NICO plus Modbus RTU

Serial interface

The serial port configuration for the serial interface (RS-232 and RS-485, respectively) is (9600, 8N1):

- Baud rate: 9600 bps
- Data bits: 8
- Stop bits: 1
- Parity: none

Datatypes

Name	Register Count	Format
Bool	1	false: 0x0000, true: 0xFF00
Uint8	1	unsigned 8 bit integer. Value range: 0x0000 - 0x00FF
Uint16	1	unsigned 16 bit integer. Value range: 0x0000 - 0xFFFF
Uint32	2	unsigned 32 bit integer. Value range: 0x00000000 - 0xFFFFFFFF
Float	2	IEEE 754 32 bit floating point value.
Char[n]	$\lceil \frac{n}{2} \rceil$	ASCII string of n characters.
Uint16[n]	n	Array of n Uint16 values.
Float[n]	2n	Array of n Float values.

Functions

These Modbus function codes are supported by NICO plus:

Name	Code	Description / Application
Read multiple registers	0x03	Read the serial number and firmware version, configuration and calibration data, and of course measurement data.
Write multiple registers	0x10	Write configuration data.
Write single register	0x06	Trigger a measurement or self-calibration process.
Report slave ID	0x11	Read serial number and firmware version.

Default slave address

The factory default setting of the slave address is **1 (0x01)**.

Read / Write multiple registers (0x03 / 0x10)

Device Busy Exceptions

Note that during a measurement, most Registers are not available; trying to read or write them will return a device busy exception instead. The only Registers that are available during a measurement are:

Read: Registers below 100, Self-Trigger

Write: Self-Trigger

Access Permissions

The R/W column describes the Registers access restrictions. An *R* means it can be read from (0x03), a *W* means it can be written to (0x10).

The following table describes the Modbus register mapping:

Name	R/W	Address	Datatype	Description
Modbus slave address	R/W	0	Uint16	The Modbus slave address of the NICO plus sensor. Valid IDs: 1…247. If an invalid ID is written, returns an illegal data value exception.
Action Result	R	3	Uint16	After issuing a command (see Write Single Register, #3), the Status of this command will be written into this register. **0:** The Command was executed Successfully **1:** Access Denied **0x4000:** The Command failed **0x8000:** The Command is still running.
Device Serial Number	R	10	Char[10]	Device Type and serial number of the sensor, separated by an underscore. E.g “NICO_07F1”
Firmware Version	R	15	Char[10]	The installed firmware version.
Lamp Serial Number	R	20	Char[8]	Type and serial number of the Xenon Flash Lamp (XFL)
Self-trigger activated	R/W	102	Bool	Enables or disables the self-trigger. For external trigger: deactivate the self-trigger. **Hint**: If used with a control unit it is recommended to disable the self-trigger.

Self-trigger interval	R/W	103	Uint32	The interval in [s] for self-triggered measurements. Value range: 1s – 86400s. **Hint**: If used with a control unit it is recommended to disable the self-trigger.
Data comment #1	R/W	109	Char[64]	1st custom comment row for measured data.
Data comment #2	R/W	141	Char[64]	2nd custom comment row for measured data.
Data comment #3	R/W	173	Char[64]	3rd custom comment row for measured data.
Data comment #4	R/W	205	Char[64]	4th custom comment row for measured data.
System date and time	R/W	237	Uint32	The date and time in seconds since 1970/01/01.
Description	R/W	239	Char[64]	Arbitrary Description. Can be used for identification.

N-NO3 / scaled	R	1000 / 1500	Float	Measured value / scaled value
NO3 / scaled	R	1002 / 1502	Float	Measured value / scaled value
SQI / scaled	R	1004 / 1504	Float	Measured value / scaled value
RefA / scaled	R	1006 / 1506	Float	Measured value / scaled value
RefB / scaled	R	1008 / 1508	Float	Measured value / scaled value
RefC / scaled	R	1010 / 1510	Float	Measured value / scaled value
RefD / scaled	R	1012 / 1512	Float	Measured value / scaled value
N-NOx / scaled	R	1014 / 1514	Float	Measured value / scaled value
NOx / scaled	R	1016 / 1516	Float	Measured value / scaled value
UVT254 / scaled	R	1018 / 1518	Float	Measured value / scaled value
UVT254n / scaled	R	1020 / 1520	Float	Measured value / scaled value
SAC254 / scaled	R	1022 / 1522	Float	Measured value / scaled value
CODeq / scaled	R	1024 / 1524	Float	Measured value / scaled value
BODeq / scaled	R	1026 / 1526	Float	Measured value / scaled value

TOCeq / scaled	R	1028 / 1528	Float	Measured value / scaled value
DOCeq / scaled	R	1030 / 1530	Float	Measured value / scaled value
Turb / scaled	R	1032 / 1532	Float	Measured value / scaled value
TSSeq / scaled	R	1034 / 1534	Float	Measured value / scaled value
AbsAU212 / scaled	R	1036 / 1536	Float	Measured value / scaled value
AbsAU254 / scaled	R	1038 / 1538	Float	Measured value / scaled value
AbsAU550/ scaled	R	1040 / 1540	Float	Measured value / scaled value

Write single register (0x06)

By writing a value that is not 0x0000 to the following coils / registers the associated action will be performed.

Name	Address	Description
Trigger measurement	1	A single measurement is triggered. Depending on the value written, a different type of measurement is performed: **0x0101:** Standard measurement Other values are reserved for future purpose and may result in undefined behavior, yet. Note: Up to and including firmware version 1.2.4, it is possible that Modbus requests will not be answered during the measurement. With all later firmware versions, the sensor provides the measured value from the previous measurement until the one currently running is completed.
Command	3	Performs certain actions on the internal Configuration state depending on which value is written. The following values are possible: **6:** Reboot **7:** Clear Data Log

Report slave ID (0x11)

The sensor name, serial number and firmware version is replied each as null terminated ASCII string.

Example:

T	R	I	O	S	0x00	N	I	C	O	p	I	u	s	0x00	7	6	2	0	0	0	1	0	0x00	1	.	1	0x00