NOVUS

We Measure, We Control, We Record

1. SERIAL COMMUNICATION

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

1.1 COMMUNICATION INTERFACE

Communication 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 Bidirectional data line;

  D0 Bidirectional inverted data line;

  C Optional connection which left communication better.

General Characteristics

- Optically isolated serial interface;
- Velocity programmable: 1200 a 11.200;
- Data Bits: 8;
- Parity: None;
- Stop Bits: 1.

Communication Protocol

The MOSBUS RTU slave is implemented, available in most SCADA software's 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 REGISTER TABLE

Equivalent to the registers referenced as 4X.

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 SP	Read: Active control SP (main SP, from ramp and soak or from remote SP). Write: to main SP. Range: from **SPLL** to **SPHL**.
0001	PV	Read: Process Variable Write: not allowed. Range: From **SPLL** to **SPHL**. The **dPPo**
0002	MV	prompt gives the decimal point position. 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	-	Reserved
0005	-	Reserved
0006	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.
0007	Prompt index	Read: Current prompt position in the parameters flowchart. Write: not allowed.
0008	Software Version	Read: The firmware version of controller. If V1.00, the read value will be 100. Write: not allowed.
0009	ID	Read: controller identification number. Write: not allowed. Values: 66 (42h) – N1040
0010	Serial Number H	Serial Number High (Upper display). Range: 0 to 9999. Read only
0011	Serial Number L	Serial Number Low (Lower display). Range: 0 to 9999. Read only
0012	Status Word 1	Read: Status bits. See table 2. Write: not allowed.
0013	Status Word 2	Read: Status bits. See table 2. Write: not allowed.
0014	Status Word 3	Read: Status bits. See table 2. Write: not allowed.
0015		Reserved
0016		Reserved
0017		Reserved
0018	**Act**	Control action. Range: 0→reverse; 1→ direct.
0019	**Atun**	Auto tune enable. Range: 0= no / 1= yes.
0020	**Ir**	Integral Rate (in repetitions/min) Range: 0 to 3000 (0.00 to 30.00)
0021	**dt**	Derivative Time (in seconds). Range: 0 to 250
0022	**Pb**	Proportional Band (in percentage) Range: 0 to 5000 (0.0 to 500.0)
0023	**ct**	Cycle Time (PWM, in seconds) Range: 5 to 1000 (0.5 to 100.0)
0024	**b IAS**	Bias. Range: -100 to +100%.
0025	**HYSt**	On/Off Control Hysteresis Range: 0 to **SPHL** - **SPLL**
0026	**SFSt**	Soft-Start time (in seconds) Range: 0 to 9999
0027	**ouLL**	Output Low Limit (minimum output power) Range: 0 to 1000 (0.0 to 100.0%).
0028	**ouHL**	Output High Limit (minimum output power) Range: 0 to 1000 (0.0 to 100.0%).
0029	SP	Control *Setpoint* (Prompt *Setpoint*). Range: from **SPLL** to **SPHL**.

Register	Symbol	Description
0030	Io 1	Channel function I/O. See **Table 4.**
0031	Io 2	The I/O availability depends on the controller model.
0032	Io 3	
0033	Io 4	
0034	IE_MV	Output in case of error.
0035	Lbdt	Loop break detection.
0036	-	Reserved
0037	-	Reserved
0038	-	Reserved
0039	FuA1	Alarm Function. Range: 0 to 6
0040	FuA2	0 > oFF
0041	FuA3	1 > Lo
0042	FuA4	2 > Hi 3 > diF 4 > diFL 5 > diFh 6 > iErr The Alarms availability depends on the controller model.
0043	SP.A1	Range: The minimum value is at SPLL for non-differential alarm or SPLL - SPLH for differential alarm
0044	SP.A2	
0045	SP.A3	
0046	SP.A4	The maximum value is at SPHL for non-differential alarm or at SPHL - SPLL for differential alarm.
0047	SP1E	Enables the respective Alarm setpoint to shows up in the operating cycle
0048	SP2E	
0049	SP3E	
0050	SP4E	
0051	HYA1	Alarm Hysteresis. Range: 0 to (SPHL - SPLL)
0052	HYA2	
0053	HYA3	
0054	HYA4	
0055	bLA1	Alarm power-up inhibit. Range:
0056	bLA2	0 > no
0057	bLA3	1 > yes.
0058	bLA4	
0059	A1t1	Alarm 1 Time 1. Range: 0 to 6500s Refer to operation manual for more details.
0060	A1t2	Alarm 1 Time 2 (in seconds) Range: same as in A1t1
0061	A2t1	Alarm 2 Time 1 (in seconds) Range: same as in A1t1
0062	A2t2	Alarm 2 Time 2 (in seconds) Range: same as in A1t1
0063	A3t1	Alarm 3 Time 1 (in seconds) Range: same as in A1t1
0064	A3t2	Alarm 3 Time 2 (in seconds) Range: same as in A1t1
0065	A4t1	Alarm 4 Time 1 (in seconds) Range: same as in A1t1
0066	A4t2	Alarm 4 Time 2 (in seconds) Range: same as in A1t1
0067	FLSh	Enables the display blink in case of alarm.
0068	-	Reserved
0069	-	Reserved
0070	-	Reserved
0071	tYPE	Input Type. Range: 0 to 3 0 > (J) -110 to 950 ºC / -166 to 1742 ºF 1 > (K) -150 to 1370 ºC / -238 to 2498 ºF 2 > (T) -160 to 400 ºC / -256 to 752 ºF 3 > (Pt100) -200 to 850 ºC / -328 to 1562 ºF
0072	unit	Temperature unit. Range: 0 to 1 0 > °C; 1 > °F
0073	dPPo	PV decimal point position Range: 0 to 3 0 > X.XXX; 1 > XX.XX; 2 > XXX.X; 3 > XXXX
0074	FLtr	Analog input filter.
0075	SPLL	*Setpoint* Low limit. Range: minimum value depends on the input type selected in tYPE (see op. Manual) to SPHL.
0076	SPHL	*Setpoint* High limit. Range: minimum value is SPLL and maximum depends on the input type selected in tYPE (see op. Manual).
0077	oFFS	PV offset Range: from SPLL to SPHL.
0078	Addr	Communication slave address Range: 1 to 247
0079	bAud	Comunication Baud Rate. Range: 0 to 7 0 > 1200 1 > 2400 2 > 4800 3 > 9600 4 > 19200 5 > 32400 6 > 57600 7 > 115200
0080	PrtY	Serial Communication Parity.
0081		Reserved
0082		Reserved
0083		Reserved
0084	run	Enable control. Range: 0→no; 1→yes.
0085	runE	Enable "run" on the main cycle. Range: 0→no; 1→yes.
0086	Auto	Control Mode. Range: 0→manual; 1→automatic.
0087 to 0101		Reserved
0102	Prot	Protection Level.
0103		Internal use
0104		
0105		
0106		
0107	rStr	Restore the factory calibration.
0108	CJ	Cold junction temperature.
0109		Internal use
0110		
0111		
0112	Key	Key press remote action. Range: 0 to 9 1: key **P** 2: key ∧ 4: key ∨ 8: key < 9: keys **P** e <

Table 01 – Registers table

1.4   STATUS WORD

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 – Reserved
	bit 5 – Reserved
	bit 6 – Reserved
	bit 7 – Reserved
	bit 8 – Hardware type
	bit 9 – Hardware type
	bit 10 – Hardware type
	bit 11 – Reserved
	bit 12 – Reserved
	bit 13 – Reserved
	bit 14 – Reserved
	bit 15 – Reserved
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 – Reserved
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 – Reserved
	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)

1.5   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

Table 03 - Exception codes

1.6   CONFIGURATION PARAMETERS I/O

I/O FUNCTION	CODE		I/O TYPE
Digital Output to be set by the serial comm.	0	oFF	Digital Output
PWM Control Output	1	ctrL	Digital Output
Alarm 1 Output	2	A1	Digital Output
Alarm 2 Output	3	A2	Digital Output
Alarm 1 OR Alarm 2	4	A1A2	Digital Output
Time interval LBD function - *Loop break detection*	5	Lbd	Digital Output

Table 04 - I/O configuration parameters