

# SMART MODULE FOR MULTIVERT® I-XTENSIO

MODBUS RTU VERSION FOR ENERGY MONITORING

IEC FUSE SWITCH DISCONNECTORS

## USER MANUAL

IMPROVING SERVICE EFFICIENCY OF LOW VOLTAGE NETWORKS



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## 1. DOCUMENT

All documentation on our SMART Module RTU is available on the MERSEN website **EP.MERSEN.COM**

Additional instruction manuals

- Datasheet
- Mounting instruction / Legal notice
- Configuration Software (*on request*)
- Software for firmware upgrade (*on request*)
- Modbus configuration table (*on request*)

## 2. HAZARDS AND WARNINGS

The assembly, use, servicing and maintenance of this equipment must only be carried out by trained, qualified professionals.

MERSEN shall not be held responsible for failure to comply with the instructions in this manual.

### 2.1 Risk of electrocution, burns

- This device must only be installed and serviced by qualified personnel who have in-depth knowledge of installing, commissioning and operating the device and who have had appropriate training. He or she should have read and understood the various safety measures and warnings stated in the instructions.
- Before carrying out any work on the device, switch off the power supply to the device.
- Always use an appropriate voltage detection device to confirm the absence of voltage.
- Replace all devices, doors and covers before turning on power to this equipment.
- Always power the device with the correct rated voltage.
- Install the device following the recommended installation instructions and in a suitable electrical cabinet.
- Failure to take these precautions could cause serious injuries

### 2.2 Risk of damaging the device

To ensure that the device operates correctly, make sure that:

- The device is correctly installed.
- The auxiliary power supply voltage indicated on the product is observed: 24 VDC  $\pm$  6V.

Failure to respect these precautions could cause damage to the device

### 2.3 Liability

- Assembly, connection and use must be carried out in accordance with the installation standards currently in force.
- The device must be installed in accordance with the rules given in this manual.
- Failure to observe the rules for installing this device may compromise the device's intrinsic protection.
- The device must be positioned within an installation which complies with the standards currently in force.
- Any cable which needs to be replaced may only be replaced with a cable having the correct rating

### 3. PRELIMINARY OPERATIONS

To ensure the safety of personnel and the product, please carefully read the contents of these instructions before installation.

Check the following points as soon as you receive the package containing the device:

- The packaging is in good condition
- The device has not been damaged during transportation
- The device reference number conforms to your order

### 4. PREREQUISITES

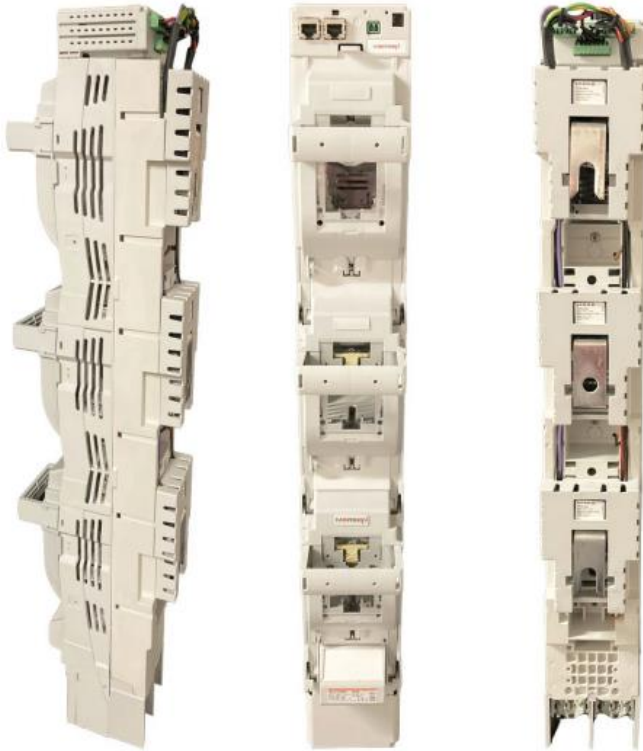
Before commissioning your SMART module, make sure it operates under the latest firmware versions.

The latest firmware versions are available on the MERSEN website.

The firmware upgrade is done using the “SmartModbusModuleSoftwareSetup” software, by connecting a laptop to your SMART module. Have a look on the description done in the further chapter.

## 5. PRODUCT OVERVIEW

### 5.1 Overview of ProGrid equipped with Smart Module and sensor devices

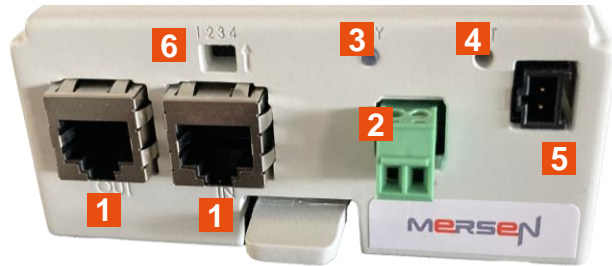


*Example of Multivert i-Xtensio  
1x3 pole switching overview  
with Smart Module solution*

### 5.2 Overview of Smart Module - Modbus RTU version



### 5.3 Smart Module Focus



#### 1 Modbus RTU connections

RJ45 plugs to connect the Smart Module on the Modbus RTU network or to use with a laptop to upload new software or make calibration.

*Daisy chain functionality:* 2 connection plugs are available to make a daisy chain for the Modbus RTU communication between modules, to the Master device (not in this scope).

Daisy chain functionality can also be used for the power supply (see point n°2).

#### 2 Smart Module Power Supply

24VDC connection to supply the Smart Module

Using the Daisy chain functionality, power supply can be distributed from one Module to another using the RJ45 connections/cables.

#### 3 Status Communication LED

- Green Flashing : Module connected and functional
- Off : Module not functional
- Green/Red Flashing : Module without Modbus information

#### 4 Reset button

- Short press : reset the parameters of Modbus communication – links, thresholds, timeouts
  - Long press (>5 s) : full reset including all calibration parameters (factory reset)
- LED becomes orange with these 2 actions.

#### 5 Digital Outputs connections

Digital outputs to get alarm on fuse blown and temperature max thresholds / Normally opened

#### 6 Dip Switch

- Allow presetting of slave address
- Activate termination resistance

## 5.4 Engineering Software installation

The module is delivered with a software to test, calibrate and set some parameters of the Smart Module using a laptop.

Once you got the last updated software under Mersen website, you should :

- Unzip the file “SmartModbusModuleSoftwareSetup\_X.X.XX\_x64”
- Launch “SmartModbusModuleSoftwareSetup\_X.X.XX\_x64” file using

## 5.5 Test & Programming using computer connection to the Smart module

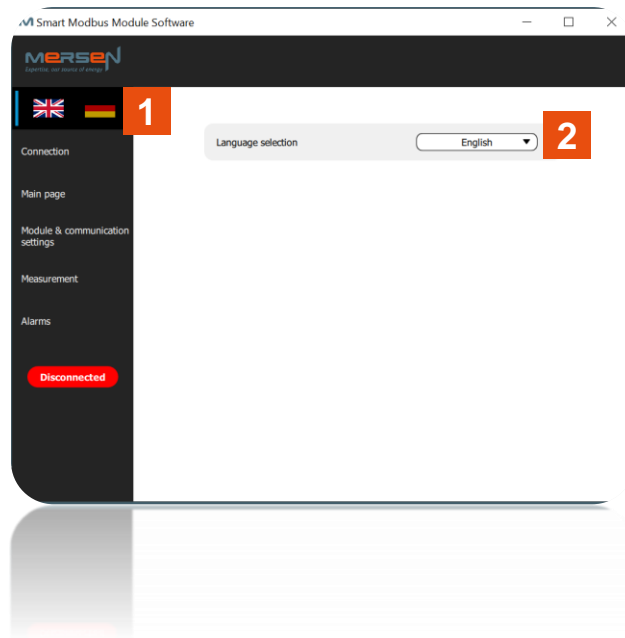
Computer connection is needed to update the firmware of the Smart Module, if it is necessary, or to use the Engineering software presented above. In order to connect the Smart Module to the computer, a specific Modbus cable USB ↔ RJ45 is needed, as described in appendix.



To be able to use this cable, a driver should be installed : [HTTPS://FTDICHIP.COM/DRIVERS/VCP-DRIVERS/](https://FTDICHIP.COM/DRIVERS/VCP-DRIVERS/)

Instructions to connect the computer to the Smart Module :

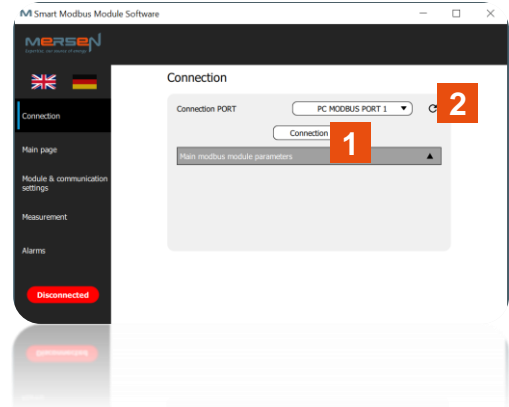
You can should your language English or Deutsch, by selecting the right language at the flags area.



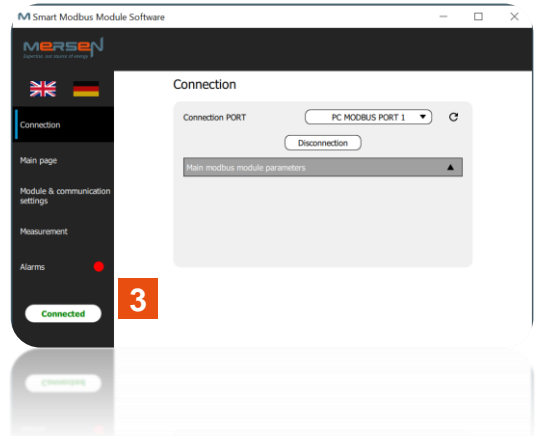


### 5.5.1 Connection

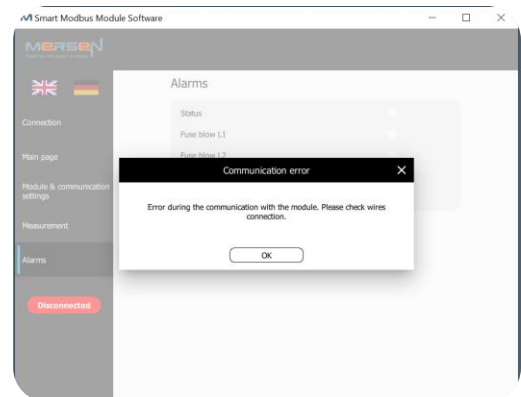
- Connect the specific cable on the COM port number of the laptop peripheral and on the Smart module
- On the opened Software, select “Connection”. If the COM port number is not available, use the “Refresh” button.



If the connection is completed it is shown by the “Connected” button

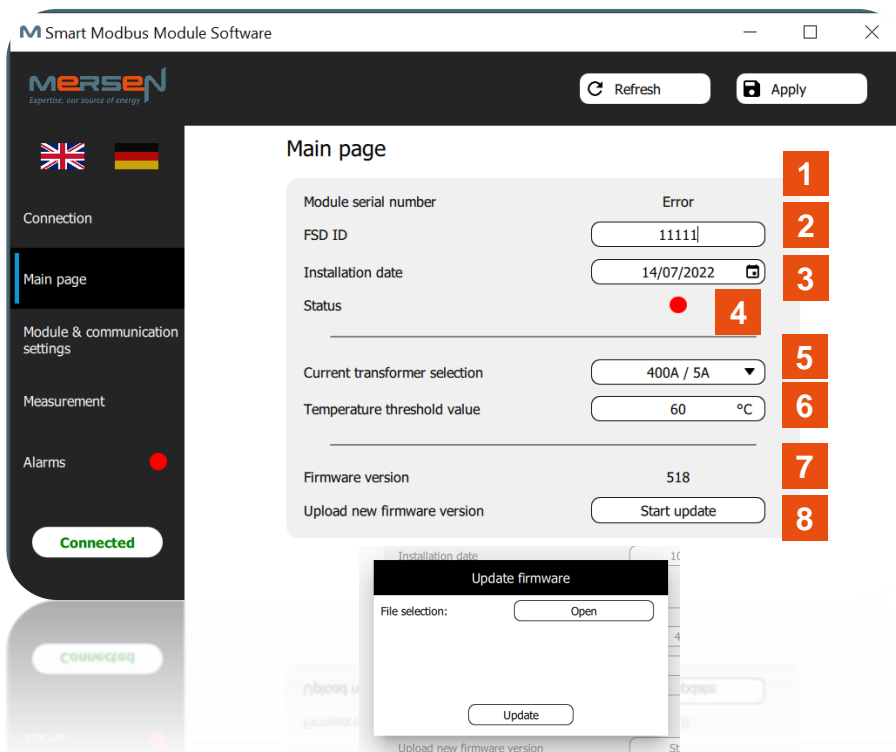


If there is an issue of the connection, a message will appear, you must check the module connection

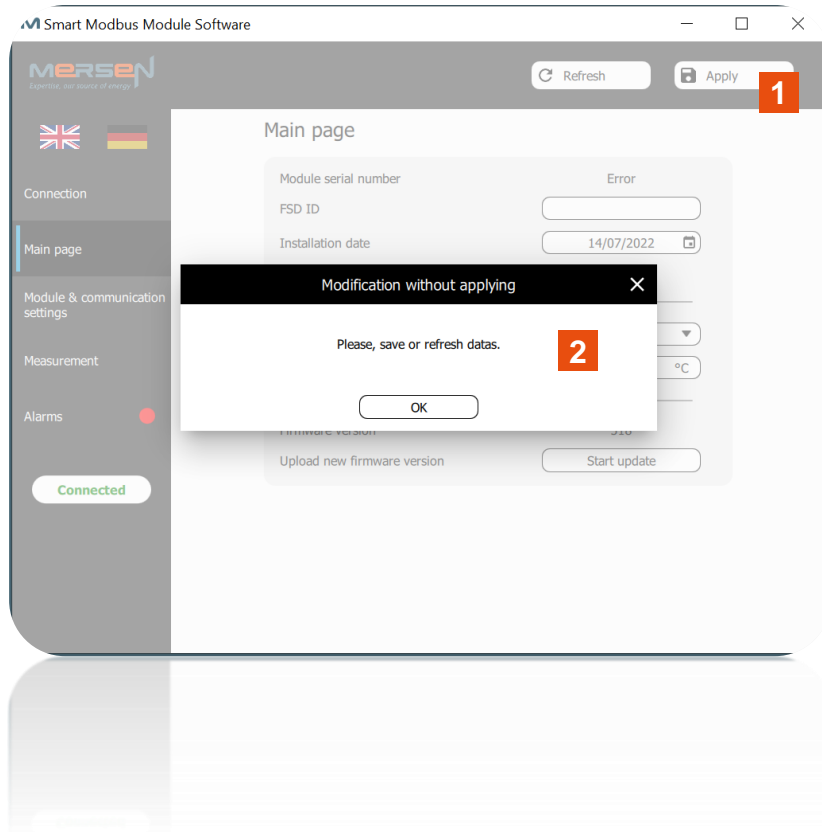


## 5.5.2 Main page

- 1 → Module serial number: coming from the module directly for traceability
- 2 → FSD ID: free space of 5 characters to identify the fusegear
- 3 → Installation date: date of installation to be completed using the agenda
- 4 → Status of the module:
  - empty : no connection
  - Green : no issue
  - Red : issue, have a look on Alarms sheet
- 5 → Current transformer selection: should be selected following the current transformer installed at the back of the fusegear : several possibilities
  - 250A/5A
  - 300A/5A
  - 400/1A
  - 400/5A
  - 600/1A
  - 600/5A
- 6 → Temperature threshold value: to be selected between 60°C and 90°C
- 7 → Firmware version: coming from the module directly to follow the firmware versioning
- 8 → Upload new firmware version: press “Start update”, “Open” the new firmware version and “update” the firmware (*file.bin*)

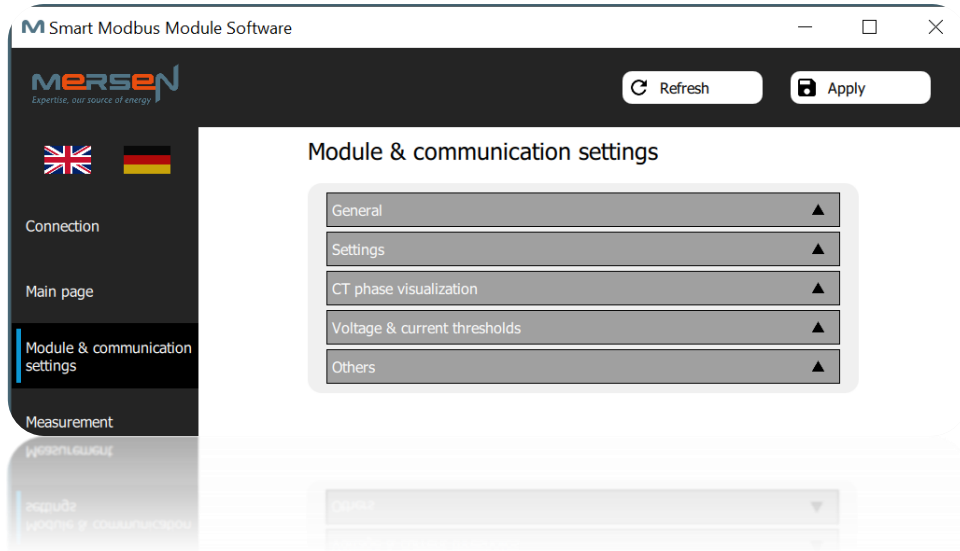


- 1 → Before to change the page, don't forget to “Apply” your changes
- 2 → otherwise, you will get an Error message



### 5.5.3 Module & communication settings

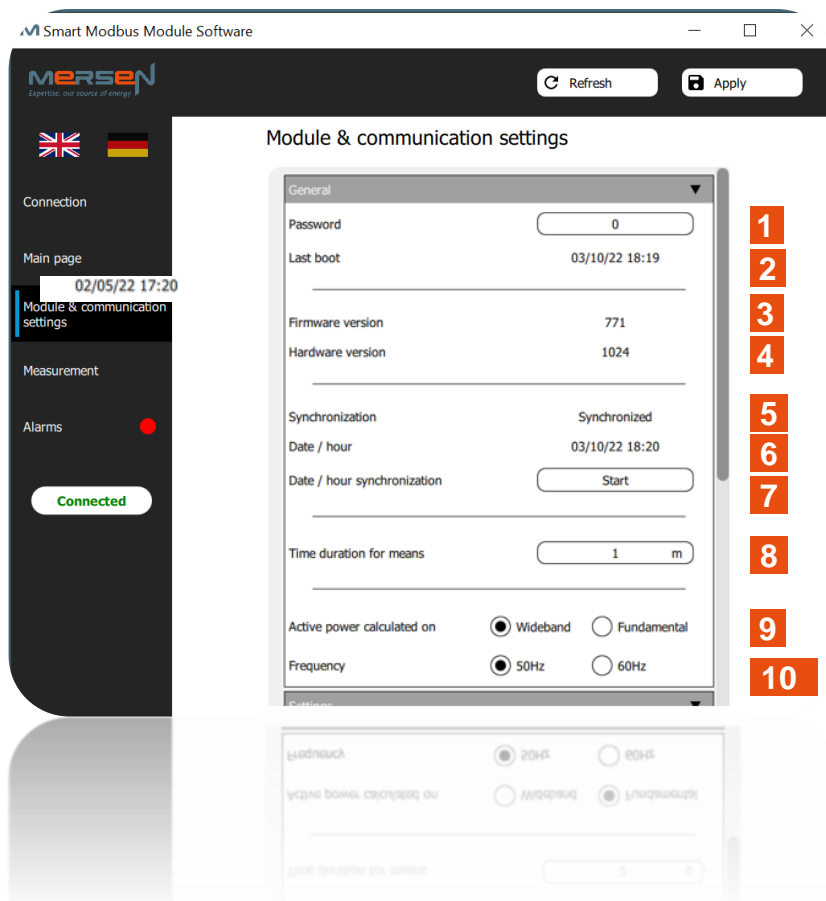
On this page you have several subchapters to adjust the settings of the module and the Modbus communication



This configuration tab is used to display “read” and to adjust “write”, if needed, the different values available in the Smart Module

## 5.5.3.1 General

- 1 → Password: could be used by the customer if needed
- 2 → Last boot: given by the module
- 3 → Firmware version: given by the module
- 4 → Hardware version: given by the module
- 5 → Synchronization: status of Synchronization: “No synchronization” in the last 24H or “Synchronized”
- 6 → Date / hour: update of the date of the last synchronization
- 7 → Date / hour synchronization: press “Start” button
- 8 → Time duration for means: could be modified by the customer
- 9 → Active power calculated on 2 possibilities : “Wideband” or “Fundamental”, could be modified by the customer
- 10 → Frequency: 50Hz or 60Hz, could be modified by the customer



### 5.5.3.2 Settings

**1** → Slave address: 247 as max value and preset value, could be modified by the customer

**2** → Baudrate: 19200 as preset value, could be modify by the customer

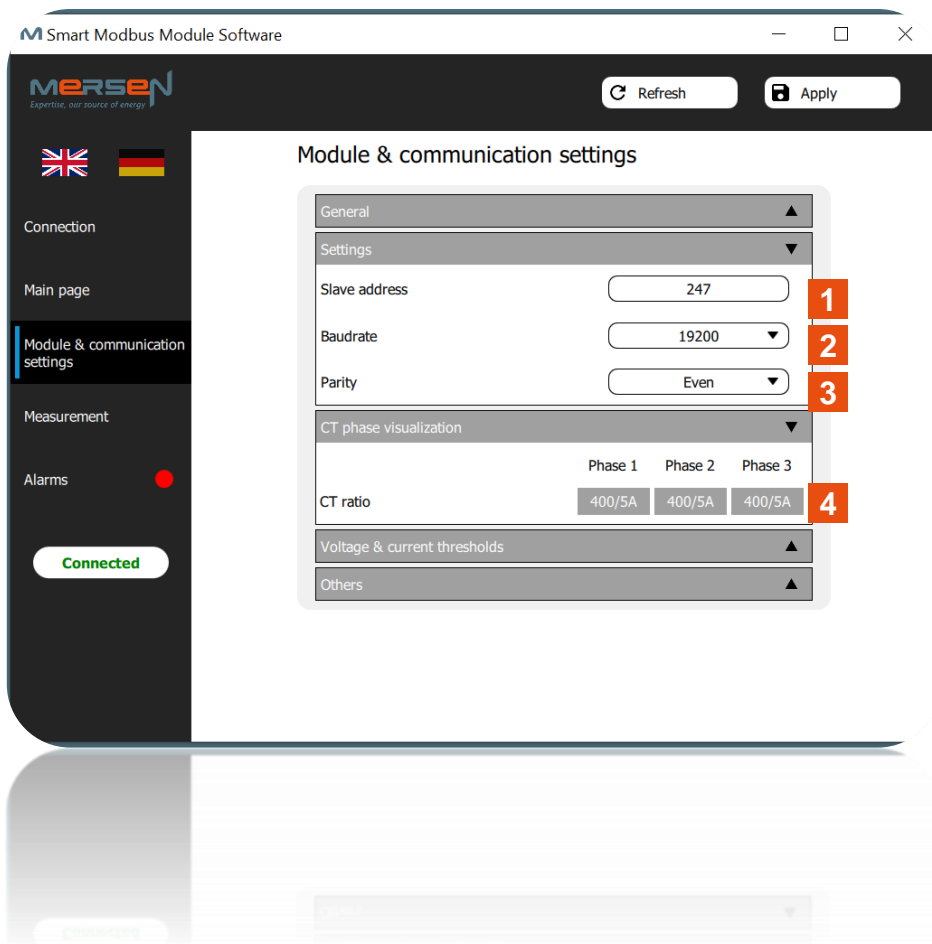
Several possibilities : 19200 / 38400 / 57600 / 115200

**3** → Parity: Even as preset value, could be modified by the customer

Several possibilities : none / even / odd

### 5.5.3.3 CT phase visualization

**4** → CT ratio: confirmation of the selection done on Main page of Current transformer



## 5.5.3.4 Voltage &amp; current threshold

- 1 → Voltage threshold  $U \ll Lx-E$ : could be modified by the customer
- 2 → Voltage threshold  $U \ll Lx-E$  duration: could be modify by the customer
- 3 → Over Current threshold  $I >$ : could be modify by the customer
- 4 → Current threshold  $I >$  duration: could be modified by the customer
- 5 → Noise reduction : could be modified by the customer?
- 6 → Overcurrent threshold  $I >>$  :could be modified by the customer?
- 7 → Overcurrent threshold  $I >>$  duration : could be modified by the customer?
- 8 → Current nominal value  $I$  : could be modified by the customer?
- 9 → Voltage nominal value  $U$  : could be modified by the customer?
- 10 → Current hysteresis value : could be modified by the customer?
- 11 → Voltage hysteresis value : could be modified by the customer?

Smart Modbus Module Software

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Refresh Apply

Connection  
Main page  
Module & communication settings  
Measurement  
Alarms

Disconnected

### Module & communication settings

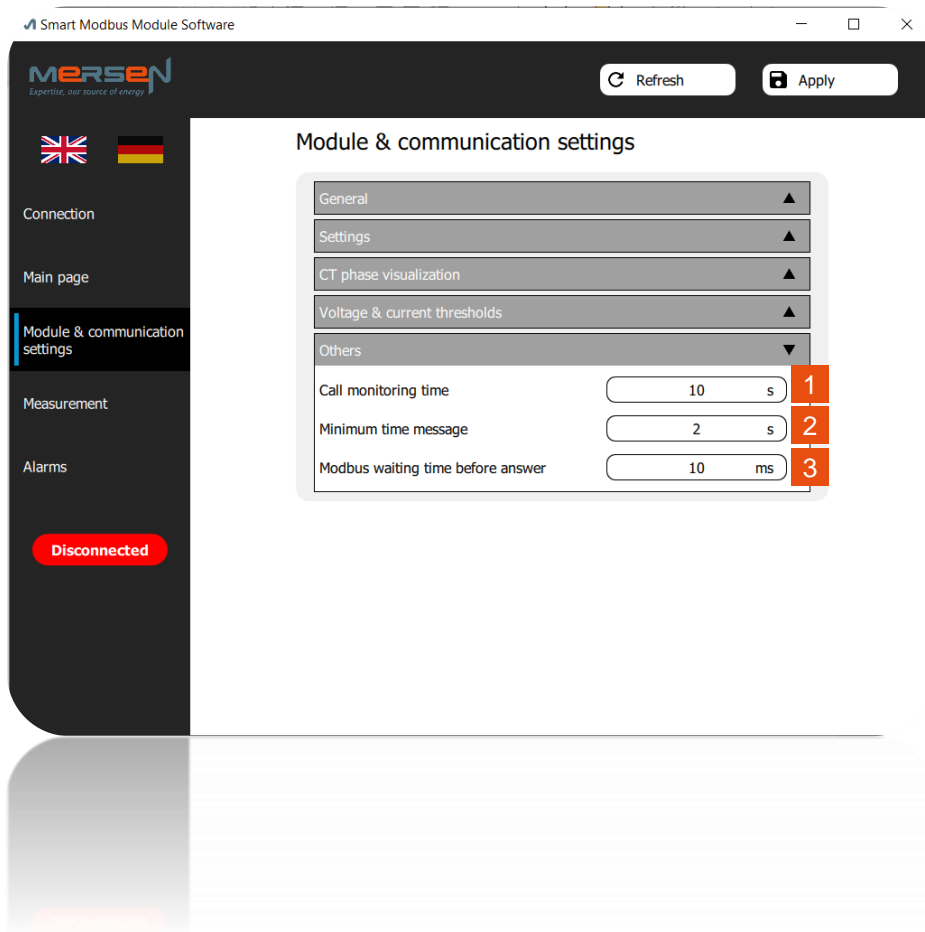
Voltage & current thresholds	
Voltage threshold $U \ll Lx-E$	10 %
Voltage threshold $U \ll Lx-E$ duration	1 s
Overcurrent threshold $I >$	80 %
Overcurrent threshold $I >$ duration	1 s
Noise reduction	2 ‰
Overcurrent threshold $I >>$	100 %
Overcurrent threshold $I >>$ duration	0 s
Current nominal value $I$	400 A
Voltage nominal value $U$	230 V
Current hysteresis value	5 %
Voltage hysteresis value	2 %

Others

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11

### 5.5.3.5 Others

- 1 → Call monitoring time: time to get a call of the master, could be modified by the customer
- 2 → Minimum time message: time minimum to get a message, could be modified by the customer
- 3 → Modbus Waiting time before answer : time to wait for having an answer from the module , could be modified by the customer

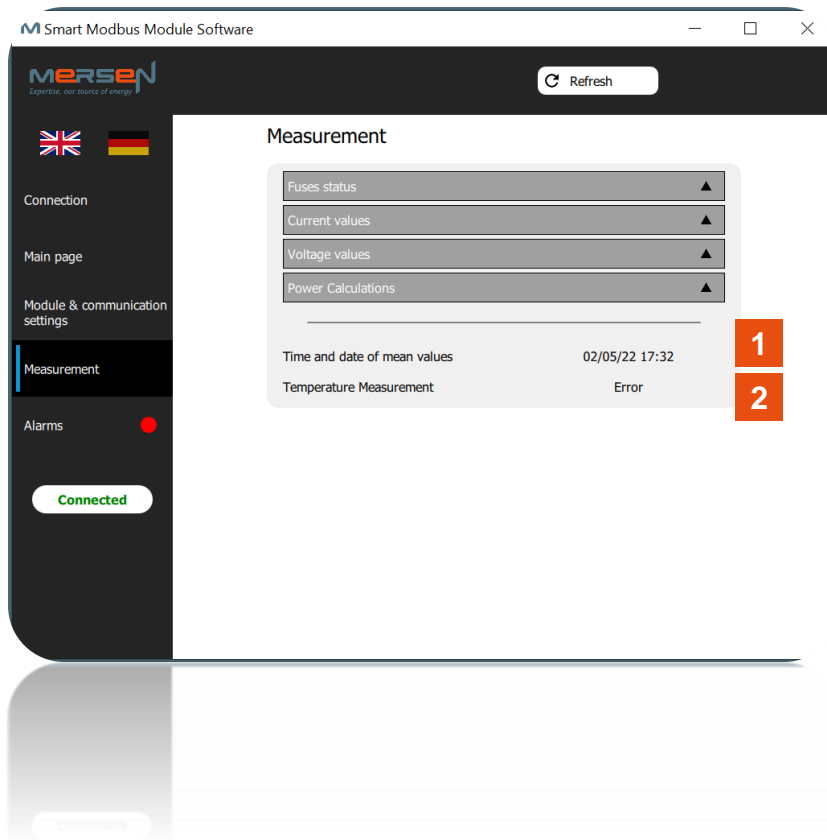




### 5.5.4 Measurement

On this page you have several subchapters to visualize the measured or calculated values

- 1 → Time and date of means values: date and time of the last mean calculation
- 2 → Temperature Measurement: value of the temperature



## 5.5.4.1 Fuses status

1 → Fuse status: status of the fuse for each phase

## 5.5.4.2 Current values

2 → Current: values measured for each phase 1, 2, and 3

3 → Current mean: mean calculated on current values for each phase

4 → Current min: current value min found during current mean calculation

5 → Current max: current value max found during current mean calculation

6 → Cosphi : cosphi calculated

Smart Modbus Module Software

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Refresh

Connection

Main page

Module & communication settings

Measurement

Alarms

Connected

### Measurement

Fuses status

	Phase 1	Phase 2	Phase 3
Fuses status	0	0	0

Current values

	L1	L2	L3	Neutral
Current	0.00 A	0.00 A	0.00 A	0.00 A
Current mean	0.00 A	0.00 A	0.00 A	0.00 A
Current min	0.08 A	0.00 A	0.08 A	0.00 A
Current max	0.08 A	0.00 A	0.00 A	0.00 A

Cosphi

	Phase 1	Phase 2	Phase 3
Cosphi	111.13	73.13	107.13

Voltage values

### 5.5.4.3 Fuses status

1 → Voltage value: voltage value for each phase, phase –neutral and phase-phase

### 5.5.4.4 Power calculations

2 → Active power: active power calculated for each phase 1, 2, and 3 and in total

3 → Active power mean: active power calculated on active power values

4 → Active power min: active power value min found during active power mean calculation

5 → Active power max: active power value max found during active power mean calculation

6 → Reactive power: reactive power calculated for each phase 1, 2, and 3 and in total

7 → Reactive power mean: reactive power calculated on active power values

8 → Reactive power min: reactive power value min found during reactive power mean calculation

9 → Reactive power max: reactive power value max found during reactive power mean calculation

Smart Modbus Module Software

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Refresh

Measurement

Voltage values

V1N	V2N	V3N	V12	V23	V31
V	V	V	V	V	V

Power Calculations

	ΣP	P1	P2	P3
Active Power	W	W	W	W
Active Power mean	W	W	W	W
Active Power min	W	W	W	W
Active Power max	W	W	W	W

	ΣQ	Q1	Q2	Q3
Reactive Power	VAR	VAR	VAR	VAR
Reactive Power mean	VAR	VAR	VAR	VAR
Reactive Power min	VAR	VAR	VAR	VAR
Reactive Power max	VAR	VAR	VAR	VAR

1

2

3

4

5

6

7

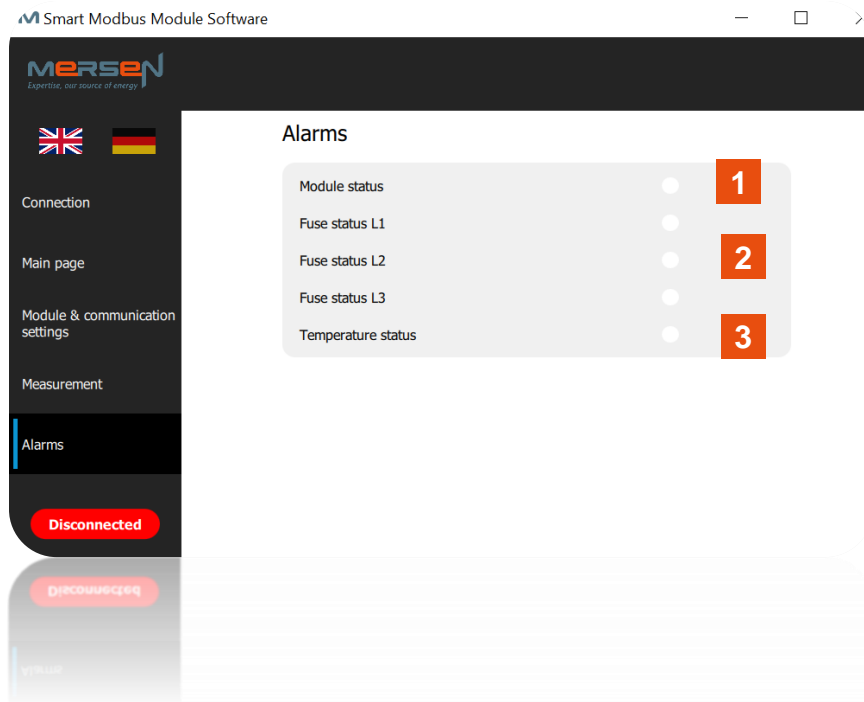
8

9

Connected

### 5.5.5 Alarms

- 1 → Module status: coming from the module directly for traceability
  - Green : no issue
  - Red : issue, have a look on below data or master communication missing
  
- 2 → Fuse status 1 / Fuse status 2 / Fuse status 3:
  - Green : no issue
  - Red : gap of voltage measurements per phase : Fuse blow or Fusegear opened
  
- 3 → Temperature status:
  - Green : no issue, temperature below the temperature threshold
  - Red : temperature over the temperature threshold



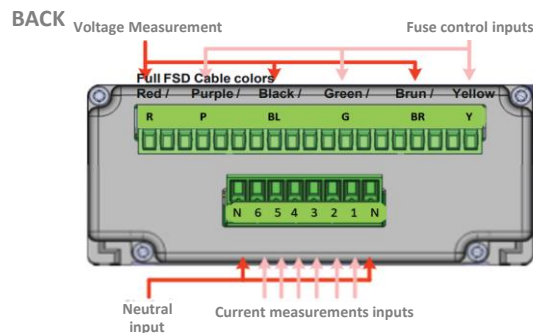
## 6. TERMINAL CONNECTIONS

### 6.1 Back connections

#### Back connection, Voltage connections

Terminal	Signal	Cable	Color
T	L3 voltage input to get Fuse blown information	1,5 mm <sup>2</sup> ~ Ø 1,3mm,690V	Red
W	L3 voltage input	1,5 mm <sup>2</sup> ~ Ø 1,3mm,690V	Purple
S	L2 voltage input to get Fuse blown information	1,5 mm <sup>2</sup> ~ Ø 1,3mm,690V	Black
V	L2 voltage input	1,5 mm <sup>2</sup> ~ Ø 1,3mm,690V	Green
R	L1 voltage input to get Fuse blown information	1,5 mm <sup>2</sup> ~ Ø 1,3mm,690V	Brown
U	L1 voltage input	1,5 mm <sup>2</sup> ~ Ø 1,3mm,690V	Yellow

#### Voltage measurement inputs connections

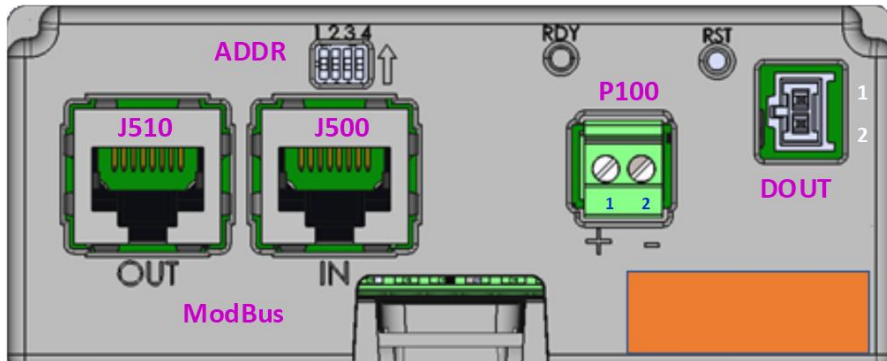


#### Current measurement inputs connections

#### Back connection, Current connections

Terminal	Signal	Cable	Number
N	Neutral input if needed (should be connected on master	1,5 mm <sup>2</sup> ~ Ø 1,3mm	N
iR1	L1 Current sensing signal Positive	1,5 mm <sup>2</sup> ~ Ø 1,3mm	1
iR2	L1 Current sensing signal Negative	1,5 mm <sup>2</sup> ~ Ø 1,3mm	2
iS1	L2 Current sensing signal Positive	1,5 mm <sup>2</sup> ~ Ø 1,3mm	3
iS2	L2 Current sensing signal Negative	1,5 mm <sup>2</sup> ~ Ø 1,3mm	4
iT1	L3 Current sensing signal Positive	1,5 mm <sup>2</sup> ~ Ø 1,3mm	5
iT2	L3 Current sensing signal Negative	1,5 mm <sup>2</sup> ~ Ø 1,3mm	6
N	Neutral input if needed (should be connected on master	1,5 mm <sup>2</sup> ~ Ø 1,3mm	N

## 6.2 Front connections



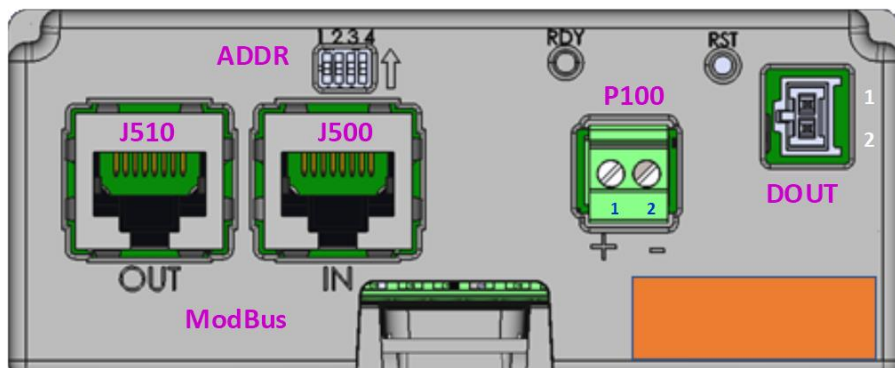
**Front connection,  
Current connections**

Terminal	Signal	Cable
P100 +	24VDC power supply input	0,75 to 1,5 mm <sup>2</sup>
P100 -	24V GND (0V)	0,75 to 1,5 mm <sup>2</sup>
DOUT 1	D1 digital output 1, 30V/2A	0,75 to 1,5 mm <sup>2</sup>
DOUT 2	D0 digital output 0, 30V/2A	0,75 to 1,5 mm <sup>2</sup>
J510	Connection with the master	RJ45
	1 = Not connected 2 = GND (or 0V) 3 = Not connected 4 = D1 (A) 5 = D0 (B) 6 = 24V 7 = 24V 8 = GND	
J500	Connection daisy chain with other slaves	RJ45
	1 = Not connected 2 = GND (or 0V) 3 = Not connected 4 = D1 (A) 5 = D0 (B) 6 = 24V 7 = 24V 8 = GND	
ADDR	Dip switch 1234 position	/

### 6.3 Slave address available

To help you to put the parameters the modules in a faster way into a cabinet :

- plug the daisy chain on 8 modules
- set manually the dip switch follow the below table with different address
- send the requested parameters for each module to one channel using the right module address
- If you have more than 8 modules, you can give another “hard” address of your module, the set address is the one recognized by the module, the address given by the dip switch is forgotten and you can reuse the dip switch address to pursue the parametrization of your daisy chain



dip switch position	address
0000	247
1000	111
0100	112
1100	113
0010	114
1010	115
0110	116
1110	117

1	2	3	4	position
				1 / top
				0 / bottom

### 6.3 Wiring and Termination resistance

The power supply should be connected at the first module, then the power supply is established via the RJ45 connection through the daisy chain using ethernet cable. No need to add additional supply of other module linked by the daisy chain.

If you have more than 8 modules a termination resistance is needed.

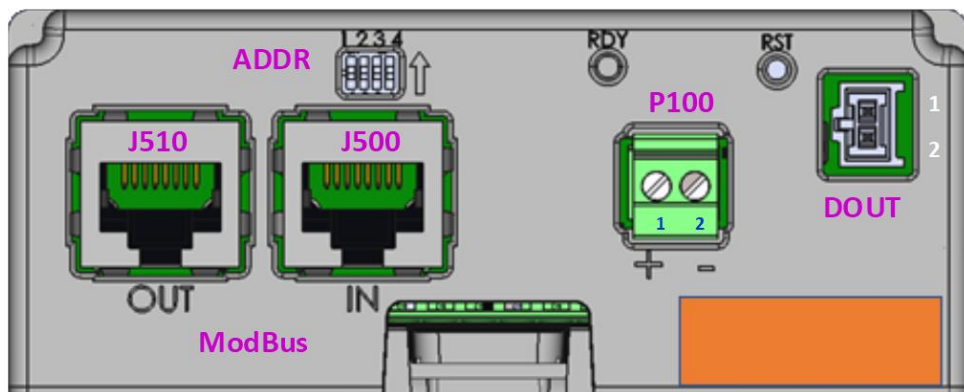
Using the dip switch you should put it at position 1, regardless of other positions of the dip switch pins.

The delivery position is always at 0.

1	2	3	4	position
				1 / top
			x	0 / bottom

Termination resistance position at 1

1	2	3	4	position
			x	1 / top
				0 / bottom





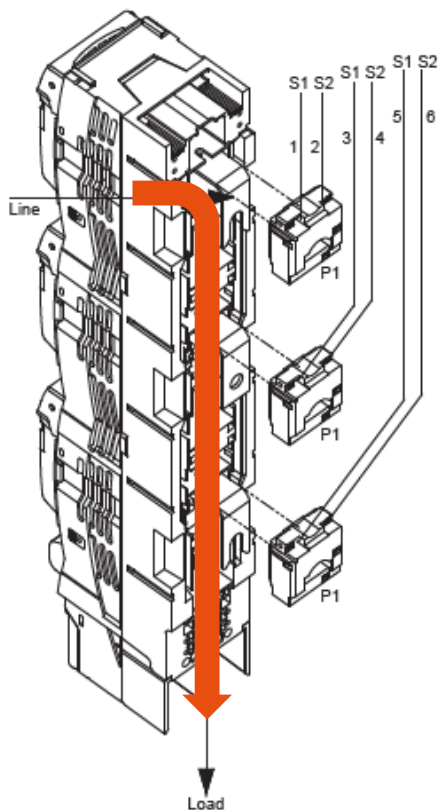
## 7. POWER DIRECTION SETTING

According to the load power direction of the fusegear, the value of the current could be positive or negative.

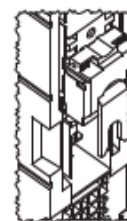
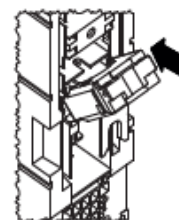
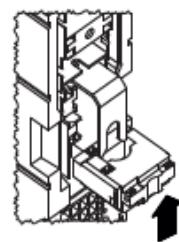
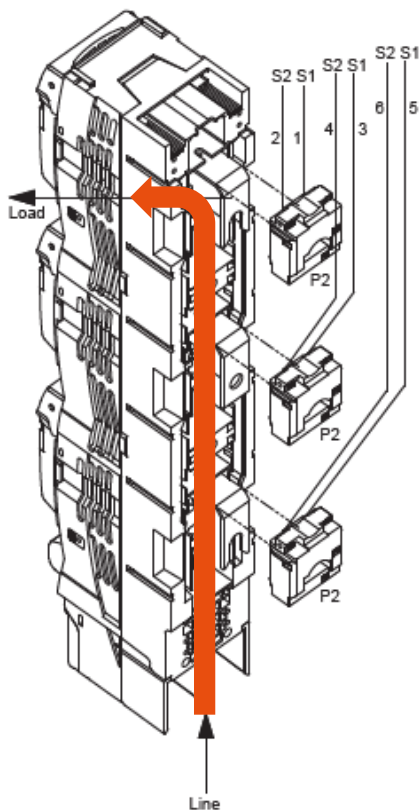
Below you will find the description by default values, when using standard load connection  
→ feeding side = Busbar side

### STANDARD LOAD CONNECTION

Feeding side = Busbar side

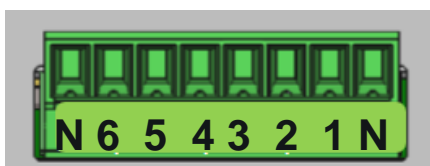


### OTHER SIDE LOAD CONNECTION



If the product is connected at the load following the “Other side load connection”, 2 options :

- Change current transformer side of installation as shown on the upper pictures
- Or reverse the connection of the module as shown below



## 8. TECHNICAL DATA

General	Accuracy class	+/-1% on voltage and current for the module (to be added to the sensors tolerance) +/-1% on temperature (in range from 0°C to 60°C)
	Degree of protection	IP20
	Visual displays	1 LED for Module status (RUN)
	Operating Temperature	-20 °C...+70 °C
	Storage/Transportation Temperature	-40 °C...+70 °C
	Humidity	Max. 95 %, without condensation
Electrical characteristics	Operating Voltage	DC24V (+/- 6V)
	Allowed interruptions of DC power supply, according to EN 61131-2	Interruption < 4 ms, time between 2 interruptions > 1 s
	Protection against reverse polarity	Yes
	Typical power consumption	1,2W / 24V - 50mA
	Internal resistance L – N	L – N: 3,0MΩ
	Measuring range L – N	AC400V (+/- 10%)
	Frequency	50/60 Hz ( +/-5%) - parametrizable
	Current transformer secondary current	1A or 5A - parametrizable
Electromagnetic compatibility	Standard	EN 61000-6-2
	Impulse withstand voltage	2kV – 1,2/50µs
	Radio noise field strength	Class A
	Air discharge	8kV
	Contact discharge	4kV
	Radio emitted disturbances	10V/m
	Conducted disturbances	1kV line to line, 2kV line to earth
	Creepage distances	The creepage distances and clearances meet the requirements of the overvoltage category II, pollution degree 2.
Analog Inputs	Voltage connection	1 per phase, spring type
	Fuse control connection	1 per phase, spring type
	Neutral connection	2 available, spring type
	Current transformer connections	2 per phase, spring type
	Potential separation	Yes
Digital Outputs	Digital output	Static relay 30V/2A
Modbus RTU interface	ModBus RTU	APS V1.1b, Configurable via software
	Number of channels	1
	Physical connection type	2 x RJ45
	Max. Bus participants	up to 247
	Transmission speed	1200 – 115200 b/s (default = 57kb/s)
Mechanical characteristics	Mounting	Horizontal
	Housing	Classification V-2 according to UL 94
	Dimensions HxWxD	39,5x95x102 mm
	Weight	200 g

### 9. MODBUS PARAMETERS

Modbus PDU Address (16bit)	Modbus-Model of data (DI = Digital inputs/ IP= Input registers)	Designation (note: with float32 -> HW = high word; LW = low word)	Status	Data type	Access (R = read; W = write)	Min/Max-value	Preset value	Comments
30000	DI	Status	0/1	BS1	R	-	-	1= no error 0 = error
30001	DI	Reserve						
30002	DI	Synchronization	0/1	BS1	R	-	-	1 = No synchronization in the last 24H 0 = Synchronized
30003 to 30499	DI	Reserve						
30501	Coil	Password	-	BS1	W	-	-	1 = Password is reset to the default value
30502 to 30999	Coil	Reserve						
31000	IR	Last Boot Millis	ms	uint16	R	0 to 59999	0	
31001	IR	Last Boot Minute	min	uint16	R	0 to 59	0	
31002	IR	Last Boot Hour	Hour	uint16	R	0 to 23	0	
31003	IR	Last Boot Day	Day	uint16	R	1 to 31	1	
31004	IR	Last Boot Month	Month	uint16	R	1 to 12	1	
31005	IR	Last Boot Year	Year	uint16	R	20 to 99	20	
31006	IR	Firmware version		uint16	R	0 to 65535	-	MSB = major / LSB = minor (0x0103 = 1.3)
31007	IR	Hardware version		uint16	R	0 to 65535	-	MSB = major / LSB = minor
31008 to 31499	IR	Reserve						
31500	HR	Date/Hour			W/R			
31501	HR	Date/Hour			W/R			
31502	HR	Date/Hour			W/R			
31503	HR	Date/Hour			W/R			
31504	HR	Time Duration for mean	min	uint8	W	1 to 60		5 1, 5 or 10 min; t applies to all mean values
31505	HR	Modbus Parity	-		W/R		1	0= none 1= even 2=odd
31506	HR	Modbus Baudrate (HW)	Bit/s		W/R		19200	19200 38400 57600 115200
31507	HR	Modbus Baudrate (LW)	Bit/s		W/R		19200	19200 38400 57600 115200
31508	HR	Modbus Slave address	-		W/R	1 to 247	247	
31509 to 31999	HR	Reserve						
50000	DI	ADDR_FCT_PRIVATE_WIDEBAND_FUNDAMENTAL	0/1	BS1	W/R	0 to 1		//choice 0 = wideband active power or 1 = fundamental
50001	DI	ADDR_FCT_PRIVATE_50HZ_60HZ	0/1	BS1	W/R	0 to 1		//choice 0 = 50H or 1 = 60Hz
50501	HR	ADDR_FCT_PRIVATE_CT_A_PHASE_1	-	UINT16	W/R	1 to 65535	-	//CT value = I primary / I secondary x 10 (see CT parameter sheet as reference)
50502	HR	ADDR_FCT_PRIVATE_CT_B_PHASE_1	-					//not use
50503	HR	ADDR_FCT_PRIVATE_CT_A_PHASE_2	-	UINT16	W/R	1 to 65535	-	//CT value = I primary / I secondary x 10 (see CT parameter sheet as reference)
50504	HR	ADDR_FCT_PRIVATE_CT_B_PHASE_2	-					//not use
50505	HR	ADDR_FCT_PRIVATE_CT_A_PHASE_3	-	UINT16	W/R	1 to 65535	-	//CT value = I primary / I secondary x 10 (see CT parameter sheet as reference)
50506	HR	ADDR_FCT_PRIVATE_CT_B_PHASE_3	-					//not use
		//customer configuration						
50507	HR	ADDR_FCT_PRIVATE_LIMITE_V	V	UINT16	W/R	0 to 65535	65535	voltage threshold
50508	HR	ADDR_FCT_PRIVATE_LIMITE_V_DURATION	s	UINT16	W/R	0 to 65535	255	duration voltage threshold
50509	HR	ADDR_FCT_PRIVATE_LIMITE_I	A	UINT16	W/R	0 to 65535	65535	current threshold
50510	HR	ADDR_FCT_PRIVATE_LIMITE_I_DURATION	s	UINT16	W/R	0 to 65535	255	duration current threshold
50511	HR	ADDR_FCT_PRIVATE_MINIMUM_TIME_MESSAGE	s	UINT16	W/R	1 to 6000	2	minimum duration time to display alerte message
50512	HR	ADDR_FCT_PRIVATE_CALL_MONITORING_TIME	s	UINT16	W/R	1 to 3600	10	Modbus message missing alerte time
		//Firmware update settings						
50521	DI	ADDR_FCT_PRIVATE_BOOTLOADER_STATUS	0/1	BS1	R	0 to 1		0 = application 1 = bootloader
50522	DI	ADDR_FCT_PRIVATE_BOOTLOADER_RESET	1	BS1	W		1	1 = to launch bootloader
50523	HR	ADDR_FCT_PRIVATE_APP_LENGTH_MSB	-	UINT16	W	0 to 65535		firmware size MSB
50524	HR	ADDR_FCT_PRIVATE_APP_LENGTH_LSB	-	UINT16	W	0 to 65535		firmware size LSB
50525	HR	ADDR_FCT_PRIVATE_APP_CHECKSUM_MSB	-	UINT16	W	0 to 65535		firmware CRC32 MSB
50526	HR	ADDR_FCT_PRIVATE_APP_CHECKSUM_LSB	-	UINT16	W	0 to 65535		firmware CRC32 LSB
50527	HR	ADDR_FCT_PRIVATE_APP_DATA_OFFSET_MSB	-	UINT16	W	0 to 65535		write offset MSB
50528	HR	ADDR_FCT_PRIVATE_APP_DATA_OFFSET_LSB	-	UINT16	W	0 to 65535		write offset LSB
50529	HR	ADDR_FCT_PRIVATE_APP_DATA1	-	UINT16	W	0 to 65535		firmware data
50530	HR	ADDR_FCT_PRIVATE_APP_DATA2	-	UINT16	W	0 to 65535		firmware data
50531	HR	ADDR_FCT_PRIVATE_APP_DATA3	-	UINT16	W	0 to 65535		firmware data
50532	HR	ADDR_FCT_PRIVATE_APP_DATA4	-	UINT16	W	0 to 65535		firmware data
50533	HR	ADDR_FCT_PRIVATE_APP_DATA5	-	UINT16	W	0 to 65535		firmware data
50534	HR	ADDR_FCT_PRIVATE_APP_DATA6	-	UINT16	W	0 to 65535		firmware data
50535	HR	ADDR_FCT_PRIVATE_APP_DATA7	-	UINT16	W	0 to 65535		firmware data
50536	HR	ADDR_FCT_PRIVATE_APP_DATA8	-	UINT16	W	0 to 65535		firmware data
		//Temperature						
		//Threshold						
50573	HR	ADDR_FCT_PRIVATE_TEMP_THRESHOLD	°C	INT16	W/R	60 to 90	90	threshold temperature value

\*Excel file of Modbus communication table available on request

10. MODBUS MEASUREMENT PROVIDED

Modbus PDU Address (16bit)	Modbus-Model of data (DI = Digital inputs/ IP= Input registers)	Designation (note: with float32 -> HW = high word; LW = low word)	Status	Data type	Access (R = read; W = write)	Comments
Note: Up to 2000 DI can be requested with a query telegram. 8 DI fit into one byte in the response telegram						
32000 to 32299	DI					
32300	DI	U> addressed	0/1	BS1	R	always "0"
32301	DI	U>> addressed	0/1	BS1	R	always "0"
32302	DI	U< addressed	0/1	BS1	R	always "0"
32303	DI	U<< addressed	0/1	BS1	R	always "0"
32304	DI	U<< L1-E addressed	0/1	BS1	R	1= V< 0,1 x voltage threshold & duration voltage measurement > duration voltage threshold 0 = V> 0,1 x voltage threshold
32305	DI	U<< L2-E addressed	0/1	BS1	R	1= V< 0,1 x voltage threshold & duration voltage measurement > duration voltage threshold 0 = V> 0,1 x voltage threshold
32306	DI	U<< L3-E addressed	0/1	BS1	R	1= V< 0,1 x voltage threshold & duration voltage measurement > duration voltage threshold 0 = V> 0,1 x voltage threshold
32307	DI	New mean available	0/1	BS1	R	Bit must be reset by the slave after querying the mean values
32308	DI	I> addressed	0/1	BS1	R	1= I> 0,8 x current threshold & duration current measurement > duration current threshold 0 = I< 0,8 x current threshold
32309	DI	I>> addressed	0/1	BS1	R	1= I> current threshold & duration current measurement > duration current threshold 0 = I< current threshold
32310	DI	Voltage quality	0/1	BS1	R	Always "0" Wiper message
32311	DI	Fuse L1	0/1	BS1	R	1= fuse blown 0 = fuse functional
32312	DI	Fuse L2	0/1	BS1	R	1= fuse blown 0 = fuse functional
32313	DI	Fuse L3	0/1	BS1	R	1= fuse blown 0 = fuse functional
32314 bis 36811		Reserve			R	
Note: Up to 125 IR can be requested with one query telegram						
36812 to 36819	IR	Intensity		A	float32	R
36820 to 36835	IR	Active and reactive power		kW / kVAR	float32	R
36836 to 36859	IR	Reserve instantaneous value			float32	R
36860 to 36863	IR	Time and date of the mean values	*	*		R
36864 to 36875	IR	Reserve				
36876 to 36883	IR	Intensity mean		A	float32	R
36884 to 36899	IR	Active/ Reactive power mean		kW / kVAR	float32	R
36900 to 36923	IR	Reserve				
36924 to 36939	IR	Intensity mean max and min		A	float32	R
36940 to 36971	IR	Active/Reactive power max and min		kW / kVAR	float32	R
36972 to 49999	IR	Reserve				R
		//display voltage V1N				
50540	IR	ADDR_FCT_PRIVATE_VOLTAGE_1_MSB		V	float32	R
50541	IR	ADDR_FCT_PRIVATE_VOLTAGE_1_LSB		V	float32	R
		//display voltage V2N				
50542	IR	ADDR_FCT_PRIVATE_VOLTAGE_2_MSB		V	float32	R
50543	IR	ADDR_FCT_PRIVATE_VOLTAGE_2_LSB		V	float32	R
		//display voltage V3N				
50544	IR	ADDR_FCT_PRIVATE_VOLTAGE_3_MSB		V	float32	R
50545	IR	ADDR_FCT_PRIVATE_VOLTAGE_3_LSB		V	float32	R
		//display current I1 (Available 36812 to 36819)				
50546	IR	ADDR_FCT_PRIVATE_CURRENT_1_MSB		A	float32	R
50547	IR	ADDR_FCT_PRIVATE_CURRENT_1_LSB		A	float32	R
		//display current I2				
50548	IR	ADDR_FCT_PRIVATE_CURRENT_2_MSB		A	float32	R
50549	IR	ADDR_FCT_PRIVATE_CURRENT_2_LSB		A	float32	R
		//display current I3				
50550	IR	ADDR_FCT_PRIVATE_CURRENT_3_MSB		A	float32	R
50551	IR	ADDR_FCT_PRIVATE_CURRENT_3_LSB		A	float32	R
		//display current PHI1				
50552	IR	ADDR_FCT_PRIVATE_PHI_1_MSB		*	float32	R
50553	IR	ADDR_FCT_PRIVATE_PHI_1_LSB		*	float32	R
		//display current PHI2				
50554	IR	ADDR_FCT_PRIVATE_PHI_2_MSB		*	float32	R
50555	IR	ADDR_FCT_PRIVATE_PHI_2_LSB		*	float32	R
		//display current PHI3				
50556	IR	ADDR_FCT_PRIVATE_PHI_3_MSB		*	float32	R
50557	IR	ADDR_FCT_PRIVATE_PHI_3_LSB		*	float32	R
		//display voltage V12				
50567	IR	ADDR_FCT_PRIVATE_VOLTAGE_12_MSB		V	float32	R
50568	IR	ADDR_FCT_PRIVATE_VOLTAGE_12_LSB		V	float32	R
		//display voltage V23				
50569	IR	ADDR_FCT_PRIVATE_VOLTAGE_23_MSB		V	float32	R
50570	IR	ADDR_FCT_PRIVATE_VOLTAGE_23_LSB		V	float32	R
		//display voltage V31				
50571	IR	ADDR_FCT_PRIVATE_VOLTAGE_31_MSB		V	float32	R
50572	IR	ADDR_FCT_PRIVATE_VOLTAGE_31_LSB		V	float32	R
		//Temperature				
		//Temperature alert				
50574	DI	ADDR_FCT_PRIVATE_TEMP_ALERT	0/1	BS1	R	1 > threshold temperature value 0 < threshold temperature value
		// Temperature measurement				
50575	IR	ADDR_FCT_PRIVATE_TEMP_MEASUREMENT	°C	float32	R	temperature value

\*Excel file of Modbus communication table available on request

## 11. TROUBLE SHOOTING

Fault Description	Fault Analysis	Trouble shooting method
Off LED	Module not functional	Check the supply of the module
Detected current value cannot match to actual current	Switch rated current may not be set correctly	Check rated current setting in the software in the <a href="#">Module &amp; communication settings</a> page, CT phase visualization. If not compliant, the settings should be updated in the software in the <a href="#">Main page</a>
No voltage data shown	Failure of the module connection	Check the connector position at the back of the module
Voltage data partially shown	Failure of the module connection	Check the connector position at the back of the module

## 12. CYBER SECURITY

### 12.1 Disclaimer

It is the sole responsibility of the customer to provide and continuously ensure a secure connection between the product and the customer network or any other network. The customer is required to establish and maintain any appropriate measures (including but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breach, unauthorized access, interference, intrusion, leakage and/or theft of data or information. MERSEN and its affiliates are not liable for damage and/or losses related to such security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

### 12.2 Secure Deployment

The user of the product should be aware that the unsecure nature of the serial Modbus protocol exposes the communication between the product and the control system. Encryption, authentication or integrity of transmitted data are not provided by the protocol. To prevent equipment to operate in an unsafe or undesirable manner due to malicious activities the product must be positioned in a trusted network, strictly limited and in a hosted portion of a network or control system. The recommendation is also to restrict physical access to the product/system to only allow authorized people to make changes to the system. Besides, the user can setup system to trigger alarm when communication is interrupted (device stops responding) and check if there are any unsafe condition.

### 13. APPENDIX - Modbus cable USB ↔ RJ45



#### TECHNICAL DATA

Isolated USB - Modbus / RS485 converter

This cable is a 2 wire RS485 adapter, with automatic receive / transmit switching, and RJ45 connection according to the Modbus specifications.

The cable have a 2.5kV isolation barrier that ensures a high quality electrical separation between the PC and remote device, thus offering excellent protection of the PC if the remote device should fail.

Just connect it and use it like any other COM port in the PC having the needed driver.

#### Com-port specs

Baud rates : 19200, 38400, 57600,115200Bps

Start bits : 1

Data bits: 7, 8

Parity: None, even, odd, mark, space

Stop bits: 1, 2

Flow control: Auto switching

Buffers: 128 bytes Rx and 256 bytes Tx fifo.

#### RS485 specifications

Powerful RS485, able to drive 256 nodes

±15 kV ESD protection on RS485 pins

No termination resistor

Fail safe

#### Modbus connections - RJ45

According to Modbus specification "Modbus over serial line"

- Pin 4 : B (D-)

- Pin 5 : A (D+)

- Pin 8 : Gnd.

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