IPT 25-70mm² SPECIFICATION

IPT 25-70mm² 产品规范

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CONTENT

1. SCOPE 适用范围

1.1 Content 内容

This specification covers the performance, test and quality requirements for high current screwed connector system IPT (hereinafter referred to as IPT).
This specification applies to the product 114-94133, 114-160062, 114-160373, but not limited to it.

本规范适用于大电流螺栓连接器系统 IPT (以下简称 IPT) 的性能，测试和质量要求。
本规范适用但不仅限于以下零件号：114-94133, 114-160062, 114-160373

1.2 Qualification 鉴定

When tests are performed, the following specifications and standards shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

本测试规范依照下面的规范及标准执行。所有的检验应依照合适的检验计划及产品图纸执行。

2. APPLICABLE DOCUMENTS 适用文件

2.1 Usable document 使用文件

In the event of conflict between the requirements of this specification and the drawing, the drawing shall take precedent.
In the event of conflict between the requirement of this specification and the referenced documents, this specification shall take precedent.

在本规范的要求与图纸发生冲突时，以产品图纸为准。在本规范的要求与参考文件发生冲突时，以本规范为准。

2.2 TE specifications 泰科电子规范

109-1: General requirements for Test Specifications / 测试通用规范

2.3 Other specifications 其他规范

DIN EN 60664-1	Isolation coordination for equipment within low voltage systems - Part 1: Principles, requirements and tests 低压系统内设备的隔离协调. 第 1 部分：原理、要求和试验
ISO 20653	Road vehicles - Degrees of protection (IP-Code) – Protection of electrical equipment against foreign objects, water and access 道路车辆.防护等级（IP Code）.电气设备对异物、水和通道的防护
ISO 6469-3	Electric Road vehicles – Safety specifications. Part3: Protection of person against electric hazards 电动道路车辆-安全规范。第 3 部分：人员防触电
LV 214-1	Test specification for motor vehicle connectors 机动车连接器试验规范
LV 215-1	Electrical/Electronic Requirements of HV Connectors 高压连接器的电气/电子要求

3. REQUIREMENT 要求

3.1 Design and Construction 设计和结构

Products must meet the design, construction and physical dimensions specified in the applicable product drawings.

产品必须满足产品图纸上的设计，结构和尺寸要求。

3.2 Material 材料

Description of the material sees the related product drawings.

材料描述见相关产品图纸。

PN	Component List	Raw material	Surface Treatment
X-1991226-X X-2315654-X 0-2141784-X X-2315660-X 2423364-X 2429927-X X-2408514-1 X-2315661-X 2488852-1	Housing Assy ① Housing ② Peripheral Seal ③ Protect Sleeve ④ Adapt Body(only for unshielded IPT)	① PA66 35%GF or PBT 30%GF ② Silicon ③ CuZn Alloy ④ PA6	① NA ② Self lubrication ③ Ni plated ④ NA
X-2177380-X X-2406165-X 2365737-1 2407801-2	Ring Tongue Terminal	CU-HCP R230	Electro-tinned or nickel plated
2413285-X 2441567-X 2430850-X 2468199-X 2468570-X	Welding Terminal	Copper Alloy	Ni plated
X-1991225-X X-2314189-X X-2423368-X 2408526-X	Protective Cover	PA66 35%GF PBT 30%GF	NA
0-1719826-X X-2396268-X X-2396193-1 2408714-X	Single Wire Seal	Silicon	Self lubrication
2358669-X 2396171-X	Shielding Sleeve	Stainless Steel SUS 304	NA
X-2364825-X	Shield Assy ① Adapter Shield Body ② Pressure Spring Contact, Spring	① Zn Alloy ② Stainless Steel	① Blank or Ni plated ② Ag plated

3.3 Test parameters and tolerances 测试参数与公差

Table 1: Test parameters and tolerances

Requirement 要求	Tolerance 公差
Ambient temperature 环境温度	23°C ± 5°C
Relative humidity 相对湿度	25% to 75%
Atmospheric pressure 大气压力	96kPa ± 10kPa

3.4 Ratings 等级

A. Operating Temperature / 工作温度: -40~140°C
B. Storage Temperature / 储存温度: -40~140°C
C. Rated voltage / 额定工作电压: ≤850V (海拔 5500 米)
D. Application / 产品应用: High voltage and high current application 高压大电流应用

3.5 General Performance and Test description 通用性能和试验描述

The product is designed to meet the electrical, mechanical and environmental performance requirements specified in Para.3.6. All testes must be performed at the test condition of the TE test specification 109-1 unless otherwise specified.

产品应能满足段落 3.6 中的电气，机械和环境等性能要求。所有试验均需按照 TE 规范 109-1 中的测试条件进行，除非另有说明。

3.6 Tests requirement and method summary 测试要求及方法

Para.	Test Item	Requirements	Method
Mechanical Requirement			
3.6.1	Visual inspection	Product shall be conforming to the requirement of applicable product drawing and application specification	Visually inspection for deflection, bending of the housing geometry and functionally inspected per applicable inspection plan
3.6.2	Error-proof design of housings	• Test load: 300N	DIN EN 60512-13-5
3.6.3	Retention force of the housing screw joint	• Retention force ＞1500N	VW_80332_2021_02_EN PG7
3.6.4	Retention force further connector parts	• Protection cover for single wire seal: 600N • Sleeves for housing: 50N	VW_80332_2021_02_EN PG7
3.6.5	Insertion force to the interface	• Insertion force ＜75N	VW_80332_2021_02_EN PG7
3.6.6	Insertion force further connector parts	• Protection cover for single wire seal: 70N	VW_80332_2021_02_EN PG8

3.6.7	Mating cycle frequency	• 20 insertion cycles	
3.6.8	Dynamic load	• Severity 4: Engine-mounted parts • Period: 22h per axis • RMS value of acceleration: 181m/s² • Temperature: -40/140℃ • Cable fixed after 100mm	VW_80332_2021_02_EN PG17
Electrical Requirement			
3.6.9	Ring tongue resistance(new part)	• Resistance: 16 mm² ＜0.05mΩ 25 mm² ＜0.035mΩ 35 mm² ＜0.029mΩ 50 mm² ＜0.025mΩ 70 mm² ＜0.019mΩ	VW_80332_2021_02_EN
3.6.10	Contact resistance and current carrying capacity of shielding(Measurement cable to interface)	• Resistance of shielding:＜10 mΩ (new part); Shielding resistance peaks up to max. 6 Ω might occur due to static environmental load. Shield resistance will decrease again in case of dynamic load or cable movement to initial value. • Durable current capacity of shielding max. 10A; Current capacity of shielding max. 25A for 60s	VW_80332_2021_02_EN
3.6.11	Insulation resistance	• Measurement voltage: 1000VDC • Ambient temperature • Time: 60s • Insulation resistance ＞200 MΩ	VW_80332_2021_02_EN DIN EN 60512-3-1
3.6.12	Dielectric strength	• Measurement voltage: 2700VAC • Ambient temperature • Time: 60s • Insulation resistance ＜10mΩ	VW_80332_2021_02_EN DIN EN 60512-3-1 ISO 6469-3
3.6.13	EMC-Electromagnetic compatibility(new part)	• Frequency: 2MHz: Delta-Transfer impedance ≤10 mΩ/m • Frequency: 30MHz: Delta-Transfer impedance ≤50 mΩ/m	LV215-1
Validation of Shielding Crimp			
3.6.14	Cross section of shielding and insulation crimp	• Cross section examination: crimp sleeves are well formed	TE-Spec. 109-18212

<table>
<tr><td>3.6.15</td><td>Mech. Shielding crimp validation</td><td>• Pull out force shield crimp: 300N</td><td>TE-Spec. 109-18212</td></tr>
<tr><td>3.6.16</td><td>Climate load of shielding crimp</td><td>• Climatic load shield crimp
Temperature shock:
Period: 144 cycles
Temperature: -40℃/+130℃ 15min respectively
Humid heat, cyclic:
Temperature: Tu=25℃,To=55℃
Relative humidity 95%</td><td>TE-Spec. 109-18212</td></tr>
<tr><td colspan="4">Validation of Contact Crimp (Ring Tongue)</td></tr>
<tr><td>3.6.17</td><td>Cross section of contact crimp</td><td>• Cross section examination: crimp is well formed</td><td></td></tr>
<tr><td>3.6.18</td><td>Mech. Contact crimp and weld force</td><td>• Pull out force crimp:
16 mm² ＞1500N
25 mm² ＞1900N
35 mm² ＞2300N
50 mm² ＞2800N
70 mm² ＞3400N
• Pull out force weld:
<table>
<tr><th></th><th colspan="2">copper wire</th><th colspan="2">aluminum wire</th></tr>
<tr><th>wire size [mm²]</th><th>tensile strength LSL [N]</th><th>peel strength LSL [N]</th><th>tensile strength LSL [N]</th><th>peel strength LSL [N]</th></tr>
<tr><td>16</td><td>1500</td><td>280</td><td>550</td><td>*</td></tr>
<tr><td>25</td><td>2000</td><td>350</td><td>850</td><td>*</td></tr>
<tr><td>35</td><td>2300</td><td>400</td><td>1200</td><td>*</td></tr>
<tr><td>50</td><td>2800</td><td>450</td><td>1650</td><td>*</td></tr>
<tr><td>70</td><td>3400</td><td>550</td><td>1880</td><td>*</td></tr>
</table></td><td>LV215-1</td></tr>
<tr><td>3.6.19</td><td>Derating</td><td>• Dependent on the application and cable type, different values are possible</td><td>See Appendix 5.1</td></tr>
<tr><td>3.6.20</td><td>Cyclic current test</td><td>• Period: 1008 cycles (1008h)
• Temperature: 23℃</td><td>TE-Spec. 108-94293</td></tr>
<tr><td>3.6.21</td><td>Temperature shock</td><td>• Period: 100 cycles
• Temperature: -40℃/+150℃ 60min respectively</td><td>DIN EN 60068-2-14</td></tr>
<tr><td>3.6.22</td><td>Long-term aging in dry heat</td><td>• Period: 1000h
• Temperature 150℃</td><td>DIN EN 60068-2-2</td></tr>
<tr><td colspan="4">Climatic and Environmental Load of IPT Assembly

• Coastal climatic load acc. PG18A/LV214
• Environmental simulation acc. PG19/LV214
• Climate load of housing acc. TG20/LV214
• Long-term temperature aging acc. PG21/LV214
• Chemical resistance, extended test acc. PG22B/LV214
• Water leak tightness acc. PG23/LV214</td></tr>
</table>

3.6.23	PG18A-1: Salt spray	• Cyclic, severity 3	VW_80332_2021_02_EN PG18
3.6.24	PG19-1: Temperature shock	• Period: 144 cycles • Temperature: -40℃/+130℃ 15min respectively	VW_80332_2021_02_EN PG19 VW_75174
3.6.25	PG19-2: Temperature cycle	• Period: 20 cycles • Temperature: -40℃/+130℃ 3h respectively • Time for temperature cycle: max. 2h	VW_80332_2021_02_EN PG19 VW_75174
3.6.26	PG19-3: Aging in dry heat	• Period: 120h • Temperature: 120℃	VW_80332_2021_02_EN PG19 VW_75174
3.6.27	PG19-4: Industrial climate	• (0.2ppm SO2，0.01ppm H2S，0.2ppm SO2，0.01ppm Cl2 /25℃/75% relative humidity/21d) • Flow rate: 1 m^3 /h	VW_80332_2021_02_EN PG19 VW_75174
3.6.28	PG19-5: Humid heat, cyclic	• Period: 10cycles of 24h each • Temperature: Tu=25℃,To=55℃ • Relative humidity 95%	VW_80332_2021_02_EN PG19 VW_75174
3.6.29	PG19-6: Dynamic load Broad-band random vibration	• Period: 6h per axis • RMS value of acceleration 13.9m/s^2	VW_80332_2021_02_EN PG19 VW_75174
3.6.30	PG19-7: Mech. shocks	• Individual shock duration: 6ms • Acceleration: 30g • No. of shocks: 50 per spatial axis	VW_80332_2021_02_EN PG19 VW_75174
3.6.31	PG20-1: Aging in dry heat	• Period: 120h • Temperature: 130℃	VW_80332_2021_02_EN PG20 VW_75174
3.6.32	PG20-2: Humid heat, constant	• Period: 10days • Temperature: 40℃ • Relative humidity 95%	VW_80332_2021_02_EN PG20 VW_75174
3.6.33	PG20-3: Low-temperature aging	• Period: 48h • Temperature: -40℃	VW_80332_2021_02_EN PG20 VW_75174
3.6.34	PG20-4: Aging in dry heat	• Period: 48h • Temperature: 80℃	VW_80332_2021_02_EN PG20 VW_75174

3.6.35	PG20-5: Drop test	• The drop test must cause no damage to the specimens impairing their function.	VW_80332_2021_02_EN PG20 VW_75174
3.6.36	PG21-1: Long-term aging in dry heat	• Period: 1000h • Temperature: 140℃	VW_80332_2021_02_EN PG21 VW_75174
3.6.37	PG22B-1: Chemical resistance, extended test	• Brake fluid, FAM test fuel (gasoline/premium), diesel, biodiesel, diesel additive AdBlue, engine oil 5W-30, power steering fluid, automatic transmission fluid, radiator antifreeze, road salt solution, no battery fluid	VW_80332_2021_02_EN PG22 VW_75174
3.6.38	PG23-1: Aging in dry heat	• Period: 120h • Temperature: 130℃	VW_80332_2021_02_EN PG23 VW_75174
3.6.39	PG23-2: Temperature shock	• Period: 144cycles • Temperature: -40℃ / +130℃ 15 min respectively	VW_80332_2021_02_EN PG23 VW_75174
3.6.40	PG23-3: Immersion with pressure difference	• Medium: low surface tension 5% NaCl solution • Normal pressure 10kPa, holding time 5min. 50kPa, holding rime 5min. Normal pressure • Change in pressure: 10kPa/min.	VW_80332_2021_02_EN PG23 VW_75174
3.6.41	PG23-4: Thermal shock test	• Medium: low- surface-tension, 5%NaCl Air temperature: 120 °C Duration: 30 min. each Water temperature: 0 °C Duration: 15 min. each, 5 cycles	VW_80332_2021_02_EN PG23 VW_75174
3.6.42	PG23-5: Degree of protection test/ pressure washer test	• Severity: IP X9K • Test duration per side: 15s Distance between nozzle and specimen: 10-15 cm Pressure: 80 bar Temperature: 80°C	VW_80332_2021_02_EN PG23 VW_75174 ISO 20653

3.7 Test sequence 试验顺序

Table 2: Test sequence for general requirements

Short description of test	PG18A	PG19	PG20	PG21	PG22B	PG23
Visual examination	1,5	1,18	1,12	1,8	1,5	1,7
Contact resistance shielding	2,4	2,4,6,8, 10,12,14,16		2,4		
Insulation resistance			2,4,6,8,10		2,4	
Functional test				5		
Drop test			11	6		
Dynamic load, broad-band random		13				
Mech. shocks		15				
Salt spray, cyclic	3					
Temperature shock		3				3
Temperature cycle		5				
Aging in dry heat		7	3,9			2
Industrial climate		9				
Humid heat, constant			5			
Humid heat, cyclic		11				
Low-temperature aging			7			
Long-term aging in dry heat				3		
Chemical resistance, extended test					3	
Immersion with pressure difference						4
Thermal shock test						5
Degree of protection test / Pressure washer test						6

The numbers show the test sequence

3.8 Test procedures for alternative cable supplier or size 适用不同品牌,尺寸的电线的试验

Table 3: Additional test requirements

Climatic and Environmental load of IPT assembly • Long-term temperature aging acc. PG21/LV214 • Water leak tightness acc. PG23/LV214
Validation of shielding crimp • Cross section of shielding and insulation crimp • Mech. Shielding crimp validation • Contact resistance of shielding
Validation of contact crimp (Ring Tongue) • Cross section of wire crimp • Mech. wire crimp validation • Derating with housing • Ring tongue crimp resistance

4. QUALITY 质量

4.1 Qualification test 鉴定

Samples must be in accordance with drawings and be taken in a random way in the production in progress.

样件必须与产品图纸一致，并且是生产过程中随机选取的。

4.2 Requalification test 重新鉴定

If changes significantly affecting form, fit, or function are made to the product or to the manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by product engineering.

如果产品或者制造过程中有显著影响外观，装配和功能的设变，质保需要协调按照原先工程部定义的测试顺序，重新验证全部或者部分测试项目。

4.3 Acceptance 验收

Acceptance is based on verification that the product meets the requirements of section 3.6. Failures attributed to equipment, test setup, or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmitted.

归咎于测试设备，样件安装或者操作员的失误的失效不应判定产品不合格。当产品失效发生时，需要有纠正措施以及重新提交样件进行验证。在重新验证前，需确认已有纠正措施。

4.4 Quality conformance inspection 质量合格检验

The applicable TE Connectivity quality inspection plan will specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification

TE Connectivity 的质量检验计划将指定适用的质量标准。尺寸和功能要求，应按照适用的产品图纸和本规范。

5. APPENDIX 附录

5.1 Derating 降低额定功率

Derating – 25mm² cable and ring tongue (Sn plated)
- Derating free in air: Current at contact without load at shield
- Ring tongue 25mm²: TE PN 1-2177380-1, Sn plated
- Test specification according to LV215-2 2013-02, PG 12, E 12.2.

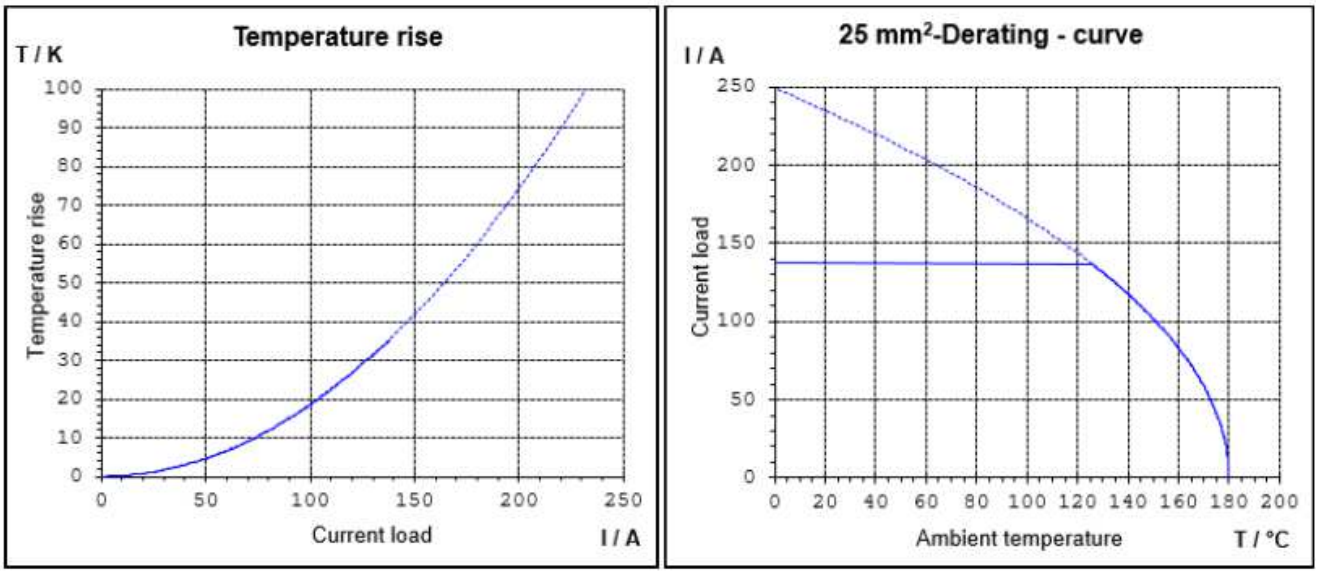

Figure 1: Derating – 25mm² cable and ring tongue (Sn plated)

Derating – 35mm² cable and ring tongue (Sn plated)
- Derating free in air: Current at contact without load at shield
- Ring tongue 35mm²: TE PN 2-2177380-1, Sn plated
- Test specification according to LV215-2 2013-02, PG 12, E 12.2.

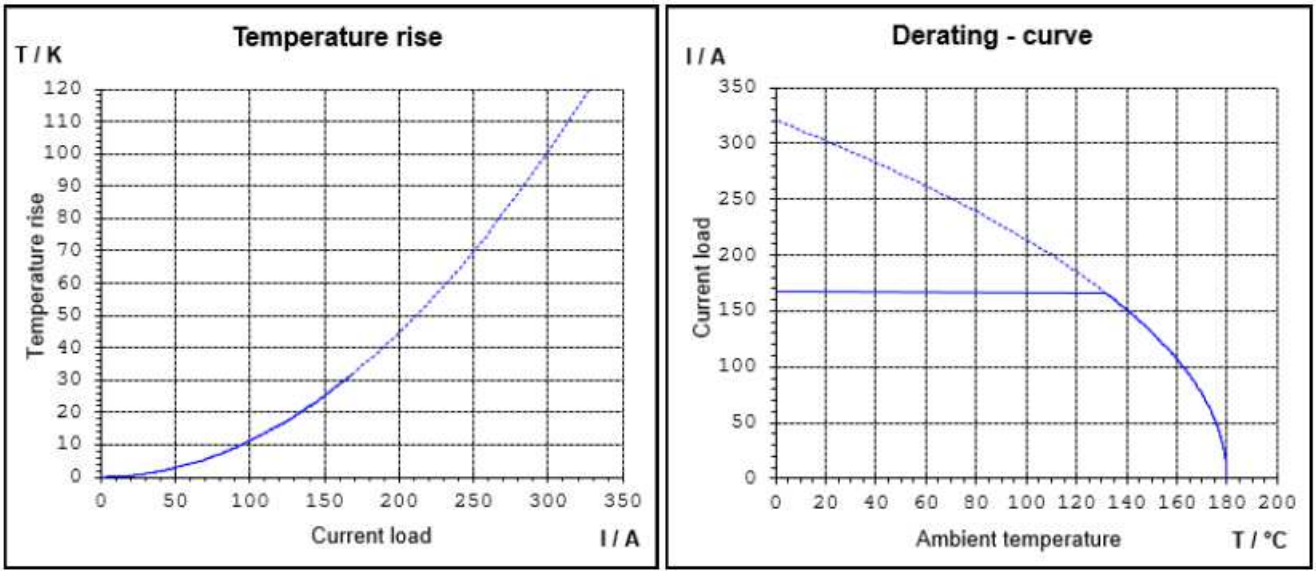

Figure 2: Derating – 35mm² cable and ring tongue (Sn plated)

Derating – 50mm² cable and ring tongue (Sn plated)

- Derating free in air: Current at contact without load at shield
- Ring tongue 50mm²: TE PN 3-2177380-1 (acc. to Intercable –No.: 380091), Sn plated
- Test specification according to LV215-2 2013-02, PG 12, E 12.2

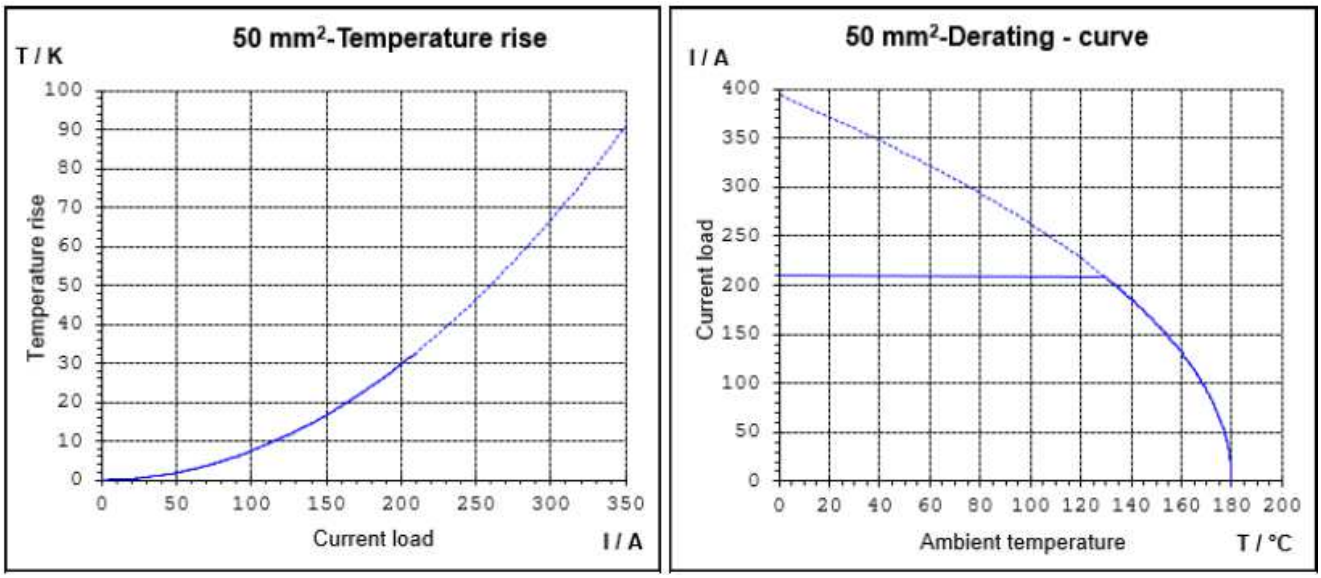

Figure 3: Derating - 50mm² cable and ring tongue (Sn plated)

Derating – 70mm² cable and ring tongue (Sn plated)

- Derating free in air: Current at contact without load at shield
- Ring tongue 70mm²: TE PN 2365737-1, Sn plated
- Test specification according to LV215-2 2013-02, PG 12, E 12.2.

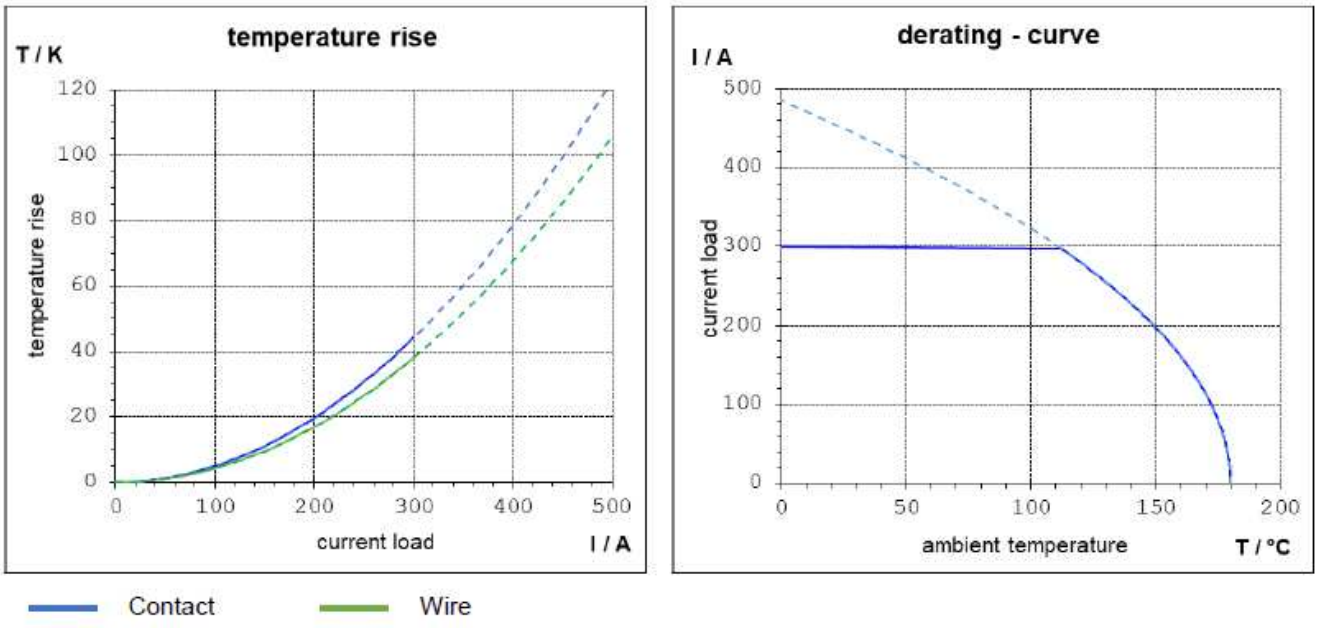

Figure 4: Derating - 70mm² cable and ring tongue (Sn plated)