1. OBJECTIVE

1.1. This specification defines the performance, test, quality and reliability requirements of the Minitek Pwr 3.0 Wire to board & Wire to Wire connector series.

2. SCOPE

This specification is applicable to the characteristics of the Minitek Pwr 3.0 family of Wire to Board & Wire to Wire products with 16-30 AWG wires using crimp technology with Gold & Tin plating.

3. Ratings

3.1. Operating Voltage Rating = 600 (VAC or VDC)

3.2. Operating Current Rating & Applicable Wires

Maximum Current Rating,

Standard Wire-to-Wire and Wire-to-Board

CURRENT DERATING REFERENCE INFORMATION FOR DUAL ROW								
AWG of wire	2-Circuit		6-Circuit		12-Circuit		24-Circuit	
	W-W	W-B	W-W	W-B	W-W	W-B	W-W	W-B
	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps
18 AWG	7*	8.5*	6*	6.4	5.5*	5.5	5*	5*
20 AWG	6*	7*	5*	5.5*	4.5*	5*	4*	4.5*
22 AWG	5.5*	6*	4 *	4.5*	3.5*	4.5	3*	3.5*
24 AWG	4.5*	5*	4*	4.5*	3*	3.5*	2*	3*
26 AWG	4*	4.5*	3*	4*	2.5*	3.3	1.5*	2.5*
28 AWG	3*	4*	2*	3*	2*	2.5	1*	2*
30 AWG	3*	3.5*	2*	3*	2*	1.7	1*	1*

CURRENT DERATING REFERENCE INFORMATION FOR SINGLE ROW						
AWG	2 Circuit		6 Circuit		12 Circuit	
	W-W	W-B	W-W	W-B	W-W	W-B
	Amps	Amps	Amps	Amps	Amps	Amps
18	7*	8.5*	6.5*	7*	6.5*	6.5*
20	6.5*	7*	5*	5.5*	4.5*	5*
22	5.5*	6*	4*	4.5*	3.5*	4*
24	5*	5.5*	4*	4.5*	3*	3.5*
26	4*	4.5*	3*	4*	2.5*	3.5*
28	3*	4*	2*	3*	2*	3*
30	3*	3.5*	2*	3*	2*	2.5*

3.2.1 Values are for REFERENCE ONLY

3.2.2 PCB trace design can greatly improve temperature rise results in Wire-to-Board Applications

3.2.3 Data is for all circuits powered

3.2.4 Including 30°C terminal temperature rise at rated current

* Indicates interpolated values

3.3 Operating Temperature Range = -40°C ~ 105°C*

** includes the terminal temperature rise when powered*

3.4 Current and Applicable Wires

AWG	Max Outside insulation Diameter
16	2.20 mm
18	2.20 mm
20	1.85 mm
22	1.85 mm
24	1.85 mm
26	1.27 mm
28	1.27 mm
30	1.27 mm

4. APPLICABLE DOCUMENTS

The following documents, of the latest issue in effect at the time of performance of the qualification tests, shall form a part of this specification to the extent specified herewith.

Federal

QQ-B-626	Brass; bar, plate, rod, strip, flat wire and special shaped sections.
QQ-B-750	Bronze, phosphor; bar, plate, rod, sheet, strip, flat wire, and structural and special shaped sections.
QQ-N-290	Plating, Nickel (electrodeposited).

Military

EIA-364	Electrical Connector/Socket Test Procedures Including Environmental
IEC-60512	Connectors for Electronic Equipment – Tests and Measurement
MIL-G-45204	Gold plating (electrodeposited).
MIL-P-81728	Plating; tin/lead (electrodeposited)

Underwriters' Laboratories, Inc.

UL-STD-94	Tests for flammability of plastic materials for parts in devices and appliances.

FCI

Application Specification: GS-20-0399

UL Files: E66906*, E467317*

*(*Please check with manufacturing site on UL status of each individual series.)*

Applicable Product Serial Numbers:

Serial Number	Description
10127716	Wire Connector, Receptacle HSG
10127717	Wire Connector, Plug HSG
10127718	Wire Connector, Receptacle Crimp Terminal
10134160	Wire Connector, Receptacle Crimp Terminal
10127719	Wire Connector, Plug Crimp Terminal
10127720	Board Connector, Right Angle Plug
10127721	Board Connector, Vertical Plug
10137924	Board Connector, Right Angle Plug
10137925	Board Connector, Right Angle Plug
10137926	Board Connector, Vertical Plug
10137927	Board Connector, Vertical Plug
10144754	Board Connector, Right Angle Plug
10138980	Board Connector, Vertical Plug
10136653	Wire Connector, Receptacle HSG
10136654	Board Connector, Right Angle Plug
10136655	Board Connector, Right Angle Plug
10136656	Board Connector, Vertical Plug
10137867	Board Connector, Right Angle Plug
10159684	Wire Connector, BMI Receptacle Housing
10159685	Board Connector, Vertical press Fit Header
10160855	Wire Connector, BMI Plug Housing
10161703	Wire Connector, Plug Crimp Terminal

5. PERFORMANCE

5.1. ELECTRICAL REQUIREMENTS

TEST ITEM		REQUIREMENT	PROCEDURE
1	Low Level Contact Resistance	10 milliohms MAXIMUM [initial]	Mate connectors: apply a maximum voltage of 20 mV and a current of 100 mA. (Does not include wire resistance) (As per EIA 364-23)
2	Contact Resistance of Wire Termination (Low Level)	5 milliohms MAXIMUM [initial]	Terminate the applicable wire to the terminal and measure wire using a voltage of 20 mV and a current of 100 mA. (As per EIA 364-23)
3	Insulation Resistance	1000 Mega ohms MINIMUM	Unmate & unmount connectors: apply a voltage of 500 VDC between adjacent terminals and between terminals to ground. (As per EIA 364-21)
4	Dielectric Withstanding Voltage	No breakdown or flashover. Current leakage < 5mA	Unmate connectors: apply a voltage of two times the rated voltage plus 1000volts VAC for 1 minute between adjacent terminals and between terminals to ground (As per EIA-364-20)
5	Temperature Rise (Via Current Cycling)	Temperature rise: +30˚C max.	Mate connector: measure the temperature rise at the rate current after: 1) 96 hours (steady state) 2) 240 hours (45 minutes ON and 15 minutes OFF per hour) 3) 96 hours (steady state) (As per EIA 364-70)

5.2. MECHANICAL REQUIREMENTS

	TEST ITEM	REQUIREMENT	PROCEDURE
6	Insertion and withdrawal force	*For 10127718* 8.0 N per circuit MAXIMUM Insertion force & 2.4 N per circuit MINIMUM withdrawal force *For 10127718 (lubed terminal)* 4.5 N per circuit MAXIMUM Insertion force & 2 N per circuit MINIMUM withdrawal force *For 10134160* 4.1 N per circuit MAXIMUM Insertion force (6N after Durability Test) & 1.5 N per circuit MINIMUM withdrawal force(For Tin Plated Contacts) and 0.6 N per circuit MINIMUM withdrawal force(For Gold Plated Contacts)	Mate and unmate connector (male to female) at a rate of 25±6mm per minute (As per EIA 364-13)
7	Terminal Retention Force (in Housing)	*For 10127718* 24.5 N MINI. retention force *For 10134160* 15 N MINI. retention force(23N Average)	Axial pullout force on the terminal in the housing at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute. (As per EIA 364-05)
8	Terminal Insertion Force (into Housing)	14.7 N MAXIMUM insertion force	Apply an axial insertion force on the terminal at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute (As per EIA 364-05)

5.2. MECHANICAL REQUIREMENTS CONTINUED

<table>
<tr><th></th><th>TEST ITEM</th><th>REQUIREMENT</th><th>PROCEDURE</th></tr>
<tr><td rowspan="6">9</td><td rowspan="6">Durability</td><td rowspan="6">LLCR: △20 mΩ max.</td><td><u>For 10127718</u>

Per EIA-364-09

• Mate connectors up to 30 cycles at a maximum rate of 10 cycles per minute

• Mate connectors up to 150 cycles at a max. rate of 10 cycles per minute prior to Environmental Tests for Lubricated Contacts</td></tr>
<tr><td><u>For 10134160</u></td></tr>
<tr><td>
<table>
<tr><th>Plating</th><th>Number of cycles</th></tr>
<tr><td>Tin</td><td>10</td></tr>
<tr><td>Gold Flash 0.1µm</td><td>20</td></tr>
<tr><td>Gold 0.38µm</td><td>100</td></tr>
<tr><td>Gold 0.76µm</td><td>200</td></tr>
</table>
</td></tr>
<tr><td>10</td><td>Vibration
(Random)</td><td>LLCR: △20 mΩ max.
&
Discontinuity < 1 microsecond</td><td>Mate connectors and vibrate per EIA 364-28, test condition VII, Letter D.
Test Duration: 15 minutes each axis.
Vibration Amplitude – 3.10 rms G minimum
(As per EIA 364-28)</td></tr>
</table>

5.2. MECHANICAL REQUIREMENTS CONTINUED

	TEST ITEM	REQUIREMENT	PROCEDURE
11	Shock (Mechanical)	LLCR: △20 mΩ max. & Discontinuity < 1 microsecond	Mate connectors and shock at 50 g's with ½ sine wave (11 milliseconds) shocks in the ±X,±Y,±Z axes (18 shocks total). (Per EIA-364-27, Test Condition H)
12	Wire Pullout Force (Axial) (Wire from Terminal)	MINIMUM pullout force 16 awg: 68.6 N 18 awg: 63 N 20 awg: 57.8 N 22 awg: 35.6 N 24 awg: 22.2 N 26 awg: 13.3 N 28 awg: 8.9 N 30 awg: 6.6 N	Apply an axial pullout force on the wire at a rate of 25+/-6mm per minute. (As per IEC 60512)
13	Normal Force	*For 10127718* 2.7 N MINIMUM	Apply a perpendicular force (As per EIA-364-04)
14	Pin to Header Retention	13.7 N MINIMUM pushout force	Apply axial push force to pin at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute. (As per EIA 364-29)
15	Thumb Latch to Ramp Yield Strength	58.0 N MINIMUM Yield Strength	Full mate and then unmated the connector at a rate of 25+/-6mm per minute.
16	Panel Mount Retention	155.7 N (35 lbf) MINIMUM pushout force. 200N(ibf) MINIMUM pushout force for BMI Hsg's	Insert connector in panel. Apply an axial force on the connector in the opposite direction of insertion at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute. (As per EIA-364-97)
17	Compliant Pin Insertion Force into PCB Hole	106.7 N (24 lbf) Maximum Insertion force (Per Terminal)	Apply an axial insertion force on the terminal at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute (As per IEC-60352)
18	Compliant Pin Retention Force in PCB Hole	Minimum Retention force (Per Terminal) Sn-PTH: 35.6 N (8.0 lbf) OSP: 13.3 N (3.0 lbf)	Apply an axial extraction force on the terminal at a rate of 25 ± 6 mm (1 ± ¼ inch) per minute. (As per IEC-60352)

5.3. ENVIRONMENTAL REQUIREMENTS

	TEST ITEM	REQUIREMENT	PROCEDURE
19	Solderability	Continuous solder coating with a min. 95% coverage	Solder pot temperature: 250 ~255 °C Soldering time: 2.5 seconds Flux: unactivated (As per IEC-60068-2-20)
22	Salt Spray	No evidence of damage. Contact resistance: 20 mΩ max. (Final)	Mate connectors Orientation: Horizontal with latch on top surface Duration: 48 hours exposure Atmosphere: Salt spray from a 5% solution Temperature: 35 ± 2°C As per EIA-364-26
21	Thermal Aging	Contact resistance: 20 mΩ max. (Final)	(As per EIA 364-17) Mate connectors: expose to 240 hours at 105 ± 2°C
			(As per EIA 364-17) Mate connectors Expose gold plated terminals to: 1,000 hours at 125 ± 2 °C
22	Humidity (Steady State)	1) 20 mΩ max. (change from initial) 2) Dielectric Withstanding Voltage: No Breakdown at 500 VAC 3) Insulation Resistance: 1000 MΩ Min.	Mate connectors: expose to a temperature of 40 ± 2℃ with a relative humidity of 90~95% for 96 hours. Note: Remove surface moisture and air dry for 1 hour prior to measurements. EIA 364-31 method II (steady state)
23	Resistance to Soldering Heat	Visual: No Damage to insulator material	Dip connector terminal tails in solder: Solder Duration: 10 seconds Max. Solder temperature: 260°C Max. (As per EIA-364-56)
24	Cold Resistance	20 milliohms Maximum	Mate connectors Duration:96 hrs Temperature: -40±3°C (Per EIA 364-59)

6.0 QUALITY ASSURANCE PROVISIONS

6.1 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.

6.2 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

6.3 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.

6.4 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.

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.

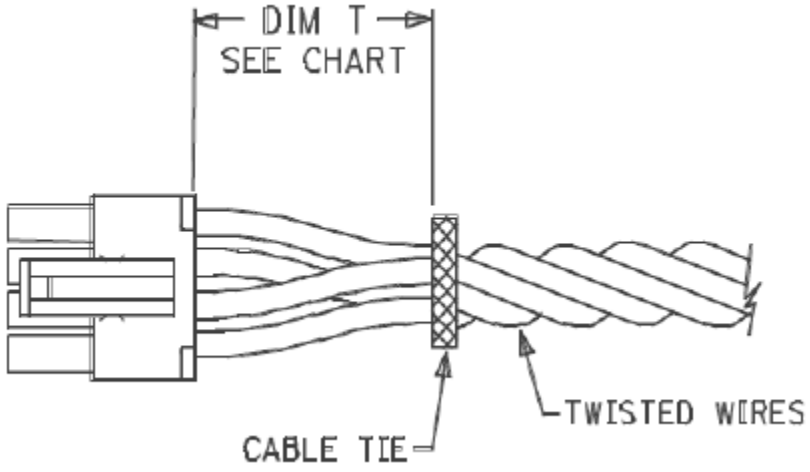
6.5 Qualification Test Table

Test or Examination	Test Group														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	M
	Test Sequence														
Examination of Product	1,9	1,11	1,7	1,5	1,3	1	1	1	1	1,3	1,5	1,3	1,3,5	1,3	1,3
Low Level Contact Resistance	2,8	2,6, 10	2,4,6	2,4		2,4					2,4				
Insulation Resistance		3,8													

Test or Examination	Test Group														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	M
	Test Sequence														
Dielectric Withstanding Voltage		4,9													
Temperature Rise (Via Current Cycling)				3											
Insertion Force	3,6														
Withdrawal Force	4,7														
Terminal Insertion Force in Housing for Cable assembly							2								
Terminal Retention Force in Housing for Cable assembly							3								
Wire Pullout Force (Axial) (Wire from Terminal)								2							
Thumb Latch to Ramp Yield Strength									2						
Durability	5														
Vibration (Random)			3												
Shock (Mechanical)			5												
Normal Force															2
Pin to header Retention												2			
Panel Retention Force														2	
Pin insertion into PCB													2		
Pin Retention in PCB													4		
Solderability					2										
Salt Spray						3									
Thermal Aging		5													
Humidity (Steady State)		7													
Resistance to Soldering Heat										2					
Cold Resistance											3				
Sample Size per Test Group	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

7.0 OTHER INFORMATION

7.1 CABLE TIE AND/OR WIRE TWIST LOCATION



Contact Size	Dim T Min.
2-8	12.7 mm
10-16	19.1 mm
18-24	25.4 mm

The “T” dimension defines a “free” length of wire, or a length of wire that is not subject to significant bias by external factors such as a wire tie, wire twisting, or other means of bending or deforming of the wires that repositions them from their natural relaxed state or location where they enter the housing. Wires are to be dressed in such a manner to allow the terminals to float freely in the pocket.

REVISION RECORD

Rev	Page	Description	EC#	Date
A	ALL	New Release		2013/10/21

B	ALL	1. Change product name to “Minitek Pwr3.0”. 2. Add Applicable P/N, Application Specification No. and UL Certification No. 3. Change plating spec. to optional plating.	ELX-T-17587	2014/04/28
C	2	Revise rated voltage to 600Vrms max.	ELX-T-19540	2014/11/25
D	ALL	Change specification for low insertion/withdrawal force version.	ELX-T-21533	2015/08/04
E	2	Change Voltage to 600Vrms	ELX-N-26578	2017/04/10
F	2	Add PNs in Product SPEC	ELX-N-31768	2018/11/01
G	ALL	Updations are: • Current Rating Table • insertion & withdrawal force per circuit value • UL details • New series added	ELX-I-40957	2021/05/19