Installation instruction

Integra Ci3 digital metering system

1. Features and options

The Integra Ci3 digital meter is designed for accurate measurement and display of all major electrical and power quality parameters. It is has been designed, developed and manufactured in the UK, by Crompton Instruments. It is user programmable to suit single-phase two wire, three-phase three-wire, and three-phase four-wire system configurations.

The product features a DIN 96 panel mounted snap-fit enclosure, backlit Liquid Crystal Display (LCD) and user programmable CT ratios, accessible via an intuitive user interface. The Integra Ci3 digital meter measures 17 electrical parameters including total harmonic distortion (THD) up to the 31st harmonic.

The Integra Ci3 digital meter offers two output ports at the rear of the product. This allows to fit either two isolated pulsed output relays or a RS-485 communication module to allow Modbus protocol or Johnson Controls communication output. These are configurable via internal settings.

1.1 Power Supply
The Integra Ci3 digital meter must be powered from an auxiliary AC or DC supply that is separate (but it may also be commoned) from the metered supply. The input range of the auxiliary is 110-400V AC or 120-350V DC. All connections are made to screw clamp terminals that accept 0.05 - 2.5mm^2 stranded or solid core cables. Terminal screws are fully tightened for shipment and must be undone before wire insertion. Terminal screws should be tightened to 0.5 Nm (4.4 lbf in) only.

1.2 RS485 Module Option
An optional RS485 module is available for purchase. Where a RS485 module is available, it can be connected to a PC for control and monitoring purposes using either Modbus protocol or Johnson Controls protocol. A maximum of one RS485 module can be fitted to an Integra Ci3 digital meter.

1.3 Pulse Relay Module Option
An optional Pulsed Relay module is available for purchase. Pulse relays are user programmable for corresponding energy type, pulse divisor (one pulse for every 0.1, 1, 10, 100 or 1000kWh/kVArh for example) and pulse width (duration). A maximum of two Pulsed Relay modules can be fitted to an Integra Ci3 digital meter, when no RS485 module is fitted. When two Pulsed Relay modules are fitted, they share a common divisor value and pulse width.

1.4 Display Screen
The display screen is used in two main modes: display of measured values and parameter setup.

1.5 Front Panel Buttons
The front of the product has four buttons that select different electrical parameters and are also used for system configuration.

V/Hz is used to select the Voltage and Frequency parameter screens.
In set-up mode this is the "Back" button.

A is used to select the Current parameter screens.
In set-up mode this is the "Up" button.

P/PF is used to select the Power and Power Factor parameter screens.
In set-up mode this is the "Down" button.

is used to select the Energy parameter screens.
In set-up mode this is the "Enter" button.

1.6 Display Mode
The parameters are viewed on a backlit LCD screen. There are 15 screens accessible via 4 buttons on the front panel allowing the user to navigate between the various screens.

1.7 Set Up Mode
In Set Up mode, the top row shows an abbreviation of the parameter name, the middle row shows the parameter value being set and the bottom row is used to confirm the input has been "set" to the desired value. In general, the and buttons change a parameter value and the key enters the value.

1.8 Start Up Screens
When power is initially applied to the Integra Ci3 digital meter, it progresses through a series of three start-up screens. The first screen provides a visual check of the LCD screen by lighting up all the LCD segments. The second displays the unit's firmware version; whilst the third displays a start-up self test result. If this self test is successful, the unit then switches to the default "Voltage" screen.

2. Display mode screen sequence (4 wire)

| Button	Screen No.	Description 3 phase 4 wire	Screen No.	3 phase 3 wire	Screen No.	1phase 2 wire
	1	Volts L1 – N Volts L2 - N Volts L3 - N	1	Volts L1 -L2 Volts L2 - L3 Volts L3 - L1	1	Volts L1
	2	Volts L1 -L2 Volts L2 - L3 Volts L3 - L1				
	3	Frequency	2	Frequency	2	Frequency
	4	Volts L1 - N THD% Volts L2 - N THD% Volts L3 - N THD%				
	5	Volts L1 -L2 THD% Volts L2 - L3 THD% Volts L3 - L1 THD%	3	Volts L1 -L2 THD% Volts L2 - L3 THD% Volts L3 - L1 THD%	3	Volts L1 THD%
	1	Current L1 Current L2 Current L3	1	Current L1 Current L2 Current L3	1	Current L1
	2	Neutral Current				
	3	L1 Current Max Demand L2 Current Max Demand L3 Current Max Demand	2	L1 Current Max Demand L2 Current Max Demand L3 Current Max Demand	2	L1 Current Max Demand
	4	Neutral Current Max Demand				
	5	Current L1 THD% Current L2 THD% Current L3 THD%	3	Current L1 THD% Current L2 THD% Current L3 THD%	3	Current L1 THD%

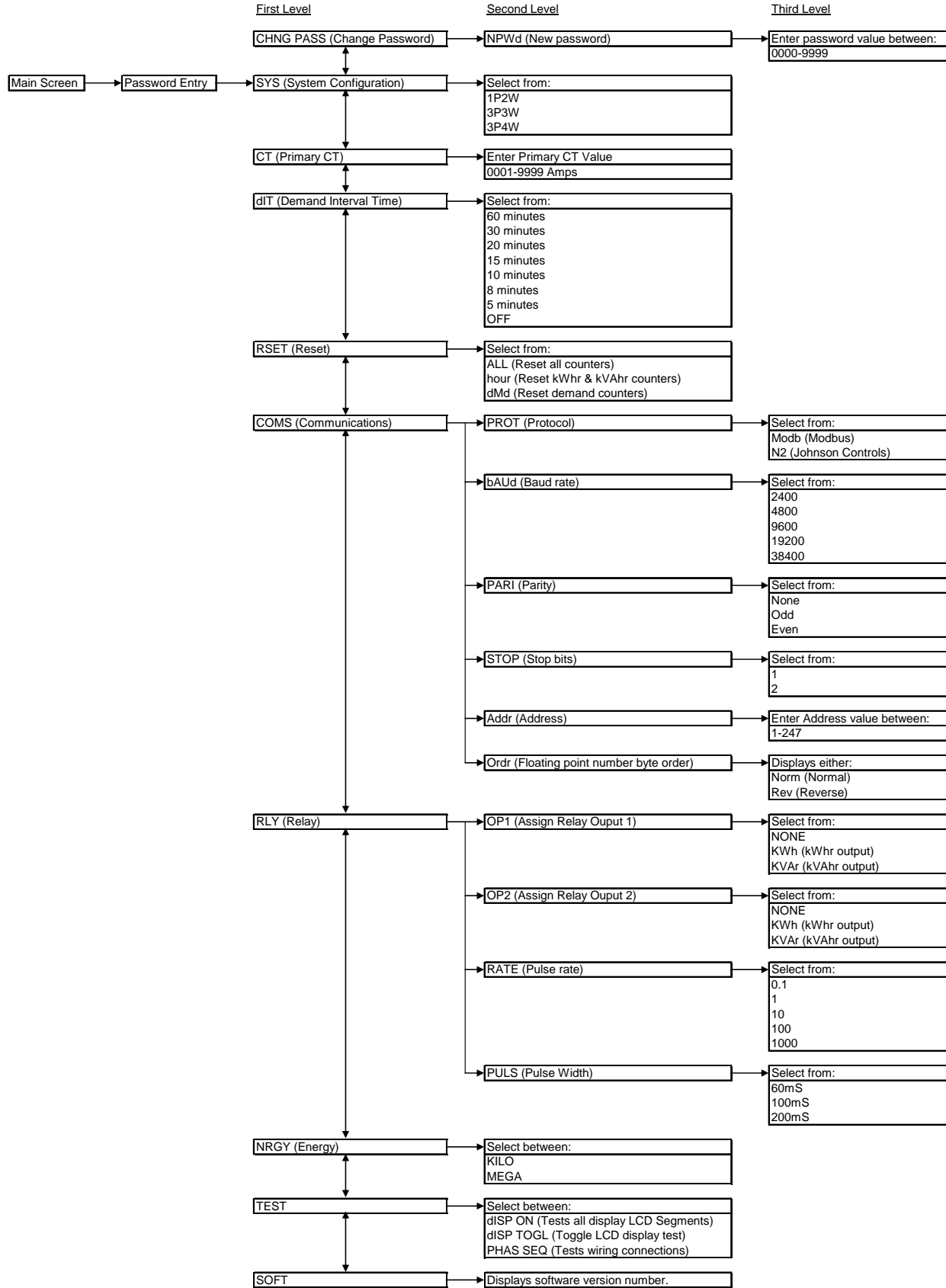|	1	kW kVAr kVA	1	kW kVAr kVA	1	kW kVAr kVA
P/PF	2	kW Max Demand	2	kW Max Demand	2	kW Max Demand
	3	Power Factor	3	Power Factor	3	Power Factor
E	1	kWh	1	kWh	1	kWh
	2	kVArh	2	kVArh	2	kVArh

3. Set Up

Set up of the Integra Ci3 digital meter may be carried out by using either the local display or the Integra Ci3 digital meter configurator software. The Integra configurator software has its own on-line guide which can be downloaded from our web-site www.crompton-instruments.com. Additionally, if required, set up parameters may be manipulated directly via the RS485 communications interface. The following sections give step by step procedures for configuring the Integra Ci3 digital meter using the front panel.

To access the Set-up screens, press and hold the 🔲 and the 🔲 buttons simultaneously for five seconds. This displays the password entry screen. Password protection is designed to prevent unauthorised access to Set-up screens. Password is normally set to 0000 when a product is shipped. When exiting Set-up mode, the instrument returns to the last selected Display screen. To return to the Display screens at any time during the set-up procedures, press the 🔲 and the 🔲 buttons simultaneously for five seconds, or keep pressing the back button 🔲. Any set up changes that have already been made will be retained.

3.1 Number Entry Procedure
When configuring the unit, many screens require the entry of a number, usually on the middle row of digits. For example, on starting the set-up section, a password will be required. The procedure is as follows: press the 🔲 and 🔲 buttons to change the digit value that is flashing on the screen. Press the 🔲 button to confirm the entry and move to the next digit in the sequence. The digits are set one at a time, from left to right until all four digits are set. At any time during this operation it is possible to press the 🔲 button to move back to the previous digit in the sequence.

4. Menu Structure

First Level | Second Level | Third Level

Main Screen → **Password Entry** →

| First Level	Second Level	Third Level
CHNG PASS (Change Password) →	NPWd (New password) →	Enter password value between: 0000-9999
SYS (System Configuration) →	Select from: 1P2W, 3P3W, 3P4W	
CT (Primary CT) →	Enter Primary CT Value 0001-9999 Amps	
dIT (Demand Interval Time) →	Select from: 60 minutes, 30 minutes, 20 minutes, 15 minutes, 10 minutes, 8 minutes, 5 minutes, OFF	
RSET (Reset) →	Select from: ALL (Reset all counters), hour (Reset kWhr & kVAhr counters), dMd (Reset demand counters)	
COMS (Communications) →	PROT (Protocol) →	Select from: Modb (Modbus), N2 (Johnson Controls)
	bAUd (Baud rate) →	Select from: 2400, 4800, 9600, 19200, 38400
	PARI (Parity) →	Select from: None, Odd, Even
	STOP (Stop bits) →	Select from: 1, 2
	Addr (Address) →	Enter Address value between: 1-247
	Ordr (Floating point number byte order) →	Displays either: Norm (Normal), Rev (Reverse)
RLY (Relay) →	OP1 (Assign Relay Ouput 1) →	Select from: NONE, KWh (kWhr output), KVAr (kVAhr output)
	OP2 (Assign Relay Ouput 2) →	Select from: NONE, KWh (kWhr output), KVAr (kVAhr output)
	RATE (Pulse rate) →	Select from: 0.1, 1, 10, 100, 1000
	PULS (Pulse Width) →	Select from: 60mS, 100mS, 200mS
NRGY (Energy) →	Select between: KILO, MEGA	
TEST →	Select between: dISP ON (Tests all display LCD Segments), dISP TOGL (Toggle LCD display test), PHAS SEQ (Tests wiring connections)	
SOFT →	Displays software version number.	

Menu navigation
Once the correct password has been entered the user can access the first level menu structure. Use the 🔼 and 🔽 buttons to navigate up and down this level until the desired parameter is reached. Then press the 🅴 button to select the desired parameter and enter the second level menu structure. For some parameters such as COMS there is an additional third level menu structure. Once all the necessary selections have been made and the required settings entered, press the 🔲 to return to the first level menu structure.
The following example shows how to set the CT primary.

- Press and hold the two outermost buttons 🔲 and 🅴 simultaneously for five seconds until the password screen is displayed.

- Press 🅴 four times to enter the default password of "0000".
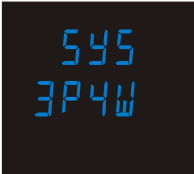
- The system setup screen will be displayed on the screen. Press the 🔽 button to scroll down the menu until you see the CT primary setting screen.

- Press the 🅴 button to enter the CT primary setting screen. The first digit should start flashing.
- Use the 🔼 and 🔽 buttons to set the digit to the required level then press 🅴 to confirm.
- Repeat this process until all four digits have been set to the desired CT primary value. (e.g. 100A = 0100A, 1000A = 1000A)
- The word "SET" should be displayed after the fourth digit has been entered to confirm that the primary CT value has been set.
- Press 🔲 to return to the first level menu structure. At this point it is possible to scroll up and down the first level menu structure so that the user can adjust another parameter (e.g. system configuration, or comms etc).
- If no other setting are required then press 🔲 to exit set-up mode and return to measurement mode.

5. Set up screens

You enter the set up screens at 5.2, press 🔼 to get to 5.1 and 🔽 to get to everything else.

5.1 CHNG PASS (Change password)
Selecting this screen takes the user to the new password screen, to enter a new four digit password between the values of 0000 and 9999.
Use the 🔼 and 🔽 buttons to set the digit to the desired number then press 🅴 to confirm.
Repeat this process until the desired 4 digit password has been set.

   Modbus is a Trademark of Schneider Automation Inc. Other Trademarks or company names mentioned herein are the property of their respective owners.

5.2 SYS (System configuration)
This screen is used to set the wiring configuration used for the instrument.
Use the 🔼 and 🔽 buttons to scroll through the following options:
- 1P2W (Single Phase)
- 3P3W (3 Phase 3 Wire)
- 3P4W (3 Phase 4 Wire)

Once the desired system configuration has been found press 🔲 to confirm.

5.3 CT (CT Primary)
This screen is used to set the value of the CT primary to be used with the Integra Ci3 digital meter. E.g. setting this screen to 0100 (100A) will tell the product that a 100/5A CT is being used on the current input and this value will be used to correctly calculate all Current and Power measurements etc.
Use the 🔼 and 🔽 buttons to set the digit to the desired number then press 🔲 to confirm.
Repeat this process until the desired CT primary value has been set.

5.4 dIT (Demand Integration Time)
This screen is used to set the period over which the current and power readings are integrated for maximum demand measurement. The values displayed are in minutes.
Use the 🔼 and 🔽 buttons to scroll through the following options:
- 60 (60 minutes)
- 30 (30 minutes)
- 20 (20 minutes)
- 15 (15 minutes)
- 10 (10 minutes)
- 8 (8 minutes)
- 5 (5 minutes)
- OFF (No demand integration time)

Once the desired demand integration time has been selected, press 🔲 to confirm.

5.5 RSET (Reset)
This screen allows Energy and Demand readings to be reset either individually or all together.
Resetting the Energy (hour) sets the kWhr and kVAhr counters to zero.
Resetting the Demand (dMd) sets the Current Demand and Watt Demand counters to zero.
Use the 🔼 and 🔽 buttons to scroll through the following options:
- ALL (Reset all counters)
- hour (Reset kWh and kVArh counters)
- dMd (Reset demand counters)

Once the desired reset has been selected, press 🔲 to confirm.

5.6 COMS (Communications)
This screen allows the adjustment of all parameters that are required for the optional communications module (if fitted). Selecting this screen opens a sub-menu of communication parameters:

5.6.1 PROT (Protocol)
This screen sets the communication protocol for the RS485 port.
Scroll through the following options:
- Modb (Modbus protocol)
- N2 (Johnson Controls Interface)

Once the desired protocol has been selected press 🔲 to confirm.

5.6.2 bAUd (Baud rate)
Scroll through the following options:
- 2400
- 4800
- 9600
- 19200
- 38400

Once the desired baud rate has been found press to confirm.

5.6.3 PARI (Parity)
Scroll through the following options:
- None
- Odd
- Even

Once the required parity has been selected press to confirm.

5.6.4 STOP (Stop Bits)*
*Note: This function is only enabled if Parity (5.6.3) is set to "None".
Scroll through the following options:
- None
- Odd
- Even

Once the required stop bits have been selected press to confirm.

5.6.5 Addr (Device Address)
The instrument will only allow valid Modbus protocol addresses in the range of 1-247 or Johnson Controls addresses in the range 1-255.
Use the and buttons to set the digit to the desired number then press to confirm.
Repeat this process until the desired 3 digit address has been set.

5.6.6 Ordr (Floating Point Byte Order)*
This screen displays the floating point number byte order, either Norm (Normal) or Rev (Reverse).
*Note: No adjustment of this parameter is allowed via the front of the Integra Ci3 digital meter. Changes to the floating point number byte order must be made on the Modbus system; for information on how to adjust this setting please refer to the Integra Communications Guide, available from our web-site.

5.7 RLY (Relay)
This screen allows the adjustment of all parameters that are required for the optional Pulse Relay Module (if fitted). Selecting this screen opens a sub menu of relay parameters:

5.7.1 OP1 (Relay Output 1)
This screen allows the user to assign Pulse Relay Output 1 to measure either None, kWh or kVArh.
Scroll through the following options:
- None   (Relay disabled)
- KWh   (kWh pulsed output)
- KVAr   (kVArh pulsed output)

Once the required pulsed output setting has been selected press to confirm.

5.7.2 OP2 (Relay Output 2)
This screen allows the user to assign Pulse Relay Output 2 to measure either None, kWh or kVArh.
Scroll through the following options:
- None   (Relay disabled)
- KWh   (kWh pulsed output)
- KVAr   (kVArh pulsed output)

Once the required pulsed output setting has been selected press to confirm.

5.7.3 RATE (Pulsed Output Rate)
This screen allows the user to adjust the number of kWh or kVArh's per output pulse:
Scroll through the following options:
- 0.1   (1 pulse per 0.1 kWh/kVArh)
- 1   (1 pulse per 1 kWh/kVArh)
- 10   (1 pulse per 10 kWh/kVArh)
- 100   (1 pulse per 100 kWh/kVArh)
- 1000   (1 pulse per 1000 kWh/kVArh)

Once the desired pulse rate has been selected, press to confirm.

5.7.4 PULS (Pulse Width)
This screen allows adjustment to the duration of the relay output pulse. Values are displayed in milliseconds (ms).
Scroll through the following options:
- 60   (60ms)
- 100   (100ms)
- 200   (200ms)

Once the desired pulse rate has been selected, press to confirm.

5.8 NRGY (Energy)
This screen selects either kWh/kVArh or MWh/MVArh Energy readings.
Scroll through the following options:
- KILO
- MEGA

Once the desired energy setting has been selected, press to confirm.

5.9 TEST (Product Self Tests)
This screen allows the selection of a number of self diagnostic test routines.
Scroll through the following options:
- dISP ON   This test illuminates all the LCD segments to identify any display errors.
- dISP TOGL   This test toggles on and off alternate halves of the LCD segments, to determine if any are stuck either on or off.
- PHAS SEQ   This test determines if the Voltage and Current connections to the Ci3 meter are correct. If all the connections are correct the product will display V 123 and I 123. For example, if the product displayed V 132 and I 123 this would indicate that the Voltage connections are in reverse sequence and need to be changed.

Once the desired self test has been selected, press to confirm.
Refer to basis of measurement and calculations for qualifying conditions, 6.7.

5.10 SOFT (Software Version Number)
This screen displays the version number of the software installed in the Integra Ci3 digital meter.

6. Basis of measurement and calculations

6.1 Phase to Phase voltages
Phase to Phase voltages are measured directly and calculated as RMS values. Situations where the phases are not spaced 120 degrees apart (e.g. 4 wire open delta) are indicated correctly.

6.2 Reactive and Apparent Power
Active powers are calculated directly by multiplication of voltage and current samples. Reactive powers are calculated using the frequency corrected quarter phase time delay method. Apparent power is calculated as the square root of the sum of the squares of active and reactive powers.

6.3 Energy resolution
Cumulative energy counts are reported using the standard IEEE floating point format. Reported energy values in excess of one million may show a small non cumulative error in the integer digits due to the

limitations of the number format. Internally the count is maintained with greater precision. The reporting error is less than 1 part per million and is automatically corrected when the count increases.

6.4 Power Factor
The magnitude of Per Phase Power Factor is derived from the per phase active power and per phase reactive power. The power factor value sign is set to negative for an inductive load and positive for a capacitive load.
The magnitude of the System Power Factor is derived from the sum of the per phase active power and per phase reactive power. Individual phases whose apparent power is less than 3% of nominal are not included in power factor determinations. The system power factor value sign is set to negative for an inductive load and positive for a capacitive load. The load type, capacitive or inductive, is determined from the signs of the sums of the relevant active powers and reactive powers. If both signs are the same, then the load is inductive, if the signs are different then the load is capacitive. The magnitude of the phase angle is the ArcCos of the power factor. Its sign is taken as the opposite of the VAr's sign.

6.5 Maximum Demand
The maximum power consumption of an installation is provided as power utilities often levy related charges. Many utilities use a thermal maximum demand indicator (MDI) to measure this peak power consumption. An MDI averages the power consumed over a number of minutes, reflecting the thermal load that the demand places on the supply system. The Integra Ci3 digital meter uses a sliding window algorithm to simulate the characteristics of a thermal MDI instrument, with the demand period being updated every minute. Demand Integration Times can be set to Off, 5, 8, 15, 20, 30 or 60 minutes. Maximum Demand is the maximum power or current demand that has occurred since the unit was last reset. This is maintained as a continuous record of the highest demand value that has been reached. Note: During the initial period when the "sliding window" does not yet contain a full set of readings (i.e. the elapsed time since the demands were last reset or the elapsed time since the Integra Ci3 digital meter was switched on is less than the selected demand integration time) then maximum demands may not be true due to the absence of immediate historical data. With the Demand Integration Time set to "Off" the "Maximum Demand" values become "Maximum" values as no averaging is performed on the measured parameters.

6.6 Total Harmonic Distortion
The calculation used for Total Harmonic Distortion is: THD = ((RMS of total waveform – RMS of fundamental) / RMS of total waveform) x 100. This is often referred to as THD – R, and lies in the range 0 to 100%. THD measurement is subject to the 'range of use' limits. The Integra Ci3 digital meter may give erratic or incorrect readings where the THD is very high and the fundamental is essentially absent. For low signal levels the noise contributions from the signal may represent a significant portion of the "RMS of total waveform" and may thus generate unexpectedly high values of THD. To avoid indicating large figures of THD for low signal levels the product will produce a display of 0 (zero). Typically, display of THD will only produce the 0 (zero) value when the THD calculation has been suppressed due to a low signal level being detected. It should also be noted that spurious signals (for example, switching spikes) may be included in the "RMS of the total waveform" and will be used in the calculation of THD. The display of THD may be seen to fluctuate under these conditions.

6.7 Phase Sequence Test
The voltage and current inputs must be above 5% of nominal for the test to operate reliably.

In three phase four wire mode the measurements are referenced from L1.

For the voltage sequence test the phase of L2 relative to L1 must be within the window 240 +/- 48 degrees and L3 relative to L1 must be within the window 120 +/- 48 degrees to record the sequence V123.

Alternatively, the phase of L2 relative to L1 must be within the window 120 +/- 48 degrees and L3 relative to L1 must be within the window 240 +/- 48 degrees to record the sequence V132.

For the current sequence test the phase of I1 relative to L1 must be within the window 0 +/- 48 degrees, I2 relative to L1 must be within the window 240 +/- 48 degrees, and I3 relative to L1 must be within the window 120 +/- 48 degrees to record the sequence i123.

Alternatively the phase of I1 relative to L1 must be within the window 0 +/- 48 degrees, I2 relative to L1 must be within the window 120 +/- 48 degrees, and I3 relative to L1 must be within the window 240 +/- 48 degrees to record the sequence i132.

In three phase three wire mode the measurements are referenced from L1-L2.

For the voltage sequence test the phase of L2-L3 relative to L1-L2 must be within the window 240 +/- 48 degrees and L3-L1 relative to L1-L2 must be within the window 120 +/- 48 degrees to record the sequence V123.

Alternatively, the phase of L2-L3 relative to L1-L2 must be within the window 120 +/- 48 degrees and L3 relative to L1-L2 must be within the window 240 +/- 48 degrees to record the sequence V132.

For the current sequence test the phase of I1 relative to L1-L2 must be within the window 330 +/- 48 degrees, I2 relative to L1-L2 must be within the window 210 +/- 48 degrees, and I3 relative to L1-L2 must be within the window 90 +/- 48 degrees to record the sequence i123.

Alternatively, the phase of I1 relative to L1-L2 must be within the window 330 +/- 48 degrees, I2 relative to L1-L2 must be within the window 90 +/- 48 degrees, and I3 relative to L1-L2 must be within the window 210 +/- 48 degrees to record the sequence i132.

The voltage and current inputs must be above 5% of nominal for the test to operate reliably.

7. Installation and Maintenance

⚠ **Warning**

> This product relies on its Protective Earth connection, made through the CT terminal block, for safety.
> As such, **under no circumstances** should this product be operated without a Protective Earth connection.

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. Protection provided by the equipment may be impaired if it is used in a manner not specified by the manufacturer. 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. Never open circuit the secondary winding of an energised current transformer. Permanently connected use, Normal Condition Measurement Category III, Pollution Degree 2, for rated voltage. Auxiliary circuit terminals are only suitable for connection to equipment which has no user accessible live parts. The insulation for such auxiliary circuits must be rated for the highest voltage connected to the instrument and suitable for single fault condition. The connection at the remote end of such auxiliary circuits should not be accessible in normal use. Depending on application, equipment connected to auxiliary circuits may vary widely. The choice of connected equipment or combination of equipment should not diminish the level of user protection specified.

7.1 Checks and Cleaning
The front of the case should be gently wiped with a dry cloth only. Do not apply any pressure over the central rectangular display viewing window area. If necessary wipe the rear case with a dry cloth. If a cleaning agent is necessary, isopropyl alcohol is the only recommended agent and should be used sparingly. Water should not be used. If the rear case exterior or terminals should accidentally be contaminated with water, the unit must be thoroughly dried before further service. Should it be suspected that water or other contaminants might have entered the unit, factory inspection and refurbishment is recommended. In normal use, little maintenance is needed. As appropriate for service conditions, isolate electrical power, inspect the unit and remove any dust or other foreign material present. Periodically check all connections for freedom from corrosion and screw tightness, particularly if vibration is present. The front

Modbus is a Trademark of Schneider Automation Inc. Other Trademarks or company names mentioned herein are the property of their respective owners.

display window also acts as an insulating barrier. It is not possible to touch, by hand, any live part, even if the window is completely missing, but if the window is perforated or significantly damaged in any other way, repair is required. In the unlikely event of a repair being necessary, it is recommended that the unit be returned to factory.

7.2 Location and Mounting
Units are suitable for panel mounting only and should be installed in a dry position, where the ambient temperature is reasonably stable and will not be outside the range -10 to +55°C. Vibration should be kept to a minimum. Preferably mount the Integra Ci3 digital meter so that the display contrast is not reduced by direct sunlight or other high intensity lighting. The Integra may be mounted in a standard DIN 96 panel up to a maximum thickness of 5 mm. Mounting is by four integral retention clips. Terminals should be inaccessible after installation. Consideration should be given to the space required above and below the instrument to allow for associated cables. If IP54 ingress protection is required, a panel gasket must be used. The terminals at the rear of the product must be protected from liquids or other contamination. This unit is intended for indoor use only at an altitude of less than 2000m.

7.3 Electromagnetic Compatibility
This unit has been designed to provide protection against EM (electro-magnetic) interference in line with EU requirements 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 the 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, surges and transients must be controlled. It is good EMC practice to suppress transients and surges 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 10 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.

7.4 Terminals
All connections are made to screw clamp terminals. Terminals are suitable for copper wires only and will accept one stranded 0.05 - 2.5mm^2 (30 - 12AWG) stranded or solid core cables. Terminal screws are fully tightened for shipment and must be undone before wire insertion. Terminal screws should be tightened to 0.5 Nm (4.4 lbf in) only.

7.5 Metered Supply Wiring

7.5.1 Input wiring and fusing
This product must be used with external current transformers. Choice of cable should meet local regulations for the operating voltage and current. This unit must be fitted with external fuses in the voltage and auxiliary supply lines. Voltage input lines must be fused with quick blow fuses rated 1A maximum. Auxiliary supply lines must be fused with a slow blow fuse rated 1A maximum. Choose fuses of a type and with a breaking capacity appropriate to the supply and in accordance with local regulations. A switch, or circuit breaker, allowing isolation of supplies to the unit must be provided.

The connection diagram shows how the CTs must be grounded in order to both minimise measurement errors and achieve safety compliance. The Integra Ci3 digital meter relies on the ground connection at the CT terminals as a Protective Earth. Under no circumstances should the Integra Ci3 digital meter be operated without this connection.
CT secondaries must be grounded in accordance with local regulations. It is desirable to make provision for shorting links to be made across CTs to permit easy replacement of a unit should this ever be necessary. Note that the –ve terminals of the three current inputs are internally shorted within the Integra Ci3 digital meter.

8. Auxiliary and Output Connections

8.1 Auxiliary Supply
The auxiliary supply is rated at 100-400V AC ± 10%, 120-350 DC ±20%. The Integra Ci3 digital meter should ideally be powered from a dedicated supply, however it may be powered from the signal source providing the source remains within tolerance of the auxiliary supply voltage range (NB: Max rating for UL installation is 300V AC/DC).

8.2 Output Connections

8.2.1 RS485 module Option
The recommended cable between the RS485 master and the Integra Ci3 digital meter is two core screened cable. Preferably select a cable specifically recommended for RS485 use (for example Belden 9860, 8761) although for shorter distances of a few metres most two core screened cables will usually be satisfactory. Cable length (transmission distance) can be up to 1200 metres in good conditions. Electrical interference or other adverse conditions may reduce the maximum cable length possible.

8.2.2 Pulse Relay Module Option
Up to 2 solid state relays can be fitted, if there is no RS485 module fitted. Relay rating is 250V, 50mA, maximum. Lines connected to these terminals must be either short in length or filtered where appropriate.

8.3 Connection Diagrams

1 PHASE 2 WIRE   3 PHASE 3 WIRE   3 PHASE 4 WIRE
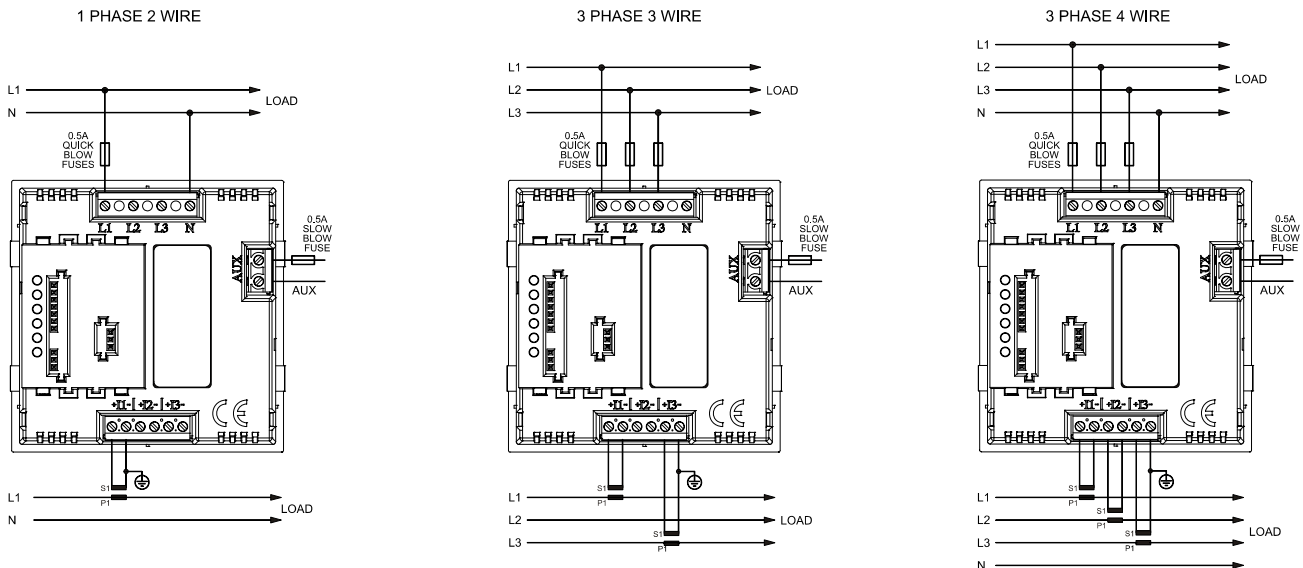
Note: I1, I2, and I3 negative terminals are commoned within the instrument.

This product must not be operated without a Protective Earth ⏚.

9. Specification

Input

Nominal input voltage	100 to 289V AC L-N (173 to 500V AC L-L)
Max. continuous input overload voltage	120% of nominal (Maximum 600V AC L-L)
Max. short duration input voltage	2 x range maximum (1 second application repeated 5 times at 5 minute intervals)
Nominal input voltage burden	< 0.2VA per phase
Nominal input current	5A AC rms
Max. continuous input overload current	120% of nominal
Max. short duration input current	10 x nominal (1 second application repeated 5 times at 5 minute intervals)
Frequency	45 to 66Hz

Auxiliary

Operating range	110 to 400V AC nominal ±10% (99-440V AC absolute limits)
	110 to 300V AC max for UL approved installations
	120 to 350V DC nominal ±20% (96-420V DC absolute limits)
	120 to 300V DC max for UL approved installations

Accuracy

Voltage (V)	0.5% of range maximum
Current (A)	0.5% of range maximum (4% for I2 in three wire mode)
Neutral current calculated (A)	4% of range maximum
Frequency (Hz)	0.1 Hz
Power factor (PF)	1% of unity
Active power (W)	± 1% of range maximum
Reactive power (VAr)	± 1% of range maximum
Apparent power (VA)	± 1% of range maximum
Active energy (kWh)	Class 1 (IEC 62053-21)
Reactive energy (kVArh)	± 1% of range maximum
THD	1% up to 31st harmonic
Response time to step input	1s typical to >99% of final value

Output modules (optional)

Pulsed output relays	1 per module
	(maximum of 2 modules fitted per Integra Ci3 digital meter)
Contact rating	50mA max at 250V AC
Type	Solid state relay
RS485 output module	1 channel per module
	(maximum of 1 module fitted per Integra Ci3 digital meter)
Type	2-wire half duplex
Baud rate	2400, 4800, 9600, 19200, 38400

Enclosure

Style	DIN 96 panel mount
Dimensions	96x96x64.1mm (depth behind panel front without module 58mm, with module 82.5mm)
Panel cut-out	92x92mm
Panel thickness	1 to 5mm
Front protection rating	IP52
Case protection rating	IP30
Material	Polycarbonate to UL94V0
Weight	300g
Terminals	Shrouded screw-clamp 0.05 to 2.5mm^2 wire Tighten to 0.5 Nm (4.4 lbf in)

Environmental

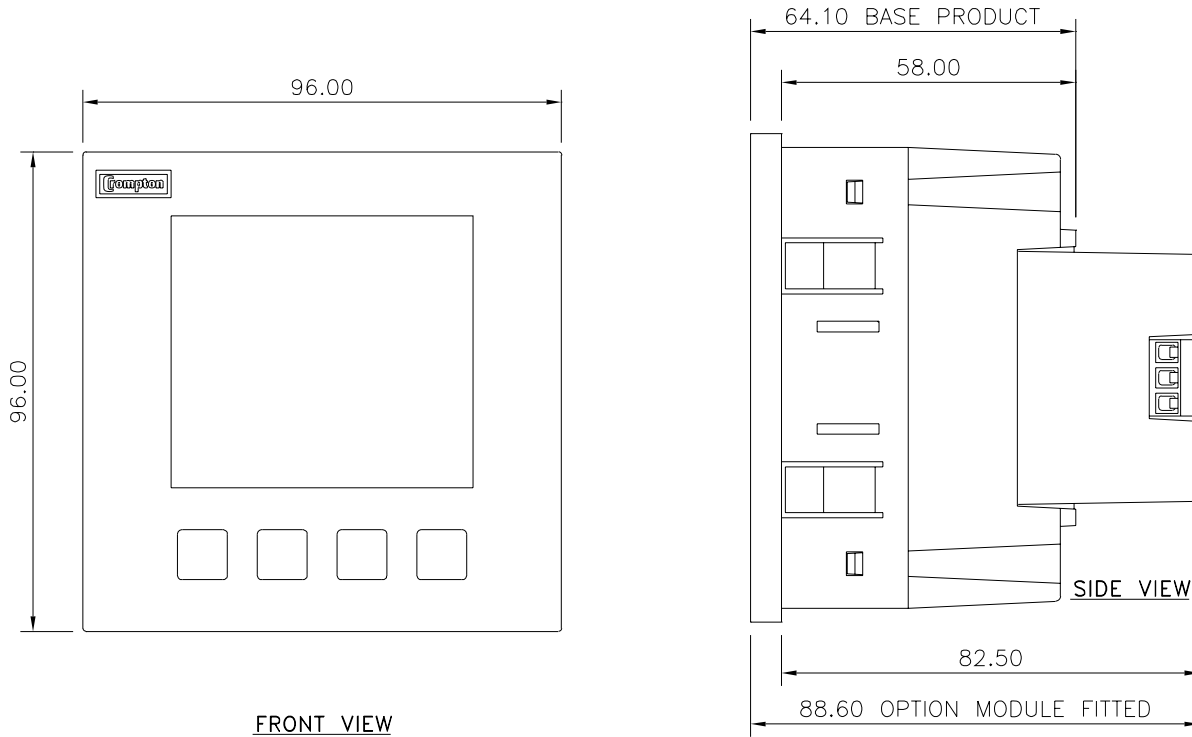|	
Operating temperature	-10°C to +55°C
Storage temperature	-20°C to +70°C
Relative humidity	0 to 90% non-condensing
Shock	30g in 3 planes
Vibration	10Hz to 50Hz, IEC 60068-2-6, 2g
Dielectric voltage Withstand test	2.2kV rms 50Hz for 1 minute between Measuring Voltage Inputs to RS485 and Relay, and between Auxiliary to RS485 and Relay.

10. Dimensions

FRONT VIEW

SIDE VIEW

11. Panel cut-out
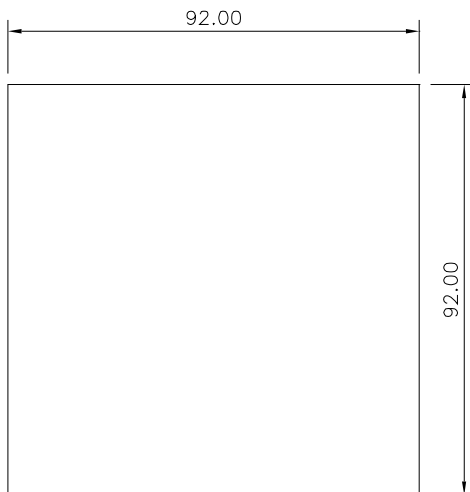
12. Graphical Symbols and Warnings

The following symbols may appear in this user guide, and may also be affixed to the products discussed in this guide:

Symbol	Description
⏚	Earth terminal
⏦	Protective conductor terminal
⚡	Caution, Risk of electric shock
⚠	Caution, Refer to accompanying text