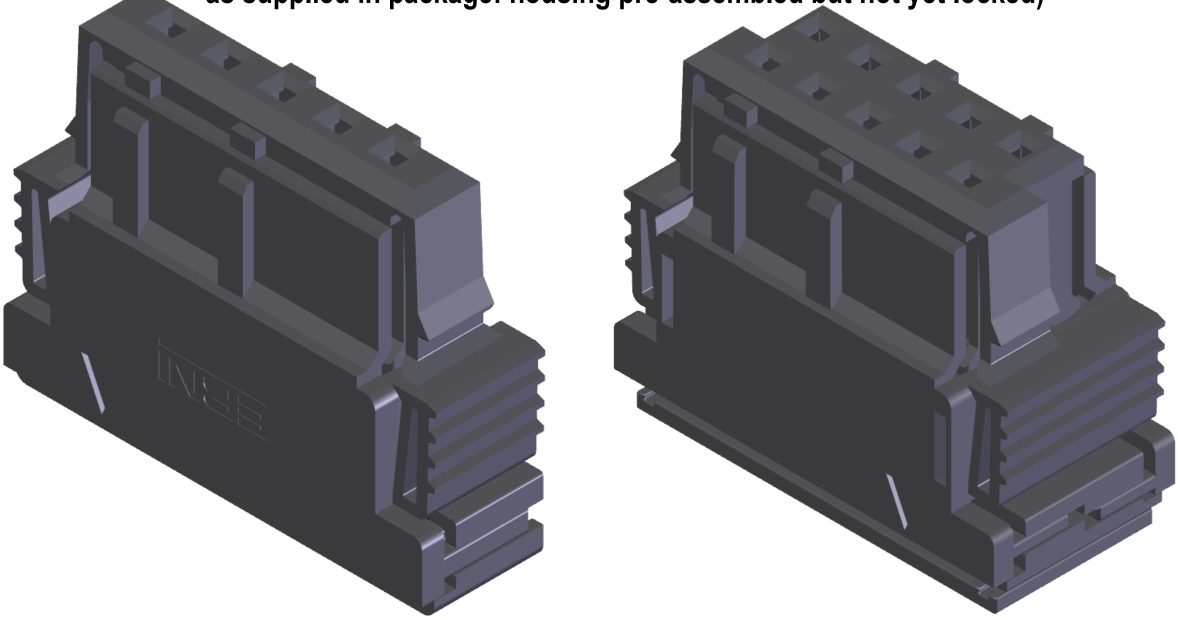


Figure 1
364226-E (single-row 5p) *474034-E (dual-row 10p)*

2. REFERENCE MATERIAL

2.1. Revision Summary

Refer to above-written Change History.

2.2. Notes, Terms and Abbreviations

ERNI is now an integral part of TE Connectivity.

All processing strictly has to follow ERNI's Processing Specification in order to ensure best results.

ERNI reserves the right to apply changes to this document without prior notice.

The Processing Specification can be obtained by download from www.erni.com. The edition on the website is the latest release and replaces all older versions. Make sure you regularly check there for more recent issues. If there is no Processing Specification available online, please contact your local ERNI representative. This also applies to the Processing Specification's attachments which may change independently from the main Processing Specification.

Products and product information in this document are meant to be informative in nature and do not imply any assurance of performance or product properties, like availability, qualification, approval, or fit for a certain application, if not stated explicitly. For binding information inquire directly with ERNI.

The visualizations in this document are of a schematical nature and have been adjusted for their respective purposes. For exact product representations please refer to product drawings and CAD models, which can be found on our website (www.erni.com) or requested from ERNI directly.

All dimensions are specified in the unit millimeter (mm) if not explicitly stated otherwise.

"," (comma) may be used as a decimal delimiter instead of "." (period) in the course of this document and both are considered equal (2,1 = 2.1).

Six-digit numbers represent ERNI part numbers in this document (now as TE numbers with a "-E" on their ends).

This document's contents have been written in a clear and distinct context. Therefore, the specific product may not be named and PRODUCT or THE PRODUCT are used as placeholders.

MaxiBridge and MaxiBridge QT are independent product families that must not be confused or intermixed, and must clearly be distinguished.

ABBREVIATIONS

AWG	American Wire Gauge
CSI	Crimp Snap-In

DEFINITION OF TERMS

Connector	herein referring to a female / receptacle housing with or without terminals if not otherwise noted
Contact	herein referring to the front part of a terminal comprising its very "contact range" meant to make contact with a pin contact
Cable	used synonymically with (electrical) wire in the context of this document
Insulation holder	the insulation crimp barrel or shorter the insulation crimp
Insulation support barrel	-"-
Insulation holding device	-"-
Insulating grip effectiveness	The insulation crimp's capability to keep a wire's insulation
Insulator crimp	insulation crimp
Pull-out strength	refers to the capability of the terminal attached to a wire to withstand pull forces (measured-value pull-out force)
Stranded wire	wire with a conductor made from several, smaller wires
Terminal	in the context of this document referring to a terminal with a crimp zone on one end and a dual-beam receptacle contact design on the other end (also referred to as "contact range"), meant to make contact with a pin contact
Termination	refers to the side of the terminal that shall be crimped
Tear-off	refers to breaking of the wire

Wire	used synonymically with cable in the context of this document

REFERENCES TO STANDARDS

DIN EN 60352-2 (international version IEC 60352-2)
Lötfreie Verbindungen - Teil 2: Crimpverbindungen - Allgemeine Anforderungen, Prüfverfahren und Anwendungshinweise; Deutsche Fassung EN 60352-2
[Solderless connections - Part 2: Crimped connections - General requirements, test methods and practical guidance; German version EN 60352-2]

LV 214 (OEM-specific equivalent VW 75174)
Kfz-Steckverbinder Prüfungen
[Motor Vehicle Connectors Tests]

INFORMATIVE REFERENCES

IPC-A-620 now IPC/WHMA-A-620
Requirements and Acceptance for Cable and Wire Harness Assemblies

VW 60330
Crimpverbindungen Lötfreie elektrische Verbindungen
[Crimp Connections Solderless Electrical Connections]

DIN EN 60512-16-4 (international version IEC 60512-16-4)
Steckverbinder für elektronische Einrichtungen - Mess- und Prüfverfahren - Teil 16-4: Mechanische Prüfungen an Kontakten und Anschlüssen - Prüfung 16d: Zugfestigkeit von Crimpverbindungen;
[Connectors for electronic equipment - Tests and measurements - Part 16-4: Mechanical tests on contacts and terminations - Test 16d: Tensile strength (crimped connections)]

DIN EN 60512-16-8 (international version 60512-16-8)
Steckverbinder für elektronische Einrichtungen - Mess- und Prüfverfahren - Teil 16-8: Mechanische Prüfungen an Kontakten und Anschlüssen - Prüfung 16h: Isolationshalterung bei Crimpverbindungen
[Connectors for electronic equipment - Tests and measurements - Part 16-8: Mechanical tests on connections and terminations - Test 16h: Insulating grip effectiveness (crimped connections)]

2.3. Drawings

Customer drawings for product part numbers are available from www.te.com. Information contained in the customer drawing takes priority.

2.4. TE Specifications

108-94926	Product Specification, provides product performance and test results.
107-94926	Product packaging specification (upon availability)
501-94926	Qualification Test Report (upon availability)
114-94926-A I	Attachment I Tools and Cables (formerly # 074729 for terminals C2022, C2022 IGF, C2426)
114-94926-A II	Attachment II Tools and Cables (formerly # 074731 for specifics of terminal C1820)

3. REQUIREMENTS

3.1. Fundamentals

The acceptance criteria for cable and harness assemblies in the current IPC-A-620 manual are generally recommended for the assembly of ERNI connectors.

3.2. Product Characteristics

Crimp-Snap-In connectors of the MaxiBridge product family are available in various versions:

NUMBER OF PINS OF SINGLE-ROW CONNECTORS

2, 3, 4, 5, 6, 8, and 10-pin

NUMBER OF PINS OF DUAL-ROW CONNECTORS

10 and 20-pin

CRIMP TERMINAL SIZES:

The crimp contacts (terminals) are available in following sizes and have been designed for their use in conjunction with the cross-sections listed here and single-wire termination. Double-wire crimps are not an intended use.

- Terminal “C2426” for AWG 24, 26 or 0.22 mm², 0.17 mm²
- Terminal “C2022” for AWG 20, 22 or 0.5 mm², 0.35 mm²
- Terminal “C1820” for AWG18 or 0.75 mm².

The “C2022” terminals are available in two versions: With Insulation Grip Feature (IGF) and without (refer to below depictions). IGF terminals feature an **improved** Insulation Grip Effectiveness.

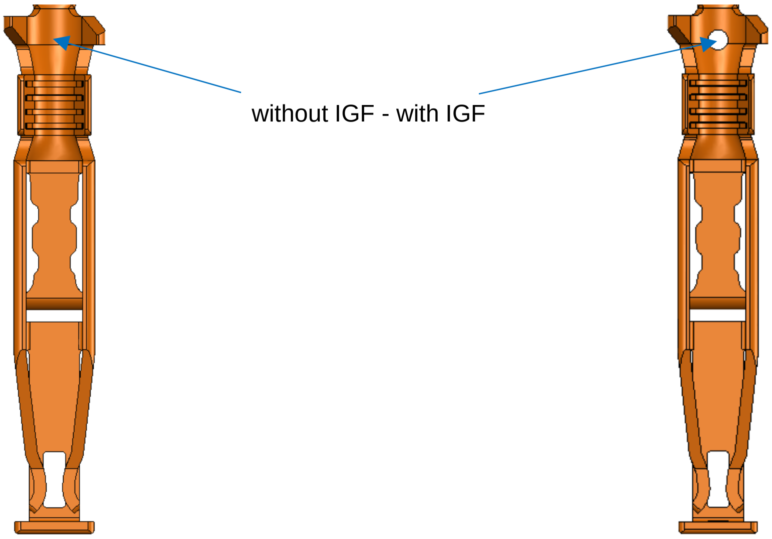


Figure 2

Additionally, the above-mentioned information can be found in the respective Attachments in more detail.

Type of conductor crimp: B-crimp
Type of insulator crimp: wrap over (entwined crimp)

Thickness of contact base material: 0.3 mm

Hint: Maximum insulation diameter may restrict the choice of wires for all conductor sizes (also refer Attachments)

3.3. Description

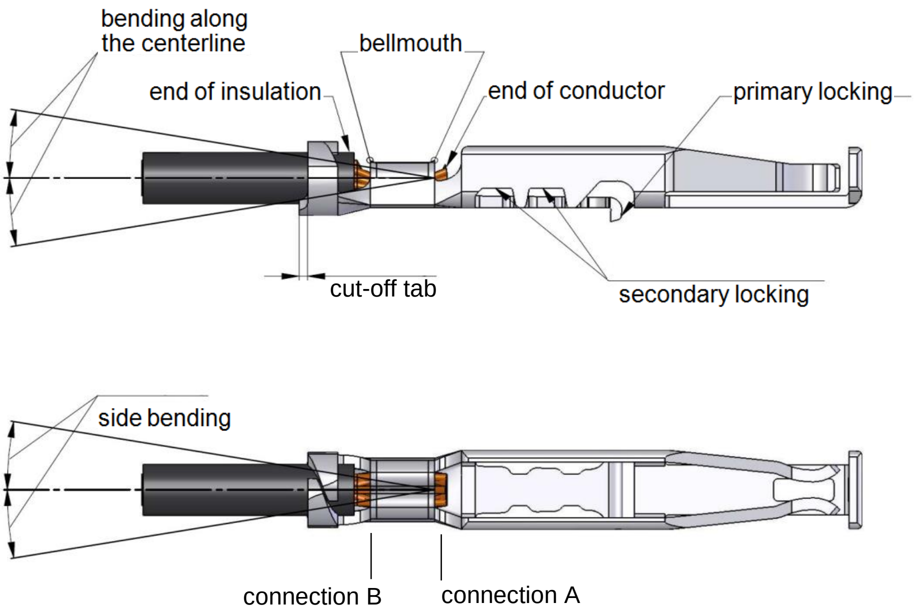


Figure 3

3.4. Specific Requirements

3.4.A. Cable Construction

The requirements to the cable construction for crimp termination shall follow IEC 60532-2.

Within the scope of the IEC 60352-2 standard, cables need to meet following criteria in general:

- Stranded wires are to be used.
- It is not permitted to solder/dip solder stranded conductors (strands) within the area intended for the crimp connection.
- After crimping, no further soldering should take place.
- Soft-annealed copper with an elongation break of at least 10% is to be used.
- Bare copper or tin-plated (tin or tin-lead) or silver-plated single strands are to be used. The surface must be free from impurities or corrosion.
- The insulation must be easily removable from the conductor without changing the physical properties of the conductor.

Possible insulation diameter ranges are shown in the respective Attachments.

Information on approved wires can be found in the respective Attachments.

3.4.B. Conductor Crimp According to IEC 60352-2

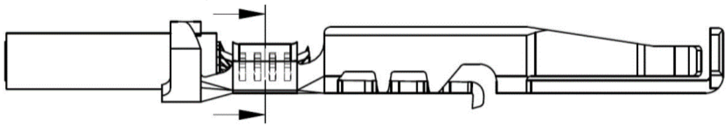


Figure 4

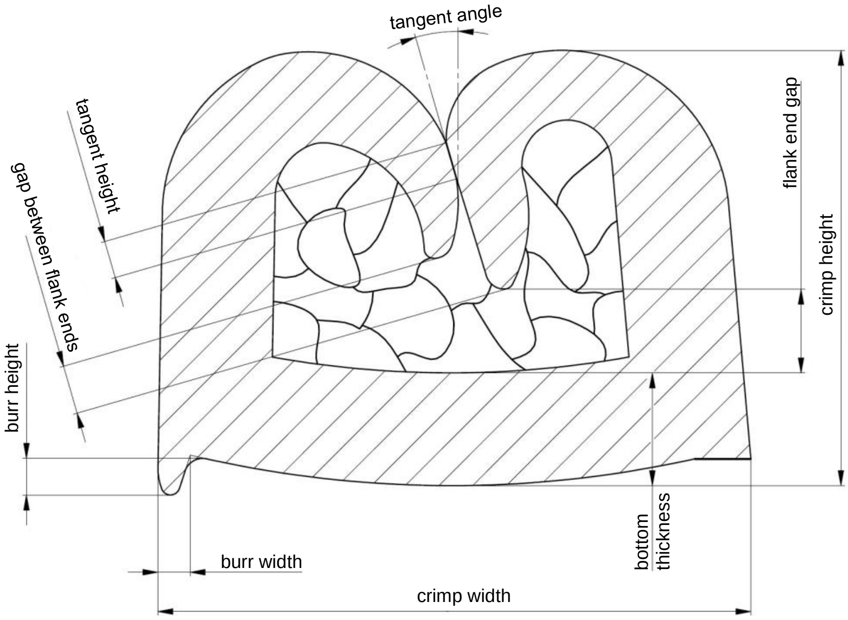


Figure 5

In addition to IEC 60352-2 following **requirements** apply to The Product:

• Crimp height:	Measured values, limits according to Attachments
• Crimp width:	Measured values, limits according to Attachments
• Pull-out force:	Measured values, limits according to Attachments
• Tangent angle:	max. 30°
• Tangent height:	min. 0.5 x terminal material thickness
• Flank end gap:	not permitted to touch the bottom
• Gap between flank ends:	max. 1.0 x terminal material thickness
• Burr height:	max. 1.0 x terminal material thickness
• Burr width:	max. 0.5 x terminal material thickness
• Bottom thickness:	min. 0.75 x terminal material thickness

- Filling:

Strands must be completely pressed in a honey-combed structure. Individual cavities due to unsym-metrical forming or an unfavorable tolerance build-up of the material and the crimping height are still per-missible as a borderline case (refer to below photo of a conductor crimp micro-section).

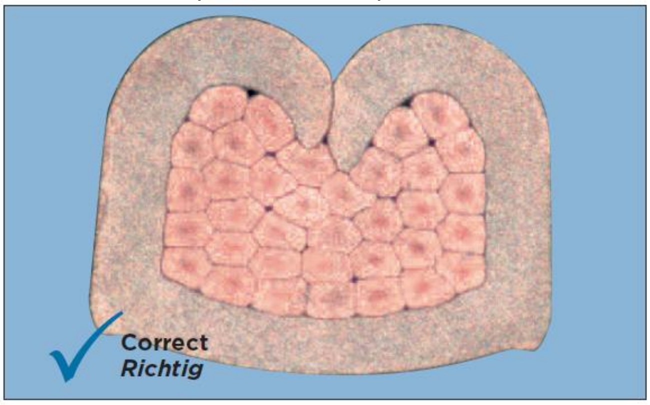


Figure 6

Formation of cracks at the bottom of the crimp barrel is not acceptable. Wrinkles which can occur at the inside of the rolled-in areas need to be distinguished.

To ensure a high current carrying capacity the contact was designed with a base material of a high thickness. Due to the material shift between the very conductor crimp range and the connection area towards the contact system ("connection A"), the formation of notches (wrinkles) is possible (refer Figure 7 – red circled areas). Based on the findings derived from stress tests this characteristic has no detrimental effect on the reliability of the terminal.

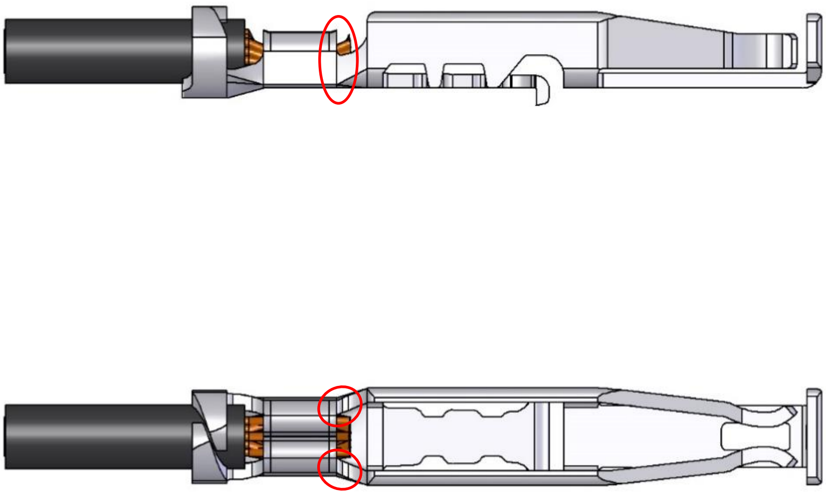


Figure 7

3.4.C. Insulation Crimp

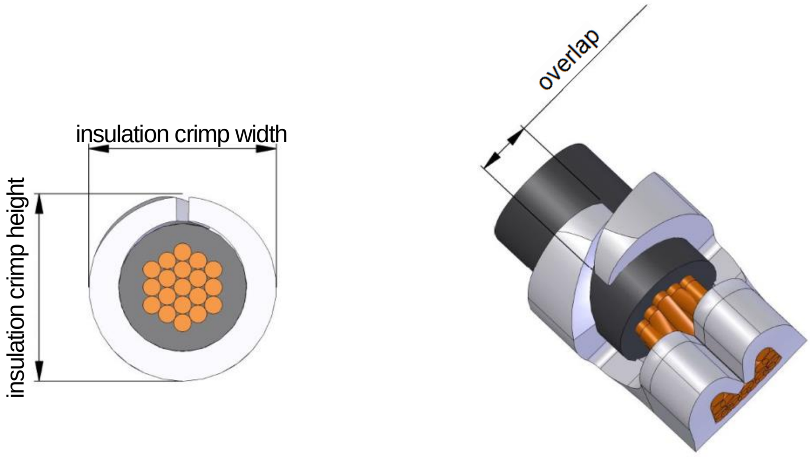


Figure 8

REQUIREMENTS:

- Insulation crimp height: Measured value, limits according to Attachments
- Insulation crimp width: Measured value, limits according to Attachments
- Overlap of the crimp flanks at the wrap-over crimp (entwine-crimp): min. 1.0 x terminal material thickness.
- Insulations crimping: Minor deformation of the insulation surface respectively a minor penetration into the insulation surface has to be achieved. Ideally, the maximal deformation of 1/3 of the insulation thickness or the terminal material thickness will not be exceeded. Stronger deformation, especially with soft insulation materials; is permitted if the insulation is not damaged by cutting, piercing, or tearing.

Deviating from the standard's requirements, fully functional insulation crimp connections can be achieved without overlap of the crimp flanks. The prerequisite for doing so, is the achievement of the minimum pull-out force according to IEC 60352-2 or another relevant standard's limits applicable within the scope of customer-specific requirements (e.g. LV 214).

The insulation holder is not to be regarded as a strain relief. It shall firmly encompass the insulating sleeve but not penetrate it.

3.4.D. Terminal - Locking Tab Deformation

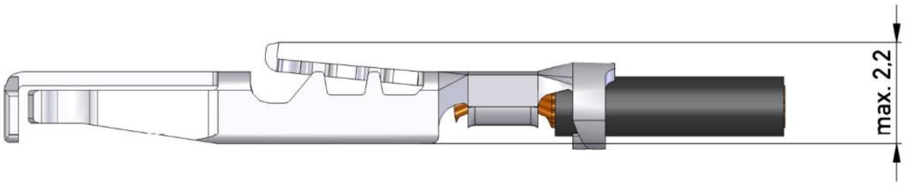


Figure 9

REQUIREMENTS:

- It is not permitted for the locking tab to be deformed inwards.
- Deformation outwards can reach a maximum of 2.2 mm.
- The locking tab must not be impaired in terms of the function.

3.4.E. Housing, Crimp Terminal and Cable

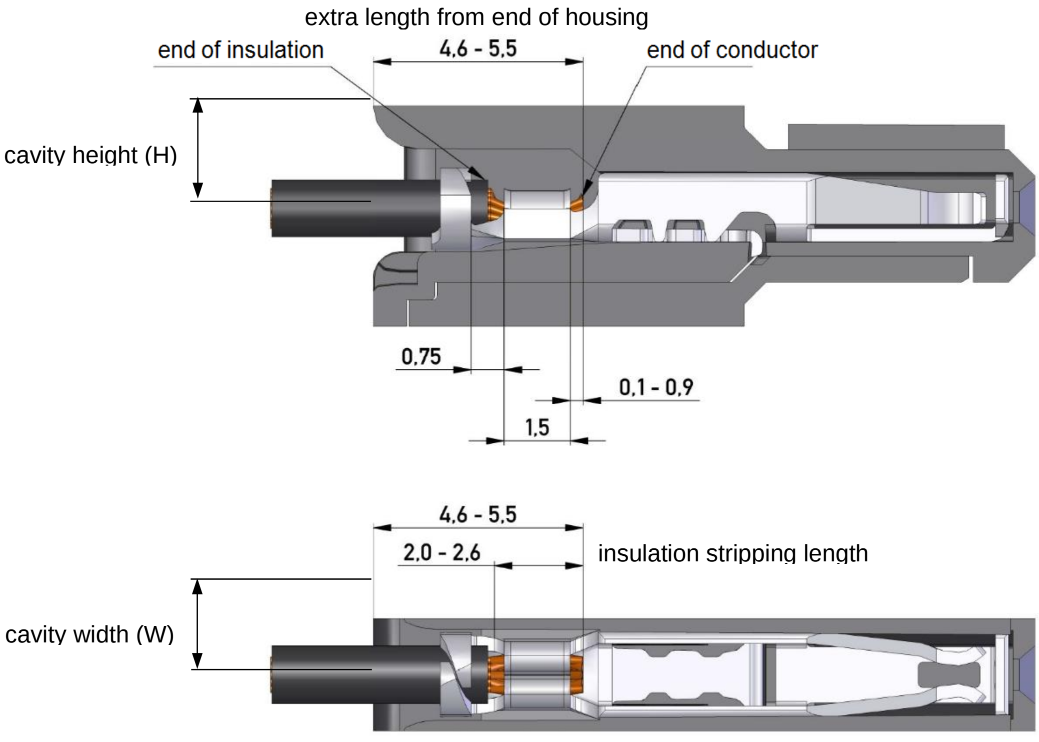


Figure 10

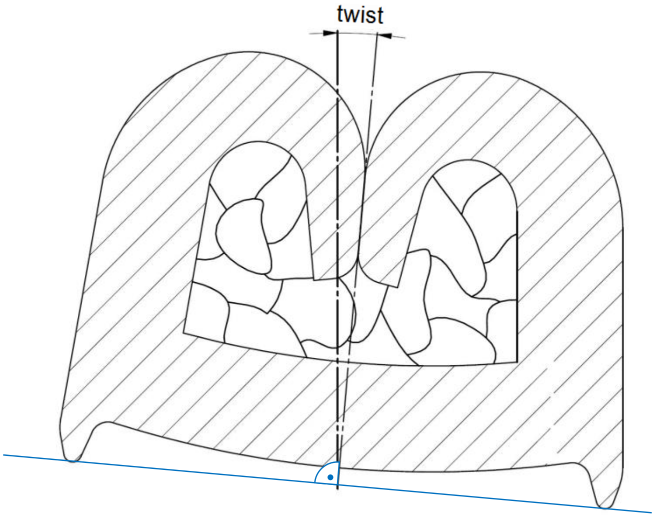


Figure 11

REQUIREMENTS:

- The suitable insulation stripping length is 2.3 ± 0.3 mm (in Figure 10 dimension „2.0 – 2.6“).
- The end of the conductor: 0.1 mm – 0.9 mm past the end of the conductor crimp area.
- Projecting strands at connection A (front bellmouth towards contact range) are permitted provided all strands are contained in the conductor crimp and insertion of the terminal into the housing is not impaired.
- The end of the insulation must be visible between the insulation crimp and the conductor crimp; ideally located in the middle.
- A bellmouth on the cable entry side (connection B) must be recognizable. A bellmouth on the side of the conductor end (connection A) is permitted.
- “Side bending” must not exceed 3° (see Figure 3).
- “Bending along the centerline” must not exceed 5° (see Figure 3).
- “Twist” between crimp and contact range must not exceed 5° (see Figure 11, missing in Figure 3).
- The separating strip must not exceed 0.3 mm (see Figure 3).
- During processing the terminal extends its rear length. This extension must be limited to ≤ 0.4 mm.

3.4.F. Pull-Out Forces According to IEC 60352-2 Respectively LV214 PG 10

Minimum pull-out forces are listed in the Attachments.

3.4.G. Tear-Off Characteristics – Informative – not an ERNI Requirement

The tear-off characteristics can be assessed as an optional criterion.

It is to be assessed positively, if the strands tear off irregularly behind the bellmouth once the required pull-out force (see Attachments) has been achieved (refer Figure 12). The decisive criterion is pull-out force to reach or exceed the required value.

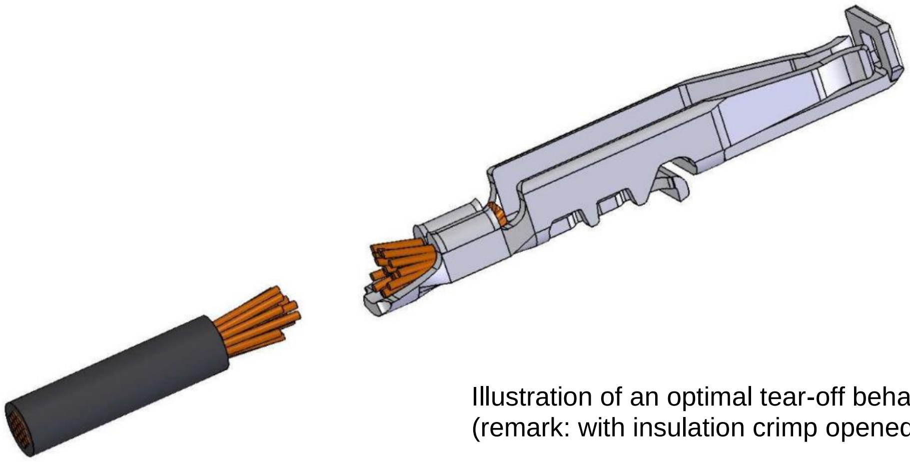


Illustration of an optimal tear-off behavior
(remark: with insulation crimp opened

Figure 12

INDICATION:

The strands tear off directly behind the bellmouth:	overpressed.
The strands do not tear off and are pulled out of the crimp:	underpressed.

3.5. Assembly – Single-Row Version

The single-row connector consists of housing with terminal cavities and locking member (secondary locking). When handling, please take note that housing and locking member do not lock unintentionally ahead of all terminals have been assembled into the housing.

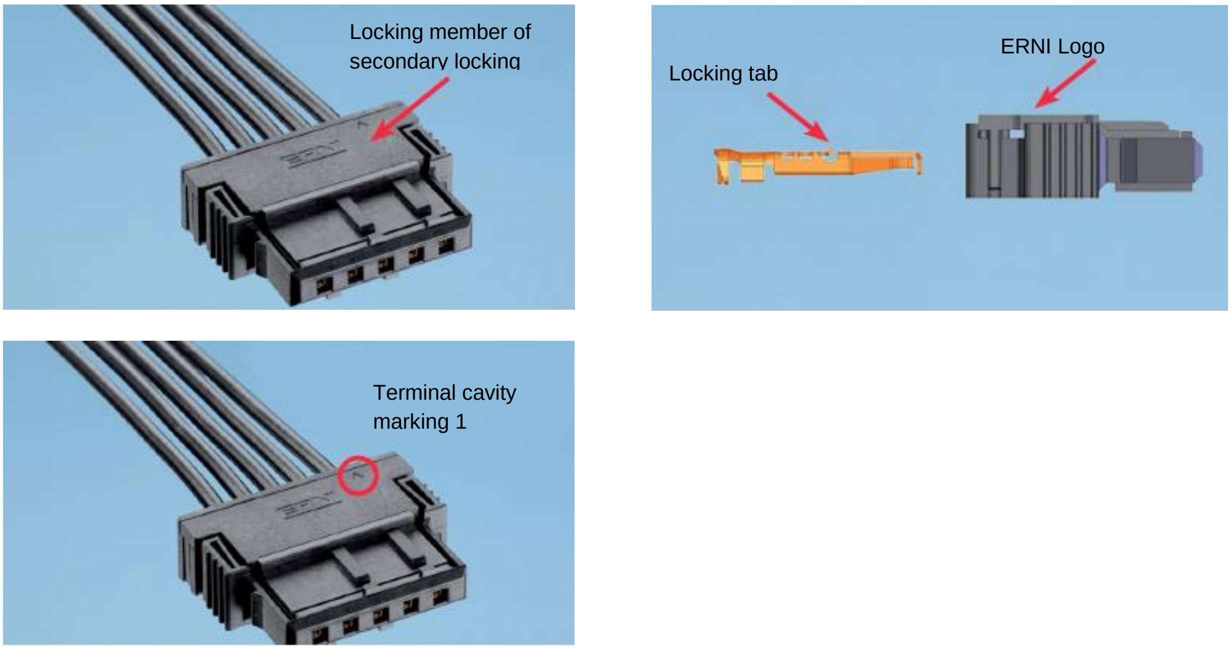


Figure 13

Populating of the terminal cavities with terminals is taking place in accordance with the work documents. The terminal must be inserted in correct orientation into the cavity until the primary locking audibly engages.

Correct engagement of the primary locking is to be checked by pulling backwards on the cable (max. 10 N).

After complete terminal assembly, lock housing and secondary locking member by gently pressing them together. The secondary locking member shall fully engage and close.

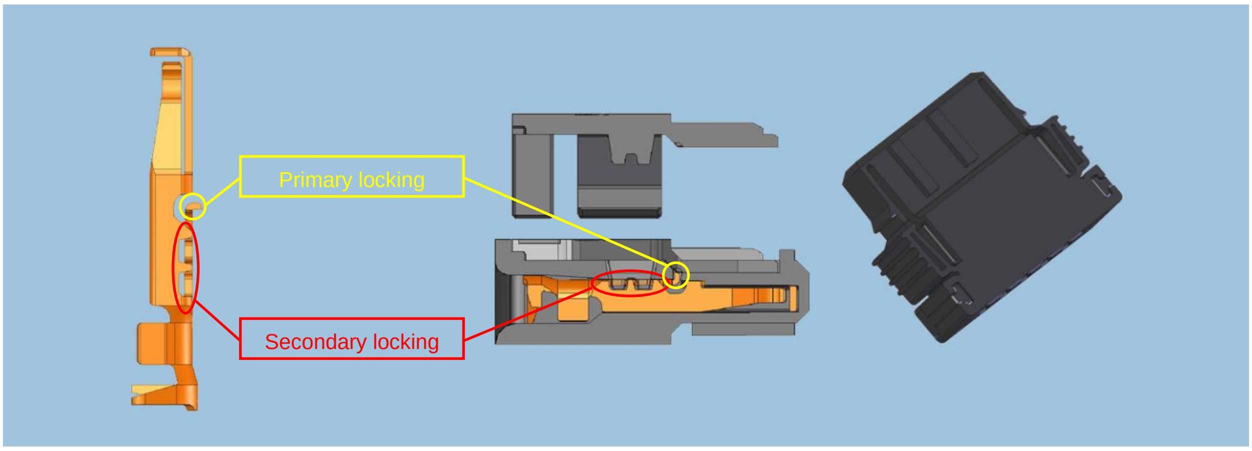


Figure 14

Only a fully engaged locking member ensures a proper secondary locking function.

3.6. Assembly – Dual-Row Version

The dual-row connector consists of housing with terminal cavities and two locking members (secondary locking left and right). When handling, please take note that housing and locking are not locked unintentionally before all the terminals have been assembled.

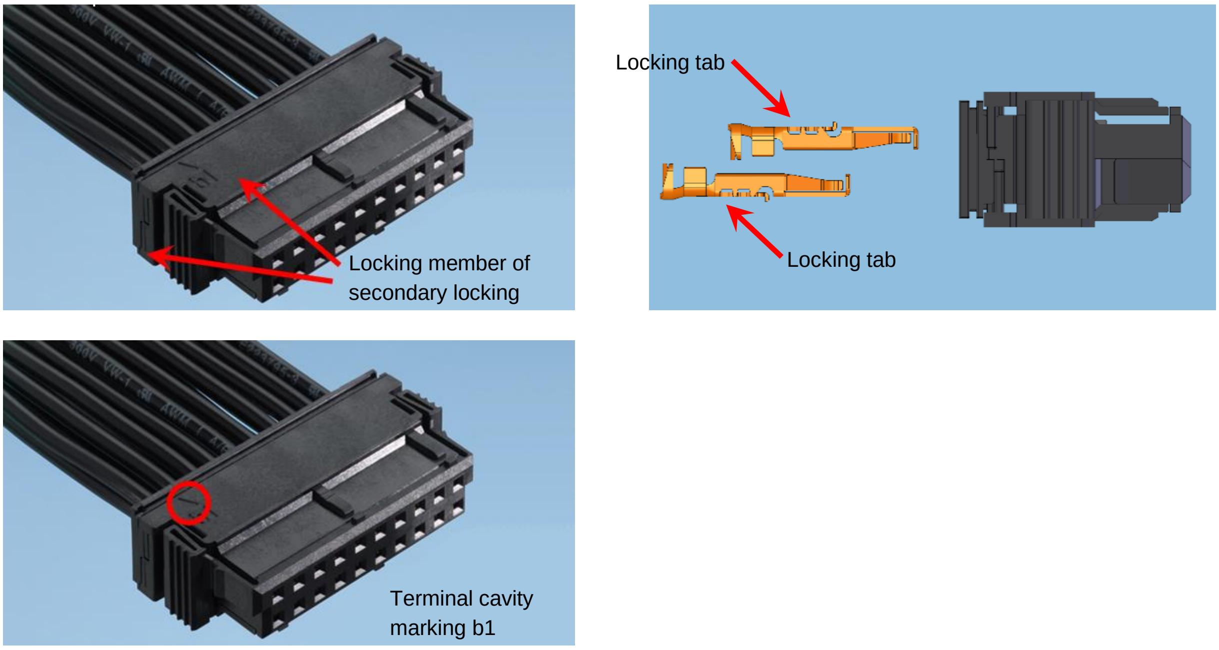


Figure 15

Populating of the terminal cavities with terminals is taking place in accordance with the work documents. The terminal must be inserted with correct orientation into the cavity until the primary locking is audibly engaged.

Correct engagement of the primary locking is to be checked by pulling backwards on the cable (max. 10 N).

After complete terminal assembly, lock housing and secondary locking member by gently pressing them together. The secondary locking member shall fully engage and close.

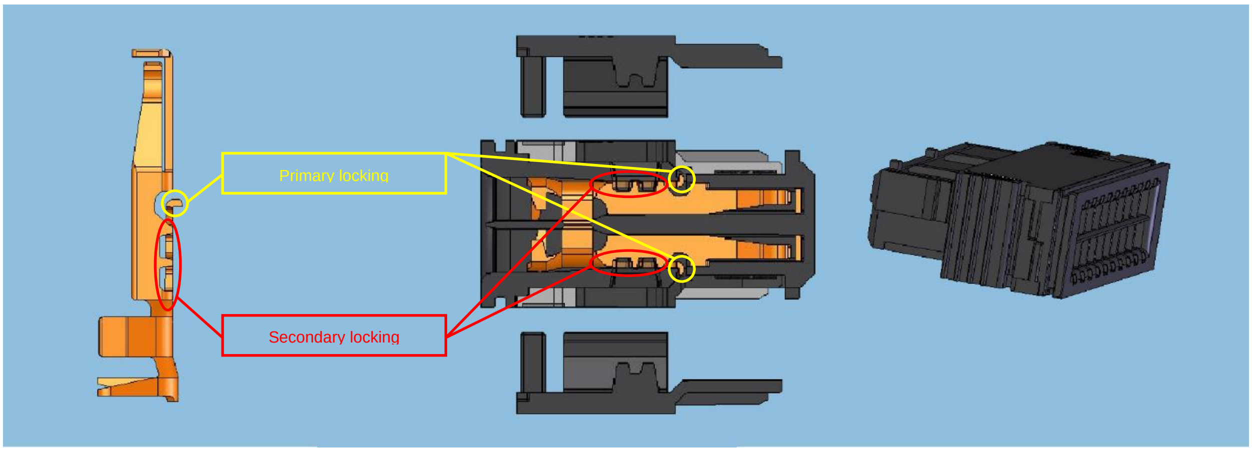
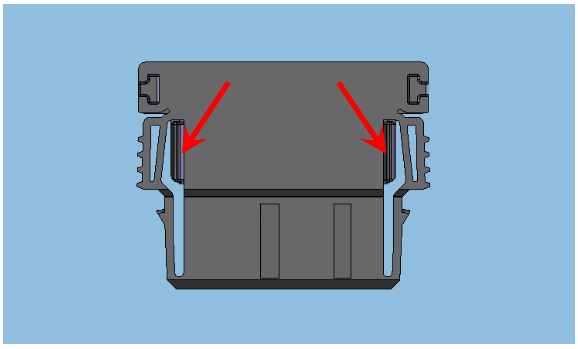


Figure 16

Only fully engaged locking members ensure a proper secondary locking function.

3.7. Crimp Terminal Replacement



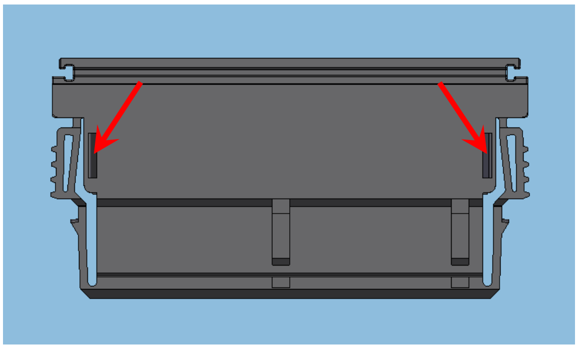


Figure 17

Single-row connector *Dual-row connector*

The interlock member (secondary locking) must be completely removed when replacing or removing a crimp terminal that already has been locked into the connector housing.

The single-row connector has one, while the dual-row connector has two secondary interlock members.

Regardless if the locking member is pre-assembled (delivery state) or already fully locked, by means of tool no. 464790-E the two locking hooks shall be depressed (red arrows in above depictions).

The locking member can then be removed. A once opened connector housing shall not be reused and must be replaced by a new one.

Push down the locking tab (primary locking) using either tool number 464790-E or a small screwdriver and remove the terminal by pulling backwards on the cable.

The crimp terminal detached from the housing can be reused, however, it must be inspected for possible damage, especially for deformation of the primary locking tab and, if necessary, be replaced.

3.8. Inspection

3.8.A. Inspection of Item Characteristics

The requirements to both, wire and insulation crimp, are to be ensured by suitable variable and attributive tests.

3.9. Engaging and Disengaging Receptacles and Headers

Tool 454374-E is meant to assist in unlocking and disengaging receptacles from their mated headers particularly in applicational situations with space-limitations where the unlocking mechanisms are difficult to reach with fingers and forces necessary for unlocking cannot be applied.

In most situations, the Product can be unlocked manually without the help of a tool.

ENGAGEMENT:

1. Align the mating faces of header and receptacle sufficiently.
2. Mate receptacle with its header counterpart.
3. After both could further align to each other the receptacle will easily slide inside the header until some resistance can be felt.
4. Then firmly press on the receptacle towards the header until there is an audible click.
5. Pull reasonably at the wire bundle (without damaging header, receptacle, and wires).

DISENGAGEMENT:

1. Firmly press the locking levers with thumb and index finger (where blue arrows indicate in below Figure 18).
2. Gently pull the receptacle at the same time.
3. If pressure on the levers is sufficiently high, the receptacle unlocks from the header and can be pulled from the header.

Hint: Do not pull the receptacle excessively to avoid any risk of damage to the header, the solder joints of the header or the PCB the header is mounted onto.

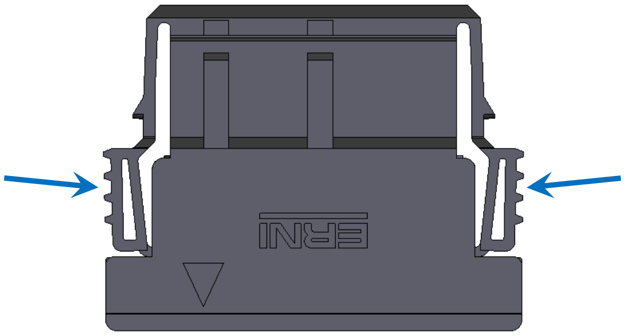


Figure 18 - Unlocking the receptacle