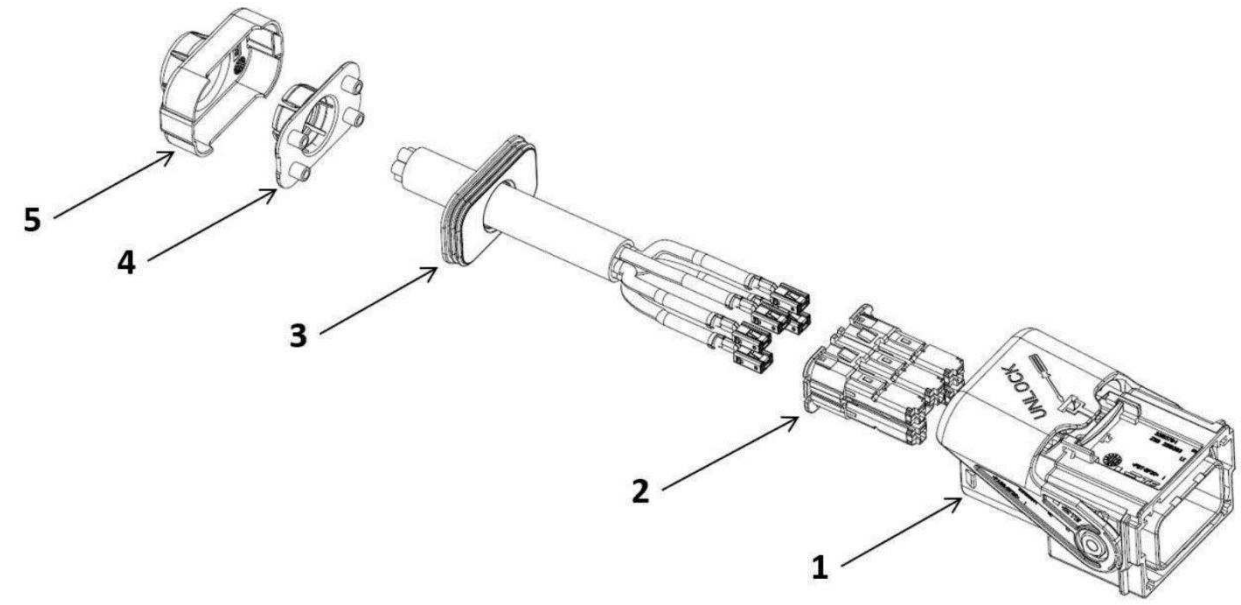
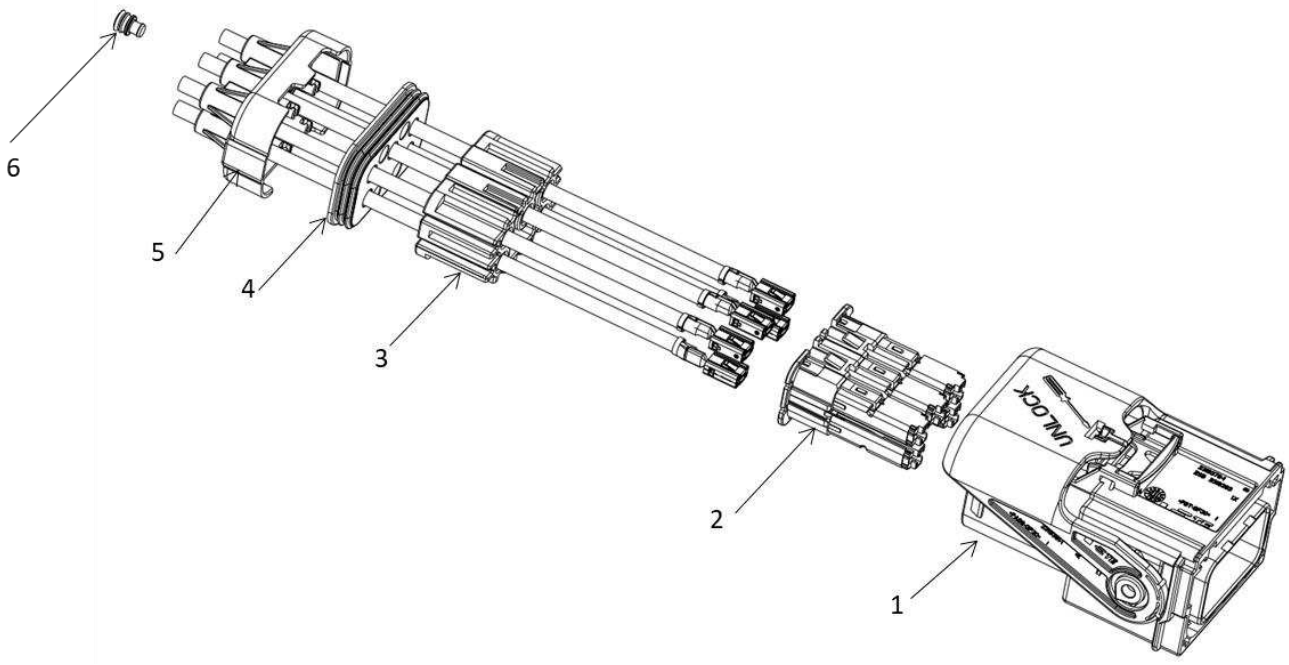
HVU630 MEB Class 2 (5pos) unshielded





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HISTORY OF CHANGES

Rev.	Description	Originator	Date
A	**New document**	**Wolfgang Balles**	**2021-03-16**
B	**Version with single wire seal added,**	**Ralf Dierkes**	**2023-04-05**

1 SCOPE

1.1 Content

This specification covers the performance, tests and quality requirements for unshielded connector HVU630 5pos. Connector is designed to meet Multicore cable with construction 5x6mm², 4x6mm² and 3x6mm² and single wire seal.

The processor is responsible for ensuring the quality of the manufacturing process and the proper function of the system. The warranty and liability is excluded, if quality deficiency or damages occurs by failing compliance to this specification or using not specified, not released tools and not released connector components.

1.2 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. Connector has been validated with cable listed in specification 114-94552. Alternative cables may be used after ensuring performance through validation testing. Performed test sequences shown in table 5.

2 APPLICABLE DOCUMENTS

The following mentioned documents are part of this specification. If there is a conflict between the information contained in the documents and this specification or with any other technical documentation supplied, the last valid customer drawings takes preference.

2.1 TE Connectivity Documents

This Product Specification based on the latest valid customer drawings.

2.1.1 Customer drawings

Table 1: Customer drawings

2pos Receptacle housing, KIT	
2319386	5POS. AMP MCP 6.3, REC HSG, ASSY SLD (Class 2)
2375949	5POS. AMP MCP 6.3, REC HSG, ASSY SLD (Class 2)

2.1.2 TE-Specifications

Table 2: TE-Specifications

108-18718	PRODUCT SPECIFICATION AMP MCP 6.3/4.8K
114-18388	APPLICATION SPECIFICATION AMP MCP 6.3/4.8K
114-94552	APPLICATION SPECIFICATION CLASS 2 5POS
TEC-109-1, Rev. J	General Requirements for Test Specifications

2.2 General Documentation

2.2.1 Normative References

Table 3: List of Standards & Customer specifications

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	3rd edition 2018-10	Electric road vehicles – Safety specifications. Part 3: Protection of person against electric hazards
SAE J 1742	1998-03 (2005-12)	Connections for High Voltage On-Board Road Vehicle, Electrical Wiring Harnesses Test Methods and General Performance Requirements
UL2231-2	2012-09-12	Personnel protection systems for electric vehicle (EV) supply circuits - Particular requirements for protection devices for use in charging systems
ECE R 100	2015-03	Regulation No 100 of the Economic Commission for Europe of the United Nations (UNECE) - Uniform provisions concerning the approval of vehicles with regard to specific requirements for the electric power train
VW 75174	2018-10	Test specification for motor vehicle connectors
VW 80332	2019-01	Electrical/Electronic Requirements of HV Connectors
W 80303	2014-06	Electrical Characteristics and Electrical Safety of High-Voltage Components in Road Vehicles
VW 75210-1	2019-06	High-Voltage Single-Core and Sheathed Cables, Unshielded for Motor, Vehicles and their Electric Drives

3 OPERATING CONDITION

3.1 Product Ratings

Connector performance and operating condition shown in table 4.

Table 4: Operating condition

Description	Range
Rated voltage	≤ 1000V DC
Rated impulse voltage (transient overvoltage) acc. VW 80303	2,5KV
Operating altitude above sea level	5500m
Pollution degree acc. DIN EN 60664-1	2
Minimum Clearance distance acc. VW 80303	> 2,39mm
Creepage Distance acc. DIN EN 60664-1 (VW 80303)	> 7,1mm
Ambient temperature	-40°C to 140°C
Voltage class B acc. ISO 6469-3	60 < V ≤ 1500 (DC) 30 < V ≤ 1000 (AC rms)
Degrees of protection against access of foreign objects, unmated situation (*+2mm clearance distance to the hazardous parts)	UL2231-2: +2mm* ISO 20653: IPXXB
Degrees of protection against access acc. ISO 20653, mated situation	IPXXD
Insulation resistance acc. SAE J 1742 (VW 80303)	> 200MΩ
Degree of protection against water acc. ISO 20653, mated situation	IPX9K, IPX7
Contact Total resistance for 6mm², Initial / Aging	< 0,68mΩ / < 1,36mΩ
Contact Total resistance for 4mm², Initial / Aging	< 0,72mΩ / < 1,44mΩ
Dynamic load acc. to VW 80332 (VW 75174)	Severity 2 “Body sealed”
Unmating of connector acc. to ISO 6469-3 (See TE-Spec. 114-94552)	Use of tool
Mating cycles	50
Mating & Unamting force	< 75N
Retention force of housing lock	> 150N
Primary Lock (Secondary Lock)	> 120N (> 60N)
Coding and Polarization (Error-proof design)	> 200N
Contact overlap (tolerance study)	> 1mm

4 QUALIFICATION

4.1 Performance and Test Description

The product is designed to meet the electrical, mechanical and environmental performance requirements specified in table 4. Unless otherwise specified, all tests shall be performed at ambient environmental conditions according to TE-TEC 109-1.

Table 5: Test sequence

Test Group / Test Sequence	0	6	7	8	13	17	18
Visual Inspection	1,6	1,7	1,7	1,5	1,6	1,9	1,6
Insulation resistance, 1000V DC, 60s., R > 200MΩ	2	6					
Total resistance: Initial 0,68mΩ, after ageing 1,36mΩ	3				2,5	2,8	2,5
Crimp resistance 0,18mΩ depend on type of wire	4						
Dielectric strength 2,15 KV DC, 60s., I < 10mA	5						
Function of the primary locking device/latch play		2					
Function of the secondary locking device/latch play		3					
Actuation forces of the secondary locking device		4					
Drop test acc. to DIN EN 60068-2-31, method 1		5					
Distinctiveness of the contact housings			2				
Holding force of the contact housing latch/lock			3				
CPA function check			4				
Insertion force and actuation force (fully loaded)			5				
HV-Safety			6				
Determining the contact insertion forces				2			
Contact pull-out strength 1st Lock				3			
Contact pull-out strength 2nd Lock				4			
Current overtemperature with contact housing					3		
Derating with contact housing					4		
Continuous monitoring of resistance						3,5,7	
Dynamic load, broadband noise						4	
Shock durability testing						6	
Salt spray, cyclic, Severity 5 (DIN EN 60068-2-52)							3
Immersion with pressure difference -50 kPa, 5min							4

Test Group / Test Sequence	20	21	22B	23	28	49	51
Visual Inspection	1,6,9, 12	1,8	1,5	1,5,11	1,4	1,5	1,4
Insulation resistance, 1000V DC, 1min., R > 200MΩ	2,5		2,4	10			
Total resistance: Initial 0,68mΩ, after ageing 1,36mΩ		2,4					
Crimp resistance 0,18mΩ depend on type of wire							
Dielectric strength 2,15 KV DC, 1min., I < 10mA							
Aging in dry heat 120h @ 140°C	3			3			
Aging in damp heat, constant (10days / 40°C / 95% hum)	4						
Low-temperature aging 48h @ -40°C	7						
Extracting and inserting at -20 °C (Mating cycle)	8						
Aging in dry heat 48h @ 80°C	10						
Drop test acc. to DIN EN 60068-2-31, method 1	11	6					
Long-term aging in dry heat 1000h @140°C		3					
Function check: 5x Mating cycle		5					
Contact extraction forces		7					
Resistance to chemicals (water-tight design)			3				
50x Mating cycles				2			
Temperature shock 144 cycles, -40°C / 140°C, 15min. each side				4			
Immersion with pressure difference -50 kPa, 5min.				6		4	
Cable movement during immersion with pressure difference				7			
Thermal shock testing, water temperature 0 °C, air temperature 140°C, duration 5 cycles				8			
IPX9K: ISO 20653 (80 bar, temperature 80°C)				9			
Storage 24 h at Ambient temperature					2		
Locking noise, Peak > 70dB(A) 600mm distance					3		
Imperviousness to dust 20cycles 20min.						2	
1x Mating cycle (without cleaning)						3	
Protection against contact IPXXB (ISO 20653)							2
Protection against contact IPXXD (ISO 20653)							3

4.2 Temperature rise / Derating

Housing Influence on the derating **with 6mm²**.
Test performed with header TE-PN: 2319386-1 acc. to 208-18044 (VW-No.: 1EA.900.962.C).
Contacts silver plated.

Figure 1: test setup housing influence on the derating

LEONI, FHLR2G2G 00002, FHLR2G2G 5x6mm²

Cable length according to DIN EN 60512-5-2

20% Safety factor included

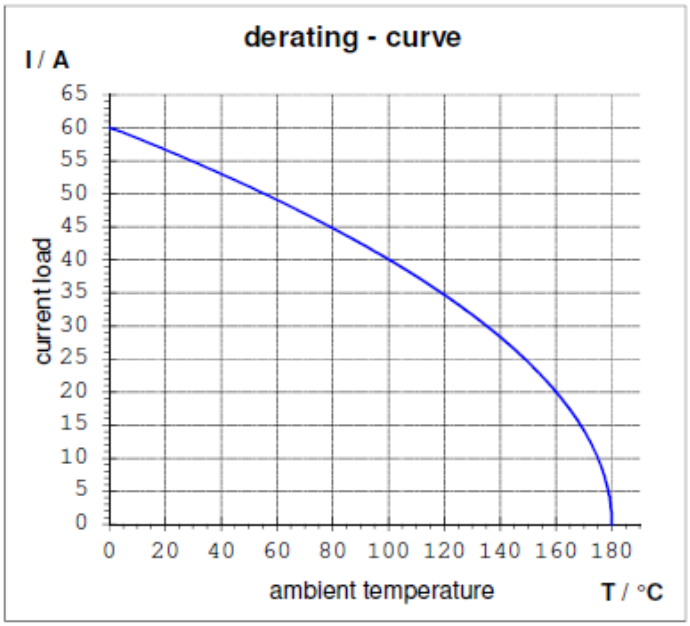

Figure 2: Derating curve applied with 20%-Safety factor.

4.3 Dynamic load

Vibration level 2 acc. to VW80332 (VW75174) with temperature profile as severity level 4.

Random with temperature cycling (20 h per axis)

Random	
a_{RMS} / m/s²	27.8
f / Hz	PSD / (m/s²)²/Hz
10	20
55	6.5
180	0.25
300	0.25
360	0.14
1000	0.14

Table 4 Vibration profile (random)

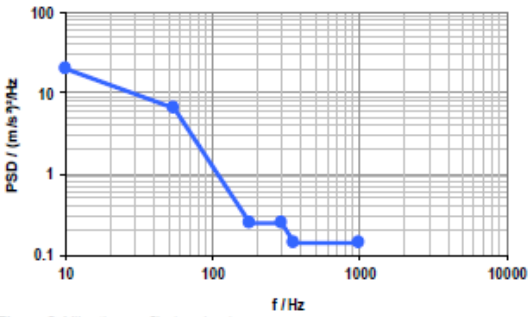

Figure 2 Vibration profile (random)

Temperature profile	
t / min	T / °C
0	20
60	-40
90	-40
240	140
420	140
480	20

Table 5 Temperature profile

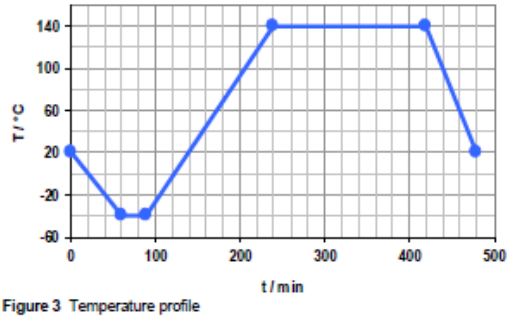

Figure 3 Temperature profile

Endurance shock test

1000 successive shocks in both directions each of the 3 perpendicular axes; A = 300 m/s²; T = 6 ms sinusoidal half-wave

Figure 3: Vibration profile “Body sealed” Severity 2

Test setup with first fastening point after 200mm and second point after 250mm.

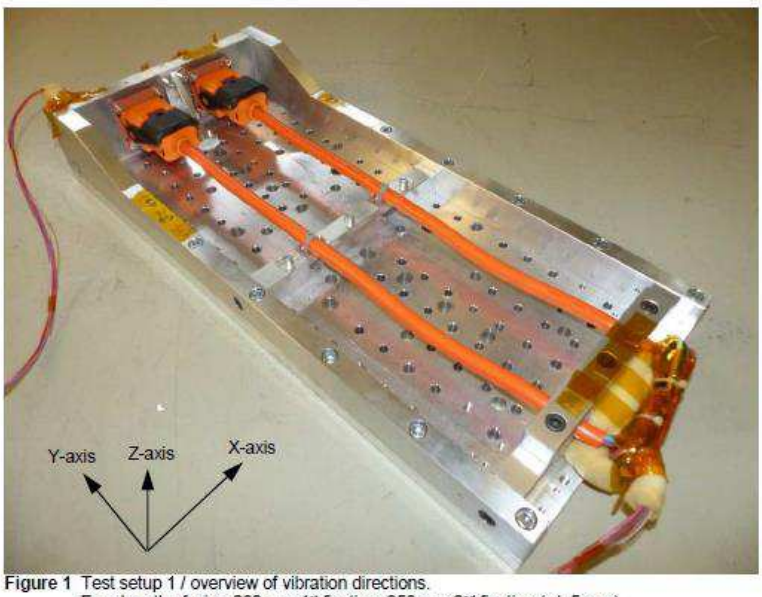

Figure 1 Test setup 1 / overview of vibration directions.
Free length of wire: 200 mm 1st fixation, 250 mm 2nd fixation (+/- 5 mm).

Figure 4: Test setup for vibration profile “Body sealed”

Results of Connection Resistance

Connection resistance

Contact	Part no.	Material	Wire cross section
AMP MCP 6.3/4.8K	2-1241408-3 Rev. A	CuNiSi / Ag	6 mm²
Tab 6.8 x 0.8	1-2318405-1 Rev. A	CuSn0.15 / Ag	--

Measuring path:
Wire -> Crimp -> Receptacle -> Headerpin

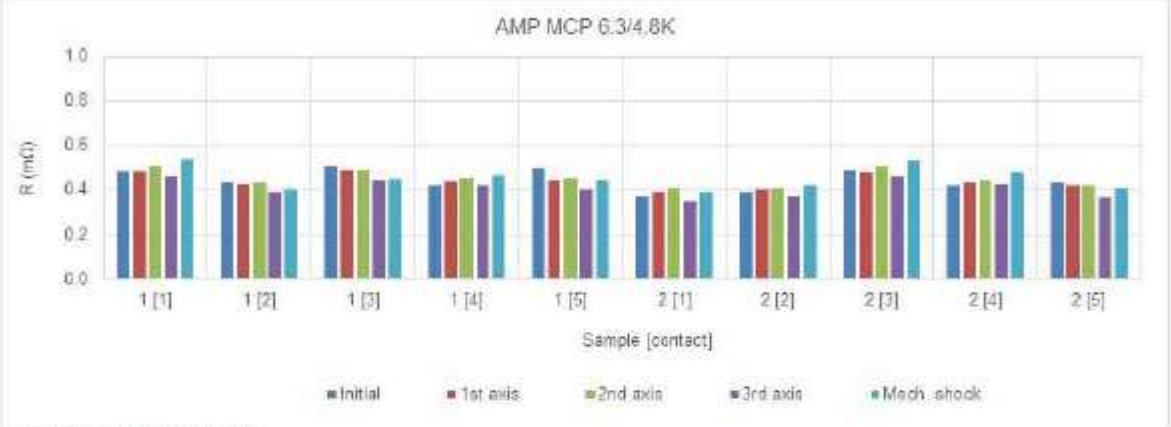

Figure 16 Connection resistance

Contact (Assembly [Path])	Initial *R* in mΩ	1st axis *R* in mΩ	2nd axis *R* in mΩ	3rd axis *R* in mΩ	Shock *R* in mΩ	Δ*R* *R* in mΩ
1 [1]	0.49	0.48	0.51	0.46	0.54	0.08
1 [2]	0.43	0.43	0.43	0.39	0.40	0.04
1 [3]	0.51	0.49	0.49	0.44	0.45	0.06
1 [4]	0.42	0.44	0.45	0.42	0.47	0.05
1 [5]	0.50	0.44	0.46	0.40	0.44	0.10
2 [1]	0.37	0.39	0.41	0.35	0.39	0.06
2 [2]	0.39	0.40	0.41	0.37	0.42	0.05
2 [3]	0.49	0.48	0.51	0.46	0.53	0.07
2 [4]	0.42	0.43	0.44	0.42	0.48	0.06
2 [5]	0.43	0.42	0.42	0.37	0.41	0.06
Maximum	0.51	0.49	0.51	0.46	0.54	0.10
Average	0.44	0.44	0.45	0.41	0.45	
Minimum	0.37	0.39	0.41	0.35	0.39	
Standard deviation	0.05	0.03	0.04	0.04	0.05	

Table 8 Connection resistance

All values in mΩ; $\Delta R = R_{MAX} - R_{MIN}$
Resistances determined including wire resistance. Wire resistance deducted afterwards.
Reference line: 700 mm wire 6 mm² = 2.00 mΩ at RT

Requirement acc. to VW 80332 (2017-09), table 2, Rinitial ≤ 0,68 mΩ / R after test ≤ 1,36 mΩ

Figure 5: Resistance intial and after vibration load "Body sealed"