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Change History

Change #	Change Description	Date (DE)
A	Initial release	26.05.2023
B	Revised	23.09.2025

Please note! There are important safety instructions in this document which extend to health risks and danger of death, and which are strictly to be followed!

Processors (e.g. cable assembly and cable harness houses) of VolTron 1000 receptacles and its subcomponents are responsible for the quality of the end products and the processes leading to the end products.

Design-in of VolTron 1000 happens in the sole responsibility of the customer. Automotive customers are required to contact TE Connectivity ahead of any design-in.

NOTE
All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters. Unless otherwise specified, dimensions have a tolerance of ±0.1mm and angles have a tolerance of ± 2 °. Figures and illustrations are for identification only and are not drawn to scale.

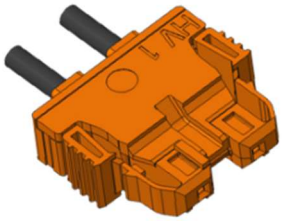
1. INTRODUCTION

This specification covers the requirements for application of “VolTron 1000 - Crimp Snap In” connectors used for electrical high voltage connections. For information about the Product’s portfolio refer to chapter “3.3 Product Characteristics”.

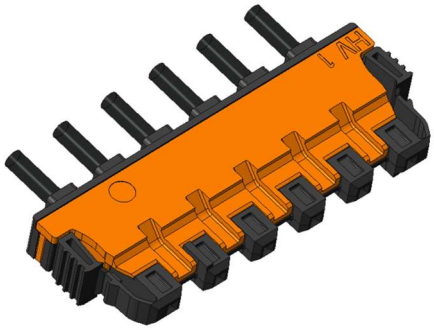
Please note, the scope of this document does not extend to the headers of the VolTron 1000 family and their processing, e.g. soldering of such.

This also applies to storage conditions for all VolTron 1000 family members.

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



VolTron 1000 2p receptacle(orange)



VolTron 1000 6p receptacle(black)

Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

update for this application specification, with add the product information.

2.2. Notes, Terms and Abbreviations

ERNI is now an integral part of TE Connectivity.

All processing strictly has to follow ERNI’s Application Specification in order to ensure best results.

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

The Application Specification can be obtained by download from TE.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 Application Specification available online, please contact your local TE representative. This also applies to the Application Specification’s attachments which may change independently from the main Application 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 TE.

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 (TE.com) or requested from TE representative 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.

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
Hipot	equals “high voltage” and both refer to dielectric withstand tests and insulation resistance tests
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

2.3. 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]

VW 80332
Kfz-Hochvolt-Kontaktierung
[Motor Vehicle High-Voltage Contacts]

SAE/USCAR-37 (Supplement to SAE/USCAR-2)
High Voltage Connector Performance

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)]

2.4. Drawings

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

2.5. TE Specifications

108-94917	Product Specification, provides product performance and test results.
107-94917	Product packaging specification (upon availability)
501-94917-1	Qualification Test Report (upon availability)
114-94917-1	Attachment I Tools and Cables .

3. REQUIREMENTS

3.1. SAFETY Instructions

Voltages according to the product specification are hazardous and constitute a danger to life. Special care must be taken during all steps of the Product's processing, i.e. wire preparation, crimping wires with terminals, assembling of crimped terminals into housing, hipot testing and mating of receptacles with headers.

The SAFETY instructions in this document are strictly to be followed in order to avoid risk to health and life.

There may be other, more specific, regulations and standards that rule a particular application. Make sure to definitely include and appropriately consider all applicable regulation.

SAFETY Instruction: VolTron 1000 receptacles are to be considered SAFETY COMPONENTS and may pose health risks and danger of death.

3.2. 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.

3.3. Product Characteristics

Crimp-Snap-In connectors of the VolTron 1000 product family are available in several versions:

NUMBER OF PINS

2,5,6-pin (availability depends on respective market introduction date)

CRIMP TERMINALS

The crimp terminals are available in following conductor cross-sectional size:

- Terminal “C2022” for AWG 22# 0,35 mm².

They are available in two versions: With Insulation Grip Feature (IGF) and without (refer to below descriptions). IGF terminals feature an **improved** Insulation Grip Effectiveness.

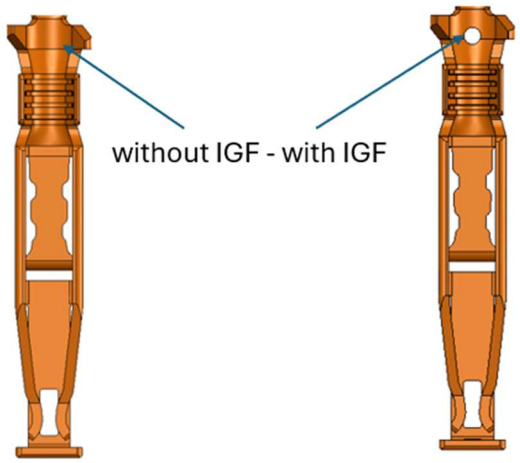


Figure 1

This terminal has been designed for its use in conjunction with the above-mentioned AWG and metric cross-sectional ranges for single-wire termination. Double-wire crimps are not an intended use for the terminals and pose safety risks.

Type of conductor crimp:	B-crimp
Type of insulation crimp:	wrap-over (entwined) crimp
Thickness of terminal base material:	0.3 mm

3.4. Design Considerations

SAFETY Instruction: For additional safety-relevant information including keep-out areas around the Product and its handling make sure to follow instructions included on drawing 544840-E-C which is available upon request.

The Product's intended use case is **INTERNAL WIRING**, i.e. during normal operation both, header and receptacle reside inside a protecting housing or shell. The implementer of a circuit containing VolTron 1000 does have the sole responsibility for the effectiveness of such a protective cover or other means for protection. **The product must be used in an IP-protected enclosure.**

Refer to the Product's documentation.

3.5. Description

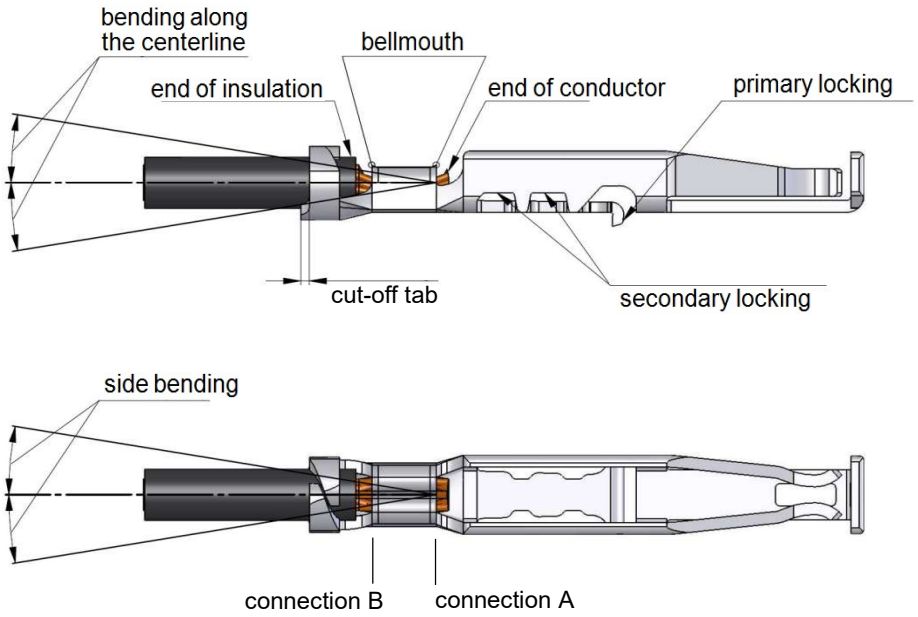


Figure 2

3.6. Specific Requirements

3.6.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 cable without changing the physical properties of the conductor.

Possible insulation diameter ranges are shown in Attachment I.

Information on approved wires can be found in Attachment I.

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

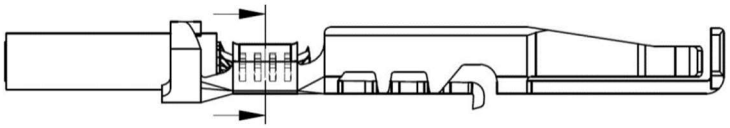


Figure 3 Location of micro-section

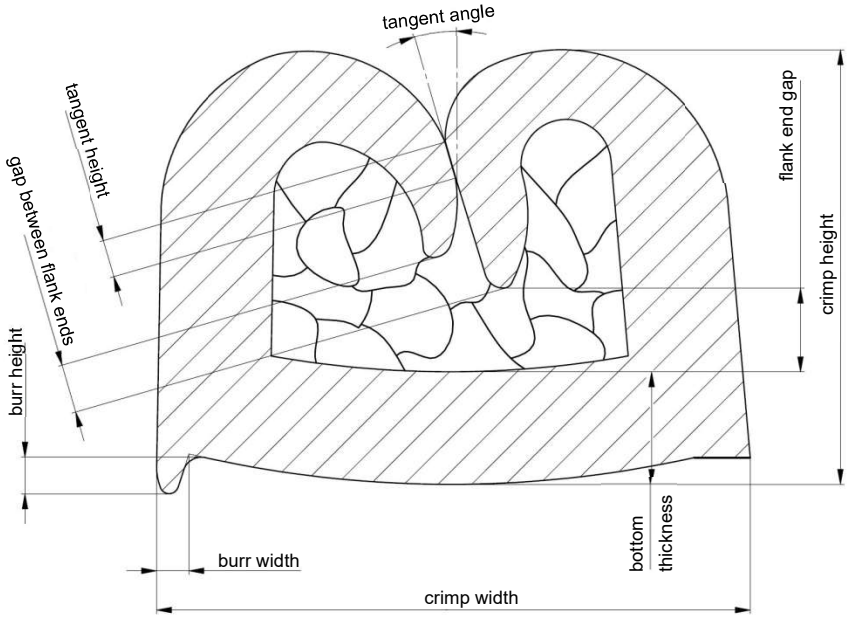


Figure 4 Micro-section (schematic)

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

- Crimp height: Measured values, limits according to Attachment I
- Crimp width: Measured values, limits according to Attachment I
- Pull-out force: Measured values, limits according to Attachment I
- 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 honeycombed structure. Individual cavities due to unsymmetrical forming or an unfavorable tolerance build-up of the material and the crimping height are still permissible as a borderline case (refer to below photo of a conductor crimp micro-section).

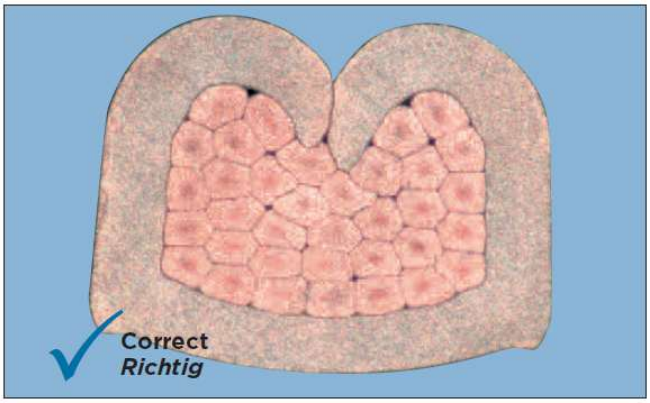


Figure 5

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 6 – red circled areas). Based on the findings derived from stress tests this characteristic has no detrimental effect on the reliability of the terminal.

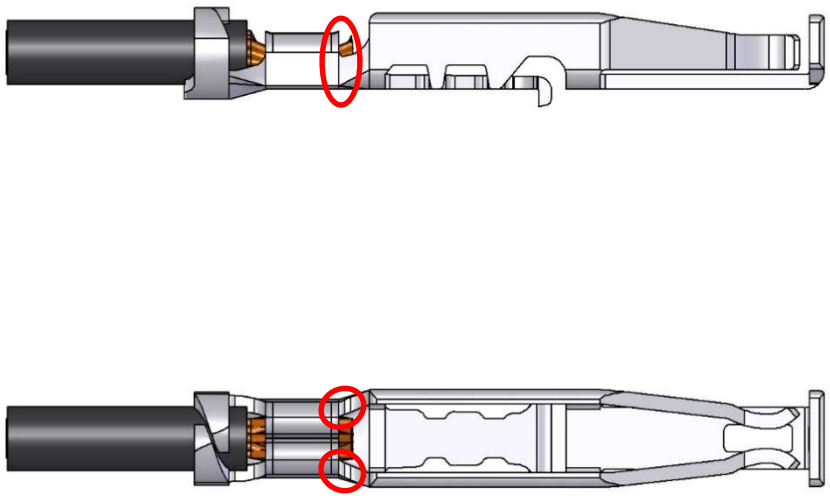


Figure 6

3.6.C. Insulation Crimp

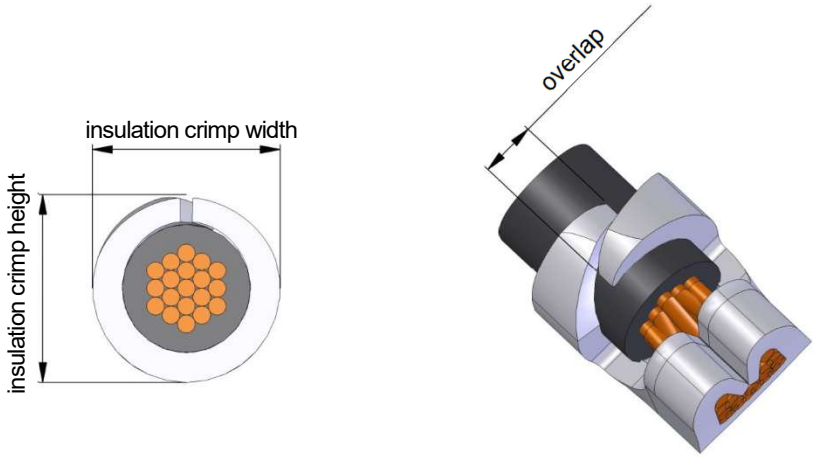


Figure 7

REQUIREMENTS:

- Insulation crimp height: Measured value, limits according to Attachment I
- Insulation crimp width: Measured value, limits according to Attachment I
- 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 must 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.

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

3.6.D. Terminal - Locking Tab Deformation

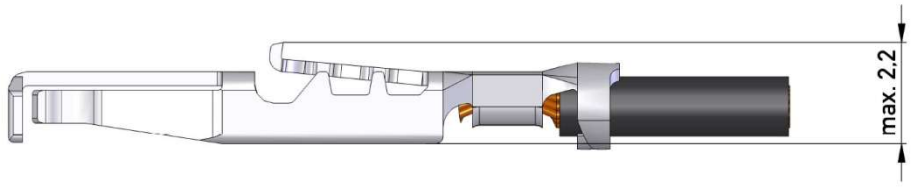


Figure 8

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.

3.6.E. Housing, Crimp Terminal, and Cable

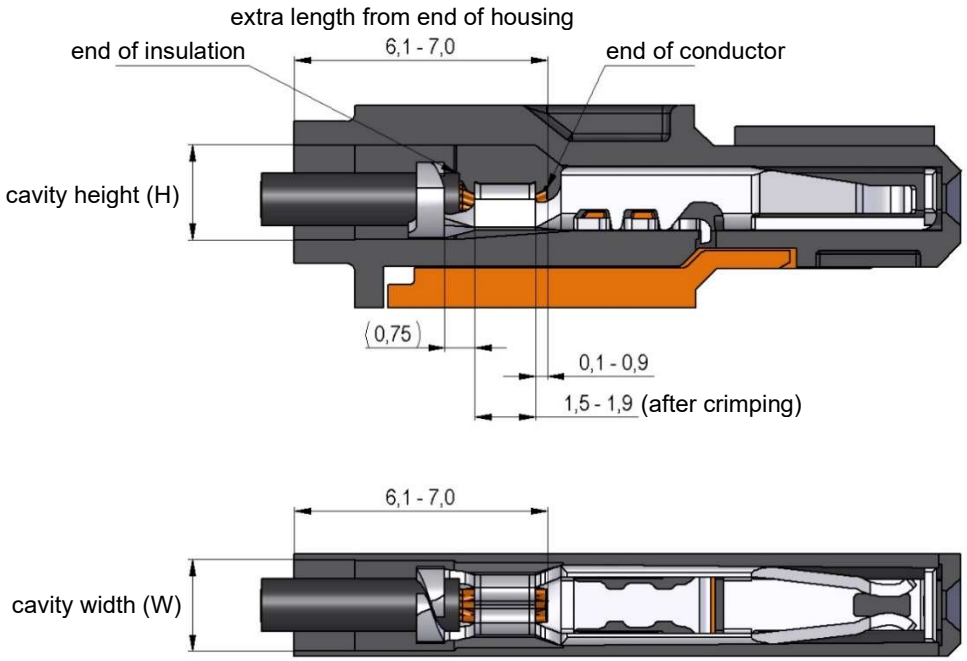


Figure 9

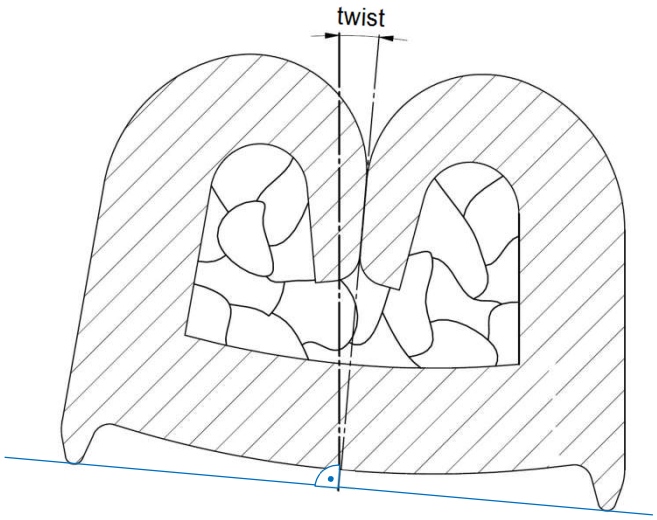


Figure 10

REQUIREMENTS:

- The suitable insulation stripping length is 2.3 ± 0.3 mm.
- 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.
  No insulation or particles of the insulation must be enclosed within the conductor crimp.
  For terminals w/ IGF the end of the insulation shall be as close as possible to the conductor crimp with strands still visible.
- 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 2).
- “Bending along the centerline” must not exceed 5° (see Figure 2).
- “Twist” between crimp and contact range must not exceed 5° (see Figure 10, missing in Figure 2).
- The separating strip must not exceed 0.3 mm (see Figure 2).
- During processing the terminal extends its rear length. This extension must be limited to ≤ 0.4 mm.

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

Minimum pull-out forces are listed in Attachment I.

3.6.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 Attachment I) has been achieved (refer Figure 11). The decisive criterion is pull-out force to reach or exceed the required value.

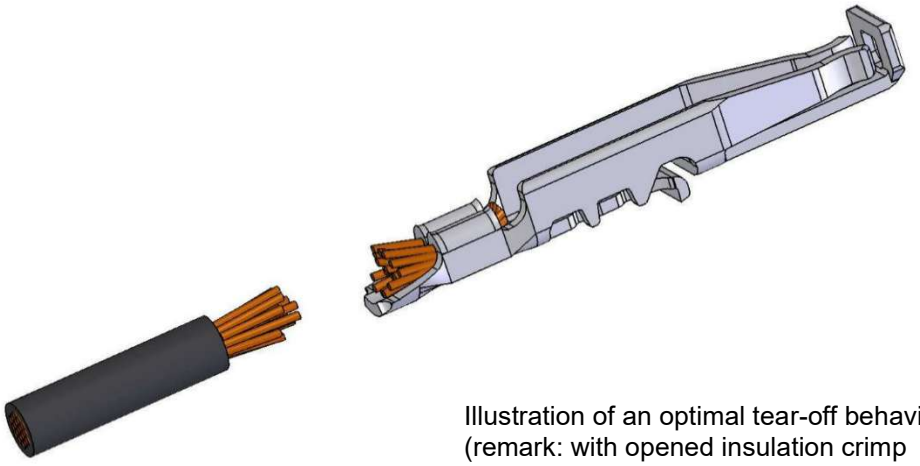


Illustration of an optimal tear-off behavior
(remark: with opened insulation crimp

Figure 11

INDICATION:

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

3.6.H. Inspection of Crimped Items Characteristics’

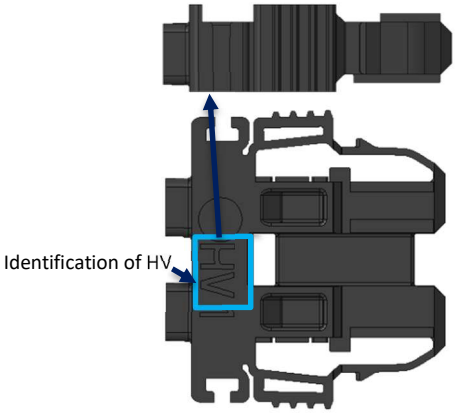
The requirements to both, wire and insulation crimp, are to be ensured by suitable variable and attributive tests.

3.7. Completing the Cable Assembly (Production Steps After Crimping)

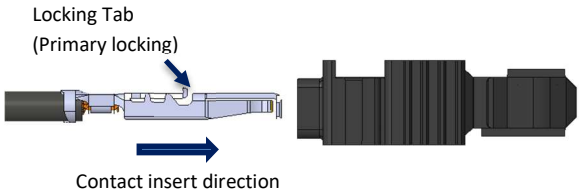
Production steps in general are wire preparation, crimping wires with terminals, assembling of crimped terminals into housings including respective inspection, end-of-line testing also including hipot testing on the fully assembled connectors and its attached wires as suggested.

SAFETY Instruction: Throughout all production steps until assembly in the end application, any damage to the wire's insulation and the connector's members have to safely be avoided!

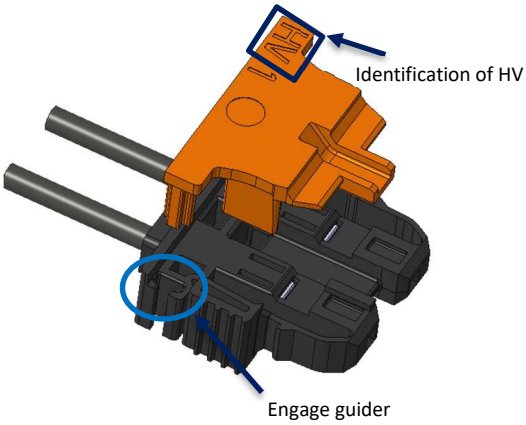
The connector consists of housing with terminal cavities and locking member (secondary locking). When handling, please take note that housing and locking member do not lock unintentionally ahead of all terminals have been assembled into the housing. Procedure as below shown (2Pos as representative).



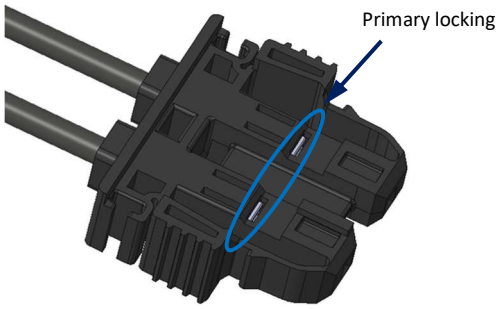
Step 1: Locate the housing as fig shown (Identification of HV downward)



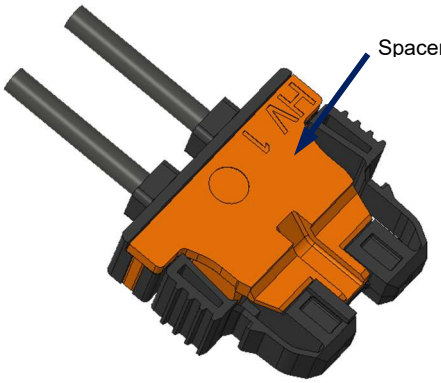
Step 2: Insert contact with locking tab upward



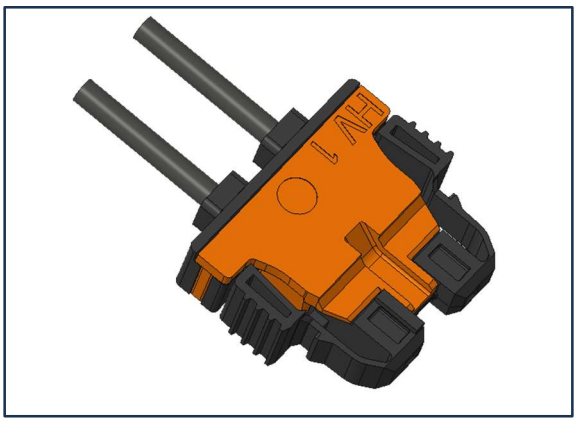
Step 4: Install the spacer through the engage guider



Step 3: Insert contact until the primary lock to right position, with audible "click"



Step 5: Press on the surface of spacer with Thumb into the right position with audible "click"



Finished with crimped cable assembly

Figure 13

Populating of the terminal cavities with terminals is taking place in accordance with the work documents (i.e. populated or not, insulation color). 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).

Upon completion of terminal assembly lock housing and assembly the spacer through the engagement guider, with press on the surface on spacer gently. The spacer shall fully engage and close with audibly engages to make sure the second locking at the right position.

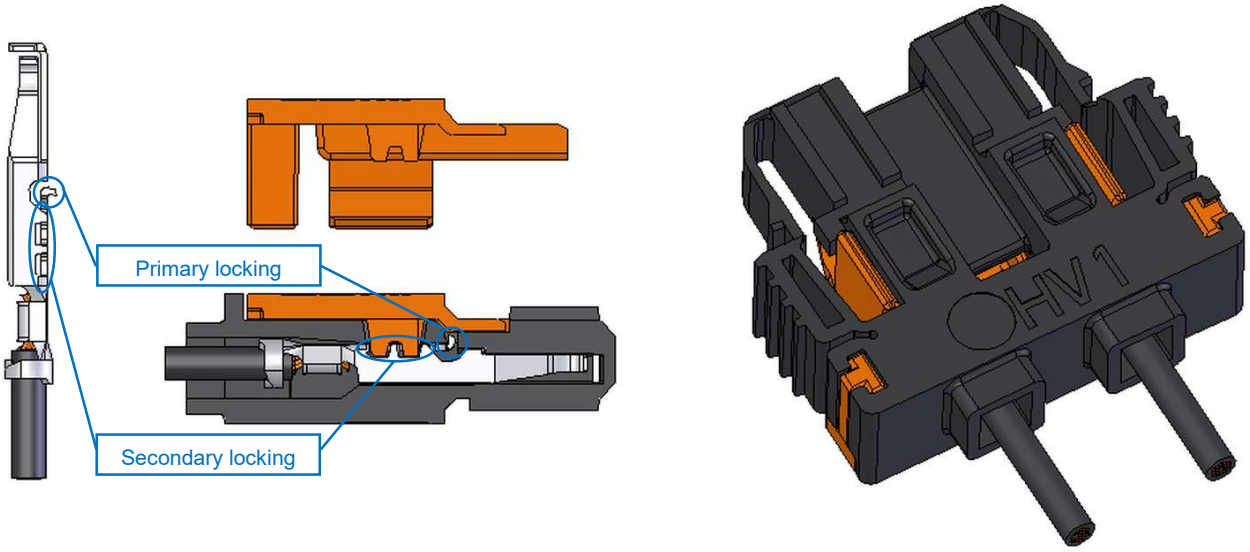


Figure 12

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

3.7.A. Inspection of Completed Assemblies

SAFETY instruction: The requirements to the cable assemblies produced and its members, particularly the assembled and locked Product including the wires entering the Product, are to be ensured by suitable variable and attributive tests.

Examples are:

- Housing completely closed & locked
- Physical integrity of the housing given
- Insulation of the wires not damaged.

3.7.B. End-of-Line Testing of Completed Assemblies

SAFETY instruction: A hipot test on each finished assembly is mandatory (suggestion).

The testing parameters (testing voltage, AC or DC voltage, testing time, …) that are to be applied during this hipot test are ruled by the relevant operating conditions of the Product in the actual application and by the full scope of applicable regulation.

Note: All parts of an assembly are exposed to the testing voltage and may be damaged or degraded in future performance through an inappropriately chosen testing voltage level.

3.8. NON-Repair Policy (no crimp terminal replacement & no housing replacement)

SAFETY instruction: The Product is not designed to undergo any repair efforts and doing so may pose a risk and danger to life. Any unlocking of the housing as well as disassembly and reassembly of the terminals are NOT intended for the Product.

3.9. Engaging and Disengaging Receptacles and Headers

NOTE: Tool 454374-E is not suitable to assist in engaging and disengaging receptacles and headers as this tool has not been designed for the use in combination with the Product.

The Product is intended to manually be locked without the assistance of a tool!

SAFETY instruction: Headers and receptacles of the Product must only be engaged and disengaged with no voltage applied. In cases where this is not feasible (e.g. plugging to and unplugging from a batterie storage system) energy, power, voltage, and current do have to safely be limited considering all aspects of applicable safety regulation.

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:

Firmly press the locking levers with thumb and index finger (where blue arrows indicate in below

1. Figure 13).
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.

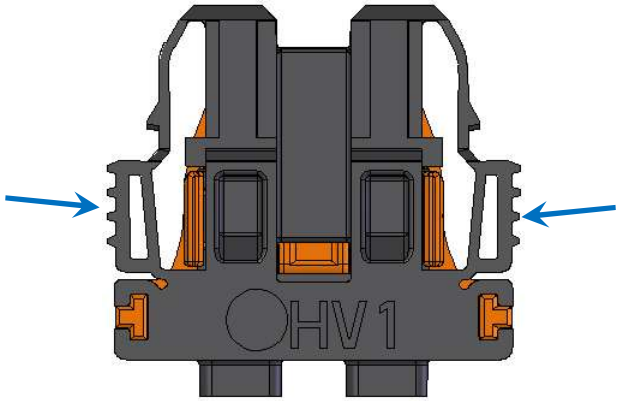


Figure 13 - Unlocking the receptacle

SAFETY instruction: If during Engagement and Disengagement or at any other occasion of the Product's life there is an indication that the physical integrity may not fully be given it is mandatory that the assembly containing the Product will be replaced.

3.10. Requirements for the Reflow soldering for the Header

Please check the following items before work

1. Soldering method

   Please reflow as a general rule.

2. Recommended mounting board dimension

   Please refer to the PCB layout shown on the customer drawing

3. PCB

   If the warpage of the PCB during the reflow process, it may cause soldering failure

Please pay attention to the reflow conditions, PCB material etc.

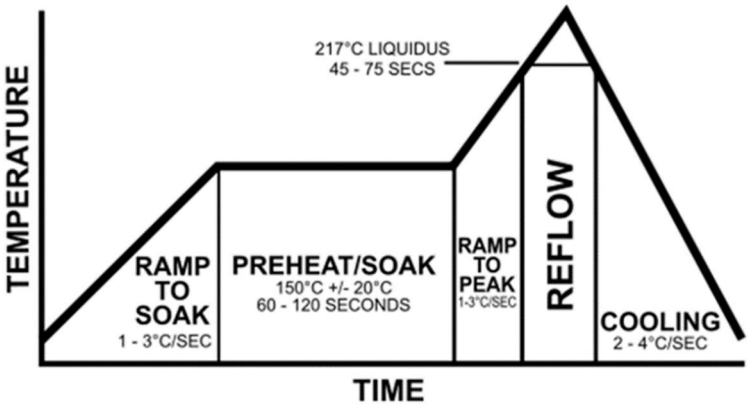
4. Solder Paste thickness

   Recommend the paste thickness 0.15mm or more. Once less than 0.15mm, soldering failure may occur

5. Reference condition for the Reflow

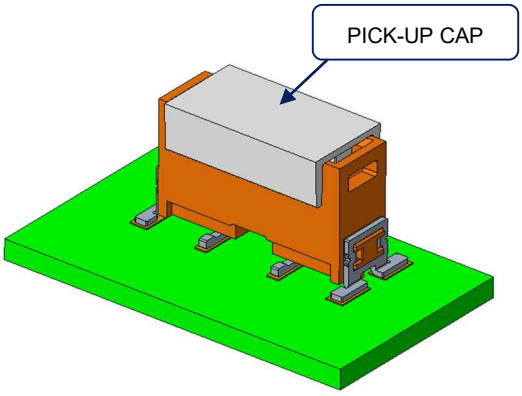
   Be careful not to deform or discolor the connector due to heat,

   Preheat temperature：150-200℃ ; preheat time：60 to 120 sec
   Peak temperature: 260℃ Peak temperature time：5 +/-5 seconds
   Time 25℃ to peak：8 minutes maximum ; Per J-STD-020, Table 5-2, Pb-Free.

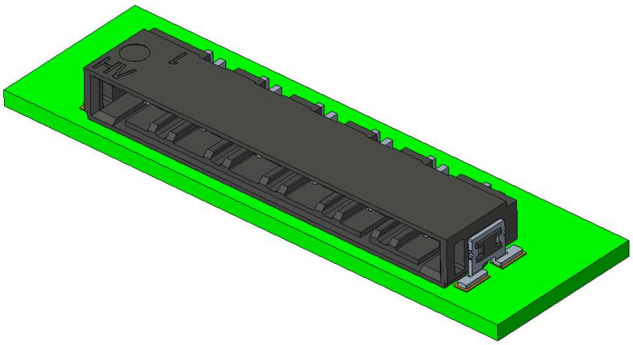


Please make sure that all leads and pegs are securely soldered.

6. Remove the pick up cap for the angled 180° header after soldering finished.



2P Angled 90°
(ORANGE)



6P Angled 180°
(BLACK)

7. Kindly notice header taken from package should be used within 12 hours, and unused header should be resealed / isolated from air in 12 hours with dessicant, especially air with high humidity, otherwise it will cause blister issue after reflow.