ThySetter

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



TABLE OF CONTENTS

ThySetter	3
Preface	3
Installation	3
Working with ThySetter	4
On line mode	4
Offline mode	8
Drop down menu	8
Menu	10
Read	10
Read \ Serial number	10
Read \ Info	10
Read \ Clock	11
Read \ Measures	11
Read \ Active profile	15
Read \ Protections	15
Read \ PLC	16
Read \ Circuit breaker supervision	17
Read \ Delayed inputs	17
Read \ Internal states	18
Read \ Relays	18
Read \ Counters	19
Read \ Self-test	20
Read \ Pilot wire diagnostic	20
Read \ Selective block - BLOCK2	20
Read \ Fault recording	21
Read \ Event recording	22
Set	22
Set \ Base	23
Set \ Inputs	23
Set \ Relays	23
Set \ LEDs	23
Set \ Self-test Relay	23
Set \ MMI	23
Set \ Profile selection	23
Set \ Profile A	24
Set \ Profile B	26
Set \ PLC	26
Set \ Circuit breaker supervision	27
Set \ VI supervision - 74VT	28
Set \ CI supervision - 74CT	29
Set \ Kemote tripping	29
Set \ Pilot wire diagnostic	29
Set \ Demand measures	
Uscillography	
Communication	
Commands	
Firmware upgrade	35
Expansion modules	
PLU (Programmable Logic Controller)	

ThySetter



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

File Co	ommunica	tion Proced	lures Upg	rade Optional	Functions Prefe	erence Help)	
	6				9 🔞 💿 d			2
- 🗋 🛛	evices				Description	Value	Um	State

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 \bigcirc 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.

Procedure	
	Serial Automatic
	Network Reading settings
Device Family	Serial configuration
O ENEL	Serial Port COM1
⊖ NTG	
PRON	Configure
	Network configuration
	Network Address 200.1.2.228
	Configure
	0%
	56%

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

Salva in: Documenti		
🗂 Adobe Scripts	📑 My eBooks	🗋 1SBC140152C0201.pdf
AdobeStockPhotos	📑 My Pictures	Default.rdp
🚞 eBook personali	🚞 Snaglt Catalog	🗋 FOTO.nri
📑 Forme personalizzate	📑 Template	NA60-CA0-c_0
📑 Immagini	📑 TT Installer Logs	NA60-CB0-c_0
📑 Links	🚍 Updater	NA90-CB0-c_0
🗂 Musica	🗂 Updater5	SME2
NA60-CA0-c_	0	
[ipo file: Tutti i file		

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.

File Comn	nunication Proce	dures Upgra	nde Optiona	Functions Preference Help	
000		6		8 🕘 😕 🍐 🖉 🍇 🕅	3 0 2
🕈 🌑 Disp	ositivi IA90-CB0-c_0			Description	Val Um State
NA90 C00	NA90-CB0-c 0	Online	Level 1	Programming state: Close	

The communication session may be closed by means the $\it Communication->Close$ command or with a click of the $\textcircled{\sc lick}$ 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 S 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.

Procedure	
	Serial Automatic
	Reading settings
Device Family	Serial configuration
O ENEL	Serial Port
O NTG	
PRON	Configure
() SIF	
	Network configuration
	Network Address 200.1.2.228
	Configure
	0%
	0%

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.

Download data			
	Port configura		
	Download		
	File	ti	- A 🔂 📹 🐯 🚝
	Exit	CT Musica	
0%			Updater D
		My Pictures	1SBC140152C0201.pdf
	Forme personalizzati	e 📑 Snagit Catalog	Default.rdp
_	mmagini	📑 Template	FOTO.nri
	inks	TT Installer Logs	NA60-CA0-c_0
Download data			•
	Derte		1
	Porto	configura	
	Do	wnload	
		File	Apri Annulla
		Exit	
	i ≝ TCP/IP par	ameters	
	Base settin	gs Modbus Timeouts	Procedures
	IP Addres	s 200.1.2.228	
	Tcp Port	502 -	
	Clear	ARP cache	
Download date			
			OK Cancel
	Port	configura	
	D	ownload	
		FI Download data	
		Ð	
		_	Port configura
	0%	—	Download
L		—	Filo
		-	File
			Exit
			11%
	Choose on	e	
		Confirm New data	-
	G	onfirm New data	
	L	eave Old Data	
		1.1.1	

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 S 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).

Salva <u>i</u> n: 🗂 Desktop	
🗂 Documenti	archivio
📑 Risorse del computer	🚍 C
📑 Risorse di rete	🚞 Collegamenti desktop inuti
(X)	Curve Matlab
07-2008	📑 D
📑 aprile	🗂 deploy-prezzi
lome file: Rokerduck	
Tipo file: Tutti i file	

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 **s** 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

ne communication Procedures opyra	de Optional Functions	Preference H Se	ssion level
		Session Lev	
	Description	🗆 Enable Log	Evel 0 (Normal user)
📕 🗃 NA90-СВ0-с_123456		Color Prefer	C Level 1
		Look And Fe	C Level 2
		Language Toolbar	C Level 3 (Manufacturer)
	8		

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

TO ask for reclinical support it is advisable to s

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]

Image: State Sta
Password corrente
Nuova Password
Verifica
OK Canc

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

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.

Communication Procedures Upgra	de C	option	al Fu	nction	is Pi	refer	ence	Hel	р				
ビ 🖬 💿 🔍 💋 🍏		θ	0		9	6			T			0	
NA90-CB0-c_123456 Age and the second seco				E	lescri	ption			V	alue	Um	Sta	te

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

File Communication Procedures U	pgi	ade Optional Functio	ns Preferer	ice Help																																									
🗋 🚰 🖬 💿 🔍 💋		1 0 0	94	a 🛓 🗊	1	0																																							
🔶 🔄 Clock 🖉	•	Description	Parameter	Value	Um	State																																							
🕈 🔄 Measures	10101	Frequency	f			Updated																																							
	0.020	Value		0.000	Hz	Updated																																							
- Calculated	- 0.03	L1 Phase current	IL1			Updated																																							
🗠 🚉 Sequence	0.000	Value		0.000	In	Updated																																							
Power				sociologica (200000000	Second Contractor	sources of	A COLORADO COLORADO	Nonananana.	Neverence	ananananananananananananananananananan		verenenene.		Second Contractor	Verenevere	antinanana a	annanananan Annananan	oononononon	ana ana ana ana		L1 Phase voltage	UL1			Updated																			
r 🔄 3rd harmonic																									0.000	Success Success	Conces -	onono.	00000	00000	0.000	Sicher State	0.000	0.000	A CONTRACT	Value		0.000	En	Updated					
🔶 🚞 4th harmonic	0.03	L2 Phase current	IL2			Updated																																							
- Sth harmonic	-		Value		0.000	In	Updated																																						
🗢 🔄 Demand power			L2 Phase voltage	UL2			Updated																																						
- Energy						0.000000000000000																																	000000000000000000000000000000000000000	Value		0.000	En	Updated	
- Car Active profile																																								Sectors.	Susansan	L3 Phase current	IL3		
🗣 🚰 PLC																																							Value		0.000	In	Updated		
Circuit Breaker super		L3 Phase voltage	UL3			Updated																																							
- California states	0.00	Value		0.000	En	Updated																																							
🕶 🚞 Relays	0.000	Residual current IE1	IE1			Updated																																							
► I Partial counters ► Intel counters	0.050	Value		0.000	IE1n	Updated																																							
⊷ 🔄 Self-test	1000	Residual current IE2	IE2			Updated																																							
👇 🔄 Pilot wire diagnostic 💽	•	Value		0.000	IE2n	Lindated																																							

Calculated

File (Comm	unicat	ion I	Procedu	ires	Upg	rade (Option	al Fur	ction	s Pr	efere	ence	Help)			
0	6	i 🔒			6	0		0	0		9	6				1 2	0	
	0	- 🔄 Ir	nfo					1	Dr	escrip	tion	_		P	arameter	Value	Um	State
	0	- 🔁 C	lock				Thern	nal ima	age					D	Theta	uru		Updated
	9	- 🤜 M	leasu	res			Value									0.000	DThetaB	Updated
		0		culated			Phase	L 1 to	phas	el2v	oltage	2		U	12			Updated
		0-	Dis	placem	ent		Value									0.000	Un	Undater
		0	Sei	quence			Dhase	12 to	nhas	0134	oltan			II	23	0.000	011	Undated
		0	2 Po	ver i harmo	nic		Volue	L2 10	pnas	CLJV	onage	-		0.	23	0.000	Lin	Undated
		0-	3rd	harmor	nic		Phase	1.244	mbas		. It a m				2.4	0.000	OII	Opuater
		0-	4th	harmor	nic		Phase	Loto	pnas	eliv	onage	•		0.	51	0.000	1 Jac	Opdated
		2	3 5th	harmor mand pl	110		value									0.000	Un	Updated
		0-6	Dei	mand p	ower		Calcu	ated r	esidu	al volt	age			U	EC			Update
		0-	🖹 Ene	ergy			Value									0.000	UECn	Updated
	0	A 🛄	ctive p	profile			Calcul	ated r	esidu	al cur	rent			IE	с			Updated
			notect PLC	ions			Value									0.000	In	Updated
	0	- 🔄 c	ircuit	Breaker	supe	r	Maxin	num ci	urrent	betw	een II	.1-IL	2-1L3	IL	max			Updated
	0	0)elaye	d inputs		=	Value									0.000	In	Updated
	2		nterna	l states			Minim	um cu	irrent	betwo	en IL	1-1L2	2-IL3	IL	min			Updated
	0		artial	counter	s		Value									0.000	In	Updated
	0	т 🔁 т	otal c	ounters			Avera	ae cur	rent l	etwe	en IL 1	-11.2-	-IL3	H.				Updated
	0	- 🔄 S	elf-tes	st			Value									0.000	In	Undater
			'llot Wi Selecti	ire diagr ve block	- BLC		Mavin		ottano	hotw	oonU	ы	1211	3 11	may	0.000	10	Undated
	0	- 🔄 Ir	nterna	l selecti	ve blo	d	Value	itanii ve	onage	Detw	cen u	0	LZ-OL	0	Linax	0.000	En	Lindator
	0	- 🔁 F	aults	recordin	g		value		tomo t		an III	4.1.0	2111.2			0.000	-11	Undet
	-	Sot	vents	recordir	ng		Avera	ge von	tage f	etwe	en UL	I-UL	2-0L3	U	-	0.000	E.c.	opuated
	-	Oscil	llogra	phy			value									0.000	En	Opdated
	0- 0	Com	muni	ation			Maxin	num ve	ortage	betw	een U	12-0	123-03	1 0	max			Updated
	2	Com	mand	S			Value									0.000	Un	Updated
	-	l Test Start	/End ≤	ettings		-	Avera	ge vol	tage k	etwe	en U1	2-U2	3-U31	U				Updated
				- mingo	•	1	Value									0.000	Un	Updated

Displacement

File Communication Procedures	Upgr	rade Optional Functions Preference H	elp			
🗋 🚰 🖬 💿 🕥 💋		📓 🕹 🖲 🕘 💁 🎍 🍇		1 2	0	
🔶 🔄 Info	-	Description	Parameter	Value	Um	State
		Displacement angle of IL1 respect to UL1	PhiL1			Updated
- Cal Direct		Value		0	deg	Updated
🗢 🔄 Calculated		Displacement angle of IL2 respect to UL2	PhiL2			Updated
Conversion Conversion		Value		0	deg	Updated
	=	Displacement angle of IL3 respect to UL3	PhiL3			Updated
🗢 🔄 2nd harmonic		Value		0	deg	Updated
2 Sind harmonic		Displacement angle of IL1 respect to U23	Alpha1			Updated
- Sth harmonic		Value		135	deg	Updated
🗢 🚞 Demand phase		Displacement angle of IL2 respect to U31	Alpha2			Updated
- O Demand power		Value		268	deg	Updated
- Chergy Active profile		Displacement angle of IL3 respect to U12	Alpha3			Updated
Protections		Value		356	deg	Updated
Circuit Breaker super		Displacement angle of UEC respect to IE1	PhiEC			Updated
nelaved innute	•	Value		n	den	Lindater

Sequence

File Communication Procedures	Upgrade Optional Functions Preference Help				
		1			
🔶 🔁 Info 📃	Description	Para	Value	Um	State
	Positive sequence current	11			Updated
- Direct	Value		0.000	In	Updated
🗢 🔄 Calculated 🛛 —	Negative sequence current	12			Updated
- Displacement	Value		0.000	In	Updated
- Dever	Negative sequence current/positive sequence current ratio	12/11			Updated
🗢 💁 2nd harmonic	Value		0.000		Updated
Gamma and the second seco	Negative sequence voltage	U2			Updated
401 Harmonic	Value		0.000	En	Undated

Power

e Communication Procedures Upg	rade Optional Functions P	reference	Help		
) 🗳 🖆 🖬 💿 🔍 🥔 🍏	📓 🕹 🔁 🕘 😕	6 @ .	1	3 🛛 🖉	0
🔶 🦳 Info	Description	Parameter	Value	Um	State
🔶 🔄 Clock	Total active power	р			Updated
🕈 🔄 Measures	Value		0.000	Pn	Updated
	Total reactive power	Q			Updated
🗣 🔄 Displacement	Value		0.000	Qn	Updated
e 🔄 Sequence	Total apparent power	S			Updated
Power P	Value		0.000	An	Updated
🗣 🔄 3rd harmonic	Power factor	CosPhi			Updated
🔶 🦳 4th harmonic	Value		0.000		Updated
Sth narmonic Demand phase	I 1 Phase active power	PI 1			Updated
🕶 🔄 Demand power	Value		0.000	Pn	Undated
🔶 🔄 Energy	I 1 Phase reactive nower	01.1	0.000		Undated
Protections	Value		0.000	On	Lindated
PLC	I 1 Dhase nower factor	CoeDhil 1	0.000	Gen	Undated
🔶 🔄 Circuit Breaker supervi	Voluo	COSPINET	0.054		Undated
- Internal states	1 2 Dhace active neuror	01.2	0.034		Undated
🕶 🔄 Relays	Lz Phase active power	PLZ	0.000	De	Undeted
	La Dhace repeting neuron	012	0.000	FIL	Undeted
- Self-test	LZ Phase reactive power	QLZ	0.000	0	Updated
🕶 🔄 Pilot wire diagnostic	value		0.000	Qn	Updated
🔶 🔄 Selective block - BLOC	L2 Phase power factor	CosPhiL2	2404440		Updated
Internal selective block	Value		0.001		Updated
- Currents recording	L3 Phase active power	PL3			Updated
🗢 🚞 Set	Value		0.000	Pn	Updated
Communication	L3 Phase reactive power	QL3			Updated
Commands	Value		0.000	Qn	Updated
🕶 🔄 Test 📃	L3 Phase power factor	CosPhiL3			Updated
🗠 🔄 Start/End settings 📃 💌	Value		0.315		Updated

2nd harmonic



3rd harmonic

le Communication Procedures U	pgrade Optional Functions Preference	e Help			
) 💕 🖆 🖬 💿 💿 💋				1	0
🔶 🔄 Measures 📃	Description	Param	Value	Um	State
🔶 🚰 Direct	L1 Phase 3rd harmonic current	IL1-3rd			Updated
Calculated	Value		0.000	In	Updated
	L2 Phase 3rd harmonic current	IL2-3rd			Updated
🗢 🔄 Power	Value		0.001	In	Updated
2nd harmonic	L3 Phase 3rd harmonic current	IL3-3rd			Updated
- 3 4th harmonic	Value		0.001	In	Updated
🗢 🚞 5th harmonic	Third harmonic of residual current IE1	IE1-3rd			Updated
👇 🔁 Demand phase 👻	Value		0.000	IE1n	Lindatad

4th harmonic and 5th harmonic

And so on.

Demand phase

e communication Procedures up	rade Optional Functions Preference	e Help			
) 🗳 🖬 🗟 🕘 🧔 🍏					0
🛉 🚞 Measures 📃 🔺	Description	Param	Value	Um	State
🔶 🚞 Direct	L1 Phase fixed currents demand	IL 1FIX			Update
Calculated	Value		0.000	In	Update
- Sequence	L2 Phase fixed currents demand	IL2FIX			Update
Power 🛁	Value		0.000	In	Update
2nd harmonic	L3 Phase fixed currents demand	IL3FIX			Update
← 🔄 4th harmonic	Value		0.000	In	Update
🔶 🚞 5th harmonic	L1 Phase rolling currents demand	IL1ROL			Update
- Demand phase	Value		0.000	In	Update
Energy	L2 Phase rolling currents demand	IL2ROL			Update
← 🔄 Active profile	Value		0.000	In	Update
	L3 Phase rolling currents demand	IL3ROL			Update
🗢 🔁 Circuit Breaker supe	Value		0.000	In	Update
← 🔄 Delayed inputs	L1 Phase peak currents demand	IL1MAX			Update
- Relays	Value		0.000	In	Update
🗢 🔄 Partial counters	L2 Phase peak currents demand	IL2MAX			Update
Iotal counters	Value		0.000	In	Update
- Clinicot	L3 Phase peak currents demand	IL3MAX			Update
- Selective block - BLC	Value		0.000	In	Update
- Calinternal selective bio	L1 Phase minimum currents demand	IL 1MIN			Update
🗢 🔄 Events recording	Value		0.000	In	Update
► 🔄 Set	L2 Phase minimum currents demand	IL2MIN			Update
Communication	Value		0.000	In	Update
e 🔄 Commands	L3 Phase minimum currents demand	IL3MIN			Update
🕶 🔄 Test 👻	Value		0.000	In	Update

Demand power

le Communication Procedures Up	grade Optional Functions Preference	e Help			
) 🗳 🖬 🗟 🔍 🧶 (0 0 0 0 0 4	1			0
🔶 🔄 Measures 🗖	Description	Param	Value	Um	State
🗢 🚞 Direct	Fixed active power demand	PFIX			Updated
Calculated	Value		0.000	Pn	Updated
	Fixed reactive power demand	QFIX			Updated
🗣 🔄 Power	Value		0.000	Qn	Updated
- 2nd harmonic	Rolling active power demand	PROL			Updated
- 3rd narmonic	Value		0.000	Pn	Updated
🗢 🔄 5th harmonic 📒	Rolling reactive power demand	QROL			Updated
- Demand phase	Value		0.000	Qn	Updated
	Peack active power demand	PMAX			Updated
🕶 🚞 Active profile	Value		0.000	Pn	Updated
Protections	Peack reactive power demand	QMAX			Updated
🕶 🔄 Circuit Breaker supe	Value		0.000	Qn	Updated
🗢 🔄 Delayed inputs	Minimum active power demand	PMIN			Updated
- Relavs	Value		0.000	Pn	Updated
🗣 🔄 Partial counters	Minimum reactive power demand	QMIN			Updated
🔶 🗢 🔁 Total counters 🖉 💌	Volue		0.000	0.	Undeted

🚹 ThySetter - V3.4.8				_
File Communication Procedures	Up	grade Optional Functions P	reference Hel	p
Measures Direct		Description	Parameter	1
		Value	EAT	0
- 🔄 Displacement		Negative active energy	EA-	
🗠 🔁 Power	_	Value		0
- Card harmonic		Total active energy	EA	
- 🔄 4th harmonic		Value		0

Read \ Active profile

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

.

🚞 5th harmonic

← 🔄 Energy ⊇ Active profile

Protections

NA90-CB0-c_123456

🖄 Demand phase

🖄 Demand power 🖄 Energy



Positive reactive energy

Positive negative energy

Level 1

Total reactive energy

Value

Value

Value

Inline

Read \ Protections

For every protection element, the following information is available:

Start state

4

NA90_C00

Trip state

Energ

- 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

Menu	Param	eter label	Parameter	Value	Measu	ring ur ′
ThySetter - V3.4.8						
le Communication Procedures Upgrade Optional	Functions Pr	reference Help				
) 🗃 🖬 💿 💿 🧔 🔳 😖 (9 9 9	6 4 1 0				r
👇 🔄 Protections	^	De	scription	Parameter	Value Um	State
- Undervoltage - 27		I> Start state		Start I>	OFF	Updated
Phase overcurry of - 50/51		l> Trip state		Trip I>	OFF	Updated
🕶 🔄 Residual overcurrent - 50N(1)/51N(1)		I> Logical block stat	e	BLK1 I>	OFF	Updated
P Residual overcurrent - 50N(2)/51N(2)		I> Input selective blo	ick state from external	BLK2IN I>	OFF	Updated
Residual overcurrent - 50N(Comp)/51 e C Overvoltage - 59	IN(Comp)	I> Internal input sele	ective block state	BLK4IN I>	OFF	Updated
🕶 🔄 Residual overvoltage - 59N		I> Cold Load Pickup	state	CLP I>	OFF	Updated
 Directional phase overcurrent - 67 		I>> Start state		Start I>>	OFF	Updated
Directional earth fault overcurrent - 67	N EST	I>> Trip state		Trip I>>	OFF	Updated
🔶 🔄 Trip circuit supervision - 74TCS	=	I>> Logical block sta	ate	BLK1 I>>	OFF	Updated
P Breaker failure - BF		I>> Input selective b	lock state from external	BLK2IN I>>	OFF	Updated
CT supervision - 74CT		I>> Internal input se	lective block state	BLK4IN I>>	OFF	Updated
🔶 🔄 PLC		I>> Cold Load Picku	p state	CLP I>>	OFF	Updated
 Circuit Breaker supervision Delayed insults 		I>>> Start state		Start I>>>	OFF	Updated
- Internal states		I>>> Trip state		Trip I>>>	OFF	Updated
🕶 🔄 Relays		l>>> Logical block s	tate	BLK1 I>>>	OFF	Updated
Partial counters		I>>> Input selective	block state from external	BLK2IN I>>>	OFF	Updated
- Self-test		I>>> Internal innut s	elective block state	BLK4IN I>>>	OFF	Updated
🗢 🚞 Pilot wire diagnostic		I>>> Cold Load Pick	up state	CLP I>>>	OFF	Updated
Selective block - BLOCK2).				- p - stow

0

State Updated

Updated Updated

Updated Updated

Updated

Updated

Updated

Updated

Updated

Updated

Updated

1 1 2

kWh

kWh

kWh

kvarh

kvarh

kvarh

0

n

0

EQ+

EQ-

EQ

Programming state: Close

Value Um

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.

File Co	mmunication Procedures Upgrade Optional Fund	ction	s Preference Help				
			9 6 8 8 1				
	🔶 🔄 Second Harmonic Restraint - 2ndh-REST		Description	Parameter	Value Urr	State	T
	 Trip circuit supervision - 74TCS 		74TCS Start state	Start 74TCS	OFF	Updated	
	BF BF BF BF Supervision - 74VT	-	74TCS Trip state	Trip 74TCS	OFF	Updated	=
4			74TCS Logical block state	BLK1 74TCS	OFF	Updated	-

Breaker failure - BF

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

ile Con	nmunication Procedures Upgrade Optional Fun	tions Preference Help			
00			0		
	🔶 🔁 Directional earth fault overcurrent - 67N	Description	Parameter	Value U	Jm State
	🔶 🛬 Second Harmonic Restraint - 2ndh-REST	BF internal and external protections state	Trip Int/Ext	OFF	Updated
	←	IBF> Start state	Start IBF>	OFF	Updated
	- T supervision - 74VT	IE1BF> Start state	Start IE1BF>	OFF	Updated
	- CT supervision - 74CT	IE2BF> Start state	Start IE2BF>	OFF	Updated
	Circuit Breaker supervision	BF Start state	Start BF	OFF	Updated
	🗣 🔄 Delayed inputs	BF Trip state	Trip BF	OFF	Updated
_	🔶 🦳 Internal states	BE Logical block state	BLK1 BE	OFF	Undated

Monitoraggio TV - 74VT

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

>		۵	00		1
	Descrizione	Parametro	Valore	Um	Stato
т	Stato blocco in uscita 74VT	Block 74VT	OFF		Aggiornato
	Stato allarme 74VT	Alarm 74VT	OFF		Aggiornato
	Stato blocco logico 74VT	BLK1 74VT	OFF		Aggiornato
		Control Contro Control Control Control Control Control Control Control Control Co	Construction C	Construction C	Image: Constraint of the sector of

CT supervision - 74CT

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

File Communication Procedures U	Jpgrade Optional Fun	ictio	ns Preference Help			
🗋 🚰 🖬 💿 💿 🥔			9 6 8 1	3 🛛 🖉	0	
🔶 🚔 Trip circuit supervi	sion - 74TCS	-	Description	Parameter	Value	Um State
🗢 🚞 Breaker failure - B	F		I* Start state	Start I*	OFF	Updated
T supervision - 7	4VT		S< Trip state	Trip S<	OFF	Updated
	401	-	S< Logical block state	BLK1 S<	OFF	Updated

Read \ PLC

User software

The name, version and compilation date informations are available.

ile Communication Procedures Upgrade Optional Fu	nctio	ns Preference H	elp		
		9 6 8 4		2	
► O Protections		Description	Value	Um	State
PLC		Name	HelloWorld		Updated
🗠 🔄 User software		Version	00.01		Updated
Contraction of the second	_	Compilation date	15/01/2009		Updated

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

File Communication Procedures Upg	ade Optional Functions Preference Help	
🗋 👩 🖬 💿 💿 💋 🎯		0
🔶 🔁 PLC	Description Parameter Val	Um State
🕈 🔁 Circuit Breaker supervisi	CB Open command state CB-Open Cmd OFF	Updated
CB Commands	CB Close command state CB-Close Cmd OFF	Updated
A90_C00 NA90-CB0-c_123456 Onli	Level 1 Programming state: Close	
ThySetter - V3.4.8		
ile Communication Procedures Upg	ade Optional Functions Preference Help	
] 🗳 🖬 🖯 🔍 🧔 🍏		0
🛉 🔄 Circuit Breaker supervisi	🔺 Description Parameter Value Um	State
🗢 🦳 CB Commands	CB State CB-State 2	Undated
		a le state a
CB Position		- passes
A90_C00 NA90-CB0-c_123456 Onli	e Level 1 Programming state: Close	
CB Position Mago_C00 NAgo-CB0-c_123456 Oul	Level 1 Programming state: Close	- Protection
A90_C00 NA90-CB0-c_123456 Onl	Level 1 Programming state: Close	
A90_CO0 NA90-CB0-c_123456 Onl		
A90_C00 NA90-CB0-c_123456 Onli ThySetter - V3.4.8 The Communication Procedures Upgrade Communication Procedures Upgrade	Optional Functions Preference Help Image: Construction of the state of the st	
A90_C00 NA90-CB0-c_123456 Ont	Description Parameter Value	Um State
A90_C00 NA90-CB0-c_123456 Ont	Optional Functions Preference Help Image: Construction of the state Image: Construction of the state Image: Construction of the state Image: Construction of the state Image: Construction of the state Image: Construction of the state	Um State Updated
A90_C00 NA90-CB0-c_123456 Onl ThySetter - V3.4.8 ThySetter - V3.	Description Preference Help Programming state: Close Optional Functions Preference Help Preference Help </td <td>Um State Updated Updated</td>	Um State Updated Updated
A90_C00 NA90-CB0-c_123456 Onl ThySetter - V3.4.8 ThySetter - V3.	Image: Construction of the second	Um State Updated Updated Updated
A90_C00 NA90-CB0-c_123456 Ont	Image: Construction of the second	Um State Updated Updated Updated Updated
A90_C00 NA90-CB0-c_123456 Onl ThySetter - V3.4.8 Recommunication Procedures Upgrade CB Position CB Position	Image: Construction of the second	Um State Updated Updated Updated Updated Updated Updated
A90_C00 NA90-CB0-c_123456 Onl	Image: Construction of the second	Um State Updated Updated Updated Updated Updated n Updated n Updated
A90_C00 NA90-CB0-c_123456 Out	Ie Level 1 Programming state: Close Optional Functions Preference Help Image: State Sta	Um State Updated Updated Updated Updated n Updated n Updated n Updated
A90_C00 NA90-CB0-c_123456 Ont ThySetter - V3.4.8 ThySetter - V3.4.8 Communication Procedures Upgrade C Circuit Breaker supervision C CB Commands C CB	Image: Construction of the second	Um State Updated Updated Updated Updated Updated n Updated n Updated n Updated n Updated
A90_C00 NA90-CB0-c_123456 Ont	Image: Construction of the second	Um State Updated Updated Updated Updated Updated n Updated n Updated n Updated n Updated n Updated updated updated updated updated updated updated updated updated Updated N Updated N Updated N Updated N Updated N Updated N N Updated N N Updated N N Updated N N N Updated N N N N N N N N N N N N N N N N N N N

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 *Ac-tive-OFF* logic.

Read \ Internal states

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

Communication Procedures Upgrade Opt	tional Functions Preference	Help	
	8 3 9 4 4		1 🧭 🚺
O Devices	Description	Value	Um State
	Reset LEDs	OFF	Updated
👇 🔄 Read	Profile selection	OFF	Updated
► 🔄 Info	Fault trigger	OFF	Updated
 Clock Measures Artive profile 	IE/IPh Block2	OFF	Updated
	IPh Block2	OFF	Updated
- C Protections	IE Block2	OFF	Updated
PLC	Block1	OFF	Updated
Circuit Breaker supervision	Tcs1	OFF	Updated
e 🔄 CB Position	Tcs2	OFF	Updated
🖕 🔄 CB Diagnostic	Trip External protections	OFF	Updated
- Internal states	Reset partial counters	OFF	Updated
► 🔄 Relays	Reset CB monitoring data	OFF	Updated
• 🔄 Partial counters	52a	OFF	Updated
Self-test	52b	OFF	Updated
🕶 🔄 Pilot wire diagnostic	Onen CB	OFF	Undater
Selective block - BLOCK2 Selective block - BLOCK2	Close CB	OFF	Undater
Galinternal selective block - BLOCK4 Selective block - BLOCK4	Thermal image presetting	OFF	Undater
- 🔄 Events recording	Remote trin	OFF	Undated
► Set Consillagraphy	MCB VT OPEN	OFF	Lindated
- Schlography	Reset on demand measures	OFF	Undated
🕶 🔄 Commands	Reset on demand measures	OFF	Undeter
• Test	Reserve energy measures	orr	Opuated
🗠 🔜 Start/End settings	/4VI ext.	OFF	Updated

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).

ile Communication Procedures Upgrade Op	otional Functions Preference	Help			
	😝 😑 💿 🧉 🦧		2		
r- 🌑 Devices 📃 🔺	Description	Value Um	n State		
- 🔁 NA90-CB0-c_123456	K1		Updated		
🕈 🔁 Read	State	OFF	Updated		
	Diagnostic	OK	Updated		
🕈 🔁 Clock	К2		Updated		
► S Active profile	State	OFF	Updated		
Protections	Diagnostic	ок	Updated		
PLC	кз		Updated		
CIrcuit Breaker supervision	State	OFF	Updated		
🕶 🔄 CB Position	Diagnostic	ок	Updated		
► CB Diagnostic	К4		Updated		
- Cal Internal states	State	OFF	Updated		
🕶 🔁 Relays	Diagnostic	ок	Updated		
← 🔄 Partial counters	К5		Updated		
	State	OFF	Updated		
- 🔁 Pilot wire diagnostic	Diagnostic	ок	Updated		
Selective block - BLOCK2	К6		Updated		
Faults recording	State	OFF	Updated		
🖕 🔄 Events recording 🚽 👻	Diagnostic	OK	Undated		

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).

Image: Second	Description	Value	Um State
	Description	Value	Um State

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 	09999
• xx Trip partial counter	09999
 xx Block1 partial counter 	09999
 xx Block2 partial counter 	09999
5	
 xx Start total counter 	09999
 xx Trip total counter 	09999
 xx Block1 total counter 	09999

Total counters

•	хх	Start total	counte
•	xx	Trip total o	ounter

- xx Block2 total counter
- 9999 9999 0...9999 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.

le Communication Procedures Upgrade Op	tional Functions Prefere	nce Help		
	0000	2 1		0
🔶 🔄 CB Diagnostic 📃	Description	Parameter	Value	Um State
🗠 🔄 Delayed inputs	I> Start total counter	TotStl>cnt		Updated
 Internal states 	Value		0	Updated
Cartial counters	I> Trip total counter	TotTrl>cnt		Updated
- Total counters	Value		0	Updated
🗢 🚞 27 - Counters	I> Block1 total counter	TotBk1l>cnt		Updated
← 349 - Counters	Value		0	Undated
 ➡ 50/51 - Counters ➡ 3 50N(1)/51N(1) - Counters ➡ 3 50N(2)/51N(2) - Counters 	I> Block2 total counter	TotBk2l>cut		Undater
	Value	TOUDHER CIR	0	Lindator
- 3 50N(Comp)/51N(Comp) - C	value	TetCalls & and	0	Opuated
► S9 - Counters ► S9 - Counters	>> Start total counter	TotSu>>chi		Opdated
►	value		U	Opdated
🗢 🔄 67N - Counters	I>> Trip total counter	TotTrl>>cnt		Updated
► 2 2ndh-REST - Counters	Value		0	Updated
r G 741CS - Counters	I>> Block1 total counter	TotBk1l>>cnt		Updated
► 🔄 74CT - Counters	Value		0	Updated
🖕 🔄 BF - Counters 🔤	I>> Block2 total counter	TotBk2l>>cnt		Updated
Generation of the second	Value		0	Updated
Selective block - BLOCK2	I>>> Start total counter	TotStl>>>cnt		Updated
🗢 🔄 Internal selective block - BLOCK	Value		0	Updated
🔶 🔄 Faults recording	I>>> Trip total counter	TotTrl>>>cnt		Undated
- Contents recording	Value		0	Lindated
🕶 🔄 Oscillography	ISSS Plackt total counts	TotPk1bbbont	0	Undated
🗢 🚞 Communication	Value	TOLDK II>CHL	0	Opuated
← 🔄 Commands	value		U	Opdated
Given a settings	I>>> Block2 total counte	r TotBk2l>>>cnt		Updated
	Value		0	Updated

Read \ Self-test

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

Communication Procedures Upgrade	Optional Functions Preference Help		
		2	
Devices	Description	Value	Um State
🕈 🚘 NA90-СВ0-с_123456	Protection and controls	ON SERVICE	Updated
🕈 🔄 Read	System diagnostic	ок	Updated
	Device diagnostic	ок	Updated
- Clock	Program diagnostic	ок	Updated
Measures	Data-base boot	ОК	Updated
🗣 🔄 Protections	Data-base run-time	ок	Updated
PLC	DSP boot	ок	Updated
Circuit Breaker supervision	DSP run-time	ок	Updated
🗢 🔄 CB Position	Memory boot	ок	Updated
← 🔄 CB Diagnostic	Memory run-time	ок	Updated
- Cal Internal states	Data Bus heavy	ок	Updated
🗢 🚞 Relays	Data Bus minor	ок	Updated
Partial counters	Oscillography run-time	ОК	Updated
Contain counters Counters	PLC boot	ок	Updated
	PLC run-time	ок	Updated
Selective block - BLOCK2	4 Protection I/O assigned verify startup	OK	Updated
🗢 🔄 Faults recording	Protection I/O assigned verify run-time major	ок	Updated
← 🔄 Events recording	Protection I/O assigned verify run-time minor	ок	Updated
- 🔄 Oscillography	Total protection I/O assigned not-matching	0	Updated
🗢 🚞 Communication	Protection I/O assigned not-matching		Um State Updated
∽ ⊡ Commands ∽ ⊖∎ Test	PLC I/O assigned verify startup	ок	Updated
∽ 🔄 Start/End settings	PLC I/O assigned verify run-time major	ок	Updated
	PLC I/O assigned verify run-time minor	ок	Updated
	Total PLC I/O assigned not-matching	0	Updated
	PLC I/O assigned not-matching		Updated
	MMI module		Updated
	Boot	OK	Updated
	Run-time	ок	Updated
	MRI module		Updated
	Boot	OFF	Updated
	Run-time	OFF	Updated
	MID16-1 module		Updated
	Devi		Lindate of

Read \ Pilot wire diagnostic

Read \ Selective block - BLOCK2

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

Information about input and output selective block is available. $Block2 \ input$

> 🚹 ThySetter - V3.4.8 File Communication Procedures Upgrade Optional Functions Preference Help 0 Pilot wire diagnostic Description Parameter Val Phase protections input selective block state BLK2IN-Iph OFF Parameter Value Um State BLK2IN-Iph OFF Updated * Block2 input
> Block2 output Ground protections input selective block sta... BLK2IN-IE OFF Updated 🔄 Internal selective block - BLOCK4 🚽 tB-lph/IE Elapsed state tB timeout OFF Updated 4 NA90_C00 NA90-CB0-c_123456 Programming state: Close Level 1

Block2 output

ile Cor	mmunication Procedures Upgrade Opti	onal Functions Preference Help			
0 6					
	🗣 🔄 Pilot wire diagnostic 🛛 🔺	Description	Parameter	Value I	Jm St.
	Selective block - BLOCK2 Selective block - BLOCK2	Starting state of ground protections enabled for external selective block on output	ST-IE-BLK2	OFF	U
	- Block2 output	Phase protections output selective block state	BLK20UT-lph	OFF	U
	🗢 🔄 Internal selective block - BLOCK4	Ground protections output selective block state	BLK20UT-IE	OFF	U
	🗣 🔄 Faults recording 📃 👻	Phase and ground protections output selective block state	BLK2OUT-lph/IE	OFF	U.

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 IL1r, IL2r, IL3r
- 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 $U_{\rm Er}$
- Calculated residual voltage UECr
- Displacement angles PhiL1r, PhiL2r, PhiL3r, Alpha1r, Alpha2r, Alpha3r, PhiEr, PhiEcr
- Thermal image
- Inputs
- Outputs
- Fault cause (info about the faulted phase)

le Communication Procedures Upgrade Opti	ion	ıal	Fun	ctio	is P	Prefe	erei	nce	He	elp										
) 🖆 🖬 💿 💿 💋 🔳 🗑)	(3		9	6	5				5	3		1	1	0				
Devices	13	Г			-	De	Inee	intic	n				_	Para	m		Value	Lim	State	
	Servers	F	ault	0		D		ipure.						i dire			Talao	0111	Updated	-
Communication Procedures Upgrade Optional I Image: Second se	ault	coui	nter											0			Update	1 =		
	ate													0			Update	1		
🗢 🚞 Clock	Setter - V3.4.8 Immunication Procedures Upgrade Optional Image: Set and the set of the	Т	ime													0			Update	1
Measures	No.000	F	ault	cau	se											N	o faults		Update	1
- Trotections	Second Second	L	1 Pr	ase	curre	ent								IL1r		0.	000	In	Update	1
	onone.	L	2 Pr	ase	curre	ent								IL2r		0.	000	In	Update	1
Circuit Breaker supervision	anana a	L	3 Pr	iase	curre	ent								IL3r		0.	000	In	Update	1
🔶 🤄 Internal states	Sold Show	L	1 Pr	ase	volta	ge								UL1	r	0.	000	En	Update	1
Image: Serial number	000000	L2 Phase voltage			UL2	UL2r	0.	0.000	En	Updated	1									
- Total counters	00000	L	3 Pr	iase	volta	ge								UL3	r	0.	000	En	Update	1
Context C	one and	Ρ	has	e L1	to ph	nase	e L2	volt	age					U12	r	0.	000	Un	Updated	1
Official of the second se		Ρ	has	e L2	to ph	ase	e L3	volt	age					U23	r	0.	000	Un	Update	1
		Phase L3 to phase L1 voltage						U31	r	0.	000	Un	Update	1						
Second and the second ing	Steeles	R	esio	lual	curre	nt IE	E1							IE1r		0.	000	IE1n	Update	1
← 🔄 Set	oncoro.	R	esio	lual	curer	nte II	E2							IE2r		0.	000	IE2n	Update	1
🗢 🚞 Oscillography	No. of Contract of	R	esio	lual	curer	nte II	EC							IECI		0.	000	In	Update	1
Communication	00000	С	alcu	late	d res	idua	al vo	Itag	е					UEC	r	0.	000	UE	Update	1
🔶 🔄 Test	News	D	ispl	acer	nent	ang	le o	f IL1	res	peo	ct 1	to U	L1	PhiL	.1r	0		deg	Update	1
🖕 🔄 Start/End settings	one of	D	ispl	acer	nent	ang	le o	f IL2	res	pec	ct t	to U	L2	PhiL	Value Um State Param. Value Um State O Updated Updated O Updated Updated O Updated Updated O Updated Updated No faults Updated Updated L1r 0.000 In Updated L2r 0.000 In Updated JL1r 0.000 En Updated JL2r 0.000 En Updated J23r 0.000 Un Updated J21r 0.000 Un Updated J23r 0.000 Un Updated J21r 0.000 Un Updated					
	1000000	D	ispl	acer	nent	ang	le o	f IL3	res	peo	ct t	to U	L3	PhiL	.3r	0		deg	Update	1
	distant.	D	ispl	acer	nent	ang	le o	f IL1	res	peo	ct 1	to U	23	Alph	a1r	0		deg	Update	1
	Solice S	D	ispl	acer	nent	ang	le o	f IL2	res!	peo	ct 1	to U	31	Alph	a2r	0		deg	Update	1
	Section of	D	ispl	acer	nent	ang	le o	f IL3	res	peo	ct f	to U	12	Alph	a3r	0		deg	Update	1
	00000	D	ispl	acer	nent	ang	le L	EC	resp	pect	et to) IE	1	PhiE	Cr	0		deg	Update	1
	on the second	Т	herr	nal i	mage	9								DTh	et	0.	00	DT	Update	1
Devices NA90-CB0-c_123456 F MA90-CB0-c_123456 Read F Massures Serial number F Massures Active profile F PLC Clock F Clock Perdetions F Plc Clock internal states F Partial counters Self-test F Selective block- BLOCK2 F F Plot wire diagnostic Selective block- BLOCK2 F Plot wire diagnostic Selective block- BLOCK2 F Selective block- BLOCK2 F F Selective block- BLOCK2 Selective block- BLOCK4 F Selective block - BLOCK2 Selective block - BLOCK4 F Selective block - BLOCK2 Selective block - BLOCK4 F Set Commands Selective block - BLOCK4 F Set Start/End settings F F Start/End settings F F F	Ir	puts	s IN'	-IN2											N	one		Update	1	
	0	utpu	its k	1-K6											N	one		Update	1	
	00000	F	ault	cau	se inf	0										0			Update	1
	0000	F	ault	1															Updated	-

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

ThySetter - 348 - Manual - 01 - 2009

Read \ Event recording

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

File Communication Procedures Upgrade Opti	tion	al Functions	Preference	Help				
	9	00	🔊 🍐 🍕	1		D		
🔶 🔄 Relays 🖉		Description	Event count.	Date	Hour	Event cause	State	T
🗢 🚞 Partial counters	0.000	Event 0	0	0	0	No events	Updated	
Total counters	00000	Event 1	0	0	0	No events	Updated	
- C Pilot wire diagnostic	0.000	Event 2	0	0	0	No events	Updated	
🗢 🔄 Selective block - BLOCK2	1000	Event 3	0	0	0	No events	Updated	
Internal selective block - BLOCK4		Event 4	0	0	0	No events	Updated	
- Carecording	0.000	Event 5	0	0	0	No events	Updated	1
🕶 🔄 Set 🔍	-	Event 6	0	0	0	No events	Updated	

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)

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

ThySetter - 348 - Manual - 01 - 2009

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.

Communication Procedures Upgrade	Optional Functions Preference Help			
6 6 0 0 0	II 😔 🕙 🥥 🌢 🌌 🔩 🕼 🐼 🧭 🗿			
🌑 Devices	Description	Value	Um	State
	Relay reference name	test		Updated
- Set	Relay nominal frequency - fn	50	HZ	Updated
← 🔄 Base	Relay phase nominal current - In	5 A		Updated
🔶 🦳 Inputs	Relay residual nominal current - IE1n	1 A		Updated
Elays	Relay residual nominal current - IE2n	1 A		Updated
🗣 🔄 Self-test Relay	Relay mominal voltage (phase to phase) - Un	100	v	Updated
mi 🔤 MMI	Relay nominal voltage (phase to ground) - En = Un / 1.73	-		Updated
Profile A	Relay residual nominal voltage (calculated measurement) - UECN = 1.73 * Un = 3 * En	-		Updated
🕶 🔄 Profile B	Relay nominal active power - Pn = 1.73 * Un * In = 3 * En * In	-		Updated
Circuit Brooker europhinion	Relay nominal reactive power - Qn = 1.73 * Un * In = 3 * En * In	-		Updated
- Circuit Breaker supervision - T supervision - 74VT	Relay nominal apparent power - Sn = 1.73 * Un * In = 3 * En * In	-		Updated
← 🔄 CT supervision - 74CT	Phase CT primary nominal current - Inp	100	A	Updated
P Int wire diagnostic	Residual CT primary nominal current - IE1np	100	A	Updated
Demand measures	Residual CT primary nominal current - IE2np	100	A	Updated
🕶 🚞 Oscillography	Line VT primary nominal voltage (phase to phase) - Unp	1000	v	Updated
Communication	Measurements reading mode	RELA		Updated
- Test	Language	Engli		Updated
🖕 🚞 Start/End settings	CB trip delay			Updated
	Value	0.10	9	Lindated

Set \ Inputs

Set \ Relavs

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.

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



Set \ LEDs

Set \ Self-test Relay

Inside the submenu the setting parameters concerning the operation mode of LEDs (Latched/Nolatched) are available.

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

ile Communication Procedures U	pgrade Optional Functions P	reference Help	Second Section 5	ronie
) 🖆 🖬 💿 💿 🧔		6 2 1	Set	A 👻
🔶 🔁 MMI	 Description 	Value		E By INPUT
🗢 🚞 Profile selection	Active profile	A		
← 🔄 Profile A ← 🔄 Profile B			_	

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).

File Communication Procedures Upgrade Optional Functio	ns Preference Help
 Communication Commands Commands Test Start/End settings Find s Send Command Abort changes 	Description Value Um State

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

ŭ 🧭	🍯 🖬 💿 💿 🧔 🥩		8 🕘 오 🤞 🍇		2		
	← 🔄 Thermal image - 49 ♀ 🗃 Phase overcurrent - 50	Setting: Picku	Description p value	Parameter	Value	Um	State Updated
	← → I> Element ← → → Setpoints → → → Setpoints → → → → → → → → → → → → → → →	Set	2.22		OFF 2.22	In	Updated Updated
	- Inverse time			_P>def	2.00	In	Updated
	- Clement		min: 0.100, mar: 0.999, step:0.001 - In	lef	1.00		Updated
A90 C00	NA90-CB0-c 123456 Onlin	Ranges	min: 10.0, mai: 40.0, step:0.1 - In		1.00	8	opuated

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



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).

munication Procedures	Ungrade Optional Fun	ctions Dreference Heln	5			
				0		
Thermal image	40	Description	Parameter	Value Ur	n State	
- We Phase overcurre	nt - 50/51	I> Enable	l> Enable	OFF	Updated	
🛉 🖮 I> Element		I> Curve type	I>Curve	DEFI	Updated	
🗢 🔄 Setpoints	5	ICI Ro Mode	ICL R> Mode	OFF	Lindated	
🗠 🛁 Definite t	ime	ICEI - MODE	ICEI - MOUE	OIT	Undated	
- Inverse	• Start relays		<u>در</u>		opdated	
► Cleme	R.M.	T Not Closed		Trip LLDs		
🕶 🔄 Residual over		Not Used	s	- reserved	Not Us	red
🗠 🚞 Residual over	E KI	Not Used		START	Not Us	ed
🗠 🔄 Residual over	E KA	I Not Dead	K1	TRIP	🗆 Not Us	led
- Overvoltage - 5	□ KS	Not Used	K2IN	GL1	🗆 Not Us	and i
- C Directional nha	I NS	Not Used	1/2011	12	🗔 Not Us	ed
- C Directional ear	□ K7	Not Used	K2001	B 13	🗆 Not Us	ied
🗠 🔄 Second Harmo	THE	T Not Used	K4	10 L4	🗌 Not Us	ied
🗠 🚞 Trip circuit sup	171.00		dh-RES	□L5	🗆 Not Us	ied
🗠 🔄 Selective block	L K9	L. Not Used		016	🗆 Not Us	bed
- Internal select	C K19	Not Used	к	1117	🗆 Not Us	ed
► Steaker failure	C Not Used	L] Not Osed	к	- L R	🗆 Not Us	ed.
- CI PLC	L. Not Osed	L Not Osed		11 L0	🗆 Not Us	ind
🗢 🚞 Circuit Breaker su	L_ Not Used	L Not Used	·L.	🗆 L 10	🗆 Not Us	ied
	L_ Not Used	L/ Not Used	-L	🗌 Not Used	🗆 Not Us	led
NA90-CB0-c_123456	L Not Used	L.] Not Used		Not Used	🗌 Not Us	ed .
	Not Used	Not Used		Not Used	Not Us	led .

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



🗢 🦳 Pro	file B		-	Descrizione	Parametro	Valore	Um	Stato
P 🔄 PL				Enable	PLC Enable	OFF		Updated
e 🔄	Setpoints		_	Relays	PLC-K	None		Updated
2	Switches			LEDs	PLC-L	None		Updated
- Cin	uit Breaker superv	ision			I INCOMPANYABILI			Shirkes Alexandra
- Aut		ioioii	*	8	Setting: Enable			
ME	60		evel 0	Programmi				
K1	Not Used	Ds				OFF OFF		-
K2	Not Used	reserved		Not Used		OFF		
🖬 кз	🗆 Not Used	START		🗆 Not Used		ON		
🛄 K4	Not Used	TR8P		🗌 Not Used				
KS	🗆 Not Used	U 11		Not Used				
🖾 кв	🗆 Not Used			🗌 Not Used				
□ K7	🖾 Not Used	D 13		🗆 Not Used				
🗆 кв	🖂 Not Used	Пи		🗆 Not Used		Canc	el Def	fault
🖂 К9	🗆 Not Used	L5		🗆 Not Used				
C K10	🗌 Not Used	016		Not Used				
Not Used	🗌 Not Used			Not Used				
Not Used	🗌 Not Used			Not Used				
Not Used	🗌 Not Used	019		Not Used				
Not Used	🗆 Not Used	110		Not Used				
Not Used	🗆 Not Used	Not Used		Not Used				
Not Used	🗌 Not Used	Not Used		Not Used				
		CT Not the of		Not Used				

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.

File Communication Procedures Upgrade Option	al Fund	ctions Preferen	ice Help			
	0	3 9 6 4				
• Trome I	-	Description	Value	Um	State	
P DLC		Switch 1	0		Updated	-
► 🔁 Setpoints		Switch 2	0		Updated	=
Switches Timers		Switch 3	0		Updated	-
- Circuit Breaker supervision		Switch 4	0		Updated	
• 🔄 VT supervision - 74VT	=	Switch 5	0		Updated	
CT supervision - 74CT		Switch 6	0		Updated	
- Clot wire diagnostic	_	Switch 7	0		Updated	
🖕 🔄 Demand measures	-	Switch 8	0		Updated	-

Timers



► Trofile B	Description Value	Um	State	
P- PLC Setting: Time	r1 🛛 🕅	s	Updated	-
e 🔄 Setpoints		s	Updated	_
- Switches		s	Updated	
- Circuit Breake Set	0.00	s	Updated	
🗢 🚞 VT supervisio		s	Updated	
CT supervisio		s	Updated	
Pilot wire diag		s	Updated	
Demand mea Scillography Ranges Renges Reng	min: 0.00, max: 0.99, step:0.01 - s min: 1.00, max: 60.00, step:0.10 - s	s	Updated	•
IA90_C00 NA90-CB0-c_123	OK Cancel Default			

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 (*ModeSum1^2t*). If the summation overcomes an user-defined threshold, an alarm is issued. The l2t 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 ($ModeSumI^2 t OM$, the *tbreak* CB opening time and the $SumI^2 t$ 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.

ile Communication Procedures Upgrad	e Optional Functions Preference Help				
) 🗳 🖬 🖬 💿 💿 🥔 🔘	📓 😣 🔁 💿 🍐 🦧 🍇 🧭 😭 🤗	0			
🛏 🕙 Dispositivi	Descrizione	Parametro	Valore	Um	Stato
	Number of CB trips mode	ModeN.Open	OFF		Updated
- Cal Read	Number of CB trips threshold	N.Open	10000		Updated
🔶 🔄 Base	Cumulative CB tripping currents mode	ModeSuml	OFF		Updated
🕶 🚞 Inputs	Cumulative CB tripping currents threshold	Suml	5000	In	Updated
e 🔄 Relays	Cumulative CB tripping IA2t mode	ModeSuml^2t	OFF		Updated
Self-test Relay	Circuit breaker opening time for IA2t calculation	tbreak	0.05	s	Updated
🕶 🚞 MMI	Cumulative CB tripping IA2t threshold	Suml^2t	5000	In^2s	Updated
Profile selection	CB operating time mode	Mode-tOpen	OFF		Updated
← 🔄 Profile A ← 🔄 Profile B	Trigger relay for CB opening time trigger measurement	Ktrig-break	None		Updated
🗢 🚞 PLC	Circuit breaker maximum allowed opening time	tbreak>			Undated
Circuit Breaker supervision	Value		1.00	9	Lindated
- CB Diagnostic	Number of CB trins diagnostic relays	N Onen K	None		Undated
🕶 🚞 VT supervision - 74VT	Cumulative CB trinning currents diagnostic relays	Suml K	None		Undated
CT supervision - 74CT	Cumulative CB tripping Currents diagnostic relays	Sumi-ry	None		Undeted
Pilot wire diagnostic		Sum ZL-K	None		Updated
🖕 🔄 Demand measures	Circuit breaker opening time diagnostic relays	tbreak-K	None		Updated
e Scillography	Number of CB trips diagnostic LEDs	N.Open-L	None		Updated
Communication	Cumulative CB tripping currents diagnostic LEDs	SumI-L	None		Updated
🕶 🔄 Test	Cumulative CB tripping I*2t diagnostic LEDs	Suml^2t-L	None		Updated
🖕 🦳 Start/End settings	Circuit breaker opening time diagnostic LEDs	tbreak-L	None		Updated

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

File Communication Procedures Upgrad	le Optional Functions Preference Help				
	📓 🕹 🕙 💿 🧉 🕼 🕼 🕼				
ዮ 🌑 Dispositivi	Descrizione	Parametro	Valore	Um	Stato
	74VT Enable	74VT Ena	OFF		Updated
e Set	74VT Negative sequence overvoltage threshold	U2VT>			Updated
🔶 🔄 Base	State		ON		Updated
- 🔄 Inputs	Pickup value		0.10	En	Updated
- CILEDS	74VT Negative sequence overcurrent threshold	I2VT>			Updated
🔶 🔄 Self-test Relay	State		ON		Updated
P MMI	Pickup value		0.10	In	Updated
Profile A	74VT Phase undervoltage threshold	UVT<			Updated
 ➡ ☐ Profile B ➡ ☐ PLC ➡ ☐ Circuit Breaker supervision ➡ ☐ VT supervision - 74VT 	State		ON		Updated
	Pickup value		0.10	En	Updated
	74VT Minimum change of current threshold	DIVT<			Updated
CT supervision - 74CT	State		ON		Updated
- I Pilot wire diagnostic	Pickup value		0.10	In	Updated
🔶 🔄 Demand measures	74VT Undercurrent inhibition threshold	IVT<			Updated
r Scillography	State		ON		Updated
- Commands	Pickup value		0.100	In	Updated
🗢 🚞 Test	74VT Alarm time delay	tVT-AL			Updated
🗢 🔄 Start/End settings	Value		1.0	s	Updated
	74VT Logical blobk	74VT-BLK1	OFF		Updated
	74VT Self-reset	74VT-AR	ON		Updated
	Block functions enable from 74VT	74VT-BK	ON		Updated
	74VT Output block relays	74VT-BK-K	None		Updated
	74VT Alarm relays	74VT-AL-K	None		Updated
	74VT Output block LEDs	74VT-BK-L	None		Updated
	THE ALL LED.	707 01 1	1000		In date of

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

Set \ Pilot wire diagnostic

Set \ Demand measures

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

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.

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

ile Com	munication Procedures Upgra	de	Optional Functions Preference Help				
0 6	🖆 🖬 💿 💿 🥔 🌑		8 8 9 4 4		9		
	Cr supervision - 74Cr		Descrizione	Parametro	Valore	Um	Stato
	 Remote inpping Pilot wire diagnostic 		Fixed demand period	tFIX	15	min	Updated
	🗠 🔄 Demand measures		Rolling demand period	tROL	5	min	Updated
0-	🚵 Oscillography	-	Number of cycles for rolling on demand	N.ROL	12		Updated

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.

Readings

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

e Communication Procedures Upg	ade	Optional Functions Pr	eference Help		
) 🗳 🖬 🗟 🕘 🧔 🍘			6 8 1	S 🛛 🖉 🚺	
🛉 🖮 NA90-CB0-c_123456		Description	Value	Um	State
🕈 🚞 Read		State	Acquire		Updated
Carllography	=	Records	0		Updated
 Cschlugraphy Readings 		Buffer storage	0	%	Updated
Trigger Setup	-				

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):

e Communication Procedures Upgra	de	Optional Functions Preference	Help		
		8 8 9 4 2	L	1	
🛉 🖮 NA90-СВ0-с_123456		Description	Value	Um	State
e 🔄 Read		iL1	Off		Updated
 Sel Oscillography Readings Trigger Setup 		uL1	Off		Updated
		iL2	Off		Updated
		uL2	Off		Updated
Set sample channels		iL3	Off		Updated
🗣 🔄 Set digital channels		uL3	Off		Updated
🖕 🔄 Communication		iE1	Off		Updated
Commanus	_	iE2	Off		Updated

Set analog channels

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

				2	
P- 🌑 Dispositivi	Description		Value	Um	State
	Analog 1		Off		Updated
- Set	Analog 2		Off		Updated
👇 🔄 Oscillography	Analog 3		Off		Updated
🕈 🔄 Readings	Analog 4		Off		Updated
Get sample channels	Analog 5		Off		Updated
 Set analog channels Set digital channels Communication Commands Commands Test Start/End settings 	Analog 6		Off		Updated
	Analog 7		Off		Updated
	Analog 8		Off		Updated
	An Set An Set An An Set	Off	money	•	
1A90_C00 NA90-CB0-c_123456 Online	ок	IL1 UL1 IL2 UL2 IL3 UL3 IE1			

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.

File Communication Procedures Opgr	ade Optional Functions Prefer	епсе нер		
	📓 😌 🕈 🏐 💭 🧉		Ø 0	
ዮ 🌑 Dispositivi	Description	Value	Um	State
	Binary 1	Off		Updated
- Set	Binary 2	Off		Updated
👇 🔄 Oscillography	Binary 3	Off		Updated
e 🔄 Readings	Binary 4	Off		Updated
- Ingger Setup	Binary 5	Off		Updated
 Set analog channels Set digital channels Communication Commands Test 	Bina Setting: Binary 3			
	Bina	,		
	Bina Set	0.5		
	Bina	on		
🖕 🚞 Start/End settings	Bina	K1		A
	Bina	K2		=
	Bins	КЗ		
		K4		
NA90_C00 NA90-CB0-c_123456 Onlin	18	K5		
		K6		
		К7		
		140		
	01/	18		

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).

🊹 Disturbance recording Manager	X
	Messaggio 🛛 🔀
0%	Command executed
	QK
50 -	Man. Rec. width (ms)
Reading Record N.	nn
Upload Rec Erase Reco	Man. Trigger Exit

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...).

oscillo 📑	🗋 a4.dat	a7.dat	🗋 fault1.cfg	🗋 ntg1
🗋 a2.cfg	a5.cfg	b6.osc	🗋 fault 1.dat	🗋 ntg3
🗋 a2.dat	🗋 a5.dat	C1.cfg	fcs4.cfg	🗋 ntg3
a3.cfg	a6.cfg	🗋 c1.dat	fcs4.dat	🗋 prov
🗋 a3.dat	🗋 a6.dat	C2.cfg	🗋 Lab2Data.zip	🗋 ргоч
🗋 a4.cfg	🗋 a7.cfg	C2.dat	ntg1.cfg	🗋 seg2
4				
lome file: Mil	d			
ipo file: Tu	tti i file			-

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

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 "0K".

Several tools are available (markers, zoom, colors, ecc..). Snapshots can be stored in JPEG format.

station name	Dino: record 1 - 19/1	10/2008 12:03			1
rec dev id	NA60 M00 rev. 015	2			
rev vear	1999				
first data point	19/10/2008, 12:02:5	4:840000			
trigger	19/10/2008, 12:02:5	5:340000			
- 33-					
hannels		ī.	Ť		
Indice	Identificativo	Indicazione di fa	ise	Colore	
ul	L1(V)	D			
	_2(A)	D			
Visualizzazione file oscili Dino: recor	lopert. rd 1 • 19/10/2008 12:03 • first point	: 19/10/2008, 12:02:54:8400	00 - trigger: 19/10/20	008, 12:02:55:340000	
		WWWWWW	WWWW		MMM
€ 250 1 0 -250 -			WWW		
۰ ۲	MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM	www.www	MM		~~~~~
7.5 € 5.0 □ 2.5 0.0					
0 100 200	300 400 500 60	0 700 800 9	0 1.000 1.1	00 1.200 1.300	1.400 1.500
	iL1(A)_1uL1(v)_2 — iL2(A)_3 — IL1	(A)_4 — IL2(A)_5		
Indicatori	Tor	200			
Marker1 Marker2 Marker2 - Marker1	0.0 ms 0.0 ms 0.0 ms 0.0 ms 0.0 ms			 Un grafico Raggruppi AntiAlias o AntiAlias f 	per linea a linee :hart :ont

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 net maskAutonegotiation
- IP address of the NA60 device

subnet address

procedure by which two connected devices choose com-

mon transmission parameters.

ile Communication Procedures U	lpgrade	Optional Functions Preference	Help		
		8 8 9 4 4		9	
🔶 🚞 Set	•	Description	Value	Um	State
🖕 🚞 Oscillography		IP host address	200.1.2.228		Updated
Communication Sevent		IP net mask	255.255.255.0		Updated
- Ethernet	=	Autonegotiation	ON		Updated
🗢 🔄 Commands		NTP synchronizing	OFF		Updated

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.

🛤 Prompt dei comandi	- 🗆 ×
C:\Documents and Settings\dino.THYTRONIC_NT_MI>ping -n 10 200.1.2.228	<u> </u>
Esecuzione di Ping 200.1.2.228 con 32 byte di dati:	
Risposta da 200.1.2.228: byte=32 durata=2ms TTL=255 Risposta da 200.1.2.228: byte=32 durata=1ms TTL=255 Risposta da 200.1.2.228: byte=32 durata=4ms TTL=255 Risposta da 200.1.2.228: byte=32 durata=1ms TTL=255 Risposta da 200.1.2.228: byte=32 durata=1ms TTL=255 Risposta da 200.1.2.228: byte=32 durata=4ms TTL=255	
Statistiche Ping per 200.1.2.228: Pacchetti: Trasmessi = 10, Ricevuti = 10, Persi = 0 (0% persi), Tempo approssinativo percorsi andata/ritorno in millisecondi: Minmo = Ins, Massimo = 4ms, Medio = 2ms	
C:\Documents and Settings\dino.THYTRONIC_NT_MI>_	-

Commands

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

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 Suml2t (CB diagnostic), Reset Breaking current Sumlt (CB diagnostic),
- · Reset on demand measures,
- Reset partial counters, Reset counters, (Reset all counters): available with Level 1 password.

	0 0				
Set S		Description	Value	Um	State

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.

le Communication Procedures Upgrade Optional Function	Preference Help	
	9 6 2 2 9 0 0	
Commands General Sections General Sections	Description Value Ur	n State

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	īming may be adj	usted.				
	ThySetter - V3.4.	.8				
	File Communication	Procedures Upgra	de Optional Functions	Preference Help	300	
	← () Commu ← () Comma ← () Set ← () Set ← ()	nication nds et ting: Day		Description	Value U 1 2000 0	Im State File File File File
	PAGE COO NAS	Ranges	1, step:1 -	▼	0	File File
Firmware upgrade		ОК	ancel Default			
1	he command allo	ws upgrading	the relay firmwar	е.		
WARNING The with Ope	procedure must n manufacturer. erations without p	only be perforn ermission can	ned in cases of e will cause severe	ffective need, i e demages ove	n the face of ex r functionalites!	igencies agreed
	Connect device t port), or standar Start ThySetter In Offline state, i a click on the Confirm execution Select i This pr are you No, I le No, I le Yes, I'r Select the serial mand is execute Status har proor	o the personal d cable for a n ssue the <i>Devia</i> icon on (Yes I'm sure ocedure can alter ave ave n sure to execute ave n sure	computer by me etwork connection ce firmware cont). device firmware, this operation? device firmware, this operation? SIF Aggiornamento firmware SIF Aggiornamento firmware Custom File: rk; in any case, a ggestion of saving the case, a ggestion of saving	Ins of a Thytro on (Ethernet) nmand availab	nic L10041 RS23	2 cable (local serial grade menu or with Configure 200.1.2.228 Configure 200.1.2.228 Configure configur
•	Status bar progr cerning the oscil a restart of proce	ess is displaye lographic reco edure must be	d by status bar. ^{[1} rder are lost whil activated.	I f power goes e the older firm	s OFF within this ware goes on. T	stage all data con- o upgrade firmware

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

ThySetter - 348 - Manual - 01 - 2009

	With the Set default setting command the factory settings are restored; all user- defined adjustments are cleared.
	• Send the <i>Set default setting</i> command (Command menu).
	Following operations must be performed: • Switch to Level 1 cossion
	send to the device. ^[2] Typically the data base must be restored whit significant upgrades.
Data base resto	DIC If the data base of the up to date release is not compatible with the former, the default date must be
	• Start upgrade.
	• Set the file .bin,
	 Set the port if different from default setting (CUM1), Select the Custom mode
	avoid wrong operation,
	 Send "Device firmware" command within Upgrade menu; a validation command is required to
	 Connect device to the personal computer by means of a Thytronic L10041 RS232 cable (local serial part) with potyerk connection (Ethernet), the precedure is not people.
	iliary power supply), a reset procedure must be performed according to the following sequence:
Download fail	If the procedure has a negative outcome (e.g. interruption to the communication process or the aux-
Download fai	Send the Set default setting command (Command menu)
	Switch to Level 1 session,
	Following operations must be performed:
	send to the device. ^[1] Typically the data baco must be restored whit significant upgrades
	If the data base of the up-to-date release is not compatible with the former, the default data must be
	Click the Exit button: the ON led shows a positive end of sequence.
	and a failed download procedure must be activated.
	all data concerning the oscillographic recorder and the firmware are lost; the relay goes out of order

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 licon). 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

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.

Module name	State	
MMI module	Enabled	
viRi module	Disabled 💌	
MID16-1 module	Enabled	
MID16-2 module	Disabled	
Current loop module	Disabled	
PT100 module	Disabled	
	WARNING!!	

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 Binary inputs for NA30 and NA70 devices Output relays LEDs:	: IN1, IN2 on board IN3IN10 with MRI module IN11IN26 with one MID16 module IN27IN42 with two MID16 modules IN1IN5 on board IN6IN13 with MRI module IN14IN29 with one MID16 module IN30IN45 with two MID16 modules K1K6 on board K7K10 with MRI module ON, START, TRIP, L1L5 on board L6L10 with MRI module

ThySetter - 348 - Manual - 01 - 2009

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 (空 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.

Praimat Rane	ations non presista		
rragna: name	gloco non prevista		
		Ibailia Palanama	1

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
- : put the PLC in preemptive mode • {Preemptive} • {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
          gioco}
Name
{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 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
                    BYTE#1
               EQ
               JMPC ON_RELE1
               T'D
                    rele
               EQ
                    BYTE#2
               JMPC ON RELE2
               LD
                    rele
                    BYTE#3
               ΕQ
               JMPC ON RELE3
               LD
                    rele
                    BYTE#4
               ΕO
               JMPC ON RELE4
               LD
                    rele
               EQ
                    BYTE#5
               JMPC ON_RELE5
               LD
                    rele
                    BYTE#6
               ΕO
               JMPC ON RELE6
               JMP
                    END
ON RELE1:
          LD
               state
                    RELE1
               ST
               \mathsf{JMP}
                    END
ON RELE2:
          Τ.D
               state
               ST
                    RELE2
               JMP
                    END
ON RELE3:
          LD
               state
               ST
                   RELES
               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 BYTE#1 ΕO JMPC ON START LD element EQ BYTE#2 JMPC ON_TRIP ΤD element EQ BYTE#3 JMPC ON_LED1 LD element EQ BYTE#4 JMPC ON LED2 LD element BYTE#5 ΕQ JMPC ON_LED3 LD element EQ BYTE#6 JMPC ON LED4 element LD BYTE#7 EQ JMPC ON LED5 JMP END ON_START: LDstate 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:
               state
          LD
               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 *)
                    valEle
               LD
                    minEle
               LT
```

```
JMPC RESET
              LD
                   valEle
              GE
                  numEle
              JMPC RESET
              (* Incrementa il prossimo elemento da accendere *)
                   valEle
              T.D
              ADD
                  BYTE#1
              ST
                   valEle
              JMP
                  TURN_ON
RESET
              (* Reset al minimo *)
                   minEle
              LD
              ST
                   valEle
TURN_ON:
         (* Accensione led indicato *)
                   valEle
              LD
                  next (* salva il valore per il prossimo giro *)
              ST
              CAL
                  leds(
                       element := valEle,
                       state := TRUE,
                       isLed := isLed
                   )
END:
              RET
END PROGRAM
****)
(*
                          Program
                                                         Pgm2
 *)
****)
PROGRAM Pqm2
         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 *)
                     : BYTE := BYTE#6; (* led di partenza del secondo
              ValLed2
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; RELE5 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 · Poml(minEle := BYTE#1 numEle :=
BYTE#2, valEle := ValLed3, isLed := TRUE, next => ValLed3);
(* Programma per il rele' *)
PROGRAM R1 WITH T4 : Pgml(minEle := BYTE#1, numEle := BYTE#1, valEle := ValRele1, isLed := FALSE, next => ValRele1);
(* Gestione watchdog *)
PROGRAM Bgk1 : Pgm2;

END_RESOURCE END_CONFIGURATION