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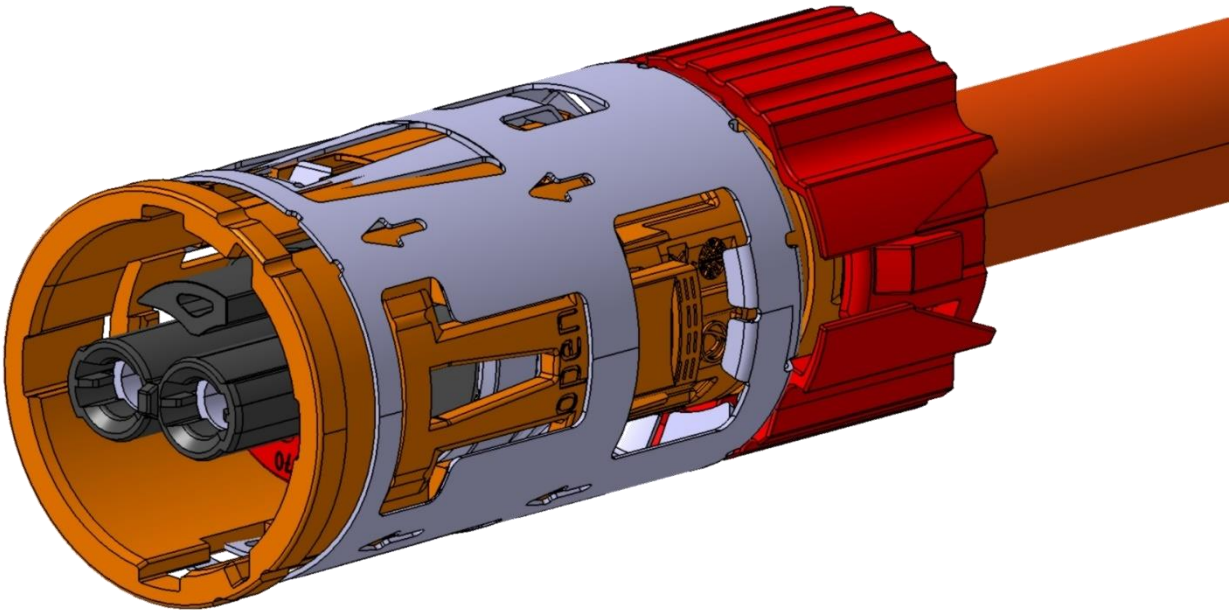
HIRSCHMANN AUTOMOTIVE

Process Specification

HIRSCHMANN AUTOMOTIVE
PowerStar 40-2 PLUS
4mm² and 6mm²



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1 General

1.1 General information and requirements

a. This process specification describes detailed requirements and guidelines by Hirschmann Automotive on how to assemble the mentioned component(s) in order to achieve compliance with the defined product- and process specification.

b. The customer/manufacturer processing the Hirschmann Automotive products is responsible for the appropriate processing of the relevant products and also for the compliance of the described process results with this specification.

c. In case of improper or deviating processing through the customer/manufacturer, any complaints need to be declined.

d. During the whole assembly process, individual components and assembly units must not be damaged in any way.

e. Both the named fixture suppliers and equipment in this process specification are not mandatory to use from Hirschmann Automotive point of view. They are only a non-binding reference which supplier and equipment Hirschmann Automotive used for the evaluation, validation and release of this process specification.

f. The customer can define different fixture suppliers and equipment for the assembly process at any time.

g. Additionally, the customer/manufacturer shall validate and release the complete assembly process independently of the chosen equipment supplier.

h. Process parameters (e.g. welding currents, - times etc.) will not be predetermined by Hirschmann Automotive. In fact, the required technical result of this process needs to be specified in the process specification. With this result, the customer will achieve the product specification conformity (e.g. welding knot geometries, min. retention forces, etc.).

i. All kind of warranty and liability claims of our customers towards Hirschmann Automotive according to the agreed contractual regulations are only valid with reservation of the compliance with the according process specification.

j. All length data for flexible components or wires are to be taken as stretched length. When recording the dimensions, it must be ensured that the components are not subjected to any loads that could lead to damage or other impairments.

1.2 Introduction

This process specification is valid for all variants mentioned in chapter 2.ff and describes the product structure as well as the assembly of the Hirschmann Automotive PowerStar 40-2 PLUS plug connection.

Table 1: HPS40-2 PLUS

85E.973.271	810-473-501	A	6mm²	HCT4	Europe
85E.973.271.A	810-473-502	B			
85E.973.271.B	810-473-503	C			
85E.973.271.C	810-473-511	A	4mm²		
85E.973.271.D	810-473-512	B			
85E.973.271.E	810-473-513	C			
85D.973.271	813-132-501	A	6mm²		China
85D.973.271.A	813-132-502	B			
t.b.d.	812-939-001	A	4mm²		MAN
t.b.d.	812-939-002	B			
t.b.d.	812-939-003	C			
t.b.d.	812-939-004	D			
VW-No.	**Hirschmann Automotive No.**	**Coding**	**Cross-Section**	**Terminal-System**	**Assignment**

The manufacturer of the listed products is responsible for the qualitative processing and the accuracy of the version.

In the case of improper processes or deviation from specification that results in quality issues, the right of complaint is void.

1.3 Applicable documents

Table 2: Applicable Documents

A	Product drawing	VW-No. TAB.010.046.EC 85D.973.271 (China) HA-No: 812-939-…00 (MAN)
B	Product specification	HA-Ho. EPS-100153-03
C	Interface drawing	VW-No. 85E.900.962.M
D	HCT4 Process specification (Ag)	EVS-100068
E	Data sheet 2x6mm² shielded cable of Coroplast	Coroplast No.: 9-2641 (2x6,0mm²)
F	Data sheet 2x4mm² shielded cable of Coroplast	Coroplast No.: 9-2641 (2x4,0mm²)
G	Data sheet 2x6mm² shielded cable of Cablena	Cablena No.: 109.206.001.7 (2x6,0mm²)
H	Data sheet 2x4mm² shielded cable of Cablena	Cablena No.: 109.204.001.7 (2x4,0mm²)
I	Data sheet 2x6mm² shielded cable of Hengtong	Hengtong No.: FHLR2GCB2G (2x6,0mm²)
J	Data sheet 2x4mm² shielded cable of Huber+Suhner	H+S Nr.: 12582308 (2x4mm²)
K	Data sheet 2x4mm² shielded cable of Huber+Suhner	H+S Nr.: 85149176 (2x4mm²)

1.4 Characteristics / Customer release

Our suggestion is that the dimensions listed below are monitored during processing. Further functional characteristics must be coordinated and defined with the OEM.

Table 3: Special Characteristics

Special Characteristics					
S	**F**	**Characteristic**	**Specific Purpose**	**Place of implementation**	**Page**
-	F1	Embossing height d	Stress-Relief, elec. shield contacting - EMC	Tier 1	44
-	F2	L12 assambly dimension Contact Holder to Housing	Plugability	Tier 1	52
-	F3	Crimp-height HCT4 acc. EVS-100068	Elec. contacting main conductor	Tier 1	32

Legend:
S - Safety
F - Function

**100% testing is not possible, as the test specimens are destroyed during testing.

Proof of capability or continuous testing of all special features must be coordinated directly with the OEM.

2 Product structure (single components)

2.1 “Europe” Configuration

Table 4: Hirschmann Automotive PowerStar 40-2 PLUS Europe

Part Information		Quantity per Version (per connector)					
		Coding A 6mm²	Coding B 6mm²	Coding C 6mm²	Coding A 4mm²	Coding B 4mm²	Coding C 4mm²
		85E.973.271	85E.973.271.A	85E.973.271.B	85E.973.271.C	85E.973.271.D	85E.973.271.E
Description/Naming	HA-Order-No.	810-473-501	810-473-502	810-473-503	810-473-511	810-473-512	810-473-513
ASSY Plastic-Housing	807-656-532	1	1	1	1	1	1
ASSY Contact-Holder PLUS Coding A	810-474-501	1	-	-	1	-	-
ASSY Contact-Holder PLUS Coding B	810-474-502	-	1	-	-	1	-
ASSY Contact-Holder PLUS Coding C	810-474-503	-	-	1	-	-	1
ASSY Contact-Holder PLUS Coding D	810-474-504	-	-	-	-	-	-
Shield-Sleeve	709-840-504	1	1	1	1	1	1
Stress-Relief 6mm²	709-841-503	1	1	1	-	-	-
Stress-Relief 4mm²	709-841-502	-	-	-	1	1	1
Wire-Seal 6mm²	709-113-506	1	1	1	-	-	-
Wire-Seal 4mm²	709-113-505	-	-	-	1	1	1
Cover-Cap PLUS 6mm²	707-208-513	1	1	1	-	-	-
Cover-Cap PLUS 4mm²	707-208-512	-	-	-	1	1	1
HCT4 Female-Terminal 6mm²	709-427-505	2	2	2	-	-	-
HCT4 Female-Terminal 4mm²	709-427-504	-	-	-	2	2	2

2.2 “China” Configuration

Table 5: Hirschmann Automotive PowerStar 40-2 PLUS China

Part Information		Quantity per Version (per connector)	
		Coding A 6mm²	Coding B 6mm²
		85D.973.271	85D.973.271.A
Description/Naming	HA-Order-No.	813-132-501	813-132-502
ASSY Plastic-Housing	807-656-532	1	1
ASSY Contact-Holder PLUS Coding A	810-474-501	1	-
ASSY Contact-Holder PLUS Coding B	810-474-502	-	1
ASSY Contact-Holder PLUS Coding C	810-474-503	-	-
ASSY Contact-Holder PLUS Coding D	810-474-504	-	-
Shield-Sleeve	709-840-504	1	1
Ferrule crimp 6mm²	710-741-501	1	1
Ferrule crimp 4mm²	710-741-502	-	-
Wire-Seal 6mm²	709-113-506	1	1
Wire-Seal 4mm²	709-113-505	-	-
Cover-Cap PLUS 6mm²	707-208-553	1	1
Cover-Cap PLUS 4mm²	707-208-552	-	-
HCT4 Female-Terminal 6mm²	709-427-505	2	2
HCT4 Female-Terminal 4mm²	709-427-504	-	-

2.3 „MAN“ Configuration

Table 6: Hirschmann Automotive PowerStar 40-2 PLUS MAN with H&S Cable

Bauteil Information		Quantity per Version (per connector)			
		Coding A 4mm² H+S	Coding B 4mm² H+S	Coding C 4mm² H+S	Coding D 4mm² H+S
		t.b.d.	t.b.d.	t.b.d.	t.b.d.
Description/Naming	HA-Order-No.	812-939-001	812-939-002	812-939-003	812-939-004
ASSY Plastic-Housing	807-656-532	1	1	1	1
ASSY Contact-Holder PLUS Coding A	810-474-501	1	-	-	-
ASSY Contact-Holder PLUS Coding B	810-474-502	-	1	-	-
ASSY Contact-Holder PLUS Coding C	810-474-503	-	-	1	-
ASSY Contact-Holder PLUS Coding D	810-474-504	-	-	-	1
Shield-Sleeve	709-840-514	1	1	1	1
Stress-Relief 4mm² (H&S)	709-841-522	1	1	1	1
Wire-Seal 4mm²	709-113-522	1	1	1	1
Cover-Cap PLUS 4mm²	707-208-512	1	1	1	1
HCT4 Female-Terminal 4mm²	709-427-504	2	2	2	2

2.4 Shielded-Cable 6mm² and 4mm²

Figure 1: Cable 6mm²

Figure 2: Cable 4mm²

Table 7: Shielded-Cable 6mm² und 4mm²

Coroflex (Coroplast)	FHLR2GCB2G 600/1000V T180	FHLR2GCB2G 600/1000V T180
	9-2641 (2x6mm²)	9-2641 (2x4mm²)
Cablena (Condumex)	FHLR2GCB2G 600/1000V T180	FHLR2G2GCB2G 600/1000V T180
	109.206.001.7 (2x6mm²)	109.204.001.7 (2x4mm²)
Hengtong	FHLR2GCB2G 600/1000V T180	FHLR2GCB2G 600/1000V T180
	8003110576 (2x6mm²)	8003110575 (2x4mm²)
Huber + Suhner	-	FHLR91XC13X-2x4 T150
	-	12582308 (2x4mm²)
Huber + Suhner	-	FHLR91XC13X-2x4 T150
	-	85149176 (2x4mm²)
Wire manufacturer	**6mm²**	**4mm²**
	Wire cross section (construction of conductor)	

Only Cables which are listed here and released by the respective OEM for the product are allowed to be used.

2.5 HCT4 Female terminal (Hirschmann Automotive)

Figure 3: HCT4 6mm²

Figure 4: HCT4 4mm²

Table 8: Hirschmann Automotive female terminal HCT4

N.108.763.01	709-427-505	6mm²	Female terminal HCT4
N.108.944.01	709-427-504	4mm²	Female terminal HCT4
VW-No.	**Hirschmann Automotive No.**	**Wire cross section (construction of conductor)**	**Product description**

The released terminals can be found in the product drawing.

VW/Audi - No.: N.108.944.01
N.108.763.01

The female terminals are delivered at terminal strip on a spool.

2.6 Stress-Relief (Hirschmann Automotive)

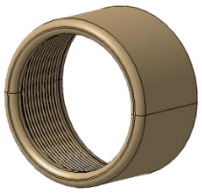

Figure 5: Stress-relief 6mm²
709-841-503

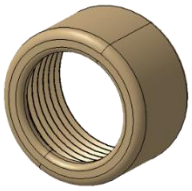

Figure 6: Stress-relief 4mm²
709-841-502

Figure 7: Stress-relief 4mm²
709-841-522

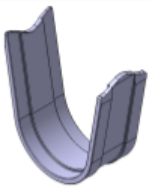

Figure 8: Ferrule crimp 6mm²
710-741-501

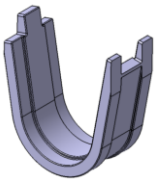

Figure 9: Ferrule crimp 4mm²
710-741-502

Table 9: Hirschmann Automotive stress relief

709-841-503	6mm²	Stress-relief HPS40-2	Europe Configuration
709-841-502	4mm²	Stress-relief HPS40-2	
710-741-501	6mm²	Ferrule crimp	China Configuration
710-741-502	4mm²	Ferrule crimp	
709-841-522	4mm²	Stress-relief HPS40-2 (H+S)	MAN Configuration
Hirschmann Automotive No.	**Wire cross section (construction of conductor)**	**Product description**	**Assignment**

The released Stress-Relief per approved wire can be found in the product drawing.

VW/Audi - No.: TAB.010.046.EC (Europa)
85D.973.271 (China)
812-939-…00 (MAN)

The stress reliefs are delivered as bulk goods.

2.7 Shield-Sleeve (Hirschmann Automotive)

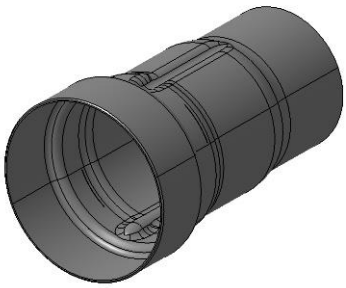

Figure 10: Shield sleeve index 504 / 514

Table 10: Hirschmann Automotive shield sleeve

709-840-514	Shield-sleeve (Heat-treatment)	with H+S Cable for MAN
709-840-504	Shield-sleeve	For Europe and China Configuration
Hirschmann Automotive No.	**Product description**	**Assignment**

The released Shield-Sleeves can be found in the product drawing.

VW/Audi - No.: TAB.010.046.EC (Europa)
85D.973.271 (China)
812-939-…00 (MAN)

The Shield-Sleeves are delivered as bulk goods.

2.8 Cover-Cap PLUS (Hirschmann Automotive)

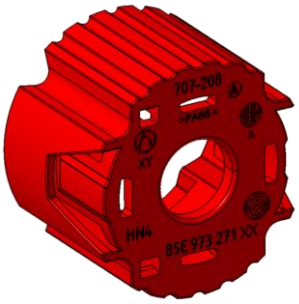

Figure 11: Cover-Cap PLUS 6mm²

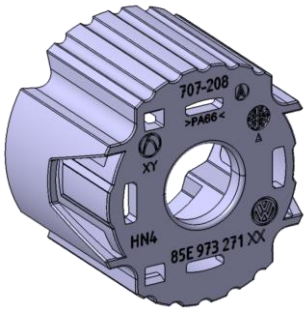

Figure 12: Cover-Cap PLUS 4mm²

Table 11: Hirschmann Automotive Cover-Cap PLUS

707-208-553	6mm²	red	Cover-Cap PLUS 6mm²	China Configuration
707-208-513	6mm²	red	Cover-Cap PLUS 6mm²	Europe Configuration
707-208-512	4mm²	grey	Cover-Cap PLUS 4mm²	Europe Configuration
Hirschmann Automotive No.	**Wire cross section (construction of conductor)**	**Color**	**Product description**	**Assignment**

The released Cover-Cap PLUS per approved wire can be found in the product drawing.

VW/Audi - No.: TAB.010.046.EC (Europa)
85D.973.271 (China)
812-939-…00 (MAN)

The cover cap is delivered as bulk goods.

2.9 Wire-Seal (Hirschmann Automotive)

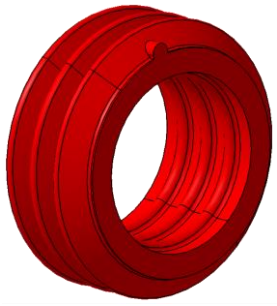

Figure 13: Wire-Seal 6mm²

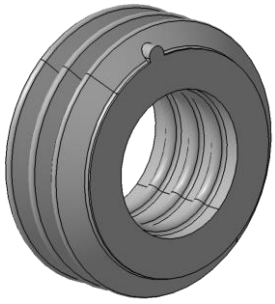

Figure 14: Wire-Seal 4mm²

Figure 15: Wire-Seal 4mm² Huber+Suhner

Table 12: Hirschmann Automotive Wire-Seal

709-113-522	4mm²	purple	Wire-Seal 4mm² for H+S Cable
709-113-506	6mm²	red	Wire-Seal 6mm²
709-113-505	4mm²	grey	Wire-Seal 4mm²
Hirschmann Automotive No.	**Wire cross section (construction of conductor)**	**Color**	**Product description**

The released Wire-Seal per approved wire can be found in the product drawing.

VW/Audi - No.: TAB.010.046.EC (Europa)
85D.973.271 (China)
812-939-…00 (MAN)

The seals are delivered as bulk goods.

2.10 ASSY Contact-Holder PLUS (Hirschmann Automotive)

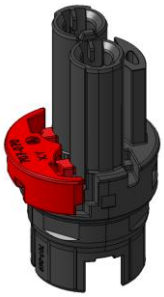

Figure 16: ASSY Contact-Holder PLUS Cod. A

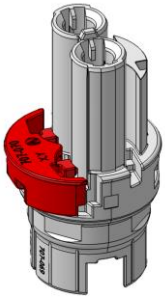

Figure 17: ASSY Contact-Holder PLUS Cod. B

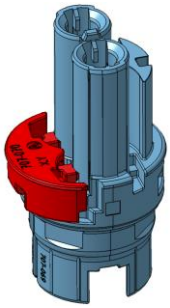

Figure 18: ASSY Contact-Holder PLUS Cod. C

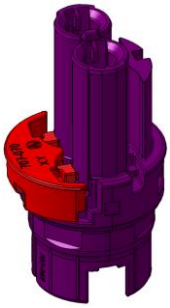

Figure 19: ASSY Contact-Holder PLUS Cod. D

Table 13: Hirschmann Automotive ASSY Contact-Holder PLUS

810-474-501	A	black	ASSY Contact-Holder PLUS Cod. A
810-474-502	B	nature/white	ASSY Contact-Holder PLUS Cod. B
810-474-503	C	blue	ASSY Contact-Holder PLUS Cod. C
810-474-504	D	purple	ASSY Contact-Holder PLUS Cod. D
Hirschmann Automotive No.	**Cod.**	**Color**	**Product description**

The ASSY Contact-Holder PLUS are delivered as bulk goods.

2.11 ASSY Plastic-Housing (Hirschmann Automotive)

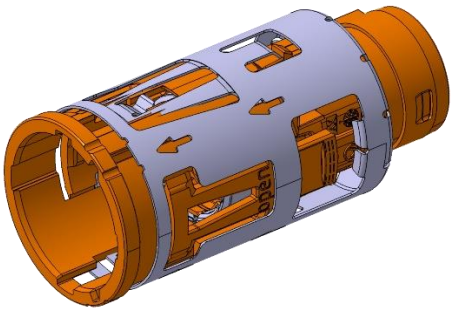

Figure 20: ASSY Plastic-Housing

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Table 14: Hirschmann Automotive ASSY Plastic-Housing

807-656-532	ASSY Plastic-Housing	VW – Logo und HA-DMC
Hirschmann Automotive No.	**Product description**	**Labeling**

The ASSY Plastic-Housing are delivered as bulk goods.

3 Processing steps

Use the following described processing steps for the wire cross sections 6mm² and 4mm².

As a reference sample, the ASSY Contact-Holder PLUS Cod. A and a 6mm² cable are used.

3.1 Cut the shielded cable

Figure 21: Symbolic representation of the shielded cable

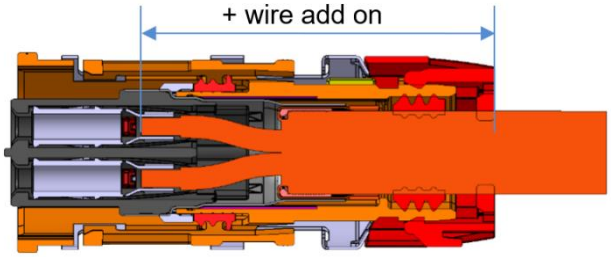


Figure 22: Wire add-on inside the HPS40-2 PLUS (pre-locking position)

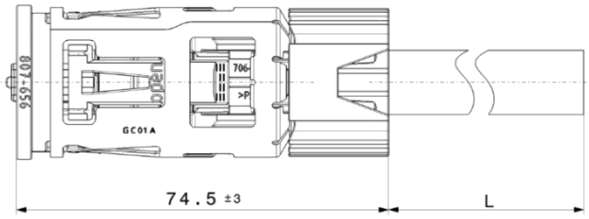


Figure 23: Wire-length add-on (pre-locking position)

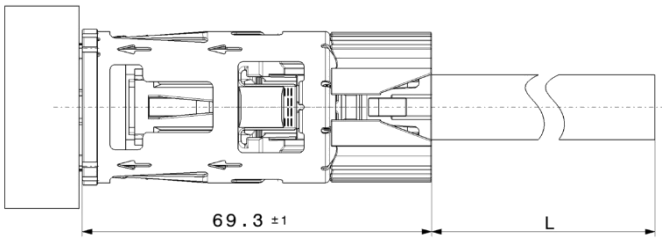


Figure 24: Wire-length add-on (end position)

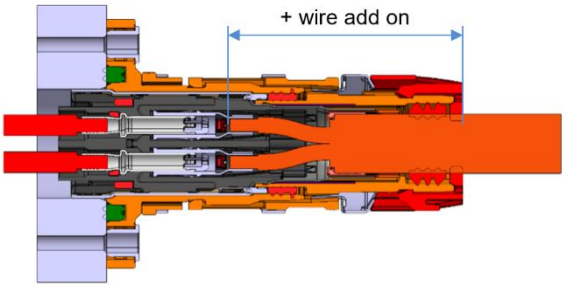


Figure 25: Wire add-on inside the HPS40-2 PLUS (end position)

Add the following lengths for the Hirschmann Automotive HPS40-2 female connector:

Table 15: additional wire length

Wire cross section	Dimension L after zero-cut (mm)	Position cover cap
6mm² 4mm²	L + 50	Cover cap PLUS in end-position (plugged, installed in the vehicle)
6mm² 4mm²	L + 54	Cover cap PLUS in pre-locking position (unplugged, delivery condition)

This dimension must be added to the planned length at cutting process of the wire for each female connector.

Note:

For reproducible series-production of the product, a double stroke system with zero cut should be used for production. When using equipment with a zero cut, it must be considered for the following process steps, that the correct over-length for the zero cut must be added. The exact length of the zero cut must be agreed with the equipment manufacturer and taken into account for the manufacturing process.

3.2 Assembly

Slide the Cover-Cap (1), the Wire-Seal (2), the ASSY Plastic-Housing (3) and the Shield-Sleeve (4) onto the shielded cable.

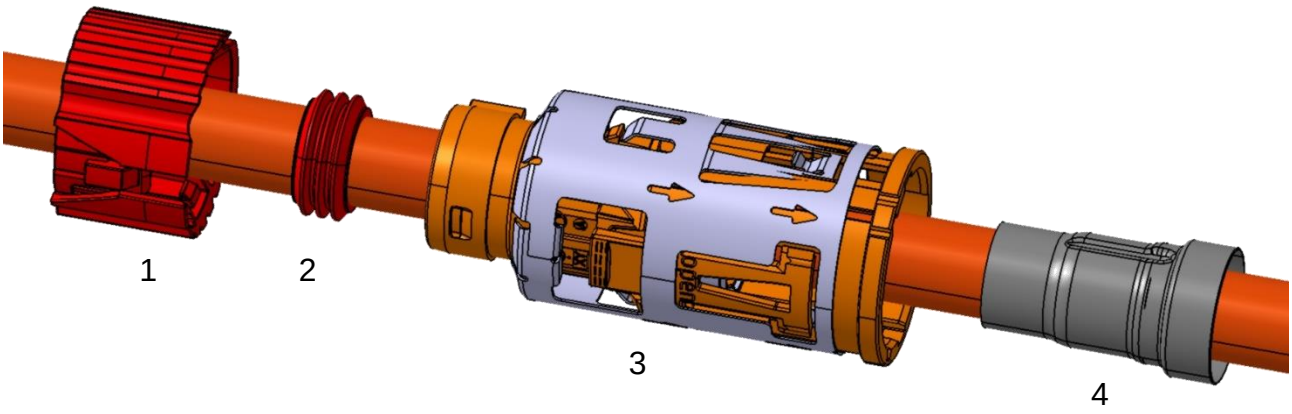


Figure 26: Assembly components

3.3 Strip off the shielded cable

Figure 27: Strip off shielded cable

Stripping length:

Figure 28: Stripping length L1

Table 16: Stripping length L1

6mm²	min. 23,5mm
4mm²	min. 23,5mm
Wire (cross section)	**Dimension L1 after zero-cut (mm)**

The dimension L1 must be more than 23.5 mm for further processing. In the case of a deviation in overlength, a zero cut, as described in chapter 3.1, must be carried out before attaching the HCT4 contacts (see chapter 3.6) to maintain dimension L5 or L5.1. The braided shield must not be damaged during processing.

3.4 Assemble the Stress-relief, remove the foil and shorten the shielding

3.4.1 Stress-relief (Europe configuration acc. TAB.010.046.EC)

Figure 29: Assemble the Stress-relief

Figure 30: remove the foil

Figure 31: shorten the shielding

- The following process steps must be done, but the manufacturer can choose the sequence:
  - Assemble the Stress-relief (709-841-…) see Table 9.
  - Remove the foil.
  - Shorten the shielding.
- An overlap of the foil around the Stress-Relief is allowed circulating up to max. 1,5mm. An overlap of the foil around the Stress-Relief, like small edges is allowed up to max. 4mm.

- Length of the remaining shielding:

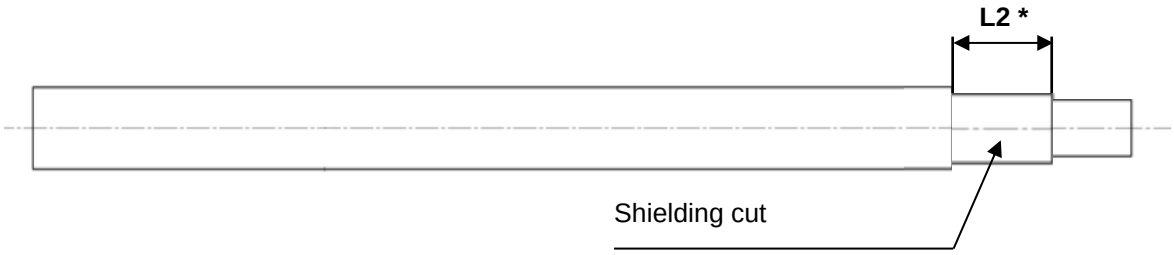


Figure 32: Dimension of the shielding

**Depending on the production method of each manufacturer, the dimension L2 can vary*.

- The length L2 of the braided shield must be defined by consideration that the shield strands are folded tightly and completely, as described in chapter 3.5. The strands must be fixed with the tape without any single strands protruding under the tape in the direction of the sealing area (see Figure 43).
- After cutting the shielding, there are no wire residues or parts of the shielding allowed on the cable. This must be ensured with some actions like the following:
  - can be avoided by removing the residues of the shielding
  - can be avoided by blowing out or by suction of the residues of the shielding

3.4.2 Assemble and crimp ferrule crimp (China configuration acc. 85D.973.271)

It is in the decision of the confectioner which device/machine is used. The crimp and assembly information contained in this chapter must be met.

The commissioning of the crimping device must be done by the confectioner.

The machine used by Hirschmann Automotive is described in chapter 4.

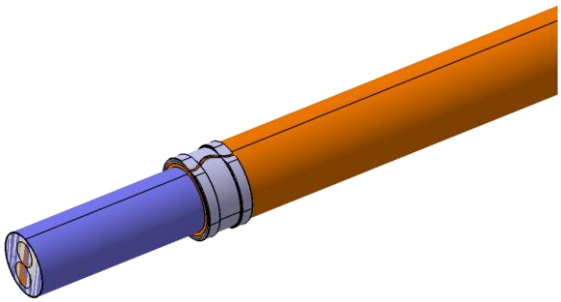


Figure 33: Crimp Ferrule

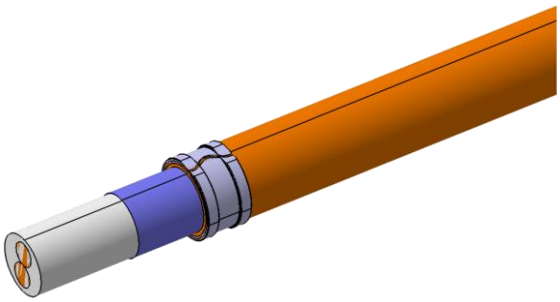


Figure 34: Removal of the foil

- The following process steps have to be done, whereby the sequence is left to the processor.:
  - Place the Ferrule-Crimp (709-741-…) see Table 9 and crimp the Ferrule-Crimp onto cable
  - Remove the foil
  - Shorten the wire-shielding

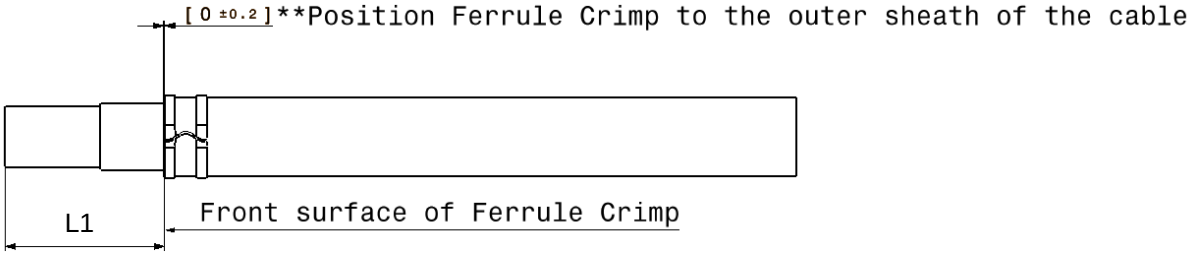


Figure 35: Position Ferrule-Crimp

- The Ferrule-Crimp has to be positioned in relation to the outer sheath of the wire. The dimension of [0±0,2]** has to be maintained. When the Ferrule-Crimp is crimped on the wire, the insulation can be pushed forward and the dimension can no longer be fulfilled. Therefore, dimension L1 should be used as a checking item.

  **An adjustment of the tolerance for positioning of the Ferrule-Crimp to [0 +0.2/-0.5] is permissible, if the condition is given that the stripping length has been adjusted accordingly. (see process step 3.3)

  Also, therefore dimension L4 should be used as a checking item.

- An overlap of the foil in the area of the Ferrule-Crimp is allowed circulating up to max. 1,5mm. An overlap of the foil, in the form of small edges, in the area of the ferrule crimp/strain relief is allowed up to max. 4mm.

- Length of the remaining cable shielding:

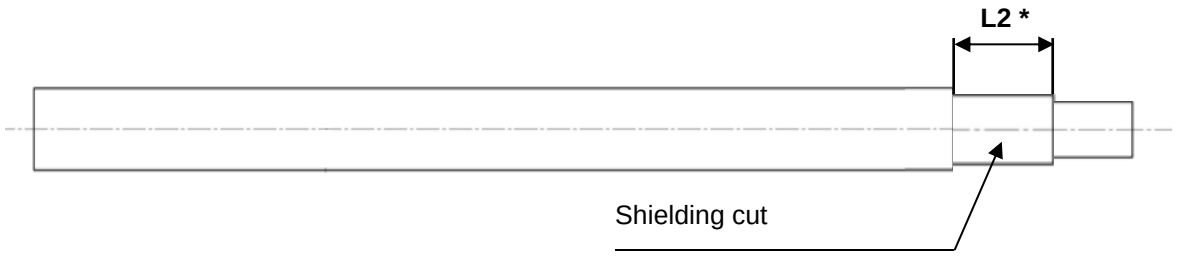


Figure 36: Dimension of the shielding

Ferrule-Crimp pressing dimension:

When crimping the ferrule crimp, the dimension Ø13.85 ± 0.15 is obtained on both shoulders of the ferrule crimp (see section A-A).

Because of the tool separation between the stamp and the sprue a slight ovality may result in the crimp width. In the crimp width, the dimension is permitted up to max. 13,90mm.

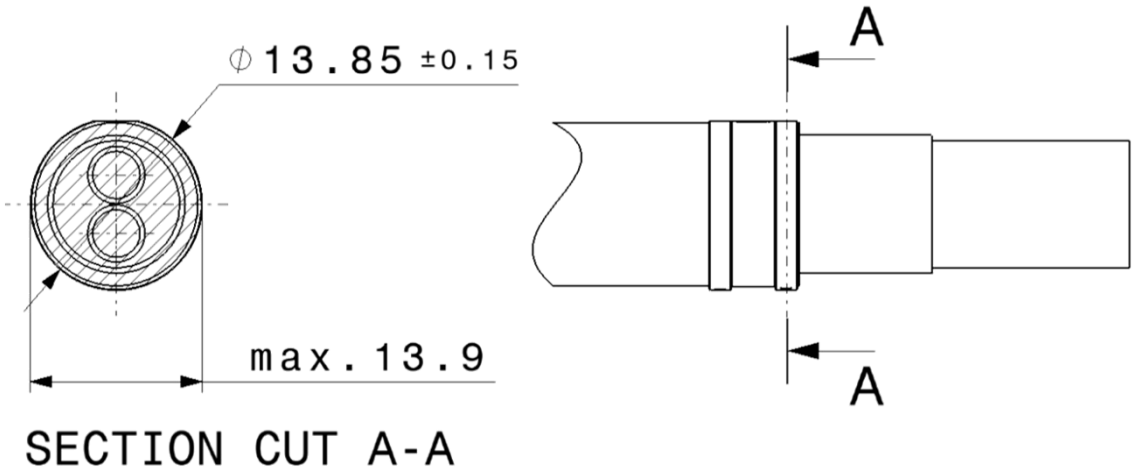


Figure 37: Ferrule crimp pressing dimension

Note:
During the crimping process of the Ferrule-crimp, a bead may be formed in the open direction of the Ferrule-crimp. When closing the crimp, this may result in a cutting (see Figure 38) due to pinching of the two flanks together.

To reduce bead formation during the crimping process, an additional measure such as a hold-down device for the jacket of the cable can be installed in consultation with the machine manufacturer.

Any cuttings that occur during the crimping process must be removed.

The cutting of the wire-jacket itself in the area of the ferrule crimp is not problematic, if the wire-jacket is not completely cut through to the shield strands.

The sheath has no insulating function in the area where it is scraped off by the sheath crimp.

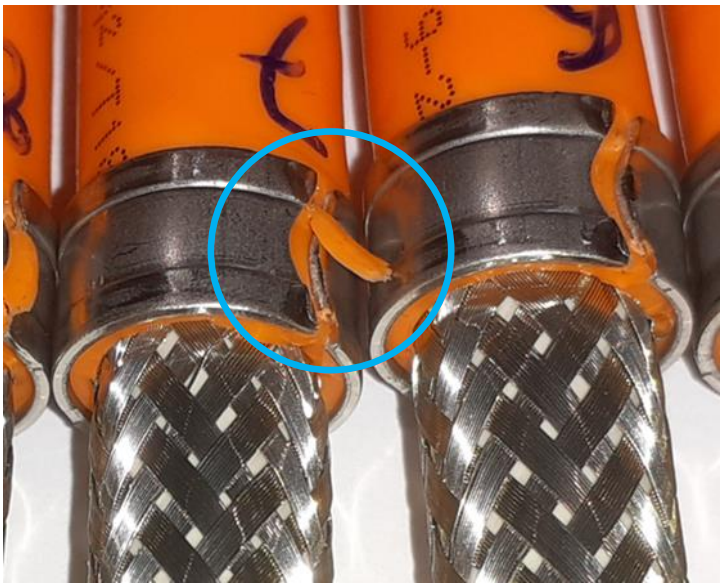


Figure 38: Scraping during cimp-process

3.5 Reverse the shield backwards, fix the shield with tape and remove filling

Figure 39: Fold over and fix the shielding

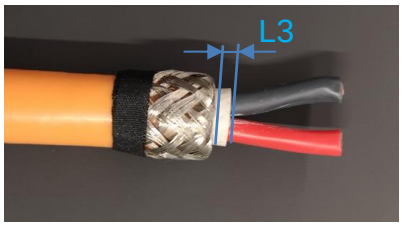


Figure 40: protrude filling material max. L3 = 3mm

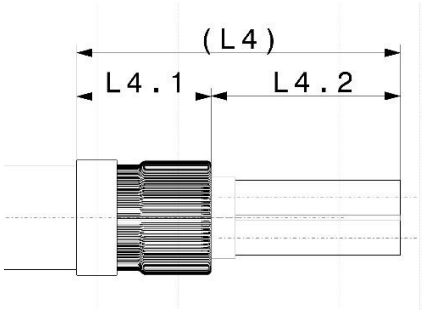


Figure 41: Position fixing band

- 100% of the shield has to be turned over the Stress-Relief. The braiding of the shield should remain as visible at Figure 39. It is not permissible to comb out the braided shield. By turning over the shield, a process related unbraiding is possible.

  After this the shield has to be fixed with a fixing device after the Stress-Relief. (for example: tape)

- The fixing tape needs to stay on, until the pressing procedure is done and can be left inside the connector. The max. width of the tape is **5mm**.

  The fixing tape has to be positioned immediately after the Stress-Relief and must not reach the Stress-Relief.

  No shielding allowed outside the fixing tape.

  The max. position of the tape is showed with the dimension L4.

  L4 = max. 40mm after zero-cut (measurement in straightened length)
  L4.1 = max. 16,7
  L4.2 = max. 23,3 mm

- In this specification the PET- fabric tape 837X (838X) 5mm of the company Coroplast is used.

  It is possible to use another product to fix the shield. The max. outer diameter after assembling is Ø 14,3mm and the Shield-Sleeve must be able to be mounted easily. The product must have min. 150°C thermal resistance.

- The filling material can protrude max. 3mm towards the outer sheath. In the area between the two single cores the filling material can be bigger than L3.

- Single strands of the shield-braid which are not fixed with the tape and stick out must be removed before further process steps.

- Do not damage the single wires during the complete processing operation.

3.6 Crimp the HCT4 female terminal

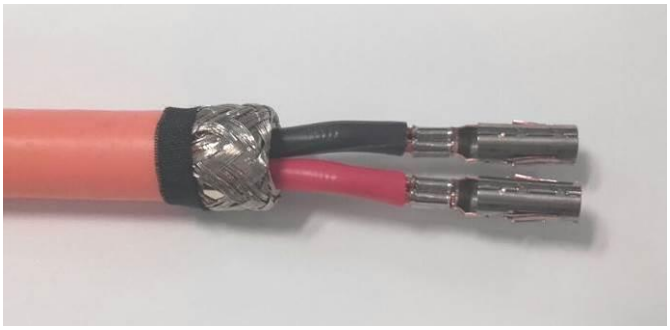


Figure 42: Crimp the HCT4 female terminal

It is up to the manufacturer which device/machine is used. The crimping and positioning data described on the following pages must be observed during the crimping process.

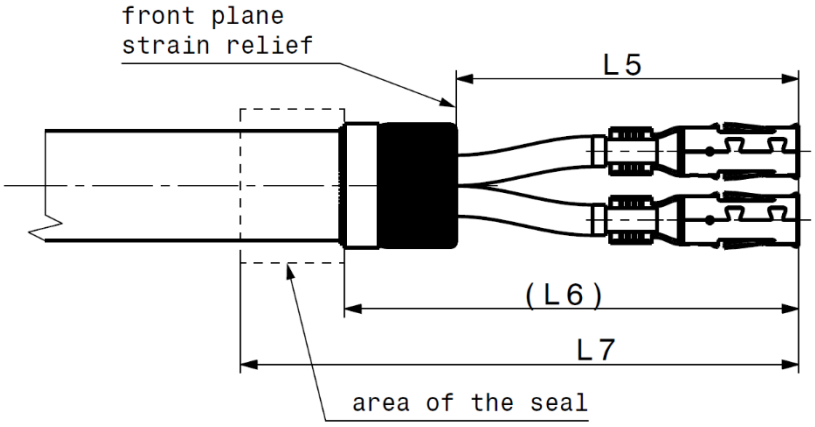
The order of a crimping device is the responsibility of the assembler.

The test equipment used by Hirschmann Automotive can be found in chapter 4.

Process data

The crimp data can be seen in the „Process specification HCT4 female terminal EVS-100068“.

The HCT4 female terminals need to be crimped in relation to the single wires.
For a smooth assembly into the contact holder, the terminals need to be crimped in the correct position. The dimensions on the following figure need to be adhered to.



$$L5 = 40{,}1 \pm 1$$

$$L6 = max.\,57{,}8$$

$$[L7 = max.\,67]$$

Figure 43: Compliance with dimensions after crimping

The dimension L5 is decisive for the position of Stress-Relief.
As alternative to L5 it is allowed to prove dimension 5.1 (see point 3.7), but one of the two combinations from L4.1 and L5.1 or L4 and L5 has to be chosen. L6 is only for information and is built from L4.1 and L5. The dimensions are caused from L1, L4 and the EVS-100068.

The difference of the length between the female terminals of max. 0,5mm is allowed.

A mark on the insulation of the single wires or on the outer sheath which is caused due to fixing the wire at the crimping process is allowed. It must be ensured that the insulation will not be damaged because this will lead to an insulation resistance failure.

At the area of the Wire-Seal, it is not allowed to deform or damage the outer sheath which has negative influence on the sealing function. (see L7)

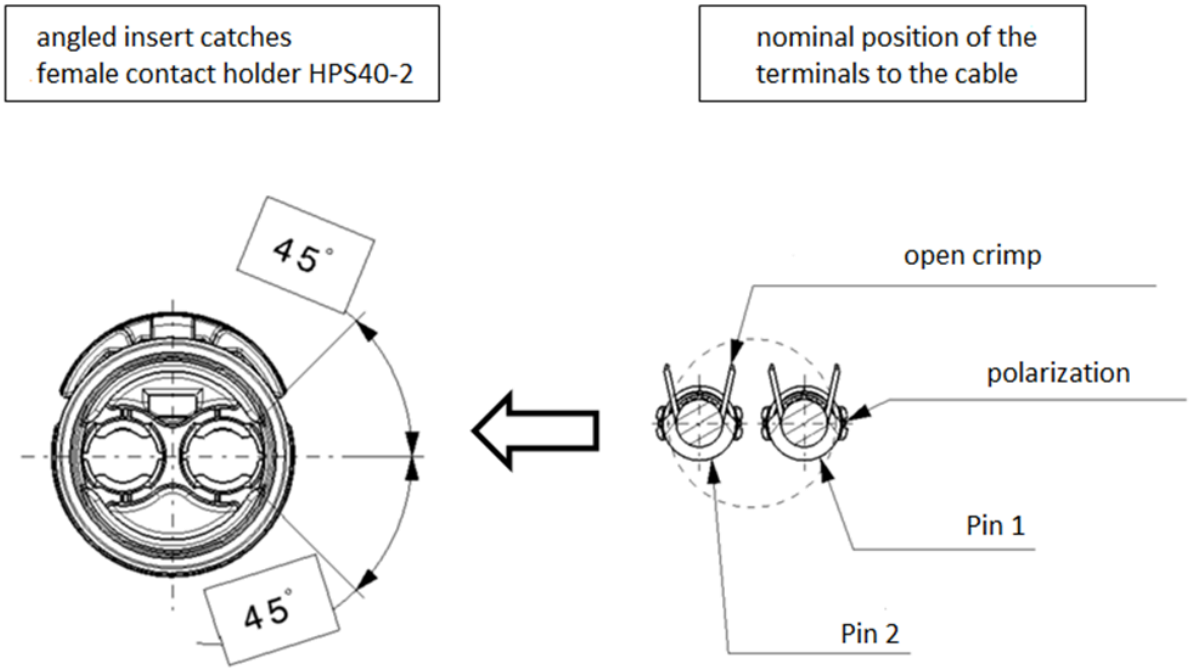


Figure 44: Geometry of the inlet bevels on the ASSY Contact-Holder PLUS

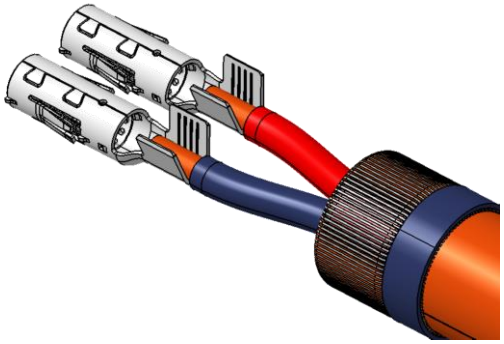


Figure 45: Symbolic representation of crimped HCT4 terminals

To do an orderly assembling / to ensure the primary locking and the secondary locking, the correct position of the terminals and the wire is very important and needs to be ensured.

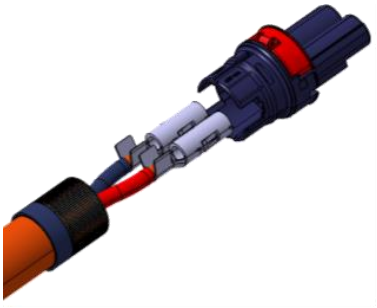
Usually, the horizontal version is intended.

The allowed angle deviation results from the geometry of the angled insert catches on the ASSY Contact-Holder PLUS and the max. assembling force of the cable with the terminals into the ASSY Contact-Holder PLUS.

This can be checked during the assembling process. (See chapter 3.7 Assembly of female terminals into the ASSY Contact-Holder PLUS)

3.7 Assembly

Assemble female terminals into the ASSY Contact-Holder PLUS (1)



2	- / may vary
1	+ / red
Pin	**Polarity / Color**

Figure 46: Assembly the female terminals into the ASSY Contact-Holder PLUS

While assembling the HCT4 female terminals, the latching lance of the HCT4 female terminals will be deflected. Once the end position is reached, the latching lance will audibly engage, and female terminals will be primary locked. (Female terminals must be crimped.)

The mounting force of the female terminals into the ASSY Contact-Holder PLUS have to be proven if the crimping machine is not used or if the terminals are mounted fully automated inside the ASSY Contact-Holder PLUS.

Table 17: Terminal insertion force

Coroflex (Coroplast)	FHLR2GCB2G 600/1000V T180	FHLR2GCB2G 600/1000V T180
	9-2641 (2 x 6mm²)	9-2641 (2 x 4mm²)
Insertion-Force	36N	30N
Cablena (Condumex)	FHLR2GCB2G 600/1000V T180	FHLR2G2GCB2G 600/1000V T180
	109.206.001.7 (2x6mm²)	109.204.001.7 (2x4mm²)
Insertion-Force	36N	30N
Hengtong	FHLR2GCB2G 600/1000V T180	FHLR2GCB2G 600/1000V T180
	8003110576 (2x6mm²)	8003110575 (2x4mm²)
Insertion-Force	36N	30N
Huber + Suhner	-	FHLR91XC13X-2x4 T150
	-	12582308 (2x4mm²)
Insertion-Force	36N	30N
Huber + Suhner	-	FHLR91XC13X-2x4 T150
	-	85149176 (2x4mm²)
Insertion-Force	36N	30N
Wire manufacturer	**6mm²**	**4mm²**
	Wire cross section	

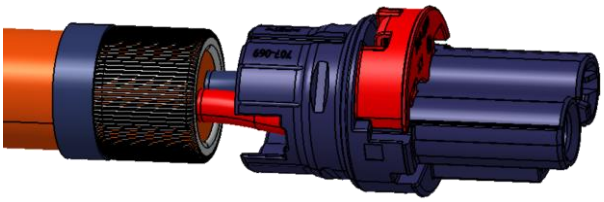


Figure 47: Sec. lock pre-locking / HV terminals primary locked

Assemble secondary locking (2)

The secondary locking can only be assembled if the terminals are in the end position. A visible difference of the terminals to each other can be possible in the terminal cavity. Because of the position of the terminals on the wire, and the play of the terminal in the terminal cavity it is possible and acceptable.

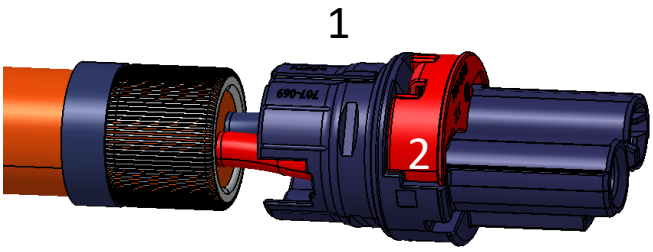
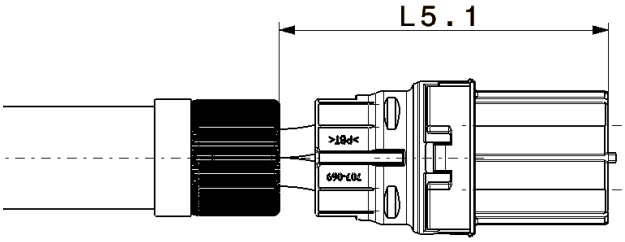


Figure 48: Secondary lock end position



L5.1 = 42,6 ±1

Figure 49: Secondary lock end position

L5.1 can be used for checking as alternative to L5 as it is described in chapter 3.6.

3.8 Push Shield-Sleeve onto ASSY Contact-Holder PLUS

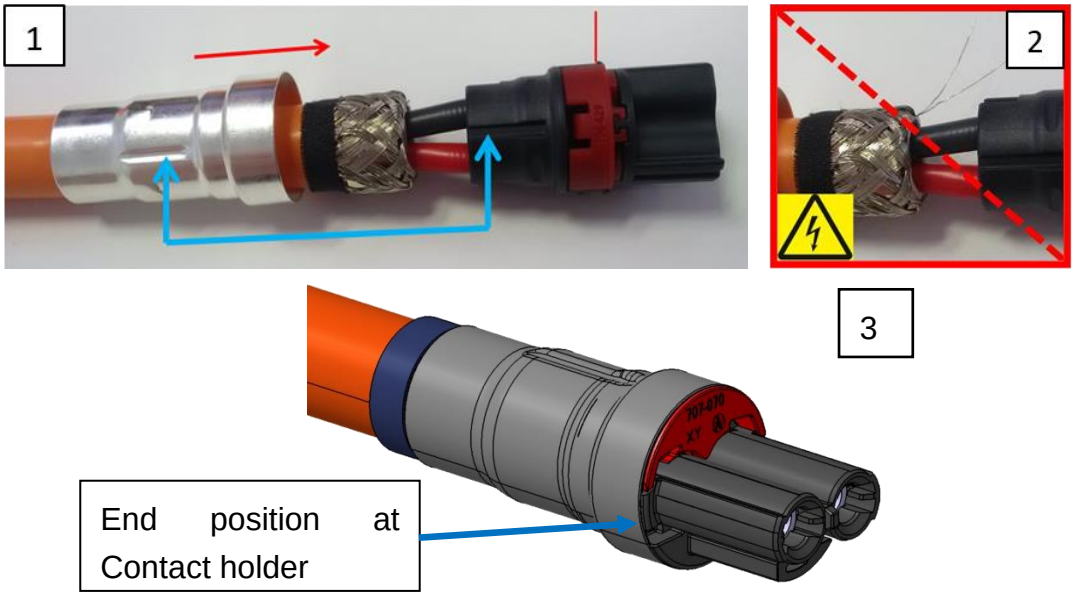


Figure 50: (1) Assembly of Shield-Sleeve, (2) Warning notice, (3) Shield-Sleeve in end position

- Before the Shield-Sleeve gets assembled a rotation of max. ±10° of the ASSY Contact-Holder PLUS relative to the cable is allowed.
- The Shield-Sleeve needs to be assembled onto the ASSY Contact-Holder PLUS in the correct position. The Shield Sleeve can be placed in 2 positions turned by 180°.
- Do not damage the Shield-Sleeve during the assembly.
- The Shield-Sleeve has to be assembled until the end position is reached.
- The fixing tape has to come out of the Shield-Sleeve completely after assembling.
- It must be ensured that no single strands of the shield stick out before the Shield-Sleeve is mounted. Demand-oriented, protruding single strands can be removed. This rework has to be clarified with each OEM.

Risk of insulation failure

3.9 Press Shield-Sleeve

It is up to the manufacturer which device/machine is used. The pressing and positioning data described on the following pages must be observed during the pressing process.

The order of a crimping device is the responsibility of the manufacturer.

The test equipment used by Hirschmann Automotive can be found in chapter 4.

Pressing data

a) The ASSY Contact-Holder PLUS incl. the female terminals have to be put into the device in the correct position.

b) Make sure that the Shield-Sleeve is on the end position of the ASSY Contact-Holder PLUS. The tape has to stick out of the end of the Shield-Sleeve.

c) The circularity of the Shield-Sleeve in the contact area has to be ensured.

d) The measurements on the following drawing, have to be adhered to, before and after pressing.

e) Two pressing actions will be done in one step

1. Shield pressing (Shield-Sleeve, shielding, Stress-Relief and Cable)
2. Pressing of the ASSY Contact-Holder PLUS (Shield-Sleeve and ASSY Contact-Holder PLUS)

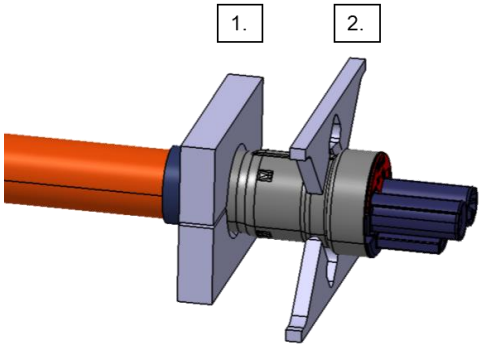
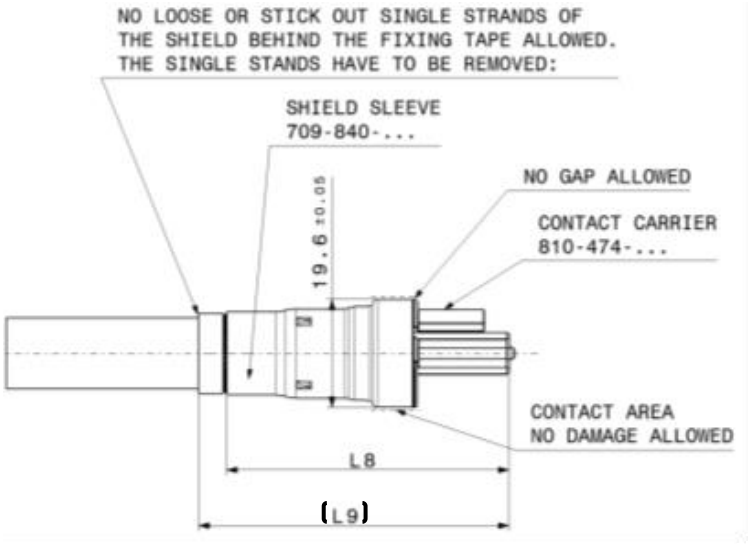


Figure 51: Symbolic representation of the pressing



$L8 = 51{,}4 \pm 0{,}4$

$L9 = \max. 59{,}6$

Figure 52: Embossing position from the cable

The dimension L8 and L9 are just for information to check the process.
The dimensions are resulting from the dimension L1, L4 and the EVS-100068.

Do not damage the following parts during the pressing process:

- Insulation of the wire
- Insulation of the single wires
- Stress relief
- Shield sleeve
- Shield strands of the wire

3.9.1 Shield pressing by two half-shells

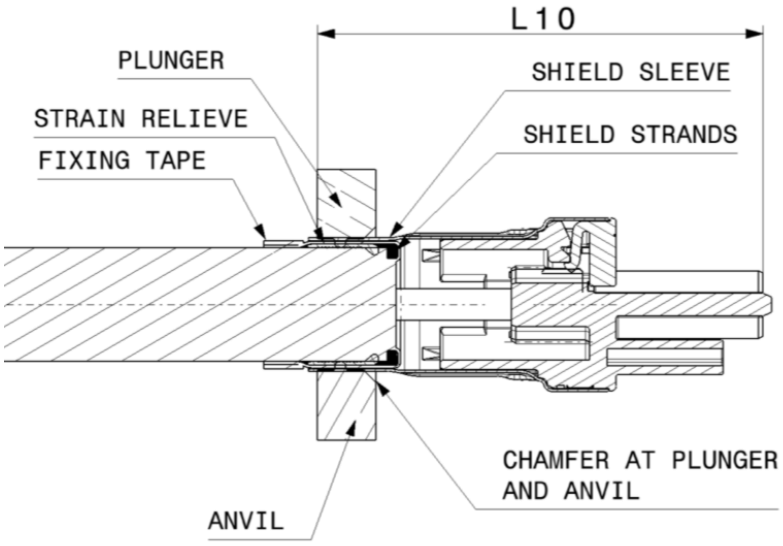
Embossing position:

The exact geometry of the plunger and anvil is given.

The position of the plunger and the anvil has to be revered to the front plane of the ASSY Contact-Holder PLUS.

The chamfer at the plunger and the anvil has to be on the side to the ASSY Contact-Holder PLUS.

The dimension L10 is defining the position of the plunger and the anvil. The dimension L10 is considered as tool dimension and must be ensured in the tool.



$$L10 = 50{,}4 \pm 0{,}1$$

Figure 53: Embossing position

Plunger and anvil geometry of the wire shield pressing

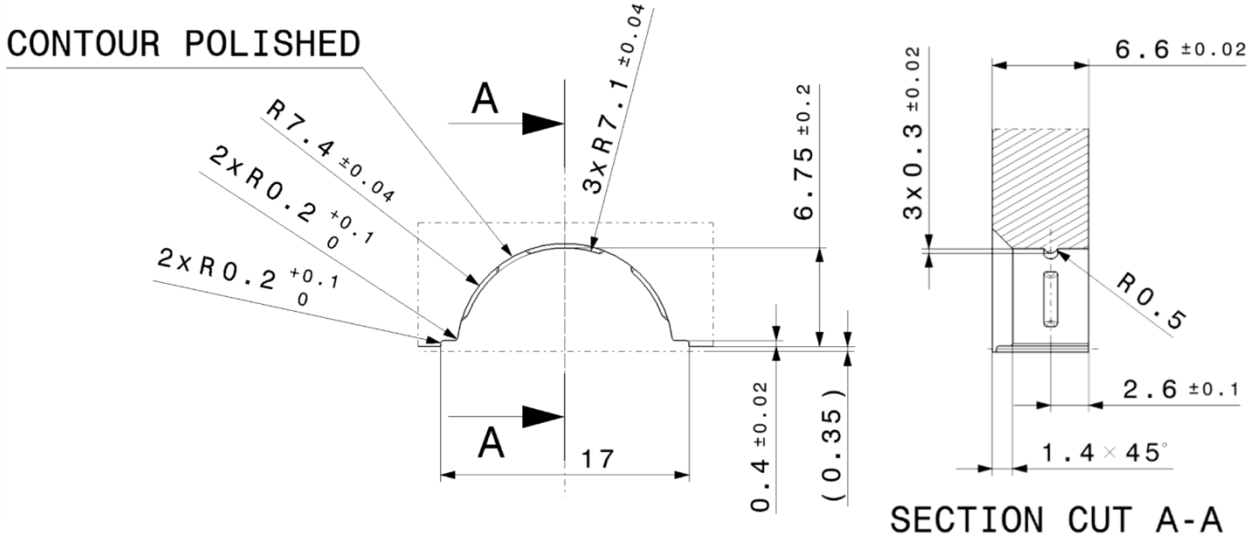


Figure 54: Plunger geometry of the wire shield pressing

Plunger geometry of the wire shield pressing

Material: 1.2721 vacuum hardened 58hrc

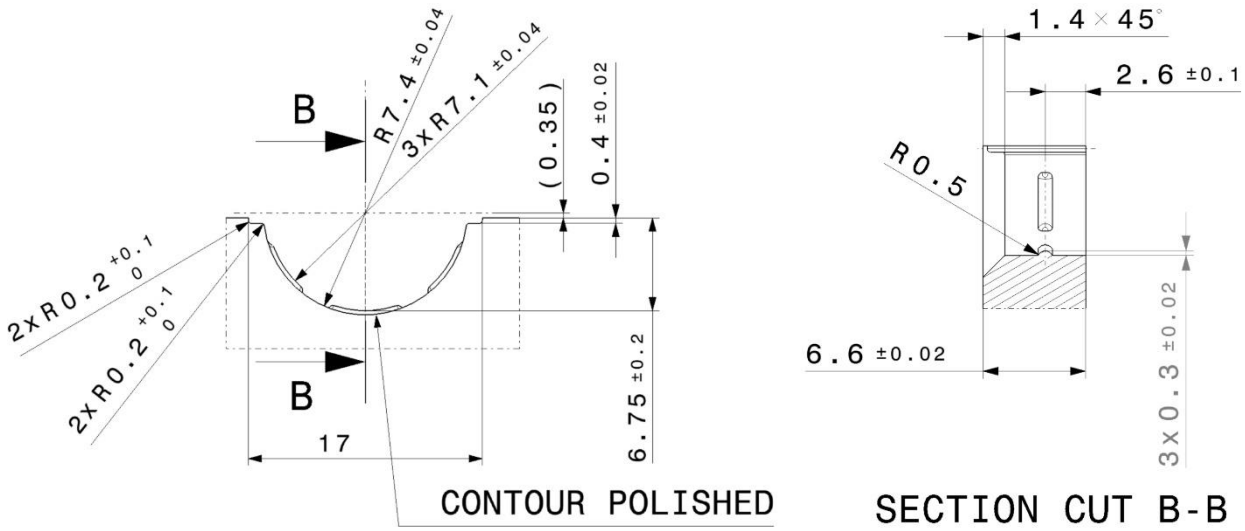


Figure 55: Anvil geometry of the wire shield pressing

Anvil geometry of the wire shield pressing

Material: 1.2721 vacuum hardened 58hrc

Note:

For 6mm² Configuration it is allowed to use the plunger and anvil geometry as described in EVS100137-03 Version 04 until the new anvil and plunger geometries acc. Figure 54 and Figure 55 are procured.
In order to fulfil the requirement for pulling force acc. Table 19 at the cable for 4mm² configuration the new anvil and plunger geometries acc. Figure 54 and Figure 55 have to be used.

Embossing height d:

The plunger and anvil are pressed together until block. Due to this the dimension **d** will be given. See table of each cross section.

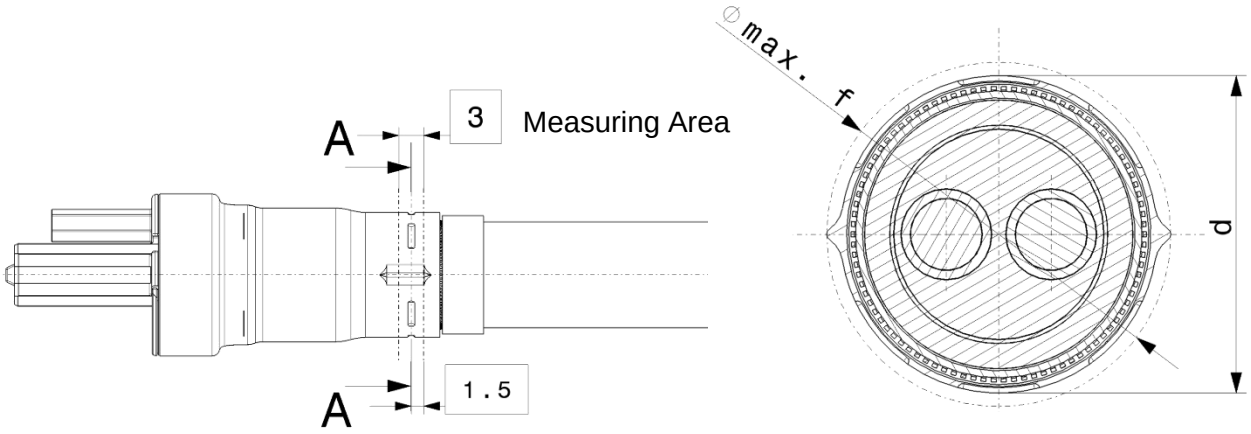


Figure 56: Drawing specification of dimension d

Table 18: press height d

	Dimension d in mm F1	
Coroflex (Coroplast)	14,57 ± 0,15	14,57 ± 0,15
Cablena (Condumex)		
Hengtong		
Huber + Suhner	-	
Wire manufacturer	6mm²	4mm²
	Wire cross section (structure of conductor)	

During the pressing process a fold appears on two sides.
This fold is not allowed to be bigger than the diameter **f = Ø16,4mm** refer to the centerline of the cable.
In the area of the fold the material of the Shield-Sleeve is not allowed to be cracked.

Check measurement of the embossing height d and the max. diameter f:

To check the dimension **f**, a gauge with an inner diameter of 16,4mm has to be used.

To check the dimension d, the height needs to be measured acc. to the drawing.
All of the dimensions have to be within the given tolerance. (see Table 18, page 44).

The measuring of the embossing height “d” must be done with a suitable measuring device. (e.g. Micrometeror caliper, measuring range: 0-25 mm) The gauge for the measurement must have a width of 3.50 ± 0.50mm. The measurement must be taken symmetrically to the embossing position.

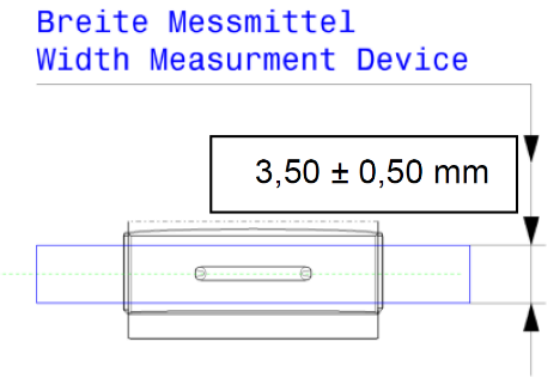


Figure 57: width of measuring device

Figure 58: schematic representation of the pressing height measurement

Pulling force of the Cable

To measure the pull-out force, the wire must be clamped firmly into a clamping device. The distance between the clamping position of the wire and the fixing tape is about 70mm. The connector must be fixed on the Shield-Sleeve at the transition between the largest and the second largest diameter.

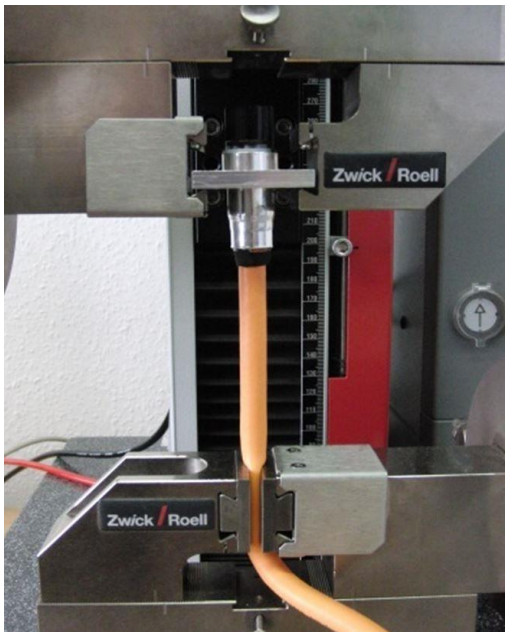


Figure 59: Test setup pulling force of shield pressing

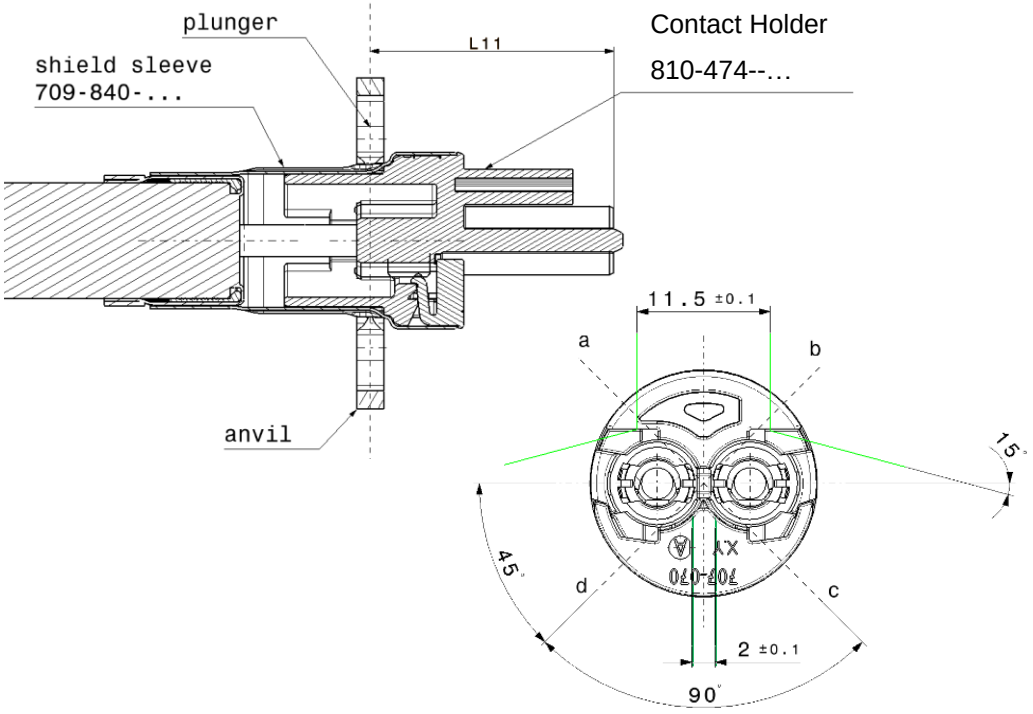
HCT4 terminals must not be installed in the test specimens, in order to test the shield pressing only. In this state, the value in the Table 19 must be reached.

Table 19: Pulling force for the several wire cross section (see VW 80332 PG10)

4mm²	≥ 300N
6mm²	≥ 300N
Wire cross section (structure of conductor)	**Pulling force**

3.9.2 Pressing contact holder PLUS

Embossing position:



$L11 = 27 \pm 0{,}1$

Figure 60: Embossing position on the contact holder

The dimension L11 describes the position of the pressing. The dimension L11 is considered as tool dimension and must be ensured in the tool.

The position of the plunger and the anvil has to be aligned in relation to the front plane of the ASSY Contact-Holder PLUS.

The four embossing positions (a-d) must be aligned in relation to the ASSY Contact-Holder PLUS. Therefor the ASSY Contact-Holder PLUS must be secured against rotation. The green areas can be used as a jack for the contact holder. Ensure that any coding version of the ASSY Contact-Holder PLUS can be inserted into the jack.

The exact geometry of the plunger and anvil is given.

Geometry of the plunger and the anvil pressing on the ASSY Contact-Holder PLUS

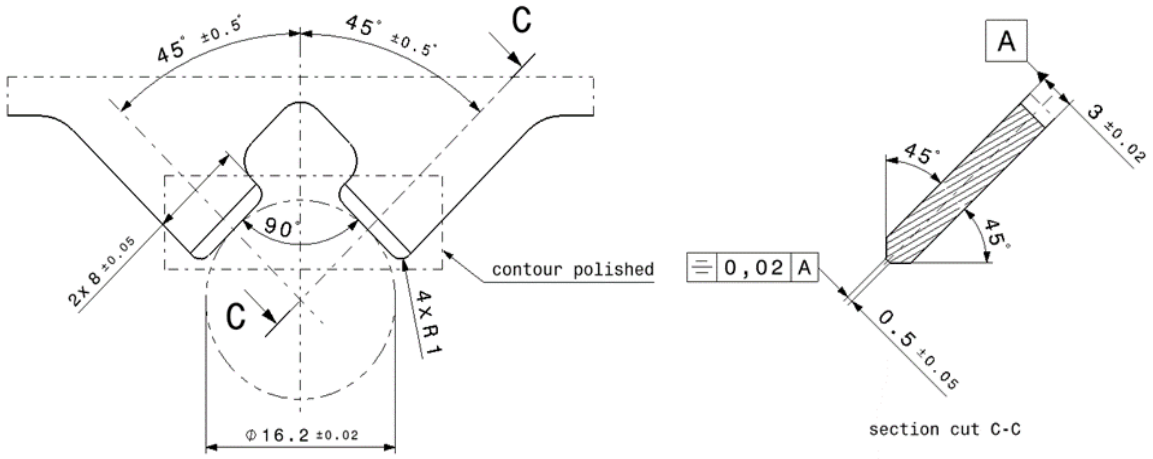


Figure 61: Geometry of the plunger and the anvil pressing on the ASSY Contact-Holder PLUS

Anvil geometry of the ASSY Contact-Holder PLUS pressing
Material: 1.2721 vacuum hardened 58hrc

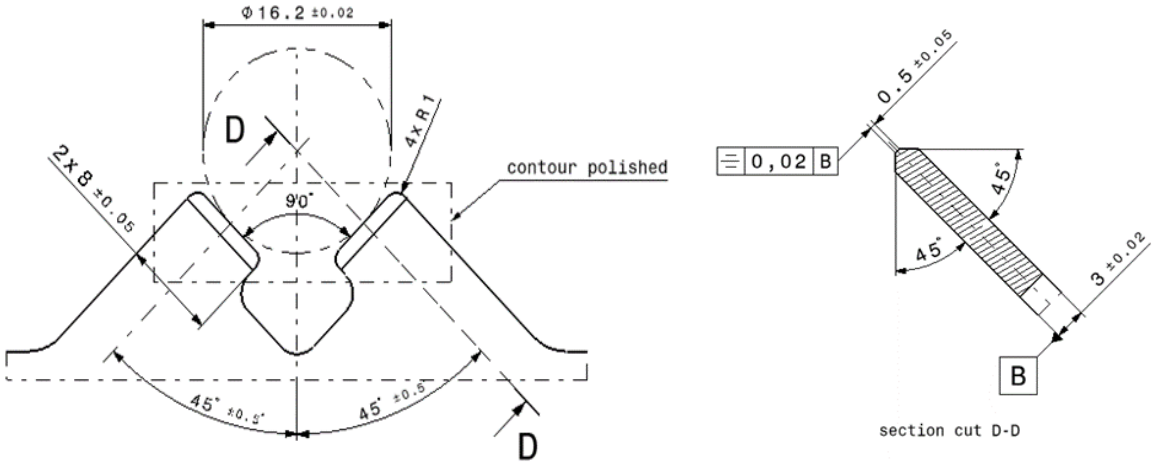
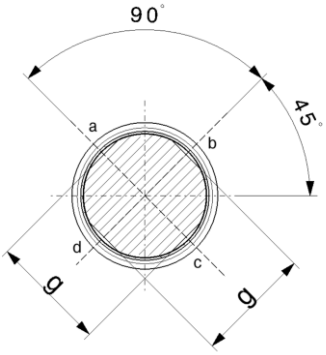


Figure 62: Geometry of the plunger and the anvil pressing on the ASSY Contact-Holder PLUS

Anvil geometry of the ASSY Contact-Holder PLUS pressing
Material: 1.2721 vacuum hardened 58hrc

Embossing height g:



The dimension g results from the embossing in between a-c and b-d.

The embossing has to be done at the same time.

Figure 63: Drawing specification of dimension g

The dimension g is defined as follwing:

(g = 16.40 mm ± 0,1 – valid for applications already in series production)

g = 16.50 mm ± 0,1 – valid for all new applications

For every new application of the HPS40-2 female connector it must be used a embossing height of 16.5mm ± 0,1mm for the dimension “**g**”.

Risk of insulation failure!

The embossing of the shield sleeve must not cause any damage to the supporting terminal holder part.

It´s not allowed to go below the min. limit of the dimension “**g**”.

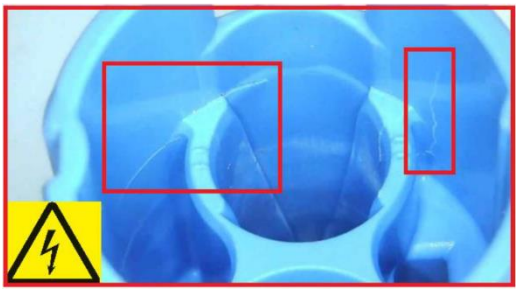


Figure 64: Possible error image for over pressing (stress marks at the plastic part)

Check the measurement of the embossing height g:

To check the dimension g, the height needs to be measured acc. to the drawing. All of the dimensions have to be within the given tolerance.

The measuring of the embossing height has to be done with a suitable measuring device. (Micrometer, measuring range: 0-25mm) The thickness of the measuring blades must be lower than 0,3mm.

Figure 65: schematic representation of the measuring device

Figure 66: schematic representation of the measurement of the pressing height

3.10 Positioning of the female locking device unit

An assembly device (hand lever press) can be used for the positioning and assembly process of the ASSY Plastic-Housing to the cable assembly.

The manufacturer is free to choose which device/machine is used. The assembly data described on the following pages must be observed during the assembly process.

The order of an assembly device is the responsibility of the manufacturer.

The test equipment used by Hirschmann Automotive can be found in chapter 4.

The ASSY Plastic-Housing has to be assembled power assisted, and in the correct position.

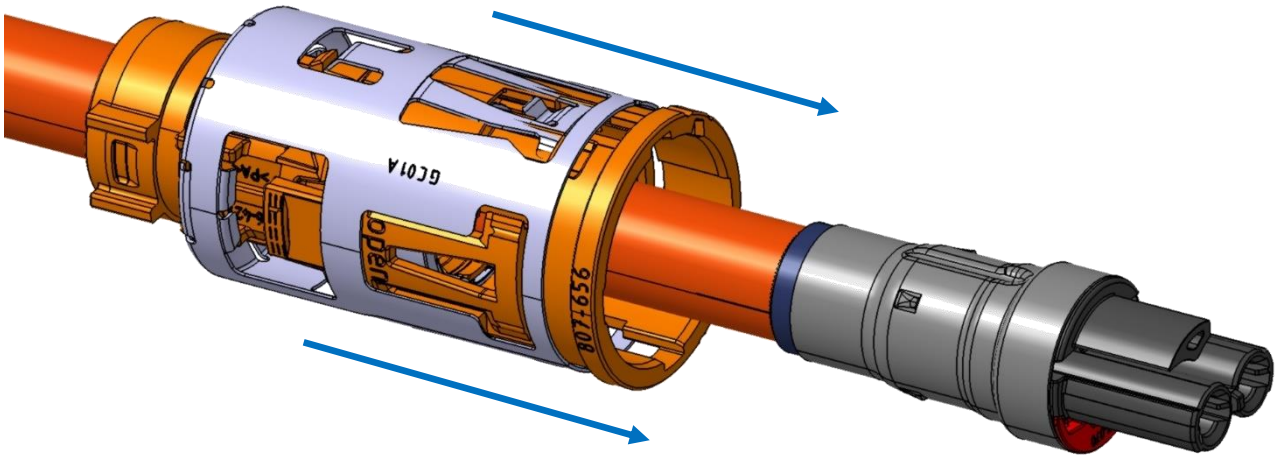


Figure 67: Mounting direction of the ASSY Plastic-Housing

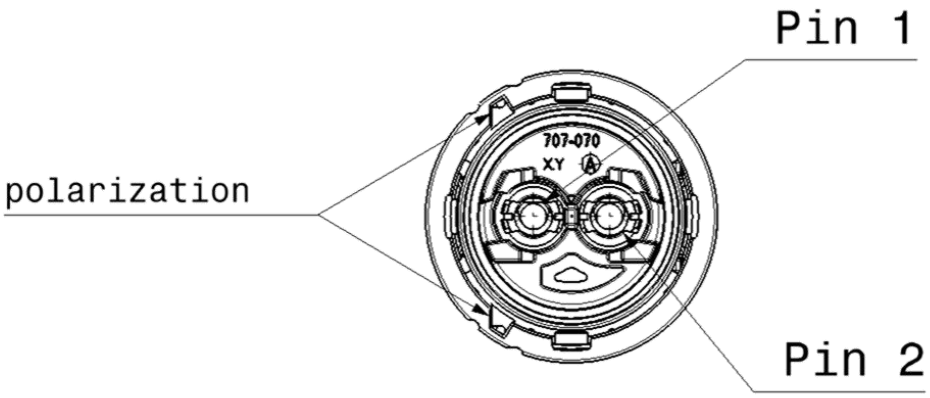
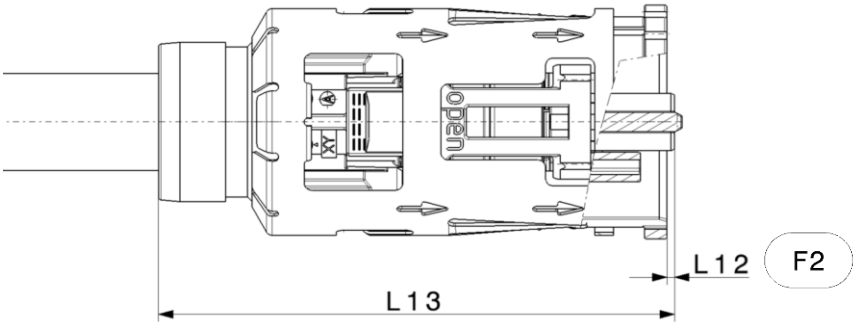


Figure 68: Position of the polarization of the ASSY Plastic-Housing

- The ASSY Contact-Holder PLUS incl. the Shield-Sleeve needs to be assembled into the ASSY Plastic-Housing in the correct position.

  Both polarizations need to be symmetric to the axis in between of the center of Pin 1 and Pin 2.

  Also, the polarization has to be on the side of Pin 1.



$$L12 = 1 \pm 0{,}1$$

$$L13 = 68{,}4\ (Info)$$

Figure 69: Assembly position of the ASSY Plastic-Housing

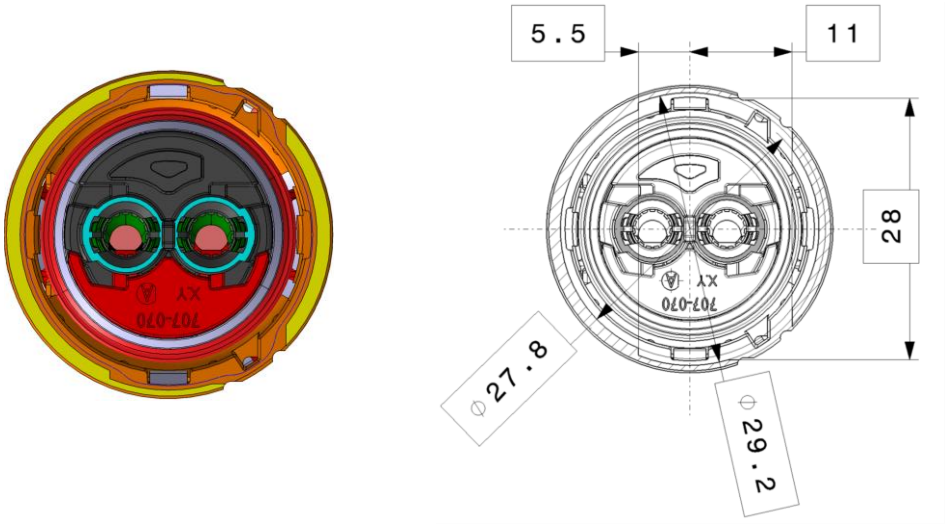


Figure 70: references to L12

Note:

With the assembly device or measuring device for dimension 12, it must be ensured that a possible mold parting line on the face of the housing is considered and does not affect the press-in depth or the measurement. The surfaces marked in yellow (end face of locking sleeve) and green (end face of contact part carrier) are used as reference surfaces as shown in Figure 70.

- The locking sleeve must be assembled onto the Shield-Sleeve force-assisted until the dimension L12 is reached.

  The dimension L12 can be checked with a testing gauge.
  Its recommended that L12 gets checked for 100%
  The dimension L13 is only for checking purposes.

- During the assembly of the safety ring (grey Ring, Figure 71) may not be exceeded or damaged after mounting process.
- During the assembling process, there are no damages allowed on the Shield-Sleeve, the ASSY Contact Holder PLUS, or the wire.
- Pull forces via the cable should be avoided when installing the pin housing. High pull force via the cable can damage the shield transition.

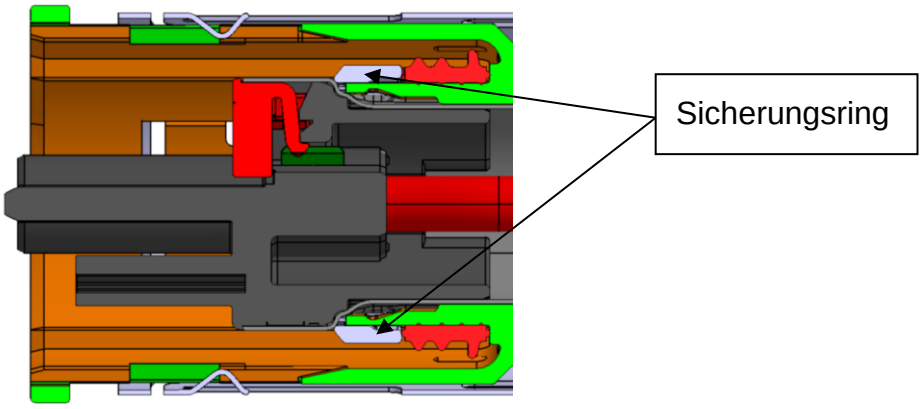


Figure 71: Maximum diameter of the safety ring after mounting process

3.11 Assembly Wire-Seal and Cover-Cap PLUS

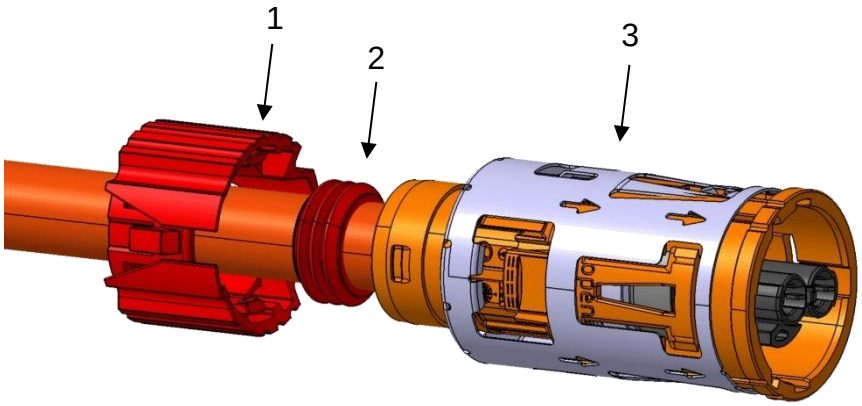


Figure 72: Assemble seal and cover cap

- Push the Wire-Seal [2] into the ASSY Plastic-Housing [3]

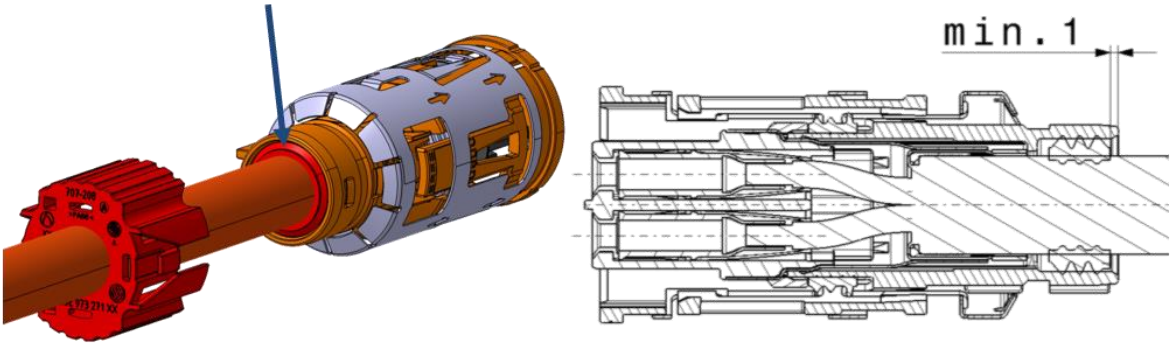


Figure 73: Symbolic representation of the seal one end position

The Wire-Seal can be slightly widened during assembly.

- It is possible to move the Wire-Seal [2] with the Cover Cap PLUS [1] on the wire, but care must be taken that the seal does not twist and is not pinched or damaged.
- It has to be ensured that Wire-Seal [2] is positioned at least 1mm inside the ASSY Plastic-Housing [3] in end-position (see Figure 73).

- Snap the Cover-Cap [1] into the peripheral groove of the ASSY Plastic-Housing [3], considering the polarization, the detachable snap hook [1a] must be located by the arrows of the CPA [3a]. In the delivery condition or unmated state, the metal CPA has to have a distance of 3,8±0,4mm to the board of the ASSY Plastic-Housing, as visible in the last picture of Figure 74.
- It must be ensured that the Cover-Cap PLUS [1] and Wire-Seal [2] do not get damaged during the processing.

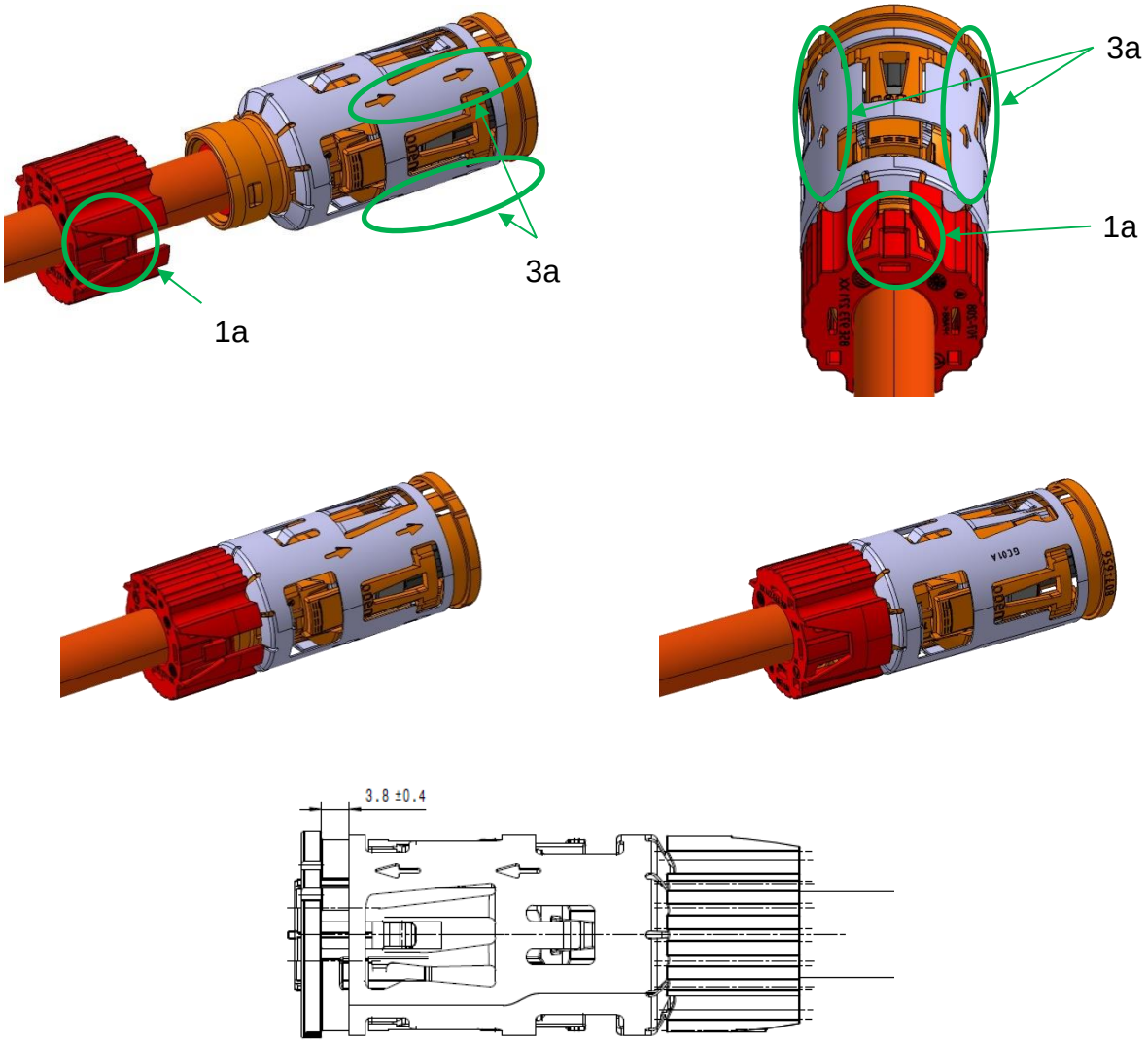


Figure 74: Cover-Cap PLUS and CPA in pre-position

3.12 Protection-Cap Assembly (optional)

Depending on whether the customer requires transport protection for the connector interface, a transport protection cap can be fitted to the pin housing.

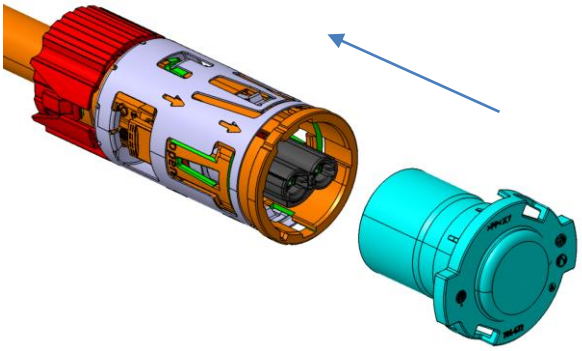


Bild 1: Montagerichtung Transportschutzkappe

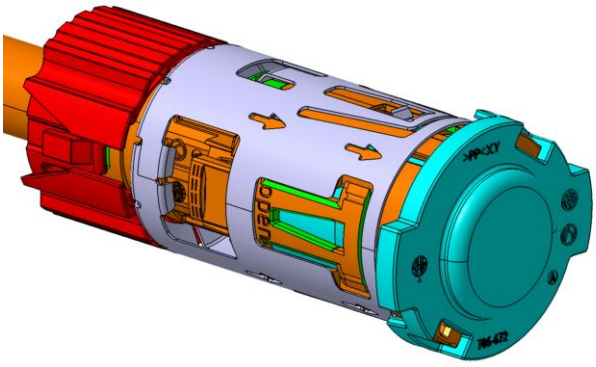


Bild 2: Transportschutzkappe in Endposition

The transport protection cap must be pushed on the face of the housing.

It is possible to rotate the transport protection cap through 360° during installation.

3.13 Technical cleanliness

In general, pay attention to the cleanliness on the connector and inside of the connector.

Metallic particles generated during the assembly process, have to be removed with a suitable device. Inside the connector and on the connector, there are no metallic particles > 1000 µm allowed.

For metallic particle at each connector: CCC = N (J4/K0) acc. to VDA Volume 19

For all other particle at each connector: CCC = N (J10/K0) acc. to VDA Volume 19

It is also important to protect the component from further contamination during transport. Suitable packaging must be considered.

4 Appendix

The machines and devices described in this chapter were used by Hirschmann Automotive for the production of numerous experimental- and validation parts. The selection, design and commissioning of these devices lies within the responsibility of the manufacturer.

4.1 Double stroke crimping machine (see chapter 3.6)

Name of the device:	**HPS40-2 Double stroke crimping machine**
Article number:	**185/16**
Name of the device:	**Interchangeable crimping unit**
Article number:	**Shown in the process specification HCT4 female terminal „EVS-100068“**
Contact:	**Schäfer Werkzeug- und Sondermaschinenbau GmbH** **Dr.-Alfred-Weckesser-Str. 6** **76669 Bad Schönborn-La, Deutschland** **Tel: +49 7253 9421-0** **Fax: +49 7253 9421-94** **www.schaefer.biz**

4.2 Pressing device (see chapter 3.4.2)

Name of the device:	**HPS40-2 MCC Ferrule Crimp**
Article number:	**EPS3000-PHS40-2-ZE**
Contact:	**Schäfer Werkzeug- und Sondermaschinenbau GmbH** **Dr.-Alfred-Weckesser-Str. 6** **76669 Bad Schönborn-La, Deutschland** **Tel: +49 7253 9421-0** **Fax: +49 7253 9421-94** **www.schaefer.biz**

4.3 Pressing device (see chapter 3.9)

Name of the device:	**Pressing device HPS40-2**
Article number:	**188/16**
Contact:	**Schäfer Werkzeug- und Sondermaschinenbau GmbH** **Dr.-Alfred-Weckesser-Str. 6** **76669 Bad Schönborn-La, Deutschland** **Tel: +49 7253 9421-0** **Fax: +49 7253 9421-94** **www.schaefer.biz**

4.4 Assembling device (see chapter 3.10)

Name:	**Assembling device HPS40-2**
Article number:	**HPS40-2**
Contact:	**WKM - Maschinenbau GmbH** **Oberes Ried 15** **A-6833 Klaus** **Tel. +43 5523 / 54907**

4.5 Degree of automation

There is a concept developed by the company Komax in which the process steps as shown in this process specification can be produced fully automatic in various stage of expansion.

This concept was developed together with the company Hirschmann Automotive.

Each manufacturer is responsible of the commissioning of the pressing device and can be requested direct at the company Komax.

KOMAX AG
Industriestraße 6
CH-6036 Dierikon
Phone: +41 41 455 04 55
www.komaxwire.com

4.6 Auxiliary measuring devices

Process queries and checks must be defined by the manufacturer with suitable measuring strategies and associated auxiliary measuring devices for the individual process steps.

5 Change History

Version	Description of change	Editor	Status	Date
00	First release	Rümmele M.	released	18.06.2021
01	Chapter 2.7: Table 10 adapted; Chapter 3.1: Table 15 adapted; note added; Chapter 3.4: Definition of foil overhang added; Chapter 3.5: Dimension L4 - added "Measurement in stretched length"; Chapter 3.7: Table 12 adapted; Chapter 3.9.1: Dimension L10 - addition/definition as tool dimension; Chapter 3.9.2: Dimension L11 - addition/definition as tool dimension; embossing height g - max. Width of measuring tips changed to 0.3mm; Chapter 3.11: Assembly of Wire-Seal adapted; Added orientation of the Cover-Cap;	Rümmele M.	released	24.02.2022
02	Chapter 3.1: Figure 18,19 and Table 10 adapted	Rümmele M.	released	07.03.2022
03	General: part description adaped; Chapter 2: table 2 added; Chapter 2.5: part number adapted; Chapter 3.5: Dimension L4.1 added + Figure 31 adapted; Chapter 3.6: L6 set as Information only; Chapter 3.7: dimension L5.1 added; Chapter 3.9: L9 set as Information only;	Rümmele M.	released	30.06.2022
04	Chapter 3.8: max. allowed rotation of ±10° added; Chapter 3.9: text of not allowed damages added;	Rümmele M.	released	18.07.2022

05	Chapter 1.1: Item J added; Chapter 1.2: table 1 adaped; Chapter 2.1: added new shield sleeve; Chapter 2.2: added; Chapter 2.5: added ferrule crimp; Chapter 2.6: added new shield sleeve; Chapter 3.4.1: added; Chapter 3.4.2 added; Chapter 3.5: Shield braid structure adjusted; Figure 29 and Figure 30 adaped; Chapter 3.8: description of rotation angle adapted Chapter 3.9.1: Figure 52 Figure 53 & Figure 54 adapded; Extraction force adjusted to 300N Chapter 4.2 added (Ferrule Crimp-Press)	Rümmele M.	released	27.06.2023
06	Chapter 2.3: Information's of Hengtong Cable completed Chapter 3.7: Table 14 completed; Chapter 3.10: Note added;	Rümmele M.	released	07.07.2023
07	Chapter 1.2: Table 1 extended; Chapter 1.3: 2x4mm² Huber+Suhner cable added; Chapter 1.4: Characteristics / Customer release added; Chapter 2.3: MAN configuration added; Chapter 2.4: Table 6 extended; Chapter 2.6: Stress Relief H+S 709-841-022 added; Chapter 2.10: Index 532 added; Chapter 3.5: Picture 38, 39 and 40 adapted; Chapter 3.7: Table 16 extended; Chapter 3.9.1: Text adapted and Picture 59 added; Picture 56 of Version 06 removed; Chapter 3.9.2: Embossing height "g" adapted;	Rümmele M.	released	14.12.2023
08	Chapter 2.2: Table 4: Cover Cap article no. changed;	Schwendinger	released	21.03.2024

09	Chapter 1.4: Pull out foce of shield pressing removed and crimp height HCT4 added as characteristic. Chapter 2.7: 709-840-501 removed; Chapter 2.8: 707-208-553 added; Chapter 2.10: Pictures actualized; Chapter 2.11: 807-656-531 removed; Chapter 3.1: Text added; zero cut removed at Table 15; Chapter 3.3: description of L1 adapted; Chapter 3.5: L4 adapted; L4.2 (Figure 41) added; Chapter 3.6: Description of L6 and L7 adapted; Chapter 3.9: L9 adapted; Bild 56 adapted; tolerance of L8 und L9 adapted; Chapter 3.10: Text for L12 adapted; Bild 70 hinzu; Bild 71 angepasst; Chapter 3.12 added; Chapter 4.6: Auxiliary measuring devices added;	Rümmele M.	released	17.06.2025