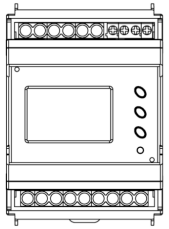
Rayleigh Instruments

RI-D384-C
Operating Instructions



SPECIFICATIONS

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

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

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

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

FREQUENCY RANGE
45-65Hz

CT PRIMARY
1A to 10000A (Programmable for any value)

CT SECONDARY
Nominal 5A (min 11mA, Max 6A)

CT Burden
0.5VA @ 5a per phase

PT PRIMARY
100 to 500KVac (Programmable for any value)

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

DISPLAY UPDATE TIME
1 Second for parameters

DISPLAY SCROLLING
Automatic / Manual

POWER CONSUMPTION
<8VA

TEMPERATURE
Operating : -10 to 55°C
Storage : -20 to 75°C

HUMIDITY
85% non-condensing

MOUNTING
Panel mounting

WEIGHT
208gms

OUTPUT
Pulsed Output : Voltage range External 24VDC max
Current capacity : 100mA

INSTALATION CATEGORY
Category III

SERIAL COMMUNICATION

Interface Standard and protocol	RS485 & 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 (bps)
Parity	None, Odd, Even
Stop bits	1 or 2
Response time	100mS

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 For L-N Voltage >20V For L-L Voltage >35V	±0.1% of Full Scale
Active Power	±1%
Reactive Power	±1%
Apparent Power	±1%
Power Factor	±0.1%
Active Energy	±1%
Reactive Energy	±1%
MAX / Min Active Power	±1%
MAX / MIN Reactive Power	±1%
MAX Apparent Power	± 1%

RESOLUTION

PT Ratio x CT Ratio	**KWh / KVAh / KVArh**
<15	0.01K
<150	0.1K
<1500	1K
<15000	0.01M
<150000	0.1M

NOTE: 1) For Voltage, Current, 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 operation 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 the manner specified by the manufacturer it might impair the protection provided by the equipment.

CAUTION
Read the instructions prior to installation and operation of the unit.

CAUTION
Risk of electrical shock

WIRING GUIDELINES

WARNING

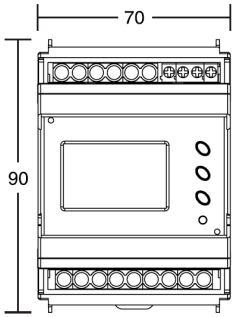
1. To prevent the risk of electric shock, power supply to the equipment must be kept OFF while installing the wiring.
2. Wiring shall be done strictly according to the terminal layout. Confirm that all connections are correct.
3. Use lugged terminals.
4. To reduce electromagnetic interference use of 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. These wires shall have current capacity of 6A.
7. Copper cable should be used (Stranded or single core cable).
8. Before attempting work on the device ensure absence of voltages using appropriate voltage detection device.

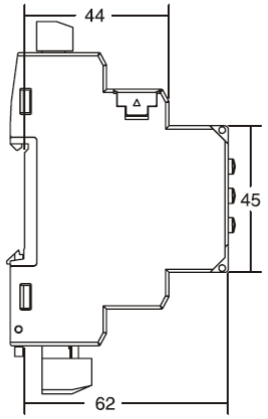
INSTALLATION GUIDELINES

CAUTION

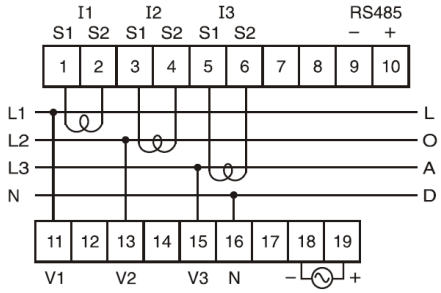
1. This equipment, being of a built-in-type, normally becomes a part of a main control panel and in case the terminals do not remain accessible to the end user after installation and internal wire.
2. Conductors must not come into contact with the internal circuitry of the equipment or it may lead to a safety hazard that may in turn endanger life or cause electrical shock to the operator.
3. Protection & disconnection means must be installed between power source and supply terminals to facilitate power 'ON' or 'OFF' function & 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 the manual.
6. The equipment does not have a built-in-type fuse. Installation of external fuse of rating 275Vac / 0.5Amp for electrical circuitry / battery is highly recommended.

DIMENSIONS (All dimensions in mm)





TERMINAL CONNECTIONS



ONLINE PAGE DESCRIPTION

There are 2 dedicated keys labelled as PAGE and PRG with symbols ⋗ and ⋀ to read meter parameters.
At power on the meter displays average phase to neutral voltage and active energy of three phases. If any key is not pressed for 60 seconds the unit resumes manual mode.

KEY PRESS	PARAMETER KEY	DESCRIPTION
ONLINE PAGE DESCRIPTION FOR 3P4W and 3P3W		
Press page (⋗) key (1st time)	——	Displays line to neutral voltage of three phases
	Press (⋀) key	Displays line to line voltage of three phases (★)
Press page (⋗) key (2nd time)	——	Displays phase current of three phases (★)
Press page (⋗) key (3rd time)	——	Displays average phase to neutral voltage, current and power factor of three phases and frequency
	Press (⋀) key	Displays average line to line voltage, current and power factor of three phases and frequency (★)
Press page (⋗) key (4th time)	——	Displays power factor of three phases and frequency
	Press (⋀) key 1st time	Displays active power of three phases
	Press (⋀) key 2nd time	Displays reactive power of three phases
	Press (⋀) key 3rd time	Displays apparent power of three phases
	Press (⋀) key 4th time	Displays total active power of three phases (★)
	Press (⋀) key 5th time	Displays total reactive power of three phases (★)
	Press (⋀) key 6th time	Displays total apparent power of three phases (★)
	Press (⋀) key 7th time	Displays Max (2nd row) and Min (3rd row) demand of total active power (★)
	Press (⋀) key 8th time	Displays Max (2nd row) and Min (3rd row) demand of total reactive power (★)
	Press (⋀) key 9th time	Displays Max demand of total apparent power (★)
Press page (⋗) key (1st time)	——-	Displays average voltage line to neutral (1st row), import active energy (2nd row) and export active energy (3rd row) of three phases (★)
	Press (⋀) key	Displays average voltage line to neutral (1st row), import reactive energy (2nd row) and export reactive energy (3rd row) of three phases (★)
	Press (⋀) key 3 seconds	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 3Phase 3Wire network only (★) marked page will be displayed.	

KEY PRESS	PARAMETER KEY	DESCRIPTION
ONLINE PAGE DESCRIPTION FOR 1P2W-P1/P2/P3		
Press page (⋗) key (1st time)	——	Displays line to neutral voltage of selected phase
Press page (⋗) key (2nd time)	——	Displays phase current of selected phase
Press page (⋗) key (4th time)	——	Displays power factor of selected phase and frequency
	Press (⋀) key 1st time	Displays active power of selected phase
	Press (⋀) key 2nd time	Displays reactive power of selected phase
	Press (⋀) key 3rd time	Displays apparent power of selected phase
	Press (⋀) key 4th time	Displays MAX (2nd row) and MIN (3rd row) demand of total active power
	Press (⋀) key 5th time	Displays MAX (2nd row) and MIN (3rd row) demand of total reactive power
	Press (⋀) key 6th time	Displays total MAX demand of total apparent power
Press page (⋗) key (5th time)	——	Displays average voltage line to neutral (1st row), import active energy (2nd row) and export active energy (3rd row) of selected phase
	Press (⋀) key 1st time	Displays average voltage line to neutral (1st row), import reactive energy (2nd row) and export reactive energy (3rd row) of selected phase
	Press (⋀) key 2nd time	Displays average voltage line to neutral (1st row) and apparent energy (3rd row) of selected phase
Note: For 1Phase 2Wire network, only selected phase parameter will be displayed		

CONFIGURATION

There are 3 dedicated keys with symbols marked as ⋀ , ⋗ and ⏎ use these 3 keys to enter into configuration menu or to change the settings.

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

SERIAL NUMBER DESCRIPTION

Press (⋀) key for 10 seconds to 8 digit serial number only for 10 seconds on the 2nd and 3rd lines of the display

Config Page	Function	Range or Selection	Factory Setting
	Password	0000-9999	1000
1.0	Change Password	No/Yes	No
1.1	New Password	0000-9998	1000
2.0	Network Selection	3P4W 3P3W 1P2W-P1 1P2W-P2 1P2W-P3	3P4W
3.0	CT Secondary	1-5A	5A
4.0	CT Primary	5A - 10000A	5A
5.0	PT Secondary	100 - 500V	350V
6.0	PT Primary	100-500KV	350V
7.0	Slave ID (Address)	1-255	1
8.0	Baud Rate	300, 600, 1200, 4800, 9600 & 19200	9600
9.0	Parity	None, Even, Odd	None
10.0	Stop Bit	1 or 2	1
11.0	Back Light	0-7200S	0000
12.0	Demand Interval Method	Sliding/Fixed	Sliding
13.0	Demand Interval Duration	1-30	15
14.0	Demand Interval Length	1-30min	1
15.0	Max auto Pages	1 to 18	18
16.0	Change Page Sequence	No/Yes	No
16.1	Page Sequence 1	No/Yes	No
16.2	Page Sequence 2	No/Yes	No
16.3	Page Sequence 3	No/Yes	No
16.4	Page Sequence 4	No/Yes	No
16.5	Page Sequence 5	No/Yes	No
16.6	Page Sequence 6	No/Yes	No
16.7	Page Sequence 7	No/Yes	No
16.8	Page Sequence 8	No/Yes	No
16.9	Page Sequence 9	No/Yes	No
16.10	Page Sequence 10	No/Yes	No
16.11	Page Sequence 11	No/Yes	No
16.12	Page Sequence 12	No/Yes	No
16.13	Page Sequence 13	No/Yes	No
16.14	Page Sequence 14	No/Yes	No
16.15	Page Sequence 15	No/Yes	No
16.16	Page Sequence 16	No/Yes	No
16.17	Page Sequence 17	No/Yes	No
16.18	Page Sequence 18	No/Yes	No
17	Reset Factory Default	No/Yes	No
18	* Password	0001-9999	1001

Config Page	Function	Range or Selection	Factory Setting
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 for password. If correct password is entered, the user will be able to reset all energy parameters. The password will be 1 grater than the main password.

MODBUS REGISTER ADDRESSES LIST

Modbus Register Addresses List

Address	Hex Address	Parameter	Range		Length (Register)	Data Structure
			Min Value	**Max Value**		
40000	0x00	Password	0	9998	1	Integer
			Value	**Meaning**		
40001	0x01	Network Selection	0x0000	3P4W	1	Integer
			0x0001	3P3W	1	
			0x0002	1P2W-P1	1	Integer
			0x0003	1P2W-P2	1	Integer
			0x0004	1P2W-P3	1	Integer
			Min Value	**Max Value**		
40002	0x02	CT Secondary (Readable Only)	5	5	1	Integer
40003	0x03	CT Primary 2	5	10000	1	Integer
40004	0x04	PT Secondary	100	500	1	Integer
40005	0x05	PT Primary	100	10000	2	Integer
40007	0x07	Slave ID	1	255	1	Integer
			Value	**Meaning**		
40008	0x08	Baud Rate	0x0000	300 bps	1	Integer
			0x0001	600 bps	1	Integer
			0x0002	1200 bps	1	Integer
			0x0003	2400 bps	1	Integer
			0x0004	4800 bps	1	Integer
			0x0005	9600 bps	1	Integer
			0x0006	19200 bps	1	Integer
40009	0x09	Parity	0x0000	None	1	Integer
			0x0001	Odd	1	Integer
			0x0002	Even	1	Integer
40010	0x0A	Stop Bit	0x0000	1	1	Integer
			0x000	2	1	Integer
			Min Value	**Max Value**		
40011	0x0B	Backlight OFF	0	7200	1	Integer
40012	0x0C	Factory Default Reset	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
40016	0x10	Auto mode sequence	1	18	1	Integer
			Page No.	**Meaning**	1	Integer
40017	0x11	Page Sequence 1	1-18	1– First page ; 18-Last page	1	Integer
40018	1x12	Page Sequence 2	1-18	1– First page ; 18-Last page	1	Integer
40019	0x13	Page Sequence 3	1-18	1– First page ; 18-Last page	1	Integer
40020	0x14	Page Sequence 4	1-18	1– First page ; 18-Last page	1	Integer
40021	0x15	Page Sequence 5	1-18	1– First page ; 18-Last page	1	Integer
40022	0x16	Page Sequence 6	1-18	1– First page ; 18-Last page	1	Integer
40023	0x17	Page Sequence 7	1-18	1– First page ; 18-Last page	1	Integer
40024	0x18	Page Sequence 8	1-18	1– First page ; 18-Last page	1	Integer
40025	0x19	Page Sequence 9	1-18	1– First page ; 18-Last page	1	Integer
40026	0x1A	Page Sequence 10	1-18	1– First page ; 18-Last page	1	Integer
40027	0x1B	Page Sequence 11	1-18	1– First page ; 18-Last page	1	Integer
40028	0x1C	Page Sequence 12	1-18	1– First page ; 18-Last page	1	Integer
40029	0x1D	Page Sequence 13	1-18	1-First page ; 18-Last page	1	Integer
40030	0x1E	Page Sequence 14	1-18	1-First page ; 18-Last page	1	Integer
40031	0x1F	Page Sequence 15	1-18	1-First page ; 18-Last page	1	Integer
40032	0x20	Page Sequence 16	1-18	1-First page ; 18-Last page	1	Integer
40033	0x21	Page Sequence 17	1-18	1-First page ; 18-Last page	1	Integer
40054	0x22	Page Sequence 18	1-18	1-First page ; 18-Last page	1	Integer
			Value		**Meaning**	
40034	0x22	Demand Interval Method	0x0000	Sliding	1	Integer
			0x000	Fixed		
40035	0x23	Demand Interval Duration	Min Value : 1	Max Value : 30	1	Integer
40036	0x24	Demand Interval Length (minutes)	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

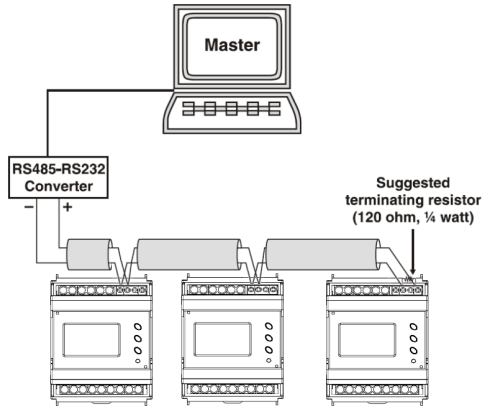
0.1 Resolution [1= 0.1 seconds] 0.01 Resolution [1 = 0.01 KWh]

Readable Parameters : [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	Import KWh
30060	0x3C	Import KVAh
30062	0x3E	Import KVArh

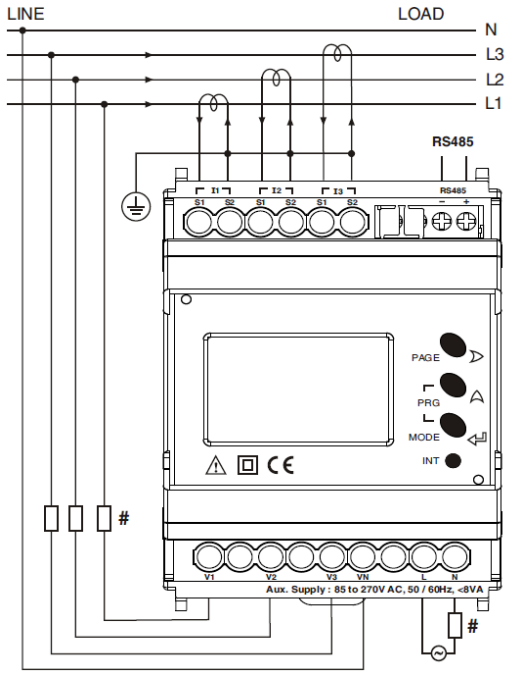
Address	Hex Address	Parameter
30064	0x40	KW MAX Active Power
30066	0x42	KW MIN Active Power
30068	0x44	KVAr MAX Reactive Power
30070	0x46	KVAr MIN Reactive Power
30072	0x48	KVA MAX Apparent Power
30074	0x4A	Export KWh
30076	0x4C	Export KVarh
30132	0x84	Serial Number
30134	0x86	Existing MAX Active Power
30136	0x88	Existing MIN Active Power
30138	0x8A	Existing MAX Reactive Power
30140	0x8C	Existing MIN Reactive Power
30142	0x8E	Existing MAX Apparent Power

CONNECTION DIAGRAM FOR COMMUNICATION

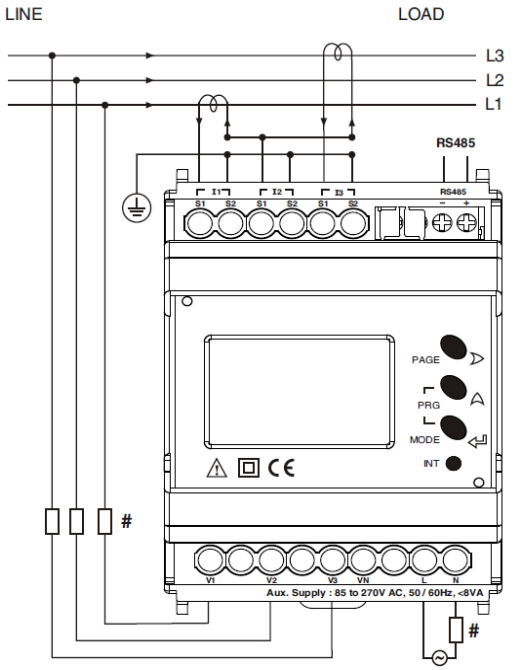


Contact sales for PC based monitoring software to communicate with the meters.

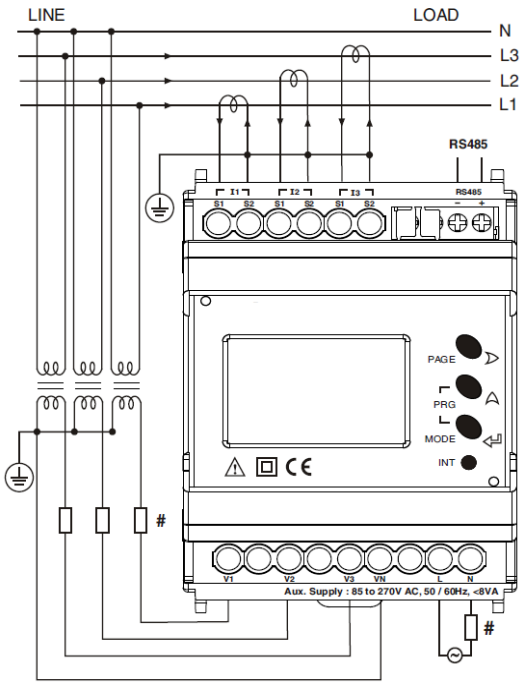
3 Phase - 4 Wire (Commonly Used) | 3 Ø - 4 Wire, 3 CT'S



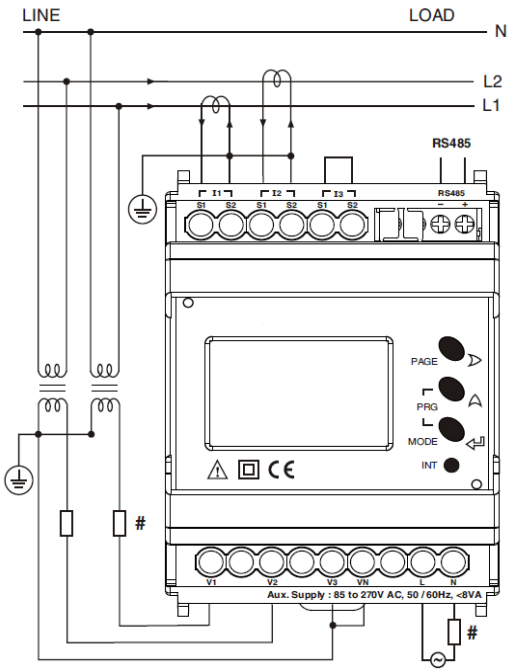
3 Phase - 3 Wire | 3 Ø - 3 Wire, 2 CT'S



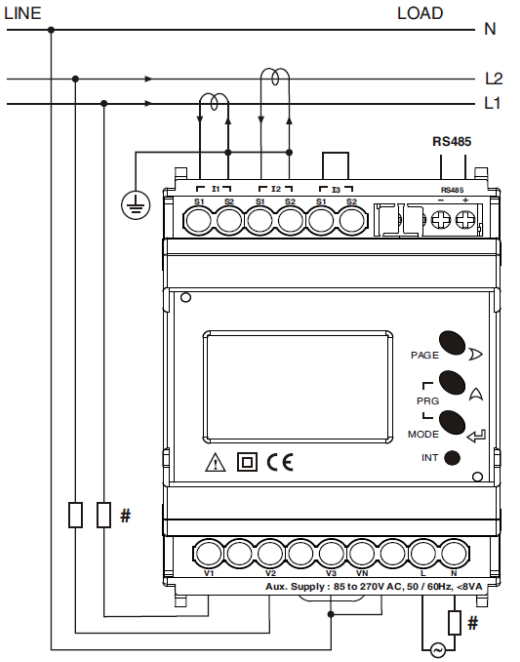
3 Phase - 4 Wire | 3 Ø - 4 Wire, 3 CT'S and 3 PT'S



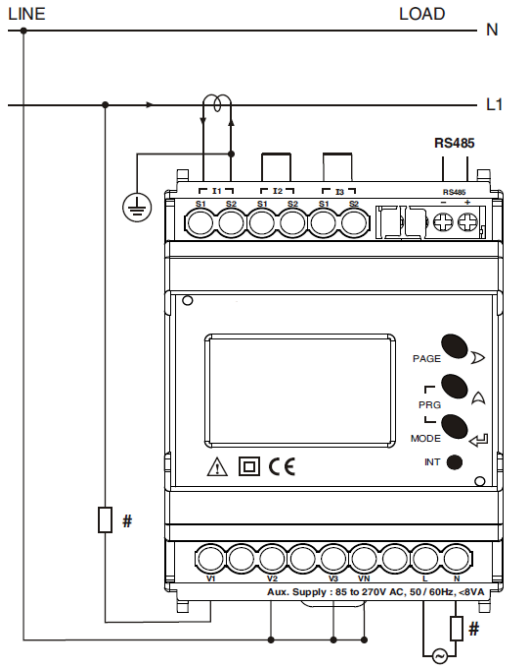
2 Phase - 3 Wire | 2 Ø - 3 Wire, 2 CT'S and 2 PT'S



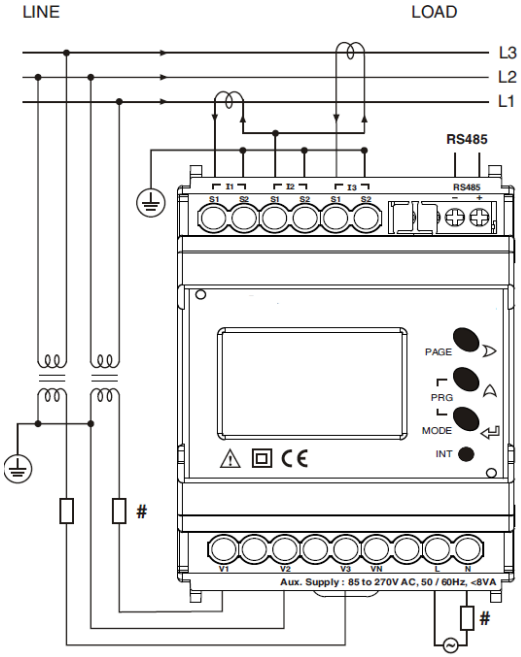
2 Phase - 3 Wire | 2 Ø - 3 Wire, 2 CT'S



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



Rayleigh Instruments
EST. 1964

Specifications subject to change as development is a continuous process

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