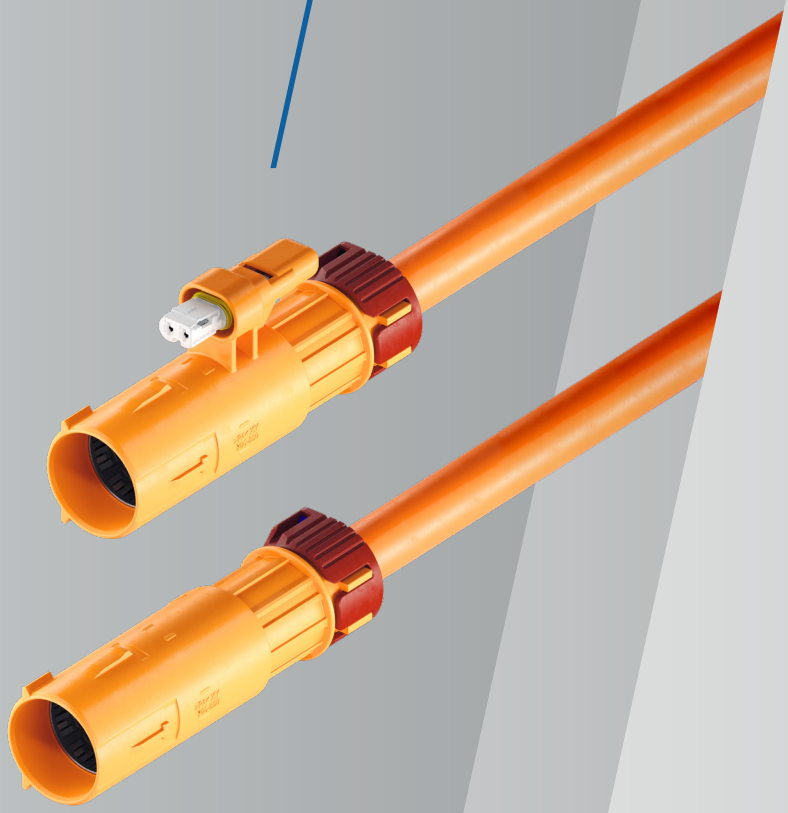


PROCESS SPECIFICATION

HPS In-Line Connector Male MCC

EVS-100113

HIRSCHMANN
AUTOMOTIVE

TABLE

1 General

1.1 Introduction

This process specification is valid for all variants mentioned and describes the product structure as well as the assembly of the HPS40-2 In-Line Connector.

System number	Coding	Wire cross section
809-999-501	A	2.5 mm² 4.0 mm² 6.0 mm²
809-999-502	B	
809-999-503	C	
809-999-504	D	

The manufacturer of the listed products is responsible for the qualitative processing and the accuracy of the version. In case of improper processes or deviation from specification that results in quality issues, the right of complaint is void.

1.2 Customer-releases

It is our suggestion that the specified dimensions are observed during processing. Further functional features must be coordinated and defined with the OEM. The adjustments in the processing specification with the status 08/ 2023 must be considered for new applications, but not for existing applications.

1.2.1 Customer: Miscellaneous

Customer: Miscellaneous					
L	**S**	**F**	**Characteristic**	**Specific Purpose**	**Place of implementation**
L1	-	-	“d” Height of shield-crimping	Strain-relief, electrical shield connection - EMC	Tier 1
L2**	-	-	Retention force of shield crimping	Strain-relief, electrical shield connection - EMC	
-	-	F1	L12 depth of contact carrier	Pluggability	

**No 100% check possible since the specimens are destroyed during testing.
Proof of capability or continuous testing of all special characteristics must be aligned with the OEM directly.

1.2.2 Customer: BMW

Customer: BMW BMW-Number.: 5 A4C A43		NAEL:	N OU53 B – VS12
Special characteristics according to GS 91011:2019-8			
L	**S**	**F**	**Characteristic**	**Specific Purpose**	**Place of implementation**
L1	-	-	“d” Height of shield-crimping	Strain-relief, electrical shield connection - EMC	Tier 1
L2**	-	-	Retention force of shield crimping	Strain-relief, electrical shield connection - EMC	
-	-	F1	L12 depth of contact carrier	Pluggability	

**No 100% check possible since the specimens are destroyed during testing.
Proof of capability or continuous testing of all special characteristics must be aligned with BMW directly.

Legend: L = Legal, S = Safety, F = Function

1.3 Other current documents

A	HCT4 Process specification (Ag)	EVS-100068
B	Data sheet 2x 2.5 mm² shielded cable (T180) of Kroschu	Kroschu No. 64996918
C	Data sheet 2x 4.0 mm² shielded cable (T180) of Kroschu	Kroschu No. 64997293
D	Data sheet 2x 6.0 mm² shielded cable (T180) of Kroschu	Kroschu No. 64995979 Kroschu No. 64997213
E	Data sheet 2x 2.5 mm² shielded cable of Coroplast	Coroplast No.: 9-2641 (2x 2.5 mm²)
F	Data sheet 2x 4.0 mm² shielded cable of Coroplast	Coroplast No.: 9-2641 (2x 4.0 mm²)
G	Data sheet 2x 6.0 mm² shielded cable of Coroplast	Coroplast No.: 9-2641 (2x 6.0 mm²)
H	Data sheet 2x 2.5 mm² shielded cable of Leoni	Leoni No.: FHLR2G2GCB2G 00001
I	Data sheet 2x 4.0 mm² shielded cable of Leoni	Leoni No.: FHLR2G2GCB2G 00002
J	Data sheet 2x 6.0 mm² shielded cable of Leoni	Leoni No.: FHLR2G2GCB2G 00003
K	Data sheet 2x 4.0 mm² shielded cable from Coficab (Not validated yet)	Coficab No.: H3XXCBX240Hxx
L	Data sheet 2x 4.0 mm² shielded cable from NBKBE	NBKBE No.: FHLR2G2GCB2G
M	Data sheet 2x 4.0 mm² shielded cable from Coficab	Coficab No.: FHLR2G2GCB2G

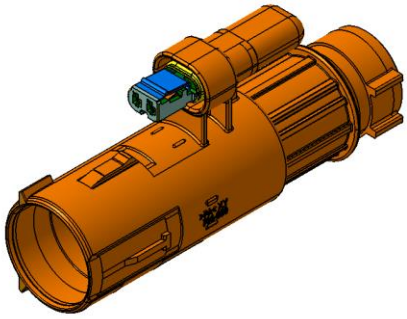
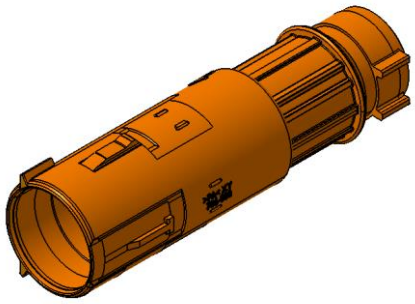
2 Product structure (single components)

2.1 Sheated cable (see table)

Wire manufacturer	Wire cross section		
	2.5 mm²	**4.0 mm²**	**6.0 mm²**
Kroschu	FHLR2G2GCB2G 600/1000V T180		
	64996918	64997293	64995979 64997213
Leoni	FHLR2G2GCB2G 600/900V T180		
	00001	00002	00003
Coficab	FHLR91X91XCB91X T3 (not validated yet) Supplier production site: t.b.d.		
	-	H3XXCBX240Hxx	-
	FHLR2G2GCB2G 600/1000 T180 Supplier production: Portugal/ Romania		
	-	FHLR2G2GCB2G	-
NBKBE	FHLR2G2GCB2G 600/1000 Supplier production: China		
	-	FHLR2G2GCB2G	-
Coroplast	FHLR2G2GCB2G 600/1000V T180		
	9-2641 (2x 2.5 mm²)	9-2641 (2x 4.0 mm²)	9-2641 (2x 6.0 mm²)

Only wires which are listed here and released by the respective OEM are allowed to use.

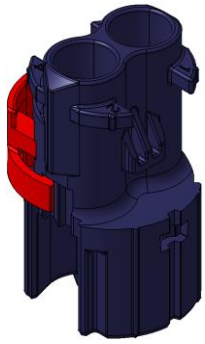
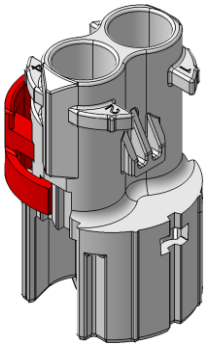
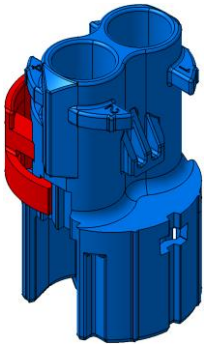
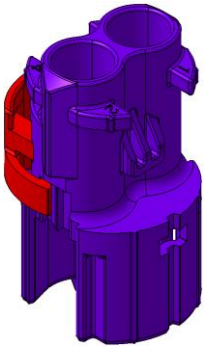
2.2 HPS40-2 In-Line male housing

	
with SealStar HVIL-bridge	without HVIL

Hirschmann Automotive No.	Wire cross section	Product description
706-880-502	2.5 mm² 4.0 mm² 6.0 mm²	Male housing
810-000-501		TB Male Housing unit with HVIL

Delivery condition: The Male Housing are delivered as bulk good.

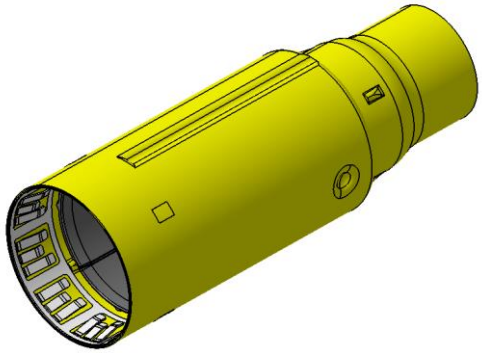
2.3 HPS40-2 In-Line contact carrier

			
Cod. A	Cod. B	Cod. C	Cod. D

Hirschmann Automotive No.	Coding	Colour	HVIL Bridge	Wire cross section
809-365-511	A	Black	No	2.5 mm² 4.0 mm² 6.0 mm²
809-365-512	B	Natural/ White	No	
809-365-513	C	Blue	No	
809-365-514	D	Purple	No	

Delivery condition: The contact carriers are delivered as bulk good.

2.4 HPS40-2 In-Line shielding sleeve

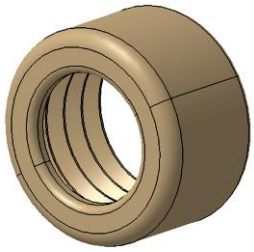
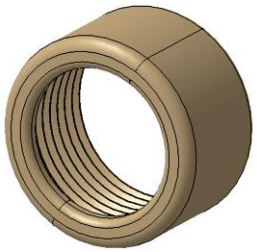
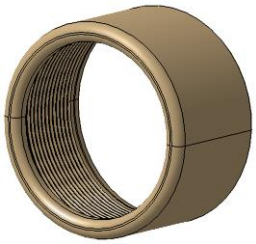
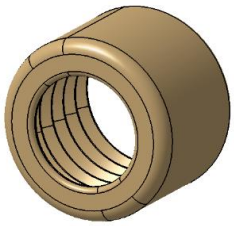
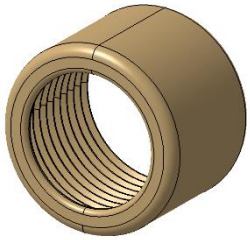


-501

Hirschmann Automotive No.	Wire cross section
810-001-501	2.5 mm² 4.0 mm² 6.0 mm²

Delivery condition: The shield sleeves are delivered as bulk good.

2.5 HPS40-2 2+2 stress relief

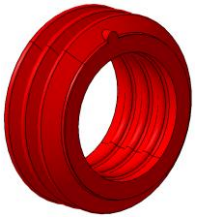
		
-501 (2.5 mm²)	-502 (4.0 mm²)	-503 (6.0 mm²)
		
-511 (2.5 mm² extended)	-512 (4.0 mm² extended)	-513 (6.0 mm² extended)

Hirschmann Automotive No.	Wire cross section
709-841-501	2.5 mm²
709-841-502	4.0 mm²
709-841-503	6.0 mm²
709-841-511	2.5 mm²
709-841-512	4.0 mm²
709-841-513	6.0 mm²

Wire manufacturer: On the product drawing (HA No. 809-999-…01), you can find the released cables for each stress relief.

Delivery condition: The stress reliefs are delivered as bulk good.

2.6 HPS40-2 2+2 wire seal

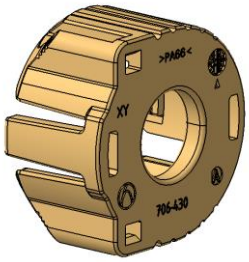
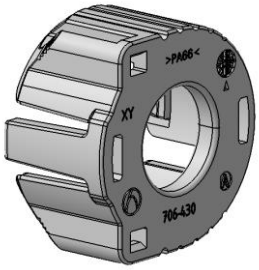
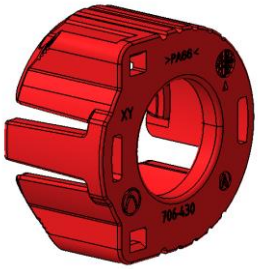
		
-504 (2.5 mm²)	-505 (4.0 mm²)	-506 (6.0 mm²)

Hirschmann Automotive No.	Colour	Wire cross section
709-113-504 (Rev. B)	Beige	2.5 mm²
709-113-505 (Rev. B)	Gey	4.0 mm²
709-113-506	Red	6.0 mm²

Wire manufacturer: On the product drawing (HA No. 809-999-…01), you can find the released cables for each seal.

Delivery condition: The seals are delivered as bulk good.

2.7 HPS40-2 2+2 cover cap

		
-501 (2.5 mm²)	-502 (4.0 mm²)	-503 (6.0 mm²)

Hirschmann Automotive No.	Colour	Wire cross section
706-430-501	Beige	2.5 mm²
706-430-502	Grey	4.0 mm²
706-430-503	Red	6.0 mm²

Wire manufacturer: On the product drawing (HA No. 809-999-…01), you can find the released cables for each cover cap.

Delivery condition: The cover caps are delivered as bulk good.

2.8 HCT4 male terminal

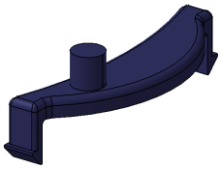
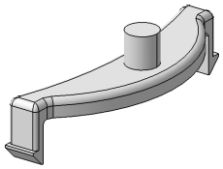
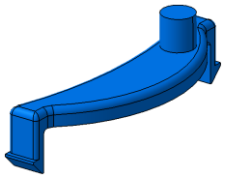
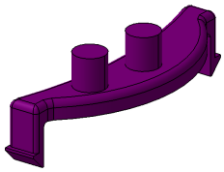
		
-504	-505	-506

Hirschmann Automotive No.	Wire cross section
709-633-504	1.5 – 2.5 mm²
709-633-505	4.0 mm²
709-633-506	6.0 mm²

Delivery condition: The male terminals are delivered reeled on a spool.

3 Product structure (optional parts)

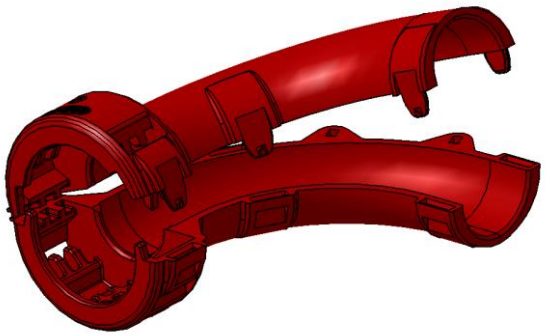
3.1 HPS40-2 2+2 coding clip

			
Cod. A	Cod. B	Cod. C	Cod. D

Hirschmann Automotive No.	Coding	Colour	Wire cross section
706-505-501	A	Black	2.5 mm² 4.0 mm² 6.0 mm²
706-505-502	B	Natural / white	
706-505-503	C	Blue	
706-505-504	D	Purple	

Delivery condition: The coding clips are delivered as bulk good.

3.2 HPS40-2 2+2 90° angle cap



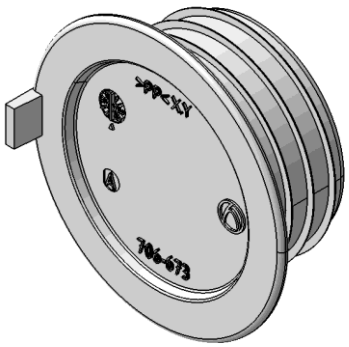
-503

Hirschmann Automotive No.	Wire cross section
706-506-503	2.5 mm² 4.0 mm² 6.0 mm²

Information: The 90° angled cap can be used as an optional part instead of the cover cap.

Delivery condition: The 90° angled caps are delivered as bulk good.

3.3 HPS40-2 2+2 protection cap



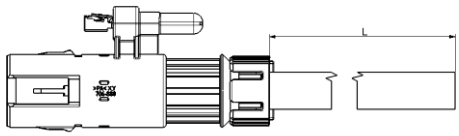
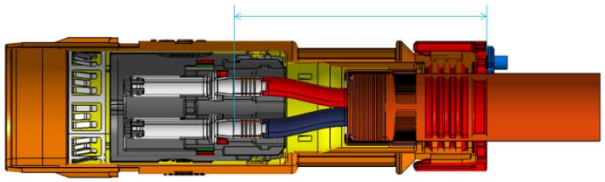
Hirschmann Automotive No.	706-673-501

Delivery condition: The transport protection caps are delivered as bulk goods.

4 Processing steps (without rotative orientation)

Use the following described processing steps for the wire cross sections 2.5 mm²/ 4.0 mm² and 6.0 mm². As a reference sample, a terminal holder coding A and a 6.0 mm² wire were used.

4.1 Cut the shielded cable

	+ wire add-on
	

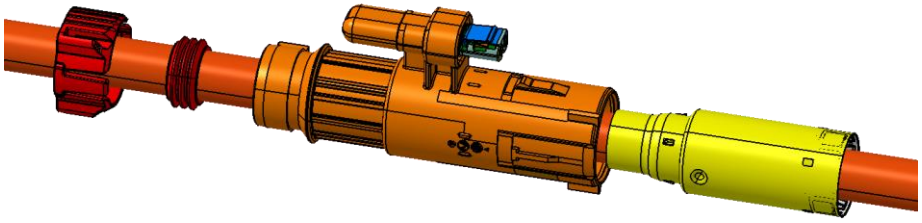
Add the following lengths for the HPS40-2 In-Line Connector:

Wire cross section	Dimensions L after zero-cut (mm)	Dimension L for the HCT4 terminal incl. zero-cut (mm)	Dimension L after zero-cut with 90° angled cap (mm)	Dimension L for the HCT4 terminal incl. zero-cut +90° angled cap (mm)
2.5 mm²	L + 48	L + 52	L + 110	L + 114
4.0 mm²	L + 48	L + 52	L + 110	L + 114
6.0 mm²	L + 48	L + 52	L + 110	L + 114

These dimensions must be added to the planned length at the cutting process of the wire for each connector.

4.2 Assembly of the single components

Slide the cover cap (1), the seal (2), the male housing (3) and the shielding sleeve (4) onto the shielded cable. If the 90° angled cap is used, the cover cap (1) is omitted.

1	2	3	4
			

4.3 Strip off the shielded cable

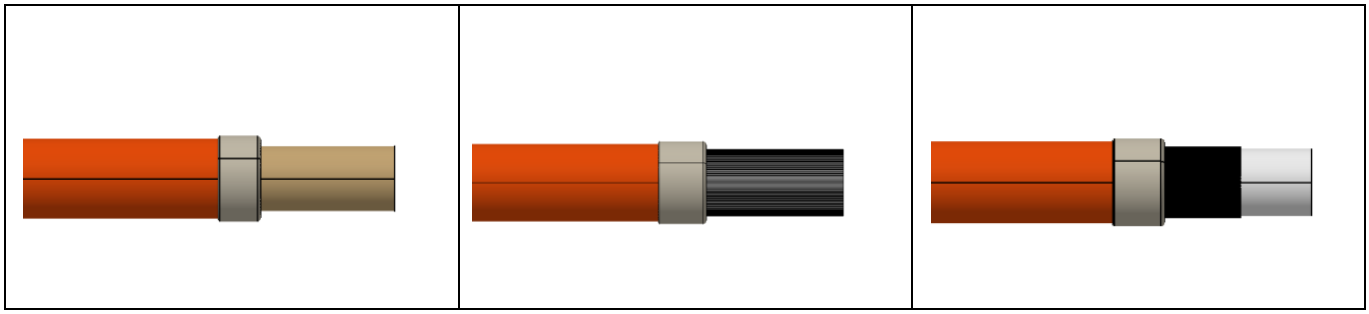
Stripping length:

Wire cross section	Dimension L1 after zero-cut (mm)	Dimension L1 for the HCT4 terminal incl. zero-gut (mm)
2.5 mm²	22.5 ± 1	26.5 ± 1
4.0 mm²	22.5 ± 1	26.5 ± 1
6.0 mm²	22.5 ± 1	26.5 ± 1

Do not damage the shielding during the processing operation.

4.4 Wire processing I

Assemble the stress relief, remove the foil and shorten the shielding

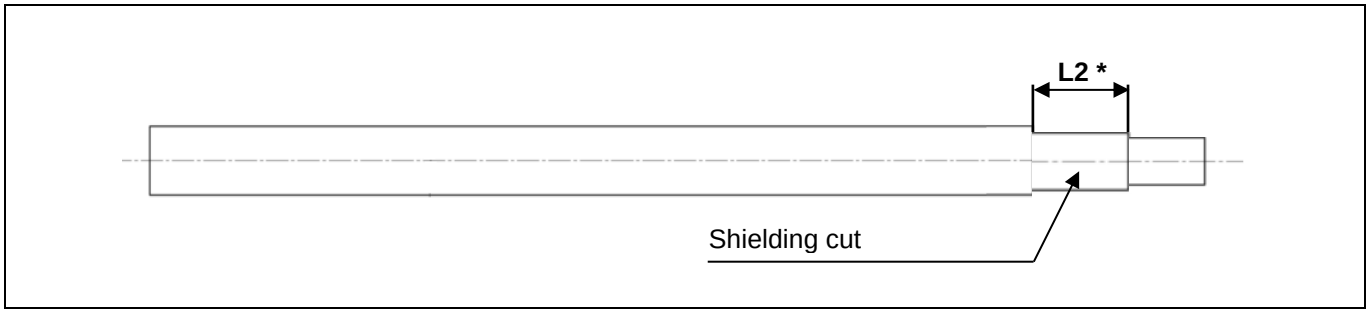


The following process steps must be done, but the manufacturer can choose the sequence:

- Assemble the stress relief
  Depending on the cross section 709-841-501 or 502 or 503 must be used
- Remove the foil
- Shorten the shielding

An overlap of the foil, around the stress relief, like small edges up to max. 4mm are allowed.

Dimension of the shielding:



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

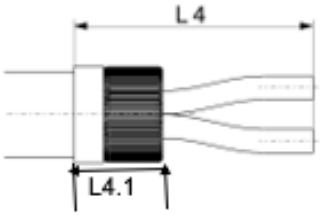
After cutting the shielding, there are no wire residues or parts of the shielding allowed on the cable. This must be ensured with some actions like the following:

- 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.

In the next process step, make sure that the shielding is rising over the stress relief at 100%

4.5 Wire processing II

Reverse the shield backwards, hold the shield with tape and remove the filling

		
	Max. L3 = 3 mm	

100% of the shield must be turned over the stress relief. A targeted unbraiding of the shield is not necessary. By turning over the shield, a process related unbraiding is possible. After this the shield must 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 **5.0 mm**. The fixing tape must 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 shown with the dimension L4.

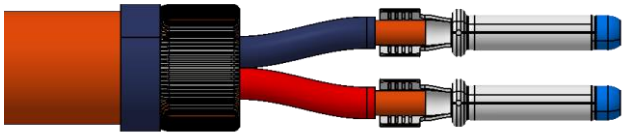
L4 = max. 35.5 after zero-cut
= max. 39.5 incl. zero-cut

L4.1 = max. 16.7

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 14.30 mm 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. 3.0 mm towards the outer sheath. In the area between the two single cores, the filling material can be longer than L3. Single strands of the shield, which are not fixed with tape and stick out, must be removed before further process steps. Do not damage the single wires during the complete processing operation.

4.6 Crimp the HCT4 male terminal



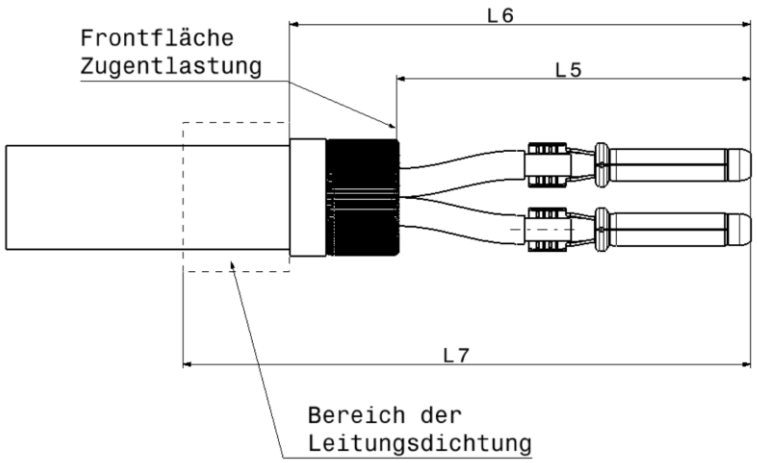
It is up to the manufacturer to decide which device/ machine is to be used. The crimping and positioning data described on the following pages must be observed during the crimping process.

The order of a crimping device is the responsibility of the assembler. The test facility used by Hirschmann Automotive is described in chapter 8.

- **Process data**

a) The crimp data can be seen in the „Process specification HCT4 male terminal EVS-100068“.
b) The HCT4 male 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 drawing need to be adhered to.

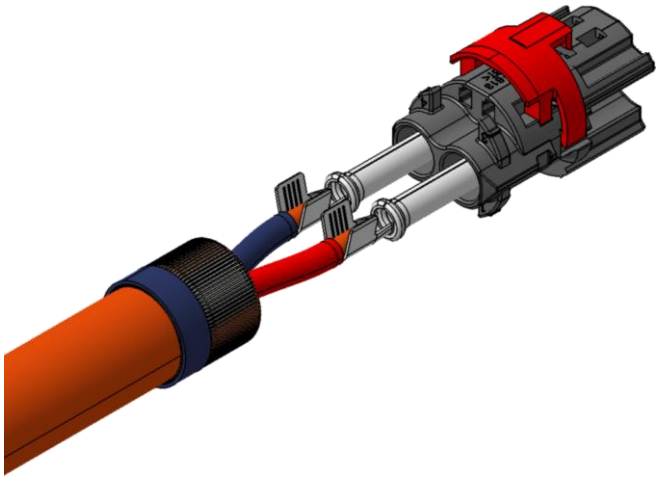


L5 = 43.75 ±1
L6 = max. 58.35
L7 = max. 71.00

The dimension L5 and L6 are for information only. The dimensions are given through the dimensions L1, L4 and the EVS-100068.

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. On 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.

4.7 Assembly I

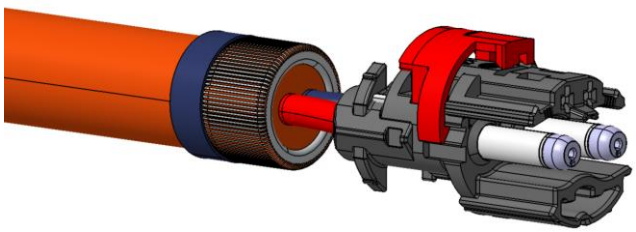
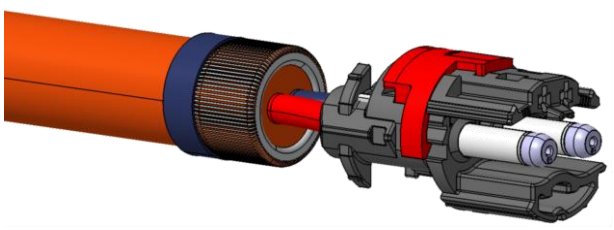
Assemble male terminals into the contact holder (1).		
	**Pin**	**Polarity/ Colour**
	1	+ / Red
	2	- / Can vary

While assembling the HCT4 male terminals, the terminal will audibly engage once the end position is reached. The male terminals must be crimped.

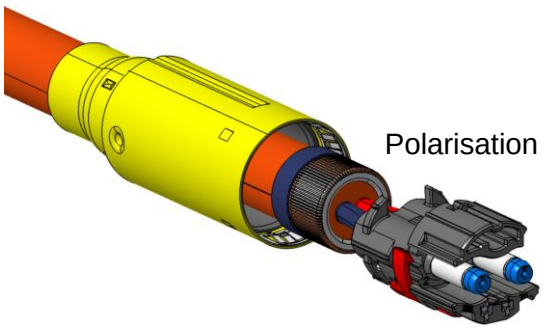
4.8 Assembly II

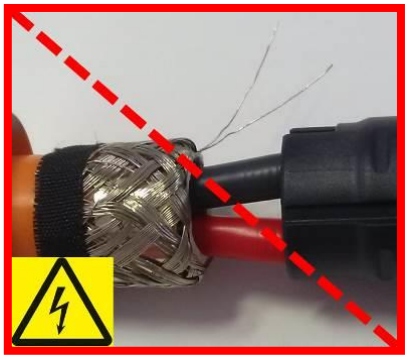
Assemble secondary locking (2)

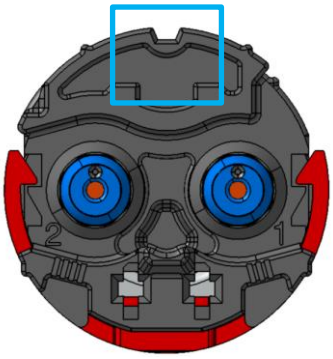
The secondary locking can only be assembled if the terminals are in the end position. A visible difference of the terminals to each other can be possible in the contact cavity. Because of the position of the contacts on the wire, and the play of the contacts in the contact cavity it is possible and acceptable.

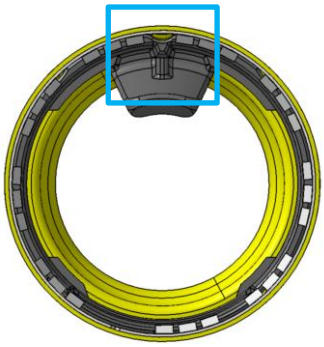
Secondary lock pre-locking HV terminals primary locked	Secondary lock end position
	

4.9 Push shielding sleeve onto contact carrier

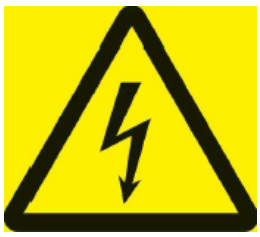






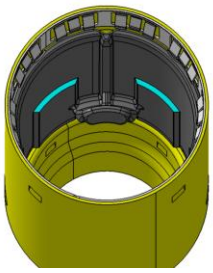
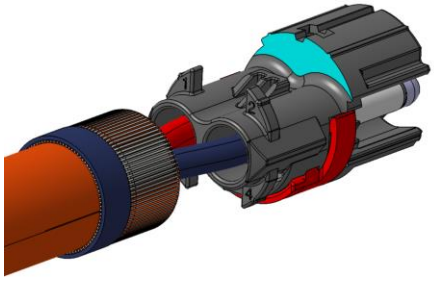
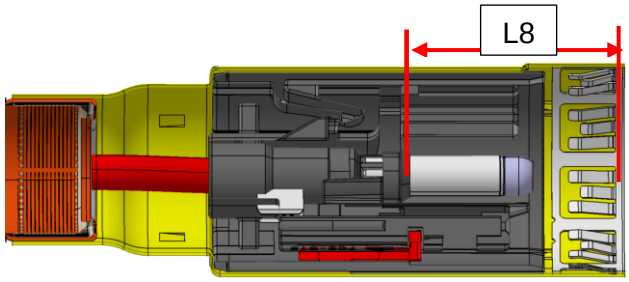


- The shielding sleeve needs to be assembled onto the contact holder in the correct position.
- Do not damage the shielding sleeve during the assembly.
- The shielding sleeve must be assembled until the end position is reached.
- The fixing tape must completely stick out of the shield sleeve after assembling.
- 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 must be clarified with each OEM.



Risk of insulation failure!

4.10 Assembly III

The contact holder incl. wires need to be pressed into end position (L8) of the TB Insert part.	
End stop area TB insert part	End stop area contact holder
	
	
$L8 = 22.25\ ^{+0.25}_{-0.35}$	

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

The order of a device is the responsibility of the assembler. The test facility used by Hirschmann Automotive is described in chapter 8.

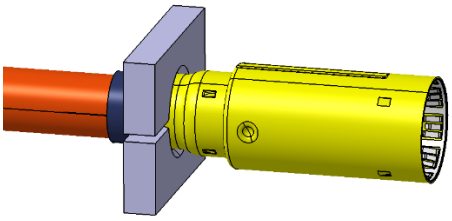
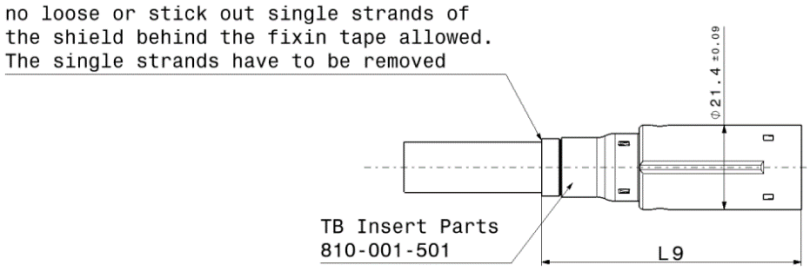
4.11 Pressing shield sleeve

The manufacturer is free to choose 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 pressing device is the responsibility of the assembler. The test facility used by Hirschmann Automotive is described in chapter 8.

- **Pressing data**

a) The contact holder incl. the male contacts must be put into the device in the correct position.
b) Make sure, the shielding sleeve is on the end position of the contact holder. The tape must stick out at the end of the shielding sleeve.
c) The circularity of the shielding sleeve in the contact area must be ensured.
d) The measurements on the following drawing, must be adhered to, before and after pressing.
e) Two pressing actions will be done in one step

	Shield pressing (shielding sleeve, shielding, stress relief and wire)
	L9 = max. 67.7

The dimension L9 is for information only. The dimensions are given through the dimensions L1, L4 and L8 and the EVS-100113.

Do not damage the following parts during the pressing process:

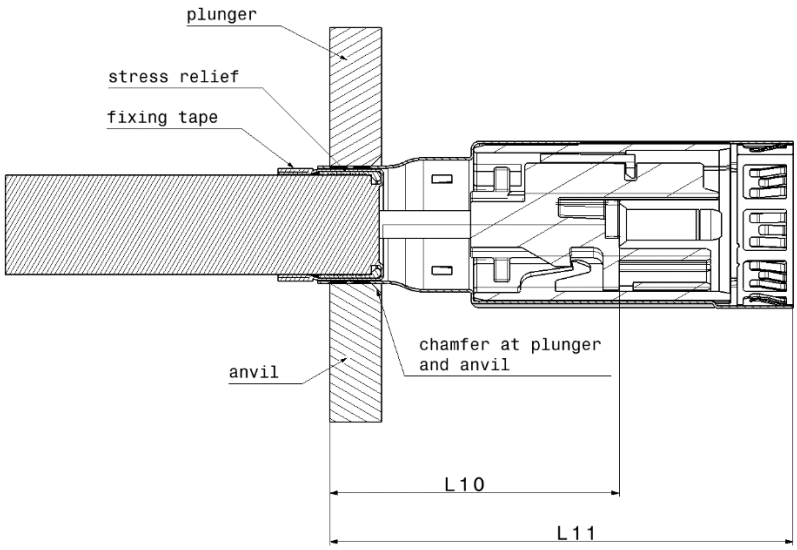
- Insulation of the wire
- Insulation of the single wires
- Stress relief
- Shield sleeve
- Shield strands of the wire

4.11.1 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 must be revered to the front plane of the contact holder. The chamber at the plunger and the anvil must be on the side to the contact holder.

The dimension L10 and L11 is for the position of the plunger and the anvil.



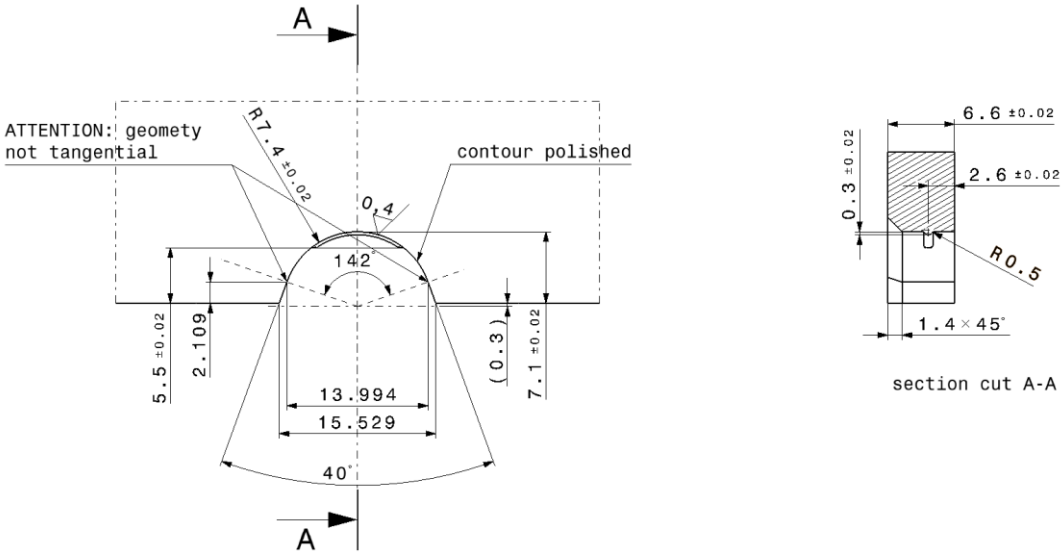
L10 = 37.15 ± 0.1
L11 = 59.45 ± 0.1

If the position point is on the base area of the contact holder, the relevant dimension for the anvil and plunger is L10. If the front area of the shielding sleeve is the position point then L11 needs to be used.

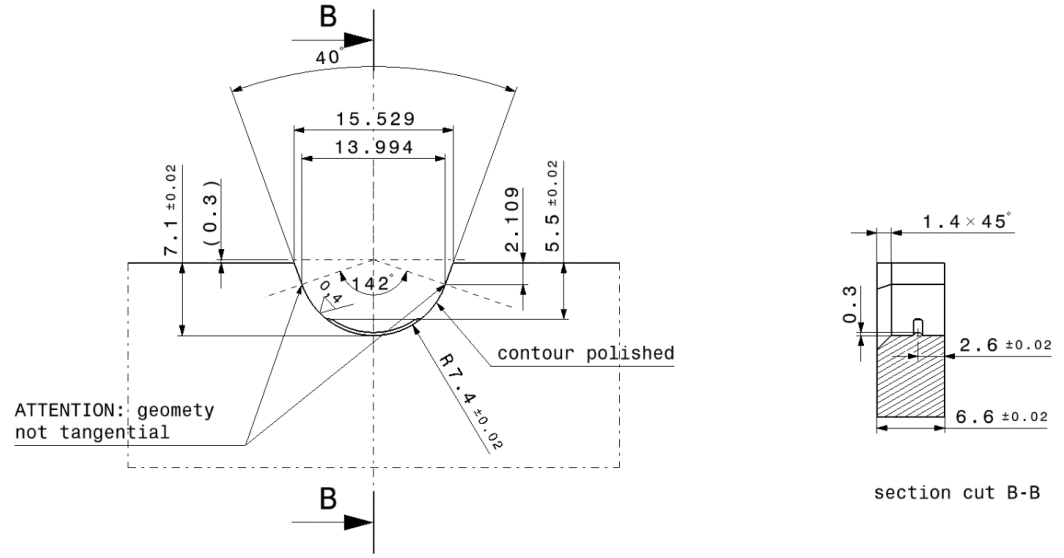
- **Plunger and anvil geometry of the wire shield pressing**

Version A

Plunger geometry of the wire shield pressing
Material: 1.2721 vaccum hardened 58hrc



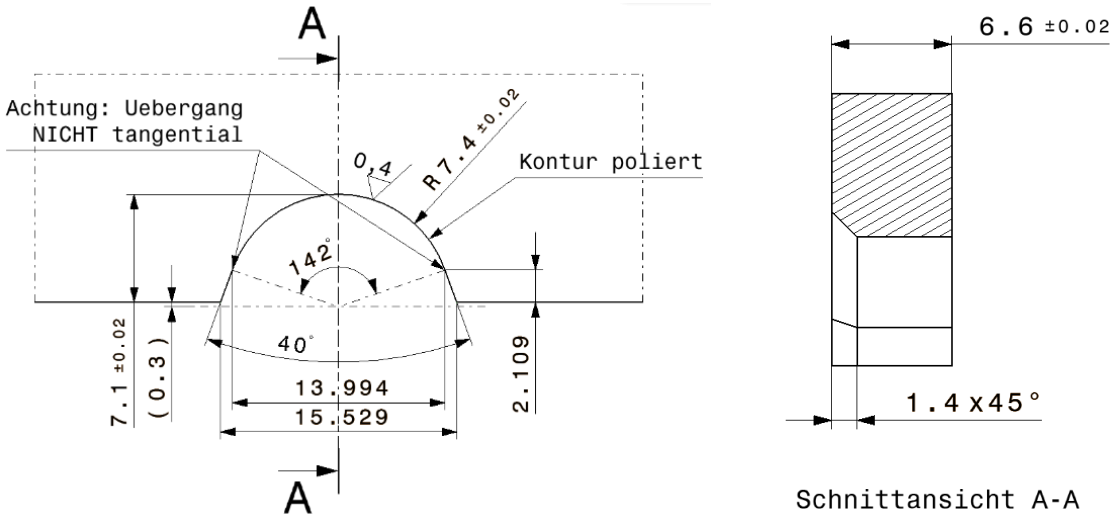
Anvil geometry of the wire shield pressing
Material: 1.2721 vaccum hardened 58hrc



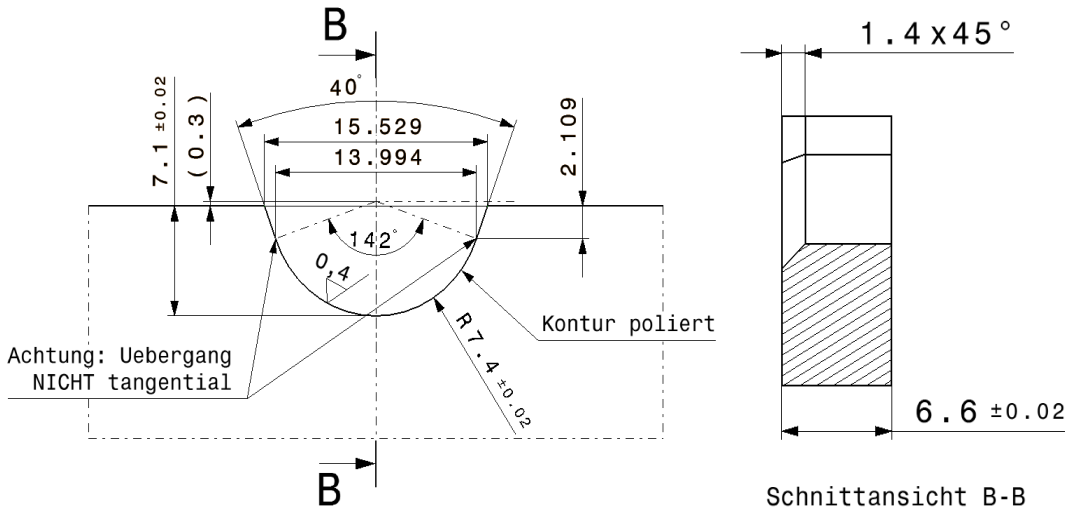
- **Plunger and anvil geometry of the wire shield pressing**

Version B !! Not valid for new design or new applications !!

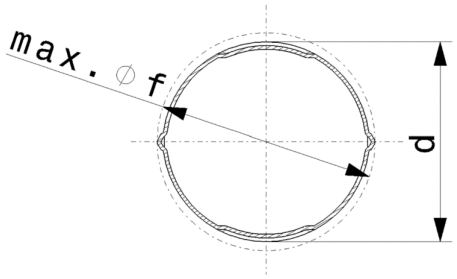
Plunger geometry of the wire shield pressing
Material: 1.2721 vaccum hardened 58hrc



Anvil geometry of the wire shield pressing
Material: 1.2721 vaccum hardened 58hrc



- **Embossing height – wire shield pressing**

	The plunger and anvil are pressed together until block. Due to this, the dimension “d” will be given. Therefore, see table of each cross section.

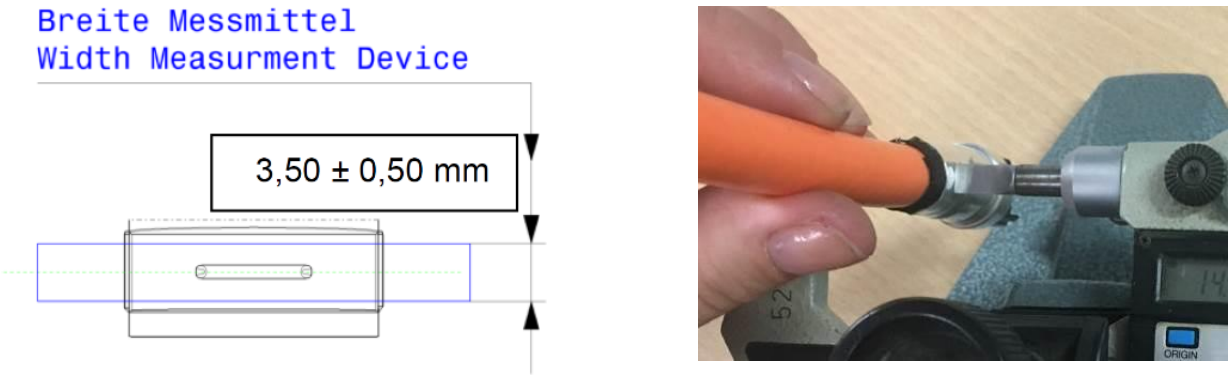
During the pressing process a fold appears on two sides. This fold is not allowed to be bigger than the diameter **Ø f = 16.4 mm** referring to the centerline of the wire. The diameter **“d”** must not be measured inside the embossing position but must be measured across the diameter. In the area of the fold the material of the shield sleeve must not be cracked.

Wire manufacturer	**Dimension “d” in mm**		
	2.5 mm²	**4.0 mm²**	**6.0 mm²**
Kroschu T180 (FHLR2GCB2G)	14.57 ± 0.15	14.57 ± 0.15	14.57 ± 0.15
Leoni			
Coroplast			
Coficab FHLR91X91XCB91X T3 (not validated yet)	-		-

- **Check measurement of pressing height shield crimp**

To check the dimension **“f”**, a gauge with an inner diameter of **16.4 mm** must be used. To check the dimension **“d”**, the height needs to be measured acc. to the drawing. To check the dimension “**f”** the height needs to be measured acc. to the drawing. The diameter **“d”** must not be measured inside the embossing position but must be measured across the diameter. All the dimensions must be within the given tolerance. All the dimensions must be within the given tolerance.

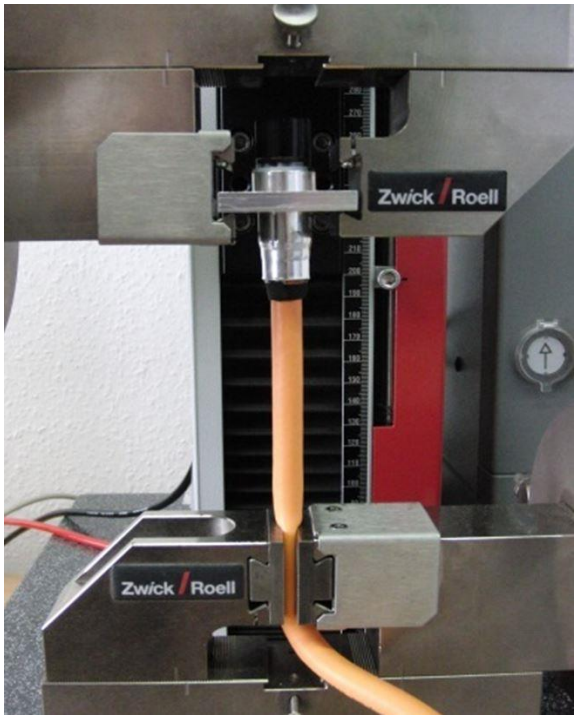
The measuring of the embossing height must be done with a suitable measuring device (Micrometer, measuring range: 0-25 mm). The measuring equipment for the measurement must have a width of 3.50 ± 0.50 mm. The measurement must be taken symmetrically to the embossing position.

Reverence picture from the process specifications HPS40-2


- **Pulling force of the wire**

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 70 mm. The connector must be fixed on the shield sleeve at the transition between the largest and the second largest diameter.

HCT4 terminals must not be installed in the test specimens, to test the shield pressing only. In this state, the figure in the table must be reached.

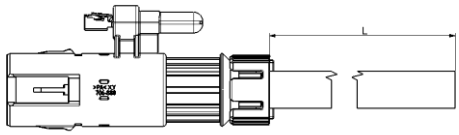
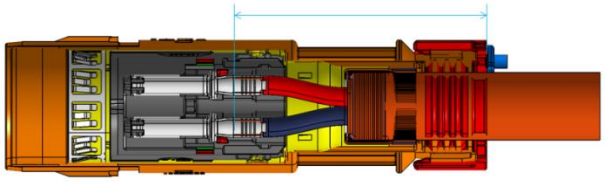


Wire cross section	Pulling force L2
2.5 mm²	≥ 120 N
4.0 mm²	≥ 120 N
6.0 mm²	≥ 120 N

5 Processing steps (rotative orientation)

Use the following described processing steps for the wire cross sections 2.5 mm²/ 4.0 mm² and 6.0 mm² where the orientation of the connector can be made. Please consider that this is only allowed in combination with the extended strain relief. As a reference sample, a terminal holder coding A and a 6.0 mm² wire was used.

5.1 Cut the shielded cable

	+ wire add-on
	

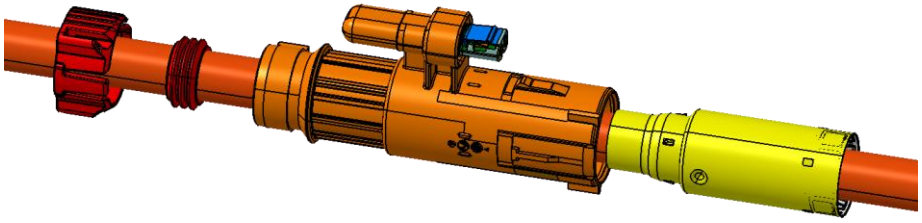
Add the following lengths for the HPS40-2 In-Line connector:

Wire cross section	Dimension L After zero-cut (mm)	Dimension L for the HCT4 terminal incl. zero-cut (mm)	Dimension L after zero-cut with 90° angled-cap (mm)	Dimension L for the HCT4 terminal incl. zero-cut +90° angled cap (mm)
6.0 mm²	L + 48	L + 52	L + 110	L + 114
4.0 mm²	L + 48	L + 52	L + 110	L + 114
2.5 mm²	L + 48	L + 52	L + 110	L + 114

These dimensions must be added to the planned length at the cutting process of the wire for each connector.

5.2 Assembly of the single components

Slide the cover cap (1), the seal (2), the male housing (3) and the shielding sleeve (4) onto the shielded cable. If the 90° angled cap is used, the cover cap (1) is omitted.

1	2	3	4
			

5.3 Strip off the shielded cable

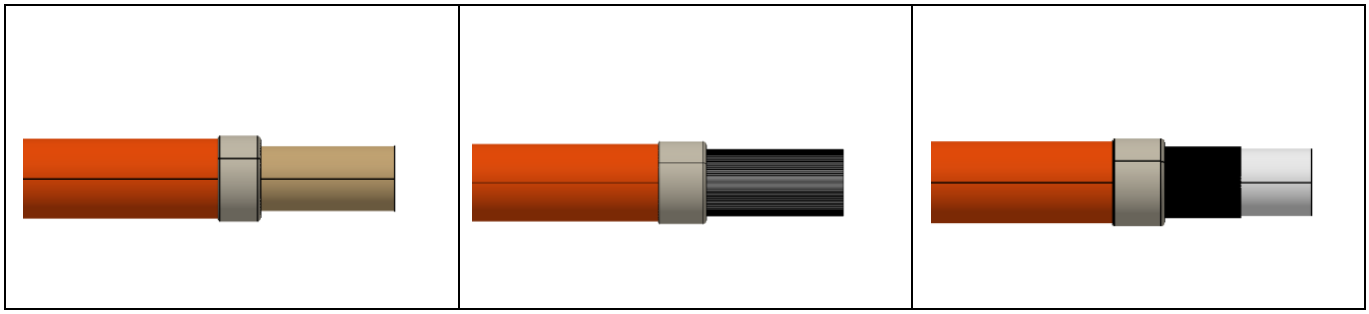
Stripping length:

Wire cross section	Dimension L1 after zero-cut (mm)	Dimension L1 for the HCT4 terminal incl. zero-gut (mm)
6.0 mm²	20.5 ± 1	24.5 ± 1
4.0 mm²	20.5 ± 1	24.5 ± 1
2.5 mm²	20.5 ± 1	24.5 ± 1

Do not damage the shielding during the processing operation.

5.4 Wire processing I

Assemble the stress relief, remove the foil and shorten the shielding

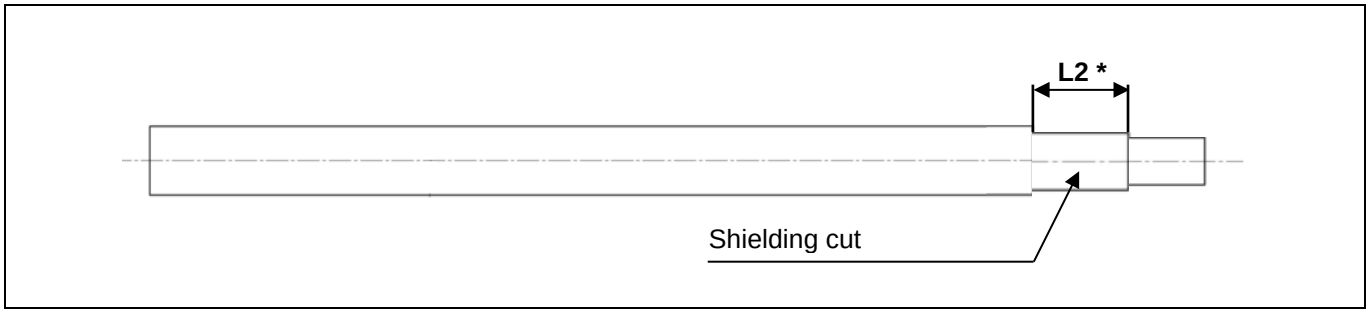


The following process steps must be done, but the manufacturer can choose the sequence:

- Assemble the stress relief
  Depending on the cross section 709-841-511 or 512 or 513 must be used
- Remove the foil
- Shorten the shielding

An overlap of the foil, around the stress relief, like small edges up to max. 4mm are allowed.

Dimension of the shielding:



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

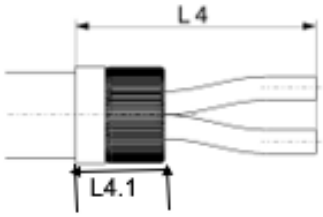
After cutting the shielding, there are no wire residues or parts of the shielding allowed on the cable. This must be ensured with some actions like the following:

- 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.

In the next process step, make sure that the shielding is rising over the stress relief at 100%

5.5 Wire processing II

Reverse the shield backwards, hold the shield with tape and remove the filling

		
	Max. L3 = 3 mm	

100% of the shield must be turned over the stress relief. A targeted unbraiding of the shield is not necessary. By turning over the shield, a process related unbraiding is possible. After this the shield must 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 **5.0 mm**. The fixing tape must 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 shown with the dimension L4.

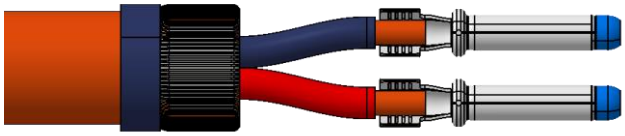
L4 = max. 35.5 after zero-cut
= max. 39.5 incl. zero-cut

L4.1 = max. 16.7

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 14.30 mm 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. 3.0 mm towards the outer sheath. In the area between the two single cores, the filling material can be longer than L3. Single strands of the shield, which are not fixed with tape and stick out, must be removed before further process steps. Do not damage the single wires during the complete processing operation.

5.6 Crimp the HCT4 male terminal



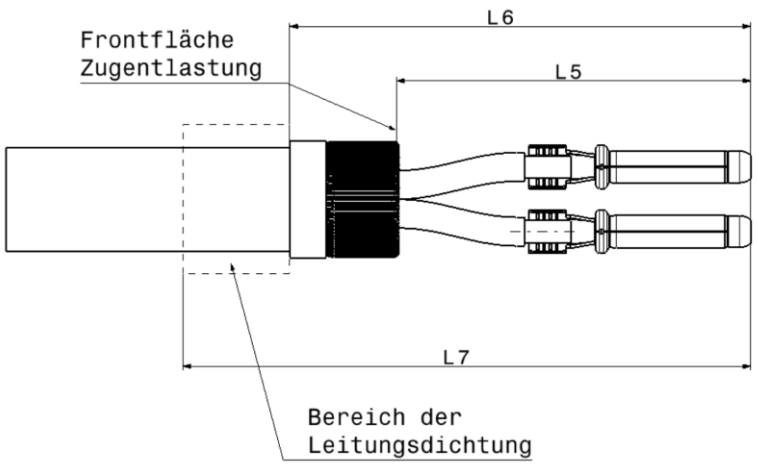
It is up to the manufacturer to decide which device/ machine is to be used. The crimping and positioning data described on the following pages must be observed during the crimping process.

The order of a crimping device is the responsibility of the assembler. The test facility used by Hirschmann Automotive is described in chapter 8.

Process data

c) The crimp data can be seen in the „Process specification HCT4 male terminal EVS-100068“.
d) The HCT4 male 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 drawing need to be adhered to.

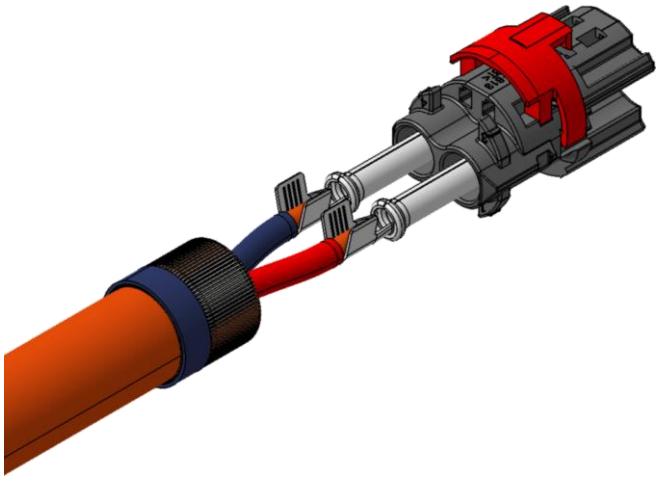


L5 = 41.75 ± 1
L6 = max. 58.35
L7 = max. 71.00

The dimension L5 and L6 are for information only. The dimensions are given through the dimensions L1, L4 and the EVS-100068.

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. On 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.

5.7 Assembly I

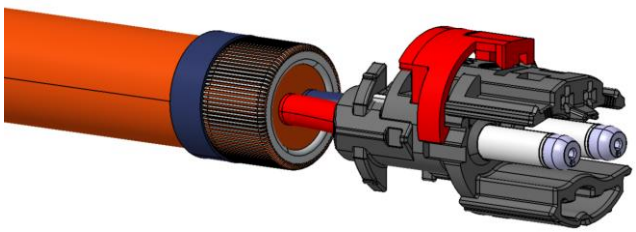
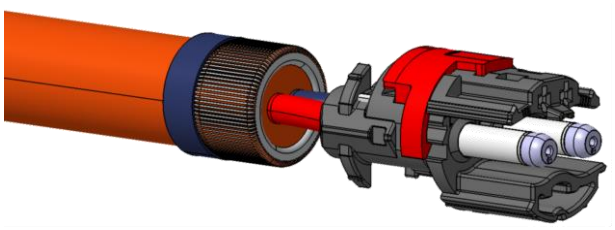
Assemble male terminals into the contact holder (1).		
	**Pin**	**Polarity/ Colour**
	1	+ / Red
	2	- / Can vary

While assembling the HCT4 male terminals, the terminal will audibly engage once the end position is reached. The male terminals must be crimped.

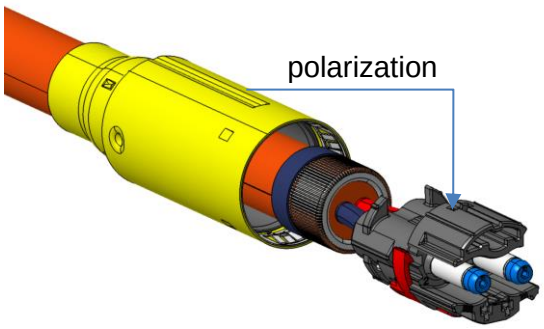
5.8 Assembly II

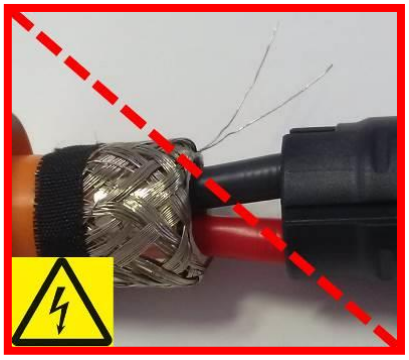
Assemble secondary locking (2)

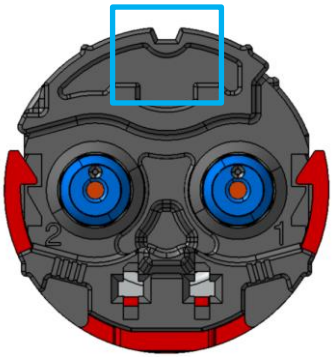
The secondary locking can only be assembled if the terminals are in the end position. A visible difference of the terminals to each other can be possible in the contact cavity. Because of the position of the contacts on the wire, and the play of the contacts in the contact cavity it is possible and acceptable.

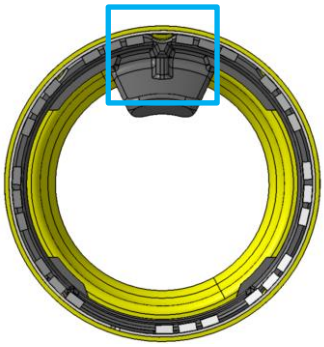
Secondary lock pre-locking HV terminals primary locked	Secondary lock end position
	

5.9 Push shielding sleeve onto contact carrier

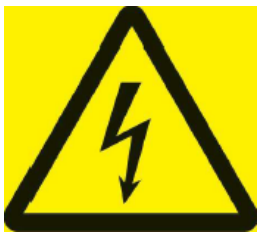






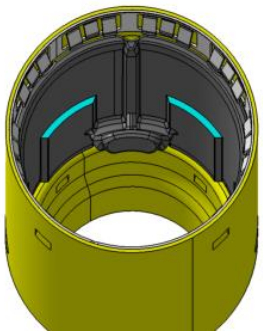
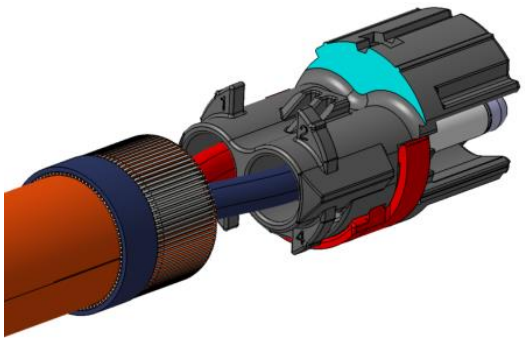
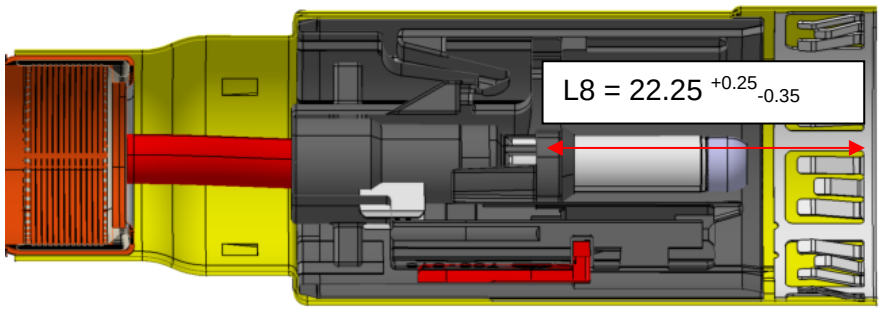


- The shielding sleeve needs to be assembled onto the contact holder in the correct position.
- Do not damage the shielding sleeve during the assembly.
- The shielding sleeve must be assembled until the end position is reached.
- The fixing tape must completely stick out of the shield sleeve after assembling.
- 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 must be clarified with each OEM.



Risk of insulation failure!

5.10 Assembly III

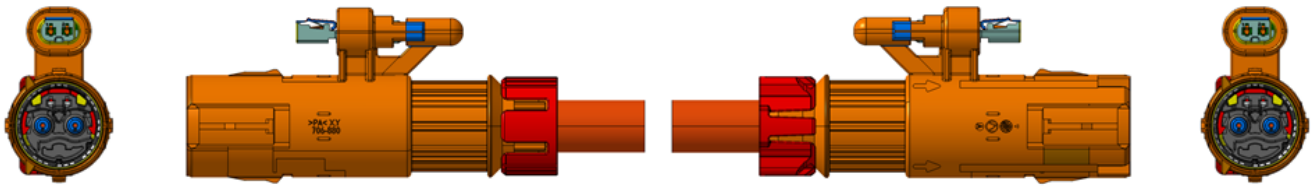
The contact holder incl. wires need to be pressed into end position (L8) of the TB Insert part.	
End stop area TB insert part	End stop area contact holder
	
	

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

It is the responsibility of the assembler to commission a fixture. The test facility used by Hirschmann Automotive is described in chapter 8.

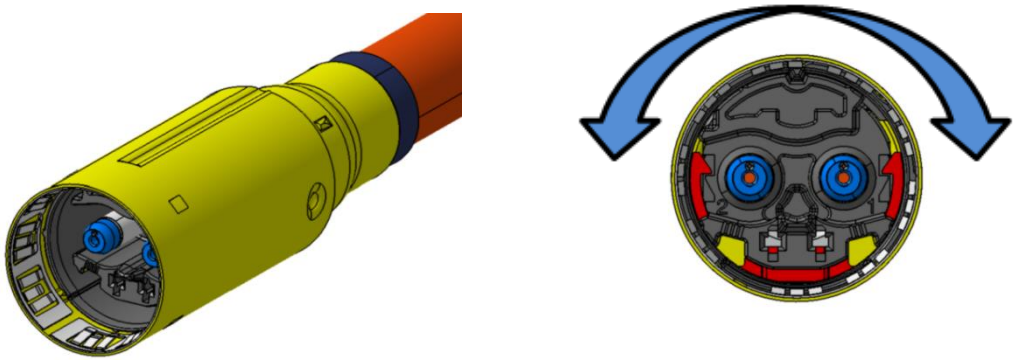
5.11 Rotative orientation

- **Application area**

Rotational alignment is used when there is a connector on both sides of the cable, and they must be aligned with each other.


Before the shield crimping, the alignment of the connector can be corrected by the following options:

- The assembled contact carrier and shield sleeve can be rotated in relation to the wire.
- The wire can be rotated in relation to the contact carrier.



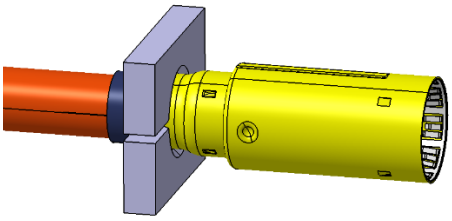
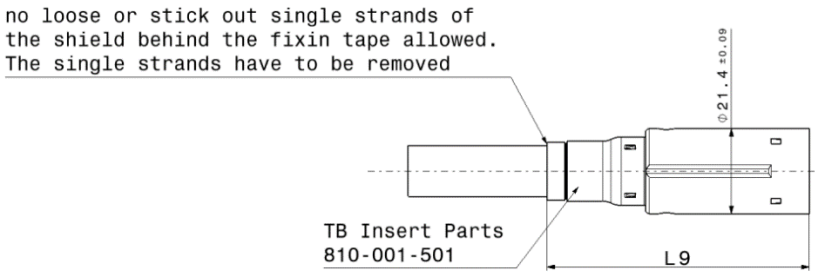
A maximum rotation of up to ± 180° is possible and cannot be exceeded. This twisting results in an overturning of the single wires, which leads to a reduction in length between the contact carrier and the strain relief. The movability must be ensured at least on one side (by the contact carrier or cable) to enable the length reduction.

5.12 Press shielding sleeve

The manufacturer is free to choose 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 pressing device is the responsibility of the assembler. The test facility used by Hirschmann Automotive is described in chapter 8.

- **Pressing data**
  a) The contact holder incl. the male contacts must be put into the device in the correct position.
  b) Make sure, the shielding sleeve is on the end position of the contact holder. The tape has to stick out at the end of the shielding sleeve.
  c) The circularity of the shielding sleeve in the contact area has to be ensured.
  d) The measurements on the following drawing, must be adhered to, before and after pressing.
  e) Two pressing actions will be done in one step.

	Shield pressing (shielding sleeve, shielding, stress relief and wire)
	L9 = max. 67.7

The dimension L9 is for information only. The dimensions are given through the dimensions L1, L4, L8 and the EVS-100113.

Do not damage the following parts during the pressing process:

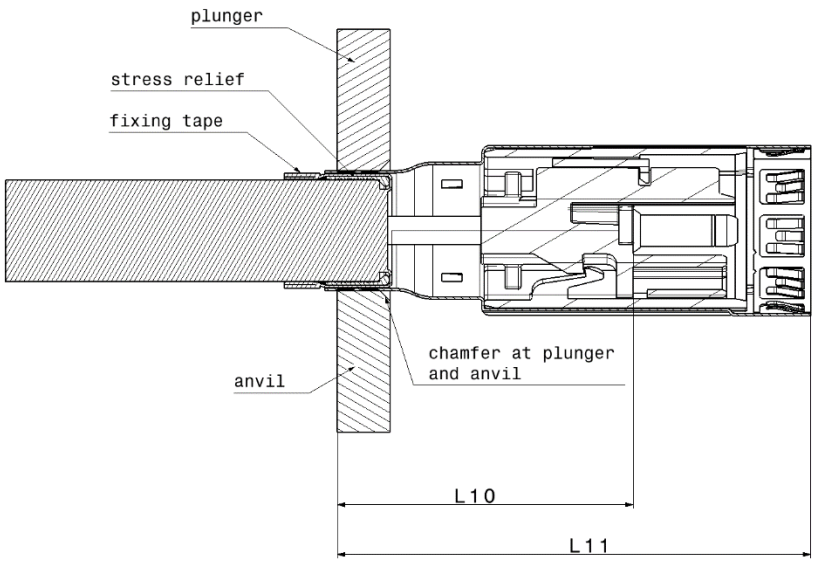
- Insulation of the wire
- Insulation of the single wires
- Stress relief
- Shield sleeve
- Shield strands of the wire

5.12.1 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 must be revered to the front plane of the contact holder. The chamfer at the plunger and the anvil must be on the side to the contact holder.

The dimension L10 and L11 is for the position of the plunger and the anvil.



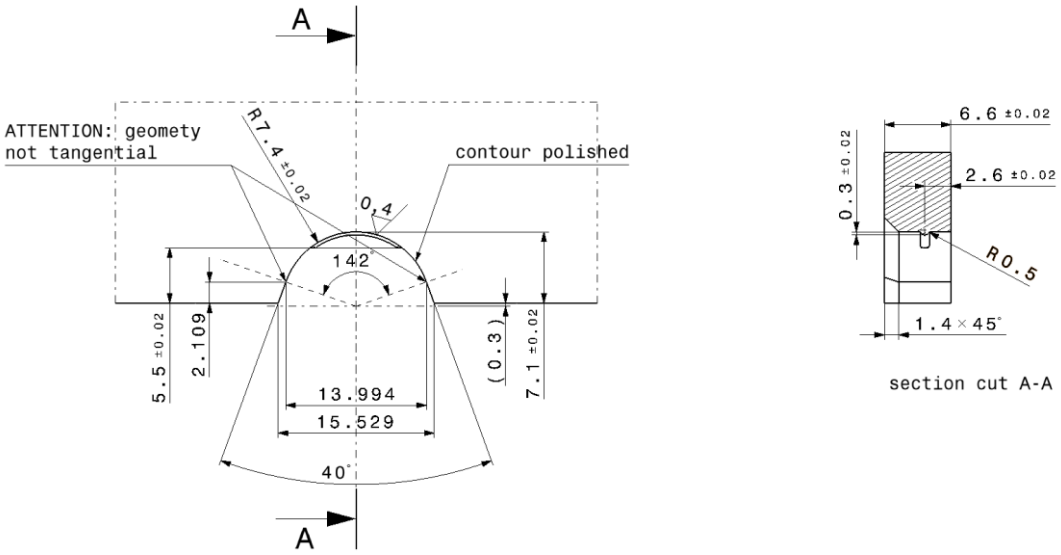
L10 = 34.79 ± 0.1
L11 = 57.09 ± 0.1

If the position point is on the base area of the contact holder, the relevant dimension for the anvil and plunger is L10. If the front area of the shielding sleeve is the position point, then L11 needs to be used.

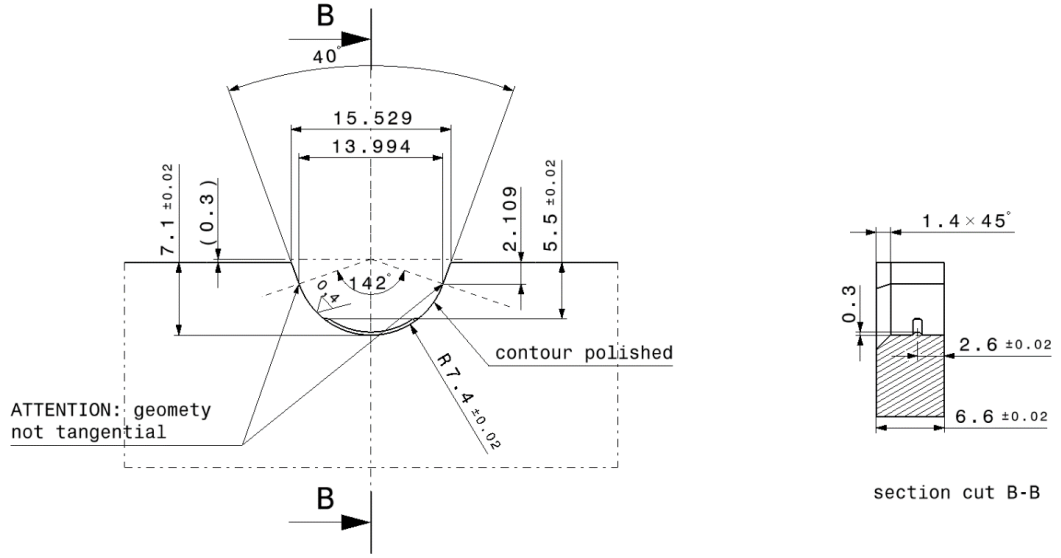
- **Plunger and anvil geometry of the wire shield pressing**

Version A

Plunger geometry of the wire shield pressing
Material: 1.2721 vaccum hardened 58hrc



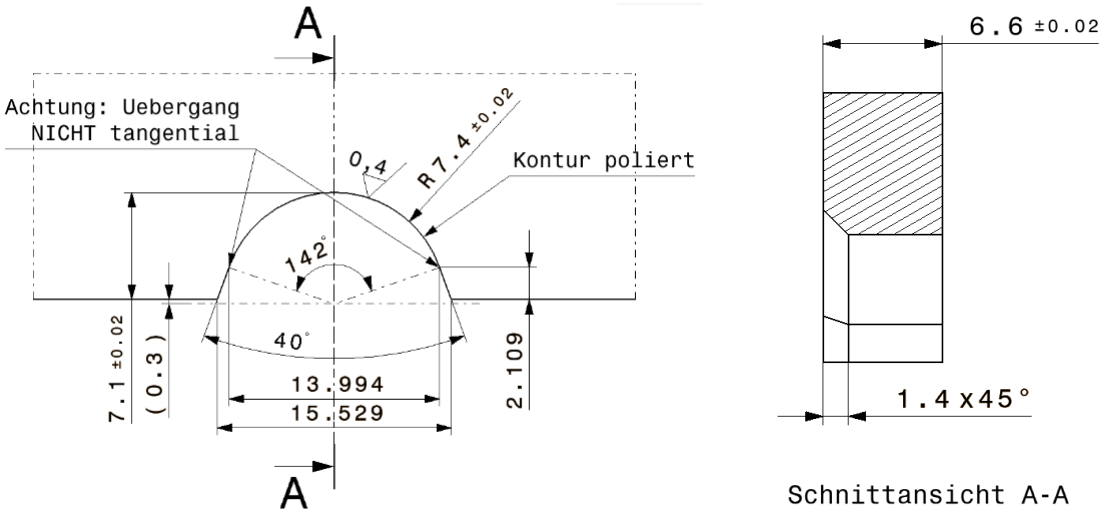
Anvil geometry of the wire shield pressing
Material: 1.2721 vaccum hardened 58hrc



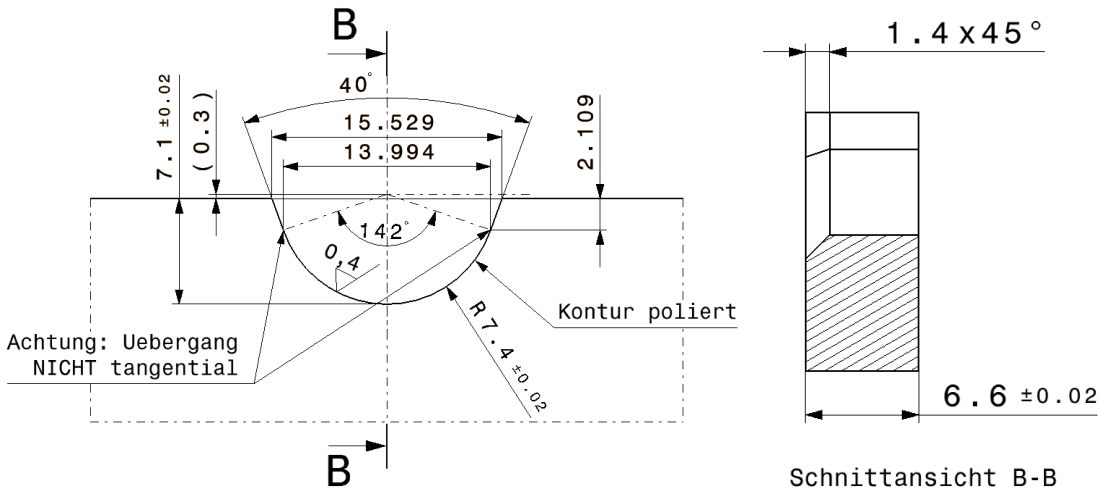
- **Plunger and anvil geometry of the wire shield pressing**

Version B !! Not valid for new design or new applications !!

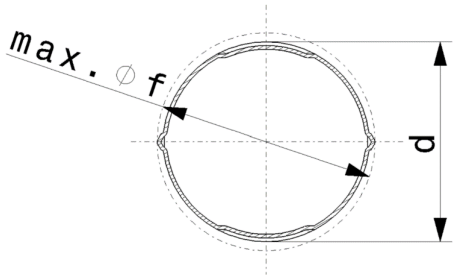
Plunger geometry of the wire shield pressing
Material: 1.2721 vaccum hardened 58hrc



Anvil geometry of the wire shield pressing
Material: 1.2721 vaccum hardened 58hrc



- **Embossing height – wire shield pressing**

	The plunger and anvil are pressed together until block. Due to this, the dimension “d” will be given. Therefore, see table of each cross section.

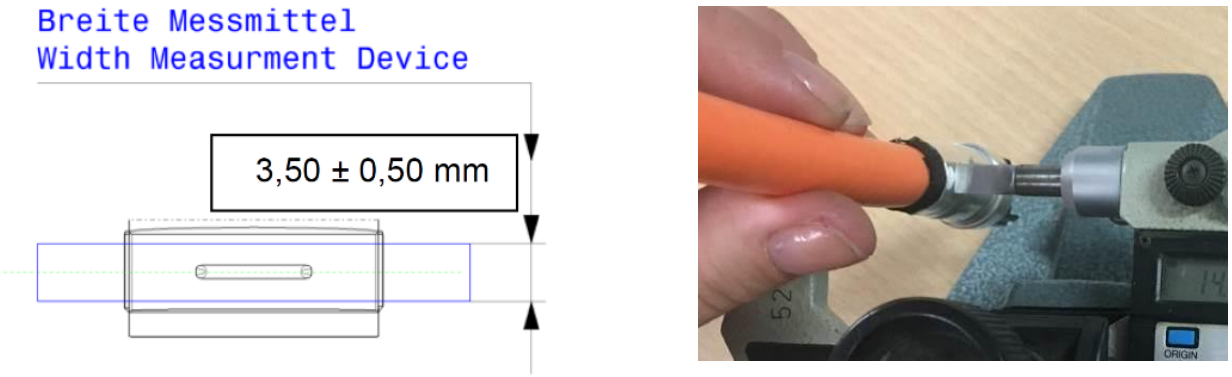
During the pressing process a fold appears on two sides. This fold is not allowed to be bigger than the diameter **Ø f = 16.4 mm** referring to the centerline of the wire. The diameter **“d”** must not be measured inside the embossing position but must be measured across the diameter. In the area of the fold the material of the shield sleeve must not be cracked.

Wire manufacturer	**Dimension “d” in mm**		
	2.5 mm²	**4.0 mm²**	**6.0 mm²**
Kroschu T180 (FHLR2GCB2G)	14.57 ± 0.15	14.57 ± 0.15	14.57 ± 0.15
Leoni			
Coroplast			
Coficab FHLR91X91XCB91X T3 (not validated yet)	-		-

- **Check measurement of pressing height shield crimp**

To check the dimension **“f”**, a gauge with an inner diameter of **16.4 mm** must be used. To check the dimension **“d”**, the height needs to be measured acc. to the drawing. To check the dimension “**f”** the height needs to be measured acc. to the drawing. The diameter **“d”** must not be measured inside the embossing position but must be measured across the diameter. All the dimensions must be within the given tolerance. All the dimensions must be within the given tolerance.

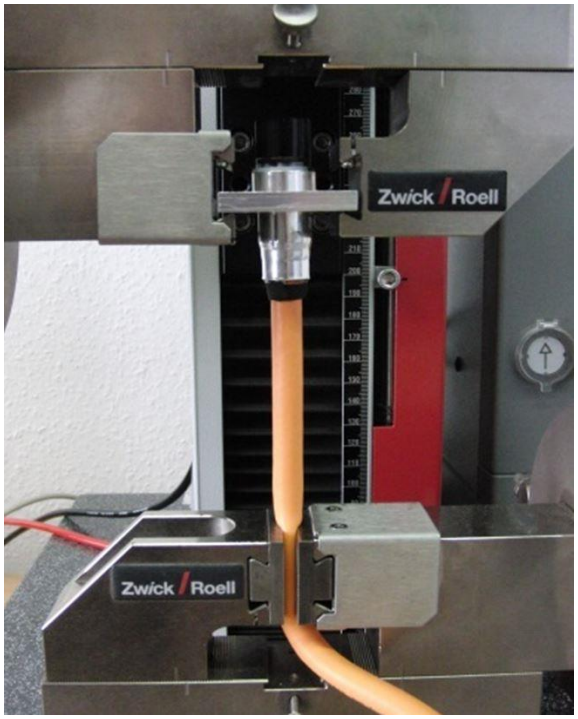
The measuring of the embossing height must be done with a suitable measuring device (Micrometer, measuring range: 0-25 mm). The measuring equipment for the measurement must have a width of 3.50 ± 0.50 mm. The measurement must be taken symmetrically to the embossing position.

Reverence picture from the process specifications HPS40-2


- **Pulling force of the wire**

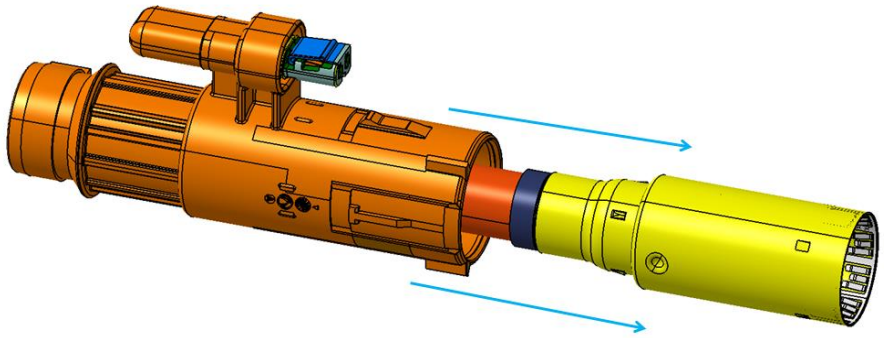
To measure the pull-out force, the wire must be clamped firmly into a clamping device. The distance between the clamping position of the wire and the fixing tape is about 70 mm. The connector must be fixed on the shield sleeve at the transition between the largest and the second largest diameter.

HCT4 terminals must not be installed in the test specimens, to test the shield pressing only. In this state, the figure in the table must be reached. Under this condition.



Wire cross section	Pulling force L2
2.5 mm²	≥ 120 N
4.0 mm²	≥ 120 N
6.0 mm²	≥ 120 N

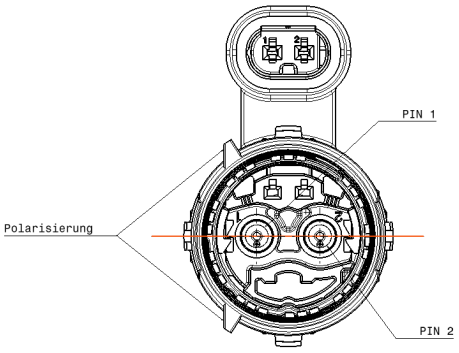
5.13 Positioning of the male locking device

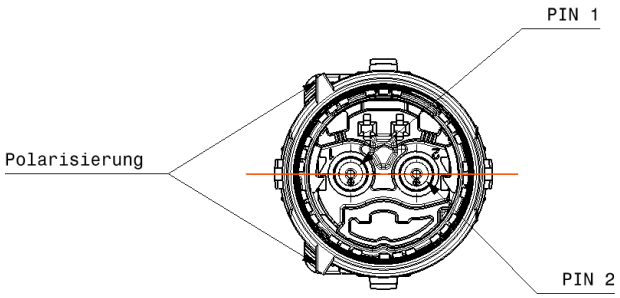
The male housing unit must be assembled power assisted, and in the correct position.


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

It is the responsibility of the assembler to commission a fixture. The test facility used by Hirschmann Automotive is described in chapter 8.

The contact holder incl. the shield sleeve needs to be assembled into the (TB) male housing unit into the correct position. Both polarizations need to be symmetrical to the axis in between of the centre of Pin 1 and Pin 2. Also, the polarization has to be on the side of Pin 1.

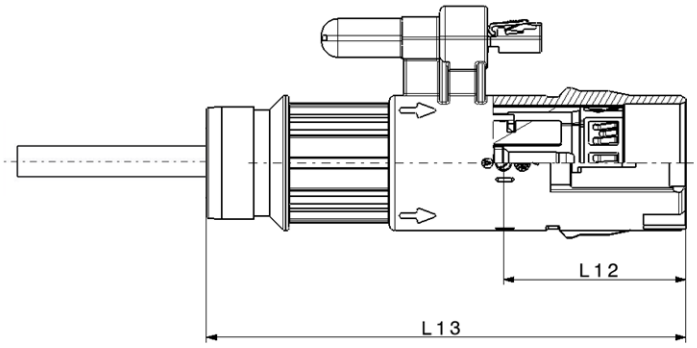




The (TB) male housing unit must be assembled onto the shield sleeve force-assisted, until the dimension L12 is reached. The dimension L13 is only for checking purposes.

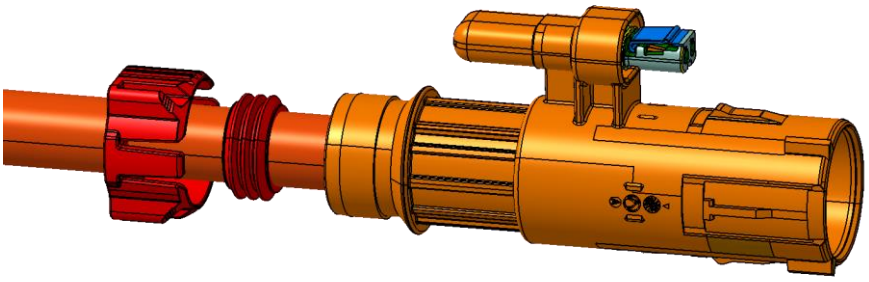
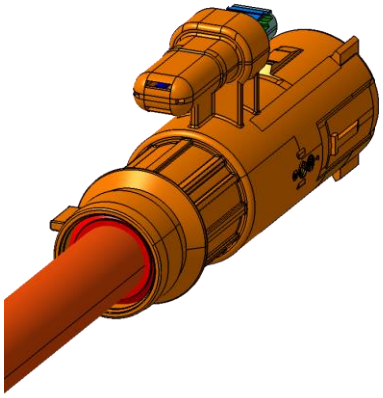
L12 = 34.3 ± 0.15 F1

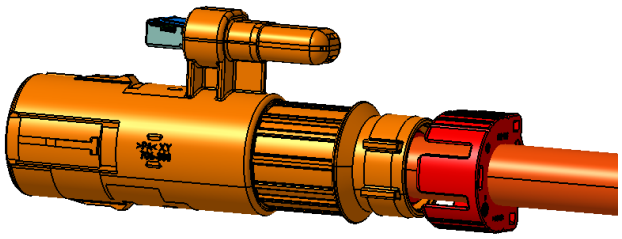
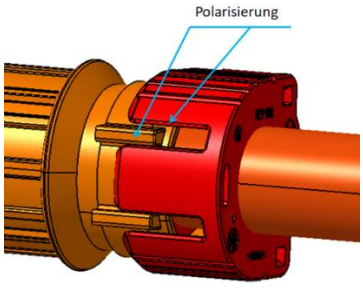
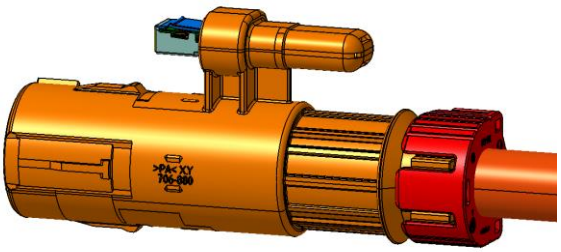
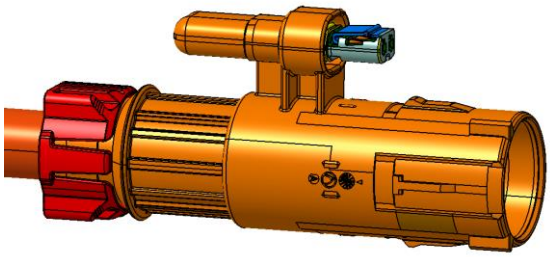
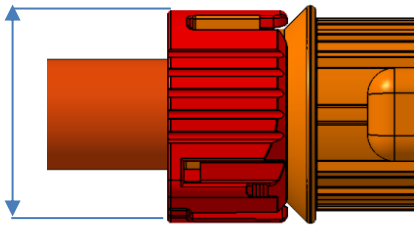
L13 = 89.6 (Info)



During the assembling process, there are no damages allowed on the shield sleeve, the contact carrier, or the wire. There is no pull on the wire necessary. Especially do not pull out the cable sheath out of the stress relief.

5.14 Assembly IV

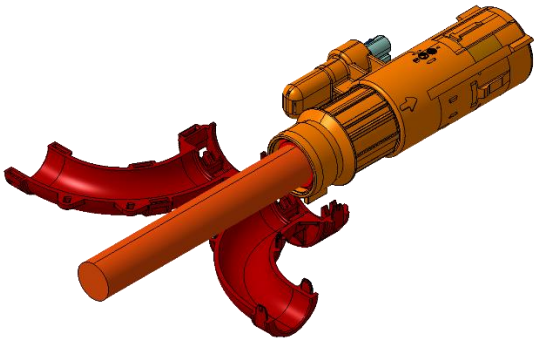
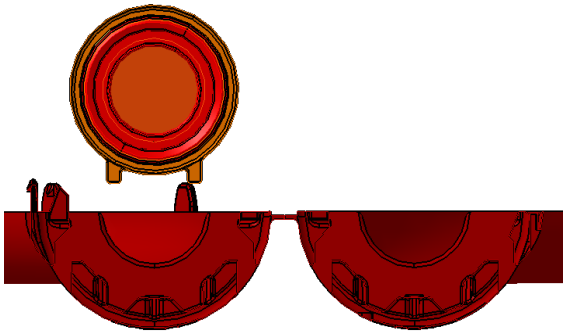
Push seal (2) into the female locking device (3)		
1	2	3
		
		The cable seal can be slightly widened during assembly. It is possible to move the seal with the cover cap (1) on the wire but care must be taken that the seal does not twist and is not pinched or damaged.

Snap the cover cap (1) into the recess of the locking device (3) and consider the polarization.	
	
	
	
cover cap on end position	end position (locked)

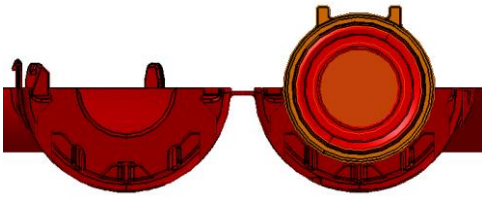
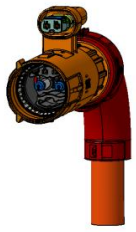
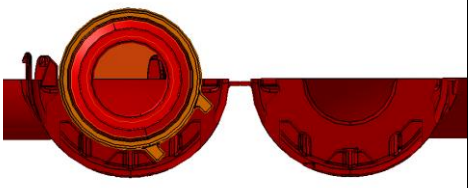
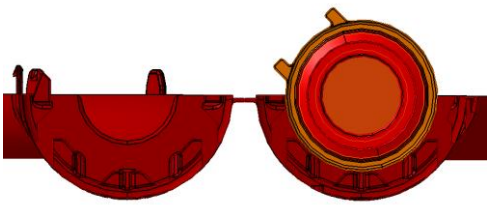
Do not damage the cover cap (1) or the seal (2) during assembly. If the cover cap is in end position, the latching hooks must fit directly on the female locking device unit on both sides. They are not allowed to stay in a deflected position. They must be within the dimension L14 = max. 25 mm. If the 90°angled cap is used, the processing steps of the cover cap (1) is omitted.

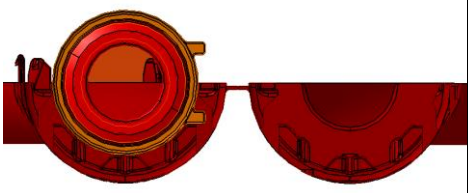
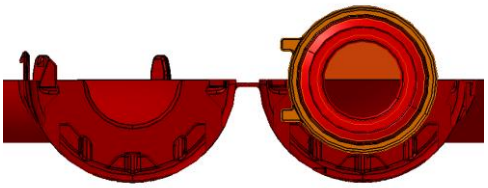
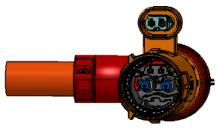
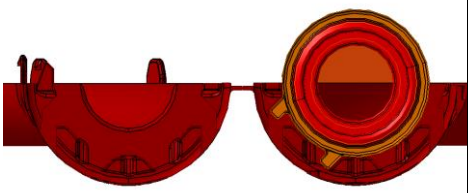
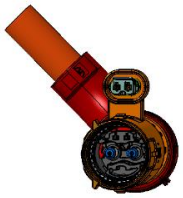
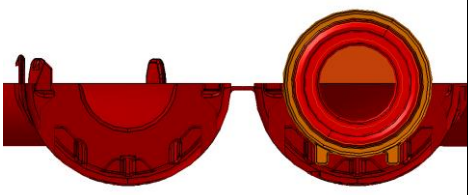
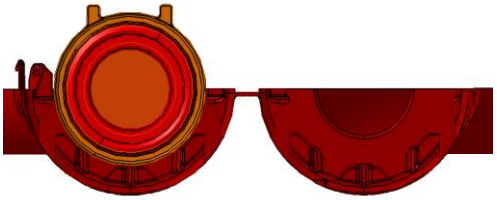
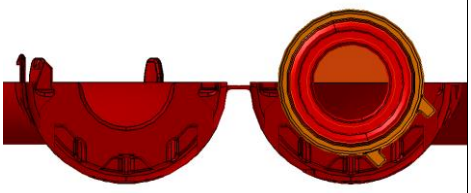
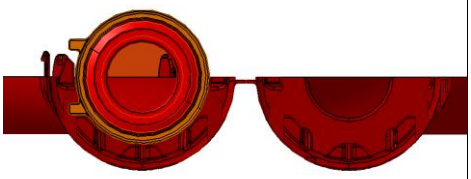
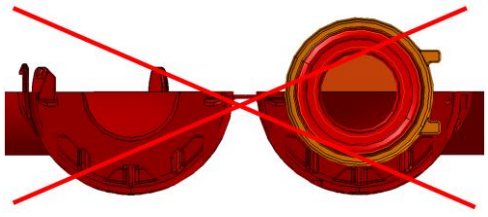
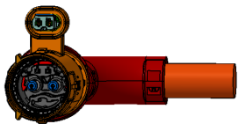
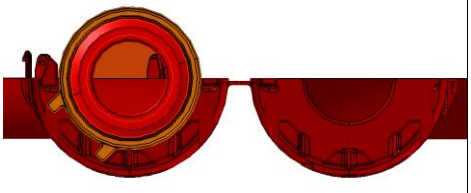
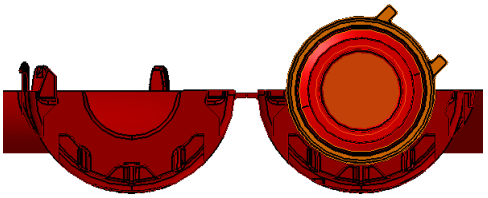
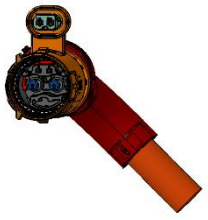
6 Processing steps (optional parts)

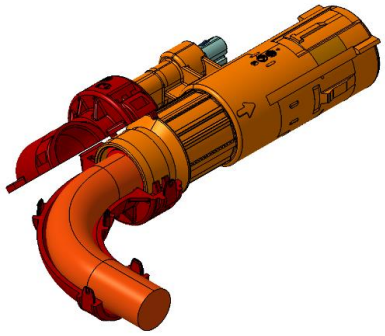
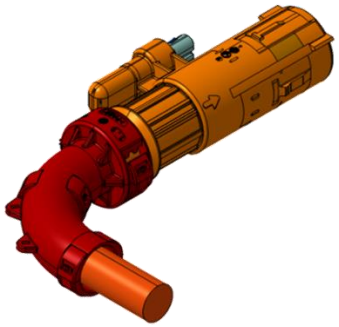
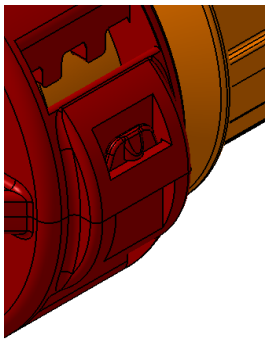
6.1 Assemble 90° angled cap

This process steps are only necessary if the 90° angled cap is used instead of the cover cap.	
	

he orientation of the wire direction will be fixed with the polarization geometry of the connector housing. The wire direction of the 90° angle cap is conceived to be set in 45° angles during the assembling process. The polarisation geometry should be placed on one side of the half-shell to get a pre orientation. (left side) It is possible to place the connector into the angle cap without pre orientation (right side) but be aware during closing, that the polarization geometry finds the correct position. The Position -90° can only be placed in one side, because on the other side there will be a collision of the half-shells with the polarization geometry during closing the angle cap.

0°			
45°			

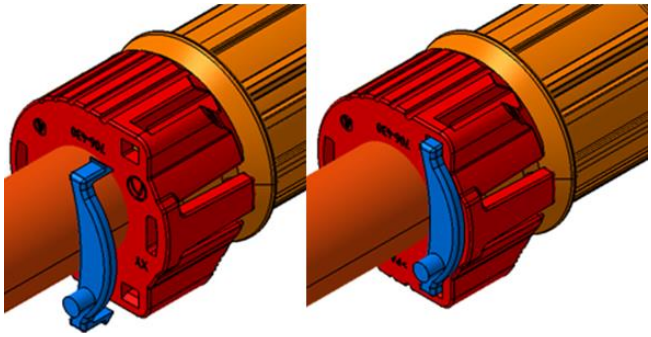
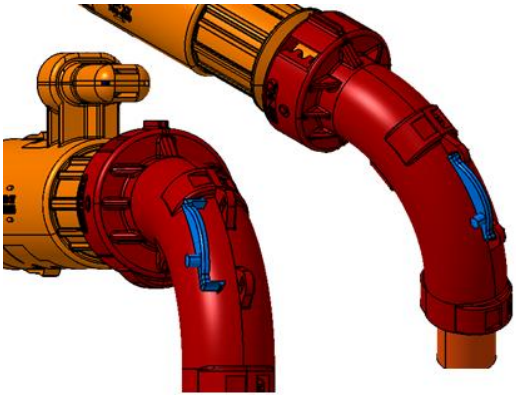
90°			
135°			
180°			
-135°			
-90°			
-45°			

Bend the wire for 90° and insert it into the half-shell of the angled cap.		
		

During closing the angled cap, make sure the wire insulation material doesn't get damaged. All five latching hooks must be locked. Once the angled cap is closed, it is not possible to change the angle.

6.2 Assemble coding clip

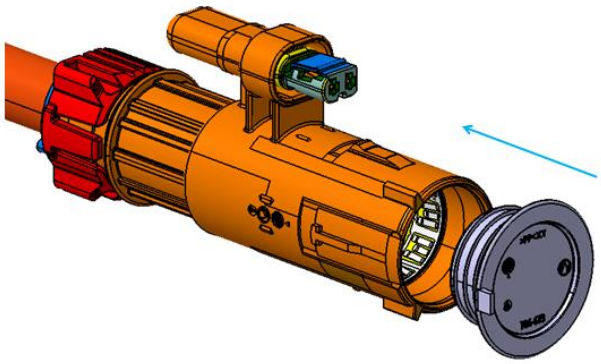
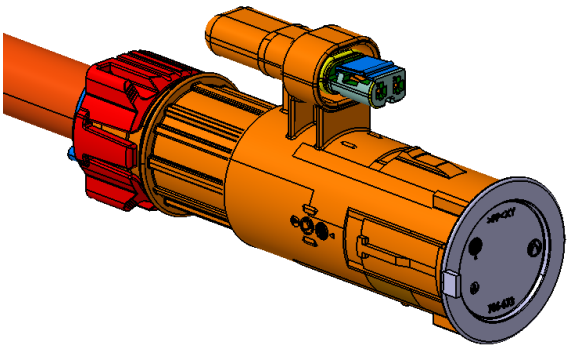
If the customer is requesting an additional coding identification, a coding clip can be assembled onto the cover cap or the 90° angled cap. The coding clip has the same colour as the contact holder and is used for a simpler identification of the plugs coding.

	
cover cap	90° angled cap

Ensure that the coding/ color of the coding clip matches the coding/ color of the built-in contact carrier. Therefor bars are attached to the coding clip according to a binary code which can be checked mechanically. The design of the bars can be found in the individual drawing of the coding clip.

6.3 Assemble transport protection cap

If the customer is requesting an additional transport protection of the connectors interface, a transport protection cap can be assembled onto the connector housing.

	
Insert the transport protection cap until both locking elements snap over the front collar of the connector housing. It is possible to turn the transport protection cap 360° during and after the assembling.	

6.4 Stacking of produced harnesses

For an orderly and controlled stacking of the harnesses to quantitatively free defined bundles.

7 Technical information

7.1 General requirements

Damages on single components are not allowed during the whole production process.

7.2 Technical cleanliness

In general, pay attention to the cleanliness on the connector and inside of the connector. Metallic particles generated during the assembly process, must be removed with a suitable device. Inside the connector and on the connector, there are no metallic particles > 1,000 µm allowed.

For metallic particles on each connector: CCC = N (J4/K0) acc. to VDA Volume 19
For all other particles on each connector CCC = N (J10/K0) acc. to VDA Volume 19

BMW-specific requirements according to QV11111 for assembled connector can be seen in the following table. The surface information can be found in the customer drawings.

Technical cleanliness acc. to QV11111			
HV system (assembled final product without cable)			
Requirement class (t.b.d. --> BMW – manufacturer)			
Reference size A (1,000 cm²)			
Number of allowable particle by length size class			
		metallic NOT shiny	metallic shiny
G	150 - 200 µm	-	-
H	200- 400 µm	1,200	1,200
I	400 – 600 µm	130	130
J	600 – 1,000 µm	60	15
K	1,000 – 1,500 µm	4	-

8 Appendix

The test plants and fixtures described in this chapter were used at Hirschmann Automotive to assemble various test and validation parts. The selection, design and commissioning of the plants and fixtures is the responsibility of the assembler.

8.1 Double stroke crimping press

Designation:	HPS40-2 double stroke crimping press
Part number:	t.b.d.
Designation:	Crimping die
Part number:	t.b.d.

Contact:

Schäfer Werkzeug- und Sondermaschinenbau GmbH
Dr.-Alfred-Weckesser-Str. 6
76669 Bad Schönborn-La, Deutschland
Phone: +49 7253 9421-0
www.schaefer.biz

8.2 Assembly device for contact bars in ZB insertion part

Description:	Shielding sleeve on contact carrier
Part number:	t.b.d.

Contact:

MAXXOM Automation GmbH
Gewerbegebiet, Salzweg. 1
A-4894 Oberhofen am Irrsee, Österreich
Phone: +43-6213-20053-0
www.MAXXOM-Automation.at

8.3 Pressing device

Designation:	t.b.d.
Item number:	t.b.d.

8.4 Assembly device pin housing

Designation:	Press-in device horizontal for positioning assembly pin housing HPS40-2 In-Line
Part number:	197079
Contact:	**WKM - Maschinenbau GmbH** **Oberes Ried 15** **A-6833 Klaus** **Phone: +43 5523 / 54907**

9 Change of documentation

Version	Change	Change date	Editor
1	First edition	08/ 2018	Bas Ü.
2	ZB Pin header without interlock added and latching of the retaining cap specified more precisely	11/ 2018	Bas Ü.
3	HCT4 numbers updated, cable shield crimping added;	01/ 2019	Bas Ü.
4	Dimension L8 changed to (base contact carrier end face of shielding sleeve)	03/ 2019	Bas Ü.
5	Punch geometry adapted for caulking	05/ 2019	Bas Ü.
6	Proposal for mounting devices inserted	08/ 2019	Bas Ü.
7	Contact carrier design adapted to current status, Conductor crimp description adapted, ZB insert assembly, process description assembly of contact part carrier in shielding sleeve, and shield crimp described in more detail.	12/ 2019	Bas Ü.
8	Added stress reliefs (extended); Added processing steps with rotative orientation	06/ 2020	Shaw S.
9	rotative orientation specified precisely, generall comments adapted, L12 adapted	05/ 2021	Bas Ü.
10	Comments and part usage for rotative orientation adapted	04/ 2021	Bas Ü.
11	L6 and L9 defined as max. dimension; added alternative embossing geometry; added a condition for version B in chapter "pulling force of the wire"	01/ 2022	Bas Ü./ Küng S.
12	Chapter 2.4 Customer releases added; Changed cleanliness requirement and added BMW specific requirement based on surface reference; BMW Number and special characteristics added;	10/ 2022	Breuss L.
13	Coficab FHLR91X91XCB91X T3 cable added (not validated yet) Page reference to dimension table on page 36, 55, 99 and 117 adjusted	12/ 2022	Natter T.
14	Update design specification	06/ 2023	Jussel E-M.
15	Adjusting data of the bottom line	07/ 2023	Jussel E-M.
16	Details/ additions regarding measuring equipment for "Crimping height d" added; Addition to cable shield crimping - punch and anvil geometry - version B no longer valid for new design or new applications;	07/ 2023	Kleiner T.
17	Update topic: 1.2 customer releases, 4.10 lines for dimensions L8, 5.6 5.6 Crimp the HCT4 male terminal and comment to page 52 “Embossing height „d“”	08/ 2023	Jussel E-M.
18	Upate topic 4.10, 5.10 – updated comment	09/ 2023	Jussel E-M.

19	Update topic 8 – with manufacturer and devices	09/ 2023	Jussel E-M.
20	Topic - Embossing height „d“ - updated dimension from 4.00 to 3.50 Topic 4.5, 5.5 – dimension L4.1 clear mentioned Topic 1.2 updated	10/ 2023	Jussel E-M.
21	Topic 4.5, 5.5 – dimension L4.1 and picture corrected	10/ 2023	Jussel E-M.
22	Topic 4.5 – dimension L.41 updated	03/ 2024	Jussel E-M.
23	Page 4) Change of L from length to legal	04/ 2024	Jussel E-M.
24	Page 32,33,51,52) Update of picture and text	06/ 2024	Jussel E-M.
25	Page 39) Added the dimension L4.1	07/ 2024	Jussel E-M.
26	Page 21,37) Update of picture	07/ 2024	Jussel E-M.
27	Page 5,6) additional NBKBE, Coficab wire	03/ 2025	Jussel E-M.