



Integra Digital Metering System

a vital part of your world

Integra Digital Metering Systems

The Integra product portfolio offers an extensive range of digital metering systems designed to suit any power monitoring application. These multi-function products replace the need for numerous single function instruments, providing significant cost savings and reduced wiring times for all new or retrofit projects.

Integra digital metering systems provide fully programmable, highly accurate measurement, display and communication of all major electrical and power quality parameters, including true rms system values, power quality data and measurement of total harmonic distortion. Designed to meet customer requirements, the Integra portfolio offers optional pulsed, analogue and digital communication outputs, DIN or ANSI case styles and high quality LED or LCD displays.



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Features

- Measurement, display and communication of electrical and power parameters
- High contrast LED or LCD display
- Annunciators for each measured parameter
- THD measurement and power quality data to 31st harmonic
- True rms and average sensing measurement
- Pulsed, analogue and digital outputs
- Modbus, Johnson Controls, Lonworks and Profibus interface options
- Fully programmable VT and CT ratios
- Industry standard case styles

Benefits

- Replaces multiple single function instruments
- Pre-calibrated plug-in options
- High accuracy
- Simple menu driven interface
- Remote monitoring
- Neutral CT input option
- True 3-and 4-wire measurement
- Monitoring, control and protection of expensive power assets

Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Embedded generation
- Energy management
- Building management
- Utility power monitoring
- Process control
- Motor monitoring
- Ground power units

Approvals

- UL



Integra 1530



Integra 2000



Integra 540



Integra 510

DIN Integra Digital Metering Specification Overview

	Integra 510	Integra 520	Integra 530	Integra 540	Integra 2000	Integra 1530	Integra 1630
96mm (3.78") x 96mm (3.78")	✓	✓	✓	✓	✓	✓	✓
Panel cut-out 92mm x 92mm (3.62")	✓	✓	✓	✓	✓	✓	✓
IP54 protection	✓	✓	✓	✓	✓	✓	✓
Single-phase system						✓	✓
Single-phase 3-wire system						✓	
3-phase 3-wire system	✓	✓	✓	✓	✓	✓	✓
3-phase 4-wire system	✓	✓	✓	✓	✓	✓	✓
3-phase 4-wire with neutral CT						✓	
3-line 4-digit LCD display	✓	✓	✓	✓			
Graphical backlit LCD display					✓		
3-line 4-digit LED display						✓	✓
Programmable display	✓	✓	✓	✓	✓	✓	✓
Programmable VT ratios					✓	✓	✓
Programmable CT ratios	✓	✓	✓	✓	✓	✓	✓
Configuration software option						✓	✓
Measured parameters							
Voltage line-to-line	✓	✓	✓	✓	✓	✓	✓
Voltage line-to-neutral	✓	✓	✓	✓	✓	✓	✓
System voltage	✓				✓	✓	✓
Current L1, L2, L3	✓	✓	✓	✓	✓	✓	✓
System current	✓				✓	✓	✓
Neutral current calculated					✓	✓	✓
Neutral current measured						✓	
Frequency 45-66Hz	✓				✓	✓	✓
Demand current		✓	✓	✓	✓	✓	✓
Max demand current		✓	✓	✓	✓	✓	✓
Demand active power					✓	✓	✓
Max demand active power					✓	✓	✓
Power factor					✓	✓	✓
Active power kW					✓	✓	✓
Reactive power kVAR					✓	✓	✓
Apparent power kVA					✓	✓	✓
kW demand					✓	✓	✓
Active energy kWh import					✓	✓	✓
Reactive energy kVAR import					✓	✓	✓
Active energy kWh export					✓	✓	✓
Reactive energy kVAR export					✓	✓	✓
Voltage % THD average						✓	✓
Voltage % THD L1, L2, L3						✓	✓
Current % THD average						✓	✓
Current % THD L1, L2, L3						✓	✓
Hours run							✓
Communication options							
Digital RS485 Modbus RTU					✓	✓	✓
Pulsed output					✓	✓	✓
Trip relay outputs			✓	✓			
Analogue outputs					✓	✓	
Lonworks					✓	✓	
Profibus						✓	
Johnson Controls Metasys NII					✓	✓	✓
Compliant with							
UL3111-1	✓	✓	✓	✓			
UL 61010B-1						✓	
IEC 1010-1 / BSEN 61010-1 CAT III	✓	✓	✓	✓	✓	✓	✓
IEC 688 / BSEN 60688	✓	✓	✓	✓			
Approvals							
UL file no. E20300						✓	



DIN Integra 1630 Series

Multifunction Integra 1630 digital metering systems provide high accuracy 0.2% measurement, display and communication of all major electrical and power quality parameters including total harmonic distortion (THD) measurement up to the 31st harmonic. To suit user requirements, the range includes single-phase, 3-phase 3-wire and 3-phase 4-wire capability, all selectable at the point of installation.

This DIN 96 panel mounted enclosure offers simple programming and display of up to 35 electrical measurement parameters via a simple menu-driven user interface on the front panel. Integra 1630 digital metering system benefits from optional pulsed and digital communication outputs. This allows enhanced status information of up to 60 measured parameters to be communicated to SCADA, building management or other systems. Additionally, a simple Windows-based software package is available to remotely configure the Integra and display all 60 major electrical and power quality parameters.

Operation

The multifunction Integra 1630 digital metering system offers uncomplicated operation and high accuracy measurement of three-phase voltage, current, frequency, Watts, VAR, VA, energy, power factor, and total harmonic distortion measurement of both phase and system, current and voltage.

3-phase 4-wire system line-to-line voltage measurements are often a vector calculation of the line-to-neutral voltage measurements. However, Integra 1630 digital metering system includes true measurement of both line-to-neutral, and line-to-line measurements, ensuring accurate readings even with unusual wiring configurations (e.g. 4-wire open delta). To suit the requirements of individual power monitoring applications, the Integra 1630 digital metering system offers simple programming and display via the menu driven interface. Alternatively, an optional Windows-based software package can be used for remote configuration and monitoring. Once configured by either method, simultaneous monitoring of up to 60 electrical and power quality variables can be communicated to building management systems via pulsed or digital communication options.

If customer requirements extend beyond the original specified capabilities, the functionality of this innovative product is easily enhanced to meet new client expectations. Integra plug-in option modules allow cost effective upgrades with any combination of pulsed and digital communication outputs. The option module is interchangeable without recalibration.

Accuracy

Integra 1630 digital metering systems utilise true rms measurement techniques up to the 31st harmonic. An exceptional tolerance to high harmonic frequencies is achieved from a robust frequency detection method, which is able to detect the fundamental frequency on any phase. For safe maintenance, the system indicates CT current in the absence of voltage signals.

System Input

Designed for all low, medium and high voltage switchgear and distribution systems, the Integra 1560 and 1580 digital metering system offer programmable VT and CT ratio capability. Direct connection up to 480V ac with 5A CT inputs is standard, and 1A CT inputs are optional.



Features

- Low profile
- High contrast LED display
- LED annunciators for each measured parameter

- User programmable system configuration (4-wire default)
- Fully programmable VT and CT ratios
- Current demand per phase
- Elapsed time counter for connected loads
- Removable bezel for very low profile applications

Benefits

- True rms measurement
- High accuracy <0.2% on some measurements
- Configurable via software package or menu-driven interface
- Import and export monitoring

Applications

- Switchgear distribution systems
- Control panels
- Embedded generation
- Energy management
- Building management
- Utility power monitoring
- Process control
- Motor monitoring

Compliant

IEC1010-1 (BSEN 61010-1 – 2001)



Measurement and Display

Up to 35 electrical and power quality parameters can be configured and displayed.

- 1 System (average) volts
System (average) current
System (total) kW
- 2 System volts (average) THD%
System current (average) THD%
- 3 Volts L1-N
Volts L2-N
Volts L3-N
(4-wire only)
Volts L1-L2
Volts L2-L3
Volts L3-L1
(3-wire only)
- 4 Volts L1-N THD%
Volts L2-N THD%
Volts L3-N THD%
(4-wire only)
Volts L1-L2 THD%
Volts L2-L3 THD%
Volts L3-L1 THD%
(3-wire only)
- 5 Volts L1-L2
Volts L2-L3
Volts L3-L1
(4-wire only)
- 6 Current L1
Current L2
Current L3
- 7 Current line 1 THD %
Current line 2 THD %
Current line 3 THD %
- 8 Neutral current
(4-wire only)
Frequency
Power factor (overall)
- 9 kVAh kVA kW
- 10 kW Hr import (7-digit resolution)
- 11 kVAh import (7-digit resolution)
- 12 kW Hr export (7-digit resolution)
- 13 kVAh export (7-digit resolution)
- 14 kW demand
Current demand
- 15 Maximum kW demand Maximum
current demand
- 16 Hours run

System Outputs

Pulsed outputs

Integra 1630 digital metering system offers optional single or dual pulsed outputs. Each output can be user programmed to represent import or export kWh, import or export kVAh or kVAh. The output pulses can be customised by both user programmable pulse rate divisor and pulse width. The solid state output relays have fully isolated volt-free connections via screw-clamp terminals.

Digital Communications

RS485 Modbus RTU

Integra 1630 digital metering systems offer an RS485 communication port for direct connection to SCADA systems using the Modbus RTU protocol or the Johnson Controls Metasys NII protocol. Remote monitoring enables the user to record systems parameters in real time, using high resolution numbers. The Integra establishes the format for the master's query automatically, and responds with the correct protocol using IEEE floating point values. The Modbus option also offers user programmable word order and support for function 8 subfunction 0, return query data diagnostic.

Enhanced status information of up to 60 measured parameters can be communicated to building management systems via the optional digital communications output. Any of 5 energy parameters can be output as pulses via optional pulse relay outputs.

Programmable Display

A two-button interface on the front panel of Integra 1630 units provides simple programming of system configuration (3-phase 4-wire etc), VT and CT ratio settings, configuration of selected communication options, and adjustment of operating parameters. To prevent unauthorised access to the product configuration settings, all set-up screens offer password protection. Once configured, status information can be viewed by scrolling through 16 screens featuring a high contrast 3-line, 4-digit LED display, with separate annunciators for each of the 35 measured parameters. Optional pulsed or digital outputs allow enhanced status information of up to 60 measured parameters to be communicated to building management systems.



Programmable Parameters

Parameter	Range
Password:	4-digit 0000-9999
CT primary current:	Maximum 9999A ** CT Secondary Current: 5A (1A option)
VT primary voltage:	Maximum 400kV **
VT secondary voltage:	Nominal input voltage ** maximum VT or CT ratios are limited so that the combination of primary voltage and current do not exceed 360MW at 120% of relevant input
Demand integration time:	8, 15, 20, 30, 60 minutes
3 independent resets:	Demands and maximum demands Energy registers Hours run
Pulse output duration:	60, 100, 200 milliseconds
Pulse rate divisors:	1, 10, 100, 1000
RS485 baud rate:	4.8, 9.6, 19.2, 38.4 kBd
RS485 parity and stop bits:	Odd or even with 1 stop bit or no parity with 1 or 2 stop bits

Specifications

Input	Value
Nominal input voltage:	57.7 to 277V L-N, 100 to 480V L-L
Max. continuous input voltage:	120% nominal
Max. short duration input voltage:	2 x nominal for 1 second, repeated 10 times at 10 second intervals
System VT ratios (primary):	Any significant 4-digit integer value up to 400kV **
Nominal input voltage burden:	< 0.2 VA
Nominal input current:	5A (1A option)
System CT primary values:	Any integer value up to 9999A **
Max. continuous input current:	120% nominal
Max. short duration input current:	20 x nominal for 1 second, repeated 5 times at 5 minute intervals
Nominal input current burden:	< 0.6 VA ** maximum CT and VT ratios are limited so that the combination of primary voltage and current do not exceed 360MW at 120% of relevant input

Outputs (optional)	
RS485 communications:	2-wire half duplex
Baud rates:	4800, 9600, 19200, 38400
Pulsed:	Solid state relays
Pulse duration:	60, 100 or 200 milliseconds
Contact rating	50mA max at 250V ac max.
Pulsed outputs:	1 or 2

Auxiliary	
Standard nominal supply voltage:	100-250V ac or dc (85-287V ac absolute limits) (85-312V dc absolute limits)
AC supply frequency range:	45-66Hz
AC supply burden:	6VA
Optional auxiliary dc supply:	12-48V dc (10.2-60V dc absolute limits)
DC supply burden:	6VA

Accuracy Defined

*Error in energy readings is expressed as a percentage of the energy count that would result from applying range maximum voltage and nominal current for the same measurement period.

Error change due to variation of an influence quantity (except temperature) by varying one influence quantity within range of use, whilst keeping all other influence quantities at their nominal value is less than twice the error allowed for the reference condition applied in the test.

(This definition is applied to limit the number of combinations to be applied during type tests)

Error due to temperature variation is as above.

Error in measurement when a measurand is within its measuring range, but outside its reference range is less than twice the error allowed at the end of the reference range adjacent to the section of the measuring range where the measurand is currently operating / being tested.

*Error in energy readings is expressed as a percentage of the energy count that would result from applying a range maximum voltage and nominal current for the same measurement period.

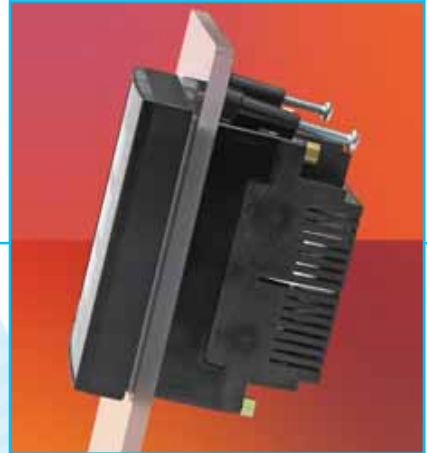


Measuring Ranges	
Voltage:	80-120% of nominal (functional 5-120%)
Current:	5-120% of nominal
Frequency:	45-66Hz
Power factor:	0.8 capacitive-1-0.8 inductive (functional 4 quadrant, 0-1 lag/lead)
THD:	Up to 31st harmonic 0-40% Measured voltage >5% of range Measured current >5% of nominal Full accuracy of voltage >25% of range Full accuracy of current >25% of nominal
Energy:	7-digit resolution

Reference conditions	
Ambient temperature:	23 ±1°C
Input frequency:	50 or 60Hz ±2%
Input waveform:	Sinusoidal (distortion factor < 0.005)
Auxiliary supply voltage:	Nominal ±1%
Auxiliary supply frequency:	Nominal ±1%
AC auxiliary supply waveform:	Sinusoidal (distortion factor < 0.05)
Magnetic field of external origin:	Terrestrial flux

Accuracy	
Voltage:	±0.17% of range maximum
Current:	±0.17% of nominal
Frequency:	0.15% of mid frequency
Active power:	±0.2% of range maximum
Power factor:	1% of unity
Reactive power (VAR):	±0.5% of range maximum
Apparent power (VA):	±0.2% of range maximum
THD:	±1%
Neutral current calculated:	±0.95% of nominal
Energy:	0.3% of range maximum (Better than class 1) IEC1036 Sect 4.6)
kVAh:	0.6% of range maximum
Temperature coefficient:	Voltage and current typical: 0.013%/°C Watts typical: 0.018%/°C

Enclosure	
Enclosure style:	DIN 96 panel mount
Compliant with:	IEC 1010-1/ BSEN 61010-1 : 2001 CAT III, CE EMC and LVD directives
Material:	Polycarbonate
Terminals:	Shrouded screw-clamp 0.05mm to 4mm wire
Dielectric voltage:	Withstand test 3.25kV rms 50Hz for 1 minute between all electrical circuits
Operating temperature:	-20 to +60°C
Storage temperature:	-30 to +80°C
Relative humidity:	0-90% (non condensing)
Warm-up time:	1 minute
Shock:	30g in 3 planes
Vibration:	10-18Hz, 1.5mm peak-to-peak 18-150Hz @1g
IP protection:	IP54
Dimensions:	96mm wide x 96mm high x 79mm deep (max). Typically <60mm depth behind panel 3.78" wide x 3.78" high x 3.11" deep (max)
Panel cut-out:	92mm x 92mm, 3.62" x 3.62"



Product Codes

INT - XX XX - X - X - X - XXX

Product family	System type	Input V	Input I	Auxiliary V	Options
16	30-LED DIN96	L - 57.7 - 139 L - N (100 - 240 L - L)	5-5A 1-1A	L - 12-48V dc M - 100-250V	000 - No Option 010 - Modbus
Low Profile	User Selectable System Type	M - 140 - 277 L - N (241 - 480 L - L)		ac/dc 110 -	100 - One Pulse One Pulse One Modbus
Features as Specified	Factory Default - 4 Wire				200 - Two Pulse 210 - Two Pulse One Modbus

Pre-configured Spares/Options

The functionality of existing Integra 1630 digital metering system products can be easily upgraded with the use of Crompton preconfigured plug-in cards.

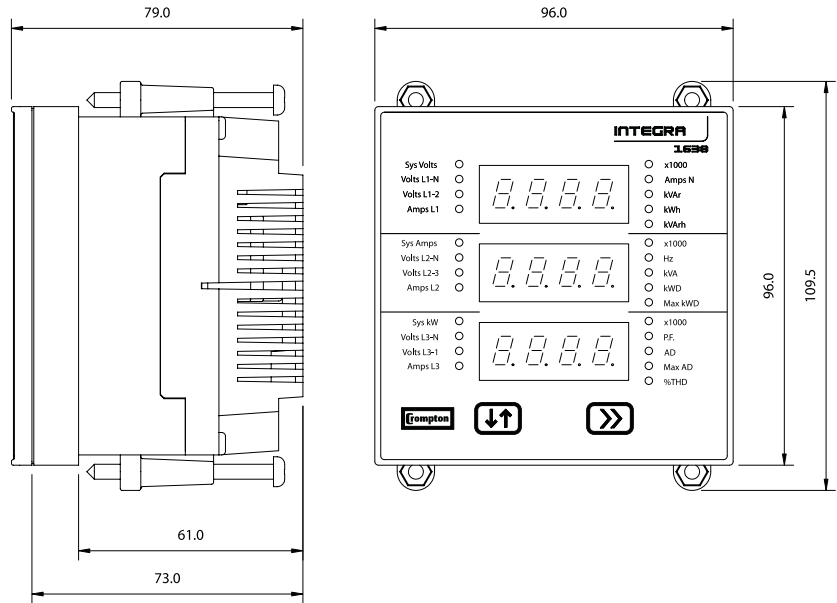
Option code	Description
OPT-1630-M-010	Modbus communications card with 100-250V auxiliary
OPT-1630-M-100	Single pulsed output card with 100-250V auxiliary
OPT-1630-M-110	Single pulsed modbus card with 100-250V auxiliary
OPT-1630-M-200	Dual pulsed card with 100-250V auxiliary
OPT-1630-M-210	Dual pulsed modbus card with 100-250V auxiliary
OPT-1630-L-010	Modbus communications card with 12-48V dc auxiliary
OPT-1630-L-100	Single pulsed output card with 12-48V dc auxiliary
OPT-1630-L-110	Single pulsed modbus card with 12-48Vdc auxiliary
OPT-1630-L-200	Dual pulsed card with 12-48Vdc auxiliary
OPT-1630-L-210	Dual pulsed modbus card with 12-48Vdc auxiliary

Order Code Example

INT-1630-M-5-M-110

Integra 1630 digital metering system, 3-phase 4-wire, nominal input voltage, 140-277V L-N (241-480V) L-L, 5A CT input, auxiliary supply 100 to 250V ac or dc, one relay pulsed output and one RS485 Modbus communication port.

Dimensions



Import and Export Connections

The connections diagrams opposite assume an import power configuration; therefore any power flow towards the load will register as imported energy. If power flows away from the load in an export power situation, then the power will register as exported energy.

Auxiliary Supply

The Integra 1630 digital metering system should ideally be powered from a dedicated supply: either 100-250 ac, dc (85–280V ac absolute or 85-315V dc absolute), or 12-48V dc (10.2-60V dc absolute). However, the device may be powered from the signal source, provided the source remains within the working range of the chosen auxiliary supply.

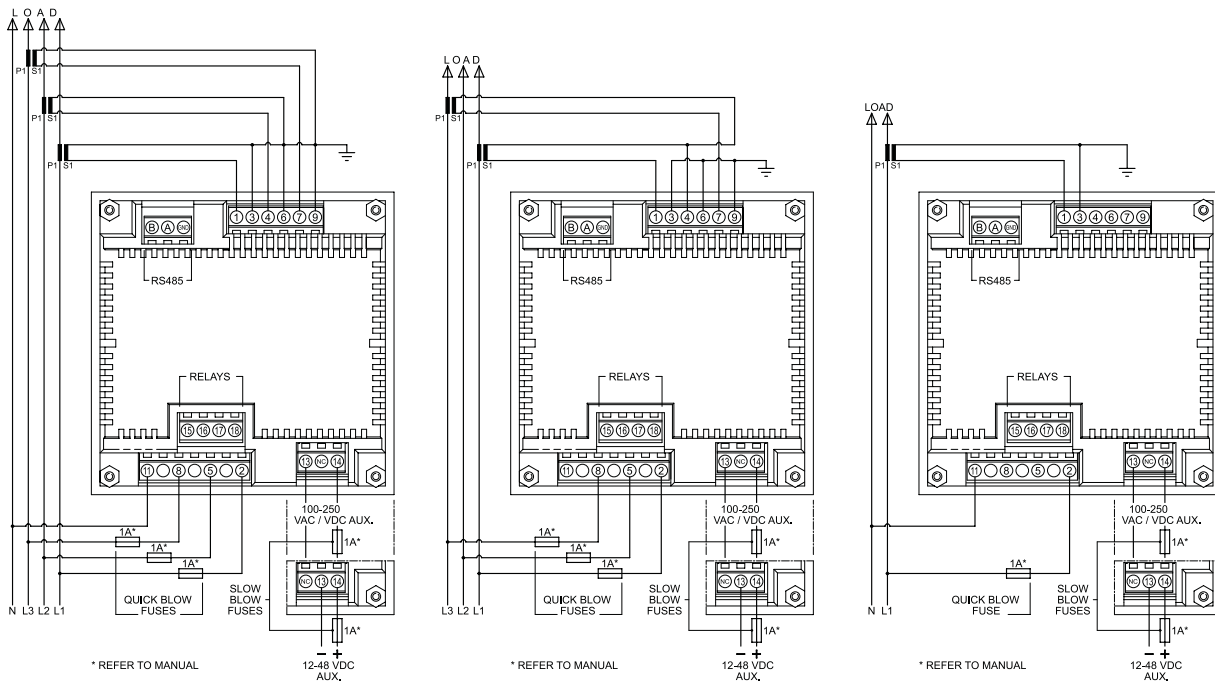
Fusing

It is recommended that all voltage lines be fitted with 1 amp fuses.

Safety/Ground Connections

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

Wiring



DIN Integra 1530 Series

Multi-function Integra 1530 digital metering systems provide high accuracy <0.2% measurement, display and communication of all major electrical and power quality parameters, including true rms system values, power quality data and total harmonic distortion (THD) measurement up to the 31st harmonic. To meet customer requirements, the range comes in single-phase, single-phase 3-wire, 3-phase 3-or 4-wire, and 3-phase 4-wire with neutral CT configurations.

This DIN 96 panel mounted enclosure offers simple programming and display of up to 34 power measurement parameters via a simple menu driven user interface on the front panel. Integra 1530 provides optional pulsed, analogue and digital communication outputs, allowing the communication of enhanced status information of up to 50 measured parameters into building management systems. Additionally, a simple Windows-based software package is available to remotely configure, monitor and communicate all 50 major electrical and power quality parameters.

Operation

Integra 1530 offers uncomplicated operation and high accuracy <0.2% measurement of three phase voltage, current, frequency, watts, VAr, VA, energy, power factor, and total harmonic distortion measurement of both phase and system, current and voltage. Usually 3-phase 4-wire system line-to-line voltage measurements are usually derived from calculating the vector of line-to-neutral voltage measurements. However, Integra 1530 readings even under phase fault conditions by providing true measurement of both line-to-neutral, and line-to-line measurements.

For individual power monitoring applications, the Integra 1530 offers simple programming and display, via the menu driven interface. An optional Windows-based software configuration package can be used for remote configuration and monitoring. Up to 50 electrical and power quality variables can be communicated into building management systems via pulsed, analogue or digital communication options.

Functionality is easily enhanced to meet new client expectations. Integra pre-calibrated plug-in option cards allow cost effective upgrades with any combination of pulsed, analogue and digital communication outputs. Cards slot simply into the back of the unit and products do not need to be removed from the installation or recalibrated.

Accuracy

Integra 1530 digital metering systems utilise true rms measurement techniques up to the 31st harmonic, providing <0.2% accuracy. The robust frequency detection method, able to lock the fundamental frequency onto any phase, results in an exceptional tolerance to high harmonic frequencies. High integrity measurements are possible where the system approximates CT current in the absence of voltage signals.

System Input

Designed for all low, medium and high voltage switchgear and distribution systems, the Integra 1530 offers programmable VT and CT ratio capability. Direct connection for up to 480V ac with 5A CT inputs is standard, and 1A CT inputs available as an option.

Neutral CT Input Option

High harmonic environments can produce unexpected and dangerous neutral currents. Traditional 3-phase systems are only able to calculate the vector of line-to-neutral current measurements, which may not register the true reading. Integra 1530 offers a 3-phase 4-wire version with a neutral 4th CT, allowing true neutral current measurement and protection in high harmonic environments.



Features

- Measure and display up to 34 electrical and power parameters
- Measure and communicate up to 50 electrical and power parameters
- High-contrast red LED display
- LED annunciators for each measured parameter
- THD measurement and power quality data to 31st harmonic
- True rms measurement
- Pulsed, analogue and digital outputs
- Modbus, Johnson Controls, Lonworks and Profibus interface options
- Fully programmable VT and CT ratios

Benefits

- Replaces multiple single function instruments
- Pre-calibrated plug-in options
- High accuracy <0.2%
- Configurable via software package or menu driven interface
- Import and export monitoring
- Neutral CT input option
- True 3-and 4-wire measurement

Applications

- Switchgear
- Distribution systems
- Control panels
- Embedded generation
- Energy management
- Building management
- Utility power monitoring
- Process control
- Motor monitoring

Compliant With

- UL file no: E20300
- UL 61010B-1
- IEC 1010-1/BSEN 61010-1 CAT III



System Outputs

Pulsed Outputs

Integra 1530 digital metering system provides optional single or dual-pulsed outputs enabling the retransmission of kWh and kVARh time-based parameters. Outputs are pulsed proportionally to the measured kWh active energy, with pulse width and rate easily programmable either locally or remotely. Output relays have fully isolated volt-free contacts, with screw-clamp connection terminals.

Analogue Outputs

Supplies up to two analogue outputs, enabling onward transmission of linear parameters with industry standard analogue signals. Each analogue channel can be assigned to one of 47 measured parameters with an output span fully adjustable to customer requirements and can be configured to operate in normal, reverse, threshold or constant current modes. Both analogue outputs share a common return which is galvanically isolated from non-analogue output terminals.

Digital Communications

RS485 Modbus RTU

Integra 1530 digital metering systems offer a RS485 communication port for direct connection to SCADA systems using Modbus RTU or Johnson Controls Metasys NII protocols. Remote monitoring enables the user to record system parameters in real time using high-resolution numbers. The Modbus protocol establishes the format for the master's query by placing it into the device address. The slave's response is also constructed using Modbus protocol; it contains the fields confirming the action taken, the data to be returned, and an errorchecking field. The Modbus option includes function 8 subfunction 0, which provides return query data diagnostic support, and the ability to change Modbus word order to suit user requirements.

Lonworks Interface

The Lonworks interface option is designed according to the LonMark Interoperability Guidelines version 3.2. This ensures Integra digital metering systems can be integrated into a single control network without requiring custom node or network tool development.

Profibus

The Profibus interface option allows Integra 1530 to communicate over a Profibus-DP network as a slave device. Integra can automatically detect the master's baud rate and communicates at data rates of up to 12Mbit via a Profibus standard 9-way D type connector over the optically isolated RS485 port. The interface supports standard DP protocol functionality, Class 1 and Class 2 services and networks can be configured using the GSD file.

INT-SOFT Communication and Configuration Software

Configuration of system parameters, outputs, pulsed relays, current and power demand are easily programmed through the INT-SOFT Windows style user interface, installable on any PC running Windows 95, NT or 2000. Communication to Integra 1530 is made with a Modbus connection to a PC COM port via a RS485/RS232 converter.

Configuration software allows the user to load and save configurations to a PC hard disk and to send and retrieve settings directly from the Integra 1530. Settings can also be copied between individual Integra units.

Status information is usually communicated into a building management system, but can also be monitored through the configuration software. The software queries the selected Integra 1530 every few seconds to obtain data, which can be viewed on a dedicated measurements page.

For more detailed information, please refer to the INT-SOFT Communication and Configuration Software section of this brochure.

Programmable Display

A two-button interface on the front panel of Integra 1530 units enables the simple programming of VT and CT ratio settings, configuring selected communication options, and adjusting operating parameters. To prevent unauthorised access to configuration settings, all set-up screens offer password protection. Once configured, status information can be viewed by scrolling through 15 screens featuring a high contrast 3-line, 4-digit LED display with separate annunciators for each of the 34 measured parameters. Optional pulsed, analogue or digital outputs allow enhanced status information of up to 50 measured parameters to be communicated into building management systems.

Programmable Parameters

Parameter	Range
Password:	4-digit, 0000-9999
Primary current:	Max 9999:5A (360MW max ^{**})
VT primary:	400kV (360MW max ^{**})
Secondary voltage:	Nominal system voltage ^{**} maximum VT and CT ratios are limited so that the combination of primary voltage and current does not exceed 360MW at 120% of relevant input
Demand integration time:	8, 15, 20, 30 and 60 minutes
Reset:	Max demand & active energy registers
Pulse output duration:	60, 100, 200 ms
Pulse rate divisors:	1, 10, 100, 1000
RS485 interface baud rate:	2.4, 4.8, 9.6, 19.2kB
RS485 parity:	Odd / even / no, 1 or 2 stop bits
Modbus address:	1-247
Analogue outputs:	User definable

Specifications

Input	
Nominal input voltage:	57.7 to 277V L-N, 100 to 480V L-L
Max continuous input voltage:	120% of nominal
Max short duration input voltage:	2 x for 1 second, repeated 10 times at 10 second intervals
System VT ratios (primary):	Any value up to 400kV ^{**}
Nominal input voltage burden:	< 0.2 VA
Nominal input current:	5A (1A option)
System CT primary values:	9999:5A or 9999:1A max 360MW ^{**}
Max continuous input current:	120% nominal
Max short duration current input:	20 x for 1 second, repeated 5 times at 5 second intervals
Nominal input current burden:	< 0.6 VA ^{**} maximum VT and CT ratios are limited so the combination of primary voltage and current does not exceed 360MW at 120% of relevant input
Outputs (optional)	
RS485 communications:	2-wire half duplex
Baud rates:	2400, 4800, 9600, 19200
Pulsed:	Clean contact SPNO
Pulse duration:	60, 100 or 200 milliseconds
Pulsed outputs:	1 or 2
Analogue outputs:	1 or 2
Auxiliary	
Standard nominal supply voltage:	100-250V, ac or dc (85-287V, ac absolute) (85-312V, dc absolute)
AC supply frequency range:	45-66Hz
AC supply burden:	6VA
Optional auxiliary dc supply:	12-48V, dc (10.2-60V, dc absolute)
dc supply burden:	6 VA



Measurement and Display

Up to 34 electrical and power quality parameters can be configured and displayed on the Integra 1530 unit.

- System volts
System current
System kW
 - System volts THD %
System current THD %
 - Volts L1-N (4-wire only)
Volts L2-N (4-wire only)
Volts L3-N (4-wire only)
 - Volts L1-L2
Volts L2-L3
Volts L3-L1
 - Volts line 1 THD %
Volts line 2 THD %
Volts line 3 THD %
 - Current L1
Current L2
Current L3
 - Current line 1 THD %
Current line 2 THD %
Current line 3 THD %
 - Neutral current (4-wire only)
Frequency
Power factor
 - kVAr
kVA
kW
 - kWh import (7-digit resolution)
 - kVArh import (7-digit resolution)
 - kWh export (7-digit resolution)
 - kVArh export (7-digit resolution)
 - kW demand
Current demand
 - kW maximum demand
Current maximum demand
- Enhanced status information of up to 50 parameters can be communicated into building management systems via optional pulsed, analogue and digital outputs.

Accuracy Definition

Error change due to variation of an influence quantity in the manner described in section 6 of IEC688:1992

2 * Error allowed for the reference condition applied in the test. Error in measurement when a measured quantity is within its measuring range, but outside its reference range.

2 * Error allowed at the end of the reference range adjacent to the section of the measuring range where the measured quantity is currently operating / being tested.

THD accuracy relates to a typical harmonic profile.

Specifications continued

Measuring ranges	
Voltage:	80-120% of nominal (functional 5-120%)
Current:	5-120% of nominal
Frequency:	45-66Hz
Power factor:	0.8 capacitive – 1 – 0.8 inductive (functional 4 quadrant, 0-1 lag/lead)
THD:	Up to 31st harmonic (0%-40%)
Energy:	7-digit resolution
Reference conditions	
Ambient temperature:	23°±1°C
Input frequency:	50 or 60Hz ±2%
Input waveform:	Sinusoidal (distortion factor < 0.005)
Auxiliary supply voltage:	Nominal ±1%
Auxiliary supply frequency:	Nominal ±1%
AC auxiliary supply waveform:	Sinusoidal (distortion factor < 0.05)
Magnetic field of origin:	Terrestrial flux
Accuracy	
Voltage:	±0.17% of range maximum
Current:	±0.17% of nominal
Frequency:	0.15% of mid frequency
Active power:	±0.2% of range maximum
Power factor:	1% of unity
Reactive power (VAr):	±0.5% of range maximum
Apparent power (VA):	±0.2% of range maximum
THD:	±1%
Neutral current calculated:	±0.95% of nominal
Neutral current measured:	±0.17%
Energy:	0.3% of range maximum (Better than class 1 IEC1036 Sect 4.6)
KVArh:	0.6% of range maximum
Temperature coefficient:	Voltage & current typical: 0.013%/°C Watts typical: 0.018%/°C
Update time:	Display: 1 second. Optional digital port: 250ms
Analogue output:	±0.2%
Enclosure	
Enclosure style:	DIN 96 panel mount
Compliant with:	UL E20300, UL61010B-1, IEC 1010-1/ BSEN 61010-1 CATIII, EMC and LVD
Material:	Polycarbonate
Terminals:	Shrouded screw-clamp
Dielectric voltage:	Withstand test 3.25kV rms 50Hz for 1 minute between all electrical circuits
Operating temperature:	-20 to +60°C
Storage temperature:	-30 to +80°C
Relative humidity:	0-90% (non condensing)
Warm-up time:	1 minute
Shock:	30g in 3 planes
Vibration:	10-15Hz, 1.5mm peak-to-peak / 15-150Hz @ 1g
IP protection:	IP54
Dimensions:	96mm wide x 96mm high x 149mm deep (max) 3.78" wide x 3.78" high x 5.87" deep (max)
Panel cut-out:	92mm x 92mm, 3.62" x 3.62"

Product Codes

Product code	Product configuration																																																																																					
INT-1531-*.**.*-option.****	Integra 1530 single-phase																																																																																					
INT-1532-*.**.*-option.****	Integra 1530 single-phase 3-wire																																																																																					
INT-1533-*.**.*-option.****	Integra 1530 3-phase 3-wire																																																																																					
INT-1534-*.**.*-option.****	Integra 1530 3-phase 4-wire																																																																																					
INT-1535-*.**.*-option.****	Integra 1530 3-phase 4-wire with neutral CT																																																																																					
Input voltage suffix *																																																																																						
L	100-240V L-L (57.7-139V L-N)																																																																																					
M	241-480V L-L (140-277V L-N)																																																																																					
Input range suffix **																																																																																						
1	1A CT input																																																																																					
5	5A CT input																																																																																					
Auxiliary supply suffix ***																																																																																						
L	12-48V dc																																																																																					
M	100-250V ac/dc																																																																																					
Communications options																																																																																						
	<table border="1"> <thead> <tr> <th>KWh pulsed output</th> <th>RS485 Modbus or Johnson Controls Metasys NII</th> <th>Lonworks interface</th> <th>Profibus interface</th> <th>Analogue output</th> </tr> </thead> <tbody> <tr> <td>000-display only</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>001</td> <td></td> <td></td> <td></td> <td>1</td> </tr> <tr> <td>002</td> <td></td> <td></td> <td></td> <td>2</td> </tr> <tr> <td>010</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>011</td> <td>1</td> <td></td> <td></td> <td>1</td> </tr> <tr> <td>012</td> <td>1</td> <td></td> <td></td> <td>2</td> </tr> <tr> <td>030</td> <td></td> <td>1</td> <td></td> <td></td> </tr> <tr> <td>050</td> <td></td> <td></td> <td>1</td> <td></td> </tr> <tr> <td>100</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>101</td> <td>1</td> <td></td> <td></td> <td>1</td> </tr> <tr> <td>102</td> <td>1</td> <td></td> <td></td> <td>2</td> </tr> <tr> <td>110</td> <td>1</td> <td>1</td> <td></td> <td></td> </tr> <tr> <td>111</td> <td>1</td> <td>1</td> <td></td> <td>1</td> </tr> <tr> <td>112</td> <td>1</td> <td>1</td> <td></td> <td>2</td> </tr> <tr> <td>200</td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>210</td> <td>2</td> <td>1</td> <td></td> <td></td> </tr> </tbody> </table>	KWh pulsed output	RS485 Modbus or Johnson Controls Metasys NII	Lonworks interface	Profibus interface	Analogue output	000-display only					001				1	002				2	010	1				011	1			1	012	1			2	030		1			050			1		100	1				101	1			1	102	1			2	110	1	1			111	1	1		1	112	1	1		2	200	2				210	2	1		
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Analogue output range ****																																																																																						
1	0-20 mA, 10V compliance (user configurable as 4-20mA, 0-10mA and 0-5mA)																																																																																					
3	-1/0/+1 mA, 10V compliance (user configurable as 0-1mA)																																																																																					

Pre-calibrated plug-in options

Functionality of existing Integra 1530 units can be easily enhanced with Crompton pre-calibrated plug-in cards.

	KWh pulsed output	RS485 Modbus or Johnson Controls Metasys NII	Lonworks interface	Profibus interface	Analogue output
OPT-1530-002-1 (0-20mA)					2
OPT-1530-002-3 (-1/0/+1mA)					2
OPT-1530-010		1			
OPT-1530-012-1 (0-20mA)		1			2
OPT-1530-012-3 (-1/0/+1mA)		1			2
OPT-1530-030			1		
OPT-1530-050				1	
OPT-1530-200	2				
OPT-1530-210	2	1			



Order Code Example

INT-1534-M-5-M-110

Integra 1530 digital metering system, 3-phase 4-wire, nominal input voltage, 140-277V L-N and 241-480V L-L, 5A CT input, auxiliary supply 100 to 250V ac or dc, one relay pulsed output and one RS485 Modbus communication port.

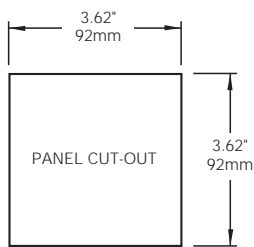
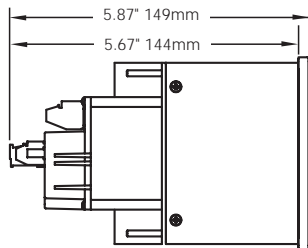
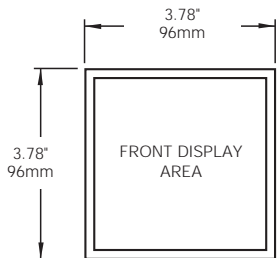


Import and Export Connections

The connection diagrams shown assume an import power configuration, therefore any power flow towards the load will register as importing energy.

If power flows away from the load in an export power situation, this power will register as exporting energy.

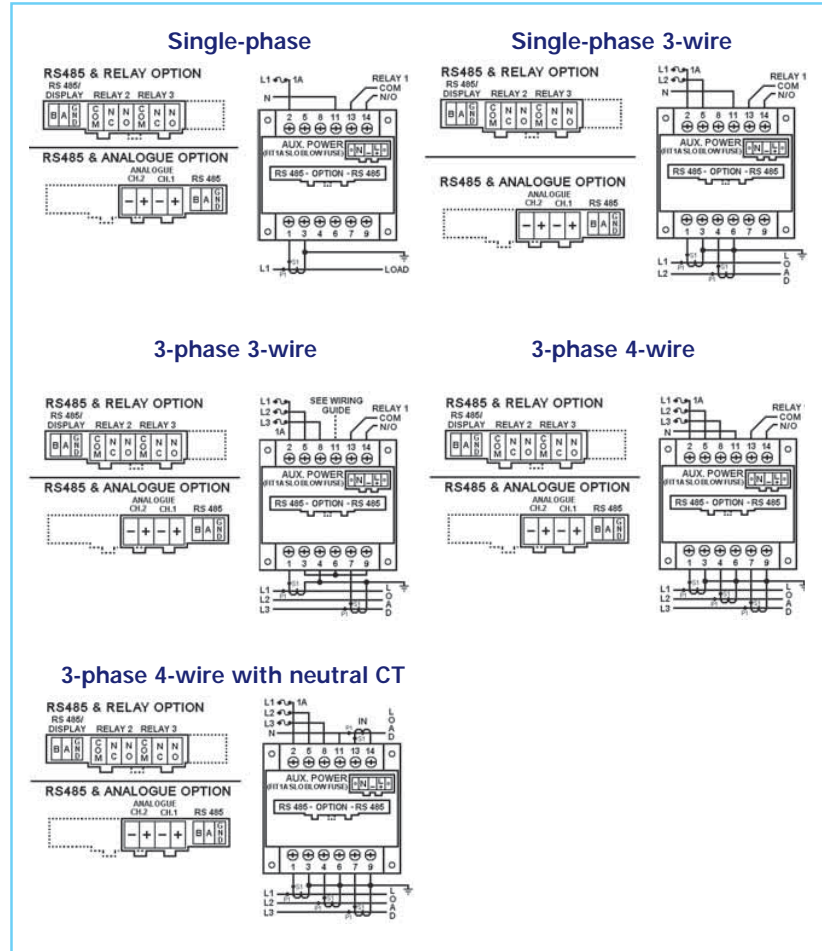
Dimensions



MAX PANEL THICKNESS 0.19", 5mm

Wiring

Input connections are made directly to shrouded screw-clamp terminals. Terminals for both current and voltage connections are sized to accept two #12 AWG (3mm²) solid or stranded wires. Connections for auxiliary power, pulsed and analogue options are via screw-clamp connectors. Connectors offer retained wire protection leaves suitable for one #13 AWG (2.5mm²) solid or stranded wire. Digital interface connections are also via screw-clamp connection, wire protection leaves and sized to accept one #15 AWG (1.5mm²) solid or stranded wire.



Auxiliary Supply

The Integra 1530 should ideally be powered from a dedicated supply, either 100–250V ac or dc (85–280V ac absolute or 85–312V dc absolute) or 12–48V dc (10.2–60V dc absolute). However the device may be powered from a signal source, provided the source remains within the working range of the chosen auxiliary supply.

Fusing

It is recommended that all voltage lines be fitted with 1 amp fuses.

Safety/Ground Connections

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

DIN Integra 2000 Series

A single multi-functional Integra 2000 digital metering system replaces numerous single-function instruments, providing significant cost savings and reduced wiring times for all power monitoring applications. Integra 2000 digital metering systems provide high accuracy true rms measurement and display of up to 103 electrical and power quality parameters.

Status information can be monitored via the high contrast graphical LCD display with LED backlight, which is ideally suited for low ambient light conditions. Alternatively, optional pulsed, analogue and digital communication outputs allow status information of measured parameters to be communicated into building management systems.

Operation

A five-button menu driven interface on the front panel of Integra 2000 enables the simple programming of VT and CT ratios, configuring selected communication options and adjustment of operating parameters.

Integra 2000 provides simple and quick access to the measured electrical data, with active reading screens typically presenting in a 4-line 4-digit format. The default screen is factory set to display volts, amps, frequency and watts, but can be customised to display any four measured parameters. User-friendly soft prompts are assigned to each of the four main parameter buttons, guiding the user easily through the menu structure to configure and monitor chosen parameters with a minimum number of button presses.

To prevent unauthorised access to configuration settings, all set-up screens offer password protection. Once configured, status information can be viewed by scrolling through up to 42 backlit dot-matrix LCD screens featuring different character font sizes for maximum clarity. Optional pulsed, analogue or digital outputs allow status information of measured parameters to be communicated into building management systems.

System Input

Designed for all low, medium and high-voltage switchgear and distribution systems, the Integra 2000 offers programmable VT and CT ratio capability. The unit is suitable for direct connection to many common voltages with 5A CT inputs.

System Outputs

Pulsed Outputs

Integra 2000 offers two pulsed outputs enabling the retransmission of time-based parameters. Each relay can be assigned to kWh or kVAh (import or export) kVAh and kAh, and will pulse at a rate proportional to the measured active energy, with both pulse width and rate easily programmable. The output relays have fully isolated volt free contacts, with connection via screw-clamp terminals.

Analogue Outputs

Four analogue outputs may also be included, enabling onward transmission of linear parameters using industry standard analogue signalling. Each 4/20mA analogue channel can be assigned to one of 44 measured parameters.

Digital Communications

RS485 Modbus RTU

Integra 2000 digital metering systems offer an RS485 communication port for direct connection to SCADA systems using either the Modbus RTU, or the Johnson Controls Metasys NII protocols. Remote monitoring enables the user to record system parameters in real time, using high resolution numbers. The Modbus protocol establishes the format for the master's query by placing it into the device address. The slave's response is also constructed using the Modbus protocol; it contains the fields confirming the action taken, the data to be returned, and an error-checking field.

Lonworks Interface

The Lonworks interface option is designed according to the LonMark Interoperability Guidelines version 3.2. This ensures Integra digital metering systems can be integrated into a single control network without requiring custom node or network tool development.



Features

- Measurement, display and communication of up to 103 electrical and power parameters
- High contrast LCD display with LED backlight
- True rms measurement
- Pulsed, analogue and digital communications
- Modbus, Johnson Controls and Lonworks interface options
- Fully programmable VT and CT ratios

Benefits

- Replaces multiple single function instruments
- Significant cost savings
- Reduced wiring times
- Simple menu driven interface
- User definable outputs and scaling
- Accurate at 4 quadrant power factors
- Import and export monitoring

Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Embedded generation
- Energy management
- Building management
- Utility power monitoring
- Process control
- Motor monitoring
- Feeder panels
- Distribution pillars

Compliant With

- IEC1010/BSEN 61010-1
- IEC 664, VDE 0110, PD 6499

Measurement, Display and Communication

Integra 2000 unit offers configuration, display and configuration of up to 103 electrical and power quality parameters.

- 1 System volts
 - System amps
 - Frequency
 - System kW
- 2 Volts L1-N (4-wire only)
 - Volts L2-N (4-wire only)
 - Volts L3-N (4-wire only)
 - Volts L-N (average)
- 3 Minimum volts L-N (per phase)
- 4 Maximum volts L-N (per phase)
- 5 Volts L1-L2
 - Volts L2-L3
 - Volts L3-L1
 - Volts L-L (average)
- 6 Minimum volts L-L (per phase)
- 7 Maximum volts L-L (per phase)
- 8 Current L1
 - Current L2
 - Current L3
 - Current (average)
- 9 Minimum current (per phase)
- 10 Maximum current (per phase)
- 11 Current demand
 - Current maximum demand
- 12 System frequency
 - Minimum frequency
 - Maximum frequency
- 13 System watts (sum)
 - System VArS (sum)
 - System VA (sum)
 - Power factor sys
- 14 Watts L1
 - Watts L2
 - Watts L3
 - Watts sum
- 15 Minimum watts (per phase)
- 16 Maximum watts (per phase)
- 17 VAr L1
 - VAr L2
 - VAr L3
 - VAr sum
- 18 Minimum VArS (per phase)
- 19 Maximum VArS (per phase)
- 20 VA L1
 - VA L2
 - VA L3
 - VA sum
- 21 Minimum VA (per phase)
- 22 Maximum VA (per phase)
- 23 Power factor L1
 - Power factor L2
 - Power factor L3
 - Power factor sys
- 24 Phase angle L1
 - Phase angle L2
 - Phase angle L3
 - Phase angle sys
- 25 kWh import (8-digit resolution)
 - kWh export (8-digit resolution)
 - KVArh import (8-digit resolution)
 - KVArh export (8-digit resolution)
 - VAh (8-digit resolution)
 - Ah(8-digit resolution)
- 26 kW demand (import)
 - kW maximum demand (import)
 - kW demand (export)
 - kW maximum demand (export)

Programmable Parameters

Parameter	Range
Password:	4-digit 0000-9999
Primary current:	Max 999.9kA (999MW max**)
VT primary:	999.9kV (999MW max**)
** maximum VT or CT ratios are limited so that the combination of primary voltage and current does not exceed 999MW at 120% of relevant input	
Reset:	Individual energy registers, minimum and maximum registers, demand registers
Demand integration time:	1-30 minutes
Demand sub-intervals:	1-30 minutes
RS485 interface baud rate:	2.4, 4.8, 9.6, 19.2 kB
RS485 parity:	Odd, even, none
Stop bits:	1, 2
Modbus address:	1-247
Analogue output assignment:	Pick list of 44 measured parameters
Pulse output assignment:	Import kWh, export kWh, import VArh, export VArh, VAh, Amph, none
Pulse rate divisors:	1, 10, 100, 1000
Pulse output duration:	20-200 milliseconds
User screen:	4 lines, choice of 42 measured parameters
Display update rate (override):	1-20

Product Codes

Product code	Product configuration
244-INMW-*.**	Integra 2000 3-phase 3-wire, 5A CT input
Input voltage suffix *	
VUA2	100V L-L input, 100-250V ac/dc auxiliary
QPA2	110V L-L input, 100-250V ac/dc auxiliary
BFA2	115V L-L input, 100-250V ac/dc auxiliary
PQA2	120V L-L input, 100-250V ac/dc auxiliary
VUA5	100V L-L input, 12-48V dc auxiliary
QPA5	110V L-L input, 12-48V dc auxiliary
BFA5	115V L-L input, 12-48V dc auxiliary
PQA5	120V L-L input, 12-48V dc auxiliary

Product code	Product configuration
244-INWW-*.**	Integra 2000 3-phase 4-wire, 5A CT input
Input voltage suffix *	
VQA2	220V L-N input, 100-250V ac/dc auxiliary
VRA2	230V L-N input, 100-250V ac/dc auxiliary
QSA2	240V L-N input, 100-250V ac/dc auxiliary
RSA2	250V L-N input, 100-250V ac/dc auxiliary
PGA2	254V L-N input, 100-250V ac/dc auxiliary
QYA2	277V L-N input, 100-250V ac/dc auxiliary
VQA5	220V L-N input, 12-48V dc auxiliary
VRA5	230V L-N input, 12-48V dc auxiliary
QSA5	240V L-N input, 12-48V dc auxiliary
RSA5	250V L-N input, 12-48V dc auxiliary
PGA5	254V L-N input, 12-48V dc auxiliary
QYA5	277V L-N input, 12-48V dc auxiliary

Communication options**	
000000	No outputs
4800P2	RS485 Modbus, 2 pulse relays
48A2P2	RS485, 4 x 4/20mA analogue outputs, 2 pulse relays
JC00P2	RS485 Johnson Controls, 2 pulse outputs
JCA2P2	RS485 Johnson Controls, 4 x 4/20mA analogue outputs, 2 pulse relays
LN0000	Lonworks interface

Order Code Example

244-INWW-VRA2-4800P2 - Integra 2000 3-phase 4-wire, input 230V L-N nominal voltage, 5A CT input, 100-250V ac/dc auxiliary, with RS485 Modbus and two pulse relay outputs.



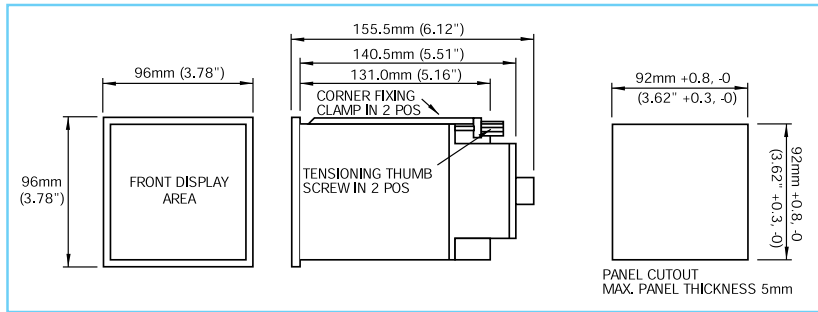
Specifications

Input	
Nominal input voltage:	220-277V L-N, 100-120V L-L
Max continuous input voltage:	120% nominal
Max short duration input voltage:	2 x for 1 second, repeated 10 times at 10 second intervals
System VT ratios (primary):	Any value up to 999.9 kV
Nominal input voltage burden:	0.2VA
Nominal input current:	5A
System CT primary values:	Any value up to 999.9 kA
Max continuous input current:	120% nominal
Max short duration current input:	20 x for 1 sec, repeated 5 times at 5 min intervals
Nominal input current burden:	0.6VA
	** maximum VT or CT ratios are limited so that the combination of primary voltage and current does exceed 999MW at 120% of relevant input
Outputs	
RS485 communications:	2-wire half duplex
Baud rates:	2400, 4800, 9600, 19200
Pulsed:	Clean contact SPNO, 100V dc 0.5A max
Pulse duration:	20-200 milliseconds (20ms steps)
Pulsed outputs:	2
Analogue outputs:	4 x 4/20mA into 500Ω (requires external dc supply, 16-27V)
Auxiliary	
Standard nominal supply voltage:	100-250V ac or dc
AC supply frequency range:	45-66Hz
AC supply burden:	6VA
Optional auxiliary dc supply:	12-48V dc
DC supply burden:	6VA
Measuring ranges	
Voltage	10-100% of nominal (functional 5-120%)
Current:	10-100% of nominal (functional 5-120%)
Frequency:	45-66Hz
Power factor:	-1/0/1/0/-1 (functional 4 quadrant, 0-1 lag/lead)
Energy:	8 digit resolution
Accuracy	
Voltage:	0.5% of reading ± 4-digits
Current:	0.5% of reading ± 4-digits
Frequency:	0.1% of mid frequency ± 2 digits
Active power:	1% of reading ± 4-digits
Power factor:	1% of reading ± 4-digits
Reactive power (VAR):	2% of reading ± 4-digits
Apparent power (VA):	2% of reading ± 4-digits
Neutral current calculated:	4% of end scale
Energy:	1% of reading ± 4-digits
KVArh	2% of reading ± 4-digits
Temperature coefficient:	±0.013%/°C typical
Update time:	Display: 1 second Optional digital port: 200ms
Analogue output:	1.5% of end scale
Enclosure	
Enclosure style:	DIN 96 panel mount
Compliant with:	IEC 1010/BS EN 61010-1, IEC 664, VDE 0110, PD 6499, EMC and LVD
Material:	Polycarbonate
Terminals:	Shrouded screw-clamp
Fixing:	2 corner clamps and thumb screws
Dielectric voltage:	Withstand test 2.2kV rms between inputs & auxiliary 1kV rms between outputs & auxiliary
Operating temperature:	0 to +50°C
Storage temperature:	-20 to +65°C
Relative humidity:	0-95% (non condensing)
Shock:	30g in 3 planes
Vibration:	10-15Hz, 1.5mm peak to peak / 15-150Hz @1g
Front of panel IP protection:	IP54
Dimensions:	96mm high x 96mm wide x 156mm deep 3.78" wide x 3.78" wide x 6.12" deep
Panel cut-out:	92mm x 92mm, 3.62" x 3.62"





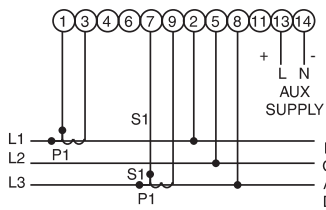
Dimensions



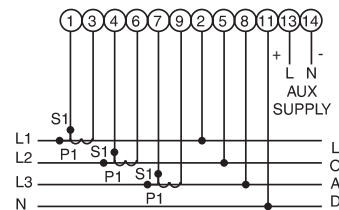
Wiring

Input connections are made directly to shrouded screw-clamp terminals. Terminals for both current and voltage connections are sized to accept two #12 AWG (3mm²) solid or stranded wires. Connections for digital interface, pulsed and analogue options are via screw-clamp connectors. Connectors offer retained wire protection leaves suitable for one #13 AWG (2.5mm²) solid or stranded wire.

3-phase 3-wire unbalanced load



3-phase 4-wire unbalanced load



Import and Export Connections

The connection diagrams shown assume an import power configuration, therefore power factor is shown as import (IMP) and current will flow towards the load. If current flows away from the load, in an export power situation, then the power factor indication will change to export (EXP). As Integra 2000 serves the full four power factor conditions separate export connections are not required.

Auxiliary Supply

The Integra 2000 should ideally be powered from a dedicated supply, either 100-250V ac/dc or 12-48V. However the device may be powered the signal source, provided the source remains within the working range of the chosen auxiliary supply.

Fusing

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

Safety/Ground Connections

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

DIN Integra 500 Series

Integra 500 digital meters replace numerous single-function instruments, providing the ideal solution for new or retrofit projects by bringing significant cost savings and reduced wiring times. The range offers a combined ammeter, voltmeter and frequency meter alongside a combined maximum demand ammeter and voltmeter. Models 530 and 540 have been enhanced with one or two additional set-point relays added to the base combined maximum demand ammeter and voltmeter unit.

Up to 15 electrical and power measurement parameters and programmable current transformer ratios can be displayed on the Integra 500's front panel. The parameters can be modified on the menu-driven interface and viewed by scrolling through up to 5 screens on the high contrast LCD display. The solid state technology is ideal for Genset and other high vibration environments.



Operation

Model 510 - Three-Phase Ammeter, Voltmeter and Frequency Meter

Ideally suited for Genset, feeder panel and low-voltage switchgear applications, this integrated unit typically replaces three conventional ammeters, a voltmeter, a selector switch and a frequency meter. Integra 510 offers programmable current transformer ratios up to 8000A, and the configuration and display of up to 12 electrical parameters. Status information is displayed on 3 screens for current per phase and system average, voltage per phase and system average, and system frequency.

Model 520 - Three-Phase Maximum Demand Indicator, Ammeter and Voltmeter

Within one compact unit, the Integra 520 provides all the functionality typically associated with three separate maximum demand indicators and a voltmeter. The unit provides simple configuration, measurement and monitoring of up to 15 electrical parameters as viewed through 5 screens. Integra 520 offers programmable current transformer ratios up to 8000A, and programmable demand integration time periods with maximum demand reset.

Model 530 - Three-Phase Maximum Demand Indicator, Ammeter and Voltmeter with Maximum Demand Set-Point Relay Output

Integra 530 offers all the benefits of model 520 with an additional programmable set-point trip relay output. When the demand current exceeds the desired set-point limit the relay will energise. The relay can be used as an alarm, or as part of an automatic load shedding system to help prevent higher utility tariffs being imposed. The relay will automatically reset once demand current falls below the set-point value.

Model 540 - Three-Phase Maximum Demand Indicator, Ammeter and Voltmeter with Two Maximum Demand Set-Point Relay Outputs

Integra 540 offers all the benefits of model 530 plus two programmable set-point trip relay outputs. The incorporation of two output relays allows for early warning alarms, or applications such as selective two-stage load shedding to help prevent higher utility tariffs being imposed. The relay will automatically reset once the demand current falls below the set-point value.

Maximum Demand

Most electricity utilities base their charges on power consumption, historically using a thermal maximum demand indicator (MDI) to measure peak power consumption averaged over a number of minutes, thus avoiding artificially high readings caused by surges. The Integra 500 series utilises a sliding window algorithm to simulate the characteristics of a thermal MDI, but updates the reading every 1/8th of a demand period for highly accurate measurements. The demand period is re-initialised at power up, and when system power or demand integration times are altered.

System Input

Designed for all low-voltage switchgear and distribution systems, the Integra 500 series offers programmable CT ratio capability. Direct connected up to 480V ac with 5A CT inputs as standard, with a 1A CT input available as an option.

Features

- Measurement and display of up to 15 electrical parameters
- High contrast LCD display
- Relay trip point models
- Fully programmable CT ratios
- Industry standard DIN96 case style
- 3-phase 3- or 4-wire options
- Wide operating temperature range
- Vibration resistant solid state technology

Benefits

- Replaces multiple single function instruments
- Simple menu driven interface
- Significant cost savings
- Reduced wiring times
- 1.5% accuracy
- Measures down to 2.5% of nominal input
- Monitoring, control and protection of expensive power assets

Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Embedded generation
- Utility power monitoring
- Process control
- Motor monitoring
- Feeder panels
- Distribution pillars

Compliant With

- UL3111-1
- IEC1010-1/BSEN 61010-1 CAT III
- IEC688:1992/BSEN 60688

Measurement and Display

Integra 510

Up to 9 electrical parameters can be displayed via 3 screens

- 1 Current L1
Current L2
Current L3
- 2 Volts L1–N (4-wire only)
Volts L2–N (4-wire only)
Volts L3–N (4-wire only)
- 3 Volts L1–L2 (3-wire only)
Volts L2–L3 (3-wire only)
Volts L3–L1 (3-wire only)
- 4 System volts
System current
System frequency

Integra 520, 530 and 540

Enhanced status information of up to 15 measured parameters can be displayed via 5 screens

- 1 Current L1
Current L2
Current L3
- 2 Current demand L1
Current demand L2
Current demand L3
- 3 Current maximum demand L1
Current maximum demand L2
Current maximum demand L3
- 4 Volts L1–N (4-wire only)
Volts L2–N (4-wire only)
Volts L3–N (4-wire only)
- 5 Volts L1–L2
Volts L2–L3
Volts L3–L1

Programmable Display

A two-button interface on the front panel of Integra 500 provides simple programming of device settings and adjustment of operating parameters. Once configured, measurements can be viewed by scrolling through up to 5 screens featuring a high contrast 3-line, 4-digit LCD display, with annunciators for each screen. Models 530 and 540 offer optional set-point relay outputs, providing maximum demand alarms. To prevent unauthorised access to the configuration settings and re-settable maximum demand registers, screens offer password protection.

Programmable Parameters

Parameter	Range
Password:	4-digit 0000-9999
Primary current:	Max 8000:5A
Demand integration time:	8, 15, 20, 30 minutes
Reset:	Maximum demand

Product Codes

Product code	Product configuration
244-513W.*.**	Integra 510 3-phase 3-wire
244-514W.*.**	Integra 510 3-phase 4-wire
244-523W.*.**	Integra 520 3-phase 3-wire
244-524W.*.**	Integra 520 3-phase 4-wire
244-533W.*.**	Integra 530 3-phase 3-wire, one set-point relay
244-534W.*.**	Integra 530 3-phase 4-wire, one set-point relay
244-543W.*.**	Integra 540 3-phase 3-wire, two set-point relays
244-544W.*.**	Integra 540 3-phase 4-wire, two set-point relays
Input range*	
10LA	100-120V L-L (58-69V L-N), 1A CT input
19LA	190-240V L-L (110-139V L-N), 1A CT input
38LA	380-480V L-L (219-277V L-N), 1A CT input
10LS	100-120V L-L (58-69V L-N), 5A CT input
19LS	190-240V L-L (110-139V L-N), 5A CT input
38LS	380-480V L-L (219-277V L-N), 5A CT input
Auxiliary supply suffix **	
Self powered	SP
10	100-120V ac
19	190-240V ac
38	380-480V ac

Order Code Example

244-513W-10LS-10 - Integra 510 digital metering system, 3-phase 3-wire, 100-120V L-L, 5A CT input, auxiliary supply 100-120V ac

Specifications

Input	
Nominal input voltage:	100-120V L-L (58-69V L-N) 190-240V L-L (110-139V L-N) 380-480V L-L (219-277V L-N)
Max continuous input voltage:	120% nominal
Max short duration input voltage:	2 x for 1 sec., repeated 10 times at 10 sec. intervals
Nominal input voltage burden:	0.2 VA approx per line
Nominal input current:	1 or 5A ac (rms)
System CT primary values:	0 to 99.99A:1 to 80A, 0 to 999.9A:81 to 800A or 0-9999A:801 to 8000A
Max continuous input current:	120% nominal
Max short duration current input:	20 x for 1 sec., repeated 5 times at 5 min. intervals 10 x for 3 sec., repeated 5 times at 5 min. intervals 5 x for 5 sec., repeated 5 times at 5 min. intervals
Nominal input current burden:	0.6 VA approx per phase
Relay outputs (530 & 540 only)	
Configuration:	Model 530: 1 x single pole changeover Model 540: 2 x single pole changeover
Rated current:	8A
Rated voltage:	250V ac
Max breaking voltage:	440V ac
Rated breaking capacity:	2000VA
Contact life:	>30,000 operations
Auxiliary	
Standard nominal supply voltage:	100-120, 190-240 or 380-480V ac
Auxiliary volts tolerance:	Nominal -10% to +20%
AC supply frequency range:	45-66Hz
AC supply burden:	Models 510 and 520: 3VA Models 530 and 540: 6VA
Measuring ranges	
Voltage (self overed):	75-125% of nominal
Voltage (auxiliary overed):	2.5-120% of nominal
Line-to-line voltage 4-wire:	0-10% difference in phase voltage
Current:	2.5-120% of nominal
Current demand:	2.5-120% of nominal (Model 510: not applicable)
Reference conditions	
Ambient temperature:	23°C
Input frequency:	45-66Hz
Input waveform:	Sinusoidal (distortion factor <0.005)
AC auxiliary supply waveform:	Sinusoidal (distortion factor <0.05)
Magnetic field of origin:	Terrestrial flux
Accuracy	
Voltage:	1.5% of nominal
Current:	1.5% of nominal
Current demand:	3% of nominal (Model 510: not applicable)
Frequency:	0.5% of mid frequency
Temperature coefficient:	0.013%/°C typical
Display update time:	Current & volts: 7.5 seconds approx Current demand & max current demand: 1/8th of demand period (Model 510: not applicable)
Circuitry response time:	<10 seconds to step input
Enclosure	
Enclosure style:	DIN 96 panel mount
Display:	3-line 4-digit LCD. 10.5mm high characters
Compliant with:	UL3111-1, IEC1010-1/BSEN 61010-1 CAT III, IEC688:1992/BSEN 60688, EMC and LVD
Material:	Polycarbonate UL94V-0/V-2
Terminals:	M3.5 captive screw-clamp
Fixing:	2 corner clamps and thumb screws
Dielectric voltage withstand:	300-600V: 3.25kV rms 50Hz for 1 minute 150-300V: 2.2kV rms 50Hz for 1 minute
Operating temperature:	-10 to +70°C
Storage temperature:	-20 to +80°C
Relative humidity:	0-95% non condensing
Warm-up time:	1 minute
Shock:	30g in 3 planes
Vibration:	10-15Hz, 1.5mm peak to peak / 15-150Hz @1g
Front of panel IP protection:	IP54
Dimensions:	96mm wide x 96mm high x 112mm deep wide 3.78" wide x 3.78" high x 4.41" deep
Panel cut-out:	92mm x 92mm, 3.62" x 3.62"



Integra 540



Integra 510

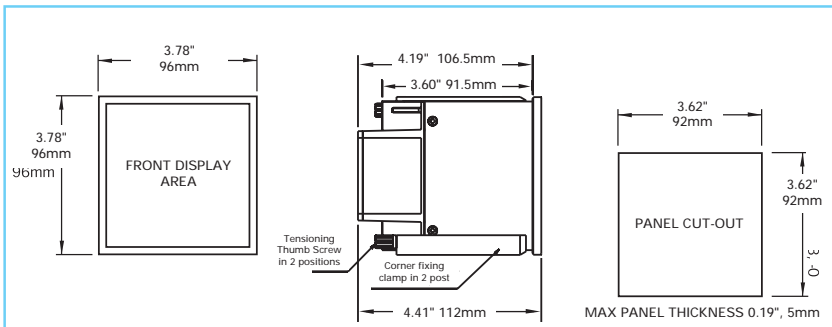


Integra 540

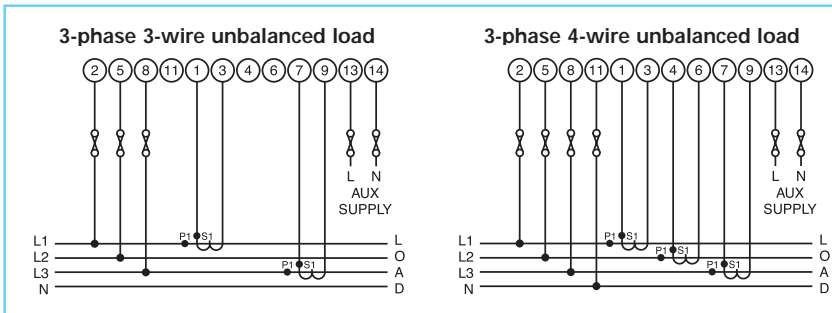


Integra 510

Dimensions

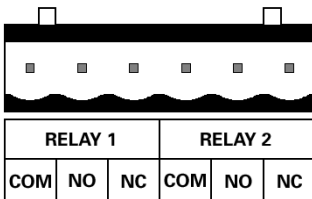


Connections



Relay Connections

Models 530 and 540



Rear view.

Integra 530 has only relay 1. Integra 540 is fitted with relay 1 and relay 2.

Wiring

Input connections are made directly to shrouded screw-clamp terminals. Terminals for both current and voltage connections are sized to accept two #12 AWG (3mm²) solid or stranded wires. Connections for relay options are via screw-clamp connectors. Connectors offer retained wire protection leaves suitable for one #13 AWG (2.5mm²) solid or stranded wire.

Auxiliary Supply

The Integra 500 should ideally be powered from a dedicated supply. However the device may be powered from the signal source, provided this remains within the working range of the chosen auxiliary supply.

Fusing

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

Safety / Ground Connections

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

ANSI Integra Digital Metering

ANSI Integra Digital Metering Specification Overview

	Integra 510	Integra 520	Integra 530	Integra 540	Integra 2000
Dimensions					
4.31" high x 4.31" wide x 6.7" deep	✓	✓	✓	✓	✓
109.4mm high x 109.4mm wide x 170.2mm deep					
Configurations					
3-phase 3-wire	✓	✓	✓	✓	✓
3-phase 4-wire	✓	✓	✓	✓	✓
Measured parameters					
Voltage line-to-line	✓	✓	✓	✓	✓
Voltage line-to-neutral (4-wire only)	✓	✓	✓	✓	✓
System voltage	✓	✓	✓	✓	✓
Current L1, L2, L3	✓	✓	✓	✓	✓
System current	✓	✓	✓	✓	✓
Neutral current (calculated)				✓	✓
Frequency 45-66Hz			✓	✓	✓
Frequency 400Hz		✓			
Demand current				✓	✓
Max demand current				✓	✓
Demand active power				✓	✓
Max demand active power				✓	✓
Power factor				✓	✓
Active power W				✓	✓
Reactive power VAR				✓	✓
Apparent power VA				✓	✓
Active energy kWh				✓	✓
Reactive energy kVARh				✓	✓
Voltage % THD average					✓
Voltage % THD L1, L2, L3					✓
Current % THD average					✓
Current % THD L1, L2, L3					✓
Communication options					
Digital RS485 RTU interface option				✓	✓
Pulsed output oOption				✓	✓
Approvals					
UL file no. 140758	✓	✓	✓	✓	✓
IEC 1010 / BSEN 61010-1	✓	✓	✓	✓	✓



Integra 1540



Integra 0640



Integra 0440



Integra 0340





ANSI Integra 1540 Series

Integra 1540 digital metering system provides programmable measurement, display and communication of up to 31 major electrical and power quality parameters including true rms system values, total harmonic distortion (THD) and power quality data. The menu-driven interface allows the user-friendly programming of voltage, current, and power measurement parameters. Status of all parameters can be viewed through 13 screens on the 3-line, 4-digit LED display. The Integra 1540 has pulsed and digital communication outputs and is ideal for all power and quality monitoring applications.

Features

- Measurement, display and communication of up to 31 power parameters
- THD measurement and power quality data
- True rms measurement
- Pulsed energy outputs
- Digital communications
- Fully programmable VT and CT ratios
- Simple menu driven interface
- ANSI case style
- High quality LED display

Benefits

- Replaces multiple single function instruments
- Simple menu driven interface
- Remote monitoring
- Monitoring, control and protection of power assets

Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Energy management
- Building management
- Utility power monitoring
- Process control
- Motor monitoring

Approvals

- UL file no: 140758
- IEC 1010 / BSEN 61010-1

Operation

A two-button interface on the front panel of Integra 1540 units enable the simple programming of VT and CT ratio settings, configuring selected communication options, and adjusting operating parameters. To prevent unauthorised access to configuration settings, all set-up screens offer password protection. Once configured, status information can be viewed by scrolling through 13 screens featuring a high contrast 3-line, 4-digit LED display, with separate annunciators for each of the 31 measured parameters. Optional pulsed or digital outputs allow status information to be communicated into building management systems.

System Input

Designed for all low, medium and high-voltage switchgear and distribution systems, the Integra 1540 has customer programmable VT and CT ratio capability. Direct connection of up to 600V ac with 5A CT inputs as standard, and 1A CT inputs available as an option.

Pulsed Outputs

Integra 1540 offers an optional pulse output module enabling the retransmission of time-based demand parameters. Outputs are pulsed proportionally to the rate of measured kWh active energy, with pulse width and rate easily programmable via the set-up screens. The output relay has a fully isolated volt free contact, with connection via screw-clamp terminals.

Digital Communications

RS485 Modbus RTU

Integra 1540 digital metering systems offer an RS485 communication port for direct connection to SCADA systems using the Modbus RTU protocol, or the Johnson Controls Metasys NII protocol. Remote monitoring enables the user to record the systems parameters in real time, using high resolution numbers. The Modbus protocol establishes the format for the master's query by placing it into the device address. The slave's response is also constructed using the Modbus protocol; it contains the fields confirming the action taken, the data to be returned, and an error-checking field. The Modbus option includes the ability to change Modbus word order to suit the requirements of the user.



Programmable Parameters

Parameter	Range
Password	4-digit 0000-9999
Primary current	Max 9999:5 (360MW max**)
VT primary	400kV (360MW max**)
	** maximum VT or CT ratios are limited so that the combination of primary voltage and current does exceed 360MW at 120% of relevant inputs
Demand integration time	8, 15, 20, 30 minutes
Reset	Max demand & active energy registers
Pulse output duration	60, 100, 200 milliseconds
Pulse rate divisors	1, 10, 100, 1000
RS 485 interface baud rate	2.4, 4.8, 9.6, 19.2 kB
RS 485 parity	Odd / even / no, 1 or 2 stop bits
Modbus address	1-247

Product Codes

Product code	Product configuration
INT-1544-***-5-*.-option	Integra 1540 3-phase 4-wire 5A CT input
INT-1543-***-5-*.-option	Integra 1540 3-phase 3-wire 5A CT input
Input voltage suffix ***	
100	100V L-L (57.7V L-N)
110	110V L-L (63.5V L-N)
115	115V L-L (66.4V L-N)
120	120V L-L (69.3V L-N)
139	139V L-L (80.2V L-N)
208	208V L-L (120V L-N)
240	240V L-L (139V L-N)
277	277V L-L (160V L-N)
380	380V L-L (220V L-N)
400	400V L-L (230V L-N)
415	415V L-L (240V L-N)
480	480V L-L (277V L-N)
600	600V L-L (346V L-N)
Auxiliary voltage suffix*	
L	12-48V dc
M	100-250V ac/dc
Communications options	
M	RS485 Modbus RTU or Johnson Controls Metasys NII
W	kWh pulsed output

Order Code Example

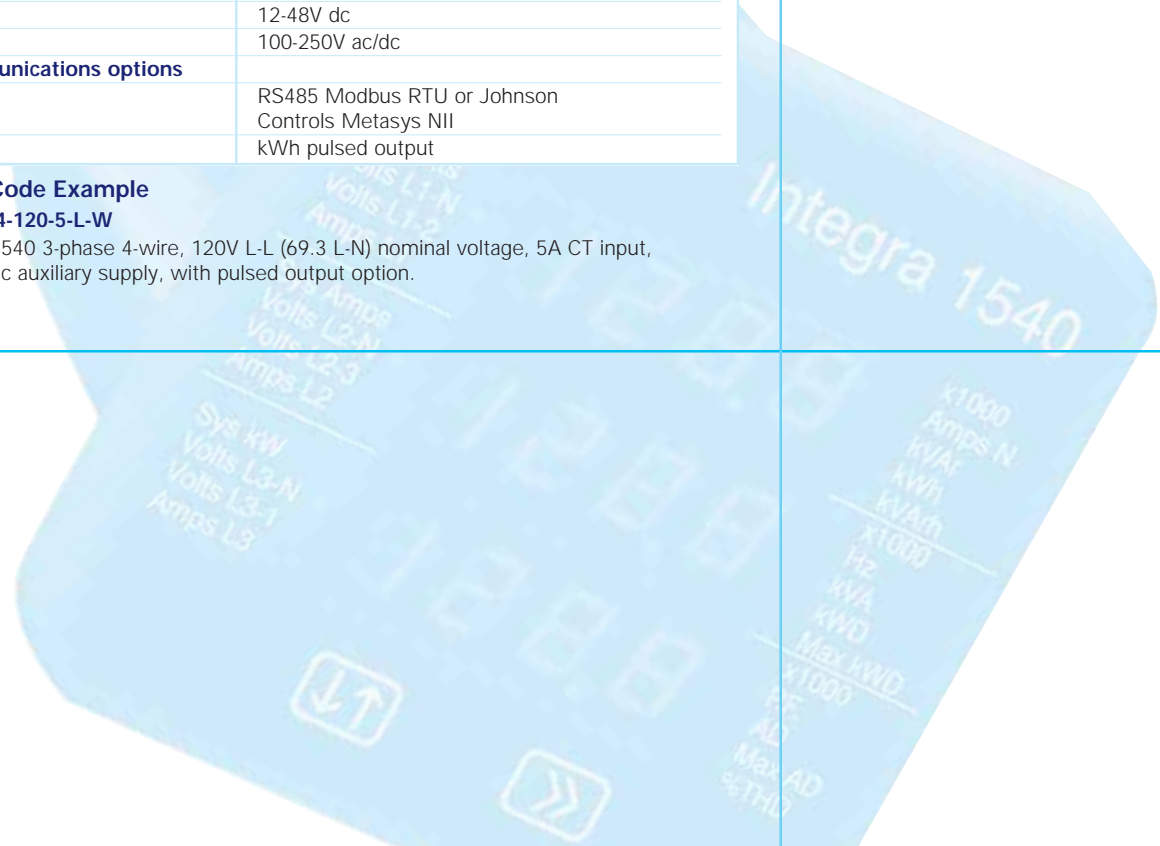
INT-1544-120-5-L-W

Integra 1540 3-phase 4-wire, 120V L-L (69.3 L-N) nominal voltage, 5A CT input, 12-48V dc auxiliary supply, with pulsed output option.

Measurement, Display and Communication

Integra 1540 offers configuration, display and communication of up to 31 electrical and power quality parameters.

- System volts
System current
System kW
- System volts THD %
System current THD %
- Volts L1-N
Volts L2-N
Volts L3-N
- Volts L1-L2
Volts L2-L3
Volts L3-L1
- Volts line 1 THD %
Volts line 2 THD %
Volts line 3 THD %
- Current L1
Current L2
Current L3
- Current line 1 THD %
Current line 2 THD %
Current line 3 THD %
- Neutral current
Frequency
Power factor
- kVAr
kVA
kW
- kWh (7-digit resolution)
- kVAh (7-digit resolution)
- kW demand
Current demand
- kW maximum demand
Current maximum demand





** maximum VT or CT ratios are limited so that the combination of primary voltage and current do not exceed 360MW at 120% of relevant input

Specifications

Input	
Nominal input voltage:	57.7 to 346V L-N, 100 to 600V L-L
Max continuous input voltage:	120% nominal
Max short duration input voltage:	2 x for 1 second, repeated 10 times at 10 second intervals
System VT ratios (primary):	400kV or 360MW **
Nominal input voltage burden:	< 0.2VA
Nominal input current:	5A (1A option)
System CT primary values:	9999:5A or 9999:1A max 360MW **
Max continuous input current:	120% nominal
Max short duration current input:	20 x for 1 second, repeated 5 times at 5 second intervals
Nominal input current burden:	< 0.6VA
Outputs	
RS485 communications:	2-wire half duplex
Baud rates:	2400, 4800, 9600, 19200
Pulsed:	Clean contact SPNO, 100V dc 0.5A max
Pulse duration:	60, 100 or 200 milliseconds
Auxiliary	
Standard nominal supply voltage:	100-250V ac or dc (85-287V ac absolute) (85-312V dc absolute)
AC supply frequency range:	45-66Hz
AC supply burden:	6VA
Optional auxiliary dc supply:	12-48V dc (10.2-60V dc absolute)
DC supply burden:	6VA
Measuring ranges	
Voltage:	50-120% of nominal (functional 5-120%)
Current:	5-120% of nominal (50%-120% for THD)
Frequency:	45-66Hz
Power factor:	0.5 inductive - 1 - 0.8 capacitive
THD:	To 15th Harmonic V & A
Energy:	7-digit resolution
Accuracy	
Voltage:	±0.1% of range ±0.4% of reading
Current:	±0.1% of range ±0.4% of reading
Power:	±0.1% of range ±0.9% of reading
THD:	±1%
Neutral current:	±4% of range
Energy:	kWh 1% IEC1036 (PF 0.8-1-0.8)
KVArh:	2% IEC1036 (PF 0.8-1-0.8)
Temperature coefficient:	0.013%/°C typical
Update time:	500ms display 250ms optional digital port
Enclosure	
Enclosure style:	ANSI C39.1
Compliant With:	UL 140758 and IEC 1010 / BSEN 61010-1
Material:	Polycarbonate front and base, steel case
Terminals:	Barrier terminal strip 6-32 binding head screw
Dielectric voltage:	Withstand test 3.25kV rms 50Hz for 1 minute between all electrical circuits
Operating temperature:	-20 to +70°C
Storage temperature:	-30 to +80°C
Relative humidity:	0-95% (non condensing)
Warm-up time:	1 minute
Shock:	30g in 3 planes
Vibration:	10-15Hz, 1.5mm peak to peak / 15-150Hz@1g
Enclosure integrity :	IP54 (front face)
Dimensions:	4.31" high x 4.31" wide x 6.7" deep 109.4mm high x 109.4mm wide x 170.2mm deep
Panel cut-out:	4.06" (103mm) diameter, 4 stud positions

ANSI Integra 1000 Series

Multi-function Integra 1000 digital metering systems accurately measure, display, and communicate electrical and power parameters required for most power monitoring applications, including true rms measurement of distorted waveforms.

This panel mounted enclosure offers simple programming and display of up to 23 power measurement parameters via a menu driven user interface on the front panel. Integra 1000 offers additional pulsed and digital communication options, allowing remote monitoring of status information via building management systems.



Operation

A two-button interface on the front panel of Integra 1000 units enables the simple programming of VT and CT ratio settings, configuration of selected communication options, and adjustment of operating parameters. To prevent unauthorised access to the configuration settings, all screens offer password protection.

Once configured, status information can be viewed by scrolling through 11 screens featuring a high contrast 3-line, 4-digit LED display, with separate annunciators for each of the 23 measured parameters.

System Input

Designed for all low, medium and high voltage switchgear and distribution systems, the Integra 1000 offers programmable VT and CT ratio capability. Direct connection of up to 600V ac with 5A CT inputs is standard, and 1A CT inputs available as an option.

Pulsed Outputs

Integra 1000 offers an optional pulse output module enabling the retransmission of time-based parameters. The output pulses at a rate proportional to the measured kWh active energy, with pulse width and rate easily programmable via the set-up screens. The output relay has a fully isolated volt free contact, with connection via screw-clamp terminals.

Digital Communications

RS485 Modbus RTU

Integra 1000 digital metering systems offer an RS485 communication port for direct connection to SCADA systems using the Modbus RTU protocol, or the Johnson Controls Metasys NII protocol. Remote monitoring enables the user to record the systems parameters in real time, using high resolution numbers. The Modbus protocol establishes the format for the master's query by placing it into the device address. The slave's response is also constructed using the Modbus protocol; it contains the fields confirming the action taken, the data to be returned, and an error-checking field. The Modbus option includes the ability to change Modbus word order to suit the requirements of the user.

Programmable Parameters

Parameter	Range
Password	4-digit 0000-9999
Primary current	Max 9999:5 (360MW max**)
VT primary	400kV (360MW max**)
	** maximum VT or CT ratios are limited so that the combination of primary voltage and current do not exceed 360MW at 120% of relevant input
Demand integration time	8, 15, 20, 30 minutes
Reset	Max demand & active energy registers
Pulse output duration	60, 100, 200 milliseconds
Pulse rate divisors	1, 10, 100, 1000
RS 485 interface baud rate	2.4, 4.8, 9.6, 19.2 kB
RS 485 parity	Odd / even / no, 1 or 2 stop bits
Modbus address	1-247

Features

- Measurement, display and communication of up to 23 power parameters
- True rms measurement
- Energy pulsed outputs
- Digital communications
- Fully programmable VT and CT ratios
- Simple menu driven interface
- ANSI case style
- High quality LED display

Benefits

- Replaces multiple single function instruments
- Simple menu driven interface
- Remote monitoring
- Monitoring, control and protection of power assets

Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Energy management
- Building management
- Utility power monitoring
- Process control
- Motor monitoring

Approvals

- UL file no: 140758
- IEC 1010 / BSEN 61010-1



Measurement, Display and Communication

Integra 1000 offers configuration, display and communication of up to 23 electrical and power quality parameters.

- 1 System volts
System current
System kW
- 2 Volts L1-N
Volts L2-N
Volts L3-N
- 3 Volts L1-L2
Volts L2-L3
Volts L3-L1
- 4 Current L1
Current L2
Current L3
- 5 Neutral current
Frequency
Power factor
- 6 kVA
kVA
kW
- 7 kWh (7-digit resolution)
- 8 kVArh (7-digit resolution)
- 9 kW demand
Current demand
- 10 kW maximum demand
Current maximum demand

Specifications

Input	
Nominal input voltage:	57.7 to 346V L-N, 100 to 600V L-L
Max continuous input voltage:	120% nominal
Max short duration input voltage:	2 x for 1 second, repeated 10 times at 10 second intervals
System VT ratios (primary):	400kV or 360MW **
Nominal input voltage burden:	< 0.2VA
Nominal input current:	5A (1A option)
System CT primary values:	9999:5A or 9999:1A max 360MW **
Max continuous input current:	120% nominal
Max short duration current input:	20 x for 1 second, repeated 5 times at 5 second intervals
Nominal input current burden:	< 0.6VA
** maximum VT or CT ratios are limited so that the combination of primary voltage and current do not exceed 360MW at 120% of relevant input.	
Outputs	
RS485 communications:	2-wire half duplex
Baud rates:	2400, 4800, 9600, 19200
Pulsed:	Clean contact SPNO, 100V dc 0.5A max
Pulse duration:	60, 100 or 200 milliseconds
Auxiliary	
Standard nominal supply voltage:	100-250V ac or dc (85-287V ac absolute) (85-312V dc absolute)
AC supply frequency range:	45-66Hz
AC supply burden:	6VA
Optional auxiliary dc supply:	12-48V dc (10.2-60V dc Absolute)
DC supply burden:	6VA
Measuring ranges	
Voltage:	50-120% of nominal (functional 5-120%)
Current:	5-120% of nominal
Frequency:	45-66Hz
Power factor:	0.5 capacitive - 1 - 0.8 inductive
Energy:	7-digit resolution 360MW max
Accuracy	
Voltage:	±0.1% of range ±0.4% of reading
Current:	±0.1% of range ±0.4% of reading
Power:	±0.1% of range ±0.9% of reading
Neutral current:	±4% of range
Energy:	kWh 1% IEC1036 (PF 0.8-1-0.8)
KVArh:	2% IEC1036 (PF 0.8-1-0.8)
Temperature coefficient:	0.013%/°C typical
Update time:	500ms display 250ms optional digital port
Enclosure	
Enclosure style:	ANSI C39.1
Compliant with:	UL 140758 and IEC 1010 / BSEN 61010-1
Material:	Polycarbonate front and base, steel case
Terminals:	Barrier terminal strip 6-32 binding head screw
Dielectric voltage:	Withstand test 3.25kV rms 50Hz for 1 minute between all electrical circuits
Operating temperature:	-20 to +70°C
Storage temperature:	-30 to +80°C
Relative humidity:	0-95% (non condensing)
Warm-up time:	1 minute
Shock:	30g in 3 planes
Vibration:	10-15Hz, 1.5mm peak-to-peak / 15-150Hz @1g
Enclosure	Integrity (front face only) IP54
Dimensions:	4.31" high x 4.31" wide x 6.7" deep 109.4mm high x 109mm wide x 170.2mm deep
Panel cut-out:	4.06" (103mm) diameter, 4 stud positions

Product Codes

Product code	Product configuration
077-IJMU- * # - options	Integra 1000 3-phase 3-wire, 5 CT input
Input voltage & current suffix*	
VU	100V L-L
QP	110V L-L
BF	115V L-L
QQ	120V L-L
QR	208V L-L
RQ	230V L-L
QS	240V L-L
QX	380V L-L
SC	400V L-L
QW	415V L-L
Z3	460V L-L
QT	480V L-L
VY	600V L-L
Auxiliary voltage suffix #	
A5	12-48V dc
A2	100-250V ac/dc
Communications options	
RS	RS485 Modbus RTU
JC	Johnson Controls Metasys NII
P1	kWh pulsed output

Product code	Product configuration
077-IJWU- * # - options	Integra 1000 3-phase 4-wire, 5 CT input
Input voltage & current suffix*	
VN	110V L-L (63.5V L-N)
Z7	115V L-L (66.4V L-N)
QL	120V L-L (69.3V L-N)
QM	173V L-L (100V L-N)
PN	190V L-L (110V L-N)
QP	200V L-L (115V L-N)
QQ	208V L-L (120V L-N)
QN	240V L-L (139V L-N)
Z3	380V L-L (220V L-N)
VR	400V L-L (230V L-N)
QR	415V L-L (240V L-N)
QY	480V L-L (277V L-N)
QZ	600V L-L (346V L-N)
Auxiliary voltage suffix #	
A5	12-48V dc
A2	100-250V ac/dc
Communications options	
RS	RS485 Modbus RTU
JC	Johnson Controls Metasys NII
P1	kWh pulsed output

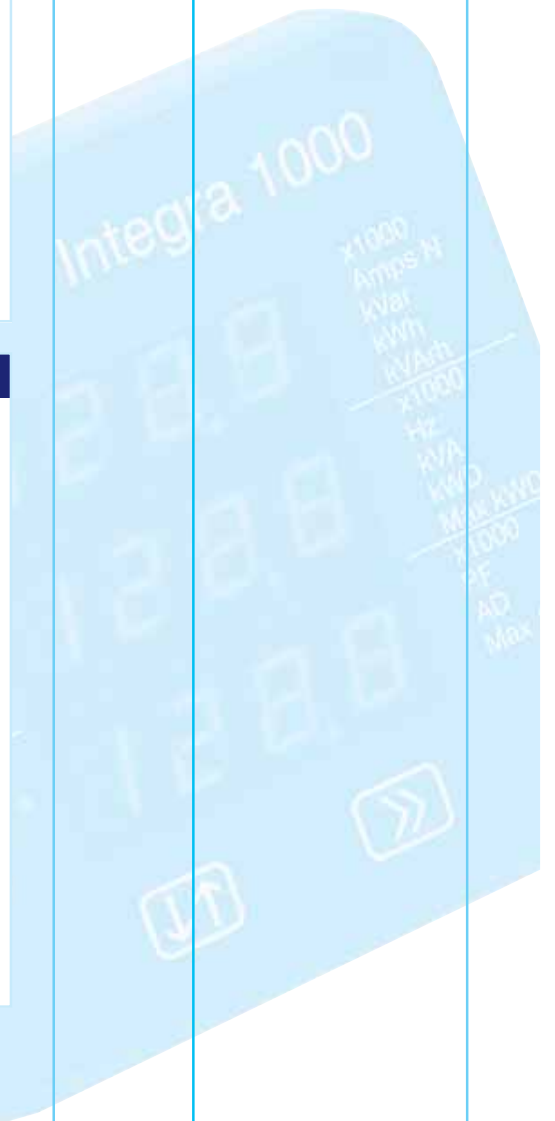
Order Code Example

077-IJWU-QQA2-P1-RS

Integra 1000 3-phase 4-wire, 208V L-L (120V L-N) nominal voltage, 5A CT input, 100-250V ac/dc auxiliary supply, with kWh pulsed output and RS485 Modbus RTU communications option.

077-IJMU-QRA5-P1

Integra 1000 3-phase 3-wire, 208V L-L nominal voltage, 5A CT input, 12-48V dc auxiliary supply, with kWh pulsed output.



ANSI Integra 0640 Series

Designed for all low, medium and high-voltage switchgear and distribution systems, Integra 0640 offers programmable measurement and display of the 12 electrical parameters critical for power generation applications. Utilising true rms techniques, Integra 0640 accurately measures and displays three-phase voltage, current and frequency with extended measurement of line voltage on each phase and phase current.

Operation

A two-button menu driven interface on the front panel allows configuration, adjustment and monitoring of measured parameters, and the simple programming of VT and CT ratios. To prevent unauthorised access to configuration settings, all screens offer password protection. Once configured, status information can be viewed by scrolling through 4 screens featuring a high contrast 3-line, 4-digit LED display, with separate annunciators for each of the 12 measured parameters.

System Input

Designed for all low, medium and high-voltage switchgear and distribution systems, the Integra 0640 offers programmable VT and CT ratio capability. Direct connection of up to 600V ac with 5A CT inputs is standard, and 1A CT inputs available as an option.

Programmable Parameters

Parameter	Range
Password	4-digit 0000-9999
Primary current	Max 9999:5 (360MW max**)
VT primary	400kV (360MW max**)
VT secondary	Set to correspond to secondary value

Product Codes

Product code	Product configuration
INT-0644-***-5-*	Integra 0640 3-phase 4-wire 5A CT input
INT-0643-***-5-*	Integra 0640 3-phase 3-wire 5A CT input
Input voltage suffix***	
ELV	100-120V L-L (57.7-69.3V L-N)
LOV	121-240V L-L (70.1-139V L-N)
MIV	241-480V L-L (140-277V L-N)
HIV	481-600V L-L (278-346V L-N)
Auxiliary voltage suffix*	
L	12-48V dc
M	100-250V ac/dc

Order Code Example

INT-0643-MIV-5-L

Integra 0640 3-phase 3-wire, 241-480 V L-L voltage, 5A CT input, 12-48V dc auxiliary supply.



Features

- Measurement and display of voltage, current & frequency
- True rms measurement
- Fully programmable VT and CT ratios
- Simple menu driven interface
- ANSI case style
- High quality LED display

Benefits

- Replaces multiple single function instruments
- Simple menu driven interface
- Monitoring, control and protection of power assets

Applications

- Switchgear
- Distribution systems
- Generator sets
- Control panels
- Utility power monitoring

Approvals

- UL file no: 140758
- IEC 1010 / BSEN 61010-1



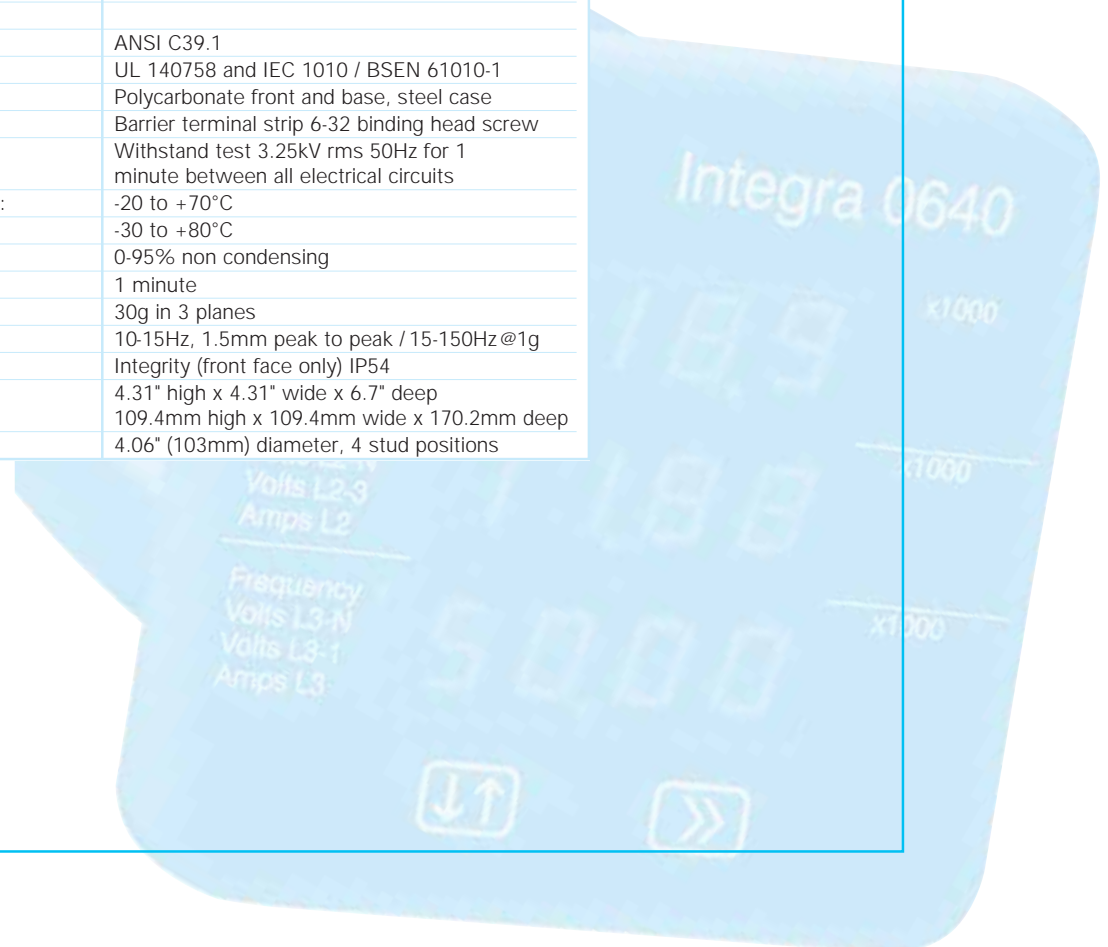
Specifications

Input	
Nominal input voltage:	57.7 to 346V L-N, 100 to 600V L-L
Max continuous input voltage:	120% nominal
Max short duration input voltage:	2 x for 1 second, repeated 10 times at 10 second intervals
System VT ratios (primary):	400kV or 360MW **
Nominal input voltage burden:	< 0.2VA
Nominal input current:	5A (1A option)
System CT primary values:	9999:5A or 9999:1A max 360MW **
Max continuous input current:	120% nominal
Max short duration current input:	20 x for 1 second, repeated 5 times at 5 second intervals
Nominal input current burden:	< 0.6VA
	** maximum VT or CT ratios are limited so that the combination of primary voltage and current do not exceed 360MW at 120% of relevant input.
Auxiliary	
Standard nominal supply voltage:	100-250V ac or dc (85-287V ac absolute) (85-312V dc absolute)
AC supply frequency range:	45-66Hz
AC supply burden:	6VA
Optional auxiliary dc supply:	12-48V dc (10.2-60V dc Absolute)
DC Supply Burden:	6VA
Measuring ranges	
Voltage:	70-120% of nominal (functional 4-120%)
Current:	5-120% of nominal
Frequency:	45-66Hz
Accuracy	
Voltage:	±0.1% of range ±0.4% of reading
Current:	±0.1% of range ±0.4% of reading
Frequency:	0.15% of mid frequency
Temperature coefficient:	0.013%/°C typical
Update time:	500ms display
Enclosure	
Enclosure style:	ANSI C39.1
Compliant with:	UL 140758 and IEC 1010 / BSEN 61010-1
Material:	Polycarbonate front and base, steel case
Terminals:	Barrier terminal strip 6-32 binding head screw
Dielectric voltage:	Withstand test 3.25kV rms 50Hz for 1 minute between all electrical circuits
Operating temperature:	-20 to +70°C
Storage temperature:	-30 to +80°C
Relative humidity:	0-95% non condensing
Warm-up time:	1 minute
Shock:	30g in 3 planes
Vibration:	10-15Hz, 1.5mm peak to peak / 15-150Hz@1g
Enclosure:	Integrity (front face only) IP54
Dimensions:	4.31" high x 4.31" wide x 6.7" deep 109.4mm high x 109.4mm wide x 170.2mm deep
Panel cut-out:	4.06" (103mm) diameter, 4 stud positions

Measurement and Display

Measurement of up to 12 electrical parameters can be programmed and displayed on the Integra 0640 unit.

- System volts
System current
System frequency
- Volts L1-N (4-wire only)
Volts L2-N (4-wire only)
Volts L3-N (4-wire only)
- Volts L1-L2
Volts L2-L3
Volts L3-L1
- Current L1
Current L2
Current L3





ANSI Integra 0440 Series

Designed for marine and aviation ground power applications, the Integra 0440 provides programmable measurement and display of the 12 electrical parameters critical to the power monitoring application at a 400Hz nominal operating frequency. Utilising true rms techniques, Integra 0440 provides accurate measurement and indication of three-phase voltage, current and system frequency.

Features

- Measurement and display of voltage, current and frequency
- 400Hz nominal frequency
- True rms measurement
- Fully programmable VT and CT ratios
- Simple menu driven interface
- ANSI case style
- High quality LED display

Benefits

- Replaces multiple single function instruments
- Simple menu driven interface
- Monitoring, control and protection of power assets

Applications

- Aviation ground power systems
- Shipboard systems
- Generator sets
- Control panels

Approvals

- UL file no: 140758
- IEC 1010 / BSEN 61010-1

Operation

A two-button interface on the front panel of Integra 0440 units provides simple programming of VT and CT ratio settings, and configuration of operating parameters. To prevent unauthorised access to configuration settings, all set-up screens offer password protection. Once configured, status information can be viewed by scrolling through 4 screens featuring a high contrast 3-line, 4-digit LED display, with separate annunciators for each of the 12 measured parameters.

System Input

Operating at a nominal 400Hz designed for all low, medium and high voltage ground power applications, the Integra 0440 offers programmable VT and CT ratio capability. Direct connected up to 600V ac with 5A CT inputs as standard, and 1A CT inputs are an available option.

Programmable Parameters

Parameter	Range
Password	4-digit 0000-9999
Primary current	Max 9999:5 (360MW max**)
VT primary	400kV (360MW max**)
VT secondary	Set to correspond to secondary value

Product Codes

Product code	Product configuration
INT-0444-***-5-*	Integra 0440 3-phase 4-wire 5A CT input
INT-0443-***-5-*	Integra 0440 3-phase 3-wire 5A CT input
Input voltage suffix***	
ELV	100-120V L-L (57.7-69.3V L-N)
LOV	121-240V L-L (70.1-139V L-N)
MIV	241-480V L-L (140-277V L-N)
HIV	481-600V L-L (278-346V L-N)
Auxiliary voltage suffix*	
L	12-48V dc
M	100-250V ac/dc

Order Code Example

INT-0443-MIV-5-L

Integra 0440 3-phase 3-wire, 241-480 V L-L voltage, 5A CT input, 12-48V dc auxiliary supply.



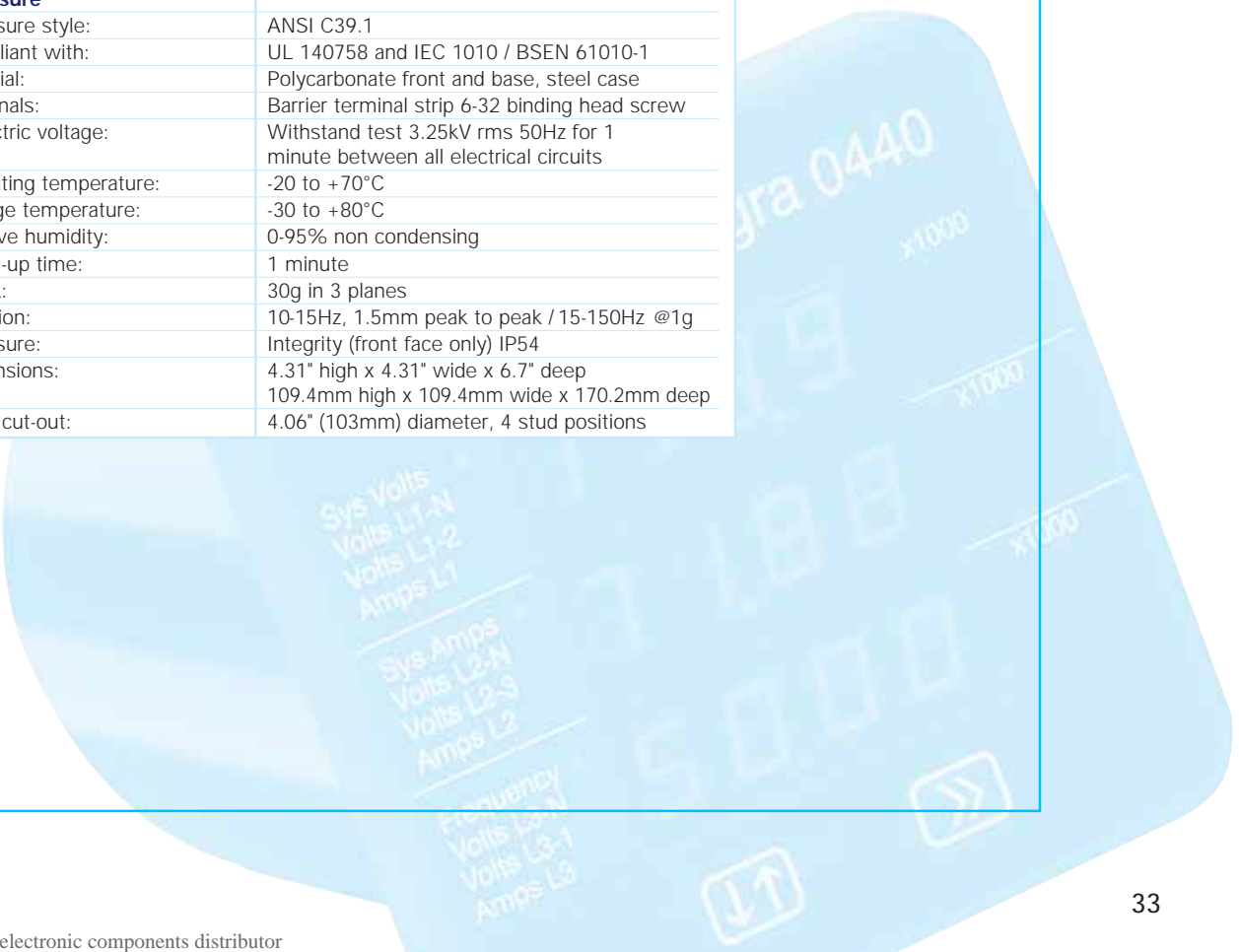
Specifications

Input	
Nominal input voltage:	57.7 to 346V L-N, 100 to 600V L-L
Max continuous input voltage:	120% nominal
Max short duration input voltage:	2 x for 1 second, repeated 10 times at 10 second intervals
System VT ratios (primary):	400kV or 360MW **
Nominal input voltage burden:	< 0.2 VA
Nominal input current:	5A (1A option)
System CT primary values:	9999:5A or 9999:1A max 360MW **
Max continuous input current:	120% nominal
Max short duration current input:	20 x for 1 second, repeated 5 times at 5 second intervals
Nominal input current burden:	< 0.6VA
	** maximum VT or CT ratios are limited so that the combination of primary voltage and current do not exceed 360MW at 120% of relevant input.
Auxiliary	
Standard nominal supply voltage:	100-250V ac or dc (85-287V ac Absolute) (85-312V dc Absolute)
AC supply frequency range:	360-440Hz
AC supply burden:	6VA
Optional auxiliary dc supply:	12-48V dc (10.2-60V dc Absolute)
DC supply burden:	6VA
Measuring ranges	
Voltage:	70-120% of nominal (functional 40-120%)
Current:	5-120% of nominal
Frequency:	360-440Hz
Accuracy	
Voltage:	1% of range
Current:	1% of range
Frequency:	1% of mid frequency
Temperature coefficient:	0.013%/°C typical
Update time:	500ms display
Enclosure	
Enclosure style:	ANSI C39.1
Compliant with:	UL 140758 and IEC 1010 / BSEN 61010-1
Material:	Polycarbonate front and base, steel case
Terminals:	Barrier terminal strip 6-32 binding head screw
Dielectric voltage:	Withstand test 3.25kV rms 50Hz for 1 minute between all electrical circuits
Operating temperature:	-20 to +70°C
Storage temperature:	-30 to +80°C
Relative humidity:	0-95% non condensing
Warm-up time:	1 minute
Shock:	30g in 3 planes
Vibration:	10-15Hz, 1.5mm peak to peak / 15-150Hz @1g
Enclosure:	Integrity (front face only) IP54
Dimensions:	4.31" high x 4.31" wide x 6.7" deep 109.4mm high x 109.4mm wide x 170.2mm deep
Panel cut-out:	4.06" (103mm) diameter, 4 stud positions

Measurement and Display

Measurement of up to 12 electrical parameters can be programmed and displayed on the Integra 0440 unit.

- 1 System volts
System current
System frequency
- 2 Volts L1-N (4-wire only)
Volts L2-N (4-wire only)
Volts L3-N (4-wire only)
- 3 Volts L1-L2
Volts L2-L3
Volts L3-L1
- 4 Current L1
Current L2
Current L3





ANSI Integra 0340 Series

The Integra 0340 is designed for simplified feeder applications where minimal data is required by the end user. This simple to use meter provides accurate measurement and display of up to 11 electrical parameters including voltage and current for the system, plus line-to-line and line-to-neutral measurements. The 0340 has programmable voltage and current transformer ratios and true rms indication for accurate measurement of distorted waveforms. Measurements can be viewed through 4 screens via a high visibility LED display. Integra 0340 presents an invaluable tool for all power monitoring applications.

Operation

A two-button interface on the front panel of Integra 0340 units provides simple programming of VT and CT ratio settings and selection, configuration and adjustment of operating parameters. To prevent unauthorised access to configuration settings, all set-up screens offer password protection. Once configured, status information can be viewed by scrolling through 4 screens featuring a high contrast 3-line, 4-digit LED display, with separate annunciators for each of the 11 measured parameters.

System Input

Designed for all low, medium and high-voltage switchgear and distribution systems, the Integra 0340 offers programmable VT and CT ratio capability. Direct connected up to 600V ac with 5A CT inputs as standard, and 1A CT inputs available as an option.

Programmable Parameters

Parameter	Range
Password	4-digit 0000-9999
Primary current	Max 9999:5 (360MW max**)
VT primary	400kV (360MW max**)
VT secondary	Set to correspond to secondary value

Product Codes

Product code	Product configuration
INT-0344-***-5-*	Integra 0340 3-phase 4-wire 5A CT input
INT-0343-***-5-*	Integra 0340 3-phase 3-wire 5A CT input
Input voltage suffix***	
ELV	100-120V L-L (57.7-69.3V L-N)
LOV	121-240V L-L (70.1-139V L-N)
MIV	241-480V L-L (140-277V L-N)
HIV	481-600V L-L (278-346V L-N)
Auxiliary voltage suffix*	
L	12-48V dc
M	100-250V ac/dc

Order Code Example

INT-0344-MIV-5-L

Integra 0340 3-phase 4-wire, 241-480 V L-L voltage, 5A CT input, 12-48V dc auxiliary supply.

Features

- Measurement and display of voltage and current
- True rms measurement
- Fully programmable VT and CT ratios
- Simple menu driven interface
- ANSI case style
- High quality LED display

Benefits

- Replaces multiple single function instruments
- Simple menu driven interface
- Monitoring, control and protection of power assets

Applications

- Switchgear
- Feeder panels
- Distribution systems
- Generator sets
- Control panels
- Utility power monitoring
- Motor monitoring

Approvals

- UL file no: 140758
- IEC 1010 / BSEN 61010-1



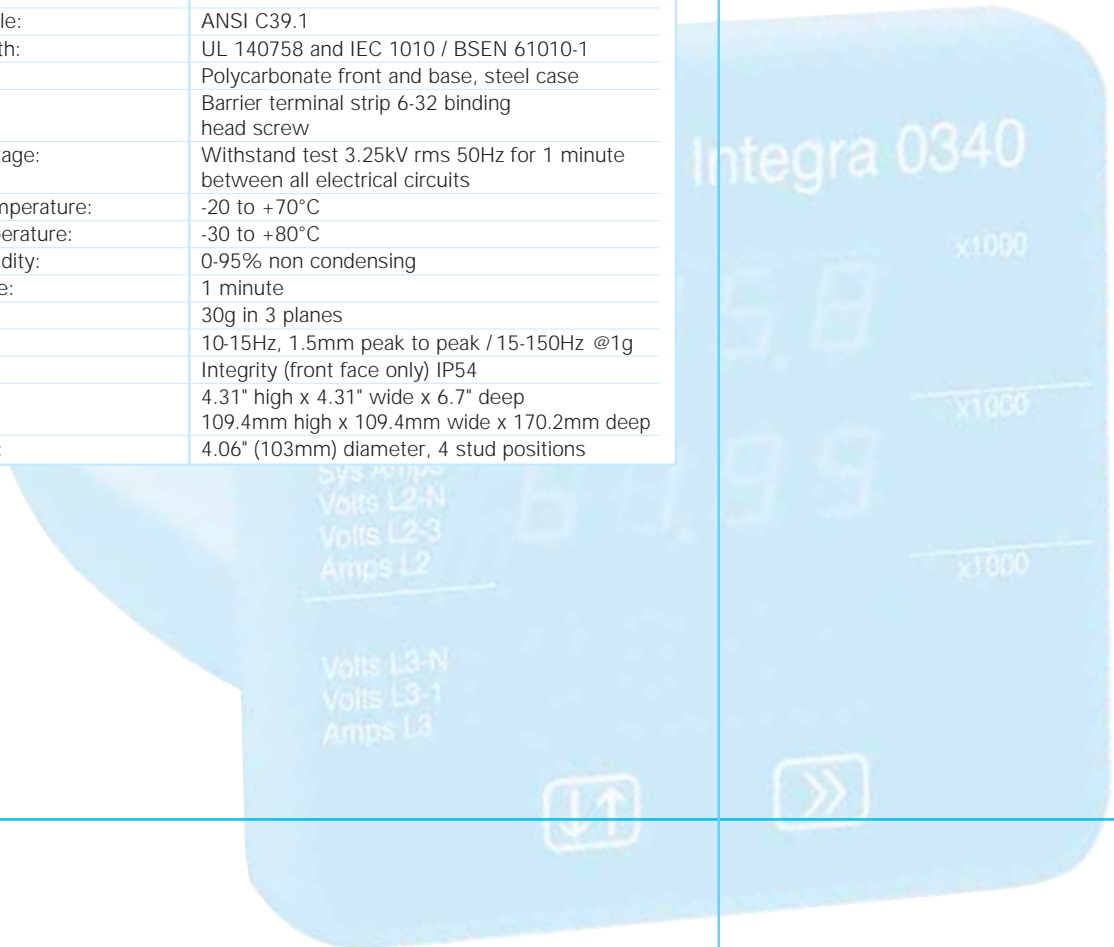
Specifications

Input	
Nominal input voltage:	57.7 to 346V L-N, 100 to 600V L-L
Max continuous input voltage:	120% nominal
Max short duration input voltage:	2 x for 1 second, repeated 10 times at 10 second intervals
System VT ratios (primary):	400kV or 360MW **
Nominal input voltage burden:	< 0.2VA
Nominal input current:	5A (1A option)
System CT primary values:	9999:5A or 9999:1A max 360MW **
Max continuous input current:	120% nominal
Max short duration current input:	20 x for 1 second, repeated 5 times at 5 second intervals
Nominal input current burden:	< 0.6VA
	** maximum VT or CT ratios are limited so that the combination of primary voltage and current do not exceed 360MW at 120% of relevant input.
Auxiliary	
Standard nominal supply voltage:	100-250V ac or dc +/- 15% (85-287V ac Absolute) (85-312V dc Absolute)
AC supply frequency range:	45-66Hz
AC supply burden:	6VA
Optional auxiliary dc supply:	12-48V dc (10.2-60V dc Absolute)
DC supply burden:	6VA
Measuring ranges	
Voltage:	70-120% of nominal (functional 40-120%)
Current:	5-120% of nominal
Accuracy	
Voltage:	±0.1% of range ±0.4% of reading
Current:	±0.1% of range ±0.4% of reading
Temperature coefficient:	0.013%/°C typical
Update time:	500ms display
Enclosure	
Enclosure style:	ANSI C39.1
Compliant with:	UL 140758 and IEC 1010 / BSEN 61010-1
Material:	Polycarbonate front and base, steel case
Terminals:	Barrier terminal strip 6-32 binding head screw
Dielectric voltage:	Withstand test 3.25kV rms 50Hz for 1 minute between all electrical circuits
Operating temperature:	-20 to +70°C
Storage temperature:	-30 to +80°C
Relative humidity:	0-95% non condensing
Warm-up time:	1 minute
Shock:	30g in 3 planes
Vibration:	10-15Hz, 1.5mm peak to peak / 15-150Hz @1g
Enclosure:	Integrity (front face only) IP54
Dimensions:	4.31" high x 4.31" wide x 6.7" deep 109.4mm high x 109.4mm wide x 170.2mm deep
Panel cut-out:	4.06" (103mm) diameter, 4 stud positions

Measurement and Display

Measurement of up to 11 electrical parameters can be programmed and displayed on the Integra 0340 unit.

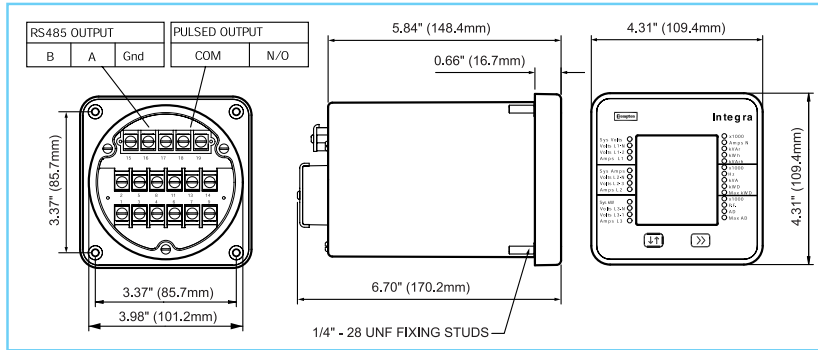
- 1 System volts
System current
- 2 Volts L1-N (4-wire only)
Volts L2-N (4-wire only)
Volts L3-N (4-wire only)
- 3 Volts L1-L2
Volts L2-L3
Volts L3-L1
- 4 Current L1
Current L2
Current L3



ANSI Integra Digital Metering

Dimensions

Integra 1540, 1000, 0640, 0440 and 0340



Integra 1540



Integra 0640

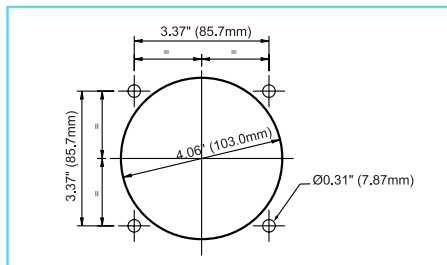


Integra 0440



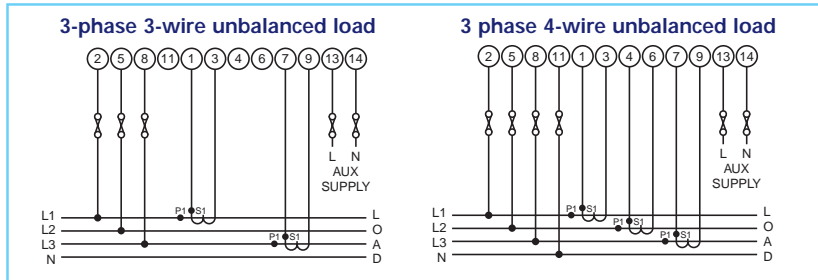
Integra 0340

Panel cut-out



Wiring

Input connections are made to screw-clamp terminals. Terminals for both current and voltage connections are sized to accept two #12 AWG (3mm²) solid or stranded wires, or ring lugs suitable for 6-32 screws. Connections for communications and pulse outputs use identical style terminals.



Auxiliary Supply

The Integra family should ideally be powered from a dedicated supply, either 100-250V ac or dc (85-280V ac Absolute or 85-312V dc Absolute) or 12-48V dc (10.2-60V dc absolute). However the device may be powered from the signal source, provided the source remains within the working range of the chosen auxiliary supply.

Fusing

It is recommended that all voltage lines be fitted with 1 amp fuses.

Safety / Ground Connections

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



Integra 1560 and 1580 Digital Transducer Systems

Integra 1560 and 1580 multi-function transducers provide high accuracy <0.2% measurement and communication of up to 50 major electrical and power quality parameters, including true rms system values, power quality data and total harmonic distortion (THD) measurement up to the 31st harmonic. The range offers a 1560 DIN rail mounted version, and a 1580 variant featuring a base plate for surface mounting. Both transducers offer the same high technical specifications and incorporate pulsed, analogue and digital communication outputs. Transducers are fully programmable through a Windows-based software configuration package, enabling remote commissioning and monitoring via building management systems. Alternatively, an optional menu driven display unit can be used to configure and monitor up to 32 measured parameters. To suit user requirements, the range includes single phase, single-phase 3-wire, 3-phase 3-or 4-wire, and 3-phase 4-wire with neutral CT configurations.

Operation

The multi-function Integra 1560 and 1580 transducers offer uncomplicated operation and high accuracy <0.2% measurement of three-phase voltage, current, frequency, watts, VAr, VA, energy, power factor and total harmonic distortion measurement of both phase and system, current and voltage.

3-phase 4-wire system line-to-line voltage measurements are usually derived from a calculation of the vector of the line-to-neutral voltage measurements. However, Integra 1530 includes true measurement of both line-to-neutral, and line-to-line measurements, ensuring accurate readings even under phase fault conditions.

A simple Windows-based software package is available to configure the transducer. Once configured, simultaneous monitoring of up to 50 electrical and power quality variables can be communicated into building management systems via pulsed, analogue or digital communication options. Status may also be monitored through the software package via a PC.

Alternatively, an optional menu driven display unit can be used to configure and monitor up to 32 measured parameters including three-phase voltage and current, and system watts, VAr, VA, power factor, energy and total harmonic distortion. This Integra Display unit can be permanently panel mounted locally to the transducer, or simply connected at times when configuration, adjustment and/or status information is required.

Accuracy

Integra transducers utilise true rms measurement techniques up to the 31st harmonic, providing <0.2% accuracy. An exceptional tolerance to high harmonic frequencies is achieved from a robust frequency detection method, which is able to lock the fundamental frequency onto any phase. High integrity measurements are possible where the system approximates CT current in the absence of voltage signals.

System Input

Designed for all low, medium and high-voltage switchgear and distribution systems, the Integra 1560 and 1580 offer programmable VT and CT ratio capability. Direct connected up to 480V ac with 5A CT inputs standard, and 1A CT inputs available as an option.

Neutral CT Input Option

High harmonic environments can produce unexpected and dangerous neutral currents. Traditional 3-phase systems are only able to calculate the vector of line-to-neutral current measurements, which may not register the true reading. Integra 1530 offers a 3-phase 4-wire version with a neutral 4th CT allowing true neutral current measurement and protection in high harmonic environments.



Features

- Measurement and communication of up to 50 electrical and power parameters
- High accuracy <0.2%
- THD measurement and power quality data
- True rms measurement
- Pulsed, analogue and digital outputs
- Modbus, Johnson Controls, Lonworks and Profibus interface options
- Fully programmable VT and CT ratios
- Configurable via software package or menu driven interface

Benefits

- Replaces multiple single function transducers
- DIN rail or base mounted options
- Local or remote configuration and monitoring via building management systems
- ANSI style local or remote LED display option
- Neutral CT input option
- True 3 and 4-wire measurement
- Monitoring, control and protection of expensive power assets

Applications

- Switchgear
- Distribution systems
- Control panels
- Energy management
- Building management
- Utility power monitoring
- Process control
- Motor monitoring

Approvals

- UL file no. E200300
- CSA pending
- IEC 1010 / BSEN 61010-1



Measurement and Communication

Up to 50 electrical and power quality parameters can be measured and communicated into building management systems or viewed through the software configuration package via a PC.

Volts L1-N, L2-N, L3-N
 Volts L1-L2, L2-L3, L3-L1
 System volts L-N (average)
 System volts L-L (average)
 Current line 1, 2 and 3
 System current (average)
 Current sum
 Current demand
 Current maximum demand
 Neutral current
 System frequency
 Watts 1, 2 and 3
 System watts (sum)
 Watts demand (import)
 Watts maximum demand (import)
 Watt-hours (import)
 VAr 1, 2 and 3
 System VAr (sum)
 VAr-hours (import)
 VA 1, 2 and 3
 System VA (sum)
 Power factor 1, 2 and 3
 System power factor (average)
 Phase angle 1, 2 and 3
 System phase angle (average)
 THD volts 1, 2 and 3
 THD system volts (mean)
 THD amps 1, 2 and 3
 THD system amps (mean)

System Outputs

Pulsed Outputs

Integra transducers offer optional pulsed outputs enabling the retransmission of kWh and kVAh time based parameters. Outputs are pulsed at a rate proportional to the measured kWh active energy, with pulse width and rate easily programmable either locally or remotely. Output relays have fully isolated volt free contacts, with connection via screw-clamp terminals.

Analogue Outputs

Up to four analogue outputs may also be included, enabling onward transmission of linear parameters using industry standard analogue signalling. Each analogue channel can be assigned to one of 47 measured parameters with the output span fully adjustable to suit customer requirements, and can be configured to operate in normal, reverse, threshold or constant current modes. Analogue outputs share a common return which is galvanically isolated from non-analogue output terminals.

Digital Communications

RS485 Modbus RTU

Integra 1560 and 1580 transducers offer up to two RS485 communication ports for direct connection to SCADA systems using the Modbus RTU protocol, or optionally, a single Johnson Controls Metasys NII protocol. Remote monitoring enables the user to record the system parameters in real time, using high resolution numbers. The Modbus protocol establishes the format for the master's query by placing it into the device address. The slave's response is also constructed using the Modbus protocol; it contains the fields confirming the action taken, the data to be returned, and an error-checking field. The Modbus option includes function 8 subfunction 0, which provides return query data diagnostic support, and the ability to change Modbus word order to suit the user requirements.

Lonworks Interface

The Lonworks interface option is designed according to the LonMark Interoperability Guidelines version 3.2. This ensures Integra transducers can be integrated into a single control network without requiring custom node or network tool development.

Profibus

The Profibus interface option allows Integra 1560 and 1580 to communicate over a Profibus-DP network as a slave device. Integra can automatically detect the master baud rate and communicate at data rates up to 12Mbit over the optically isolated RS485 port. Connection is made via a Profibus standard 9-way D type connector. The interface supports standard DP protocol functionality, Class 1 and Class 2 services and networks can be configured using the GSD file.

INT-SOFT Communication and Configuration Software

Configuration of up to 50 measured parameters, outputs, pulsed relays, current and power demand are easily programmed through a Windows style user interface, which can be installed on any PC running Windows 95, NT or 2000. Communication with the transducer is through a connection with a PC COM port via a RS485/RS232 converter.

Configuration software allows the user to load and save configurations to a PC hard disk and to send and retrieve settings directly from the Integra 1530. Settings can also be copied between individual Integra units.

Status information is usually communicated into a building management system, but can also be monitored through the configuration software. The software inquires the selected transducer every few seconds to obtain data, which can be viewed on a dedicated measurements page.

Programmable Display Unit Option

As an alternative to the standard software configuration package, voltage and current transformer ratios, communication options and power measurement parameters can be configured via the optional menu driven Integra display unit.

A simple two-button interface on the front panel of the unit allows display of 32 major electrical and power quality parameters. To prevent unauthorised access to the product settings, all screens can be protected by an optional customer programmable password.

Once configured, the status of each parameter can be viewed by scrolling through 13 screens, featuring a 3-line, 4-digit LED display. The unit requires an independent auxiliary power supply and thus may be positioned either locally, or remotely from the transducer at a distance limited only by the communication restrictions of RS485.

Programmable Parameters

Parameter	Range
Password:	4-digit 0000-9999
Primary current:	Max 9999A (360MW max**)
VT primary:	400kV (360MW max**)
Secondary voltage:	Nominal system voltage
	** maximum VT or CT ratios are limited so that the combination of primary voltage and current do not exceed 360MW at 120% of relevant input
Demand integration time:	8, 15, 20, 30 and 60 minutes
Reset:	Max demand & active energy registers
Pulse output duration:	60, 100, 200 milliseconds
Pulse rate divisors:	1, 10, 100, 1000
RS485 interface baud rate:	2.4, 4.8, 9.6, 19.2 kB
RS485 parity:	Odd / even / no, 1 or 2 stop bits
Modbus address:	1-247
Analogue outputs:	User definable parameters & ranges

Specifications

Input	
Nominal input voltage:	57.7 to 277V L-N, 100 to 480V L-L
Max continuous input voltage:	120% nominal
Max short duration input voltage:	2 x for 1 second, repeated 10 times at 10 second intervals
System VT ratios (primary):	Any value up to 400kV **
Nominal input voltage burden:	< 0.2VA
Nominal input current:	5A (1A option)
System CT primary values:	9999:5A or 9999:1A max 360MW **
Max continuous input current:	120% nominal
Max short duration current input:	20 x for 1 second, repeated 5 times at 5 second intervals
Nominal input current burden:	< 0.6VA
	** maximum VT or CT ratios are limited so that the combination of primary voltage and current does not exceed 360MW at 120% of relevant input
Outputs	
RS485 communications:	2-wire half duplex
Baud rates:	2400, 4800, 9600, 19200
Pulsed:	Clean contact SPNO
Pulse duration:	60, 100 or 200 milliseconds
Pulsed outputs:	Up to 6
Analogue outputs:	Up to 4

Continued



Measurement and Display

Up to 32 electrical and power quality measurements can be configured and monitored on the DIS-1540 optional display unit. The displayed parameters appear in the following order.

- System volts
System current
System kW
- System volts THD %
System current THD %
- Volts L1-N (4-wire only)
Volts L2-N (4-wire only)
Volts L3-N (4-wire only)
- Volts L1-L2
Volts L2-L3
Volts L3-L1
- Volts line 1 THD %
Volts line 2 THD %
Volts line 3 THD %
- Current L1
Current L2
Current L3
- Current line 1 THD %
Current line 2 THD %
Current line 3 THD %
- Neutral current (4-wire only)
Frequency
Power factor
- kVAr
kVA
kW
- kWh (7-digit resolution)
- kVArh (7-digit resolution)
Current demand
- kW maximum demand
Current maximum demand



Accuracy Definition

Error change due to variation of an influence quantity as described in section 6 of IEC688:1992.

THD accuracy relates to a typical harmonic profile.

Specifications Continued

Auxiliary	
Standard nominal supply voltage:	100-250V ac or dc (85-287V ac absolute) (85-312V dc absolute)
AC supply frequency range:	45-66Hz
AC supply burden:	6VA
Optional auxiliary dc supply:	12-48V dc (10.2-60V dc absolute)
DC supply burden:	6VA
Measuring ranges	
Voltage:	80-120% of nominal (functional 5-120%)
Current:	5-120% of nominal
Frequency:	45-66Hz
Power factor:	0.8 capacitive – 1 – 0.8 inductive
THD:	Up to 31st harmonic 0% - 40%
Energy:	7-digit resolution
Reference conditions	
Ambient temperature:	23°±1°C
Input frequency:	50 or 60 Hz ±2%
Input waveform:	Sinusoidal (distortion factor < 0.005)
Auxiliary supply voltage:	Nominal ±1%
Auxiliary supply frequency:	Nominal ±1%
AC auxiliary supply waveform:	Sinusoidal (distortion factor < 0.05)
Magnetic field of origin:	Terrestrial flux
Accuracy	
Voltage:	±0.17% of range
Current:	±0.17% of range
Frequency:	0.15% of mid frequency
Power:	±0.2% of range
Power factor:	1% of unity
Reactive power (VAr):	±0.5% of range
Apparent power (VA):	±0.2% of range
THD:	±1%
Neutral current calculated:	±0.95% of range
Neutral current measured:	±0.17%
Energy:	KWh 1% IEC1036
KVArh:	2%
Temperature coefficient:	Voltage & current typical: 0.013%/°C Watts typical: 0.018%/°C
Update time:	Display: 1 second. Optional digital port: 250ms
Analogue output:	±0.2% (Compliance 10V)
Enclosure	
Enclosure style:	DIN rail or base mounted
Compliant with:	UL E200300 and IEC 1010/BSEN 61010-1
Material:	Polycarbonate
Terminals:	Shrouded screw-clamp
Dielectric voltage:	Withstand test 3.25kV rms 50Hz for 1 minute between all electrical circuits
Operating temperature:	-20 to +60°C
Storage temperature:	-30 to +80°C
Relative humidity:	0-90% (non condensing)
Warm-up time:	1 minute
Shock:	30g in 3 planes
Vibration:	10-15Hz, 1.5mm peak-to-peak / 15-150Hz @1g
DIN rail transducer dimensions:	5.5" high* x 3.72" wide x 3.72" deep 139.6mm high x 94.4mm wide x 94.4mm deep *Excluding connectors
Base mounted transducer dimensions:	5.2" high* x 3.74" wide x 5.24" deep 131.5mm high x 95mm wide x 133.5mm deep *Excluding connectors
Transducer display dimensions:	4.31" high x 4.31" wide x 2.9" deep 109.4mm high x 109.4mm wide x 73.7mm deep
Transducer display panel cut-out:	4.06" (103mm) diameter, 4 stud positions

Product Codes

Ordering code	Product configuration				
INT-1561-*.***.***-option-#	Integra 1560 single-phase, DIN rail				
INT-1562-*.***.***-option-#	Integra 1560 single-phase 3-wire, DIN rail				
INT-1563-*.***.***-option-#	Integra 1560 3-phase 3-wire, DIN rail				
INT-1564-*.***.***-option-#	Integra 1560 3-phase 4-wire, DIN rail				
INT-1565-*.***.***-option-#	Integra 1560 3-phase 4-wire with neutral CT, DIN rail				
INT-1581-*.***.***-option-#	Integra 1580 single-phase, base mount				
INT-1582-*.***.***-option-#	Integra 1580 single-phase 3-wire, base mount				
INT-1583-*.***.***-option-#	Integra 1580 3-phase 3-wire, base mount				
INT-1584-*.***.***-option-#	Integra 1580 3-phase 4-wire, base mount				
INT-1585-*.***.***-option-#	Integra 1580 3-phase 4-wire with neutral CT, base mount				
Input voltage suffix *					
L	1561 & 1581: 57.7-139V L-N 1562 & 1582: 114-278V L-L (57.7-139V L-N) 1563,4 & 1583/4: 100-240V L-L (57.7-139V L-N)				
M	1561 & 1581: 140-277V L-N 1562 & 1582: 279-480V L-L (140-240V L-N) 1563,4 & 1583/4: 241-480V L-L (140-277V L-N)				
Input range suffix **					
1	1A CT Input				
5	5A CT Input				
Auxiliary supply suffix ***					
L	12-48V dc				
M	100-250V ac/dc				
Communications options					
	KWh pulsed output	RS485 Modbus or Johnson Controls Metasys NII	Lonworks interface	Profibus interface	Analogue output
010		1			
011		1			1
012		1			2
013		1			3
014		1			4
020		2			
021		2			1
022		2			2
023		2			3
024		2			4
040		1	1		
060		1		1	
110	1	1			
111	1	1			1
112	1	1			2
113	1	1			3
114	1	1			4
120	1	2			
121	1	2			1
122	1	2			2
123	1	2			3
124	1	2			4
210	2	1			
220	2	2			
Analogue output range #					
1	0-20 mA, 10V compliance (user configurable as 4-20 mA, 0-10mA and 0-5mA)				
3	-1/0/+1 mA, 10V compliance (user configurable as 0-1mA)				



Order Code Example

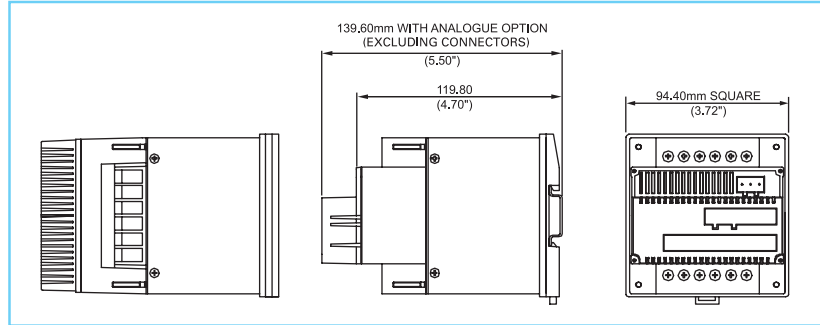
INT-1564-M-5-M-120

Integra 1560 transducer, 3-phase 4-wire, DIN rail mounted, 241 to 480V L-L nominal input voltage, 5A CT input, auxiliary supply 100 to 250V ac or dc, one relay pulsed output and two RS485 Modbus communication ports.



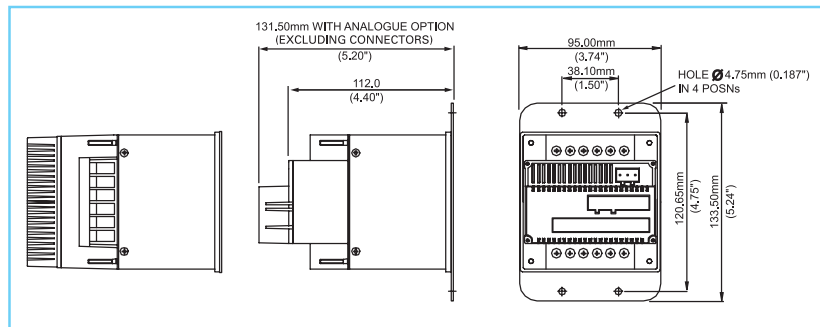
Integra 1560

Dimensions Integra 1560 DIN Rail Mounted Transducer



Integra 1580

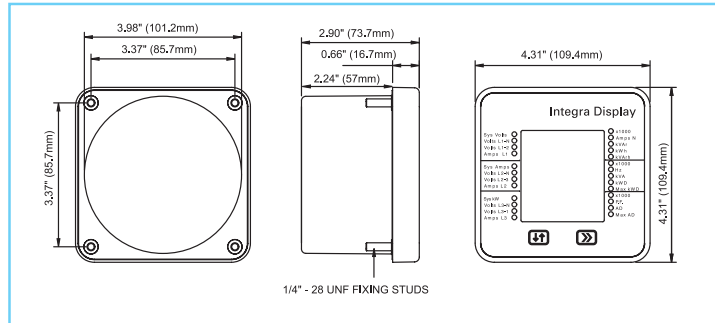
Integra 1580 Base Mounted Transducer



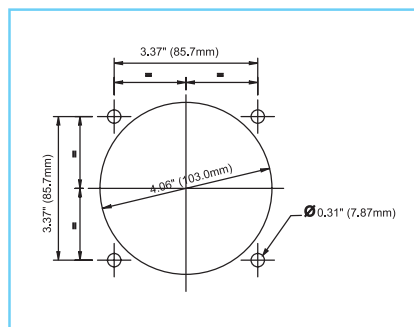
Optional Remote Display (for use with Integra 1560 or 1580 Transducer)



Optional Remote Display



Optional Remote Display Panel cut-out



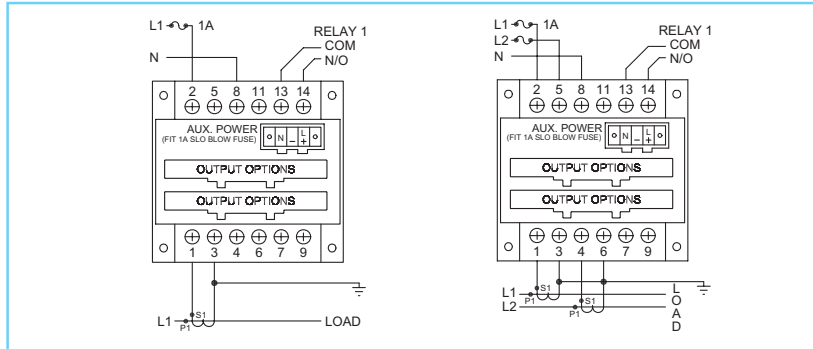
Wiring

Input connections are made directly to shrouded screw-clamp terminals. Terminals for both current and voltage connections are sized to accept two #12 AWG (3mm²) solid or stranded wires. Connections for auxiliary power, pulsed and analogue options are via screw-clamp connectors. Connectors offer retained wire protection leaves suitable for one #13 AWG (2.5mm²) solid or stranded wire. Digital interface connections are similarly via screw-clamp connection, wire protection leaves and sized to accept one #15 AWG (1.5mm²) solid or stranded wire.



Single-phase

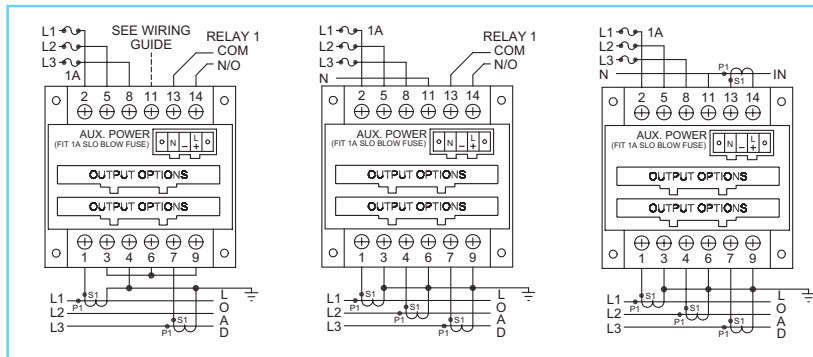
Single-phase 3-wire



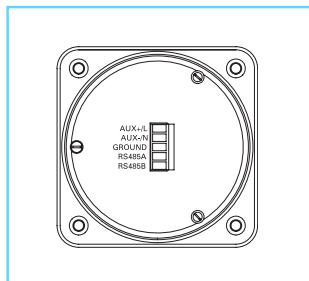
3-phase 3-wire

3-phase 4-wire

3-phase 4-wire with Neutral CT



DIS-1540 Remote Display



Auxiliary Supply

The Integra family should ideally be powered from a dedicated supply, either 100-250V ac or dc (85-280V ac absolute or 85-312V dc absolute) or 12-48V dc (10.2-60V dc absolute). However the device may be powered from the signal source, provided the source remains within the working range of the chosen auxiliary supply.

Fusing

It is recommended that all voltage lines be fitted with 1 amp fuses.

Safety / Ground Connections

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



Accessories

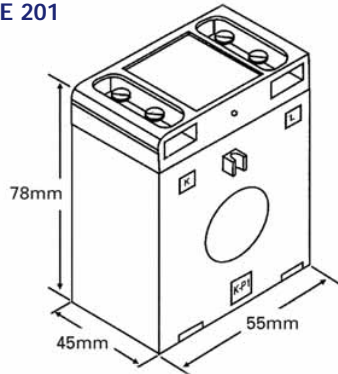
CT Accessories

The Crompton Instruments, business unit of Tyco Electronics also offers a complete range of high quality current transformers offering comprehensive measuring and protection class accuracies. The range offers a wide selection of system current ratings, busbar sizes, case widths, apertures and mounting options to every application.

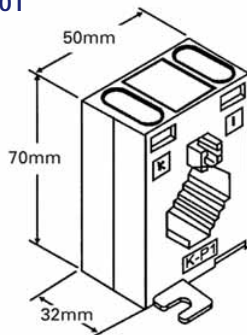
Features

- Cost effective moulded case measuring current transformers
- Limited range include the seven most popular sizes of current transformers
- Ratio ratings from 30/5 to 4000/5
- Comprehensive measurement of class accuracy
- Wide range of system current ratings, busbar sizes, case widths and apertures
- Wire sealable terminal covers
- Feet mounting and busbar options

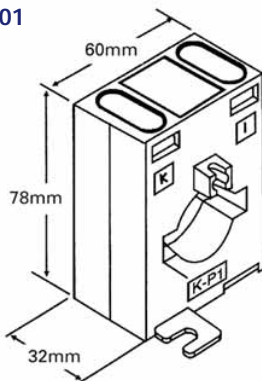
PE 201



PE 301



PE 401



Product Codes

Product code	Ratio range	VA at CL 3	VA at CL 1	VA at CL 0.5
PE201	30/5	1.5	-	-
PE201	40/5	1.5	-	-
PE201	50/5	-	1.5	-
PE201	60/5	-	1.5	-
PE201	80/5	-	4	-
PE201	100/5	-	4	-
PE201	200/5	-	8	-
PE201	250/5	-	10	-

PE301	75/5	1	-	-
PE301	80/5	1	-	-
PE301	100/5	-	1	-
PE301	125/5	-	1	-
PE301	150/5	2.5	1	-
PE301	200/5	3	2.5	-
PE301	250/5	3	2.5	-
PE301	300/5	5	2.5	-
PE301	400/5	7.5	5	-
PE301	500/5	7.5	5	-
PE301	600/5	7.5	5	-

PE401	150/5	-	2.5	-
PE401	200/5	-	2.5	-
PE401	300/5	-	2.5	-
PE401	400/5	7.5	5	-
PE401	500/5	-	7.5	5
PE401	600/5	-	7.5	5
PE401	750/5	-	7.5	5
PE401	800/5	-	7.5	5

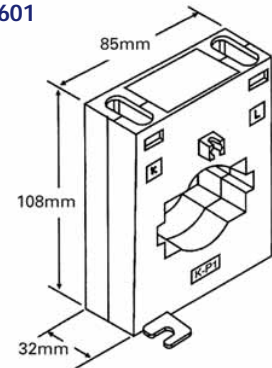
Product code	Ratio range	VA at CL 3	VA at CL 1	VA at CL 0.5
PE601	400/5	-	10	-
PE601	500/5	-	10	-
PE601	600/5	-	15	10
PE601	800/5	-	15	10
PE601	1000/5	-	15	10
PE601	1200/5	-	-	15
PE601	1500/5	-	-	15
PE601	1600/5	-	-	15

PE801	400/5	-	5	5
PE801	500/5	-	7.5	5
PE801	600/5	-	7.5	5
PE801	800/5	-	15	10
PE801	1000/5	-	15	10
PE801	1200/5	-	-	10
PE801	1500/5	-	15	10
PE801	1600/5	-	15	10
PE801	2000/5	-	15	10

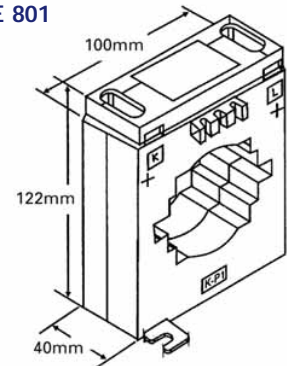
PE1001	400/5	-	-	5
PE1001	500/5	-	10	5
PE1001	600/5	15	10	5
PE1001	800/5	-	15	10
PE1001	1000/5	-	15	15
PE1001	1200/5	-	15	15
PE1001	1500/5	-	30	15
PE1001	1600/5	-	30	15
PE1001	2000/5	-	30	15
PE1001	3000/5	-	-	30
PE1001	4000/5	-	-	30



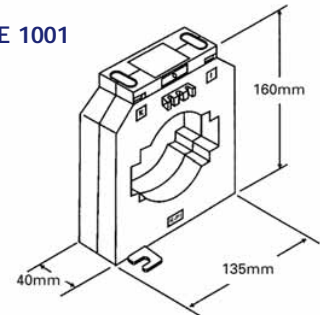
PE 601



PE 801



PE 1001





INT-SOFT Communication and Configuration Software

INT-SOFT is a simple Windows-style user interface enabling remote monitoring and configuration of Integra parameters, outputs, digital communications, pulsed relays, current and power demand. INT-SOFT can be installed on any PC running Windows 95, NT or 2000. INT-SOFT allows the user to load and save configurations to a PC hard disk and to send and retrieve settings directly from the Integra. Settings can also be copied between individual Integra units.

Up to 31 Integra units can be connected to a PC COM port via an RS485/RS232 converter, however, INT-SOFT can only communicate with one Integra at a time.

Status information of measured parameters is usually communicated into a building management system, but can also be monitored through the configuration software. The software queries the selected Integra every few seconds to obtain data which can be viewed on a dedicated measurements page.

Features

- Remote metering
- Remote status information
- PC configuration of programmable parameters
- Full access to each and every parameter
- Upload and download Integra settings
- View and edit Integra settings
- Load and save parameter settings
- Print data logs
- Password protected

Models Supported

- Integra 1530
- Integra 1560/1580

Applications

- PC based communication systems
- SCADA Systems
- PLC interfacing
- Energy management systems

Minimum Recommended System Requirements

Processor:	486 66MHz
Operating systems:	Windows 95, NT or 2000
RAM:	16Mb
Monitor:	12" SVGA (640 x 480 resolution)
Hard Disc:	5 Mb free
CD-ROM drive:	Required for installation
RS232 port:	9-pin D0type connector

Password Security

Access to Integra programmable parameters is password protected, however, settings and the electrical measurements can be viewed without entering the password. The access passwords entered on the PC must be identical to those stored inside the Integra.

Operation

INT-SOFT is designed to provide two basic functions: to display and configure the parameters of an Integra unit, and to monitor the measured values of the selected Integra. INT-SOFT is extremely simple to operate, featuring user-friendly navigation toolbars and drop-down menus.

INT-SOFT window	Menu
Measurements:	Displays all measurement values
System window:	System type, volts, current, max system power, secondary volts, nominal volts, firmware version, special product code
Password:	Existing password, new password, confirm password, change password
Energy and demands:	Demand period, demand interval, reset demands, pulse rate divisor, pulse width, reset energy.
Analogue outputs:	Set-up of phase readings, output modes, operating mode, trim controls, output of power factor parameters
Digital communications:	Baud rate, parity, stop bits and unique address
Read / write register:	Display and modification of Modbus registers
Configuration toolbar	Description
New configuration:	Create new Integra configuration
Open configuration file:	Load an existing configuration from a disk file
Save configuration file:	Save the current configuration to a disk file
Print configuration:	Send the current configuration to a printer
Online:	Connect to the selected Integra
Offline:	Disconnect from the selected Integra
Upload configuration:	Upload the configuration from the selected Integra
Download configuration:	Send current configuration to the selected Integra
Configure PC communications:	Enables setting of PC communications

Product Code

INT-SOFT	Integra Communication and Configuration Software.
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RS232 to RS485 Serial Converter

Many Integra models feature an integral RS485 communication port, allowing direct connection to SCADA systems via Modbus RTU or Johnson Controls Metasys NII protocols. However, the SCADA systems or PC based equipment used for remote monitoring of electrical and power parameters often have RS232 communication ports, requiring conversion to RS485. The 9D-485 module is a simple non-isolated two-wire half duplex RS485 converter which fits into any PC based system.

This port powered two-channel module converts the TD and RD RS232 lines into balanced half-duplex RS485 signals via a 9 way female D type connector on the RS232 side, and a screw-clamp terminal block connector on the RS-485 side. The module has an internal connection to prevent data transmitted from the RS232 port being echoed back.

Operation

The 9D-485 module is powered from two RS232 output handshake lines. An external 12V dc power supply can be connected to two terminals on the RS485 connector if no handshake lines are available. When using an external supply, the supply should be connected only to specifically labelled power inputs (power jack, terminal block, etc.).

Note: Connecting an external power supply to the handshake lines may damage the unit.

Although the 9D 485 module uses handshake lines to power the converter, no handshaking is required to control the RS485 driver. The RS485 driver is automatically enabled during each spacing state on the RS232 side. During the marking or idle state, the RS485 driver is disabled and the data lines are held in the marking state by pull up and pull down resistors.

Specifications

Protocols supported:	Modbus RTU or Johnson Controls Metasys NII
Internal power:	2 x RS232 handshake lines
External power: unavailable	12V dc to RS485 side if handshake lines
Current draw:	35mA max when externally powered
RS232 connector:	9-way female D Type
RS232 signals:	Passes through pins 3 (TD) and 2 (RD) Pins 7 (RTS) and 8 (CTS) are tied together Pins 4 (DTR), 6 (DSR), and 1 (CD) are tied together
RS485 connector:	Screw-clamp terminal block
RS485 signals:	Automatic control circuit enables driver only when transmitting
RS485 receiver:	Disabled when transmitting to prevent echo back to RS232
RS485 communications:	Half duplex 2-wire operation
RS485 baud rate:	Up to 115.2k baud
Maximum distance:	Up to 1200 meters (4000 feet)
Multidrop connections:	Up to 32
Compliant with:	EN 55022, EN 61000-6-1, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11
Dimensions:	89mm long x 34mm wide x 17mm deep 3.50" long x 1.34" wide x 0.67" deep

Product Code

9D-485	Port powered RS232 to RS485 serial converter
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Features

- Direct connection to PC RS232 serial port
- 9 way female D type connector
- Port powered or externally powered
- Balanced RS485 signals
- Very high noise immunity
- 2-wire half duplex
- Prevents echo-back to RS232

Compatible With

- Integra 2000
- Integra 1530
- Integra 1540
- Integra 1000
- Integra 1560/1580

Applications

- PC based communication systems
- SCADA Systems
- PLC interfacing
- Energy management systems

Glossary of Measurement Terminology



RMS

Abbreviation for Root Mean Square, a measurement and calculation technique for accurately determining current and voltage values, taking into consideration the ac wave shape and any harmonic distortion content. True rms measurements always ensure accurate readings regardless of the wave shape.

THD

Abbreviation for Total Harmonic Distortion, a measurement of power quality, usually expressed as a percentage. The lower the THD figure, the better the supply. High THD levels can interfere with the normal operation of equipment. Some electrical loads introduce distortion back into the supply network, which can affect all other connected equipment. Measuring and monitoring the THD level is recommended to avoid levy charges imposed by some power utilities on industrial consumers who introduce distortions to the supply.

System volts

At a glance indication of the nominal system primary voltage (potential difference) is correct. The average of up to three voltage phases is displayed, so the loss of one or more phase voltages will result in a significantly lower reading.



Volts per phase

Individual measurement and display of each phase voltage, allowing the user to identify the loss of any phase due to a fault or failed fuse. Close matching of the phase voltages can be monitored, as an unbalanced supply voltage by as little as 10% can increase three-phase motor operating temperature to 150% of normal.

System amps

At a glance indication of the nominal system primary current, displaying an average of up to three phase currents. The loss of one or more phase currents will result in a significantly lower reading.



Amps per phase

Individual measurement and display of each phase current allowing the user to identify the loss of any phase due to a fault or failed fuse. Essential information for monitoring single-phase conditions on three-phase motors.

Neutral current

The neutral conductor usually operates with minimal voltage to ground, and may carry an unbalanced load current. Neutral current should be measured and monitored if harmonic distortion is present within the system, since it is possible that up to 173% of the rated phase current could flow back into the neutral conductor.

AD

Abbreviation for Amps Demand. Demand is the rate at which energy is used, and the measurement is averaged over an adjustable demand interval. This ensures short periods of intense use, such as motor start-up, have minimal impact on readings. Instantaneous load currents can be difficult to read when fluctuating, so an averaged demand figure is useful for checking that operations are within the capability of the switchgear and cables.

Max AD

Abbreviation for Maximum Amps Demand, a record of the highest amps demand value. Power utilities often levy charges on the basis of maximum demand for each billing period. Monitoring the maximum demand reading allows management to consider disconnecting some non-essential loads at certain times to avoid this cost penalty.



PF

Abbreviation for Power Factor, the ratio of real power (kW) to reactive power (kVAR) or apparent power (kVA). A unity power factor (1.0) indicates that the current is in phase with the voltage and that reactive power is zero. The reading can be inductive or capacitive, depending on the type of load. An adverse power factor could be due to faulty capacitors within correction equipment or to harmonic distortion.



Frequency

The number of complete cycles of sinusoidal waveform per second. The most widely used frequencies are 50 and 60Hz. Some marine and aviation applications operate at 400Hz.

System kW

Abbreviation for System Kilowatts, also known as real power or active power. The rate at which electrical energy is produced, transferred or consumed. A useful measurement for monitoring is whether they motors are running within their published kW rating. 1 kW = 1000 watts.

kWh

Abbreviation for Kilowatt-hour, a unit of energy equal to one kilowatt for one hour. This is the normal quantity used for metering and billing electricity customers. The measurement records the total cumulative energy usage, and can be reset to zero if required. Since this measurement may ultimately be used for cost control, high accuracy and resolution (number of digits) may also be important.

kVA

Abbreviation for Kilovolt Amperes, the unit of apparent power which is the mathematical product of voltage and current. Useful for monitoring whether transformers are operating within their published kVA ratings.

kVAR

Abbreviation for KiloVAR, the unit of reactive power typically used by motors, transformers and other electromagnetic equipment to establish and maintain a magnetic field. This measurement is useful to check reactive losses in a system.

kWD

Abbreviation for Kilowatt Demand, a measurement that shows the average real power requirement of the kilowatt load over a defined time interval,

Max kWD

Abbreviation for Maximum Kilowatt Demand, a measurement that shows the highest real power requirement of the maximum recorded average kilowatt load.

Auxiliary supply

Usually a dedicated ac or dc supply can be used to power the instrumentation, ensuring continuous operation even if the monitored circuit is disconnected.

Pulse output

A signal that indicates the rate of power consumption. The pulse rate (number of pulses per unit time) is proportional to the measured energy and is typically connected to energy management systems or data loggers.

Analogue output

A signal which uses continuously varying small electric currents directly proportional to a measured quantity. This is a traditional and cost effective method of telemetry which is used by many building management and SCADA systems.

RS485

A standard for serial data transmission between multiple devices, using low voltage balanced signals. The format of the actual data is determined by the protocol, not the RS485 standard.

Modbus

A communication protocol widely used in building management, SCADA and process control applications. The protocol defines a message structure for data transmission to and from the instrument.

Profibus and Lonworks

Open fieldbus standards for use in manufacturing, building automation and process control.





Total Harmonic Distortion

Harmonic problems are almost always introduced by the consumers' equipment and installation practices. Harmonic distortion is caused by the high use of non-linear load equipment such as computer power supplies, electronic ballasts, compact fluorescent lamps and variable speed drives, which create high current flow with harmonic frequency components. The limiting rating for most electrical circuit elements is determined by the amount of heat that can be dissipated to avoid overheating busbars, circuit breakers, neutral conductors, transformer windings and generator alternators.

Definition

THD is defined as the rms value of the waveform remaining when the fundamental is removed. A perfect sine wave is 100%, the fundamental is the system frequency of 50 or 60Hz. Harmonic distortion is caused by the introduction of waveforms at frequencies in multiples of the fundamental, ie: 3rd harmonic is 3x the fundamental frequency / 150Hz. Total harmonic distortion is a measurement of the sum value of the distorted waveform.

Power measurement

Despite the use of good quality test meter instrumentation, high current flow can often remain undetected or under estimated by as much 40%, despite the use of good quality test-meter instrumentation. This severe under-estimation causes overly high running temperatures of equipment and nuisance tripping. This is simply because the average reading test meters commonly used by maintenance technicians, are not designed to accurately measure distorted currents, and can only indicate supply conditions at the time of checking. Power quality conditions change continuously, and only instruments offering true rms measurement of distorted waveforms and neutral currents can provide the correct measurements to accurately determine the ratings of cables, busbars and circuit breakers.

Neutral currents

High harmonic environments can produce unexpected and dangerous neutral currents. In a balanced system, the fundamental currents will cancel out, but, triple-N's will add, so harmonic currents at the 3rd, 9th, 15th etc. will flow in the neutral. Traditional 3-phase system meters are only able to calculate the vector of line-to-neutral current measurements, which may not register the true reading. Integra 1530, 1560 and 1580 offer a 3-phase 4-wire version with a neutral 4th CT allowing true neutral current measurement and protection in high harmonic environments.

Harmonic profiles

There is much discussion over the practical harmonic range of a measurement instrument, however a study of the harmonic profiles of typically installed equipment can guide the system designer to the practical solution. A typical harmonic profile graph will show a logarithmic decay as the harmonic frequency increases. It is necessary to establish the upper level at which the harmonic content is negligible.

Example:

A laptop switch mode power supply causes approximately 25% of 3rd harmonic, 19% of 5th harmonic, 10% of 7th harmonic and 5% of 9th harmonic, etc. Therefore, it is clear that almost all the harmonic content in an IT dominated load will be below the 15th harmonic.

In a 3-phase load incorporating 6-pulse bridge technology as is common in many variable speed drives, UPS systems and dc converters, similar profiles will be observed which also extends to the 25th and 27th harmonic. It can therefore be deduced that in the majority of industrial and commercial applications, an instrument measuring up to the 31st harmonic is ideal.

Costs

Harmonic currents add to the fundamental load current and can affect revenue billing by introducing errors into kilowatt hour metering systems, which will directly increase the net billable kilowatt demand and kilowatt hour consumption charges.

The commercial effects of harmonic distortion to power quality are dramatically shorter equipment lifetimes, reduced energy efficiency and a susceptibility to nuisance tripping. The costs of supply interruption are high, however caused, resulting in data corruption, disruption of process manufacturing and failure of telecommunications facilities etc.

Notes

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