We Measure, We Control, We Record

N1500 / N1500LC / N1500G INDICATOR
COMMUNICATION MANUAL V2.3x D

1. COMMUNICATION INTERFACE

The optional serial interface RS485 allows addressing 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 connection between the master and up to 31 slave indicators in bus topology. You can reach up to 247 knots by using multiple output converters.
- Maximum communication distance: 1000 meters.
- The RS485 signals are:

  D1= D: Bidirectional data line;

  D0 = $\overline{D}$: Bidirectional inverted data line;

  C = GND: Optional link that improves communication performance.

GENERAL CHARACTERISTICS

- Optically isolated serial interface.
- Programmable Baud Rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200 bps.
- Data Bits: 8.
- Parity: None or even.
- Stop Bits: 1.

COMMUNICATION PROTOCOL

The Mosbus RTU slave protocol is supported, available in most SCADA software on the market.

All configurable parameters can be accessed (for reading or writing) through the Registers Table. In Broadcast mode, it is also allowed to write to the Registers, using the address 0.

The available Modbus commands are:

The MOSBUS RTU slave is implemented, available in more SCADA software's 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.

2. CONFIGURATION OF SERIAL COMMUNICATION PARAMETERS

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

bAud: Baud Rate. All devices have the same Baud Rate.

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

HOLDING REGISTERS

Equivalent to Holding Registers (reference 4XXXX).

The Holding Registers are the internal indicator parameters. From address 12, all registers can be written and read. Up to this address, most registers are read-only. It is necessary to check each case.

HOLDING REGISTERS	PARAMETER	REGISTER DESCRIPTION
0000	PV	Read: Process variable. Write: Not allowed. Range: The minimum value is the value set in **InLoL**. The maximum value is the configured value in **InH IL**. The decimal point position depends on the **dPPoS** screen.
0001	PV min	Read: Minimum value of PV. Write: Not allowed.
0002	PV max	Read: Maximum value of PV. Write: Not allowed.
0003	PV	Read: Process variable. Write: Not allowed. Maximum range: 0 a 120000.
0004	Display Value	Read: Current display value. Write: Not allowed. Maximum range: -31000 a 31000. The range depends of the showed display.
0005	Display Number	Read: Current display number. Write: Not allowed.
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: XXYYh, when: XX: Hardware type. bit 0 – Alarm 1; bit 1 – Alarm 2; bit 2 – Alarm 3; bit 3 – Alarm 4; bit 4 – Analog output; bit 5 – RS 485; bit 6 – Reserved; bit 7 – Reserved. YY: Digital inputs and alarms states. bit 0 – Alarm 1 state: 0 → Inactive; 1 → Active; bit 1 – Alarm 2 state: 0 → Inactive; 1 → Active; bit 2 – Alarm 3 state: 0 → Inactive; 1 → Active; bit 3 – Alarm 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. Read values: If the equipment version is V1.00, for example, the value read is 100.
0008	ID	Read: Identification device number. Write: Not allowed. Read values: 3 – N1500. Other values: Special devices.
0009	Status Word 2	Read: Indicator status bits. Write: Not allowed. Read value: Verify each bit: bit 0 – Sensor error; bit 1 – Cable error; bit 2 – Underflow; bit 3 – Overflow; 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; Value **15** → Tare.
0011	dPPoS	Decimal point position of PV. Range: 0 to 5. 0 → XXXXX; 1 → XXXXX.X; 2 → XXXX.XX; 3 → XXX.XXX; 4 → XX.XXXX; 5 → X.XXXXX.
0012	FFunc	F key Function. Standard Model : 0 → oFF; 1 → HoLd; 2 → rESEt; 3 → PHoLd. LC Model: 0 → oFF; 1 → HoLd; 2 → rESEt; 3 → PHoLd; 4 → H I; 5 → Lo; 6 → 2Ero.
0013	d IG. In	Digital Input Function. Standard Model : 0 → oFF; 1 → HoLd; 2 → rESEt; 3 → PHoLd. LC Model: 0 → oFF; 1 → HoLd; 2 → rESEt; 3 → PHoLd; 4 → H I; 5 → Lo; 6 → tArE.
0014	F ILtr	Input digital filter. Range: 0 to 60.
0015	oFSEt	Input Offset value. Range: From InLoL to InH IL.
0016	SCALE	SCALE parameter condition. 0 → Configurable indication from – 31000 to + 31000. 1 → Configurable indication from 0 to + 60000. 2 → Configurable indication from 0 to +120000.
0017	Sroot	Input Square Root. Range: 0 to 1. 0 → No; 1 → Yes.
0018	outEr	4-20mA analog output on error condition. 0 → Down; 1 → Up.
0019	ALrEF	Alarm Reference.

		Range: From InLoL to InH IL.
0020	outtY	Retransmission type of PV. Range: 0 to 1. 0 → 4 a 20mA retransmission; 1 → 0 a 20mA retransmission .
0021	SPAL 1	Alarm 1 Preset. The minimum value is InLoL set for not differential alarm or (InLoL - InH IL) for differential alarm. The maximum value is in InH IL set for not differential alarm or (InH IL - InLoL) if differential alarm.
0022	SPAL2	Alarm 2 Preset. Range: Same as SPAL 1 or dFAL 1.
0023	SPAL3	Alarm 3 Preset. Range: Same as SPAL 1 or dFAL 1.
0024	SPAL4	Alarm 4 Preset. Range: Same as SPAL 1 or dFAL 1.
0025	FuAL 1	Alarm 1 Function. Range: 0 to 7. 0 → oFF; 1 → IErr; 2 → Lo; 3 → H I; 4 → d IF.Lo; 5 → d IF.H I; 6 → d IF.oU 7 → d IF. In
0026	FuAL2	Alarm 2 Function. Range: Same as FuAL 1.
0027	FuAL3	Alarm 3 Function. Range: Same as FuAL 1.
0028	FuAL4	Alarm 4 Function. Range: Same as FuAL 1.
0029	bLAL 1	Alarm 1 power-up inhibit. Range: 0 a 1. 0 → No; 1 → Yes.
0030	bLAL2	Alarm 2 power-up inhibit. Range: Same as bLAL 1.
0031	bLAL3	Alarm 3 power-up inhibit. Range: Same as bLAL 1.
0032	bLAL4	Alarm 4 power-up inhibit. Range: Same as bLAL 1.
0033	HYAL 1	Alarm 1 Hysteresis (engineering unit). Range: 1 to span do sensor.
0034	HYAL2	Alarm 2 Hysteresis (engineering unit). Range: Same as HYAL 1.
0035	HYAL3	Alarm 3 Hysteresis (engineering unit). Range: Same as HYAL 1.
0036	HYAL4	Alarm 4 Hysteresis (engineering unit). Range: Same as HYAL 1.
0037	InTYP	Input sensor type Input list for the standard model. Range: 0 to 27. 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; 9 → 0 to 50mV; 10 → 0 to 5V; 11 → 0 to 10V; 12 → 0 to 50mV (custom linearization); 13 → 0 to 5V (custom linearization); 14 → 0 to 10V (custom linearization); 15 → Lin J; 16 → Lin K; 17 → Lin T; 18 → Lin E; 19 → Lin N; 20 → Lin R; 21 → Lin S; 22 → Lin B; 23 → Lin Pt100; 24 → 0 to 20mA; 25 → 4 to 20mV; 26 → 0 to 20mA (custom linearization); 27 → 4 to 20mV (custom linearization); LC - Load Cell model (types 0 to 9): 0 → 0 to 20mV; 1 → -20 to 20mV; 2 → 0 to 50mV; 3 → 0 to 20mV (custom linearization); 4 → -20 to 20mV (custom linearization); 5 → 0 to 50mV (custom linearization); 6 → 0 to 20mA; 7 → 4 to 20mV; 8 → 0 to 20mA (custom linearization); 9 → 4 to 20mV (custom linearization);
0038	un It	Temperature Unit. Range: 0 to 1. 0 → °C; 1 → °F. Not available on LC model.
0039	InLoL	Indication Low limit. Range: The minimum value depends of input type configured in **InLYP** and the maximum is in **InH IL** configured.
0040	InH IL	Indication High limit. Range: From **InLoL** to the input maximum configured in **InLYP**.
0041	AdrES	Slave address. Range: 1 to 247.
0042	bAud	Communication Baud Rate. Range: 0 to 7. 0 → 1200; 1 → 2400; 2 → 4800; 3 → 9600; 4 → 19200; 5 → 38400; 6 → 57600; 7 → 115200; 8 a 15 repeat baud rates from 1200 to 115200, but with invert polarity.
0043	Serial Number High	Serial Number (High Display). Range: 0 to 9999. Read only.
0044	Serial Number Low	Serial Number (Low Display). Range: 0 to 9999. Read only.
0045	-	Reserved.
0046	AL It 1	Alarm 1 Time 1 of timer. Range: 0 to 6500 sec. See operation manual for details.
0047	AL It2	Alarm 1 Time 2 of timer (in seconds). Range: Same as **AL It 1**.
0048	AL2t 1	Alarm 2 Time 1 of timer (in seconds). Range: Same as **AL It 1**.
0049	AL2t2	Alarm 2 Time 2 of timer (in seconds). Range: Same as **AL It 1**.
0050	AL3t 1	Alarm 3 Time 1 of timer (in seconds). Range: Same as **AL It 1**.
0051	AL3t2	Alarm 3 Time 2 of timer (in seconds). Range: Same as **AL It 1**.
0052	AL4t 1	Alarm 4 Time 1 of timer (in seconds). Range: Same as **AL It 1**.
0053	AL4t2	Alarm 4 Time 2 of timer (in seconds). Range: Same as **AL It 1**.
0054	oULoL	**Low Limit for Analog Retransmission** – Defines the PV value that results in a 4mA (or 0mA) analog output current.
0055	oUH IL	**High Limit for Analog Retransmission** – Defines the PV value that results in a 20mA analog output current.
	-	Reserved
	-	Reserved.
	-	Reserved.
	-	Reserved.
	-	Reserved.
	-	Reserved.
0061 to 0090	InP.0 1 to InP.30	Custom linearization value.
0091 to 0120	out.0 1 to out.30	Value to be displayed in point of custom linearization

Table 01 – Registers table

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.

Table 02 – Digital output states

3. EXCEPTION RESPONSES – ERROR CONDITIONS

The MODBUS RTU protocol checks the CRC in the data blocks received. If there is a CRC error at reception, no response will be sent to the master. For commands received without error a consistency of command and requested registers is made. If invalid, an exception response is sent with the corresponding error code. In exception responses, the field corresponding to the Modbus command in the response is summed as 80H.

If a write command sends a value outside the allowed range, the maximum value allowed for this parameter is forced, returning that value as a response.

Broadcast READ commands are ignored by the indicator and there is no response. It is only possible to WRITE in broadcast mode.

ERROR CODE	ERROR DESCRIPTION
01	Invalid Command or non-existent
02	Invalid Register Number or out of range
03	Invalid Register Quantity or out of range

Table 03 – Error codes