LUMEL

PROGRAMMABLE DIGITAL PANEL METER N12 TYPE

USER'S MANUAL

CE

PROGRAMMABLE DIGITAL PANEL METER N12 TYPE

CONTENTS

1. APPLICATION

N12 programmable digital panel meters of S, H and T executions are destined to measure d.c. voltages and d.c. currents, temperature, resistance and other quantities converted into electrical signals.

A 5 or 4-digit display field (14 or 20mm heigh digits, in red or green colour ensures a good legibility at a long distance.

They realized other additional functions as:

- signalling the set alarm value exceeding,
- signalling the measuring range exceeding,
- counting of the measuring quantity into any optional quantity on the base of individual, linear characteristic,
- programmable indication resolution,
- programmable measurement repetition rate,
- storage of maximal and minimal values,
- monitoring of set parameter values,
- blocking the parameter introduction by means of a password,
- conversion of the measured quantity into a standard programmable current or voltage signal,
- supply two-wire object transducers (24 V), in the N12S execution,
- highlighting any optional measuring unit as per the order.
- handling the RS-485 in the MODBUS protocole, both ASCII and RTU.

With the meter we deliver:

- a guarantee certificate,
- 2 holders to fix the meter on a panel,
- a service manual,
- a connector with screw connections or self-locking connections,
- a set of stickers with units.

When unpacking the meter, please check whether the type and execution code on the data plate correspond to the order.

Symbols located in this service manual mean:

- especially important, one must be familiar with this before connecting the meter

- one must take note of this when the meter is working inconsistently to the expectations

2. BASIC REQUIREMENTS, OPERATIONAL SAFETY

N12 meters are destined to be mounted into panels and cubicles. In the range of operational safety they are in conformity with the IEC 1010-1+A1 standard requirements.

Remarks concerning the operator safety:

- The installation and meter connection should be operated by qualified personnel.
- One must take into consideration all accessible protection requirements.
- Before switching the instrument on, one must check the correctness of the network lead connection IEC 1010-1 p. 6.10 and p. 6.11.2.
- In case of the protection terminal connection with a separate lead, one must remember to connect it before the connection of network leads.
- Do not connect the meter to the network through an autotransformer.
- Before taking the meter housing out, one must turn the supply off.
- The removal of the meter housing during the guarantee contract period may cause its cancellation.

3. FITTING

Prepare a $(92^{+0.6} \times 45^{+0.6})$ mm hole in the panel. The thickness of the material from which the panel is made can not exceed 15 mm. One should introduce the meter from the front of the panel with disconnected supply circuit.

After introducing the meter, fasten it by means of holders.

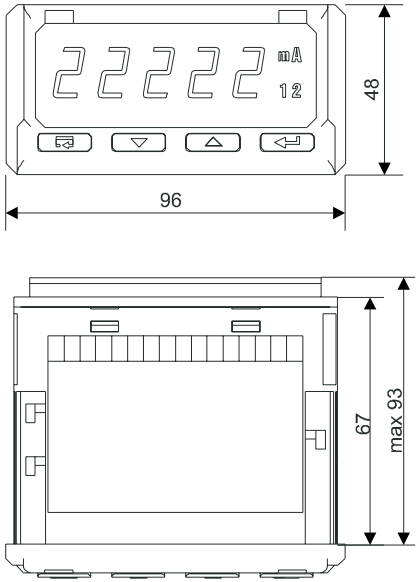


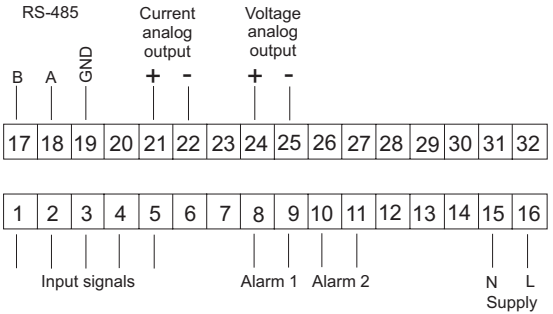
Fig. 1. Overall dimensions

4. CONNECTION

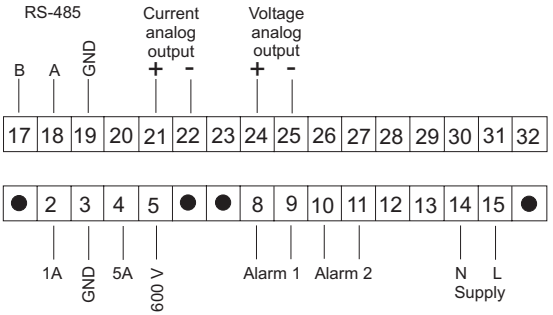
At the rear side of the meter there are two terminal strip seats. A connector with screw terminals or a self-locking connector is added to the meter depending on the meter type chosed in the ordering code.

The fig. 2. shows the connection way of external signals. The description of the connector is also printed on the meter housing.

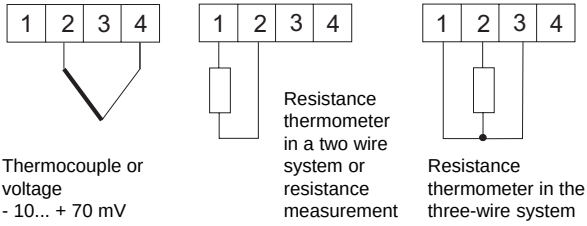
a) Description of the N12S and N12T meter terminal strips



b) Description of the N12H meter terminal strip



c) Connection of input signals in the N12T meter



d) Connection of input signals in the N12S meter.

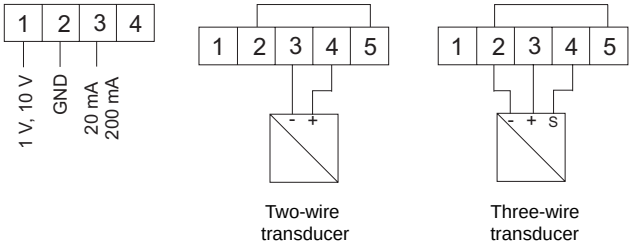


Fig. 2. Connection ways of input signals to the N12 meter.

In case of a meter working in an environment of high interferences, one should use external filters.

It is recommended to use screened leads on the meter input. As a feeder cable, one must use a two-wire cable and choose the lead cross-section such that in case of a short-circuit from the device side, the protection of the cable was ensured by means of the electric installation fuse.

Requirements related to the feeder cable are regulated by the IEC 1010-1 p.6.10. and p.6.11.2. standard.

5. OPERATION

After switching the meter on, its type and next the program version are displayed on the display. After 10 sec., the meter transits automatically into the measuring mode and the input signal value is displayed.

The meter blanks automatically insignificant zeros. The exceeding of the alarm threshold is signalled by means of alarm diodes 1 and 2.

The basic unit of the measured value is automatically highlighted by the meter [1].

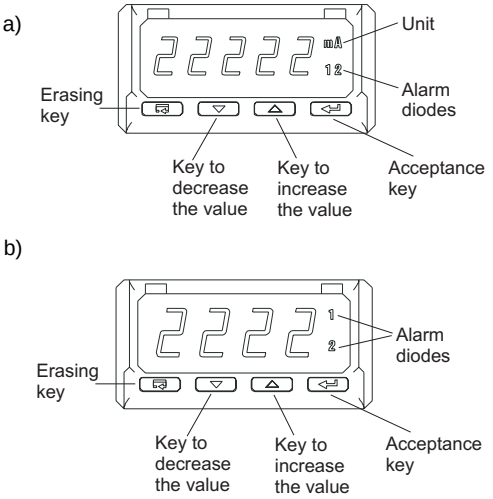


Fig. 3. Description of the meter faceplate a) 5-digit execution b) 4-digit execution

[1] *Not exists in the 4-digit (20mm) execution.*

Key functions:

 - acceptance key

- entry into the programming mode (hold down during 3 seconds),
- moving through the menu - choice of the level,
- entry into the change mode of the parameter value,
- acceptation of the changed parameter value.

 - key to increase the value

- displaying of the maximal value,
- entry to the parameter group level,
- moving through the chosen level,
- change of the chosen parameter value - increase of the value
- successive parameter in the monitoring mode

 - key to decrease the value

- displaying of the minimal value,
- entry to the parameter group level,
- moving through the chosen level,
- change of the chosen parameter value - decrease of the value
- successive parameter in the monitoring mode

 - erasing key

- entry to the menu of parameter monitoring (hold down during 3 seconds),
- exit from the monitoring menu,
- erasing of the parameter change,
- absolute exit from the programming mode

The pressure of the [ESC] [↵] key combination and hold down during 3 sec. causes the erasing of alarm signalling. This operation exclusively acts when the support function is switched on.

The pressure of the [ESC] [▼] key combination causes the erasing of the minimal value.

The pressure of the [ESC] [▲] key combination causes the erasing of the maximal value.

The pressure and hold down of the [↵] key during 3 sec. causes the entry into the programming matrix. The programming matrix is secured by the safeguard code.

The pressure and hold down of the [ESC] key during 3 sec. causes the entry into the monitoring menu. After the monitoring menu one must move by means of [▼] and [▲] keys. In this menu, all programmable meter parameters, except service parameters, are only accessible to the read-out. The exit from the monitoring menu takes place by means of the [ESC] key. On the monitoring menu, parameter symbols are alternately displayed together with their values. The fig. 4. shows the operation algorithm of the meter.

The appearance of the following symbols on the digital displays means:

- Uncorrectly introduced security code.


- Overrunning of the upper measuring range or a lack of sensor.


- Overrunning of the lower measuring range or sensor short-circuited.

- Compensation error of the lead resistance. No connected or damaged lead.

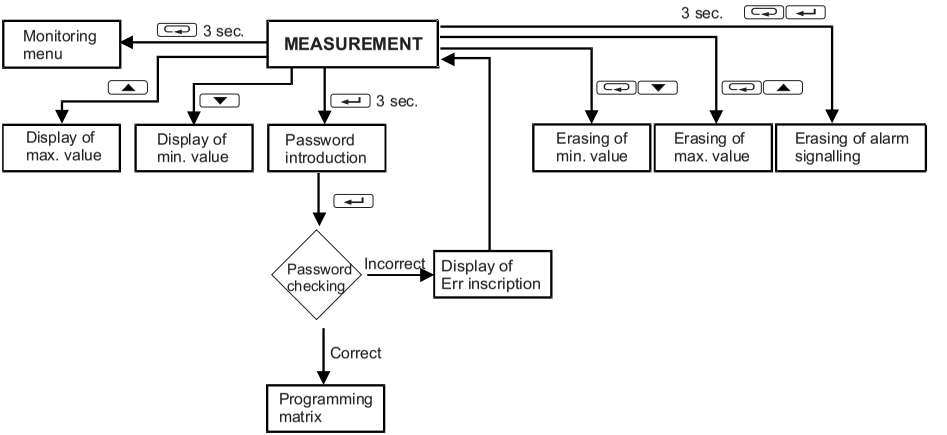


Fig. 4. Operation algorithm of the N12 meter

6. PROGRAMMING

The key [↵] pressure and its holding down during 3 seconds causes the display of the security code symbol SEC alternately with the 0 value set up by the manufacturer. The writing of the correct code causes the entry into the programming matrix. The transition matrix into the programming mode is shown on the fig. 5.

We choose the level by means of the [↵] key, whereas the entry and moving through parameters of the chosen level is carried out by means of the [▼] and [▲] keys. Parameter symbols are displayed alternately with their actual values.

In order to change the value, one must use the [↵] key. To resign of the parameter change one must press the [↩] key. To exit from the chosen level one must select the - - - symbol and press the [↵] key.

In order to exit from the programming matrix into measurement, one must press the [↩] key.

The inscription **HEY** occurs and after 5 sec. the meter will automatically enter into the measurement of the input quantity.

Way of changing the value of the chosen parameter

In order to increase the value of the chosen parameter, one must press the [▲] key. A single pressure of this key causes a value increase of 1. The hold of the pressed [▲] key causes a continuous increase of the value down to the display of the **0** value.

The jump to the next digit follows after this value . The further change is similar. The key release in any moment causes a jump to the first digit. It is similarly in case of the value decrease.

A single pressure of the ▼ key causes a value decrease of one. The hold of the ▼ key pressure down causes a continuous decrease of the value down to the display of the 0 value. The jump to the next digit follows after this value. The further change is similar. The key release in any moment causes a jump on the first digit.

In order to accept the set up parameter, one must press the ↵ key. Then, the writing of the parameter and display of its symbol follows alternately with the new value. The pressure of the ↵ key during the change of the parameter causes the resignation of the record.

Item No											
1	**InP** Input parameters	**tYP** Input type	**Con** Kind of compen. (1)	**d_P** Decimal point	**Cnt** Measure-ment number	**Ind** Linear charact.	**H1** (2)	**Y1** (2)	**H2** (2)	**Y2** (2)	- - -
2	**ALr1** Alarm 1	**PrL1** Lower threshold	**PrH1** Upper threshold	**tYP1** Alarm type	**dLY1** Alarm delay	**LEd1** Alarm support	- - -				
3	**ALr2** Alarm 2	**PrL2** Lower threshold	**PrH2** Upper threshold	**tYP2** Alarm type	**dLY2** Alarm delay	**LEd2** Alarm support	- - -				
4	**Out** Output	**TYPA** Kind of output (Volt/Current)	**AnL** Lower threshold analogue output	**AnH** Upper threshold analogue output	**bAud** Baud rate	**trYb** Kind of transm.	**Adr** Device address	- - -			
5	**SEr** Service	**SEt** Writing of standard paramet.	**SEC** Password introduct.	**tSt** Display test	**JEd** High-ligted unit (3)	- - -					

(1) - *exists only in the N12T execution*
(2) - *exists only when the individual characteristic is switched on* (**Ind = On**)
(3) - *exists only in the 5-digit execution*

Fig. 5. Transition matrix into the programming mode

TABLE 1

Parameter symbol	Description	Range of changes
tYP	Kind of connected input signal. It depends on the meter type	**N12T:** Resistance thermometers: **Pt1** - Pt100 **Pt5** - Pt500 **Pt10** - Pt1000 **Cu1** - Cu100 **Ni1** - Ni100 Thermocouples: **t E-J** - J (Fe-CuNi) **t E-h** - K (NiCr-NiAl) **t E-n** - N (NiCrSi-NiSi) **t E-E** - E (NiCr-CuNi) **t E-r** - R (PtRh13-Pt) **t E-S** - S (PtRh10-Pt) **nAP** - voltage measurement **rEZL** - resistance measurement up to 400 Ω **rEZH** - resistance measurement up to 4 kΩ **N12S:** **1U** - 1 V range **10U** - 10 V range **nnAL** - 20 mA range **nnAH** - 200 mA range N12H: **600U** - 600 V range **1A** - 1 A range **5A** - 5 A range

Table 1 (continuation)

Con	Kind of compensation of sensor working condition changes: ● in case of resistance thermometers and resistance measurements it concerns the compensation of resistance changes of leads connecting the sensor to the meter. ● in case of thermocouples it concerns the compensation of cold junction temperature changes. The automatic compensation does not work in case of measurements of **rEZH**, **Pt10** and **Pt5**.	**Auto -** automatic compensation (in case of resistance thermometers and resistance measurements, a 3-wire line is required) **0...60°C** - Fiducial temperature value for thermocouples. **0...40 Ω** - Resistance of two leads for resistance thermometers and resistance measurements. Accuracy of data introducing: ± 0.1. Writing of values beyond the manual compensation interval will cause the automatic compensation switching on.
d_P	Setup of the decimal point. This setup works both at switched off and switched on individual characteristic. In the only exception that at the switched off individual characteristic, the decimal point is limited in the 5-digit meters. ● In case of rEZL temperature resistance, 600 V and 200 mA measurements, to 1 digit after the decimal point (one can set up 0000.0 or 00000). ● In case of 60 mV or 10 V voltage and 20 mA current measurements, to two digits after the decimal point (one can set up 000.00, 0000.0 or 00000)	Setting possibilities: in 4-digit execution: 0000 000.0 00.00 0.000 in 5-digit execution: 00000 0000.0 000.00 00.000 0.0000

	● In case of 1 V, 1 A and 5 A measurements, to three digits after the decimal point (one can then set up 00.000, 000.00, 0000.0, 00000). ● In case of rEZH resistance measurement, lack of decimal point. In a 4-digit meter: ● In case of temperature measurement lack of decimal point ● Other inputs as above. Other possibilities are ignored and the meter automatically sets up the decimal point.	
Cnt	Number of measurements	In 4-digit execution: 0...9999 In 5-digit execution: 0...19999 The 0 writing causes the measurement switching off and the display blanking
Ind	Switching off or on the individual linear characteristic of the user	On - switched on characteristic OFF - switched off characteristic In case of a change of **Ind** from 1 - „On" into 0 - „OFF" the decimal point **d_P** is set on the maximal value of the given range.
H1, Y1 **H2, Y2**	Parameters of the individual characteristic. On the base of given coordinates of two points by the user, the meter assigns coefficients of the individual characteristic a and b Y = aH + b. At the same time H1 and H2 - measured value Y1 and Y2 - expected value on the display	In 4-digit execution: -1999...9999 In 5-digit execution: -19999...19999

Table 1 (continuation)

PrL1 **PrL2**	Alarm lower threshold	In 4-digit execution: -1999...9999 In 5-digit execution: -19999...19999
PrH1 **PrH2**	Alarm upper threshold	In 4-digit execution: -1999...9999 In 5-digit execution: -19999...19999
tYP1 **tYP2**	Alarm type. The fig. 6. shows the graphical illustration of alarm types	nor - normal On - switched on OFF - switched off H_On - manually switched on, till the time of changing the alarm type, the alarm output is switched on for good. H_OF - manually switched off, till the time of changing the alarm type, the alarm output is switched off for good.
dLY1 **dLY2**	Delay of alarm operation. The parameter is defined by the number of measurements, one must give after how many measurements the alarm operation follows. The alarm switching off follows without delay. The parameter takes in account the number of averaged measurements **Cnt** and treats the whole cycle of averaging as a single measurement.	In 4-digit execution: 0...9999 In 5-digit execution: 0...19999 The introduction of **0** causes the operation at the moment of alarm appearance.
LEd1 **LEd2**	Support of the alarm signalling. In the situation when the function of support is switched on after the withdrawal of the alarm state, the signalling diode is not blanked.	On - support switched on OFF - support switched off

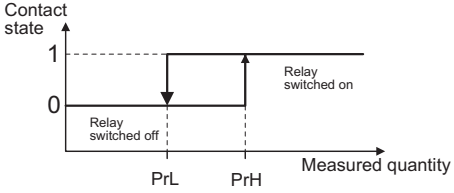
Table 1 (continuation)

	The function signals the alarm state till the moment of its blanking by means of the combination of ⊂ and ↵ keys. This function only and exclusively concerns the alarm signalling and the relay contacts will act without support, according the chosen alartm type.	
tYPa	Type of analog output.	PrAd - current nAP - voltage
AnL	Lower threshold of the analog output. It is the parameter defining the value on the display for which we want obtain 0 on the analog output.	In the 4-digit execution: -1999...9999 In the 5-digit execution: -19999...19999
AnH	Upper threshold of the analog output. It is the parameter defining the value on the display for which we want obtain the max. value (20 mA or 10 V) on the analog output.	In the 4-digit execution: -1999...9999 In the 5-digit execution: -19999...19999
bAud	Baud rate of the RS-485 interface.	2400-2400 bps 4800-4800 bps 9600-9600 bps
TrYb	Kind of transmission through the RS-485 interface.	**OFF** - interface switched off **A8n1** - ASC II 8N1 **A7E1** - ASCII 7E1 **A7o1** - ASCII 7O1 **r8n2** - RTU 8N2 **r8E1** - RTU 8E1 **r8o1** - RTU 8O1
Adr	Device address.	**0...247**

Table 1 (end)

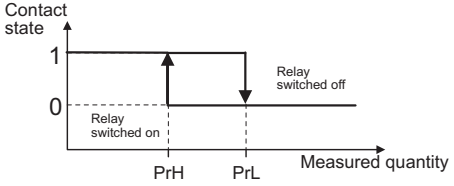
SEt	Writing down of manufacturer's settings. Parameter values set up by the manufacturer are shown in the table 2.	A pressure of the ↵ key causes the writing down of standard parameters into the meter. The execution of this operation is signalled by the inscription **End.**
SEC	Introduction of a new password	In 4-digit execution: -1999...9999 In 5-digit execution: -19999...19999
tSt	Display test. The test consists on consecutive switching on of digital display segments. Alarm diodes and illuminating diodes of the unit should be lightened or blinking. The blinking diode means that the relay is switched off.	The pressure of the ↵ key causes the test switching on. The ↩ ends the test.
JEd		On - highlighting switched on OFF - highlighting switched off
– – – –	Exit of the parameter group from the chosen level.	The pressure of the ↵ key causes the exit of the parameter group from the chosen level.

a) **nor**



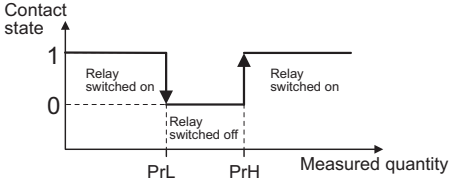
PrH > PrL

b) **nor**



PrH < PrL

c) **OFF**



d) **On**

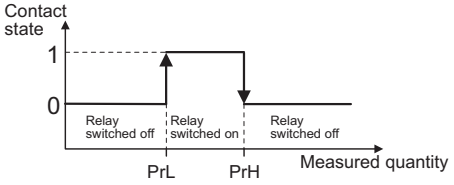


Fig. 6. Alarm type a), b) normal c) switched off d) switched on

CAUTION ! 

- In case of **On** and **OFF** alarm types, the writing down of **PrL>PrH** will cause an automatic transcription of the value from the threshold **PrL** into **PrH** and from **PrH** into **PrL**.
  The alarm type will not change.
- In case of a measuring range overrunning the relay reaction is concordant with written down **PrL**, **PrH** and **tYP** parameters. In spite of displaying the overrunning, the meter will carry out the measurement as before.
- In case of meter operation with a resistance thermometer in a two-wire system the choice of the automatic compensation of lead resistance changes will cause a defective meter work.
- The automatic compensation is switched off when **Pt10**, **Pt5** and **rEZH** sensors are chosen.
- In case of an individual characteristic switching on (**Ind=On**) the measurement result is transformed linearly in accordance with introduced **H1**, **Y1**, **H2**, **Y2** parameters.
- The meter currently checks up the value of the actually introduced parameter. In case when the introduced value exceeds the upper range of changes given in the table 1, the meter will automatically carry out the change into the minimal value. Similarly, in case when the introduced value exceeds the lower range of changes given in the table 1, the meter will automatically carry out the change into the maximal value.

Standard parameters of the meter TABLE 2

Parameter symbol	Level in the matrix	Standard value		
		N11T	N11S	N11H
tYP	1	Pt1	nnAL	600U
Con	1	rEn = 0	---	---
d_P	1	0.0	0.00	0.0
Cnt	1	8	8	8
Ind	1	OFF	OFF	OFF
H1,Y1,H2,Y2	1	0	0	0
PrL1, PrL2	2, 3	-200.0	-19.99	-199.9
PrH1, PrH2	2, 3	850.0	20.00	600.0
tYP1, tYP2	2, 3	OFF	OFF	OFF
dLY1, dLY2	2, 3	0	0	0
LEd1, LEd2	2, 3	OFF	OFF	OFF
tYPA	4	PrAd	PrAd	PrAd
AnL	4	-199.9	-19.99	-199.9
AnH	4	850.0	20.00	600.0
bAud	4	9600	9600	9600
trYb	4	r8N2	r8N2	r8N2
Adr	4	1	1	1
SEC	5	0		
JEd	5	On		

7. RS-485 INTERFACE

N12 programmable digital meters have their serial link in the RS-485 standard to communicate in computer systems and with other devices fulfilling the Master function. The MODBUS asynchronous character communication protocol has been implemented on the serial link. The transmission protocol describes the ways of information exchange between devices through the serial link.

7.1. Connection way of the serial interface

The RS-485 standard enables the direct connection to 32 devices on a single serial link of 1200 m length. For the connection of a greater quantity of devices it is necessary to apply additional intermediate-separating systems.
The lead out of the interface line is given in the meter service manual. To obtain a correct transmission it is necessary to connect lines **A** and **B** in parallel with their equivalents in other devices.
The connection must be carried out with a screened lead. The screen must be connected to the protective grounding in a single point. The **GND** line serves to an additional protection of the interface line for long connections. One must connect it to the protective grounding (this is not necessary for the interface correct work).
In order to obtain the connection with an IBM PC computer, an RS-485 interface card or a RS-232/RS-485 converter is indispensable.
On the Fig. 7. the device connection is shown.

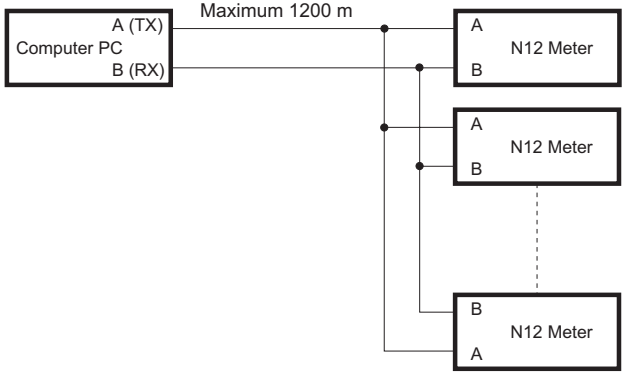


Fig. 7. Way of the RS-485 interface connection

The marking of the transmission line for the card in the PC computer depends on the card producer.

7.2. Description of the MODBUS protocol implementation

The implemented protocol is compatible with the PI-MBUS-300 Rev G Modicon Company.
Combination of meter serial link parameters in the MODBUS protocol:

- meter address - 1...247
- baud rate - 2400, 4800, 9600 bps
- working modes - ASCII, RTU
- information unit - ASCII: 8N1, 7E1, 7O1
  - RTU: 8N2, 8E1, 8O1

The parameter configuration of the serial link is described in the further parts of this service manual. It consists on the settlement of the baud rates (**bAud** parameter), device address (**Adr** parameter) and the information unit type (**trYb** parameter).

Caution:

Each meter connected to the communication network must have:
- a unique address, different from addresses of other devices connected in the network,
- an identical baud rate and information type.

7.3. Description of used functions

Following functions of the MODBUS protocol have been implemented in meters of N12 series:

Description of functions Table 3

Code	Meaning
03	Reading of n-registers
06	Writing of a single register
16	Writing of n-registers
17	Identification of the slave device

Read-out of n-registers (code 03 h)

Function is inaccessible in the publication mode.

Example: readout of 2 registers beginning from the register with the address 1 DBDh (7613).

Request:

Device address	Function	Register address Hi	Register address Lo	Number of registers Hi	Number of registers Lo	Check-sum CRC
01	03	1D	BD	00	02	52 43

Response:

Device address	Function	Number of bytes	Value from the register 1DBD (7613)				Value from the register 1DBE (7614)				Check sum CRC
01	03	08	3F	80	00	00	40	00	00	00	42 8B

Record of values into the register (code 06h)

The function is accessible in the publication mode.

Example: record of the register of 1DBDh (7613) address.

Request:

Device address	Function	Register address Hi	Register address Lo	Value from the register 1DBD (7613)				Check-sum CRC
01	06	1D	BD	3F	80	00	00	85 AD

Response:

Device address	Function	Register address Hi	Register address Lo	Value from the register 1DBD (7613)				Check-sum CRC
01	06	1D	BD	3F	80	00	00	85 AD

Record into n-registers (code 10h)

The function is accessible in the publication mode

Example: record of two registers beginning from the register with 1DBDh (7613) address.

Request:

Device address	Function	Register address Hi	Register address Lo	Number of registers Hi	Number of registers Lo	Number of bytes	Value for the register 1DBD (7613)				Value for the register 1DBE (7614)				Check-sum CRC
01	10	1D	BD	00	02	08	3F	80	00	00	40	00	00	00	03 09

Response:

Device address	Function	Register address Hi	Register address Lo	Number of registers Hi	Number of registers Lo	Check-sum (CRC)
01	10	1D	BD	00	02	D7 80

Report identifying devices (code 11h)

Request:

Device address	Function	Checksum (CRC)
01	11	C0 2C

Response:

Device address	Function	Number of bytes	Device identifier	Device state	Field depending on the type of device	Check-sum
X	11	08	X	FF	XXXXXX	

Device address	- depending on the set value
Function	- function No: 0x11;
Number of bytes	- 0x08;
Device identifier	- 0x60 - N12S - 0x61 - N12H - 0x62 - N12T - 0x63 - N12O - 0x64 - N12P - 0x65 - N12B
Device state	- 0xFF;
Field depending on the device type	- XXXXXX
Device name	- transmitted as ASCII character and defines the meter type S - 0x53, 53 X X X X X H - 0x48, 48 X X X X X T - 0x54, 54 X X X X X O - 0x4F, 4F X X X X X P - 0x50, 50 X X X X X B - 0x42, 42 X X X X X
Quantity of display	- Field depending on the quantity of meter displays - 0x04 - 4-digit meters, X 04 X X X X - 0x05 - 5-digit meters, X 05 X X X X
No of the programming version	- programming version implemented in the meter X X _ _ _ _ - 4-bytes variable of float type

Control total - 2 bytes in the case of work in the RTU mode
1 byte in the case of work in the ASCII code

Example:

Work in the **RTU** mode, e.g.: **trYb=r8n2** (value 0x02 in the case of reading/writing through the interface).

N12S meter
Execution with a **4**- digit display,
No of the programming version **1.00**,
Device address set on **Adr=0x01**,

For this type of meter the frame will have the following shape:

Device address	Function	Quantity of bytes	Device identifier	Device state	Field depending on the device type	Control total (CRC)
01	11	08	60	FF	53 04 3F 80 00 00	CE 60

7.4. Register map of N12 meter

Register map of the N12 series meter Table 4.

Address range	Value type	Description
7000-7200	float (32 bits)	The value is placed in two succesive 16 bit registers. Registers include the same data as 32-bit registers from the 7500 area. Registers are only for reading.

7200-7400	float (32 bits)	The value is placed in two succesive 16 bit registers. Registers include the same data as 32-bit registers from the 7600 area. Registers can be read and written in.
7500-7600	float (32 bits)	The value is placed in a 16-bit register. Registers can be read and written in.
7600-7700	float (32 bits)	The value is placed in a 32-bit register. Registers can be read and written in.

7.5. REGISTERS FOR WRITING AND READING

N12S meters **Table 5.**

The value is placed in two successive 16-bit registers. Registers include the same data as 32-bit register from the 7600 area.	The value is placed in 32-bit registers	Symbol	writing(w)/ reading(r)	Range	Description	
7200	7600	**Identifier**	r	_	**Device identifier**	
					Value	
					60 xx	Identifier
					xx 04	4-digits execution
					xx 05	5-digits execution
7202	7601	**tYP**	w/r	0...3	**Input type**	
					Value	
					0	1 V range
					1	10 V range
					2	20 mA range
					3	200 mA range
					Each change of the input type causes the setting of the decimal point on the maximal value.	
					For 1 V range tYP=0 → d_P=3 For 10 V range tYP=1 → d_P=2 For 20 mA range tYP=2 → d_P=2 For 200 mA range tYP=3 → d_P=1	

Table 5 (continuation)

7204	7602	**Ranu**	Not occurs[1)]		
7206	7603	**Rani**	Not occurs[1)]		
7208	7604	**Tru**	Not occurs[1)]		
7210	7605	**Tri**	Not occurs[1)]		
7212	7606	**Aur**	Not occurs[1)]		
7214	7607	**Ual**	Not occurs[1)]		
7216	7608	**Con**	Not occurs[1)]		
7218	7609	**SCAL**	Not occurs[1)]		
7220	7610	**ConS**	Not occurs[1)]		
7222	7611	**E_in**	Not occurs[1)]		
7224	7612	**Auto**	Not occurs[1)]		
7226	7613	**d_P**	w/r	0...4	**Decimal point**
					Value / If **Ind**=0
					0...3 — For 1 V range tYP=0
					0...2 — For 10 V, 20 mA range tYP=1 or 2
					0...1 — For 200 mA range tYP=3
					If **Ind**=1
					0...3 — 4 - digit meters
					0...4 — 5 - digit meters
7228	7614	**Cnt**	w/r	0...19999	**Quantity of measurements**
					Value
					0...9999 — 4 - digit meters
					0...19999 — 5 - digit meters
7230	7615	**Ind**	w/r	0...1	**Individual characteristic**
					Value
					0 — Charakteristic switched off
					1 — Charakteristic switched on
					In case of change **Ind** from 1 - „**on**" into 0 - „**off**", the decimal point **d_P** is set on the max. value of the given range.
7232	7616	**H1**	w/r	-1999.9...1999.9	**Parameters of the individual characteristic**
					Value
					-199.9...999.9 — 4 - digit meters
					-1999.9...1999.9 — 5 - digit meters
					The range of **H1** and **H2** parameters depends on the max. range of the input signal. The writing of the value with a greater number of significant places after the decimal point will cause its round-off. Values beyond the range cause the return of the error code 03 (not allowed data value).

Table 5 (continuation)

7234	7617	**Y1**	w/r	-19999...19999	**Parameters of the individual characteristic**
					Value
					-1999...9999 — 4 - digit meters
					-19999...19999 — 5 - digit meters
					The parameter **Y1, Y2, PrL1, PrH1, PrL2, PrH2, AnL, AnH** range depends only on the set decimal point **d_P.** The writing of the value with a greater number of significant places after the decimal point will cause its round-off. Values beyond the range cause the return of the error code 03 (not allowed data value).
7236	7618	**H2**	w/r	-1999.9...1999.9	**Parameters of the individual characteristic**
					Change range as for the **H1** parameter
7238	7619	**Y2**	w/r	-19999...19999	**Parameters of the individual characteristic**
					Change range as for the **Y1** parameter
7240	7620	**P_aI**	Not occurs [1]		
7242	7621	**PrL1**	w/r	-19999...19999	**Lower threshold of alarm 1**
					Change range as for the **Y1** parameter
7244	7622	**PrH1**	w/r	-19999...19999	**Upper threshold of alarm 1**
					Change range as for the **Y1** parameter
7246	7623	**tYP1**	w/r	0...4	**Type of alarm 1**
					Value
					0 — Normal
					1 — Switched on
					2 — Switched off
					3 — Switched on manually
					4 — Switched off manually
7248	7624	**dLY1**	w/r	0...19999	**Delay of alarm1**
					Value
					0...9999 — 4 - digit meters
					0...19999 — 5 - digit meters
7250	7625	**LEd1**	w/r	0...1	**Support of alarm1 signalling**
					Value
					0 — support switched off
					1 — support switched on
7252	7626	**P_a2**	Not occurs [1]		
7254	7627	**PrL2**	w/r	-19999...19999	**Lower threshold of alarm 1**
					Change range as for the **Y1** parameter
7256	7628	**PrH2**	w/r	-19999...19999	**Upper threshold of alarm 1**
					Change range as for the **Y1** parameter

Table 5 (continuation)

7258	7629	**tYP2**	w/r	0...4	**Type of alarm**
					Value
					0 Normal
					1 Switched on
					2 Switched off
					3 Switched on manually
					4 Switched off manually
7260	7630	**dLY2**	w/r	0...19999	**Delay of alarm 2**
					Value
					0...9999 4 - digit meters
					0...19999 5 - digit meters
7262	7631	**LEd2**	w/r	0...1	**Support of alarm 2 signalling**
					Value
					0 Support switched off
					1 Support switched on
7264	7632	**tYPO**	not occurs[1)]		
7266	7633	**ConO**	not occurs[1)]		
7268	7634	**P_an**	not occurs[1)]		
7270	7635	**tYPa**	w/r	0...1	**Analogue output type**
					Value
					0 Current
					1 Voltage
7272	7636	**AnL**	w/r	-19999...19999	**Lower threshold of analogue output**
					Change range as for the **Y1** parameter
7274	7637	**AnH**	w/r	-19999...19999	**Upper threshold of analogue output**
					Change range as for the **Y1** parameter
7276	7638	**hour**	not occurs[1)]		
7278	7639	**Jed**	w/r	0...1	**ON, OFF, unit highlighting**
					Value
					0 Highlighting switched off
					1 Highlighting switched on
					Occurs only in 5-digit meters
7280	7640	**Del_min**	w/r	0...1	**Erasing of the minimal value**
					Value
					0 Lack of operation
					1 Erasing of the minimal value
7282	7641	**Del_max**	w/r	0...1	**Erasing of the maximal value**
					Value
					0 Lack of operation
					1 Erasing of the maximal value

Table 5 (continuation)

7284	7642	**Start/Stop/ resetting**	not occurs[1)]
7286	7643	**CEnP**	not occurs[1)]
7288	7644	**CEnq**	not occurs[1)]
7290	7645	**CEnS**	not occurs[1)]
7292	7646	**CPAu**	not occurs[1)]
7294	7647	**CUAu**	not occurs[1)]

[1)] In case of registers no occuring in the given series of meters, their value is equal 1E+20

N12H meters

Table 6.

The value is placed in two successive 16-bit registers. Registers include the same data as 32-bit register from the 7600 area.	The value is placed in 32-bit registers	Symbol	writing(w)/ reading(r)	Range	Description	
7200	7600	**Identifier**	r	–	**Device identifier**	
					Value	
					61 xx	Identifier
					xx 04	4-digits execution
					xx 05	5-digits execution
7202	7601	**tYP**	w/r	0...2	**Input type**	
					Value	
					0	600 V range
					1	1 A range
					2	5 A range
					Each change of the input type causes the setting of the decimal point on the maximal value.	
					For 600 V range tYP=0 → d_P=1 For 1 A range tYP=1 → d_P=3 For 5 A range tYP=2 → d_P=3	

Table 6 (continuation)

7204	7602	**Ranu**	Not occurs[1)]		
7206	7603	**Rani**	Not occurs[1)]		
7208	7604	**Tru**	Not occurs[1)]		
7210	7605	**Tri**	Not occurs[1)]		
7212	7606	**Aur**	Not occurs[1)]		
7214	7607	**Ual**	Not occurs[1)]		
7216	7608	**Con**	Not occurs[1)]		
7218	7609	**SCAL**	Not occurs[1)]		
7220	7610	**ConS**	Not occurs[1)]		
7222	7611	**E_in**	Not occurs[1)]		
7224	7612	**Auto**	Not occurs[1)]		
7226	7613	**d_P**	w/r	0...4	**Decimal point**
					Value
					If **Ind**=0
					0...1 — For 600 V range tYP=0
					0...3 — For 1 A, 5 A range tYP=1 or 2
					If **Ind**=1
					0...3 — 4 - digit meters
					0...4 — 5 - digit meters
7228	7614	**Cnt**	w/r	0...19999	**Quantity of measurements**
					Value
					0...9999 — 4 - digit meters
					0...19999 — 5 - digit meters
7230	7615	**Ind**	w/r	0...1	**Individual characteristic**
					Value
					0 — Characteristic switched off
					1 — Characteristic switched on
					In case of change **Ind** from 1 - „**on**" into 0 - „**off**", the decimal point **d_P** is placed the maximal value for the given range.
7232	7616	**H1**	w/r	-1999.9...1999.9	**Parameters of the individual characteristic**
					Value
					-199.9...999.9 — 4 - digit meters
					-1999.9...1999.9 — 5 - digit meters
					The range of **H1** and **H2** parameters depends on the max. range of the input signal. The writing of the value with a greater number of significant places after the decimal point will cause its round-off. Values beyond the range cause the return of the error code 03 (not allowed data value).

Table 6 (continuation)

7234	7617	**Y1**	w/r	-19999...19999	**Parameters of the individual characteristic**
					Value
					-1999...9999 — 4 - digit meters
					-19999...19999 — 5 - digit meters
					The parameter **Y1, Y2, PrL1, PrH1, PrL2, PrH2, AnL, AnH** range depends only on the set decimal point d_P. The writing of the value with a greater number of significant places after the decimal point will cause its round-off. Values beyond the range cause the return of the error code 03 (not allowed data value).
7236	7618	**H2**	w/r	-1999.9...1999.9	**Parameters of the individual characteristic**
					Change range as for the **H1** parameter
7238	7619	**Y2**	w/r	-19999...19999	**Parameters of the individual characteristic**
					Change range as for the **Y1** parameter
7240	7620	**P_aI**	Not occurs [1)]		
7242	7621	**PrL1**	w/r	-19999...19999	**Lower threshold of alarm 1**
					Change range as for the **Y1** parameter
7244	7622	**PrH1**	w/r	-19999...19999	**Upper threshold of alarm 1**
					Change range as for the **Y1** parameter
7246	7623	**tYP1**	w/r	0...4	**Type of alarm 1**
					Value
					0 — Normal
					1 — Switched on
					2 — Switched off
					3 — Switched on manually
					4 — Switched off manually
7248	7624	**dLY1**	w/r	0...19999	**Delay of alarm1**
					Value
					0...9999 — 4 - digit meters
					0...19999 — 5 - digit meters
7250	7625	**LEd1**	w/r	0...1	**Support of alarm1 signalling**
					Value
					0 — Support switched off
					1 — Support switched on
7252	7626	**P_a2**	Not occurs [1)]		
7254	7627	**PrL2**	w/r	-19999...19999	**Lower threshold of alarm 1**
					Change range as for the **Y1** parameter
7256	7628	**PrH2**	w/r	-19999...19999	**Upper threshold of alarm 1**
					Change range as for the **Y1** parameter

Table 6 (continuation)

7258	7629	**tYP2**	w/r	0...4	**Type of alarm**
					Value
					0 Normal
					1 Switched on
					2 Switched off
					3 Switched on manually
					4 Switched off manually
7260	7630	**dLY2**	w/r	0...19999	**Delay of alarm 2**
					Value
					0...9999 4 - digit meters
					0...19999 5 - digit meters
7262	7631	**LEd2**	w/r	0...1	**Support of alarm 2 signalling**
					Value
					0 Support switched off
					1 Support switched on
7264	7632	**tYPO**	not occurs[1)]		
7266	7633	**ConO**	not occurs[1)]		
7268	7634	**P_an**	not occurs[1)]		
7270	7635	**tYPa**	w/r	0...1	**Analogue output type**
					Value
					0 Current
					1 Voltage
7272	7636	**AnL**	w/r	-19999...19999	**Lower threshold of analogue output**
					Change range as for the **Y1** parameter
7274	7637	**AnH**	w/r	-19999...19999	**Upper threshold of analogue output**
					Change range as for the **Y1** parameter
7276	7638	**hour**	not occurs[1)]		
7278	7639	**Jed**	w/r	0...1	**Switching on / off, unit highlighting**
					Value
					0 Highlighting switched off
					1 Highlighting switched on
					Occurs only in 5-digit meters
7280	7640	**Del_min**	w/r	0...1	**Erasing of the minimal value**
					Value
					0 Lack of operation
					1 Erasing of the minimal value
7282	7641	**Del_max**	w/r	0...1	**Erasing of the maximal value**
					Value
					0 Lack of operation
					1 Erasing of the maximal value

Table 6 (continuation)

7284	7642	**Start/Stop/ resetting**	not occurs[1)]
7286	7643	**CEnP**	not occurs[1)]
7288	7644	**CEnq**	not occurs[1)]
7290	7645	**CEnS**	not occurs[1)]
7292	7646	**CPAu**	not occurs[1)]
7294	7647	**CUAu**	not occurs[1)]

[1)] In case of registers no occuring in the given series of meters, their value is equal 1E+20

N12T meters **Table 7.**

The value is placed in two successive 16-bit registers. Registers include the same data as 32-bit register from the 7600 area.	The value is placed in 32-bit registers	Symbol	writing(w)/ reading(r)	Range	Description	
7200	7600	**Identifier**	w	-	**Device identifier**	
					Value	
					62 xx	Identifier
					xx 04	4-digit execution
					xx 05	5-digit execution
7202	7601	**tYP**	w/r	0...13	**Input type**	
					Value	
					0	Resistance thermometer Pt100
					1	Resistance thermometerPt500
					2	Resistance thermometer Pt1000
					3	Resistance thermometer Cu100
					4	Resistance thermometerNi100
					5	Thermocouple J
					6	Thermocouple K
					7	Thermocouple N
					8	Thermocouple E
					9	Thermocouple R
					10	Thermocouple S
					11	Voltage measurement

Table 7 (continuation)

					12	Resistance measurement up to 400 Ω
					13	Resistance measurement up to 4 kΩ
					Each change of the input type causes the setting of the decimal point on the maximal value.	
					For tYP=0 to tYP=10 and tYP=12 For tYP=11 → d_P=1 → d_P=2 For tYP=13 → d_P=0	
7204	7602	**Ranu**	Not occurs[1)]			
7206	7603	**Rani**	Not occurs[1)]			
7208	7604	**Tru**	Not occurs[1)]			
7210	7605	**Tri**	Not occurs[1)]			
7212	7606	**Aur**	Not occurs[1)]			
7214	7607	**Ual**	Not occurs[1)]			
7216	7608	**Con**	w/r	0...1999.9	**Kind of change compensation of sensor work conditions**	
					Value	
					0...999.9	4 - digit meters
					0...1999.9	5 - digit meters
7218	7609	**SCAL**	Not occurs[1)]			
7220	7610	**ConS**	Not occurs[1)]			
7222	7611	**E_in**	Not occurs[1)]			
7224	7612	**Auto**	Not occurs[1)]			
7226	7613	**d_P**	w/r	0...4	**Decimal point**	
					Value	
					If **Ind**=0	
					0...1	From tYP=0 to tYP=10 and tYP=12
					0...2	For tYP=11
					0	For tYP=13
7228	7614	**Cnt**	w/r	0...19999	**Quantity of measurements**	
					Value	
					0...9999	4 - digit meters
					0...19999	5 - digit meters
7230	7615	**Ind**	w/r	0...1	**Individual characteristic**	
					Value	
					0	Characteristic switched off
					1	Characteristic switched on
					In case of change **Ind** from 1 - „**on**" into 0 - „**off**", the decimal point **d_P** is seton the max. value of the given range.	

Table 7 (continuation)

7232	7616	**H1**	w/r	-19999...19999	**Parameters of the individual characteristic**
					Value
					-1999...9999 — 4 - digit meters
					-19999...19999 — 5 - digit meters
					The range of **H1** and **H2** parameters depends on the max. range of the input signal. The writing of the value with a greater number of significant places after the decimal point will cause its round-off. Values beyond the range cause the return of the error code 03 (not allowed data value).
7234	7617	**Y1**	w/r	-19999...19999	**Parameters of the individual characteristic**
					Value
					-1999...9999 — 4 - digit meters
					-19999...19999 — 5 - digit meters
					The parameter **Y1, Y2, PrL1, PrH1, PrL2, PrH2, AnL, AnH** range depends only on the set decimal point d_P. The writing of the value with a greater number of significant places after the decimal point will cause its round-off. Values beyond the range cause the return of the error code 03 (not allowed data value).
7236	7618	**H2**	w/r	-19999...19999	**Parameters of the individual characteristic**
					Change range as for the **H1** parameter
7238	7619	**Y2**	w/r	-19999...19999	**Parameters of the individual characteristic**
					Change range as for the **Y1** parameter
7240	7620	**P_al**	Not occurs [1]		
7242	7621	**PrL1**	w/r	-19999...19999	**Lower threshold of alarm 1**
					Change range as for the **Y1** parameter
7244	7622	**PrH1**	w/r	-19999...19999	**Upper threshold of alarm 1**
					Change range as for the **Y1** parameter
7246	7623	**tYP1**	w/r	0...4	**Type of alarm 1**
					Value
					0 — Normal
					1 — Switched on
					2 — Switched off
					3 — Switched on manually
					4 — Switched off manually
7248	7624	**dLY1**	w/r	0...19999	**Delay of alarm1**
					Value
					0...9999 — 4 - digit meters
					0...19999 — 5 - digit meters

Table 7 (continuation)

7250	7625	**LEd1**	w/r	0...1	**Support of alarm1 signalling**
					Value |
					0 | Support switched off
					1 | Support switched on
7252	7626	**P_a2**	Not occurs [1)]		
7254	7627	**PrL2**	w/r	-19999...19999	**Lower threshold of alarm 1**
					Change range as for the **Y1** parameter
7256	7628	**PrH2**	w/r	-19999...19999	**Upper threshold of alarm 1**
					Change range as for the **Y1** parameter
7258	7629	**tYP2**	w/r	0...4	**Type of alarm**
					Value |
					0 | Normal
					1 | Switched on
					2 | Switched off
					3 | Switched on manually
					4 | Switched off manually
7260	7630	**dLY2**	w/r	0...19999	**Delay of alarm 2**
					Value |
					0...9999 | 4 - digit meters
					0...19999 | 5 - digit meters
7262	7631	**LEd2**	w/r	0...1	**Support of alarm 2 signalling**
					Value |
					0 | Support switched off
					1 | Support switched on
7264	7632	**tYPO**	not occurs[1)]		
7266	7633	**ConO**	not occurs[1)]		
7268	7634	**P_an**	not occurs[1)]		
7270	7635	**tYPa**	w/r	0...1	**Analogue output type**
					Value |
					0 | Current
					1 | Voltage
7272	7636	**AnL**	w/r	-19999...19999	**Lower threshold of analogue output**
					Change range as for the **Y1** parameter
7274	7637	**AnH**	w/r	-19999...19999	**Upper threshold of analogue output**
					Change range as for the **Y1** parameter
7276	7638	**hour**	not occurs[1)]		
7278	7639	**Jed**	w/r	0...1	**ON, OFF, unit highlighting of the unit**
					Value |
					0 | Highlighting switched off
					1 | Highlighting switched on
					Occurs only in 5-digit meters

Table 7 (continuation)

7640	7640	**Del_min**	w/r	0...1	**Erasing of the minimal value**	
					Value	
					0	Lack of operation
					1	Erasing of the minimal value
7641	7641	**Del_max**	w/r	0...1	**Erasing of the maximal value**	
					Value	
					0	Lack of operation
					1	Erasing of the maximal value
7284	7642	**Start/Stop/ resetting**	not occurs[1)]			
7286	7643	**CEnP**	not occurs[1)]			
7288	7644	**CEnq**	not occurs[1)]			
7290	7645	**CEnS**	not occurs[1)]			
7292	7646	**CPAu**	not occurs[1)]			
7294	7647	**CUAu**	not occurs[1)]			

[1)] In case of registers no occuring in the given series of meters, their value is equal 1E+20

7.6. Registers only for reading

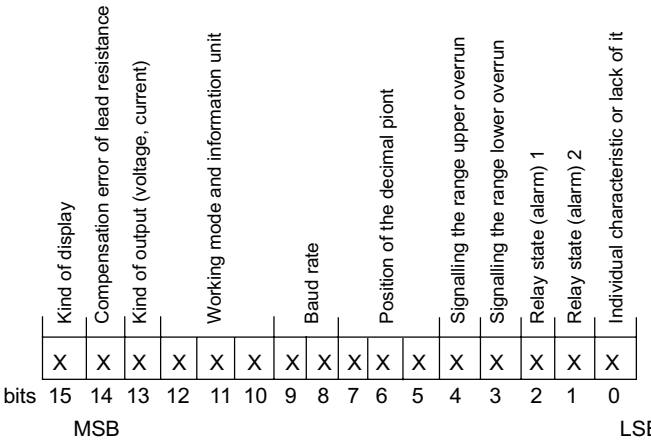
The value is placed in two successive 16-bit registers. Registers include the same data as 32-bit register from the 7600 area.	The value is placed in 32-bit registers	Symbol	Writing (w) /reading (r)	Unit	Quantity name
7000	7500	Identifier	r	-	Constant identifying the device.
7002	7501	Status	r	-	The status is the register describing the meter present state.
7004	7502	Steering	r	%	It is the register defining the steering of the analogue output.
7006	7503	Minimum	r	-	Minimal value of the currently displayed value.
7008	7504	Maximum	r	-	Maximal value of the currently displayed value.
7010	7505	Displayed value	r	-	Currently displayed value
7012	7506	Not occurs[1)]			
7014	7507	Not occurs[1)]			
7016	7508	Not occurs[1)]			
7018...7096	7509...7548	Not occurs[1)]			

1) In case of registers no occuring in the given series of meters, their value is equal 1E+20

Caution!

- The parameter „Displayed value" „minimum", „maximum" at the moment of the upper or lower range exceeding is equal 1E+20.
- For the parameter Cnt=0 (measurement switching off and displays blanking), „minimum", „maximum" and „displayed value" parameters are set on the value 1E+20.

Description of the status register



Bit-15 Kind of display

0 - meter with a 4-digit display
1 - meter with a 5-digit display

Bit-14 Compensation error of the lead resistance

0 - lack of error
1 - signalling a compensation error

Caution!
This bit is only set in the N12T meter. For other types of N12 meter executions, the value of this bit is optional.

Bit-13 Kind of output (voltage, current)

0 - current
1 - voltage

Bit-12...10 Working mode and information unit

000 - interface switched off
001 - 8N1 - ASCII
010 - 7E1 - ASCII
011 - 7O1 - ASCII
100 - 8N2 - RTU
101 - 8E1 - RTU
110 - 8O1 - RTU

Bit-8...9 Baud rate

00 - 2400 bit/s
01 - 4800 bit/s
10 - 9600 bit/s

Bit-5...7 Position of the decimal point

000 - lack
001 - 0.0
010 - 0.00
011 - 0.000
100 - 0.0000 (only for 5-digit meter executions)

Bit-4 Signalling the range upper overrun

0 - normal work
1 - range overrun

Bit-3 Signalling the range lower overrun

0 - normal work
1 - range overrun

Bit-2 Relay state (alarm 2)

0 - switched off
1 - switched on

Bit-1 Relay state (alarm 1)

0 - switched off
1 - switched on

Bit-0 Individual charakteristic

0 - Individual charakteristic switched off
1 - Individual charakteristic switched on

8. TECHNICAL DATA

Panel meter dimensions	96 × 48 × 93 mm
Protection index ensured by the housing	IP 50
Protection index ensured from the terminal side	IP 20

Rated operating conditions:

– supply voltage depended on the execution code	85...230...253 V a.c. d.c. 20...24...40 V a.c. d.c.
– supply voltage frequency	40...50...440 Hz
– ambient temperature	0...23...50°C
– relative humidity	< 75% (water vapour condensation inadmissible)
Power consumption	max 5 VA
Storage temperature	- 20...+85°C

Display field

N12T4, N12S4, N12H4	four 7 segment LED displays two alarm diodes
N12T5,N12S5, N12H5	five 7 segment LED displays two alarm diodes, two diodes to the unit highlighting

Indication range of the digital display:

N12T4, N12S4, N12H4	-1999... 9999
N12T5, N12S5, N12H5	-19999...19999
Servicing	four keys

Relay outputs

- programmable alarm thresholds,
- three types of alarms (see chapter 6),
- hysteresis defined by means of the lower and upper alarm threshold,
- signalling of alarm action by means of diodes,
- programmable delay of the alarm operation,
- two relay outputs,
- voltageless make contacts - maximal load capacity:
  - voltage: 250 V a.c., 150 V d.c.
  - current: 5 A 30 V d.c., 250 V a.c.
  - resistance load: 1250 VA, 150 W

Analogue output

- current programmable 0/4...20 mA
  - load resistance $\leq$ 500 Ω
- voltage programmable 0...10 V
  - load resistance $\geq$ 500 Ω
- galwanic insulation,
- resolution: 0.01% of the range
- basic error: ± (0.1 % i.v.+ 0.2% u.l.)[1]

Digital output

- RS-485 interface ,
- MODBUS transmission protocol:
  - ASCII: 8N1, 7E1, 7O1
  - RTU: 8N2, 8E1, 8O1,
- Baud rate: 2400, 4800, 9600 bauds,
- Maximal response time for query frame: 300 ms

[1] i.v. - indicated value
u.l.- upper limit of the measuring subrange

Two-wire supply of object transducers:

24 V d.c. / max 25 mA - only in the N12S (galwanically insulated)

Fastness against supply decays: acc. EN 50082-2

Electromagnetic compatibility:

- immunity acc. EN 50082-2
- emission acc. EN 50081-2

Safety requirements:

according IEC 1010-1 standard:

- installation category III
- level of polution 2
- maximal voltage in relation to the earth 600 V a.c.

PARAMETERS OF THE N12H METER:

- indication range:

4 digits	**5 digits**
-199.9...600.0 V	- 600.0...600.0 V
-1.000...1.000 A	-1.000...1.000 A
-1.999...5.000 A	-5.000...5.000 A

- input resistance for ranges:
  voltage Ri > 2.7 MΩ,
  current 1A Ri = 50 mΩ ±10%,
  current 5A Ri = 10 mΩ ±10%,
- long lasting exceeding of the upper range: 10%
- basic error: ± (0.1% i.v.+ 0.2% u.l.)
- additional error from ambient temperature changes: ± (0.1% u.l. /10K)

PARAMETERS OF THE N12S METER:

- indication range:

4 digits	5 digits
-1.000...1.000 V	-1.000...1.000 V
-10.00...10.00 V	-10.00...10.00 V
-19.99...20.00 mA	-20.00...20.00 mA
-199.9...200.0 mA	-200.0...200.0 mA

- input resistance for range:
  voltage Ri >1 MΩ,
  current Ri< 5 Ω
- long-lasting overrun of the upper range: 10%
- basic error: ± (0.1% i.v.+ 0.2% u.l.)
- additional error from ambient temperature changes: ± (0.1% u.l. /10K)

PARAMETERS OF THE N12T METER:

Thermocouples

Sensor	Measuring range	Basic error
J (Fe-CuNi)	(-100...+1200)°C	± (0.1% i.v. + 0.2% u.l.)[1]
K (NiCr-NiAl)	(-100...+1370)°C	± (0.1% i.v. + 0.2% u.l.)
N (NiCrSi-NiSi)	(-100...+1300)°C	± (0.1% i.v. + 0.2% u.l.)
E (NiCr-CuNi)	(-100...+1000)°C	± (0.1% i.v. + 0.2% u.l.)
R (PtRh13-Pt)	(-50...+1760)°C	± (0.1% i.v. + 0.2% u.l.)
S (PtRh10-Pt)	(-50...+1760)°C	± (0.1% i.v. + 0.2% u.l.)
Voltage measurements	(-10...70) mV	± (0.1% i.v. + 0.1% u.l.)

Characteristics acc. IEC

[1] i.v. - indicated value
u.l. - upper limit of the measuring subrange

Resistance thermometers

RTD resistance thermometers

- current intensity flowing through the resistance thermometer < 0.17 mA
- resistance of leads connecting the resistance thermometer to the meter < 20 Ω/per lead

Sensor	Measuring range	Basic error
Pt100	(-199...+850)°C	± (0.1% i.v. + 0.2 % u.l.)
Pt500	(-199...+850)°C	± (0.1% i.v. + 0.2 % u.l.)
Pt1000	(-199...+850)°C	± (0.1% i.v. + 0.2 % u.l.)
Cu100	(-50...+180)°C	± (0.1% i.v. + 0.3 % u.l.)
Ni100	(-60...+180)°C	± (0.1 % i.v. + 0.3 % u.l.)
Resistance measurement	(0...400) Ω	± (0.1%i.v. + 0.1% u.l.)
Resistance measurement	(0...4000) Ω	± (0.1% i.v. + 0.2% u.l.)

Characteristics acc. IEC 751+A1+A2.

i.v. = indicated value

u.l. = upper limit of the measuring subrange

Additional errors in rated working conditions

- compensation of cold junction temperature changes ± 0.2% u.l.
- compensation of lead resistance changes ± 0.2 % u.l.
- from ambient temperature changes ± 0.1% u.l./10°K

Time of preliminary heating 15 minutes

Weight 0.2 kg

Time of measurement programmable, min. 125 ms[2)]

[2)] *in case of a temperature meter with a switched ACJC on, one must add the time of compensation duration which is 0.5 sec. It is the time which we add to the averaged measurement. That means, if we introduce the parameter value Cnt = 8, then the measurement time without switched ACJC on will be 1 sec., and with the switched on compensation, 1.5 sec.*

9. BEFORE A FAILURE WILL BE DECLARED

SYMPTOMS	PROCEDURE
1. The meter does not operate	Check the connection of the feeder cable
2. Only the diodes are lighting	Number of measurements = 0 has been introduced. The meter operates in the SLEEP mode. The display is blanked.
3. Only the horizontal dashes are displayed	Check the correctness of the input signal connection. See page 8 and 9 in the service manual.
4. Only the inscription **ErrC** is displayed	The automatic function of temperature compensation has been chosen, however the meter is working in a two-wire system. Connect the third lead or switch the automatic compensation off. The inscription can also be displayed if the automatic compensation is switched on and a **Pt10, Pt5** or **rEZH** sensor is chosen.
5. Only the inscription **noC** is displayed	The meter is discalibrated, Contact the nearest authorized service workshop.
6. The entry into the programming mode is not possible. The inscription **Err** is displayed	The programming mode is protected by the password. If the user forgets which password has been introduced one must contact the nearest authorized service workshop.

7. Lack of certainty if all display segments are efficient	Enter into the service mode and switch on the display test. In the same time the same segments should be lighted on all displays. The state with blanked displays does never occur. Otherwise submit the defect to the nearest authorized service workshop.
8. During operations in the programming mode, parameter values inconsistent with the range of changes given in the table 1 appear on the display	Enter into the service mode and accept the **SEt** parameter. The meter will introduce values in accordance with the table 2.
9. A result inconsistent with our expectations appears on the display.	Check if the individual characteristic is not switched on. In case of necessity enter into the service mode and accept the SEt parameter. The meter will introduce parameters in accordance with the table 2.
10. The meter does not accept the introduced decimal point by the user.	Some positions of the decimal point in the case when the individual characteristic is switched off are unlisted. See the description of the d_P parameter in table 1
11. H1, Y1, H2, Y2 parameter symbols are not displayed in the programming mode.	In case of switched individual characteristic off, mentioned symbols are omitted.
12. Despite of the alarm threshold overrun neither the alarm relay nor the signalling diode is switched on.	Check the introduced delay in the alarm operations into the meter. If need be, correct the **dLY** parameter
13. Despite of the relay switching off, the alarm diode does not go out.	Check if the alarm signalling support is not switched on. **LED** parameter. In case of need, switch it off.

14. Lack of possibility to erase the signalling diode by means of key combination (fig. 4.) when the parameter of alarm signalling support is switched on.	The alarm still lasts. The erased diode is immediately re-lighted.
15. Despite the fact that the alarm still remains, the signalling diod does not light up.	Check if a delay of the alarm operation has not been introduced **dLY** parameter
16. Instead to display the measurement result, the meter displays the parameter symbol alternately with its value despite we were not entered into the programming mode.	The meter works in the reviewing mode.
17. A delay of the alarm operation has been introduced, e.g. 30 measurements, however after this time the alarm has not operated.	The lasting alarm state was shorter than the programmed, e.g. during the lasting time of the alarm the state of alarm withdrawal has occured. In that case the meter begins counting the measurements from the beginning.
18. The meter does not establish contact with the computer.	Check if the interface leads (A, B, GND) have been correctly connected. Then, check in the programming matrix the interface setting (trYb, bAud, Adr). These parameters must be the same as in the used software.

10. PROGRAMMING EXAMPLES OF N12 METERS

Example 1: Programming of an individual characteristic.

If we want to programme so that the value 4.00 mA will correspond to the value 0 on the display, whereas the value 20.00 mA will correspond to the value 100, one must:

- enter into the programming mode and choose the **d_P** parameter responsible for the decimal point. Set up the point on the position 1, that is to say 0000,
- choose the **Ind** parameter and switch the individual characteristic **On,**
- choose the **H1** parameter and introduce the value 4.00,
- pass on the **Y1** parameter and introduce the value 0,
- pass on the **H2** parameter and introduce the value 20.00,
- pass on the **Y2** parameter and introduce the value 100.

Example 2 - Programming of an inverse individual characteristic.

If we want to programme so that the value 4.00 mA will correspond to the value 120.5 on the display, whereas the value 20.00 mA will correspond to the value 10.8, one must:

- enter into the programming mode and choose the **d_P** parameter responsible for the decimal point. Set up the point on the position 2, that is to say 000.0;
- choose the **Ind** parameter and switch the individual characteristic **On,**
- choose the **H1** parameter and introduce the value 4.00,
- pass on the **Y1** parameter and introduce the value 120.5,
- pass on the **H2** parameter and introduce the value 20.00,
- pass on the **Y2** parameter and introduce the value 10.8.

Example 3 - Programming of the alarm with hysteresis

If we want to programme the alarm 1 operation so that the alarm will be switched on at the value 850° C, whereas switched off at the value 100°C, and the alarm 2 so that at the value 1000°C the alarm will be switched off and on at the value -199°C, one must:

- enter into the programming mode and choose the level with the **ALr1** symbol,
- enter on the **ALr1** level, choose the **PrL1** parameter and introduce the value 100,
- pass on the **PrH** parameter and introduce the value 850,
- pass on the **tYP** parameter and choose the function design ted as **nor,**
- exit from the **ALr1** level and pass on the **ALr2** level,
- choose the **PrL** parameter and introduce the value 1000,
- pass on the **PrH** parameter and introduce the value -199,
- pass on the **tYP** parameter and choose the function **nor**.,

Example 4 - Programming of an alarm operating in the given interval with delay.

If we want that the alarm 1 will be switched on in the interval from 100 V up to 300 V and operated only after 10 sec, one must:

- enter into the programming mode and choose the **Alr1** level,
- pass on the **PrL** parameter and introduce the value 100,
- pass on the **PrH** parameter and introduce the value 300,
- pass on the **tYP** parameter and choose the **On** function,
- pass on the **dLY** parameter.

The meter measurement time is 125ms. Assuming that the **Cnt** parameter has not been changed and is equal 8 (that is the manufacturer setting) the measurement time is 8 x 125 ms = 1 sec.
If we want to obtain a delay of 10 sec for the alarm operation one must write down the **dLY** parameter, the value 10 s/1 s = 10

- introduce the value 10 under the dLY parameter,
- exit from the programming mode.

In case of the alarm state duration for a time longer than 10 sec., the meter will switch the alarm relay on and the alarm diode will be lighted.

Example 5 - Programming of analogue output

If we want to program that the 0.00 mA value will correspond to the 4 mA value on the current analogue output, whereas the 20.00 mA value to the 20 mA value, one must:

- enter into the programming mode and choose the **TYPA** parameter responsible for the analogue output type. Choose the **PrAd** current output.

  Under the **AnL** parameter, one must write down the value of the imput signal for which we want 0 mA on the analogue output. For this reason one must calculate the **AnL** parameter: (20 - 0) (20 - 4) = 1.25 $\rightarrow$ 0 - (4 $\times$ 1.25) = - 5

- choose the **AnL** parameter and introduce the value - 5.00
- choose the **AnH** parameter and introduce the value 20.00

11. EXECUTION CODES

METER N12	X	X	X	X	X	XX	X	XXX
Input:								
temperature, programmable input	**T**							
1 V d.c., 10 V d.c., 20 mA d.c, 200 mA. d.c.	**S**							
600 V d.c. , 1 A d.c. , 5 A d.c.	**H**							
turns, frequency, period, pulses	**O**							
single-phase parameters	**P**							
for synoptic panels	**B**							
as per the order	**X**							
Number of displays:								
4 × 20 mm high digits		**4**						
5 × 14 mm high digits		**5**						
Display colour:								
red			**0**					
green			**1**					
Supply voltage:								
230 V a.c. d.c.				**1**				
24 V a.c. d.c.				**2**				
Kind of terminals:								
socked-plug with screw connections					**0**			
socked-plug with self-locking connections					**1**			
Execution:								
standard						**00**		
custom-made						**XX**		
Acceptance tests:								
without a quality acceptance test							**0**	
with a quality inspection certificate							**1**	
acc. customer's agreement							**X**	
Unit field:								
introduce the unit symbol								**XXX**

Order example: N12-S-4-1-1-0-00-0 mA means: a meter with standard signals, with 4 displays in green colour, voltage supply: 230 V a.c., d.c., kind of terminal: socket-plug with screw connection, standard execution, without a quality acceptance test, with the highlighted mA unit.

- In case of a custom-made execution or need of more detailed technical information please contact our Technical Department.
- In case of any meter failure one must contact the nearest authorized service workshop.

12. MAINTENANCE AND GUARANTEE

The N12 meter does not required any periodical maintenance. In case of some incorrect unit operations:

1. In the period of 12 months from the date of purchase:
   One should take the meter down from the installation and return to the manufacturer's Quality Control Dept. If the unit has been used in compliance with the instructions, the manufacturer guarantees to repair it free of charge.
2. After the guarantee period:
   One should turn over the meter to repair in a certified service workshop.

The disassembling of the housing causes the cancellation of the granted guarantee.
Spart parts are available for the period of ten years from the date of purchase.

We reserve the right to make changes in design and specifications of any products as engineering advances or necessity requires.

SALES PROGRAMME

MEASUREMENT
CONTROL
RECORDING

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- BARGRAPH INDICATORS
- MEASURING TRANSDUCERS
- ANALOGUE PANEL METERS (DIN INSTRUMENTS)
- DIGITAL CLAMP-ON METERS
- PROCESS and HOUSEHOLD CONTROLLERS
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