

SOFTWARE USER MANUAL

Modbus Master TCP/IP AddOn V22-1



1. Table of contents

1. Table of contents	2
2. About this document	5
2.1. Legend	5
3. Modbus Slave vs. Modbus Master Module	6
3.1. Links	6
3.2. Supported Protocols	6
3.3. Platform	7
3.4. Compatibility	7
3.4.1. Update to Version 2	7
3.4.2. Warnings	8
3.4.2.1. Hardware Setup	8
3.4.2.2. Channel Setup	9
3.4.3. Update example	10
3.4.4. Notable changes in version 2.x	11
3.5. Files and Directories	12
3.5.1. Important DewesoftX® Directories	12
3.6. Licensing	13
3.6.1. Requesting an Evaluation license	13
3.6.2. Activating the Evaluation license	13
3.7. Module Installation	14
3.7.1. Registering the Modules	14
3.8. Input Fields	15
3.8.1. Input Confirmation	15
3.8.2. Input Warnings/Errors	15
4. Module Settings	16
4.1. Module Settings: Devices	17
4.1.1. Module Settings: Toolbar	17
4.1.2. Module Settings: Devices Grid	17
4.1.3. Add/Edit Devices	18
4.1.3.1. Device Name	18
4.1.3.2. Modbus settings	18
4.1.3.3. TCP/IP settings	19
4.1.3.4. Alternative TCP/IP Settings (aka. Redundancy Feature)	20
4.1.3.5. Log Settings	20
4.1.4. Log files	21
4.1.4.1. Log levels	21
5. Channel Setup	22
5.1. Devices	22
5.1.1. Orphaned Devices	22
5.2. Device Settings	23

5.2.1. Sample Rate	23
5.2.2. Minimize # of requests	24
5.2.2.1. Minimize # of requests: Activated	24
5.2.2.2. Minimize # of requests: Deactivated	24
5.2.3. Address Display Offset	25
5.2.3.1. DS-NET example	25
5.2.4. Info Channels	28
Connection Info Channel	28
5.2.5. Modbus tables	29
5.2.6. Table Prefix	29
5.3. Channel List	30
5.3.1. Channel Setup Grid Toolbar	30
5.3.2. Channel Setup Grid	31
5.3.3. Auto Channel Name	32
5.3.4. Add/Edit Boolean Channel	33
5.3.5. Add/Edit Numeric Channel	34
5.3.5.1. Scaling	36
5.3.5.2. Display Type	37
6. General	38
6.1 Status – Error messages	38
6.1.1. Socket Error # 10061	38
6.1.2. Socket Error # 11004	38
6.2. Modbus – Error codes	38
6.3. Modbus M Setup Menu	39
6.3.1. Copy & Paste	39
6.3.2. Copy & Paste Device configuration	39
6.3.3. Copy & Paste Module configuration	39
6.3.4. Save & Load	40
6.3.5. Save & Load Device configuration	40
6.3.6. Save & Load Module configuration	40
6.3.7. Device: Import from Modbus Slave	40
6.3.8. Reset Module configuration	40
6.4. Grid	40
6.4.1. Search-Box & Count-label	40
6.4.2. Header pop-up	41
6.4.2.1. Edit columns	41
6.4.2.2. Grid Sorting	42
6.4.3. Multi-select	42
6.5. DS-NET	43
7. Warranty information	44
7.1. Calibration	44
7.2. Support	44
7.3. Service/repair	44

7.4. Restricted Rights	44
7.5. Printing History	45
7.6. Copyright	45
7.7. Trademarks	45
8. Safety instructions	45
8.1. Safety symbols in the manual	45
8.2. General Safety Instructions	45
8.2.1. Environmental Considerations	46
8.2.2. Product End-of-Life Handling	46
8.2.3. System and Components Recycling	46
8.2.4. General safety and hazard warnings for all Dewesoft systems	46
9. Documentation version history	49

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.


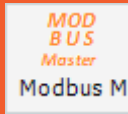


Example

Gives you an example of a specific subject.

3. Modbus Slave vs. Modbus Master Module

This section describes the differences between the two DewesoftX® Modules: Modbus Master (this Module) and Modbus Slave:

	 Modbus Slave	 Modbus Master (THIS Module)
Modbus Role	Slave	Master
TCP/IP Role	TCP/IP Server	TCP/IP Client
Data direction	Remote devices can send commands to the DEWESoft's Modbus Slave Module to read the current data from DEWESoft's channels	The DEWESoft's Modbus Master Module will send commands to remote Modbus Slave devices to read the data from their Modbus registers and will write this data to DEWESoft's channels.



Hint

Since both DEWESoft's Modules use the same protocol you could even use them together: e.g. use the Modbus Slave Module on a remote DewesoftX® system (e.g. on an R8DB) and read the data of those channels via the Modbus Master 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's NET option. See also: chapter Device: Import from Modbus Slave.

3.1. Links

- DEWESoft 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

3.2. Supported Protocols

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

3.3. 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 Dewesoft's dialogue:

When the DewesoftX® version ends with (64-bit) then you have the 64-bit version, otherwise it is the 32-bit version.

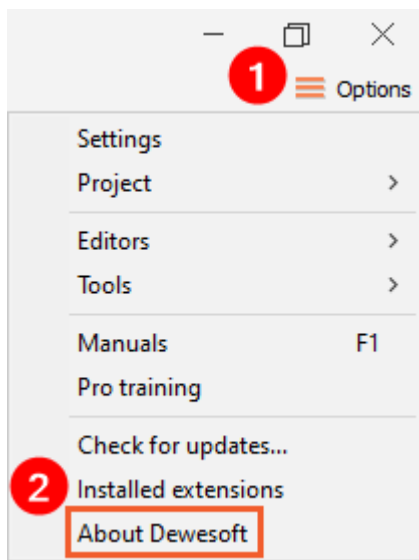


Image 1: Open the About dialogue

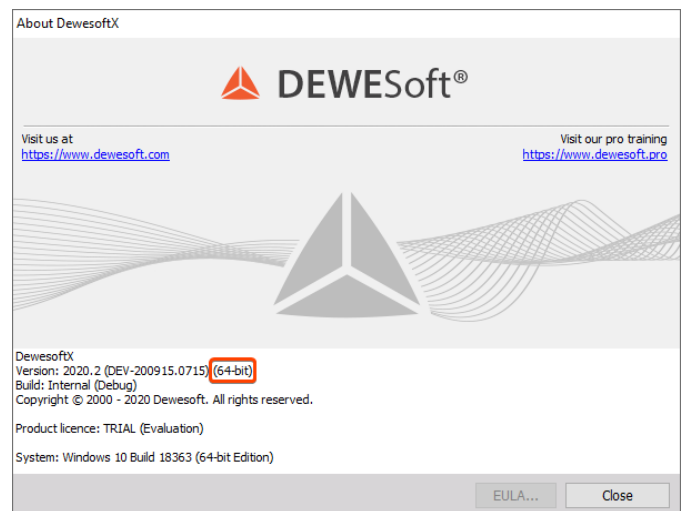


Image 2: About dialogue 64-bit

3.4. Compatibility

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

3.4.1. Update to Version 2

Module version 2.x is very different from version 1 – also the XML setup structure has changed significantly.

As soon as you start DewesoftX® with the new Modbus Module version 2, the older project/setup files will be updated automatically. There is usually no manual user-interaction required. However, there are some notable facts related to the update, which we will discuss in this chapter.



Important

When you start to use version 2.x of the Module, the old setups will be updated automatically. Keep in mind, that the older Module versions 1.x will not be able to read the new structure: e.g. in the case when you have multiple PCs running different versions of the Module, you may want to update all instances, so that you can share the setups. Note: the Module will make a backup copy of the original setup files – just in case something unexpected happens and you want to revert to the older 1.x version.

3.4.2. Warnings

When the Module detects old XML structures in the setup/project files, it will update them to version 2.x automatically. The Module will also make a backup copy of the original file and issue a warning message to make the user aware of the update.

3.4.2.1. Hardware Setup

The hardware setup will be updated as soon as it is activated: e.g. when you start DewesoftX®, or when you switch to another project within DewesoftX®. In this case, the Module will show a warning, like this:

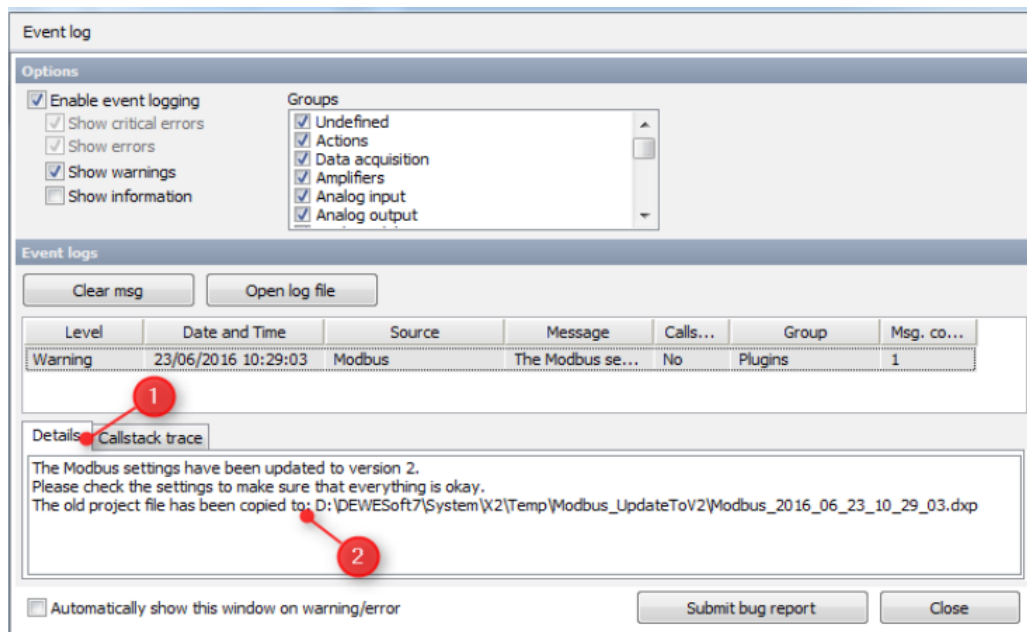


Image 3: Hardware setup update warning

When you click the **Warning** button at the right-top of DewesoftX®, you will see the *Event viewer* dialogue:

- (1) Switch to the Details tab-sheet, so that you can read the whole message
- (2) Note, that the message mentions the path to where the original project file has been copied to. The Module will also append the current date/time to the end of the project file name.

3.4.2.2. Channel Setup

The channel setup will be updated as soon as you load it. In this case, the Module will show a Event log warning, like on the image 4:

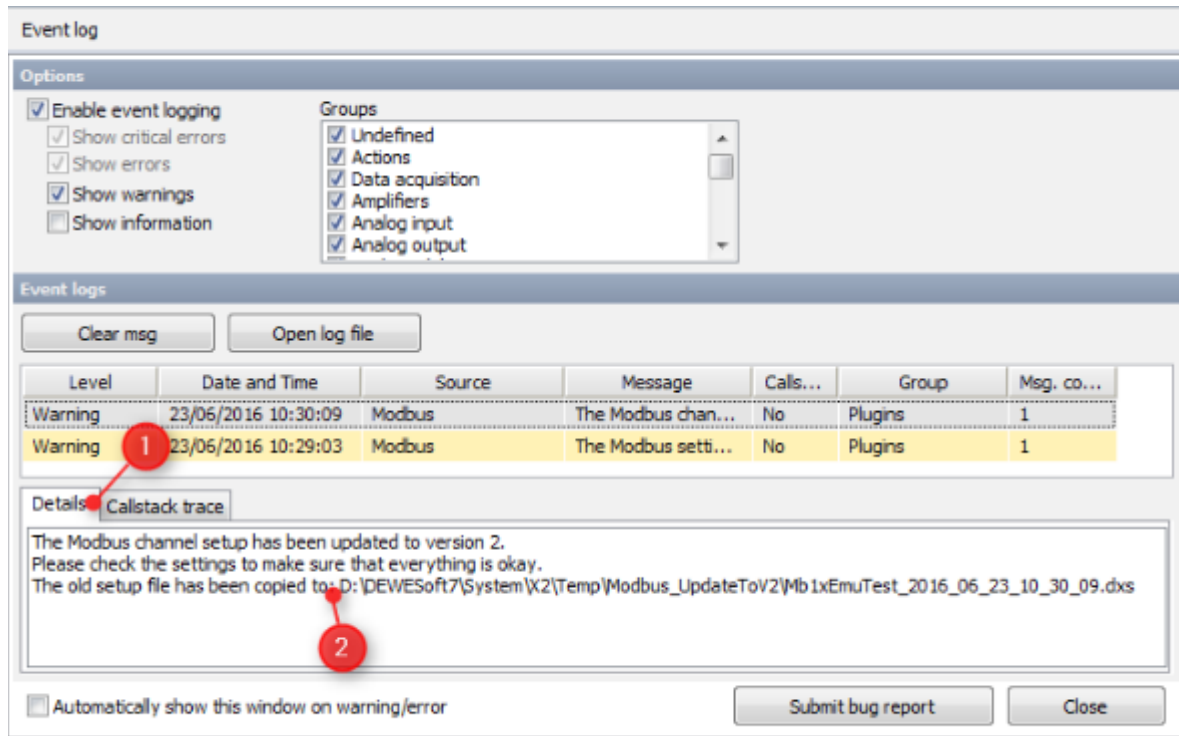


Image 4: Hardware setup update warning

When you click the **Warning** button at the right-top of DewesoftX®, you will see the Event viewer dialogue:

- (1) Switch to the Details tab-sheet, so that you can read the whole message
- (2) Note, that the message mentions the path to where the original setup file has been copied to. The Module will also append the current date/time to the end of the project file name.



Hint

Note, that the channel setup will not be saved automatically: So, until you click the Save button, the channel setup on disk will still remain in version 1.x. That also means, when you don't click save and load the old channel setup again, it will again be updated and you will see another warning and now have 2 backup files.

3.4.3. Update example

Let's take a look at a test-setup example in Module version 1.x:

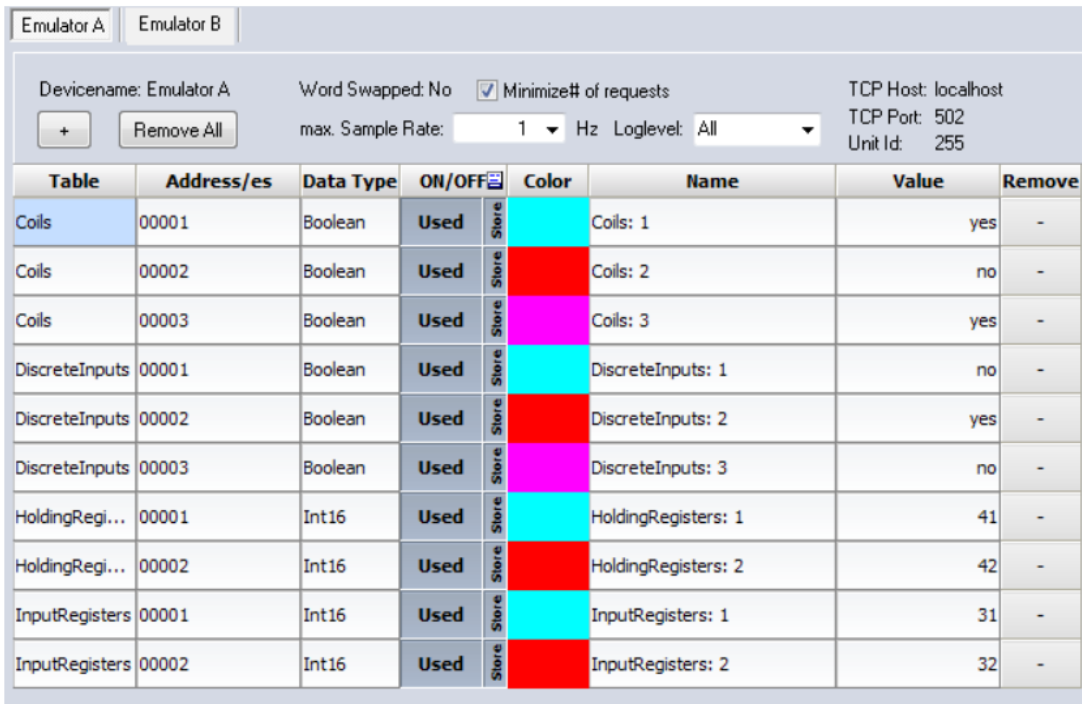
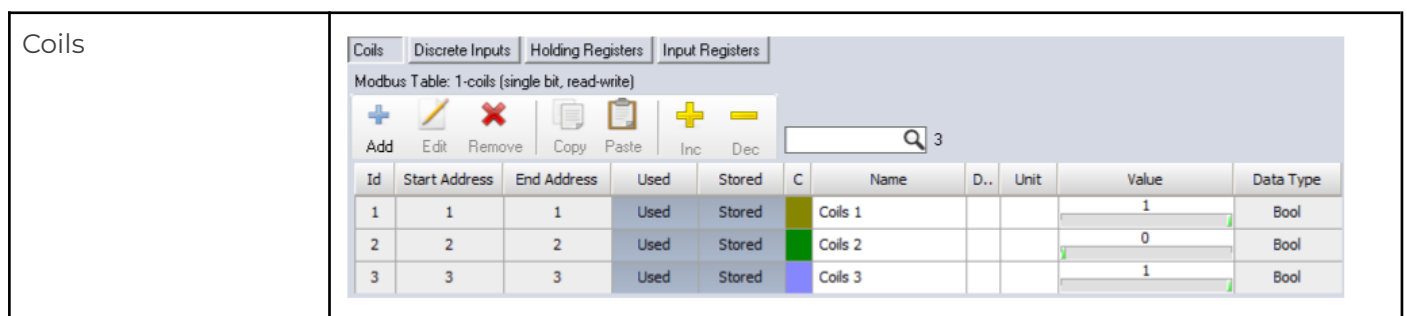


Table	Address/es	Data Type	ON/OFF	Color	Name	Value	Remove
Coils	00001	Boolean	Used	Red	Coils: 1	yes	-
Coils	00002	Boolean	Used	Green	Coils: 2	no	-
Coils	00003	Boolean	Used	Blue	Coils: 3	yes	-
DiscreteInputs	00001	Boolean	Used	Red	DiscreteInputs: 1	no	-
DiscreteInputs	00002	Boolean	Used	Green	DiscreteInputs: 2	yes	-
DiscreteInputs	00003	Boolean	Used	Blue	DiscreteInputs: 3	no	-
HoldingRegi...	00001	Int16	Used	Red	HoldingRegisters: 1	41	-
HoldingRegi...	00002	Int16	Used	Green	HoldingRegisters: 2	42	-
InputRegisters	00001	Int16	Used	Red	InputRegisters: 1	31	-
InputRegisters	00002	Int16	Used	Green	InputRegisters: 2	32	-

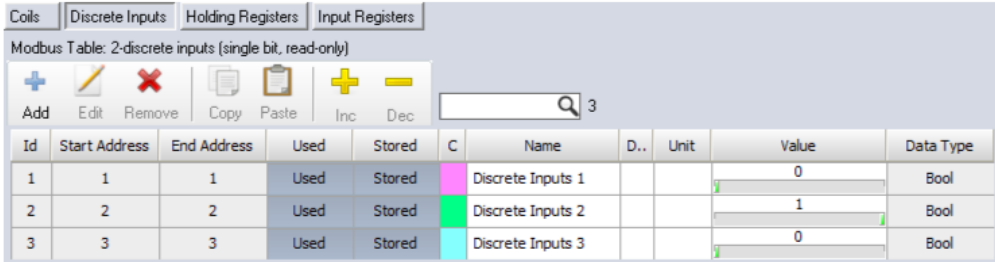
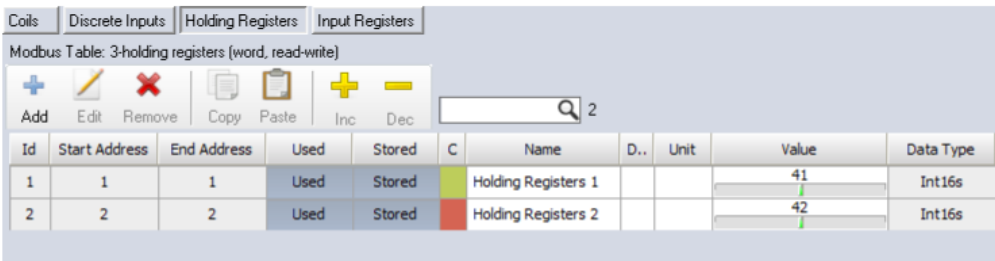
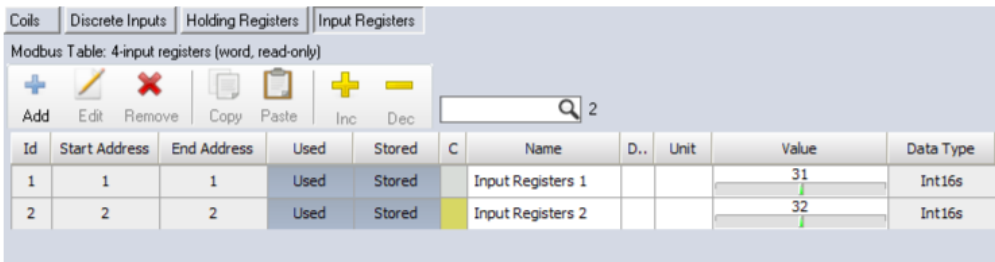
Image 5: Channel Setup Version 1.x

Note that we use some channels for every Modbus table (Coils, Discrete Inputs, Holding Registers and Input Registers). Also take a look at the Values: we have used an emulator and set the values manually, so that they will never change.

Now, let's take a look at what we get after the upgrade to version 2.x:



Id	Start Address	End Address	Used	Stored	C	Name	D..	Unit	Value	Data Type
1	1	1	Used	Stored	1	Coils 1			1	Bool
2	2	2	Used	Stored	0	Coils 2			0	Bool
3	3	3	Used	Stored	1	Coils 3			1	Bool

Discrete Inputs	 <p>Coils Discrete Inputs Holding Registers Input Registers</p> <p>Modbus Table: 2-discrete inputs (single bit, read-only)</p> <p> <input type="button" value="Add"/> <input type="button" value="Edit"/> <input type="button" value="Remove"/> <input type="button" value="Copy"/> <input type="button" value="Paste"/> <input type="button" value="Inc"/> <input type="button" value="Dec"/> <input type="text" value="3"/> </p> <table border="1"> <thead> <tr> <th>Id</th> <th>Start Address</th> <th>End Address</th> <th>Used</th> <th>Stored</th> <th>C</th> <th>Name</th> <th>D..</th> <th>Unit</th> <th>Value</th> <th>Data Type</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>1</td> <td>Used</td> <td>Stored</td> <td></td> <td>Discrete Inputs 1</td> <td></td> <td></td> <td>0</td> <td>Bool</td> </tr> <tr> <td>2</td> <td>2</td> <td>2</td> <td>Used</td> <td>Stored</td> <td></td> <td>Discrete Inputs 2</td> <td></td> <td></td> <td>1</td> <td>Bool</td> </tr> <tr> <td>3</td> <td>3</td> <td>3</td> <td>Used</td> <td>Stored</td> <td></td> <td>Discrete Inputs 3</td> <td></td> <td></td> <td>0</td> <td>Bool</td> </tr> </tbody> </table>	Id	Start Address	End Address	Used	Stored	C	Name	D..	Unit	Value	Data Type	1	1	1	Used	Stored		Discrete Inputs 1			0	Bool	2	2	2	Used	Stored		Discrete Inputs 2			1	Bool	3	3	3	Used	Stored		Discrete Inputs 3			0	Bool
Id	Start Address	End Address	Used	Stored	C	Name	D..	Unit	Value	Data Type																																			
1	1	1	Used	Stored		Discrete Inputs 1			0	Bool																																			
2	2	2	Used	Stored		Discrete Inputs 2			1	Bool																																			
3	3	3	Used	Stored		Discrete Inputs 3			0	Bool																																			
Holding Registers	 <p>Coils Discrete Inputs Holding Registers Input Registers</p> <p>Modbus Table: 3-holding registers (word, read-write)</p> <p> <input type="button" value="Add"/> <input type="button" value="Edit"/> <input type="button" value="Remove"/> <input type="button" value="Copy"/> <input type="button" value="Paste"/> <input type="button" value="Inc"/> <input type="button" value="Dec"/> <input type="text" value="2"/> </p> <table border="1"> <thead> <tr> <th>Id</th> <th>Start Address</th> <th>End Address</th> <th>Used</th> <th>Stored</th> <th>C</th> <th>Name</th> <th>D..</th> <th>Unit</th> <th>Value</th> <th>Data Type</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>1</td> <td>Used</td> <td>Stored</td> <td></td> <td>Holding Registers 1</td> <td></td> <td></td> <td>41</td> <td>Int16s</td> </tr> <tr> <td>2</td> <td>2</td> <td>2</td> <td>Used</td> <td>Stored</td> <td></td> <td>Holding Registers 2</td> <td></td> <td></td> <td>42</td> <td>Int16s</td> </tr> </tbody> </table>	Id	Start Address	End Address	Used	Stored	C	Name	D..	Unit	Value	Data Type	1	1	1	Used	Stored		Holding Registers 1			41	Int16s	2	2	2	Used	Stored		Holding Registers 2			42	Int16s											
Id	Start Address	End Address	Used	Stored	C	Name	D..	Unit	Value	Data Type																																			
1	1	1	Used	Stored		Holding Registers 1			41	Int16s																																			
2	2	2	Used	Stored		Holding Registers 2			42	Int16s																																			
Input Registers	 <p>Coils Discrete Inputs Holding Registers Input Registers</p> <p>Modbus Table: 4-input registers (word, read-only)</p> <p> <input type="button" value="Add"/> <input type="button" value="Edit"/> <input type="button" value="Remove"/> <input type="button" value="Copy"/> <input type="button" value="Paste"/> <input type="button" value="Inc"/> <input type="button" value="Dec"/> <input type="text" value="2"/> </p> <table border="1"> <thead> <tr> <th>Id</th> <th>Start Address</th> <th>End Address</th> <th>Used</th> <th>Stored</th> <th>C</th> <th>Name</th> <th>D..</th> <th>Unit</th> <th>Value</th> <th>Data Type</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>1</td> <td>Used</td> <td>Stored</td> <td></td> <td>Input Registers 1</td> <td></td> <td></td> <td>31</td> <td>Int16s</td> </tr> <tr> <td>2</td> <td>2</td> <td>2</td> <td>Used</td> <td>Stored</td> <td></td> <td>Input Registers 2</td> <td></td> <td></td> <td>32</td> <td>Int16s</td> </tr> </tbody> </table>	Id	Start Address	End Address	Used	Stored	C	Name	D..	Unit	Value	Data Type	1	1	1	Used	Stored		Input Registers 1			31	Int16s	2	2	2	Used	Stored		Input Registers 2			32	Int16s											
Id	Start Address	End Address	Used	Stored	C	Name	D..	Unit	Value	Data Type																																			
1	1	1	Used	Stored		Input Registers 1			31	Int16s																																			
2	2	2	Used	Stored		Input Registers 2			32	Int16s																																			

Notes:

- The new Module now has 4 separate channel lists for every Modbus table
- All possible settings have been correctly updated, except:
 - The colour of the channels has changed, because the default colours are now different. Note: that this does only affect channels that still have the default colour: i.e. when you have manually assigned a different colour for a channel in version 1.x then this custom colour will be updated correctly.
- The channel indexes are also automatically updated: so the widgets in Measure mode should still be assigned to the correct channels.
- The Start and End Addresses still have the same values as in the old Module (this is because the upgrade automatically sets the Address Display Offset to 1 (see chapter Address Display Offset)

3.4.4. Notable changes in version 2.x

- Now you can even use the highest possible address (65536 could not be used in version 1.x)
- Address Display Offset feature (see chapter Address Display Offset) this was requested by some customers for convenience and to avoid confusion
- Now you can enter arbitrary Sampling Rates
- Support for enhanced TCP/IP settings (Timeouts)
- Discrete Items of a channel are now stored in the setup
- Copy and Paste feature for channels, devices and for the whole setup

- Now it's possible to change the start address directly (in version 1.x you had to delete the channel and add a new one)
- Fixed a problem with wrong timeout settings related to the Transaction Id:
 - Example: we send a request with e.g. Transaction Id 10. The Modbus device does not respond in the specified timeout (e.g. 100ms), so we discard request 10 and send the next request with Transaction Id 11. When we now receive the response for request 10 (which maybe just took a little too long – e.g. 105ms), then the old Module version 1.x has discarded request 11, because the response Transaction Id (10) did not match the expected Transaction Id (11). This problem would continue, until the communication is restarted.

3.5. 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® .

3.5.1. Important DewesoftX® Directories

The following tables show 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:\Dewesoft\Bin\X3
		64-bit	C:\Dewesoft\Bin64\X3
Module	The files for Modules (.dll, mth) must be copied into this directory	32-bit	C:\Dewesoft\Bin\X3\Addons
		64-bit	C:\Dewesoft\Bin64\X3\Addons64
Data	Folder for the measurement data files		C:\Dewesoft\Data
Setups	Folder for the setup files		C:\Dewesoft\Setups
Systems	Folder for the project files		C:\Dewesoft\System\X3
Log	Folder for the log files		C:\Dewesoft\System\X3\Logs

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

3.6. Licensing

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

3.6.1. 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** license button

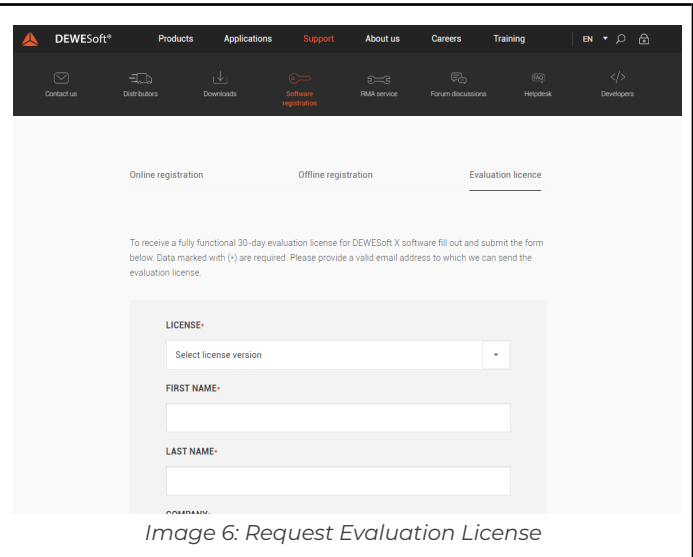


Image 6: Request Evaluation License

3.6.2. 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.

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

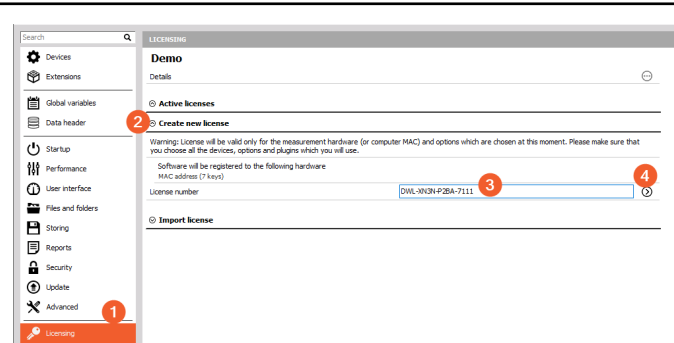


Image 7: Enter license key

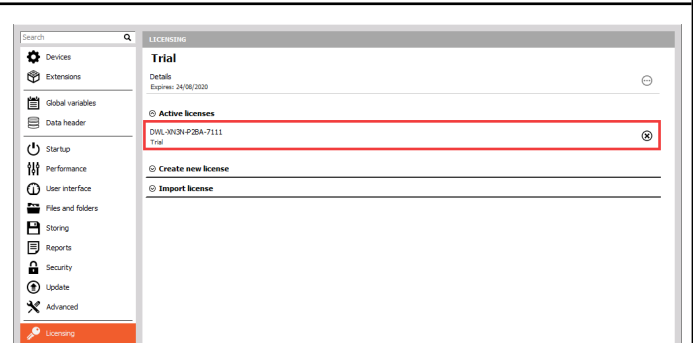


Image 8: Valid trial license

3.7. Module Installation

Simply copy the file Modbus64.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).

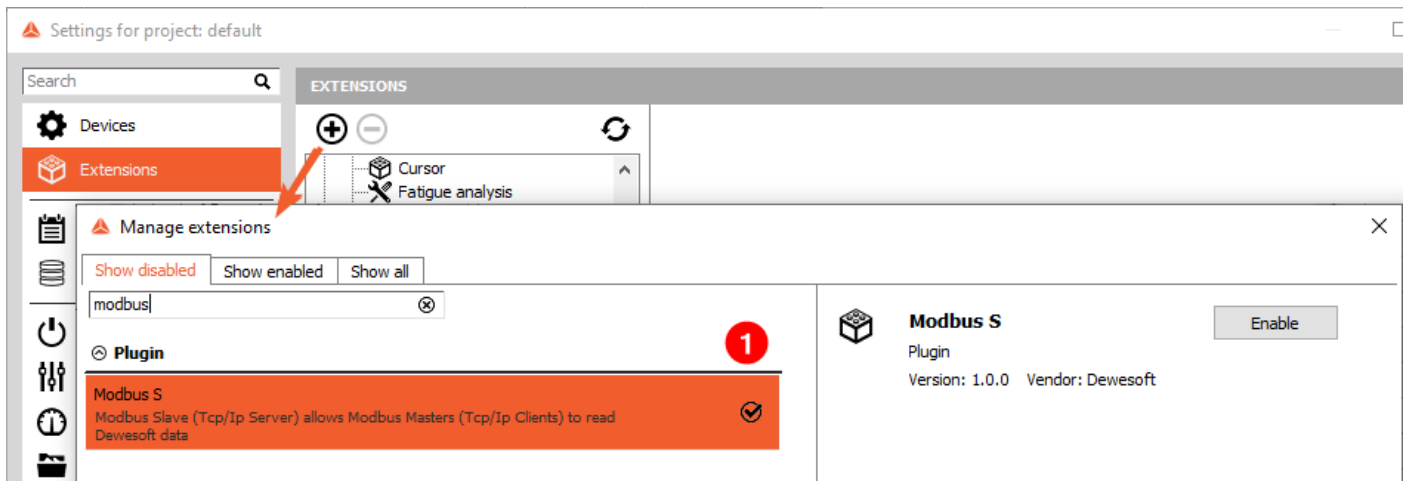


Image 9: Enable Modules

3.7.1. Registering the Modules

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 Modules 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.

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® .

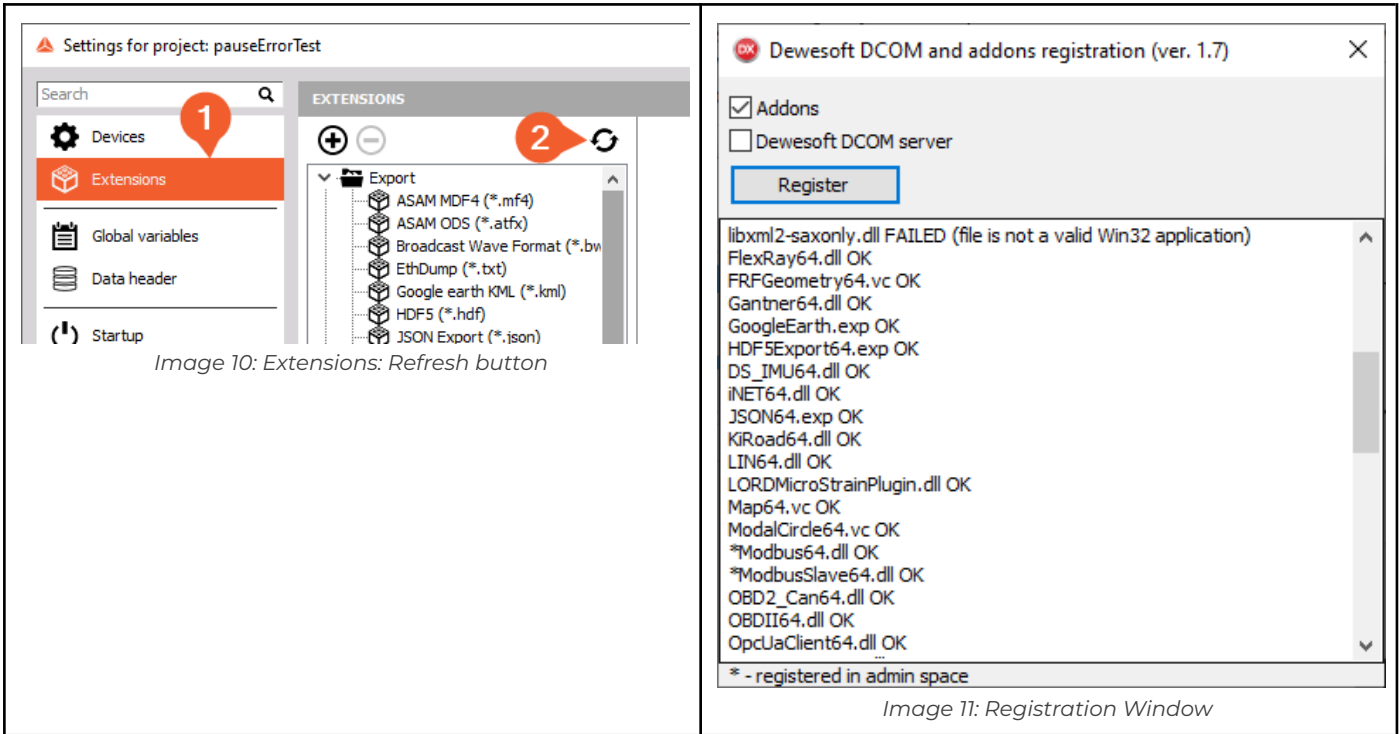
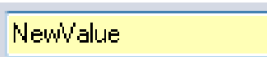



Image 10: Extensions: Refresh button

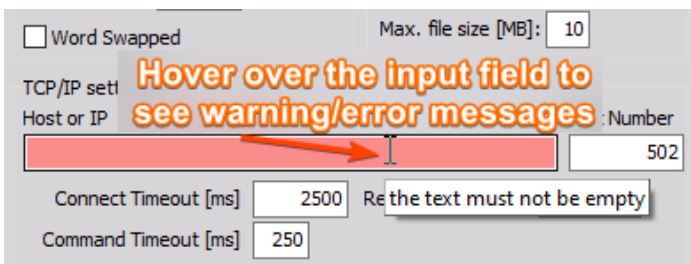
Image 11: Registration Window

3.8. Input Fields

3.8.1. Input Confirmation

<p>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.</p>	
<p>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).</p>	

3.8.2. Input Warnings/Errors

<p>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:</p>	
---	--

4. 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.

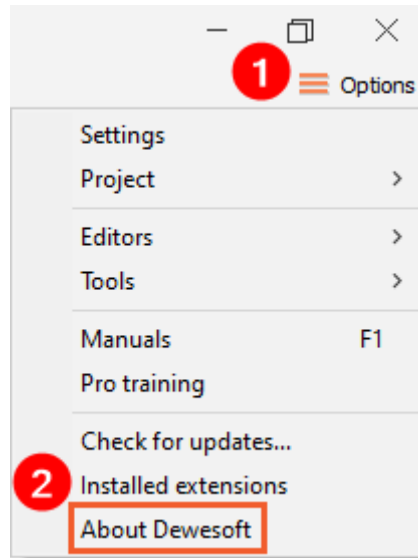


Image 12: Settings

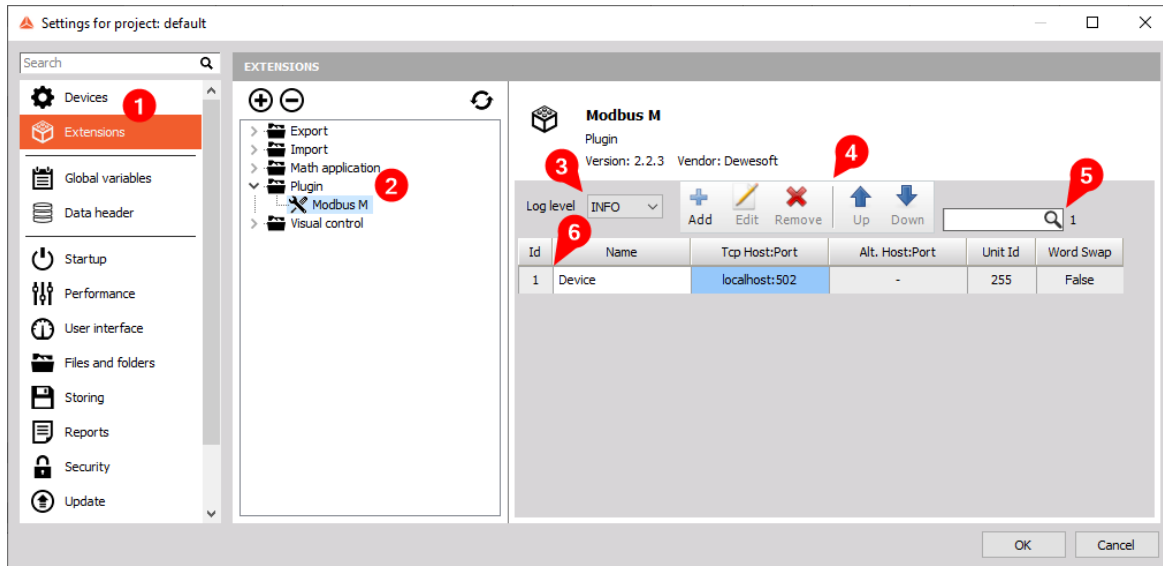


Image 13: Module Settings

- (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 Settings: Toolbar
- (5) See chapter Module Settings: Devices Grid
- (6) See chapter Module Settings: Devices Grid

4.1. Module Settings: Devices

The Module supports multiple devices. You can use the toolbar to manipulate the devices in the Module Settings: Devices Grid.

4.1.1. Module Settings: Toolbar

The toolbar-buttons are used to manage the devices in the Module Settings: Devices Grid.

Add	Will add a new device and open a dialogue window so that you can configure it: see chapter Add/Edit Devices
Edit	Will open a dialogue window so that you can edit the currently selected device/s (only active if at least one device is selected); 2.1.3 Add/Edit Devices on page 13 Note: you can also double click on a grid-row to edit the device/s. Note: if you have selected multiple devices, then you can press the Cancel button in the dialogue to abort the sequence (i.e. the dialogue will not be shown again for the remaining selected devices).
Remove	Will remove all selected devices. The button is only enabled, if you have selected at least one device.
Up	Will move the selected device/s up. The order of devices in the Module Settings: Devices Grid will also be used in the channel setup. The top device will be the leftmost device in channel setup.
Down	Will move the selected device/s up. The order of devices in the Module Settings: Devices Grid will also be used in the channel setup. The top device will be the leftmost device in channel setup.

4.1.2. Module Settings: Devices Grid

The grid shows all defined devices. Use the Module Settings: Toolbar (see chapter Module Settings: Toolbar) to manipulate the grid.

See also chapter Grid for a general overview of the grid-features.

Column	Information
Id	This is just a unique consecutive number to identify the row of the grid
Name	The <i>Device Name</i> : see chapter Device Name
Tep Host:Port	The TCP Host or IP and the Port Number: see chapter TCP/IP settings. The background colour of this cell will change according to the Connection status: see Status in chapter TCP/IP settings.
Alt. Host:Port	See chapter Alternative TCP/IP Settings (aka. Redundancy Feature. The background colour of this cell will change according to the Connection status: see Status in chapter TCP/IP settings.
Unit ID	The Modbus Unit Identifier: see chapter Modbus settings.
Word Swap	The Word Swapped setting: see chapter Modbus settings.

4.1.3. Add/Edit Devices

- (1) *Device Name*: see chapter Device Name
- (2) *Modbus settings*: see chapter Modbus settings
- (3) *TCP/IP settings*: see chapter TCP/IP settings
- (4) *Alternative TCP/IP settings*: see chapter Alternative TCP/IP Settings (aka. Redundancy Feature)
- (5) *Logging Settings*: see chapter Log Settings
- (6) *Errors/Warnings*: will be visible when there are errors or warnings related to this device

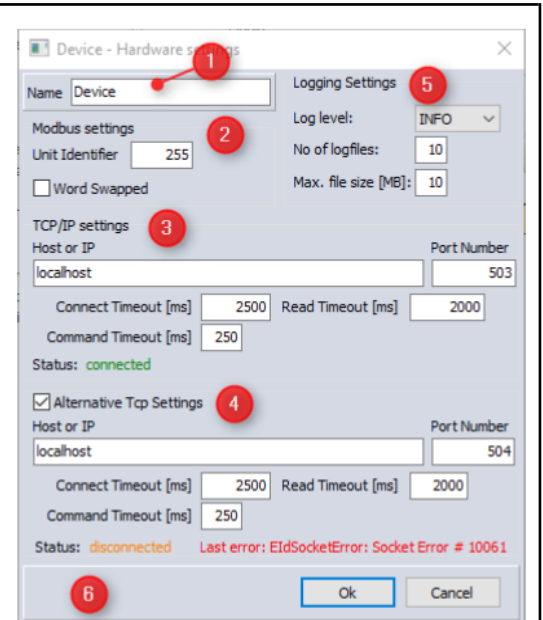


Image 14: Add/Edit Device

4.1.3.1. Device Name

The *Device Name* must be unique (i.e. you cannot create two devices with the same name). The *Device Name* is important because it is used to find the corresponding channel setup information for the device. Therefore you should not change the name once it has been set.

If you change the device name anyway, your saved channel setup files (*.dxs) may not work any more – see chapter Orphaned Devices for details on how to fix this problem.

4.1.3.2. Modbus settings

Unit Identifier

The Modbus TCP IP unit identifier is a number between 0 and 255. When you set a wrong unit identifier, you will not receive any data from the Modbus master.

According to the Modbus specification, this should always be 255 (0xFF) for Modbus over TCP/IP, 0 (0x00) is also okay. Since not all hardware devices follow this specification, you can enter any arbitrary unit identifier.

e.g. DS-NET uses 1 (0x01): see also 4.5 DS-NET on page 38.

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 devices may send the high and low word of a 32 bit data-type (e.g. Float32) in different order.

The Modbus Module lets you configure Word Swapping in the Hardware setup. You must make sure, that the Modbus master uses the same Word Swapping as the Modbus Module or the data will be incorrectly formatted.

4.1.3.3. TCP/IP settings

Host or IP

The TCP host name or the IP address of the Modbus Slave device. Entering the IP address has the advantage that no host name resolution is required, but should not be used, if your Modbus Slave uses DHCP.

Port Number

The TCP port that the Modbus Slave is listening to. According to the Modbus specification, the default port is 502, but the Modbus Module also allows you to use any other port number. The DEWESoft's Modbus Master TCP/IP Module will send the read-command so this port. The DS-NET (see also chapter DS-NET) for example uses port 10000 as default (but this can be configured in the DS-GATE).

Connection Timeout

This is the maximum number of milliseconds that the Module will wait when trying to establish a connection to your server. When the server cannot open a connection within this time, the Module will report an error and retry to open the connection after a short time.
Note: Connection establishment will call into operating system code. So it is possible that the Module must wait until this call returns. DewesoftX® may appear to be frozen during this period.

Command Timeout

This is the maximum number of milliseconds that the Module will wait for a response from the server after sending a command. If the server does not respond within the specified time-out it considers the command to have failed. The connection will remain open and we send the next command.

Read Timeout

If we do not receive data for more than this timeout (in milliseconds), then the Module will close and reopen the TCP/IP connection.



Hint

The read timeout should always be longer than the sampling rate: i.e. when you set the sampling rate to 0.1Hz and you have only 1 channel, then the Module will only send one command every 10 seconds. If the read-timeout is only 2 seconds, then the Module will unnecessarily reopen the connection several times.

Status

The Module will constantly try to establish a connection to the TCP server that you specify and show the status:

- Connecting: the Module is currently trying to open the TCP connection. Usually this status is only shown for a very short duration – you may not even see it. If you see this status for a longer time, you may have entered a wrong Hostname or IP address. If so, the status should change to Error after some time: see chapter Socket Error # 11004
- Connected: the Module has successfully connected to the TCP host on the specified port
- Error: an error has occurred: see chapter Status – Error messages for details.



Hint

The status Connected only means that we could open a TCP/IP connection to the specified host and port number. It does not mean that the host is a Modbus device. i.e. this could be any other program that is listening to the specified port.

4.1.3.4. Alternative TCP/IP Settings (aka. Redundancy Feature)

When you activate the *Alternative TCP/IP Settings* checkbox, you can enter another set of TCP/IP settings: see chapter TCP/IP settings above. You must of course enter another host or port number for the alternative Modbus device.

When the connection to one of the Modbus devices is lost, the Module will try to connect to the other device, until one of the devices returns some data. This does of course mean that the alternative device should return the exact same data as the main Modbus device: i.e. the alternative device measures the same data and is thus redundant.

Note: reconnection will only be done when the connection to the device is lost: e.g. the Module will not switch back from the alternative Modbus device to the main device, as long as the connection to the alternative device is okay.

You can use the *Connection Info* channel to see info about successful connection to a Modbus device: see chapter Connection Info Channel:

4.1.3.5. Log Settings

These are the log-settings for the current device.

The log-level defines how much log-information will be written (it is recommended to use the default INFO) – see also: 2.1.4.1 Log levels on page 16.

The log-files have a feature to limit the maximum amount of disk space that will be used. Whenever the log file grows larger than *Max. file size [MB]*, it will be closed and a new log-file will be created. When the maximum number of log files (defined by *No of log files*) is reached, the oldest file will be deleted.

The name of the log-file will contain the name of the device.



Example

If your device is called Device A, the log-file name is: TODO Modbus M_Device_A.log (note: all non-ASCII characters may be replaced by underscores, to make sure, that it is a valid filename: i.e. the space character in this example).

4.1.4. 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 logfile is Modbus.log.

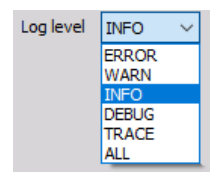
When the Module is started, it will immediately start to log to the windows temporary directory. As soon as the DewesoftX® application is available to the Module, all subsequent logs will be written to the standard DewesoftX® log directory (e.g. C:\Dewesoft\System\X3\Log).

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

4.1.4.1. 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

5. Channel Setup

The **Modbus M** channel setup will show all devices that you have configured in Hardware setup in the corresponding order:

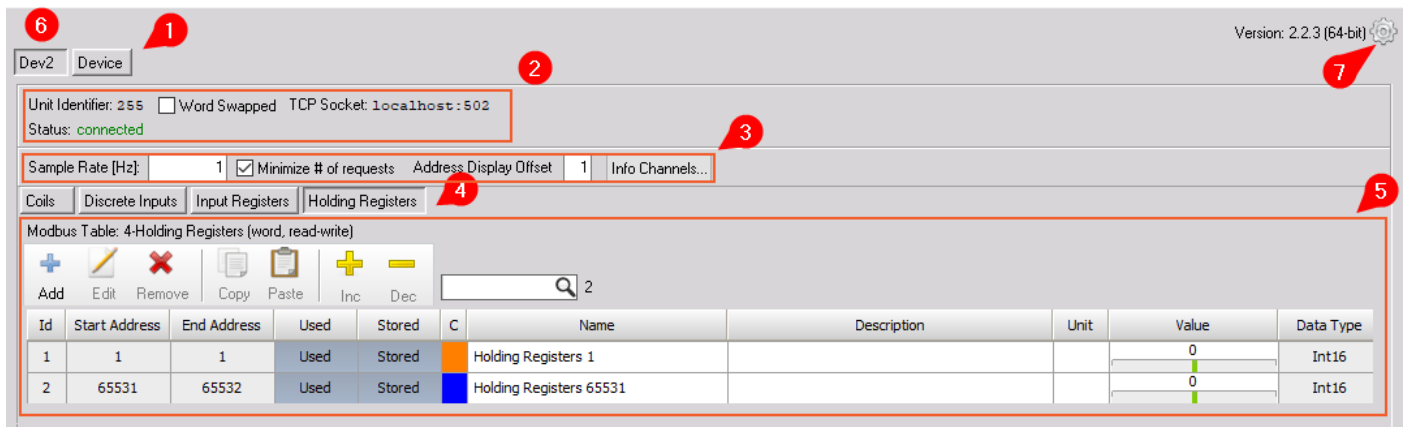


Image 15: Channel Setup Overview

- (1) All Modbus devices that you have defined: see chapter Devices
- (2) Overview of the Hardware settings and the connection status of the current device: see chapter Add/Edit Devices. When you use the Redundancy Feature (see chapter Alternative TCP/IP Settings (aka. Redundancy Feature)), the TCP Socket will show both values separated by a slash: e.g. localhost:503 / localhost504
- (3) Device settings of the current device: see chapter Device Settings
- (4) All Modbus tables of the current device: see chapter Modbus tables
- (5) Channel list of the current Modbus table: see chapter Channel List
- (6) When there are any warnings/errors in your setup, a message will be shown in this location.
- (7) Module version and Modbus setup menu: see chapter Modbus M Setup Menu

5.1. Devices

The device list will show the name of all devices that are defined in the hardware setup (in the same order as they are defined in the hardware setup) – see also chapter Module Settings: Devices. If orphaned devices exist (see chapter Orphaned Devices), they will be shown at the end of the list (right side).

Devices which contain errors or warnings will be displayed in red/orange colour.

5.1.1. Orphaned Devices

An orphaned device is a device that exists in channel setup, but does not exist (any more) in the current hardware setup. Orphaned devices may occur in the following cases:

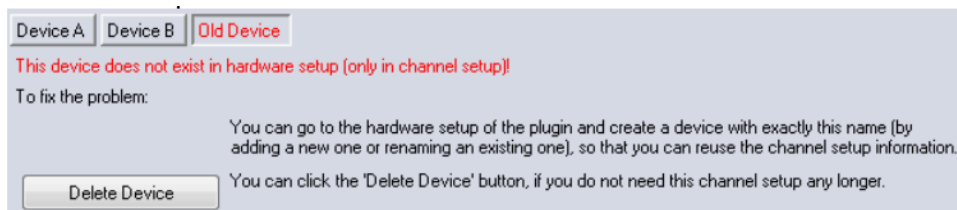
1. if you go to hardware setup, delete one of the devices (or rename a device) and go back to channel setup
2. if you load a setup which included a device that does not exist in the current hardware setup (i.e. it may have been renamed)

It's best to explain this with a small example. Say we have defined 2 devices in the hardware setup (see Image 16), named *Device A* and *Device B*.

Id	Name
1	Device A
2	Device B

Image 16: Hw Setup

Now we load an old setup which has included a device named *Old Device*. Then the device list in channel setup will look this:



The devices which are new (or still exist) in hardware setup are listed first (in the same order like in the hardware setup list). And at the end (right hand-side) you have the orphaned *Old Device* which no longer exists in hardware setup.

When you have an orphaned device in channel setup, you have the following options:

- Open the hardware setup: you can add a device to the hardware setup with the name of the orphaned device (or rename a an existing device) – then you can re-use the device – see also chapter Add/Edit Devices
- Delete the device, if you don't need it anymore Note: you may also want to copy the settings from this device to the clipboard: see chapter Copy & Paste Device configuration

5.2. Device Settings

5.2.1. Sample Rate

This setting defines how often the Module will try to poll the Modbus device for data. Note, that the actual sample rate may be lower, depending on how fast your Modbus server can respond.



Example

Fetching the data from the device may take longer than the sample rate that you have set: e.g. when you set the sample rate to 100Hz, the Module will try to get the data from the device every 10ms. But when the device responds very slowly (e.g. it takes 50ms for the device to reply), then the actual sampling rate will be lower (only about 20Hz). In this case you should reduce the sampling rate to a value that is not too much for your Modbus device.



Hint

Keep in mind that a very high setting (e.g. 1000Hz) will also increase the required bandwidth and the CPU load. The Module will show a warning when you enter a sample rate higher than 100Hz.

5.2.2. Minimize # of requests

This is activated per default and can greatly increase the read-performance of the Modbus communication. You should only deactivate it for cases where it is really required.



Example

Consider a configuration where you have defined 4 channels in the coils table: Coil 1, 5, 10 and 16. If this Minimize # of requests is activated, it will send one request to read the coils 1 to 16. From the response we only use the data of coils 1, 5, 10 and 16 and ignore the others. If it were deactivated, the Modbus Module would send one request for Coil 1, wait for the response, then send another request for Coil 5, wait for the response and so on.

5.2.2.1. Minimize # of requests: Activated

In this case, the Modbus Module will try to minimize the read requests to the Modbus device by sending block read commands:

The Modbus protocol specifies block-read commands which permits to read up to 250 bytes in one command; or in other words:

- up to 2000 contiguous Coils or Discrete Inputs
- up to 125 contiguous Input or Holding Registers

This read mode usually has much better performance because channels tend to be in contiguous address ranges.

5.2.2.2. Minimize # of requests: Deactivated

In this mode, the Modbus Module will read each channel separately. That means for each channel it will send a separate request to the Modbus device and wait for the response (which will include the data for this one channel).

You may need to use this in rare cases, when you have a Modbus device that does not support all addresses and you want to read data that spans an address gap – see Example.



Example

Let's assume we have a Modbus device that implements only the registers 1000 to 1010 and the registers from 1020 to 1030. All registers in between 1011 to 1019 are not implemented and will return an error \$02 'Illegal Data Address' when you try to read them. Let's further assume that we want to read registers 1002 and 1025. If *Minimize # of requests* are activated, the Module will send a request to read all registers from 1002 to 1025: this request will fail, because the registers are 1011 to 1019 invalid. To solve this problem, you must deactivate *Minimize # of requests*, so that the Module will send 2 separate requests: one for Register 1002 and one for 1025.

5.2.3. Address Display Offset

Unfortunately there is some confusion about the Modbus addresses. Some Modbus servers start at address 0 and others from address 1. This is maybe due to the Addressing Model defined in the Modbus Application protocol:

The MODBUS application protocol defines precisely PDU addressing rules.

In a MODBUS PDU each data is addressed from 0 to 65535.

It also clearly defines a MODBUS data model composed of 4 blocks that comprises several elements numbered from 1 to n.

In the MODBUS data Model each element within a data block is numbered from 1 to n

Quote from "Modbus Application Protocol V1.1b"

So, the intention of the Modbus standard is clearly to show addresses starting from 1 to the users and using addresses starting from 0 internally (for the programmers).

To make it easier for use to enter/read the addresses, you can set the address display offset of 0 or 1. This will only affect how the addresses are displayed to the user in DewesoftX®, but it will not change the PDU addresses that are actually sent over TCP/IP.



Hint

In the Channel Setup Grid (see chapter Channel Setup Grid), there are 2 hidden columns that show the PDU Start and End Address. You will notice that changing the Address Display Offset, will only affect the Start Address and End Address values but the PDU Start Address and PDU End Address remain the same.

5.2.3.1. DS-NET example

The DS-NET *software test.commander displays* the PDU addresses (that start from 0) to the user.

For example, we have defined a variable named *Counter* that increases every second. In the *Statistics* dialogue you can see that the *ModbusRegisterOffset* is 1003 (and the *Sis* 2, because it is a 32bit floating point type):

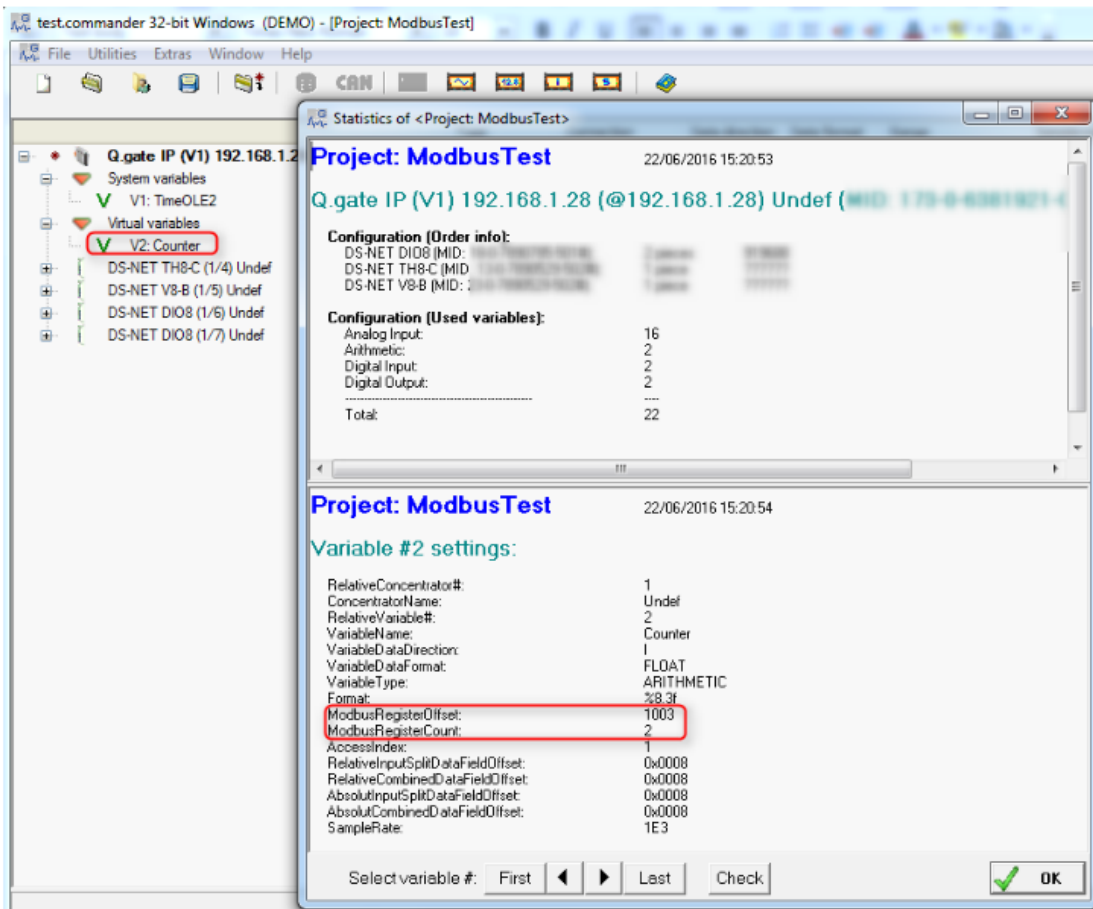


Image 17: DS-NET Modbus Address in test.commander

Now, let's define a corresponding channel in DEWESoft® and check the data:

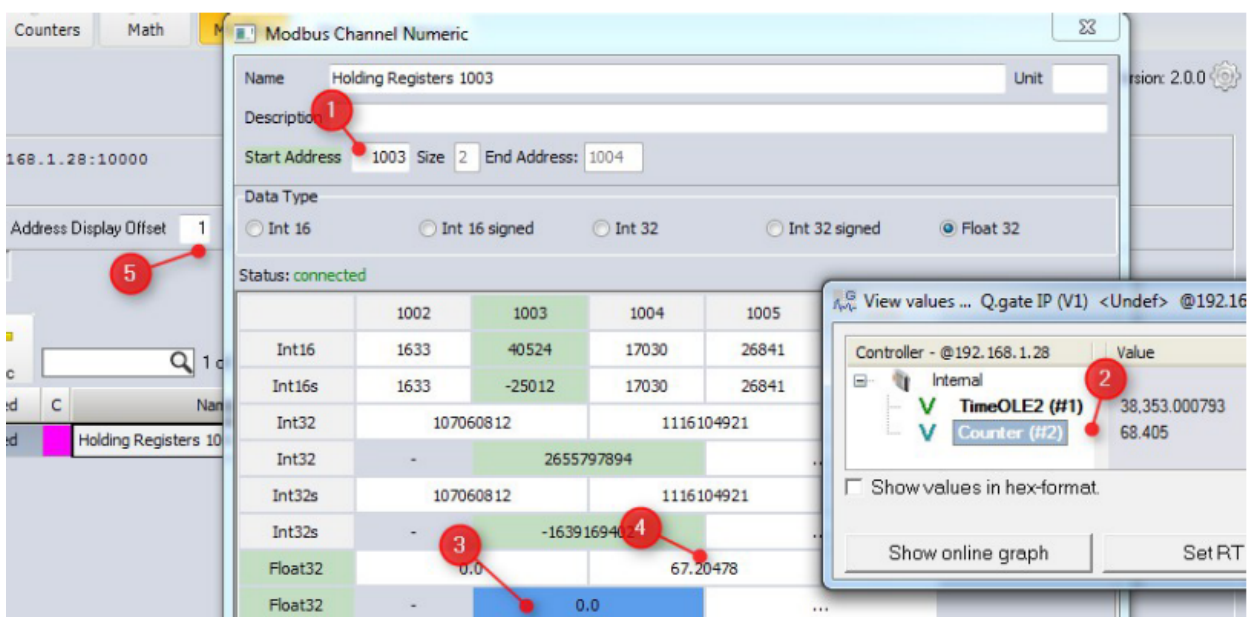


Image 18: DS-NET setup

Note, that Image 18 shows the *View values...* dialogue from *test.commander* on top of the DewesoftX® window, so that we can compare the values of the *Counter variable*. Note the following facts:

- (1) Start Address: the first thing we do is to use the register 1003 as the start address. This is the address that we see in the *test.commander Statistics* dialogue: see Image 17
- (2) The value in the *test.commander View values...* dialogue is about 68
- (3) In DewesoftX® we see that the value at register 1003 is 0.0 and not what we expect!
- (4) When we look at the adjacent register 1004, we can see the value that we expect: 67.02 looks promising
- (5) Note, that we have used the default **Address Display Offset** of 1

Now click on the correct value cell (or change the *Start Address* manually to 1004) and click **OK** to close the *Modbus Channel Numeric* dialogue. Now let's take a look at the channel setup grid:

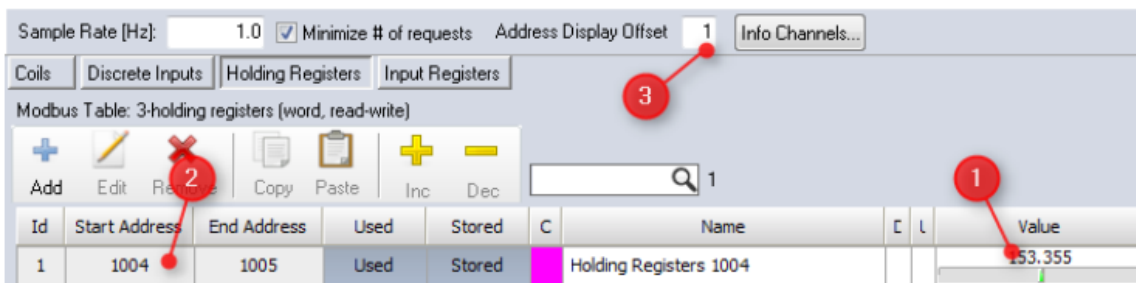


Image 19: DS-NET Grid: Default Address Display Offset

- (1) The Value of the channel is okay.
- (2) The address shows 1004
- (3) The Address Display Offset is 1 (the default value)

Reading the data does already work, but for our convenience, we'd like to see Start Address 1003, so that it is exactly the same as in *test.commander*. We can easily do this by changing the *Address Display Offset* to 0:

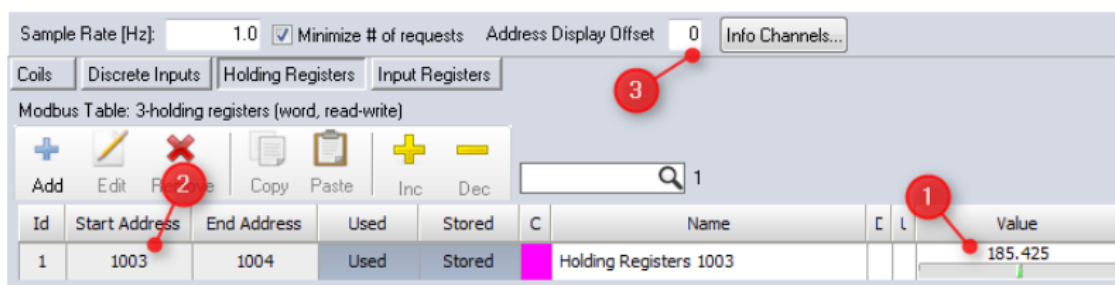


Image 20: DS-NET Grid: Address Display Offset: Zero

Great! Now the start-address that we see in *test.commander* matches what we use in the DewesoftX® *Start Address* fields/columns:

- (1) The Value of the channel is (still) okay.
- (2) The address shows 1003 (the same as in *test.commander*)
- (3) The Address Display Offset is now 0 and only affects the display (we still read the same value from the DS-NET)

5.2.4. Info Channels

Normally the Info channels should remain unused, but you may want to activate them for debugging:

- *Command Time*: this channel will stop the approximate time it took from sending the request to the device, until we received the response.
- *Transaction Id*: each command that we send to the Modbus device must include a *Transaction Id* (which is always incremented). The Modbus device must also write the same *Transaction Id* into the response, so that we know to which command the response belongs to.
 - *Transaction Id Send*: each time before we send a command, we write the *Transaction Id* into this channel
 - *Transaction Id Receive*: each time when we receive a reply from the Modbus device, we write the *Transaction Id* into this channel
- *Connection Info*: see chapter Connection Info Channel below

Connection Info Channel

The connection info channel will show the connection status.

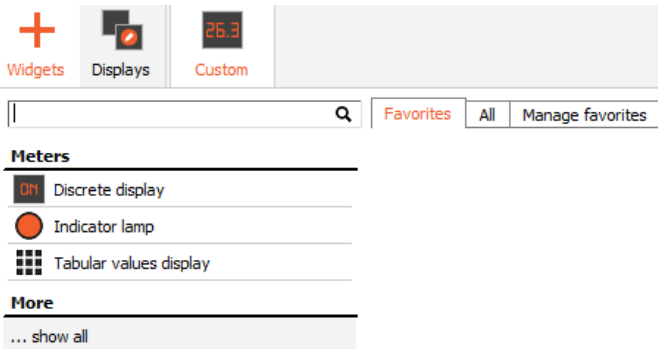


Image 21: Widgets

Use an *Indicator Lamp* widget or *Discrete display* – see Image 22) or a *Tabular values display*.

Image 23: Widget Display:

(1) *The Indicator Lamp* widget shows the current connection status.

(2) In the *Tabular values display*, you can see the changes of the *Connection Info*.

Connection Info:

- *Disconnected*: there is currently no connection to any Modbus device.
- *Main*: we are connected to the main TCP/IP connection
- *Alternative*: we are connected to the alternative TCP/IP connection: see also: chapter Alternative TCP/IP Settings (aka. Redundancy Feature)

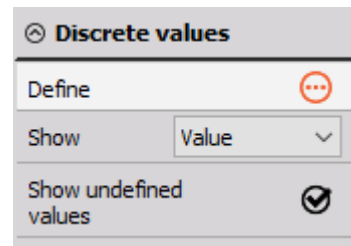


Image 22: Discrete display Mode

Connection Info	
Alternative	
Time	Connection Info
33,7520	Alternative
33,6260	Disconnected
33,1040	Main
23,1000	Main
22,9760	Disconnected
17,9760	Alternative
7,9760	Alternative
0,0020	Disconnected

Image 23: Widget display

5.2.5. 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**. Since this address range starts from 1, the addresses are said to be 1-based (see also chapter Address Display Offset).

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.

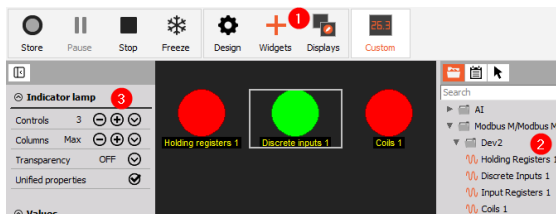
Modbus Data Table	Access type	Read Function Code	Object Type	Data-Type
Coils	Read-Write*	0x01	Single bit	Boolean
Discrete Inputs	Read-Only	0x02	Single bit	
Input Registers	Read	0x03	16-bit word	Numeric: <i>Int16, Int6s, Int32, Int32s, Float32</i> see: chapter Add/Edit Numeric Channel
Holding Registers	Read-Write*	0x04	16-bit word	

* Modbus-M plugin in DewesoftX only supports the read option



Hint

Boolean data is best displayed with the Indicator lamp widget:



- (1) Drag the Lamp widget from the toolbar to the measurement screen
- (2) Select any boolean channels from the list (e.g. Coils, Discrete Inputs)
- (3) You may want to click on the + button to add more channels to the widget

5.2.6. 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 does NOT relate to the Read Function Code. Some devices use 4 digits to represent the address, others use 5 digits and some use a completely different schema (see Example below).

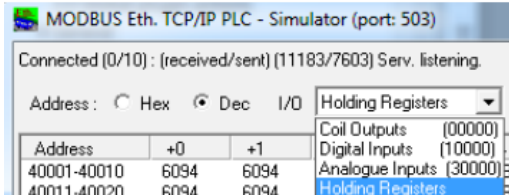
Modbus Data Table	Read Function Code	4 digit Example	5 digit Example
Coils	0x01	00001 - 09999	000001 - 065536
Discrete Inputs	0x02	10001 - 19999	100001 - 165536
Input Registers	0x03	30001 - 39999	300001 - 365536

Holding Registers	0x04	40001 - 49999	400001 - 465536
-------------------	------	---------------	-----------------



Example

The Modbus emulator MOD_RSSim uses 0 for Coils 1 for Digital Inputs 3 for Analogue Inputs 4 for Holding Registers.



5.3.Channel List

The channel list let's you define and change the channels of each Modbus table.

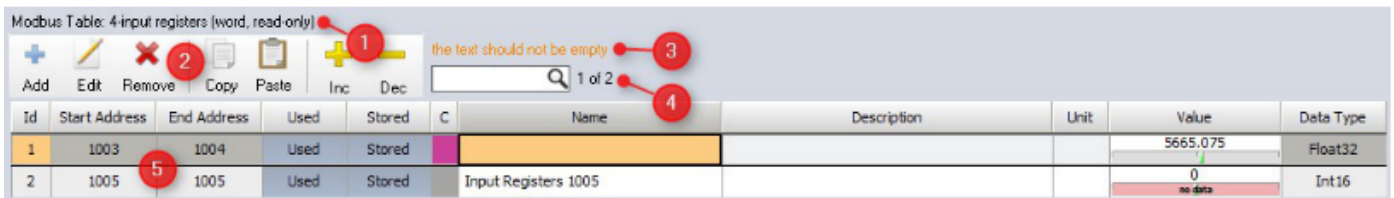


Image 24: Channel List

- (1) This text describes the current Modbus table: see also chapter Modbus tables. For your convenience, it also shows the Table Prefix (4 in this case) : see also chapter Table Prefix.
- (2) Use the toolbar to manipulate the channel grid: see chapter Channel Setup Grid Toolbar.
- (3) This text will only be visible when there is a warning or an error in the channel grid note: it will show details when you select an erroneous cell
- (4) See chapter Search-Box & Count-label.
- (5) See chapter Channel Setup Grid.

5.3.1. Channel Setup Grid Toolbar

The buttons on the toolbar will affect the channels in the Channel Setup Grid:

Add	Will add a new channel and open a dialogue window so that you can configure it: see chapter Add/Edit Boolean Channel and chapter Add/Edit Numeric Channel.
Edit	Will open a dialogue window so that you can edit the currently selected channel/s (only active if at least one channel is selected): see chapter Add/Edit Boolean Channel and chapter Add/Edit Numeric Channel. Note: you can also double click on a grid-row to edit the channel/s. Note: if you have selected multiple channels, then you can press the Cancel button in the dialogue to abort the sequence (i.e. the dialogue will not be shown again for the remaining selected devices).
Remove	Will remove all selected channels.

	The button is only enabled, if you have selected at least one channel.
Copy	Will copy the selected channel/s to the Windows® clipboard, so that you can later paste the channel/s to another Modbus Table, Device or DewesoftX® setup. The button is only enabled, if you have selected at least one channel.
Paste	Will paste the previously copied channel/s to the current Modbus table. Note: the button will only be enabled, when there is some matching data in the clipboard: e.g. you cannot paste <i>Boolean</i> channels (e.g. from the Coils table) to a <i>Numeric</i> Modbus table (e.g. <i>Holding Registers</i>)
Inc	Will increase the <i>Start Address</i> of the selected channel/s. Note: instead of increasing <i>Start Addresses</i> , you may want to change the <i>Address Display Offset</i> (see chapter <i>Address Display Offset</i>) The button is only enabled, if you have selected at least one channel.
Dec	Will decrease the <i>Start Address</i> of the selected channel/s. The button is only enabled, if you have selected at least one channel.

5.3.2. Channel Setup Grid

The Channel Setup Grid shows information about all channels of the Module and also live values

Column	Information
Id	This is just a unique consecutive number to identify the row/channel of the grid
PDU Start Address	The PDU start-address is always 0-based. This is the address that will be sent to the Modbus master. The column is hidden per default. Note: the <i>Address Display Offset</i> (see chapter <i>Address Display Offset</i>) will not affect this address.
PDU End Address	The PDU end-address is always 0-based. The column is hidden per default. Note: the <i>Address Display Offset</i> (see chapter <i>Address Display Offset</i>) will not affect this address.
Start Address	The start-address of the channel. Note: the <i>Address Display Offset</i> (see chapter <i>Address Display Offset</i>) will affect this address.
End Address	The end-address of the channel Note: the <i>Address Display Offset</i> (see chapter <i>Address Display Offset</i>) will affect this address
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 <i>Measure Mode</i> 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 <i>Measure Mode</i> , 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 <i>Math</i> channel to the DewesoftX® data file (but not the original data).
C	This colour will be used by the displays in <i>Measure Mode</i> . 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): see also chapter Auto Channel Name 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!
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).
Scale	The scale-factor of the channel: see chapter Scaling Note: this column is not visible by default
Offset	The scale-offset of the channel: see chapter Scaling Note: this column is not visible by default
Data Type	Shows information about the data-type. For the Boolean Modbus tables (Coils and Discrete Inputs), this column will always show Bool. For the Numeric Modbus tables (Holding Registers and Input Registers) see:chapter Add/Edit Numeric Channel for more details

5.3.3. Auto Channel Name

When you add a new channel, the default name will be the name of the Modbus table and the Start-address: e.g. *Holding Registers 1*. This name will automatically be changed when you change the start-address.



Example

When you create a new channel the name may be *Holding Registers 1024*. When you then change its start-address e.g. to 17 the channel name will automatically be changed to *Holding Registers 17*.

As soon as you change the channel name to anything else (e.g. *Temperature*), then the default, the name you have entered will be used and changing the start-address will not affect the channel name.

It is recommended to always give meaningful names to your channels: e.g. *Temperature* is much easier to remember as *Input Register 1024*.

5.3.4. Add/Edit Boolean Channel

This dialogue can be used to add or edit Boolean channels for the corresponding Modbus tables (Coils and Discrete Inputs):

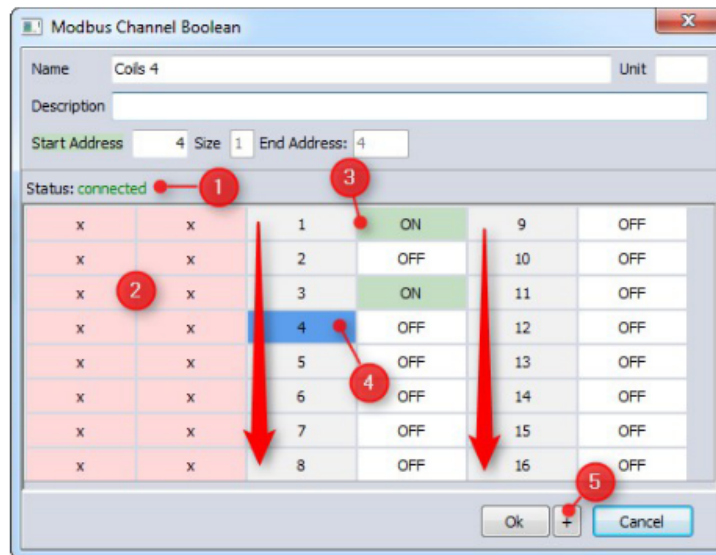


Image 25: Add/Edit Boolean Channel

You can define *Name*, *Unit* and *Description* as you like. See also: chapter Auto Channel Name.

You must specify the *Start Address* to read the correct item from the Modbus table:

- See also: chapter Address Display Offset
- The *Size* of Boolean channels will always be 1
- The *End Address* will always be the same as the Start-Address (since the *Size* is 1)

Notes:

(1) This text shows the TCP/IP connection status: see chapter Status o for details The Module will constantly try to connect to the Modbus device and read some data periodically (about once per second) that will be displayed in the grid below. The grid will show the status of up to 24 Coils/Discrete Inputs at a time (in top-down order – see the red arrows in Image 25), so that you can see the adjacent items to easily find out, if you are using the correct start-address.

(2) Invalid addresses will be shown in red colour: e.g. 1 is the lowest possible start-address – 0 is invalid (when the Address Display Offset is set to 1).

(3) Coils/Discrete Inputs that are on (value 1) will be shown in green background colour

(4) The cell of the currently selected item (same start-address) will be shown in blue background colour.

(5) The + button is only visible when you **add** a new channel (not when you edit an existing channel).

When you click it, the current channel will be saved (e.g. the same as clicking **OK**), and the dialogue will immediately show up again with the same settings and the next *Start-Address*.

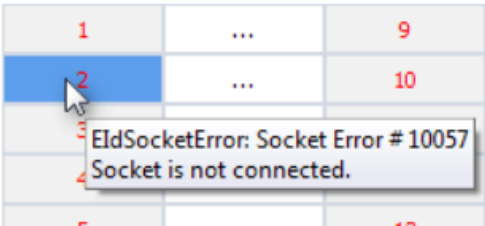
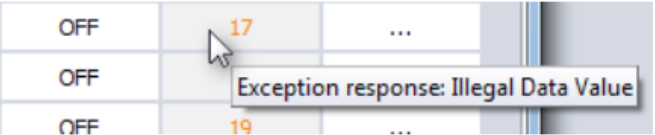
This is convenient if you want to add many adjacent channels.



Hint

You can directly click on a cell to select it and change the *Start-address*.

When the value column shows 3 dots it means that the Module is currently trying to read the new value: i.e. we have already sent the command to the Modbus device, but have not received a response yet.

<p>When an error occurs, the Modbus address will turn red and you can hover the mouse pointer over the cell to see the detailed error message.</p>	
<p>When a warning occurs, the Modbus address will turn orange and you can hover the mouse pointer over the cell to see the detailed error message. e.g. in the example to the right, we try to read coil number 17 from a device, that only has 16 coils.</p>	

5.3.5. Add/Edit Numeric Channel

This dialogue can be used to add or edit Numeric channels for the corresponding Modbus tables (Holding Registers and Input Registers):

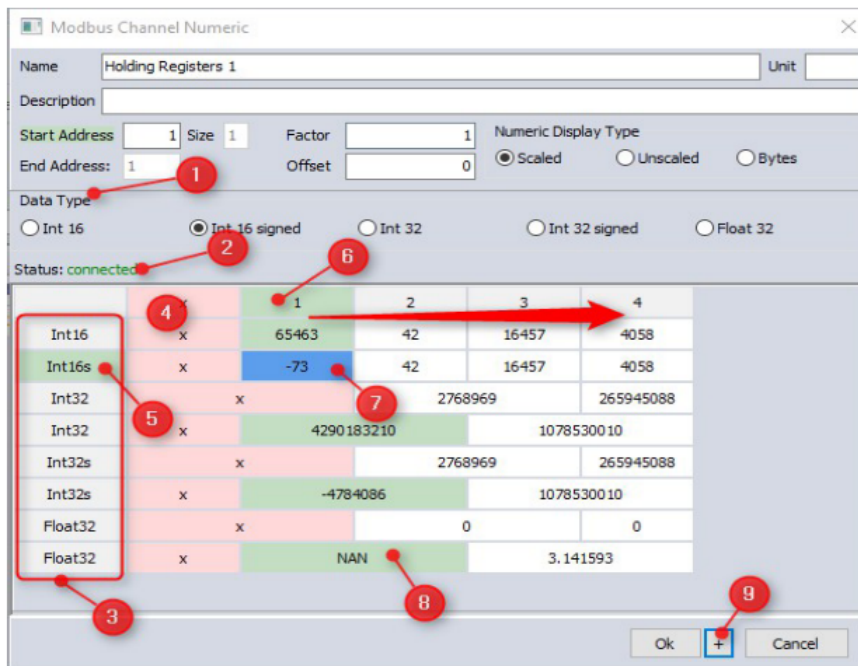


Image 26: Add/Edit Numeric Channel

You can define *Name*, *Unit* and *Description* as you like: see also: chapter Auto Channel Name.

You must specify the *Start Address* to read the correct item from the Modbus table:

- See also: chapter Address Display Offset
- The *Size* is dependant on the current *Data-Type*
 - The *Size* is 1 (Register) for the 16-bit data-types: *Int16* and *Int16s*
 - The *Size* is 2 (Registers) for the 32-bit data-types: *Int32*, *Int32s* and *Float32*
- The *End Address* is the *Start Address* plus the *Size*

Factor, *Offset*: see chapter Scaling

Numeric Display Type: see chapter Display Type

Notes:

(1) Data Type: The data-type defines how many registers we need to read and how to interpret the returned bytes: see (3) below for more details

(2) Status: This text shows the TCP/IP connection status: see Status on page 15 for details The Module will constantly try to connect to the Modbus device and read some data periodically (about once per second) that will be displayed in the grid below. The grid will show the status of up to 5 Registers at a time (in left-to-right order: see the red arrow in Image 26), so that you can see the adjacent items to easily find out, if you are using the correct start-address.

(3) The Module will show a preview of the Modbus data represented for all known data-types

- Note: the signed and unsigned interpretation will yield different results for negative numbers e.g. compare the values of the rows *Int16* (65463) and *Int16s* (73) in Image 26
- For the 32-bit data-types (2 registers), we show 2 rows per data-type, so that one row is offset by 1 register: this makes it easy to find out when you have the address wrong by 1. See also chapter Address Display Offset
- Note: For 32-bit data-types, not all byte-combinations may result in valid numbers: thus you may also see text in the cells: like INVALID or NAN → see also (8) below
- Note: For 32-bit data-types, also the Word Swapped setting is important: see Word Swapped on page 14

(4) Invalid addresses will be shown in red colour: e.g. 1 is the lowest possible start-address – 0 is invalid (when the Address Display Offset is set to 1).

(5) The first cell in the row of the currently selected data-type will be shown in green background colour

(6) The top cell in the row of the currently set Start-Address will be shown in green background colour

(7) The cell of the currently selected item (Data-Type and Start-address) will be shown in blue background colour

(8) For 32-bit data-types, not all byte-combinations may result in valid numbers: in this case: NAN: Not A Number

(9) The + button is only visible when you add a new channel (not when you edit an existing channel).

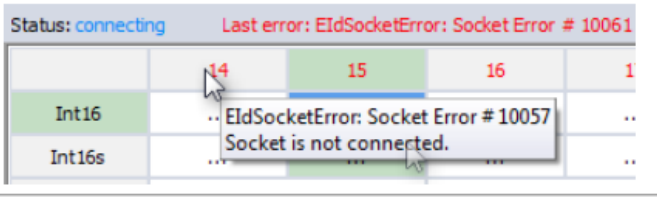

When you click it the current channel will be saved (e.g. the same as clicking OK), and the dialogue will immediately show up again with the same settings and the next Start-Address. This is convenient if you want to add many adjacent channels.



Hint

You can click on a cell to directly select the corresponding Data-type (row) and Start-address (column).

When the value column shows 3 dots it means that the Module is currently trying to read the new value: i.e. we have already sent the command to the Modbus device, but got no response yet.

<p>When an error occurs, the Modbus address will turn red and you can hover the mouse pointer over the cell to see the detailed error message.</p>	
<p>When a warning occurs, the Modbus address will turn orange and you can hover the mouse pointer over the cell to see the detailed error message. e.g. in the example to the right, we try to read register number 16 from a device that only has 15 registers.</p>	

Note: the maximum possible range for numeric channels is $-1e20$ to $1e20$ (higher values might cause errors in DewesoftX®, because building the sum for the average calculation would fail due to range overflow issues).



Important

Please note, that each register for the preview-data grid will be read separately (e.g. one request per register). Thus, the 32-bit data may show wrong data when we read the 2 registers while the data-value changes.

This cannot occur during measurement, because the Module will make sure to read all registers that belong to a single channel in one Modbus command.

5.3.5.1. Scaling

You can use the Factor and Offset input boxes to define the default DewesoftX® channel-scaling. Note: the channel will always store only the unscaled value in the data-file. DewesoftX® will apply the scaling factor and offset automatically. This means that it is possible to change the Scale-factor/offset during or even after the measurement. E.g. you can open the data-file in analyse mode and change the scaling.

5.3.5.2. Display Type

You can select a display type to change the interpretation of the data in the preview grid: The following images below all show the same Modbus data in different display types:

Unscaled shows the numeric value that we read from the Modbus registers. It does not apply the scaling.

Scaled shows the numeric value that we read from the Modbus registers with the applied scaling. This is also the data that will be written to the channel during measurement.

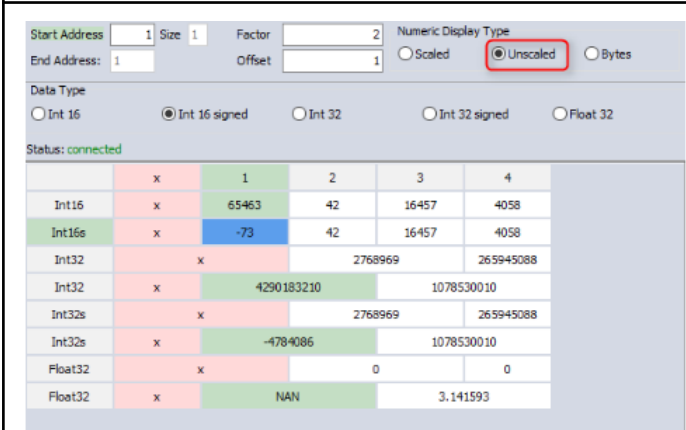


Image 27: Unscaled

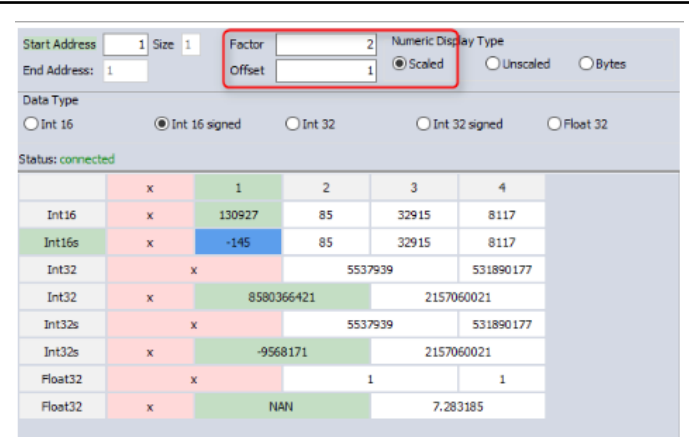


Image 28: Scaled

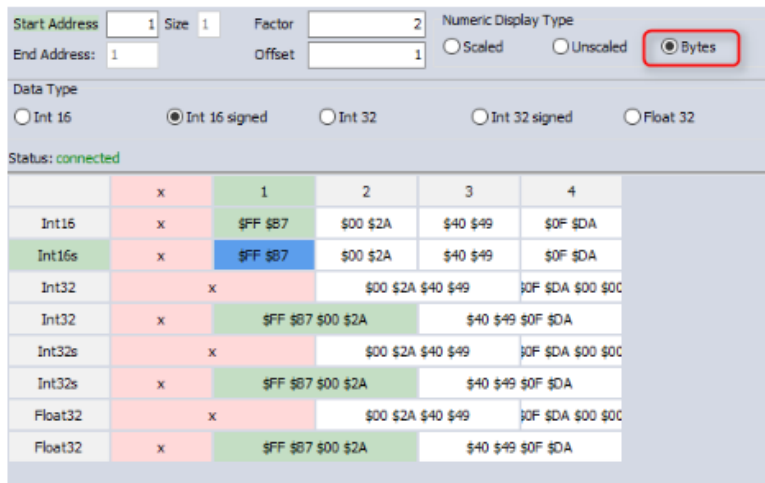


Image 29: Bytes

Bytes shows the numeric value that we read from the Modbus registers in hexadecimal notation (no scaling applied).

6. General

6.1 Status – Error messages

The Module will constantly try to establish a TCP/IP connection to the Modbus server. If this fails for some reason, it will show the error that has occurred. This chapter lists some error-messages that you may see and mentions possible reasons and solutions.

See also: chapter Status

6.1.1. Socket Error # 10061

This usually means, that the TCP/IP host could be reached (in contrast to Socket Error # 11004), but that no program is listening to the specified port number.

Check that the Port number is correct and that your Modbus server is running. You may also try to restart your Modbus server.

6.1.2. Socket Error # 11004

One possible reason for this is that the Module cannot reach the TCP/IP host.

Check that your Host name or IP address is correct.

6.2. Modbus – Error codes

The Modbus Module will handle Modbus error codes: i.e. this means that the request has been sent to the Modbus device, but that the device cannot handle this request for some reason and thus has sent back a Modbus error response.

Error code	Name	Note
0x01	Illegal Function	
0x02	Illegal Data Address	Possible reason: you tried to read a Holding or Input Register from an address, that is not supported by the Modbus device. Solution: correct your start-address
0x03	Illegal Data Value	Possible reason: you tried to read a Coil or Discrete Input from an address, that is not supported by the Modbus device. Solution: correct your start-address
0x04	Slave Device Failure	
0x05	Acknowledge	
0x06	Slave Device Busy	
0x08	Memory Parity Error	

0x0A	Gateway Path Unavailable	Possible reason: you used the wrong <i>Unit Id</i> e.g. when you used <i>Unit Id</i> 255 for DS-NET (instead of 1) Solution: correct the <i>Unit Id</i> in Hardware setup: see Unit Identifier
0x0B	Gateway Target Device Failed To Respond	

Table 7: Modbus Error Codes

6.3. Modbus M Setup Menu

When you click the gear-tooth icon on the right side of the version-label, you will see the channel setup menu: see Image 30.

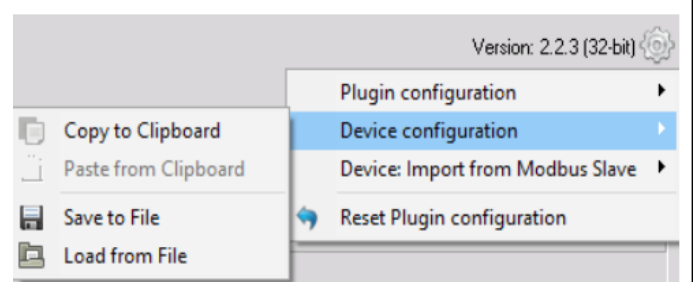


Image 30: Modbus M Setup Menu



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.

6.3.1. Copy & Paste

You can copy and paste configuration settings to the Windows clipboard.

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 from there, paste it into another DewesoftX® setup.

6.3.2. Copy & Paste Device configuration

This will copy/paste the configuration settings of the currently shown device (i.e. channel names, etc.) to/from the clipboard.

6.3.3. Copy & Paste Module configuration

This will copy/paste the configuration settings of the complete Module to the clipboard: i.e. the channel names of all devices, etc.

6.3.4. Save & Load

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.

6.3.5. Save & Load Device configuration

This will save/load the configuration settings of the currently shown device (i.e. channel names, etc.) to/from a file.

6.3.6. Save & Load Module configuration

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

6.3.7. Device: Import from Modbus Slave

When you have used the “Export to Modbus Master” feature in the Modbus Slave Module, you can import this data via this submenu: either paste it from the clipboard or load it from a file.

6.3.8. Reset Module configuration

This will reset the configuration of the Module to the defaults: i.e. all channel setup configuration of the Modbus M 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.

6.4. Grid

This chapter describes some general features of the grid.

6.4.1. 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 31.

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.

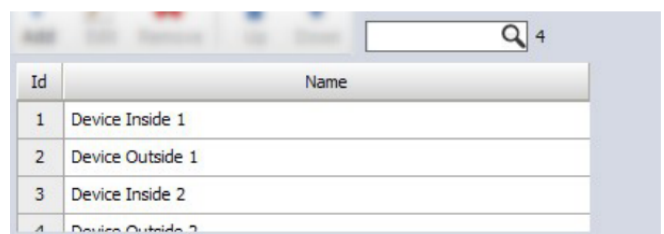


Image 31: Grid: 4 rows

When you 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).

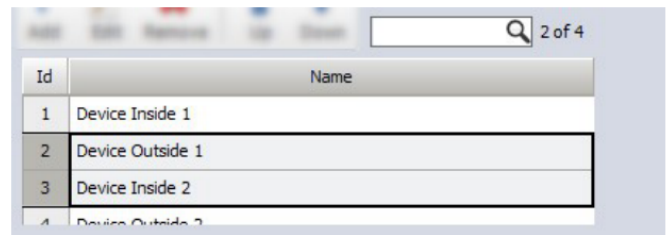


Image 32: Grid: 4 rows, 2 selected

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).

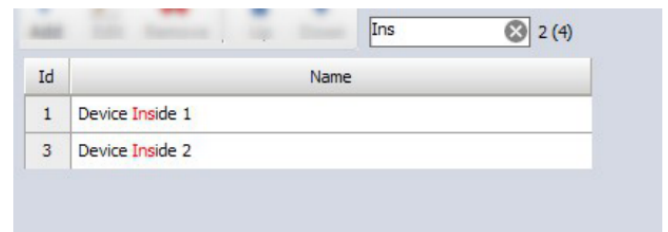


Image 33: Filtered Grid: shows 2 rows (of 4)

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.

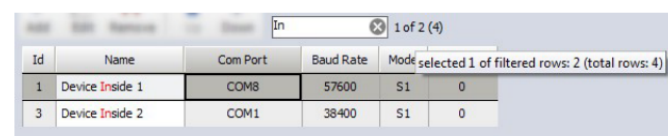


Image 34: Filtered Grid – one row selected

Image 34 Also shows the hint that will appear when you hover the mouse over the count label.

6.4.2. 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 35: Grid: Header Popup

6.4.2.1. Edit columns

When you click *Edit columns* from the pop-up, you will see the *Choose columns* dialogue (see Image 36). 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**)

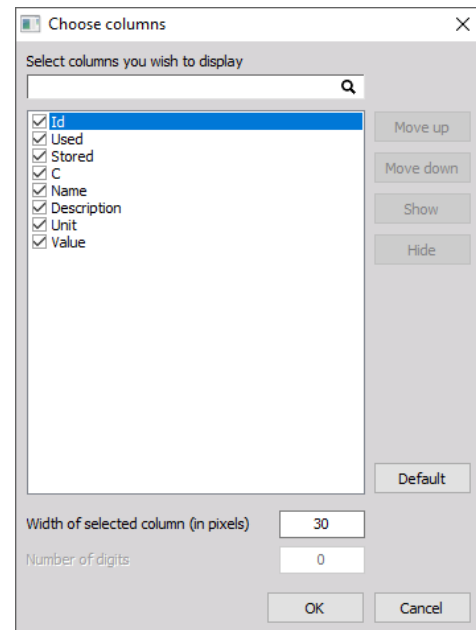


Image 36: Choose columns

6.4.2.2. Grid Sorting

When you select *Sort by this Column* from the header pop-up menu (see Image 35), the grid rows will be sorted by the values of the selected column: i.e. in Image 37 the grid is sorted by the Name column in ascending order. The small arrow at the bottom of the column reader (see red rectangle in Image 37) represents the sort order which is now ascending.

Select *Sort by this Column* again, to change the sort order to descending.

Also note that the values of the *Id* column are also sorted: i.e. the

Id it is not a row-number, but it is a unique number, that identifies the row.

When you select *Unsort* from the header pop-up menu (see Image 35), the rows will be in the default order (ordered by *Id*) again.

Note that some Grids allow to move their elements Up/Down. This is of course only possible if the grid is *Unsorted*.

Id	Used	Stored	C	Name
4	Used	Stored		Row 4
3	Used	Stored		Row 3
2	Used	Stored		Row 2
1	Used	Stored		Row 1

Image 37: Sorted Grid

6.4.3. Multi-select

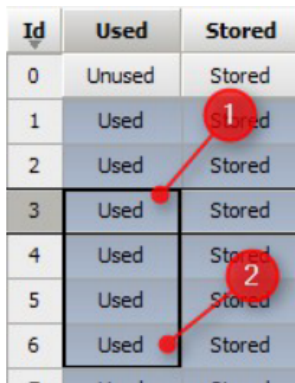
You can select and edit multiple rows/cells at once.

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 38, 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 39, 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 38):

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



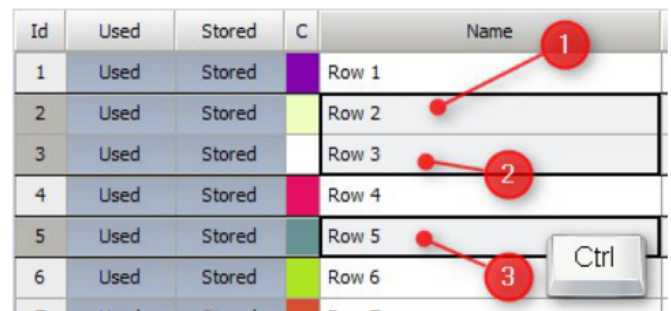
Id	Used	Stored
0	Unused	Stored
1	Used	Stored
2	Used	Stored
3	Used	Stored
4	Used	Stored
5	Used	Stored
6	Used	Stored

Image 38: Range selection

Arbitrary selection (see Image 39):

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



Id	Used	Stored	C	Name
1	Used	Stored		Row 1
2	Used	Stored		Row 2
3	Used	Stored		Row 3
4	Used	Stored		Row 4
5	Used	Stored		Row 5
6	Used	Stored		Row 6

Image 39: Arbitrary Selection

6.5. DS-NET

Some notes, for using DS-NET:

- Modbus TCP/IP must be activated in the settings of the DS-GATE: this can be done in *test.commander*
- The default port is 10000 (not 502): see Host or IP on page 14
- The unit-identifier should be set to 1 (255 will not work) *test.commander* shows the PDU addresses instead of the User-addresses: Therefore, you should set the Address Display Offset to 0 (see chapter Address Display Offset)
- The first usable DS-NET variable will have (PDU) address 10033
- See also: chapter DS-NET example

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7.1. 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.

7.2. 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)

7.3. 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>.

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8. Safety instructions

Your safety is our primary concern! Please be safe!

8.1. 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.

8.2. 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.

8.2.1. Environmental Considerations

Information about the environmental impact of the product.

8.2.2. Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

8.2.3. 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.

8.2.4. 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.

9. Documentation version history

Version	Date	Notes
2.0.0	06.07.2016	Major changes since version 1.x – see chapter “Update to Version 2” for details.
2.1.0	22.06.2017	<ul style="list-style-type: none"> ☑ Added Redundancy feature ☑ Added Scaling and Offset for Numerical Channels
2.2.0	14.12.2017	<ul style="list-style-type: none"> ☑ 64-bit version is now available (Doc has been updated) ☑ Fixed possible DEWESoft® problem with high negative numbers
2.2.2	22.02.2018	<ul style="list-style-type: none"> ☑ The plugin needs less memory (ExpectedAsyncRate is now set exactly) ☑ Corrected “3.3.1 Function Code Prefix” (now 3.3.1 Table Prefix). The prefix for Coils is now 0 (was 1) and for Discrete Inputs 1(was 0) ☑ Renamed everything to “Modbus Master” (updated Logo) to avoid confusion with the new “Modbus Slave” AddOn
2.2.3	26.04.2018	<ul style="list-style-type: none"> ☑ Improved channel setup popup-menu: <ul style="list-style-type: none"> □ added Load&Save config feature □ added “Import from Modbus Slave” feature: see chapter “Device: Import from Modbus Slave” ☑ When the TCP/IP connection to a device fails, we only write Debug-logs to avoid huge logs when a device is not used
Modbus Master 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