Test Report

Industrial M12 Series Cable Assembly

1. INTRODUCTION

1.1 Purpose

Testing was performed on M12 Series Circular Connector with cable assembly type to determine its conformance to the requirements of product specification 108-106140.

1.2 Scope

This specification covers performance, test and quality requirements for Industrial M12 Series Circular Connector with cable assembly. Testing was performed at TE Connectivity Shanghai Electrical Test Laboratory.

1.3 Product Description

Part Number	Interface	Type	Code	Poles	Cable
T415XXXXXXX-XXX Un-shielded Type CA	M12 Plug M12 Receptacle	Straight Right Angle	A-Code B-Code D-Code	2 Pins 3 Pins 4 Pins 5 Pins	PVC(22AWG) PUR(22AWG)
T416XXXXXXX-XXX Shielded Type CA	M12 Plug M12 Receptacle	Straight Right Angle	A-Code B-Code D-Code	2 Pins 3 Pins 4 Pins 5 Pins	PVC(22AWG) PUR(22AWG)

1.3.1 Take minimum samples as below for testing to cover the whole family due to platform design

			A	B	C	D	E	Total
	PN	Description		Follow up with Group A				
Pair	T4151110005-001	RPC-M12-MS-5CON-PVC-0.5	9	3	3	3	3	12
	T4151420005-001	RPC-M12-FR-5CON-PUR-0.5	9	3	3	3	3	12
Pair	T4151220002-001	RPC-M12-MR-2CON-PUR-0.5	9	3	3	3	3	12
	T4151310002-001	RPC-M12-FS-2CON-PVC-0.5	9	3	3	3	3	12
Pair	T4161110005-001	RPC-M12-MS-5CON-PVC-0.5SH	3	3	0	0	0	3
	T4161320005-001	RPC-M12-FS-5CON-PUR-0.5SH	3	3	0	0	0	3
Pair	T4161210005-001	RPC-M12-MR-5CON-PVC-0.5SH	3	3	0	0	0	3
	T4161420005-001	RPC-M12-FR-5CON-PUR-0.5SH	3	3	0	0	0	3

1.4 Product Qualification Test Sequence

Test or Examination	Test Group				
	A(a)	B	C	D	E(f)
	Test Sequence				
Examination of product	1	3,6,11,20,26	8	9	1
Voltage proof(withstanding voltage)	4	10,19,25	4,7	4,8	
Insulation resistance	3	9,13,18,24	3,6	3,7	
LLCR	2	2,5,8,17,23	2	2	2,6
Temperature Rising				5(e)	
Impacting water		21	5	6	
Dust(IP6X)		22(b)			
Durability					4
Mating and Un-mating Force					3,5
Sinusoidal vibration		1			
Mechanical shock		4			
Rapid change in temperature		7		1	
Dry heat		12			
Damp heat, cyclic		14(c),16(d)			
Cold		15			
Mixed flowing gas			1		

(a) When the initial test group A has been completed, the specimens are divided in the 3 groups B, C, D. All connectors in each group shall undergo the tests specified for the relevant group numbers indicate sequence in which tests are performed.
(b) It's allowed to perform with an additional specimen, extending the total number of specimen by 1.
(c) First cycle
(d) Remaining cycles
(e) Test with additional specimen for over-molding type cable assembly
(f) This test group should be tested without the screw nut

*** Notes:**

Numbers indicate the sequence in which the tests are performed.

1.5 Environmental Conditions

Unless otherwise specified, the following environmental conditions prevailed during testing:

- Temperature: 15 to 35°C
- Relative Humidity: 20 to 80%

2. SUMMARY OF TESTING

2.1. Initial Examination of Product

All specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2 Test Group
2.2.1 Group A+B

Group	Test Item	Sample	Requirement	Test Condition and Result	Conclusion
A	LLCR	See 1.3.1	10 m Ω Max.	<10 m Ω	meet spec.
	Insulation resistance	See 1.3.1	100MΩ Min	>100MΩ	meet spec.
	Voltage Proof	See 1.3.1	No breakdown or flashover	No breakdown and flashover	meet spec.
B	Sinusoidal vibration	See 1.3.1	No physical damage; No electrical discontinuity greater than 1μs	See 2.3.1 Fig.1	meet spec.
	LLCR	See 1.3.1	Δ15mΩ max.	<15 mΩ	meet spec.
	Examination of product	See 1.3.1	No defect would impair normal operation	Normal	meet spec.
	Mechanical shock	See 1.3.1	No physical damage; No electrical discontinuity greater than 1μs	See 2.3.2 Fig.2	meet spec.
	LLCR	See 1.3.1	Δ15mΩ max.	<15 mΩ	meet spec.
	Examination of product	See 1.3.1	No defect would impair normal operation	Normal	meet spec.
	Rapid change in temperature	See 1.3.1	No physical damage	See 2.3.3 Fig.3	meet spec.
	LLCR	See 1.3.1	Δ15mΩ max.	<15 mΩ	meet spec.
	Insulation resistance	See 1.3.1	100MΩ Min	>100MΩ	meet spec.
	Voltage proof(withstanding voltage)	See 1.3.1	No breakdown or flashover	No breakdown and flashover	meet spec.
	Examination of product	See 1.3.1	No defect would impair normal operation	Normal	meet spec.
	Dry heat	See 1.3.1	No physical damage	Normal	meet spec.
	Insulation resistance	See 1.3.1	100MΩ Min	>100MΩ	meet spec.
	Damp heat, cyclic	See 1.3.1	No physical damage	See 2.3.2 Fig.4	meet spec.
	Cold	See 1.3.1	No physical damage	Normal	meet spec.
	Damp heat, cyclic	See 1.3.1	No physical damage	See 2.3.2 Fig.4	meet spec.
	LLCR	See 1.3.1	Δ15mΩ max.	<15 mΩ	meet spec.
	Insulation resistance	See 1.3.1	100MΩ Min	>100MΩ	meet spec.
	Voltage proof(withstanding voltage)	See 1.3.1	No breakdown or flashover	No breakdown or flashover	meet spec.

	Examination of product	See 1.3.1	No defect would impair normal operation	Normal	meet spec.
	Impacting water	See 1.3.1	No water ingress	No water ingress	meet spec.
	LLCR	See 1.3.1	Δ15mΩ max.	<15 mΩ	meet spec.
	Insulation resistance	See 1.3.1	100MΩ Min	>100MΩ	meet spec.
	Voltage proof(withstanding voltage)	See 1.3.1	No breakdown or flashover	No breakdown or flashover	meet spec.
	Examination of product	See 1.3.1	No physical damage	Normal	meet spec.

2.2.2 Group A+C

Group	Test Item	Sample Number	Requirement	Test Condition and Result	Conclusion
A	LLCR	See 1.3.1	10 m Ω Max.	<10 m Ω	meet spec.
	Insulation resistance	See 1.3.1	100MΩ Min	>100MΩ	meet spec.
	Voltage Proof	See 1.3.1	No breakdown or flashover	No breakdown and flashover	meet spec.
C	Mixed Flowing Gas	See 1.3.1	No corrosion and defect	See 2.3.5 Fig.5	meet spec.
	LLCR	See 1.3.1	Δ15mΩ max.	<15 mΩ	meet spec.
	Insulation resistance	See 1.3.1	100MΩ Min	>100MΩ	meet spec.
	Voltage proof(withstanding voltage)	See 1.3.1	No breakdown or flashover	No breakdown and flashover	meet spec.
	Impacting water	See 1.3.1	No water ingress	No water ingress	meet spec.
	Insulation resistance	See 1.3.1	100MΩ Min	>100MΩ	meet spec.
	Voltage proof(withstanding voltage)	See 1.3.1	No breakdown or flashover	No breakdown and flashover	meet spec.
	Examination of product	See 1.3.1	No defect would impair normal operation	Normal	meet spec.

2.2.3 Group A+D

Group	Test Item	Sample Number	Requirement	Test Condition and Result	Conclusion
A	LLCR	See 1.3.1	10 m Ω Max.	<10 m Ω	meet spec.
	Insulation resistance	See 1.3.1	100MΩ Min	>100MΩ	meet spec.
	Voltage Proof	See 1.3.1	No breakdown or flashover	No breakdown and flashover	meet spec.
D	Rapid change in temperature	See 1.3.1	No physical damage	See 2.3.3 Fig.3	meet spec.
	LLCR	See 1.3.1	Δ15mΩ max.	<15 mΩ	meet spec.
	Insulation resistance	See 1.3.1	100MΩ Min	>100MΩ	meet spec.
	Voltage proof(withstanding voltage)	See 1.3.1	No breakdown or flashover	No breakdown and flashover	meet spec.

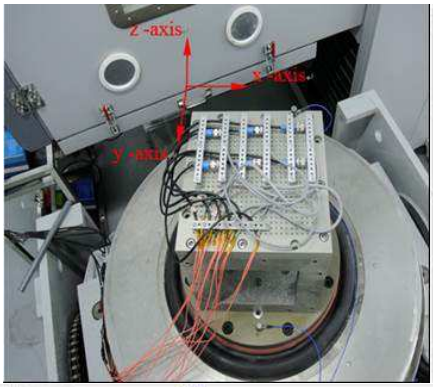
	Temperature Rising	See 1.3.1	ΔT 30° C Max.	See 2.3.6 Fig.6	meet spec
	Impacting water	See 1.3.1	No water ingress	No water ingress	meet spec.
	Insulation resistance	See 1.3.1	100MΩ Min	>100MΩ	meet spec.
	Voltage proof (withstanding voltage)	See 1.3.1	No breakdown or flashover	No breakdown and flashover	meet spec.
	Examination of product	See 1.3.1	No defect would impair normal operation	Normal	meet spec.

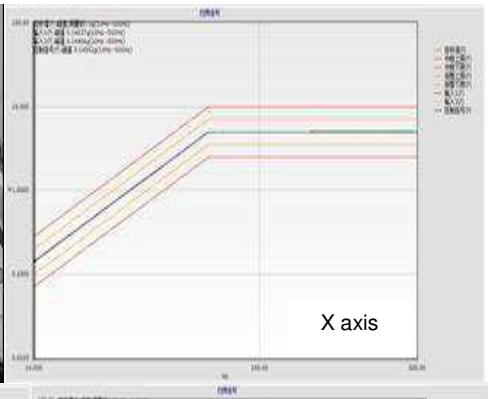
2.2.3 Group E

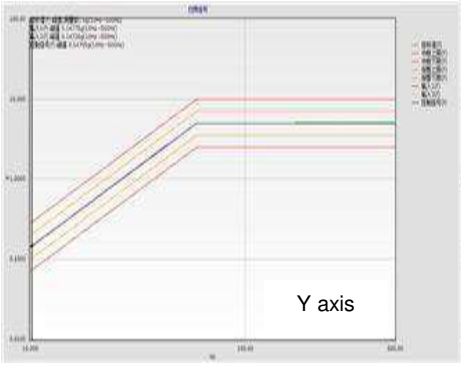
Group	Test Item	Sample Number	Requirement	Test Condition and Result	Conclusion
E	Examination of product	See 1.3.1	No defect would impair normal operation	Normal	meet spec.
	LLCR	See 1.3.1	10 m Ω Max.	<10 m Ω	meet spec.
	Mating and Un-mating Force	See 1.3.1	15N Max.	<15N	meet spec.
	Durability	See 1.3.1	100 cycles for gold plating 50 cycles for silver plating 20 cycles for tin plating	Normal	meet spec.
	Mating and Un-mating Force	See 1.3.1	15N Max.	<15N	meet spec.
	LLCR	See 1.3.1	10 m Ω Max.	<10 m Ω	meet spec.

2.3 Test Condition and results

2.3.1 Vibration test







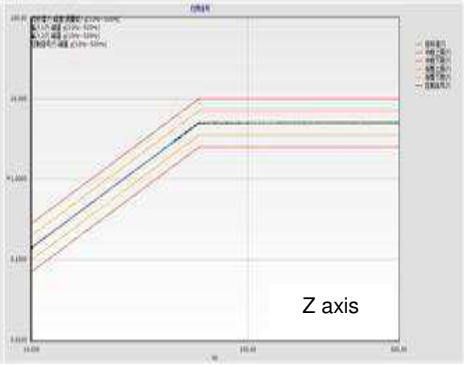
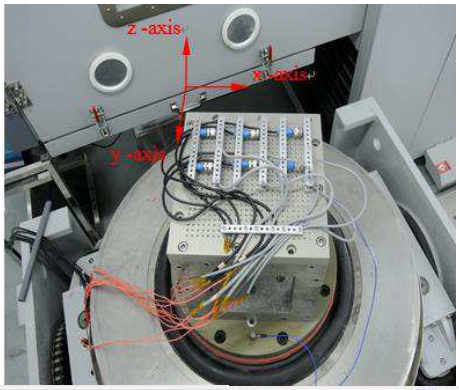


Fig.1

2.3.2 Mechnical shock



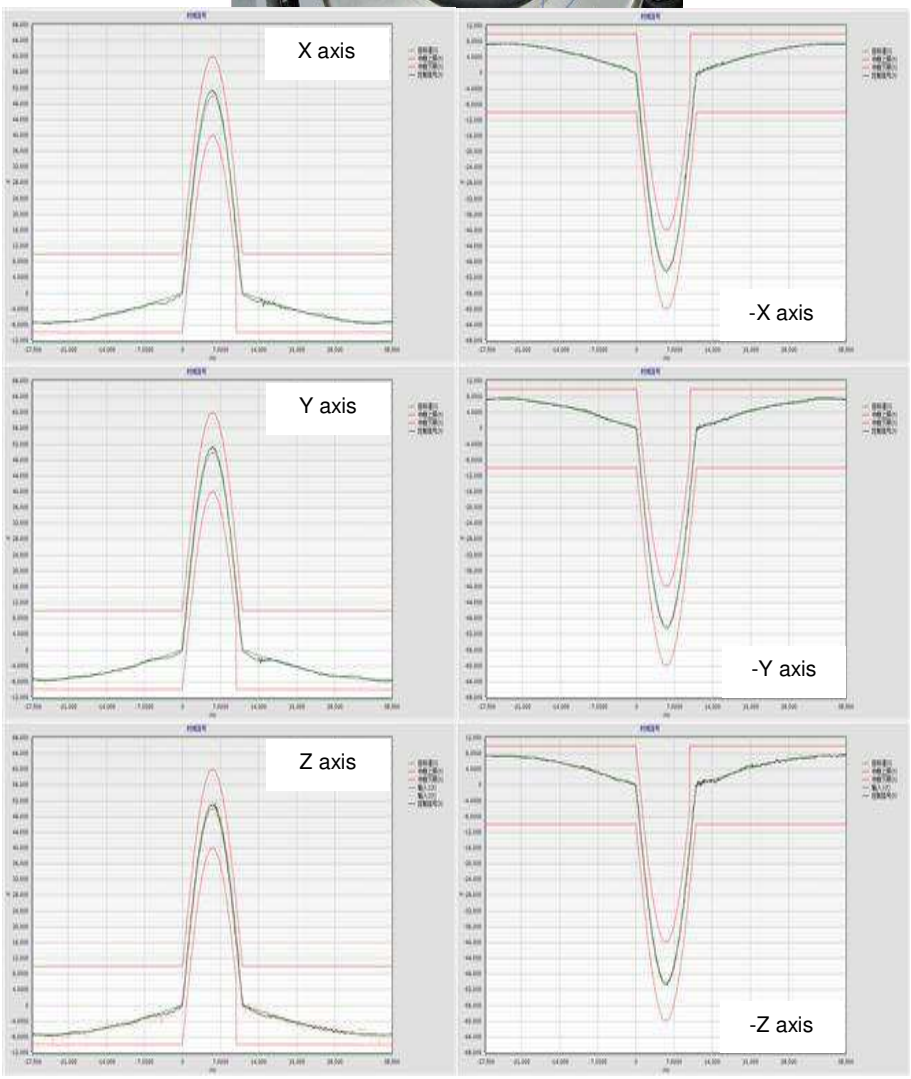
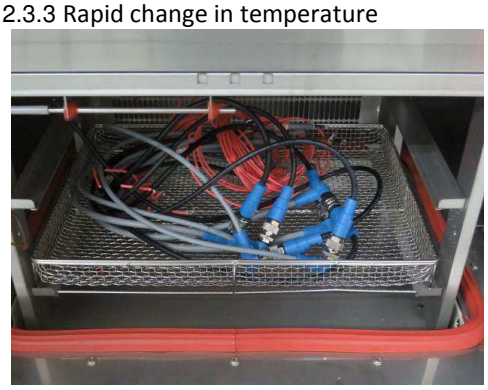


Fig.2

2.3.3 Rapid change in temperature



Test Step	Temperature	Period
1	-25℃	30Minutes
2	85℃	30 Minutes
Temperature transfer time: ≤5min Cycles: 5		

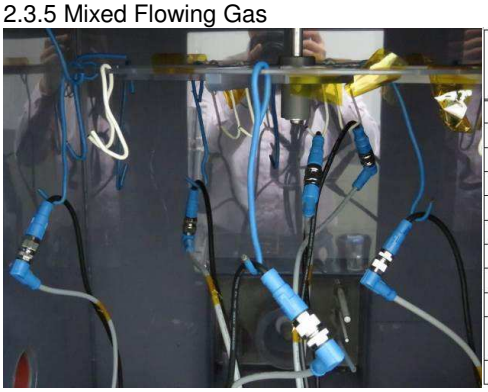
Fig.3

2.3.4 Damp heat, cyclic

Test Step	Initial	Final	Period
1	23℃/95%RH	40℃/95%RH	3h
2	40℃/95%RH	40℃/95%RH	9h
3	40℃/95%RH	23℃/95%RH	3h
4	23℃/95%RH	23℃/95%RH	9h
Cycles: 5			

Fig.4

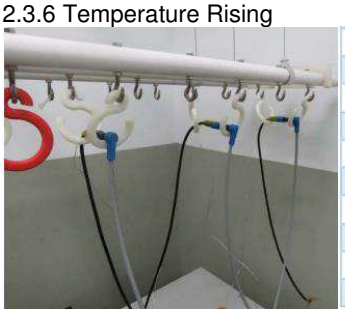
2.3.5 Mixed Flowing Gas



Gas	Test Condition		Actual Gas Concentration				
	Source(S)	Test Spec.(Ct)	Data1 Set(q)	Data2 Set(q)	Data3 Set(q)	Data4 Set(q)	Data5 Set(q)
Cl_2	100ppm	10ppb	80 0.15	80 0.15			
NO_2	0.10%	200ppb	1000 0.2	1000 0.2			
NO_2							
H_2S	99.5ppm	10ppb	100 0.1	100 0.1			
H_2S							
SO_2	0.1%	100ppb	1100 0.2	1100 0.2			
SO_2							
Dry-bulb Temp.	25℃	25℃	25.1℃	25.0℃			
Wet-bulb Temp.	75%RH	21.5℃	21.5℃	21.4℃			
Tester							
Date			3/11	3/14			

Fig.5

2.3.6 Temperature Rising



4A	01-01	01-02	01-03	Test Ambient
1	36.27	36.68	36.00	24.11
2	36.26	36.74	36.17	24.19
3	36.34	36.85	36.13	24.26
T	36.34	36.85	36.13	24.26
ΔT	12.08	12.59	11.87	/
max	12.59			
min	11.87			
ave	12.18			
NOTES: The number 1-3 dedicated the last three readings of recorder to show whether the data were stable in testing.				

Fig.6