NOTE
The product described in this document has not been fully tested to ensure conformance to the requirements outlined below. Therefore, TE Connectivity (TE) makes no representation or warranty, express or implied, that the product will comply with these requirements. Further, TE may change these requirements based on the results of additional testing and evaluation. Contact TE Engineering for further details.

QP 6.5 Connector Systems

1. SCOPE

1.1. Content

This specification covers performance, tests, and quality requirements for the QP 6.5 connector systems.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

1.3. Qualification Test Results

Successful qualification testing on the subject product line has not been completed. The Qualification Test Report number will be issued upon successful qualification testing.

1.4. Revision Summary

Revisions to this specification include:

- Production release

2. APPLICABLE DOCUMENTS AND FORMS

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

2.1. TE Connectivity Specifications

114-160619	Application Specification – QP 6.5 Connector Systems
501-161197	Qualification Test Report

2.2. Commercial Standards and Specifications

EIA-364	Electrical Connector/Socket Test Procedures Including Environmental Classifications
IEC 60335	International Standard – Household and Similar Electrical Appliances – Safety
IEC 60512	International Standard – Connectors for Electronic Equipment

2.3. Reference Documents

109-1	General Requirements for Testing

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction, materials and physical dimensions specified on the applicable product drawing.

3.2. Materials

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

3.3. Ratings

A. Voltage Rating: 600 VAC/VDC

B. Current Rating: See Figure 5

C. Temperature Rating (includes ambient temperature plus thermal increase due to current flow):

- –40°C to +105°C

3.4. Performance Requirements and Test Description

The product should meet the electrical, mechanical and environmental performance requirements specified in Figure 1. All tests shall be performed at ambient environmental conditions otherwise specified.

3.5. Test Requirements and Procedure Summary

Test Description	Requirement	Procedure
Examination of Product	Meet requirements of product drawing and TE application specification. After testing, there shall be no corrosive influence on the performance and no physical damage that would impair product performance.	EIA-364-18 Visual and dimensional (C of C) inspection per the product drawing.
Electrical		
Termination Resistance (Low Level Contact Resistance)	Initial: 10 mΩ (milliohm) (maximum) Final: 20 mΩ (milliohm) (maximum)	EIA-364-23 Subject contacts assembled in a housing to 20mV (max.) open circuit at 10 mA. Subtract the resistance of the wire from the measurement. Connection per Figure 4.
Insulation Resistance	1000 MΩ (minimum)	EIA-364-21 Apply 500 VDC and hold for 2 minutes. Test between contacts in adjacent circuits and between housing and contacts in a mated connector.
Dielectric Withstanding Voltage	1 minute hold without a creep discharge or flashover. Current Leakage: 5 mA (maximum)	EIA-364-20, Method A, Condition 1 Hold at 1.5 kV AC at sea level for 1 minute. Current Leakage: 5 mA (maximum) Test between contacts in adjacent circuits and between housing and all contacts in a mated connector.
Temperature Rise vs. Current	30°C maximum when subjected to rated current	EIA-364-70, Method 1 Measure the temperature rise above ambient created by the energizing current. Measurement must be taken at a place where there is no influence from air convection. Contacts to be assembled in housing with all circuits connected. The thermocouple is to be attached to the contact in the center circuit. Stabilize at a single current level until 3 readings at 5 minute intervals are within 1°C.

Figure 1 (continued)

Test Description	Requirement	Procedure
Termination Resistance on Crimped Portion	5 mΩ (milliohm) (maximum)	EIA-364-23 Subject contacts to 20mV (max.) open circuit at 10 mA.
Mechanical		
Sinusoidal Vibration	No electrical discontinuity greater than 1 µs shall occur. No physical damage that would impair product performance.	EIA-364-28, Condition I Subject mated connector to 10-55-10 Hz traversed in 1 minute at 1.52 mm amplitude. Apply 2 hours in each of 3 mutually perpendicular planes. 100 mA applied.
Mechanical Shock	No electrical discontinuity greater than 1 µs shall occur. No physical damage that would impair product performance.	EIA-364-27, Condition A Subject mated connector to 50G's half-sine shock pulse of 11 ms duration. 3 drops each to normal and reversed directions of X, Y and Z axis. Total of 18 drops.
Durability	No physical damage that would impair product performance.	EIA-364-9 Mate and un-mate connectors with a rate of 10 cycles/minute. (a) Mate and un-mate connectors to 6 cycles (b) Mate and un-mate connectors to 30 cycles
Connector Mating Force	9.8x Pos N (maximum) initial and after 6 and 30 cycles	EIA-364-13, Method A Operation Speed: 25.4 mm/min Measure the force required to mate connectors without locking latches.
Connector Unmating Force	For 2P: 1.2 N (minimum) initial and after 6 cycles, 1.0 N (minimum) after 30 cycles For 4P: 2.4 N (minimum) initial and after 6 cycles, 2.0 N (minimum) after 30 cycles For 6P: 3.6 N (minimum) initial and after 6 cycles, 3.0 N (minimum) after 30 cycles	EIA-364-13, Method A Operation Speed: 25.4 mm/min Measure the force required to unmate connectors.
Crimp Tensile Strength	**Wire Size (AWG [mm²])** / **Crimp Tensile (minimum) (N [kgf])** 22 [0.31] / 39.2 20 [0.51] / 58.8 18 [0.87] / 107.8 16 [1.27] / 127.4	EIA-364-8 Operation Speed: 25.4 mm/min Apply an axial pull force to the crimped wire. Contact to be secured to the tester. Insulation barrel crimp to be disabled. *Contact must be held in a fixture during testing to equalize forces during testing.

Figure 1 (continued)

Test Description	Requirement	Procedure
Post Retention Force	19.6 N (minimum)	EIA-364-29 Operation Speed: 25.4 mm/min. Measure post retention force.
Housing Locking Strength	49 N (minimum)	EIA-364-98 Operation Speed: 25.4 mm/min Ensure that locking latches are fully engaged.
Contact Insertion Force	8.82 N (maximum) per contact	EIA-364-5 Operation Speed: 25.4 mm/min Measure force to insert contact into housing.
Contact Retention Force	39.2 N (minimum)	EIA-364-29, Method A Operation Speed: 25.4 mm/min Measure the axial force required to remove contact from the housing.
Environmental		
Thermal Shock	No physical damage that would impair product performance.	EIA-364-32, Test Condition VII. Subject mated specimens to 10 cycles between -55 and 105°C with 30 minute dwells at temperature extremes and 1 minute transition between temperatures.
Humidity-Temperature Cycling	No physical damage that would impair product performance.	EIA-364-31, Method IV Subject mated specimen to 10 cycles between 25°C and 65°C at 80-100% RH. Measurements to be recorded after specimens are held for 3 hours at ambient temperature and humidity. 1 cycle is 24 hours.
Temperature Life	No physical damage that would impair product performance.	EIA-364-17, Method A, Test Condition A, Test Condition 4 Subject mated connector to 105°C for a duration of 96 hours. Measurements to be recorded after specimens are held for 3 hours at ambient temperature and humidity.
Resistance to Cold	No physical damage that would impair product performance.	IEC 60512-11-10 Subject mated connector to –40°C ± 2°C for 96 hours.
Salt Spray	No physical damage that would impair product performance.	EIA-364-26, Condition B Subject mated connectors to 5±1% salt concentration for 48 hours.

Figure 1 (continued)

Test Description	Requirement	Procedure
Solderability	Wet Solder Coverage: 95% (minimum)	Solder Temperature: 260±3°C Immersion Duration: 3±0.5 seconds Immerse 1.2mm from the tip of terminal Steam Aging: 8 hours
Resistance to Soldering Heat	No physical damage that would impair product performance.	EIA-364-56 Test connector on PCB. Solder Temperature: 260 ± 5°C Immersion Duration: 5 ± 0.5 second
Industrial Gas (SO2)	No physical damage that would impair product performance.	Subject mated connectors to SO2 gas (50 ± 5 ppm, 95% RH) at 40 ± 2°C for 24 hours.
Ammonia	No physical damage that would impair product performance.	Subject mated specimens and exposure into NH3 gas evaporating from 28% Ammonia solution for 40mins. (25milli liter in 1 liter).

Figure 1 (end)

NOTE
Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 2.

3.6. Product Qualification and Requalification Test Sequence

TEST OR EXAMINATION	TEST GROUP (a)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	TEST SEQUENCE (b)														
Examination of Product	1,9	1,12	1,6	1,12	1,7	1,4	1,3	1,4	1,5	1,7	1,4	1,3	1,3	1,5	1,5
Termination Resistance (Low Level Contact Resistance)	2,4,6,8	3,10	3,5	2,6,9	2,4,6				2,4	2,4,6				2,4	2,4
Insulation Resistance				3,10											
Dielectric Withstanding Voltage				4,11											
Termination Resistance on Crimped Portion											2				
Temperature Rise vs. Current			4												
Sinusoidal Vibration	5														
Mechanical Shock	7														
Durability	3(b)	5(a),8(b)	2(b)	5(b)	3(b)			2(b)		3(b)					
Connector Mating Force		2,6,9													
Connector Unmating Force		4,7,11													
Crimp Tensile Strength											3				
Post Retention Force							2								
Housing Locking Strength								3							
Contact Insertion Force						2									
Contact Retention Force						3									
Thermal Shock				7											
Humidity-Temperature Cycling				8											
Temperature Life										5					
Resistance to Cold					5										
Salt Spray									3						
Solderability												2			
Resistance to Soldering Heat													2		
Industrial Gas (SO2)														3	
Ammonia															3

Figure 2

NOTE
(a) See paragraph 4.2.
(b) Numbers indicate sequence in which tests are performed.

4. QUALITY ASSURANCE PROVISIONS

4.1. Test Conditions

Unless otherwise specified, all the tests shall be performed in any combination of the following test conditions shown in Figure 3.

Temperature	15°C – 35°C
Relative Humidity	45% – 75%
Atmospheric Pressure	86.6 – 106.6 kPa

Figure 3

4.2. Qualification Testing

A. Specimen Selection

Specimens shall be prepared in accordance with applicable instruction and application sheets and shall be selected at random from current production.

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 2.

4.3. Requalification Testing

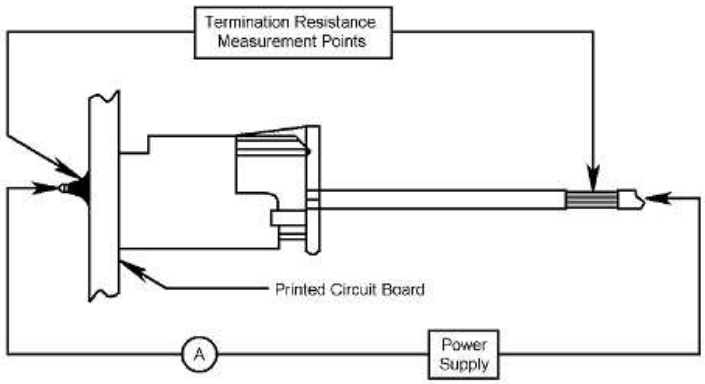
If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.4. Acceptance

Acceptance is based on verification that the product meets the requirements in Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.5. Quality Conformance Inspection

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



LLCR Measurement Points
(Subtract Wire Bulk)

Figure 4

	Position	2P	4P	6P	
Rated Current (MAX.) and Applicable wires	**16 AWG**	10 A	9 A	9 A	
	18 AWG	9 A	8 A	8 A	
	20 AWG	7 A	6 A	6 A	
	22 AWG	5 A	4 A	4 A	

Figure 5: Current Rating for Standard Temperature Terminals

NOTE

These currents are expected to produce an initial 30° C temperature rise (maximum) at the contacts. The temperature rise at the end of consecutive sequential testing (i.e. humidity-temperature cycling, temperature life, and vibration) may be higher.