MODBUS

COMMUNICATION PROTOCOL:
PUE C32 Weighing Indicator
PUE HX7 Weighing Indicator
PUE HX5.EX Weighing Indicator

SOFTWARE MANUAL

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CONTENTS

1. GENERAL INFORMATION

Modbus protocol implemented in weighing indicator can be applied when serial connector RS232, RS485* (Modbus RTU) or Ethernet (Modbus TCP and MODBUS RTU over TCP) are used.

*) - Not apply to the PUE C32 indicator.

2. WEIGHING INDICATOR SETTINGS - CONFIGURATION

To set weighing indicator communication via Modbus protocol go to **<SETUP / Peripherals / Modbus>**. For detailed description of settings configuration read **PUE C32**, **PUE HX7**, **PUE HX5.EX** indicators software manuals.

3. IMPLEMENTED FUNCTIONS

Modbus 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
Platform 1 mass	0	30001	2	float
Platform 1 tare	2	30003	2	float
Platform 1 unit	4	30005	1	word
Platform 1 status	5	30006	1	word
Platform 1 LO threshold	6	30007	2	float
Platform 2 mass *	8	30009	2	float
Platform 2 tare *	10	30011	2	float
Platform 2 unit *	12	30013	1	word
Platform 2 status *	13	30014	1	word
Platform 2 LO threshold *	14	30015	2	float
Process status (Stop, Start)	32	30033	1	word
Input 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

*) – Applies only to the PUE HX7 indicator.

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, measurement stable 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

Input state – bitmask of indicator inputs. The first 4 least significant bits represent weighing indicator inputs.

Example:

Read HEX value: 0x000B

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	1	0	1	1

Inputs 1, 2 and 3 of the weighing indicator take 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
Output state	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
Formulation	524	40525	1	word
Dosing process	525	40526	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:

Record of the register by value 0x02

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.

> ⚠ *A command is executed once upon detecting that its bit has been set. If the command is to be executed more than once, it is necessary to zero the bit first, and reset it to the required value next.*

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

⚠	***Complex command requires setting address of respective parameter (from 40503 to 40525 – refer to: HOLDING table).***
⚠	***A command with a parameter is executed once when its bit setting is detected. If the command is to be executed more than once, it is necessary to zero the bit first, and reset it to the required value next.***

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) multiple holding registers function. As a result, a tare value of 1.0 is set on the balance.

Platform – complex command parameter: weighing platform number (1 or 2*).

*) – Applies only to the PUE HX7 indicator.

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 high state for output 1 and 3 of the weighing indicator.

Output mask:

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	1	0	1

Upon conversion to HEX the result is 0x05

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, outputs 1 and 3 take high state.

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

MAX – complex command parameter: MAX threshold value (in the unit set for the 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.