
## *Product Description*

The Phase series combines leading power quality capabilities with exceptional revenue metering accuracy at an economical price. Created to provide solutions in general electric systems, this multifunction power meters will measure and monitor the energy comsumption in several applications like energy sharing of residential and commercial buildings, shopping centers or any applications that needs the monitoring of considerable variables in a single device. For example, is possible to measure real time data such as: voltage, current, power (active, reactive and apparent), power factor, phase angle, demand of active and reactive power and more.

A highlight to multifunction power meter PH3500. It can afford applications with Industry 4.0 necessities, measure and monitor in real time accompanied by IoT platforms. IoT is the future of industrial automation and promisses a lot in terms of data safety, business operations and industrial performance.

In addition, the Phase series has the following features:

- Great cost/benefit relation
- RS-485 incorporated interface with support for MODBUS RTU protocol
- Ethernet 10/100 BASE-T incorporated (PH3500)
- MODBUS TCP, MQTT e SNTP supported (PH3500)
- Storage capacity to register measures for futher analysis (PH3500)
- Voltage and current harmonic measure until 31$^{st}$ order (PH3500)

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# *Ordering Information*

## *PH1600 Included Items*

The product package contains the following items:

- PH1600 Multifunction Power Meter
- Clamps for fixing to the panel

## *PH3500 Included Items*

The product package contains the following items:

- PH3500 Multifunction Power Meter
- Screws for fixing to the panel

## *Product Code*

The following code should be used to purchase the product:

| Code | Denomination |
|---|---|
| **PH1600** | Multifunction Power Meter with RS-485 integrated |
| **PH3500** | Multifunction Power Meter with RS-485 and ETHERNET integrated |
| **PH3500/C** | Multifunction Power Meter with RS-485, ETHERNET integrated and PCB with conformal coating |

## *Related Products*

The following products must be purchased separately:

| Code | Denomination |
|---|---|
| **AMJG0808** | RJ45-RJ45 cable (2m) |
| **AL-2306** | RS-485 cable for MODBUS |
| **AL-2600** | RS-485 network conector and terminator |

**Notas:**

**AMJG0808:** RJ45-RJ45 simple cable with 2m.

**AL-2306:** Shielded twisted pair cable without connector intended to be used on RS-485 networks. This cable allows the connection between PH3100 and AL-1413, Al-2600, FBS-CM25C, PO8525 or any other RS-485 compatible product. This cable can reach lengths of up to 500 meters. When longer cables are required AL-2301 must be used.

**AL-2600:** RS-485 network connector/terminator module. It is used to make possible the AL-2306 cable interconnection with the AL-2000 Series and QUARK PLCs and also to provide the RS-485 network termination, preventing signals reflection problems.

## *General Features*

| | PH1600 | PH3500 |
|---|---|---|
| **Module type** | Multifunction Power Meter | Multifunction Power Meter |
| **Current** | Phase current measurement | Phase current and average Phase current measurements |
| **Voltage** | Phase voltage measurement | Phase voltage measurement and average phase voltage measurements |
| **Active power** | Phase active power and load active power measurements | Phase active power and load active power measurements |
| **Reactive power** | Phase reactive power and load reactive power measurements | Phase reactive power and load reactive power measurements |
| **Apparent power** | Phase apparent power and load apparent total power measurements | Phase apparent power and load apparent total power measurements |
| **Frequency** | Frequency measurement | Frequency measurement |
| **Power factor** | Load and phase power factor measurements | Load and phase power factor measurements |
| **Demand** | - | Active, reactive and apparent demand measurements |
| **Active energy** | Imported and exported active energy measurements | Imported and exported, gross and net active energy |
| **Reactive energy** | Imported and exported reactive energy measurements | Imported and exported, gross and net reactive energy |
| **THD** | - | Voltage and current harmonic measure until 31st order |
| **Harmonic** | - | Average and maximum measures for voltage and current harmonic until 31st order |
| **Display** | LED display with 3 lines and 4 columns<br>3 bright levels | LCD display with 4 lines and 16 columns<br>(64 characteres) |
| **Keypad** | 4 keys | Polycarbonate front with 6 resin keys |
| **Mechanical assembly** | Overlap on panel door | Overlap on panel door |
| **Storage temperature** | -20°C to 75°C | -25°C to 65°C |
| **Operation temperature** | -10°C to 55°C | 0°C to 55°C |
| **Operation humidity** | Up to 80% | 40 to 70% |
| **IP level** | IP 65 (front) | IP-54 (front) |
| **Standards** | IEC 61326-1<br>CE – 2014/30/EU (EMC)<br>CE | |
| **Dimensions (W x H x D)** | 96 x 96 x 93 mm | 92 x 92 x 82 mm |
| **Cut-out size** | 90 x 90 mm | 91 x 91 mm |

### *Accuracy*

| | PH1600 | PH3500 |
|---|---|---|
| **Voltage** | ±0,5% | ±0,5% |
| **Current** | ±0,5% | ±0,5% |
| **Frequency** | ±0,5% | ±0,01 Hz |
| **Power** | Classe C | ±0,5% |
| **Power factor** | Classe C | ±0,5% |
| **Energy** | Classe C | Classe C |
| **THD/harmonic** | - | ±5% |

**Note:**
"Classe C" refers to NBR 14519

## *Eletrical Features*

| | PH1600 | PH3500 |
|---|---|---|
| **Current measurement** | 0,5 to 5 A | 0,5 to 10 A |
| **Voltage measurement** | 0,5 to 500 Vac | 70 to 500 Vac |
| **Frequency measurement** | 45 to 65 Hz | 42,5 a 57,5 Hz (50 Hz)<br>51,0 to 69,0 Hz (60 Hz) |
| **Memory capacity** | - | 128 MB |
| **Measument input** | 3 voltange and current inputs | 3 voltange and current inputs |
| **Power input** | 85 to 265 Vac<br>100 to 300 Vdc | 85 to 300 Vac/ Vdc |
| **Consumption** | 5 VA | 20 VA |
| **Digital input** | - | 1 (pulse counter) |
| **Digital output** | - | 1 (dry contact) |

### *Communication*

| | PH1600 | PH3500 |
|---|---|---|
| **Connections** | 1 | 2 |
| **Physical interface** | RS-485 | RS-485 and Ethernet RJ45 |
| **Protocols** | Modbus-RTU | Modbus-RTU, Modbus-TCP, MQTT and SNTP |
| **Baud rate** | 1200 a 9600 bps | 1200 a 115.200 bps (RS-485), 10/100 Mbps (Ethernet) |
| **Data format** | 8N1, 8O1, 8E1 | 8N1, 8N2, 8E1, 8E2, 8O1, 8O2 (RS-485) |

### *Digital input*

| | PH3500 |
|---|---|
| **Input type** | 1 optoisolated input |
| **Input voltage** | 5-24Vcc |
| **Input impedance** | 10kΩ |
| **Minimum pulse width** | 2ms |
| **Detection** | Rising and/or falling edge |
| **Maximum frequency** | 100hz |

### *Digital output*

| | PH3500 |
|---|---|
| **Output type** | 1 relay dry contact output |
| **Output voltage** | 250V |
| **Maximum current** | 3A |

## Software

The PowerMANAGER software allows you to manage several multimeters in a database that is saved on the user's computer, allowing the software to quickly connect to the equipment connected to the registered networks. It supports the creation of Serial, Serial over Ethernet and Ethernet networks.

Some of its most common applications include:

- Monitor electrical variables using reports, graphs and tables;
- Analyze collected data in real time;
- Download and analyze data stored in equipment with mass memory;
- Control and program the equipment remotely;

### Minimum requirements for installation and operation

| | |
|---|---|
| **Platform** | Windows 7 or higher |
| **Processor** | Pentium Quad Core or higher |
| **Framework** | Microsoft.Net Framework 4.0 installed, internet access for automatic installation or higher version |
| **RAM memory** | 4GB |
| **Disk space** | 200MB |
| **Network card** | Ethenet 10/100Mpbs |
| **Resolution** | 1024x600 |

## Installation

**DANGER:**

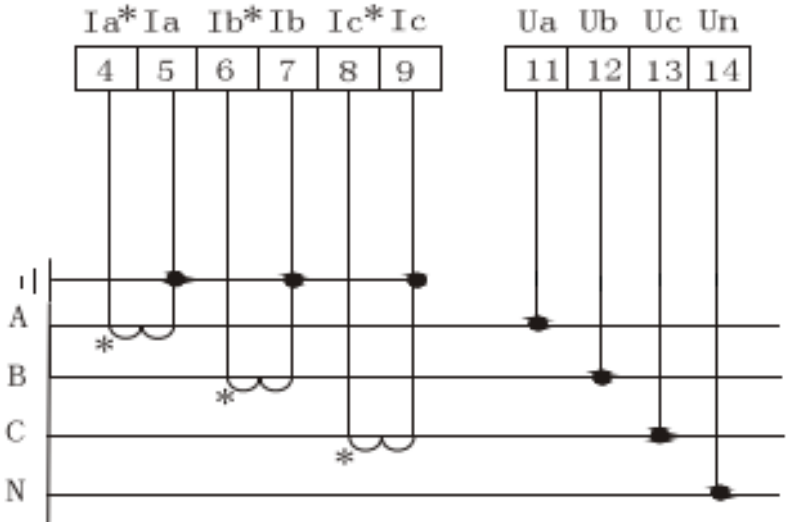
**RISK OF ELETRIC SHOCK**

**This module can operate with high voltages. Special care must be taken during the installation, which should only be done by qualified technicians.**

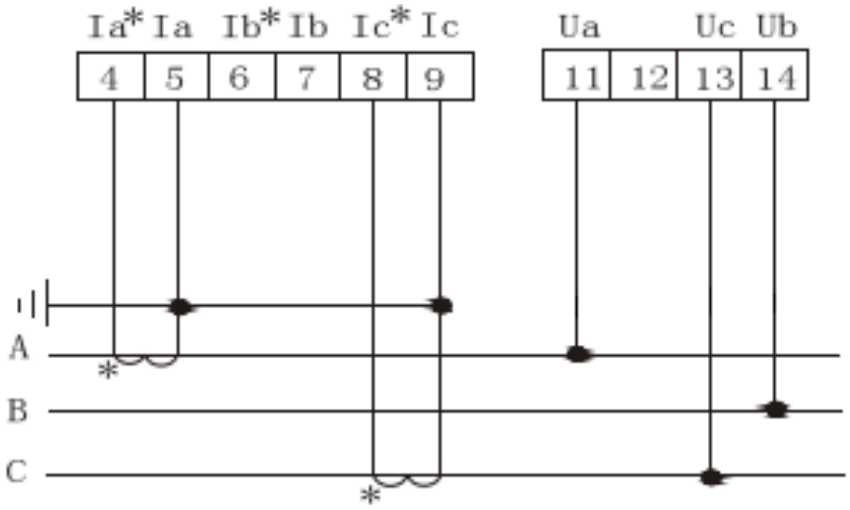
**Do not touch on the field wiring connection when in operation.**

### PH1600 Electrical Installation

***4-wire installation for voltage and current measument***

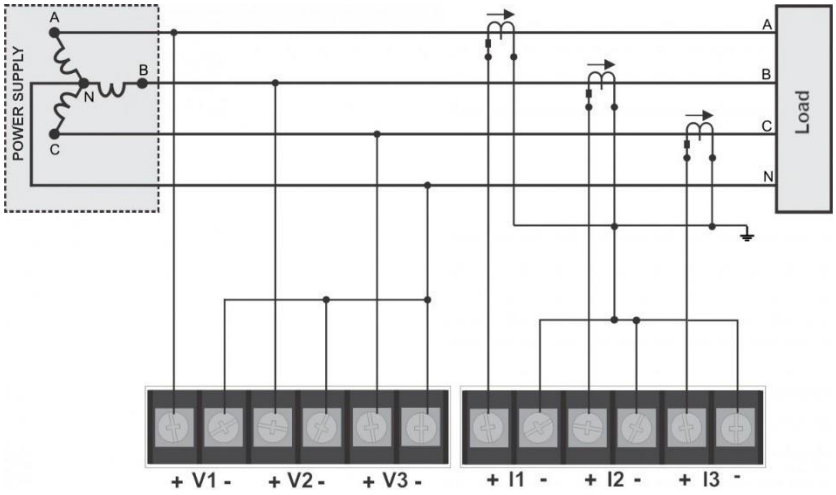



***3-wire installation for voltage and current measument***

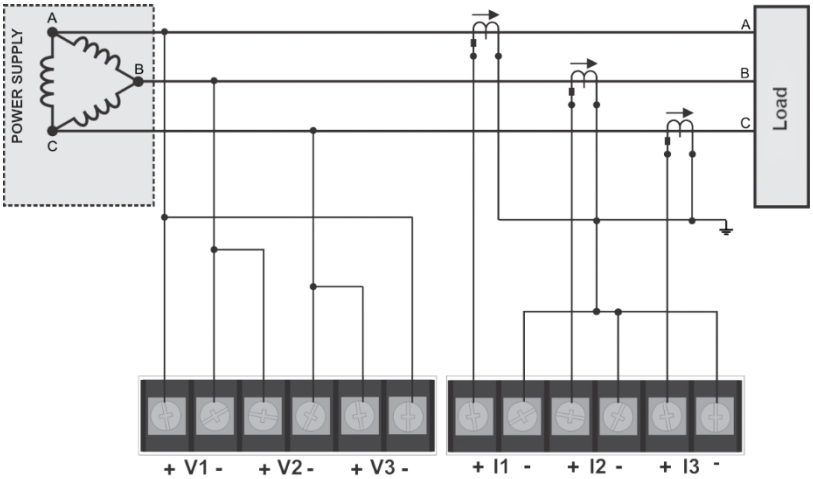


## PH3500 Electrical Installation

### 4-wire installation for three-phase voltage and current measument



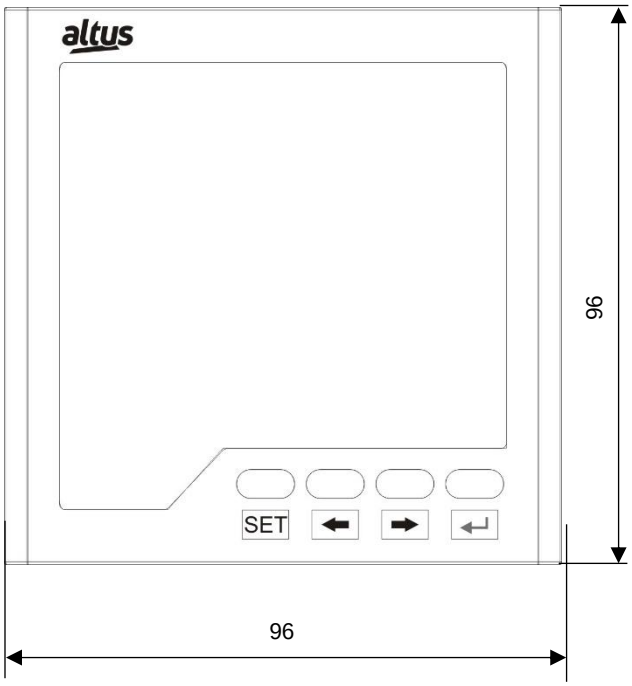

### 3-wire installation for three-phase voltage and current measument



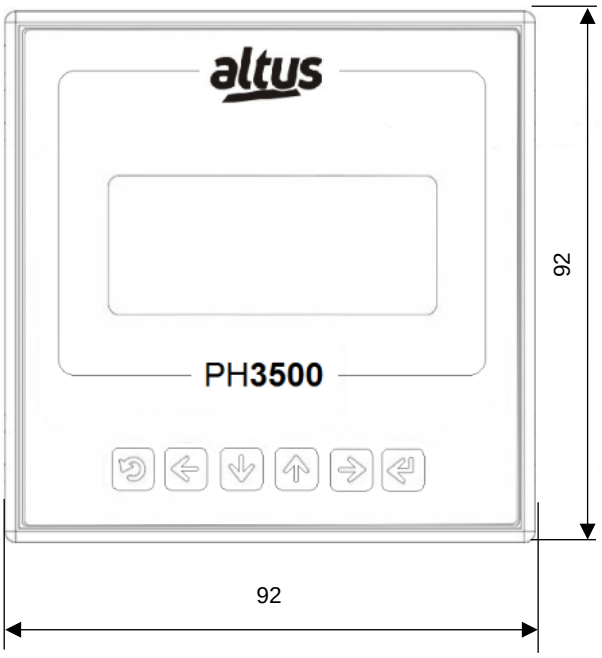
## Physical Dimensions

Dimensions in mm

### PH1600




### PH3500



## *Manuals*

For further technical details, configuration, installation and programming of Phase Series the table below should be consulted. This table is only a guide of some relevant documents that can be useful during the use and maintenance of Phase Series.

| Code | Description | Language |
|---|---|---|
| **CT157915** | Caracteristicas Técnicas Serie Phase II | Portuguese |
| **CE157915** | Phase Series II - Technical Characteristics | English |
| **MU821006** | Manual de Utilização PH3500 | Portuguese |
| **MU821007** | Manual de Utilização PH1600 | Portuguese |
| **MU821008** | Manual de Utilização PhaseMANAGER | Portuguese |