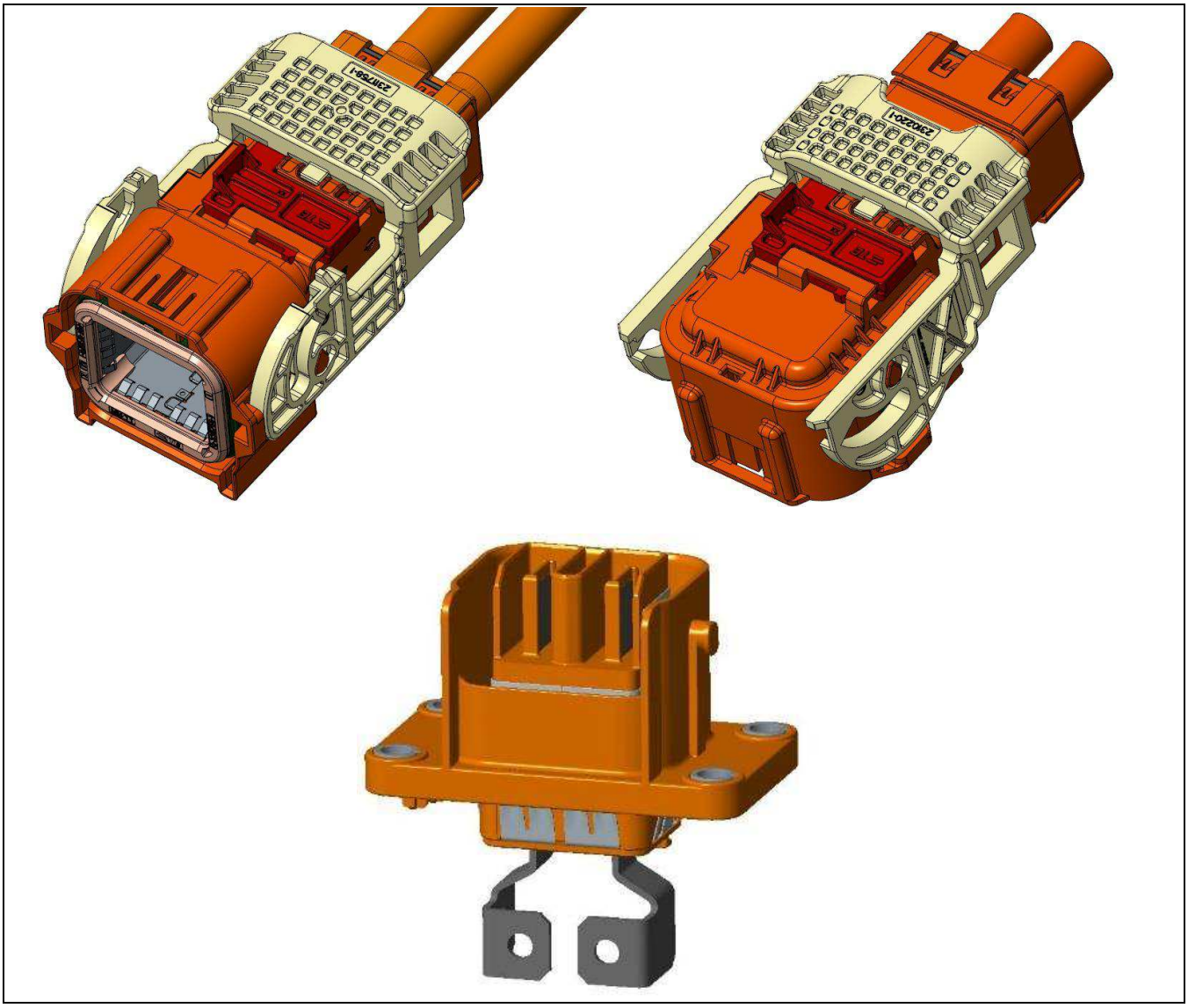
Class 1



HVA1200 180° AND 90° CONNECTOR

| Indicates Change

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CHANGE HISTORY

Rev.	Change	Originator	Date
A	New document	Georg Puckel	11JUL2019
A1	PG8: Max. force for 180° terminal corrected to 249 N	Gabriel Hotea	25JUL2019

1. SCOPE

1.1. Introduction

TE Connectivity's touch-proof 2 position connector HVA1200 and header are designed on basis of LV215-1 specification, which has been developed by working group 4.3.3. It is designed for a metric wire size range of 2x16mm².

With an 180deg and 90deg cable outlet the sealed connector system implies two PCON12 contacts and an integrated High Voltage Interlock (HVIL) system. The HVA1200 incorporates 360deg conductive EMI shields to reduce radiated emissions in the application. Plugging is simplified with a lever assist for low operating force. The housings are molded in orange to denote a high voltage system.

1.2. Content

This specification covers the performance, tests and quality requirements for the 2 position HVA1200 connector with PCON12 contact system. Performance, tests and quality requirements of the contact systems are not part of this specification but are included by the validation of the connector system.

1.3. Qualification

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

2. APPLICABLE DOCUMENTS

The following mentioned documents are part of this specification. Unless otherwise specified, the latest edition of the documents applies. In the event of conflict between the requirements of this specification and the information contained in the referenced documents, this specification shall take precedence (except documents of the PCON12 contact system).

2.1. TE Connectivity documents

General requirements

Requirements	Description
109-1; Rev. J	General requirements for testing

Customer drawings

2 position HVA1200 Connector	
114-94518	HVA1200 Connector Assembly, 2positions, Overview Assembly
2311753	HVA1200, Receptacle Housing, 2 positions, 180°, sealed
2310213	HVA1200, Receptacle Housing, 2 positions, 90°, sealed
2840877	Back cover
2840876	Family Seal
2310221	Inner Ferrule
2310222	Outer Ferrule
2310223	Ferrule sleeve
2840575	PCON12 Terminal, 16mm², 180°
2840573	PCON12 Terminal, 16mm², 90°
2pos HVA1200 Pin header	
2310224	Header Assy HV-Connector, 2pos.
2325634	Header Assy Inner Housing
2310225	Header Assy Outer Housing

Specifications

Specification	Description
108-32193	Product Specification PCON12 Contact System
114-162014	Application Specification PCON12 Contact System
114-94518	Application Specification for HVA1200 Connector 2pos.
114-94515	Application Specification HVA1200 Header
208-18103	Interface drawing, Adapter plate HVA1200-2pos

2.2. Other Documents

Document number	Edition	Standard: Title, Author
DIN EN 60664-1	2008-01	Isolation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests
ISO 20653	2013-02	Road vehicles - Degrees of protection (IP-Code) - Protection of electrical equipment against foreign objects, water and access
ISO 6469-3	2011-12	Electrically propelled road vehicles - Safety specifications - Part 3: Protection of persons against electric shock
ISO 16750	-1: 2006-08 -2: 2012-11 -3: 2012-12 -4: 2010-04	Road vehicles – Environmental conditions and testing for electrical and electronic equipment
LV 214-1	2010-03	Test specification for motor vehicle connectors
LV 215-1	2013-02	Electrical/Electronic Requirements of HV Connectors
LV215-2	2013-02	Test specification for HV motor vehicle connectors

3. REQUIREMENTS

3.1. Design and Construction

The product design, construction and physical dimensions corresponds to the latest customer drawings.

Please note, prototype parts or pre-serial parts can be slightly different in dimensioning, form- and position tolerances to the interface drawings.

3.2. Material

Descriptions for material see latest valid customer drawings and material specifications.

3.3. Product Ratings

Description	Range
Max. working voltage	1000 VDC
Voltage class acc. ISO 6469-3	B
Class 1 equipment acc. ISO 6469-3	1
Dielectric withstand voltage (6000m a.s.l.)	4000V
Isolation resistance acc. ISO 6469-3	> 200MΩ
Isolation Group acc. DIN EN 60664-1	I (CTI = 600)
Pollution degree acc. DIN EN 60664-1	2
Clearance distance acc. DIN EN 60664-1	≥ 2.55mm
Creepage Distance acc. DIN EN 60664-1	≥ 7.1mm
Current carrying capability:	**max. 2x120A @ 65°C Derating see appendix 5.1**
Ambient temperature	-40°C to 140°C
Shielding resistance between cable shielding and connector shield	< 3mΩ
Shielding resistance between connector shield and header shield	< 4mΩ
Shielding resistance between header shield and aggregat	Dependent on Material of aggregate, Header shielding silver plated
Ampacity of shielding at ambient temp.	10A

Short term ampacity of shielding	25A (60s)
Mating cycles	50
Degrees of protection (IP-Code) against access acc. ISO 20653	open: IPxxB connected: IPxxD
Degrees of protection (IP-Code) acc. ISO 20653; connected	IP6K9K, IP6K7
Identification of high voltage component	Housing parts orange

3.4. Performance and Test Description

The product is designed to meet the electrical, mechanical and environmental performance requirements. Unless otherwise specified, all tests shall be performed at ambient environmental conditions according to Test Specification 109-1.

3.5. Test Requirements and Procedures Summary

Not shown test-details see LV215-2

Test Description	Requirement	Procedure
PG 0 **RECEIVING INSPECTION**		
E 0.1 Visual inspection	Basic function proven	LV215-2 DIN EN 60512-1-1
E 0.2 Contact resistance	PCON12 Contact ≤0.15mΩ HVIL-contact ≤15mΩ Shielding cable – Header < 9mΩ	LV215-2 DIN EN 60512-2-1
E 0.3 Insulation resistance	Insulation resistance at 1kVDC: >200MΩ	LV215-2 DIN EN 60512-3-1
PG 1 **DIMENSIONS**		
SEE PPAP DOCUMENTS FOR MEASUREMENTS ACCORDING CUSTOMER DRAWINGS		
PG 2 **MATERIAL AND SURFACE ANALYSIS, CONTACTS**		
SEE PCON12 TERMINAL PRODUCT SPECIFICATION 108-32193		
PG 3 **MATERIAL AND SURFACE ANALYSIS, HOUSINGS AND SINGLE-WIRE SEALS**		
SEE PPAP DOCUMENTS FOR MATERIAL DATA SHEETS		
PG 4 **CONTACT OVERLAPPING**		
E 4.1 Contact engagement length	Values see appendix 5.3	Theoretical study

PG 6 **INTERACTION BETWEEN CONTACT AND HOUSING**		
E 6.1 Deflection of contacts in the housing cavity	No damage during joining	Theoretical study
B6.1 Drop test	Drop test from 1m height; No damages or impairments of function	LV215-2 DIN EN 60068-2-31
E6.4 Functioning of secondary lock	No secondary lock available	LV214
PG 7 **HANDLING AND FUNCTIONAL RELIABILITY OF THE HOUSINGS**		
E 7.1 Error-proof design of housings	Coding / Polarisation Test load: 200N No mating possible	LV214 DIN EN 60512-13-5
E 7.2 Retention force of the housing latch/lock	Retention force of the housing catch mechanism Housing interlock: >250N	LV215-2 DIN EN 60512-15-6
E 7.3 Functionality of CPA	Actuation force closing/opening: 25- 30N CPA Efficiency: >80N	LV214
E 7.4 Insertion force or actuation force for insertion with removal aids	Insertion and actuation force: ≤ 75N	LV214
PG 8 **MATING AND RETENTION FORCE OF CONTACT PART**		
E 8.1 Contact insertion forces	90° PCON12 terminal: 12.2-37.7 N 180° PCON12 terminal: 8.8-12.3 N	Value Determination
E 8.2 Contact removal force from the housing	Primary lock only 90° PCON12 terminal: 174-216 N max. 180° PCON12 terminal: 219-249 N max.	Value Determination
PG 9 **SKEWED INSERTION ANGLE**		
E 9.2 Max. possible insertion inclination	Max. possible insertion inclination <2°	Theoretical study

E 9.3 Koshiri Safety	Live parts must only touch its counter-part while mounting (including insertion chamfers). In case of incorrect insertion of the plug no live parts must be touched	Theoretical study
PG 10 CONTACTS: CONDUCTOR PULL-OUT STRENGTH		
SEE PCON12 TERMINAL PRODUCT SPECIFICATION 108-32193		
PG 11 **CONTACTS: INSERTION AND REMOVAL FORCES, MATING CYCLE FREQUENCY**		
SEE PCON12 TERMINAL PRODUCT SPECIFICATION 108-32193		
PG 12 **CONTACTS, CURRENT HEATING, DERATING**		
SEE PCON12 TERMINAL PRODUCT SPECIFICATION 108-32193		
PG 13 **HOUSING INFLUENCE ON THE DERATING**		
E 13.2 Derating with housing	Derating see appendix 5.1	LV215-2 DIN EN 60512-5-1/2

PG 14 **THERMAL TIME CONSTANT (CURRENT EXCESS TEMPERATURE AT N TIMES RATED CURRENT)**		
SEE PCON12 TERMINAL PRODUCT SPECIFICATION 108-32193		
PG 15 **ELECTRICAL STRESS TEST**		
SEE PCON12 TERMINAL PRODUCT SPECIFICATION 108-32193		
PG 16 **FRICTION CORROSION**		
SEE PCON12 TERMINAL PRODUCT SPECIFICATION 108-32193		
PG 17 **DYNAMIC LOAD**		
B 17.2 Dynamic Load; broad-band random	Severity 2: “Body” sealed; Details see appendix 5.2 Slight wear, surface ok. Resistances after testing PCON12 Contact ≤0.3mΩ HVIL-contact ≤15mΩ Shielding cable – Header < 9mΩ	LV214 DIN EN 60068-2-64
B 17.3 Endurance shock test	30g; T=6ms; N=6000 Slight wear, surface ok. Resistances after testing PCON12 Contact ≤0.3mΩ HVIL-contact ≤15mΩ Shielding cable – Header < 9mΩ	LV214 DIN EN 60068-2-27
In the event of particularly critical installation conditions, special agreements shall be made between the manufacturer and the user		

PG 18 A/C COASTAL CLIMATE LOAD / DEICING SALT LOAD		
SEE PCON12 TERMINAL PRODUCT SPECIFICATION 108-32193		
PG 19 **ENVIRONMENTAL SIMULATION**		
SEE PCON12 TERMINAL PRODUCT SPECIFICATION 108-32193		
PG 20 **CLIMATIC LOAD OF HOUSINGS**		
B 20.1 Dry heat	Dry heat 120h / 140°C	LV214
B 20.2 Damp heat	Damp heat 10 days / 40°C / 95% rel. humidity Insulation resistance at 1kVDC: >200MΩ	LV214
B 20.3 Climatic cold	Climatic cold 48h / -40°C Plugging / unmating possible at -20°C	LV214
B 20.1 Dry heat	Dry heat 48h / 80°C	LV214
B6.1 Drop test after aging	Not performed	LV215-2 DIN EN 60068-2-31
PG 21 **LONG-TERM AGING**		
B 21.1 Long-term aging in dry heat	1000h at 140°C; Resistances after aging: Contact ≤0.17mΩ Shielding< 0.88mΩ Functionality; Contact Removal forces acc. E8.2	LV215-2 DIN EN 60068-2-2
B6.1 Drop test after aging	Drop test from 1m height; No damages or impairments of function	LV215-2 DIN EN 60068-2-31
E 8.2 Contact removal force from the housing	Primary lock only 90° PCON12 terminal: 261-372 N 180° PCON12 terminal: 274-467 N	Value Determination

PG 22B **CHEMICAL RESISTANCE**		
B 22.1B Chemical Resistance	Application of media for 48h at specified temperature; Resistant against brake fluid, engine oil 5W-30, power steering fluid, automatic transmission fluid, radiator antifreeze, road salt solution, FAM test fuel, diesel fuel, diesel additive AdBlue	LV214
PG 23 **WATER TIGHTNESS**		
B 19.3 Aging in dry heat	120h at 120°C	DIN EN 60068-2-2
B 19.1 Temperature shock	144 cycles -40°C / +140°C each 15min	DIN EN 60068-2-14
B 23.1 Immersion with pressure difference	Low pressure: -100mbar, holding time 5min. -500mbar, holding time 5min.	LV214 DIN EN 60512-14-5
B 23.2 Immersion with pressure difference	Movement of cable at low pressure: -100mbar, holding time 5min. -500mbar, holding time 5min.	LV214 DIN EN 60512-14-5
B 23.3 Thermal shock test	30min. in 120°C air; 15min in 0°C Water 5 cycles	LV214
B 23.4 Degree of protection test/pressure washer test	Severity: IP X9K Test duration per side: 15s Distance to nozzle: 10 - 15 cm Pressure: 80 bar Temperature: 80°C	LV214 DIN 40050-9
E 0.3 Insulation resistance	Insulation resistance at 500VDC: >100MΩ	LV215-2 DIN EN 60512-3-1

<table>
<tr><th colspan="3">PG 24
IMPENETRABILITY TO PAINT</th></tr>
<tr><td colspan="3">NOT APPLICABLE</td></tr>
<tr><th colspan="3">PG 28
LOCKING NOISE</th></tr>
<tr><td>E 28.1
Locking Noise</td><td>Locking noise ≥70dB(A)</td><td>LV214</td></tr>
<tr><th colspan="3">PG 50
EMC- ELECTROMAGNETIC COMPATIBILITY</th></tr>
<tr><td>PG50
EMI-Test performance</td><td><table><tr><th>Frequency</th><th>Delta transfer impedance</th></tr><tr><td>DC</td><td><2mΩ</td></tr><tr><td>2MHz</td><td>6.1-9.5mΩ</td></tr><tr><td>30MHz</td><td>127.6-138.9mΩ</td></tr></table></td><td>Value determination</td></tr>
<tr><th colspan="3">PG 51
IP PROTECTION OPEN CONNECTOR</th></tr>
<tr><td>PG51
Protection open connector</td><td>IP-protection IPXXB
(VDE test finger Ø12mm)</td><td>ISO 20653</td></tr>
</table>

3.6. Test sequence

The sequence of tests shall be verified by test groups as specified.

3.7. Additional Test Procedures

ADDITIONAL TEST PROCEDURES AND TEST RESULTS		
A1 Crimp validation Shielding	Pull out force shield crimp: ≥180N Cross section examination: crimp sleeves are well formed, uniform pressing of screening braid Crimp resistance initial <2mΩ; after aging <3mΩ	TE-Spec. 109-18212

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

The samples shall be prepared in accordance with product drawings and shall be selected at random from current production.

4.2. Requalification Testing

If changes significantly affecting form, fit, or function depending on the product or manufacturing process, product engineering shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality, and reliability engineering.

A Acceptance

Acceptance is based on verification that the product meets the requirements of chapter 4. 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 resubmittal.

B Quality Conformance Inspection

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

5. APPENDIX

5.1. Housing influence on derating

Current at PCON12 contacts in housing with additional load at shield of 10A. the 80%-curves of the measured values are shown in the diagram.

The derating has been operated with the following cables:

Coficab 16mm² shielded

Cable length according to DIN EN 60512-5-2

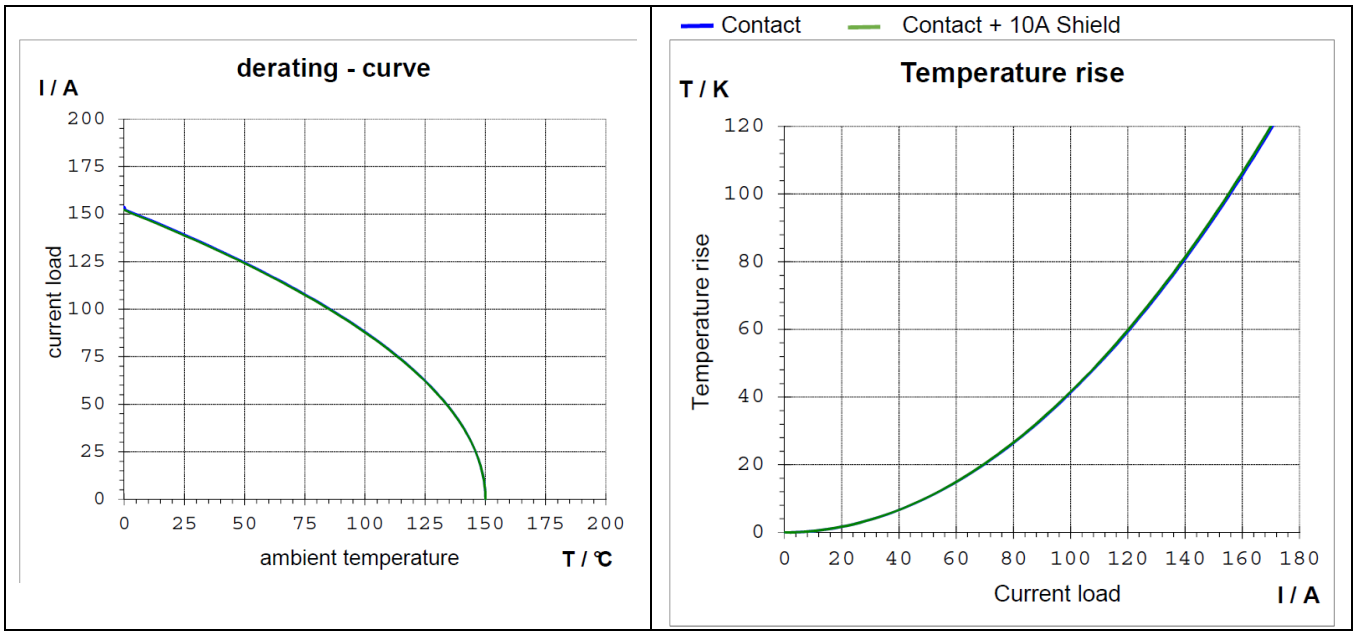


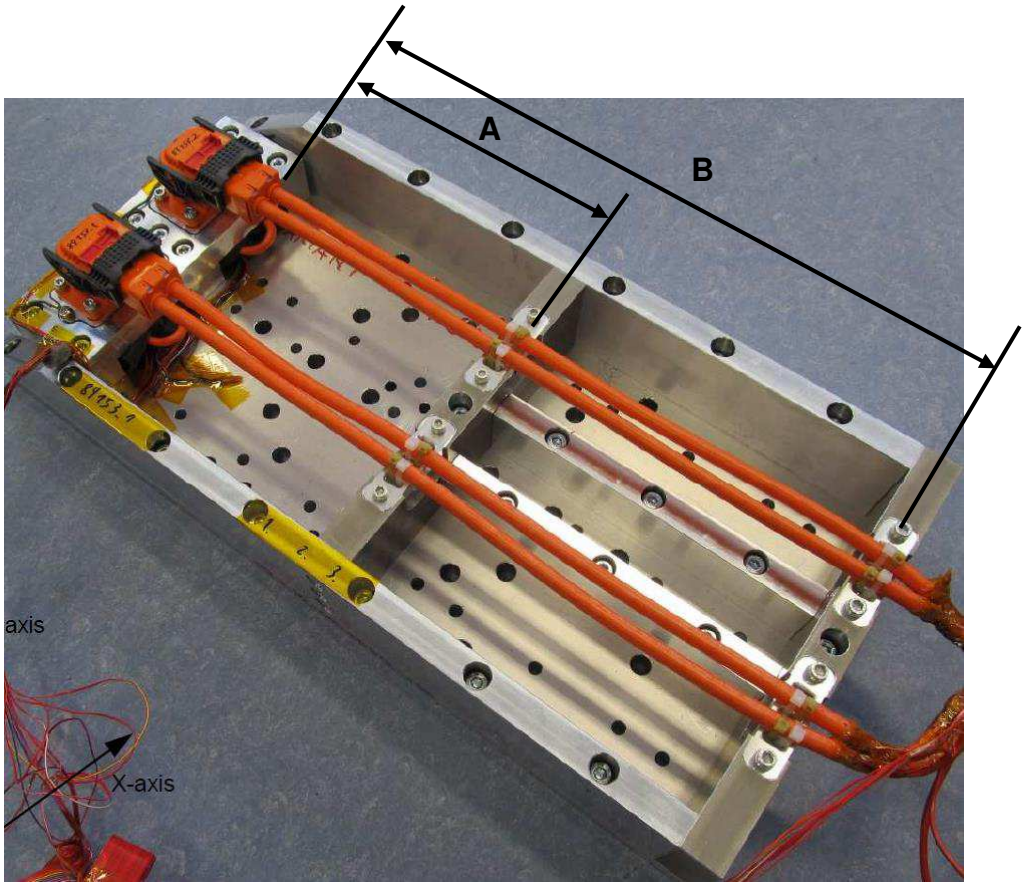
Figure 1: Derating and temperature rise in housing. Current loaded on contacts + 10A on shield according LV215-2

5.2. Dynamic load

Design of vibration device acc. LV214 (see Figure 3)

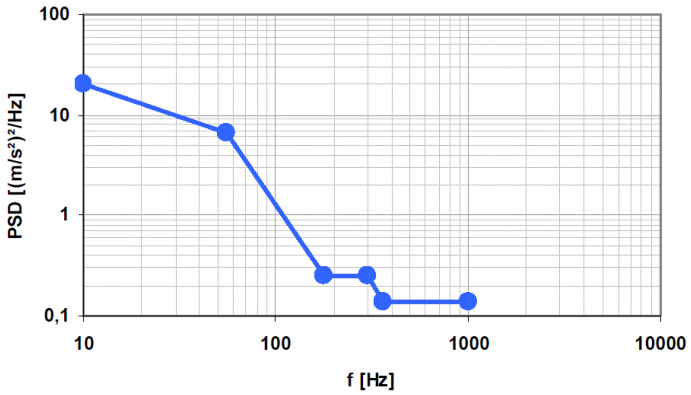
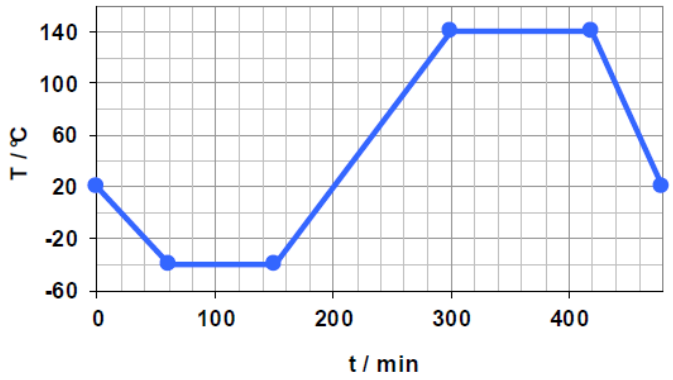
Cable fixed after (see Figure 2)
Dimension A = 100mm
Dimension B = 200mm

Figure 2: Connector on vibration device



Load profile vibration severity 2: “Body” sealed

Temperature profile modified to -40°C / 140°C

LV214-1 Severity 2: “Body” sealed		
Shock:	a= 300m/s² T=6ms	No. of shocks: 6000
Random:  	a_{eff} f [Hz] 10 55 180 300 360 1000	$27,8\ (m/s^2)_{RMS}$ PSD $[(m/s^2)^2/Hz]$ 20 6,5 0,25 0,25 0,14 0,14
Temperature profile:  	[min] 0 60 150 300 420 480	[°C] 20 -40 -40 140 140 20

5.3. Contact engagement length

Contact overlap – power contact	≥ 1mm
Contact overlap – HVIL contact	≥ 1mm
Contact overlap – Shielding	≥ 1mm
Interlock Disconnected advanced at pull-out process	≥ 1mm

DR G. PUCKEL 11JUL2019	TE CONNECTIVITY GERMANY GMBH A TE CONNECTIVITY LTD. COMPANY AMPÈRESTRAßE 12-14 D-64625 BENSHEIM GERMANY		
CHK H. RIPPER 11JUL2019			
APP Z. STJEPANOVIC 11JUL2019	NO 108-94749	REV A	LOC AI
TITLE	PRODUCT SPECIFICATION FOR HVA1200 180° AND 90°. CONNECTOR		