



An extensive range of 48, 72, 96 and 144mm DIN style panel meters offering measurement of all electrical and electronic parameters. Meters are shock resistant and vibration proof and supplied with terminal covers. A selection of slide in dials and customised options are available.

## Movements

In Crompton Instruments' world-patented 'Hi-Q' taut band suspension, all the delicate parts of the traditional instruments are eliminated. There are no pivots, no jewel bearings, no hair-springs and no air damping vane. Instead, a tough platinum ribbon suspends the moving element between front and rear tension springs. Specially contoured pads are fitted to the ends of the spindle, and the working gap at each end is filled with a high quality silicon fluid. The pads, together with the fluid reservoir, form a system which acts as a resilient built-in shock absorber. This provides both rotational and longitudinal damping as the moving element floats on oil with no bearing friction and is effectively cushioned against shock and vibration. 360° Synchrosopes and power factor meters have robust pivot and jewel bearings with oil damping.

## Dials, Scales and Pointers

Standard dials are matt white with black printed scales and bar knife-edge pointers. Black dials with white or yellow scales and pointers are also available. Interchangeable slide in dials are used on models 242, 243 and 244 90° moving iron, moving coil and frequency meters.

General options include red supplementary pointers, red indexes (quadrant scales), red, green or blue lines, bands or segments, finely spaced divisions, multi-scales, special scales and captions to customer' requirements.

## Illumination

Internal illumination is available in the following models:

- 244 and 246 shortscale moving coil and moving iron vane.
- 243, 244 and 246 longscale moving coil and moving iron vane.

Through dial (Translucent) illumination on 244 and 246 models.

Edge illumination on 243, 244 and 246 models.

Replaceable 6, 12 or 24V lamps are used on all models except 243 longscale meters, where the lamps are internal.

## Specification

|                         |                                                                                                                       |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Performance             | BSEN60051                                                                                                             |
| Measuring Ranges        | DIN 43701                                                                                                             |
| Accuracy Overload       | BSEN60051                                                                                                             |
| Dimensions              | DIN 43700                                                                                                             |
| Scale Marking Generally | DIN43802                                                                                                              |
| Magnetic Influence      | BSEN60051                                                                                                             |
| Safety                  | IEC414                                                                                                                |
| Terminals               | Clamp strap M4 up to 25A. Clamp strap M8 over 25A                                                                     |
| Humidity Range          | Up to 95% RH (non condensing)                                                                                         |
| Test Voltage @50Hz      | 2kV RMS for 1 minute                                                                                                  |
| Overload AC Current     | x 1.2 continuous x 10 for 5 seconds                                                                                   |
| Overload AC Voltage     | x 1.2 continuous x 2 for 5 seconds                                                                                    |
| Frequency               | See main pages for other instruments                                                                                  |
| Damping Time            | Less than 3 seconds is standard. More heavily damped movements are available on request.                              |
| Standard Calibration    | 23°C                                                                                                                  |
| Operating Temperature   | -20°C to +60°C                                                                                                        |
| Enclosure Code          | IP54 as standard (to BSEN60529). IP55 consult factory<br>Terminals IP20B with terminal cover or terminal boots fitted |
| Case                    | Grade UL94V0                                                                                                          |
| Base                    | Grade UL94V1                                                                                                          |

## Features

An extensive range of specialist measuring meters in 4 case sizes

Shock resistant taut band suspension

Vibration-proof Hi-Q damping

Slide in dials for 90°current, voltage and frequency on models 242, 243 and 244

Terminal covers supplied as standard

## Benefits

Low cost

Local indication

Ease of installation

Minimal training

Low maintenance

Customised options and features

## Applications

Switchgear

Distribution systems

Generator sets

Control panels

Energy management

Building management

Utility power monitoring

Process control

Motor control

## Approvals

LRS and BV Approvals.

## DIN 16257 symbol meaning for calibration position



Inclination of dial surface to the horizontal e.g 60°.  
Required orientation must always be stated when ordering if other than vertical mounting is required.

## Specification Continued

|                   |                                                                                                                                                                                                                                                                                 |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Case              | Dimensions and panel cutout conform to IEC473, DIN 43700. Models 242, 243 and 244 have cases and bezels injection moulded in flame retardant engineering thermoplastic, recognised by Underwriters Laboratory materials specification. All 246 models have pressed steel cases. |
| Bezel             | Slim-line DIN43802 black as standard                                                                                                                                                                                                                                            |
| Bezel Window      | Standard sheet glass, with zero adjusters where appropriate. Non reflecting glass or polycarbonate shatterproof windows are available.                                                                                                                                          |
| Installation      | Installations in switchboard panel or mosaic arrangement on equipment or machine with a panel thickness of up to 40mm in a horizontal or vertical plane. Installation Category III                                                                                              |
| Fixing on Panel   | Models 242, 243 and 244 – 2 corner fixing clamps and tensioning thumb screws<br>Model 242 – available with a one piece 'push on' clamp.<br>Model 246 – 2 side fixing spring clips                                                                                               |
| Mounting Position | Normal vertical mounting or as indicated on the scale in accordance with DIN 16257. A deviation of $\pm 15^\circ$ is permissible                                                                                                                                                |
| Approvals         | Lloyds Shipping (LRS), Bureau Veritas (BV), EMC and LVD                                                                                                                                                                                                                         |

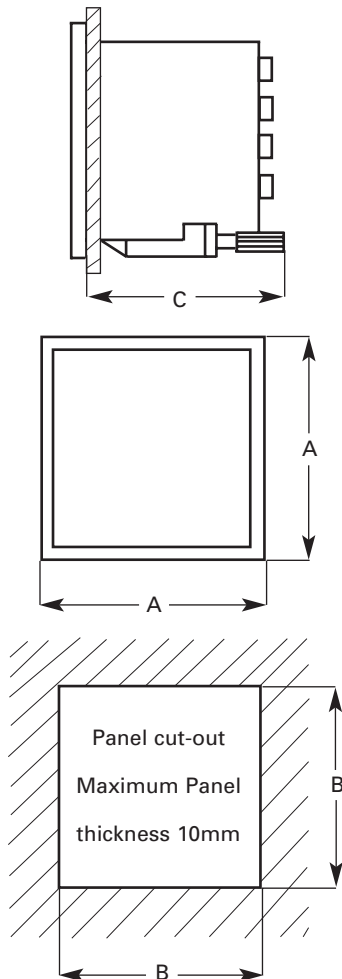
## Dimensions

| Model                                    | 242     | 243     | 244     | 246       |
|------------------------------------------|---------|---------|---------|-----------|
| Bezel 'A'                                | 48 x 48 | 72 x 72 | 96 x 96 | 144 x 144 |
| Panel cut-out 'B'                        | 45 x 45 | 68 x 68 | 92 x 92 | 138 x 138 |
| Scale Length: 90°                        | 42      | 65      | 94      | 145       |
| Scale Length: 240°                       | 72      | 112     | 150     | 230       |
| <b>Maximum overall depth 'C':</b>        |         |         |         |           |
| Ammeters and Voltmeters A.C. & D.C.*     | 64      | 64      | 64      | 60        |
| Ammeters and Voltmeters with switch*     | –       | –       | 64      | –         |
| Dual Meters*                             | –       | –       | 64      | –         |
| Elapsed Time Meter/Hours Run*            | 64      | 64      | 64      | –         |
| Maximum Demand Indicator*                | –       | 64      | 64      | 60        |
| Combined MDI & MI Indicator*             | –       | –       | 64      | 60        |
| Maximum Demand Indicator with relay*     | –       | –       | 90      | –         |
| Frequency Meter 90°*                     | 64      | 64      | 64      | 60        |
| Frequency Meter 240°*                    | §       | §       | 120     | 125       |
| Phase Angle, Power Factor Meter 90°*     | §       | §       | 107     | §         |
| 240°*                                    | §       | §       | 107     | §         |
| M.C. Indicator with separate transducer* | 64      | 64      | 64      | 60        |
| Dynamometer 360° Synchroscope*           | –       | –       | 120     | 125       |
| Dynamometer 360° Power Factor Meter*     | –       | –       | 120     | –         |
| Phase Sequence Indicator*                | –       | 64      | 64      | –         |
| Position Indicator*                      | §       | §       | 120     | 125       |
| Speed Indicator*                         | 64      | 64      | 64      | 60        |
| Temperature Indicators*                  | –       | –       | 120     | 125       |
| Quadra Meters*                           | –       | –       | 64      | –         |
| Impulse Counters*                        | 64      | 64      | 64      | –         |
| Wattmeter, Varmeter 90°                  | §       | §       | 107     | 125       |
| Wattmeter, Varmeter 240°                 | §       | §       | 107     | 125       |
| Model 244-21Y & 244-21Z                  | –       | –       | 142     | –         |
| LED Synchroscope & Synchro Check Relay   | –       | –       | 80      | –         |
| LED 360° Synchroscope                    | –       | –       | 80      | –         |

§ Indicator Only

\* If separate terminal cover is used add 20 mm to dimension C

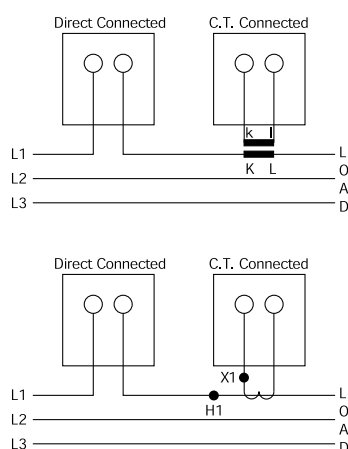
– Not available



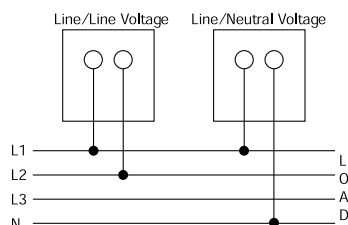


## Connections

### A.C. Ammeter



### A.C. Voltmeter



## Moving Iron A.C. Ammeters and Voltmeters

Designed to measure A.C. current or voltage, these meters indicate true r.m.s. values and are substantially independent of system waveform. Scales are calibrated down to 20%, and ammeters can have overload scales x2, x3, x5 or x6 for motor start duty. Ammeters can be supplied for use with  $\pm 1A$  or  $\pm 5A$  current transformers, whilst voltmeters can be scaled for use with voltage transformers. Heavy damping is available as an option. Meters can be used to measure D.C. at reduced accuracy.

### Specification – Short Scale

|                 |                                                                                                                                                                            |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accuracy:       | Class 1.5                                                                                                                                                                  |
| Frequency:      | 50 or 60Hz, (400Hz on request)                                                                                                                                             |
| Burden at 50Hz: | Ammeters: 0.5VA<br>Voltsmeters: Up to 4.5VA maximum                                                                                                                        |
| Ratings:        | Ammeters: 0.5A to 100A A.C. direct connected (40A for 242-75A and 246-07A). Maximum system voltage 720V A.C. Low load / high middle maximum 10A<br>Voltsmeters: 6V to 600V |

### Product Codes – Short Scale

|                      |         |         |         |         |
|----------------------|---------|---------|---------|---------|
| Bezel Size mm        | 48      | 72      | 96      | 144     |
| Scale length mm      | 42      | 65      | 94      | 145     |
| <b>Product Codes</b> |         |         |         |         |
| A.C. ammeter         | 242-75A | 243-02A | 244-02A | 246-07A |
| x2 overload ammeter  | 242-752 | 243-022 | 244-022 | 246-072 |
| x3 overload ammeter  | 242-753 | 243-023 | 244-023 | 246-073 |
| x5 overload ammeter  | 242-755 | 243-025 | 244-025 | 246-075 |
| x6 overload ammeter  | 242-756 | 243-026 | 244-026 | 246-076 |
| Low load ammeter     | –       | 243-02H | 244-02H | –       |
| A.C. voltmeter       | 242-75V | 243-02V | 244-02V | 246-07V |
| Low middle voltmeter | –       | 243-02M | 244-02M | –       |

### Specification – Long Scale

|                 |                                                                                                                                                      |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accuracy:       | Class 1.5                                                                                                                                            |
| Frequency:      | 50 or 60Hz, (400Hz on request)                                                                                                                       |
| Burden at 50Hz: | Ammeters: 1.5VA<br>Voltsmeters: 4.5VA maximum                                                                                                        |
| Ratings:        | Ammeters: 0.5A to 25A A.C. direct connected<br>Maximum system voltage 720V A.C. Low load / high middle (maximum 10A)<br>Voltsmeters: 6V to 600V A.C. |

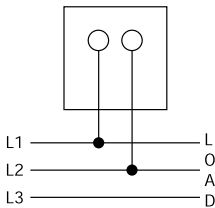
### Product Codes – Long Scale

|                      |         |         |         |         |
|----------------------|---------|---------|---------|---------|
| Bezel Size mm        | 48      | 72      | 96      | 144     |
| Scale length mm      | 72      | 112     | 150     | 230     |
| <b>Product Codes</b> |         |         |         |         |
| Ammeter              | 242-03A | 243-03A | 244-03A | 246-03A |
| x2 overload ammeters | 242-032 | 243-032 | 244-032 | 246-032 |
| x3 overload ammeters | 242-033 | 243-033 | 244-033 | 246-034 |
| x5 overload ammeters | 242-035 | 243-035 | 244-035 | 246-035 |
| x6 overload ammeters | 242-036 | 243-036 | 244-036 | 246-036 |
| Low load ammeters    | –       | 243-03H | 244-03H | –       |
| Voltmeter            | 242-03V | 243-03V | 244-03V | 246-03V |

# 240 Series DIN Panel Meters



### Connections



### Frequency Meters

These Frequency meters use an integral electronic converter and a moving coil indicator. This meter is easy to read with an accuracy Class 0.5.

### Specification

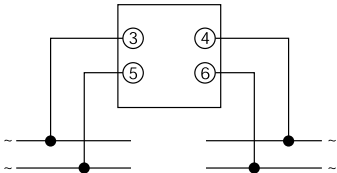
|                 |                                                                                                                                                                                      |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accuracy:       | Class 0.5                                                                                                                                                                            |
| Ratings:        | 100V-125V A.C.<br>200V-250V A.C.<br>380V-440V A.C.*<br>500V A.C.*<br>*For voltages above 380V use 242-013 with a 253-THZ, in place of 242-41S<br>Models available for use with V.T.s |
| Frequency 0.5%: | 45/55Hz,<br>55/65Hz,<br>45/65Hz,<br>360/440Hz<br>Other scalings available on request                                                                                                 |
| Burden:         | 4VA Maximum                                                                                                                                                                          |

### Product Code

|                 |         |                     |                     |         |         |         |         |         |
|-----------------|---------|---------------------|---------------------|---------|---------|---------|---------|---------|
| Bezel Size mm   | 48      | 48                  | 72                  | 72      | 96      | 96      | 144     | 144     |
| Scale length mm | 42      | 72                  | 65                  | 112     | 94      | 145     |         |         |
| Product Code    | 242-41S | 242-053<br>+253-THZ | 243-41S<br>+253-THZ | 243-053 | 244-41S | 244-41L | 246-41S | 246-41L |



### Connections



### Dual Frequency Meters

Two instruments in one case can be used to measure a wide range of frequencies. These dual instruments save both panel space and assembly time. The 244-41D is an ideal component in synchronising applications.

### Specification

|                 |                                                                                                        |
|-----------------|--------------------------------------------------------------------------------------------------------|
| Accuracy:       | Class 0.5                                                                                              |
| Ratings:        | 100V-125V A.C.<br>200V-250V A.C.<br>380V-440V A.C.<br>500V A.C.<br>Models available for use with V.T.s |
| Frequency 0.5%: | 45/55Hz,<br>55/65Hz,<br>45/65Hz,<br>360/440Hz                                                          |
| Burden:         | 4VA Maximum                                                                                            |

### Product Code

|                 |         |
|-----------------|---------|
| Bezel Size mm   | 96      |
| Scale length mm | 65      |
| Product Code    | 244-41D |



## Moving Coil D.C. Ammeters and Voltmeters

Moving Coil Meters are suitable for all D.C. systems. The linear scale is calibrated down to zero and the accuracy maintained down to 10%. High currents are measured with separate shunts and suitably scaled indicators. Suppressed, centre and offset zero models are available.

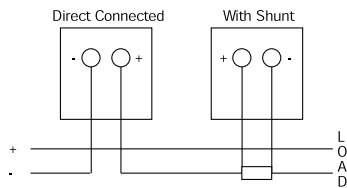
### Specification

|            |                                                                                                                                                                                                                   |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accuracy:  | Class 1.5                                                                                                                                                                                                         |
| Ratings:   | Ammeters: 100 $\mu$ A to 25A, (200 $\mu$ A for 05 model)<br>4/20mA suppressed zero<br>40A for model 243/244-01A<br>Voltmeters: 50mV to 600V<br>1/5V suppressed zero<br>50, 60, 75, 100, 150mV for use with shunts |
| Impedance: | Ammeters: 75mV internal shunt above 60mA<br>Voltmeters: 1000 $\Omega$ /V above 1V                                                                                                                                 |

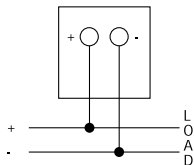
Further details on our T-Sheet T118 available on request.

### Connections

#### D.C. Ammeter



#### D.C. Voltmeter



### Product Codes – Short Scale

|                            |         |         |         |         |
|----------------------------|---------|---------|---------|---------|
| Bezel Size mm              | 48      | 72      | 96      | 144     |
| Scale length mm            | 42      | 65      | 94      | 145     |
| <b>Product Codes</b>       |         |         |         |         |
| Ammeters                   | 242-89A | 243-01A | 244-01A | 246-10A |
| Ammeters suppressed zero   | 242-89R | 243-01R | 244-01R | 246-10R |
| Voltmeters                 | 242-89V | 243-01V | 244-01V | 246-10V |
| Voltmeters suppressed zero | 242-89S | 243-01S | 244-01S | 246-10S |

### Product Codes – Long Scale

|                            |         |         |         |         |
|----------------------------|---------|---------|---------|---------|
| Bezel Size mm              | 48      | 72      | 96      | 144     |
| Scale length mm            | 72      | 112     | 150     | 230     |
| <b>Product Codes</b>       |         |         |         |         |
| Ammeter                    | 242-05A | 243-05A | 244-05A | 246-05A |
| Ammeters suppressed zero   | 242-05R | 243-05R | 244-05R | 246-05R |
| Voltmeters                 | 242-05V | 243-05V | 244-05V | 246-05V |
| Voltmeters suppressed zero | 242-05S | 243-05S | 244-05S | 246-05S |



## Moving Coil Dual D.C. Ammeters and Voltmeters

Dual instruments can be used to measure a wide range of currents and voltages, and save both space and time by requiring only one panel cut-out.

The 244-80M allows for independent measurement of two D.C. currents in one case. The 244-80E allows for independent measurement of two D.C. voltages in one case.

### Specification

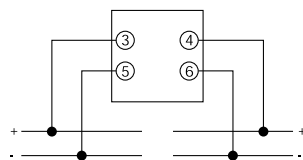
|           |                                                                                                                                                                                |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accuracy: | Class 1.5                                                                                                                                                                      |
| Ratings:  | D.C. Current: 100 $\mu$ A to 25A direct connected<br>4/20mA suppressed zero.<br>D.C. Volts: 50mV to 600V<br>1/5 volt suppressed zero<br>50, 60, 75, 150mV for use with shunts. |

### Product Codes

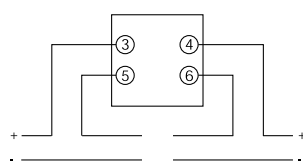
|                     |         |
|---------------------|---------|
| Bezel Size mm       | 96      |
| Scale length mm     | 94      |
| <b>Product Code</b> |         |
| Ammeters            | 244-80M |
| Voltmeters          | 244-80E |

### Connections

#### Dual D.C. Ammeter



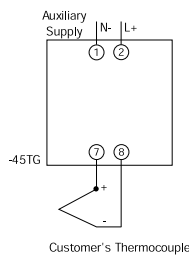
#### Dual D.C. Voltmeter



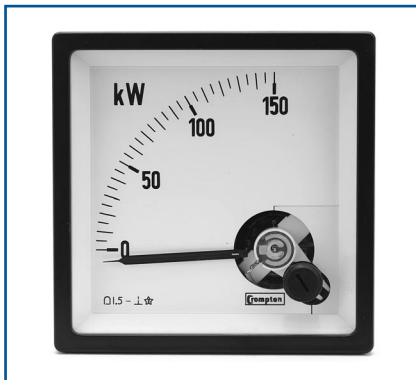
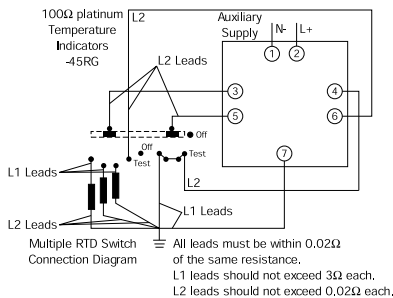


## Connections

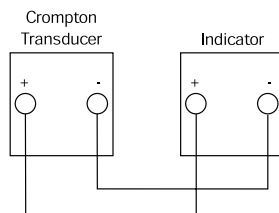
### Thermocouple Indicators -45TG



### RTD Indicators -45RG



## Connections



## Temperature Indicators

Longscale Indicators to read temperature values, usually remotely with RTD or thermocouple sensors supplied by the customer. RTD (Resistance Temperature Detector) indicators measure the change in resistance of the sensor. A 2 or 3 wire system may be used. Thermocouple indicators accept standard millivolt input signals. Cold junction compensation is provided and thermocouple break indication is incorporated.

## Specification

|                   |                                                                                                                                                                                                                                               |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accuracy:         | Class 1.5 - Indicator only. RTD indicator suitable for 10Ω copper 100Ω platinum, 100 & 120Ω nickel sensors Power in RTD is 100μW approximately. Thermocouple indicator suitable for J (0-700°C), K (0-1200°C) 50Ω maximum Circuit Resistance. |
| Auxiliary Supply: | Model 45R: from 63.5V to 480V A.C. at 50/60Hz<br>Model 45T: 110, 115, 220, 240, 380, 400, 480V A.C. and 12, 24, 48, 110, 125V D.C.                                                                                                            |
| Burden:           | -45R 2VA, -45T 3VA                                                                                                                                                                                                                            |

## Product Codes

|                      |         |         |
|----------------------|---------|---------|
| Bezel Size mm        | 96      | 144     |
| Scale length mm      | 150     | 230     |
| <b>Product Codes</b> |         |         |
| RTD                  | 244-45R | 246-45R |
| Thermocouple         | 244-45T | 246-45T |

## Process Indicators

Used to check process functions locally or remotely at centralised controls. These moving coil instruments offer a wide variety of electrical and mechanical readouts operated by transducer, tachogenerator, thermocouple, resistance bulb or other D.C. analogue signals. Suppressed, centre and offset zero models are available on request.

## Specification

|           |                                             |
|-----------|---------------------------------------------|
| Accuracy: | Class 1.5                                   |
| Ratings:  | 1, 2, 5, 10 & 20mA. 4/20mA suppressed zero. |
| Burden:   | See our technical data sheet T118.          |

## Product Codes – Short Scale Models

|                      |         |         |         |         |
|----------------------|---------|---------|---------|---------|
| Bezel Size mm        | 48      | 72      | 96      | 144     |
| Scale length mm      | 42      | 65      | 94      | 145     |
| <b>Product Codes</b> |         |         |         |         |
| A.C. Current         | 242-89A | 243-01A | 244-01A | 246-10A |
| A.C. Voltage         | 242-89V | 243-01V | 244-01V | 246-10V |
| Speed                | 242-892 | 243-012 | 244-012 | 246-102 |
| Frequency            | 242-893 | 243-013 | 244-013 | 246-103 |
| Phase Angle          | 242-894 | 243-014 | 244-014 | 246-104 |
| Watts                | 242-895 | 243-015 | 244-015 | 246-105 |
| VArs                 | 242-896 | 243-016 | 244-016 | 246-106 |
| VA                   | 242-897 | 243-017 | 244-017 | 246-107 |

## Product Codes – Long Scale Models

|                      |         |         |         |         |
|----------------------|---------|---------|---------|---------|
| Bezel Size mm        | 48      | 72      | 96      | 144     |
| Scale length mm      | 72      | 112     | 150     | 230     |
| <b>Product Codes</b> |         |         |         |         |
| A.C. Current         | 242-05A | 243-05A | 244-05A | 246-05A |
| A.C. Voltage         | 242-05V | 243-05V | 244-05V | 246-05V |
| Speed                | 242-052 | 243-052 | 244-052 | 246-052 |
| Frequency            | 242-053 | 243-053 | 244-053 | 246-053 |
| Phase Angle          | 242-054 | 243-054 | 244-054 | 246-054 |
| Watts                | 242-055 | 243-055 | 244-055 | 246-055 |
| VArs                 | 242-056 | 243-056 | 244-056 | 246-056 |
| VA                   | 242-057 | 243-057 | 244-057 | 246-057 |

# Catalogue Numbering System

## Guide to Catalogue Numbering System – Example Code: 244 – 03AG – LSPK – C6 – ER

| 244                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | A                                                                                                                                                                                                                                        | G                                      | LS | PK | C6                                                                                             | ER |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|----|----|------------------------------------------------------------------------------------------------|----|
| <b>SERIES</b><br>016 – Fiesta<br>075 – Short-case switchboard<br>077 – Standard switchboard<br>078 – Hi-shock sealed<br>079 – 8¾" switchboard<br>083 – 2" sealed<br>084 – 2½" sealed<br>242 – 48mm DIN<br>243 – 72mm DIN<br>244 – 96m DIN<br>246 – 144mm DIN<br>E242– 48mm short-scale<br>E243– 72mm short-scale<br>E244– 96mm short-scale                                                                                                                                                                                                                                                                                                                                                         | <b>TYPE / FUNCTION</b><br>A – Amperes DC<br>B – Rectified amperes<br>C – Center zero amps<br>D – Zero offset current<br>F – Amperes AC<br>G – Volts AC<br>H – High middle<br>K – DC input non electrical scaling<br>L – VAr self contained<br>N – Center zero voltage<br>P – Zero offset voltage<br>R – Live zero current<br>S – Live zero voltage<br>V – Volts DC<br>W – Rectified voltage<br>Y – Expanded scale AC<br>Z – Expanded scale DC<br>2 – 2 x overload ammeters<br>3 – 3 x overload ammeters<br>5 – 1-phase 2-wire watts<br>6 – 6 x overload ammeters<br>8 – 3-phase 3-wire watts<br>9 – 3-phase 4-wire watts | <b>INPUT OR MOVEMENT RATING</b><br>LA – 1A<br>LS – 5A<br>PZ – 150V<br>RX – 300V<br>SJ – 600V<br>PN – 120V<br>RP – 240V<br>SE – 480V<br>QQ – 120V 5A<br>QS – 240V 5A<br>QT – 480V 5A etc                                                  | <b>OPTIONS</b><br>Indicate as required |    |    |                                                                                                |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                          |                                        |    |    | <b>SYSTEM FREQUENCY</b><br>(AC Meters)<br>C4 – 400Hz<br>C5 – 50Hz<br>C6 – 60Hz<br>C7 – 50/60Hz |    |
| <b>MOVEMENT CODE</b><br>01 – Short-scale AC and DC<br>02 – Short-scale AC<br>03 – Long-scale AC and DC<br>05 – Long-scale AC and DC<br>07 – Edgewise AC DC<br>08 – Long-scale AC<br>10 – Edgewise AC and DC<br>11 – Long-scale DC<br>12 – Phase sequence meter<br>13 – 360 rotating iron PFI<br>14 – Synchroscope<br>15 – Elapsed time meter<br>16 – Thermal demand ammeter<br>21 – Wattmeter<br>30 – Meter relay<br>31 – VArmeter<br>41L – Frequency meter long-scale<br>41S – Frequency meter short-scale<br>42 – Power factor meter<br>45 – RTD temperature<br>92 – Shunts<br>94 – Current transformers<br>HW – Kilowatt hour class 1.0<br>KH – Kilowatt hours<br>KW – Kilowatt hours class 2.0 | <b>NATIONAL STANDARD</b><br>A – ANSI C39.1<br>B – BS 89<br>G – DIN<br>I – ANSI fixing captions<br>J – Japanese instrument Standard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>SCALING OR OUTPUT</b><br>BX – Volt free relay contacts<br>FA – 1mA<br>HG – 4/20mA<br>PK – 0/100<br>PZ – 0/150<br>RL – 0/200<br>RX – 0/300<br>SC – 0/400<br>SJ – 0/600<br>SS – 0/1000<br>TM – 0/2000<br>UB – 0/4000<br>UJ – 0/5000 etc |                                        |    |    |                                                                                                |    |

This guide is not inclusive of all catalogue numbers and should be used for reference only, as improper combinations can be achieved.

This guide is not inclusive of all catalogue numbers and should be used for reference only, as improper combinations can be achieved.

# Glossary

## Glossary of Terms

|                                      |                                                                                                                                                                      |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>MI</b>                            | Moving iron, also called 'iron vane' in the North American market for measuring AC amps and volts.                                                                   |
| <b>MC</b>                            | Moving coil for measuring DC amps and volts.                                                                                                                         |
| <b>Taut band suspension movement</b> | A meter movement held under tension, usually on a ligament.                                                                                                          |
| <b>Ligament</b>                      | The taut band.                                                                                                                                                       |
| <b>Pivot and jewel (P&amp;J)</b>     | A movement which rotates on a spindle, and pivots within an oil filled jewel. This type of movement typically offers excellent vibration resistance characteristics. |
| <b>Short-scale</b>                   | Angle of deflection for a movement is usually 90 degrees but ANSI is 100 degrees in some products.                                                                   |
| <b>Long-scale</b>                    | Angle of deflection for a movement is usually 240 degrees but is frequently referred to as 270 degree.                                                               |
| <b>FSD</b>                           | Full scale deflection.                                                                                                                                               |
| <b>ES</b>                            | End scale.                                                                                                                                                           |
| <b>Input</b>                         | Electrical value from which the measurement is derived to achieve the full scale deflection of the movement.                                                         |
| <b>Linear</b>                        | A term used to state that the input is constant, allowing for an even scaling.                                                                                       |
| <b>Non linear</b>                    | The opposite of linear, giving a scale shape which will cramp at some point on the dial. Usually inaccurate below 20% of the full-scale value.                       |
| <b>Logarithmic scaling</b>           | A log scale usually derived from a non linear DC output.                                                                                                             |
| <b>Scale</b>                         | The graphical representation of the value being measured.                                                                                                            |
| <b>Dual arc</b>                      | More than one set of figures on a dial plate.                                                                                                                        |
| <b>Dial plate/scale plate</b>        | Surface on which the dial is drawn.                                                                                                                                  |
| <b>Calibration chart</b>             | A chart matching input values to scale mark, mainly used for complicated scales.                                                                                     |
| <b>Enclosure rating</b>              | Usually expressed in the form of IP rating or as NEMA in America. This states the product, resistance to the ingress of moisture and dust.                           |
| <b>DIN</b>                           | European standard meter shape. It is based on multiples of 24mm, i.e. 48, 72, 96, 144 mm.                                                                            |
| <b>ANSI</b>                          | American National Instrument Standard.                                                                                                                               |
| <b>JIS</b>                           | Japanese Instrument Standard.                                                                                                                                        |
| <b>BS89</b>                          | Old British Standard usually refers to rectangular meter or "Fiesta" style products.                                                                                 |
| <b>Switchboard meter</b>             | General term for long-scale instruments.                                                                                                                             |
| <b>Panel meter</b>                   | General name for short-scale instruments.                                                                                                                            |
| <b>Analogue indicator</b>            | Generic term for instruments usually refers to a low accuracy meter. An indicator only.                                                                              |

## Analogue Instruments DIN Panel Meters

The product should be panel mounted using the mounting hardware supplied. Consideration should be given to the space behind the unit to allow for bends in the connecting cables. The terminals on the meter rear should be protected from liquids.

The unit must not be mounted where it can be subjected to direct sunlight, and vibration should be kept to a minimum. Connection wires must be sized to comply with local regulations and must be terminated on tags suitable for screw connection. The product has no internal fuse, therefore; external fuses must be used for safety protection under fault conditions.

### SAFETY INSTALLATION FOR COMPLIANCE TO SAFETY STANDARDS

#### WARNING

- During normal operation, voltages hazardous to life may be present at some of the terminals of this unit. Installation and servicing should be performed only by qualified, properly trained personnel' abiding by local regulations. Ensure all supplies are de-energised before attempting connection or other procedures.
- Terminals should not be user accessible after installation and external installation provisions must be sufficient to prevent hazards under fault conditions.
- Never open circuit the secondary winding of an energised current transformer.

### SAFETY STANDARDS

This product complies with:  
International standard: IEC1010-1  
For UK: BS EN 61010-1 (IEC1010-1)

#### Fusing and connections

This unit must be fitted with external fuses in voltage supply lines. Voltage input lines must be fused with a quick blow fuse 1A maximum. Choose fuses of a type and with a breaking capacity appropriate to the supply and in accordance with local regulations.

### SAFETY SPECIFICATION

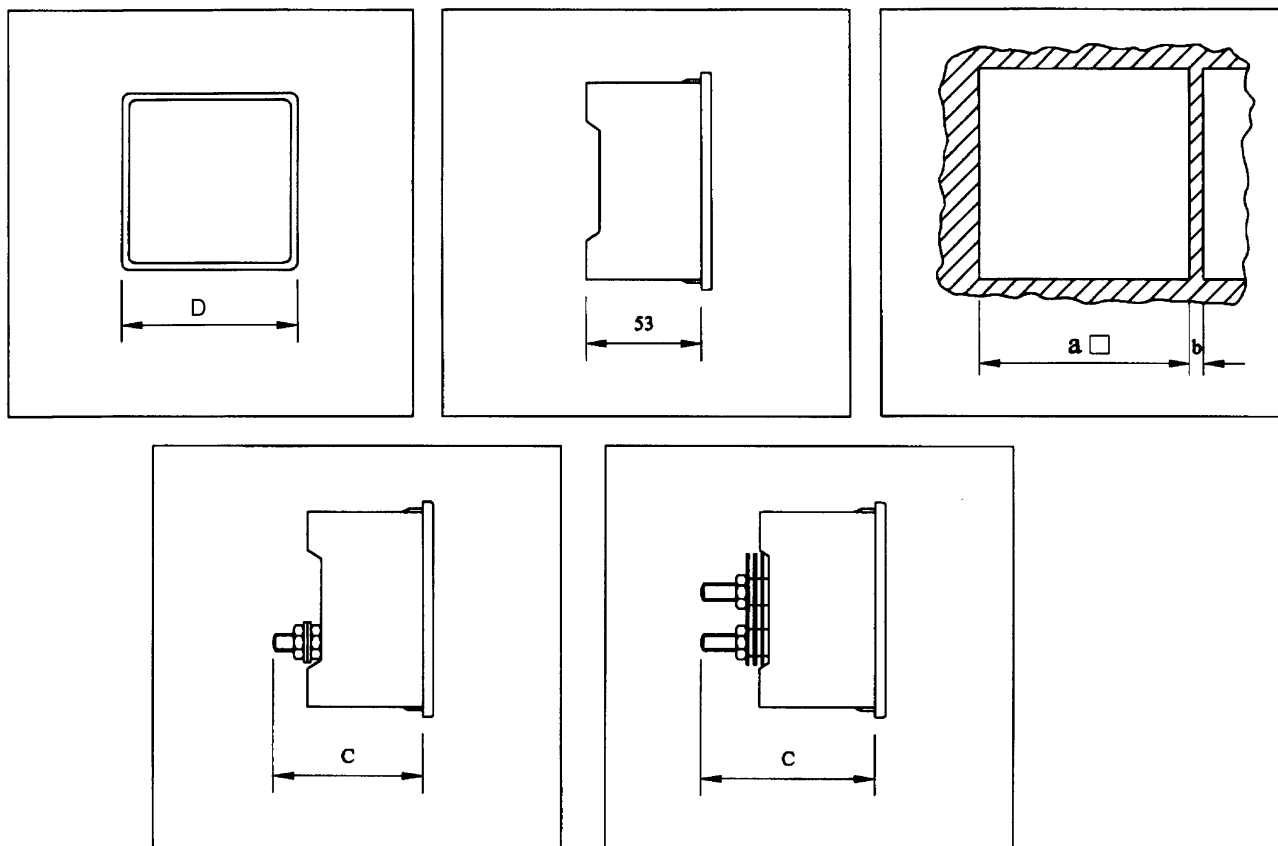
- Permanently connected use.
- Normal condition
- Basic insulation
- Installation category II
- Pollution degree 2
- This product is intended as part of a permanent installation.
- Low Voltage Directive BSEN 61010-1
- For use in altitudes up to 2000m
- Temperature 0-40 degree C Maximum relative humidity 80% for temperature up to 31° C decreasing linearly to 50% RH at 40°C
- Operating temperature to retained stated product accuracy 0-40°C

### Electromagnetic Compatibility

This unit has been designed to provide protection against EM (electro-magnetic) interference in line with requirements of EU and other regulations. Precautions necessary to provide proper operation of this and adjacent equipment will be installation dependent and so the following can only be general guidance:-

- Avoid routing wiring to this unit alongside cables and products that are, or could be, a source of interference.
- The auxiliary supply to the unit should not be subject to excessive interference. In some cases, a supply line filter may be required.
- To protect the product against incorrect operation or permanent damage, surge transients must be controlled. It is good EMC practice to suppress differential surges to 2kV or less at the source. The unit has been designed to automatically recover from typical transients, however in extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation.
- Screened communication and small signal leads are recommended and may be required. These and other connecting leads may require the fitting of RF suppression components, such as ferrite absorbers, line filters etc., if RF fields cause problems. It is good practice to install sensitive electronic instruments that are performing critical functions in EMC enclosures that protect against electrical interference causing a disturbance in function.

## INSTALLATION INSTRUCTIONS

Analogue Instruments  
DIN Panel Meters

For Moving Coil  
measuring range:  
6 A to 60A      C=67mm  
>60A            C=78 mm

For Moving Iron  
measuring range:  
0 to 30A      C=64mm  
>60A            C=67mm

| D         | A         | B |
|-----------|-----------|---|
| 48 x 48   | 45 x 45   | 4 |
| 72 x 72   | 68 x 68   | 4 |
| 96 x 96   | 92 x 92   | 4 |
| 144 x 144 | 135 x 135 | 4 |

The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product. However, Tyco Electronics has no control over the field conditions, which influence product installation. It is the user's responsibility to determine the suitability of the installation method in the user's field conditions. Tyco Electronics' only obligations are those in Tyco Electronics' standard Conditions of Sale for this product and in no case will Tyco Electronics be liable for any other incidental, indirect or consequential damages arising from the use or misuse of the products. Crompton is a trademark.



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Ref: IWYSNC – Rev 6 – Sept 02

## Products Covered

### Model Description

244-14A) Single Phase or 3 phase 3/4 Wire LED  
 077-14A) - synchroscope  
 244-14L) Single Phase or 3 phase 3/4 wire LED  
 077-14L) - Synchroscope and Synchro check relay  
 244-14G) 244-14L with voltage difference input range  
 244-14H 244-14D with voltage difference input range  
 244-14D) Single phase or 3-phase 3/4 wire LED  
 077-14D) - Synchroscope and Synchro check relay with deadbus

## Introduction

244 models may be mounted in a panel of any thickness up to a maximum of 12mm. Mounting is by two clamps and thumbscrews.

077 Models may be mounted in a panel thickness up to a maximum of 8mm (5/16"). Mounting is by 4 x 1/4 - 28 UNF studs and nuts.

For all models consideration should be given to the space required behind the units to allow for bends in the connecting cables. Additional protection to the panel may be obtained by the use of an optional gasket. The terminals at the rear of the case should be protected from liquids. Units should be mounted in a reasonably stable ambient temperature and in any event where the temperature is within the range 0-60 °C.

The unit should not be mounted where it is subjected to excessive direct sunlight; vibration should be kept to a minimum. Connection wires should be sized to comply to local regulations and should be terminated in tags suitable for the crew connections provided, labels are fixed to the units and carry full connection information and data including type number, input voltage, current, frequency and supply as appropriate. The products do not have internal fuses therefore external fuses **must** be used for safety protection under fault conditions.

## Fusing and connections

1. This unit must be fitted with external fuses in voltage supply lines.
2. Voltage input lines must be fused with a quick blow fuse 1A maximum.
3. Choose fuses of a type and with a breaking capacity appropriate to the supply and in accordance with local regulations.

## Warning

- During normal operation, voltages hazardous to life may be present at some of the terminals of this unit. Installation and servicing should be performed only by qualified, properly trained personnel' abiding by local regulations. Ensure all supplies are de-energised before attempting connection or other procedures.

## Analogue Instruments

### DIN Instruments 240 Series & ANSI

### Switchboard Meters 070 Series

### LED Synchroscope & Synchrocheck

### Relay with Dead Bus

- It is recommended adjustments be made with the supplies de-energised, but if this is not possible, then extreme caution should be exercised.
- Terminals should not be user accessible after installation and external installation provisions must be sufficient to prevent hazards under fault conditions.
- This unit is not intended to function as part of a system providing the sole means of fault protection - good engineering practice dictates that any critical function be protected by at least two independent and diverse means.

## Screw torque

Main terminal screws should be tightened to 1.35Nm or 1.0 ft/lbf only. Detachable terminal connector screws should be tightened to 0.9Nm or 0.7 ft/lbf only. Where fitted, terminal covers are held in place by miniature self tapping screws into plastic. These screws should be tightened by hand only, sufficiently to secure the terminal cover and prevent it vibrating.

## Electromagnetic Compatibility

This unit has been designed to provide protection against EM (electro-magnetic) interference in line with requirements of EU and other regulations. Precautions necessary to provide proper operation of this and adjacent equipment will be installation dependent and so the following can only be general guidance:-

- Avoid routing wiring to this unit alongside cables and products that are, or could be, a source of interference.
- The auxiliary supply to the unit should not be subject to excessive interference. In some cases, a supply line filter may be required.
- To protect the product against incorrect operation or permanent damage, surge transients must be controlled. It is good EMC practice to suppress differential surges to 2kV or less at the source. The unit has been designed to automatically recover from typical transients, however in extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation.
- Screened communication and small signal leads are recommended and may be required. These and other connecting leads may require the fitting of RF suppression components, such as ferrite absorbers, line filters etc., if RF fields cause problems.

It is good practice to install sensitive electronic instruments that are performing critical functions in EMC enclosures that protect against electrical interference causing a disturbance in function.

### Setting Up and Maintenance

Units are adjusted before despatch and therefore no adjustments are required. Unless a fault develops, the unit requires little attention. During routine servicing and inspection of the associated equipment, the unit should be inspected to normal standards for this class of equipment. For example remove accumulations of dust and check all connections for tightness and corrosion. In the event of a repair being necessary, it is recommended that the unit be returned to the factory or to the nearest Crompton Instruments Service Centre, (details on page 2). Should repair be attempted then replacement components must be of the same type, rating and tolerance as those used in the original circuit. It is important that should calibration be deemed necessary, say after repair, then this should only be attempted if the required high accuracy equipment is available. With any enquiry please quote the full model number found on the side of the label. The unit must be recalibrated after repair.

### The operation as a Synchroscope

The 244-14A and 077-14A synchroscopes provide illuminated indication of the actual phase difference between the generator GEN voltages and the busbar voltage. If the LED display rotates clockwise the generator frequency is too high and must be reduced and visa versa if the LED display turns anticlockwise.

### The operation as synchrocheck relay

The 244-14L/G and 077-14L synchroscopes are based on a microcontroller, which interprets the input signals and displays the phase and voltage information on a series of light emitting diodes (LED's).

Twenty four red LED's are arranged in a ring simulating the traditional 360° analogue movement. Only one LED is lit at any one time indicating the phase difference between the busbar (BUS) and generator (GEN) signals. The unit will operate correctly at any frequency within its range. The voltage levels of the two input signals are continuously measured and compared with the user adjustable voltage difference setting. If the measured difference is outside the allowable range, the ring of LED's will be extinguished and the red GEN LED will be lit. If the voltage difference is within range the green GEN LED will be lit and the ring of LED's will indicate the phase relationship.

Once the BUS and GEN signals become coincident, the unit will wait for an adjustable time delay before lighting the green triangular SYNCHRONISED LEDS and operating the relay. The ring of LED is also extinguished which means the user will only see green LED's when the generator GEN is synchronised with the BUS.

The rear pot adjustments should be set to suit operational requirements.

## INSTALLATION INSTRUCTIONS

### Analogue Instruments

### DIN Instruments 240 Series & ANSI

### Switchboard Meters 070 Series

### LED Synchroscope & Synchrocheck

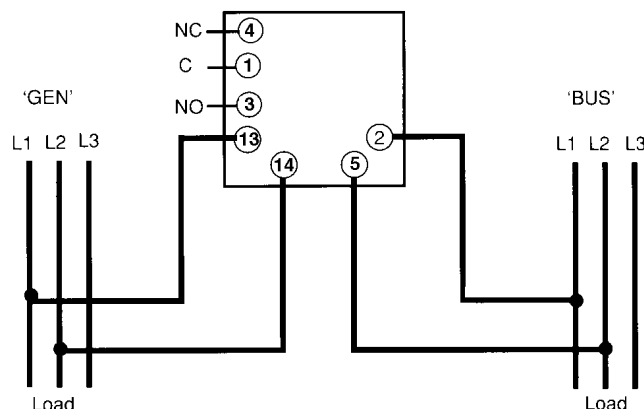
### Relay with Dead Bus

#### The Operation as Synchro Check Relay with Dead Bus

##### Relay Ratings

Single pole changeover 250V, 5A a.c. resistive.

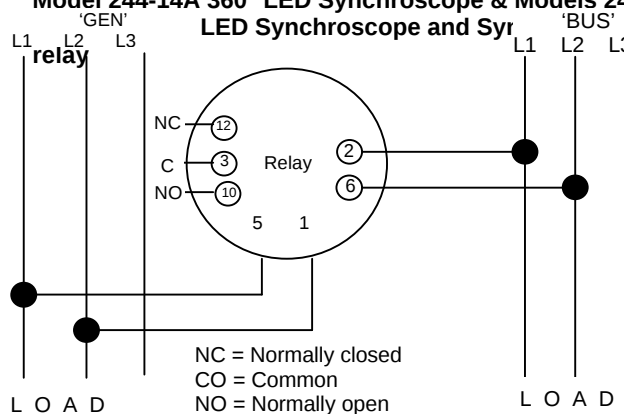
#### Model 077-14A 360° LED Synchroscope & 360 LED Synchroscope and Synchro Check Relay Models 077-14L/D/G/H



The 244-14D/H and 077-14D operate in the same way as the 244-14L and 077-14L Synchro check relays with the addition of a dead bus option. This optional feature enables the relay to energise with a GEN supply only thus allowing the generator to power the BUS during a supply failure.

### Connection Diagrams

#### Model 244-14A 360° LED Synchroscope & Models 244-LED Synchroscope and Synchro Check Relay Models 244-14L/D/G/H



Terminals 3, 10 and 12 are not used on Model 077-14A.

Terminals 1, 3 & 4 are not used on Model 244-14A.

NC = Normally closed  
CO = Common  
NO = Normally open

The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product. However, Tyco Electronics has no control over the field conditions, which influence product installation. It is the user's responsibility to determine the suitability of the installation method in the user's field conditions. Tyco Electronics' only obligations are those in Tyco Electronics' standard Conditions of Sale for this product and in no case will Tyco Electronics be liable for any other incidental, indirect or consequential damages arising from the use or misuse of the products. Crompton is a trademark.



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