OP625-V01

selec

MFM284
Operating Instructions

72 X 72

SPECIFICATIONS

DISPLAY
Liquid crystal display with backlight
4 lines, 4 digits per line to show electrical parameters
5th line, 8 digits to show energy

LCD INDICATIONS
- **-** Communication in progress
- **MAX DMD -** Maximum and Minimum Demand Power
- **THD -** For Total harmonics distortion
- **IM -** Import Energy
- **EP -** Export Energy

WIRING INPUT
3 Ø - 4 wire, 3 Ø - 3 wire, 2 Ø - 3 wire and
1 Ø - 2 wire system (Programmable as P1,P2,P3)

RATED INPUT VOLTAGE
11 to 300V AC (L-N) ;
19 to 519V AC (L-L) ; Installation Category III (600V)

FREQUENCY RANGE
45-65 Hz

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

BURDEN
0.5 VA@5A per phase

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,Default or Manual (Programmable)

POWER CONSUMPTION
Less than 8VA

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

Temperature : Operating : -10°C to 55°C
Storage : -20°C to 75°C
Humidity : Up to 85% non-condensing

PROTECTION CLASS : II

MOUNTING : Panel mounting

OUTPUT
Pulse Output : Voltage range : External 24V DC max.
Current capacity : 100mA max
Pulse Width : 100 ms ± 5ms(Programmable depending upon CT x PT Ratio.)

ORDER CODE INFORMATION

Product	Supply	Certification
MFM284-CE-RoHS	85 to 3270V AC, -15% + 12%, 50 / 60Hz, ±5%	CE
Installation Category III		

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	500m maximum
Transmission Speed	300, 600,1200, 2400, 4800, 9600,19200 (in bps)
Parity	None, Odd, Even
Stop bits	1 or 2

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%

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 and Power, resolution is automatically adjusted.
2) For power factor, resolution is 0.001

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

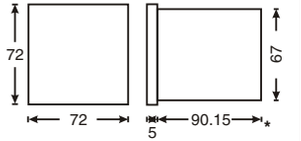
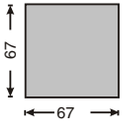
⚠ WARNING :
1. To prevent the risk of electric shock, power supply to the equipment must be kept OFF while doing the wiring arrangement.
2. Wiring shall be done strictly according to the terminal layout. Confirm that all connections are correct.
3. Use lugged terminals.
4. To reduce electromagnetic interference 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°C (min)). These wires shall have current carrying capacity of6A.
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.

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.

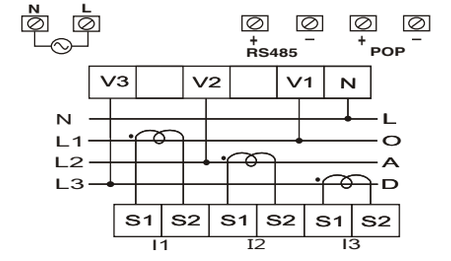
OUTLINE Dimensions (in mm)	PANEL CUTOUT Dimensions (in mm)
	

*Size with terminal cover

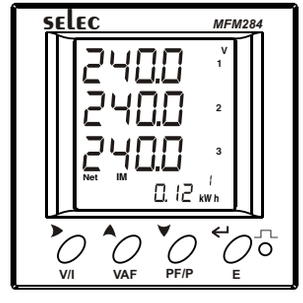
MAINTENANCE
1. The equipment should be cleaned regularly to avoid blockage of ventilating parts.
2. Clean the equipment with a clean dry or damp cloth. Do not use any cleaning agent other than water.

TERMINAL CONNECTIONS

CONNECTIONS DIAGRAM



FRONT PANEL DESCRIPTION



ONLINE PAGE DESCRIPTION

There are 4 dedicated keys labelled as V/I, VAF, PF/P, E. Use these 4 keys to read meter parameters. Simply press these keys to read the parameters.

KEY PRESS	ONLINE PAGE DESCRIPTION
Press "V/I"	**The 1st screen** : Display Line to neutral voltage of Three Phase. **The 2nd screen** : Display line to line Voltage of Three Phase. **The 3rd screen** : Display Total Percantage Harmonics of Line to neutral voltage of three phase and avg Line to neutral Voltage. **The 4th screen** : Display Total Percantage Harmonics of Line to Line voltage of three phase and avg Line to Line Voltage. **The 5th screen** : Display three phase of current and Neutral Current. **The 6th screen** :Display Phase Maximum Current Demand of three phase and Avg phase Current. **The7th screen** : Display Total Percentage Harmonics of current of three Phase and Avg Phase Current **The 8th screen** :Press for 3Sec.Displays Voltage sequence detection. **Note :** 1) For 3 Ø 3 wire system, for only the 2nd, 4th,5th,6th and 7th screen will be available. 2) In 1 Ø 2 wire system only the 1nd, 3rd,5th,6th and 7th screen will be available.
Press "VAF"	**The 1st screen** : Display Voltage,current,power Factor and Frquency of 1st Phase. **The 2nd screen** : Display Voltage,current,power Factor and Frquency of 2nd Phase. **The 3rd screen** : Display Voltage,current,power Factor and Frquency of 3rd Phase. **The 4th screen** : Display Avg voltage,Current.power Factor and Frquency of Three phase. **The 8th screen:** Press for three Sec Displays current connection indication Page. **Note :** 1) In 3 Ø 3 wire system Avg voltage current power factor and freq. will be line to line. 2) In 1 Ø 2 wire system only selectabel phase parameter will be available.
Press "PF/P"	**The 1st screen** : Display power Factor of three phase and Avg Power Factor. **The 2nd screen** : Display Active Power of Three Phase and Avg Active Power. **The 3rd screen** : Display Reactive Power of Three Phase and Avg Reactive Power. **The 4th screen** : Display Apperant power of three Phase and Avg Apperant Power. **The 5th screen** : Display Total Active ,Reactive, Apperant Power and Avg Power Factor of Three Phase. **The 6th screen** :Display Max Active Power Demand,Max Reactive Power Demand and Max appearant Power Demand. **The7th screen** : Displaly Min Active Power Demand and Reactive Power Demand. **Note :** 1) For 3 Ø 3 wire system, for only the 5th,6th and 7th screen will be available. 2) In 1 Ø 2 wire system only selectabel phase parameter will be available.
Press "E"	**The 1st screen** : Display IMP kWh of 1st Phase. **The 2nd screen** : Display IMP kWh of 2nd Phase. **The 3rd screen** : Display IMP kWh 3rd Phase. **The 4th screen** : Display EXP kWh of 1st Phase. **The 5th screen** : Display EXP kWh of 2nd Phase. **The 6th screen** :Display EXP kWh of 3rd Phase. **The** 7th **screen** : Display Total IMP kWh of Three Phase. **The 8th screen** : Display Total EXP kWh of Three Phase. **The 9th screen** : Display Total Net kWh of Three Phase. **The 10th screen** : Display IMP kVArh of 1st Phase. **The11th screen** : Display IMP kVArh of 2nd Phase. **The** 12**th screen** :Display IMP kVArh of 3rd Phase.
Press "E"	**The 13th screen** : Display EXP kVArh of 1st Phase. **The 14th screen** : Display Exp kVArh of 2nd Phase. **The 15th screen** : Display EXP kVArh of 3rd Phase. **The 16th screen** : Display Total IMP kVArh of Three Phase. **The 17th screen** : Display Total EXP kVArh of Three Phase. **The 18th screen** :Display Total Net kVArh of Three Phase. **The 19th screen** : Dispaly kVAh of 1st Phase. **The 20th screen** : Display kVAh of 2nd Phase. **The 21th screen** : Display kVAh of 3rd Phase. **The 22nd screen** : Display Total Net kVAh of Three Phase. **The 23rd screen** : Dispaly run hour **The 24th screen** :Dispaly Auxillary interupt (How many time auxilary interupted)

Note :
1)For 3P3W network 19th,18th, 22nd, 23rd and 24th screen will be availabel.
2) For 1 phase 2 wire network, all page will be same as 3 phase 4 wire but only selected phase

AUTOMATIC/MANUAL/DEFALT MODE DESCRIPTION

Press E (↵) button for 3 seconds to toggle between Default , Automatic and Manual mode.
Note : By default unit operates in Manual 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 any key is not pressed for 5 sec, unit resumes automatic mode.
In Default mode after 60 sec of any page, Product will shift to Voltage L-N page automatically.

SERIAL NUMBER DESCRIPTION

Press PF/P (▼) key for 10sec. to display 8 digit serial number only for 10sec. at 5th line of display

CONFIGURATION

There are 4 dedicated keys with symbols marked as ➤, ▲, ▼,↵ . use these 4 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 ➤ keys to move curser right by one digit each time.
- Use ▲, ▼ keys for increasing and decreasing parameters value.
- Long press▲ Key and press↵ key simultaneously to go back to previouse 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	3P4W, 3P3W, 1P2W-P1, 1P2W-P2 and 1P2W-P3	3P4W
3	CT Secondary	1A or 5A	5
4	CT Primary	1A, 5A to 10,000A	5
5	PT Secondary	100V to 500V	350
6	PT Primary	100V to 500kV	350
7	Demand interval method	Sliding / Fixed	Sliding
8	Demand interval duration	1 to 30	15
9	Demand interval length	1 to 30 min	1
10	Pulse weight (kWh)	0.01 to 99.99	0.01
11	Pulse duration (Sec)	0.1 to 2.0	0.1
12	Run Hour selection(%)	0 to 10	0
13	Slave Id	1 to 255	1
14	Baud Rate	300, 600, 1200, 2400, 4800, 9600 and 19200 (bps)	9600
15	Parity	None, Odd, Even	None
16	Stop Bit	1 or 2	1
17	Back Light	0 to 7200 sec.	0000
18	Factory default	No / Yes	No
19	Reset Energy and MAX demand	No / Yes	No
• 19.0	Password	0001 to 9999	1001
19.1	Reset active energy	No / Yes	No
19.2	Reset reactive energy	No / Yes	No
19.3	Reset apparent energy	No / Yes	No
19.4	Reset MAX Demand	No / Yes	No
19.5	Reset Run Hour	No / Yes	No
19.6	Reset Auxillary Interupt	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, 1P2W (P1/P2/P3)
3P3W	3P3W

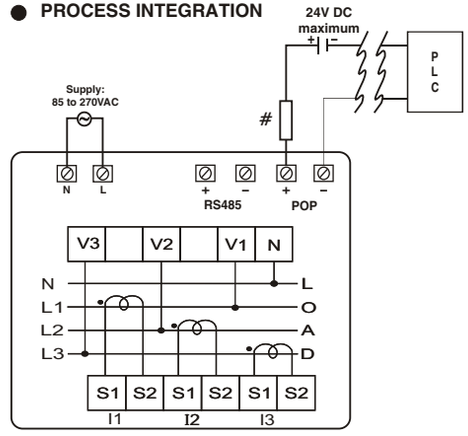
Note : P1, P2 and P3 are Three Phase.

RUN HOUR SELECTION

The value set in configuration is the percentage of current to be apply to increment run hour.If 5% is selected then after applying 5% of current run hour will increment as 0.01 at every 36 sec.If 0% is selected then run hour will increment at every 36sec even after no current is appiled.

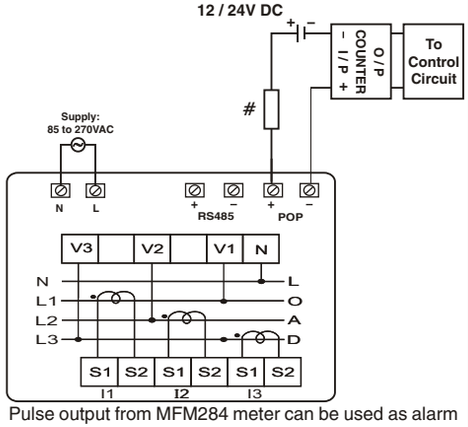
APPLICATION OF PULSE OUTPUT

● PROCESS INTEGRATION



Pulse output from MFM284 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.

● ENERGY CONTROLLER



Pulse output from MFM284 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.

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

MODBUS REGISTER ADDRESSES LIST

Readable parameters for Communication Model Only : [Length (Register) : 2 ; Data Structure : Float]

Address	Hex Address	Parameter
30000	0x00	Voltage V1N
30002	0x02	Voltage V2N
30004	0x04	Voltage V3N
30006	0x06	Average Voltage LN
30008	0x08	Voltage V12
30010	0x0A	Voltage V23
30012	0x0C	Voltage V31
30014	0x0E	Average Voltage LL
30016	0x10	Current I1
30018	0x12	Current I2
30020	0x14	Current I3
30022	0x16	Average Current
30024	0x18	kW1
30026	0x1A	kW2
30028	0x1C	kW3
30030	0x1E	kVA1
30032	0x20	kVA2
30034	0x22	kVA3
30036	0x24	kVAr1
30038	0x26	kVAr2
30040	0x28	kVAr3
30042	0x2A	Total kW
30044	0x2C	Total kVA
30046	0x2E	Total kVAr
30048	0x30	PF1
30050	0x32	PF2
30052	0x34	PF3
30054	0x36	Average PF
30056	0x38	Frequency
30058	0x3A	Total kWh
30060	0x3C	TotalkVAh
30062	0x3E	Total kVArh
30064	0x40	kW MAX Active Power
30066	0x42	kW MIN Active Power
30068	0x44	kVAr MAX Reactive Power
30070	0x46	kVAr MIN Reactive Power
30072	0x48	kVA MAX Apparent Power
30074	0x4A	MAX I1 Demand
30076	0x4C	MAX I2 Demand
30078	0x4E	MAX I3 Demand
30080	0x50	MAX Avg. I Demand
30082	0x52	Run Hour
30084	0x54	IMP kWh1
30086	0x56	IMP kWh2
30088	0x58	IMP kWh3
30090	0x5A	EXP kWh1
30092	0x5C	EXP kWh2
30094	0x5E	EXP kWh3
30096	0x60	Total IMP kWh
30098	0x62	Total EXP kWh
30100	0x64	IMP kVarh1
30102	0x66	IMP kVarh2
30104	0x68	IMP kVarh3
30106	0x6A	EXP kVarh1
30108	0x6C	EXP kVarh2
30110	0x6E	EXP kVarh3
30112	0x70	Total IMP kVarh
30114	0x72	Total EXP kVarh
30116	0x74	KVah1
30118	0x76	KVah2
30120	0x78	KVah3
		Total Harmonic Distortion (THD)
30124	0x7C	THD of Voltage V1N
30126	0x7E	THD of Voltage V2N
30128	0x80	THD of Voltage V3N
30130	0x82	THD of Voltage V12
30132	0x84	THD of Voltage V23
30134	0x86	THD of Voltage V31
30136	0x88	THD of Current I1
30138	0x8A	THD of Current I2
30140	0x8C	THD of Current I3
30684	0x2AC	Serial No.(Data structure: Hex)

Formula to find address of individual Harmonic

Constant Parameter	Meaning
0	Voltage V1N
1	Voltage V2N
2	Voltage V3N
3	Voltage V12
4	Voltage V23
5	Voltage V31
6	Current I1
7	Current I2
8	Current I3

{143 + [(Harmonic no-2) x 2] + 60 x Constant Parameter }

For Example,

To find the 14th Harmonic address of Voltage V31 following formula can be used :

Formula with the parameter :
{143 + [(Harmonic no-2) x 2] + 60 x C P}
Eg. {143 + [(14-2) x 2] + 60 x 5} = 467

So, Check the 14th Harmonic of Voltage V31 at 467 address.

MODBUS register addresses list ***continued***

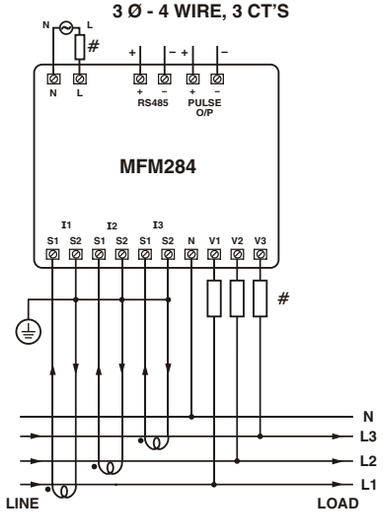
Readable / writable parameters for Communication Model Only :

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	1	Integer
			2	1P2W-P1	1	Integer
			3	1P2W-P2	1	Integer
			4	1P2W-P3	1	Integer
40002	0x02	CT Secondary (A)	1	5	1	Integer
40003	0x03	CT primary (CT Secondary = 5) (A)	5	10000	1	Integer
		CT primary (CT Secondary = 1) (A)	1	10000		
40004	0x04	PT Secondary (V)	100	500	1	Integer
40005	0x05	PT primary (V)	100	500000	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		
			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.)	0	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
			Value	**Meaning**		
40016	0x22	Demand Interval Method	0X0000	Sliding	1	Integer
			0X0001	Fixed		
40017	0x23	Demand Interval Duration	Min Value : 1	Max Value : 30	1	Integer
40018	0x24	Demand Interval Length(min)	Min Value : 1	Max Value : 30	1	Integer
40019	0x25	Reset MAX/MIN Demand	1	Reset MAX/MIN Demand	1	Integer
40020	0x26	Reset Run Hour	1	Reset Run Hour	1	Integer
40021	0x26	Reset Auxillary Interupt	1	Reset Auxillary Interupt	1	Integer
40022	0x26	Pulse Weight (kWh)	0.01	99.99	1	Integer
40023	0x26	Pulse duration (Sec)	0.1	2	1	Integer

TYPICAL WIRING DIAGRAM

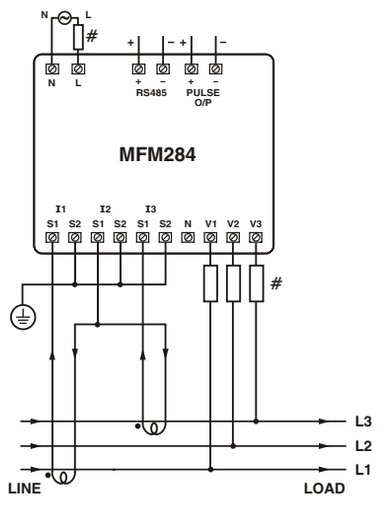
3 PHASE 4-WIRE (COMMONLY USED)

3 Ø - 4 WIRE, 3 CT'S



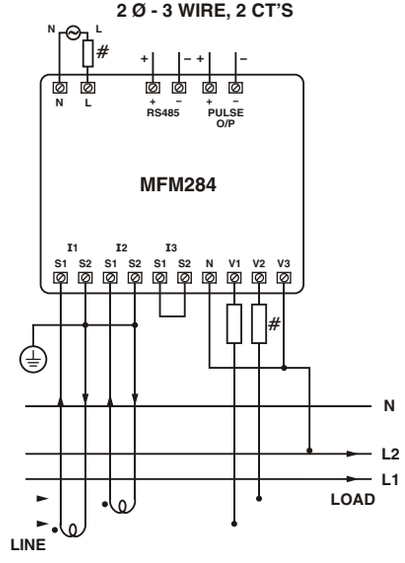
3 PHASE 3-WIRE

3 Ø - 3 WIRE, 2 CT'S



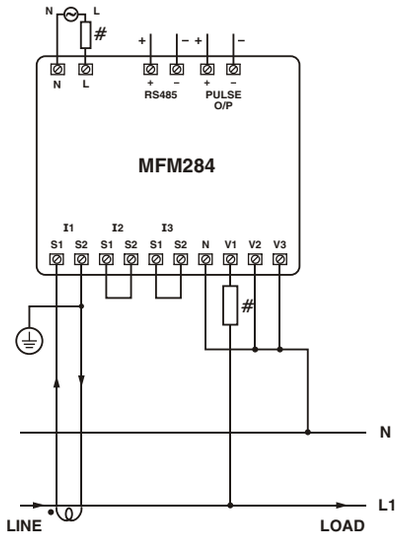
2 PHASE - 3 WIRE

2 Ø - 3 WIRE, 2 CT'S

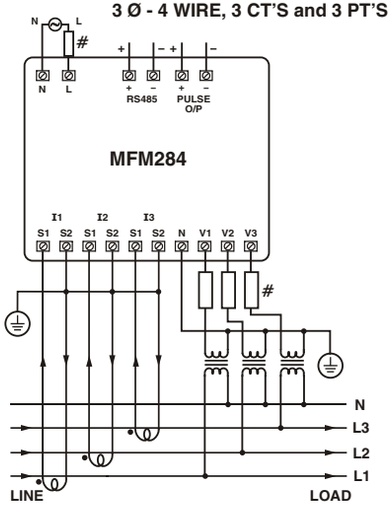


1 PHASE - 2 WIRE

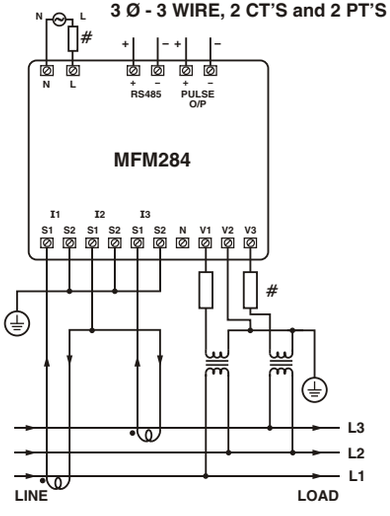
1 Ø - 2 WIRE, 1 CT



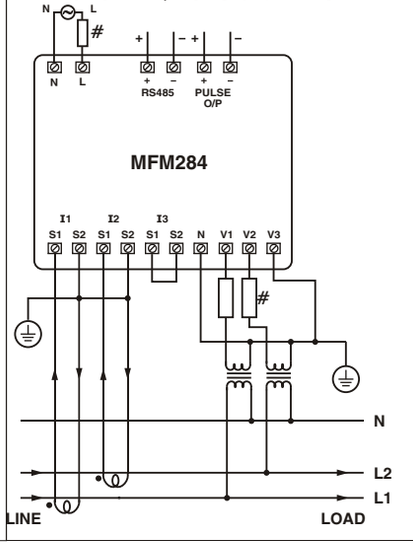
3 Ø - 4 WIRE, 3 CT'S and 3 PT'S



3 Ø - 3 WIRE, 2 CT'S and 2 PT'S

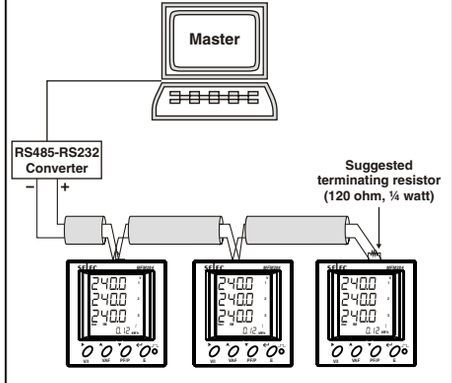


2 Ø - 3 WIRE, 2 CT'S and 2 PT'S



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

CONNECTION DIAGRAM FOR COMMUNICATION



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

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

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