

Test Report

Industrial M12 Series Circular Connector

Tyco Electronics. (Shanghai) Co., Ltd.

1. INTRODUCTION

1.1 Purpose

Testing was performed on Industrial M8 and M12 Series Circular Connector to determine its conformance to the requirements to product specification 108-106140.

1.2 Scope

This specification covers performance, test and quality requirements for Industrial M8 and M12 Series Circular Connector. Testing was performed at TE Connectivity Shanghai Electrical Test Laboratory.

1.3 Product Description

Part Number	Interface	Type	Code	Poles	Cable Outlet
T411XXXXXXX-XXX	M12 Plug M12 Receptacle	Straight Right Angle	A-Code	2 Pins 3 Pins 4 Pins 5 Pins	PG7 PG9
				8Pins 12 Pins	PG9
			B-Code D-Code	2 Pins 3 Pins 4 Pins 5 Pins	PG7 PG9

1.4 Product Qualification Test Sequence

Test or Examination	Test Group				
	A(a)	B	C	D	E
	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	2,4	2,6
Temperature Rising				5	
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

* 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 A

Group	Test Item	Sample Number	Requirement	Result			Conclusion
				Max.	Min.	Ave.	
A	LLCR	12	8 mΩ Max.	7.52	2.43	3.83	meet spec.
	Insulation resistance	12	100MΩ Min	9.94x10 ¹⁰ Ω	3.83 x10 ¹⁰ Ω	6.61 x10 ¹⁰ Ω	meet spec.
	Voltage Proof	12	No breakdown or flashover	No breakdown and flashover			meet spec.

2.3 Test Group B

Group	Test Item	Sample Number	Requirement	Result			Conclusion
				Max.	Min.	Ave.	
B	Vibration	3	No physical damage; No electrical discontinuity greater than 1 μs	Refer to fig.1, fig.2			meet spec.
	LLCR	3	Δ15 mΩ Max.	6.46	1.37	2.77	meet spec.
	Mechanical shock	3	No physical damage; No electrical discontinuity greater than 1 μs	Refer to fig.3, fig.4			meet spec.
	LLCR	3	Δ15 mΩ Max.	10.87	4.29	7.89	meet spec.
	Rapid change of temperature	3	No visual change	Refer to Fig.5			meet spec.
	LLCR	3	Δ15 mΩ Max.	4.16	1.89	2.46	meet spec.
	Insulation resistance	3	100MΩ Min	6.66x10 ¹⁰ Ω	3.58x10 ¹⁰ Ω	5.11x10 ¹⁰ Ω	meet spec.
	Voltage Proof	3	No breakdown or flashover	No breakdown and flashover			meet spec.
	Dry Heat	3	No visual change	No visual change was found after test. Fig.6			meet spec.
	Insulation resistance	3	100MΩ Min	7.51x10 ¹⁰ Ω	1.2x10 ¹⁰ Ω	4.27x10 ¹⁰ Ω	meet spec.
	Damp heat, cyclic	3	No visual change	Refer to Fig.7			meet spec.
	Cold	3	No visual change	Refer to Fig.8			meet spec.
	Damp heat, cyclic	3	No visual change	Refer to Fig.9			meet spec.
	LLCR	3	Δ15 mΩ Max.	5.48	3.02	3.02	meet spec.
	Insulation resistance	3	100MΩ Min	11.97x10 ¹⁰ Ω	5.01x10 ¹⁰ Ω	8.04x10 ¹⁰ Ω	meet spec.
	Voltage Proof	3	No breakdown or flashover	No breakdown and flashover			meet spec.
	Impacting water	3	No water ingress was found after test.	Refer to Fig.10			meet spec.

2.3.1 Vibration test

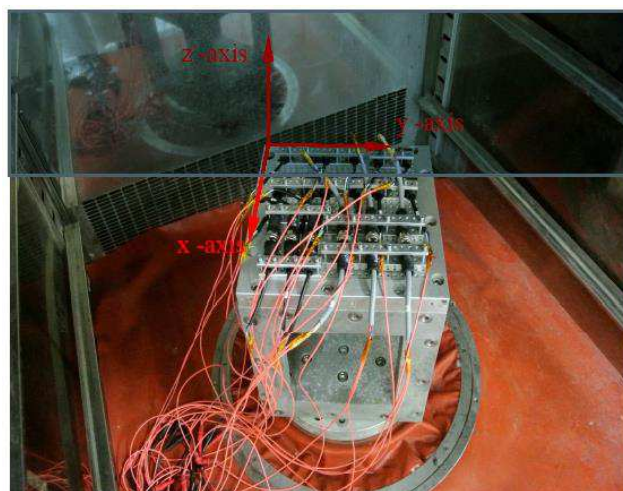


Fig.1

Text Curve (z-axis)

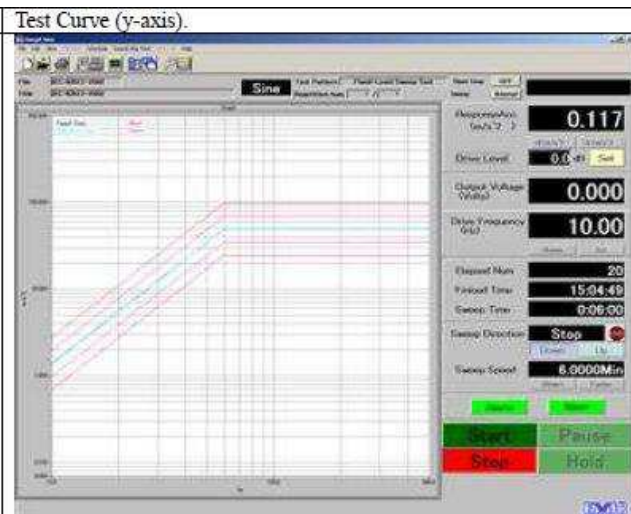
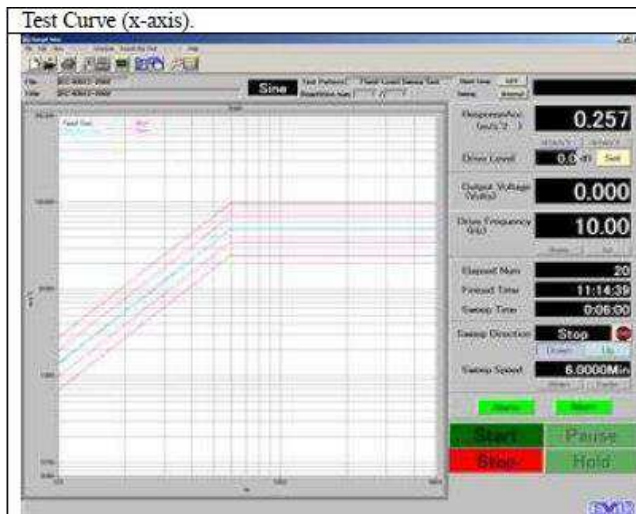
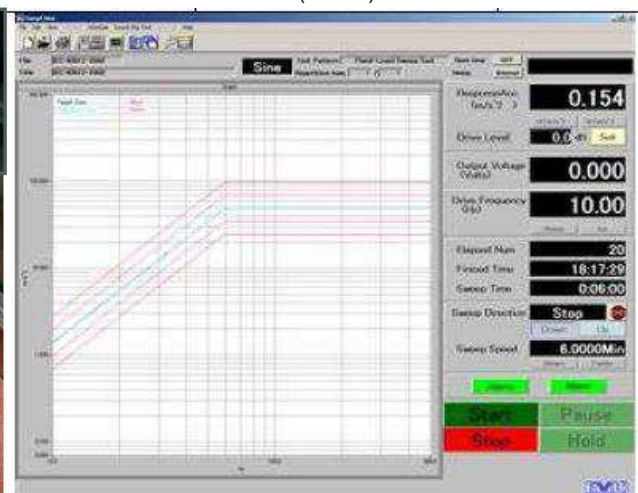


Fig.2

2.3.2 Mechanical shock

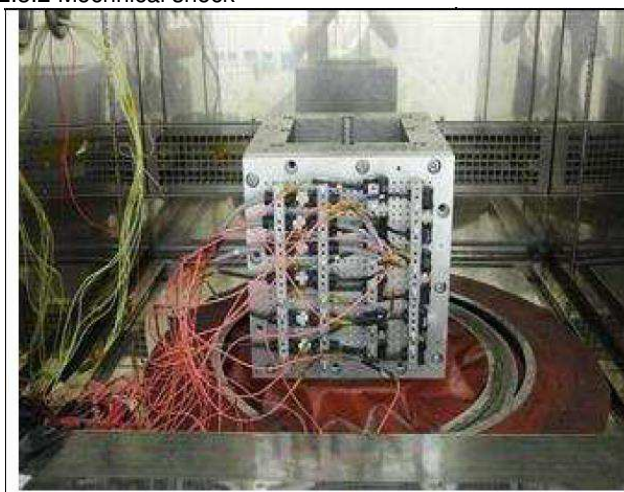
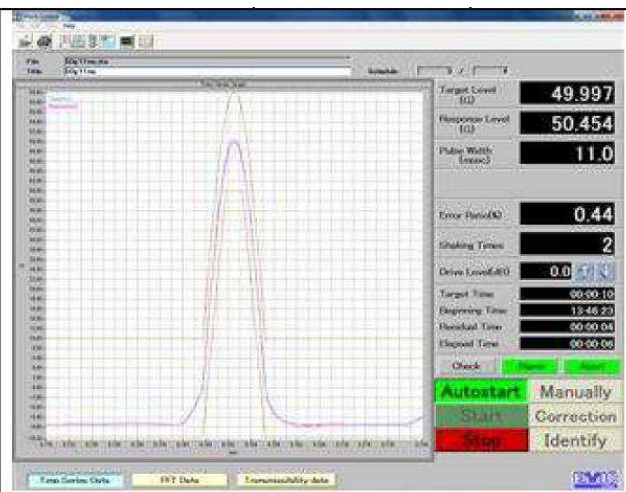


Fig.3



Text Curve(z-axis)

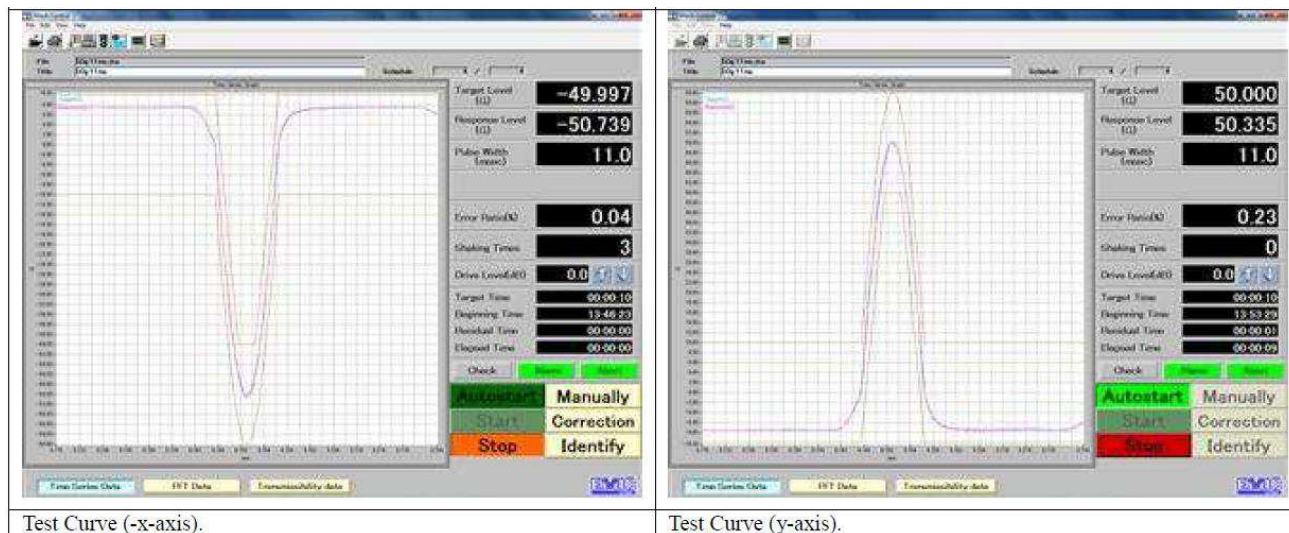


Fig.4

2.3.3 Rapid Change In Temperature

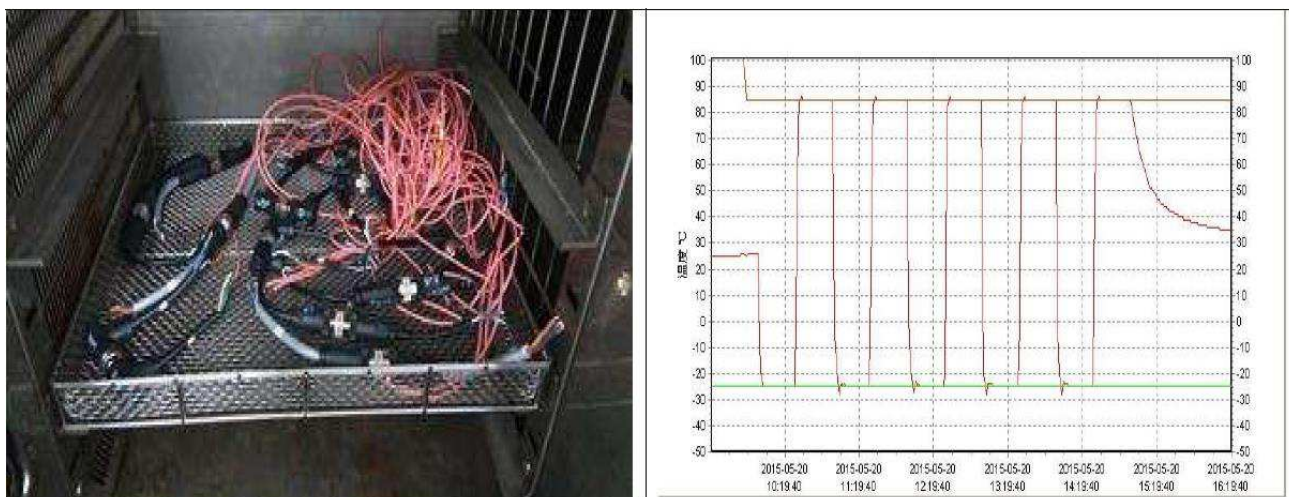


Fig.5

2.3.4 Dry Heat

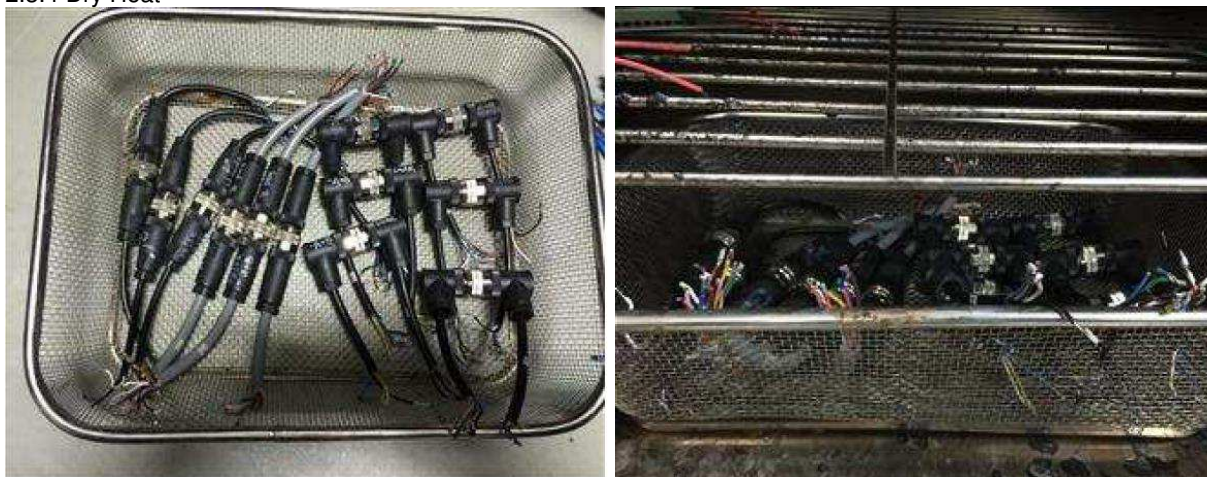


Fig.6

2.3.5 Damp Heat Cyclic



Fig.7

2.3.6 Cold

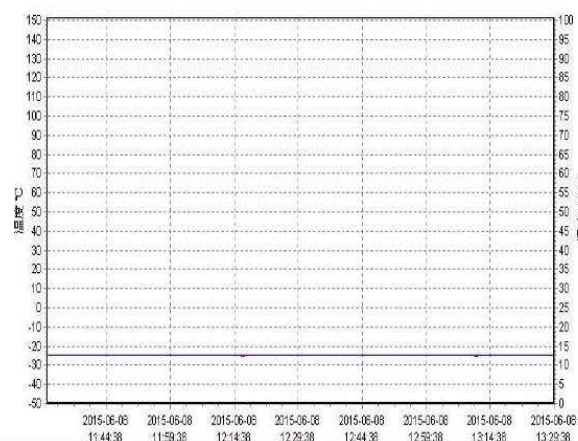


Fig.8

2.3.7 Damp heat, cyclic

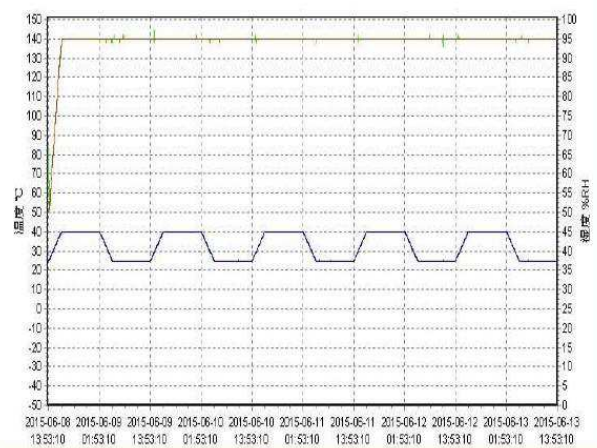


Fig.9

2.3.8 Impacting water



Fig.10

2.4 Test Group C

Group	Test Item	Sample Number	Requirement	Result			Conclusion
				Max.	Min.	Ave.	
C	Mixed flowing gas	3	No corrosion and defect	Refer to Fig.11			meet spec.
	LLCR	3	$\Delta 15 \text{ m}\Omega$ Max.	4.85	1.41	2.42	meet spec.
	Insulation resistance	3	100M Ω Min.	$6.24 \times 10^{10} \Omega$	$1.94 \times 10^{10} \Omega$	$3.19 \times 10^{10} \Omega$	meet spec.
	Voltage Proof	3	No breakdown or flashover	No breakdown and flashover			meet spec.
	Impacting water	3	No ingress of water	Refer to Fig.10			meet spec.
	Insulation resistance	3	100M Ω Min.	2.84	1.17	1.97	meet spec.
	Voltage Proof	3	No breakdown or flashover	No breakdown and flashover			meet spec.
	Examination product	3	No defect	No visual change			meet spec.

2.4.1 Mixed flowing gas

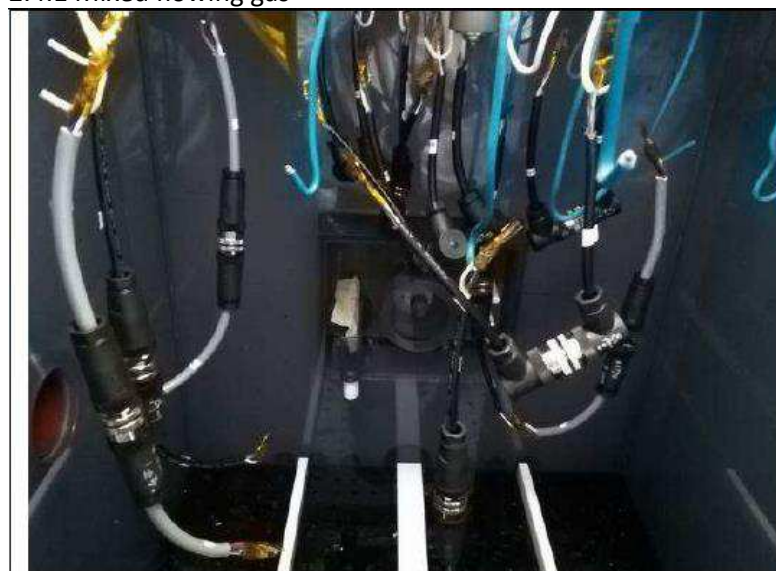


Fig.11

Gas	Test Condition	
	Source(S)	Test Spec.(Ct)
Cl ₂	100ppm	10ppb
NO ₂	0.10%	200ppb
NO ₂		
H ₂ S	99.5ppm	10ppb
H ₂ S		
SO ₂	1%	200ppb
SO ₂		
Dry-bulb Temp.	30℃	30℃
Wet-bulb Temp.	70%	25.5℃

2.5 Test Group D

Group	Test Item	Sample Number	Requirement	Result			Conclusion
				Max.	Min.	Ave.	
D	Rapid change of temperature	3	No visual change	Refer to Fig.5			meet spec.
	LLCR	3	$\Delta 15 \text{ m}\Omega$ Max.	8.00	3.21	4.06	meet spec.
	Insulation resistance	3	100M Ω Min.	$2.9 \times 10^{10} \Omega$	$5.46 \times 10^9 \Omega$	$1.16 \times 10^{10} \Omega$	meet spec.
	Voltage Proof	3	No breakdown or flashover	No breakdown and flashover			meet spec.
	Temperature rising	3	$\Delta T 30^\circ\text{C}$ Max	Refer to Fig.12			meet spec.
				17.28 $^\circ\text{C}$	11.78 $^\circ\text{C}$	14.78 $^\circ\text{C}$	
	Impacting water	3	No water ingress was found after test.	Refer to Fig.10			meet spec.
	Insulation resistance		100M Ω Min.	$7.85 \times 10^{10} \Omega$	$1.32 \times 10^8 \Omega$	$3.17 \times 10^{10} \Omega$	meet spec.
	Voltage Proof		No breakdown or flashover	No breakdown and flashover			meet spec.
	Examination product	3	No visual change	No visual change			meet spec.

2.5.1 Temperature rising

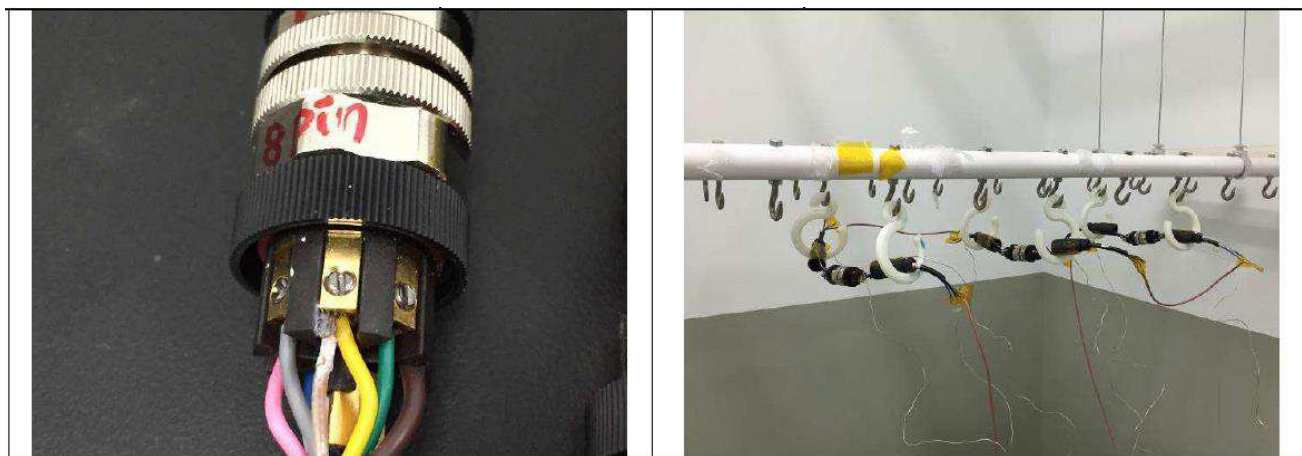


Fig.12

2.6 Test Group E

Group	Test Item	Sample Number	Requirement	Result			Conclusion
				Max.	Min.	Ave.	
E	LLCR	3	$\Delta 15 \text{ m}\Omega$ Max.	6.04	3.83	5.06	meet spec.
	Mating and Unmating Force	3	Refer to 108-106140	Refer to Fig.13			meet spec.
	Durability	3	No physical damage	No physical damage			meet spec.
	Mating and Unmating Force	3	Refer to 108-106140	Refer to Fig.14			meet spec.
	LLCR	3	$\Delta 15 \text{ m}\Omega$ Max.	6.84	2.53	3.56	meet spec.

2.6.1 Mating & unmating force

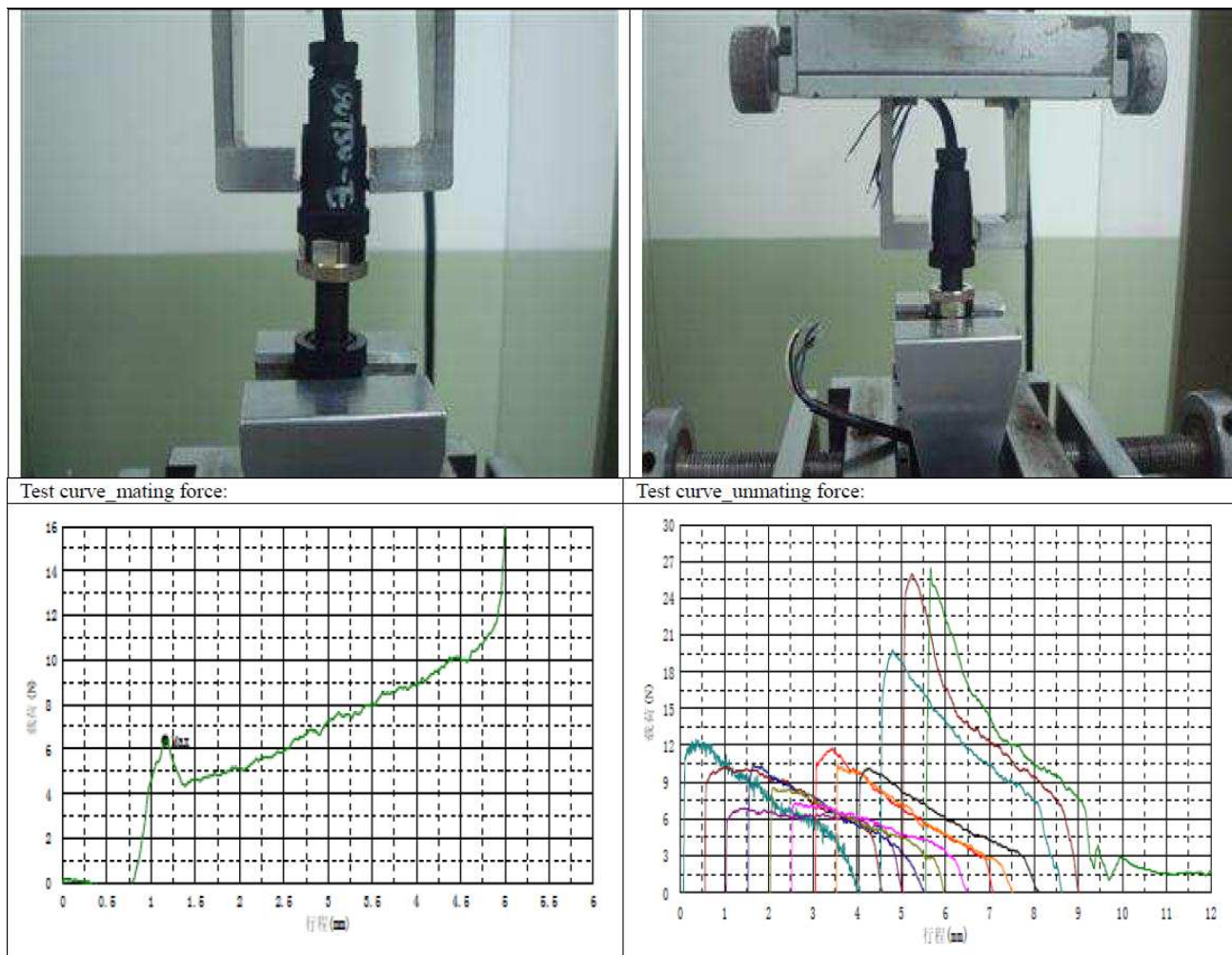


Fig.13

2.6.2 After durability test the mating & unmating force

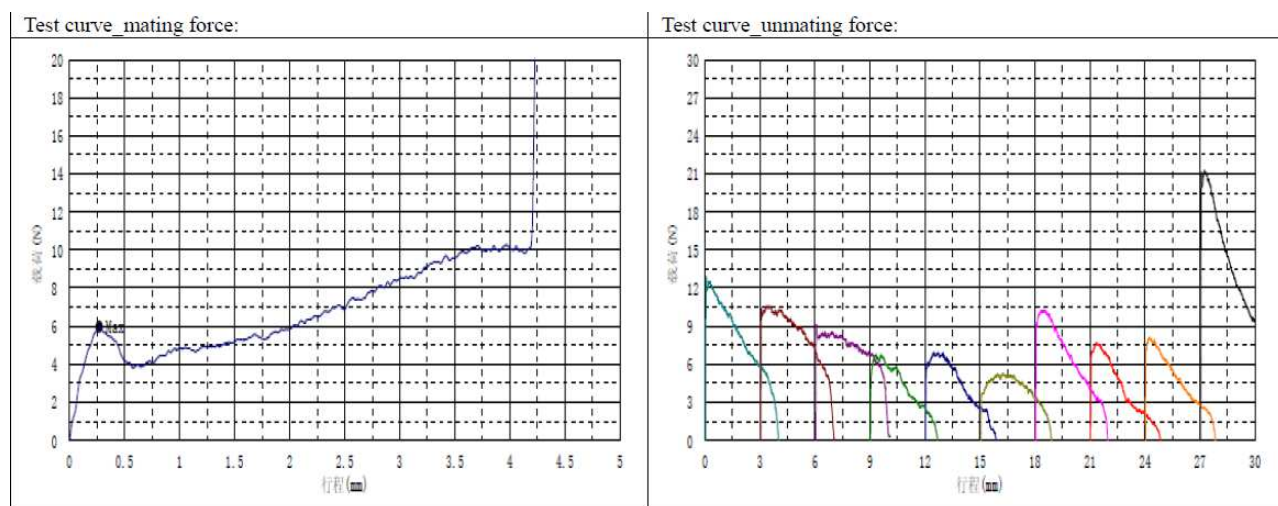


Fig.14

3. Conclusion

Based on the test results Industrial M12 Series Circular Connectors meet all requirements according to Tyco Electronics product specification 108-106140.