

Modbus – LonWorks Gateway

LM-GATE



User Manual

Ed.1 11.07.2020

Contents

1	Description	2
2	Modbus-RTU interface.....	2
2.1	Communication parameters.....	2
2.2	Master/Slave	2
2.3	Supported functions.....	2
3	LON interface.....	3
4	LM-GATE configuration tool	3
4.1	Introduction	3
4.2	Project opening and saving, project structure	4
4.3	Configuring the LON and Modbus interfaces	5
4.4	Creating a list of LON devices	7
4.5	Creating a list of LON - variables.....	8
4.6	Setting up Modbus registers	11
4.7	Project compilation and diagnostic messages.....	13
4.8	Device identification by Service Pin.....	14
4.9	Loading of configuration in LM-GATE	15
5	Appearance, Indications, Connection	16
6	Main features	18

1 Description

LM-GATE device provides translation of data from Modbus protocol to LonWorks protocol and vice versa. LM-GATE sets logical correspondence between Modbus registers and LonWorks network variables (SNVT, UNVT).

The Modbus-register address map is fully customizable, any LonWorks variable can be freely mapped to the desired Modbus-register address.

LM-GATE has two physical interfaces - one RS-485 for Modbus network connection (using RTU protocol), the second one for LonWorks network connection (TP/FT-10 with 78kbps speed).

On the Modbus side, the device supports registers of Input and Holding types. On the LonWorks side all standard (SNVT) as well as custom (UNVT) network variables are supported.

2 Modbus-RTU interface

2.1 Communication parameters

The baud rate can be selected from a range of: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200. Data bits: 8, parity: No, stop bits: 1

2.2 Master/Slave

Modbus protocol is a Master/Slave type protocol. A device working as a Master polls devices working as Slave on the network. In turn, Slave devices cannot initiate data transfer themselves and must wait for a request from the Master device. Depending on the configuration, LM-GATE can operate on the network as either Master or Slave. In Slave Modbus mode LM-GATE registers are available for external remote master in Modbus network. In Master Modbus mode LM-GATE registers correspond to registers of external remote Slave devices in Modbus network, which are available for LM-GATE.

2.3 Supported functions

For reading the Modbus registers the functions 03 (reading the holding-registers) and 04 (reading the input registers) are used.

To write Modbus registers the functions 06 (single holding-register writing) and 16 (single holding-register sequence writing) are used.

If more than one register is specified for reading or writing, the range of addresses requested must match the continuous address sequence in the LM-GATE configuration.

LM-GATE supports the following Modbus-register formats:

- signed/unsigned integer 2 bytes long (16 bits)
- signed/unsigned integer 4 bytes long (32 bits)
- single precision floating point (IEEE-754) 4 bytes long (32 bits)
- array of bytes with an addition, if necessary, of a high byte to the even total number.

For registers 2 bytes long, the byte order is always defined from high to low (big endian).

For registers 4 bytes long, the order of register pairs is determined by the corresponding settings in the LM-GATE configuration.

For byte arrays, the byte order is defined by the user when creating a data parcel.

When creating a query with incorrect data or address, LM-GATE (in Slave mode) returns the corresponding error code (modbus exception code).

3 LON interface

The basic concepts of LON networks are neuron chip, node, network variable, neuron ID.

The *node* is an intelligent device that contains a neuron chip and has a unique 48-bit *neuron ID*, which is written into the chip at the factory. The *neuron ID* is transmitted to the Lon-bus when the *Service pin* button is pressed.

LM-GATE supports two types of addressing when accessing LonWorks network nodes:

- Direct addressing via unique neuron ID of the polled device;
- Addressing the logical address of the respondent device;

The logical address is assigned to the node at the stage of creating Lon - network and linking devices with each other using special software, for example - LonMaker and consists of a combination of three parameters - the domain number (Domain ID), subnet number (Subnet), node number (Node).

Each node has a set of input and output network variables that it exchanges with other nodes. Input variables are prefixed with *nvi*, output variables with *nvo*.

Variables belonging to a specific device are listed in the so-called XIF file of the device, which is supplied on a data carrier together with the equipment, and can also be obtained on request from the equipment manufacturer or downloaded directly from the device itself. The XIF file of the device is the source document for creating the LM-GATE configuration.

All network variables have a type that describes the units, scale and structure of data contained in the network variable. The use of standard variable types ensures that products from different manufacturers are compatible. The standard SNVT (Standart Network Variable Type) network variables are designed and maintained by LonMark International. Some manufacturers of LON devices may use non-standard (custom) types of network variables - UNVT.

4 LM-GATE configuration tool

4.1 Introduction

LM-GATE Tool is Windows compatible software designed to configure the LM-GATE gateway.

The tool allows creating a new project, opening and editing a project created earlier, compiling a project into a LM-GATE boot file, uploading the resulting file to the device.

The appearance of the program after launch is shown in Figure 4-1

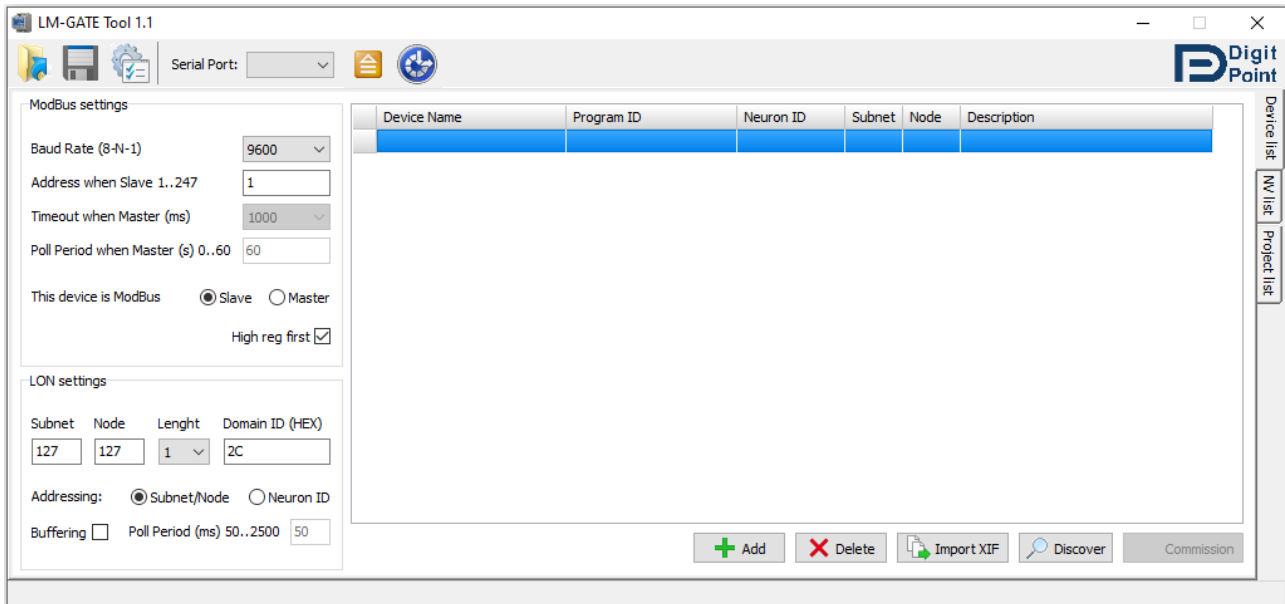


Figure 4-1

4.2 Project opening and saving, project structure

To open a previously saved project, press the *Open Project* button in the program menu bar (Figure 4-2).

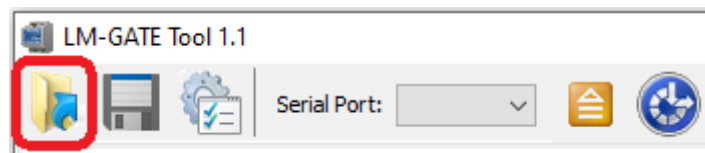


Figure 4-2

In the dialog box that opens, select a file with the project name and the extension *prj*. The previously saved settings will be loaded into the program.

To save the edited project, press the *Save Project* button in the program menu bar (Figure 4-3).

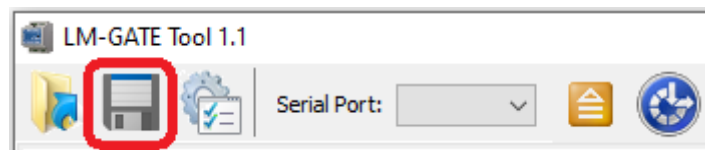


Figure 4-3

In the dialog that opens, select the file with the project name and the extension *prj* to update the previous version, or specify the path and name for the new one. If necessary, you can create a new project folder.

The program with projects has the following structure. The root folder of LM-GATE Tool contains the executive file of *LM-GATE Tool.exe* and the auxiliary file *SNVT.csv*. The *Projects* folder is located in the same place. For the convenience of further maintenance, it is recommended to create in it a separate folder with its name for each project, where you can place all the accompanying documentation and save project files there.

Each project consists of six files:

- Project name.sg1
- Project name.sg2
- Project name.sg3
- Project name.prj
- Project name.csv
- Project name.dat

Files with *sg1- sg3* and *prj* extensions contain saved project parameters.

The file with *csv* extension contains the final list of project variables. The file allows you to edit it in Microsoft Excel, import it into OPC, create accompanying project documentation. The file is generated every time you save the project.

The file with the extension *dat* appears after a successful compilation of the project and is then loaded into the LM-GATE gateway.

4.3 Configuring the LON and Modbus interfaces

On the Device List tab on the left side of the program there is an interface configuration area consisting of two sections - **Modbus settings** (Modbus interface settings, Figure 4-4) and **LON settings** (LON interface settings, Figure 4-5).

The *Modbus settings* section contains the following settings:

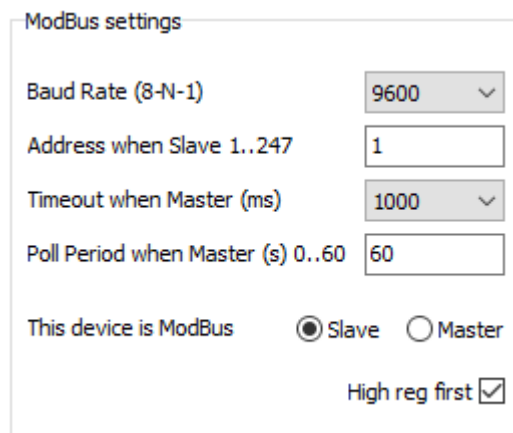


Figure 4-4

Baud Rate (8-N-1) – a drop-down list containing all supported LM-GATE communication speeds on the RS-485 port. Frame format is fixed, with the following settings: data bits: 8, parity: no, stop bits: 1.

Address when Slave 1..247 – LM-GATE address from the Modbus network when operating in Slave mode. According to the Modbus specification, it can be in the range of 1 - 247.

Timeout when Master (ms) – a drop-down list with values of response waiting time (in milliseconds) from polled Modbus slave devices when LM-GATE is operating in Master mode.

Poll Period when Master (s) 0..60 – period of cyclic polling of Modbus slave devices (in seconds) when LM-GATE is operating in Master mode. Maximum value 60 seconds. The value 0 corresponds to a continuous cyclic polling.

This device is Modbus: Slave/Master – selection of LM-GATE status in Modbus network.

When selecting *Slave*, the device is polled by another device or server with Master status.

When selecting *Master*, the device can query other devices with Slave status by addressing them at the network address.

High reg first – the order of register pairs in 4-byte values. When this setting is set, the most senior pair is passed first, then the least senior pair (big-endian format), otherwise the order changes backwards (little - endian).

The *LON settings* section contains the following settings:

Figure 4-5

Subnet – the subnetwork number to which the LM-GATE is connected (value in the range 0...255) is relevant when using logical addressing (Subnet/Node).

Node – the node number selected for LM-GATE (value in the range 0...127) is relevant when using logical addressing (Subnet/Node).

Length – a drop-down list containing possible domain number lengths in bytes is relevant when using logical addressing (Subnet/Node).

Domain ID (HEX) – domain number in hexadecimal format with the record length according to the value of Length field, actual when using logical addressing (Subnet/Node).

Addressing: Subnet-Node/Neuron ID – option of addressing type when polling LON devices.

- *Subnet/Node* – logical addressing via Domain ID, Subnet, Node values assigned to devices in the network. These parameters must be obtained from the project planning documentation or by using the “Device identification by Service Pin” procedure described below.
- *Neuron ID* - direct addressing to the unique Neuron device ID. It is used if it is not possible to determine the above parameters or if the surveyed LonWorks devices are in different domains.

When using logical addressing (Subnet/Node), the *Length* and *Domain ID* parameters set in the configurator program must match the same parameters of the LonWorks network in which LM-GATE is planned to operate, and the combination of *Subnet* and *Node* parameters for the device must be unique within the network.

Buffering – switching on the buffering mode of the LON-network device polling. LM-GATE enables the enquiry of LON devices in two modes - direct and buffered (the latter is only relevant when LM-GATE is operated in Modbus-Slave mode).

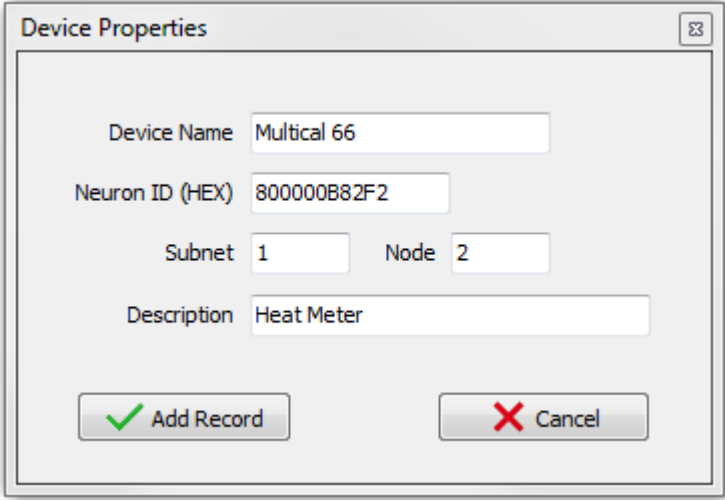
In the direct mode, requests received from the Modbus network master are processed by the device and transmitted to the LON network, the received response is processed by the device again and transmitted to the Modbus network. In this way, the exchange between the networks takes place in real time. However, in the case of a batch request to read or write a group of variables (when the corresponding Modbus registers are configured in series) the response time may eventually increase as LM-GATE will sequentially poll all LON variables from the list before it generates a response to the master. In doing so, the wizard will receive actual data or current error messages if reading or writing was not successful for any reason. To reduce the response delay, it is recommended to separate consecutive blocks of registers belonging to two LON variables with one missing register during the configuration of the Modbus map. The device capacity in direct mode is 1500 LON-variables.

In buffered mode, LM-GATE cyclically polls the LON variables by placing the values in the buffer and also writes the updated values from the buffer to the LON devices. The Modbus master reads the buffered data and writes new values to the buffer. This mode eliminates long delays in response to packet requests, but the wizard will always get the correct confirmation of buffer writing and reading regardless of whether or not the data have been exchanged with the corresponding LON-variable. The device capacity is 1500 Modbus-registers in buffered mode. The mode is selected by the user based on the requirements to the system.

Poll Period (ms) 50..2500 – delay time between two consecutive requests from LM-GATE to LON network (in milliseconds). Actual for buffered mode, used to reduce traffic in LON network.

4.4 Creating a list of LON devices

The list of served LON devices is created and edited in the *Device List* tab. In order to add a new device, press the *Add* button and in the appeared *Device Properties* window (Figure 4-6) fill in the fields according to their description:



The screenshot shows a 'Device Properties' dialog box with the following fields and values:

- Device Name: Multical 66
- Neuron ID (HEX): 800000B82F2
- Subnet: 1
- Node: 2
- Description: Heat Meter

At the bottom of the dialog, there are two buttons: 'Add Record' (with a green checkmark icon) and 'Cancel' (with a red X icon).

Figure 4-6

Device Name – unique within the project name LON - device. It is recommended to assign a meaningful name that allows to uniquely identify the device within the project. Field, required to be filled in.

Neuron ID (HEX) – a unique 6-byte node identifier recorded in hex format. It is filled in if direct addressing (Neuron ID) is selected in the LON-interface settings. If this LON device parameter is not known at the time of project planning, it can be determined at a later date by using the procedure "Device identification by Service Pin" (described below) after LM-GATE is connected to the LonWorks network at the facility.

Subnet – subnet number. To be filled in if logical addressing (Subnet/Node) is selected in the LON-interface settings. The field can be filled in at any stage of the project design before compiling the project.

Node – the node number. To be filled in if logical addressing (Subnet/Node) is selected in the LON-interface settings. The field can be filled in at any stage of the project design before compiling the project.

Description – text description of the device. Information field for easy project support, not necessary to fill in.

After filling out the fields of the window you should press the *Add Record* button to add the device to the general list. To cancel the changes, you have made, press the *Cancel* button.

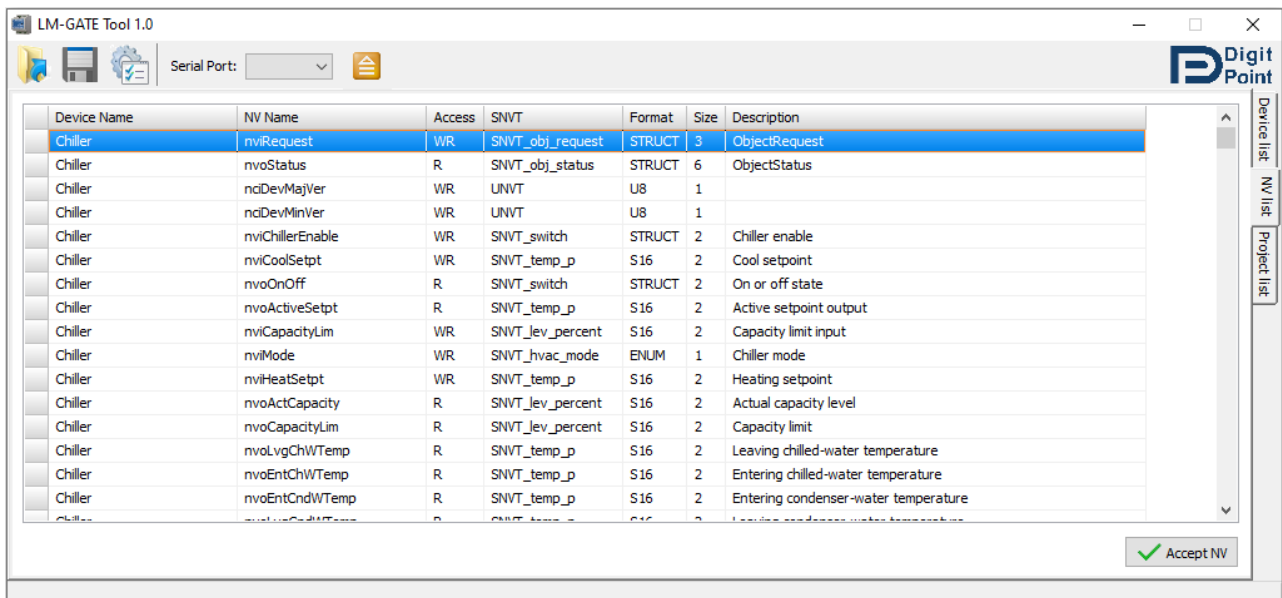
When editing an already existing record, you should select the desired record with the mouse pointer (the selected line should be highlighted in blue), double-click on the selected record with the left mouse button, edit the fields and save changes by clicking *Save Record* or abandon changes by clicking *Cancel*.

Apart from the fields listed above, the *Device List* tab has an uneditable *Program ID* field - an 8-byte identifier describing the device functionality. This field is automatically filled in when an XIF file is loaded into the program or when the "Device Identification by Service Pin" procedure is performed.

To delete a device from the list, select the desired entry with the mouse pointer (the selected line should be highlighted in blue) and press the *Delete* button.

4.5 Creating a list of LON - variables

The source of the variable list for each LON device is its *XIF file* (eXternal Interface File). To load an *XIF file* into the project, select the device of interest from the *Device List* tab (the selected line should be highlighted in blue) and press the *Import XIF* button. In the dialog box that opens, select the *XIF file* corresponding to the device. If the file is loaded successfully, all LON device variables will be added to the table on the *NV List* tab (Figure 4-7)



Device Name	NV Name	Access	SNVT	Format	Size	Description
Chiller	nviRequest	WR	SNVT_obj_request	STRUCT	3	ObjectRequest
Chiller	nvoStatus	R	SNVT_obj_status	STRUCT	6	ObjectStatus
Chiller	ncDevMajVer	WR	UNVT	U8	1	
Chiller	ncDevMinVer	WR	UNVT	U8	1	
Chiller	nviChillerEnable	WR	SNVT_switch	STRUCT	2	Chiller enable
Chiller	nviCoolSetpt	WR	SNVT_temp_p	S16	2	Cool setpoint
Chiller	nvoOnOff	R	SNVT_switch	STRUCT	2	On or off state
Chiller	nvoActiveSetpt	R	SNVT_temp_p	S16	2	Active setpoint output
Chiller	nviCapacityLim	WR	SNVT_lev_percent	S16	2	Capacity limit input
Chiller	nviMode	WR	SNVT_hvac_mode	ENUM	1	Chiller mode
Chiller	nviHeatSetpt	WR	SNVT_temp_p	S16	2	Heating setpoint
Chiller	nvoActCapacity	R	SNVT_lev_percent	S16	2	Actual capacity level
Chiller	nvoCapacityLim	R	SNVT_lev_percent	S16	2	Capacity limit
Chiller	nvoLvgChWTemp	R	SNVT_temp_p	S16	2	Leaving chilled-water temperature
Chiller	nvoEntChWTemp	R	SNVT_temp_p	S16	2	Entering chilled-water temperature
Chiller	nvoEntCndWTemp	R	SNVT_temp_p	S16	2	Entering condenser-water temperature
Chiller	nvoLvgCndWTemp	R	SNVT_temp_p	S16	2	Leaving condenser-water temperature

Figure 4-7

The table consists of the following fields:

Device Name – the unique name of a LON device assigned to it when added to the *Device List* tab.

NV Name – the name of the variable is defined by the equipment manufacturer and usually reflects its purpose. Input variables are prefixed with *nvi* (*nci* - for configuration parameters), output variables with *nvo*.

Access – variable access type. This field may have the following values:

- R – read. The current variable value can only be read. Output variable LON devices (*nvo*).
- W – write. The new value can only be written to a variable. Input variable LON devices (*nvi* / *nci*).
- WR – write/read. A variable can be used either to write a new value or to read a value written to it by other LonWorks devices. Input variable LON devices (*nvi* / *nci*).

SNVT – type of variable according to the LonMark specification. It can be standard (SNVT) or custom (UNVT). In case of SNVT, variable structure and its description is available in SNVT Master List document. The UNVT structure can be reflected in the technical documentation for the equipment used.

Format – variable format. All variables are divided into several groups according to the format of their data:

- *F32* - Single Precision Floating Point (IEEE-754) with a length of 32 bits (4 bytes);
- *S32* – signed integer 32-bit (4 bytes);
- *U32* – unsigned integer 32-bit (4 bytes);
- *S16* – signed integer 16-bit (2 bytes);
- *U16* – unsigned integer 16-bits (2 bytes);
- *S8* – signed integer 8-bit (1 byte);
- *U8* – unsigned integer 8-bit (1 byte);
- *ENUM* – signed enumeration 8-bit (1 byte);
- *STRUCT* – structure, can be up to 31 bytes long, field description - in SNVT Master List document for SNVT and technical documentation from the equipment manufacturer for UNVT.

Size – variable size in bytes.

Description – text description of the variable (information from the equipment manufacturer, may not be available in XIF).

As a rule, not all variables present in a LON device are of interest for the work. To move the necessary variables from the list to the project, you need to mark them by clicking on the leftmost field of the line of interest. A blue mark will appear in the field (Figure 4-8).

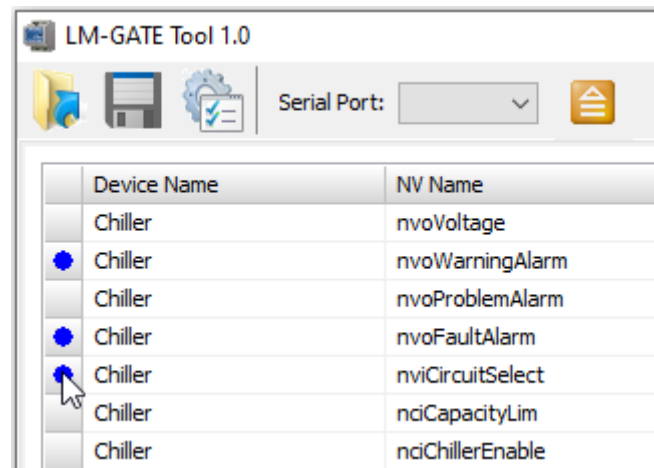


Figure 4-8

Clicking again on the marked area removes the selection. If you want to select all variables, just click on the same field in the table header. Clicking again on a field in the table header also removes all selections (Figure 4-9). To speed up the configuration process, you can combine the two techniques.

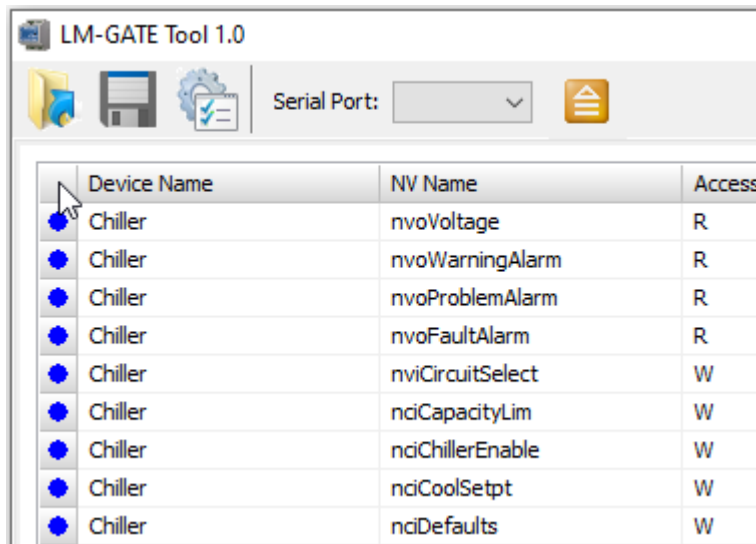


Figure 4-9

Transfer of the selected variables in the project by pressing the *Accept NV*. The labels of the selected variables change color from blue to green, and the corresponding variables are added to the final project table in the *Project List* tab. To remove a variable from a project, you need to mark the lines with LON-variables in the table of the *Project List* tab using methods described earlier. Rows with the variables to be deleted are marked with a red mark (Figure 4-10).

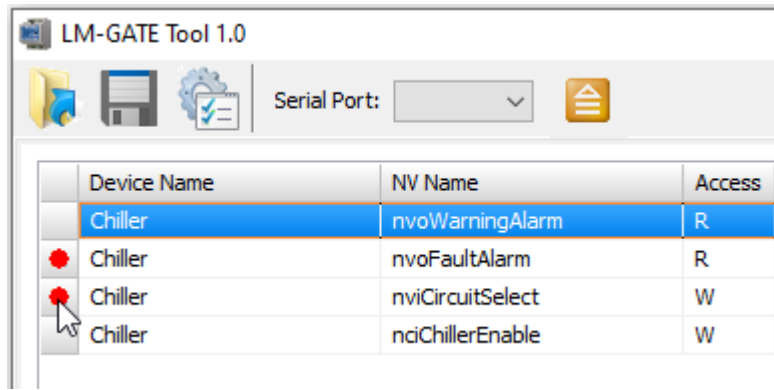


Figure 4-10

Delete the selected variables from the project by pressing the *Remove NV* button. In this case, the corresponding rows disappear from the project table in the tab *Project List*, and in the table tab *NV List* green labels are removed from these rows.

4.6 Setting up Modbus registers

After formation of the LON-variable project list, the final configuration is performed in the *Project List* tab table (Figure 4-11).

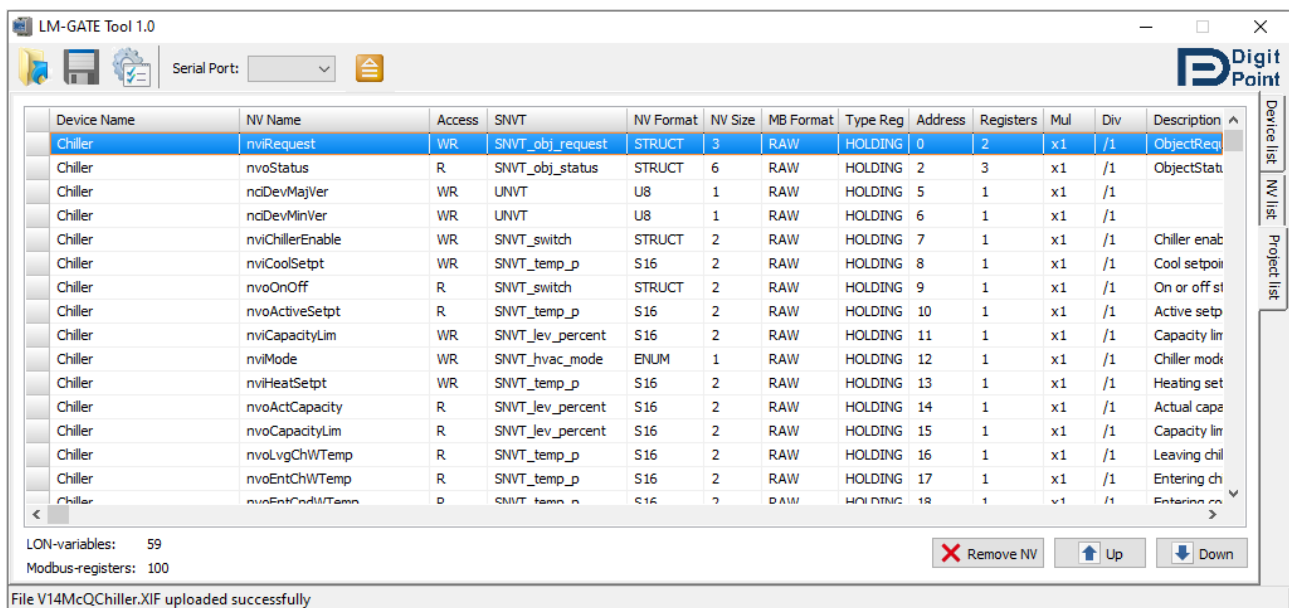


Figure 4-11

The project table repeats the fields of the *NV List* tab described earlier and adds more:

In Modbus-Slave operation mode:

MB Format – a drop-down list containing possible data formats in Modbus registers related to the LON variable. The following classification of data formats is used:

- **RAW** – the so-called "raw format." The data is placed in Modbus registers as an array of bytes according to the description of the compared SNVT (UNVT) variable. It is usually used for interaction with LON-variables of STRUCT type. The byte order is the first byte forward (big endian). The parsing of the fields of received structures, as well as the filling of sent structures, falls on the exchange initiator.

Since the length of a LON variable in bytes may be odd, and the length of an array packed in Modbus registers is always multiple of two, the RAW array is formed according to the following rule: the length of the array is equal to the length of the LON variable if the size of the last even and one byte more if the length of the LON variable is odd (with an additional and insignificant byte being the first byte of the array).

- *S16* – signed integer 16-bit (2 bytes);
- *U16* – unsigned integer 16-bit (2 bytes);
- *S32* – signed integer 32-bit (4 bytes);
- *U32* – unsigned integer 32-bit (4 bytes);
- *F32* - Single Precision Floating Point (IEEE-754) with a length of 32 bits (4 bytes);

The only structural type of SNVT variable to which any Modbus register format can be assigned is *SNVT_switch*. If a format other than RAW is selected, data are converted to *SNVT_switch* according to the following principle: The resulting value is assigned to the Value field and the state field is set to "1" if the value is not zero. In case of reverse conversion, the output value is assigned to zero if the state field contains "0" otherwise the value of Value field is assigned to *SNVT_switch* variable.

Type Reg – a drop-down list containing possible types of Modbus registers. Two types are supported:

- *HOLDING* – registers that allow data to be written into and read from them;
- *INPUT* – registers that only read data from them;

Address – Modbus register address (user-assigned value in the range from 0 to 16383);

Registers – the number of Modbus registers allocated to the LON variable it compares (the value is not editable, is calculated automatically);


Mul – a drop-down list containing the coefficients - multipliers: X1, X10, X100, X1000. The value received from the Modbus network is multiplied by the selected factor and sent to the LonWorks network. A similar conversion takes place in the reverse direction. Allows for storing fractional values in Modbus registers. For example, the temperature of 76.46 °C received from the LON network and passed through the X100 multiplier is transmitted to the Modbus register as 7646.

Div - a drop-down list containing the coefficients - dividers: /1, /10, /100, /1000. The value received via Modbus port is divided by the selected factor and sent to the LonWorks network. A similar conversion is performed in the reverse direction. It allows receiving fractional values from Modbus registers. For example, a value of 7646 received from a Modbus network and passed through the divider /100 is transmitted to LonWorks as 76.46.

Description - text description of the LON-variable. By default it is filled with a string from XIF and is available for editing by the user according to his presentation.

In Modbus-Master operation mode an additional field appears:

Slave # - network address of the Slave device with the registers of which the LON variable is mapped.

To change the content of the field, double-click the left mouse button to put the selected line into the editing mode, the blue highlighting of the line will disappear and the editing symbol will appear in the leftmost field of the line: 

In order for the drop-down list to appear, you should put the mouse cursor over the field and press the right mouse button, after that you should choose the necessary value from the list. In some cases, the inapplicable values are not available for selection.

Left-clicking on a neighboring line or an empty field allows you to exit the editing mode and the editing symbol disappears.

The program allows you to automatically number the addresses of Modbus registers taking into account the number of registers allocated for each variable. To do this, select with the mouse the range of lines (or the whole list) of interest and press the right mouse button in the area of *Address* fields. Set the automatic numbering settings in the window that appears (Figure 4-12).

SNVT	NV Format	NV Size	MB Format	Type Reg	Address	Register
SNVT_temp_p	S16	2	RAW	HOLDING	0	1
SNVT_state	STRUCT	2	RAW	HOLDING	1	1
SNVT_switch	STRUCT	2	RAW	HOLDING	2	1
SNVT_temp_p	S16	2	RAW	HOLDING	3	1
SNVT_tem	RAW	RAW	HOLDING	4	1	
SNVT_tem	RAW	RAW	HOLDING	5	1	
SNVT_tem	RAW	RAW	HOLDING	6	1	
SNVT_hva	RAW	RAW	HOLDING	7	1	
SNVT_tem	RAW	RAW	HOLDING	8	1	
SNVT_hva	RAW	RAW	HOLDING	9	1	
SNVT_tem	RAW	RAW	HOLDING	10	1	
SNVT_hvac_mode	ENUM	1	RAW	HOLDING	11	1

Auto Enumeration x


Start Address:

Insert Gap

Figure 4-12

Start Address – The starting address of the Modbus-register block. Value range 0..16383.

Insert Gap – this setting generates a gap in one register between the blocks of Modbus registers that belong to two consecutive variables. The setting may be relevant in direct poll mode to avoid long delays in LM-GATE response. In this case, an external Modbus - master will not be able to poll several variables with a single query.

If the selected string block contains registers of different types (Holding and Input), then numbering will be performed separately for each type. Exiting the allowed range of addresses is accompanied by an error message, and the string with the wrong address is marked by the symbol: 

Using the *Up* and *Down* buttons, you can move the selected line or block of lines vertically, which allows you to organize them by the field of interest to the user. The block of rows is selected by pressing the left mouse button with the SHIFT key pressed.

4.7 Project compilation and diagnostic messages

To form a load file from the currently opened project, you should compile it. To do it, you should press the *Compile Project* button in the program menu bar (Figure 4-13)

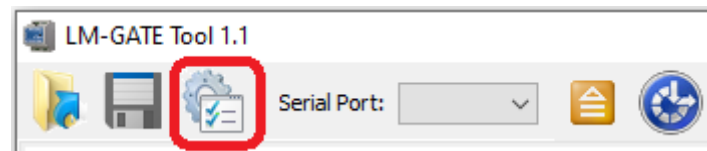



Figure 4-13

During the compilation process, the program will check the project for logical errors and generate the corresponding message when they are detected. In the *Project List* tab, the lines of the project with detected errors are marked with the following symbol: 

In this case you should eliminate errors and repeat the compilation. The program's informational messages are listed in Table 4-1

Table 4-1

Код	Причина
E01	Attempt to add LON devices with the same name to the table.
E02	Incorrect parameter input (out of range, invalid characters)
E03	The requested file is missing or damaged
E04	No parameter value is set
E05	Mutual intersection of Modbus-register regions with two LON-variables
E06	No connection to LM-GATE
E07	LM-GATE error code accepted
E08	Exceeding the limit of variables in the configuration
W01	The program identifier (PID) of the LON-node previously registered in the project is different from the one just received. A choice must be made whether to accept the new value or leave the old one. It is possible that the XIF file does not correspond to your physical device

If the compilation was successful, the program will offer to save the current project. You need to specify a new path or confirm the existing path and project name. The boot file with the same name but with the *dat* extension will be saved there as well.

4.8 Device identification by Service Pin

In the absence of source data to provide logical addressing to LON devices (Domain, Subnet, Node), you can use direct addressing by the unique Neuron ID. As a rule, the Neuron ID is printed on the case or board of the device, but in case of absence it can be obtained with the help of the Service button, located in all LON-nodes.

To do this, connect any of the FT1 or FT2 ports of the LM-GATE gateway to the TP/FT-10 bus of the LonWorks network. Using RS-485/USB converter connect RS-485 port to a computer with LM-GATE Tool. Apply power to the device.

Open the system project in LM-GATE Tool. In the table of *Device List* tab select the line with the device of interest and press *Discover* button. After LM-GATE search and detection a message will appear (Figure 4-14).

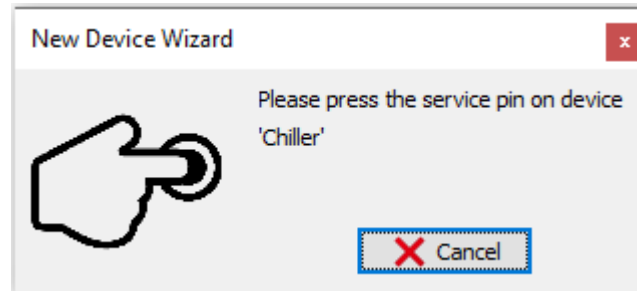



Figure 4-14

The *Status* LED on the LM-GATE housing shows the service mode of the instrument (see section "Appearance, indication, connection"). Then press the *Service* button on the LON-device.

Neuron ID, *Domain ID*, *Subnet* and *Node* received from the device are automatically entered into the corresponding fields of the selected table row.

The *Domain ID* field is displayed in the *Device List* table when *Neuron ID* addressing is selected in the LON settings, is not editable and is informative.

If the XIF file of the device has been loaded into the project by now, the program identifier (*PID*) written in the *XIF file* and received from the device will also be checked. If they do not match, an error message will be displayed.

For correct operation, each LON device must be in the network in active mode (on-line). If the identified device is in passive mode and not integrated in any LonWorks network, it is marked with the symbol: 

When selecting a line with this symbol, the *Commission* button becomes available to put the selected device into active mode. To perform the operation, LM-GATE must be in the service mode.

4.9 Loading of configuration in LM-GATE

To load the configuration file into LM-GATE, the power supply to the terminals "+" and "-" of the device must be $\pm 6..24V$. Connect a computer with LM-GATE Tool to terminals "A" and "B" of the RS-485 port using RS-485/USB converter. Only one device must be connected to the RS-485 line.

In the *Serial Port* drop-down list of the program menu bar, select the COM port to which LM-GATE is connected. Press the *Load CFG* button located next to it (Figure 4-15)

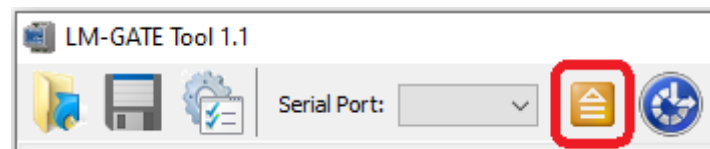


Figure 4-15

The program will search for the device and when detected, LM-GATE will prompt the user to select a file to download. In this case *Status* LED indication on LM-GATE housing will show the device operation in service mode. The process of searching the device and loading the configuration is accompanied by explanatory messages in the status bar at the bottom of the program.

After a successful download you should press the *Reset* button on the device for the updated configuration parameters to take effect. Make sure that the *Status*-LED indicates that the instrument is out of service mode. LM-GATE in service mode can also be rebooted remotely by pressing the *Reset LM-GATE* button in the program menu bar (Figure 4-16)

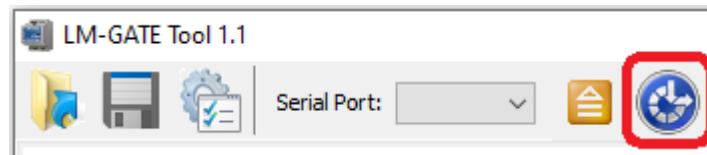


Figure 4-16

5 Appearance, Indications, Connection

Appearance of the device is shown in Figure 5-1.

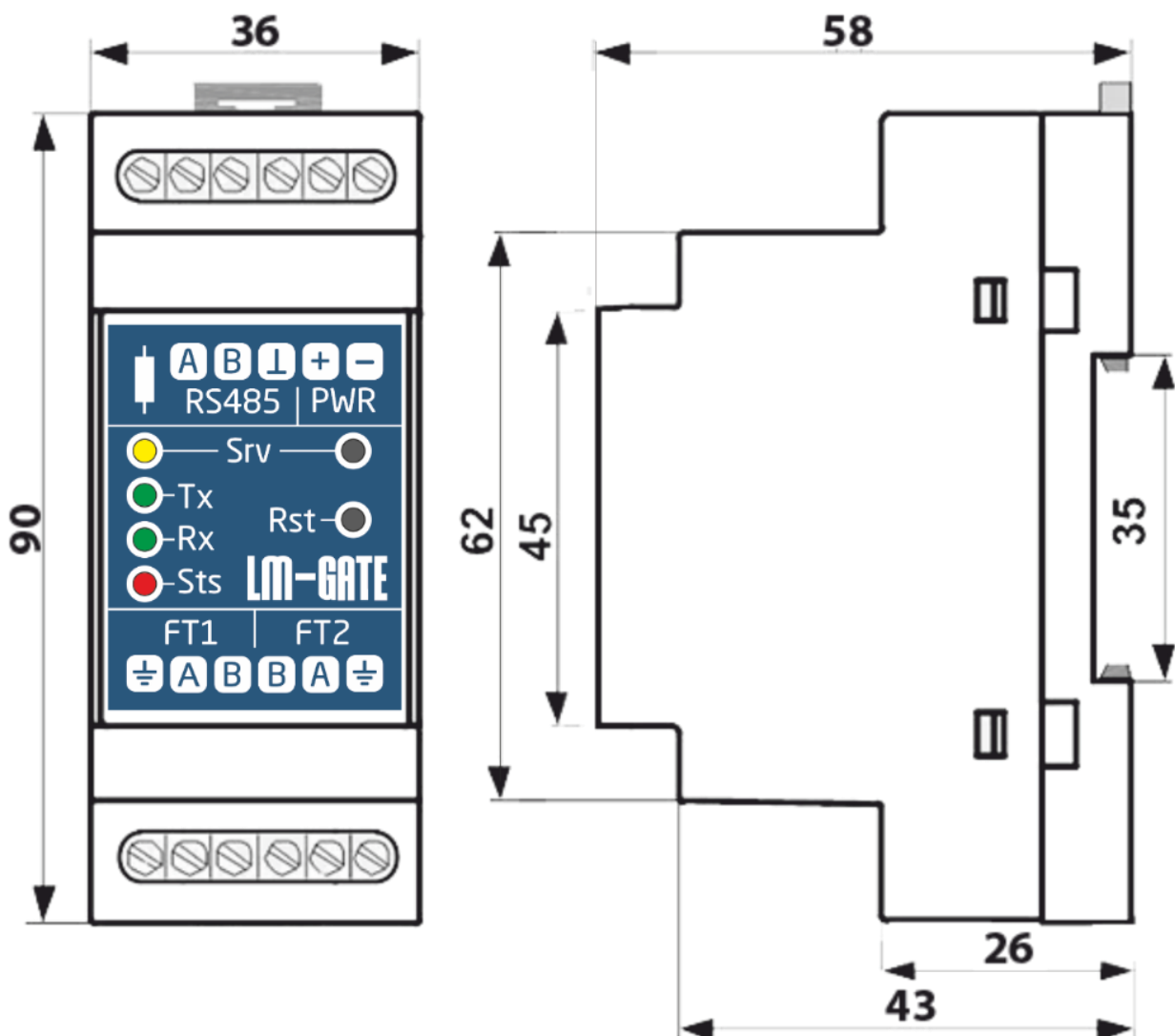


Figure 5-1

The following controls and indicators are used to interact with LM-GATE:

- *Rst* – Reset Pin - the button is used to hardware reset the device.

- *Srv* – Service Pin - the button is used to identify the device on the LonWorks network.
- *Rx* - green LED - displays packet reception by LM-GATE from LonWorks network.
- *Tx* - green LED - shows the transmission of packets by LM-GATE to the LonWorks network.
- *Srv* – Service LED - yellow LED is the standard NeuronChip diagnostic indicator. It has the following states:
 - ✓ Off: module configured, application is running
 - ✓ Flashing: module not configured
 - ✓ On: module without application. NeuronChip checksum errors detected
- *Sts* – Status LED - red LED - an indicator that shows the operating status of the device by means of blink - codes (number of flashes in a periodic four-second interval). Possible combinations of the indicator readings and their corresponding operating states are shown in Table 5-1.

Table 5-1

Status of the "Status LED" indicator	LM-GATE state
One flash	Standard operation of the device
Two flashes	Error in configuration file. Inconsistency of parameters written in the configuration file with the real one, unknown parameter, etc.
Three flashes	Error code obtained when querying via LonWorks network
Four flashes	Timeout when requesting via LonWorks network
Five flashes	Error code received when requesting via Modbus
Six flashes	Timeout when requesting via Modbus network
Constant fast flashing (frequency 2 Hz)	The device is in service mode. You can exit the mode by resetting the power supply or pressing the <i>Reset</i> button
Slow constant flashing (frequency 0.25 Hz)	Error of configuration file checksum. File missing or damaged.
Constant glow	Error in program memory checksum.

The indicator status is updated every four seconds.

The LM-GATE module has three terminal groups for connecting:

- to the Modbus interface (RS485). Terminals *A* - not inverted signal, *B* - inverted signal, \perp - RS-485 interface ground
- to LonWorks network based on FTT-10A (*FT1* and *FT2*). Terminals *A* and *B* allow for polarity free connection, additional lead for protective earth.
- to a power supply of $\pm 6..24V$ (*PWR*)

FT1 and *FT2* groups - terminal pairs connected in parallel to each other for easy installation of the bus topology.

LM-GATE has a built-in pluggable line conditioning resistor RS-485. When connecting the gateway at the RS-485 communication line end, the switch on the left of the RS-485 terminals must be set to ON.

6 Main features

- Configurable gateway between LonWorks TP/FT10 and Modbus RTU RS-485 networks
- DOES NOT NEED the experience with the LonWorks protocol
- DOES NOT NEED any special license software for configuration (LonMaker, NL220, etc.)
- DOES NOT NEED project files of the existing LonWorks network
- DOES NOT CHANGE the existing LonWorks network when configuring and operating
- Configuration is performed by a free utility LM-GATE Tool
- Loading of configuration via RS-485 port
- Converts 1500 LonWorks variables into Modbus registers
- Uses Modbus registers of INPUT and HOLDING types
- Working with single Modbus registers, register pairs, register arrays
- Modbus data format - signed, unsigned, floating point (IEEE 754), array
- Supports all types of LonMark SNVT
- Enables scaling of Modbus registers data (x10, x0.1, etc.)
- Enables operation in Master and Slave modes
- Provides direct and buffered polling of LonWorks variables
- Bidirectional exchange between LonWorks and Modbus networks
- Supply voltage $\pm 6..24$
- Input power not more than 2W
- Housing size 36mm L x 90mm W x 58mm H, DIN rail mounting
- LED status indication of Modbus and LonWorks
- Operating temperature $-40^{\circ}\text{C} .. +70^{\circ}\text{C}$
- Humidity 5%..90%