

1. SERIAL COMMUNICATION

1.1 COMMUNICATION INTERFACE

The optional serial interface RS485 allows to address up to 247 indicators in a network communicating remotely with a host computer or master controller.

RS485 Interface

- compatible line signals with RS485 standard
- 2 wire connexion from master to up to 31 slaves indicators in a multidrop bus. It is possible address 247 nodes with multiple outputs converters.
- Maximum communication distance: 1000 meters
- The RS485 signals are:
 - D: Bidirectional data line.
 - \bar{D} : Bidirectional inverted data line.
 - GND: Optional connexion which left communication better.

General Characteristics

- Optically isolated serial interface
- Programmable baud rate: 1200, 2400, 4800, 9600 or 19200bps.
- Data Bits: 8
- Parity: Nenhuma
- Stop Bits: 1

Communication Protocol

The MOSBUS RTU slave is implemented, available in more SCADA softwares in the market.

All configurable parameters can be accessed (readed or writed) through the Registers Table. Broadcast commands are supported as well (address 0).

The available Modbus commands are:

03 - Read Holding Register

05 - Force Single Coil (Force Digital Output state)

06 - Preset Single Register

The registers are arranged in a table in such a way that several registers can be read in the same request.

1.2 CONFIGURATION OF SERIAL COMMUNICATION PARAMETERS

Two parameters must be configured in the device for serial communication:

baud: Baud rate. All devices with same baud rate.

Address: Device communication address. Each device must have an exclusive address.

Holding Registers

Equivalent to the registers referência 4XXXX.

The holding registers are basically a list of the internal indicator parameters. All registers above address 12 can be written and readed. The registers up to this address in more are read only. Please verify each case. Each table parameter is a 16 bits two complement signed word.

Holding Registers	Parameter	Descrição do Registrador
0000	PV	Read: Process variable. Write: not allowed. Range: the minimum value is in <i>inLoL</i> seted and the maximum value is in <i>inHiL</i> seted and the decimal point position depends of <i>dPPoS</i> .
0001	PV min	Read: Minimum value of PV Write: not allowed.
0002	PV max	Read: Maximum value of PV Write: not allowed.
0003	-	Reserved
0004	Valor Tela	Read: Current display value. Write: Current display value. Range: -1999 to 9999. The range depends of the showed display.

0005	Display Number	Read: Current display Number. Write: not allowed. Range: 0000h to 060Ch Display number format: XYYh, when: XX→number of display cycle YY→number of display (see display fluxogram).
0006	Status Word 1	Read: Digital Inputs and Alarms (high part) and Hardware type (low part). Write: not allowed. Range: 0000h to FFFFh Value format: XYYh, when: XX: Hardware type 0→without optionals; 1→alarms 3 and 4 optionals; 2→digital input optional. YY: digital inputs and alarms states bit 0 - Alarme 1 state: 0→inactive; 1→active bit 1 - Alarme 2 state: 0→inactive; 1→active bit 2 - Alarme 3 state: 0→inactive; 1→active bit 3 - Alarme 4 state: 0→inactive; 1→active bit 4 - Digital Input: 0→inactive; 1→active bit 5 - reserved bit 6 - reserved bit 7 - reserved
0007	Software Version	Read: Software version. Write: not allowed. Readed values: If the version is V1.00, for example, will be read 100.
0008	ID	Read: Identification device Number. Write: not allowed. Readed values: 1 – N1100/N2000; 3 – N1500. Other values: special devices.
0009	Status Word 2	Read: Indicator status bits. Write: not allowed. Readed value: verify each bit: bit 0 – reserved bit 1 – reserved bit 2 – reserved bit 3 – reserved bit 4 – reserved bit 5 – Alarm 1 power-up inhibit (0-no; 1-yes) bit 6 – Alarm 2 power-up inhibit (0-no; 1- yes) bit 7 – Alarm 3 power-up inhibit (0-no; 1- yes) bit 8 – Alarm 4 power-up inhibit (0-no; 1- yes) bit 9 – Unit (0-°C; 1-°F) bit 10 – reserved bit 11 – Output 1 state bit 12 – Output 2 state bit 13 – Output 3 state bit 14 – Output 4 state bit 15 – Output 5 state
0010	Special Command	Special function command. Write: Value 0 – Tare reset; Value 5 – Hold and Peak-hold clean; Value 10 – Maximum and minimum clean.
0011	<i>dPPoS</i>	Decimal point position of PV. Range: 0 to 3 0→X.XXX; 1→XX.XX; 2→XXX.X; 3→XXXX
0012	<i>FFunc</i>	F key Function. Range: 0 to 5 0→oFF; 1→HoLd; 2→RL oFF; 3→rESEt; 4→PHoLd; 5→ tRRtE
0013	<i>dIGIn</i>	Digital Input Function. Range: 0 to 5 0→oFF; 1→HoLd; 2→RL oFF; 3→rESEt; 4→PHoLd; 5→ tRRtE
0014	<i>FILtR</i>	Input digital filter. Range: 0 to 20. Defalut value: 4
0015	<i>oFSEt</i>	Input Offset value. Range: from <i>inLoL</i> to <i>inHiL</i>
0016	<i>SCALE</i>	Indication Scale factor. Range: 0 to 1 0→scalex1; 1→scalex10
0017	<i>Sroot</i>	Input Square Root. Range: 0 to 1 0→no; 1→yes
0018	-	Reserved

0019	<i>ALREF</i>	Alarme Reference. Range: from <i>inLoL</i> to <i>inH iL</i>
0020	<i>outtY</i>	Retransmission type of PV. Range: 0 to 1 0→4 a 20mA retransmission; 1→0 a 20mA retransmission
0021	<i>SPRL 1</i> Or <i>dfAL 1</i>	Alarm 1 Preset. Range: the minimum value is in <i>inLoL</i> seted for not differential alarm or (<i>inLoL</i> - <i>inH iL</i>) for differential alarm; The maximum value is in <i>inH iL</i> seted for not differential alarm or (<i>inH iL</i> - <i>inLoL</i>) if differential alarm.
0022	<i>SPRL 2</i> Or <i>dfAL 2</i>	Alarm 2 Preset Range: same as <i>SPRL 1</i> or <i>dfAL 1</i> .
0023	<i>SPRL 3</i> Or <i>dfAL 3</i>	Alarme 3 Preset Range: same as <i>SPRL 1</i> or <i>dfAL 1</i> .
0024	<i>SPRL 4</i> or <i>dfAL 4</i>	Alarme 4 Preset Range: same as <i>SPRL 1</i> or <i>dfAL 1</i> .
0025	<i>FuRL 1</i>	Alarm 1 Function. Range: 0 to 6 0→oFF; 1→iErr; 2→Lo; 3→H I; 4→d iFL; 5→d iFH; 6→d iF.
0026	<i>FuRL 2</i>	Alarm 2 Function Range: same as <i>FuRL 1</i> .
0027	<i>FuRL 3</i>	Alarm 3 Function Range: same as <i>FuRL 1</i> .
0028	<i>FuRL 4</i>	Alarm 4 Function Range: same as <i>FuRL 1</i> .
0029	<i>bLRL 1</i>	Alarm 1 power-up inhibit. Range: 0 a 1 0→não; 1→sim.
0030	<i>bLRL 2</i>	Alarm 2 power-up inhibit Range: same as <i>bLRL 1</i> .
0031	<i>bLRL 3</i>	Alarm 3 power-up inhibit Range: same as <i>bLRL 1</i> .
0032	<i>bLRL 4</i>	Alarm 4 power-up inhibit Range: same as <i>bLRL 1</i> .
0033	<i>HYRL 1</i>	Alarm 1 Hysteresis (engineering unit) Range: 0 to span do sensor
0034	<i>HYRL 2</i>	Alarm 2 Hysteresis (engineering unit) Range: same as <i>HYRL 1</i> .
0035	<i>HYRL 3</i>	Alarm 3 Hysteresis (engineering unit) Range: same as <i>HYRL 1</i> .
0036	<i>HYRL 4</i>	Alarm 4 Hysteresis (engineering unit) Range: same as <i>HYRL 1</i> .
0037	<i>intYP</i>	Input sensor type Range: 0 to 22. 0→tc J; 1→tc K; 2→tc T; 3→tc E; 4→tc N; 5→tc R; 6 →tc S; 7→tc B; 8→Pt100(degree decimal); 9→ Pt100(degree unit); 10→Lin J; 11→Lin K; 12→Lin T; 13→ Lin E; 14→Lin N; 15→Lin R; 16→Lin S; 17→Lin B; 18→ Lin Pt100 degree decimal; 19→Lin Pt100; 20→0- 50mV; 21→4-20mA; 22→0-5V
0038	<i>un iL</i>	Temperature Unit. Range: 0 to 1 0→°C; 1→°F.
0039	<i>inLoL</i>	Indication Low limit. Range: the minimum value depends of input type configured in <i>intYP</i> and the maximum is in <i>inH iL</i> seted.
0040	<i>inH iL</i>	Indication High limit. Range: from <i>inLoL</i> to the input maximum configured in <i>intYP</i> .
0041	<i>AdrES</i>	Slave address Range: 1 to 247
0042	<i>bAud</i>	Communication Baud Rate. Range: 0 to 4 0→1200;1→2400;2→4800;3→9600; 4→19200
0043	Serial Number High	Serial Number (High Display) Range: 0 to 9999. Read only
0044	Serial Number Low	Serial Numbe (Low Display) Range: 0 to 9999. Read only
0045	Key	Remote action of pressed key. Range: 0 to 9 1→; 2→; 4→; 8→; 9→ and .
0046	<i>RL t 1</i>	Alarm 1 Time 1 of timer. Range: 0 to 6500sec See operation manual for details.

0047	<i>RL t 2</i>	Alarm 1 Time 2 of timer (in seconds) Range: same as <i>RL t 1</i> .
0048	<i>RL 2 t 1</i>	Alarm 2 Time 1 of timer (in seconds) Range: same as <i>RL t 1</i> .
0049	<i>RL 2 t 2</i>	Alarm 2 Time 2 of timer (in seconds) Range: same as <i>RL t 1</i> .
0050	<i>RL 3 t 1</i>	Alarm 3 Time 1 of timer (in seconds) Range: same as <i>RL t 1</i> .
0051	<i>RL 3 t 2</i>	Alarm 3 Time 2 of timer (in seconds) Range: same as <i>RL t 1</i> .
0052	<i>RL 4 t 1</i>	Alarm 4 Time 1 of timer (in seconds) Range: same as <i>RL t 1</i> .
0053	<i>RL 4 t 2</i>	Alarm 4 Time 2 of timer (in seconds) Range: same as <i>RL t 1</i> .
	-	Reserved
	-	Reserved.
	-	Reserved.
	-	Reserved.
	-	Reserved.
	-	Reserved.
	-	Reserved.
0061	<i>inP 0 1</i>	Custom linearization first value.
0062	<i>inP 0 2</i>	Custom linearization point #02
0063	<i>inP 0 3</i>	Custom linearization point #03
0064	<i>inP 0 4</i>	Custom linearization point #04
0065	<i>inP 0 5</i>	Custom linearization point #05
0066	<i>inP 0 6</i>	Custom linearization point #06
0067	<i>inP 0 7</i>	Custom linearization point #07
0068	<i>inP 0 8</i>	Custom linearization point #08
0069	<i>inP 0 9</i>	Custom linearization point #09
0070	<i>inP. 10</i>	Custom linearization point #10
0071	<i>inP. 11</i>	Custom linearization point #11
0072	<i>inP. 12</i>	Custom linearization point #12
0073	<i>inP. 13</i>	Custom linearization point #13
0074	<i>inP. 14</i>	Custom linearization point #14
0075	<i>inP. 15</i>	Custom linearization point #15
0076	<i>inP. 16</i>	Custom linearization point #16
0077	<i>inP. 17</i>	Custom linearization point #17
0078	<i>inP. 18</i>	Custom linearization point #18
0079	<i>inP. 19</i>	Custom linearization point #19
0080	<i>inP. 20</i>	Custom linearization point #20
0081	<i>out. 0 1</i>	Value to be displayed in point #01 of custom linearization (in engineering units)
0082	<i>out. 0 2</i>	Value to be displayed in point #02 of custom linearization
0083	<i>out. 0 3</i>	Value to be displayed in point #03 of custom linearization
0084	<i>out. 0 4</i>	Value to be displayed in point #04 of custom linearization
0085	<i>out. 0 5</i>	Value to be displayed in point #05 of custom linearization
0086	<i>out. 0 6</i>	Value to be displayed in point #06 of custom linearization
0087	<i>out. 0 7</i>	Value to be displayed in point #07 of custom linearization
0088	<i>out. 0 8</i>	Value to be displayed in point #08 of custom linearization
0089	<i>out. 0 9</i>	Value to be displayed in point #09 of custom linearization
0090	<i>out. 1 0</i>	Value to be displayed in point #10 of custom linearization
0091	<i>out. 1 1</i>	Value to be displayed in point #11 of custom linearization
0092	<i>out. 1 2</i>	Value to be displayed in point #12 of custom linearization
0093	<i>out. 1 3</i>	Value to be displayed in point #13 of custom linearization
0094	<i>out. 1 4</i>	Value to be displayed in point #14 of custom linearization
0095	<i>out. 1 5</i>	Value to be displayed in point #15 of custom linearization
0096	<i>out. 1 6</i>	Value to be displayed in point #16 of custom linearization
0097	<i>out. 1 7</i>	Value to be displayed in point #17 of custom linearization
0098	<i>out. 1 8</i>	Value to be displayed in point #18 of custom linearization
0099	<i>out. 1 9</i>	Value to be displayed in point #19 of custom linearization
0100	<i>out. 2 0</i>	Value to be displayed in point #20 of custom linearization

Digital Output States

Equivalent to *Coil Status* (reference 0XXXX). The digital output states are basically the Boolean status of the respective digital outputs. The Read allows the actual

state of digital outputs, regardless of their function.

Writing to an output bit is only possible if the output has no function assigned to it (the output is configured to "OFF" in alarm cycle).

Coil Status	Output Description
1	Alarm 1 Output status
2	Alarm 2 Output status
3	Alarm 3 Output status
4	Alarm 4 Output status

Exceptions - Error conditions

The Modbus RTU protocol checks the CRC in the data blocks received.

Reception errors are detected by the CRC, causing the indicator to discard the packet, not sending any reply to the master. After receiving an error-free packet, the indicator processes the packet and verifies whether the request is valid or not, sending back an exception error code in case of an invalid request.

If a write command sends a out-of-range value to a parameter, the indicator clamp the value to the parameter range limits, replying with a value which reflects these limits (maximum or minimum value allowed for the parameter).

Broadcast read commands are ignored by the indicator; only broadcast write commands are processed.

Error Code	Error Description
81h	Invalid command
82h	Invalid register number or out of range
83h	Invalid register quantity or out of range

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