



GREENCONN TECHNOLOGY CO.,LTD.

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類 別	CSGA111 SERIES PRODUCT SPECIFICATION
PS	

文件變更履歷表

版次	制 / 修 / 廢原因			頁次	制 / 修 / 廢日期
A/0	新制產品規範			全 部	2023/10/09
核準	邱國延	審查	黃超	制定	王文睿
日期	2023/10/9	日期	2023/10/9	日期	2023/10/9



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1.0 SCOPE（范围）：

This specification covers the requirements for product performance and test methods of the CSGA111 series connector. Product shall be of the design, construction and physical dimensions specified in the applicable product drawing. (本規格書涵蓋了CSGA111系列連接器的產品性能要求和測試方法。產品應符合適用產品圖面中規定的設計、結構、尺寸等。)

2.0 APPLICABLE DOCUMENTS（適用文件）：

The following document, of the latest issue in effect at the time of performance of the qualification tests, shall form a part of this specification to the extent specified herewith. (本版本中以下文件，在性能鑒定試驗時生效，將構成本規範的一部分。)

DIN IEC 60512, IEC 60512-2-1, DIN IEC 60512-8, DIN IEC 68-2-20, VDA Band 19 / ISO 16232, LV214.

Test methods for electrical connectors. (DIN IEC 60512, IEC 60512-2-1, DIN IEC 60512-8, DIN IEC 68-2-20, VDA Band 19 / ISO 16232, LV214 電器連接器的測試方法)

3.0 PRODUCT DESCRIPTION AND PART NUMBER（產品描述和型號）：

Product description（產品描述）						Part No.（型號）	
RASTLink	5.0mm	Single	Row	Female	Co	CSGA111	SERIES
nnector							

4.0 PROPERTY（特性）：

4.1 Ratings（額定值）：

4.1.1 Current Rating(額定電流): 6Amp

4.1.2 Voltage Rating(額定電壓): 250V AC/DC.

4.1.3 Operating Temperature Range(工作溫度): -40°C~120°C.

4.1.4 Operating Humidity(工作濕度): 85% Max.

4.2 Materials（材料）：

4.2.1 Housing(塑殼殼): High Temperature Thermoplastic(高溫熱塑性塑膠): LCP, Nylon 6T, Nylon 9T or Nylon 46, flame retardant 94V-0 per UL-94; or other high performance resin.

Thermoplastic(熱塑性塑膠):PBT or Nylon 66,flame retardant

94V-0 per

UL-94; or other high performance resin.

4.2.2 Contact(端子): Brass, Phosphor Bronze or other equivalent copper alloys.

Finish(表面處理): See plating drawing.

4.2.3 Harmful Material Should Be Compliant to GREENCONN Standards (Per QPNQ0817).

有害物質應符合格菱公司的標準(參考文件QPNQ0817)。

5.0 TEST CONDITION（測試條件）：

5.1 Temperature range（溫度範圍）：15°C to 30°C.

5.2 Humidity range（濕度範圍）：30% RH to 75%RH.

6.0 STORAGE CONDITION（儲藏條件）：

6.1 Temperature range（溫度範圍）：25±5°C.

6.2 Humidity range（濕度條件）：≤70% RH.



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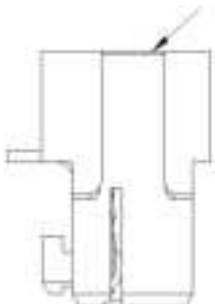
6.3 Shelf life (存储期限): 6 Months.

7.0 PRODUCT TEST GROUP ACCORDING TO LV 214 (2010/03):

依据LV 214 (2010/03) 的产品试验

Group	Test item测试项目	Remark备注
PG 0	Inspection of as-received condition入厂检验	Connector Compliant
PG 1	Dimensions尺寸	Connector Compliant
PG 2	Material and surface analysis, contacts端子材料和表面分析	Cable Compliant
PG 3	Material and surface analysis, housings and single-wire seals护套和防水栓材料和表面分析	Connector Compliant
PG 4	Contact engagement length端子接合长度	Connector Compliant
PG 5	Mechanical and thermal relaxation behavior机械和热松弛特性	Cable Compliant
PG 6	Interaction between contact and housing端子和护套之间的相互作用	Cable Compliant
PG 7	Handling and functional reliability of the housing护套操作和功能可靠性	Connector Compliant
PG 8	Insertion and retention forces of the contact parts in the housing护套内端子的插入力和保持力	Not Applicable
PG 9	Pin insertion inclination/misuse safe (scoop-proofing)插入偏斜/错误防护(防斜插)	Connector Compliant
PG 10	Contacts: conductor pull-out strength端子: 导线拉拔强度	Cable Compliant
PG 11	Contacts: Insertion and removal forces, mating cycle frequency端子: 插拔力, 插拔次数频率	Cable Compliant
PG 12	Current heating, derating电流加热, 降额	Cable Compliant
PG 13	Housing influence on the derating护套对降额的影响	Connector Compliant
PG 14	Thermal time constant (current excess temperature at n times rated current)热时间常数(在n倍额定电流下的电流过载温度)	Cable Compliant
PG 15	Electrical stress test电应力试验	Cable Compliant
PG 16	Friction corrosion摩擦腐蚀	Cable Compliant
PG 17	Dynamic load动力载荷	Cable Compliant
PG 18 A	Coastal climate load沿海气候载荷	Connector Compliant
PG 18 C	Deicing salt load除冰盐载荷	Cable Compliant
PG 19	Environmental simulation环境模拟	Cable Compliant
PG 20	Climate load of the housing护套气候载荷	Connector Compliant
PG 21	Long-term temperature aging长时间热老化	Connector Compliant
PG 22A	Chemical resistance耐化学性	Connector Compliant
PG 22B	Chemical resistance, extended test耐化学性, 扩展试验	Cable Compliant
PG 23	Water leak tightness水密封性	Not Applicable
PG 24	Impenetrability to paint涂漆不可渗透性	Cable Compliant
PG 25	Test group omitted实验组删除	N/A
PG 26	Test group omitted实验组删除	N/A
PG 27	Test group omitted实验组删除	N/A
PG 28	Locking noise锁止噪音	Connector Compliant
PG 29	Retention force of the blind plugs盲堵保持力	Not Applicable

8.0PRODUCT ADDITIONAL TEST:产品额外的测试:

Test item (測試項目)	Test procedure (測試流程)	Condition of test specimens (測試狀態)	Requirement (要求)
Mating Force (插入力)	Per EIA-364-13 Insert a card at a rate of 25.4mm/ minute. (依照 EIA-364-13 以 25.4mm/ minute 的速度插入插頭。)	Mating (配對)	4N Max. per pin. (最大 4.0N 每 PIN)
Unmating Force (拔出力)	Per EIA-364-13 Withdrawal a card at a rate of 25.4mm/ minute. (依照EIA-364-13以25.4mm/ minute的速度拔出插頭。)	Mating (配對)	0.50N Min. per pin. (最小 0.5N 每 PIN)
Retaining force /locking device (鎖扣力)	Per LV-214 PG7 (鎖扣力 依LV-214 PG7) 	Mating (配對)	No defects of header housing after testing F: Unassembled Housing: 13.4N Min. 測試後無損壞： 塑膠:13.4N Min。
Plastic latch retention(保持力)	Withdrawal a PCB at a rate of 25.4mm/ minute 		1N Min



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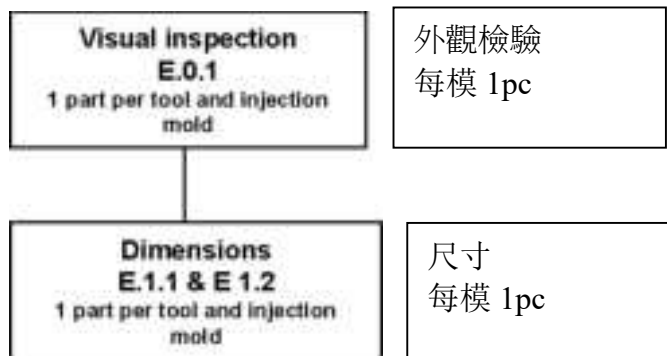
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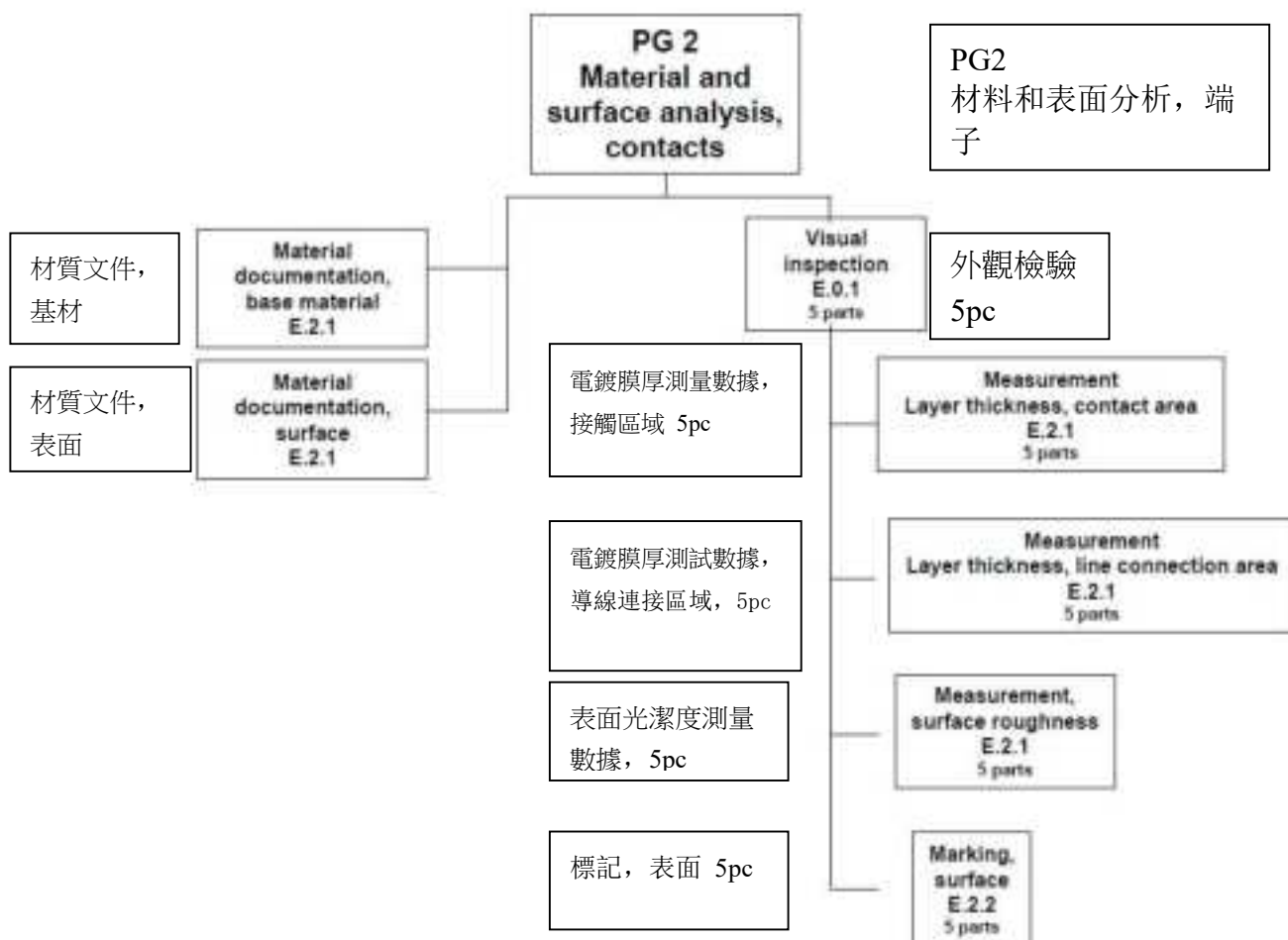
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9.0 PRODUCT QUALIFICATION AND TEST SEQUENCE: 产品鉴定和测试顺序

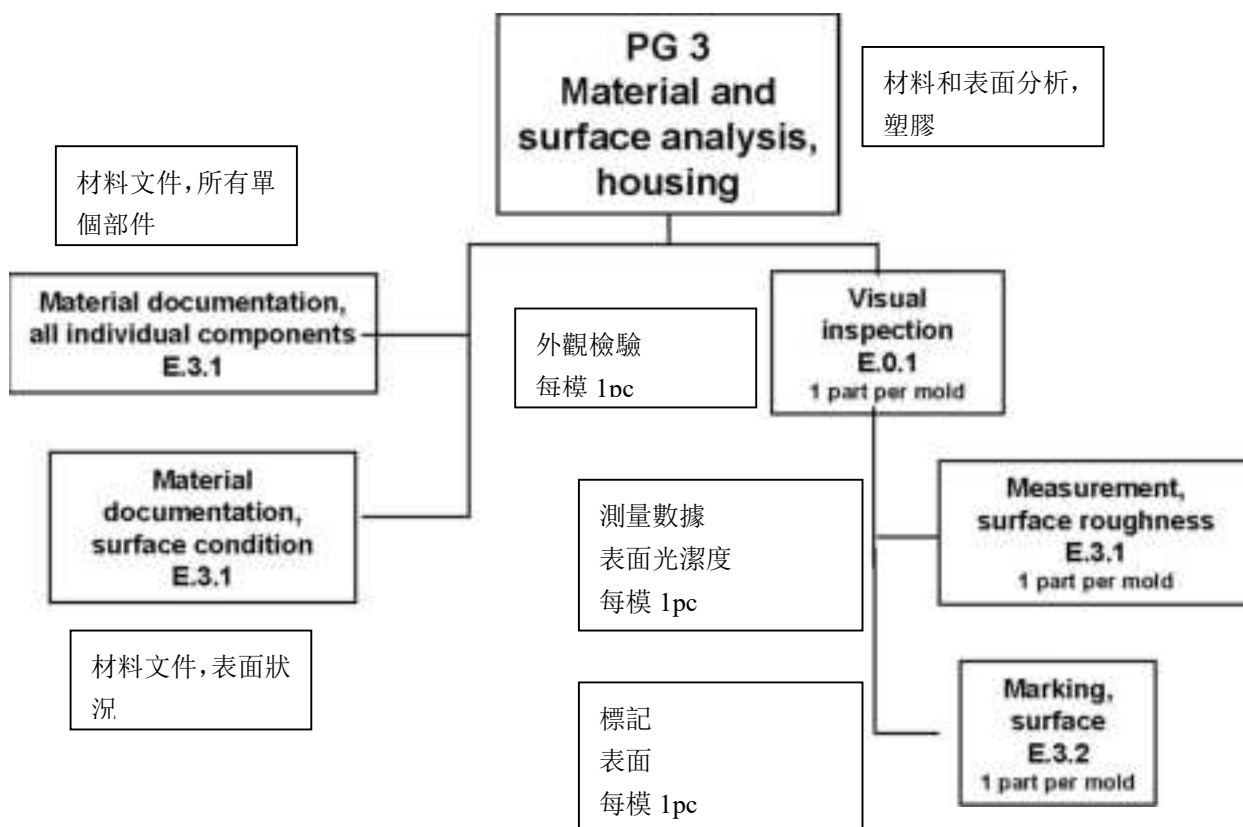
PG 1. Dimensions尺寸



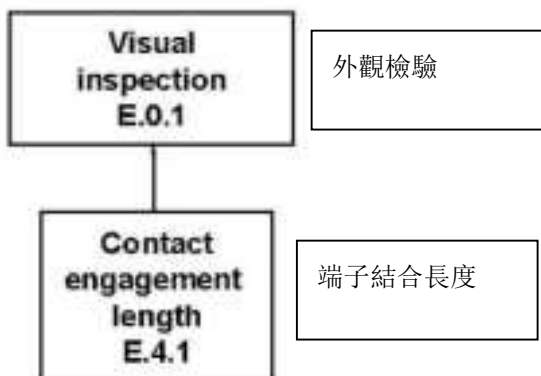
PG2. Material and surface analysis, contacts端子的材料和表面分析



PG 3. Material and surface analysis, housings and single-wire seals 护套和防水栓材料和表面分析



PG 4. Contact engagement length 端子接合长度





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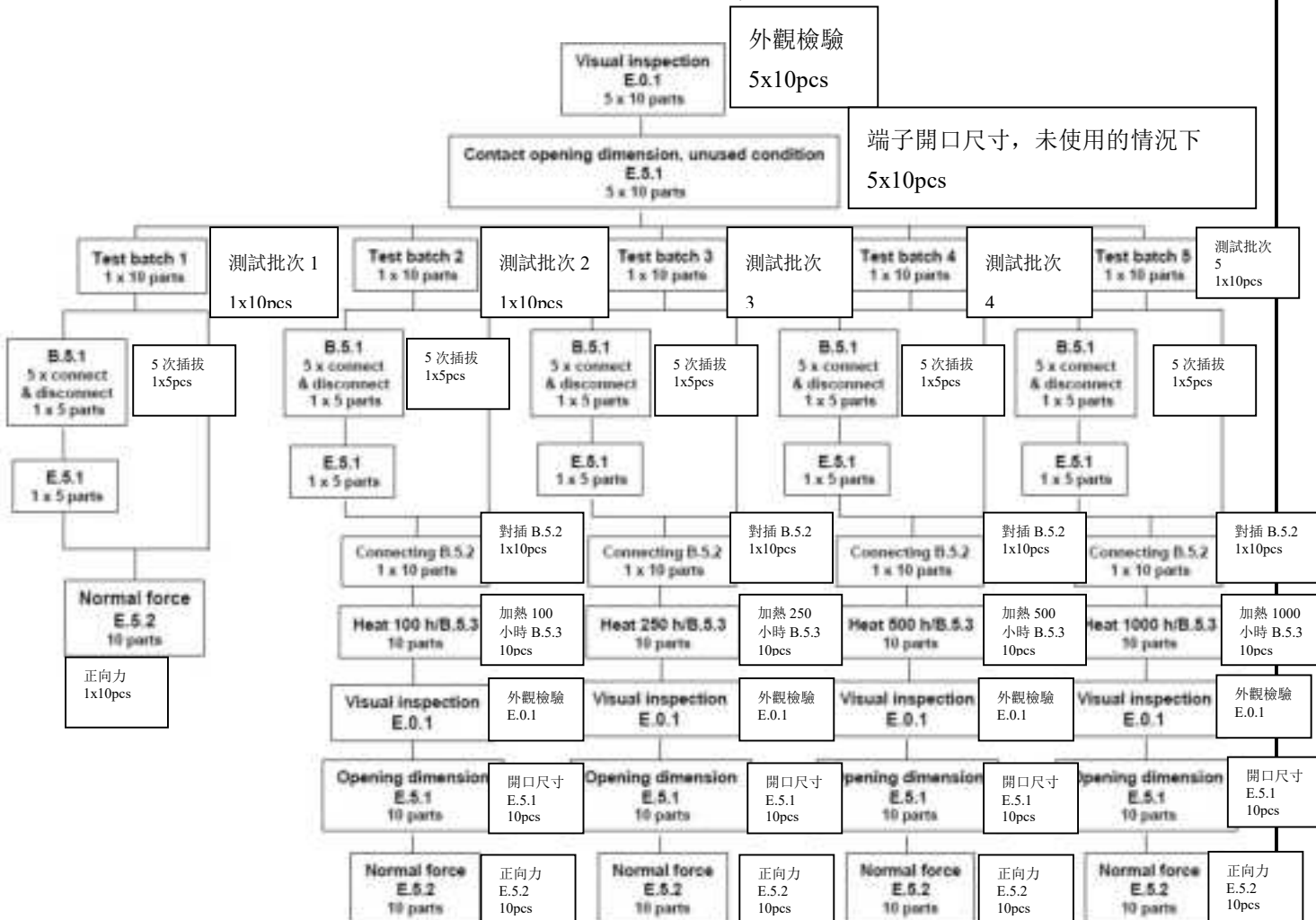
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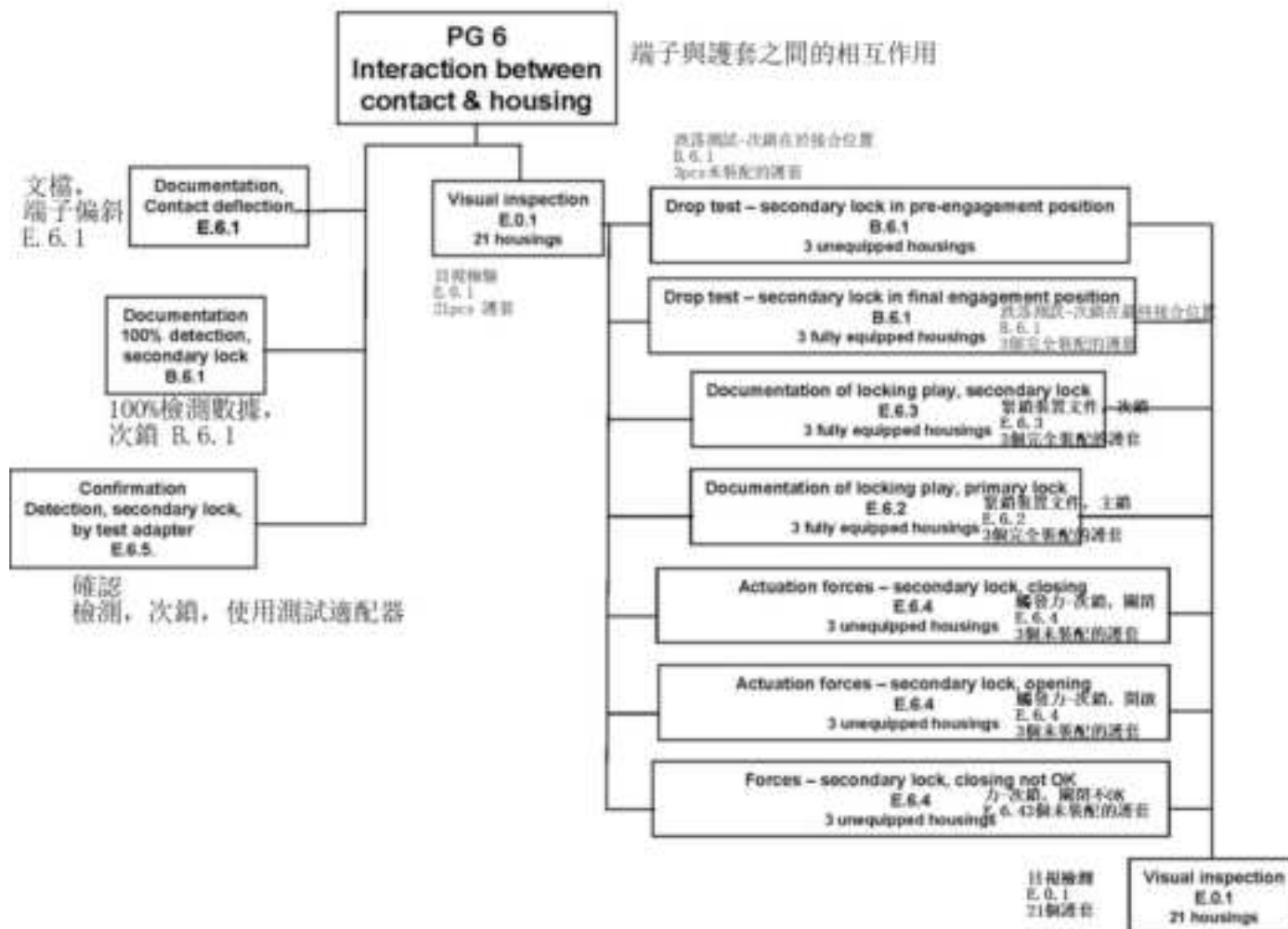
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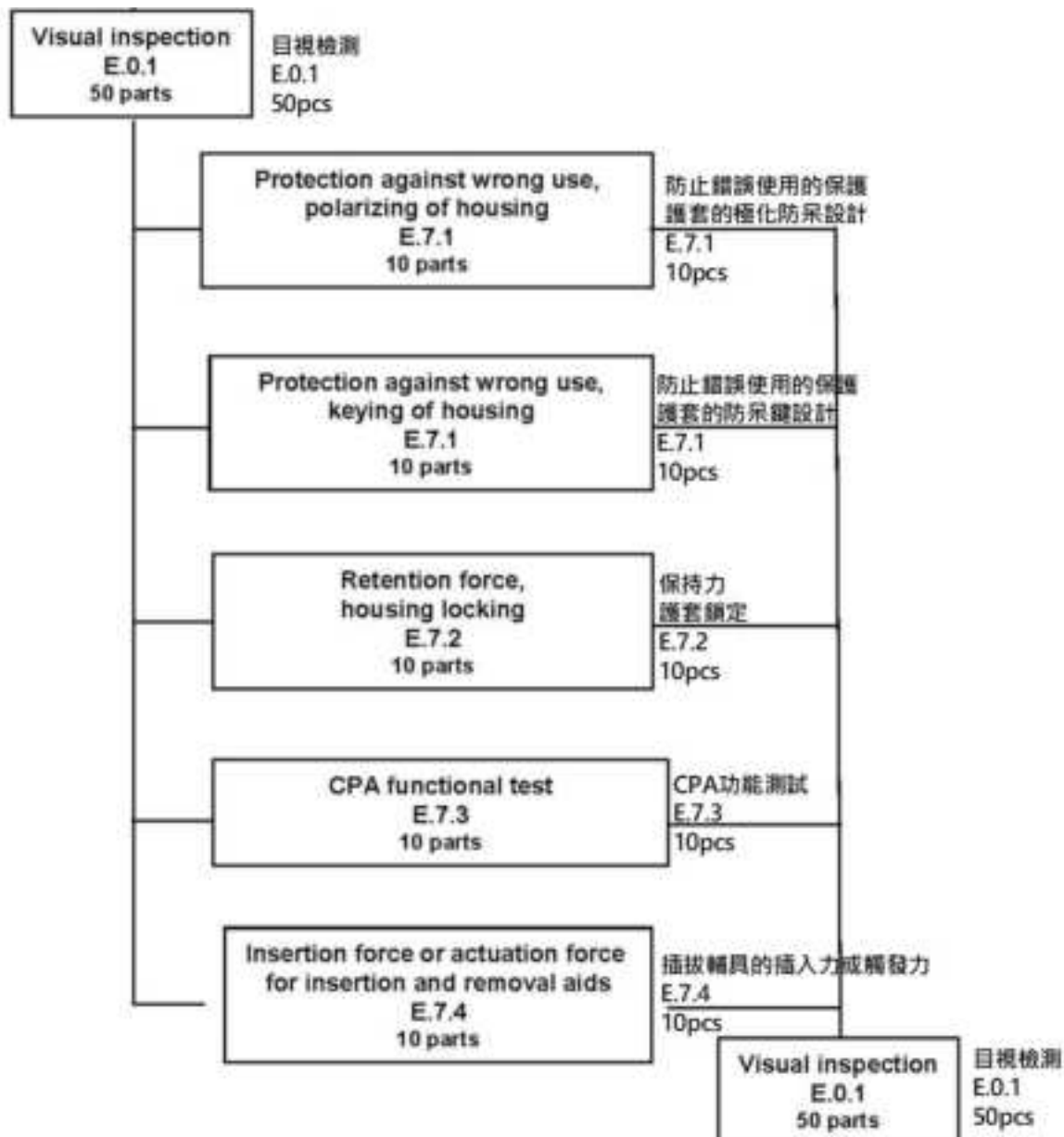
PG 5. Mechanical and thermal relaxation behavior 机械和热松弛特性



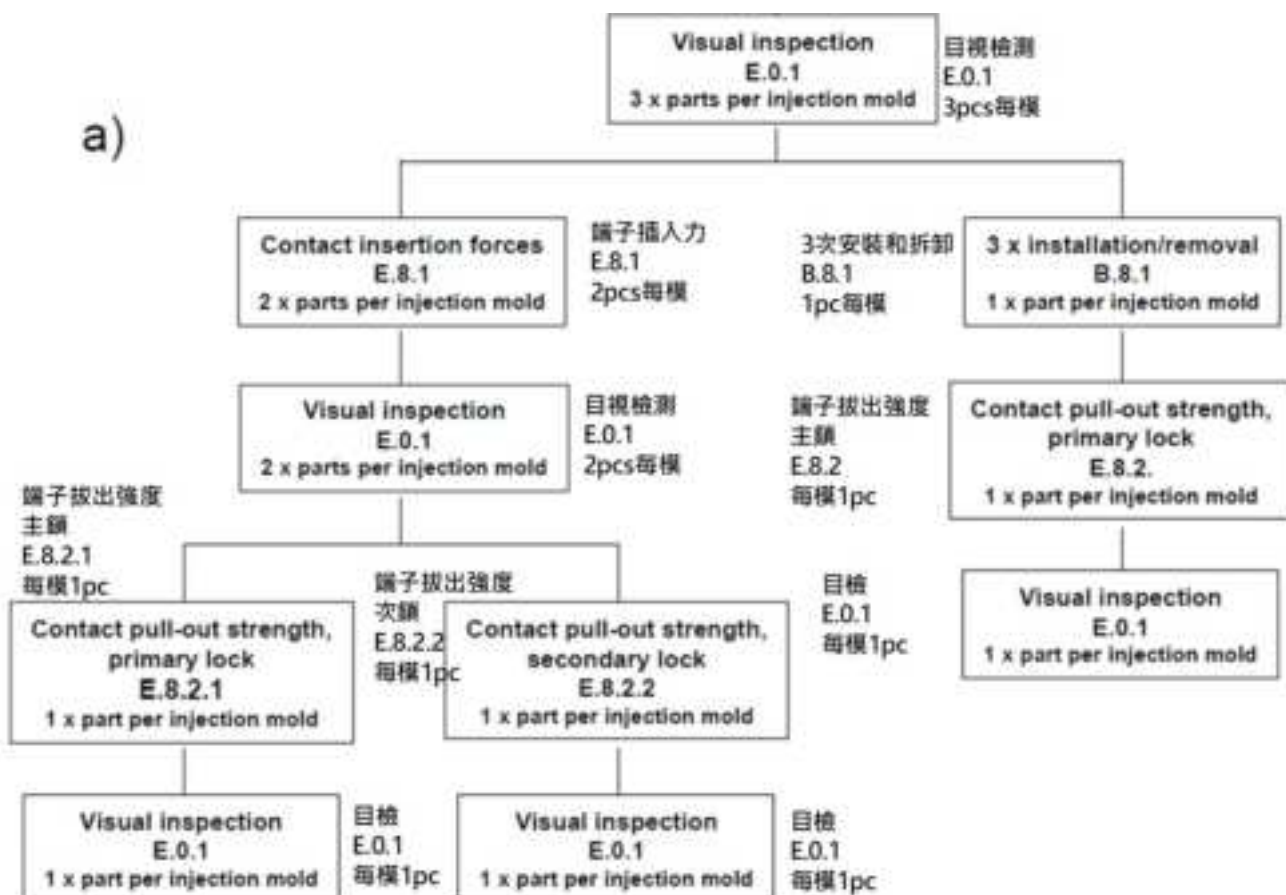
PG.6 Interaction between contact & housing 端子與護套之間的相互作用



PG 7. Handling and functional reliability of the housing 护套操作和功能可靠性

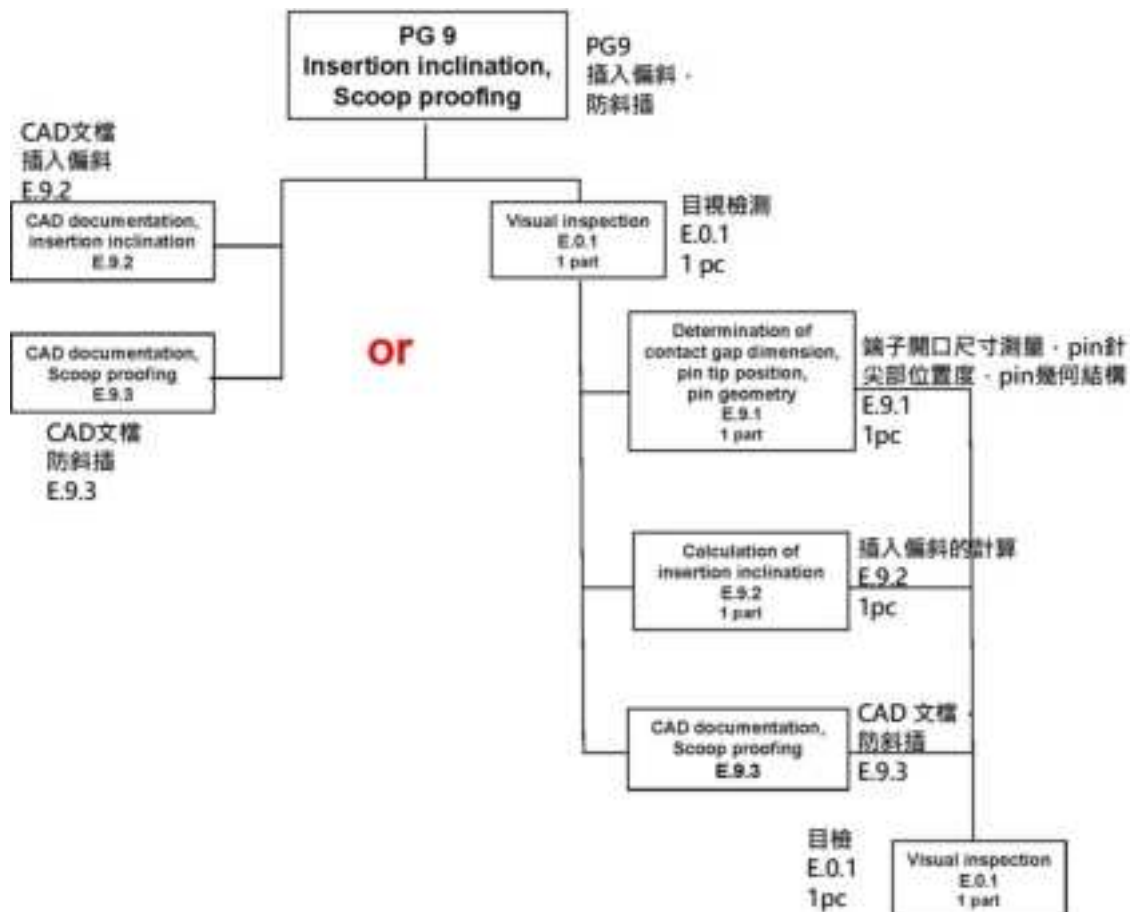


PG 8. Insertion and retention forces, contacts in the housing
护套内端子的插入力和保持力

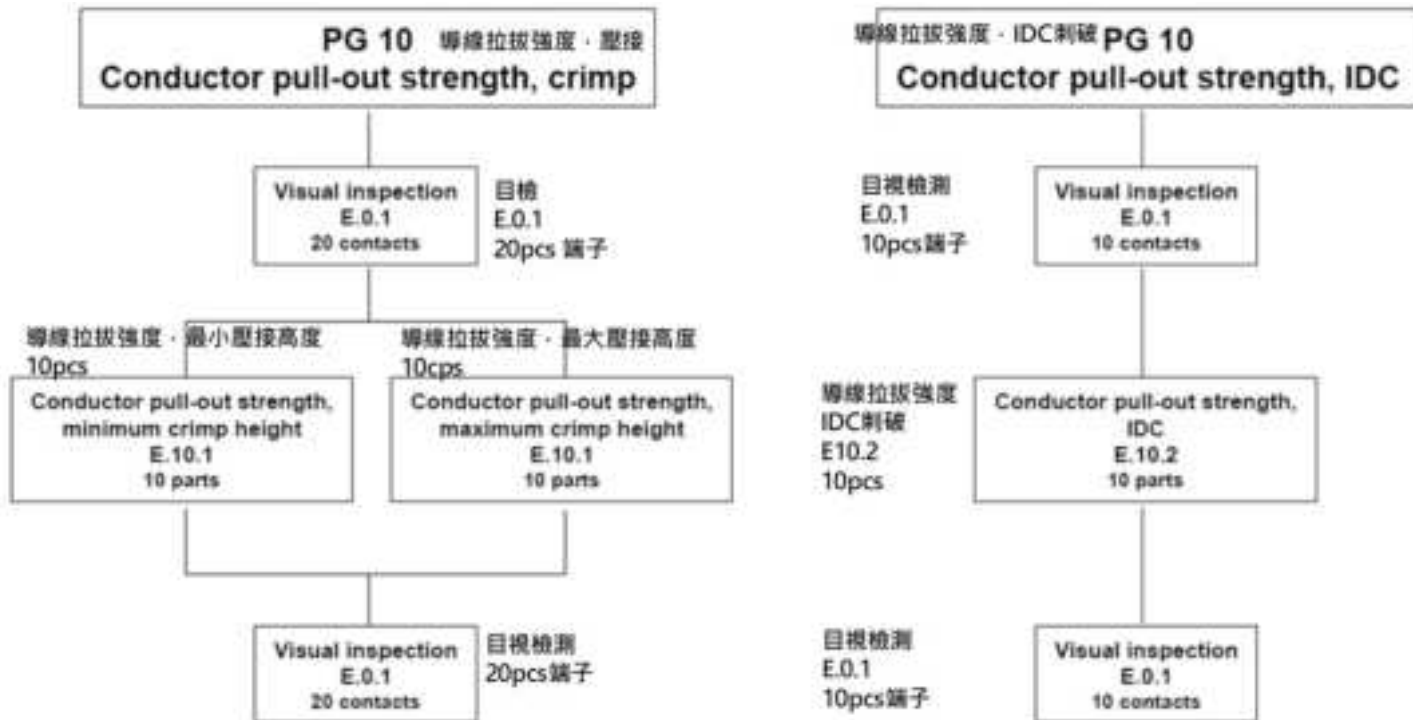


PG 9. Pin insertion inclination/misuse safe (scoop-proofing)

插入偏斜/错误防护（防斜插）



PG 10. Contacts: conductor pull-out strength 端子: 导线拉拔强度

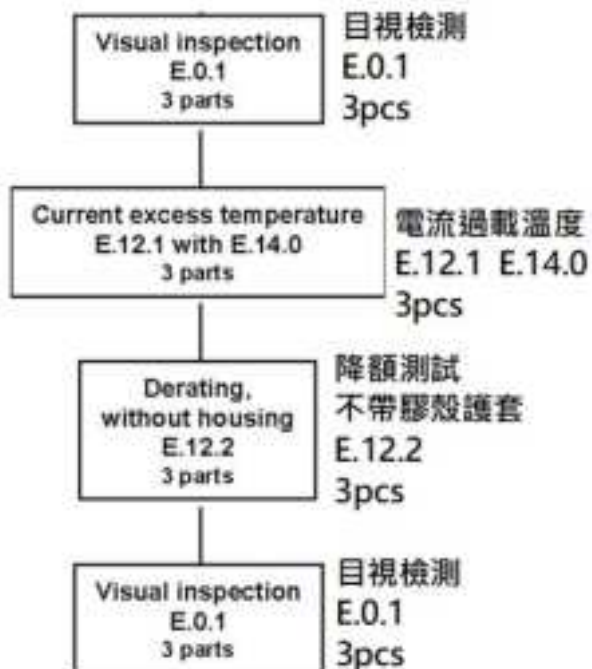


PG 11. Contacts: Insertion and removal forces, mating cycle frequency

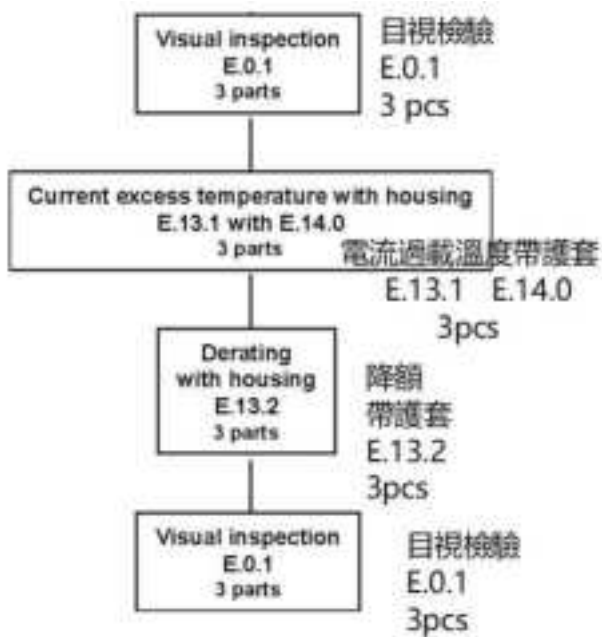
端子：插拔力，插拔次数频率



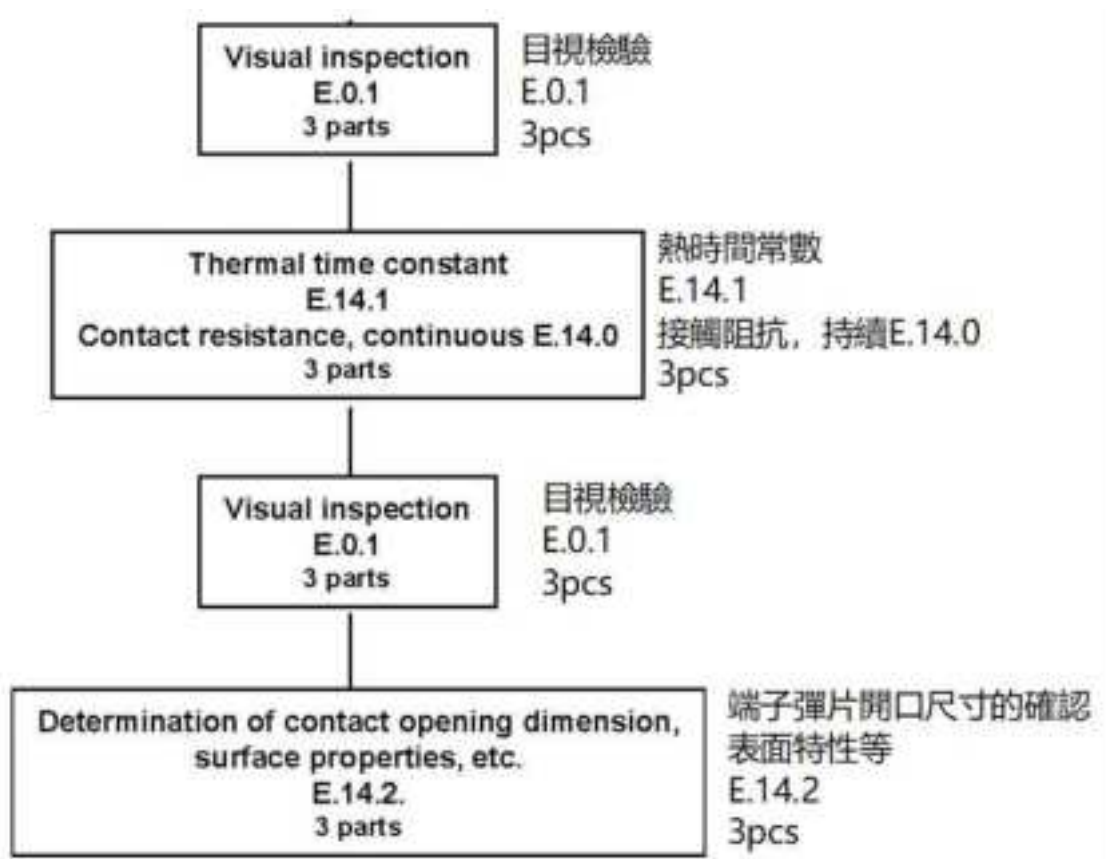
PG 12. Current heating, derating 电流加热，降额



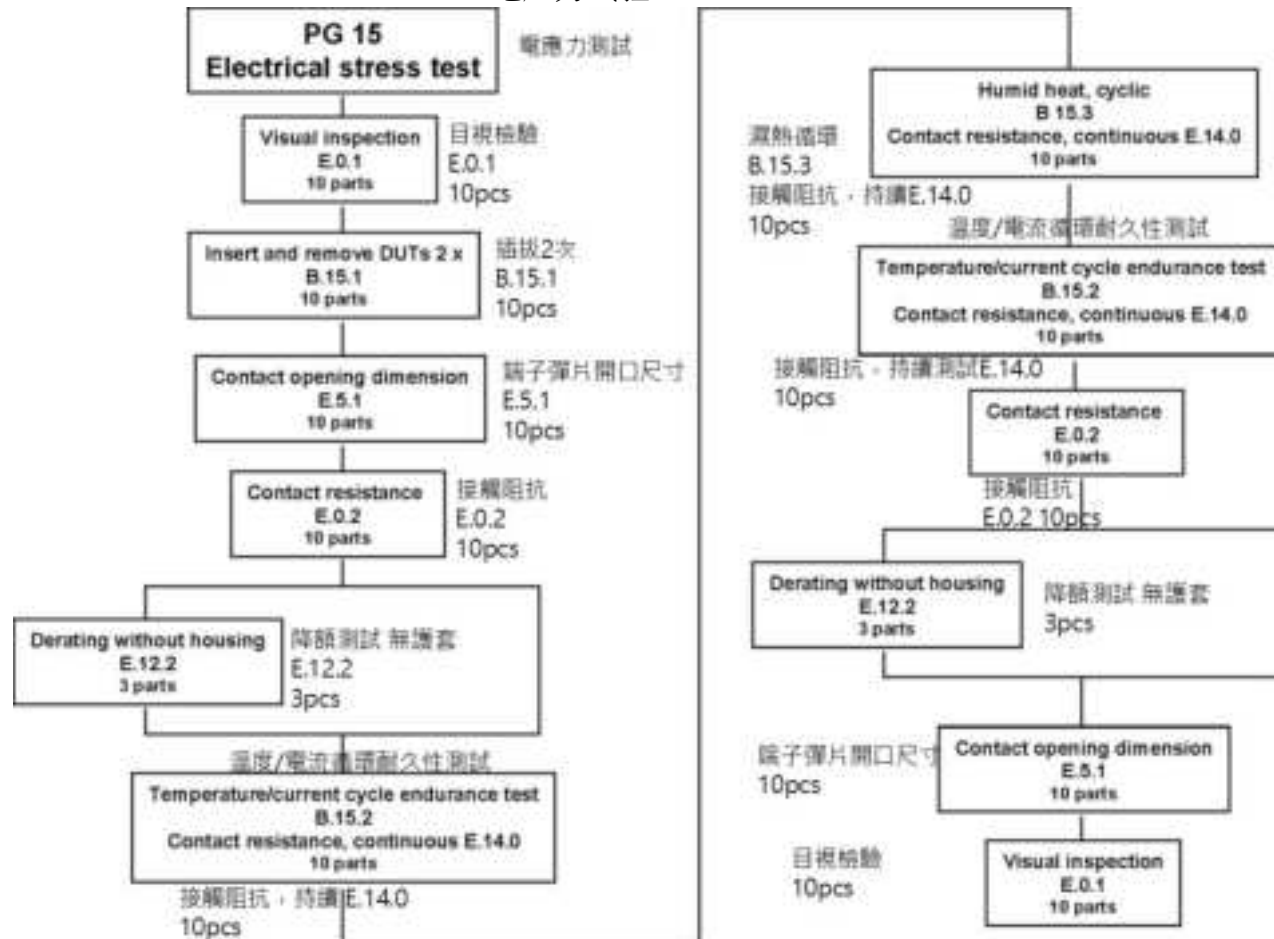
PG 13. Housing influence on the derating 护套对降额的影响



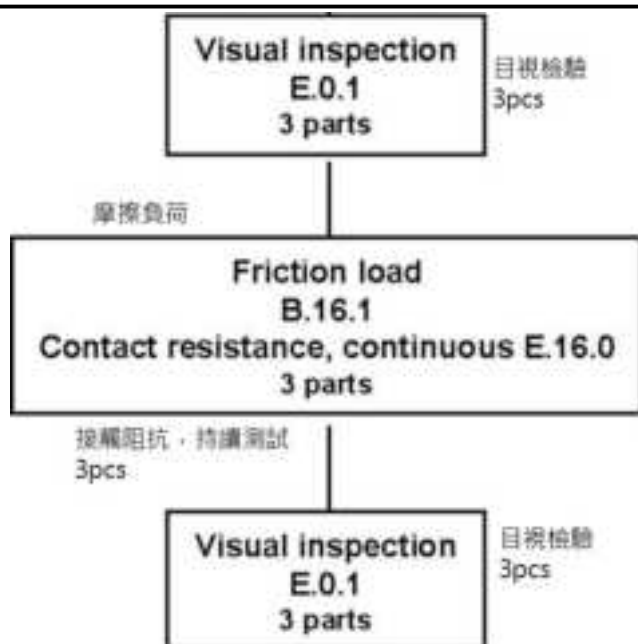
PG 14. Thermal time constant (current excess temperature at n times rated current)熱時間常數（在n倍額定電流下的電流過載溫度）



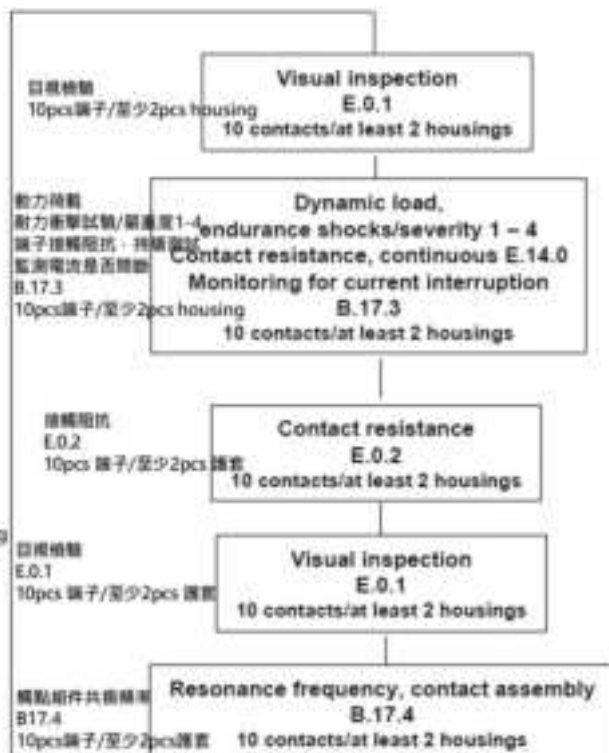
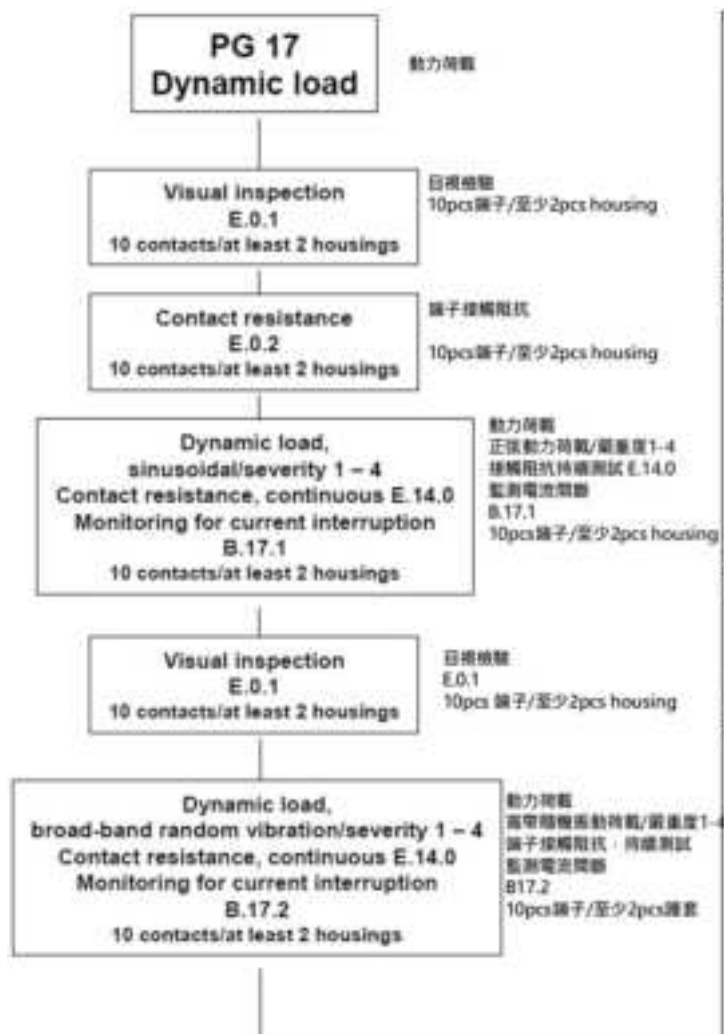
PG 15. Electrical stress test 电应力试验



PG 16. Friction corrosion 摩擦腐蚀



PG 17. Dynamic load 動力荷載





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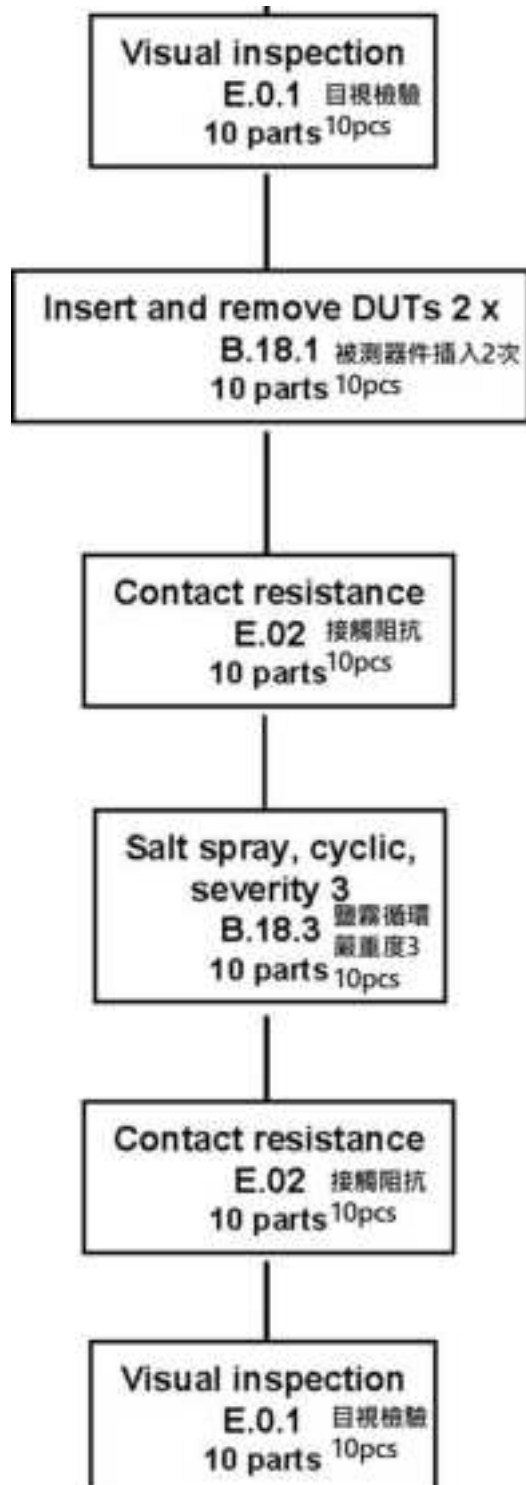
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PG 18A. Coastal climate load沿海气候载荷





PG 19 Environmental simulation – page 1

環境模擬

Visual inspection
E.0.1
30 parts
目視檢驗
30pcs

Contacts, group 1
connect 1 x
10 parts
端子・群組1
插入1次
10pcs

Contacts, group 2
connect 1 x
10 parts
端子・群組2
插入1次
10pcs

Contacts, group 3
connect 1 x
10 parts
端子・群組3
插入1次
10pcs

Contact resistance
E.0.2
10 parts
接觸阻抗
10pcs

Contact resistance
E.0.2
10 parts
接觸阻抗
10pcs

Contact resistance
E.0.2
10 parts
接觸阻抗
10pcs

Contacts, group 1
disconnect 1 x acc. to B.19.0
10 parts
端子・群組1
拔出1次依照B.19.0
10pcs

Contacts, group 2
connect 1 x acc. to B.19.0
10 parts
端子・群組2
插入1次依照B.19.0
10pcs

Contacts, group 3
connect 50% x acc. to B.19.0
10 parts
端子・群組3
插入50%依照B.19.0
10pcs

Temperature shock
B.19.1
10 parts
溫度衝擊
B.19.1
10pcs

Temperature shock
B.19.1
Contact resistance, continuous E.14.0
10 parts
溫度衝擊
接觸阻抗・持續測量
10pcs

Temperature shock
B.19.1
Contact resistance, continuous E.14.0
10 parts
溫度衝擊
接觸阻抗・持續測量
10pcs

Temperature cycle
B.19.2
10 parts
溫度循環
B.19.2
10pcs

Temperature cycle
B.19.2
Contact resistance, continuous E.14.0
10 parts
溫度循環
接觸阻抗・持續測量
10pcs

Temperature cycle
B.19.2
Contact resistance, continuous E.14.0
10 parts
溫度循環
接觸阻抗・持續測量
10pcs

Aging in dry heat
B.19.3
10 parts
乾熱老化測試
B.19.3
10pcs

Aging in dry heat
B.19.3
Contact resistance, continuous E.14.0
10 parts
乾熱老化測試
接觸阻抗・持續測量
10pcs

Aging in dry heat
B.19.3
Contact resistance, continuous E.14.0
10 parts
乾熱老化測試
接觸阻抗・持續測量
10pcs

Visual inspection
E.0.1
10 parts
目視檢驗
10pcs

Visual inspection
E.0.1
10 parts
目視檢驗
10pcs

PG 19 Environmental simulation – page 2

Industrial atmosphere
B.19.4
10 parts
工業氣候
10pcs

Industrial atmosphere
B.19.4
10 parts
工業氣候
10pcs

Visual inspection
E.0.1
10 parts
目視檢驗
10pcs

Humid heat, cyclic
B.19.5
Contact resistance, continuous E.14.0
10 parts
濕熱循環
接觸阻抗・持續測量
10pcs

Humid heat, cyclic
B.19.5
Contact resistance, continuous E.14.0
10 parts
濕熱循環
接觸阻抗・持續測量
10pcs

Industrial atmosphere
B.19.4
10 parts
工業氣候
10pcs

Visual inspection
E.0.1
10 parts
目視檢驗
10pcs

Visual inspection
E.0.1
10 parts
目視檢驗
10pcs

Humid heat, cyclic
B.19.5
10 parts
濕熱循環
B.19.5
10pcs

Dynamic load, broad-band random vibration
B.19.6
Contact resistance, continuous E.14.0
10 parts
動力負載・寬帶隨機振動
接觸阻抗・持續測量
10pcs

Dynamic load, broad-band random vibration
B.19.6
Contact resistance, continuous E.14.0
10 parts
動力負載・寬帶隨機振動
接觸阻抗・持續測量
10pcs

Visual inspection
E.0.1
10 parts
目視檢驗
10pcs

Mechanical shock
B.19.7
Contact resistance, continuous E.14.0
10 parts
機械衝擊
接觸阻抗・持續測量
10pcs

Mechanical shock
B.19.7
Contact resistance, continuous E.14.0
10 parts
機械衝擊
接觸阻抗・持續測量
10pcs

Contacts, group 1
connect 1 x
10 parts
端子・群組1
插入1次
10pcs

Contact resistance
E.0.2
10 parts
接觸阻抗
10pcs

Contact resistance
E.0.2
10 parts
接觸阻抗
10pcs

Contact resistance
E.0.2
10 parts
接觸阻抗
10pcs

Contacts, group 2
disconnect and connect 1 x B.19.8
10 parts
端子・群組2
1次插拔
10pcs

Contacts, group 3
disconnect and connect 1 x B.19.8
10 parts
端子・群組3
1次插拔
10pcs

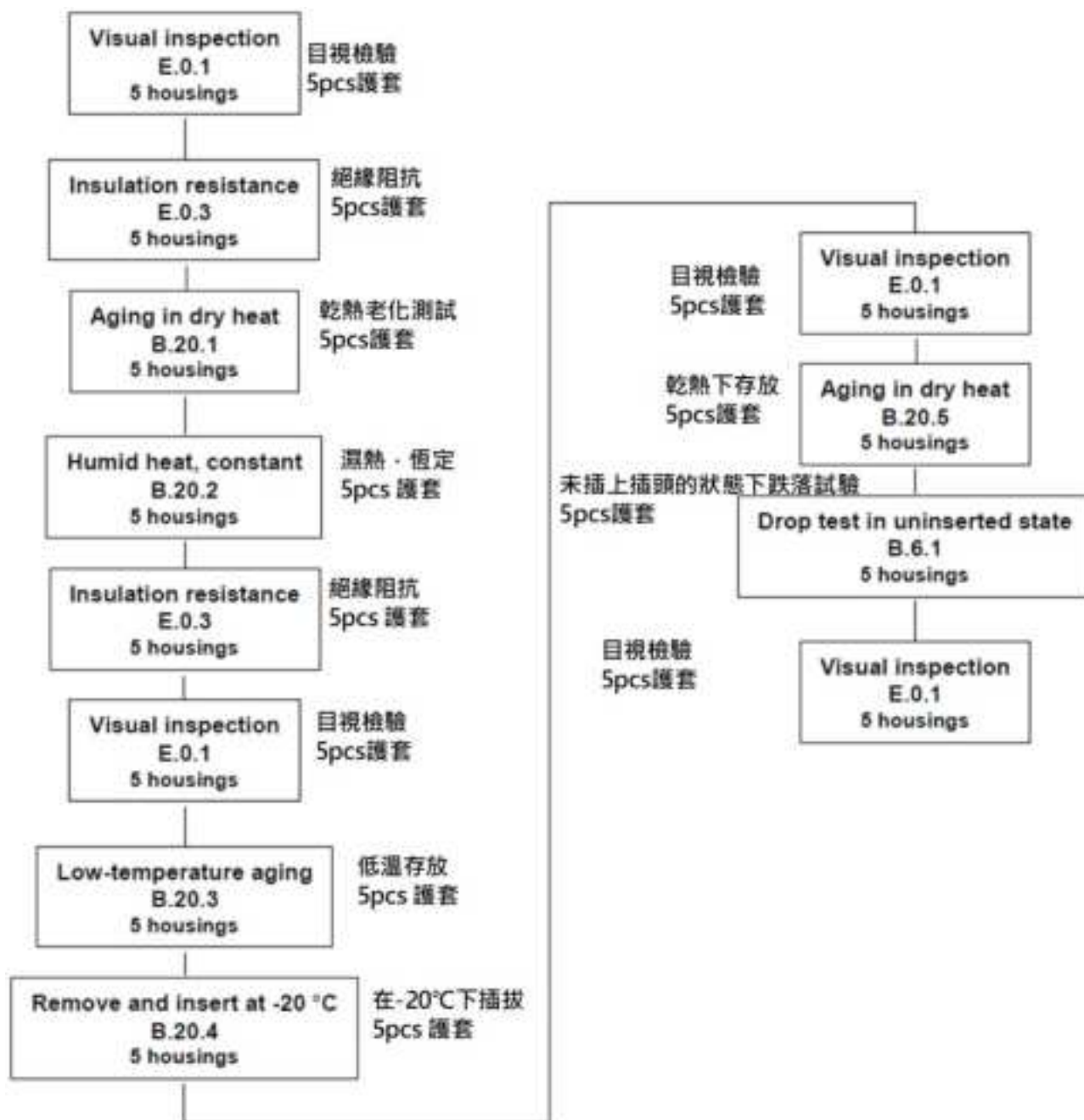
Visual inspection
E.0.1
10 parts
目視檢驗
10pcs

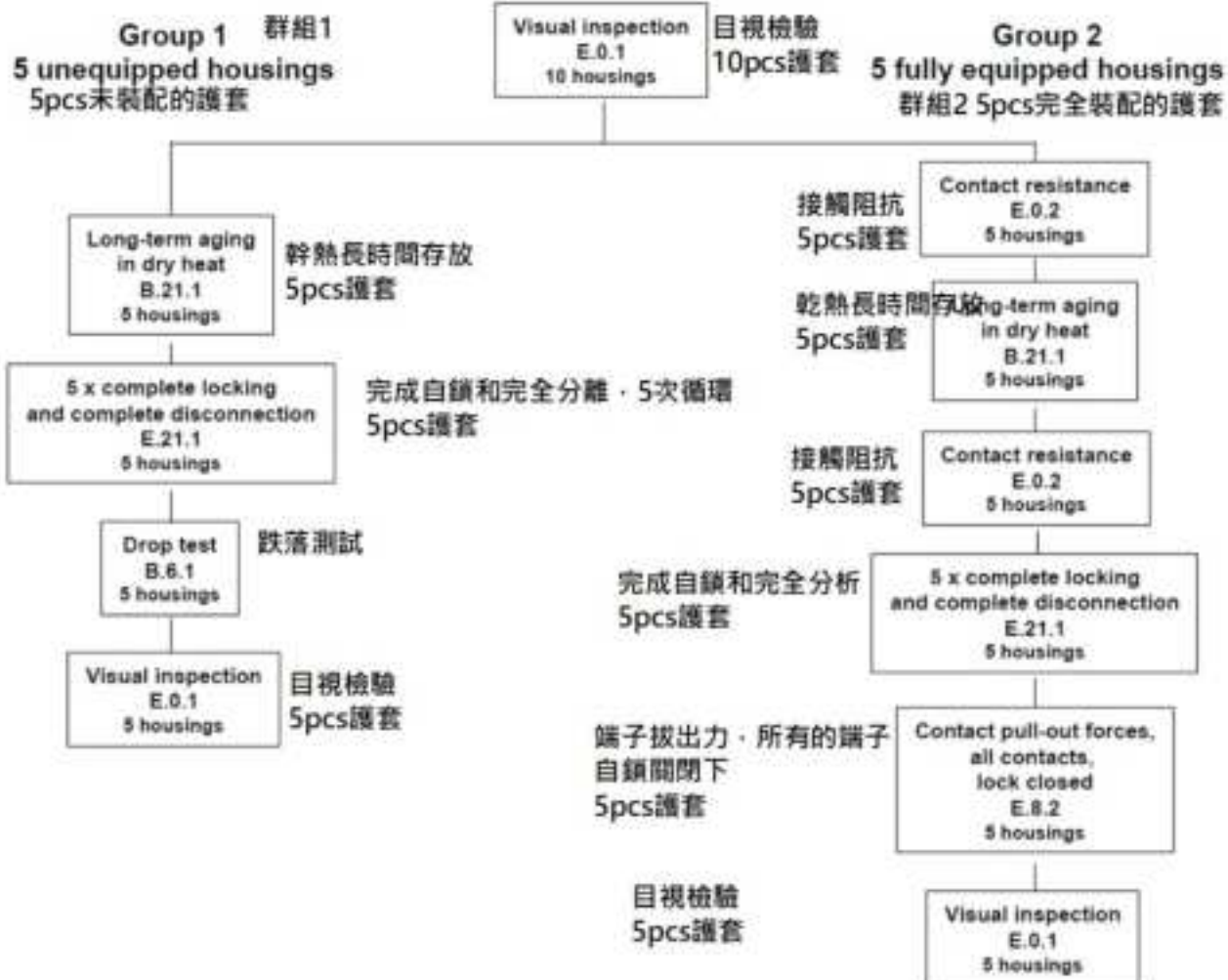
Contact resistance
E.0.2
10 parts
接觸阻抗
10pcs

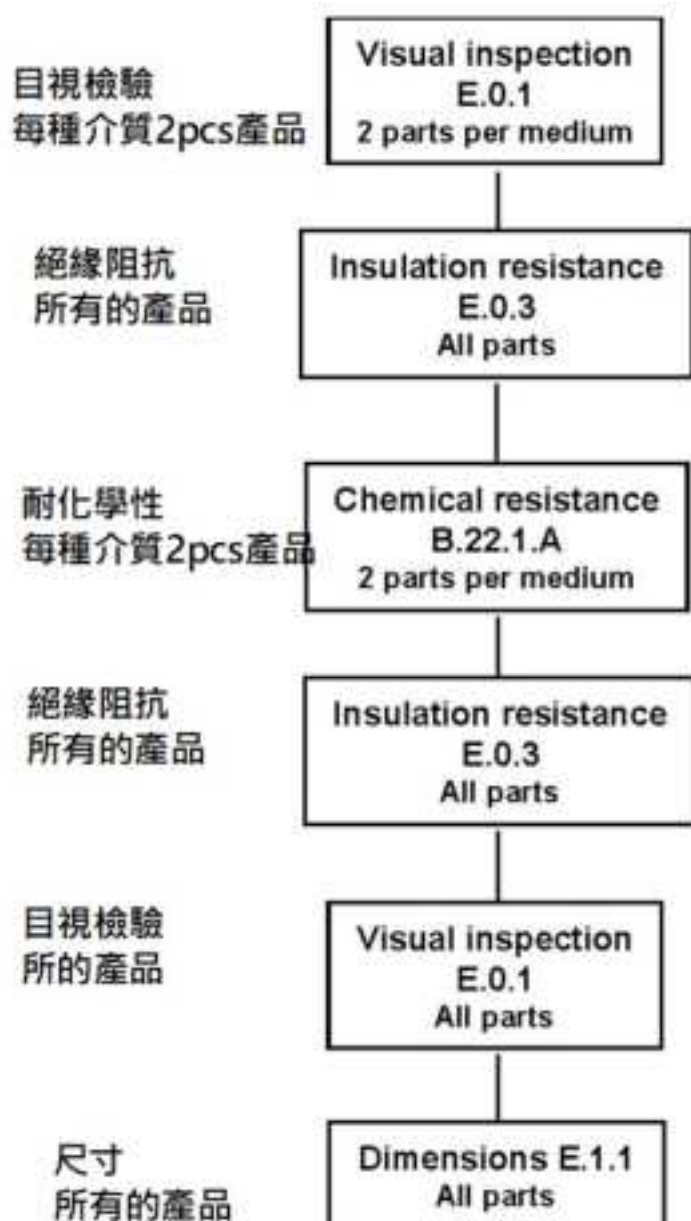
Contact resistance
E.0.2
10 parts
接觸阻抗
10pcs

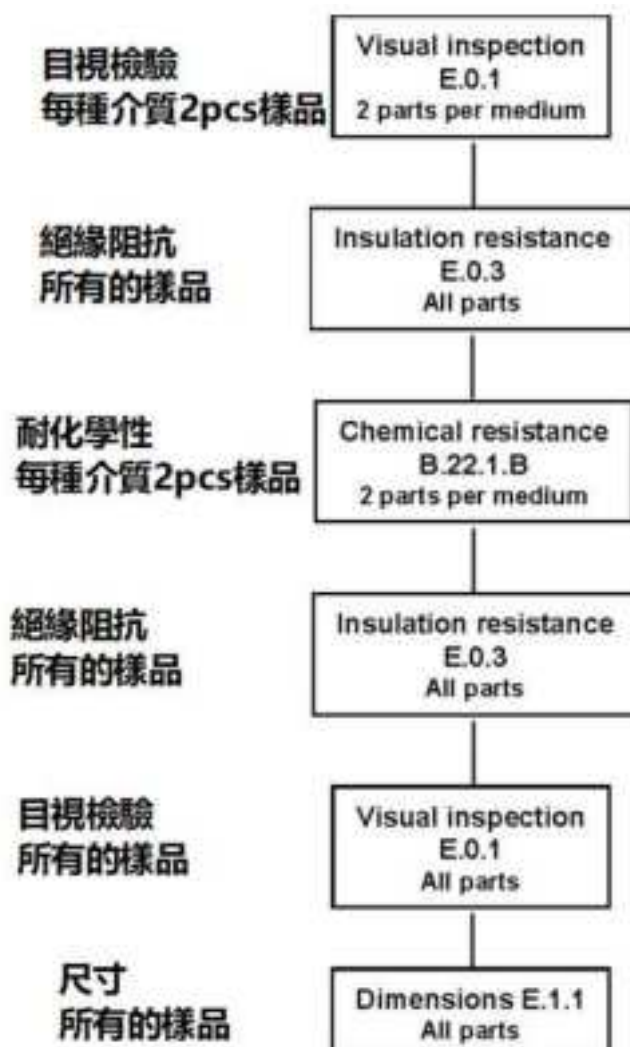
Visual inspection
E.0.1
10 parts
目視檢驗
10pcs

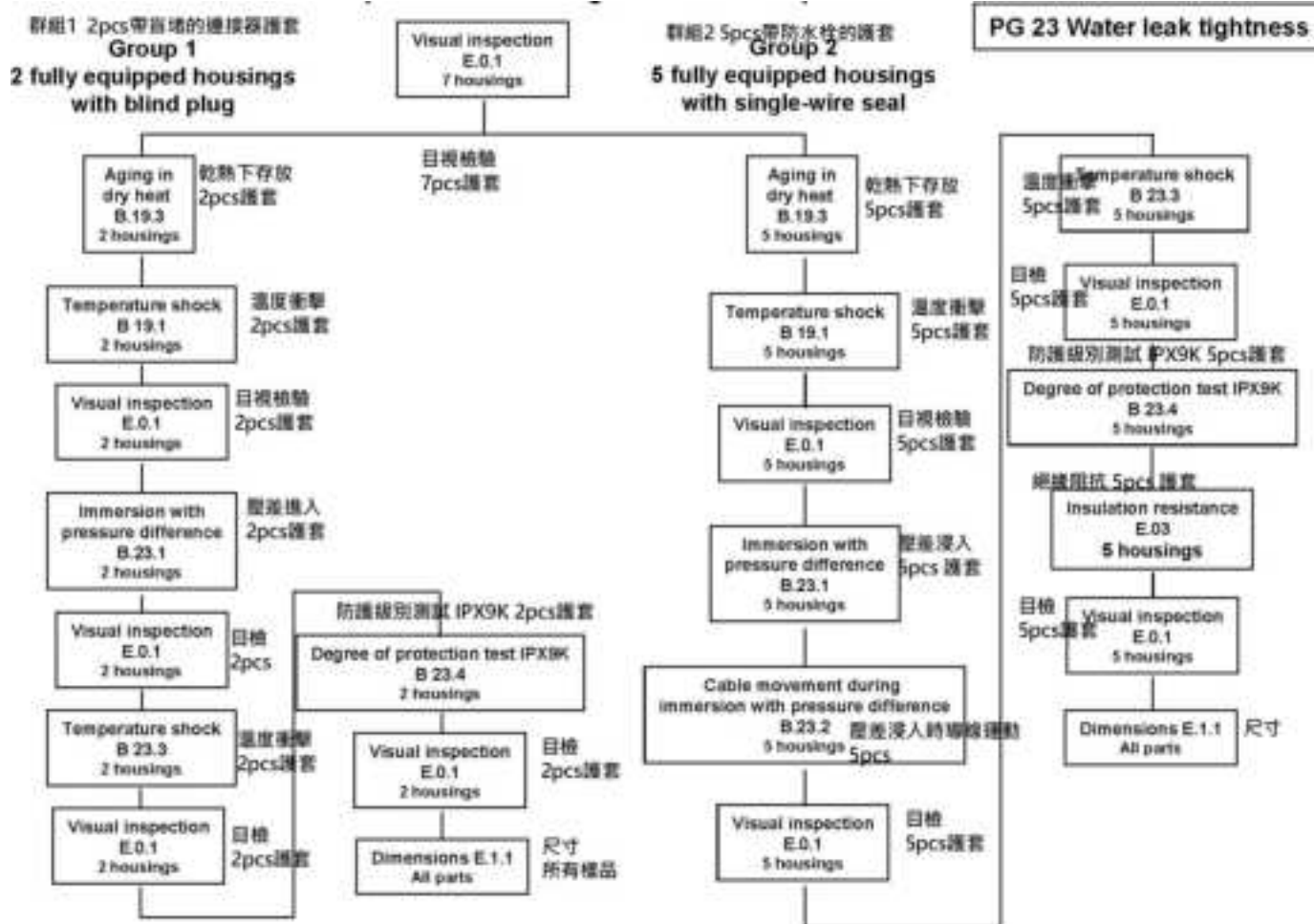
Visual inspection
E.0.1
10 parts
目視檢驗
10pcs







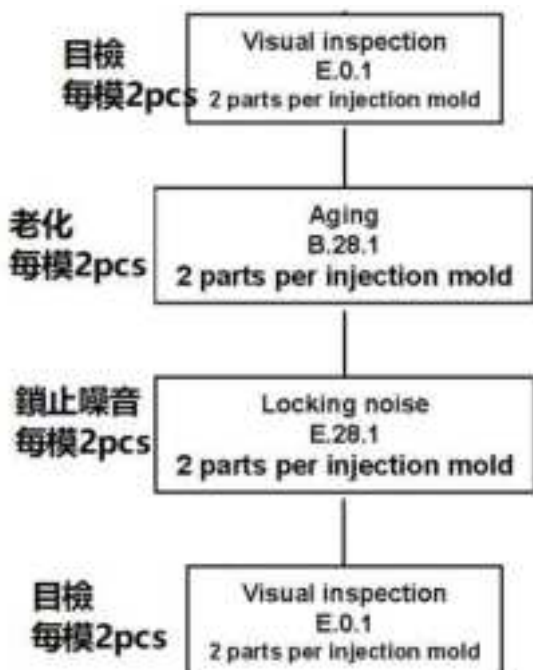




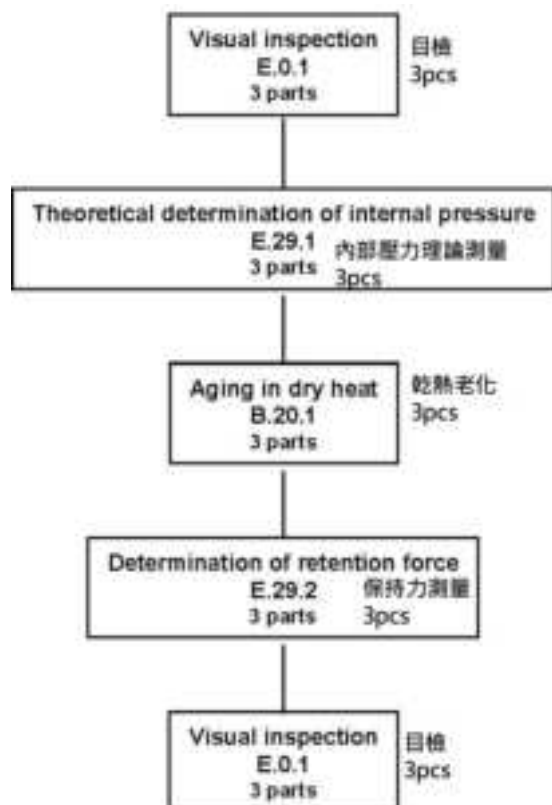
PG 24. Impenetrability to paint 涂漆不可渗透性



PG 28. Locking noise锁止噪音



PG 29. Retention force of blind plugs盲塞固位力





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PG 0. Inspection of as-received condition

Aim: Basic examination of all contact and housing parts in the unused condition, without prior loads. Requirement: Determination of deviations from a given target state.

E 0.1 Visual inspection (DIN EN 60512-1-1)

Contact parts: all variants that occur

Housings: all variants that occur

Single-wire seals: all variants that occur

The basic mechanical functions of the connector must be checked as part of the visual inspection.

E 0.2 Contact resistance (DIN EN 60512-2-1)

Contact parts: 10 DUTs per variant

Line cross-section: all cross-sections that occur

Type of test:

E 0.2.1 Contact resistance in the contact area (DIN EN 60512-2-1)

E 0.2.2 Contact resistance in the connection area (DIN EN 60512-2-1)

Requirement:

The measured values must correspond to the manufacturer's specifications. The limits must be complied with (see Appendix D), and the measured values (initial value, final value, standard deviation, and resistance change of the respective DUTs) must be documented accordingly in the test report.

E 0.3 Insulation resistance (DIN EN 60512-3-1)

Contact parts: arbitrary

Housings: 1 housing per injection mold

Insulation resistance between all adjacent contacts

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PG 0 入厂检验		
目的：在施加载荷前，对所有未使用的端子和护套进行基本检验。要求：与给定目标状态偏差地方的测定。		
E0.1	目测	DIN EN 60512-1-1
	端子：	所有型号
	护套：	所有型号
	防水栓：	所有型号
	对连接器的基本机械功能进行检查，作为目测的一部分。	
E0.2	接触电阻	DIN EN 60512-2-1
	端子：	每样 10 个被测件
	导线线径：	所有线径
	试验类型	
E0.2.1	接触区域的接触电阻	DIN EN 60512-2-1
E0.2.2	接线区域的接触电阻	DIN EN 60512-2-1
	要求：	
	测量值必须满足制造商规范要求。必须满足限定值（见附录 D），需将测量值（初始值、最终值、标准偏差、被测器件电阻变化）记录在检测报告中。	
E0.3	绝缘电阻	DIN EN 60512-3-1
	端子：	任意
	护套：	一套注塑模具一个护套
	相邻端子之间的绝缘电阻	

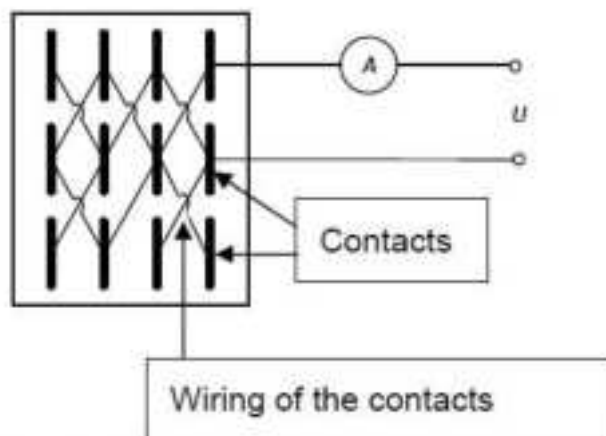


Figure 3 Insulation resistance measurement setup

Requirement:

$R_{iso} > 100 \text{ M}\Omega$ at $U = 500 \text{ V}$, $t = 60 \text{ s}$

R_{iso} = insulation resistance

U = DC test voltage

T = read cycle time

PG 1. Dimensions

Aim: Dimensional inspection of all contact parts, housing parts, and single-wire seals

Batch size: 1 piece per die or mold

Contact parts: all crimped and non-crimped variants that occur; for permissible double crimps, see Appendix A

Housings: all variants that occur

Single-wire seals: all variants that occur

Type of test:

E 0.1 Visual inspection(DIN EN 60512-1-1)

E 1.1 Dimensions(DIN EN 60512-1-2)

Requirement:

The measured values must correspond to the release drawing or product specifications. Indications must be provided in the measurement report.

Furthermore, all function-relevant dimensions for leak tightness, locking and latching geometries, clearances and creepage distances, and the most important dimensions that ensure the scoop-proofing and contact engagement length must be documented. These dimensions (first-sample test report and design dimensions, etc.) must be marked in the release drawing.

E 1.2 Dimensions (of processed components)(DIN EN 60512-1-2)

Requirement:

The measured values of processed contacts (crimp parameters, metallographic sections) must correspond to the release drawing and the product specifications.

PG 1 尺寸

目的：对所有端子、护套、防水栓进行尺寸检验

数量：一副模具一件

端子：产生的所有压接和非压接变样，双压接参见附录 A

护套：所有型号

防水栓：所有型号

试验类型：

E0.1 目测

DIN EN 60512-1-1

E1.1 尺寸

DIN EN 60512-1-2

要求：

测量值必须满足认可的图纸要求以及产品要求。要在检测报告中做出说明。

此外，将所有功能相关尺寸：密封性、锁紧装置尺寸、间隙、沿面距离，以及能够保证防斜插和端子连接长度最重要的尺寸记录在报告中。这些尺寸（首样检测报告和设计尺寸等）必须在认可的图纸中注明。

E1.2 尺寸（加工零件）

DIN EN 60512-1-2

要求：

加工的端子测量值（压接参数、切片）必须满足认可的图纸要求以及产品要求。

PG 2. Material and surface analysis, contacts

Aim: Determination of all material parameters of metal parts

Batch size: 5 pieces

Test object: all materials and surfaces that occur

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 2.1 Material test of contact parts

The material test must be documented for all individual parts of the contact (contact area and line area).

All materials must be documented in the manufacturer's product specifications.

>Material documentation of the base material:

Data sheets must be attached to the test report as documentation.

- >Material certificate
- > Electrical conductances
- >Tensile strength
- >Modulus of elasticity of the contact spring
- >Material documentation of the surface:
 - >Material certificates
 - >Measurement of coating thickness on the finished contact area and on the line connection area
 - >Measurement of surface roughness (if limits are specified, e.g., in drawings) and documentation that the surface was not damaged by the production process.

E 2.2 Markings on the visible surface

- The markings on the contact must be recognizable after the processing procedure (e.g., crimping):
- >Clear legibility of all indications that are specified in the drawings

Requirement:

Confirmation that all materials are in conformance with applicable legal requirements and the drawings.

Function-relevant pores, cracking, or other damage to the surface in the contact zone area and line connection area are not permissible.

The contact labels must be recognizable after processing. The description of the nomenclature must be described in the product specifications.

The material breakdown of the materials used must be available in the IMDS.

PG 2 端子材料和表面分析

目的：测量金属零件的所有材料参数

数量：5 个

试验对象：所有材料和表面

试验类型：

E0.1 目测

DIN EN 60512-1-1

E2.1 端子材料试验

对端子各成分进行材料试验，并做记录（端子区域和导线区域）

所有材料必须显明在制造商产品规范中。

- 基材文档

将数据表附在检测报告中：

材料证书

电导性

拉伸强度

接触弹簧弹性系数

- 表面材料文档：

材料证书

端子镀层厚度测量和导线连接区域镀层厚度测量

表面光洁度测量（如果对限定有规范，如图纸）以及证明材料证明表面不会受到生产加工过程损害。

E2.2 可视表面标记

PG 3. Material and surface analysis, housings and single-wire seals

Aim: Determination of all material parameters of plastic and silicone parts

Batch size: 1 component per injection mold

Housings: all variants that occur

Single-wire seals: all variants that occur

Type of test:

E 0.1 Visual inspection (evaluate injection faults, e.g., burrs) (DIN EN 60512-1-1)

E 3.1 Material test of housings and single-wire seals

The material test must be documented for the single-wire seal and for all individual partsof the housing (including slides, CPAs, sealing elements, and the like). Data sheets mustbe attached to the test report as documentation. The portion of the component's ownsprue regenerate must be documented in the release drawing.

All materials must be documented.

A. Documentation of the materials:

A1. Material certificate and declaration of all possible materials



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A2. The RAL colors (for all keyings)

B. Documentation of the surface quality:

B1. Measurement of maximum permissible burrs at the function-relevant locations

B2. Measurement of surface roughness (if limits are specified, e.g., in drawings) and documentation that the surface was not damaged by the production process.

E 3.2 Markings on the surface

The markings on the housing parts must be recognizable after processing (manufacture of the wiring harness):

A. Clear legibility of the housing labeling that is specified in the drawings

Requirement:

Injection molded skins, tool offset, and mold separation marks must not impair the handling or function.

Burrs, tool offset, etc. are permissible within the drawing specifications.

NOTE Burrs are not permissible on the actuation surfaces. Burrs, tool offset, or part markings are not permissible (due to the design) on surfaces that come in contact with seals.

The material breakdown of the materials used must be available in the IMDS.

PG 3 护套和防水栓材料和表面分析

目的：对塑料和硅胶零件的所有材料参数进行测量

数量：一副注塑模具一个零件

护套：所有型号

防水栓：所有型号

试验类型：

E0.1 目测（评估注塑缺陷,如毛刺）

DIN EN 60512-1-1

E3.1 护套防水栓材料试验

对防水栓和护套所有成分（包括滑片、定位装置 CPAs、密封元件等等）进行材料试验，并做记录。数据表必须附在报告中。图纸中必须注明零件注口再生部分。

必须注明所有材料。

- 材料文档：

材料证书和所有可能材料声明

RAL 颜色（所有编码）

- 表面质量文档：

在功能相关区域的最大允许毛刺数量测量

表面光洁度测量（如果对限定有规范，如图纸）以及证明材料证明表面不会受到生产加工过程损害。

E3.2 表面标记

加工之后（线束生产）护套标记必须可见。

图纸中规定的护套标签必须清晰可见。

要求：

注塑模具表面，刀具位置偏位和分离毛刺不能损害到操作和功能。

允许图纸规范内出现的毛刺和刀具位置偏位等。

注意：操作表面不允许出现毛刺。与防水栓接触的表面不允许出现毛刺、刀具位置偏位和零件标记（由于设计）。

已使用材料的材料归类需在 IMDS 中找到获得。

PG 4. Contact engagement length

Aim: Documentation of the minimum required contact engagement length under all worst conditions, including using theoretical studies (e.g., CAD)

Batch size: 3 housings

Up to 5-pin, fully equipped; for 6-pin and above, with 5 contacts

Contact parts: all variants that occur, line cross-section and surface arbitrary

Housings: all variants that occur, keying and color arbitrary

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 4.1 Contact engagement length

The contact engagement length and the required clearance (according to the manufacturer's specifications) from the pin tip to the contact bottom must be documented computationally under all worst conditions of the contacts and housings and their locks (including, e.g., pulling on the line until all locks are at the stop). The contact pin and the contact socket must touch only at the contact points.

Definition of contact engagement length (Figure 4)

PG 4 端子接合长度

目的: 在所有恶劣条件下包括使用理论研究(如 CAD)对最小允许的端子接合长度进行测量记录。

数量: 3 个护套

5 孔及以下的, 装备齐全: 6 孔及以上的, 5 个端子

端子: 所有型号, 线径和表面任意

护套: 所有型号, 编码和颜色任意

试验类型:

E0.1 目测

DIN EN 60512-1-1

E4.1 端子接合长度

记录所有恶劣条件下端子、护套以及锁扣(包括比如拉扯导线直至所有锁扣停止)时的端子接合长度和从插头到接触底部的需要间隙(根据制造商规范)。插头和插座只能在接触点接触。

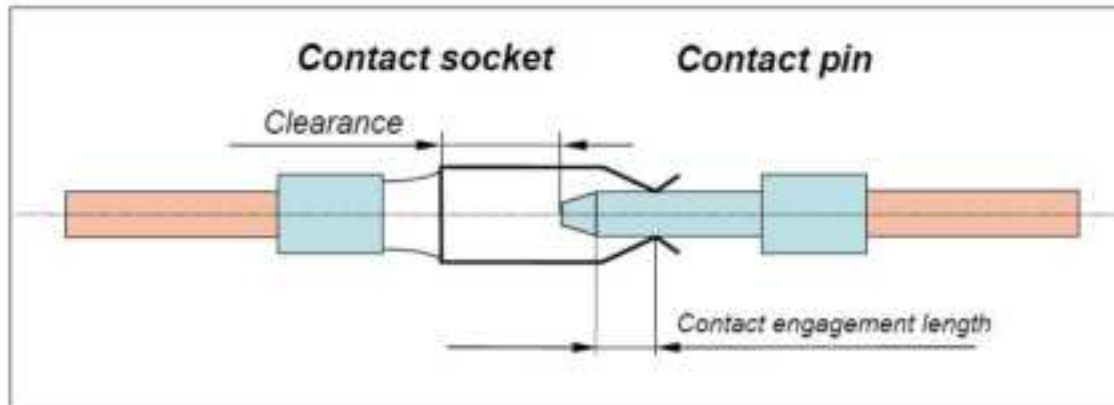


Figure 4 Contact engagement length of a pin-socket pair

Contact engagement length is defined as the length at which a contact pin penetrates the contact socket with its full cross-section. Measurements are taken from the contact point of the socket contact to the end of the insertion bevel at the full cross-section (in deviation from DIN EN 60512-2-3).

The distance between the pin tip and the contact bottom is called the clearance. This clearance is absolutely required for floating support of the contact in the cavity and must still be present taking into consideration all tolerances of the pin-socket pair.

Requirement:

Contact engagement length: >1,00 mm (for all contact points)

Clearance: >0 (in the worst case)

A tolerance calculation with dimensional specification is required.

端子接合长度定义 (图 4)

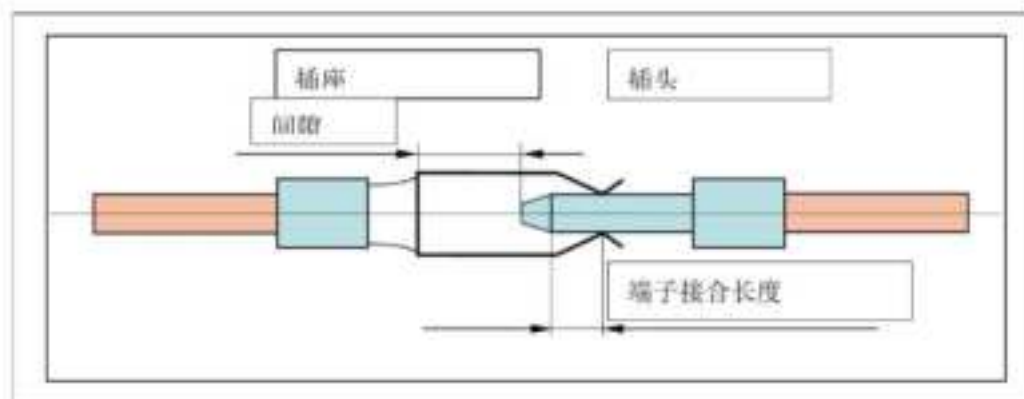


图 4 单孔端子接合长度

端子接合长度是指插头连同全部横截面插入插座的长度。从插座触电的接触点到全部横截面插入倾斜面末端为测量部分 (与 DIN EN 60512-2-3 有偏差)。

插头针尖和接触底部的距离称为间隙。这个间隙是用于端子在腔穴内的浮动支撑。在考虑所有公差后都要保留这一间隙。

要求:

端子接合长度: >1,00mm (针对所有触点)

间隙: >0 (在最恶劣条件下)

需要根据尺寸标准对公差进行计算。

PG 5. Mechanical and thermal relaxation behavior

Aim: Functional evaluation of the upper limit temperature (= Tmax) of the contact system specified by the manufacturer and of the normal force.

Batch size: 5 test batches of 10 contact parts each per sampling time

Contact parts: all materials and design variants that occur in the contact area

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 5.1 Contact opening dimension in the unused condition (optical measurement) – all test batches

B 5.1 One half (5 pieces each) of all test batches is inserted and disconnected 5 times before further loading.

E 5.1 Contact opening dimension of the DUTs inserted 5 times (optical measurement) – all test batches

E 5.2 Normal contact force

Determination of the normal contact force – on test batch 1

The measuring method must be documented. Indirect measurement is permissible.

B 5.2 All DUTs of test batches 2 – 5 are inserted. The DUTs must not be disconnected until measurement of the contact opening dimension and the normal contact force.

B 5.3 Aging in dry heat, inserted (DIN EN 60068-2-2) Test B

Duration 1 000 h

Max. temperature Tmax limit temperature from derating curve ($I = 0$ A)

Test batches 2 – 5 are aged and are successively removed at the respective times (1 h, 100 h, 200 h, 500 h, and 1 000 h), and the normal force is measured.

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 5.1 Contact opening dimension (optical measurement) – on test batches 2 – 5

E 5.2 Normal contact force

Determination of the normal contact force on all test batches

The measuring method must be documented. Indirect measurement is permissible.

Requirement:

The normal contact force must be documented. Graphical representation (simple logarithmic time representation) extrapolated to 3 000 h.

Intermediate values at 0 h, 1 h, 100 h, 200 h, 500 h, and 1 000 h.

The contact opening dimensions must be documented.

PG 5 机械和热松弛特性

目的：对制造商规定的接触系统和正向力的接触系统的最高温度（ T_{max} ）进行功能评估。

数量：每次取样时间，10 个端子中取 5 个试验批次

端子：接触区域出现的所有材料 and 设计变体

试验类型：

E0.1 目测

DIN EN 60512-1-1

E5.1 未使用状态的端子开口尺寸（选择性测量）-所有试验批次

B5.1 所有试验批次的一半（各 5 个）在进一步施加载荷前插拔 5 次

E5.1 插入 5 次的被测器件的端子开口尺寸（选择性测量）-所有试验批次

E5.2 正常接触力

测量正常接触力—在试验批次 1 上

记录测量方法，允许间接测量。

B5.2 试验批次 2 的所有被测器件—5 次插入，直到测出端子开口尺寸和正常接触力后不能拔出被测器件。

B5.3 干热存放，插入

DIN EN 60068-2-2 Test B

持续时间：1000 小时

最高温度 T_{max} : 来自降额曲线的极限温度（ $I=0A$ ）

将试验批次 2-5 进行存放，依次在 1 小时、100 小时、200 小时、500 小时和 1000 小时取出，测量正常接触力。

E0.1 目测

DIN EN 60512-1-1

E5.1 端子开口尺寸（选择性测量）-试验批次 2-5

E5.2 正常接触力

所有试验批次测量正常接触力

记录测量方法，允许间接测量。

要求：

记录正常接触力。图示法（简单的对数时间表示）外推到 3000 小时。

显示在 0 小时、1 小时、100 小时、200 小时、500 小时和 1000 小时的数值。

记录端子开口尺寸。

PG 6. Handling and functional reliability of the housing

Aim: Documentation of the function of the cavity and of the contact locks

Batch size: 3 fully equipped housings for E 6.2 and E 6.3

6 housings for B 6.1

>3 fully equipped housings, secondary lock in the end engagement position

>3 unequipped housings, secondary lock in the preengagement position

>3 times 3 unequipped housings for E 6.4



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Contact parts: arbitrary

Line cross-sections: smallest and largest cross-section and, if applicable, permissible
double-wire crimps, see Appendix A

Housings: all variants that occur, keying and color arbitrary

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 6.1 Deflection of contacts in the housing cavity (theoretical documentation according to
manufacturer's specification)

E 6.2 Function of the primary lock/latch play (with new housings, see batch size)

E 6.3 Function of the secondary lock/latch play (with new housings, see batch size)

PG 6 端子护套之间的相互作用

目的: 记录腔室和触锁功能

数量: E6.2 和 E6.3 需要 3 个设备齐全的护套

B6.1 需要 6 个护套

—3 个齐全的护套, 次锁在接合位置末端

—3 个未装配的护套, 次锁在预接合位置

E6.4 需要 3 个未装配的护套, 3 次

端子: 任意

线径: 最小和最大线径, 若可以, 允许使用双导线压接, 见附录 A

护套: 所有型号, 编码和颜色任意

试验类型:

E0.1 目测

DIN EN 60512-1-1

E6.1 插入护套内端子的偏斜 (根据制造商规范的理论文档)

E6.2 主要紧锁装置/卡槽功能 (使用新的护套, 见数量)

E6.3 次要紧锁装置/卡槽功能 (使用新的护套, 见数量)

Requirement:

Deflection: Based on the cavity and pin drawings, it must be documented that the pin and contact can be joined one in the other without any damage. The documentation must be provided graphically or computationally for the worst case.

Latch play: Must be examined using the contact parts in the housing cavity. The primary lock must latch audibly and must be checked by pulling it back (max. 10 N). The secondary lock must be closable at the end stop. The secondary lock must not be closable until all contacts are properly locked in the housing cavity in the correct position.

B 6.1 Drop test (with new housings, see batch size)

To test the housing stability and the locks, the housings (cut off the lines directly behind the housing) are tested in a rotating drum (see DIN EN 60068-2-31).

>Test at room temperature (RT) according to ISO 554-23/50 ordinary (normal)

>All DUTs are tested at the same time.

>Rotational speed: e.g., 3 rpm (the speed must be set so that all parts strike in the drop area)

>Number of revolutions: 30

>Thickness of the steel plate in the drop area: at least 5 mm

要求:

偏斜: 根据孔位和 pin 脚图纸, 必须注明 pin 脚和端子可以合二为一, 不受损害。能够提供最恶劣条件下的图示文档和计算文档。

卡槽: 使用护套内端子进行检验。主锁可以听见锁上, 通过回拉检查 (最大 10N 的力), 次级锁在最后停止时锁上。直到所有端子在护套内正确的位置被锁上, 次级锁才可锁上。

B6.1 跌落试验 (使用新的护套, 见数量描述)

为检查护套稳定性和锁定, 在转筒中对护套 (在护套后直接切断导线) 进行试验 (参见 DIN EN 60068-2-31)。

- 根据 ISO 554-23/50 正常条件在室温下进行试验
- 同时对被测器件进行试验
- 转速: 例如 3rpm (每分钟转动次数) (转速必须设定成所有部分都击打在跌落区域)
- 转数: 30
- 跌落区域的钢板厚度: 至少 5mm

With: L1 = 1 200 mm, L2 = 500 mm, L3 = 700 mm, L4 = 500 mm, L5 = 1 000 mm,
L6 = L7 = 100 mm

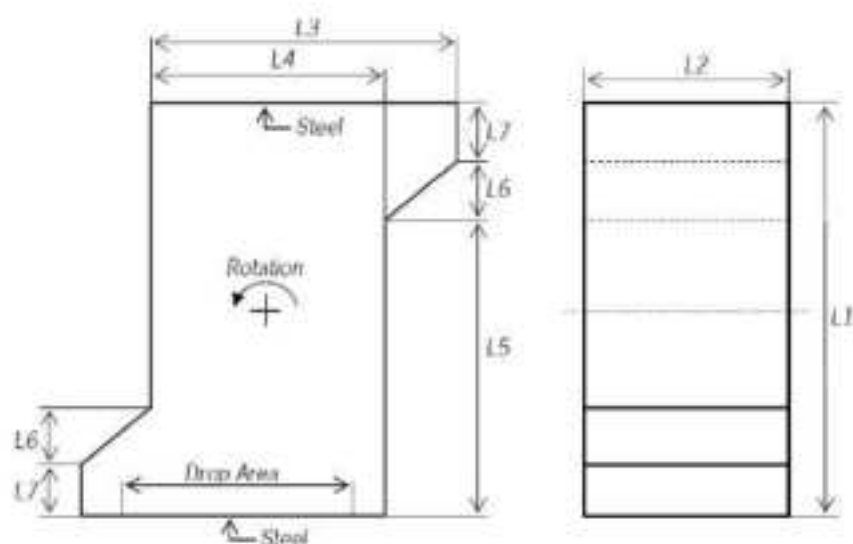


Figure 5 Drop test in drum

E 0.1 Visual inspection (DIN EN 60512-1-1)

Requirement:

- >The secondary lock in the pre-engagement position (simulation of transport of unequipped housings) must not close in the drop test.
- >The secondary lock in the end engagement position (simulation of transport of equipped housings) must not open in the drop test.

E 6.4 Actuation forces for secondary lock (with new housings in each case, see batch size)

Table 2 Actuation force requirements

Actuation	Condition	Limits
Open	-	$F_a = 10 \text{ N} \dots 50 \text{ N}$
Close	For film hinge, hinge length < 15 mm	$F_s < 50 \text{ N}$
Close	For film hinge, hinge length $\geq 15 \text{ mm}$	$F_s < 75 \text{ N}$
Close	For slide	$F_s < 50 \text{ N}$
Close not OK	At contact position 0, not in end position	$F_{s \text{ NOK}} > 3 \text{ times } F_s$ at least $F_{s \text{ NOK}} > F_s + 50 \text{ N}$

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 6.5 Detection of secondary lock by test adapter

An open or only partially closed secondary lock must be reliably detected by the test adapter at the cable manufacturer through a 100% final inspection. Confirmation by a cable manufacturer must be provided.

NOTE Must preferably be clarified before tool manufacture.

E0.1 目測

DIN EN 60512-1-1

要求:

- 预接合位置的次级锁（模拟运输未装配护套）在跌落试验中不能关闭。
- 在接合位置末端的次级锁（模拟装配齐全的护套运输）在跌落试验中不能打开。

E6.4 次级锁触发力（每次使用新的护套，参见数量说明）

表格 2 触发力要求

动作	条件	限定
开	-	$F_a=10\text{N}\cdots 50\text{N}$
关	针对薄膜铰链，铰链长度 < 15mm	$F_s < 50\text{N}$
关	针对薄膜铰链，铰链长度 $\geq 15\text{mm}$	$F_s < 75\text{N}$
关	针对滑片	$F_s < 50\text{N}$
关 n, i, 0	在触点位置 0，不在终端位置	$F_{s \text{ nio}} > 3 \times F_s$ 至少 $F_{s \text{ nio}} > F_s + 50\text{N}$

E0.1 目测

DIN EN 60512-1-1

E6.5 通过试验适配器测量次级锁

电缆制造商必须通过试验适配器对打开的次级锁或部分关闭的次级锁进行 100% 终检。

电缆制造商需提交确认报告。

注意：在工具制造前必须解释清楚。

PG 7. Handling and functional reliability of the housing

Aim: Housing test, documentation of the holding and actuation forces

Batch size: at least 10 equipped and unequipped housings;

New components can be used for each of the following property tests within this test group.

Housings: all variants that occur

PG 7 护套操作和功能可靠性

目的：护套试验，记录保持力和触发力

数量：至少 10 个装配齐全和未装配的护套

在试验组内可使用新的零件用于下面各特性试验。

护套：所有型号

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E0.1 目测

DIN EN 60512-1-1

E 7.1 Error-proof design of housings (unequipped housings) (DIN EN 60512-13-5)
(keying/polarizing)

E7.1 护套防呆设计（未装配护套）（编码/偏光度） DIN EN 60512-13-5

E 7.2 Retention force of the housing latch/lock (DIN EN 60512-15-6)
(unequipped housings)

Applicable to housings for inline plug-in connections and device-mounted plug-in connections.

Sample preparation: 10 complete connector couplings without contacts.

If the connector housings have a CPA, the tests must be performed both with the CPA open and with the CPA closed.

E7.2 护套卡槽/锁保持力(未装配护套)

DIN EN 60512-15-6

适用于内联插件和安装元件内联插件的护套

准备试样：10 个无端子的连接器耦合

如果护套有定位装置 CPA，必须进行两种试验，一是定位装置打开，另一个是定位装置关闭状态。

The DUTs must be fastened in the tensile testing machine with suitable holders so that the housings are not damaged or deformed. The force must be applied opposite the plugging direction of the housings. The maximum force on the first displacement millimeter is defined as the retention force (see Figure 6).

采用合适的夹具将被测器件固定在拉力试验机上，护套不能损坏和变形。施加与插入护套力相反方向的力，第一次产生位移毫米的最大力称为保持力（见图6）

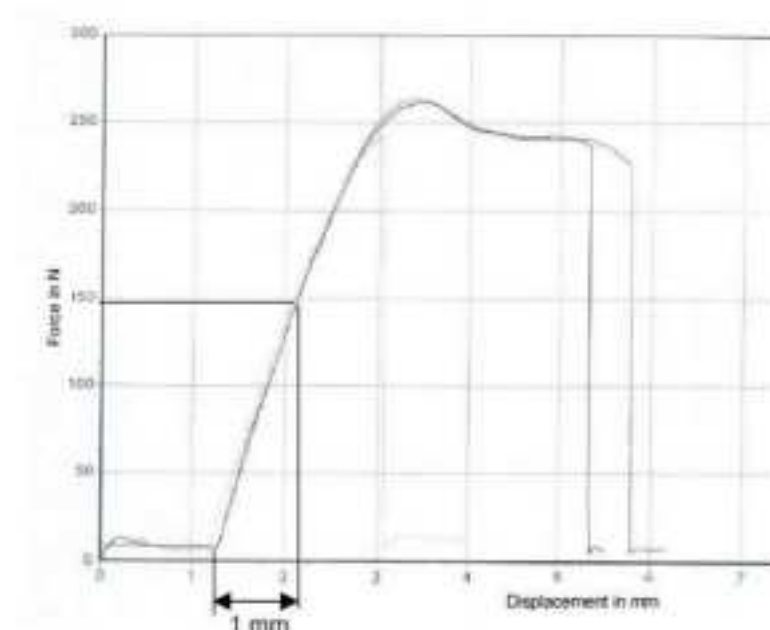


Figure 6 Retention force load-displacement curve

E 7.3 CPA functional test (unequipped housings)

E 7.4 Insertion force or actuation force for insertion and removal aids (fully equipped housings)

The insertion force in the plugging direction or actuation force of the insertion and removal aid must be measured. The insertion force (including for insertion aids) must always be measured in the actuation direction. The DUTs must be fastened in the tensile testing machine with suitable holders so that the housings are not damaged or deformed.

E7.3 CPA 定位装置功能试验（未装配护套）

E7.4 插拔装置的插入力和触发力（设备齐全的护套）

必须对插拔辅助装置插入方向的插入力或触发力进行测量。必须一直在触发方向对插入力（包括插入辅助装置）进行测量。采用合适的夹具将被测器件固定在拉力试验机上，护套不能损坏和变形。

E 0.1 Visual inspection (DIN EN 60512-1-1)

Requirement:

> No cracks or fractures must occur in the entire housing including add-on parts

(CPAs, locks, levers, sliders, film hinges, etc.).

>Actuated contact locks must not open as a result of the test.

Keying efficiency >3 times the insertion force (equipped housing), but at least 80 N

Polarizing efficiency >3 times the insertion force (equipped housing), but at least 80 N

The housing retention forces must fulfill the following table values:

ED. 1 目測

DIN EN 60512-1-1

要求:

—整个护套上包括附加部分（定位装置 CPAs、锁、控制杆、滑片和薄膜铰链等）不能出现裂纹和破裂。

—触发端子锁不能打开。

编码控效率>3 倍插入力（装配齐全的护套），最少 80N

偏光度>3 倍插入力（装配齐全的护套），最少 80N

护套保持力必须满足下列表格中的值：

Table 3 Positive-locking retention forces			
Positive-locking housing retention forces (N)			
Contact size	Number of pins		
	1...2-PIN	3...6-PIN	>6-PIN
0.40*0.50 mm	*	*	>80
0.63 to 1,2 mm	>60	>80	>100
>1,2 to 2,8 mm	>80	>100	>100
>2,8 to 6,3 mm	>100	>100	>100
>6,3 mm	>150	>150	>150

Table 4 Friction-locking retention forces

Friction-locking housing retention forces (N)			
Contact size	Number of pins		
	1...2-pin	3...6-pin	>6-pin
0,63 to 1,2 mm	>60	>60	*
>1,2 to 2,8 mm	>80	>80	*
>2,8 to 6,3 mm	*	*	*
>6,3 mm	*	*	*
* Values must be agreed upon in each individual case; positive-locking geometries must preferably be used			

For mixed connectors, the value applies to the entire number of contacts and to the largest contact present in the connector.

Insertion force/actuation force of fully equipped housings: max. 75 N. For higher insertion and removal forces, an insertion/removal aid (integrated or separate tool) must be provided for.

It must not be possible to actuate the CPA if the housing is not locked in the end position: Alternatively, the CPA must be capable of locking housings that are sitting incorrectly.

CPA actuation force when the housing is locked in the end position: 5 to 30 N;

CPA efficiency >1,5 times the maximum insertion force (equipped housing), but at least 80 N.

The properties must correspond to the product specifications or the drawing note.

混装连接器，上述值适用于整个插头数和连接器内最大插件。

装配齐全护套的插入力/触发力：最大 75N。针对较高的插拔力，必须使用插拔辅助装置（集成工具或开发工具）。

如果护套在终端位置没有被锁住，不可能触发定位装置 CPA。

或者，定位装置能够锁住匹配不当的护套。

当护套在终端位置被锁住时，定位装置 CPA 触发力为：5 到 30N

定位装置 CPA 效率 >1.5 倍最大插入力（装备齐全的护套），至少 80N

特性必须满足产品规范和图纸要求。

PG 8. Insertion and retention forces of the contact parts in the housing

Aim: Documentation of the cable manufacturability and of the contact locks

Batch size: at least 3 fully equipped housings per mold, but at least 10 contacts

Contact parts: all variants that occur

Housings: all variants that occur (molds)

a) 2 fully equipped housings per mold:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 8.1 Determination of the contact insertion forces

E 8.2 Contact removal force from the housing

E 8.2.1 Contact removal force from the housing, primary lock only(one housing per mold)

E 8.2.2 Contact removal force from the housing, secondary lock only(one housing per mold)

E 0.1 Visual inspection (DIN EN 60512-1-1)

b) 1 fully equipped housing per mold (new parts):

E 0.1 Visual inspection (DIN EN 60512-1-1)

B 8.1 Removal of the contacts three times with original release tools

E 8.2 Contact pullout force from the housing, primary lock only

(1 housing per mold), but at least 10 contacts with the lowest values from E.8.2.1

E 0.1 Visual inspection (DIN EN 60512-1-1)

Requirement:

The insertion forces of the contacts into the cavity must be measured and documented.

The contact pull-out forces must correspond to the following Table.

Primary lock test displacement: $s \leq 1$ mm (for required retention forces)

F_{prim} = primary lock pull-out force

F_{sec} = secondary lock pull-out force

Table 5 Contact pull-out forces

Blade width	F_{prim} (pin)	(latching)	F_{prim} (clean body)	F_{sec}
0,63/1,2	>55		>40	>55
1,5 to 2,8 mm	>80		>60	>80
>2,8 to 6,3 mm	>120		>80	>120
>6,3 to 8,0 mm	>180		>110	>180
>8,0 mm	>200		>150	>200

The Table applies to parts in unused condition. After removal three times, the measured values are documented.

PG 8 护套内端子插入力和保持力

目的：记录电缆可制造性和端子锁

数量：每副模具至少 3 个齐全的护套，至少 10 个端子

端子：所有型号

护套：所有型号（模具）

a) 每副模具 2 个齐全的护套：

E0.1 目测

DIN EN 60512-1-1

E8.1 测量端子插入力

E8.2 端子从护套拉拔力

E8.2.1 端子从护套拉拔力，仅主锁（每副模具 1 个护套）

E8.2.2 端子从护套拉拔力，仅次锁（每副模具 1 个护套）

E0.1 目测

DIN EN 60512-1-1

b) 每副模具 1 个齐全的护套（新零件）

E0.1 目测

DIN EN 60512-1-1

B8.1 使用原释放工具拔出端子 3 次

E8.2 端子从护套拉拔力，仅主锁（每副模具 1 个护套）但至少 10 个端子满足 E8.2.1 的最低值

E0.1 目测

DIN EN 60512-1-1

要求：

测量和记录端子插入力。

端子拉拔力必须满足下表要求：

主锁测试位移： $s \leq 1\text{mm}$ （针对要求的保持力）

F_{prim} =主锁拉拔力

F_{sec} =次锁拉拔力

表格 5 端子拉拔力

刀片宽度	F_{prim} (卡槽 pin 脚)	F_{prim} (实体清除)	F_{sec}
0.63/1.2	>55	>40	>55
1.5 到 2.8mm	>80	>60	>80
>2.8mm 到 6.3mm	>120	>80	>120
>6.3mm 到 8.0mm	>180	>110	>180
>8.0mm	>200	>150	>200

本表格适用于未使用状态的零件。在拔出 3 次之后，记录测量值。

PG 9. Pin insertion inclination/misuse safe (scoop-proofing)

Aim: Documentation for housings that the inclined insertions that occur cannot damage the contact.

Batch size: Examination is performed using CAD

Contact parts and Housings: all variants that occur, so long as they can affect the pin insertion inclination

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 9.2 Max. possible pin insertion inclination

One insertion process each at the maximum possible pin insertion inclination in the X and Y-directions (Z is the insertion direction)

Examination is performed using CAD

E 9.1 Determination of contact opening dimension (optical measurement), pin tip position, and pin geometry

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 9.3 Examination of housing for scoop-proofing

Examination is performed using CAD

E 0.1 Visual inspection (DIN EN 60512-1-1)

Inclined insertion requirements:

Before the contact pair touches, sufficient guiding of the housings must be achieved so that expansion of the contacts or bending of the pins is precluded in consideration of the permissible tolerances (worst case, design specifications).

The maximum possible pin insertion inclination through housing and contact parts must be determined by the manufacturer for each housing/each contact and must be indicated on the release drawing. The pin insertion inclination must not exceed the value permissible for the contact part.

Corresponding documentation must be provided.

If an examination cannot be conducted in the CAD system, E 9.1 must be performed.

The pin tip position and the contact opening dimension must change only within the specified tolerance.

Scoop-proofing requirements:

Scoop-proofing is required; documentation must be provided.

It must be possible to touch signal- and current-carrying components (contacts) during removal/installation only with their signal- and current-carrying mating piece (and its guide cup). The design must preclude contact with housing parts.

PG 9 插入偏斜/错误防护（防斜插）

目的：记录斜插对端子不会造成损坏的护套

数量：使用 CAD 检测

端子：只要影响斜插的所有型号

护套：只要影响斜插的所有型号

试验类型

E0.1 目测 DIN EN 60512-1-1

E9.2 最大允许斜插

X 和 Y 轴方向（Z 是插入方向）最大允许斜插时的插入过程

使用 CAD 检验

E9.1 测量端子开口尺寸（选择性测量）、针脚位置和 pin 脚几何

E0.1 目测 DIN EN 60512-1-1

E9.3 对护套防斜插进行检测

使用 CAD 检验

E0.1 目测 DIN EN 60512-1-1

斜插要求：

在接触双方接触前，必须针对护套进行足够地指导，以便在考虑到允许公差内排除端子膨胀和 pin 脚弯曲（恶劣条件、设计标准）

制造商必须对每个护套/端子允许的最大斜插进行测量，并在认可图纸上注明。斜插不能超过端子允许值。

必须提供相关文件。

如果不能用 CAD 系统进行检验，必须实施 E9.1. 针脚位置和端子开口尺寸必须在标准公差内变化。

防斜插要求：

需要防斜插，必须提供文件。

在插拔时只能用携带信号-电流匹配件（指示杯）触摸携带信号-电流零部件（端子）。

设计要排除与护套部件的接触。

PG 10.Contacts: conductor pull-out strength

Aim: Evaluation of the line connection at the contact

Batch size: at least 10 contact parts

Contact parts: all materials and surfaces that occur in the line area, crimp height at upper and lower tolerance in each case

Line cross-section: all variants that occur, see Table 6 (for conductor pull-out strength)

Type of test

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 10.1 Conductor pull-out strength (only in connection with crimp)

E 10.2 Pull-out force from the IDC(only in connection with IDC)

E 0.1 Visual inspection (DIN EN 60512-1-1)

PG 10 端子：导线拉拔强度

目的：对端子处导线连接的评估

数量：至少 10 个端子

端子：导线区域出现的所有材料和表面，上下公差内的压接高度

线径：所有型号：见表格 6（导线拉拔强度）

试验类型：

E0.1 目测

DIN EN 60512-1-1

E10.1 导线拉拔强度（只与压接有关）

E10.2 从绝缘位移连接的拉拔力(仅与绝缘位移连接有关 IDC)

E0.1 目测

DIN EN 60512-1-1

Requirement:

Conductor pull-out strength from the crimp

Table 6 Conductor pull-out strengths

Cable cross-section	Contact size				
	0,63	1,2/1,5	2,8	4,8	9,5
0,35 mm ²	50 N (75 N)				-
0,5 mm ²	60 N (85 N)				-
0,75 mm ²	85 N (105 N)				-
1,0 mm ²	-	108 N (125 N)		140 N (162 N)	-
1,5 mm ²	-	150 N (180 N)	150 N (180 N)		-
2,5 mm ²	-	-	200 N (235 N)		
4,0 mm ²	-	-	-	310 N (325 N)	
6,0 mm ²	-	-	-	450 N	450 N
10,0 mm ²	-	-	-	-	500 N
16,0 mm ²	-	-	-	-	1 500 N
25 mm ²	-	-	-	-	1 900 N

NOTE If for production reasons the conductor pull-out strength is measured with an insulation crimp/single-wire seal, the values in parentheses apply.

PG 11.Contacts: Insertion and removal forces, mating cycle frequency

Aim: Evaluation of the contact surfaces through insertions and the forces that occur during these

Batch size: at least 10 contact parts

Contact parts: all materials and surfaces that occur.

Housings: with/without housing for contact retention

(low friction, without seals, latching arms, etc.)

Type of test

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 5.1 Contact opening dimensions

E 11.1 Plugging and removal force, without additional lubricants

B 11.1 Mating cycle frequency

Surface: Sn 20 insertion/withdrawal cycles (unless otherwise specified)

Ag 50 insertion/withdrawal cycles (unless otherwise specified)

Au 100 insertion/withdrawal cycles (unless otherwise specified)

E 5.1 Contact opening dimension

E 11.1 Plugging and removal force, without additional lubricants

E 0.1 Visual inspection (DIN EN 60512-1-1)

Requirement:

The insertion force may change by at most 25% compared to the initial value.

The insertion and removal forces must correspond to the drawing or the product specifications.

Rubbing through the contact surface is not permissible. Corresponding documentation must be provided.

PG 11 端子：插拔力，接插次数频率

目的：通过插拔力评估端子表面

数量：至少 10 个端子

端子：所有材料和表面

护套：带护套/不带护套端子保持力（低摩擦，无密封、卡槽臂等）

试验类型：

E0.1 目测

DIN EN 60512-1-1

E5.1 端子开口尺寸

E11.1 插拔力，无附加润滑油

B11.1 插接次数频率

表面： 锡 20 个插入/回拉周期（除非有其他规定）

银 50 个插入/回拉周期（除非有其他规定）

金 100 个插入/回拉周期（除非有其他规定）

E5.1 端子开口尺寸

E11.1 插拔力，无附加润滑油

E0.1 目测

DIN EN 60512-1-1

要求：

插入力与初始值相比最大变化 25%。

插拔力必须满足图纸要求和产品规范。

不允许对端子表面进行摩擦。必须提供相关文件。

PG 12. Current heating, derating

Aim: Documentation of the current carrying capacity of contacts

Batch size: 3 contact-part pairs

Contact parts: All surfaces are documented.

(Note: It is permissible to measure a surface and to derive the values of the other surfaces from it.)

Line cross-section: all variants that occur

Line length: according to (DIN EN 60512-5-2)

Housings: without

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 12.1 Current excess temperature (measurement setup in principle like E 14.0)
(DIN EN 60512-5-1)

E 12.2 Derating without housing (DIN EN 60512-5-2)

E 0.1 Visual inspection (DIN EN 60512-1-1)

Current excess temperature: Loading with current, which must be increased incrementally, and measurement of the current excess temperature.

Note: The limit temperature of the derating graph is documented with the "Electrical stress test" test group one time for each material surface combination of the contact system.

Requirement:

The measured values must correspond to the manufacturer's specifications.

The following must be marked in the derating graph:

>The indication "free in air" must be contained.

>The 80% characteristic curve of the measured values must be represented in the graph (according to DIN EN 60512-5-2). The rated current is the current that can be read from the derating curve at 80 °C ambient temperature.

>The documentation of the results must contain the following:

Photograph of the contact with the temperature sensors and the temperature indications of the respective point. (Note: This is an examination for locating the hottestpoint.)

>The pin contact with which the derating has been determined must be indicated. The geometry, the base material, and the surface must be described. Unless otherwise agreed, the same line must be crimped on the pin contact as on the socket contact.

PG 12 电流加热、降额

目的：对端子载流量进行记录形成文件

数量：3 对端子接插件

端子：记录所有表面

(注意：允许测量一个表面，由这个表面得出另一表面的值)

线径：所有型号

导线长度：根据 DIN EN 60512-5-2

护套：不用

试验类型：

E0.1 目测 DIN EN 60512-1-1

E12.1 电流过载温度 (测量设置大体同 E14.0) DIN EN 60512-5-1

E12.2 不带护套的降额 DIN EN 60512-5-2

E0.1 目测 DIN EN 60512-1-1

电流过载温度：逐级施加电流，测量电流过载温度

注意：降额图上的极限温度和试验组“电应力试验”针对与接触系统结合的材料表面一起记录。

要求：

测量值必须与制造商规范一致。

在降额图上必须注明下列信息：

- 必须包含“外露”指示
- 必须在图中呈现测量值 80% 的特性曲线 (根据 DIN EN 60512-5-2)。额定电流是指在 80℃ 时降额曲线上的读数。
- 结果文件必须包含以下内容：
使用温度传感器和温度指示器各点端子照片 (注意：这是用于定位最热点的检验)
- 必须指出被测定降额的 pin 脚接触，必须对几何、基材和表面进行说明。除非有其他规定，如同插座触点将同一导线压接到 pin 脚触点处。

PG 13. Housing influence on the derating

Aim: Determination of the maximum housing influence on the derating by supplying current to all neighboring contacts at the same time.

Batch size: 3 fully equipped housings in each case

Contact parts: All surfaces are documented. (Note: It is permissible to measure a surface and to derive the values of the other surfaces from it.)

Line cross-section: all cross-sections that occur, same cross section in one DUT

Line length: according to (DIN EN 60512-5-2)

Housings: Sealed or unsealed housings. For sealed housings, all sealing elements must be present. The number of pins must be agreed upon between the manufacturer and the user.

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 13.1 Current excess temperature with housing

(measurement setup in principle like E 14.0) DIN EN 60512-5-1

The contact is measured for which the maximum temperature influence, e.g., due to Adjacent cavities is to be expected.

E 13.2 Derating with housing

E 0.1 Visual inspection (DIN EN 60512-1-1)

Current excess temperature: Loading with current, which must be increased incrementally, and measurement of the current excess temperature.

Note: The limit temperature of the derating graph is documented with the "Electrical stress test" test group one time for each material surface combination of the contact system.

Requirement:

The measured values must correspond to the manufacturer's specifications.

The following must be marked in the derating graph:

>The indication "derating in the housing" must be contained. The housing must be described (including number of pins).

>The 80% characteristic curve of the measured values must be represented in the graph (according to DIN EN 60512-5-2).

The documentation of the results must contain the following:

>Photograph of the contact arrangement in the housing (mating face view)

>Photograph of the contacts with the temperature sensors and the temperature indications of the respective points. (Note: This is an examination for locating the hottest points.)

>Derating curves must be provided (so long as housings are available); determined with a housing selected as an example:

1. Low-pin (1- to 10-pin)

2. High-pin (>10-pin)

>The pin contact with which the derating has been determined must be indicated. The geometry, the base material, and the surface must be described. Unless otherwise agreed, the same line must be crimped on the pin contact as on the socket contact.

PG 13 护套对降额的影响

目的：在同一时间对所有相邻端子提供电流测量护套对降额的最大影响。

数量：每个条件下取 3 个齐全的护套

端子：记录所有表面（注意：允许测量一个表面，由这个表面得出另一表面的值）

线径：所有线径，被测器件同一线径

导线长度：根据 DIN EN 60512-5-2

护套：密封或未密封护套，密封护套必须提供所有密封元件；pin 脚数必须由制造商和用户协商确定。

试验类型：

E0.1 目测 DIN EN 60512-1-1

E13.1 不带护套的电流过载温度

（测量设置大体同 E14.0）

DIN EN 60512-5-1

端子被测是为了获得所需要的最大环境影响，比如由于相邻孔位的影响。

E13.2 带护套的降额

E0.1 目测 DIN EN 60512-1-1

电流过载温度：逐级施加电流，测量电流过载温度

注意：降额图上的极限温度和试验组“电应力试验”针对与接触系统结合的材料表面一起记录。

要求：

测量值必须与制造商规范一致。

在降额图上必须注明下列信息：

- 必须包含“护套降额”指示，必须对护套进行说明（包括孔位数）
- 必须在图中呈现测量值 80% 的特性曲线（根据 DIN EN 60512-5-2）。

结果文件必须包含以下内容：

- 护套内触电排列照片（接触面视图）
- 使用温度传感器和温度指示器各触点照片（注意：这是用于定位最热点的检验）
- 必须提供降额曲线（只要护套可用），举例带护套进行测量：
 - 1、低引脚（1 到 10 个引脚）
 - 2、高引脚（>10 个引脚）
- 必须指出被测定降额的 pin 脚接触，必须对几何、基材和表面进行说明。除非有其他规定，如同插座触点将同一导线压接到 pin 脚触点处。

PG 14. Thermal time constant (current excess temperature at n times rated current)

Aim: Evaluation of briefly exceeding the max. current capacity (peaks)

Batch size: 3 contact parts

Contact parts: all materials that occur

Line cross-section: maximum line cross-section

Line length: according to (DIN EN 60512-5-2)

Housings: with or without housings equipped with 1 contact part

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 14.0 Measurement setup for E 14.1 in principle like E 14.0

E 14.1 Thermal time constant

The rated current that was determined in PG 12 must be used.

Test procedure:

Loading of a contact with 1x/2x/3x/4x/5x rated current and simultaneous recording of the temperature curve over time until stabilization or until the max. permissible component temperature is reached.

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 14.2 Determination of contact opening dimension, surface analysis

Requirement:

>The contacts must still be fully functional after the test.

>The measured values must correspond to the manufacturer's specifications.

>Documentation: The graph "current over time" must be provided.

PG 14 热时间常数（在 n 次额定电流下的电流过载温度）

目的：对短暂超过最大载流量（峰值）进行评估

数量：3 个端子

端子：所有材料

线径：最大线径

导线长度：根据 DIN EN 60512-5-2

护套：带配备 1 个端子的护套，或不带配备 1 个端子的护套

试验类型：

E0.1 目测

DIN EN 60512-1-1

E14.0 测量设置 14.1 大体同 E14.0

E14.1 热时间常数

必须使用 PG12 中测量的额定电流。

测试步骤：

对端子施加 1 倍额定电流/2 倍额定电流/3 倍额定电流/4 倍额定电流/5 倍额定电流，并同步记录温度曲线直至温度，或直到达到最大允许零件温度。

E0.1 目测

DIN EN 60512-1-1

E14.2 测量端子开口尺寸、表面分析

要求：

试验后端子仍能完全发挥作用。

测量值必须满足制造商规范。

必须提供电流曲线图。

PG 15. Electrical stress test

Aim: Functional evaluation of the upper limit temperature of the contact system specified by the manufacturer with current supply, temperature cycling, and humid heat.

Batch size: at least 10 contact parts

Contact parts: all materials and surfaces that occur

Line cross-section: max. cross-section

Line length: must be decided case-by-case

Housings: must be decided case-by-case: free contact or unsealed housing

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

B 15.1 The DUTs are inserted and disconnected 2 times

E 5.1 Contact opening dimension

E 0.2 Contact resistance (DIN EN 60512-2-1)

E 12.2 Derating (DIN EN 60512-5-2)

3 DUTs with the greatest contact resistance from the previous E 0.2 loading with test current. Monitoring of the voltage drop on the test specimens, documentation of the resistance on the test specimens.

It must be documented whether the test is performed with or without housings.

E 14.0 Continuous contact resistance during B 15.2 with test current

Measurement frequency: 1 measured value per 5 min

The test current, the voltage drop, and the measured contact temperature are continuously recorded.

B 15.2 Temperature cycle endurance test/current cycle endurance test

Number of cycles: 60

Determination of the upper climate chamber temperature (before the start of the test):

T_o is determined once at the start of the test such that after thermal equilibrium is established, the contact temperature corresponds to the limit temperature.

Description of a test cycle:

Temperature in climate chamber: $-40\text{ }^{\circ}\text{C}/T_o$ (upper temperature in the climate chamber)

For course, see graph in Appendix C

Test current I_{test} : Is read from the derating curve at $80\text{ }^{\circ}\text{C}$ ambient temperature. The test current is constant.

Current supply according to Appendix C

Contact temperature: The contact temperature is measured with temperature sensors at the contact in the climate chamber and is brought to the limit temperature by changing T_o .

B 15.3 Humid heat, cyclic (DIN EN 60068-2-30)

Number of cycles: 21 (1 day = 1 cycle)

relative humidity 95%, $T_u = 25\text{ }^{\circ}\text{C}$, $T_o = 55\text{ }^{\circ}\text{C}$

T_u = lower cycle temperature

T_o = upper cycle temperature

E 14.0 Contact resistance continuous during B 15.2 with test current

Measurement frequency: 1 measured value per 5 min

B 15.2 Temperature cycle endurance test/current cycle endurance test

Number of cycles: 60

E 0.2 Contact resistance (DIN EN 60512-2-1)

E 12.2 Derating (DIN EN 60512-5-2)

with the DUTs from previous derating

It must be documented whether the test is performed with or without housings.

E 5.1 Contact opening dimension

E 0.1 Visual inspection (DIN EN 60512-1-1)

Requirement:

>The contact opening dimension is documented.

>The resistance limits of the Table (Appendix D) must not be exceeded.

>For the derating before and after the test, the current carrying capacity at 80 °C ambient temperature may change at most by 20% relative to the derating at the start of the PG.

PG 15 电应力试验

目的：对供应商规定的接触系统最高温度通过电流、温度循环和湿热进行评估。

数量：至少 10 个端子

端子：所有材料和表面

线径：最大线径

导线长度：视具体情况而定

护套：视具体情况而定：空置触头或未密封护套

试验类型：

E0.1 目测

DIN EN 60512-1-1

B15.1 将被测器件插拔 2 次

E5.1 端子开口尺寸

E0.2 接触电阻

DIN EN 60512-2-1

E12.2 降额

DIN EN 60512-5-2

将从先前 E0.2 得到最大接触电阻的 3 个被测器件施加试验电流，对试样进行电压降监测，记录试样电阻。

记录试验是否带护套进行。

E14.0 在 B15.2 期间用试验电流测量连续接触电阻

测量频率：每 5 分钟测量 1 次

持续记录试验电流、电压降和测得的端子温度。

B15.2 温度循环耐久性试验/电流循环耐久性试验

循环次数: 60

测量气候箱最高温度 (在试验开始前):

在试验开始前测量 T_0 , 以便达到热平衡后, 端子温度满足限定温度值。

气候箱温度: $-40^{\circ}\text{C}/T_0$ (气候箱最高温度)

参见附录 C

试验电流 I_{test} : 在周围温度 80°C 时从将额曲线读出, 试验电流恒定

电流参见附录 C

端子温度: 用温度传感器对气候箱内的端子进行温度测量, 通过改变 T_0 达到极限温度。

B15.3 湿热循环

循环次数: 21 (1 天=1 循环)

相对湿度 95%, $T_u=25^{\circ}\text{C}$, $T_o=55^{\circ}\text{C}$.

T_u =低循环温度

T_o =高循环温度

E14.0 在 B15.2 期间施加试验电流不断测量接触电阻

测量频率: 每 5 分钟测 1 次

B15.2 温度循环耐久性试验/电流循环耐久性试验

循环次数: 60

E0.2 接触电阻

DIN EN 60512-2-1

E12.2 降额

DIN EN 60512-5-2

使用先前降额的被测器件

记录试验是否带护套进行

E5.1 端子开口尺寸

E0.1 目测

DIN EN 60512-1-1

要求:

记录端子开口尺寸

不能超过表格中电阻极值 (附录 D)

针对降额, 试验前后, 在周围温度 80°C 时最大载流量与试验组开始时降额相比变化最大 20%。

PG 16. Friction corrosion

Aim: Abrasion resistance of the surface treatment (destructive test)

"Fingerprint"/snapshot of the contact surface

Batch size: 3 contact parts

Contact parts: all material/surface combinations that occur, all lubricants that occur

Housings: without

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 16.0 Contact resistance, continuous monitoring during B 16.1, recording, and storing:

Measurement frequency: 4 Hz

B 16.1 Friction load

Frictional distance: 50 μm

Cycle time: 1 Hz

Number of cycles: 100 000

Electrical load: max. 100 mV, 10 mA

E 0.1 Visual inspection (DIN EN 60512-1-1)

Requirement:

Graph: course of the contact resistance against the number of cycles
Indication of the friction cycle number to achieve the contact resistance of 300 m Ω
Indication of lubricants used (material and amount)

PG 16 摩擦腐蚀

目的: 表面处理的耐磨强度 (破坏性试验)

端子表面“指印”/快照

数量: 3 个端子

端子: 所有材料/表面结合, 所有润滑油

护套: 无

试验类型:

E0.1 目测

DIN EN 60512-1-1

E16.0 接触电阻, 在 B16.1 期间持续监测, 记录和保存:

测量频率: 4Hz

B16.1 摩擦负荷

摩擦距离: 50 μm

循环时间: 1Hz

循环次数: 100000

电力负荷: 最大 100mV, 10mA

E0.1 目测

DIN EN 60512-1-1

要求:

曲线图: 接触电阻对循环次数

指出摩擦次数以达到接触电阻 300m Ω

给出所使用的润滑剂 (材料和数量)

PG 17. Dynamic load

Aim: General requirements

Batch size: at least 10 contact parts, distributed among at least 2 housings

Contact parts: all variants that occur

Line cross-section: to be determined on a case-by-case basis

Housings: sealed/not sealed, to be specified individually

Lines: The insulation must withstand the test temperature (see Section "General rules"),

Line type (from LV 112) must be documented in the test report.

The contact resistance (E 0.2) is measured before and after each spatial axis in the clamped

and firmly wired state (before it is converted to a new axis).

In order to document the freedom from resonance of the clamping device, a resonance analysis must be performed in the designated frequency range before the start of the vibration test (load: 1 g); this is not a component test but rather an examination of the test setup.

PG 17 动力荷载

目的：一般要求

数量：至少 10 个端子，至少分配在 2 个护套上

端子：所有型号

线径：视具体情况而定

护套：密封/无密封，单独指定

导线：绝缘必须能经受住试验温度（见总则章节）

导线型号（来自 LV 112）必须记录在检测报告中。

在空间轴处于夹紧和牢固的连接状态前后对接触电阻（E0.2）进行测量。（在它转向新轴前）

为记录免于夹紧装置的共振，在振动试验开始前（载荷：1g）以指定的频率范围进行共振分析，这不是零件试验，而是对试验设置的检验。

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 0.2 Contact resistance (DIN EN 60512-2-1)

E 14.0 Contact resistance continuous during B 17.1 with test current (100 mA)

Measurement frequency: 1 measured value per min

B 17.1 Dynamic load, sinusoidal (DIN EN 60068-2-6)

Severity: see Table 7

Sweep speed: 1 oct./min

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 14.0 Contact resistance continuous during B 17.2 with test current (100 mA)

Measurement frequency: 1 measured value per min

B 17.2 Dynamic load, broad-band random vibration (DIN EN 60068-2-64)

Severity: see Table 7

E 0.1 Visual inspection (DIN EN 60512-1-1)

NOTE B 17.1 and B 17.2 can also be performed simultaneously (SOR).

E 14.0 Contact resistance continuous during B 17.3 with test current (100 mA)

Measurement frequency: 1 measured value per min

B 17.3 Endurance shock test (DIN EN 60068-2-27)

Severity: see Table 7

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 0.2 Contact resistance (DIN EN 60512-2-1)

B 17.4 Resonance frequency of the contact assembly

Determination of the resonance frequency of the housing parts including contacts and lines under sinusoidal vibration

Vibration transducers of the smallest dimensions must be affixed to the housing, which is not screwed fast to the vibrator table.

Dynamic load, sinusoidal (DIN EN 60068-2-6)

Sweep speed: 1 oct./min

$a = 10 \text{ m/s}^2$

$f = 5 \text{ Hz} - 2000 \text{ Hz} - 5 \text{ Hz}$

试验类型:

E0.1 目测 DIN EN 60512-1-1

E0.2 接触电阻 DIN EN 60512-2-1

E14.0 在 B17.1 内施加试验电流 (100mA) 持续测量接触电阻

测量频率: 每隔 1 分钟测量 1 次

B17.1 正弦动力荷载

严重度: 见表格 7

扫描速度: 1oct/min

E0.1 目测 DIN EN 60512-1-1

E14.0 在 B17.2 内施加试验电流 (100mA) 持续测量接触电阻

测量频率: 每隔 1 分钟测量 1 次

B17.2 宽带随机振动动力荷载 DIN EN 60068-2-64

严重度: 见表格 7

E0.1 目测 DIN EN 60512-1-1

注意: B17.1 和 B17.2 可同时进行 (特殊操作要求)

E14.0 在 B17.3 内施加试验电流 (100mA) 持续测量接触电阻

测量频率: 每隔 1 分钟测量 1 次

B17.3 耐力冲击试验 DIN EN 60068-2-27

严重度: 见表格 7

E0.1 目测 DIN EN 60512-1-1

E0.2 接触电阻 DIN EN 60512-2-1

B17.4 触点组件共振频率

测量护套包括在正弦振动下端子和导线的共振频率

将最小尺寸的振动传感器粘在护套上, 不能螺旋固定在振动台上。

正弦动力荷载

DIN EN 60068-2-6

扫描速度: 1oct./min

$a=10\text{m/S}^2$

$f=5\text{Hz}-2000\text{Hz}-5\text{Hz}$

Requirement B 17.4:

The vibration responses of the housing must also be recorded and documented as a graph together with the excitation profile in the test report.

Table 7 Severity

Severity	TC (temperature cycle)	Random vibration with TC	Sine wave with TC	No. of shocks
1) "Body" unsealed	0 min/20 °C 60 min/-40 °C 150 min/-40 °C 300 min/105 °C 420 min/105 °C 480 min/20 °C	8 h per axis RMS value of acceleration 19,7 m/s ² Hz (m/s ²) ² /Hz 10 10 55 3,25	No sine wave	A = 30 g T = 6 ms sinusoidal half-wave No. of shocks: 6 000

Severity	TC (temperature cycle)	Random vibration with TC	Sine wave with TC	No. of shocks
3) "Applications close to power-train"	0 min/20 °C 60 min/-40 °C 90 min/-40 °C 240 min/120 °C 420 min/120 °C 480 min/20 °C	22 h per axis RMS value of acceleration 105,5 m/s ² Hz (m/s ²) ² /Hz 20 10 95 10 110 0,01 380 0,01 410 20 800 10 1 500 5	22 h per axis Hz mm 100 0,095 Hz m/s ² 200 150 220 150 221 100 400 100	

4) "Engine-mounted parts" Requirement B	0 min/20 °C 60 min/-40 °C 90 min/-40 °C 240 min/140 °C 420 min/140 °C 480 min/20 °C	22 h per axis RMS value of acceleration 181 m/s ² Hz (m/s ²) ² /Hz 10 10 100 10 300 0,51 500 20 2 000 20	22 h per axis Hz m/s ² 100 100 150 150 200 200 240 200 255 150 440 150	
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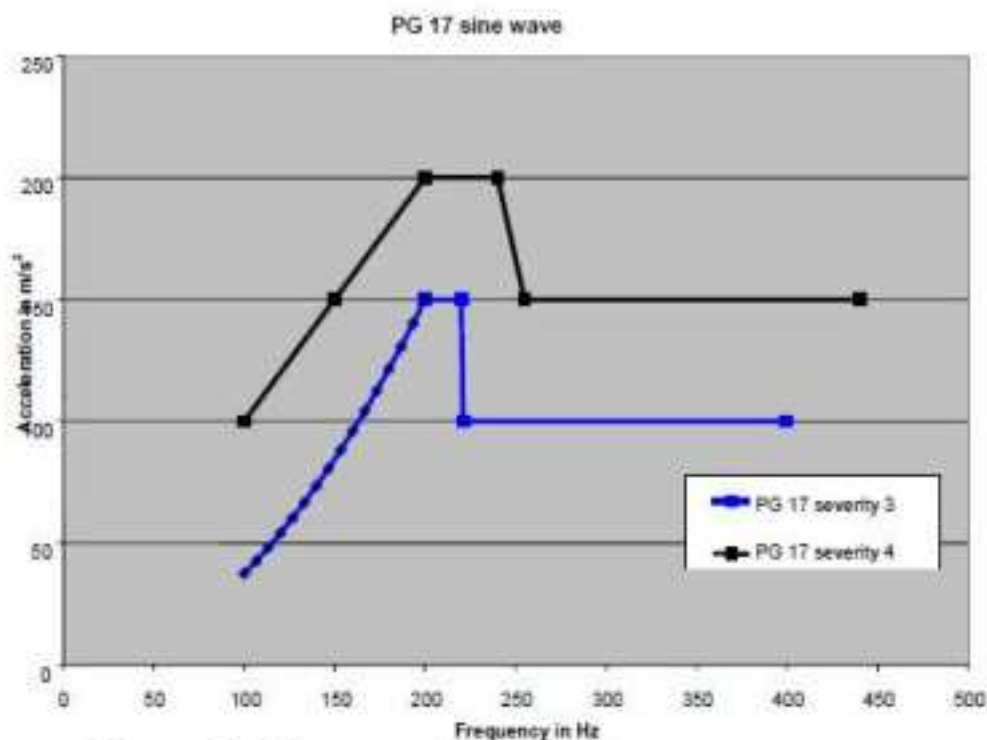


Figure 7 Sine wave test profile

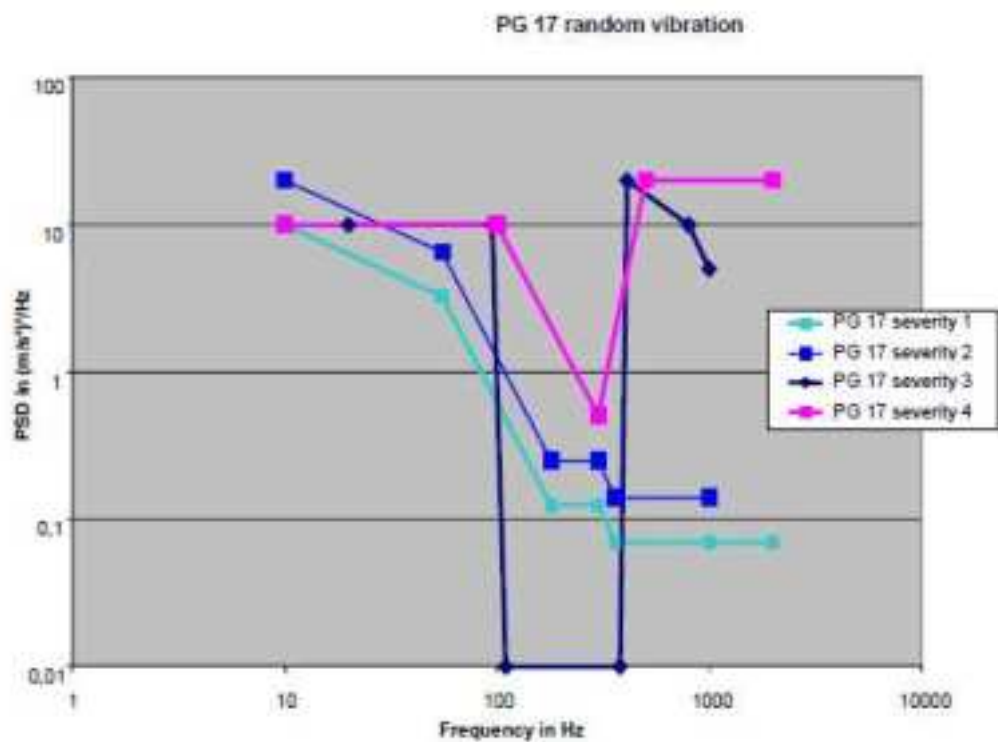


Figure 8 Random vibration test profile

Note

DUTs mounted on the vibration generator according to Figure B.1 or Figure B.2 (see Appendix B).

For especially critical installation conditions, special agreements must be made between the manufacturer and user.

Requirement:

The maximum values of the Table (Appendix D) must not be exceeded.

Documentation of the tested profile and results in the specified form (e.g., form, customer drawing, and possibly in OEM-specific databases required).

No function-relevant damage must occur.

Circuit interruption monitoring takes place during the test. Permissible circuit interruption < 1 000 ns. The circuit is considered interrupted when the contact resistance exceeds 7Ω .

Interruptions are not permissible.

NOTE Other limits may apply to other requirements (e.g., data transfers). These must be documented separately.

注意:

安装在振动器上的被测器件按照图 B.1 或图 B.2 (见附录 B)

极其关键的安装条件需要制造商和用户协商确定。

要求:

不能超过表格 (附录 D) 中的最大值。

示意图和结果文件按指定形式 (如表格、客户图纸、或整车厂指定的数据库)。

不能出现功能相关的损坏。

试验期间进行电路干扰监控, 电路干扰断允许小于 1000ns (毫微秒), 当接触电阻超过 7Ω 时, 要考虑到是电路干扰。不允许出现中断。

注意: 其他限定可以适用于其他要求 (例如数据传输)。这些必须单独记录存档。

PG 18A. Climate load

Aim: Test for metal parts (test for sea transport or use near the coast)

Batch size: 10 contact parts in unsealed housing(s)

Contact parts: all materials and surfaces that occur

Housings: open (not sealed), plugged in, average number of pins

Line cross-sections: arbitrary

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

B 18.1 The DUTs are inserted 2 times.

E 0.2 Contact resistance (DIN EN 60512-2-1)

B 18.2 Salt spray, cyclic (DIN EN 60068-2-52)

Severity 3

E 0.2 Contact resistance (DIN EN 60512-2-1)

E 0.1 Visual inspection (DIN EN 60512-1-1)

(In particular, crimp area of the line and contact zone with photo documentation in Disassembled state)

Requirement:

The maximum values of the Table (Appendix D) must not be exceeded

PG 18A 沿海气候载荷

目的：对金属零件进行试验（试验针对海洋运输或在海岸附近的使用）

数量：无密封护套内的 10 个端子

端子：所有材料和表面

护套：打开（无密封）、插上插头、pin 脚数平均

线径：任意

试验类型：

E0.1 目测

DIN EN 60512-1-1

B18.1 将被测器件插入 2 次

E0.2 接触电阻

DIN EN 60512-2-1

B18.2 盐雾循环

DIN EN 60068-2-52

严重度 3

E0.2 接触电阻

DIN EN 60512-2-1

E0.1 目测

DIN EN 60512-1-1

(尤其是导线和端子压接区域以拆解状态照片形式存档)

要求：

不能超过表格（附录 D）中的最大值。

PG 18C. Deicing salt load

Aim: Test for light metals (use of "Nordic country salt")

Batch size: 10 contact parts in unsealed housing(s)

Contact parts: all materials and surfaces that occur

Housings: open (not sealed), plugged in, average number of pins

Line cross-sections: arbitrary

E 0.1 Visual inspection (DIN EN 60512-1-1)

B 18.1 The DUTs are inserted 2 times

E 0.2 Contact resistance (DIN EN 60512-2-1)

B 18.3 Salt spray, cyclic (DIN EN 60068-2-52)

Severity 3

Salt mixture (Nordic country salt): 3% salt solution, of which 95% is NaCl, 2,5% is MgCl₂, and 2,5% is CaCl₂

E 0.2 Contact resistance (DIN EN 60512-2-1)

E 0.1 Visual inspection (DIN EN 60512-1-1)

(In particular, crimp area of the line and contact zone with photo documentation in the disassembled state)

Requirement:

The maximum values of the Table (Appendix D) must not be exceeded.

PG 18C 除冰盐载荷

目的：对轻金属进行试验（使用**北欧国家盐**）

数量：无密封护套内的 10 个端子

端子：所有材料和表面

护套：打开（无密封）、插上插头、pin 脚数平均

线径：任意

E0.1 目测

DIN EN 60512-1-1

B18.1 将被测器件插入 2 次

E0.2 接触电阻

DIN EN 60512-2-1

B18.3 盐雾循环

DIN EN 60068-2-52

严重度 3

盐混合物（**北欧国家盐**）3%盐溶液，95%是氯化钠 NaCl, 2.5%是氯化镁 MgCl₂, 2.5%是氯化钙 CaCl₂。

E0.2 接触电阻

DIN EN 60512-2-1

E0.1 目测

DIN EN 60512-1-1

（尤其是导线和端子压接区域以拆解状态照片形式存档）

要求：

不能超过表格（附录 D）中的最大值。

PG 19. Climate load of the housingEnvironmental simulation

Aim: Test for plug contacts

Batch size: 3 groups with at least 10 contact parts per group

Contact parts: all materials and surfaces that occur

Lines: Insulation must withstand the test temperature, i.e., PVC is not permissible

Line cross-section: to be determined for the individual case

Housings: open (not sealed), to be determined in individual case, plugged in

Table 8 Description of the 3 groups

	Group 1	Group 2	Group 3
Batch size	10	10	10
Insertions before the loads	1x	1x	Half the required number of insertion/removal cycles.
During load	Unplugged	Plugged	Plugged
Resistance measuring method	E 0.2	E 14.0	E 14.0

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 0.2 Contact resistance (all groups) (DIN EN 60512-2-1)

B 19.0 Inserting and removing groups according to "Table 8"

E 0.2 Contact resistance (all groups) (DIN EN 60512-2-1)

E 14.0 Contact resistance continuous during B 19.1 with test current (100 mA)(Only groups 2 + 3)

Measurement frequency: 1 measured value per min

B 19.1 Temperature shock (all groups) (DIN EN 60068-2-14) Test Na

Duration: 144 cycles

Temperature: -40 °C/130 °C 15 min respectively

Acclimatization period: max. 10 s

E 14.0 Contact resistance continuous during B 19.2 with test current (100 mA)(Only groups 2 + 3)

Measurement frequency: 1 measured value per 5 min

B 19.2 Temperature cycle (all groups) (DIN EN 60068-2-14) Test Nb

Duration: 20 cycles

Temperature: -40 °C/130 °C 3 h respectively

Time for temperature cycle: max. 2 h

E 14.0 Contact resistance continuous during B 19.3 with test current (100 mA)(Only groups 2 + 3)

Measurement frequency: 1 measured value per 5 min

B 19.3 Aging in dry heat (all groups) (DIN EN 60068-2-2) Test B

Duration: 120 h

Temperature: 130 °C

E 0.1 Visual inspection (DIN EN 60512-1-1)

B 19.4 Industrial climate (multi-component climate) (all groups) (DIN EN 60512-11-14)

(0,2 ppm SO₂, 0,01 ppm H₂S, 0,2 ppm NO₂, 0,01 ppm Cl₂/25 °C/75% relative humidity/21 d)

Flow rate: 1 m³/h

E 14.0 Contact resistance continuous during B 19.5 with test current (100 mA)(Only groups 2 + 3)

Measurement frequency: 10 measured values per min

B 19.5 Humid heat, cyclic (all groups) (DIN EN 60068-2-30) Variant 2

Relative humidity: 95% constant

Duration: 10 cycles of 24 h each

Temperatures: T_u = 25 °C, T_o = 55 °C

T_u = lower cycle temperature

To = upper cycle temperature

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 14.0 Contact resistance continuous during B 19.6 with test current (100 mA)(Only groups 2 + 3)

Measurement frequency: 10 measured values per min

B 19.6 Dynamic load, (DIN EN 60068-2-64)

Broad-band random vibration (only groups 2 + 3)

6 h per axis

RMS value of acceleration 13,9 m/s²

Table 9 Broad-band random vibration

Hz	(m/s ²) ² /Hz
0	5
55	1,625
180	0,0625
300	0,0625
360	0,035
1 000	0,035

In order to document the freedom from resonance of the clamping device, a resonance analysis must be performed in the designated frequency range before the start of the vibrationtest (load: 1 g); this is not a component test but rather an examination of the test setup.

E 14.0 Contact resistance continuous during B 19.7 with test current 100 mA(Only groups 2 + 3)

Measurement frequency: 10 measured values per min

B 19.7 Mech. shocks (single shocks) (all groups) (DIN EN 60068-2-27)

Acceleration a = 30 g

Individual shock duration t = 6 ms, sinusoidal half-wave

No. of shocks: 50 per spatial axis

B 19.8 One-time disconnection and insertion (all groups)

E 0.2 Contact resistance (all groups) (DIN EN 60512-2-1)

E 0.1 Visual inspection (DIN EN 60512-1-1)

Requirement:

- >The contact resistance must not exceed the maximum values of the Table (AppendixD) in any test.
- >No corrosion must occur in the area of the contact zone.
- >Rubbing through is not permissible in the contact area.

PG 19 环境模拟

目的：对插头进行试验

数量：3 组，每组至少 10 个端子

端子：所有材料和表面

导线：绝缘必须能经受住试验温度，也就是不允许使用 PVC

线径：视具体情况而定

护套：打开（无密封），视具体情况而定，插上插头

表格 8 3 组说明

	组 1	组 2	组 3
数量	10	10	10
施加载荷前插入	1X	1X	所需插拔次数的一半
载荷期间	未插插头	插入插头	插入插头
电阻测量方法	E0.2	E14.0	E14.0

试验类型：

E0.1 目测

DIN EN 60512-1-1

E0.2 接触电阻(所有组)

DIN EN 60512-2-1

B19.0 根据表格 8 插拔

E0.2 接触电阻(所有组)

DIN EN 60512-2-1

E14.0 在 B19.1 期间施加试验电流（100mA）持续测量接触电阻

（只针对组 2 和组 3）

测量频率：每隔 1 分钟测量 1 次

B19.1 温度冲击（所有组）

DIN EN 60068-2-14

试验 Na

持续时间：144 周期

温度：-40℃/130℃ 各 15 分钟

适应期：最多 10 秒

E14.0 在 B19.2 期间施加试验电流（100mA）持续测量接触电阻

（只针对组 2 和组 3）

测量频率：每 5 分钟测量 1 次

B19.2 温度循环（所有组）

DIN EN 60068-2-14

试验 Nb

持续时间：20 个周期

温度：-40℃/130℃ 各 3 小时

温度循环时间：最多 2 小时

E14.0 在 B19.3 期间施加试验电流（100mA）持续测量接触电阻

（只针对组 2 和组 3）

测量频率：每 5 分钟测量 1 次

B19.3 干热老化（所有组）

DIN EN 60068-2-2 试验 B

持续时间: 120 小时

温度: 130℃

E0.1 目测

DIN EN 60512-1-1

B19.4 工业气候 (多组分气候) (所有组)

DIN EN 60512-11-14

(0.2ppmSO₂, 0.01ppm H₂S, 0.2ppm NO₂,
0.01ppm Cl₂/25℃/75%相对湿度/21 天)

流速: 1m²/h

E14.0 在 B19.5 期间施加试验电流 (100mA) 持续测量接触电阻
(只针对组 2 和组 3)

测量频率: 每 1 分钟测量 10 次

B19.5 湿热循环 (所有组)

DIN EN 60068-2-30 变化 2

相对湿度: 95% 恒定

持续时间: 每次 24 小时 10 个周期

温度: T_h=25℃, T_c=55℃

T_c 低循环温度

T_h 高循环温度

E0.1 目测

DIN EN 60512-1-1

E14.0 在 B19.6 期间施加试验电流 (100mA) 持续测量接触电阻
(只针对组 2 和组 3)

测量频率: 每 1 分钟测量 10 次

B19.6 动力载荷

DIN EN 60068-2-64

宽带随机振动 (只针对组 2 和组 3)

每轴 6 小时

加速度 13.9m/S² 均方根值

表格 9 宽带随机振动

Hz	(m/S ²) ^{1/2} /Hz
0	5
55	1.625
180	0.0625
300	0.0625
360	0.035
1000	0.035

为记录免于夹紧装置的共振, 在振动试验开始前 (载荷: 1g) 以指定的频率范围进行共振分析, 这不是零件试验, 而是对试验设置的检验。

E14.0 在 B19.7 期间施加试验电流 (100mA) 持续测量接触电阻

(只针对组 2 和组 3)

测量频率: 每 1 分钟测量 10 次

B19.7 机械冲击 (单冲击) (所有组)

DIN EN 60068-2-27

加速度 $a=30g$

单个冲击持续时间: $t=6ms$ (毫秒), 正弦半波

冲击数: 每个空间轴 50 次

B19.8 一次插拔 (所有组)

E0.2 接触电阻 (所有组)

DIN EN 60512-2-1

E0.1 目测

DIN EN 60512-1-1

要求:

接触电阻不能超过表格 (附录 D) 中最大值

接触区域不能出现腐蚀现象

不允许在接触区域摩擦

PG 20. Climate load of the housing

Aim: Test for connector housings/general requirement

Batch size: 5 housings. Up to 5-pin, fully equipped; for 6-pin and above, with 5 contacts

Contact parts: any type

Housings: all variants that occur (keying, color arbitrary)

Lines: insulation must withstand the test temperature

Increased requirements (e.g., temperatures) must be agreed upon with the OEM.

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 0.3 Insulation resistance (DIN EN 60512-3-1)

B 20.1 Aging in dry heat (DIN EN 60068-2-2)

Test B

Duration: 120 h

Temperature: 130 °C

B 20.2 Humid heat, constant (DIN EN 60068-2-30)

Duration: 10 days

Temperature: 40 °C

Relative humidity: 95 %

After conclusion of test B 20.2, the insulation resistance must be measured at the earliest after 30 min and at the latest after 60 min.

E 0.3 Insulation resistance (DIN EN 60512-3-1)

E 0.1 Visual inspection (DIN EN 60512-1-1)

B 20.3 Low-temperature aging (DIN EN 60068-2-1)



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Duration: 48 h

Temperature: -40 °C

B 20.4 Removal and insertion at -20 °C

E 0.1 Visual inspection (DIN EN 60512-1-1)

B 20.5 Aging in dry heat (DIN EN 60068-2-2)

Test B

Duration: 48 h

Temperature: 80 °C

B 6.1 Drop test in the unplugged state.

E 0.1 Visual inspection (DIN EN 60512-1-1)

Requirement:

After completion of the tests, no function deviations must have occurred.

It must be possible to open and re-close the connector even at -20 °C.

Any film hinges and latch elements present must not break off or crack upon actuation.

The drop test must cause no damage to the specimens impairing their function. Locks must not open.

PG 20 护套气候载荷

目的: 对连接器护套进行试验/一般要求

数量: 5 个护套, 5 孔及以下的, 配备齐全, 6 孔及以上的, 需 5 个端子

端子: 任意型号

护套: 所有型号 (键、颜色任意)

导线: 绝缘必须经受住试验温度

增加的要求 (如温度) 必须和整车厂协商确定。

试验类型:

E0.1 目测 DIN EN 60512-1-1

E0.3 绝缘电阻 DIN EN 60512-3-1

B20.1 干热存放 DIN EN 60068-2-2 试验 B

持续时间: 120 小时

温度: 130°C

B20.2 湿热、恒定 DIN EN 60068-2-30

持续时间: 10 天

温度: 40°C

相对湿度: 95%

试验 B20.2 得出结果后, 最早在试验结束 30 分钟后, 最迟 60 分钟需对绝缘电阻进行测量。

E0.3 绝缘电阻 DIN EN 60512-3-1

E0.1 目测 DIN EN 60512-1-1

B20.3 低温存放 DIN EN 60068-2-1

持续时间: 48 小时

温度: -40°C

B20.4 在-20°C下插拔

E0.1 目测

DIN EN 60512-1-1

B20.5 干热存放

DIN EN 60068-2-2 试验 B

持续时间: 48 小时

温度: 80℃

B6.1 未插上插头状态的跌落试验

E0.1 目测

DIN EN 60512-1-1

要求:

试验完成之后, 不能出现功能性偏差。

即使在-20℃下也可以打开再关上连接器

任何薄膜铰链和卡槽在触发时不能出现折断或裂纹。

跌落试验不能引起任何对试样功能造成影响的损坏, 不能打开锁。

PG 21. Long-term temperature aging

Aim: Test of the long-term stability of the housings and the contact parts

Batch size: 2 groups, 5 housings per group

Housings: Group 1 unequipped

Group 2 per contact size: Up to 5-pin, fully equipped; for 6-pin and above, with 5 contacts

Contact parts: as agreed upon, but at least 10 contact pairs for contact resistance measurements

Single-wire seals: all variants that occur

Lines: insulation must withstand the test temperature

Conductor cross-section: lines with max. conductor cross-section

Housings: all

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

All parts

E 0.2 Contact resistance (DIN EN 60512-2-1)

(Group 2 only)

B 21.1 Long-term aging in dry heat (all parts) (DIN EN 60068-2-2)

Test B

Duration: 1 000 h

Temperature: 130 °C

Subsequent aging 48 h at RT

E 0.2 Contact resistance (DIN EN 60512-2-1)

(Group 2 only)

E 21.1 Functional test with both groups:

Actuation: Connection of the connector housings until complete latching, Opening of the



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lock and complete disconnection of the connector housings

Number of cycles: 5

B 6.1 Drop test (only group 1) (DIN EN 60068-2-31)

E 8.2. Contact pull-out forces of all contacts of group 2,

The value for secondary locks from PG 8 applies as the limit, even if the primary and secondary locks are closed here.

E 0.1 Visual inspection (DIN EN 60512-1-1)

Requirement:

>After completion of the test, there must be no functional impairments detected on the housings. Cracking or delaminations that affect the function are not permissible.

>Contact resistance: The limits from the Table in Appendix D must be complied with.

>Contact pull-out force: The limits for locking from the requirement table in PG 8 must be complied with.

PG 21 长时间热老化

目的: 对护套和端子长时间稳定的试验

数量: 2 组, 每组 5 个护套

护套: 组 1: 未装配

组 2 根据端子尺寸: 5 孔及以下的配备齐全, 6 孔及以上的, 需 5 个端子

端子: 协商确定, 至少 10 对端子用于接触电阻测量

防水栓: 所有型号

导线: 绝缘必须能经受住试验温度

线径: 最大线径

护套: 所有

试验类型:

E0.1 目测

DIN EN 60512-1-1

所有部分

E0.2 接触电阻

DIN EN 60512-2-1

(仅组 2)

B21.1 干热长时间存放 (所有部分)

DIN EN 60068-2-2 试验 B

持续时间: 1000 小时

温度: 130℃

随后存放: 在室温下 48 小时

E 0.1 目检

DIN EN 60512-2

B 21.1 长期干热老化

DIN EN 60068-2-2

试验 Ba

时间:

1000 小时

温度:

120℃

存储:

室温下 1 周

E 0.1 目检

DIN EN 60512-1-1

要求:

试验完成后, 试样无功能损坏。不允许出现裂纹或分层。

E0.2 接触电阻

DIN EN 60512 2-1

(仅组 2)

E21.1 两组进行功能试验

触发: 完成自锁后才能连接连接器护套

打开锁紧装置, 完成连接器护套分离

循环次数: 5

B6.1 跌落试验 (仅组 1)

DIN EN 60068-2-31

E8.2 所有组 2 端子拉拔力

即使主锁和次级锁关闭, PG 8 次级锁的值也适用。

E 0.1 目检

DIN EN 60512-2

要求:

试验结束之后, 护套上不能出现功能性损坏。不允许出现影响功能的裂纹和分层。

接触电阻: 需满足附录 D 中表格的限定值

端子拉拔力: 需满足 PG 8 表格中锁紧装置要求

PG 22A. Chemical resistance

Aim: Test of the chemical resistance of the housings

For water-tight requirements, test according to PG 22B

Batch size: 2 fully equipped housings per test fluid

Contact parts: any type

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 0.3 Insulation resistance (DIN EN 60512-3-1)

B 22.1 A Resistance to agents (general requirements)

Test procedure:

DUTs must be exposed to the fluids (for chemicals and method, see Appendix E) and aged for 48 h at the required aging temperature.

After the test is complete, the DUTs must be rinsed thoroughly with water and dried.

E 0.3 Insulation resistance (DIN IEC 60512-3-1)

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 1.1 Dimensions (DIN EN 60512-1-2)

Requirement:

>No functionally significant structural or dimensional change

>Deviations from the original state must be documented

>Insulation resistances >100 MΩ

>The DUT must remain fully functional.

PG 22A 耐化学性

目的：对护套耐化学性进行试验

针对防水要求，试验根据 PG 22B

数量：每样试验液体配 2 个齐全护套

端子：任意型号

试验类型

E 0.1 目检 DIN EN 60512-1-1

E0.3 绝缘电阻 DIN EN 60512-3-1

B22.1 A 耐试剂（一般要求）

试验步骤：

将被测器件暴露于试验液体中（化学制品和方法见附录 E），在要求的老化温度下老化 48 小时。

试验结束后，将被测器件用水清洗干净并弄干。

E0.3 绝缘电阻 DIN EN 60512-3-1

E 0.1 目检 DIN EN 60512-1-1

E1.1 尺寸 DIN EN 60512-1-2

要求：

重要功能结构和尺寸不能改变。

与原始状态的偏差需要记录存档

绝缘电阻 > 100 MΩ

被测器件功能保持完整

PG 22B. Chemical resistance, extended test

Aim: Extended test of the chemical resistance of the housing material

Batch size: 2 fully equipped, sealed housings + 1 housing with blind plugs per test fluid

Contact parts: any type



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E 0.1 Visual inspection (DIN EN 60512-1-1)

E 0.3 Insulation resistance (DIN EN 60512-3-1)

B 22.1 B Resistance to agents (water-tight design)

Test procedure:

DUTs must be exposed to the fluids (for chemicals and method, see Appendix E) and aged for 48 h at the required aging temperature.

In contrast to PG 22A, the DUTs are not rinsed with water.

E 0.3 Insulation resistance (DIN EN 60512-3-1)

E 0.1 Visual inspection (DIN EN 60512-1-1)

E 1.1 Dimensions (DIN EN 60512-1-2)

Requirement:

>No functionally significant structural or dimensional change

>Deviations from the original state must be documented

>Insulation resistances >100 MΩ

>The DUT must remain fully functional.

PG 22B 耐化学性、扩展试验

目的：对护套材料耐化学性进行扩展试验

数量：2 个齐全密封护套+1 个带盲堵护套用于每个试验液体

端子：任一型号

试验类型

E 0.1 目检

DIN EN 60512-1-1

E0.3 绝缘电阻

DIN EN 60512-3-1

B22.1B 耐试剂（防水设计）

试验步骤：

将被测器件暴露于试验液体中（化学制品和方法见附录 E），在要求的老化温度下老化 48 小时。

与 PG 22A 相比，被测器件不能用水清洗。

E0.3 绝缘电阻

DIN EN 60512-3-1

E 0.1 目检

DIN EN 60512-1-1

E1.1 尺寸

DIN EN 60512-1-2

要求：

重要功能结构和尺寸不能改变。

与原始状态的偏差需要记录存档

绝缘电阻 > 100MΩ

被测器件功能保持完整

PG 23. Water leak tightness

Aim: Test of the leak tightness of sealed connector housings, blind plugs, and single-wireseals

Group 1: connector housings with blind plugs

Group 2: connector housings with single-wire seals

Batch size: Group 1: 2 housings

Group 2: 5 fully equipped housings

Contact parts: arbitrary

Housings: all water-tight designs

Line cross-section: smallest and largest permissible conductor cross-sections persealing element

Lines: insulation must withstand the test temperature

The ends of all stranded wires of the cables are sealed pressure-tight.

For sealing systems without single-wire seals, the contacts must be removed and reinserted once before the load.

Type of test:

E 0.1 Visual inspection DIN EN 60512-1-1

B 19.3 Aging in dry heat (all groups, plugged state) (DIN EN 60068-2-2) Test B

Duration: 120 h

Temperature: 130 °C

B 19.1 Temperature shock (all groups) (DIN EN 60068-2-14) Test Na

Duration: 144 cycles

Temperature : -40 °C/130 °C 15 min respectively

Acclimatization period: max. 10 s

E 0.1 Visual inspection (all groups) (DIN EN 60512-1-1)

B 23.1 Immersion with pressure difference (all groups) (DIN EN 60512-14-5) (DIN EN 60068-2-13)

Both groups are pressurized using suitable means. The remaining contact cavities are closed using blind plugs or sealed line ends.

Subsequently, pressure values differing from the surrounding pressure (normal pressure) are set in the interior of the contact housing.

The specified holding times apply once the required pressure values (a – d) are maintained.

Medium: low surface-tension 5% NaCl solution

a) Normal pressure

b) - 10 kPa, holding time 5 min

c) - 50 kPa, holding time 5 min

d) Normal pressure

Change in pressure: 10 kPa/min

B 23.2 Line movement during immersion with pressure difference – vacuum: (only for group 2)

For housings with cover caps, the test must be performed without the cover caps. For housings that cannot be installed without cover caps (e.g., for insertion and removal aids), this test section is omitted.

Definition of line movement:

>No fixed clamping of the lines (no tension on the lines)

>Free moving line length: 100 mm

>Movement profile:

- Deflection of the line bundle by 100 mm (final position) at a 100 mm distance from the single-wire seal

- Hold for 10 s,
- Deflection until the opposite final position,
- Hold for 10 s.

>The movement profile is performed once per pressure stage during the pressure loading.

>Movement direction: perpendicular to the cable routing separation direction, in both spatial axes

E 0.1 Visual inspection (all groups) (DIN EN 60512-1-1)

B 23.3 Thermal shock test (all groups)

Medium: low surface-tension 5% NaCl solution

Air temperature: 120 °C Duration: 30 min each

Water temperature: 0 °C Duration: 15 min each

Number of cycles: 5

E 0.1 Visual inspection (all groups) (DIN EN 60512-1-1)

B 23.4 Degree of protection test/pressure washer test (all groups) (DIN 40050-9)

Severity: IP X9K

All three sides of the DUT must be exposed to the steam jet. The jet must also be directed especially at the sealing elements of the DUT.

Test duration per side: 15 s

Distance, nozzle-DUT: (100 – 150) mm

Pressure: 80 bar

Temperature: 80 °C

The test is performed 3 times.

E 0.3 Insulation resistance (only for group 2) (DIN EN 60512-3-1)

E 0.1 Visual inspection (all groups) (DIN EN 60512-1-1)

E 1.1 Dimensions (DIN EN 60512-1-2)

Requirement:

No medium must penetrate into the connector (possible use of water finding paste).

The insulation resistance must be >100 MW.

The function of the locking and releasing elements must remain fully intact.

The dimensions of the housings must correspond to the release drawing before and after the tests.

PG 23 水密封性

目的: 对密封护套、盲堵和防水栓进行密封性试验

组 1: 带盲堵的连接器护套

组 2: 带防水栓的连接器护套

数量：组 1：2 个护套

组 2：5 个齐全护套

端子：任意

护套：所有防水设计

线径：每样密封元件选最小和最大线径

导线：绝缘必须经受住试验温度

绞股线末端必须耐压密封。

针对不带防水栓的密封系统，在施加载荷前将端子拔出再插入。

试验类型：

E 0.1 目检 DIN EN 60512-1-1

B19.3 干热老化（所有组，插上插头状态） DIN EN 60068-2-2 试验 B

持续时间：120 小时

温度：130℃

B19.1 温度冲击（所有组） DIN EN 60068-2-14 试验 Na

持续时间：144 个周期

温度：-40℃/130℃ 各 15 分钟

适应期：最大 10 秒

E 0.1 目检（所有组） DIN EN 60512-1-1

B23.1 压差浸入（所有组） DIN EN 60512-14-5

DIN EN 60068-2-13

两组使用合适的方法加压。剩下的孔位使用盲堵或密封导线末端塞住。

随后，在护套内部设置与周围气压（标准压力）不一样的压力值。

一旦达到所要求的压力值（a-d），使用规定的保持时间。

介质：表面张力低的 5%氯化钠溶液

a 标准压力

b -10kPa, 保持时间 5 分钟

c -50kPa, 保持时间 5 分钟

d 标准压力

压力变化: 10kPa/分钟

B23.2 压差浸入时导线运动—真空: (只针对组2)

有护盖的护套, 试验时不能带护套。针对没有护盖不能安装的护套 (例如针对插拔辅助装置), 可不做本章节试验。

导线运动定义:

导线无固定夹紧 (导线上无张力)

自由运动导线长度: 100mm

运动概况:

在距离防水栓 100mm 处 (终点位置) 线束偏斜 100mm

保持 10s

偏斜直至反向终点位置

保持 10s

运动概况根据压力负载时压力级实施

运动方向: 垂直于电缆路线分离方向, 在两个空间轴内。

E 0.1 目检 (所有组)

DIN EN 60512-1-1

B23.3 防护级试验/蒸汽喷射试验 (所有组) DIN 40050-9

严重度: IP X9K

被测器件的 3 个面必须置于蒸汽喷嘴下。喷嘴必须直接位于被测器件的密封元件处。

每面试验持续时间: 15 秒

喷嘴到被测器件的距离: (100-150) 毫米

压力: 80bar

温度: 80℃

试验进行 3 次

E0.3 绝缘电阻 (仅针对组2)

DIN EN 60512-3-1

E 0.1 目检 (所有组)

DIN EN 60512-1-1

E1.1 尺寸

DIN EN 60512-1-2

要求:

没有介质穿入连接器中 (可以使用试水膏)

绝缘电阻必须大于 100MΩ

锁紧和释放功能必须保持完好

试验前后护套尺寸必须与认可图纸一致。

PG 24. Impenetrability to paint

Aim: Test of the resistance to painting

Batch size: 10 housings that are mounted on the PCB and contacted according to the applicable mounting specifications.

Contact parts: all that occur

Housings: all housing leads that come in contact with fluid dip paint in their further processing.

Type of test:

E 0.1 Visual inspection (DIN EN 60512-1-1)

B 24.1 Dip painting

The housing parts/PCBs are dipped for 1 min in fluid paint (e.g., paint type "SL 1331 N" by Peters) and subsequently dried at a temperature of 80 °C for 6 h.

E 0.1 Visual inspection (DIN EN 60512-1-1)

Requirement:

The dip paint must not penetrate the contact area. The mechanical and electrical functions must not be impaired.

PG 24 涂漆不可渗透性

目的: 对耐油漆进行试验

数量: 10 个装在印刷电路板 PCB 板上的护套, 根据安装规范接触连接。

端子: 所有型号

护套: 在后面加工中所有与液体接触的护套浸漆

试验类型:

E 0.1 目检 DIN EN 60512-1-1

B24.1 浸漆

将护套/PCB 板浸入液体涂料 1 分钟, (例如涂料型号: Peters "SL 1331 N") 然后在 80°C 下干燥 6 小时。

E 0.1 目检 DIN EN 60512-1-1

要求:

浸的漆涂料不能穿入接触区域, 机械和电气性能不能受到影响。

PG 25. Test group omitted 实验组删除

PG 26. Test group omitted 实验组删除

PG 27. Test group omitted 实验组删除

PG 28. Locking noise

Aim: All locks to be actuated in vehicle assembly must produce an audible locking feedback.

Batch size: 2 fully equipped housings per injection mold

Housings: all variants that occur, does not apply to housings with mounting aids

E 0.1 Visual inspection (DIN EN 60512-1-1)

B 28.1 Aging 24 h at RT

E 28.1 Locking noise

Distance to measuring microphone: (600 ± 50) mm

Actuation of the lock: by hand, with the least possible contact,

Avoidance of falsifying reflections by underlying structures (table) or near walls (see Figure 9)

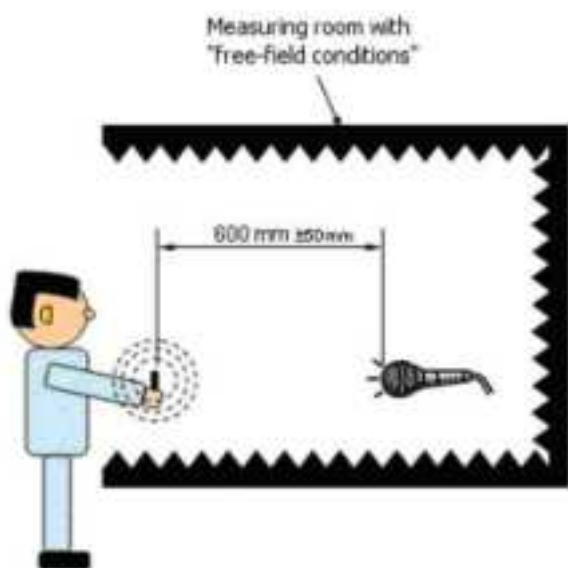


Figure 9 Schematic of the measurement setup
"volume measurement"

E 0.1 Visual inspection (DIN EN 60512-1-1)

Requirement:

The measured dB(A) values must be documented.

For this purpose, the signal-to-noise ratio between the locking noise and ambient noise must be at least 7 dB(A).

The locking noise must be at least $L_{Apeak} \geq 70$ dB(A).

L_{Apeak} : peak level of the sound level with frequency weighting A

PG 28 锁止噪音

目的：汽车装配中的所有待触发的锁必须产生声音锁反馈。

数量：每副注塑模具 2 个齐全的护套

护套：所有型号，不用于带安装辅助装置的护套

E 0.1 目检

DIN EN 60512-1-1

B28.1 老化

室温下 24 小时

E28.1 锁止噪音

至测量麦克风的距离：(600±50) mm

锁触发：用手，最少的接触

避免底层结构（工作台）或靠近墙壁伪反射（见图 9）

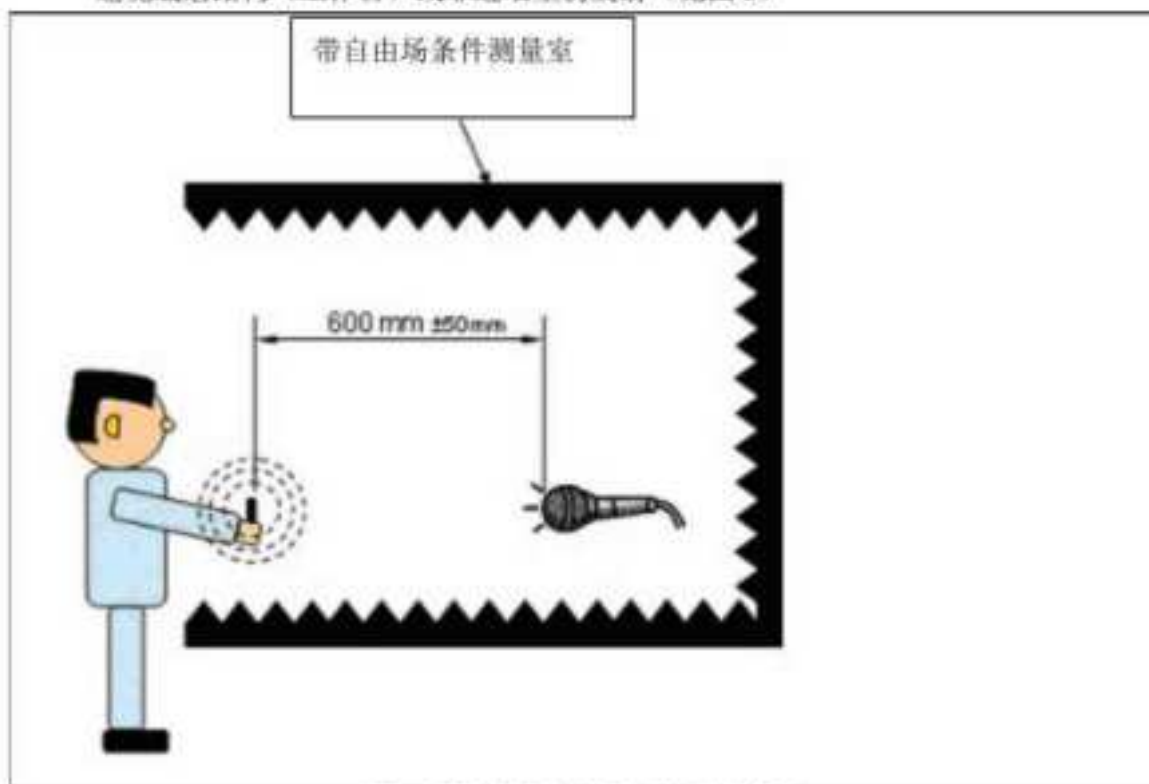


图 9 测量设置示意图“音量测量”

E 0.1 目检

DIN EN 60512-1-1

要求：

记录测量的分贝值 dB (A)

锁止噪音和周围噪音的信噪比至少为 7dB(A).

锁止噪音至少为 $L_{Apeak} \geq 70\text{dB (A)}$

L_{Apeak} 频率加权为 A 的噪声值峰值。

PG 29. Retention force of the blind plugs

Aim: Assurance of the retention force of the blind plugs in relation to the internal pressure of the sealed contact assembly in the contacting process

NOTE If it is ensured that the possible max. internal pressure is 0,5 bar, this PG may be replaced by including an over-pressure test in B 23.1.

Batch size: 3 fully equipped, sealed housings, but at least 10 blind plugs

Contact parts: none

E 29.1 Theoretical determination of the internal pressure P_0

Determination of the air volumes in the interior of the contact assembly housing in the closed state and in the state when the housing seal touches the mating piece for the first time. With the two volumes, the maximum internal pressure p_0 that occurs can be computed.

E 0.1 Visual inspection (DIN EN 60512-1-1)

B 20.1 Aging in dry heat (DIN EN 60068-2-2)

Duration: 2 h Test B

Temperature: 60 °C

E 29.2 Determination of the retention force of the blind plugs p_{max}

Continuously increase the pressure difference of the closed and locked contact assembly with respect to the external environment (0,5 bar/min), until at least one blind plug slides out (= p_{max})

The internal pressure may be increased or the external pressure may be lowered.

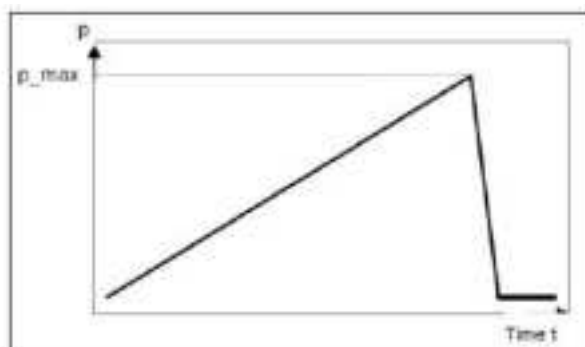


Figure 10 Retention force pressure-time graph

Requirement: $p_{max} > 1,5 \cdot p_0$

E 0.1 Visual inspection (DIN EN 60512-1-1)

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PG 29 盲堵保持力

目的：在接插过程中涉及到密封接触装配的内部压力的，确保盲堵的保持力。

注意：如果确保内部最大压力为 0.5bar,本试验组可被 B23.1 包括超压试验代替。

数量：3 个齐全密封护套，但至少 10 个盲堵。

端子：无

E29.1 内部压力 p0 理论测量

测量护套在闭合状态以及护套密封第一次接触插件时的内部空气体积。通过这两个体积可以计算出最大内部压力 p0.

E 0.1 目检 DIN EN 60512-1-1

B20.1 干热老化 DIN EN 60068-2-2 试验 B

持续时间：2 小时

温度：60℃

E29.2 测量盲堵保持力 pmax

考虑到外部环境，持续增加闭合和锁紧接触件的压差（0.5bar/分钟），直至盲堵滑出（=pmax）。

可以增加内部压力或者降低外部压力。

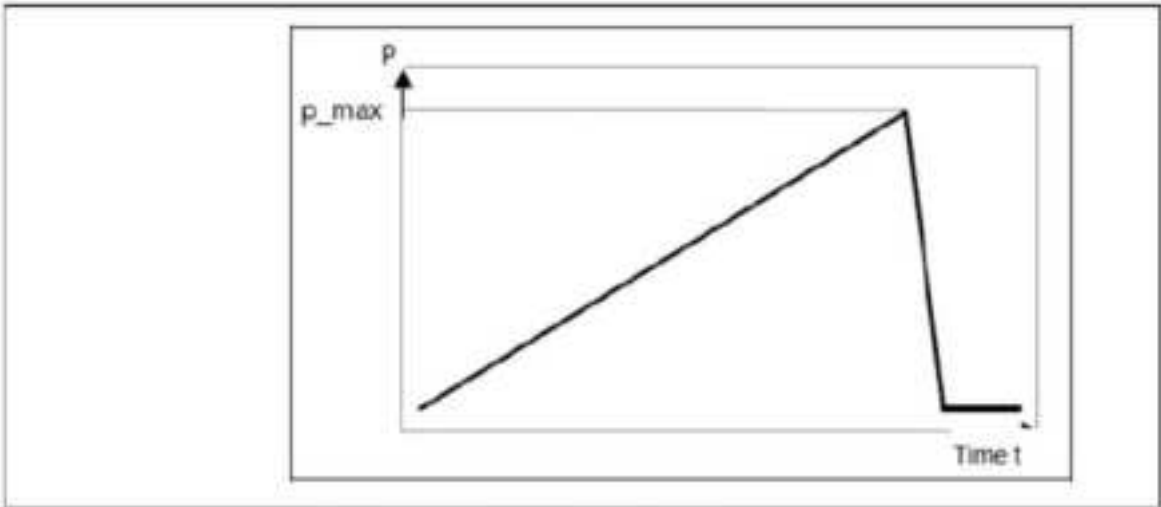


图 10 保持力 压力-时间示意图

要求： $p_{max} > 1.5 \cdot p_0$

E 0.1 目检 DIN EN 60512-1-1

Appendix A Double crimp

Possible conductor cross-section combinations for double crimp, solderless connections

Table A.1 Double crimp

Possible conductor cross-section combinations for double crimp, solderless connections								
		Conductor 1						
	mm ²	0,35	0,50	0,75	1,0	1,5	2,5	4,0
Conductor 2	0,35	X	X					
	0,50	X	X	X				
	0,75		X	X	X			
	1,0			X	X	X		
	1,5				X	X	X	
	2,5					X	X	X
	4,0						X	X

Only insulation reduced cables with stranded wire conductors must be used.

Solid conductors are not permissible.

The use of double crimps is not permissible with coaxial cables, individual cable sealing systems, or on the engine and gearbox.

附录 A 双压接

双压接、无焊连接的线径组合

表格 A.1 双压接

双压接、无焊连接的线径组合								
		导体 1						
	mm ²	0.35	0.50	0.75	1.0	1.5	2.5	4.0
导体 2	0.35	X	X					
	0.50	X	X	X				
	0.75		X	X	X			
	1.0			X	X	X		
	1.5				X	X	X	
	2.5					X	X	X
	4.0						X	X

只能使用含绞股线导体的绝缘减少的电缆

不允许使用实心导线

同轴电缆、单独电缆密封系统、发动机和变速箱上不能使用双压接。

Appendix B Vibrator table mounting

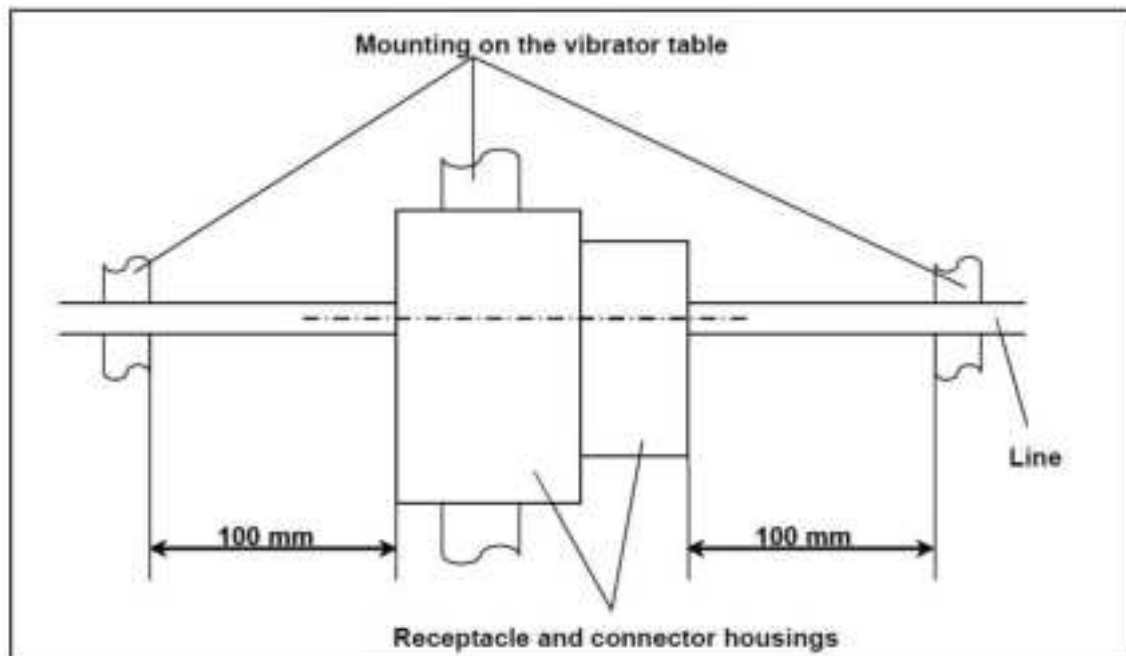


Figure B.1 Mounting on vibrator table, coupling

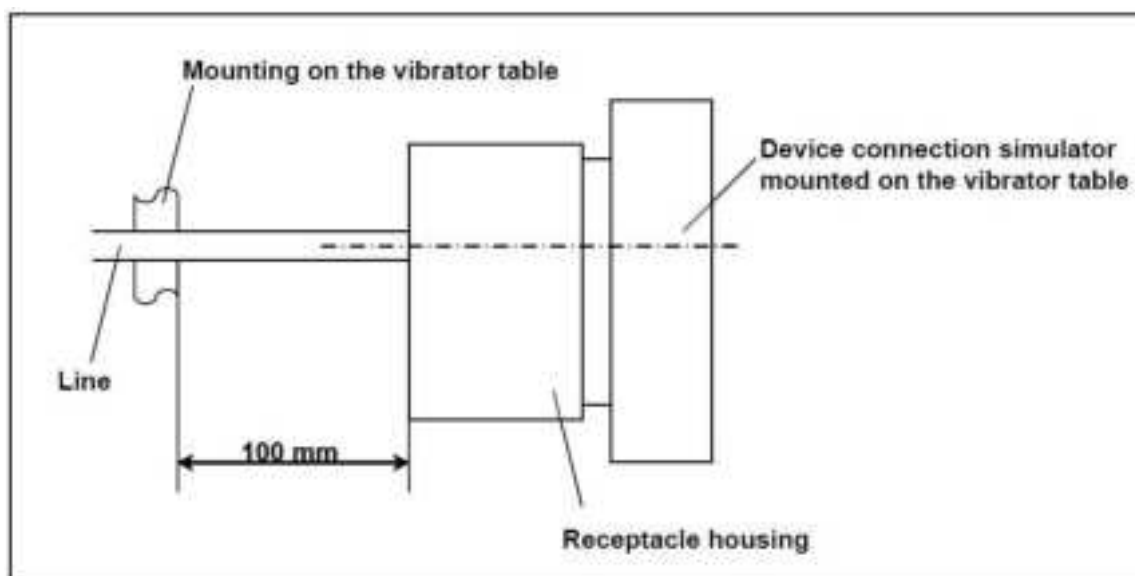


Figure B.2 Mounting on vibrator table, device connection

附录B 振動臺安裝

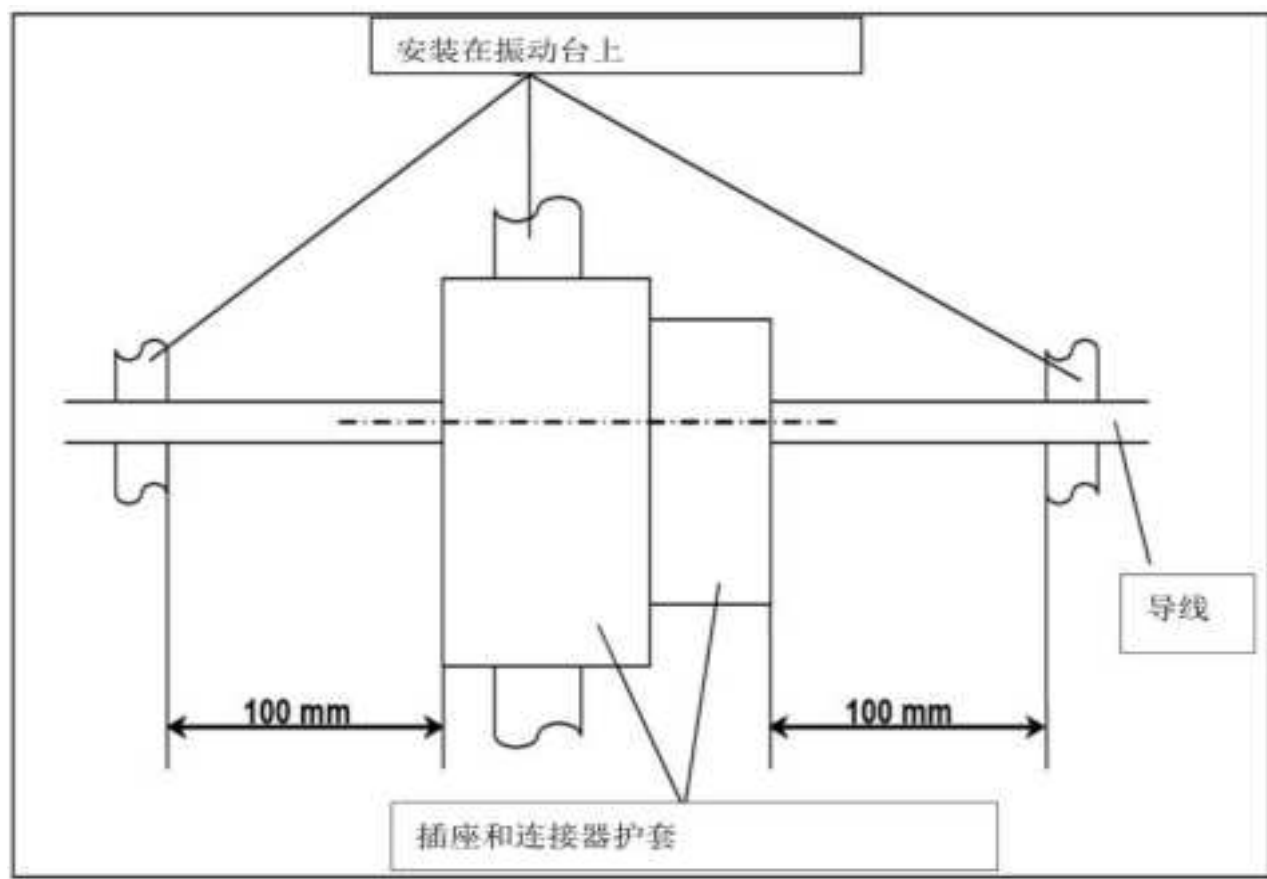


图 B.1 振动台安装，耦合

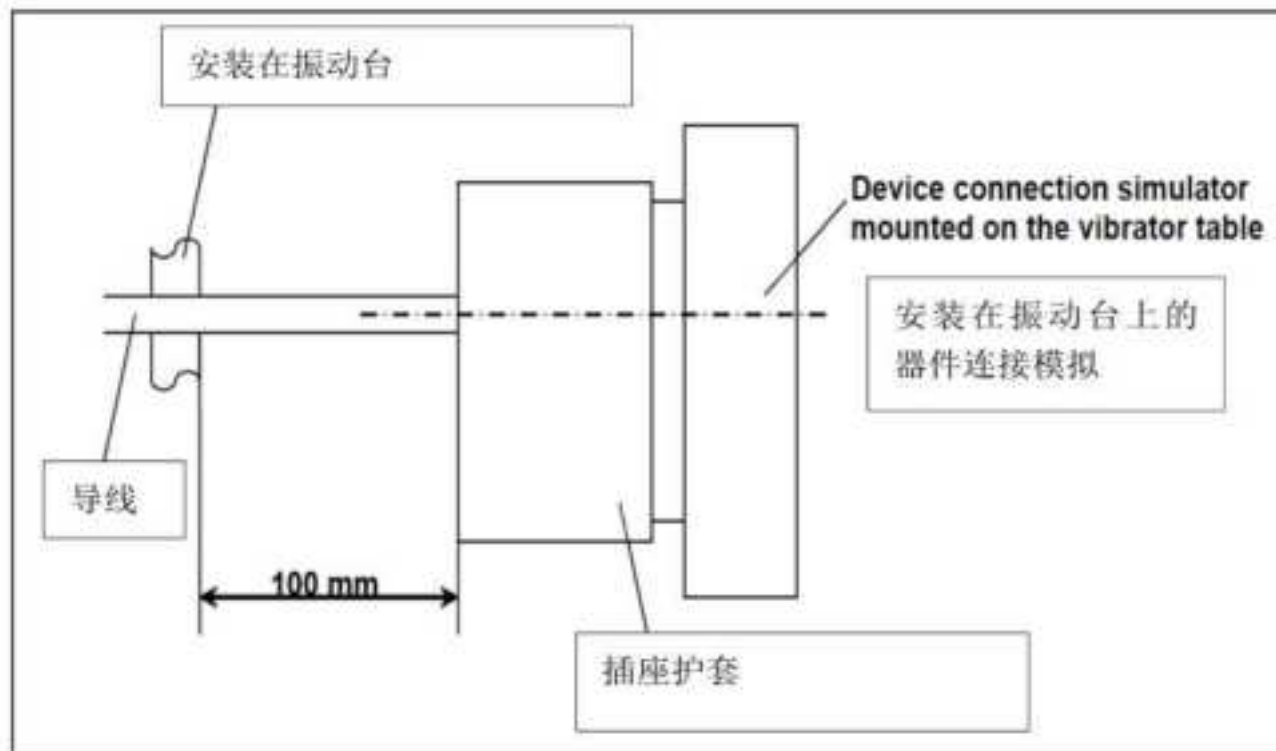


图 B. 2 振动台安装、器件连接

Appendix C Temperature cycle with current supply

Temperature cycle with current supply at I_N during the heat-up phase and the holding time at T_o

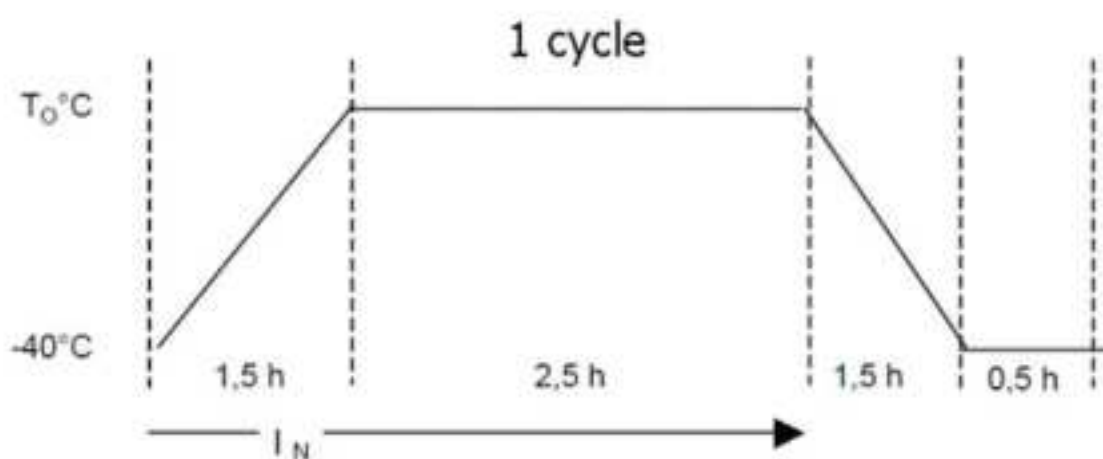


Figure C.1 Temperature cycle

附录 C 供应电流的温度循环

加热阶段和 T_o 保持阶段施加电流 I_N 的温度循环

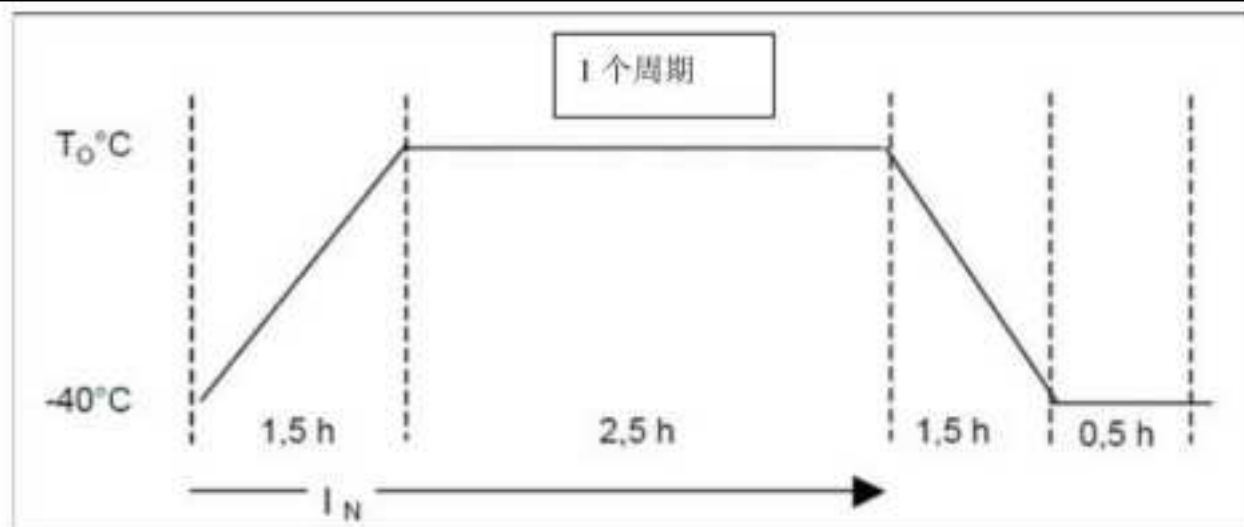


图 C.1 温度循环

Appendix D Resistance limits

Maximum limits of the contact resistance in m_{Ω} at room temperature after aging

The values include: contact contact resistance + 2 * crimp contact resistance, measured according to (DIN EN 60512-2-1)

Lines according to LV 112 (line test specification, low-voltage lines)

Contact material conductivity >20% IACS, correction factor for smaller conductivities according to (DIN EN 60352-2)

Applies to all surfaces (e.g., Au, Ag, Sn)

Table D.1 Resistance limits

	Group 1						Group 2					Group 3	
Conductor cross-section in mm ² /contact size in mm	0,13	0,22	0,35	0,5	0,75	1,0	1,5	2,5	4	6	10	16	>16
0,63	30	30	15	15	15	-	-	-	-	-	-	-	-
1,2	20	20	15	15	15	15	10	-	-	-	-	-	-
1,5	-	15	15	15	15	15	10	10	-	-	-	-	-
2,8	-	15	15	15	15	10	10	10	5	-	-	-	-
4,8-6,3	-	10	10	8	8	8	5	5	3	3	2	-	-
8	-	-	-	-	-	-	-	3	3	3	2	2	-
9,5-12	-	-	-	-	-	-	-	-	3	2	2	1	1



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附录 D 电阻限定

老化后在室温下的接触电阻最大限定值，单位 $m\Omega$ 。

值包括：端子接触电阻+2*压接接触电阻，根据 DIN EN 60512-2-1 测量

导线根据 LV 112(导线试验标准、低压导线)

端子材料电导率 $>20\%$ IACS(导电率)，小一点的导电校正因素按照 DIN EN 60352-2

适用于所有表面（如金、银、锡）

表格 D.1 电阻限定

	组 1						组 2					组 3	
线径/端子 尺寸	0.13	0.22	0.35	0.5	0.75	1.0	1.5	2.5	4	6	10	16	> 16
0.63mm	30	30	15	15	15	-	-	-	-	-	-	-	-
1.2mm	20	20	15	15	15	15	10	-	-	-	-	-	-
1.5mm	-	15	15	15	15	15	10	10	-	-	-	-	-
2.8mm	-	15	15	15	15	10	10	10	5	-	-	-	-
4.8-6.3mm	-	10	10	8	8	8	5	5	3	3	2	-	-
8mm	-	-	-	-	-	-	-	3	3	3	2	2	-
9.5-12mm	-	-	-	-	-	-	-	-	3	2	2	1	1

Appendix E Media list (see PG 22 A and PG 22 B)

Table E.1 Media list

No.	PG	Chemical agent	Description	Application			Aging temp. °C
				Dousing	Rubbing in	Spraying	
							48 h
1	22 A	Cold-cleaning agent/cockpit cleaning agent	Commercially available			x	50
2	22 A	Penetrating oil	Commercially available			x	50
3	22 A	Undiluted washer fluid anti-freeze	Commercially available	x			50
4	22 A	Isopropanol	Commercially available	x			RT
5	22 A	Grease	High melting point grease		x		50
6	22 B	Brake fluid	DOT 4/DOT 5	x			50
7	22 B	FAM test fuel (gasoline/premium)	Commercially available	x			RT
8	22 B	Diesel	DIN EN 590	x			RT
8	22 B	Biodiesel	DIN EN 14214	x			RT
8	22 B	Diesel additive AdBlue	DIN 70070	x			RT
9	22 B	Engine oil 5W-30	Fully synthetic	x			50
10	22 B	Power steering fluid	According to requirement	x			50
10	22 B	Automatic transmission fluid	Fully synthetic	x			50
11	22 B	Radiator antifreeze	Stable to -40 °C	x			50
12	22 B	Battery fluid: Relevant only for DUTs that can come into contact with battery fluid	Diluted sulfuric acid; density 1,28 g/ml	x			50
13	22 B	Road salt solution	Mixture PG18C	x			50

At least 100 ml (according to DIN EN ISO 175 at least 8 ml/cm² surface)
damp cotton cloth
approx. 1 s per side

Dousing
Rubbing in
Spraying

附录 E 介质清单 (见 PG 22A 和 PG 22B)

表格 E.1 介质清单

浸透
摩擦
喷射

至少 100ml (根据 DIN EN ISO 175, 表面至少 8ml/cm²)
湿棉布
每面约 1s

序号	试验组 PG	试剂	描述	运用			老化温度 ℃
				浸透	摩擦	喷射	
							48 小时
1	22A	冷清洁剂/驾驶座舱清洁剂	市面上的			X	50
2	22A	渗透润滑油	市面上的			X	50
3	22A	未稀释的防冻洗涤剂	市面上的	X			50
4	22A	异丙醇	市面上的	X			室温
5	22A	润滑脂	高熔点润滑脂		X		50
6	22B	制动液	DOT 4/DOT 5	X			50
7	22B	FAM 试验燃料汽油/premium	市面上的	X			室温
8	22B	柴油	DIN EN 590	X			室温
8	22B	生物柴油	DIN EN 14214	X			室温
8	22B	柴油添加剂尿素	DIN 70070	X			室温
9	22B	发动机油 5W-30	全合成	X			50
10	22B	动力转向液	根据要求	X			50
10	22B	自动变速箱油	全合成	X			50
11	22B	散热器防冻剂	稳定到 -40℃	X			50
12	22B	电池液: 只用于与电池液接触的被测器件	未稀释硫酸, 密度 1.28g/ml	X			50
13	22B	道路盐溶液	混合物 PG 18C	X			50

11.1 CUSTOMER CAN NOT PROVIDE MATING CONNECTOR, FACTORY IMPLEMENT THE FOLLOWING TEST SEQUENCE, OTHER PERFORMANCE TEST IS ORGANIZED BY CUSTOMER.(客戶不能提供配套對插連接器,工廠測試時依以下測試順序,其他性能測試由客戶組織)

11.2 PRODUCT ADDITIONAL TEST:(產品附加測試)

Test Item	A	B
Sample Size (PCS) (取樣數量)	5	5
Examination of Product (產品檢查)	1	1,3
Mating Force (插入力)	2	
Unmating Force (拔出力)	3	
Retaining force/locking device(Optional) (鎖釦力(依產品選擇))		2

11.3 PRODUCT QUALIFICATION AND TEST SEQUENCE:

(產品認證和測試順序:)

a> PG 0. Inspection of as-received condition(入厂检验)

b> PG 1. Dimensions(尺寸)

c> PG 3. Material and surface analysis, housings and single-wire seals
(护套和防水栓材料和表面分析)

d> PG 18A. Coastal climate load (Not contain contact resistance test)
(沿海氣候負荷 (不含接觸電阻試驗))