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NANOVIP PLUS MEM

Supplemento al manuale di istruzione Nanovip Plus • *Supplement to Nanovip Plus manual* • Supplement au manuel d'instruction Nanovip Plus • *Ergänzung zum bedienungshandbuch Nanovip Plus* • Suplemento al manual de instrucciones Nanovip Plus

NANOVIP PLUS MEM

SUPPLEMENT TO NANOVIP PLUS MANUAL

INDEX

The new functions on the NANOVIP PLUS MEM with respect to the NANOVIP PLUS model are the following:

a) Recording of campaigns of automatic measures in an internal serial memory of 8 Megabits (1 Mbyte).. .....page 24

b) Addition and control of backlighting on display LCD. .....page 25

c) “Restore default” command of factory setup parameters of the instrument.. .....page 25

d) Display of the Active Power measure relative to the harmonic selected.....page 25
.....

e) Downloading through serial line of the voltage and current waveforms.....page 26

f) Management of Harmonics Autoscroll.
.....page 28

g) New Modbus command for setting a determined Harmonic.. .....page 28

h) Input for external DC feeder (6 VDC, 150 mA).
.....page 29

Internal memory structure. .....page 34

Downloading data on measure campaigns stored in internal memory. .....page 38

A) RECORDING OF MEASURE CAMPAIGNS (operation)

This function allows you to store in a special flash-type auxiliary memory (1024Kbyte) the entire range of measures managed by NANOVIP PLUS, with a maximum of 4032 recorded blocks of measures at intervals from 2 second to 1...99 minutes.

The campaigns are recorded through the menu.

The **SETUP MENU** allows access to 4 pages for setting data recording functions:

- Date setup
- Time setup (date and time are included at the top of every record)
- Setup of the time interval between two recordings (every 2 seconds, or at intervals of 1...99 minutes)
- Deletion of recorded data.

In the **LOG CTRL MENU** the recording of the measure campaigns can be activated or deactivated; this menu also displays the percentage recorded in memory and the programmed rate of recording. Once activated, the data LOG continues until it is either deactivated or the memory is full: during this time the part of the Setup menu relative to the LOG (see the block diagram on the menu pages) is deactivated; if the device is turned off and then turned on again recording starts again.

In the **MEAS PAGE** two more pages are included with display of the date and time.

To download data by serial line, see the dedicated section.

B) DISPLAY BACKLIGHTING

The SETUP MENU is added with a Setup page on display backlighting control with commands DISP ON, DISP OFF and DISP AUT (automatic backlighting for 10 seconds at each keystroke). The life of the battery is about 45 hours with DISP ON (the first five hours of which with backlighting on and the following 40 hours with backlighting off) and approximately double with DISP OFF.

C) RESTORE DEFAULT SETUP PARAMETERS

The SETUP MENU includes the possibility to restore the default settings by using a command (TV ratio, TA ratio, Configuration setup, Harmonics setup, COM Setup).

D) DISPLAY OF ACTIVE POWER MEASURE OF SELECTED HARMONIC

In the page displaying the RMS values relative to the harmonic selected, there is now the possibility to see the Active Power value (besides the values of V, I and Power Factor) by keeping the Sel key pressed.

E) DOWNLOADING OF VOLTAGE AND CURRENT WAVEFORM

The format of the string transmitted by NANOVIP PLUS containing 200 waveform samples is as follows:

E:0103 D1 D2**D3D4** D5D6 D7D8D9 V1..**V200** D10**D11D12** D13D14 D15D16D17 I1..**I200** CS CRLF

Where :
: = start Modbus string
01= NANOVIP PLUS default address
03= data reading command
D1= number of frames inside the data buffer where a frame is equal to an entire sampling for one signal (either Voltage or Current)

D2= type of signal identified by the first frame
D3= number of sampling data relative to first frame (LSB)
D4= number of sampling data relative to first frame (MSB)

D5= lsb zero corresponding to samplings of the first frame (Voltage)
D6= msb zero corresponding to samplings of the first frame (Voltage)

D7= lsb calibration factor relative to first frame (Voltage)
D8= msb calibration factor relative to first frame (Voltage)
D9= calibration factor exponent relative to first frame (Voltage)

V1...**V200** = samplings relative to first frame (Voltage buffer)

D10= type of signal identified by second frame
D11= lsb number of sampling data relative to second frame (LSB)
D12= msb number of sampling data relative to second frame (MSB)

D13= lsb zero corresponding to samplings of second frame (Current)

D14= msb zero corresponding to samplings of second frame (Current)

D15= lsb calibration factor relative to second frame (Current)
D16= msb calibration factor relative to second frame (Current)
D17= calibration factor exponent relative to second frame (Current)

I1...**I200** = samplings relative to second frame (Current buffer)
CS = Modbus checksum

NOTE: Using the sampling values relative to Voltage and Current, the value of the measures of the different quantities can be reconstructed. Formulas for a single-phase connection are given below:

$$V_{rms} = \sqrt{\frac{1}{200}\sum_{k=1,200} V_k^2} \times 0.0008579 \times \text{Calibration factor V} \times \text{PT Ratio}$$

$$I_{rms} = \sqrt{\frac{1}{200}\sum_{k=1,200} V_k^2} \times 0.0008579 \times \text{Calibration factor I} \times \text{CT Ratio} / 1000$$

$$W = \frac{1}{200}\sum_{k=1,200} V_k \times I_k \times 0.0008579^2 \times \text{Calibration factor V} \times \text{Calibration factor I} \times \text{PT Ratio} \times \text{CT Ratio} / 1000$$

$$VA = V_{rms} \times I_{rms}$$

$$\text{Power Factor} = W / VA$$

F) AUTOSCROLL MANAGEMENT

During activation of the measures LOG(storage), the Autoscroll of the harmonic displayed, when enabled, increases the harmonic index at each recording cycle. The frequency of the increment thus coincides with the “LOG_RATE” and enables the recording of all 24 Harmonics consecutively. In the 3 pages displaying the Harmonics the status of the SCROLL enabled and commanded by the LOG function is shown by turning on MEM in the display.

G) MODBUS COMMAND FOR SETTING A DETERMINED HARMONIC

The NANOVIP PLUS includes a Modbus command that allows you to set the immediate calculation of a determined harmonic.
The Modbus command to be sent is the following:

:01060279 Hn 00 Crc CR LF

where :

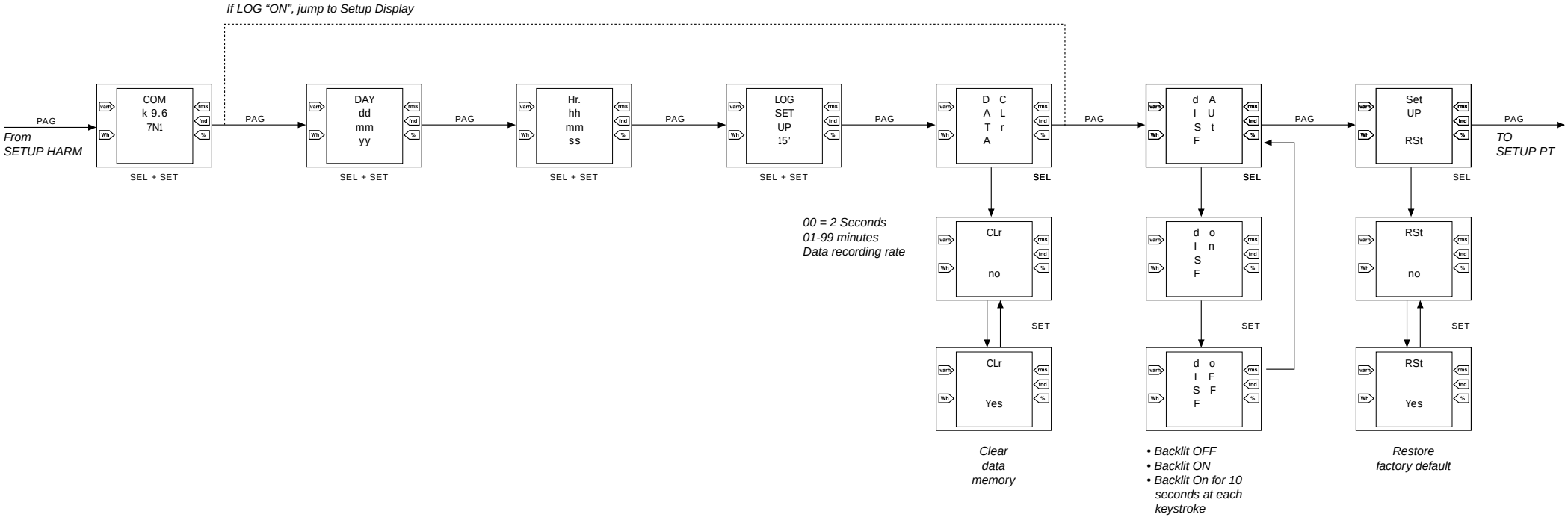
: = start of Modbus string
01= default address of NANOVIP PLUS
06 = write command
0279 = Harmonic address
Hn = value from 0 to 24 to set Harmonic desired
00 = value not managed by NANOVIP PLUS used only to complete the Modbus string
Crc = check-sum
CR = carriage-return
LF = line-feed

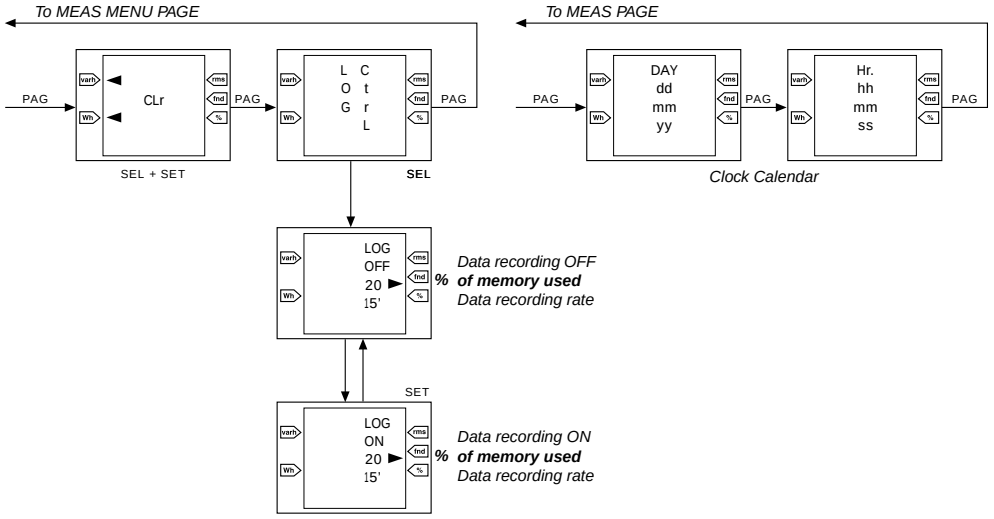
Note that this type of operation remains valid only when autoscrolling of the Harmonics is disabled. If this is not the case, the Modbus command sets the Harmonic desired, but the autoscrolling, starting just from this Harmonic, goes on increasing the index.

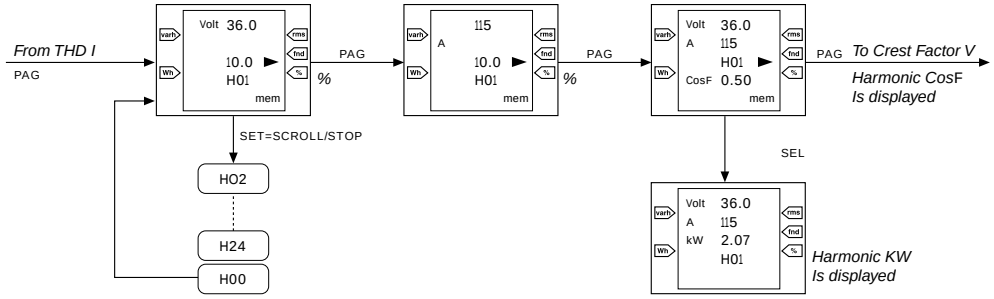
H) SOCKET FOR EXTERNAL DC FEEDER

A socket has been added for external feeder with output 6 VDC (+4% -35%), 150 mA, 0.15 A.

This feeder is also available as accessory, code 4AAQI


If LOG "ON", jump to Setup Display
PAG
From SETUP HARM
COM
k 9.6
7N1
SEL + SET
DAY
dd
mm
yy
Hr.
hh
mm
ss
LOG
SET
UP
15'
D C
A L
T r
A
SEL
CLr
no
SET
CLr
Yes
00 = 2 Seconds
01-99 minutes
Data recording rate
Clear
data
memory
d A
I U t
S
F
d o
I n
S
F
d o
I F
S F
• Backlit OFF
• Backlit ON
• Backlit On for 10 seconds at each keystroke
Set
UP
RSt
RSt
no
RSt
Yes
Restore
factory default
TO
SETUP PT
ENGLISH





("**MEM**" is ON if "SCROLL ON" and "LOG ON")

ENGLISH

NANOVIP PLUS MEM:
INTERNAL MEMORY STRUCTURE

- Storage medium utilized: 0Serial Flash Memory type NX25F080 (NEXCOM); 8 Megabit Serial Flash Memories managed as 2048 sectors of 536 bytes.

- Type of data recorded: 4 different measure "families" are recorded: RMS measures, MEM measures, PEAK measures and finally measures THD + DC Ripple + HARMONIC in pre-set intervals of 2 seconds or from 1-99 minutes.

Recording is carried out in "records" of 32 byte defined as follows:

• **RMS measures:**

YY	MM	GG	HH	MM	**0x01**	24 Byte record data	SS	Check
YY	MM	GG	HH	MM	**0x11**	24 Byte record data	SS	Check

Where:

- YY, MM, DD, HH, MM are the year, month, day, hour and minute when the record was recorded (D1..D5);
- SS are the seconds (D31)
- **0x01** is the type of **record: record 1, under record 0** (D6);
- Record data:
  - Voltage measure (V) *(D7..D9: base + exp)*
  - Current measure (I) *(D10..D12: base + exp)*
  - Active Power measure (Watt) *(D13..D15: base + exp)*
  - Power Factor *(D16..D18: base + exp)*
  - Reactive Power measure (var) *(D19..D21)*
  - Apparent Power measure (VA) *(D22..D24: base + exp)*
  - Frequency (Hertz) *(D25..D27: base + exp)*
  - D28..D30 not used
  - D32 Modbus check-sum
- **0x11** is the type of record: **record 1, under record 1** (D6);
- Record data:
  - kWh positive *(D7..D11: bcd format)*
  - kvarh positive *(D12..D16: bcd format)*
  - kWh negative *(D17..D21: bcd format)*
  - kvarh negative *(D22..D26: bcd format)*
  - D27..D30 not used
  - D32 Modbus check-sum

• **MEM measures:**

YY	MM	GG	HH	MM	**0x02**	24 Byte record data	SS	Check

Where:

- YY, MM, DD, HH, MM are the year, month, day, hour and minute when the record was stored (D1..D5);
- SS are the seconds (D31)
- **0x02** is the type of record: **record 2, under record 0** (D6);
- Record data:
  - Voltage saved in MEM mode (V) *(D7..D9: base + exp)*
  - Current saved in MEM mode (I) *(D10..D12: base + exp)*
  - Active Power saved in MEM mode (Watt) *(D13..D15: base + exp)*
  - Power Factor stored *(D16..D18: base + exp)*
  - difference in Voltage (DV) with respect to the value MEM *(D19..D21: base + exp)*
  - difference in Current (DI) with respect to the value MEM *(D22..D24: base + exp)*
  - difference in Active Power (DWatt) with respect to MEM *(D25..D27: base + exp)*
  - D28..D30 not used
  - D32 Modbus check-sum

• **PEAK measures:**

YY	MM	GG	HH	MM	**0x02**	24 Byte record data	SS	Check

Where:

- YY, MM, DD, HH, MM are the year, month, day, hour and minute when the record was stored (D1..D5);
- SS are the seconds (D31)
- **0x03** is the type of record: **record 3, under record 0** (D6);
- Record data:
  - minimum Voltage measure saved in PEAK mode *(D7..D9: base + exp)*
  - maximum Current measure saved in PEAK mode *(D10..D12: base + exp)*
  - maximum Active Power measure in PEAK mode *(D13..D15: base + exp)*
  - Power Factor saved in PEAK mode *(D16..D18: base + exp)*
  - Reactive Power measure saved in PEAK mode (var) *(D19..D21)*
  - Apparent Power measure saved in PEAK mode (VA) *(D22..D24: base + exp)*
  - frequency saved in PEAK mode (Hertz) *(D25..D27: base + exp)*
  - D28..D30 not used
  - D32 Modbus check-sum

• THD + DC Ripple + HARMONIC measures:

YY	MM	GG	HH	MM	**0x04**	24 Byte record data	SS	Check
YY	MM	GG	HH	MM	**0x14**	24 Byte record data	SS	Check
YY	MM	GG	HH	MM	**0x24**	25 Byte record data		Check

Where:

- YY, MM, DD, HH, MM are the year, month, day, hour and minute when the record was stored (D1..D5);
- **0x04** is the type of record: **record 4, under record 0** (D6);
- Record data:
  - V Total Harmonic Distortion factor (ref. fundamental) *(D7..D9: base + exp)*
  - V THD (ref. RMS) *(D10..D12: base + exp)*
  - I THD (ref. fundamental) *(D13..D15: base + exp)*
  - I THD (ref. RMS) *(D16..D18: base + exp)*
  - V Crest Value *(D19..D21: base + exp)*
  - V % Crest Value *(D22..D24: base + exp)*
  - I Crest Value *(D25..D27: base + exp)*
  - I % Crest Value *(D28..D30: base + exp)*
  - SS are the seconds *(D31)*
  - D32 Modbus check-sum

- **0x14** is the type of record: **record 4, under record 1** (D6);
- Record data:
  - VDC Ripple *(D7..D9: base + exp)*
  - % VDC Ripple *(D10..D12: base + exp)*
  - ADC Ripple *(D13..D15: base + exp)*
  - % ADC Ripple *(D16..D18: base + exp)*
  - D19..D30 not used
  - SS are the seconds (D31)
  - D32 Modbus check-sum

- **0x24** is the type of record: **record 4, under record 2** (D6);
- Record data:
  - Harmonic N selected *(D7 decimal)*
  - Harmonic N volt *(D8..D10: base + exp)*
  - Harmonic N volt ref. to fundamental *(D11..D13: base + exp)*
  - Harmonic N amps *(D14..D16: base + exp)*
  - Harmonic N amps ref. to fundamental *(D17..D19: base + exp)*
  - Cosphi Harmonic N *(D20..D22: base + exp)*
  - volt fundamental *(D23..D25: base + exp)*
  - amps fundamental *(D26..D28: base + exp)*
  - cosphi fundamental *(D29..D31: base + exp)*
  - D32 check-sum tipo Modbus

The base + exp values are represented as: lsb_base(bcd), msb_base(bcd), exp(decimal).

Through the Setup menu (LOG SETUP) the data recording mode can be configured:

- **LOG_RATE** - Setup of measures sampling time; allowable values are 00..99 (00 = every two measure cycles, i.e., every 2 seconds; 01..99 minutes).

DOWNLOADING DATA ON MEASURE CAMPAIGNS STORED IN INTERNAL MEMORY

The downloading of recorded data takes place through Modbus commands:

- Command for request of number of records memorized;
- Command for request of number of records starting with number m.

Using the Modbus protocol for data request made it necessary to assign the reading command with a range of virtual addresses that would simulate the data request from memory; specifically, the address 0x4000 was assigned to the request for the number of records stored, whereas the range of addresses of records stored ranges from 0x8000 to 0xEE40; which are the 28224 max records that can be stored. The transmission takes place only at 8 bits; up to 7 records can be transmitted through a Modbus command.

Format of the request string:

":0103 4000 0001 3B" + cr lf
Request of number of records stored

":0103 xxxx yyyy LL" + cr lf
Request of yyyy records starting from number xxxx;

":0105 0006 0000 F4" + cr lf Set UART 8 bit
":0105 0007 0000 F3" + cr lf Reset UART

Given that the test on the reception of a Modbus command by the NANOVIP PLUS MEM takes place when the calculation is finished, there would be the transmission of each record block requested approximately every second, which is the time NANOVIP PLUS MEM takes to perform the measure. To accelerate the total downloading of the memory, as soon as the first data request is made you do not return immediately to performing the next measure, but "listen" for a set amount time to the serial to receive the next command for downloading data. When entering the maximum transmission speed at 38400 baud, the maximum time for downloading all the memories completely (1 Megabyte) is 15 minutes.

Format of transmitted data:

Response string for request of number of records stored:
":0103 01 xxxx LL" + cr lf
xxxx represents the number of records stored

Response string for n record request :
":0103 nn
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AABBBBBBBBBBBBBBBBBBBBBBBB… LL"
+ cr lf

- nn represents the number of words transmitted
- A max. of 7 records of 32 bytes follow; these are the records requested starting with the first one.

The format of the string transmitted by the NANOVIP PLUS MEM is not pure Modbus ASCII as that of the other strings; the max. 7 records are in an 8 bits binary format, not 7 bits ASCII, so the Uart must be set at 8 bits with the special command before making the transmission, then the setting restored with a further command.