Class 1

Table of Contents

目录

1. SCOPE

This Specification contains the guidelines for the termination of wires to terminals by ultrasonic-weld.
This specification applies to the automotive industry.
In case of doubt the Chinese text is valid.
Only valid in relation with specification 114-94391.

1. 内容

该文件为使用超声波焊接的端子和导线提供指导，并应用于汽车领域.
如有疑问，中文文本是有效的。仅与规范114-94391相关有效

2. REFERENCED DOCUMENTS

2.1. CUSTOMER DRAWING

with the dimensions and materials of the contacts.

2. 1. 客户图

图面定义了端子的尺寸和材料

C-2347435

2.2. PRODUCT SPECIFICATION

2. 2. 产品规格书

Refer to charging inlet product specification

2.3. NATIONAL / INTERNATIONAL STANDARDS

2. 3. 本地和国际标准

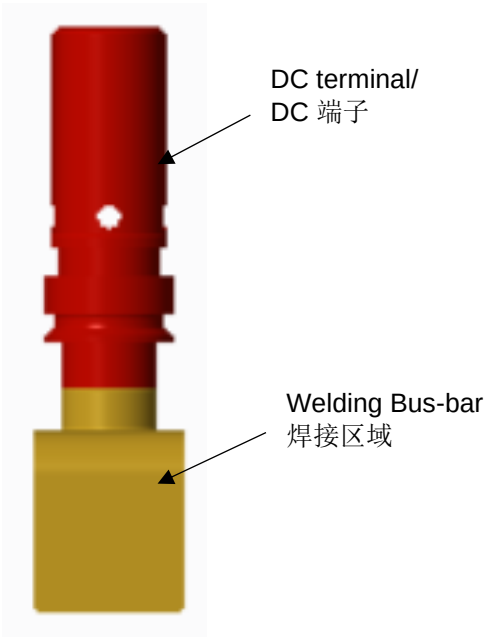
LV216-2:2011	High-Voltage shielded Electric Wiring in Motor Vehicles	LV216-2:2011	电动汽车高压屏蔽电线
114-94391	General guideline for the application of ultrasonic weld connections	114-94391	超声波焊接应用的一般指导文件
109-18508	Test specification to carry out pull- and peel tests of ultrasonic welded cable to terminal connections	109-18508	对超声波焊接电缆进行端子焊接的拉拔力和剥离力的试验规范

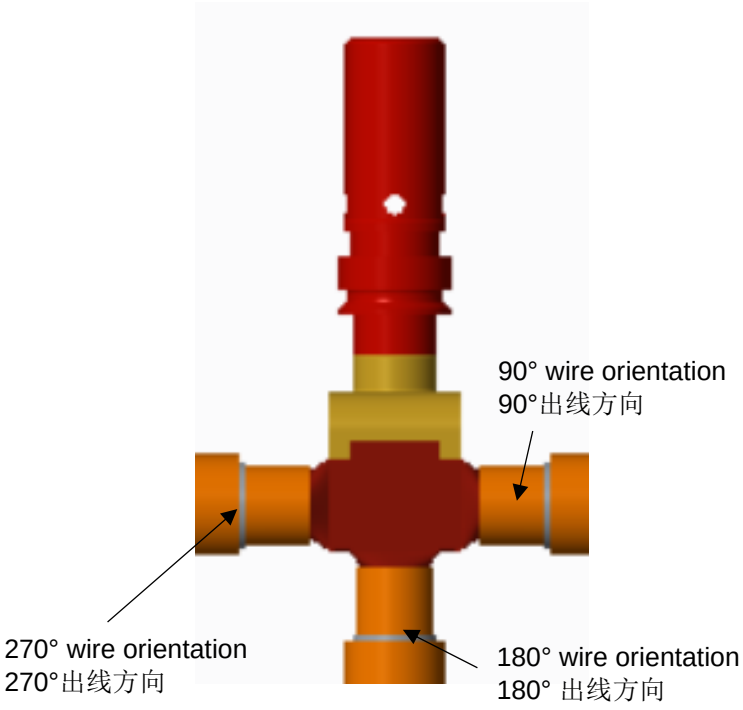
3. DESCRIPTION

The following terms are used in this specification

3. 描述

规格书中用到以下描述.





4. TERMINALS

Table 1 shows all with this specification applicable DIA 12MM, GB DC TERMINAL part numbers.

4. 端子

表格 1 中列出了和此规范相关的所有的端子料号及信息。

Conductor material 导体材料	wire orientation 出线方向	Surface of weld pad 焊接面材料	Weld pad size UxW 焊接面尺寸 UxW	Wire size 线径	Part number 料号
Cu	90° / 270°	Bus-bar:Cu	24mmx22.2mm	70mm²	2347435-1
	90° / 270°		24mmx24.7mm	95mm²	2347435-2

Table / 表格 1

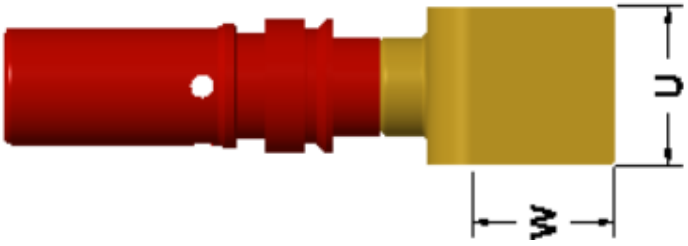


Figure /图示 1 for table 1 / 表格 1 DIA 12MM, GB DC TERMINAL

5. MACHINE REQUIREMENTS

The contact system DIA 12mm, GB DC TERMINAL will be validated with ultra-sonic metal weld machine named "MT 8000" or "TT7" built by TELSONIC AG. Only certified machines must be used to applicate. The exact specifications of the machine are shown in Table 2. It must be approved by TE and harness maker if the machine be changed.

5. 设备要求

12mm GB DC 端子用"MT 8000" 或 "TT7" TELSONIC AG 超声波机台进行验证。只有经过验证的机台才能用于生产。表格 2 中定义了焊接机的具体参数。目前并没有其他的设备推荐用于焊接。变更焊接机台必须得到 TE 和线束厂的同意。

Ultrasonic welding machines/超声波焊接机台		For 70mm²
Machine/机器	MT8000 PowerWheel-10KW	Telso®Terminal TT7-14,4 KW
Manufacturer/设备厂商	Telsonic GmbH	Telsonic GmbH Dieter-Streng-Straße 7 90766 Fürth-Germany
Generator/电机	SG22-10000 Series	MAG 14,4
Frequency/频率	20kHz	20 kHz
Torsion drive/扭力驱动	10KW Series M12x1	921360110 Torsionsschwinger 14.4kW
Booster	-	921370160 Booster 1:1.60
Sonotrode/声极	980015627 Custom version for 70mm2 copper fine strands	980016185 Powerwheel-Sonotrode
Ambos system/控制系统	AS3 Plus universal system, D270658	888027521
Mask	-	888027541 (90°) +888027540 (270°)
Terminal clamp/端子夹具	D270640	888025535+888025536
Cable clamp/导线夹具	D264520,D264521	888027561+888027562

Ultrasonic welding machines/超声波焊接机台		For 95mm²
Machine/机器	MT8000 PowerWheel-10KW	Telso®Terminal TT7-14,4 kW
Manufacturer/设备厂商	Telsonic GmbH	Telsonic GmbH Dieter-Streng-Straße 7 90766 Fürth -Germany
Generator/电机	SG22-10000 Series	MAG 14,4
Frequency/频率	20kHz	20 kHz
Torsion drive/扭力驱动	10KW Series M12x1	921360110 Torsionsschwinger 14.4kW
Booster	-	921370160 Booster 1:1.60
Sonotrode/声极	980015627 Custom version for 95mm2 copper fine strands	980016185 Powerwheel-Sonotrode
Ambos system/控制系统	AS3 Plus universal system, D270658	888027521
Mask	-	888027541 (90°) +888027540 (270°)
Terminal clamp/端子夹具	D252878	888025535+888025536
Cable clamp/导线夹具	D259604, D260023	888027561+888027562

Table / 表格 2

The correct functionality of the product can only be guaranteed with the above-mentioned machine and its parameter configuration. A new product qualification must be provided by the user, should different machines and/or parameters be used.

使用上述的焊接机台和参数，才能实现产品的功能。如果要使用其他的机台或者参数，使用者应该提前进行验证.

6. JOURNAL

It is recommended to store the machine journal with all weld parameters and errors. The process data may be used for SPC (statistical process control).

6. 日志

建议将所有的生产参数和错误记录在机台的生产日志中。生产过程可能用到过程统计控制。

7. HANDLING OF PARTS

The use of appropriate gloves during handling, processing, assembly and packaging of contact sockets is recommended. It is also recommended to replace used gloves periodically. Electronic components cannot be touched during the entire handling process of the contact sockets. Terminal need to be welded immediately after seal off.

7. 零件处理

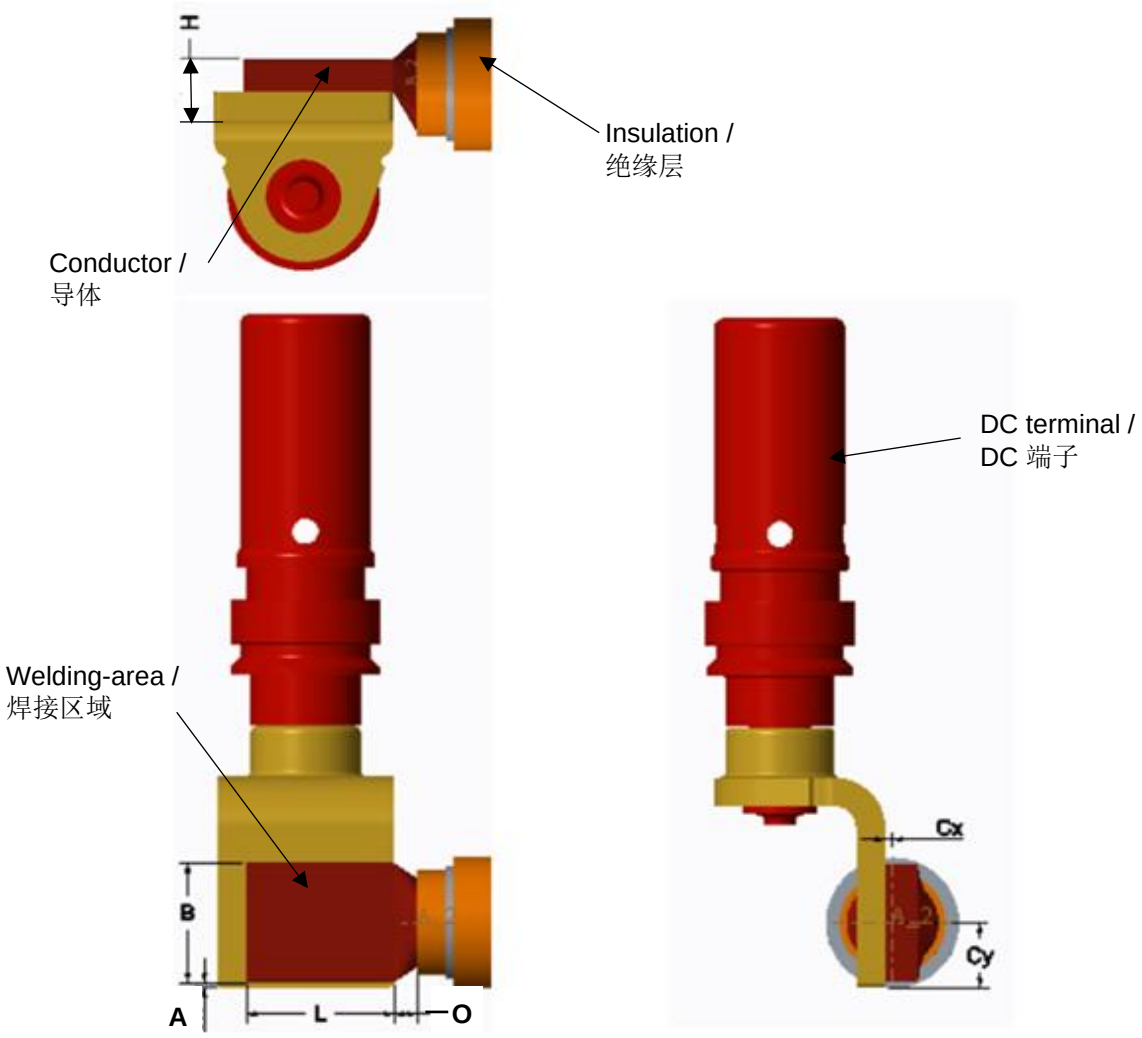
在处理/制程/装配/包装的过程中要使用合适的手套，并定期更换手套。在整个过程中不能触碰电子元器件。端子拆封后，请即时焊接。

8. CONDUCTOR WELD CONNECTION

8.1. POSITION OF CONDUCTOR END

8. 导线焊接

8. 1. 导线的形状位置



Figure/ 图示 2 Design 90° / 设计 90

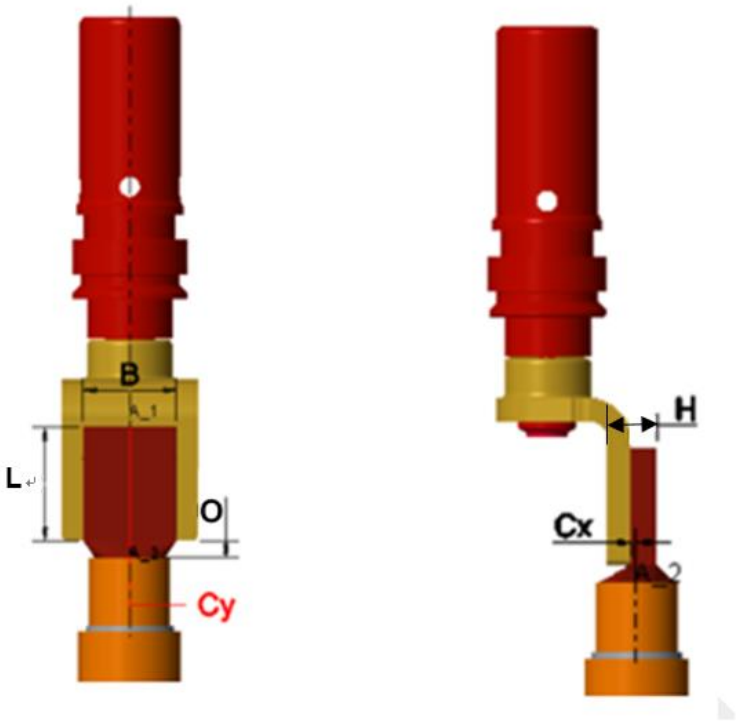


Figure / 图示 3 Design 180° / 设计 180°

9. WELD PARAMETER

Only the following welding parameters are permitted in combination with the cables mentioned in the appendix.

9.1. FOR 70MM² WIRE

Only the wires mentioned in the appendix are permissible.

9.1.1. RECOMMENDED SETTINGS ON THE "MT8000" MACHINE:

- pressure 3.4 bar
  (resulting force value at 4750 N)
- amplitude 100%
  (free oscillating without load 27 µm)
- energy 11000 Ws
- Pre-heating 52°C
- Welding time max. 4s
- Trigger value 1200N
  (Force value at which the horn begins to vibrate)

If these values do not produce a result that conforms to the specifications, the following procedure is recommended:

The parameters can be adjusted to a certain extent. The value for the energy must always be the first one to be changed. Only if this does not lead to success, the amplitude may be adjusted. Finally, the air pressure may also be changed

9. 焊接参数

下面的焊接参数用于此文件中申明的导线的焊接。

9. 1. 用于 70MM² 导线

只允许使用附表中列出的导线。

9.1.1 "MT8000" 机台参数设置推荐：

- 压力 3.4 bar
  (合力值是 4750N)
- 振幅 100%
  (无受力情况下自由振动 27 µm)
- 能量 11000Ws
- 预加热 52°C
- 最大焊接时间 4s
- 触发值 1200N
  (焊头在该力值下开始振动)

如果这些值不能产生符合规范的结果，建议采用以下步骤:

这些参数可以在一定程度上进行调整。能量的值必须是第一个被改变的值。只有在调整能量不成功的情况下，才可以调整幅度。最后，气压也可以调整。

Possible minimum and maximum values:

- Pressure 3.4~4.0 bar
  (resulting force value at 4750 - 5600 N)
- Amplitude 90~100%
  (free oscillating without load 24 - 27 µm)
- Energy 10000~15000 Ws
  Trigger value 1200N (Force value at which the horn begins to vibrate)

A change in the pressure higher than 4.0 bar is only acceptable in exceptional cases if the required values cannot be reached. In this case, a capability analysis of the tensile force must be carried out on at least 50 parts. The minimum capability value to be reached is 1,67 (without unit).

可能的最小和最大值：

- 压力 3.4~4.0 bar
  (合力值是 4750~5600N)
- 振幅 90~100 %
  (无载荷自由振动 24 - 27 µm)
- 能量 10000~15000 Ws
- 触发力值 1200N(到达触发值后压头开始振动)

高于 4.0bar 的压力只有在无法达到要求值的特殊情况下才可以使用。在这种情况下，至少要对 50 个零件进行拉力性能分析。要达到的最小能力值是 1,67(无单位)。

9.1.2. RECOMMENDED SETTINGS ON THE "TT7" MACHINE:

9.1.2 "TT7"机台参数设置推荐：

	Recommended settings on the machine			
Telsonic® Terminal TT7 – 14,4 kW	Variant	preferred	variant 2	variant 3
	Downforce	4,0 kN	4,0 kN	4,5 kN
	Downforce rise time	0,2 s	0,2 s	0,2 s
	Amplitude	40 µm (95%)	42 µm (100%)	36 µm (86%)
	Energy	13400 Ws	15000 Ws	12000 Ws
	Cooling Temp	24°C	24°C	24°C
	Welding time max.	4 s	4 s	4 s
	Trigger value	2000 N	2000 N	2000 N

Table / 表格 3

If these values do not produce a result that conforms to the specifications, please have a look into chapter 12 Appendix Parameter Selection Process.

如果这些值不能生产出符合规范的结果，请查看第 12 章附录参数选择过程。

Welding width B = 16.4mm ±0.5
Welding height H = 9.4 mm ±0.8
Welding length . L = 18.5 mm ±1
Gap distance A= 1.00mm (for reference)

焊接宽度 B = 16.4mm ±0.5
焊接高度 H = 9.4 mm ±0.8
焊接长度 L = 18.5 mm ±2
间隙距离 A= 1.00mm（参考）

Position cable design 90°/270°
O = 1.5mm ±1.5
Cx = 1mm ±1
Cy = 8.97mm ±1

出现方向 90°/270°
O = 1.5mm ±1.5
Cx = 1mm ±1
Cy = 8.97mm ±1

Position cable design 180°
O = 1.5mm ±1.5
Cx = 1mm ±1
Cy = 0mm ±1

出现方向 180°
O = 1.5mm ±1.5
Cx = 1mm ±1
Cy = 0mm ±1

9.2. FOR 95MM² WIRE

Only the wires mentioned in the appendix are permissible.

9.2.1. RECOMMENDED SETTINGS ON THE "MT8000" MACHINE:

- pressure 4 bar
  (resulting force value at 5600 N)
- amplitude 100%
  (free oscillating without load 27 µm)
- energy 15000 Ws
- Pre-heating 52°C
- Welding time max. 4s
- Trigger value 1500N
  (Force value at which the horn begins to vibrate)

If these values do not produce a result that conforms to the specifications, the following procedure is recommended:

The parameters can be adjusted to a certain extent. The value for the energy must always be the first one to be changed. Only if this does not lead to success, the amplitude may be adjusted. Finally, the air pressure may also be changed.

Possible minimum and maximum values:

- pressure 3.5 – 4.0 bar
  (resulting force value at 4900 - 5600 N)
- amplitude 90 - 100%
  (free oscillating without load 24 - 27 µm)
- energy 15000 – 19000 Ws

A change in the pressure higher than 4.0 bar is only acceptable in exceptional cases if the required values cannot be reached. In this case, a capability analysis of the tensile force must be carried out on at least 50 parts. The minimum capability value to be reached is 1,67 (without unit).

9.2.2. RECOMMENDED SETTINGS ON THE "TT7" MACHINE:

	Recommended settings on the machine			
Telso®Terminal TT7 – 14,4 kW	Variant	preferred	variant 2	variant 3
	Downforce	4.6 kN	4.2 kN	5.5 kN
	Downforce rise time	0,2 s	0,2 s	0,2 s
	Amplitude	39 µm (95%)	39 µm (95%)	40 µm (98%)
	Energy	17000 Ws	19300 Ws	17000 Ws
	Cooling Temp	24°C	24°C	24°C
	Welding time max.	4 s	4 s	4 s
	Trigger value	1000 N	1000 N	1000 N

Table / 表格 4

9. 2. 用于 95MM² 导线

只允许使用附表中列出的导线。

9.2.1 "MT8000"机台参数设置推荐：

- 压力 4 bar
  (合力值是 5600N)
- 振幅 100%
  (无受力情况下自由振动 27 µm)
- 能量 15000 Ws
- 预加热 52°C
- 最大焊接时间 4s
- 触发值 1500N
  (焊头在该力值下开始振动)

如果这些值不能产生符合规范的结果，建议采用以下步骤:

这些参数可以在一定程度上进行调整。能量的值必须是第一个被改变的值。只有在调整能量不成功的情况下，才可以调整幅度。最后，气压也可以调整。

可能的最小和最大值：

- 压力 3.5 – 4.0 bar
  (合力值是 4900 - 5600 N)
- 振幅 90 - 100%
  (无受力情况下自由振动 24 - 27 µm)
- 能量 15000 – 19000 Ws

高于 4.0 bar 的压力只有在无法达到要求值的特殊情况下才可以使用。在这种情况下，至少要对 50 个零件进行拉力性能分析。要达到的最小能力值是 1,67(无单位)。

9.2.2 "TT7"机台参数设置推荐：

If these values do not produce a result that conforms to the specifications, please have a look into chapter 12 Appendix Parameter Selection Process.

如果这些值不能生产出符合规范的结果，请查看第 12 章附录参数选择过程。

Welding width B = 18.5mm ±0.5
Welding height H = 9.6 mm ±0.8
Welding length L = 18.5 mm ±2
Gap distance A= 1.45mm（for reference）

Position cable design 90°/270°
O = 1.5mm ±1.5
Cx = 1mm ±1
Cy = 10.7mm ±1

Position cable design 180°
O = 1.5mm ±1.5
Cx = 1mm ±1
Cy = 0mm ±1

焊接宽度 B = 18.5mm ±0.5
焊接高度 H = 9.6mm ±0.8
焊接长度 L = 18.5 mm ±2
间隙距离 A= 1.45mm(参考)

出现方向 90°/270°
O = 1.5mm ±1.5
Cx = 1mm ±1
Cy = 10.7mm ±1

出现方向 180°
O = 1.5mm ±1.5
Cx = 1mm ±1
Cy = 0mm ±1

10. INSPECTION OF WELD CONNECTION

10.1. DIMENSIONS OF THE WELD CONNECTION

As a control it is possible to check the height and width in the weld connection area. Both must be measured in the middle of the weld connection area. For measuring the height, it is recommended to use a calibrated crimp height micrometer or better. The measuring of the width is recommended with a calibrated sliding caliper.
Note:
The dimensions of height and width are only to control the travel dimensions of the welding tool. They are not for quality monitoring of the weld connection.

10. 焊接部位的检测

10. 1. 焊接尺寸

管控要求，需检测焊接区域中间位置的高度和宽度。推荐用校准过的千分尺量测焊接高度，用滑动式卡尺量测焊接宽度。

备注：
焊接高度和宽度尺寸只是用来控制焊接治具的运动行程。并不用于监测焊接的质量。

10.2. MECHANICAL SOLIDITY

The mechanical strength of the welded nugget must be checked each time the machine is set up according to TE specification 109-18508. At least 3 parts must be checked for tensile force and optionally, 3 parts for shear tensile force. The minimum values of 3400N(70mm²)/4200 N （95mm² ）for the tensile force and 550N(70mm²)/675N （95mm² ） for the shear force must be observed.

Values for Cmk capability study:
Cmk ≥ 1.67
With Pull Force lower specification limit, LSL = 3400 N (70 mm²)/4200 N (95 mm²)

10. 2. 焊接强度

焊接的机械强度按照 TE 109-18508 规范，必须在每次机器安装时进行检查。至少要检查 3 个零件的拉力和 3 个零件的剪切拉力。拉力的最小值 3400 N (70mm²)/4200 N (95mm²)，剪切力的最小值 550N (70mm²)/675 N (95mm²).

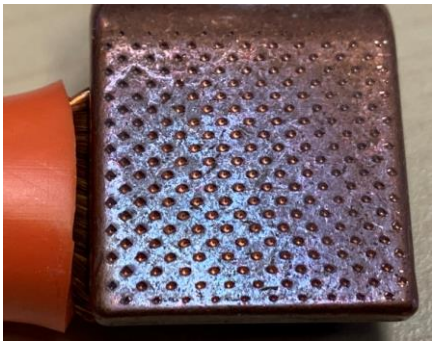
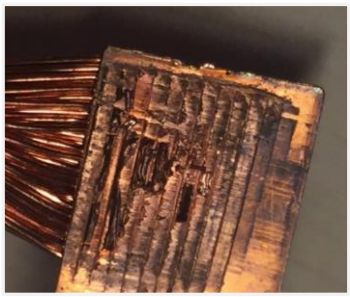
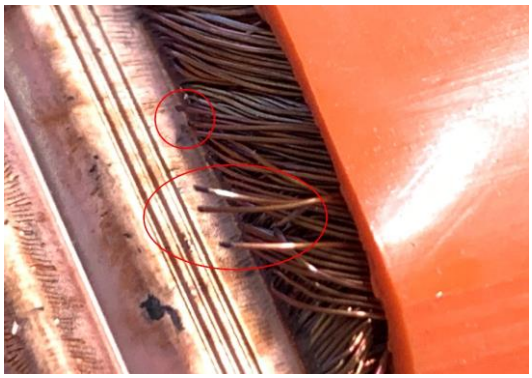
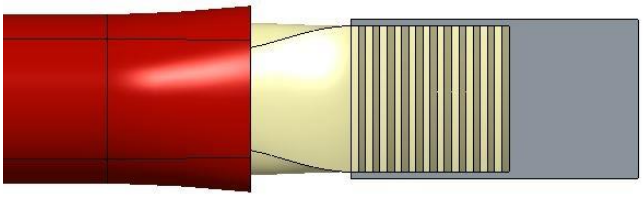
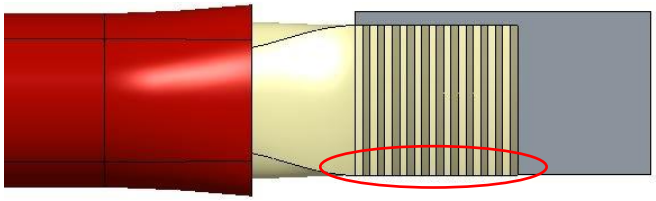
CmK 能力值：
Cmk ≥ 1.67
对于拉力规格下限，LSL= 3400 N (70mm²)/4200 N (95mm²)

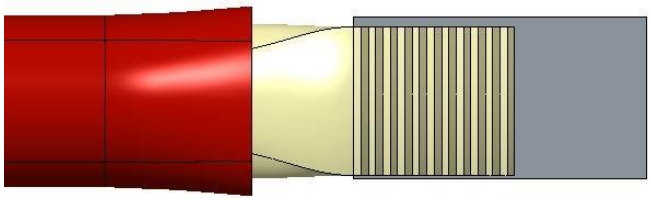
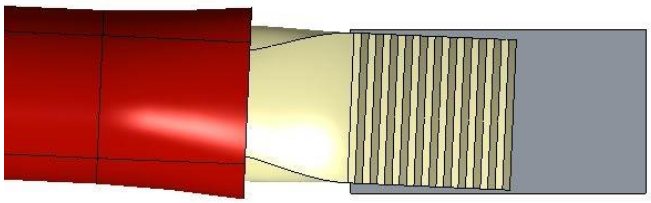
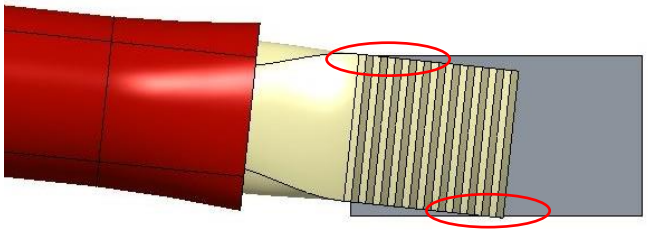
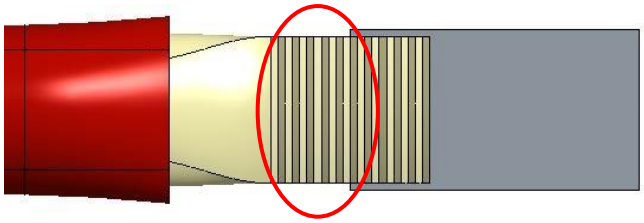
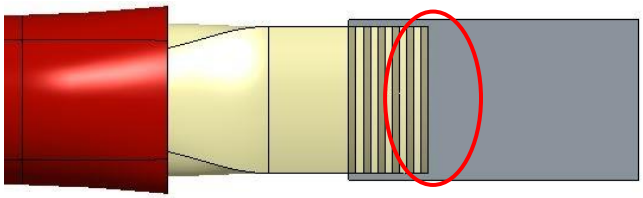
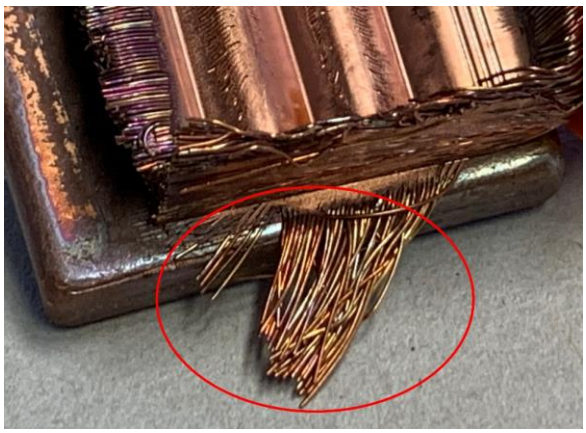
10.3. VISUAL INSPECTION

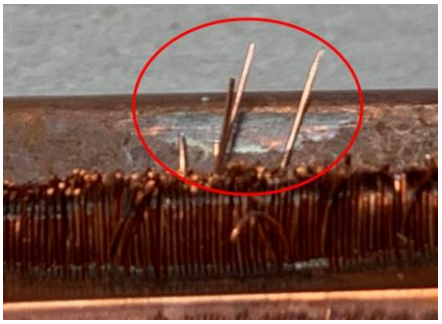
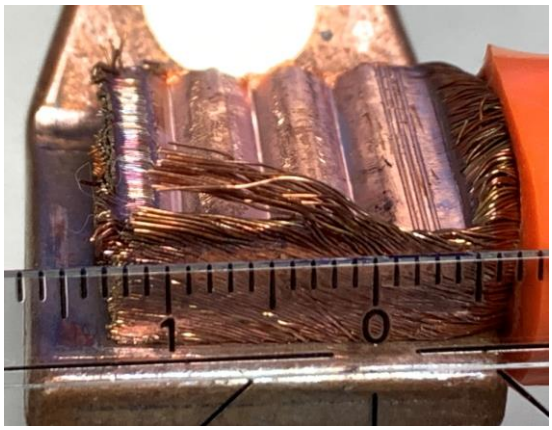
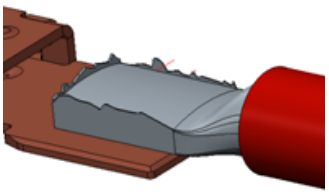
The following failure catalogue shall not replace the required testing and serves as supporting material only.

10. 3. 外观检查

下列不良模式不应代替所需的测试，仅作为辅助材料。

Picture/图示	Comment/描述	
	零件上的铁砧压痕 Anvil impression on the component	合格零件 Good part
	工具磨损:零件上没有明显的砧形痕迹。 Tool wear: No clear imprint of the profile of the anvil on the part is visible.	不合格零件 Bad part
	剥线过程和焊接过程，超过3%的线芯断裂是不允许的。 More than 3% of individual wires cut after the welding process is forbidden, including the stripping process of the wire.	不合格零件 Bad part
	需满足尺寸 (L, CX ， CY)要求 Requirements (L, CX and CY) fulfilled	合格零件 Good part
	只能在一边看到 bus-bar 边缘 edge only visible on one side	不合格零件 Bad part

	偏移量:边缘可见两边和尺寸满足 CY 要求。 Offset: edge visible on both sides and dimension CY fulfilled	合格零件 Good part
	倾斜量:边缘可见两边和尺寸满足 CY 要求。 Sloping position: edge visible on both sides and dimension CY fulfilled	合格零件 Good part
	倾斜位置:边缘仅在一侧可见 Sloping position: edge only visible on one side	不合格零件 Bad part
	工具位置不正确:接触处焊接不完整。需满足 L 尺寸要求。 Incorrect tool alignment: Welding not complete on the contact. Requirement of dimension L.	不合格零件 Bad part
	电线插入深度太短:需满足图 3 中 L 尺寸要求。 The wire insertion depth is too short: Requirement acc. Figure3, Dimension L	不合格零件 Bad part
	焊接位置的下部突出的铜线是不允许的 Protruding strands at the lower part of the weld nugget not allowed	不合格零件 Bad part

	伸出，过长单线不得与焊垫重叠*1) Overhanging, too long single wires must not overlap the welding pad *1)	不合格零件 Bad part
	颜色变化不是质量标准。 Colour changes are not a quality criterion.	合格零件 Good part
	在 1000 伏以下使用时，焊接包侧面的直立铜线必须小于 3.2 毫米。*1) Upstanding strands at the side of the weld package must be shorter than 3.2 mm for applications up to 1000 V. *1)	不合格零件 Bad part
	最大毛刺高度不得超过允许的焊接高度*1)。 The maximum burr height must not exceed the permissible welding height.*1)	不合格零件 Bad part

*1) 允许重工/ Reworking is allowed

Table / 表格 5

~~**10.4. BENDING TEST**~~

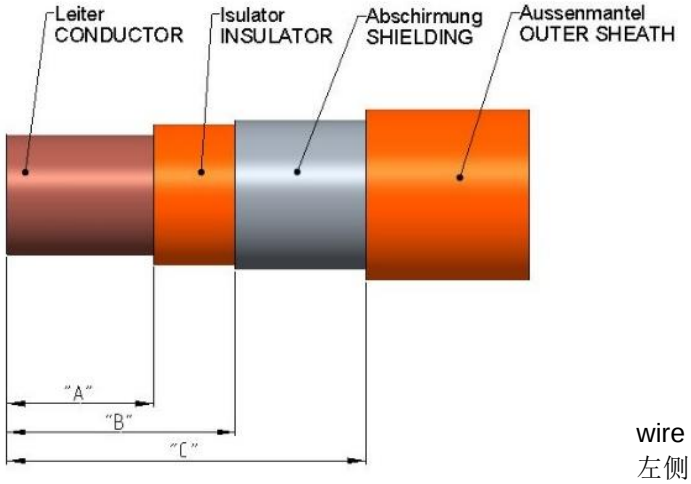
~~The test sample is fixed in the welding area. The cable is bent twice by 90 ° (in the direction of the welding area) and then bent back into its original position. Individual strands must neither be broken nor get loose.~~

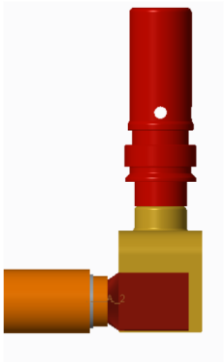
~~**10. 4. 弯折测试**~~

~~试样固定在焊接区域内。电缆弯曲两次 90°(在焊接区域的方向)，然后弯曲回原来的位置。个别的线既不能断也不能松。~~

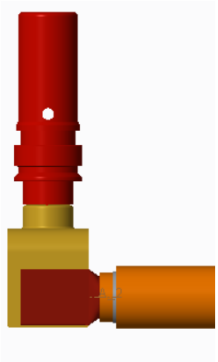
11. APPENDIX WIRES

11. 焊接使用的导线





wire direction left（270°） /
左侧出线（270°）



wire direction right（90°） /
右侧出线（90°）

Striping length/剥线长度		
2347435-1/2347435-2		
Direction	Wire direction left	Wire direction right
Dim A	19±1	19±1
Dim B	See TE Spec. 114-32207 for 2347435-1 See TE Spec. 114-32219 for 2347435-2	
Dim C		

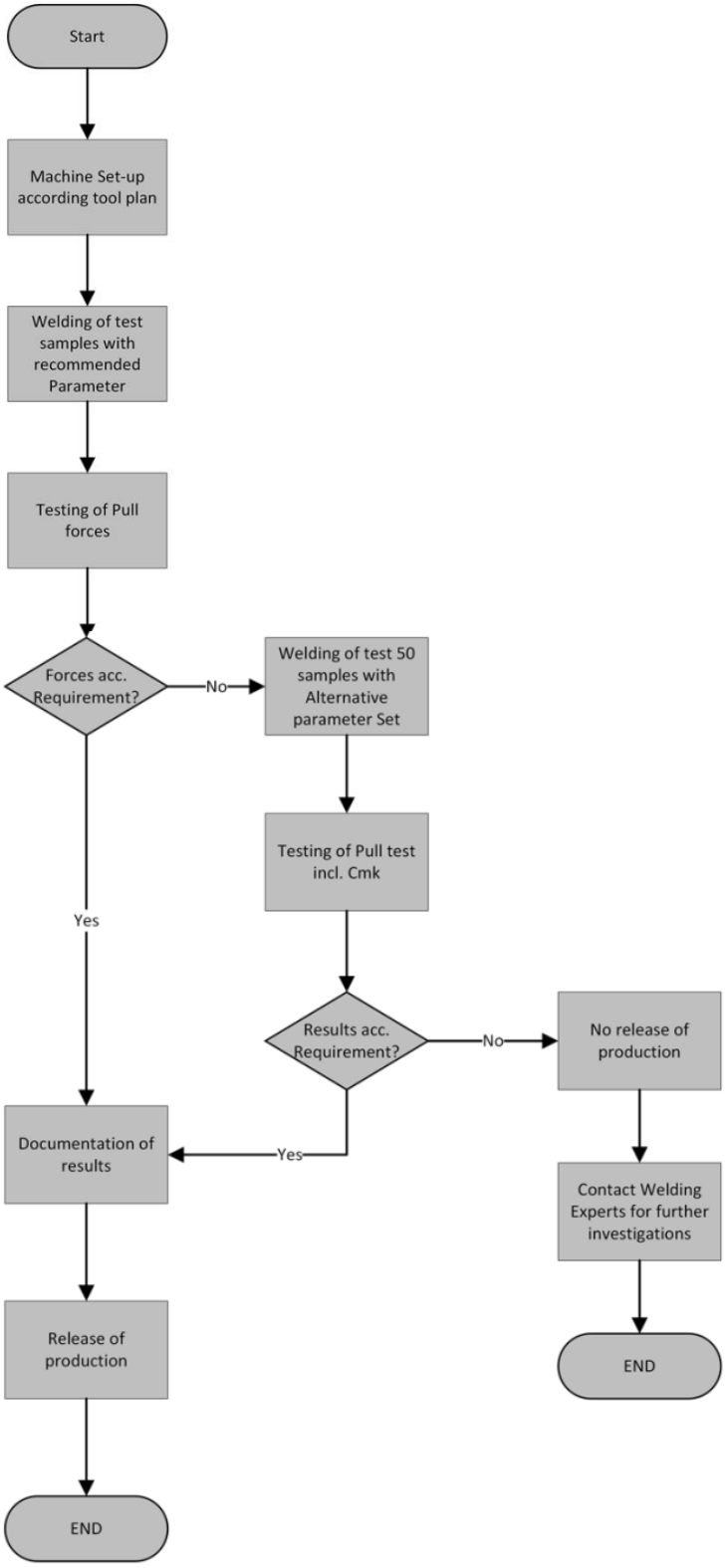
Table /表格 6

Material 材质	Cross section 线径[mm²]	Standard 标准	Identification 规格	Wire supplier 供应商	Color 颜色	Temperature range 耐温	Permissible voltage 耐压
CuETP	70	LV216-2	FHLR2GCB2G /70 mm2 / 0.21 T180 0.6/1.0 Kv	Coroplast	Orange	-40° C~180° C	600V AC/1000V DC
CuETP	95	LV216-2	FHLR2GCB2G/ 95mm² /0.21/ T180 0.6/1.0Kv	Coficab	Orange	-40° C~180° C	600V AC/1000V DC

TABLE / 表格 7

12. APPENDIX PARAMETER SELECTION PROCESS

12. 参数选择流程



LTR	REVISION RECORD	DWN	APP	DATE
A	Initial released	Gerry Zhang	Ivan Yin	12th Aug.2020
A1	1. Update section 7 on page 5 2. Update tolerance of Dim O on page 7&8	Gerry Zhang	Weidong Zhang	20th DEC.2020
A2	1. Add spec. 109-18508 Test specification to carry out pull- and peel tests of ultrasonic welded cable to terminal connections to Chapter 2.3 on page 2 2. Add the ultrasonic welding machine model for 95mm2 welding on page 4 3. Updated welding parameters for 95mm2 on pages 8 4. Add value of Cmk to Chapter 10.2 on Page 9 5.Add Chapter 12 on Page 14 6.Delete Chapter 10.4 on Page 12	Bingbing Liu	Weidong Zhang	27th OCT.2023
A3	Add 70 mm² welding for 2347435-1 on TT7 machine	Bingbing Liu	Weidong Zhang	30th APR.2024