Software manual

ITKP-41-01-11-21-EN

MODBUS

Communication Protocol of MW-01-A Mass Converter:
MODBUS RTU
MODBUS TCP
MODBUS RTU over TCP

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CONTENTS

1. GENERAL INFORMATION

Modbus protocol implemented in MW-01-A 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-01-A mass converter settings for communication via **Modbus** protocol run "**MwManager**" PC software and go to **<Parameters / Set Communication>** 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

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
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
Dosing status	32	30033	1	word
Input status	33	30034	1	word
Min	34	30035	2	float
Max	36	30037	2	float
Fast dosing threshold	38	30039	2	float
Precise dosing threshold	40	30041	1	float
Adjustment status	50	30051	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 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 – returns value of LO threshold in an adjustment unit.

Input state – bitmask of mass converter inputs. 8 least significant bits represent the mass converter 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

Inputs 1, 2 and 3 of the mass converter take HI state.

MIN – returns **MIN** threshold value in an adjustment unit.

MAX – returns **MAX** threshold value in an adjustment unit.

Fast dosing threshold - response: fast dosing threshold value (in adjustment unit.

Precise dosing threshold - response: slow dosing threshold value (precise dosing) in adjustment unit.

Adjustment status – determines adjustment process status.

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

Dosing status – determines process status:

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	256	40257	1	word
Command with parameter	257	40258	1	word
Platform	258	40259	1	word
Tare	259	40260	2	float
LO threshold	261	40262	2	float
Output state	263	40264	1	word
Min	264	40265	2	float
Max	266	40267	2	float
Fast dosing threshold	268	40269	2	float
Precise dosing threshold	270	40271	1	float
Adjustment weight mass	272	40273	1	float

5.4. HOLDING Registers

Basic command – setting a respective value triggers direct performance of a given task, see the table:

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.

Complex command – setting a respective value triggers 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 40258 to 40272 – 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:
40257 – 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:
40259 – tare value, two least significant bytes – 0x0000.
40260 – 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 (always 1).

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

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

Output state – complex command parameter: state of mass converter outputs.

Example:

Setting high state for output 1 and 3 of the mass converter.

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: fine dosing threshold value (in adjustment unit).

Adjustment weight mass - complex command parameter: adjustment weight value.