

S401-L

Panel Mounting Indicator with OLED data Display.

1. GENERAL SPECIFICATIONS

The S401-L module is a panel mounting indicator with OLED data display. The module has two RS485 serial ports, both supporting MODBUS-RTU protocol. Master MODBUS-RTU Port: through it the data exchange with the connected slave I/O modules is performed. Slave MODBUS-RTU Port: through it the data acquired from the slave I/O modules and their elaborations are exchanged with a master device. Through this port it is besides possible the indicator software configuration. New Possibility: by a self-reading to visualize and read the data written from an modbus-rtu master module connected to the Modbus-rtu slave port(when S401-L is in modbus-rtu MASTER modality). Besides the module has the following features:

- Complete parameters configurability both by the programming Menu and via software through the Slave RS485 port.
- Easy navigation on the programming Menu by three buttons on the frontal panel.
- Possibility to read and at choice to display up to 20 quantities.
- New Autocall for visualized values.
- Possibility to define and display up to 1 elaborated quantities, obtained by the application of mathematical or logical functions on the acquired/elaborated quantities.
- Optional calculation for the acquired analog quantities.
- Optional scaling of the acquired/elaborated analog quantities.
- Possibility to force the continuous or trigger writing of 10 quantities relative to the connected slave modules.
- Possibility to define, for each elaborated quantity, an alarm with two individually activable thresholds.
- Alarm signaling by warning message or by trigger writing.
- The quantities acquired through the Master MODBUS-RTU port and their elaborations are made available to a master device through the Slave MODBUS RTU port.

-Selectable menu language: Italian, English, French.

-Settable display contrast: 1 to 15.

-Number of quantities to view on the same display screen: 1, 2 or 3 measurements.

-Settable number of decimal figures: automatic, 1, 2 or 3.

2. TECHNICAL SPECIFICATIONS

2.1 Power Supply Specifications
Power Supply: 10-40 Vdc, 19, 28 Vac
Consumption: 1 W, Maximum 1,5 W
Protection: Max 12 Vdc, Max 350 W (R X 20 us)

2.2 Master RS485 Specifications

Modality: Half-duplex RS485
Capacity: 32 Standard
Protocol: Slave MODBUS-RTU
Protection: Max 12 Vdc, Max 350 W (R X 20 us)

2.3 General Technical Features

Environmental Conditions: Temperature: -10...80°C
Humidity: max. 30% max 90% at 40°C non-condensing
Storage Temperature: -20...85°C
Isolation: 1500 V among each pair of ports.
Conformity: CE
Previous standards: EN60947-1, EN60947-2, EN60947-3
Three buttons for menu navigation.
Protection Degree: IP65 (on the frontal panel with the provided seal).
Dimensions (L x H x W): 88 x 48 x 40 mm
Standards: EN61000-6-4/2002-10 (electromagnetic emission, industrial environment),
EN61000-6-2/2002-10 (electromagnetic immunity, industrial environment),
EN61010-1/2007 (safety).
All circuits must be isolated from the other circuits under dangerous voltage with double isolation. The power supply transformer must comply with EN60742. Isolated transformers and safety transformers.

3. FUNCTIONING DESCRIPTION

The S401-L module is a front-panel display and it is configurable in Modbus RTU "master" or "slave" modality. The S401-L module can display and process the data acquired from the modbus-rtu slave modules in MASTER modality. In the same modality it can make a self-reading (at address #248 of the internal register from 41000 to 41099) for the written data by Modbus-rtu master module connected to the S401-L slave port. The data exchange with the measurement modules is performed through the Master RS485 port, according to MODBUS-RTU Master protocol; so the acquired data may be viewed by the OLED display. In Master modality the S401-L can read the written data from an master module connected to the S401-L slave port. The three buttons on the frontal panel allow to scroll the acquired data list and to access to the programming menu.

3.1 Setting Modalities

All the module parameters may be set both by the programming menu and through the Slave RS485 port by the configuration tool.

3.2 Data Acquisition through the Master MODBUS-RTU Port

The instrument may be programmed to acquire up to 20 quantities through the Master RS485. The following data types may be acquired:

- Floating-point
- Long
- Word
- Boolean

In case of Floating-point and Long data types, it is possible to define the order of the two registers which compose the data.

3.2.1 Acquired quantities Moving Average
It is possible to acquire for each Long, Word or Floating-point acquired quantities, the moving average calculation on the last 8 read measurements.

3.3 Elaborated Quantities
It is possible to define and view up to 10 elaborated quantities, obtained by the application of mathematical and logical functions on the acquired or elaborated quantities. The functions and operations may be applied on all the acquirable data types. The result may also be viewed or not by display.

An alarm with two individually activable thresholds and corresponding hysteresis may be associated to each elaborated quantity.

3.3.1 Applicable Functions and Operations
The user has at his disposal different operations to execute on the defined quantities.

For the boolean quantities the following operations may be executed: AND and OR. All the operations are listed on the section 4.2.2.

3.3.2 Alarms on elaborated quantity
An alarm may be associated to each not boolean elaborated quantity.

The following parameters may be set for each alarm: High Threshold, Low Threshold, Hysteresis on the High Threshold, Hysteresis on the Low Threshold.

When the quantity value is greater than the High Threshold, the high alarm condition is activated; the alarm condition ends when the quantity value is < High Threshold - High Hysteresis.

When the quantity value is smaller than the Low Threshold, the low alarm condition is activated; the alarm condition ends when the quantity value is > Low Threshold - Low Hysteresis.

All the alarm conditions are displayed by an alarm message, alternated to the value of the quantity.

3.4 Acquired and Elaborated Quantities Scaling
During the definition of an acquired or elaborated quantity, it is possible to decide also its scaling.

So the DATA OFFSET and the SCALE FACTOR parameters have to be set.

The resulting Scaled Quantity is:

3.5 Display Data List

The user may decide just during the definition phase of a reading or function, to display its value or not. Once the quantity insertion procedure has been finished, it is always possible to enable/disable its presence on the display list; also the position on the display list may be modified later.

3.6 Data Writing through the Master MODBUS-RTU port

The instrument may be programmed to write through the Master RS485 port, up to 10 quantities relative to the connected I/O modules. The same acquirable data types may be written:

- Floating-point
- Long
- Word
- Boolean

3.6.1 Writing Modalities: Continuous or Trigger

It is possible to set up to 10 writings.

Continuous Writing
The writing is performed at every program cycle (if the quantity to write is available).

It is possible to write on the selected I/O registers the value of a previously defined acquired or elaborated quantity.

Trigger Writing
The writing is associated to the value of a previously defined elaborated quantity. If two alarm thresholds or at least one of them have been defined for the quantity, it is possible to enable the writing only at the verifying of one of the alarm conditions. In case of single writing, an action of alarm end is performed.

Instead in case of analog register writing, at the end of the alarm condition the writing operation only ends to be executed.

3.7 Configuration through the Slave MODBUS RTU port
All the menu parameters may be programmed through the Slave RS485 port, so the complete programming of the instrument is possible. The apostrophe Z-NET3 software is available for a fast and easy configuration of the module.

4. PROGRAMMING MENU

The programming menu allows to completely configure the module on all the functionalities described in Chapter 3.

4.1 Navigation modalities on the programming Menu

When the module is in view phase, press the OK MENU button to access to the menu; on the lower part of the display the following message appears: OK MAIN MENU; until this message is visible (for approximately 40 sec.) the pressure of the OK MENU button allows the access to the menu and to view the MAIN MENU.

4.1.1 Access to the Programming Menu

When the module is in view phase, press the OK MENU button to access to the menu; on the lower part of the display the following message appears: OK MAIN MENU; until this message is visible (for approximately 40 sec.) the pressure of the OK MENU button allows the access to the menu and to view the MAIN MENU.

4.1.2 Buttons Meaning

The instrument has three buttons: UP, DOWN, OK MENU.

On the programming menu, the buttons have the following functionalities:

UP
-It allows to scroll the menu items towards the top, in order to place on the item of interest. The selected item is marked by a flashing cursor at its left.

DOWN
-During the setting of the numeric or literal values, it allows to select the figure or the letter of interest; a pressure entails the passage to the figure of following numeric value (ex. 1-2) or to the next alphabetic letter (ex. A-B).

OK MENU
-It allows to scroll the menu items downwards in order to place on the item of interest. The selected item is marked by a flashing cursor at its left.

-During the setting of the numeric or literal values, it allows to select the figure or the letter of interest; a pressure entails the passage to the figure of previous numeric value (ex. 2-1) or to the previous alphabetic letter (ex. B-A).

OK MENU
-Access to the programming menu (see 4.1.1 Access to the programming menu)

-It allows to confirm the item selected by UP and DOWN buttons and to go to the next screen. The selected item is marked by a flashing cursor at the left of the item.

-During the setting of numeric or literal values, it allows to confirm the figure or the letter selected by the UP and DOWN buttons. Once the value of the figure or letter has been confirmed, the procedure automatically continues with the figure or letter in the next position. At the end of the parameter setting, the confirmation of the set value is required.

-Since the button has many functionalities, its meaning is sometimes indicated on the lower part of the display.

4.1.3 Parameters Modify
Once the user has selected (by subsequent pressure of the 3 navigation buttons) an item which entails the setting of one or more parameters, the editing or modify of the parameters is performed figure by figure (numeric), letter by letter (if literal).

Numeric Parameter Modify
During the editing or modify phase, the first figure flashes: the pressure of the UP button increases the value of a unit, a pressure of DOWN decreases the value of a unit.

When the OK MENU button, the value set for the figure is confirmed and the procedure goes on with the next figure. The position of the OK MENU button is marked by the flashing of the next figure.

In case of signed parameters, for the first figure only "+" or "-" signs may be selected (always by the UP and DOWN buttons). Once also the last figure has been modified, the pressure of the OK MENU button entails the passage to the Confirmation Menu which allows to save the setting, return to the parameter setting or exit from the setting.

During the editing or modify phase, the first letter flashes: the pressure of the UP button entails the view of the next alphabetic letter (ex. A-B), the pressure of the DOWN button entails the view of the previous alphabetic letter (ex. B-A); by pressing the OK MENU button the letter set for that position is confirmed and the procedure continues with the letter of the next position. The position of the OK MENU button is marked by the flashing of the next letter.

Once also the last letter has been modified, the pressure of the OK MENU button entails the passage to the Confirmation Menu which allows to save the setting, return to the parameter setting or exit from the setting.

4.2 Menu Description
The S401-L, in master modality uses the addresses from #1 to #247 for communicate with slaves module; it is also possible to execute the auto-reading function at the address #248 for the modulus registers written previously from a master module connected to the S401-L RS485 slave port.

4.2.1 READINGS MENU
It is possible to define and read from the I/O modules connected through the Master RS485 port and the data came from an modbus master module through the RS485 slave port.

This menu allows to:

- 1) Insert a new reading.
- 2) Delete a previously defined reading.
- 3) Modify a previously defined reading.
- 4) Decide if the read data will be viewed or not and in the first case to select the data position on the display list.

Readings Setting Modalities
For each defined reading, it is possible to set the following parameters:

Description
Identification name for the reading.

Slave Address
The S401-L, in master modality uses the addresses from #1 to #247 for communicate with slaves module; it is also possible to execute the auto-reading function at the address #248 for the modulus registers written previously from a master module connected to the S401-L RS485 slave port.

Register address
Modbus address of the data to read on the connected slave I/O module.

The register for the self-reading are from 41000 to 41099 at address #248. Use the following addressing modality depending on the utilized Modbus function and on the data type to read:

Scale Factor = Scale Factor * Original quantity + DATA OFFSET

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DATA OFFSET

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Data Format

The user may select the data type to read. The following formats may be selected:

- Float: 32-bit floating point format.
- Long Integer: 32-bit integer format.
- Short Integer: 16-bit integer format.
- Boolean: boolean format.

Reading Order (only for Float or Long Integer formats)

Order of the two words which constitute Float or Long Integer data. The following items may be selected:

- MSW first: The most significant word is read before, then the least significant one.
- LSW first: The least significant word is read before, then the most significant one.

Data Display Format (Decimal Figures) only for Float or Long/Short Integer formats
Number of decimal figures to view after the decimal point:

-Automatic: Maximum Displayable number of decimal figures.

-Max 1 Figures: 1 decimal figure after the decimal point.

-Max 2 Figures: 2 decimal figures after the decimal point.

-Max 3 Figures: 3 decimal figures after the decimal point.

Boolean Logic (only for Boolean format)
Reading logic of boolean data:

-Positive: the same logic value present on the I/O module register is displayed.

-Negative: the negated logic value of the one present on the I/O module register is displayed.

Measure Units (only for Float, Long and Short formats)
It allows to insert a measure unit, settable letter by letter.

Data Offset (only for Float, Long and Short formats)
It represents with the scale factor one of the two parameters defining the data scaling. The Data Offset value may be both long and float. The resulting scaled quantity depends on the Data Offset according to the following formula:

Scaled Quantity = Scale Factor * Read quantity + Data Offset

Scale Factor (only for Float, Long and Short formats)
It represents with the Data Offset one of the two parameters defining the data scaling. The Scale Factor value may be both long and float. The resulting scaled quantity depends on the Scale Factor according to the following formula:

Scaled Quantity = Scale Factor * Read quantity + Data Offset

Time Average (only for Float, Long and Short formats)
By activation (YES) of this functionality, the moving average value is calculated on the last 8 readings. The mean value is displayed (if enabled).

Display Data
By selecting YES, the data will be displayed. Also the position on the display list may be chosen.

The Readings Menu is illustrated on the schemes on page 19.

4.2.2 FUNCTIONS MENU
It allows to define 10 Functions, obtained by the elaboration of one or more read or/and elaborated quantities. This menu allows to:

1) Insert a new function.

2) Delete a previously defined function.

3) Modify a previously defined function and possibly modify only the alarm thresholds.

4) Decide if the elaborated function will be viewed or not and in the first case to select the data position on the display list.

Functions Setting Modalities
For each function the following settings are possible:

-It allows to confirm the item selected by UP and DOWN buttons and to go to the next screen. The selected item is marked by a flashing cursor at the left of the item.

-During the setting of numeric or literal values, it allows to confirm the figure or the letter selected by the UP and DOWN buttons. Once the value of the figure or letter has been confirmed, the procedure automatically continues with the figure or letter in the next position. At the end of the parameter setting, the confirmation of the set value is required.

-Since the button has many functionalities, its meaning is sometimes indicated on the lower part of the display.

Operation
Operation to execute. The selectable operations and the supported data types are listed on the below table:

Operation Code	Operation	Operands Number	Operands and Resulting Quantity Format
0	Identity	1	Integer (Long/Word) and Float
1	Sum	2	Integer (Long/Word) and Float
2	Sum/3	3	Integer (Long/Word) and Float
3	Subtraction	2	Integer (Long/Word) and Float
4	Multiplication	2	Integer (Long/Word) and Float
5	Division	2	Integer (Long/Word) and Float
6	Square	1	Integer (Long/Word) and Float
7	Cube	1	Integer (Long/Word) and Float
8	Square Root	1	Integer (Long/Word) and Float
9	Math. Average of 2	2	Integer (Long/Word) and Float
10	Math. Average of 3	3	Integer (Long/Word) and Float
11	Logical AND of 2	2	Boolean
12	Logical AND of 3	3	Boolean
13	Logical OR of 2	2	Boolean
14	Logical OR of 3	3	Boolean
15	Bit extraction 0...15	1	Integer (Word)

By activation (YES) of this functionality, it is possible to define the alarm thresholds. These thresholds may be both activated, both disabled or individually enabled. So the user may define:

-High Threshold: High Alarm threshold. The value may be both Long and Float.

-High Threshold Hysteresis: Hysteresis of the high threshold. The value may be both Long and Float.

-Low Threshold: Low Alarm threshold. The value may be both Long and Float.

-Low Threshold Hysteresis: Hysteresis of the low threshold. The value may be both Long and Float.

Boolean Logic (only for Boolean format)
Interpretation logic of boolean data:

-Positive: the displayed logic value is the operation result.

-Negative: the displayed logic value is the negation of the operation result.

Display Data
By selecting YES the data will be displayed. Also the position on the display list may be chosen.

The Functions Menu is illustrated on the schemes on pages 19 and 20.

4.2.3 WRITINGS MENU

It allows to define some continuous or trigger writings on the quantities of an I/O module connected through the Master RS485 port.

The Writings Menu allows to:

- 1) Insert a new writing.
- 2) Delete a previously defined writing.
- 3) Modify a previously defined writing.

Writings Setting Modalities
The following settings are possible for each writing:

Select Data
It allows to select the read or elaborated quantity which will be involved on the writing operation. This quantity may be used on the following ways:

1) If we select a Read Quantity or a Function without active alarms: the value of this quantity (analog or digital) will be continuously written on the I/O register which will be set by the Register Address.

2) If we select a Function with at least an activated alarm threshold: it is possible to choose between the continuous writing of the function on the I/O register (as in point 1) or the writing only in case of alarm condition (with the correspondent alarm and action). In this case it will be possible to write a constant, a bit or the quantity selected at the beginning in this field.

Slave Address
Address assigned to the instrument when it is used as a Modbus slave. Default: 1.

Slave Address
Address of the slave I/O module connected to the Master RS485 and where the data will be written. Values from 1 to 247.

Register Address
Modbus address of the register which will be written.

Use the following addressing modality depending on the utilized Modbus function and on the data type to write:

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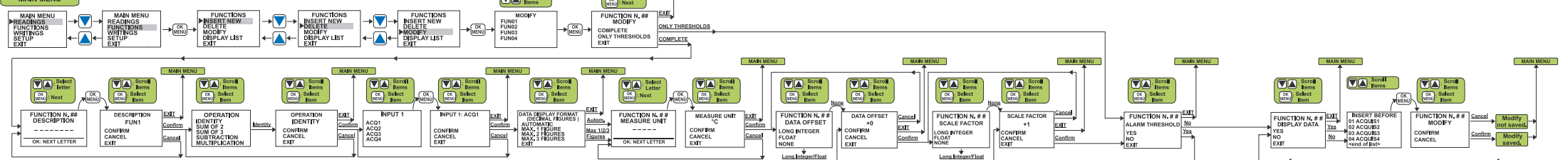
SYSTEM PARAMETERS

It allows to set the communication parameters of the two RS485 ports.

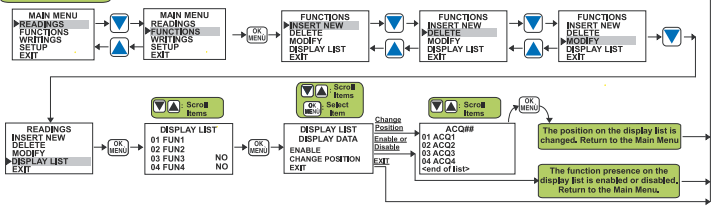
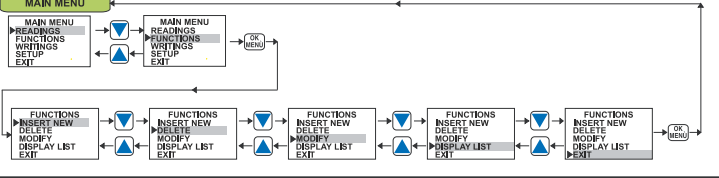
Master Mode
Reception timeout

It represents the reception timeout of the master module: maximum time in which the master waits for an answer from the connected slaves modules before declaring the operation failed. Values from

FUNCTIONS SETUP

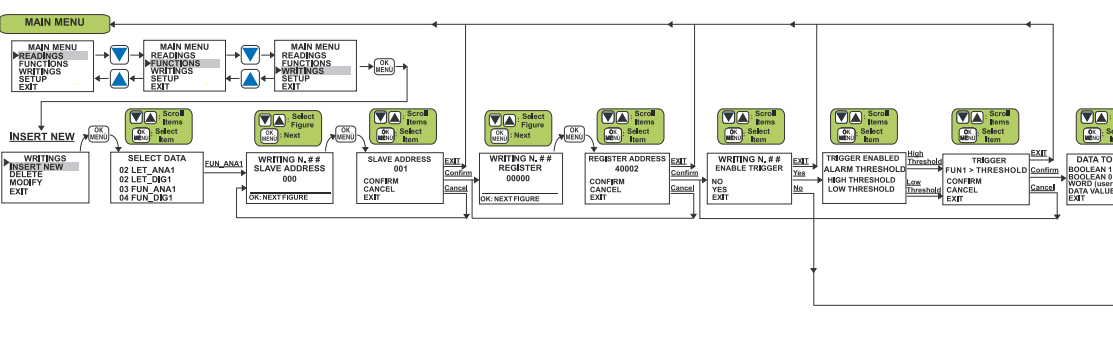
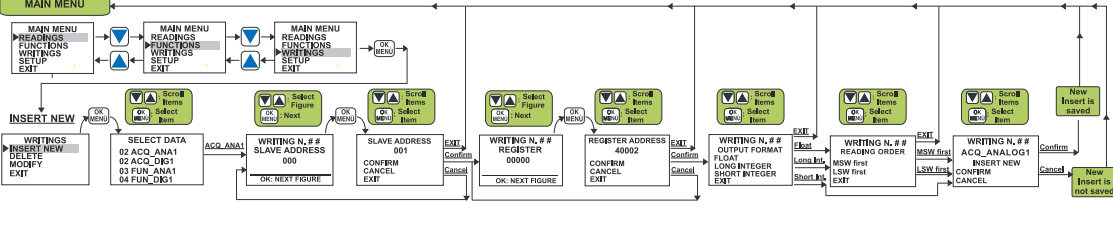
[MAIN MENU](#)

MAIN MENU ←

[View All Details](#)

INSERT A NEW CONTINUOUS WRITING

INSERT A NEW CONTINUOUS WRITING. THE VALUE OF AN ANALOG QUANTITY (READING OR FUNCTION) IS CONTINUOUSLY WRITTEN IN AN ANALOG REGISTER (FLOAT, LONG INTEGER, SHORT INTEGER).



INSERT A NEW CONTINUOUS WRITING. THE VALUE OF A DIGITAL QUANTITY (READING OR FUNCTION) IS CONTINUOUSLY WRITTEN IN AN DIGITAL REGISTER OR IN A BIT OF A ANALOG REGISTER.

