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Software manual

ITKP-21-04-06-22-EN

MODBUS

Communication protocol of MW-04 Mass Converter:
MODBUS RTU
MODBUS TCP
MODBUS RTU over TCP

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1. GENERAL INFORMATION

Modbus protocol implemented in MW-04 mass converter can be applied when serial connector RS485 (Modbus RTU) or Ethernet (Modbus TCP and MODBUS RTU over TCP) are used.

2. MASS CONVERTER SETTINGS AND CONFIGURATION

To configure MW-04 mass converter settings for communication via **Modbus** protocol run **"MWManager"** PC software and go to **<Parameters / Communication / Devices / Interfaces>** submenu. For detailed description of settings configuration read **"MWManager"** user manual.

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 Single 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 CDAB. e.g. if R30001 register has the value of 0x72B0 and R30002 register has the value of 0x3E68, then after conversion to 0X3E6872B0 float the result is 0.227. 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
Platform 3 mass	16	30017	2	float
Platform 3 tare	18	30019	2	float
Platform 3 unit	20	30021	1	word
Platform 3 status	21	30022	1	word
Platform 3 LO threshold	22	30023	2	float
Platform 4 mass	24	30025	2	float
Platform 4 tare	26	30027	2	float
Platform 4 unit	28	30029	1	word
Platform 4 status	29	30030	1	word
Platform 4 LO threshold	30	30031	2	float
Input status	33	30034	1	word
Pl. 1 min	34	30035	2	float
Pl. 1 max	36	30037	2	float
Pl. 1 fast dosing threshold	38	30039	2	float
Pl. 1 precise dosing threshold	40	30041	1	float
Pl. 1 adjustment status	50	30051	1	word
Pl. 1 dosing status	51	30052	1	word
Pl. 2 dosing status	52	30053	1	word
Pl. 2 dosing status	53	30054	1	word
Pl. 2 dosing status	54	30055	1	word
Pl. 2 adjustment status	55	30056	1	word
Pl. 3 adjustment status	56	30057	1	word
Pl. 4 adjustment status	57	30058	1	word
Pl. 2 min	58	30059	2	float
Pl. 2 max	60	30061	2	float
Pl. 2 fast dosing threshold	62	30063	2	float
Pl. 2 precise dosing threshold	64	30065	1	float
Pl. 2 min	66	30067	2	float
Pl. 2 max	68	30069	2	float
Pl. 3 fast dosing threshold	70	30071	2	float

Pl. 3 precise dosing threshold	72	30073	1	float
Pl. 4 min	74	30075	2	float
Pl. 4 max	76	30077	2	float
Pl. 4 fast dosing threshold	78	30079	2	float
Pl. 4 precise dosing threshold	80	30081	1	float

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 form:

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].

Platform 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.

Input state – bitmask of module inputs. 8 least significant bits represent the weighing module inputs state.

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

The weighing module inputs number 1, 2 and 3 are in high state.

MIN – response: **MIN** threshold value (in adjustment unit).

MAX – response: **MAX** threshold value (in adjustment unit).

X fast dosing threshold – response: fast dosing threshold value (in adjustment unit).

X precise dosing threshold – response: slow dosing (precise dosing) threshold value in adjustment unit.

X *- weighing platform number*

Adjustment status – determines status of the weighing platform (x).

HEX value	
0x00	Process finished correctly
0x01	Start mass/adjustment coefficient determination in progress
0x02	Range exceeded
0x03	Time exceeded
0x04	Process aborted
0x05	Awaiting for data

(x) dosing status – determines dosing process status of the weighing platform (x).

HEX value	
0x00	Process disabled
0x01	Dosing in progress
0x02	Process stopped
0x03	Process finished

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
Fast dosing threshold	512	40513	2	float
Precise dosing threshold	514	40515	1	float
Adjustment weight mass	524	40525	1	float

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
5	Process start
6	Process stop
8	Start mass determination
9	Adjustment factor determination
10	Adjustment parameters record

Example:

Writing the register with 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.***
	***Parameters of the basic command refer to the weighing platform specified in the HOLDING 40503 register.***

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 outputs status
3	Setting MIN threshold value
4	Setting MAX threshold value
5	Setting fast dosing threshold
6	Setting precise dosing threshold
9	Adjustment weight mass

	***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 of 1.0 value to the scale.

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 least significant bytes – 0x0000.

40504 – tare value, two most significant bytes – 0x3F80.

The registers are written using 16 (0x10) preset 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 (1-4).

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 module.

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

After conversion to HEX it is 0x05.

Executing the command requires writing 2 holding registers:

40502 – command with parameter - value 0x04 - which is output state record.

40507 – output mask 0x05.

The registers are written using 16 (0x10) preset multiple holding registers function. As a result, outputs number 1 and 3 take high state.

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

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

Fast dosing threshold – complex command parameter: fast dosing threshold value (in adjustment unit).

Precise dosing threshold – complex command parameters: precise dosing threshold value (in adjustment unit).

Adjustment weight mass – complex command parameter: MAX threshold value (in an adjustment unit).