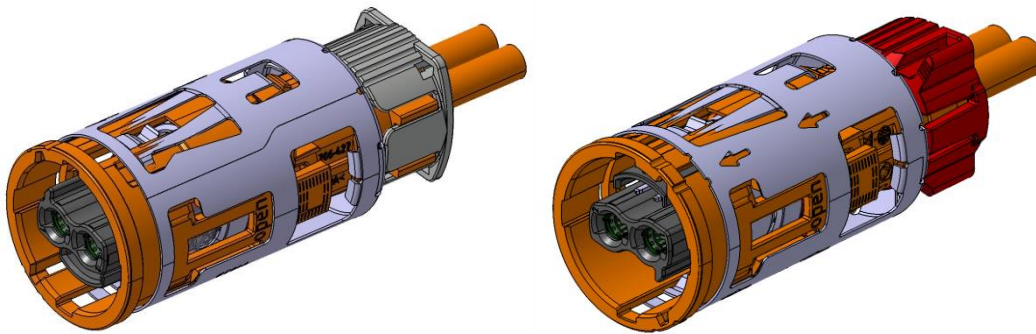


Process Specification

HIRSCHMANN PowerStar 40-2 HCT4 **3,0mm², 4,0mm², 5,0mm², 6,0mm²** **Shielded Single-Core Cable**



EVS-100111

November 2020
VS17

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1. General

1.1. Introduction

This process specification is valid for all variants mentioned in chapter 3.ff, and describes the product structure as well as the assembly of the Hirschmann PowerStar 40-2 plug connection.

807-655-501	A	3 / 4 / 5 / 6 mm ²	HCT4 + HVIL
809-886-501			
809-887-501			
807-655-502	B		
809-886-502			
809-887-502			
807-655-503	C		
809-886-503			
809-887-503			
807-655-504	D		
809-886-504			
809-887-504			
807-655-507	Z		
809-886-507			
809-887-507			
Hirschmann No.	Coding	Cross section	Note

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

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



1.2. Documentation of change

Date of issue	VS	Change	Editor
October 2019	09	Deactivated Sumitomo 3mm ² ; JUDD + Force 5mm ² ; Leoni, Coficab + Coroplast 6mm ² / Updated L1; L5	Hoor R.
November 2019	10	Updated general structure of document: Chapter 1 → General information Chapter 2 → Product structure Chapter 3 → Assembly 3,0mm ² , 4,0mm ² , 5,0mm ² Chapter 4 → Assembly 6,0mm ² Chapter 5 → Completion 3,0mm ² , 4,0mm ² , 5,0mm ² , 6,0mm ²	Hoor R.
November 2019	11	Updated 6mm ² Version	Hoor R.
December 2019	12	Activated 6mm ² cables; put L10 and L11 in brackets (3,0mm ² 4,0mm ² 5,0mm ²); updated 6mm ² version	Hoor R.
January 2020	13	Updated L1 / L2 / L3 / L7 / width of shield-crimping geometry	Hoor R.
February 2020	14	Added L4/L5 (6mm ²); put L8 and L9 in brackets (6mm ²), removed obsolete cables; added visual check of terminals;	Hoor R.
April 2020	15	Added Aluminium-wire; adapted L7 (4mm ²) and L5 (6mm ²); defined measurement for ØX (4mm ²); permitted residual foil; added comment for L3; added L4* (6mm ²); added comments for the assembly of the seal	Hoor R.
May 2020	16	added BMW-Document No.; permitted deviation of processing sequence for 4mm ² ; specified measurement of L5 for 4mm ² ; specified measurement of L12 for 4mm ² and 6mm ² ; added process data for 6mm ² aluminium conductors;	Hoor R.
November 2020	17	L3 was made theoretical, additional comments on the positioning of the strain-relief and x-ring were added; non-existing components for 3mm ³ and 5mm ² were crossed out; Coficab was reactivated on page 56 added clamping of the wires during assembly of the shield sleeve (chapter 3.8 and 4.7)	Hoor R.



1.3. Other current documents

A	HCT4 Process specification (Ag)	EVS-100068
B	Datasheet Shielded SCC 3,0mm² Sumitomo	tbd
C	Datasheet Shielded SCC 4,0mm ² Huber & Suhner	H&S Nr.: FLR91XC33X-1x4 T150
D	Datasheet Shielded SCC 4,0mm ² Coficab	Coficab Nr.: FHLR91XCB91X T4
E	Datasheet Shielded SCC 4,0mm ² Coroplast	Coroplast Nr.: 9-2611 (1x4,0mm ²)
F	Datasheet Shielded SCC 4,0mm ² Kroschu	Kroschu Nr.: 64998372
G	Datasheet Shielded SCC 4,0mm ² Leoni	Leoni Nr.: FHLR2GCB2G 00003
H	Datasheet Shielded SCC 5,0mm² Judd	tbd
I	Datasheet Shielded SCC 5,0mm² Force	tbd
J	Datasheet Shielded SCC 6,0mm ² Coficab	Coficab Nr.: FHLR91XCB91X T4
K	Datasheet Shielded SCC 6,0mm ² Coroplast	Coroplast Nr.: 9-2611 (1x6,0mm ²)
L	Datasheet Shielded SCC 6,0mm ² Kroschu	Kroschu Nr.: 64998373
M	Datasheet Shielded SCC 6,0mm ² Leoni	Leoni Nr.: FHLR2GCB2G 00004
N	Datasheet Shielded SCC 6,0mm ² Gebauer & Griller	G&G Nr.: FHLALR2GCB2G 1X6,0(0,40)/T180
O	HCT4 Process specification Aluminum	EVS-100145

1.4. Customer-releases

BMW	5 A37 9F8
Customer	Document number



2. Product structure (single components)

2.1. Shielded cable 3,0mm², 4,0mm², 5,0mm² and 6,0mm² see table



Leoni	-	FHLR2GCB2G 4,0/0,31/T180/ 600V AC / 1000V DC	-	FHLR2GCB2G 6,0/0,31/T180/ 600V AC / 1000V DC
Kroschu	-	FHLR2GCB2G 4.00 QMM/0.21/T180 600/1000V OR	-	FHLR2GCB2G 6.00 QMM/0.21/T180 600/1000V OR
Coroplast	-	- FHLR2GCB2G 4,0mm ² / 0,21 T180 0,6/1,0 kV	-	FHLR2GCB2G 6,0mm ² / 0,21 T180 0,6/1,0 kV
Coficab	-	FHLR91XCB91X T4 4,0mm ²	-	FHLR91XCB91X T4 6,0mm ²
Huber & Suhner	-	FLR91XC33X 1x4 T150 1x4mm ² RADOX 155S FLR	-	-
BEIJING FORCE AUTOMOTIVE WIRE CO.LTD	-	-	FORCE-S61-2009 150°C, 600V	-
JUDD WIRE INC.	-	-	4C-BC XLPO/XLPO, SHIELDED; ISO 150°C, 600V, HEV	-
SUMITOMO ELECTRIC INTERCONNECT PRODUCTS (SUZHOU) LTD.	SUMITOMO- SZ EXZSW-F 3 150°C 600V	-	-	-
Gebauer & Griller	-	-	-	FHLALR2GCB2G 1X6,0(0,40)/T180
Wire Manufacturer	3,0mm²	4,0mm²	5,0mm²	6mm²
	Wire Cross-Section			

Table 1: shielded cable 3,0mm², 4,0mm², 5,0mm² and 6,0mm²

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

2.2. HCT4 Female terminal (Hirschmann)

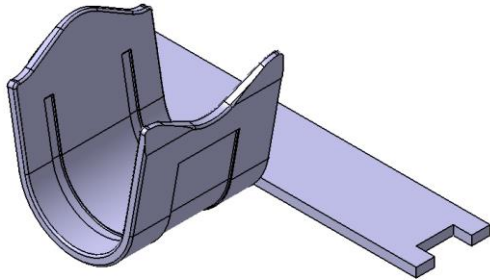


709-427-504	3,0 / 4,0 / 5,0 mm ² / (6,0mm Al)	Female terminal HCT4
709-427-505	6,0 mm ² (Cu)	Female terminal HCT4
Hirschmann No.	Wire cross section (construction of conductor)	Product description

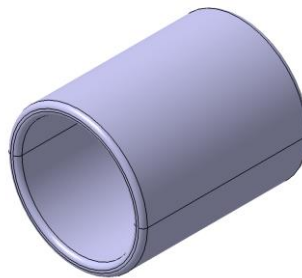
Table 2: Hirschmann female terminal HCT4

The female terminals are delivered on a spool.

2.3. Strain-relief HPS40-2 SCC (Hirschmann)



3,0mm², 4,0mm², 5,0mm²



6,0mm²

710-671-501	6,0mm ²	Strain-relief 6mm ²
710-195-503	5,0mm ²	Crimp ferrule 5mm ²
710-195-502	4,0mm ²	Crimp ferrule 4mm ²
710-195-501	3,0mm ²	Crimp ferrule 3mm ²
Hirschmann No.	Wire cross section (construction of conductor)	Product description

Table 3: Hirschmann strain-relief

On the product drawing (Hirschmann No. 807-655-...xx), you can find the released cables for each strain-relief.

The crimp ferrules are delivered on coils, the strain-reliefs as bulk goods.



2.4. X-Ring (Hirschmann)



6mm²

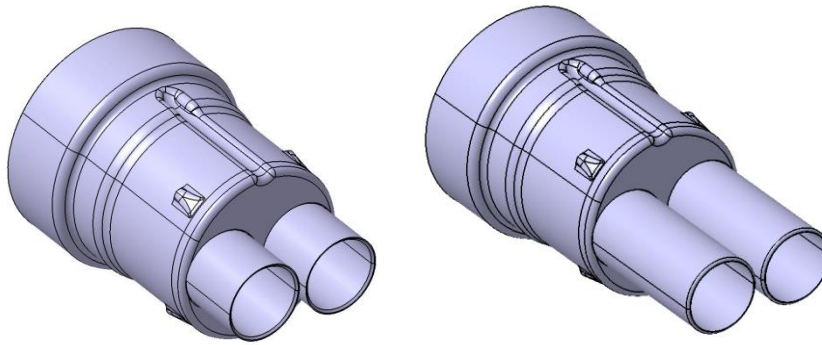
710-675-501	6,0mm ²	X-Ring 6mm ²
Hirschmann No.	Wire cross section (construction of conductor)	Product description

Table 4: Hirschmann X-Ring

The X-Rings are delivered as bulk goods.



2.5. Shield sleeve HPS40-2 SCC (Hirschmann)



3,0mm², 4,0mm², 5,0mm²

6,0mm²

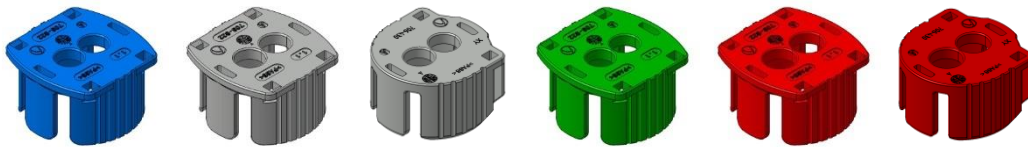
710-161-503	6,0mm ²	Shield sleeve HPS40-2 SCC
710-161-501	3,0/4,0/5,0mm ²	Shield sleeve HPS40-2 SCC
Hirschmann No.	Wire cross section (construction of conductor)	Product description

Table 5: Hirschmann shield sleeve

The shield sleeves are delivered as bulk goods.



2.6. Cover cap HPS40-2 (Hirschmann)



3,0mm²

4,0mm²

5,0mm²

6,0mm²

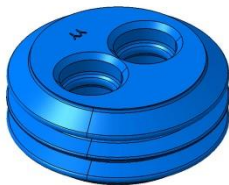
706-430-505	6,0mm ²	Red	Cover cap HPS40-2 SCC polarized
706-822-505	6,0mm ²	red	Cover cap HPS40-2 SCC
706-822-504	5,0mm ²	green	Cover cap HPS40-2 SCC
706-430-504	4,0mm ²	grey	Cover cap HPS40-2 SCC polarized
706-822-503	4,0mm ²	grey	Cover cap HPS40-2 SCC
706-822-502	3,0mm ²	blue	Cover cap HPS40-2 SCC
Hirschmann No.	Wire cross section (construction of conductor)	Colour	Product description

Table 6: Hirschmann cover cap

On the product drawing (Hirschmann No. 807-655-...xx), you can find the released cables for each cover cap.

The cover caps are delivered as bulk goods.

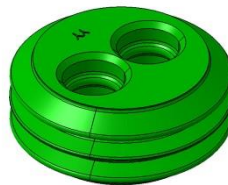
2.7. Seal HV (Hirschmann)



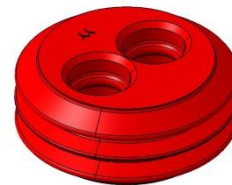
3,0mm²



4,0mm²



5,0mm²



6,0mm²

709-972-504	6,0mm ²	red	Seal HV SCC
709-972-503	5,0mm ²	green	Seal HV SCC
709-972-502	4,0mm ²	grey	Seal HV SCC
709-972-501	3,0mm ²	blue	Seal HV SCC
Hirschmann No.	Wire cross section (conductor construction)	Colour	Product description

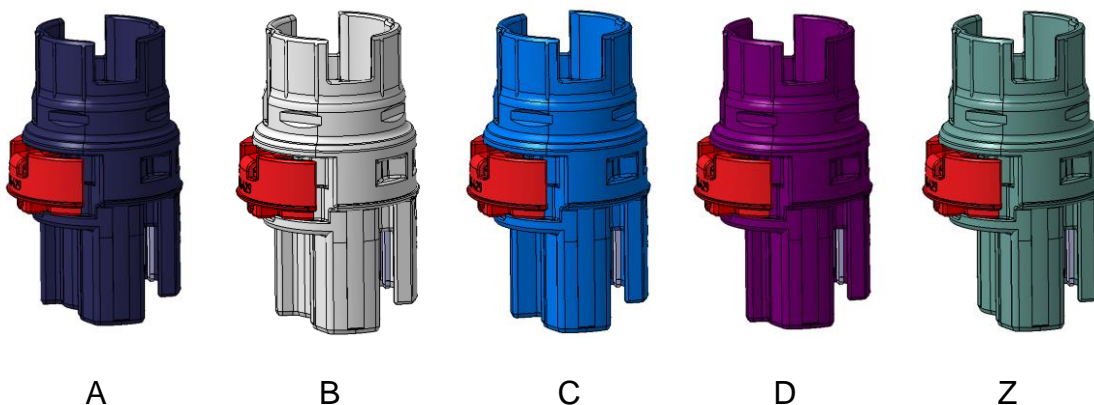
Table 7: Hirschmann seal HV

On the product drawing (Hirschmann No. 807-655-...xx), you can find the released cables for each seal.

The seals are delivered as bulk goods.



2.8. Terminal holder HPS40-2 (Hirschmann)

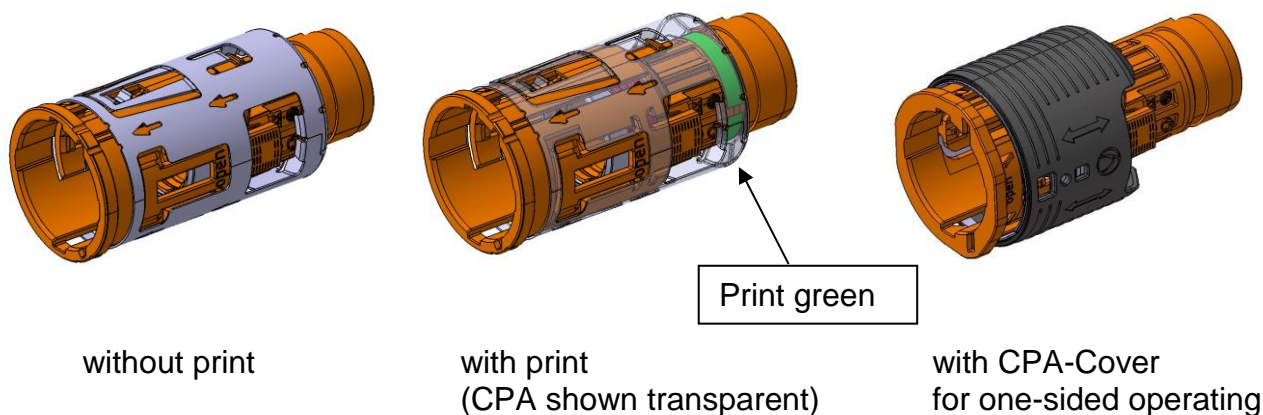


807-657-501	A	black	yes	3,0 / 4,0 / 5,0,0 / 6,0mm ²	HB	Terminal holder HPS40-2
807-657-502	B	natural/ white	yes		HB	Terminal holder HPS40-2
807-657-503	C	blue	yes		HB	Terminal holder HPS40-2
807-657-504	D	purple	yes		HB	Terminal holder HPS40-2
807-657-507	Z	water blue	yes		HB	Terminal holder HPS40-2
807-657-551	A	black	yes		V-0	Terminal holder HPS40-2
807-657-552	B	natural/ white	yes		V-0	Terminal holder HPS40-2
807-657-553	C	blue	yes		V-0	Terminal holder HPS40-2
807-657-554	D	purple	yes		V-0	Terminal holder HPS40-2
807-657-557	Z	water blue	yes		V-0	Terminal holder HPS40-2
Hirschmann No.	Cod.	Colour	HVIL bridge	Wire cross section (construction of conductor)	Flammability according to UL94	Product description

Table 8: Hirschmann terminal holder

The terminal holders are delivered as bulk goods.

2.9. Female locking device unit HPS40-2 (Hirschmann)



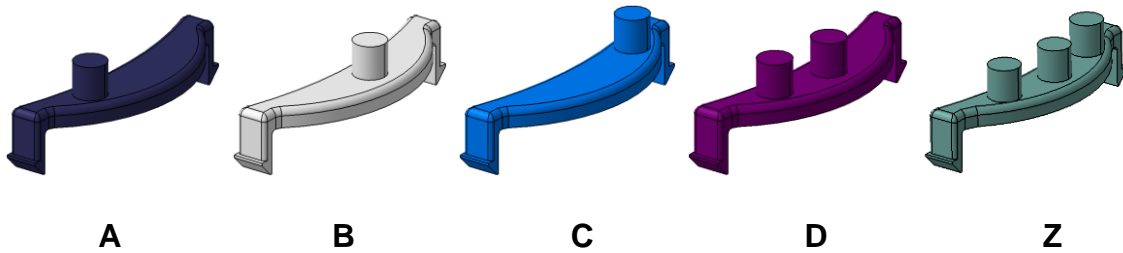
807-656-503	3,0/4,0/5,0/6,0mm ²	Female locking device unit HPS40-2 CPA-Cover
807-656-502		Female locking device unit HPS40-2 printed
807-656-501		Female locking device unit HPS40-2
Hirschmann No.	Wire cross section (construction of conductor)	Product description

Table 9: Hirschmann female locking device unit

The female locking device units are delivered as bulk goods.



2.10. Coding clip HPS40-2 (Hirschmann)



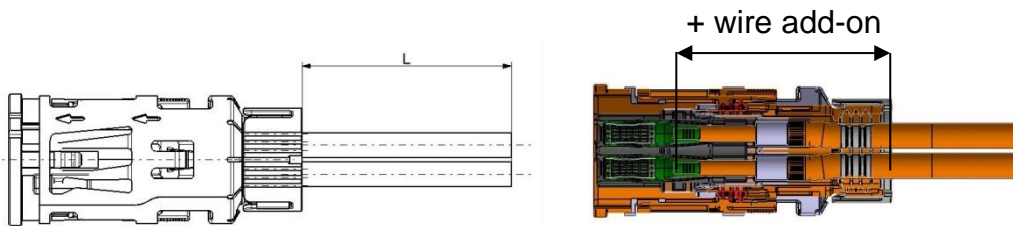
706-505-501	A	black	3,0/4,0/5,0/6,0mm ²	Coding clip HPS40-2
706-505-502	B	natural / white		Coding clip HPS40-2
706-505-503	C	blue		Coding clip HPS40-2
706-505-504	D	purple		Coding clip HPS40-2
706-505-507	Z	water blue		Coding clip HPS40-2
Hirschmann No.	Cod.	Colour	Wire cross section (construction of conductor)	Product description

Table 10: Hirschmann coding clip

The coding clips are delivered as bulk goods.

3. Processing steps 3,0mm², 4,0mm², 5,0mm²

3.1. Cut the shielded cable



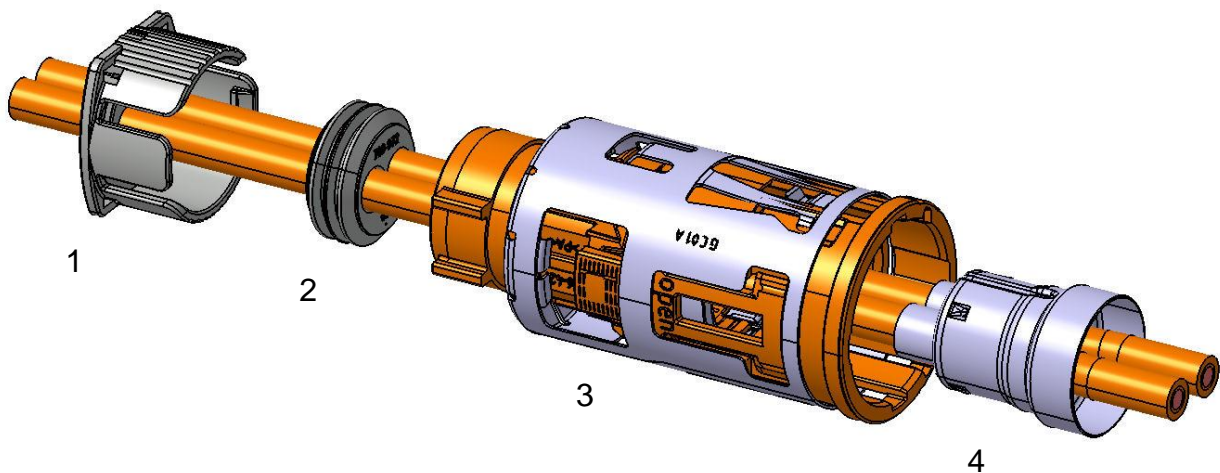
Add the following lengths for the Hirschmann HPS40-2 female connector:

5,0mm ²	L + 50	L + 54
4,0mm ²	L + 50	L + 54
3,0mm ²	L + 50	L + 54
Wire cross section (construction of conductor)	Dimension L after zero-cut (mm)	Dimension L for the Hirschmann HCT4 terminal incl. zero-cut (mm)

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

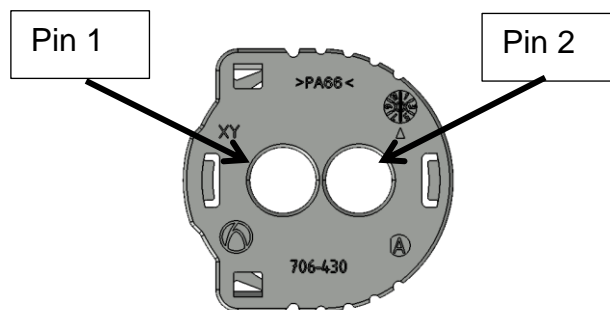
3.2. Assembly

Slide the cover cap (1), the seal (2), the female locking device unit (3) and the shielding sleeve (4) onto the shielded cables. Seal, locking device and shielding sleeve can be assembled either way.



Note: The locking device unit (3) and shielding sleeve (4) may as well be assembled onto the cable after step 3.6 (crimping of HCT4-female terminals).

If the cover cap (1) 706-430-502 or 706-430-504 is used, pay attention to the pinning, as it can not be rotated afterwards:



3.3. Strip of the shielded cables

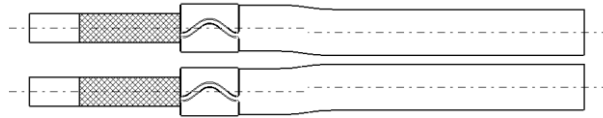
- Stripping length



5,0mm ²	18±1	22±1
4,0mm ²	18±1	22±1
3,0mm ²	18±1	22±1
Wire (cross section)	Dimension L1 after zero-cut (mm)	Dimension L1 for the Hirschmann HCT4 terminal incl. zero-cut (mm)

- Do not damage the shielding during the processing operation.

3.4. Crimp the crimp ferrule (3,0mm², 4,0mm², 5,0mm²)



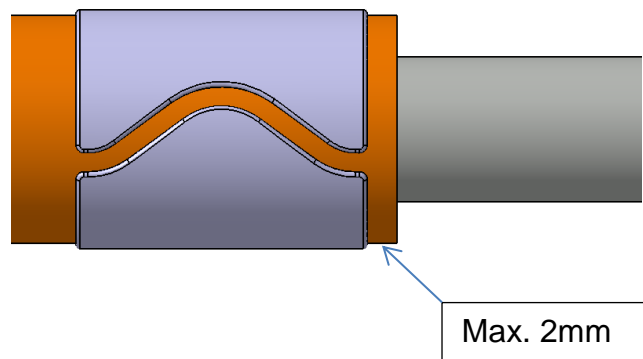
3,0mm², 4,0mm², 5,0mm²

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

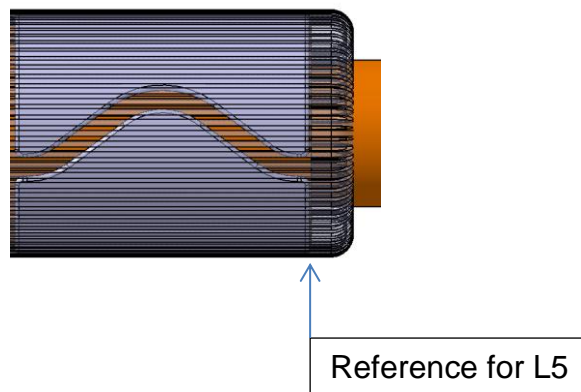
- Crimp the crimp ferrule
- Remove the foil.
- Shorten the shielding.

In this processing specification, the recommended sequence is shown.

If required, the stripping of the cable (3.3) can be done after the crimping of the crimp ferrule. Then, a maximum overlap of the inner jacket of 2mm has to be ensured.



Nevertheless, it has to be ensured that L5 (3.6) is referenced to the ferrule.



- **Single stroke crimping machine**

For the positioning and the crimping process of the crimp ferrules, the crimping machine of the company "Schaefer" can be used:

Name of the device: Crimp-Device Crimp-Ferrule HPS40-2 SCC
Article number: EPS2001-HPS40-2-SCC

The individual details referring to commissioning, handling and process description of the device can be requested directly at the supplier:

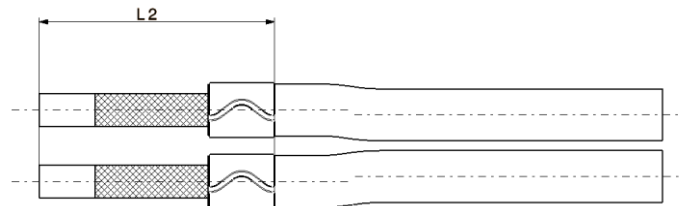
Schaefer Werkzeug- und Sondermaschinenbau GmbH
Dr.-Alfred-Weckesser-Str. 6
76669 Bad Schoenborn-La, Deutschland
Tel: +49 7253 9421-0
Fax: +49 7253 9421-94
www.schaefer.biz

The commissioning of the crimping device has to be done by the manufacturer.

In this edition you can only find the information of the crimping and positioning of the crimping process.

Process data

a) The crimp ferrules need to be crimped in relation to the single wires.



3,0mm², 4,0mm², 5,0mm²

L2 = max. 25,5 mm after zero-cut
 max. 29,5 mm incl. zero-cut
 max. 31,0 mm if L5 is guaranteed by a dimensional reference-cut

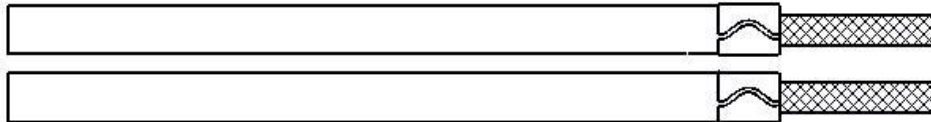


5,0mm ²	TBD
4,0mm ²	6,1±0,1
3,0mm ²	TBD
Wire (cross section)	Dimension ØX

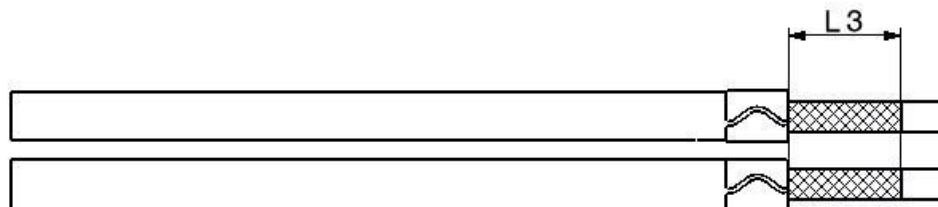
The measurement of ØX shall be done in crimping direction.



- An overlap of the foil in the area of the crimp max. 1mm is allowed.



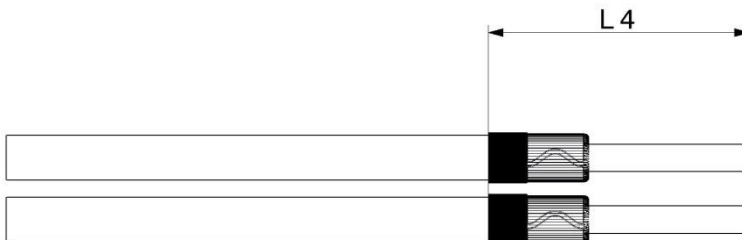
- Dimension of the shielding:



Depending on the production method of each manufacturer, the dimension L3 can vary.

- After cutting the shielding, there are no wire residues or parts of the shielding permitted on the cable. This has to be ensured with actions like the following:
 - removing the residues of the shielding
 - 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 crimp 100%.

3.5. Reverse the shield backwards, hold the shield with tape



- 100% of the shield has to be turned over the crimp.
A targeted unbraiding of the shield is not necessary. By turning over the shield, a process related unbraiding is possible.
After this the shield has to be fixed with a fixing aid behind the crimp.
(for example: tape)
- The fixing tape must 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 crimp, and must not overlap the crimp.
No shielding is allowed outside the fixing tape.
The max. position of the tape is shown with the dimension L4.
L4 = max. 35 mm after zero-cut
max. 39 mm incl. zero-cut

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 assembly is $\varnothing 6,75$ and the shield sleeve must be able to be mounted easily.
The product must have min. 150°C thermal resistance.

- Single strands of the shield which are not fixed with the tape and stick out have to be removed before further process steps.
- Do not damage the single wires during the complete processing operation.

3.6. Crimp the HCT4 female terminal



- **Double stroke crimping machine**

For the positioning and the crimping process of the HCT4 female terminals, the crimping machine of the company “Schaefer” can be used:

Name of the device: HPS40-2 Double stroke crimping machine
Order number: EPS2001-HPS40-2

Name of the device: Interchangeable crimping unit
Article number: Shown in the process specification HCT4 female terminal „EVS-100068“

The individual details referring to commissioning, handling and process description of the device can be requested directly at the supplier:

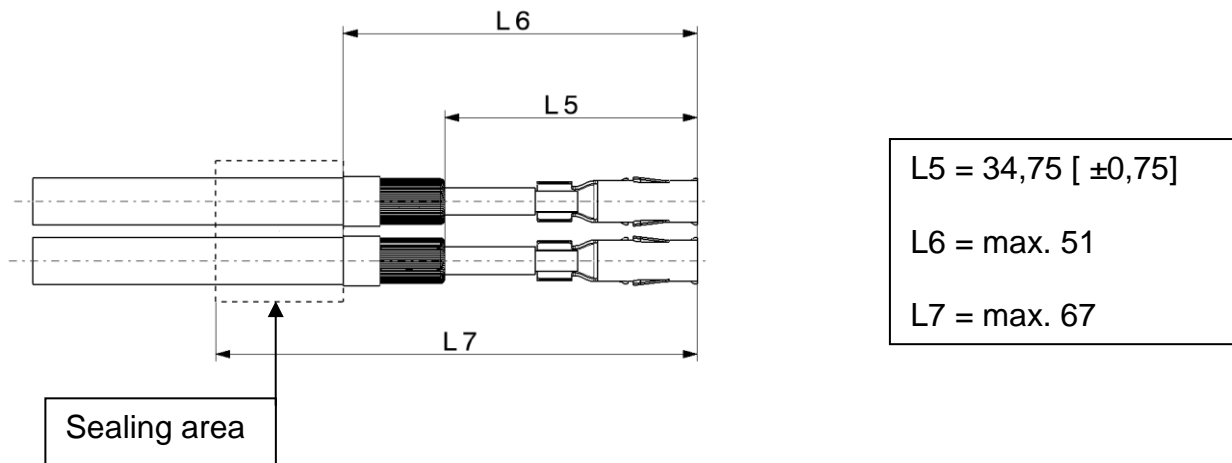
Schaefer Werkzeug- und Sondermaschinenbau GmbH
Dr.-Alfred-Weckesser-Str. 6
76669 Bad Schoenborn-La, Deutschland
Tel: +49 7253 9421-0
Fax: +49 7253 9421-94
www.schaefer.biz

The commissioning of the crimping device has to be done by the manufacturer.

In this edition you can only find the information of the crimping and positioning of the crimping process.

Process data

- a) The crimp data can be seen in the „Process specification HCT4 female terminal EVS-100068“.
- b) The HCT4 female terminals need to be crimped in relation to the single wires. For a smooth assembly into the terminal holder, the terminals need to be crimped in the correct position. The dimensions on the following drawing need to be adhered to.



The dimension L5 and L6 are just for information. The dimensions are caused from the dimension L1, L4 and the EVS-100068.

The length difference between the female terminals shall not be greater than 0.5mm.

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.

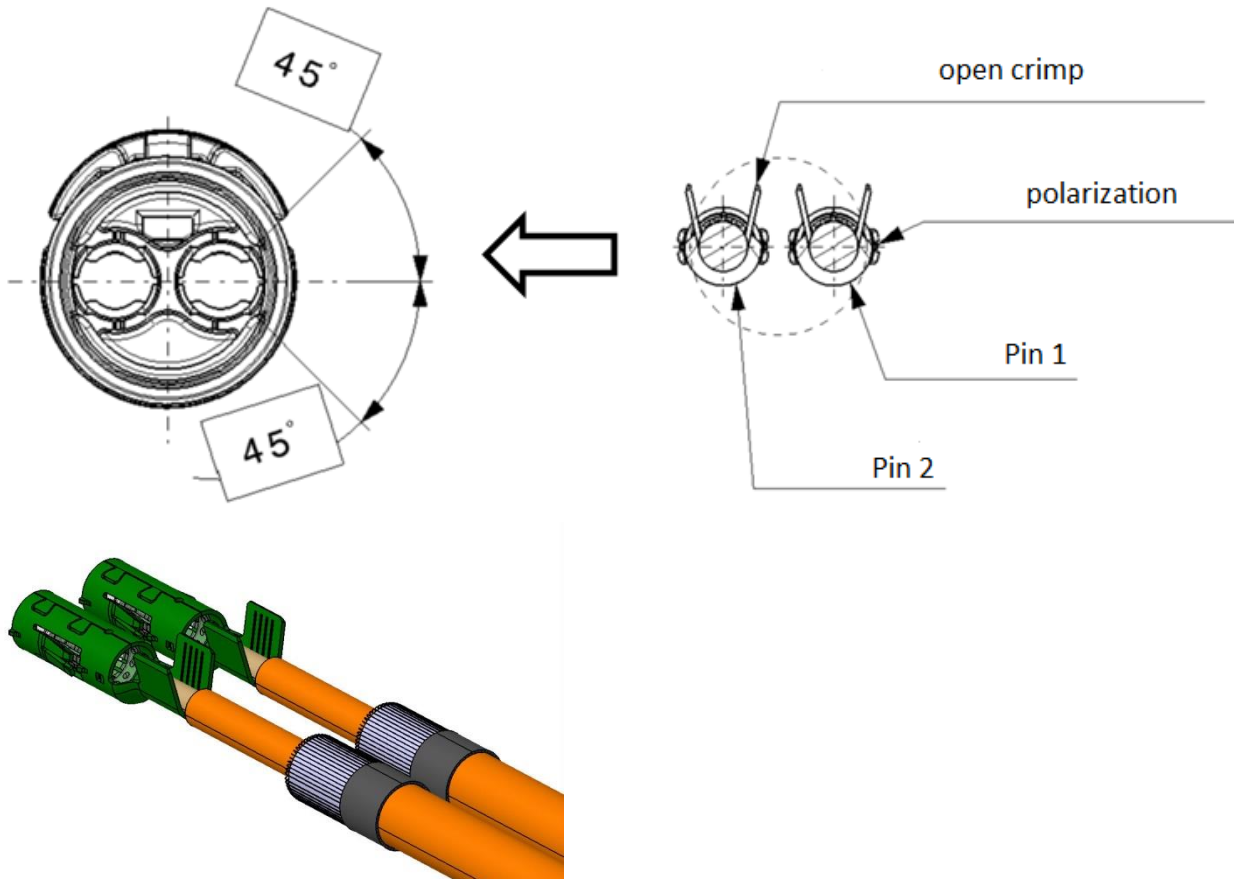
At the area of the wire seal it is not allowed to deform or damage the outer sheath which has negative influence to the sealing function.

If agreed to by the OEM, either L2 or L5 has to be proven, since they are correlating.



angled insert catches
female contact holder HPS40-2

nominal position of the
terminals to the cable



To do an orderly assembly / 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.

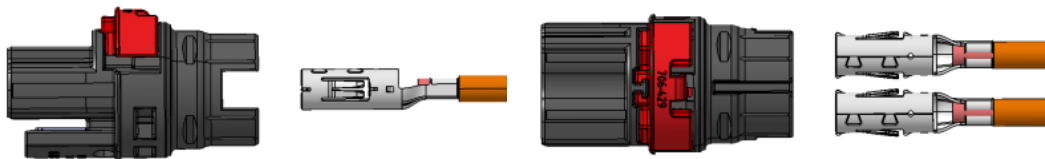
The allowed angle deviation results from the geometry of the angled insert catches on the female terminal holder and the max. assembly force of the cable with the terminals into the terminal holder.

This can be checked during the assembly process. (See chapter 3.7 Assembly female terminals into the terminal holder)

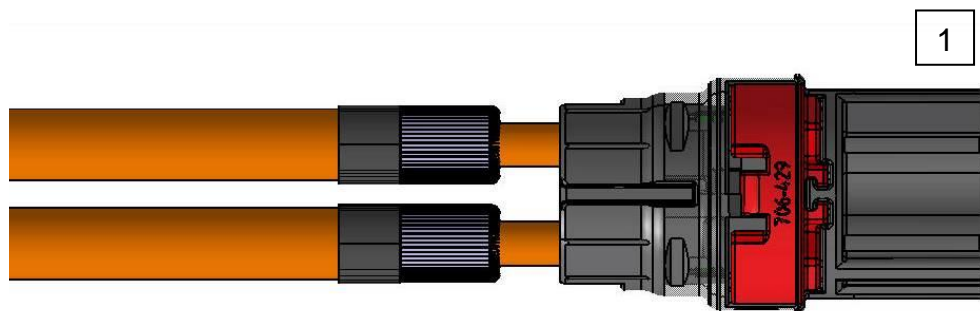
Note: As described in chapter 3.2, the locking device unit and shielding sleeve may as well be assembled onto the cable after step 3.6 (crimping of HCT4-female terminals).

3.7. Assembly

- Assemble female terminals into the terminal holder (1).



If two wires with the same colour are used, the pinning has to be confirmed by electrical testing.



PIN 1 → + / PIN 2 → -

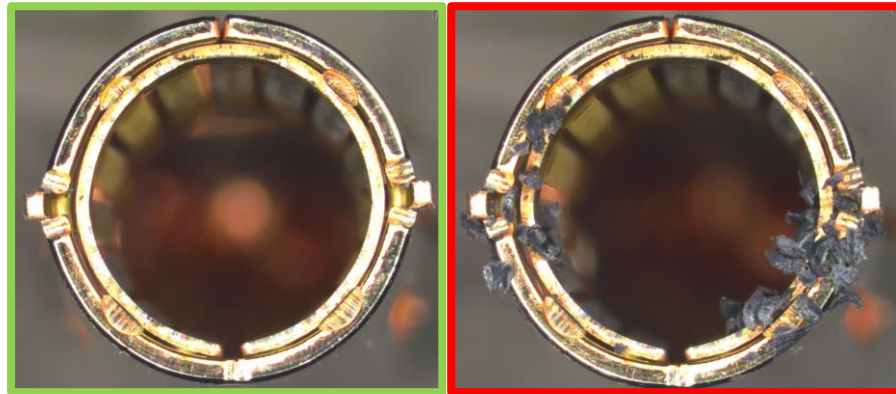
While assembling the HCT4 female terminals, the latching lance of the HCT4 female terminals will be deflected. Once the end position is reached, the latching lance will audibly engage, and the female terminals will be primary locked.

If the terminal is assembled wrong, this can cause a plastic burr inside the chamber and the terminal. The terminal holders and terminals must be checked:



These terminal holders may no longer be used and have to be scrapped!

The terminals must be checked for plastic burrs and be cleaned before further assembly. If cleaning does not remove all residual plastic, the terminals must be scrapped!



OK

NOK

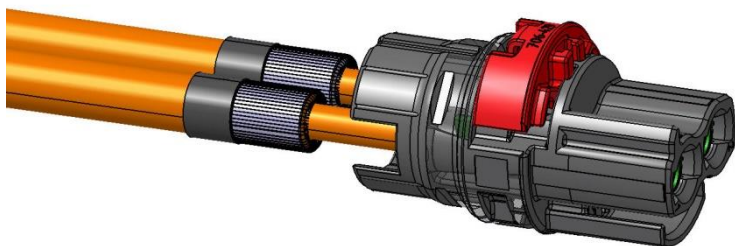


Leoni	-	FHLR2GCB2G 4,0/0,31/T180/ 600V AC / 1000V DC	-
	-	30 N	-
Kroschu	-	FHLR2GCB2G 4.00 QMM/0.21/T180 600/1000V OR	-
	-	30 N	-
Coroplast	-	FHLR2GCB2G 4,0mm ² / 0,21 T180 0,6/1,0 kV	-
	-	30 N	-
Coficab	-	FHLR91XCB91X T4 4,0mm ²	-
	-	30 N	-
Huber & Suhner	-	FLR91XC33X 1x4 T150 1x4mm ² RADOX 155S FLR	-
	-	30 N	-
BEIJING FORCE AUTOMOTIVE WIRE CO.LTD	-	-	FORCE-S61-2009 150°C, 600V
	-	-	36-N
JUDD WIRE INC.	-	-	1C BC XLPO/XLPO, SHIELDED; ISO 150°C, 600V, HEV
	-	-	36-N
SUMITOMO ELECTRIC INTERCONNECT PRODUCTS (SUZHOU) LTD.	SUMITOMO- SZ EXZSW-F 3 150°C 600V	-	-
	30-N	-	-
	30-N	-	-
Wire Manufacturer	3,0mm²	4,0mm²	5,0mm²
	Wire Cross-Section		

The female terminals have to be crimped.

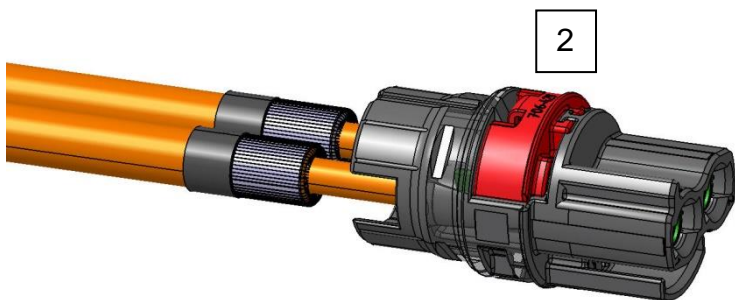
For automatic assembly of the HCT4 terminals into the terminal holder, either force- or distance surveillance must be proven.

Sec. lock pre-locking / HV terminals primary locked

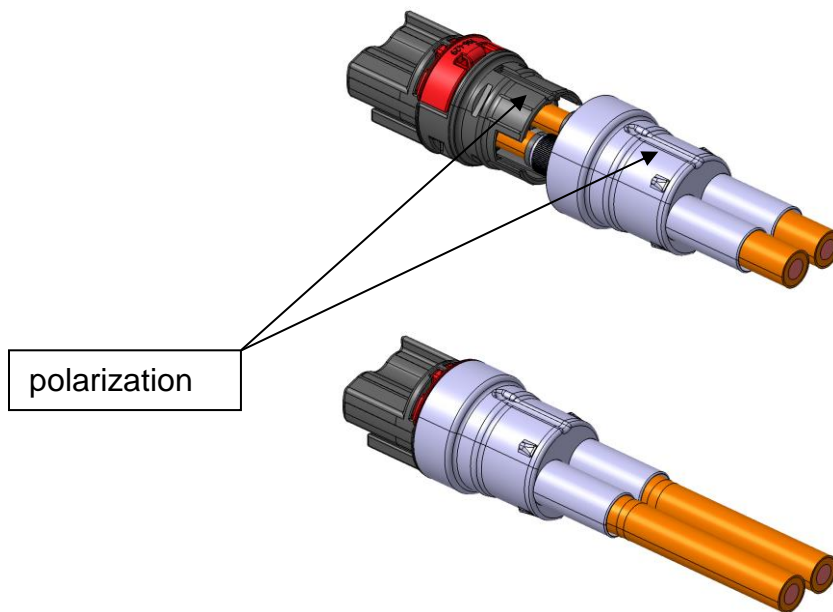


- Assemble secondary locking (2)

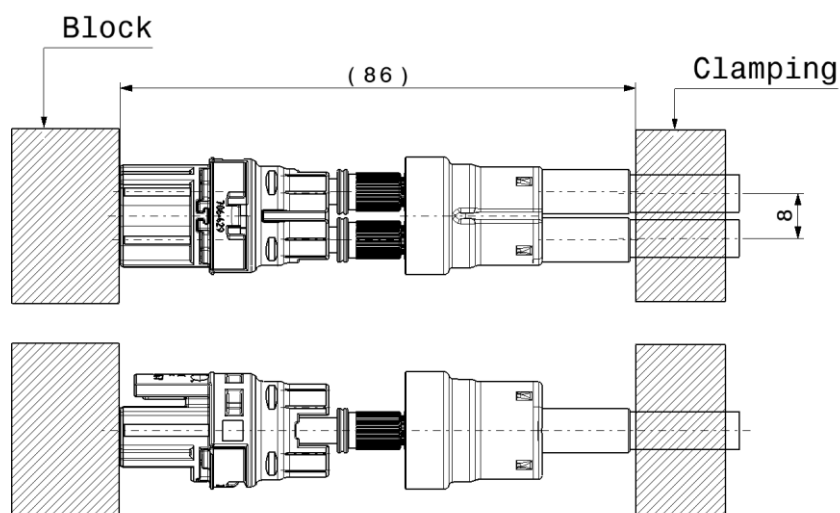
The secondary locking can only be assembled if the terminals are in the end position. A visible difference of the terminals to each other can be possible in the terminal cavity. Because of the position of the terminals on the wire, and the clearance of the terminals in the terminal cavity it is possible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



3.8. Push shielding sleeve onto terminal holder

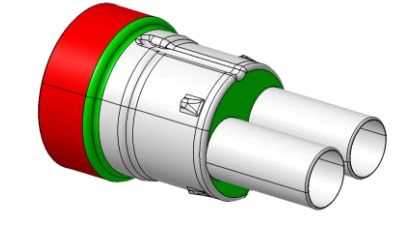


- The wires shall be
 - Stretched (10-40N/cable), to ensure axial alignment
 - Clamped, so that the wires cannot be dislocated or damaged during the assembly of the shield sleeve. The position of the clamping is shown below:

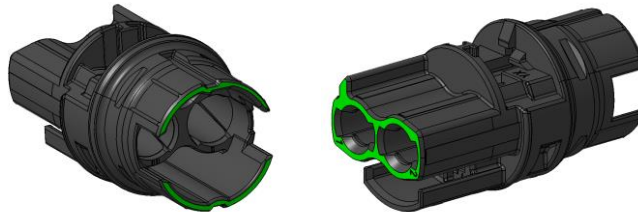


The axis of the wire, the shield-sleeve and the contact carrier shall be aligned.

Shield sleeve:



- Green: Permitted areas to apply axial force (max. 80N)
- Red: Contact area, no damage / scratches etc. permitted



Terminal carrier:

- Green: Permitted areas to apply axial force (max. 80N)

Neither the wire nor any other component may be damaged by the clamping process.

- The maximum velocity for the assembly of the shield sleeve shall be 500mm/min. If a greater value is used, the harness maker takes responsibility for the results.
- The shielding sleeve has to be assembled until the blocking position is reached.
- 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

- **Pressing device**

For the process of positioning and pressing of the strain-relief and the shielding sleeve, the following pressing device of the company Schaefer can be used:

Name: Pressing device HPS40-2 SCC
Article number: EPS3000-HPS40-2

The details of the commissioning, handling and the process guideline of the device can be requested directly at the supplier:

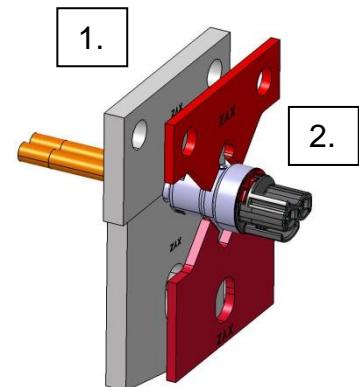
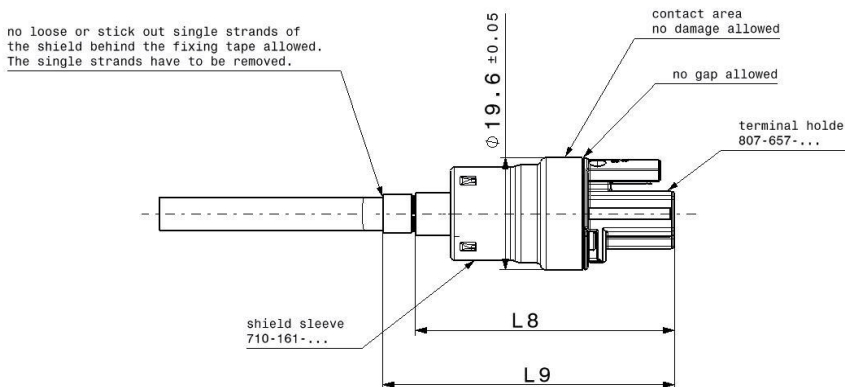
Schaefer Werkzeug- und Sondermaschinenbau GmbH
Dr.-Alfred-Weckesser-Str. 6
76669 Bad Schoenborn-La, Deutschland
Tel: +49 7253 9421-0
Fax: +49 7253 9421-94
www.schaefer.biz

The commissioning of the pressing device has to be done by the manufacturer.

In this edition you can only find the information of the pressing data of the pressing.

• **Pressing data**

- a) The terminal holder incl. the female terminals have to be put into the device in the correct position.
- b) Make sure that the shielding sleeve is on the end position of the terminal holder. The tape has to stick out of the end of the shielding sleeve.
- c) The circularity of the shielding sleeve in the terminal 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
 - i. Shield pressing (shielding sleeve, shielding, strain-relief and wire)
 - ii. Pressing of the terminal holder (shielding sleeve and terminal holder)



The dimension L8 and L9 are just for information. The dimensions are caused by 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
- Strain-relief
- Shield sleeve
- Shield strands of the wire

$L8 = [44,7 \pm 0,25]$

$L9 = [50 \pm 1]$

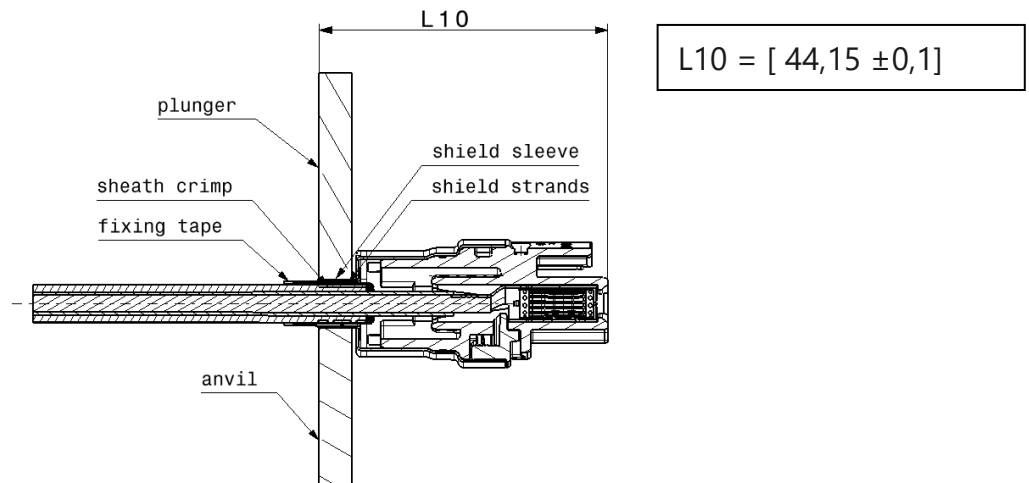
3.9.1. Shield pressing by two half-shells

- **Embossing position:**

The exact geometry of the plunger and anvil is given.

The position of the plunger and the anvil has to be referenced to the front plane of the terminal holder.

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

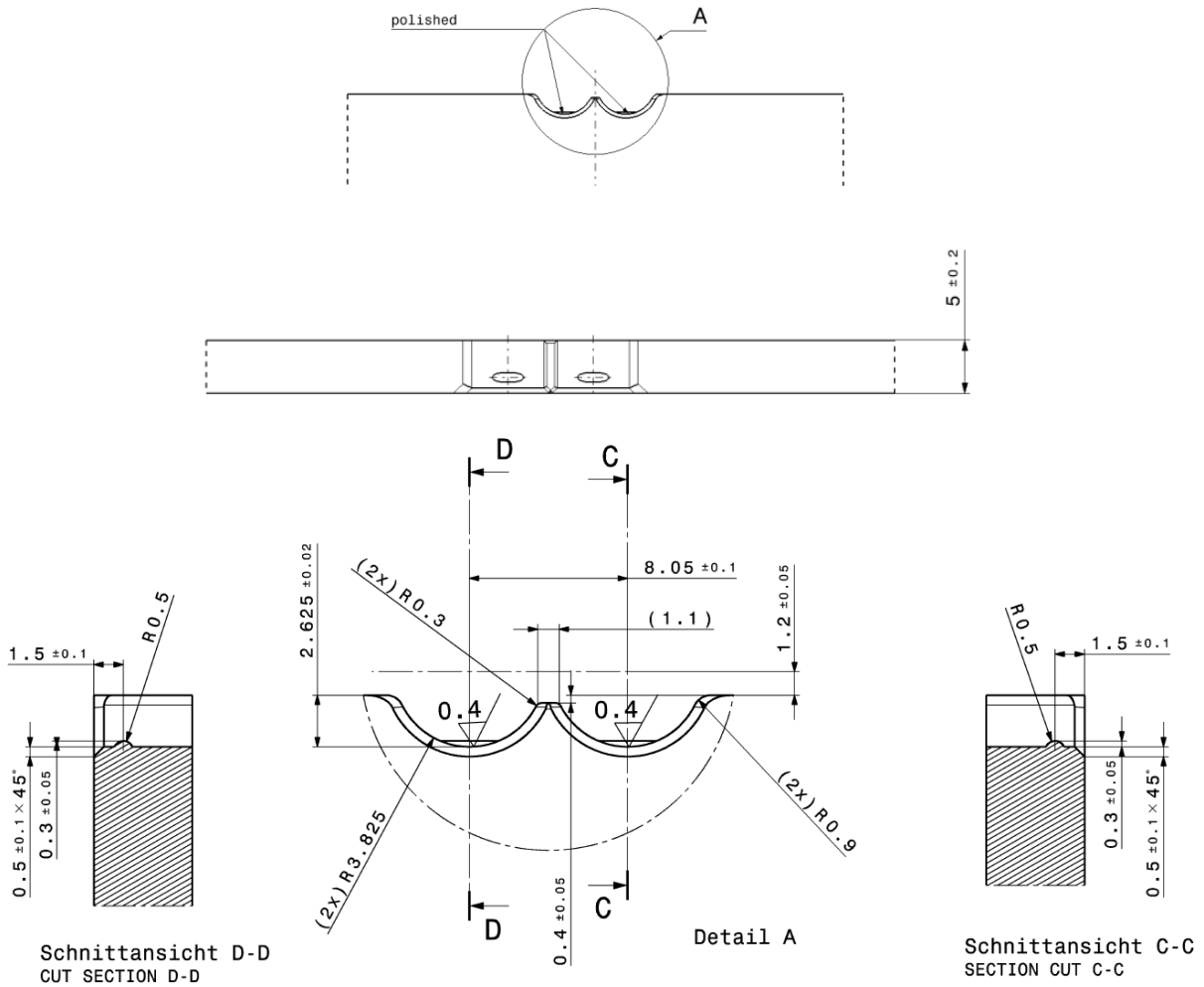


The chamfer on both anvil and plunger must face towards the shield-sleeve.



Plunger and anvil geometry of the wire shield pressing

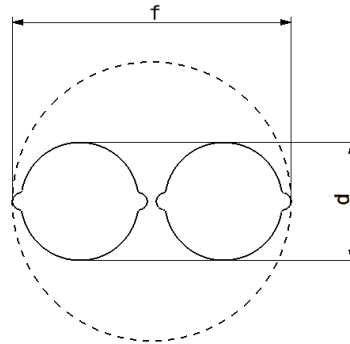
Plunger and anvil geometry of the wire shield pressing
 Material: 1.2721 vacuum hardened 58hrc





- Embossing height:**

The plunger and anvil are pressed together to 0.2mm clearance. Due to this the dimension **d** will be given. See table of each cross section.



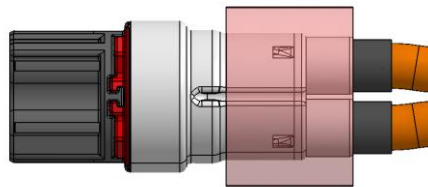
	Dimension d in mm
Leoni	6.15 ± 0.1
Kroschu	
Coroplast	
Force	
Judd	
Huber & Suhner	
Coficab	
Sumitomo	
Wire manufacturer	
	Wire cross section (structure of conductor)

During the pressing process a fold appears on two sides.
This fold is not allowed to be bigger than the diameter $\varnothing f = 17.2$ (17.1 ± 0.1) refer to the centerline of the connector.

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 **17.2** mm has to be used.
The diameter f has to be respected within the entire highlighted area:



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 page 38).

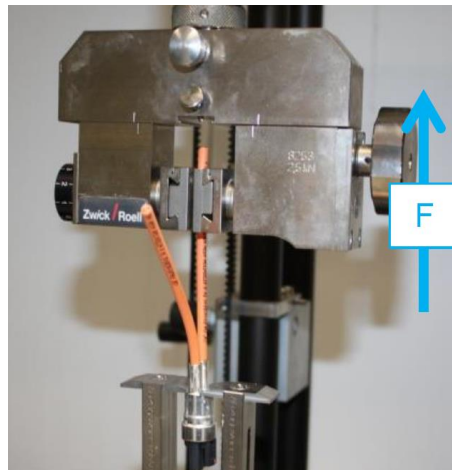
The measuring of the embossing height, has to be done with a suitable measuring device.



- **Pulling force of the wire**

In order to measure the pull-out force, the wire shall be clamped firmly into a clamping device. The distance between the clamping position of the wire and the shield sleeve shall be 70mm. The connector must be fixated on the shield sleeve at the transition between the small and large sleeves.

3,0mm ²	≥ 150N
4,0mm ²	≥ 150N
5,0mm ²	≥ 150N
6,0mm ²	≥ 150N
Wire cross section (structure of conductor)	Pulling force



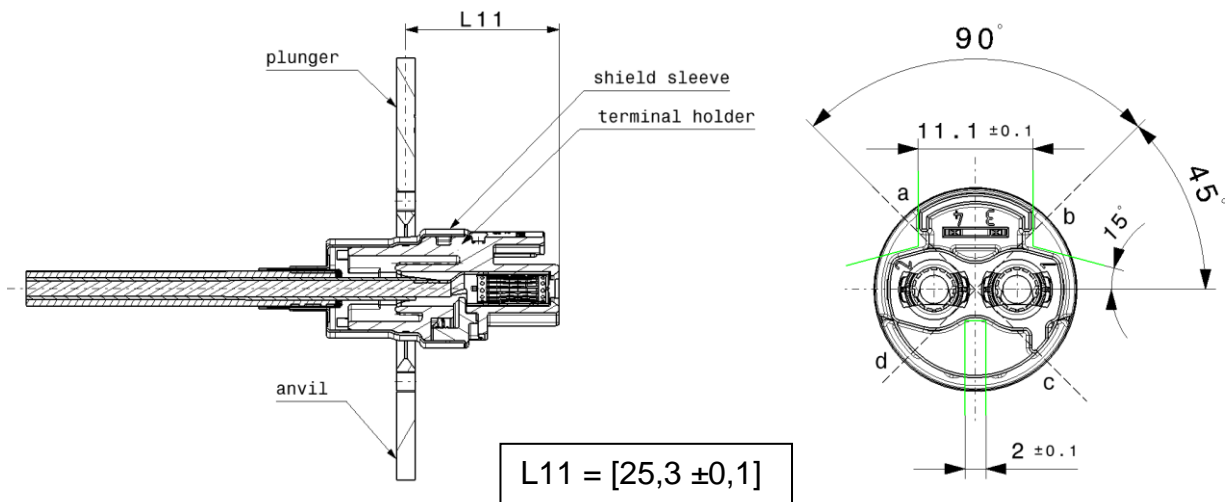
HCT4 terminals must not be installed in the test specimens, in order to test the shield pressing only.

In this state, the figure in the table must be reached.

The single wires have to be tested individually.

3.9.2. Pressing terminal holder

- **Embossing position:**



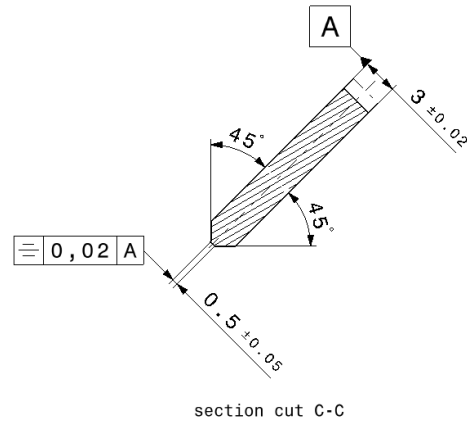
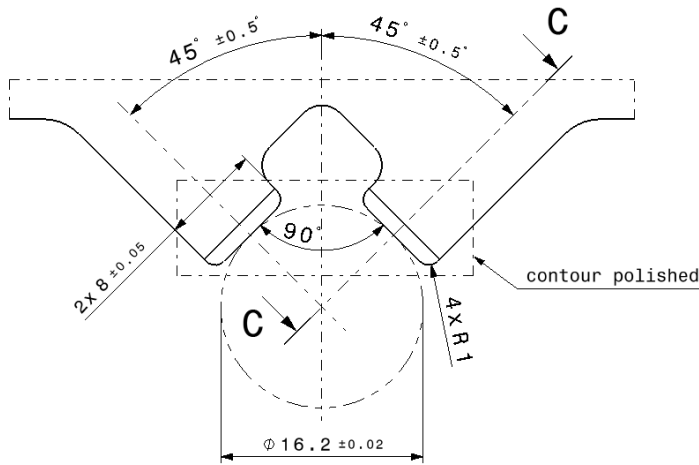
The dimension L11 describes the position of the pressing.

The position of the plunger and the anvil has to be aligned in relation to the front plane of the terminal holder.

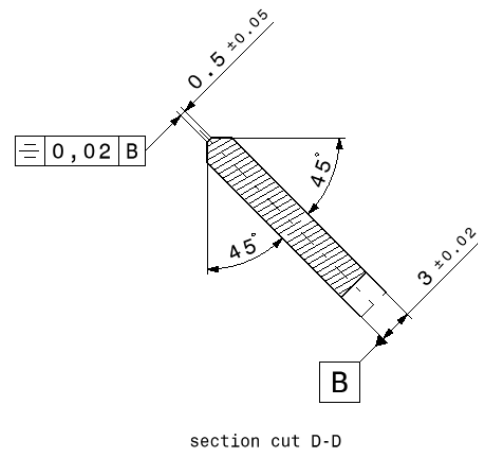
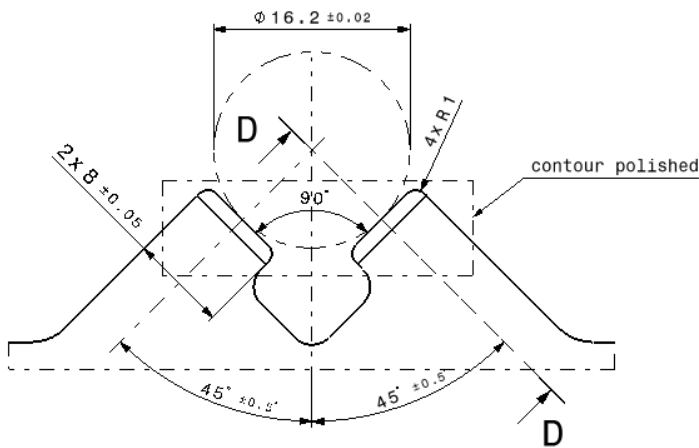
The four embossing positions (a-d) must be aligned in relation to the terminal holder. Therefore the terminal holder must be secured against rotation. The green areas can be used as a jack for the terminal holder.

The exact geometry of the plunger and anvil is given.

- Geometry of the plunger and the anvil pressing on the terminal holder**



Plunger geometry of the terminal holder pressing.
 Material: 1.2721 vacuum hardened 58hrc



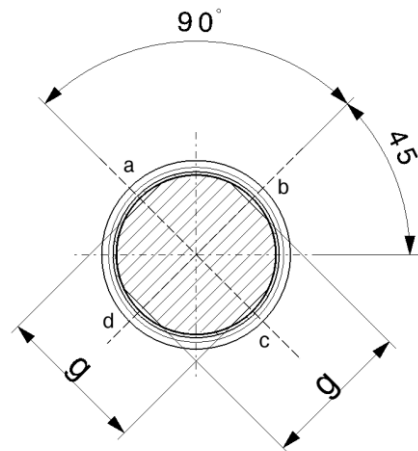
Anvil geometry of the terminal holder pressing
 Material: 1.2721 vacuum hardened 58hrc

- **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.

dimension g = 16,40 mm ± 0,1



- **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.

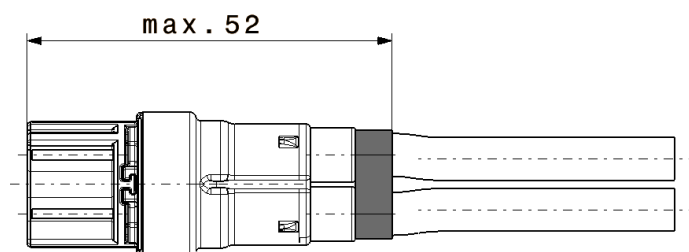
The thickness of the measuring blades must be lower than 0,6mm.



3.10. Taping of the wires (optional)

To ensure that the welding of the shield-sleeve is not damaged after step 3.9, the two wires have to be taped together. In this specification the PET- fabric tape 837X (838X) 5mm of the company Coroplast is used.

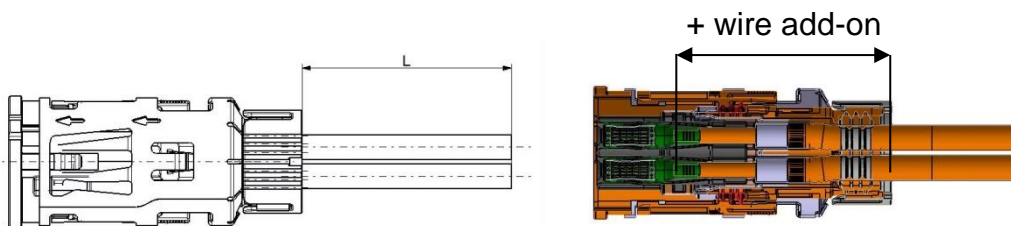
It is possible to use another product to fix the wires. The product must have min. 150°C thermal resistance.



This process step can be skipped if it is ensured that the wires are not pulled apart in a different way.

4. Processing steps 6,0mm²

4.1. Cut the shielded cable



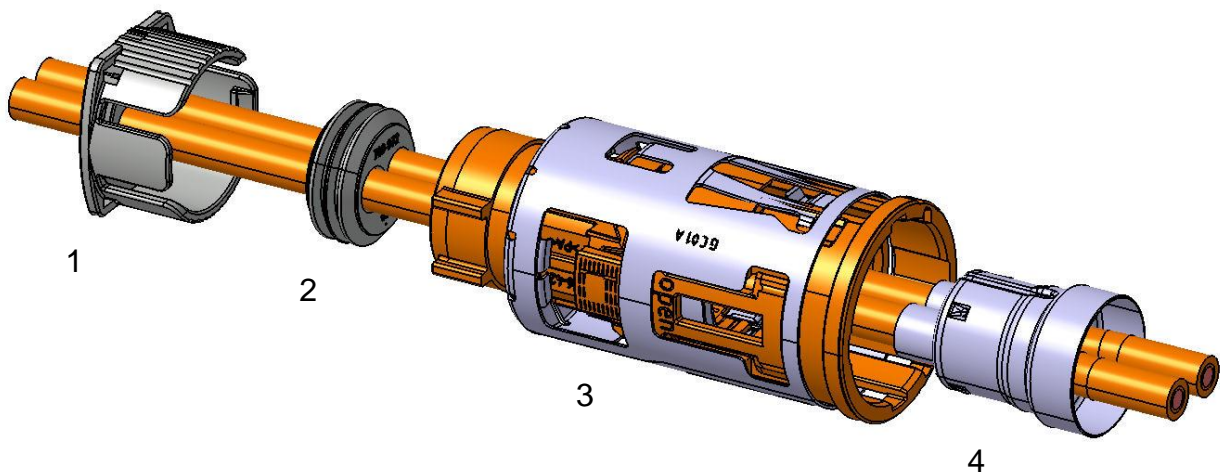
Add the following lengths for the Hirschmann HPS40-2 female connector:

6,0mm ²	L + 50	L + 54
Wire cross section (construction of conductor)	Dimension L after zero-cut (mm)	Dimension L for the Hirschmann HCT4 terminal incl. zero-cut (mm)

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

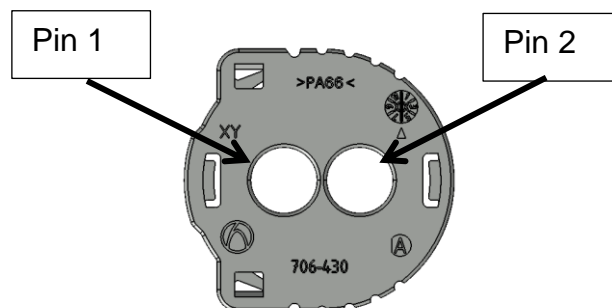
4.2. Assembly

Slide the cover cap (1), the seal (2), the female locking device unit (3) and the shielding sleeve (4) onto the shielded cables. Seal, locking device and shielding sleeve can be assembled either way.



Note: The locking device unit (3) and shielding sleeve (4) may as well be assembled onto the cable after step 4.5 (crimping of HCT4-female terminals).

If the cover cap (1) 706-430-502 or 706-430-504 is used, pay attention to the pinning, as it can not be rotated afterwards:



4.3. Strip of the shielded cables

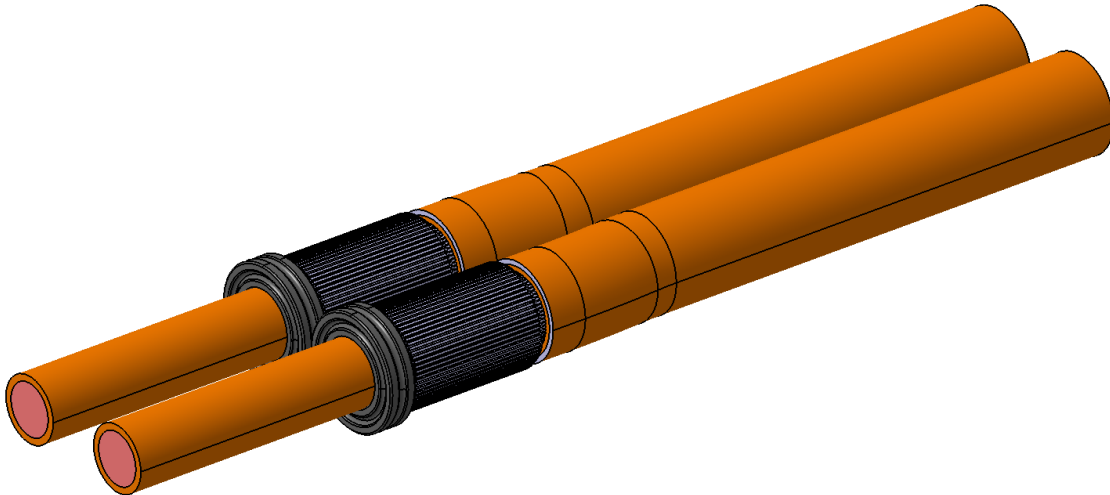
- Stripping length



6,0mm ² Al	29,5±1	33,5±1
6,0mm ² Cu	30,5±1	34,5±1
Wire (cross section)	Dimension L1 after zero-cut (mm)	Dimension L1 for the Hirschmann HCT4 terminal incl. zero-cut (mm)

- Do not damage the shielding during the processing operation.

4.4. Assemble strain-relief (6,0mm²)



6,0mm²

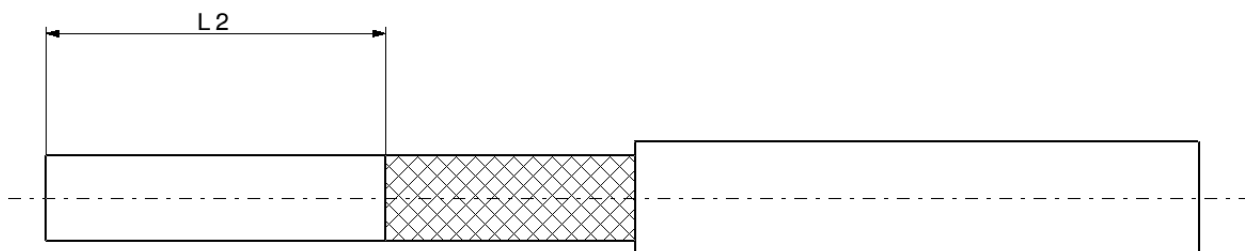
The following process steps have to be done, but the manufacturer can choose the sequence:

- Assemble the strain-relief
- Remove the foil (max. 1mm revolving or single edges \leq 3mm)
- Shorten the shielding.

In this processing specification, the recommended sequence is shown.

Process sequence

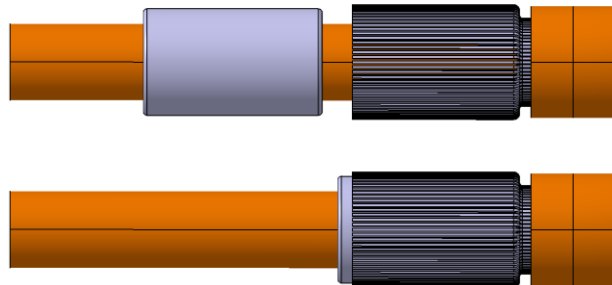
a) The shielding needs to be cut



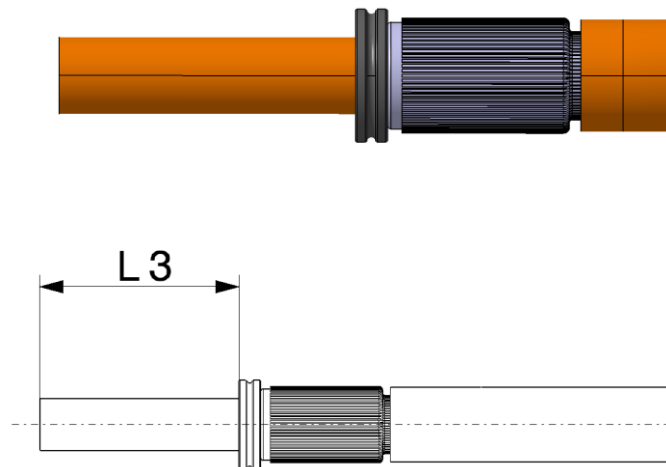
6,0mm ² Al	21,6±1	25,6±1
6,0mm ² Cu	22,6±1	26,6±1
Wire (cross section)	Dimension L2 after zero-cut (mm)	Dimension L2 for the Hirschmann HCT4 terminal incl. zero-cut (mm)

- After cutting the shielding, there are no wire residues or parts of the shielding allowed on the cable. This has to be ensured with actions like the following:
 - removing the residues of the shielding
 - blowing out or by suction of the residues of the shielding

b) Shielding needs to be spread slightly, strain-relief has to be assembled



c) Strain-relief needs to be fixed in place with X-ring
 The assembly of the strain-relief and fixture with X-ring can be done in one step.

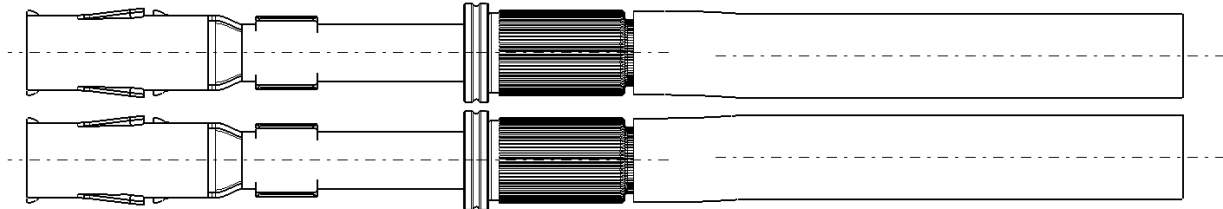


6,0mm ² Al	(18,2)	(22,2)
6,0mm ² Cu	(19,2)	(23,2)
Wire (cross section)	Dimension L3 after zero-cut (mm)	Dimension L3 for the Hirschmann HCT4 terminal incl. zero-cut (mm)

- L3 ensures the correct position of the strain-relief
- The strain-relief shall be assembled so it will block on the final position
- The X-ring shall be assembled so it will block on the strain-relief
- Do not damage the single wires during the complete processing operation



4.5. Crimp the HCT4 female terminal



- **Double stroke crimping machine**

For the positioning and the crimping process of the HCT4 female terminals, the crimping machine of the company "Schaefer" can be used:

Name of the device: HPS40-2 Double stroke crimping machine
Order number: EPS2001-HPS40-2

Name of the device: Interchangeable crimping unit
Article number: Shown in the process specification HCT4 female terminal „EVS-100068“

The individual details referring to commissioning, handling and process description of the device can be requested directly at the supplier:

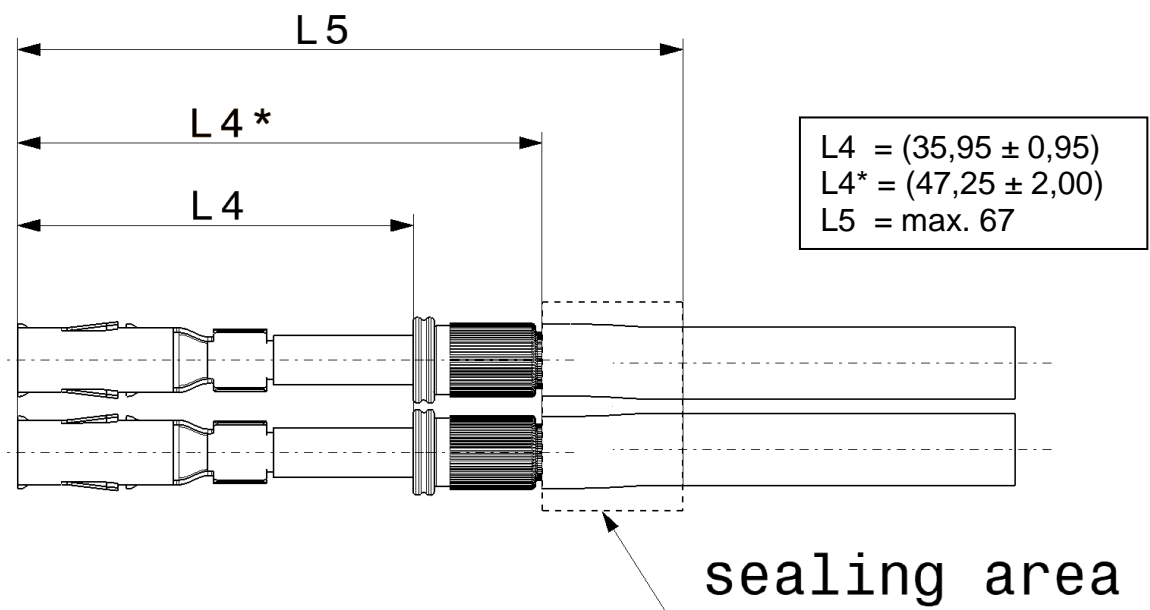
Schaefer Werkzeug- und Sondermaschinenbau GmbH
Dr.-Alfred-Weckesser-Str. 6
76669 Bad Schoenborn-La, Deutschland
Tel: +49 7253 9421-0
Fax: +49 7253 9421-94
www.schaefer.biz

The commissioning of the crimping device has to be done through the manufacturer.

In this edition you can only find the information of the crimping and positioning of the crimping process.

Process data

- d) The crimp data can be seen in the „Process specification HCT4 female terminal EVS-100068“.
- e) The HCT4 female terminals need to be crimped in relation to the single wires. For a smooth assembly into the terminal holder, the terminals need to be crimped in the correct position. The dimensions on the following drawing need to be adhered to.
- f) If aluminium conductors are used, special processing steps apply, please get in terminal with Hirschmann Automotive GmbH directly.



The dimension L4 and L5 are just for information. The dimension is caused by the dimensions L1, L3 and the EVS-100068.

If agreed to by the OEM, either L3, L4* or L4 has to be proven, since they are correlating.

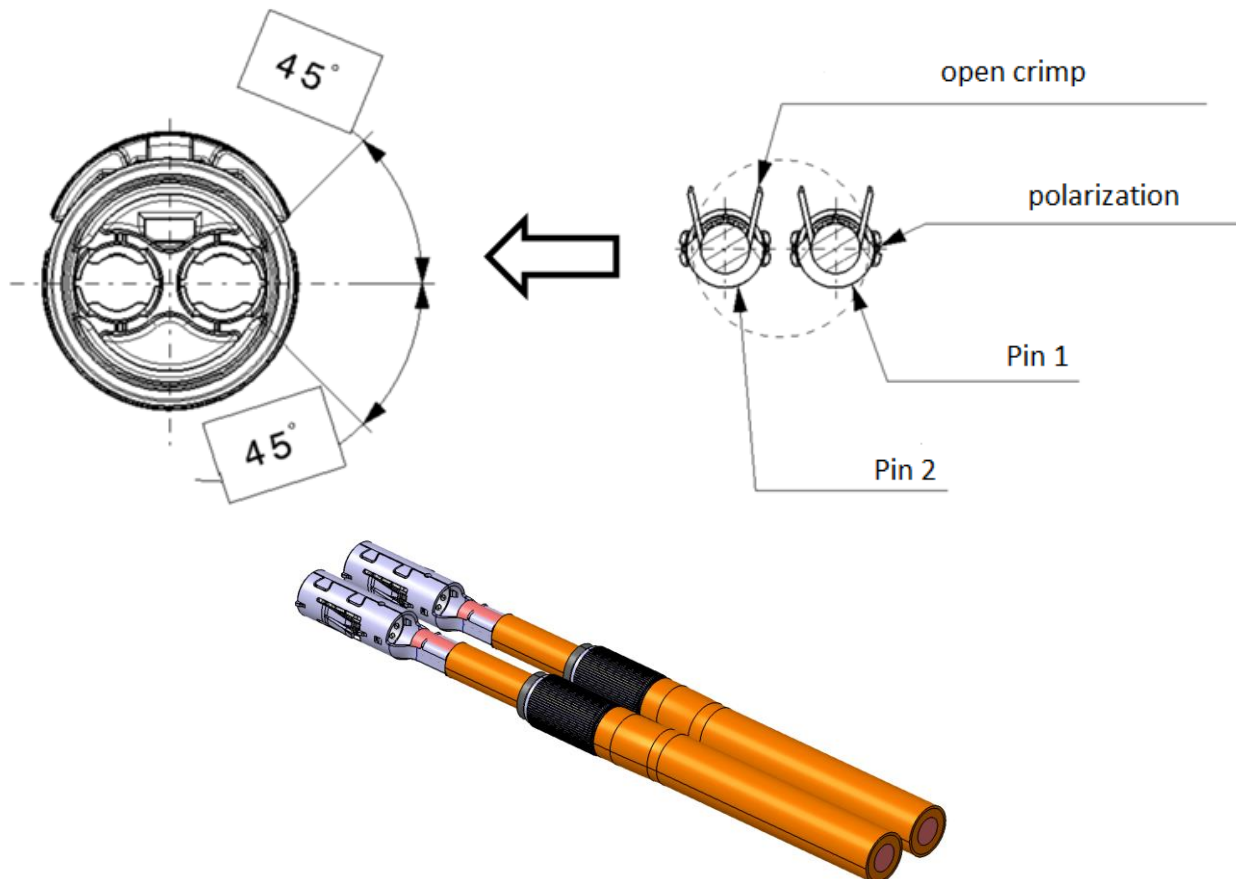
A mark on the insulation of the single wires or on the outer sheath which is caused due to fixing the wire at the crimping process is allowed. It must be ensured that the insulation will not be damaged because this will lead to an insulation resistance failure.

At the area of the wire seal it is not allowed to deform or damage the outer sheath which has negative influence to the sealing function.



angled insert catches
female contact holder HPS40-2

nominal position of the
terminals to the cable



To do an orderly assembly / 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.

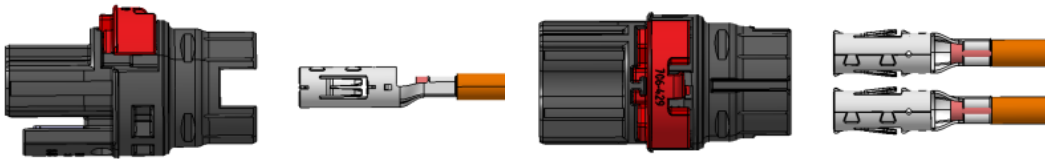
The allowed angle deviation results from the geometry of the angled insert catches on the female terminal holder and the max. assembly force of the cable with the terminals into the terminal holder.

This can be checked during the assembly process. (See chapter 4.7 Assembly female terminals into the terminal holder)

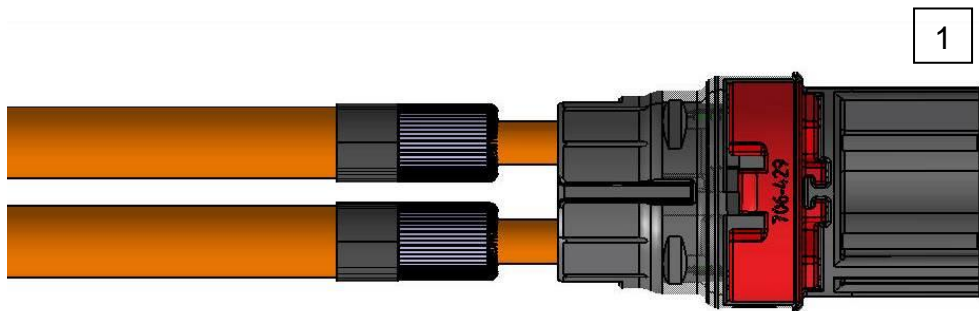
Note: As described in chapter 4.2, the locking device unit and shielding sleeve may as well be assembled onto the cable after step 4.6 (crimping of HCT4-female terminals).

4.6. Assembly

- Assemble female terminals into the terminal holder (1).



When two wires with the same colour are used, the pinning has to be confirmed via electrical testing.



PIN 1 → + / PIN 2 → -

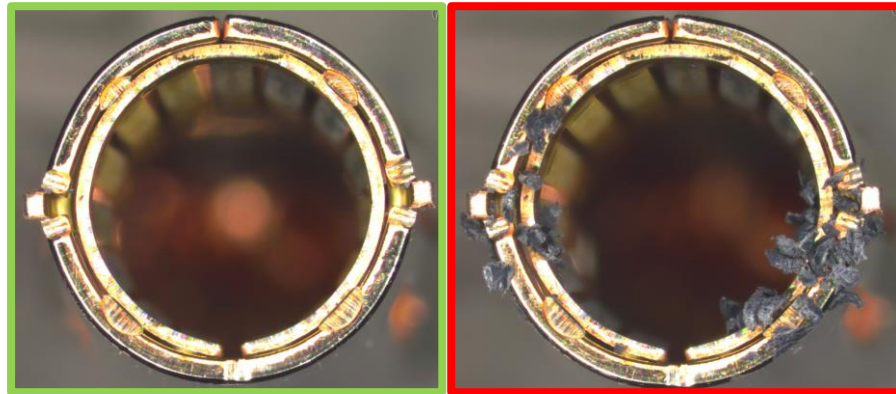
While assembling the HCT4 female terminals, the locking lance of the HCT4 female terminals will be deflected. Once the end position is reached, the latching lance will audibly engage, and the female terminals will be primary locked.

If the terminal is assembled wrong, this can cause a plastic burr inside the chamber and the terminal. The terminal holders and terminals must be checked:



These terminal holders may no longer be used and have to be scrapped!

The terminals must be checked for plastic burrs and be cleaned before further assembly. If cleaning does not remove all residual plastic, the terminals must be scrapped!



OK

NOK



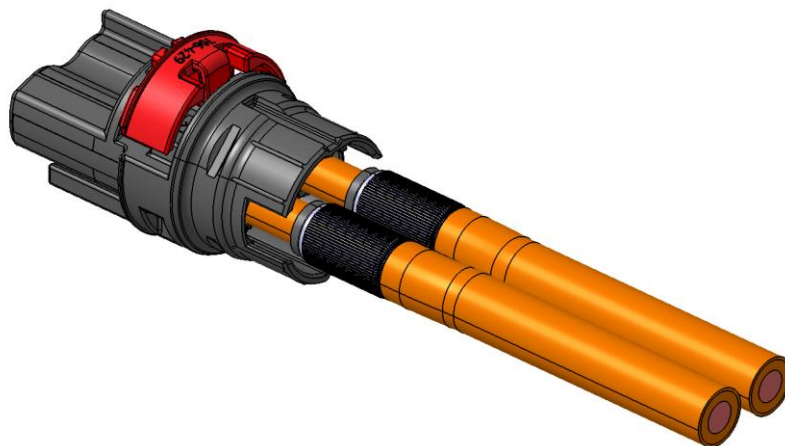
Leoni	FHLR2GCB2G 6,0/0,31/T180/ 600V AC / 1000V DC
	36 N
Kroschu	FHLR2GCB2G 6.00 QMM/0.21/T180 600/1000V OR
	36 N
Coroplast	FHLR2GCB2G 6,0mm ² / 0,21 T180 0,6/1,0 kV
	36 N
Coficab	FHLR91XCB91X T4 6,0mm ²
	36 N
Gebauer & Griller	FHLALR2GCB2G 1X6,0(0,40)/T180
	TBD
Wire Manufacturer	6,0mm²
	Wire Cross-Section

The female terminals have to be crimped (Cu)

If aluminum conductors are used, special processing steps apply; please get in terminal with Hirschmann Automotive GmbH directly.

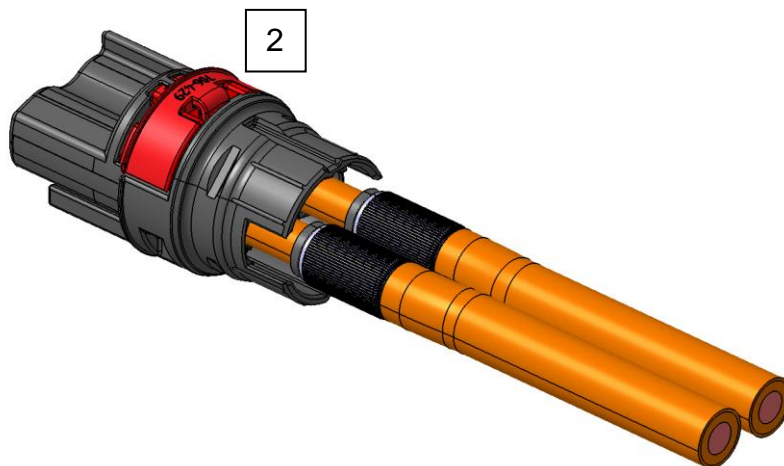
For automatic assembly of the HCT4 terminals into the terminal holder, either force- or distance surveillance must be proven.

Sec. lock pre-locking / HV terminals primary locked

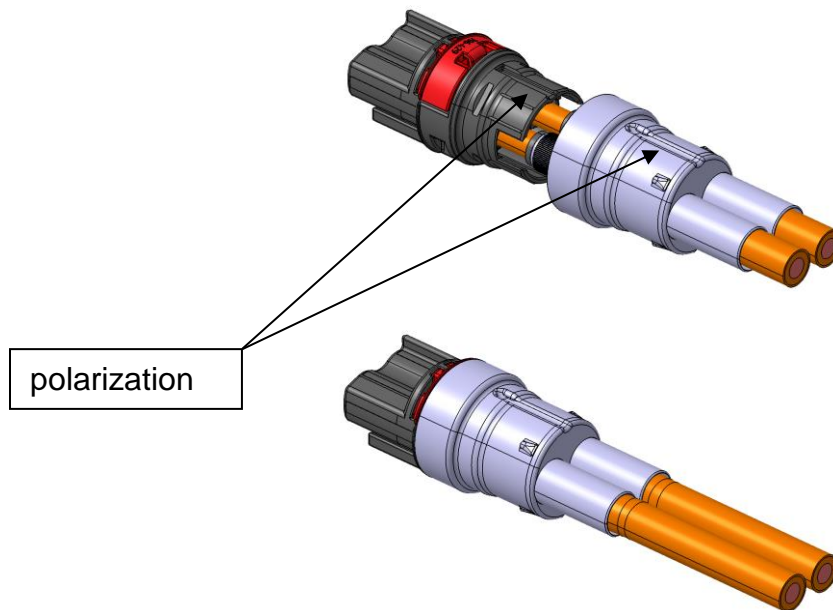


Assemble secondary locking (2)

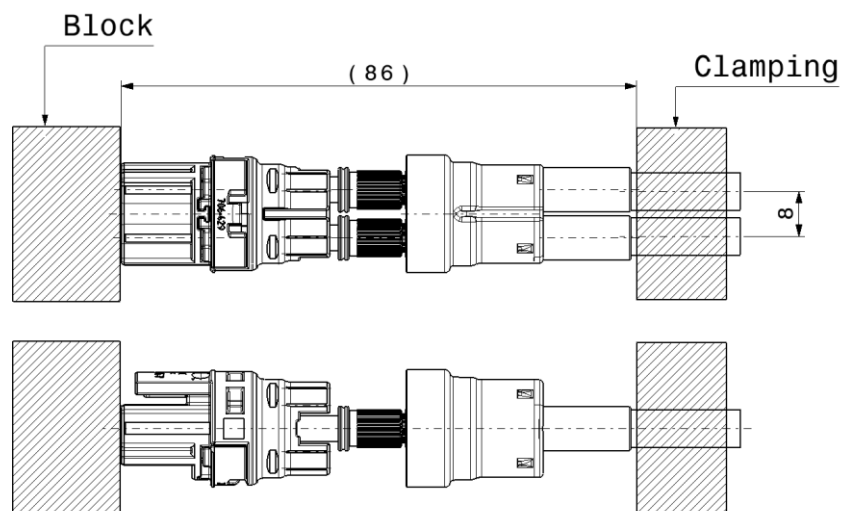
The secondary locking can only be assembled if the terminals are in the end position. A visible difference of the terminals to each other can be possible in the terminal cavity. Because of the position of the terminals on the wire, and the clearance of the terminals in the terminal cavity it is possible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



4.7. Push shielding sleeve onto terminal holder

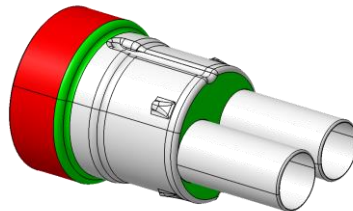


- The wires shall be
 - Stretched (10-40N/cable), to ensure axial alignment
 - Clamped, so that the wires cannot be dislocated or damaged during the assembly of the shield sleeve. The position of the clamping is shown below:

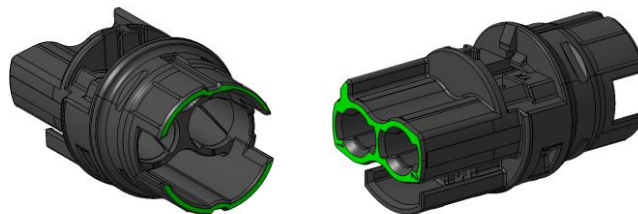


The axis of the wire, the shield-sleeve and the contact carrier shall be aligned.

Shield sleeve:



- Green: Permitted areas to apply axial force (max. 80N)
- Red: Contact area, no damage / scratches etc. permitted



Terminal carrier:

- Green: Permitted areas to apply axial force (max. 80N)

Neither the wire nor any other component may be damaged by the clamping process.

- The maximum velocity for the assembly of the shield sleeve shall be 500mm/min. If a greater value is used, the harness maker takes responsibility for the results.
- The shielding sleeve has to be assembled until the blocking position is reached.
- 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



4.8. Press shield sleeve

- **Pressing device**

For the process of positioning and pressing of the strain-relief and the shielding sleeve, the following pressing device of the company Schaefer can be used:

Name: Pressing device HPS40-2 SCC
Article number: EPS3000-HPS40-2

The details of the commissioning, handling and the process guideline of the device can be requested directly at the supplier:

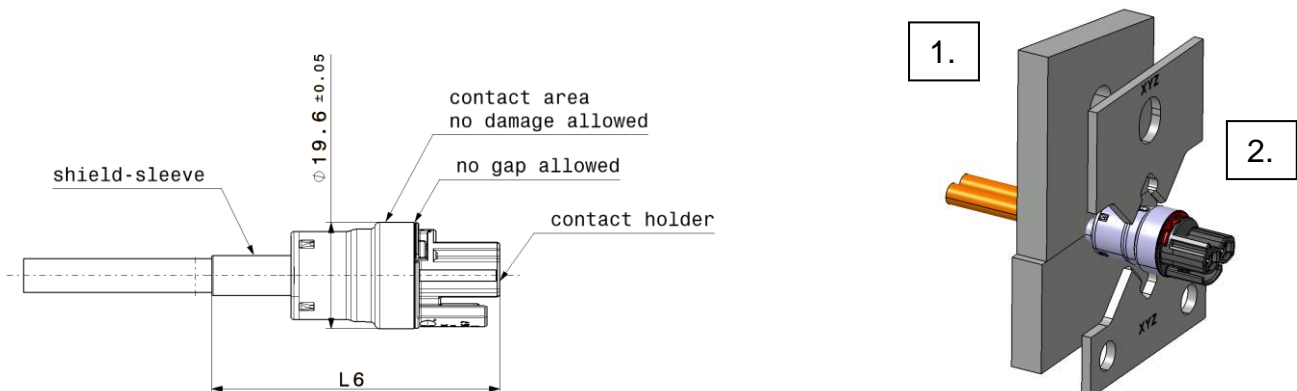
Schaefer Werkzeug- und Sondermaschinenbau GmbH
Dr.-Alfred-Weckesser-Str. 6
76669 Bad Schoenborn-La, Deutschland
Tel: +49 7253 9421-0
Fax: +49 7253 9421-94
www.schaefer.biz

The commissioning of the pressing device has to be done through the manufacturer.

In this edition you can only find the information of the pressing data of the pressing.

- **Pressing data**

- f) The terminal holder incl. the female terminals have to be put into the device in the correct position.
- g) Make sure, the shielding sleeve is on the end position of the terminal holder.
- h) The circularity of the shielding sleeve in the terminal area has to be ensured.
- i) The measurements on the following drawing have to be adhered to, before and after pressing.
- j) Two pressing actions will be done in one step
 - i. Shield pressing (shielding sleeve, shielding, strain-relief and wire)
 - ii. Pressing of the terminal holder (shielding sleeve and terminal holder)



The dimension L6 is just for information. The dimension is caused 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
- Strain-relief
- Shield sleeve
- Shield strands of the wire

$L6 = [53,2 \pm 0,25]$

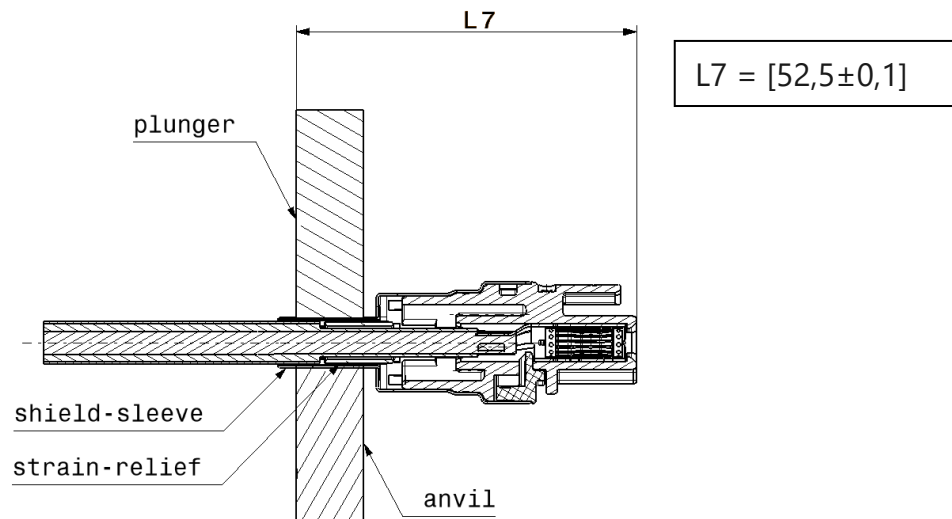
4.8.1. Shield pressing by two half-shells

- **Embossing position:**

The exact geometry of the plunger and anvil is given.

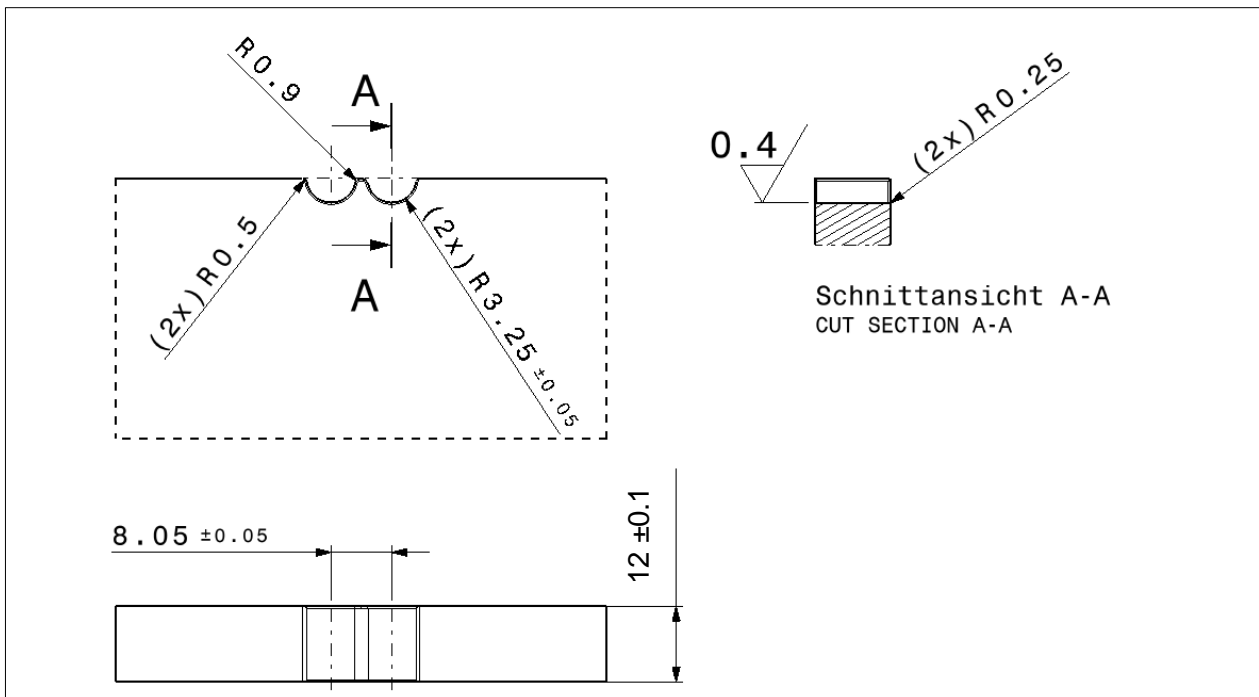
The position of the plunger and the anvil has to be referred to the front plane of the terminal holder.

The dimension L7 is the position of the plunger and the anvil.



Plunger and anvil geometry of the wire shield pressing

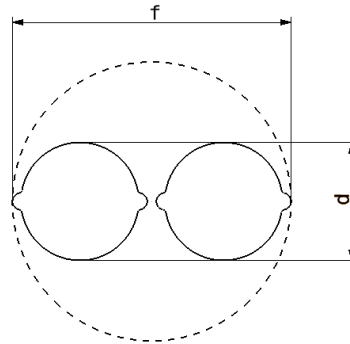
Plunger and anvil geometry of the wire shield pressing
Material: 1.2721 vacuum hardened 58hrc





- Embossing height:**

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



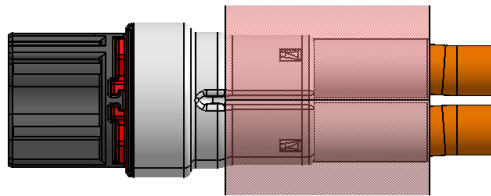
	Dimension d in mm
Leoni	6.8 ± 0.1
Kroschu	
Coroplast	
Force	
Judd	
Huber & Suhner	
Coficab	
Sumitomo	
Wire manufacturer	
	Wire cross section (structure of conductor)

During the pressing process a fold appears on two sides.
This fold is not allowed to be bigger than the diameter $\varnothing f = 16,9$ refer to the centerline of the connector.

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 **16,9** mm has to be used.
The diameter f has to be respected within the entire highlighted area:



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 page 64).

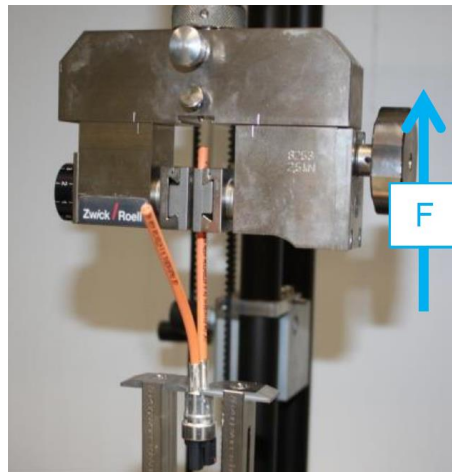
The measuring of the embossing height, has to be done with a suitable measuring device.



- Pulling force of the wire**

In order 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 shield sleeve shall be 70mm. The connector must be fixated on the shield sleeve at the transition between the small and large sleeves.

3,0mm ²	≥ 150N
4,0mm ²	≥ 150N
5,0mm ²	≥ 150N
6,0mm ²	≥ 150N
Wire cross section (structure of conductor)	Pulling force



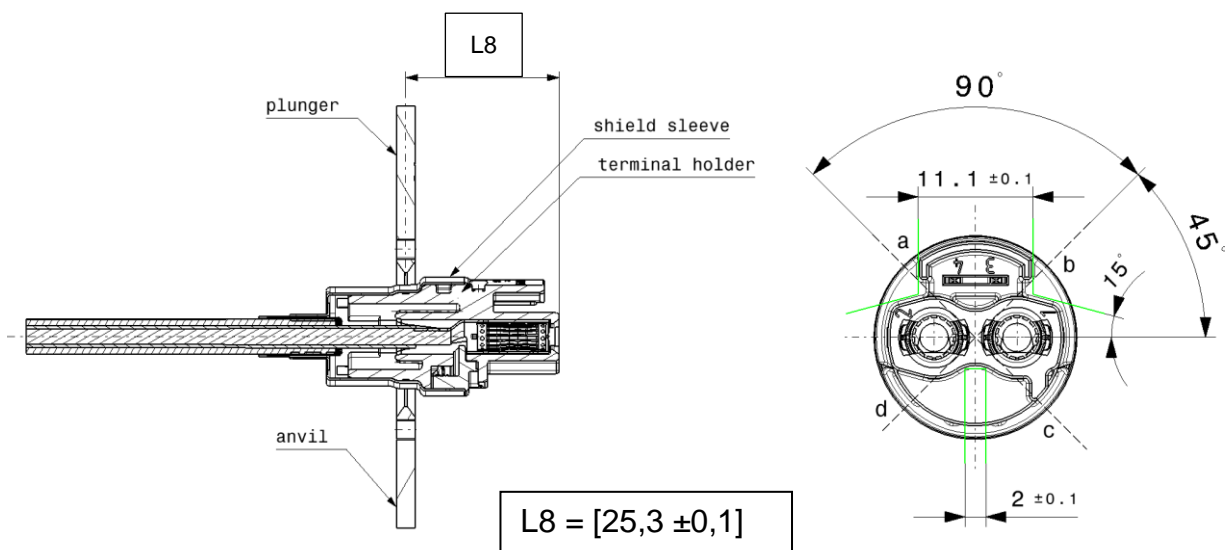
HCT4 terminals must not be installed in the test specimens, in order to test the shield pressing only.

In this state, the figure in the table must be reached.

The single wires have to be tested individually.

4.8.2. Pressing terminal holder

- **Embossing position:**



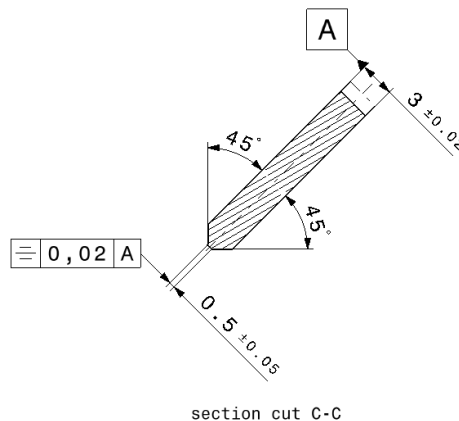
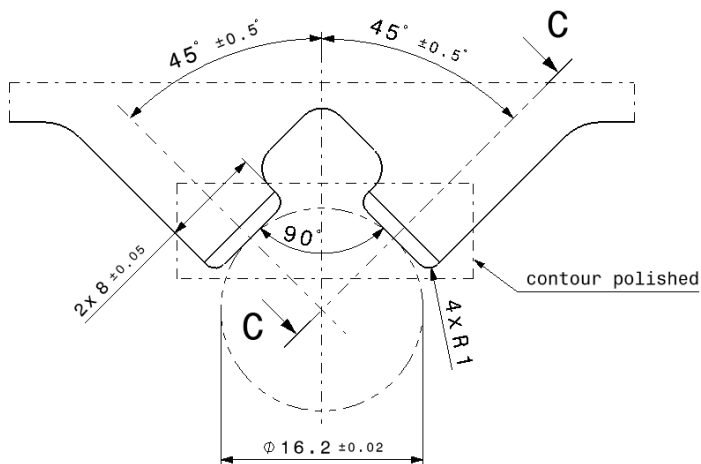
The dimension L8 describes the position of the pressing.

The position of the plunger and the anvil has to be aligned in relation to the front plane of the terminal holder.

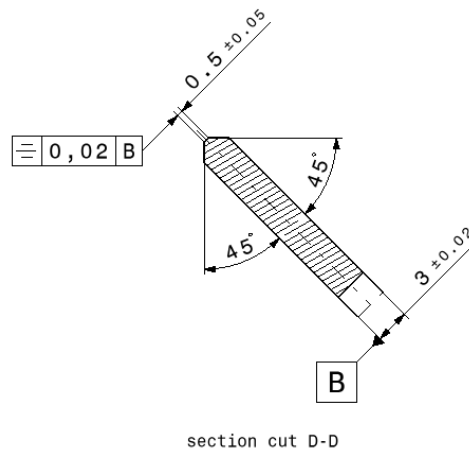
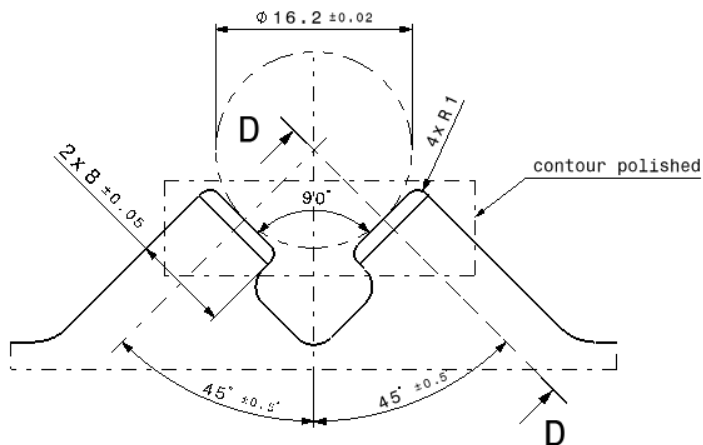
The four embossing positions (a-d) must be aligned in relation to the terminal holder. Therefore the terminal holder must be secured against rotation. The green areas can be used as a jack for the terminal holder.

The exact geometry of the plunger and anvil is given.

- Geometry of the plunger and the anvil pressing on the terminal holder**



Plunger geometry of the terminal holder pressing.
 Material: 1.2721 vacuum hardened 58hrc



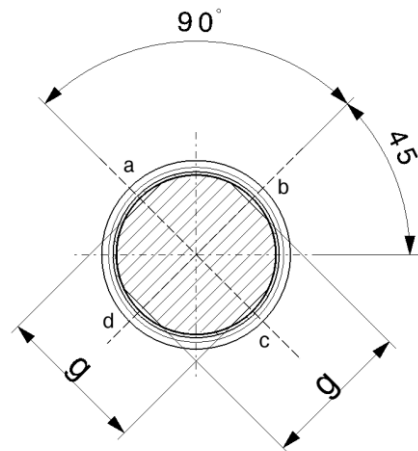
Anvil geometry of the terminal holder pressing
 Material: 1.2721 vacuum hardened 58hrc

- **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.

dimension g = 16,40 mm ± 0,1



- **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. The thickness of the measuring blades must be lower than 0,6mm.



5. Completion steps 3,0mm², 4,0mm², 5,0mm², 6,0mm²

5.1. Positioning of the female locking device unit

The female locking device unit has to be assembled power assisted, and in the correct position.



For the positioning and the assembly process of the female locking device unit onto the wire unit, the assembly device (Hand device) of the company WKM can be used.

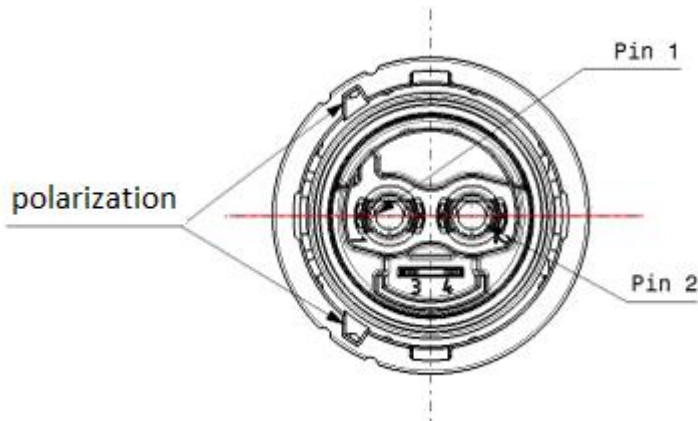
Name: Assembly device HPS40-2
Article number: HPS40-2

The details of the commissioning, handling and the process guideline of the device can be requested directly at the supplier:
Each manufacturer is responsible of the commissioning of the pressing device.

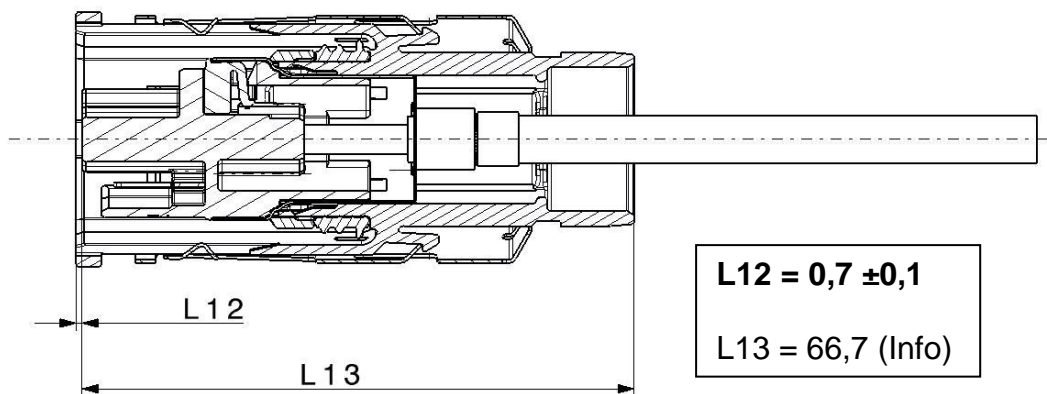
WKM - Maschinenbau GmbH
Oberes Ried 15
A-6833 Klaus
Tel. +43 5523 / 54907

The commissioning of the pressing device has to be done through the manufacturer.

In this edition you can only find the assembly data of the pressing process.



- The terminal holder incl. the shield sleeve need to be assembled into the locking device unit in the correct position.
Both polarizations need to be symmetric 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.

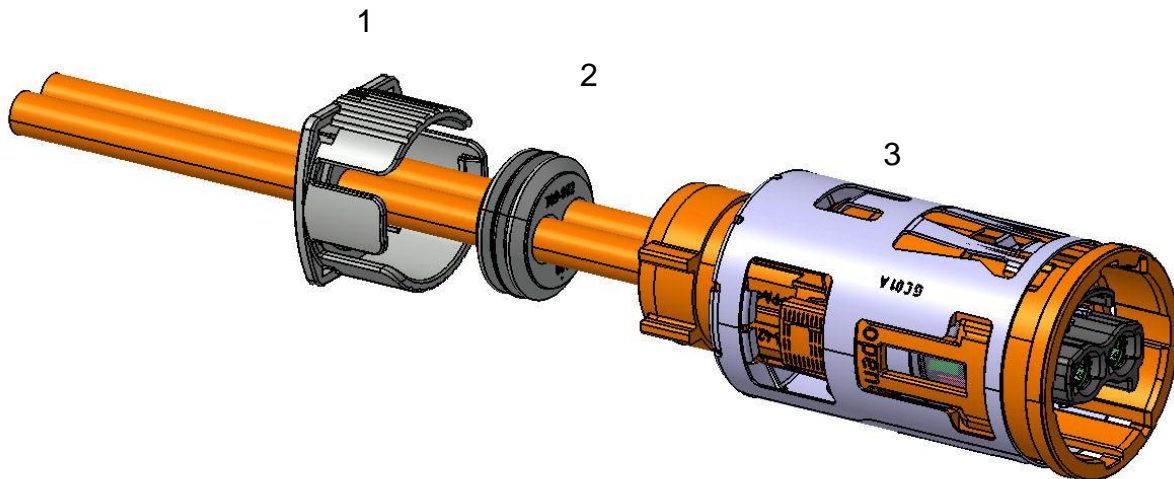


- The locking sleeve must be assembled onto the shield sleeve force-assisted until the dimension L12 is reached. The reference on the terminal holder is in the middle between PIN 1 and PIN 2.

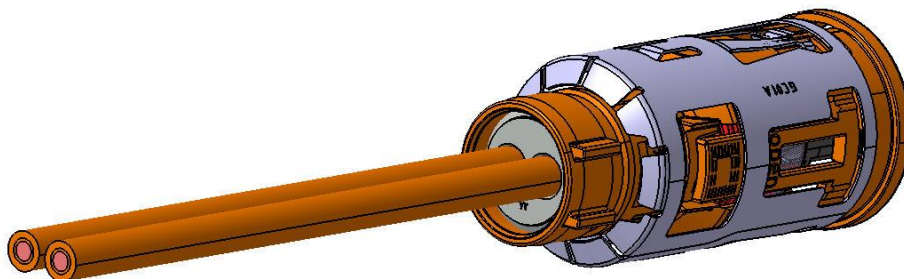
The dimension L13 is only for checking purposes.

- During the assembly process, there are no damages allowed on the shield sleeve, the terminal holder or the wire.
- There is no pull on the wire necessary.
Especially do not pull out the cable sheath out of the strain-relief.

5.2. Assemble seal and cover cap



- Push seal [2] into the female locking device unit [3]



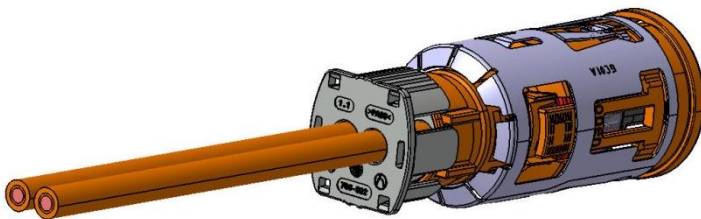
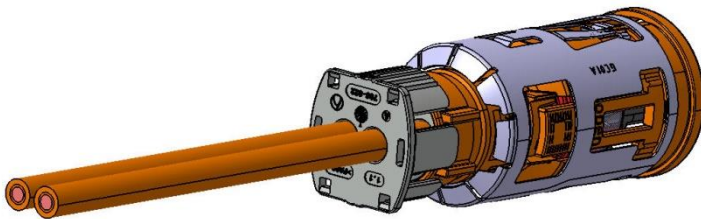
The cable seal can be slightly widened during assembly.

It is possible to move the seal with the cover cap on the wire but care must be taken that the seal does not twist and is not pinched or damaged. If the cover cap locks properly, the correct position of the seal is given, no additional pushing is required.

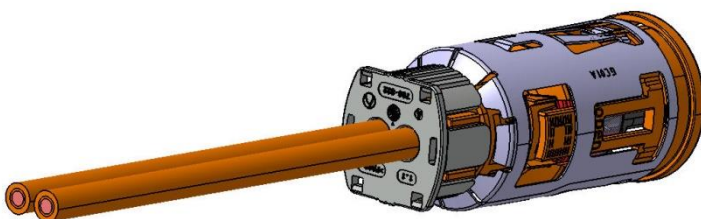
The seal is lubricated, no additional lubricants are permitted.

It is necessary to coordinate with the respective OEM whether a final inspection ensures the correct and damage-free installation of the seal.

- Snap the cover cap [1] into the recess of the female locking device unit [3].
The cap can be assembled either way, as it is 180° symmetrical.



Cover cap on end position

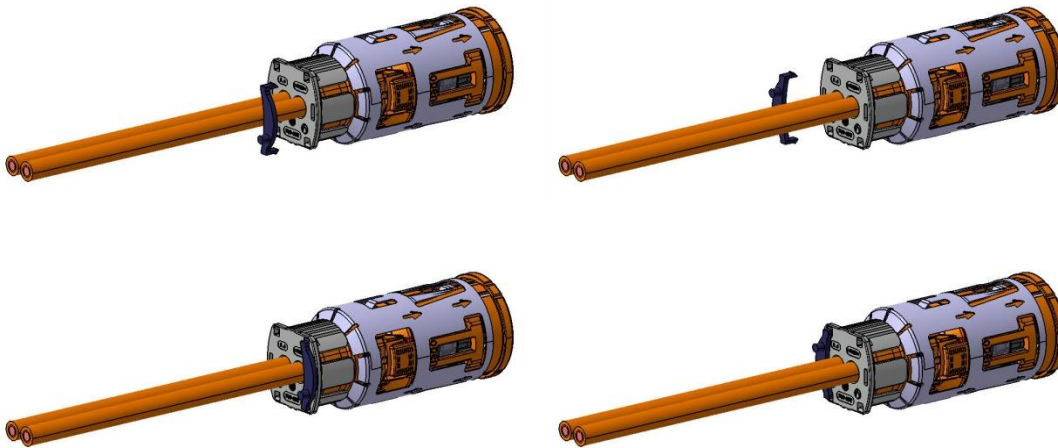


- Do not damage the cover cap (1) or the seal (2) during assembly.

5.3. Assemble coding clip (optional)

Depending if a coding clip is requested by the customer, a coding clip can be assembled onto the cover cap. Since it can be assembled in two positions, this has to be clarified with the customer.

The coding clip has the same colour as the terminal holder, and is used for a simpler identification of the plugs coding.



Ensure that the coding / color of the coding clip matches the coding / color of the built-in terminal holder. Therefore 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.

5.4. Stacking of produced harnesses

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

5.5. 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 > 1000µm allowed.

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

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

5.6. 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.

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

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

concept of automation HPS40-2

5.7. General requirements

Damage on the single components is not allowed during the whole production process.