

# selec

**MFM384 / MFM384-C**  
**/ MFM384-C-230/**  
**MFM384-230 (96x96)**  
 Operating Instructions

OP347-V02



## SPECIFICATIONS

### DISPLAY

Liquid crystal display with backlight  
 4 lines, 4 digits per line to show electrical Parameters  
 5th line, 8 digits to show energy  
 Bar graph for current indication

### LCD INDICATIONS

- INT** - Integration of energy
- PRG** - Unit is in configuration menu
- ←** - Communication in progress

**MAX DMD** - Maximum Demand of Power

### WIRING INPUT

3 Ø - 4 wire, 3 Ø - 3 wire, 2 Ø - 3 wire, &  
 1 Ø - 2 wire system

### RATED INPUT VOLTAGE

11 to 300V AC (L-N) ; 19 to 519V AC (L-L)  
 Installation Category III

### FREQUENCY RANGE

45-65 Hz

### RATED INPUT CURRENT

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

### 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

100 to 500V AC (L-L)(Programmable for any value)

### Display update time

1 sec for all parameters

### Display Scrolling

Automatic or Manual (Programmable)

### AUXILIARY SUPPLY RANGE

**MFM384 / MFM384-C** : 100 to 240V AC,  
 +12%, -15%, 50/60Hz (± 5%)  
 Installation Category II

**MFM384-230V / MFM384-C-230V** : 230V AC,  
 ± 20%, 50/60Hz

### BURDEN

0.5 VA @5A per phase

### ENVIRONMENTAL CONDITIONS

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

### Temperature

Operating : 0 to 50°C  
 Storage : -20 to 75°C

### Humidity

Up to 85% non-condensing

### MOUNTING

Panel mounting

### WEIGHT

MFM384 / MFM384-C : 318gms  
 MFM384-230V / MFM384-C-230V : 362gms

### OUTPUT

**Pulse Output** : Voltage range : External 24VDC max.  
 Current capacity : 100 mA max  
**Pulse Width:** 100 ms ± 50 ms.

### SERIAL COMMUNICATION

[ Applicable for MFM384-C / MFM384-C-230V ]

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

### RESOLUTION

PT Ratio x CT Ratio	kWh/ kVAh/ kVArh	Pulse
<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 0.001
- 3) INT blinks after every 5 seconds, if load is connected on at least any one of 3 phases.

### ACCURACY :

Measurement	Accuracy
Voltage $V_{L-N}$	±0.5% of Full scale
Voltage $V_{L-L}$	±0.5% of Full scale
Current	±0.5% of Full scale
Frequency	±0.1% For L-N Voltage >20V , For L-L Voltage >35V
Active Power	1%
Apparent power	1%
Reactive Power	1%
Power factor	±0.01
Active energy	Class 1
Reactive energy	Class 1
Apparent energy	Class 1
MAX / MIN Active Power	1%
MAX / MIN Reactive Power	1%
MAX Apparent Power	1%

### 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:** Read complete instructions prior to installation and operation of the unit.

**CAUTION:** Risk of electric shock.

### 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 eliminate electromagnetic interference use of wires with adequate ratings and twists of the same in equal size shall be made.
5. Cable used for connection to power source, must have a cross section of 1.5mm<sup>2</sup>. These wires shall have current carrying capacity of 6A.
6. Before attempting work on device, ensure absence of voltages using appropriate voltage detection device.

### MAINTENANCE

1. The equipment should be cleaned regularly to avoid blockage of ventilating parts.
2. Clean the equipment with a clean soft cloth.  
Do not use Isopropyl alcohol or any other cleaning agent.

### 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.

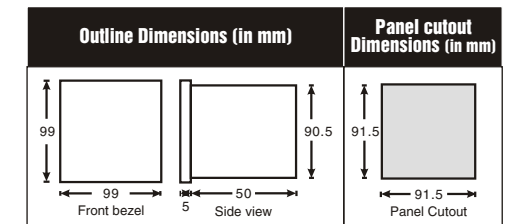
#### CAUTION:

1. The equipment shall not be installed in environmental conditions other than those mentioned in this manual.
2. The equipment does not have a built-in-type fuse. Installation of external fuse of rating 275V AC/0.5Amp for electrical circuitry is highly recommended.

### MECHANICAL INSTALLATION

For installing the meter

1. Prepare the panel cutout with proper dimensions as shown below:



2. Push the meter into the panel cutout. Secure the meter in its place by fitting the clamp on the rear side. fit clamps on both sides in diagonally opposite location for optimum fitting.
3. For proper sealing, tighten the screws evenly with required torque.
4. Recommended conductor cross section = 1.5mm<sup>2</sup>  
Terminal screw tightening torque = 0.5 N-m  
Screw clamp tightening torque = 0.1N-m

#### CAUTION:

The equipment in its installed state must not come in close proximity to any heating sources, caustic vapors, oils, steam, or other unwanted process by-products.

### EMC Guidelines:

1. Use shorter input power cables with shortest connections and twisted type.
2. Layout of connecting cables shall be away from any internal EMI source.

## FRONT PANEL DESCRIPTION



## ONLINE PAGE DESCRIPTION

There are 6 dedicated keys labelled as V, I, VAF, PF, P, E. Use these 6 keys to read meter parameters. Simply press these keys to read the parameters.

KEY PRESS	ONLINE PAGE DESCRIPTION
Press "V"	<p><b>The first screen:</b> Displays Line to Neutral Voltage of three phases &amp; average Line to Neutral Voltage.</p> <p><b>The second screen:</b> Displays Line to Line Voltage of three phases &amp; average line to line Voltage.</p> <p><b>Note:</b> For 3 Ø 3 wire system, only the second screen will be available.</p>
Press "I"	<p><b>The first screen:</b> Displays phase Current of three phases &amp; average phase Current.</p>
Press "VAF"	<p><b>The first screen:</b> Displays Voltage, Current, Power factor of first phase &amp; Frequency.</p> <p><b>The second Screen:</b> Displays Voltage, Current, Power factor of second phase &amp; Frequency.</p> <p><b>The third Screen:</b> Displays Voltage, Current, Power factor of third phase &amp; frequency.</p> <p><b>The fourth Screen:</b> Displays Average, Value of Voltage, Current, Power factor of three phases &amp; Frequency.</p>
Press "PF"	<p><b>The first screen:</b> Displays Power factor of three phases &amp; average Power factor.</p> <p><b>Note:</b> For 3 Ø 3 wire system, only average Power factor will be available on this screen.</p>

KEY PRESS	ONLINE PAGE DESCRIPTION
Press "P"	<p><b>The first screen :</b> Displays Active power of three phases &amp; total Active Power.</p> <p><b>The second screen:</b> Displays Reactive Power of three phases &amp; total Reactive Power.</p> <p><b>The third screen :</b> Displays Apparent Power of three phases &amp; total Apparent Power.</p> <p><b>The fourth screen :</b> Displays Active, Reactive , Apparent power &amp; Power factor of first phase.</p> <p><b>The fifth screen :</b> Displays Active, Reactive, Apparent power &amp; Power factor of second phase.</p> <p><b>The sixth screen :</b> Displays Active, Reactive, Apparent power &amp; Power factor of third phase.</p> <p><b>The seventh screen :</b> Displays total Active, Reactive , Apparent power &amp; average Power factor of three phases.</p> <p><b>The eighth screen :</b> Displays maximum Active power demand, Reactive power demand &amp; Apparent power demand.</p> <p><b>The ninth screen :</b> Displays minimum Active power demand &amp; Reactive power demand.</p> <p><b>Note:</b> For 3 Ø 3 wire system, only seventh, eighth and ninth screen will be available.</p>
Press "E"	<p><b>The first screen :</b> Displays total Active energy of three phases.</p> <p><b>The second screen :</b> Displays total Apparent energy of three phases.</p> <p><b>The third screen :</b> Displays total Reactive energy of three phases.</p>

## AUTOMATIC / MANUAL MODE DESCRIPTION

Press E (←) button for 3 seconds to toggle between Automatic & Manual mode.

**Note:** By default unit operates in automatic mode. In automatic mode online pages scroll automatically at the rate of 5 seconds per page. In automatic mode when any key is pressed, unit temporarily switches to manual mode and the appropriate page is displayed, also if no key is pressed for 5 sec, unit resumes automatic mode.

## CONFIGURATION

There are 6 dedicated keys with symbols marked as ◀, ▶, ▼, ▲, ←, → use these 6 keys to enter into configuration menu / change setting.

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

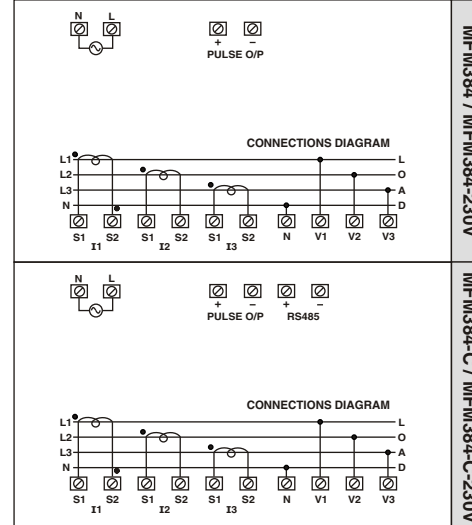
For the configuration setting mode :

- Use ▲ + ▼ keys for 3 sec to enter or exit from the configuration menu.
- Use ◀ or ▶ keys to move cursor left or right by one digit each time.
- Use ▲ or ▼ keys for increasing or decreasing parameters value.
- Use ← key to go back to previous page.
- Use → key to save the setting and move on to next page.

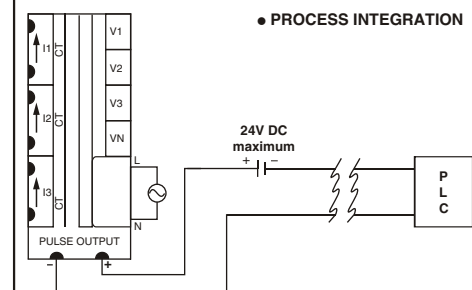
Config page.	Function	Range or Selection	Factory Setting
	Password	0000 to 9998	1000
1	Change Password	No / Yes	No
1.1	New Password	0000 to 9998	1000
2	Network Selection	3P3W and 3P4W	3P4W
3	CT Secondary	1A or 5A	5
4	CT Primary	1A, 5A to 10,000A (10.0kA)	5
5	PT Secondary	100V to 500V	350
6	PT primary	100V to 500kV	350
* 7	Slave Id	1 to 255	1
* 8	Baud Rate	300, 600,1200, 2400, 4800, 9600 &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 30 min	1
15	Max Page Auto	1 to 17	17
16	Change Page Sequence	No / Yes	No
16.01	Page sequence 1	_____	1
16.02	Page sequence 2	_____	2
16.03	Page sequence 3	_____	3
16.04	Page sequence 4	_____	4
16.05	Page sequence 5	_____	5
16.06	Page sequence 6	_____	6
16.07	Page sequence 7	_____	7
16.08	Page sequence 8	_____	8
16.09	Page sequence 9	_____	9
16.10	Page sequence 10	_____	10
16.11	Page sequence 11	_____	11
16.12	Page sequence 12	_____	12
16.13	Page sequence 13	_____	13
16.14	Page sequence 14	_____	14
16.15	Page sequence 15	_____	15
16.16	Page sequence 16	_____	16
16.17	Page sequence 17	_____	17
17	Factory Default	No / Yes	NO
18	Reset Energy & 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 Active Power	No / Yes	NO
18.05	Reset Min Active Power	No / Yes	NO
18.06	Reset Max Reactive Power	No / Yes	NO
18.07	Reset Min Reactive Power	No / Yes	NO
18.08	Reset Max Apparent Power	No / Yes	NO

\* Marked parameters are available only in MFM384-C / MFM384-C-230V  
 • For resetting energy parameters user will be prompted for 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.

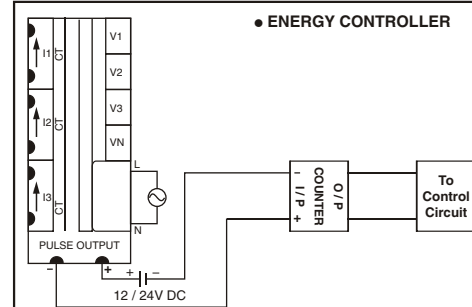
## TERMINAL CONNECTIONS



## APPLICATION OF PULSE OUTPUT



Pulse output from MFM384 meter can be interfaced into a process through a PLC for on line control of energy content in the process. If the PLC has a self excited digital input, external DC supply is not needed. The kWh pulse is also used to derive average kWh information at the PLC.



Pulse output from MFM384 meter can be used as alarm generator or total energy controller by interfacing it with Pre-settable counter and control circuits (Contactors, Relay, Trip Circuit). The counter is loaded with the maximum energy consumption. When count reaches setpoint it provides output to control circuit to take appropriate action.

## MODBUS REGISTER ADDRESSES LIST

MODBUS register addresses list				
Readable parameters from MFM384:				
Address	Hex Address	Parameter	Length (Register)	Data Structure
30000	0x00	Voltage V1N	2	Float
30002	0x02	Voltage V2N	2	Float
30004	0x04	Voltage V3N	2	Float
30006	0x06	Average Voltage LN	2	Float
30008	0x08	Voltage V12	2	Float
30010	0x0A	Voltage V23	2	Float
30012	0x0C	Voltage V31	2	Float
30014	0x0E	Average Voltage LL	2	Float
30016	0x10	Current I1	2	Float
30018	0x12	Current I2	2	Float
30020	0x14	Current I3	2	Float
30022	0x16	Average Current	2	Float
30024	0x18	kW1	2	Float
30026	0x1A	kW2	2	Float
30028	0x1C	kW3	2	Float
30030	0x1E	kVA1	2	Float
30032	0x20	kVA2	2	Float
30034	0x22	kVA3	2	Float
30036	0x24	kVAr1	2	Float
30038	0x26	kVAr2	2	Float
30040	0x28	kVAr3	2	Float
30042	0x2A	Total kW	2	Float
30044	0x2C	Total kVA	2	Float
30046	0x2E	Total kVAr	2	Float
30048	0x30	PF1	2	Float
30050	0x32	PF2	2	Float
30052	0x34	PF3	2	Float
30054	0x36	Average PF	2	Float
30056	0x38	Frequency	2	Float
30058	0x3A	kWh	2	Float
30060	0x3C	kVAh	2	Float
30062	0x3E	kVArh	2	Float
30064	0x40	kW MAX Active Power	2	Float
30066	0x42	kW MIN Active Power	2	Float
30068	0x44	kVAr MAX Reactive Power	2	Float
30070	0x46	kVAr MIN Reactive Power	2	Float
30072	0x48	kVA MAX Apparent Power	2	Float

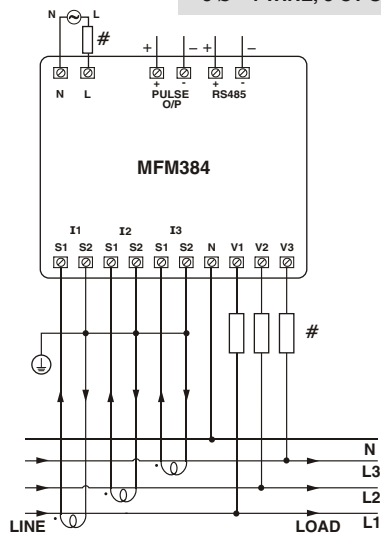
Readable / writable parameters :						
Address	Hex Address	Parameter	Range		Length (Register)	Data Structure
			Min value	Max value		
40000	0x00	Password	0	9998	1	Integer
			Value	Meaning		
40001	0x01	N/W selection	0	3P-4W	1	Integer
			1	3P-3W		
40002	0x02	CT Secondary	1	5	1	Integer
			5	10000		
40003	0x03	CT primary (CT Secondary = 5)	1	10000	1	Integer
			100	500		
40004	0x04	PT Secondary	100	500	1	Integer
40005	0x05	PT primary	100	500kV	2	Integer
40007	0x07	Slave id	1	255	1	Integer

MODBUS register addresses list <i>continued</i>						
Readable / writable parameters from MFM384:						
Address	Hex Address	Parameter	Range		Length (Register)	Data Structure
			Min Value	Max Value		
40008	0x08	Baud rate	0x0000	300	1	Integer
			Value	Meaning		
			0x0001	600		
			0x0002	1200		
			0x0003	2400		
			0x0004	4800		
			0x0005	9600		
			0x0006	19200		
40009	0x09	Parity	0x0000	None	1	Integer
			0x0001	Odd		
			0x0002	Even		
			Value	Meaning		
40010	0x0A	Stop bit	0x0000	1		
			0x0001	2		
			Min value	Max value		
			0	7200		
40011	0x0B	Backlight OFF	1	Set to factory setting range	1	Integer
40012	0x0C	Factory Default	Value	Meaning		
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
40016	0x10	Auto Mode Pages	Page No	Meaning		
			1- 17			
40017	0x11	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
			Value	Meaning		
40018	0x12	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40019	0x13	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40020	0x14	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40021	0x15	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40022	0x16	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40023	0x17	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40024	0x18	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40025	0x19	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40026	0x1A	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40027	0x1B	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40028	0x1C	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40029	0x1D	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40030	0x1E	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40031	0x1F	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40032	0x20	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40033	0x21	Page Address Sequence	1- 17	1- First Page ; 17-Last Page	1	Integer
40034	0x22	Demand Interval Method	Value	Meaning		
			0X0000	Sliding		
			0X0001	Fixed		
40035	0x23	Demand Interval Duration	MIN Value : 1	MAX Value : 30	1	Integer
40036	0x24	Demand Interval Length	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 Active 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)

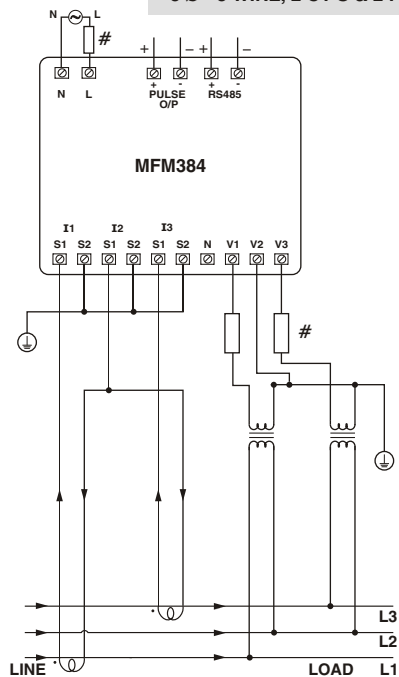
3 Ø - 4 WIRE, 3 CT'S



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

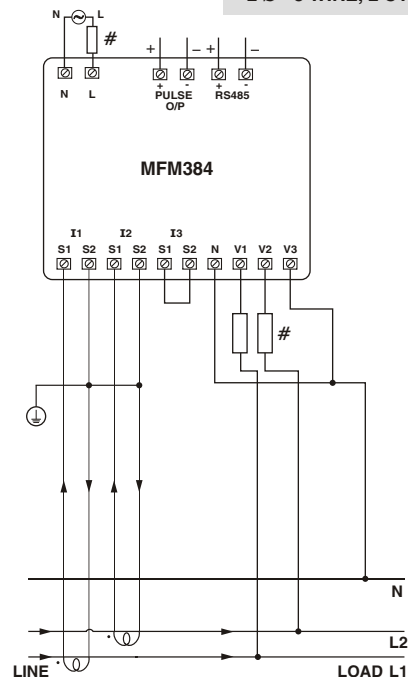
## 3 PHASE 3-WIRE

3 Ø - 3 WIRE, 2 CT'S & 2 PT'S



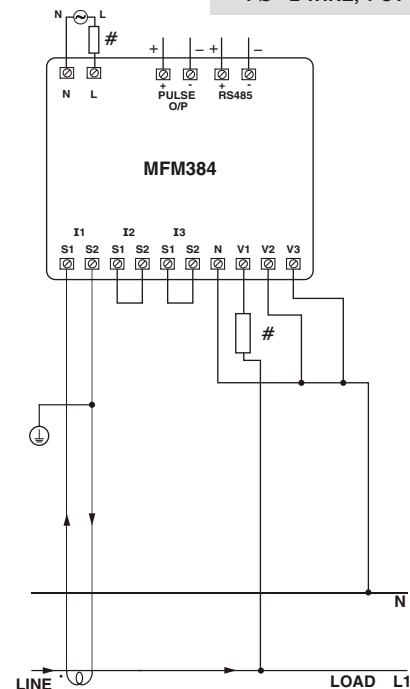
## 2 PHASE - 3 WIRE

2 Ø - 3 WIRE, 2 CT'S

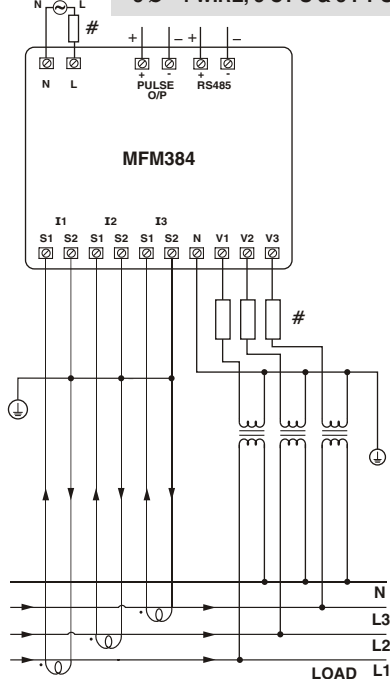


## 1 PHASE - 2 WIRE

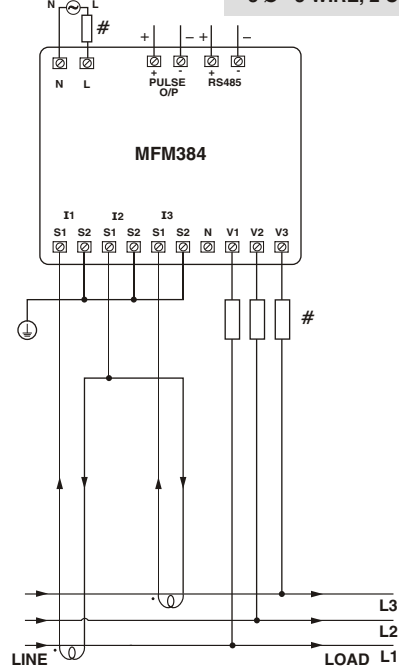
1 Ø - 2 WIRE, 1 CT



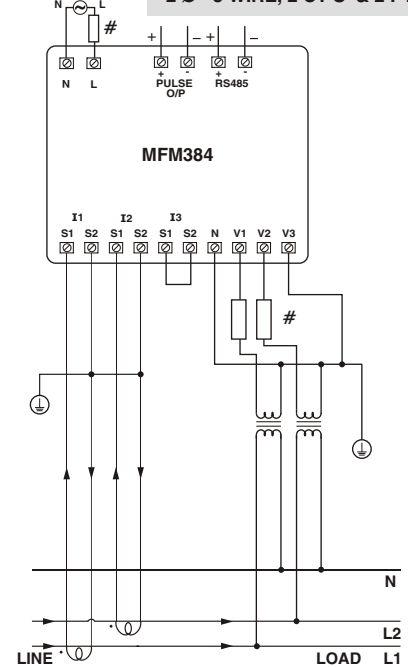
3 Ø - 4 WIRE, 3 CT'S & 3 PT'S



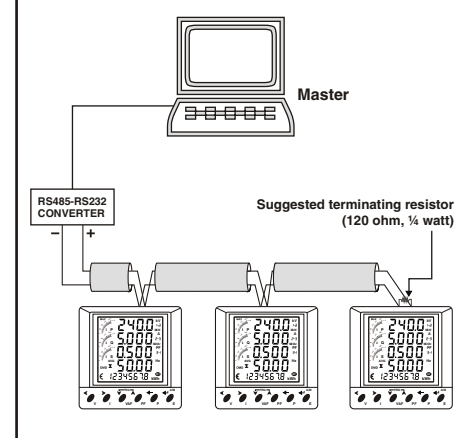
3 Ø - 3 WIRE, 2 CT'S



2 Ø - 3 WIRE, 2 CT'S & 2 PT'S



### CONNECTION DIAGRAM FOR COMMUNICATION



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

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