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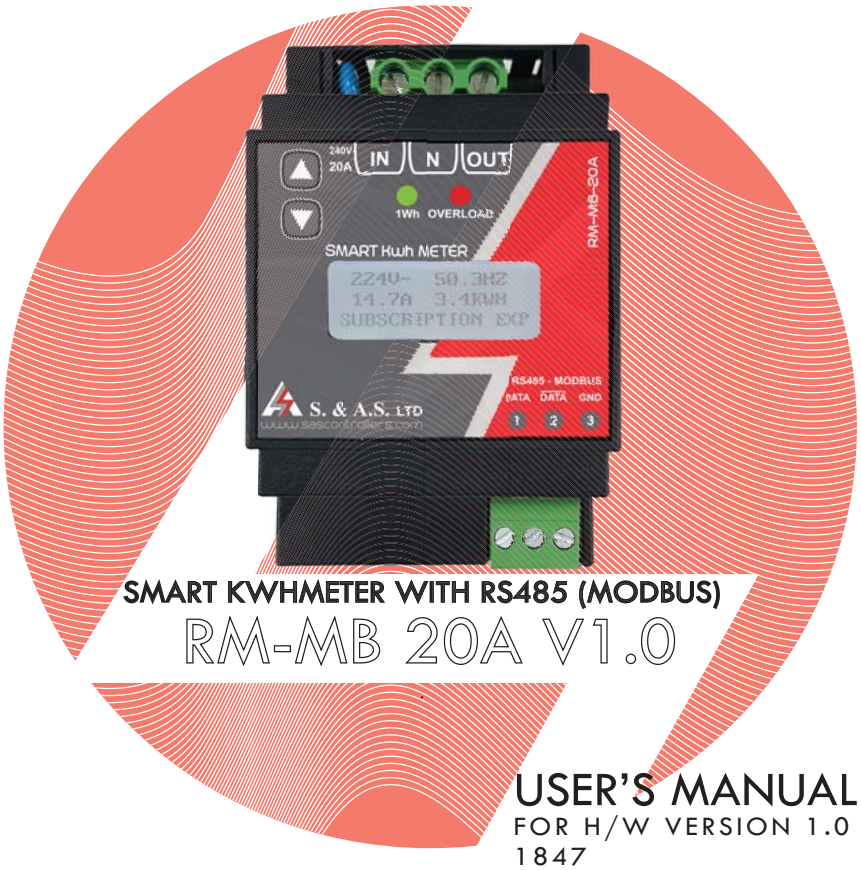


SMART KWHMETER WITH RS485 (MODBUS)

RM-MB 20A V1.0

USER'S MANUAL

FOR H/W VERSION 1.0

1847

1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The RM-MB is a new power metering device that measures and displays the consumed energy in KWh, as well as the AC Voltage, frequency and current.

The RM-MB can offer a solution for power providers (Utilities and private Gensets) to manage their customer base with pre-paid or post-paid bills. The billing type, KWh balance, power cut-off time and all subscriber related parameters are displayed on the LCD display and can be accessed and configured from the menu.

These parameters can also be remotely accessed via RS485 port with any Modbus enabled host.
For power providers that do not wish to use the RS485 Modbus data connection, the QR code embedded is the most practical solution to read the meters.
A relay is provided to cut power from the subscriber when needed.

1.2 FEATURES

- In accordance to IEC62052-11, IEC62053-2x specification
- LCD display for energy in KWh, AC voltage, frequency, current, subscription status
- QR code containing the subscriber name and the current KWh count.
- Multi drop RS485 using ModBus protocol
- True RMS measurement
- Over current monitoring
- Over / Under Voltage protection
- Over / Under Frequency protection
- Menu access to all parameters
- Pre-settable thresholds and delays for over current detection
- Wide operating voltage range
- Wiring through plug in connector
- Case conforms to DIN 43 880 of the British Standard
- Fits onto 35mm symmetric DIN rail to BS5584 (EN 50 022, DIN 46277-3)
- Humidity class, DIN 40040
- Environmental protection, DIN 40 050

1.3 OPERATION

In addition to measuring and displaying the consumed energy, voltage, frequency and current, the RM-MB can function as an over current Relay if the Over Current control is enabled from the menu. Following is a description of the operation:
On start-up, the output relay is energized. This condition persists until the current goes above the High Current (%) for High Current Delay or above the Very High Current (%) for 0.5 seconds (Status page shows OVER CURRENT). Once the over current status occurs, the relay is de-energized. The relay is energized again after Delay between Trials.
If the current remains above High Current (%) after Total Number of attempts, the relay is energized again after the elapse time of the sleep delay set in SLEEP Delay parameter.

2. TECHNICAL SPECIFICATIONS

Operating voltage	90 to 285 Volts
Auxiliary contact rating	20A 250V AC
Operating temperature	0 to 70°C
Data sampling rate	33 samples/sec

3. DISPLAY DESCRIPTION

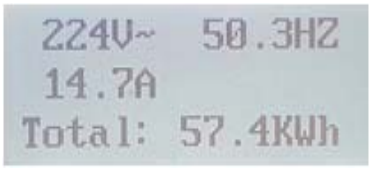
3.1 LEDS DESCRIPTION

- The Green LED blinks every 1wh
- The Red LED is ON when a supply fault is detected (over current, over / under voltage, over / under frequency)
- Red LED blinking, while the load is engaged, indicates that a pre-alarm exists. (over current, over / under voltage, over / under frequency)
- Red LED blinking, while the load is dis-engaged, indicates that normal supply voltage / frequency is detected and that the "on delay" is counted to engage the load.

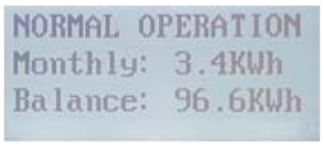
3.2 MEASUREMENTS DISPLAY

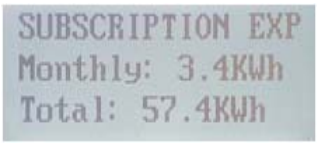
A graphical LCD display is used to display 3 pages:

- Home page showing the voltage, the frequency, the current and the total energy consumed in KWH.

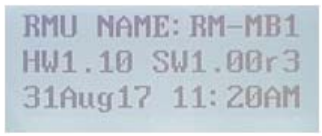


- Page showing the RM-MB status (the normal / overload status or the subscription status for prepaid customers), the monthly consumed energy and the remaining KWh balance (for prepaid customers).





- Page showing the RM-MB name, the hardware version (HW) and the firmware version along with the revision number (SW),the date and the time



- Page showing a QR-code holding the subscriber name and the current KWh count. (refer to section 3.3)

3.3 QR CODE DESCRIPTION

For power providers that do not wish to use the **RS485 Modbus** data connection, the QR is the most practical solution to read the meters.
The **RM-MB-20A** has now an additional page that shows a **QR code**. The QR code has the information of the subscriber name and the current **KWH count.**
An **Android** mobile phone with App provided by S. & A.S. is used to scan the QR codes of all subscribers. This is simply done by running the App and pointing the camera of the phone to the RM-MB-20A display showing the **QR code.** The info is captured in less than 1 second and it is displayed on the phone. By pointing the phone to another meter, this process is repeated and the next meter is read. As many meters as needed can be read.
The information collected on the mobile phone is downloaded by a desktop application provided by S. & A.S. once the mobile phone is connected to the PC using a USB cable.

3.4 MENU DESCRIPTION

Follow the steps described below to access the menu:

1. Press the "Down" push button for three seconds. You will be prompted to enter a Five-digit code.
2. Use the "Up" push button to scroll to the desired number.
3. Press the "Down" push button. "*" replaces the first digit.
4. Repeat steps 2 and 3 until all digits are entered.
5. If the entered password is valid, the user will have access to the menu below.

Notes:

- If no push button is pressed for 25 seconds while in the menu, the system will automatically exit the menu.
- If no push button is pressed for 10 seconds while editing a parameter in the menu, the system will automatical exit the edit mode.
- Use the "Up" push button to highlight the submenu (or parameter).
- Once a Submenu (or parameter) line is highlighted, it can be accessed by pressing the "Down" push button.
- Once a parameter is in edit mode, the "Up" push button is used to increment the parameter and the "Down" push button is u

What you see on the display	Description	Visibility Condition	Range	Default Value
User Settings	User settings sub menu	N/A	N/A	N/A
RMU Settings	RMU Settings sub menu	N/A	N/A	N/A
Modbus	Modbus sub menu	N/A	N/A	N/A
Renew Subsc.	Renew Subscription	N/A	N/A	N/A
Exit	Exit menu	N/A	N/A	N/A

3.4.1 USER SETTINGS SUBMENU

What you see on the display	Description	Visibility Condition	Range	Default Value
Date	System date	N/A	N/A	N/A
Time	System time	N/A	N/A	N/A
RMU Name	RMU Description Name	N/A	ASCII Characters	XXXXXX
Customer Amp	Customer max Amp subscription	N/A	1 to 20A	10A
Billing	Billing Type	N/A	Postpaid, Prepaid	Postpaid
KWH Balance	KWH Balance	Billing type set to prepaid	0000 to 9999	0
Cut-Off Ena.	Cut-off enabled	N/A	N, Y	N
Cut-Off Day	Cut-off day (in dd/mm/yy format)	Cut-off enabled	N/A	N/A
Cut T.	Cut-off type	Cut-off enabled and Billing type set to postpaid	Immediate or Interval	Interval
Time S.	Cut-off start time	Cut-off enabled and Billing type set to postpaid and Cut-off type set to interval	N/A	9:00 am
Time E.	Cut-off end time	Cut-off enabled and Billing type set to postpaid and Cut-off type set to interval	N/A	2:00 pm
Grace period	Grace period in days	Cut-off enabled and Billing type set to postpaid and Cut-off type set to interval	0 to 20 days	1
Skip Saturday	No cut-off on Saturday	Cut-off enabled and Billing type set to postpaid and Cut-off type set to interval	N, Y	Y
Skip Sunday	No cut-off on Sunday	Cut-off enabled and Billing type set to postpaid and Cut-off type set to interval	N, Y	Y

3.4.2 RMU SETTINGS SUBMENU

What you see on the display	Description	Visibility Condition	Range	Default Value
OverCurrent En.	Over current control enabled	N/A	N, Y	Y
NormalC del	Delay in seconds before considering a valid Current reading in order to reset the number of attempts	Over current enabled	0 to 999”	30”
High C.	High Current (% from the Customer Amp)	Over current enabled	0 to 150%	105%
High C. del	High Current Delay in seconds	Over current enabled	0 to 999”	10”
VHigh C.	Very High Current (% from the Customer Amp)	Over current enabled	0 to 150%	110%
Trials del	Delay between Trials in seconds before reaching the number of attempts	Over current enabled	0 to 999”	60”
Sleep del	Delay between Trials in seconds after reaching the number of attempts	Over current enabled	0 to 999”	120”
Number Att.	Number of attempts	Over current enabled	N, 1 to 20	3
Over Volt.	Over voltage threshold setting in volts Set to 0 to disable this feature.	N/A	N, 1 to 999V	260 V
OVolt del.	Over voltage response delay in seconds	N/A	0 to 999”	2”
Under Volt.	Under voltage threshold setting in volts Set to 0 to disable this feature.	N/A	N, 1 to 999V	160 V
UVolt del.	Under voltage response delay in seconds	N/A	0 to 999”	6”
Over Freq.	Over frequency threshold setting in Hz Set to 0 to disable this feature	N/A	N, 1 to 999Hz	N
OFreq del.	Over frequency response delay in seconds	N/A	0 to 999”	2”
Under Freq.	Under frequency threshold setting in Hz Set to 0 to disable this feature	N/A	N, 1 to 999Hz	N
UFreq del.	Under frequency response delay in seconds	N/A	0 to 999”	5”
On delay	ON delay setting in seconds	N/A	N, 1 to 999”	10”
Mx Eng.Del	Maximum engagement delay in second. A random delay will be generated based on this parameters, it will be between 0.0 seconds and the value assigned to this parameter	N/A	N, 1 to 999”	N

3.4.3 MODBUS SUBMENU

What you see on the display	Description	Visibility Condition	Range	Default Value
Enabled	Modbus Enabled	N/A	N, Y	Y
Slave ID	RM-MB Modbus ID	Modbus Enabled	1 to 247	2
Baudrate	Modbus Baud Rate	Modbus Enabled	0:9600 1:14400 2:19200 3:28800 4:38400 5:56000 6:57600 7:115200	9600
Parity	Modbus parity	Modbus Enabled	0: None 1: Odd 2: Even	None
Stop Bits	Modbus stop bits	Modbus Enabled	1 1.5 2	1 stop bit
Mode	Modbus mode	Modbus Enabled	RTU ASC	RTU

4. RS485 MODBUS REGISTERS DESCRIPTION

All the RM-MB registers can be accessed via the RS485 port:

4.1 MEASUREMENTS READINGS

Name	Description	Type	Address	Number of Registers	Access
Voltage	AC Voltage (V)	Input register	30001	1	R
Current	AC Current (A) *10 format (i.e. if this register value is 92 this means that the Current is 9.2A)	Input register	30002	1	R
Frequency	Frequency (Hz) *10 format (i.e. if this register value is 504 this means that the frequency is 50.4Hz)	Input register	30003	1	R
Energy	Current Consumed Energy (in wh)	Input register	(30004:MSB 30005:LSB)	2	R
Output Relay	Output Relay status 0: Open 1: Closed	Input register	30006	1	R
Total Energy	Total Consumed Energy (wh)	Input register	(30007:MSB 30008:LSB)	2	R
Subscription Status	Subscription Status: 0: Valid 1: Invalid but within grace period 2: Invalid and cut-off applied	Input register	30009	1	R

4.2 SETTINGS

The password should be entered before a read/write access to any other register.

Name	Description	Type	Address	Number of Registers	Access
Enter Password	Used to enter the password required to be able to view/change the parameters	Holding register	40001	1	W
Date	System date	Holding register	40002	3	R/W
Time	System Time	Holding register	40005	3	R/W
RMU Name	RMU Description Name	Holding register	40047	6	R/W
Customer Amp	Customer max Amp subscription	Holding register	40008	1	R/W
Billing Type	Billing Type	Holding register	40009	1	R/W
KWh Balance	KWh Balance	Holding register	40010	1	R/W
Cut-Off Enabled	Cut-off enabled	Holding register	40011	1	R/W
Cut-Off Day	Cut-Off Day of the month	Holding register	40012	3	R/W
Cut-Off Type	Cut-off type	Holding register	40016	1	R/W

Name	Description	Type	Address	Number of Registers	Access
Cut-Off start time	Cut-off start time	Holding register	40017	3	R/W
Cut-Off end time	Cut-off end time	Holding register	40020	3	R/W
Grace period	Grace period in days	Holding register	40023	1	R/W
Skip Saturday	No cut-off on Saturday	Holding register	40024	1	R/W
Skip Sunday	No cut-off on Sunday	Holding register	40025	1	R/W
Over Current Enabled	Over Current enabled	Holding register	40026	1	R/W
Normal Current Delay	Delay in seconds before considering a valid Current reading in order to reset the number of attempts	Holding register	40027	1	R/W
High Current	High Current (% from the Customer Amp)	Holding register	40028	1	R/W
High Current Delay	High Current Delay in seconds	Holding register	40029	1	R/W
Very High Current	Very High Current (% from the Customer Amp)	Holding register	40030	1	R/W
Delay between trials	Delay between Trials in seconds before reaching the number of attempts	Holding register	40032	1	R/W
Sleep delay	Delay between Trials in seconds after reaching the number of attempts	Holding register	40033	1	R/W
Number of attempts before sleep delay	When the current reaches the High/Very High Current Limit, if the current number of attempts is less than the total number of attempts, the "delay between trials" is counted before retrying. If the current number of attempts reaches the total number of attempts the "Sleep delay" is counted before retrying.	Holding register	40034	1	R/W
Over Volt.	Over voltage threshold setting in volts Set to 0 to disable this feature.	Holding register	40035	1	R/W
OVolt del.	Over voltage response delay in seconds	Holding register	40036	1	R/W
Under Volt.	Under voltage threshold setting in volts Set to 0 to disable this feature.	Holding register	40037	1	R/W
UVolt del.	Under voltage response delay in seconds	Holding register	40038	1	R/W
Over Freq.	Over frequency threshold setting in Hz Set to 0 to disable this feature	Holding register	40039	1	R/W
OFreq del.	Over frequency response delay in seconds	Holding register	40040	1	R/W
Under Freq.	Under frequency threshold setting in Hz Set to 0 to disable this feature	Holding register	40041	1	R/W

Name	Description	Type	Address	Number of Registers	Access
UFreq. del	Under frequency response delay in seconds	Holding register	40042	1	R/W
On delay	ON delay setting in seconds	Holding register	40043	1	R/W
STPM Timeout	STPM Timeout delay	Holding register	40044	1	R/W
RMU Name	RMU Description Name	Holding register	40046	6	R/W
Modbus ID	RM-MB Modbus ID	Holding register	40052	1	R/W
Modbus BaudRate	Modbus over RS485 Baud Rate: 0:9600 1:14400 2:19200 3:28800 4:38400 5:56000 6:57600 7:115200	Holding register	40053	1	R/W
Modbus parity	Modbus over RS485 parity: 0: none 1: Odd 2: Even	Holding register	40054	1	R/W
Modbus stop bits	Modbus over RS485 stop bits: 0: 1 stop bit 1: 1.5 stop bits 2: 2 stop bits	Holding register	40055	1	R/W
Modbus mode	Modbus mode: 0: RTU 1: ASCII	Holding register	40056	1	R/W

4.3 COMMANDS

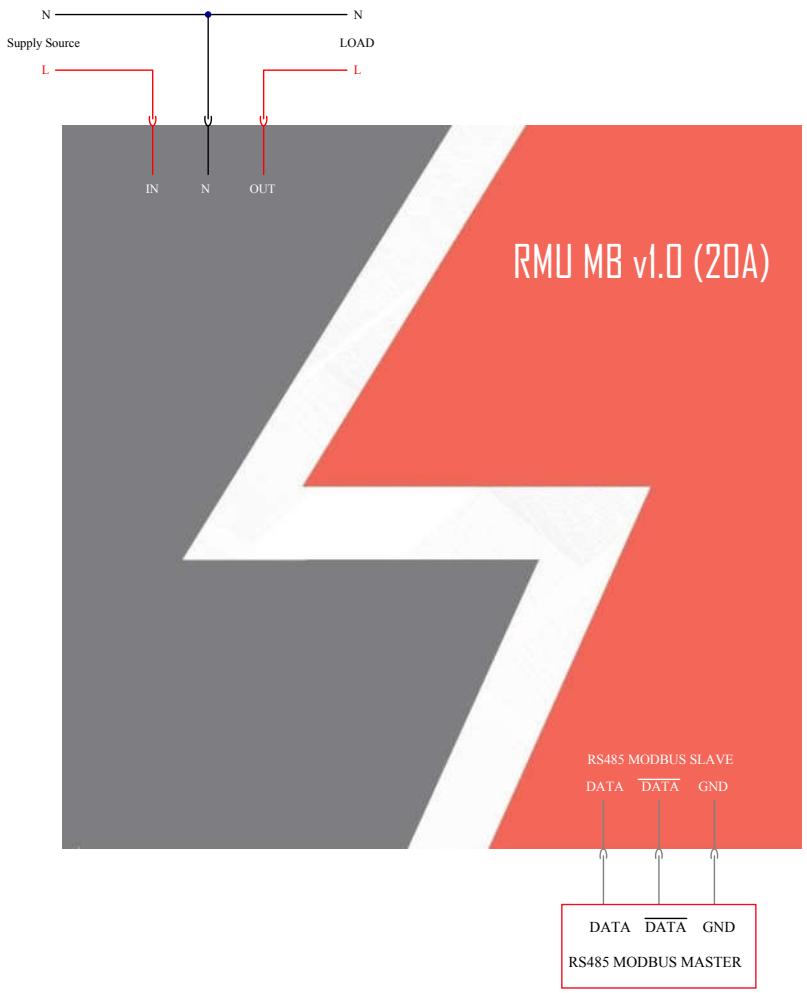
Password must be entered before using the commands

Name	Description	Type	Address	Size(bits)	Access
Open Relay Control	When set to 1 it forces the relay to open independently of the control, when set to 0 the relay will be controlled back by the RM-MB Over Current control system	Output coil	1	1	W
Restart	When set to 1, forces the RM-MB to restart	Output coil	2	1	W
Renew Subscription	When set to 1, Renew the subscription	Output coil	3	1	W

5. APPENDIX A

This appendix contains all wiring diagrams relevant to assembling the board in a panel.

RMU_MB v1.0 (20A) Wiring



RMU_MB v1.0 (20A) Wiring	**S.&A.S. Ltd.** **Jieh Chouf** **Lebanon** **support@sascontrollers.com**
	RMU_MB v1.0 (20A) WIRING DIAG
Size: B	FCSM No.: -
DWG No.: ATS12a.Sch	Rev: 1
Scale: -	Sheet: 1 of 1

WHICH GENERATOR CONTROLLER IS RIGHT FOR YOU?

	Smart Turbo v1.2	Smart GT v1.0	Surf LT v1.0	Surf 1.2c
				
Automatic engine starting and stopping	✓	✓	✓	✓
Automatic mains failure	—	—	✓	✓
User Access	3 Push Buttons	3 Push Buttons	8 Push Buttons	5 Push Buttons
Dimensions (WidthxHeightxDepth)	72x72x32 mm	72x72x32 mm	208x160x32 mm	196x144x33 mm
Panel cut out	68.5x68.5 mm	68.5x68.5 mm	184x139 mm	182x137 mm
Number of Phases	1 Phase	1 Phase	1phase/3Phases	1phase/3Phases
Digital Outputs	4	4	6	10
Digital Inputs	5	5	5	5
Analog Inputs	—	2	4	4
Voltage Measurement	1 L-N	1 L-N	3 L-N, 3L-L	3 L-N, 3L-L
Frequency Measurement	✓	✓	✓	✓
Current Measurement	—	✓	✓	✓
Power Measurement	—	✓	✓	✓
Energy Measurement	—	✓	✓	✓
Run hours counter	✓	✓	✓	✓
Oil run hours counter	✓	✓	✓	✓
Over / Under voltage alarm and shut down	✓	✓	✓	✓
Over / Under frequency alarm and shut down	✓	✓	✓	✓

	Smart Turbo v1.2	Smart GT v1.0	Surf LT v1.0	Surf 1.2c
				
Overload alarm and shut down	—	✓	✓	✓
Low oil pressure alarm and shut down	✓	✓	✓	✓
High engine temperature alarm and shut down	✓	✓	✓	✓
Battery alarm	✓	✓	✓	✓
Dynamo fail alarm and shut down	✓	✓	✓	✓
Low coolant level alarm and shut down	✓	✓	✓	✓
Low fuel alarm and shut down	✓	✓	✓	✓
Tank Empty alarm and shut down	—	—	✓	✓
Automatic shutdown on fault condition	✓	✓	✓	✓
Solid-state short circuit protected outputs	✓	✓	✓	✓
Galvanic isolation for utility and Genset AC inputs	—	—	—	✓
Oscilloscope	—	—	✓	—
Faults Logging	—	Up to 10 faults	Up to 15 faults	Up to 100 faults

	Smart Turbo v1.2	Smart GT v1.0	Surf LT v1.0	Surf 1.2c
				
EVENTS AND DATA LOGGING	—	—	—	✓
USB interface	✓	✓	✓	✓
CAN Module (J1939 Protocol)	—	—	Optional	✓
Ethernet Module	—	—	—	✓
RS485 (Modbus)	—	—	Optional	✓
MicroSD Card	—	—	—	✓
SMS via GSM Module (RS232 Interface)	—	—	—	✓
On-site Firmware Upgrade	✓	✓	✓	✓
Remote Online Firmware Upgrade	—	—	—	✓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