Nano MAG-MATE* Terminals

1. INTRODUCTION

1.1. Purpose

Testing was performed on the TE Connectivity (TE) Nano MAG-MATE to determine its conformance to the requirements of Product Specification 108-140191.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of Nano MAG-MATE. Testing was performed at Tyco Electronics Japan G.K Test Laboratory between April 13, 2020 and May 29, 2020.

1.3. Conclusion

All part numbers listed in paragraph 1.4 conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-140191, Revision A.

1.4. Test Specimens

The test specimens were representative of normal production lots, and the following part numbers were used for testing (see Figure 1). Plastic cavity 411-106401 was used for all testing. (see Figure 2).

Test Group	Quantity	Part Number	Description
1	6	2366999-1	Nano MAG-MATE on Φ0.09mm Cu magnet wire (single termination)
	6	2366999-1	Nano MAG-MATE on Φ0.25mm Cu magnet wire (single termination)
	12	2366999-1	Nano MAG-MATE on Φ0.09mm x2 Cu magnet wire (double termination)
	12	2366999-2	Nano MAG-MATE on Φ0.25mm x2 Cu magnet wire (double termination)
2	6	2366999-1	Nano MAG-MATE on Φ0.09mm Cu magnet wire (single termination)
	6	2366999-1	Nano MAG-MATE on Φ0.25mm Cu magnet wire (single termination)
	12	2366999-1	Nano MAG-MATE on Φ0.09mm x2 Cu magnet wire (double termination)
	12	2366999-2	Nano MAG-MATE on Φ0.25mm x2 Cu magnet wire (double termination)
3	6	2366999-1	Nano MAG-MATE on Φ0.09mm Cu magnet wire (single termination)
	6	2366999-1	Nano MAG-MATE on Φ0.25mm Cu magnet wire (single termination)
	12	2366999-1	Nano MAG-MATE on Φ0.09mm x2 Cu magnet wire (double termination)
	12	2366999-2	Nano MAG-MATE on Φ0.25mm x2 Cu magnet wire (double termination)
4	6	2366999-1	Nano MAG-MATE on Φ0.09mm Cu magnet wire (single termination)
	6	2366999-1	Nano MAG-MATE on Φ0.25mm Cu magnet wire (single termination)
	12	2366999-1	Nano MAG-MATE on Φ0.09mm x2 Cu magnet wire (double termination)
	12	2366999-2	Nano MAG-MATE on Φ0.25mm x2 Cu magnet wire (double termination)
5	10	2366999-1	Nano MAG-MATE on Φ0.09mm Cu magnet wire (single termination)
	10	2366999-1	Nano MAG-MATE on Φ0.25mm Cu magnet wire (single termination)

Figure 1

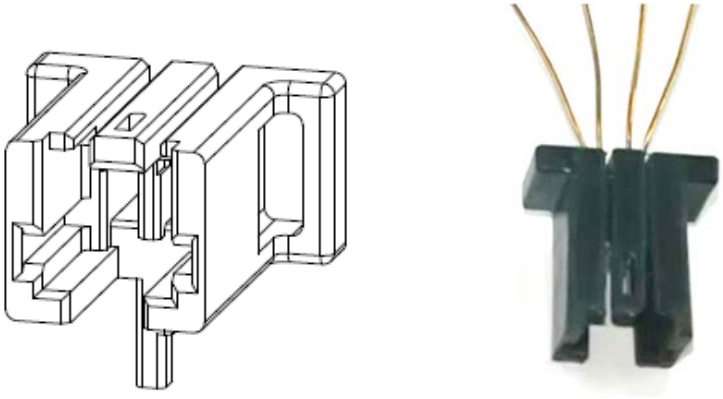

Figure 2

1.5. Qualification Test Sequence

TEST OR EXAMINATION	TEST GROUP (a)				
	1	2	3	4	5
	TEST SEQUENCE (b)				
Initial examination of product	1	1	1	1	1
Low level contact resistance (LLCR)	2, 4	2, 4	2, 4	2, 4	
Vibration, sinusoidal			3		
Retention force					2
Thermal shock	3				
Humidity, steady state		3			
Temperature life				3	
Final examination of product	5	5	5	5	

NOTE
(a) See Paragraph 1.4.
(b) Numbers indicate sequence which tests were performed.

Figure 3

1.6. Environmental Conditions

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

Temperature: 15℃ to 35℃
Relative Humidity: 20% to 80%

2. SUMMARY OF TESTING

2.1. Initial Examination of Product – All Test Group

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by Product Assurance. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Low Level Contact Resistance (LLCR) – Test Group 1, 2, 3 and 4

All LLCR measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage met the requirement of 22.5mΩ for AWG#36 to 40 and 14.1mΩ for AWG#30 to 34. LLCR summary data is shown in Table 1.

Table 1 - Contact Resistance

Test Group	Number of Data Points	Condition		Unit	Test Result			Requirement
					Min	Max	Mean	
1	6	PN2366999-1 Φ0.09mm (Single)	Initial	mΩ	7.30	9.80	8.67	22.5 Max.
			Final	mΩ	6.90	9.20	8.22	22.5 Max.
	6	PN2366999-1 Φ0.25mm (Single)	Initial	mΩ	2.22	2.87	2.55	14.1 Max.
			Final	mΩ	2.46	3.02	2.70	14.1 Max.
	12	PN2366999-1 Φ0.09mm x2 (Double)	Initial	mΩ	7.50	10.90	8.88	22.5 Max.
			Final	mΩ	7.30	10.70	8.80	22.5 Max.
	12	PN2366999-2 Φ0.25mm x2 (Double)	Initial	mΩ	2.45	3.02	2.68	14.1 Max.
			Final	mΩ	2.38	2.91	2.68	14.1 Max.
2	6	PN2366999-1 Φ0.09mm (Single)	Initial	mΩ	7.00	9.40	8.50	22.5 Max.
			Final	mΩ	7.40	9.90	8.87	22.5 Max.
	6	PN2366999-1 Φ0.25mm (Single)	Initial	mΩ	2.49	2.81	2.62	14.1 Max.
			Final	mΩ	2.28	2.83	2.63	14.1 Max.
	12	PN2366999-1 Φ0.09mm x2 (Double)	Initial	mΩ	7.00	11.90	9.41	22.5 Max.
			Final	mΩ	7.40	12.50	9.85	22.5 Max.
	12	PN2366999-2 Φ0.25mm x2 (Double)	Initial	mΩ	2.63	3.07	2.82	14.1 Max.
			Final	mΩ	2.69	3.24	2.94	14.1 Max.
3	6	PN2366999-1 Φ0.09mm (Single)	Initial	mΩ	6.60	8.60	7.62	22.5 Max.
			Final	mΩ	6.60	8.70	7.78	22.5 Max.
	6	PN2366999-1 Φ0.25mm (Single)	Initial	mΩ	2.38	2.91	2.59	14.1 Max.
			Final	mΩ	2.42	2.95	2.71	14.1 Max.
	12	PN2366999-1 Φ0.09mm x2 (Double)	Initial	mΩ	7.40	10.30	8.99	22.5 Max.
			Final	mΩ	7.70	10.90	9.37	22.5 Max.
	12	PN2366999-2 Φ0.25mm x2 (Double)	Initial	mΩ	2.71	3.26	2.98	14.1 Max.
			Final	mΩ	2.79	3.39	3.08	14.1 Max.

Test Group	Number of Data Points	Condition		Unit	Test Result			Requirement
					Min	Max	Mean	
4	6	PN2366999-1 Φ0.09mm (Single)	Initial	mΩ	6.60	9.00	7.77	22.5 Max.
			Final	mΩ	6.30	8.90	7.77	22.5 Max.
	6	PN2366999-1 Φ0.25mm (Single)	Initial	mΩ	2.42	2.90	2.67	14.1 Max.
			Final	mΩ	2.46	3.01	2.82	14.1 Max.
	12	PN2366999-1 Φ0.09mm x2 (Double)	Initial	mΩ	6.40	10.70	9.18	22.5 Max.
			Final	mΩ	6.60	10.80	9.39	22.5 Max.
	12	PN2366999-2 Φ0.25mm x2 (Double)	Initial	mΩ	2.65	3.46	2.97	14.1 Max.
			Final	mΩ	3.53	2.76	3.16	14.1 Max.

2.3. Thermal Shock – Test Group 1

There was no evidence of physical damage to the connectors as a result of thermal shock.

2.4. Humidity, steady state – Test Group 2

There was no evidence of physical damage to the connectors as a result of exposure to humidity, steady state.

2.5. Vibration – Test Group 3

There was no evidence of physical damage to the connector and discontinuities of one microsecond or greater occurred during testing.

2.6. Temperature Life – Test Group 4

There was no evidence of physical damage to the connector as a result of temperature life testing.

2.7. Contact Retention Force – Test Group 5

All contact insertion force measurements were greater than 9.8N for terminal cavity retention. Contact retention force summary data is shown in Table 2.

Table 2 - Contact Retention Force

Test Group	Number of Data Points	Condition	Unit	Test Result			Requirement
				Min	Max	Mean	
5	10	PN2366999-1 Φ0.09mm (Single)	N	13.5	16.5	14.7	9.8 Min.
	10	PN2366999-1 Φ0.25mm (Single)	N	18.3	26.3	21.8	9.8 Min.

2.8. Final Examination of product – All Test Group

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

3. TEST METHODS

3.1. Initial Examination of Product

Testing was performed in accordance with EIA-364-18. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3.2. Low Level Contact Resistance (LLCR)

Testing was performed in accordance with EIA 364-23 using a test current of 100 milliamperes maximum and 20 millivolts maximum open circuit voltage. The measurement points were at the locations indicated in Figure 3 of Product Specification 108-140191 Rev. A.

3.3. Thermal Shock

Specimens were subjected to 25 cycles of thermal shock with each cycle consisting of 30 minutes durations at -55 and 125℃. The transition between temperatures was less than 1 minute. Testing was conducted in accordance with TE Product Specification 108-140191 Rev. A and EIA-364-32.

3.4. Humidity, Steady state

Specimens were exposed to humidity of 40℃ and 95% for 4 days. Testing was conducted in accordance with TE Product Specification 108-140191 Rev. A and EIA-364-31.

3.5. Vibration

The test specimens were subjected to a sinusoidal vibration test in accordance with specification EIA-364-28. The parameters consist of simple harmonic motion having an amplitude if 1.52mm. The vibration frequency was varied logarithmically between the approximate limits of 10 to 55 hertz (Hz). The entire frequency range of 10 to 55 Hz and return to 10 Hz was traversed in approximately 1 minute. This cycle was performed in all three mutually perpendicular axes for total period of approximately 2 hours in each plane.

3.6. Temperature Life

Specimens were exposed to a temperature of 118℃ for 792 hours (33 days). Testing was conducted in accordance with TE Product Specification 108-140191 Rev. A and EIA-364-17.

3.7. Contact Retention Force

The force necessary to terminal out of cavity was measured using a tensile/compression device. Testing was conducted in accordance with TE Product Specification 108-140191 Rev. A and EIA-364-5.

3.8. Final Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance. Testing was performed in accordance with EIA-364-18.