ImpedoDU0®



DUAL FEEDER - MULTI-FUNCTION POWER MONITOR WITH GPS LOCKED TIME SYNCHRONISATION

- Power Quality Measurement (IEC 61000-4-30-Class A)
- Harmonic & Inter-harmonics (IEC 61000-4-7)
- Flicker Meter (IEC 61000-4-15)
- SCADA Transducer (IEC 61850)(Optional)
- Synchrophasor Recorder





The Impedo DUO contains two independent GPS synchronised instruments in one – each with 4 x voltage and 4 x current inputs. It is housed in a rugged machined aluminium enclosure and features an on-board GPS, high-resolution LED Display, multi-touch man-machine interface, 2 x Gigabit Ethernet ports and 2 x USB2.0 (HS) ports. All communication is secure and the instrument password protected.

Xross-Trigger® and Snapshot® Mechanisms

The Xross-Trigger[®] event synchronisation mechanism enables the recording of a Snapshot[®] of GPS time synchronised data from a group of remotely installed instruments. Each instrument maintains a large buffer of raw GPS time synchronised voltage and current data. When triggered one instrument will dispatch a Xross-Trigger[®] command to the others via the IP network. Upon receipt of a Xross-Trigger[®] command, each instrument will retrieve and store the requested raw historic data from its on-board buffer. Once retrieved the user can analyse and display the Snapshot[®] of data.

Features & Highlights

•	Permanent GPS time synchronisation	•	0.5 MHz simultaneous sampling rate	•	Dual synchronised architecture
•	Multi-Touch colour LED display	•	Waveform capturing	•	Android Operating System
•	On-board GPS & real-time clock	•	1/6 th -Sense [®] RMS & phasor capturing	•	Installation Wizard
•	Dual USB2.0 peripheral ports	•	Xross Trigger [®] Event Synchronisation	•	Graphical Real-Time Display
•	Dual Gigabit Ethernet ports	•	Snapshot [®] Recording	•	On-board telemetry data
•	Secure IP connectivity	•	IEC 61000-4-30 Class-A PQ Parameters	•	On-board SQL data store
•	Universal PFC AC/DC supply + PoE	•	IEC 61000-4-7 Harmonic & Inter-Harmonic	•	Osprey Lite: Free remote support
•	5 - Year maintenance free battery	•	IEC 61000-4-15 Flicker		Software
•	0.1% Accuracy	•	IEC 61850 Substation Automation Protocol	•	Solid state data storage (Flash)

MEASURED PARAMETERS	Waveforms	1/6th Cycle	10/12-Cycle Block	10/12-Cycle Harmonics	10/12- Cycle Inter- Harm	Aggregated Trends	Aggregated Harmonics	Aggregated Inter-Harm
VOLTAGE								
Frequency (Hz)		х	х			х		
Voltage (Volt)	х	х	х	х	х	х	х	х
Voltage (% of Nominal)		х	х	х	х	х	х	х
Voltage (% of Fundamental)				х	х		х	х
Voltage Phase Angle (Degrees)		х	х	х				
Voltage Unbalance (%)		х	х	х		х	х	
V-Positive Amplitude (Volt)			х			x		
V-Positive Angle (Degrees)			х					
V-Negative Amplitude (Volt)			х			х		
V-Negative Angle (Degrees)			х					
V-Zero Amplitude (Volt)			х			х		
V-Zero Angle (Degrees)			х					
Voltage Under-Deviation			х			х		
Voltage Over-Deviation			х			х		
Voltage THD			х			х		
Flicker (Pst)			х			х		
Flicker (Plt)						х		
CURRENT								
Current (Ampere)	х	х	х	х	х	х	х	х
Current (% of Fundamental)		х		х	х		х	х
Current Phase Angle (Degrees)		х	х	х				
Current Unbalance (%)		х	х	х		х	х	
I-Positive Amplitude (Ampere)			х			х		
I-Positive Angle (Degrees)			х					
I-Negative Amplitude (Ampere)			х			х		
I-Negative Angle (Degrees)			х					
I-Zero Amplitude (Ampere)			х			х		
I-Zero Angle (Degrees)			х					
Current THD			х			х		
Crest Factor		х	х			х		
K-Factor			х			х		
POWER								
Active Power (Watt)		х	х	х		х	х	
Reactive Power (VAR)		х	х	x		х	х	
Apparent Power (VA)		х	х	х		х	х	
Power Angle (Degrees)		х	x	x		x	x	
Power Factor		х	x	x		x	x	
POWER – IMPORT								
Imported Active Power (Watt)			х			х		
Imported Reactive Power (VAR)			х			х		
Imported Apparent Power (VA)			x			x		
Imported Power Angle (Degrees)			х			х		
Imported Power Factor			х			х		
POWER – EXPORT								
Exported Active Power (Watt)			x			x		
Exported Reactive Power (VAR)			x			x		
Exported Apparent Power (VA)			x			x		
Exported Power Angle (Degrees)			x			x		
Exported Power Factor			x			x		
IEC-61000-4-30								
IEC Conformance Flag			х	х	х	x	x	x

Measurement Interfaces

Each voltage measurement unit interfaces directly to VT circuits (110V) or Mains (<600V) through the differential voltage measurement interface. The instrument calculates line voltages from the instantaneously sampled phase voltages.

CT-circuits interface directly to the galvanically isolated current inputs.

Voltage output current transducers like Rigowsky coils interface directly to the differential $1V_{RMS}$ current transducer inputs. The instrument calculates "missing current" by assuming the sum of all currents = zero.

Power sources

The instrument is powered from a Power Factor Corrected AC/DC supply input or via IEEE 802.3-2008 compliant PoE Plus (<25W) sources. The internal LiFePO⁴ battery powers the instrument in the absence of power. This battery guarantees 2,000 charge/discharge cycles. It translates to a 5-year life expectancy if cycled once per day. The life expectancy of the battery is in excess of 10 years.

Communication

2 x Gigabit Ethernet ports facilitate local and WAN communication. One port is used to interface with corporate networks (DHCP or fixed IP support). The other port is used to create a local network. The remote support software (Osprey Lite) automatically discovers instruments connected onto the same network.

USB ports are only used as an external peripheral interface to devices like mass storage, WiFi modules, GPRS Modems, actuators, digital I/O sensors etc.

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Remotely installed instruments automatically establish secure communication links to a corporate/web based server. The instrument management system (IMS) automatically keeps track of each instrument's location, configuration, health (telemetry) and data. Downloading of data is completely automated and recorded data can be accessed via the Internet in graphical, tabled and report form as and when it becomes available. Raw data can be exported for further analysis. Specialist analysis tools are available to group events and classify and report on data according to industry standards like NRS048, EN50160 and IEE1158. All communications are encrypted and each instrument is password protected.



Multi-touch LED Display

Captured data is stored in an on-board SQL database. The full-colour multi-touch LED Display facilitates powerful real-time data browsing and instrument configuration. Real-time data Viewer and an installation wizard enable fault-free installations. No laptop is required to install or retrieve data.

Sampling Rate

The instrument samples all analog inputs at a sampling rate of 0.5MHz. All parameters are calculated and events are triggered from these high-speed digitised waveforms. Captured waveform data are subsampled and compressed to reduce stored data size. The user can configure the waveform-sampling rate from 1kHz to 50kHz.

1/6th Sense[®]

The Impedo DUO calculates a complete set of 1-cycle sliding RMS and fundamental phasor parameters on every zero-cross of each of the three voltage phases to obtain $1/6^{th}$ cycle parameters (6 samples per cycle). The higher resolution 1-cycle data translates into more accurate depth/duration calculations and smoother event profiles.

Event Recording

Upper and/or lower thresholds can be defined for waveform, $1/6^{th}$ -sense[®], 10/12-Cycle block and aggregated parameters. Single-phase and multiple-phase triggers can be defined. When exceeded, the Impedo DUO will retain depth and duration data with pre- and post information for each recorded event.

10/12-Cycle Block Trend Recording

High-speed (\approx 5 samples per second) RMS, Phasor and Harmonic data trends are derived from IEC61000-4-30 Class-A compliant 10/12-cycle blocks (\approx 200ms block). These block values contain both amplitude and angle information of harmonics and unbalance phasors (sequence components). Each block is time-stamped with a 1µs time resolution. Alternatively the user can average N x blocks to reduce the sampling interval. (Averaged block harmonic and unbalance phasors does not retain phase angle information).

Clock synchronised recording

Clock synchronised trends are aggregated according to IEC61000-4-30 Class-A requirements over a userdefined time interval. Clock synchronised parameters are time-stamped with a 1s time resolution.



Impedo DUO



VOLTAGE INPUTS						
Number of channels	2 sets of 4 x differential inputs (3/4 Wire + 4 th Diff)					
Measurement input range	0 – 600 V _{RMS}					
Voltage measurement	Single Phase, 3-Phase (Star, Delta), DC					
Input impedance/channel	>1 MΩ					
CURRENT INPUTS						
Number of channels	2 sets of 4 x galvanically isolated inputs					
Measurement input range	0 – 5.0 A _{RMS}					
Maximum continuous current	6.0 A _{RMS}					
3 sec over-current withstand	50 A					
VA Burden @ 5A	< 1 VA					
Galvanic isolation	1,000 V					
CURRENT TRANSDUCER INPUTS						
Number of channels	2 sets of 4 differential inputs					
Measurement input range	0 – 1.0 V _{RMS} (±1.414V Peak)					
Input impedance/channel	>1MΩ					
ACCURACY & BANDWIDTH						
Power frequency range	DC, 50Hz (40-60Hz), 60Hz (50-70Hz)					
Harmonic bandwidth	1-64 th (harmonic and inter-harmonic)					
Measurement sampling rate	0.5 MHz (simultaneously sampled)					
Waveform storage rate	1kHz-50kHz (user configurable)					
ADC Resolution	16-Bit					
Overall accuracy class	0.1%					
Fast Transient Capturing	> 20 µs					
COMMUNICATION						
Ethernet	2 x Gigabit Ethernet - IEEE 802.3-2008 compliant					
USB	2 x USB2.0 – 480Mbit (powered)					
CLOCKS						
On-Board GPS	On-board 3V3 power for active external antennae					
Overall Accuracy Class	± 20 μs from absolute time					
On-Board RTC drift	1 ppm (32-seconds per annum)					
MAN-MACHINE INTERFACES						
LCD	7" - 800x480 - LED colour display					
Multi-Touch	Projected capacitive (gesture recognition)					
OLED Display	256x64 – monochrome					
POWER						
Maximum Power Consumption	< 25 VA					
AC/DC supply voltage input range	90-300 V _{RMS} , 42-69 Hz (power factor corrected)					
Power over Ethernet	IEEE 802.3 compliant (35-60 V _{DC})					
On-board battery	LiFePO ⁴ (2,000 charge/discharge cycles)					
PHYSICAL						
Construction	Aluminium, 250x135x65 (L x W x H)					
Mounting options	3U-19" Rack, Panel Mount, Portable					
Electrical connections	Pluggable screw type (screw lock-down)					
Electrical isolation class	600V Class II					
COMPLIANCE						
PQ Measurement	IEC 61000-4-30, Class-A					
Harmonics						
	IEC 61000-4-7					
Flicker	IEC 61000-4-7					



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