

ENGLISH

User manual



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1. SAFETY PRECAUTIONS AND PROCEDURES

This instrument has been designed in compliance with IEC/EN61010-1 directive. For your own safety and to avoid damaging the instrument we suggest you follow the procedures hereby prescribed and to read carefully all the notes preceded by the symbol ⚠.



CAUTION

Should you fail to keep to the prescribed instructions you could damage the instrument and/or its components or endanger your safety.

Take extreme care of the following conditions while taking measurements:

- Do not perform any measurement in humid or wet environments.
- Do not use the instrument in presence of explosive gas (material), combustible gas (material), steam or dust.
- Do not touch the circuit under test if no measurement is being taken.
- Do not use the instrument if it seems to be malfunctioning (i.e. if you notice deformations, breaks, leakage of substances and so on).

The herewith symbols are used:



Caution: refer to the instruction manual; an improper use may damage the instrument or its components



Danger high voltage: risk of electrical shocks



De-energize the plant under test before connecting the instrument



Double insulated instrument



AC voltage and current

1. PRELIMINARY INSTRUCTIONS

- It can be used for **CURRENT** measurements up to 2500A on installations with overvoltage category CAT III 1000V~ to ground or CAT IV 600V~ to ground.
- Please use the standard safety precautions aimed at protection against dangerous electric currents and protect the instrument against incorrect operations
- Do not test circuits exceeding the current and voltage limits.
- De-energize the plant under test before connecting the instrument. Take all the safety precautions before taking actions on the plant.

- Do not perform any test under environmental conditions exceeding the limits indicated in this manual (see § 10.2).
- Make sure that batteries are correctly installed.
- Only the accessories supplied with the instrument guarantee compliance with the safety standards. They must be in good conditions and must be replaced, if necessary, with identical models.

2. DURING USE

Carefully read the following recommendations and instructions:



CAUTION

Non compliance with warnings and/or instructions may cause damage to the tester or its components or injure the operator.

- During a current measurement keep the clamp as far as possible from cables not involved in measurement.
- During a current measurement keep the cable under test in the very middle of the jaws.

3. AFTER USE

- If you expect not to use the instrument for a long period of time remove the batteries and strictly follow the indications at § 9.2.

4. MEASUREMENT CATEGORIES - DEFINITIONS

The IEC/EN61010-1 guideline (Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements) defines what a measurement category (usually called “overvoltage category”) is. At § 6.7.4: Measuring circuits it says:

(OMISSIS)

Circuits are divided into the following measurement categories:

- **Measurement category IV** is for measurements performed at the source of low voltage installations
Examples are electricity instruments and measurements on primary overcurrent protection devices and ripple control units.
- **Measurement category III** is for measurements performed in the building installation.
Examples are measurements on distribution boards, circuit breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to fixed installation.
- **Measurement category II** is for measurements performed on circuits directly connected to the low voltage installation
Examples are measurements on household appliances, portable tools and similar equipment.
- **Measurement category I** is for measurements performed on circuits not directly connected to MAINS
Examples are measurements on circuits not derived from MAINS, and specially protected (internal) MAINS-derived circuits. In the latter case, transient stresses are variable; for that

reason, the norm requires that the transient withstand capability of the equipment is made known to the user.

2. GENERAL DESCRIPTION

2.1. INTRODUCTION

The instrument was designed to grant the user the utmost safety conditions thanks to a new concept assuring double insulation and overvoltage CAT III 1000V~ to ground or CAT IV 600V~ to ground.

2.2. FUNCTIONS

This manual is referred to two models: **XL421** and **XL422**. XL421 can recording a **single Current** in single phase or three phase plant. XL422 can recording up to **3 Currents** simultaneously in single phase or three phase plant.

Where not expressly indicated the characteristics are common for both models.

The instrument can monitoring a plant for a long time thanks to a sophisticated memory-managing algorithm. More exactly, the instrument uses the following sampling periods:

Measuring Interval	XL421 – Autonomy (days)	XL422 – Autonomy (days)
1s	5	1.5
6s	34	8
30s	170	42
1min	364 (*)	91
5min	1820 (*)	455 (*)

(*) Depending on batteries autonomy

The instrument starts each recording using the Measuring Interval set through PC management software (see § 8). Just before the event of full memory, the instrument applies the successive measuring Interval to all the memory, thus getting more free memory locations. The instrument continues the data storing according to the new Measuring Interval.

3. PREPARATION FOR USE

3.1. PRELIMINARY CHECKS

This instrument has been checked mechanically and electrically before shipment. All precautions have been taken to assure that the instrument reaches you in perfect condition. However, it is advisable to carry out a rapid check in order to detect any possible damage, which might have occurred in transit. Check the accessories contained in the packaging to make sure they are the same as reported in § 11.

3.2. POWER SUPPLY

The instrument is powered by 2x1.5V type AA LR06 alkaline batteries. For battery fitting operation procedure please see § 9.2.

CAUTION

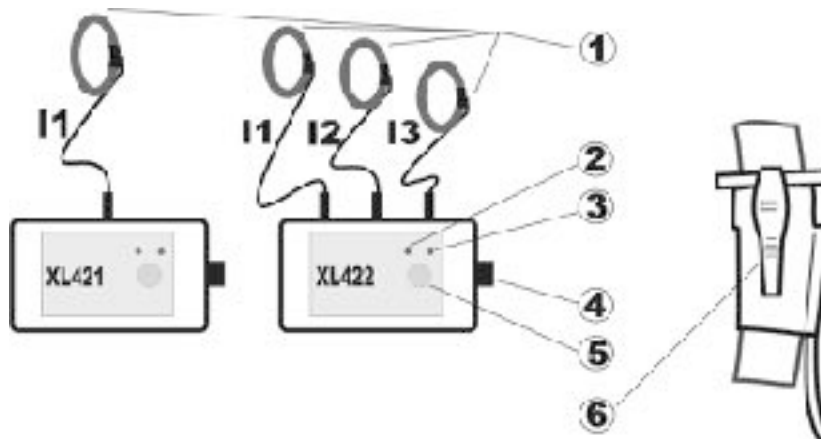


- The instrument, after fitted batteries, is always continuously ON also if STATUS and ALARM LED are OFF. Pressing of **START/STOP** key activate or disable recordings only.
- During a recording the blinking ALARM LED every 3 seconds means a low battery status.

3.3. STORAGE

In order to guarantee the accuracy of the measurements, after a period of storage in extreme environmental conditions wait for the instrument to stabilize to within the listed operating conditions (see § 10.2.1).

4. INSTRUMENT DESCRIPTION



CAPTION:

1. Flexible head
2. "STATUS" LED
3. "ALARM" LED
4. RS232 port
5. "START/STOP" key
6. Press here to open the head

Fig. 1: Instrument description

4.1. KEYBOARD

LED "STATUS" blinks every time the **START/STOP** key is pressed.

5. INITIAL SETTINGS

5.1. DATE, TIME AND MEASURING INTERVAL

It's possible to set measuring interval as well as date and time by using the management software. This program allows to:

- Set the Measuring Interval.
- Control data and time of the instrument's internal clock.
- Set instrument date and time.
- Check battery status.

How to operate:

1. Connect the instrument to PC COM using included serial cable.
2. Run **TopView** software and open the "**PC-Instrument Connection**" section
3. Perform the detection of the instrument by using the "**Find the instrument**" or "**Autoset**" keys
4. Select the "**Configure the instrument**" command and press the "**Next**" key in order to set date/time in the instrument and the measurement interval in the "**Integrated Period**" field selecting values **1s, 6s, 30s, 1min or 5min**
5. Confirm with "**Send**" command



CAUTION



The instrument could keep the data stored even without batteries. The set date and time don't get lost provided that the battery replacement takes less than 2 minutes.

6. OPERATIVE INSTRUCTIONS

6.1. USING THE INSTRUMENT IN A SINGLE PHASE SYSTEM

CAUTION



The measurement category is CAT III 1000V~ to ground or CAT IV 600V~ to ground. Do not attempt to take any voltage measurements exceeding the limits indicated in this manual. Exceeding the limits could cause electrical shock or damage to the instrument.

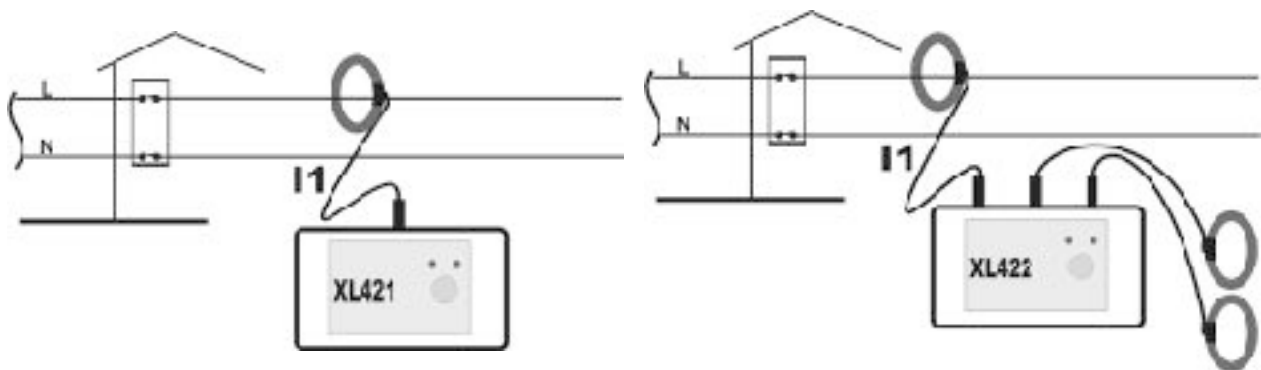


Fig. 2: Instrument's connection in Single Phase system

CAUTION



If possible de-energize the plant under test before connecting the instrument. Take all the safety precautions before taking actions on the

1. De-energize the plant under test before connecting the instrument.
2. Open the flexible head by pressing on expected points (see Fig. 1).
3. Clamp the cable under measurement with the head and close it.
4. To increase the reading accuracy the clamped cable must be in the middle of the head.
5. Re-energize the plant under test.
6. **How to start a Recording:**
 - If no recording was performed or if the recording data was already downloaded to a PC, pressing and keeping the **START/STOP** key for 3 seconds. The STATUS LED will be lighting for the same time, than will be stable lighting for 1 second and the instrument will start the recording
 - If the recording data was not already downloaded to a PC **but the operator wants to overwrite these data**, pressing and keeping the **START/STOP** key for 6 seconds. The STATUS LED will be quickly blinking during the key pressing for the same time, than the LED will be stable lighting for 1 second and the instrument will start the recording. **The old recording will be deleted and overwritten by the new one.** The instrument will wait for the next minute beginning (second=00) and the

STATUS LED is double blinking. After that the recording starts and the STATUS LED blinks every 3 seconds. The instrument is storing the data.

7. During a Recording:

- A STATUS LED 3 seconds blinking meaning that the recording is active and the instrument is storing the data.
- An ALARM LED 3 seconds blinking means that the batteries are low. During a recording any RS232 communication is possible.
- **During Recording operations RS-232 serial communications to PC is not possible.**

8. Stop a Recording:

- To stop a Recording pressing **START/STOP** key and keep it pressed for 3 seconds. The STATUS LED will quickly blinks three times and the instrument will stop the recording, then stop blinking.

For more details about the blinks of STATUS and ALARM LED meaning, please refer to the § 7.

6.3. USING THE INSTRUMENT IN A THREE PHASE SYSTEM

CAUTION



The measurement category is CAT III 1000V~ to ground or CAT IV 600V~ to ground. Do not attempt to take any voltage measurements exceeding the limits indicated in this manual. Exceeding the limits could cause electrical shock or damage to the instrument.

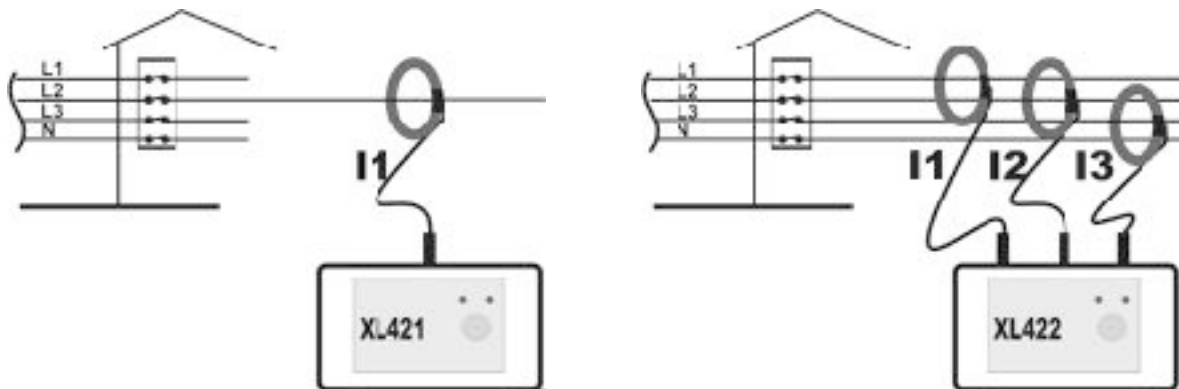


Fig. 3: Instrument's connection in Three Phase system

CAUTION



If possible de-energize the plant under test before connecting the instrument. Take all the safety precautions before taking actions on the

1. De-energize the plant under test before connecting the instrument.
2. Open the flexible heads by pressing on expected points (see Fig. 1).
3. Clamp the cables under measurement with the heads and close it.
4. To increase the reading accuracy the clamped cable must be in the middle of the head.
5. Re-energize the plant under test.
6. **How to start a Recording:**
 - If no recording was performed or if the recording data was already downloaded to a PC, pressing and keeping the **START/STOP** key for 3 seconds. The STATUS LED will be lighting for the same time, than will be stable lighting for 1 second and the instrument will start the recording
 - If the recording data was not already downloaded to a PC **but the operator wants to overwrite these data**, pressing and keeping the **START/STOP** key for 6 seconds. The STATUS LED will be quickly blinking during the key pressing for the same time, than the LED will be stable lighting for 1 second and the instrument will start the recording. **The old recording will be deleted and overwritten by the new one.** The instrument will wait for the next minute beginning (second=00) and the

STATUS LED is double blinking. After that the recording starts and the STATUS LED blinks every 3 seconds. The instrument is storing the data.

7. During a Recording:

- A STATUS LED 3 seconds blinking meaning that the recording is active and the instrument is storing the data.
- An ALARM LED 3 seconds blinking means that the batteries are low. During a recording any RS232 communication is possible.
- **During Recording operations RS-232 serial communications to PC is not possible.**

8. Stop a Recording:

- To stop a Recording pressing **START/STOP** key and keep it pressed for 3 seconds. The STATUS LED will quickly blinks three times and the instrument will stop the recording, then stop blinking.

For more details about the blinks of STATUS and ALARM LED meaning, please refer to the § 7.

7. LED MESSAGES DESCRIPTION

For the STATUS and ALARM LEDs messages please refer to the following table:

LED	START/STOP Key	Light	Description
STATUS	Kept pressed 3 seconds at least	On for 1 second	Recording process correctly started. The previous recorded data was transferred to a PC
STATUS	Kept pressed 6 seconds at least	6 times blinking after 1 second on	Recording process correctly started. The previous recorded data was not transferred to a PC and were lost
STATUS	Not pressed	2 times blinking every 3 seconds	Waiting for the next minute (seconds=00)
STATUS	Not pressed	1 time blinking every 3 seconds	Recording in progress
STATUS	Pressed	3 times blinking	The recording process was stopped
ALARM	Not relevant	1 time blinking every 3 seconds	Low batteries. Stop the recording, transfer the data to a PC and replace batteries

8. CONNECTION OF INSTRUMENT TO PC

The connection of the instrument to a PC is possible through a serial cable supplied with the instrument. To download data to the PC (after installation of management software) keep to the below procedure:

1. Connect the serial cable to the instrument serial port and to a RS232 COM port of the PC.
2. Run **TopView** software and open the “**PC-Instrument Connection**” section
3. Perform the detection of the instrument by using the “**Find the instrument**” or “**Autoset**” keys
4. Select the “**Download data**” command and press the “**Next**” key



CAUTION

During Recording operations RS-232 serial communications to PC is not possible.

5. Select the recording and click on **Download** key to start download procedure. A dialogue box displays the recording stored in the instrument's memory. By choosing the “**Download**” command the data transfer procedure will start.
6. At the end of the download the “Recording analysis” section will automatically start.

For more details see the HELP on line of TopView software

9. MAINTENANCE

9.1. GENERAL INFORMATION

Whether in use or in storage, please do not exceed the specifications to avoid any possible damage or danger during use. Do not place this instrument in high temperature and/or humidity or expose to direct sunlight. For long term storing, remove the batteries to avoid leakage of battery fluid that can damage the internal components.

9.2. BATTERY REPLACEMENT

A blinking of ALARM LED for 3 seconds means that the batteries are low. Stop the recording and replace the batteries with a new set. The management software allows the operator to verify the batteries' status.

CAUTION



The instrument could keep the data stored even without batteries. The set date and time don't get lost provided that the battery replacement takes less than 2 minutes.

CAUTION



Only experts and trained technicians should perform this operation. Remove the flexible head from the conductor under test before replacing the batteries.

1. Stop the recording (if necessary), remove the flexible heads from the conductors under test and transfer the stored data to a PC.
2. Remove the covers on the bottom side of the instrument using a screwdriver in the proper positions (1) and unscrew the 4 fixing screws (see Fig. 4).

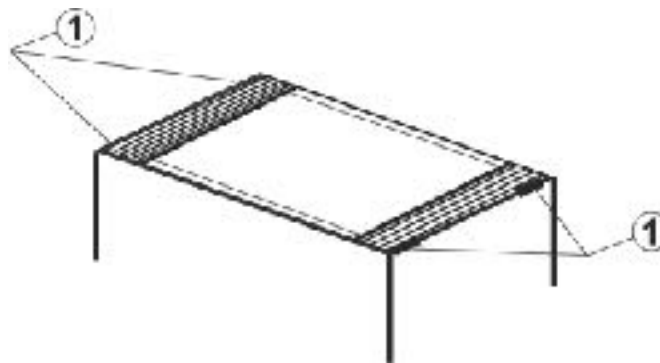


Fig. 4: Battery replacement

3. Open the box and unscrew the cover's fixing screw of the battery housing.
4. Replace the batteries with a new set of the same type (see § 10.1.2). Close the battery housing with the screw, reinsert the screws, screw them and reinsert the plastic covers. Do not throw flat batteries in the environment after use.

9.3. CLEANING

To clean the instrument, use a soft dry cloth. Never use a wet cloth, solvents or water, etc.

9.4. END OF LIFE



CAUTION: this symbol indicates that equipment and its accessories shall be subject to a separate collection and correct disposal.

10. TECHNICAL SPECIFICATIONS

10.1. CHARACTERISTICS

Accuracy is calculated as $\pm [\%rdg + (dgt \cdot resolution)]$ referred to $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$, $<60\%\text{RH}$

AC TRMS CURRENT MEASUREMENT

Range	Resolution	Accuracy
2 ÷ 2500A	1A	$\pm(2\%rdg + 2 \text{ digit})$

- > Additional error due to not centering: 2% reading
- > Crest Factor max: 3
- > Frequency (Hz): $50 \pm 6\%$, $60 \pm 6\%$
- > Conversion mode: TRMS
- > Bandwidth: 3200Hz
- > Sampling frequency: 64 samples each 20ms
- > Memory size: 1Mbyte
- > Sampling period: 1s, 6s, 30s, 1min, 5min
- > Serial port: RS232

10.1.1.Reference guidelines

Safety:	IEC/EN61010-1
EMC:	IEC/EN61326-1
Insulation:	double insulation
Pollution level:	2
Max height of use:	2000m (6562ft)
Measurement category:	CAT III 1000V, CAT IV 600V to ground

10.1.2.General data

Mechanical characteristics

Dimensions (L x W x H):	120 x 80 x 43mm (5 x 3 x 2in)
Max diameter cable clamped:	174mm (7in)
Head length:	600mm (24in)
Weight (including battery):	about 0.5kg (10lv)
Protection index:	IP65 (RS232 connector closed)

Power supply

Battery type:	2x1.5V AA LR06 alkaline batteries
Battery life:	> 6 months (with charged batteries)

10.2. ENVIRONMENTAL CONDITIONS

10.2.1.Climatic conditions

Reference temperature:	$23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ($73 \pm 41^{\circ}\text{F}$)
Operating temperature:	$-20^{\circ}\text{C} \div 60^{\circ}\text{C}$ ($-4^{\circ} \div 140^{\circ}\text{F}$)
Operating humidity:	100%RH (RS232 connector closed)
Storage temperature:	$-20^{\circ}\text{C} \div 60^{\circ}\text{C}$ ($-4^{\circ} \div 140^{\circ}\text{F}$)
Storage humidity:	100%RH (RS232 connector closed)

This instrument complies with the requirements of Low Voltage Directive 2014/35/EU (LVD) and of EMC Directive 2014/30/EU

This instrument complies with the requirements of 2011/65/EU (RoHS) directive and 2012/19/EU (WEEE) directive

10.3. ACCESSORIES**10.3.1. Standard accessories**

Adhesive Velcro 50 x 70 cm

VELCRO

Carrying bag

BORSA2000

Management software + serial cable C2004

TOPVIEW2004

Batteries

User manual

YAMUM0009HT0

10.3.2. Optional accessories

RS-232/USB adapter

C2009

11. SERVICE

11.1. WARRANTY CONDITIONS

This equipment is guaranteed against any material fault or manufacturer's defect, in accordance with the general conditions of sale. During the warranty period (one year), faulty parts may be replaced, with the manufacturer reserving the right to decide either to repair or replace the product. In the event of returning the equipment to the after-sales service or to a regional branch, the outward transport is to the charge of the customer. The returning must be agreed in advance with the supplier or local distributor. A report indicating the reasons for returning and defects detected must accompany the instrument. The manufacturer will not be responsible for any damage against persons or things.

The warranty doesn't apply to the following cases:

- Accessories and batteries (not covered by warranty).
- Improper use of the equipment or combination of the instrument with incompatible equipment.
- Damages caused by incorrect shipping procedures.
- Damages caused by repair/service trials of unauthorized people.
- Modifications to the equipment without explicit authorization of our Technical Dept.
- Adaptation to a particular application not provided for by the definition of the equipment or by the user manual.

The contents of this manual may not be reproduced in any form whatsoever without our agreement.

Our products are patented. The logotypes are registered. We reserve the right to modify characteristics and prices as part of technological developments which might be required.

11.2. AFTER-SALE SERVICE

If the equipment doesn't work properly, before contacting our Service Dept. please test the battery condition and replace them whether necessary. If the problem persists check if your operating procedure agrees with the one described in this manual. In the event of returning the equipment to the after-sales service or to a regional branch, the outward transport is to the charge of the customer. The returning must be agreed in advance with the supplier or local distributor. A report indicating the reasons for returning and defects detected must accompany the instrument. The manufacturer will not be responsible for any damage against persons or things.