DEIF

-power in control

CE

DESCRIPTION OF OPTION

Modbus Interface for Energy and Power meters AEM and APM

- Technical reference

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Table of contents

1. About this document

This chapter includes general user information about this handbook concerning the general purpose, the intended users and the overall contents and structure.

General purpose

This document describes the usage of the Modbus interface used along with a DEIF Energy meter or Power meter.

Intended users

The document is mainly intended for the person responsible for the unit parameter setup and installation. In most cases, this would be a panel builder designer. Naturally, other users might also find useful information here.

Contents/overall structure

The document is divided into chapters and in order to make the structure of the document simple and easy to use, each chapter will begin from the top of a new page. The following will outline the contents of each of the chapters.

About this document

This first chapter includes general information about this handbook as a document. It deals with the general purpose and the intended users of the document. Furthermore, it outlines the overall contents and structure of the document.

Warnings and legal information

The second chapter includes information about general legal issues and safety precautions relevant in the handling of DEIF products. Furthermore, this chapter will introduce the note and warning symbols, which will be used throughout the handbook.

First part

The first part of this document describes the usage, wiring and technical data of the interface.

Second part

The second part of this document describes the Modbus protocol, and it contains the user guide for the Modbus Master USW.

2. Warnings and legal information

This chapter includes important information about general legal issues relevant in the handling of DEIF products. Furthermore, some overall safety precautions will be introduced and recommended. Finally, the highlighted notes and warnings, which will be used throughout this handbook, are presented.

Legal information and responsibility

DEIF takes no responsibility for installation of the energy and power meters. If there is any doubt about how to install or operate the products, the company responsible for the installation or the operation of the products must be contacted.

The units are not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

Electrostatic discharge awareness

Sufficient care must be taken to protect the terminals against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

Safety issues

Installing the unit implies work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.

Be aware of the hazardous live currents and voltages. Do not touch any AC measurement or supply inputs as this could lead to injury or death.

Definitions

Throughout this document a number of notes and warnings will be presented. To ensure that these are noticed, they will be highlighted in order to separate them from the general text.

Notes

The notes provide general information which will be helpful for the reader to bear in mind.

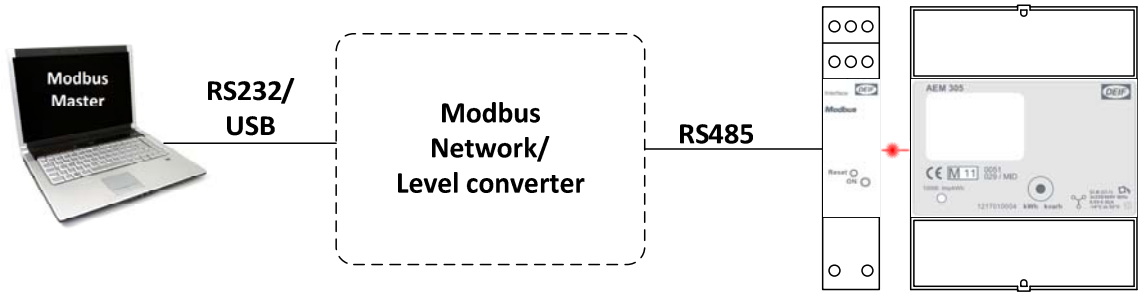
Warnings

The warnings indicate a potentially dangerous situation which could result in death, personal injury or damaged equipment, if certain guidelines are not followed.

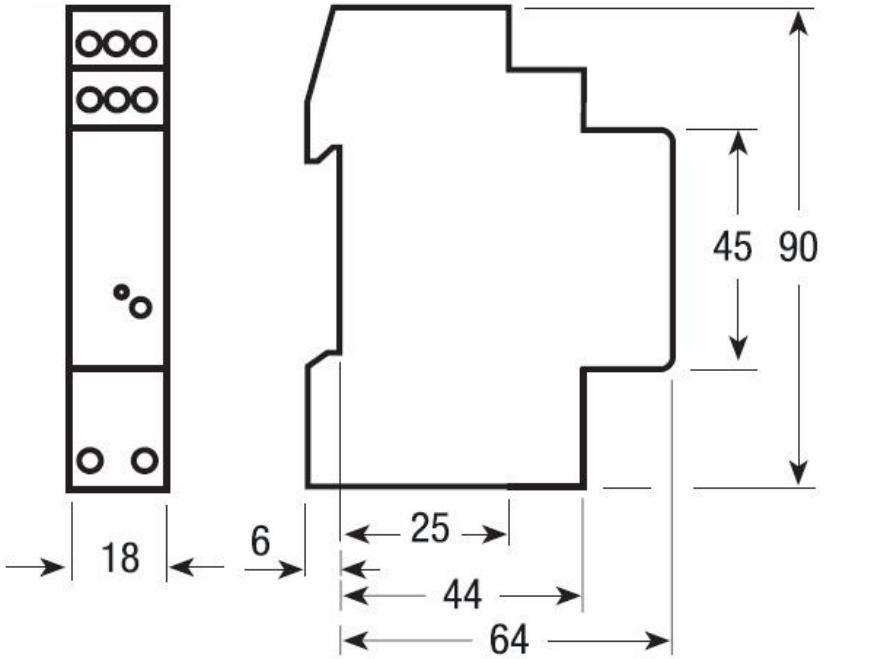
3. Preface

System description

The Modbus interface can be used in several applications by simply reading/controlling the Modbus slave (Modbus interface) by a master; this could be a PC with a master programme.
Below you have an example of connection for the interface. A minimal system configuration require at least one energy meter beside the Modbus interface and a master station to control the communication and the configuration.



4. Mechanical reference

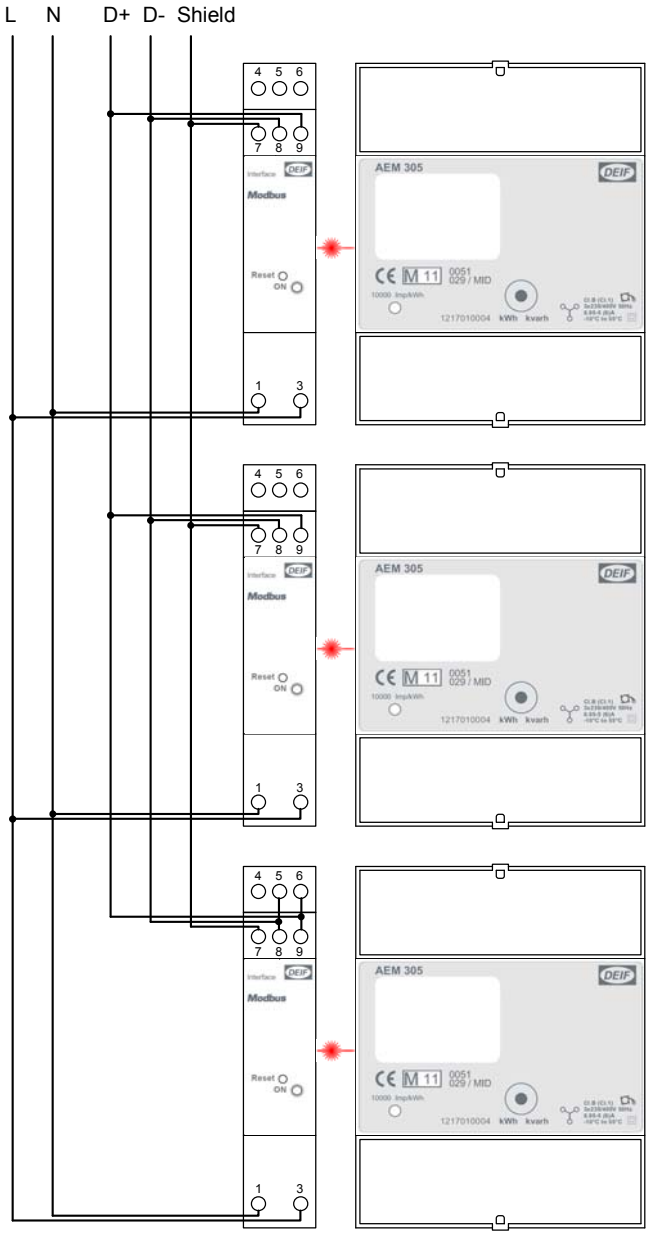


5. Wiring

The cabling of the communication interface consists of 2 terminals for power and 5 terminals for the communication:

L, N:	Line and neutral
D+/D-:	Terminals for data transmission on the Rs485 bus.
RT+/RT-:	Internal RS485 bus termination resistor. Must be connected with D+/D- on the last interface on the bus.
Shield:	Terminal to connect the cable shield for protection against noise.

In the picture shown below a connection scheme with 3 Energy Meters. The last interface has its termination resistor connected.



6. Technical data

Data in compliance with IEC 60950, EN 61000-6-2, EN 61000-6-3 and EN 61000-4-2

General characteristics			
- Housing	DIN 43880	DIN	1 interface
- Mounting	EN 60715	35 mm	DIN rail
- Depth		mm	70
Auxiliary supply			
- Auxiliary power rating		VA	≤10
- Auxiliary voltage rating ***Un***		V(AC)	230
- Auxiliary voltage range		V(AC)	(0.80 to 1.20) x ***Un***
- Frequency rating		Hz	50/60
- Frequency range		Hz	45 … 65
Modbus interface			
- HW interface	RS 485	N° terminals	3 (+/-, cable shield)
- Input resistence		UL (kΩ)	1 (12)
- Termination resistence		Ω	180
- SW protocol	SW selectable		Modbus/ASCII - Modbus/RTU
- Data transfer speed	SW selectable	baud	1200 ÷ 38400. Default 19200.
- Parity			none/even. Default: none
- Addressing			1 to 247
Interface to measuring instrument			
- HW interface	optical IR	No.	2 (Tx, Rx)
- SW protocol			proprietary
Safety acc. To IEC 60950			
- Degree pollution			2
- Overvoltage category			II
- Working voltage		V	300
- Clearance		mm	≥ 4
- Creepage distance		mm	≥ 4
- Test voltage	impulse (1,2/50 µs) peak value		
	on Ac power supply	kV	2.5
	on telecommunication network	kV	1.5
	50 Hz 1 min.	kV	2.5
- Housing material flame resistance	UL 94	class	V0
Connection terminals			
- Type cage	screw head Z +/-	POZIDRIV	PZ1
- Terminal capacity	solid wire min. (max.)	mm^2	0.15 (2.5)
	stranded wire with sleeve min. (max.)	mm^2	0.15 (4)
Environmental conditions			
- Operating temperature		˚C	0 … +55

- Limit temperature of storage		˚C	-25 ... +70
- Relative humidity		%	≤ 80
- Vibrations	sinusoidal vibration at 50 Hz	mm	± 0.25
- Protection class	acc. to IEC 60950		II
- Degree of protection	housing when mounted in front		IP20

7. Settings

Default settings

Baudrate: 19200 baud
Protocol: Modbus RTU
Address: 001
Parity: None
Stop bits: 1

Available quantities

Available quantities when connected with a single-phase counter:	**Available quantities when connected with a three-phase counter:**
Active energy imported, tariff 1	Active energy imported, tariff 1, L1
Active energy imported, tariff 2	Active energy imported, tariff 1, L2
Active Power	Active energy imported, tariff 1, L3
Active energy exported, tariff 1	Active energy imported, tariff 1, total
Active energy exported, tariff 2	Active energy imported, tariff 2, L1
Reactive energy imported, tariff 1	Active energy imported, tariff 2, L2
Reactive energy imported, tariff 2	Active energy imported, tariff 2, L3
Reactive energy exported, tariff 1	Active energy imported, tariff 2, total
Reactive energy exported, tariff 2	Active Power L1
Reactive Power	Active Power L2
Voltage	Active Power L3
Current	Active Power total
Apparent Power	Active energy exported, tariff 1, L1
Power Factor cos φ	Active energy exported, tariff 1, L2
Frequency	Active energy exported, tariff 1, L3
Tariff in use	Active energy exported, tariff 1, total
Status	Active energy exported, tariff 2, L1
	Active energy exported, tariff 2, L2
	Active energy exported, tariff 2, L3
	Active energy exported, tariff 2, total
	Reactive energy imported, tariff 1, L1
	Reactive energy imported, tariff 1, L2
	Reactive energy imported, tariff 1, L3
	Reactive energy imported, tariff 1, total
	Reactive energy imported, tariff 2, L1
	Reactive energy imported, tariff 2, L2
	Reactive energy imported, tariff 2, L3
	Reactive energy imported, tariff 2, total
	Reactive energy exported, tariff 1, L1
	Reactive energy exported, tariff 1, L2
	Reactive energy exported, tariff 1, L3
	Reactive energy exported, tariff 1, total
	Reactive energy exported, tariff 2, L1
	Reactive energy exported, tariff 2, L2
	Reactive energy exported, tariff 2, L3
	Reactive energy exported, tariff 2, total
	Reactive Power L1
	Reactive Power L2

	Reactive Power L3 Reactive Power total Voltage L1-N Voltage L2-N Voltage L3-N Voltage L1-L2 Voltage L2-L3 Voltage L3-L1 Current phase1 Current phase2 Current phase3 Apparent Power phase1 Apparent Power phase2 Apparent Power phase3 Apparent Power Total Power Factor cos φ phase1 Power Factor cos φ phase2 Power Factor cos φ phase3 Frequency Tariff in use Status

8. Frontal panel

A green LED reports the state of the communication with the meter:

- LED blinking communication not active
- LED ON communication active

On the frontal panel there is a reset button which can be used to restore the default settings on the interface (see fig. 8.1).

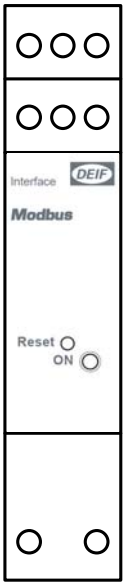


Fig. 8.1

9. Modbus Protocol

Implemented functions

The interface supports only two types of commands, one for reading the register values, one for writing the configuration registers. The reading is only possible for a block of registers (the command for a single register reading is not supported).

Read holding registers (function code 03)

This function code is used to read the contents of a continuous block of holding registers (1 to 125 registers) in a remote device. The request frame specifies the starting register address and the number of registers.

Write single register (function code 06)

This function code is used to write a single holding register in a remote device. The request specifies the address of the register to be written. The normal response is an echo of the request, returned after the register contents have been written.

Read holding registers (function code 03)

Because of the limited size of a Modbus frame, not all the internal registers can be sent on a single reading request. This means that a complete snapshot can only be acquired performing more (three) read holding registers calls with different starting address.
Example:

poll nr. 1	**start 4099**	**no. of registers 100**
poll nr. 2	**start 4197**	**no. of registers 100**
poll nr. 3	**start 4297**	**no. of registers 10**

Frame layout

ADR	03	STh	STl	NRh	NRl	CRCh	CRCl

ADR Modbus Address
03 Read holding register function code (fixed)
STh Starting address register (high order bits)
STl Starting address register (low order bits)
NRh Number of registers (high order bits)
NRl Number of registers (low order bits)
CRCh Modbus Checksum (high order bits)
CRCl Modbus Checksum (low order bits)

Internal registers

This is the complete list of the internal registers.

Register Address	Designation	AEM/APM 380/305	AEM 180	
4099	Device type	x	x	
4100	Firmware version	x	x	
4101	Range overflow alarm	x	x	
4102	Running tariff	x	x	
4104	PID (Product Identification) bytes 1 and 2	x	x	General
4105	PID – bytes 3 and 4	x	x	reading
4106	PID – bytes 5 and 6	x	x	registers
4107	PID – bytes 7 and 8	x	x	
4108	PID – bytes 9 and 10	x	x	
4109	PID – bytes 11 and 12	x	x	
4110	PID – bytes 13 and 14	x	x	
4111	Protocol type	x	x	
4112	Speed	x	x	
4113	Parity	x	x	
4114	Stop bits	x	x	Writing
4115	Modbus address	x	x	registers
4116	Reset interface command	x	x	
4117	Value format	x	x	
4118	Reset energy counters command	x	x	
4119…4122	Active Energy 1st phase T1, imp (kWh)	x	x	
4123…4126	Active Energy 2nd phase T1, imp (kWh)	x		
4127…4130	Active Energy 3rd phase T1, imp (kWh)	x		
4131…4134	Active Energy Σ T1, imp (kWh)	x		
4135…4138	Active Energy 1st phase T2, imp (kWh)	x	x	
4139…4142	Active Energy 2nd phase T2, imp (kWh)	x		
4143…4146	Active Energy 3rd phase T2, imp (kWh)	x		
4147…4150	Active Energy Σ T2, imp (kWh)	x		
4151…4152	Active Power 1st phase (kW)	x	x	
4153…4154	Active Power 2nd phase (kW)	x		
4155…4156	Active Power 3rd phase (kW)	x		
4157…4160	Active Power Σ (kW)	x		
4161…4164	Active Energy 1st phase T1, exp (kWh)	x	x	
4165…4168	Active Energy 2nd phase T1, exp (kWh)	x		Reading
4169…4172	Active Energy 3rd phase T1, exp (kWh)	x		quantities
4173…4176	Active Energy Σ T1, exp (kWh)	x		registers
4177…4180	Active Energy 1st phase T2, exp (kWh)	x	x	
4181…4184	Active Energy 2nd phase T2, exp (kWh)	x		
4185…4188	Active Energy 3rd phase T2, exp (kWh)	x		
4189…4192	Active Energy Σ T2, exp (kWh)	x		
4193…4196	Reactive Energy 1st phase T1, imp (kvarh)	x	x	
4197…4200	Reactive Energy 2nd phase T1, imp (kvarh)	x		
4201…4204	Reactive Energy 3rd phase T1, imp (kvarh)	x		
4205…4208	Reactive Energy Σ T1, imp (kvarh)	x		
4209…4212	Reactive Energy 1st phase T2, imp (kvarh)	x	x	
4213…4216	Reactive Energy 2nd phase T2, imp (kvarh)	x		
4217…4220	Reactive Energy 3rd phase T2, imp (kvarh)	x		
4221…4224	Reactive Energy Σ T2, imp (kvarh)	x		
4225…4228	Reactive Energy 1st phase T1, exp (kvarh)	x	x	

4229…4232	Reactive Energy 2nd phase T1, exp (kvarh)	x	
4233…4236	Reactive Energy 3rd phase T1, exp (kvarh)	x	
4237…4240	Reactive Energy Σ T1, exp (kvarh)	x	
4241…4244	Reactive Energy 1st phase T2, exp (kvarh)	x	x
4245…4248	Reactive Energy 2nd phase T2, exp (kvarh)	x	
4249…4252	Reactive Energy 3rd phase T2, exp (kvarh)	x	
4253…4256	Reactive Energy Σ T2, exp (kvarh)	x	
4257…4258	Reactive Power 1st phase (kvar)	x	x
4259…4260	Reactive Power 2nd phase (kvar)	x	
4261…4262	Reactive Power 3rd phase (kvar)	x	
4263…4266	Reactive Power Σ (kvar)	x	
4267…4268	Voltage L1-N (V)	x	x
4269…4270	Voltage L2-N (V)	x	
4271…4272	Voltage L3-N (V)	x	
4273…4274	Voltage L1-L2 (V)	x	
4275…4276	Voltage L2-L3 (V)	x	
4277…4278	Voltage L3-L1 (V)	x	
4279…4280	Phase1 current (A)	x	x
4281…4282	Phase2 current (A)	x	
4283…4284	Phase3 current (A)	x	
4285…4286	Apparent Power phase1 (kVA)	x	x
4287…4288	Apparent Power phase2 (kVA)	x	
4289…4290	Apparent Power phase3 (kVA)	x	
4291…4294	Apparent Power Σ (kVA)	x	
4295…4296	Power Factor cos φ phase1	x	x
4297…4298	Power Factor cos φ phase2	x	
4299…4300	Power Factor cos φ phase3	x	
4301…4302	Power Factor cos φ Σ	x	
4303…4304	Frequency (Hz)	x	x

Interface and counter types

Depending on the type of counter connected to the Modbus interface, you have a different set of registers at your disposal.
In the table above, you can see four columns where all the possible combination are listed:

AEM 380/305 Three-phase counter and Modbus interface. Energy and power quantities on all the
APM 380/305 phases.

AEM 180 Single-phase counter and Modbus interface. Energy and power quantities on a single phase.

Anyway, all the registers can always be read but if you try to access a register not supported in the combination counter-interface shown above, you will get a value of 0.
Example: If you try to read the register 4231 (Active Energy Σ T1, imp (kWh)) when you have a single-phase counter and a Modbus interface (SE column) you will always get a value of 0.

General reading registers - function code 03

This family of registers store general information about the interface.
All the registers are always available regardless to the counter you have.

Register	Designation	Description
4099	Device type	Code that identifies the combination interface-counter 0 No communication with the counter on the IR port 2 Three-phase Basic 4 Single-phase Basic
4100	Firmware version	Version of the interface firmware
4101	Range overflow alarm	The register is set by the counter if it has the detected a value over the voltage or the current nominal threshold. The lowest order byte of the register is bit-coded as follows: n.u.|n.u.|OFV3|OFI3|OFV2|OFI2|OFV1|OFI1 Where: OFV Voltage overflow (on phase 1, 2 and 3) OFI Current overflow (on phase 1, 2 and 3) n.u. Not Used
4102-03	Running tariff	0 Tariff 1 is currently in use 1 Tariff 2 is currently in use
4104-10	PID	Part number identification string (a maximum of 14 bytes)

Writing registers - function code 06

This set of registers is for the interface configuration. One register (4118) is dedicated to request the reset of the counter internal energy registers.
All the registers are always available regardless to the counter you have.

The registers from 4111 to 4115 are controlled by the Reset interface command register (4116): all the changing you make to the first ones take effect only when you ask a reset of the interface by assigning a value of 1 to the last one.
Any change to the registers 4117 and 4118 is immediately effective.

Register	Designation	Description
4111	Protocol type	0 Modbus RTU protocol 1 Modbus ASCII protocol
4112	Speed	One of the following: 1200, 2400, 4800, 9600, 19200, 38400
4113	Parity	0 None 1 Even 2 Odd
4114	Stop bits	1 or 2
4115	Modbus address	From 1 to 247
4116	Reset interface command	0 Changes made on registers 4111-4115 are not effective 1 Changes made on registers 4111-4115 take effect
4117	Value format	0 Quantities coded as floating point 32 bit (low byte first) 1 Quantities coded as integers (see par. 9.4.1)
4118	Reset energy counters command	1 Reset active energy registers 2 Reset reactive energy registers 3 Reset all the registers

The register 4118, is a “pass-through” register because the final target of the command is the counter connected to the interface. If you change the register value, a command will be given to the counter in order to call a reset of the counter internal registers.
All the other writing registers modify the interface behaviour.

Reading quantities - function code 03

These registers hold the electrical quantities controlled by the counter connected to the interface. As stated in internal registers, the available quantities depend on the combination counter/interface you have. Three-phase counter/LAN interface or single-phase counter/LAN interface.

Register address	Designation	Three phase	Single phase	Size
4119…4122	Active Energy 1st phase T1, imp. (kWh)	x	x	4
4123…4126	Active Energy 2nd phase T1, imp. (kWh)	x		4
4127…4130	Active Energy 3rd phase T1, imp. (kWh)	x		4
4131…4134	Active Energy Σ T1, imp. (kWh)	x		4
4135…4138	Active Energy 1st phase T2, imp. (kWh)	x	x	4
4139…4142	Active Energy 2nd phase T2, imp. (kWh)	x		4
4143…4146	Active Energy 3rd phase T2, imp. (kWh)	x		4
4147…4150	Active Energy Σ T2, imp. (kWh)	x		4
4151…4152	Active Power 1st phase (kW)	x	x	2
4153…4154	Active Power 2nd phase (kW)	x		2
4155…4156	Active Power 3rd phase (kW)	x		2
4157…4160	Active Power Σ (kW)	x		4
4161…4164	Active Energy 1st phase T1, exp. (kWh)	x	x	4
4165…4168	Active Energy 2nd phase T1, exp. (kWh)	x		4
4169…4172	Active Energy 3rd phase T1, exp. (kWh)	x		4
4173…4176	Active Energy Σ T1, exp. (kWh)	x		4
4177…4180	Active Energy 1st phase T2, exp. (kWh)	x	x	4
4181…4184	Active Energy 2nd phase T2, exp. (kWh)	x		4
4185…4188	Active Energy 3rd phase T2, exp. (kWh)	x		4
4189…4192	Active Energy Σ T2, exp. (kWh)	x		4
4193…4196	Reactive Energy 1st phase T1, imp. (kvarh)	x	x	4
4197…4200	Reactive Energy 2nd phase T1, imp. (kvarh)	x		4
4201…4204	Reactive Energy 3rd phase T1, imp. (kvarh)	x		4
4205…4208	Reactive Energy Σ T1, imp. (kvarh)	x		4
4209…4212	Reactive Energy 1st phase T2, imp. (kvarh)	x	x	4
4213…4216	Reactive Energy 2nd phase T2, imp. (kvarh)	x		4
4217…4220	Reactive Energy 3rd phase T2, imp. (kvarh)	x		4
4221…4224	Reactive Energy Σ T2, imp. (kvarh)	x		4
4225…4228	Reactive Energy 1st phase T1, exp. (kvarh)	x	x	4
4229…4232	Reactive Energy 2nd phase T1, exp. (kvarh)	x		4
4233…4236	Reactive Energy 3rd phase T1, exp. (kvarh)	x		4
4237…4240	Reactive Energy Σ T1, exp. (kvarh)	x		4
4241…4244	Reactive Energy 1st phase T2, exp. (kvarh)	x	x	4
4245…4248	Reactive Energy 2nd phase T2, exp. (kvarh)	x		4
4249…4252	Reactive Energy 3rd phase T2, exp. (kvarh)	x		4
4253…4256	Reactive Energy Σ T2, exp. (kvarh)	x		4
4257…4258	Reactive Power 1st phase (kvar)	x	x	2
4259…4260	Reactive Power 2nd phase (kvar)	x		2
4261…4262	Reactive Power 3rd phase (kvar)	x		2
4263…4266	Reactive Power Σ (kvar)	x		4
4267…4268	Voltage L1-N (V)	x	x	2
4269…4270	Voltage L2-N (V)	x		2
4271…4272	Voltage L3-N (V)	x		2

4273…4274	Voltage L1-L2 (V)	x		2
4275…4276	Voltage L2-L3 (V)	x		2
4277…4278	Voltage L3-L1 (V)	x		2
4279…4280	Phase1 current (A)	x	x	2
4281…4282	Phase2 current (A)	x		2
4283…4284	Phase3 current (A)	x		2
4285…4286	Apparent Power phase1 (kVA)	x	x	2
4287…4288	Apparent Power phase2 (kVA)	x		2
4289…4290	Apparent Power phase3 (kVA)	x		2
4291…4294	Apparent Power Σ (kVA)	x		4
4295…4296	Power Factor cos φ phase1	x	x	2
4297…4298	Power Factor cos φ phase2	x		2
4299…4300	Power Factor cos φ phase3	x		2
4301…4302	Power Factor cos φ Σ	x		2
4303…4304	Frequency (Hz)	x	x	2

T1/T2 stand for Tariff 1 and tariff 2.
The symbol Σ indicates a total amount (for example: the Reactive Power Σ (kVAr) value is the total reactive power on the three phases. It is of course significant only if you have a three-phase counter connected to the interface).

imp/exp (imported/exported) indicates whether the energy is generated (exported) or consumpted (imported).

Length in bytes of the quantity. Note that because a Modbus register is 2 bytes long, all the quantities are split on more registers (4 bytes: 2 registers; 8 bytes: 4 registers).

Notice: With this configuration (register 4117=0), all the quantities are coded as 32 bit floating point values. For each register, the first byte contains the low order bits and the second contains the high order bits. If you want to switch to an integer representation, you have to change the value of the configuration register 4117 to 1 (see writing registers).

Quantities coded as Integer values

While the notation using floating point 32 bit values is unambiguous, when you switch to the integer notation something must be explained in order to allow the correct interpretation of original value.

Quantities 4 bytes long

The integer value stored in these registers (2) must be divided by a factor of 10000 to rebuild the original value.

Example:
Active Power 1st phase
Integer value: 122447
Original value: 122447/10000=12,2447 (kW)

Quantities 8 bytes long

The rebuilding of the original value is slightly more complicated.
The value stored in the first 4 bytes must be multiplied by a factor of 10^9 (1000000000).
Then it must be added to the value stored in the following 4 bytes.
Finally, the result must be divided by 10000.
Example: Active Power total
Integer value (most significant 4 bytes): 12344
Integer value (less significant 4 bytes): 765532
Original value: (12344*1000000000+765532)/10000=1234400076,5532 (kW)

10. References

For any further information concerning the Modbus protocol implementation, please consult the following documents and references:

Modbus application protocol specifications V 1.1b, at http://www.modbus-IDA.org

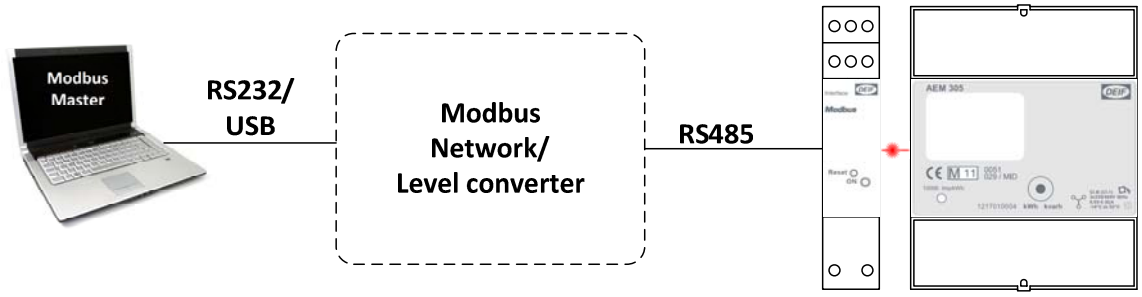
Modbus over serial line – Specification and implementation guide V. 1.02, at http://www.modbus.org.

11. Modbus master manual

Preface

System description

This document describes the usage of the **Modbus Master** application.
The **Modbus Master** software application gives an easy way to manage a Modbus communication interface. The present software hides for the most part the complexity of the communication protocols used by the interface and allow a better decoding of the quantities provided by the Counter connected to the interface itself.
Even more, it allows a diagnostic detection and it offers also the possibility to save the measures captured.



Hardware Requirements

To use this system you need at least:

- one com interface connected to
- one energy meter or power meter
- an RS232/RS485 (or even an USB/Rs485) converter
- a Windows PC

Software Requirements

The application is developed for Windows and the minimum requirements are:

- Windows XP/2000
- Microsoft .NET Framework ver. 1.1

Get ready in few steps

Preliminary checks
In order to use successfully the present application, we assume that you are working with a system like the one introduced in the system description. Then be sure that:

- All the physical links are operating.
- The RS232/RS485 converter is well connected
- The communication interface and the counter are powered-on

Application start-up
Execute the application setup and run it. Once in the application, you will see a sequence of panels, briefly described below:

PANEL	DESCRIPTION
COUNTERS	Management of the Interface database.
COMMUNICATION	Readings control. Window to show the current readings snapshot.
SETTINGS	Energy counters reset. Communication protocol settings. Storage control.

Connection to the network

The first operation is the **COM port selection**.
In the communication panel, select the right COM port you plan to use to communicate with the RS232/RS485 converter.
You have also to define the communication parameters: speed , parity and stop bits (the data bits are always 8). By default, the interfaces are set to work at 19200 baud, parity none, 1 stop bits.
The second operation is the **protocol selection**.
You have to define whether you want to manage a Modbus/RTU or a Modbus/Ascii protocol.

Adding a new interface
This paragraph described how to add new communication interfaces.

- Go to the counter panel
- Enter a convenient alias name for the interface
- Enter the Modbus address (001 is the default for an unconfigured interface)
- Press the ADD button

If you have more than one Modbus interface to add to the network, you have to add them one by one because they all come with the same default address (001).

Read out the values

- Go to the communication panel
- From the poll list box select the wanted interfaces
- Press the start button to enable the polling of the interfaces. At each reading a new interface will be enquired.

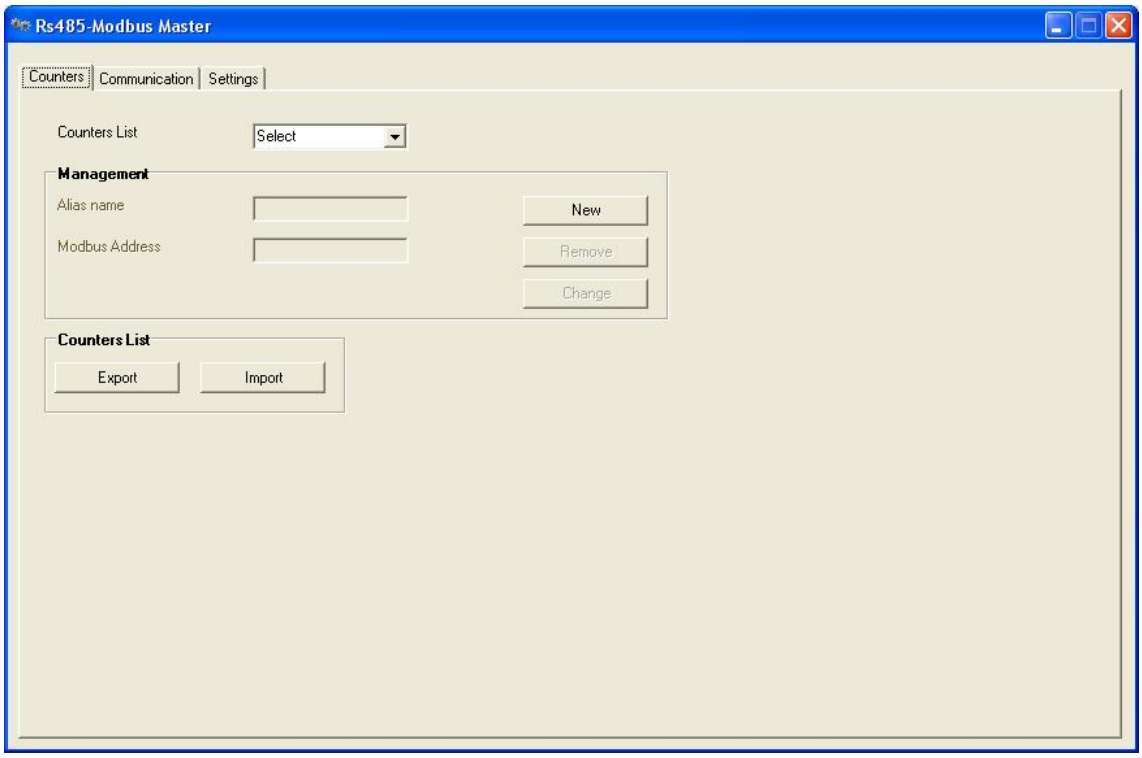
Functions description

The programme allows you to:

- Handle the local database of the communication interfaces
- Read out snapshots of the measures provided by the counters connected to the communication interfaces
- Make the essential configuration of the protocol parameters for each interface
- Manage the measure storage

Be careful to select the proper protocol (RTU or ASCII) from the radio button placed near the start button.

The counters panel



Management

All the operations made in this section affects a local database of the interfaces (a simple XML file created in the working folder of the application). The communication on the Modbus network is not involved here.

New

The new button allow you to add a new interface.
Once clicked, you have to enter an alias name, for an easy identification of the interface, and the Modbus address for the new Modbus interface. Note that the default address for an unconfigured interface is always 001.

If you have more than one Modbus interface to add to the network, you have to add them one by one because they all come with the same default address (001).

Remove

This button allows you to remove an interface from the local database. You have first to select the wanted interface from the interface listbox.

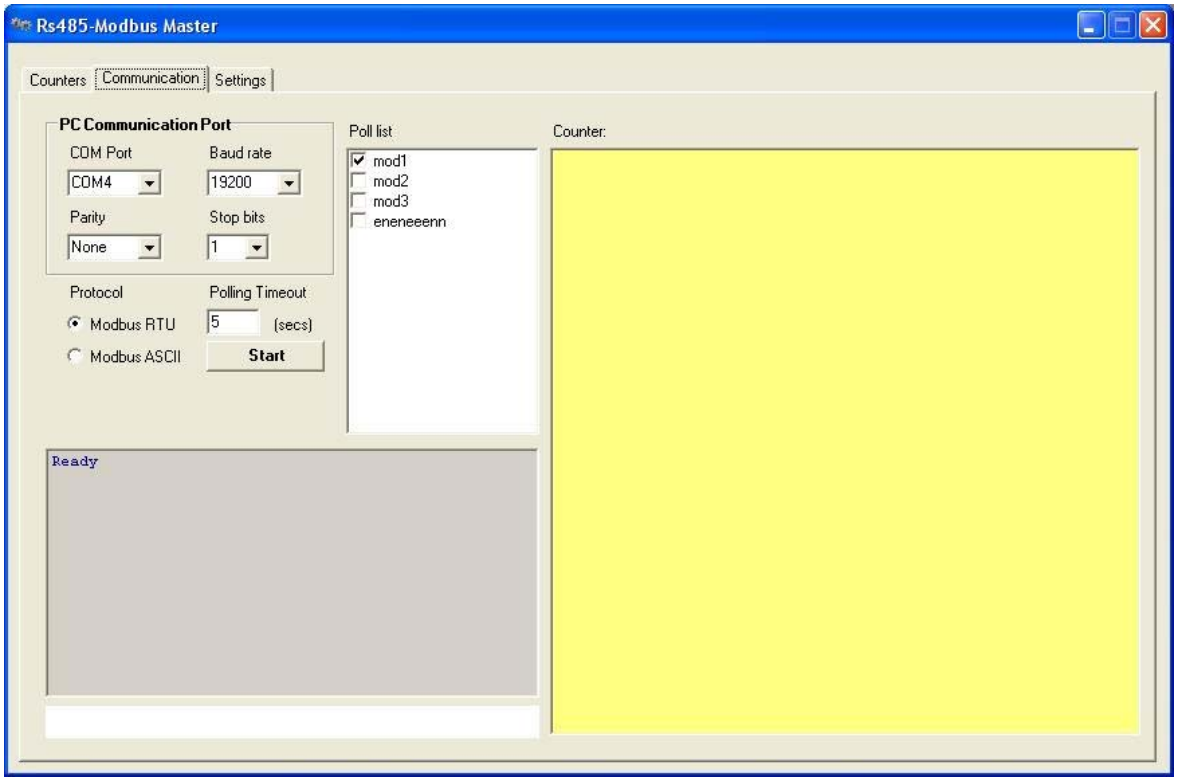
Change

The change button allows you to make changes to the local database. Nothing happens to the remote interface.

Interfaces list

As told before, the local database of the communication interfaces is stored locally into an XML file. If you want install the Modbus Master application on different PCs, can be useful to transport the database from a station to another one.
Click to the **export** button if you want to easily access to the XML file of your original PC in order to saving it somewhere. Then, on the target PC, click on the **import** button and find out the location where you have previously exported the XML file.

Communication



COM Port

The first section of the communication panel allow you to select which **COM port** you used to control the network. For your Modbus network you have also to define the communication parameters: **speed** , **parity** and **stop bits** (the data bits are always 8). By default, the interfaces are set to work at 19200 baud, parity none, 1 stop bits.

The polling process

The **poll list** window shows all the devices currently present in the local database. If you want to perform a reading from one or more of them, you have to flag the corresponding alias.
The **polling timeout** box (in seconds) allow you to define the interval of time between two consecutive readings (by default is 5 seconds). Note that if you have flagged more then one interface in the poll list, an interface is polled every N * t seconds (where N is the number of interfaces under poll and t is the poll timeout in seconds).
Mind that you have also to specify which **protocol subtype** you want to use (Modbus RTU or Modbus ASCII).

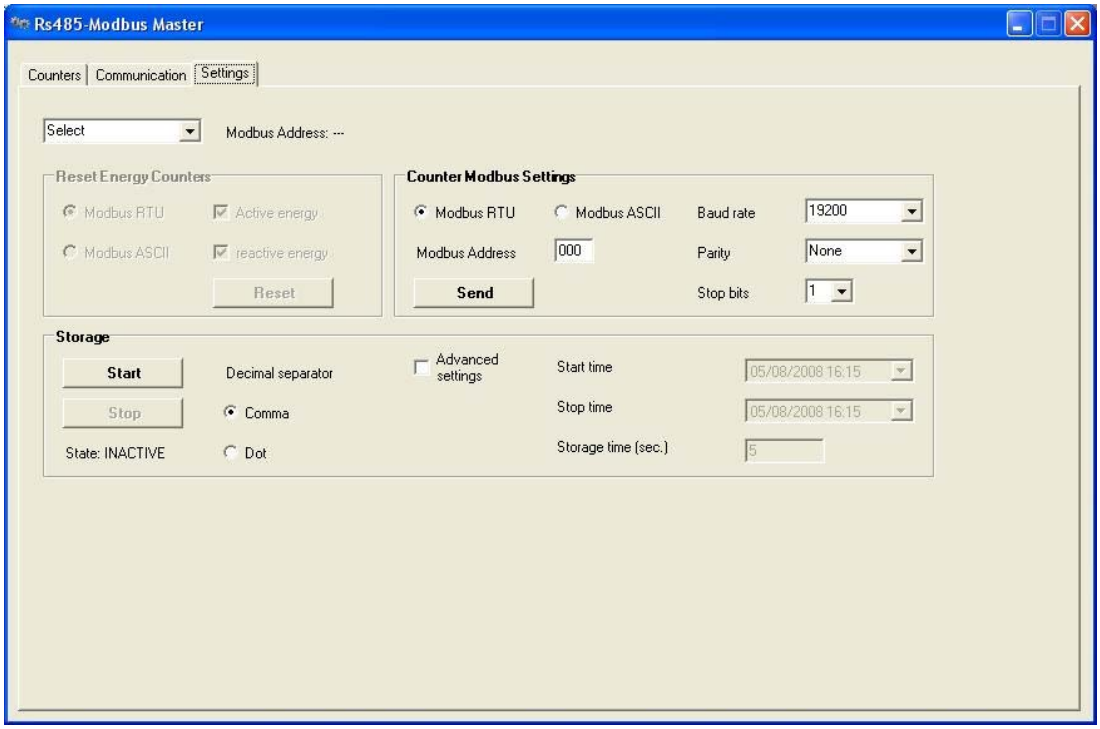
To activate the polling process just click the **start** button.

You can see the measure snapshots in the main yellow window, while in the grey window, you have a dump of the data exchanged during the communication process (useful for diagnostic) and some event reports too.

If you want to capture the dump either from the diagnostic window or from the readings windows, click with the mouse right button on the window and select the "copy to clipboard" option. All the window content will be copied to the Windows clipboard to make it available to any application.

Click the **stop** button to end the capture process.
Please refer to the settings chapter for a detailed description of the **storage** feature.

Settings



The settings panel collects a list of functions useful at runtime to manage the behaviour of the interface and the behaviour of the counter attached to the interface.

Concerning the counter, you can:

- Require the reset of the internal energy counters (active and reactive energy)

Concerning the interface you can:

- Change the Modbus address
- Change the communication protocol (RTU/ASCII)
- Change the communication settings (speed, parity and stop bits)

In order to perform any command, **you have first to select your target** from the interface list box.
Note that, in any case, you will be prompted for a confirmation.

Even more, you can manage here the data storage process.

Resetting the energy counters

This section allow to reset the energy registers internal to the counter connected to the Rs485-Modbus interface.
Just check the type of registers you want to reset (the ones related to the active energy, the ones for the reactive energy or both) and eventually select the RTU/ASCII subtype. Then click the **reset** button.

Modbus settings

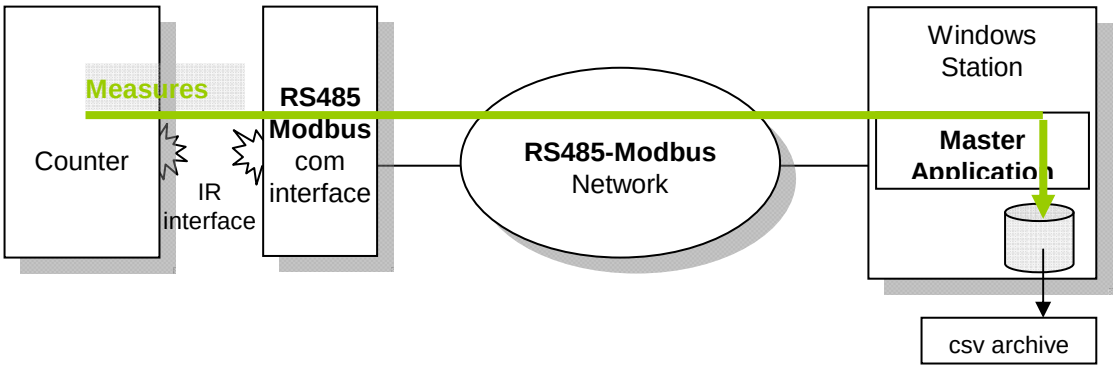
The interfaces have some parameters to be configured. By this part of the window you can change on the remote selected interface the following settings:

- Protocol subtype (RTU/ASCII)
- Modbus address
- Baud rate (from 1200 to 38400)
- Parity (none, even, odd)
- Stop bits (1 or 2)

Storage

This panel controls the storage feature that allow you to store the incoming measures into .csv (comma separated values) archives that can be imported into the most common applications.
The storage works in junction with the readings functionality:

- Go to the storage panel and enable the function (see below for details)
- Go to the communication panel, select the wanted interfaces and click the start button.



Path of the measured data.

All the .csv file are created in the Modbus Master application working folder.
Each file is automatically named using the alias name entered into the local interface database.

Main controls

Start button: enable the storage
Stop button: stop the storage process

An information string placed in one corner of the section, reports the current state of the storage process.

Advanced settings

You can decide to start the storage activity at a desired date and time and/or to stop the activity at another definable date and time. Also the storage period can be defined. Consider, in-fact, that every instrument sends data approximately once per 4 seconds, so it could be useful to store only a subset of the data received filling the storage time box with a convenient period of time.
If you leave the start and the stop time at the same value, the storage will remain always active.

To enable the described section, you have to flag the **advanced settings** check box.

Due to the country differences, you would define the decimal separator used to store the measures in the .csv files.
By the decimal separator control you can select the separator suitable for you.