The Z-NET™ model S401 has a configurable OLED display. The S401 is configurable via the front panel or Modbus. The display shows labels, engineering units or raw data values. It can display up to 20 quantities. The S401 also features an alarm with 2 thresholds for up to 10 'derived' quantities, which are obtained by applying math or logic functions on the acquired/derived quantities. The Alarm can signal a warning message or trigger writing to a Modbus register. Decimal points are configurable to be automatic or up to 3 characters. The S401 has 2 RS485 ports so it can be a Modbus master and/or a slave allowing it to be utilized in any Modbus application.

The Z-NET™ Series offers flexible, cost effective solutions to industry’s increasingly diverse applications including distributed control, data acquisition, SCADA & telemetry. An ideal solution for process control and management using distributed I/O on plant and machinery. The I/O modules can be widely distributed or grouped together and accept all standard field signals. Modbus RTU protocol guarantees universal connectivity so applications are limitless: data acquisition, automation, telemetry control, etc.

More flexibility from ioSelect.

### Communication Specifications
- **Protocol**: Modbus RTU Master or Slave
- **Speed**: 1200 to 115,200 bps
- **Memory**: 256 byte RAM, 4 kB DDRAM, 32 kB Flash (512 byte single block), 128 byte scratchpad memory
- **Settings**: Communication parameters, language, contrast, brightness, scale, offset, unit of measure
- **Serial Comm**: Address, parity, baud rate, delay response time, transmission delay, receiving time-out
- **Queries**: 20 maximum
- **Datalogging**: Data storage from modules in RAM

### Performance Specifications
- **Front Protection**: IP65
- **Humidity**: 30-90% @ 40 °C non-condensing
- **Operating Temp**: -10 to +60 °C (14 to 140 °F)
- **Storage Temp**: -10 to +60 °C (14 to 140 °F)
- **Power**:
  - L: 10 to 40 Vdc / 19 to 28 Vac
  - H: 85 to 265 Vac
- **Dimensions**: 96 x 48 x 40 mm (3.78 x 1.89 x 1.575 in)
- **Panel Cut Out**: 91 x 45 mm (3.58 x 1.77 in)
- **Weight**: 200 g (7.055 oz)

### Ordering Information
**IOS-ZNET-S401**

- **Options**:
  - **H**: 80-265 Vac power
  - **L**: 10-40 Vdc or 19-28 Vac power

877 3 GET IOS (877.343.8467)
Wiring Instructions
RS485

Slave
<table>
<thead>
<tr>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (+)</td>
<td>B (-)</td>
<td>GND</td>
</tr>
</tbody>
</table>

Master
<table>
<thead>
<tr>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (+)</td>
<td>B (-)</td>
<td>GND</td>
</tr>
</tbody>
</table>

Power
<table>
<thead>
<tr>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+)</td>
<td>(-)</td>
</tr>
</tbody>
</table>

H option: 80-265 Vac
or
L option: 10-40 Vdc or 19-28 Vac

Sample Applications

Display & Buttons

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

**UP BUTTON & DOWN BUTTON**
- Scrolls the menu items up or down, respectively, to access the item of interest. The selected item is marked by a flashing cursor at its left.
- When setting a numeric or literal value, it selects the figure or the letter of interest; pressure toggles the figure to the following numeric value (ex: 1->2 with UP, 2->1 with DOWN) or to the next alphabet letter (ex: A->B).

**OK/ MENU BUTTON**
- Access to the programming menu (see section 4.1.1 in manual)
- Confirms the item selected by UP and DOWN buttons. The selected item is marked by a flashing cursor at the left of the item.
- During the numeric or literal value selection, it confirms 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 functions, the meaning is sometimes indicated on the lower part of the display.

Dimensions

---

877 3 GET IOS (877.343.8467)
3. FUNCTIONAL DESCRIPTION

The S401 instrument is a panel mounted indicator, able to collect data from the connected measurement modules. 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 on the OLED display. The three buttons on the front panel scroll the acquired data list and access the programming menu. It is possible both to configure the module and to exchange the collected data with a master device through the Slave RS485.

3.1 Set Up the Display

All the module parameters may be set both by the programming menu and through the Slave RS485 port utilizing the Z-NET3 configuration tool.

3.2 Data Acquisition through the Master MODBUS-RTU Port

3.2.1 Number and Types of Acquirable Data

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.

3.2.2 Acquired Quantities Moving Average

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

3.3 Derived Quantities

It is possible to define and view up to 10 derived quantities, obtained by the application of mathematical and logical functions on the acquired or derived quantities. Functions and operations may be applied on all the acquirable data types. The result may also be viewed or not by the display. An alarm with two individually activable thresholds and corresponding hystereses may be associated to each derived quantity.

3.3.1 Applicable Functions and Operations

The user has 27 different operations to execute on the defined quantities. For example the following operations may be used: arithmetic, geometric and quadratic average of two or three quantities. Other operations are: sum, subtraction, multiplication, division, square, cube, square root, etc. For the boolean quantities the following operations may be executed: AND, OR and XOR. All the operations are listed in section 4.2.2.

3.3.2 Alarms on Derived Quantities

An alarm may be associated to each derived quantity, except the boolean type. The following parameters may be individually activated: 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 less than the Low Threshold, the low alarm condition is activated; the alarm condition ends when the quantity value is > Low Threshold + Low Hysteresis. The alarm conditions are displayed by an alarm message, alternated with the quantity value on the display list.

3.4 Acquired and Derived Quantities Scaling

During the definition of an acquired or derived quantity, it is possible to also decide its scaling. This means that the DATA OFFSET and the SCALE FACTOR parameters have to be set. The resulting Scaled Quantity is:

Scaled Quantity = SCALE FACTOR * Original quantity + DATA OFFSET

3.5 Display Data List

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

3.6 Data Writing through the Master MODBUS RTU port

3.6.1 Number and Types of Writable Data
The instrument may be set 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.

3.6.2 Writing Methods: Continuous or Trigger
It is possible to set up to 10 Modbus Writes.

Continuous Writing
The writing is performed at every program cycle (if the quantity to write is available). Only a previously defined acquired or
derived quantity value may be written to the selected I/O registers.

Trigger Writing
The Modbus write event is associated with the alarm threshold of a previously defined derived quantity. The write executes
upon verification of an alarm status. A digital write executes upon alarm status verification and when the alarm condition
no longer exists. An analog write continues every cycle as long as the alarm status exists.

3.7 Configuration through the Slave MODBUS RTU port
All the menu parameters may be programmed through the Slave RS485 port; complete instrument programming is
possible. The Z-NET3 software allows easy module configuration.

4. PROGRAMMING MENU
The programming menu enables configuration of each function described in Section 3 without external software.

4.1 Navigation Methods on the Programming Menu

4.1.1 Access to the Programming Menu
With the module in view mode, hold the OK MENU button to enter the menu (for approximately 40 sec) : on the lower part
of the display the following message appears: OK: MAIN MENU

4.1.2 Button Definition
The instrument has three buttons: UP, DOWN, OK MENU.
Their functions have been described on the second page of this document.

4.1.3 Parameter Modification
Once the user has selected (by subsequent presses of the 3 navigation buttons) an item which includes setting of one or
more parameters, the editing of the parameters is performed character by character. During the editing or modification
phase, the first character flashes: pressing the UP button increases the value, pressing the DOWN button decreases the
value. Pressing the OK MENU button, sets the value displayed and the procedure goes on with the next character, which
begins flashing. When selecting a signed parameter for the first figure only ‘+’ or ‘-’ signs may be selected (always by the UP
and DOWN buttons). Once the last character has been modified, press the OK MENU button to display the Confirmation
Menu which allows saving of the settings, return to set the parameter for modification or exit from parameter modification.
The following table contains the available characters:

<table>
<thead>
<tr>
<th>Available characters for all literal parameters except Measure Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Z 0 - 9 % _ - /</td>
</tr>
<tr>
<td>Measure Unit available characters</td>
</tr>
<tr>
<td>A - Z a - z ² ³ α β γ Σ Ω μ T Φ Θ δ Φ ε % ( ) / °</td>
</tr>
</tbody>
</table>

4.1.4 Exit from the Menu
Exiting from the programming menu is performed by selecting Exit from the Main Menu or from the Setup Menu. If the
buttons are not used for approximately 40 seconds the display automatically exits from the menu and returns to view mode.
PROGRAMMING MENU (continued)

4.2 Menu Description

The programming menu is structured into four basic submenus:
1) Readings Menu
2) Functions Menu
3) Writings Menu
4) Setup Menu

This section illustrates all the parameters which may be set for each submenu.

4.2.1 Readings Menu

Allows definition of the data read from the I/O Modules connected through the Master RS485 port.

This menu allows the user to:
1) Insert a new Modbus Read.
2) Delete a previously defined Modbus Read.
3) Modify a previously defined Modbus Read.
4) Decide if the read data will be displayed or not and the position on the display list.

Readings Settings

For each defined Modbus Read it is possible to set the following parameters:

- **Description**: Identification name for the Modbus Read
- **Slave Address**: The address of the slave I/O module connected to the Master RS485 and from which the data is acquired. Values from 1 to 247.
- **Register Address**: Modbus address of the data to read on the corresponding slave I/O module. Use the following addressing method depending on the Modbus function utilized and on the data type to read:
  - For example if we want to read a holding register with address 40002 then the Register Address has to be set at 40002.
- **Data Format**: Sets 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 work is read first, then the least significant one.
  - **LSW first**: The least significant work is read first, then the most significant one.
- **Data Display Format (Characters after the Decimal Point - only for Float or Long/Short Integer formats)**
  - **Automatic**: Maximum displayable number of integers.
  - **Max 1 Figure**: 1 figure after the decimal point.
  - **Max 2 Figures**: 2 figures after the decimal point.
  - **Max 3 Figures**: 3 figures after the decimal point.
- **Boolean Logic (only for Boolean format)**
  - **Positive**: the same logic value present on the I/O module register is displayed.
  - **Negative**: the inverted logic value of the one present on the I/O module register is displayed.
- **Measure Unit (only for Float, Long and Short formats)**
  - Insert a unit of measure, user defined - selected letter by letter.
- **Data Offset (only for Float, Long and Short formats)**
  - One of the two parameters that defines the data scale. The Data Offset value may be both Long and Float. The resulting Scaled Quantity depends on the Data Offset according to the following formula:
    
    \[
    \text{Scaled Quantity} = \text{Scale Factor} \times \text{Read Quantity} + \text{Data Offset}
    \]
PROGRAMMING MENU (continued)

4.2.1 Readings Menu (continued)

Scale Factor (only for Float, Long and Short formats)
One of the two parameters that defines the data scale. The Scale Factor value may be both Long and Float. The resulting Scaled Quantity depends on the Scale Factor according to the following formula:

\[ \text{Scaled Quantity} = \text{Scale Factor} \times \text{Read Quantity} + \text{Data Offset} \]

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

Display Data
Select "Yes" to display. The position in the display list may also be chosen.

4.2.2 Functions Menu
Functions are available for defining derivations of one or more read and/or derived quantities. Under this menu the user may:
1) Insert a new function.
2) Delete a previously defined function.
3) Modify a previously defined function and quickly modify alarm thresholds.
4) Determine whether a derived quantity will be displayed and select the data position on the display list.

Functions Settings
For each function the following settings are possible:

Description - Identification Name for the Function
Operation
Executable operations:

<table>
<thead>
<tr>
<th>Operation Code</th>
<th>Operation</th>
<th>Operands Number</th>
<th>Operands and Resulting Quantity Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Identity</td>
<td>1</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>1</td>
<td>Sum of 2 ((x + y))</td>
<td>2</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>2</td>
<td>Sum of 3 ((x + y + z))</td>
<td>3</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>3</td>
<td>Subtraction ((x - y))</td>
<td>2</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>4</td>
<td>Multiplication ((x \times y))</td>
<td>2</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>5</td>
<td>Division ((x/y))</td>
<td>2</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>6</td>
<td>Square ((x^2))</td>
<td>1</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>7</td>
<td>Cube ((x^3))</td>
<td>1</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>8</td>
<td>Square Root ((x^{0.5}))</td>
<td>1</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>9</td>
<td>Inverse ((1/x))</td>
<td>1</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>10</td>
<td>Inverse Square ((1/x^2))</td>
<td>1</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>11</td>
<td>Inverse Cube ((1/x^3))</td>
<td>1</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>12</td>
<td>Inverse Square Root ((1/x^{0.5}))</td>
<td>1</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>13</td>
<td>Average of 2 ((x + y)/2)</td>
<td>2</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>14</td>
<td>Average of 3 ((x + y + z)/3)</td>
<td>3</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>15</td>
<td>Geometric Average of 2 ((xy)^{0.5})</td>
<td>2</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>16</td>
<td>Geometric Average of 3 ((xyz)^{0.33})</td>
<td>3</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>17</td>
<td>Square Average of 2 ((x^2+y^2)/2)^{0.5}</td>
<td>2</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>18</td>
<td>Square Average of 3 ((x^2+y^2+z^2)/3)^{0.5}</td>
<td>3</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>19</td>
<td>Logical AND of 2</td>
<td>2</td>
<td>Boolean</td>
</tr>
<tr>
<td>20</td>
<td>Logical AND of 3</td>
<td>3</td>
<td>Boolean</td>
</tr>
<tr>
<td>21</td>
<td>Logical OR of 2</td>
<td>2</td>
<td>Boolean</td>
</tr>
<tr>
<td>22</td>
<td>Logical OR of 3</td>
<td>3</td>
<td>Boolean</td>
</tr>
<tr>
<td>23</td>
<td>Logical XOR of 2</td>
<td>2</td>
<td>Boolean</td>
</tr>
<tr>
<td>24</td>
<td>Normal Volume Compensation</td>
<td>3</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>25</td>
<td>Standard Volume Compensation</td>
<td>3</td>
<td>Integer (Long/Word) and Float</td>
</tr>
<tr>
<td>32 - 47</td>
<td>Bit Extraction 0-15 from register</td>
<td>1</td>
<td>Integer (Word)</td>
</tr>
</tbody>
</table>
PROGRAMMING MENU (continued)

4.2.2 Functions Menu (continued)

Input N.1 or 2 or 3
Provides selection of the read or derived quantities among which the operation will be performed. All the previously defined readings and functions (if their data type is supported) may be selected. Depending on the operation type, it will be possible to select 1, 2 or 3 operands.

Data Display Format (Decimal Precision) (only for Float or Long/Short Integer Formats)
Number of characters to view after the decimal point:
- Automatic: Maximum displayable decimal precision.
- Max 1 Figure: 1 character after the decimal point.
- Max 2 Figures: 2 characters after the decimal point.
- Max 3 Figures: 3 characters after the decimal point

Measure Unit (only for Float, Long and Short formats)
Enter units of measure. Select letter by letter.

Data Offset (only for Float, Long and Short formats)
One of the two parameters (with Scale Factor) that define 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:

\[ \text{Scaled Quantity} = \text{Scale Factor} \times \text{Derived not scaled Quantity} + \text{Data Offset} \]

Scale Factor (only for Float, Long and Short formats)
One of the two parameters (with Data Offset) that define 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:

\[ \text{Scaled Quantity} = \text{Scale Factor} \times \text{Derived not scaled Quantity} + \text{Data Offset} \]

Alarm Threshold (only for Float, Long and Short formats)
Enables the ability to define the alarm thresholds. User may define:
- High Threshold: High Alarm threshold. The value may both Long and Float.
- High Threshold Hysteresis: Hysteresis of the high threshold, through which the alarm reset is defined. The value may both Long and Float.
- Low Threshold: Low Alarm threshold. The value may both Long and Float.
- Low Threshold Hysteresis: Hysteresis of the low threshold, through which the alarm reset is defined. The value may both Long and Float.

Boolean Logic (only for Boolean format)
Interpretation of 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 n the display list may be chosen.

4.2.2 Writings Menu
Provides the ability to define some continuous or trigger writings on the quantities of an I/O module connected through the Master RS485 port. Allows:
1) Insert a new write.
2) Delete a previously defined write.
3) Modify a previously defined write.

Writings Menu Selections
The following settings are possible for each write:

Select Data
Select the read or derived quantity which will be involved on the writing operation. This quantity may be used in 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.
PROGRAMMING MENU (continued)

4.2.3 Writings Menu (continued)

Select Data (continued)
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 end action). In this last case it will be possible to write a constant, a bit or the quantity selected at the beginning in this field.

Slave Address
Address of the slave I/O module connected to the Master RS-485 and where the data will be written. Values from 1 to 247.

Register Addresses
Modbus address of the register to which data will be written. User the following addressing modality depending on the Modbus function used and on the data type written:

<table>
<thead>
<tr>
<th>ADDRESSES</th>
<th>DATA TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 10000</td>
<td>Boolean</td>
<td>05</td>
</tr>
<tr>
<td>40001 to 50000</td>
<td>Boolean</td>
<td>06 read-modify-write: write the single bit on the register without modifying the other ones</td>
</tr>
<tr>
<td>40001 to 50000</td>
<td>Float/Long Int/Short Int</td>
<td>06/16</td>
</tr>
</tbody>
</table>

Enable Trigger
This functionality may be activated only if a function with at least an active threshold has been set in Data Select. By selecting Yes, the trigger writing is enabled. The writing is executed only if the selected function is in alarm condition. If the trigger is disabled the continuous writing is performed.

Alarm Threshold
If the trigger has been enabled (writing on alarm) in Trigger Enable it is possible to decide the threshold which will be associated to the writing. It is not possible to enable the writing on both thresholds:
- High Threshold: Writing is enabled when the function is greater than the high threshold.
- Low Threshold: Writing is enabled when the function is below the low threshold.

Data to Write
If the trigger has been enabled this mode sets the data type which will be written. The following formats may be selected:
- Boolean 1 (0): In case of alarm condition a specified bit will be forced to the logical value 1. At the end of the alarm condition it is forced to the logical value 0.
- Boolean 0 (1): In case of alarm condition a specified bit will be forced to the logical value 0. At the end of the alarm condition it is forced to the logical value 1.
- Data Value: In case of alarm condition the selected (in Data Select field) function is written. In this case it is necessary to set the output format (see Output Format field). If the output format is long or float, it is also necessary to specify the writing data order (MSW first or LSW first). Once the alarm condition no longer exists the function writing stops.

Output Format
If the trigger has not been enabled in Enable Trigger of if Data Value has been selected in Data to Write) The data type to write is set. The following formats are selectable:
- Float: 32-bit floating point format.
- Long Integer: 32-bit integer format.
- Short Integer: 16-bit integer format.
When Float or Long Integer formats are selected it is necessary to set the Reading Order of the two words which compose the data:
- MSW first: The high word is transmitted first, then the low word.
- LSW first: The low word is transmitted first, then the high word.

Writing Selections (only if a boolean reading / function has been selected in Data Select or if Boolean 1 (0) / Boolean 0 (1) has been set in Data to Write)
If we want to write a boolean value it is necessary to specify the writing modes:
- Single Output: The value is written by using the function 05 (write single coil). Take the opportunity to set the register addresses in the Register Address (in this case addresses from 1 to 10000)
PROGRAMMING MENU (continued)

4.2.3 Writings Menu (continued)
-Read-Modify-Write: The bit value is written by using the function 06 (write single register) of 16-bit register writing. In this case only the specified bit is modified while the remaining bits of the word are not changed. Pay attention to take the opportunity to set the register address (in this case addresses from 40001 to 50000).

Bit Index
If the value to write is boolean and if the Read-Modify-Write writing mode has been selected, the index of the bit to write within the 16-bit word is selected. Value may be from 0 to 15.

4.2.4 Setup Menu
The system general parameters and the communication ports parameters:
1) Language
2) Number of data displayed on the same screen
3) Display contrast
4) Modbus Master port parameters
5) Modbus Slave port parameters

Language
English, Italian and French are available.

Data View
Choose how many data rows to display on the same screen: 3, 2 or 1 row.

Contrast
Display contrast: values from 1 to 15.

SYSTEM PARAMETERS
Communication parameters of the two RS-485 ports.

Master Module
Reception Timeout: it represents the reception time-out of the master module: maximum time in which the master waits for an answer for the connected slave modules before declaring the operation failed. Values from 10 mS to 2.55 s (default = 100 ms).

Parity: Type of parity control of the port: absent, even or odd (default = absent).

Tx/Rx Baud Rate: Port communication speed. Values: 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200 (Default - 9600).

Delay between pools: Delay time that the master waits before sending the request to a connected slave. Values from 10 ms to 2.55 s (default = 10 ms)

Slave Module
Device Address: Address assigned to the instrument when it is used as a Modbus slave. Values from 1 to 255 (default = 1).

Parity: Type of parity control of the port: absent, even or odd (default = absent).

Tx/Rx Baud Rate: Port communication speed. Values: 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200 (Default - 9600).

Answer Delay: The number of pauses, of 6 characters each, to be entered between the end of the Rx message and the start of the Tx. Values from 0 to 20 (default = 0)

5. FUNCTIONING IN VIEW MODE
In view mode the indicator displays the values of the quantities defined on the display list. One, two or three lines of data may appear on the screen. In View Mode the UP and DOWN buttons scroll through the display list on the screen.

6. ERRORS
The errors are directly viewed on the display. The possible Errors and their meaning are listed below. They flash instead of the usual steady display of an appropriate numerical value. If no data has been inserted on the Display List, the LIST EMPTY message is displayed.

6.1 Reading Error Signals
NO ANSWER: the I/O module connected through the master RS485 port does not answer.
Z-NET™ S401
Modbus RTU Indicator with OLED Display

ERRORS (continued)

6.2 Functions Error Signals (continued)
SLAVE ERROR: an error message has been received from the connected I/O module.
RX ERROR: value not available due to an error on the answer of the connected I/O module.
SINGLE ERROR: presence of a generic error (of any nature).
BAD INPUT: the value of one or more operands is not available.
DIVISION_BY_ZERO: the operation involves a division by a null quantity.

6.3 Alarm Signals
TOO HIGH: the function value is greater than the high threshold.
TOO LOW: the function value is smaller than the low threshold.

7. MODBUS REGISTERS ACCESSIBLE THROUGH THE SLAVE RS485 PORT
The read and derived quantities are available within blocks of 16-bit registers and are accessible by the slave RS485 serial communication. In the below tables the notation Bit [x:y] indicates all bits from x to y. For example Bit [2:1] indicates bit 2 and bit 1, and serves to illustrate the meaning of the various united combinations of the values of the two bits. The 16-bit Holding Registers have the following structure:

Most Significant bit

<table>
<thead>
<tr>
<th>Bit Index</th>
<th>Bit [x:y]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15:0</td>
</tr>
</tbody>
</table>

7.4 Memory Mapping of Read and Derived Data
Basic module registers and the position in the memory of the registers corresponding to each read and derived quantity. All the listed registers are Read Only. The values are represented in floating point (32 bits, 2 Modbus registers). Only one floating point value can be read at a time.

### Supported MODBUS COMMANDS

<table>
<thead>
<tr>
<th>Code</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>Read Holding Registers</td>
<td>Read up to 16 word registers</td>
</tr>
<tr>
<td>04</td>
<td>Read Input Registers</td>
<td>Read up to 16 word registers</td>
</tr>
</tbody>
</table>

### Register Description

<table>
<thead>
<tr>
<th>Register Description</th>
<th>ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MACHINE ID</td>
<td>40001</td>
</tr>
<tr>
<td>(Bit [15:8]: contain the module’s ID: 37 (hexadecimal: 0x17))</td>
<td></td>
</tr>
<tr>
<td>(Bit [7:0]: contain the firmware’s revision)</td>
<td></td>
</tr>
</tbody>
</table>

### READ DATA

<table>
<thead>
<tr>
<th>Register</th>
<th>ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA_MSW_READING1</td>
<td>40801</td>
</tr>
<tr>
<td>DATA_LSW_READING1</td>
<td>40802</td>
</tr>
<tr>
<td>DATA_MSW_READING2</td>
<td>40803</td>
</tr>
<tr>
<td>DATA_LSW_READING2</td>
<td>40804</td>
</tr>
<tr>
<td>DATA_MSW_READING3</td>
<td>40805</td>
</tr>
<tr>
<td>DATA_LSW_READING3</td>
<td>40806</td>
</tr>
<tr>
<td>DATA_MSW_READING4</td>
<td>40807</td>
</tr>
<tr>
<td>DATA_LSW_READING4</td>
<td>40808</td>
</tr>
<tr>
<td>DATA_MSW_READING5</td>
<td>40809</td>
</tr>
<tr>
<td>DATA_LSW_READING5</td>
<td>40810</td>
</tr>
<tr>
<td>DATA_MSW_READING6</td>
<td>40811</td>
</tr>
<tr>
<td>DATA_LSW_READING6</td>
<td>40812</td>
</tr>
<tr>
<td>DATA_MSW_READING7</td>
<td>40813</td>
</tr>
<tr>
<td>DATA_LSW_READING7</td>
<td>40814</td>
</tr>
<tr>
<td>DATA_MSW_READING8</td>
<td>40815</td>
</tr>
<tr>
<td>DATA_LSW_READING8</td>
<td>40816</td>
</tr>
<tr>
<td>DATA_MSW_READING9</td>
<td>40817</td>
</tr>
<tr>
<td>DATA_LSW_READING9</td>
<td>40818</td>
</tr>
<tr>
<td>DATA_MSW_READING10</td>
<td>40819</td>
</tr>
<tr>
<td>DATA_LSW_READING10</td>
<td>40820</td>
</tr>
</tbody>
</table>

### DERIVED DATA

<table>
<thead>
<tr>
<th>Register</th>
<th>ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA_MSW_FUNCTION1</td>
<td>40901</td>
</tr>
<tr>
<td>DATA_LSW_FUNCTION1</td>
<td>40902</td>
</tr>
<tr>
<td>DATA_MSW_FUNCTION2</td>
<td>40903</td>
</tr>
<tr>
<td>DATA_LSW_FUNCTION2</td>
<td>40904</td>
</tr>
<tr>
<td>DATA_MSW_FUNCTION3</td>
<td>40905</td>
</tr>
<tr>
<td>DATA_LSW_FUNCTION3</td>
<td>40906</td>
</tr>
<tr>
<td>DATA_MSW_FUNCTION4</td>
<td>40907</td>
</tr>
<tr>
<td>DATA_LSW_FUNCTION4</td>
<td>40908</td>
</tr>
<tr>
<td>DATA_MSW_FUNCTION5</td>
<td>40909</td>
</tr>
<tr>
<td>DATA_LSW_FUNCTION5</td>
<td>40910</td>
</tr>
<tr>
<td>DATA_MSW_FUNCTION6</td>
<td>40911</td>
</tr>
<tr>
<td>DATA_LSW_FUNCTION6</td>
<td>40912</td>
</tr>
<tr>
<td>DATA_MSW_FUNCTION7</td>
<td>40913</td>
</tr>
<tr>
<td>DATA_LSW_FUNCTION7</td>
<td>40914</td>
</tr>
<tr>
<td>DATA_MSW_FUNCTION8</td>
<td>40915</td>
</tr>
<tr>
<td>DATA_LSW_FUNCTION8</td>
<td>40916</td>
</tr>
<tr>
<td>DATA_MSW_FUNCTION9</td>
<td>40917</td>
</tr>
<tr>
<td>DATA_LSW_FUNCTION9</td>
<td>40918</td>
</tr>
<tr>
<td>DATA_MSW_FUNCTION10</td>
<td>40919</td>
</tr>
<tr>
<td>DATA_LSW_FUNCTION10</td>
<td>40920</td>
</tr>
</tbody>
</table>

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