INSTRUCTION MANUAL
Multi Function Meter
SPML300

ISO 9001: 2018 ISO 50001: 2018

Manufactured by

SPZ
Proactive Monitoring

www.spowerz.com

1.Overview

The SPML300 Multifunction meter offers comprehensive Three-Phase Electrical Instrumentation and load Management facilities in a compac t and rugged package. To get the best out of your investment, we suggest that you take a few moments to review the manual. This manual contains the operating instructions and also explains the installation and setup step before the master is ready for use. Before use the meter, based on our requirement we have to set the PT and CT ratios through the front panel keys.

Fig 1.1 SPML300 Multi Function Meter

1.1 General specifications

- Meter measures Active, Reactive, Apparent energy on 3 phase 4 wire system,
- All four quadrant measurement for MD, kWh, kVAh, kVArh (lag and lead) are measured and stored in four energy accumulators,
- Measure Instantaneous Parameters
  - Phase to Phase voltage
  - Phase to Neutral voltage
  - Phase wise current
  - Phase wise power factors
  - Phase wise active power
  - Phase wise reactive power
  - Phase wise apparent power
  - Value of system frequency
  - Date and Time
  - Phase sequence
  - Rising Demand in kVA/kW
- Stores accumulated parameters
  - Cumulative Kwh, kVAh, kVArh (Lead and lag)
  - MD value (in kVA/kw)
- LoraWan Communication-Class C

1.2 Physical Characteristics

Front: The front panel has the first 3 rows of 4 digits / characters each with auto scaling "K" kilo and “M” Mega,”G” Giga scaling of "Energy". The Left/Right Arrow Mark to the left of the display gives the indication of Import/Export . Mains Import can be used to calculate the energy. Four smart -keys make navigating the parameter very quickly and configuring the SPML300.

Rear: The Voltage and Current terminals and the Auxiliary, Potential Free Terminals, are located on the back of the meter.

1.3 Front Line Description

The Front panel has the following indication

Fig 1.3.1 Front Description of SPML300

The first 3 row of seven segment Led displays, 4 digits each that displays the energy parameters kWh, kVAh, kVArh (lag and lead) parameter. This will be updated every second.

- For each row: kilo "K", Mega ”M”,Giga “G” indicator and Energy indicator.
- Mains energy can be calculated in Kwh,Mwh,Gwh.
- Four keys to scroll through the display.

1.4 The Keys And Its Operations

By using the 4 smart keys, we can easily go through the display. The following table shows the operation of the key.

Keys	Operations
Mode / Set	To edit and enter the parameter values
Up	To View the previous parameter and to increment the value while setting
Next	To view the next parameter and to select the digit while setting.
scroll / Esc	To stop and view and scroll and exit the parameter

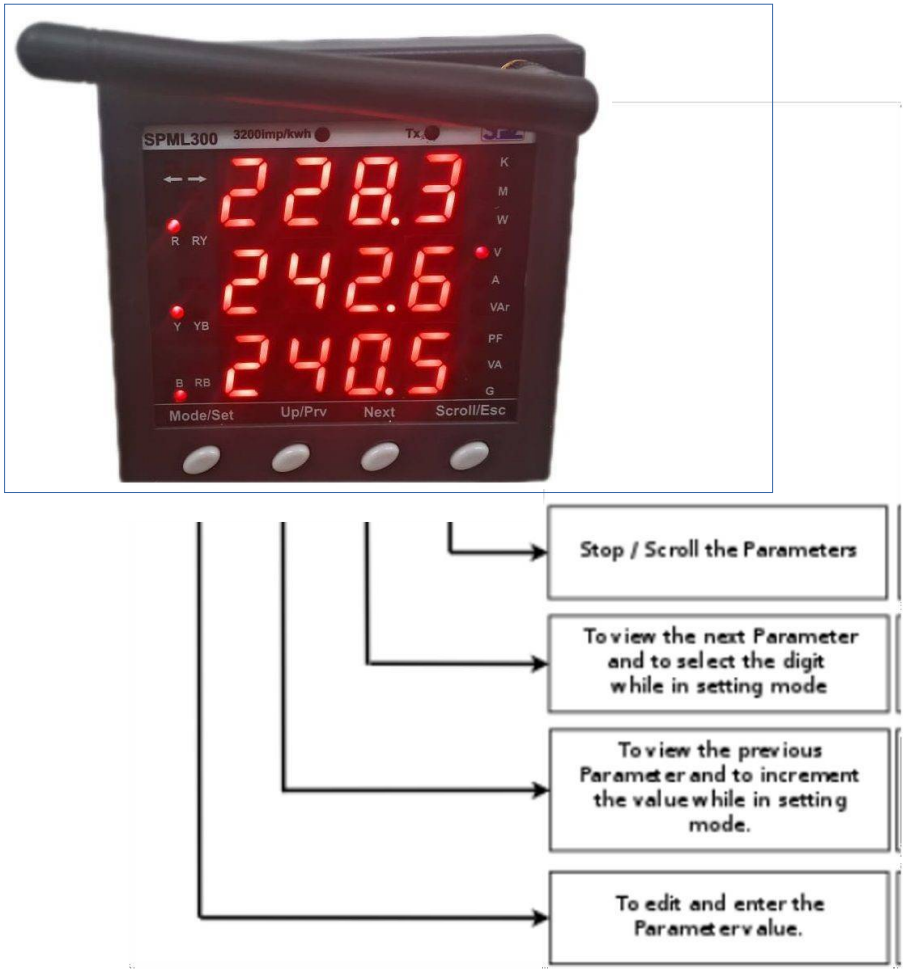

Fig 1.4.1 Key Operations of SPML300

1.5 Technical specifications

The SPML300 is a high accuracy, low cost and compac t energy meter that offers quality, accuracy and functional capability.

- **Auxiliary Supply**

The auxiliary supply is 85-300VAC/DC.

- **Voltage PT**

Primary side - Programmable (110V to 33KV)

Secondary side - 110 to 440 V

- **Current CT**

Primary side - Programmable (1A to 9999A)

Secondary side – 1A or 5A

- **Starting Current**

The initial current in that meter is 10mA.

- **Power Factor**

The power factor of the SPML300 is four quadrants.

- **Frequency**

The frequency is 45 - 65 Hz, ±5%

- **Communication**

LoraWan-Class C

- **Temperature**

Operating Temp. - (-10 to 70)°C

Storage Temp. - (- 20 to 70)°C

Humidity 5 to 95% RH at 50 °C(Non-Condensing)

- **Dimension**

The dimension is (96 x 96 x 48) mm (Inclusive of connector)

- **Panel Cutout**

The panel cutout is in the range of 92 x 92 mm (-0.5mm)

- **Mounting**

It is panel mountable

- **Connector Type**

It is a Screw type terminals (U Lug 2.5mm) connector.

- **Weight**

The weight of the meter is 350gms. (app.)

- **Accuracy**

Measurement	Accuracy
Voltage Line - Neutral	0.5
Voltage Line - Line	0.5
Voltage Line - Neutral Avg	0.5
Voltage Line - Line Avg	0.5
Amp per Phase	0.5
Amp per avg	0.5
Power Factor for each phase	1°
Frequency	0.1
Real power and kW per phase & total	0.5
Reactive power kVAr per phase and total	0.6
Apparent power kVA per phase & total	0.5
Active energy kWh import/export	0.5
Reactive energy (kVArh) & (Lead/Lag)	1
Apparent energy (kVAh)	0.5

- **System type**

The system type is 3P4W/3P3W system.

- **Input Voltage**

The input voltage of the SPML300 is 3*240 VAC.

- **Resolution**

Resolution of this meter is 0.1 for combined kWh and kVAh

2. Quick Start Guide

This chapter helps to use the meter easily

- Viewing individual phases & total average voltage simultaneously.
- Viewing Per phase values
- Viewing energy values
- Viewing the % of load bar graph
- Resetting energy values.
- Setting up the meter before use.

2.1 Display Details

- LED with Seven Segment Display - The parameters are calculated by the meter are displayed.
- Scroll rate - The scroll rate of the display parameter scroll in 4 sec.
- Keys are provided to stop, scroll, edit and view the particular parameter.

2.2 Display parameter

- Real Time Clock (RTC)
- Date System (Star/Delta)
- Meter ID
- PT Primary
- PT Secondary
- CT Primary
- CT Secondary
- Frequency
- Cumulative-RYB-Active Energy (kWh)
- Cumulative-RYB-Apparent Energy (kVAh)
- Cumulative-RYB-Reactive Energy (kVArh) lead
- Cumulative-RYB-Reactive Energy (kVArh) lag
- Power ON hour
- Load ON hour

- Voltage L-N (R, Y, B)
- AVG voltage
- Voltage L-L (RY, YB, BR)
- Current Phase Wise (R, Y, B),
- AVG current
- Power Factor (R,Y,B),
- AVG PF (RYB)
- Instant-Active Power kW (R, Y, B),
- Instant-Apparent Power kVA (R, Y, B)
- Instant-RYB-Reactive Power (kVAr)
- Combined kW, kVA, kVAr
- Rising Demand (kVA / kW)
- Maximum Demand (kVA / kW)
- Voltage (Total Harmonic distortion)
- Current (Total Harmonic distortion

2.3 Key Features of SPML300

SET mode entry		**While the meter is scrolling the Parameters**
	Press **MODE** Key	Meter request for Password (8282 default)
	Press **MODE** Key	Use UP & NEXT key and enter correct Password
		Password is accepted and goes to set mode
PT Primary set		**While PT Primary is selected**
	Press **MODE** key	Now PT primary value can be changed
	Press **MODE** key	Use UP & NEXT key to edit PT primary value
		New PT primary value is registered
PT Secondary set		**While PT Sec is selected**
	Press **MODE** key	Now PT secondary value can be changed
	Press **MODE** key	Use UP & NEXT key to edit the PT secondary
		The New PT secondary value is registered
CT Primary set		**While CT Primary is selected**
	Press **MODE** key	Now CT primary value can be changed
	Press **MODE** key	Use UP & NEXT key to edit CT primary value
		New CT primary value is registered
CT Secondary		**While CT Secondary is selected**
	Press **MODE**	Now CT secondary can be changed

set	key	
	Press **MODE** key	Use UP & NEXT key to edit the CT Sec value
		New CT secondary value is registered
Time and Date set		**While Time set is selected**
	Press **MODE** key	Time can be adjusted.
		Use UP & NEXT key to adjust Real Time
	Press **MODE** key	The New real time is registered
	Press **MODE** key	Now Date can be corrected
		Use UP & NEXT key to set real Date
	Press **MODE** key	The Real date is registered.
Reset		**While MD Reset is selected**
	Press **MODE** key	Request clear/unclear the MD value.
	Press **UP** key	To Clear MD & Average Value
	Press **NEXT** key	To Unclear the MD & Average Value
Energy Reset		**While Energy reset is selected**
	Press **UP** key	Energy parameter is selected
	Press **MODE** key	Enter the Password
	Press **UP** key	To Clear Energy
	Press **NEXT** key	To Un Clear Energy
MD in kVa/kW		**While MD Setting option is selected**
	Press **MODE** key	MD setting option can be changed
		Enter the MD Parameter option
		Use UP key to choose kW or kVA
	Press **MODE** key	The selected Option is registered
Edit password		**While Change Password is selected**
	Press **MODE** key	Password can be Changed.
		Use UP & NEXT key to enter new Password
	Press **MODE** key	New password is Registered

3. Electrical Installation

This chapter discuss about the need of PT and CT, Auxiliary supply, PT and CTconnections.

3.1 Auxiliary Power Supply

The SPML300 requires a single-phase ac / dc power supply to spply power to its internal electronic circuitary.

External surge suppressors are necessary in the Auxiliary supply circuit for proper operation during extreme surge conditions, where the voltage exceeds the Auxiliary supply limits.

Auxiliary Supply Range: 85 VAC- 300 VAC/DC

3.2 PT and CTs

Large electrical installation have voltages and currents, which may exceed the direct connection rating of the meter. In this case, potential transformer and current transformers are used to preciesly "Step Down" or reduce the voltage and current level to suit the meter rating. Potential transformer usually have a full-scale output of 110Vac RMS line-line and current transformers, a full scale output of 5A or sometimes 1A.

The PTs and CTs must be planned , installed and tested by a qualified electrical contactors before wiring the meter. The accuracy of the measurements also depend on the Accuracy and phase-angles error of the PTs and CTs.

Ensure that the CT primary rating has been selected so that your normal load variation lies between 40% and 80% of its full scale. If your CT is over- rated, say if the load is always less than 10% of the CT primary rating, accuracy suffers and on the other hand, if the CT is under- rated, then you may exceed its full-scale and burn out both the CT and EZ SPML300.

3.3 PT, CT Wiring

The PTs and CTs must have adequate VA rating to support the load on the secondaries. You may want to support the Auxiliary supply from one of the PTs. Ct wiring can impose additional load on the CT.If the wiring distance from the CT secondary is greater means, the CT could get over-burdened and give large errors. Choosing 1A CT secondary can reduce this error. The CT secondary value must be user programmed into the meter.

3.4 Voltage Signal connections

For proper meter operation, the voltage connection must be maintained. The voltage must correspond to the correct terminal. The cable required to terminate the voltage sense circuit should have an insulation rating greater than 600V ac and a current rating greater than 0.1A.

There are 4 voltage input terminals marked as VL1, VL2, VL3 and Vn.

3.5 Current Signal Connections

There are three pairs of current input terminals marked S1, S2 – IL1, S1, S2 – IL2, S1, S2 – IL3 and has an arrow indicating the direction of current flow. For proper measurements, the phase identification as well as the polarity of the current signals must be correct. The forward flow current direction must be into the S1 terminal and the exit from the S2 terminal. Please maintain the correct sequence and polarity to avoid wrong readings.

3.6 CT Polarity

When the meter is connected using th CTs, you must maintain the correct CT polarities. CT polarities are dependent upon correct connections of CT leads, and upon the direction the CTs are facing when clamped around conductors. The dot on the CT must face the line side; the corresponding secondary connection must connect to the appropriate input on the meter.

Failure to connect CTs properly results in accurate power readings. If your meter is not reading power properly, it is more than likely that the CT is incorrectly wired. If one or two CTs are reversed, then the energy parameters accumulate only one phase value. If two or all the phases of the CT are reversed, Energy will not accumulate.

3.7 CT Connection Reversal

To check the polarity of the CT after the meter has been installed, simply look at the phase wise W readings to see that each of the readings are are positive. If one of the W readings are negative, That particular phase CT is reversed and must be correctd. On the other hand if you are exporting power, all threephase-wise W readings must be negative.

4. MECHANICAL INSTALLATION

The SPML300 is panel- mounted and has reliable, rear-mounted terminal strips rated at 600V.The 92 x 92mm cut-out and 96 x 96 mm bezel dimensions adhere to DIN IEC 61554 and DIN 43700.

Depth required behind the Bezel is 80 mm, plus space for wiring. Two side clamps are provided for firm mounting.

Diagram below displays the various dimensions of mec hanical installations

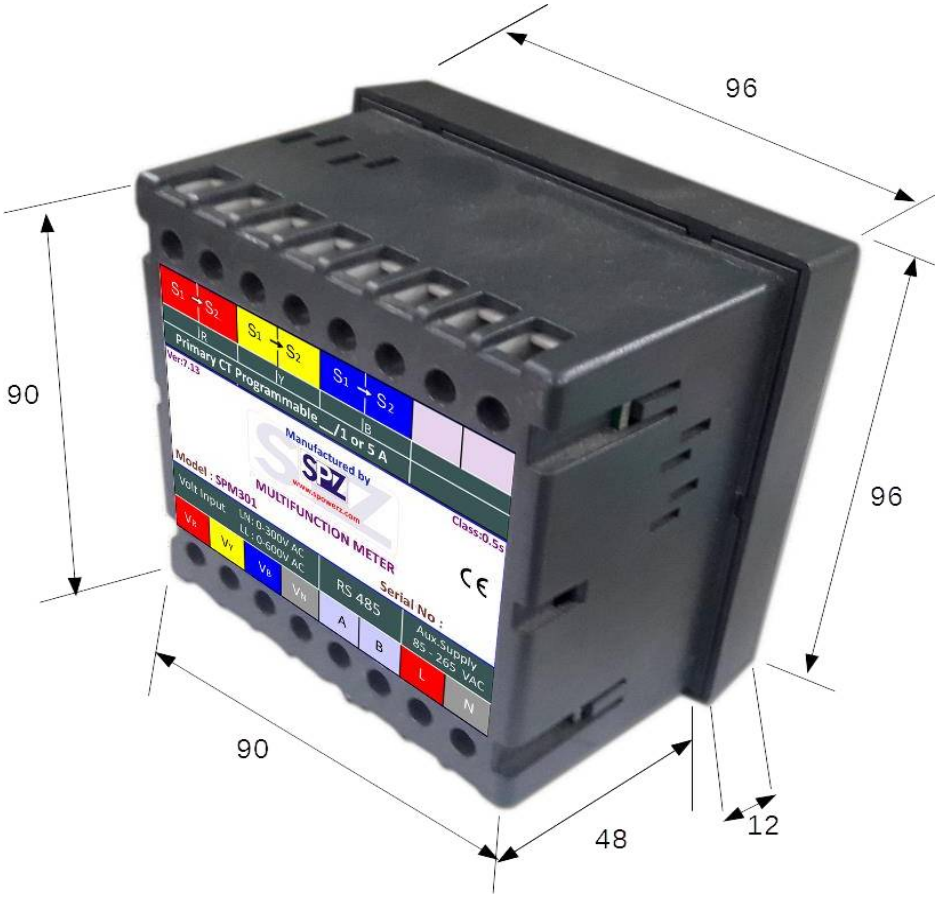

Fig 5.1 Dimensions of SPML300

Front View

Fig 5.2 Front View of SPML300

4.1 Usage

First, decide on how the SPML300 is going to be used. If you do not already have an Energy Management program in operation, then your Energy Consultant should be able to help you identify which load(s) offer maximum savings potential. This will help you decide: Which point is to be monitored, where the readings will be viewed from, who must have access to the instrument and how often. For best performanc e, choose a location, which provides all the required signals with minimum wiring lengths.

4.2 Panel Considerations and Environment

The SPML300 is a high – precision measuring instrument and its operating environment is of utmost importanc e. For maximum performanc e, the instrument should be mounted in a dry, dust – free location, away from the heat sources and strong electromagnetic fields. To operate reliably, the following conditions must be met:

Relative Humidity	: 5 to 95% RH at 50
°C Storage Temperature	: (- 10 to 70) °C
Operating Temperature	: (- 20 to 70) °C

The SPML300 should be separated from other equipment and sufficient space must be provided all around for cooling air to rise vertically past the instrument. The cooling air temperature must be below the specified operating temperature.

The panel or housing, in which the SPML300 is mounted, should protect it from dust, moisture, oil, corrosive vapors, etc.

The panel doors must be easily opened to provide easy access to the SPML300 wiring for trouble-shooting. Allow clearance if the unit is going to swing out, as well as adequate slack in the wiring. Allow

Space for terminal blocks, CT shorting blocks, fuses, auxiliary contractors and other necessary components.

4.3 Viewing

For ease of operation, in the location should be preferably at. Or slightly above, eye - level. For viewing comfort, minimizing glare and reflections from strong light sources.

4.4 Mounting

Before Mounting and Wiring, the setup should have been completed.

The SPML300 is panel mountable.

Panel cut-out	: 92±0.5 X 92±0.5
Panel thickness	: 1.6 mm
Instrumental Bezel dimension	: 96X96mm
Depth behind Bezel	: 48mm
Mounting Clamp Screws	: 2 nos.

The cut-out should be punched with the proper tool and should be free burrs. Before Wiring insert the SPML300 into the cut-out from the front, tighten both side clamp screws in a cress- cross pattern till all slack is taken up and then apply one full turn. Do not over-tighten.

5. Connection Diagram

Choose the diagram below that describes our application. In this manual we describe our CT and LT Connection diagram.

5.1 SPML300 Rear panel

The meter terminals are located in rear panel. It has 16 terminals.

- Six terminals for current, one for in and one for out.
- Four terminals for voltage, for three phase and neutral.
- Two terminals for Meter Auxiliary supply (85 – 300VAC/DC).
- Two terminals for 24VDC Contactor Input.
- Two terminals for Potential Free output.

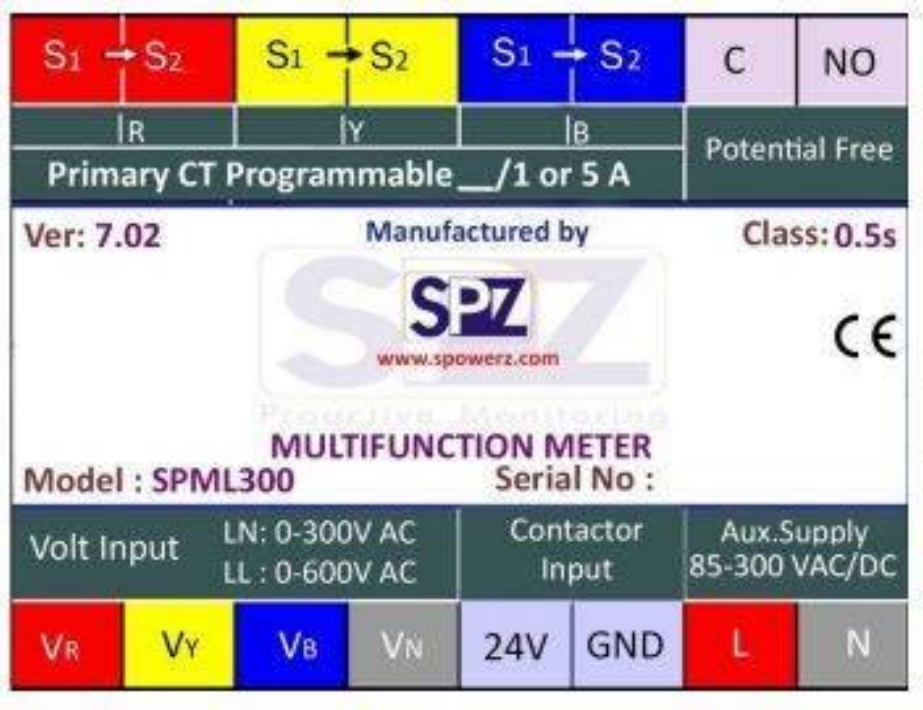

Fig 6.1.1 Rear Panel of SPML300

5.2 Connection Diagram for LT and HT

The below diagram displays the LT and CT connection for 3 phase 4 wire system.

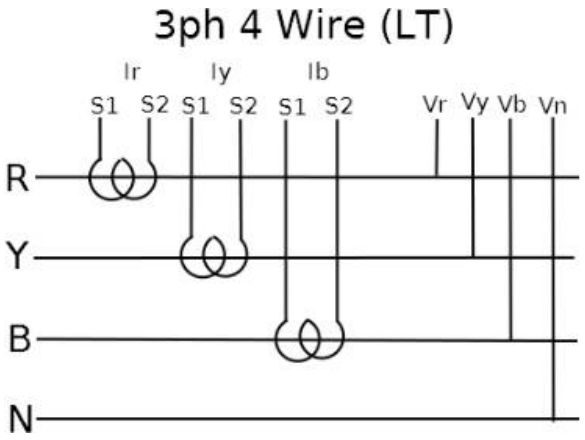

Fig 6.2.1 3ph 4 wire (LT)

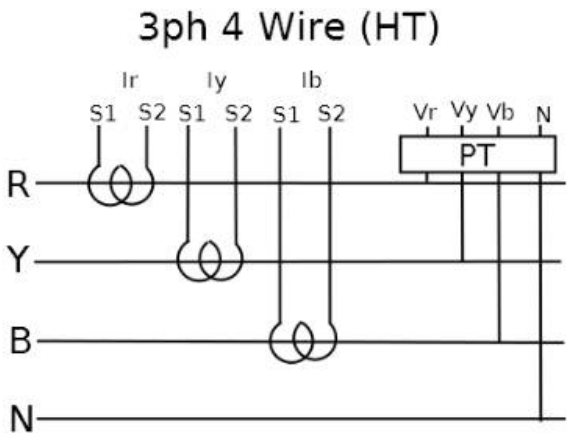

Fig 6.2.2 3ph 4 wire (HT)

5.3 Three phase four wire star

3 CTs. Direct voltage connections if voltages are less than 601V AC L-L. Otherwise 3 Pts. For single phase the same diagram will be used. The unused current terminals will be shorted together to reduce noise.

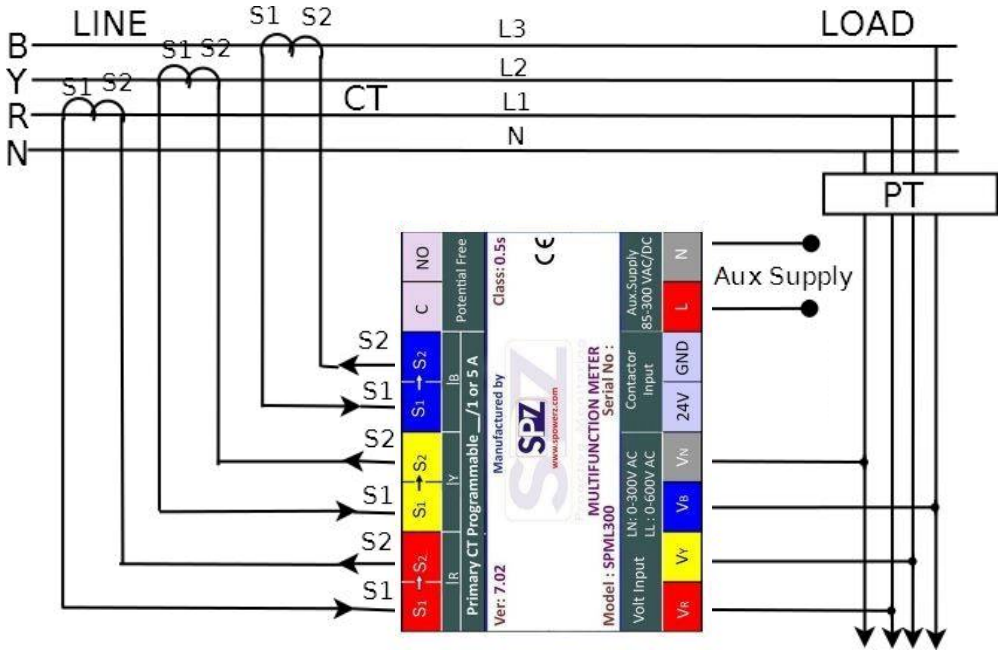

Fig 6.3 Three Phase Four Wire Star

6. Communication

6.1 Communication Details

LoraWan Network	:Class C
Transmission Power	:19dbm
Receiving Sensitivity	:-140dbm
Antenna	:External
Bandwidth	:125kHZ
Frequency	:865-867MHZ