Modbus TCP / RTU Gateway

Manual

for models

IE-GW-MB-2TX-1RS232/485

IE-GWT-MB-2TX-1RS232/485

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Weidmüller

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IE-GWT-MB-2TX-1RS232/485

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Contents

1. INTRODUCTION 5

1.1 Overview Modbus TCP/RTU Gateway 5

1.2 Modbus Basics 6

2. PACKAGE CHECKLIST 8

3. OVERVIEW PRODUCT FEATURES 8

4. HARDWARE DESCRIPTION 9

4.1 Panel Layout 9

4.2 LED Indicators 9

4.3 Dimensions 10

4.4 Jumpers 11

4.5 DIN-Rail, Wall Mounting 12

4.6 Pin Assignments 13
4.6.1 DB9 male connector (RS232) 13
4.6.2 Terminal Block (RS-422, RS-485) 13
4.6.3 Power Input, Relay Output 13

5. SPECIFICATIONS 14

6. GETTING STARTED 16
6.1 Reset to factory default values by external Reset button 16
6.2 Connecting Power 16
6.3 Connecting Serial Devices 16
6.4 Connecting to a Host or Network 16

7. DEVICE CONFIGURATION 17

7.1 Device configuration by Web-Interface 17
7.1.1 Menu items “Basic Settings” 18
7.1.2 Menu items “Advanced Settings” 23
7.1.3 Menu items “Maintenance Settings” 30
7.1.4 Menu item “Restart” 33

7.2 Configuration and Monitoring via PC-based tool *Modbus Gateway Administrator* 34

8. TYPICAL APPLICATIONS 51
8.1 Ethernet Master (TCP) with multiple serial Slaves (RTU) 51
8.2 Serial Master (RTU) with serial Slaves (RTU) and Ethernet Slaves (TCP) 52
8.3 Serial Master (RTU) with multiple serial Slaves (RTU) over Ethernet 53

1. Introduction

Welcome to the Weidmüller Modbus TCP/RTU gateways. All models feature easy integration of Modbus TCP to Modbus RTU/ASCII and feature RS-232/422/485 ports for Modbus serial communication.

1.1 Overview Modbus TCP/RTU Gateway

The Weidmüller Modbus TCP/RTU Gateways provides users with

- Seamless integration of Ethernet and serial Modbus devices
- Powerful operation modes to handle almost any Modbus application
- Windows utility for easy setup and traffic monitoring

Seamless integration of Ethernet and serial Modbus devices

Modbus is one of the most popular automation protocols in the world, supporting traditional RS-232/422/485 devices and recently developed Ethernet devices. Many industrial devices, such as PLCs, DCSs, HMIs, instruments, and meters, use Modbus as their communication standard. However, the Ethernet-based Modbus protocol is different from the original serial-based protocols that a communication gateway is needed as a bridge for integration.

In order to integrate Modbus networks, the Modbus TCP/RTU Gateway includes an Ethernet interface and a serial port that supports RS-232, RS-422 and RS-485 communication. It automatically and intelligently translates between Modbus TCP (Ethernet) and Modbus ASCII/RTU (serial) protocols, allowing Ethernet-based controllers to communicate with instruments over RS-485 without additional programming or any other software-based adaptions.

Powerful operation modes to handle almost any Modbus application

With the Modbus protocol, devices must be clearly defined as either masters or slaves. The Modbus Gateway can be configured to operate as master or slave mode at the serial port. In the slave mode it is possible that several Ethernet masters control serial slaves simultaneously, in the Master mode a serial master can control multiple Ethernet slaves.

Extra address mapping and exception parameters are provided to ensure that most situations can be handled.

Windows utility for easy setup and traffic monitoring

Alternatively to the Web-based configuration of the Gateway the Windows utility ***Modbus Gateway Administrator*** can be used for device configuration. This utility has an integrated search function to detect the IP addresses of LAN-connected Modbus Gateways. This is very helpful if the IP address of a Modbus TCP/RTU Gateway is unknown. Additionally traffic monitoring functions help you troubleshoot Modbus communication problems by tracking items such as connection status and address translation errors.

1.2 Modbus Basics

Introduction

Modbus is one of the most popular automation protocols in the world. It supports both serial and Ethernet devices. Many industrial devices, such as PLCs, DCSs, HMIs, instruments, meters, motors, and drivers use Modbus as their communication standard.

Devices are either Masters or Slaves

All Modbus devices are classified as either a master or a slave. Masters initiate all communication with slaves and do not communicate to other masters. Slaves are completely passive and communicate only by sending a response to a master's request.

Slaves are identified by ID

Each Modbus slave in a system is assigned a unique ID between 1 and 247. Whenever a master sends a request, the request must include the ID of the intended recipient. Master devices themselves have no ID.

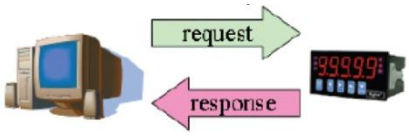
Modbus address assignment (Slave ID's):	0	Broadcast address
	1-247	Slave individual address
	258-255	Reserved

Communication is done by Request and Response

Modbus communication generally is running by request and response. A master sends a request and an addressed slave sends a response. The master will wait for the slave's response before sending the next request. For broadcast commands no response is expected. This is illustrated by three scenarios as follows:

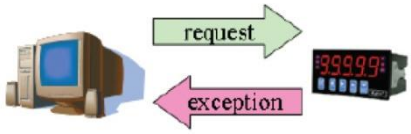
Normal communication (Peer-to-Peer)

The master sends a request to the slave. The slave sends a response with the requested information.



Exception

The master sends a request to the slave. The slave may not support the command or an error is detected. As result the slave sends an exception to the master.



Broadcast

The master sends a broadcast command, such as a reset command. Every slave on the network accepts the command. No response is sent to the master.

Requests Need a Time Limit – Response timeout

The original Modbus protocol was not designed for simultaneous requests or simultaneous masters, so only one request on the network can be handled at a time. When a master sends a request to a slave, no other communication may be initiated until the slave responds. The Modbus protocol specifies that masters use a **response timeout** function to identify when a slave is nonresponsive due to device or communication failure. This function allows a master to discard a request if no response is received timely.

To integrate a wide range of devices (with different baudrates or line conditions) into a Modbus communication a limit for a response time is not set and can be determined by the manufacturers. However, this also makes it difficult for system integrators to know what response timeout value to use during configuration, especially with older or proprietary devices.

The Weidmüller Modbus Gateway provides a speciual function that tests all attached devices and recommends a response timeout value. This function saves considerable time and effort for system integrators, and results in more accurate timeout settings.

2. Package Checklist

All models of Weidmüller Modbus TCP/RTU Gateways are shipped with the following items:

- 1 Modbus Gateway
- Hardware Installation Guide (includes Download-Links for this user manual and firmware updates)

3. Overview Product Features

- Integration of Modbus TCP and Modbus RTU/ASCII networks
- Up to 31 Modbus RTU/ASCII slaves can be connected to the serial port (RS-485)
- Up to 32 Modbus TCP slaves can be connected to a Modbus RTU/ASCII master
- Up to 16 Modbus TCP masters can control Modbus RTU/ASCII slaves simultaneously
- Configuration via Web interface, Telnet or Windows utility *Modbus TCP/RTU Gateway Administrator*
- 2 RJ45 Ethernet ports 10/100 (TX)
- 1 high speed serial interface (SubD connector for RS232, Terminal block for RS422/485)
- Software-selectable RS-232/485/422 communication
- High speed serial interface supporting baud rates up to 921.6 Kbps
- ProCOM: Virtual Serial Port for flexible Modbus to Modbus TCP communication

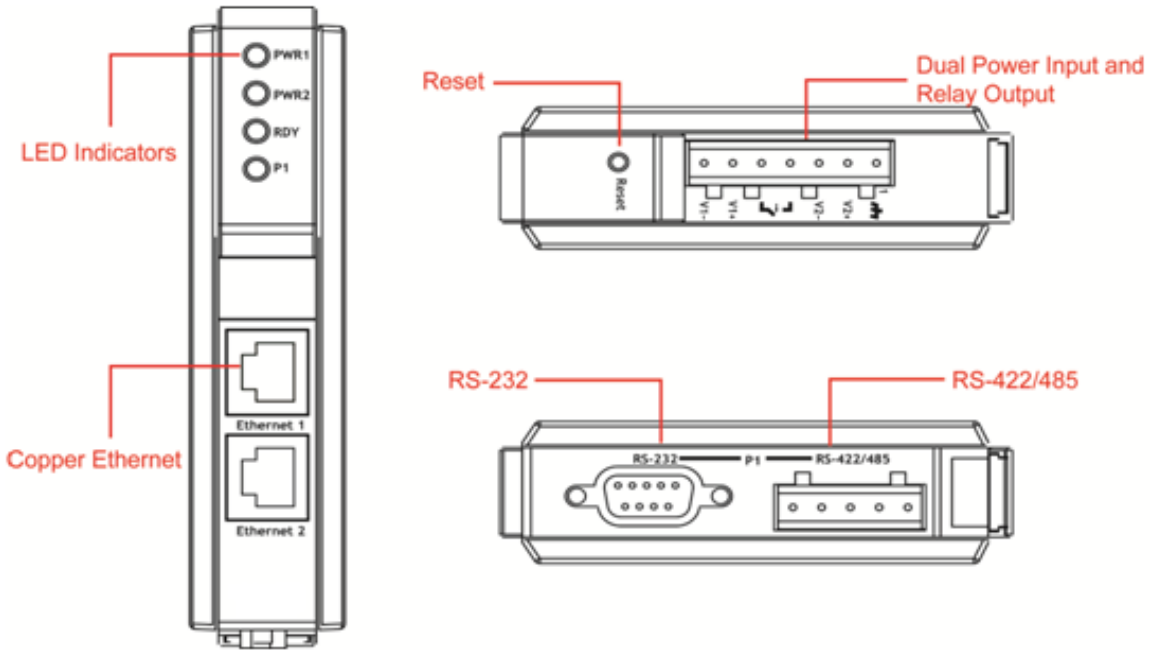
4. Hardware description

The hardware information is valid for models

IE-GW-MB-2TX-1RS232/485 → Standard Temperature range model (0 to 55°C)

and **IE-GWT-MB-2TX-1RS232/485** → Extended Temperature range model (-40 to 75°C)

4.1 Panel Layout

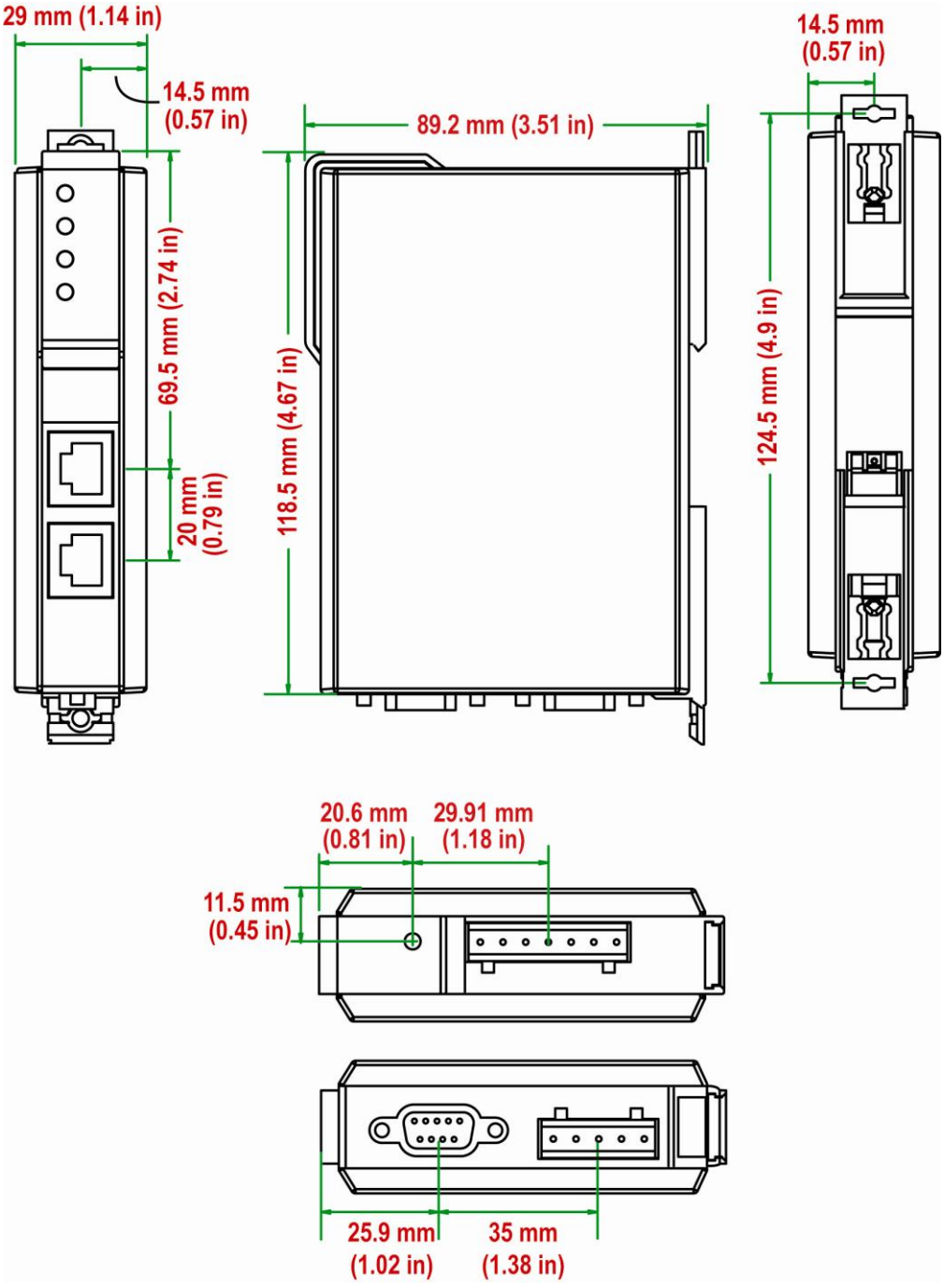


4.2 LED Indicators

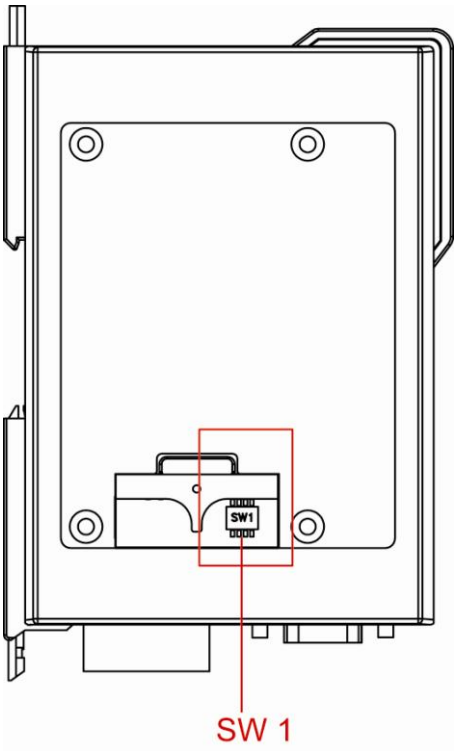
Name	Color	Function
PWR1	Red	Power is being supplied to the power input.
PWR2	Red	Power is being supplied to the power input.
RDY	Red	**Steady on**: Power is on and unit is booting up. **Blinking:** Indicates an IP conflict, or DHCP or BOOTP server is not responding properly.
	Green	**Steady on:** Power is on and unit is running properly. **Blinking:** Unit is responding to software function „Locate“.
	Off	Power is off or power error condition exists.
Ethernet	Orange	10 Mbps Ethernet connection.
	Green	100 Mbps Ethernet connection.
	Off	Ethernet cable is disconnected, or has a short.

P1	Orange	Serial port is receiving data.
	Green	Serial port is transmitting data.
	Off	No data is being transmitted or received through the serial port.

4.3 Dimensions



4.4 Jumpers



The DIP switches are located beneath the DIP switch panel on the side of the unit.

To add a 120 Ω termination resistor set switch 3 to ON.

To disable the 120 Ω termination resistor set switch 3 to OFF (default setting).

To set the pull high/low resistors to 150 KΩ set DIP switches 1 and 2 to OFF (default setting).

To set the pull high/low resistors to 1 KΩ set DIP switches 1 and 2 to ON.

Note:

DIP switch 4 is not used (reserved for future function).

Attention:

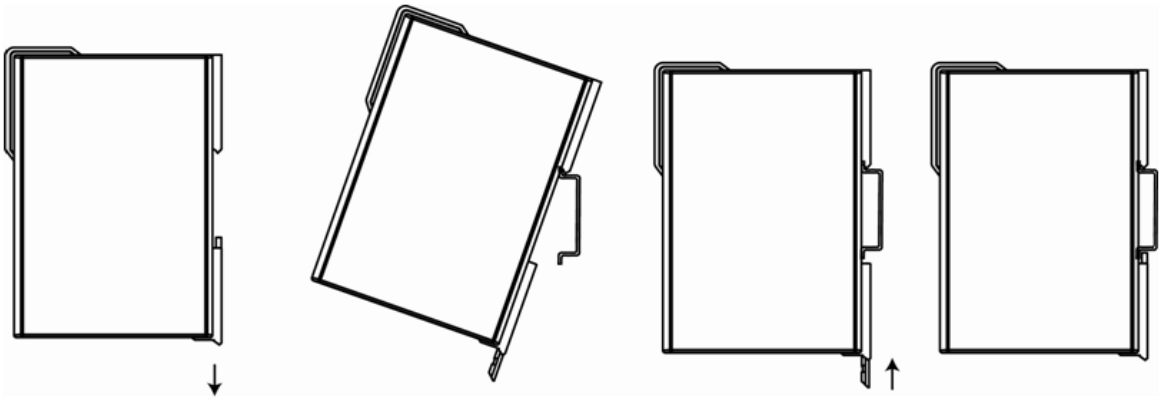
Do not use the 1 KΩ pull high/low setting on the device when using the RS-232 interface. Doing so will degrade the RS-232 signals and reduce the effective communication distance.

4.5 DIN-Rail, Wall Mounting

There are two sliders on the rear side of the unit for DIN-rail and wall mounting.

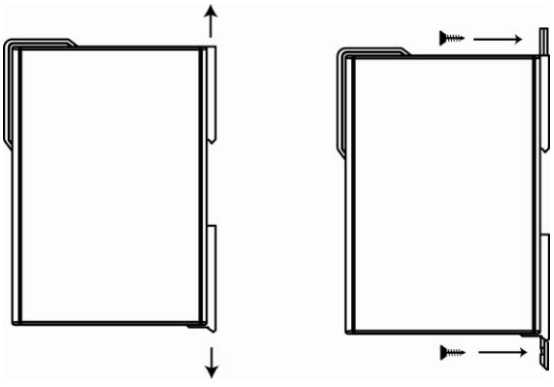
Mounting on a DIN-rail

Pull out the bottom slider, latch the unit onto the DIN-rail, and push the slider back in.



Mounting on the wall

Pull out both the top and bottom sliders and align the screws accordingly.

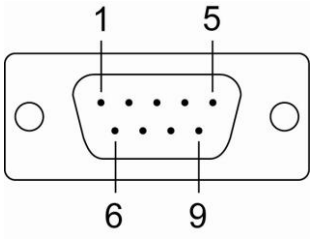


4.6 Pin Assignments

4.6.1 DB9 male connector (RS232)

Use DB9 connector (male) for RS-232 connections to Modbus RTU or ASCII devices.

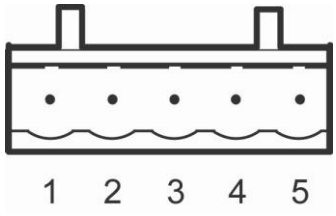
Pin	RS-232
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS



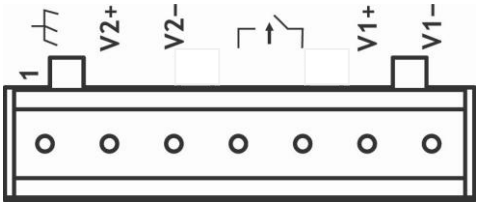
4.6.2 Terminal Block (RS-422, RS-485)

Use terminal block connector for RS-422 and RS-485 connections to Modbus RTU or ASCII devices.

Pin	RS-422 RS-485 (4-wire)	RS-485 (2-wire)
1	TxD+	---
2	TxD-	---
3	RxD+	Data+
4	RxD-	Data-
5	GND	GND



4.6.3 Power Input, Relay Output



<u>Relais conditions:</u>

Open when Power-off or when a relay-based alarm is triggered.

Closed when Power-on and no relay-based alarm is triggered.

⏚	V2+	V2-	⌐↑⌐		V1+	V1-
Shielded Ground	DC Power Input 2	DC Power Input 2	Relay Output	Relay Output	DC Power Input 1	DC Power Input 1

5. Specifications

Software Features	
Operation Modes	RTU Slave, RTU Master, ASCII Slave, ASCII Master
Multi-Masters and Multi-Request	16 simultaneous TCP masters, 32 simultaneous requests for each TCP master Serial redirection, Priority control
Power Requirements	
Power Input	12 to 48 VDC
Power Consumption	Max. 435 mA @ 12 VDC, Max. 130 mA @ 48 VDC
Physical Characteristics	
Housing	Plastic, IP30
Dimensions	29 (W) x 124.5 (H) x 89.2(D) mm
Installation	DIN-Rail Mounting
Ethernet Interfaces	
Ethernet ports	2 RJ45 ports 10/100BaseT(X), Auto MDI/MDI-X
Magnetic isolation protection (RJ45)	1.5 kV built-in
Serial Interfaces	
Serial ports	1
Serial connector types	DB9 RS-232, 5-pin terminal block for RS-422/485
Signals	RS-232: TxD, RxD, RTS, CTS, DTR, DSR, DCD, GND RS-422: Tx+, Tx-, Rx+, Rx-, GND RS-485 (2-wire): Data+, Data-, GND RS-485 (4-wire): Tx+, Tx-, Rx+, Rx-, GND
RS-485 data direction control	ADDC® (automatic data direction control)
Serial line protection	15 KV ESD protection for all signals
Pull high/low resistor for RS-485	1 kOhm, 150 kOhm
Terminating resistor for RS-485	120 Ohm
Serial Communication Parameters	
Baudrates	Baud rate 50 bit/s to 921.6 kbit/s
Parity	None, Even, Odd, Space, Mark
Data Bits	7, 8
Stop Bits	1, 2

Flow Control	RTS/CTS, XON/XOFF
Alarm Contact	
Relay Output	1 relay output with a current capacity of 1 A @ 30 VDC Conditions: Open when Power-off or when a relay-based alarm is triggered Closed when Power-on and no relay-based alarm is triggered
Environmental Limits	
Operating Temperature	0 to 55°C (32 to 131°F), -40 to 75°C (-40 to 167°F) for –T model
Storage Temperature	-40 to 85 °C (-40 to 185 °F)
Operating Humidity	5 to 95% RH

Regulary Approvals	
EMC standards	FCC Part 15 Subpart B Class A EN 55022 Class A EN 61000-4-2 (ESD), Level 3 EN 61000-4-3 (RS), Level 3 EN 61000-4-4 (EFT), Level 4 EN 61000-4-5 (Surge), Level 3 EN 61000-4-6 (CS), Level 3 EN 61000-4-8 EN 61000-4-11
Security	UL 508
Hazardous Location	UL/cUL Class 1 Div 2 Groups A, B, C, D
Free fall	according to IEC 60068-2-32
Shock	according to IEC 60068-2-27
Vibration	according to IEC 60068-2-6
MTBF	
Time	210.794 hrs
Database	Telcordia (Bellcore), GB
WARRANTY	
Time Period	5 years

6. Getting Started

6.1 Reset to factory default values by external Reset button

The reset button – located on top side of the housing - is used to load factory defaults. Use a pointed object such as a straightened paper clip to **hold the reset button down for 5 seconds. Release the reset button when the Ready LED stops blinking**.

6.2 Connecting Power

Connect the unit to a power source of range 12 to 48 VDC. For pin assignments of power terminal block please refer to chapter 4.6 (Pin Assignments).

Note: The unit does not have an on/off switch. It automatically turns on when it receives power. The PWR LED on the top panel will glow to indicate that the unit is receiving power.

6.3 Connecting Serial Devices

The unit's serial port P1 is located at botton side of the housing. There are two options for connecting serial devices, depending on the 2 different connector types:

For RS232 connections the DB9 male connector has to be used. You can either use a standard DCE/DTE cable or you may make your own customized serial cable to connect a serial device to the unit. For the pin assignments of the unit's DB9 connector please refer to chapter 4.6 (Pin Assignments).

For connecting multiple devices via a RS-485 multidrop network the 5-pin terminal block has to be used. All devices that are connected to the serial port must use the same protocol (i.e., either Modbus RTU or Modbus ASCII). For the pin assignments of the unit's terminal block connector please refer chapter 4.6 (Pin Assignments).

RS-485 Termination and Pull High/Low Resistors

In some critical RS-485 environments, you may need to add termination resistors to prevent the reflection of serial signals. When using termination resistors, it is important to set the pull high/low resistors correctly so that the electrical signal is not corrupted. For serial port DIP switches are used to set the pull high/low resistor values. A built-in 120 Ω termination resistor can also be enabled.

To modify the termination and pull high/low resistor settings, please refer to chapter 4.4 (Jumpers).

6.4 Connecting to a Host or Network

The unit is equipped with 2 10/100BaseTX Ethernet ports located on the unit's front panel. Both ports behave like an unmanaged 2-Port-Switch. For the connection to a host or an Ethernet Switch use a standard straight-through or a crossover Ethernet cable. The unit's Link LED will light up to indicate a live Ethernet connection.

7. Device Configuration

The Modbus TCP/RTU Gateway can be configured via one of the 2 Ethernet ports by

- Integrated Webinterface
- Telnet Console
- or by PC-based utility “Modbus Gateway Administrator”

7.1 Device configuration by Web-Interface

The Web interface can be accessed via IP address 192.168.1.110 and subnet mask 255.255.255.0 (Factory default values).

Connect the PC to one of the both Ethernet ports and set the PC’s IP address to a free one of network range 192.168.1.0 / 255.255.255.0

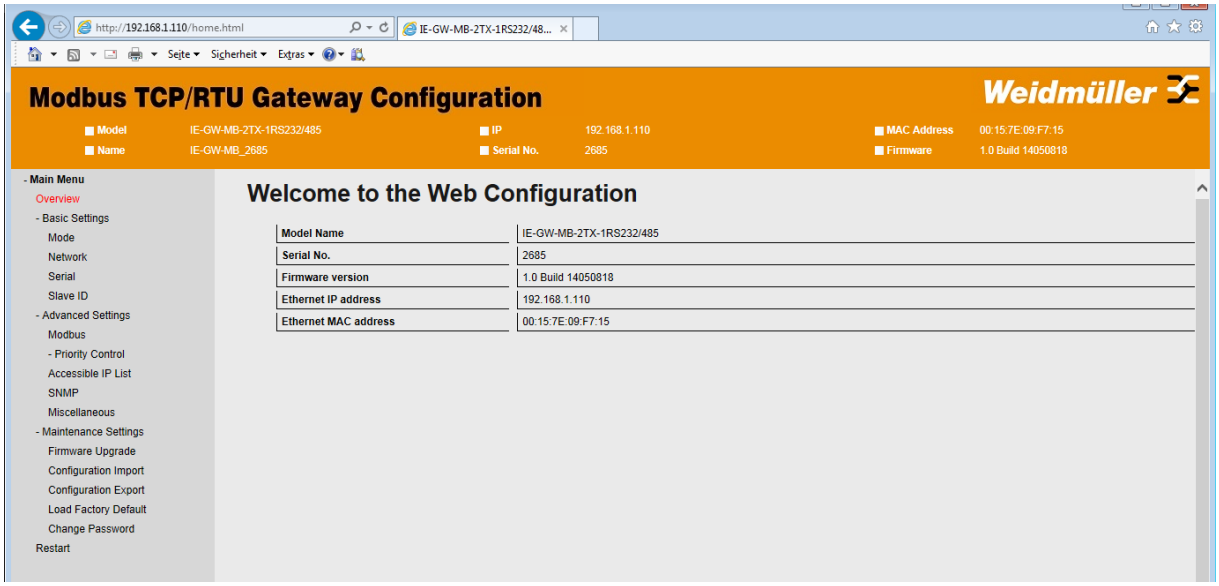
Start a Web browser and enter the IP address of the connected Gateway into the browser’s address line (http://192.168.1.110).

After the appearance of the login prompt, please enter following login data (factory settings):

User name: **admin**

Password: **Detmold**

After a few moments the home page will appear as shown below.

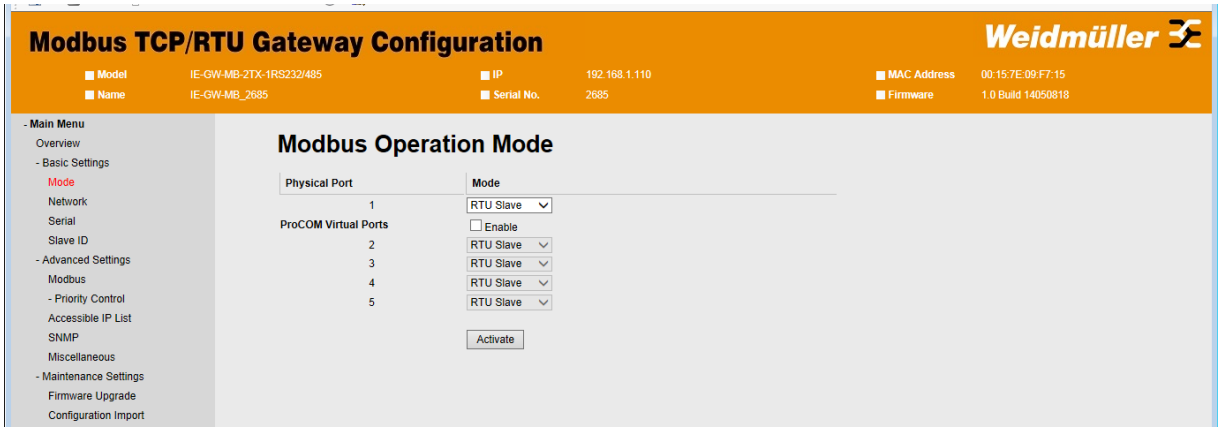


7.1.1 Menu items “Basic Settings”

The **Basic Settings** section includes the most common settings required by administrators to maintain and control a Weidmüller Modbus Gateway.

7.1.1.1 Basic Settings → Mode

The menu item **Mode** allows users to configure the Modbus operation modes.



Operation mode of physical serial port

The operation mode determines whether the device(s) that are connected to the serial port will operate as master or as slave(s), and whether the Modbus RTU or Modbus ASCII protocol will be used.

Operation mode of up to 4 virtual COM-Ports (ProCom) which can be installed on a Windows-PC

This function uses virtual COM ports on a PC and enables a PC’s Modbus application - running as **RTU/ASCII Master** - to communicate with RTU/ASCII Slaves via Ethernet and the Modbus Gateway. PCs can use ProCOM’s virtual COM-Port driver to communicate over Ethernet with serial devices (which are connected to the Modbus Gateway) as if they were connected to the PC’s native COM ports.

Note: ***To use this feature you need to install the virtual COM-Ports (ProCom) with utility Modbus Gateway Administrator. Please refer to chapter 7.2.9 how to configure.***

There are four operation modes as follows:

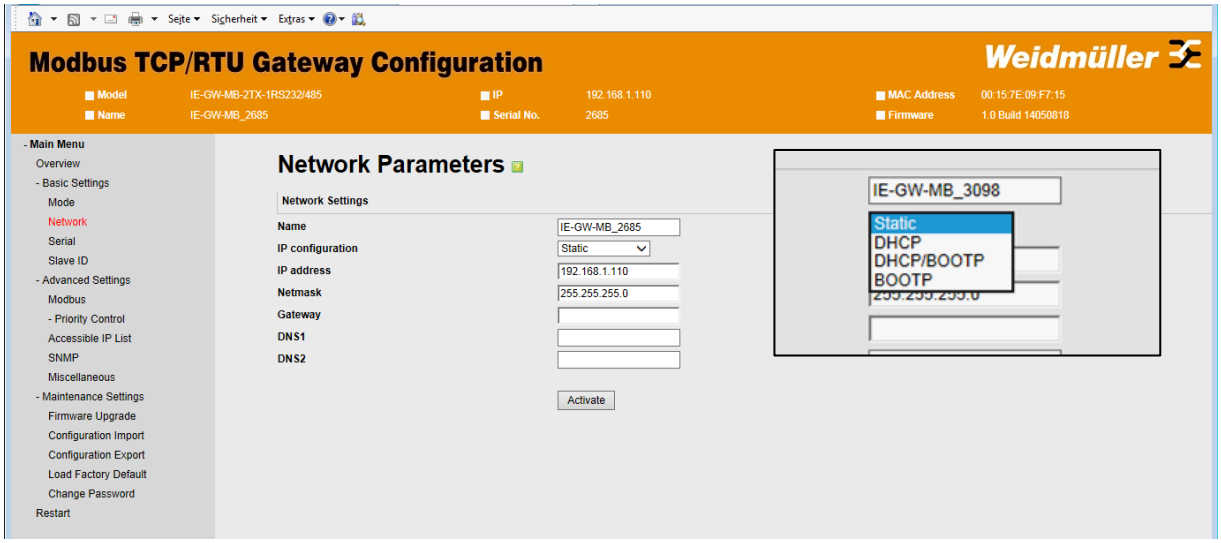
RTU Slave → One ore more Modbus RTU slave(s) shall be connected to the serial port.
RTU Master → One Modbus RTU master shall be connected to the serial port.
ASCII Slave → One ore more Modbus ASCII slave(s) shall be connected to the serial port.
ASCII Master → One Modbus ASCII master shall be connected to the serial port.

Note: The **Mode** setting refers allways to the serial port and has to be set same as the connecting device(s).

- If you have connected one or more serial devices running as slave(s) then select either RTU Slave or ASCII Slave.
- If you have connected a serial Master (only 1 is allowed) then select either RTU Master or ASCII Master.

7.1.1.2 Basic Settings → Network

The **Network** configuration allows users to configure the Ethernet network parameters.

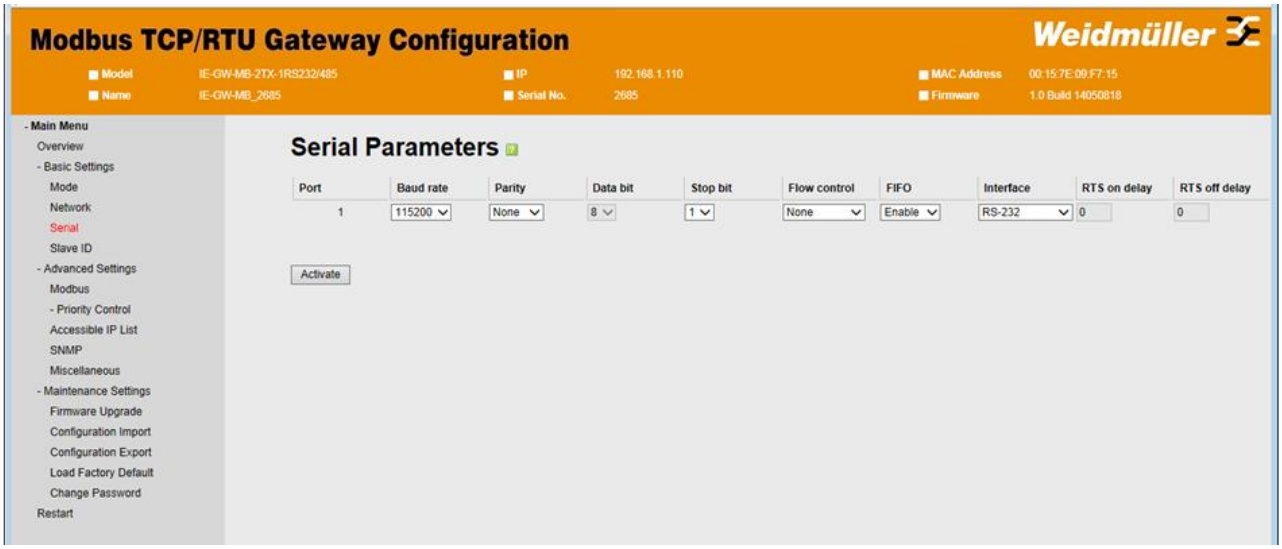


Network parameter settings

Setting	Description	Factory Default
IP Configuration		
Static	Select “Static IP” if you are using a fixed IP address. The unit's default IP address 192.168.1.110	Static
DHCP	The Gateway’s IP address will be assigned automatically by the network’s DHCP or BootP server.	
DHCP/BOOTP		
BootP		
IP Parameters		
IP address	Identifies the Modbus Gateway on a TCP/IP network.	192.168.1.110
Subnet mask	Identifies the type of network to which the Modbus Gateway is connected (e.g., 255.255.0.0 for a Class B network, or 255.255.255.0 for a Class C network).	255.255.255.0
Gateway	The IP address of the router that connects the LAN to an outside network.	None
DNS1 (1st DNS Server’s IP address)	The IP address of the DNS Server used by your network. After entering the DNS Server's IP address, you can input the Gateway's URL in your browser's address field, instead of entering the IP address.	None
DNS2 (2nd DNS Server’s IP address)	The IP address of the DNS Server used by your network. The Gateway will try to locate the 2nd DNS Server if the 1st DNS Server fails to connect.	None

7.1.1.3 Basic Settings → Serial

The menu item **Serial** is where the serial port's communication parameters are configured. You can configure **Baud Rate, Parity, Stop Bit, Flow Control, FIFO** and **Interface Mode.**

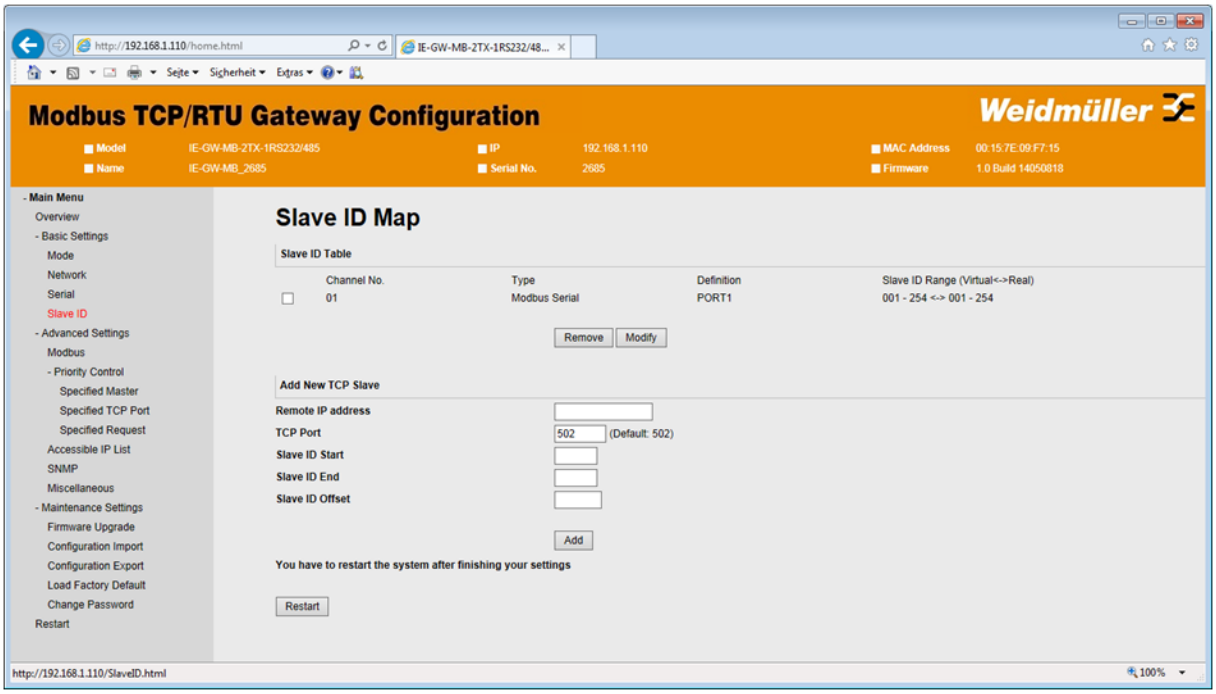


Serial parameter settings

Parameter	Value
Interface Mode	RS-232
	RS-422
	RS-485, 2-wire
	RS-485, 4-wire
Baud Rate	50 bps to 961200 bps
Parity	None, Odd, Even, Space, Mark
Stop Bits	1, 2
Flow Control	None, Xon/Xoff, RTS/CTS, RTS Toggle
UART FIFO	Enable, Disable
RTS On Delay	0 to 100 ms
RTS Off Delay	0 to 100 ms

7.1.1.4 Basic Settings → Slave ID

The menu item **Slave ID Map** is where the slave ID's of the serial Modbus devices are managed. This mapping determines how requests from a Master will be routed to slave devices.



Slave ID related parameter settings when adding new TCP slaves

Parameter	Value
Remote IP address	IP address of remote Modbus TCP slave
TCP Port	Default port value 502 (Modbus TCP Standard)
Slave ID Start	Numeric range from 001 to 254
Slave ID End	Numeric range from 001 to 254
Slave ID Offset	This specifies the difference between the virtual slave ID (is the public ID from the perspective of a Master) and the actual slave ID. If a slave's virtual ID is 16 and the actual ID is 5, you would set the offset to -11.

How Slave ID mapping is working

Modbus RTU/ASCII slaves generally will be addressed by an unique device ID. The device ID of a Modbus device is set at the Modbus slave itself and is called the „real" device ID.

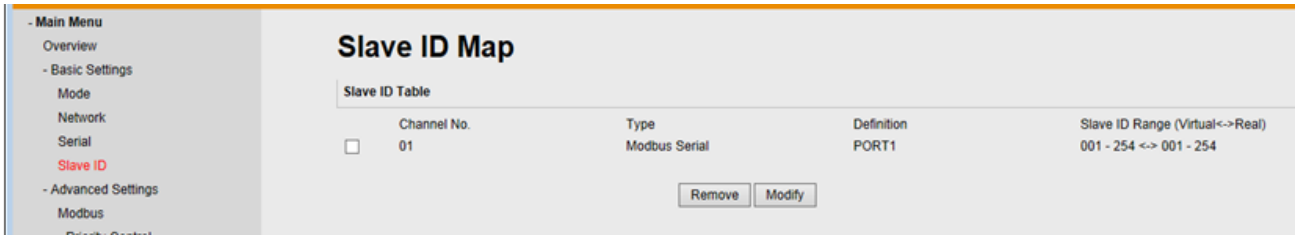
To be able to address via the Modbus Gateway a complete Modbus slave network – consisting of RTU/ASCII Slaves (connected to the serial Interface) and additional Ethernet-based Modbus TCP slaves - a „Slave ID Map" will be used for addressing by unique device ID's.

In the „Slave ID Map" public virtual ID's are created and assigned to the real device ID's. The result is that from the perspective of a Master device each slave is accessible by it's assigned virtual

device ID. This kind of mapping allows a unique addressing of serial RTU/ASCII and Modbus TCP devices having the same real device ID.

Example 1:

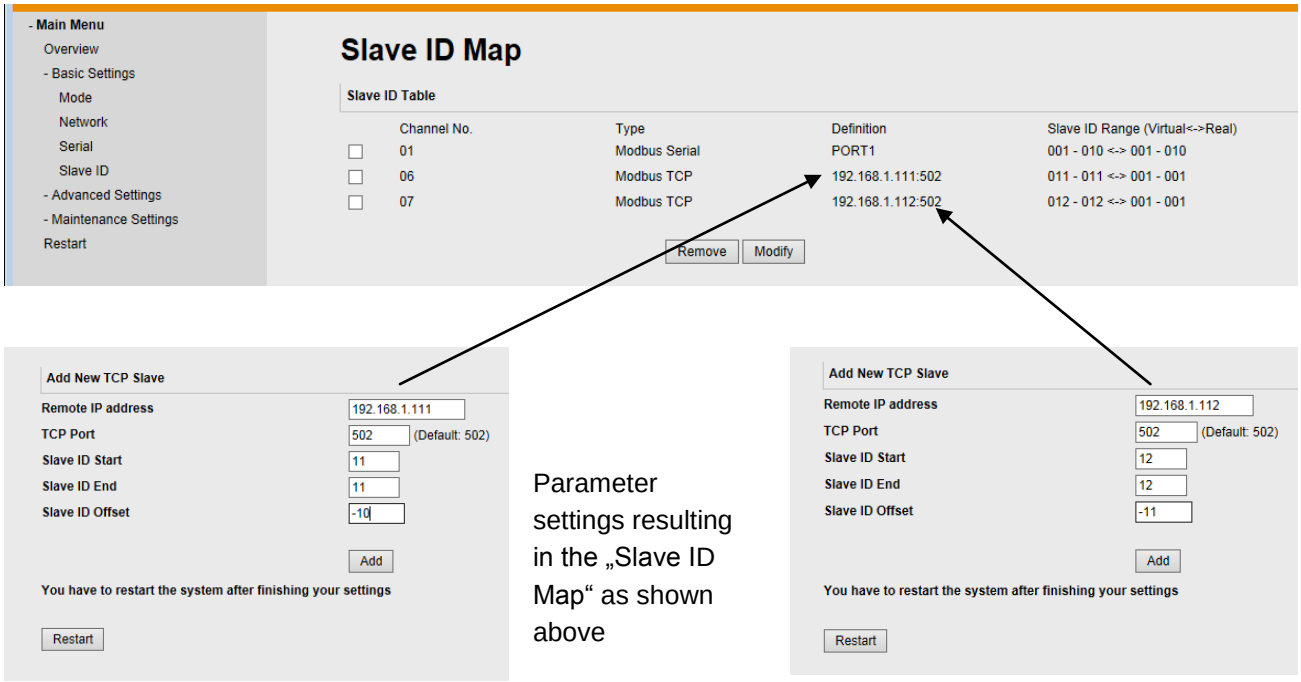
Default „Slave ID Map“ for RTU/ASCII slaves connected to the serial port. By default there is direct assignment between virtual and public accessible device ID and real device ID (without any offset).



Example 2:

In this example a Modbus TCP Master can address its slave devices (via the Modbus gateway) as follows:

- 10 Modbus RTU/ASCII slaves connected to the serial port by virtual device ID’s 1 to 10. The real device ID’s are the same.
- 1 Modbus TCP slave with IP 192.168.1.111 (Port 502) by virtual device ID 11. The real device ID is 1
- 1 Modbus TCP slave with IP 192.168.1.112 (Port 502) by virtual device ID 12. The real device ID is 1



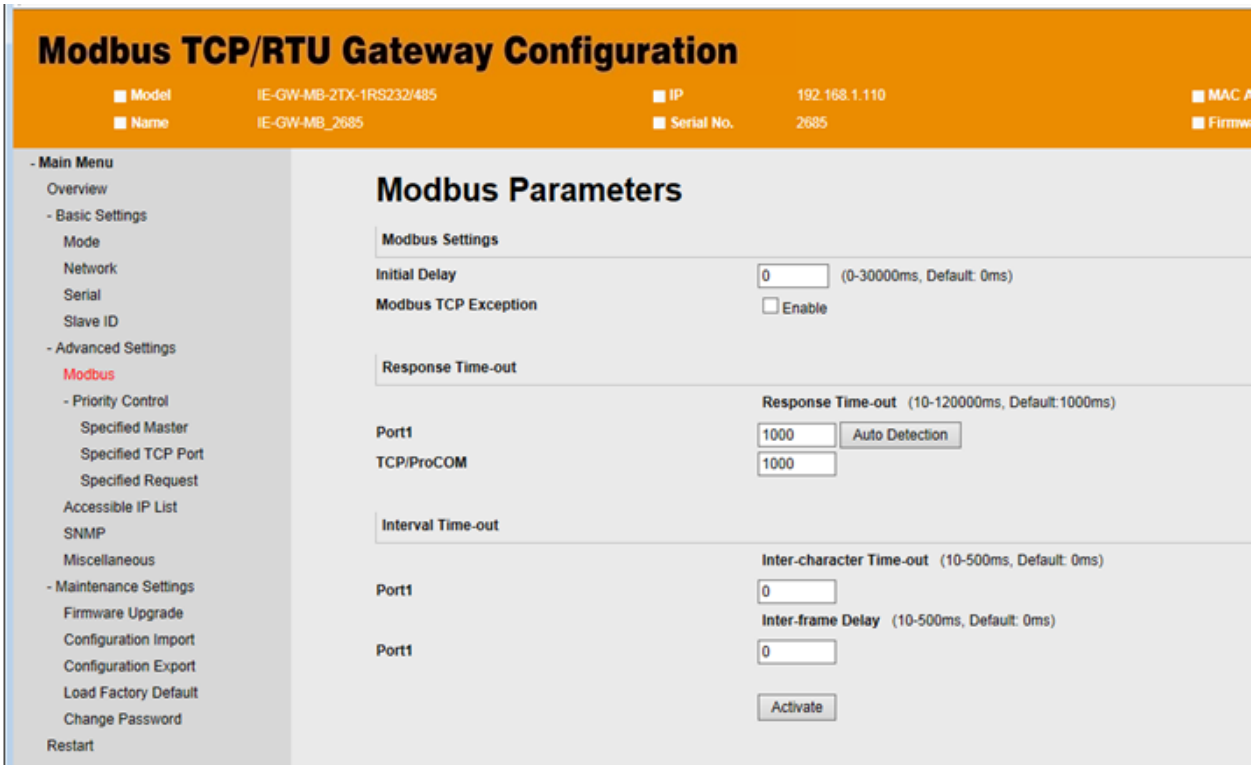
Note:

The Modbus Gateway will disregard any request that is not addressed to an existing virtual slave ID on its slave ID map. If a real device ID has not been assigned to a public virtual slave ID, it will not be accessible by masters on the other side of the Modbus gateway.

7.1.2 Menu items “Advanced Settings”

7.1.2.1 Advanced Settings → Modbus

The menu item **Modbus** is where certain adjustments can be made to optimize the communication between Modbus devices.



Modbus parameter settings

Initial Delay

Some Modbus slaves may take more time to boot up than other devices. For certain environments, this may cause the entire system to suffer from repeated exceptions during the initial boot-up. You can force the Modbus Gateway to wait after booting up before sending the first request with the “Initial Delay” setting.

Modbus TCP Exceptions

The Modbus Gateway is a protocol converter that transparently passes requests and responses between the Ethernet and serial interfaces. In some situations, it may be necessary for the Gateway to return an exception to a request from a Modbus TCP master instead of a slave response. This can be enabled or disabled with the “Modbus TCP Exception” setting. When enabled, the Modbus Gateway can return two types of exceptions:

Exception type:	Conditions
Timeout →	There is no response from the slave. Maybe the device is off-line or the serial cable is broken.
Request dropped →	There are two situations that will result in this exception: 1. The request queue is full (32 request queue for each master). 2. The destination ID not included in the slave ID map.

Note: Not all Modbus TCP masters require this exception. It depends on the application to determine if this setting should be enabled.

Response Timeout (applicable to physical serial Port and virtual TCP/Procom ports)

According to the Modbus standard, the time that it takes for a slave device responding to a request is defined by the device manufacturer. Based on this response time, a master can be configured to wait a certain amount of time for a slave's response. If no response is received within the specified time, the master will ignore the request and continue operation. This allows the Modbus system to continue operation even if a slave device is disconnected or faulty.

On the Modbus Gateway the parameter *Response Time-out* is used to configure how long the gateway will wait for a response from a Modbus ASCII or RTU slave. Please refer to your device manufacturer's documentation to manually set the response time-out.

Button Auto Detection

The device also provides an automatic calibration of the response timeout. Instead of setting manually, you can click button "Auto Detection". The Modbus Gateway then starts a request for all defined slave ID's configured in menu item Slave ID. The response times will be displayed in a separate window. Based on the results the timeout values can be set for best performance.

Inter-Character Timeout (Serial Port)

Use this function to determine the timeout interval between characters for Modbus devices that cannot receive Rx signals within an expected time interval. If the response is timed out, all received data will be discarded. Note that this timeout mechanism only works in RTU slave mode. The Modbus Gateway automatically determines the timeout interval if the timeout value is set to 0.

Inter-Frame Delay

In operation mode *RTU slave* a user can determine the time-delay for transmitting the data frame received from a slave device to the upstream. The device automatically determines the time-delay if it is set to 0.

7.1.2.2 Advanced Settings → Priority Control

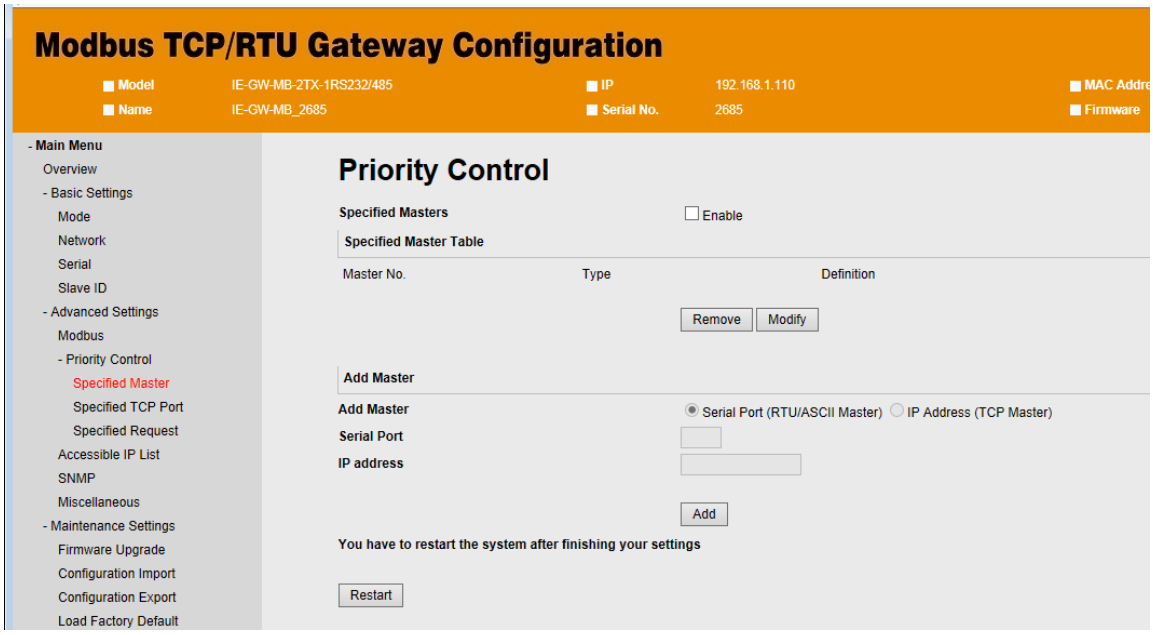
By using **Priority Control** emergency requests can be treated with higher priority. This feature is designed for requests that are sent to Modbus RTU/ASCII slaves. Since Modbus RTU/ASCII slaves can't handle multiple requests, the Modbus Gateway must send each request individually and wait for the response before sending the next request. When requests stack up, the response time can suffer. This can cause problems for certain critical requests that require an immediate response.

With priority control, you can specify that certain requests are sent to the front of the queue for more immediate response times. Priority requests can be specified by

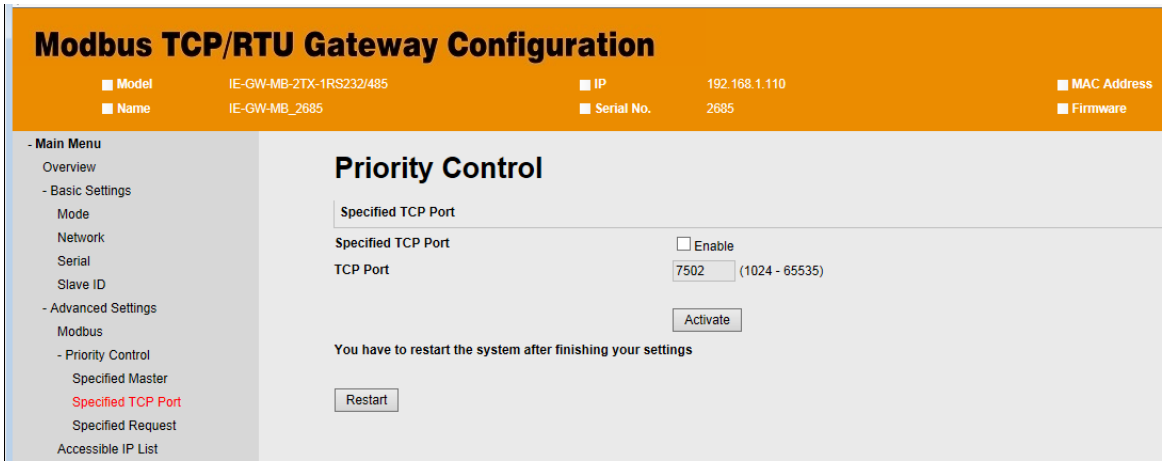
- Specified Master (Master selection using IP address or serial port)
- Specified TCP Port (Define a prioritized port number for Modbus TCP communication)
- Specified Request (based on parameters slave ID, function code or data segments)

When the Modbus gateway identifies a priority request, the request will immediately be placed at the front of the queue.

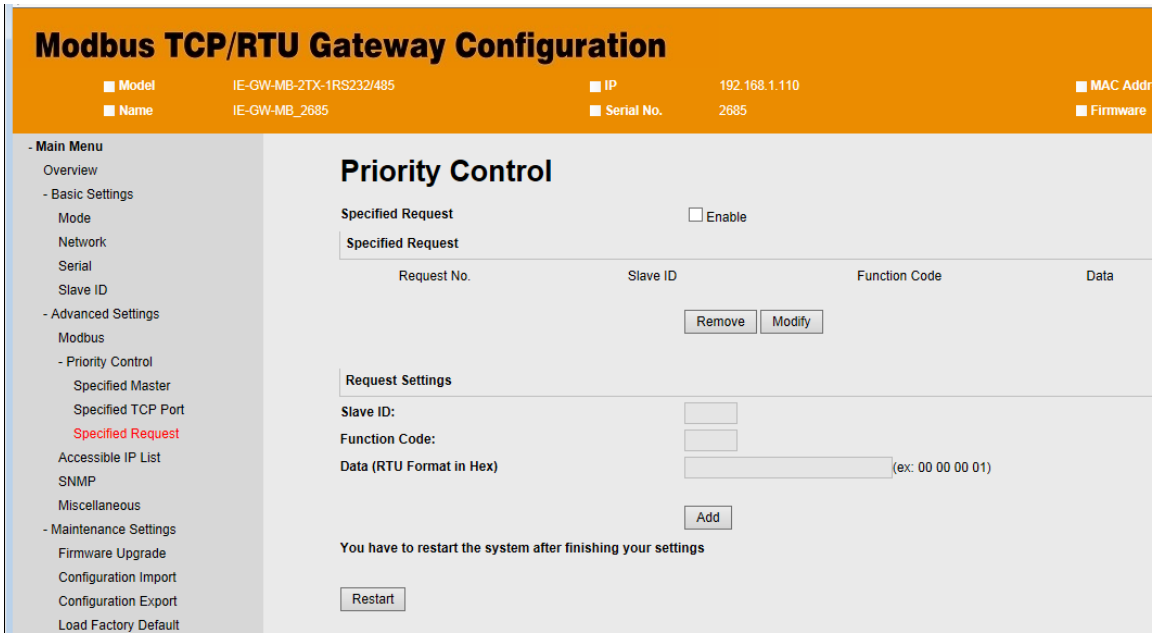
Advanced Settings → Priority Control → Specified Master



Advanced Settings → Priority Control → Specified TCP Port



Advanced Settings → Priority Control → Specified Request



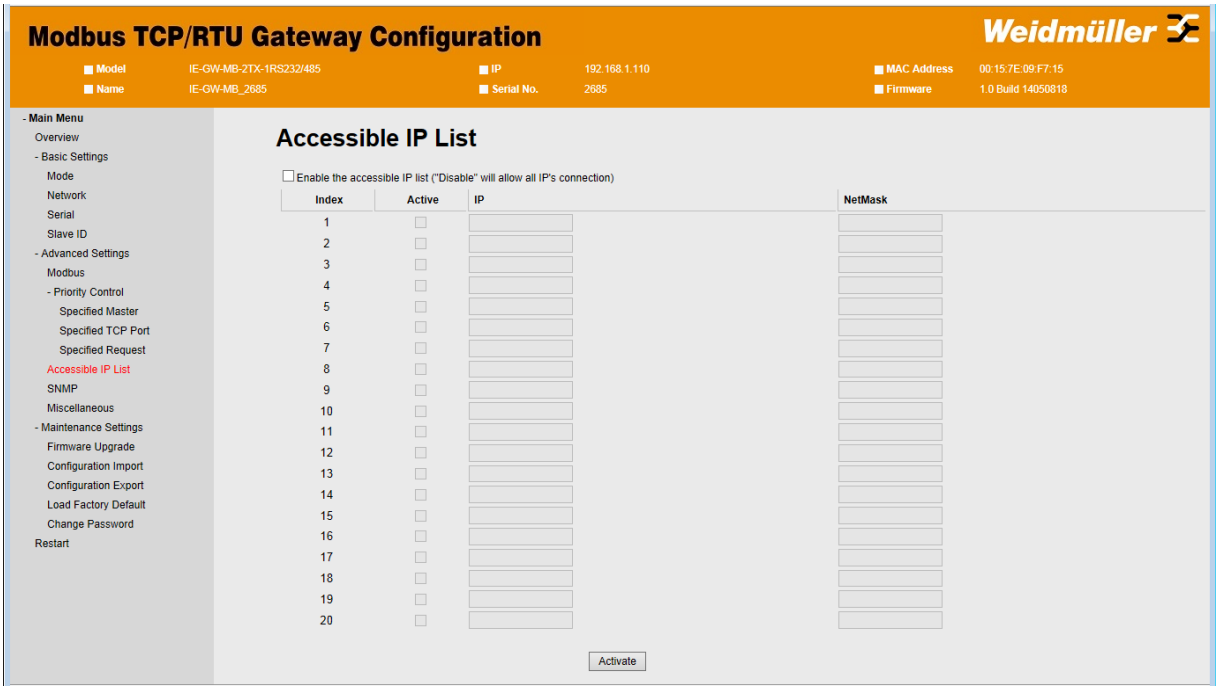
To define a priority request, enable the appropriate priority scheme (**Specified Masters**, **Specified TCP Port**, or **Specified Requests**). Then set the parameters for a priority request. Finally, click **Add/Modify** to apply this definition. (This last step is not necessary for **Specified TCP Port)**.

For example, if you want to give priority to all requests from IP 192.168.10.100 (TCP Master) you would follow these steps:

1. Enable parameter **Specified Masters**.
2. Parameter Add Master → Enable checkbox **IP Address (TCP Master)**
3. Enter IP address 192.168.10.100.
4. Click button **Add** (the new settings additionally will be saved)
5. Click button **Restart** to activate the changes

7.1.2.3 Advanced Settings → Accessible IP List

The Modbus Gateway uses an IP address-based filtering method to control access by itself. The **Accessible IP List** function allows you to add or block remote host IP addresses to prevent unauthorized access.



Example configurations

Example 1 : Only one host with a specific IP address shall access the device

Enter target IP address (e.g. 162.168.1.99) which shall have access

Enter net mask 255.255.255.**255** to be the only device (not an IP address range)

Activate checkbox belonging to the address line

Click button **Activate**

Example 2 : Only hosts of class C network range 192.168.1.0 / 255.255.255.0 shall have access to the Gateway

Enter IP address range 162.168.1.0 into field IP

Enter net mask 255.255.255.**0** to allow access for IP address range **192.168.1.1 to 192.168.1.254**

Activate checkbox belonging to the address line

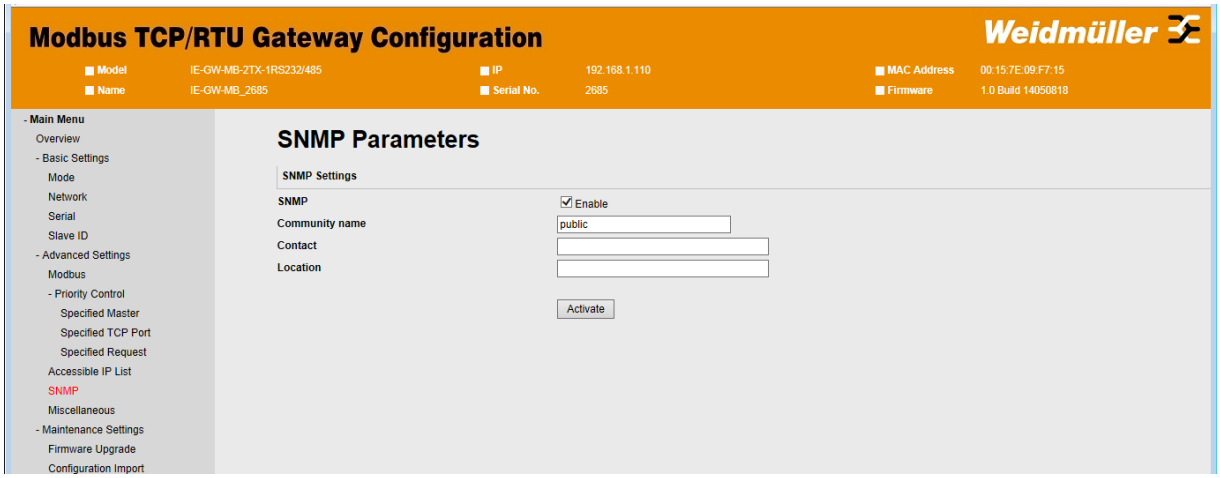
Click button **Activate**

Example 3 : Any host can access the Gateway

Disable this function by clearing the checkbox “Enable the accessible IP list”.

7.1.2.4 Advanced Settings → SNMP

The **SNMP** function allows users to adjust SNMP related settings.



To enable the **SNMP** function, select the **Enable** checkbox.

Community Name:

This field specifies the read/write community string used for the SNMP Agent. This is a text password mechanism that is used to weakly authenticate queries to agents of managed network devices. The default value is **public**.

Contact:

This is an optional free text field that can be used to specify the SNMP emergency contact name or telephone.

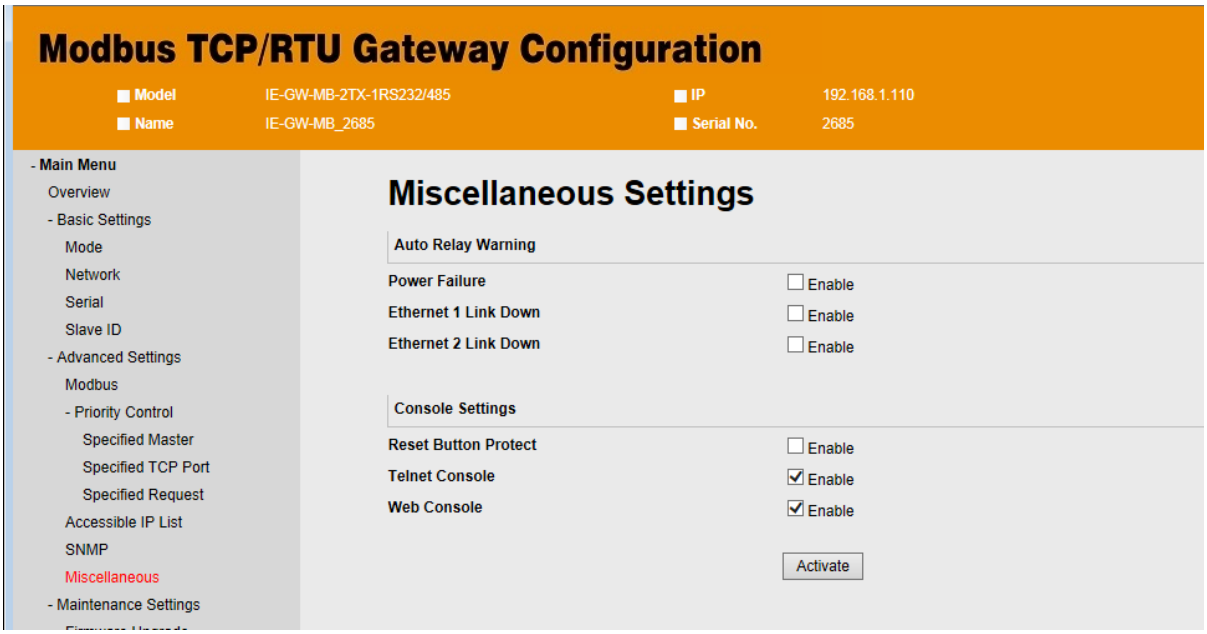
Location:

This is an optional free text field that can be used to specify the location of the Gateway (when the requested by an SNMP agent).

7.1.2.5 Advanced Settings → Miscellaneous

This menu item provides settings for

- Warning functionality using the built-in relay
- Behaviour of external Reset Button and
- Access to Webinterface and Telnet console.



Auto Relay Warning Functions

The built-in relay can be used for warnings based on following trigger events:

- Power failure
- No link or link down of Ethernet port 1
- No link or link down of Ethernet port 2

Conditions of relay: Open when Power-off or when a relay-based alarm is triggered
Closed when Power-on and no relay-based alarm is triggered

When a checked trigger condition occurs the Ready-LED „RDY“ additionally changes the color from green to red and starts flashing.

Console Settings Functions

Checkbox Reset Button Protect → Activating the checkbox prevents to reset the Gateway to Factory default values by the external reset button. By default the checkbox is not set to allow a reset to Factory defaults.

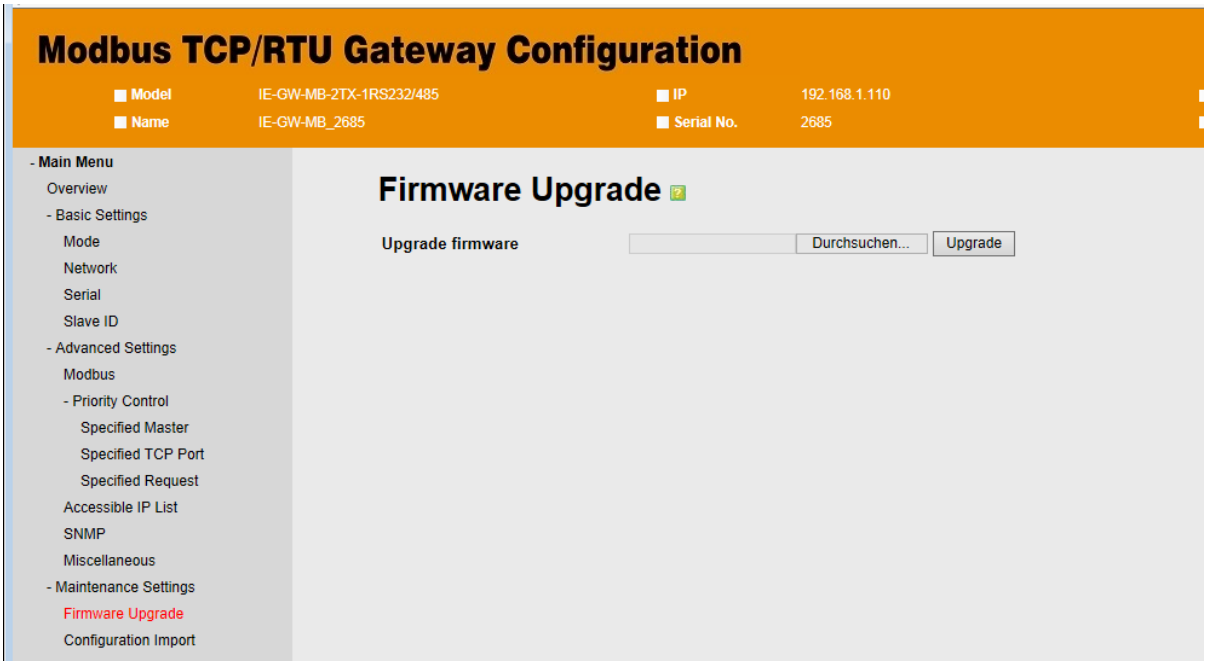
Checkbox Telnet Console → Allows or prevents the device access by Telnet (Default enabled)

Checkbox Web Console → Allows or prevents the device access by Webinterface (Default enabled)

7.1.3 Menu items “Maintenance Settings”

7.1.3.1 Maintenance Settings → Firmware Upgrade

This menu item can be used to upgrade the Firmware by installing a file with extension “.rom” (eg. FWR_IE-GW-MB-2TX-1RS232_485_V1.0_Build_14050818.rom)



The dialog boxes will guide you through the process. You will need to browse your PC for the firmware file. When updating the firmware the progress is displayed in the window.

The latest firmware version can be downloaded using following links:

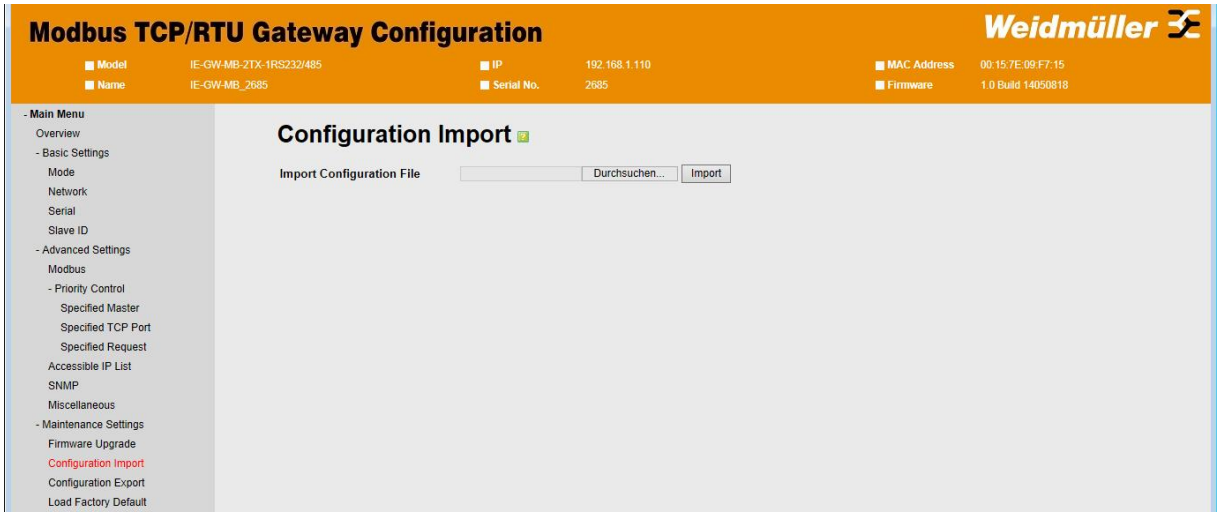
Goto http://www.weidmueller.com

► Select **Product Catalogue**
⇨ Select „Industrial Ethernet active“
⇨ Select „Modbus TCP/RTU Gateway“
⇨ Select Product model
⇨ Click and expand section „Downloads“
⇨ Select and download the firmware file

► or alternatively
⇨ Select **Downloads**
⇨ Select Software
⇨ Select „Industrial Ethernet“
⇨ Goto section Modbus TCP/RTU Gateway
⇨ Select and download the firmware file

7.1.3.2 Maintenance Settings → Import Configuration

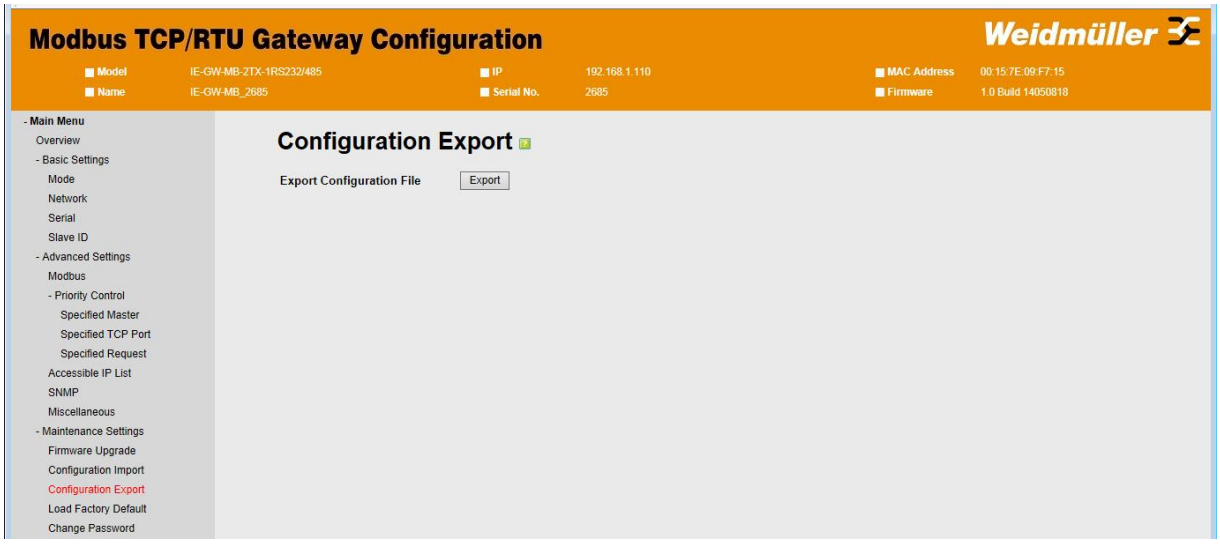
This feature can be used to upload a file-based configuration with extension type *.cfg into the Gateway.



To import a configuration file into the Modbus Gateway, click **Browse** to select the configuration file (which originally was stored via the function *Export configuration*). The upload procedure will proceed automatically after clicking **Import**.

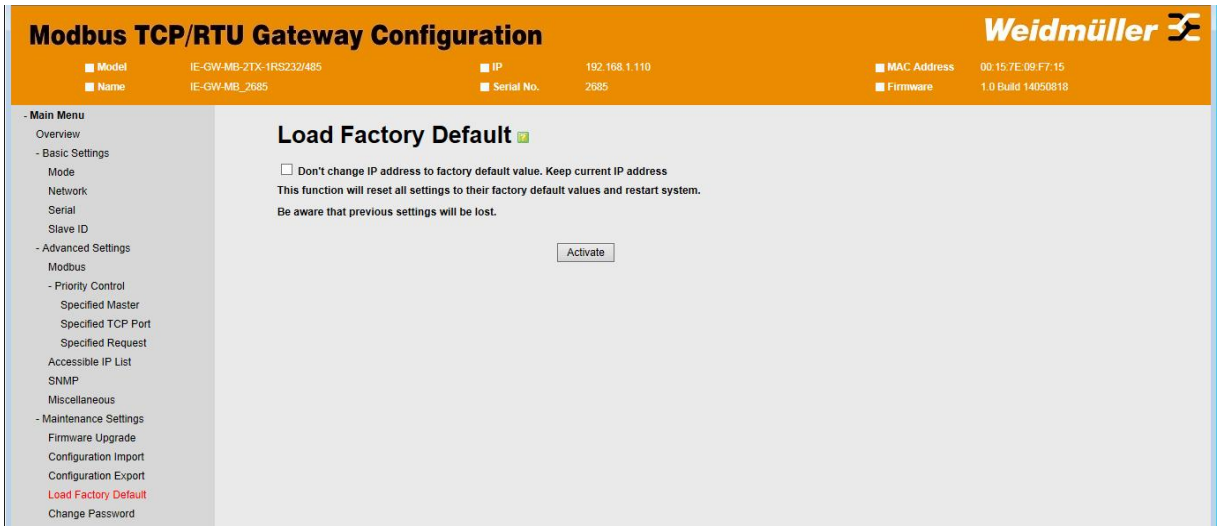
7.1.3.3 Maintenance Settings → Configuration Export

The current configuration can be exported to the PC by clicking the button *Export*. The default name of the export file is **IE-GW-MB-2TX-1RS232-485.cfg**.



7.1.3.4 Maintenance Settings → Load Factory Default

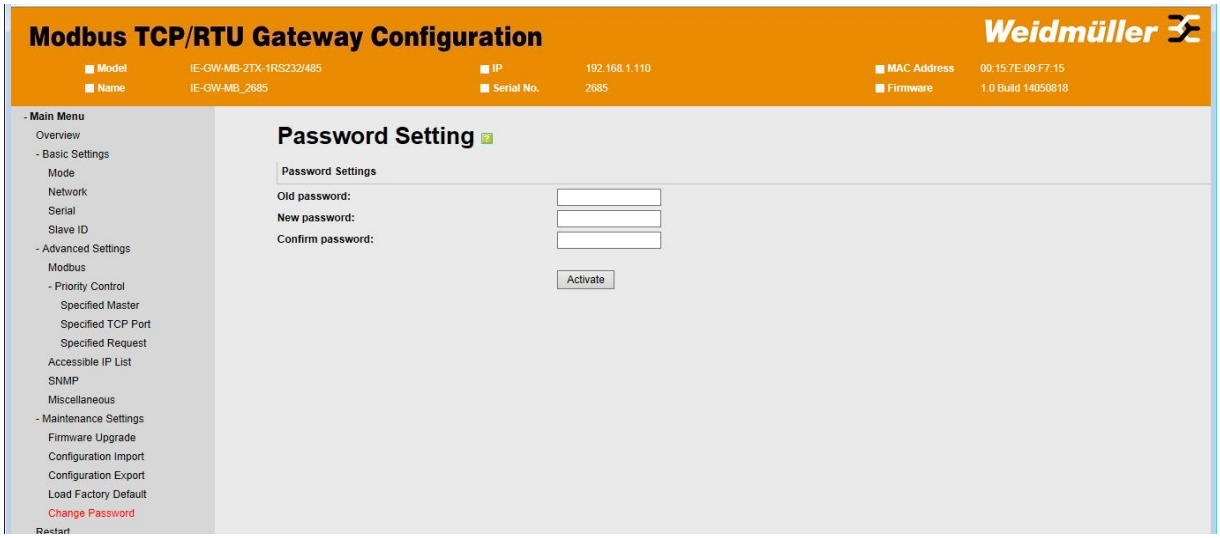
Via menu item **Load Factory Default** the Modbus Gateway can be reset to Factory default values.



By activating the checkbox the current IP address will not be changed when clicking button Activate. If the checkbox is cleared then also the IP address will be reset to factory default IP 192.168.1.110.

7.1.3.5 Maintenance Settings → Change Password

Via this menu item a password can be set or cleared to ensure an authorized access to the device. A set password controls the access by Webinterface, Telnet console or PC-based utility Modbus Gateway Administrator.

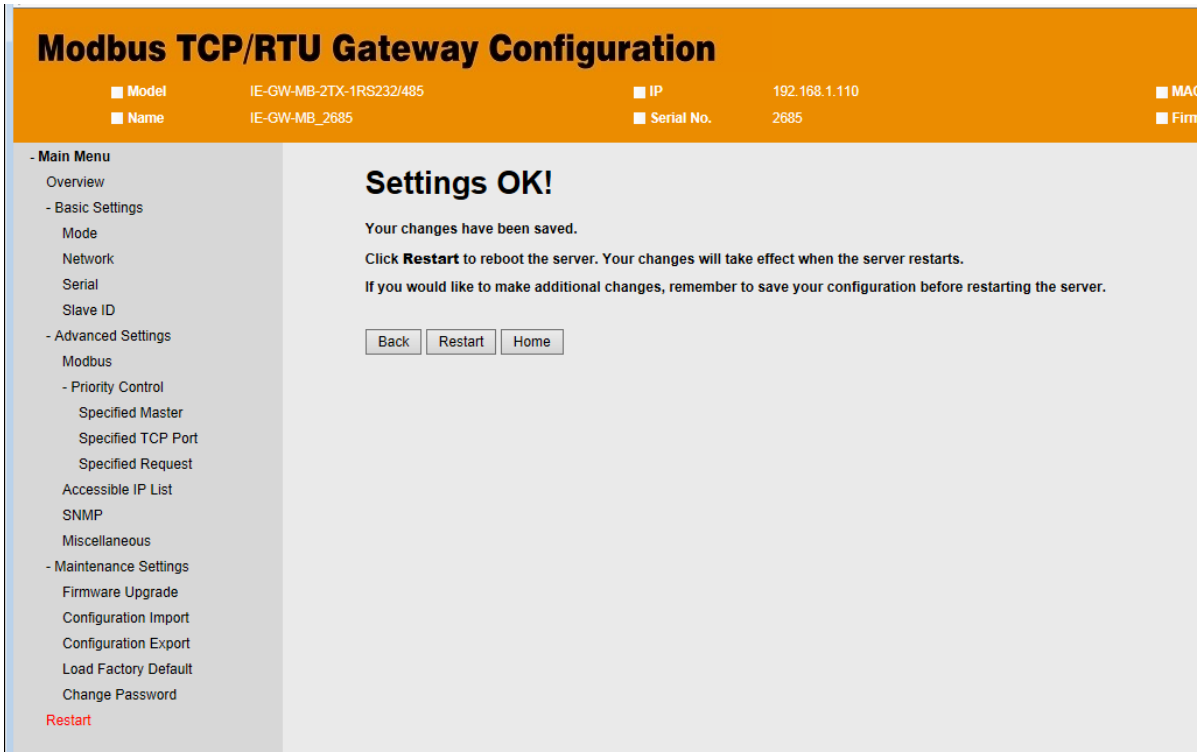


Password Settings

Setting	Description	Factory Default
Old password (max. 16 characters)	Enter the current password when changing the password	**Detmold**
New password (max. 16 characters)	Type new password when changing the password	None
Confirm password (Max. 16 characters)	If you type a new password in the Password field you will be required to retype the password in the retype new password field before updating the new password.	None

7.1.4 Menu item “Restart”

This menu item can be used to reboot the device explicitly. This menu also will be displayed automatically if you have changed any parameters in other menus to activate the changes.



7.2 Configuration and Monitoring via PC-based tool *Modbus Gateway Administrator*

The PC-based software tool Modbus Gateway Administrator can be used for

- Device configuration (alternatively to Web-based configuration)
- Data monitoring and troubleshooting
- Providing virtual COM-Ports on a PC (called ProCOM) to allow communication between a PC-based Modbus RTU master application and serial slaves (connected to Modbus Gateway) via Ethernet

The utility ***Modbus Gateway Administrator*** can be downloaded from the Weidmüller Internet page using below described links:

Goto **http://www.weidmueller.com**

► Select „**Product Catalogue“**

→ Select „Industrial Ethernet active“

→ Select „Modbus TCP/RTU Gateway“

→ Select Product model

→ Click and expand section „Downloads“

→ Download software „Modbus Gateway Administrator“

► or alternatively:

→ Select **„Downloads“**

→ Select „Software“

→ Goto section „Industrial Ethernet“

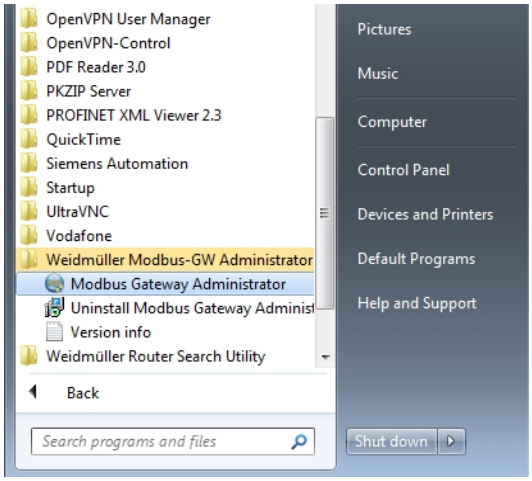
→ Goto section „Modbus TCP/RTU Gateway“

→ Download software „Modbus Gateway Administrator“

7.2.1 Installing and starting the Software

Please unzip the downloaded file and Install the extracted file with extension „.exe“ (eg. Modbus_GW_Admin_V_1.0_Build_14050718.exe) as proposed by the setup process.

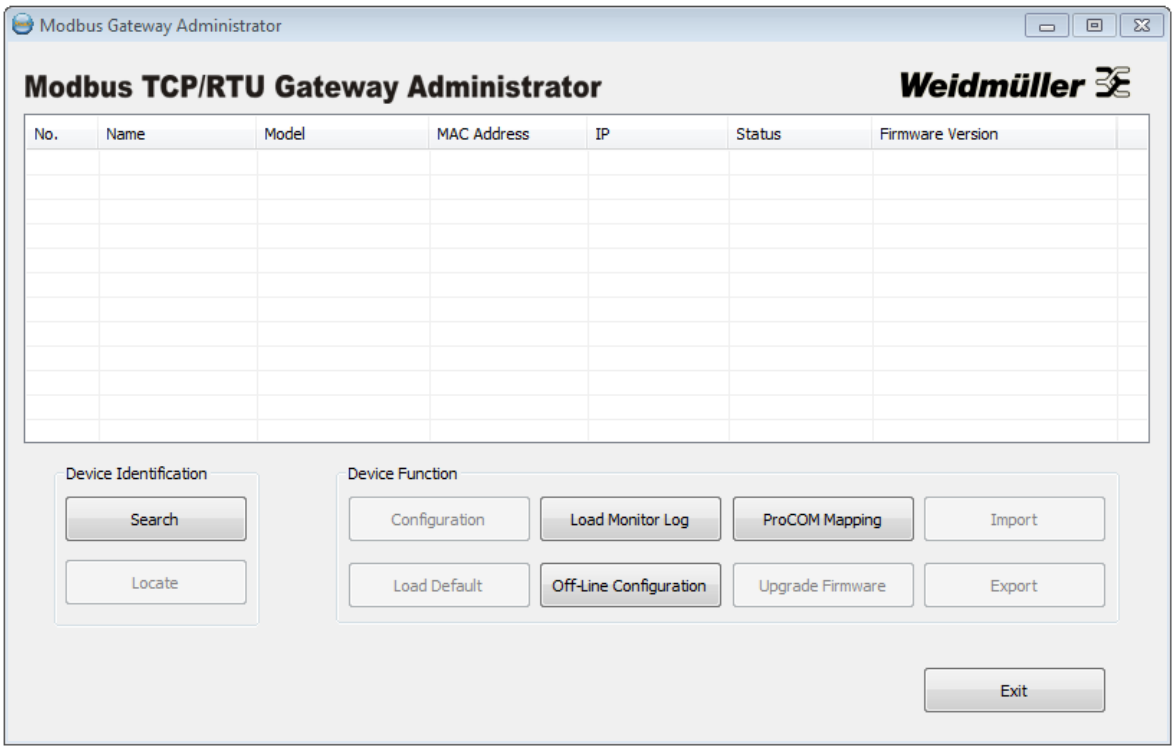
After successfull installation you will find a new item in the Windows menu programs.



The utility Modbus Gateway Administrator now can be started via Start → Programs → Weidmüller Modbus-GW Administrator → Modbus Gateway Administrator as shown.

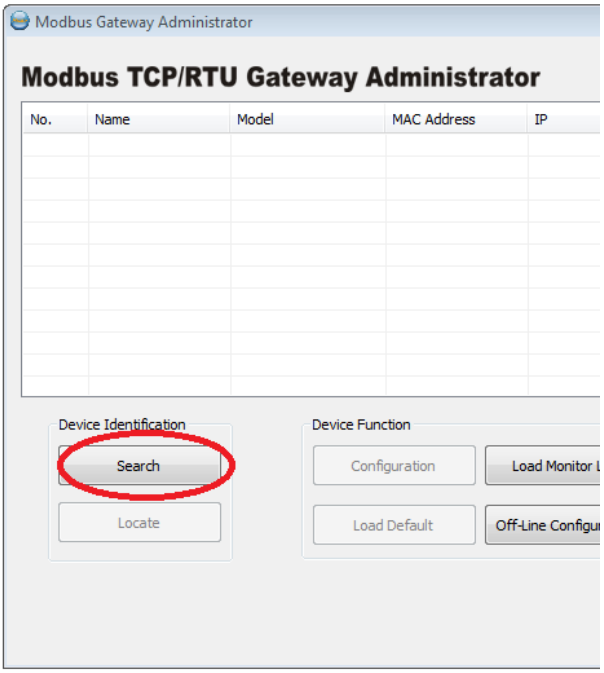
Alternatively the by default created Desktop icon can be used for starting the software.

The Modbus Gateway Administrator window should appear as shown below.



7.2.2 Searching Devices

Searching for Modbus Gateway devices



The button **Search** can be used to find devices either by Broadcast search or by addressing an unique IP address.

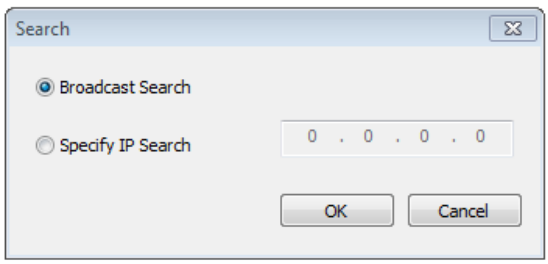
Broadcast Search allows to find Modbus Gateway‘s on the LAN by sending a Layer-2 based Ethernet broadcast frame independant of used IP addresses. Detected devices will be displayed in the windows. If you want to configure a detected device then both devices – the PC and the Modbus Gateway – must be in the same IP range that they are able to communicate with each other.

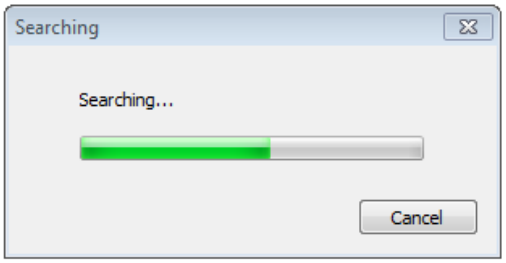
The method „Search by IP“ attempts to connect to a unit directly by a specified IP address. This method has to be used if a unit is located outside the LAN and can only be accessed by going through a router.

Broadcast Search

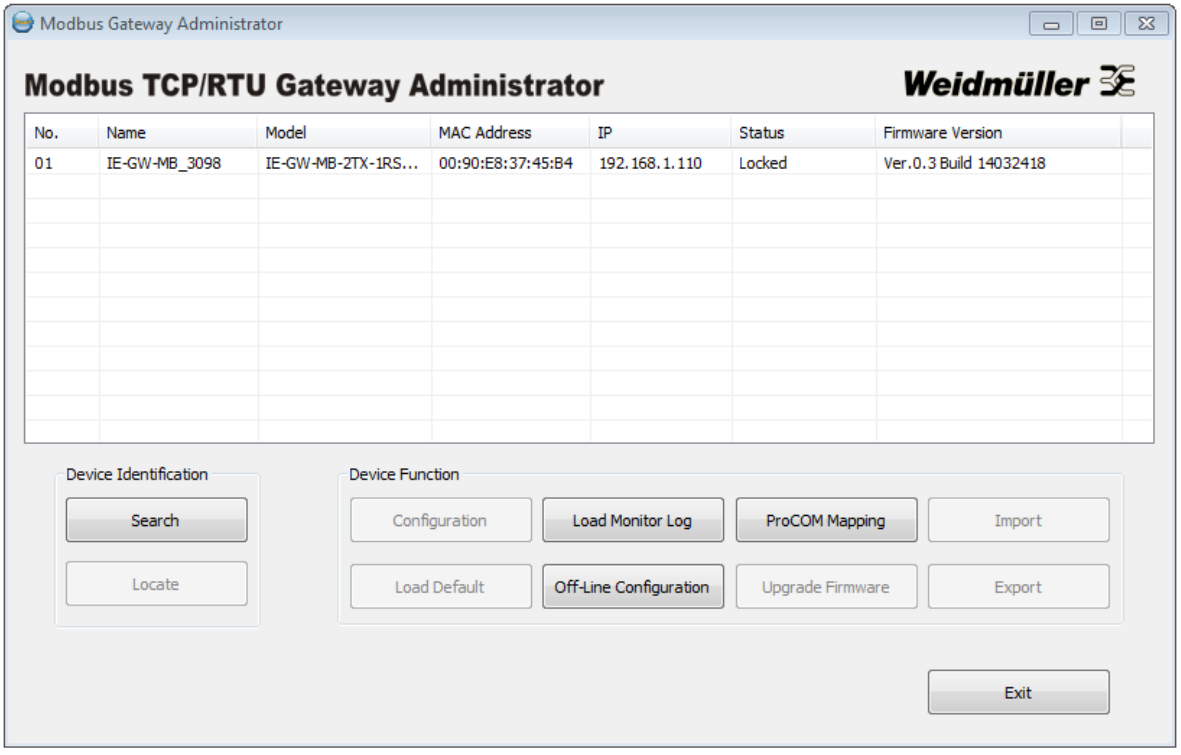
Click button **Search** and following window will pop up.

Select **Broadcast Search (default)** and click **OK** to begin searching the LAN for all Gateway units.

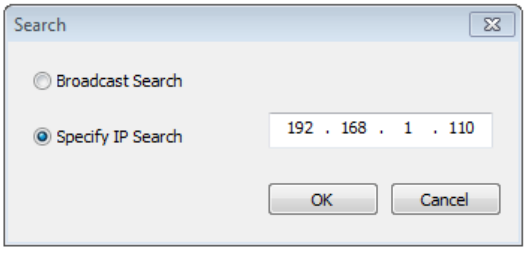




When the search is complete, every device that is found on the LAN will be displayed in the window as shown below.



Search by specifed IP Address

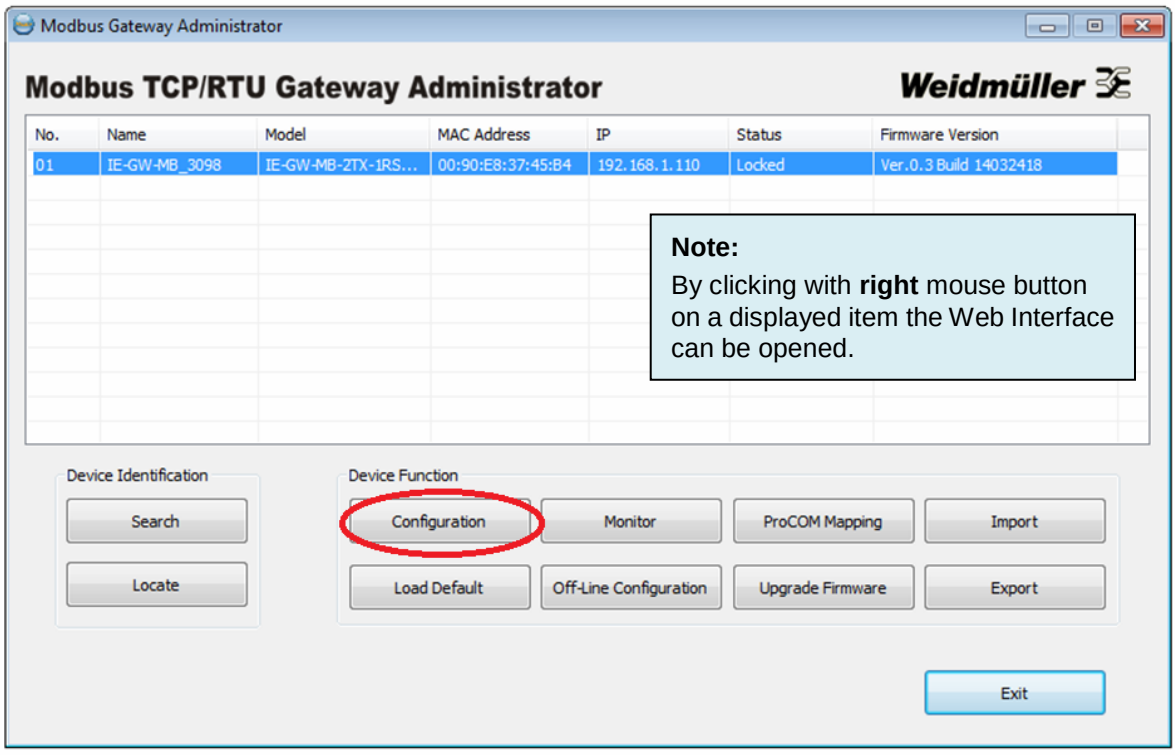


Click button search and select checkbox **Specify IP Search**. Then enter the desired IP address of the device which you want to connect. Then click button OK.

If the search is successfull the device will be displayed as shown in the screenshot above.

7.2.3 Modifying the Configuration

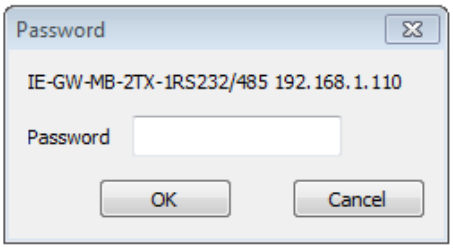
Once your unit is displayed in the device list window, select it by clicking on it. The **Configuration** button will become available.



Click button **Configuration** to open the configuration window.

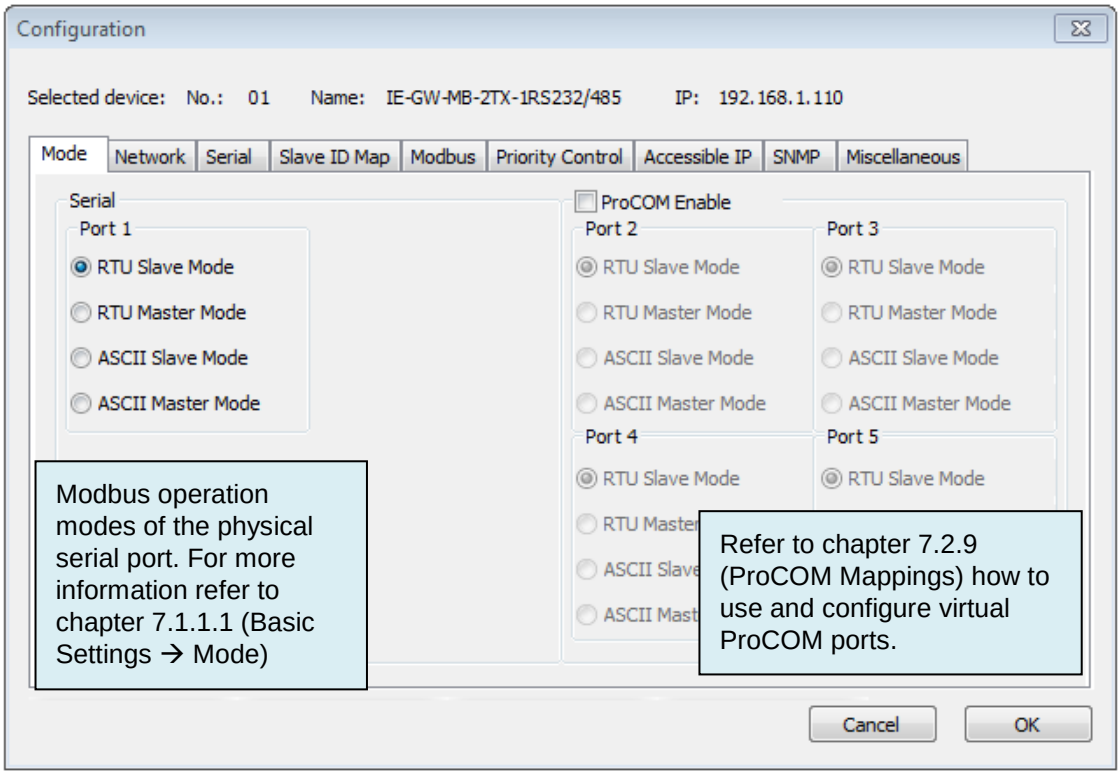
Note:

By Factory defaults a password is set for accessing the configuation of the Modbus Gateway. For this reason the **Password** login window will open. Enter the default Password **Detmold** and then click OK to continue.

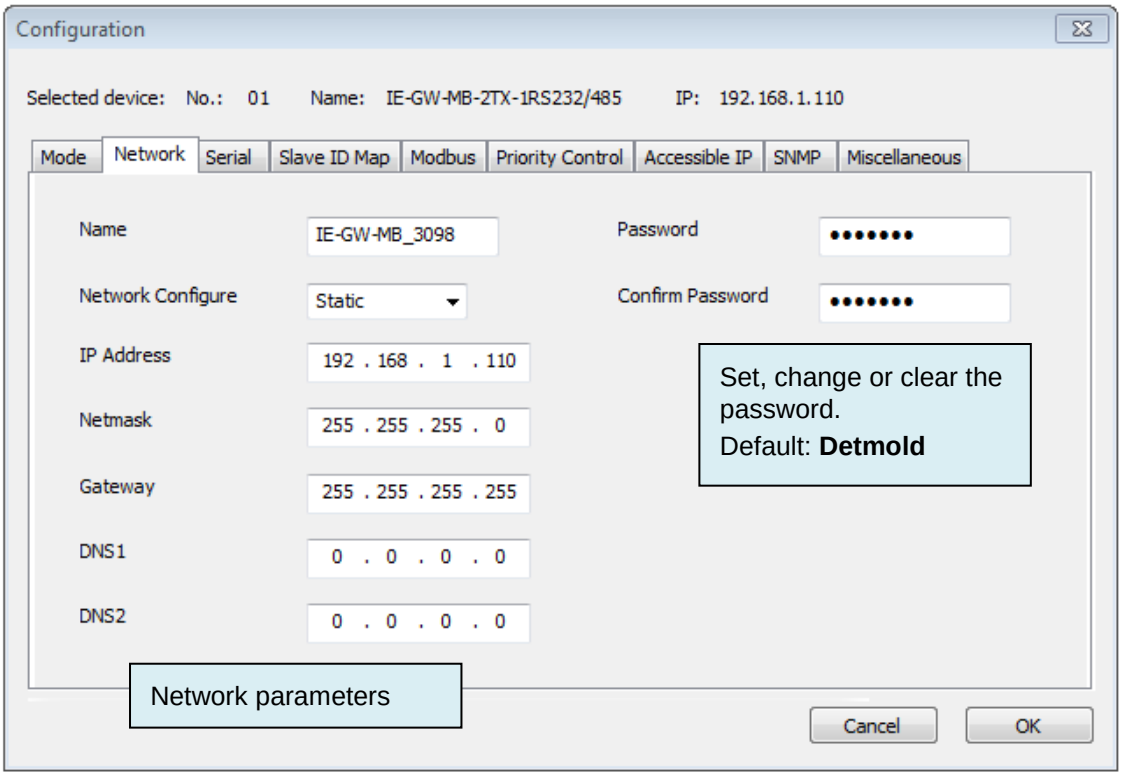


Now the **Configuration window** appears showing the current device configuration. Changes can be made by adapting the parameters located on the tabs Mode, Network, Serial, etc. as shown in the following screenshots.

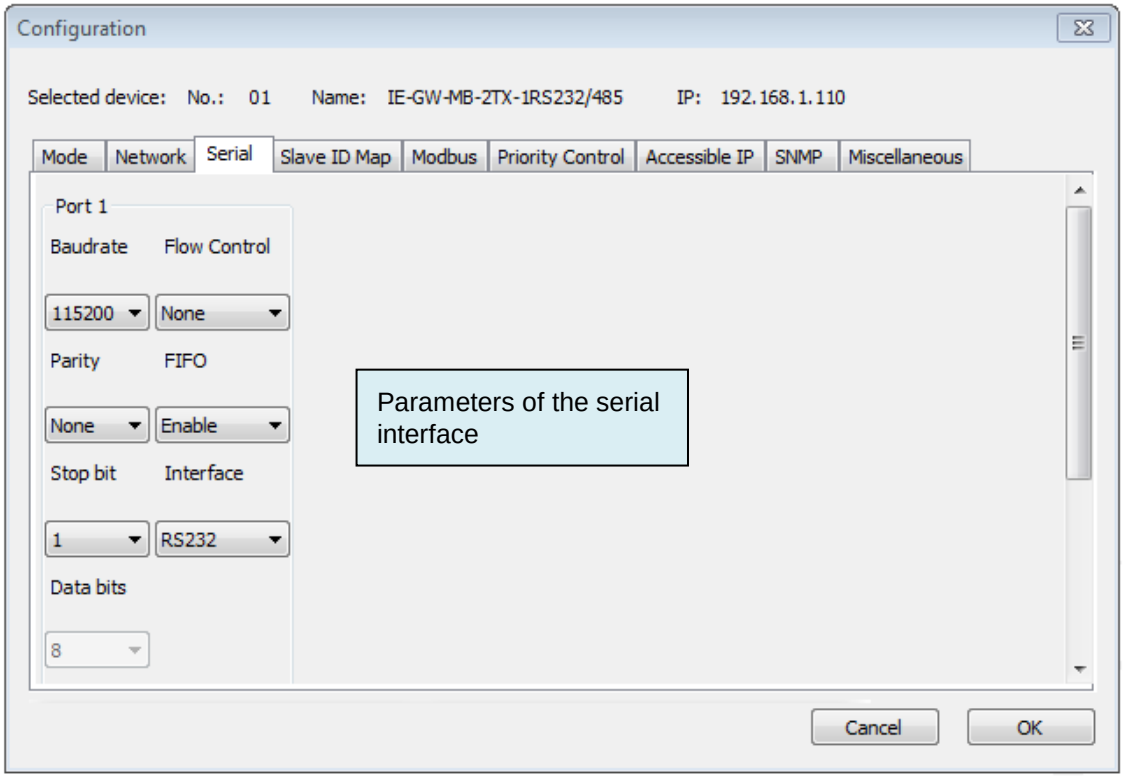
Configuration → Tab Mode



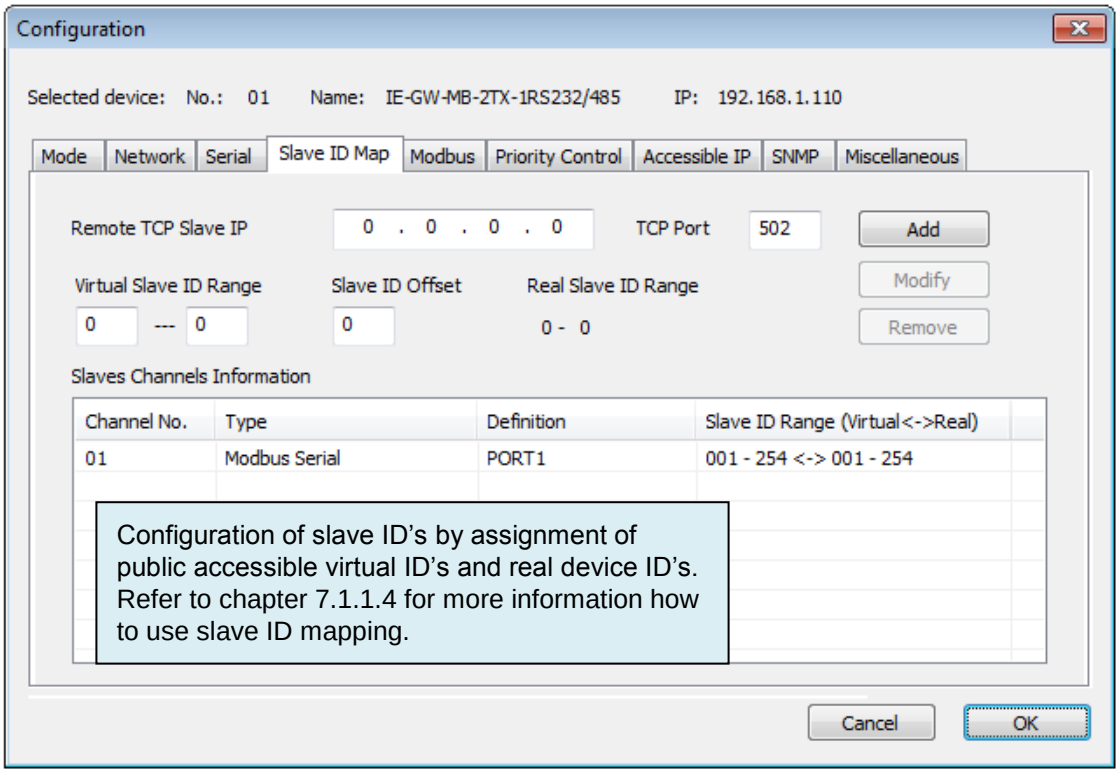
Configuration → Tab Network



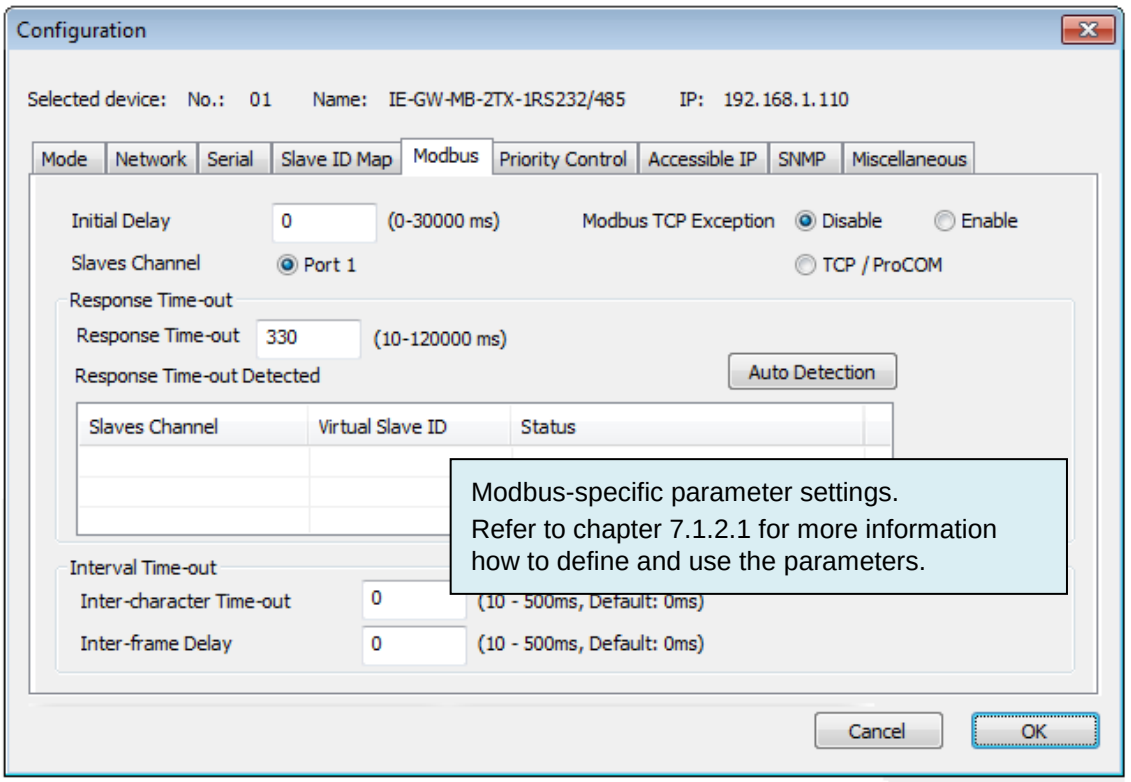
Configuration → Tab Serial



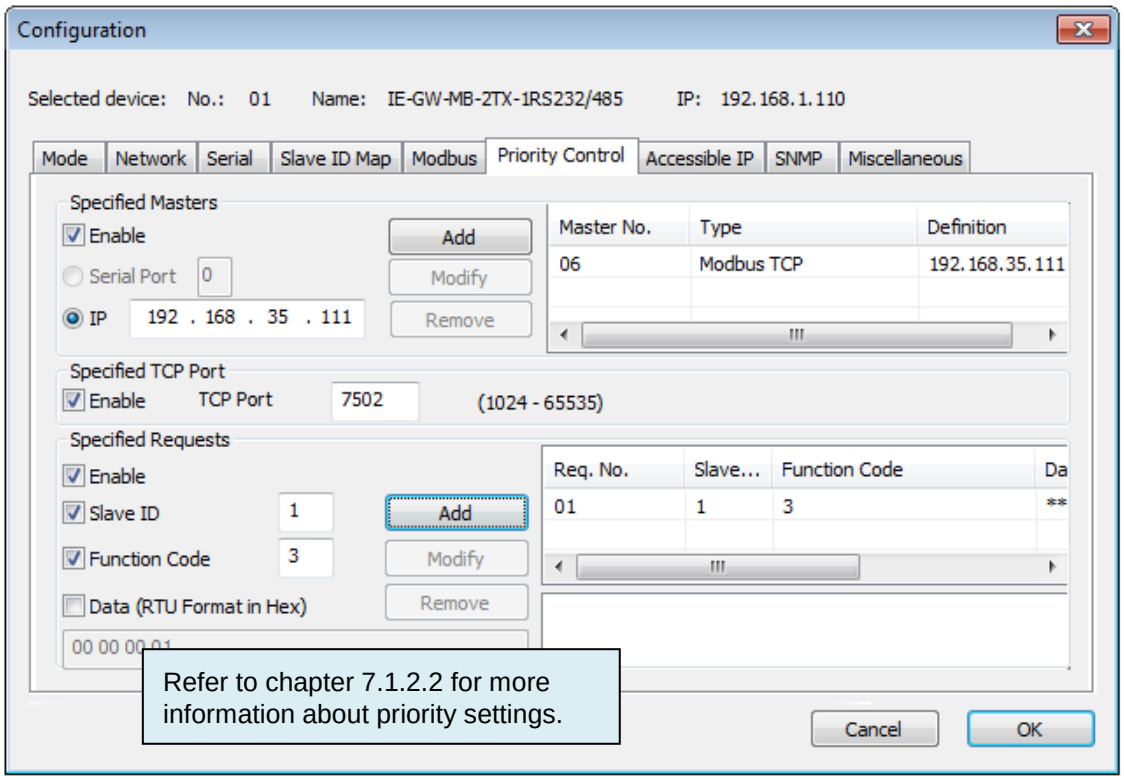
Configuration → Tab Slave ID Map



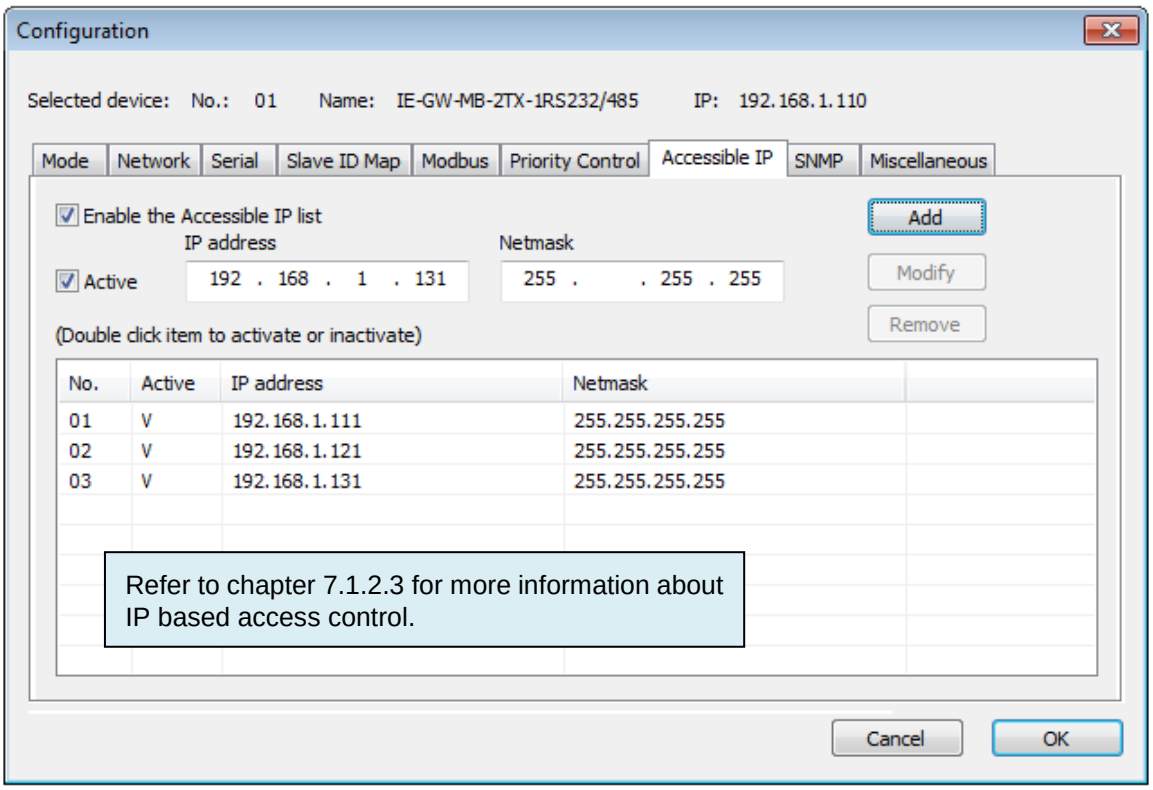
Configuration → Tab Modbus



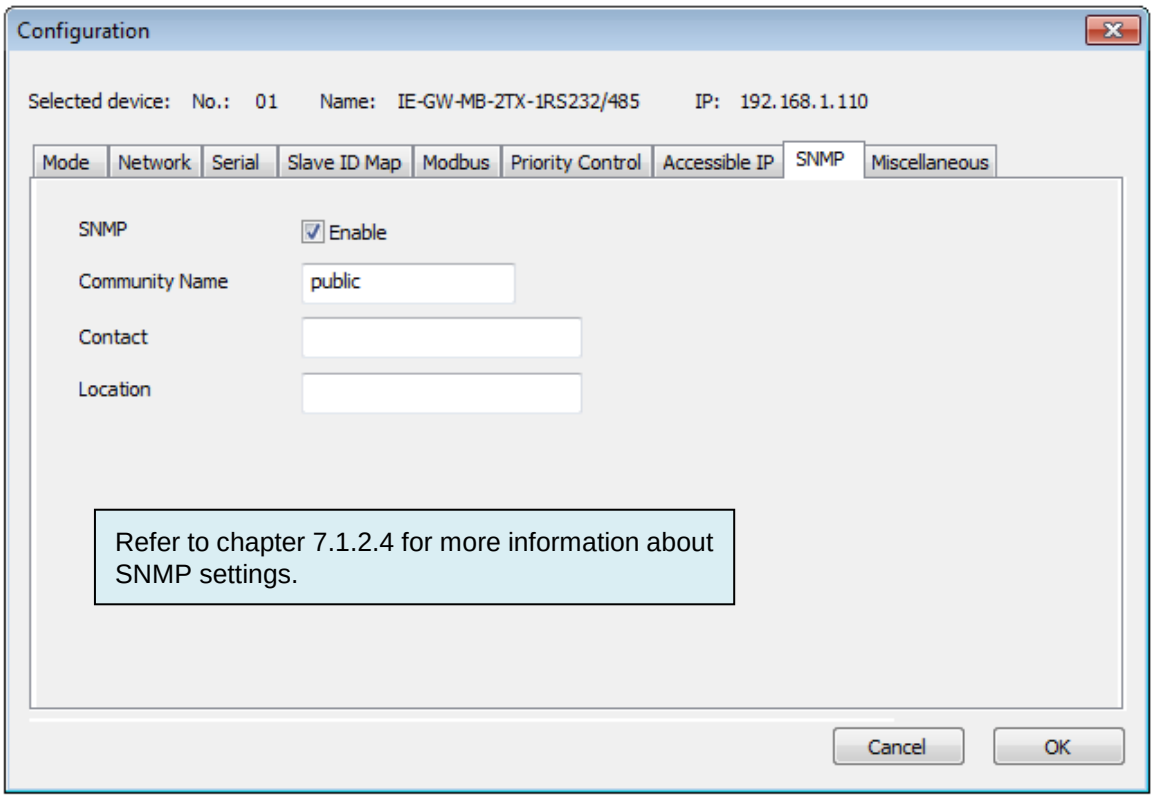
Configuration → Tab Priority Control



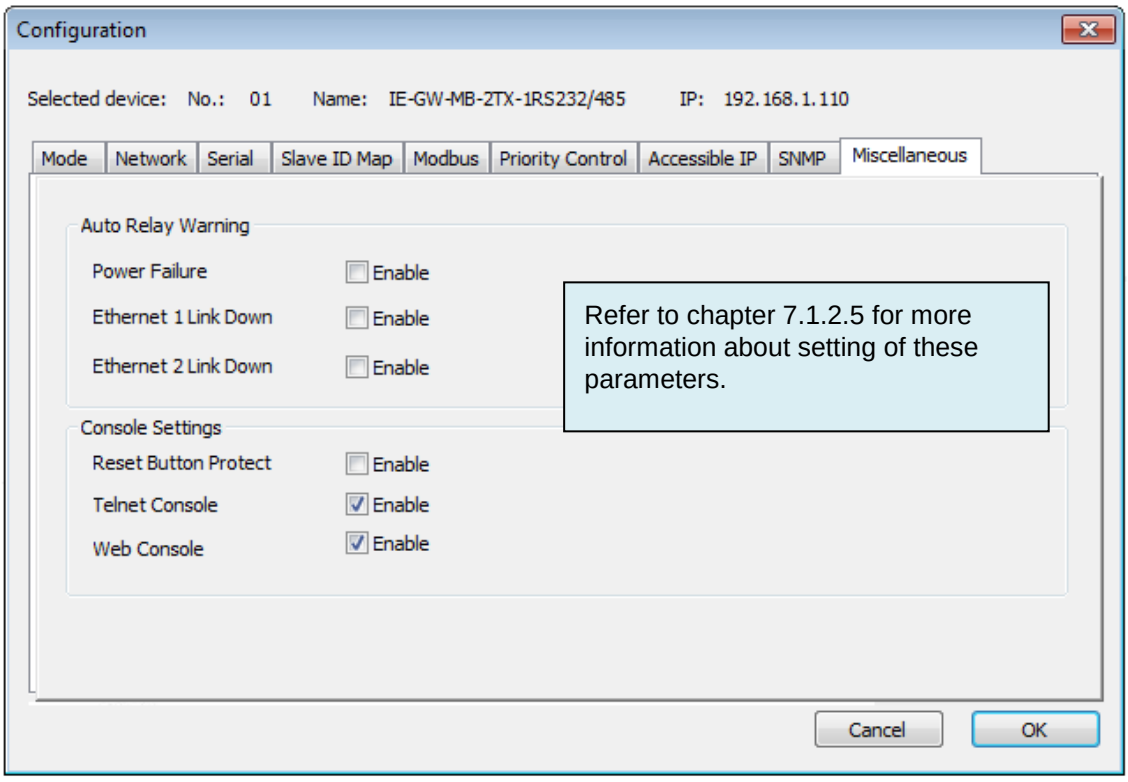
Configuration → Tab Accessible IP



Configuration → Tab SNMP

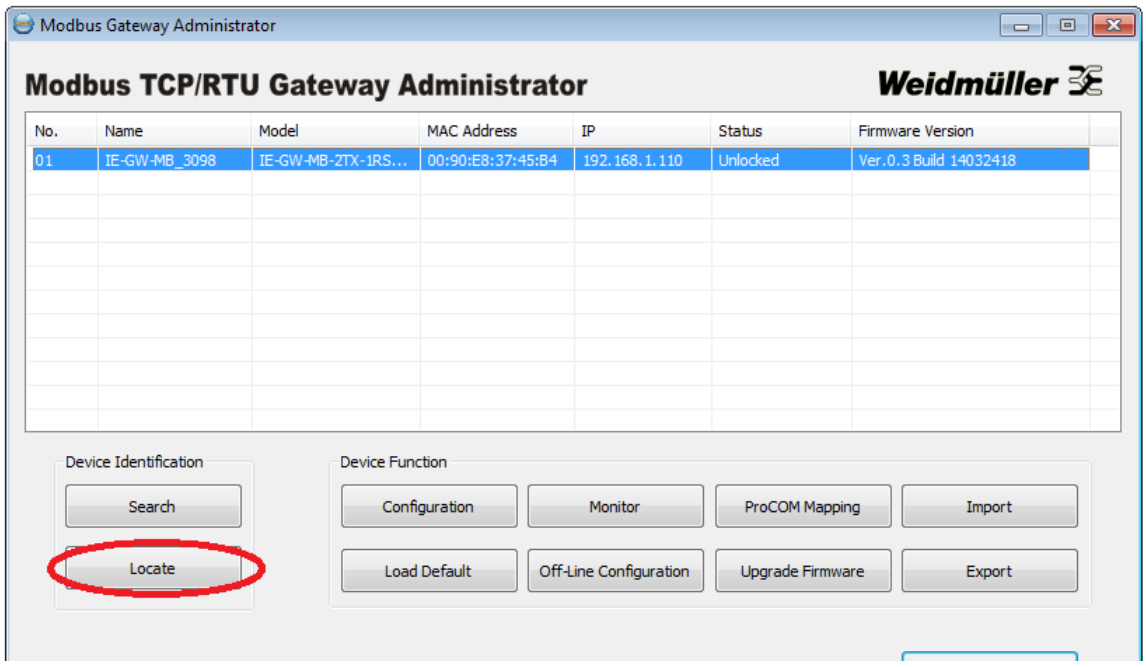


Configuration → Tab Miscellaneous



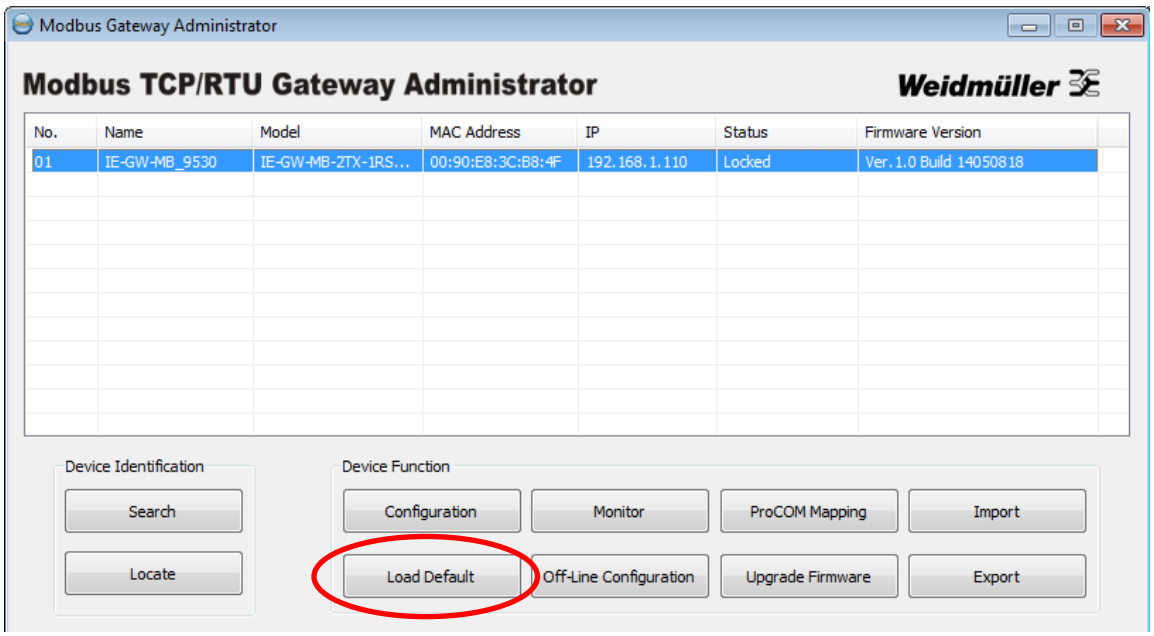
7.2.4 Verifying the Location of the Unit

If you are managing multiple Modbus Gateway‘s, you may wonder if you are configuring the correct unit in Modbus Gateway Administrator. You can select a unit in the device list and click button **Locate.** The “Ready” LED of the selected device starts flashing and the device will beep until you press the button „Stop“ displayed in an popup window.



7.2.5 Load Factory Defaults

By clicking button **Load Default** the Modbus Gateway can be reset to Factory default values. If a password is set then you need to enter the password to reset the device to Factory defaults.

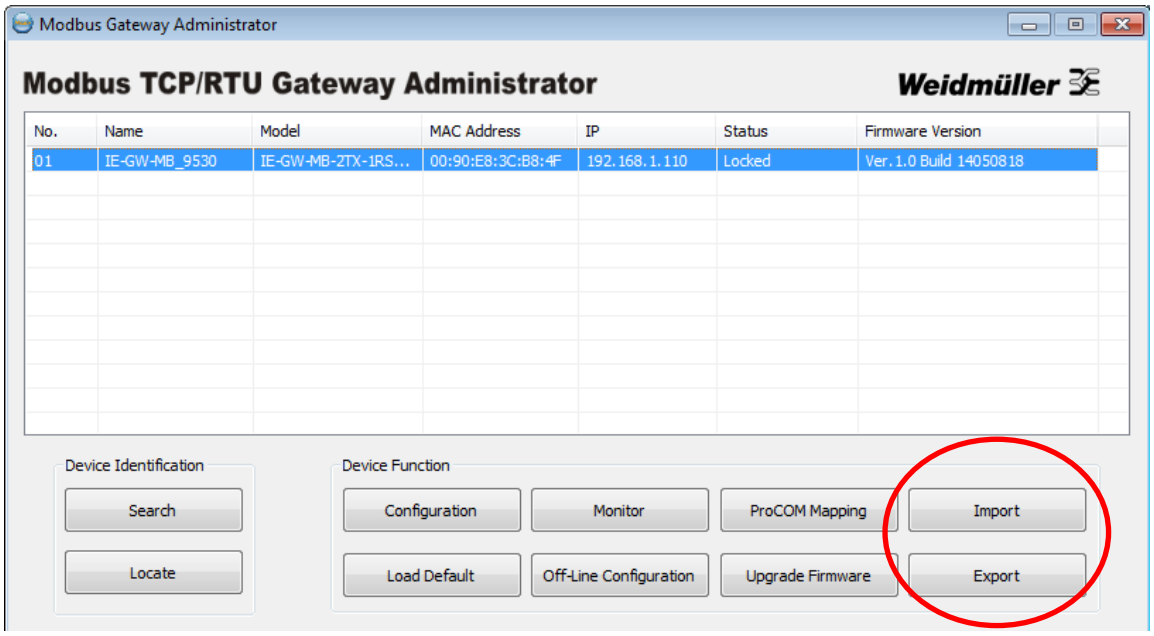


7.2.6 Import / Export

The Export button can be used to save a configuration into a file with extension *.cfg. The default name of the export file is **IE-GW-MB-2TX-1RS232-485.cfg.**

By clicking the Import button a file-based configuration with extension type *.cfg can be uploaded into the Gateway.

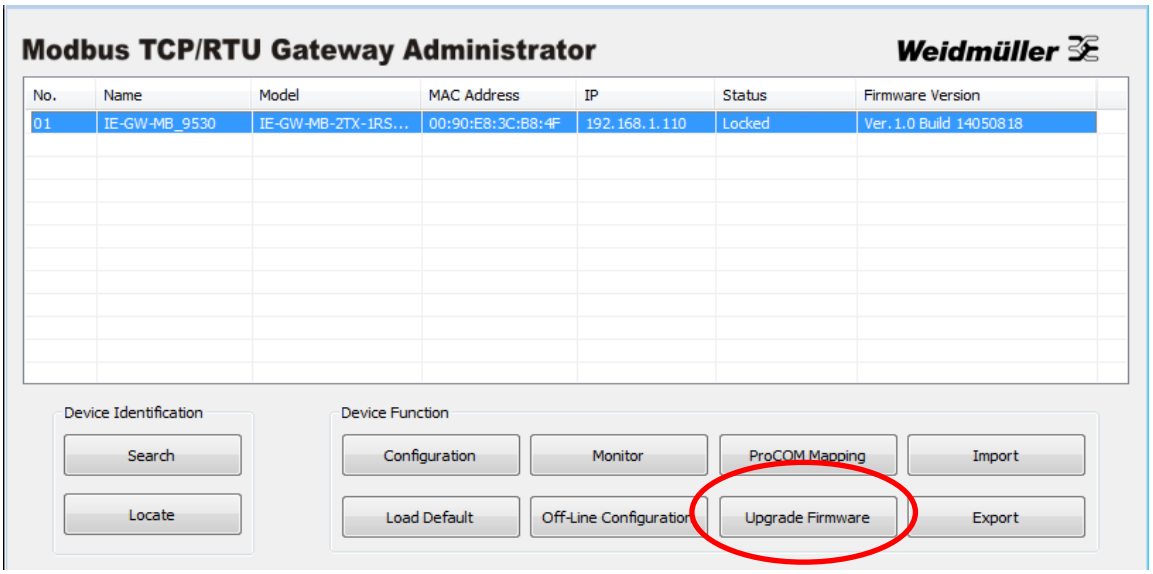
If a password is set then you need to enter it before exporting or importing.



7.2.7 Upgrade Firmware

This button can be used to upgrade the Firmware by installing a file with extension ".rom" (eg. FWR_IE-GW-MB-2TX-1RS232_485_V1.0_Build_14050818.rom).

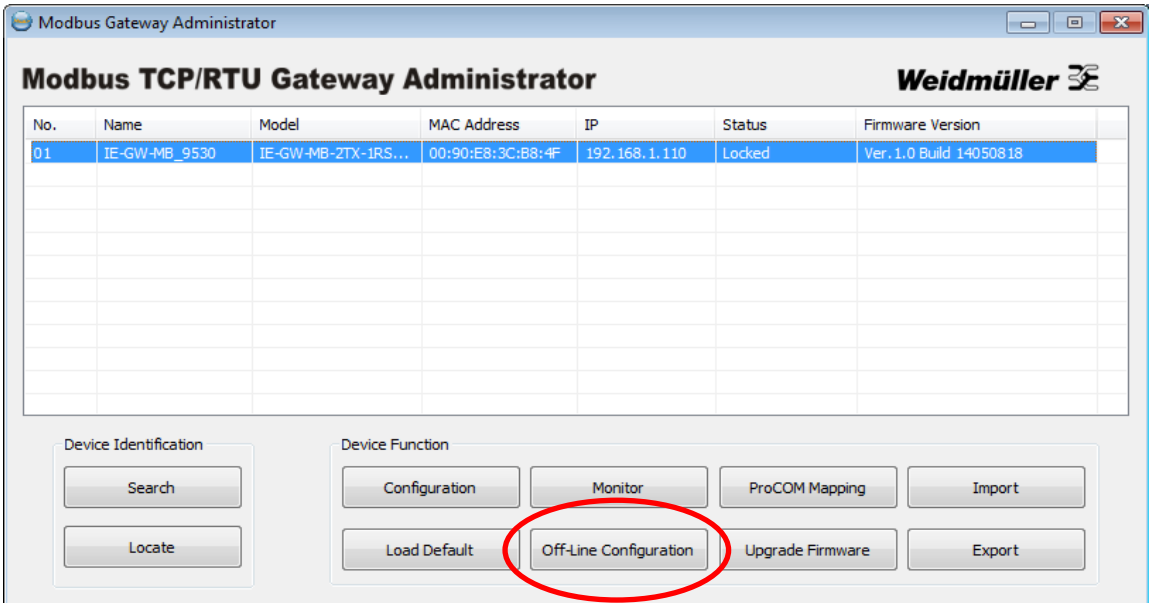
The dialog boxes will guide you through the process. You will need to browse your PC for the firmware file. When updating the firmware the progress is displayed in the window. If a password is set then you need to enter it before upgrading.



7.2.8 Off-Line Configuration

This function can be used

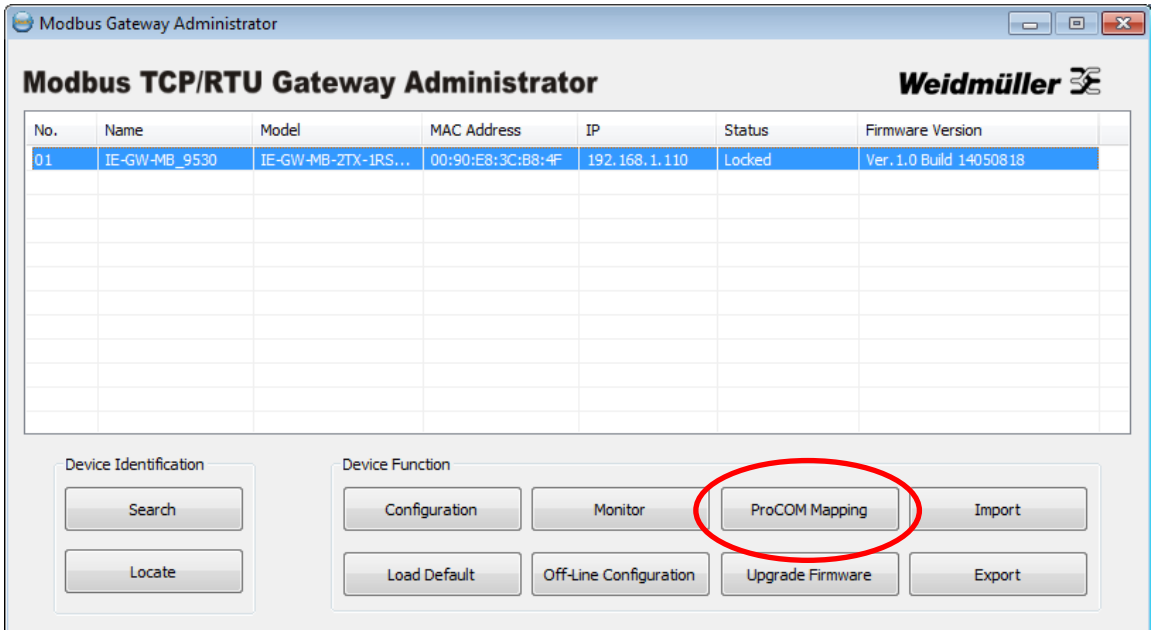
- to create a configuration file of a Modbus Gateway without having a device connected or
- to modify an existing file-based configuration



As result a new created or modified configuration will be store as file with extension *.cfg. It can be used to upload a predefined configuration into a Modbus Gateway by using the Import function.

7.2.9 ProCOM Mapping

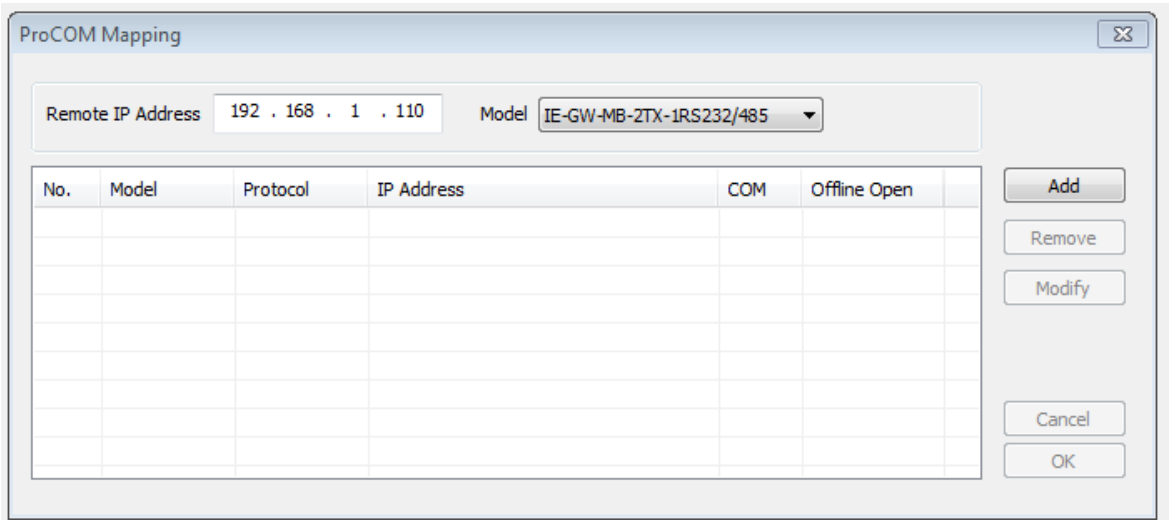
This function installs up to 4 virtual COM ports on a PC and enables a PC's Modbus application – eg. running as RTU/ASCII Master - to communicate with RTU/ASCII Slaves via Ethernet and the Modbus Gateway. A PC can use ProCOM's virtual COM-Ports to communicate over the Ethernet with serial devices as if they were connected to the PC's native COM ports.



Example how to install and use virtual ProCOM ports on the PC which is running as Modbus RTU Master.

The serial slaves which shall be accessed by the RTU Master, are connected at the serial port of the Modbus gateway. PC and Modbus Gateway can communicate with each other via an Ethernet network.

1. Click button **ProCOM Mapping** to open the mapping dialog box as illustrated below.

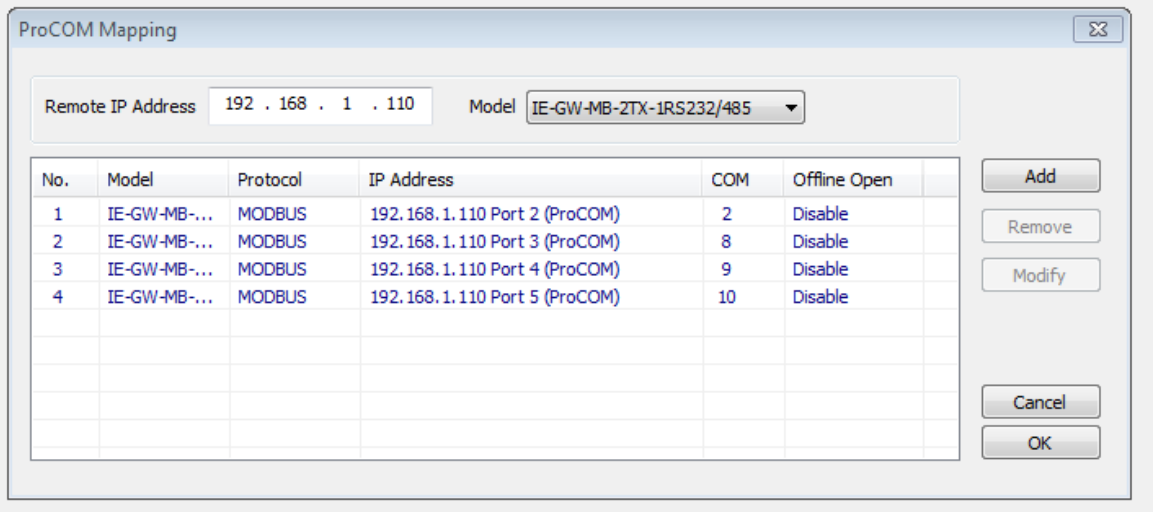


Note: The IP address of the selected Modbus Gateway automatically is used if the item was highlighted. If you want you can change the IP address referring to another Modbus Gateway.

2. Click button **Add** to install 4 new virtual COM-Ports on the PC. As COM-Port numbers 4 free port numbers automatically will be assigned. In this example following assignment will be done for communication between Gateway's ProCom function and PC's virtual Com-Ports:

Gateway's ProCom Port	Virtual PC Com-Port
Port2	virt. ComPort 2
Port3	virt. ComPort 8
Port4	virt. ComPort 9
Port5	virt. ComPort 10

The PC's Com-Port numbers can be changed to other unused ones by highlight an item and clicking button **Modify**.



3. Click button **OK** to install and activate the virtual COM-Ports.

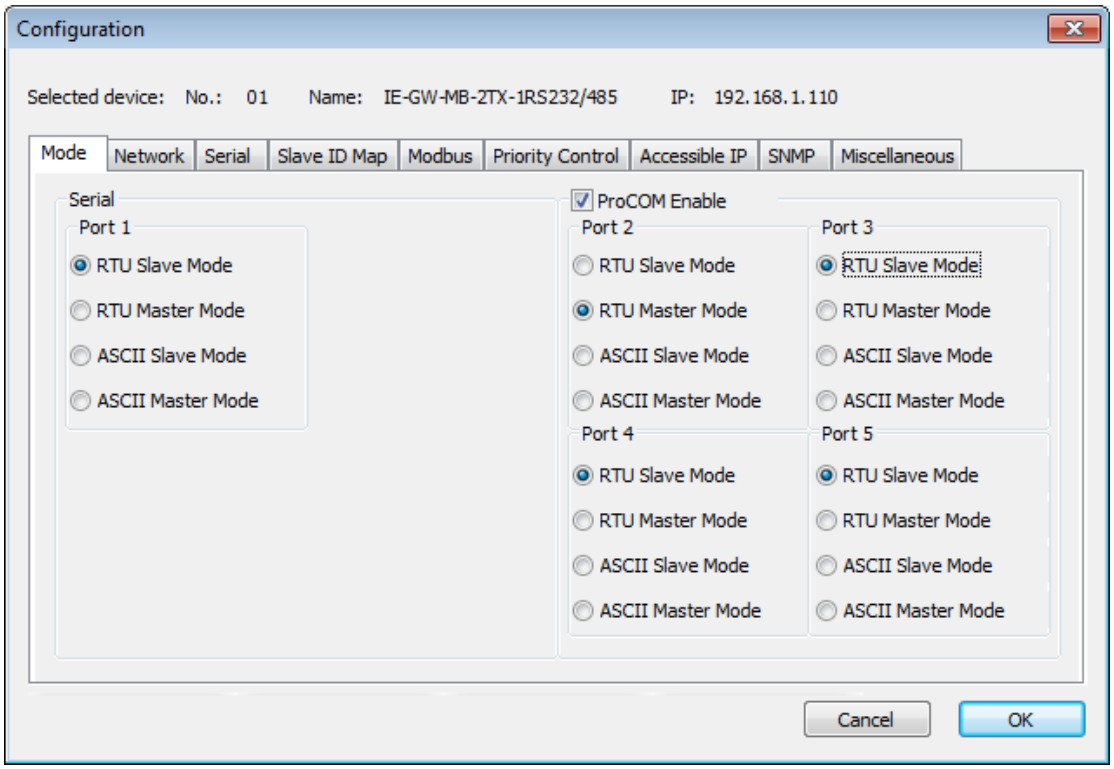
The Com-Ports can be addressed now by the Modbus RTU Master application.

Note:

Installed virtual ProCOM-Ports are constantly available and will be automatically re-activated after starting the PC. To remove the virtual ProCom-Ports open the ProCOM mapping table again, highlight the items and click button *Remove*.

Now the **Gateway's** ProCOM function has to be configured regarding the operation mode.

4. Click button **Configuration** and select tab **Mode** (Default tab)



We want to use PC's virtual Com-Port 2 to communicate with serial slaves behind the Modbus Gateway with IP 192.168.1.110. According to ProCOM mapping the PC's Com-Port 2 is assigned to Gateway's ProCOM-Port 2. For this reason we configure the Gateway's ProCOM-Port 2 running in RTU Master mode because the PC is running as Modbus RTU Master..

5. Active checkbox **ProCOM Enable** and select **RTU Master Mode** of **Port 2** as shown above.

Note: The operation mode of Gateway's ProCOM-Ports 3, 4 and 5 we will ignore because we only need ProCOM-Port 2 for communication wirh PC's virtual port .

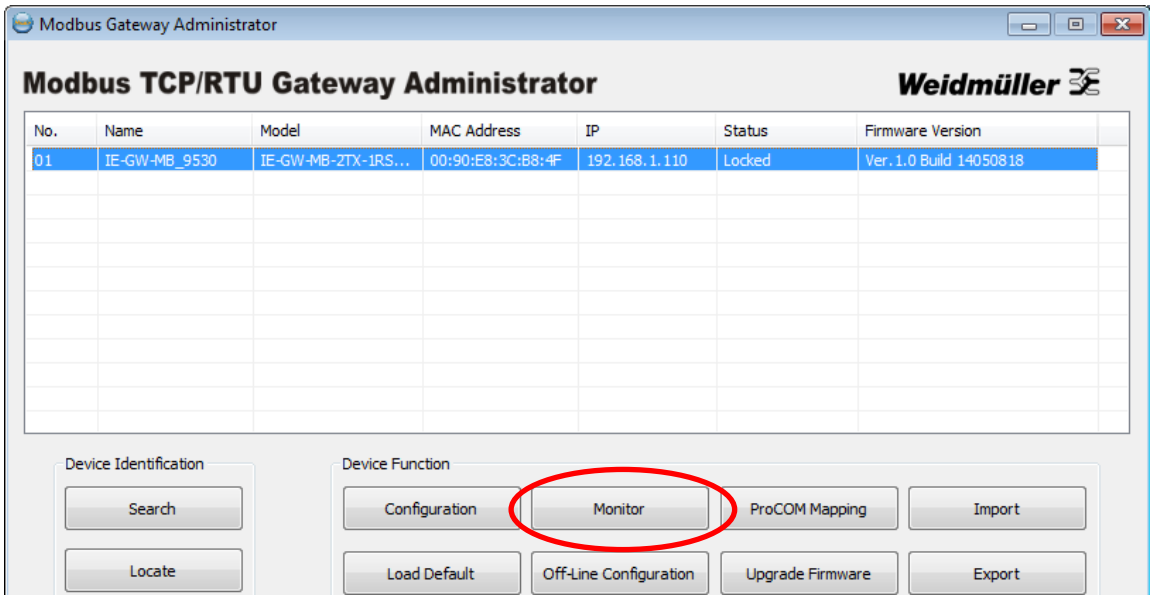
6. Click button OK to apply the changes.

Now the PC's Modbus RTU Master application should be able to access the serial slaves via PC's virtual Com-Port 2.

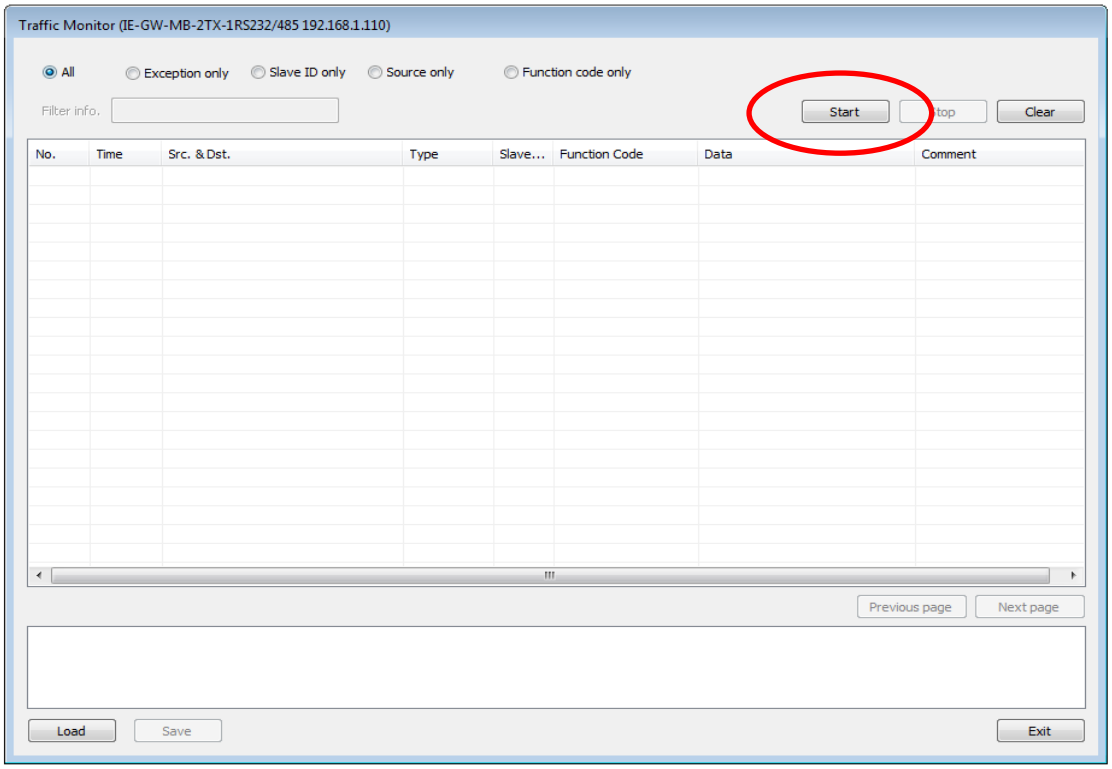
This way, when the PC's Modbus **RTU** Master application sends a request to virtual Com-Port 2 (provided by ProCOM), the driver will forward the request to the enabled ProCom-Port 2 of the Gateway. Then the Gateway forwards the request to the target Modbus device using the pre-set Modbus device mode and Slave ID.

7.2.10 Monitoring Modbus Activity

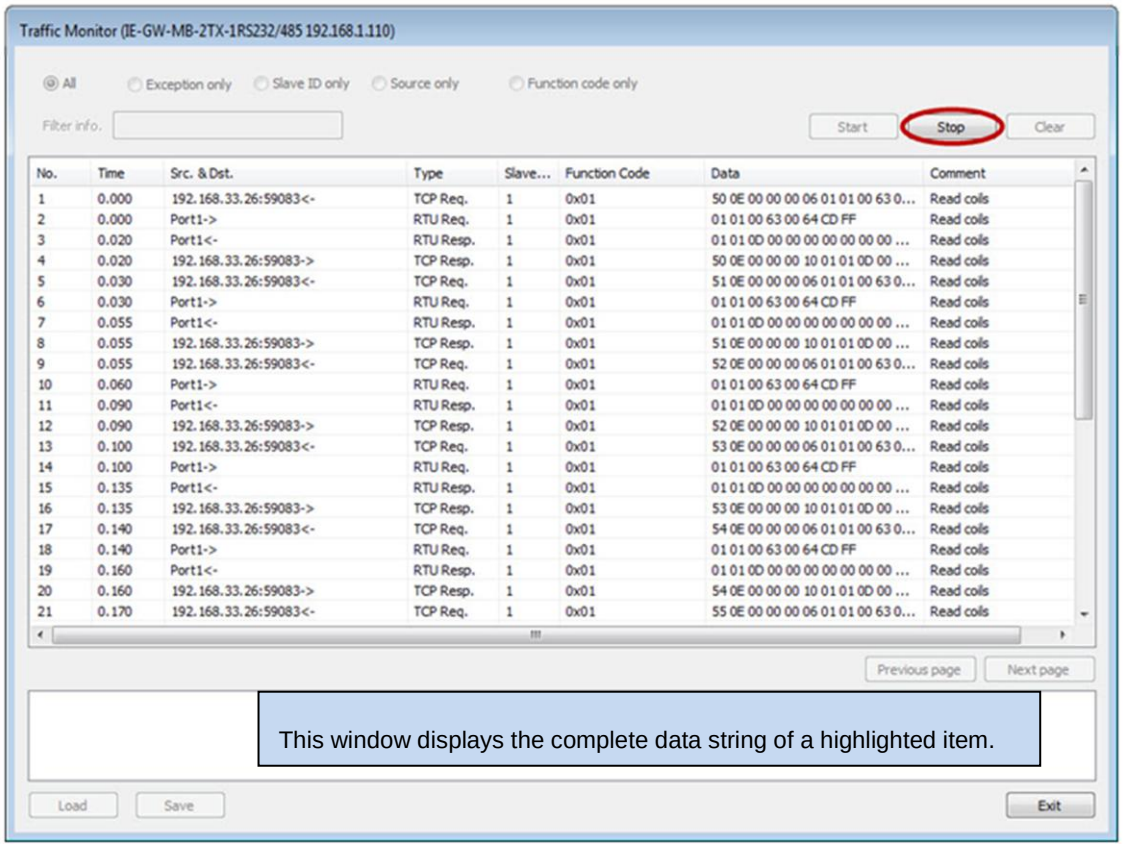
For troubleshooting or management purposes, you can monitor the data passing through a Modbus Gateway on the network. Data events can be logged when they pass the gateway. Rather than simply echoing the data this feature presents the data in an intelligent and easily-understood format displaying fields like source and destination addresses, contents, traffic direction and more. Events can be filtered in different ways and the complete log can be saved to a file for later analysis.



Select the unit that you wish to monitor and click button **Monitor** to open the Traffic Monitor window as shown below. By default each passing traffic will be monitored (Check box „All“ is activated). Click button **Start** to begin live monitoring of the data passing through the selected Modbus Gateway.



If any traffic is passing the Gateway it will be displayed in the window as shown below for example.



To stop capturing the logging click button **Stop**.

Filter Traffic Information

By default, all events are displayed in the traffic monitor window. The feature Traffic Monitoring also allows to filter the data limited to relevant informations. The filter is selected using the radio buttons and customized using the “Filter info” field, as follows:

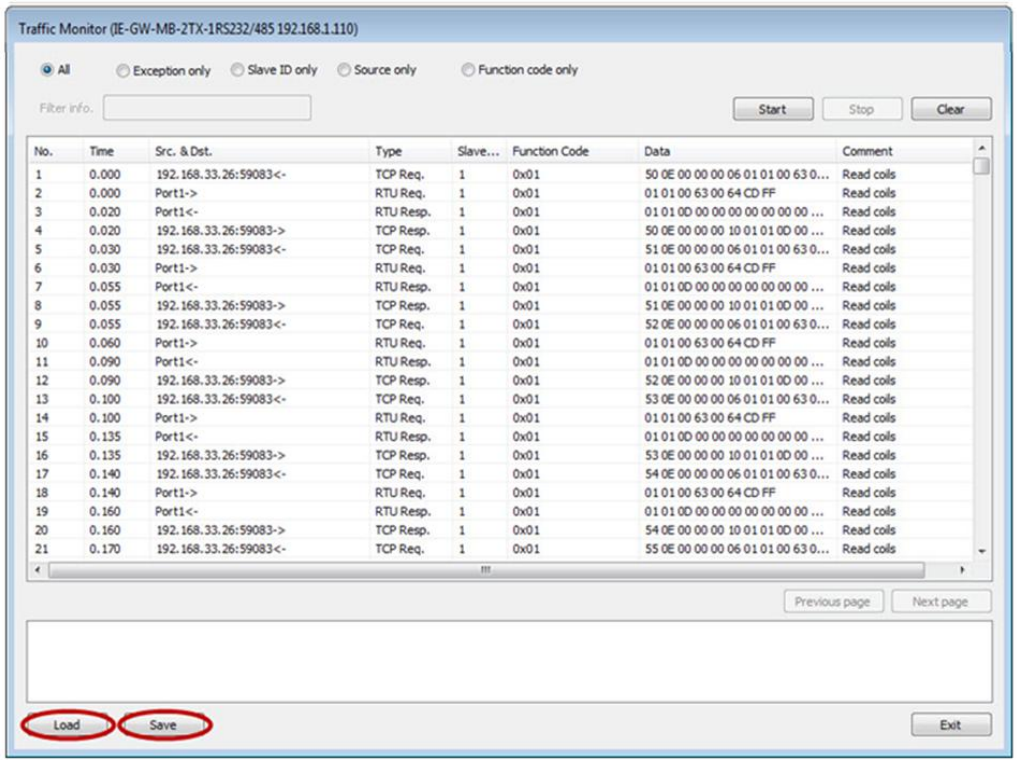
Filter	Customization	Description
All	-	Show all traffic
Exception only	-	Show only exceptions
Slave ID only	VSID=< virtual slave ID> (e.g., “VSID=1”)	Show only traffic to and from the specified “virtual” slave ID (as assigned in the Gateway’s slave ID map)
	RSID=< actual slave ID> (e.g., “RSID=1”)	Show only traffic to and from the specified “actual” slave ID (as assigned on the device itself)
Source only	IP=<IP address> (e.g., “IP=192.168.1.2”)	Show only traffic sent from the specified IP address
	PORT=< Modbus Gateway serial port number> (e.g., “PORT=1”)	Show only traffic sent from the specific serial port on the Gateway

Function code only	FCODE=<Modbus function code> (e.g., “FCODE=3”)	Show only traffic for a specific function code

Note: Filtering is only enabled for filter criteria Slave ID only, Source only and Function code only.

Save / Load of logged data

To save the data log to a file, click **Save.** You may retrieve a saved log by clicking **Load.**



8. Typical Applications

8.1 Ethernet Master (TCP) with multiple serial Slaves (RTU)

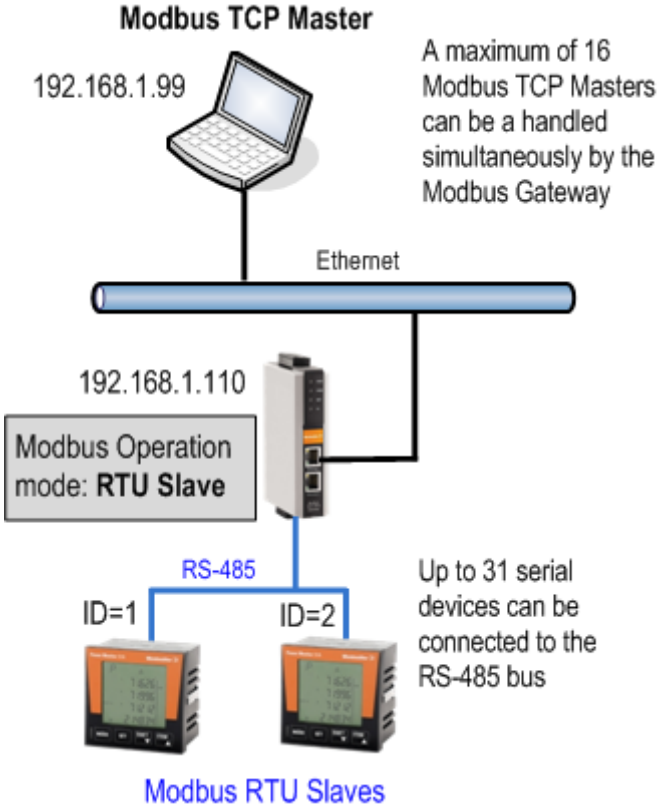
Application:

The Modbus TCP Master is connected to the Ethernet network running Modbus TCP protocol.

Serial Modbus devices – running as RTU slaves - are connected to the Ethernet network via the Modbus TCP/RTU Gateway.

On Ethernet-side the Modbus Gateway supports up to 16 simultaneous master connections (means 16 Modbus TCP Masters).

The serial interface supports both RS-232 and RS-422/485 connections, configurable by software configuration. At a time only one connector may be used. Either connect one RS-232 serial device (Peer-to-Peer) via DB9 connector or use the terminal block to connect one RS-422 serial device (Peer-to-Peer) or up to 31 RS-485 serial devices (bus structure).



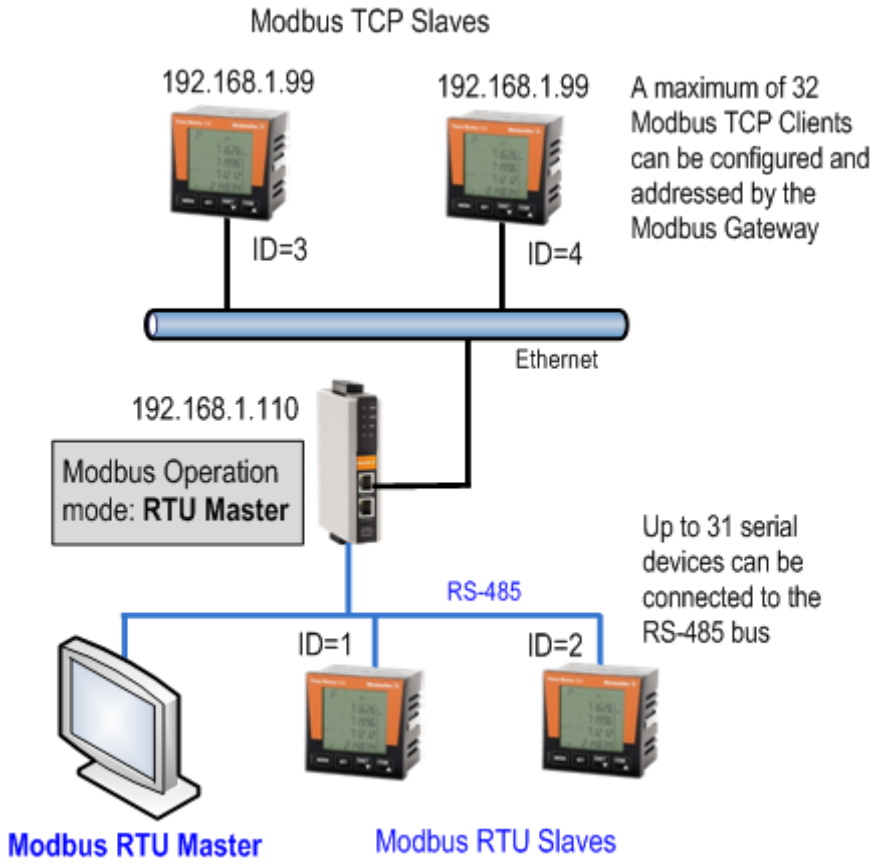
8.2 Serial Master (RTU) with serial Slaves (RTU) and Ethernet Slaves (TCP)

Application:

One serial Master (Modbus RTU/ASCII) and several Modbus RTU Slaves are connected to the serial port of the Modbus Gateway.

Ethernet-based Modbus devices (Modbus TCP) – running as slaves - are connected to the Ethernet network.

If running operation mode **RTU Master** only one Modbus RTU Master is allowed.



8.3 Serial Master (RTU) with multiple serial Slaves (RTU) over Ethernet

Application:

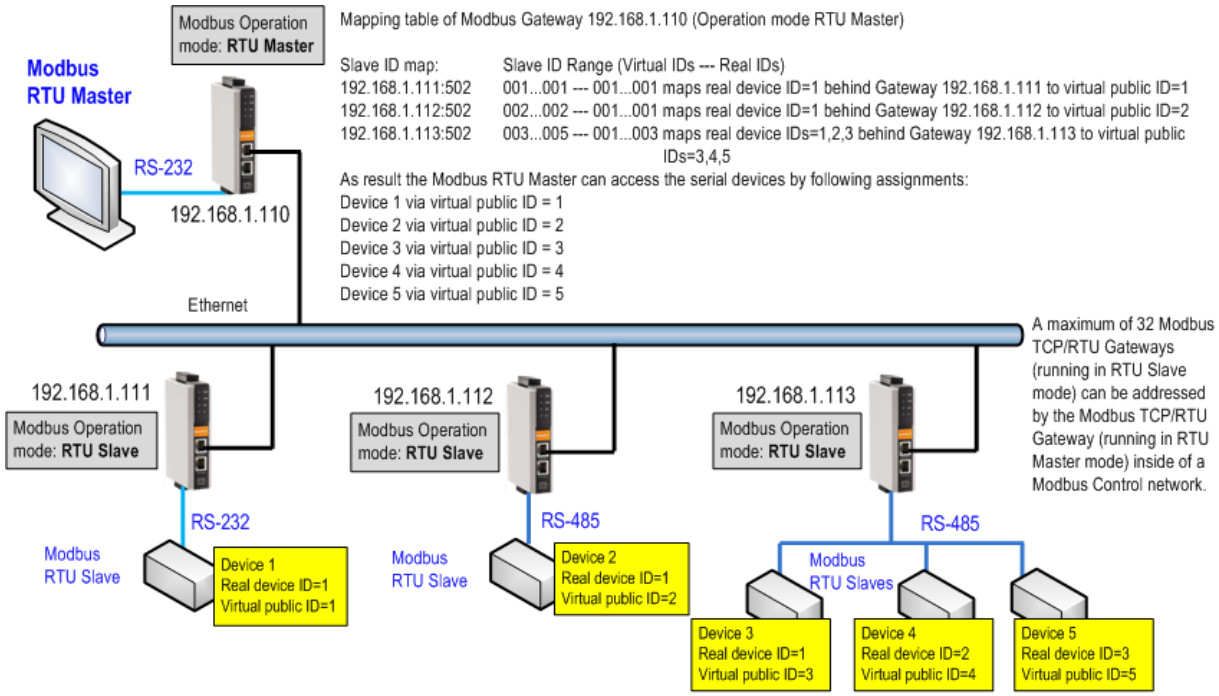
One serial Master (Modbus RTU/ASCII) is connected to the serial port of the Modbus Gateway.

At remote side multiple groups of serial Slaves are connected each to a Modbus Gateway.

Each Modbus Gateway is able to communicate via Ethernet/Internet with each other.

Using this scenario a serial Master can access a serial Modbus control network over long distances by using Ethernet/Internet connections. Up to 32 Modbus Gateways can be installed in a single control network.

The Modbus RTU Master can access the serial devices of the Modbus network by addressing them via their virtual public ID's (which are assigned in the Slave ID map of the RTU-Master Gateway).



The Slave ID mapping table of RTU-Slave Modbus Gateways 192.168.1.111 /.112/.113 are configured as follows:
Modbus Serial (Port1): Virtual ID = Real ID = 1...254 (= factory defaults)

Screenshot of Slave ID Map of Gateway running as Modbus RTU Master