

⇒ Highlights

- Lightweight compact size
- Single- and three-phase versions, accuracy classes 0.2, 0.1, 0.05
- Color graphic display and alphanumeric keypad
- USB, RS-232 and optical interface for local data exchange with multifunctional meters according to IEC 62056-21
- Configuration and data stored in high capacity memory (min. 1 GB)
- Vector diagram and signal shape display (oscilloscope mode)
- Harmonics analysis in tabular and graphical format
- LED and TTL impulse outputs with programmable energy proportional meter constant or programmable frequency
- Enhanced internal database system for tested meters and measured results with search capabilities
- Enhanced self-adjusting optical scanning head
- Synchronous differential energy consumption measurement
- Two universal input channels for any combination of Voltage and Current probes for Power or CT / VT ratio, phase and burden measurement
- Compatibility with SensorLink® high voltage and high current products via Universal Sensor Gate optional accessories
- Enhanced fast synchronization of measured data and configuration with PC
- PC software for MS Windows
- Transport case with high protection degree
- Optional portable printer for printing of results and actual display content
- Optional universal isolated input/output (relay, logic signal)
- Configurable user interface (regional and functional modifications)



⇒ Description

The **Working Standard WS 2x20** is a single-phase (WS 2120) and three-phase (WS 2320) precision reference meter for electrical power and energy measurement, dedicated to on-site meters testing. The device can be used also as hand-held unit for local data exchange with smart meters (programming and data readout of meters).

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 ones as well.

Universal inputs can be equipped with any combination of interchangeable precision voltage sensors working up to 600 V and current sensors working up to 6000 A or more.

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 accumulators, from external power adapter, from car outlet or optionally also from measured voltage circuit.

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 2120A-base WS 2320A-base	WS 2120B-base WS 2320B-base	WS 2120C-base WS 2320C-base
Current	dependent on type of current sensor		
Voltage	0.05 %	0.05 %	0.1 %
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; Active, Reactive and Apparent Energy, Power Factor, Phase Angle, Frequency, Distortion; Active Power of Harmonics; Burden, phase and transformation ratio of current and voltage transformers

General Specifications

Basic Frequency	40 .. 70 Hz	
Input Circuits	1-phase 2-wire (WS 2120 & WS 2320) 1-phase 3-wire and 2-phase (WS 2320) 3-phase 3-wire / 4-wire (WS 2320)	
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 °	
Communication Interfaces	USB and RS-232 (SCPI compatible comm. protocol), optical interface for communication with meters according to IEC 62056-21 (via OPTH 1200), optionally wireless (2.4 GHz)	
Display	3.5" / 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 Consumption	approx. 1.5 W	
Power Supply	from int. rechargeable accumulators (4 x NiMH / AA size) from Power Adapter (100 - 240 V _{AC} / 12 V _{DC}) from Car Outlet Adapter (12 V) from measured voltage circuit (30 - 520 V / 45 - 65 Hz) ^{*7}	
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 Measurement category : CAT IV (with VT 2x60) Protection resistance: 4 MΩ (each voltage input)	
Dimensions (W x D x H)	210 x 105 x 40 mm (basic device) 464 x 366 x 176 mm (transport case)	
Weight (approx.)	0.55 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 2x20-base)

WSB 2x20, VC 2360, OPTS 2100 /WS, WSSC 2000, OPFC 1000, WSPA 2000, WSCA 1000, WSTC 2000, WSNS 2000, CCU 1000, WSSW 1000, WSIO 2000, WSSS 3000, OPTI 2000, VC 2x60, BAA 2000, WSPA 2000, WSCA 1000

Optional Accessories

VT 2x60, VT 3x30, WSVS 2x60, CT 3x20, WSCS 3x00, CC 2x12B /16, FCP 3x21D /WS, OPTH 1200, PP 2000, CCR 1000, VC 2x00, VC 2x05, VC 2x10, VC 2x20, VC 2x30, WSPE 1020, USeGate

Voltage Transducer VT 2x60 (CAT IV 600V)

Voltage Range	0.1 .. 600 V phase to neutral	
Basic Error (5 V – 500 V)	VT 2x60A	0.05 % (with WS 2x20C/B/A)
Signal Cable Length ^{*5}	1.75 m	

VT 2x60 is without power from measured circuit (PFMC) feature

Voltage Transducer VT 3x30 (CAT III 300V)

Voltage Range	0.1 .. 300 V phase to neutral	
Supply Voltage Range	30 .. 520 V between any 2 inputs (max. peak voltage 750V)	
Basic Error ^{*6} (5 V – 300 V)	VT 3x30A	0.05 % (with WS 2x20C/B/A)
Signal Cable Length ^{*5}	1.75 m	

VT 3x30 is with power from measured circuit (PFMC) feature

Current Transducer CT 3x20

Current Range	1 mA .. 20 A	
Basic Error (10 mA – 20 A)	CT 3x20A	0.05 %, 0.05 ° (with WS 2x20A)
	CT 3x20B	0.1 %, 0.1 ° (with WS 2x20B/A) 0.2 %, 0.2 ° (with WS 2x20C)
Signal Cable Length ^{*5}	1.5 m	
Dimensions	105 x 70 x 50 mm	
Weight	0.2 / 0.3 kg (CT 3120 / 3320)	

Current Clamps CC 2x12B /16

Current Range	1 mA .. 120 A	
Basic Error ^{*2} (20 mA – 100 A)	0.1 %, 0.1 ° (with WS 2x20B/A) 0.2 %, 0.2 ° (with WS 2x20C)	
Signal Cable Length ^{*5}	2 m	
Max. Cable Size in Jaws	Ø 16 mm	
Dimensions	140 x 40 x 30 mm	
Weight	0.4 / 0.8 kg (CC 2112B / 2312B)	

Flexible Current Probe FCP 3x21 /WS

Current Range	0.2 A .. 6000 A (or more)	
Basic Error ^{*4} (6 A – 6000 A)	FCP 3x21D	0.5 %, 0.3 °
Sensor Cable Diameter / Minimum Bend Radius	6 mm / 50 mm	
Sensor Diameter ^{*5}	Ø 160 mm	
Signal Cable Length ^{*5}	1.5 m	
Dimensions	160 x 160 x 10 mm	
Weight	0.15 / 0.4 kg (FCP 3121 / 3321)	

Portable Printer PP 2000

Printing Method	Thermal, bidirectional	
Character Matrix	8x8 and 12x8 dots, graphical	
Printing Speed	37.5 char/s	
Paper Width	112 mm (Ø 38 mm)	
Interface	RS-232 (1200-9600 bps)	
Dimensions (W x D x H)	165 x 135 x 50 mm	
Weight	0.55 kg (inclusive batteries)	
Supplied Accessories	<ul style="list-style-type: none"> • 1 roll of paper • batteries • 1.5 m cable (DIN / D-Sub) 	

^{*1} related to apparent power

^{*2} specified for compensated ranges

^{*3} specified for cable position more than 25 mm away from the coupling area

^{*4} different lengths to be specified in order

^{*5} specified when supplied only from internal batteries

^{*7} option contained only in VT 3x30 (have to be specified in order)

⇒ Accessories

Code	Description
WSB 2120	Working Standard device (single phase body)
WSB 2320	Working Standard device (three phase body)
VT 2160A	Voltage Transducer (1 x 500 V, 0.05 %)
VT 2360A	Voltage Transducer (3 x 500 V, 0.05 %)
VT 3130A	Voltage Transducer (1 x 300 V, 0.05 %) with PFMC*
VT 3330A	Voltage Transducer (3 x 300 V, 0.05 %) with PFMC*
CT 3120A	Current Transducer (1 x 20 A, 0.05 %)
CT 3320A	Current Transducer (3 x 20 A, 0.05 %)
CT 3120B	Current Transducer (1 x 20 A, 0.1 %)
CT 3320B	Current Transducer (3 x 20 A, 0.1 %)
CC 2112B /16	Current Clamps (Ø 16 mm / 1 x 120 A)
CC 2312B /16	Current Clamps (Ø 16 mm / 3 x 120 A)
FCP 3121D /WS	Flexible Current Probe (1 x 6000 A)
FCP 3321D /WS	Flexible Current Probe (3 x 6000 A)
WSCS 3100	Current Cables for CT (single phase set)
WSCS 3200	Current Cables for CT (two phase set)
WSCS 3300	Current Cables for CT (three phase set)
WSVS 2160	Voltage Cables for VT (single phase set)
WSVS 2260	Voltage Cables for VT (two phase set)
WSVS 2360	Voltage Cables for VT (three phase set)
VC 2160	Standard Voltage Clips (single phase set)
VC 2360	Standard Voltage Clips (three phase set)
VC 2100	Special Voltage Clips (single phase set)
VC 2300	Special Voltage Clips (three phase set)
VC 2105	Retractable Voltage Clips (single phase set)
VC 2305	Retractable Voltage Clips (three phase set)
VC 2110	Omega Voltage Clips (single phase set)
VC 2310	Omega Voltage Clips (three phase set)
VC 2120	Spike Voltage Clips (single phase set)
VC 2320	Spike Voltage Clips (three phase set)
VC 2130	Magnetic Voltage Clips (single phase set)
VC 2330	Magnetic Voltage Clips (three phase set)
OPTS 2100 /WS	Optical Sensor
WSSC 2000	Optical Sensor Cable
OPFC 1000	Fixing Clamp for Optical Sensor
OPTH 1200	Optical Communication Head
WSIO 2000	Impulse Output Cable with BNC connector
WSSS 3000	Snap Switch with integrated Impulse Input Base
OPTI 2000	Impulse (SO) Cable
PP 2000	Portable Printer
CCR 1000	Communication Cable RS-232
CCU 1000	Communication Cable USB
BAA 2000	Rechargeable Accumulators (4 x NiMH / AA size)
WSPA 2000	Power Adapter (100-240V)
WSCA 1000	Car Outlet Adapter (12V)
WSTC 2000	Transport Case
WSNS 1000	Neck Strap
WSSW 1000	Software for PC (Installation USB key)
WSUG 1000	Printed User's Guide
WSCC 1000	Calibration Certificate from accredited laboratory
WSPE 1020	Probe Cable Extension to length 20 meters
USeGate	Universal Sensor Gate for providing compatibility with SensorLink® high voltage and high current products

* PFMC = power from measured circuit