



# METER OF NETWORK PARAMETERS ND30 TYPE

## SUPERVISORY RELAY (supplement to the ND30 meter user manual)

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## **1 ENABLING THE EXTENDED FUNCTION OF THE SUPERVISORY RELAY**

To enable additional functionality in the ND30 meter, enter the appropriate code received from the manufacturer from the meter menu (Information → Service code). The code is assigned to the serial number of the meter and cannot be used in another meter.

However, before the functionality of the supervisory relay is purchased, it is possible to check / test its operation in the form of temporary full-functional access for the period of 48 hours (the meter's working time with the power on is counted). This is done from the menu level of the meter (Information → Service code) by entering the code "001". This code can be entered only once, and after 48 hours the functionality of the supervisory relay is disabled. It is only possible to re-enable the supervisory relay after purchasing and entering the appropriate code received from the manufacturer.

## **2 OPERATING MODES**

(supplement to item 7 of the ND30 meter user manual)

Alarms	<b>Configuration of alarms</b>		Supervisory relay 1 <input type="radio"/> Off <input type="radio"/> On	Supervisory relay 2 <input type="radio"/> Off <input type="radio"/> On				
	The menu visible only when the Supervisory relay is deactivated							
	<b>Alarm 1 Alarm 2</b>		<b>Settings</b>	Logic actions <input checked="" type="radio"/> C1 <input type="radio"/> C1 v C2 v C3 <input type="radio"/> C1 ^ C2 ^ C3 <input type="radio"/> (C1 ^ C2) v C3 <input type="radio"/> (C1 v C2) ^ C3	State of relay with active alarm <input type="radio"/> Off <input checked="" type="radio"/> On	Lock of alarm deact. <input checked="" type="radio"/> Off <input type="radio"/> On	Alarm signaling <input checked="" type="radio"/> Off <input type="radio"/> On	Default settings <input checked="" type="radio"/> No <input type="radio"/> Yes
			<b>Condition C1 Condition C2 Condition C3</b>	Quantity <input checked="" type="radio"/> U1 <input type="radio"/> I1 <input type="radio"/> P1 <input type="radio"/> Q1 . <input type="radio"/> hh:mm	Type of condition <input checked="" type="radio"/> n_on <input type="radio"/> noFF <input type="radio"/> on <input type="radio"/> oFF <input type="radio"/> H_on . <input type="radio"/> 3_oF	Lower value of condition [%]  +0099.0	Upper value of condition [%]  +101.0	Delay of condition act. [s]  0000
				Delay of condition deactivation [s]  0000	Locking the reactivation of condition [s]  0000	Signaling of condition occurrence  <input checked="" type="radio"/> Off <input type="radio"/> On		
	The menu visible only when the Supervisory relay is activated							
	<b>Alarm 1 Alarm 2 (supervisor y relay)</b>		State of the relay during alarm <input checked="" type="radio"/> Off <input type="radio"/> On	Number of active phases <input type="radio"/> 1st phase <input type="radio"/> 2nd phase <input type="radio"/> 3rd phase <input type="radio"/> 1-2 phases <input type="radio"/> 1-3 phases <input type="radio"/> 2-3 phases <input checked="" type="radio"/> All phases	Alarm type <input checked="" type="radio"/> Min. voltage <input type="radio"/> Min. current <input type="radio"/> Max. voltage <input type="radio"/> Max. current <input type="radio"/> Window (Voltage) <input type="radio"/> Window (Current) <input type="radio"/> Phase loss <input type="radio"/> Asymmetry (Voltage) <input type="radio"/> Asymmetry (Current) <input type="radio"/> Phase sequence	Latch <input checked="" type="radio"/> Off <input type="radio"/> On	Low threshold [%]  095	
			High threshold [%]  105	Threshold for Asymmetry [%]  03	Alarm activation delay [s]  0000	Alarm deactivation delay [s]  0000	Maintaining restart (Latch)  <input checked="" type="radio"/> No <input type="radio"/> Yes	

Fig.1. Programming matrix (supplement to Fig. 12a of the ND30 meter user manual)

### 2.1 Supervisory relay mode

Supplement to item 7.3 of the ND30 meter user manual.

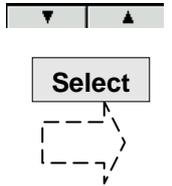
To enable the supervisory relay function, set the parameter "Supervisory relay" to On in the menu Alarms → Alarm configuration. The configuration applies to each alarm separately. If it is selected that the Supervisory Relay 1 is enabled, parameters related to the supervisory relay will appear in the Alarm 1 sub-menu instead of the standard alarm parameters (Fig. 1). The same situation applies to Alarm 2. The relay functions can

also be programmed from the Modbus RTU and Modbus TCP levels.

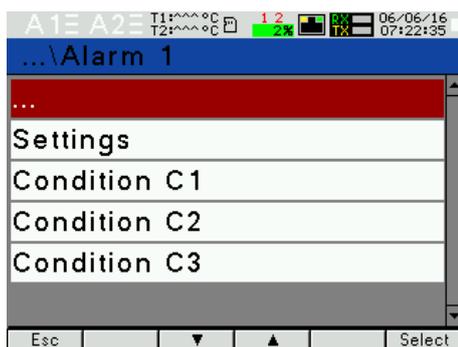
In the options, select the **Alarm** mode and confirm the selection by pressing **Select**.



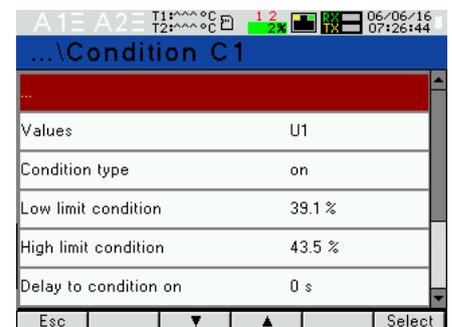
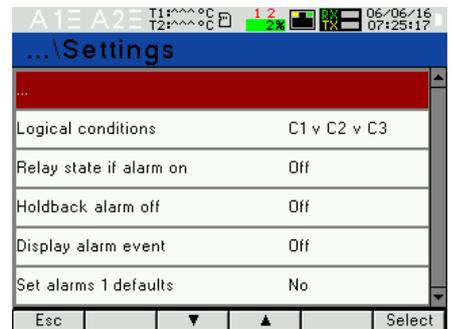
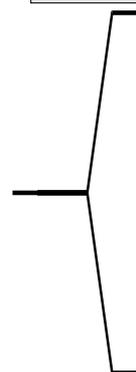
Select



When the supervisory relay is off:



Select



When the supervisory relay is on:

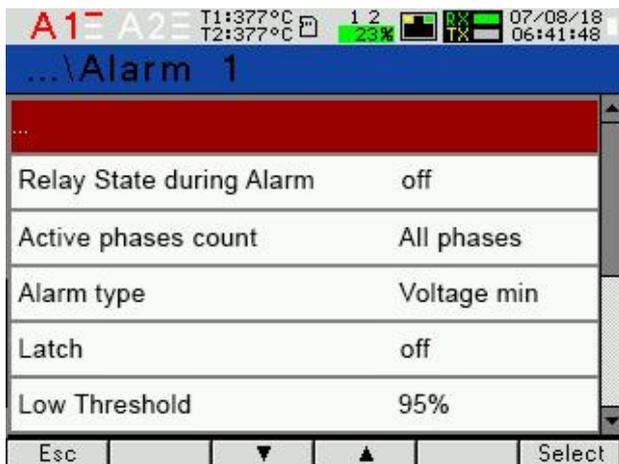


Fig.1. Alarm mode screens (supplement to Figure 16)

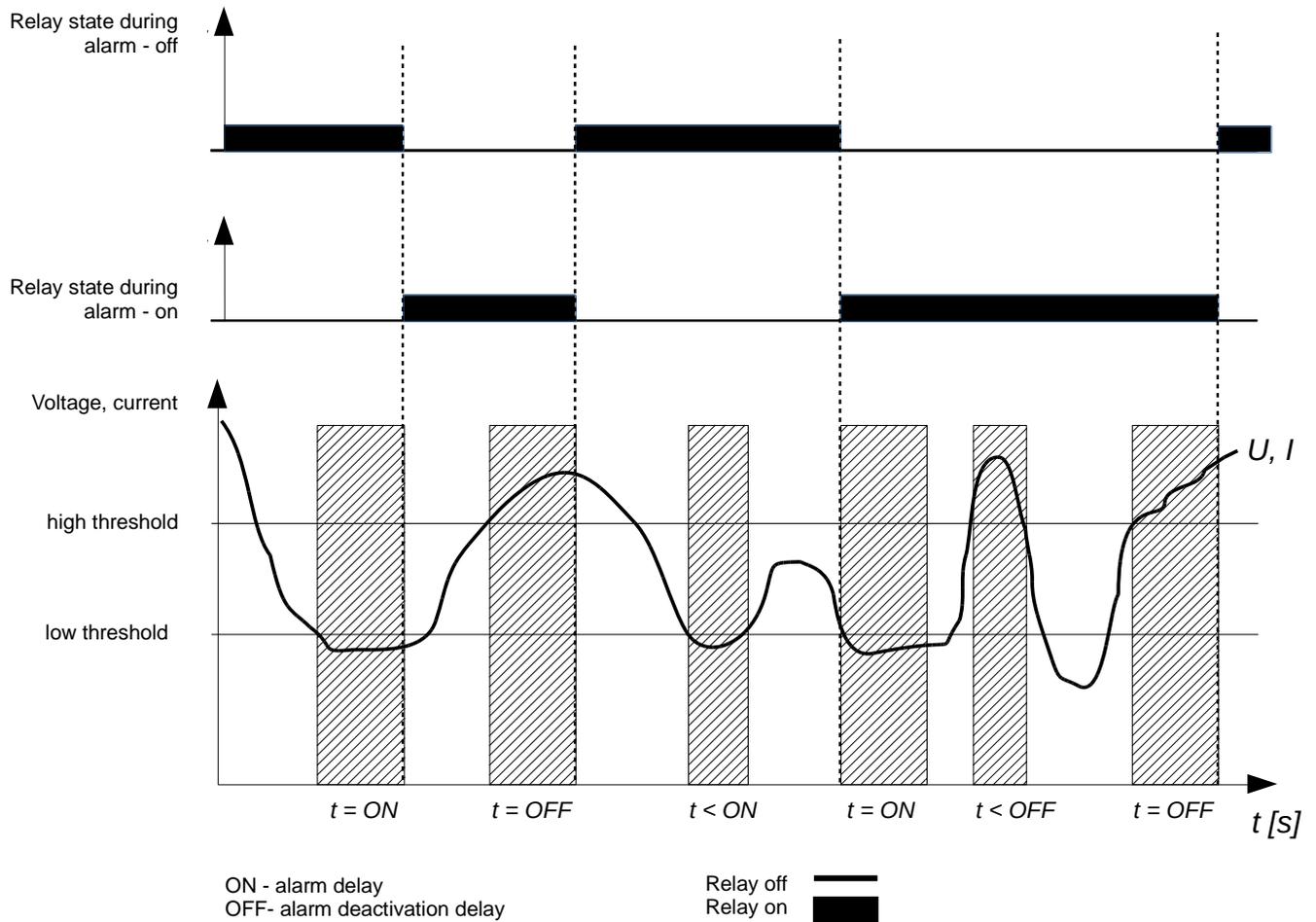
(supplement to Table 2 of the ND30 meter user manual)

No.			Parameter name	range	Notes / description	Default value
		Configuration of alarms	Supervisory relay 1, 2	Off On		
1	Supervisory relay off	Factory	Logic actions	C1 C1 v C2 v C3 C1 ^ C2 ^ C3 (C1 ^ C2) v C3 (C1 v C2) ^ C3		C1
2			State of relay with active alarm	Off/On	State of relay with activated alarm	On
3			Lock of alarm deact.	Off/On		Off
4			Alarm signaling	Off/On	When the function of alarm signaling is switched on, then after the state of emergency the alarm symbol is not blanked, but it begins to flash. Signaling is active till it is switched off by pressing the buttons <b>Delete</b> and <b>Alarm</b> (> 1 sec.). The function only applies to the alarm signaling, thus relay contacts will act without maintaining, according to the selected type of alarm.	Off
5	Supervisory relay off	Condition 1 Condition 2 Condition 3	Quantity	U1,I1,...,T2/B2, hh:mm	Quantity in the alarm output the parameter according to table 8	U1
6			Type of condition	n_on, noFF, on,oFF, H_on, HoFF, 3non, 3noF, 3_on, 3_oF	Acc. to fig. 17	n-on
7			Lower value of condition	-144.0... 144.0	in % of the nominal value of input quantity	90.0
8			Upper value of	-144.0... 144.0	in % of the nominal value of input	110.0

		condition		quantity	
9		Delay of condition act.	0 ... 3600	in seconds	0
10		Delay of condition deact.	0 ... 3600	in seconds	0
11		Locking the reactivation of condition	0 ... 3600	in seconds	0
12		Signaling of condition occurrence	Off/On	When the function of maintaining is switched on, after the state of condition is finished, the condition symbol is not blanked, but it begins to flash. Signaling is active till it is switched off by pressing the buttons <b>Delete</b> and <b>Alarm</b> (> 3 sec.).	Off

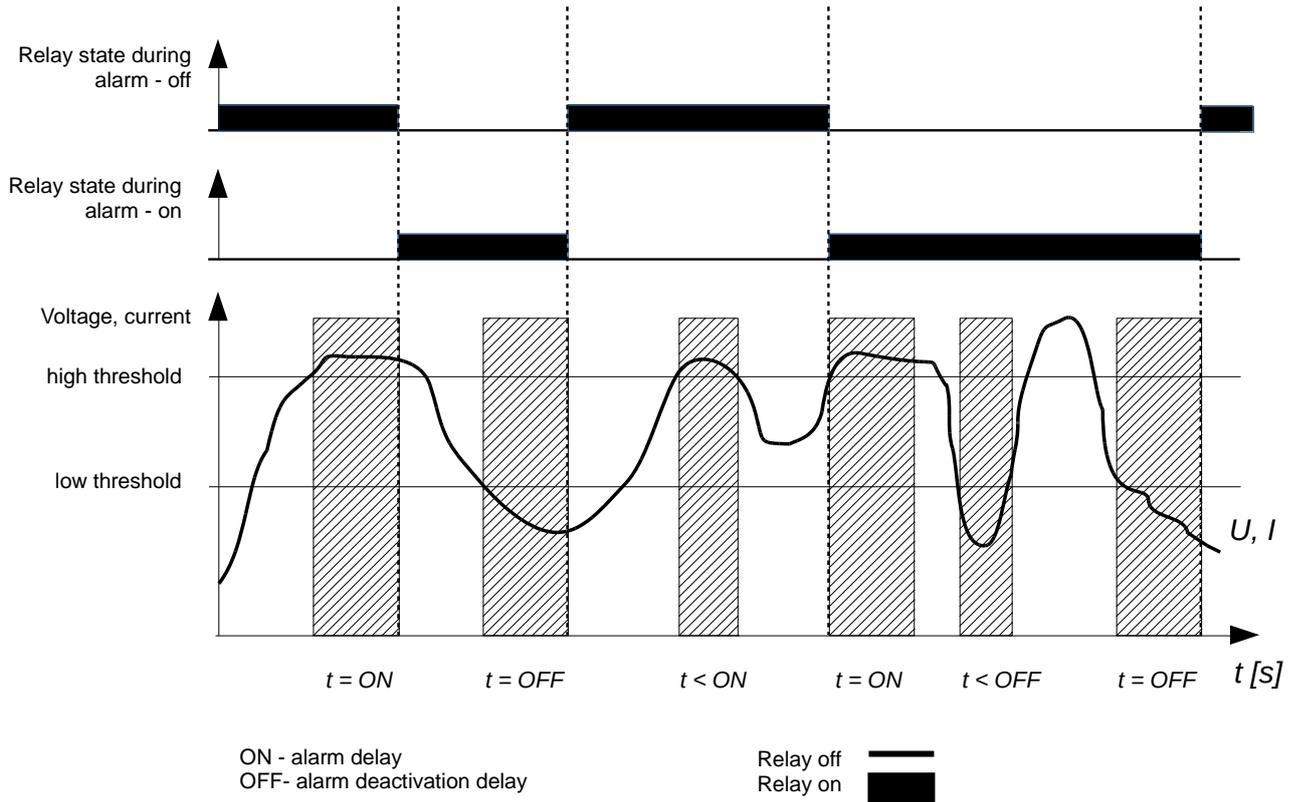
	Supervisory relay on	State of the relay during alarm	Off/On		Off
13		Number of active phases	1st phase, 2nd phase, 3rd phase, 1-2 phases, 1-3 phases, 2-3 phases, All phases		All phases
14		Alarm type	Min. voltage, Min. current, Max. voltage, Max. current, Window (Voltage), Window (Current), Phase loss, Asymmetry (Voltage), Asymmetry (Current), Sequence of phases		Min. voltage
15		Latch	Off/On		
16		Low threshold	5...140	in % of the nominal value of input quantity	95
17		High threshold	5...140	in % of the nominal value of input quantity	105
18		Threshold for Asymmetry	1...30	in % of the nominal value of input quantity	3
19		Alarm activation delay [s]	0...3600	in seconds	0
20		Alarm deactivation delay [s]	0...3600	in seconds	0
21		Maintaining restart (Latch)	No/Yes		No

Types of alarm: "Min. Voltage", "Min. Current"



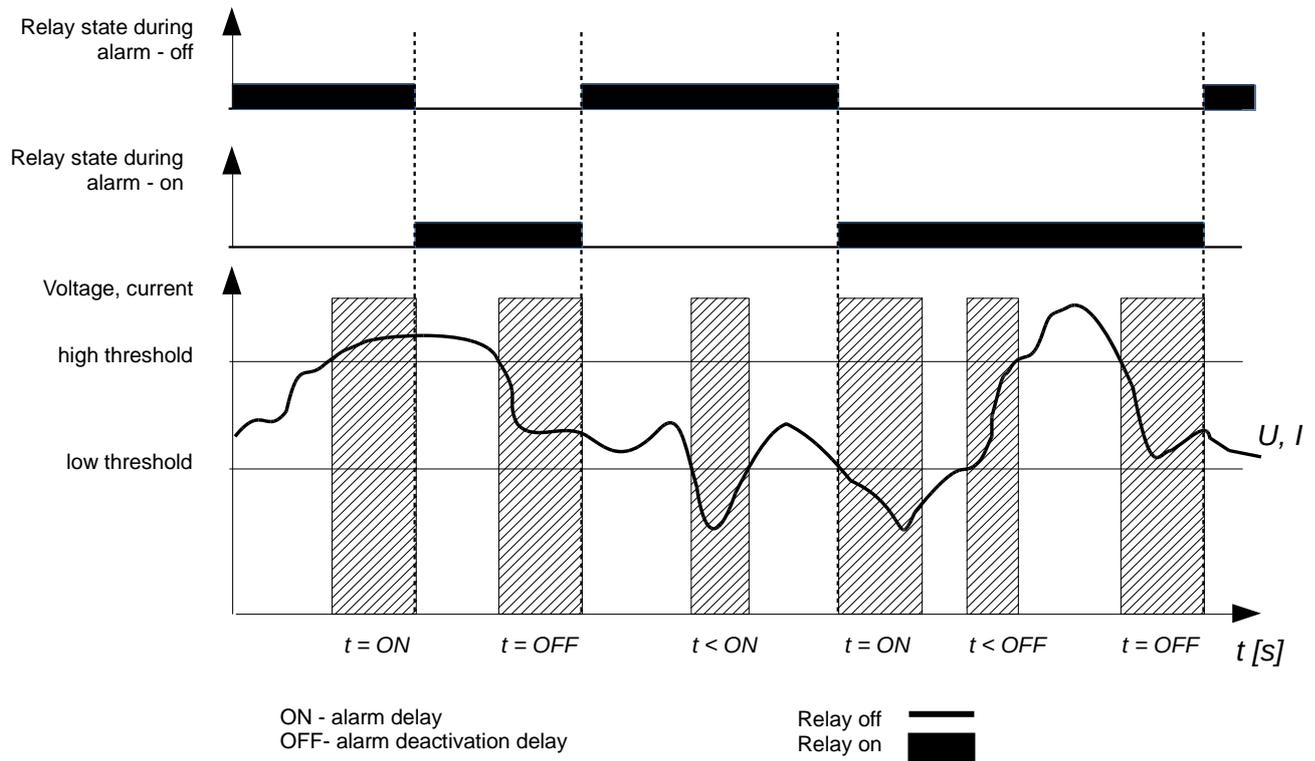
The alarm is triggered when the measured value (rms value) of the voltage or current (depends on the "Alarm type" parameter) on one of two or one of three phases (depends on the "Number of active phases" parameter) falls below the value defined in the "Low Threshold" parameter. After exceeding the threshold, the timing of the alarm activation delay begins (parameter "Alarm activation delay"). After this time, the alarm is activated and the relay goes into the state defined by the parameter "Relay status during alarm". The alarm is switched off when the measured value (rms value) of voltage or current on one, two or three phases (depends on the "Number of active phases" parameter) increases above the value defined by the "High Threshold" parameter. Then, the timing of the alarm deactivation delay begins (parameter "Alarm deactivation delay"). After this time, the alarm is turned off. In the case when the value of any of the parameters "Alarm activation delay", "Alarm deactivation delay" is equal to zero, then when the alarm is activated/deactivated, the relay will be switched on/off at the same time.

**Types of alarm: "Max. Voltage", "Max. Current"**



The alarm is triggered when the measured value (rms value) of the voltage or current (depends on the "Alarm type" parameter) on one of two or one of three phases (depends on the "Number of active phases" parameter) increases above the value defined in the "High Threshold" parameter. After exceeding the threshold, the timing of the alarm activation delay begins (parameter "Alarm activation delay"). After this time, the alarm is activated and the relay goes into the state defined by the parameter "Relay status during alarm". The alarm is switched off when the measured value (rms value) of voltage or current on one, two or three phases (depends on the "Number of active phases" parameter) falls below the value defined by the "Low Threshold" parameter. Then, the timing of the alarm deactivation delay begins (parameter "Alarm deactivation delay"). After this time, the alarm is turned off. In the case when the value of any of the parameters "Alarm activation delay", "Alarm deactivation delay" is equal to zero, then when the alarm is activated/deactivated, the relay will be switched on/off at the same time.

**Types of alarm: "Window (of voltage)", "Window (of current)"**

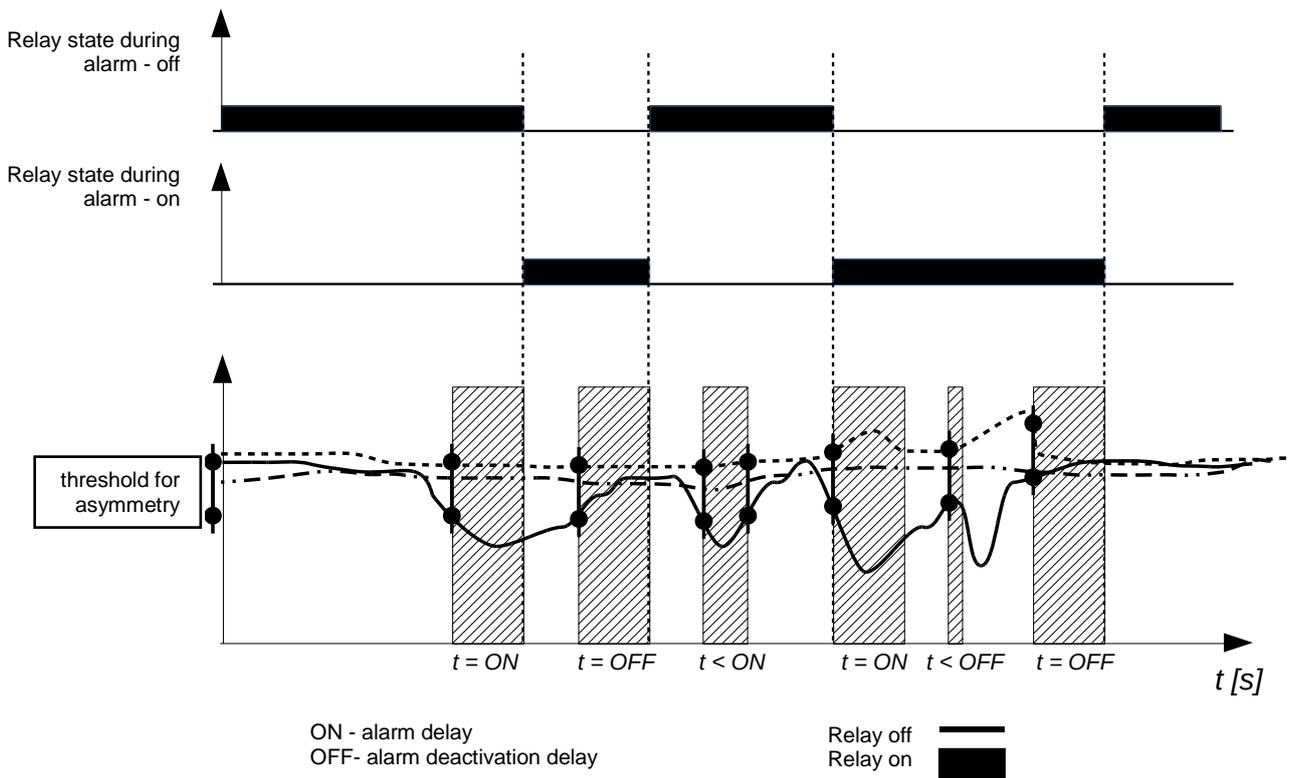


The alarm is triggered when the measured value (rms value) of the voltage or current (depends on the "Alarm type" parameter) on one of two or one of three phases (depends on the "Number of active phases" parameter) increases above the value defined by the "High Threshold" parameter or falls below the value specified by the "Low Threshold" parameter. After exceeding the threshold, the timing of the alarm activation delay begins (parameter "Alarm activation delay"). After this time, the alarm is activated and the relay goes into the state defined by the parameter "Relay status during alarm". The alarm is switched off when the measured value (rms value) of voltage or current on one, two or three phases (depends on the "Number of active phases" parameter) falls between the values defined by the "High Threshold" and "Low Threshold" parameters. Then, the timing of the alarm deactivation delay begins (parameter "Alarm deactivation delay"). After this time, the alarm is turned off. In the case when the value of any of the parameters "Alarm activation delay", "Alarm deactivation delay" is equal to zero, then when the alarm is activated/deactivated, the relay will be switched on/off at the same time.

**Types of alarm: "Phase loss"**

The principle of the alarm operation is analogous to the principle of the operation of the alarm type: **"Min. Voltage", "Min. Current"**

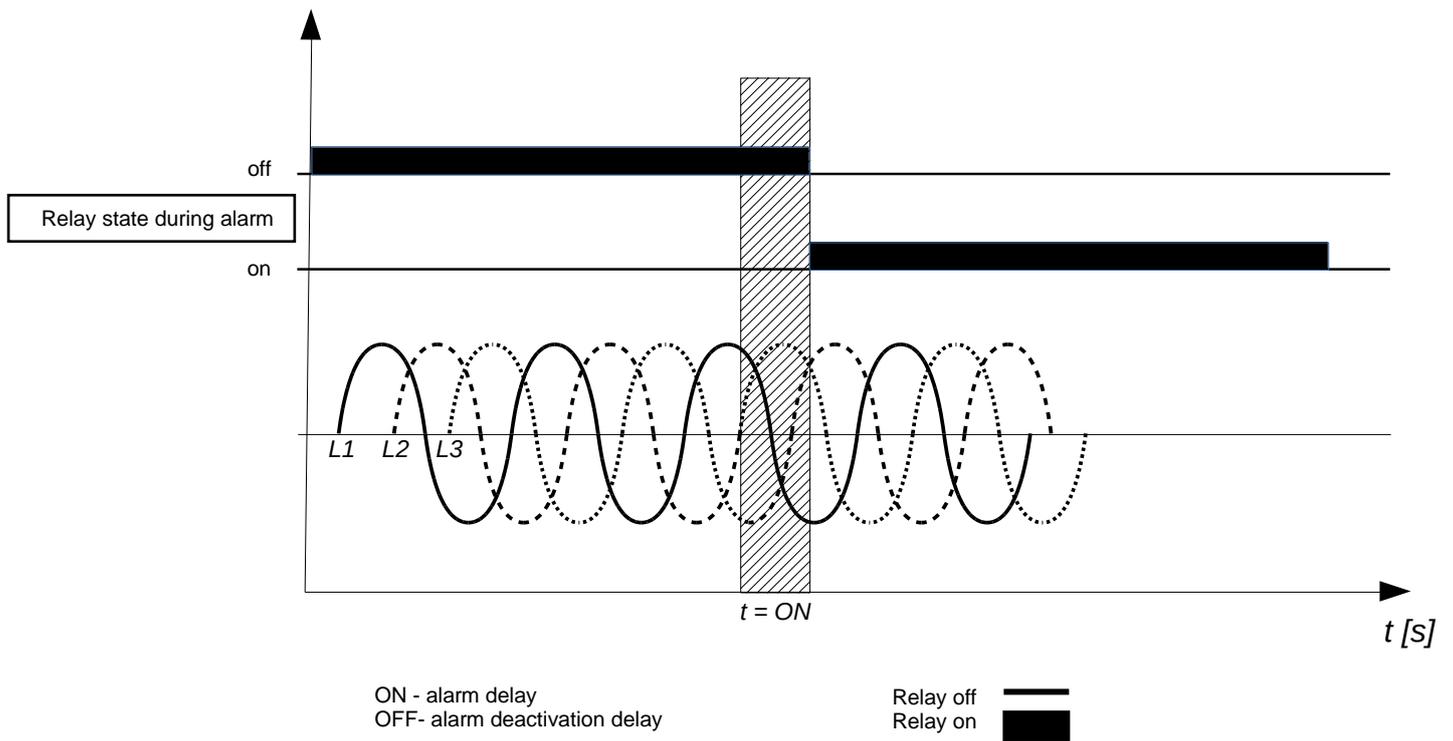
Types of alarm: "Asymmetry (Voltage)", "Asymmetry (Current)"



When the asymmetry for measured values (rms values) of voltages or currents (depends on the "Alarm type" parameter) between two phases (depends on the "Number of active phases" parameter) increases above the value defined by the "Asymmetry threshold" parameter, the timing of the alarm activation delay begins (parameter "Alarm activation delay"). After this time, the alarm is activated and the relay goes into the state defined by the parameter "Relay status during alarm". The alarm is switched off when the asymmetry for measured values (rms values) of voltages or currents (depends on the "Alarm type" parameter) between phases (depends on the "Number of active phases" parameter) falls below the value defined by the "Asymmetry Threshold" parameter. Then, the timing of the alarm deactivation delay begins (parameter "Alarm deactivation delay"). After this time, the alarm is turned off. In the case when the value of any of the parameters "Alarm activation delay", "Alarm deactivation delay" is equal to zero, then when the alarm is activated/deactivated, the relay will be switched on/off at the same time.

For this type of alarm, the "Number of active phases" parameter must be set to two or all phases.

Types of alarm: "Phase sequence"



If a change in the phase sequence is detected, the timing of the alarm activation delay begins (parameter "Alarm activation delay"). After this time, the alarm is activated and the relay goes into the state defined by the parameter "Relay status during alarm". The alarm is deactivated when the phase order is correct. Then, the timing of the alarm deactivation delay begins (parameter "Alarm deactivation delay"). After this time, the alarm is turned off. In the case when the value of any of the parameters "Alarm activation delay", "Alarm deactivation delay" is equal to zero, then when the alarm is activated/deactivated, the relay will be switched on/off at the same time.

For this type of alarm, the "Number of active phases" parameter must be set to two or all phases.

### 3 MAP OF REGISTERS OF ND30 METER

#### Supplement to item 11 of the ND30 meter user manual.

In ND30 meter the data is placed in 16- and 32-bit registers. Process variables and parameters of the meter are located in the address space of registers in a manner dependent on the type of the variable. Bits in 16-bit register are numbered from the youngest to the oldest (b0-b15). 32-bit registers contain floating point numbers in IEEE-754 standard. Byte order 3210 – the oldest is sent first.

#### Supplement to Table 15 of the ND30 meter user manual

Address range	Value type	Description
4400- 4440	Integer (16 bits)	Value placed in one 16-bit register. Registers of statuses, energy values, the meter MAC address, configuration data. Description of registers can be found in table 20. Read-only registers.
4600-4610	Integer (16 bits)	Value placed in one 16-bit register. Configuration registers of supervisory relay.

#### Base with the address 4500 (16-bit registers) in ND30 for the supervisory relay

Register address	Operations	Range	Description	Default
4600	RW	0 .. 1	The number of the relay for configuration. 0 – relay number zero, 1 – relay number one,	0
4601	RW	0 .. 1	Relay function: 0 – standard relay supported by the ND30 alarm functions, 1 – function of the supervisory relay,	0
4602	RW	0 .. 1	Relay status at the time of the alarm: 0 – disabled, 1 – enabled.	0
4603	RW	0 .. 6	The quantities to which the alarm is to operate: 0 - first phase, 1 - second phase, 2 - third phase, 3 - first and second phase, 4 - first and third phase, 5 - second and third phase, 6 - all phases,	6
4604	RW	0 .. 9	Alarm type 0 - Minimum voltage, 1 - Minimum current, 2 - Maximum voltage, 3 - Maximum current, 4 - Window (voltage), 5 - Window (current), 6 - Phase loss, 7 - Asymmetry (voltage) - available at supervision of at least 2 phases, 8 - Asymmetry (current) - available at supervision of at least 2 phases, 9 - Phase sequence - available with supervision of 3 voltage phases	0
4605	RW	0 .. 2	Latch 0 - when an alarm occurs, it will not latch, 1 - when an alarm occurs, it will latch, that is, after the alarm condition disappears, it is still active, 2 - resetting the alarm occurrence and returning the relay to the position	0

			that occurs when there is no alarm,	
4606	RW	5 .. 140 [%]	Lower threshold of quantity in percentage (relative to nominal current or voltage)	95
4607	RW	5 .. 140 [%]	Upper threshold in percentage (relative to nominal current or voltage) - upper threshold value cannot be lower than the lower threshold	105
4608	RW	1 .. 30 [%]	Value threshold for asymmetry relative to the nominal value (voltage or current)	3
4609	RW	0 .. 3600 [s]	Delay time (in units of 1s) of alarm activation in seconds - time 0 means the shortest possible activation time resulting from hardware limitations	0
4610	RW	0 .. 3600 [s]	Delay time (in units of 1s) of alarm deactivation in seconds - time 0 means the shortest possible deactivation time resulting from hardware limitations	0

**Supplement to Table 20 of the ND30 meter user manual**

Register address	Operations	Range	Description	Default
4424	R	0...65535	Status register 7– description below	0

**Status register 7 (address 4424, R)**

- Bit 15 – “1” - presence of binary inputs
- Bit 14 – reserved
- Bit 13 – reserved
- Bit 12 – reserved
- Bit 11 – reserved
- Bit 10 – reserved
- Bit 9 – reserved
- Bit 8 – reserved
- Bit 7 – reserved
- Bit 8 – reserved
- Bit 7 – reserved
- Bit 6 – reserved
- Bit 5 – reserved
- Bit 4 – reserved
- Bit 3 – reserved
- Bit 2 – reserved
- Bit 1 – “1” – functions of MQTT protocol enabled
- Bit 0 – “1” – functions of supervisory relay enabled