OP396-V01

selec

MFM384-R-C

Operating Instructions



SPECIFICATIONS

DISPLAY
Liquid crystal display with backlight
1 line, 4 digits and 2 lines, 7 digits per line
to show electrical Parameters

LCD INDICATIONS
MD - Maximum Demand of Power
⇄ - Communication in progress

LED INDICATIONS
INT - Integration of energy(1000pulses/kWh)

WIRING INPUT
3 Ø 4 wire, 1 Ø 2 wire, 3 Ø 3 wire, 2 Ø - 3 wire

RATED INPUT VOLTAGE
11 to 300V AC (L-N) ;
19 to 519V AC (L-L)

RATED INPUT CURRENT
Nominal 5A AC (Min-11mA, Max-6A)

BURDEN
0.5 VA@5A per phase

FREQUENCY RANGE
45-65 Hz

CT PRIMARY
1A / 5A to 10,000A (Programmable for any Value)
Note : 1A to 10,000A if CT secondary is 1 else
CT primary is 5A to 10,000A

CT SECONDARY
1A or 5A (Programmable)

PT PRIMARY
100V to 500kV (Programmable for any value)

PT SECONDARY
100V to 500V (Programmable for any value)

OVER VOLTAGE CATEGORY
For Power Supply(L/N) : I
For Input Voltage : III

DISPLAY UPDATE TIME
1sec for all parameters

DISPLAY SCROLLING
Auto / Manual / Default (programmable)

DISPLAY SCROLLING TIME
5 Sec.

POWER CONSUMPTION
Less than 8VA

ENVIRONMENTAL CONDITIONS
- Indoor use
- Altitude of up to 2000 meters
- Pollution degree II

Temperature : Operating : -5°C to 60°C
Storage : -20°C to 75°C
Group : I
Humidity : Up to 85% RH.

PROTECTION CLASS : II

MOUNTING
Din Rail mounting

WEIGHT
208gms.

ORDER CODE INFORMATION

Product	Supply	CE
MFM384-R-C	85 to 270V AC, 50 / 60Hz	■

SERIAL COMMUNICATION

Interface standard and protocol	RS485 AND MODBUS RTU
Communication address	1 to 255
Transmission mode	Half duplex
Data types	Float and Integer
Transmission distance	500 Meter maximum
Transmission speed	300, 600,1200, 2400, 4800, 9600,19200 (in bps)
Parity	None, Odd, Even
Stop bits	1 or 2
Response time	100ms (max and independent of baud rate)

RESOLUTION

PT Ratio x CT Ratio	kWh	INT
<15	0.01K	0.01K
<150	0.1K	0.1K
<1500	1K	1K
<15000	0.01M	0.01M
<150000	0.1M	0.1M
≥1500000	1M	1M

NOTE : 1) For Voltage, Current, Power, resolution is automatically adjusted
2) For power factor, resolution is 0.01

ACCURACY :

Measurement	Accuracy
Voltage V_{L-N}	| 0.5 | of full range
Voltage V_{L-L}	| 0.5 | of full range
Current	| 0.5 | of full range
Frequency For L-N Voltage >20V, For L-L Voltage >35V	| 0.1 | of full range
Active Power	| 1.0 | of full range
Apparent power	| 1.0 | of full range
Reactive Power	| 1.0 | of full range
Power factor	±0.01 of full range
Active energy	| 1.0 | of full range
Reactive energy	| 1.0 | of full range
Apparent energy	| 1.0 | of full range
MAX / MIN Active Power	| 1.0 | of full range
MAX / MIN Reactive Power	| 1.0 | of full range
MAX Apparent Power	| 1.0 | of full range

⚠ SAFETY PRECAUTIONS

All safety related codifications, symbols and instructions that appear in this operating manual or on the equipment must be strictly followed to ensure the safety of the operating personnel as well as the instrument.

If the equipment is not used in a manner specified by the manufacturer it might impair the protection provided by the equipment.

- Do not use the equipment if there is any mechanical damage.
- Ensure that the equipment is supplied with correct voltage.

⚠ CAUTION :

1. Read complete instructions prior to installation and operation of the unit.
2. Risk of electric shock.
3. The equipment in its installed state must not come in close proximity to any heating sources, oils, steam, caustic vapors or other unwanted process by products.

WIRING GUIDELINES

⚠ WARNING :

1. To prevent the risk of electric shock, power supply to the equipment must be kept OFF while doing the wiring arrangement.
2. Wiring shall be done strictly according to the terminal layout. Confirm that all connections are correct.
3. Use lugged terminals.
4. To reduce electromagnetic interference use of wires with adequate ratings and twists of the same in equal size shall be made with shortest connections.
5. Layout of connecting cables shall be away from any internal EMI source.
6. Cable used for connection to power source, must have a cross section of 0.5mm^2 to 2.5mm^2 (20 to 14AWG ; 75^{0}C (min)). These wires shall have current carrying capacity of 6A.
7. Copper cable should be used (Stranded or Single core cable).
8. Before attempting work on device, ensure absence of voltages using appropriate voltage detection device.

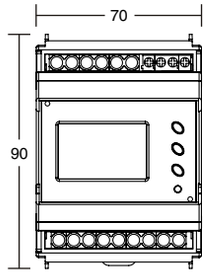
INSTALLATION GUIDELINES

⚠ CAUTION :

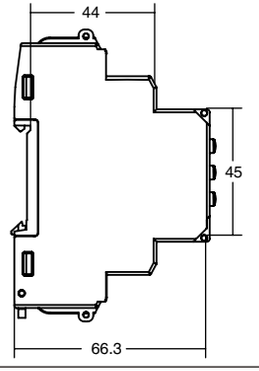
1. This equipment, being built-in-type, normally becomes a part of main control panel and in such case the terminals do not remain accessible to the end user after installation and internal wiring.
2. Conductors must not come in contact with the internal circuitry of the equipment or else it may lead to a safety hazard that may in turn endanger life or cause electrical shock to the operator.
3. Circuit breaker or mains switch must be installed between power source and supply terminals to facilitate power 'ON' or 'OFF' function. However this switch or breaker must be installed in a convenient position normally accessible to the operator.
4. Before disconnecting the secondary of the external current transformer from the equipment, make sure that the current transformer is short circuited to avoid risk of electrical shock and injury.
5. The equipment shall not be installed in environmental conditions other than those mentioned in this manual.
6. The equipment does not have a built-in-type fuse. Installation of external fuse of rating 275V AC / 0.5Amp for electrical circuitry / battery is highly recommended.

DIMENSIONS (All dimensions in mm)

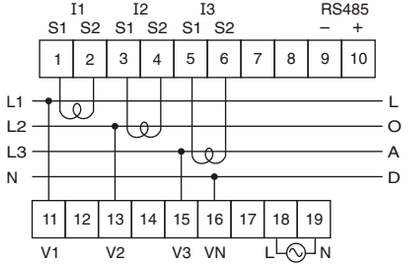
Front View



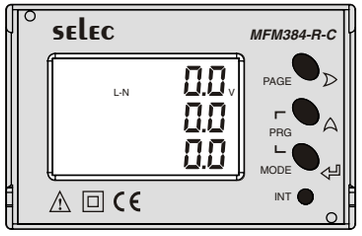
Side View



TERMINAL CONNECTIONS



FRONT PANEL DESCRIPTION



ONLINE PAGE DESCRIPTION

There are 2 dedicated key labeled as PAGE and PRG with symbols marked as ⋗ and ⋀ to read meter parameters.

For 3P4W and 3P3W

KEY PRESS	PARAMETER KEY	DESCRIPTION
Press page (⋗) key (1st time)	—— (Page 1)	Displays line to neutral voltage of three phases
	Press ⋀ key (Page 2)	Displays line to line voltage of three phases (✱)
Press page (⋗) key (2nd time)	—— (Page 3)	Displays phase current of three phases (✱)
Press page (⋗) key (3rd time)	—— (Page 4)	Displays average line to neutral voltage, current and power factor of three phases and frequency.
	Press ⋀ key (Page 5)	Displays average line to line voltage, current and power factor of three phases and frequency. (✱)
Press page (⋗) key (4th time)	—— (Page 6)	Displays power factor of three phases and frequency.
	Press ⋀ key 1st time (Page 7)	Displays active power of three phases.
	Press ⋀ key 2nd time (Page 8)	Displays reactive power of three phases.
	Press ⋀ key 3rd time (Page 9)	Displays apparent power of three phases.
	Press ⋀ key 4th time (Page 10)	Displays total active power of three phases.(✱)
	Press ⋀ key 5th time (Page 11)	Displays total reactive power of three phases. (✱)
	Press ⋀ key 6th time (Page 12)	Displays total apparent power of three phases.(✱)
	Press ⋀ key 7th time (Page 13)	Display MAX(2nd row) and MIN(3rd row) demand of total active power (✱)
	Press ⋀ key 8th time (Page 14)	Display MAX(2nd row) and MIN (3rd row) demand of total reactive power (✱)
	Press ⋀ key 9th time (Page 15)	Display MAX demand of total apparent power (✱)
Press page (⋗) key	—— (Page 16)	Displays average voltage line to neutral (1st row) and Import (2nd row) and export (3rd row) active energy of three phases. (✱)
	Press ⋀ key 1st time (Page 17)	Displays average voltage line to neutral (1st row) and Import (2nd row) and export (3rd row) reactive energy of three phases.(✱)
	Press ⋀ key 2nd time (Page 18)	Displays average voltage line to neutral (1st row) and apparent energy (3rd row) of three phases.(✱)
	For this key function in 1st row for 3P3W voltage will be average line to line.	

Note : For 3 phase 3 wire network only (✱) marked page will be display.

For 1P2W - P1 / P2 / P3

KEY PRESS	PARAMETER KEY	DESCRIPTION
Press page (⋗) key (1st time)	—— (Page 1)	Displays line to neutral voltage of selected phase.
Press page (⋗) key (2nd time)	—— (Page 3)	Displays phase current of selected phase.
Press page (⋗) key (4th time)	—— (Page 6)	Displays power factor of selected phase and frequency.
	Press ⋀ key 1st time (Page 7)	Displays active power of selected phase.
	Press ⋀ key 2nd time (Page 8)	Displays reactive power of selected phase.
	Press ⋀ key 3rd time (Page 9)	Displays apparent power of selected phase.
	Press ⋀ key 7th time (Page 13)	Display MAX(2nd row) and MIN(3rd row) demand of total active power.
	Press ⋀ key 8th time (Page 14)	Display MAX(2nd row) and MIN (3rd row) demand of total reactive power.
	Press ⋀ key 9th time (Page 15)	Display MAX demand of total apparent power.
Press page (⋗) key	—— (Page 16)	Displays average voltage line to neutral (1st row) and Import (2nd row) and export (3rd row) active energy of selected phase.
	Press ⋀ key 1st time (Page 17)	Displays average voltage line to neutral (1st row) and Import (2nd row) and export (3rd row) reactive energy of selected phase.
	Press ⋀ key 2nd time (Page 18)	Displays average voltage line to neutral (1st row) and apparent energy (3rd row) of selected phase.

Note : For 1 phase 2 wire network, only selected phase Parameter will display.

SERIAL NUMBER DESCRIPTION

Press ⋀ key for 10sec. to display 8 digit serial number only for 10sec. at 2nd and 3rd line of display

AUTO / MANUAL / DEFAULT PAGE MODE DESCRIPTION :

Press MODE key for 3sec. to change the on-line page mode. The sequence will be Auto / Manual / Default

CONFIGURATION

There are 3 dedicated key with symbols marked as ⋗, ⋀ and ⏎. Use these 3 key to enter into configuration / change setting.

Note : The settings should be done by a professional, after going through this users manual and after having understood the application situation.

For the configuration setting mode :

- Use ⋀ and ⏎ for 3 sec. to enter or exit from config. mode.
- Use ⋗ shift key to move cursor left or right by one digit each time. After last digit of display cursor shift at 1st digit of display.
- Use ⋀ increment key for increasing the parameter value.
- Use ⏎ key to save the setting and move on to next page.
- Use ⋀ and ⋗ keys to go back to previous page.

Config. page.	Function	Range or Selection	Factory Setting
	Password	0000 to 9998	1000
1	Change Password	No / Yes	No
1.1	New Password	0000 to 9998	1000
2	Network Selection	3P4W, 3P3W, 1P2W-P1, 1P2W-P2, 1P2W-P3.	3P4W
3	CT Secondary	1 or 5	5
4	CT Primary	5A to 10,000A	5
5	PT Secondary	100V to 500V	350
6	PT primary	100V to 500kV	350
7	Slave Id	1 to 255	1
8	Baud Rate	300, 600, 1200, 2400, 4800, 9600 and 19200	9600
9	Parity	None, Even, Odd	None
10	Stop Bit	1 or 2	1
11	Back Light	0 to 7200 sec.	0000
12	Demand interval method	Sliding / Fixed	Sliding
13	Demand interval duration	1 to 30	15
14	Demand interval length	1 to 30min	1
15	Max auto Pages	1 to 18	18
16	Change Page Sequence	No / Yes	No
16.1	Page Sequence 1	01 to 18	1
16.2	Page Sequence 2	01 to 18	2
16.3	Page Sequence 3	01 to 18	3
16.4	Page Sequence 4	01 to 18	4
16.5	Page Sequence 5	01 to 18	5
16.6	Page Sequence 6	01 to 18	6
16.7	Page Sequence 7	01 to 18	7
16.8	Page Sequence 8	01 to 18	8
16.9	Page Sequence 9	01 to 18	9
16.10	Page Sequence 10	01 to 18	10
16.11	Page Sequence 11	01 to 18	11
16.12	Page Sequence 12	01 to 18	12
16.13	Page Sequence 13	01 to 18	13
16.14	Page Sequence 14	01 to 18	14
16.15	Page Sequence 15	01 to 18	15
16.16	Page Sequence 16	01 to 18	16
16.17	Page Sequence 17	01 to 18	17
16.18	Page Sequence 18	01 to 18	18
17	Factory Default	No / Yes	No
18	Reset Energy and MAX Demand	No / Yes	No
• 18.1	Password	0001 to 9999	1001
18.01	Reset Active Energy	No / Yes	No
18.02	Reset Reactive Energy	No / Yes	No
18.03	Reset Apparent Energy	No / Yes	No
18.04	Reset MAX Power	No / Yes	No

- For resetting energy parameters user will be prompted the password. If correct password is entered, the user will be able to reset all energy parameters. This password will be value which will be greater than the configuration password by 1.

NETWORK SELECTION AND WIRING INPUT

Network selection in configuration mode	Wiring
3P4W	**3P4W, 2P3W**
3P3W	**3P3W**
1P2W	**1P2W-P1/P2/P3**

NOTE : P1/P2/P3 will be the phase one, two and three.

MODBUS REGISTER ADDRESSES LIST

Readable parameters : [Length (Register) : 2 ; Data Structure : Float]

Note : In four byte data type , LSB will be displayed on lower address and MSB will be displayed on higher address.

Address	Hex Address	Parameter	Address	Hex Address	Parameter	Address	Hex Address	Parameter
30000	0x00	Voltage 1st Phase	30030	0x1E	kVA1	30060	0x3C	Import kVah
30002	0x02	Voltage 2nd Phase	30032	0x20	kVA2	30062	0x3E	Import kVarh
30004	0x04	Voltage 3rd Phase	30034	0x22	kVA3	30064	0x40	kW MAX Active Power
30006	0x06	Average Voltage LN	30036	0x24	kVAr1	30066	0x42	kW MIN Active Power
30008	0x08	Voltage V12	30038	0x26	kVAr2	30068	0x44	kVar MAX Reactive Power
30010	0x0A	Voltage V23	30040	0x28	kVAr3	30070	0x46	kVar MIN Reactive Power
30012	0x0C	Voltage V31	30042	0x2A	Total kW	30072	0x48	kVa MAX Apparent Power
30014	0x0E	Average Voltage LL	30044	0x2C	Total kVA	30074	0x4A	Export kWh
30016	0x10	Current I1	30046	0x2E	Total kVAr	30076	0x4C	Export kVarh
30018	0x12	Current I2	30048	0x30	PF1	30132	0x84	Serial no (Data Structure : Hex)
30020	0x14	Current I3	30050	0x32	PF2	30134	0x86	Existing MAX active power
30022	0x16	Average Current	30052	0x34	PF3	30136	0x88	Existing MIN active power
30024	0x18	kW1	30054	0x36	Average PF	30138	0x8A	Existing MAX reactive power
30026	0x1A	kW2	30056	0x38	Frequency	30140	0x8C	Existing MIN reactive power
30028	0x1C	kW3	30058	0x3A	Import kWh	30142	0x8E	Existing MAX apparent power

MODBUS REGISTER ADDRESSES LIST

MODBUS register addresses list

Readable / writable parameters from MFM384-R-C :

Address	Hex Address	Parameter	Range		Length (Register)	Data Structure
			Min value	**Max value**		
40000	0x00	Password	0	9998	1	Integer
			Value	**Meaning**		
40001	0x01	N/W selection	0x0000	3P-4W	1	Integer
			0x0001	3P-3W	1	Integer
			0x0002	1P2W-P1	1	Integer
			0x0003	1P2W-P2	1	Integer
			0x0004	1P2W-P3	1	Integer
			Min value	**Max value**		
40002	0x02	CT Secondary (A)	1	5	1	Integer
40003	0x03	CT primary (CT Secondary = 1)(A)	1	10000	1	Integer
		CT primary (CT Secondary = 5)(A)	5	10000	1	Integer
40004	0x04	PT Secondary (V)	100	500	1	Integer
40005	0x05	PT primary (V)	100	500kV	2	Integer
40007	0x07	Slave id	1	255	1	Integer
			Value	**Meaning**		
40008	0x08	Baud rate (bps)	0x0000	300	1	Integer
			0x0001	600		
			0x0002	1200		
			0x0003	2400		
			0x0004	4800		
			0x0005	9600		
			0x0006	19200		

MODBUS REGISTER ADDRESSES LIST

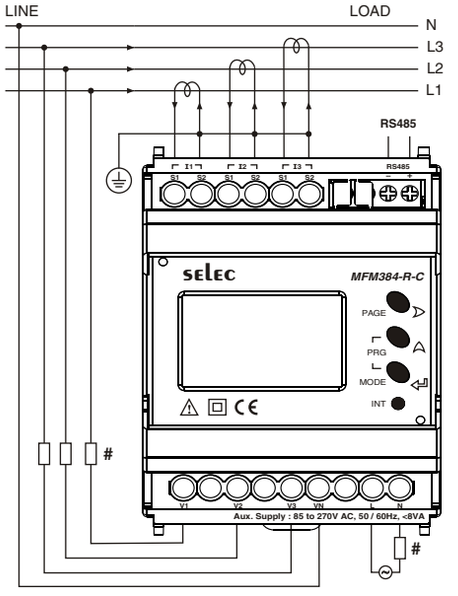
MODBUS register addresses list

Readable / writable parameters from MFM384-R-C :

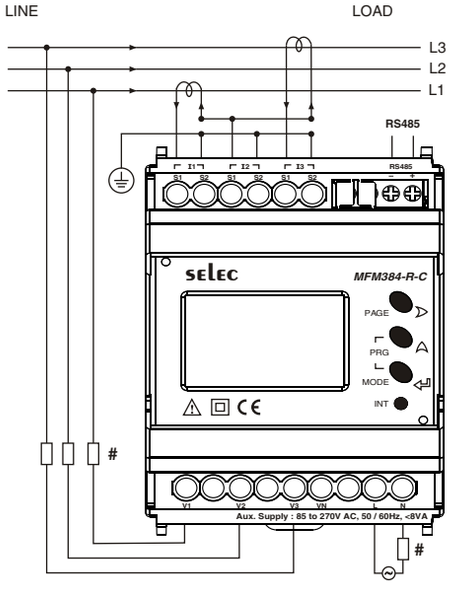
Address	Hex Address	Parameter	Range		Length (Register)	Data Structure
			Value	**Meaning**		
40009	0x09	Parity	0x0000	None	1	Integer
			0x0001	Odd		
			0x0002	Even		
40010	0x0A	Stop bit	0x0000	1	1	Integer
			0x0001	2		
40011	0x0B	Backlight OFF (sec.)	Min Value : 0	Max Value : 7200	1	Integer
40012	0x0C	Factory Default	1	Set to factory setting range	1	Integer
40013	0x0D	Reset kWh	1	Reset total active energy	1	Integer
40014	0x0E	Reset kVah	1	Reset total apparent energy	1	Integer
40015	0x0F	Reset kVArh	1	Reset total reactive energy	1	Integer
			Min value	**Max value**		
40016	0x10	Auto mode sequence	1	18	1	Integer
			Page No.	**Meaning**		
40017	0x11	Page address sequence 1	1-18	1 - First page ; 18 - Last page	1	Integer
40018	0x12	Page address sequence 2	1-18	1 - First page ; 18 - Last page	1	Integer
40019	0x13	Page address sequence 3	1-18	1 - First page ; 18 - Last page	1	Integer
40020	0x14	Page address sequence 4	1-18	1 - First page ; 18 - Last page	1	Integer
40021	0x15	Page address sequence 5	1-18	1 - First page ; 18 - Last page	1	Integer
40022	0x16	Page address sequence 6	1-18	1 - First page ; 18 - Last page	1	Integer
40023	0x17	Page address sequence 7	1-18	1 - First page ; 18 - Last page	1	Integer
40024	0x18	Page address sequence 8	1-18	1 - First page ; 18 - Last page	1	Integer
40025	0x19	Page address sequence 9	1-18	1 - First page ; 18 - Last page	1	Integer
40026	0x1A	Page address sequence 10	1-18	1 - First page ; 18 - Last page	1	Integer
40027	0x1B	Page address sequence 11	1-18	1 - First page ; 18 - Last page	1	Integer
40028	0x1C	Page address sequence 12	1-18	1 - First page ; 18 - Last page	1	Integer
40029	0x1D	Page address sequence 13	1-18	1 - First page ; 18 - Last page	1	Integer
40030	0x1E	Page address sequence 14	1-18	1 - First page ; 18 - Last page	1	Integer
40031	0x1F	Page address sequence 15	1-18	1 - First page ; 18 - Last page	1	Integer
40032	0x20	Page address sequence 16	1-18	1 - First page ; 18 - Last page	1	Integer
40033	0x21	Page address sequence 17	1-18	1 - First page ; 18 - Last page	1	Integer
40054	0x36	Page address sequence 18	1-18	1 - First page ; 18 - Last page	1	Integer
			Value	**Meaning**		
40034	0x22	Demand Interval Method	0X0000	Sliding	1	Integer
			0X0001	Fixed		
40035	0x23	Demand Interval Duration	Min Value : 1	Max Value : 30	1	Integer
40036	0x24	Demand Interval Length(min)	Min Value : 1	Max Value : 30	1	Integer
40037	0x25	Reset MAX kW	1	Reset MAX Active Power	1	Integer
40038	0x26	Reset MIN kW	1	Reset MIN Reactive Power	1	Integer
40039	0x27	Reset MAX kVar	1	Reset MAX Reactive Power	1	Integer
40040	0x28	Reset MIN kVar	1	Reset MIN Reactive Power	1	Integer
40041	0x29	Reset MAX kVA	1	Reset MAX Apparent Power	1	Integer

TYPICAL WIRING DIAGRAM

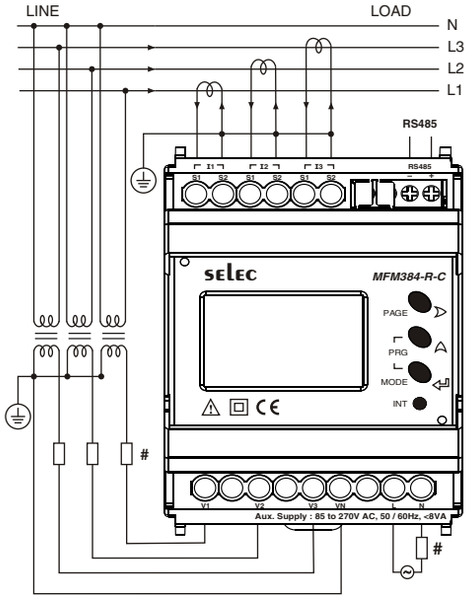
3 Phase - 4 Wire (Commonly Used) | **3 Ø - 4 Wire, 3 CT'S**



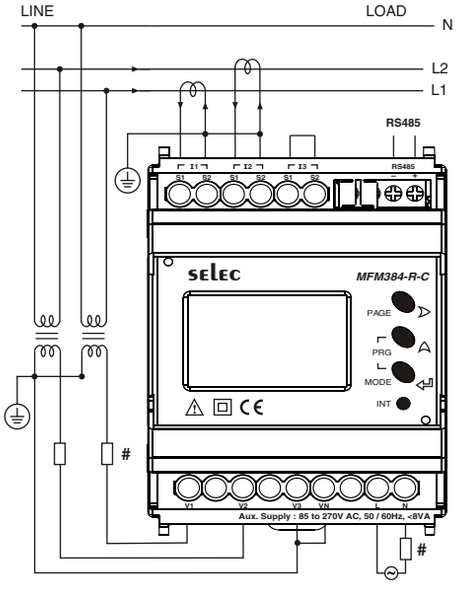
3 Phase - 3 Wire | **3 Ø - 3 Wire, 2 CT'S**



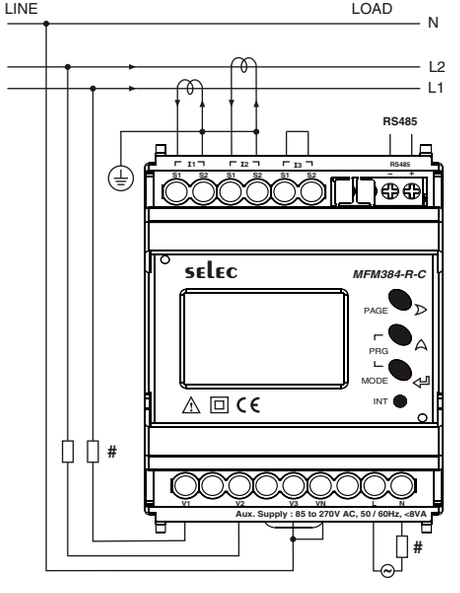
3 Phase - 4 Wire | **3 Ø - 4 Wire, 3 CT'S and 3 PT'S**



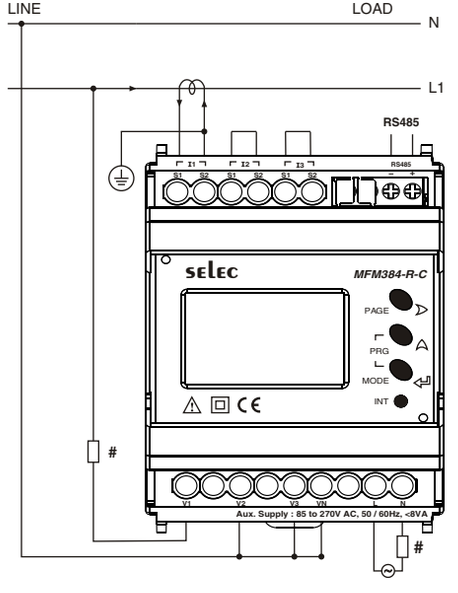
2 Phase - 3 Wire | **2 Ø - 3 Wire, 2 CT'S and 2 PT'S**



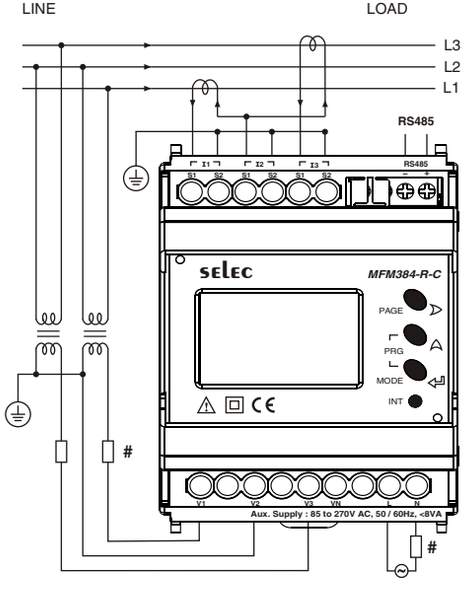
2 Phase - 3 Wire | **2 Ø - 3 Wire, 2 CT'S**



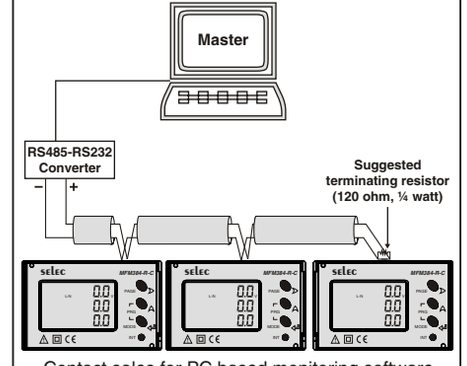
1 Phase - 2 Wire | **1 Ø - 2 Wire, 1 CT**



3 Phase - 3 Wire | **3 Ø - 3 Wire, 2 CT'S and 2 PT'S**



CONNECTION DIAGRAM FOR COMMUNICATION



Contact sales for PC based monitoring software to communicate with the meters.

All fuse types : 0.5A class CC UL type
0.5A fast acting 600V

(Specifications subject to change as development is a continuous process.)

Selec Controls Pvt. Ltd., India

Factory Address :
EL-27/1, Electronic Zone, TTC Industrial Area,
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