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**Engineering Standard – NSW**

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**Title**  
**Specification - Solderless Terminals Screw  
and Spring Clamp Terminal Blocks**

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## **About This Standard**

This specification describes the general requirements for solderless screw and spring clamp type wire terminal blocks for use in wiring railway signal apparatus.

This specification covers terminal blocks, which shall be suitable for both "DIN rail" mounting, and for surface mounting.

## Document History

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### List of Amendments –

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## Contents

1.	Introduction.....	6
2.	Applicable Documents.....	6
2.1	ARTC Specifications .....	6
2.2	Australian Standards.....	6
2.3	International Standards.....	6
3.	Definitions.....	6
4.	General Description.....	7
5.	Environmental Conditions .....	7
6.	Service Conditions .....	8
7.	Material.....	8
7.1	Insulating Material.....	8
7.2	Metallic Parts and Coating .....	8
7.3	Fire and Heat Characteristics.....	8
8.	Types and Applications .....	8
8.1	Test - Disconnect Terminal (Link Type) Blocks.....	8
8.2	Test - Disconnect Terminal (Pin or KnifeType) Blocks.....	8
8.3	Feed Through Terminal Blocks .....	9
8.3.1	For Conductors to 70 sq mm.....	9
8.3.2	For Conductors over 70 sq mm.....	9
8.4	Fuse Terminal Blocks.....	9
8.4.1	Type 1 .....	9
8.4.2	Type 2 .....	9
8.4.3	Type 3 .....	9
8.5	Earth Terminal Blocks .....	9
8.6	Surface Mounted Terminal Blocks .....	10
9.	Mechanical Design and Testing 9.1 Surface Leakage .....	10
9.1	General Features .....	10
10.	Electrical Requirements .....	10
11.	Dielectric Properties, Current Leakage and Insulating Requirements.....	10
12.	Identification and Marking .....	11
13.	Labelling .....	11

## 1. Introduction

This specification describes the general requirements for solderless screw and spring clamp type wire terminal blocks for use in wiring railway signal apparatus.

This specification covers terminal blocks, which shall be suitable for both "DIN rail" mounting, and for surface mounting.

## 2. Applicable Documents

### 2.1 ARTC Specifications

Specification SPS 06: Connectors for Signalling Interface.

### 2.2 Australian Standards

This Specification refers to the following Australian Standards:

AS 1125	Conductors in Insulated Electric Cables and Flexible Cords.
AS 1147.1	Electrical Material for Coal Mines - Insulating Materials. Part 1: Materials for Insulating Power Conducting Components.
AS 2420	Fire Test Methods for Solid Insulating Materials and Non-Metallic Enclosures Used in Electrical Equipment.
AS 3000	SAA Wiring Rules.
AS 3013	Electrical' Installations - Wiring Systems for Specific Applications.
AS 3100	Approval and Test Specification - General Requirements for Electrical Equipment.
AS 3169	Approval and Test Specification - Flat, Quick Connect Termination.

### 2.3 International Standards

This Specification refers to the following International Standards:

VDE 0607	Specifications for Clamps of Screwless Terminals for Connecting or Joining Copper Conductors from 0.5 mm <sup>2</sup> up to 16 mm <sup>2</sup> .
BS 4579	Specification for the Performance of Compression Joints in Electric Cable and Wire Connectors.
AAR Part 14.1.2	Recommendations for Design Criteria and Operating / Functional Guidelines for Solderless Screw Clamp Type Terminal Blocks for Use in Wiring Signal Apparatus with Copper Wire Only.
DIN 46277/EN	Mounting Rail TS 32

## 3. Definitions

For the purpose of this specification, the following definitions shall apply :-

### Vital Circuits

Circuits directly involved in ensuring the safety of the signalling system. Non-Vital Circuits

Circuits involved in the control and indication of the signalling system, but not directly connected with the safety functions.

### Dielectric

Material which offers relatively high resistance to the passage of an electric current.

### Comparative Tracking Index

The numerical value of the voltage corresponding to the asymptote to a curve produced from the results of tests carried out in accordance with this specification.

### Creepage Distance

The shortest path between two conductive parts, or between a conductive part and the bounding surface of the equipment, measured along the surface of the insulating material.

### DIN Rail

Mounting rail to DIN 46 277-1 (DIN 1) or DIN 46 277-3 (DIN 3) or NFC 63015 (DIN 3).

## **4. General Description**

Solderless clamp type terminal blocks are used for terminating wiring and cable with solid or multistrand conductors, for circuits rated up to 600 volts, to signal apparatus in weather-protected instrument and termination cases and housings. Conductor cross sectional areas range from 0.5sq mm to 300sq mm.

All stranded conductors of less than 4sq mm cross sectional area shall be terminated with a pin type crimp lug or ferrule before insertion into the terminal.

Dimensions of feed-through and disconnect terminals shall be sufficient to permit the uncrowded termination of a large number of stranded conductors, each of typically 3mm overall diameter insulation and fitted with a double insulated pin type crimp lug or ferrule and pre-printed identification sleeve.

Except for earthing terminals and terminals for cable in excess of 70sq mm, the terminal block assembly shall be fully insulated with no exposed conductive parts.

## **5. Environmental Conditions**

Terminal blocks and accessories, including DIN rail shall be suitable for service under the following conditions:

Temperature: -5 ° C to 85 ° C Relative Humidity: 0 to 95%

Vibration: As detailed in Specification SPS 02

All non-metallic materials shall resist deterioration caused by ultraviolet light exposure.

Exposure to dust, dirt, and moisture shall not cause deterioration of the terminal blocks. All materials shall be fungi growth resistant.

## **6. Service Conditions**

All non-metallic materials shall resist, warping or softening in temperature up to 85 ° C and shall not become brittle in temperatures down to -5 ° C.

All non-metallic materials shall resist deterioration due to contamination with petroleum products, common cleaners, water displacement films and vapours.

All non-metallic materials shall be chemically inert with regard to the metallic components.

## **7. Material**

### **7.1 Insulating Material**

Insulating material shall be Melamine, Polyamide 6 (PA6) or an equivalent with natural tracking resistance, KB > 600, as measured in accordance with DIN/VDE 0303 part 1.

### **7.2 Metallic Parts and Coating**

All metallic portions of the terminal block and terminal block assembly shall be either of corrosion resistant material or coated or electroplated to prevent corrosion.

Coatings shall be of cadmium, zinc, chromium, lead, nickel, tin, and silver or tin/lead combination. All current carrying components shall be of copper or copper alloy. Cadmium and Zinc coating shall not be used on the current carrying parts. All threaded and clamping components and screws shall be of steel or stainless steel.

### **7.3 Fire and Heat Characteristics**

Materials shall be fire resistant and self-extinguishing upon removal of direct flame.

Smoke and toxic gas propagation shall be minimised.

Terminals shall be tested in accordance with the requirements of AS-2420 and AS-3013 (or equivalent international standards) and test results shall be made available on request.

## **8. Types and Applications**

The following requirements relate to terminal blocks for mounting on DIN-rail.

These terminal blocks may be used in non-vital and vital circuits rated up to 600 volts using single conductors and multi-strand conductors of 0.5 sq mm to 16 sq mm cross sectional area.

### **8.1 Test - Disconnect Terminal (Link Type) Blocks**

Terminal blocks with disconnect by slide link shall be used only for non-vital circuits. The sliding disconnecting device shall allow the circuit to be opened and closed without having to disturb the permanent wiring. Test probe sockets shall be provided to allow the easy connection of test or measuring instruments. The slide clamp shall be able to be actuated by a normal flat blade screwdriver.

### **8.2 Test - Disconnect Terminal (Pin or Knife Type) Blocks**

Disconnect pin type terminal blocks shall employ a multi-contact Beryllium Copper spring which ensures a high number of disconnect/connect operations whilst



maintaining a low through resistance. The disconnect pin shall be able to be disconnected/withdrawn with the fingers to open or interrupt a circuit. The grip of the disconnecting pin shall be shaped to allow good grip and shall incorporate a coloured band, which remains visible until the pin is fully pushed home.

Knife type disconnect terminal blocks shall be able to be opened by hand and, when opened, shall spring to the fully open position with no possibility of contact being made without positive pressure being applied to the disconnect link.

The current capacity of these terminal blocks shall be 25A (unless otherwise specified) and the terminal block shall provide provision for permanent connection of two or more in parallel (bussing).

Test probe sockets shall be provided to allow the easy connection of test or measuring instruments.

### **8.3 Feed Through Terminal Blocks**

#### **8.3.1 For Conductors to 70 sq mm**

Feed through terminal blocks for conductors to 70 sq mm cross sectional area shall be fully enclosed types with no exposed conductive parts. Clamping screws shall be operated by a flat bladed screwdriver and provision shall be made for bussing of terminals.

#### **8.3.2 For Conductors over 70 sq mm**

Feed through terminal blocks for conductors 70 sq mm and over cross sectional area shall provide either bolts and nuts or studs and nuts for the termination of crimp lugs. The bolt or stud diameter shall be commensurate with the terminal cable capacity but shall not be less than M8.

These terminals are not required to be fully enclosed.

### **8.4 Fuse Terminal Blocks**

Three types of fuse terminal blocks are required. Each type shall provide for bussing of multiple fuse blocks

#### **8.4.1 Type 1**

This type of fuse terminal block shall accept fuses with indicator to DIN 41576 (5x20mm). Fuse range 0.1 Amps to 6.3 Amps (250V).

#### **8.4.2 Type 2**

This type of terminal block shall accept fuses to DEF 59-96, 1 1/4in x 1/4 in, (32mm x 6.35mm) with current capacities from 1 to 16 Amps (250V).

#### **8.4.3 Type 3**

This terminal shall accept fuses with indicator to DIN 49522 (Neozed) ranging from 20 Amps to 63 Amps (440V) with the approximate fuse size of 15x36.5mm.

### **8.5 Earth Terminal Blocks**

The earthing terminal block shall provide positive electrical connection to the mounting rail. The form of the terminal block shall be similar to “feed through” terminal blocks.

## **8.6 Surface Mounted Terminal Blocks**

Surface mounted terminal blocks (2, 3, 4, 6 10 or 12 way) shall be fitted with a clamp plate or spring. Terminals in which the clamp screw directly contacts the conductor are not acceptable.

## **9. Mechanical Design and Testing 9.1 Surface Leakage**

The surface leakage distance between any two adjacent terminals and between the two sides of a disconnect terminal, when the link (or pin) is open shall be at least 6 mm.

### **9.1 General Features**

All metallic and current carrying portions of the terminal shall be retained within the insulating and housing frame and irrespective of whether the wire or conductor clamping mechanism is tightened or not.

The mechanical strength of the terminal block and the conductor clamping mechanism shall exceed the maximum force, which can be exerted by the clamping screws or spring.

The clamping screw shall not directly make contact with the conductor. A captive clamping plate or similar, which cannot rotate, shall separate the screw and conductor.

The clamping screw shall also be captive.

The conductor clamping method shall be designed so that it will securely clamp the smallest multistranded conductor for which the terminal is rated without the possibility of individual strands becoming free.

All surfaces shall be smooth as possible to minimise entrapment of dirt, dust and other contaminants.

A positive mechanical locking mechanism shall be provided to lock the terminal block assembly to the rail, where mounting rail is used.

Rail mounted terminals shall clip into place from the side of the rail.

## **10. Electrical Requirements**

The minimum value of insulation resistance between terminal to adjacent terminal or terminal to mounting rail shall be 100 M-Ohm when measured with a 500V DC insulation tester.

Testing for the Comparative Tracking Index shall be performed in accordance with Appendix D of AS 2420 (or with an equivalent international standard). The Comparative Tracking Index shall be not less than 600.

Creepage distances and clearances shall be in accordance with the values shown in Section 4 of AS 3100.

## **11. Dielectric Properties, Current Leakage and Insulating Requirements**

Dielectric properties shall be measured when the maximum size conductor, for which the terminal is rated, is terminated. Both volume and surface leakage currents shall be

assessed.

All tests shall be made at room temperature of 20 +/- 2 C with a relative humidity of 65 +/- 5%, by applying a 50 Hz 3,000 volt peak constant voltage test potential between the two points between which the volume and surface leakage current flow and flashover are to be measured.

- 1) The flashover test shall be made by applying the test potential for a period of one minute. The flashover resistance requirement shall be met if, after one minute current flow does not exceed one milliampere, and no evidence of insulation fracture or rupture is observed.
- 2) The leakage test shall be made by applying the test potential for one additional minute if the requirements of the flashover test have been met. The leakage test requirement shall be met if the leakage current does not exceed 1 x 10 the maximum rated amperage of the smallest cross sectional area conductor for which the terminal is rated.

## 12. Identification and Marking

Each terminal block shall be identified and marked at manufacture, and shall include the following information:

- a) Manufacturer's name and identification mark.
- b) Type reference or catalogue number.
- c) Conductor size or range of conductor sizes.
- d) Recommended tightening torque for the clamp screw if relevant for a specific application.

## 13. Labelling

A means shall be provided on the terminal block for attachment of numbering or labelling. The identification shall be firmly and securely attached to withstand all environmental and operating conditions and requirements. It shall be possible to remove, replace or change the identification without damage to the terminal block.