

MICROPROCESSOR
THREE PHASE VOLTAGE PROTECTION RELAY
WITH
ISLANDING DETECTION
TYPE
"MC2-30V"

OPERATION MANUAL



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1. General Utilization and Commissioning Directions

Always make reference to the specific description of the product and to the Manufacturer's instruction. Carefully observe the following warnings.

1.1 - Storage and Transportation

Must comply with the environmental conditions stated in the product's specification or by the applicable IEC standards.

1.2 - Installation

Must be properly made and in compliance with the operational ambient conditions stated by the Manufacturer.

1.3 - Electrical Connection

Must be made strictly according to the wiring diagram supplied with the Product, to its electrical characteristics and in compliance with the applicable standards particularly with reference to human safety.

1.4 - Measuring Inputs and Power Supply

Carefully check that the value of input quantities and power supply voltage are proper and within the permissible variation limits.

1.5 - Outputs Loading

Must be compatible with their declared performance.

1.6 - Protection Earthing

When earthing is required, carefully check its effectiveness.

1.7 - Setting and Calibration

Carefully check the proper setting of the different functions according to the configuration of the protected system, the safety regulations and the co-ordination with other equipment.

1.8 - Safety Protection

Carefully check that all safety means are correctly mounted, apply proper seals where required and periodically check their integrity.

1.9 - Handling

Notwithstanding the highest practicable protection means used in designing electronic circuits, the electronic components and semiconductor devices mounted on the modules can be seriously damaged by electrostatic voltage discharge which can be experienced when handling the modules.

The damage caused by electrostatic discharge may not be immediately apparent but the design reliability and the long life of the product will have been reduced. The electronic circuits are completely safe from electrostatic discharge (8 KV IEC 255.22.2) when housed in their case; withdrawing the modules without proper cautions expose them to the risk of damage.

1.10 - Maintenance

Make reference to the instruction manual of the Manufacturer; maintenance must be carried-out by specially trained people and in strict conformity with the safety regulations.

1.11 - Waste Disposal of Electrical & Electronic Equipment

(Applicable throughout the European Union and other European countries with separate collection program). This product should not be treated as household waste when you wish dispose of it. Instead, it should be handed over to an applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequence to the environment and human health, which could otherwise be caused by inappropriate disposal of this product. The recycling of materials will help to conserve natural resource.

1.12 - Fault Detection and Repair

Internal calibrations and components should not be altered or replaced.
For repair please ask the Manufacturer or its authorized Dealers.

Misapplication of the above warnings and instruction relieves the Manufacturer of any liability.

2. General

The main features of the relays are:

User friendly front face with hi-resolution graphic display (240x128), 10 signal Leds, 6 push-buttons (configurable) and four push-button for complete local management, USB for local communication.

Eight user programmable Output Relays.

Eight opto-isolated, self powered Digital Inputs.

RS485 communication port (independent from the USB port on front panel)

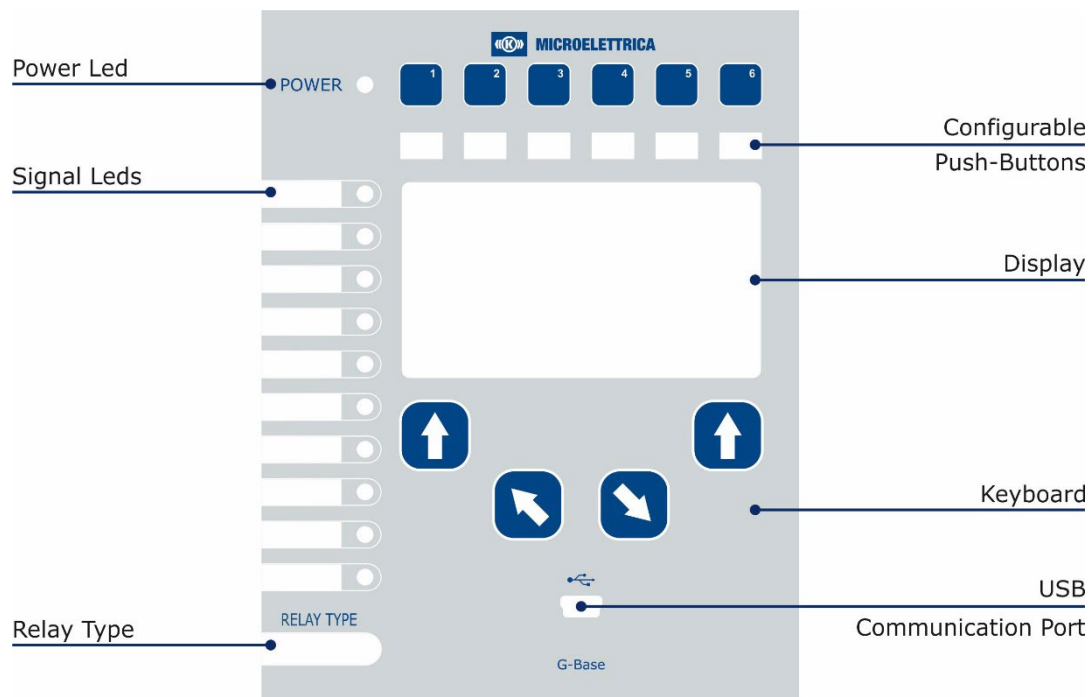
2.1 - Power Supply

The relay can be fitted with two different types of **power supply**:

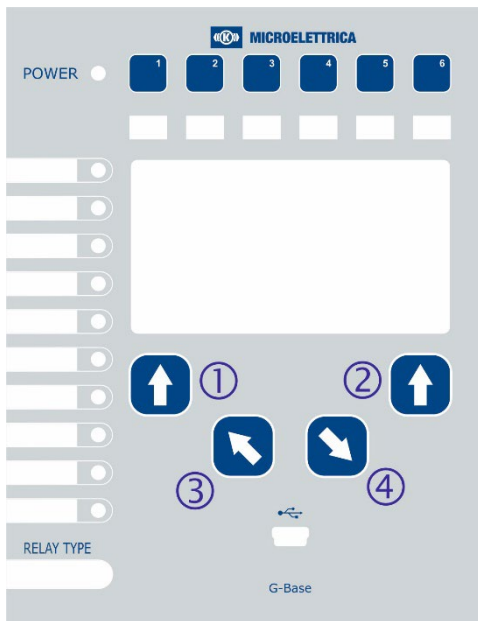
Type 1	24V(-20%) / 110V(+15%) a.c.	24V(-20%) / 125V(+20%) d.c.
Type 2	80V(-20%) / 220V(+15%) a.c.	90V(-20%) / 250V(+20%) d.c.

Before energizing the unit check that supply voltage is within the allowed limits.

3. Front Panel



4. Keyboard and Display



1

Push-buttons Programmable

6

Navigation menu

Navigation menu

By these buttons the options showed in correspondence on the display are selected.

Increase

Increase

These buttons are used to scroll the items of the different menus (Local Control, Measurements, Energy metering etc).

Decrease

Decrease

By the key ② select the windows showing the ICONS of the available menus.

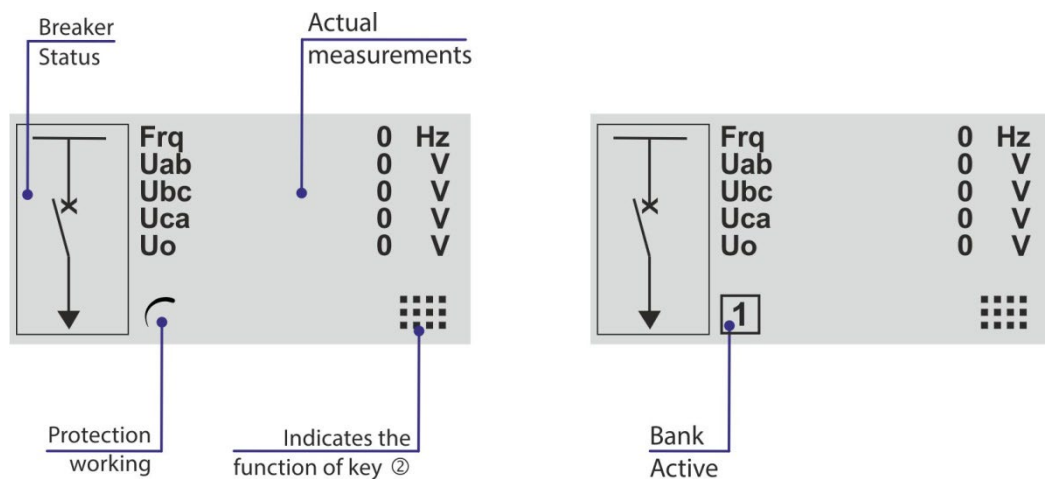
By the key ③, ④ select the desired icon and enter by key ①

The different elements can be selected by the key ③ and ④.

The details of the individual menus are given in the following paragraphs.

4.1 - Display

The 240x128 pixel hi-resolution LCD display the available information (menu, etc.).



5. Icons of Display

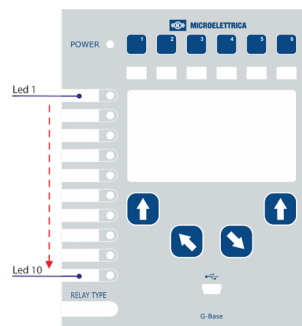
	LocalCmd	Local Commands
	Measure	Actual Measurements
	Max Val.	Maximum Values
	TripRec.	Trip Recording
	Counter	Partial Counters (Resettable Counter)
	ROCnt	Total Counter (Read Only Counter)
	Events	Event Recording
	Setting	Function Settings
	System	System Settings
	InfoStatus	Information Status
	TimeDate	Time And Date
	Healthy	Diagnostic Information
	Dev.Info	Relay Version

6. Signalization

Eleven signal leds are provided:

1	Led Power Supply	Not programmable	Green
10	Leds	Programmable (via software)	

N°	Colours
1	Green
2	Green
3	Green
4	Yellow
5	Red
6	Red
7	Red
8	Yellow
9	Red
10	Green



In case of auxiliary power supply failure the status of the leds is recorded and reproduced when power supply is restored.

6.1 - Leds Manual Reset

For Leds manual reset operate as follows:

- Press **"Menu"** for access to the main menu with icons.
- Select icon **"LocalCmd"**.
 - Press **"Select"**,
- Select **"LedClear"**
 - Press **"Select"** to execute the command.
- When command has been executed the display shows **"Command Done"**;

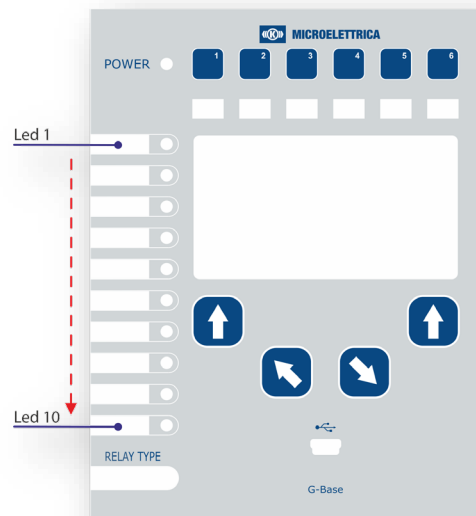
6.2 - Display of the last trip

Beside the signalization of the led "Trip", indicating a generic function trip, the display shows a window indicating the last function that was tripped and the number of events that are stored in the memory. The display will show this window until the reset button or external reset are operated.

- Press **"Menu"** to access to the main menu with icons.
 - Press **"Home"** to erase trip visualization.
 - Ex. "tTCS" (flashing) is the last trip.

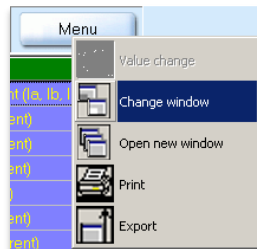
7. Leds Configuration

The relay manage up to 10 signal leds (Programmable), 1 led "Power" (green).

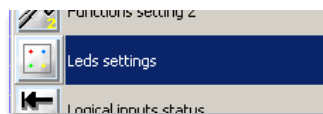


For Leds programming (only via software) operate as follows:

- Open the software program and connect to the relay.
- Select "Change Windows" from "Menu" button (options)



- Select "Led Setting"



The window for leds configuration will show:

ID	Name	Link enable	Status	Light prog.	Funct. Mode	Functions
1	Led 1 (Read only)	Not linked	Light off	Light on	Volatile	11>
2	Led 2 (Read only)	Not linked	Light off	Light on	Volatile	11>

7.1 - Name

Led name – for leds position see picture

7.2 - Link enable

<i>Linked</i>	=	Enable to operate
<i>Not Linked</i>	=	Disable

7.3 - Status

<i>Light-off</i>	=	Normal condition	See "Light Prog"
<i>Light-on</i>	=	When cause appear led is illuminated	
<i>Flashing</i>	=	When cause appear led is flashing	

7.4 - Light Prog.

<i>Light-on</i>	=	When cause appear led is illuminated
<i>Flashing</i>	=	When cause appear led is flashing

7.5 - Funct. Mode

<i>Volatile</i>	=	When cause disappear led turn-off (Not memorized)
<i>Latched</i>	=	When cause disappear led remain illuminated (memorized)

7.6 - Functions

Select the function assigned to specific led (see table 1).
 It's possible to configure only one function for each led.
 For configuration multiple functions use "UserVar" function.



7.7 - Table 1

1U>	Start	First overvoltage element
t1U>	Trip	
2U>	Start	Second overvoltage element
t2U>	Trip	
1U<	Start	First undervoltage element
t1U<	Trip	
2U<	Start	Second undervoltage element
t2U<	Trip	
1f>	Start	First overfrequency element
t1f>	Trip	
2f>	Start	Second overfrequency element
t2f>	Trip	
1f<	Start	First underfrequency element
t1f<	Trip	
2f<	Start	Second underfrequency element
t2f<	Trip	
1Uo>	Start	First zero sequence overvoltage element
2Uo>	Start	Second zero sequence overvoltage element
U1<	Start	First Voltmetric unlock islanding detector element
U2>	Start	Second Voltmetric unlock islanding detector element
1df/dt	Start	First Frequency rate of change element
2df/dt	Start	Second Frequency rate of change element
tTCS	Start	Trip coil supervision
IRF	Start	Internal Relay Failure
tIRF	Trip	
DskClean		Disk near Full clean operation is required
DskFull		Disk Full Write should be lock
DskWR		Disk write in progress
DskFRMT		Disk Format in progress
DskCHK		Check disk in progress
manOpCmd		Manual Open Command
L/Rdisc		Local/Remote signal Discrepancy
CL-Cmd		Close Command
C/Bfail		Circuit Breaker failure
Gen.Start	Start	Generic
Gen.Trip	Trip	
User Trigger Oscillo		User Variable for Oscillographic Recording
UserVar 0		
to		User Variable
UserVar 24		
Vcc		Reserved
Gnd		Reserved
ResetLog		Reset signal logic
P1		Push-button 1
P2		Push-button 2
P3		Push-button 3
P4		Push-button 4
P5		Push-button 5
P6		Push-button 6
0.D1		
0.D1Not		
to		Digital Inputs
0.D8		
0.D8Not		
0.R1		
0.R2		
0.R3		
0.R4		
0.R5		Output relays
0.R6		
0.R7		
0.R8		

7.8 - Example: Change settings for "Led1"

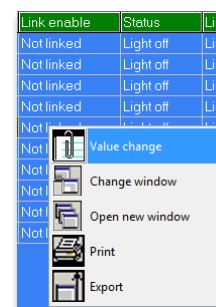
Change settings for "**Led1**" : "Enable", "Flashing", "Latched", "1U>".

Main Windows:

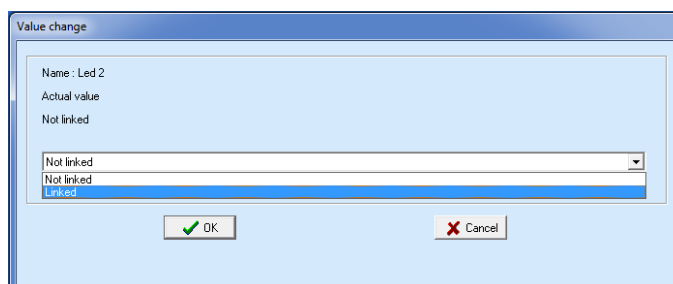
ID	Name	Link enable	Status	Light prog.	Funct. Mode	Functions
1	Led 1	Not linked	Light off	Light on	Volatile	---
2	Led 2	Not linked	Light off	Light on	Volatile	---
3	Led 3	Not linked	Light off	Light on	Volatile	---
4	Led 4	Not linked	Light off	Light on	Volatile	---
5	Led 5	Not linked	Light off	Light on	Volatile	---
6	Led 6	Not linked	Light off	Light on	Volatile	---
7	Led 7	Not linked	Light off	Light on	Volatile	---
8	Led 8	Not linked	Light off	Light on	Volatile	---
9	Led 9	Not linked	Light off	Light on	Volatile	---
10	Led 10	Not linked	Light off	Light on	Volatile	---

7.8.1 - "Link Enable"

Select "**Link enable**" related to "Led 1" and press right button on mouse, select "Value change":

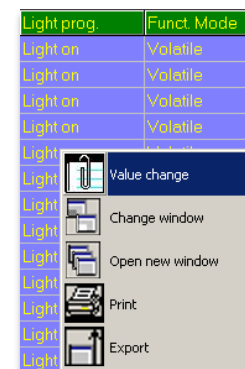


Select "**Linked**" and press "OK" (if Password is request, see § Password):

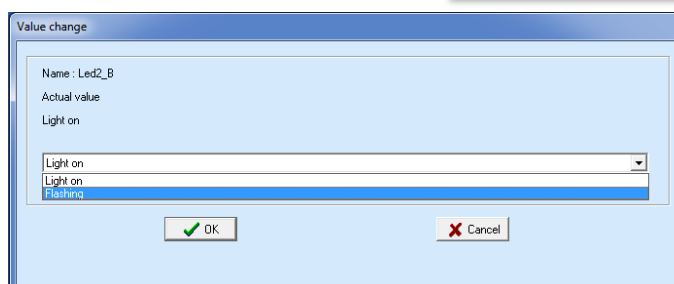


7.8.2 - "Flashing"

Select "**Light prog**" related to Led 1 and press right button on mouse, select "Value change":

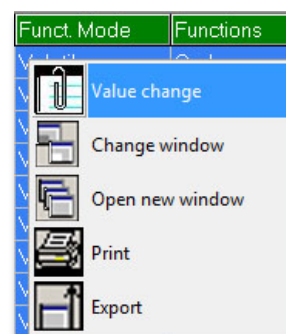


Select "**Flashing**" and press "OK" (if Password is request, see § Password):

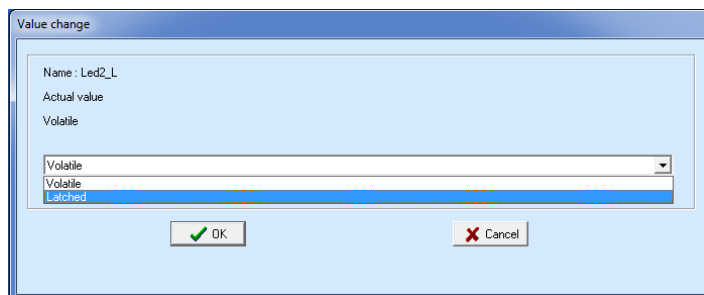


7.8.3 - "Funct.Mode"

Select "**Funct.Mode**" related to Led 1 and press right button on mouse, select "Value change":

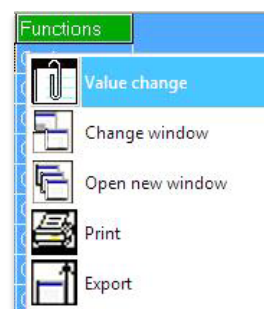


Select "**Latched**" and press "OK"
(if Password is request, see § Password):

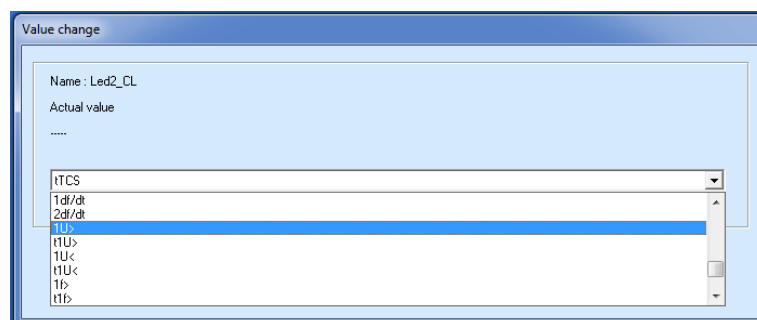


7.8.4 - "Functions"

Select "**Functions**" related to Led 1 and press right button on mouse, select "Value change":



Select "**1U>**" and press "OK"
(if Password is request, see § Password):



8. User Variables

The "User Variable" is a result of a logical operation (Or, AND, ecc...), it can be used like other logical output. This operation is possible only via software.

Name	User descr.	Linked functions	OpLogic	Timer	Timer type	Extra	Logical status
------	-------------	------------------	---------	-------	------------	-------	----------------

8.1 - Name

Internal progressive name

8.2 - User Descr.

Custom identification label for user variable

8.3 - Linked functions

Selection functions

8.4 - OpLogic

Operation Logic = [None, OR, AND, XOR, NOR, NAND, NOT, Ff-SR, Counter, Rise-UP, Fall-Down]

8.5 - Timer

Time delay (0-600)s, step 0.01s

8.6 - Timer type

<i>Delay</i>	=	Add a delay on output activation. The "Timer" is edge triggered on rise edge.
<i>Monostable P</i>	=	Activated the output for the time "Timer"
<i>Monostable N</i>	=	Disactivated the output for the time "Timer".
<i>Blinking</i>	=	The output switches periodically at the frequency defined by "Timer".
<i>Delay-Fall-Down</i>	=	<i>Delay-Fall-Down</i>

8.7 - Extra

Extra Time (0 - 65000)s, step 1s

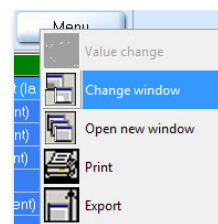
8.8 - Logical status

"User Variable" Logical status

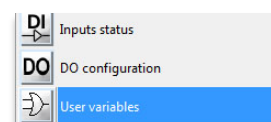
8.9 - Example: Setting "User Variable"

Open software program and connect to the relay.

Select "Change Windows" from "Menu" button



Select "User Variable"

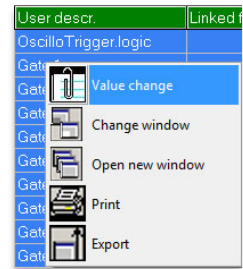


Setting for "UserVar<0>" : "Voltage Trip", "1U>,2U>", "OR", "1", "Monostable P", "10".

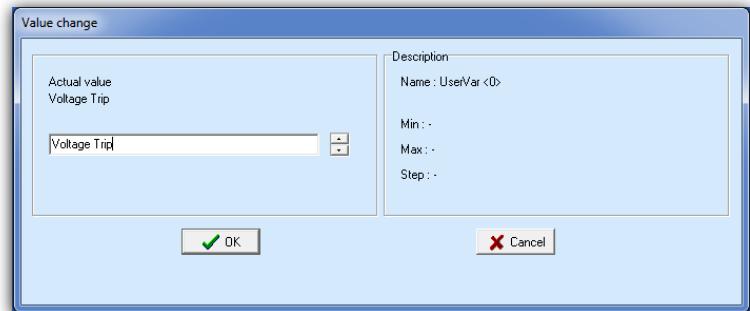
ID	Name	User descr.	Linked functions	OpLogic	Timer	Timer type	Extra	Logical status
1	UserTrigger Oscillo	OscilloTrigger.logic		None	0	Delay	0	0
2	UserVar <0>	Current.Trip.....	1>.2>.3>.	OR	1	Monostable P	10	0

8.9.1 - "User description" (User descr.)

Select "**User descr**" related to "UserVar<0>" and press right button on mouse, select "Value change":

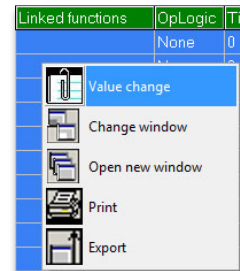


Insert "**Voltage Trip**" into box and press "OK":

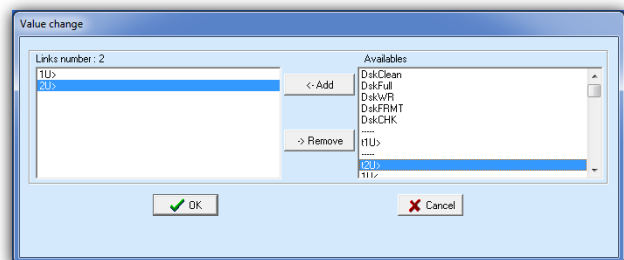
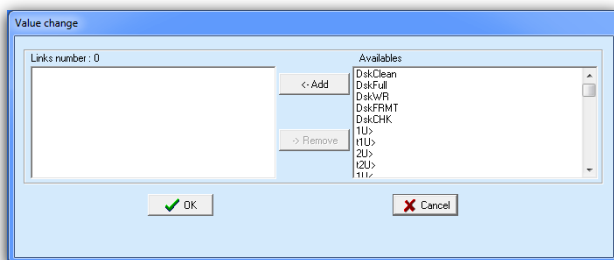


8.9.2 - "Linked Functions"

Select "**Linked Functions**" related to "UserVar<0>" and press right button on mouse, select "Value change":

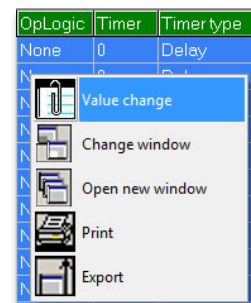


Select "**1U>, 2U>**" from "Available" box via push-button "<Add", and press "OK". For remove functions, use push-button ">Remove".

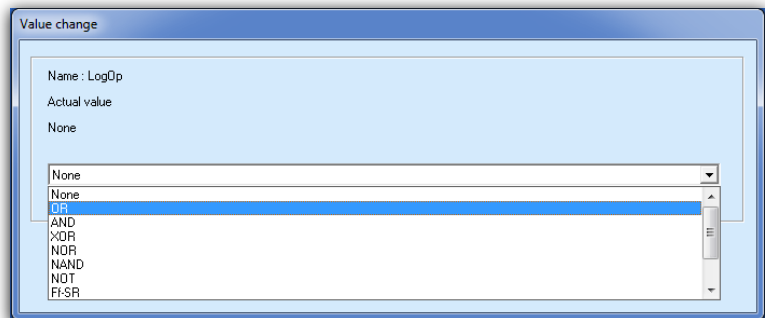


8.9.3 - "Operation Logic" (Oplogic)

Select "**Oper Logic**" related to "UserVar<0>" and press right button on mouse, select "Value change":

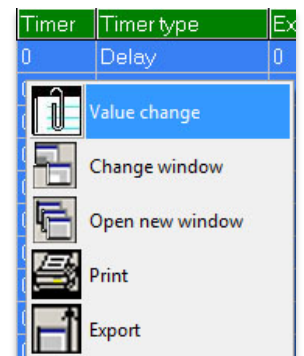


Insert "**OR**" into box and press "OK":

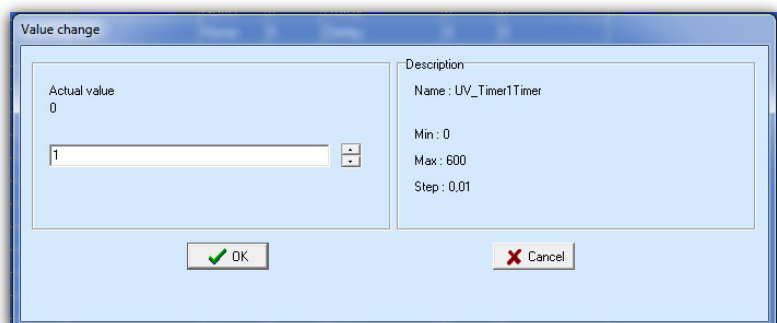


8.9.4 - "Timer"

Select "**Timer**" related to "UserVar<0>" and press right button on mouse, select "Value change":

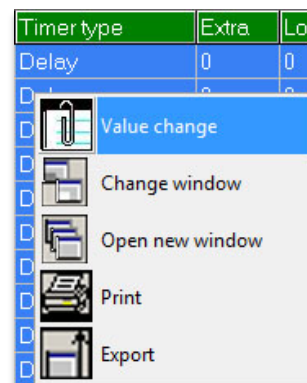


Select "**1**" into box and press "OK":

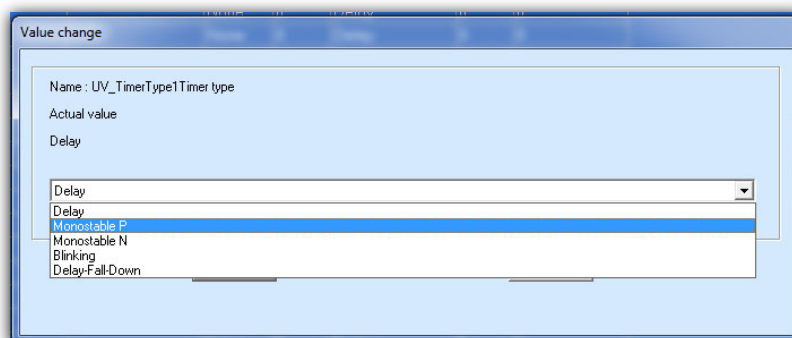


8.9.5 - "Timer type"

Select "**Timer**" related to "UserVar<0>" and press right button on mouse, select "Value change":

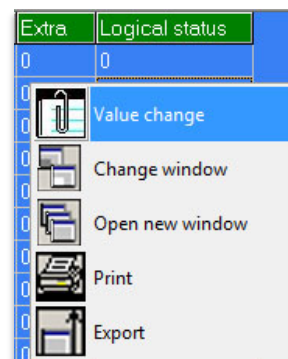


Select "**Monostable P**" into box and press "OK":

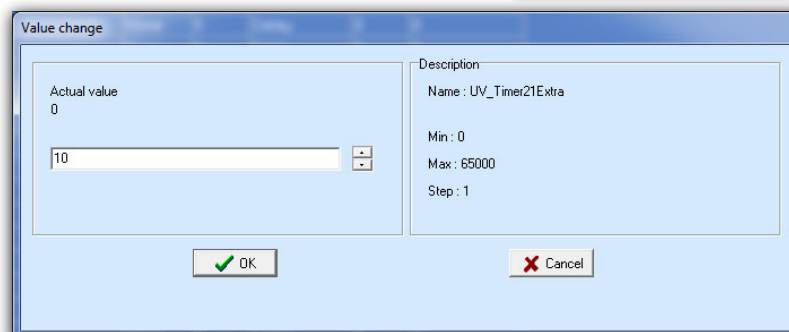


8.9.6 - "Extra"

Select "**Extra**" related to "UserVar<0>" and press right button on mouse,



Select "**10**" into box and press "OK":

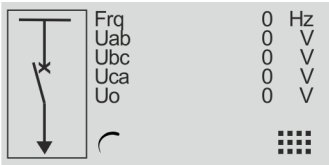
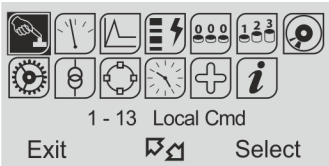
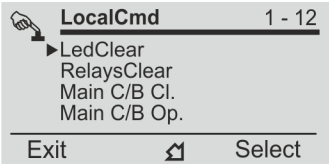
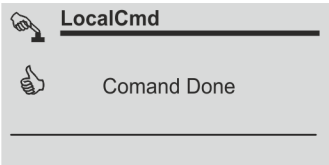


9. Local Commands

"**Local Commands**" allow to operate from relay front face controls like Thermal Memory reset, Leds reset, etc.

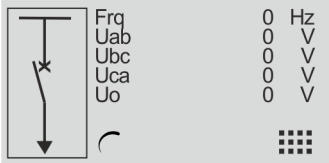
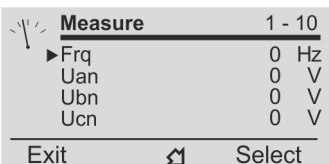
Menu	Description	Password
<i>Led</i> <i>Clear</i>	Reset of signal Leds	No
<i>Relays</i> <i>Clear</i>	Manual reset of output relays	No
<i>main C/B</i> <i>Cl.</i>	Manual C/B closing (conditioned by Password)	Yes
<i>main C/B</i> <i>Op.</i>	Manual C/B opening (conditioned by Password)	Yes
<i>Event</i> <i>Clear</i>	Reset Events	Yes
<i>LTrip</i> <i>Clear</i>	Reset Last Trip	Yes
<i>Counter</i> <i>Clear</i>	Reset Counters	Yes
<i>HistFail</i> <i>Clear</i>	Reset of Internal Failure Historic records	Yes
<i>Leds</i> <i>Test</i>	Signal Leds test	No
<i>Force</i> <i>Osc</i>	Force Oscillo Recording	Yes
<i>Format</i> <i>iDisk</i>	Format internal disk	Yes
<i>Check</i> <i>iDisk</i>	Check internal disk	Yes

To operate one command by the Front Face Keyboard, proceed as follows (Led Clear in the present example).

- 
 - Press "**Menu**" for access to the main menu with icons.
- 
 - Select "**LocalCmd**" icon with pushbutton "**Increase**" or "**Decrease**".
 - Press "**Select**" for access.
- 
 - Select with pushbutton "**Increase**" or "**Decrease**" the menu "**LedClear**".
 - Press "**Select**" to execute the command.
(if Password is request, see § Password).
- 
 - When command has been executed the display shows "**Command Done**"; go to "3".

10. Measure

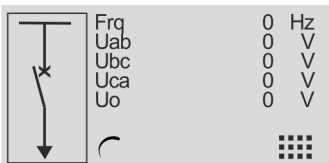
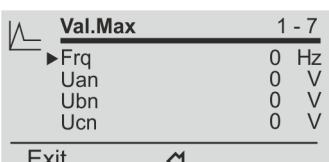
Real time values as measured during the normal operation.

- 
 - Press "**Menu**" for access to the main menu with icons.
- 
 - Select "**Measure**" icon with pushbutton "**Increase**" or "**Decrease**".
 - Press "**Select**" for access.
- 
 - Scroll the menu "**Measure**" with pushbutton "**Increase**" or "**Decrease**" to display the measurement.
 - Press "**Exit**" to go to the main menu.

Frq	(30 ÷ 70)	Hz	Frequency
Uan	(0 ÷ 99999)	V	Phase voltage A-N
Ubn	(0 ÷ 99999)	V	Phase voltage B-N
Ucn	(0 ÷ 99999)	V	Phase voltage C-N
Uab	(0 ÷ 99999)	V	Phase-to-voltage A-B
Ubc	(0 ÷ 99999)	V	Phase-to-voltage B-C
Uca	(0 ÷ 99999)	V	Phase-to-voltage C-A
Uo	(0 ÷ 99999)	V	Zero sequence voltage
V1	(0 ÷ 99999)	Vn	Positive sequence voltage
V2	(0 ÷ 99999)	Vn	Negative sequence voltage

11. Maximum Values

Maximum demand values recorded starting from 100ms after closing of main Circuit Breaker. (updated any time the breaker closes).

- 
 - Press "**Menu**" for access to the main menu with icons.
- 
 - Select "**Max.Val.**" icon with pushbutton "**Increase**" or "**Decrease**".
 - Press "**Select**" for access.
- 
 - Scroll the menu "**Max.Val.**" with pushbutton "**Increase**" or "**Decrease**" to display the measurement.
 - Press "**Exit**" to go to the main menu.

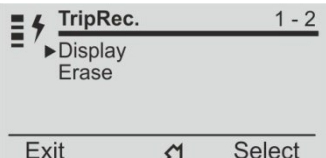
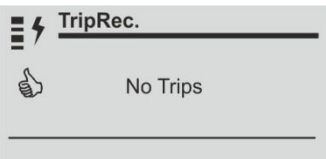
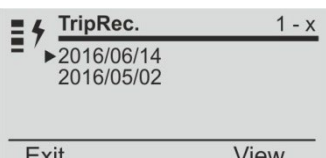
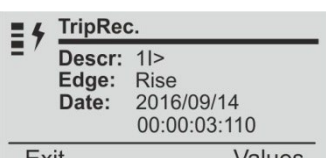
Frq	(30 ÷ 70)	Hz	Frequency
Uan	(0 ÷ 99999)	V	Phase voltage A-N
Ubn	(0 ÷ 99999)	V	Phase voltage B-N
Ucn	(0 ÷ 99999)	V	Phase voltage C-N
Uo	(0 ÷ 99999)	V	Zero sequence voltage
V1	(0 ÷ 99999)	Vn	Positive sequence voltage
V2	(0 ÷ 99999)	Vn	Negative sequence voltage

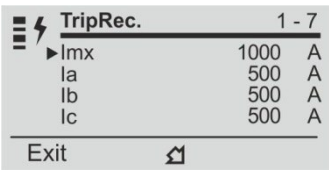
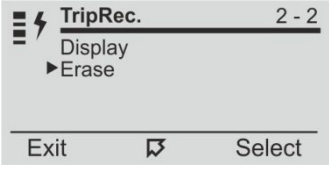
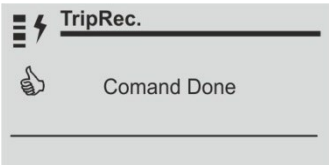
12. Trip Recording

Display of the function which caused the tripping of the relay plus values of the measurement at the moment of tripping. The last 30 events are recorded.

The memory buffer is refreshed at each new relay tripping (FIFO logic).

<i>Display</i>	→	Reading of recorded Trips.
<i>Erase</i>	→	Clear all Trips recorded.

- 1 
 - Press "**Menu**" for access to the main menu with icons.
- 2 
 - Select "**TripRec.**" icon with pushbutton "**Increase**" or "**Decrease**".
 - Press "**Select**" for access.
- 3 
 - Select "**Display**" with pushbutton "**Increase**" or "**Decrease**".
 - Press "**Select**" for access.
 - For "**Erase**" go to "8"
- 4 
 - If no trip is recorded the display shows "**No Trips**".
- 5 
 - If any trip was recorded, select "**View**" to display the chronological list of the records.
 - By the keys "**Increase**" or "**Decrease**" select the date of the record to be checked.
- 6 
 - Will be shown:
 - "**Descr**" the function that caused the event (Example: t1I> = Rise)
 - "**Edge**" if the function was tripped (Rise) or reset (Fall)
 - "**Date**", date of trip, year/month/day, hour:minutes:seconds:milliseconds
 - Press "**Value**", for reading the value of input quantities on tripping.

- 7
- 
- Scroll with pushbuttons "**Increase**" or "**Decrease**" the available measurements.
 - Select "**Exit**" to go back to "5" for another selection, or "2" go back to the main menu.
- 8
- 
- Select "**Erase**" with button "**Decrease**".
 - Press "**Select**" to execute the commands; **All** Trips recorded are erased. (if Password is request, see § Password).
- 9
- 
- When command has been executed the display shows "**Command Done**";
 - Press "**Exit**" to go back to the main menu.

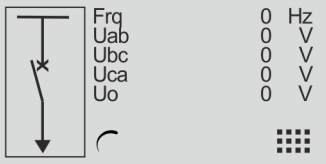
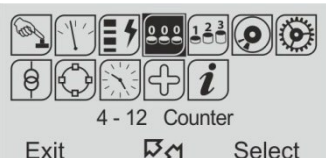
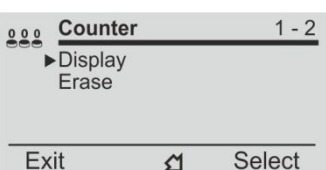
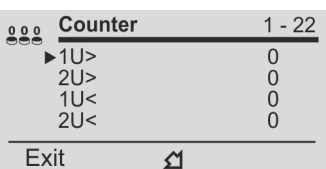
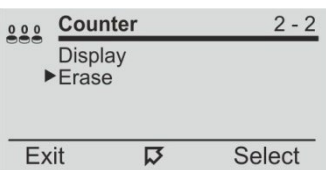
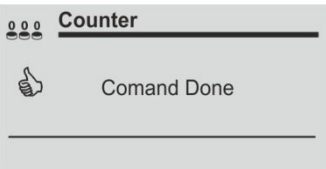
<i>Frq</i>	(30 ÷ 70)	Hz	Frequency
<i>Uan</i>	(0 ÷ 99999)	V	Phase voltage A-N
<i>Ubn</i>	(0 ÷ 99999)	V	Phase voltage B-N
<i>Ucn</i>	(0 ÷ 99999)	V	Phase voltage C-N
<i>Uo</i>	(0 ÷ 99999)	V	Zero sequence voltage
<i>V1</i>	(0 ÷ 99999)	Vn	Positive sequence voltage
<i>V2</i>	(0 ÷ 99999)	Vn	Negative sequence voltage
<i>df/dt</i>	(0 ÷ 99999)	Hz/s	Frequency rate of change

13. Partial Counters

Partial counters of the number of operations for each of the relay functions.

<i>Display</i> →	<i>1U></i>	0	Operations counters	<i>First overvoltage element</i>
	<i>2U></i>	0	Operations counters	<i>second overvoltage element</i>
	<i>1U<</i>	0	Operations counters	<i>First undervoltage element</i>
	<i>2U<</i>	0	Operations counters	<i>second undervoltage element</i>
	<i>1f></i>	0	Operations counters	<i>First overfrequency element</i>
	<i>2f></i>	0	Operations counters	<i>second overfrequency element</i>
	<i>1f<</i>	0	Operations counters	<i>First underfrequency element</i>
	<i>2f<</i>	0	Operations counters	<i>second underfrequency element</i>
	<i>1Uo></i>	0	Operations counters	<i>First zero sequence overvoltage element</i>
	<i>2Uo></i>	0	Operations counters	<i>Second zero sequence overvoltage element</i>
	<i>U1<</i>	0	Operations counters	<i>First Voltmetric unlock islanding detector element</i>
	<i>U2></i>	0	Operations counters	<i>Second Voltmetric unlock islanding detector element</i>
	<i>1df/dt</i>	0	Operations counters	<i>First element df/dt</i>
	<i>2df/dt</i>	0	Operations counters	<i>Second element df/dt</i>
	<i>TCS</i>	0	Operations counters	<i>Trip Circuit Supervision</i>
	<i>IRF</i>	0	Operations counters	<i>Internal Relay Fault</i>
	<i>BrkF</i>	0	Operations counters	<i>Breaker failure</i>
	<i>AutOp</i>	0	Operations counters	<i>Automatic C/B Opening</i>
	<i>AutCL</i>	0	Operations counters	<i>Automatic C/B Closing</i>
	<i>ManOp</i>	0	Operations counters	<i>Manual C/B Opening</i>
	<i>ManCL</i>	0	Operations counters	<i>Manual C/B Closing</i>
	<i>OvrOp</i>	0	Operations counters	<i>Overall C/B Opening (Automatic + Manual)</i>
	<i>OvrCL</i>	0	Operations counters	<i>Overall C/B Closing (Automatic + Manual)</i>

Erase → Reset all Counters. (By the interface program software it is possible to individually reset the counters and set an initial starting number)

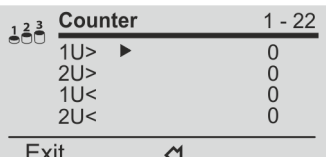
- 
 - Press "**Menu**" for access to the main menu with icons.
- 
 - Select "**Counter**" icon with pushbutton "**Increase**" or "**Decrease**".
 - Press "**Select**" for access.
- 
 - Select "**Display**" with pushbutton "**Increase**" or "**Decrease**".
 - Press "**Select**" for access.
 - For "**Erase**" to go to "5"
- 
 - Display of the number of operations of each individual function.
 - With pushbuttons "**Increase**" or "**Decrease**" scroll the parameters
 - Press "**Exit**" go back to "3".
- 
 - Select "**Erase**" with pushbutton "**Decrease**".
 - Press "**Select**".
 - (if Password is request, see § Password).
- 
 - When command has been executed the display shows "**Command Done**"; and return to "5".
 - With pushbutton "**Exit**" to go back to the main menu.

14. Total Counters

Counters of the total number of operations of each individual function.
These counters cannot be reset

<i>Display</i>	→	<i>1U></i>	0	Operations counters	<i>First overvoltage element</i>
		<i>2U></i>	0	Operations counters	<i>second overvoltage element</i>
		<i>1U<</i>	0	Operations counters	<i>First undervoltage element</i>
		<i>2U<</i>	0	Operations counters	<i>second undervoltage element</i>
		<i>1f></i>	0	Operations counters	<i>First overfrequency element</i>
		<i>2f></i>	0	Operations counters	<i>second overfrequency element</i>
		<i>1f<</i>	0	Operations counters	<i>First underfrequency element</i>
		<i>2f<</i>	0	Operations counters	<i>second underfrequency element</i>
		<i>1Uo></i>	0	Operations counters	<i>First zero sequence overvoltage element</i>
		<i>2Uo></i>	0	Operations counters	<i>Second zero sequence overvoltage element</i>
		<i>U1<</i>	0	Operations counters	<i>First Voltmetric unlock islanding detector element</i>
		<i>U2></i>	0	Operations counters	<i>Second Voltmetric unlock islanding detector element</i>
		<i>1df/dt</i>	0	Operations counters	<i>First element df/dt</i>
		<i>2df/dt</i>	0	Operations counters	<i>Second element df/dt</i>
		<i>TCS</i>	0	Operations counters	<i>Trip Circuit Supervision</i>
		<i>IRF</i>	0	Operations counters	<i>Internal Relay Fault</i>
		<i>BrkF</i>	0	Operations counters	<i>Breaker failure</i>
		<i>AutOp</i>	0	Operations counters	<i>Automatic C/B Opening</i>
		<i>AutCL</i>	0	Operations counters	<i>Automatic C/B Closing</i>
		<i>ManOp</i>	0	Operations counters	<i>Manual C/B Opening</i>
		<i>ManCL</i>	0	Operations counters	<i>Manual C/B Closing</i>
		<i>OvrOp</i>	0	Operations counters	<i>Overall C/B Opening (Automatic + Manual)</i>
		<i>OvrCL</i>	0	Operations counters	<i>Overall C/B Closing (Automatic + Manual)</i>

Erase → Reset all Counters
(By the interface program software it is possible to individually reset the counters and set an initial starting number)

- 
 - Press "**Menu**" for access to the main menu with icons.
- 
 - Select "**ROCnt**" icon with pushbutton "**Increase**" or "**Decrease**".
 - Press "**Select**" for access.
- 
 - With pushbuttons "**Increase**" or "**Decrease**" scroll the parameters.
 - With pushbutton "**Exit**" to go back to the main menu.

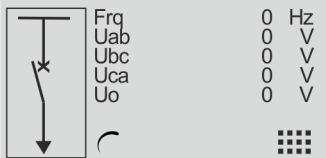
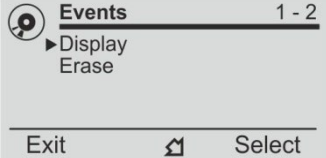
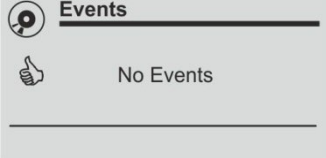
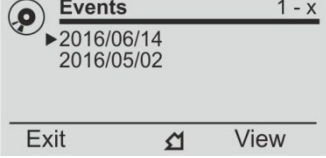
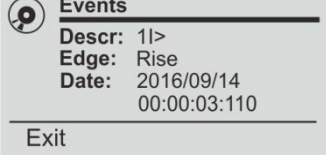
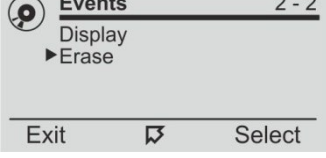
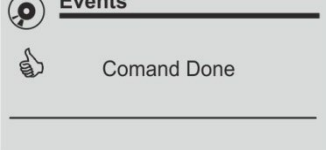
15. Events

Display of the function which caused any of the following events: - *Status change of digital Inputs/Outputs*. - *Start of protection functions* – *Trip of protection function* – *Function reset*.

The last 500 events are recorded at pick-up (rise) or drop-out (fall).

The memory buffer is updated at each new event.

Display	→	Reading events recorded.
Erase	→	Clear all events recorded.

- 1 
 - Press "**Menu**" for access to the main menu with icons.
- 2 
 - Select "**Events**" icon with pushbutton "**Increase**" or "**Decrease**".
 - Press "**Select**" for access.
- 3 
 - Select "**Display**" with pushbutton "**Increase**" or "**Decrease**".
 - Press "**Select**" for access.
 - For "**Erase**" go to "7"
- 4 
 - If no event is recorded the display shows message "**No Events**".
- 5 
 - If any event was recorded, select "**View**" to display the chronological list of the records.
 - By the keys "**Increase**" or "**Decrease**" select the date of the record to be checked.
- 6 
 - Will be shown:
 - "**Descr**" the function that caused the event (Example: 1I> = Start, t1I> = Trip)
 - "**Edge**" if the function was tripped (Rise) or reset (Fall)
 - "**Date**", date of trip, year/month/day, hour:minutes:seconds:milliseconds
- 7 
 - Select "**Erase**" with button "**Decrease**".
 - Press "**Select**" to execute the commands; **All** Events recorded are erased. (if Password is request, see § Password).
- 8 
 - When command has been execute the display shows "**Command Done**";
 - Press "**Exit**" to go back to the main menu.

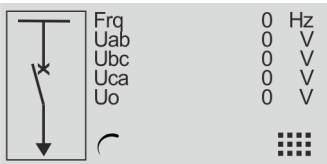
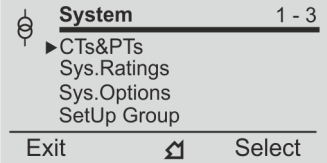
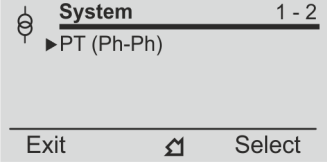
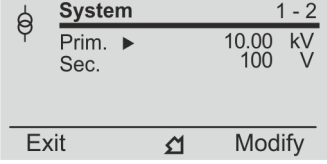
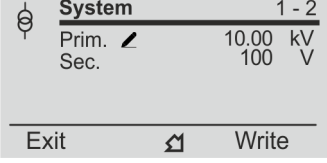
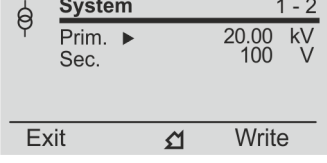
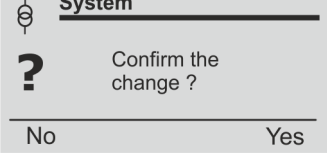
15.1 – Events on display

Functions	Events Displayed	Events Description				Status
1U>	1U>	1U>	Start	First overvoltage element	Rise	
	t1U>	t1U>	Trip		Rise	Fall
2U>	2U>	2U>	Start	Second overvoltage element	Rise	
	t2U>	t2U>	Trip		Rise	Fall
1U<	1U<	1U<	Start	First undervoltage element	Rise	
	t1U<>	t1U<	Trip		Rise	Fall
2U<	2U<	2U<	Start	Second undervoltage element	Rise	
	t2U<	t2U<	Trip		Rise	Fall
1f>	1f>	1f>	Start	First overfrequency element	Rise	
	t1f>	t1f>	Trip		Rise	Fall
2f>	2f>	2f>	Start	Second overfrequency element	Rise	
	t2f>	t2f>	Trip		Rise	Fall
1f<	1f<	1f<	Start	First underfrequency element	Rise	
	t1f<	t1f<	Trip		Rise	Fall
2f<	2f<	2f<	Start	Second underfrequency element	Rise	
	t2f<	t2f<	Trip		Rise	Fall
1Uo>	1Uo>	1Uo>	Start	First zero sequence overvoltage element	Rise	
	t1Uo>	t1Uo>	Trip		Rise	Fall
2Uo>	2Uo>	2Uo>	Start	Second zero sequence overvoltage element	Rise	
	t2Uo>	t2Uo>	Trip		Rise	Fall
U1<	U1>	U1>	Start	First Voltmetric unlock islanding detector element	Rise	
	tU1>	tU1>	Trip		Rise	Fall
U2>	U2>	U2>	Start	Second Voltmetric unlock islanding detector element	Rise	
	tU1>	tU1>	Trip		Rise	Fall
1df/dt	1df/dt	1df/dt	Start	First Frequency rate of change	Rise	
2df/dt	2df/dt	2df/dt	Start	Second Frequency rate of change	Rise	
TCS	TCS	TCS	Start	Trip Coil Supervision	Rise	
	tTCS	tTCS	Trip		Rise	Fall
IRF	IRF	IRF	Start	Internal Relay Failure	Rise	
	tIRF	tIRF	Trip		Rise	
	TimeSincro			Time synchronization	Rise	
Disk	DskClean			Disk near to full clean operation is required	Rise	
	DskFull			Disk full write should be lock	Rise	
	L/R disc			Local/Remote signal Discrepancy	Rise	
	rDskAttach			Removable disk usb attach		
	rDskDetach			Removable disk usb detach		
	rDskDachable	Not used		Removable disk usb now detachable		
	rDskClean			Removable disk usb near to full clean operation is required		
C/B	rDskFull			Removable disk usb full, write locked		
	manOpKey			Circuit Breaker intentional open by key	Rise	
	manOpLocC			Circuit Breaker intentional open by local command	Rise	
	manOpRemC			Circuit Breaker intentional open by remote command	Rise	
	manOpExtIn			Circuit Breaker intentional open by external input	Rise	
	ExterManOp			Circuit Breaker intentional external open	Rise	
	manCIKey			Circuit Breaker intentional close by key	Rise	
	manCILocC			Circuit Breaker intentional close by local command	Rise	
	manCIRemC			Circuit Breaker intentional close by remote command	Rise	
	manCIExtIn			Circuit Breaker intentional close by external input	Rise	
	ExterManCh			Circuit Breaker intentional external close	Rise	
	CB-Fail			Circuit Breaker (C/B Failure)	Rise	Fall
	CRCInChCB			Cycle blocked intentional CB Close	Rise	
	Charat 1			Switch to SetUp Group1	Rise	Fall
	Charat 2			Switch to SetUp Group2	Rise	Fall
	Charat 3			Switch to SetUp Group3	Rise	Fall
	Charat 4			Switch to SetUp Group4	Rise	Fall
	Gen.Trip			General Trip	Rise	
	Gen.Start			General Start	Rise	
Digital Inputs	0.D1			Digital Input D1	Rise	Fall
	↓					
Output Relays	0.D8			Digital Input D8	Rise	Fall
	0.R1			Output relays R1	Rise	Fall
	↓					
	0.R8			Output relays R8	Rise	Fall

16. System (System parameters)

Setting of system parameters.

CTs&PTs	Phase PT	Primary	Prim.	→	10	kV	(1 ÷ 500)	step	0.01	kV
		Secondary	Sec.	→	100	V	(50 / 150)	step	1	V
Sys.Ratings		Fn → 50 Hz (50 / 60) Nominal Frequency								
		Un → 10 kV (0.1 ÷ 500) step 0.01 kV Nominal Current								
Sys.Options		27/59 → E Hz (E / U) Operation of Function								
		NCy → 3 (3 ÷ 10) step 1 Number of periods for df/dt calculation								
Setup Group		Group	→	1	(1 ÷ 4)					

- 
 - Press **"Menu"** for access to the main menu with icons.
- 
 - Select **"System"** icon with pushbuttons **"Increase"** or **"Decrease"**.
 - Press **"Select"** for access.
- 
 - Select **"CTs&PTs"**.
 - Press **"Select"** for access.
- 
 - Select **"PT"**.
 - Press **"Select"** for access.
- 
 - Select **"Primary"** to modify the value, or press **"Decrease"**.
 - Press **"Modify"** to modify the parameter.
(if Password is request, see § Password).
- 
 - Appear  icon.
 - Use pushbuttons **"Increase"** or **"Decrease"** to set the value.
 - Press **"Write"** to confirm the value
- 
 - The value is now set.
 - To set a new value return to the point "4".
 - Press **"Exit"**.
- 
 - The display show **"Confirm the change?"**.
 - Choose **"Yes"** to confirm the changes.
 - Choose **"No"** to **not** confirm the changes.
 - After set confirmation (or non-confirmation) the display goes back to point "3".

17. Settings

Two complete banks of settings of the programmable variables are available in the "**SETTING**" menu. Both "Group #1" to "Group #4" include the hereunder listed variables.

1  **Setting** 1 - 22

- 1  Communic
-  Customize
-  FileSys
- 1U>

Exit  Select

1 Indicates the Setting Group that is actually being modified.

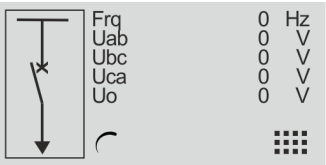
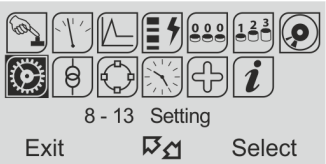
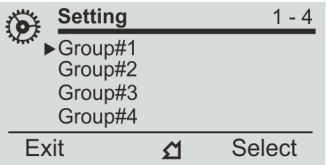
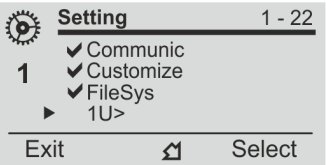
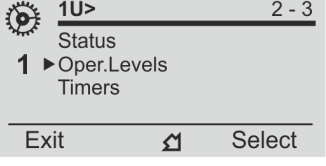
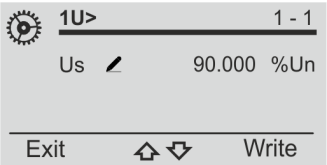
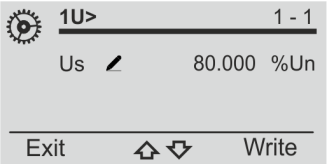
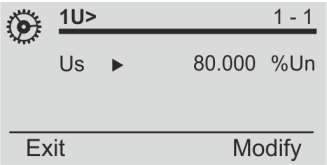
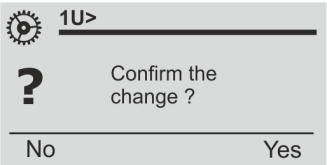
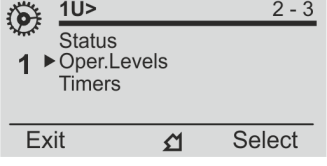
 This symbol indicates that the function aside is enabled; symbol missing indicates that the function is disabled.

Group#1; #2; #3; #4	Descriptions
<i>Communic.</i>	Serial communication parameters
<i>Customise</i>	Visualization parameters
<i>FileSys</i>	File Systems and disks management
<i>1U></i>	First Overvoltage Element
<i>2U></i>	Second Overvoltage Element
<i>1U<</i>	First Undervoltage Element
<i>2U<</i>	Second Undervoltage Element
<i>1f></i>	First Overfrequency Element
<i>2f></i>	Second Overfrequency Element
<i>1f<</i>	First Underfrequency Element
<i>2f<</i>	Second Underfrequency Element
<i>1Uo></i>	First Zero sequence overvoltage element
<i>2Uo></i>	Second Zero sequence overvoltage element
<i>U1<</i>	First Voltmetric unlock islanding detector element
<i>U2></i>	Second Voltmetric unlock islanding detector element
<i>1df/dt</i>	First Frequency rate of change
<i>2df/dt</i>	Second Frequency rate of change
<i>TCS</i>	Setting variables for Trip Circuit Supervision
<i>IRF</i>	Internal Relay Fault
<i>Oscillo</i>	Setting variables for Oscillographic recording
<i>CB-Mngn</i>	C/B command Local / Remote setting
<i>ExtReset</i>	Configuration for external reset input

17.1 - Modifying the setting of variables

To modify any variable setting by the keyboard, proceed as follows:

(example: change setting of element "1U>", from "Us 90.000 %Un" to "Us 80.000 %Un")

- 1 
 - Press "**Menu**" for access to the main menu with icons.
- 2 
 - Select icon "**Setting**" by pushbuttons "**Increase**" or "**Decrease**".
 - Press "**Select**".
- 3 
 - Select by pushbuttons "**Group#1**".
 - Press "**Select**".
- 4 
 - Select by pushbuttons "**Increase**" or "**Decrease**" the parameter "1U>".
 - Press "**Select**".
- 5 
 - Select by buttons "**Increase**" or "**Decrease**" the menu "**Oper.Levels**".
 - Press "**Select**".
- 6 
 - The arrow aside "**Us**" shows the parameter selected for changing
 - Press "**Modify**".
 - If Password is request, see § Password
- 7 
 - Appear  icon.
- 8 
 - Set new values pushbuttons "**Increase**" or "**Decrease**" buttons
 - Press "**Write**".
- 9 
 - If the change of parameters is completed, press "**Exit**".
- 10 
 - "**Yes**" confirm all changes.
 - "**No**" voids all the changes.
- 11 
 - The relay returns to point "4".

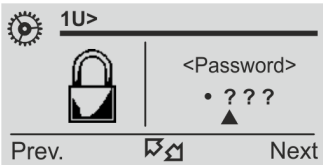
17.2 - Password

The password is requested any time the user wishes to modify any password protected parameter (example "1U>" menu "Setting").

The factory default password is "1111".

The password is only modifiable with the software.

When password is requested, proceed as follows:

- 1 
 - Use the key "**Increase**" and "**Decrease**" and set the first digit of password.
- 2 
 - Press "**Next**" to validate and go to the next digit.
- 3 
 - Use the key "**Increase**" or "**Decrease**" to set second digit.
- 4 
 - Press "**Next**" to validate and go to the next digit.
- 5 
 - Use the key "**Increase**" or "**Decrease**" to set the third digit.
- 6 
 - Press "**Next**" to validate and go to the next digit.
- 7 
 - Use the key "**Increase**" or "**Decrease**" to set the fourth digit.
- 8 
 - Press "**Next**" to validate and go to modify the next parameter.

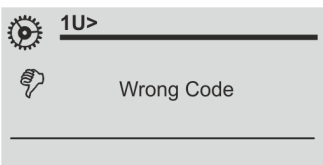


By key "**Prev**" go back to previous digit.



The password validity expires 60 sec after the last setting modification or as soon as you go back to the main menu

Frq	0	Hz
Uab	0	V
Ubc	0	V
Uca	0	V
Uo	0	V

- 1 
 - If set the incorrect password the display shows "**Wrong code**".
- 2 
 - The display will repeat the initial interrogation

17.3 – Menu: **Communic.** (Communication)

Options	→	BRLoc	19200	[9600 / 19200 / 38400]
	→	PRRem	MODBUS	[MODBUS / IEC103]
Node Address	→	Addr.	1	[1 ÷ 250]

17.3.1 – Description of variables

BRRem	:	USB (Front Panel) serial communication speed
PRRem	:	Remote Protocol
Addr.	:	Identification number for the connection on serial communication bus

17.3.2 – Front Panel USB serial communication port (RS232)

A Mini-USB socket is available on Relay's front face for connection. Through this port - and by the interface program for Windows - it is possible connect a Personal Computer to download all available information, operate any control and program the relay; the protocol used is "Modbus RTU".

To avoid electronic damage apply ESD caution.

17.3.3 – Cable for connection from Relay to Personal Computer

The connection cable is a standard USB-A/mini USB-B



17.3.4 – Main serial communication port (RS485)

From the Relay's back terminal board, a RS485 ports is available for communication with SCADA system with Protocol Modbus RTU or IEC60870-5-103 (selectable).

The communication interface allows to program all settings, operate all commands and download all information and records.

The physical connection can be via a normal pair of wires (RS485).

17.4 - Menu: **Customise** (Human Machine Interface)

Options	→	Lang	English	[English / Loc.Lang]
	→	Light	On	[Auto / On]

Timers	→	tBckL	20	s	(5÷120)	step	1	s
---------------	---	--------------	----	---	---------	------	---	---

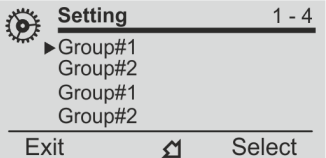
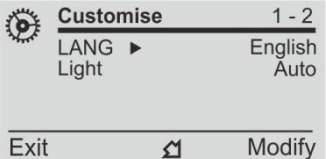
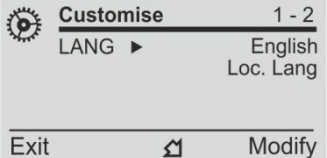
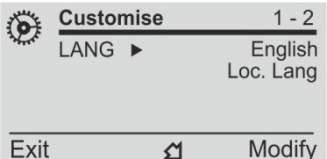
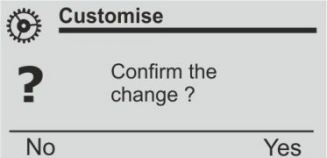
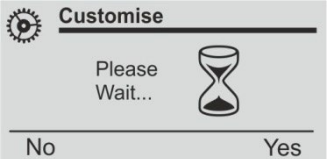
17.4.1 - Description of variables

Lang	:	Set Language
Light	:	Set Display backlight
tBckL	:	Set Display backlight time

This menu allows to customize the Language and the Display.

The Display backlight can be programmed always on "ON" or switched-on "Automatically" for a few second (set parameter "tBckL") at any operation of the keyboard.

Example: set Local Language.

- 
 - Press "**Menu**" for access to the main menu with icons.
- 
 - Select icon "**Setting**" by pushbuttons "**Increase**" or "**Decrease**".
 - Press "**Select**".
- 
 - Select "**Group 1**" or "**Group 2-3-4**".
 - Select "**Customize**".
 - Select "**Options**".
 - Press "**Select**".
- 
 - Select "**Lang**".
 - Press "**Modify**".
- 
 - Select "**Loc.Lang**".
 - Press "**Write**".
 - If Password is requested, see § Password
- 
 - Press "**Exit**".
- 
 - "**Yes**" confirms all changes.
 - "**No**" void all changes.
- 
 - After set confirmation the display shows "**Please Wait**".

17.5 - Function: **FileSys** (File system and Disk management)

Options	→	iDwr	enable	[enable / disable]
	→	OniDF	StopWrite	[StopWrite / DelOldFiles]

17.5.1 - Description of variables

iDwr	:	Internal Disk write
<i>Enable</i>	:	Protection log file write enabled
<i>Disable</i>	:	Protection log file write disabled
OniDF	:	Write policy on internal full disk condition
<i>StopWrite</i>	:	Write disable
<i>DelOldFiles</i>	:	Delete older folder and write

17.5.2 - Download file informations

Files related to "Journal" - "Fault log" - "Oscillo" are available in the relay internal memory.

Connect the USB cable to the relay and wait a few moments.



17.5.2.1 - Journal file

Example:

Directory			Descriptions
DATALOG	2016		Year
		Jul	Month
		03	Day
		Jrnl_03.07.2016.txt	Journal File

Jrnl_03.07.2016.txt			
Date	Time	Event	
2016/07/03	18:42:07:100	Vcc	Rise
2016/07/03	18:42:07:100	L/Rdisc	Rise
2016/07/03	18:42:07:110	IPU boot	Rise



17.5.2.2 – Faults log file

Example:

Directory			Descriptions
TRIPS	2016		Year
	Jul		Month
		15	Day
		Trips_15.06.2016.txt	Trips log File

Trips_15.06.2016.txt			
Date	Time	Event	Values
2016/06/15	08:17:27:200	tTCS	Uab=0.0; Ubc=0.0; Uca=0.0;
2016/06/15	10:31:03:901	tTCS	Uab=0.0; Ubc=0.0; Uca=0.0;

17.5.2.3 – Oscillographic file

Example:

Directory			Descriptions
OSCILLO	2016		Year
	Jul		Month
		15	Day
		fault1_2016.05.04.15.56.45.cfg	Oscillographic Comtrade
		fault1_2016.05.04.15.56.45.dat	File



17.6 - Function: **1U>** (First Overvoltage Element F59)

Status	→	Enab.	No	[No / Yes]		
Oper. Levels	→	Us	90	%Un (10 ÷ 190)	step	1
Timers	→	ts	100	s (0.08 ÷ 100)	step	0.01

17.6.1 - Description of variables

Enab.	:	Function enabling (No = Disable / Yes = Enable)
Us	:	Minimum operation level
ts	:	Trip time delay

17.6.2 - Operation

Tripping of the function operates a user programmable output relay.

17.7 - Function: **2U>** (Second Overvoltage Element F59)

Status	→ Enab.	Yes	[No / Yes]		
Oper. Levels	→ Us	90	%Un (10÷190)	step	1
Timers	→ ts	100	s (0.08÷100)	step	0.01

17.7.1 - Description of variables

Enab.	: Function enabling (No = Disable / Yes = Enable)
Us	: Minimum operation level
ts	: Trip time delay

17.7.2 - Operation

Tripping of the function operates a user programmable output relay.

17.8 - Function: **1U<** (First Undercurrent Element F27)

Status	→ Enab.	Yes	[No / Yes]		
Oper. Levels	→ Us	90	%Un (10÷190)	step	1
Timers	→ ts	100	s (0.08÷100)	step	0.01

17.8.1 - Description of variables

Enab.	: Function enabling (No = Disable / Yes = Enable)
Us	: Minimum operation level
ts	: Trip time delay

17.8.2 - Operation

Tripping of the function operates a user programmable output relay.

17.9 - Function: **2U<** (Second Undercurrent Element F27)

Status	→ Enab.	Yes	[No / Yes]		
Oper. Levels	→ Us	90	%Un (10÷190)	step	1
Timers	→ ts	100	s (0.08÷100)	step	0.01

17.9.1 - Description of variables

Enab.	: Function enabling (No = Disable / Yes = Enable)
Us	: Minimum operation level
ts	: Trip time delay

17.9.2 - Operation

Tripping of the function operates a user programmable output relay.

17.10 - Function: **1f**> (First Overfrequency Element F81>)

Status	→	Enab.	Yes		[No / Yes]		
Oper. Levels	→	Fs	52	Hz	(40÷70)	step	0.01
Timers	→	ts	10	s	(0.1÷100)	step	0.01

17.10.1 - Description of variables

Enab.	:	Function enabling (No = Disable / Yes = Enable)
Fs	:	Minimum operation level
ts	:	Trip time delay

17.10.2 - Operation

Tripping of the function operates a user programmable output relay.

17.11 - Function: **2f**> (Second Overfrequency Element F81>)

Status	→	Enab.	Yes		[No / Yes]		
Oper. Levels	→	Fs	52	Hz	(40÷70)	step	0.01
Timers	→	ts	10	s	(0.1÷100)	step	0.01

17.11.1 - Description of variables

Enab.	:	Function enabling (No = Disable / Yes = Enable)
Fs	:	Minimum operation level
ts	:	Trip time delay

17.11.2 - Operation

Tripping of the function operates a user programmable output relay.

17.12 - Function: **1f**< (First Underfrequency Element F81<)

Status	→	Enab.	Yes	[No / Yes]			
Oper. Levels	→	Fs	48	Hz	(40÷70)	step	0.01
Timers	→	ts	10	s	(0.1÷100)	step	0.01

17.12.1 - Description of variables

Enab.	:	Function enabling (No = Disable / Yes = Enable)
Fs	:	Minimum operation level
ts	:	Trip time delay

17.12.2 - Operation

Tripping of the function operates a user programmable output relay.

17.13 - Function: **2f**< (Second Underfrequency Element F81<)

Status	→	Enab.	Yes	[No / Yes]			
Oper. Levels	→	Fs	48	Hz	(40÷70)	step	0.01
Timers	→	ts	10	s	(0.1÷100)	step	0.01

17.13.1 - Description of variables

Enab.	:	Function enabling (No = Disable / Yes = Enable)
Fs	:	Minimum operation level
ts	:	Trip time delay

17.13.2 - Operation

Tripping of the function operates a user programmable output relay.

17.14 - Function: **1Uo>** (First Zero Sequence Overvoltage Element F59Vo)

Status	→	Enab.	Yes	[No / Yes]		
Oper. Levels	→	Us	10	%Un (1÷100)	step	1
Timers	→	ts	100	s (0.08÷100)	step	0.01

17.14.1 - Description of variables

Enab.	:	Function enabling (No = Disable / Yes = Enable)
Us	:	Minimum operation level
ts	:	Trip time delay

17.14.2 - Operation

Tripping of the function operates a user programmable output relay.

17.15 - Function: **2Uo>** (Second Zero Sequence Overvoltage Element F59Vo)

Status	→	Enab.	Yes	[No / Yes]		
Oper. Levels	→	Us	10	%Un (1÷100)	step	1
Timers	→	ts	100	s (0.08÷100)	step	0.01

17.15.1 - Description of variables

Enab.	:	Function enabling (No = Disable / Yes = Enable)
Us	:	Minimum operation level
ts	:	Trip time delay

17.15.2 - Operation

Tripping of the function operates a user programmable output relay.

17.16 - Function: **U1<** (First Voltmetric unlock islanding detector Element F81v)

Status	→	Enab.	Yes	[No / Yes]		
Oper. Levels	→	Us	90	%Un (10÷190)	step	1
Timers	→	ts	100	s (0.08÷100)	step	0.01

17.16.1 - Description of variables

Enab.	:	Function enabling (No = Disable / Yes = Enable)
Us	:	Minimum operation level
ts	:	Trip time delay

17.16.2 - Operation

Tripping of the function operates a user programmable output relay.

17.17 - Function: **U2>** (Second Voltmetric unlock islanding detector Element F81v)

Status	→	Enab.	Yes	[No / Yes]		
Oper. Levels	→	Us	90	%Un (10÷190)	step	1
Timers	→	ts	100	s (0.08÷100)	step	0.01

17.17.1 - Description of variables

Enab.	:	Function enabling (No = Disable / Yes = Enable)
Us	:	Minimum operation level
ts	:	Trip time delay

17.17.2 - Operation

Tripping of the function operates a user programmable output relay.

17.18 - Function: **1df/dt** (First Frequency rate of change Element)

Status	→	Enab.	Yes	[No / Yes]
Options	→	Sfr	POS	(POS/NEG/POS-NEG)
Oper. Levels	→	df/dt	1	Hz/s (0.1÷9.9)
	→	Ub	30	%Un (30÷90)
				step 0.1
				step 1

17.18.1 - Description of variables

Enab.	:	Function enabling (No = Disable / Yes = Enable)		
Sfr	:	Rate of Change direction:	POS	Positive
			NEG	Negative
			POS-NEG	Positive and Negative
df/dt	:	Minimum operation level		
Ub	:	Minimum voltage level		

17.18.2 - Operation

Tripping of the function operates a user programmable output relay.

17.19 - Function: **2df/dt** (Second Frequency rate of change Element)

Status	→	Enab.	Yes	[No / Yes]
Options	→	Sfr	POS	(POS/NEG/POS-NEG)
Oper. Levels	→	df/dt	1	Hz/s (0.1÷9.9)
	→	Ub	30	%Un (30÷90)
				step 0.1
				step 1

17.19.1 - Description of variables

Enab.	:	Function enabling (No = Disable / Yes = Enable)		
Sfr	:	Rate of Change direction:	POS	Positive
			NEG	Negative
			POS-NEG	Positive and Negative
df/dt	:	Minimum operation level		
Ub	:	Minimum voltage level		

17.19.2 - Operation

Tripping of the function operates a user programmable output relay.

17.20 - Function: **TCS** (Trip Circuit Supervision)

Status	→ Enab.	No	[No / Yes]
Timers	→ ts	0.1	s (0.1÷100) step 0.01

18.20.1 - Description of variables

Enab.	: Function enabling (No = Disable / Yes = Enable)
ts	: Trip time delay

17.20.2 - Operation

The relay includes a complete Circuit Breaker Trip Circuit Supervision unit that is associated to the Contact "9-10" of the "R1" Output Relay.

The contact of "R1" is used to trip the C/B as reported in the drawing here below.

The supervision works when the C/B is closed and recognizes the Trip Circuit as sound as far as the current flowing exceeds "1mA".

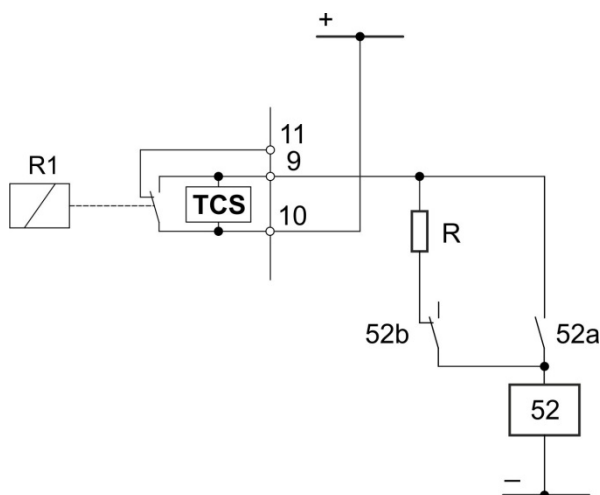
In case of Trip Circuit Fault detection, the diagnostic relay is operated and the Led starts flashing (see § Signalization).

To have Supervision also with the C/B open one N/C contact (52b) from the C/B and an external resistor "R" are needed.

$$R[k\Omega] \leq \frac{V}{1mA} - R_{52} \quad \text{where} \quad R_{52} = \text{Trip Coil internal resistance [k}\Omega\text{]}$$

V = Trip Circuit Voltage

$$P_R \geq 2 \cdot \frac{V^2}{R} [W] \quad \text{Designed power of external resistance "R"}$$



Tripping of the function operates a user programmable output relay.

17.21 - Function: **IRF** (Internal Relay Fault)

In this menu it is possible to configure the operation of the Relay Internal Fault detection element

Status	→ Enab.	No	[No / Yes]
Timers	→ tIRF	5	s (5÷200) step 0.01

17.21.1 - Description of variables

Enab.	: Function enabling (No = Disable / Yes = Enable)
tIRF	: Trip time delay

17.21.2 - Operation

Tripping of the function operates a user programmable output relay.

17.22 - Function: **Oscillo** (Oscillographic Recording)

Status	→ Enab.	No	[No / Yes]
Options	→ Trig	Trip	[Start / Trip / OnCmd / REUserLg / FEUserLg]
Timers	→ tPre	0.5	s (0.01÷2) step 0.01
	→ tPost	0.5	s (0.01÷8) step 0.01

17.22.1 - Description of variables

Enab.	: Function enabling (No = Disable / Yes = Enable)
Trig	: Selection of the Trigger command source (start recording):
Start	= Trigger on time start of protection functions
Trip	= Trigger on trip (time delay end) of protection functions
OnCmd	= On Asynchronous Force trigger command
REUserLg	= On rising edge of "User Logic" (see § "User Trigger Oscillo")
FEUserLg	= On falling edge of "User Logic"
tPre	: Recording time before Trigger
tPost	: Recording time after Trigger

17.22.2 - Operation

In the options: "Trig = Start" and "Trig = Trip", the oscillographic recording starts respectively when any protection function starts operating or trip.

The "Oscillo" Function includes the oscillographic recorder of input quantities able to store up to 10 seconds for each record.

The number of events recorded depends on the duration of each individual recording (tPre + tPost).

In any case the number of events stored cannot exceed 40 (40 x 1 sec).

Any new event exciting the memory capability, cancels and overwrites the former records (FIFO Memory).

Example:

tPre	=	0.5s	=	1s	→	40	Oscillographic recording
tPost	=	0.5s					
tPre	=	2s	=	10s	→	4	Oscillographic recording
tPost	=	8s					



17.22.3 – Available on software

Internal Disk	DskClean		Disk near Full clean operation is required	
	DskFull		Disk Full Write should be lock	
	DskWR		Disk write in progress	
	DskFRMT		Disk Format in progress	
	DskCHK		Check disk in progress	
1U>	1U> t1U>	Alarm Trip	First overvoltage element	
2U>	2U> t2U>	Start Trip	Second overvoltage element	
1U<	1U< t1U<	Start Trip	First undervoltage element	
2U<	2U< t2U<	Start Trip	Second undervoltage element	
1f>	1f> t1f>	Start Trip	First overfrequency element	
2f>	2f> t2f>	Start Trip	Second overfrequency element	
1f<	1f< t1f<	Start Trip	First underfrequency element	
2f<	2f< t2f<	Start Trip	Second underfrequency element	
1Uo>	1Uo> t1Uo>	Start Trip		
2Uo>	2Uo> t2Uo>	Start Trip		
U1<	U1< tU1<	Start Trip		
U2>	U2> tU2>	Start Trip		
1df/dt	1df/dt	Start		
2df/dt	2df/dt	Start		
TCS	tTCS	Start	trip coil supervision	
IRF	IRF tIRF	Start Trip	Internal Relay Failure	
Characteristic	Charat 1		Switch to SetUp Group 1	
	Charat 2		Switch to SetUp Group 2	
	Charat 3		Switch to SetUp Group 3	
	Charat 4		Switch to SetUp Group 4	
C/B	manOpCmd		Manual Open Command	
	CL-Cmd		Close Command	
	C/Bfail		Circuit Breaker failure	
	L/Rdisc		Local/Remote signal Discrepancy	
	Gen.Start		Start Generic	
	Gen.Trip		Trip Generic	
	UserTriggerOscillo		User Variable for Oscillographic Recording	
	UserVar<0>			
	to		User Variable	
	UserVar<24>			
	Vcc		Reserved	
	Gnd		Reserved	
	ResLog		Reset signal logic	
	P1			
	to		Push-button	
	P6			
	0.D1		Digital Input "0.D1"	activated
	0.D1Not		Digital Input "0.D1"	deactivated
	to			
	0.D8		Digital Input "0.D8"	activated
	0.D8Not		Digital Input "0.D8"	deactivated
Digital Inputs				

17.22.4 – Setting "User Trigger Oscillo"

The "User trigger Oscillo" is a result of a logical operation (Or, AND, ecc...), it can be used like other logical output. This operation is possible only via software.

Name	User descr.	Linked functions	OpLogic	Timer	Timertype	Extra	Logical status
------	-------------	------------------	---------	-------	-----------	-------	----------------

17.22.4.1 - Name

Internal name

17.22.4.2 - User descr.

Fixed

17.22.4.3 - Linked functions

Selection functions

17.22.4.4 - OpLogic

Operation Logic = [None, OR, AND, XOR, NOR, NAND, NOT, Ff-SR, Counter, Rise-UP, Fall-Down]

17.22.4.5 - Timer

Time delay (0-600)s, step 0.01s

17.22.4.6 - Timer type

<i>Delay</i>	= Add a delay on output activation. The "Timer" is edge triggered on rise edge.
<i>Monostable P</i>	= Activated the output for the time "Timer"
<i>Monostable N</i>	= Disactivated the output for the time "Timer".
<i>Blinking</i>	= The output switches periodically at the frequency defined by "Timer".
<i>Delay-Fall-Down</i>	= Delay-Fall-Down

17.22.4.7 - Extra

Extra Time (0-65000)s, step 1s

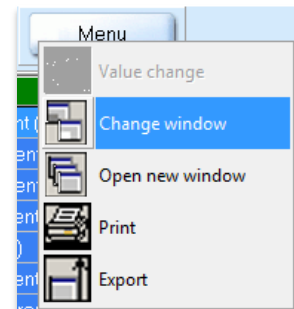
17.22.4.8 - Logical status

"User Trigger Oscillo" Logical status

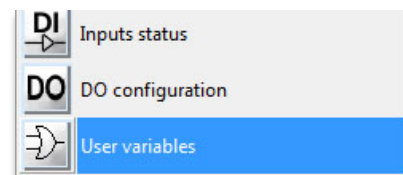
17.22.5 – Example: Setting "Oscillo Trigger Logic"

Open software program and connect to the relay.

Select "Change Windows" from "Menu" button



Select "User Variable"

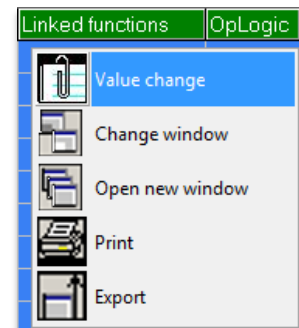


Setting for "User Trigger Oscillo" : "1U>/2U>", "AND", "1", "Monostable", "10".

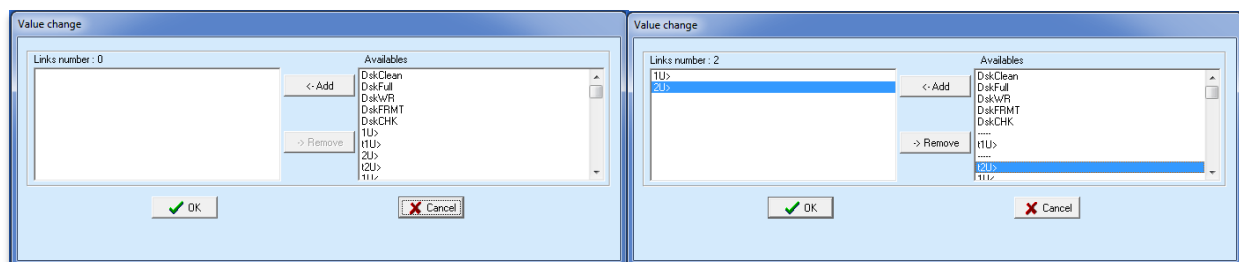
Name	User descr.	Linked functions	OpLogic	Timer	Timer type	Extra	Logical status
UserTrigger Oscillo	OscilloTrigger.logic	1U>.2U>.3U>	AND	1	Monostable P	10	0
UserVar <0>	Gate.1.....		None	0	Delay	0	0

17.22.5.1 – "Linked Functions"

Select "**Linked Functions**" related to "User Trigger Oscillo" and press right button on mouse, select "Value change":

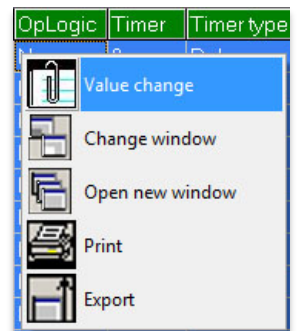


Select "1U>, 2U>" from "Available" box via push-button "<Add", and press "OK".
For remove functions, use push-button ">Remove".

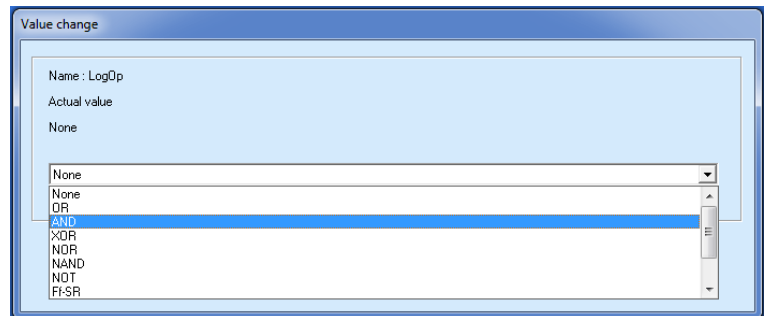


17.22.5.2 – "Operation Logic" (Oplogic)

Select "**Oper Logic**" related to "User Trigger Oscillo" and press right button on mouse, select "Value change":

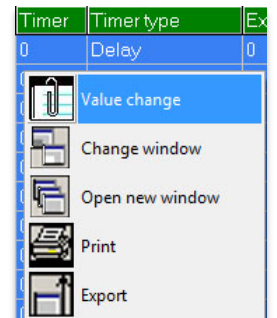


Insert "**AND**" into box and press "OK":

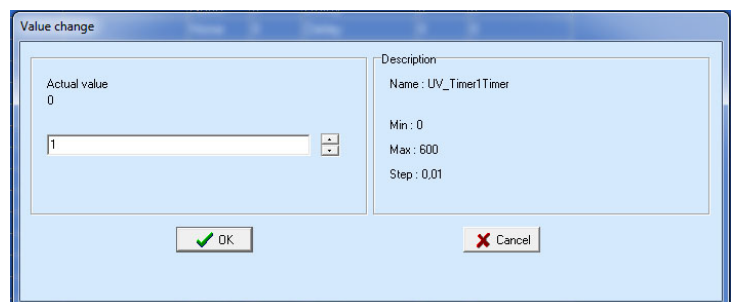


17.22.5.3 – "Timer"

Select "**Timer**" related to "User Trigger Oscillo" and press right button on mouse, select "Value change":

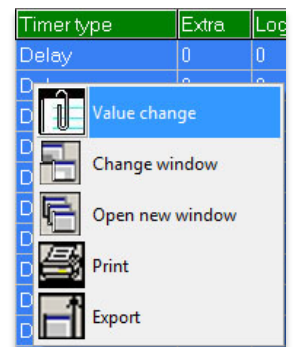


Select "**1**" into box and press "OK":



17.22.5.4 – "Timer type"

Select "**Timer**" related to "User Trigger Oscillo" and press right button on mouse, select "Value change":



Select "**Monostable P**" into box and press "OK":

Value change

Actual value
0

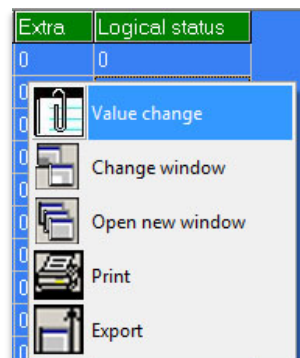
10

Description
Name: UV_Timer21Extra
Min: 0
Max: 65000
Step: 1

OK Cancel

17.22.5.5 – "Extra"

Select "**Extra**" related to "User Trigger Oscillo" and press right button on mouse,



Select "**10**" into box and press "OK":

Value change

Actual value
0

10

Description
Name: UV_Timer21Extra
Min: 0
Max: 65000
Step: 1

OK Cancel

17.23 - Function: **CB Mngn** (Control C/B)

This menu allows to configure the command for C/B operation.

Options	→ L/R	Ignored	[Ignored / Active]			
	→ Key	Enable	[Disable / Enable]			
	→ Key0	None	[None / P1 / P2 / P3 / P4 / P5 / P6]			
	→ KeyC	None	[None / P1 / P2 / P3 / P4 / P5 / P6]			
Timers	→ tL/R	0.05	s	(0.05 ÷ 1)	step	0.05
	→ tC/Bs	0.5	s	(0.05 ÷ 1)	step	0.05

17.23.1 - Description of variables

L/R	: Selection of Local/Remote C/B operation mode Ignored or Active
Key	: Disable = The pushbuttons on Front Panel are disabled; Enable = The pushbuttons on Front Panel are Enable
Key0	: Configure a Key as C/B Open
KeyC	: Configure a Key as C/B Close
tL/R	: Admissible time before detection of the Local/Remote discrepancy alarm.
tC/Bs	: Maximum admissible delay for detection of status signal after C/B operation.

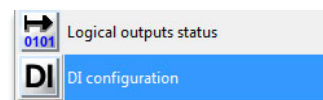
17.23.2 - Push-Buttons (Programmable only via software)

It is possible to program up to six buttons on front of the relay, assigning any action / function.

Example: "**OPEN C/B**" to "**P1**" and "**CLOSE C/B**" to "**P2**".

17.23.2.1 - "DI Configurations" (Digital Inputs)

Select "**DI configuration**":



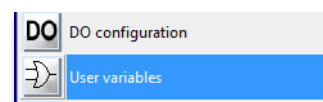
Assign to:

Type	Functions
Main C/B CloseSts	0.D1 digital input
Local State	0.D3 digital input
Remote State	0.D4 digital input

ID	Name	Status	Functions
1	Group 1-2	Gruppo-1 (0)	
2	ExtR (external reset input)	Not active	
3	Local State	ACTIVE	0.D3.
4	Remote State	Not active	0.D4.
5	C/B Open command	Not active	
6	C/B Close command	Not active	
7	Main C/B CloseSts (Main Circuit Breaker CLOSE position status)	Not active	0.D1.

17.23.2.2 – "User Variables"

Select **"User Variable"**:



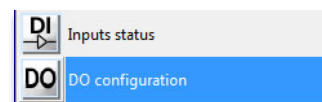
Assign to:

Type	Linked Functions		
UserVar(0)	Gate.1	manOpCmd,Gen.Trip	Manual Open Command, Generic Trip
UserVar(0)	Gate.2	CL-Cmd	Close Command

ID	Name	User descr.	Linked functions	OpLogic	Timer	Timer type	Extra	Logical status
1	UserTrigger Oscillo	OscilloTrigger.logic		None (0)	0	Delay (0)	0	0
2	UserVar <0>	Gate.1	manOpCmd,Gen.Trip.	OR (1)	0	Delay (0)	0	0
3	UserVar <1>	Gate.2	CL-Cmd.	None (0)	0	Delay (0)	0	0
4	UserVar <2>	Gate.3		None (0)	0	Delay (0)	0	0

17.21.2.3 – "DO Configuration"

Select **"DO Configuration"**:



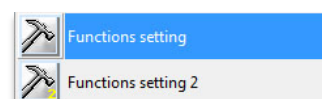
Assign to:

Type	Linked Functions
0.R1	Gate.1
0.R2	Gate.2

ID	Relay	Linked functions	Logical status	Output config	Function	tON	Relay status
1	0.R1 [Master board, R:1]	Gate.1	Off	Normally Denergized	Automatic reset	0.1	Off
2	0.R2 [Master board, R:2]	Gate.2	Off	Normally Denergized	Automatic reset	0.1	Off
3	0.R3 [Master board, R:3]		Off	Normally Denergized	Automatic reset	0.1	Off

17.21.2.4 – "Function Setting"

Select **"Function Setting"**:



Assign to "CB Manage":

Type	Settings
Enable Local/remote	Active
Enable Local Keys	Enable
KeyO	P1
KeyC	P2

CB Manage (Local/Remote C/B management and missed operation diagnostic) ()			
Enable Local/Remote Handler	Attivo (1)		
Enable Local Keys	Abilitati (1)		
KeyO (Configure a key as C/B open)	P1 (1)		
KeyC (Configure a key as C/B close)	P2 (2)		
Local/Remote inconsistent filter Time	0.05	sec	
Time check circuit breaker	0.5	sec	

17.24 - Function: **ExtResCfg** (External Reset Configuration)

This menu allows to select the edge polarity of the signal on the digital input configured to reset the relay after a trip.

The reset input will reset all the output relays configured as manual reset (latched), the signalisation of the trip on the display and the indication of the LED are cleared also.

Options	→ ActOn	RiseEdge
---------	----------------	----------

[RiseEdge / FallEdge]

17.24.1 - Description of variables

ActOn	:	RiseEdge	Active on Rise Edge (Digital Input close).
		FallEdge	Active on Fall Edge (Digital Input open).

18. Input – Output (via software)

The firmware can manage up to 8 digital inputs and 8 output relays.

The interfacing software also allows to program the operation of the output relays (Physical Output), and Digital Inputs.

18.1 – Digital Input

0.D1	Programmable (D1)
0.D2	Programmable (D2)
0.D3	Programmable (D3)
0.D4	Programmable (D4)
0.D5	Programmable (D5)
0.D6	Programmable (D6)
0.D7	Programmable (D7)
0.D8	Programmable (D8)

Any digital input is active when the relevant terminals (see wiring diagram) are shorted.

18.2 – "DI" Configuration (via software)

Any of the Digital Inputs can be programmed to control one or more of the following functions.

For each Protection Function it is possible to activate a Blocking Logic allowing for inhibiting their operation by external signals supplied to the Digital Input.

ExtR	External Reset input
Local state	Locate state
Remote state	Remote state
C/B open command	Open C/B Command
C/B close command	Close C/B Command
Main C/B CloseSts	Main Circuit Breaker CLOSE position status
Bi1U>	Blocking input
Bi2U>	Blocking input
Bi1U<	Blocking input
Bi2U<	Blocking input
Bi1F>	Blocking input
Bi2F>	Blocking input
Bi1F<	Blocking input
Bi2F<	Blocking input
Bi1Uo>	Blocking input
Bi2Uo>	Blocking input
BiU1<	Blocking input
BiU2>	Blocking input
Bi1df/dt	Blocking input
Bi2df/dt	Blocking input
Group 1	Selection of the setting Group 1
Group 2	Selection of the setting Group 2
Group 3	Selection of the setting Group 3
Group 4	Selection of the setting Group 4

18.2.1 – Example

ID	Name	Status	Functions
----	------	--------	-----------

18.2.2 – Name

Logical Input name

18.2.3 – Status

Logical Input status

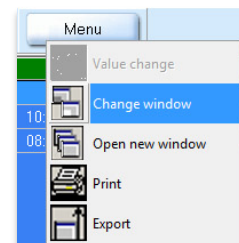
18.2.4 – Functions

Selection function

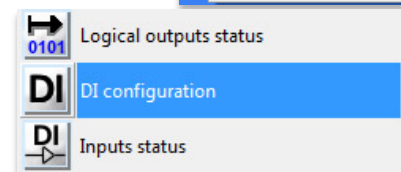
18.2.5 – Example: Setting "Digital Input"

Open software program and connect to the relay.

Select "Change Windows" from "Menu"



Select "DI configuration"

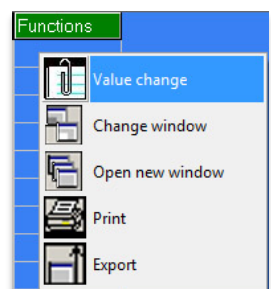


Setting for "**Bi1U>**" : "**1U>**".

ID	Name	Status	Functions
1	Bi1U>	Not active	1U>

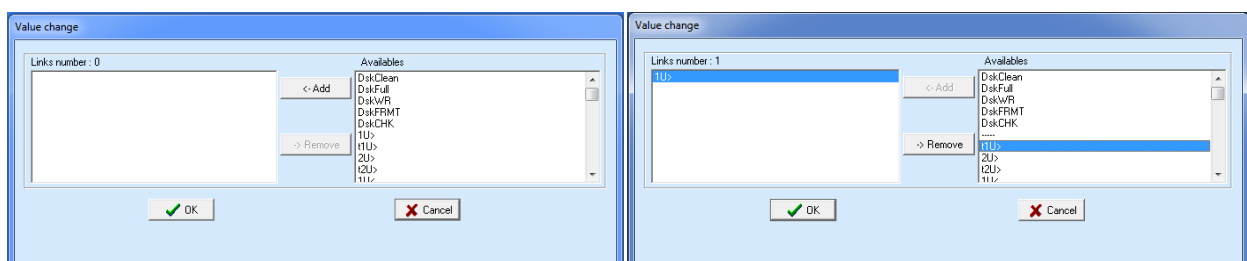
18.2.5.1 – "Functions"

Select "**Functions**" related to "**BiR1U>**" and press right button on mouse, select "Value change":



From box "Available", select "**1U>**" and press "Add".

Press "OK" for confirmation. (if Password is request, see § Password)



18.3 – Physical Outputs

The output relay are fully user programmable and controlled by any protection functions and by any digital inputs.

0.R1	Programmable (R1)
0.R2	Programmable (R2)
0.R3	Programmable (R3)
0.R4	Programmable (R4)
0.R5	Programmable (R5)
0.R6	Programmable (R6)
0.R7	Programmable (R7)
0.R8	Programmable (R8)

Available in the relay

18.4 - "DO" Configuration

Any Output Relay can be programmed to be controlled (energized) by one or more of the following functions or Digital Inputs:

18.4.1 - Example configuration

ID	Relay	Linked functions	Logical status	Output config	Function	tON	Relay status
1	0.R1 [Master board, R.1]	Gate 1.	Off	Normally Dennergized	Automatic reset	0,1	Off
2	0.R2 [Master board, R.2]	Gate 2.	Off	Normally Dennergized	Automatic reset	0,1	Off

18.4.1.1 - Relay

Relay internal name

18.4.1.2 - Linked function

It's available only 1 link, select the function for tripping the output relay (for multiple association use "User Variable")

18.4.1.3 - Operation Logic

Not Used

18.4.1.4 - Logical Status

Relay Logical status

18.4.1.5 - Output Configuration

Normally Dennergized	The output relay is dennergized in normal conditions and gets energized on activation of the controlling Functional Output; reset means dennergizing.
Normally Energized	The output relay is energized in normal conditions and gets dennergized on activation of the controlling Functional Output; reset means energizing.

18.4.1.6 - tON (Operation Time)

This timer controls the duration of the activation of the output relay.

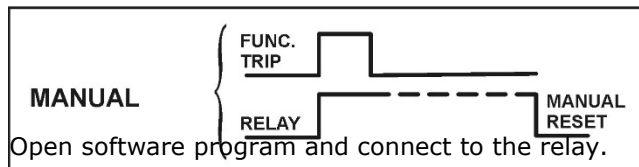
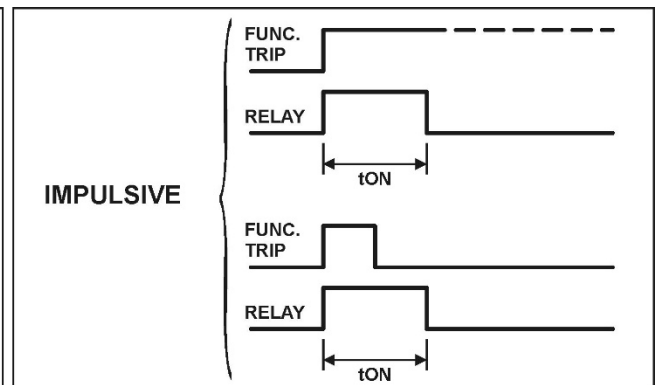
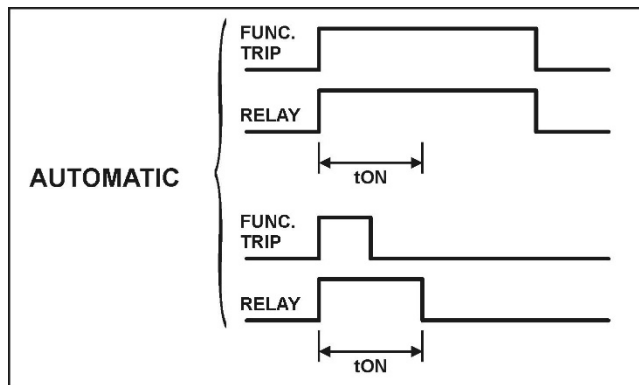
tON : 0 (0.01-10)s, step 0.01s

18.4.1.7 - Relay Status

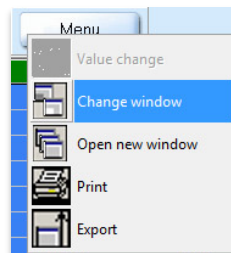
Relay – Physical status

18.4.2 - Functions - Operation Mode

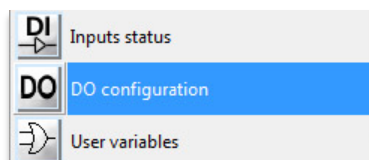
- Automatic** : In this mode the output relay is "operated" (energized if "N.D.", deenergized if "N.E.") when the controlling Functional Output is activated and it is reset to the "non operated" condition when the Functional Output gets deactivated but, anyhow, not before the time "tON" has elapsed (minimum duration of the operation time)
- Manual** : In this mode the output relay is "operated" when the controlling Functional Output is activated and remains in the operated condition until a manual reset command is issued by the relay keyboard (local commands menu) or via the serial communication. In this mode the timer "tON" has no effect.
- Impulsive** : In this mode the output relay is "operated" when the controlling Functional Output is activated, and it remains in the "operated" condition (energized if "N.D.", deenergized if "N.E.") for the set time "tON" independently from the status of the controlling Functional Output.



Select "Change Windows" from "Menu"



Select "DO Configuration"



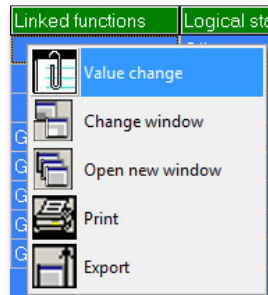
18.4.2.1 - Example: Change settings for "0.R1"

Change settings for "0.R1" : "1U>", "Normally Denergized", "Automatic reset", "0.5".

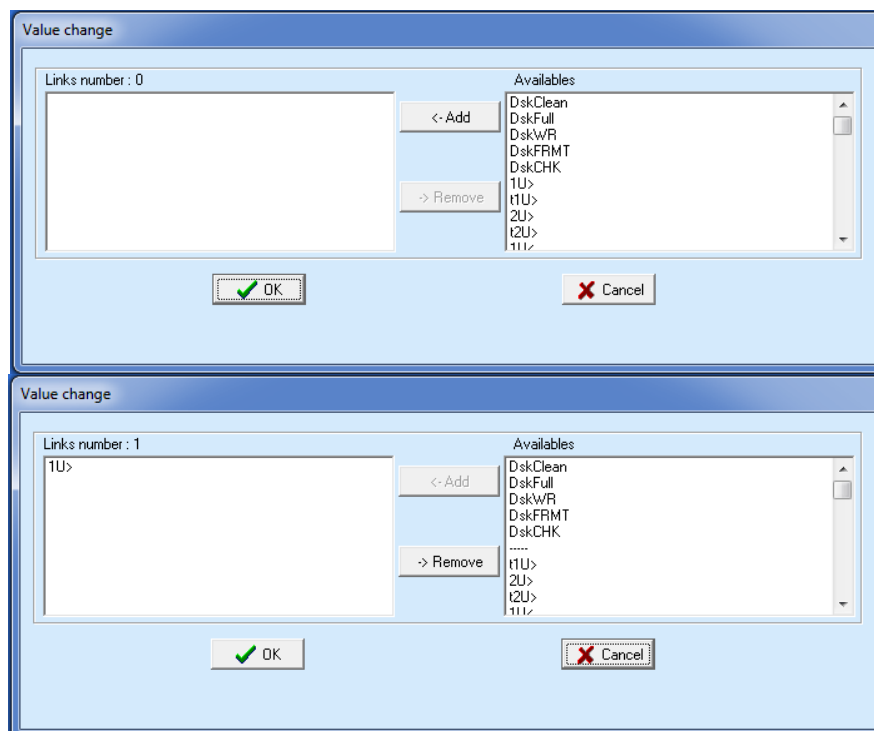
ID	Relay	Linked functions	Logical status	Output config	Function	tON	Relay status
1	0.R1 [Master board, R:1]	1U>	Off	Normally Denergized	Automatic reset	0.5	Off
2	0.R2 [Master board, R:2]		Off	Normally Denergized	Pulse	0.01	Off

18.4.2.2 - "Linked Functions"

Select "**Linked Functions**" related to 0.R1 and press right button on mouse, select "Value change":

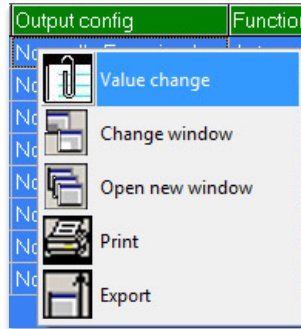


From box "Available", select "1U>" and press "Add".
Press "OK" for confirmation. (if Password is request, see § Password)

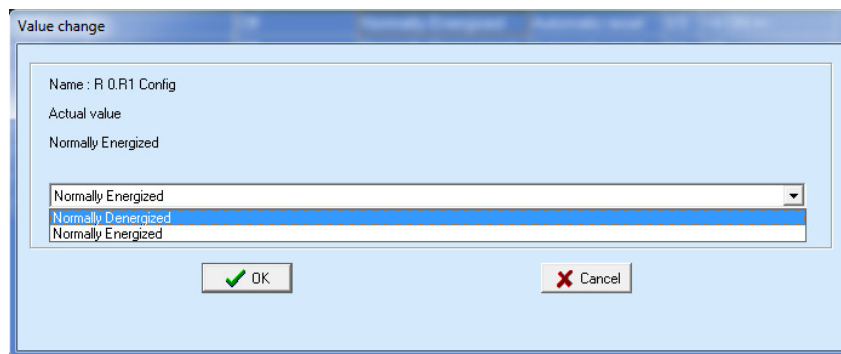


18.4.2.3 - "Output Config"

Select "**Output Config**" related to "0.R1" and press right button on mouse, select "Value change":

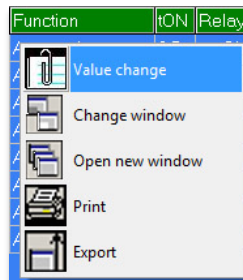


Select "**Normally Denegized**" from combo box and press "OK"
(if Password is request, see § Password)

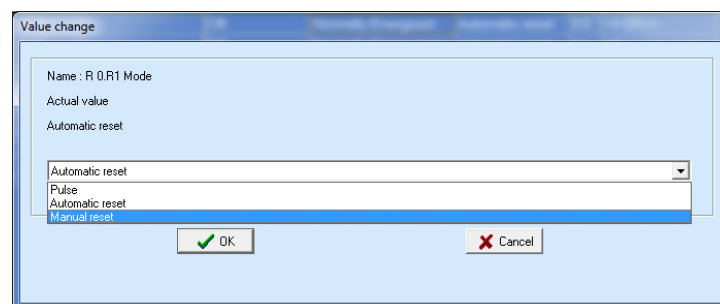


18.4.2.4 - "Function"

Select "**Function**" related to "0.R1" and press right button on mouse, select "Value change":

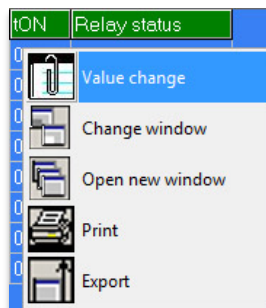


Select "**Manual reset**" from combo box and press "OK"
(if Password is request, see § Password):

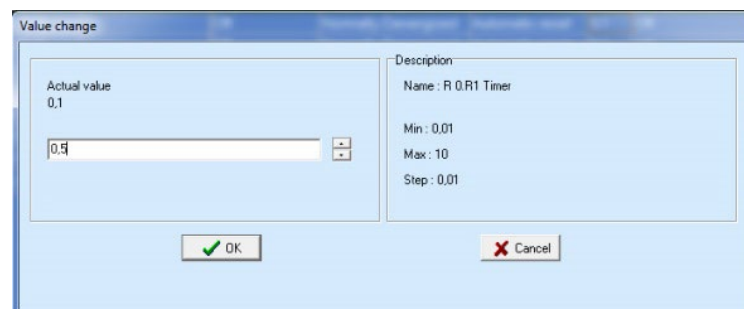


18.4.2.5 - "tON"

Select "**tON**" related to "0.R1" and press right button on mouse, select "Value change":



Set "**0.5**" and press "OK" (if Password is request, see § Password):



19. InfoStatus

In this menu is shown the status of relay. To configure Local/Remote see § CB Mngn and Digital input (Local state and Remote state); the configuration is possible only via software.

Options → *LocR* Disable

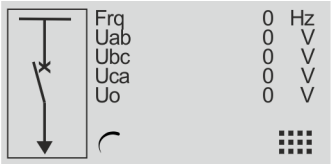
19.1 - Description of variables

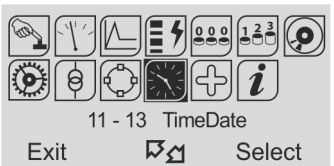
<i>LocR</i>	:	<i>Disable</i>	Local/Remote handler not configured
		<i>Local</i>	Local state detected
		<i>Remote</i>	Remote state detected
		<i>Discrepancy</i>	Local/Remote inputs discrepancy detected

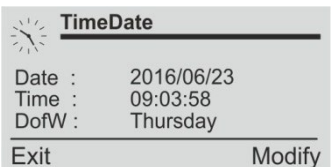
20. Date and Time

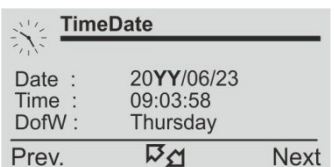
In this menu it is possible to configure the Date and Time

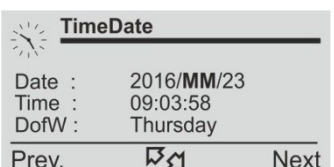
Date:	20YY / MM / DD	(2000/01/01 ÷ 2099/12/31) YY = Year / MM = Month / DD = Day
Time:	HH : MM : 00	HH = hour / MM = Minutes / 00
DofW:	Day	Es: Wednesday

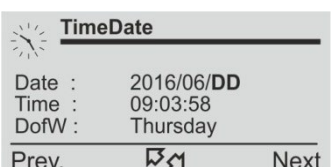
- 

 - Press "**Menu**" for access to the main menu with icons.
- 

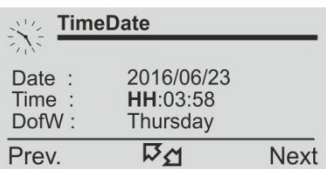
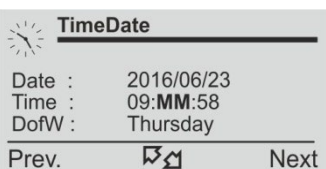
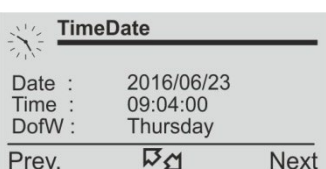
 - Select icon "**TimeDate**" by pushbuttons "**Increase**" or "**Decrease**".
 - Press "**Select**".
- 

 - Press "**Modify**".
- 

 - The last two figures of the Year will appear in bold character; by pushbuttons "**Increase**" or "**Decrease**" set the new figures.
 - Press "**Next**" to go to the next setting.
- 

 - As above for changing the "Month"
 - Press "**Next**" to go to the next setting.
- 

 - As above for changing the "Day"
 - Press "**Next**" to go to the next setting.

- 7 
 - As above for changing the "Hours"
 - Press "**Next**" to go to the next setting.
- 8 
 - As above for changing the "Minutes"
 - Press "**Next**" to go to the next setting.
- 9 
 - The **Day of the Week** is calculated and displayed automatically.
 - Press "**Exit**" to go back to the main menu.
 - Press "**Modify**" to go back to the step "3"



Press the button "**Next**" to go back to the previous display.

20.1- Clock synchronization

The internal clock has 1ms resolution and a stability of $\pm 35\text{ppm}$ in the operational temperature range.

It can be synchronized with an external time reference in the following ways:

- ☐ Using the standard "Time Synchronization" procedure of the "IEC870-5-103" protocol.
- ☐ Using the software or from the DCS with the Modbus RTU protocol.

22. Healthy (Diagnostic Information)

The relay operates a continuous checking of the vital functionalities and in case an internal failure is detected, the I.R.F. function (see § I.R.F.) is activated and the Power/IRF led is set to flashing.

<i>Device</i>	→	<i>No Fail</i>	→	No Fail
		<i>Fail</i>	→	Fail present
		<i>MinorFail</i>	→	Minor Fail
		<i>HistoricalFail</i>	→	Cleared Fail
		<i>IAU FW notC</i>	→	Firmware MPUs not compatible

<i>Boards</i>	→	<i>Int.Ram</i>	→	Internal RAM fault
		<i>SCI 1</i>	→	Serial comm. Controller 1
		<i>SCI 2</i>	→	Serial comm. Controller 2
		<i>SDRAM</i>	→	SDRAM fault
		<i>Keys</i>	→	Keyboard failure
		<i>TK stop/fail</i>	→	Time Keeper to sync or stopped/failure
		<i>E2pCorrupt</i>	→	E2P Corrupt
		<i>SRAM</i>	→	SRAM Corrupt
		<i>Code Corrupt</i>	→	Code Corrupt
		<i>Data Corrupt</i>	→	Data Corrupt
		<i>SPI</i>	→	Serial peripheral interface
		<i>IIC</i>	→	I2C bus failure

If an internal self-clearing (transient) fault is detected, it is recorded into an historical file without any other action.

23. Dev.Info (Relay Version)

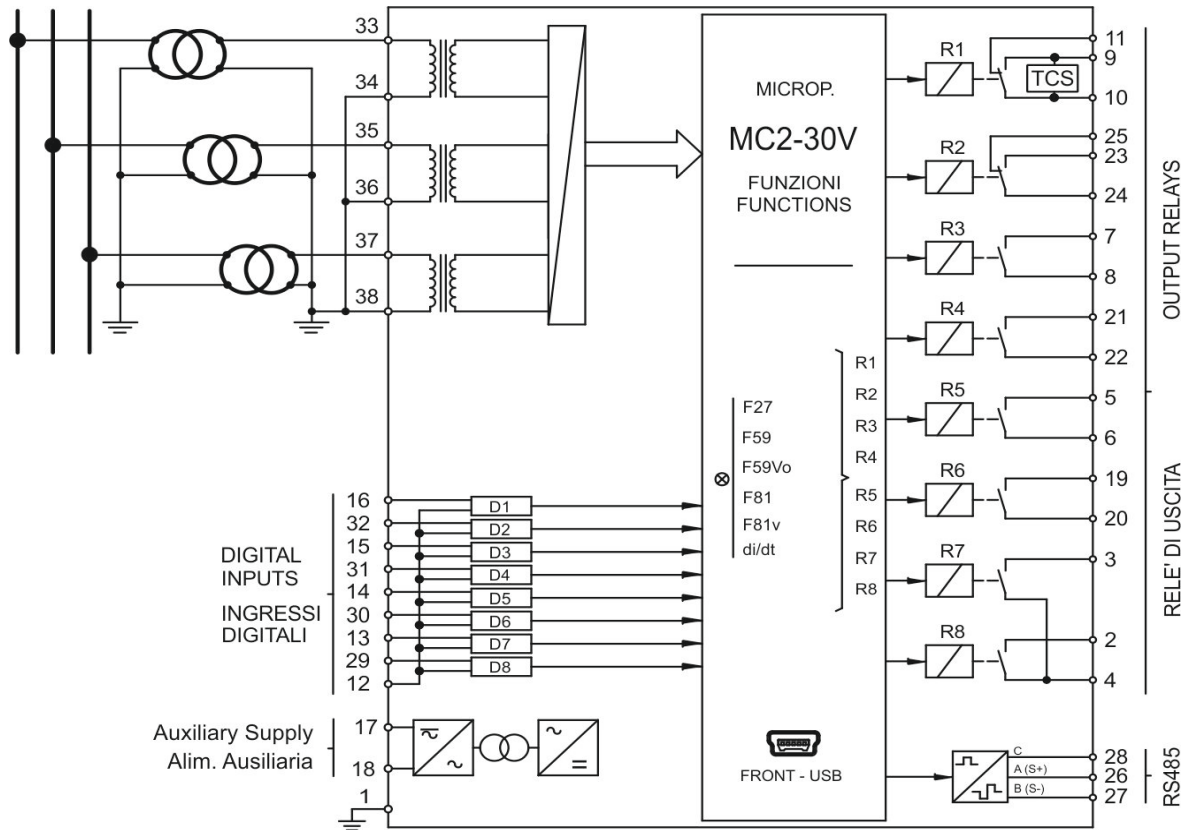
In this menu it is possible to read the information relevant to relay unit.

<i>SW Version</i>	<i>IPU-R</i>	→	####.##.##.##	Firmware version
<i>Protect.Model</i>		→	xxxxxx	Protection Type
<i>Serial Number</i>		→	###/##/##/####	Relay Serial Number
<i>User Tag</i>		→	xxxxxxx	Relay identification label. This information can only be modified by the interface program software and allows the user to give to the relay any suitable denomination.
<i>Build</i>		→	#####	Build identification label.
<i>Line</i>		→	#####	Line identification label.

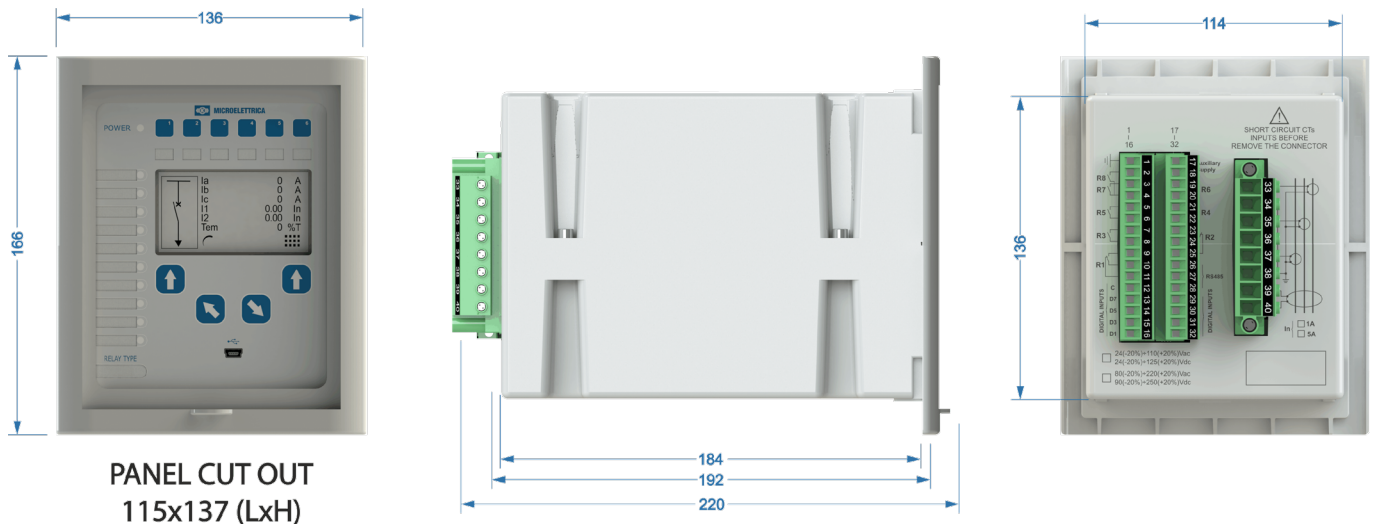
24. Maintenance

No maintenance is required. In case of malfunctioning please contact Service or the local Authorized Dealer mentioning the relay's Serial No reported in the label on relays enclosure.

25. Wiring Diagram



26. Overall Dimensions



27. Electrical Characteristics

Approval: Ce	IEC 60255 - CE DIRECTIVE - EN/IEC61000 - IEEE C37		
Reference Standards			
Dielectric test voltage	IEC 60255-5	2kV, 50/60Hz, 1 min.	
Impulse test voltage	IEC 60255-5	5kV (c.m.), 2kV (d.m.) – 1,2/50µs	
Insulation resistance	> 100MΩ		

Environmental Std. Ref. (IEC 60068)			
Operation ambient temperature	-10°C / +55°C		
Storage temperature	-25°C / +70°C		
Environmental testing	(Cold)	IEC60068-2-1	
	(Dry heat)	IEC60068-2-2	
	(Change of temperature)	IEC60068-2-14	
	(Damp heat, steady state)	IEC60068-2-78	RH 93% Without Condensing AT 40°C

CE EMC Compatibility (EN61000-6-2 - EN61000-6-4 - EN50263)				
Electromagnetic emission	EN55011	industrial environment		
Radiated electromagnetic field immunity test	IEC61000-4-3	level 3	80-2000MHz	10V/m
	ENV50204		900MHz/200Hz	10V/m
Conducted disturbances immunity test	IEC61000-4-6	level 3	0.15-80MHz	10V
Electrostatic discharge test	IEC61000-4-2	level 3	6kV contact / 8kV air	
Power frequency magnetic test	IEC61000-4-8		1000A/m	50/60Hz
Pulse magnetic field	IEC61000-4-9		1000A/m, 8/20µs	
Damped oscillatory magnetic field	IEC61000-4-10		100A/m, 0.1-1MHz	
Immunity to conducted common mode disturbance 0Hz-150KHz	IEC61000-4-16	level 4		
Electrical fast transient/burst	IEC61000-4-4	level 3	2kV, 5kHz	
HF disturbance test with damped oscillatory wave (1MHz burst test)	IEC60255-22-1	class 3	400pps, 2,5kV (m.c.), 1kV (d.m.)	
Oscillatory waves (Ring waves)	IEC61000-4-12	level 4	4kV(c.m.), 2kV(d.m.)	
Surge immunity test	IEC61000-4-5	level 4	2kV(c.m.), 1kV(d.m.)	
Voltage interruptions	IEC60255-4-11			
Resistance to vibration and shocks	IEC60255-21-1 - IEC60255-21-2	10-500Hz	1g	

Characteristics	
Accuracy at reference value of influencing factors	1% Un for measure 2% + to (to=20÷30ms@ 2xVs) for times
Rated Voltage	100 ÷ 125V
Voltage Overload	2 Vn continuous
Burden on voltage inputs	0.1VA at Vn
Average power supply consumption	< 7 VA
Output relays	rating 6 A; Vn = 250 V A.C. resistive switching = 1500W (400V max) make = 30 A (peak) 0,5 sec. break = 0.3 A, 110 Vcc, L/R = 40 ms (100.000 op.)

Communication Parameter	
Rear serial port (Terminal Blocks)	RS485 – 9600 to 38400 bps – 8,n,1 – Modbus RTU – IEC60870-5-103
Front serial port (USB)	RS232(virtual) – 9600 to 57600 bps – 8,n,1 – Modbus RTU

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Microelettrica Scientifica S.p.A.

20090 Buccinasco (MI) · Via Lucania 2 · Italy · Tel.: +39 02 575731
E-Mail: info@microelettrica.com · www.microelettrica.com