

## ELCON Mini cable-to-board power connector system, Two Position

**NOTE**

*The product may not perform according to the product specification if precautions have not been taken in the application to provide mechanical stability of the connector in relation to its mating parts*

### 1. SCOPE

#### 1.1. Content

This specification covers the performance, test and quality requirements for the ELCON Mini two position cable connector plug and two mating board mount connectors. The cable connector plug assembly is used to connect to the pc-board connector assembly (by means of front panel connection, or internal cabling). A cable connector plug consists of: 2 position housing suitable for standard- and power-timer contacts, latch, and optional coding contacts for 3 different coding options.

The cable connector plug mates to a two position male board connector (right angle or straight), fixed with a latch device, through the front panel, or in internal cabling applications.

#### 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.

### 2. APPLICABLE DOCUMENTS

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 in this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between requirements of this specification and the referenced documents, this specification shall take precedence.

#### 2.1. TE Documents

- 501-19131 Test report. Cable/Board Power Connector assy. Cable connector without pull tab (right angle or straight)
- 501-128008 Test report. Cable/Board Power Connector assy. Cable connector with pull-tab (right angle or straight)
- 114-19110 Application specification Cable/Board Power Connector System. (Right angle or straight)
- 114-18037 Application specification Standard Power Timer Contact
- 108-18025 Product specification Standard Power Timer Contact.
- TEC-109-201 Test-specification, Component Heat Resistance to Lead-Free Reflow Soldering.

### 3. REQUIREMENTS

#### 3.1. Design and Construction

Products shall be of design, construction and physical dimensions as specified on the applicable customer product drawings C-1982295, C-2042274 C-1982299, C-2178186, and C-2246068.

#### 3.2. Materials and Finish

- Housings, cable connector - Glass filled high temp thermoplastic, color black, UL 94V-0.
- Housings, board connector - Glass filled high temp thermos plastic, color black, UL 94V-0.
- Contacts, power - Copper alloy, silver plated.
- Contacts, coding (optional) - Copper alloy, under layer nickel plated, contact area selective gold or PdNi plated.

### 3.3. Ratings

<b>Operating voltage</b>	500V AC/DC
<b>Current</b>	26 Ampere max. Per contact when used with 4mm <sup>2</sup> cable 40 Ampere max. Per contact when used with 6mm <sup>2</sup> cable
<b>Operating temperature</b>	-40°C to 125°C.
<b>Durability</b>	50 cycles.



#### **NOTE**

Connectors are applied to test board with 2 ounce copper 4 layers printed circuit boards.

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

Table 1

ELECTRICAL		
Termination resistance power contacts	Max. open voltage 20mV. Max. current 100 mA DC. All contacts to be ensured. Measuring points shall be as indicated in Figure 2 Termination resistance 1: Requirement: 0, 8 mΩ max. (Initial) 0, 8 mΩ max. (Final) Termination resistance 2: Requirement: 0,3 mΩ max. (Initial) 0, 3 mΩ max. (Final)	IEC 60512-2-1
Termination resistance coding contacts	Max. open voltage 20mV. Max. Current 100 mA DC. All contacts to be measured. Measuring points shall be as indicated in Figure.2 Termination resistance 3: Contacts: Requirement: 15 mΩmax. (Initial) ΔR 5 mΩmax. (Final)	IEC 60512-2-1
Insulation resistance	Test voltage 100V DC or AC peak. Duration: 1 minute. Test between adjacent contacts. Requirement: 5x10 <sup>3</sup> MΩ□min. initial 10 <sup>3</sup> MΩ□min. final	IEC 60512-3-1
Voltage proof	Test voltage 750 Vrms for adjacent Contacts and coding contacts unmated. Duration 1 minute. Requirement: no break-down or flash-over	IEC 60512-4-1
Short-circuit capacity power contacts	Test current 3000 A/ 10 ms mated Cable board connector. Max 5 operations. Executed by customer.	
Electrical load and temperature	Oven temperature: 65°C Current: 26 A, all contacts charged for 4mm <sup>2</sup> conductor. 40 A, all contacts charged for 6mm <sup>2</sup> conductor Duration: 1000 hrs Requirement: ΔT 30°C max.	IEC 60512-9-2
Current temperature derating curve	Temperature rise: 30°C maximum over ambient temperature (65°C) at 26A for 4mm <sup>2</sup> conductor and 40A for 6mm <sup>2</sup> conductor	IEC 60512-5-2 test 5b
Resistance at crimp (Only for pull-tab type)	Current should be 1 A max. Open voltage should be 0.5 V max. The conductor with the length 1mm should be subtracted. Measuring points shall be as indicated in Figure 4 Requirement: 4mm <sup>2</sup> Conductor=0,103mΩ 6mm <sup>2</sup> Conductor=0,073mΩ	

Table 2

MECHANICAL		
Test Title	Severity Requirements	Procedure
Vibration sinusoidal	10-500 Hz sweeping 1 oct./min., displacement 0,75mm Peak/accel. 10 g , 30 minutes in each 3 mutual perpendicular axes. 3x10 Sweep cycles. No Physical damage. No discontinuity > 1 µsec.	IEC 60512-6-4
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.	IEC 60512-6-3
Insertion/withdrawal forces No latch (Only for without pull-tab type)	Mate and un-mate connector-pair Speed: 2 mm/sec. Rest: 30 s min. Total mating force 40 N max. Total un-mating force 20 N min Mating-force 15 N max./power contact l.p. Un-mating-force 2 N min./power contact l.p. For Gold to Gold Power Contacts Mating- force 20N max / power contact. Un-mating Force 10N min / power contact.	IEC 60512-13-2
Insertion/withdrawal forces (Only for pull-tab type)	Mate and un-mate connector-pair Speed: 10 mm/min. total mating force 50N maximum total un-mating force 10N minimum, 30N maximum	IEC 60512-13-2
Insertion forces during wrong polarization. Board connector mounted in fixture.	Apply 250 N straight force at the cable connector, in mating direction during 10 Sec.	IEC 60512-15-1
Latch activation.	Force to open latch 20 N max	
Mechanical operation. (Only for pull-tab type)	Mate and un-mate connector-pair Rate: 500 cycles/hour. Speed: 10 mm/s Operation cycles: 50 times at -10°C to +65°C 1 times at -40°C to -10°C and +65°C to +85°C	IEC 60512-9-1
Mechanical operation (Only for without pull-tab type)	Mate and un-mate connector-pair Rate: 500 cycles/hour. Speed: 10 mm/s Operation cycles: 50 total.	IEC 60512-9-1
Contact retention force in cable connector.	Apply 50 N straight force at a contact of the cable connector, in un-mating Direction during 10 sec. Requirement: Max. displacement 0,2 mm	IEC 605115-1
Coding contact activation.	The coding contacts shall only make contact when power contacts are mated. See fig.3	
Cable pull in five directions up-down-right-left-straight.	Cable connector mated on board connector. Pull on pair of wires with 60 N forces, during 10 sec. requirement: No functional damage, latch should be In place.	IEC 60512-17-3
Retention force latch Cable/Board connector	Apply 100 N straight force at the cable Connector, in un-mating direction.	IEC 60512-15-1

<p>Crimp tensile (Only for pull-tab type)</p>	<p>Tensile strength (crimped connections) Determine crimp tensile at a rate of 25 to 100mm per minute. The cable clamp should not be attached (it must be left open) when performing the tensile test. Requirement: Power Contact Conduct Size      Tensile 4mm<sup>2</sup>                285N min. 6mm<sup>2</sup>                370N min.</p>	<p>IEC 60512-16-4</p>
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Table 3

ENVIRONMENTAL		
Test Title	Performance / Severity Requirements	Procedure
Rapid change of Temperature.	-40°/90°C, 0,5 hrs / 0,5 hrs, 5 cycles	IEC 60512-11-4.
Climatic sequence	Dry heat 90° C, 16 Hrs 1st damp heat cycle 25°/55° C, RH 93 % 24 Hrs Cold -40° C Two Hrs 2nd Damp heat cycle 25° /55° C RH 93% 24 Hrs	IEC 60512-11-1
Damp/heat steady state (only for without pull-tab type)	Temperature 40°C, RH 93%; duration: 56 days	IEC 60512-11-3
Damp/heat steady state (only for pull-tab type)	Temperature 40°C, RH 93%; duration: 21 days	IEC 60512-11-3
Corrosion mixed flowing gas	Temperature 25°C, RH 75%, Cl2 10 ppb, NO2 200 ppb, H2S 10 ppb, SO2 200 ppb. Duration: 10 days	IEC 60512-11-7
Resistance to soldering heat board connector (only for without pull-tab type)	Specimens were subject to the reflow profile. Shown in Figure 1.	TE 109-201, Method C
Thermal shock (only for pull-tab type)	Subject mated specimens to 5cycles between -65 and 105°C with 120 minute dwells at temperature extremes. no functional damage is allowed Locking latch shall latch into the PCB connector.	EIA-364-32F, Test Condition II.
Temperature life (only for pull-tab type)	Subject mated specimens to 105°C for 1000 hours. no functional damage is allowed Locking latch shall latch into the PCB connector.	EIA-364-17, Method B, Test Condition 4 Test Time Condition C.

Table 4


**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 5.*

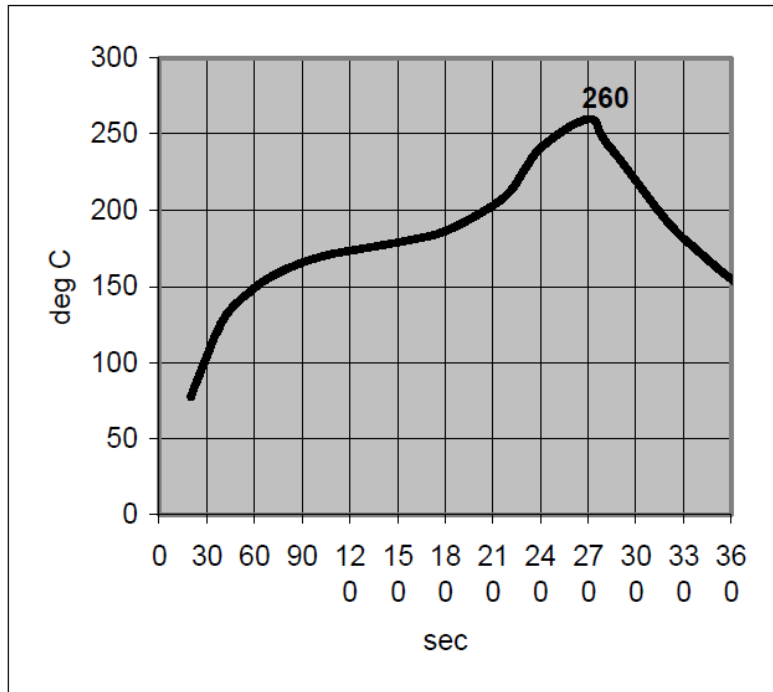


Figure 1

### 3.5. Additional Test and Measuring Details

#### A. Termination Resistance Measurement.

Termination resistance shall be measured as indicated in Figure 2.

Bulk of wire is not included in the requirement and therefore it shall be measured and documented separately.

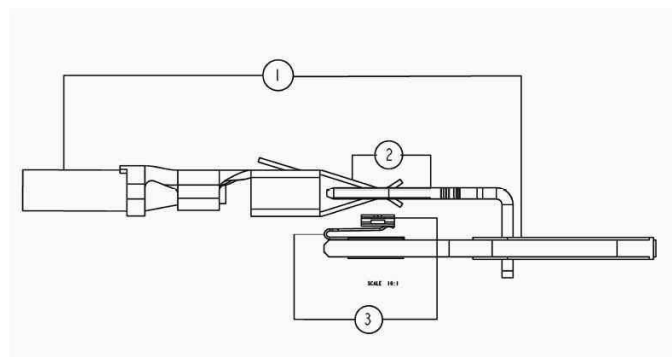


Figure 2

## B. Activation of the Coding Contacts

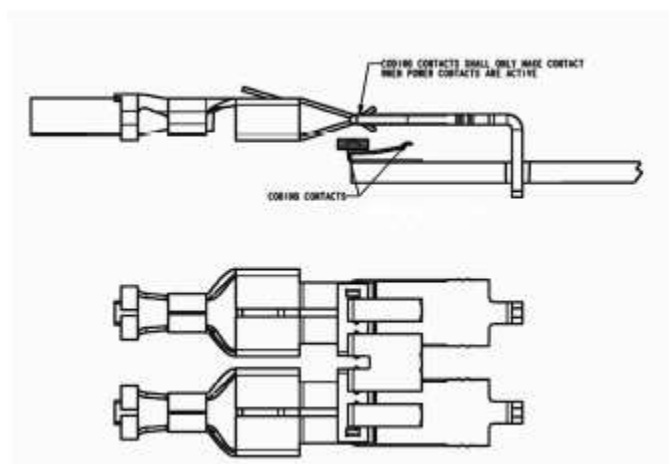


Figure 3

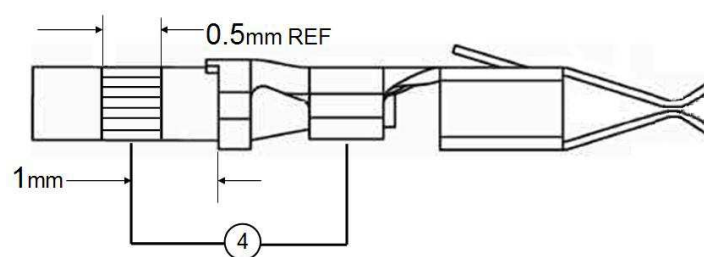


Figure 4



### 3.6. Product Qualification and Requalification Test Sequence

#### 3.6.1 Product Qualification and Requalification Test Sequence for without pull-tab type

TEST	TEST-GROUP (a)					
	1	2	3	4	5	6
	TEST-SEQUENCE (b)					
Examination of product	1,13	1,9	1,6	1,17	1,3	1, 3[c]
Termination Resistance	2,5,	2,4,6,8	2,5	2,6,10,14		
Insulation Resistance				3,7,11,15		
Voltage proof				4,8,12,16		
Current derating curve	3					
Current temperature	4					
Vibration sinusoidal			3			
Short circuit capacity power contacts						2
Physical shock			4			
Mechanical operation (half of number)		3,7				
Insertion force during wrong polarization	7					
Latch activation force	8					
Latch retention force	9					
Cable pull in 5 directions	10					
Contact retention in insert	11					
Coding contacts activation	12					
Rapid change of temperature				5		
Climatic sequence				9		
Damp/heat steady state				13		
Corrosion mixed flow gas		5				
Short-circuit capacity power contacts						
Resistance to soldering heat, board conn.					2	
Insertion/Withdrawal Force	6					

Table 5

### 3.6.2 Product Qualification and Requalification Test Sequence for pull-tab type

TEST	TEST-GROUP (a)						
	1	2	3	4	5	6	7
	TEST-SEQUENCE (b)						
Examination of product	1	1	1	1	1	1	1
Termination Resistance(power contacts & coding contacts)	2,7,11	2,5	2,4,6,8	2,6,10,1 4			
Insulation Resistance				3,7,11,1 5			
Voltage proof				4,8,12,1 6			
Electrical load and temperature		4					
Current temperature derating curve		3					
Short-circuit capacity power contacts							2(c)
Short circuit capacity power contacts					2		
Resistance at crimp	5						
Vibration Sinusoidal	6						
Physical shock	3						
Insertion/withdrawal forces	4						
Insertion forces during wrong polarization.						2,5	
Latch activation force(no power contact)			3,7				
Mechanical operation(half of number)	12						
Contact retention force in cable connector.	8						
Cable pull in 5 directions	9						
Locking latch strength					3		
Crimp tensile.	13						
Coding contact activation				5			
Rapid change of temperature				9			
Climatic sequence				13			
Damp/heat steady state			5(d)				
Corrosion mixed flowing gas						3	
Thermal shock						4	
Temperature life	10,14	6	9	17	4	6	3(c)
Final examination of product							

Table 6

- (a) See paragraph 4.1
- (b) Numbers indicate sequence in which tests are performed.
- (c) Executed by the customer
- (d) Connectors for this tests shall be preconditioned by mating and un-mating 10 cycle.

Sample-quantities	Sum	Test-Group						
		1	2	3	4	5	6	7
Board connectors	24	6	6	3	3		3	3
Cable connectors (Terminated to cable)	21	6(e)	6(e)	3	3			3
Cable with power contact	6					6(e)		
Cable connectors (no cable)	3						3	

(e) Half are 4mm<sup>2</sup> cables the other half are 6mm<sup>2</sup> cables

Figure 5

## 4. QUALITY ASSURANCE PROVISIONS

### 4.1. Qualification testing

#### Sample Selection

Samples shall be prepared in accordance with applicable instructions and shall be selected at 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 five connectors of applicable type. Qualification inspection shall be verified by testing samples

### 4.2. Requalification testing

If changes significantly affecting form, fit or function are made to product or manufacturing process, product assurance shall coordinate requalification 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 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