PROGRAMMABLE DIGITAL PANEL INDICATOR

N12B TYPE

USER'S MANUAL

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1. APPLICATION

N12B programmable digital panel indicators are destined to be installed in synoptic panel boards and display the value transmitted by the RS-485 interface. The 5 or 4 digit read-out field (14 or 20 mm high digits) in red or green colour ensures a good readability at a long distance.

They realise other additional functions as:

- signalling of the set alarm value overrunning,
- signalling of the measuring range overrunning,
- re-calculation of the measuring quantity into an optional quantity on the base of an individual, linear characteristic,
- programming of the indication resolution,
- programming of the averaging number of transmitted values,
- saving of maximal and minimal values,
- monitoring of set parameter values,
- blocking of the parameter introduction by means of a password,
- highlighting of any optional measuring unit as per the order,
- servicing of the interface with a MODBUS protocol, both ASCII and RTU,
- conversion of the measured quantity into a standard programmable current or voltage signal,
- interception and display of the register value from the device connected to the bus
- Master-asking of the device connected to the bus

With the meter we deliver:

- a guarantee certificate,
- 2 holders to fix the indicator on a panel,
- a connector with screw or self-locking connections (as per order),
- a service manual,
- a set of stickers with units.

After unpacking the indicator, 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 acquaint with this before connecting the meter. The non-observance of notices marked by these symbols can occasion the damage of the meter.

One must take note of this when the meter is working inconsistently to the expectations.

2. BASIC REQUIREMENTS, OPERATIONAL SAFETY

N12B indicators are destined to be mounted into panels and cubicles. In the range of operational safety they are in conformity with the EN 61010-1 standard requirements.

- The installation and indicator connection should be operated by a 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.
  Requirements in respect to the main lead must be in accordance with the EN 61010-1 standard. There must be a cut-off installed in the building. This cut-off should be installed near the device and easy accessible for the operator.
- 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 instrument to the network through an auto-transformer.
- Before taking the indicator housing out one must turn the supply off.
- The removal of the indicator housing during the warranty 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 indicator from the front of the panel when the supply circuit is turned off. After introducing the indicator, fasten it by means of holders.

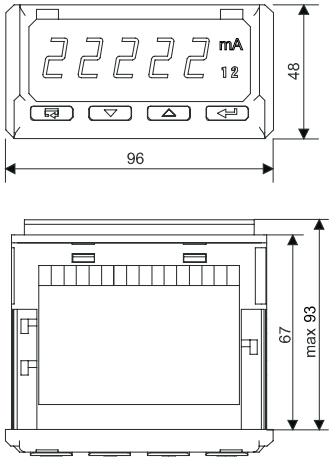


Fig. 1. Overall dimensions

4. CONNECTION

At the rear side of the indicator there are two terminal strip seats. A connector with screw terminals or a self-locking connector is added to the meter depending on the indicator type chosen in the ordering code. The fig. 2. shows the connection way of external signals. The description of the connector is also printed on the indicator housing.

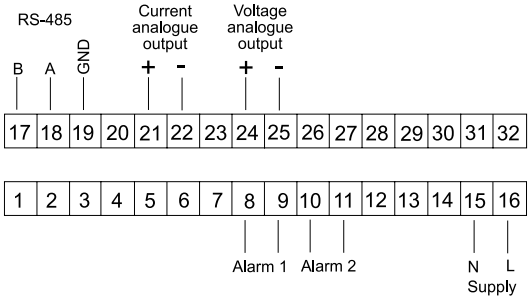


Fig. 2 Connection ways of the N12B indicator

It is recommended to use screened leads on the indicator 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.

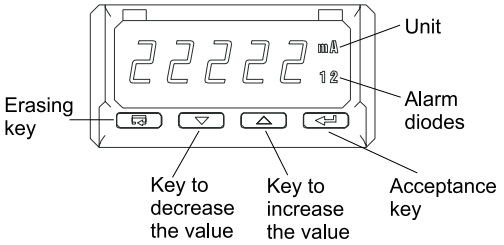
Requirements related to the feeder cable are regulated by the EN 61010-1 standard.

5. OPERATION

After switching the indicator on, its type and next the program version are displayed on the display. After ca 10 sec, the indicator transits automatically into the measuring mode and the input signal value is displayed. The indicator 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 indicator [1)].

a)



b)

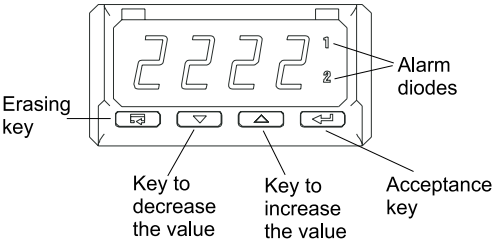


Fig. 3. Description of the indicator faceplate:

a) 5-digit execution

b) 4-digit execution

[1)] No exist in the 4-digit (20 mm) execution

Key functions:

 - acceptance key

- entry into the programming mode (hold down during ca 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

- display 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

- display 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.

 - resignation key

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

The pressure of the  key combination causes the erasing of alarm signalling. This operation exclusively acts when the support function is switched on.

The pressure of the  key combination causes the erasing of all minimal values.

The pressure of the  key combination causes the erasing of all maximal values.

The pressure and holding down of the  key during ca 3 sec. causes the entry into the programming matrix. The programming matrix is secured by the safeguard code.

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

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

- Incorrectly introduced security code.


- Exceeding of the upper measuring range


- Exceeding of the lower measuring range


- Exceeding of the waiting limit time for information

6. PROGRAMMING

The [↵] key pressure and its holding down during ca 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 ca 5 sec., the indicator will automatically enter into the displaying mode of the value transmitted by the RS-485 interface.

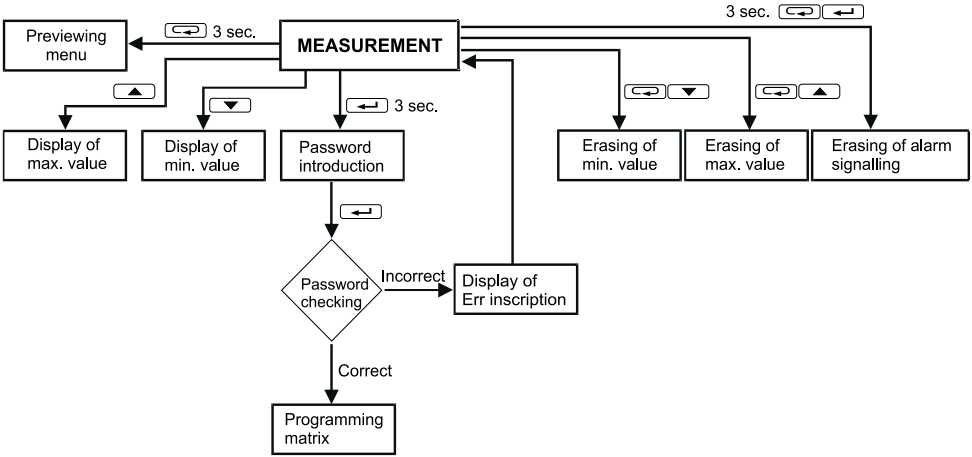


Fig. 4. Operation algorithm of the N12B indicator

Item No									
1	**InP** Input parameters	**d_P** Decimal point	**Cnt** Number of averagings	**Ind** Linear characte-ristic	**H1** (1)	**Y1** (1)	**H2** (1)	**Y2** (1)	- - -
2	**ALr1** Alarm 1	**PrL1** Lower threshold	**PrH1** Upper threshold	**tYP1** Alarm type	**dLY1** Alarm delay	**LEd1** Signal support	- - -		
3	**ALr2** Alarm 2	**PrL2** Lower threshold	**PrH2** Upper threshold	**tYP2** Alarm type	**dLY2** Alarm delay	**LEd2** Signal support	- - -		
4	**Out** Output	**tYPA** Kind of output (volt/cur.)	**AnL** Lower threshold analog output	**AnH** Upper threshold analog output	**bAud** Baud rate	**trYb** Kind of transmis-sion	**Adr** Device address	**toUt** Time limit	- - -
5	**OPt** Options	**SOUr** Kind of indicator work	**dAdr** Device address (*)	**drEJ** Register address (*)	**trEJ** Register type (*)	**FFOr** Register format	- - -		
6	**SEr** Service	**SEt** Writing of standard parameters	**SEC** Password introduct.	**tSt** Display test	**JEd** High-ligted unit (2)	- - -			

(*) Concerns only SOUr = bUS or nnAS
(1) Exists only when the individual characteristic is attached (**Ind =0**)
(2) Exists only in the 5-digit executions.

Fig. 5. Transition matrix into the programming mode

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. In any moment, the key release 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 saving.

Table 1

Parameter symbol	Description	Range of changes
d_P	Setting of the decimal point. This setting acts both when the individual characteristic is switched off and when the characteristic is switched on.	Optional.
Cnt	Number of averages of transmitted values	In 4-digit execution: **0...9999** In 5-digit execution: **0...99999** The inscription of 0 cause the blanking of the display.
Ind	Switching off or on of the user's individual linear characteristic	**ON** - Characteristic switched on **OFF** - Characteristic switched off

Table 1 (continuation)

Parameter symbol	Description	Range of changes
H1, Y1 **H2, Y2**	Parameters of the individual characteristic. On the base of co-ordinates of two points given by the user, the indicator assigns coefficients of the individual characteristic a and b **Y= aH+b**, where: **H1** and **H2** - value transmitted by the RS-485 interface, **Y1** and **Y2** - expected value on the display	In 4-digit execution: **-1999...9999** In 5-digit execution: **-19999...99999**
PrL1 **PrL2**	Alarm lower threshold	In 4-digit execution: **-1999...9999** In 5-digit execution: **-19999...99999**
PrH1 **PrH2**	Alarm upper threshold	In 4-digit execution: **-1999...9999** In 5-digit execution: **-19999...99999**
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 the alarm type change, the alarm output is switched on for good. **H_OF** - manually switched off, till the time of the alarm type change, the alarm output is switched off for good.
dLY1 **dLY2**	Delay of alarm operation. The parameter is defined in number of received values i.e. one must give after how many values from the RS-485 interface the alarm operation follows. The alarm switching off follows without delay. The parameter takes in account the number of averages of Cnt values, i.e. the whole averaging cycle is treated as a single value.	In 4-digit execution: **0...9999** In 5-digit execution: **0...99999** The introduction of **0** causes the operation at the moment of alarm occurrence.

Table 1 (continuation)

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 blank. It signals the alarm state till the moment of its blanking by means of the combination of [⊂⊃] [↵] keys. This function only and exclusivey concerns the alarm signalling and then the relay contacts will act without support, according the chosen alarm type.	**On** - support switched on **OFF** - support switched off
tYPA	Type of analogue output.	**PrAd** - current **nAP** - voltage
AnL	Lower threshold of the analogue output. It is the parameter defining the value on the display for which we want obtain 0 on the analogue output.	In the 4-digit execution: **-1999... 9999** In the 5-digit execution: **-19999... 99999**
AnH	Upper threshold of the analogue 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 analogue output.	In the 4-digit execution: **-1999... 9999** In the 5-digit execution: **-19999... 99999**
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**

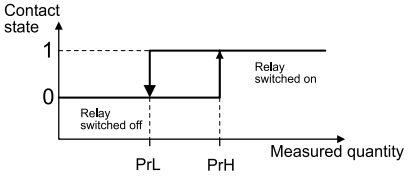
Table 1 (continuation)

Parameter symbol	Description	Range of changes
ToUt	Waiting time limit to obtain information (in seconds) after which „**- - - -**" have to be displayed on the display. The write of the „0" value will cause the switching parameter action off. In case when **SOUr=nnAS,** the write of the „0" value will cause the index operation switching as master off.	In the 4-digit execution: **0... 999,9** In the 5-digit execution: **0... 9999,9**
SOUr	Choice of indicator kind of work	**Syn** - display of value transmitted through the interface to the register 7648 **BUS** - interception and display of the register value from the device connected to the bus interception parameters are set in ToUt, Dadr, DrEJ, TrEJ, FFOr. **nnAS** - indicator work as master. Parameters of the questioned device are set in ToUt, Dadr, DrEJ, TrEJ, FFOr.
DAdr	Device address from which the register value has to be intercepted or the address of the questioned device.	**1... 247** - this address must be different from the indicator address itself.
DrEJ	Register address to intercept or question.	In the 4-digit option: **1...9999** In the 5-digit option: **1...65535**
TrEJ	Type of intercepted or questioned register.	**32b** - 32-bit registers of float type **16b** - 2x16-bit registers of float type **32S** - 32-bit registers of signed long type **32U** - 32-bit registers of unsigned long type **16S** - 16-bit registers of signed int type **16U** - 16-bit registers of unsigned int type

Table 1 (continuation)

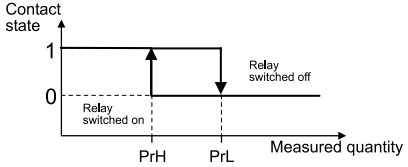
FFOr	Format of the transmitted register by the MODBUS protocol.	Where TrEJ = 32b, 16b, 32S, 32U **3210** - as the first, oldest byte is sent or the byte including the character and exponent. **1032** - words with exchanged places. **0123** - float transmitted in inversed sequence. **2301** - returned bytes in words.
		Where TrEJ = 16U, or 16S **0010** - as first, the oldest byte is transmitted. **0001** - as first, the youngest byte is transmitted.
SEt	Writing down of manufacturers 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 the 4-digit execution: **-1999...9999** In the 5-digit execution: **-19999...99999**
tSt	Display test. The test consists on the consecutive switching of digital display segments on. Alarm diodes and highlighting diodes of the unit should flicker. The continuous lighting of the alarm diodes signals that the relay is switched on.	The pressure of the ↵ key causes the test switching on. The ↵ key ends the test.
JEd	Unit highlighting switching on.	**On** - highlighting switched on **OFF** - highlighting switched off
- - -	Exit from the parameter group of the chosen level.	The pressure of the ↵ key causes the exit from the parameter group of the chosen level.

a) **nor**



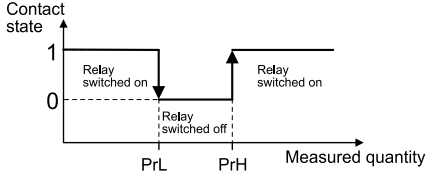
PrH > PrL

b) **nor**



PrH ≤ PrL

c) **OFF**



c) **On**

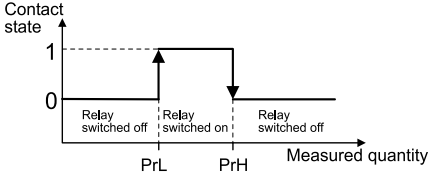


Fig. 6. Alarm type: a) and b) normal, c) switched off, d) switched on

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 exceeding the relay reaction is concordant with written down **PrL**, **PrH** and **tYP** parameters. In spite of displaying the exceeding, the indicator will carry out the measurement as before.
- 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 indicator 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 indicator 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 indicator will automatically carry out the change into the maximal value.

Standard parameters of the indicator Table 2.

Parameter symbol	Level in the matrix	Standard value
d_P	1	0.00
Cnt	1	1
Ind	1	OFF
H1,Y1,H2,Y2	1	0
PrL1, PrL2	2,3	-19.99 or -199.99
PrH1,PrH2	2,3	99.99 or 999.99
tYP1, tYP2	2,3	OFF
dLY1, dLY2	2,3	0
LEd1, LEd2	2,3	OFF
tYPA	4	PrAd
AnL	4	-19.99 or -199.99
AnH	4	99.99 or 999.99
bAud	4	9600
trYb	4	r8n2
Adr	4	1
toUt	4	10.0

Standard parameters of the indicator Table 2 (continuation)

Parameter symbol	Level in the matrix	Standard value
SOUr	5	SYn
dAdr	5	2
drEJ	5	7505
trEJ	5	32 b
FFOr	5	3210
SEC	6	0
JEd	6	On

7. RS-485 INTERFACE

N12B programmable digital indicator series 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 long. 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 paragraph 4. 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. and Fig. 8 the device connection is shown.

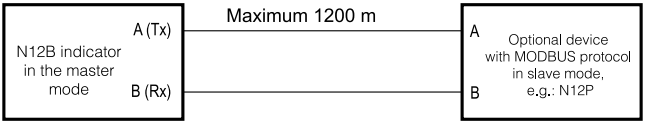


Fig. 7. Way of the RS-485 interface connection in the master mode

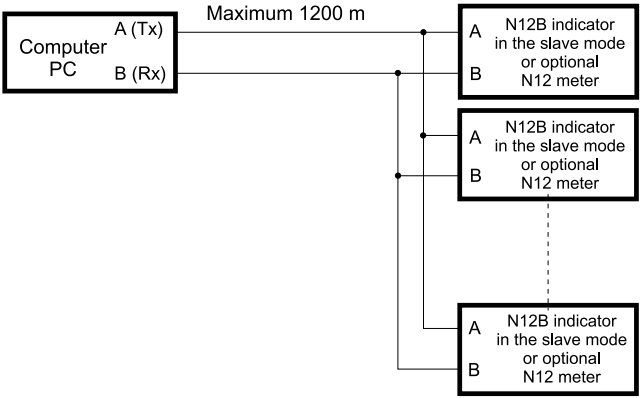


Fig. 8. Way of RS-485 interface connection in the slave mode

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.

Setting-up 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).

Notice:

Each indicator or 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 unit type.

7.3. Description of used functions

Following functions of the MODBUS protocol have been implemented in meters of N12 series and in N12B indicators:

Code of functions Table 3

Code	Meaning
0x03	Read-out of n-register
0x06	Writing of a single register
0x10	Writing of n-registers
0x11	Identification of the slave device

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

The function is inaccessible in the publication mode.

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

Request:

Device address	Function code	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 code	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

Caution!

It is possible to readout simultaneously up to 28 registers.

Write of values in 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: write of 2 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

Caution!

It is possible to readout simultaneously up to 28 registers.

Report identifying devices (code 11h)

Example: Data readout identifying the device for NA5 with a universal input.

Request:

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

Response:

Device address	Function code	Quantity of bytes	Device identifier	Device state	Field depending on the device type	Control total
01	11	08	65	FF	XXXXXX	

Device address - depending on the set value

Function - function No: 0x11;

Number of bytes - 0x08;

Device identifier - 0x65 - N12B

Device state - 0xFF;

Field depending on the device type - XXXXXX

Device name - transmitted as ASCII character and defines the indicator type:
B - 0x42, 42 X X X X X

Number of display - Field depending on the number of indicator display digits
- 0x04 - 4-digit indicators, X 04 X X X X
- 0x05 - 5-digit or indicators, X 05 X X X X

No of the programming version - programming version implemented in the meter or indicator X X _ _ _ _ - 4-byte 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 mode

Example:

Working in the **RTU** mode, e.g.: **trYb=r8n2**.
N12B indicator
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	Number of bytes	Device identifier	Device state	Field depending on the device type	Control total (CRC)
01	11	08	60	FF	42 04 3F 80 00 00	CF B1

7.4. Register map of N12B indicators

Register map of the N12B indicators Table 4

Address range	Value type	Description
7000-7200	float (32 bits)	The value is placed in two successive 16-bit registers. Registers include the same data as 32-bit registers from the 7500 area. Registers are only for read-out.
7200 - 7400	float (32 bits)	The value is placed in two successive 16-bit registers. Registers include the same data as 32-bit registers from the 7600 area. Registers can be read out and written in.
7500 - 7600	float (32 bits)	The value is placed in a 32-bit register. Registers are only for read-out .
7600 - 7700	float (32 bits)	The value is placed in a 32-bit register. Registers can be read out and written in.

7.5. Registers for writing and read-out

N12B - indicators

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) / read-out (r)	Range	Description	
7200	7600	**Identifier**	r	0x6504...6505	**Device identifer**	
					Value	
					6504	4 digit execution
					6505	5 digit execution
7202	7601	no occurs 1)				
7204	7602	no occurs 1)				
7206	7603	no occurs 1)				
7208	7604	no occurs 1)				
7210	7605	no occurs 1)				
7212	7606	no occurs 1)				
7214	7607	no occurs 1)				
7216	7608	no occurs 1)				
7218	7609	no occurs 1)				
7220	7610	no occurs 1)				
7226	7613	**d_P**	w/r	0... 4	**Decimal point**	
					Value	
					0...3	4 digits execution
					0...4	5 digits execution
7228	7614	**Cnt**	w/r	0... 99999	**Number of measurements**	
					Value	
					0...9999	4 digits execution
					0...99999	5 digits execution

7230	7615	**Ind**	w/r	0... 1	**Individual characteristic**	
					Value	
					0	Character. switched off
					1	Character. switched on
7232	7616	**H1**	w/r	-19999... 99999	**Parameters of the individual characteristic**	
					Value	
					-1999...9999	4-digit indicators
					-19999...99999	5-digit indicators
					The range of **H1, H2, Y1, Y2, PrL1, PrH1, PrL2, PrH2, AnL, AnH** parameters depends only the set up decimal point d_P. The writing of the value with a higher 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... 99999	**Parameters of the individual characteristic**	
					Value	
					-1999...9999	4-digit indicators
					-19999...99999	5-digit indicators
					Change of range as for the **H1** parameter	
7236	7618	**H2**	w/r	-19999... 99999	**Parameters of the individual characteristic**	
					Change of range as for the **H1** parameter	
7238	7619	**Y2**	w/r	-19999... 99999	**Parameters of the individual characteristic**	
					Change of range as for the **H1** parameter	
7240	7620	No occurs [1]				
7242	7621	**PrL1**	w/r	-19999... 99999	**Lower threshold of alarm 1**	
					Change of range as for the **H1** parameter	
7244	7622	**PrH1**	w/r	-19999... 99999	**Upper threshold of alarm 1**	
					Change of range as for the **H1** parameter	
7246	7623	**tYP1**	w/r	0... 4	**Type of alarm 1**	
					Value	
					0	Normal
					1	Switched on
					2	Switched off
					3	Manually switched on
					4	Manually switched off

7248	7624	**dLY1**	w/r	0... 99999	**Delay of alarm 1**	
					Value	
					0...9999	4-digit indicators
					0...99999	5-digit indicators
7250	7625	**LEd1**	w/r	0... 1	**Support of alarm 1 signalling**	
					Value	
					0	Support switched off
					1	Support switched on
7252	7626	no occurs 1)				
7254	7627	**PrL2**	w/r	-19999... 99999	**Lower threshold of alarm 2**	
					Change of range as for the **H1** parameter	
7256	7628	**PrH2**	w/r	-19999... 99999	**Upper threshold of alarm 2**	
					Change of range as for the **H1** parameter	
7258	7629	**tYP2**	w/r	0... 4	**Type of alarm 2**	
					Value	
					0	Normal
					1	Switched on
					2	Switched off
					3	Manually switched on
					4	Manually switched off
7260	7630	**dLY2**	w/r	0... 99999	**Delay of alarm 2**	
					Value	
					0...9999	4-digit indicators
					0...99999	5-digit indicators
7262	7631	**LEd2**	w/r	0... 1	**Support of alarm 2 signalling**	
					Value	
					0	Support switched off
					1	Support switched on
7264	7632	no occurs 1)				
7266	7633	no occurs 1)				
7268	7634	no occurs 1)				
7270	7635	**tYPa**	w/r	0... 1	**Type of analogue output**	
					Value	
					0	Current
					1	Voltage

7272	7636	**AnL**	w/r	-19999... 99999	**Lower threshold of the analogue output**	
					Change of range as for the **H1** parameter	
7274	7637	**AnH**	w/r	-19999... 99999	**Upper threshold of the analogue output**	
					Change of range as for the **H1** parameter	
7276	7638	no occurs 1)				
7278	7639	**Jed**	w/r	0... 1	**Switching on or switching off on the 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 in of the minimal value**	
					Value	
					0	Lack of operation
					1	Erasing of the minimal value
7282	7641	**Del_maks**	w/r	0... 1	**Erasing in of the maksimal value**	
					Value	
					0	Lack of operation
					1	Erasing of the maximal value
7284	7642	no occurs 1)				
7286	7643	no occurs 1)				
7288	7644	no occurs 1)				
7290	7645	no occurs 1)				
7292	7646	no occurs 1)				
7294	7647	no occurs 1)				
7296	7648	**Synoptic**	w/r		**Value to display on the display**	
					The range of this parameter only depends on the set up 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). The number value for this register must be included in the interval from **-8388608** to **8388608**	
7298	7649	no occurs 1)				

7300	7650	**SOUr**	w/r	0... 2	**Choice of kind of indicator work**	
					Value	
					0	Display of transmitted value through the interface into the register 7648
					1	Interception and display of the register value from the device connected to the bus. Caution! The indicator intercepts response frames (code 03h) transmitted to the master device.
					2	The indicator works as Master.
7302	7651	**dAdr**	w/r	1... 247	**Device address from which the register value is to be intercepted, or the device address to ask**	
					Caution! The address must be different from the indicator address.	
7304	7652	**DrEJ**	w/r	1... 65536	**Register address to intercept**	
					Value	
					1...9999	4-digit indicator
					1...65536	5-digit indicator
7306	7653	**TrEJ**	w/r	0... 1	**Type intercepted or asked address**	
					Value	
					0	32-bit float type
					1	2x16 bit float type
					2	32 bit signed long
					3	32 bit unsigned long
					4	16 bit signed int
					5	16 bit unsigned int

<table>
<tr><td>7308</td><td>7654</td><td>FFOr</td><td>w/r</td><td>0... 3</td><td colspan="2">Format of sent register by the Modbus protocol</td></tr>
<tr><td colspan="5" rowspan="6"></td><td colspan="2">Value</td></tr>
<tr><td colspan="2">For trEJ = 0, 1, 2, 3</td></tr>
<tr><td>0</td><td>3210 - as the first the oldest byte or the byte including the character and exponent is sent (in case of float type).</td></tr>
<tr><td>1</td><td>1032 - words changed in places</td></tr>
<tr><td>2</td><td>0123 - float sent in inversed sequence</td></tr>
<tr><td>3</td><td>2301 - bytes inversed in words</td></tr>
<tr><td colspan="5" rowspan="3"></td><td colspan="2">Dla trEJ = 4 or 5</td></tr>
<tr><td>0</td><td>10 - as the first the most significant byte to sent</td></tr>
<tr><td>1... 3</td><td>01 - as the first the less significant byte to sent</td></tr>
<tr><td>7310</td><td>7655</td><td>ToUt</td><td>w/r</td><td>0... 9999.9</td><td colspan="2">For SoUr=0 or 1. The waiting time limit to obtain information (in seconds) after which „– – – –” are displayed.
For SoUr=2. Interval time between asking frames sent from the device in Master mode.</td></tr>
<tr><td colspan="5" rowspan="4"></td><td colspan="2">Value</td></tr>
<tr><td>0... 999.9</td><td>4-digit indicators</td></tr>
<tr><td>0... 9999.9</td><td>5-digit indicators</td></tr>
<tr><td colspan="2">Caution!
For SoUr=0 or 1. The write of „0” value will cause the switching of the parameter operation off.
For SoUr=2. The write of „0” value will cause the switching of master device off.</td></tr>
</table>

[1] In case of registers no occurring in the indicator, their values are equal 1E+20

7.6. Registers only for read-out

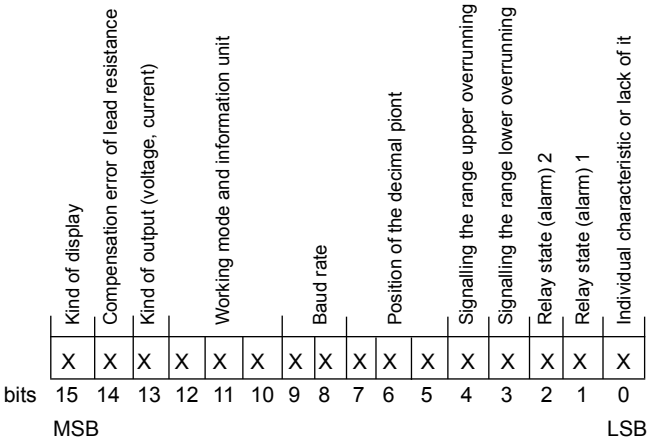
The value is placed in two successive 16-bit registers. Registers include the same data as 32-bit register from the 7600 area.	The value is placed in 32 bit registers	Name	Unit	Quantity name
7000	7500	Identifier	–	Constant identifying the device
				0×65 - N12B
7002	7501	Status	–	Status is the register describing the current state of the indicator.
7004	7502	Control	%	It is the register describing the control of the analogue output (rzeczywista jest tylko w zakresie 0...120%).
7006	7503	Minimum	–	Minimal value of the currently displayed value
7008	7504	Maximum	–	Maximal value of the currently displayed value
7010	7505	Displayed value	–	Currently displayed value
7012	7506	No occurs [1]		
7014	7507	No occurs [1]		
7016	7508	No occurs [1]		
7018...7096	7509...7548	No occurs [1]		

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

Caution!

- At the moment of the upper or lower range exceeding, „minimum", „maximum" and „Displayed value" parameters are 1E + 20 (unbelievable measurement result).
- For the parameter Cnt = 0 (blanking of the displays), parameters „minimum", „maximum" and „displayed value" are set up on the value 1E + 20.

Description of the status register



Bit-15 Kind of display

0 - meter or indicator with a 4-digit display

1 - meter or indicator with a 5-digit display

Bit-14 Reserved

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-9...8 Baud rate

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

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

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

Bit-4 Signalling of the range upper overrunning

0 - normal work
1 - range overruning

Bit-3 Signalling of the range lower overrunning

0 - normal work
1 - range overrunning

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 characteristic

0 - Individual characteristic switched off
1 - Individual characteristic switched on

8. TECHNICAL DATA

Panel indicator dimensions	96 × 48 × 93 mm
Protection index ensured by the housing front	IP 50
Protection index ensured from the terminal side	IP 20
Rated operating conditions:	
● supply voltage depended on the execution code	85... 253 V a.c. d.c. 20... 40 V a.c. d.c.
● supply voltage frequency	40... 440 Hz
● ambient temperature	0... 50^{0}C
● relative air humidity	< 75% (water vapour condensation inadmissible)
Power consumption	max 5 VA
Storage temperature	-20^{0}C...+85^{0}C
Display field	
N12B4 indicator	four 7-segment LED displays and two alarm diodes
N12B5 indicator	five 7-segment LED displays, two alarm diodes, and two diodes to the unit highlighting
Indication range of the digital display:	
N12B4 indicator	-1999...9999
N12B5 indicator	-19999...99999
Servicing	cztery przyciski 

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 load resistance ≤ 500 Ω — 0/4...20 mA
- voltage programmable load resistance ≥ 500 Ω — 0...10 V
- galvanic insulation,
- resolution — 0.01% of the range
- basic error — ±(0.2% of the range)

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: 600 ms

Electromagnetic compatibility:

- immunity — acc. EN 61000-6-2
- emission — acc. EN 61000-6-4

Safety requirements:

according EN 61010-1 standard:

- installation category — III
- level of pollution — 2
- maximal voltage in relation to the earth — 300 V a.c.

Protection level:

- ensured by the housing — IP 50
- ensured by the terminals — IP 20

Weight — 200 g

Time of the display restoring — programmed, min. 20 ms

9. BEFORE A FAILURE WILL BE DECLARED

SYMPTOMS	PROCEDURE
1. The indicator does not operate	Check the connection of the feeder cable
2. Only the diodes are lighting	The number of transmitted averaged values which has been introduced = 0 The indicator operates in the SLEEP mode. The display is blanked.
3. Only the horizontal dashes are displayed on the display.	Transmitted values are beyond the indicator range.
4. Lack of possibility to enter into the programming mode. 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 authorised service workshop.
5. Lack of certainty if all display segments are efficient	Enter into the service mode and switch on the display test. Simultaneously the same segments should be lighted on all displays. The state with blanked displays does never occur. Otherwise, submit the defect to the nearest authorised service workshop.
6. 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 indicator will introduce values in accordance with the table 2.
7. 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 indicator will introduce parameters in accordance with the table 2.
8. **H1**, **Y1**, **H2**, **Y2**, **d_P** parameter symbols are not displayed in the programming mode.	In case of switched individual characteristic off, mentioned symbols are omitted
9. Despite of the alarm threshold exceeding neither the alarm relay nor the signalling diode is switched on.	Check the introduced delay of the alarm operations into the indicator. If need be, correct the **dLY** parameter

10. 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
11. When the parameter of the alarm signalling support is switched on, lack of possibility to erase the signalling diode by means of the key combination. (Fig.4).	The alarm still lasts. The erased diode is immediately re-lighted
12. Despite the fact that the alarm still remains, the signalling diode does not light up.	Check if a delay of the alarm operation has not been introduced **dLY** parameter.
13. Instead to display the measurement result, the indicator displays the parameter symbol alternately with its value despite we were not entered into the programming mode.	The indicator works in the previewing mode.
14. A delay of the alarm operation has been introduced, e.g. 30 averages, however after this time the alarm has not operate.	The lasting alarm state was shorter than the programmed, e.g. during the lasting time of the alarm the state of alarm withdrawal has occurred. In that case the indicator starts counting the measurements from the beginning
15. The indicator does not establish the communication 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 N12B METERS

Example 1 - Programming of an individual characteristic.

If we want to programme so that to the value 4.00 is to correspond the value 0.00 on the display, whereas to the value 20.00 is to correspond the value 100.00 one must:

- enter to the programming mode and choose the **d_P** parameter responsible for the decimal point. Set up the point on the 000.00 position
- choose the **Ind** parameter, and switch the individual characteristic on

- choose the parameter **H1** and introduce the value 4.00
- pass on the **Y1** parameter and introduce the value 0.00
- pass on the **H2** parameter and introduce the value 20.00
- pass on the **Y2** parameter and introduce the value 100.00

Example 2 - Programming of an inverse individual characteristic.

If we want to programme so that to the value 4.00 is to correspond the value 120.50 on the display, whereas to the value 20.00 is to correspond the value 10.80, one must:

- enter to the programming mode and choose the **d_P** parameter responsible for the decimal point. Set up the point on the 000.00 position
- 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 120.50
- pass on the **H2** parameter and introduce the value 20.00
- pass on the **Y2** parameter and introduce the value 10.80

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, whereas switched off at the value 100, and the alarm 2 so that at the value 1000 the alarm will be switched off whereas switched on at the value -199, one must:

- enter into the programming mode and choose the level with the **ALr1** symbol,
- enter on the level **Alr1**, choose **PrL** parameter and introduce the value 100
- pass on the **PrH1** parameter and introduce the value 850
- pass on the **tYP** parameter and choose the function designed as **nor**,
- exit from the **ALr1** level and pass on the **ALr2** level,
- choose the **PrL** parameter and introduce the value1000
- 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 is to be switched on in the interval from 100 up to 300 and is to operate only after 10 transmitted values, 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

Assuming that the **Cnt** parameter has not been changed and is equal 1 (acc. the manufacturer setting), after the **dLY** parameter we must introduce the value 10. If e.g. **Cnt** = 2, then **dLY** = 5.

- 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 transmitted values, the indicator will switch the alarm relay on and the alarm diode will be lighted.

Example 5 - Programming of an analogue output

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

- enter into the programming mode and choose the **tYPA** parameter responsible for the type of the analogue output. Choose the **PrAd** current output,
- pass on the **tYPA** parameter responsible for the analog output type. Choose the **PrAd** current output.
- under the **AnL** parameter, one must write down the value for which we want 0 mA on the analogue output. For this reason one must calculate the **AnL** parameter:

$$(20 - 0)/(20 - 4) = 1.25 => 0 -(4*1.25) = - 5$$

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

11. EXECUTION CODES

N12 DIGITAL METERS	X	X	X	X	X	XX	X	XXX

Inputs:

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**
rotations, frequency, period, pulse number ..... **O**
single-phase parameters ..... **P**
indicator for synoptic pannel ..... **B**
acc. order * ..... **X**

unit symbol*)

Number of digits on the display:

4 digits, digit height = 20 mm **4**
5 digits, digit height = 14 mm **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:

- socket plug with screw connections **0**
- socket-plug with self-locking connections **1**

Execution:

- standard execution **00**
- custom-made execution ** ..... **XX**

Acceptance tests:

- without a quality inspection certificate **8**
- with a quality inspection certificate **7**
- acc. customer's agreement ..... **X**

Unit symbol ..... **XXX**

* Introduce the unit symbol which is to be highlighted.

** The code number is established by the manufacturer.

Order example: N12B 4 1 1 0 00 7 means: a N12B indicator for synoptic panels, with 4 displays in green colour, voltage supply: 230 V a.c., d.c., kind of terminal: socket-plug with screw connection, standard execution, with a quality acceptance test.

In case of any meter failure one must contact the nearest authorized service workshop.

12. MAINTENANCE AND GUARANTEE

The N12B indicator does not require any periodical maintenance.

In case of some incorrect unit operations:

1. **From the shipping date, during the period given in the annexed guarantee card.**

   One should take the instrument down from the installation and return it to the Manufacturer's Quality Control Dept.

   If the instrument 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 instrument to repair in a certified service workshop. The disassembling of the housing causes the cancellation of the granted guarantee.

   Spare parts are available for the period of ten years from the date of purchase.

The Manufacturer's policy is one of continuous improvement and we reserve the right to make changes in design and specifications of any products as engineering advances or necessity requires and revise the above specification without notice.

SALES PROGRAMME

MEASUREMENT
CONTROL
RECORDING

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- MEASURING TRANSDUCERS
- ANALOG PANEL METERS (DIN INSTRUMENTS)
- ANALOG and DIGITAL CLAMP-ON METERS
- PROCESS and HOUSEHOLD CONTROLLERS
- CHART AND PAPERLESS RECORDERS
- POWER CONTROL UNITS and SOLID-STATE RELAYS
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- 1-PHASE AND 3-PHASE WATT-HOUR METERS
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Tel.: (48-68) 329 51 00 (exchange)
Fax: (48-68) 329 51 01
e-mail:lumel@lumel.com.pl
http://www.lumel.com.pl

Export Department:
Tel.: (48-68) 329 53 02 or 04
Fax: (48-68) 325 40 91
e-mail: export@lumel.com.pl

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