

# N1100 / N2000 / N3000

## Communication Protocol – V2.0x A

### 1. SERIAL COMMUNICATION

#### 1.1 COMMUNICATION INTERFACE

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

##### RS485 Interface

- Compatible line signals with RS485 standard
- 2 wire connection 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:
  - D1 = D: Bidirectional data line.
  - D0 =  $\bar{D}$ : Bidirectional inverted data line.
  - C = GND: Optional connection which left communication better.

##### General Characteristics

- Optically isolated serial interface
- Programmable baud rate: 1200, 2400, 4800, 9600 or 19200bps.
- Data Bits: 8
- Parity: None
- Stop Bits: 1

##### Communication Protocol

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

All configurable parameters can be accessed (for reading or writing) 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.

**Addr:** Device communication address. Each device must have an exclusive address.

#### 1.3 REGISTERS TABLE

Equivalent to the registers referenced as 4XXXX.

The holding registers are basically a list of the internal indicator parameters. All registers above address 12 can be read or written. 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	Register Description
0000	Active SV	Read: Active control SV (main SV, from ramp and soak or from remote SV). Write: to main SV Range: from <b>SPLL</b> to <b>SPHL</b> .
0001	PV	Read: Process Variable Write: not allowed. Range: From <b>SPLL</b> to <b>SPHL</b> . The <b>dPPO</b> prompt gives the decimal point position.
0002	MV	Read: Output Power in automatic or manual mode. Write: not allowed. See address 29. Range: 0 to 1000 (0.0 to 100.0%).
0003	-	Reserved.
0004	Display value	Read: Current value shown on display. Write: Current value shown on display. Range: -1999 to 9999. The range depends on the displayed parameter.
0005	Prompt index	Read: Current prompt position in the parameters flowchart. Write: not allowed. Range: 0000h to 060Ch Prompt number format: XXYYh, where: XX→menu cycle number (see operation manual) YY→prompt number (index).
0006	Status Word 1	Read: Status bits. See table 2 Write: not allowed.

0007	Software Version	Read: The firmware version of controller. If V1.00, the read value will be 100. Write: not allowed.
0008	ID	Read: controller identification number. Write: not allowed. Values: 1 – N1100; 2 - N2000; 3 - N1500. Other values: special instruments.
0009	Status Word 2	Read: Status bits. See table 2. Write: not allowed.
0010	Status Word 3	Read: Status bits. See table 2. Write: not allowed.
0011	<b>Ir</b>	Integral Rate (in repetitions/min) Range: 0 to 3000 (0.00 to 30.00)
0012	<b>dt</b>	Derivative Time (in seconds). Range: 0 to 250
0013	<b>Pb</b>	Proportional Band (in percentage) Range: 0 to 5000 (0.0 to 500.0)
0014	-	Reserved.
0015	<b>ct</b>	Cycle Time (PWM, in seconds) Range: 5 to 1000 (0.5 to 100.0)
0016	-	Reserved.
0017	<b>HYS</b>	On/Off Control Hysteresis (in selected type engineering unit). Range: 0 to <b>SPHL</b> - <b>SPLL</b>
0018	-	Reserved.
0019	<b>ouLL</b>	Output Low Limit (minimum output power) Range: 0 to 1000 (0.0 to 100.0%).
0020	<b>ouHL</b>	Output High Limit (minimum output power) Range: 0 to 1000 (0.0 to 100.0%).
0021	<b>AutoEn</b>	<b>N2000 only.</b> Auto/Man key Enable – $\frac{ON}{OFF}$ 1→ Key enabled 0 → Key disabled
0022	<b>FFunc</b>	<b>N2000 only.</b> F key function. 0 → Not used. 7 → Controller start/stop. 8 → Select remote SP. 9 → Ramp and soak hold. 10 → Enable ramp and soak profile 1.
0023	Serial number H	Serial Number High (Upper display). Range: 0 to 9999. Read only
0024	Serial number L	Serial Number Low (Lower display). Range: 0 to 9999. Read only
0025	SV	Control <i>Setpoint</i> (Prompt <i>Setpoint</i> ). Range: from <b>SPLL</b> to <b>SPHL</b> .
0026	<b>SPLL</b>	<i>Setpoint</i> Low limit. Range: minimum value depends on the input type selected in <b>TYPE</b> (see op. Manual) to <b>SPHL</b> .
0027	<b>SPHL</b>	<i>Setpoint</i> High limit. Range: minimum value is <b>SPLL</b> and maximum depends on the input type selected in <b>TYPE</b> (see op. Manual).
0028	Manual MV	Manual output power (in percentage) Range: 0 to 1000 (0.0 to 100.0%)
0029	<b>oFF5</b>	PV offset Range: from <b>SPLL</b> to <b>SPHL</b> .
0030	<b>dPPO</b>	PV decimal point position Range: 0 to 3 0→0.000; 1→00.00; 2→000.0; 3→0000
0031	<b>SPR1</b>	Alarm 1 Setpoint. Range: The minimum value is at <b>SPLL</b> for non-differential alarm or <b>SPLL</b> - <b>SPHL</b> for differential alarm The maximum value is at <b>SPHL</b> for non-differential alarm or at <b>SPHL</b> - <b>SPLL</b> for differential alarm.
0032	<b>SPR2</b>	Alarm 2 Setpoint. Range: same as in <b>SPR1</b> .
0033	<b>SPR3</b>	Alarm 3 Setpoint. Range: same as in <b>SPR1</b> .
0034	<b>SPR4</b>	Alarm 4 Setpoint. Range: same as in <b>SPR1</b> .
0035	<b>FUR1</b>	Alarm 1 Function. Range: 0 to 8 0→ <b>oFF</b> ; 1→ <b>IErr</b> ; 2→ <b>r5</b> ; 3→ <b>rFA I</b> ; 4→ <b>La</b> ; 5→ <b>H I</b> ; 6→ <b>d IFL</b> ; 7→ <b>d IFH</b> ; 8→ <b>d IF</b> .
0036	<b>FUR2</b>	Alarm 2 Function. Range: same as in <b>FUR1</b> .
0037	<b>FUR3</b>	Alarm 3 Function. Range: same as in <b>FUR1</b> .
0038	<b>FUR4</b>	Alarm 4 Function. Range: same as in <b>FUR1</b> .
0039	<b>HYR1</b>	Alarm 1 Hysteresis. Range: 0 to 9999 (0.00 to 99.99%)
0040	<b>HYR2</b>	Alarm 2 Hysteresis. Range: same as in <b>HYR1</b> .
0041	<b>HYR3</b>	Alarm 3 Hysteresis. Range: same as in <b>HYR1</b> .
0042	<b>HYR4</b>	Alarm 4 Hysteresis. Range: same as in <b>HYR1</b> .
0043	<b>TYPE</b>	PV input type Range: 0 to 18. See operation manual.
0044	<b>Addr</b>	Communication slave address Range: 1 to 247
0045	<b>bAud</b>	<i>Communication Baud-Rate</i> . Range: 0 to 4 0→1200;1→2400;2→4800;3→9600; 4→19200
0046	<b>Auto</b>	Control Mode. Range: 0→manual; 1→automatic.
0047	<b>run</b>	Enable control. Range: 0→no; 1→yes.

0048	<b>Act</b>	Control action. Range: 0→reverse; 1→direct.
0049	<b>Actun</b>	Auto tune enable. Range: 0→no; 1→yes.
0050	<b>blA1</b>	Alarm 1 power-up inhibit. Range: 0→no; 1→yes.
0051	<b>blA2</b>	Alarm 2 power-up inhibit Range: same as in <b>blA1</b> .
0052	<b>blA3</b>	Alarm 3 power-up inhibit Range: same as in <b>blA1</b> .
0053	<b>blA4</b>	Alarm 4 power-up inhibit Range: same as in <b>blA1</b> .
0054	Key	Key press remote action. Range: 0 to 9 1→[OK]; 2→[▲]; 4→[▼]; 8→[BACK]; 9→[BACK] e [OK].
0055	<b>rSLL</b>	Remote Setpoint Low limit Range: Minimum value depends on the input type selected in <b>TYPE</b> , and maximum value is in <b>rSHL</b> .
0056	<b>rSHL</b>	Remote Setpoint High limit Range: Minimum value is in <b>rSLL</b> , and maximum depends on the input type selected in <b>TYPE</b> .
0057	<b>Io 1</b>	IO 1 Function. Range: 0 to 5 Refer to operation manual for more details.
0058	<b>Io 2</b>	IO 2 Function. Range: 0 to 5 Refer to operation manual for more details.
0059	<b>Io 3</b>	IO 3 Function. Range: 0 to 10 Refer to operation manual for more details.
0060	<b>Io 4</b>	IO 4 Function. Range: 0 to 10 Refer to operation manual for more details.
0061	<b>Io 5</b>	IO 5 Function. Range: 0 to 16 Refer to operation manual for more details.
0062	<b>AlT1</b>	Alarm 1 Time 1. Range: 0 to 6500s Refer to operation manual for more details.
0063	<b>AlT2</b>	Alarm 1 Time 2 (in seconds) Range: same as in <b>AlT1</b> .
0064	<b>AlT1</b>	Alarm 2 Time 1 (in seconds) Range: same as in <b>AlT1</b> .
0065	<b>AlT2</b>	Alarm 2 Time 2 (in seconds) Range: same as in <b>AlT1</b> .
0066	<b>SFS</b>	Soft-Start time (in seconds) Range: 0 to 9999
0067	<b>unit</b>	Temperature unit. Range: 0 to 1 0→°C; 1→°F.
0068	<b>bIAS</b>	Bias. Range: -100 to +100%.
0069	<b>Io 6</b>	<b>N2000 only.</b> IO 6 Function. Allowed values: 0, 6, 7, 8, 9 and 10. Refer to operation manual for more details.
0070	R&S Segment	Ramp and Soak segment being executed (read only). Range: 0 to 4
0071	<b>Pr n</b>	Ramp and Soak segment to be viewed or edited. Range: 1 to 4
0072	<b>Pr n</b>	Ramp and Soak segment to be executed Range: 0 to 4
0073	<b>PE 1</b>	Segment 1 Event of R&S Program 1. Range: 0 to 15. See op. Manual.
0074	<b>PE 2</b>	Segment 2 Event of R&S Program 1. Range: same as in <b>PE 1</b> .
0075	<b>PE 3</b>	Segment 3 Event of R&S Program 1. Range: same as in <b>PE 1</b> .
0076	<b>PE 4</b>	Segment 4 Event of R&S Program 1. Range: same as in <b>PE 1</b> .
0077	<b>PE 5</b>	Segment 5 Event of R&S Program 1. Range: same as in <b>PE 1</b> .
0078	<b>PE 6</b>	Segment 6 Event of R&S Program 1. Range: same as in <b>PE 1</b> .
0079	<b>PE 7</b>	Segment 7 Event of R&S Program 1. Range: same as in <b>PE 1</b> .
0080	<b>PE 1</b>	Segment 1 Event of R&S Program 2. Range: 0 to 15. See op. Manual.
0081	<b>PE 2</b>	Segment 2 Event of R&S Program 2. Range: same as in <b>PE 1</b> .
0082	<b>PE 3</b>	Segment 3 Event of R&S Program 2. Range: same as in <b>PE 1</b> .
0083	<b>PE 4</b>	Segment 4 Event of R&S Program 2. Range: same as in <b>PE 1</b> .
0084	<b>PE 5</b>	Segment 5 Event of R&S Program 2. Range: same as in <b>PE 1</b> .
0085	<b>PE 6</b>	Segment 6 Event of R&S Program 2. Range: same as in <b>PE 1</b> .
0086	<b>PE 7</b>	Segment 7 Event of R&S Program 2. Range: same as in <b>PE 1</b> .
0087	<b>PE 1</b>	Segment 1 Event of R&S Program 3. Range: 0 to 15. See op. Manual.
0088	<b>PE 2</b>	Segment 2 Event of R&S Program 3. Range: same as in <b>PE 1</b> .
0089	<b>PE 3</b>	Segment 3 Event of R&S Program 3. Range: same as in <b>PE 1</b> .

0090	<b>PE 4</b>	Segment 4 Event of R&S Program 3. Range: same as in <b>PE 1</b> .
0091	<b>PE 5</b>	Segment 5 Event of R&S Program 3. Range: same as in <b>PE 1</b> .
0092	<b>PE 6</b>	Segment 6 Event of R&S Program 3. Range: same as in <b>PE 1</b> .
0093	<b>PE 7</b>	Segment 7 Event of R&S Program 3. Range: same as in <b>PE 1</b> .
0094	<b>PE 1</b>	Segment 1 Event of R&S Program 4. Range: 0 to 15. See op. Manual.
0095	<b>PE 2</b>	Segment 2 Event of R&S Program 4. Range: same as in <b>PE 1</b> .
0096	<b>PE 3</b>	Segment 3 Event of R&S Program 4. Range: same as in <b>PE 1</b> .
0097	<b>PE 4</b>	Segment 4 Event of R&S Program 4. Range: same as in <b>PE 1</b> .
0098	<b>PE 5</b>	Segment 5 Event of R&S Program 4. Range: same as in <b>PE 1</b> .
0099	<b>PE 6</b>	Segment 6 Event of R&S Program 4. Range: same as in <b>PE 1</b> .
0100	<b>PE 7</b>	Segment 7 Event of R&S Program 4. Range: same as in <b>PE 1</b> .
0101	<b>PE 1</b>	Segment 1 Event of R&S Program 5. Range: 0 to 15. See op. Manual.
0102	<b>PE 2</b>	Segment 2 Event of R&S Program 5. Range: same as in <b>PE 1</b> .
0103	<b>PE 3</b>	Segment 3 Event of R&S Program 5. Range: same as in <b>PE 1</b> .
0104	<b>PE 4</b>	Segment 4 Event of R&S Program 5. Range: same as in <b>PE 1</b> .
0105	<b>PE 5</b>	Segment 5 Event of R&S Program 5. Range: same as in <b>PE 1</b> .
0106	<b>PE 6</b>	Segment 6 Event of R&S Program 5. Range: same as in <b>PE 1</b> .
0107	<b>PE 7</b>	Segment 7 Event of R&S Program 5. Range: same as in <b>PE 1</b> .
0108	<b>PE 1</b>	Segment 1 Event of R&S Program 6. Range: 0 to 15. See op. Manual.
0109	<b>PE 2</b>	Segment 2 Event of R&S Program 6. Range: same as in <b>PE 1</b> .
0110	<b>PE 3</b>	Segment 3 Event of R&S Program 6. Range: same as in <b>PE 1</b> .
0111	<b>PE 4</b>	Segment 4 Event of R&S Program 6. Range: same as in <b>PE 1</b> .
0112	<b>PE 5</b>	Segment 5 Event of R&S Program 6. Range: same as in <b>PE 1</b> .
0113	<b>PE 6</b>	Segment 6 Event of R&S Program 6. Range: same as in <b>PE 1</b> .
0114	<b>PE 7</b>	Segment 7 Event of R&S Program 6. Range: same as in <b>PE 1</b> .
0115	<b>PE 1</b>	Segment 1 Event of R&S Program 7. Range: 0 to 15. See op. Manual.
0116	<b>PE 2</b>	Segment 2 Event of R&S Program 7. Range: same as in <b>PE 1</b> .
0117	<b>PE 3</b>	Segment 3 Event of R&S Program 7. Range: same as in <b>PE 1</b> .
0118	<b>PE 4</b>	Segment 4 Event of R&S Program 7. Range: same as in <b>PE 1</b> .
0119	<b>PE 5</b>	Segment 5 Event of R&S Program 7. Range: same as in <b>PE 1</b> .
0120	<b>PE 6</b>	Segment 6 Event of R&S Program 7. Range: same as in <b>PE 1</b> .
0121	<b>PE 7</b>	Segment 7 Event of R&S Program 7. Range: same as in <b>PE 1</b> .
0122	<b>PEtol</b>	R&S Program 1 Tolerance Range: 0 to valor de ( <b>SPHL - SPLL</b> ).
0123	<b>LP</b>	Program 1 Link Range: 0 to 7
0124	<b>PE 1</b>	Time 1 of Program 1. Range: 0 to 9999 minutes.
0125	<b>PE 2</b>	Time 2 of Program 1. Range: 0 to 9999 minutes.
0126	<b>PE 3</b>	Time 3 of Program 1. Range: 0 to 9999 minutes.
0127	<b>PE 4</b>	Time 4 of Program 1. Range: 0 to 9999 minutes.
0128	<b>PE 5</b>	Time 5 of Program 1. Range: 0 to 9999 minutes.
0129	<b>PE 6</b>	Time 6 of Program 1. Range: 0 to 9999 minutes.
0130	<b>PE 7</b>	Time 7 of Program 1. Range: 0 to 9999 minutes.
0131	<b>PSPD</b>	Setpoint 0 of Program 1. Range: From <b>SPLL</b> to <b>SPHL</b> .

0132	<b>PSP1</b>	Setpoint 1 of Program 1 Range: same as in <b>PSP0</b> .
0133	<b>PSP2</b>	Setpoint 2 of Program 1 Range: same as in <b>PSP0</b> .
0134	<b>PSP3</b>	Setpoint 3 of Program 1 Range: same as in <b>PSP0</b> .
0135	<b>PSP4</b>	Setpoint 4 of Program 1 Range: same as in <b>PSP0</b> .
0136	<b>PSP5</b>	Setpoint 5 of Program 1 Range: same as in <b>PSP0</b> .
0137	<b>PSP6</b>	Setpoint 6 of Program 1 Range: same as in <b>PSP0</b> .
0138	<b>PSP7</b>	Setpoint 7 of Program 1 Range: same as in <b>PSP0</b> .
0139	<b>PtoL</b>	R&S Program 2 Tolerance Range: 0 to valor de ( <b>SPHL</b> - <b>SPLL</b> ).
0140	<b>LP</b>	Program 2 Link Range: 0 to 7
0141	<b>Pt1</b>	Time 1 of Program 2. Range: 0 to 9999 minutes.
0142	<b>Pt2</b>	Time 2 of Program 2. Range: 0 to 9999 minutes.
0143	<b>Pt3</b>	Time 3 of Program 2. Range: 0 to 9999 minutes.
0144	<b>Pt4</b>	Time 4 of Program 2. Range: 0 to 9999 minutes.
0145	<b>Pt5</b>	Time 5 of Program 2. Range: 0 to 9999 minutes.
0146	<b>Pt6</b>	Time 6 of Program 2. Range: 0 to 9999 minutes.
0147	<b>Pt7</b>	Time 7 of Program 2. Range: 0 to 9999 minutes.
0148	<b>PSP0</b>	Setpoint 0 of Program 2. Range: From <b>SPLL</b> to <b>SPHL</b> .
0149	<b>PSP1</b>	Setpoint 1 of Program 2 Range: same as in <b>PSP0</b> .
0150	<b>PSP2</b>	Setpoint 2 of Program 2 Range: same as in <b>PSP0</b> .
0151	<b>PSP3</b>	Setpoint 3 of Program 2 Range: same as in <b>PSP0</b> .
0152	<b>PSP4</b>	Setpoint 4 of Program 2 Range: same as in <b>PSP0</b> .
0153	<b>PSP5</b>	Setpoint 5 of Program 2 Range: same as in <b>PSP0</b> .
0154	<b>PSP6</b>	Setpoint 6 of Program 2 Range: same as in <b>PSP0</b> .
0155	<b>PSP7</b>	Setpoint 7 of Program 2 Range: same as in <b>PSP0</b> .
0156	<b>PtoL</b>	R&S Program 3 Tolerance Range: 0 to ( <b>SPHL</b> - <b>SPLL</b> ).
0157	<b>LP</b>	Program 3 Link Range: 0 to 7
0158	<b>Pt1</b>	Time 1 of Program 3. Range: 0 to 9999 minutes.
0159	<b>Pt2</b>	Time 2 of Program 3 Range: same as in <b>Pt1</b> .
0160	<b>Pt3</b>	Time 3 of Program 3 Range: same as in <b>Pt1</b> .
0161	<b>Pt4</b>	Time 4 of Program 3 Range: same as in <b>Pt1</b> .
0162	<b>Pt5</b>	Time 5 of Program 3 Range: same as in <b>Pt1</b> .
0163	<b>Pt6</b>	Time 6 of Program 3 Range: same as in <b>Pt1</b> .
0164	<b>Pt7</b>	Time 7 of Program 3 Range: same as in <b>Pt1</b> .
0165	<b>PSP0</b>	Setpoint 0 of Program 3. Range: from <b>SPLL</b> to <b>SPHL</b> .
0166	<b>PSP1</b>	Setpoint 1 of Program 3 Range: same as in <b>PSP0</b> .
0167	<b>PSP2</b>	Setpoint 2 of Program 3 Range: same as in <b>PSP0</b> .
0168	<b>PSP3</b>	Setpoint 3 of Program 3 Range: same as in <b>PSP0</b> .
0169	<b>PSP4</b>	Setpoint 4 of Program 3 Range: same as in <b>PSP0</b> .
0170	<b>PSP5</b>	Setpoint 5 of Program 3 Range: same as in <b>PSP0</b> .
0171	<b>PSP6</b>	Setpoint 6 of Program 3 Range: same as in <b>PSP0</b> .
0172	<b>PSP7</b>	Setpoint 7 of Program 3 Range: same as in <b>PSP0</b> .
0173	<b>PtoL</b>	R&S Program 4 Tolerance Range: 0 to ( <b>SPHL</b> - <b>SPLL</b> ).
0174	<b>LP</b>	Program 4 Link Range: 0 to 7
0175	<b>Pt1</b>	Time 1 of Program 4 Range: 0 to 9999 (in minutes)
0176	<b>Pt2</b>	Time 2 of Program 4 Range: same as in <b>Pt1</b> .
0177	<b>Pt3</b>	Time 3 of Program 4 Range: same as in <b>Pt1</b> .

0178	<b>Pt4</b>	Time 4 of Program 4 Range: same as in <b>Pt1</b> .
0179	<b>Pt5</b>	Time 5 of Program 4 Range: same as in <b>Pt1</b> .
0180	<b>Pt6</b>	Time 6 of Program 4 Range: same as in <b>Pt1</b> .
0181	<b>Pt7</b>	Time 7 of Program 4 Range: same as in <b>Pt1</b> .
0182	<b>PSP0</b>	Setpoint 0 of Program 4. Range: from <b>SPLL</b> to <b>SPHL</b> .
0183	<b>PSP1</b>	Setpoint 1 of Program 4 Range: same as in <b>PSP0</b> .
0184	<b>PSP2</b>	Setpoint 2 of Program 4 Range: same as in <b>PSP0</b> .
0185	<b>PSP3</b>	Setpoint 3 of Program 4 Range: same as in <b>PSP0</b> .
0186	<b>PSP4</b>	Setpoint 4 of Program 4 Range: same as in <b>PSP0</b> .
0187	<b>PSP5</b>	Setpoint 5 of Program 4 Range: same as in <b>PSP0</b> .
0188	<b>PSP6</b>	Setpoint 6 of Program 4 Range: same as in <b>PSP0</b> .
0189	<b>PSP7</b>	Setpoint 7 of Program 4 Range: same as in <b>PSP0</b> .
0190	<b>PtoL</b>	R&S Program 5 Tolerance Range: 0 to ( <b>SPHL</b> - <b>SPLL</b> ).
0191	<b>LP</b>	Program 5 Link Range: 0 to 7
0192	<b>Pt1</b>	Time 1 of Program 5 Range: 0 to 9999 (in minutes)
0193	<b>Pt2</b>	Time 2 of Program 5 Range: same as in <b>Pt1</b> .
0194	<b>Pt3</b>	Time 3 of Program 5 Range: same as in <b>Pt1</b> .
0195	<b>Pt4</b>	Time 4 of Program 5 Range: same as in <b>Pt1</b> .
0196	<b>Pt5</b>	Time 5 of Program 5 Range: same as in <b>Pt1</b> .
0197	<b>Pt6</b>	Time 6 of Program 5 Range: same as in <b>Pt1</b> .
0198	<b>Pt7</b>	Time 7 of Program 5 Range: same as in <b>Pt1</b> .
0199	<b>PSP0</b>	Setpoint 0 of Program 5. Range: from <b>SPLL</b> to <b>SPHL</b> .
0200	<b>PSP1</b>	Setpoint 1 of Program 5 Range: same as in <b>PSP0</b> .
0201	<b>PSP2</b>	Setpoint 2 of Program 5 Range: same as in <b>PSP0</b> .
0202	<b>PSP3</b>	Setpoint 3 of Program 5 Range: same as in <b>PSP0</b> .
0203	<b>PSP4</b>	Setpoint 4 of Program 5 Range: same as in <b>PSP0</b> .
0204	<b>PSP5</b>	Setpoint 5 of Program 5 Range: same as in <b>PSP0</b> .
0205	<b>PSP6</b>	Setpoint 6 of Program 5 Range: same as in <b>PSP0</b> .
0206	<b>PSP7</b>	Setpoint 7 of Program 5 Range: same as in <b>PSP0</b> .
0207	<b>PtoL</b>	R&S Program 6 Tolerance Range: 0 to ( <b>SPHL</b> - <b>SPLL</b> ).
0208	<b>LP</b>	Program 6 Link Range: 0 to 7
0209	<b>Pt1</b>	Time 1 of Program 6 Range: 0 to 9999 (in minutes)
0210	<b>Pt2</b>	Time 2 of Program 6 Range: same as in <b>Pt1</b> .
0211	<b>Pt3</b>	Time 3 of Program 6 Range: same as in <b>Pt1</b> .
0212	<b>Pt4</b>	Time 4 of Program 6 Range: same as in <b>Pt1</b> .
0213	<b>Pt5</b>	Time 5 of Program 6 Range: same as in <b>Pt1</b> .
0214	<b>Pt6</b>	Time 6 of Program 6 Range: same as in <b>Pt1</b> .
0215	<b>Pt7</b>	Time 7 of Program 6 Range: same as in <b>Pt1</b> .
0216	<b>PSP0</b>	Setpoint 0 of Program 6. Range: from <b>SPLL</b> to <b>SPHL</b> .
0217	<b>PSP1</b>	Setpoint 1 of Program 6 Range: same as in <b>PSP0</b> .
0218	<b>PSP2</b>	Setpoint 2 of Program 6 Range: same as in <b>PSP0</b> .

0219	<b>PSP3</b>	Setpoint 3 of Program 6 Range: same as in <b>PSP0</b> .
0220	<b>PSP4</b>	Setpoint 4 of Program 6 Range: same as in <b>PSP0</b> .
0221	<b>PSP5</b>	Setpoint 5 of Program 6 Range: same as in <b>PSP0</b> .
0222	<b>PSP6</b>	Setpoint 6 of Program 6 Range: same as in <b>PSP0</b> .
0223	<b>PSP7</b>	Setpoint 7 of Program 6 Range: same as in <b>PSP0</b> .
0224	<b>PtOL</b>	R&S Program 7 Tolerance Range: 0 to ( <b>SPHL</b> - <b>SPLL</b> ).
0225	<b>LP</b>	Program 7 Link Range: 0 to 7
0226	<b>Pt1</b>	Time 1 of Program 7 Range: 0 to 9999 (in minutes)
0227	<b>Pt2</b>	Time 2 of Program 7 Range: same as in <b>Pt1</b> .
0228	<b>Pt3</b>	Time 3 of Program 7 Range: same as in <b>Pt1</b> .
0229	<b>Pt4</b>	Time 4 of Program 7 Range: same as in <b>Pt1</b> .
0230	<b>Pt5</b>	Time 5 of Program 7 Range: same as in <b>Pt1</b> .
0231	<b>Pt6</b>	Time 6 of Program 7 Range: same as in <b>Pt1</b> .
0232	<b>Pt7</b>	Time 7 of Program 7 Range: same as in <b>Pt1</b> .
0233	<b>PSP0</b>	Setpoint 0 of Program 7. Range: from <b>SPLL</b> to <b>SPHL</b> .
0234	<b>PSP1</b>	Setpoint 1 of Program 7 Range: same as in <b>PSP0</b> .
0235	<b>PSP2</b>	Setpoint 2 of Program 7 Range: same as in <b>PSP0</b> .
0236	<b>PSP3</b>	Setpoint 3 of Program 7 Range: same as in <b>PSP0</b> .
0237	<b>PSP4</b>	Setpoint 4 of Program 7 Range: same as in <b>PSP0</b> .
0238	<b>PSP5</b>	Setpoint 5 of Program 7 Range: same as in <b>PSP0</b> .
0239	<b>PSP6</b>	Setpoint 6 of Program 7 Range: same as in <b>PSP0</b> .
0240	<b>PSP7</b>	Setpoint 7 of Program 7 Range: same as in <b>PSP0</b> .

Status Word 2	bit 0 – Automatic (0- manual; 1- automatic) bit 1 – Run (0-stop; 1-run) bit 2 – Control Action (0- reverse; 1 - direct) bit 3 – Reserved bit 4 – Auto-tune (0-no; 1-yes) 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 status bit 12 – Output 2 status bit 13 – Output 3 status bit 14 – Output 4 status bit 15 – Output 5 status
Status Word 3	bit 0 – Very low PV conversion (0-no; 1-yes) bit 1 – Negative conversion after calibration (0-no; 1-yes) bit 2 – Very high PV conversion (0-no; 1-yes) bit 3 – Exceeded linearization limit (0-no; 1-yes) bit 4 – Very high Pt100 cable resistance (0-no; 1-yes) bit 5 – Self zero conversion out of range (0-no; 1-yes) bit 6 – Self span conversion out of range (0-no; 1-yes) bit 7 – Cold junction conversion out of range (0-no; 1-yes) bit 8 – Reserved bit 9 – Reserved bit 10 – Reserved bit 11 – Reserved bit 12 – Reserved bit 13 – Reserved bit 14 – Reserved bit 15 – Reserved

Table 2: Values of Status Words

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	Output 1 Status (I/O1)
2	Output 2 Status (I/O2)
3	Output 3 Status (I/O3)
4	Output 4 Status (I/O4)
5	Output 5 Status (I/O5)

Register	Value format
Status Word 1	bit 0 – Alarm 1 (0-inactive; 1-active) bit 1 – Alarm 2 (0-inactive; 1-active) bit 2 – Alarm 3 (0-inactive; 1-active) bit 3 – Alarm 4 (0-inactive; 1-active) bit 4 – Input – I/O 5 (0- inactive; 1- active) bit 5 – Input – I/O 3 (0- inactive; 1- active) bit 6 – Input – I/O 4 (0- inactive; 1- active) (N1100) - Input – I/O 6 (0- inactive; 1- active) (N2000) bit 7 – Reserved bit 8 – Hardware type bit 9 – Hardware type bit 10 – Reserved bit 11 – Reserved bit 12 – Reserved bit 13 – Reserved bit 14 – Reserved bit 15 – Reserved

### Exception Responses – Error Conditions

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

Reception errors are detected by the CRC, causing the controller to discard the packet, not sending any reply to the master.

After receiving an error-free packet, the controller processes the packet and verifies whether the request is valid or not, sending back an exception error code in case of an invalid request. Response frames containing error codes have the most significant bit of the Modbus command set.

If a WRITE command sends an out-of-range value to a parameter, the controller will clamp the value to the parameter range limits, replying with a value that reflects these limits (maximum or minimum value allowed for the parameter).

The controller ignores broadcast READ commands; the controller processes only broadcast WRITE commands.

Error Code	Error Description
01	Invalid Command
02	Invalid Register Number or out of range
03	Invalid Register Quantity or out of range