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Operating time counter
four-channel
with MODBUS RTU output

MB-LG-4
Hi

5 9 0 8 3 1 2 5 9 8 4 6 6

Do not dispose of this device to a garbage bin with other unsorted waste!
In accordance with the Waste Electrical and Electronic Equipment Act any household electro-waste can be turned in free of charge and in any quantity to a collection point established for this purpose, as well as to the store in the event of purchasing new equipment (as per the old for new rule, regardless of brand). Electro-waste thrown in the garbage bin or abandoned in the bosom of nature pose a threat to the environment and human health.

Purpose

The MB-LG-4 counter is a four-channel, one-way operating time counter with implemented function to exchange the registered data via RS-485 port in accordance with the MODBUS RTU protocol.

Features

* four independent counters
* overall results in the FLOAT (floating) values for hours and INT (integer) broken down into seconds, minutes, hours, days (4 registers per counter).
* counter input designed to work with AC/DC signals
* factor adjustment (a floating-point value)
* selecting a mode of state 1 trigger: with high or low voltage
* time filter that allows you to limit the maximum length of the input signal (to eliminate interferences on the input of the counter)
* memory of counter status after power failure
* digital input

Operation

The MB-LG-4 module is a four-channel one-way counter. Each channel is independent and counts the time in accordance with individual settings. The result is presented in the form of a floating-point number, and in parallel as integer values broken down into components in the form of days, hours, minutes and seconds.

The counter has a software function that allows to reset the counter of each channel independently. Maximum time is approx. 150 years. After reaching the maximum number (overflow), the counter automatically resets itself and starts counting from 0. The module has configurable options of counting with low (0V) or high (V +) signal and the closing or opening of the input signal circuit. Counter allows to set the minimum length of input signal time, which will be seen at the input and will be treated as an activation of the input (time filter). Shorter signals are ignored. This is used for correcting the interference (false pulses) that may appear on the input.
Counting input can be used as a DI digital input with the ability to read its state.
Reading of the counter can be reset independently for each channel. Once the maximum number of pulses (overflow) is reached, counter automatically resets and counts from 0. The module has configurable options of counting pulses with low (0V) or high (V+) signal and with leading or trailing edge.
Reading the counted values, adjustment of all counting parameters, communication and data exchange is carried out via RS-485 port using MODBUS RTU communication protocol. Power is indicated by a green LED U light. Correct data exchange between the module and other device is indicated by the LED yellow Tx light.

MODBUS RTU Communication parameters

Communication parameters	
Protocol	MODBUS RTU
Operation mode	SLAVE
Port settings (factory settings)	bit/s: 1200 / 2400 / 4800 / **9600** / 19200 / 38400 / 57600 / 115200 Data bits: **8** Parity: **NONE** / EVEN / ODD Start bits: **1** Stop bits: 1 / 1.5 / **2**
Range of network addresses (factory setting)	1÷245 (**1**)
Command codes	1: Input state reading (0×01 - Read Coils) 3: Registers group reading (0×03 - Read Holding Register) 6: Single register value setting (0×06) - Write Single Register)
Max. frequency of queries	15Hz

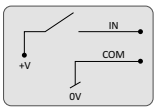
Communication registers				
address	**description**	**funct.**	**type**	**atrrib.**
256	Reading of current one and recording of new base address: 1÷245	03 06	int	read write
257	Reading of current one and recording of new transmission rate: 0:1200 / 1:2400 / 2:4800 / 3:9600 / 4:19200 / 5:38400 / 6:57600 / 7:115200	03 06	int	read write
258	Reading of current one and recording of new parity value: 0:NONE / 1:EVEN / 2:ODD	03 06	int	read write
259	Readout of current one and recording of new stop bits quantity: 0:1 bit / 1:1.5 bit / 2:2bits	03 06	int	read write
260	Factory settings : Enter 1.	06	int	write
Please note! Any change in communication parameters (transmission rate, quantity of stop bits, parity) will be applied only after power restart.				
1024-1025	Module operation time [s] R1024×256²+R1024	03	int	read
1026-1027	Serial number R1026×256²+R1027	03	int	read
1028	Production date: 5 bits – day, 4 bits – month, 7 bits – year (without 2000)	03	int	read
1029	Software version	03	int	read
1030	Completion: 0 - Lo; 1 - Hi.	03	int	read
1031-1035	Identifier: F& | F | MB | -4 | LG	03	int	read
1039	Configuration jumper: 0 – open, 1 - closed	03	int	read
The transducer does not support broadcast commands (address 0).				

Digital inputs registers				
address	**description**	**command**	**type**	**atrrib.**
0	Input states reading 0/1 - 4 bits (e.g. 1001) Order: | In4 | In3 | In2 | In1 |	01	int	read
16	In1: input state 0/1	03	int	read
38	In2: input state 0/1	03	int	read
54	In3: input state 0/1	03	int	read
70	In4: input state 0/1	03	int	read

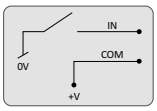
Counters registers				
address	**description**	**command**	**type**	**attrib.**
16-17	In1: operating time – overall result [hours]	03	float	read
18	In1: operating time – constituent [days]	03	int	read
19	In1: operating time – constituent [hours]	03	int	read
20	In1: operating time – constituent [minutes]	03	int	read
21	In1: operating time – constituent [seconds]	03	int	read
23	In1: input activations number	03	int	read
31	In1: counter reset. Enter 0.	06	int	write
32-33	In2: operating time – overall result [hours]	03	float	read
34	In2: operating time – constituent [days]	03	int	read
35	In2: operating time – constituent [hours]	03	int	read
36	In2: operating time – constituent [minutes]	03	int	read
37	In2: operating time – constituent [seconds]	03	int	read
39	In2: input activations number	03	int	read
47	In2: counter reset. Enter 0.	06	int	write
48-49	In3: operating time – overall result [hours]	03	float	read
50	In3: operating time – constituent [days]	03	int	read
51	In3: operating time – constituent [hours]	03	int	read
52	In3: operating time – constituent [minutes]	03	int	read
53	In3: operating time – constituent [seconds]	03	int	read
55	In3: input activations number	03	int	read
63	In3: counter reset. Enter 0.	06	int	write
64-65	In4: operating time – overall result [hours]	03	float	read
66	In4: operating time – constituent [days]	03	int	read
67	In4: operating time – constituent [hours]	03	int	read
68	In4: operating time – constituent [minutes]	03	int	read
69	In4: operating time – constituent [seconds]	03	int	read
71	In4: input activations number	03	int	read
79	In4: counter reset. Enter 0.	06	int	write
The overall result and the constituent results For input In1: registers 18÷21 are the four constituents of the overall value of the registers 16÷17. For example: operating time (R16÷R17) = 12.53 (h) when converted from decimal value for: R18=0 (days); R19=12 (h); R20=31 (min); R21=48 (sec). Similarly for inputs In2, In3 and In4.				

Configuration registers				
address	**description**	**command**	**type**	**attrib.**
512	In1: min. pulse time [ms]. Range 1÷15000	03/06	int	r/w
513	In1: logic. 0: circuit closed; 1: circuit open	03/06	int	r/w
528	In2: min. pulse time [ms]. Range 1÷15000	03/06	int	r/w
529	In2: logic. 0: circuit closed; 1: circuit open	03/06	int	r/w
544	In3: min. pulse time [ms]. Range 1÷15000	03/06	int	r/w
545	In3: logic. 0: circuit closed; 1: circuit open	03/06	int	r/w
560	In4: min. pulse time [ms]. Range 1÷15000	03/06	int	r/w
561	In4: logic. 0: circuit closed; 1: circuit open	03/06	int	r/w
Please note! For AC input signal set pulse duration to 0. For the registers: In1 - 512; In2 - 528; In3 - 544; In4 - 560.				
Default values: logic = 0; pulse duration = 10 ms;				

Implementation of connecting of counting and digital inputs



Triggering
with high voltage level



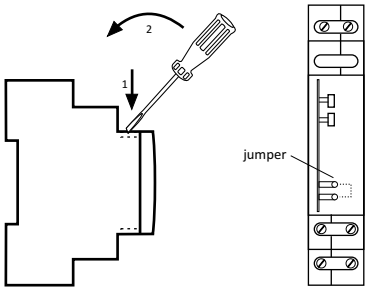
Triggering
with low voltage level

Table of triggering options and assigned to them logic states TRUE (1) and FALSE (0)

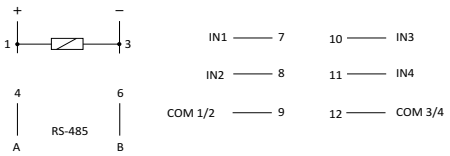
option	registry setting	closed	setting	open
level +V	0	TRUE	0	FALSE
	1	FALSE	1	TRUE
level 0V	0	TRUE	0	FALSE
	1	FALSE	1	TRUE

Reset of communication settings

The configuration jumper is located under the front casing of the module. Activating the controller with closed jumper will restore factory settings of the communication parameters. To do this, remove the front casing of the module and put the jumper cap on both pins. When the reset is done, remove the jumper.

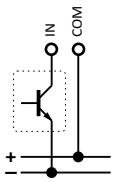


Description of in/out



1-3 converter power supply
4-6 RS-485 serial port
7,8 counter inputs In1 and In2
9 COM input (shared) for In1 and In2
10,11 counter inputs In3 and In4
12 COM input (shared) for In3 and In4

Example of OC (open collector) type output connection to the input of the module



Registry setting: 0
OC ON -> IN = TRUE (1)
OC OFF -> IN = FALSE (0)

Registry setting: 1
OC ON -> IN = FALSE (1)
OC OFF -> IN = TRUE (0)

Installation

General guidelines:
* Use of surge protectors and interference filters is recommended (e.g. OP-230).
* Use of shielded twisted wires is recommended for connecting the unit to another device.
* If using shielded cables, ground the shield on one side only and as close to the device as possible.
* Do not run signal cables parallel and in direct proximity to high- and medium-voltage line.
* Do not install the module in direct proximity to high power receivers, electromagnetic measuring devices, appliances with phase power adjustment and any other devices that can create interferences.

Installation:
1. Set the selected MODBUS communication parameters and counting options prior to unit installation.
2. Disconnect the power in the distribution box.
3. Install the module on the rail.
4. Connect the module power supply to terminals 1-3 as indicated.
5. Connect signal output 4-6 (RS-485 port) to the MASTER output of another device.
6. Connect the wires to counting inputs in accordance with selected triggering option (with low or high signal).

Protection

1. Galvanic isolation between IN... and COM... contacts and the rest of the system (2.5 kV min.).
2. No galvanic isolation between power supply and RS-485 lines.
3. Overcurrent protection of power supply inputs and communication inputs (up to a maximum of 60V DC) with automatic return feature.

Please note!

External control voltage is needed in each case to trigger input. If the module power supply is used for this, it results in the loss of galvanic separation between control inputs, power supply and communication.

Specifications

supply voltage	9÷30V DC
number of LG/DI inputs	4
counting input voltage	160÷265V AC/DC
max. counting frequency	100Hz
maximum measured time	>150 years
circuit input impedance	≥300kΩ
port	RS-485
communication protocol	Modbus RTU
operation mode	SLAVE
communication parameters	
rate – to set	1200÷115200 bit/s
data bits	8
stop bits	1 / 1.5 / 2
parity bits	EVEN / ODD / NONE
address	1÷247
power consumption	0.1W
working temperature	-20÷50°C
terminal	2.5mm² screw terminals
tightening torque	0.4Nm
dimensions	1 module (18 mm)
mounting	on TH-35 rail
ingress protection	IP20