

MODBUS RTU

COMMUNICATION PROTOCOL:
PUE HX5.EX WEIGHING INDICATOR

SOFTWARE MANUAL

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1. GENERAL INFORMATION

Modbus RTU protocol implemented in the indicator can be applied using RS232 (1 master – 1 slave) or RS485 (1 master – multiple slaves) serial ports.

2. WEIGHING INDICATOR SETTINGS - CONFIGURATION

To set indicator communication via Modbus RTU protocol go to **<SETUP/ Peripherals / Modbus RTU>**. For detailed description of settings configuration read „**PUE HX5.EX - Indicator Software Manual**”.

3. IMPLEMENTED FUNCTIONS

Modbus RTU communication is based on 4 functions:

- 03 (0x03) Read Holding Registers – reading holding register.
- 04 (0x04) Read Input Registers – reading input register.
- 06 (0x06) Write Holding Register – writing single holding register.
- 16 (0x10) Write Multiple Registers – writing multiple holding registers.

4. DATA STRUCTURE

All registers are 2-byte type (WORD). Floating point data (such as mass and tare) are stored in 2 consecutive registers and are FLOAT-type data. If the first register consists of 2 AB bytes and the other of 2 CD bytes, then FLOAT value is HEX ABCD, e.g. if R30001 register has the value of 0x3E68 and R30002 register has the value of 0x72B0, then after conversion to 0X3E6872B0 float the result is 0.227.

The lot number also consists of 2 bytes and has a LONG string. As in the FLOAT case, the data is structured in the following way: AB (first register) CD (second register). 0x0043DE21 example after conversion to decimal value is 447777. The lot number can only be numerical. Other characters are skipped.

Other registers must be read as HEX values.

5. MEMORY MAP

5.1. INPUT Registers (Read-Only)

Register	Offset	Modbus address	Length [WORD]	Data type
Mass	0	30001	2	float
Tare	2	30003	2	float
Unit	4	30005	1	word
Status	5	30006	1	word
LO threshold	6	30007	2	float
Process status (Stop, Start)	32	30033	1	word
Inputs status	33	30034	1	word
Min	34	30035	2	float
Max	36	30037	2	float
Lot number	42	30043	2	long
Operator	44	30045	1	word
Product	45	30046	1	word
Customer	46	30047	1	word
Packaging	47	30048	1	word
Formulation	50	30051	1	word
Dosing process	51	30052	1	word

5.2. INPUT Registers

Mass – response: mass value of a given platform in current unit

Tare – response: tare value of a given platform in adjustment unit

Unit – determines currently displayed mass unit of a given platform

Bit No.	Unit
0	gram [g]
1	kilogram [kg]
2	carat [ct]
3	pound [lb]
4	ounce [oz]
5	Newton [N]

Example:

Read HEX value: 0x02. Binary:

B1/7	B1/6	B1/5	B1/4	B1/3	B1/2	B1/1	B1/0	B0/7	B0/6	B0/5	B0/4	B0/3	B0/2	B0/1	B0/0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

The unit of the weighing instrument is kilogram [kg].

Status – determines weighing instrument status

Status bits	
0	Measurement correct (weighing instrument does not report an error).
1	Measurement stable.
2	Weighing instrument indicates zero.
3	Weighing instrument is tared.
4	Weighing instrument is in II weighing range.
5	Weighing instrument is in III weighing range.
6	Weighing instrument reports NULL error.
7	Weighing instrument reports LH error.
8	Weighing instrument reports FULL error.

Example:

Read HEX value: 0x13

B1/7	B1/6	B1/5	B1/4	B1/3	B1/2	B1/1	B1/0	B0/7	B0/6	B0/5	B0/4	B0/3	B0/2	B0/1	B0/0
0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1

The weighing instrument does not report any error, stable measurement in II weighing range.

LO threshold - response: **LO** threshold value in adjustment unit.

Process status – determines dosing or formulations process status:

- 0x00 – process disabled
- 0x01 – process stopped
- 0x02 – process aborted
- 0x03 – process finished

Inputs status – input mask of the IM01 indicator/communication module. The first 4 least significant bits represent weighing terminal inputs, 12 next bits represent communication module inputs.

Example:

Read HEX value: 0x8023

B1/7	B1/6	B1/5	B1/4	B1/3	B1/2	B1/1	B1/0	B0/7	B0/6	B0/5	B0/4	B0/3	B0/2	B0/1	B0/0
1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1

Inputs 1 and 2 of the weighing indicator and inputs 1 and 12 of the communication module are in high state.

MIN - response: **MIN** threshold value (in current unit).

MAX - response: **MAX** threshold value (in current unit).

Lot number – response: lot number. Only numerical values are accepted! All other characters are skipped.

Operator – response: code of logged in operator.

Product – response: code of selected product.

Customer – response: code of selected customer.

Packaging – response: code of selected packaging.

Formulation – response: code of selected formulation.

Dosing process– response: code of selected dosing process.

5.3. HOLDING Registers (Read/Write)

Variable	Offset	Modbus address	Length [WORD]	Data type
Command	500	40501	1	word
Command with parameter	501	40502	1	word
Platform	502	40503	1	word
Tare	503	40504	2	float
LO threshold	505	40506	2	float
Outputs status	507	40508	1	word
Min	508	40509	2	float
Max	510	40511	2	float
Lot number	516	40517	2	long
Operator	518	40519	1	word
Product	519	40520	1	word

Customer	520	40521	1	word
Packaging	521	40522	1	word
Source warehouse	522	40523	1	word
Target warehouse	523	40524	1	word
Formulation/Dosing process	524	40525	1	word

5.4. HOLDING Registers

Basic command – writing the register with respective value triggers the following actions:


Bit No.	Operation
0	Zero the platform
1	Tare the platform
2	Delete statistics
3	Save/Print
4	Process start
5	Process stop

Example:

Writing the register with 0x02 value

B1/7	B1/6	B1/5	B1/4	B1/3	B1/2	B1/1	B1/0	B0/7	B0/6	B0/5	B0/4	B0/3	B0/2	B0/1	B0/0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0



This causes balance taring.

	<p><i>A command is executed once when its bit setting is detected. If the command with the same bit is to be executed again, zero the bit and set it to respective value again.</i></p>
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Complex command – setting a respective value results with performance of a given task, see the table:

Bit No.	Operation
0	Setting tare value for a given platform
1	Setting LO threshold value for a given platform
2	Setting lot number
3	Setting outputs status

4	Operator selection
5	Product selection
6	Packaging selection
7	Setting MIN threshold value
8	Customer selection
9	Source warehouse selection
10	Target warehouse selection
11	Dosing process selection
12	Setting MAX threshold value

	<i>Complex command requires setting address of respective parameter (from 40503 to 40525 – refer to: HOLDING table).</i>
	<i>A command with a parameter is executed once when its bit setting is detected. If the command with the same bit is to be executed again, zero the bit and set it to respective value again.</i>

Example: sending tare value of 1.0 to the balance

Executing the command requires writing 3 holding registers:

40502 – command with parameter - value 0x01 - which is tare setting.

Float-type 1.0 value after conversion to HEX has the following format: 0x3F800000.

Holding registers feature the following values written:

40503 – tare value, two most significant bytes – 0x3F80

40504 – tare value, two least significant bytes – 0x0000

The registers are written using 16 (0x10) preset multiple registers function. As a result, a tare value of 1.0 is set on the balance.

Platform – complex command parameter: weighing platform number (for this balance version it is always 1)

Tare – complex command parameter: tare value (in an adjustment unit).

LO threshold – complex command parameter: LO threshold value (in an adjustment unit).

Outputs status – complex command parameter: status of weighing indicator and communication module outputs.

Example:

Setting the weighing terminal output no. 1 and the communication module output no. 3 to high state.

Output mask format:

B1/7	B1/6	B1/5	B1/4	B1/3	B1/2	B1/1	B1/0	B0/7	B0/6	B0/5	B0/4	B0/3	B0/2	B0/1	B0/0
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1

After conversion to HEX it is 0x41.

Executing the command requires writing 2 holding registers:

40502 – command with parameter - value 0x08 – which is output state record.

40507 – output mask 0x05.

The registers are written using 16 (0x10) preset multiple registers function. As a result, the weighing terminal output no. 1 and the communication module output no. 3 are set to high state.

MIN – complex command parameter: MIN threshold value (in the current unit selected for active working mode).

MAX – complex command parameter: MAX threshold value (in the current unit selected for active working mode).

Lot number – complex command parameter: lot number.
Only numerical values are accepted! All other characters are skipped.

Operator – complex command parameter: Operator's code.

Product – complex command parameter: Product code.

Customer – complex command parameter: Customer's code.

Packaging – complex command parameter: Packaging code.

Formulation – complex command parameter: Formulation code.

Dosing process – complex command parameter: Dosing process code.



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