Test Report

Industrial M12 Plug Insert Series Connector

1. INTRODUCTION

1.1 Purpose

Testing was performed on M12 Plug Insert Series Connector to determine its conformance to the requirements of product specification 108-137405.

1.2 Scope

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

1.3 Product Description

Part Number	Interface	Type	Code	Poles
T414XXXXXXX-XXX Solder PCB Type	M12 Plug M12 Receptacle	Plug Insert	L-Code	4 Pins

1.4 Product Qualification Test Sequence

Test Examination	Test Group				
	A(a)	B	C	D	E
	Test Sequence				
Examination of product	1	5,14	5	1	
Voltage proof (withstanding voltage)	4	4,13	4	9	
Insulation resistance	3	3,7,12	3	8	
LLCR	2	2,11	2	2,7	
Current-temperature derating					1
Durability				5	
Mating and Un-Mating Force				4,6	
Retention force of the contacts in the insulator			6		
Rapid change in temperature		1		3	
Dry heat		6			
Damp heat, cyclic		8(b),10(c)			
Cold		9			
Mixed flowing gas			1		

NOTE:

(a) When the initial test group A has been completed, the specimens are divided in the 2 groups B, C, all connectors in each group shall undergo the tests specified for the relevant group numbers indicate sequence in which tests are performed.
(b) First cycle
(c) Remaining cycles

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 Number	Requirement	Test Condition and Result	Conclusion
A	LLCR	3	5 m Ω Max. (Initial)	<5 m Ω	meet spec.
	Insulation resistance	3	100MΩ Min	>100MΩ	meet spec.
	Voltage Proof	3	No breakdown or flashover	No breakdown and flashover	meet spec.
B	Rapid change in temperature	3	No physical damage	See 2.3.1 Fig.1	meet spec.
	LLCR	3	Δ10mΩ max.	ΔR <10 mΩ	meet spec.
	Insulation resistance	3	100MΩ Min	>100MΩ	meet spec.
	Voltage proof (withstanding voltage)	3	No breakdown or flashover	No breakdown and flashover	meet spec.
	Examination of product	3	No defect would impair normal operation	Normal	meet spec.
	Dry heat	3	No physical damage	Normal	meet spec.
	LLCR	3	Δ10mΩ max.	ΔR <10 mΩ	meet spec.
	Insulation resistance	3	100MΩ Min	>100MΩ	meet spec.
	Damp heat, cyclic	3	No physical damage	See 2.3.2 Fig.2	meet spec.
	Cold	3	No physical damage	Normal	meet spec.
	Damp heat, cyclic	3	No physical damage	See 2.3.2 Fig.2	meet spec.
	LLCR	3	Δ10mΩ max.	ΔR <10 mΩ	meet spec.

	Insulation resistance	3	100MΩ Min	>100MΩ	meet spec.
	Voltage proof (withstanding voltage)	3	No breakdown or flashover	No breakdown and flashover	meet spec.
	Examination of product	3	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	3	5 m Ω Max. (Initial)	<5 m Ω	meet spec.
	Insulation resistance	3	100MΩ Min	>100MΩ	meet spec.
	Voltage Proof	3	No breakdown or flashover	No breakdown and flashover	meet spec.
C	Mixed Flowing Gas	3	No corrosion and defect	See 2.3.3 Fig.3	meet spec.
	LLCR	3	Δ10mΩ max.	ΔR <10 mΩ	meet spec.
	Insulation resistance	3	100MΩ Min	>100MΩ	meet spec.
	Voltage proof (withstanding voltage)	3	No breakdown or flashover	No breakdown and flashover	meet spec.
	Examination of product	3	No defect would impair normal operation	Normal	meet spec.
	Retention force of the contacts in the insulator	3	30N min. IEC 60512 (15 a - d)	Male ≥50N Female≥50N	meet spec.

2.2.3 Group D

Group	Test Item	Sample Number	Requirement	Test Condition and Result	Conclusion
D	Examination of product	3	No defect would impair normal operation	Normal	meet spec.
	LLCR	3	5 m Ω Max. (Initial)	<5 m Ω	meet spec.
	Rapid change in temperature	3	No physical damage	See 2.3.1 Fig.1	meet spec.
	Mating and Un-Mating Force	3	Total insertion force 90 N max for 4 poles Total withdrawal force 70 N max 4 poles	Initial: Mating force: 20.8 N Max. Withdrawal force: 26.3 N Max.	meet spec.
	Durability	3	250 cycles for gold plating	Normal	meet spec.
	Mating and Un-Mating Force	3	Total insertion force 90 N max for 4 poles Total withdrawal force 70 N max 4 poles	After: Mating force: 21.9 N Max. Withdrawal force: 15.7 N Max.	meet spec.
	LLCR	3	After value: final value=1.5* Initial value mΩ Max.	ΔR= (Final-1.5*initial value) <0	meet spec

	Insulation resistance	3	100MΩ Min	>100MΩ	meet spec.
	Voltage proof (withstanding voltage)	3	No breakdown or flashover	No breakdown and flashover	meet spec.

2.2.4 Group E

Group	Test Item	Sample Number	Requirement	Test Condition and Result	Conclusion
E	Current-temperature derating	3	Specified current carrying capacity has to be guaranteed for the specified ambient temperature when all contacts are loaded simultaneously The sum of ambient temperature t1 and the temperature ΔT shall not exceed the upper temperature limit of the plastic material (105◦C)	The break-point of derating curve corresponds to the current 16A&46℃ ambient temperature	See 2.3.4 Fig.4

2.3 Test Condition and Picture

2.3.1 Rapid change in temperature

Test Step	Temperature	Test Duration
1	-40°C	30 minutes
2	105°C	30 minutes
Temperature transfer time: ≤5 minutes Cycles: 5		

Fig.1

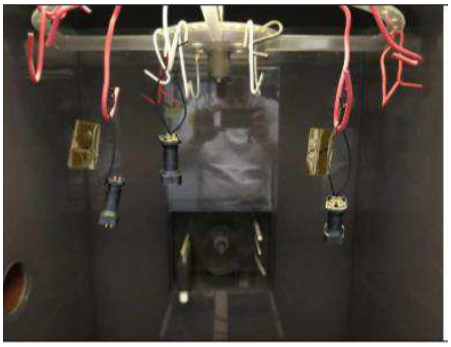
2.3.2 Damp heat, cyclic

Y axis Z axis

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.2

2.3.3 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	100 / 0.1	100 / 0.1			
NO_2	0.10%	200ppb	1000 / 0.2	1000 / 0.2			
H_2S	99.5ppm	10ppb	100 / 0.1	100 / 0.1			
H_2S							
SO_2	0.10%	200ppb	1000 / 0.2	1000 / 0.2			
SO_2							
Dry-bulb Temp.	25℃	25.0℃	25.0℃	25.0℃			
Wet-bulb Temp.	75%RH	21.5℃	21.5℃	21.5℃			
Tester			Lisa Xu	Lisa Xu			
Date			5/10/2019	5/14/2019			

Fig.3

2.3.4 derating curve

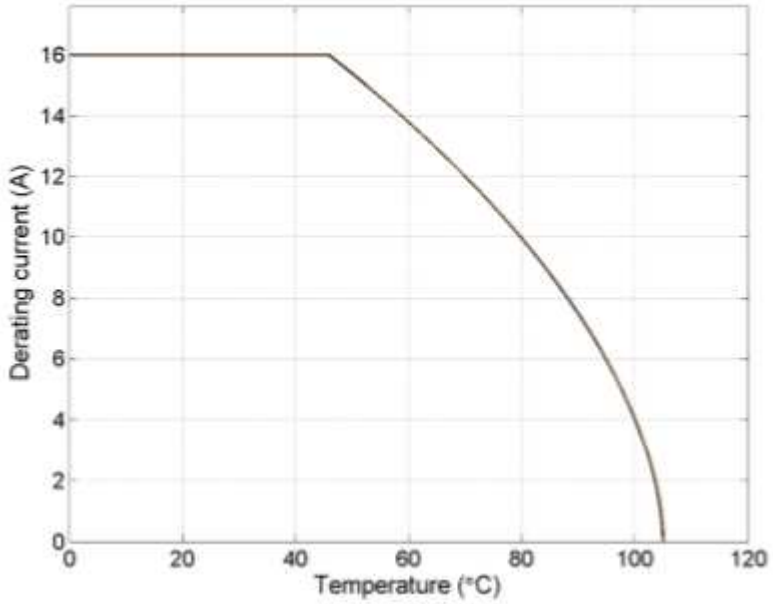


Fig.4