



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.

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.

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 Terminals IP20B with terminal cover or terminal boots fitted
Case	Grade UL94V0
Base	Grade UL94V1

DIN 16257 symbol meaning for calibration position



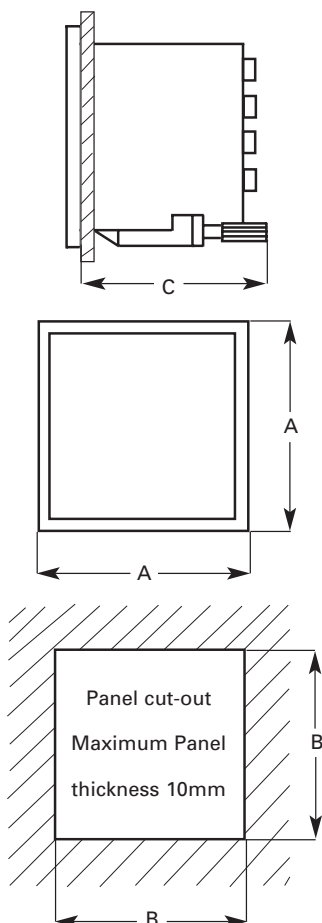
Inclination of dial surface to the horizontal e.g 60°.

Required orientation must always be stated when ordering if other than vertical mounting is required.

Specification Continued

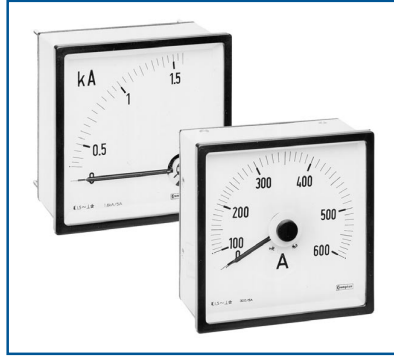
Case	Dimensions and panel cutout conform to IEC473, DIN 43700. Models 242, 243 and 244 have cases and bezels injection moulded in flame retardant engineering thermoplastic, recognised by Underwriters Laboratory materials specification. All 246 models have pressed steel cases.
Bezel	Slim-line DIN43802 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 Model 242 – available with a one piece ‘push on’ clamp. 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
Maximum overall depth 'C':				
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

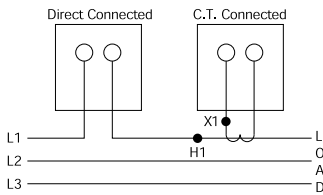
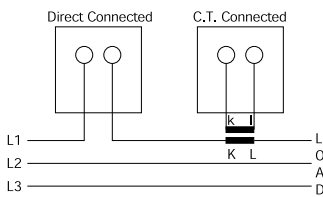


Moving Iron A.C. Ammeters and Voltmeters

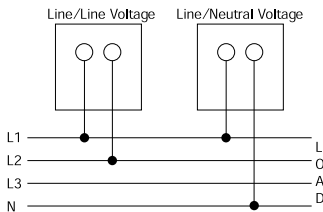
Designed to measure A.C. current or voltage, these meters indicate true r.m.s. values and are substantially independent of system waveform. Scales are calibrated down to 20%, and ammeters can have overload scales x2, x3, x5 or x6 for motor start duty. Ammeters can be supplied for use with -/1A or -/5A 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.

Connections

A.C. Ammeter



A.C. Voltmeter



Specification – Short Scale

Accuracy:	Class 1.5
Frequency:	50 or 60Hz, (400Hz on request)
Burden at 50Hz:	Ammeters: 0.5VA Voltmeters: 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 Voltmeters: 6V to 600V

Product Codes – Short Scale

Bezel Size mm	48	72	96	144
Scale length mm	42	65	94	145
Product Codes				
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 Voltmeters: 4.5VA maximum
Ratings:	Ammeters: 0.5A to 25A A.C. direct connected Maximum system voltage 720V A.C. Low load / high middle (maximum 10A) Voltmeters: 6V to 600V A.C.

Product Codes – Long Scale

Bezel Size mm	48	72	96	144
Scale length mm	72	112	150	230
Product Codes				
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



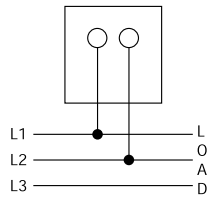
Frequency Meters

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

Connections



Product Code

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



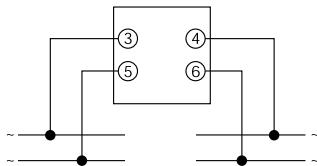
Dual Frequency Meters

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. 200V-250V A.C. 380V-440V A.C. 500V A.C. Models available for use with V.T.s
Frequency 0.5%:	45/55Hz, 55/65Hz, 45/65Hz, 360/440Hz
Burden:	4VA Maximum

Connections



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.

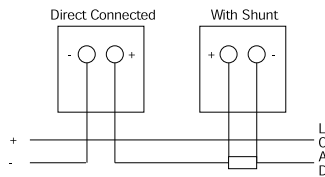
Specification

Accuracy:	Class 1.5
Ratings:	Ammeters: 100 μ A to 25A, (200 μ A for 05 model) 4/20mA suppressed zero 40A for model 243/244-01A Volts: 50mV to 600V 1/5V suppressed zero 50, 60, 75, 100, 150mV for use with shunts
Impedance:	Ammeters: 75mV internal shunt above 60mA Volts: 1000 Ω /V above 1V

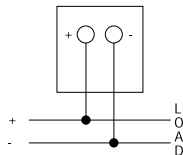
Further details on our T-Sheet T118 available on request.

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
Product Codes				
Ammeters	242-89A	243-01A	244-01A	246-10A
Ammeters suppressed zero	242-89R	243-01R	244-01R	246-10R
Volts	242-89V	243-01V	244-01V	246-10V
Volts 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
Product Codes				
Ammeter	242-05A	243-05A	244-05A	246-05A
Ammeters suppressed zero	242-05R	243-05R	244-05R	246-05R
Volts	242-05V	243-05V	244-05V	246-05V
Volts suppressed zero	242-05S	243-05S	244-05S	246-05S



Moving Coil Dual D.C. Ammeters and Voltmeters

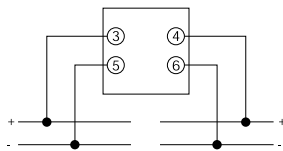
Dual instruments can be used to measure a wide range of currents and voltages, and save both space and time by requiring only one panel cut-out. The 244-80M allows for independent measurement of two D.C. currents in one case. The 244-80E allows for independent measurement of two D.C. voltages in one case.

Specification

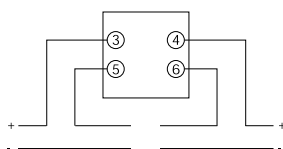
Accuracy:	Class 1.5
Ratings:	D.C. Current: 100 μ A to 25A direct connected 4/20mA suppressed zero D.C. Volts: 50mV to 600V 1/5 volt suppressed zero 50, 60, 75, 150mV for use with shunts.

Connections

Dual D.C. Ammeter



Dual D.C. Voltmeter



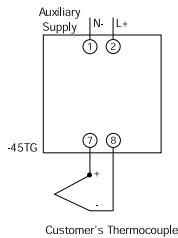
Product Codes

Bezel Size mm	96
Scale length mm	94
Product Code	
Ammeters	244-80M
Volts	244-80E

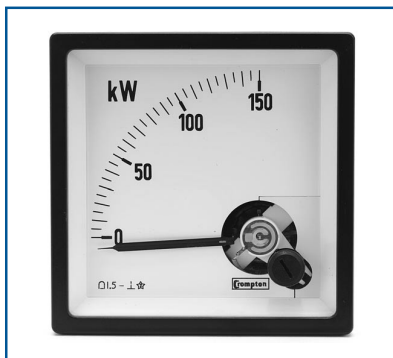
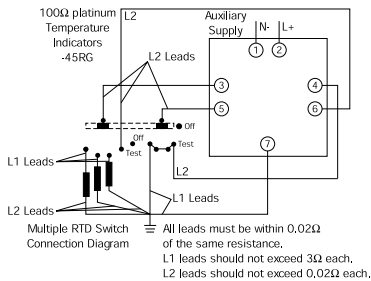


Connections

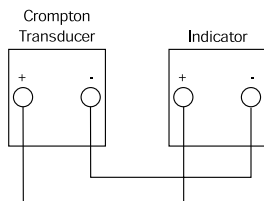
Thermocouple Indicators -45TG



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

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

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

Page 1 of 2

Ref: DIN – Rev 1 – Sept 02

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

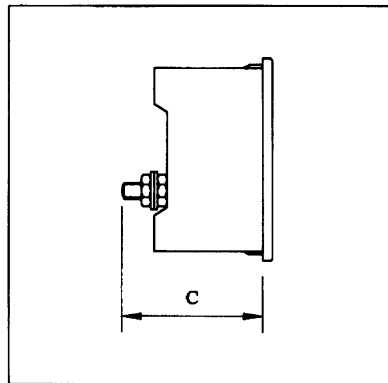
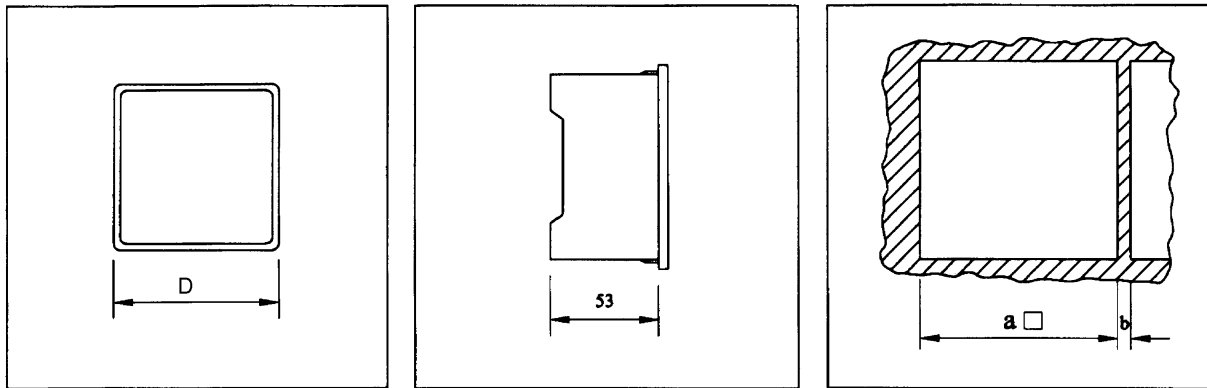
This unit has been designed to provide protection against EM (electro-magnetic) interference in line with requirements of EU and other regulations. Precautions necessary to provide proper operation of this and adjacent equipment will be installation dependent and so the following can only be general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

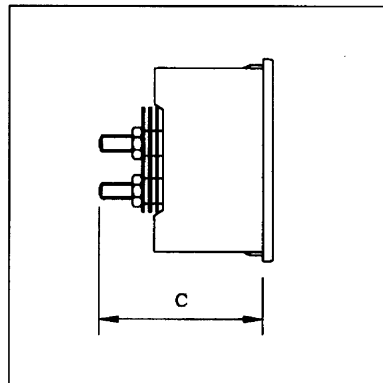


INSTALLATION INSTRUCTIONS

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

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Page 1 of 2

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.



INSTALLATION INSTRUCTIONS

Analogue Instruments DIN Instruments 240 Series & ANSI Switchboard Meters 070 Series LED Synchroscope & Synchrocheck Relay with Dead Bus

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 synchrosopes 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 synchrosopes 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).

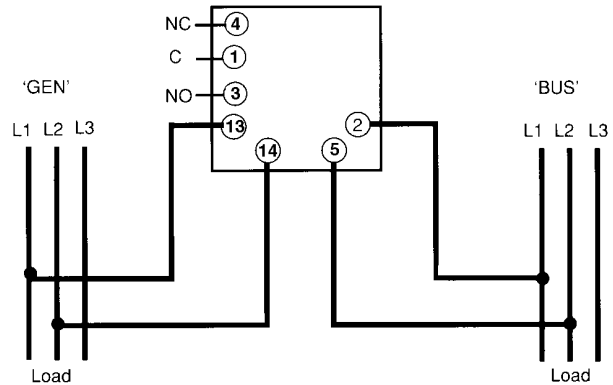
Twenty four red LED's are arranged in a ring simulating the traditional 360° analogue movement. Only one LED is lit at any one time indicating the phase difference between the busbar (BUS) and generator (GEN) signals. The unit will operate correctly at any frequency within its range. The voltage levels 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.

The Operation as Synchro Check Relay with Dead Bus

Relay Ratings

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

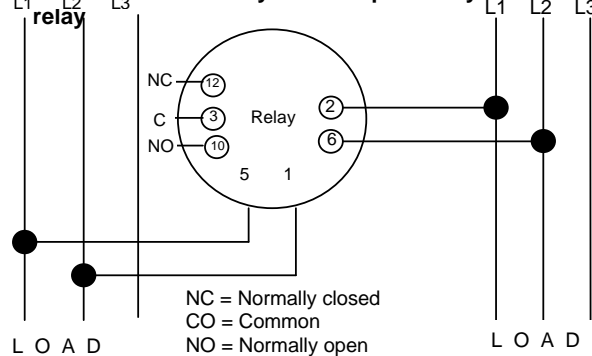
Model 077-14A 360° LED Synchroscope & 360 LED Synchroscope and Synchro Check Relay Models 077-14L/D/G/H



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



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

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