# User manual

## Weighing module MW-01

Manual number:
ITKU-29-05-08-14-A



Modbus®

PROFI® PROCESS FIELD BUS BUS

RADWAG®

**BALANCES AND SCALES**

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## 1. APPLICATION

MW-01 weighing module is intended for conftruction of industrial load cell scales. Depending on the needs, communication with the module may be established by the following interfaces: RS232, RS485, Ethernet, Profibus and ModBus protocol. MW-01 Module may cooperate with PUE 5, PUE 7 terminals or PC computer.

Operating of the weighing module MW-01 from a PC level is carried out with a computer software **"MwManager"**. A detailed description of the application is included in the further section of the MW-01 user manual.

## 2. PRECAUTIONARY MEASURES

A. Please, read carefully this user manual and use the device according to its intended use;

B. Weighed loads should be placed possibly in the central setion of the weighing platform;

C. The weighng platform should be loaded with objects which gross weight does not exceed the maximal capacity of the scale;

D. Do not leave heavy loads on the weoghing patform for longer period of time;

E. In case of failure, immediately disconnect the power supply;

F. Devices that are to be decommissioned should be utilized according to valid legal regulations.

## 3. WARRANTY CONDITIONS

A. RADWAG is obliged to repair or change those elements that appear to be faulty because of production and construction reason,

B. Defining defects of unclear origin and outlining methods of their elimination can be carried out only in participation of the user and the manufacturer representatives,

C. RADWAG does not take any responsibility connected with defecting or loss deriving from unauthorized or inappropriate (not adequate to manuals) production or service processes,

D. Warranty does not cover:

- Mechanical failures caused by inappropriate exploitation of the device or failures of thermal or chemical origin or
- Defects caused by atmospheric discharge, overvoltage in mains or other random event,
- Maintenance activities (cleaning of the weighing module).

E. Warranty loss appears if:

- A repair is carried out by an unauthorized service,
- Intrusion into mechanical or electronic construction of unauthorized people,
- Removing or destroying protection stickers for the weighing module

F. The detailed warranty conditions are listed in the warranty certificate.

G. Contact with Authorized Service: +48 48 384 88 00 ext. 106 or 107.

## 4. TECHNICAL PARAMETERS

| **MODEL** | **MW-01 ver.1** | **MW-01 ver.2** |
|---|---|---|
| Interface | RS232, RS485, Ethernet | RS232, PROFIBUS |
| Power Supply | 8 ÷ 30VDC | |
| Housing | metal | |
| IP rating | IP 66 | |
| Working temperature | -10°C ÷ 40°C | |
| OIML class | III | |
| Number of verification intervals | 10 000 | |
| Max. increase of input signal | 19,5mV | |
| Min. voltage per verification division | 0,5µV | |
| Min. load cell impedance | 80Ω | |
| Max. load cell impedance | 1200Ω | |
| Load cell excitation voltage | 5VDC | |
| Load cell connectivity | 4 or 6 wire shielded cable | |
| Number of weighing platforms | 1 | |
| 2INE/3OUT | Standard | |
| Transmission Speed RS232 RS485 | Default 57600 bit/s | |

### 4.1. INPUT/OUTPUT parameters

The module features 2 optoisolated inputs, 2 reed relay outputs and fast transistorized output type open collector.

| **OUT1 – OUT2 Parameters** | |
|---|---|
| Number of outputs | 2 |
| Type of outputs | Reed operating contact |
| Conductor intersection | 0.14 – 0.5mm$^2$ |
| Maximum switchable current | 200mA |
| Maximum conducted voltage | 50VDC |

| **Output OUT3 Parameters** | |
|---|---|
| Number of outputs | 1 |
| Type of outputs | Transistor |
| Umax | 5VDC |
| Imax | 100mA |

| **Input Parameters** | |
|---|---|
| Number of inputs | 2 |
| Type of inputs | Optocoupled |
| Conductor intersection | 0.14 – 0.5mm$^2$ |
| Control voltage range | 5 -24V DC |

## 5. CONSTRUCTION

Weighing module comprises metal housing. Signal cables are fed through cable glands. Communication with the peripheral devices is established by one of the following interfaces: RS485, RS232, Ethernet, Profibus.

The weighing module enables cooperation with indicators or PC computers. It features 2 optoisolated inputs, 2 reed relay outputs and one fast transistor output. The weighing module is supplied form 8÷30VDC.

## 5.1. External view

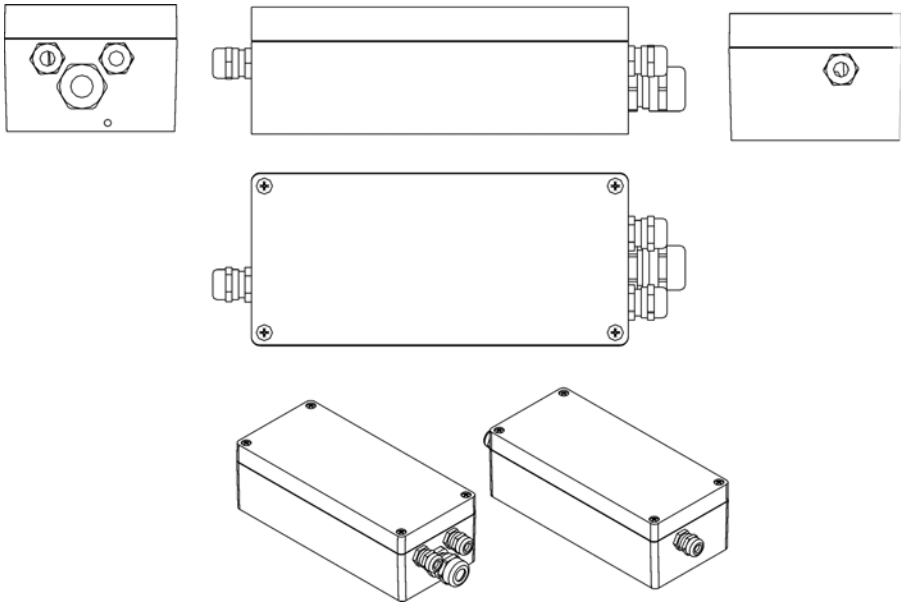


*Fig.1 Weighing module MW-01*

## 5.2. Dimensions

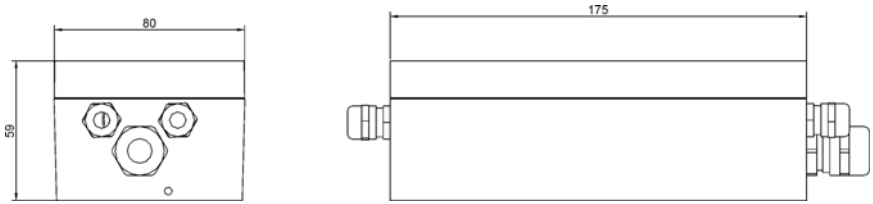



*Fig.2 Dimensions of the MW-01*

## 5.3. Interfaces

MW-01 ver.1 has cables fed through cable glands.
MW-01 ver.2 has 2 sockets (PROFIBUS IN and PROFIBUS OUT),
RS232 is fed though cable gland.

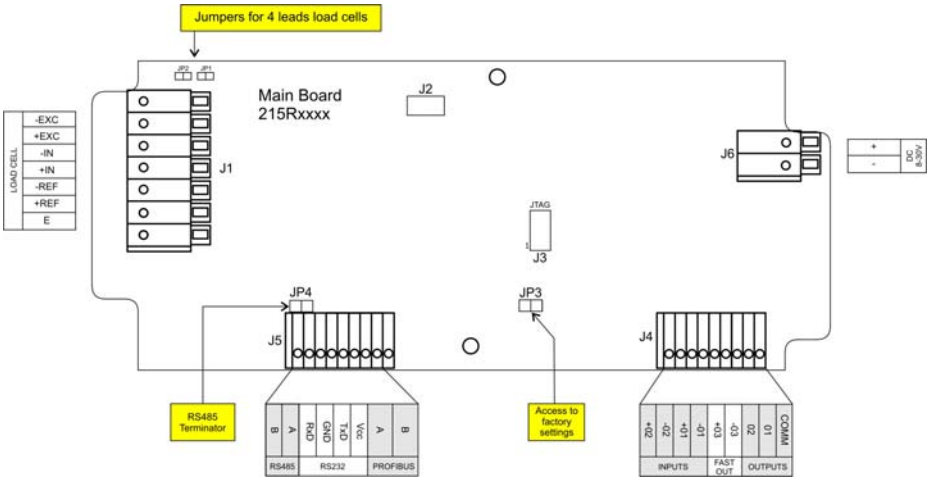



*Fig.3 Location and marking of interfaces for MW-01 main board*

### 5.3.1. PROFIBUS

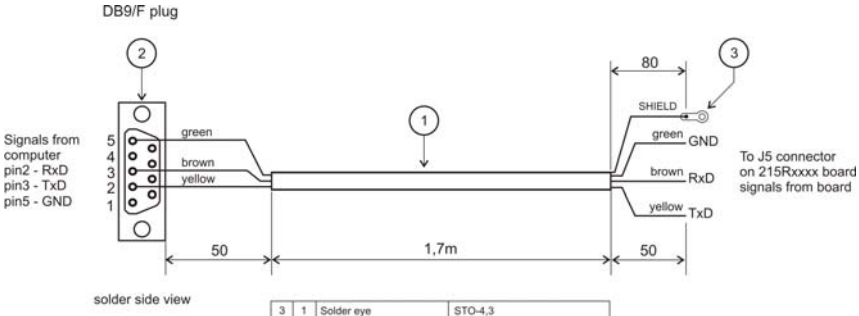
MW-01 module, version 2, is equipped with input and output socket for PROFIBUS. The volatage, indispensable for correct operation of a terminator is 5VDC on an output socket. Available socket standard is M12 5 pin B coded (for DP PROFIBUS).

**Sockets' topology:**

| | | |
|---|---|---|
| PROFIBUS IN (male) |  | Pin1 – NC<br>Pin2 – A<br>Pin3 – NC<br>Pin4 – B<br>Pin5 – NC |
| PROFIBUS OUT (female) |  | Pin1 - +5V<br>Pin2 – A<br>Pin3 – GND<br>Pin4 – B<br>Pin5 – NC |

## 5.4. Diagrams of connection cables

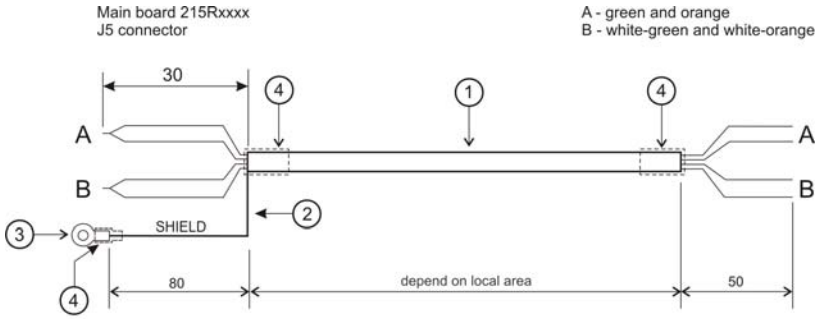
### RS232 cable




| 3 | 1 | Solder eye | STO-4,3 |
|---|---|---|---|
| 2 | 1 | DB9/F plug | DSC-109 w obudowie DSC-209 |
| 1 | 1 | FTP cable | 4x2xAWG26 |
| Pos. | Pcs. | Component name | Designator |

*Fig. 4 PT0145 Cable*

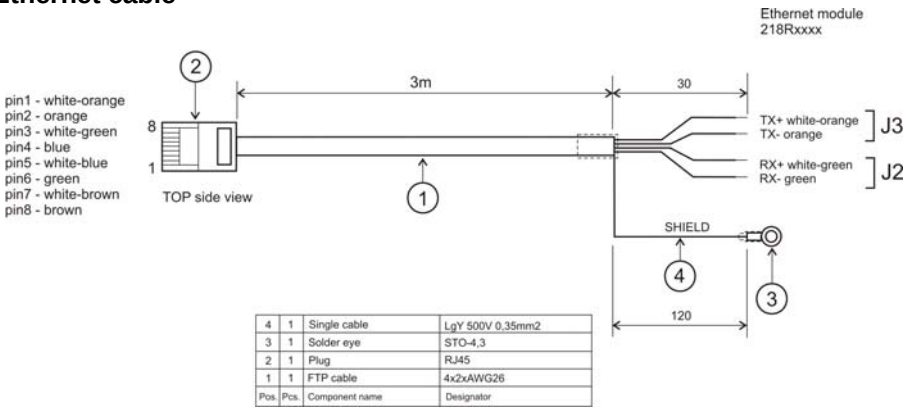
### RS485 cable




| 4 | x | Insulation | RC 9,5/4,8 |
|---|---|---|---|
| 3 | 1 | Solder eye | STO-4,3 |
| 2 | 1 | Single cable | LgY 500V 0,35mm2 |
| 1 | 1 | FTP cable | 4x2xAWG26 |
| Pos. | Pcs. | Component name | Designator |

*Fig. 5 PT0012 Cable*

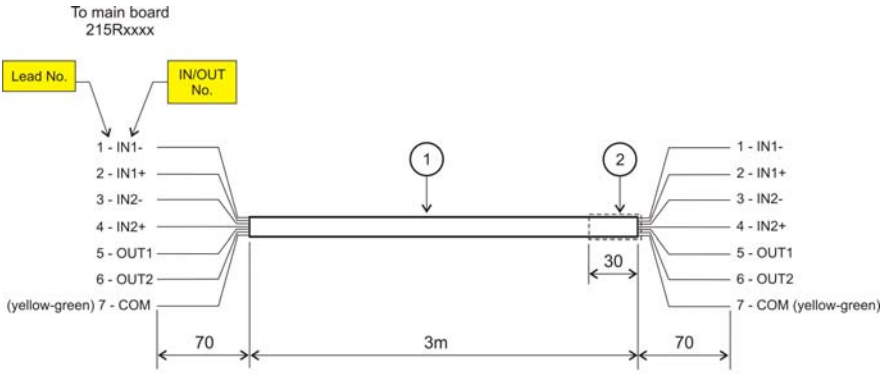
## Ethernet cable




| Pos. | Pcs. | Component name | Designator |
|---|---|---|---|
| 4 | 1 | Single cable | LgY 500V 0,35mm2 |
| 3 | 1 | Solder eye | STO-4,3 |
| 2 | 1 | Plug | RJ45 |
| 1 | 1 | FTP cable | 4x2xAWG26 |

*Fig. 6 PT0014 Cable*

## IN/OUT cable




| Pos. | Pcs. | Component name | Designator |
|---|---|---|---|
| 2 | 1 | Insulation | RC 12,7/6,4 |
| 1 | 1 | Cable | JZ-500 7G0.5mm2 |

*Fig. 7 PT0146 Cable*

# 6. INSTALLATION of “MwMANAGER” software

***Caution:***

- *In order to install the program on the computer with older version **“MwManager”** softwre, uninstall the previous version first,*
- *The installation instruction was made for Windows 7 and it is compatibile with former versions of MS Windows*
- *Proper operation of the program reguires installing Microsoft .NET Framework ver. 2.0 or higher. It is accessible on Microsoft website:* http://www.microsoft.com/downloads/details.aspx?displaylang=pl&FamilyID=0856eacb-4362-4b0d-8edd-aab15c5e04f5
- *Proper operation of the program reguires installing all accessible ServicePacks for your operating system.*
- *Due to continuous software updates there may occur some discrepancies between the instruction and the program,*
- *RADWAG takes no responsibility for the consequences of the software operation, and any errors resulting from the incorrect software operation,*
- *RADWAG takes no responsibility for loss or protection of any data caused by the incorrect utilization of the software or computer.*

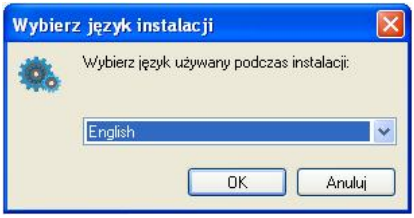
## 6.1. Minimal hardware requirements

Proper operation of the software requires a computer with below specified configuration:

- A PC computer with installed OS MS Windows 2000/XP/2003/Vista/7,
- processor 2.4 GHz or faster,
- RAM 512 MB or more (recommended 1 GB),
- At least 1 GB of free space on the hard drive,
- Display with minimum resolution 800 x 600,
- DVD drive.

## 6.2. Installation procedure

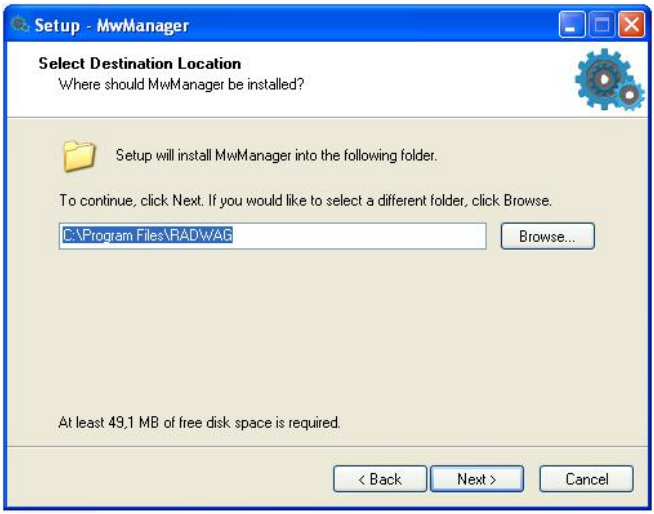
1. On receiving an installation file of **MwManager x.x.x.x.exe** software, run installation file, select language version and press OK key.




2. Press Next > in the welcome window:

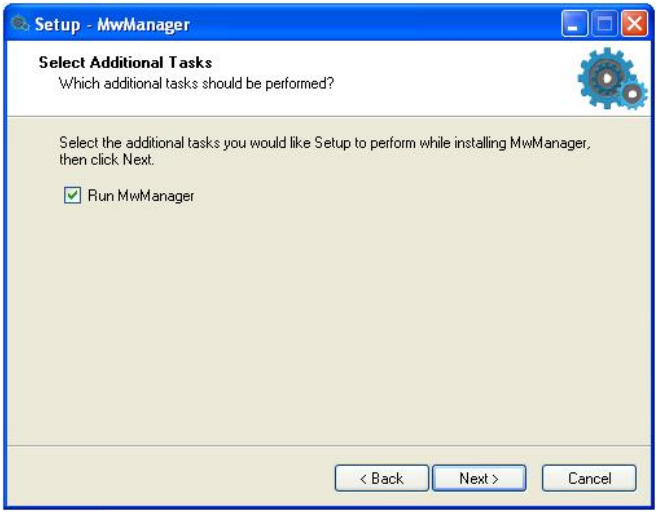


3. Browse window:



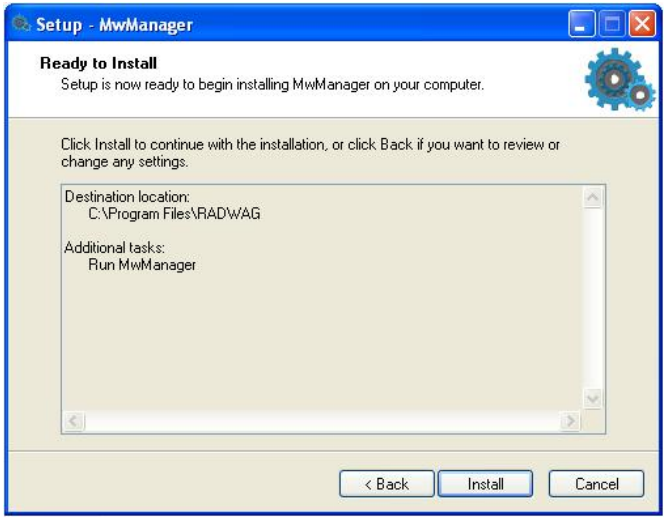

If necessary, change the software insallation folder, and press Next >.

4. Window for selecting tasks:




On marking / unmarking available option, press Next > key.

5. Installation window:




In order to install the software, press **„Install"** key.

6. Software installation completion window:




To finish installation process, press **„Finish"** key.

7. A shortcut will be created on computer's desktop.



## 7. PC PROGRAM DESCRIPTION

Operation of the weighing module from PC computer level requires application "**MwManager"**. The application can operate in MS Windows environment with installed add-on **.NET framework 2.0**. The program enables calibrationg the module, displaying current mass indication, tarring, zeroing, setting filters and functions for corresponding inputs and outputs.

***Caution:***

1. *This manual complies with the software **"MwManager"** starting from version **1.0.2.1** and weighing module program **Prj215** from version **2.2**.*
2. *The entered values are accepted by pressing **Enter** key. The changes are saved in the weighing module on pressing **Save** key. All temporary parameters settings that are not saved in the weighing module are highlighte in red.*

### 7.1. Weighing window

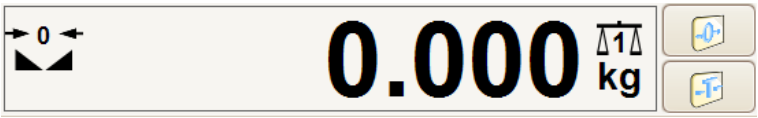



*Fig.8 View of the software's weighing window*

On completing initializating procedure, the weighing window displays below pictograms:




- precise zero indication
- stable measurement result
- weighing unit
- weighing platform number

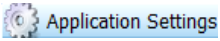
If the indication is other than zero – press the **zeroing** key.

**Function keys:**

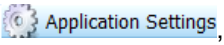
 - Zeroing

 - Taring

## 7.2. Application settings

Tab  comprises the settings for conneting the weighing module, choosing interface language version and other software options.

### 7.2.1. Connection settings

In tab ,  key opens a window for establishing connection with the weighing module.

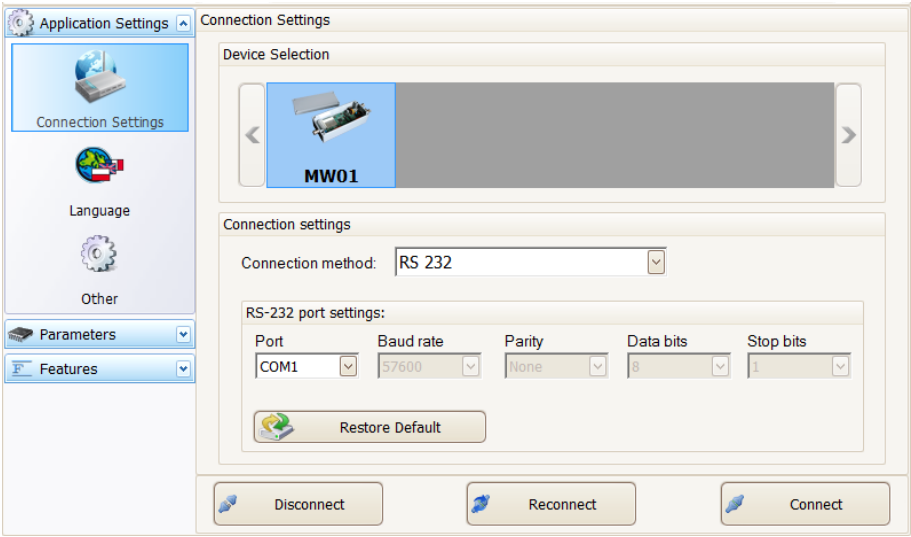



*Fig.9 Connection settings' window*

## Description:

| | |
|---|---|
| Means of connection | Interface for connecting to the weighing module |
| RS 232 | Connection via port RS232 |
| TCP/IP | Ethernet connection |
| RS 485 | RS 485 connection |
| Offline | The offline mode is used for saving and editing all indispensable parameters of the configuration file. |

**RS232:**

| | |
|---|---|
| Port | Choosing a COM port number to which the weighing module is plugged |
| Baud rate | Baud rate for the RS232 interface. **57600** bps by default |
| Parity | Parity bit parameter. “None” by default |
| Data bits | Number of data bits. 8 by default |
| Stop bits | Number of stop bits. 1 by default |

**TCP/IP:**

| | |
|---|---|
| Adres IP | IP address of the device, default setting **192.168.0.2** |
| Port | Port set in the weight module, default setting **4001.** |

## RS485:

| | |
|---|---|
| Port | Choosing a COM port number to which the weighing module is plugged |
| Baud rate | Baud rate for the RS485 interface. **57600** bps by default |
| Address | Weighing module address in the net |

### *Caution:*

1. *The default baud rate of RS232 and RS485 interfaces in the **MW-01** is set to **57600** bps;*
2. *If case of problems with establishing a connection to the weighing module, set and check accessible baud rates or connect through Ehternet interface;*
3. *If the display is set to port RS232, then connecting the computer software through the same port is impossible. Display operation on this port is restored on restarting the module (unplugging and repeated plugging to mains).*

**Keys description:**

| | |
|---|---|
| Disconnect | Communication disconnected |
| Reconnect | Switching off and on (communication restart) communication with the device |
| Connect | Establishing connection with the weighing module |

### 7.2.2. Language

Use tab Application Settings, and Language key to open a window enabling changing the language of the software.




*Fig.10 Language selection window*

On selecting the language version, press **"Apply"** key to save the changes.
Accessible language versions:

- Czech
- English
- French
- German
- Polish
- Spanish

### 7.2.3. Other

Use tab Application Settings, Other key to start other software options.




*Fig.11 Other options window*

Tick **"autostart"** option, so that on switching on the software automatically connects to the weighing module, by the default of last activated means of connection.

## 7.3. Parameters

Tab Parameters comprises all factory and user parameters, and also the communication parameters of the weighig module and functions of 2 inputs and 3 outputs.

### 7.3.1. User Parameters

Use tab Parameters, User parameters key to open a window with user parameters of the weoghing module. The parameters are visible and edittable for each software user.

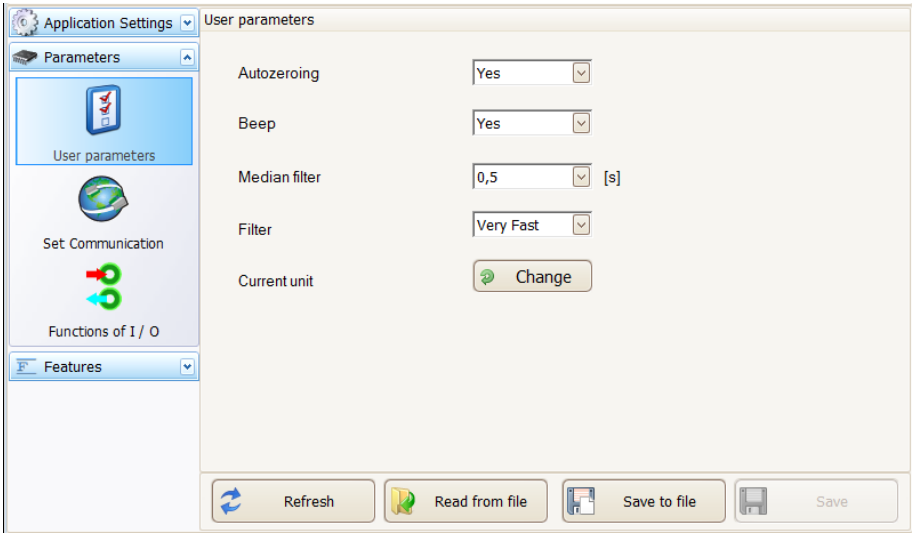



*Fig.12 User parameters window*

**List of user parameters:**

| | | |
|---|---|---|
| Autozeroing | - | tick to enable autozeroing |
| Beep | - | Sound signal |
| Median filter | - | tick to enable median filter |
| Filter | - | tick to enable averaging filter |
| Current unit | - | Toggling between weighing units in the weighing window |

### 7.3.2. Communication settings

Use tab Parameters, Set Communication key to open a window with communication parameters of the weighing module and configuration of peripheral devices. The parameters are visible and edittable to all software users, who establish cmmunication with the weighing module.

- **Ethernet**

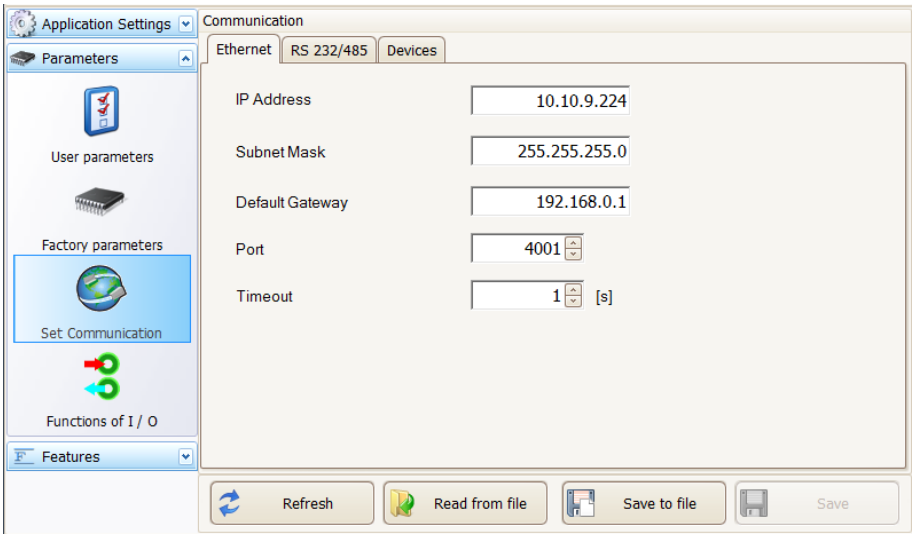



*Fig. 13 Communication parameters window for Ethernet*

**List of fields with description:**

| | | |
|---|---|---|
| IP address | - | Device's IP address, default **192.168.0.2** |
| Subnet mask | - | Ethernet subnet mask, default **255.255.255.0** |
| Default gate | - | Ethernet default gate, default **192.168.0.1** |
| Port | - | TCP communication port, default **4001.** |
| Timeout | - | Inactivity time in which the device breaks communication, expressed in seconds, range 0 – 300 [s]. |

- **RS 232/485**

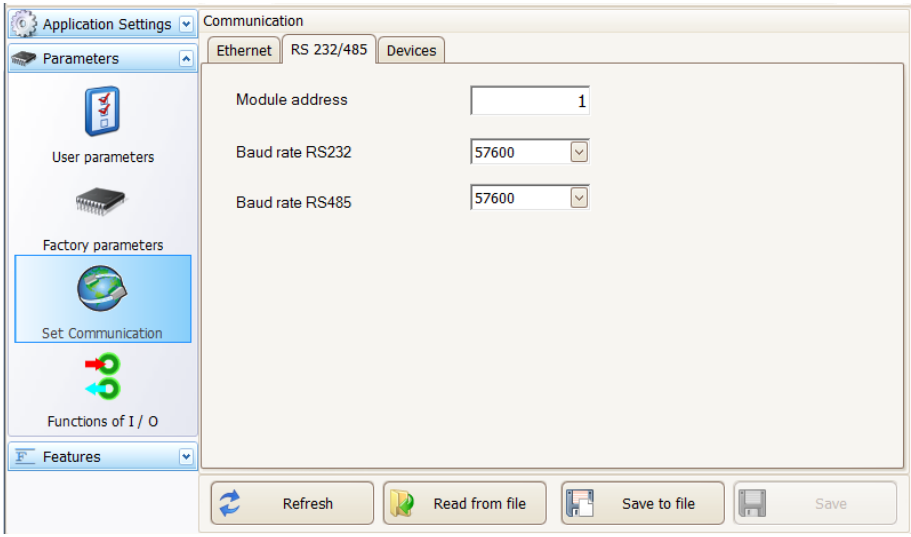



*Fig.14 RS 232/485 comunication parameters window*

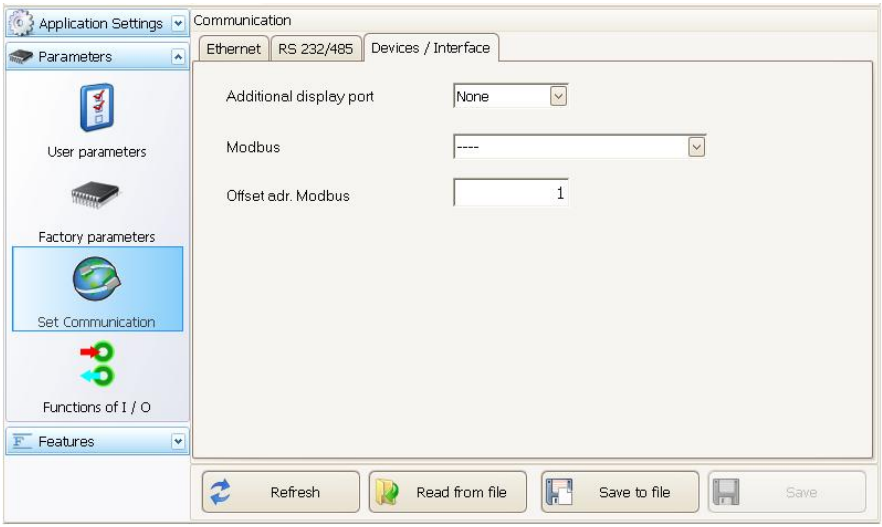
**List of fields with description:**

| | | |
|---|---|---|
| Module address | - | Weighuing module address in RS 485 network (the network requires setting different address for each of the devices), default set to 1. Available range from 1 to 254. |
| Baud rate RS232 | - | Baud rate setting for RS 232 communication interface. Default **57600** bps |
| Baud rate RS485 | - | Baud rate setting for RS 485 communication interface. Default **57600** bps |

***Caution:***
*Indicator series PUE7 and other devices may use the address for Ethernet connection (TCP/IP) and connection through RS232. In such case, set parameter „**Module address**" to default value **1** for MW-01 and in the settings of PUE7.*

On changing the communication parameters, save the settings and restart the weighing module (by unplugging and repeated plugging to mains), so that the inserted changes are effective. Remember, that the new parameters are inserted in the connection settings window with the weighing module.

- **Devices / Interface**




**List of fields with description:**

| | | |
|---|---|---|
| Additional display port | - | Interface setting for the additional display for the communication protocol of LCD display. |
| Modbus | - | Selecting Modbus protocol type and operating interface, |
| Offset adr. Modbus | - | Offsetting memory addressing for Modbus protocol,<br>Default value **1** for correct operation of PLC controller.<br>***Caution!*** In case of testing software ProfiModBusTester set the value to **0**. Available values **0** - **255**. |

### 7.3.3. Functions I/O

The weighing module features two inputs and three outputs.

Use tab Parameters, Functions of I / O key to open a window enabling software user to access configurating functions of the weighing module inputs and outputs.

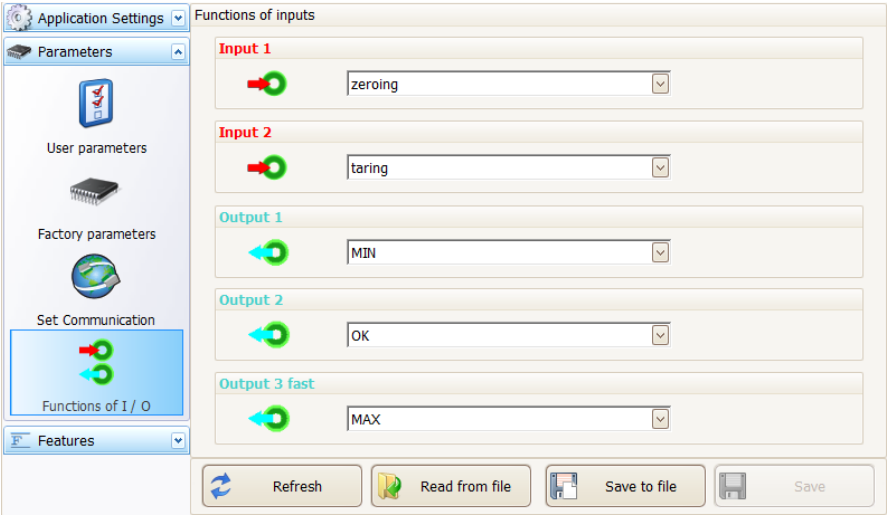



*Fig.15 I/O configuration window*

- **Inputs' configuration**

  Accessible input functions:

| | |
|---|---|
| **No** | Input inactive |
| **Tarring** | Platform tarring |
| **Zeroing** | Platform zeroing |
| **Start dosing** | Initiate batching process |
| **Stop dosing** | Stop batching process |

- **Outputs' configuration**

  Accessible output functions:

| | |
|---|---|
| **None** | Output inactive |
| **Stable** | Signalling stable weighing result over LO limit |
| **MIN stable** | Signalling stable weighing result over LO limit but below MIN limit |
| **MIN** | Signalling unstable weighing result over LO limit but below MIN limit |
| **OK stable** | Signalling stable weighing result between MIN and MAX limits |
| **OK** | Signalling unstable weighing result between MIN and MAX limits |

| | |
|---|---|
| **MAX stable** | Signalling stable weighing result over MAX limit |
| **MAX** | Signalling unstable weighing result over MAX limit |

***Notice:***
*If a function is assigned to a specific output and the same output is used for bulk or fine dosing then on batching start and continuation, the outputs will be activated compatibly to the dosing parameters. End of dosing process causes switching over the functions to outputs.*

## 7.4. Functions

Use tab Features to functions of dosing (batching), checkweighing, inputs and outputs status and simulation.

### 7.4.1. Dosing

Use tab Features, Dosage key to open a window enabling setup of dosing process.

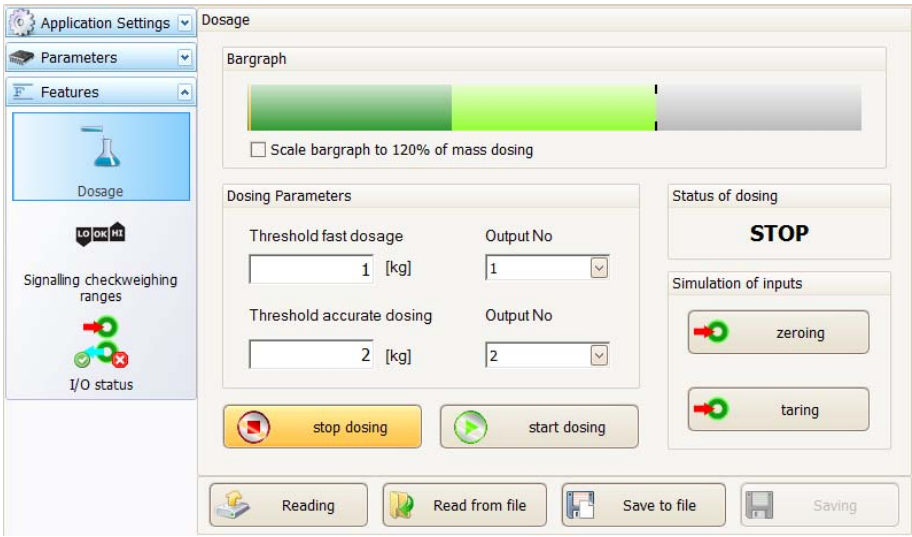



*Fig.16 Window of dosing parameters*

- **Bargraph**

  The dosing window features a graphic bar visualizing mass indication within the weighing range of the weighing module

  Ticking the additional option extends bar graph scaling to 120 % of the maximum dosing limit. If the fine dosing threshold is disabled, then the bar graph is scaled according to the bulk dosing criteria.

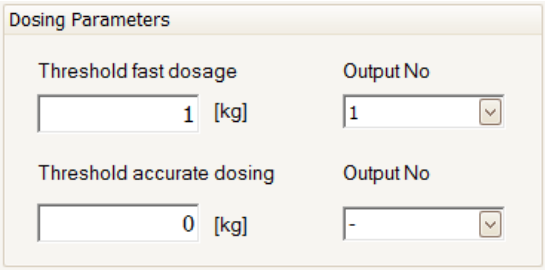



*Fig.17 Bar graph scaling for bulk dosing limit*

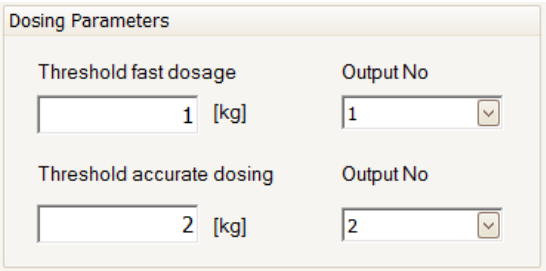



*Fig.18 Bar graph scaling for bulk and fine dosing limits*

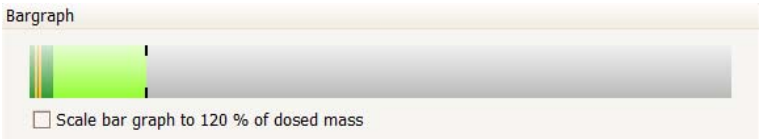



*Fig.19 Bar graph for low weight without scaling*

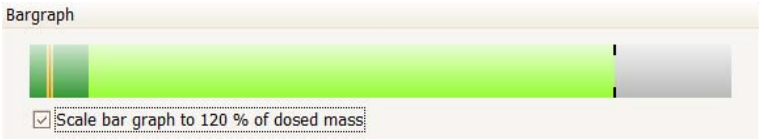



*Fig.20 The same bar graph with enabled scaling option*

- **Dosing parameters**

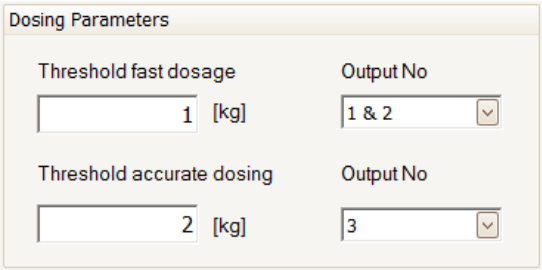



*Fig.21 Window for setting dosing parameters*

The dosing process can consist of one or two phases depending on the needs.

**List of fields with description:**

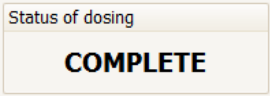
| | |
|---|---|
| **Bulk dosing limit** | Mass value for which the high state of selected outputs is set in the first dosing phase, |
| **Output No. for bulk dosing** | Selection of output or outputs numbers assigned to the first dosing phase, |
| **Fine dosing limit** | Mass value for which the high state of selected outputs is set in the second dosing phase, |
| **Output No. for fine dosing** | Selection of output or outputs numbers assigned to the second dosing phase, |

**Accessible outputs for specific dosing phase:**

| | |
|---|---|
| **1** | High state on the first reed relay output |
| **2** | High state on the second reed relay output |
| **3** | High state on the third transistor output |
| **1 & 2** | Activating the first and second reed relay output |
| **1 & 3** | Activating the first reed relay output and the third transistor output |
| **2 & 3** | Activating the second reed relay output and the third transistor output |
| **1 & 2 & 3** | High state for all outputs |
| **-** | Dosing switched off for specific limit |

- **Dosing status**

  The dosing status window displays the current status of dosing process

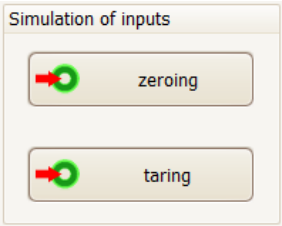



**Description:**

| | |
|---|---|
| **Dosing status** | Dosing process status:<br>DOSING – dosing in progress<br>DISCONTINUED – dosing terminated by pressing STOP key.<br>STOP – dosing stoppage,<br>COMPLETED – Dosing completed. |

- **Simulation of inputs' operation**

  Inputs simulation enables simulating the operation of a function assigned to a specific input. The first input corresponds to the upper key, and the bottom key simulates operation of a function assigned to the second input.



- **Dosing simulation**

  The lower part of the window comprises keys for starting and stopping dosing process independently on the functions assigned to the inputs. They enable starting and stopping the dosing process.




### 7.4.2. Checkweighing

Start option Features and press Signalling checkweighing ranges key to open a window enabling checkweighing setting.

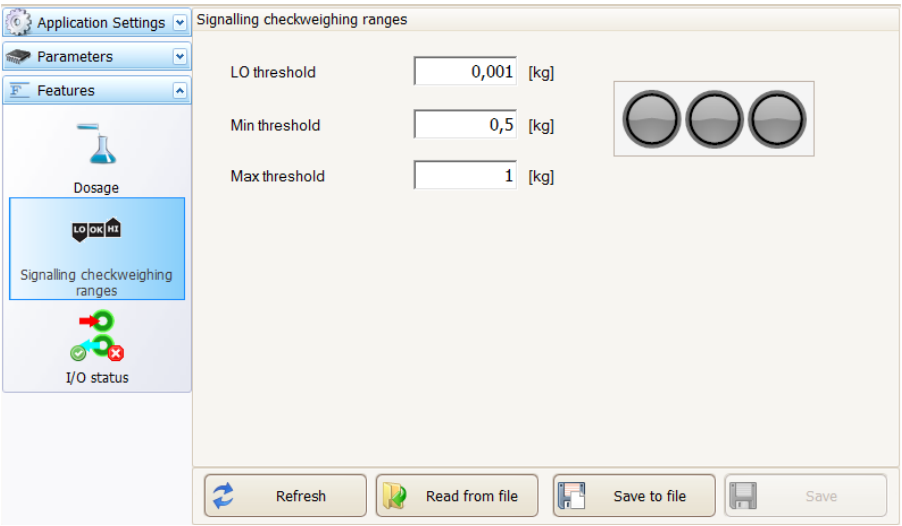



*Fig.22 Checkweighing settings window*

**List of fields with description:**

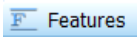
| | |
|---|---|
| **LO limit** | Output signals MIN, OK, MAX only if it is over (net) LO limit |
| **Min limit** | Net mass value below which the MIN limit is signalled, above OK |
| **Max limit** | Net mass value for which the OK limit is signalled, above MAX |

**Signalling function with limits:**

| | |
|---|---|
|  | **MIN** |
|  | **OK** |
|  | **MAX** |

***Caution:***
*The checkweighing signalization in the software is accessible on setting the functions to outputs.*

### 7.4.3. Input/output state

Start option 

and press 

key to open a window enabling setting the input and output signalling and setting output status.

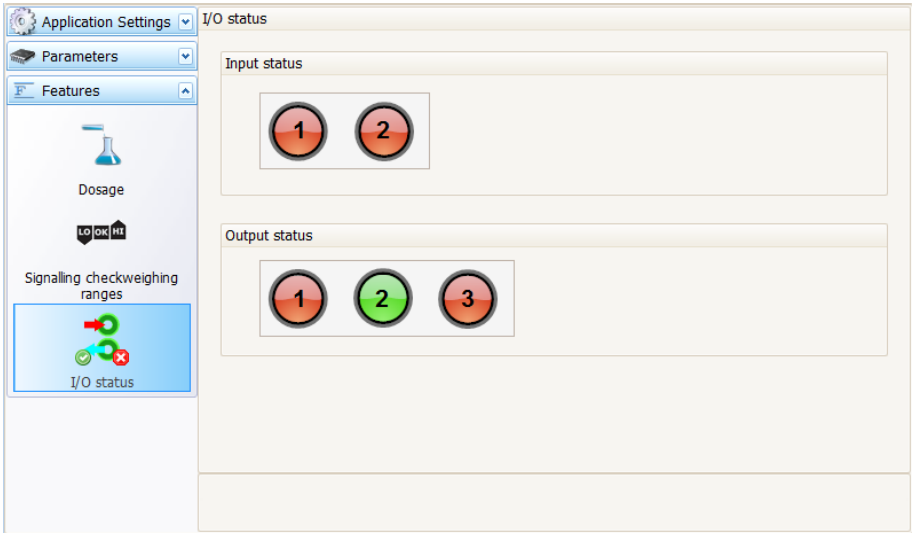



*Fig.23 Window of inputs and outputs status*

Software inputs and outputs are numbered according the weighing module documentation.

| | |
|---|---|
|  | Active input / output (high state) |
|  | Inactive input / output (low state) |

The simulation of output operation is possible on pressing the output number which is activated immediately, provided there is no function assigned to the output.

The simulation of inputs is accessible in the dosing window.

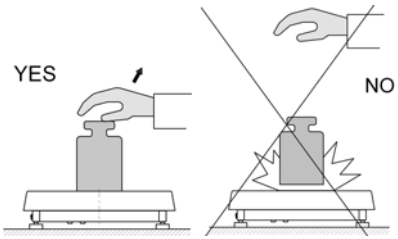
## 8. WEIGHING

Place weighed load on the weighing platform. As the stable measurement pictogram is displayed, read the measurement result.

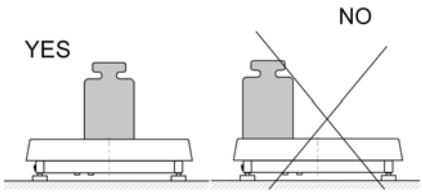
### 8.1. Terms of use

In order to ensure a long lasting operation and correct measuring of weighed loads it is advised to:

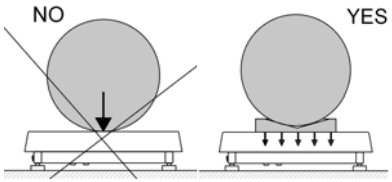
- Place the loads on the weighing platform gently and shocklessly:



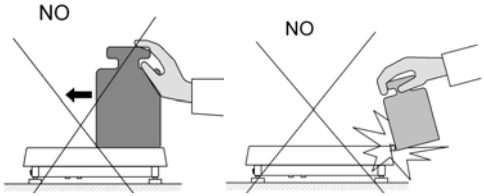

- Place the loads in the centre of the weighing platform (eccentric weighing errors are outlined in the norm PN-EN 45501 sections 3.5 and 3.6.2):




- Do not load the weighing platform with concentrated force:




- Avoid side loads and particularily side shocks:




## 8.2. Zeroing

In order to zero the mass indication in program **„MwManager”** press  key in the weighing window (the top right corner) or recall the zeroing function. The display should indicate mass equal to zero and pictograms: →0← and ◣◢ should be displayed.

Zeroing is equivalent to setting a new zero point comprehended by the scale as a precise zero. Zeroing is possible only for stable display status.

Zeroing can be carried out by pressing the external push-button connected to an input configured to zeroing function.

***Caution:***
*Zeroing display status can only be carried out within the* ***±2%*** *of the maximal scale capacity. If a zeroed indication is beyond the range* ***±2%*** *of maximal scale indication, the display indicates error message* ***Err2****.*

*The procedure of defining inputs - keys is described in section 6.3.3 of this manual.*

## 8.3. Tarring

In order to determine net weight place a container on the weighing platform and on indication staibilization press  key or recall the tarring function. The display should indicate mass equal to zero and pictograms: ***Net*** i ◣◢ should be displayed.

While using tarring function pay attention not to exceed the maximal measuring range of a scale. When taking the load and its packaging off the weighing platform the display indicates value that is a sum of tarred weigts preceded by minus sign.

Tarring can be carried out by pressing the external push-button connected to an input configured to tarring function

***Caution:***
*Tarring cannot be carried out if the scale display indicates zero or negative values. In such case the display indicates error message* ***Err3****.*

*The procedure of defining inputs - keys is described in section 6.3.3 of this manual.*

## 8.4. Weighing on dual range scales

Switching between the **1st range** and the **2nd range** takes place automatically, without operator's interference, at the point of reaching the Max of the **1st range**.

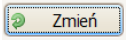
Weighing in **range II** is signalled by displaying pictogram →|2|← in the top left corner of the display. When unloading the weighing platform, the indication returns to zero. Weighing in the **2nd range** continuous until the indication returns to AUTOZERO zone.




*Fig. 24 Weighing window in the 2nd range*

When in AUTOZERO zone, the indication retirns to precise zero, which is signalled by pictogram →0← and pictogram of the **2nd range** →|2|← disappears from the display. Weighing returns automatically to the **1st range**.

## 8.5. Toggling between weight units

The weight unit can be changes in the main window of **"MwManager"** software by pressing  key.



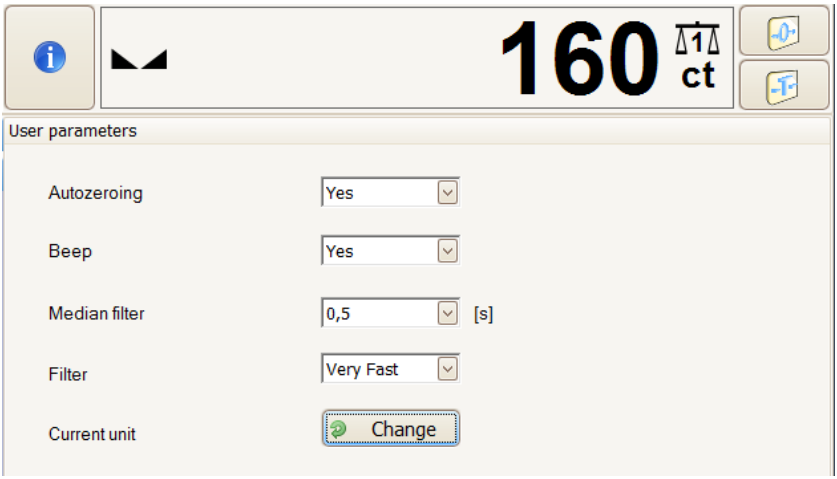


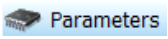

*Fig. 25 The main window with changed weighing unit*

**Selection options:**

- If the basic weighing unit [kg], the following units are accessible: [kg, lb, oz, ct, N, g]. F*or verifies scales, [lb, oz, N] are not accessible*;
- If the basic weighing unit is [g], the following units are accessible: [g, kg, lb, oz, ct, N] F*or verifies scales, [lb, oz, N] are not accessible.*

# 9. SCALE PARAMETERS

Users can adjust the scale to ambient conditions (filtering level) or user needs (autozero operation) and also determine the minimum weight limit for operation of some basic scale functions.

The parameters are accessible in tab 

> 

.

**List of scale parameters:**

- Autozero
- Median Filter
- Filter

## 9.1. Autozero function

In order to ensure precise scale indications the software “AUTOZERO” function has been introduced. It is designed to automatically control and correct scale’s zero indication.

When autozero function is enabled, the subsequent results are compared in constant time intervals. If two subsequent results differ less than the declared AUTOZERO range the scale automatically sets new zero point and pictograms of stability –  and zero state – → 0 ← are displayed.

If AUTOZERO is enabled, then each measurement always starts from the precise zero point. There are, however, cases in which the function may disturb measuring process. It is for instance while very slow loading the weighing platform (for instsance pouring a load). In such case the zero correcting set can correct the actual indication of load placed on the scale’s weighing platform.

**Procedure:**

- Enter the **User parameters** window by pressing 

key, choose parameter **<Autozeroing>** and set the appropriate value.

**Accessible settings:**

**NO** - autozero disabled
**YES** - autozero enabled

## 9.2. Median filter

The intended use of the median filtering is eliminating shortlasting interference of impulse character (e.g. mechanical shocks).

**Procedure:**

- Enter **User parameters** window by pressing 

key, choose parameter **<Median Filter>** and set its appropriate value.

**Accessible settings:**

**None** - median filter disabled
**0.5, 1, 1.5, 2, 2.5** - median filter enabled

## 9.3. Filter

The intended use of the averaging filter is adjustment to existing ambient conditions.

**Procedure:**

- Enter **User parameters** by pressing 

key, choose parameter **<Filter>** and set its appropriate value.

**Accessible settings:**

No, Very Fast, Fast, Average, Slow

***Caution:***
*The higher filtering level the longer stabilization time of measurement result.*

# 10. CHECKWEIGHING

Checkweighing is a function that aims at precise weighing a sample with pre-defined low anf high weighing limits (checkweighing thresholds (LO – sample mass too low, HI – sample mass too high, OK – sample mass correct).




Signalling checkweighing ranges

Such software solution is a very good means for quick mass value evaluation with no need for contiinuous monitoring the measurement result. The above mentioned weighing status (LO, OK, HI) have their graphic visualization presented on scale's display.

The status is also indicated by optical signalization or controlled by the set of external devices.



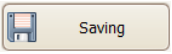

*Fig. 26 Illustration of intervals for checkweighing function*

***Caution:***
*The checkweighing configuration is described in section 7.4.2 of this manual.*

## 10.1. LO limit

Parameter **<LO limit>** determines the net weight indicated on the display which activates opertaion of outputs for status MIN, OK, MAX.

**Procedure:**

- Enter parameter **<LO limit>,** insert the value of **LO** limit and press **Enter** key. Save changes using 

key.

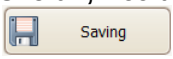
## 10.2. MIN/MAX limit

Parameter **<MIN limit>** in checkweighing determines the net weight limit for which the checkweighing status is switched between MIN and OK.

Parameter **<MAX limit >** in checkweighing determines the net weight limit for which the checkweighing status is switched between OK and MAX.

Output signalization is activated over the set net value of **LO LIMIT**.

**Procedure:**

- Enter parameter **<MIN threshold>** or **<MAX threshold>,** insert the limit value and press **Enter** key. Save changes using 

key.

## 11. DOSING

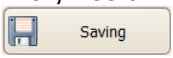
Dosing is a function enabling precise load measurement to a pre-defined target value.



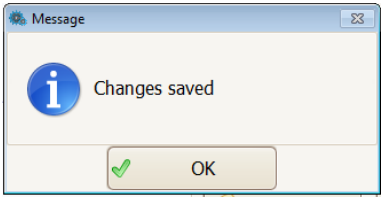

Parameter **<Bulk dosing limit>** determines in fast (bulk) dosing the value of net mass for which one or a few outputs are activated.

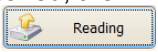
Parameter **<Fine dosing limit>** determines in slow (fine) dosing the value of net mass for which one or a few outputs are activated.

**Procedure:**

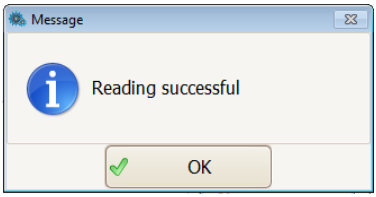
- Enter parameter **<Bulk dosing limit>** or **<Fine dosing limit>,** insert the limit value and press **Enter** key. Save changes using 

key.
- Changes are confirmed by a message box:




- If any changes in limits values are introduced and but not saved, then it is possible to preview the currently set limits by pressing 

key.
- The readout is confirmed by a message box:




***Caution:***
*The dosing function and its parameters are described in section 7.4.1 of this manual.*

## 12. PARAMETERS IN FILE

**“MwManager”** software features saving set parameters in a file format ***.sav**. The function can be utilized for saving weighing module settings in a backup copy, which is restorable in case of module defect or further utilization of the parameters while configuring larger number of weighing modules.

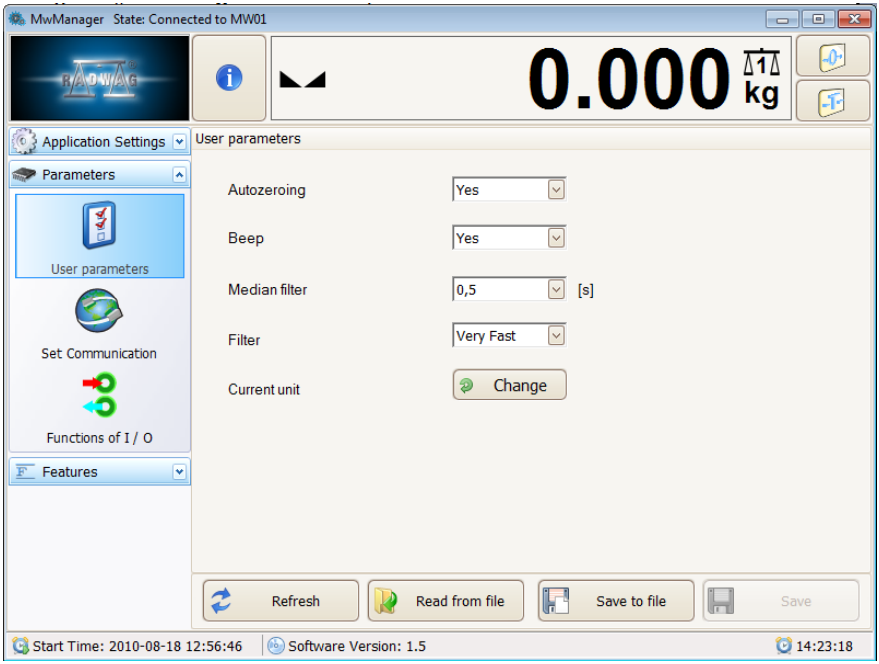


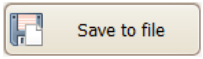

*Fig.27 An instance of a windpw with accessible option for saving and uploading a file*

**File format:**

MW01_(factory number)_YY-MM-DD_HH-MM.sav

## 12.1. Saving to file

**Procedure:**

- As the weighing module parameters are set, press 

key to save them in a file.
- Then, using system operation window browse for file saving directory, and press 

key.

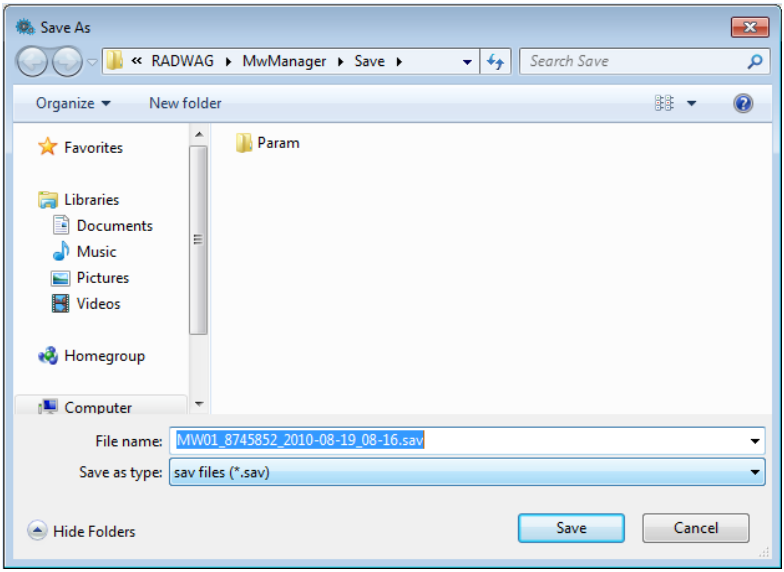
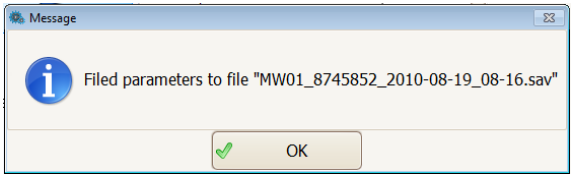



*Fig.28 System window "Save as"*

Default saving directory: **C:\Program Files\RADWAG\MwManager\Save**

- Correctly saved parameters cause displaying the below message box:




***Caution:***
*The system window look depends on installed OS version, and may differ fro mthe one visible in Fig.28.*

## 12.2. Uploading file data

**Procedure:**

- In order to upload parameters from a file, press Read from file key,
- Then, using system dialogue window, see fig. 29, select an earlier saved file, and press Open key

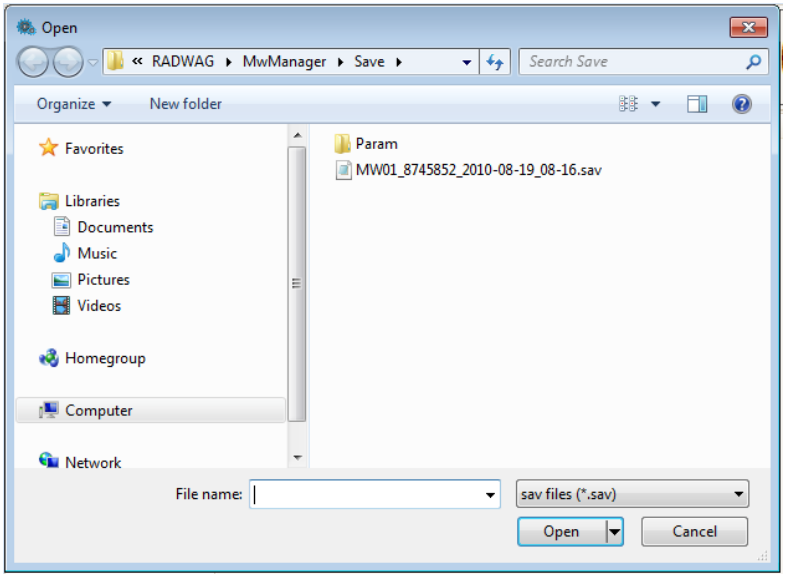



*Fig.29 System window „Open”*

- Next, using window for uploading groups of parameters select one or all parameters to be uploaded to the weighing module.

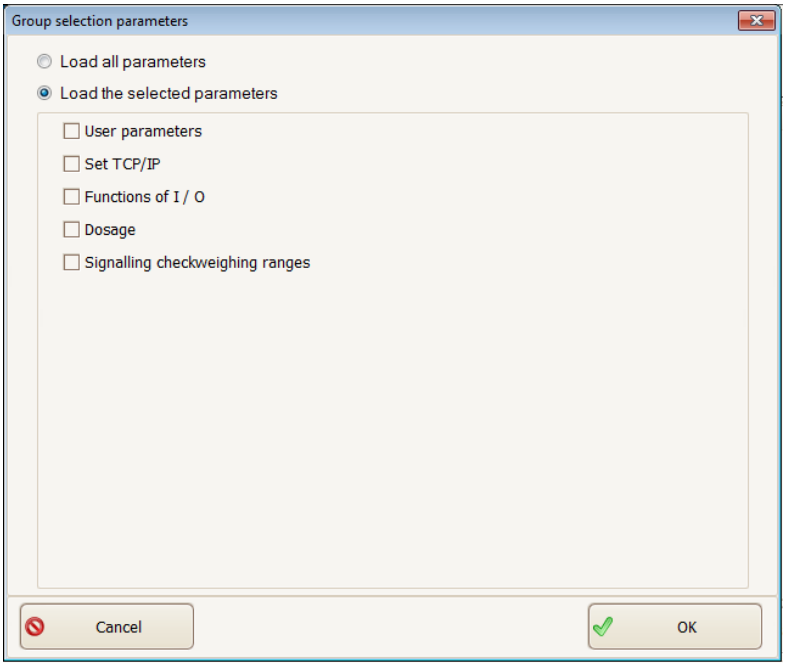
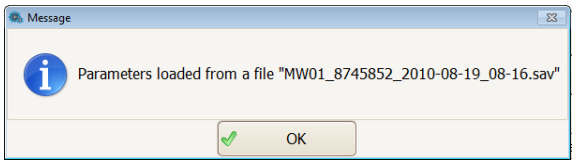



*Fig.30 Window for selecting groups of parameters*

The selected parameters are grouped according to their location in the main software menu.

- Parameters that are correctly uploaded are confirmed by the below message box:



## 13. OFFLINE MODE

The **Offline** mode enables starting different software options with no need to connect to a weighing module. This mode of connection is created to enable saving parameters without phsycial connecting to a weighing device.

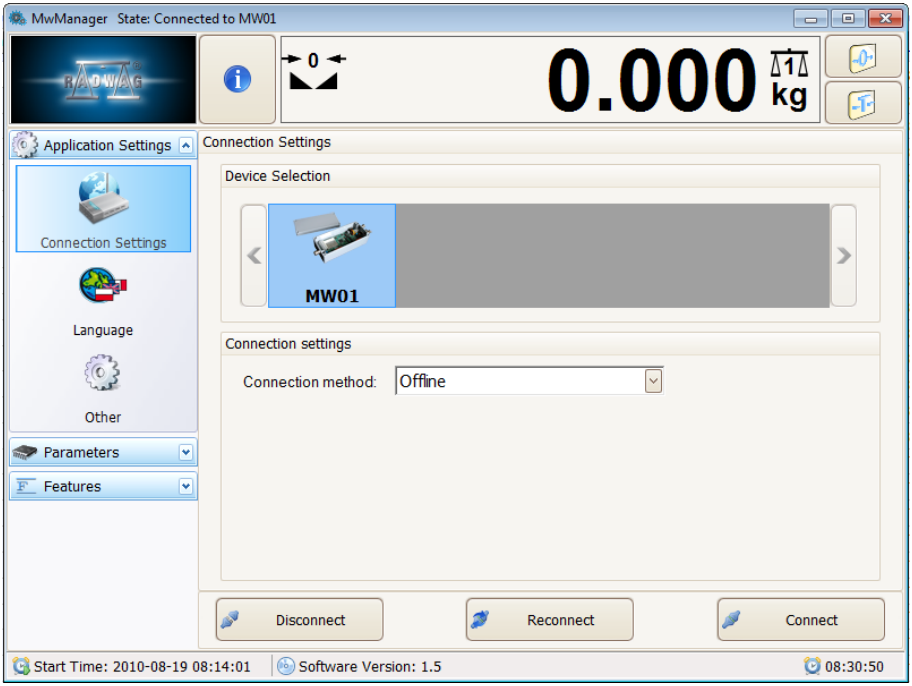



*Fig. 31. Window for starting Offline mode.*

**Procedure:**

- On software start, enter connection settings tab and in the connection settings options select **Offline**, and press 

key,
- The weighing window displays a communicate as presented in Fig. 31,
- Set parameters and save them into a file according to description in section 12.1 of this manual.

# 14. COMMUNICATION PROTOCOL

## 14.1. General information

A. Serial communication protocol "weighing module – terminal" is designed for establishing communication between a MW-01 weighing module and a peripheral device through interfaces: RS232, RS485, Ethernet;

B. The protocol consists of commands sent from a peripheral device to the weighing module, and responses sent inversely;

C. The responses are sent from the weighing module on each receipt of a command. Each response is a reaction for a specific command;

D. Commands which form serial communication protocol enable checking device's status, and trigger its reaction, e.g. obtaining measurement result from the weighing module, preview mass displaying window, etc.

## 14.2. A set of commands

| Commands | Description of commands |
|---|---|
| **Z** | Zeroing |
| **T** | Tarring |
| **OT** | Get tare value |
| **UT** | Set tare value |
| **S** | Send the stable result in basic unit |
| **SI** | Send the result immediately in basic unit |
| **SU** | Send the stable result in current unit |
| **SUI** | Send the result immediately in current unit |
| **C1** | Switch on continuous transmission in basic unit |
| **C0** | Switch off continuous transmission in basic unit |
| **CU1** | Switch on continuous transmission in current unit |
| **CU0** | Switch off continuous transmission in current unit |
| **DH** | Set lower threshold |
| **UH** | Set upper threshold |
| **ODH** | Read lower threshold |
| **OUH** | Read upper threshold |
| **PC** | Send all implemented commands |

***Notice:***

1. *Each command have to be terminated in CR LF;*
2. *The best Policy for communication is not sending another command until the former answer has been received.*

### 14.3. Respond message format

After sending a request message you can receive:

| | |
|---|---|
| **XX_A CR LF** | command accepted and in progress |
| **XX_D CR LF** | command completed (appears only after XX_A) |
| **XX_I CR LF** | command comprehended but cannot be executed |
| **XX _ ^ CR LF** | command comprehended but time overflow error appeared |
| **XX _ v CR LF** | command comprehended but the indication below the |
| **XX _ OK CR LF** | Command done |
| **ES_CR LF** | Command not comprehended |
| **XX _ E CR LF** | error while executing command – time limit for stable result exceeded (limit time is a descriptive parameter of the scale) |

**XX** - command name
**_** - substitutes spaces

### 14.4. Command's description

#### 14.4.1. Zeroing

Syntax **Z CR LF**

Possible answers:

**Z_A CR LF** - command accepted and in progress
**Z_D CR LF** - command completed

**Z_A CR LF** - command accepted and in progress
**Z_^ CR LF** - command comprehended but zero range overflow appeared

**Z_A CR LF** - command accepted and in progress
**Z_E CR LF** - time limit for stable result exceeded

**Z_I CR LF** - command comprehended but cannot be executed

### 14.4.2. Tarring

Syntax: **T CR LF**

Possible answers:

**T_A CR LF** - command accepted and in progress
**T_D CR LF** - command completed

**T_A CR LF** - command accepted and in progress
**T_v CR LF** - command comprehended but tare range overflow appeared

**T_A CR LF** - command accepted and in progress
**T_E CR LF** - time limit for stable result exceeded

**T_I CR LF** - command comprehended but cannot be executed

### 14.4.3. Get tare value

Syntax: **OT CR LF**

Reply: **OT_TARA CR LF** – command executed

**Frame format:**

| 1 | 2 | 3 | 4-12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| O | T | space | tare | space | unit | | | space | CR | LF |

**Tare** - 9 characters justified to the right
**Unit** - 3 characters justified to the left

***Notice:***
*Tare values are always send in calibration unit.*

### 14.4.4. Set tare value

Syntax: **UT_TARE CR LF**, where **TARE** – tare value

Possible replies:

**UT_OK CR LF** - command completed
**UT_I CR LF** - command correct, but not accessible at the moment
**ES CR LF** - command incorrect (e.g. incorrect tare format)

***Notice:***
*Use dots as decimal points in tare values.*

### 14.4.5. Send the stable result in basic unit

Syntax: **S CR LF**

Possible answers:

**S_A CR LF** - command accepted and in progress
**S_E CR LF** - time limit for stable result exceeded

**S_I CR LF** - command comprehended but cannot be executed

**S_A CR LF** - command accepted and in progress
**MASS FRAME** - mass value in basic unit is returned

**Frame format:**

| 1 | 2-3 | 4 | 5 | 6 | 7-15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S | space | stability | space | sign | mass | space | unit | | | CR | LF |

**Example:**

**S CR LF** – computer command
**S _ A CR LF** - command accepted and in progress
**S _ _ _ _ - _ _ _ _ _ _ 8 . 5 _ g _ _ CR LF** – command done, mass value in basic unit is returned.

### 14.4.6. Send the result immediately in basic unit

Syntax: **SI CR LF**

Possible answers:

**SI_I CR LF** - command comprehended but cannot be executed at the moment
**MASS FRAME** - mass value in basic unit is returned

**Frame format:**

| 1 | 2 | 3 | 4 | 5 | 6 | 7-15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | I | space | stability | space | sign | mass | space | unit | | | CR | LF |

**Example:**

**S I CR LF** – computer command
**S I _ ? _ _ _ _ _ _ _ 1 8 . 5 _ k g _ CR LF** - command done, mass value in basic unit is returned immediately.

### 14.4.7. Send the stable result in current unit

Syntax: **SU CR LF**

Possible answers:

**SU_A CR LF** - command accepted and in progress
**SU_E CR LF** - timeout while waiting for stable results

**SU_I CR LF** - command comprehended but cannot be executed

**SU_A CR LF** - command accepted and in progress
**MASS FRAME** - mass value in current unit is returned

**Frame format:**

| 1 | 2 | 3 | 4 | 5 | 6 | 7-15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | U | space | stability | space | sign | mass | space | unit | | | CR | LF |

**Example:**

**S U CR LF** – computer command
**S U _ A CR LF** - command accepted and in progress
**S U _ _ _ - _ _ 1 7 2 . 1 3 5 _ N _ _ CR LF** - command done, mass value in current unit is returned.

### 14.4.8. Send the result immediately in current unit

Syntax: **SUI CR LF**

Possible answers:

**SUI_I CR LF** - command comprehended but cannot be executed
**MASS FRAME** - mass value in current unit is returned immediately

**Frame format:**

| 1 | 2 | 3 | 4 | 5 | 6 | 7-15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | U | I | stability | space | sign | mass | space | unit | | | CR | LF |

**Example:**

**S U I CR LF** – computer command
**S U I ? _ - _ _ _ 5 8 . 2 3 7 _ k g _ CR LF** - command executed and mass returned

### 14.4.9. Switch on continuous transmission in basic unit

Syntax: **C1 CR LF**

Possible answers:

**C1_I CR LF** - command comprehended but cannot be executed

**C1_A CR LF** - command comprehended and in progress
**MASS FRAME** - mass value in basic unit is returned

**Frame format:**

| 1 | 2 | 3 | 4 | 5 | 6 | 7-15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | I | space | stability | space | sign | mass | space | unit | | | CR | LF |

### 14.4.10. Switch off continuous transmission in basic unit

Syntax: **C0 CR LF**

Possible answers:

**C0_I CR LF** - command comprehended but cannot be executed

**C0_A CR LF** - command comprehended and executed

### 14.4.11. Switch on continuous transmission in current unit

Syntax: **CU1 CR LF**

Possible answers:

**CU1_I CR LF** - command comprehended but cannot be executed

**CU1_A CR LF** - command comprehended and in progress

**MASS FRAME** - mass value in current unit is returned

**Frame format:**

| 1 | 2 | 3 | 4 | 5 | 6 | 7-15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | U | I | stability | space | sign | mass | space | unit | | | CR | LF |

### 14.4.12. Switch off continuous transmission in current unit

Syntax: **CU0 CR LF**

Possible answers:

**CU0_I CR LF** - command comprehended but cannot be executed

**CU0_A CR LF** - command comprehended and executed

### 14.4.13. Set lower threshold

Syntax: **DH_XXXXX CR LF**, where: **XXXXX** – mass format

Possible answers:

**DH_OK CR LF** - command executed

**ES CR LF** - command not comprehended (wrong mass format)

### 14.4.14. Set upper threshold

Syntax: **UH_XXXXX CR LF**, where: **XXXXX** – mass format

Possible answers:

**UH_OK CR LF** - command executed

**ES CR LF** - command not comprehended (wrong mass format)

### 14.4.15. Read lower threshold

Syntax: **ODH CR LF**

Possible answers: **DH_MASA CR LF** - command executed

**Frame format:**

| 1 | 2 | 3 | 4-12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| D | H | space | mass | space | unit | | | space | CR | LF |

**Mass** - 9 characters justified to the right
**Unit** - 3 characters justified to the left

### 14.4.16. Read upper threshold

Syntax: **OUH CR LF**

Possible answers: **UH_MASA CR LF** - command executed

**Frame format:**

| 1 | 2 | 3 | 4-12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| U | H | space | mass | space | unit | | | space | CR | LF |

**Mass** - 9 characters justified to the right
**Unit** - 3 characters justified to the left

### 14.4.17. Send all implemented commands

Syntax: **PC CR LF**

Possible answers:

**PC_A_"Z,T,S,SI,SIA,SU,SUI,C1,C0,CU1,CU0,DH,ODH,UH,OUH,OT,UT, PC"** – command executed, the weighing module has sent all the implemented commands.

# 15. COMUNICATION MODULE PROFIBUS

## 15.1. General information

Communication module Profibus ensures exchanging data between a superordinate controlling unit (master) and a weighing module MW-01 (slave) in accordance with protocol Profibus DP.

The superordinate unit (master):

- cyclically reads inputs signals fro mthe weighing module MW-01,
- cyclically saves outputs status to the weighing module MW-01.

Functions of Profibus communication with the weighing module MW-01:

- Mass readout from the weighing module
- Tarring the weighing module
- Zeroing the weighing module
- Reading module's status
- Reading current measuring unit
- Setting and reading tare value
- Setting and reading **LO** threshold value
- START / STOP of dosing process
- Setting and reading the value of bulk (fast) dosing threshold
- Setting and reading the value of fine (slow) dosing threshold
- Setting outputs status
- Reading the status of dosing process
- Reading inputs status
- Setting and reading **Min** threshold value
- Setting and reading **Max** threshold value

## 15.2. Setting instrument's address in a Profibus network

The address of the weighing module MW-01 in Profibus network has to be set in accordance with module addressing specification. (See point 7.3.2 of this user manual – „Communication settings"). Field ***module address*** is used to set corresponding address of the device in Profibus network.

## 15.3. Memory map

### 15.3.1. Output address

| Address / Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | M | M | M | M | T | T | T | T | J | J |
| **1** | S | S | LO | LO | LO | LO | - | - | - | - |
| **2** | - | - | - | - | - | - | - | - | - | - |
| **3** | - | - | - | - | - | - | - | - | - | - |
| **4** | - | - | - | - | - | - | - | - | - | - |
| **5** | - | - | - | - | - | - | - | - | - | - |
| **6** | - | - | - | - | ST | ST | SW | SW | MIN | MIN |
| **7** | MIN | MIN | MAX | MAX | MAX | MAX | DS | DS | DS | DS |
| **8** | DW | DW | DW | DW | - | - | - | - | - | - |
| **9** | - | - | - | - | - | - | - | - | - | - |

*Table. 1*

**M** - Mass for a platform, 4 bytes, float
**T** - Tare for a platform, 4 bytes, float
**J** - Current measuring unit of a platform, 2 bytes, word
**S** - Platform status, 2 bytes, word
**LO** - Lo threshold of a platform, 4 bytes, float
**ST** - Process status, 2 bytes, word
**SW** - Inputs status, 2 bytes, word
**MIN** - MIN threshold, 4 bytes, float
**MAX** - MAX threshold, 4 bytes, float
**DS** - Bulk (fast) dosing threshold, 4 bytes, float
**DW** - Fine (slow) dosing threshold, 4 bytes, float

### 15.3.2. Input address

| Address / Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | C | C | CP | CP | - | - | T | T | T | T |
| **1** | LO | LO | LO | LO | SW | SW | MIN | MIN | MIN | MIN |
| **2** | MAX | MAX | MAX | MAX | DS | DS | DS | DS | DW | DW |
| **3** | DW | DW | - | - | - | - | - | - | - | - |
| **4** | - | - | - | - | - | - | - | - | - | - |

*Table. 2*

**C** - command, 2 bytes, word
**CP** - command with a parameter, 2 bytes, word
**T** - Tare for a platform, 4 bytes, float
**LO** - Lo threshold of a platform, 4 bytes, float
**SW** - Outputs status, 2 bytes, word
**MIN** - MIN threshold, 4 bytes, float
**MAX** - MAX threshold, 4 bytes, float
**DS** - Bulk (fast) dosing threshold, 4 bytes, float
**DW** - Fine (slow) dosing threshold, 4 bytes, float

## 15.4. Description of variables

### 15.4.1. Output variables

Readout of output variables enables obtaining data on instrument's status.

***Notice:***
*All output values, except for mass, are displayed in adjustment/calibration unit.*

| Name of output variable | address | length [word] | data type |
|---|---|---|---|
| mass | 0 | 2 | float |
| tare | 4 | 2 | float |
| unit | 8 | 1 | word |
| status | 10 | 1 | word |

| | | | |
|---|---|---|---|
| LO | 12 | 2 | float |
| process status | 64 | 1 | word |
| input status | 66 | 1 | word |
| MIN | 68 | 2 | float |
| MAX | 72 | 2 | float |
| bulk (fast) dosing threshold | 76 | 2 | float |
| fine (slow) dosing threshold | 80 | 2 | float |

*Table. 3*

- **mass** – mass value in current unit is returned,
- **tare** – tare value in calibration/adjustment unit is returned,
- **unit** – determines current (displayed) measuring unit:

| Unit / Byte no. | | B5 | B4 | B3 | B2 | B1 | B0 | Dec |
|---|---|---|---|---|---|---|---|---|
| g | gram | 0 | 0 | 0 | 0 | **1** | 0 | 1 |
| kg | kilogram | 0 | 0 | 0 | 0 | 0 | **1** | **2** |
| ct | carat | 0 | 0 | 0 | **1** | 0 | 0 | 4 |
| lb | pound | 0 | 0 | **1** | 0 | 0 | 0 | 8 |
| oz | ounce | 0 | **1** | 0 | 0 | 0 | 0 | 16 |
| N | Newton | **1** | 0 | 0 | 0 | 0 | 0 | 32 |

- **status** – determines scale's status

| Status bytes | Task | Dec |
|---|---|---|
| 0 | correct measurement (no error message from scale) | 1 |
| 1 | stable measurement | 2 |
| 2 | scale in zero indication | 4 |
| 3 | scale tarred | 8 |
| 4 | scale in second measuring range | 16 |
| 5 | scale in third measuring range | 32 |
| 6 | scale reports NULL error | 64 |
| 7 | scale reports LH error | 128 |
| 8 | scale reports FULL error | 256 |

**For instance:**

| byte no. | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
|---|---|---|---|---|---|---|---|---|---|
| value | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |

The scale does not report an error, the measurement is stable in the second measuring range.

- **LO** – the value of **LO** threshold in calibration/adjustment unit is returned.
- **Process status** – determines the status of dosing process

| Decimal value of a variable (Dec) | process status | byte no. | |
|---|---|---|---|
| | | B1 | B0 |
| **0** | process disabled (inactive) | 0 | 0 |
| **1** | dosing start | 0 | 1 |
| **2** | dosing stop | 1 | 0 |
| **3** | end of dosing process | 1 | 1 |

- **Inputs status** – determines the status of inputs in a weighing module MW-01:

| input status | | byte no. | | Decimal value of a variable (Dec) |
|---|---|---|---|---|
| In2 | In1 | B1 | B0 | |
| OFF | OFF | 0 | 0 | 0 |
| OFF | ON | 0 | 1 | 1 |
| ON | OFF | 1 | 0 | 2 |
| ON | ON | 1 | 1 | 3 |

- **MIN** – set value of **MIN Threshold** (in calibration/adjustment unit) is returned.
- **MAX** – set value of **MAX Threshold** (in calibration/adjustment unit) is returned.
- **Bulk (fast) dosing threshold** – set value of bulk (fast) dosing threshold (in calibration/adjustment unit) is returned.
- **Bulk (slow) dosing threshold** – set value if fine (slow) dosing threshold (in calibration/adjustment unit) is returned.

### 15.4.2. Input variables

Saving the input variables into the weighing module MW-01 enables controlling module's operation.

***Notice:***
*All input values are set in reation to calibration/adjustment unit.*

| Name of input variable | address | length [word] | data type |
|---|---|---|---|
| command | 0 | 1 | word |
| complex command | 2 | 1 | word |
| **Complex command parameters** | | | |
| tare | 6 | 2 | float |
| LO | 10 | 2 | float |
| output status | 14 | 1 | word |
| MIN | 16 | 2 | float |
| MAX | 20 | 2 | float |
| bulk (fast) dosing threshold | 24 | 2 | float |
| fine (slow) dosing threshold | 28 | 2 | float |

*Table. 4*

- **command** – basic command. Setting of an appropriate command's byte is directly responsible for carrying out a task, in accordance with below table:

| command bytes | task | Dec |
|---|---|---|
| 0 | scale zeroing | 1 |
| 1 | scale tarring | 2 |
| 5 | dosing process start | 32 |
| 6 | dosing process stop | 64 |

**For instance:**

**0000 0000  0010 0000** – command carried out, dosing process start

- **complex command** - Setting of an appropriate command's byte is directly responsible for carrying out a task, in accordance with below table:

| command bytes | task | Dec |
|---|---|---|
| 0 | setting tare value | 1 |
| 1 | setting **LO** threshold value | 2 |
| 2 | setting outputs status | 4 |
| 3 | setting **MIN threshold** value | 8 |
| 4 | setting **MAX threshold** value | 16 |
| 5 | setting the value of bulk (fast) dosing threshold | 32 |
| 6 | setting the value of fine (slow) dosing threshold | 64 |

**For instance:**

**0000 0000  0000 0010** – command carried out, LO threshold set to value given in LO parameter (address 10); See *Table 4*.

***Notice:***
*A complex command requires setting an appropriate address parameter from 6 to 28. See Table.4.*

- **tare** – complex command parameter – tare value (in calibration / adjustment unit).
- **LO** – complex command parameter – **LO** threshold value (in calibration / adjustment unit).
- **outputs status** – complex command parameter determining outputs status of the weighing module MW-01.

| Output status | | | byte no. | | | Dec |
|---|---|---|---|---|---|---|
| **Out3** | **Out2** | **Out1** | **B2** | **B1** | **B0** | |
| OFF | OFF | OFF | 0 | 0 | 0 | 0 |
| OFF | OFF | ON | 0 | 0 | 1 | 1 |
| OFF | ON | OFF | 0 | 1 | 0 | 2 |
| OFF | ON | ON | 0 | 1 | 1 | 3 |
| ON | OFF | OFF | 1 | 0 | 0 | 4 |
| ON | OFF | ON | 1 | 0 | 1 | 5 |
| ON | ON | OFF | 1 | 1 | 0 | 6 |
| ON | ON | ON | 1 | 1 | 1 | 7 |

- **MIN** - complex command parameter – **MIN threshold** value (in calibration / adjustment unit).

- **MAX** - complex command parameter – **MAX threshold** value (in calibration / adjustment unit).

- **bulk (fast) dosing threshold** – complex command parameter – the value of bulk (fast) dosing threshold (in calibration / adjustment unit).

- **fine (slow) dosing threshold** – complex command parameter – the value of fine (slow) dosing threshold (in calibration / adjustment unit).

***Notice:***
*A command or a command with parameter is executed once on detecting its corresponding byte setting. Should a command with the same byte be re-executed, the byte must be reseted.*

***For instance:***

| command | address 1 | address 0 |
|---|---|---|
| tarring | 0000 0000 | 0000 0010 |
| zeroing command bytes | 0000 0000 | 0000 0000 |
| tarring | 0000 0000 | 0000 0010 |

## 16. MODBUS COMMUNICATION PROTOCOL

### 16.1. Basic information

The weighing module MW-01 enables complete operation of programmable controllers (PLC), which communicate through Modbus protocol class 0. The weighing module in a network using modbus standard operates as slave on an accessible interfaces, ***RS485*** or ***Ethernet***. According to the standard, Modbus class 0, the device uses two functions:

- Read multiple registers (fc 3), for cyclic readout of signals from the weighing module,
- Write multiple registers (fc 16), for cyclic record of the weighing module statuses.

The weighing module MW-01 can operate in one of three modes:

- RS484 - RTU (device interface RS485, frame RTU),
- TCP/IP - RTU (device interface Ethernet, frame RTU),
- TCP/IP - Open ModBus (device interface Ethernet, frame Open Modbus).

The functionalitz of Modbus protocol is based on a scheme used in Profibus protocol, as described in point 15.3 and 15.4 of this user manual.

***Caution:***
*Modbus address offset in the module that cooperates with PLC controller is set to value **1,** i.e. deafult setting. In case of a weighing module cooperating with a test computer software, set the value to **0**.*

### 16.2. Addressing a device in ModBus network

Address of the weighing module MW-01 in modbus netowrk has to be set in accordance to module addressing specification. (see point 7.3.2 of this user manual – „Communication settings"). Use tab ***RS232/485,*** field ***module address*** to set address of a device appropriate for the Modbus network.

The default ***port*** of the Ethernet interface (TCP/IP) in Modbus network is set to 502.

### 16.3. Register tables in ModBus network

Numbers on the output and input register tables are described below, and they are compatible with the ***Offset of Modbus address*** set for value **0**. In case of a value setting from 0 do 255, add the set value of ***Offset of Modbus address*** to the output or input register number.

### 16.3.1. Table of output registers

The weighing module uses 42 addresses for function *Read* ***Holding Registers*** as listed in below table.

| Name of output variable | address | Length [words | Data type | Read Holding Registers |
|---|---|---|---|---|
| Mass | 0 | 2 | float | 0 |
| | | | | 1 |
| Tare | 4 | 2 | float | 2 |
| | | | | 3 |
| Unit | 8 | 1 | word | 4 |
| Status | 10 | 1 | word | 5 |
| Lo | 12 | 2 | float | 6 |
| | | | | 7 |
| *N. A.* | 16 | 2 | float | 8 |
| | | | | 9 |
| *N. A.* | 20 | 2 | float | 10 |
| | | | | 11 |
| *N. A.* | 24 | 1 | word | 12 |
| *N. A.* | 26 | 1 | word | 13 |
| *N. A.* | 28 | 2 | float | 14 |
| | | | | 15 |
| *N. A.* | 32 | 2 | float | 16 |
| | | | | 17 |
| *N. A.* | 36 | 2 | float | 18 |
| | | | | 19 |
| *N. A.* | 40 | 1 | word | 20 |
| *N. A.* | 42 | 1 | word | 21 |
| *N. A.* | 44 | 2 | float | 22 |
| | | | | 23 |
| *N. A.* | 48 | 2 | float | 24 |
| | | | | 25 |
| *N. A.* | 52 | 2 | float | 26 |
| | | | | 27 |
| *N. A.* | 56 | 1 | word | 28 |
| *N. A.* | 58 | 1 | word | 29 |
| *N. A.* | 60 | 2 | float | 30 |
| | | | | 31 |
| Process status (Stop, Start) | 64 | 1 | word | 32 |
| Inputs status | 66 | 1 | word | 33 |
| Low threshold value | 68 | 2 | float | 34 |
| | | | | 35 |
| High threshold value | 72 | 2 | float | 36 |
| | | | | 37 |
| Bulk (fast) dosing threshold value | 76 | 2 | float | 38 |
| | | | | 39 |
| Fine (slow) dosing threshold value | 80 | 2 | float | 40 |
| | | | | 41 |

N. A. – Register inactive.

### 16.3.2. Table of input registers

The weighing module uses 16 addresses for function *Write* ***Multiple Registers*** as listed in below table.

| Name of input variable | address | Length [word] | Data type | Write Multipe Registers |
|---|---|---|---|---|
| Command | 0 | 1 | word | 0 |
| Command with parameter | 2 | 1 | word | 1 |
| *N. A.* | 4 | 1 | word | 2 |
| tare | 6 | 2 | float | 3 |
| | | | | 4 |
| Lo | 10 | 2 | float | 5 |
| | | | | 6 |
| Outputs status | 14 | 1 | word | 7 |
| MIN | 16 | 2 | float | 8 |
| | | | | 9 |
| MAX | 20 | 2 | float | 10 |
| | | | | 11 |
| Bulk (fast) dosing threshold | 24 | 2 | float | 12 |
| | | | | 13 |
| Fine (slow) dosing threshold | 28 | 2 | float | 14 |
| | | | | 15 |

N. A. - Register inactive.

### 16.4. Software for controller PLC SIEMENS S7-300

Description of software Siemens S7-300.
The software enables communicating of the weighing module MW-01 with the Siemiens S7-300 controller through Open Modbus TCP protocol.
The software is designed for below hardware specification.
Unit CUP: S7-313 2DP (6ES7 313-6CE00-0AB0 /V1.0)
Communication processor: CP 343-1 (6GK7 343-1EX10-0XE0 / V2.0)

Minimum software requirements:
Programming environment: STEP 7 V5.4 + SP3
Additional libraries: SIEMENS OPEN MODBUS TCP

**Description:**
Exchanging data with a weighing module MW01 is carried out through data block **DB1** of the following structure.

| Name | Type | Description |
|---|---|---|
| **Data acquired from the MW01 weighing module when a flag is set to Read_Write = FALSE** | | |
| Mass | REAL | Mass from the weighing module |
| Tare | REAL | Tare value from the weighing module |
| Unit | WORD | Measuring unit from the weighing module |
| Status | WORD | Weighing status from the weighing module |
| LO | REAL | LO threshold the weighing module |
| **Data saved to the MW01 weighing module when a flag is is set to Read_Write = TRUE** | | |
| CMD | WORD | Command without a parameter sent to the module |
| CMD_PARAM | WORD | Command with a parameter sent to the module |
| RESERVED | WORD | N/A |
| Tara1 | REAL | Tare value for a command with a parameter |
| LO1 | REAL | Value of LO threshold with a parameter |
| OutPutsState | WORD | Output status for a command with a parameter |
| MIN | REAL | Min value for for a command with a parameter |
| MAX | REAL | Max value for a command with a parameter |
| FastDosing | REAL | Value of bulk (fast) dosing threshold for a command with a parameter |
| SlowDosing | REAL | Value of fine (slow) dosing threshold for a command with a parameter |
| Read_Write | BOOL | Flag for switching between date readout and record |

## 17. ERROR MESSAGES

| | | |
|---|---|---|
| **Err2** | - | Value beyond zero range |
| **Err3** | - | Value beyond tare range |
| **Err8** | - | Exceeded time of tarring / zeroing operation |
| **NULL** | - | Zero value from A/D converter |
| **FULL** | - | Measuring range exceeded |
| **HI** | - | Display range exceeded |
| **LH** | - | Start mass error, indication out of range (from -5% to +15% of start mass) |

**BALANCES AND SCALES**

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