

KTB SERIES TEST BLOCK SYSTEM

KTB4300 / KTB4320



Feature

- Colour coded 'finger safe' test sockets suit standard or shrouded type 4mm banana plugs
- 14 independent circuits suitable for CT or VT connections
- Test plug available with automatic CT shorting option
- Test plug fitted with insertion handles & locking screws
- Side label instructions on changing from normal service condition to the test condition
- Optional automatic DC auxiliary isolation function
- High current / voltage rating
- Compact & economic design

Application

Test links are an important accessory for protection, metering & control panels. They enable test technicians to quickly & safely isolate protection relays so that test signals may be injected & system performance verified. There are a number of advantages in performing injection tests at the protection relay panel:

- Reduction in down time of the equipment under test.
- Testing does not cause disturbance to wiring, terminals or equipment settings.
- Existing auxiliary supply to the equipment under test may be isolated.

The KTB4300 Test Link Panel has been designed as a general-purpose isolation & test signal injection point. Standard 4mm diameter sockets are employed so that common banana plugs may be used to short CT inputs & connect test equipment. Equipment under test need only be removed for servicing if problems are detected.

Description

The **Test Block** type KTB4300 comprises fourteen (14) test circuits, each of which is connected to a separate pair of terminals at the rear of the case. During the normal operation of the associated protection equipment, each pair of terminals are connected together by a circuitshorting link. Changing the KTB4300 Test Block from the normal service condition to the test condition is described below & depicted in figure 3:

**Test Circuit Access**

Access to the circuits, for testing purposes, is gained by first removing the front cover. For the KTB4300-B model the **Isolation Plug** is withdrawn & the circuit between terminals 13 & 14 interrupted. By routing the main DC supply to the protection scheme or relay through this circuit, removal of the Isolation Plug will thereby prevent inadvertent tripping of the protection during the ensuing tests.

**Test Plug Insertion**

Insertion of the **Test Plug** type KTB4320, isolates the live side circuits from the equipment side. The Test Plug carries 28 4mm 'finger safe' test sockets. These sockets are suitable for shrouded or standard 4mm banana plugs. Each test socket is identified by a number, which corresponds to the numbered terminal on the rear of the case when the Test Plug is inserted. The test socks are colour coded - BLACK to identify the equipment side sockets & YELLOW to identify the live side sockets.

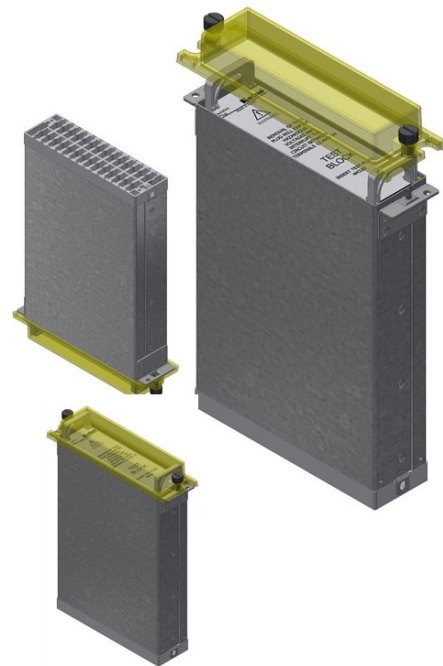


Figure 1: KTB4320-A Test Plug

## RECOMMENDED WIRING LAYOUT

It is recommended that the Test Block is always wired with connections to the protective relay or scheme made to the EVEN numbered equipment side terminals. Connections to other equipment, e.g. CT's , VT's & DC supplies, should be made to the ODD numbered live side terminals on the Test Block. This ensures that when the Test Plug is used, the BLACK sockets of the Test Plug are the isolated relay circuits & the YELLOW sockets on the

Test Plug are connected to the potentially live supplies as shown in figure 8. Test equipment can be connected to the relay or scheme using the BLACK sockets in the Test Plug, & operation of contacts can be monitored. When using the KTB4300-B Test Block, the DC supply may be used during testing by linking across sockets 13/14 & 15/16 of the Test Plug.

## Operation

### CT SHORTING – MANUAL (External)

It is essential that the sockets of the KTB4320 Multi-Finger Test Plug which correspond to the current transformer (CT), secondary windings are linked prior to the test plug being inserted into the test block. This ensures that the current transformer secondary windings are not open circuited when they are isolated from the protection relay scheme.

This may be achieved using external shorting links to ensure that the CT secondary windings are short circuited before they are disconnected from the protection relay or scheme, thereby avoiding dangerously high voltages.

The continuity of the shorting plug / wire links & their state of insulation should be checked prior to into the KTB4300 test block.

### CT SHORTING – AUTOMATIC (Internal)

The KTB4320 may be ordered with internal CT shorting links fitted to pre-designated positions as follows:

KTB4320-B Internal links between terminals 21-23-25-27 Refer figure 8

Where these KTB4320 test plug versions are employed it is essential that the CT circuits are wired to the KTB4300 test block in the matching positions.

To Reiterate: The KTB4320 requires the USER to ensure that the necessary shorting links - manual or automatic – are fitted prior to plugging into the KTB4300 test block.

### TEST LEAD INSERTION

Before use the insulation of the flying leads should be visibly checked for damage. Flexible banana test leads with shrouded plugs are recommended for operator safety. 2.5mm<sup>2</sup> multi-strand wire with PVC insulation is recommended for adequate current rating and flexibility.

### TEST PLUG INSERTION



To avoid high voltage shock hazard external CT circuits must NOT be open circuited. Shorting links must be in position BEFORE test plug insertion

Insertion of the KTB4320 connects the live side circuits to the YELLOW test sockets on the front panel. The equipment side circuits are connected to the BLACK test sockets on the front panel. Each test socket is identified by a number, which corresponds to the numbered terminal on the rear of the case when the Test Plug is inserted.

### FINGER SAFE TEST SOCKETS

BLACK - even numbered - equipment side sockets

YELLOW - odd numbered - live side sockets



Figure 2: Close up view of the 'finger safe' test plug sockets that accept standard 4mm shrouded test plugs

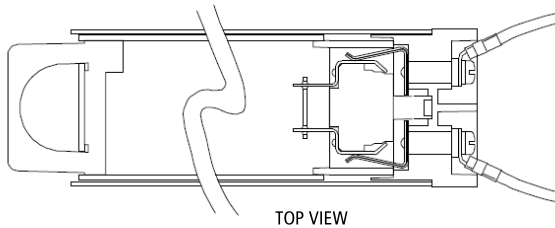
**Operation**

**Figure 3**

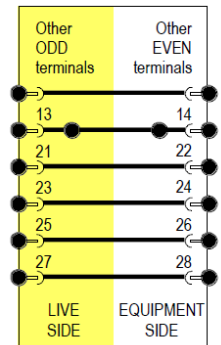
Changing the KTB4300 Test Block system from the normal service condition to the secondary injection test condition is achieved in three steps shown in figure 3 below:

KTB4300-B Test Block Terminal Status

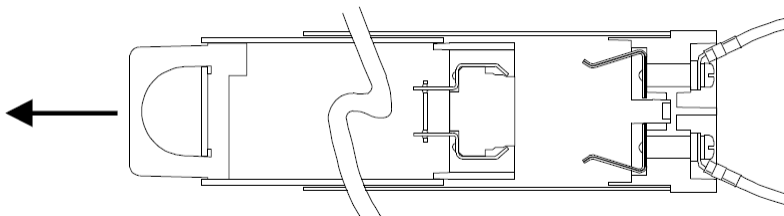
**NORMAL SERVICE CONDITION**



Shown with isolation plug fitted to short terminals 13 & 14 (KTB4300-B model only)

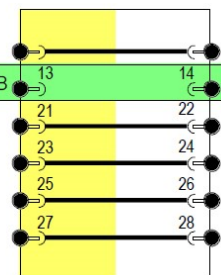


**Step 1 - DC AUXILIARY SUPPLY ISOLATION**



WITHDRAW DC AUXILIARY ISOLATION PLUG (KTB4300-B model only) DC auxiliary supply link between terminals 13 & 14 is removed

Auxiliary supply isolated – KTB4300-B

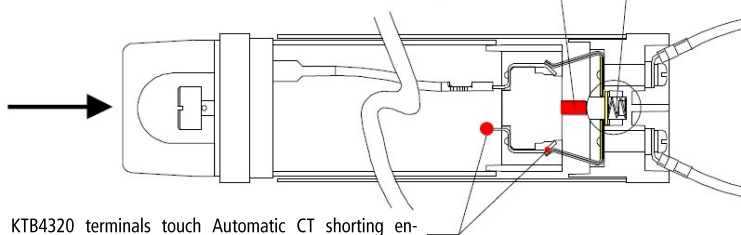


**Step 2 - AUTOMATIC CT SHORTING**

**INSERT KTB4320[B] TEST PLUG**

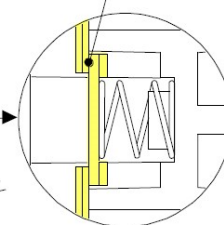
Automatic shorting of CT's wired to terminals 22, 24, 26 & 28

Circuit isolating bar not yet engaged

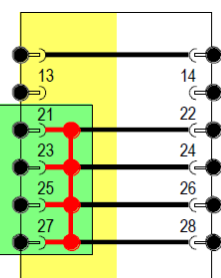


KTB4320 terminals touch Automatic CT shorting engaged

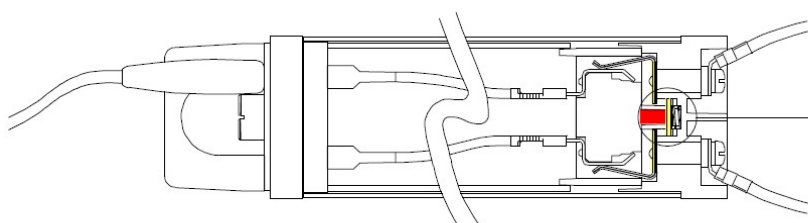
Equipment side & live side contacts shorted



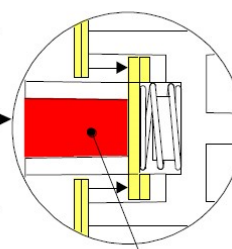
CT shorting links engaged  
KTB4300 Manual  
KTB4320 Automatic



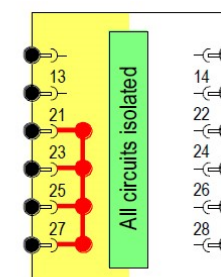
**Step 3 - CIRCUIT ISOLATION**



KTB4320[B] Test Plug fully inserted



Circuit isolating bar engaged Equipment side circuits isolated from live side circuits



**SECONDARY INJECTION TEST CONDITION**

**Technical Data**

**KTB4300-A TEST BLOCK** (Isolating Plug not fitted)

14 Equipment side terminals (Even terminal numbers). 14 Live side terminals (Odd terminal numbers).

14 Live side to equipment side shorting links.

This arrangement provides for up to 14 independent circuits to be connected.

An isolating circuit is not provided on this model.

**KTB4300-B TEST BLOCK** (Includes Isolating Plug)

14 Equipment side terminals (Even terminal numbers). 14 Live side terminals (Odd terminal numbers).

13 Live side to equipment side shorting links. 1 Isolating circuit between terminals 13 & 14

This arrangement provides for up to 12 independent circuits to be connected.

An additional DC auxiliary circuit is provided with an isolating link across terminals 13 & 14. This circuit is automatically opened when the Isolation Plug is removed.

**KTB4320 TEST PLUG**

28 test sockets suitable for 4mm banana plugs.

Securing screws to retain the Test Plug during testing operations.

**CURRENT RATINGS**

All CT circuits & terminals: 20A continuous (Terminal 1 to 28) 400A 1s

**VOLTAGE RATINGS**

All circuits & terminals: 600V AC continuous 350V DC continuous System auxiliary voltage: 40V DC minimum

**CASE TYPE**

28 terminals

**INSULATION WITHSTAND**

All Models

In accordance IEC 255-5:

2KV RMS for 1 min. between all terminals & all terminals & frame. 1.2/50 5KV impulse between all terminals & all terminals & frame.

KTB4300-B Test Block & KTB4320 Test Plug only In accordance IEC 255-5:

1KV RMS for 1 min. between terminals 13 & 14 when the isolation plug is removed (e.g. opening the auxiliary supply or trip circuit)

**AMBIENT OPERATING TEMPERATURE RANGE**

-5 to 55 degrees C.

**WEIGHT**

KTB4300: 950g      KTB4320: 595g



Figure 6

**Test Link Plug**

Depicted in the normal service condition with the isolation plug installed

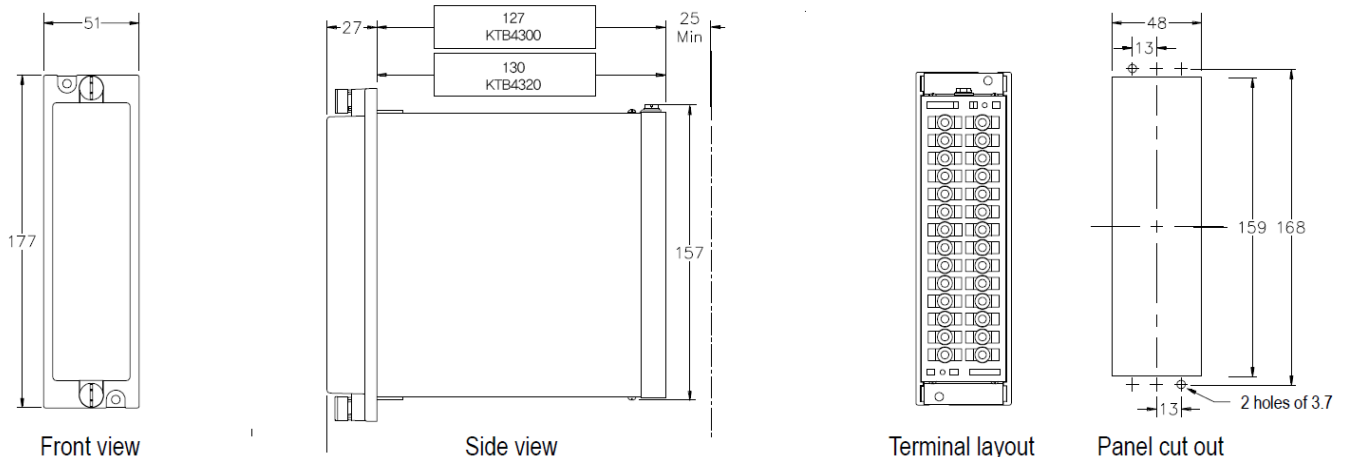


Figure 7: Case details

**Test Leads**

**SHROUDED TEST LEADS**

Three types of shrouded 'finger safe' test leads are available:

Part Number	Description	Quantity supplied per KTB4320
310-230-075-1	Two ended test lead - 75mm	3
310-230-180-1	Two ended test lead - 180mm	3

Wire type: 2.5mm<sup>2</sup> multi-strand wire with yellow PVC insulation

**TEST LEAD PLUGS**

Two types of shrouded plug are employed on each test lead as depicted in figure 4.

Single Plug

The single plug is the most compact & may be plugged into any test socket.

Dual Plug

The dual or 'piggy back' plug is larger & should be plugged into the test sockets on the outside edge of the KTB4320T.

**CONNECTING MULTIPLE TEST LEADS**

Test leads may be linked in a daisy chain arrangement to perform manual CT shorting as described on page 2. Three (3) leads are required to short a group of four (4) CT circuits as follows:

Connect the first lead between sockets 21-23

Connect the second lead between sockets 25-27

Connect the third lead to link the dual plugs in sockets 21-25

An additional lead may be fitted into the third lead dual plug for a ground connection where required.

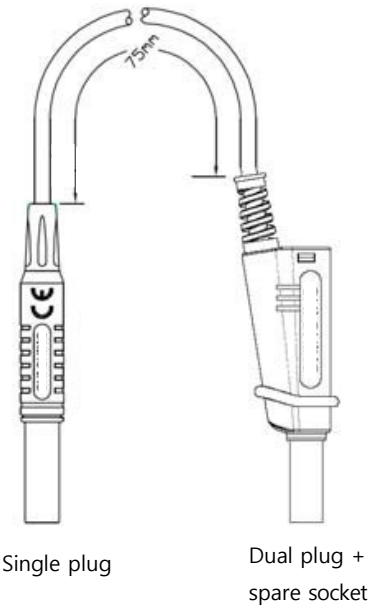


Figure 4: Two ended test lead - short P/N 310-230-075-1 75mm wire length version depicted

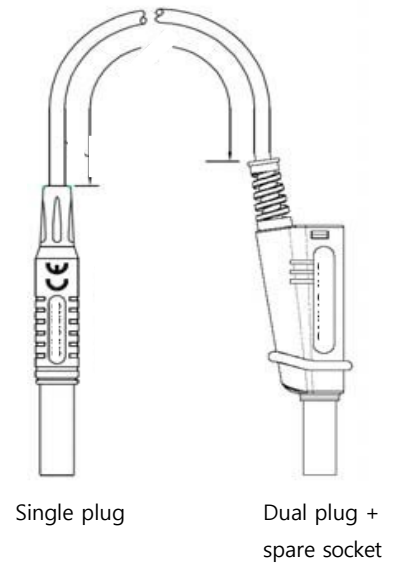
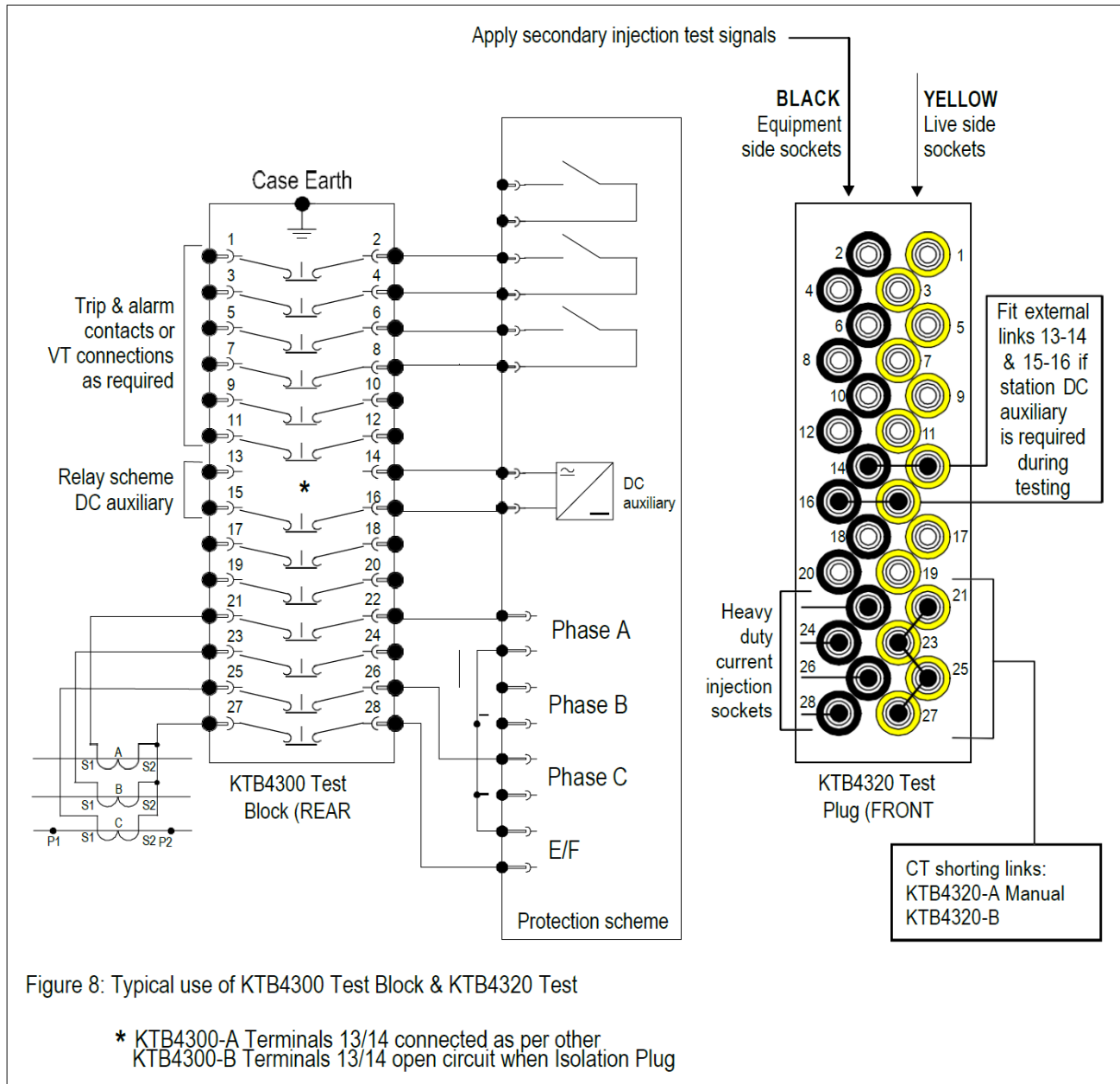


Figure 5: Two ended test lead - long P/N 310-230-180-1 180mm wire length version depicted

Typical Application

TYICAL APPLICATION OF KTB4300 TEST BLOCK & KTB4320 TEST PLUG



Installation

Handling of Electronic Equipment

A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling electronic circuits can cause serious damage, which often may not be immediately apparent but the reliability of the circuit will have been reduced.

The electronic circuits of KUN HUNG ELECTRIC CO., LTD products are immune to the relevant levels of electrostatic discharge when housed in the case. Do not expose them to the risk of damage by withdrawing modules unnecessarily.

Each module incorporates the highest practicable protection for its semiconductor devices. However, if it becomes necessary to withdraw a module, the following precautions should be taken to preserve the high reliability and long life for which the equipment has been designed and manufactured.

1. Before removing a module, ensure that you are at the same electrostatic potential as the equipment by touching the case.
2. Handle the module by its front-plate, frame, or edges of the printed circuit board.
3. Avoid touching the electronic components, printed circuit track or connectors.

4. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.
5. Place the module on an antistatic surface, or on a conducting surface which is at the same potential as yourself.
6. Store or transport the module in a conductive bag.

If you are making measurements on the internal electronic circuitry of an equipment in service, it is preferable that you are earthed to the case with a conductive wrist strap.

Wrist straps should have a resistance to ground between 500k – 10M ohms. If a wrist strap is not available, you should maintain regular contact with the case to prevent the build up of static.

Instrumentation which may be used for making measurements should be earthed to the case whenever possible.

### Equipment Connections

Personnel undertaking installation, commissioning or servicing work on this equipment should be aware of the correct working procedures to ensure safety. The product documentation should be consulted before installing, commissioning or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present hazardous voltage unless the equipment is electrically isolated.

If there is unlocked access to the rear of the equipment, care should be taken by all personnel to avoid electric shock or energy hazards.

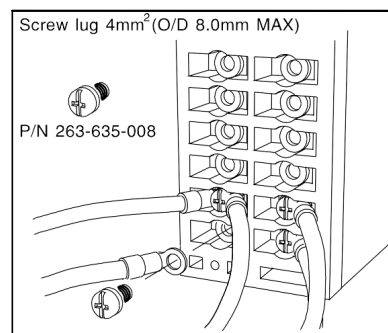
Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

Before energising the equipment it must be earthed using the protective earth terminal, or the appropriate termination of the supply plug in the case of plug connected equipment. Omitting or disconnecting the equipment earth may cause a safety hazard.

The recommended minimum earth wire size is 2.5mm<sup>2</sup>, unless otherwise stated in the technical data section of the product documentation.

Before energising the equipment, the following should be checked:

1. Voltage rating and polarity;
2. CT circuit rating and integrity of connections;
3. Protective fuse rating;
4. Integrity of earth connection (where applicable)



### Current Transformer Circuits

Do not open the secondary circuit of a live CT since the high voltage produced may be lethal to personnel and could damage insulation.

### External Resistors

Where external resistors are fitted to relays, these may present a risk of electric shock or burns, if touched.

### Insulation & Dielectric Strength Testing

Insulation testing may leave capacitors charged up to a hazardous voltage. At the end of each part of the test, the voltage should be gradually reduced to zero, to discharge capacitors, before the test leads are disconnected.

### Insertion of Modules

These must not be inserted into or withdrawn from equipment whilst it is energised, since this may result in damage.

## Electrical Adjustments

Pieces of equipment which require direct physical adjustments to their operating mechanism to change current or voltage settings, should have the electrical power removed before making the change, to avoid any risk of electric shock.

## Mechanical Adjustments

The electrical power to the relay contacts should be removed before checking any mechanical settings, to avoid any risk of electric shock.

## Draw Out Case Relays

Removal of the cover on equipment incorporating electromechanical operating elements, may expose hazardous live parts such as relay contacts.

## Insertion & Withdrawal of Heavy Current Test Plugs

When using a heavy current test plug, CT shorting links must be in place before insertion or removal, to avoid potentially lethal voltages.

## Commissioning Preliminaries

Carefully examine the module and case to see that no damage has occurred during transit. Check that the relay serial number on the module, case and cover are identical, and that the model number and rating information are correct.

Carefully remove any elastic bands/packing fitting for transportation purposes.

Check that the external wiring is correct to the relevant relay diagram or scheme diagram. The relay diagram number appears inside the case.

Particular attention should be paid to the correct wiring and value of any external resistors indicated on the wiring diagram/relay rating information.

Note that shorting switches shown on the relay diagram are fitted internally across the relevant case terminals and close when the module is withdrawn. It is essential that such switches are fitted across all CT circuits.

If a test block system is to be employed, the connections should be checked to the scheme diagram, particularly that the supply connections are to the 'live' side of the test block.

### Earthing

Ensure that the case earthing connection above the rear terminal block, is used to connect the relay to a local earth bar.

### Insulation

The relay, and its associated wiring, may be insulation tested between:

- all electrically isolated circuits
- all circuits and earth

An electronic or brushless insulation tester should be used, having a dc voltage not exceeding 1000V. Accessible terminals of the same circuit should first be strapped together. Deliberate circuit earthing links, removed for the tests, subsequently must be replaced.

## Commissioning Tests

If the relay is wired through a test block it is recommended that all secondary injection tests should be carried out using this block.

Ensure that the main system current transformers are shorted before isolating the relay from the current transformers in preparation for secondary injection tests.

### DANGER

DO NOT OPEN CIRCUIT THE SECONDARY CIRCUIT OF A CURRENT TRANSFORMER SINCE THE HIGH VOLTAGE PRODUCED MAY BE LETHAL AND COULD DAMAGE INSULATION.

It is assumed that the initial preliminary checks have been carried out.



### Relay CT shorting switches

With the relay removed from its case, check electrically that the CT shorting switch is closed.

### Primary injection testings

It is essential that primary injection testing is carried out to prove the correct polarity of current transformers.

Before commencing any primary injection testing it is essential to ensure that the circuit is dead, isolated from the remainder of the system and that only those earth connections associated with the primary test equipment are in position.

### Decommissioning & Disposal

#### Decommissioning:

The auxiliary supply circuit in the relay may include capacitors across the supply or to earth. To avoid electric shock or energy hazards, after completely isolating the supplies to the relay (both poles of any dc supply), the capacitors should be safely discharged via the external terminals prior to decommissioning.

**Disposal:** It is recommended that incineration and disposal to water courses is avoided. The product should be disposed of in a safe manner.



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