

# MiCOM AGILE P99X

## Test Block, Multi-finger Test Plug and Single-finger Test Plug

The MiCOM Agile P991 test block offers safe and configurable facilities for monitoring and secondary injection testing in any power system protection scheme when used with the P992 multi-finger test plug.

A single-finger test plug, type P993, is also available, providing a safe and isolated means solely for the verification of CT circuits.

The P991 test block features visible automatic line CT shorting, prior to the relay CT circuit being broken on insertion of a P992 multi-finger test plug. Up to three stages of sequential contact operation are provided by the P991 test plug. To avoid accidental tripping, an extraction stop facility is included.

The P991 test block carries a maximum of 14 circuits, each of which is factory configurable to the customer's requirements. Each circuit is brought out to separate pairs of 4 mm screw terminations at the rear of the test block.

### Application

The P990 series allows easy wiring verification and aids in the commissioning of relays and instruments. It can be used as a test facility either for individual relays or a protection scheme. The P991 test block offers facilities for monitoring and secondary injection testing of power system protection schemes and measurement schemes when used with the P992 multi-finger test plug.

Access to current transformers (CT), voltage transformers, auxiliary supply, plant status and trip circuits is possible without the need to disturb the relay or instrument wiring.

On insertion of the P992 multi-finger test plug, the shorting of adjacent line CT connections always takes place before breaking the connection to the relay or instrument, in order to prevent open circuit CTs.

A P993 single-finger test plug is also available for onload verification of the current flow in individual CT circuits routed through the P991 test block and 5 kV rms isolation is provided.

A P994 isolation plug is available to isolate trip and I/O circuits via the P991 test block.



## Testing & Commissioning

- Monitoring & secondary injection test facilitates
- Monitoring and testing up to 14 circuits with specific test block cassettes selectable for each circuit
- Test block eliminates the need to disturb protective system wiring for testing
- Cassettes available for CT shorting, and staged-break and make operation
- Single-finger test plug providing isolated CT current monitoring

## Design Flexibility

- Modular and customizable design to meet unique application requirements
- Test block can be mounted adjacent to MiCOM P40 Agile or MiDOS relays reducing panel space requirements
- Models Include:
  - Factory configurable test block (P991),
  - Multi-finger test plug (P992),
  - Single-finger test plug for CT current verification (P993),
  - Isolation Plug (P994)



## Description

### P991 Test Block

The P991 test block houses 14 cassettes. The cassettes are of a modular construction. The cassettes contain contact pairs that allow circuits to be completed via the screw terminals at the rear. Note that blank cassettes are an exception that have no contacts. There are specific types of cassette to suit any circuit; these can be configured in any order.

### P992 Multi-finger Test Plug

Access to the circuits connected to the P991 test block is provided by the P992 multi-finger test plug. The P992 is compatible with any configuration of the P991.

The P992 enables convenient wiring of the test equipment prior to insertion into the test block.

Use of the P992 ensures that the circuits operate in a predetermined sequence, according to the application, before breaking the connection between the circuit and line connection. Each socket is numbered at the front and relates to the corresponding terminal on the rear of the test block.

### Current Transformer Shorting

Operation of the P991 test block with the P992 multi-finger test plug ensures automatic shorting of all the current transformer circuits connected to the P991 before allowing access to the relays.

This prevents open circuiting of current transformers and the consequential unwanted generation of dangerously high voltages.

### P993 Single-finger Test Plug

The P993 single-finger test plug is provided for the verification of CT circuits. It has been designed solely for use with the CT cassette of the P991 test block.

For maximum safety, the P993 converts the monitored current into a voltage which can be measured using a high impedance voltmeter.

The isolation between contact-fingers and 4 mm output sockets is 5 kV rms.

Two switch-selectable current ranges are available:

- 0 to 2 A (I) - scale 1 V = 1 A
- 2 A to 20 A (II) - scale 1 V = 10 A

The insertion of the P993 will not cause the CT circuit to be open circuited.

### P994 Isolation Plug

The P994 isolation plug is provided for isolating trip and I/O circuits by opening stage I/II/III cassette contacts in the P991. The P994 should not be used to open the secondary circuits of live CT circuits via the P991 for safety reasons. The P994 has a feature to prevent accidental insertion into the CT cassettes. The P994 is polarized to only fit cassettes in one orientation, see Figure 5.

## Configuration

The required configuration for the P991 test block must be specified at the time of the order. The sequence of operation of the cassettes is defined by circuit type, as described below.

## Operating Sequence

With the various circuits connected via a test facility, it is sometimes necessary to provide a sequence of operation during test plug insertion and extraction. This is achieved by the use of different cassette types.

There are three stages of operation of cassette contacts in the P991 test block: Stage I contacts are the first to be opened, followed by Stage II then Stage III.

Refer to Figure 1 - Sequence Diagram.

- 1<sup>st</sup> stage opening of normally closed contacts of Stage I cassettes.
- 2<sup>nd</sup> stage opening of normally closed contacts of Stage II cassettes. Shorting adjacent CT cassettes in a group.
- 3<sup>rd</sup> Stage Break CT circuit connection to relay. Open normally closed contacts of Stage III cassettes. Make connection with normally open cassette contacts.

## Circuit Types

### Stage I cassette

This has normally closed contacts and is the first to be opened when inserting the P992 multi-finger test plug. This type of circuit can be used to provide trip circuit isolation, or to remotely indicate that the protection is out of service. It may also be used for preventing intertripping and breaking both watchdog and I/O circuits.

### Stage II cassette

This has normally closed contacts and is the second to be opened when inserting the P992 multi-finger test plug. This type of circuit can be used for removing the auxiliary supply and for VT and I/O circuits.

### Stage III cassette

This has normally closed contacts and is the third to be opened when inserting the P992 multi-finger test plug. It is suitable for VT and I/O circuits.

### CT cassette

This has normally closed contacts and protects the line CT secondary from being open circuited. It also prevents the consequential generation of dangerously high voltages. The CT cassette contacts are automatically shorted to adjacent CT cassette contacts, in the same group, when inserting the P992 multi-finger test plug (For sequence of operation, see Figure 1).

This cassette should only be used for CTs. CTs should not be connected to other cassette types as these do not provide automatic CT shorting.

**Note:** Insertion of a P993 single-finger test plug does not cause CTs connected to adjacent cassettes to be shorted together. CT current can be safely monitored using a P993 inserted into a CT cassette.

### Monitoring cassette

The two terminals of this cassette are permanently isolated from each other. This provides the ability to monitor two independent para-meters (eg. + and - auxiliary supply terminals). When connected to the positive and negative terminals of the auxiliary power supply, this provides access for the monitoring and the supply of power to test equipment.



Caution should be exercised when using this cassette type, since between Stage I and Stage III one side of the plug contact will be momentarily connected with inverse polarity

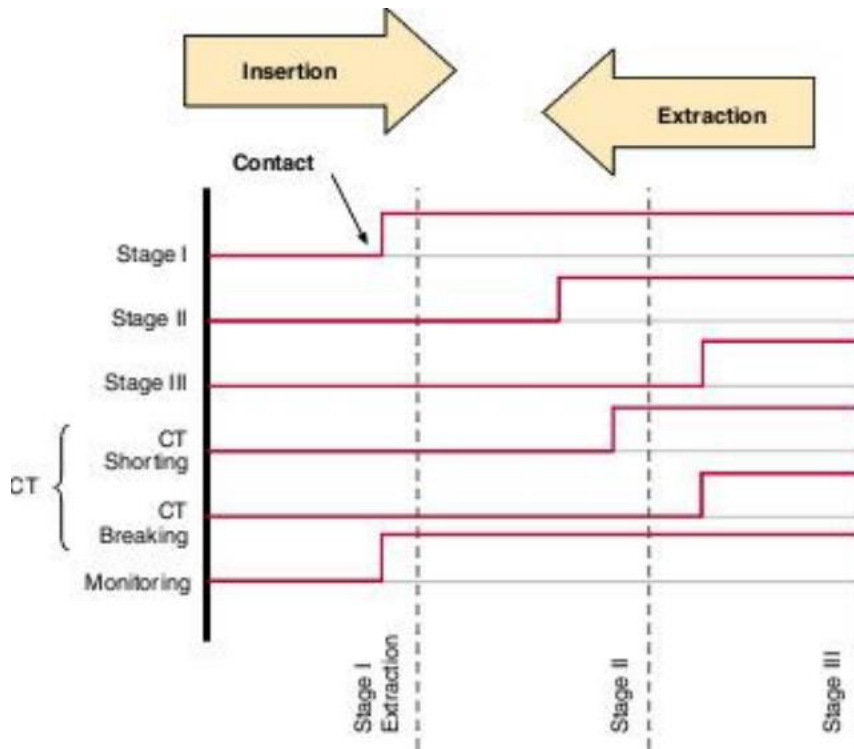


Figure 1 Sequence diagram during insertion and extraction of P992

The monitoring cassette should only be used for monitoring purposes. Damage could be caused if it is used to power any products using EMC input filtering or ancillary equipment with an earthed supply input terminal.

### Blank cassette

This is an empty cassette. It may be used for increased isolation and must be used for completing test block assemblies where the maximum number of circuits is not required. Blank cassettes also provide additional space for customer labelling of adjacent cassettes.

Cassette identification and labelling may be identified at the front of the test block:

Cassette	Symbol	Background colour
CT		Orange
Monitoring	//	White
Stage I	I	White
Stage II	II	White
Stage III	III	White
Blank	None	White

A space is provided for customer defined labels on the cover to identify circuits.

### Installation and Use

The generic safety guide SFTY/4L M and P994 safety guide P994-SG-4L-1 should be read before installing or using the P990 series test block or test plugs.

### Test block

No cassettes other than CT cassettes must be used for connection to CT circuits. Only the odd numbered terminals should be used for P991 test block line side connections (e.g. line CT connections) to maintain automatic CT shorting. Numbered terminals are generally designated as the relay/instrument side of the block.



This product must not be disassembled.

Foreign objects must not be inserted into the P991 test block, as this may compromise the safety features designed into the product. Only the P992 multifinger test plug or P993 single-finger test plug should be used to access the test block connections at the front of the panel.

### Warning



Do not open the secondary circuit of a live CT since the high voltage produced may be lethal to personnel and could damage insulation. Short the secondary of the line CT before opening any connections to it.



At any stage in the handling of the test plugs, care must be taken not to make contact with test plug-fingers, as they may be connected to live equipment either via the test block or test equipment.



### Multi-finger test plug

Do not use the P992 to break normally closed live circuits without a shorting link in place. Do not short-circuit the terminals of normally open monitor cassettes.

Reference should be made to the Safety Guide, Pxxx-SG(4LM)-EN-2 and warning labels on the P992 test blocks concerning safety recommendations when using the P99x.

Before use, the insulation of test leads should be visually checked for damage.

The retaining nuts should be hand tightened after insertion of the P992 to ensure that the P992 cannot be accidentally withdrawn. See figure 2.

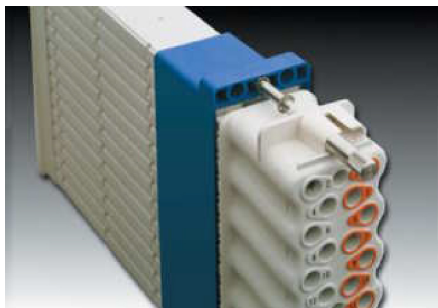


Figure 2  
To use the extraction stop feature, first centre the extraction stops (see figure 3)

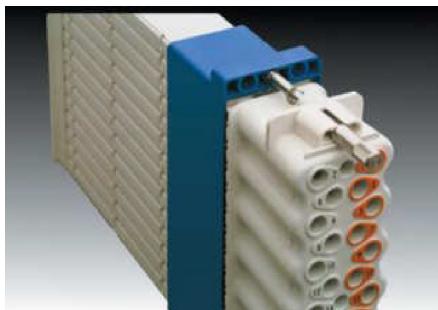


Figure 3  
Then, pull out the P992 until it stops in the stage 1 position (see figure 4)

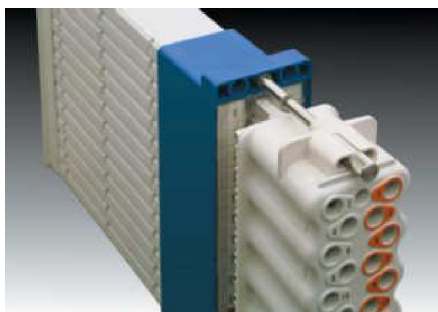


Figure 4

Care must be taken when removing the P992 from the P991 test block to avoid contact bounce, which may be experienced during rapid withdrawal.

When the P992 is not in use, it should be stored in its protective case to maintain the test plug in a serviceable condition.

## Single-finger Test Plug

It is safe to insert the single-finger test plug into a test block with or without a voltmeter connected to it.

The single-finger test plug should be used in conjunction with a high impedance voltmeter ( $> 1 \text{ MOhm}$ ).

Only one single-finger test plug should be used within any one group of CTs at any one time.

There are two ranges of current measurement on the single-finger test plug. Each range has a scaling factor as detailed in Table 1.

P993 Setting	Range (A)	Scaling factor for 2 V range*
1	0-2	1 V = 1 A
2	2-20	1 V = 10 A

Table 1: Single-finger test plug ranges

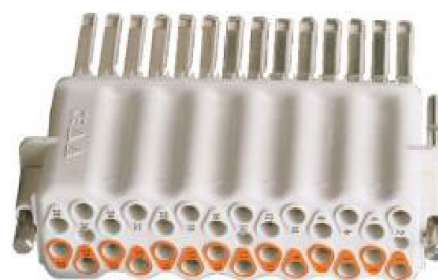


Figure 5 P994 isolation plug inserted into P991 test block

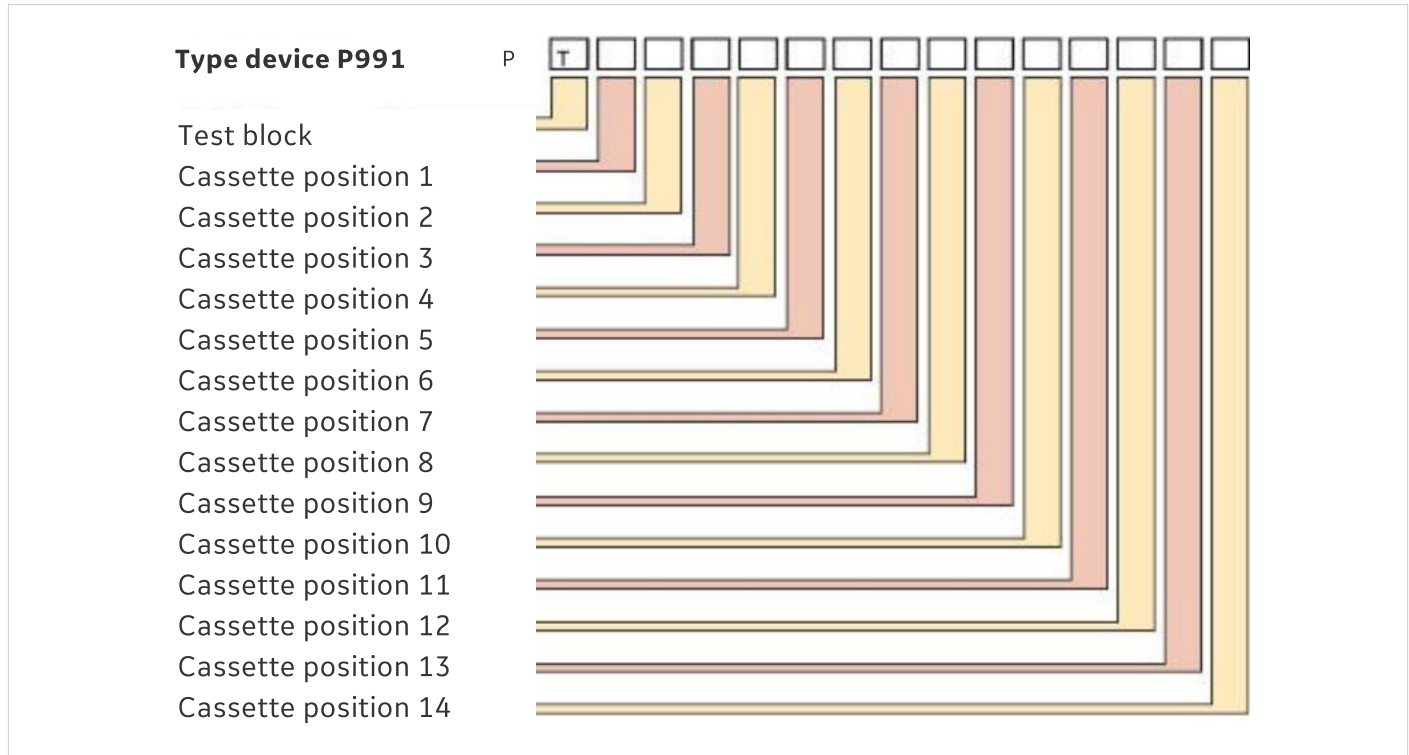
**Note:** When performing current measurements using the single-finger test plug the output should not exceed 2 V as the accuracy will be adversely affected. If necessary, change to the higher test plug setting. Care must be taken when removing the P993 from the P991 test block to avoid contact bounce, which may be experienced during rapid withdrawal. When the P993 is not in use, it should be stored in its protective case to maintain the test plug in a serviceable condition.



The single-finger test plug must only be inserted in CT cassettes to avoid both maloperations and personal safety hazards.



## Information Required with Order



### Cassette Types

Cassette type numbers used for ordering (these are used in the P991 test block number):

Ref. No.

0: Blank cassette

1: Stage I cassette

2: Stage II cassette

3: Stage III cassette

4: Monitoring cassette

8: CT cassette with shorting bar to next cassette below

9: This is the last CT cassette in a CT group

The minimum number of cassettes in any CT group is 2.

### Multi-finger Test Plug

Model number P992C

### Single-finger Test Plug

Model number P993C

### Isolation plug

Model number P994A

### P991 Test Block Cover

To achieve IP52 dust/water protection the cover must be fitted.

## Disposal and Recycling

### Disposal

It is recommended that incineration or disposal in watercourses be avoided. The product should be disposed of in a safe manner according to the regulations in the country of operation.

### Recycling

For recycling purposes, the plastic parts should be separated according to the plastic identity information on each moulding.



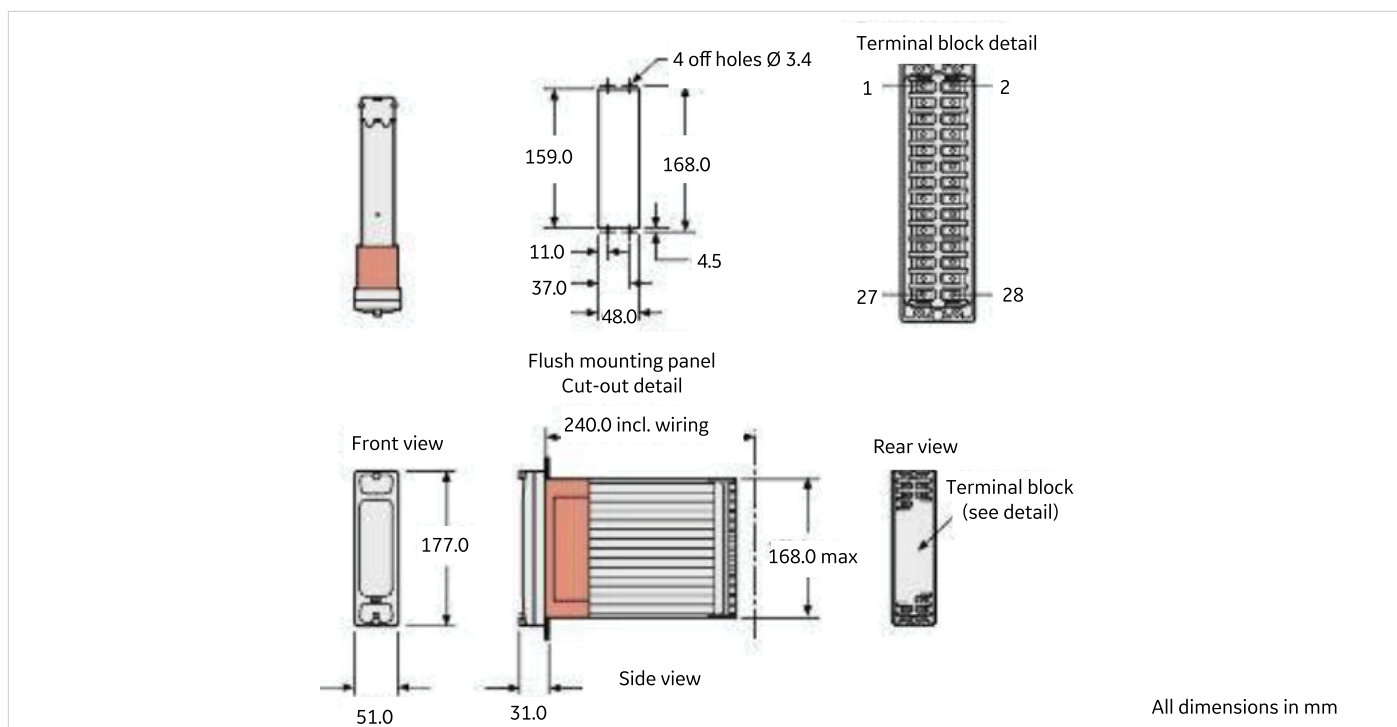


Figure 6 Mounting Details

## Technical Data Summary

### Test Block and Multi-finger Test Plug

#### Test Block Circuit Withstands

- 20 A continuous (UL 5 A nominal)
- 150 A for 10 s
- 500 A for 1 s

#### Multi-finger Test Plug Circuit Withstands

- 20 A continuous (UL 5A nominal)
- 50 A for 10 s
- 100 A for 3 s
- 150 A for 1 s

#### Maximum Working Voltages

- 300 Vac rms or dc relative to earth/neutral (UL 250 Vac rms or dc)
- 600 Vac rms or dc between any adjacent cassettes

### Single-Finger Test Plug

#### Accuracy

- Setting range 0 A to 2 A: 1m A rms to 2 A rms,  $\pm 5\%$  of reading
- Setting range 2 A to 20 A: 2 A rms to 20 A rms,  $\pm 5\%$  of reading

#### Burden

- Less than 10 m on both setting ranges

### Current Withstands

- 20 A continuous (UL 5 A nominal)
- 150 A for 10 s
- 500 A for 1 s

### Isolation Plug

#### Maximum working voltages

- 300 Vac rms or dc

### Test Block and Test Plugs

#### EMC Compliance

2014/30/EU



This product has been classified as electromagnetically benign and is therefore excluded from the European Community EMC Directive 2014/30/EU.

#### Product Safety

2014/35/EU



Compliance with the European Community Low Voltage Directive 2014/35/EU is demonstrated by reference to general safety standards: EN 60255-5: 2001.

Relevant clauses of  
EN 61010-1: 2001  
EN 60950-1: 2001

These products are listed under UL file number E155724

### Temperature

Test Block and Test Plugs  
IEC 60255-6: 1988  
IEC 60068-2-1: 2007

Cold operation IEC60068-2-2: 2007

Dry heat operation and storage.

Storage and transit:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ;

Operation:  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ .

### Humidity

IEC60068-2-78: 2013  
Damp heat steady state, 56 days at  $40^{\circ}\text{C}$  and 93% relative humidity.

Cyclic temperature with humidity  
IEC 60068-2-30: 1980 Cyclic temperature with humidity, six (12+12 hour) cycles,  $+25^{\circ}\text{C}$  ( $\geq 95\%$  relative humidity) to  $+55^{\circ}\text{C}$  ( $93\% \pm 3\%$  relative humidity).

## Rear Terminal Recommendations

CHARACTERISTICS		
Size	M4 coarse thread X 7 mm long	
Material	Steel or brass	
Plating	Nickel or passivated zinc	
Tightening torque	1.5 Nm nominal/2 Nm maximum	
Type M4 ring	90°	Straight
Supplier	JST	JST/AMP
Terminal connector combinations	2 1 0	0 1 1
Pre-insulated connectors (red)	Wire range 0.25 - 1.65 mm <sup>2</sup>	
Pre-insulated connectors (blue)	Wire range 1.04 - 2.63 mm <sup>2</sup>	
Post insulated (sleeved) connectors	Wire range 2.64 - 6.64 mm <sup>2</sup>	

UL recognised wire and crimps must be used to maintain any UL approval.

CASE MOUNTING SCREWS	
Size/Material	M4 sems steel thread forming 12 mm long (could use steel or brass M4 screws into pre-tapped holes).
Plating	Nickel or passivated zinc
Tightening torque	1.5 Nm nominal/2 Nm maximum

## Additional Information

Full technical specifications, cassette operation descriptions and application examples can be found in the P990 technical data sheet document P99x/EN TDS.

DEVICE TRACK RECORD
MMLG test blocks deployed worldwide - Over 500,000 units delivered since first introduced in 1983.
Over 70,000 MMLB delivered since first introduced in 1983.
P991 Test blocks introduced in 2002, with more than 40,000 units delivered.
P992 Test plugs introduced in 2002, with more than 6,000 units delivered.
P993 Test plugs introduced in 2002, with more than 1,300 units delivered.

**Note:** The test plugs are intended only for temporary use and should not be left inserted in the test block whilst unattended

For more information, visit  
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