

# Electric energy meter

WS0101, WS0102, WS1102

WS0301, WS0302, WS1302



Picture 1: Electric energy meter WS0101



Picture 2: Electric energy meter WS0102



Picture 3: Electric energy meter WS1302

## FEATURES:

- Direct connection up to 65 A (WSX10X)
- Connection with current transformer (WSX30X)
- Industrial applications or meters with type approval according to European Directive 2004/22/EC MID
- Active energy - class B in compliance with EN 50470-3, class 1 in compliance with EN 62053-21
- Reactive energy - class 2 in compliance with EN 62053-23
- Three-phase connection
- Energy measurement in both directions (import-export)
- Microprocessor control
- 7 digit energy counter (WS0101, WS0301)
- Double 7 digit energy counter (WS0102, WS0302)
- LCD 9 digit display (WS1102, WS1302)
- Tariff inputs (option)
- Communication (option): RS485 (MODBUS protocol)
- Pulse outputs (option)
- Housing for DIN rail mounting
- Protective cover for terminals (possible seal up against non-authorized access)

## APPLICATION

The WSX10X energy meters are used for measuring energy using direct connection in three-phase systems with current up to 65A while the WSX30X meters are used for connection with current transformers. Optional also the measurement of apparent energy is possible. Housing is provided with terminals protection covers, which can be seal up against non-authorized access. They are built to be fastened to EN 60715 standard guides. The meters are microprocessor controlled. Display of quantities depends on meters type. They can be displayed on 7 digit electromechanical counter or on LCD display.

According to the customer's demands, meters can be equipped with a RS485 serial communication (option) with the MODBUS protocol, which enables data transmission and thus connection of the measuring places into the network for the control and management with energy. They can also be equipped with tariff input (option).

A built-in pulse output (option) is designed for sending data to the devices for checking and monitoring consumed energy.

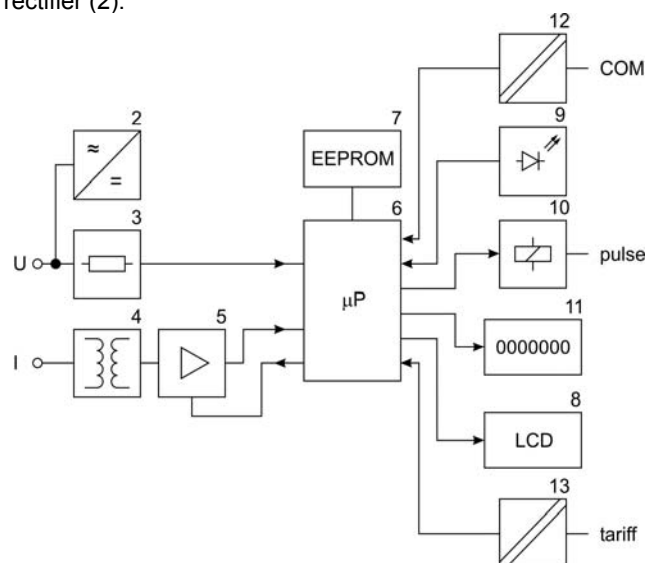
## LAYOUT AND MODE OF OPERATION

A method for sampling voltages and currents with an A/D converter is used. Current inputs are electrically isolated from the system by means of measuring transformer (4) (Picture 4), voltages are measured by the resistor voltage divider (3). Input currents are amplified in programmable amplifier (5). After A/D conversion the signal is computed in microprocessor (6). Not only data on the meter type but also calibration constants are stored in the EEPROM (7). There are no adjustable elements (potentiometers) in the meter, which assures a better long-term stability. A built-in auto range of current inputs assures accuracy also at small currents. High rate of sampling enables measuring distorted signals, as well.

One or two (optional) S0 output (10) is built into each meter. A number of pulses depend on consumed energy. Measured quantities are displayed on 7 digit electromechanical counter (11) or on LCD display (8). LED diodes (9) are used for detection of starting current, indication of communication (transmission) and test output proportional to measured power. LED diodes are only built in WS0X01 and WS0X02 meters.

Galvanic separated communication (12), RS485 enables data transfer and tariff setting. Tariff can also be set via tariff input (13) (option).

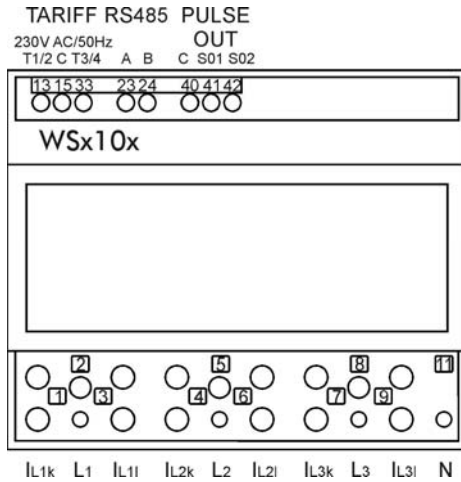
The meter is supplied from the measuring system. The instrument electronic part is supplied via the supply rectifier (2).



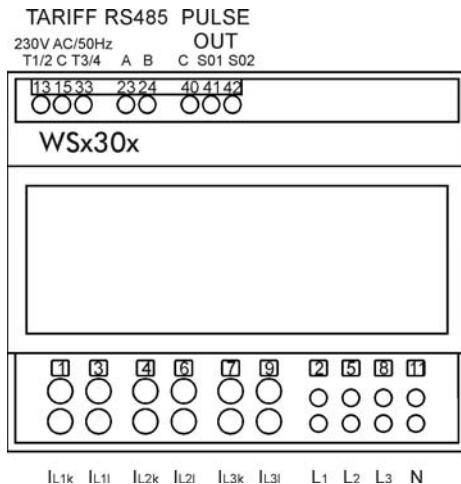
Picture 4: Block diagram

## CONNECTION

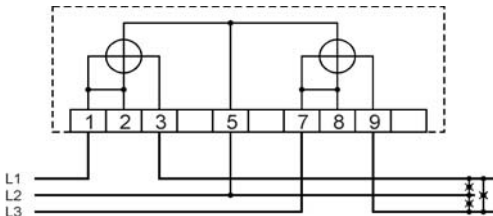
Meter terminals are positioned on the bottom and the top side of the meter and are covered with the protection cover. Current and voltage circuits are located on the bottom side as shown on the picture below. For the direct connection meters voltage inputs are equipped with protection bung, which allows you to physically break contact, before connecting or disconnecting voltage to the meter. On the top side are connection terminals for communication, pulse outputs and tariff inputs (picture 5). A label with connection diagram is located on the bottom of the cover. Regarding to the meter version the meter connection can be three-phase with unbalanced load. Its measuring system can be performed either in 3 or 4-wire connection.



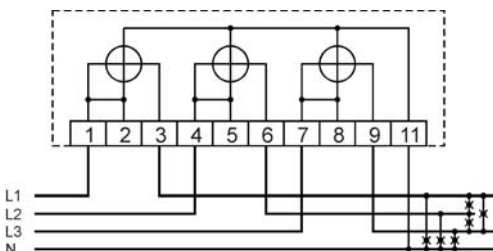
Picture 5: picture of connection terminals WSX10X



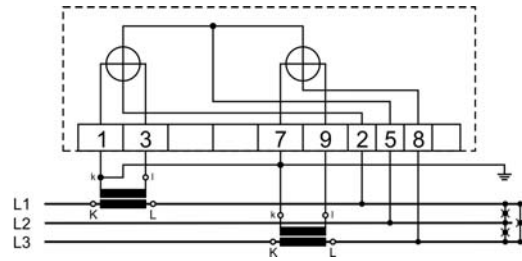
Picture 6: picture of connection terminals WSX30X



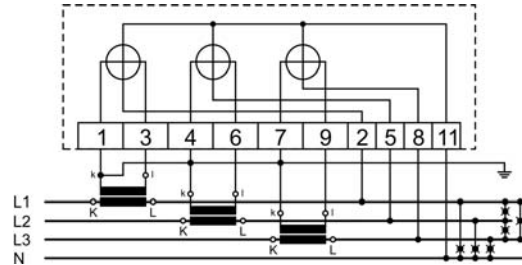
Picture 7: Three phase system (three wire unbalanced - 3u) WSX10X



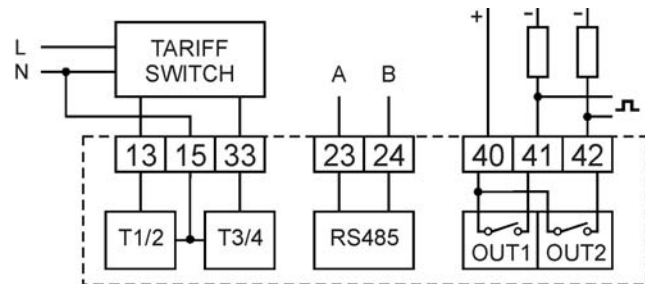
Picture 8: Three phase system (four wire unbalanced - 4u) WSX10X



Picture 9: Three phase system (three wire unbalanced - 3u) WSX30X



Picture 10: Three phase system (four wire unbalanced - 4u) WSX30X



Picture 11: Connection of auxiliary circuits (the same for all versions)

## TECHNICAL DATA

### ACCURACY CLASS:

- Active energy EN 50470-3 Class B (EN 62053-21 Class 1)
- Reactive energy EN 62053-23 Class 2

### VOLTAGE INPUT:

- Nominal voltage ( $U_n$ ) 3x230/400 V or 3x400 V
- Supply voltage range 0.8 ... 1.15  $U_n$
- Consumption < 3 VA

### CURRENT INPUT:

#### Direct connection (WSX10X)

- Minimum current ( $I_{min}$ ) 0.25 A (0.5 A)
- Transitional current ( $I_{tr}$ ) 0.5 A (1 A)
- Reference (basic) current ( $I_{ref}$ ) 5 A (10 A)
- Maximal current ( $I_{max}$ ) 65 A (63 A)
- Starting current ( $I_{st}$ ) 0.004  $I_{ref}$
- Consumption at  $I_{ref}$  (10 A) < 0.02 VA

#### Connection with current transformer (WSX30X)

- Nominal current ( $I_n$ ) 5 A or 1 A
- Minimum current ( $I_{min}$ ) 0.05 A or 0.01 A
- Transitional current ( $I_{tr}$ ) 0.25 A or 0.05 A
- Maximal current ( $I_{max}$ ) 6 A or 1.2 A
- Starting current ( $I_{st}$ ) 0.002  $I_{ref}$
- Consumption at  $I_{ref}$  (5 A) < 0.02 VA

### FREQUENCY RANGE:

- Nominal frequency ( $f_n$ ) for WSX30X 50 Hz and 60 Hz
- Nominal frequency ( $f_n$ ) for WSX10X 50 Hz or 60 Hz
- Frequency range Specified at order 0.98 ... 1.02  $f_n$

MID approval is valid only for 50 Hz

## OVERLOAD CAPACITY

- Direct connection WSX10X

| Input value           | Number of applications | Duration of one application | Interval between two successive applications |
|-----------------------|------------------------|-----------------------------|--|
| 100 A at $U_n$        | 5                      | 3 s                         | 5 min  |
| 250 A at $U_n$        | 1                      | 1 s                         | —  |
| 30 $I_{max}$ at $U_n$ | 1                      | 10 ms                       | —  |

- Connection with current transformer (WSX30X)

| Input value | Number of applications | Duration of one application | Interval between two successive applications |
|-------------|------------------------|-----------------------------|--|
| 120 A       | 1                      | 0.5 s                       | —  |

## PULSE OUTPUTS (optional):

WS1X02 – one pulse output required for test purpose

### Electrical values

- Number of pulse outputs max. 2
- Pulse duration 35 ms ± 5 ms
- Interpulse period > 30 ms
- $U_{ext}$  max. 40 V
- Switched current max. 27 mA
- Pulse output constant for WSX10X 1000 imp/kWh
- Pulse output constant for WSX30X 1000 imp/kvarh
- secondary metering 10000 imp/kWh (imp/kvarh)
- primary metering See table 1

## TARIFF INPUTS (OPTIONAL):

- Number of tariff inputs max. 2 (MID – max. 1)
- Number of tariffs max. 4 (MID – max. 2)
- Nominal voltage ( $U_n$ ) 230 V
- Input voltage range 0.8 ... 1.15  $U_n$
- Current at nominal voltage < 0.5 mA
- For industrial application tariff switching is possible also using RS485 communication

## COMMUNICATION (optional):

### RS485

- Connection type: Multi-drop (32 connections per link)
- Signal levels: RS485
- Cable type: Screened twisted pair
- Maximum cable length: 1000 m
- Connector: Screw terminals
- Isolation: 3.7 kV rms for 1 minute between all terminals and all other circuits
- Transmission mode: Asynchronous
- Message format: MODBUS RTU
- Data rate: 1200 to 19200 bits/s
- Function
  - Industrial application Data reading
  - MID Register designation
  - MID Tariff switching
  - MID Input of transformer data for primary metering
  - MID Setting of communication parameters
  - MID Setting device name
  - MID Data reading
  - MID Setting of communication parameters
  - MID Setting device name

## DISPLAY:

### WS0X01 and WS0X02

- Display type electromechanical counter, WS0X01 one counter, WS0X02 two counters
- Digit height 4 mm
- Digit width 1.2 mm
- Number of digits (WS010X) 7 (6 + 1)
- Unit (WS010X) kWh (kvarh)
- Number of digits and unit (WS030X)
  - secondary metering 7 (5 + 2) kWh (kvarh)
  - primary metering See table 1

## WS1X02

- Display type LCD
- Digit height 4.9 mm
- Digit width 3.0 mm
- Number of digits WS1102 2 x 9 (7 + 2)
- Unit WS1102 kWh (kvarh)
- Number of digits and unit WS1302
  - secondary metering 2 x 9 Wh (varh)
  - primary metering See table 1

## LED (only meters with electromechanical register):

- Run – measuring status red LED
- Com – communication status green LED
- Test output red LED
  - WS010X 1000 imp/kWh (imp/kvarh)
  - WS030X second. metering 10000 imp/kWh (imp/kvarh)
  - WS030X primary metering See table 1

Register resolution and meter constant depend on nominal primary current or nominal primary power in case of CT and VT

| Nominal primary current ; Primary power per phase | Register resolution | Register digits and units | Pulse output and LED constant * |
|---|---------------------|---------------------------|---------------------------------|
| WS030X  |                     |                           |                                 |
| ≤50 A; ≤11.5 kW                                   | 100 Wh              | 6+1 kWh                   | 1000 imp/kWh                    |
| ≤500 A; ≤115 kW                                   | 1 kWh               | 7 kWh                     | 100 imp/kWh                     |
| ≤5000 A; ≤1.15 MW                                 | 10 kWh              | 5+2 MWh                   | 10 imp/kWh                      |
| ≤11.5 MW  | 100 kWh             | 6+1 MWh                   | 1 imp/kWh                       |
| WS1302  |                     |                           |                                 |
| ≤50 A; ≤11.5 kW                                   | 10 Wh               | 7+2 kWh                   | 1000 imp/kWh                    |
| ≤500 A; ≤115 kW                                   | 100 Wh              | 8+1 kWh                   | 100 imp/kWh                     |
| ≤5000 A; ≤1.15 MW                                 | 1 kWh               | 9 kWh                     | 10 imp/kWh                      |
| ≤11.5 MW  | 10 kWh              | 7+2 MWh                   | 1 imp/kWh                       |

\* - constant of impulse indication on display (\*) at WS1302 is ten times lower than LED constant

Table 1: Register resolution and meter constants for primary metering

## HOUSING:

- Material of housing: PC unflamable, according to **UL 94 V-0**
- Dimensions: height 90 mm, depth 72 mm, width 108 mm
- Mounting: For rail mounting, 35 mm according to **EN 60715: 2001**
- Enclosure protection: IP 50 according to **EN 60529: 1989**
- Weight: WSX10X cca 560 g, WSX30X cca 420 g

## CONNECTION TERMINALS:

### Cross section of the connection leads:

- Current terminals (WSX10X) 2.5 mm<sup>2</sup> to 16 mm<sup>2</sup>
- Current terminals (WSX30X) 1 mm<sup>2</sup> to 4 mm<sup>2</sup>
- Voltage terminals: 1 mm<sup>2</sup> to 2.5 mm<sup>2</sup>
- Communication, pulse and tariff terminals: max. 2.5 mm<sup>2</sup> or 2 x 1.5 mm<sup>2</sup>

### Protection

- Protection for connection terminals: IP20
- Protection cover against non authorized access

## REGULATIONS:

- Protection: Protective class **II**, **300 V rms**, installation category **III**, Pollution degree 2
- Test voltage: 3.7 kV rms according to EN 61010-1: 2004

## ENVIRONMENTAL CONDITIONS:

- Climatic rating: according to EN 50470-1: 2006  
Indoor meter
- Operating temperature -25 °C to +55 °C
- Storage temperature -25 °C to +70 °C
- Annual mean relative humidity: ≤ 95% r.h.  
(without condensing)
- Mechanical environments M1  
according to EN 50470-1: 2006

## EU DIRECTIVES CORRESPONDING FOR CE MARKING

Low voltage directive **2006/95/EC**:

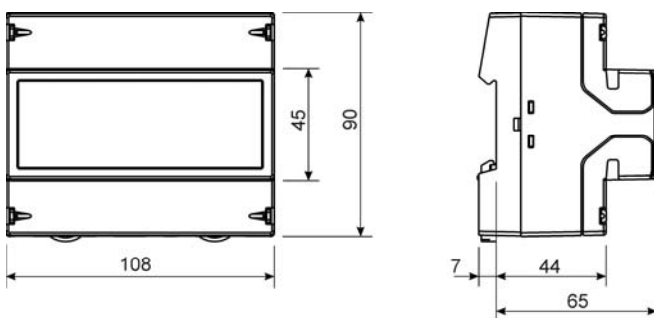
EN 61010-1: 2004 Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1: General requirements

EMC directive **2004/108/EC**

Electromagnetic compatibility per EN 50470-1: 2006

Measuring instrument directive MID **2004/22/EC** for active energy (option MID)

## DIMENSIONAL DRAWING



Picture 12: Dimensional drawing (all dimensions are in mm)

## DATA FOR ORDERING

Sample:

Two tariff active energy meter for direct 4-wire connection 50 Hz 5(65) A with RS485 and one impulse output MID approved - **WS0102 model 41112210**

\* - Not available for MID approved meters

\*\* - Quadrants of registered energy

\*\*\* - For MID approved meters with primary metering the primary current must be specified at order - fixed parameters. For industrial meters WS030X the primary current of CT shall be specified for primary metering due to counter resolution. For industrial meters WS1302 with RS485 communication any primary current of CT and resolution can be set afterwards using communication.

WS X X 0 X

0 - electromechanical register

1 - LCD display

1 - direct connection

3 - connection with current transformers

1 - one electromechanical register

2 - two electromechanical registers or LCD

Model X X X X X X X X X X

### Meter connection

1 - meter for 3 wire network

2 - meter for 4 wire network

3 - meter for 3 wire network - MID

4 - meter for 4 wire network - MID

### Current range/Frequency (only WSX10X)

1 - 5 (65) A - 50 Hz

2 - 10 (63) A - 50 Hz

3 - for CT In 5 A - primary metering\*\*\*

4 - for CT In 1 A - primary metering\*\*\*

5 - for CT In 5 A - secondary metering

6 - for CT In 1 A - secondary metering

7 - 5 (65) A - 60 Hz

8 - 10 (63) A - 60 Hz

### Communication interface

0 - without communication interface

1 - RS 485 communication

### Tariff inputs

0 - no tariff inputs

1 - one tariff input (T1/T2)

2 - two tariff inputs (4 tariffs) \*

### Register 1

1 - active energy (I+IV\*\* - all tariffs)

2 - active energy (I+IV - T1)

3 - active energy (II+III - all tariffs)

4 - absolute active energy (all tariffs)

5 - reactive energy (I+II - all tariffs) \*

6 - reactive energy (absolute - all tariffs) \*

7 - reactive energy (III+IV - all tariffs) \*

9 - custom specification \*

### Register 2

0 - no register - disabled

1 - active energy (II+III - all tariffs)

2 - active energy (I+IV - T2)

3 - active energy (I+IV - all tariffs)

4 - absolute active energy (all tariffs)

5 - reactive energy (I+II - all tariffs)

6 - reactive energy (absolute - all tariffs)

7 - reactive energy (III+IV - all tariffs)

9 - custom specification \*

### Impulse output 1

0 - no register - disabled

1 - active energy (I+IV - all tariffs)

2 - active energy (I+IV - T1)

3 - active energy (II+III - all tariffs)

4 - absolute active energy (all tariffs)

5 - reactive energy (I+II - all tariffs)

6 - reactive energy (absolute - all tariffs)

7 - reactive energy (III+IV - all tariffs)

9 - custom specification \*

### Impulse output 2

0 - no register - disabled

1 - active energy (II+III - all tariffs)

2 - active energy (I+IV - T2)

3 - active energy (I+IV - all tariffs)

4 - absolute active energy (all tariffs)

5 - reactive energy (I+II - all tariffs)

6 - reactive energy (absolute - all tariffs)

7 - reactive energy (III+IV - all tariffs)

9 - custom specification \*

### Primary current (only WSX30X)

X - primary current value in A\*\*\*



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