DewesoftX® Modbus Server (TCP/IP) Module

SOFTWARE USER MANUAL

DewesoftX® Modbus Server (TCP/IP) Module V23-1

1. Table of contents

2. About this document

2.1. Legend

The following symbols and formats will be used throughout the document.

Important
It gives you important information about the subject.
Please read carefully!

Hint
It gives you a hint or provides additional information about a subject.

Example
Gives you an example of a specific subject.

2.2. Terms

Bit
Bit is the generic term for a Discrete Input or Coil: since these data items only store a single Bit (i.e. they only have 2 states: ON or OFF)

Data Item
Data Item is the generic term for a Discrete Input, Coil, Input Register or Holding Register

PDU
The MODBUS protocol defines a simple protocol data unit (PDU) independent of the underlying communication layers.
In a MODBUS PDU each data is addressed from 0 to 65535.

Register
A Modbus Register consists of 2 Bytes (=16 Bits); aka. one Word

2.3. Modbus Server vs. Modbus Client Module

This section describes the differences between the two Dewesoft's Modules Modbus Server (this Module) and Modbus Client:

	Modbus Server (THIS Module)	Modbus Client
Modbus Role	Server	Client
TCP/IP Role	TCP/IP Server	TCP/IP Client
Data Direction	Remote devices can send commands to the DewesoftX® Modbus Server Module to read the current data from DewesoftX® channels	The Dewesoft's Modbus Client Module will send commands to remote Modbus Server devices to read the data from their Modbus registers and will write this data to Dewesoft's channels. The Modbus Client have also the option to read to certain channels from Modbus Server.

Hint

Since both DewesoftX® Modules use the same protocol you could even use them together: e.g. Use the Modbus Server Module on a remote DewesoftX® system (e.g. on an R8DB) and read the data of those channels via the Modbus Client Module (on another DewesoftX® instance: e.g. a computer in your office).

Note: This setup will work, but there are better and more convenient ways to establish remote connections between DewesoftX® instances: usually you would use the Dewesoft NET option. See also: chapter Export to Modbus Client.

2.4. Links

- DewesoftX® download section to download Modules
  http://www.dewesoft.com/download
- The Modbus Module development is based on the following official documents of the Modbus Organization:
  - MODBUS Protocol Specification V1.1b
    http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b.pdf
  - MODBUS TCP/IP
    http://www.modbus.org/docs/Modbus_Messaging_Implementation_Guide_V1_0b.pdf

2.5. Protocol Support

The Modbus Module supports 'Modbus over TCP/IP'.

2.5.1. Supported Function Codes

The Module currently supports these Modbus Function Codes:

- $01 Read Coils
- $02 Read Discrete Inputs
- $03 Read Input Registers
- $04 Read Holding Registers

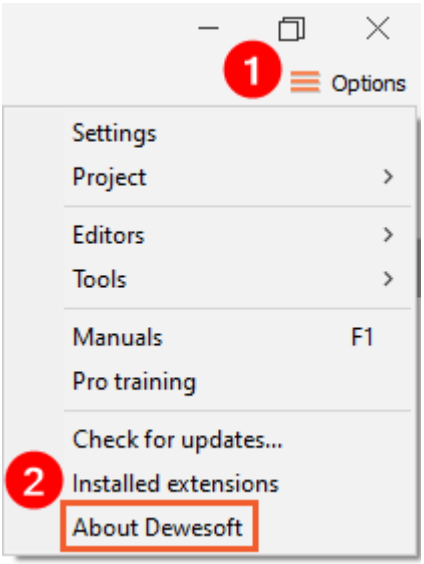
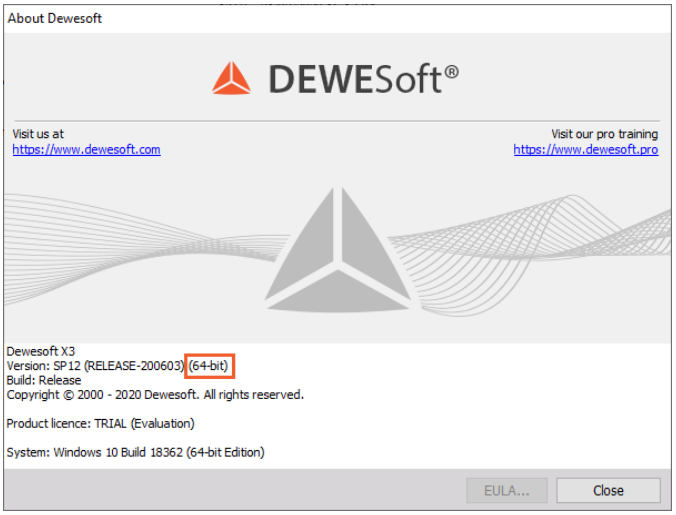
When a Modbus Client sends any other function code, the DewesoftX® Modbus Server (TCP/IP) Module will respond with 0x01: Illegal Function. See also: Modbus Tables

2.6. Platform

Since version DewesoftX® you can choose to install DewesoftX® 32-bit or 64-bit. All previous versions (X2, X1, etc.) only supported 32-bit versions.

Hint

Note that the 64-bit DewesoftX® version also needs 64-bit versions of the Modules. At the time of writing this documentation not all Modules are available as 64-bit versions and some older Modules may never be converted.

If you are not sure which DewesoftX® version you have installed, you can easily see it in the About dialogue:	When the DewesoftX® version ends with (64-bit) then you have the 64-bit version, otherwise it is the 32-bit version.
 *Image 1: Open the About dialogue*	 *Image 2: About dialogue 64-bit*

2.7. Compatibility

The Module requires at least Dewesoft X2. It is compatible with DewesoftX® and Dewesoft X3 32-bit or 64-bit.

2.8. Files and Directories

The actual location of the directories on your computer may vary depending on your computer's locale settings and the settings you chose when installing DewesoftX® .

2.8.1 Important DewesoftX® Directories

The following table shows the default paths of your DewesoftX® installation. Note, that the paths may be different, depending on your operating system, DewesoftX® version and language settings.

Name	Explanation	Platform	Default path
Bin	Contains DewesoftX.exe	32-bit	C:\DewesoftX\Bin
		64-bit	C:\DewesoftX\Bin64
Module	The files for Modules (.dll, mth) must be copied into this directory	32-bit	C:\DewesoftX\Bin\Addons
		64-bit	C:\DewesoftX\Bin64\Addons64
Data	Folder for the measurement data files		C:\DewesoftX\Data
Setups	Folder for the setup files		C:\DewesoftX\Setups
System	Folder for the project files		C:\DewesoftX\System
Log	Folder for the log files		C:\DewesoftX\System\Logs

The paths may be different depending on your DewesoftX® version.

2.9. Licensing

The Module requires a valid DewesoftX® license.
To test the Module you can use an *Evaluation license*.

2.9.1. Requesting an Evaluation license

You can request an Evaluation license from our homepage: http://www.dewesoft.com/registration

(1) Click on *Evaluation license*
(2) Fill out all the required fields
(3) Click the **Request** Dewesoft button

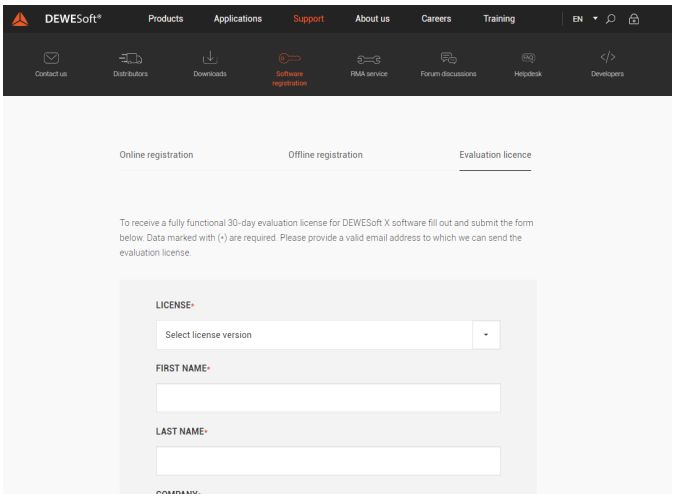


Image 3: Request Evaluation License

2.9.2. Activating the Evaluation license

When you have received your trial licence key, open DewesoftX®, go to *Settings - Hardware Setup...*, select the Registration tab sheet and enter the license code (if you already have other licenses, you may need to click the **Create** button).

Now enter the license code and click the **Register online** button.

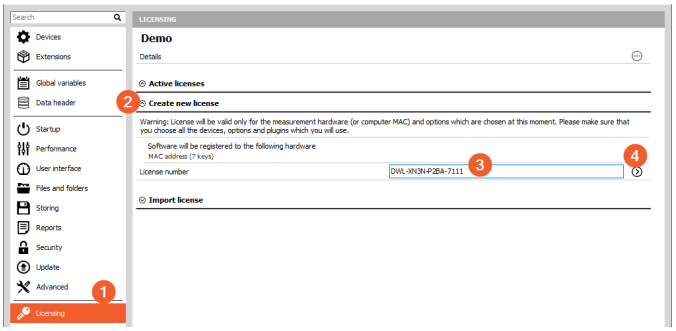


Image 4: Enter license key

Then your new license key will show up in the list and should have the *Status Valid*.

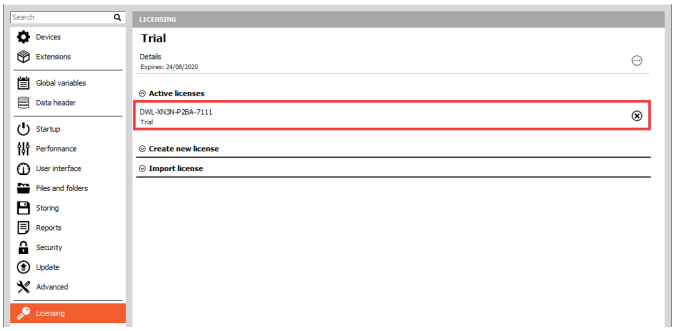


Image 5: Valid trial license

2.10. Module Installation

Simply copy the file ModbusServer64.dll into the Addons folder of your DewesoftX® installation (e.g. C:\DewesoftX\Bin64\Addons64\).
Then you can start DewesoftX® and register the Module (aka. Extension). Click Settings - Settings..., select Extensions and click the plus sign. Then find the Module in the list and activate it (i.e. click the check-box (1) in Image 6) - when the Module does not show up in the list, you may need to register it first (see chapter Registering the Plug-In).

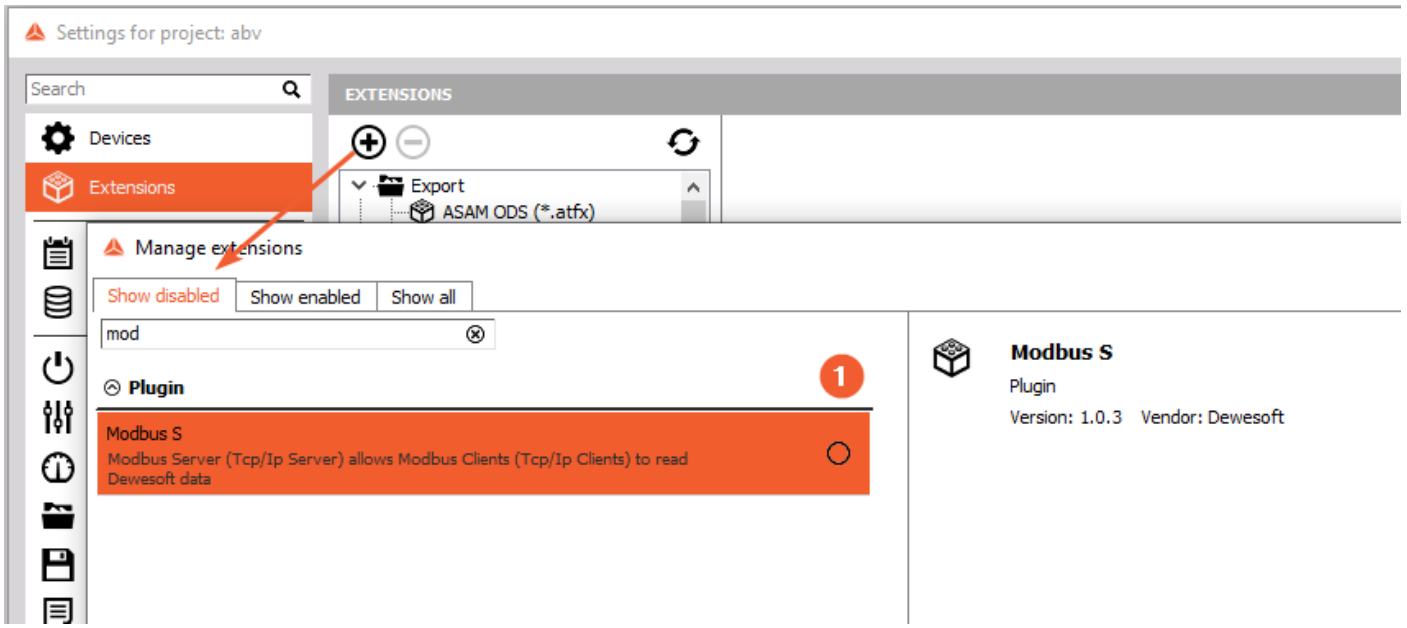


Image 6: Enable Module

2.10.1 Registering the Module

Before you can use *Modules* in DewesoftX®, they must be registered once.

When DewesoftX® is started it will try to register all Modules (dll files) that it finds in the Addons folder. But in order to do that, DewesoftX® requires administrator permissions (because it must write to the Windows® registry). When DewesoftX® is not started with administrator permissions, the registration cannot be done automatically. In the latest versions the registration of modules is done automatically, even if the software is not opened with administrator rights.

When the Module does not show up in the Extensions list, you must press the **Refresh** button (see (2) in Image 7). Note: you may need to start DewesoftX® as administrator (depending on the UAC settings of your Windows user/installation). Also make sure that you use the correct dll file for your platform (32-bit or 64-bit): see chapter Platform	When you have pressed the Refresh button, then you will see the registration Window in Image 8 for a short time. After that, you must restart DewesoftX®.

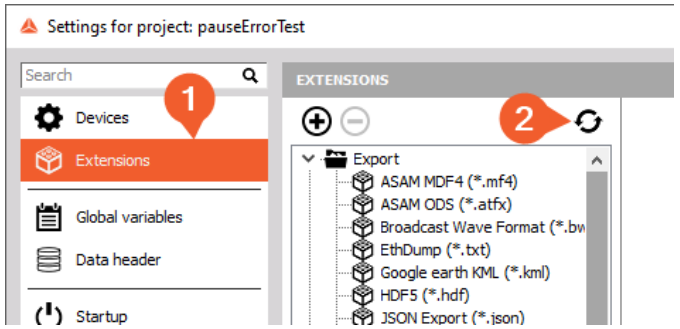


Image 7: Extensions: Refresh button

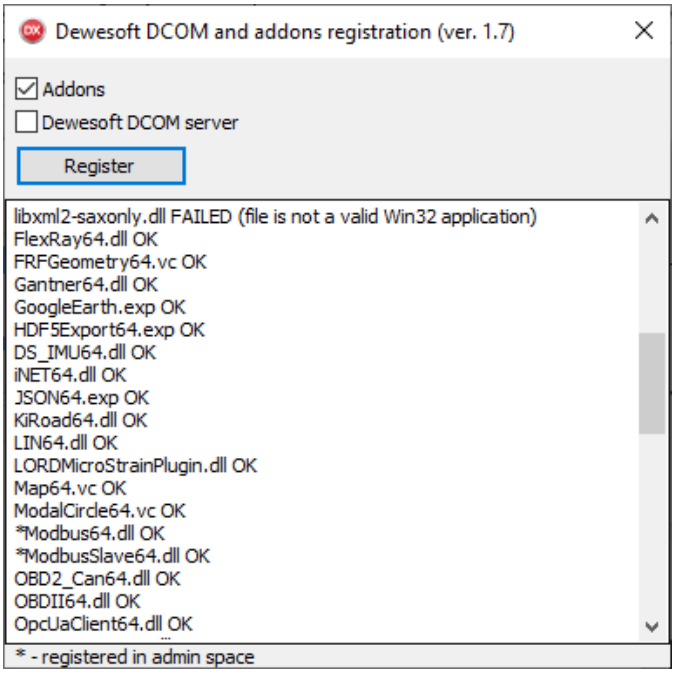
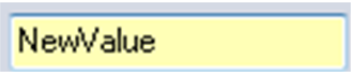
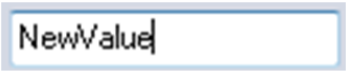


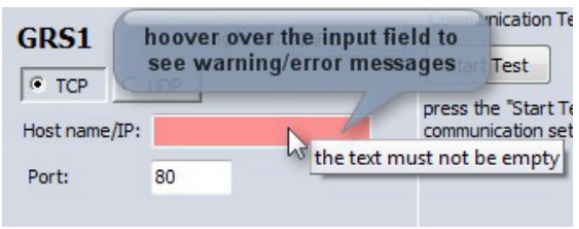
Image 8: Registration Window

2.11. Input Fields

2.11.1. Input Confirmation

When you change the value of an input field, the background colour of the input field will turn yellow to indicate that you have changed something and that this change has not been confirmed yet. Your input will automatically be confirmed when set the focus to another input field (i.e. by clicking with the mouse or by pressing the Tab key). You can also press Return to manually confirm your change.	
After the input has been confirmed the background colour of the input field will be white again (or red/orange, when there are errors/warnings).	

2.11.2. Input Warnings/Errors

An invalid input may cause a warning and error. Warnings will be highlighted in orange, errors in red. When you hover over the input field you will see a hint with a detailed description of what is wrong:	

3. Module Settings

After you have installed the Module (see chapter Module Installation), start DewesoftX® and go to *Options – Settings*. Note: Options will be disabled during the measurement.

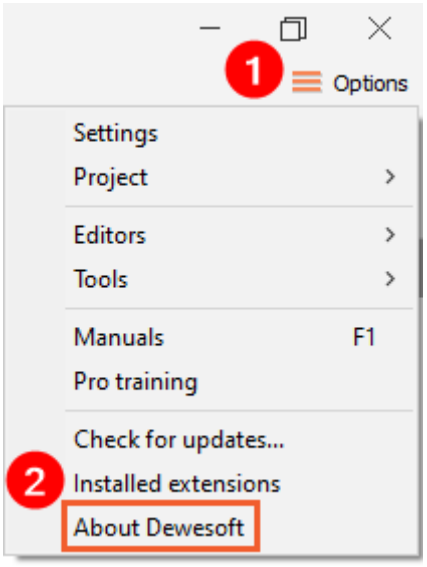


Image 9: Settings

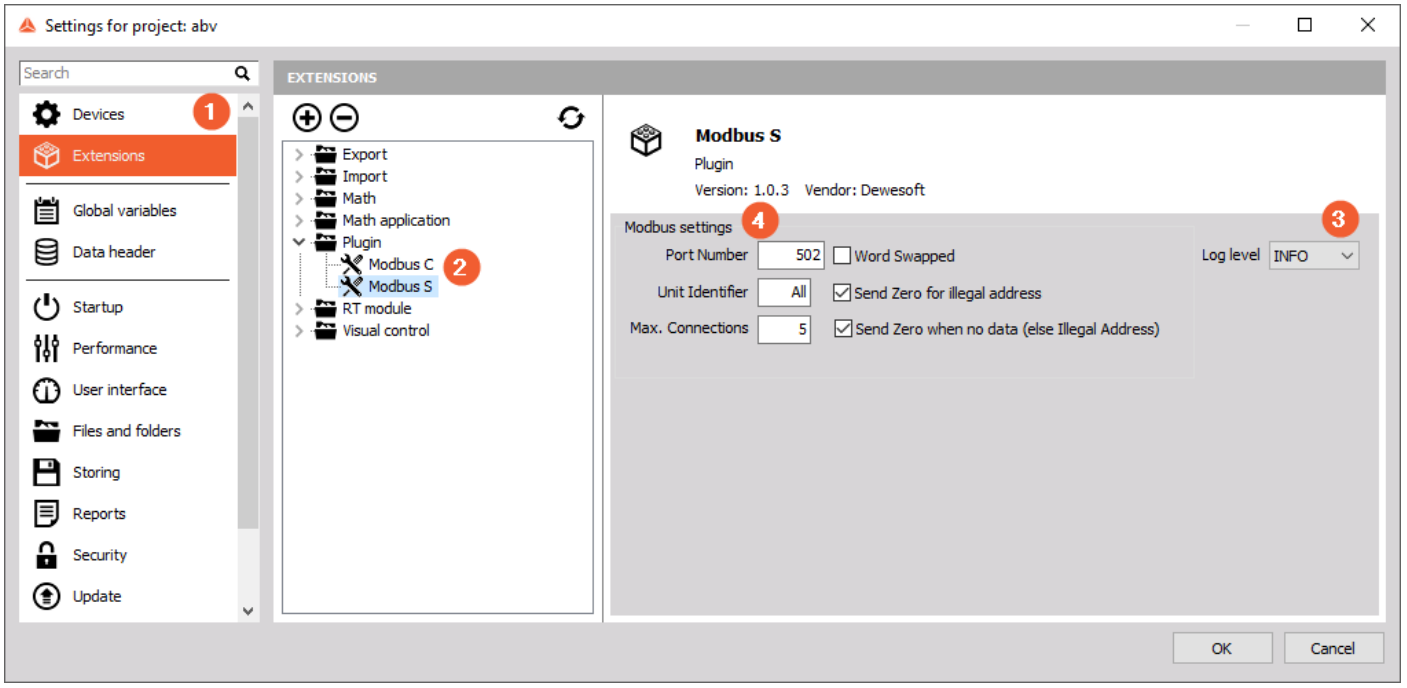


Image 10: Module Settings

(1) Go to the Extensions section
(2) In the Extensions section look for the node named Modbus S
Now will see the settings of the Module at the right of the screen:
(3) see chapter Log files
(4) see chapter Module Modbus Settings

3.1. Module Modbus Settings

3.1.1. Port Number

The TCP port that the Modbus Server is listening to. According to the Modbus specification, the default port is 502, but the Dewesoft's Modbus Server (TCP/IP) Module also allows you to use any other port number.

3.1.2. Unit Identifier

Each command that a Modbus Client sends to this Modbus Server Module contains a Unit Identifier. The Modbus TCP/IP unit identifier is a number between 0 and 255.
When you keep the default setting All, the Module will accept all unit identifiers.
When you specify a numeric value the Module will only accept commands that include the specified Unit Identifier: For all other Unit Identifiers, the Module will send an error-response with exception-code 4.2.5 0x0A: Gateway Path Unavailable on page 26

3.1.3. Max. Connections

This is the maximum number of TCP connections that the Modbus Server Module will accept. You can enter the value 0 or Max to allow the maximum possible number of TCP connections for your system.
The number of currently connected Modbus Clients is shown in Channel Setup (see chapter 3 on page 12) and will be written to the # Connections info channel (see chapter chapter)

3.1.4. Word Swapped

This is only relevant for data types that use more than 16 bit (e.g. Float32 uses 32 bits).
The Modbus specification does not define how data types larger than 16 bit should be handled. Thus, different Modbus Client devices may expect the high and low word of a 32 bit data-type (e.g. Float32) in different order.
You must make sure, that the Modbus Client uses the same Word Swapping as the DewesoftX® Modbus Server (TCP/IP) Module or the data will be misinterpreted.

3.1.5. Send Zero for illegal address

This check-box defines what will happen when a Modbus Client requests data from an address that is not configured in your Channel Setup:

Checked	This is the **default** setting. The Module will return the value 0
Unchecked	The Module will return the error response 0x02: Illegal Data Address

3.1.6. Send Zero when no data (else Illegal Address)

This check-box defines what will happen when a Modbus Client requests data from a DewesoftX® channel that does not have any data samples yet:

Checked	This is the **default** setting. The Module will return the value 0

Unchecked	The Module will return the response 0x02: Illegal Data Address

3.2. Log files

The Module will write log files during operation. The amount of log messages is configurable via the Log level drop down box in the *Hardware setup*. The name of the log file is ModbusServer.log.

When the Module is started, it will immediately start to log to the windows temporary directory.

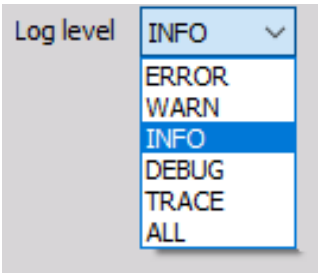
As soon as the DewesoftX® application is available to the Module, all subsequent logs will be written to the standard DewesoftX® log directory (e.g. C:\Dewesoft\System\Logs).

Note: There is also a log file called ModbusServer.dll.log in the Modules directory (see 1.8 Files and Directories). This will normally be empty. It will only contain messages when there is a bug very early in the Module initialization.

3.2.1. Log levels

With the *log level* drop down box you can set the detail level of the logging function.

If you set a high log level (e.g. TRACE, ALL) a lot of log messages will be written and the log files will roll over quite often. This is also dependent on the sample rate – the higher the sample rate is, the more often data will be fetched and thus more log messages will be written.



For production-use the log level INFO is recommended.

Log level	Description
ERROR	Will only log error messages
WARN	Will also log warning messages
INFO	Will also log info messages – this is **recommended** for production use
DEBUG	Will also log debug messages
TRACE	Will also log trace messages
ALL	Will log all messages

4. Channel Setup

The Modbus Server channel setup looks like this:

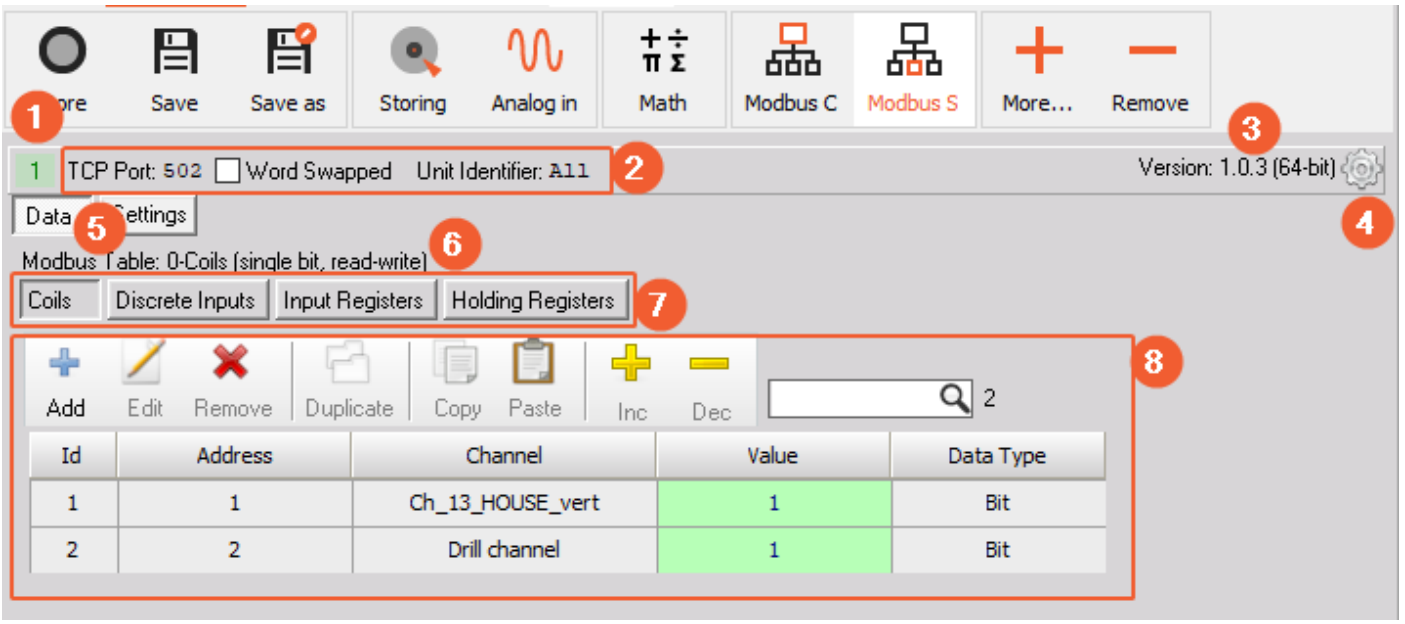


Image 11: Channel Setup Overview

(1) Shows the connection status / the number of currently connected Modbus Clients: see chapter Connection Status Label below (Note: when you hover the mouse over the status, it will show more info in a hint)
(2) Overview of the Module settings: see chapter Module Modbus Settings
(3) The Module version
(4) The Gear icon will open the Channel Setup pop-up menu: see chapter Channel Setup Menu
(5) Switch between the Data (see 3.3 Data on page 15) and Settings (see chapter Settings) view
(6) Textual information about the Modbus Table that is currently selected in (7)
(7) Switch between the Modbus Tables. see also: chapter Modbus Tables
(8) The Data Grid shows the data-items (Bits/Registers) of the Modbus Table that is currently selected in (7)

4.1. Connection Status Label

When the connection status label background is green, it shows the number of currently connected Modbus Clients (i.e. the remote Modbus devices that are currently connected via TCP/IP to the Dewesoft's Modbus Server (TCP/IP) Module see also: chapter # Connections

When the connection status label background is red, there was some problem while starting the TCP/IP listener on the specified Port (see chapter Port Number). Hover the mouse pointer over the label to see the error-message hint:

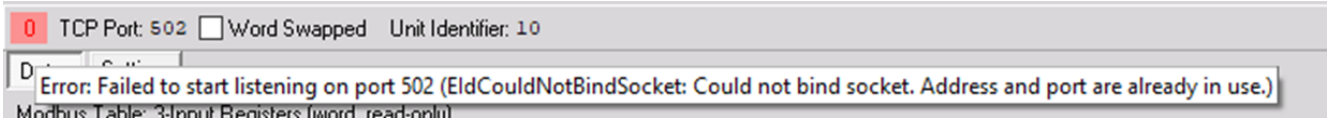


Image 12: Error-Message hint

In the example above, the error is:
EIdCouldNotBindSocket: Could not bind socket.
See also: Chapter Address and port are already in use.

4.2. Modbus Tables

According to the Modbus specification, a Modbus device may have up to 4 logical data tables and each of these Modbus data tables can have **official address numbers from 1 to 65536**.

Note, that a Modbus device is not strictly required to support the whole address range. Thus a device may, for example, only support the address range from 1000 to 1016. Requests for unsupported addresses may result in an error-response with exception-code 0x02: Illegal Data Address

Modbus Data Table	Access type	Read Function Code	Object Type	Data-Type
Coils	Read-Write	0x01	Single bit	Boolean
Discrete Inputs	Read-Only	0x02	Single bit	
Input Registers	Read-Only	0x03	16-bit word	Numeric: Int16, Int6s, Int32, Int32s, Float32 see chapter Register Data-Types
Holding Registers	Read-Write	0x04	16-bit word	

4.2.1. Table Prefix

Sometimes you see an unofficial convention (not mentioned in the Modbus specification), where a register address is prefixed with a leading digit to indicate the Modbus table. Note that this is NOT related to the Read Function Code. Some devices use 4 digits to represent the address, others use 5 digits and some use a complete different schema:

Modbus Data Table	Read Function Code	4 digit Example	5 digit Example
Coils	0x01	00001 - 09999	000001 - 065536
Discrete Inputs	0x02	10001 - 19999	100001 - 165536
Input Registers	0x03	30001 - 39999	300001 - 365536
Holding Registers	0x04	40001 - 49999	400001 - 465536

4.3. Data

In the Data-Grid you can configure all data items of the Modbus Tables.
The data grid shows a list of all data-items that are defined:

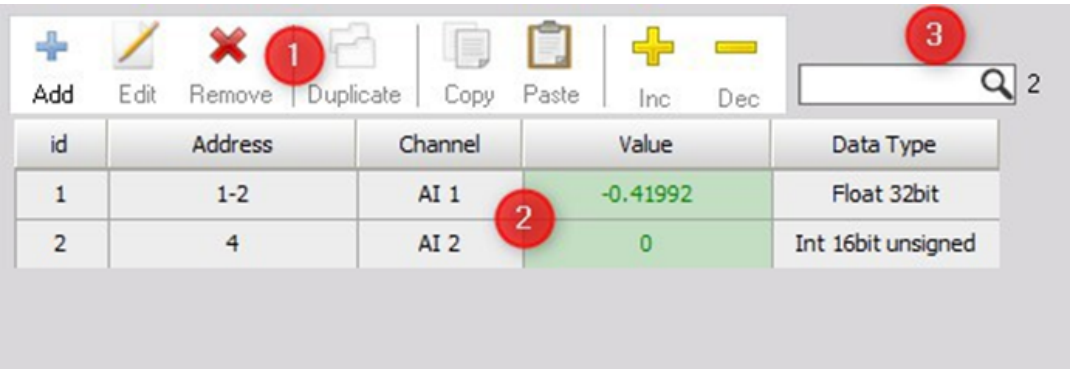


Image 13: Channel Setup Data-Grid

You can use the toolbar (1) (see chapter Toolbar) to manipulate the grid items (2) and you can use the search-box (3) to filter the grid.

For a general introduction how to use the Grid, see 5.5. Grid on page 30.
2 See also: chapter Supported Function Codes

4.3.1. Data-Grid

The data grid shows a list of all data-items for the currently active Modbus Table. Some columns are hidden by default and can be shown via the Edit columns dialogue (see chapter Edit columns). Chapter Columns below describes all available columns.

4.3.1.1. Columns

The data grid has following columns (columns with a bold name are visible per default):

Column-name	Information
Id	This is just a unique consecutive number to identify the row/channel of the grid
PDU Start Address	The PDU start-address in the Modbus Table: Valid range: 0 to 65535
PDU End Address	The PDU end-address in the Modbus Table: Valid range: 0 to 65535
Start Address	The (user) start-address: Valid range: 1 to 65536
End Address	The (user) end-address: Valid range: 1 to 65536

Address	Shows the address of the current data-item: When the start and end-address are the same it will only show one address, otherwise it shows the *Start Address*, a dash as separator and then the *End Address*
Channel	Shows the name of the Dewesoft's channel where we get the data from.
Value	Shows the current data of the selected *Channel*.
Bytes (hex)	Shows the byte value of the register/s in bytes (for the current *Value* of the *Channel*.
Data Type	Shows the selected data-type of this row.

4.3.2. Toolbar

4.3.2.1. Add

Will add a new item to the grid and open the Edit Item dialogue: see chapter Add/Edit Bits and chapter Add/Edit Registers for details

4.3.2.2. Edit

Will open the Edit Item dialogue for the currently selected items:
See chapter Add/Edit Bits and chapter Add/Edit Registers for details

4.3.2.3. Remove

Will remove the selected items.

4.3.2.4. Duplicate

This toolbar-button will only be active when you have selected exactly one item. It will open the Channel Selection dialogue:

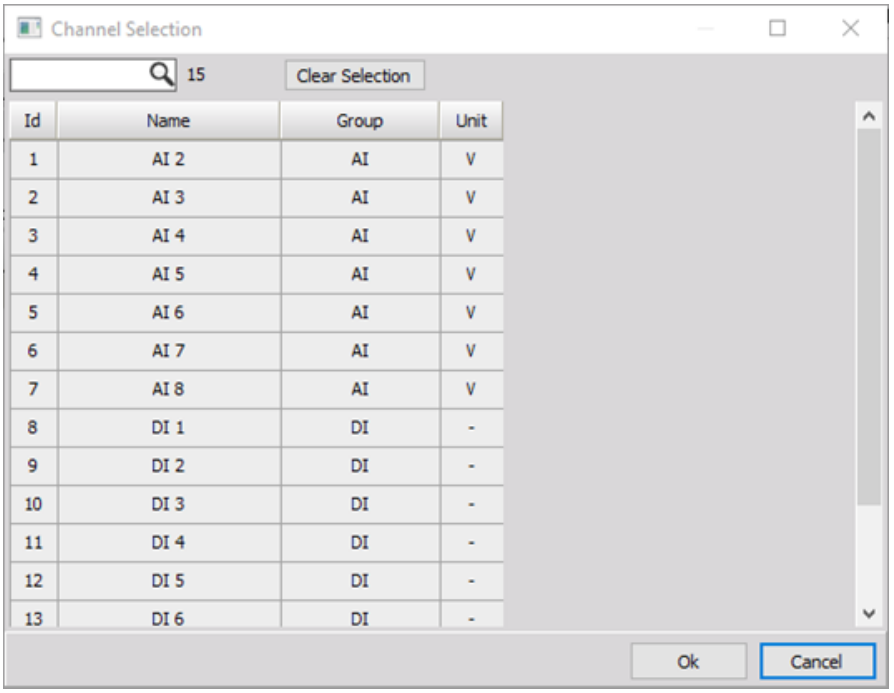


Image 14: Channel Selection dialogue

When you press **Ok**, a new Item will be created for each of the selected channels. The properties of the new items will be set to the properties of the selected item. The addresses of the new items will be the next free addresses after the currently selected item.
Note that the list will only contain channels that you have not used yet for other data-items.

Example
When you select a Register with Data Type Float 32bit, and then select 3 channels in the Chanel Selection dialogue, 3 new items with Data Type Float 32bit will be created.

4.3.2.5. Copy

Will copy the selected items to the Windows® clipboard. The copied data is in XML format and can be pasted to other Modbus tables (of the same type: Bit/Register) or even to other channel-setups.

4.3.2.6. Paste

The button is only active, when the Windows® clipboard contains data in the correct XML format (e.g. after you press Copy).

Conflict Resolution
When you paste items, it is possible that there is an address conflict. In this case the Module will show the Address *Conflict Resolution* dialogue. This is best explained with a detailed example:

Let's assume we have *Input Registers* with the addresses 1-2 and 4 defined.	We select 4 *Holding Registers* and click the Copy toolbar-button.

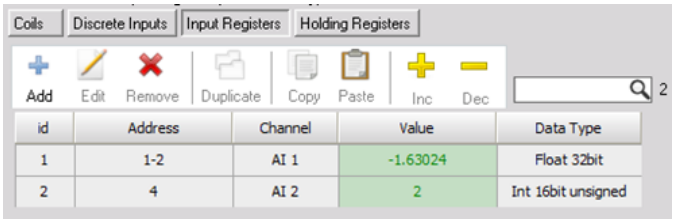


Image 15: Before Paste

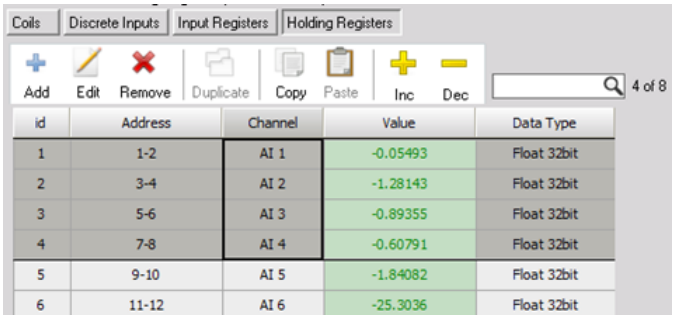


Image 16: Copy Items

Now we can go back to the *Input Registers* and paste the items from the clipboard. Since the copied *Holding Registers* (2) with *Id* 1 and 2 (addresses 1-2 and 3-4) conflict with the existing *Input Registers*, the *Id* column will show the red error indication for the conflicting items (1) and the Module will show the *Address Conflict Resolution* dialogue (3), so that you can choose what to do about it:

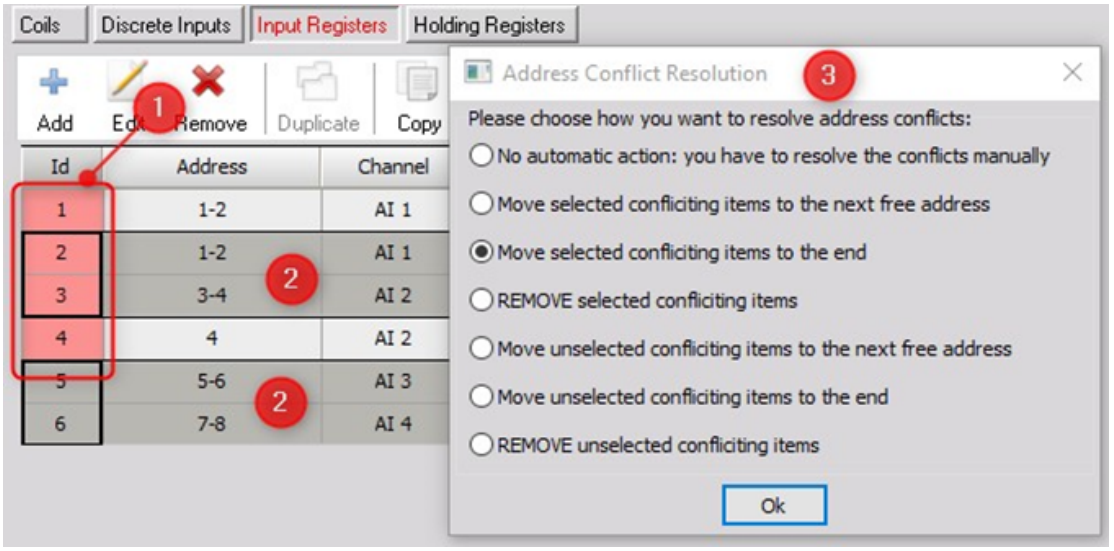


Image 17: Address Conflict Resolution dialogue

Note, that the pasted items are now selected in the grid, and that the *Id* column of the items with conflicting addresses have a red background colour to indicate the error.

You have following options:

- *No automatic action*:
  The addresses will not be changed. When you close the dialogue the address conflict will still exist and you must manually resolve it: e.g. use Inc/Dec or edit the items to change the addresses
- *Move selected conflicting items to the next free address:*
  the addresses of the conflicting items will be changed to the next free address In our example the items with Id: 2, 3
- Move selected conflicting items to the end:
  the addresses of the conflicting items will be changed so that they are higher than the currently highest end-address In our example the items with Id: 2, 3
- *REMOVE selected conflicting items*:
  the selected conflicting items will be removed

- *Move unselected conflicting items to the next free address*:
  the addresses of the conflicting items will be changed to the next free address In our example the items with Id: 1, 4
- *Move selected conflicting items to the end*:
  the addresses of the conflicting items will be changed so that they are higher than the currently highest end-address. In our example the items with Id: 1, 4

4.3.2.7. Inc

Will increase the start-address of the selected item/s by 1.

4.3.2.8. Dec

Will decrease the start-address of the selected item/s by 1.

4.3.3. Coils/Discrete Inputs

This chapter describes features for *Coils* and *Discrete Inputs*.

4.3.3.1. Add/Edit Bits

When you click **Add** or **Edit** the following dialogue will be shown:

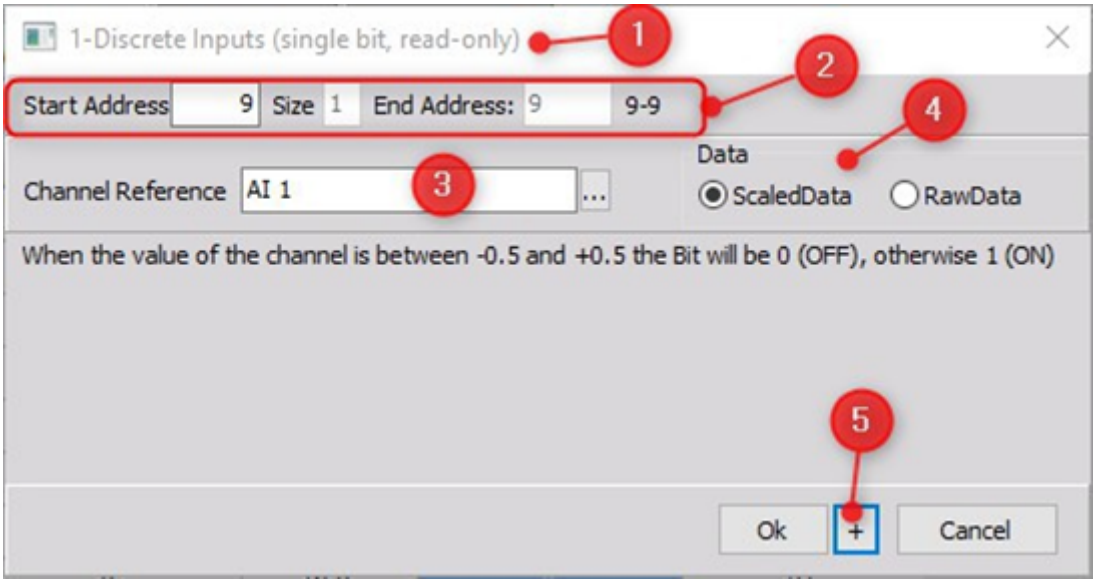


Image 18: Add Bits dialogue

(1) The dialogue title will show information about the Modbus table (see also chapter Modbus Tables)
(2) The top section shows the Modbus address info. You can change the Start Address to any valid address (e.g. the address must not be used yet by other items)
(3) The channel from where this bit gets the data. To select a channel (or change the currently selected channel), click on the ellipsis button: then select a channel in the Channel Selection dialogue.
(4) You can select which data we read from the channel.
Scaled Data respects the Scale factor/Offset of the channel, Raw Data does not.

(5) The + button is only visible when you have clicked Add (not for Edit). It saves the current changes, and opens the dialogue again with a new item.
i.e. it is like clicking **Ok** and then clicking the Add toolbar-button again.

4.3.4. Holding/Input Registers

This chapter describes features for *Holding Registers* and *Input Registers*.

4.3.4.1. Add/Edit Registers

When you click **Add** or **Edit** the following dialogue will be shown:

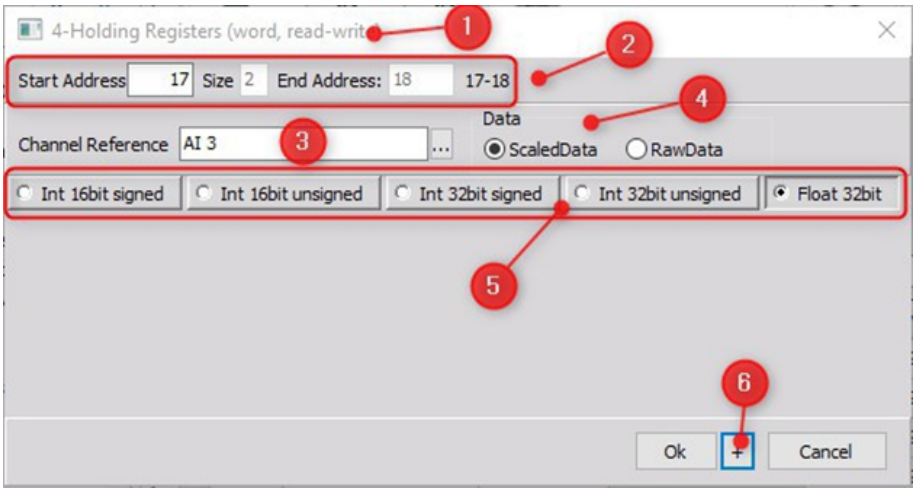


Image 19: Add Bits dialogue

(1) The dialogue title will show information about the Modbus table (see also chapter Modbus Tables)
(2) The top section shows the Modbus address info.
You can change the *Start Address* to any valid address (e.g. the address must not be used yet by other items). The Size is the number of registers that an item of the selected Data-Type (5) needs.The *End Address* is the *Start Address* plus the Size. The final label shows the *Start Address* and the *End Address*
(3) The channel from where this Register/s get/s the data. To select a channel (or change the currently selected channel), click on the ellipsis button: then select a channel in the Channel Selection dialogue.
(4) You can select which data we read from the channel.
Scaled Data respects the Scale factor/Offset of the channel, Raw Data does not.
(5) Data Type: The selected data-type defines how the channel value is stored in the Register/s. see chapter Register Data-Types below
(6) The + button is only visible when you have clicked Add (not for Edit). It saves the current changes, and opens the dialogue again with a new item.
i.e. it is like clicking **Ok** and then clicking the Add toolbar-button again.

4.3.4.2. Register Data-Types

The Module supports the following data-types for Registers:

	No Of Registers (Size)	Min Value	Max Value	Notes
Int 16bit signed	1	-32,768	32,767	
Int 16bit unsigned	1	0	65,535	
Int 32bit signed	2	-2,147,483,648	2,147,483,647	see also: 2.1.4 Word Swapped on page 12
Int 32bit unsigned	2	0	4,294,967,295	
Float 32 bit	2	-3.4E+38	+3.4E+38	

Hint

When the current value of the assigned channel is lower than the Min Value or higher than the Max Value, the Min/Max Value will be used instead.
When you assign a decimal number to an integer, the value will be rounded.

4.4. Settings

The settings view looks like this:

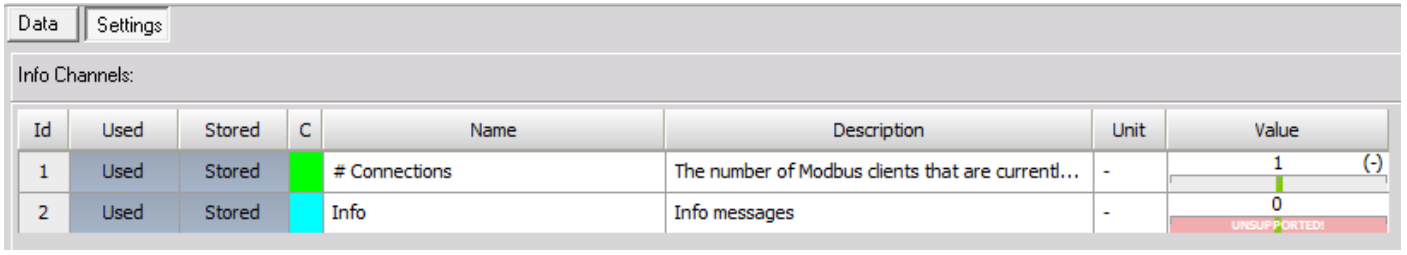


Image 20: Channel Setup – Settings view

4.4.1. Info Channels

The grid (see also chapter Grid) allows to configure the info-channels:

Column	Information
Id	This is just a unique consecutive number to identify the row/channel of the grid
Used	You can click on the buttons in this row to toggle the *Used* status from **Used** to **Unused**. Only channels that are set to **Used** will show up in *Measure Mode* and can be stored in DewesoftX® data files.
Stored	This is only useful if the channel is set to **Used** (see description above). For **Used** channels you may want to deactivate the **Store** button. Then you can see and use the values of this channel in *Measure Mode*, but the channel data will not be stored in the DewesoftX® data file. This can be useful if you just want to check the data, but don't need it after the measurement. Another use-case is to use the data of the channel in other *Math* channels (e.g. to calculate some statistics) and then only store the *Math* channel to the DewesoftX® data file (but not the original data).
C	This colour will be used by the displays in *Measure Mode*. You can click on the colour to change it.
Name	This is the name of the channel as it will show up in the channel list of the Measure mode. Make sure to enter a useful name for the channel (also it makes sense to use unique names to avoid confusion). If you enter a blank name, then you will get a warning.
Description	Detailed description of the channel.
Unit	This is the unit that will be displayed for the channel. Note: Changing the unit will NOT trigger any conversion! i.e. if a channel has a value of *100V* and you change the unit from *V* to *kV*, the channel will be displayed as *100kV* – which can lead to a lot of confusion. Thus, changing the unit is not recommended.
Value	This column will show the online data of the channels. Note: you will only see live data of channels that are set to **Used** (see description above).

4.4.1.1. # Connections

This channel shows the number of Modbus Client devices that are currently connected to the Modbus Server (TCP/IP) Module.
If there is an error, the number will be -1 to indicate the error (e.g. see chapter Address and port are already in use).
See also: chapter Max. Connections

4.4.1.2. Info Channel

The info channel may contain various textual info messages. Here is an example:

Image 21: Info Channel Example Screenshot

Note: to display textual data in DewesoftX®, just drag a Value table control to the measurement screen.

Time	Notes
0.0	At the start of measurement, we had another program listening on port `502`. Thus, the first entry is an error-message: see also: chapter Address and port are already in use
9.2	Now we closed the other application and now the Modbus Server (TCP/IP) Module can start the TCP/IP Server on port `502`.
21.5	We started a Modbus Client on another PC (with IP `192.168.1.161`)
40.0	We stopped the Modbus Client on the PC with IP `192.168.1.161`

5. General

5.1. Troubleshooting

5.1.1. Address and port are already in use

When the Modbus Server (TCP/IP) Module cannot start the TCP/IP listener on the specified port, we will see this error:

Failed to start listening on port 502 (EIdCouldNotBindSocket: Could not bind socket. Address and port are already in use.)

The problem is usually that another program has already started a TCP/IP listener on this port. To resolve the issue, close the other program or change the Port Number: see chapter Port Number.

This error will be shown as hint on the Connection Status Label (see chapter chapter) and also in the Info Channel

5.1.1.1. Find Program Listening on Port

In Windows® 10 you can use the Resource Monitor to easily find out which program is currently listening on a TCP/IP port.

To open the program, press the Windows® key and type resource (1) to filter all programs. Then you should already find the *Resource Monitor* in the list (2).

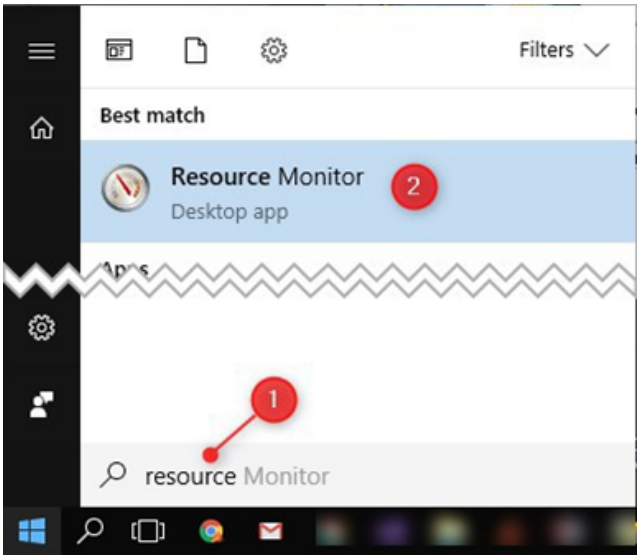


Image 22: Open Resource Monitor

In the *Resource Monitor*:

(1) Go to the Network tab
(2) Make sure that the up-arrow is shown on the *Listening ports* group (if you see the down arrow, click to toggle)
(3) You can click on the Port column header to change the sort order (click again to toggle between ascending and descending order)

(4) Now it is easy to find the row for the port (502 in this case) and identify which program is listening. In this case the program is called mod_Rsim.exe
Note, that also the *Firewall status* column is useful: make sure that the firewall is not blocking the communication on that port.

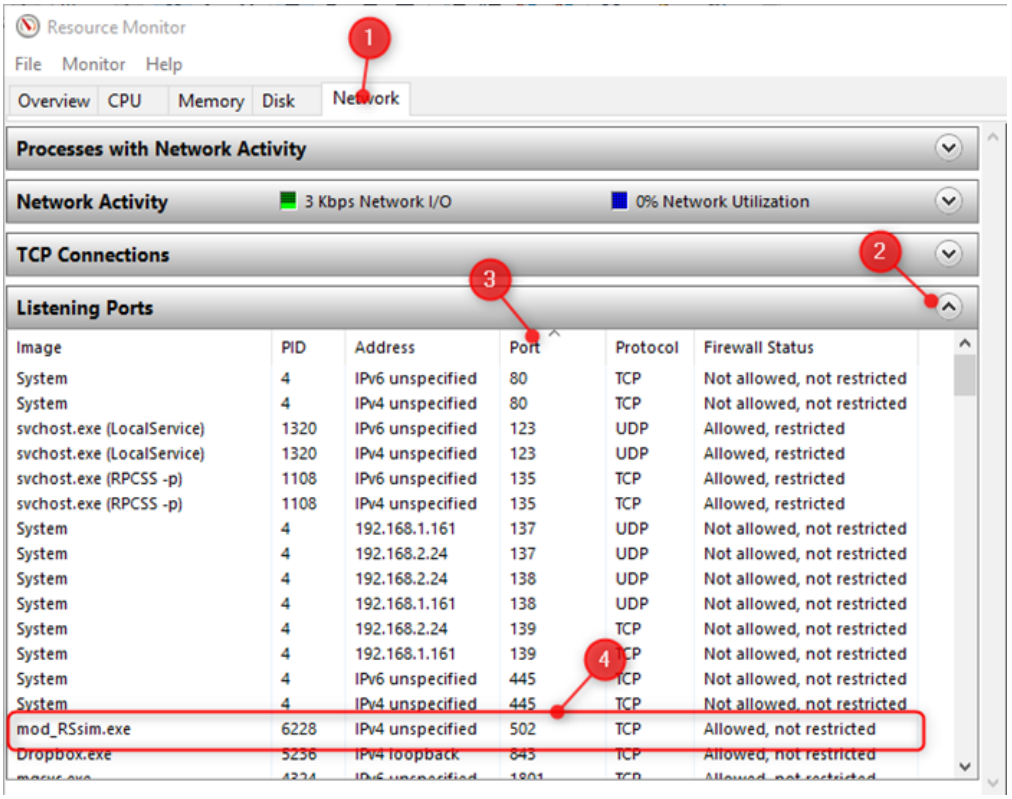


Image 23: Resource Monitor

5.2. Modbus – Exception codes

The Modbus Server (TCP/IP) Module may answer requests with error-responses that include a Modbus exception code: i.e. this means that the request that we have received cannot be handled for some reason.

5.2.1. 0x01: Illegal Function

When a Modbus Client sends a command for an unknown function code, the Modbus Server (TCP/IP) Module will respond with 0x01: Illegal Function: Chapter 1.5.1 Supported Function Codes on page 6 lists all supported function codes.

5.2.2. 0x02: Illegal Data Address

The Modbus Client device asks for a data address that you have not configured in the channel setup or the assigned channel does not have any data samples yet.

Note, that the following settings will influence when this exception-code will be sent:

- 2.1.5 Send Zero for illegal address on page 12
- 2.1.6 Send Zero when no data (else Illegal Address) on page 12

Hint

It is also possible that the Modbus Client tries to read a range of registers which has gaps. E.g. when you have defined registers 10 and 12 to return the value of Int16 channels (1 register each), then register 11 is undefined.
When the Modbus Client sends a request to read the register range 10 to 12, then the Modbus Server will answer with the 0x02: Illegal Data Address exception-code, because register 11 is not defined. This is the behaviour when Send Zero for an illegal address is unchecked.

Example

The Modbus Client sends a request to read the Input Register with Address 1111, but you have not specified the Input Register with Address 1111 in your Channel Setup. In this case the Module will answer with the 0x02: Illegal Data Address exception-code when Send Zero for illegal address is unchecked

Example

The Modbus Client sends a request to read the Input Register with Address 2222. You have specified that the Input Register with Address 2222 should return the current value of an async channel, but this channel does not have any data samples yet.
In this case the Module will answer with the 0x02: Illegal Data Address exception-code, when Send Zero when no data (else Illegal Address) is unchecked

5.2.3. 0x03: Illegal Data Value

This is usually only caused when the Modbus Client sends some illegal command.

Example

The Modbus specification for command *0x03 Read Holding Registers* defines that the Quantity of Registers in the request must be a number between 1 and 125.
If the Modbus Client sends a request where *Quantity of Registers* is e.g. 150, the DewesoftX® Modbus Server (TCP/IP) Module will send back an error response with the exception-code 0x03: Illegal Data Value

5.2.4. 0x04: Server Device Failure

When any unexpected errors occur, the Modbus Server (TCP/IP) Module will send back an error response with the exception-code 0x04: Server Device Failure. In this case we must check the DewesoftX® log-files for details (see chapter Log files)

5.2.5. 0x0A: Gateway Path Unavailable

This exception-code will be returned when the Modbus Client requests data with a Unit-Identifier other than the Unit-Identifier that you have specified in the Module Settings: see chapter Unit Identifier.

Possible Solutions:

- Reconfigure the Unit-Identifier in the Module Settings: see chapter Unit Identifier
- Set the Unit-Identifier in the Module Settings (see chapter Unit Identifier) to All, so that any Unit-Identifiers will be accepted

5.3. Timing

The Modbus protocol is request-response based and does not include any timing information. Thus it is only useful for relatively slow sampling rates in the range of some Hz.
The Module will read the data of the Dewesoft's channel in every data-acquisition cycle (which is per default every 20ms): i.e. when we get a read-request we will send back the most recently read data, which may already be up to 20ms old. So theoretically the maximum meaningful sampling rate is 50Hz. If the Modbus Client sends the requests faster, it may get the same samples multiple times.

5.4. Channel Setup Menu

When you click the gear-tooth icon at the right side of the version-label, you will see the channel setup menu: see Image 24

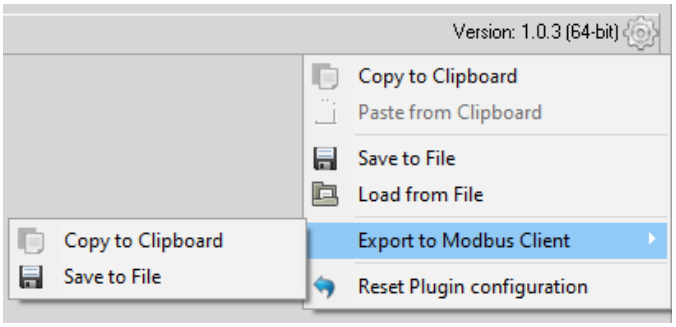


Image 24: Channel Setup Menu

Important

Importing the configuration (paste or load) actually deletes the old channels and creates new channels. Thus the connection to the widgets will be lost: i.e. when you go to measure mode, you will have to click on the widgets and assign the new channels to it.
The import/export feature can only work reliably when you use the same version of the Module. When you use different versions the Module may even crash.

5.4.1. Copy & Paste

This will copy/paste the configuration settings of the complete Module to the Windows® clipboard: i.e. all configured Registers, etc.

The data in the clipboard will have a special XML syntax, so you could even paste the clipboard data into a mail (or text file), send it to a remote location and paste it into another DewesoftX® setup.

5.4.2. Save & Load

This will save/load the configuration settings of the complete Module to/from a file.

You can save the configuration settings to a file and then load the file back into another setup or DewesoftX® instance.

The data in the file will have a special XML syntax, so you can open it with any XML or text-editor.

5.4.3. Export to Modbus Client

This submenu allows to export the Modbus Client configuration to the clipboard (or save it to a file) in a special export format that can be imported into the Modbus Client Module (e.g. on another PC or DewesoftX® instance).

5.4.4. Reset Module configuration

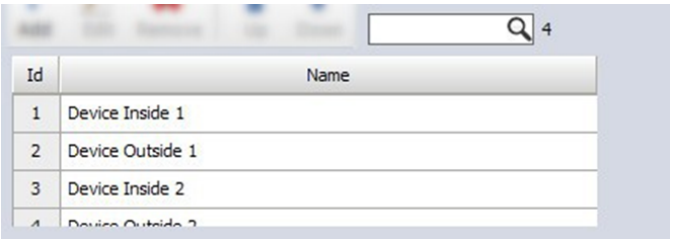
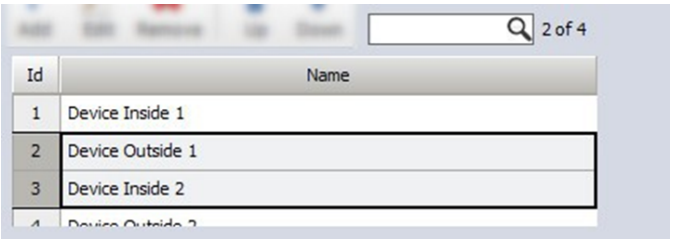
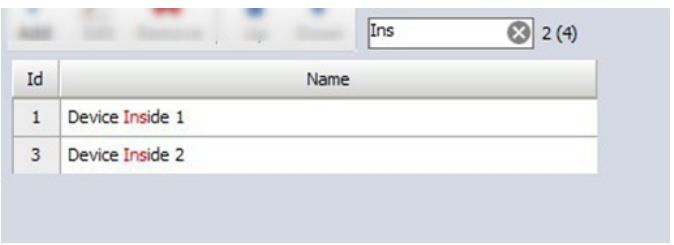
This will reset the configuration of the Module to the defaults: i.e. all channel setup configuration of the Modbus Server Module will be reset to the defaults.
In comparison to really creating a new setup, all other channel setup settings (i.e. of other Modules, DewesoftX® analogue channels, Math channels, etc.) will remain unchanged.

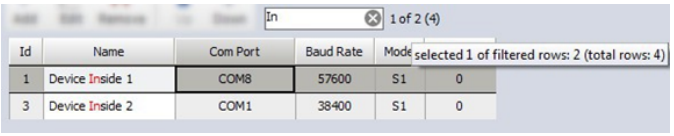
5.5. Grid

This chapter describes some general features of the grid.

5.5.1. Search-Box & Count-label

The search box can be used to easily filter the Grid, so that it only shows rows that contain the search text. The count-label on the right side of the search box shows information about the rows in the grid. It can show the total number of rows, the number of filtered rows and the number of currently selected rows (you can hover over the label to see a hint).

This is best explained with a simple example: see Image 25. We have 4 rows in the grid, the filter box is empty and no rows are selected. In this case the count-label shows the total number of rows in the grid: in this example 4	 *Image 25: Grid: 4 rows*
When you now select 2 rows in the grid (see chapter Multi-select), you can see that the label shows 2 of 4 (2 rows of the total 4 rows are selected).	 *Image 26: Grid: 4 rows, 2 selected*
Now let's enter the text *Ins* into the search box. You can see that the grid is immediately filtered and only the rows that match our input text are shown (the matching part of the text will be shown in red).	 *Image 27: Filtered Grid: shows 2 rows (of 4)*

The count label changed and now shows 2 (4) to indicate that only 2 of the total 4 rows are visible because we have filtered the grid. To clear the filter, you can: • simple delete the text in the search-box • press the X-icon on the right side • press the Esc button (while the focus is on the search-box)	
When you now select one of the 2 filtered rows the count label will change again to: 1 of 2 (4) to indicate that one row of the 2 filtered rows is selected – and that there are 4 rows in total. Image 28 Also shows the hint that will appear when you hover the mouse over the count label.	 *Image 28: Filtered Grid – one row selected*

5.5.2. Header pop-up

When you right-click on the header row of the grid, you can specify which columns you want to see (i.e. show/hide columns) and you can also sort/unsort the grid by certain columns.	 *Image 29: Grid: Header Popup*

5.5.2.1. Edit columns

When you click *Edit columns* from the pop-up, you will see the *Choose columns* dialogue (see Image 30). In this dialogue you can:

- change the order of the columns (**Move up** and **Move down** buttons)
- change the visibility of the columns (**Show** and **Hide** buttons)
- change the column width (edit field at the bottom)
- reset everything to the default (button **Default**)

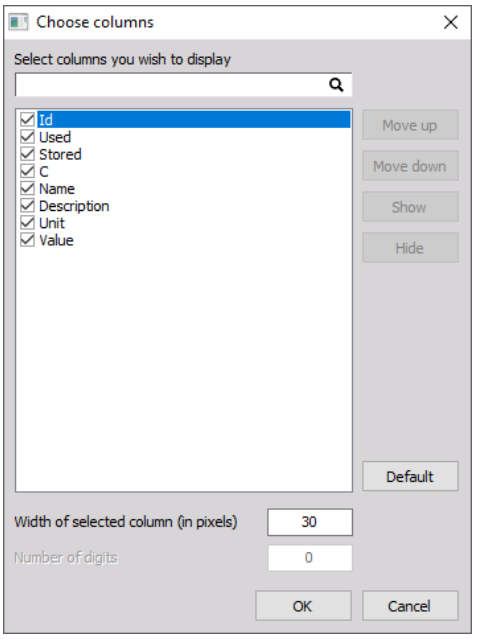


Image 30: Choose columns

5.5.3. Multi-select

You can select and edit multiple rows/cells at once.

The selected cells will be surrounded by a black rectangle. When you click into the selected region, you can apply actions to all selected rows at once (e.g. in Image 31, clicking into the surrounded black rectangle will set the channels 3, 4, 5 and 6 to unused).

Note: this does also work for text-columns: i.e. when you select the rows, as shown in Image 32, and start typing characters on the keyboard, the Names of the channels with ID 2, 3 and 5 will be changed accordingly.

Range selection (see Image 31):

1. left-click a cell and hold the mouse button
2. move the mouse (while still holding down the mouse button) to the target cell and then release the mouse button

Arbitrary selection (see Image 32):

1. click the Name column of row 2, to select row 2
2. hold down the Ctrl key and click into the Name column of row 3, to add row 3 to the selection now rows 2 and 3 are selected
3. hold down the Ctrl key and click into the Name column of row 5, to add row 5 to the selection now rows 2, 3 and 5 are selected

Release the Ctrl key when you are done selecting channels

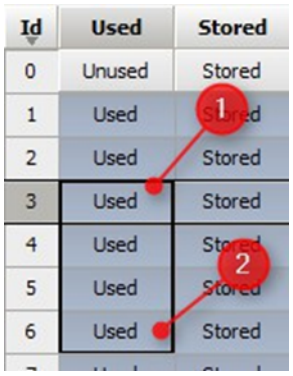


Image 31: Range selection

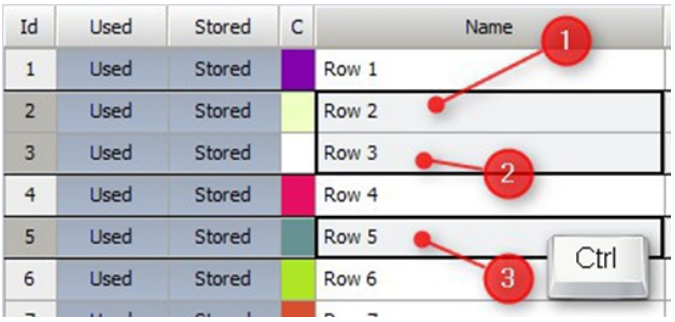


Image 32: Arbitrary Selection

6. Warranty information

Notice:
The information contained in this document is subject to change without notice.

Note:
Dewesoft d.o.o. shall not be liable for any errors contained in this document. Dewesoft MAKES NO WARRANTIES OF ANY KIND WITH REGARD TO THIS DOCUMENT, WHETHER EXPRESS OR IMPLIED. DEWESOFT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Dewesoft shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory, in connection with the furnishing of this document or the use of the information in this document.

The copy of the specific warranty terms applicable to your Dewesoft product and replacement parts can be obtained from your local sales and service office. To find a local dealer for your country, please visit https://dewesoft.com/support/distributors.

6.1. Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

6.2. Support

Dewesoft has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or Dewesoft directly.

Dewesoft d.o.o.
Gabrsko 11a
1420 Trbovlje Slovenia

Europe Tel.: +386 356 25 300
Web: http://www.dewesoft.com
Email: support@dewesoft.com
The telephone hotline is available Monday to Friday from 07:00 to 16:00 CET (GMT +1:00)

6.3. Service/repair

The team of Dewesoft also performs any kinds of repairs to your system to assure a safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly on https://dewesoft.com/support/rma-service.

6.4. Restricted Rights

Use Slovenian law for duplication or disclosure. Dewesoft d.o.o. Gabrsko 11a, 1420 Trbovlje, Slovenia / Europe.

6.5 Printing History

Version 2.0.0, Revision 217 Released 2015 Last changed: 23. July 2018 at 16:54.

6.6.Copyright

6.7. Trademarks

We take pride in our products and we take care that all key products and technologies are registered as trademarks all over the world. The Dewesoft name is a registered trademark. Product families (KRYPTON, SIRIUS, DSI, DS-NET) and technologies (DualCoreADC, SuperCounter, GrandView) are registered trademarks as well. When used as the logo or as part of any graphic material, the registered trademark sign is used as a part of the logo. When used in text representing the company, product or technology name, the ® sign is not used. The Dewesoft triangle logo is a registered trademark but the ® sign is not used in the visual representation of the triangle logo.

7. Safety instructions

Your safety is our primary concern! Please be safe!

7.1 Safety symbols in the manual

Warning

Calls attention to a procedure, practice, or condition that could cause the body injury or death

Caution

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

7.2 General Safety Instructions

Warning

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Dewesoft d.o.o. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as an option and will not be shipped as standard parts.

7.2.1. Environmental Considerations

Information about the environmental impact of the product.

7.2.2. Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

7.2.3. System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid unnecessary pollution of the environment and to keep natural resources.

This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further information about recycling on the Dewesoft web site www.dewesoft.com

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment and is outside the scope of the 2002/95/EC RoHS Directive. However, we take care of our environment and the product is lead-free.

7.2.4. General safety and hazard warnings for all Dewesoft systems

Safety of the operator and the unit depend on following these rules.

- Use this system under the terms of the specifications only to avoid any possible danger.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- You may not connect higher voltages than rated to any connectors.
- The power cable and connector serve as Power-Breaker. The cable must not exceed 3 meters, the disconnect function must be possible without tools.
- Maintenance must be executed by qualified staff only.
- During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advice for using the system.
- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non-interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals.
- Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.
- The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.
- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorized personnel only.
- Adverse environmental conditions are Moisture or high humidity Dust, flammable gases, fumes or dissolver Thunderstorm or thunderstorm conditions (except assembly PNA) Electrostatic fields, etc.
- The measurement category can be adjusted depending on module configuration.
- Any other use than described above may damage your system and is attended with dangers like short-circuiting, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until the safe operation can be verified by service-trained personnel. If necessary, return the product to Dewesoft sales and service office for service and repair to ensure that safety features are maintained.
- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more riskless operation is not possible anymore if the system is damaged obviously or causes strange

noises. The system does not work anymore. The system has been exposed to long storage in adverse environments. The system has been exposed to heavy shipment strain.

- Warranty void if damages caused by disregarding this manual. For consequential damages, NO liability will be assumed!
- Warranty void if damage to property or persons caused by improper use or disregarding the safety instructions.
- Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE).
- Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
- Prevent using metal bare wires! Risk of short circuit and fire hazard!
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
- Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
- DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
- Avoid operation in the immediate vicinity of high magnetic or electromagnetic fields, transmitting antennas or high-frequency generators, for exact values please refer to enclosed specifications.
- Use measurement leads or measurement accessories aligned with the specification of the system only. Fire hazard in case of overload!
- Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatise the system unpowered to room temperature.
- Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.
- The electrical installations and equipment in industrial facilities must be observed by the security regulations and insurance institutions.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use in humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already- lower level may damage your system.
- Please also consider the detailed technical reference manual as well as the security advice of the connected systems.
- This product has left the factory in safety-related flawlessness and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advice and warnings in this manual.

EN 61326-3-1:2008
IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1.

Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally well-tried”, are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for the protection of buildings, are excluded from the scope of IEC 61326-3-1.

8. Documentation version history

Version	Date	Notes
0.1.0	05.04.2018	☑ First beta test version.
1.0.0	26.04.2018	☑Added feature to export the setup to the Modbus Client plugin: see chapter “Export to Modbus Client”
Modbus Slave (TCP/IP) Module V20-1	17.8.2020	Update to the new design. General check of screenshots, numbering and content
Modbus Slave (TCP/IP) Module V22-1	20.6.2022	Add a warning in Modbus tables, that Modbus-M plugin only supports read option
Modbus Server (TCP/IP) Module V23-1	6.1..2023	Rename of the module to Modbus Server