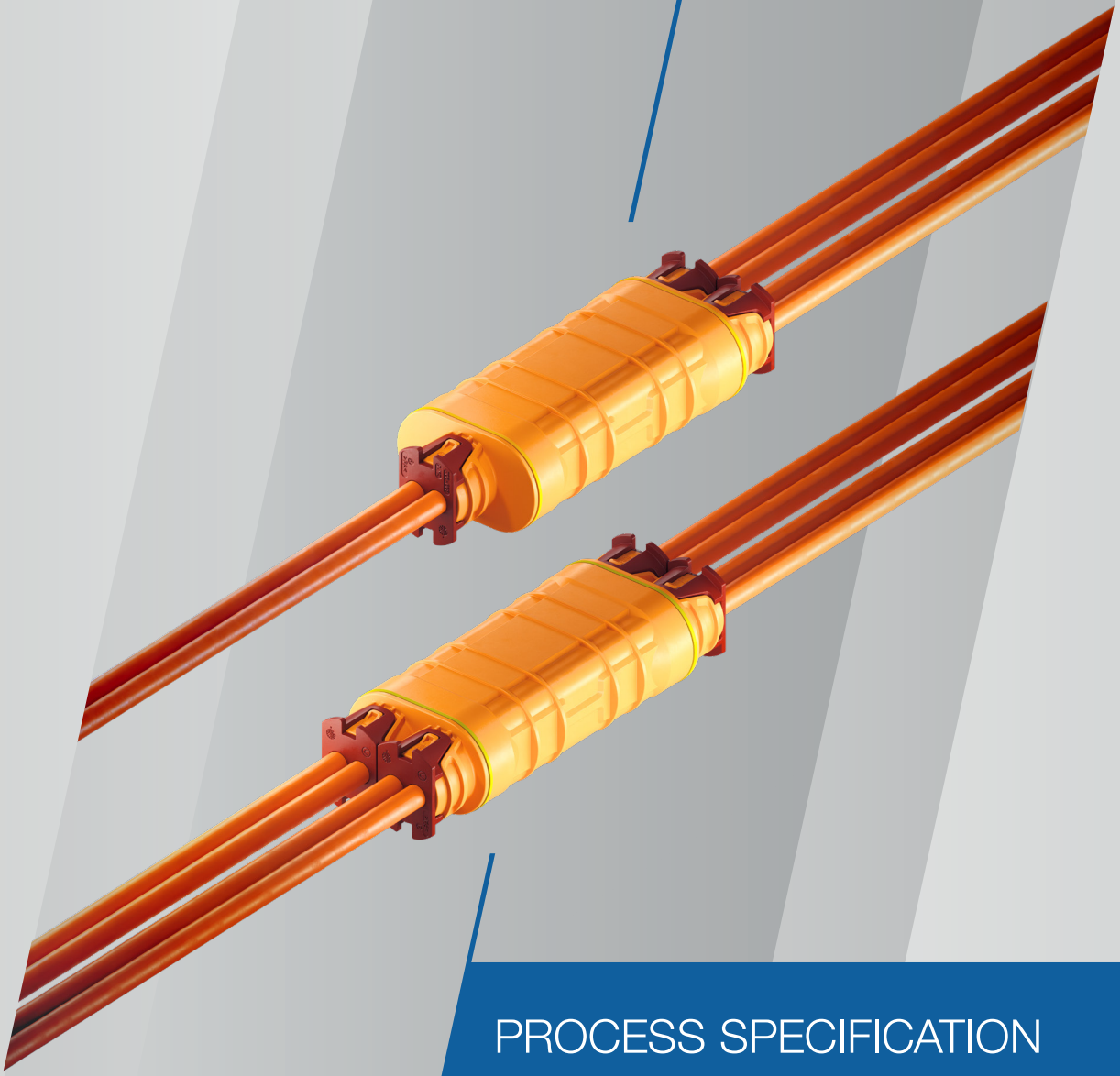


PROCESS SPECIFICATION

HPS Y/H Distributor SCC

EVS-100131

HIRSCHMANN
AUTOMOTIVE

TABLE

1 General

1.1 Introduction

This process specification is valid for all variants and describes the product structure as well as the assembly of the HPS Distributor-systems SCC.

System number	Type	Wire cross section	Remark
809-852-512	H	4.0 mm² 6.0 mm²	2x Input / 2x Output
809-852-511	Y		1x Input / 2x Output

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

1.2 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 10/ 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**
-	S1**	-	Retention force of welding (longitudinal)	Quality of welding	Tier 1
L1	-	-	N Height of shield-crimping	Strain-relief, electrical shield connection – EMC	
L2**	-	-	Retention force of shield-crimping	Strain-relief, electrical shield connection - EMC	

**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 OEM directly.

1.2.2 Customer: BMW

Customer: BMW BMW-Number.: 5 A37 9B9		NAEL:	E 2437 0 –VS06 E 1C44 A –VS08 E 3T36 A – S10 E 0M39 B –VS11 N OU53 B –VS12
Special characteristics according to GS 91011:2019-8			
L	**S**	**F**	**Characteristic**	**Specific Purpose**	**Place of implementation**
-	S1**	-	Retention force of welding (longitudinal)	Quality of welding	Tier 1
L1	-	-	N Height of shield-crimping	Strain-relief, electrical shield connection – EMC	
L2**	-	-	Retention force of shield-crimping	Strain-relief, electrical shield connection - EMC	

**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~~	~~Data sheet 1x 4.0 mm² shielded cable (T180) of Kroschu~~	~~Kroschu No.: 64998372~~
B	Data sheet 1x 6.0 mm² shielded cable (T180) of Kroschu	Kroschu No.: 64998762
C	Data sheet 1x 4.0 mm² shielded cable of Coroplast	Coroplast No.: 9-2611 (1x 4.0 mm²)
D	Data sheet 1x 6.0 mm² shielded cable of Coroplast	Coroplast No.: 9-2611 (1x 6.0 mm²)
E	Data sheet 1x 4.0 mm² shielded cable of Leoni	Leoni No.: FHLR2GCB2G 00003
F	Data sheet 1x 6.0 mm² shielded cable of Leoni	Leoni No.: FHLR2GCB2G 00004
G	Data sheet 1x 4.0 mm² shielded cable of Coficab	Coficab No.: FHLR91XCB91X T4
H	Data sheet 1x 6.0 mm² shielded cable of Coficab	Coficab No.: FHLR91XCB91X T4
I	Data sheet 1x 6.0 mm² shielded cable of Gebauer & Griller (Al)	G&G No.: FHLALR2GCB2G 1X6,0 (0,40)/T180
J	Data sheet 1x 4.0 mm² shielded cable of Gebauer & Griller (Cu)	G&G FHLR2GCB2G 1x4/ T180 OR
K	Data sheet 1x 6.0 mm² shielded cable of Gebauer & Griller (Cu)	G&G FHLR2GCB2G 1x4/ T180 OR

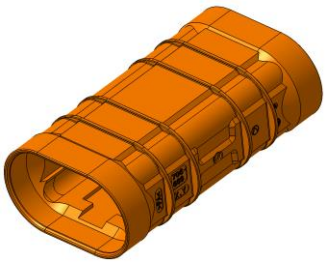
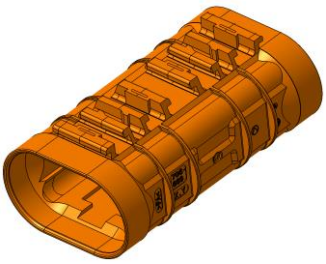
2 Product structure (single components)

2.1 Sheated cable (see table)

Wire manufacturer	Wire cross section	
	4.0 mm²	**6.0 mm²**
Kroschu	FHLR2G2GCB2G 600/ 1.000V T180	
	~~64998372~~	64998762
Leoni	FHLR2G2GCB2G 600/ 1.000V T180	
	00003	00004
Coroplast	FHLR2G2GCB2G 600/ 1.000V T180	
	9-2611 (1x 4.0 mm²)	9-2611 (1x 6.0 mm²)
Coficab	FHLR91XCB91X T4	
	FHLR91XCB9 1x 4.0 mm²	FHLR91XCB9 1x 6.0 mm²
Gebauer & Griller	FHL (AL)R2GCB2G	
	FHLR2GCB2G 1x4/ T180 OR	FHLALR2GCB2G 1x6.0 (0,42) / T180 OR (Al)
		FHLR2GCB2G 1x6.0 / T180 OR (Cu)

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

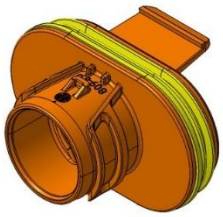
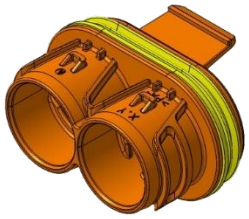
2.2 HPS Distributor shield housing

	
-501	-502

Hirschmann Automotive No.	Wire cross section	Product description
706-669-501	4.0 mm² 6.0 mm²	HPS Distributor shield housing neutral
706-669-502		HPS Distributor Shield housing locator element

Delivery condition: The HPS Distributor shield housings are delivered as bulk good.

2.3 HPS Distributor cable housing

	
-501	-502

Hirschmann Automotive No.	Wire cross Section	Product description
809-853-501	4.0 mm² 6.0 mm²	HPS Distributor cable housing ONE
809-853-502		HPS Distributor cable housing TWO

Delivery condition: The HPS Distributor cable housings are delivered as bulk good.

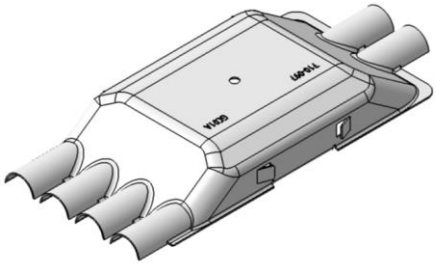
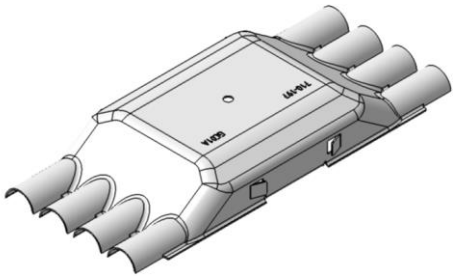
2.4 HPS Distributor insulator

	
-501	-502

Hirschmann Automotive No.	Wire cross section
706-671-501	4.0 mm² 6.0 mm²
706-671-502	

Delivery condition: The HPS Distributor insulators are delivered as bulk good.

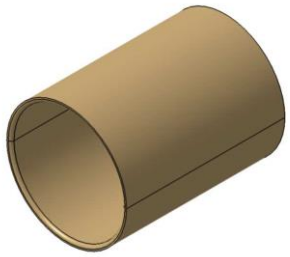
2.5 HPS Distributor shield

	
710-097-511	710-197-511

Hirschmann Automotive No.	Wire cross section
710-097-511	4.0 mm² 6.0 mm²
710-197-511	

Delivery condition: The HPS Distributor shields are delivered as bulk good.

2.6 HPS Distributor shield sleeve



-501

Hirschmann Automotive No.	Wire cross section
710-099-511	4.0 mm² 6.0 mm²

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

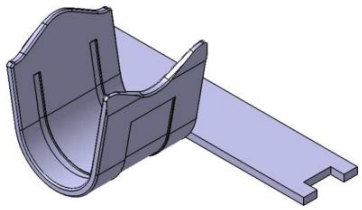
2.7 HPS Distributor X-Ring

-501

Hirschmann Automotive No.	Wire cross section
710-675-501	6.0 mm²

Delivery condition: The HPS Distributor x-rings are delivered as bulk good.

2.8 HPS Distributor ferrule crimp/ strain relief



710-195-502

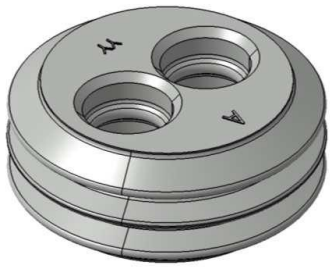
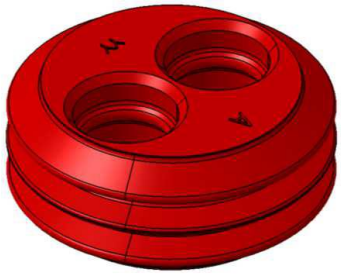
710-671-501

Hirschmann Automotive No.	Wire cross section	Procut description
710-671-501	6,0 mm²	Strain relief
710-195-502	4,0 mm²	Ferrule crimp

Information: On the product drawing Hirschmann Automotive no. 809-852-…00 you can find the released cables for each strain-relief.

Delivery condition: The HPS Distributor strain-reliefs and the ferrule crimp are delivered as bulk good.

2.9 HPS Distributor wire seal

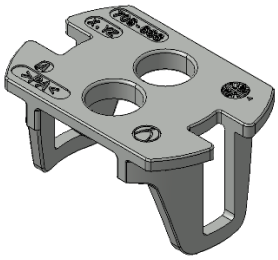
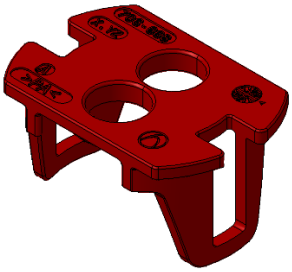
	
-502	-504

Hirschmann Automotive No.	Colour	Wire cross section
709-972-502	Grey	4.0 mm²
709-972-504	Red	6.0 mm²

Information: On the product drawing Hirschmann Automotive no. 809-852-…00 you can find the released cables for each seal.

Delivery condition: The HPS Distributor seals are delivered as bulk good.

2.10 HPS Distributor cap

	
-512	-513

Hirschmann Automotive No.	Colour	Wire cross section
706-668-512	Grey	4.0 mm²
706-668-513	Red	6.0 mm²

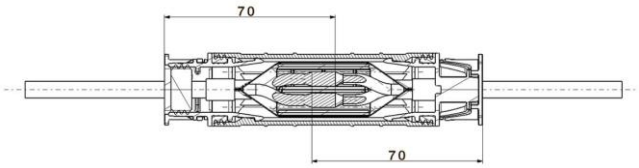
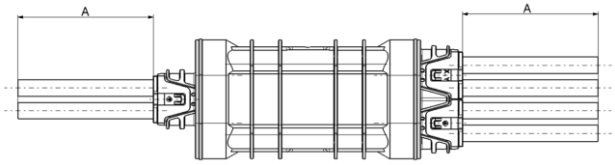
Information: On the product drawing Hirschmann Automotive no. 809-852-…00 you can find the released cables for cables for each cap.

Delivery condition: The HPS Distributor caps are delivered as bulk good.

3 Processing steps

The following process steps are valid for 4.0 mm² and 6.0 mm² wires. As reference sample, the version Y-Distributor with 6.0 mm² wire was chosen.

3.1 Cut the shielded cable

	+ wire add-on
	

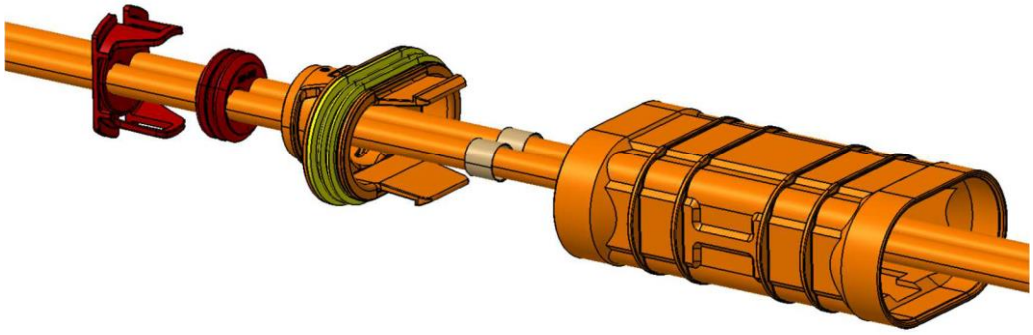
Wire add-on for the HPS Distributor:

Wire cross section	Dimension A (mm)
4.0 mm²	A + 70
6.0 mm²	

This length must be added to the planned length at the cutting process for each distributor side and is valid for Y- and H-Distributor systems.

3.2 Assembly of the single components

Preassemble Cap (1), wire-seal (2), cable housing (3), shield-sleeve (4) and shield housing (5) onto the cable. The shield housing can be assembled onto the side of the single output, or the side of the double output (Y-distributor), or on one of both sides of the double output (H-distributor).

1	2	3	4	5
				

3.3 Strip off the shielded cable

Stripping length:

Wire cross section	Dimension B (mm)
4.0 mm²	46.0 ± 1
6.0 mm²	53.5 ± 1

Do not damage the shielding during the processing operation.

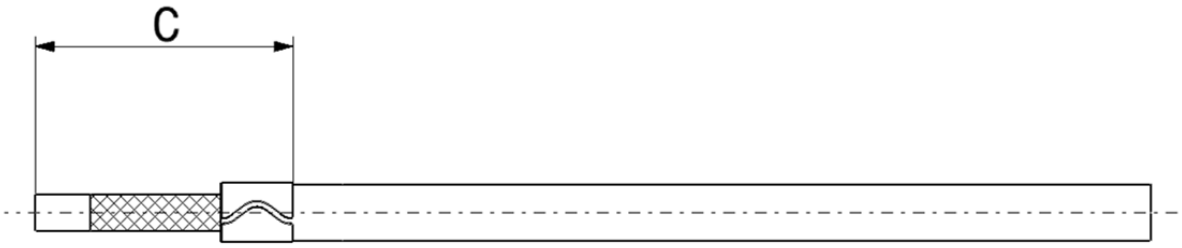
3.4 Crimp the shield sleeve

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

- Crimp the shield sleeve
- Remove the foil (max. 1 mm circumferential or ≤ 3.0 mm once)
- Shorten the shielding

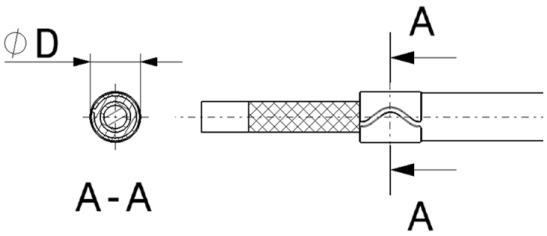
4.0 mm²

Shield sleeve must be crimped in accordance with the cable.



Wire cross section: 4.0 mm²	**Dimension C:** 53.5 ± 1

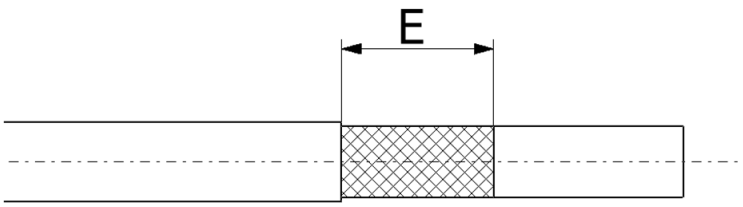
Die Messung von **ØD** hat in Crimp-Richtung zu erfolgen.



Wire cross section: 4.0 mm²	**ØD (mm):** 6.1 ± 0.1

An overlap of the foil in the area of the strain relief (small edges) is allowed.

Length of the shielding:



Depending on the production method of each manufacturer, the dimension “E” can vary.

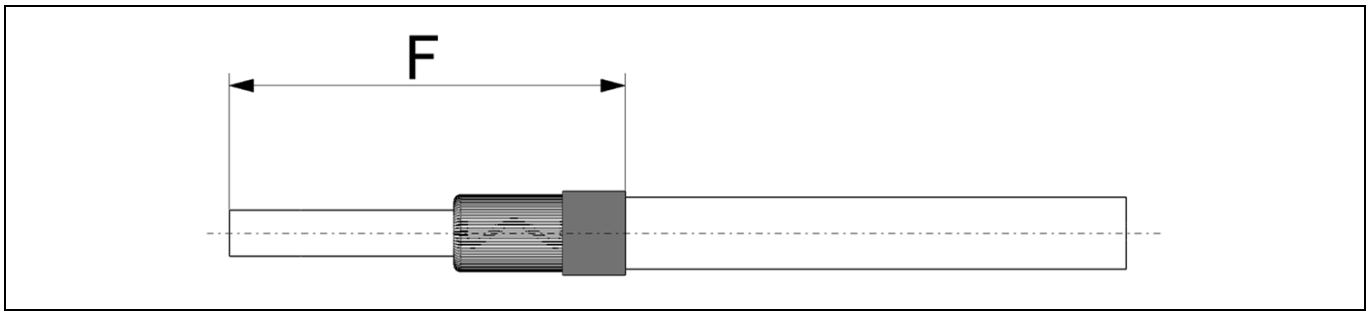
After cutting the shielding, there are no wire residues or parts of the shielding allowed on the cable. This must be ensured through the following actions such as:

- Prevention through removing the cut-off shielding.
- Prevention through blowing out or suction of residues of the shielding.

In the next processing step, ensure that 100% of the shielding is rising over the shield sleeve.

3.5 Wire processing I

Put shield back and tape the shielding.



Reverse 100% of the shielding backwards over the crimp ferrule. A targeted unbraiding of the shield is not necessary. Turning over the shield may result in a process related unbraiding. After this, the shield must be fixed with a device just behind the strain relief. (For example: tape) The fixing tape must hold the shielding in place until the pressing process of the shield sleeve is completed. Max. permitted width of the fixing tape is **5.0 mm**. The fixing tape needs to be positioned just after the crimp ferrule and cannot be over/on top of the crimp ferrule. The shielding may not protrude at the end of the tape. The max. position of the fixing tape is defined through the dimension **F.** max. 60.5 mm

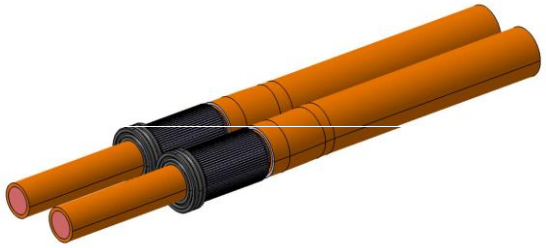
In this specification, the PET-fabric tape 837X (838X) 5mm of the manufacturer Coroplast is used. Another product to fix the shield can also be used if a max. outer Ø of 6.8 mm will not be exceeded and the shielding sleeve can be easily assembled. The product must have min. 150°C thermal resistance.

Single strands which cannot be fixed with the tape, which may protrude outwards or towards the front, must be removed before any further processing. Do not damage single wires during the complete processing operation.

3.6 Assemble strain relief

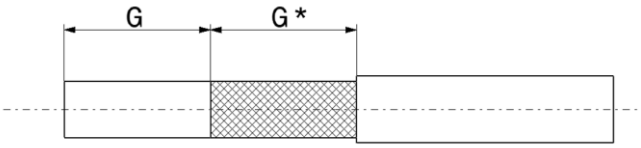
The following processing steps must be done, but the manufacturer can choose the sequence:

- Assemble the strain relief and the X-Ring
- Remove foil (max. 1.0 mm circumferentially or ≤ 3.0 mm once)
- Shorten the shielding



6.0 mm²

- **Processing steps**

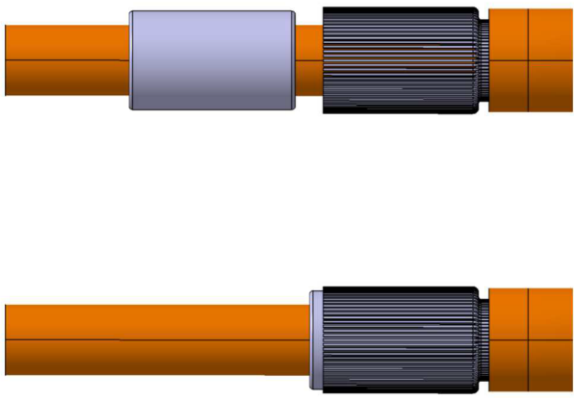
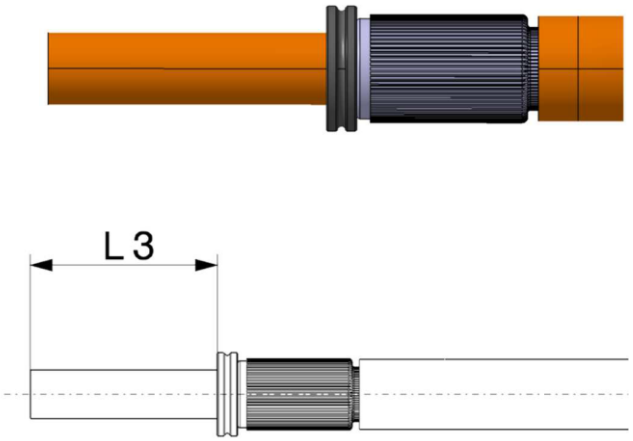
Shorten the shielding.		
		
Wire cross section: 6.0 mm²	**Dimension G** = 45.6 ± 1 mm	**Dimension G*** = B = G

After shortening the shielding, there are no wire residues or parts of the shielding allowed on the cable. This must be ensured through the following actions such as:

- Prevention through removing the cut-off shielding.
- Prevention through blowing out or suction of residues of the shielding.

The length of the shield strands and the uniform arrangement of the shield strands on the strain relief have a direct influence on the retention-force of the shield crimp and its stability.

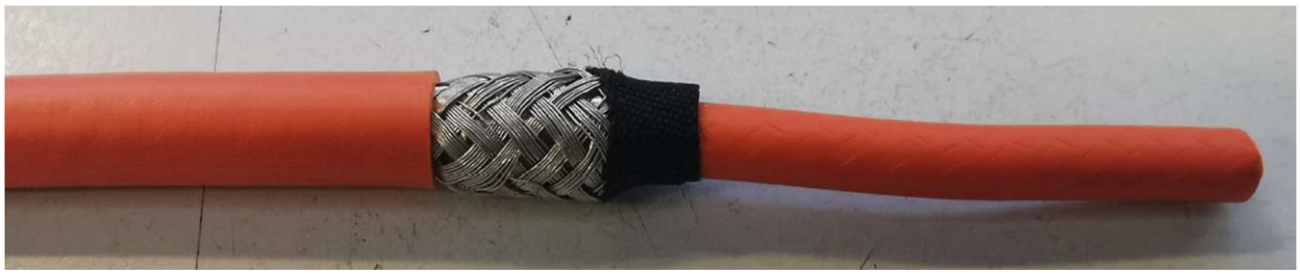
This can be improved through suitable measures, such as: Machine cutting of shielding

The shielding must be slightly widened, and the strain relief must be assembled.	The strain relief must be fixed using the x-ring. The strain relief and the x-ring can be assembled in one step.
	
Wire cross section: 6.0 mm²	**Dimension L3:** 42.2 ± 0.5

The dimension L3 shows the correct position on the strain relief. Don´t damage single wires during the complete processing operation.

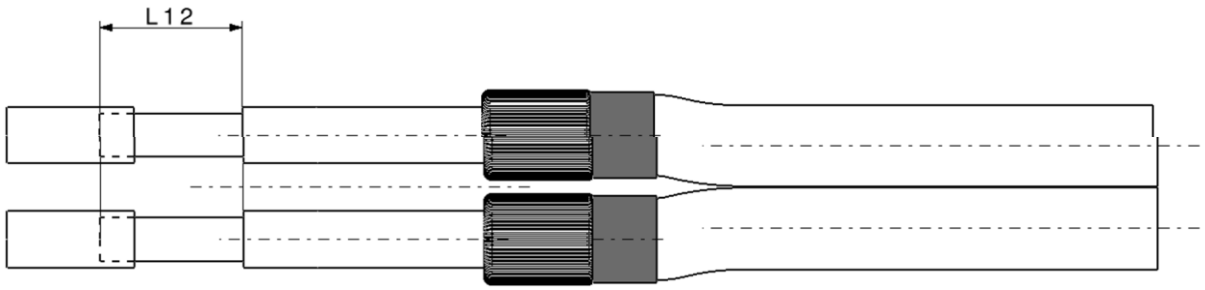
- **Processing step OPTIONAL**

For this optional processing step, the x-ring is not applicable and is instead replaced by taping the shielding strands. The tape must not reach over the strain-relief, loose strands are not permitted.



3.7 Wire processing I

It must be created a part strip on wires.

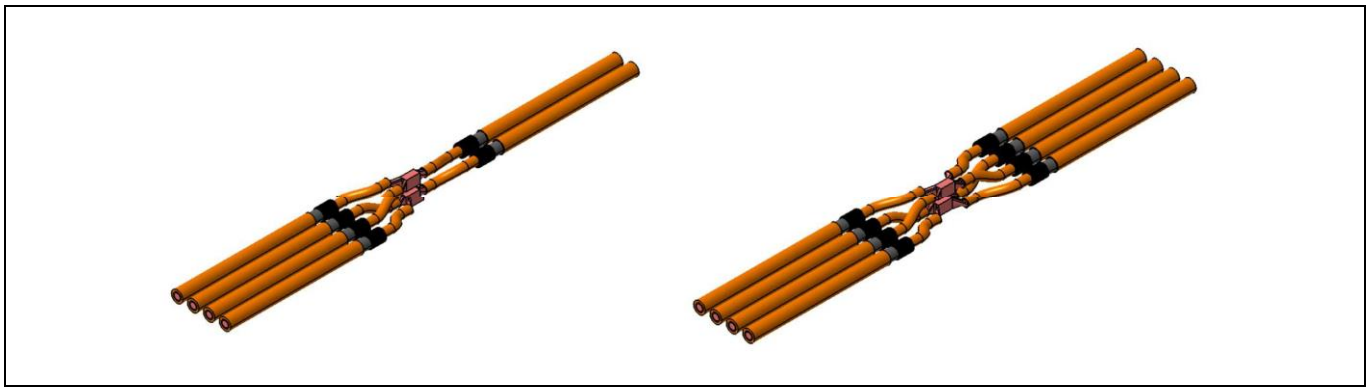


Wire cross section	Dimension L12 (mm)
6.0 mm²	16.0 ± 1
4.0 mm²	

The dimension L12 depends on the used Sonotrode of the ultrasonic welding process. The limitations must be considered.

The figures shown in the table are valued for a 13 mm sonotrode.

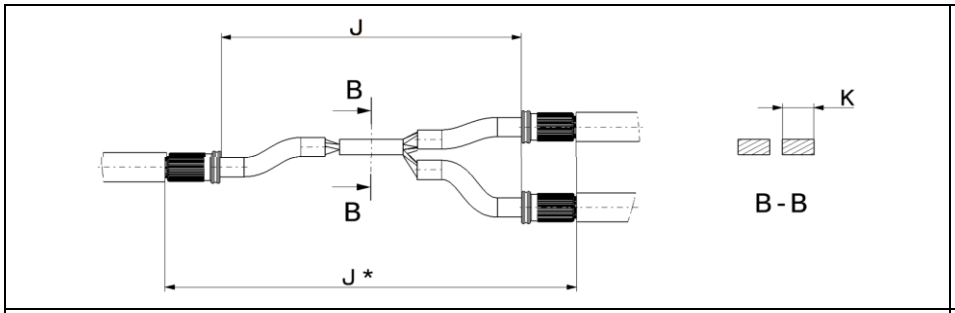
3.8 Welding-splice



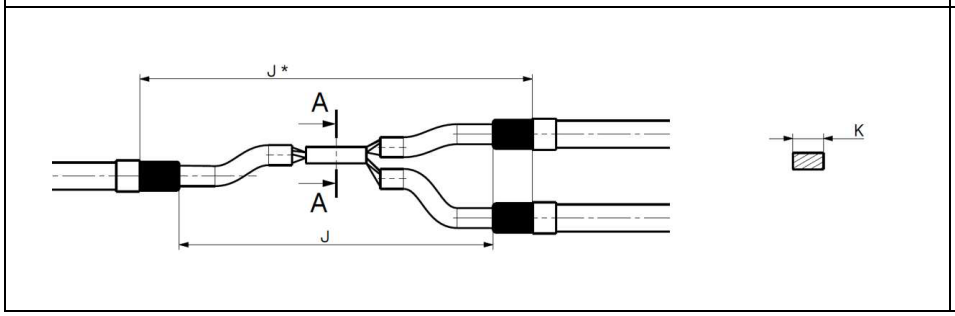
- **Welding machine**

The manufacturer is at liberty to use a device/machine of his choice. The welding process must meet the welding and positioning data which are specified on the following pages.

- **Process data**



6.0 mm² illustrated



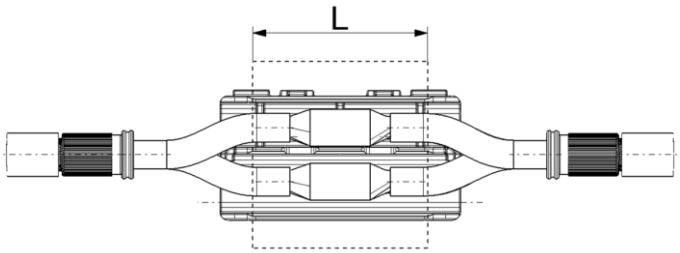
4.0 mm² illustrated

Wire cross section	Dimension J (mm)	Dimension J* (mm)	Dimension K (mm)
4.0 mm²	75.6 ± 1.5	92.0 ± 1.0	max. 6.5
6.0 mm²	69.0 ± 1.5	93.0 ± 1.3	

The width of the sonotrode depends on the manufacturer of the equipment. The limitations must be considered. Either “J” or “J*” must be proven, as they are correlating. These dimensions can be measured in stretched condition of the welded wires only. Bending of the wire in mounted condition affect the dimensions.

- **Deviation from the welding geometry depending on voltage**

The dimension **L** defines for each respective voltage, in which area of the insulator, exposed HV wires may be located. By utilizing the dimension, tolerances of previous processes as well as the positioning of the welding inside of the insulator must be taken into consideration. In the range of **L,** particular care (no damages on the wire insulation) as well as cleanliness (no metallic particles >1,000 µm) must be ensured.

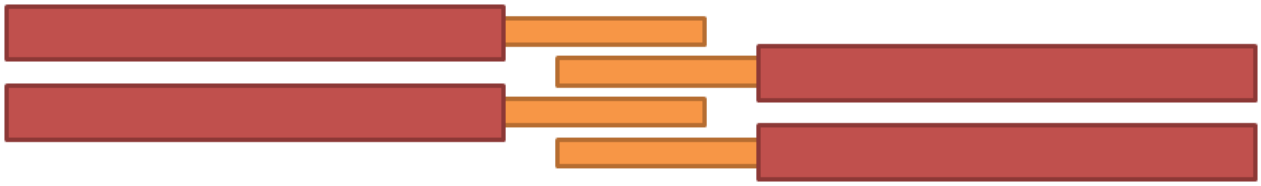


System voltage (V)	Rated surge voltage (VDC)	Dimension L (mm)
500	3,000	26
750	4,000	24
1,000	4,000	22
	**Risk of insulation failure!**	

- **Welding sequence**

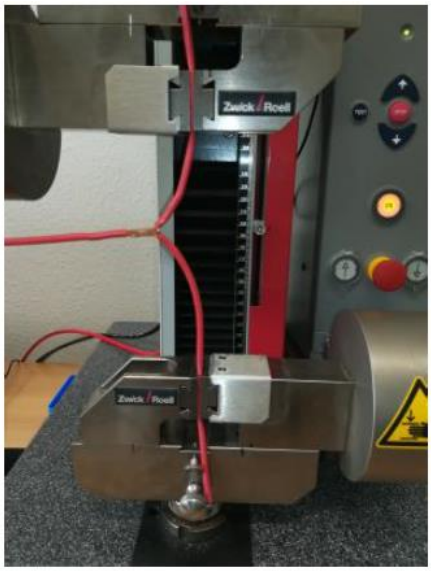
Depending on accessibility, the following inlay sequence is recommended.

Y-Distributor

H-Distributor


- **Pulling force of welding**

To measure the pull-off force of the welding, the wire must be fixated into a tensile-testing device, see picture:

	
Test setup longitudinal tension	Test setup peeling tension

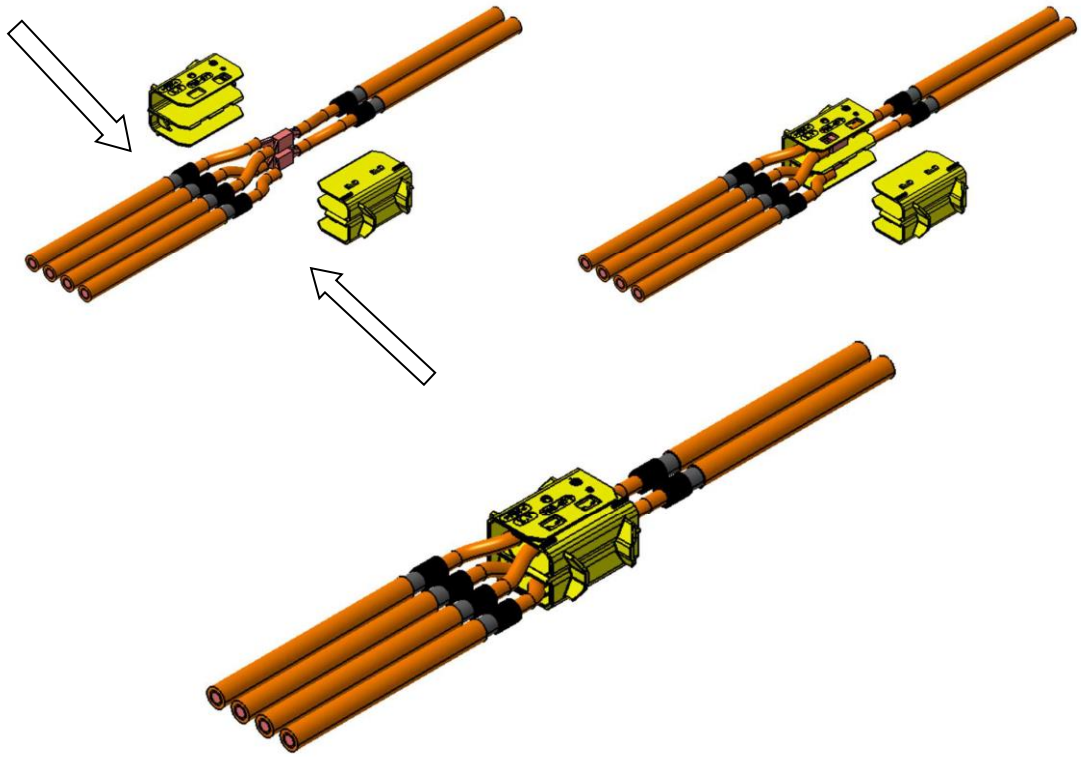
To test the peeling tension, the wire must be peeled out of the welding geometry, which was situated on the side of the anvil during the welding process. (The one side which has the lowest ultrasonic penetration.) The figures shown in the table must be reached. Wether longitudinal tension or peeling tension is required, has to be clarified in cooperation with the OEM.

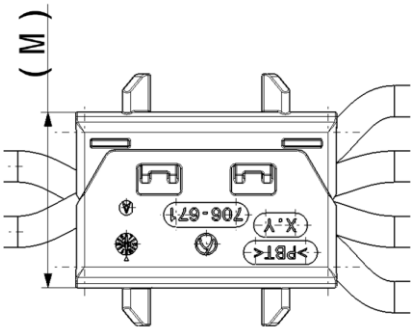
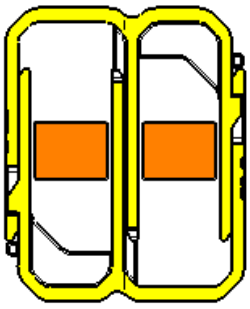
Wire cross section	Longitudinal pull-off force S1	Shear pull-off force
4.0 mm²	≥ 350 N	≥ 100 N
6.0 mm²	≥ 500 N	≥ 130 N
6.0 mm²	≥ 150 N	n.a.

- **General requirements**

Protruding strands are not permitted.

3.9 Assembly Isolator

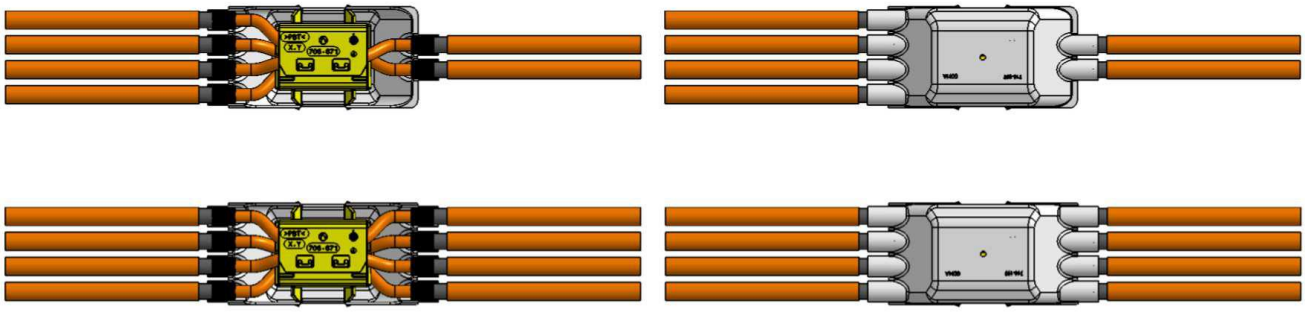
Assemble isolator over the welding-splice.


The isolator consists of two identical parts. (see section-cut)	
	

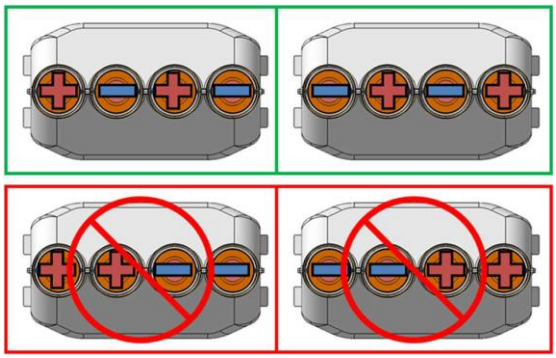
Dimension M (mm) = 24.2

Depending on the query-system during shield-pressing, 1x 706-671-501 and 1x 706-671-502 can be assembled optionally. When assembling the insulator, the latches will deflect and engage audibly. To ensure a double sided engaging, the dimensions “M” must be ensured on both sides of the insulator. This dimension is valid for the Y- and H-distributor. The axial position of the insulator will not be defined yet in this process step. During assembly of the insulator, the insulation of the wire must not be damaged.

3.10 Position shield and shield-sleeves

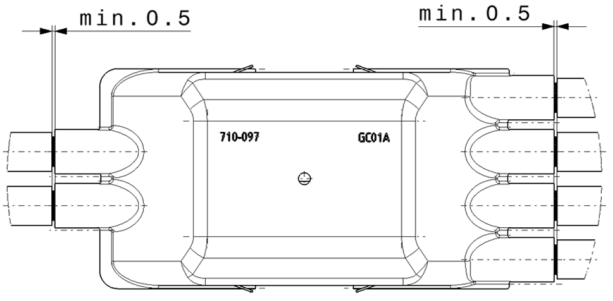


Polarity shall be respected as shown in the pictures below; deviations shall be agreed with the OEM.



Depending on the manufacturing process, the dimension B / G / H / J and J* can be reduced evenly below the tolerance limit to optimize the positioning of the individual wires. It is important that all these dimensions are reduced equally and exclusively together.
For example: B= 51 → G = 43.1 → H=39.7 → J= 64 → J*= 88

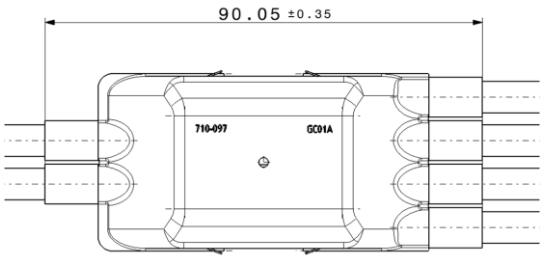
The wires must be positioned so that there is a visible, symmetric clearance between shield plate and 6.0 mm² = the cable jacket 4.0 mm²= the tape. The dimension min. 0.5 are guiding values which are not needed to measure during production. The jacket/tape must not lie under the shield plate halves.



Push shield sleeve until blocking. The shield plate consists of two identical parts.

The insulator will be positioned in the shield plate automatically. When the insulator is positioned correctly in the first shield plate, the second shield plate can be assembled. The wires must not be damaged during positioning.

The cable knot inside the insulator and the shield plate needs to be positioned, so the black fixing tape will protrude symmetrically out of the shield plate (4.0 mm²). For the 6.0 mm² Variant, a centered position needs to be ensured. No protruding wires are allowed after assembling the shield plate. Demand-oriented, single wires can be removed. Rework must be agreed with the OEM.

<table>
<tr>
<td> 
</td>
<td> 
Risk of insulation failure!</td>
</tr>
</table>

3.11 Press shield-sleeves

- **Pressing device**

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

Name:	Pressing device HPS40-2
Article number:	188/16

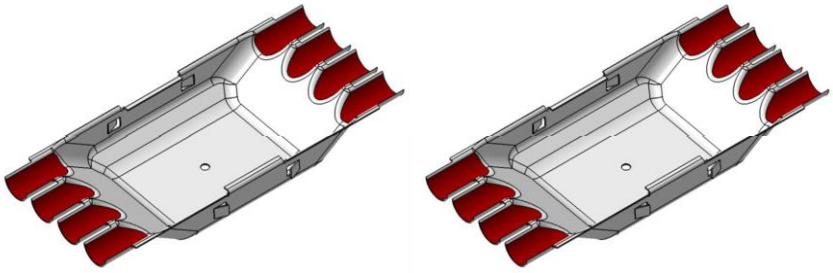
Based on the processing guidelines of Hirschmann, the device was designed and produced. The details of the commissioning, handling and the process guideline of the device can be requested directly at the supplier:

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 must be done through the manufacturer. The manufacturer is free to use a shield-crimping device of his choice. The shield-crimping process must meet the dimensional and qualitative requirements that are mentioned in the following pages.

- **Pressing data**

a) The shielding plate must be assembled location oriented. The shield sleeve must be assembled to the stop of the shield plate. The fixing tape must protrude out of the shield plate symmetrically (4.0 m² variant).
b) The circularity of the shield in the contact area (red) must be ensured.
c) It is possible to compress both distributor-sides at once.



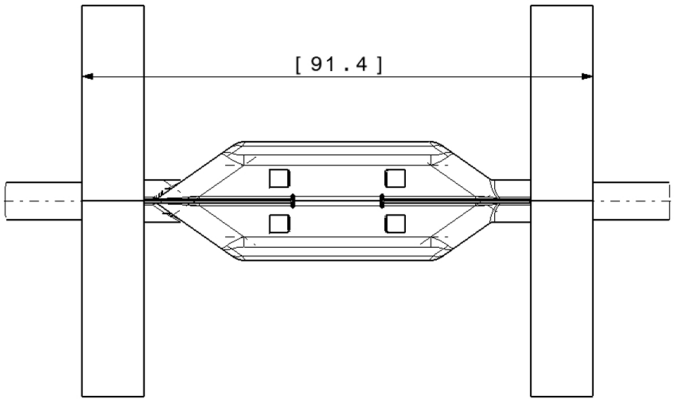
Do not damage the following parts during the pressing process.

- Insulation of the shielded cable
- Insulation of the single wires
- Stress relief
- Shield plate
- Shielding

3.12 Shield pressing by two half-shells

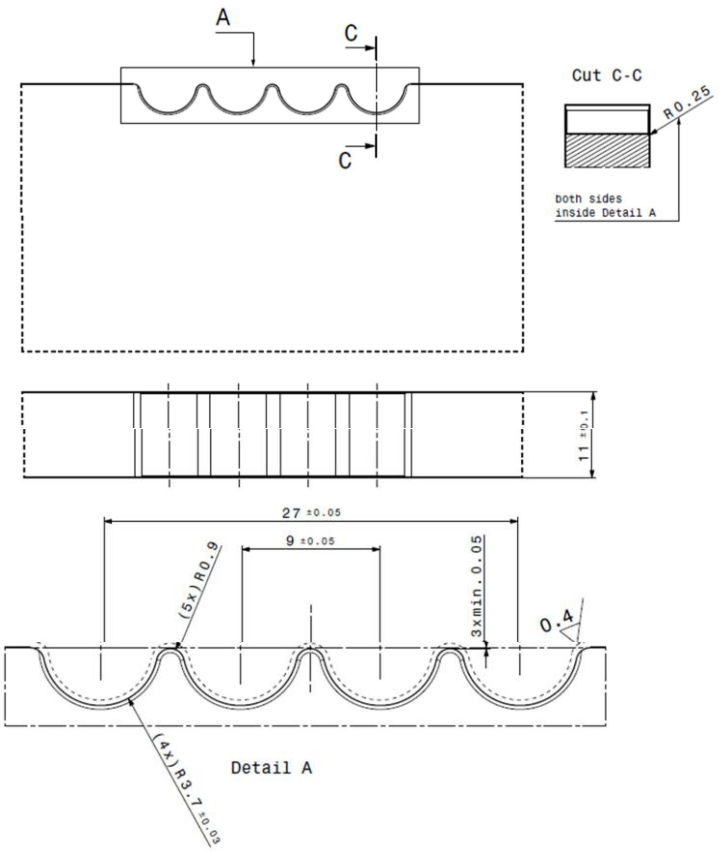
- **Embossing position**

The exact geometries of the plunger and the anvil are given.



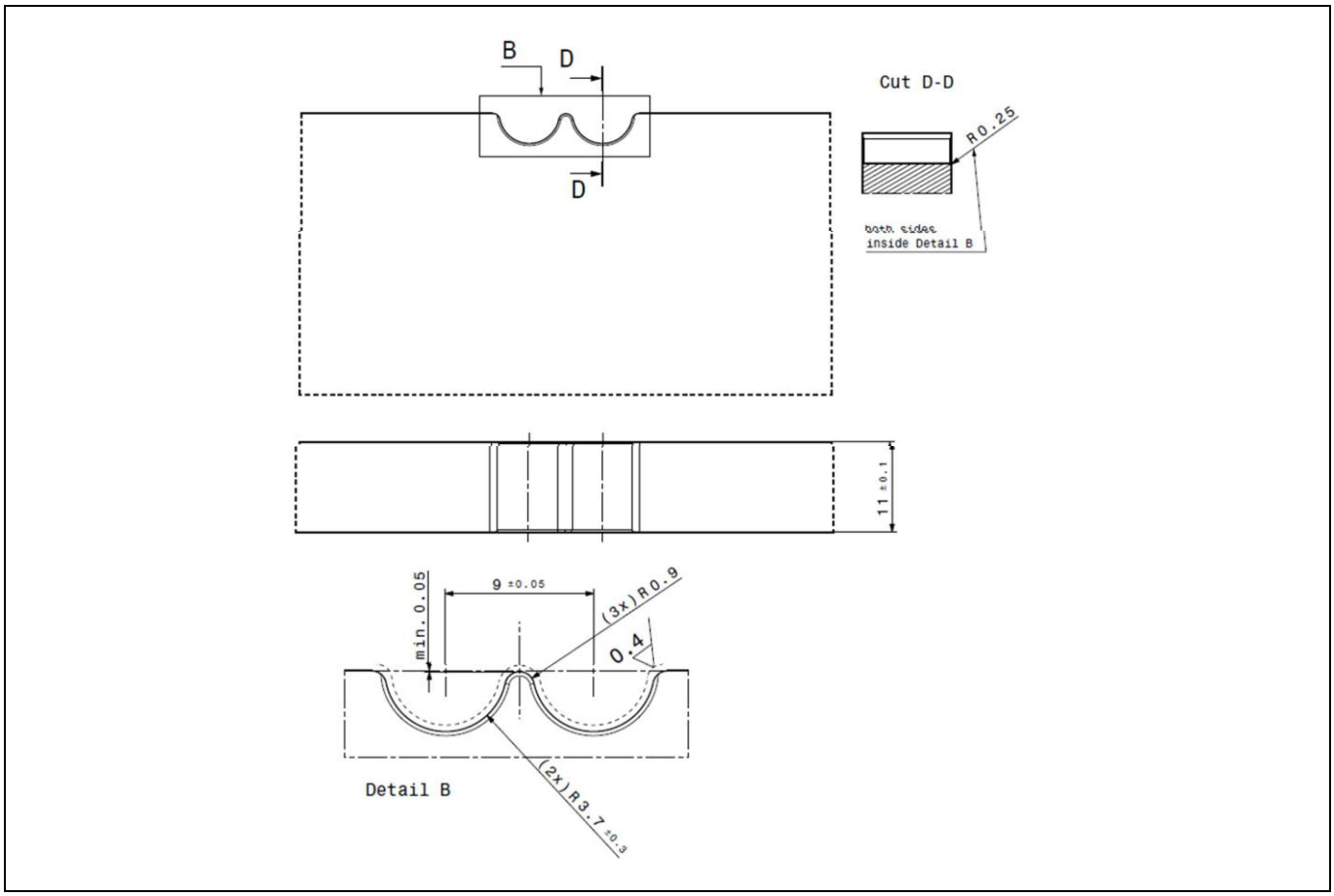
- **Plunger and anvil geometry of the wire shield pressing**

Plunger geometry of the wire shield pressing (double)
Material: 1.2721 vacuum hardened 58hrc



Plunger geometry of the wire shield pressing (single)

Material: 1.2721 vacuum hardened 58hrc



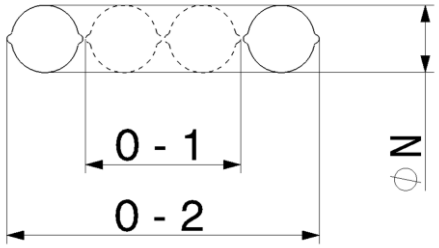
Plunger and anvil are geometrically identical.

- **Embossing height “N”**

The plunger and anvil must be aligned to each other, so after pressing, the dimension **“N”** results. The figures for each cable can be found in the table below.

Wire cross section	Dimension “N” in mm	
	4.0 mm²	6.0 mm²
Coficab	7.7 +0.15/ -0.25	7.7 +0.15/ -0.25
Kroschu T180		
Leoni		
Coroplast		
Gebauer & Griller		

Through pressing, tow folds will be on each side. For the Y-distributor, O-1 and O-2 are relevant, for the H-distributor 2x O-2 is applicable.

	O-1 → max. 18.8 mm O-2 → max. 37.8 mm

The material of the shield sleeve must not be cracked within the area of the fold.

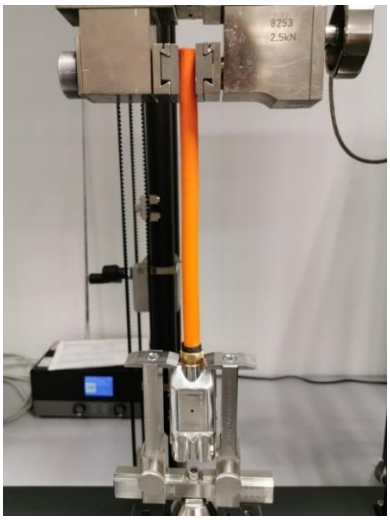
- **Check measurement of the embossing height “N”**

To check the dimension “**N”**, the height must be measured as given on the drawing. The figures must be within the given tolerance.

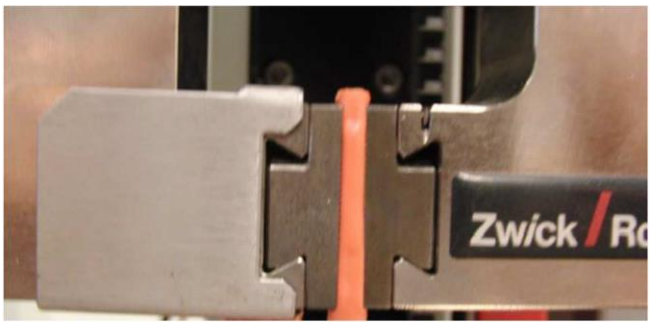
The measurement of the pressing height must be done with a suitable measuring device. Only the highest numerical value is relevant, as it represents the worst-case compression.

- **Pulling force of the wire**

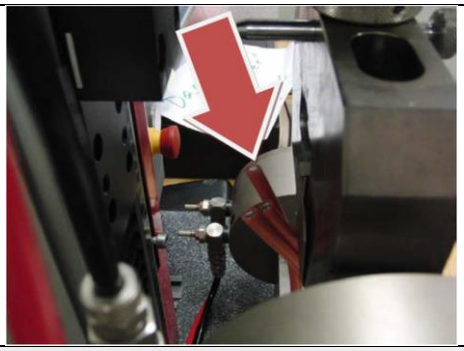
To measure the pull-out force, the wire must be clamped firmly into a clamping device. The distance between the cable and the shield sleeve shall be approx. 70 mm. To test the cable shield pressing, there must not be a welding knot. For this test, the figures in the table must be reached. One side of the distributor shall be clamped in a suitable device, see picture below. Due to this, a maximum of four values per specimen can be determined.



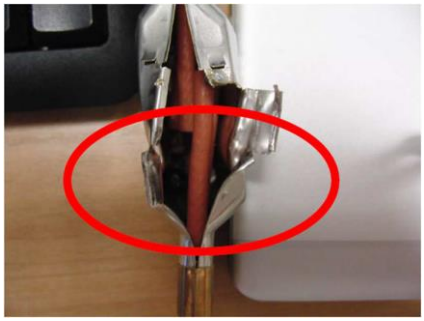
Wire cross section	Pulling force
4.0 mm²	≥ 120 N L2
6.0 mm²	≥ 120 N L2



The wires shall be clamped firmly.

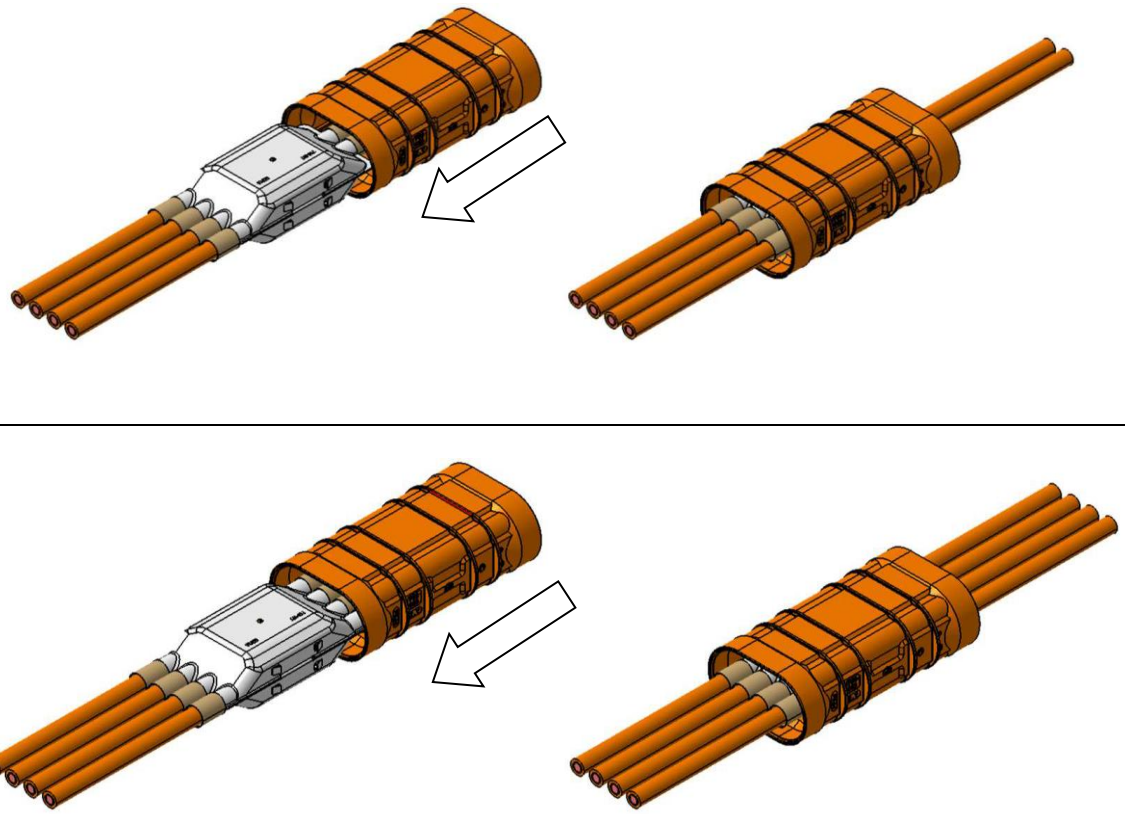


Remaining wires shall be bent aside as long as they are not being tested.



The wires on the inside of the distributor shall not be clamped.

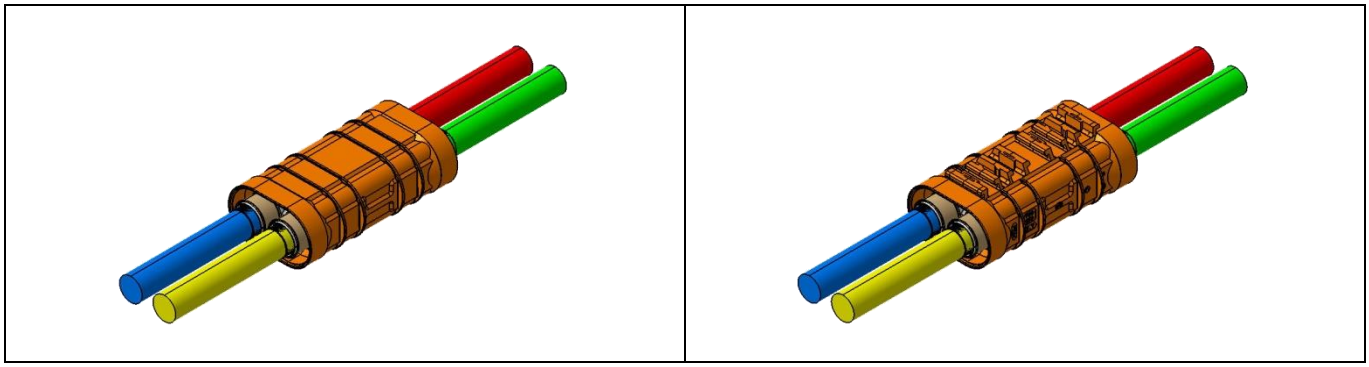
3.13 Assemble Distributor shield housing



The Distributor shield housing is symmetrical and can be assembled from both sides.
During assembly, locking latches in the shield are deflected and lock audible.

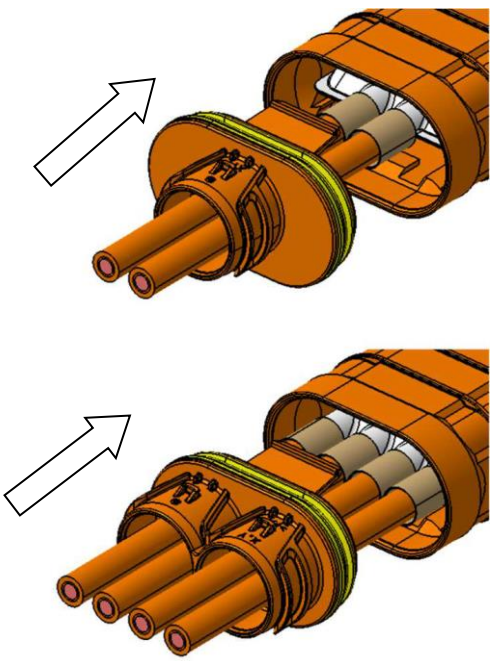
Attention:

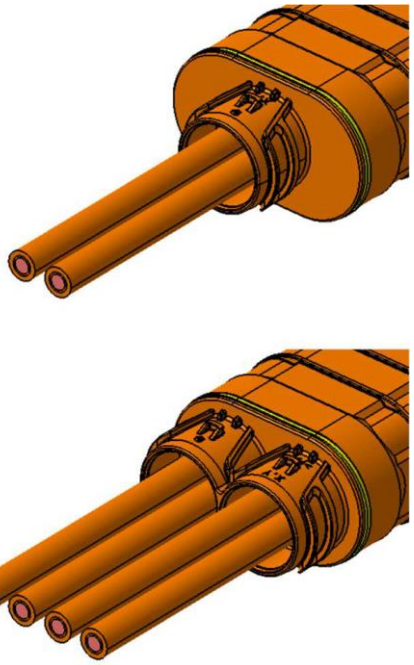
When using the shield housing with locator part (706-669-502) on the H-distributor, pay attention to the correct direction when assembling. The shield housing may only be rotated along the middle axis, and therefore the position of the locator elements may not be correct in reference to the wires, see picture:



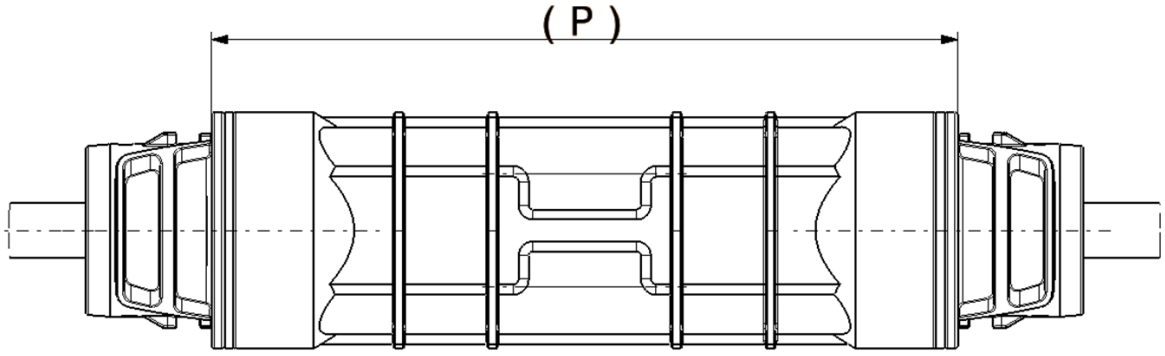
3.14 Assemble cable housing

Assemble the cable housings. This process step is valid for both distributor sides.



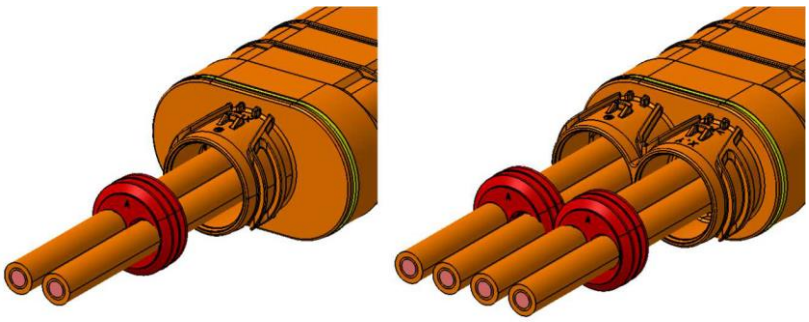
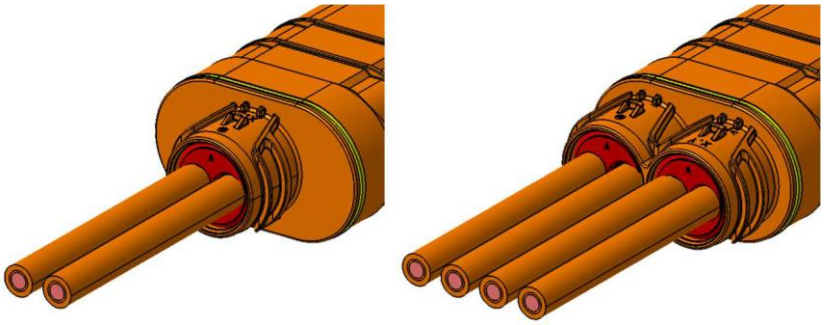


When assembling the cable housings, locking latches deflect and lock audible.

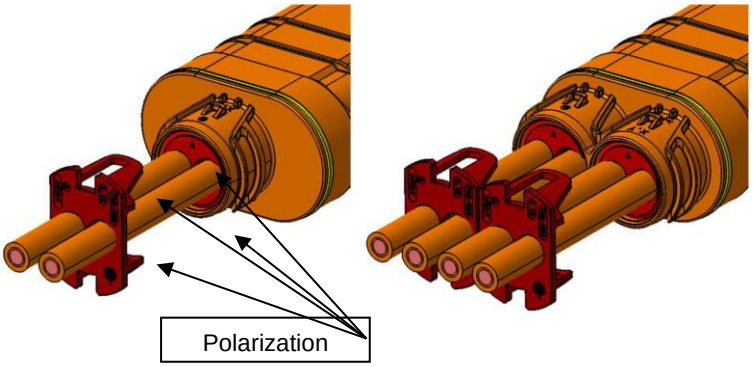
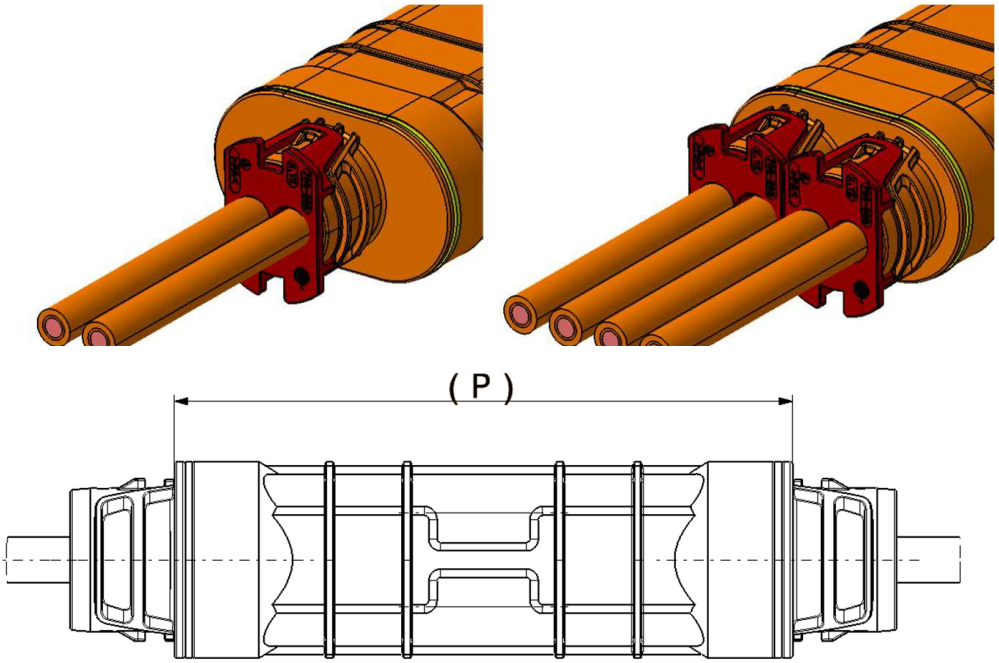


Dimension “P” (mm) = 89.2

3.15 Assemble wire seal and cap

Assemble the wire seal into the cable housing.

Seal in end-position


The cable seal can slightly be widened during the assembly. It is possible to slide on the seal using the cover cap, but ensure not to twist, clamp, or damage the seal. The cable seal is oil-bleeding, additional lubricants could lead to an undefined swelling of the seal, and therefore, it is not permitted. It must be clarified in cooperation with the OEM if a correct and damage free assembly of the seal would be ensured with an end test.

Assemble cap into cable housing (polarized)

Cap in end-position. Cap and seal should not be damaged during this process step.

Dimension “P” (mm) = 122,4

3.16 Stacking of produced harnesses

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

4 Technical information

4.1 General requirement

Single components must not be damaged during the whole production-process.

4.2 Technical cleanliness

In general, pay attention to the cleanliness on the distributor and inside of the distributor. Metallic particles generated during the assembly process, must be removed with a suitable device.
Inside the distributor, there are no metallic particles > 1,000 µm permitted.
For metallic particle at each distributor: CCC = N (J4/K0) acc. to VDA Band 19
For all other particle at each distributor: CCC = N (J10/K0) acc. to VDA Band 19

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

Technical cleanliness acc. to QV11111			
HV systeme (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
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	-

5 Documentation of change

Version	Change description	Change date	Editor
1	English version	06/ 2020	Hoor R.
2	Updated Dimension N and O; added dimension J* (chapter 3.8); specified positioning of shielding plate (chapter 3.10); added crimping geometry; updated crimper position (chapter 3.10.1)	08/ 2020	Hoor R.
3	Added optional taping step (chapter 3.6); updated dimension N and O; reduced with of crimping tool to 11 mm (former: 12 mm); added R0.9; (chapter 3.11)	09/ 2020	Hoor R.
4	Added picture for retention-force and crimping-height measurement (chapter 3.11); changed J* to 86 mm (chapter 3.8); added BMW No.; added dimension 90,05 (chapter 3.10)	10/ 2020	Hoor R.
5	Updated dimension G and G* (chapter 3.6) Updated retention-force and crimping-height measurement (chapter 3.11); Added comment for dimension J and J* (chapter 3.8); Updated position of crimping (chapter 3.11.1); Defined orientation of wires (chapter 3.10)	12/ 2020	Hoor R.
6	Added BMW F-characteristics; Corrected BMW No.: 5 A37 9B9 / Added recommendation for machine cutting of shielding (chapter 3.6)	03/ 2021	Hoor R.
7	Changed dismanteling of wire to 53.5 mm; raised tolerance of Shield crimp height to ±0.15	06/ 2021	Breuss L.
8	dimensions G, H, J, J* changed, stick out of shield strands at shield sleeve changed, shield pressing geometry dimension min. 0.05mm / added, dimension N tolerance changed to +0.15/-0.25; added option of wire processing;	12/ 2021	Breuss L.
9	Dimension G adjusted to 45.6 mm in the english version; changed embossing position from 90.4 mm to 91.4 mm; deleted Kroschu 1x 4.0 mm² wire;	03/ 2022	Küng S.
10	Added process data for 4.0 mm² cable (B,C,F,J,J*); Changed cleanliness requirement and added BMW specific requirement based on surface reference; BMW special characteristics changed acc. to OEM requirement;	10/ 2022	Breuss L.
11	Update design specification	06/ 2023	Jussel E-M.
12	Adjusting data of the bottom line update picture distribution cap	07/ 2023	Jussel E-M.
13	Topic 1.2: adjusted with additional “Miscellaneous”	10/ 2023	Jussel E-M.
14	Page 4) Change of L from length to legal	04/ 2024	Jussel E-M.
15	Topic 1.2 Kroschu-PN updated 64998762	04/ 2024	Jussel E-M.

16	Topic 2.1 Kroschu-PN updated 64998762	09/ 2024	Jussel E-M.