

⇒ Highlights

- Handy and Lightweight Design with 5.7" Color Display
- Integrated Voltage Input 300 V CAT IV / 600 V CAT III
- Integrated Power Supply Function from Measured Circuit
- Two Universal Inputs for Voltage and Current Probes for Power or CT / VT Ratio, Phase and Burden measurement
- Accuracy Classes 0.2, 0.1, 0.05
- Color Graphic Display and Alphanumeric Keypad
- USB Connectivity with PC
- Enhanced Optical Scanning Head
- Optical Interface for Local Data Exchange with Smart Meters According to IEC 62056-21
- High Capacity Memory for Configuration and Data Storage
- LED and TTL Impulse Outputs with Programmable Meter Constant or Frequency
- Vector Diagram and Signal Shape Display (Oscilloscope Mode)
- Harmonics Analysis in Tabular and Graphical Format
- Database System for Tested Meters and Measured Results with Search Capabilities
- Fast Synchronization of Measured Data and Configuration with PC
- PC Software for MS Windows
- Configurable User Interface (Regional and Functional Modifications)
- Transport Case with High Protection Degree



⇒ Description

The **Working Standard WS 2330** is a three-phase precision reference meter for electrical power and energy measurement, dedicated to on-site meters testing. The device provides also function of local data exchange with smart meters (data readout).

The device is designed for operation in single-, two- and three-phase systems, where it evaluates and displays all individual quantities per phase and cumulative three-phase quantities.

Universal inputs can be equipped with any combination of interchangeable precision voltage and current sensors up to 600 V and 6000 A. It contains direct voltage input 300V CAT IV / 600 V CAT III and provides function of supply from measuring circuit.

Measurement is based on precision A/D conversion and DSP technology and enables accurate high-speed real time evaluation of all main and informative quantities.

Beyond measurement of power, voltage, current and phase the device indicates voltage sequence, evaluates active, reactive and apparent energy and measures distortion and wave-form of measured signals.

The device can generate any programmed energy proportional or constant frequency on the impulse output. This unique feature allows precision error evaluation with minimum integration period. The device is equipped with integrated error calculator and meter scanner capturing LED, DISK or Closed Contact output of tested meters and snap switch for simple manual testing.

The device can be supplied from internal rechargeable battery, from external power adapter or from car outlet. Function of supply from measured circuit is integrated as a standard.

Software for MS Windows enables transfer and presentation of measured data in PC.

Optional portable printer enables on-site printing of results or actual display content.

⇒ Technical Specification

Basic Error	WS 2330A-base	WS 2330B-base	WS 2330C-base
Current	dependent on type of current sensor		
Voltage	0.05 %	0.05 %	0.05 %
Apparent Power	0.05 %	0.1 %	0.2 %
Active Power ^{*1}	0.05 %	0.1 %	0.2 %
Reactive Power ^{*1}	0.05 %	0.1 %	0.2 %
Power Factor	0.001	0.002	0.004
Frequency	0.01 Hz	0.01 Hz	0.01 Hz
Distortion	0.2 %	0.5 %	0.5 %
Phase Angle	0.01 °	0.03 °	0.1 °

Measured Quantities

Voltage, Current; Active, Reactive and Apparent Power and Energy, Power Factor, Phase Angle, Frequency, Distortion; Active Power of Harmonics; Burden, Phase and Ratio of current and voltage transformers

General Specifications

Input Circuits	1-phase 2-wire 1-phase 3-wire and 2-phase 3-phase 3-wire / 4-wire	
Voltage Range	0.1 .. 600 V (phase to neutral)	manual or auto range
Current Range	depending on type of current sensor - up to 20 A / 120 A / 240 A / 6000 A (or more)	
Power Factor Range	-1 .. 0 .. 1	
Phase Angle	0 .. 360 °	
Basic Frequency	40 .. 70 Hz	
Bandwidth	up to 3000 Hz	
Harmonics	up to 60 th	
Communication Interfaces	USB (SCPI compatible comm. protocol), wireless (2.4 GHz) – Bluetooth, optical interface for communication with meters according to IEC 62056-21 (via OPTH 1000)	
Display	5.7" / 320 x 240 pixels / 256 colors	
Memory for Data	min. 1 GB (>1000 load points)	
Temperature Coeff.	< 50 x 10 ⁻⁶ / °C	
Oper. Temperature	-20 .. +50 °C	
Storage Temperature	-25 .. +60 °C	
Operating Humidity	max. 95% relative humidity (non-condensing)	
Power Supply	from int. rechargeable battery (Li-Ion) from Power Adapter (100 - 240 V _{AC} / 12 V _{DC}) from Car Outlet Adapter (12 V _{DC}) from Measured Circuit (PFMC) (30 - 300 V / 45 - 65 Hz)	
Power Consumption	from battery: 2 W (body only), 4 W (body + CC @ 100 A) PFMC: 5 W / 10 VA (body only), 7 W / 14 VA (body + CC @ 100 A)	
Applicable Standards	IEC 60736, IEC 62056-21, IEC 61010-2-032	
Degree of Protection	IP-42 (device), IP-67 (transport case)	
Safety Requirements	Isolation protection : EN 61010-1 Category : 300V CAT IV / 600V CAT III	
Dimensions (W x D x H)	220 x 160 x 60 mm (basic device) 464 x 366 x 176 mm (transport case)	
Weight (approx.)	0.85 kg (basic device), 6.5 kg (total standard setup)	

Impulse Output

Impulses Assigned to	Active, Reactive, Apparent Energy or programmable constant frequency
Meter Constant	programmable
Max. Imp. Frequency	70 kHz

Basic Accessories (for WS 2330-base)

WSB 2330, OPTS 2100 /WS, WSSC 2030, OPFC 1000, WSPA 2000, WSCA 1000, VC 2360, WSVS 3360, WSTC 2030, CCU 1000, WSSW 1000, WSIO 2030, WSSS 3030, OPTI 2000, WSUG 1030, WSCC 1000

Optional Accessories

CC 2312B /P, CT 3320 /P, FCP 3321 /P, WSCS 3300, OPTH 1000, PP 2000, VC 2300, VC 2305, VC 2310, VC 2320, VC 2330, WSPE 1020 /P, USeGate /P, CC 4300C /P (please refer to separate datasheet)

Internal Voltage Input (CAT IV 300V / CAT III 600 V)	
Voltage Range	0.1 .. 600 V phase to neutral
Basic Error (5 V – 500 V)	0.05 %

Current Transducer CT 3320 /P

Current Range	1 mA .. 20 A	
Basic Error (10 mA – 20 A)	CT 3320A /P	0.05 %, 0.05 ° (with WS 2330A)
	CT 3320B /P	0.1 %, 0.1 ° (with WS 2330B/A) 0.2 %, 0.2 ° (with WS 2330C)
Signal Cable Length ^{*5}	1.5 m	
Dimensions	105 x 70 x 50 mm	
Weight	0.3 kg	

Current Clamps CC 2312B /P

Current Range	1 mA .. 120 A	
Basic Error ^{*2} (20 mA – 100 A)	0.1 %, 0.1 ° (with WS 2330B/A) 0.2 %, 0.2 ° (with WS 2330C)	
Signal Cable Length ^{*5}	2 m	
Max. Cable Size in Jaws	Ø 16 mm	
Dimensions	140 x 50 x 25 mm	
Weight	0.9 kg	

Flexible Current Probe FCP 3321 /P

Current Range	0.2 A .. 6000 A (or more)	
Basic Error ^{*4} (6 A – 6000 A)	FCP 3321D /P	0.5 %, 0.3 °
	FCP 3321C /P ^{*6}	0.2 %, 0.2 °
Sensor Cable Diameter / Minimum Bend Radius	6 mm / 50 mm	
Sensor Diameter ^{*5}	Ø 160 mm	
Signal Cable Length ^{*5}	2 m	
Dimensions	160 x 160 x 10 mm	
Weight	0.4 kg	

Portable Printer PP 2000

Printing Method	Thermal, bidirectional
Interface	Bluetooth

^{*1} related to apparent power

^{*2} specified for compensated ranges

^{*3} specified for cable position more than 15 mm away from the coupling area

^{*4} specified for cable position more than 25 mm away from the coupling area

^{*5} different lengths to be specified in order

^{*6} only on special request

Parts / Accessories List

Code	Description
WSB 2330	Working Standard Body
CT 3320A /P	Current Transducer (3 x 20 A, 0.05 %)
CT 3320B /P	Current Transducer (3 x 20 A, 0.1 %)
CC 2312B /P	Current Clamps (Ø 16 mm / 3 x 120 A)
CC 4300C /P	Current Clamps (Ø 50 mm / 3 x 1000 A)
FCP 3321D /P	Flexible Current Probe (3 x 6000 A, 0.5%)
FCP 3321C /P ^{*6}	Flexible Current Probe (3 x 6000 A, 0.2%)
WSCS 3300	Current Cables for CT (three phase set)
WSVS 3360	Voltage Cables for VT (three phase set)
VC 2360	Standard Voltage Clips (three phase set)
VC 2300	Special Voltage Clips (three phase set)
VC 2305	Retractable Voltage Clips (three phase set)
VC 2310	Omega Voltage Clips (three phase set)
VC 2320	Spike Voltage Clips (three phase set)
VC 2330	Magnetic Voltage Clips (three phase set)
OPTS 2100 /WS	Optical Sensor
WSSC 2030	Optical Sensor Cable
OPFC 1000	Fixing Clamp for Optical Sensor
OPTH 1000	Optical Communication Head
WSIO 2030	Impulse Output Cable with BNC connector
WSSS 3030	Snap Switch with integrated Impulse Input Base
OPTI 2000	Impulse (SO) Cable
PP 2000	Portable Printer
CCU 1000	Communication Cable USB
WSPA 2000	Power Adapter (100-240V)
WSCA 1000	Car Outlet Adapter (12V)
WSTC 2030	Transport Case
WSSW 1000	Software for PC (Installation USB key)
WSUG 1030	Printed User's Guide
WSSC 1000	Calibration Certificate from accredited laboratory
WSPE 1020 /P	Probe Cable Extension to length 20 meters
USeGate /P	Universal Sensor Gate for providing compatibility with SensorLink® high voltage and high current products