

TEST BLOCKS | TEST PLUGS | TEST LEADS

# 14 Circuit Test Block System 4M400

Flexible and high performance test block system with a focus on operator safety.  
Suitable for application on a wide range of protection relay panels.

- > Finger safe test sockets
- > Automatic CT shorting
- > 14 independent test groups
- > Custom specified test circuits
- > Made in Australia



## System Components

- > 14 test circuits may be specified in any configuration
- > 'Finger safe' test sockets
- > Multi finger test plug



4M400 Test block



4M420 Multi finger test plug

## Features

- > 14 independent test groups may be specified with any combination of circuit types
- > Automatic shorting of CT circuits completed in the test block - No test links or operator intervention required
- > Isolation plug provides sequential circuit isolation timing in three (3) stages
- > 'Finger safe' test sockets suit standard or shrouded type 4mm banana plugs for direct access to the protection or measurement scheme
- > Clear and concise front panel circuit identification
- > Test plug fitted with insertion handle and thumb screw retention system to enhance operator safety and system security
- > Side label instructions on test plug for changing from normal service to the test condition
- > High current / voltage rating
- > Made in Australia

## Application

Test blocks enable test technicians to quickly and safely isolate protection relays so that test signals may be injected and 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 4M400 Test Block is designed as a general-purpose isolation and test signal injection point. 'Finger safe' sockets are employed to improve operator safety and suit 4mm shrouded 'finger safe' type banana plugs.

Equipment under test need only be removed for servicing if problems are detected or for routine maintenance.

Where more than 14 test circuits are required refer to the 4M402 model that provides 28 test circuits.



## Test Circuit Access

Access to the circuits, for testing purposes, is achieved in a three stage process.

**STAGE I** Test Block Cover Extraction

Isolation Isolation of Type 1 circuits

**STAGE II** Isolation Plug Extraction

CT Shorting Automatic shorting of all CT circuits

Isolation Isolation of Type 3 circuits

Isolation of Type 2, 8 and 9 circuits

**STAGE III** Test Plug Insertion

Insertion 4mm Test Sockets available

The above procedure should be completed in the reverse order to place the protection system back in service.

Insertion of the Test Plug type 4M420 connects the live side circuits to the 4mm yellow test sockets. The equipment side circuits are connected to the 4mm black test sockets. 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. Refer to figure 6.

## Description

The 4M400 Test Block is an evolution of our popular 4M300 system. The main difference is that each of the fourteen (14) test groups may be specified at time of order to provide automatic CT shorting and sequential circuit isolation to suit specific protection schemes:

- > Auxiliary supply isolation
- > CT shorting
- > Trip isolation
- > General circuit isolation

The main advantage of this approach is the improved level of safety and security afforded to the CT circuits. This is because the CT shorting function takes place within the 4M400 Test Block irrespective of the CT circuit position. In many test block systems, the CT shorting is only accomplished when the Test Plug is inserted which leaves open the possibility of a CT circuit becoming open circuit due to the CT shorting links being omitted or in the wrong position. This potential problem is negated in the 4M400 and allows a single model 4M420 Test Plug to be employed for all 4M400 Test Block configurations.

Each test circuit is connected to a separate pair of terminals at the rear of the case. During normal operation of the associated protection equipment, each terminal pair is connected via a circuit-shortening link.

Changing the 4M400 Test Block from the normal service condition occurs in three (3) stages as depicted in the timing diagram figure 1.

Where more than 14 test circuits are required such as in EHV transmission protection panels, the 4M402 Test Block with 28 test circuits may be employed.

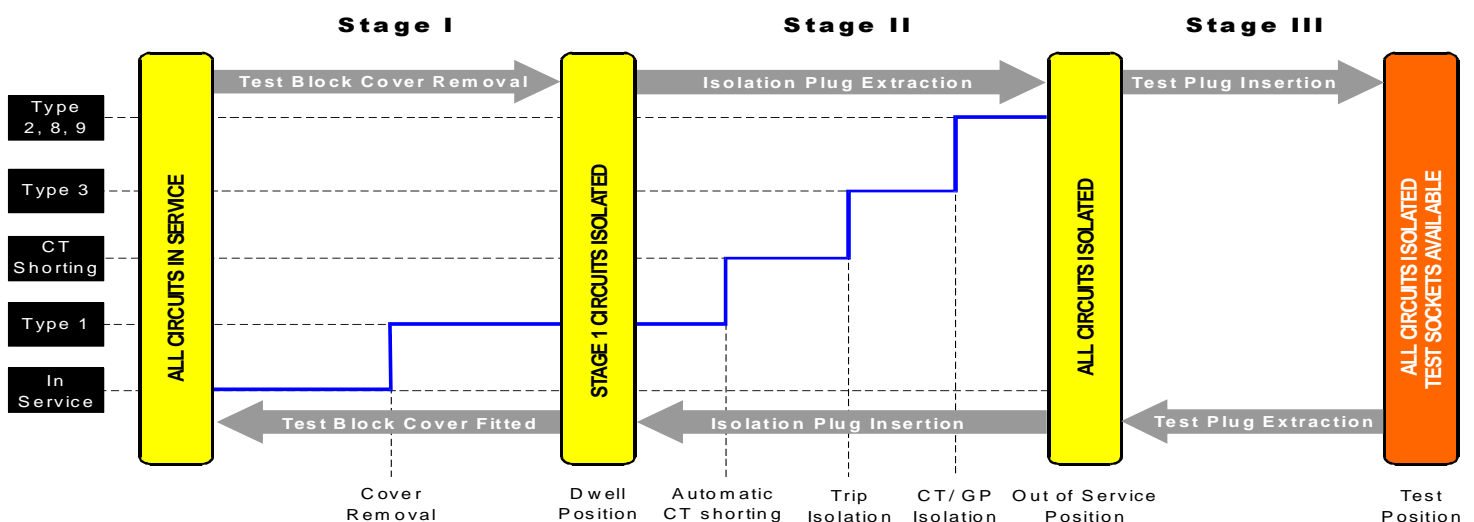


Figure 1: Timing diagram for sequential circuit isolation and CT shorting

## Safety Overview

While providing considerable convenience and efficiencies to system testing, test block systems must provide a high degree of safety. This section describes the key design features employed in the 4M400 test block system to enhance operator safety.

## Finger Safe Test Sockets

- BLACK** - Equipment side sockets  
**YELLOW** - Live side sockets



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

The 4M420 Test Plug employs 'finger safe' test sockets. This allows the use of shrouded 'finger safe' banana plugs to greatly reduce the possibility of an operator coming into contact with any part of the test circuit.

## Test Plug Handles

The 4M420 employs handles at the top and bottom of the plug assembly to ensure the operators hand is well separated from the test sockets during insertion. Retention thumb screws are provided at the top and bottom of the test plug to avoid inadvertent removal of the plug during testing.



Figure 3:

## 28 Test Circuit Versions

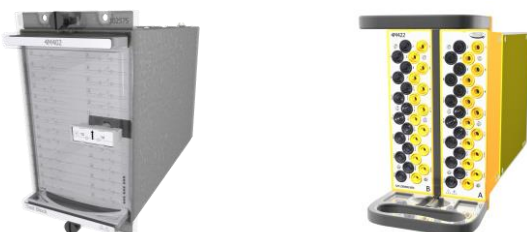


Figure 4:

4M402 Test block

4M422 Multi finger test plug

## Automatic CT Shorting

In traditional test block systems CT shorting is achieved by the operator manually fitting shorting links to the appropriate positions before inserting the test plug. This can lead to serious errors due to incorrect or poorly interpreted wiring diagrams.

The 4M400 Test Block system employs a fool proof method of CT shorting. When the 4M400 Isolation Plug is removed the CT shorting is accomplished automatically within the test block irrespective of the CT position or test block configuration. The 4M420 Test Plug does not require any special configuration before insertion as the CT shorting positions have already been specified at the time of order to suit a particular wiring arrangement.

## Test Block Polarization

Where conventional test block wiring schemes are employed in a protection panel, sub-station or indeed across a power utility network, there exists the possibility of a test plug being inserted into the wrong test block. The 4M400 Test Block avoids the potential for operator error as it incorporates a polarization pin so that only the 4M400 Isolation Plug and 4M420 Test Plug may be inserted.

## 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. 2.5mmsq 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.

Insertion of the 4M420 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.


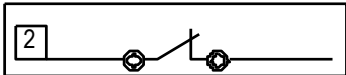
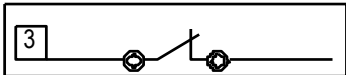
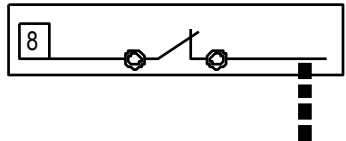
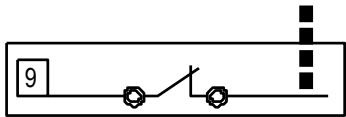
Type	Description	Function	Front Panel Labeling
0	Blank circuit	To allow additional space for labeling on the front panel and isolation to adjacent test circuits. May be specified where less than 28 test circuits are required.	CUSTOM TEXT (2 lines x 15 characters)
1	Test Block Cover	This circuit type is isolated at Stage I as the front cover is removed from the Test Block. Use to provide: <ul style="list-style-type: none"> <li>Isolation of auxiliary supply</li> <li>Isolation of trip circuits</li> </ul>	
2	General Purpose Cassette	This circuit type is the <u>third</u> to be isolated during Stage II as the Isolation Plug is removed from the Test Block. Use to provide: <ul style="list-style-type: none"> <li>Isolation of trip circuits</li> <li>Remote 'Out of Service' indication</li> <li>Isolation of inter-tripping circuits</li> <li>Isolation of watchdog alarms</li> <li>Isolation of VT circuits</li> <li>Isolation of I/O circuits</li> </ul>	
3	Trip Cassette	This circuit type is the <u>second</u> to be isolated during Stage II as the Isolation Plug is removed from the Test Block. Use to provide: <ul style="list-style-type: none"> <li>Isolation of trip circuits</li> <li>Isolation of inter-tripping circuits</li> <li>Isolation of watchdog alarms</li> </ul>	
8	CT cassette with shorting bar to the adjacent circuit below	Use for CT connections so that they will be automatically shorted <u>first</u> during Stage II as the Isolation Plug is removed. Shorting is made to the adjacent CT circuit below. After shorting, the CT circuit is isolated.	
9	Last CT cassette on a CT group	Use for CT connections so that they will be automatically shorted <u>first</u> during Stage II as the Isolation Plug is removed. Shorting is made to the adjacent CT circuit above. After shorting, the CT circuit is isolated.	

Table 1: Test circuit selection chart

- Notes:
1. Type 1 cassettes cannot be specified in adjacent positions.
  2. A maximum of four (4) CT cassettes may be specified in a single group.
  3. CT circuits must be specified with either cassette type 8 or 9.



## Test Block Terminal Format

The product images, recommended wiring layout and application drawings are based on the 4M400-S terminal format shown below. It should be noted that automatic CT shorting in the Test Block always takes place on the Live Side.

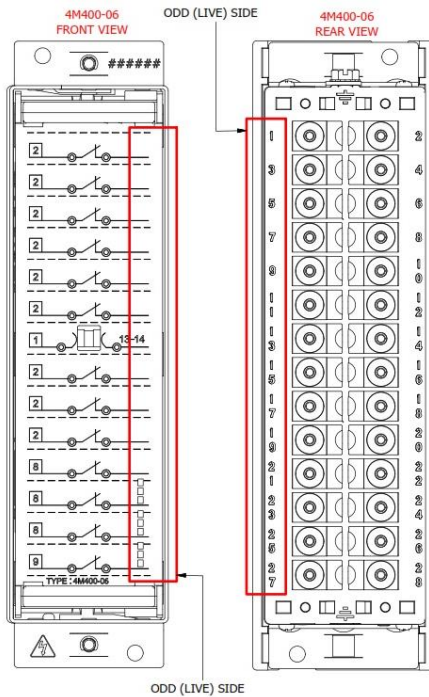


Figure 5: Position of Live Side terminals on 4M400-S Order Code versions

## Test Plug Terminal Format

The product images, recommended wiring layout and application drawings are based on the 4M420-S terminal format shown below. It should be noted that automatic CT shorting in the Test Block always takes place on the Live Side.

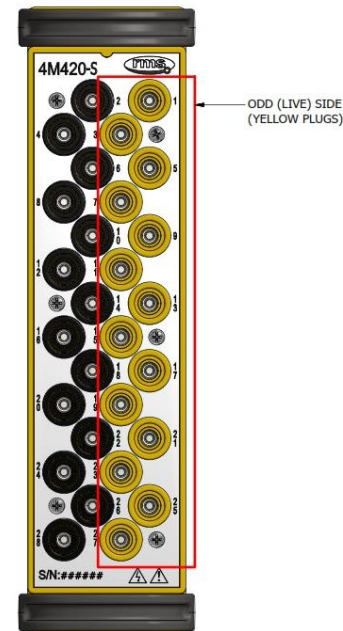


Figure 6: Position of Live Side terminals on 4M420-S Order Code versions

## Recommended Wiring Layout

It is recommended that the Test Block is 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 and DC supplies, should be made to the ODD numbered live side terminals on the Test Block. This ensures that when the Test Plug is inserted, the black sockets are connected to the isolated relay circuits and the yellow sockets are connected to the potentially live supplies as shown in figures 8 to 13.

## CT Circuits

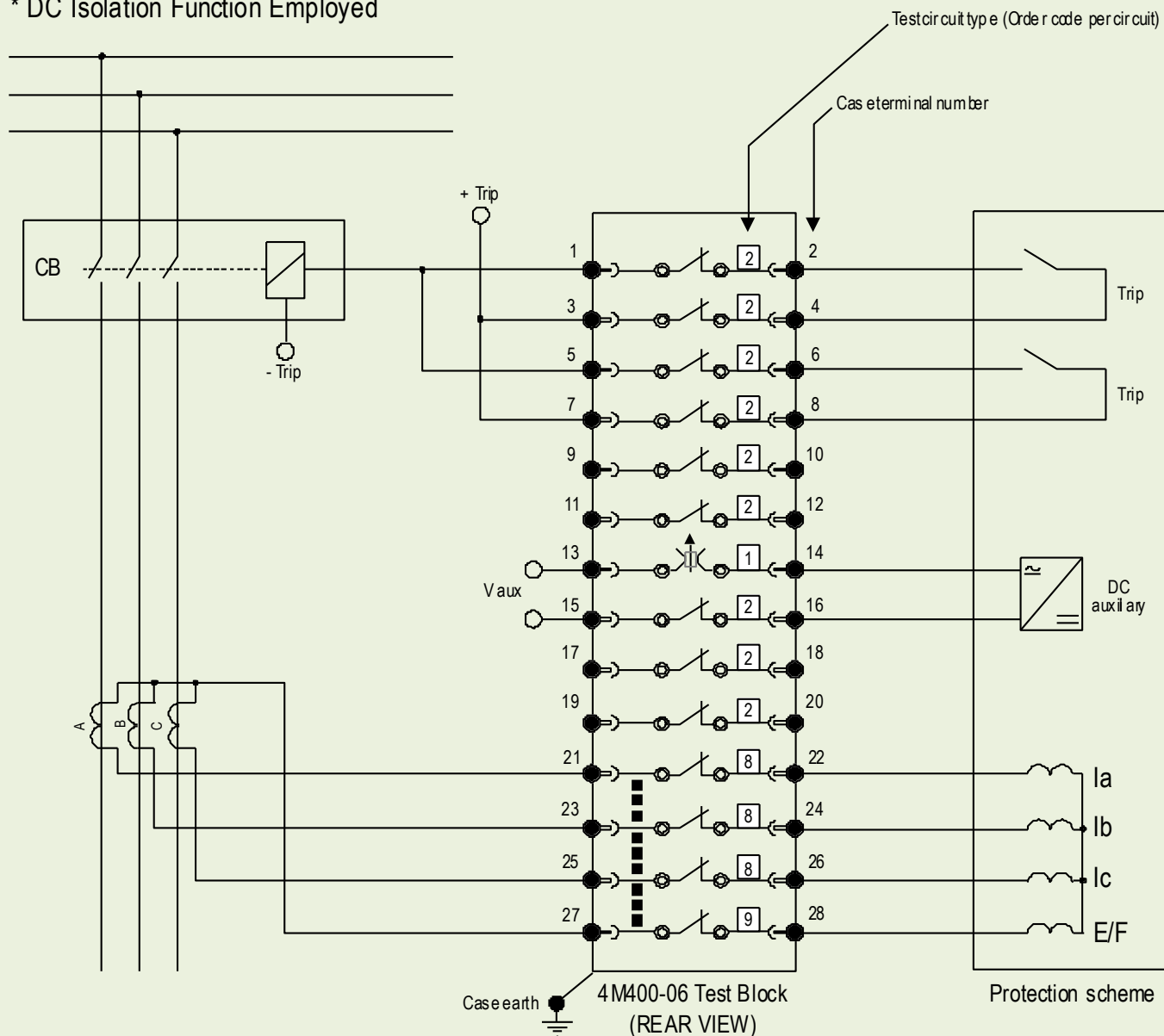
CT circuits must be specified with either cassette type 8 or 9.  
CT circuits must not be wired to cassette types 0, 1 or 2 as this will result in open circuit CT's as the isolation plug is removed.



## Typical application for a three phase overcurrent & EF protection scheme

\* DC Isolation Function Employed

4M400-06



■ Automatic CT shorting bar engages before circuit is isolated

Figure 8: Application wiring example for a three phase overcurrent and EF protection scheme with auto CT shorting  
Viewed from rear terminal side

Full order code: 4M400-S- 2 2 2 2 2 1 2 2 2 8 8 8 9

Short code: 4M400-06

## Typical application for a three phase directional overcurrent & E/F or distance protection scheme 4M400-07

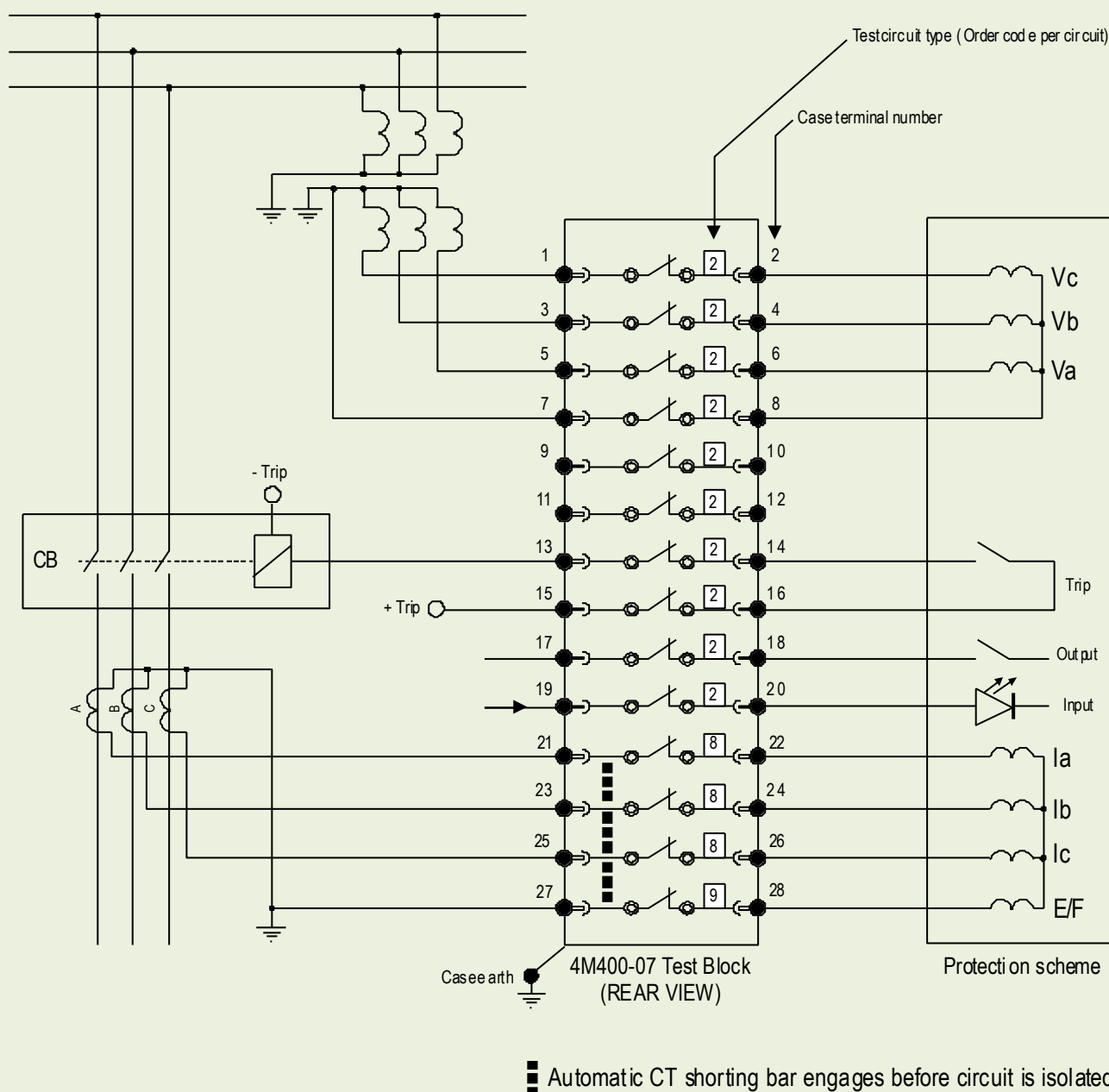


Figure 9: Application wiring example for a three phase directional O/C and E/F for distance protection scheme with auto CT shorting

Viewed from rear terminal side

Full order code: 4M400-S- 2 2 2 2 2 2 2 2 2 2 8 8 8 9

Short code: 4M400-07



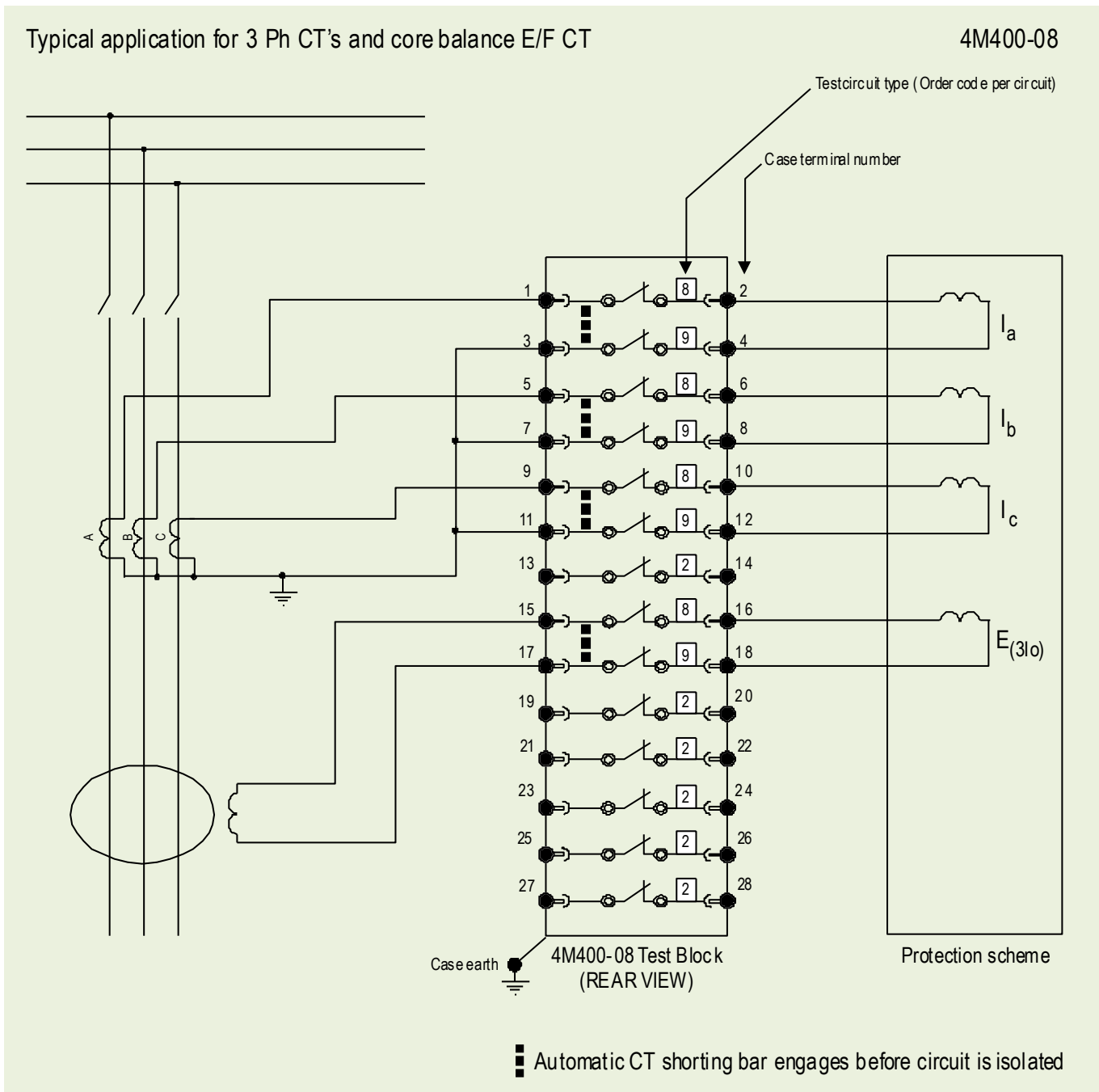


Figure 10: Application wiring example for a three phase CT's and core balance E/F CT with auto CT shorting  
Viewed from rear terminal side

Full order code: 4M400-S- 8 9 8 9 8 9 2 8 9 2 2 2 2 2

Short code: 4M400-08

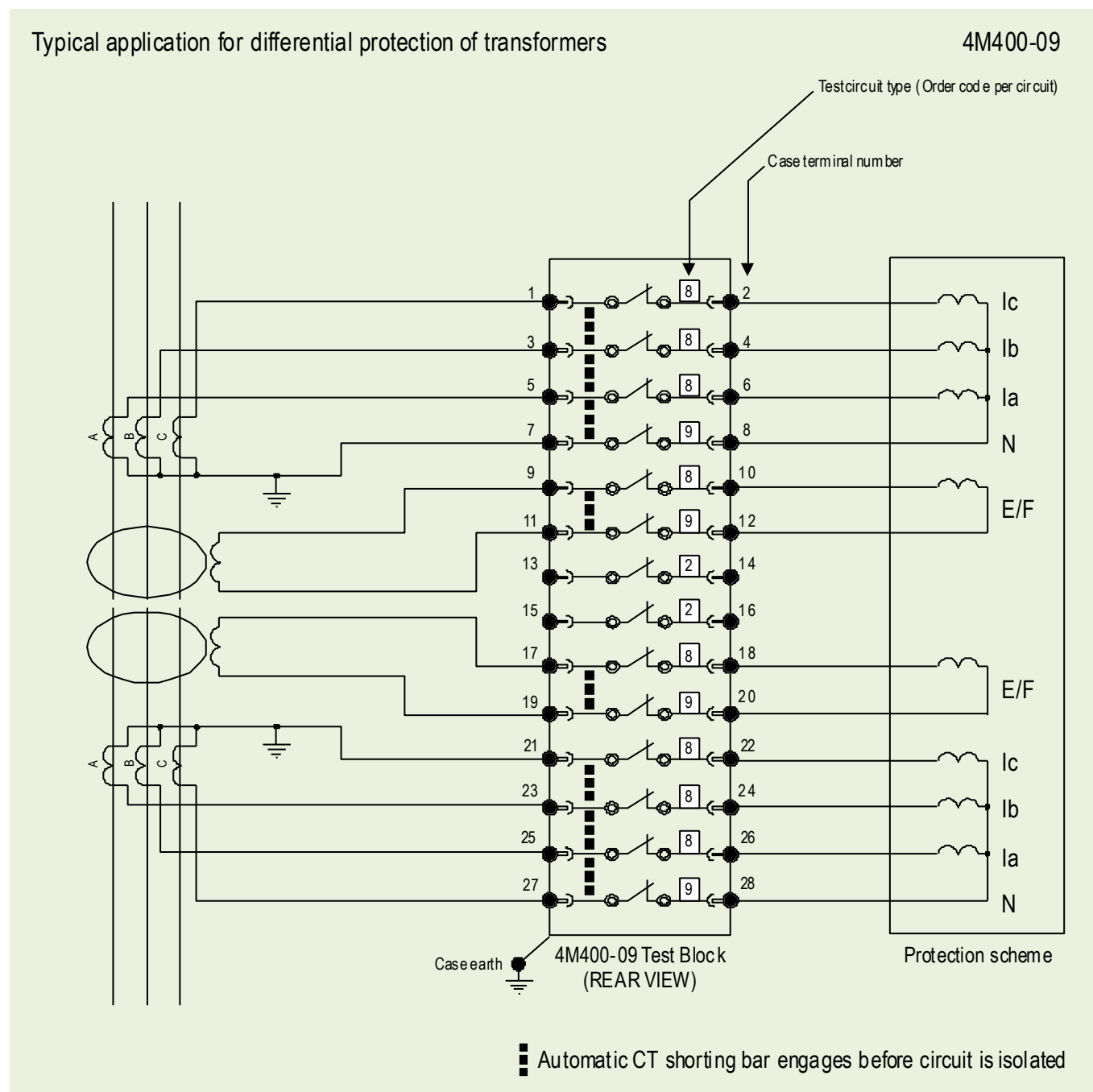


Figure 11: Application wiring example for differential protection of transformers with auto CT shorting

Viewed from rear terminal side

Full order code: 4M400-S- 8 8 8 9 8 9 2 2 8 9 8 8 9

Short code: 4M400-09

## 4M400-21

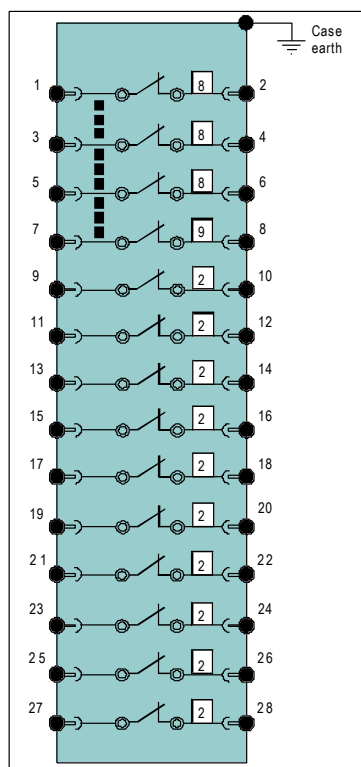


Figure 12: Viewed from rear terminal side  
Full order code: 4M400-S- 8 8 8 9 2 2 2 2 2 2 2 2  
Short code: 4M400-21

## 4M400-22

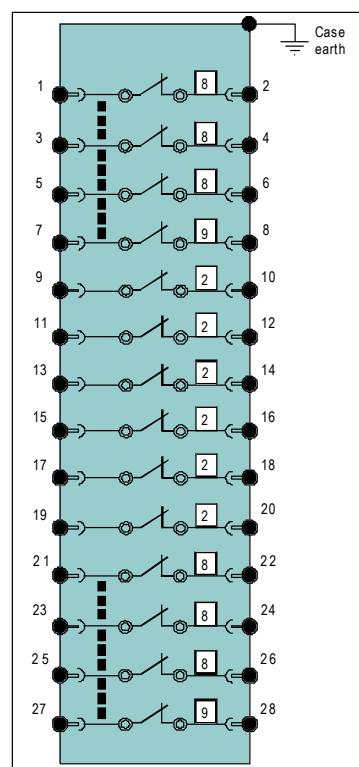


Figure 13: Viewed from rear terminal side  
Full order code: 4M400-S- 8 8 8 9 2 2 2 2 2 2 8 8 8 9  
Short code: 4M400-22

## Shrouded Test Leads

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

Part Number	Description
310-230-075-1	Two ended test lead - 75mm
310-230-180-1	Two ended test lead - 180mm

## Test Lead Plugs

### Single Plug

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

### Dual Plug

The dual or 'piggy back' plug is larger and should be plugged into the test sockets on the outside edge of the 4M420.

## Connecting Multiple Test Leads

Test leads may be linked in a daisy chain arrangement using the socket available at one end of each test lead.

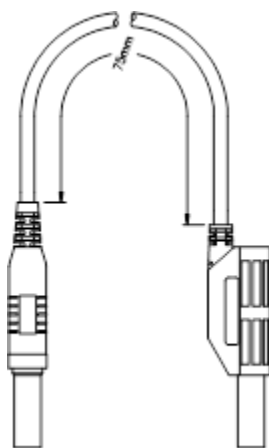


Figure 14: Two ended test lead - short  
P/N 310-230-075-1  
75mm wire length version depicted  
Multi-strand conductor rated cross section 2.5 sq. mm

## 4M400 Test Block

14 Equipment side terminals (Even terminal numbers).

14 Live side terminals (Odd terminal numbers).

14 Live sides to equipment side shorting links.

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

## 4M420 Multi-Finger Test Plug

28 test sockets suitable for 4mm shrouded 'finger safe' type or standard banana plugs.

Securing screws to retain the Test Plug during testing operations.

## Current Ratings

CT circuits and terminals	20A	continuous
	400A	1s
Other circuits	10A	continuous
	200A	1s

## Rated Cross Section of Conductors

CT circuits and terminals	2.5 sq. mm
Other circuits	0.75 sq. mm

## Case Type

2M28-S	Size 2 28 terminals
Mounting	Flush 4U high rack mount

## Individual Transport Packaging

1x 4M400 Test Block in a size 2 packing box

Size: 360 x 250 x 100mm

Weight: 1.7 Kg

## Bulk Transport Packaging

10x 4M400 Test Blocks with inner packing in a shipping carton

Size: 470 x 430 x 350mm

Weight: 15 Kg

Typical pallet sizes (Add 15Kg for pallet)

2L x 3W x 2H

12 x shipping cartons per pallet

## Insulation – 4M400 - In Service

Standard	IEC 61010-2-030
Type	Level
Between any contact pair & either adjacent contact pair.	3.3kV ac rms for 1 minute
Between all case terminals & the case earth	5.0kV ac rms for 1 minute
Between any alternate contact pair, provided that the intermediate pair is not used.	5.0kV ac rms for 1 minute

## Insulation – 4M420

Standard	IEC 61010-2-030
Type	Level
Between any contact.	3.3kV ac rms for 1minute
Between any alternate contact pair, provided that the intermediate pair is not used.	5.0kV ac rms for 1 minute

## Insulation – 4M400 with 4M420 Fitted

Standard	IEC 61010-2-030
Type	Level
Between incoming & outgoing contacts.	3.3kV ac rms for 1minute
Between all case terminals & the case earth	5.0kV ac rms for 1 minute

## Voltage Rating

Standard	IEC 60255-27
All circuits and terminals	600V AC continuous 320V DC continuous
System auxiliary voltage:	40V DC minimum

## Performance Standard

Low-voltage switchgear and control gear

Part 7.1: Ancillary equipment – Terminal blocks for copper conductors

Standard	IEC 60947-7-1
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## Temperature

Standard	IEC 60068-2-1/2
Operating Range	-10 to +55 degrees Celsius
Storage Range	-25 to +70 degrees Celsius

## Humidity

Standard	IEC 60068-2-78
Operating Range	40 degrees Celsius and 93% RH non condensing

## IP Rating

Standard	IEC 60529
Installed	IP5x

## Vibration - Sinusoidal

Standard	IEC 60255-21-1 Class I	
Vibration Response	0.5gn	≤5%
Vibration Endurance	1.0gn	≤5%

## Shock and Bump

Standard	IEC 60255-21-2 Class I	
Shock Response	5gn, 11ms	≤5%
Shock Withstand	15gn, 11ms	≤5%
Bump Test	10gn, 16ms	≤5%

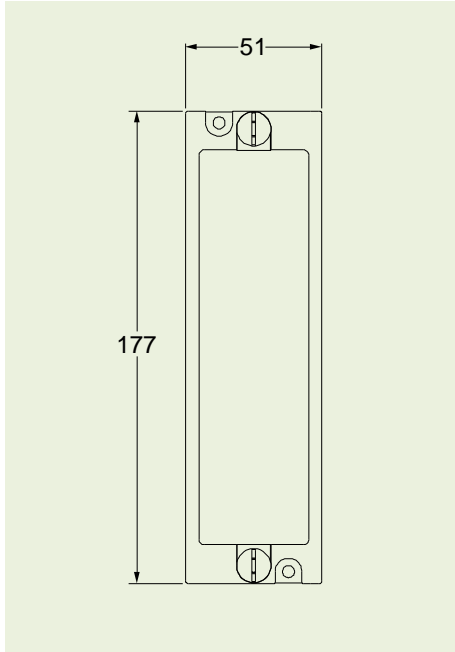
## Seismic

Standard	IEC 60255-21-3 Class I	
Seismic Response	1gn	≤5%

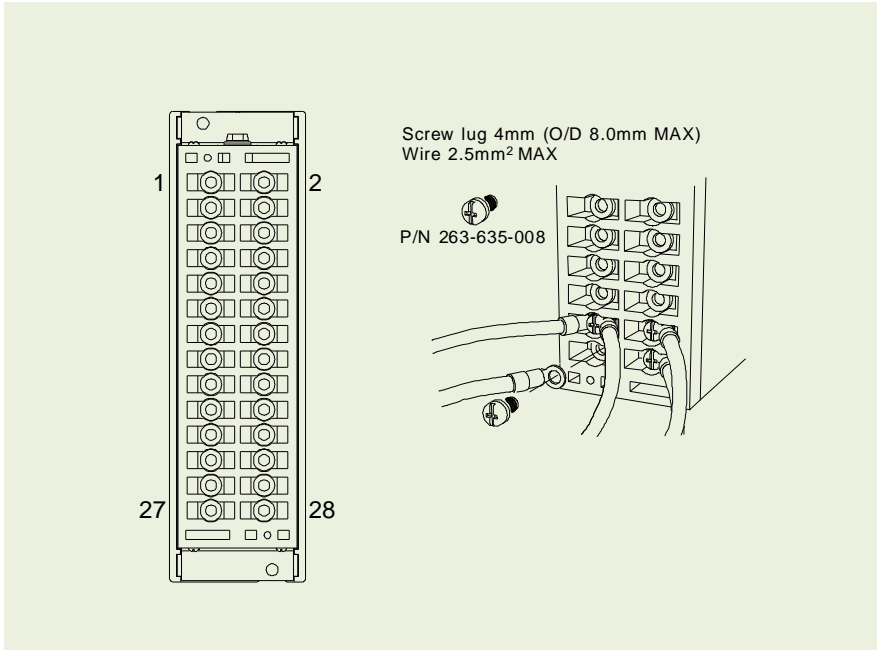
## Mechanical Classification

Durability	> 10 <sup>5</sup> operations at no load
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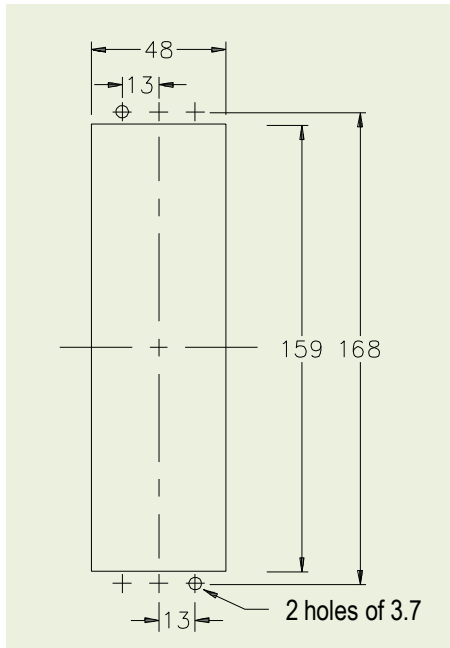
Front View



Rear View



Panel Cut-out



Side View

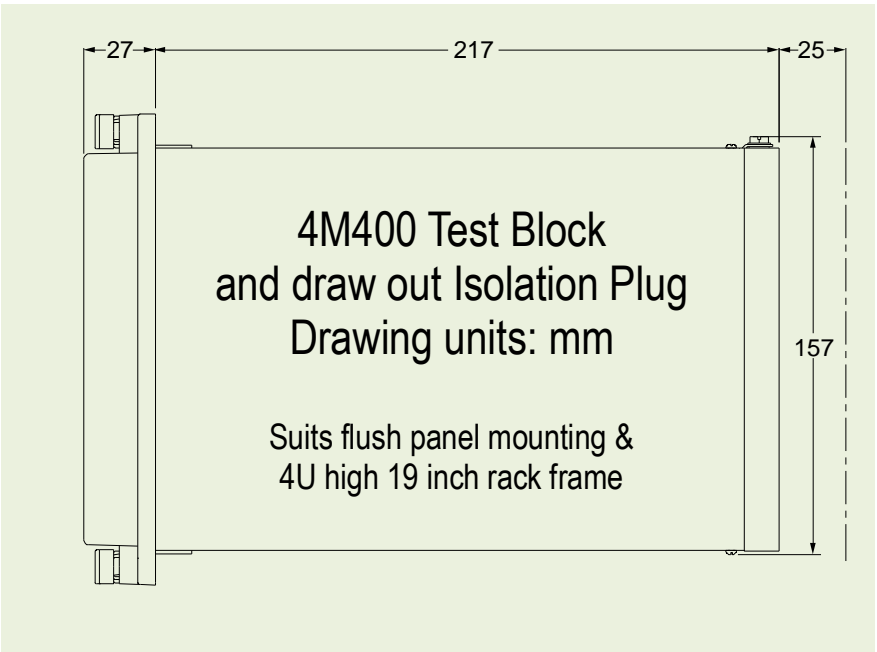


Figure 15: 4M400-S Case details



Custom Test Block Configuration

4M400 -			-																
Live side - ODD terminals on LEFT side when viewed from the rear		S																	
Test Circuits	Blank circuit		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stage 1 isolation circuit		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Stage 2 isolation circuit		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Stage 3 isolation circuit		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	CT circuit with shorting bar to adjacent circuit below		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	-
	The last CT circuit on a CT group		-	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

Order Code Limitations

1.

Type 1 cassettes cannot be specified in adjacent positions.
2.

A maximum of four (4) CT cassettes may be specified in a single group.
3.

Standard configuration codes 00 to 49 employ terminal format 4M400-S

Standard Test Block Order Codes

Short Code	Diagram	4M400 -	[ Equivalent test circuit pair order codes ]	Test Plug
4M400-06	Figure 8	06	[ 2 2 2 2 2 2 1 2 2 2 8 8 8 9 ]	4M420-S
4M400-07	Figure 9	07	[ 2 2 2 2 2 2 2 2 2 2 8 8 8 9 ]	
4M400-08	Figure 10	08	[ 8 9 8 9 8 9 2 8 9 2 2 2 2 2 ]	
4M400-09	Figure 11	09	[ 8 8 8 9 8 9 2 2 8 9 8 8 8 9 ]	
4M400-21	Figure 12	21	[ 8 8 8 9 2 2 2 2 2 2 2 2 2 2 ]	
4M400-22	Figure 13	22	[ 8 8 8 9 2 2 2 2 2 2 8 8 8 9 ]	

Test Plug

The 4M420-S is the default Test Plug version and is suitable for application with all 4M400-S Test Blocks.

4M420 - 

S

Test socket position when viewed from the front

S

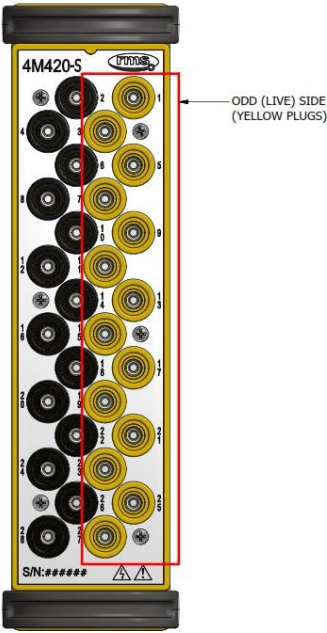
Live Side YELLOW terminals on RIGHT

Shrouded Test Leads

Part Number	Description
310-230-075-1	Two ended test lead - 75mm
310-230-180-1	Two ended test lead - 180mm

Cross Reference Chart

		RMS Codes
MMLG-01	2RMLG-01	4M300-B **
MMLG-02	2RMLG-02	4M300-A
-		4M400-06
MMLG-07	2RMLG-07	4M400-07
MMLG-08	2RMLG-08	4M400-08
-	2RMLG-09	4M400-09



\* The 4M420 Test Plug is not compatible with the MMLG or the 2RMLG Test Blocks.

\*\* Refer to the 4M300 Technical Bulletin for details on these versions where auto CT shorting is not required.

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TEST BLOCKS | TEST PLUGS | TEST LEADS

# 28 Circuit Test Block System

## 4M402

Flexible and high performance test block system with a focus on operator safety.  
Suitable for application on a wide range of protection relay panels.

- > Finger safe test sockets
- > Automatic CT shorting
- > 28 independent test groups
- > Custom specified test circuits
- > Made in Australia



## System Components

- > 28 test circuits may be specified in any configuration
- > 'Finger safe' test sockets
- > Multi finger test plug



4M402 Test block



4M422 Multi finger test plug

## Features

- > 'Finger safe' test sockets suit standard or shrouded type 4mm banana plugs for direct access to the protection or measurement scheme
- > 28 independent test groups may be specified with any combination of circuit types
- > Automatic shorting of CT circuits completed in the test block - No test links or operator intervention required
- > Isolation plug provides sequential circuit isolation timing in three (3) stages
- > Clear and concise front panel circuit identification
- > Test plug fitted with insertion handle and thumb screw retention system to enhance operator safety and system security
- > Side label instructions on test plug for changing from normal service to the test condition
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## Application

Test blocks enable test technicians to quickly and safely isolate protection relays so that test signals may be injected and 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 4M402 Test Block is designed as a general-purpose isolation and test signal injection point. 'Finger safe' sockets are employed to improve operator safety and suit 4mm shrouded 'finger safe' type banana plugs.

Equipment under test need only be removed for servicing if problems are detected or for routine maintenance.

Where up to 14 test circuits are required refer to the 4M400 model that provides 14 test circuits.



## Test Circuit Access

Access to the circuits, for testing purposes, is achieved in a three stage process.

<b>STAGE I</b>	Test Block Cover Extraction	
Isolation	Isolation of Type 1 circuits	
<b>STAGE II</b>	Isolation Plug Extraction	
CT Shorting	Automatic shorting of all CT circuits	
Isolation	Isolation of Type 3 circuits	Isolation of Type 2, 8 and 9 circuits
<b>STAGE III</b>	Test Plug Insertion	
Insertion	4mm Test Sockets available	

The above procedure should be completed in the reverse order to place the protection system back in service.

Insertion of the Test Plug type 4M422 connects the live side circuits to the 4mm yellow test sockets. The equipment side circuits are connected to the 4mm black test sockets. 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. Refer to figure 4.

## Description

The 4M402 Test Block is an evolution of our popular 4M400 system. The main difference is that twenty-eight (28) test groups may be specified at time of order to provide automatic CT shorting and sequential circuit isolation to suit specific protection schemes:

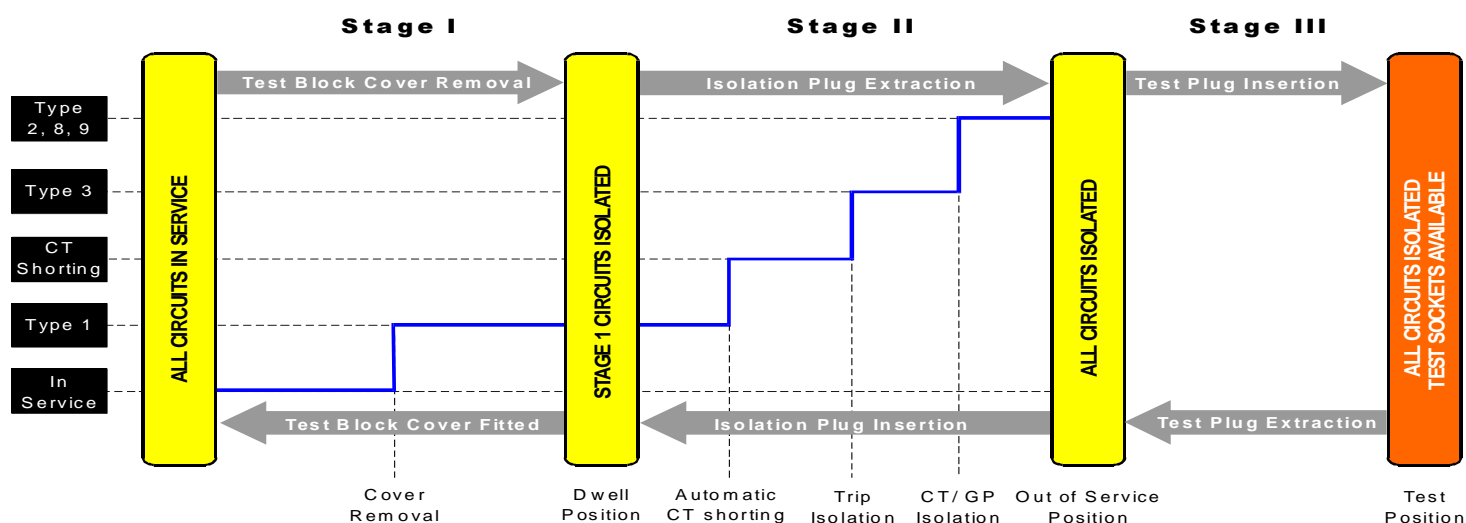
- > Auxiliary supply isolation
- > CT shorting
- > Trip isolation
- > General circuit isolation

The main advantage of this approach is the improved level of safety and security afforded to the CT circuits. This is because the CT shorting function takes place within the 4M402 Test Block irrespective of the CT circuit position. In many test block systems, the CT shorting is only accomplished when the Test Plug is inserted which leaves open the possibility of a CT circuit becoming open circuit due to the CT shorting links being omitted or in the wrong position. This potential problem is negated in the 4M402 and allows a single model 4M422 Test Plug to be employed for all 4M402 Test Block configurations.

Each test circuit is connected to a separate pair of terminals at the rear of the case. During normal operation of the associated protection equipment, each terminal pair is connected via a circuit-shortening link.

Changing the 4M402 Test Block from the normal service condition occurs in three (3) stages as depicted in the timing diagram figure 1.

Where up to 14 test circuits are required, the 4M400 Test Block with 14 test circuits may be employed.





## Safety Overview

While providing considerable convenience and efficiencies to system testing, test block systems must provide a high degree of safety. This section describes the key design features employed in the 4M402 test block system to enhance operator safety.

## Finger Safe Test Sockets

**BLACK** - Equipment side sockets

**YELLOW** - Live side sockets



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

The 4M422 Test Plug employs 'finger safe' test sockets. This allows the use of shrouded 'finger safe' banana plugs to greatly reduce the possibility of an operator coming into contact with any part of the test circuit.

## Test Plug Handles

The 4M422 employs handles at the top and bottom of the plug assembly to ensure the operators hand is well separated from the test sockets during insertion. Retention thumb screws are provided at the top and bottom of the test plug to avoid inadvertent removal of the plug during testing.



Figure 3:

## 14 Test Circuit Versions



Figure 4:

4M400 Test block

4M420 Multi finger test plug

## Automatic CT Shorting

In traditional test block systems CT shorting is achieved by the operator manually fitting shorting links to the appropriate positions before inserting the test plug. This can lead to serious errors due to incorrect or poorly interpreted wiring diagrams.

The 4M402 Test Block system employs a fool proof method of CT shorting. When the 4M402 Isolation Plug is removed the CT shorting is accomplished automatically within the test block irrespective of the CT position or test block configuration. The 4M422 Test Plug does not require any special configuration before insertion as the CT shorting positions have already been specified at the time of order to suit a particular wiring arrangement.

## Test Block Polarization

Where conventional test block wiring schemes are employed in a protection panel, sub-station or indeed across a power utility network, there exists the possibility of a test plug being inserted into the wrong test block. The 4M402 Test Block avoids the potential for operator error as it incorporates a polarization pin so that only the 4M402 Isolation Plug and 4M422 Test Plug may be inserted.

## Test Lead Insertion

Before use the insulation of the flying leads should be visibly checked for damage.

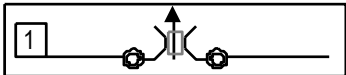
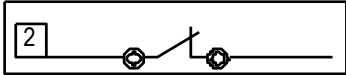
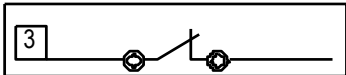
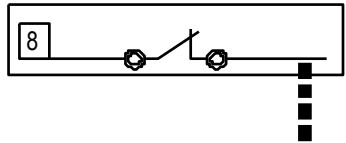
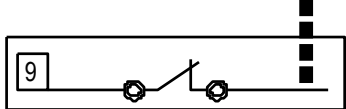
Flexible banana test leads with shrouded plugs are recommended for operator safety. 2.5mm<sup>2</sup> multi-strand wire with PVC insulation is recommended for adequate current rating and flexibility.

## Test Plug Insertion



To avoid high voltage shock hazard external CT circuits must NOT be open circuited.

Insertion of the 4M422 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.

Type	Description	Function	Front Panel Labeling
0	Blank circuit	To allow additional space for labeling on the front panel and isolation to adjacent test circuits. May be specified where less than 28 test circuits are required.	CUSTOM TEXT (2 lines x 15 characters)
1	Test Block Cover	This circuit type is isolated at Stage I as the front cover is removed from the Test Block. Use to provide: <ul style="list-style-type: none"> <li>Isolation of auxiliary supply</li> <li>Isolation of trip circuits</li> </ul>	
2	General Purpose Cassette	This circuit type is the <u>third</u> to be isolated during Stage II as the Isolation Plug is removed from the Test Block. Use to provide: <ul style="list-style-type: none"> <li>Isolation of trip circuits</li> <li>Remote 'Out of Service' indication</li> <li>Isolation of inter-tripping circuits</li> <li>Isolation of watchdog alarms</li> <li>Isolation of VT circuits</li> <li>Isolation of I/O circuits</li> </ul>	
3	Trip Cassette	This circuit type is the <u>second</u> to be isolated during Stage II as the Isolation Plug is removed from the Test Block. Use to provide: <ul style="list-style-type: none"> <li>Isolation of trip circuits</li> <li>Isolation of inter-tripping circuits</li> <li>Isolation of watchdog alarms</li> </ul>	
8	CT cassette with shorting bar to the adjacent circuit below	Use for CT connections so that they will be automatically shorted <u>first</u> during Stage II as the Isolation Plug is removed. Shorting is made to the adjacent CT circuit below. After shorting, the CT circuit is isolated.	
9	Last CT cassette on a CT group	Use for CT connections so that they will be automatically shorted <u>first</u> during Stage II as the Isolation Plug is removed. Shorting is made to the adjacent CT circuit above. After shorting, the CT circuit is isolated.	

The product images, recommended wiring layout and application drawings are based on the 4M402-S and 4M422-S terminal format shown below. It should be noted that automatic CT shorting in the Test Block always takes place on the Live Side.



## Code versions

CT circuits must not be wired to cassette types 0, 1, 2 or 3 as this will result in open circuit CT's as the isolation plug is removed.



It is recommended that the Test Block is 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 and DC supplies, should be made to the ODD numbered live side terminals on the Test Block. This ensures that when the Test Plug is inserted, the black sockets are connected to the isolated relay circuits and the yellow sockets are connected to the potentially live supplies as shown in figures 8 to 12.

## Test Plug Terminal Format

The product images, recommended wiring layout and application drawings are based on the 4M420-S terminal format shown below. It should be noted that automatic CT shorting in the Test Block always takes place on the Live Side.

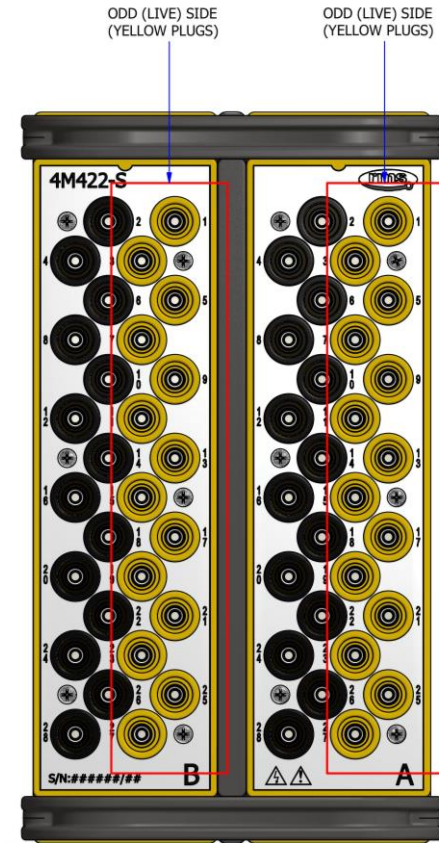


Figure 6: Position of Live Side terminals on 4M422-S Order Code versions

## Test Plug Terminal Format

The product images, recommended wiring layout and application drawings are based on the 4M420-S terminal format shown below. It should be noted that automatic CT shorting in the Test Block always takes place on the Live Side.



Figure 7: 4M422-S Test Plug  
Note 'finger safe' test sockets to accept 4mm shrouded test plugs

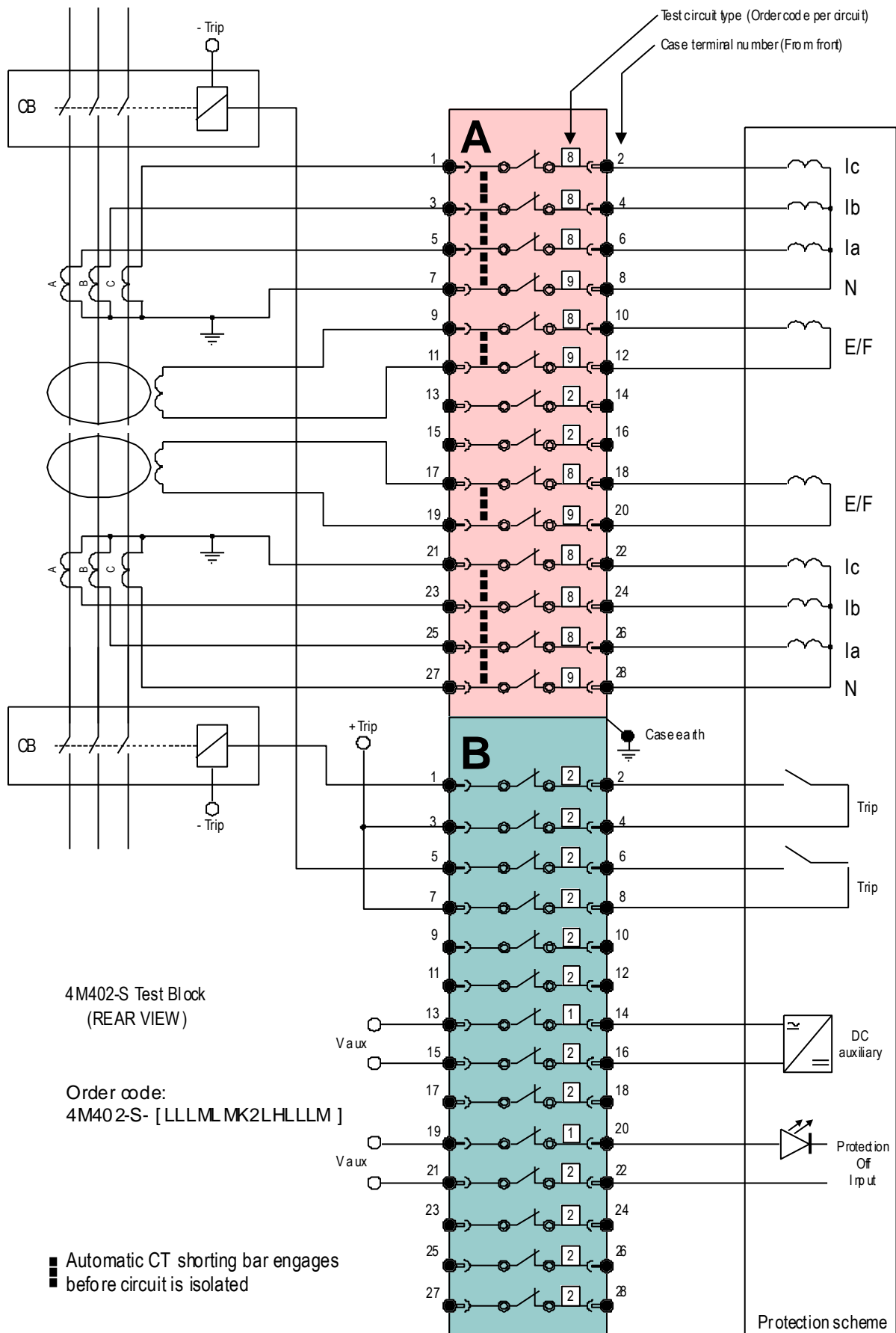


Figure 8: Application wiring example for differential protection of transformers with auto CT shorting (Rear terminal view)



## 4M402-06

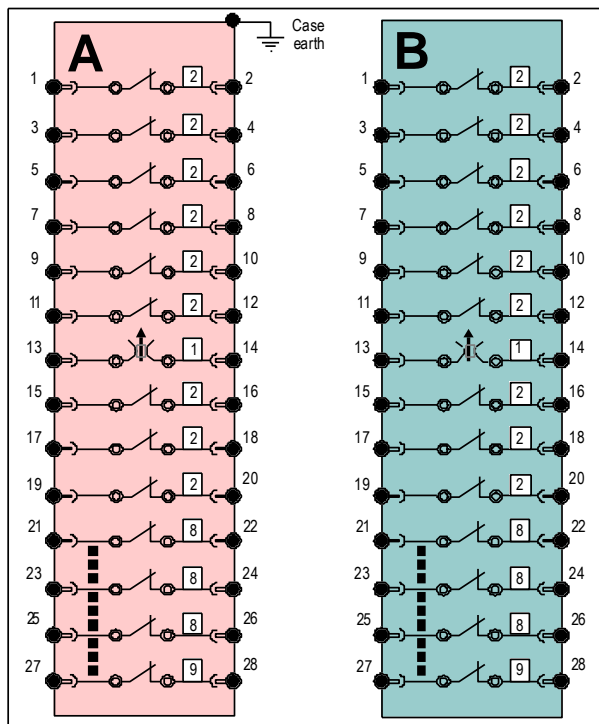


Figure 9: Viewed from rear terminal side  
Full order code: 4M402-S- 2 2 2 2 2 2 1 2 2 2 8 8 8 9  
Short code: 4M402-06

## 4M402-08

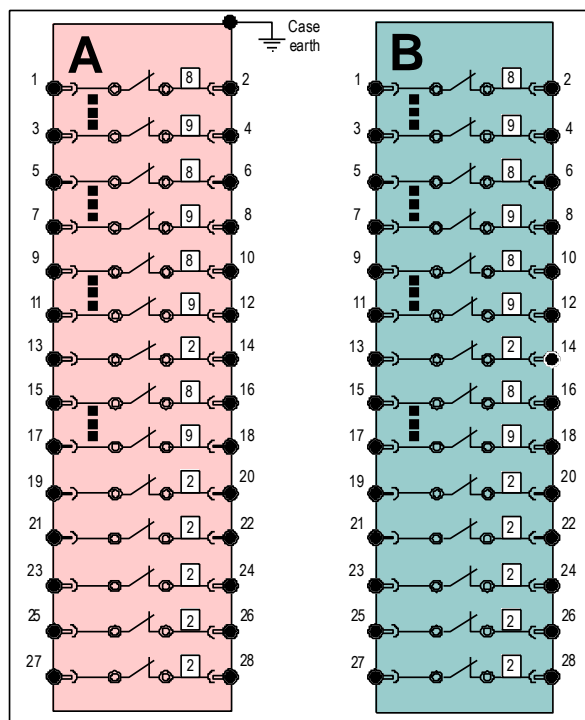


Figure 11: Viewed from rear terminal side  
Full order code: 4M402-S- 8 9 8 9 8 9 2 8 9 2 2 2 2 2  
Short code: 4M402-08

## 4M402-07

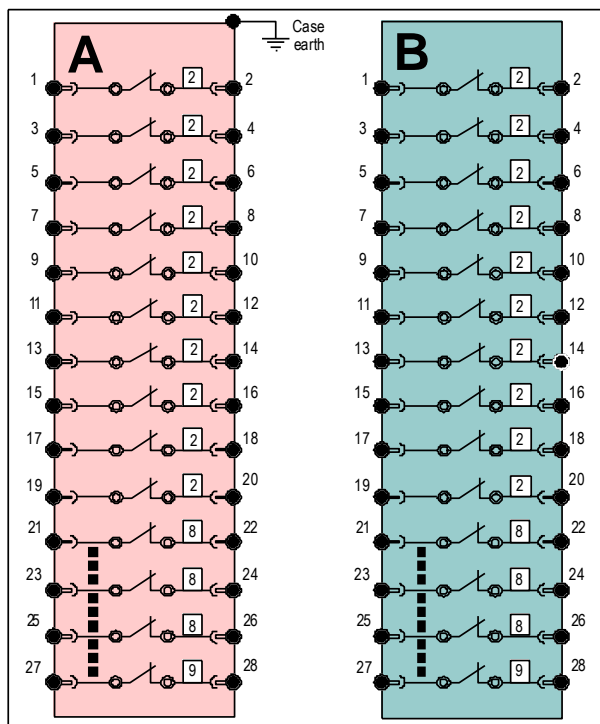


Figure 10: Viewed from rear terminal side  
Full order code: 4M402-S- 2 2 2 2 2 2 2 2 2 2 8 8 8 9  
Short code: 4M402-07

## 4M402-09

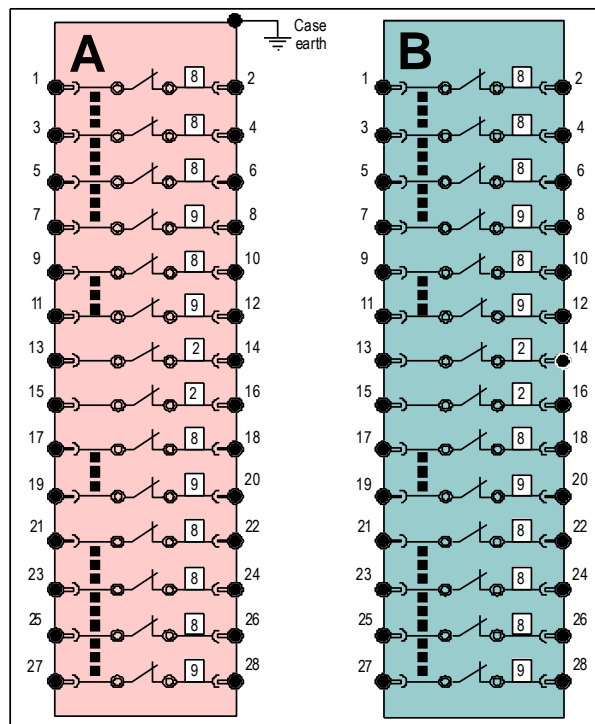


Figure 12: Viewed from rear terminal side  
Full order code: 4M402-S- 8 8 8 9 8 9 2 2 8 9 8 8 8 9  
Short code: 4M402-09



## Shrouded Test Leads

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

Part Number	Description
310-230-075-1	Two ended test lead - 75mm
310-230-180-1	Two ended test lead - 180mm

## Test Lead Plugs

### Single Plug

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

### Dual Plug

The dual or 'piggy back' plug is larger and should be plugged into the test sockets on the outside edge of the 4M422.

## Connecting Multiple Test Leads

Test leads may be linked in a daisy chain arrangement using the socket available at one end of each test lead.

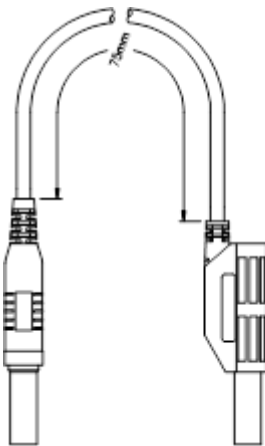


Figure 13: Two ended test lead - short  
P/N 310-230-075-1  
75mm wire length version depicted  
Multi-strand conductor rated cross section 2.5 sq. mm

## 4M402 Test Block

28 Equipment side terminals (Even terminal numbers).

28 Live side terminals (Odd terminal numbers).

28 Live side to equipment side shorting links.

This arrangement provides for up to 28 independent circuits to be connected.

## 4M422 Multi-Finger Test Plug

56 test sockets suitable for 4mm shrouded 'finger safe' type or standard banana plugs.

Securing screws to retain the Test Plug during system testing operations.

## Current Ratings

CT circuits and terminals	20A 400A	continuous 1s
Other circuits	10A 200A	continuous 1s

## Rated Cross Section of Conductors

CT circuits and terminals	2.5 sq. mm
Other circuits	0.75 sq. mm

## Case Type

4M56-S	Size 4 continuous 56 terminals
Mounting	Flush 4U high rack mount

## Individual Transport Packaging

1x 4M402 Test Block in a size 4 packing box

Size: 360 x 250 x 100mm

Weight: 2 Kg

## Insulation – 4M402 - In Service

Standard	IEC 61010-2-030
Type	Level
Between any contact pair & either adjacent contact pair.	3.3kV ac rms for 1 minute
Between all case terminals & the case earth	5.0kV ac rms for 1 minute
Between any alternate contact pair, provided that the intermediate pair is not used.	5.0kV ac rms for 1 minute

## Insulation – 4M422

Standard	IEC 61010-2-030
Type	Level
Between any contact.	3.3kV ac rms for 1minute
Between any alternate contact pair, provided that the intermediate pair is not used.	5.0kV ac rms for 1 minute

## Insulation – 4M402 with 4M422 Fitted

Standard	IEC 61010-2-030
Type	Level
Between incoming & outgoing contacts.	3.3kV ac rms for 1minute
Between all case terminals & the case earth	5.0kV ac rms for 1 minute

## Voltage Rating

Standard	IEC 60255-27
All circuits and terminals	600V AC continuous 320V DC continuous
System auxiliary voltage:	40V DC minimum

## Performance Standard

Low-voltage switchgear and control gear

Part 7.1: Ancillary equipment – Terminal blocks for copper conductors

Standard	IEC 60947-7-1
----------	---------------

## Temperature

Standard	IEC 60068-2-1/2
Operating Range	-10 to +55 degrees Celsius
Storage Range	-25 to +70 degrees Celsius

## Humidity

Standard	IEC 60068-2-78
Operating Range	40 degrees Celsius and 93% RH non condensing

## IP Rating

Standard	IEC 60529
Installed	IP5x

## Vibration - Sinusoidal

Standard	IEC 60255-21-1 Class I	
Vibration Response	0.5gn	≤ 5%
Vibration Endurance	1.0gn	≤ 5%

## Shock and Bump

Standard	IEC 60255-21-2 Class I	
Shock Response	5gn, 11ms	≤ 5%
Shock Withstand	15gn, 11ms	≤ 5%
Bump Test	10gn, 16ms	≤ 5%

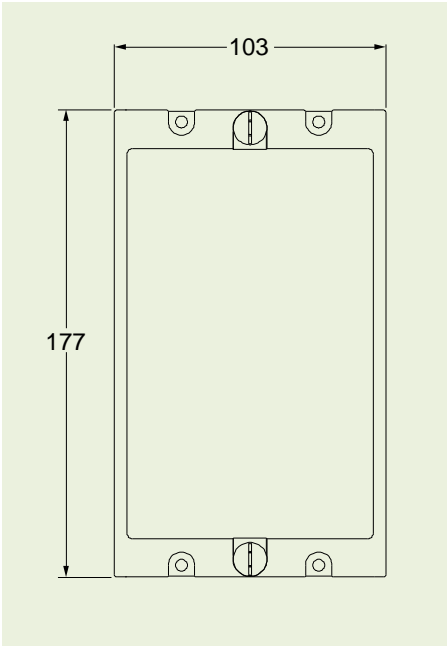
## Seismic

Standard	IEC 60255-21-3 Class I	
Seismic Response	1gn	≤ 5%

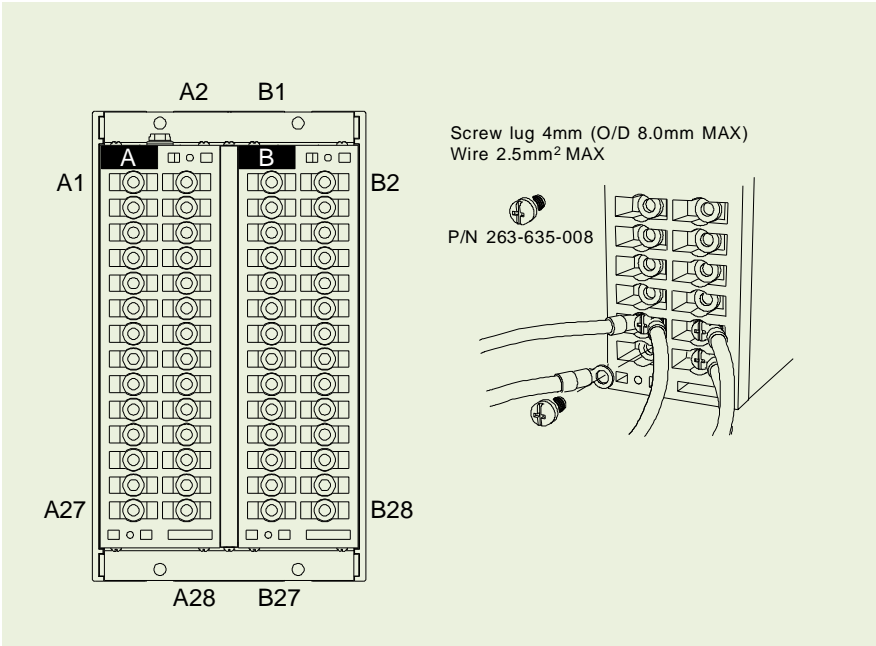
## Mechanical Classification

Durability	> 10 <sup>5</sup> operations at no load
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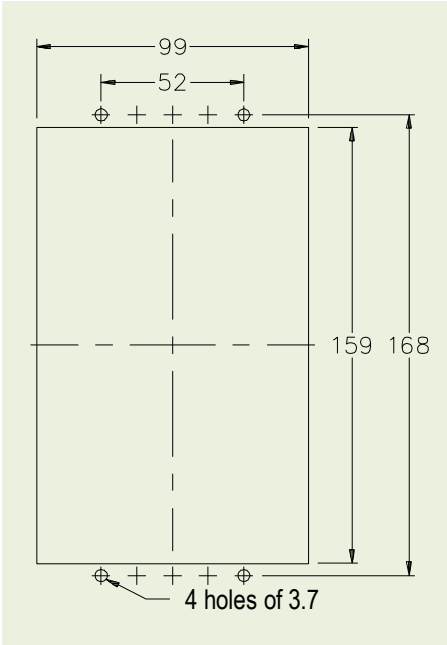
## Front View



## Rear View



## Panel Cut-out



## Side View

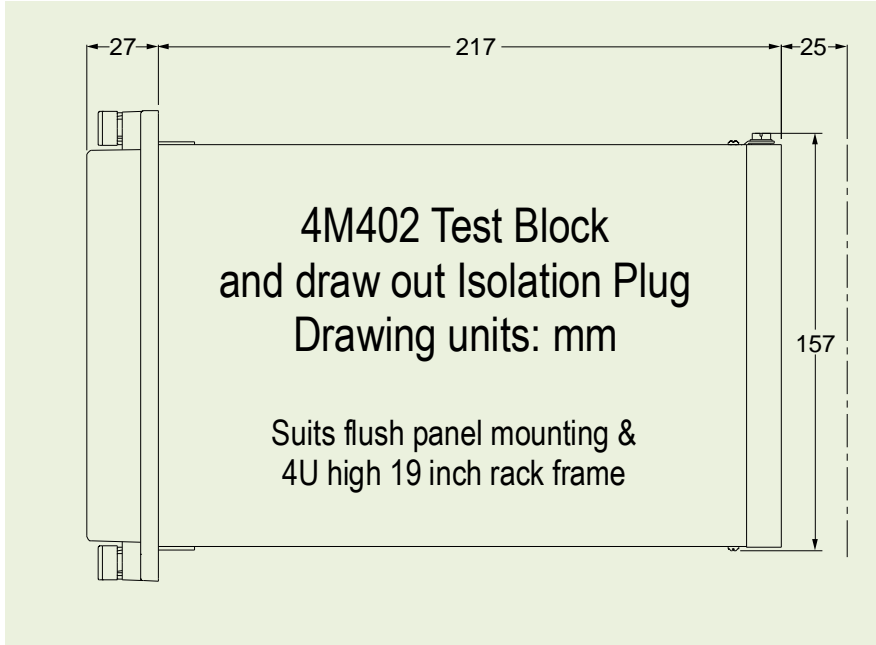


Figure 14: 4M402-S Case details

Standard Test Block Configuration Codes

4M402 -	<input type="checkbox"/>	[ Equivalent test circuit pair order codes ]		
	06	[ 2 2 2 2 2 2 1 2 2 2 8 8 8 9 ]	Figure 9	
	07	[ 2 2 2 2 2 2 2 2 2 2 8 8 8 9 ]	Figure 10	
	08	[ 8 9 8 9 8 9 2 8 9 2 2 2 2 2 ]	Figure 11	
	09	[ 8 8 8 9 8 9 2 2 8 9 8 8 8 9 ]	Figure 12	

Test Plug

The 4M422-S is the default Test Plug version and is suitable for application with all 4M402-S Test Blocks.

4M422 -	<input type="checkbox"/>	
	S	Live Side YELLOW terminals on RIGHT

Test Circuit Groups

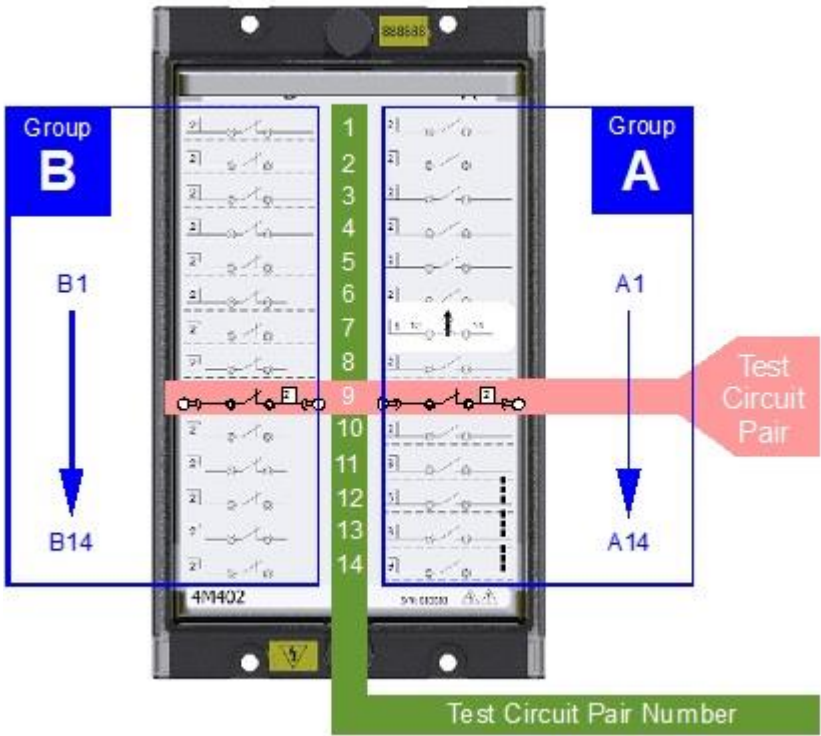
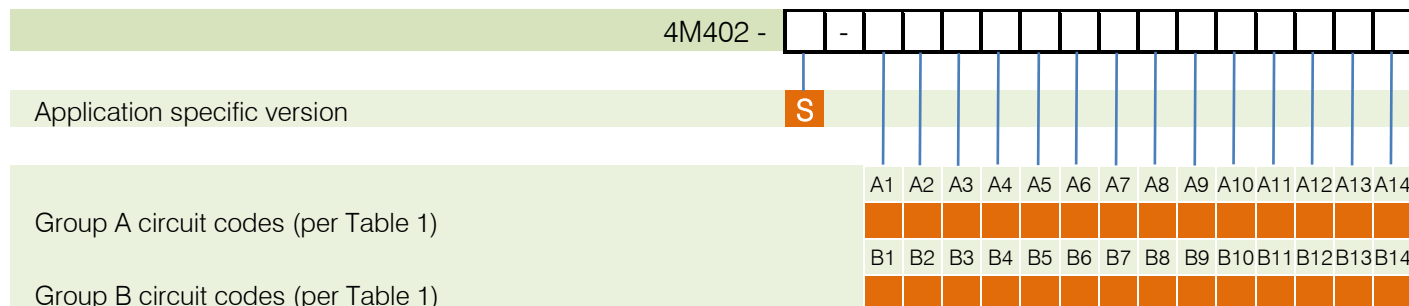


Figure 15: 4M402-S Test circuit groups

## Test Block Configuration



For each test circuit pair, 1 through to 14, utilize the test circuit pair look up table to determine the test circuit pair order code.

For example, one of the pairs utilizes test circuit type 2 on Group A and test circuit type 1 on Group B.

This yields a test circuit pair order A as per table 2:

## Test Circuit Group Order Codes

A \ B	0	1	2	3	8	9	
0	0	-	-	-	-	-	
1	-	1	A	B	C	D	
2	-	K	2	E	L	M	
3	-	F	G	3	H	J	
8	-	N	P	Q	8	R	Not allowed in Position 14
9	-	S	T	U	V	9	Not allowed in Position 1
				Not allowed in Position 14	Not allowed in Position 1		

Table 2

Type	Description
0	Blank circuit
1	Test Block Cover
2	General Purpose Cassette
3	Trip Cassette
8	CT cassette with shorting bar to the adjacent circuit below
9	Last CT cassette CT group

- Notes:
1. Type 1 cassettes cannot be specified in adjacent positions.
  2. A maximum of four (4) CT cassettes may be specified in a single group.
  3. CT circuits must be specified with a cassette type 8 or 9 in Group A or B.
  4. Refer to figure 2 for timing diagram of CT shorting and circuit isolation.

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Due to RMS continuous product improvement policy this information is subject to change without notice.





## Features

- 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
- Made in Australia

## 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 4M300 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.

Technical Bulletin

**4M300**

**Test Block System**



Figure 1:  
4M320-A Test Plug

## Description

Made in Australia

The **Test Block** type 4M300 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 circuit-shortening link. Changing the 4M300 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 4M300-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 4M320, 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.

## 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 4M300-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 4M320 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 4M300 test block.

### CT SHORTING – AUTOMATIC (Internal)

The 4M320 may be ordered with internal CT shorting links fitted to pre-designated positions as follows:

4M320-B Internal links between terminals 21-23-25-27  
 Refer figure 8

Where these 4M320 test plug versions are employed it is essential that the CT circuits are wired to the 4M300 test block in the matching positions.

To Reiterate: The 4M320 requires the **USER** to ensure that the necessary shorting links - manual or automatic – are fitted prior to plugging into the 4M300 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 4M320 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

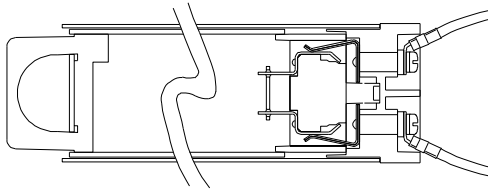


Figure 2: Close up view of the 'finger safe' test plug sockets that accept standard 4mm shrouded test plugs

## Operation

Changing the 4M300 Test Block system from the normal service condition to the secondary injection test condition is achieved in three steps shown in figure 3 below:

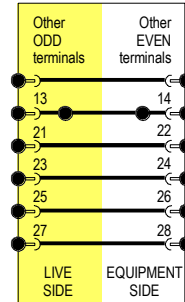
### NORMAL SERVICE CONDITION



TOP VIEW

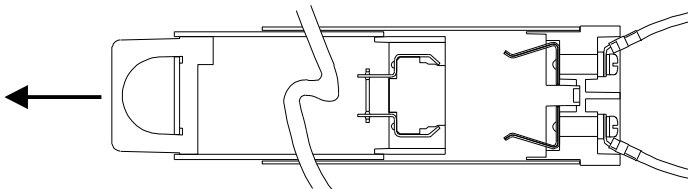
Shown with isolation plug fitted to short terminals 13 & 14 (4M300-B model only)

4M300-B Test Block Terminal Status

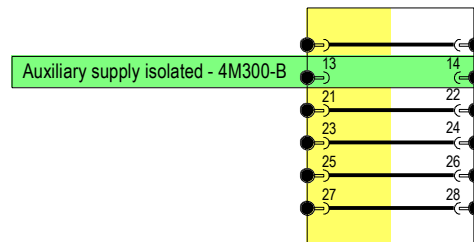


REAR VIEW

### Step 1 - DC AUXILIARY SUPPLY ISOLATION



WITHDRAW DC AUXILIARY ISOLATION PLUG (4M300-B model only)  
DC auxiliary supply link between terminals 13 & 14 is removed

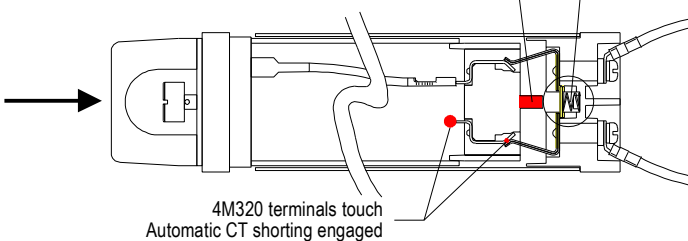


### Step 2 - AUTOMATIC CT SHORTING

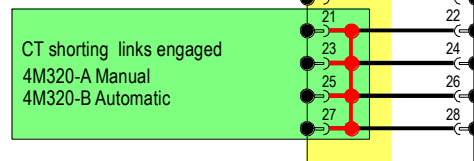
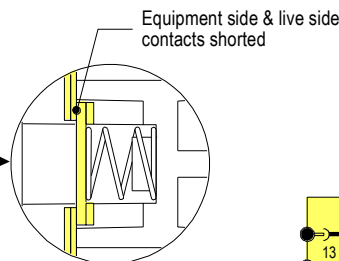
INSERT 4M320[B] TEST PLUG

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

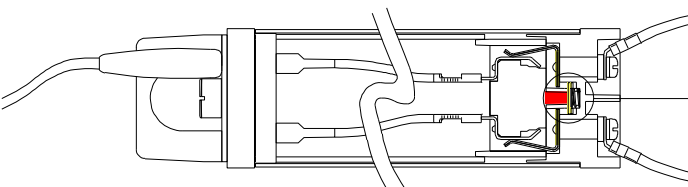
Circuit isolating bar not yet engaged



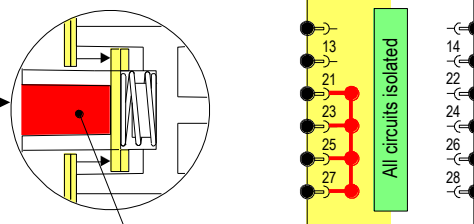
4M320 terminals touch  
Automatic CT shorting engaged



### Step 3 - CIRCUIT ISOLATION



4M320[B] Test Plug fully inserted



### SECONDARY INJECTION TEST CONDITION

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

Figure 3

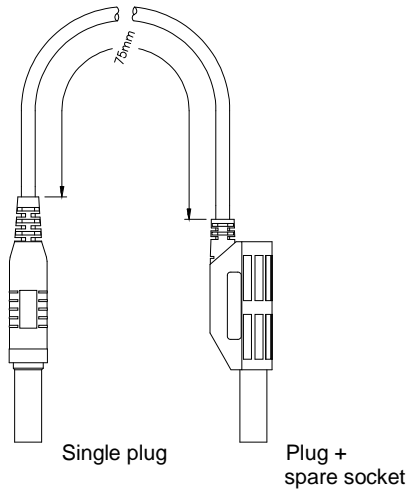


Figure 4: Two ended test lead - short  
 P/N 310-230-075-1 75mm wire length version depicted

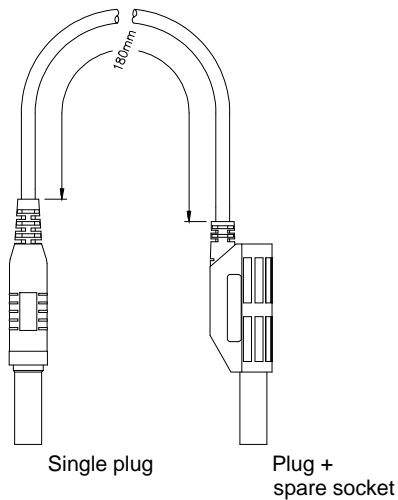


Figure 5: Two ended test lead - long  
 P/N 310-230-180-1 180mm wire length version depicted

## Test Leads

### SHROUDED TEST LEADS

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

Part Number	Description	Quantity supplied per 4M320
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 & 5.

#### 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 4M320. The lead emerging from the dual plug should face out from center of the 4M430 to ensure adequate clearance for other plugs.

### 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:

1. Connect the first lead between sockets 21-23
2. Connect the second lead between sockets 25-27
3. 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 6  
4M300-B Test Link Plug  
Depicted in the normal service condition  
with the isolation plug installed

**4M300-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.

**4M300-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 Isolating Plug is removed.

## Technical Data

### 4M320 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  
320V DC continuous  
System auxiliary voltage: 40V DC minimum

### CASE TYPE

2M28 Size 2 28 terminals

### COMPLIANCE STANDARDS

IEC 60068-2-1, 60068-2-2, 60068-2-78  
IEC 60255-1, 60255-21-1, 60255-21-2, 60255-21-3, 60255-27  
IEC 60529  
IEC 60947-1, 60947-7-1  
IEC 61010-2-030

### INSULATION WITHSTAND (to IEC 61010-2-030)

#### All Models

3.3kV AC RMS for 1 min: Between all terminals & all terminals & case.  
1.2/50 $\mu$ s 5KV impulse between any contact pair and either adjacent contact pair. All terminals and case.

#### 4M300-B Test Block & 4M320 Test Plug only

1KV AC RMS for 1 min. between terminals 13 & 14 when the test block isolation plug is removed.

### TEMPERATURE

Operating range: -10 to +55 °C  
Storage range: -25 to +70 °C

### HUMIDITY

Operating range: 40°C and 93% relative humidity non-condensing

### IP RATING

Installed: IP5x (from front with cover fitted)

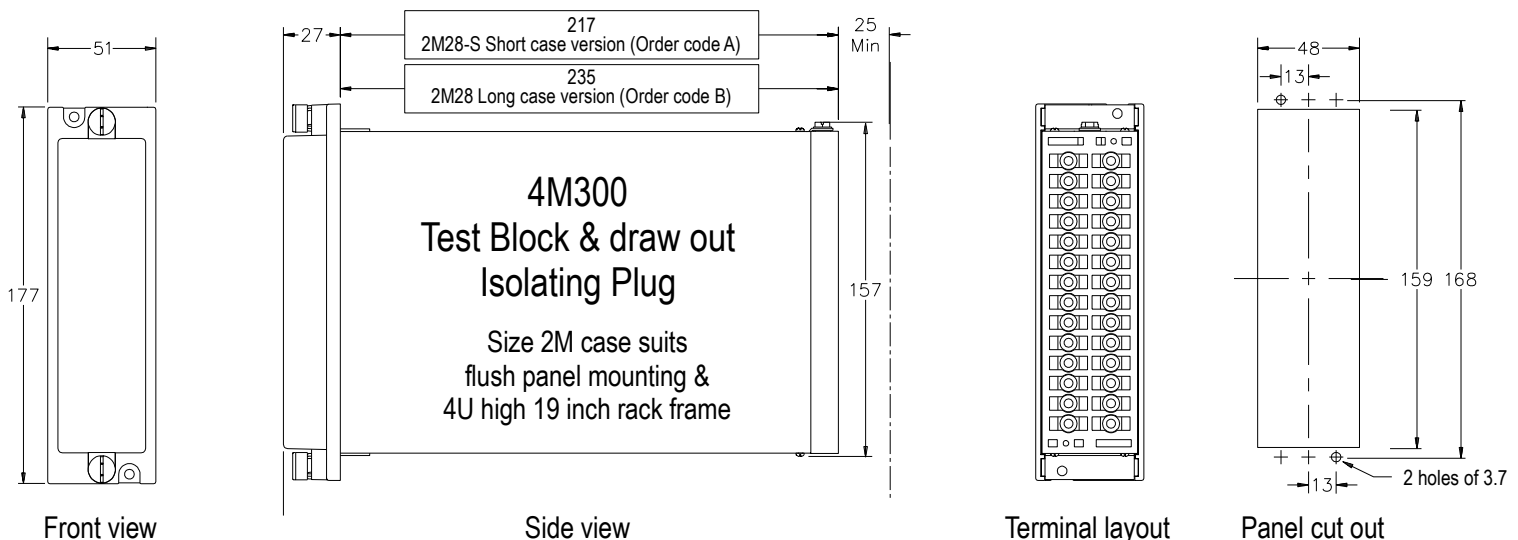


Figure 7: Case details



Generate the required ordering code as follows: e.g. 4M300-BA

**4M300** 1 2 **TEST BLOCK (SOCKET)**

**1 AUXILIARY SUPPLY ISOLATING LINK**

- A Not required (Isolation Plug not supplied)  
 B Required (Test Block supplied with Isolation Plug)

**2 CASE LENGTH** (Match to 4M320 case length)

- A Short Default  
 B Long

## Ordering Information

Generate the required ordering code as follows: e.g. 4M320-BA

**4M320** 1 2 **TEST PLUG**

**1 CT SHORTING LINKS**

- A Manual (External links to be fitted by operator)  
 B Automatic (Internal links fitted between terminals 21, 23, 25 & 27)

**2 CASE LENGTH** (Match to 4M300 case length)

- A Short Default  
 B Long

### TYPICAL APPLICATION OF 4M300 TEST BLOCK & 4M320 TEST PLUG

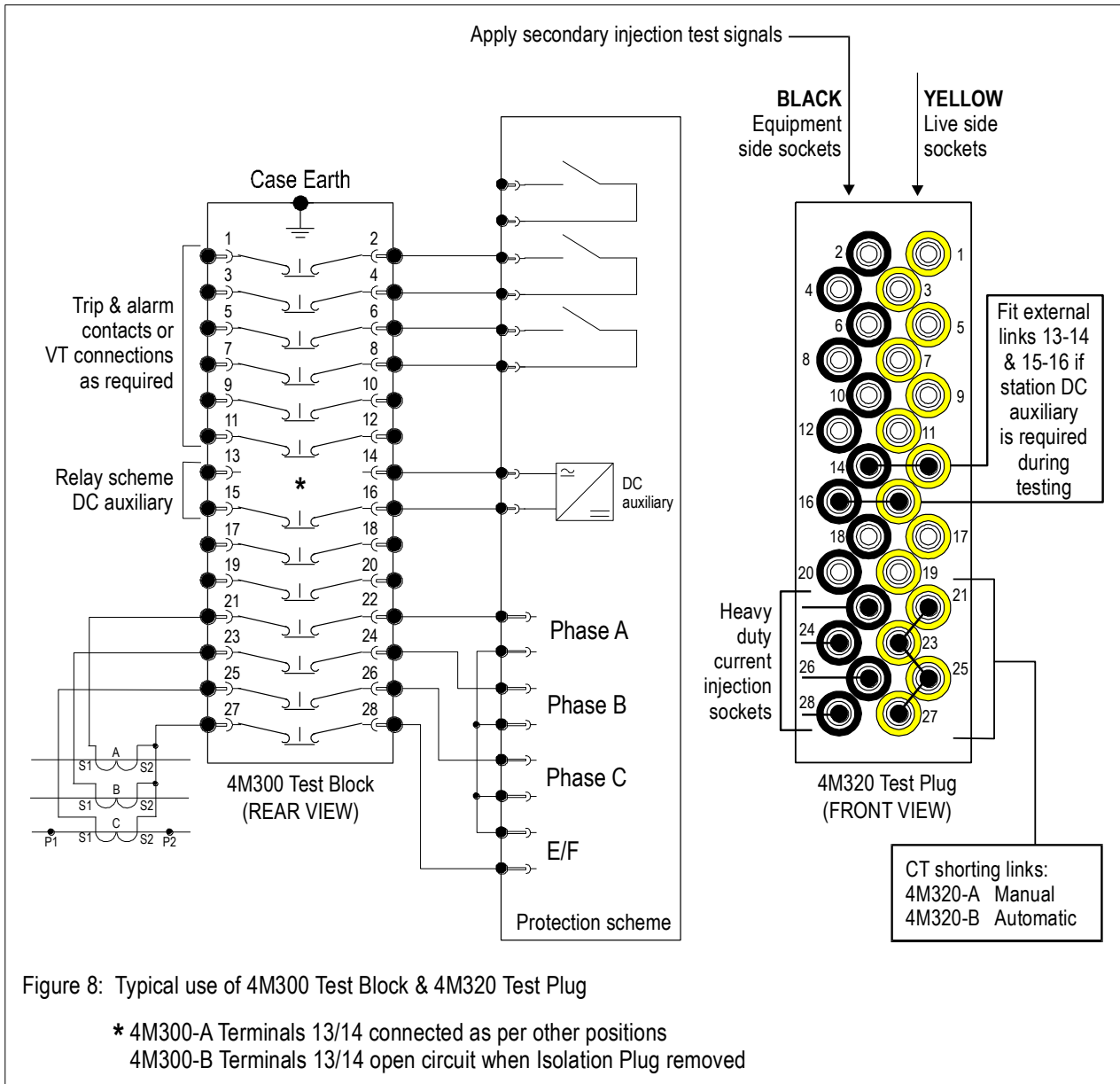


Figure 8: Typical use of 4M300 Test Block & 4M320 Test Plug



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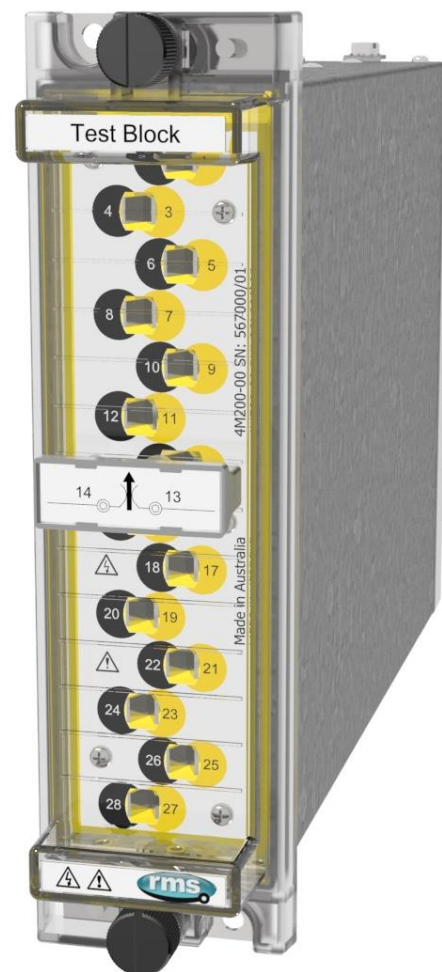
TEST BLOCKS | TEST PLUGS | TEST LEADS

# Test Block System

## 4M200

Flexible and high-performance test block system suitable for application on a wide range of protection relay panels.

- > Colour coded finger safe test sockets
- > 14 independent test groups
- > Compatible with industry standard 14 circuit test blocks and test plugs
- > Optional auxiliary supply isolation circuit
- > Identification of CT circuits on front panel
- > Flush panel or rack mounting
- > IEC 60255 Compliant
- > Optional polarized test block and test plug system
- > Made in Australia



4M200-01 Test Block

## System Components

- > 14 circuit Test Block
- > Test Plug



4M200-01 Test Block



4M220-00 Test Plug

## Description

The 4M200 Test Block system is an evolution of the 14 test circuit versions widely employed in the power utility sector. The primary difference is the incorporation of 'finger safe' test sockets which allow the use of shrouded 4mm banana plugs.

Several 4M200 Test Block configurations are available to suit specific protection and control applications as depicted in the wiring diagram examples.

The 4M200 Test Block has 14 pairs of spring loaded contacts which are linked to a terminal block positioned at the rear of the enclosure.

Insertion of the 4M220 Test Plug into the Test Block first connects & then open circuits each pair of contacts which connected to the rear terminals.

The 4M220 test plug locates securely into the test block & can be retained by two knurled screws.

The 28 'finger safe' test sockets on the 4M220 are divided into two groups of 14:

- > 14 even numbered equipment side **BLACK** test sockets
- > 14 odd numbered live side **YELLOW** test sockets

Each of these 28 test sockets accepts a 4mm shrouded or standard type test plug.

## Features

- > 14 independent test groups
- > 'Finger safe' test sockets suit standard or shrouded type 4mm banana plugs for direct access to the protection or measurement scheme
- > Auto CT shorting test plugs available
- > Clear and concise front panel circuit identification
- > High current / voltage rating
- > Compatible with industry standard 14 circuit test blocks and test plugs
- > Made in Australia

## Application

Test blocks enable test technicians to quickly and safely isolate protection relays so that test signals may be injected and system performance verified.

There are several 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 4M200 Test Block is designed as a general-purpose isolation and test signal injection point. 'Finger safe' sockets are employed to improve operator safety and suit 4mm shrouded 'finger safe' type banana plugs.

Equipment under test need only be removed for servicing if problems are detected or for routine maintenance.



## Finger Safe Test Sockets

Note the black - even numbered - equipment side sockets.

Note the yellow - odd numbered - live side sockets.



Figure 1: Close up view of the 'finger safe' test plug sockets that accept standard 4mm shrouded test plugs.

## CT Shorting – Manual (External)

It is essential that the sockets of the 4M220 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 may be achieved using external shorting link lead to ensure that 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 4M200 test block.

The 4M220-00 Test Plug is for use with the 4M200-01 to -09 non-polarized Test Block versions

## CT Shorting – Automatic (Internal Links)

The 4M220 may be ordered with internal CT shorting links fitted to pre-designated positions as follows:

4M220-P7	Can only be used with 4M200-P6 and 4M200-P7 test blocks Internal shorting links between contacts: 21-23-25-27
4M220-P8	Can only be used with 4M200-P8 test blocks Internal shorting links between contacts: 1-3, 5-7, 9-11, 15-17
4M220-P9	Can only be used with 4M200-P9 test blocks Internal shorting links between contacts: 1-3-5-7, 9-11, 17-19, 21-23-25-27

Where these 4M220 test plug versions are employed it is essential that the CT circuits are wired to the 4M200 test block in the matching positions.

To Reiterate: The 4M220-00 requires the **USER** to ensure that the necessary shorting links are in the correct positions **BEFORE** plugging into the test block.

## Test Plug 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.

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

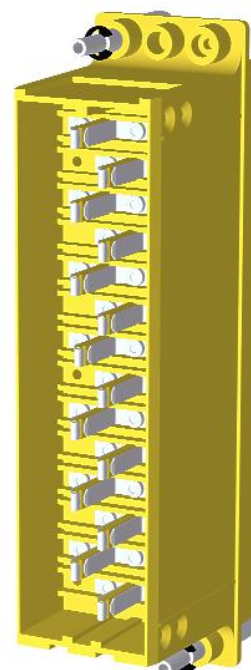


Figure 2: Rear view of the 4M220 showing connection fingers that interface with the 4M200 test block.

The 'hook' shape of the odd side connection fingers ensures 'make before break' functionality when inserting into the test block. This function is provided to ensure the continuity of CT circuits is maintained during insertion of the test plug.

Insertion of the 4M220 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.

Note: Test block circuit 13 – 14 must not be used for CT connections as the associated 4M220 test plug contact finger is shorter than the other fingers and will lead to a CT open circuit.

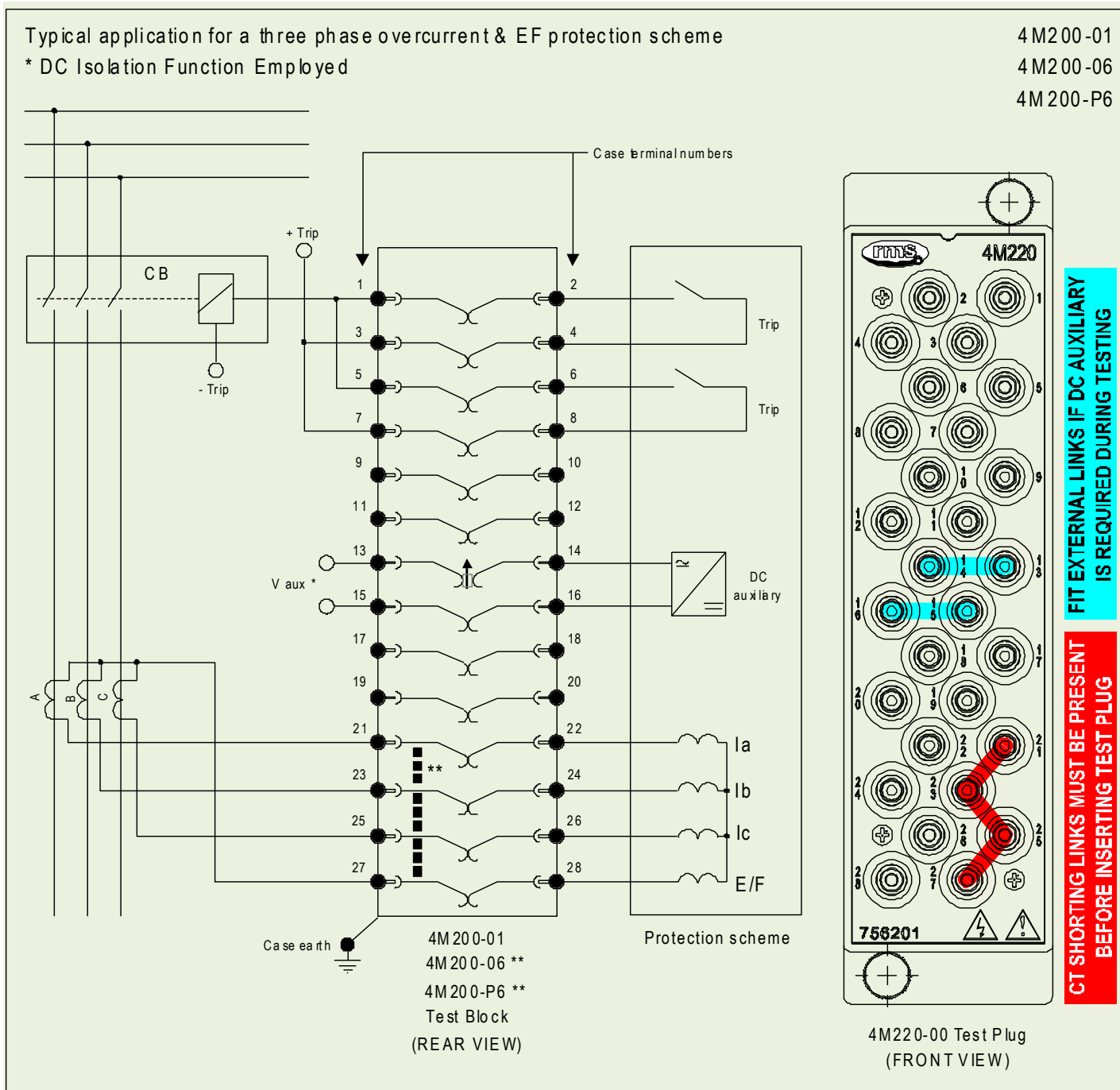


Figure 3: Test Block Application wiring example for a three phase overcurrent and EF protection scheme

Test Block	DC Isolation	Fixed CT Positions ** Designation on Test Block Facia	Polarized	Test Plug	Comment
4M200-01	YES	NO	NO	4M220-00	Operator must manually fit CT shorting links to the Test Plug in correct positions.
4M200-06		YES			
4M200-P6			YES	YES	4M220-P7

Note: Test block circuit 13 – 14 must not be used for CT connections. Removal of the cover will open circuit 13-14.

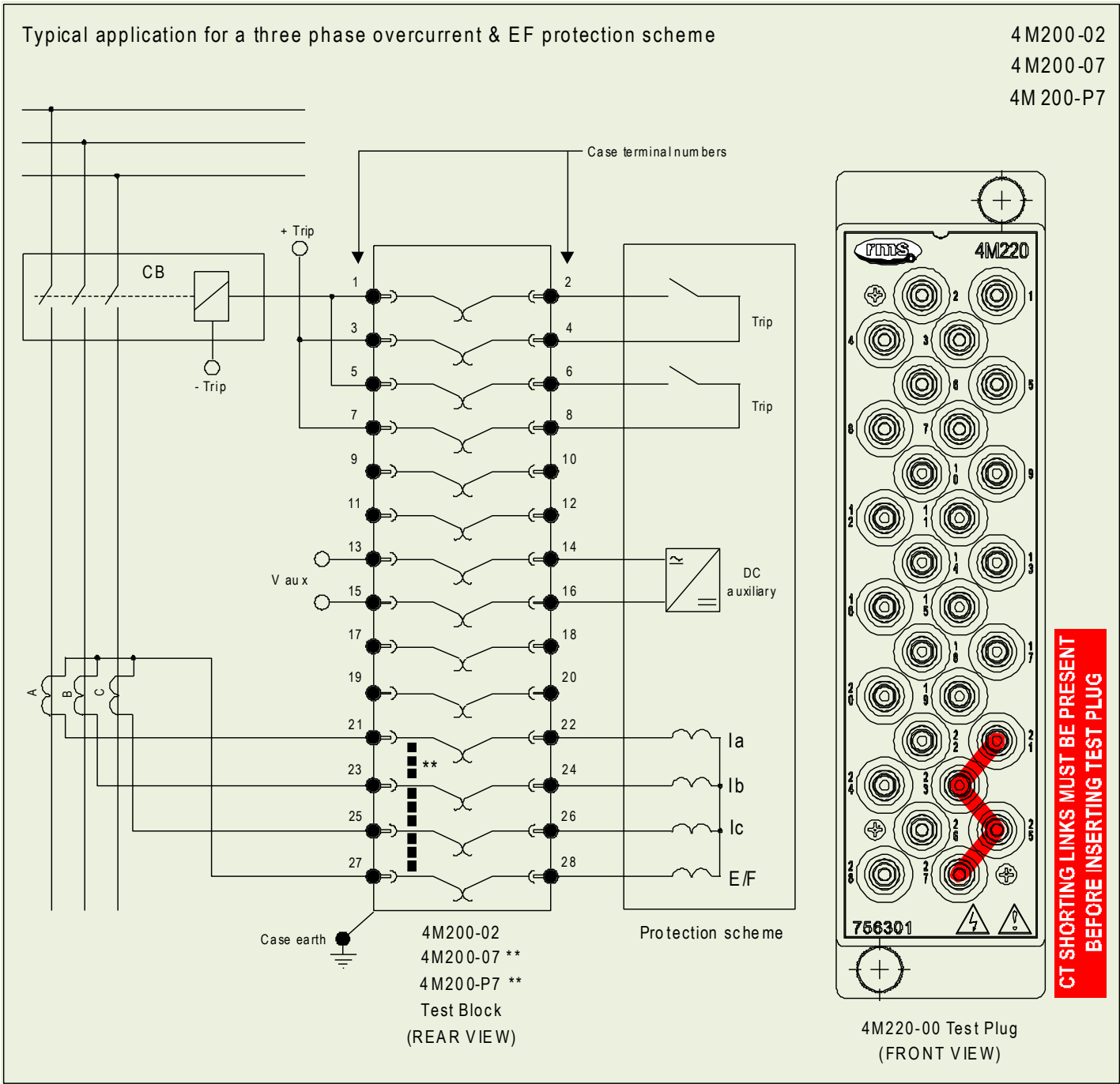


Figure 4: Test Block Application wiring example for a three phase overcurrent and EF protection scheme

Test Block	DC Isolation	Fixed CT Positions ** Designation on Test Block Facia	Polarized	Test Plug	Comment
4M200-02	NO	NO	NO	4M220-00	Operator must manually fit CT shorting links to the Test Plug in correct positions.
4M200-07		YES	YES	4M220-P7	Test Plug has fixed shorting positions to terminals 21-23-25-27
4M200-P7					

Note: Test block circuit 13 – 14 must not be used for CT connections as the associated 4M220 test plug contact finger is shorter than the other circuits and will lead to a CT open circuit.



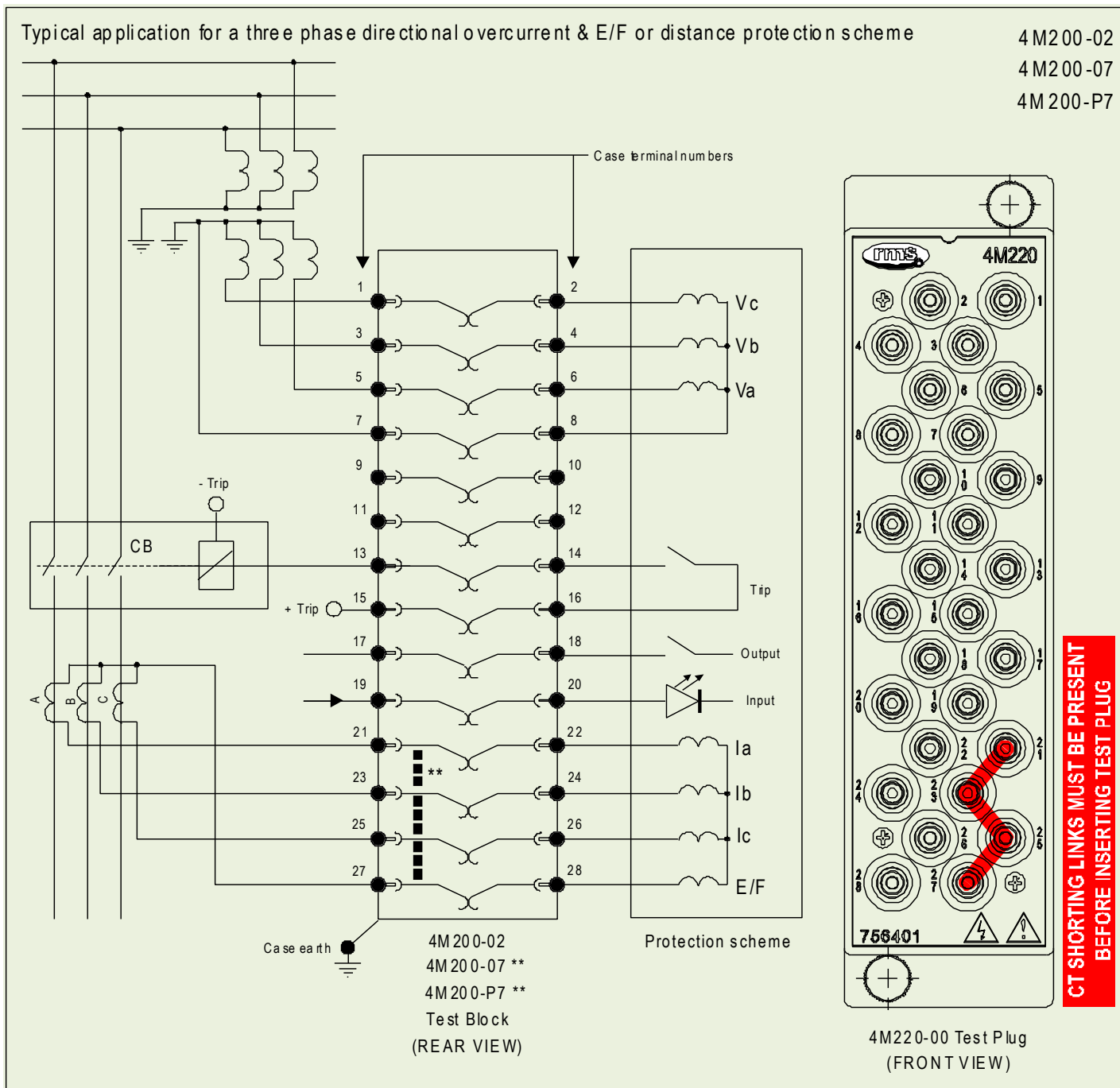


Figure 5: Typical application for a three phase directional overcurrent & E/F or distance protection scheme

Test Block	DC Isolation	Fixed CT Positions ** Designation on Test Block Facia	Polarized	Test Plug	Comment
4M200-02	NO	NO	NO	4M220-00	Operator must manually fit CT shorting links to the Test Plug in correct positions.
4M200-07		YES	YES	4M220-P7	Test Plug has fixed shorting positions to terminals 21-23-25-27
4M200-P7					

Note: Test block circuit 13 – 14 must not be used for CT connections as the associated 4M220 test plug contact finger is shorter than the other circuits and will lead to a CT open circuit.

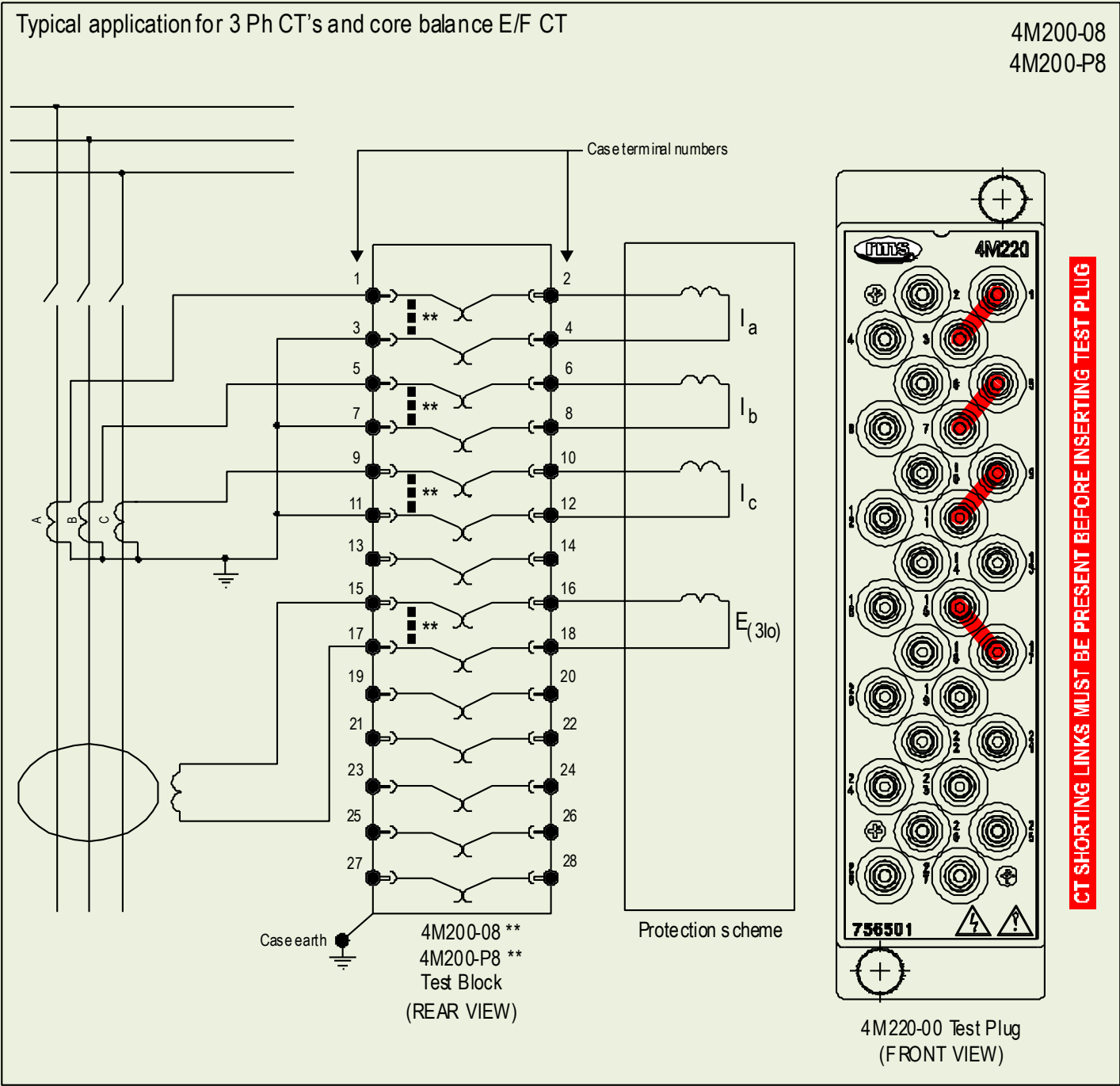


Figure 6: Typical application for 3 Ph CT's and core balance E/F CT

Test Block	DC Isolation	Fixed CT Positions ** Designation on Test Block Facia	Polarized	Test Plug	Comment
4M200-08	NO	YES	NO	4M220-00	Operator must manually fit CT shorting links to the Test Plug in the designated positions.
4M200-P8			YES	4M220-P8	Test Plug has fixed shorting positions to terminals 1-3, 5-7, 9-11, 15-17

Note: Test block circuit 13 – 14 must not be used for CT connections as the associated 4M220 test plug contact finger is shorter than the other circuits and will lead to a CT open circuit.



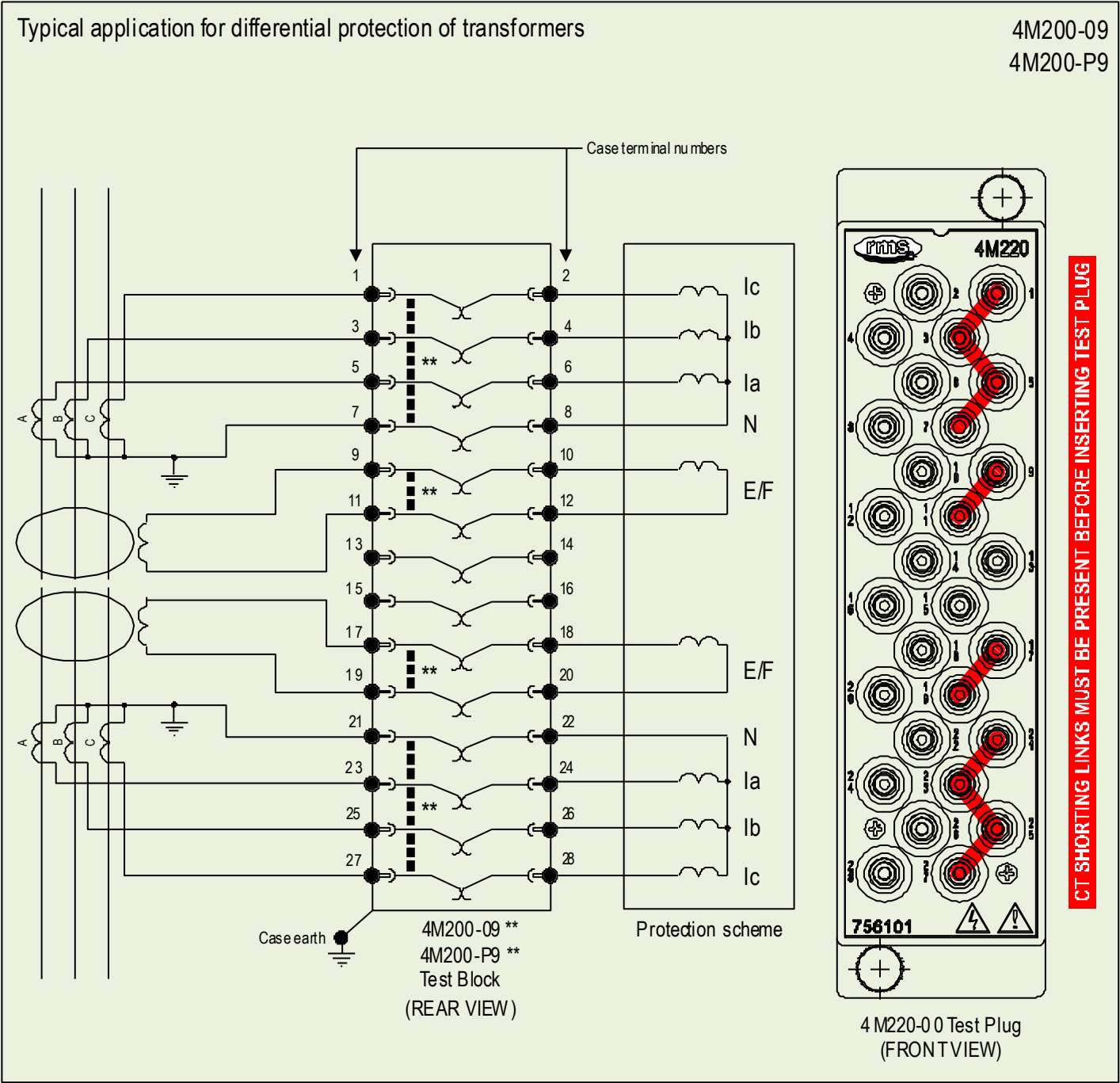
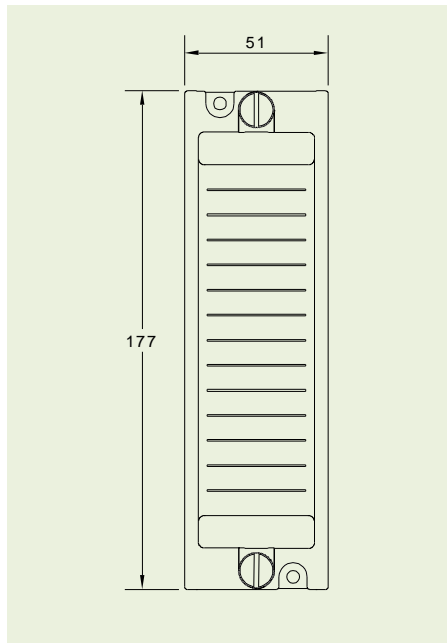


Figure 7: Typical application for differential protection of transformers

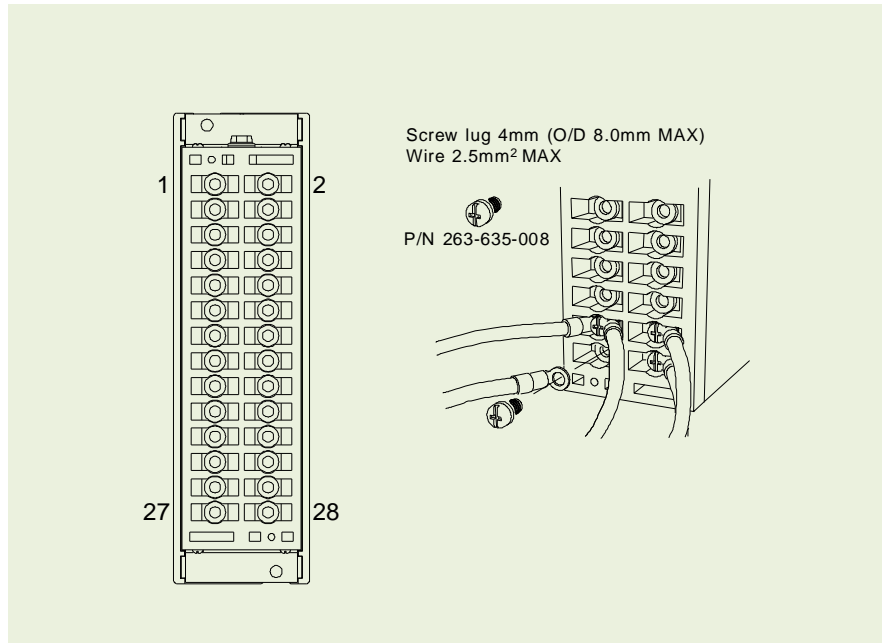
Test Block	DC Isolation	Fixed CT Positions ** Designation on Test Block Facia	Polarized	Test Plug	Comment
4M200-09	NO	YES	NO	4M220-00	Operator must manually fit CT shorting links to the Test Plug in the designated positions.
4M200-P9			YES	4M220-P9	Test Plug has fixed shorting positions to terminals 1-3-5-7, 9-11, 17-19, 21-23-25-27

Note: Test block circuit 13 – 14 must not be used for CT connections as the associated 4M220 test plug contact finger is shorter than the other circuits and will lead to a CT open circuit.

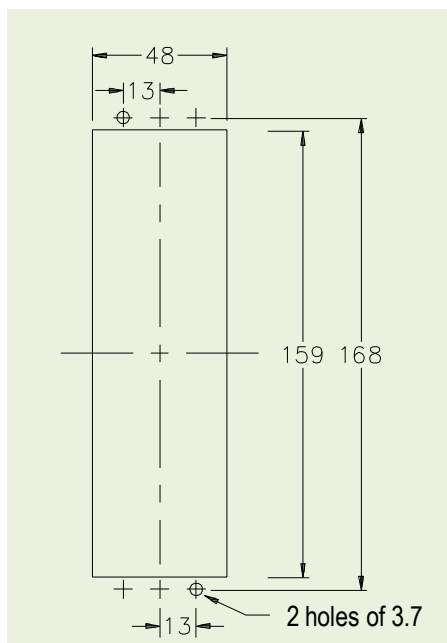
**Front View**



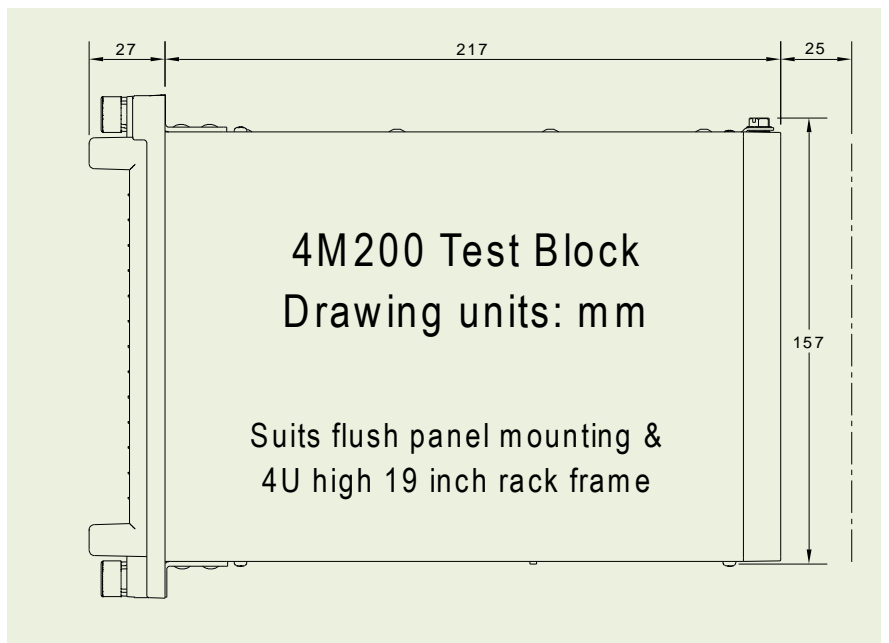
**Rear View**



**Panel Cut-out**



**Side View**



## ELECTRICAL ENVIRONMENT

### Voltage Rating

Standard	IEC 60255-27,
Test Identification	Test specification
Pollution degree	2
Overvoltage category	III
Rated insulation voltage	300 V rms or d.c.
System auxiliary voltage	40 V DC minimum

### Current Rating

Standard	IEC 60947-7-1
Test Identification	Test specification
Rated Wire Cross-section	2.5 mm <sup>2</sup>
Current withstand	Continuous withstand: 20 A
	Short-time withstand: 400 A for 1 s

### Clearances and Creepage Distances

Standard	IEC 60255-27, #10.6.3, Table C.6
Test Identification	Test specification
Creepage distance	3.0 mm
Clearance	3.0 mm
Clearances and Creepage Compliance	CAD drawings assessment

### Safety-related Electrical Tests

Standard	IEC 60255-27, #10.6.4
Test Identification	Test specification
Between any contact pair & either adjacent contact pair	5 kV 1.2/50 $\mu$ s 0.5 J 3 impulses of each polarity 2.2 kV ac rms for 1 minute
Between any terminal and the case earth	5.0 kV ac rms for 1 minute
Between any alternate contact pair, provided that the intermediate pair is not used	5.0 kV ac rms for 1 minute
Across Open Contacts of Auxiliary Power Supply Circuit (No Shorting pin)	1 kV ac rms for 1 minute

### 4M200 with 4M220 Fitted

Standard	IEC 60255-27, #10.6.4
Test Identification	Test specification
Between any contact pair & either adjacent contact pair	5 kV 1.2/50 $\mu$ s 0.5 J 3 impulses of each polarity 2.2 kV ac rms for 1 minute
Between Incoming & Outgoing contacts	2.2 kV ac rms for 1 minute
Between any terminal and the case earth	5.0 kV ac rms for 1 minute

### Electrical Environment and Flammability

Standard	IEC 60255-27, #10.6.5
Test Identification	Test specification
Single-fault condition	Assessment for CT input circuits
Maximum temperature of accessible parts at ambient temperature +40°C	Metal parts: < 70°C
	Non-metallic parts: < 80°C
Flammability of insulating materials, components and fire enclosures	Assessment

### Terminal Block Performance

Standard	IEC 60947-7-1, #7.2.
Test Identification	Test specification
Temperature Rise	< 45 K

## ATMOSPHERIC ENVIRONMENT

### Temperature

Standard	IEC 60068-2-1, IEC 60068-2-2	
Test Identification	Test specification	Auxiliary power Supply voltage
Operating Range	-10 to +55°C	Min and Max
Storage Range	-25 to +70°C	Non-energized
Test duration	16 hours at top and bottom temperatures	

### Damp Heat (Humidity)

Standard	IEC 680068-2-78	
Test Identification	Test specification	
Operating Range	40°C and 93% RH non condensing	
Test duration	16 hours	

### IP Rating

Standard	IEC 60529	
Test Identification	Test specification	
Installed	IP5x	

## Performance Standard

Low-voltage switchgear and control gear

Part 7.1: Ancillary equipment – Terminal blocks for copper conductors

Standard	IEC 60947-7-1
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## MECHANICAL ENVIRONMENT

### Vibration - Sinusoidal

Standard	IEC 60255-21-1 Class 1	
Test Identification	Test specification	Variation
Vibration Response in each of 3 axes	0.035 mm/0.5 gn peak 1 sweep cycle 10-150 Hz	≤5%
Vibration Endurance in each of 3 axes	1.0 gn peak 20 sweep cycles 10-150 Hz	Non-energized

### Shock and Bump

Standard	IEC 60255-21-2 Class 1	
Test Identification	Test specification	Variation
Shock Response in each of 3 axes	5 gn, 11 ms, 3 pulses in each direction	≤5%
Shock Withstand in each of 3 axes	15 gn, 11 ms, 3 pulses in each direction	Non-energized
Bump Test in each of 3 axes	10 gn, 16 ms, 1000 bumps in each direction	Non-energized

### Seismic

Standard	IEC 60255-21-3 Class 2	
Test Identification	Test specification	Variation
Seismic Response Horizontal, on each axis	7.5 mm/2.0 gn, 1 sweep cycle 1-35Hz	≤5%
Seismic Response Vertical	3.5 mm/1.0 gn, 1 sweep cycle 1-35Hz	≤5%

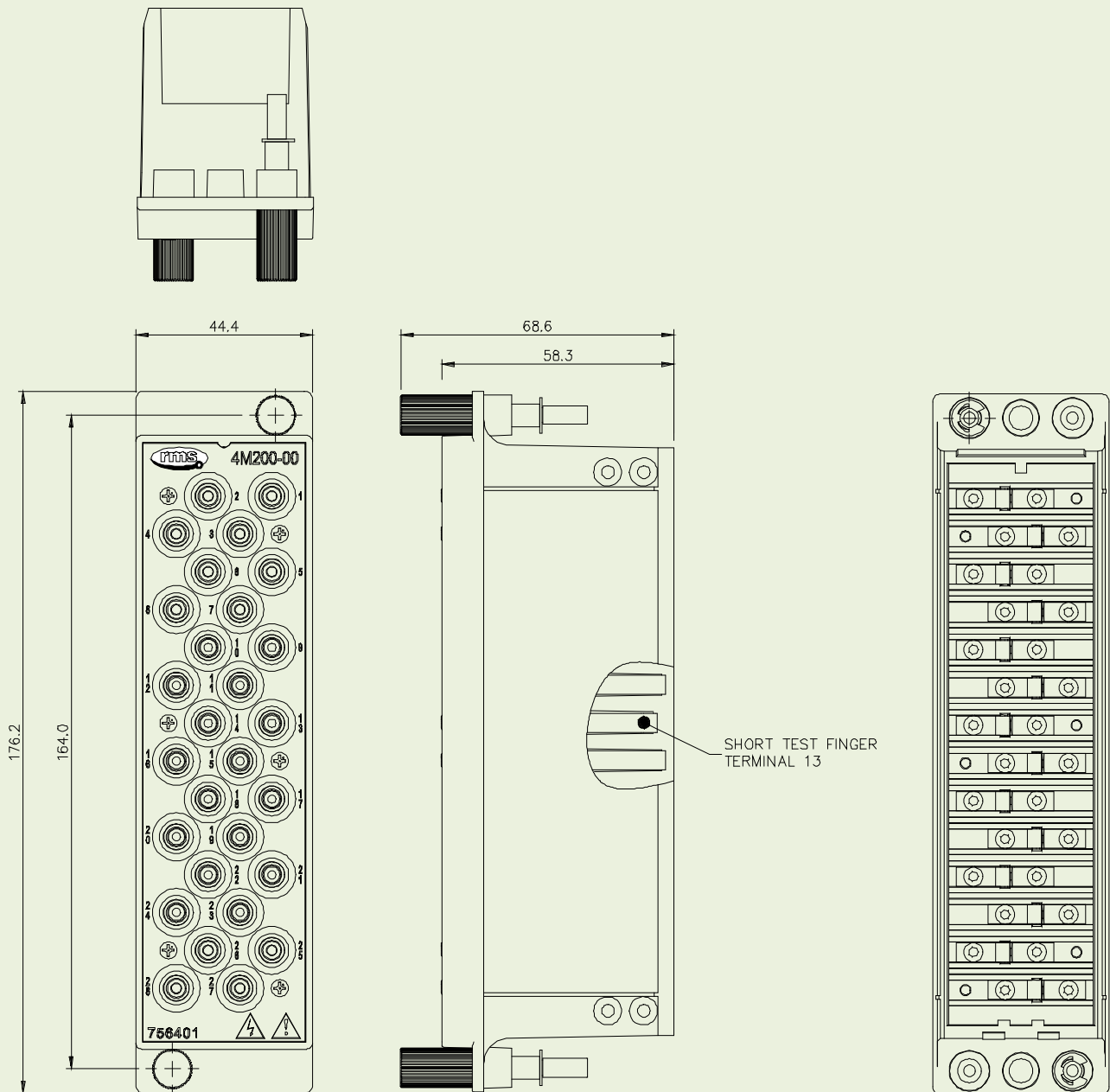
### Mechanical Classification

Durability	10 <sup>3</sup> insertions of the Test Plug
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## 4M220 Multi Finger Test Plug

28 test sockets suitable for 4mm shrouded banana plugs.

Securing screws are integrated to retain the Test Plug during testing operations.



Note: Test block circuit 13 – 14 must not be used for CT connections as the associated 4M220 test plug contact finger is shorter than the other circuits and will lead to a CT open circuit.

Shrouded Test Leads

Two types of shrouded ‘finger safe’ test leads are available:

Part Number	Description	Quantity supplied per 4M220
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 PVC insulation

Test Lead Plugs

Two types of shrouded plug are employed on each test lead as depicted in figure 10 and 11.

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 4M220. The lead emerging from the dual plug should face out from centre of the 4M220 to ensure adequate clearance for other plugs.

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:

- 1. Connect the first lead between sockets 21-23
- 2. Connect the second lead between sockets 25-27
- 3. 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.

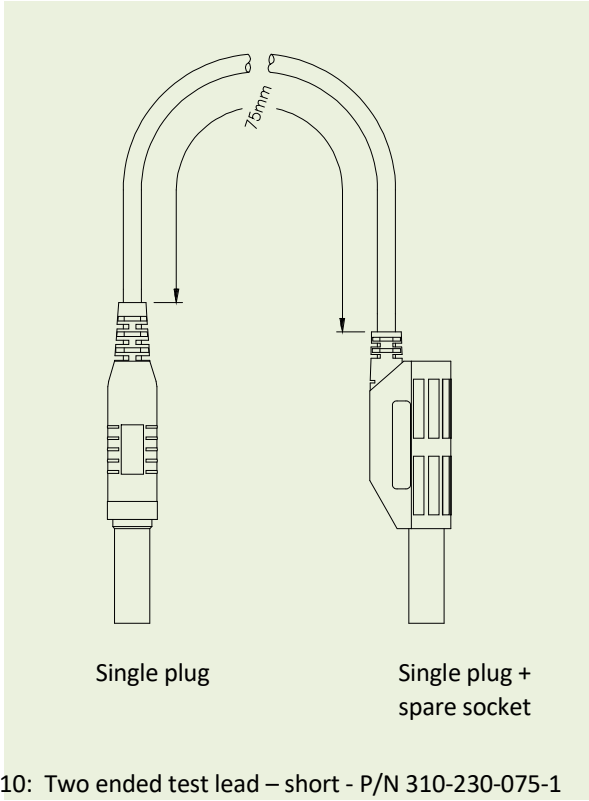


Figure 10: Two ended test lead – short - P/N 310-230-075-1

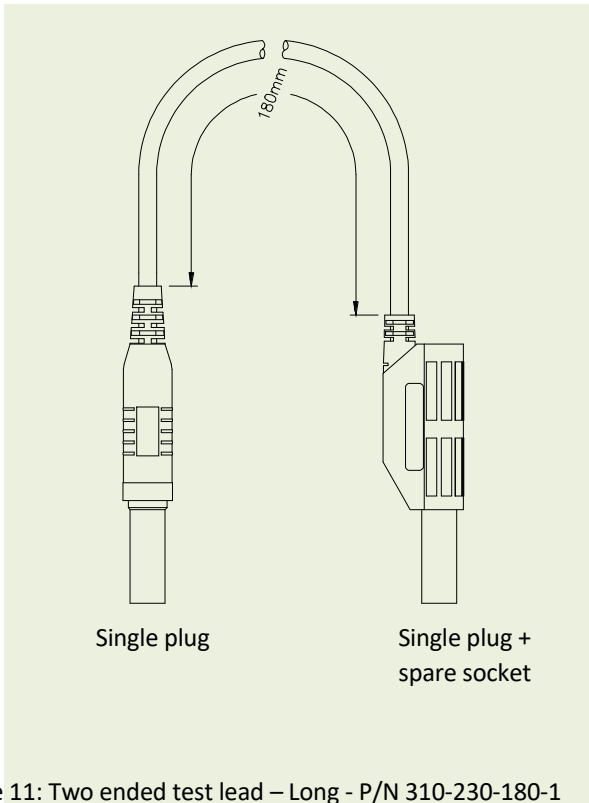


Figure 11: Two ended test lead – Long - P/N 310-230-180-1

## 4M200 Test Block Order Code

Generate the required ordering code as follows: e.g. 4M200-02

4M200 -  -  -

	01	Vx isolation 13-14
	02	Vx isolation not required
	06	Vx isolation 13-14, CT's 21-23-25-27, non-polarized
	07	No Vx isolation, CT's 21-23-25-27, non-polarized
	08	CT's 1-3, 5-7, 9-11, 15-17, non-polarized
	09	CT's 1-3-5-7, 9-11, 17-19, 21-23-25-27, non-polarized
	P6	Vx isolation 13-14, CT's 21-23-25-27, polarized
	P7	No Vx isolation, CT's 21-23-25-27, polarized
	P8	CT's 1-3, 5-7, 9-11, 15-17, polarized
	P9	CT's 1-3-5-7, 9-11, 17-19, 21-23-25-27, polarized
Mounting	-	Standard vertical mounting
	H	Horizontal mounting
Non-standard parameters	-	None
	-IP2X	With IP2X terminal cover

Refer to Appendix 1 for further detail on IP2X terminal covers.

## 4M220 Test Plug Order Code

Generate the required ordering code as follows: e.g. 4M220-00

4M220 -

CT Shorting Links	00	External links to be fitted by operator – Must be Fitted Manually by Tester
	P7	Internal links fitted between contacts 21-23-25-27, polarized
	P8	Internal links fitted between contacts 1-3, 5-7, 9-11, 15-17, polarized
	P9	Internal links fitted between contacts 1-3-5-7, 9-11, 17-19, 21-23-25-27, polarized

## Cross Reference Charts

### > Non-polarized Test Blocks

		RMS Codes
MMLG-01	2RMLG-01	4M200-01
MMLG-02	2RMLG-02	4M200-02
MMLG-03	-	4M200-01-H
MMLG-04	-	4M200-02-H
-	-	4M200-06
-	-	4M200-07
-	-	4M200-08
-	-	4M200-09

### > Non-polarized Test Plugs

		RMS Code
MMLB-01	2RMLB-R1 2RMLB-S1	4M220-00

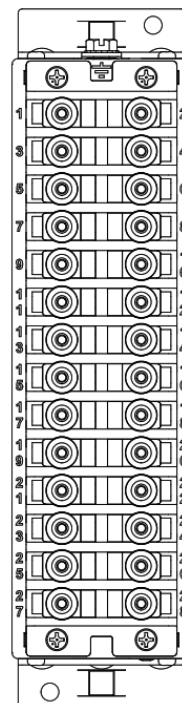
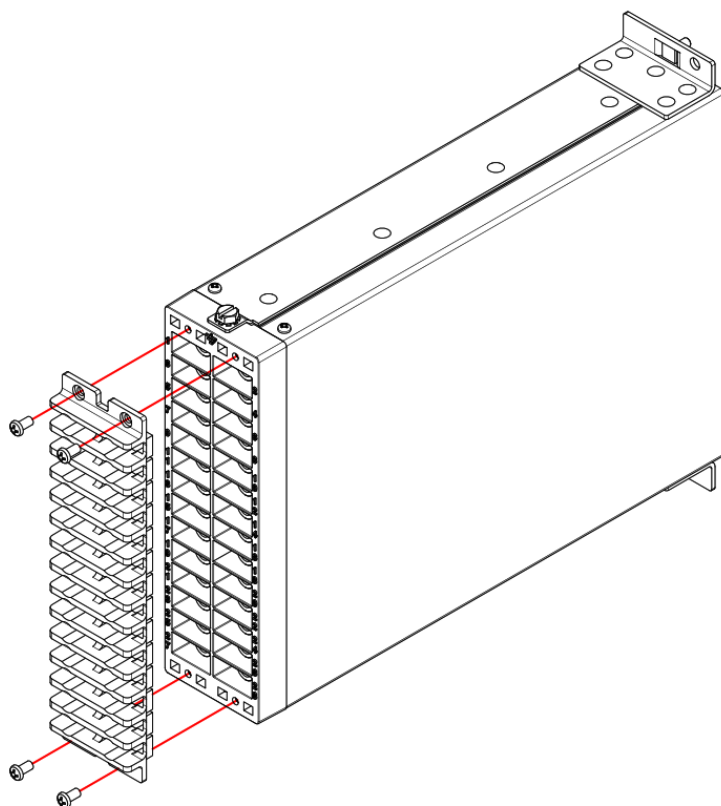
### > Polarized Test Blocks

		RMS Codes
-	2RMLG-07	4M200-P7
-	2RMLG-08	4M200-P8
-	2RMLG-09	4M200-P9

### > Polarized Test Plugs

		RMS Codes
MMLB-07	2RMLB-R7 2RMLB-S7	4M220-P7
-	2RMLB-R8 2RMLB-S8	4M220-P8
-	2RMLB-R9 2RMLB-S9	4M220-P9





2M28-S Case with IP2X cover

Note: IP2X terminal covers are fitted prior to relay wiring termination.



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