

Ranger PM7000



With
Bluetooth Pocket PC
See behind closed doors

A comprehensive,
high performance tool
for *all* your P. Q.
measurement needs

- **Easy to use**
- **Automatic measurements**
- **Water resistant**

- The Cat IV 600V Phase A powered Power Quality Analyser
- Over 470 channels Reporting to the Standards
- 32 Troubleshooting channels with detail
- 8 channels for Waveform Capture, at High Speed over 1 Ms/sec (24576 samples per cycle at 50Hz).
- Intelligent, effective data handling technique, the Ranger patented **Adaptive Store**. Now joined by **Waveform Ranking** where the 'best / worst' ones are selectively retained for effective data management.

Virtually unlimited memory
Automatic copy to memory stick
Zero download time!



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High Speed Comprehensive Power Quality Analyser

Routine measurements, Troubleshooting & High Speed Waveform Capture Simultaneously!

Ranger PM7000



- Auto-ranking Waveform Capture
- Records **32 channels** simultaneously for **2 WEEKS** with single cycle resolution on changes because of our **Exclusive Patented "Single Cycle Adaptive Store"**
- Also, records over **470 channels** of general parameters) in **10 minute**(or user specified) increments. Gives unprecedented detail.
- **Pocket PC included** with every unit
- Reports to the Standards.
- Can automatically download data after each recording to USB stick

- **The only analyser to include the required Instantaneous Flicker Sensation output. Provides authoritative Flicker measurements to IEC61000-4-15.**
- **Harmonic Direction** shows if Harmonics are **upstream or downstream** of the point of measurement. Also measures individual Harmonics to the **50th**, and Interharmonics (optional)
- Comes with **Pre-stored Configurations**. Just choose through the communication port, or program your own with the included PMScreen Software.
- **Phasor Diagram Display** ensures correct hook up and shows the phase relationship of individual harmonics, **NOT** just the fundamental.
- On-screen **HELP** guides users through configuration and hook up
- **Stores up to 200 configurations on board. Eliminates the need to program on site. Just choose a configuration, press Load and Start.**
- **Over 200 Megabyte of on Board Data Storage** plus USB Flash Memory Expansion Port.
- Sampling rate:

PM7000	384	samples / cycle @ 50 Hz
PM7000H	3072	samples / cycle @ 50 Hz
PM7000T	24576	samples / cycle @ 50 Hz
- The **Cat IV 600V Phase A powered** Power Quality Analyser

See on the PDA:

Status, live screens for waveforms, Harmonics, Interharmonics, Trends, Disturbance Incidents (3D Bar, CBEMA, Severity Duration v Time), phasors & many more.



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Each KIT Includes

- **Ranger PM7000** power quality analyser
- Four 24" 6000 Amp Flexible Current Clamps (max conductor size 8"), braided
- Five Voltage probes 1000V Cat III (600V Cat IV), braided
- Three Neutral Common Leads
- Mains lead or charger (US)
- USB lead
- Pronto for Windows Analysis Software
- Customer CD
- Pocket PC

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High Speed Comprehensive Power Quality Analyser

Example Screens of the *Ranger* PM7000

Ranger PM7000
 BETA: 0.206 Serial No: 1.018.0246.550203

14:16:12 10 Jul 06 Main Menu Help ?

Connections Rogowski Coil 3Ø 4w Wye

← Back Main Menu

Operations
 Explore Configure Stop Recording Power Off

Display Graphs & Tables
 General Parameters Detail Recording Channels
 Volts Current Power
 Harmonics and Phasors Compare to Standards ENS0160 GS/4 IEEE519
 Waveforms

14:26:03 10 Jul 06

← Back Information

Ranger PM7000 Power Master Series
 Serial No: 1.018.0246.550203
 Date calibrated: 4/Jul/06

← Back PM7000 Help

Help for the PM7000 series products is available primarily by pressing a button and holding it down for a second or more.

Try it here... Contents
 Then press briefly for more help. Index
 General
 Press here to skip this introduction in future (re-enabled on next Logger power-up). Skip

← Back Configure

Preferences Utilities Available Configs

Current Configuration is Initial Config

Hook Up Record Mode & Times Review
 Detail Recording Channels Save as...
 Input Signals Waveform Capture Flicker

← Undo Select Hook-up Accept

3-Phase 4-Wire Wye (Optional)

V-Line V-Return Current
 Some connections may be suspect Details

← Undo Input Signals Accept

VOLTAGE GROUP Secondary PT
 Set signals individually Ratio 200:1

CURRENT GROUP Secondary CT
 Set signals individually Ratio 200:5

Select Current Sensor (& Range)
 Rogowski Coil High 3000A Mid 320.0A
 Voltage Output CT 0-1V rms Ratio 10:1

← Undo Set Waveform Capture parameters Accept

Retain Wave Sets on basis of
 Greatest Disturbances First Past Threshold

Captured Wave Bracket 100 ms
 Press within waves to choose start & stop

Signals to be Captured
 Triggers to be used Set

← Undo Setup Record Mode & Times Accept

General Parameters Record Every 1 min

Detail Recording (Trouble Shooting)
 Storage Mode Adaptive Store Point Store
 Record Time 7 days
 Recycling FIFO On Off

← Undo Detail Recording Channels Accept

Setup the recording channel functions: (press function TWICE to edit or use buttons)

10 RMS Ic (I3) Aac
 11 RMS In (I4) Aac
 12 Flicker Sensation Van Pfs
 13 Flicker Sensation Vbn Pfs
 14 Flicker Sensation Vcn Pfs
 15 Flicker PLT Van (V1) Plt

List by: Channel Name Signal

← Undo Edit Channel Function Accept

+/- % One Harmonic Apply to Channel: 16
 1 2 3 4 5
 6 7 8 9 10
 11-20 21-30 31-40 41-50
 of Signal Units %
 Van Vbn Vcn Vne
 Ia Ib Ic In
 High Alarm +0.0 Off Low Alarm +0.0 Off

Recording Suggestions Return to List

Most recent channel defined: (press to edit, or clear using button)
 7 Calculated RMS Vac Vac Clear

No. of next channel to be defined: 8
 Suggestions for next channel: (press on a function to select then edit above)

RMS Ia (I1) Aac
 THD Van (V1) %
 Other

← Back Detail Recording Channels

1: RMS Van (V1)	2: RMS Vbn (V2)
+222.1 Vac	+0.0 Vac
3: RMS Vcn (V3)	4: RMS Vne (V4)
+0.1 Vac	+0.0 Vac
5: Calc RMS Vab	6: Calc RMS Vbc
+222.1 Vac	+0.1 Vac
7: Calc RMS Vac	8: RMS Ia (I1)
+222.2 Vac	+12. Aac

Set Channels to Display

← Back General Parameters - Live Summary

Summary	Volts	Current	Volts Flicker
Signal	V-rms [V]	Signal	I-rms [A]
Van	222.0	Ia	12
Vbn	0.1	Ib	0.
Vcn	0.1	Ic	6.
Vbc	0.0	In	7.
Parameter		Parameter	
Unbal %	199.73	kW	+2.
NPS/PPS	100.00	kVar	+0.
PF	+0.94	kVA	2.
Freq. (Hz)	49.89	kWhr	7.

← Back Harmonic Presentation

BarGraph Phasor Trend Table

Signal All
 Harm. 1-21
 Remove Fund. Show Direction

← Back Harmonic Presentation

BarGraph Phasor Trend Table

Harm	Rel(%)	Phase	Value
1	100.0	0	222.6
2	0.0		0.0
3	0.9	204	1.9
4	0.0		0.0
5	0.9	114	1.9
6	0.0		0.0
7	1.9	189	4.3
8	0.0		0.0
9	0.3	236	0.7
10	0.0		0.0

← Back Live Waveforms Stored Waveforms

Zoom History

← Back Live Waveforms Stored Waveforms

Zoom History

← Back Live Waveforms Stored Waveforms

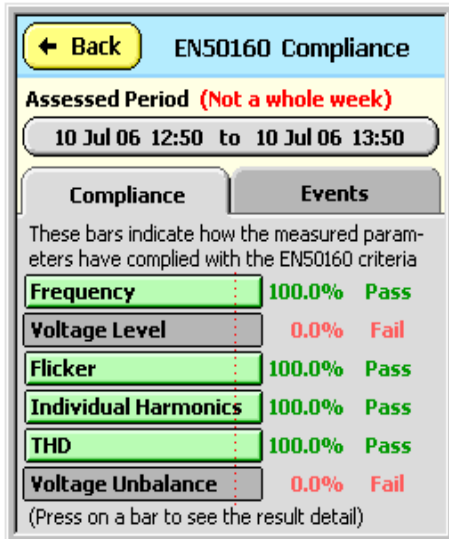
Zoom History

← Back Live Waveforms Stored Waveforms

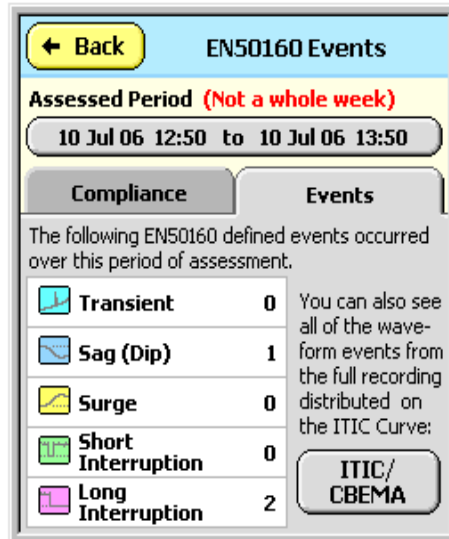
Zoom History

High Speed Comprehensive Power Quality Analyser

Ranger PM7000



Screen a)



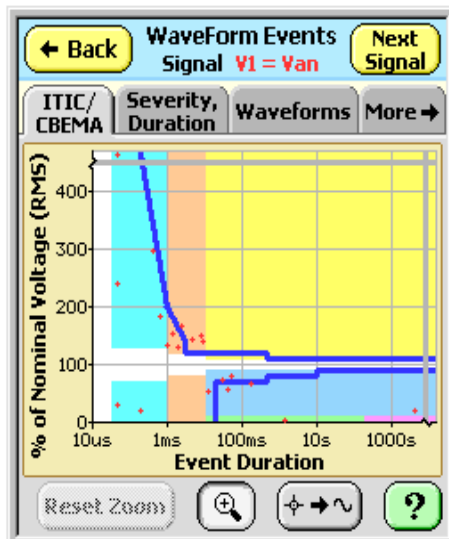
Screen b)

Recorded results may be compared against various Standards, for example EN50160 the European Public Voltage Supply characteristic.

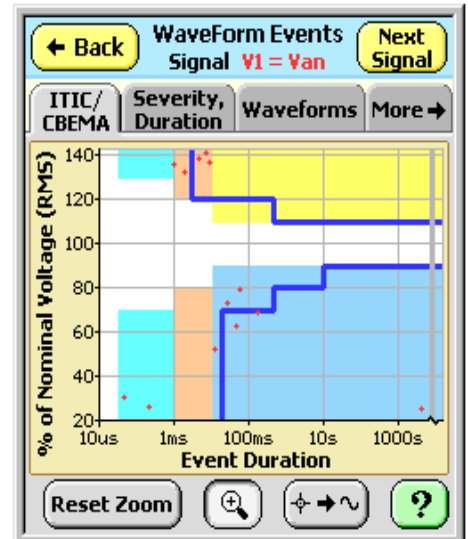
The screens here show examples a) of the summaries for compliance of the supply during the assessed period, and b) the number of specific events.

For both of these screens the assessment period can be adjusted.

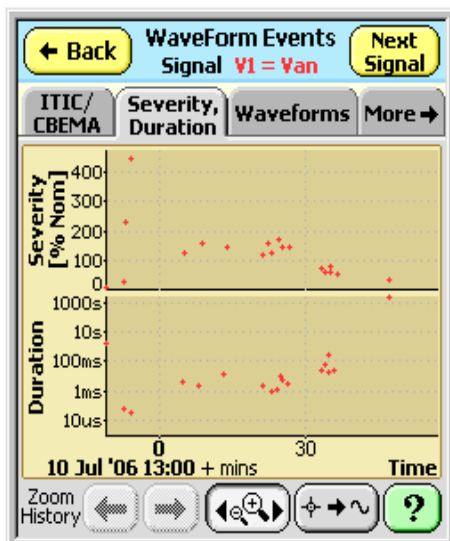
The screens to the right and below show different ways of presenting recorded event data. Screen c) is the conventional ITIC (CBEMA) presentation. This graph can be zoomed (d) to distinguish elements of a cluster, then the relevant waveform can be displayed.



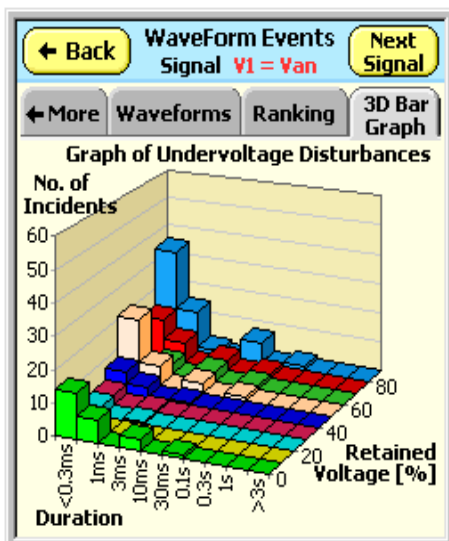
Screen c)



Screen d)



Screen e)



Screen f)

Screen e) shows event severity and duration against time for the recording. This too can be zoomed in.

Screen f), the 3D Undervoltage Disturbance graph, shows how serious the supply disruptions have been in terms of an industrial process being disturbed.

Remember that sags/dips may affect processes more seriously than complete outages.

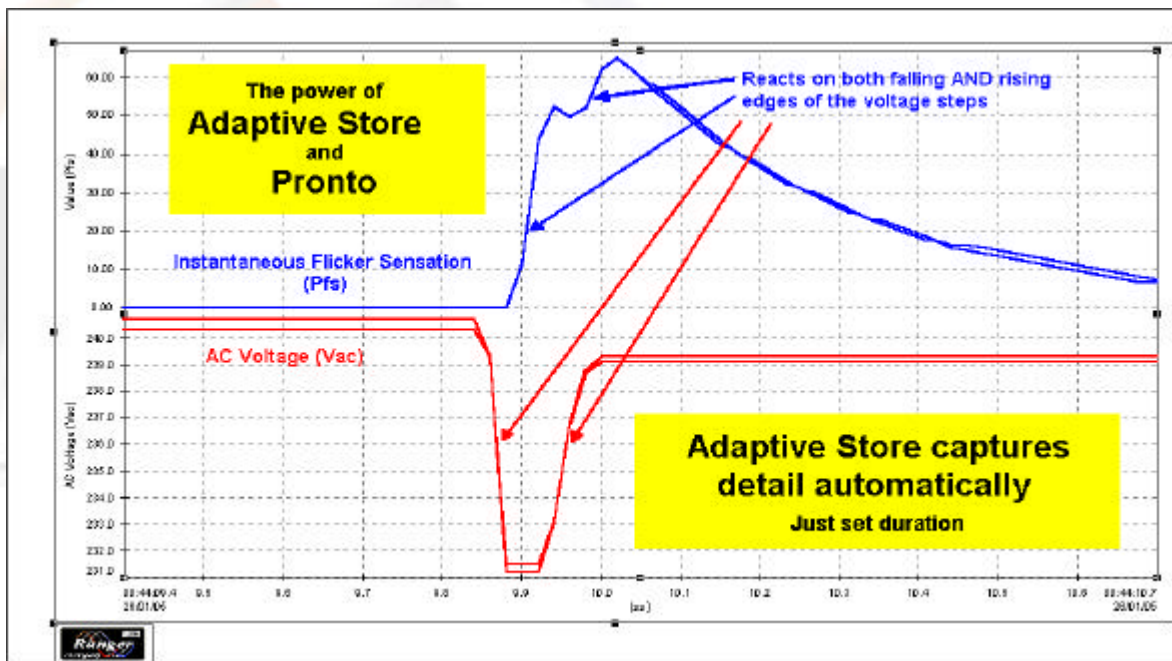
High Speed Comprehensive Power Quality Analyser

Introducing the *Ranger* software **Pronto for Windows**

The PM7000 gives you detail over long recording periods thanks to ORL's intelligent, effective, data handling technique, **Adaptive Store**.

This unique capability is combined with the comprehensive scope of the Ranger data analysis software, **Pronto for Windows**, to produce graphs and reports.

Example graph



Use the graphing wizard to help you get the graph you want in a few clicks, or be an adventurous user and design your own graph and report layouts, then create a template which Pronto will remember for future use.

All the *Ranger* Power Master series of power quality analysers use the same software, **Pronto for Windows**, and have a similar user interface. Therefore once you have used one of them you can feel comfortable whichever PM you use.

Facilities in Pronto

- Powerful and flexible graphing
- Zooming and panning
- Various forms of text annotations
- Exception reports
- Mixed & matched parameters
- Overlay data from multiple *Rangers*
- Templates
- Listings & tables
- Cut & paste to Word
- Export to spreadsheets

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Adaptive Store Mode

Ranger's patented Adaptive Store recording mode is designed to make the best use of available memory, to meet two conflicting requirements:

- To provide long-term trend data, observing the worst extremes of maximum and minimum values, and;
- To provide detail where new activity occurs, i.e., detecting and capturing sudden changes.

Adaptive Store assesses signal conditions in real time and does not require any prior user description. The only required user parameter is the total time of the record.

Adaptive Store recognizes the *unpredictability* of future signal activity by employing its 13 predictive algorithms, against which all samples are tested as they are received. This unique method of *anticipating* the possible signal path and testing each sample for conformity has these advantages:

- It spreads out the computational load uniformly over time
- It allows for immediate reaction to transients
- It works with extremely long recording periods

The Ranger Adaptive Store recording mode is the most powerful automatic data compression system available on any data logger.

Autoranking Waveform Capture

Ranger's Autoranking Waveform Capture is designed to manage the high speed waveform data. It tracks and ranks multiple categories of sub-cycle transient and other problem event types and discards smaller events when larger ones occur. This automatic real time data management process has these advantages:

- It captures the best, most revealing events without any prior knowledge of what might happen. Setting thresholds is not necessary.
- It increases quality of data at the same time as reducing volume and consequently speeds up download time as well as making review easier.
- It works equally well over short and long recording periods.
- It is continuously re-triggerable and does not require re-arming.

Ranger PM7000



Use the PM7000 to measure any low voltage supply including the mains supply or high voltage through secondary transformers.

e-mail sales@outramresearch.co.uk

Ranger PM7000S, PM7000H, PM7000T

Specification

Input Voltage: Four 0-600 Vac. input channels. Sensors: Inline shrouded 4mm banana sockets. Fused leads, crocodile clip.

Input Currents: Four input channels. Sensors: two ranges on two types. Menu Selectable Rogowski coil 0- 6000A, 0-400A, or Voltage Type 0-1 Vac. Safety BNC Socket. Phase reversal in software.

Three distinct simultaneous Recording Systems:

Waveform capture: High Speed sampling on all inputs.

Troubleshooting: utilizing the patented **single cycle Adaptive Store to capture comprehensive detail over long recording periods** on up to 32 selected parameters.

General Parameter Analysis: including reporting to Standards.

Configurations: Space for over 200 files. These may be used for configuration or recording sessions

Accuracy: < 0.25% (excluding sensors), +/- 2LSBs (in target ranges).

Resolution: Programmable to 0.1 Vac and 0.1 Aac, 0.01V high resolution mode.

General Parameter measurement: happens automatically. Fixed Functions recorded on (selected) intervals. (1sec to 2 hours) Voltage & Current RMS (Max, Min, Avg). THD / Harmonic Value (8 inputs), Flicker (3 Voltage inputs). Power (kW, VAR, AP, PF), Individual Harmonics 2-50 (8*50 signals). Unbalance.

Troubleshooting Maths Functions:

AC Single Phase Installation: RMS, Stray Voltage RMS Hi Res < 35V, (line-neutral, line-line where appropriate). Real power W, Reactive Power VARS, Apparent Power VA, Power Factor PF, Displacement Power Factor, Phase Angle, Frequency, **Instantaneous Flicker Sensation**, Short Term & Long Term Perceptibility, Flicker Flag, Distortion Power.

AC 2 (split) Phase Installation: Real Power, Reactive Power VARS, Apparent Power, Power Factor

AC 3 Phase Installation (Delta, Wye and variants): Real Power, Reactive Power VARS, Apparent Power, Power Factor, Voltage Unbalance, (Conventional & Sequential Components), Current Unbalance. Distortion Power, Positive Sequence Fundamental Real & Reactive Power (IEEE1459).

Harmonics: Odds, Evens, Triplens, Individual Harmonics value and % and Harmonic Direction to the 50st, K Factor, % Total Harmonic Distortion, Total Harmonic Value. Interharmonics.

Other Maths Options: Channel X * Constant, Channel X / Channel Y, Filtered Channel X, Internal Temperature, On Charge, Battery Volts.

Waveform Capture: Sample rate - up to 1.2288 Ms/s in the PM7000T (~ 24,576 samples/cycle at 50 Hz) on 8 channels. Events examined, **Ranked** & stored in real time.

Selectable waveform parameters:

Wave Retention Basis: **Greatest disturbances (automatic ranking and low rank discard)** and first past a threshold.

Capture wave bracket: Wave Sets: from 20ms up to 160ms. Can be contiguous; no re-arming.

Signals to be captured: offending wave / complementary current or voltage, All Voltages, All Currents.

Triggers to be used: Transient, Ring, Notch, Sag, Surge, THD Volts, THD Current.

Wave Allocation: waves allocated across trigger functions.

Sampling:	PM7000S (Standard)	19.2	k Samples per sec
	PM7000H (High speed)	153.6	k Samples per sec
	PM7000T (Turbo)	1,228.8	k Samples per sec

Ranger PM7000S, PM7000H, PM7000T Specification side 2

Memory: 128MB Flash memory for all files. 32MB RAM for high speed waveform capture data, 64MB working RAM.. Expansion with USB Memory Device.

Firmware (program memory) - Flash upgradeable 2MB

User Preferences—Stored in non-volatile Flash Memory

PDA Requirements for PMScreens: Pocket PC

Data Retention: During recording sequential data is saved to Flash memory. Waveform capture data is held in RAM and transferred to Flash memory when recording ends. Configurations etc stored in Flash memory.

User Interface via remote screen: PC via Bluetooth or USB running PMScreens, or PDA (provided) via Bluetooth running PMScreens. Setup/Configuration and Data Review via remote screen. Data analysis using Pronto for Windows. Automatic download to USB stick

Displays On PMScreens: Power & Energy, Waveforms, Harmonics, Phasors, Harmonic Phasors, Trends, Statistics, List of Channels. Comparison to Standards. Interharmonics (optional)

Communications:

Bluetooth: Wireless interface (isolated)

USB: Memory module interface (non-isolated).

USB: Serial interface to PC (isolated > 2.5kV) download to PC & control through Pronto for Windows.

Protocol: MODBUS ASCII

Power: Requires 90-660 VRMS, 15 W Max from Phase A voltage measurement (40 - 64Hz Rated power consumption 11Watts) or separate power supply @12Vdc, 6 W.

Burden: Normally <10 VA from Phase A. If a charger is used the Power Supply is automatically disconnected from Phase A (input impedance per phase 32MOhms).

Battery Capacity: 2100mAh (5 HI-Temp NiMH batteries).

Battery Ride Through: ten minutes at a time.

Charge Method: From V1 input or from 12V Wall Charger (auto switching)

A/D Converters, 2 sets : (i) 24 bit at 19.2 kSps, top 16 bits used normally for harmonics, power & energy, Flicker. (ii) 12 bits for High Speed and Turbo only.

Measurement & Reporting Standards: IEC 61000-4-15, IEC 61000-4-7, IEC 61000-4-30, IEEE1453 (Flicker), IEEE1459, IEEE100, Report to EN50160

Safety Standards: IEC 61010, (600v Cat. IV, pollution level 2, 1000V CAT III if PSU fuses removed), CE Fused voltage leads (lead fuses 500mA, 700V, 50kA rupture current), IEC 61326 (EMC).

Internal fusing: PSU (x2), Charger input, Battery stack, Internal Thermal Switch (x2)

Computer Requirements for Pronto Software: Windows 9x, ME, NT4, XP, 2000, Pentium class processor or higher;

Case: Pelican 1150 Guard Box: Dimensions. 22.9 x 19.1 x 11.0cm

Weight: 3.5 kg. without leads and clamps

Operating Temp: -20° C (-4° F) to 60° C (140° F)

Environmental: IP65. Target - Main unit water resistant to IP67. Leads and their connections are not watertight and for safety reasons we strongly recommend that the operator does not connect and disconnect the unit in wet environments.

Applicable Patents: 6424277, 0230712, 4910692

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