1 SCOPE

1.1 Content
This specification covers the performance, test and quality requirements for the TE Connectivity micro SFP+board and cable connector. The cable plug assembly is used to connect the cable to the board connector.

1.2 Qualification
When tests are performed on subject product, procedures specified in this Product Specification shall be used. All inspections shall be performed using applicable inspection plan and product drawing.

1.3 Applicable partnumbers
The partnumbers of subject products:

- x-2246041-x micro SFP+ board connector
- x-2142969-x micro SFP+ cable assembly
- x-2142970-x micro SFP+ - Standard SFP+ cable assembly

1.4 Completion
Qualification testing of the micro SFP+ has successfully been completed in JUL2012 and is reported in Qualification Test Report with number 501-19193. This documentation is on file and available from Engineering Practices and Standards (EPS).

2 Applicable Documents
The following documents form a part of this specification to extend specified herein. Unless otherwise specified, latest edition of the document applies. In the event of conflict between the requirements in this specification and the product drawing, product drawing shall take precedence. In the event of conflict between requirements of this specification and referenced documents, this specification shall take precedence.

2.1 TE Documents
501-19193 Test report Cable/Board micro SFP+
114-19151 Application specification micro SFP+

2.2 Other Documents
IEC 60512 Basic testing procedures and measuring methods for electromechanical components for electronic equipment.
MSA-SFF 8431 Compliant

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3 Requirements:

3.1 Design and Construction.

Products shall be of design, construction and physical dimensions as specified on the applicable customer, product drawings 2246041, 2142969 and 2142970.

3.2 Materials and Finish.

Materials used in the construction of this product shall be as specified on the applicable customer drawing.

3.3 Ratings

A.	Data-rate (differential)	- 10 Gb/s
B.	Impedance	- 100 ohm
C.	Operating voltage	- 30 Volt DC max.
D.	Current	- 0,5 Amp Max.
E.	Operating temperature	- -55℃ to 105℃.
F.	Durability	- 100 cycles.

3.4 Performance and Test Description.

The product is designed to meet mechanical and environmental performance specified in this paragraph as tested per test sequence specified in paragraph 3.5.
Unless otherwise specified, all tests are performed at ambient environmental conditions per IEC specification 60068-1 clause 5.3 and are performed with connectors in mated condition.

VISUAL			
Para	**Test Description**	**Performance Requirements or Severity**	**Procedures**
3.4.1.	Examination of product	Meets requirements of product Drawing and applicable instructions on customer drawing, instruction sheet, application specification.	Visual, dimensional and functional per applicable inspection plan.

ELECTRICAL			
Para	**Test Description**	**Performance Requirements or Severity**	**Procedures**
3.4.2	Termination resistance Board connector – Cable connector (signal and ground)	Max. open voltage 20mV. Max. current 100 mA DC. All contacts to be measured. Measuring points shall be as indicated in fig.1 Requirement: 30 mΩ max. (Initial; exclusive bulk) 40 mΩ max. (Final; exclusive bulk)	In acc. With IEC 60512-2-1
3.4.3	Termination resistance Board connector – Cable connector (shield)	Max. open voltage 20mV. Max. current 100 mA DC. Measuring points shall be as indicated in fig 2. Requirement: Initial: 10 mΩ max. Final: 20 mΩ max.	In acc. With IEC 60512-2-1
3.4.4	Insulation resistance	Test voltage 100V DC. Duration: 1 minute. Test between adjacent contacts. Requirement: 10^3 MΩ min.	In acc. with IEC 60512-3-1
3.4.5	Voltage proof	Test voltage 300 VDC for adjacent contacts. Duration 1 minute. Requirement: no break-down or flash-over	In acc. with IEC 60512-4-1
3.4.6	Current temperature de-rating curve	Temperature rise: 30°C maximum over ambient temperature (65°C) at 0,5 A	In acc. with IEC 60512-5-2 / test 5b

MECHANICAL			
Para	**Test Description**	**Performance Requirements or Severity**	**Procedures**
3.4.10	Signal Contact spring force	Min. 0,5N	At deflection of 0.165 mm.
3.4.11	Shielding Contact spring force (outside springs on BCv1)	Min. 2,5N	At deflection: till Board connector shield
3.4.12	Shielding Contact spring force (outside springs on BCv2)	Min. 2,5N at A=0,25mm (see figure 3)	At required deflection to reach dimension A (see figure 3). Maximum deflection to be applied: A=0,15mm.
3.4.13	Shielding Contact spring force (inside-bended springs on board connector version 2)	Min. 1,0N at B=0,25mm (see figure 4)	At required deflection to reach dimension B (see figure 5). Maximum deflection to be applied: B=0,15mm.
3.4.14	Vibration	10-500 Hz sweeping 1 oct./min., displacement 0,75mm peak/accel. 10 g , 30 minutes in each of 3 mutual perpendicular axes. Requirement: No Physical damage. No discontinuity > 1 µsec.	In acc. with IEC 60068-2-6
3.4.15	Physical shock	Subject connector to 50 g half sine shock pulses of 11 ms duration. 6 shocks in two directions of 3 mutual perpendicular axes.	In acc. with IEC 60512-6-3
3.4.16	Insertion-force during wrong polarization.	Apply 100 N straight force at the cable connector (placed upside down) in mating direction during 10 sec. Requirement: No functional damaging and no electrical contacting on signal-traces.	In acc. with IEC 60512-15-1
3.4.17	Mate / un-mate force without latch.	Mate and un-mate connector-pair. Speed: 2 mm/sec. rest 30 sec min. Requirement: Total mating force 50 N max. Total un-mating force 10 N min to 40 N max.	In acc. with IEC 60512-13-2
3.4.18	Mechanical operation (Inclusive latch)	Mate and un-mate specimens for 100 cycles at a maximum rate of 500 cycles per hour with cage latch operable at room conditions.	In acc. With IEC 60512-9-1

3.4.19	Side-load in 4 directions (up-down-right-left).	Cable connector mated on board connector. BCv1: Apply 40 N on cable-connector in every direction (individually) (at 27mm from edge of pcb), during 10 sec. (see figure 5) BCv2: Apply 60 N on cable-connector in every direction (individually) (at 27mm from edge of pcb), during 10 sec. (see figure 5) Requirement: No functional damage, latch should be in place.	In acc. with IEC 60512-17-3
3.4.21	Locking latch strength	Apply 100 N straight force at the mated cable connector, in un-mating direction.	In acc. with IEC 60512-15-1
3.4.22	Rotational pull force (not applicable for BCv1)	Load cabled module into board-connector. Apply an axial pull-force of 60N on the cable, the pull-force will be in a 33 degrees angle with the axial direction of the connector. Rotate the load 3 full rotations (1080 degrees) with respect to the axial direction of the connector. Requirement: plug shall remain mated with no evidence of housing damage.	
3.4.23	Mounting-force board-connector. (not applicable for BCv1)	Measure force necessary to push the board-connector into the host board at a maximum rate of 12.7mm per minute. Requirement: 20N maximum.	

SIGNAL INTEGRITY			
Para	**Test Description**	**Performance Requirements or Severity**	**Procedures**
3.4.30	Characteristic Impedance	Time Domain (TDR) measurement Impedance profile : the test board, PCB cable connector and 1000ps cable Rise-time of incident pulse : 30ps (10%-90%) Pairs 15-16 and 18-19 Requirement : 100 Ω +/- 10%; 100 Ω -20% for footprint for time period of 250ps	IEC 60512-25-7
3.4.31	Skew	Time Domain (TDT) measurement Risetime of incident pulse: 30ps (10%-90%) Pairs 15-16 and 18-19 Samples : 1m and 8m Requirement : 15ps	IEC 60512-25-4

3.4.32	Return Loss	Frequency Domain (FDR) S-parameter measurement Pairs 15-16 and 18-19 Samples : 1m with AWG26 Requirement : IEEE 802.3ap for 10GBaseKR -3dB.	IEC 60512-25-5 Reference : IEEE Std 802.3ap-2007 – Amendment to IEEE Std 802.3-2005:CSMA/CD – Annex 69B
3.4.33	Insertion Loss	Frequency Domain (FDT) S-parameter measurement Pairs 15-16 and 18-19 Samples : 1m, 4m and 8m with AWG26 Requirement : § IEEE 802.3ap for 10GBaseKR § 1.1dB/GHz -0.5dB @ 1GHz to 5GHz for 1m with AWG26 § Suck out frequency (resonance) > 8GHz	IEC 60512-25-5 Reference : IEEE Std 802.3ap-2007 – Amendment to IEEE Std 802.3-2005:CSMA/CD – Annex 69B
3.4.34	Cross Talk	Frequency Domain (FDT) S-parameter measurement Samples : 1m, 4m, 8m with AWG26 Requirement on 1m: Pairs 15-16 and 18-19 - NEXT < -30dB up to 1GHz. All pairs - Power sum NEXT and FEXT < -24dB up to 1GHz.	IEC 60512-25-1
3.4.35	Insertion Loss to Cross Talk Ratio over 10Gbps link	Frequency Domain (FDT) S-parameter measurement Pairs 15-16 and 18-19 Samples : 1m, 4m and 8m with AWG26 Requirement : Samples 1m and 4m - IEEE 802.3ap for 10GBaseKR Samples 8m - < -55dB up to 100MHz - < -36dB up to 1GHz - < -28dB up to 2.5GHz - < -23dB up to 5.0GHz	Calculated values based on 3.4.11 and 3.4.12
3.4.36	Screening Attenuation	Samples : 1m with AWG26 Requirement : < -40dB at 0 to 5GHz for cable assembly and PCB connector	IEC 62153-4-4 and IEC 62153-4-7
3.4.37	Time Delay Rx to Tx	Max 400ps asymmetry between pairs (Rx - Tx)	Measurements to be performed on 1m and 8m cable assemblies

ENVIRONMENTAL			
Para	**Test Description**	**Performance Requirements or Severity**	**Procedures**
3.4.40	Rapid change of Temperature	-40℃/90℃, 0,5 hrs / 0,5 hrs, 5 cycles	In acc. with IEC 60512-11-4
3.4.41	Climatic sequence Dry heat 1st Damp heat cycle Cold 2nd Damp heat cycle	90℃, 16 hrs 25℃/55℃, RH 93%, 24 hrs -40℃, 2 hrs 25℃/55℃, RH 93%, 24 hrs	In acc. with IEC 60512-11-1
3.4.42	Damp/heat steady state	Temperature 40℃, RH 93%, Duration: 21 days	In acc. with IEC 60512-11-3
3.4.43	Temperature life.	Subject mated specimens to 105℃ for 240 hours without electrical load.	In acc. with IEC 60512-11-9
3.4.44	Corrosion mixed flowing gas	Temperature 25℃, RH 75%, Cl_2 10 ppb, NO_2 200 ppb, H2S 10 ppb, SO_2 200 ppb. Duration: 20 days (un-mated)	In acc. with IEC 60512-11-7
3.4.45	Resistance to soldering heat board connector	Specimens were subject to the following reflow profile. Fig 6	Tyco 109-201, method C

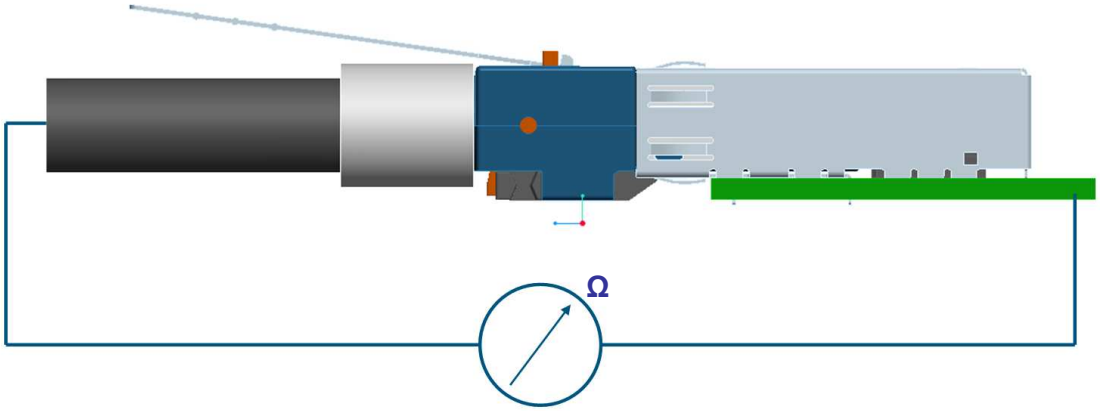

Figure 1

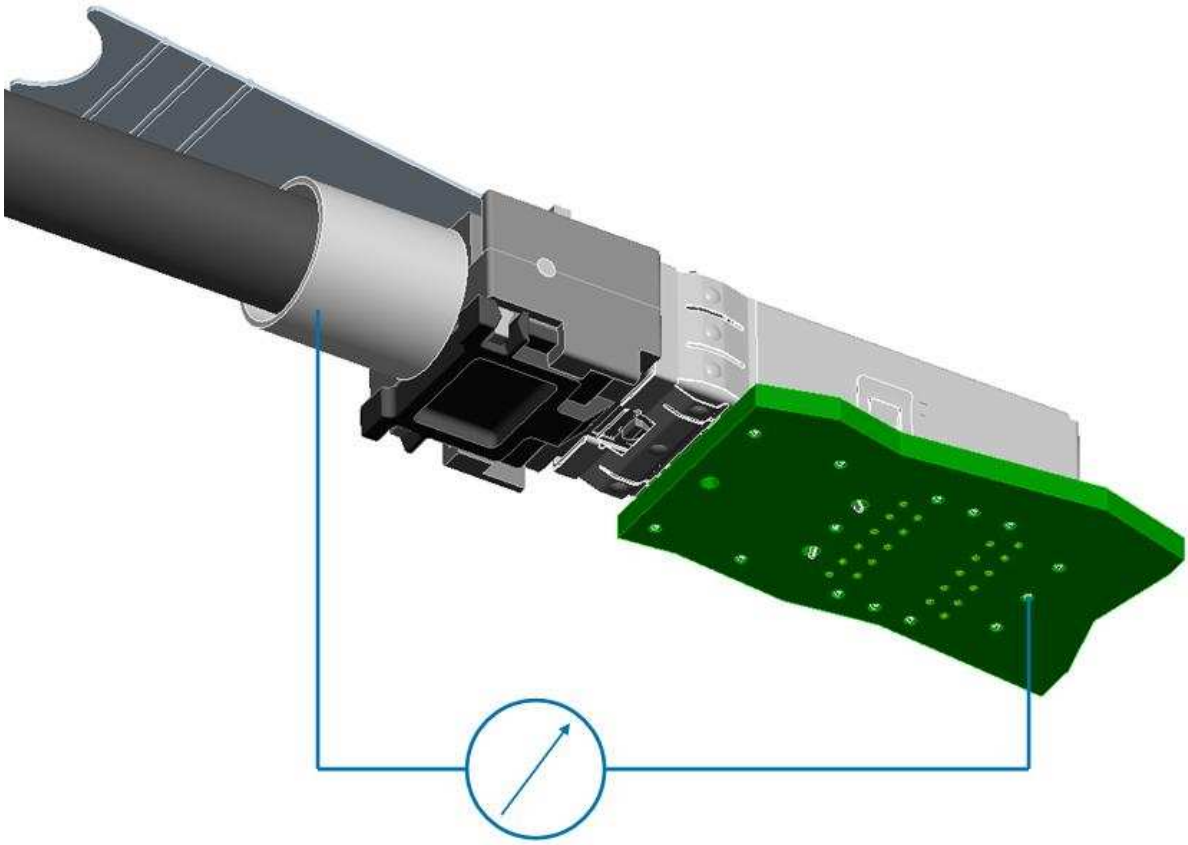

Figure 2

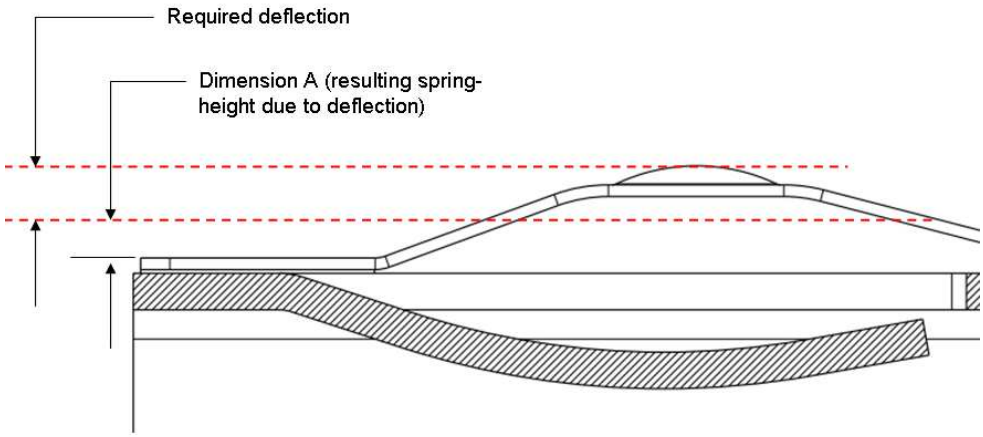

Figure 3

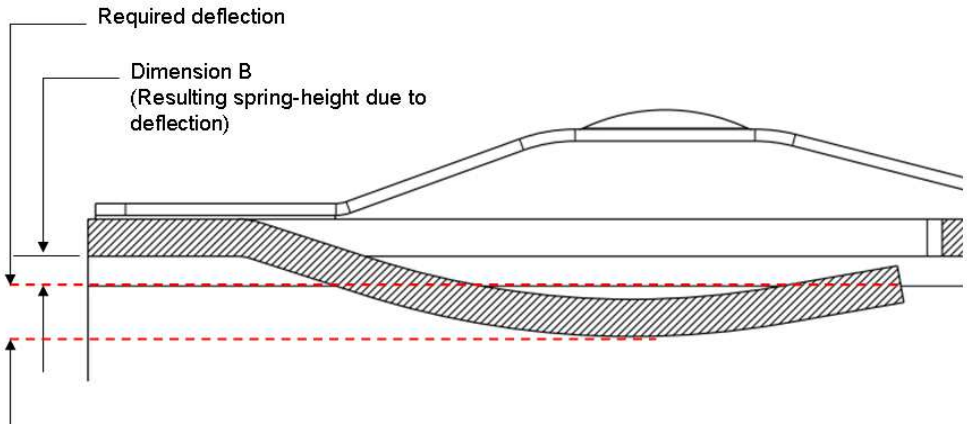

Figure 4

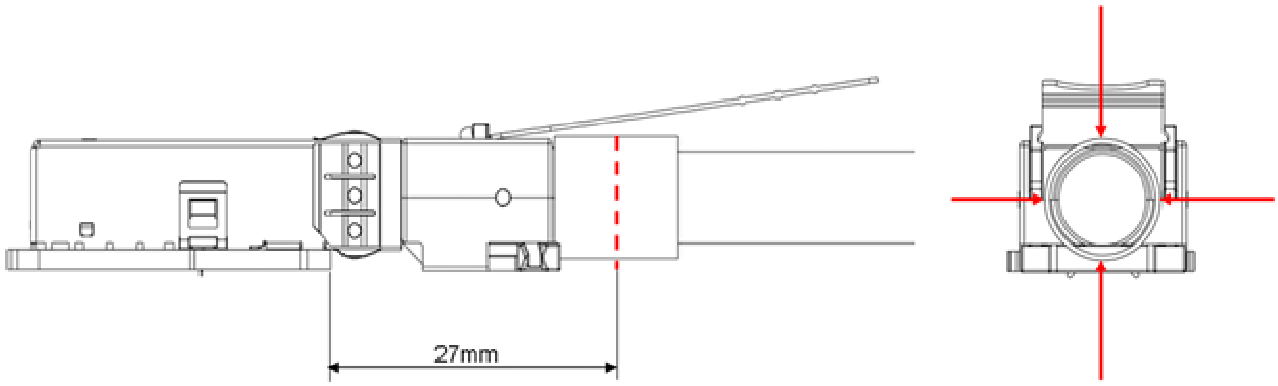

Figure 5

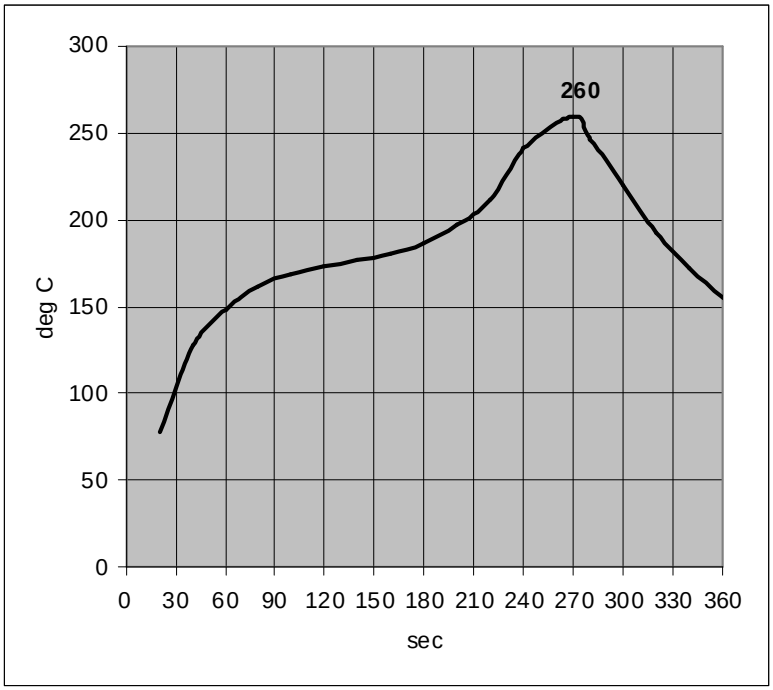

Figure 6

3.5 Product Qualification and Requalification Test Sequence

3.5.1 Test sequence applicable for micro SFP:

Test-sequence applicable for Board Connector version 1								
test or examination	paragraph	Testgroup (a)						
		1	2	3	4	5	6	7
		Test-sequence (b)						
Examination of product	3.4.1	1, 7	1,7	1, 11	1,6	1,17	1,7	1,10
Termination resistance board connector - cable connector (signal and ground)	3.4.2	2, 4	2,4,6	2,4,6,8	2,5	2,6,10, 14,16		
Termination resistance board connector - cable connector (shield)	3.4.3							
Insulation resistance	3.4.4					3,7,11		
Voltage proof	3.4.5					4,8,12		
Current temperature derating curve	3.4.6	3						
Signal Contact spring force	3.4.10						2,5	
Shield contact spring force (board connector version 1)	3.4.11						3,6	
Shield contact spring force (outside-bended springs on board connector version 2)	3.4.12							
Shield contact spring force (inside-bended springs on board connector version 2)	3.4.13							
Vibration	3.4.14				3			
Physical shock	3.4.15				4			
Insertion force during wrong polarization	3.4.16	6						
Mate / unmate force without latch	3.4.17	5						
Mechanical operation (half of numbers)	3.4.18			3,7				
Side-load in 4 directions	3.4.19		3					
Locking latch strength	3.4.20		5					
Rapid change of temperature	3.4.40					5		
Climatic sequence	3.4.41					9		
Damp/heat steady state	3.4.42					13		
Temperature life	3.4.43					15		
Corrosion mixed flowing gas (board-connector)	3.4.44			5				
Resistance to soldering heat (board-connector)	3.4.45						4	
Characteristic impedance	3.4.30							2
Skew	3.4.31							3
Return loss	3.4.32							4
Insertion loss	3.4.33							5
Cross talk	3.4.34							6
Insertion loss to crosstalk ratio	3.4.35							7
Screening attenuation	3.4.36							8
Time delay Rx to Tx	3.4.37							9

(a) See paragraph 4.1

(b) Numbers indicate sequence in which tests are performed

3.5.2 Test sequence applicable for micro SFP+:

Test-sequence applicable for Board Connector version 2									
test or examination	paragraph	Testgroup (a)							
		1	2	3	4	5	6	7	8
		Test-sequence (b)							
Examination of product	3.4.1	1, 7	1, 9	1, 11	1, 8	1, 21	1, 10	1, 9	1, 3
Termination resistance board connector - cable connector (signal and ground)	3.4.2	2, 4	2, 4, 6, 8	2, 5, 8	2, 7	2, 7, 11, 16, 19			
Termination resistance board connector - cable connector (shield)	3.4.3			3, 6, 9	3, 6	3, 12, 17, 20			
Insulation resistance	3.4.4					4, 8, 13			
Voltage proof	3.4.5					5, 9, 14			
Current temperature derating curve	3.4.6	3							
Signal Contact spring force	3.4.10						2, 7		
Shield contact spring force (board connector version 1)	3.4.11								
Shield contact spring force (outside-bended springs on board connector version 2)	3.4.12						3, 8		
Shield contact spring force (inside-bended springs on board connector version 2)	3.4.13						4, 9		
Vibration	3.4.14				4				
Physical shock	3.4.15				5				
Insertion force during wrong polarization	3.4.16	6							
Mate / unmate force without latch	3.4.17	5							
Mechanical operation (half of numbers)	3.4.18			4, 10					
Side-load in 4 directions	3.4.19		3						
Locking latch strength	3.4.20		5						
Rotational pull force	3.4.21		7						
Mounting-force board-connector	3.4.22						5		
Rapid change of temperature	3.4.40					6			
Climatic sequence	3.4.41					10			
Damp/heat steady state	3.4.42					15			
Temperature life	3.4.43					18			
Corrosion mixed flowing gas (board-connector)	3.4.44			7					
Resistance to soldering heat (board-connector)	3.4.45						6		
Characteristic impedance	3.4.30							2	
Skew	3.4.31							3	
Return loss	3.4.32							4	
Insertion loss	3.4.33							5	
Cross talk	3.4.34							6	
Insertion loss to crosstalk ratio	3.4.35							7	
Screening attenuation	3.4.36								2
Time delay Rx to Tx	3.4.37							8	

4 QUALITY ASSURANCE PROVISIONS.

4.1 Qualification Testing.

Sample Selection.

Samples shall be prepared in accordance with applicable instructions and shall be selected random from current production.

Unless details to perform test require otherwise, plugs shall be terminated on cables according to applicable instructions and requirements specified in appropriate Application Specification and Instruction Sheet.

Unless otherwise specified all test groups shall consist of a minimum of 5 connectors of applicable type.

Qualification inspection shall be verified by testing samples as specified in Para 3.5.

4.2 Requalification Testing.

If changes significantly affecting form, fit or function are made to product or manufacturing process, product assurance shall coordinate re-qualification testing, consisting of all or part of original testing sequence as determined by product, quality and reliability engineering.

4.3 Acceptance.

Acceptance is based on verification that product meets requirements of Para 3.4. Failures attributed to equipment, test set-up, test sub-components or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before re-submittal.

4.4 Quality Conformance Inspection.

Applicable TE Connectivity quality inspection plan will specify sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with applicable product drawing and this specification.