

## Installation and Operating Instructions QUADRATIC INTEGRA 510



**CROMPTON  
Quadratic INTEGRA 510  
Three Phase Digital Volts, Amps  
and Frequency Indicator**

**Installation & Operating Instructions  
Models 244-513, 244-514**

Crompton Instruments  
Freebournes Road  
Witham  
Essex  
CM8 3AH  
England

Tel: +44 (0) 1376 509 509

Fax: +44 (0) 1376 509 511

E-Mail: [crompton.info@tycoelectronics.com](mailto:crompton.info@tycoelectronics.com)

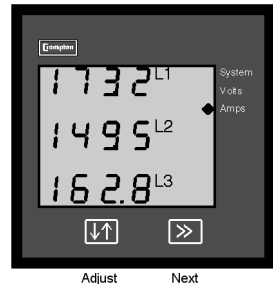
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## 1. Introduction

The Crompton INTEGRA 510 is a panel mounted 96 x 96mm DIN Digital Metering System, for the measurement and display of current, voltage and system frequency. The instrument integrates accurate measurement technology (all voltage and current measurements are average sensing RMS calibrated) with a clear, wide temperature range liquid crystal display.

INTEGRA 510 is available in 3 Phase 3 Wire and 3 Phase 4 Wire versions.

The front panel has two push buttons through which the user may scroll through the available measurement readings, reset the demand readings and configure the product.



The available measurement parameters and how they are indicated on the display are as follows:-

Measured Quantity	Parameter Indication	Unit of measurement
Current in each of the 3 phases	L1,L2,L3 Amps	Amps
Voltage of each of the 3 phases with respect to neutral *	L1,L2,L3 Volts	Volts
Line to Line Voltages **	L12,L23,L31 Volts	Volts
System Current (Average)	Sys, A	Amps
System Voltage (Average)	Sys, V	Volts
System Frequency	Sys, Hz	Hertz

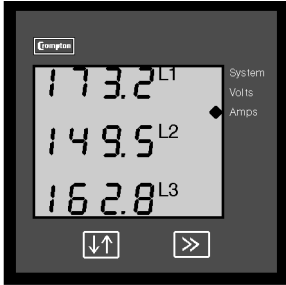
\* Four wire version only

\*\* Three wire version only

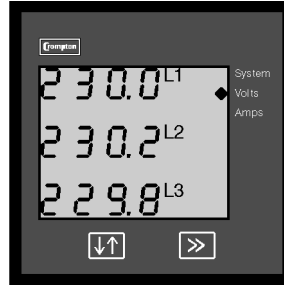
## 2. Measurement Reading Screens

In normal operation the user is presented with one of a number of measurement reading screens. These screens may be scrolled through one at a time by pressing the >> Next key.

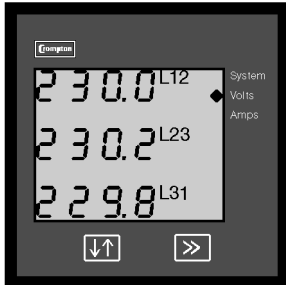
**Screen 1 Amps per line**



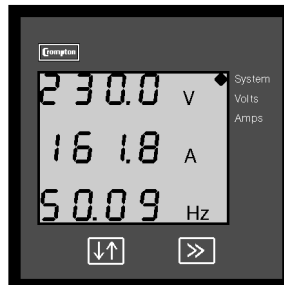
**Screen 2 Volts per line (4 wire)**



**Screen 2 Volts Line to Line (3 wire)**



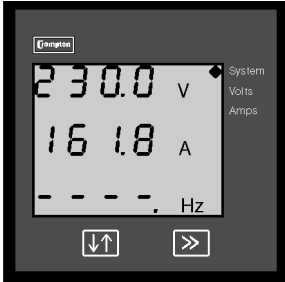
**Screen 3 System**



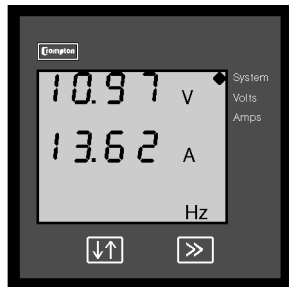
## 2.1 Frequency Display Modes

There are three conditions which can be determined from the frequency display.

Normal operation, in this mode the frequency of the signal present on the "Line 1" input to the product is indicated on the bottom line of the display.



**Frequency Out of Range.** In this mode the bottom line of the display changed to four horizontal bars "----". This indicates that an a.c. signal has been detected on Line 1 but that the frequency is outside the nominal frequency range of the product.



**No Signal Found.** In this mode the bottom line of the display will be blanked. This indicates that the signal present on Line 1 is below the amplitude necessary to reliably detect the frequency.

This condition may be transiently generated if the display screen selection is changed just after the unit has started a regular update. This is to avoid the display showing a spurious value by asking it to calculate and display the frequency of input waveform whilst it is being sampled.

### 3. Programming

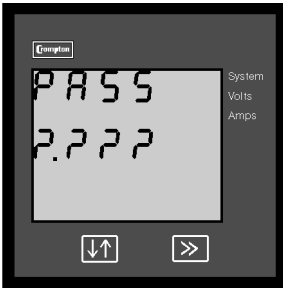
The following sections comprise step by step procedures for configuring the INTEGRA 510 for individual user requirements.

To access the set-up screens press and hold the "↑↓ Adjust" and ">> Next" Key simultaneously for 5 seconds. This will take the User into the Password Protection Entry Stage (Section 3.1). To return to the measurement reading screens at anytime during these procedures, press the "↑↓ Adjust" and >> Next Key simultaneously for 5 seconds.

#### 3.1. Password Protection

Password protection can be enabled to prevent unauthorised access to set-up screens, by default password protection is not enabled.

Password protection is enabled by selecting a four-digit number other than 0000, setting a password of 0000 disables the password protection.



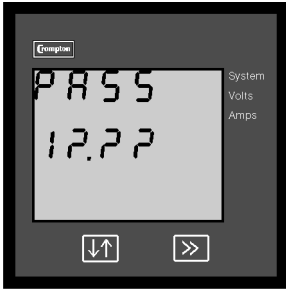
**Enter Password.** Prompt for first digit (signified by presence of decimal point to right of first digit).

Press the "↑↓ Adjust" key to scroll the value of the first digit from 0 through to 9. The value will change from 9 back to 0 if the "↑↓ Adjust" is pressed when "9" is displayed.

Press the ">> Next" key to advance to the next digit.

In the special case where the Password is "0000" pressing the ">> Next" key when prompted for the first digit will advance to the "Password Confirmed" screen.

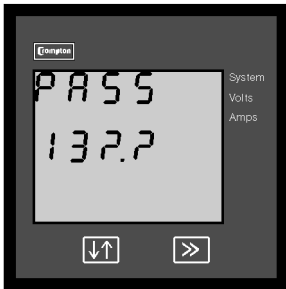
**Note:** If a password has not been set, pressing the >> Next key with 4 question marks displayed will allow the User to access the set-up screens.



**Enter Password.** First digit entered, prompt for second digit (signified by presence of decimal point to right of second digit).

Press the "↑↓ Adjust" key to scroll the value of the second digit from 0 through to 9. The value will change from 9 back to 0 if the "↑↓ Adjust" is pressed when "9" is displayed.

Press the ">> Next" key to advance to the next digit.

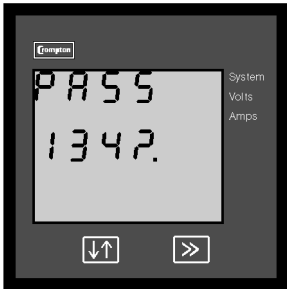


**Enter Password.** Second digit entered, prompt for third digit (signified by presence of decimal point to right of third digit).

Use the "↑↓ Adjust" key to scroll the value of the third digit from 0 through to 9. The value will change from 9 back to 0 if the "↑↓ Adjust" is pressed when "9" is displayed.

Press the ">> Next" key to advance to the next digit.

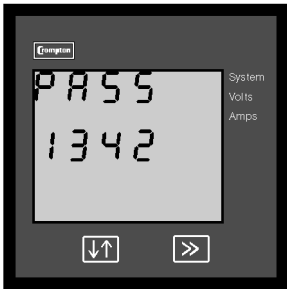




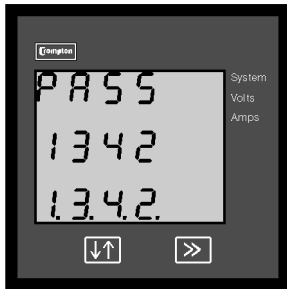
**Enter Password.** Third digit entered, prompt for fourth digit (signified by presence of decimal point to right of fourth digit).

Use the "↕ Adjust" key to scroll the value of the fourth digit from 0 through to 9. The value will change from 9 back to 0 if the "↕ Adjust" is pressed when "9" is displayed.

Press the ">> Next" key to advance to verification of the Password.



**Enter Password.** Four digits entered, awaiting confirmation of the Password.



### Password Confirmed

Pressing "↕ Adjust" key will advance to the New/Change Password entry stage.

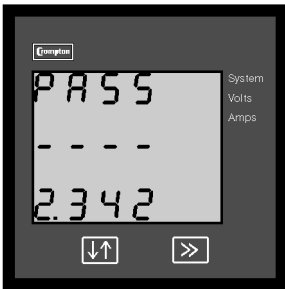
Pressing the ">> Next" key will advance to the System Amps set up Screen (See Section 3.2.1.).



**Password Incorrect** The unit has not accepted the Password entered.

Pressing the "↕ Adjust" key will return to the Enter Password stage.

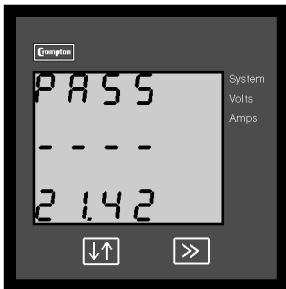
Pressing the >> Next key exits the set-up menus and returns operation to the measurement reading mode.



**New/Change Password.**

Pressing the "↕ Adjust" key will scroll the value of the first digit from 0 through to 9. The value will change from 9 back to 0 if the "↕ Adjust" is pressed when 9 is displayed.

Pressing the >> Next key advances the operation to the next digit and sets the first digit, in this case to 2.

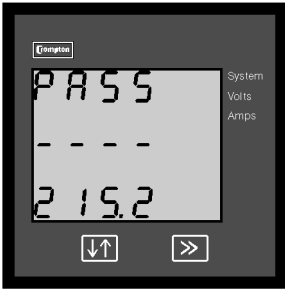


**New/Change Password.**

First digit entered, prompt for second digit.

Pressing the "↕ Adjust" key will scroll the value of the second digit from 0 through to 9. The value will change from 9 back to 0 if the "↕ Adjust" is pressed when 9 is displayed.

Pressing the >> Next key advances the operation to the next digit and sets the second digit, in this case to 1.

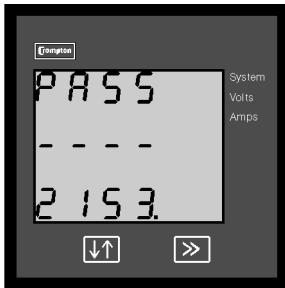


**New/Change Password.**

Second digit entered, prompt for third digit.

Pressing the "↕ Adjust" key will scroll the value of the third digit from 0 through to 9. The value will change from 9 back to 0 if the "↕ Adjust" is pressed when "9" is displayed.

Pressing the ">> Next" key advances the operation to the next digit and sets the third digit, in this case to "5".

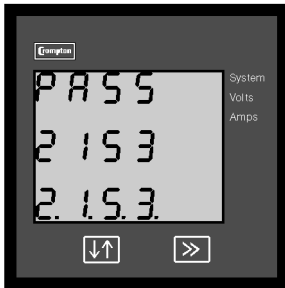


**New/Change Password.**

Third digit entered, prompt for fourth digit.

Pressing the "↕ Adjust" key will scroll the value of the fourth digit from 0 through to 9. The value will change from 9 back to 0 if the "↕ Adjust" is pressed when "9" is displayed.

Pressing the ">> Next" key advances the operation to the New Password Confirmation stage and sets the fourth digit, in this case to "3"



**New Password Confirmed.**

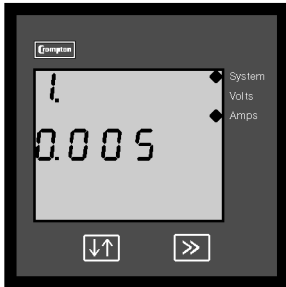
Pressing "↕ Adjust" key will return to "Change Password".

Pressing the ">> Next" key will advance to the "System Amps" set up screen. (See Section 3.2.1)

### 3.2 Set Up Screens

#### 3.2.1. System Amps

The user enters the system C.T.s primary value in Amps into this screen. The INTEGRA 510 has a nominal current input of 1A or 5A as indicated on the product label, the C.T. primary value entered in this screen must be the current flowing in the primary of the C.T. to produce the 1A or 5A into the product.



#### System Amps Edit

Pressing the ">> Next" key accepts the present value and returns the product to the measurement reading screens.

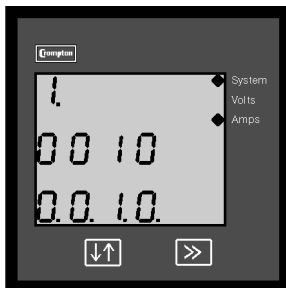
Pressing the "↑↓ Adjust" key will enter the System Amps Edit mode. This will scroll the value of the most significant digit from 0 through to 8. The value will change from 8 back to 0 if the "↑↓ Adjust" is pressed when 8 is displayed. (0 to 9 for lesser significant digits)

Pressing the >> Next key will advance to the next less significant digit (signified by the position of the decimal point).

When the least significant digit has been set, pressing the ">> Next" key will return the product to the measurement reading screens.

**Note:** When the most significant digit is set to 8 the lesser significant digits are all forced to zero.

The minimum value allowed is 1, the value will be forced to 1 if the display contains zero when the ">> Next" key is pressed.



#### System Amps Confirmed.

The System Amps value entered has been stored.

This screen will only appear following an edit of the System Amps.

If the scaling is not correct, pressing the "↑↓ Adjust" key will return to the "System Amps Edit" stage with the most significant digit highlighted (associated decimal point flashing) and the bottom line of the display will be blanked.

Pressing the ">> Next" key returns the product to the measurement reading screens.

## 4. Installation

The INTEGRA 510 may be mounted in a panel of any thickness up to a maximum of 5 mm. Mounting is by two corner clamps and thumb screws. Consideration should be given to the space required behind the instrument to allow for bends in the connection cables.

As the enclosure conforms to IP54 it is protected from water spray from all directions, additional protection to the panel may be obtained by the use of an optional panel gasket. The terminals at the rear of the product should be protected from liquids.

The INTEGRA 510 should be mounted in a reasonably stable ambient temperature and where the operating temperature is within the range -10 to +70 degrees celcius. Vibration should be kept to a minimum.

### Caution

1. In the interest of safety and functionality this product must be installed by a qualified engineer.
2. Voltages dangerous to human life are present at some of the terminal connections of this unit. Ensure that all supplies are de-energised before attempting any connection or disconnection.
3. These products do not have internal fuses therefore external fuses must be used to ensure safety under fault conditions.

### 4.1 EMC Installation Requirements

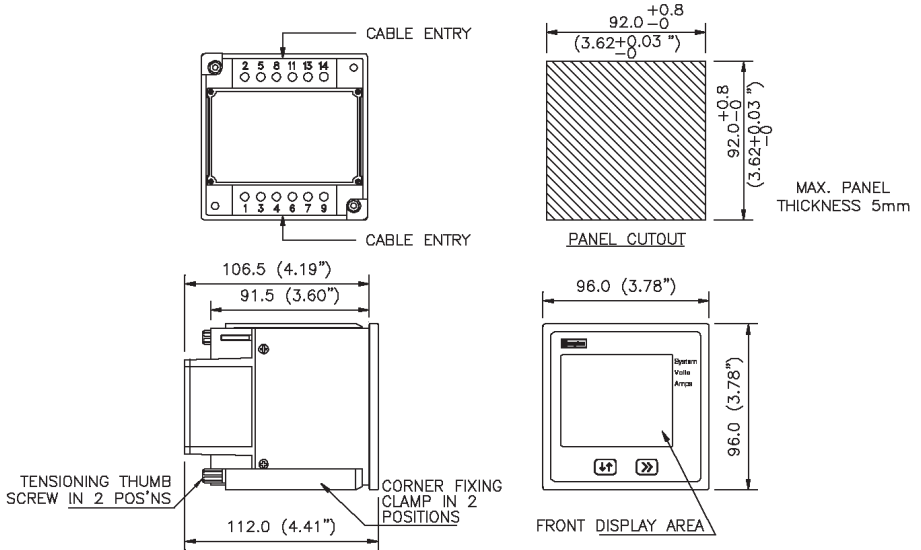
This product has been designed to meet the certification of the EU directives when installed to a good code of practice for EMC in industrial environments, e.g.

1. Screened output and low signal input leads or have provision for fitting RF suppression components, such as ferrite absorbers, line filters etc., in the event that RF fields cause problems.

**Note:** It is good practice to install sensitive electronic instruments that are performing critical functions, in EMC enclosures that protect against electrical interference which could cause a disturbance in function.

2. Avoid routing leads alongside cables and products that are, or could be, a source of interference.
3. To protect the product against permanent damage, surge transients must be limited to 2kV pk. It is good EMC practice to suppress differential surges to 2kV at the source. The unit has been designed to automatically recover in the event of a high level of transients. 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.
4. ESD precautions must be taken at all times when handling this product.

## 4.2 Case Dimension and Panel Cut Out



**Wiring**

Input connections are made directly to shrouded screw clamp terminal. Numbering is clearly marked in the plastic moulding. Choice of cable should meet local regulations. Terminals for both current and voltage inputs will accept up to 3mm<sup>2</sup> x 2 diameter cables.

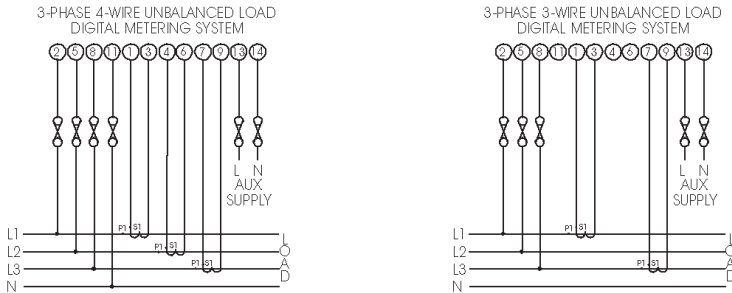
**Fusing**

It is recommended that all voltage lines are fitted with 1 amp sand filled fuses.

**Earth/Ground Connections**

For safety reasons, CT secondary connections should be grounded in accordance with local regulations.

**4.3 Connection Diagrams**



Auxiliary supply connections (terminals 13 and 14) are not necessary for products supplied as self powered.

## 5. Specification

### System

3 Phase 3 Wire	244-513 (requires 2 system CTs)
3 Phase 4 Wire	244-514 (requires 3 system C.Ts)

### Inputs

Nominal input voltage (Three wire and Four wire)	100 to 120V L-L (a.c. rms) 190 to 240V L-L 380 to 480V L-L
Max continuous input voltage	120% of nominal (up to 600V max.)
Max short duration input voltage	2 x nominal (1s application repeated 10 times at 10s intervals)
Nominal input voltage burden	0.2VA approx. per line 3VA Line 2-3 on self-powered 3 wire 3VA Line 3 to Neutral on self-powered 4 wire
Nominal input current	1 or 5A a.c. rms
Max continuous input current	120% of nominal
Nominal input current burden	0.6VA approx. per phase
Max short duration current input	20 x nominal (1s application repeated 5 times at 5 min. intervals)  10 x nominal (3s application repeated 5 times at 5 min. intervals)  5 x nominal (5s application repeated 5 times at 5 min. intervals)
System CT primary values	Values within the range 1A to 8000A inclusive (1 or 5 Amp secondaries)



Auxiliary (where fitted)

Standard nominal a.c. supply voltage	100 to 120V 190 to 240V 380 to 480V
a.c. supply voltage tolerance	-10% of lower nominal voltage to +20% of upper nominal voltage
a.c. supply frequency range	45 to 66 Hz
a.c. supply burden	3VA

### Measuring (Reference) Ranges

Values of measured quantities for which headline accuracy figures apply

Current	2.5 .. 120% of nominal
Voltage (Self Powered Product)	75 to 125%, of: 115V (100 to 120V product) 230V (190 to 240V product) 460V (380 to 480V product)
Voltage (Auxiliary Powered Product)	2.5 .. 120% of nominal

### Accuracy

Voltage	1.5% of nominal
Current	1.5% of nominal
Frequency	0.5% of mid frequency
Temperature coefficient	0.013%/°C typical
Circuitry Response time to step input	<10 seconds

Error change due to variation of an influence quantity in the manner described in section 6 of IEC688:1992 2x Class Index.

**Reference conditions of influence quantities**

Values that quantities affecting measurement errors to a minor degree have to be for the headline accuracy for measured quantities to apply.

Ambient temperature	23°C
Input frequency	45 to 66 Hz
Input waveform	Sinusoidal (distortion factor 0.005)
Auxiliary supply voltage (where fitted)	75 to 125%, of: 115V (100 to 120V product) 230V (190 to 240V product) 460V (380 to 480V product)
Auxiliary supply frequency	45 to 66 Hz
Auxiliary supply distortion factor	0.05
Magnetic field of external origin	Terrestrial flux

**Nominal range of use of influence quantities for measurands**

Values of quantities affecting measurement errors to a minor degree for which the magnitude of the measurement error is defined in this specification.

Input Frequency	45 to 66 Hz
Temperature	-10 .. +70°C
Input waveform distortion	1% 3rd Harmonic distortion
Auxiliary supply voltage	75 to 125%, of: 115V (100 to 120V nominal) 230V (190 to 240V nominal) 460V (380 to 480V nominal)
Auxiliary supply frequency	45 to 66 Hz
Magnetic field of external origin	400 A/m

**Functional ranges of measurands, and of influence quantities for measurands**

Values of measured quantities, components of measured quantities, and quantities which affect measurement errors to a minor degree, for which the product gives meaningful readings.

Voltage	0 .. 120% of nominal
Current	0 .. 120% of nominal
Frequency	45 .. 66 Hz
Temperature	-10 .. +70°C

**Display**

Screen Characters	4 digits 10.5mm high plus figures and enunciators
Update	7.5 seconds approx.

**Controls**

User Interface	Two buttons
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**Standards**

Terms, Definitions and Test Methods	IEC688:1992 (BSEN 60688)
EMC Emissions	BSEN 50081-1 (1994) Emissions (Class B equipment)
EMC Immunity	BSEN 50082-2 (1995) Industrial Immunity (Enclosure 10V/m, Conducted 3V/m, ESD 8kV, High frequency disturbance 2kV)
Safety	Designed to meet UL3111-1 IEC1010-1 (BSEN 61010-1) Installation (Overvoltage) Insulation category III, pollution degree 2, Basic Insulation, Max. working voltage to ground 850Vpk.

**EU Directives**

Low Voltage Directive	73/23/EEC amended by 93/68/EEC
EMC Directive	89/336/EEC amended by 93/68/EEC



**Isolation**

Dielectric voltage withstand test between circuits and accessible surfaces	For Line Voltage 300 to 600V RMS 3.25kV RMS 50Hz for 1 minute For Line Voltage 150 to 300V RMS 2.2kV RMS 50Hz for 1 minute
Max. working voltage between circuits	600V RMS
AC power surge voltage	IEC 61000-4-5, 1.2/50 microseconds 4kV
High Frequency Disturbance Test	IEC61000-4-4 2kV peak on all measuring inputs.

**Environmental**

Operating temperature	-10 .. +70°C
Storage temperature	-20 .. +80°C
Relative humidity	0 .. 95% non condensing
Warm up time	1 minute
Shock	30g in 3 planes
Vibration	10 .. 55 Hz, 0.15mm amplitude
Enclosure code (front)	IP54 (standard) IP65 (optional)

**Approvals**

Consult Factory

**Quality System**

ISO 9001  
AQAP 41

**Enclosure**

Style	96mm x 96mm DIN
Material	UL94V-0/V-2
Terminals	M3.5 captive screw clamp
Length	104mm std. case
Weight	0.7 kg



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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 trade mark.

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**Tyco Electronics UK Limited**  
**Crompton Instruments**

Freebournes Road, Witham, Essex, CM8 3AH, UK  
Tel: +44 1376 509 509 Fax: +44 1376 509 511

<http://energy.tycoelectronics.com>