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Change History

Change #	Description of Changes	Date (DE)
01	Imported "Version 5 Dating 20.06.2017" into current CAQ System QBD.Net plus mainly minor orthographic corrections	13.08.20
02	Pressing dimension tolerances, ERNI genuine tools, partial loading, qualified wires now in separate attachment	17.08.20
03	Changed template closer to TE appearance while maintaining CAQ document numbers. All requirements were maintained w/o changes over previous version with document # 074707. Minor corrections of textual formulation at various places. Newly introduced unlocking tool 484816-E.	17.04.23
04	Added clarification about filling wires (dummy wires). Removed any occurrence of "partial contact loading" and supporting empty cavity with a tool during closing the housing. Added notes about pressing speed and processing time improvement, settling time. Added clarification about pressing force. Added return-stroke lock mechanism as a requirement for manual presses. Added clarification about cable position in cable guide for 90°.	10.05.23

Change #	Description of Changes	Date (DE)
	Added clarification concerning flat ribbon cable positioning. Added clarification about inspection criteria of ID contact tips in inspection windows. Added notes about shrink tubing and taping. Added note about non-repair policy. Added note about first mating cycle during electrical test.	
05	Changed to 114 template.	25.05.2023
06	Inserted new TE doc number 114-160988	16.06.2023
07	Put "mating header" as correct term at Electrical Inspection section	24.07.2023
08	Minor correction in TE/ERNI wording ahead of first publication on TE.com. Change of Revision from numerical to alphabetical	12.02.2024

1. INTRODUCTION

This specification covers the requirements for the application of “MiniBridge IDC” receptacle connectors used in a great variety of applications and various types of electrical connections. IDC-terminated connectors of the MiniBridge product family are available in two versions as MiniBridge Standard and MiniBridge Koshiri version.

These parts come pre-assembled, ready-to-be processed. For some information about the Product’s portfolio refer to chapter 3.2.

Please note, the scope of this document does not extend to the PCB headers of the MiniBridge family and their processing, e.g. soldering of such and it also does not cover the processing of MiniBridge IDC cable headers.

This also applies to storage conditions or packaging.

When corresponding with TE personnel, use the terminology provided in this specification to facilitate inquiries for information. Figure 1 and Figure 2 visualize the Product in general.

MiniBridge 6-position receptacles

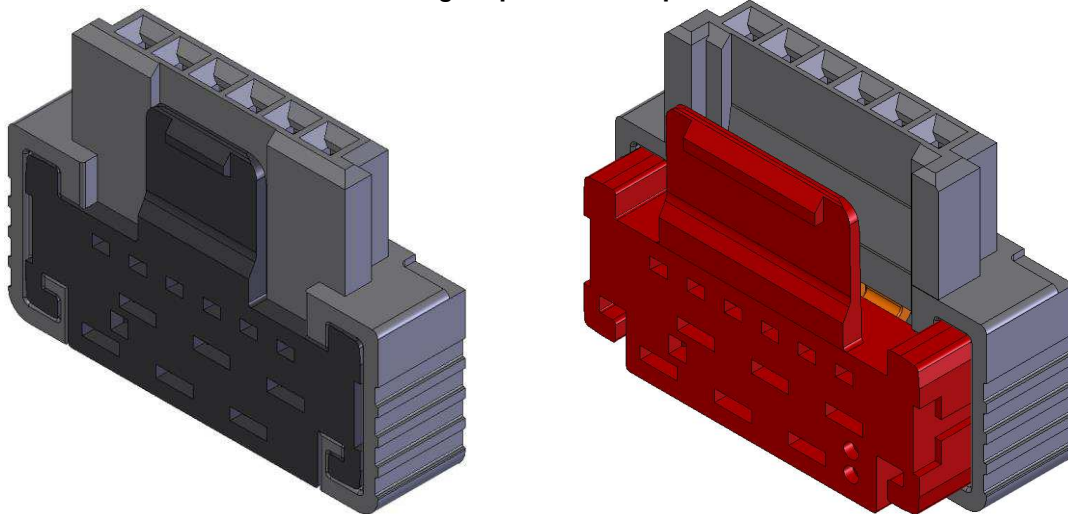


Figure 1

MiniBridge Standard Straight (224399-E / closed) MiniBridge Koshiri Straight (484082-E / pre-assembled)

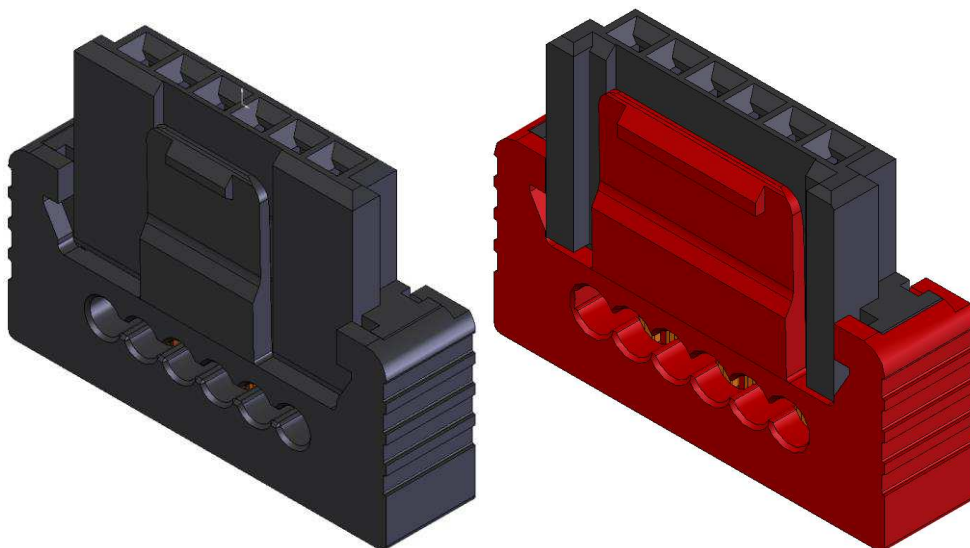


Figure 2

MiniBridge Standard angled (e.g. 224395-E / closed) MiniBridge Koshiri angled (e.g. 474832-E / closed)

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 the on-hand Application Specification in order to ensure best results.

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

The Application Specification can be obtained by download from www.erni.com or www.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 ERNI 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 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 www.te.com) or requested from TE 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.

TERMS

beams electrical contact-making parts of the u-shaped insulation displacement contact system (sometimes also referred to as “flanks”)
cable used synonymically with “wire” and can be exchanged in the context of this document.
holder = fixture the part of the tool-set that retains the connector under processing as desired. In the case of the tooling offerings for The Product the lower tool keeps processed parts.
Pin position = pin number = number of the wire assembly position
 number 1 is marked at the connector housing of the receptacles; refer to respective product drawing
Number of poles = pin count = number of individual contact systems (circuits) per connector housing

ABBREVIATIONS

IDC Insulation Displacement Connection
ID Insulation Displacement

REFERENCES TO STANDARDS

DIN EN 60352-4
Lötfreie elektrische Verbindungen - Teil 4: Lötfreie nichtzugängliche Schneidklemmverbindungen; Allgemeine Anforderungen, Prüfverfahren und Anwendungshinweise; Deutsche Fassung EN 60352-4
[Solderless connections - Part 4: Solderless non-accessible insulation displacement connections - General requirements, test methods and practical guidance]

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

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

108-160988	Product Specification, provides product performance and test results (upon availability).
107-160988	Product packaging specification (upon availability)
501-160988	Qualification Test Report (upon availability)
114-160988-1	Attachment I Cables (formerly # 074720)

3. REQUIREMENTS

3.1. Fundamentals

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

3.2. Product characteristics

Among the MiniBridge product family two versions are available in general

- MiniBridge Standard
- MiniBridge Koshiri.

i Critical Note: MiniBridge Standard and MiniBridge Koshiri are not cross-compatible – headers of MiniBridge Standard and receptacles of MiniBridge Koshiri must not be combined with each other and vice versa.

NUMBER OF PINS

2, 3, 4, 6, 8, 10 and 12 pins

LOCKING TYPES

Positive lock:

Indicated through a red cable guide and latch for both, Standard and Koshiri version. The latch features a hook. The positive lock can be unlocked with an appropriate tool. TE ERNI offers unlocking tool 484816-E.

Friction lock:

Indicated through a black cable guide and latch solely for the Standard version (not available as Koshiri version). Receptacles of the friction-lock type are detachable by hand without tools since the latch features a ramp.

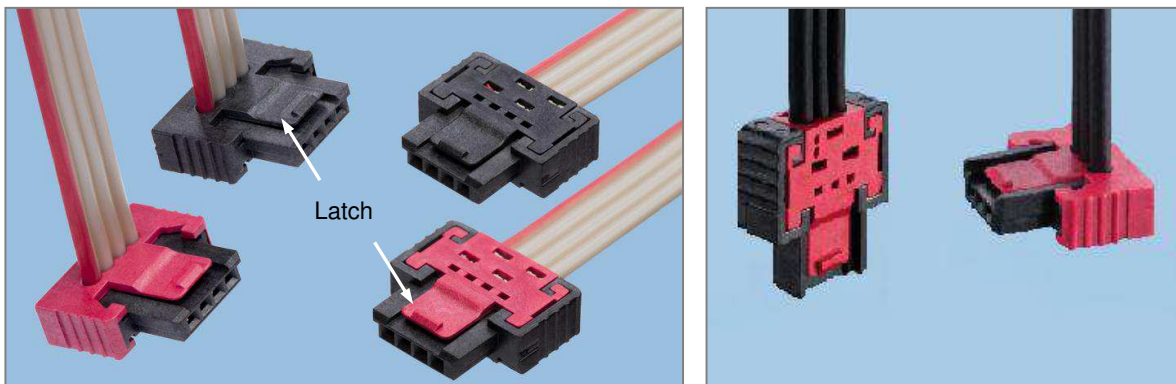


Figure 3
 MiniBridge Standard (positive and friction lock) MiniBridge Koshiri (positive lock)

TERMINATION SIZES (ACCEPTABLE CONDUCTOR CROSS-SECTION SIZES)

- IDC termination for the Standard version is available in AWG 26/24 and AWG 22 size.

- IDC termination for the Koshiri version is available in AWG 22 size.

ORIENTATION OF THE CABLE OUTLET

- angled (90° / type P)
- straight (180° / type A)

**Note:**

The above list of features does not impose all possible combinations are available in the portfolio offered. For information on actual availability consult our website and our sales teams.

3.3. Cable Types

The MiniBridge IDC termination meets the requirements of DIN EN 60352-4. Cables with following properties are permissible according to this standard in general:

- Ribbon cables or single wires with solid round conductors or stranded conductors with seven single strands shall be used.
- Stranded conductors shall have strands plated with tin, tin-lead or silver.
- The insulation material shall be PVC or another material with properties compatible with the insulation displacement process, i.e. the insulation material shall be capable of being readily displaced by the inner edges of the beams without damaging the conductor. In the case of stranded conductors, the insulation shall, in addition, be capable of keeping the strands in place so that they are not unduly displaced when making the ID connection.
- For ribbon cables, the insulation between the conductors including any additional insulation forming the ribbon shall additionally be capable of being readily penetrated by the tips of the beams.

Due to the compact design of the connector, only cables with an outer diameter, which easily fits into the corresponding cable guide, can be used. The absolute maximum outer cable diameters, leaving no clearance at all, are 1.07 mm and 1.27 mm, depending on the cable guide.

Qualified cable and wire types are listed in Attachment I.

3.4. Tools

3.4.A. General Information

In order to prevent connector damage from excessive pressure the only tools allowed are those which limit the press-in distance so that it is ensured to not press below the lower dimensional limit of the parts.

Tools need to have sufficient clearance (play for elastic sections of the cable guide of the connector / typically in the lower tool/fixture) so that the locking mechanisms cannot become damaged during the pressing process.



The use of TE ERNI genuine tools for the processing of MiniBridge female connectors is mandatory.



All processing equipment (manual, semi-automated or fully automated machines) must adhere to the requirements of the on-hand application specification.

3.4.B. About Partially Populated MiniBridge Connector Assemblies

The design of The Product is not intended to have empty wire positions after the housing has been closed (pressed). From a final application's point of view non-functional wire positions must not be left open but need to be fitted with a filling wire (dummy wire). All positions of a housing need to be filled with the same type of wire while the color of the insulation may still vary. Otherwise, reliability of The Product may be compromised in the application.

3.4.C. Processing Parameters

3.4.C.1. Pressing force

The pressing force depends on conductor cross-section and insulation material. Pressing forces up to 100 Newton per contact may be needed for processing MiniBridge connectors.

Devices such as hand-lever presses, other types of presses, or machines should be designed or selected accordingly.

3.4.C.2. Pressing speed

A maximum pressing speed of 10 mm/s is recommended. Lower pressing speeds are allowed.

NOTES:

- For semi-automatic and fully automatic processing equipment the implementation of a faster travel of the upper tool, until this comes into close proximity to the connector being in process, may help save valuable processing time (e.g. 250 mm/s).
- For such equipment, a short settling time span (e.g. 250 ms) with no further movement is recommended, after the tool reached its lower dead center and before starting its travel upwards again.

i *Once a pressing cycle has started, it shall not be interrupted. Hand-lever presses shall have a return-stroke lock mechanism to ensure this requirement.*

When using toggle presses in manual mode, exceeding the maximum specified pressing speed is practically impossible.

3.4.D. Tools Available from TE ERNI

3.4.D.1. Tools for hand lever presses

The basic tool set with TE ERNI part number 501260-E consists of upper tool and lower tool holder for assembly on hand-lever presses with Ø 10H7 for the upper tool holder and T-slot 10H9 for the lower tool holder.

3.4.D.2. Lower Tools for MiniBridge Straight Receptacle Connectors (Type A)

- 2 pins Part- No. 172000-E
- 3 pins Part- No. 172001-E
- 4 pins Part- No. 172002-E
- 6 pins Part- No. 172003-E
- 8 pins Part- No. 172004-E
- 10 pins Part- No. 172005-E
- 12 pins Part- No. 172006-E

EXAMPLE

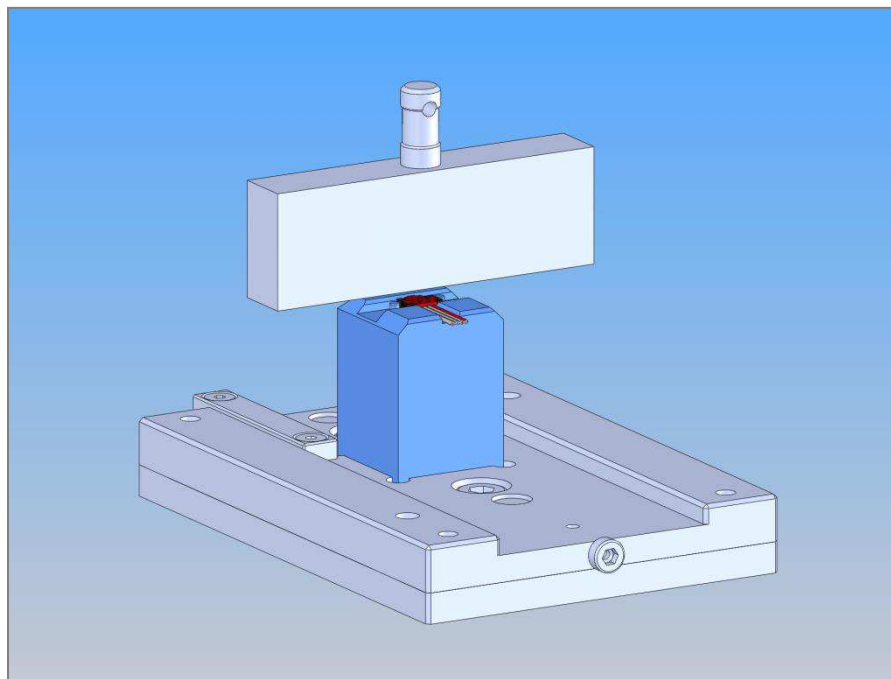


Figure 4 Tooling example for straight receptacles

3.4.D.3. Lower Tools for MiniBridge Angled Receptacle Connectors (Type P)

- 2 pins Part- No. 172007-E

- 3 pins Part- No. 172008-E
- 4 pins Part- No. 172009-E
- 6 pins Part- No. 172010-E
- 8 pins Part- No. 172011-E
- 10 pins Part- No. 172012-E
- 12 pins Part- No. 172013-E

EXAMPLE

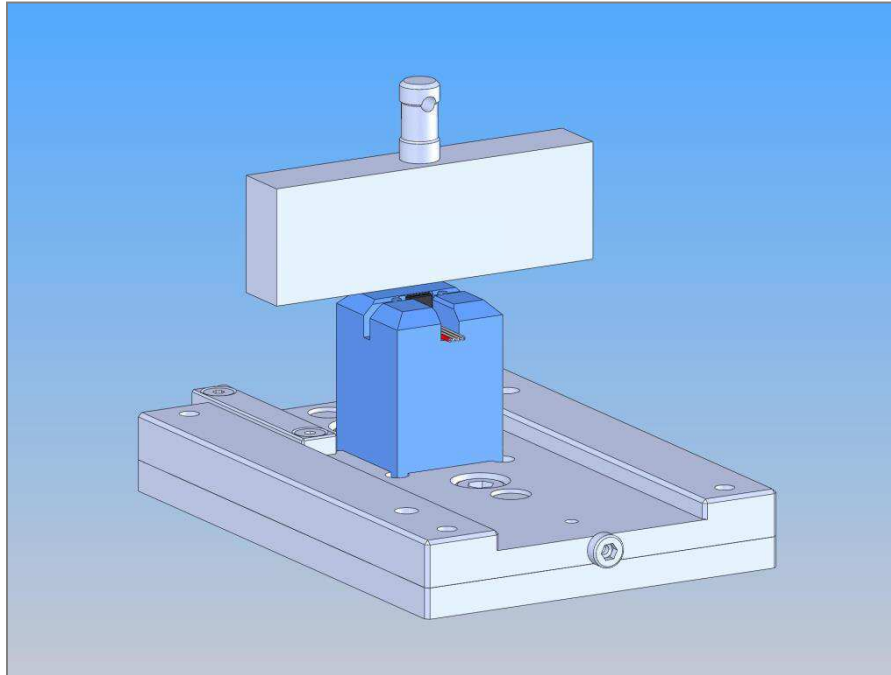


Figure 5 Tooling example for angled receptacles

3.5. Assembly

3.5.A. Positioning of the Wire

3.5.A.1. Angled Cable Termination (Type P)

If the cable begins or ends at the connector housing under consideration, a flush position of the end of the cable with the housing respectively with the cable guide is to be attained.

The maximum undercut of 0.3 mm relates to the distance between the end of the conductor, or end of the bundle of conductor strands respectively, and the surface of the cable guide. This applies to both, connector orientations possible for the angled version (Figure 6).

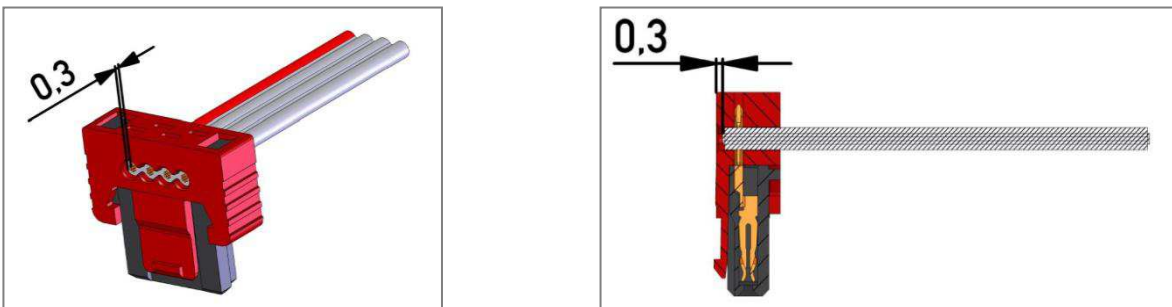


Figure 6 Undercut

Cable protrusion (overhang) is not directly relevant to the quality of the finished cable assembly and can be arbitrary. The maximal permissible protrusion depends on the application of the cable assembly.

The exposed conductors at the end of the cable(s), also in combination with cable protrusion and insulation retraction (conductor protrusion) may highly impact the isolating capabilities of a cable assembly. This may limit the allowance of the protrusion for a specific application (Figure 7).

An application-specific guideline is recommended if the IPC-A-620 criteria are not sufficient.

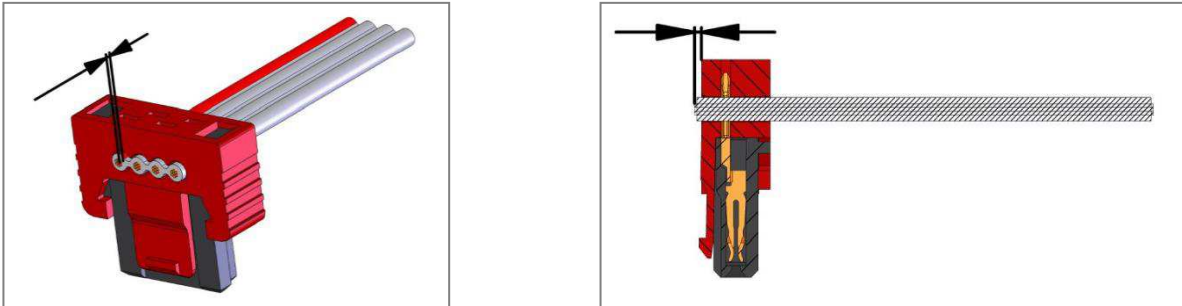


Figure 7 Overhang

3.5.A.2. Straight Cable Termination (Type A)

Sufficient insertion depth for flat ribbon cables or discrete wires for the straight cable termination type must be ensured and safely achieved. This is guaranteed if the cables (their insulation) are visible within each of the inspection windows (white arrows in Figure 8).

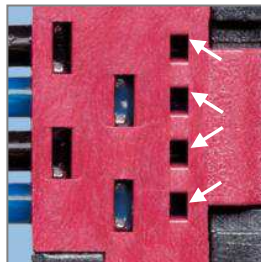


Figure 8 Inspection windows

3.5.B. Flat Ribbon Cable Alignment

A right angle (90°) between the IDC connector and the flat ribbon cable shall be attained.

Allowable deviation is $\pm 2^\circ$ (Figure 9).



All requirements for undercut and overhang described in the preceding Chapter 3.5.A also apply to flat ribbon cables.

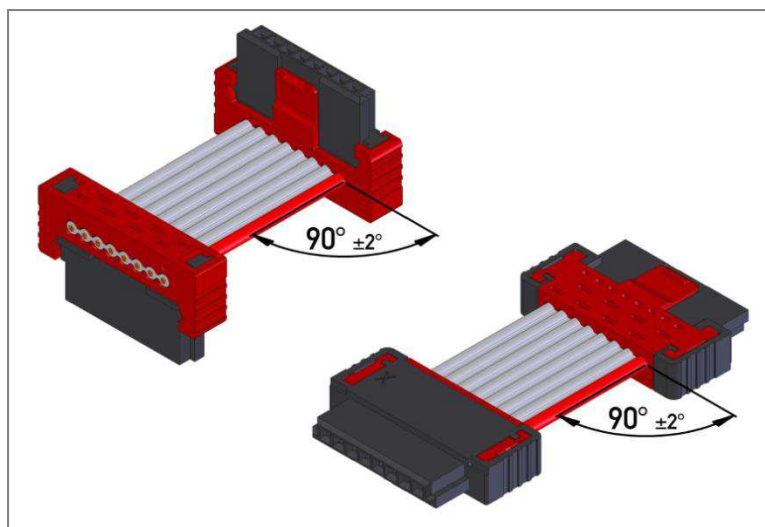


Figure 9 Flat ribbon cable alignment

3.5.C. Position of the ID Contact System after Closing the Housing (Insulation Displacement)

The correct flat ribbon cable or discrete wire position within the ID contact system is achieved if the tips of the ID contact beams are visible in their respective inspection window of the cable guide (refer white arrows in Figure 10 and Figure 11).



The tips of the beams of the contact system must be visible and not be hidden by insulation residues.

MINIBRIDGE ANGLED RECEPTACLE CONNECTOR (TYPE P)

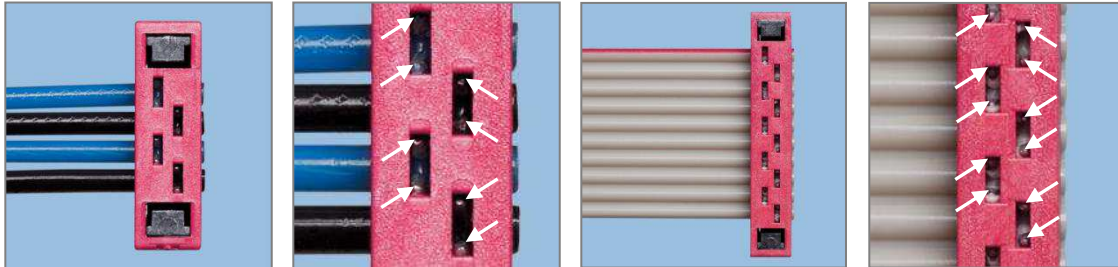


Figure 10 Inspection windows for insulation displacement of angled version

MINIBRIDGE STRAIGHT RECEPTACLE CONNECTOR (TYPE A)

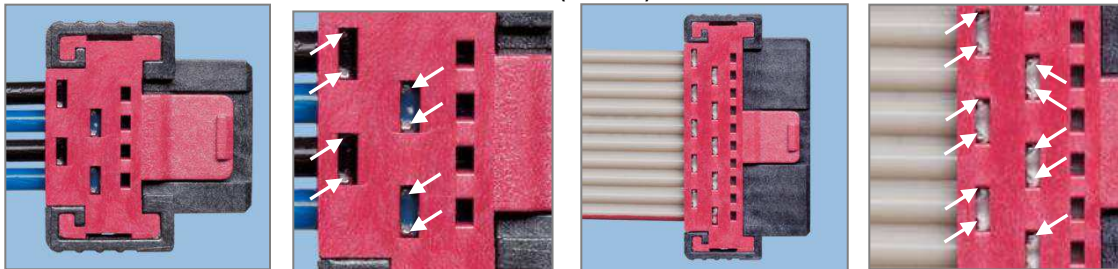


Figure 11 Inspection windows for insulation displacement of straight version

3.5.D. Cable Guide Locking

3.5.D.1. Visual Characteristics

Both parts (housing and cable guide) must be fully engaged after pressing, however, they must not be over-pressed.

3.5.D.2. Visual Characteristics of the Engaged (Closed) Connector

MINIBRIDGE STRAIGHT RECEPTACLE CONNECTOR (TYPE A)

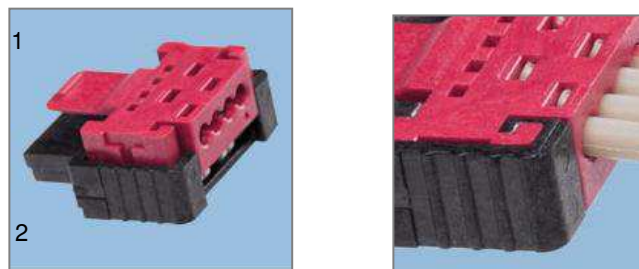


Figure 12

Cable guide (1) pre-assembled in housing (2)

Fully engaged

MINIBRIDGE ANGLED RECEPTACLE CONNECTOR (TYPE P)



Figure 13
Cable guide (1) pre-assembled in housing (2) Fully engaged

3.5.E. Dimensions

The following dimensions must be achieved for the fully engaged, i.e. fully closed connector.

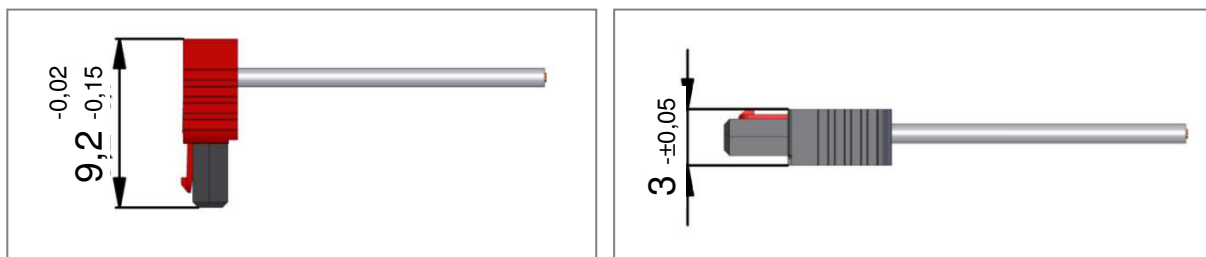


Figure 14
MiniBridge angled receptacle connector (Type P) MiniBridge straight receptacle connector (Type A)

3.5.F. NON-Repair Policy

The Product is not designed to be opened again for whatever reason.



Attempts to repair defective Products must not be undertaken. A cable can only be connected once at a certain location.

3.6. Inspection

3.6.A. Inspection of Processed Parts' Characteristics

The requirements are to be ensured by suitable variable and attributive tests/inspections.

- Cable position in the housing
- Flat ribbon cable alignment
- Position of the IDC terminations (tips of the contact beams in inspection windows)
- Complete engagement of the members of the housing
- Dimensions of the fully closed connector
- Orientation of the latch (still as in pre-assembled parts, i.e. latch not deformed by the tools).

3.6.B. Electrical Inspection (Electrical Test)

A suitable contact probe with a probe tip shall be used for electrical test. This method provides a connection on the “tip” of the spring contact (at the connector’s mating face) without damaging the surface where contact is made. A spring-loaded contact probe with a diameter of 0.35 mm and a spring load of 0.6 N is recommended.

Alternatively, a male connector soldered onto a PCB can be used for the electrical test as well (Figure 15).

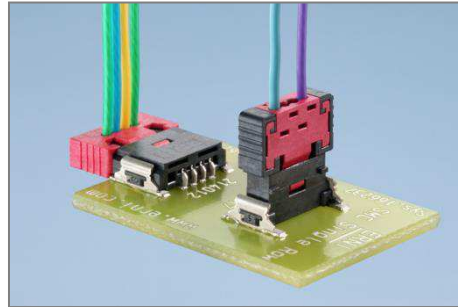


Figure 15 PCB Header for adaption

NOTE:

Using a mating header during electrical testing leads to a first contact mating for a receptacle.

4. APPLICATION NOTE

4.1.A. Recommendation for Cable-Laying

The bending radius shall not be less than triple¹ cable diameter-size for cable-laying directly behind the contact end. This avoids the impairment of the insulation support next to the IDC area and detrimental influence on the reliability of the contact points between the strands of the conductor and the contact system within the housing (Figure 16).

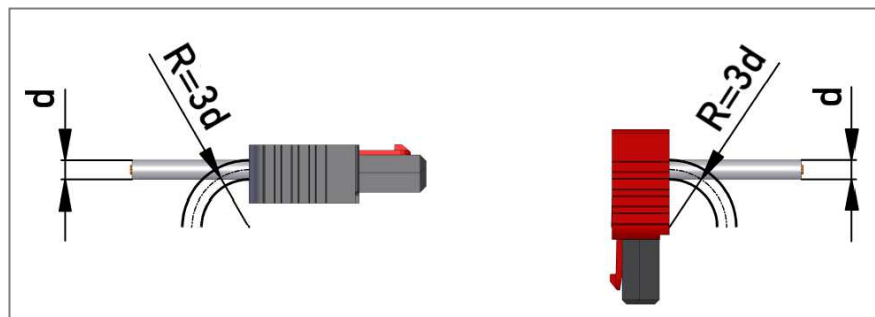


Figure 16

4.1.B. Cable Bundling and Harness Protection

Shrink tubing or taping of cable assemblies and cable harnesses may introduce force onto the wires by driving them into bundles of a round shape. This may lead to permanent or temporary pull-forces that unexpectedly can reach excessive levels due to leverage effects. Over time, reliability of such assemblies may be compromised.



Make sure shrink tubing and taping leaves sufficient distance from their ends to the cable entry of the connector housing.

¹ Based on bending radii for flexible cables according to DIN VDE 0298 Part 3