

IPT HD 50/70/95mm² ISO CABLE SPECIFICATION (High Current Screwed Connector Sealed)

IPT HD 50/70/95mm² ISO cable 产品规范



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1. SCOPE 适用范围

1.1 Content 内容

This specification covers the performance, test and quality requirements for IPT HD 50/70/95mm² ISO cable.

本规范适用于 IPT HD 50/70/95mm² ISO 线缆的性能，测试和质量要求。

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

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

2.3 Customer Drawings 客户图纸

Drawing No.	Component Description List
C-2371019	1pos Ring Tongue, Housing, Assy, Sealed
C-2371017	2pos Ring Tongue, Housing, Assy, Sealed
C-2355146	3pos Ring Tongue, Housing, Assy, Sealed
C-2355153	Protective cover
C-2355148	Shielding sleeve
C-2355150	Shielding
C-2355151	Single wire seal
C-2177380	50mm ² wire Ring tongue
C-2365737	70 mm ² & 95 mm ² wire Ring tongue
WIRE	50/70/95mm ² ISO H+S cable

2.4 Specifications 规范

Specification	Description
108-160480	IPT HD 50/70/95mm ² ISO CABLE SPECIFICATION
114-160263	IPT HD 50/70/95mm ² ISO CABLE APPLICATION SPECIFICATION

2.5 Other specifications 其他规范

Doc number	Edition	Standard: Title, Author
DIN EN 60664-1	2008-01	Isolation coordination for equipment within lowvoltage systems - Part 1: Principles, requirements and tests
DIN 40050-9	1993-05	Degrees of protection (IP-Code) - Protection of electrical equipment against foreign objects, water and access
ISO 20653	2006-08	Road vehicles – Degrees of protection (IPCode) - Protection of electrical equipment against foreign objects, water and access
ISO 6469-3	2001-01	Electric road vehicles – Safety specifications. Part 3: Protection of person against electric hazards
ISO 16750	-1: 2006-01 -2: 2010-03 -3: 2007-07 -4: 2010-04 -5: 2010-04	Electric road vehicles – Environmental conditions and testing for electrical and electronic equipment
SAE J1742	1998-03 (2005-12)	Connections for High Voltage On-Board Road Vehicle, Electrical Wiring Harnesses Test Methods and General Performance Requirements
LV 214-1	2010-03	Test specification for motor vehicle connectors
LV215-1	2009-02	Electrical/Electronic Requirements of HV Connectors
VW80332	2017-09	Motor Vehicle High-Voltage Contacts
UL2231-2	2012-09	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits

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 refer to related customer drawings.

材料描述见相关客户图纸。

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	45% to 75%
Atmospheric pressure 大气压力	96kPa ± 10kPa

3.4 Ratings 等级

Description	Range
Max. Voltage acc. DIN EN 60664-1	≤1000VDC
Dielectric withstand voltage acc. ISO 6469-3, SAE J 1742	4000VAC
Insulation resistance acc. ISO 6469-3, SAE J 1742	>200MΩ
Isolation Group I acc. DIN EN 60664-1	600≤CTI
Pollution degree acc. DIN EN 60664-1	2
Ambient temperature	-40°C to 140°C
Degrees of protection (IP-Code) against access acc. ISO 20653	IPXXB
Degrees of protection (IP-Code) against foreign objects and water acc. ISO 20653	IPX9K, IP68
Color of plastic housing	Orange similar RAL 2003
Durability mating cycle	20 Max.

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 chapter 3.6. All tests must be performed at the test condition of the TE test specification 109-1 unless otherwise specified.

产品应能满足 3.6 章中的电气，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

Test Item	Requirements	Procedure
PG0 received Inspection		
Visual inspection	Visually Examine No defects.	LV215-2
Ring tongue crimp resistance	50mm ² ≤0.025mΩ 50mm ² After aging≤0.05 mΩ 70mm ² ≤0.019mΩ 70mm ² After aging≤0.038 mΩ 95mm ² ≤0.016mΩ 95mm ² After aging≤0.032 mΩ	LV215-2
Ring tongue Contact resistance	50mm ² ≤0.13mΩ 50mm ² After aging≤0.26 mΩ 70mm ² ≤0.12mΩ 70mm ² After aging≤0.24 mΩ 95mm ² ≤0.11mΩ 95mm ² After aging≤0.22 mΩ	LV215-2
Shielding Contact resistance	Shielding resistance≤10mΩ	LV215-2
Insulation resistance	Insulation Resistance ≤200MΩ	1000VDC 60s LV215-2
Electric withstand	Leakage current ≤10 mA.	4000VAC for 60s LV215-2
PG6 Interaction between contact and housing		
Drop test	No defects	Drop the sample from height of 1 meter. LV215-2
PG7 Handling and functional reliability of the housings		
Retention force of the housing screw join	Min.1500N	Retention force of the housing screw join DIN EN 60512-8
Protection cover for single wire seal retention force	Min. 600N	Protection cover for single wire seal retention force DIN EN 60512-8
PG 11 Contacts: Plugging and unplugging forces		
Insertion force and remove force to the interface	Max. 75N	Insertion and remove force to the interface DIN EN 60512-8
Mating cycle frequency	20 cycles	LV215-2
PG 12 Current heating, derating		
Derating with wire	Dependent on application and cable type different values are possible Max.	LV215-2 DIN EN 60512-5-2
Derating with shielding	Value determination Derating see appendix 5.1	LV215-2 DIN EN 60512-5-2
PG 13 Housing influence on the derating		

Derating with Housing	Derating with housing Dependent on application and cable type different values are possible Max. Derating see appendix 5.1	LV215-2 DIN EN 60512-5-2												
ISO16750-3 Dynamic loading VII														
Vibration test	No physical damage, harmful crack, or deformation shall exist. Circuit interruption <1 μs (< 7 Ω)	<table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Table 12 — Values for PSD and frequency</caption> <thead> <tr> <th>Frequency Hz</th> <th>PSD (m/s²)²/Hz</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>18</td> </tr> <tr> <td>20</td> <td>36</td> </tr> <tr> <td>30</td> <td>36</td> </tr> <tr> <td>180</td> <td>1</td> </tr> <tr> <td>2 000</td> <td>1</td> </tr> </tbody> </table> <p>NOTE r.m.s. acceleration value = 57,9 m/s².</p> <p>32h for each plane</p>	Frequency Hz	PSD (m/s ²) ² /Hz	10	18	20	36	30	36	180	1	2 000	1
Frequency Hz	PSD (m/s ²) ² /Hz													
10	18													
20	36													
30	36													
180	1													
2 000	1													
Shielding Contact resistance	Shielding resistance ≤ 10mΩ	LV215-2												
Ring tongue crimp resistance	50mm ² ≤ 0.025mΩ 50mm ² After aging ≤ 0.05 mΩ 70mm ² ≤ 0.019mΩ 70mm ² After aging ≤ 0.038 mΩ 95mm ² ≤ 0.016mΩ 95mm ² After aging ≤ 0.032 mΩ	LV215-2												
PG 18A Coastal climate load														
Salt spray, cyclic	Shielding resistance < 10mΩ (after Salt spray)	LV215-2 DIN EN 60068-2-52(SG5)												
PG 20 Climatic load of the housing														
Aging in heat	Place the sample in the 140 °C heat chamber for 120h	DIN EN 60068-2-2&LV215-2.												
Humid heat, constant	Place the sample in the 40°C, 95%RH chamber for 10 days	DIN EN 60068-2-2&LV215-2.												
Low temperature aging and mating cycle	Place the sample in the -40 °C chamber for 48h, un-mating and mating the plug and header for one time at -20°C.	DIN EN60068-2-1&LV215-2.												
Dry heat test	Place the sample in the 80°C heat chamber for 48h	DIN EN 60068-2-2&LV215-2.												
Insulation resistance	Insulation Resistance ≤ 200MΩ	1000VDC 60s LV215-2												
Drop test	No defects	Drop the sample from height of 1 meter. LV215-2												
PG 21 Long-term temperature aging														
Long time aging in dry heat	Pass group other tests	Place the sample in the 140 °C chamber for 1000h DIN EN 60068-2-2&LV215-2.												

Shielding Contact resistance	Shielding resistance $\leq 10\text{m}\Omega$	LV215-2																														
Ring tongue Contact resistance	50mm ² $\leq 0.13\text{m}\Omega$ 50mm ² After aging $\leq 0.26\text{ m}\Omega$ 70mm ² $\leq 0.12\text{m}\Omega$ 70mm ² After aging $\leq 0.24\text{ m}\Omega$ 95mm ² $\leq 0.11\text{m}\Omega$ 95mm ² After aging $\leq 0.22\text{ m}\Omega$	LV215-2																														
Drop test	No defects	Drop the sample from height of 1 meter. LV215-2																														
PG 22B Resistance to chemicals																																
Chemical resistance	<table border="1"> <thead> <tr> <th>No</th> <th>Chemical agents</th> <th>Test require temperature</th> <th>Duration</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Brake fluid</td> <td>50°C</td> <td rowspan="10">48h</td> </tr> <tr> <td>2</td> <td>FAM test fuel(gasoline/premium)</td> <td rowspan="2">RT</td> </tr> <tr> <td>3</td> <td>Diesel fuel</td> </tr> <tr> <td>4</td> <td>Biodiesel</td> </tr> <tr> <td>5</td> <td>Diesel additive AdBlue</td> <td rowspan="2">50°C</td> </tr> <tr> <td>6</td> <td>Engine oil 5W-30</td> </tr> <tr> <td>7</td> <td>Power steering fluid</td> <td rowspan="3">50°C</td> </tr> <tr> <td>8</td> <td>Automatic transmission fluid</td> </tr> <tr> <td>9</td> <td>Radiator antifreeze</td> </tr> <tr> <td>10</td> <td>Road solution</td> <td></td> </tr> </tbody> </table>	No	Chemical agents	Test require temperature	Duration	1	Brake fluid	50°C	48h	2	FAM test fuel(gasoline/premium)	RT	3	Diesel fuel	4	Biodiesel	5	Diesel additive AdBlue	50°C	6	Engine oil 5W-30	7	Power steering fluid	50°C	8	Automatic transmission fluid	9	Radiator antifreeze	10	Road solution		LV215-2
No	Chemical agents	Test require temperature	Duration																													
1	Brake fluid	50°C	48h																													
2	FAM test fuel(gasoline/premium)	RT																														
3	Diesel fuel																															
4	Biodiesel																															
5	Diesel additive AdBlue	50°C																														
6	Engine oil 5W-30																															
7	Power steering fluid	50°C																														
8	Automatic transmission fluid																															
9	Radiator antifreeze																															
10	Road solution																															
Insulation resistance	Insulation Resistance $\leq 200\text{M}\Omega$	1000VDC 60s LV215-2																														
PG 23 IP68, IP6K9K																																
Aging in dry heat	140 °C for 120h	LV215-2																														
Thermal shock air-air	-40°C and 140°C 144 cycles	LV215-2																														
Immersion with pressure difference	Medium: Low surface-tension 5% NaCl solution 1. Normal pressure 2. -10 kPa, hold time 5 min 3. -50 kPa, hold time 5 min 4. Normal pressure Pressure change: 10 kPa/min	LV215-2																														
Thermal shock, air-fluid:	30 minutes @ 120°C air, 15 minutes @ 0°C in 5% NaCl;	LV215-2																														
IP68/IP69K	IP68/IP69K	LV215-2&ISO23653																														
Insulation resistance	Insulation Resistance $\leq 200\text{M}\Omega$	1000VDC 60s LV215-2																														
PG 50 EMC testing																																
EMC	<table border="1"> <thead> <tr> <th>Initial condition</th> <th>Requirements</th> </tr> </thead> <tbody> <tr> <td>2 MHz</td> <td>< 5 mΩ/m</td> </tr> <tr> <td>30 MHz</td> <td>< 50 mΩ</td> </tr> </tbody> </table>	Initial condition	Requirements	2 MHz	< 5 mΩ/m	30 MHz	< 50 mΩ	LV215-2																								
Initial condition	Requirements																															
2 MHz	< 5 mΩ/m																															
30 MHz	< 50 mΩ																															

3.7 Additional Test Procedures and Test Results 附加的测试方法和结果

Test Item	Requirements	Procedure
PG1 shielding & ring tongue crimping		
Visual inspection	No defects.	Visual inspection Insulation and shielding crimp closed TE-Spec 109-18079
Cross section for shielding	Cross section inspection	TE-Spec 109-18079
Wire pull force for shielding	Pull out force of shield crimp: >150 N. Pull out force of insulation: >30N	Pull speed. 50 ±5 mm/min TE-Spec 109-18079
PG2 shielding crimp temperature shock test		
Visual inspection	No defects.	No defects. TE-Spec 109-18079
Contact resistance shielding	Resistance of shielding:<10mΩ	TE-Spec 109-18079
temperature shock	- 40°C /140 °C, 15 min. 500 cycles	TE-Spec 109-18079
Contact resistance shielding	Resistance of shielding:<10mΩ	TE-Spec 109-18079
humid heat cycling	Humid Heat cycling 95% rel. humidity, 25/55°C, 10 cycles 24h	TE-Spec 109-18079
Contact resistance shielding	Resistance of shielding:<10mΩ	TE-Spec 109-18079

3.8 Test sequence 试验顺序

Test or examination	SAMPLE QUANTITIES												
	Test Group(PG)												
	0	6	7	11	12	13	Dynamic Loading	18	20	21	22	23	50
Visual inspection	1	1	1	1	1	1	1	1	1	1	1	1	1
Ring tongue crimp resistance	2												
Ring tongue Contact resistance										2			
Shielding Contact resistance	3			4			2	2					
Insulation resistance	4	3							2			7	
Electric withstand	5												
Drop test		2							8				
Retention force of the housing screw join			2										
Protection cover for single wire seal retention force			3										
Insertion force and remove force to the interface				2									
Mating cycle frequency				3									
Mechanical shielding crimp validation													
Derating for wire assemble					2								
Derating with Housing						2							
Vibration test							3						
Salt spray, cyclic								3					
Aging in heat									3			2	
Humid heat, constant									4				
Low temperature aging and mating cycle									6				
dry heat test									7				
Long time aging in dry heat										3			
Chemical resistance											2		
Thermal shock air-air												3	
Immersion with pressure difference												4	
Thermal shock, air-fluid												5	
IP68/IP69K												6	
EMC													2

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

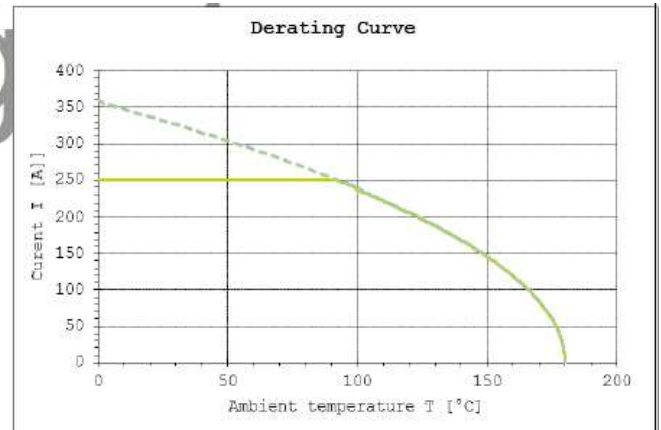
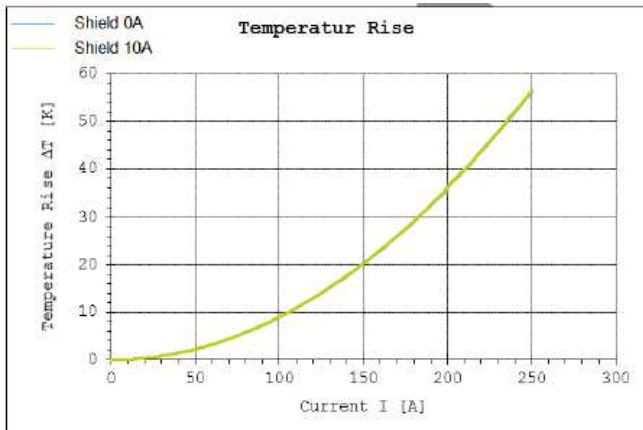
The applicable TE Connectivity quality inspection plan will specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification

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。

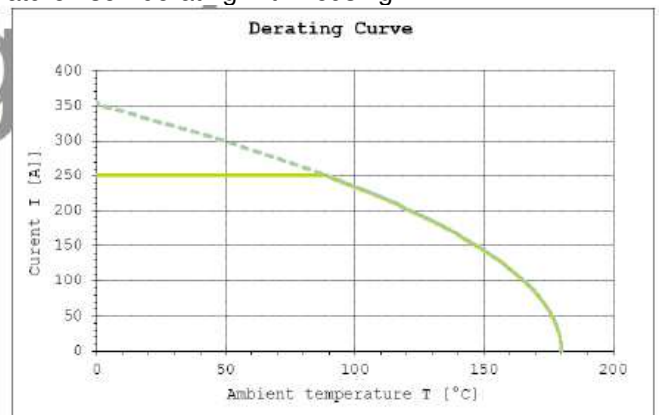
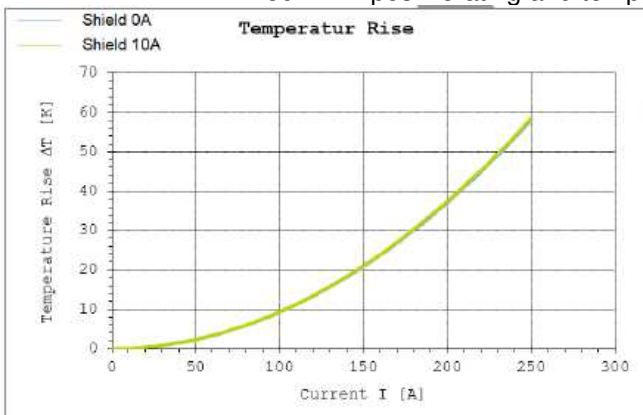
5. APPENDIX 附件

5.1 Derating inside housing 成品温升降额曲线

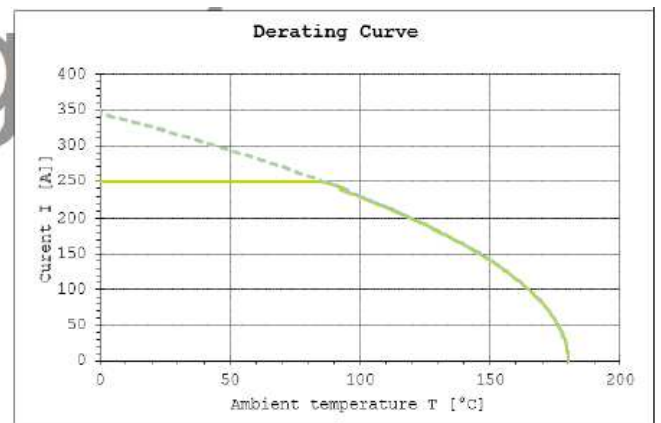
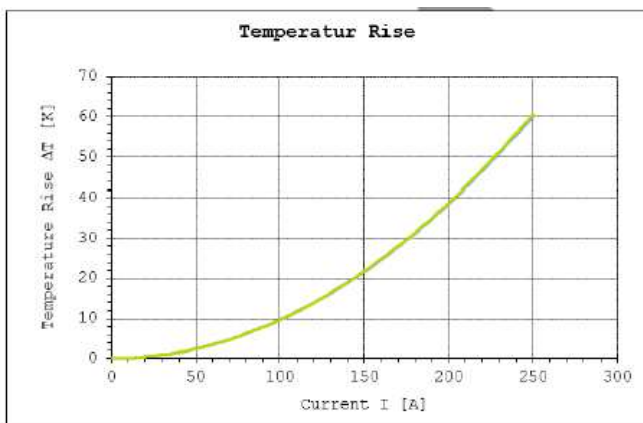
Housing influence on derating: 1pos 2pos 3pos connector
 Derating inside housing: Current at contact with load at shield
 80% Characteristic curve of measured value, cable length according to DIN EN 60512-5-2



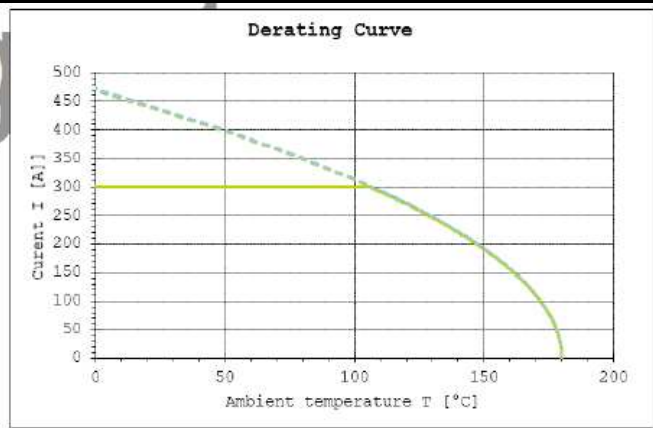
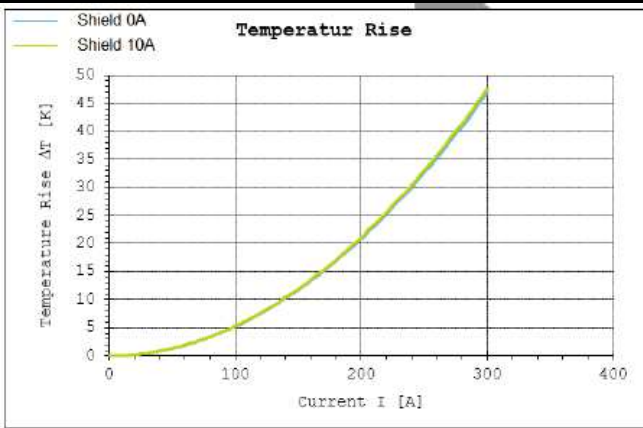
50mm² 1pos Derating and temperature rise - derating with housing



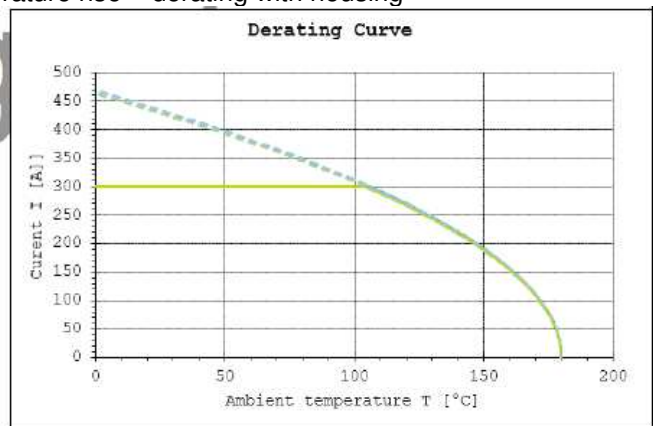
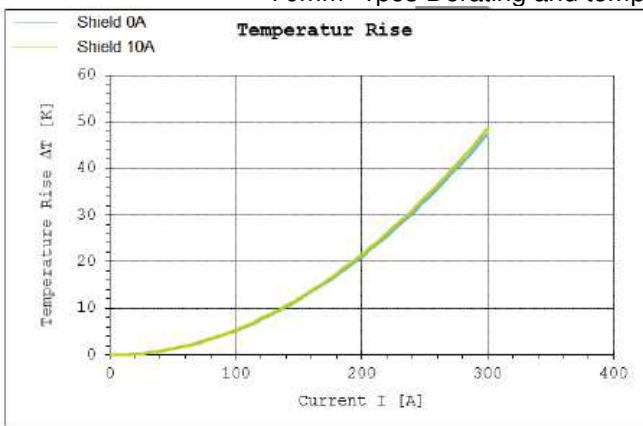
50mm² 2pos Derating and temperature rise - derating with housing



50mm² 3pos Derating and temperature rise - derating with housing

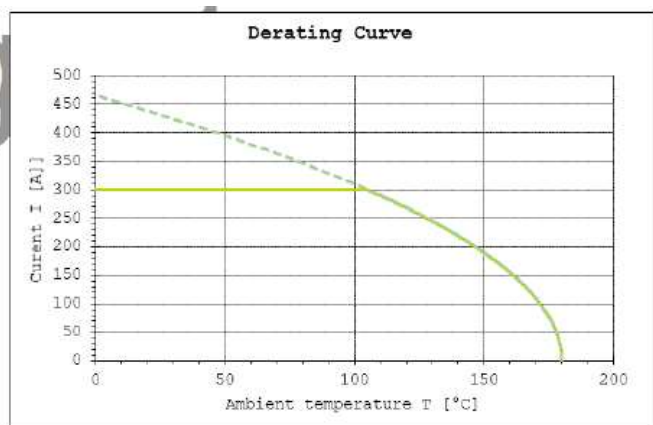


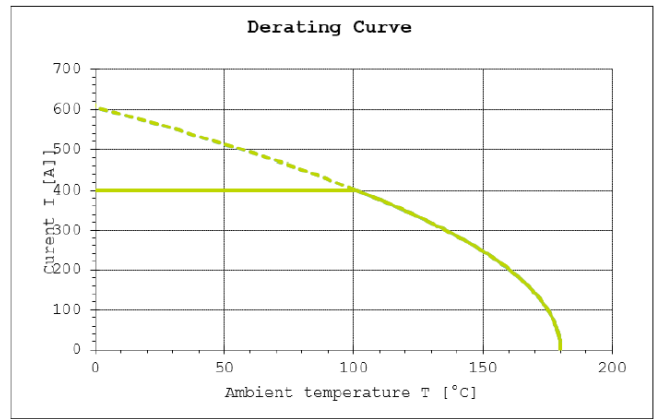
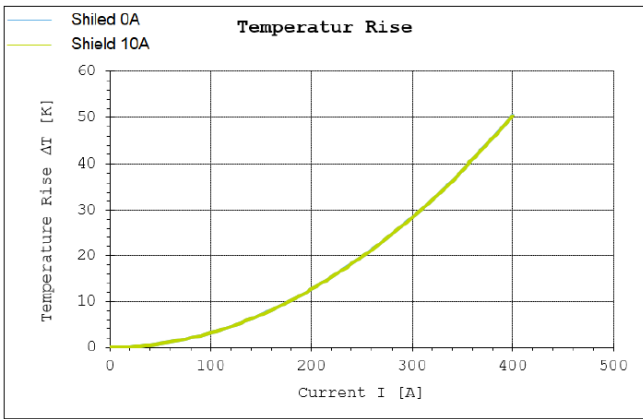
70mm² 1pos Derating and temperature rise – derating with housing



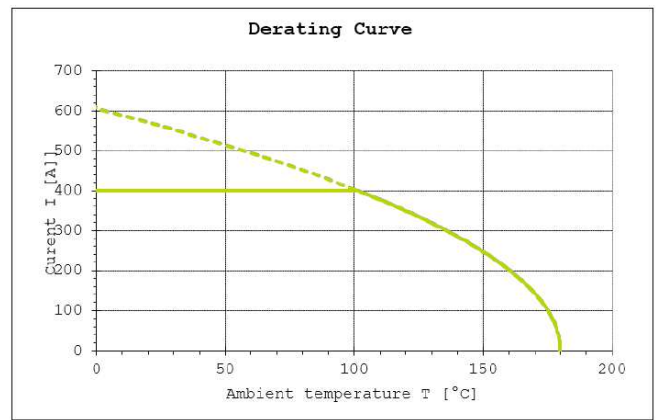
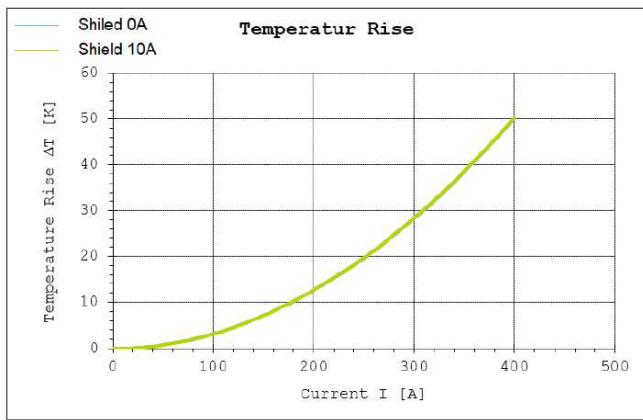
70mm² 2pos Derating and temperature rise – derating with housing

70mm² 3pos Derating and temperature rise – derating with housing

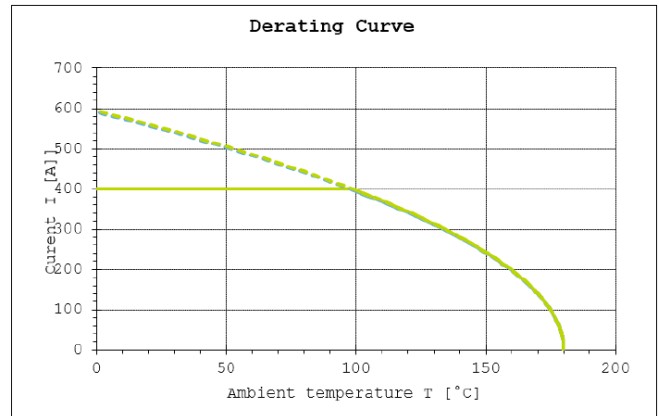
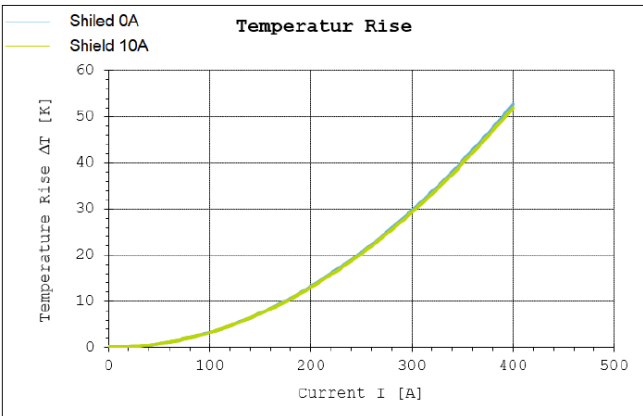




95mm² 1pos Derating and temperature rise – derating with housing



95mm² 2pos Derating and temperature rise – derating with housing



95mm² 3pos Derating and temperature rise – derating with housing