

NUMBER <b>GS-12-1446</b>	TYPE <b>PRODUCT SPECIFICATION</b>	<b>Amphenol FCI</b>	
TITLE <b>MicroSpeed 1.0mm</b>		PAGE <b>1 of 14</b>	REVISION <b>D</b>
		AUTHORIZED BY <b>LQ.Lei</b>	DATE <b>Oct 12 2022</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

## 1.0 Objective

This specification defines the performance, test, quality and reliability requirements of the Microspeed product.

## 2.0 Scope

This specification is applicable to the termination characteristics of the Microspeed family of products which provides PCB header-to-PCB receptacle interconnecting

## 3.0 Ratings

- 3.1 Operating Voltage Rating = TBD
- 3.2 Operating Current Rating = 1 A signal contacts /10 A per shield
- 3.3 Operating Temperature Range = -55 °C ~125°C

## 4.0 Applicable Documents

### 4.1 AFCI Specifications

Engineering drawings

- 10146153 – Microspeed RA Male SMD 26P
- 10146994 – Microspeed RA Female SMD 56P
- 10147073 – Microspeed RA Female SMD 26P
- 10147074 – Microspeed RA Female SMD 44P
- 10147075 – Microspeed RA 26P Combo
- 10150095 – Microspeed RA Female SMD 32P
- 10150096 – Microspeed RA Male SMD 32P
- 10150097 – Microspeed VT Female 10H SMD 32P
- 10150098 – Microspeed VT Male 2H SMD 32P
- 10146152 – Microspeed VT Female 4H Series 26P/32P/50P/56P
- 10168699 – Microspeed VT Male 1H SMD 83P
- 10168700 – Microspeed VT Female 6H SMD 83P
- 10171848 – Microspeed VT Male 1H SMD 91P
- 10171849 – Microspeed VT Female 6H SMD 91P

### 4.2 Industry or Trade Association standards

Telcordia GR-1217

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#### 4.3 National or International Standards

4.3.1 Flammability: UL94V-0 or similar applicable specification

4.3.2 IEC 60512: Connectors for Electronic Equipment – Tests and Measurement

4.3.3 IEC 60068: Solder Reflow

#### 4.4 AFCE Laboratory Reports - Supporting Data

NA

#### 4.5 Safety Agency Approvals

NA

### 5.0 Requirements

#### 5.1 Qualification

Connectors furnished under this specification shall be capable of meeting the qualification test requirements specified herein.

#### 5.2 Material

The material for each component shall be as specified herein or equivalent.

##### 5.2.1 Housing material:

Insulation body: LCP

UL flame rating: UL 94 V-0

UL file plastic material: E83005

MSL JEDEC J-STD-020: Level 1

##### 5.2.2 Contact and Shield Material:

Base material: Cu alloy

#### 5.3 Finish

The finish for applicable components shall be as specified herein or equivalent.

5.3.1 Mating area: Gold and PdNi over Nickel Plating with Lubrication

5.3.2 Termination area: Tin plating over Nickel

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5.4 Visual examination, IEC 60 512 test 1 a/1 b (Telcordia GR-1217-Core para. 5.1.1)

Connectors shall be of the design, construction, and physical dimensions specified on the applicable product drawing. There shall be no cracks, burrs, or other physical defects that may impair performance.

## 6.0 Electrical Characteristics

### 6.1 Contact Resistance

Measurements shall be in accordance with IEC 60 512 test 2 a., Millivolt method (Telcordia GR-1217-Core para. 5.4.1 or MIL STD-1344 A-3002.1)

LLCR SPEC	Signal contacts	Shielding
Male RA VS Female RA	Nominal: ≤ 50 mΩ	Nominal: ≤ 10 mΩ
Male RA VS Female VT 4H	Nominal: ≤ 25 mΩ	Nominal: ≤ 5 mΩ
Male VT 2H VS Female RA	Nominal: ≤ 25 mΩ	Nominal: ≤ 5 mΩ
Male VT 1H VS Female VT 6H	Nominal: ≤ 25 mΩ	Nominal: ≤ 5 mΩ
Male VT 2H VS Female VT 10H	Nominal: ≤ 50 mΩ	Nominal: ≤ 10 mΩ

The following details shall apply:

- a. Test Voltage - 20 milli-volts DC max open circuit.
- b. Test Current - Not to exceed 100 milli-amperes.

### 6.2 Insulation Resistance

Measurements shall be in accordance with IEC 60 512 test 3 a, adapter measurement (Telcordia GR-1217-Core para. 5.4.6 or MIL STD-1344 A-3003.1)

General the insulation resistance shall not be less than  $1 \times 10^{10}$  ohms, except the insulation resistance shall not be less than  $1 \times 10^9$  after dry heat test.

The following details shall apply:

- a. Test Voltage - 500 volts DC.
- b. Electrification Time - 1 minutes.
- c. Points of Measurement - Between adjacent contacts (*and between contacts and other conductive surfaces, if applicable*).

### 6.3 Voltage proof

Measurements shall be in accordance with IEC 60 512 test 4 a (Telcordia GR-1217-Core para. 5.4.7 or

MIL STD-1344 A-3001.1)

There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current > 2mA when (*unmated or mated*)

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The following details shall apply:

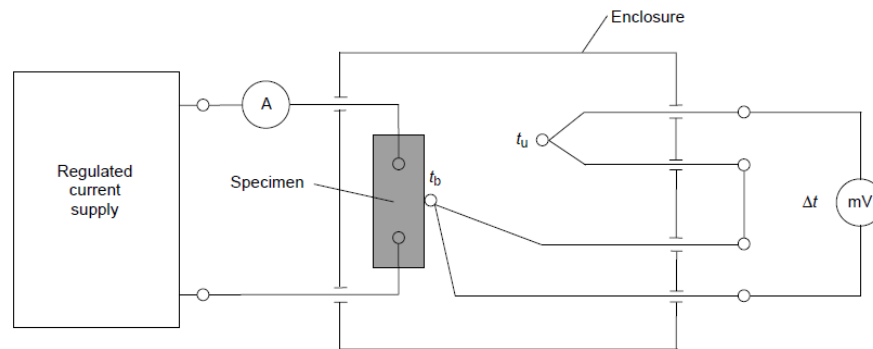
- Test Voltage - 500 volts (AC RMS, 60Hz).
- Test Duration - 60 seconds.
- Test Condition - 1 (760 Torr - sea level).
- Points of Measurement - Between adjacent contacts (*and between contacts and other conductive surfaces, if applicable*).

#### 6.4 Derating curve

Measurements shall be in accordance with IEC 60 512 test 5b

The following details shall apply:

- Upper temperature limit: 125 °C
- Method of measurement reference below figure



## 7.0 Mechanical Characteristics

### 7.1 Total Insertion and Withdrawal force

Measurements shall be in accordance with IEC 60 512 test 13 b (Telcordia GR-1217-Core Sect. 5.1.5 or MIL STD 1344 A - 2013.1)

Microspeed connector	Insertion and withdrawal Force :
26 Pole	≤18 N
32 Pole	≤22 N
44 Pole	≤30 N
50 Pole	≤34 N
56 Pole	≤58 N
83 Pole	≤86 N
91 Pole	≤94 N

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The following details shall apply:

- a. Cross Head Speed – 25.4 mm per minute.
- c. Utilize free floating fixtures.

7.2 Gauge Contact Retention (For Receptacle Connector)

Measurements shall be in accordance with IEC 60 512 test 16 e.

Nominal  $\geq 0.1$  N,

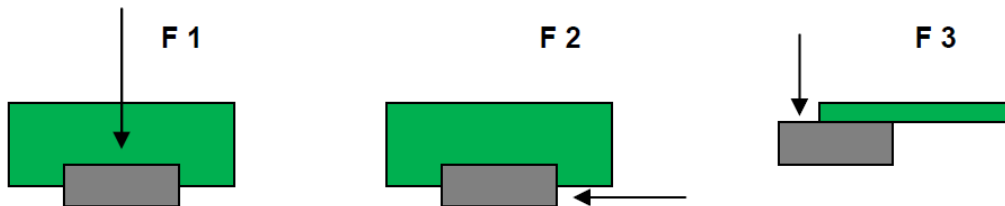
- a. Gauge Spec: SQ 0.295  $\pm$  0.025mm
- b. 5 contacts per sample
- c. Cross Head Speed – 0.2 inch per minute.
- d. Utilize free floating fixtures.

7.3 Shearing force (Unit: N) with SMD connectors

F 1 Shearing force in transverse direction

F 2 Shearing force in longitudinal direction

F3 - Shear force vertically against the soldering surface (For R/A type)



Microspeed connector	F1 Force :	F2 Force	F3 Force
26 Pole	$\geq 150$ N	$\geq 150$	/
32 Pole	$\geq 180$ N	$\geq 180$ N	/
44 Pole	$\geq 250$	$\geq 250$	/
50 Pole	$\geq 300$	$\geq 300$	/
56 Pole	$\geq 300$	$\geq 300$	$\geq 80$
83 Pole	$\geq 300$	$\geq 300$	/
91 Pole	$\geq 300$	$\geq 300$	

- a. Cross Head Speed – 20mm/min.
- b. Utilize free floating fixtures.
- c. Require 5 test samples
- d. Test Board FR4/ 1,6 mm thickness

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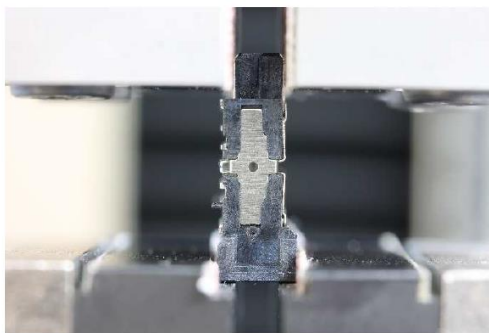
- 7.4 Mechanical operation  
Measurements shall be in accordance with IEC 60 512 test 9 a
- Number Cycles -500 cycles
  - Cycling Rate – 10mm/s max
  - Rest period (not inserted): 30 s
  - Latches disabled (If applicable)
  - Use free floating fixtures

- 7.5 Polarization  
Measurements shall be in accordance with IEC 60 512 test 13 e

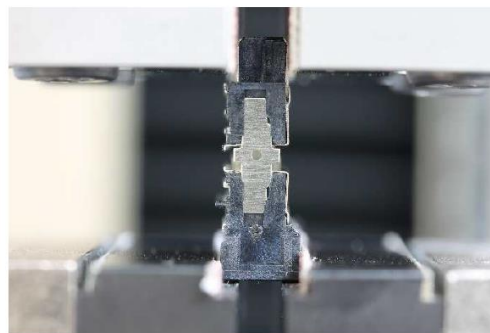
- 7.6 Contact retention  
Measurements shall be in accordance with IEC 60 512 test 15a

Connector type	Specification
RA Series product	≥ 2 N
VT Series product	≥ 3 N

- Cross Head Speed – 25.4mm per minute.
  - Hold 10s than removed
  - Require 6 contacts/specimen
- 7.7 Connection Plate retention  
Measurements shall be in accordance with IEC 60 512 test 15a  
Test force ≥ 5 N
- Cross Head Speed – 0.5 mm per second.
  - Hold 10s than removed
  - Require 5 specimen



Before test



after test

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## 8.0 Environmental Conditions

After exposure to the following environmental conditions in accordance with the specified test procedure and/or details, the product shall show no physical damage and shall meet the electrical and mechanical requirements per paragraphs 6.0 and 7.0 as specified in the Table 1 test sequences. Unless specified otherwise, assemblies shall be mated during exposure.

*Use recommended details or select others as appropriate*

### 8.1 Rapid change of temperature

Measurements shall be in accordance with IEC 60 512 test 11 d

- a. Number of Cycles - 5
- b. Temperature Range - Between -55 and +125 deg C
- c. Time at Each Temperature - 30 minutes
- d. Transfer Time - 5 minutes, maximum

### 8.2 Industrial atmosphere

Measurements shall be in accordance with IEC IEC 60 512 test 11 g

- a. Test climate: 25°C/ 75% r.F.
- b. Gas concentration: mixed gas 0.5 ppm SO<sub>2</sub>+ 0.1ppm H<sub>2</sub>S
- c. Duration - 10 days
- d. One half of contacts inserted, the other half not inserted

### 8.3 Vibration Sinusoidal

Measurements shall be in accordance with IEC 60 512 test 6 d (Telcordia GR-1217-Core Sect. 6.3.5 or MIL STD 1344 A - 2005.1)

- a. Vibration Amplitude – 1.5mm order 20 G
- b. Frequency Range -10 to 2000 hertz
- c. Sweep Time and Duration - 15 minutes per sweep, 10 cycles each of three orthogonal axes (7.5 hours total)
- d. Mounting - Rigidly mount assemblies; specify cable length and mounting location if appropriate.
- e. No discontinuities greater than 1 microsecond

### 8.4 Shock

Measurements shall be in accordance with IEC 60 512 test 6 c (Telcordia GR-1217-Core Sect. 6.3.6 or MIL STD 1344 A - 2004.1)

- a. 50G, 11 millisecond, half-sine pulse type
- b. Shocks - 10 shocks in both directions along each of three orthogonal axes (30 shocks total)
- c. Mounting - Rigidly mount assemblies; specify cable length and mounting location if appropriate.
- d. No discontinuities greater than 1 microsecond

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- 8.5 Dry heat  
Measurements shall be in accordance with IEC 60 512 test 11 i
- Temperature: 125 °C
  - Duration : 16 hours
- 8.6 Temperature (Dry heat)  
Measurements shall be in accordance with IEC 60 512 test 9 b
- Temperature: 125 °C
  - Duration : 1000 hours
- 8.7 Damp heat cyclical  
Measurements shall be in accordance with IEC 60512 test 11m (variant 1)
- Temperature: 25 ~ 55°C
  - Relative Humidity: 90~96%
  - Total cycle: 6
- 8.8 Damp heat, constant  
Measurements shall be in accordance with IEC 60512 test 11c  
Require without polarization voltage after test
- Polarization voltage: 60 V DC
  - Test climate: 40 °C / 93% r.F.
  - Duration: 56 days.
- 8.9 Cold Temperature Life  
Measurements shall be in accordance with IEC 60 512 test 11 j
- Test Temperature: -55 °C
  - Test Duration: 2 hours
- 8.10 Solderability (solder bath process, method 1)  
Measurements shall be in accordance with IEC 60 512 test 12 a (solder bath process, method 1)
- Steam or dry aging - 16 hours/ 155 °C
  - Temperature of the solder bath: 245 ± 5 °C, Tin: Sn96Ag3Cu0.5
  - Duration of immersing: 3 ± 0.3s
  - The terminations were complete coated with Sn



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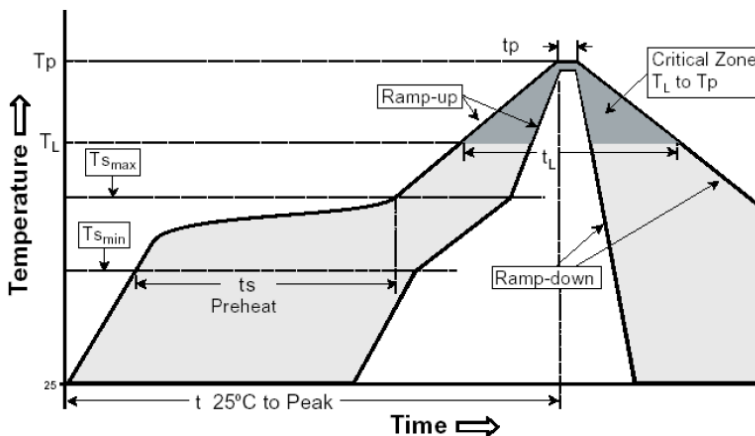
8.11 SMT/ THR Solder Reflow

Measurements shall be in accordance with IEC 60068-2-58

- a. Solder paste: SnAgCu / melting point: 217°C
- b. Soldering of all termination was without any failures

Reflow profile to determine Solderability

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate ( $T_{s_{max}}$ to $T_p$ )	3°C/ second max.
<b>Preheat</b> – Temperature Min ( $T_{s_{min}}$ ) – Temperature Max ( $T_{s_{max}}$ ) – Time ( $t_{s_{min}}$ to $t_{s_{max}}$ )	150 ± 5°C 180 ± 5°C 60-120 seconds
Time maintained above: – Temperature ( $T_L$ ) – Time ( $t_L$ )	225°C 20 ± 5seconds
Peak/Classification Temperature ( $T_p$ )	235°C (+0/-5°C)
Time within 5 °C of actual Peak Temperature ( $t_p$ )	10 seconds
Ramp-Down Rate	6 °C/second max.



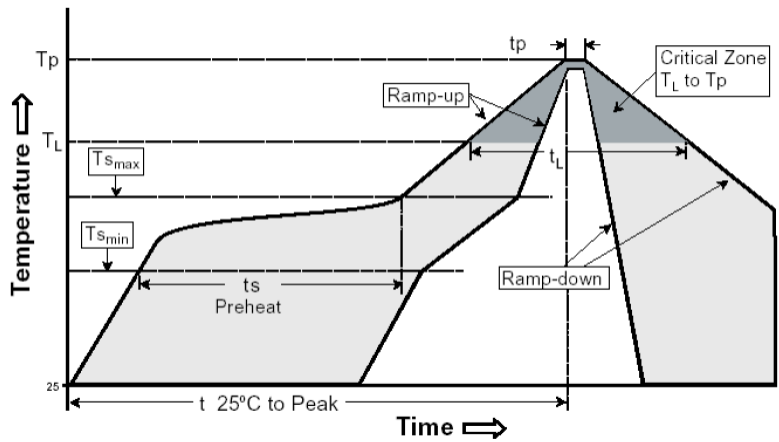
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8.12 SMT/ THR Reflow Heat resistance,  
Measurements shall be in accordance with IPC/ JEDEC J-STD-020

- a. Test Number of cycles: 3
- b. There shall be no evidence of physical or mechanical damage

Heat resistance Reflow profile test

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate ( $T_{S_{max}}$ to $T_p$ )	3°C/ second max.
<b>Preheat</b>	
- Temperature Min ( $T_{S_{min}}$ )	150°C
- Temperature Max ( $T_{S_{max}}$ )	200°C
- Time ( $t_{S_{min}}$ to $t_{S_{max}}$ )	60-180 seconds
Time maintained above:	
- Temperature ( $T_L$ )	217°C
- Time ( $t_L$ )	60-150 seconds
Peak/Classification Temperature ( $T_p$ )	260°C (+0/-5°C)
Time within 5 °C of actual Peak Temperature ( $t_p$ )	20-40 seconds
Ramp-Down Rate	6°C/second max.
Time 25 °C to Peak Temperature	8 minutes max



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## 9.0 QUALITY ASSURANCE PROVISIONS

### 9.1 Equipment Calibration

All test equipment and inspection facilities used in the performance of any test shall be maintained in a calibration system in accordance with ANSI Z-540 and ISO 9000.

### 9.2 Inspection Conditions

Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions:

- a. Temperature: 25 +/- 5 deg C
- b. Relative Humidity: 30% to 60%
- c. Barometric Pressure: Local ambient

### 9.3 Sample Quantity And Description

Use this paragraph to describe the test samples required for the specific Test Groups in the qualification test table. Include information such as: number and size of plug and receptacle connectors and/or mated pairs, terminated or not terminated, printed wiring board conditions, wire size, crimp conditions, lubrication conditions, etc. Attach and reference drawings if necessary to clarify the description.

Unless otherwise specified in the application specification, sample quantities for each test group shall be specified in this section and/or the qualification test table. Refer to GS-01-029 section 5.9 for sample quantity recommendations.

### 9.4 Acceptance

9.4.1 Electrical and mechanical requirements placed on test samples as indicated in paragraphs 6.0 and 7.0 shall be established from test data using appropriate statistical techniques or shall otherwise be customer specified, and all samples tested in accordance with this product specification shall meet the stated requirements.

9.4.2 Failures attributed to equipment, test setup, or operator error shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for qualification.

### 9.5 Qualification Testing

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. The test sequences shall be as shown in the qualification test table. Data shall be provided with the samples noting production history: production lot codes for components and assemblies, components and assemblies produced to print revision \_\_, verification of plating composition and thickness, etc.

### 9.6 Re-Qualification Testing

If any of the following conditions occur, the responsible product engineer shall initiate requalification testing consisting of all applicable parts of the qualification test matrix.

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- a. A significant design change is made to the existing product which impacts the product form, fit or function. Examples of significant changes shall include, but not be limited to, changes in the plating material composition or thickness, contact force, contact surface geometry, insulator design, contact base material, or contact lubrication requirements.
- b. A significant change is made to the manufacturing process which impacts the product form, fit or function.
- c. A significant event occurs during production or end use requiring corrective action to be taken relative to the product design or manufacturing process.

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9.7 Qualification Test Table

Test	Para	Test Sequences							
		Group P	Group AP	Group BP	Group CP	Group DP	Group EP	Group ZP	Group F ⑤
Visual Examination	5.4	1	10,20	9	5	7	2		
Contact Resistance	6.1	3	17	4	3	4			
Insulation Resistance	6.2	4	8,12,16	6	2				
Voltage proof	6.3	5	4,9,18	7	4	5			
Derating curve	6.4							1	
Total Insertion and Withdrawal force	7.1		2,19					2	
Gauge Contact Retention	7.2		1	1,8		1,6			
Shearing force	7.3							3	
Mechanical operation	7.4			2③,5 ④		2③			
Polarization	7.5	2							
Contact retention	7.6						1		
Connection Plate retention	7.7								1
Rapid change of temperature	8.1		7						
Industrial atmosphere	8.2			3					
Vibration Sinusoidal	8.3		5						
Shock	8.4		6						
Dry heat	8.5		11						
Temperature (Dry heat)	8.6					3			
Damp heat cyclical	8.7		13①,1 5②						
Damp heat , constant	8.8				1				
Cold Temperature Life	8.9		14						
Solderability	8.10		3						
SMT/ THR Solder Reflow	8.11							4	
SMT/ THR Reflow Heat resistance,	8.12							5	
<b>Sample size</b>		<b>22⑥</b>	<b>9⑦</b>	<b>8</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>24</b>	<b>5⑧</b>

①. Perform 1 cycle; ②. Perform 5 cycle; ③. Operation1.half. ④. Operation2.half. ⑤. Testing for Combo product only

⑥. The 22pcs connectors of Group P were divided into 4 Groups. 6pcs connectors were used for Group AP, 8pcs connectors were used for Group BP and 4pcs connectors were used for each Group CP and DP.

⑦. Samples #1~#3 were tested for Insulation Resistance, Voltage Proof and Vibration discontinuities event

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monitor. Samples #4~#6 were tested for Contact resistance; Samples #7~#9 were only used for Solderability testing.

⑧. The 24pcs connectors of Group ZP were divided into 5 parts. 3pcs connectors were used for derating curve, 15pcs connectors were used for Shearing force, 3pcs connectors were used for SMT/ THR Solder Reflow and 3pcs connectors were used for SMT/ THR Reflow Heat Resistance

### REVISION RECORD

Rev	Page	Description	EC#	Date
A	All	Initial	/	10/11'18
B	4,7	1. Revise Item:7.2 spec to nominal $\geq 0.1$ N from nominal $> 0.1$ N 2. Revise condition d of item 8.2 to one half of contacts inserted, the other half not inserted from Unmated for $\frac{1}{2}$ the duration and mated the remaining $\frac{1}{2}$ duration, add step 20 in group AP	ELX -N-33341	11/3' 18
C	All	1. Add Microspeed 32pos into spec in	ELX -N-43940	03/01'22
D	All	2. Add Microspeed 83pos/91pos and VT Female 4H series into spec in file. 3. Add 10 A per shield, defined contact retention force for VT series product 4. Change name of item 8.6 Electrical load and Temperature (Dry heat ) to Temperature (Dry heat) 5. Revise sample test quantity as actual needed.	ELX -N-48354	5/29'23