

## 1.0 SCOPE

### 1.1. Content:

This specification covers performance, tests and quality requirements ding rail spring clamp type Terminal Block connector (**With ground function**). Applicable product descriptions and part numbers are as shown on product drawing.

### 1.2. Qualification:

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

## 2.0 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 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 Documents:

114-137138: Application Specification for ding rail spring clamp type Terminal Block Connector

501-137142: Qualification Test Report for ding rail spring clamp type Terminal Block Connector

## 3.0 REQUIREMENTS

### 3.1 Design and Construction

Product shall be of the design, construction 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 product drawing.

### 3.4 Ratings

A. Wire Size Range: see table 1

B. Operating Temperature: -40 to 105°C

C. Storage Environment:

Temperature: - 25°C to 40°C      Relative humidity: 15%-70%

### 3.5 Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements. Unless otherwise specified, all tests shall be performed in the room temperature (5~35°C), relative humidity (45~85%), air pressure (86~106kPa), and special case temperature (18~22°C), relative humidity (60~70%), unless otherwise specified.

## 3.6 Test Requirements and Procedures Summary

### 3.6.1 Examination:

Test Description	Requirement	Procedure
Examination of the product	Meets visual requirements.	Visual inspection per product drawing. Per EIA-364-18

### 3.6.2 ELECTRICAL

Test Description	Requirement	Procedure
Contact Resistance (Low Level)	20 mΩ Max	Subject mated contacts assembled in housing to closed circuit current of 100 mA Max. at open circuit voltage of 20mV Max. Per EIA-364-23
Insulation resistance.	2000 MΩ Min.	Unmated connector with 500 V DC between: (a)Terminal and terminal(Live parts that are not conductively interconnected for mult-level type and two adjacent terminal blocks) (b)Terminal and Body for 1 min. Per IEC 60998-1/60998-2-2
Dielectric Withstanding Voltage	No flashover or breakdown shall occur during the test	Applying a voltage of substantially sine -wave form, having a frequency of 60 Hz and 2200V Voltage between adjacent contacts or test objects for 1 min. Current: 10mA (a)Terminal and terminal(Live parts that are not conductively interconnected for mult-level type and two adjacent terminal blocks) b)Between Live parts and insulation body
Voltage Drop Test	a) The voltage drop shall not exceed 3.2 mV, when measured across the clamping units; b) The voltage drop shall not exceed 6.4 mV, when measured from the clamping units to the support.	The voltage drop is to be measured on each terminal block as shown in Figure 3, with a DC current ( <u>See table 2</u> ) of 0.1 times the maximum rated current of the terminal block passing through the measurement points.
Current test	There shall be no damage to the terminal block or its support.	Following the measurement of voltage drop, three separate applications of the test current specified in Table 3 are to be applied, one after another, through the current paths 1-1 and 2-2, as appropriate, as shown in Figure 4. The test current is to be applied for 1 second during each application with an interval of 6 minutes or less between applications of the current.
Voltage drop test repeated	a) The voltage drop shall not exceed 3.2 mV, when measured across the clamping units; b) The voltage drop shall not exceed 6.4 mV, when measured from the clamping units to the support; c) The voltage drop shall not exceed 150 percent of the voltage drop measured in Voltage drop test (a) and (b).	Following the current test and after cooling to room temperature and without any change to the arrangement, the voltage drop test is to be repeated.

### 3.6.3 MECHANICAL

Test Description	Requirement	Procedure
Connection of conductors	Shall be accepted one conductors	Terminals shall accept one conductor of the same or of different nominal cross-sectional areas or composition (Use solid wire for 30~10AWG, the wire should be stranded for 8AWG and larger size). ( <u>see table 1</u> ),
Secureness test	The joint between a terminal and the wire of a sample set shall be intact after test.	Wire size see table 1 (Solid & Stranded), the wire should be stranded for 8AWG and larger size. Duration time : 15minutes Per UL 486E, <u>section12</u> .
Conductor tensile force test(Pull test)	After the Rotating test and the terminal shall not separate from the wire as a result.	The force (refer to table 5) should be applied in one smooth and continuous application, for 1 min, in the direction of the axis of the conductor. Using the max. size and Min. size wire(solid and stranded) refer to table 1 , the wire should be stranded for 8AWG and larger size. (Per <u>UL486E Table14.1</u> )

### 3.6.4 Environmental

Test Description	Requirement	Procedure
Low temperature test	See Note1	Temperature :-40 °C; Duration:24 hr

High temperature test	See Note1	Temperature :105 °C; Duration:24 hr
High temperature and high humidity test	See Note 1	Temperature :40 °C; Humidity: 90-95% Duration:24 hr
Accelerated Aging test	There is no evidence of blistering, cracking, softening, or melting of any of the part. Any distortion shall not affect the integrity of the device.	Temperature :105 °C Duration:168 hr, Per CSA 222.

**Figure 1**

**NOTE**

1. 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.
2. A terminal block using spring force connectors is to be tested using both solid and stranded wire for 30 - 10 AWG (0.05 - 5.3 mm<sup>2</sup>) wire sizes and using stranded wire for 8 AWG (8.4 mm<sup>2</sup>) and larger wire sizes unless the terminal is marked according to UL1059 section [34.2](#) in which case the wire used is to be of the type the terminal block is rated.

**3.6.5 Product Qualification and Requalification Test Sequence**

Test group	A	B	C	D	E	F
Examination of product	1,5	1,4	1,4	1,6	1,6	1,6
Contact resistance				5	5	5
Insulation resistance.				3	3	3
Dielectric Withstanding Voltage				4	4	4
Voltage Drop Test	2					
<b>Current test</b>	3					
<b>Voltage drop test repeated</b>	4					
Connection of conductors		2				
Secureness test			2			
Conductor tensile force test(Pull test)			3			
Low temperature test				2		
High temperature test					2	
High temperature and high humidity test						2
Accelerated Aging test		3				
Sample size	3	3	6	3	3	3

**Figure 2**

**4.0 Quality Assurance Provisions**

**4.1 Qualification Testing**

**A. Specimen Selection**

Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production.

**B. Test Sequence**

Qualification inspection shall be verified by testing specimens as specified.

**4.2. 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.

#### 4.3. Acceptance

Acceptance is based on verification that the product meets the requirements. 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 resubmitted.

#### 4.4. 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

**Figure 3**  
**Voltage Drop Test Measurement Points**

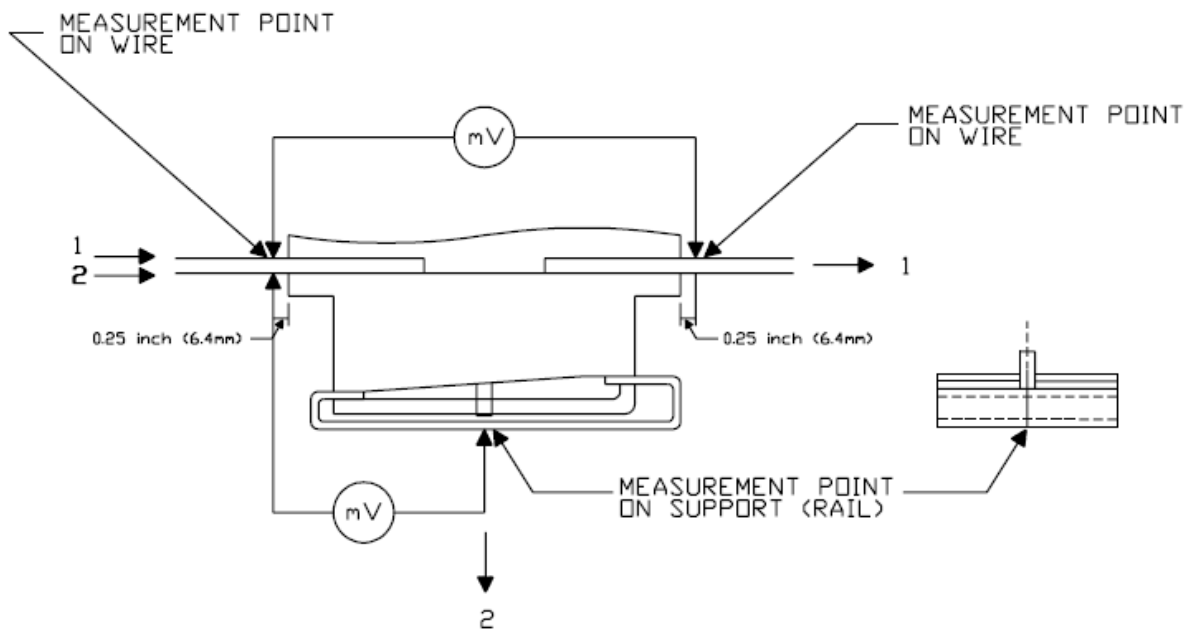


Figure 4  
Current Path for Current Test

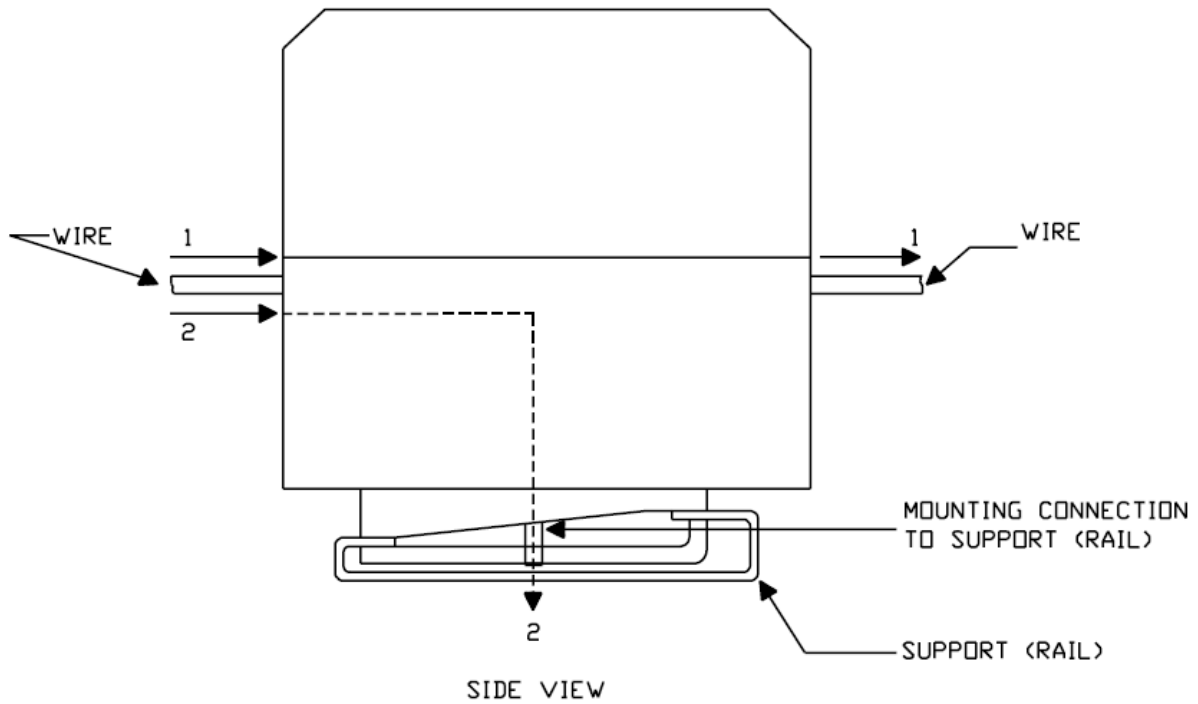
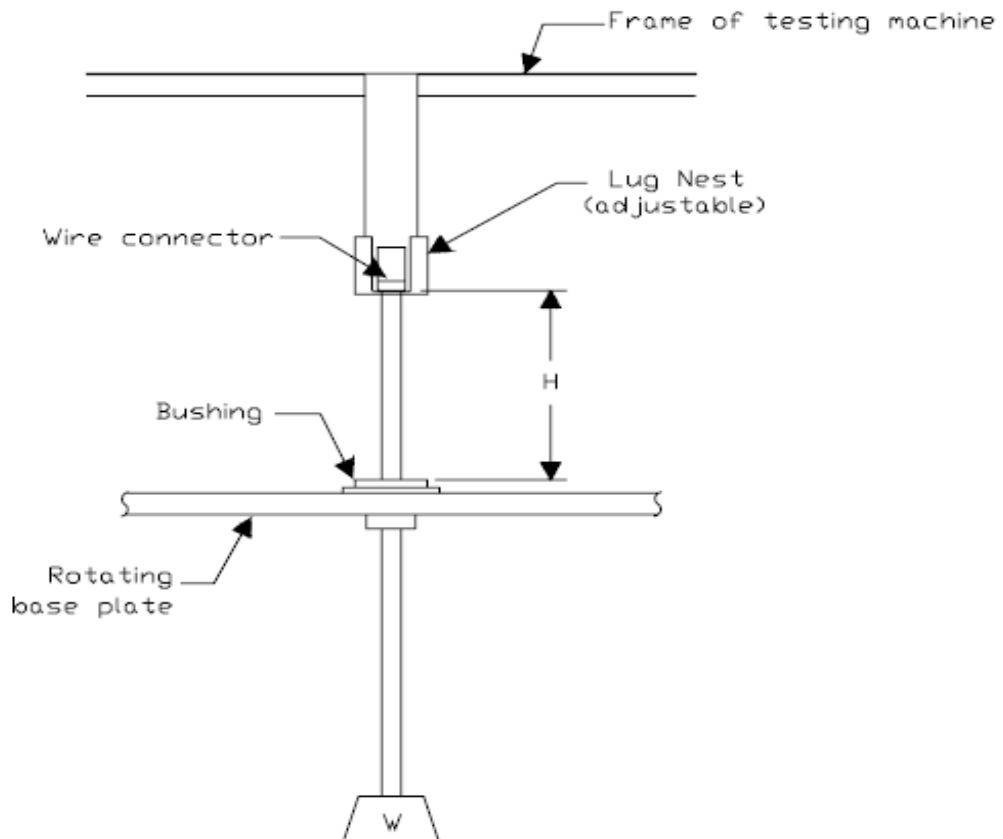


Fig 5  
Secureness test setup



**Table 1 Wire Section Range**

Conductor Section (mm <sup>2</sup> )	Series Describe	TE Series	Conductor Size Range (AWG)
1.5	1 in-1 out	DTS 1.5-G	28-14
2.5	1 in-1 out	DTS 2.5-G	28-12
	2 level	DTS 2.5 DO-G	28-12
	1 in 2 out	DTS 2.5 TW-G	28-12
4	1 in-1 out	DTS 4-G	28-10
	1 in 2 out	DTS 4 TW-G	28-10
6	1 in-1 out	DTS 6-G	24-8
10	1 in-1 out	DTS 10-G	24-6
16	1 in-1 out	DTS 16-G	24-4
35	1 in 1 out	DTS 35-G	14-2

**Table 2 Current loading for voltage drop test**

Conductor Section (mm <sup>2</sup> )	Series Describe	TE Series	Current loading (A)
1.5	1 in-1 out	DTS 1.5-G	1.5
2.5	1 in-1 out	DTS 2.5-G	2.0
	2 level	DTS 2.5 DO-G	2.0
	1 in 2 out	DTS 2.5 TW-G	2.0
4	1 in-1 out	DTS 4-G	3.0
	1 in 2 out	DTS 4 TW-G	3.0
6	1 in-1 out	DTS 6-G	4.5
10	1 in-1 out	DTS 10-G	6.5
16	1 in-1 out	DTS 16-G	6.5
35	1 in 1 out	DTS 35-G	11.5

**Table 3**

**Short-time test currents**

Copper conductor size		Test current (A)
AWG	(mm <sup>2</sup> )	
14	(2. 1)	252
12	(3. 3)	396
10	(5. 3)	636
8	(8. 4)	1008
6	(13. 3)	1598
4	(21. 2)	2554
3	(26. 7)	3204
2	(33. 6)	4032
1	(42. 4)	5088

**Table 4**

**Test values for secureness test**

Size of Conductor		Diameter of Bushing Hole		Height		Weight	
AWG	(mm <sup>2</sup> )	Inch	(mm)	Inch	(mm)	Pounds	Kg
18	(0.82)	1/4	(6.4)	10-1/4	(260)	1	(0.45)
16	(1.3)	1/4	(6.4)	10-1/4	(260)	1	(0.45)
14	(2.1)	3/8	(9.5)	11	(279)	1.5	(0.68)
12	(3.3)	3/8	(9.5)	11	(279)	2	(0.9)
10	(5.3)	3/8	(9.5)	11	(279)	3	(1.4)
8	(8.4)	3/8	(9.5)	11	(279)	4.5	(2)
6	(13.3)	1/2	(12.7)	11-3/4	(298)	6.5	(2.9)
4	(21.2)	1/2	(12.7)	11-3/4	(298)	10	(4.5)
3	(26.7)	9/16	(14.3)	12-1/2	(318)	13	(5.9)
2	(33.6)	9/16	(14.3)	12-1/2	(318)	15	(6.8)
1	(42.4)	5/8	(15.9)	13-1/2	(343)	19	(8.6)

**Table 5**

**Test values for pullout force**

Size Of Conductor		Pullout Force	
AWG	mm <sup>2</sup>	Pounds	N
30	(0.05)	1/2	2.2
28	(0.08)	1	4.5
26	(0.13)	2	8.9
24	(0.20)	3	13.4
22	(0.32)	4.5	20
20	(0.52)	6.75	30
18	(0.82)	6.75	30
16	(1.3)	9	40
14	(2.1)	11.5	50
12	(3.3)	13.5	60
10	(5.3)	18	80
8	(8.4)	20.5	90
6	(13.3)	21	94
4	(21.2)	30	133
3	(26.7)	35	156
2	(33.6)	42	186
1	(42.4)	53	236