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M1M 12

Warning! Installation by person with electrotechnical expertise only.

1. FEATURES

- STAR (Wye)/ DELTA/1 Phase Programmable
- Universal Auxiliary (80 - 300 VAC / DC) supply
- PT ratio / CT ratio programmable including CT secondary
- True RMS measurement
- Active energy, positive energy accumulation & reverse Lock
- 'OLD' register to store the previously cleared energy value
- User configurable (Editable) password
- Simultaneous sampling of Volts & Amps
- Universal Voltage Input: 50 - 550 VAC and Current Secondary (0.05A to 5A) with overload of 20%
- Energy selection: Wh / VAh
- Simultaneous sampling of Volts & Amps

2. UNIQUE FEATURES

- 3/2 row, 6 digit displays on each row for better readability
- Two sure selectable parameters from basic (VLL, VLN, A, Hz) or W, VA, or PF
- Auto scrolling in both upward and downward direction
- Auto-scaling of kilo, mega & giga decimal point
- Energy display programmable-counter based or resolution based. Energy resetting at 999999KVAh*Multiplication factor

3. KEY FUNCTIONS

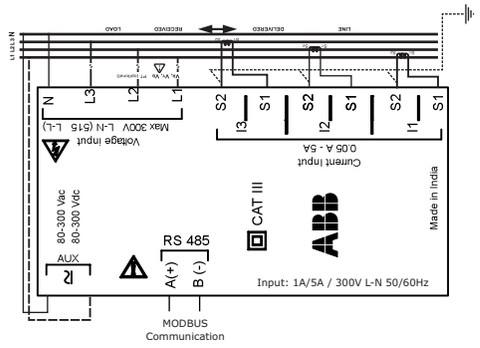
Key	In SET (Programming) mode	In RUN (Measurement) mode
UP	To select the value and accept the value (it act as a Right key in programming mode)	Up scroll pages to look at different parameters
DOWN	To edit the value/ system type down -ward in edit mode and scroll through the parameters	To scroll pages to look at different parameters

4. LED INDICATIONS

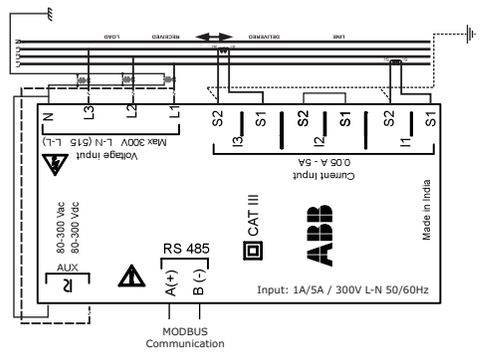
LED status	Meaning
KILO - ON	Kilo
MEGA - ON	Mega
KILO & **M**EGA - ON	Giga
KILO & **M**EGA - OFF	Direct reading
Minus (**-**) ON	Lag/Minus
Minus (**-**) OFF	Lead/Plus
Old - ON	Old Readings (Cleared readings)
⎍⎍- Blink	Reserved Pulse LED

5. WIRING DIAGRAM

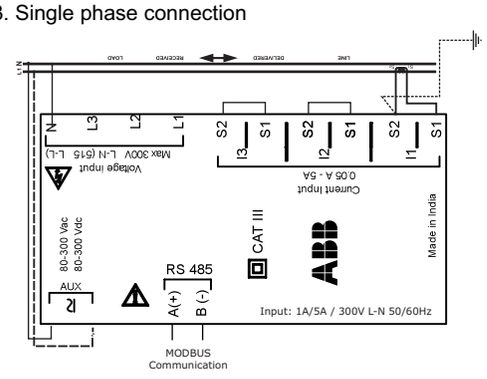
5.1. Star connection (3E) 3 phase 4 wire system



5.2. Delta connection (2E) 3 phase 3 wire system



5.3. Single phase connection



Note: Wiring should be in accordance with the National Electrical Code and/or the Canadian Electrical Code, Part I.

For DC AUX Voltage, +/-ve can be connected anyway.

6. DISPLAY OF PARAMETERS

DISPLAY	MEANING
LL	Voltage line to line
Ln	Voltage line to Neutral
ry	Voltage L1L2 Phase
yb	Voltage L2L3 Phase
br	Voltage L3L1 Phase
A	Current Average
F	Frequency
UA	Total VA
Ut	Watts Total
PF	Power Factor
Uh *	Active Energy Received
Ld.Hr/Lh	Load Hour
On.t	On Hours/Time
or/y/b	Power Factor R Phase/Y Phase/B Phase
CLr	Clear
Sr/y/b	VA - L1 Phase/L2 Phase/L3 Phase
P	Parity
Id	Identification number

* Conversions of alphabets used U (W)

WARNING: When using a modem interface between the host computer and any remote device(s), ensure that the host computer is not used to set the BAUD RATE parameter of any selected device outside the working range of the modem. Doing so will cause that meter to cease communicating. Re-establishing communication with that meter is possible through performing the following:

1. Reset the baud rate of the remote device from its front panel to a value within the working range of the modem.
2. Set the computer to communicate at the baud rate at which the remote device has been set to communicate.

7. CONFIGURE (SETUP MODE)

Step	Actions	Display Reads	Range/Options/ Comments
1	Press UP & DOWN keys together to enter SETUP	Row 1: 0000 with first digit "0" blinking Row 2: SEtCLr (SETUP, CLEAR) Displayed.	Press DOWN key to decrement the first digit to '9' sequentially come to digit '.1' Default password '1000'.
2	Press UP key four times to accept the password.	Row 1: CLr (Clear) Row 2: Blank Row 3: blank (throughout the setup)	Defines the clearing option for the meter.
3	Press DOWN key to navigate	Row 1: StAr Row 2: ELEn (Element)	Defines the power system configuration. Options: STAR / DELTA/ 1 Phase
4	Press UP key to select STAR/DELTA/ 1. PHASE	Row 1: StAr Blinks StAr/ dELt/1.Phase Row 2: ELEn	(selected mode blinks) For selection press down key
5	Press UP key to accept STAR/ DELTA/1.PHASE	Row 1: selected mode Row 2: ELEn	
6	Press DOWN key to navigate next parameter	Row 1: xxxx (415.0 -default/ factory set) Row 2: PPrI (PT Primary)	
7	Press UP key to set the PT primary value	Row 1: First digit blinking can be edited using DOWN key. Row 2: PPrI	
8	Press UP key to accept the edited value for first digit.	Row 1: Second digit blinking, can be edited using DOWN key. Press UP key to accept the edited value. Continue the same method till fourth digit. Row 2: PPrI	Program Range for PT Primary : 100V to 999kV
9	Press UP key	Row 1: Decimal point blinking. Can be set at appropriate location using DOWN key. Ascertain the correct scale (Kilo/ Mega/Giga) is selected. Kilo/ Mega/Giga is placed on the right hand side of the display by Letter K/M/G. Row 2 : PPrI	Eg: To set 11.00kV Set first four digits (1100)as explained above keep pressing DOWN key to place decimal point at appropriate location USE UP/DOWN KEY Letter K/M/G will indicate the Kilo/ Mega/Giga. Press UP key to accept the edited value.
10	Press DOWN key to go to the next parameter.	Row 1: xxxx (415.0 -default/ factory set) Row 2: PSEC (PT Secondary). Follow the procedure as described in steps 7 to 9.	Range: 50V to 550V If value set is above the limit, display returns to the maximum PT sec value.
11	Press DOWN key	Row 1: xxxx (5.000-default/ factory set) Repeat steps 7 to 9 to change the settings. Row 2 : CPrI (CT Primary)	Program Range for CT Primary 0.5A to 99kA
12	Press DOWN key	Row 1: xxxx (5.000 -default/ factory set) Row 2: CSEC (CT Secondary). Repeat steps 7 to 9	Range: 0.5A to 6A
13	Press DOWN key	Row 1: no Row 2: rEvL Revers Lock	Reverse lock - blocks energy accumulation in case the CT polarity reverse Option : NO/YES
14	Press DOWN key	Row 1: UECH (Vector harmonics) Row 2: VASL (Method of VA Selection).	Arithmetic (Arth), (Vector harmonics (UEC.H). Vector (UECt) can be selected using DOWN key.
15	Press DOWN key	Row 1: xxxx (9600 default/ factory set) Row 2: bAUd (baud rate) communication speed.	Defines the baud rate. Option :2400,4800, 9600,19.20k
16	Press DOWN key	Row 1: EUEn Row 2: PrtY	EUEn (even)/ odd(odd)/ no(no parity) Internal communication error check
17	Press DOWN key	Row 1: 1000 Row 2: dUId (device ID)	Defines the (ID) communications identification number.1 to 247
18	Press DOWN key	Row 1: ---- Row 2: Pyd (Password user definable).	Range: 1000-9999. CAUTION: Password can be re-setted only at the factory.
19	Press DOWN key	Row 1: rESL Row 2: EnEr	Energy value format i.e., the energy accumulated in the meter to be displayed in resolution (default) or counter format.
20	Press DOWN key	Row 1: Uh Row 2: ESEL	Energy Selection Option: Wh/VAh

21	Press DOWN key	Row 1: SAVE Y "Y" blinking.	If "n"(no) is selected then Meter enters into RUN mode without affecting any edited Values in the setup
22	Press DOWN key	Row 1 : xxxxLL Row 2 : xxxx A Row 3 : xxxx F	

CAUTION: Memorize the Password. Use the same password for next time. Instruments will reject other Passwords.
"Please notice that configuration pages related to Digital Outputs (d1.Pr, d1.th, d2.Pr, d2.th, ddel, POP.t) are not available in M1M 12"

7.1 The List of parameters can be configured and the range is given below

Sl.No.	Parameter	Default setup	Range
1	Connection mode (ELEM)	**STAR**	STAR/ DELTA/ 1.Phase
2	PT Primary(PT.Pri)	**415.0**	100V- 999kV
3	PT Secondary (PT SEC)	**415.0**	50V - 550V
4	CT Primary(CT.Pri)	**5.000**	0.5A - 99kA
5	CT SECondary (CT SEC)	**5.000**	0.5A - 6A
6	VA selection (UA.SL)	**UEC.H (Vector harmonics)**	Arith (Arithmetic)/ UECt (vector)/ UEC.H (Vector Harmonics)
7	Baud rate (bAUd)	**9600**	2400 to 19.2k
8	Parity (Prty)	**Even**	Even/ Odd/ no
9	Device Id (dEV.Id)	**1.000**	1.000 to 247.0
10	Reverse lock(rEU.L)	**no**	Yes/no
11	Password (PWd)	**1000**	1000 to 9999
12	EnEr (Energy)	**rESL**	rESL /COUП
13	Energy Selection (E.SEL)	**Wh**	Wh / VAh

NOTE: Programming is applicable as per displayed parameter.

8. CLEARING PARAMETERS

To clear parameters from the front panel, Press UP and DOWN keys together, and "**Set.CLr"** (Set-Clear) is shown on the display. Enter the Password (default password is 1000. Setup and Clear has the same password) and it will display "**Clr**". Press UP key for selecting (Integ Clear). Display will prompt to select "**y**" or "**n**" and Press the UP key to do the operation.

⚠ **CAUTIONS : Once the data is cleared (except energy) the value will not be retained.**

9. ENABLING AND DISABLING

Enabling auto scrolling: Press UP key continuously for 5 seconds or until display shows **EnbL Auto.Sc** for upward scrolling. Press Down key continuously for 5 seconds or until display shows **EnbL Auto.Sc** for downward scrolling.

Disabling auto scrolling: Press any key (UP/DOWN), display show **dSbL Auto.Sc** and returns to normal mode.

10. MULTIPLICATION FACTOR

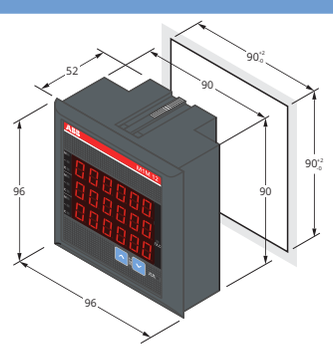
Energy display programmable for counter based or Resolution based.

Multiplication factor for counter based energy mode							
• Full Scale kW $\sqrt{3}$ V Pri LL x A Pri / 1000	0.4 to 4.0	4.01 to 40	40.1 to 400	400.1 to 4,000	4Mega to 40 M	40 M to 400 M	400 M to 4000 M
• Multiplication Factor:	0.01	0.1	1.0	10	100	1000	10000

Note: 999999 kVAh x Multiplication Factor.

Multiplication Factor is applicable only for designing energy reset.

11. MECHANICAL SPECIFICATION



⚠ **CAUTION : Use MCB to connect and disconnect the device for auxiliary and measurement circuit.**

12. COMMUNICATION REGISTER MAP

This is applicable for M1M 12 with communication. All the parameters declared in the communication map are either float or unsigned long as follows;

Standard : Modbus RTU protocol (Half Duplex)
Baud rate : 2400 / 4800 / 9600 / 19200
Parity : Even / Odd / No
Stop bit : 1 / 2
Modbus Function : 03 (Read holding register)

Sl.No.	Parameter	Data type	Address
1	Watts Total	float	40101
2	Watts L1 phase	float	40103
3	Watts L2 phase	float	40105
4	Watts L2 phase	float	40107
5	VAR Total	float	40109
6	VAR L1 phase	float	40111
7	VAR L2 phase	float	40113
8	VAR L3 phase	float	40115
9	PF Ave. (Inst.)	float	40117
10	PF L1 phase	float	40119
11	PF L2 phase	float	40121
12	PF L3 phase	float	40123
13	VA total	float	40125
14	VA L1 phase	float	40127
15	VA L2 phase	float	40129
16	VA L3 phase	float	40131
17	VLL average	float	40133
18	V L12 line	float	40135
19	V L23 line	float	40137
20	V L31 line	float	40139
21	VLN average	float	40141
22	V L1 phase	float	40143
23	V L2 phase	float	40145
24	V L3 phase	float	40147
25	Current Total	float	40149
26	Current L1 phase	float	40151
27	Current L2 phase	float	40153
28	Current L3 phase	float	40155
29	Frequency	float	40157
30	Wh Received	float	40159
31	Load Hours Received	Unsigned long	40217

13. TECHNICAL SPECIFICATION

Auxiliary power supply	
Range	80V to 300 V AC or DC
Frequency	50 - 60Hz
Burden	5VA Max
Installation category	CAT III
Protection fuse	200mA

Measurement accuracy	
Voltage	±1,0%
Current	±1,0%
Active Power (M1M 12)	±1,0%
Active Energy (M1M 12)	±1,0%

Voltage measurement inputs	
Measurement range	80-300V AC (p-n)
Measurement category	CAT III
Rated frequency	50 - 60Hz
Max. VT Primary	999 Kv
Burden	0.2VA Max. per phase

Current measurement inputs	
Number of current inputs	3 (L1, L2, L3)
CT secondary	1A or 5A
Measurement range without accuracy derating	50mA-6A (5%-120% as per standard. From 50mA onwards, it will measure)
Max. CT Primary	99 kA
Burden	0.2VA Max. per phase

User Interface	
Access to device	2 pushbuttons
Display type	LED display
LED Digit height	10 mm

Communication protocol (M1M 12 Modbus) - RS485	
Protocol	Modbus RT
Communication interface	RS485 with optical isolation
Baud rate	2400 bps to 19200 bps
Parity number	Odd, Even, None
Stop bit	1.2
Address	1-247

Mechanical characteristics	
Overall dimensions	96 X 96 X 58 mm (52 mm depth inside the switchboard)
IP degree of protection	IP51 (IEC 60529)
Weight	0,300 kg

Climatic conditions	
Operating temperature	-10°C to +60°C
Storage temperature	-25°C to +70°C
Relative humidity	5% to 95% non condensing
Pollution degree	2
Altitude	Below 2000ms

Terminal characteristics	
Current inputs	6 terminals, 3 inputs, 5A with S1 and s2 on each input
Voltage inputs	4 terminals. 80-520V LL
RS485 Serial port (M1M 12 Modbus)	0,300 kg

Standards	
Electrical safety	IEC 61010
EMC	IEC 61000 4-2,4-3,4-6,4-8,4-4,4-11, CISPR-22

Note:
Accuracy class note for current: **For input current below 250mA, additional error of 0.1% of full scale.**

Accuracy class error for Temperature: **Below 10°C, mean temperature coefficient for the meter is 0.15%/K**

Safety Requirments:

- The warnings, cautions & notes specified in this guide shall be followed strictly (see the all pages).
- The specified safety regulations must be observed.
- Use dedicated fuse or circuit breaker in the Voltage and auxiliary circuit in all the elmeasure make meters for the safe operation.
- Fuse shall be used after PT.
- Fuse / circuit breaker is not part of the instruments (refer rare side of the TB Label). Recommended to use by the customer for safety requirements.

TROUBLESHOOTING

Due to programming error, site conditions, some problems can cause the Meter malfunction. The fault symptoms and their remedial action for correction is given below.

1. If the display does not turn ON:
a) Check that there is at least 80 volts available to the power supply (L and N connections) on the Aux supply terminals. If the above steps do not solve the problem, Contact us.

2. If the voltage or current readings are incorrect:
a) Check that the Connection mode (star/delta) is properly programmed.
b) Check that the voltage and current ratios are properly set.
c) Check the output of the CT's and PT's being used.

3. If the kW or Power Factor readings are incorrect but voltage and current readings are correct:
a) Make sure that the phase relationship between voltage and current inputs are correct by comparing the wiring with the appropriate wiring diagram.
b) CT reversal can be observed by either seeing the phase wise kW. Negative kW is shown where the current polarity is reversed, need to be corrected. Model where kW information is not available, you may check Amps Phase angle.

4. If RS-485 communication does not work:
a) Check that the baud rate of the host computer/PLC is the same as Meter.
b) Check that the device ID of the meter are unique and should not replicate.
c) Check all communications wiring is complete.
d) Check that the number of data bits is set to 8, with one stop bit and even parity.

If the symptom persists after performing the specified steps, or if the symptom is not listed above, contact your local representative or the technical support / customer support department.

Precautionary Measures to be taken while Wiring the Circuit:

- ☐ Turn OFF the power to the circuit, when wiring the circuit. Connecting or removing measurement cables while the power is turned ON is dangerous.
- ☐ Take special caution not to wire a current measurement circuit to the voltage input terminal or vice-versa.
- ☐ Strip the insulation cover of the measurement cable so that when it is wired to the input terminal, the conductive parts (bare wires) do not protrude from the terminal. It is recommended to use appropriate pre lug after crimping the wire. Also, make sure to fasten the input terminal screws securely so that the cable does not come loose.
- ☐ Use cables with safety terminals that cover the conductive parts for connecting to the voltage input terminals. Using a terminal with bare conductive parts is dangerous if the terminal comes loose.
- ☐ After connecting the measurement cable, attach the current input protection cover for your safety. Make sure that the conductive parts are not exposed from the protection cover.
- ☐ Use the suitable star screw driver and apply optimum torque to prevent damage to the meter terminals.

⚠ **CAUTION : During normal operation of this instrument, hazardous voltages are present at the rear terminals, which can cause severe injury or death. These voltages are present throughout the potential transformer (PT), current transformer (CT) auxiliary supply, communication & Input / Output terminal. Installation, disconnection or removal of the meter should be carried out only by qualified, properly trained personnel, after de-energizing connected circuits. Improper installation, including improper wiring and/or improper grounding will void warranty.**