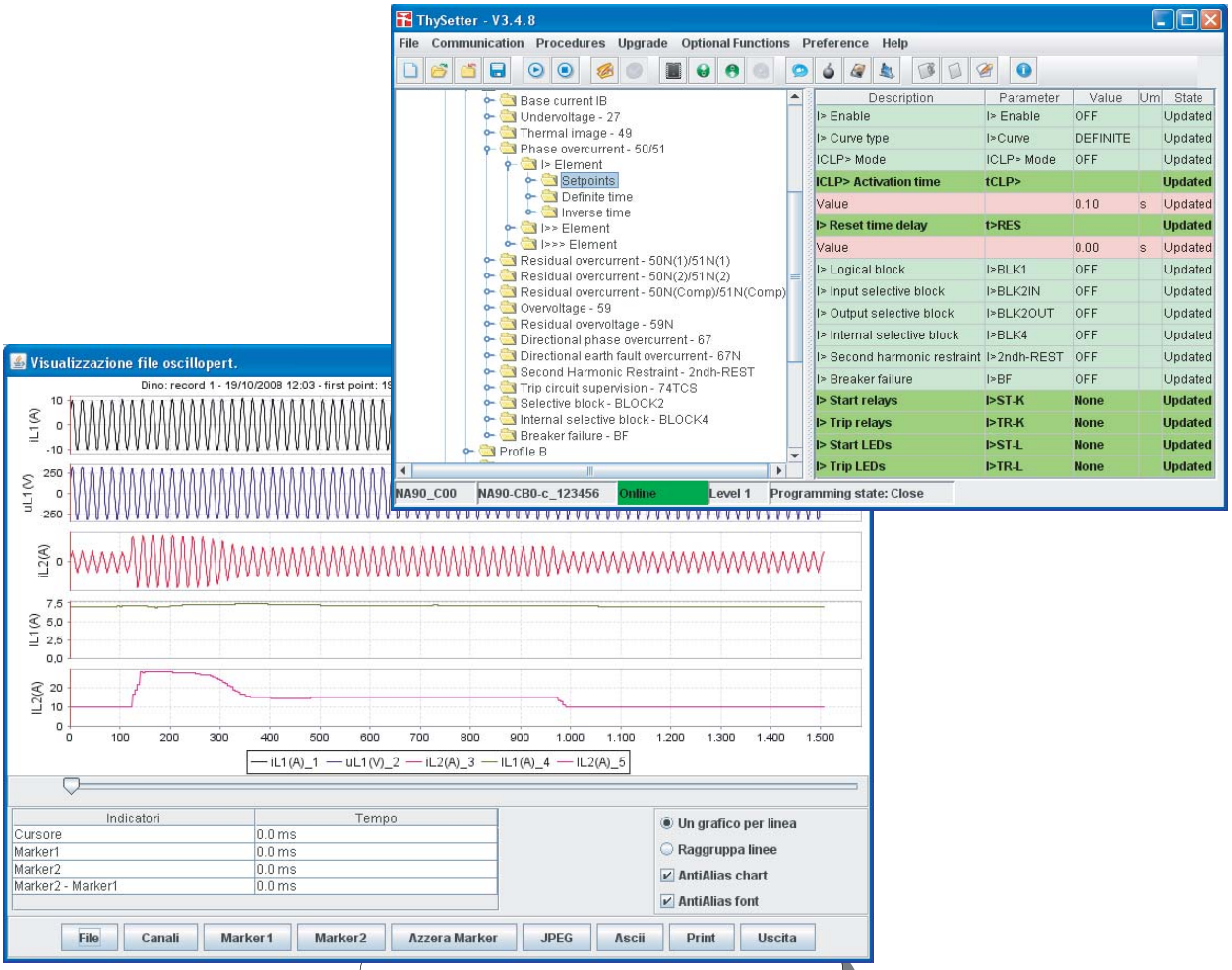
ThySetter

PC SOFTWARE
PARAMETER SETTING AND CONFIGURATION
GRAPHICAL USER INTERFACE FOR THYTRONIC PROTECTIVE RELAYS



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ThySetter

WARNING

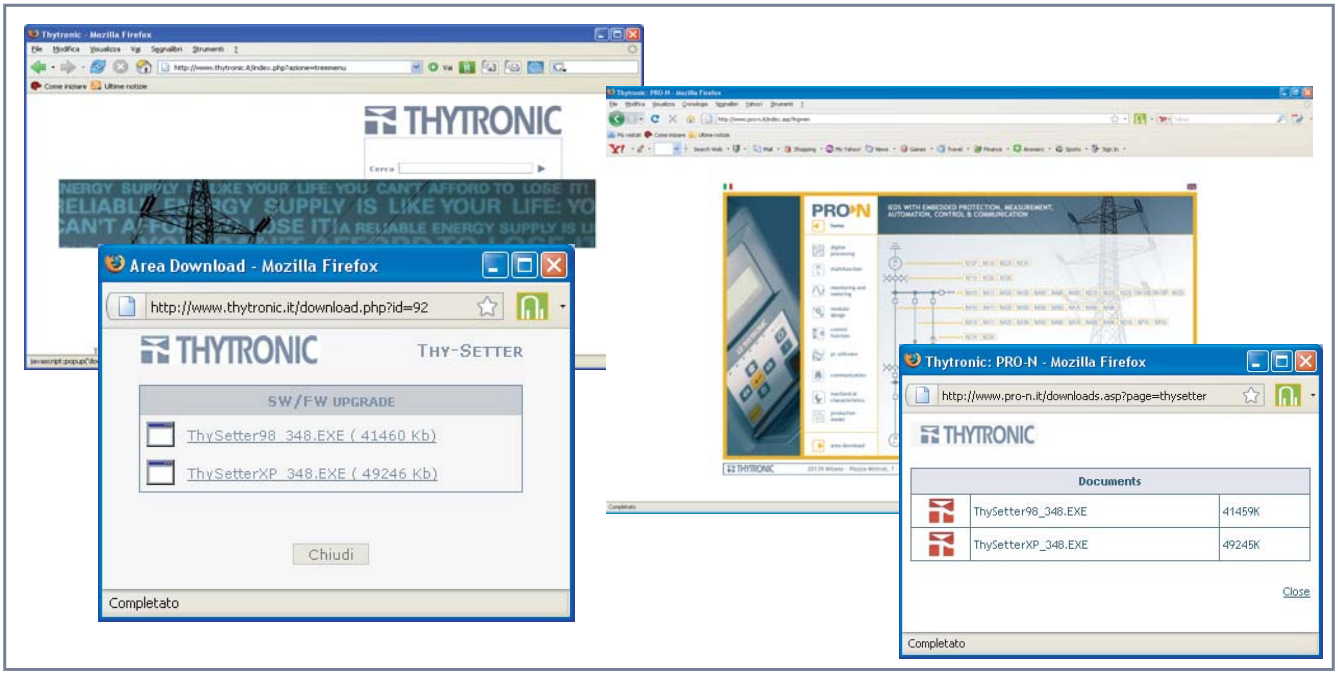
For safety reasons, a change of the following parameters become active only after an hw reset:
- Relay nominal frequency (f_n) and nominal voltages (U_n, UE_n)
- Ethernet communication parameters (IP host address, IP net mask, Autonegotiation).

Preface

The ThySetter sw is a "browser" of data (setting, measure, etc..); it implements an engine that is afford to rebuild the menu set up and the relationships to data concerning all Thytronic protective relays by means of XML files.
Following operations are performed by means ThySetter:
- Open-store of setting files;
- ASCII or Excel export reports;
- Open/close communication;
- Send settings, read settings and oscillography reading;
- Firmware upgrades;
- Session level selection and log enabling (log files);

After the device selection Thysetter allows to:
- Set the relay reference data;
- Set the communication parameters (Modbus address, TCP-IP address and parameters);
- Set the rated nominal values (relay nominal current, primary CTs nominal currents, etc..);
- Set the common parameters (self-test relays, circuit breaker commands and diagnostic, CT monitoring, binary input allocation, relays and LEDs configuration);
- Set profiles (A e B);
- Read info, measures, etc... (protections state, binary input states, output relays state, counters, etc...);
- Read oscillography;
- Acquire data concerning stored Faults and Events;
- Run commands (reset, send default setting, clock, etc.);
- Start-stop settings.

The latest release of ThySetter can be downloaded free of charge from the www.thytronic.it site (PRODUCT/SOFTWARE APPLICATIONS/THY-SETTER/download area), or from www.pro-n.it site (Software pc - area download).



Installation

Minimum requirements:

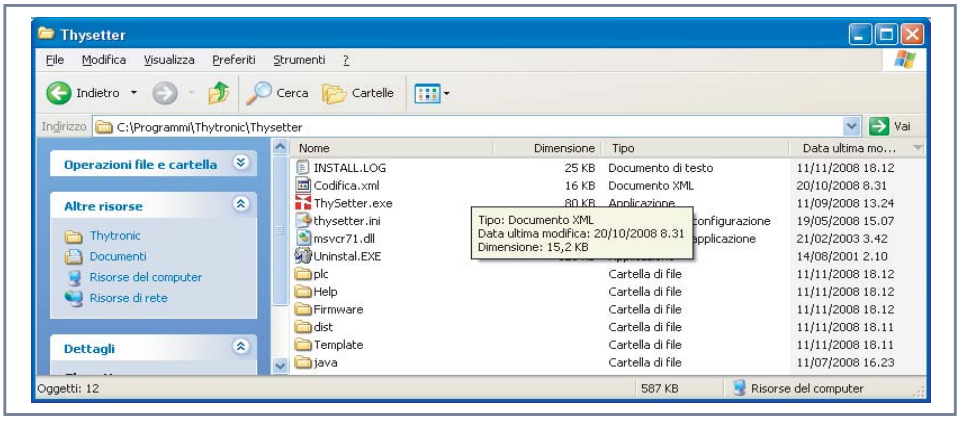
- CPU Pentium 450 MHz
- RAM > 128 MB.
- Hard disk space > 10 GB.
- SVGA 800 x 600, 256 colors.
- Serial port. Windows operating system (98[1] e subsequent).[2]

Note 1 The optional functions (PLC and oscillography) are non available for Windows 98 version

Note 2 Windows 95, Windows 98 first edition or Millennium edition are not supported.

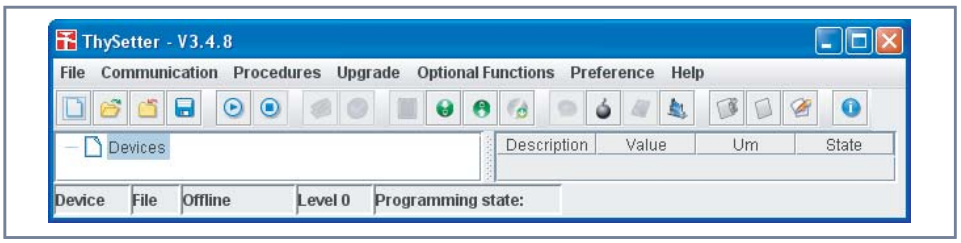
Setup

As soon as the right version is available, the sutup may be start (eg: ThySetterXP_348.exe for Windows XP operating system).
If an older version is already present, a suitable message will ask user to remove the oldest before proceeding.
All the components are installed (inclusive of the Java(TM) Platform, Standard Edition Runtime Environment).
After completion the following directory was created: \Programs\Thytronic\Thysetter



Working with ThySetter

A similar window opens



Two operating modes are available:
- On line (with device connection),
- Off line (building of setting file without connection to device).

On line mode

The following operation may be performed when the communication with device is active:
- In standing connection mode an automatic communication session is activated; the configuration file stays open until the "Save" or "Close" commands are issued.
- In Upload or Download data an automatic communication session is activated only for a short time required for send or receive data to/from device; at the end of the data transfer all the files are closed.

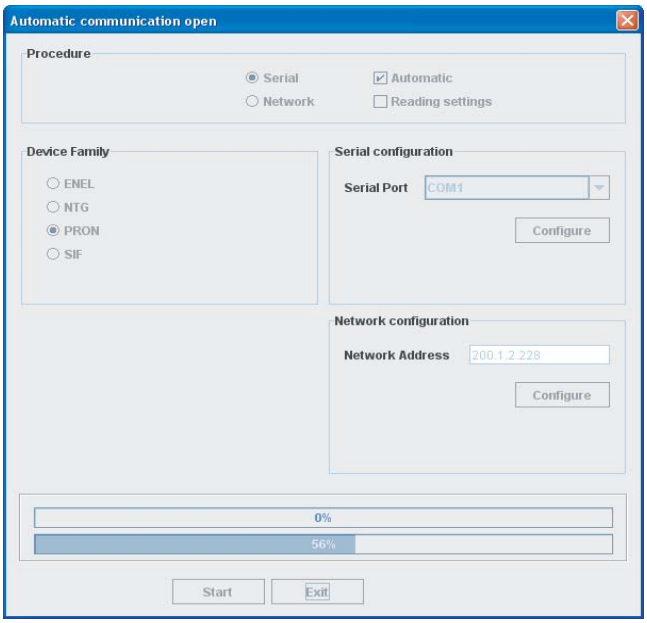
Standing connection

The communication must be open with the *Communication->Open* command or with a click of the button.
The communication port must be configured (**Procedure** upper panel):
- **RS232** whenever the serial port (RS232 or RS485) is used.
- **Network** whenever the Ethernet network is used.

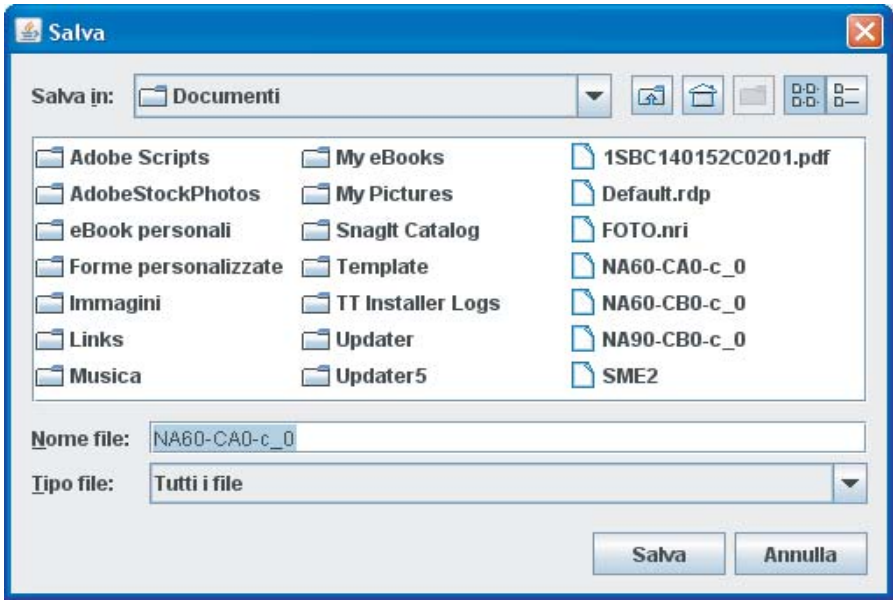
Correspondingly, a subsequent windows is proposed for the concerning parameters; if the Automatic procedure is selected only the COM serial number for the serial port and the IP adress for the Ethernet port are required, whereas, with Manual selection (removing the tick on the Automatic parameter) the followings may be adjusted:
- data rate, data bit number, stop bit number, Modbus address, as well as several timer parameters useful for RS485 communication,
- IP address, TCP port, as well as several timer parameters useful for network communication.

Moreover, inside the **Procedure** upper panel, is possible to select (tick on the Reading settings) if the settings must be updated.
- With "Reading settings" selection the communication session starts and the reading progress is shown with a status bar; at last the device type is highlighted (left side on the bottom of desktop); by means of the Windows commands the menu may be resized as much you like.[1]
- Without "Reading settings" selection the communication session starts without reading the settings; they are updated when the relative menus are accessed. This operating mode is very fastest and so it is advantageous when the settings updating is not needed.

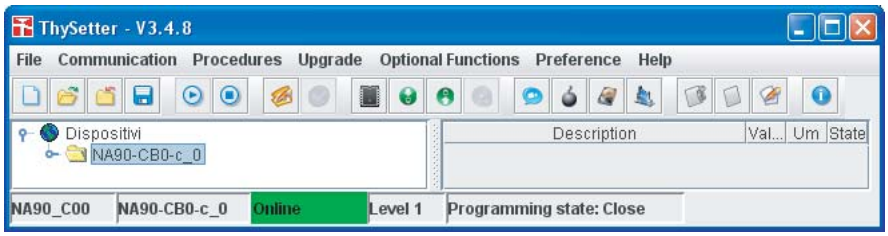
Note 1 The shown images explain some menu levels; all examples are indicatives and unrealistic.



For both the operating modes the configuration file must be saved (e.g.: NA60 -CA0-c_xxxxxx" where xxxxxx stands for the serial number).



At last the device type is highlighted (left side on the bottom of desktop, e.g.NA90-CB0-c_0); the "Online" session is highlighted over a green field.



The communication session may be closed by means the *Communication->Close* command or with a click of the button.

Download or Upload data

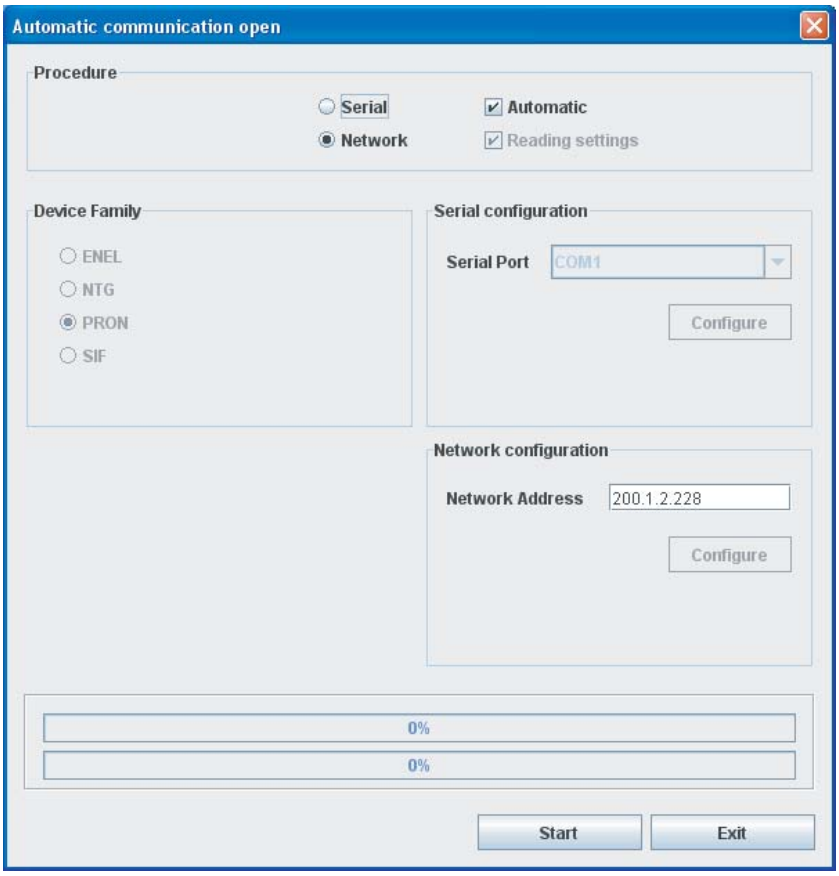
The operating mode allows the automatic data transfer from and towards the linked device.

Upload data

The operating procedure is started with the *Procedures->Upload Data* command or with a click of the button (Upload data from device).
The communication port must be configured (**Procedure** upper panel):
- **RS232** whenever the serial port (RS232 or RS485) is used.
- **Network** whenever the Ethernet network is used.

Correspondingly, a subsequent windows is proposed for the concerning parameters; if the Automatic procedure is selected only the COM serial number for the serial port and the IP adress for the Ethernet port are required, whereas, with Manual selection (removing the tick on the Automatic parameter) the followings may be adjusted:
- data rate, data bit number, stop bit number, Modbus address, as well as several timer parameters useful for RS485 communication,
- IP address, TCP port, as well as several timer parameters useful for network communication.

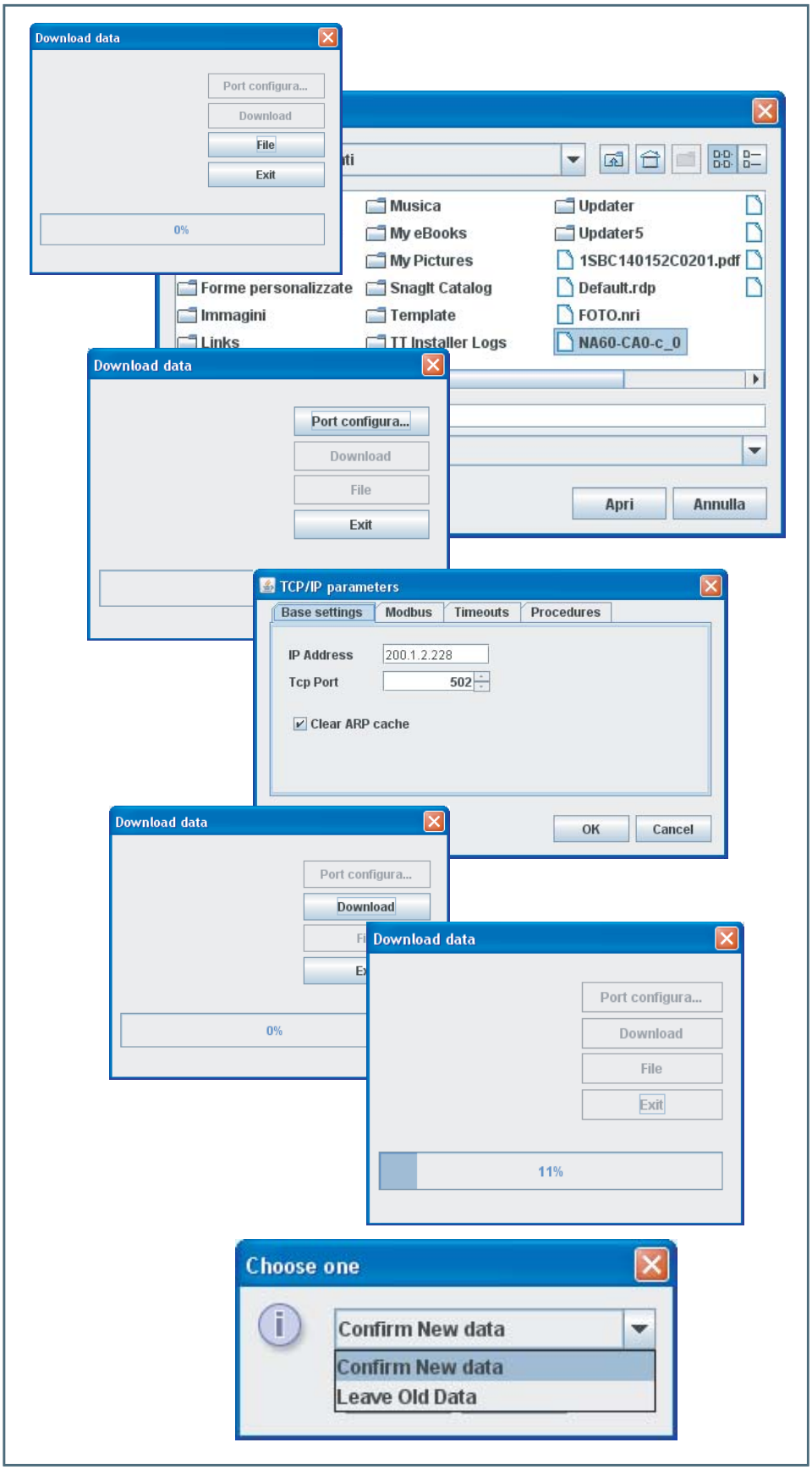
Inside the **Procedure** upper panel the Reading setting option is forced (tick on the Reading settings). the configuration file must be saved
With "Start" command the configuration file name is asked, so the communication session starts and the reading progress is shown with a status bar.
The file name is temporarily shown inside the "device" area of ThySetter but then it is cleared to show the transfer session fulfilment.



Download data

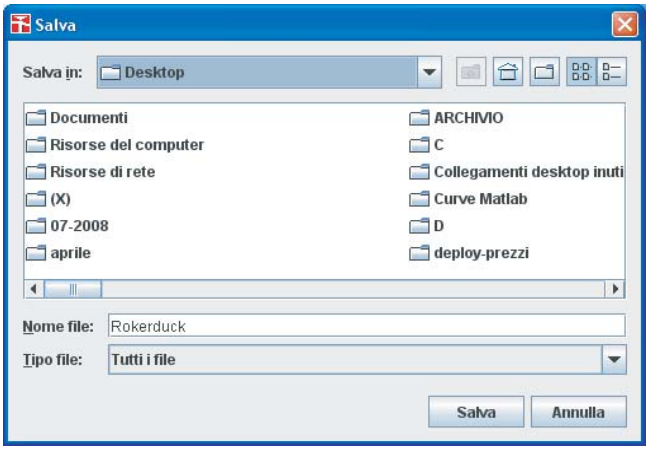
The operating procedure is started with the *Procedures->Download Data* command or with a click of the button (Download data to device).
To start transfer it is need:
- select the file (*File -> Open*)
- configure the communication port ("Port Configuration")
- click the "Download" button

at the end of the data transfer, the new setting data must be confirmed.



Offline mode

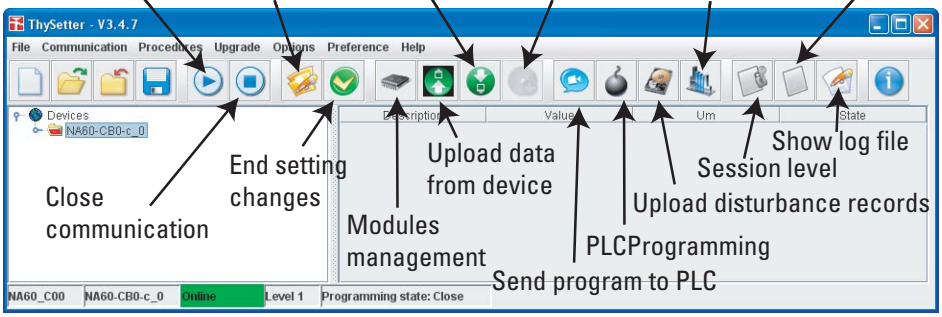
In off-line mode (without link to device), it is possible to modify settings through the generating one or more files containing the desired settings, which can then be transferred over the relay by means of the *Download data* command.
The file may be constructed by creating it from scratch, by starting from a file already present on a Personal Computer, or from a file taken from a relay by means of the *Upload data* command which can be activated from the Procedures menu or by means of the button (Upload data from device) in the upper command bar.
At the end the file may be saved with the Windows-like procedures.
To build up a new file, the "**File New**" command must be activate, so the protection device must be select inside a window.
By means of the usual Windows-like commands a user defined name and the destination folder must be entered (Paperduck in the example).



The "Paperduck" file can be modified with Thysetter commands, with the well-described procedures for Online mode (except for the Start/End change setting commands not required) .
After having completed construction of the desired file, with the device connected, it is possible to download it over the relay by means of the *Download data* command which may be accessed from the Procedures menu, or by means of the button (Download data to device) in the upper command bar (see previous paragraph).

Drop down menu

Some general-use drop-down menus are provided; for some there is also a button (icon) with the same function.



File

Within the **File** drop down menu, besides all the usual "Windows" commands for opening and saving files, there is the command which allows exporting data relating to readings reports in ASCII and Excel formats ("Export Report File in ASCII Format" or "Export Report File in Excel Format).

Communication

Within the **Communication** drop down menu are available the open and close communication commands.

Procedure

Within the **Procedures** drop-down menu, or by means of the button (Download data to Device), button (Upload data from Device) buttons, the settings files from a Personal computer to the relay may be transferred and vice versa.

Upgrade

The *Upgrade->Device firmware* command or by means of the button (Device firmware) allows upgrading the relay firmware.

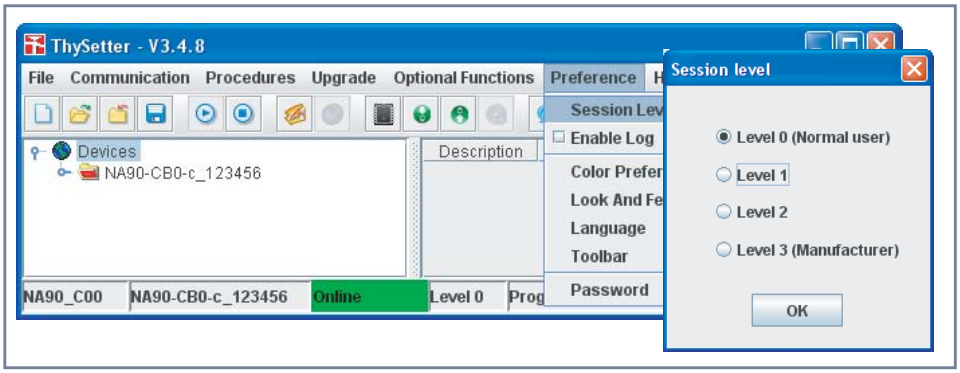
Optional functions

Inside the **Optional functions** menu the Disturbance and PLC options are available (inclusive of licences activation).

Preference

Inside the **Preference** menu, the following submenus are available:

Session level



The Level 0 (User), normally used, don't require password.
The Level 1 is available through password. The following operation which are forbidden al Level 0, are allowed:[1]

- Send default configuration
- Serial number setting
- Counters reset: through a single command all counters are cleared (the partial counters can be cleared even from level 0 session)

The Level 2 is planned for future use only.
The Level 3 (Manufacturer) is available through a reserved password (Thytronic ownership) for calibration purposes.

Enable Log

When the log is enabled all operation are recorded.
With the intent that to make easier the file hint, it is advisable to:

- Erase the old file; the file ThySetter.log is located inside the same directory of the Thysetter (c:\Programs\Thytronic\ThySetter).
- Start ThySetter
- Tick on the Enable log command The operating procedure is started with the *Preference->Enable log* command or with a click of the button (Enable log).
- Run all ThySetter functions; all operations are automatically recorded (file ThySetter.log); the file may be shown by means any text editor, or with a click of the button (Show log file).

To ask for technical support it is advisable to send by e-mail the log file.

Color Preference

Color layout may be customized.

Look and feel

The Graphical User Interface may be selected.

Language

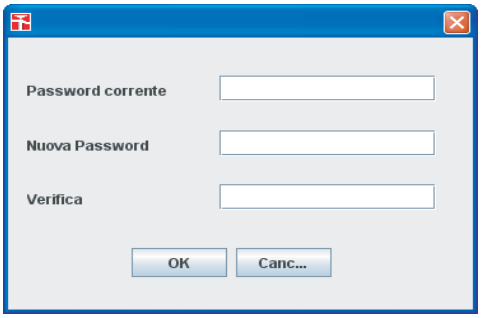
The menu language may be selected.

Toolbar

The icon dimensions may be adjusted.

Password

The level 1 password may be changed.
It is necessary to enter the old and the new password and to confirm it.
The default password is "level1" (enter without "")[2]



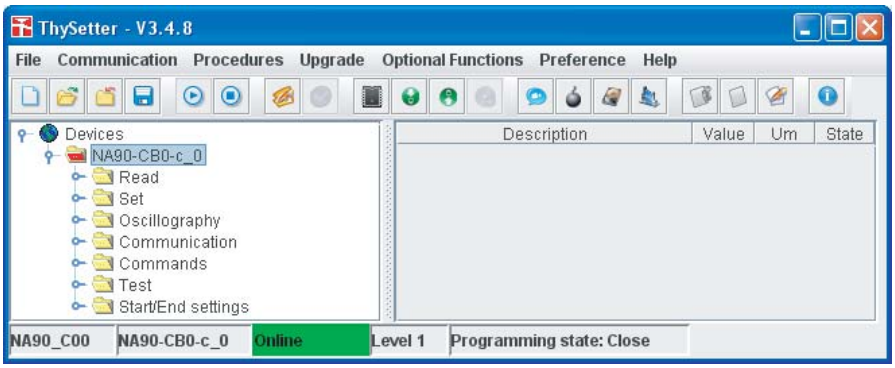
Nota 1 The session level is concerning the Thysetter sw; for network connections, the session level is common for all devices on the same net

Nota 2 If the password is lost, a new installation of the ThySetter must be performed

Menu

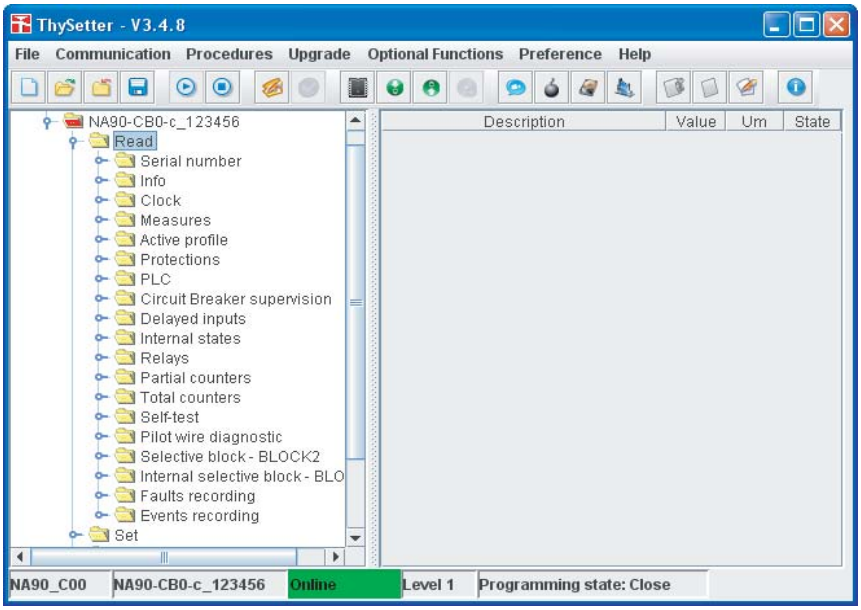
For any operating mode (Online or Offline), the following element are provided inside the menu tree, common for all the Pro-N devices:[1]

- Read
- Set
- Oscillography
- Communication
- Commands
- Test
- Start/End settings.



Read

Inside the Read menu all states and measurements are available.

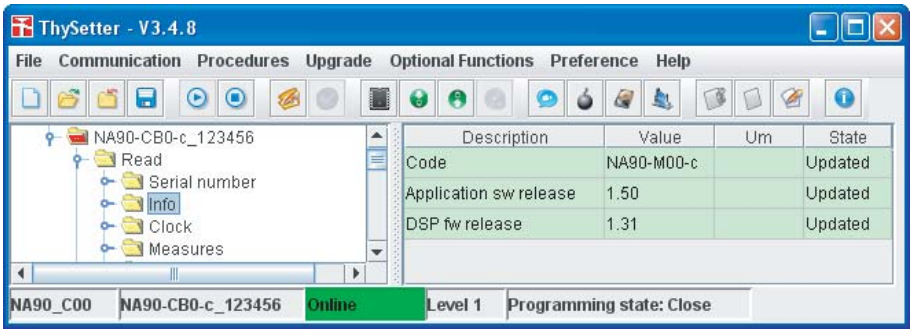


Read \ Serial number

Inside the submenu the serial number can be displayed.

Read \ Info

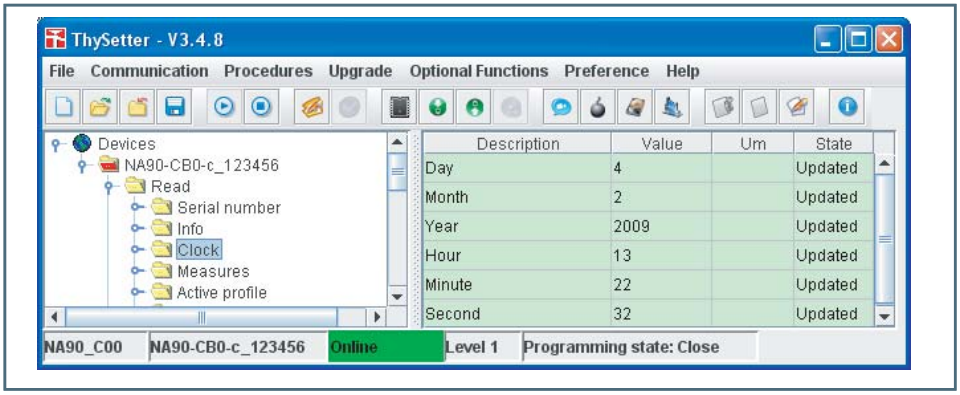
Inside the submenu the device code, the firmware and software release are available.



Note 1 The shown images explain some menu levels; all examples are indicatives and unrealistic.

Read \ Clock

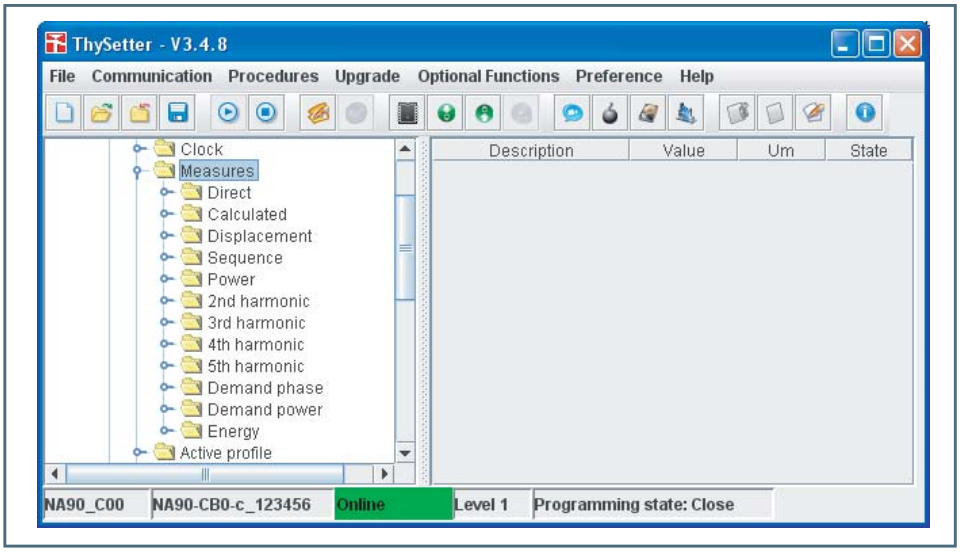
Inside the submenu the data and time are available. The parameters may be adjusted with *Real Time Clock* command (**Commands** menu).



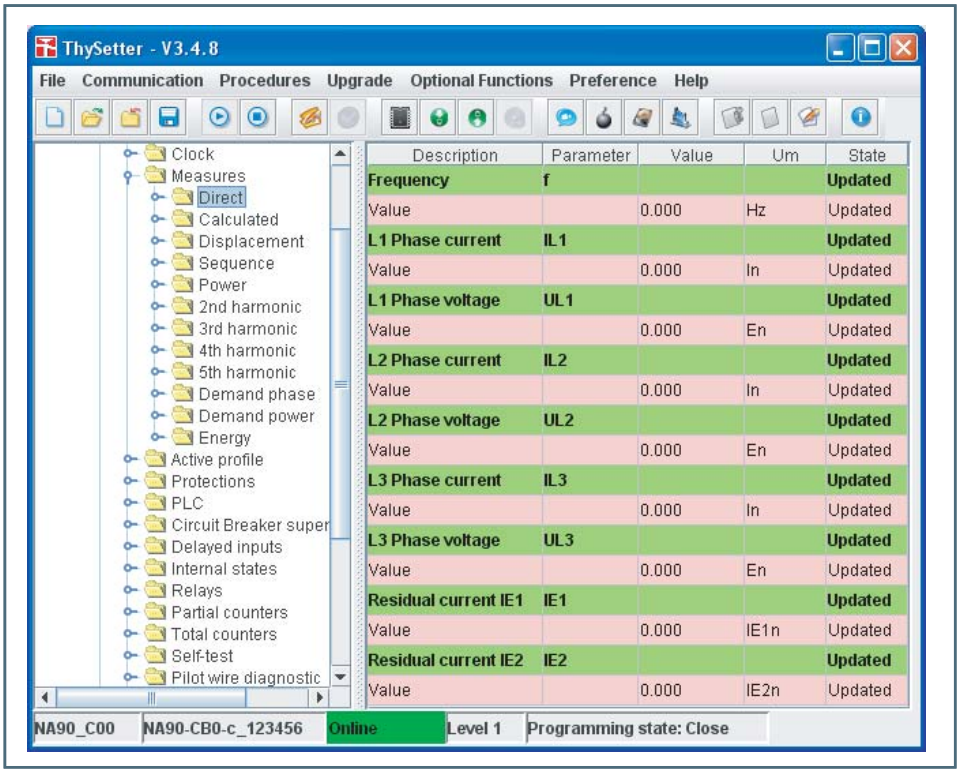
Read \ Measures

All the measures are available; they are set in the following order:

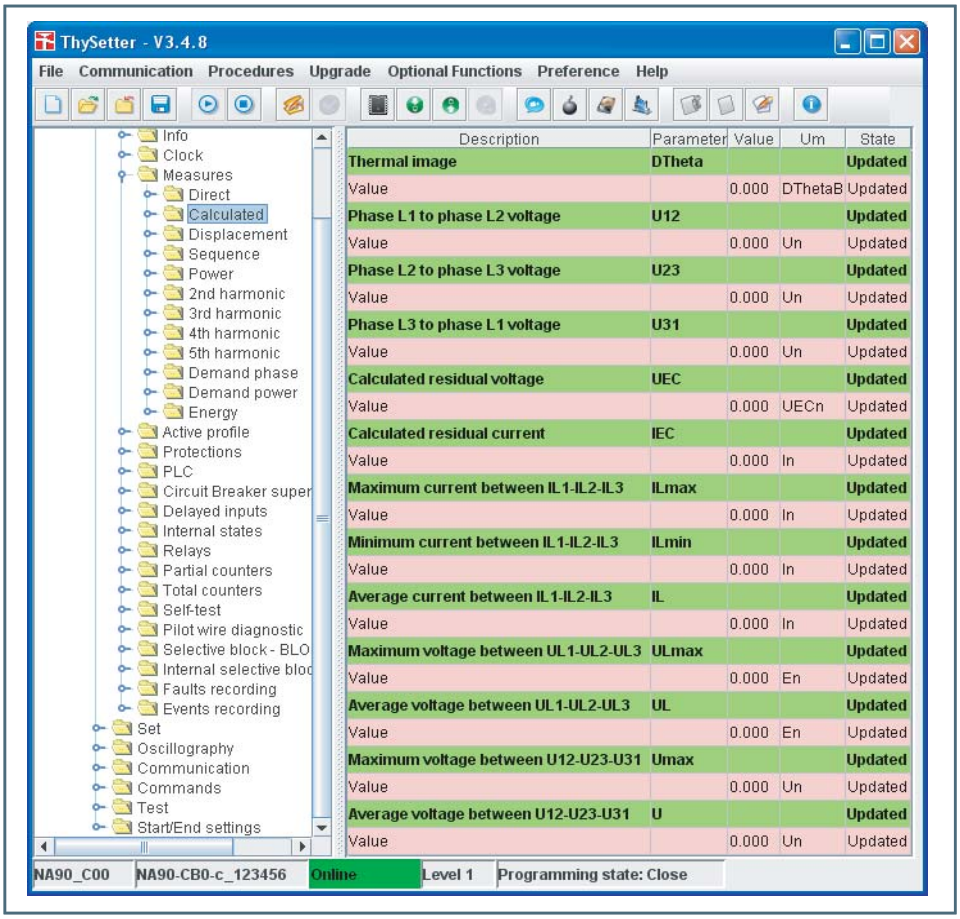
- Direct, Calculated, Displacement, Sequence, Power, 2nd harmonic, 3rd harmonic, 4th harmonic, 5th harmonic, Demand phase, Demand power, Energy.



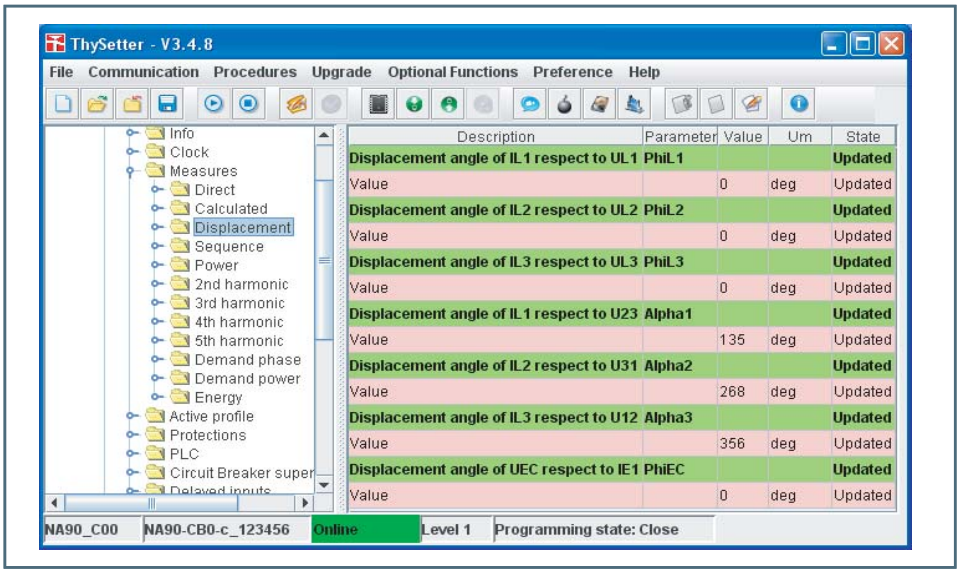
Direct



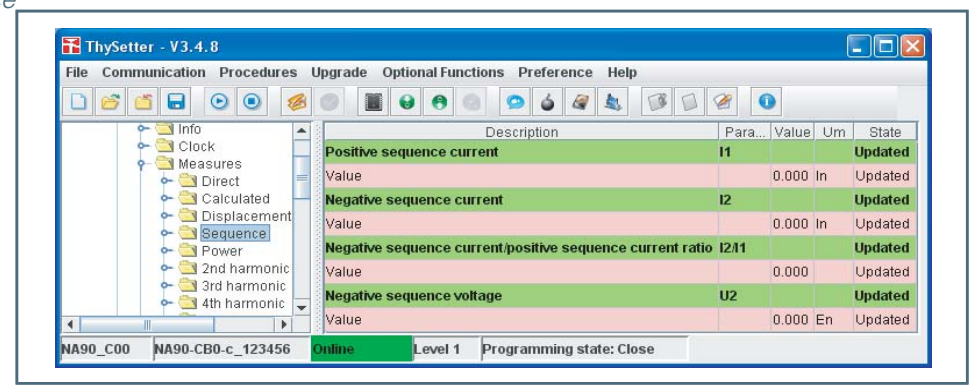
Calculated



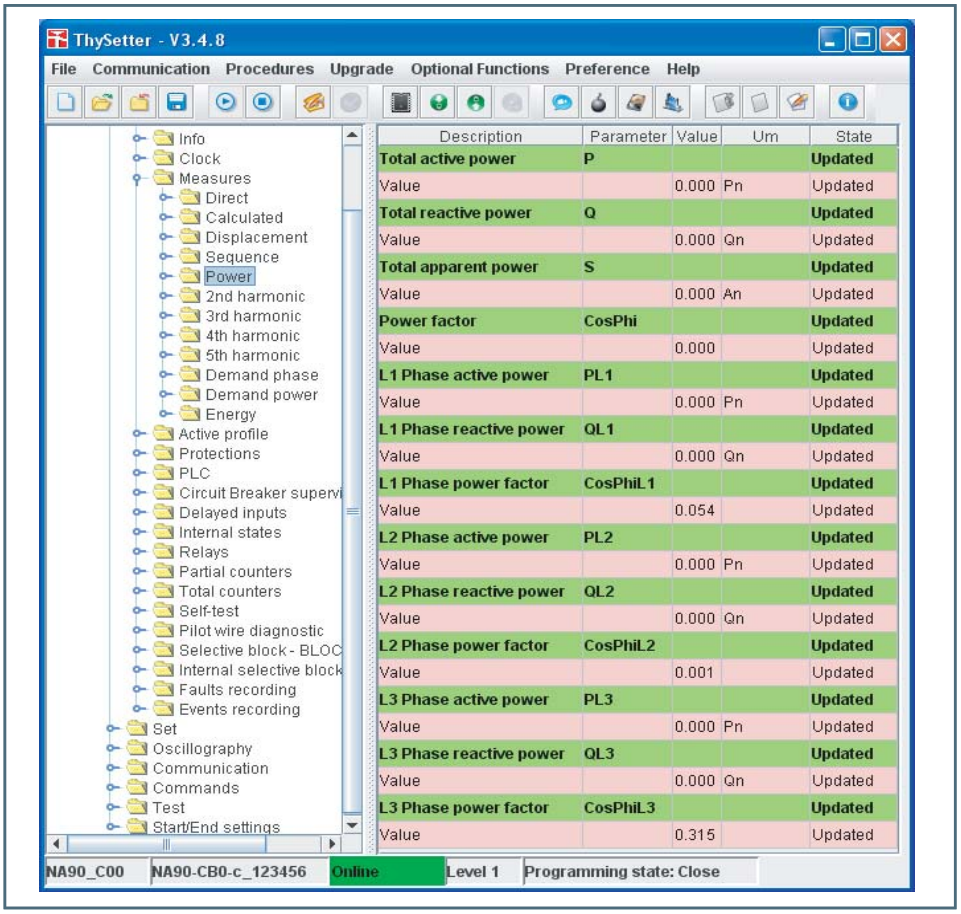
Displacement



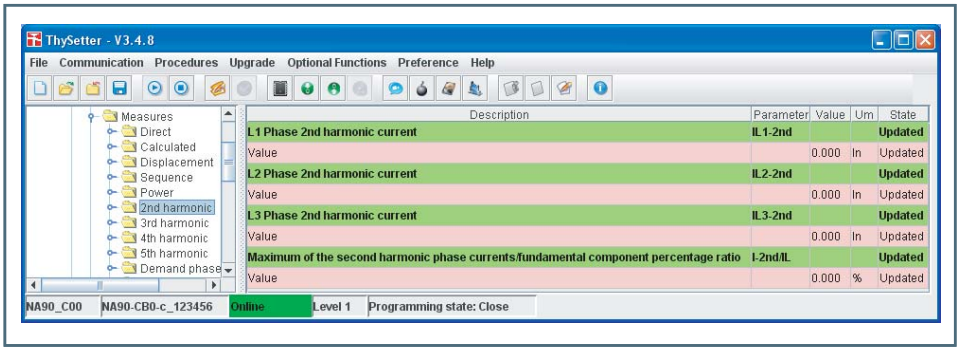
Sequence



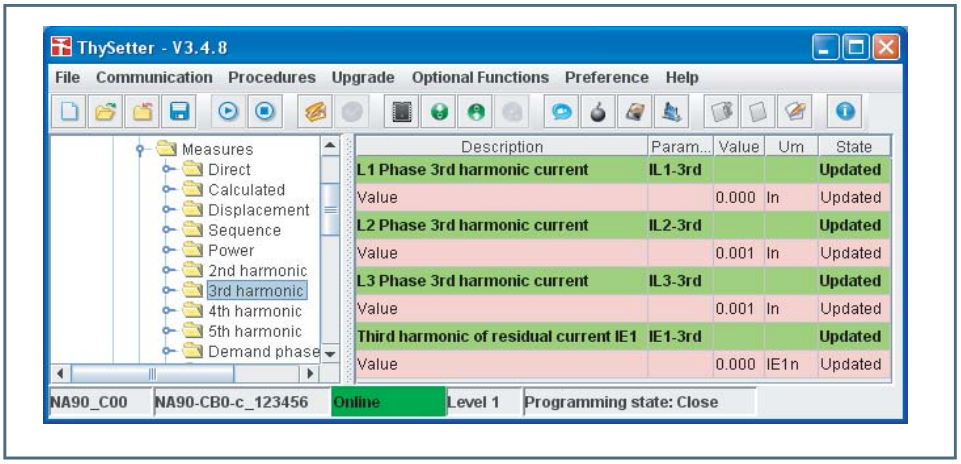
Power



2nd harmonic



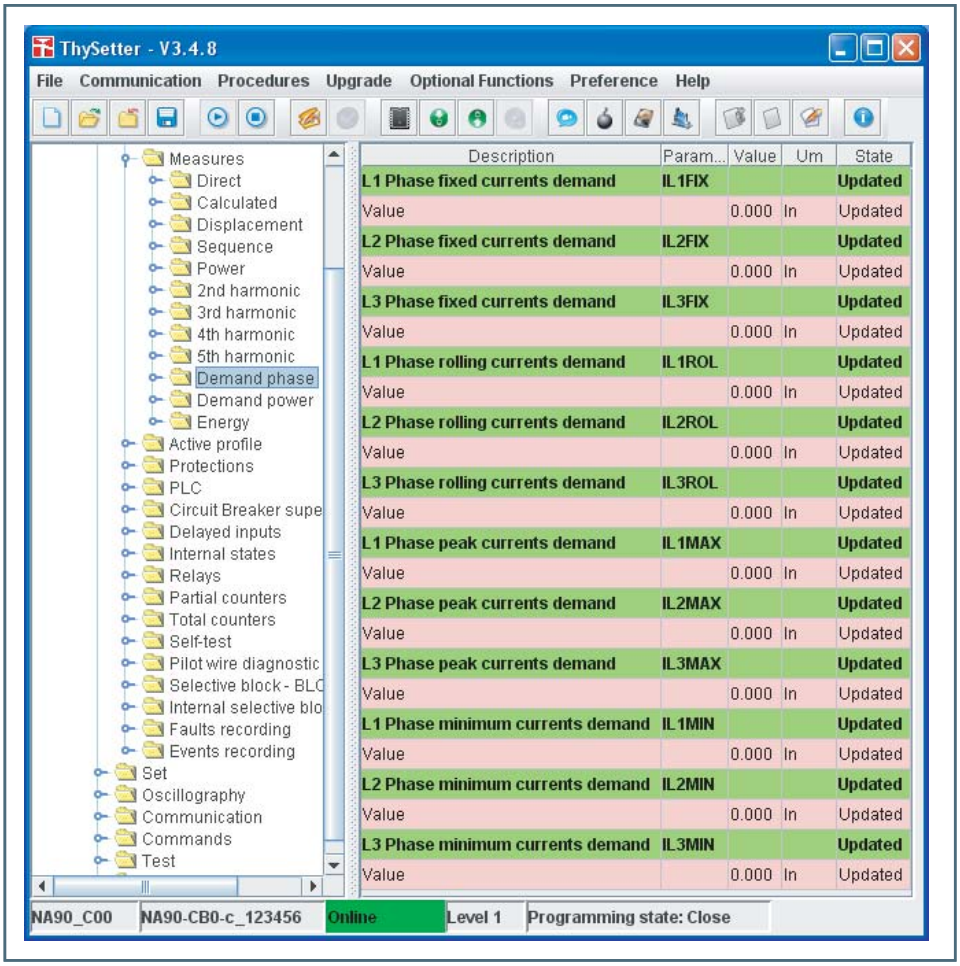
3rd harmonic



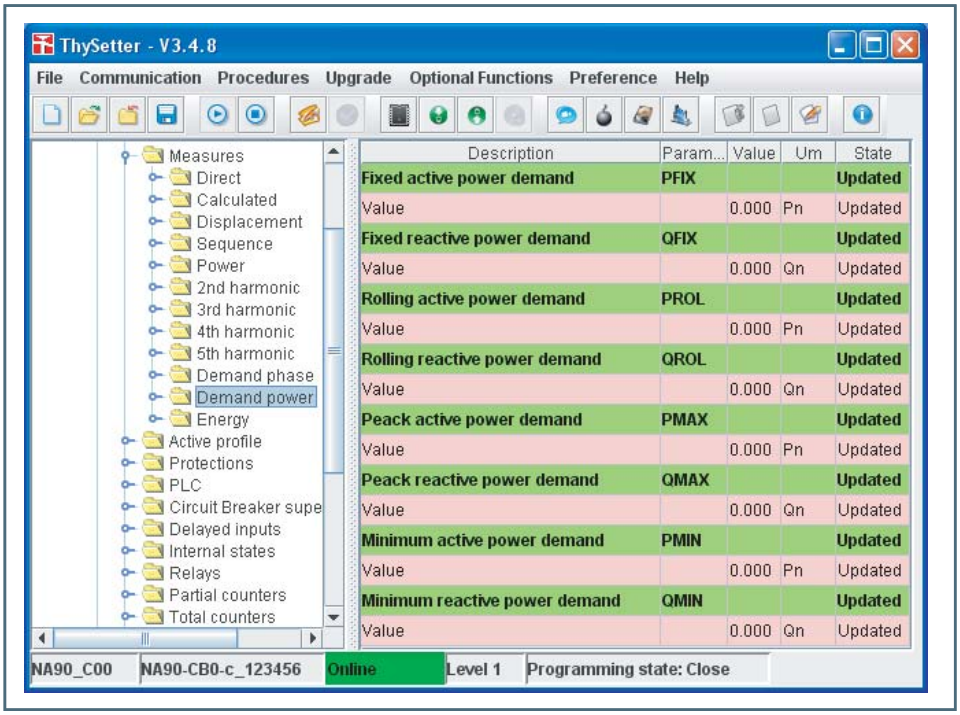
4th harmonic and 5th harmonic

And so on.

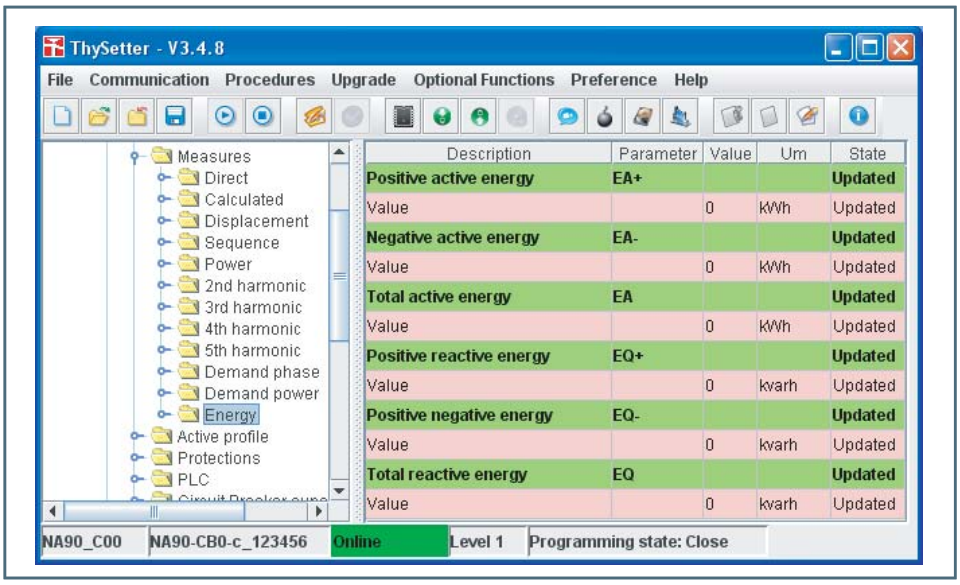
Demand phase



Demand power

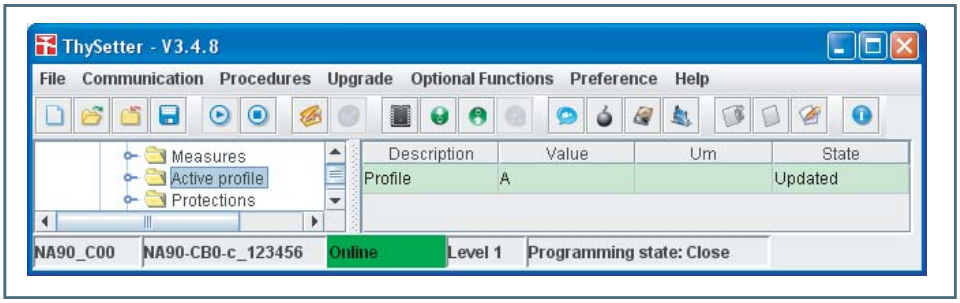


Energy



Read \ Active profile

Information about the current setting profile (A or B) is available.



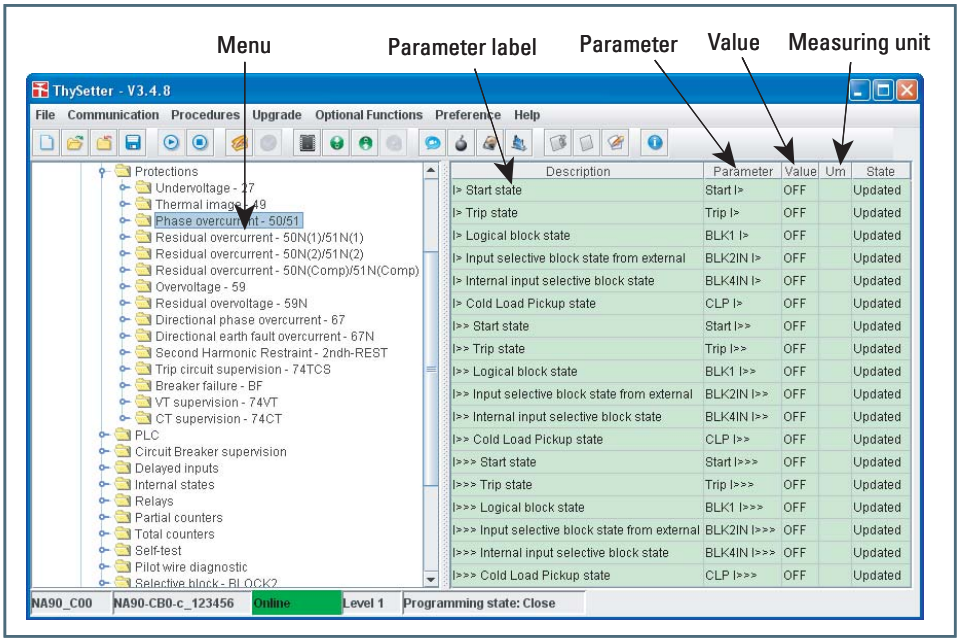
Read \ Protections

For every protection element, the following information is available:

- Start state
- Trip state
- Logical block (Block1) state
- Selective block (Block2) state
- Cold load pickup state

Phase overcurrent - 50/51

Example of reading concerning the Phase overcurrent - 50/51 protective element; similarly for all the protection elements

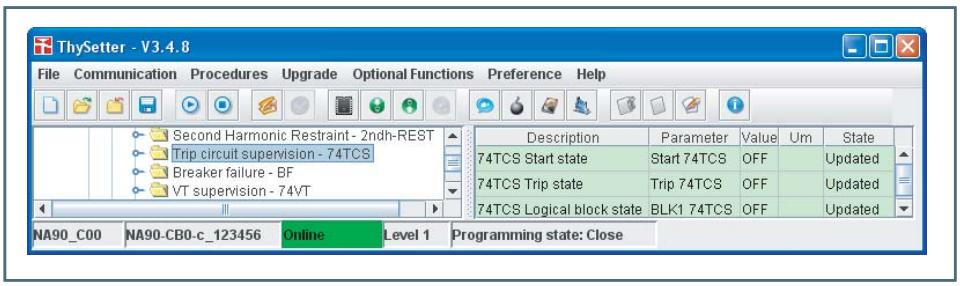


Second harmonic restraint

The start state of the second harmonic restraint is available.

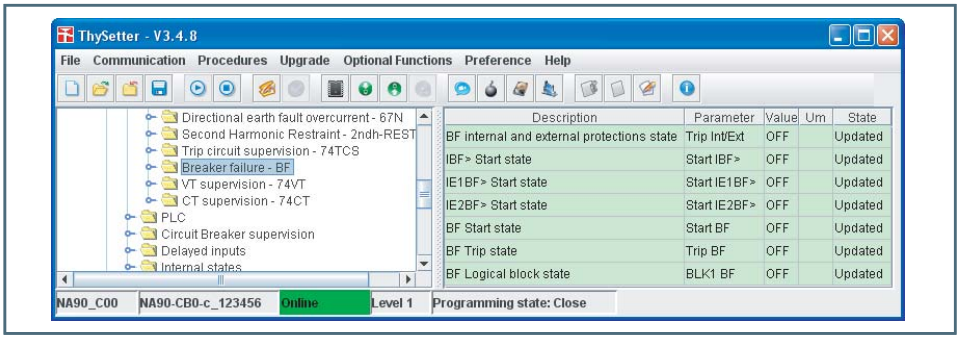
Trip circuit supervision - 74TCS

The start, trip and logical block state of the 74TCS element are available.



Breaker failure - BF

The start, trip and logical block state of the BF element are available.

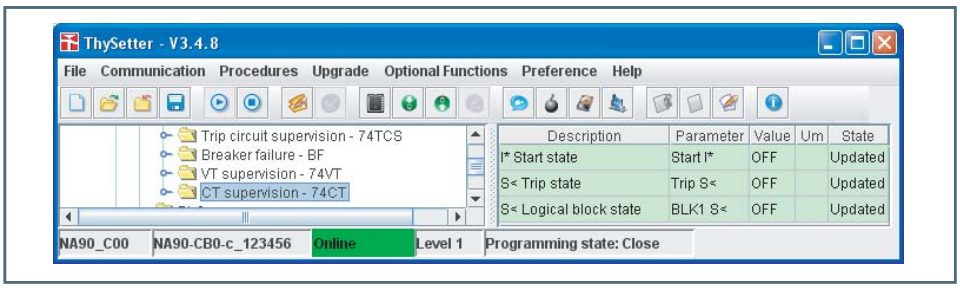


Monitoraggio TV - 74VT

The start, trip and logical block state of the 74VT element are available.

CT supervision - 74CT

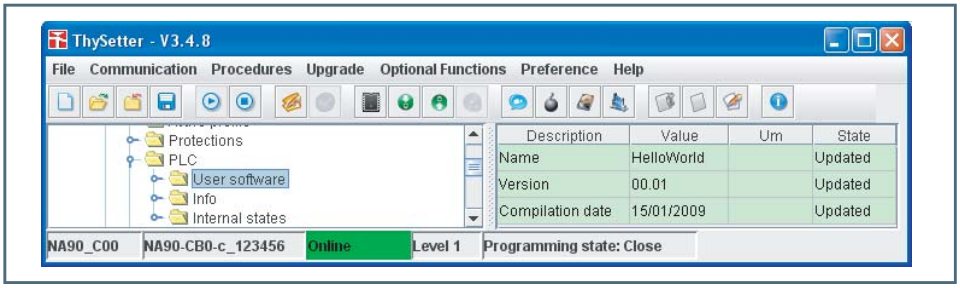
The start, trip and logical block state of the 74CT element are available.



Read \ PLC

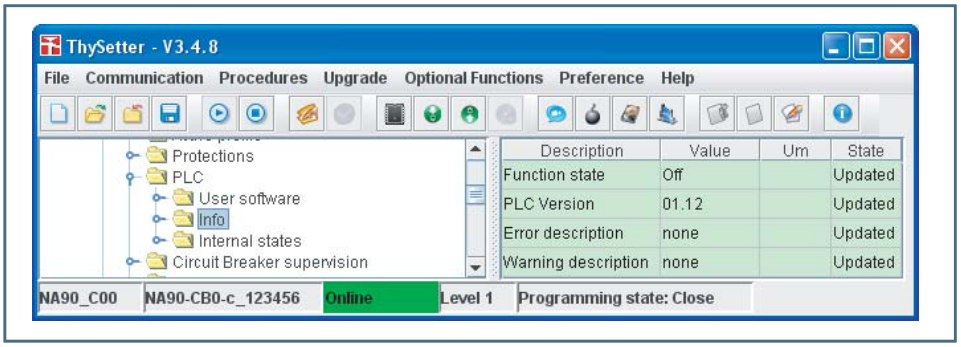
User software

The name, version and compilation date informations are available.



Info

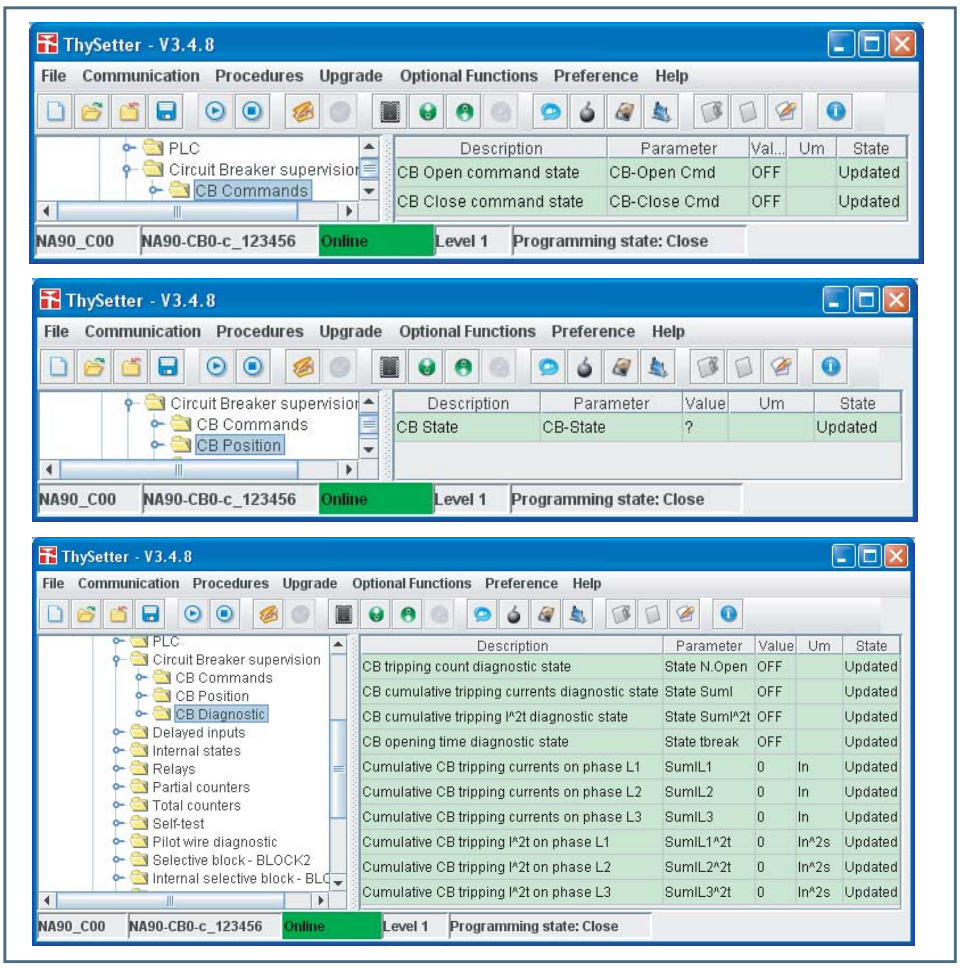
The current state of the PLC software is available.



Read \ Circuit breaker supervision

The following information concerning the circuit breaker is available:

- CB commands (open and close commands)
- CB position
- CB diagnostic



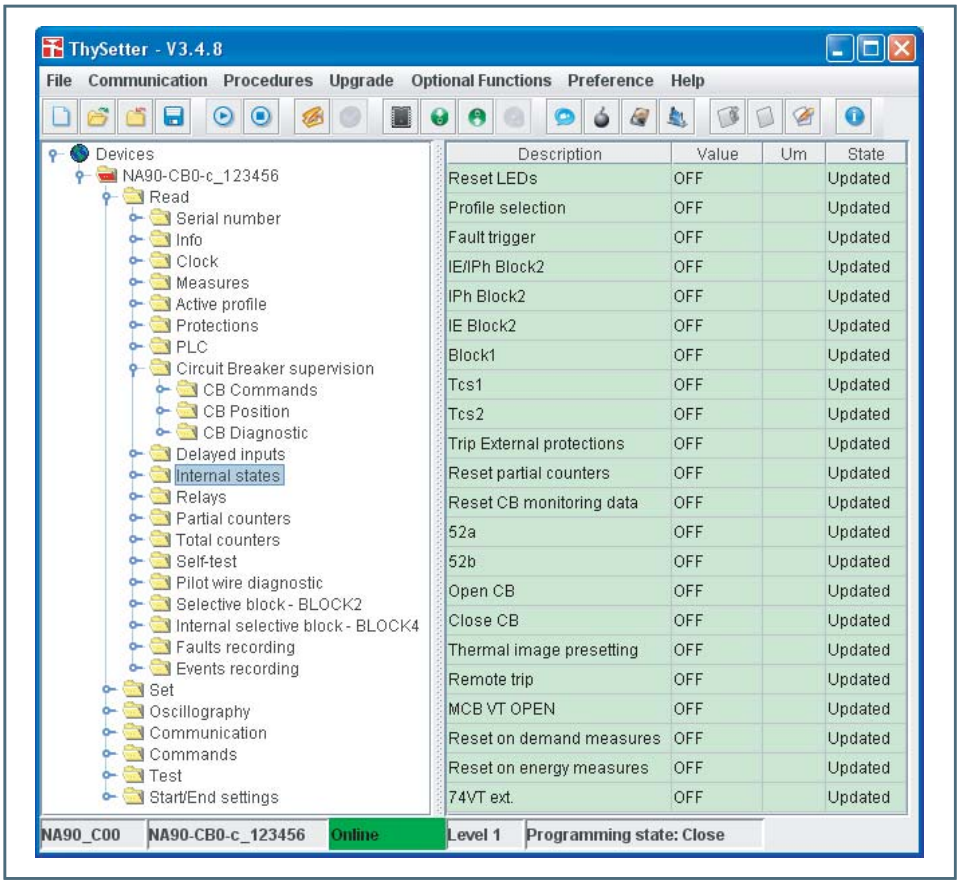
Read \ Delayed inputs

The state information concerning the binary inputs is available; it is acquired on the signals coming out from the operating mode and timer settings:

- ON when input is powered and *Active-ON* logic or when the input is not powered and *Active-OFF* logic.
- OFF when the input is not powered and *Active-ON* logic, or when the input is powered and *Active-OFF* logic.

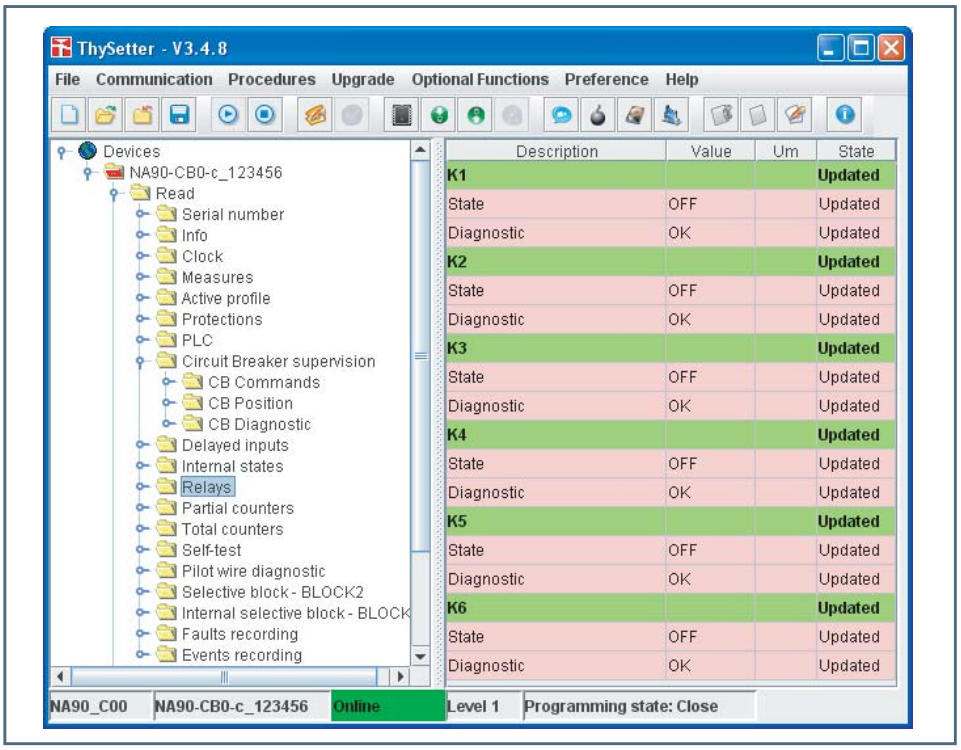
Read \ Internal states

State of input functions assigned to the binary inputs are available.



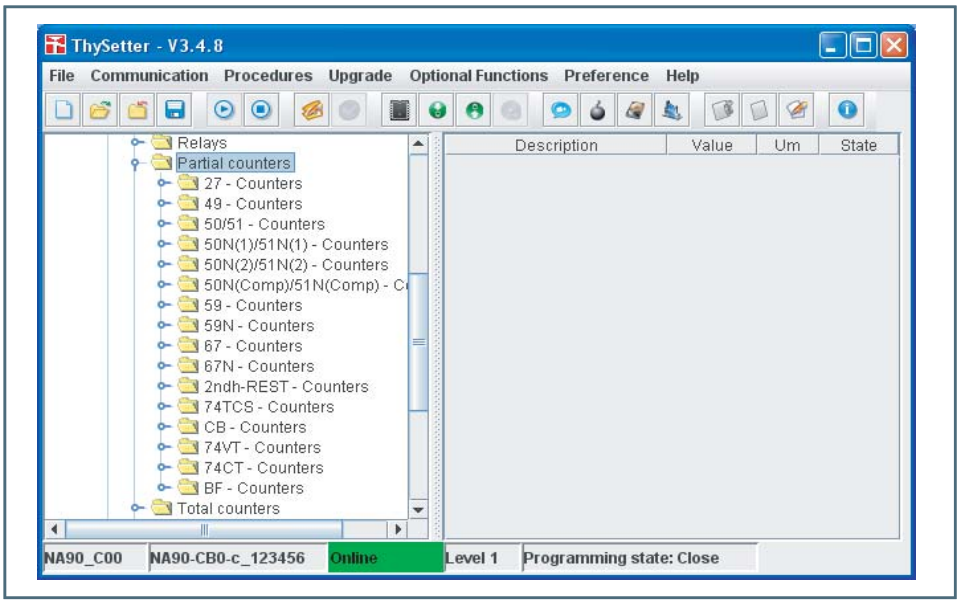
Read \ Relays

Status (ON/OFF) and diagnostic information are available for all the output relays (on-board K1...K6 and K7...K10 when MRI is active).



Read \ Counters

For every protective element two set of counters are available (Partial counters and Total counters); the partial counters can be cleared by the user level, while the Total counter reset can be achieved with password (Session Level 1).



Every partial counter is reset to zero when ten thousand count is passed.
All partial counters can be cleared by means a single command; for this purpose the Reset partial counters command must be issued (**Commands\Reset** submenu).

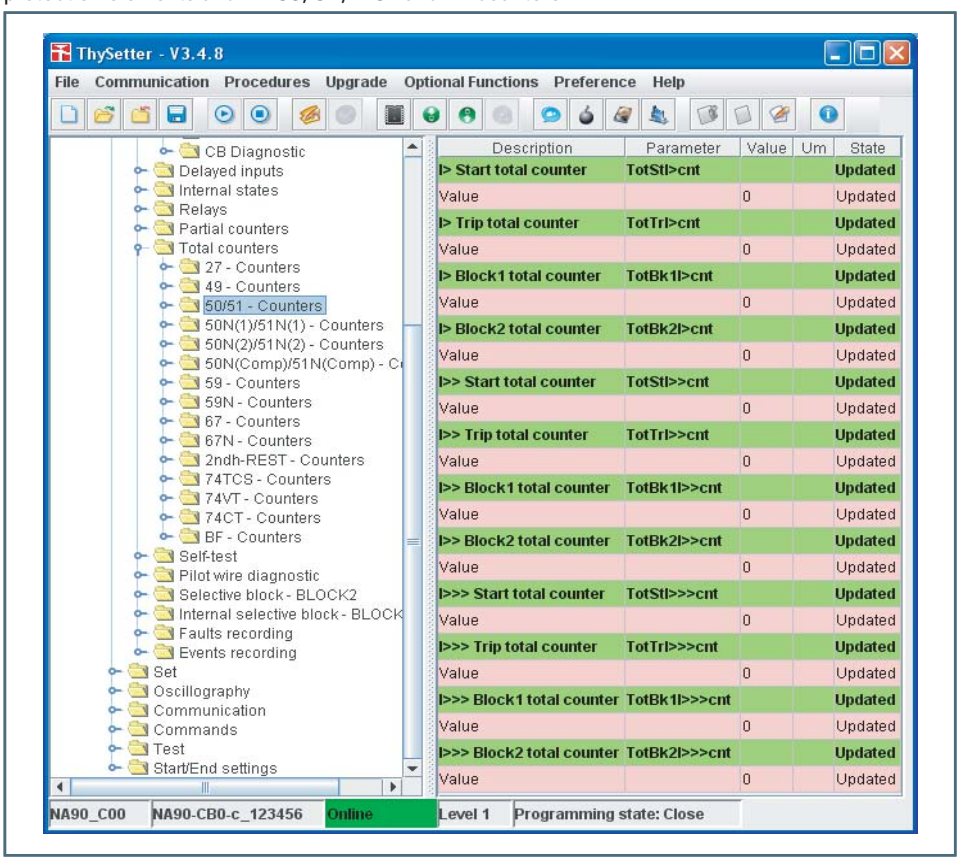
Partial counters

- xx Start partial counter *0...9999*
- xx Trip partial counter *0...9999*
- xx Block1 partial counter *0...9999*
- xx Block2 partial counter *0...9999*

Total counters

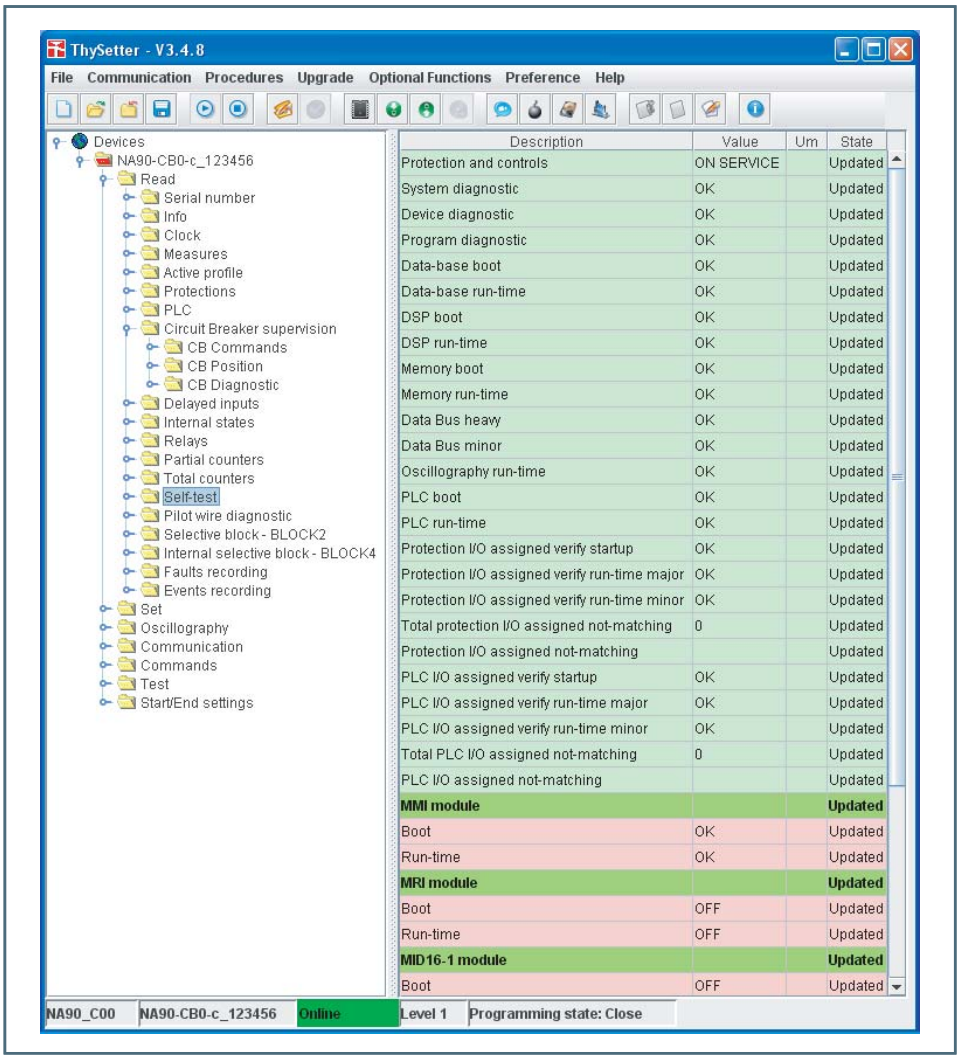
- xx Start total counter *0...9999*
- xx Trip total counter *0...9999*
- xx Block1 total counter *0...9999*
- xx Block2 total counter *0...9999*

Example of reading concerning the Phase overcurrent - 50/51 protective element; (similarly for all the protection elements and 74TCS, CB, 74CT and BF counters.



Read \ Self-test

On the start-up and run-time, a self test over the hardware and software modules is performed.



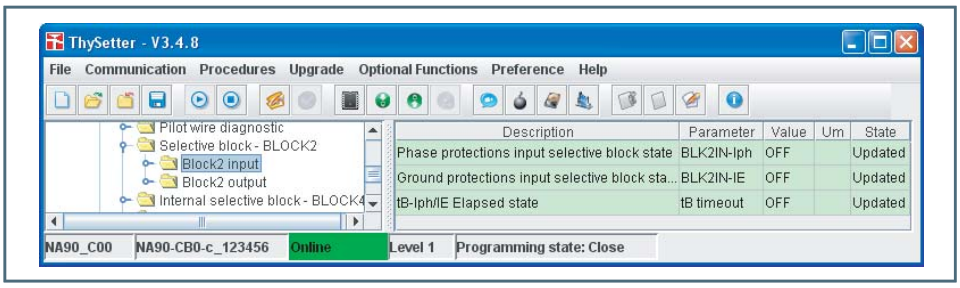
Read \ Pilot wire diagnostic

Information about pilot wire diagnostic is available (BLIN1 breaked or shorted).

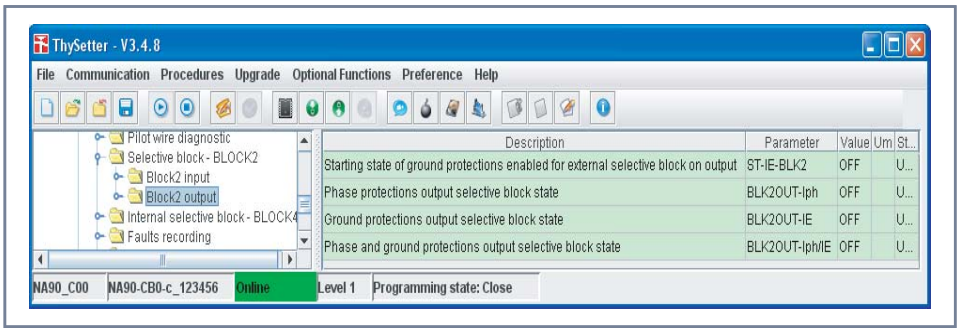
Read \ Selective block - BLOCK2

Information about input and output selective block is available.

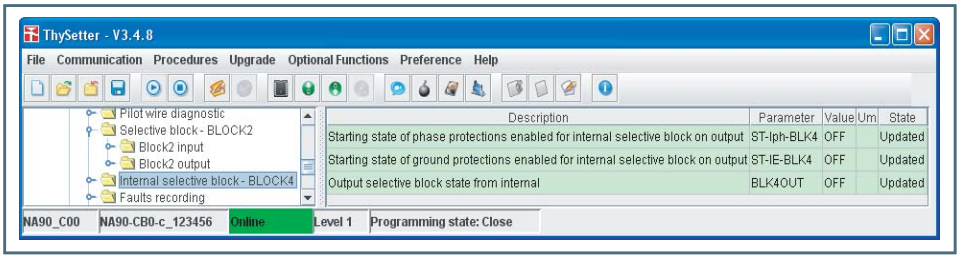
Block2 input



Block2 output



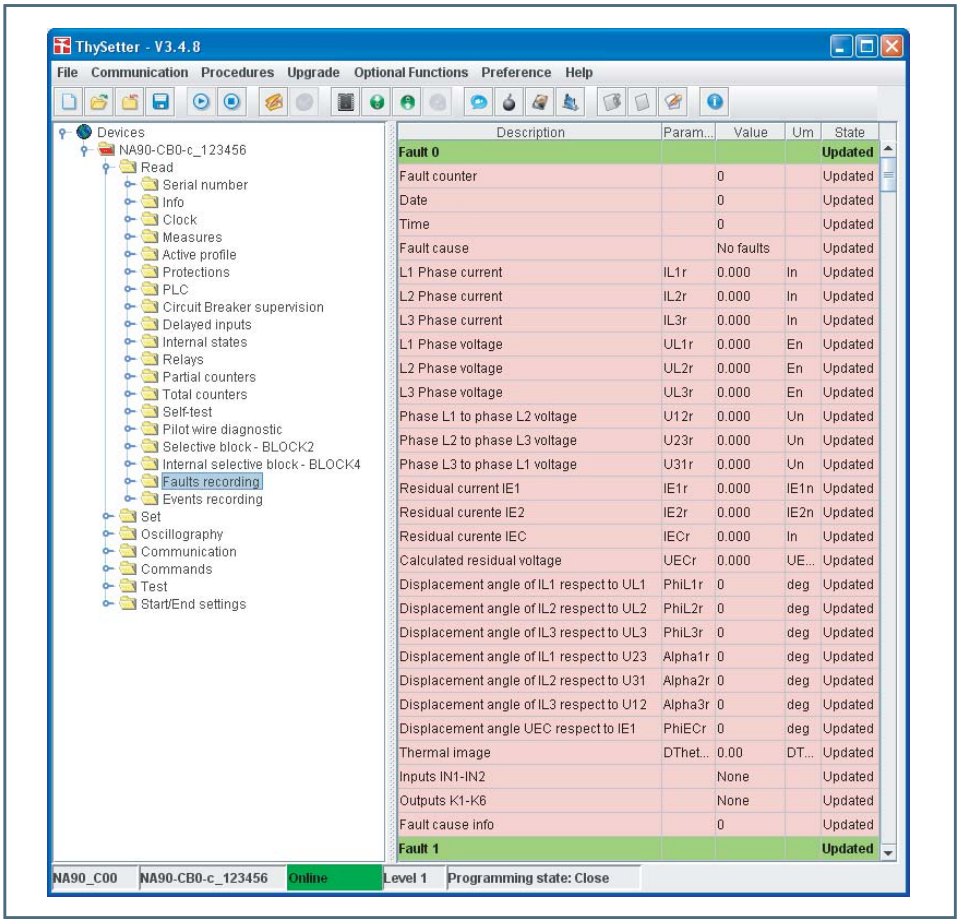
Internal selective block - BLOCK4



Read \ Fault recording

Recording[1] is triggered by:
- Relay OFF-ON switching,
- External trigger (binary input set as *Fault Trigger*),
- Trip of a protection or control element.

Twenty faults are recorded into a circular FIFO (First In, First Out) buffer,[2]
Following information are stored in every record:
- Fault counter,[3]
- Date and time,
- Fault cause (binary input/output relay/setting changes)
- Phase currents I_{L1r}, I_{L2r}, I_{L3r}
- Phase voltages U_{L1r}, U_{L2r}, U_{L3r}
- Phase-to-phase voltages U_{12r}, U_{23r}, U_{31r}
- Residual current I_{Er}
- Measured residual voltage U_{Er}
- Calculated residual voltage U_{ECr}
- Displacement angles Phi_{L1r}, Phi_{L2r}, Phi_{L3r}, $Alpha_{1r}$, $Alpha_{2r}$, $Alpha_{3r}$, Phi_{Er} , Phi_{ECr}
- Thermal image
- Inputs
- Outputs
- Fault cause (info about the faulted phase)



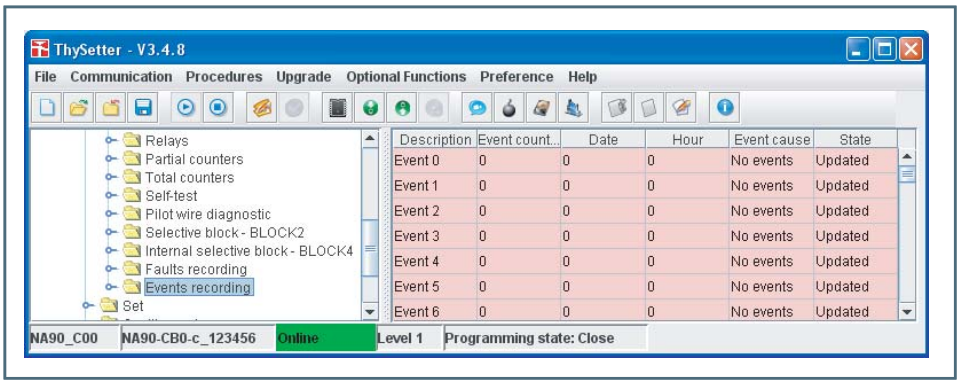
Note 1 Data concerning the fault recorder are stored in RAM, so they are lost when auxiliary power supply goes OFF.

Note 2 Fault 0 is the newest fault, while the fault 19 is the oldest

Note 3 Counter is updated at any new record; it may be cleared by means ThySetter

Read \ Event recording

Three hundred events are recorded into a circular FIFO (First In, First Out) buffer[1].

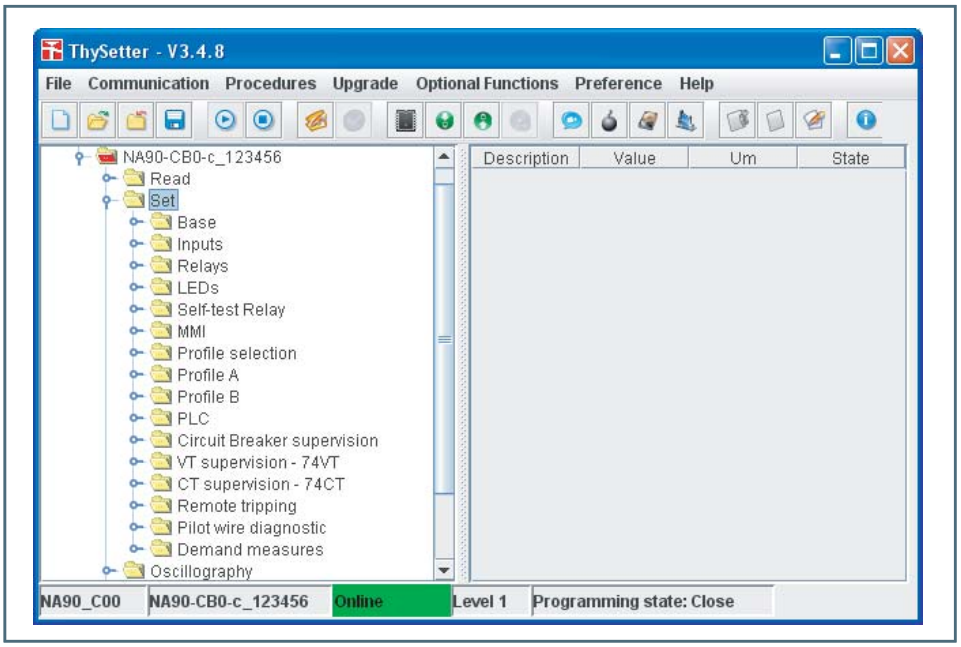


Recording is triggered by:
- Relay switching (OFF-ON or ON-OFF)
- External trigger (binary input)
- Setting modify.

Following information are stored in every record:
- Event counter[2]
- Date and time,
- Event cause (binary input/output relay/setting changes)

Set

Inside the Set menu the settings data must be displayed and/or modified[3].



Some setting are commons to both profiles (Profile A and Profile B):
- Base
- Inputs
- Relays
- LEDs
- Self-test Relay
- MMI
- Profile selection
- PLC
- Circuit Breaker supervision
- VT supervision - 74VT
- CT supervision - 74CT
- Remote tripping
- Pilot wire diagnostic
- Demand measures

while some settings are independently adjustable for any setting profile.

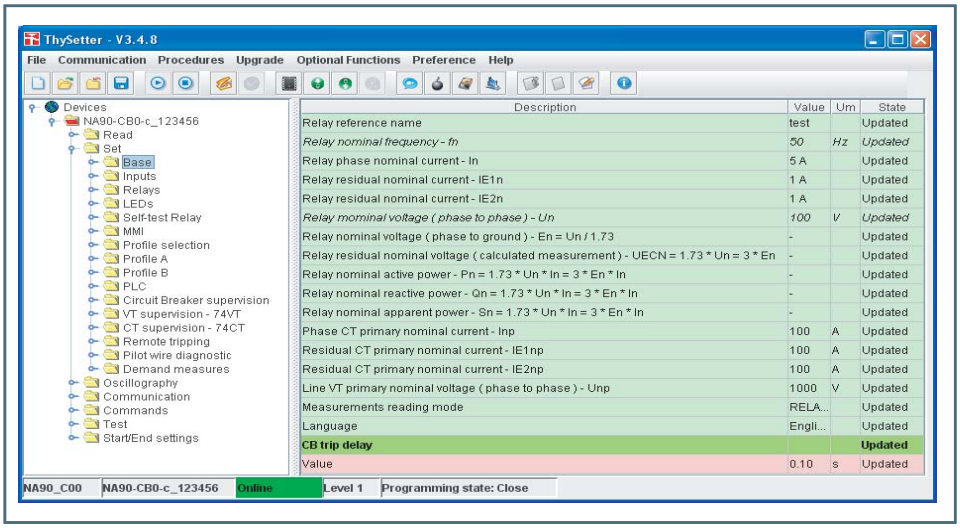
Note 1 Event 0 is the newest event, while the event 299 is the oldest

Note 2 Counter is updated at any new record; it may be cleared by means ThySetter

Note 3 For any change of settings the "Start/End settings" sequence must be performed .

Set \ Base

Inside the submenu the Relay reference name may be entered (free editing field), the nominal frequency and current may be set and the reading mode may be selected.

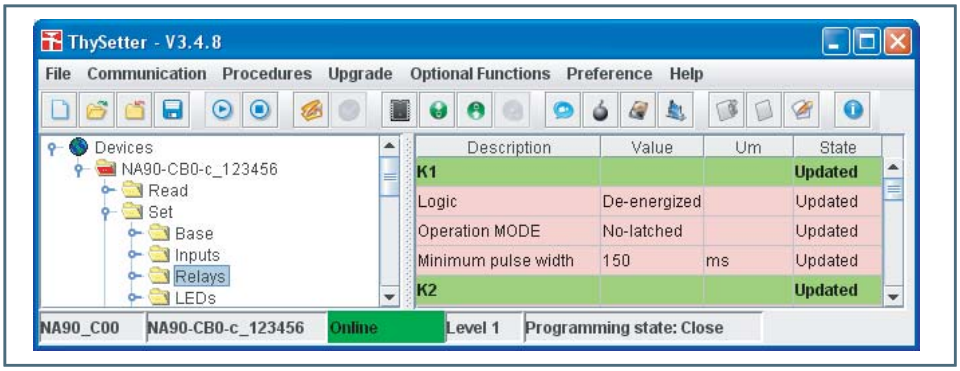


Set \ Inputs

Inside the submenu the operating logic (Active-ON/Active-OFF), the timers (IN1 tON, IN1 tOFF, IN2 tON, IN2 tOFF) and the matching for the binary input may be set.[1]
The state of the input is acquired after tON and tOFF delays.
The activation timer defines the time interval following the OFF-ON transition of the input signal elapsed before the binary input state is acquired.
The de-activation timer defines the time interval following the ON-OFF transition of the input signal elapsed before the binary input state is acquired.

Set \ Relays

Inside the submenu the setting parameters concerning the output relays are available.
(Logic, Operation mode and Minimum pulse width).[2]



Set \ LEDs

Inside the submenu the setting parameters concerning the operation mode of LEDs (Latched/No-latched) are available.

Set \ Self-test Relay

Inside the submenu the setting parameters concerning the Self-test relay (Latched/No- latched) are available.
Any relevant diagnostic alarm may be associated to a Self-test relay; minor fail alarms may be also associated to the same relay (K1...K6,...).[3]

Set \ MMI

Settings by means MMI can be enabled or disabled; the operation requires “Level 1” session with password .
The MMI tree is shown inside the 7.2 MMI Man Machine Interface section.

Set \ Profile selection

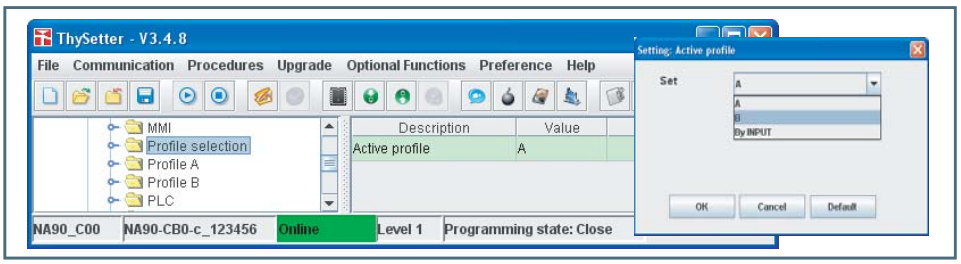
The active profile may be selected.[4]
- *A*: The Profile A settings are active,
- *B*: The Profile B settings are active,
- *By INPUT*: The Profile A or Profile B settings are active depending on the binary input state. If the input is in the rest state (OFF) the Profile A is active, if the input is in the operate state (ON) the Profile B is active.

Note 1 According to the Thybus active external modules (MID16, the concerning binary inputs are available

Note 2 According to the Thybus active external modules (MRI), the concerning output relays are available

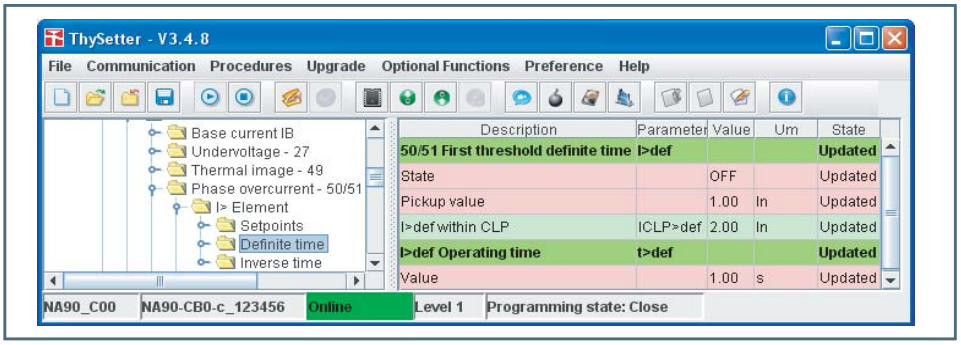
Note 3 The “Energized” logic and “No-latched” operating mode may be set for the self-test relay; other function must not be associated to the same relay.

Note 4 If the double setting is not used , the Profile A is the default configuration; the Profile B data is not required



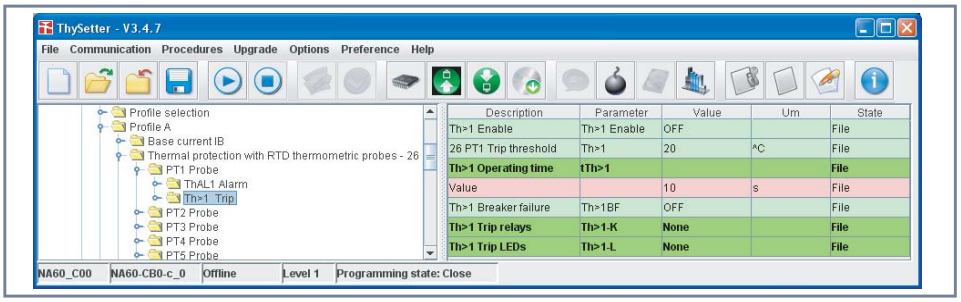
Set \ Profile A

Inside the submenu are sorted all parameters concerning the Profile A; a tree structure is provided.



Thermal protection with RTD thermometric probes - 26

Inside the submenu all the setting concerning the RTD thresholds can be read and/or changed.



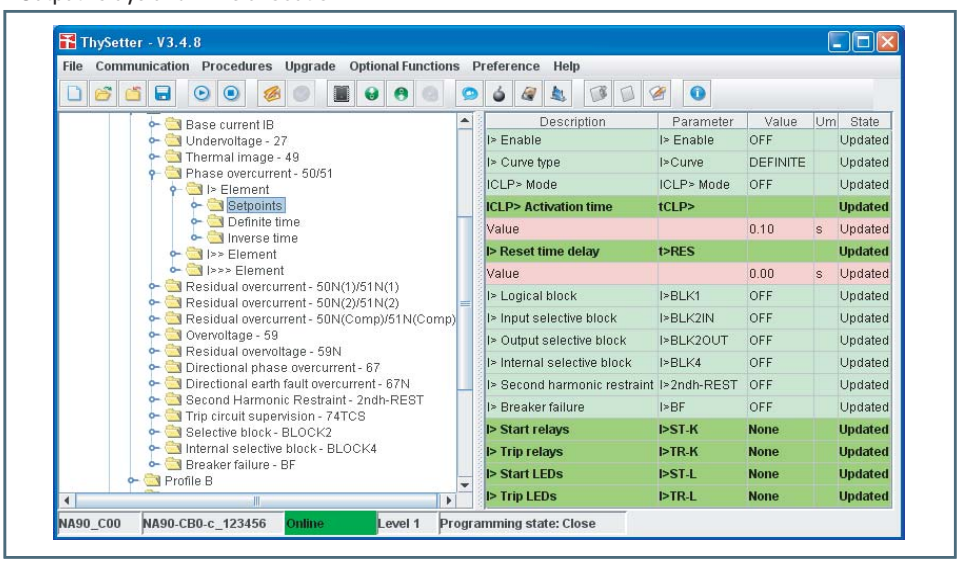
Undervoltage - 27

Inside the submenu all the setting can be read and/or changed according a 50/51 example-like procedure (see below).

Phase overcurrent - 50/51

Example of setting concerning the Profile A Phase overcurrent - 50/51 protective element.[1]
Inside the submenu all the setting concerning the three threshold can be read and/or changed:

- Threshold enable or disable, Curve type (Definite or inverse for first and second thresholds)
- CLP operating mode and CLP activation time
- Reset time delay adjustment
- Logical block (Block1) enable or disable, Selective block input and output (Block2) enable or disable
- Second harmonic restraint enable or disable, Breaker failure enable or disable
- Output relays and LEDs allocation.



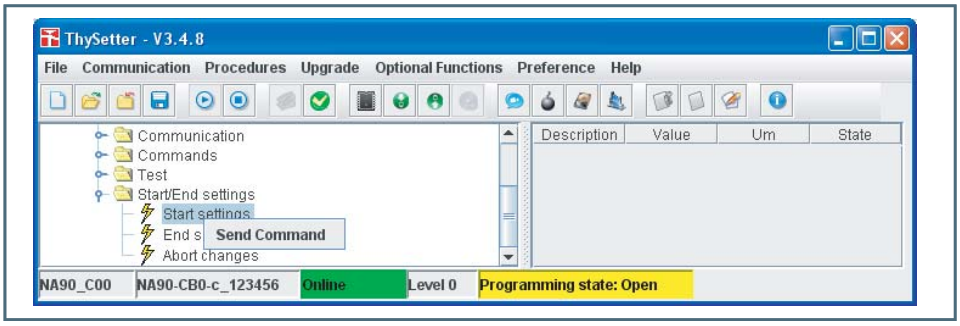
Note 1 If the double setting is not used , the Profile A is the default configuration; the Profile B data is not required

Example

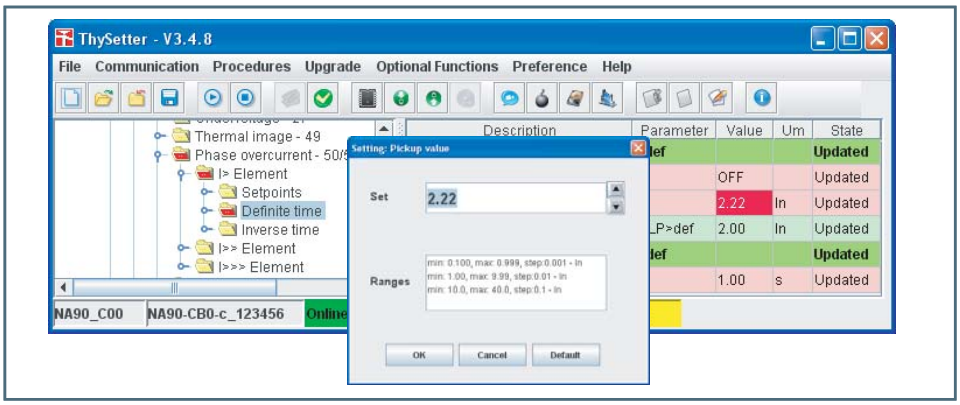
Example: setting of the first element pickup I> = 2.22 In with definite time curve, start on K1 relay and trip signalling on L2 LED; the following operating procedure must be performed:

• Open the setting session with *Start settings* command (menu or by means click on the icon).

The setting session state is shown inside a yellow background message (Programming state: Open).



• Carry out the changes (I>def threshold adjustment).



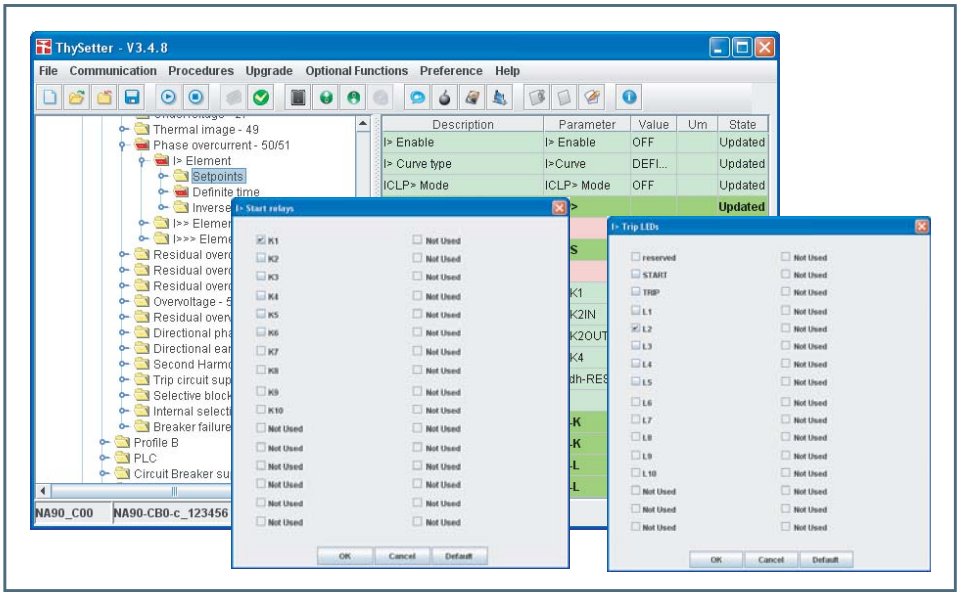
The change in progress is highlighted by a red field up to completion of the setting session.

WARNING

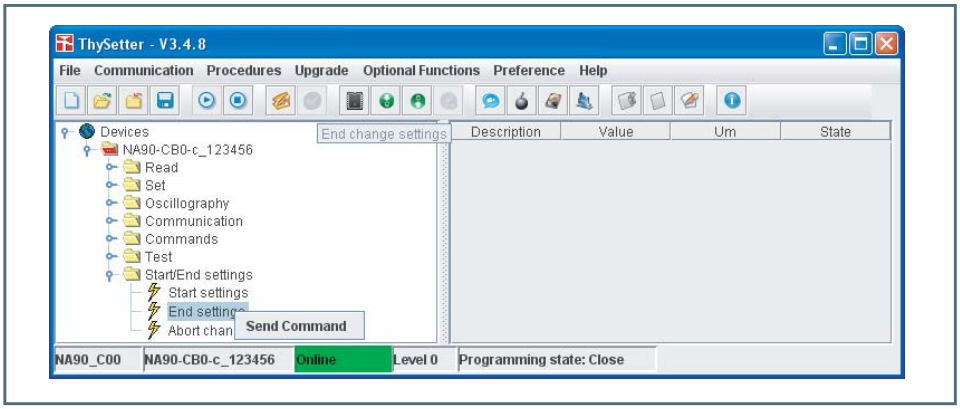
A threshols becomes active when:
- The enable parameter inside the Set\ ProfileA (or B)\xxx Element\Setpoints (e.g. I> Enable) is set (ON) AND
- The State parameter concerning a threshold, inside the Set\ ProfileA (or B)\xxx Element\Definite time (or Inverse time) is set (ON)

Changes are active after the "End settings" command.

• Carry out the changes no the output association (LED and output relays).



- Close the setting session with **End settings** command (menu or by means click on the icon); the setting session state is shown inside a gray background message (Programming state: Close).



Similarly the settings can be performed for all protective elements[1]:

- Thermal image - 49
- Residual overcurrent - 50N/51N
- Overvoltage - 59
- .....

Second harmonic restraint - 2ndh-REST

Inside the menu the threshold value, the reset time delay and the output relays and LED allocation can be read and/or changed.

Trip Circuit Supervision - 74TCS

Inside the menu the enable flag, the logic block enabling and the output relays and LED allocation can be read and/or changed.

Selective block - BLOCK2

Inside the menu the operating mode, the maximum input activation time, the output dropout times and the output relays and LED allocation can be read and/or changed.

Internal selective block - BLOCK4

Inside the menu the operating mode the output dropout times can be read and/or changed.

Breaker Failure - BF

Inside the menu the enable flag, the threshold values, the BF time delay, the logic block and the output relays and LED allocation can be read and/or changed.

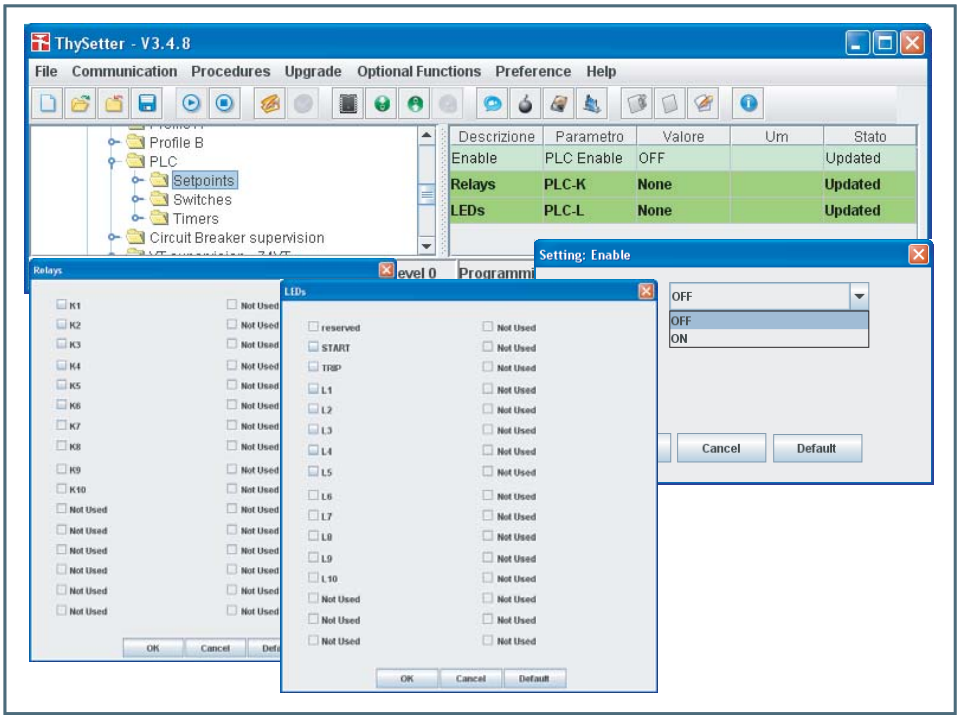
Set\Profile B

Same for Profile A.

Set\PLC

Setpoints

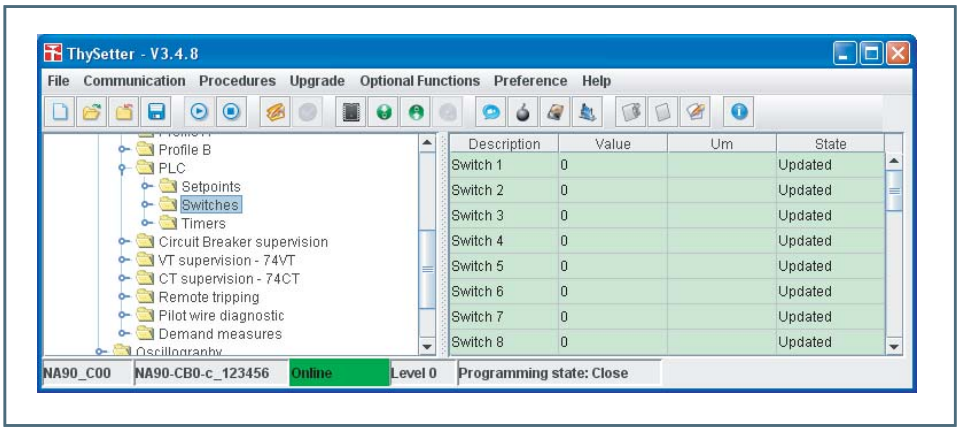
Inside the menu the enable setting and the I/O assignments may be changedzione degli ingressi e delle uscite (LED e relè) dedicate alla funzione PLC.



Note 1 Number and type of protective elements are different for any Pro-N devices

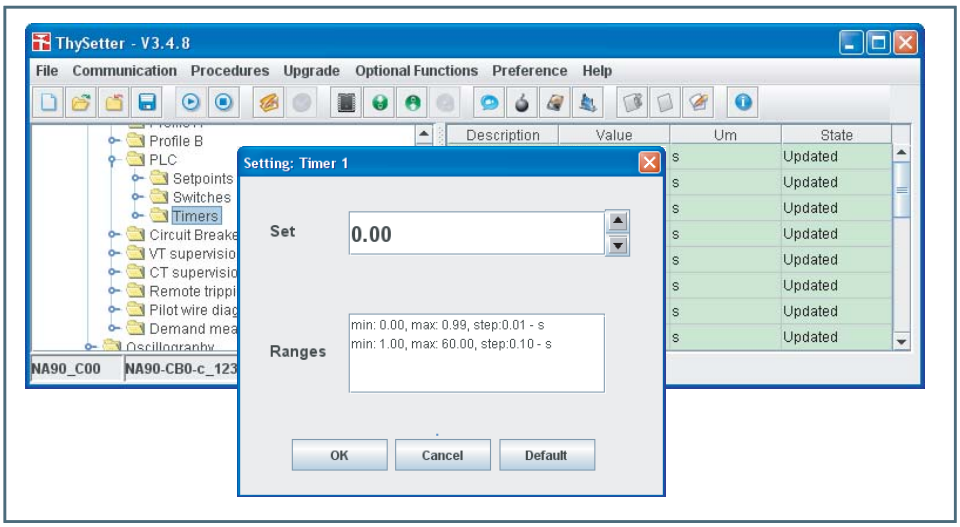
Switches

Inside the menu the state of switches may be read and/or changed.



Timers

Inside the menu the state of timers may be read and/or changed.

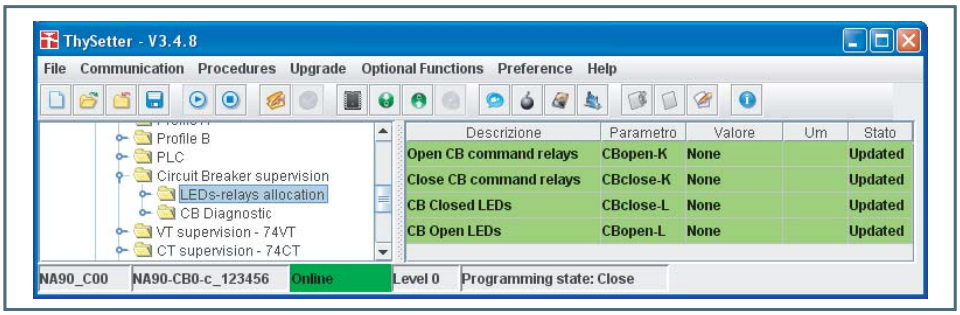


Set \ Circuit breaker supervision

LEDs Relay allocation

Inside the submenu are sorted all parameters concerning the LEDs and output relays:

- Open and Close CB command relays,
- Open and Close CB command LEDs.[1].



CB Diagnostic

Four diagnostic criteria are implemented.

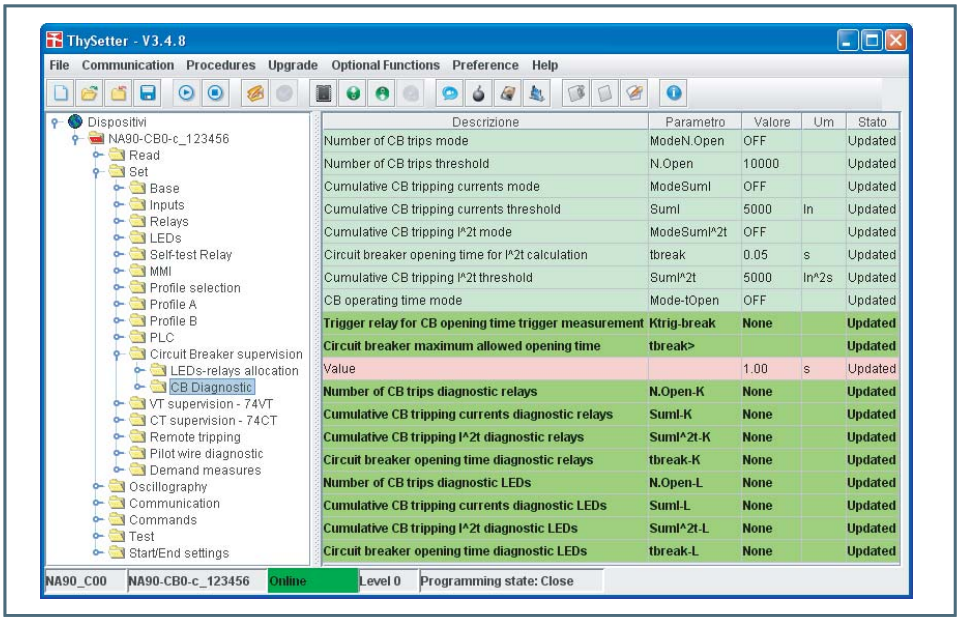
1) Number of trips. If the trip count value overcomes an user-defined threshold, an alarm is issued. The Number of trips procedure may be enabled (*ModeN.Open ON*) and the *N.Open* threshold may be set.
2) Summation of tripping current (*ModeSumI*). If the summation overcomes an user-defined threshold, an alarm is issued. The summation of tripping current procedure may be enabled (*ModeSumION*) and the *SumI* threshold may be set.
3) Summation of tripping energy (*ModeSumI^2t*). If the summation overcomes an user-defined threshold, an alarm is issued. The I2t or Joule integral is a measure of the thermal stress or thermal energy let through by the CB during fault current interruption. It is the integral of the square of the current over a given time and is expressed in ampere square seconds. The energy calculation is based on phase current measures acquired when the trip commands is issued and the CB opening time (user-programmable according the manufacturer data). The summation of tripping

Note 1 The acquisition of both 52a and 52b informations is essential

energy procedure may be enabled (*ModeSumI^2t ON*), the *tbreak* CB opening time and the *SumI^2t* threshold may be set.

4) CB operating time. If the delay elapsed from the trip command and the CB open state acquisition overcomes an user-defined threshold, an alarm is issued. The CB operating time procedure may be enabled (*Mode-tOpen ON*) and the *tbreak* threshold may be set inside the **Set\Circuit Breaker supervision\CB Diagnostic** submenu. The the delay elapsed from the trip command and the CB open state acquisition is calculated from trigger of a selectable relay (*Ktrig-break* parameter matched with K1...Kx.

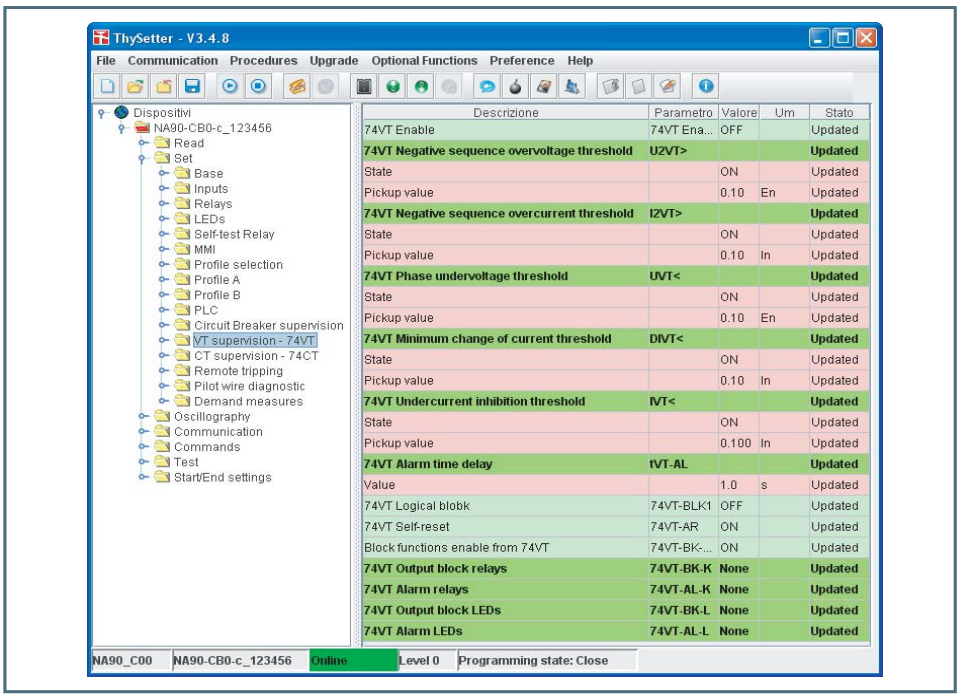
The four criteria can be singly or contemporaneously used; *N.Open-K*, *SumI-K*, *SumI^2t-K*, *tbreak-K* (output relays) and/or *N.Open-L*, *SumI-L*, *SumI^2t-L*, *tbreak-L* (LED) matching may be assigned to the alarm.



Set\VT supervision - 74VT

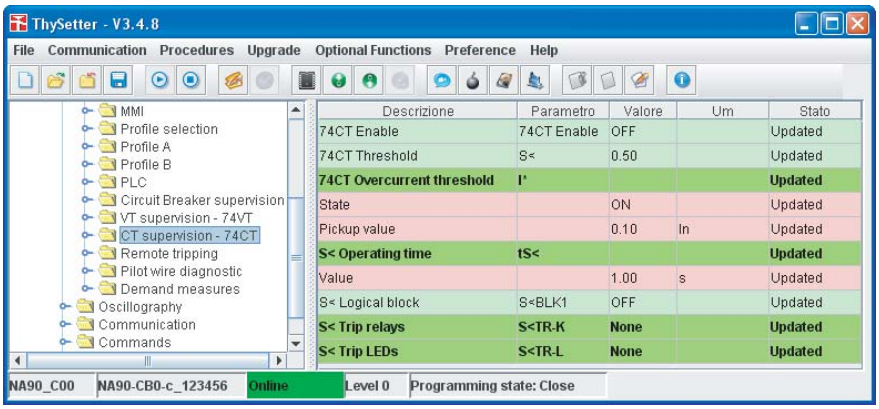
Inside the menu the threshold values, the logic block and the output relays and LED allocation can be read and/or changed:

- Negative sequence overvoltage threshold (U2VT>)
- Negative sequence overcurrent threshold (I2VT>)
- Phase undervoltage threshold (UVT<)
- Minimum change of current threshold (DIVT<)
- Undercurrent inhibition threshold (IVT<)
- Alarm time delay (tVT-AL)
- Logical block (74VT-BLK1)
- Self-reset (74VT-AR)
- Block function enable from 74VT (74VT-BK-EN)
- LED and relays



Set \ CT supervision - 74CT

Inside the menu the threshold values, the logic block and the output relays and LED allocation can be read and/or changed:
- 74CT threshold (S<)
- Overcurrent threshold (I*)
- Operating time (tS<)
- Logical block
- LED and relays



Set \ Remote tripping

Inside the menu the output relays and LEDs allocation are available.

Set \ Pilot wire diagnostic

Inside the submenu the period adjustment for input/output pilot wire pulses are available and the output relays and LED allocation can be read and/or changed.

Set \ Demand measures

Fixed demand period, rolling demand period and number of cycles for rolling on demand parameters are available.

Oscillography

Upon trigger of tripping/starting of any protective function or external command, the device records, in COMTRADE format:[1]
- Oscillography with instantaneous values,
- RMS value of fundamental components,
- Logic states (binary inputs and output relays.

Records are automatically created and stored in sequential order until the allocated RAM[2] memory if overfill; after which the oldest records are overwritten.

The following parameters must be set:
- Buffer alarm enable; the alarm output a warning so the user may download the RAM data and then erase it avoiding to lose oldest records.
- Pre-trigger and post trigger time intervals.
- Sampled measures.
- Analog channels allocation (1...12).
- Digital channels allocation (1...12).
- Trigger setup.

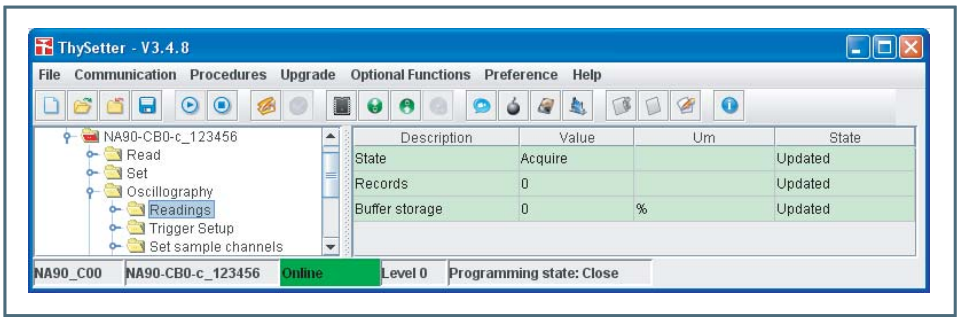
Note 1 The oscillographic recorder requires a licence; to purchase it please contact Thytronic.

Note 2 data are stored in RAM, them are lost when power supply goes OFF.

Readings

The following information are available:

- State; the operative state (*Fail* if diagnostic errors are detected, *Acquire* in normal operation, *Trigger* during the acquisition time following a trigger, etc...),
- Records stored,.
- Memory buffer use.

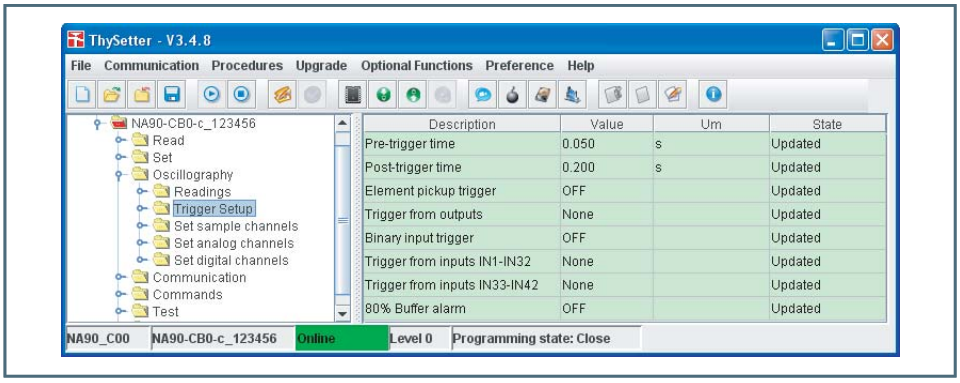


Trigger setup

Recording start when a binary input and/or an output relay switching takes place.
Settings:

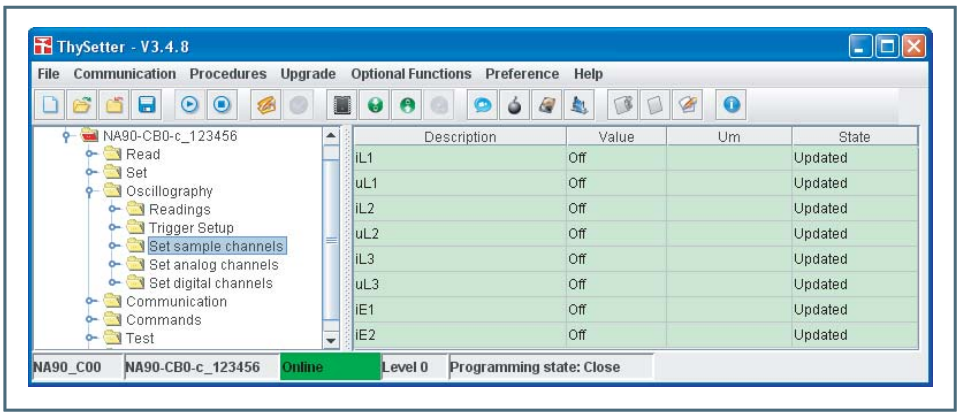
- Pre-trigger time
- Post-trigger time
- Trigger from outputs enabling (output relays)[2]
- Trigger from inputs enabling (binary inputs)[1]
- Alarm output enabling (80% buffer)

Depending on pre-trigger and post-trigger setting and quantity of measures, the maximum number of records is defined.



Set sampled channels

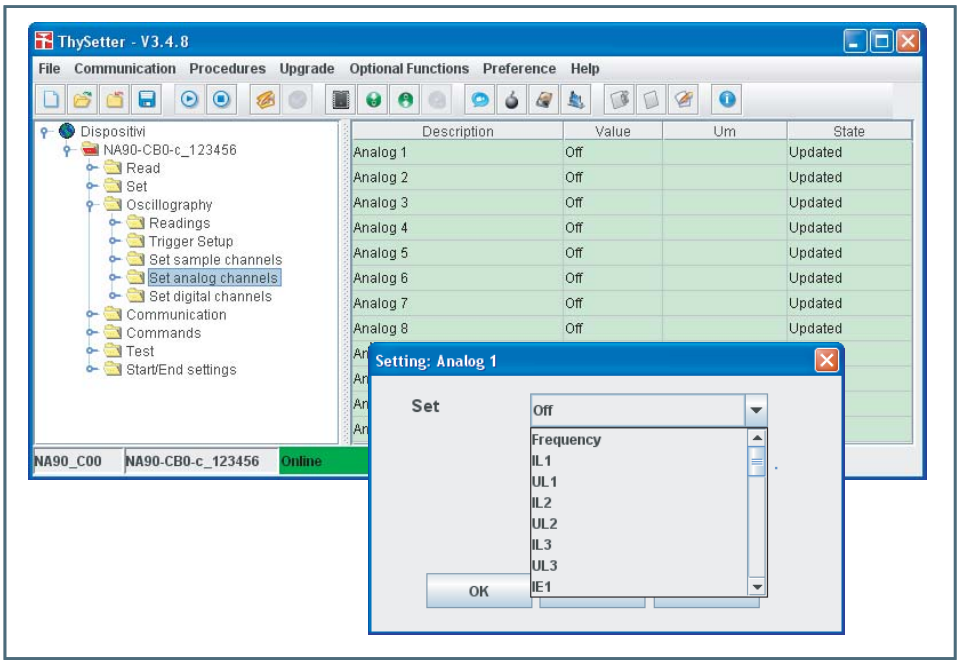
The following sampled measures can be recorded (24 samples/power cycle):



Note 1 According to the Thybus active external modules (MID16 and/or MRI), the concerning binary inputs and output relays are available.

Set analog channels

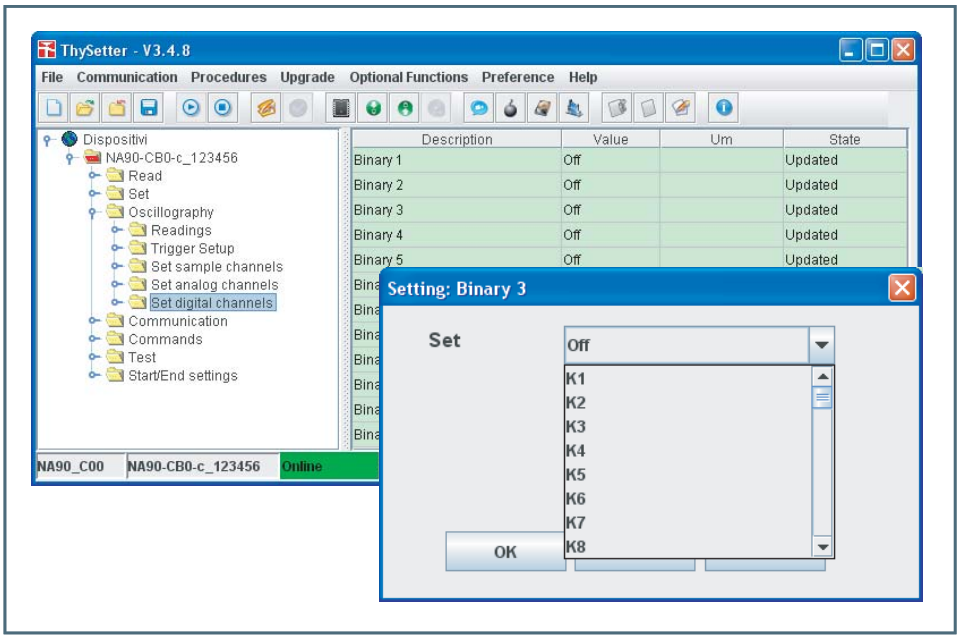
The following analog (RMS of the fundamental components) measures can be recorded within every 12 available channels.



Set digital channels

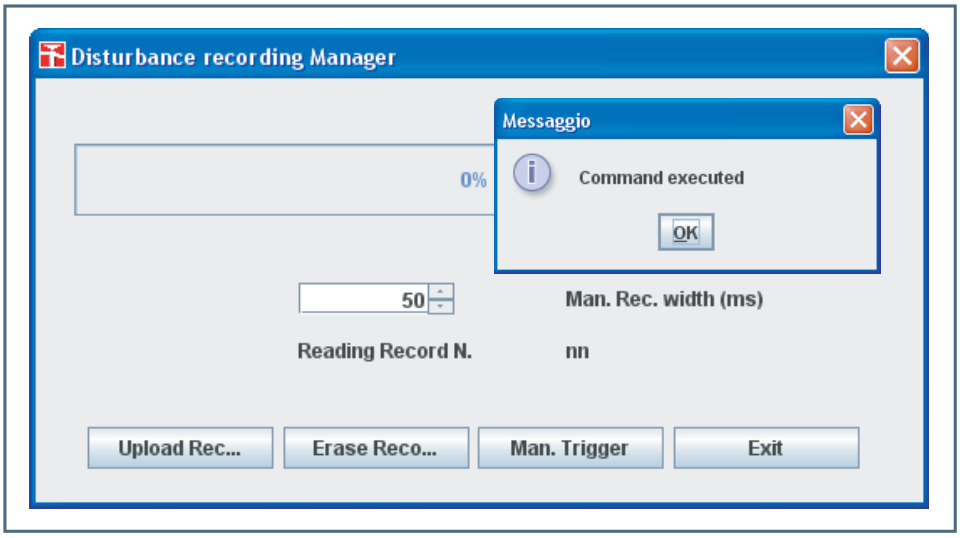
Every one of 12 digital channels may be assigned to a the following signals:

- Output relay state K1, K2,...K6...Kx
- Binary input state IN1, IN2,...INx.



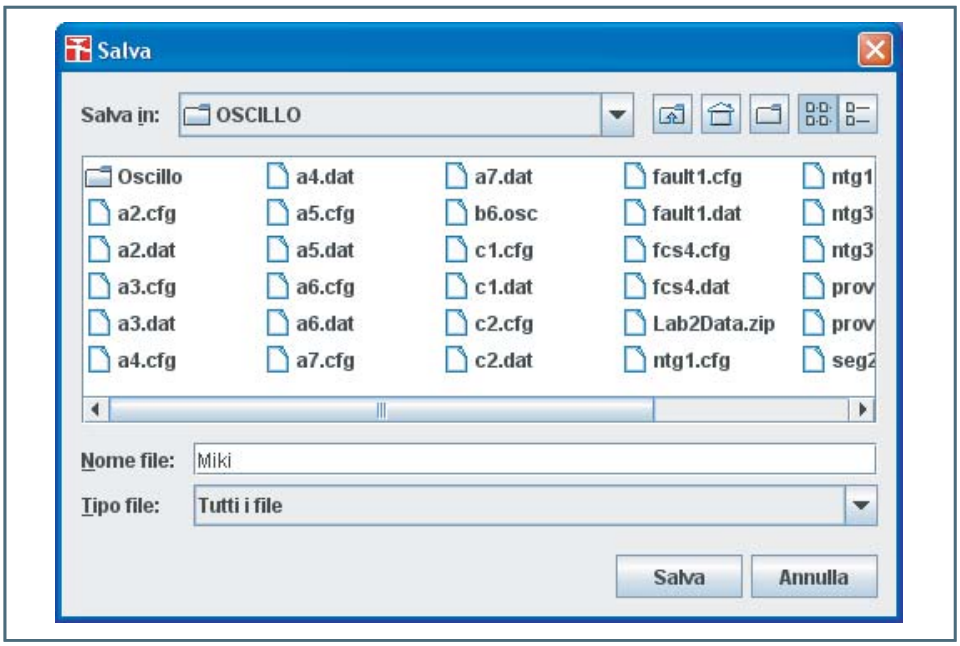
Manual activation

For diagnostic purposed may be useful to trigger manually the oscillographic recording.
After trigger setup, and setting of the post-trigger time (default 50 ms)[1] the manual trigger may be started by means the *Man. trigger* command inside the *Upload disturbance records* (**Optional functions->Disturbance** top down menu).



Record keeping

The records may be uploaded by means the "Upload Records" command inside the "Upload disturbance record" (**Options->Disturbance->Upload disturbance records** top down menu). The name of the record can be defined.[2]
The selected record (the last for default) or all recording can be acquired at the same time.
The single records are stored with the user-defined name; an automatic index is automatically added to point the recording order (e.g.: seq1.cfg, seq2.cfg...).



Note 1 The Man rec. width is the post trigger time when a manual trigger is issued, whereas the pre trigger time must be adjusted inside the Oscillography \ Set trigger menu

Nota 2 The .cfg extension is automatically added

Record visualization

The desired file may be visualized with a click on "File" button inside **Options->Disturbance->Upload disturbance visualization** top down menu.
The desired .cfg file may be selected; so the measures to display may be selected. The visualization starts with a click on "OK".
Several tools are available (markers, zoom, colors, ecc..).
Snapshots can be stored in JPEG format.

Communication

Several communication protocol are provided.

RS485

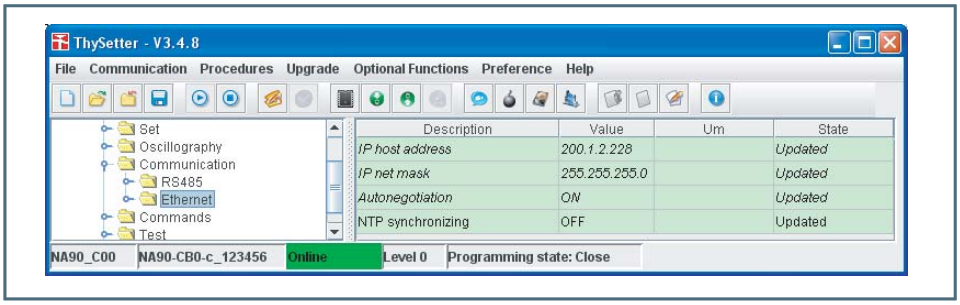
One protocol may be select:[1]
- *MODBUS* protocol,
- *IEC60870-5-103* protocol.

The *Address* parameter allows identification of a single device inside a RS485 field bus.
The *Baud rate* parameter must be set according the field bus device characteristics.

Ethernet

Following parameters are available:

- *IP host address* — IP address of the NA60 device
- *IP net mask* — subnet address
- *Autonegotiation* — procedure by which two connected devices choose common transmission parameters.



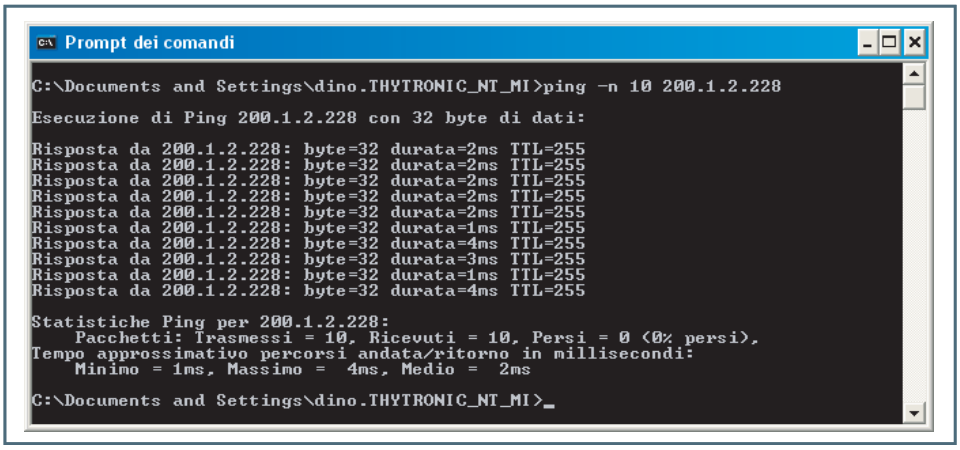
Note 1 To be select on order

If the *Autonegotiation* parameter is set to *ON* the connected devices first share their capabilities as for these parameters and then choose the fastest transmission mode they both support.
If the *NTP synchronization* parameter is set to *ON* and a primary time servers is available, all the IED connected to the same network can be synchronized with a common clock.

IP test

A very simple check over the IP address may be performed with following PC commands:
- Open a DOS session: "Start -> Programs -> Prompt MS-Dos";
- Type "ping -n 10 200.1.1.225" -> Enter

If the response is "Reply from...", the communication is active; vice versa, if the response is "Request timed out" the Ethernet setting must be corrected.

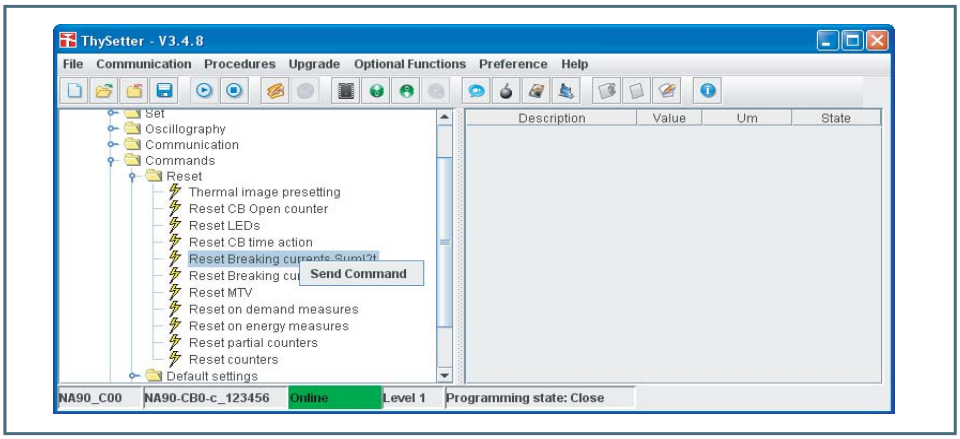


Type "exit" to close the MS-Dos section.

Commands

Reset

Following commands are available:[1]
- Thermal image presetting,
- Reset CB Open counter (CB diagnostic), Reset LEDs,
- Reset CB time action (CB diagnostic),
- Reset Breaking current SumI2t (CB diagnostic), Reset Breaking current SumIt (CB diagnostic),
- Reset on demand measures,
- Reset partial counters, Reset counters, (Reset all counters): available with Level 1 password.

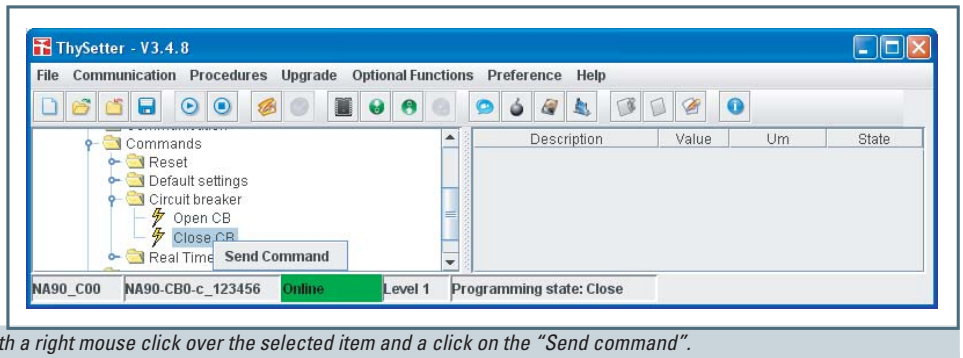


Default setting

The factory settings (default) can be loaded: available with Level 1 password only.

Circuit breaker

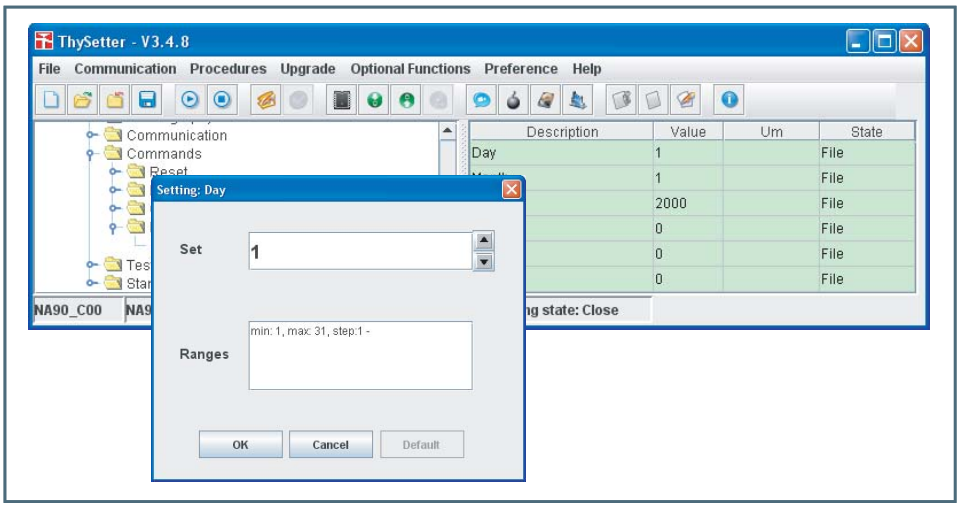
Open or Close command may be send: available with Level 1 password only.



Note 1 The command may be send with a right mouse click over the selected item and a click on the "Send command". Unlike all the setting, the commands may be sent without the "Start setting" and "End setting" sequence.

Real Time Clock

Timing may be adjusted.



Firmware upgrade

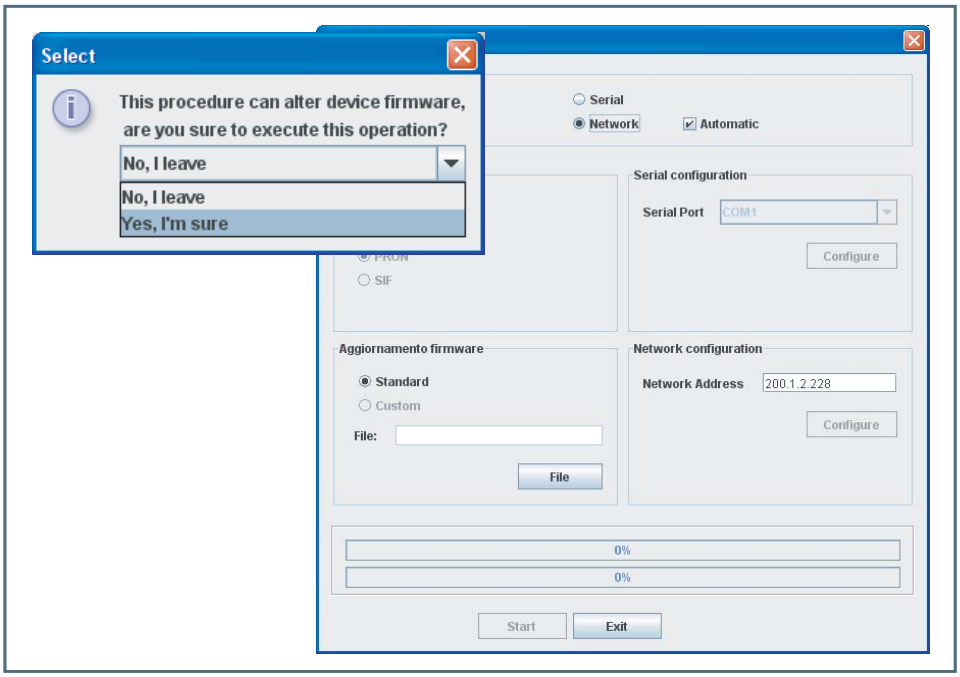
The command allows upgrading the relay firmware.

WARNING

The procedure must only be performed in cases of effective need, in the face of exigencies agreed with manufacturer.
Operations without permission can will cause severe demages over functionalites!

The operating procedure is scheduled in the following steps:

- Connect device to the personal computer by means of a Thytronic L10041 RS232 cable (local serial port) , or standard cable for a network connection (Ethernet)
- Start ThySetter
- In Offline state, issue the *Device firmware* command available inside the **Upgrade** menu or with a click on the icon
- Confirm execution (Yes I'm sure).



- Select the serial port or Network; in any case, after the Start activation, an automatic open command is executed with usual suggestion of saving the file concerning the current configuration.
- Status bar progress is displayed by status bar.[1] If power goes OFF within this stage all data concerning the oscillographic recorder are lost while the older firmware goes on. To upgrade firmware a restart of procedure must be activated.

After completion the firmware replacement take place; within this stage, where all function of the relays are suspended, is showed by temporary stop of the clock.[2]If power goes OFF within this stage

Nota 1 The power supply breakdown, while this stage is in progress, causes loss of all oscillographic records, while away the device proceeds with a right operation (the firmware previously loaded is not corrupted)

Nota 2 The power supply breakdown, while this stage is in progress, causes loss of all oscillographic records and the the firmware previously loaded is corrupted; the relay must be revamped

all data concerning the oscillographic recorder and the firmware are lost; the relay goes out of order and a failed download procedure must be activated.
The completion is showed by the "`BOOTLOADING PROGRAM`" message.
• Click the Exit button; the ON led shows a positive end of sequence.
If the data base of the up-to-date release is not compatible with the former, the default data must be send to the device.[1]
Typically the data base must be restored whit significant upgrades.
Following operations must be performed:
• Switch to Level 1 session,
Send the *Set default setting* command (**Command** menu)

Download failed

If the procedure has a negative outcome (e.g. interruption to the communication process or the auxiliary power supply....), a reset procedure must be performed according to the following sequence:
• Connect device to the personal computer by means of a Thytronic L10041 RS232 cable (local serial port); with network connection (Ethernet), the procedure is not possible.
• Send "Device firmware" command within **Upgrade** menu; a validation command is required to avoid wrong operation,
• Set the port if different from default setting (COM1),
• Select the *Custom* mode,
• Set the file .bin,
• Start upgrade.

Data base restore

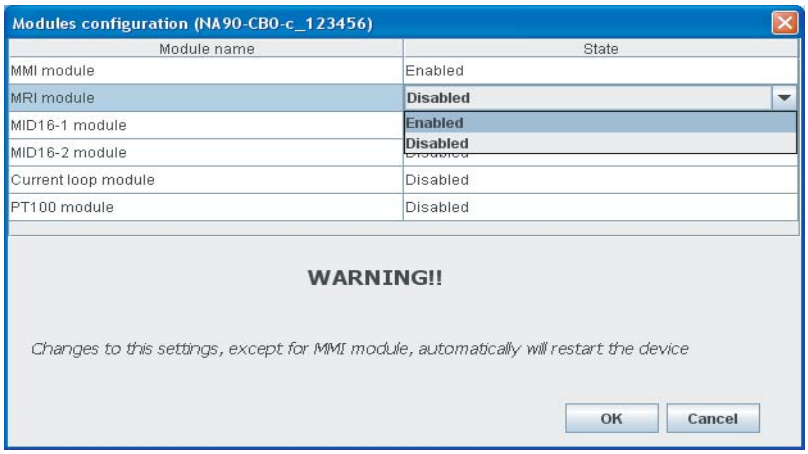
If the data base of the up-to-date release is not compatible with the former, the default data must be send to the device.[2] Typically the data base must be restored whit significant upgrades.
Following operations must be performed:
• Switch to Level 1 session,
• Send the *Set default setting* command (**Command** menu).

WARNING

With the **Set default setting command** the factory settings are restored; all user- defined adjustments are cleared.
Be carefully to enter the correct parameter!

Expansion modules

The Thybus modules may be set inside the Procedure menu (or by means a click on the icon).
After installation, the modules must be enabled (working with level 1 session level).
Following up any module configuration an automatic reset is issued and the I/O devices are included inside the device menu. [3] When two MID16 modules are enabled, the hardware address must be set; the dip-switch layout is showed inside the INSTALLATION section.



Nota 1 Anomaly is pointed out by message and LED flashing.

Nota 2 Anomaly is pointed out by message and LED flashing.

Note 3 Binary inputs and output names (ThySetter):

Binary inputs for all devices except for NA30 and NA70:	*IN1, IN2 on board*
	IN3...IN10 with MRI module
	IN11...IN26 with one MID16 module
	IN27...IN42 with two MID16 modules
Binary inputs for NA30 and NA70 devices	*IN1...IN5 on board*
	IN6...IN13 with MRI module
	IN14...IN29 with one MID16 module
	IN30...IN45 with two MID16 modules
Output relays	*K1...K6 on board*
	K7...K10 with MRI module
LEDs:	*ON, START, TRIP, L1...L5 on board*
	L6...L10 with MRI module

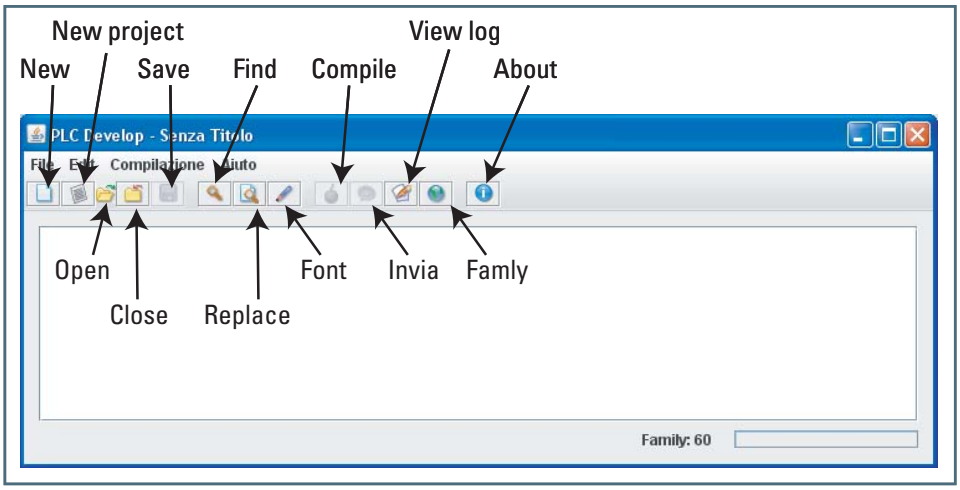
PLC (Programmable Logic Controller)

A little example stands for a preliminary example of a programmable user defined logic embedded inside ThySetter and Pro_N protective devices.[1]

Following topics are shown:
- The integrated development environment (IDE)
- The IL compiler[2] (Instruction List).

Development environment

The IL programming language for the PLC device may be carried out, according to the IEC61131-3 standard, by means of any editor or the ThysSetter IDE, while the compilation and sending operations must be performed by means of ThySetter.
The development environment may be started inside the Option -> PLC -> Develop menu, or by means of a click on the icon.



An Integrated Development Environment (IDE) is provided.
An existing file may be open or a new file may be created; inside the New Project menu (icon) some examples are available to familiarize with the matter.

Some buttons are available inside the upper desktop:
- "File save": the key become active when any change is performed on the file
- "File": a PLC program file may be loaded (icon)
- "Send": the selected file may be send to device; the key become active when only for good files when device is online (icon)
- "View SRecord": the object file may be shown when the compilation is fulfilled
- "Compile": start compilation
- "Compila": the key starts compilation
- "View Logs": the key shown the log file following the compilation
- "Family": the key allows setting of the device code; this selection is operated automatically whe the cennected device is Online
- "Exit": the command closes the PLC IDE.

Compilation and sending program

Following operation must be performed:
- Open communication
- Open the PLC IDE
- Load the program file
- Compile
- Send the file (S-record) to device

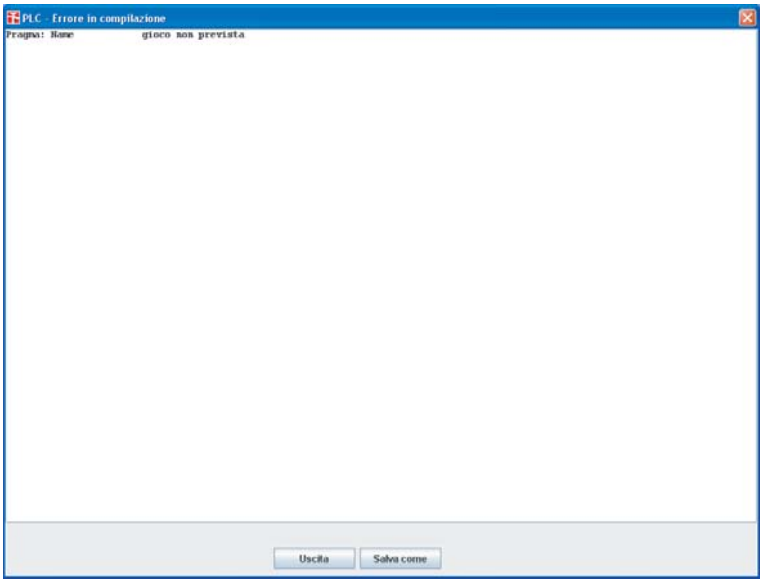
If the pre-compiled file is available the ollowing operation must be performed:
- Open communication
- Select option "Procedure->PLC->Send program"; Thysetter will send the file only if the compatibility with device is verified.

Note 1 For the PLC function a licence is required; call Thytronic for purchasing.

Note2 With ThySetter V3.4.3 and IEC 61131-3 V1.2.7 compiler releases, the IL language is implemented (Instruction List); other languages, according to standard IEC 61131 (ST (Structured Text)), LD (Ladder Diagram), FBD (Function Block Diagram), SFC (Sequential Functional Chart), will be available in the next

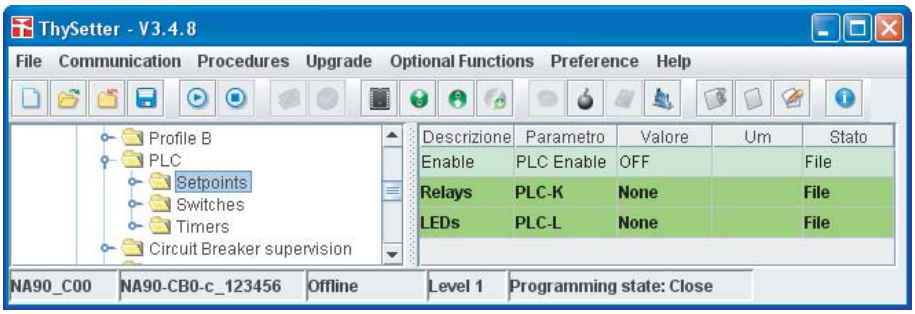
Error management

If any error is detected, (both within the compilation and sending program), an express message is shown.



Example

For training aid a simple example is shown; the "gioco.il" is a PLC program where the LED START, TRIP, 1, 2, 3, 4, 5 and K1 relay are driven; the full listing is placed in the end of this section.[1]
The I/O circuit by the PLC function (LED START, TRIP, 1, 2, 3, 4, 5 and the K1 relay), must be enabled inside the **Set \ PLC \ Setpoints** menu.



IL IEC61131-3 Compiler

The embedded PLC compiler is compliance to IEC61131-3 standard; presently the "IL (instruction list)" is implemented.
Typical format of a generic program:

- pragma definition
- Function (FUN) definition
- Function (FUB) definition
- Program (PROGRAM) definition
- Configuration (CONFIGURATION) definition

pragma

The beginning of program holds some pragma, (compliler directives):

- {Include "..."} : file including in IL code
- {Name ..} : program name
- {Version xx.yy} : program release (exadecimal)
- {Date dd/mm/yyyy hh:mm} : program compilation date
- {Preemptive} : put the PLC in preemptive mode
- {Watchdog mm} : watchdog time in ms, 0: disabled (default)
- {DeviceCode xx} : device identifier
- {Options -xx -yy ...} : compilation options

Following pragma are included inside the example:

```
{Preemptive     }
{Name      gioco}
{Watchdog  1000}
```

Note 1 The example have educational purpose only.

```
{Device        0}
{Options    -NMI}
```

with meaning:

- The PLC scheduler is placed in “preemptive” mode that is an high priority task can stop a lower priority or background task[1]
- The program name is “gioco”
- The watchdog interval is 1000 ms
- The “0” code (universale) is assigned to device

Function (FUN)

Some functions may be included (none in the example).

Function Block (FUB)

Following function block are defined:

- “SetRele”: allows to switch ON/OFF the selected relay, this FUB is a FUB SetIO support
- “SetIO”: allows to switch ON/OFF the selected IO.

Program (PROGRAM)

The following programs are defined:[2]

- “Pgm1”: a range of IO is managed; the state is toggled when the function is called, in circular mode
- “Pgm2”: the watchdog refresh is performed.

CONFIGURATION

The following specifications are defined:[1]

- Global variables
- Configuration resources, task and program-task association.

Note 1 up to 12 task may be defined

Note 2 Complete informations may be available on the IEC61131-3 standard

Example

The following operations are performed:

- the cyclic task T1 that powers the LED 1, 2, 3 with 1000 ms cycle is defined
- the cyclic task T2 that powers the LED 4, 5 with 500 ms cycle is defined
- the cyclic task T3 that powers the LED START, TRIP with 250 ms cycle is defined
- the cyclic task T4 that toggles the K1 relay with 1000 ms cycle is defined
- the background program that operates the watchdog refresh is defined

Listing

```
{Preemptive     }
{Name      gioco}
{Watchdog   1000}
{Device        0}
{Options    -NIM}

(*************************************************************************)
(* FUB: SetRele   (Imposta lo stato dei rele')                           *)
(*************************************************************************)

FUNCTION_BLOCK SetRele
            VAR_INPUT
                  rele  : BYTE; (* Rele  da attivare*)
                  state : BOOL; (* stato del rele - TRUE: aperto, false chiuso *)
            END_VAR

            VAR_EXTERNAL
                  RELE1 : BOOL;
                  RELE2 : BOOL;
                  RELE3 : BOOL;
                  RELE4 : BOOL;
                  RELE5 : BOOL;
                  RELE6 : BOOL;
            END_VAR

                  (* Verifica quale rele' gestire *)

                  LD    rele
                  EQ    BYTE#1
                  JMPC  ON_RELE1

                  LD    rele
                  EQ    BYTE#2
                  JMPC  ON_RELE2

                  LD    rele
                  EQ    BYTE#3
                  JMPC  ON_RELE3

                  LD    rele
                  EQ    BYTE#4
                  JMPC  ON_RELE4

                  LD    rele
                  EQ    BYTE#5
                  JMPC  ON_RELE5

                  LD    rele
                  EQ    BYTE#6
                  JMPC  ON_RELE6

                  JMP   END

ON_RELE1:   LD    state
                  ST    RELE1
                  JMP   END

ON_RELE2:   LD    state
                  ST    RELE2
                  JMP   END

ON_RELE3:   LD    state
                  ST    RELE3
                  JMP   END

ON_RELE4:   LD    state
                  ST    RELE4
```

```
                    JMP   END
ON_RELE5:   LD      state
                    ST    RELE5
                    JMP   END

ON_RELE6:   LD      state
                    ST    RELE6

END:                RET
END_FUNCTION_BLOCK

(*************************************************************************)
(* FUB: SetIO (Imposta lo stato del led)                                 *)
(*************************************************************************)

FUNCTION_BLOCK SetIO
            VAR_INPUT
                  element : BYTE; (* Led da accendere *)
                  state    : BOOL; (* stato del led - TRUE: acceso, false
spento *)
                  isLed   : BOOL; (* Indica se l'elemento e' un led *)
            END_VAR

            VAR_EXTERNAL
                  START : BOOL;
                  TRIP  : BOOL;
                  LED1  : BOOL;
                  LED2  : BOOL;
                  LED3  : BOOL;
                  LED4  : BOOL;
                  LED5  : BOOL;
            END_VAR

            VAR
                  rele : SetRele;
            END_VAR

                  (* Verifica se deve settare RELE *)

                  LD    isLed
                  EQ    FALSE
                  JMPC  GST_RELE

                  (* Verifica quale led settare *)

                  LD    element
                  EQ    BYTE#1
                  JMPC  ON_START

                  LD    element
                  EQ    BYTE#2
                  JMPC  ON_TRIP

                  LD    element
                  EQ    BYTE#3
                  JMPC  ON_LED1

                  LD    element
                  EQ    BYTE#4
                  JMPC  ON_LED2

                  LD    element
                  EQ    BYTE#5
                  JMPC  ON_LED3

                  LD    element
                  EQ    BYTE#6
                  JMPC  ON_LED4

                  LD    element
                  EQ    BYTE#7
                  JMPC  ON_LED5

                  JMP   END

ON_START:   LD      state
                    ST    START
                    JMP   END
```

```
ON_TRIP:    LD    state
                  ST    TRIP
                  JMP   END

ON_LED1:    LD    state
                  ST    LED1
                  JMP   END

ON_LED2:    LD    state
                  ST    LED2
                  JMP   END

ON_LED3:    LD    state
                  ST    LED3
                  JMP   END

ON_LED4:    LD    state
                  ST    LED4
                  JMP   END

ON_LED5:    LD    state
                  ST    LED5
                  JMP   END

GST_RELE:   CAL         rele(
                              rele := element,
                              state := state
                        )

END:              RET
END_FUNCTION_BLOCK

(*************************************************************************)
(* Program Pgm1                                                          *)
(*************************************************************************)

PROGRAM Pgm1
            VAR_INPUT
                  minEle : BYTE;  (* IO piu' basso il cui stato deve essere
cambiato *)
                  numEle : BYTE;  (* numero elementi da gestire *)
                  valEle : BYTE;  (* elemento a cui cambiare stato *)
                  isLed  : BOOL;  (* indica se l'elemento e' un led (TRUE) o
un rele' (FALSE) *)
            END_VAR

            VAR_OUTPUT
                  next : BYTE;    (* prossimo led da accendere *)
            END_VAR

            VAR
                  leds  : SetIO;  (* FUB utilita' per set stato led *)
                  count : BYTE;
            END_VAR

                  (* Per prima cosa spegne tutti gli elementi compresi nel
range *)

                  LD    minEle
                  ST    count

LOOP_OFF:   CAL   leds(
                              element := count,
                              state := FALSE,
                              isLed := isLed
                        )

                  LD    count
                  ADD   BYTE#1
                  ST    count
                  LE    numEle
                  JMPC  LOOP_OFF

                  (* Poi verifica che il valore sia nel range *)

                  LD    valEle
                  LT    minEle
```

```
                    JMPC  RESET

                    LD    valEle
                    GE    numEle
                    JMPC  RESET

                    (* Incrementa il prossimo elemento da accendere *)

                    LD    valEle
                    ADD   BYTE#1
                    ST    valEle
                    JMP   TURN_ON

RESET:              (* Reset al minimo *)

                    LD    minEle
                    ST    valEle

TURN_ON:     (* Accensione led indicato *)

                    LD    valEle
                    ST    next (* salva il valore per il prossimo giro *)

                    CAL   leds(
                                element := valEle,
                                state := TRUE,
                                isLed := isLed
                          )
END:                RET
END_PROGRAM

(*************************************************************************
****)
(*                              Program                              Pgm2
   *)
(*************************************************************************
****)

PROGRAM Pgm2
            VAR_EXTERNAL
                  M_FLAG_WatchdogTrg : BOOL;
            END_VAR

            VAR
                  pippo : BYTE;
            END_VAR

                  (* Gestione watchdog  *)

                  LD    TRUE
                  ST    M_FLAG_WatchdogTrg
                  RET
END_PROGRAM

(*************************************************************************
****)
(*                            Configuration                          Cfg1
   *)
(*************************************************************************
****)

CONFIGURATION Cfg1
            VAR_GLOBAL
                  (* Variabili globali per la gestione dei led *)

                  ValLed1   : BYTE := BYTE#3;  (* led di partenza del primo
gruppo *)
                  ValLed2   : BYTE := BYTE#6;  (* led di partenza del secondo
gruppo *)
                  ValLed3   : BYTE := BYTE#1;  (* led di partenza del terzo
gruppo *)

                  (* Varibili globali per la gestione dei rele' *)

                  ValRele1  : BYTE := BYTE#1;  (* rele' di partenza del primo
gruppo *)

                  (* Varibili globali per la definizione degli I/O *)
```

```
            START AT %QX1.1 : BOOL;
            TRIP  AT %QX1.2 : BOOL;
            LED1  AT %QX1.3 : BOOL;
            LED2  AT %QX1.4 : BOOL;
            LED3  AT %QX1.5 : BOOL;
            LED4  AT %QX1.6 : BOOL;
            LED5  AT %QX1.7 : BOOL;

            RELE1 AT %QX0.0 : BOOL;
            RELE2 AT %QX0.1 : BOOL;
            RELE3 AT %QX0.2 : BOOL;
            RELE4 AT %QX0.3 : BOOL;
            RELE5 AT %QX0.4 : BOOL;
            RELE6 AT %QX0.5 : BOOL;

            (* FLAG MEMORY *)

            M_FLAG_WatchdogTrg AT %MX0.4 : BOOL;

      END_VAR

      RESOURCE Res1 ON Cpu01
            (* Task per l'accensione dei led *)

            TASK T1  (INTERVAL := t#1000ms,  PRIORITY := 1);
            TASK T2  (INTERVAL := t#500ms,   PRIORITY := 2);
            TASK T3  (INTERVAL := t#250ms,   PRIORITY := 3);

            (* Task per la movimentazione dei rele' *)

            TASK T4  (INTERVAL := t#1000ms,  PRIORITY := 4);

            (* Programmi per i led *)

            PROGRAM L1 WITH T1   : Pgm1(minEle := BYTE#3, numEle :=
BYTE#5, valEle := ValLed1 , isLed := TRUE, next => ValLed1);
            PROGRAM L2 WITH T2   : Pgm1(minEle := BYTE#6, numEle :=
BYTE#7, valEle := ValLed2,  isLed := TRUE, next => ValLed2);
            PROGRAM L3 WITH T3   : Pgm1(minEle := BYTE#1, numEle :=
BYTE#2, valEle := ValLed3,  isLed := TRUE, next => ValLed3);

            (* Programma per il rele' *)

            PROGRAM R1 WITH T4 : Pgm1(minEle := BYTE#1, numEle :=
BYTE#1, valEle := ValRele1, isLed := FALSE, next => ValRele1);

            (* Gestione watchdog *)

            PROGRAM Bgk1 : Pgm2;

      END_RESOURCE
END_CONFIGURATION
```