DESIGN OBJECTIVES

High Voltage Detective Connector

108-32179

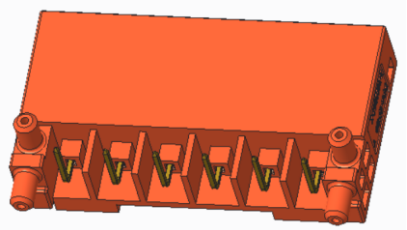
The product described in this document has not been fully tested to ensure conformance to the requirements outlined herein. TE Connectivity makes no representation or warranty, express or implied that the product will comply with these requirements. Further, TE Connectivity reserves the right these requirements based on the results of additional testing and evaluation. Contact TE Connectivity Engineering for further information. If necessary, this document will become the Product Specification at successful completion of testing.

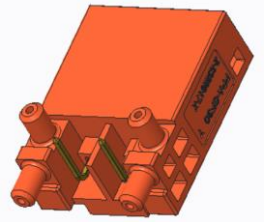
1. Scope:

1.1 Content

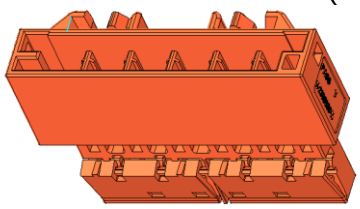
This specification covers the requirements for product performance, test methods and quality assurance provisions of High Voltage Detective Connector.

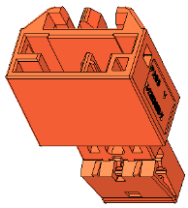
MQS 2P/6P HEADER ASSY RIGHT ANGLE/VERTICAL ANGLE:
TE PN: 2322946-1/2322946-2 (6P RIGHT ANGLE)
2322949-1/2322949-2 (6P VERTICAL ANGLE)
2-2322946-1/2-2322946-2 (2P RIGHT ANGLE)
2-2322949-1/2-2322949-2 (2P VERTICAL ANGLE)





MQS 2P/6P TAB HOUSING:
TE PN: 2359930-1/2359930-2 (6P)
2389098-1/2389098-2 (2P)

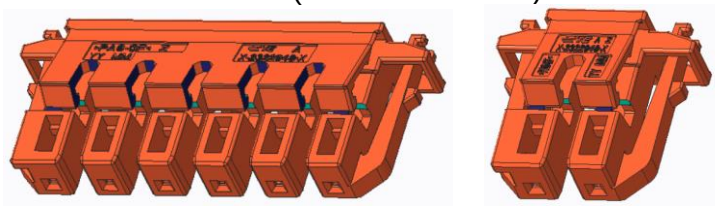




				DR X.Li 08SEP2018	TE Connectivity Shanghai, China		
				CHK C.ZHOU 19NOV2018			
				APP W.WU 20NOV2018	NO. 108-32179	REV A1	LOC ES

A1	**Revised**	W.Z	23MAY2024	PAGE 1 of 11	TITLE High Voltage Detective Connector
A	**Released**	W.Z	20NOV2018		
LTR	REVISION RECORD	DR	DATE		

MQS 2P/6P RECEPTACLE HOUSING:
TE PN: 2322948-1/2322948-2 (6P)
2-2322948-1/2-2322948-2 (2P)
Terminal: 5-963715-1 (wire size: 0.5mm^2)



2. Applicable Documents:

The following documents form a part of this specification to the extent specified herein. In the event of conflict between the requirements of this specification and the product drawing, product drawing shall be taken precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1 Specifications:

A. USCAR-2-2013
B. USCAR-37-2008
C. GMW3172-2015
D. GMW3191-2012
E. DIN IEC 68 2-20
F. IEC 60068-2-54
G. IEC 60512-5-2
H. IEC 60529
I. EIA 364-70A

3. Requirements:

3.1 Design and Construction

Product shall be of the design, construction and physical dimensions specified in the applicable product drawing.

3.2 Materials

MQS 2P/6P HEADER ASSY RIGHT ANGLE/ VERTICAL ANGLE:
Housing: PPA-GF30 V0
Terminal: Cu-alloy, Plating: Sn over Ni

MQS 2P/6P TAB HOUSING:
PA66 V0

MQS 2P/6P RECEPTACLE HOUSING:
PA6-GF20 V0

3.3 Ratings:

A. Operating Temperature Range: Class 3 (-40℃ to +125℃)

B. Nominal operating voltage: 1000V DC
For application at higher voltage please contact TE Connectivity.
Current: 1A Max at 125℃

C. Vibration Range: Class 1
GWM3172-2015 9.3.1.3 Mounting Location Underhood Sprung Masses

D. Sealing range: IP XXB

3.4 Quality Assurance Provision

A. Sample Preparation:
The test samples to be used for the test shall be prepared by random selection from the current production. No sample shall be reused, unless otherwise specified.

B. Test Condition:
All the tests shall be performed under any combination of the following test condition, unless otherwise specified:
Room temperature: 23±5℃
Relative humidity: 45~75%
Atmospheric pressure: 860~1060 mbar

3.5 Requirements and Procedures Summary

General Test			
Para.	Test items	Requirements	Procedures
3.5.1	Visual inspection	No defect and non-functionality. Such as cracks, tarnishing, flash, etc.	Visually, Dimensionally and functionally inspected per applicable inspection plan. USCAR-2 Section 5.1.8 Visual inspection.
3.5.2	Heat Resistance to Reflow Soldering	Note any blisters, deformation/warpage, melting or physical damage (visual inspection by 30X max magnification).	Reflow profile refers to APPENDIX 5.1
3.5.3	Connector and/or Terminal Cycling	Complete mate and un-mate each connector or terminal pair 10times	USCAR-2 Section 5.1.7 Connector and/or Terminal Cycling
Mechanical Test			
Para.	Test items	Requirements	Procedures
3.5.4	Terminal to Connector Insertion Force (TPA in open position)	TPA in Open Position: Insertion Force F≤30N	USCAR-2 Section 5.4.1.3 A Insertion Force
3.5.5	Terminal to Connector Insertion Force (Forward stop)	F≥50N or wire buckling	USCAR-2 Section 5.4.1.3 A Insertion Force
3.5.6	Terminal from Connector Retention Force- Primary lock only	0.64mm Terminal: F≥30N	USCAR-2 Section 5.4.1.3 B Retention Force
3.5.7	Terminal from Connector Retention Force- Primary Lock and TPA/PLR	0.64mm Terminal: 1. Primary + Secondary Lock after Moisture Conditioning, F≥60N 2. Primary + Secondary Lock after Temp/Humidify and HTE, F≥50N	USCAR-2 Section 5.4.1.3 B Retention Force
3.5.8	Connector Mating force	F≤75N	USCAR-2 Section 5.4.2 Mating Force
3.5.9	Connector Un-mating Force	F≤75N	USCAR-2 Section 5.4.2 Un-Mating Force
3.5.10	Connector to Connector Latch Retention Force	Using connector pairs without wires and terminals F≥80N	GMW3191 4.2.18 Locked Connector Disengagement Force
3.5.11	Polarization Feature Effectiveness	3X Maximum value of mating force (60N≤F≤150N). No damage for connector and no electrical contact shall be made between male/female terminals.	USCAR-2 Section 5.4.4 Polarization Feature Effectiveness
3.5.12	Header Pin Retention	15N Min	USCAR-2, Section 5.7.1 Header Pin Retention

Electrical Test			
Para.	Test items	Requirements	Procedures
3.5.13	Circuit Continuity Monitoring	There must be no instance in which the resistance of any terminal pair exceeds 7Ω for more than 1 microsecond.	USCAR-2 Section 5.1.9 Circuit Continuity Monitoring
3.5.14	Dry Circuit Resistance	Contact Resistance 20mΩ Max	USCAR-2 Section 5.3.1 Dry Circuit Resistance
3.5.15	Voltage Drop	Maximum Voltage Drop 50mV	USCAR-2 Section 5.3.2 Voltage Drop
3.5.16	Isolation Resistance	Resistance ≥ 100 MΩ at 1000VDC	USCAR-2 Section 5.5.1 Isolation Resistance.
3.5.17	Dielectric Withstanding	There shall be no dielectric break-down or flash over between cavities or between circuits in cavities and the outside of the connector or shield. Leakage Current 1mA Max at 3000VAC	USCAR 37, Section 5.5.2 3000VAC applied to the samples. Dielectric withstanding voltage test Un-sealed connector pairs shall be conditioned for ⩾3hrs at lab ambient conditions prior to conducting dielectric strength testing.
3.5.18	Temperature Rise	Test Current: 1A Ambient Temp: 125°C The measured temperature of the terminal pair interface must not exceed +5°C rise over ambient temperature. Contact Resistance 20mΩ Max.	EIA 364-70A Method 1 IEC 60512-5-2
Environmental Test			
Para.	Test items	Requirements	Procedures
3.5.19	Mechanical Shock and Vibration	Connector function meets the needs of Para. 3.5.13, 3.5.14, 3.5.15, 3.5.1	USCAR-2 Section 5.4.6 Mechanical shock V1 GWM3172-2015 9.3.1.3 Mounting Location Underhood Sprung Masses Profile refers to APPENDIX 5.2, 5.3
3.5.20	Thermal Shock	Connector function meets the needs of Para. 3.5.13, 3.5.14, 3.5.15, 3.5.16, 3.5.17, 3.5.1	USCAR-2 Section 5.6.1 Thermal Shock 300 cycles, -40℃~+125℃
3.5.21	Temperature/ Humidity Cycling	Connector function meets the needs of Para. 3.5.14, 3.5.15, 3.5.16, 3.5.17, 3.5.7, 3.5.1	USCAR 2, Section 5.6.2 Temperature 125℃, 40 cycles Profile refers to APPENDIX 5.4
3.5.22	High Temperature Exposure	Connector function meets the needs of Para. 3.5.14, 3.5.15, 3.5.16, 3.5.17, 3.5.1	USCAR 2, Section 5.6.3. Temperature 125℃, 1008hours.
3.5.23	Protection against accidental contact, IPXXB (Finger)	No contact between HV circuits and 12mm dia. Finger probe at 10 N±10%	IEC 60529, section 12

Solderability Test			
Para.	Test items	Requirements	Procedures
3.5.24	Solderability – Wetting Test	Surface must be 100% wetted, surface defects are not allowed (visual inspection by 4X to 25X magnification).	IEC 60068-2-54 (wetting balance test method) Pre-ageing: 50% of the devices: 1h steam aging by IEC 60068-2-20, chapter 4.1.1 method 1a 50% of the devices: 4h 155°C by IEC 60068-2-20, chapter 4.1.1 method 3a Solder bath temperature: 235 ± 3°C (leaded soldering) 245 ± 3°C (lead-free soldering) Dip in duration: 30sec ± 15sec Immersion depth: according to solder area of header pins
3.5.25	Solderability – De-wetting Test	De-wetting is not allowed (visual inspection by 4X to 25X magnification).	According to IEC 60068-2-20 5.2.5 Pre-aging: None Solder bath temperature: 260 ± 3°C (leaded soldering) 270 ± 3°C (lead-free soldering) Dip in duration: 2x 5 sec ± 0,5 sec Immersion depth: according to solder area of header pins

3.6 Product Qualification Test and Sequences

Test or examination		Test Group					
		1	2	3	4	5	6
3.5.1 Visual Inspection		1, 5	1, 4	1, 6	1, 4	1, 4	1, 4
3.5.2 Heat Resistance to Reflow Soldering			2	2	2	2	2
3.5.3 Connector and/or Terminal Cycling							
3.5.4 Terminal to Connector Insertion Force (TPA in open position)		2					
3.5.5 Terminal to Connector Insertion Force (Forward stop)		3					
3.5.6 Terminal from Connector Retention Force- Primary lock only		4					
3.5.7 Terminal from Connector Retention Force- Primary Lock and TPA/PLR				5			
3.5.8 Connector Mating Force				3			
3.5.9 Connector Un-mating Force				4			
3.5.10 Connector to Connector Latch Retention Force			3				
3.5.11 Polarization Feature Effectiveness					3		
3.5.12 Header Pin Retention						3	
3.5.13 Circuit Continuity Monitoring							
3.5.14 Dry Circuit Resistance							3
3.5.15 Voltage Drop							
3.5.16 Isolation Resistance							
3.5.17 Dielectric withstanding							
3.5.18 Temperature Rise							3
3.5.19 Mechanical Shock and Vibration							
3.5.20 Thermal Shock							
3.5.21 Temperature/Humidity Cycling							
3.5.22 High Temperature Exposure							
3.5.23 Protection against accidental contact, IPXXB (Finger)							
3.5.24 Solderability – Wetting							
3.5.25 Solderability – De-wetting							
Sample Size	6P Connector	**4**	**10**	**10**	**4**	**4**	**4**
	6P Terminal	**24**	**-**	**24**	**-**	**-**	**-**
	2P Connector	**5**	**10**	**10**	**4**	**4**	**5**
	2P Terminal	**10**	**-**	**10**	**-**	**-**	**-**

3.6 Product Qualification Test and Sequences (continued)

Test or examination		Test Group						
		7	8	9	10	11	12	13
3.5.1 Visual Inspection		1, 8	1, 12	1, 12	1, 12	1, 3	1, 3	1, 3
3.5.2 Heat Resistance to Reflow Soldering		2	2	2	2			
3.5.3 Connector and/or Terminal Cycling		3	3	3	3			
3.5.4 Terminal to Connector Insertion Force (TPA in open position)								
3.5.5 Terminal to Connector Insertion Force (Forward stop)								
3.5.6 Terminal from Connector Retention Force- Primary lock only								
3.5.7 Terminal from Connector Retention Force- Primary Lock and TPA/PLR				13	13			
3.5.8 Connector Mating Force								
3.5.9 Connector Un-mating Force								
3.5.10 Connector to Connector Latch Retention Force								
3.5.11 Polarization Feature Effectiveness								
3.5.12 Header Pin Retention								
3.5.13 Circuit Continuity Monitoring		5	7					
3.5.14 Dry Circuit Resistance		4, 6	4, 8	4, 8	4, 8			
3.5.15 Voltage Drop		7	9	9	9			
3.5.16 Isolation Resistance			5, 10	5, 10	5, 10			
3.5.17 Dielectric withstanding			6, 11	6, 11	6, 11			
3.5.18 Temperature Rise								
3.5.19 Mechanical Shock and Vibration		5						
3.5.20 Thermal Shock			7					
3.5.21 Temperature/Humidity Cycling				7				
3.5.22 High Temperature Exposure					7			
3.5.23 Protection against accidental contact, IPXXB (Finger)						2		
3.5.24 Solderability – Wetting							2	
3.5.25 Solderability – De-wetting								2
Sample Size	6P Connector	**10**	**10**	**10**	**10**	**4**	**-**	**-**
	6P Terminal	**-**	**-**	**24**	**-**	**-**	**10**	**10**
	2P Connector	**10**	**10**	**10**	**10**	**4**	**-**	**-**
	2P Terminal	**-**	**-**	**10**	**-**	**-**	**10**	**10**

4. QUALIFICATION TEST

4.1 Sample selection
Samples shall be prepared in accordance with applicable specification.

4.2 Test sequence
Qualification test shall be conducted as sequence specified in table of section 3.6.

4.3 Requalification test
If changes significantly affecting form, fit or function are made to product or manufacturing process, product assurance shall co-ordinate requalification testing, consisting of all or part of original testing sequence as determined by developments, product, quality and reliability engineering.

5. APPENDIX

5.1 Reflow Profile (see Fig. 1)

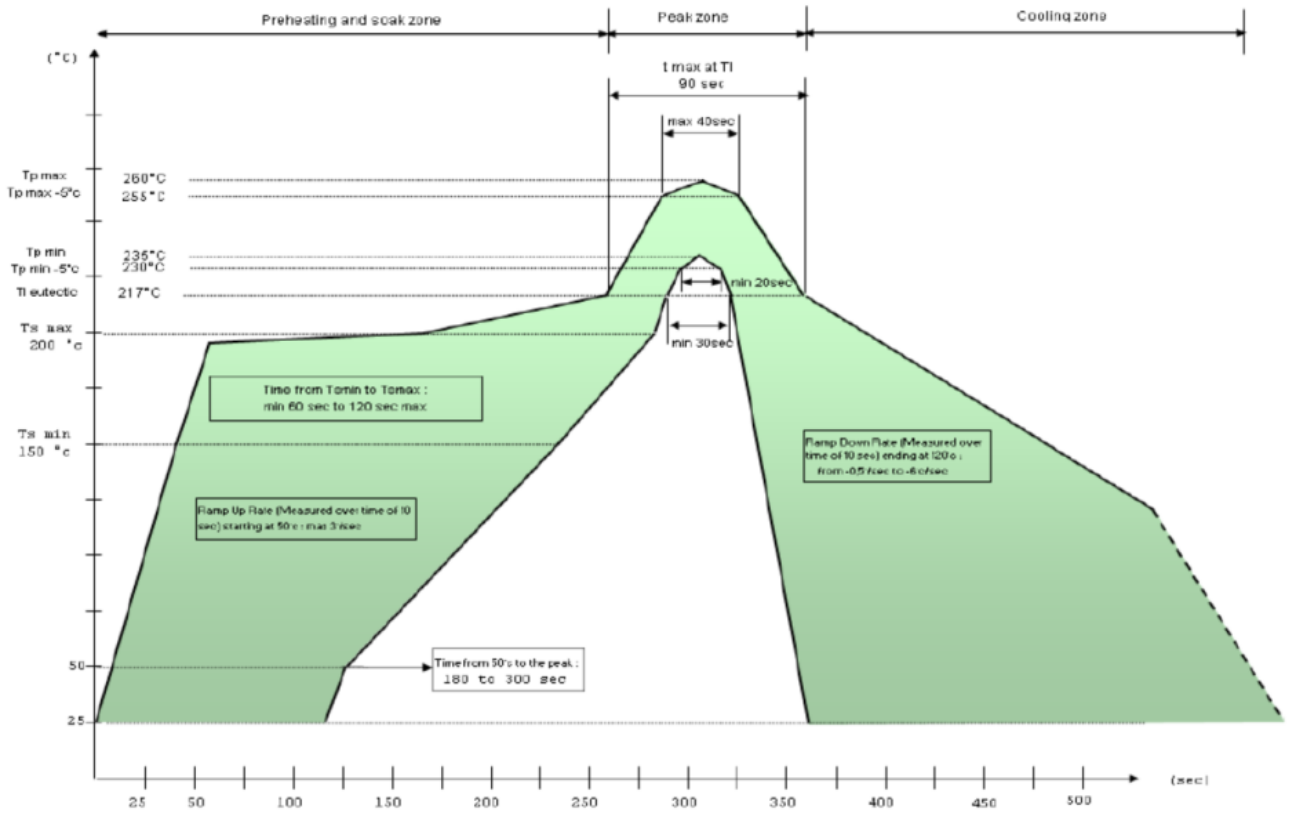


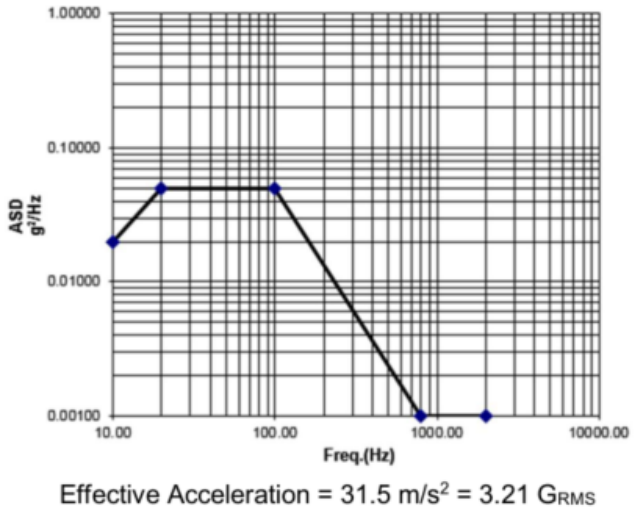
Fig. 1

5.2 Mechanical Shock Schedule (see Fig. 2)

Vibration Class	Shocks per Axis	Wave Shape	Direction (+/-)	Duration (ms)	Acceleration (g)
V1	10	Half Sine Wave	Positive	5 ~ 10	35

Fig. 2

5.3 Random Vibration Profile for Underhood Sprung Masses (see Fig. 3)

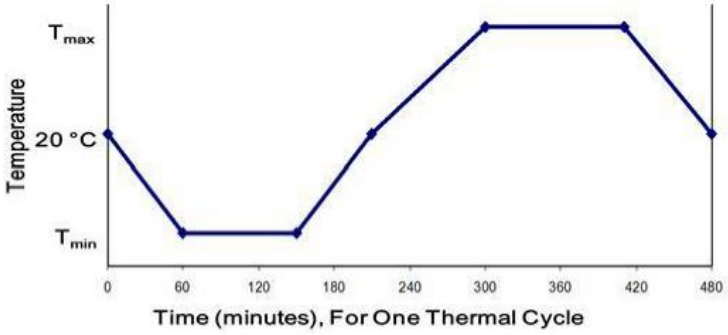


Effective Acceleration = 31.5 m/s^2 = 3.21 G_{RMS}

Frequency	Power Spectral Density
10 Hz	1.9324 $(m/s^2)^2$/Hz = 0.0200 g^2/Hz
20 Hz	4.8085 $(m/s^2)^2$/Hz = 0.0500 g^2/Hz
100 Hz	4.8085 $(m/s^2)^2$/Hz = 0.0500 g^2/Hz
800 Hz	0.0962 $(m/s^2)^2$/Hz = 0.0010 g^2/Hz
2000 Hz	0.0962 $(m/s^2)^2$/Hz = 0.0010 g^2/Hz

Fig. 3

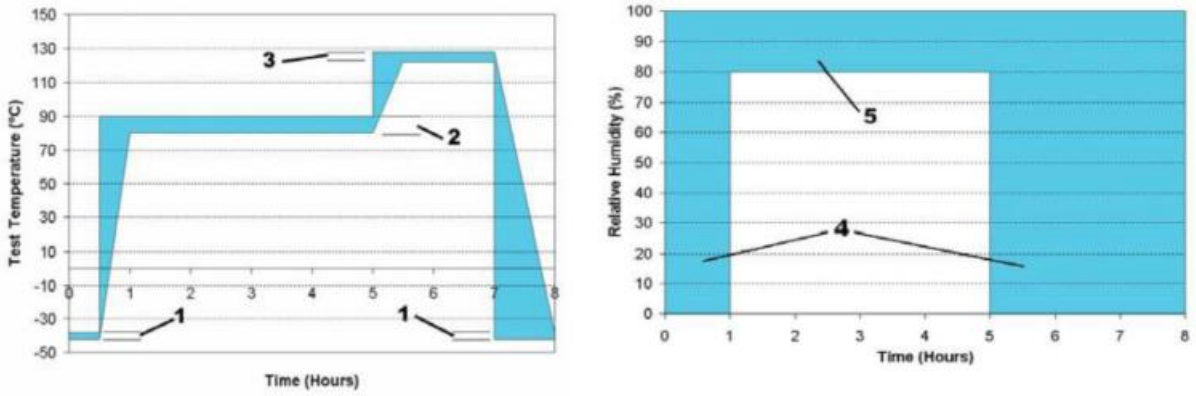
Thermal Cycle Profile Used During Vibration Test (see Fig. 4)



Time	Temperature
0 minutes	+20 °C
60 minutes	T_{min}
150 minutes	T_{min}
210 minutes	+20 °C
300 minutes	T_{max}
410 minutes	T_{max}
480 minutes	+20 °C

Fig.4

5.4 Temperature/Humidity Cycling Schedule (see Fig. 5)



Key: 1 (-40)°C 2 (80 – 90)°C 3 125° C
4 Relative Humidity, uncontrolled. Do not vent chamber at hour 5. 5 (80 – 100)% Relative Humidity

Fig. 5