USER MANUAL

T203PM100-MU
T203PM300-MU
T203PM600-MU

SINGLE-PHASE AC / DC TRUE RMS POWER METER
WITH MODBUS RTU PROTOCOL AND ANALOGUE AND DIGITAL OUTPUTS

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ORIGINAL INSTRUCTIONS

The content of this documentation refers to products and technologies described in it.
All technical data contained in the document may be changed without notice.
The content of this documentation is subject to periodic review.
To use the product safely and effectively, read the following instructions carefully before use.
The product must be used only for the use for which it was designed and manufactured: any other use is under the full responsibility of the user.
Installation, programming and set-up are allowed only to authorized, physically and intellectually suitable operators.
Set-up must be performed only after correct installation and the user must follow all the operations described in the installation manual carefully.
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There may be errors and inaccuracies in this document that could damage your system, so proceed with caution, the author(s) will not take responsibility for it.
Technical specifications are subject to change without notice.

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1. INTRODUCTION

ATTENTION!

This user manual extends the information from the installation manual to the configuration of the device. Use the installation manual for more information.

ATTENTION!

In any case, SENECA s.r.l. or its suppliers will not be responsible for the loss of data/revenue or consequential or incidental damages due to negligence or bad/improper management of the device, even if SENECA is well aware of these possible damages.
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1.1. DESCRIPTION

T203PM is a transducer for measuring AC/DC current and voltage in an isolated way (insulation relating to the communication ports and the analogue and digital output), aimed at measuring energy (bidirectionally) that can be installed on DIN 46277 rail.

Model	Description	Communication protocols
T203PM-MU	ModBUS 1PH Power Meter with analogue and digital output	ModBUS RTU

Measuring the voltage and current of the network, the instrument allows to measure the RMS values, instantaneous powers and energies of the devices to be monitored.
The 1.3kHz input measurement band guarantees the measurement of voltage and currents with harmonic components up to the twenty-first (at the mains frequency of 60 Hz).
The use of this device is compatible with single-phase inverters.

The list of measurements made available by the tool is provided below:

- TRUE RMS AC VOLTAGE and CURRENT MEASUREMENTS (TRUE EFFECTIVE VALUE)
- DC VOLTAGE and BIPOLAR DC CURRENT MEASUREMENTS (the current can take on the +/- signs)
- MEASUREMENTS OF INSTANT POWER and ACTIVE, REACTIVE AND APPARENT ENERGY
- POWER FACTOR
- THD (AT NETWORK FREQUENCIES of 50 or 60 Hz)
- NETWORK FREQUENCY

The measured energies are stored in non-volatile memory cyclically once per second.
For further information refer to the paragraph on ENERGY METERS

1.2. COMMUNICATION PORT SPECIFICATIONS

RS485 COMMUNICATION PORTS	
Number	1
Baudrate	From 2400 to 115200 bit/s configurable
Parity, Data bit, Stop bit	Configurable
Protocol	ModBUS RTU Slave

USB COMMUNICATION PORT	
Number	1
Protocol	ModBUS RTU Slave
Use	For configuration with Easy-setup software and firmware update

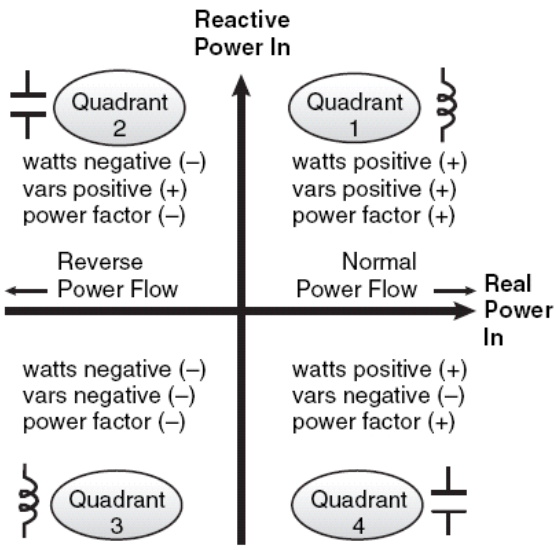
ATTENTION!

WHEN THE USB PORT IS CONNECTED TO A CABLE THE COMMUNICATION ON THE RS485 PORT IS BLOCKED.
TO RESTORE COMMUNICATION ON THE RS485 PORT, PHYSICALLY DISCONNECT THE CABLE FROM THE USB PORT.

2. MEASURES AVAILABLE FROM SERIAL

2.1. CONVENTIONS

The device provides the measurement values of the powers on all 4 quadrants. The conventions for the signs of the measurements used in the product are summarized in the following image:



Where:

quadrant Q1 relates to an inductive load with imported (absorbed) active energy, classic use case.
quadrant Q2 relates to a capacitive load with exported (generated) active energy.
quadrant Q3 relates to an inductive load with exported (generated) active energy.
quadrant Q4 relates to a capacitive load with imported (absorbed) active energy.

2.2. INSTANTANEOUS VALUES PROVIDED and MINIMUM-MAXIMUM ABSOLUTE VALUES

The following table provides the list of instant measurements provided by the instrument; all instantaneous measurements have a minimum and maximum memory that can be reset via the ModBUS CLEAR MIN/MAX command (refer to the COMMAND register in the register list)

Voltage	V
AC/DC (+/-) current	I
Active power (+/-)	P
Reactive power (+/-)	Q
Apparent power (+/-)	S
Power Factor	PF
Frequency	F (frequency measured on the mains voltage)
THD	% (measured on current)

2.3. ENERGY METERS and INITIAL SETTINGS

The following table lists the 64-bit integer counters whose values are saved in Fe-RAM (memory writable an unlimited number of times):

ACTIVE ENERGY [Wh/10] (TOTAL (+/-))
REACTIVE ENERGY [VARh/10] (TOTAL (+/-))
APPARENT ENERGY [VAh/10] (TOTAL (+/-))

To these 64-bit counters corresponds the value of the energies in 32-bit floating point value as shown in the following table (refer to the table of ModBUS registers at the end of the manual):

MEASUREMENT	64BIT INTEGER REGISTER	FLOAT32 REGISTER
ACTIVE ENERGY	EN_INT_ACTIVE [Wh/10]	MISEN_F_ACTIVE [Wh]
REACTIVE ENERGY	EN_INT_REACTIVE [VARh/10]	MISEN_F_REACTIVE [VARh]
APPARENT ENERGY	EN_INT_APPARENT [VAh/10]	MISEN_F_APPARENT [VAh]

The ability to customize the 64-bit energy values is also made available to the user by following the following procedure which uses the sending of ModBUS commands to first unlock the write protection and then to finalize the writing in non-volatile memory:

- In the COMMAND register, send the ENABLE WRITE CUSTOM ENERGIES command
- Now the instrument no longer integrates the energies into memory; it is therefore possible to write the desired initial values in the 64bit integer registers relating to the ACTIVE / REACTIVE / APPARENT energies
- At this point it is possible to complete the writing using the ModBUS WRITE CUSTOM ENERGIES AND REBOOT command.

If, on the other hand, one only wishes to bring the values of these counters to zero, execute the ModBUS CLEAR ENERGIES command

Note:

- During normal operation, energies are saved in non-volatile memory once per second
- When customizing the energies, once the non-volatile write protection has been disabled, the device can return to normal operation using the ModBUS WRITE CUSTOM ENERGIES AND REBOOT or REBOOT commands.

3. MEASUREMENT AND CALCULATION TIMES

3.1. SAMPLING TIMES

The sampling time of the current and voltage channels is 47000 samples per second.
The number of equivalent bits of the detected measurements is 13.5 bits

3.2. RESPONSE TIMES FOR RMS VALUES

We define the settling time as the time required for the RMS value to reach 99.5% of the full scale in response to an input from 0% to 100% of the full scale.

	DC measurements	**AC measurements**
Settling time	500 ms max	1000 ms max
Rise time	<250ms	<250ms
Fall time	<250ms	<250ms

3.3. RESPONSE TIMES OF THE ANALOGUE AND MODBUS OUTPUTS

Analogue Output Response Time: Typical 100ms (10-90%)
Modbus Response Time: Typical 5 ms

MEASUREMENT PRECISION AT 23°C

Type of measurement	***Precision at 23°C***
Current RMS	1%
RMS voltage	1%
Powers / Energies	1%
THD	1%
Analogue output voltage	0.2% +0.05V

4. DEVICE CONFIGURATION

ATTENTION!

TO CONFIGURE THE DEVICE USE THE EASY SETUP 2 SOFTWARE

Measurements provided by the device are subject to the user settings. The meaning of the device configuration registers that act on the electrical measurements performed is listed below (refer to the ModBUS registers at the end of the manual):

MODBUS REGISTER	DESCRIPTION	DEFAULT VALUE
USR_MULTV	Set TV multiplication factor	1
USR_MULTI	Set TA multiplication factor	1
USR_TVRATIO	Set TV ratio factor	1
USR_AMPCUTOFF	Current cut-off value (zero = disabled)	0
USR_VOLTCUTOFF	Current cut-off value (zero = disabled)	0

4.1. ANALOGUE AND DIGITAL OUTPUT

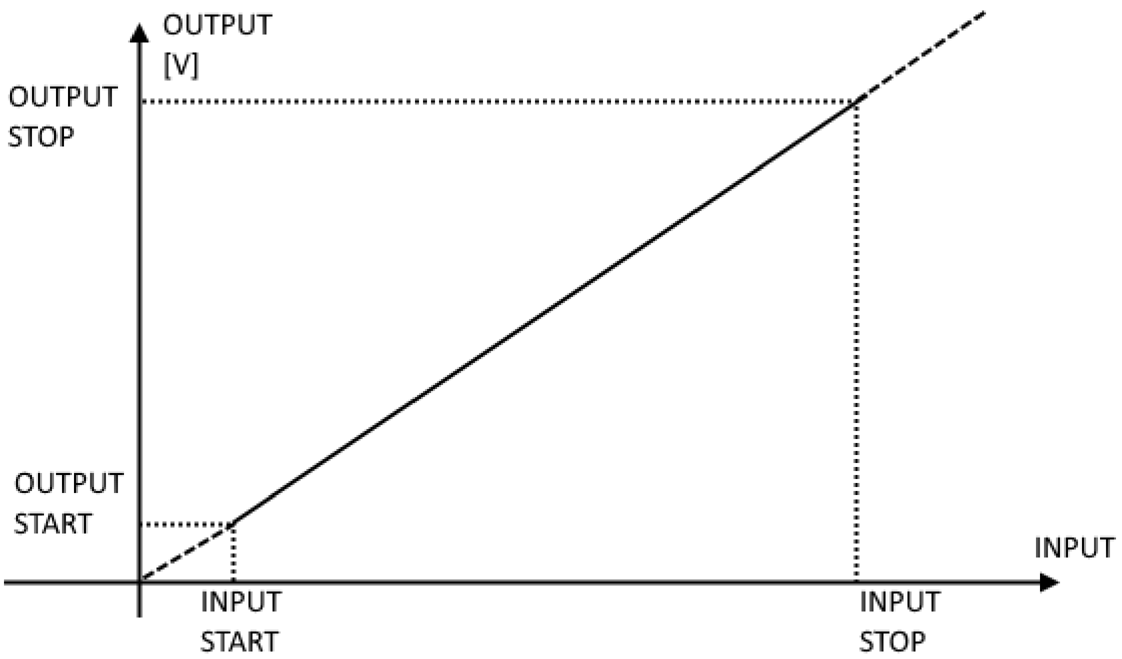
The analogue and digital outputs can be associated respectively to one of the instantaneous measurements provided between *VOLTAGE / CURRENT / ACTIVE P. / REACTIVE P. / APPARENT P./ FREQUENCY / PF / THD.*
Below you can see the configuration details separately for the analogue and digital output.

4.1.1. Analogue output

The analogue output is able to provide a voltage in the 0 ÷ 10V range; the analogue repetition of a measurement is performed by defining:

- A range of the input measurement (beginning and end of the measurement scale)
- A range of the output voltage to which the measurement will be associated (Start and end of the output scale)

The image below graphically illustrates the values described above



MODBUS REGISTERS RELATING TO THE ANALOGUE OUTPUT	
MODBUS REGISTER	**DESCRIPTION**
USR_ALARMTYPE_AO__DO	Select the type of measurement that can be combined [V, A, W, VAR, VA, Hz, PF, THD]
USRRO_AO_OUTPUTVOLTAGE	Value of the analogue voltage generated at the output
USR_AO_STARTINSCALE	Initial value of the measurement to be repeated [V, A, W, VAR, VA, Hz, PF, THD]
USR_AO_STOPINSCALE	Final value of the measurement to be repeated [V, A, W, VAR, VA, Hz, PF, THD]
USR_AO_STARTVOLTOUT	Minimum value of the output voltage associated with the start of the measurement scale
USR_AO_STOPVOLTOUT	Maximum value of the output voltage associated with the end of the measurement scale

4.1.2. *Digital output*

The digital output is used for signalling alarms that may occur for a given measurement associated with it combined or for generating pulses related to the measured energy(*).
Below is a table with a brief description of the fields necessary to configure the digital output:

MODBUS REGISTERS RELATING TO THE DIGITAL OUTPUT	
MODBUS REGISTER	**DESCRIPTION**
USR_ALARMTYPE_AO__DO	Select the type of measurement that can be combined [V, A, W, VAR, VA, Hz, PF, THD]
USR_ALARM_DO_BEHAVIOUR	Behaviour of the alarm: NONE / MAX / MIN / INSIDE WINDOW/ OUTSIDE WINDOW / PULSES GENERATION: 1000 – 100 – 10 - 1 PULSES/kWh, 100 – 10 -1 PULSES/MWh (*)
USR_DO_ALNORMALLYHIGH	Set output as normally high or low
USR_DO_LOWVAL	Minimum alarm threshold of the measurement [V, A, W, VAR, VA, Hz, PF, THD]
USR_DO_HIGHVAL	Maximum alarm threshold of measurement [V, A, W, VAR, VA, Hz, PF, THD]
USR_DO_HIST	Hysteresis value of the min/max thresholds [V, A, W, VAR, VA, Hz, PF, THD]
USR_DO_TIMER10MS	Time spent in the alarm situation. The alarm is confirmed when this time is exceeded (multiples of 10ms)
USRRO_DO_ALSTATUS	Current alarm signalling: NO ALARM , MIN – MAX threshold PREALARM – INSIDE WINDOW - OUTSIDE WINDOW , MIN – MAX ALARM – INSIDE WINDOW – OUTSIDE WINDOW. (For numerical values refer to the list of ModBUS registers)

(*): The pulse duration is 50ms ± 10ms, the pulse generation is relative to the active energy.

5. *USB CONNECTION and CONFIGURATION RESET*

The front USB port allows a simple connection to configure the device via the configuration software.
If it is necessary to restore the instrument's initial configuration, use the configuration software.

⚠ATTENTION!

WHEN THE USB PORT IS CONNECTED TO A CABLE THE COMMUNICATION ON THE RS485 PORT IS BLOCKED.
TO RESTORE COMMUNICATION ON THE RS485 PORT, PHYSICALLY DISCONNECT THE CABLE FROM THE USB PORT.

6. *FIRMWARE UPDATE*

It is possible to update the firmware through the USB port (for more information refer to the Easy Setup 2 software)

⚠ATTENTION!

WHEN THE USB PORT IS CONNECTED TO A CABLE THE COMMUNICATION ON THE RS485 PORT IS BLOCKED.

TO RESTORE COMMUNICATION ON THE RS485 PORT, PHYSICALLY DISCONNECT THE CABLE FROM THE USB PORT.

7. MODBUS COMMUNICATION PROTOCOL

The supported communication protocol is:

- Modbus RTU Slave (from both the RS485 and USB ports)

ATTENTION!

WHEN THE USB PORT IS CONNECTED TO A CABLE THE COMMUNICATION ON THE RS485 PORT IS BLOCKED.
TO RESTORE COMMUNICATION ON THE RS485 PORT, PHYSICALLY DISCONNECT THE CABLE FROM THE USB PORT.

For more information on these protocols, see the website:
http://www.modbus.org/specs.php.

7.1. SUPPORTED MODBUS FUNCTION CODES

The following ModBUS functions are supported:

- Read Holding Register (function 3)
- Write Single Register (function 6)
- Write Multiple registers (function 16)

ATTENTION!

All 32-bit values are contained in 2 consecutive registers

ATTENTION!

All 64-bit values are contained in 4 consecutive registers

ATTENTION!

Any registers with RW* (in flash memory) can be written up to about 10000 times
The PLC/Master ModBUS programmer must not exceed this limit

8. MODBUS REGISTER TABLE

The following abbreviations are used in the register tables:

MS	Most Significant
LS	Least Significant
MSBIT	Most Significant Bit
LSBIT	Least Significant Bit
MMSW	"Most" Most Significant Word (16bit)
MSW	Most Significant Word (16bit)
LSW	Least Significant Word (16bit)
LLSW	"Least" Least Significant Word (16bit)
RO	Read Only
RW*	Read-Write: REGISTERS IN FLASH MEMORY: WRITABLE ABOUT 10,000 TIMES MAXIMUM
RW**	Read-Write: REGISTERS THAT CAN BE WRITTEN ONLY AFTER WRITING THE "ENABLE WRITE CUSTOM ENERGIES = 49616" COMMAND
UNSIGNED 16 BIT	Integer register without sign that can take values from 0 to 65535
SIGNED 16 BIT	Integer register with sign that can take values from -32768 to +32767
UNSIGNED 32 BIT	Integer register without sign that can take values from 0 to 4294967296
SIGNED 32 BIT	Integer register with sign that can take values from -2147483648 to 2147483647
UNSIGNED 64 BIT	Integer register without sign that can take values from 0 to 18,446,744,073,709,551,615
SIGNED 64 BIT	Integer register with sign that can assume values from -2^63 to 2^63-1
FLOAT 32 BIT	32-bit, single-precision floating-point register (IEEE54) https://en.wikipedia.org/wiki/IEEE_754
BIT	Boolean register, which can take the values 0 (false) or 1 (true)

8.1. NUMBERING OF "0-BASED" OR "1-BASED" MODBUS ADDRESSES

According to the ModBUS standard the Holding Registers are addressable from 0 to 65535, there are 2 different conventions for numbering the addresses: "0-BASED" and "1-BASED".
For greater clarity, Seneca shows its register tables in both conventions.

ATTENTION!

CAREFULLY READ THE DOCUMENTATION OF THE MODBUS MASTER DEVICE IN ORDER TO UNDERSTAND WHICH OF THE TWO CONVENTIONS THE MANUFACTURER HAS DECIDED TO USE

8.2. NUMBERING OF MODBUS ADDRESSES WITH "0-BASED" CONVENTION

The numbering is:

HOLDING REGISTER MODBUS ADDRESS (OFFSET)	***MEANING***
0	FIRST REGISTER
1	SECOND REGISTER
2	THIRD REGISTER
3	FOURTH REGISTER
4	FIFTH REGISTER

Therefore the first register is at address 0.
In the following tables, this convention is indicated with ***"ADDRESS OFFSET".***

8.3. NUMBERING OF MODBUS ADDRESSES WITH "1 BASED" CONVENTION (STANDARD)

The numbering is that established by the Modbus consortium and is of the type:

HOLDING REGISTER MODBUS ADDRESS 4x	***MEANING***
40001	FIRST REGISTER
40002	SECOND REGISTER
40003	THIRD REGISTER
40004	FOURTH REGISTER
40005	FIFTH REGISTER

In the following tables this convention is indicated with ***"ADDRESS 4x"*** since a 4 is added to the address so that the first Modbus register is 40001.

A further convention is also possible where the number 4 is omitted in front of the register address:

HOLDING MODBUS ADDRESS WITHOUT 4x	MEANING
1	FIRST REGISTER
2	SECOND REGISTER
3	THIRD REGISTER
4	FOURTH REGISTER
5	FIFTH REGISTER

8.4. BIT CONVENTION WITHIN A MODBUS HOLDING REGISTER

A Modbus Holding Register consists of 16 bits with the following convention:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0

For instance, if the value of the register in decimal is
12300
the value 12300 in hexadecimal is:
0x300C

the hexadecimal 0x300C in binary value is:
11 0000 0000 1100

So, using the above convention, we get:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0

8.5. MSB and LSB BYTE CONVENTION WITHIN A MODBUS HOLDING REGISTER

A Modbus Holding Register consists of 16 bits with the following convention:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0

LSB Byte (Least Significant Byte) defines the 8 bits ranging from Bit 0 to Bit 7 included, we define MSB Byte (Most Significant Byte) the 8 bits ranging from Bit 8 to Bit 15 inclusive:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
BYTE MSB								BYTE LSB							

8.6. REPRESENTATION OF A 32-BIT VALUE IN TWO CONSECUTIVE MODBUS HOLDING REGISTERS

The representation of a 32-bit value in the ModBUS Holding Registers is made using 2 consecutive Holding Registers (a Holding Register is a 16-bit register). To obtain the 32-bit value it is therefore necessary to read two consecutive registers:
For example, if register 40064 contains the 16 most significant bits (MSW) while register 40065 contains the least significant 16 bits (LSW), the 32-bit value is obtained by composing the 2 registers:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
40064 MOST SIGNIFICANT WORD															

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
40065 LEAST SIGNIFICANT WORD															

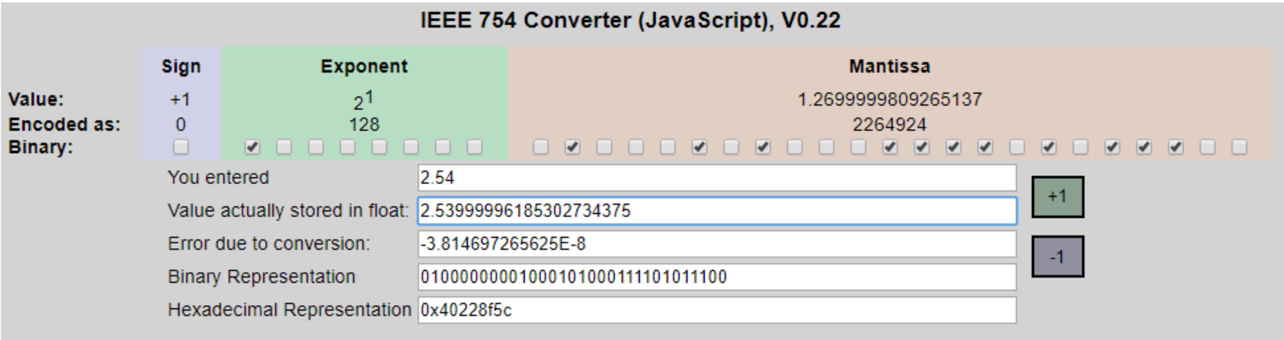
$$Value_{32bit} = Register_{LSW} + (Register_{MSW} * 65536)$$

In the reading registers it is possible to swap the most significant word with the least significant word, therefore it is possible to obtain 40064 as LSW and 40065 as MSW.

8.7. *TYPE OF 32-BIT FLOATING POINT DATA (IEEE 754)*

The IEEE 754 standard (https://en.wikipedia.org/wiki/IEEE_754) defines the format for representing floating point numbers.
As already mentioned, since it is a 32-bit data type, its representation occupies two 16-bit holding registers.
To obtain a binary / hexadecimal conversion of a floating point value it is possible to refer to an online converter at this address:

http://www.h-schmidt.net/FloatConverter/IEEE754.html



Using the last representation the value 2.54 is represented at 32 bits as:

0x40228F5C

Since we have 16-bit registers available, the value must be divided into MSW and LSW:

0x4022 (16418 decimal) are the 16 most significant bits (MSW) while 0x8F5C (36700 decimal) are the 16 least significant bits (LSW).

8.8. T-203PM-MU: MODBUS 4X HOLDING REGISTERS TABLE (FUNCTION CODE 3)

ADDRESS (4x)	OFFSET	REGISTER		DESCRIPTION	W/R	TYPE
40001	0	RESERVED				UNSIGNED 16 BIT
40002	1	ROM_FWREV		Device firmware revision		UNSIGNED 16 BIT
40003	2	USR_SLAVEID		Device slave ID	RW*	UNSIGNED 16 BIT
40004	3	RESERVED			RO	UNSIGNED 16 BIT
40005	4	COMMAND		Register for command execution: REBOOT=49568 WRITE TO FLASH=49600 CLEAR ENERGIES=45505 CLEAR MIN/MAX=49612 ENABLE WRITE CUSTOM ENERGIES=49616 WRITE CUSTOM ENERGIES AND REBOOT=49617	RO	UNSIGNED 16 BIT
40072	71	USR_MULTV	MSW	Multiplier for voltage [> 0]	RW*	FLOAT 32 BIT
40073	72		LSW			
40074	73	USR_MULTI	MSW	Multiplier for current [> 0]	RW*	FLOAT 32 BIT
40075	74		LSW			
40076	75	USR_TVRATIO	MSW	Voltage transformation ratio [> 0]	RW*	FLOAT 32 BIT
40077	76		LSW			
40078	77	USR_AMPCUTOFF	MSW	current cutoff, 0 = disabled [A]	RW*	FLOAT 32 BIT
40079	78		LSW			
40080	79	USR_VOLTCUTOFF	MSW	voltage cutoff, 0 = disabled [V]	RW*	FLOAT 32 BIT
40081	80		LSW			
40082	81	USR_STOPBIT_PARITY_BAUDRATE		Bit [12] NR StopBit 0 = 1 stop bit 1 = 2 stop bit Bit [8-9] Parity 0=UART_PARITY_NONE 1=UART_PARITY_EVEN 2=UART_PARITY_ODD Bit [0-7] LSB Baudrate: 0=2400 1=4800 2=9600 3=19200 4=38400 5=57600 6=115200	RW*	UNSIGNED 16 BIT

40083	82	USR_MEASURE		Selects the type of measure (0=AC or 1=DC)	RW*	UNSIGNED 16 BIT
40084	83	USR_ALARMTYPE_AO__DO		Measure associated with the analog output AO (8 Bit MSB) and digital DO (8 Bit LSB). The selectable measures are: 0=NONE 1=VOLTAGE 2=CURRENT 3=ACTIVE P. 4=REACTIVE P. 5=APPARENT P. 6=FREQUENCY 7=PF 8=THD	RW*	UNSIGNED 16 BIT
40085	84	USR_ALARM_DO_BEHAVIOUR		Type of DO ALARMS: 0=NONE 1=MAX 2=MIN 3=INSIDE WINDOW 4=OUTSIDE WINDOW Pulses (PLS): 5=1000 PLS/kWh 6=100 PLS/kWh 7=10 PLS/kWh 8= 1 PLS/kWh 9=100 PLS/MWh 10=10 PLS/MWh 11=1 PLS/MWh	RW*	UNSIGNED 16 BIT
40086	85	USR_AO_STARTINSCALE	MSW	Analog output: initial value of the input [V, A, W, VAR, VA, Hz, PF, THD]	RW*	FLOAT 32 BIT
40087	86		LSW			
40088	87	USR_AO_STOPINSCALE	MSW	Analog output: final value of the input [V, A, W, VAR, VA, Hz, PF, THD]	RW*	FLOAT 32 BIT
40089	88		LSW			
40090	89	USR_AO_STARTVOLTOUT	MSW	Analog output: minimum voltage [V]	RW*	FLOAT 32 BIT
40091	90		LSW			
40092	91	USR_AO_STOPVOLTOUT	MSW	Analog output: maximum voltage [V]	RW*	FLOAT 32 BIT
40093	92		LSW			
40094	93	USRRO_AO_OUTPUTVOLTAGE	MSW	Analog output: voltage generated at the output [V]	RO	FLOAT 32 BIT
40095	94		LSW			
40096	95	USR_DO_ALNORMALLYHIGH		Digital output: alarm state, 1 = normally high 0 = normally low	RW*	UNSIGNED 16 BIT
40097	96	USR_DO_LOWVAL	MSW	Digital output: lower alarm threshold [V, A, W, VAR, VA, Hz, PF, THD]	RW*	FLOAT 32 BIT
40098	97		LSW			
40099	98	USR_DO_HIGHVAL	MSW	Digital output: upper alarm threshold [V, A, W, VAR, VA, Hz, PF, THD]	RW*	FLOAT 32 BIT
40100	99		LSW			
40101	100	USR_DO_HIST	MSW	Digital output: alarm hysteresis value [V, A, W, VAR, VA, Hz, PF, THD]	RW*	FLOAT 32 BIT
40102	101		LSW			
40103	102	USR_DO_TIMER10MS		Digital output: time filter applied to the alarm (multiples of 10ms)	RW*	UNSIGNED 16 BIT

40104	103	USRRO_DO_ALSTATUS		Digital output: alarm status. 0=NONE 1=MAX_PREALARM 2=MIN_PREALARM 4=INTWIN_PRE_ALARM 8=EXTWIN_PRE_ALARM 256=MAX_ALARM 512=MIN_ALARM 1024=INTWIN_ALARM 2048=EXTWIN_ALARM	RO	UNSIGNED 16 BIT
40105	104	MISRMS_F_V	MSW	RMS voltage measurement [V]	RO	FLOAT 32 BIT
40106	105		LSW			
40107	106	MISRMS_F_I	MSW	RMS current measurement [A]	RO	FLOAT 32 BIT
40108	107		LSW			
40109	108	MISPOW_F_ACTIVE	MSW	Active power measurement [W]	RO	FLOAT 32 BIT
40110	109		LSW			
40111	110	MISPOW_F_REACTIVE	MSW	Reactive power measurement [VAR]	RO	FLOAT 32 BIT
40112	111		LSW			
40113	112	MISPOW_F_APPARENT	MSW	Apparent power measurement [VA]	RO	FLOAT 32 BIT
40114	113		LSW			
40115	114	MISEN_F_ACTIVE	MSW	Active energy measurement [Wh]	RO	FLOAT 32 BIT
40116	115		LSW			
40117	116	MISEN_F_REACTIVE	MSW	Reactive energy measurement [VARh]	RO	FLOAT 32 BIT
40118	117		LSW			
40119	118	MISEN_F_APPARENT	MSW	Apparent energy measurement [VAh]	RO	FLOAT 32 BIT
40120	119		LSW			
40121	120	MISFREQ_F	MSW	Frequency measurement [Hz]	RO	FLOAT 32 BIT
40122	121		LSW			
40123	122	MISPF_F	MSW	PF measurement PF (±0..1)	RO	FLOAT 32 BIT
40124	123		LSW			
40125	124	MISTHD_F	MSW	THD measurement (0..100%)	RO	FLOAT 32 BIT
40126	125		LSW			
40127	126	RESERVED				UNSIGNED 32 BIT
40128	127					
40129	128	RESERVED				UNSIGNED 16 BIT
40130	129	RESERVED				FLOAT 32 BIT
40131	130					
40132	131	RESERVED				FLOAT 32 BIT
40133	132					
40134	133	RESERVED				FLOAT 32 BIT
40135	134					
40136	135	RESERVED				FLOAT 32 BIT

40137	136					
40138	137	RESERVED				FLOAT 32 BIT
40139	138					
40140	139	MIN_MISRMS_F_V	MSW	Minimum RMS voltage measurement [V]	RO	FLOAT 32 BIT
40141	140		LSW			
40142	141	MAX_MISRMS_F_V	MSW	Maximum RMS voltage measurement [V]	RO	FLOAT 32 BIT
40143	142		LSW			
40144	143	MIN_MISRMS_F_I	MSW	Minimum RMS current measurement [A]	RO	FLOAT 32 BIT
40145	144		LSW			
40146	145	MAX_MISRMS_F_I	MSW	Maximum RMS current measurement [A]	RO	FLOAT 32 BIT
40147	146		LSW			
40148	147	MIN_MISPOW_F_ACTIVE	MSW	Minimum active power measurement [W]	RO	FLOAT 32 BIT
40149	148		LSW			
40150	149	MAX_MISPOW_F_ACTIVE	MSW	Maximum active power measurement [W]	RO	FLOAT 32 BIT
40151	150		LSW			
40152	151	MIN_MISPOW_F_REACTIVE	MSW	Minimum reactive power measurement [VAR]	RO	FLOAT 32 BIT
40153	152		LSW			
40154	153	MAX_MISPOW_F_REACTIVE	MSW	Maximum reactive power measurement [VAR]	RO	FLOAT 32 BIT
40155	154		LSW			
40156	155	MIN_MISPOW_F_APPARENT	MSW	Minimum apparent power measurement [VA]	RO	FLOAT 32 BIT
40157	156		LSW			
40158	157	MAX_MISPOW_F_APPARENT	MSW	Minimum apparent power measurement [VA]	RO	FLOAT 32 BIT
40159	158		LSW			
40160	159	MIN_MISFREQ_F	MSW	Minimum frequency measurement [Hz]	RO	FLOAT 32 BIT
40161	160		LSW			
40162	161	MAX_MISFREQ_F	MSW	Maximum frequency measurement [Hz]	RO	FLOAT 32 BIT
40163	162		LSW			
40164	163	MIN_MISPF_F	MSW	Minimum PF measurement (±0..1)	RO	FLOAT 32 BIT
40165	164		LSW			
40166	165	MAX_MISPF_F	MSW	Maximum PF measurement (±0..1)	RO	FLOAT 32 BIT
40167	166		LSW			
40168	167	MIN_MISTHD_F	MSW	Minimum THD measurement (0..100%)	RO	FLOAT 32 BIT
40169	168		LSW			
40170	169	MAX_MISTHD_F	MSW	Maximum THD measurement (0..100%)	RO	FLOAT 32 BIT
40171	170		LSW			
40172	171	RESERVED	MSW			UNSIGNED 32 BIT
40173	172		LSW			

40174	173	MISRMS_INT_V		RMS voltage measurement [V / 10]: (Example: 2300 -> 230.0 V)	RO	SIGNED 16 BIT
40175	174	MISRMS_INT_I		RMS current measurement [A/10]: (Example: 1000 -> 100.0 A)	RO	SIGNED 16 BIT
40176	175	MISPOW_INT_ACTIVE	MSW	Active power measurement [W/10]: (Example 1000 -> 100.0 W)	RO	SIGNED 32 BIT
40177	176		LSW			
40178	177	MISPOW_INT_REACTIVE	MSW	Reactive power measurement [VAR/10]: (Example 1000 -> 100.0 VAR)	RO	SIGNED 32 BIT
40179	178		LSW			
40180	179	MISPOW_INT_APPARENT	MSW	Apparent power measurement [VA/10]: (Example 1000 -> 100.0 VA)	RO	SIGNED 32 BIT
40181	180		LSW			
40182	181	EN_INT_ACTIVE	MMSW	Active energy measurement [Wh/10]: (Example 1000 -> 100.0 Wh)	RW**	UNSIGNED 64 BIT
40183	182		MSW			
40184	183		LSW			
40185	184		LLSW			
40186	185	EN_INT_REACTIVE	MMSW	Reactive energy measurement [VARh/10]: (Example 1000 -> 100.0 VARh)	RW**	UNSIGNED 64 BIT
40187	186		MSW			
40188	187		LSW			
40189	188		LLSW			
40190	189	EN_INT_APPARENT	MMSW	Apparent energy measurement [VAh/10]: (Example 1000 -> 100.0 VAh)	RW**	UNSIGNED 64 BIT
40191	190		MSW			
40192	191		LSW			
40193	192		LLSW			
40194	193	MIS_INT_FREQ		Frequency measurement [Hz/10]: (Example 500 -> 50.0 Hz)	RO	UNSIGNED 16 BIT
40195	194	MIS_INT_PF		PF measurement [±0..1000]: (Example 755 -> 0.755)	RO	SIGNED 16 BIT
40196	195	MIS_INT_THD		THD measurement [0..100% / 10]: (Example 800 -> 80%)	RO	SIGNED 16 BIT
40197	196	MIN_MISRMS_INT_V		Minimum RMS voltage measurement [V/10]: (Example 2300 -> 230.0 V)	RO	SIGNED 16 BIT
40198	197	MAX_MISRMS_INT_V		Maximum RMS voltage measurement [V/10]: (Example 2300 -> 230.0 V)	RO	SIGNED 16 BIT
40199	198	MIN_MISRMS_INT_I		Minimum RMS current measurement [A/10]: (Example 1000 -> 100.0 A)	RO	SIGNED 16 BIT
40200	199	MAX_MISRMS_INT_I		Maximum RMS current measurement [A/10]: (Example 1000 -> 100.0 A)	RO	SIGNED 16 BIT
40201	200	MIN_MISPOW_INT_ACTIVE	MSW		RO	SIGNED 32 BIT

40202	201		LSW	Minimum active power measurement [W/10]: (Example 1000 -> 100.0 W)		
40203	202	MAX_MISPOW_INT_ACTIVE	MSW	Maximum active power measurement [W/10]: (Example 1000 -> 100.0 W)	RO	SIGNED 32 BIT
40204	203		LSW			
40205	204	MIN_MISPOW_INT_REACTIVE	MSW	Minimum reactive power measurement [VAR/10]: (Example 1000 -> 100.0 VAR)	RO	SIGNED 32 BIT
40206	205		LSW			
40207	206	MAX_MISPOW_INT_REACTIVE	MSW	Maximum reactive power measurement [VAR/10]: (Example 1000 -> 100.0 VAR)	RO	SIGNED 32 BIT
40208	207		LSW			
40209	208	MIN_MISPOW_INT_APPARENT	MSW	Minimum apparent power measurement [VA/10]: (Example 1000 -> 100.0 VA)	RO	SIGNED 32 BIT
40210	209		LSW			
40211	210	MAX_MISPOW_INT_APPARENT	MSW	Maximum apparent power measurement [VA/10]: (Example 1000 -> 100.0 VA)	RO	SIGNED 32 BIT
40212	211		LSW			
40213	212	MIN_MIS_INT_FREQ		Minimum frequency measurement [Hz/10]: (Example 500 -> 50.0 Hz)	RO	SIGNED 16 BIT
40214	213	MAX_MIS_INT_FREQ		Maximum frequency measurement [Hz/10]: (Example 500 -> 50.0 Hz)	RO	SIGNED 16 BIT
40215	214	MIN_MIS_INT_PF		Minimum PF measurement [±0..1000]: (Example 755 -> 0.755)	RO	SIGNED 16 BIT
40216	215	MAX_MIS_INT_PF		Maximum PF measurement [±0..1000]: (Example 755 -> 0.755)	RO	SIGNED 16 BIT
40217	216	MIN_MIS_INT_THD		Minimum THD/10 measurement (0..100%): (Example 800 -> 80.0%)	RO	SIGNED 16 BIT
40218	217	MAX_MIS_INT_THD		Maximum THD/10 measurement (0..100%): (Example 800 -> 80.0%)	RO	SIGNED 16 BIT

By adding offset 1000 to the register it is possible to obtain the 32-bit swapped values, for example the floating point current measurement register:

40107	**106**	**MISRMS_F_I**	**MSW**	**Current measurement RMS [A]**	**RO**	**FLOAT 32 BIT**
40108	107		LSW			

The same register can also be found at 41107-41108 swapped:

41107	**1106**	**MISRMS_F_I**	**LSW**	**Current measurement RMS [A]**	**RO**	**FLOAT 32 BIT**
41108	1107		MSW			