

Overview

18 Channel Power Meter, 0.5 Class Accuracy

The N2-KW1850 Series meters combine high performance with ease of integration to provide an energy measurement and monitoring solution. The meter comes standard to be DIN rail mounted but is also available in a panel upgrade version that comes with NEMA 4X panel enclosure, pre-wired and labeled terminal blocks for voltage input, and industrial grade fuses (see ordering grid). The meter supports unidirectional monitoring up to 18 CT inputs or 6 three-phase circuits simultaneously for multi-point energy measurement. The compact design is suited for high density applications to be used in conjunction with commercial, industrial, and residential multi-tenant energy management systems. Key functions include multi-tariff time-of-use (TOU), billing mode feature, and power quality analysis- see table 1 for additional measurement functions and parameters. The meter has either 8MB (N2-KW1850-P1-D-S) or 8GB (N2-KW1850-P1-D-W) memory for data logging, recording system events, and over/under limit alarming information that can be retrieved via a serial connection or remotely by Ethernet, depending on the model selected.



The N2-KW1850 Series incorporates Snap On CT technology which reduces polarity errors, installation time, and eliminate CT wiring configuration. For CT connection, the CTs are terminated and plugged directly into the meter using the provided connectors. The meter features a built-in LCD display and a five button keypad designed to simplify setup and provide local readings of all measurements of meter data. Many of the advanced meter functions are accessed via the Accuvue Software which requires an RS-485 to USB converter for the N2-KW1850-P1-D-S to connect to a PC or laptop, or the N2-KW1850-P1-D-W which utilizes either Ethernet or Wi-Fi. The meter supports multiple user-selectable communication protocols, pulse output communication, 18 digital inputs, 6 digital outputs, and 2 alarm relays which allows seamless integration with data acquisition systems. The tamper-proof design is approved for revenue applications. The N2-KW1850 Series is compatible with multiple Current Transformer input options, however, 333mV CT or Flexible Rogowski Coil CTs should not be intermixed within a specific meter.

Current Transformers are sold separately as shown on the Hinged, Split Core, Solid Core, or Rogowski Coils CT product data sheets.

Applications: Multi Point Sub-Metering Electrical Panel for Tenant Billing, Equipment Load Monitoring, Power Quality Monitoring, Data Centers, Industrial Applications, Predicted Maintenance, Renewable Energy, Overhead Cost Reduction, "NET ZERO", LEED, Green Buildings and Refrigeration

The N2-KW1850 Power Meters are covered by a Five (5) Year Limited Warranty.

Part Numbers

N2-KW1850-P1-D-S	N2-KW1850-P1-D-W	N2-KW1850-P1-D-S-PC
N2-KW1850-P1-D-W-PC	N2-SO-SP1	N2-USB-RS485
N2-AK-03	N2-KW1850-ENC	

Product Specifications

Service Type:	Single Phase, 3 Phase – Four Wire (WYE), Three Phase – Three Wire (Delta)
Power Supply¹:	100 - 415Vac, 50/60Hz, 100 - 300Vdc on terminals L and N
Power Consumption:	5W
Rated Voltage:	100-400VAC Line to Neutral (L-N) or 100-690VAC Line to Line (L-L) RMS for three phase or 100-400VAC RMS for single phase
Input Impedance:	2MΩ/Phase
PT Burden:	<0.2VA
Number of CT Inputs:	18
Acceptable CT Inputs:	333mV or Rogowski Coil (cannot mix CT's)
Accuracy:	ANSI C 12.20 class 0.5; IEC62053-22 Class 0.5s - See Table 2 for parameter accuracy, resolution, and range
AC Protection:	1A/250VAC External Fuse (not provided)
Measurement Type:	Real-time, True RMS measurement of instantaneous Voltage, Current, Power, Frequency, Harmonics, Phase Angle, Demand, Unbalance Factor, Running Time, and Power Factor
Line Frequency:	45/65Hz
Digital Inputs / Type:	18 Digital Inputs for Water and Gas Metering Pulse Counting / Dry Node
Input Current (MAX):	2mA
Input Voltage:	15-30VDC
Pulse Frequency (MAX):	100Hz, 50% Duty Cycle
SOE Resolution:	2ms
Auxiliary Power Output:	15VDC, 1W
Relay Output	
Load Voltage:	250VAC, 30VDC
Max Load Current:	3A (Resistant Load)
Isolation Voltage:	4000VAC (1 min)
Action Time (MAX):	10 milliseconds
Mechanical Life:	>5,000,000 cycles, typical
Conduction Impedance (MAX):	100mΩ
Measurement Data Parameters:	Energy, time of Use, Power Demand, Current Demand, Real Time Metering, Power Quality, Time, Alarming, Data Logging – See Table 1 complete list of Functions and Parameters
Multi-Tariff Time of Use (TOU):	4 tariffs (sharp, peak, normal, valley), 14 schedules, 14 segments, weekends and 10-year holiday settings
Over/Limit Alarms:	Ten limit alarms configured for peak demand, current, or power quality
Display:	LCD Graphic Display with Backlight High-resolution Display
Pulse Output:	Two-wire pulse train, Isolation Voltage 2500VAC, 0-30 VDC Load Voltage, 10mA Max Load Current, Pulse Width 20~100ms (80ms Default), Pulse Constant 1~60,000 (50000 Default) IMP/N2-KWh
Hardware:	RS-485 Serial, Dual Ethernet (N2-KW1850-P1-D-W Only), Wireless Network Card (N2-KW1850-P1-D-W Only)

Specifications subject to change without notice.

1150 Roberts Boulevard, Kennesaw, Georgia 30144

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#N2-KW1850 Series - 8/23/23

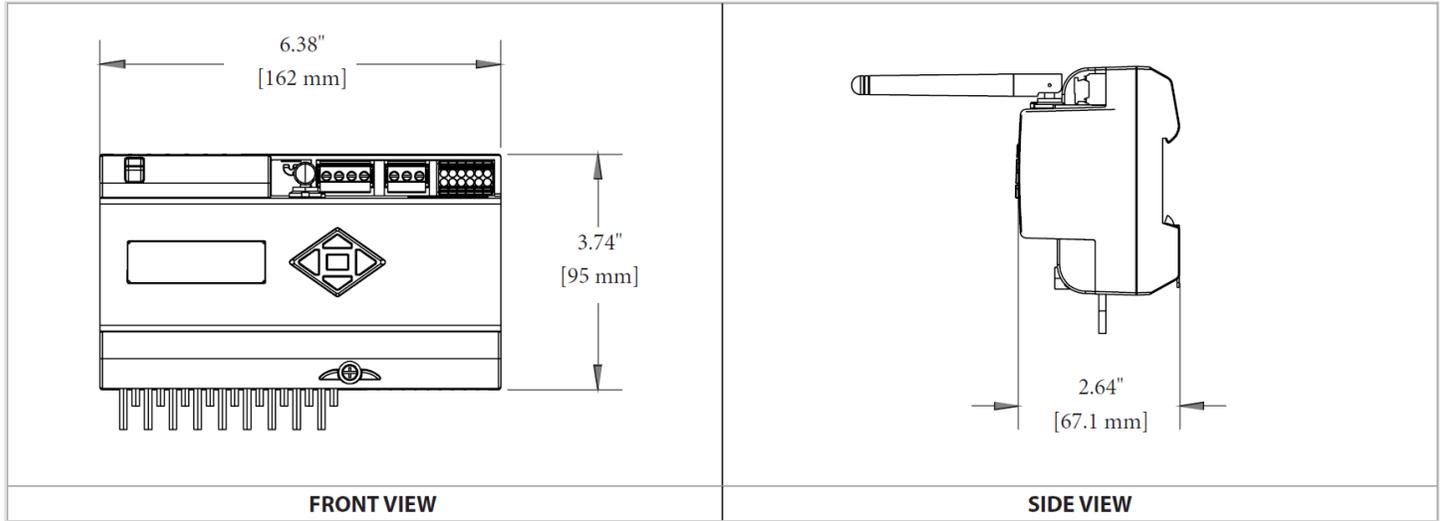
Memory Capacity:	8GB or 8MB (based on model selection) onboard memory for data-logging and historical trend analysis
Supported Protocols:	N2-KW1850-P1-D-S: Modbus RTU and BACnet MS/TP via RS485 N2-KW1850-P1-D-W: Modbus TCP, BACnet IP, SNMP, SNTP, WiFi, WPA, WPA2, HTTP/HTTPS, FTP, SMTP, NTP, SNMP MQTT, RSTP, IPV6
Maximum Distance:	1200 meters (3,937 Feet) with data range of 100K bits/second or less
Supported Modbus Baud Rates:	1200 to 115200 Baud Rate (19200 Modbus Default)
Data Bits / Parity / Stop Bit	8 / None (default), Even, Odd / 2, 1 (default)
Modbus Address Range:	1 to 247 (The default is 1)
Operating Temperature Range:	-13 to 158°F (-25 to 70°C)
Storage Temperature Range:	-40 to 185°F (-40 to 85°C)
Operating / Storage Humidity Range:	5 to 95%, non-condensing
Enclosure Material / Flammability Rating:	Polycarbonate / 94-V0
Wire Size:	16-22 AWG (1.5 to 0.6 mm ²)
Mounting:	IEC 35mm DIN Standard
Software:	Accuview Utility Software, Windows Based. USB-RS485 converter is required to connect to computer for N2-KW1850-P1-D-S only.
Security:	Password Protected to access Settings. Sealed and Tamper Proof Cover.
Agency Approvals:	BTL Certified, CE, RoHS2, cULus Listed (File # E359521)
Product Dimensions (L x W x H):	6.38" (162 mm) x 3.74" (95 mm) x 2.64" (67 mm)
N2-KW1850 Panel Upgrade	(Optional):
NEMA Rating:	NEMA 4X / IP66 Enclosure
Material:	Polycarbonate
Fuse:	600 VAC/2A
Wiring:	DIN rail mounted pre-labeled terminal blocks for voltage connection pre-installed
Flammability Rating:	UL 746C 5-inch flame test
Certifications:	UL 508A, EN62208
Dimensions (L x W x H):	11.81" (300 mm) x 11.81" (300 mm) x 7.01" (178 mm)
Enclosure Product Weight:	8 lbs. (3.63 kg)

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Dimensional Drawings



Power Meter Panel Upgrade

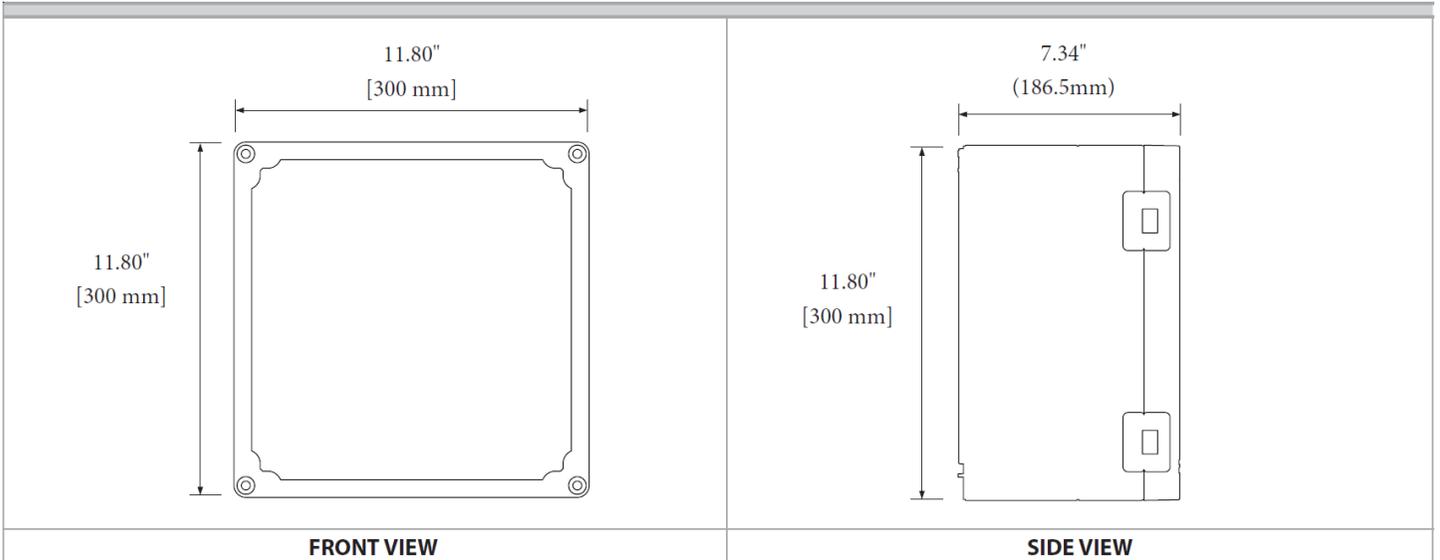


Table 1

Function		Parameters	N2-KW1850-P1-D-S	N2-KW1850-P1-D-W
Energy	Active Energy	Ep	•	•
	Reactive Energy	Eq	•	•
	Apparent Energy	Es	•	•
Time Of Use	4 Tariffs, 14 Schedules	TOU	•	•
Power Demand	Active Power Demand	Demand_P	•	•
	Reactive Power Demand	Demand_Q	•	•
	Apparent Power Demand	Demand_S	•	•
	Peak Power Demand	Demand_P_max	•	•
Current Demand	Current Demand	Total and each circuit	•	•
	Peak Current Demand	Total and each circuit	•	•
Real Time Metering	Phase Voltage	V1,V2,V3	•	•
	Line Voltage	V12,V23,V31	•	•
	Current	Total and each circuit	•	•
	Power	Total and each circuit	•	•
	Reactive Power	Total and each circuit	•	•
	Apparent Power	Total and each circuit	•	•
	Power Factor	Total and each circuit	•	•
	Frequency	F	•	•
Power Quality	Total Harmonic Distortion	THD*	•	•
	Individual Harmonics	2nd ~ 31st (Voltage and Current)*	•	•
	Current K Factor	KF	•	•
	Voltage Crest Factor	CF	•	•
	Voltage Unbalance	U_unbl	•	•
	Current Unbalance	I_unbl	•	•
Time	Real Time Clock (Year, Month, Date, Hour, Minute, Second)		•	•
Alarming	Over/Under Limit Alarming		•	•
Data Logging	8MB Memory		•	•
	8GB Memory			•
	RS485 Modbus®-RTU		•	•
	Ethernet Modbus®-TCP, HTTP, BACnet-IP, SMTP, SNTP, SNMP			•
	WiFi			•
I/O Option	18 Digital Inputs with 15Vdc power supply		•	•
	6 Digital Outputs, Second Pulse, Demand Cycle		•	•
	2 Relay Outputs		•	•
Display	LCD		•	•

Table 2

Parameters	MEASURE		
	Accuracy	Resolution	Range
Active Energy	0.5s	0.1N2-KWh	0~99999999.9N2-KWh
Reactive Energy	1%	0.1kvarh	0~99999999.9kvarh
Apparent Energy	1%	0.1kVAh	0~99999999.9kVAh
Voltage	0.5%	0.1V	10~400V
Current	0.5%	0.001A	5mA~10,000A
Real Power	0.5%	0.1W	4000.0N2-KW
Reactive Power	0.5%	0.1var	4000.0kvar
Apparent Power	0.5%	0.1VA	4000.0kVA
Power Factor	0.5%	0.001	-1.000~1.000
Frequency	0.2%	0.01Hz	45~65Hz
Real Power Demand	0.5%	0.1W	4000.0N2-KW
Reactive Power Demand	0.5%	0.1var	4000.0kvar
Apparent Power Demand	0.5%	0.1VA	4000.0kVA
Current Demand	0.5%	0.001A	5mA~10,000A
Unbalance	2%	0.01%	0~300%
Harmonics	2%	0.01%	0~100%
Meter Running Time		0.01hour	0~999999.9h
Temperature Drift	less than 100ppm/°C(0-50°C)		

Standard Ordering

Part #	Description
N2-KW1850-P1-D-S	18 Circuit, 0.5 Class Accuracy, Power Meter w/LCD, and serial RS-485 Modbus RTU and BACnet MS/TP Only
N2-KW1850-P1-D-W	18 Circuit, 0.5 Class Accuracy, Power Meter w/LCD, Serial and Ethernet Communication protocols, and Wi-Fi enabled
N2-KW1850-P1-D-S-PC	Panel Upgrade, same as N2-KW1850-P1-D-S installed in NEMA 4X Enclosure w/ labeled and prewired supply voltage connections
N2-KW1850-P1-D-W-PC	Panel Upgrade, same as N2-KW1850-P1-D-W installed in NEMA 4X Enclosure w/ labeled and prewired supply voltage connections

Accessory Ordering

Part #	Description
N2-KW1850-ENC	NEMA 4X/IP66 Wall Mount Enclosure with Steel Mounting Plate - DIN Rail not Provided
N2-SO-SP1	Snap On CT Replacement Connector Kit (Package of 20)
N2-USB-RS485	RS485 to USB Converter to connect N2-KW1850-P1-D-S to PC
N2-AK-03	Three Fuse Pack; Inline Fuse Kit; 600V, 2A; Slow Blow

Mounting Instructions

 Tip	Use dry cloth to wipe the meter.
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Before installation, please check the environment, temperature, and humidity to ensure the N2-KW1850 series meter is being placed where it will not be damaged.

Temperature

N2-KW1850 operating temperature is -25~70°C. Exceeding this temperature range will cause damage to the meter. Please note it can influence the meters life negatively if the meter operates in extremely high or extremely low temperatures. N2-KW1850 storage temperature range is -40~85°C.

Humidity

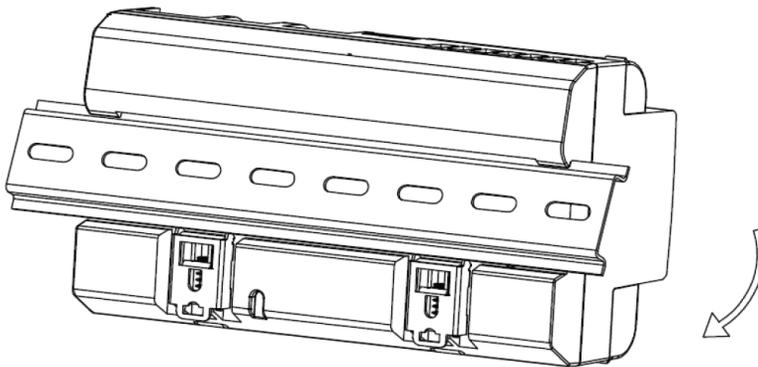
5% to 95% non-condensing.

Location

N2-KW1850 series meter should be installed in a dry and dust free environment. Avoid exposing meter to excessive heat, radiation, and high electrical noise sources.

Installation Steps

This meter is DIN rail mounted, which fits 35 mm standard rails. Insert the meter groove all the way into the rail, and flip the meter case as the Figure below shows, making the meter mounted onto the rail.



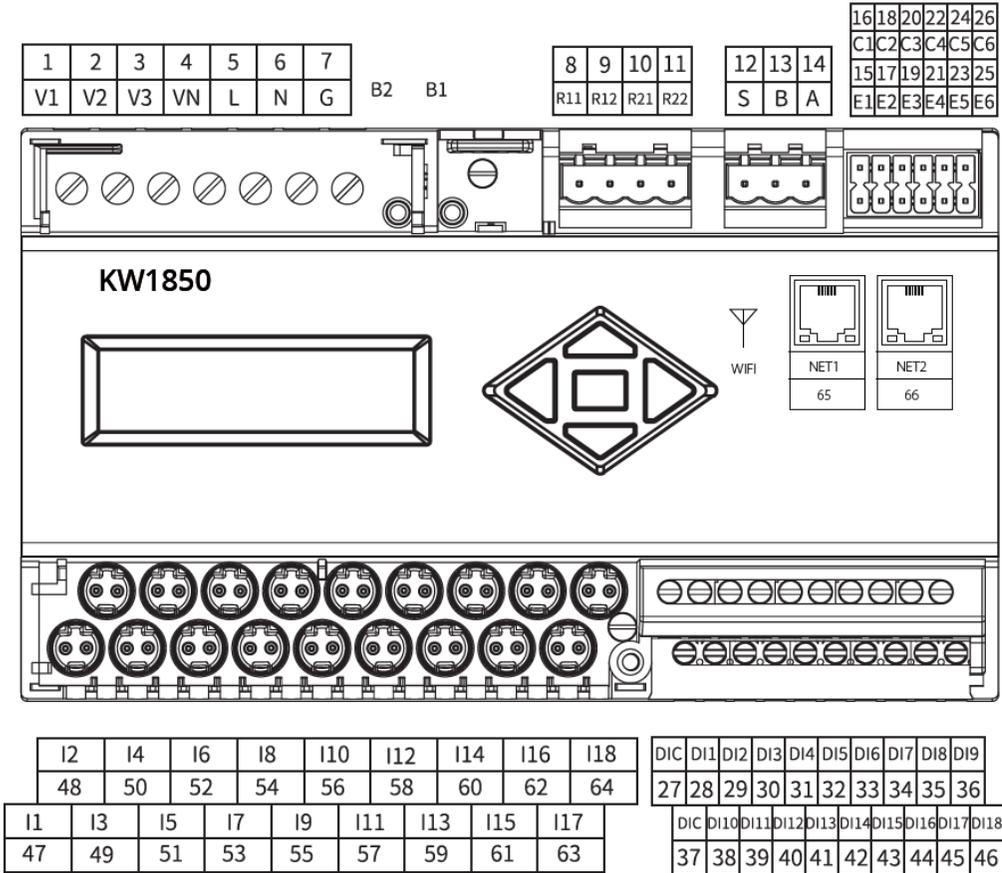
Wiring Instructions

- The installation must be performed by qualified, competent, accredited professionals who have received formal training and have experience with high voltage and current devices. Appropriate safety wear (gloves, glasses, arc flash suit, etc.) is mandatory to ensure safe installation.
- During normal meter operation, caution should be used when handling the following as high voltage may be present: Terminal Blocks, Current Transformer connection nodes, Potential Transformer connection nodes and the related circuits. All primary and secondary circuits may contain lethal current and voltage. Contact with current channels must be avoided.
- The power meter and I/O modules cannot be installed on the primary side of transformers or where VA has limitations. The power meter can be only installed on the secondary side. Avoid contact with meter terminals after the completion of installation.
- Do not input voltage above the rated maximum limit of the power meter and devices connected to it. Before energizing the meter, please refer to the meter's label and specifications.
- Do not perform high voltage test / insulation experiment to output, input, or communication terminals.
- The use of shorting blocks and fuses are recommended.
- Failure to follow manufacturer guidelines for installation and use may compromise the safety of the meter and the user.
- Any repair should only be performed by the manufacturer. A switch or circuit breaker should be utilized in the equipment. The switch should be placed close to the equipment and easy to reach. The switch is regarded as part of the breaking device.

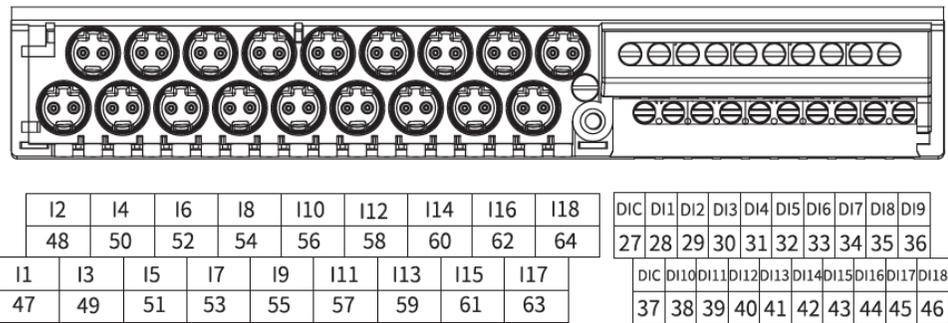
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Meter Terminals

Upper row: Voltage Input, Power Supply, Seal Button (B1), Relay Output, RS485, Digital Output, Ethernet Ports (via WEB2 module)

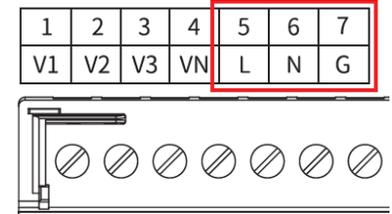


Lower row: Current Input, Digital Input



Power Supply

N2-KW1850 power supply is 100-415Vac, 50/60Hz or 100-300Vdc, which are universally supported. If any other power supply is required, please contact the manufacturer. The power consumption of the power meter is low during normal operation; therefore, the power supply can be either via a standalone power supply or via the measured circuit. A regulator is recommended where the voltage is not stabilized. The power supply terminal number is L/N/G.



Power Supply wiring is AWG22~16 or 0.6~1.5mm².

A fuse or small-sized circuit breaker is mandatory for the N2-KW1850 Power Supply. The fuse recommendation is 1A/250Vac, time delay. If a circuit breaker is utilized, it must be CE certified and comply with IEC 947 standard.

An isolated transformer or EMC filter should be used in the auxiliary power supply loop if there is a power quality issue in the power supply.

Voltage Input Signal

400Vac L-N, 690Vac L-L. A fuse (typical 1A/250Vac) or air circuit breaker must be used in the voltage input loop.

Current Input Connection

For CT Connection, the CTs are terminated and plugged directly into the meter using connectors on the CT. If the CT does not have this connector an adapter can be used to connect the CT successfully to the meter.

SnapOn Connector Polarity

North America: White lead is positive. Black lead is negative.

International: Red lead is positive. White lead is negative.

V_n Connection

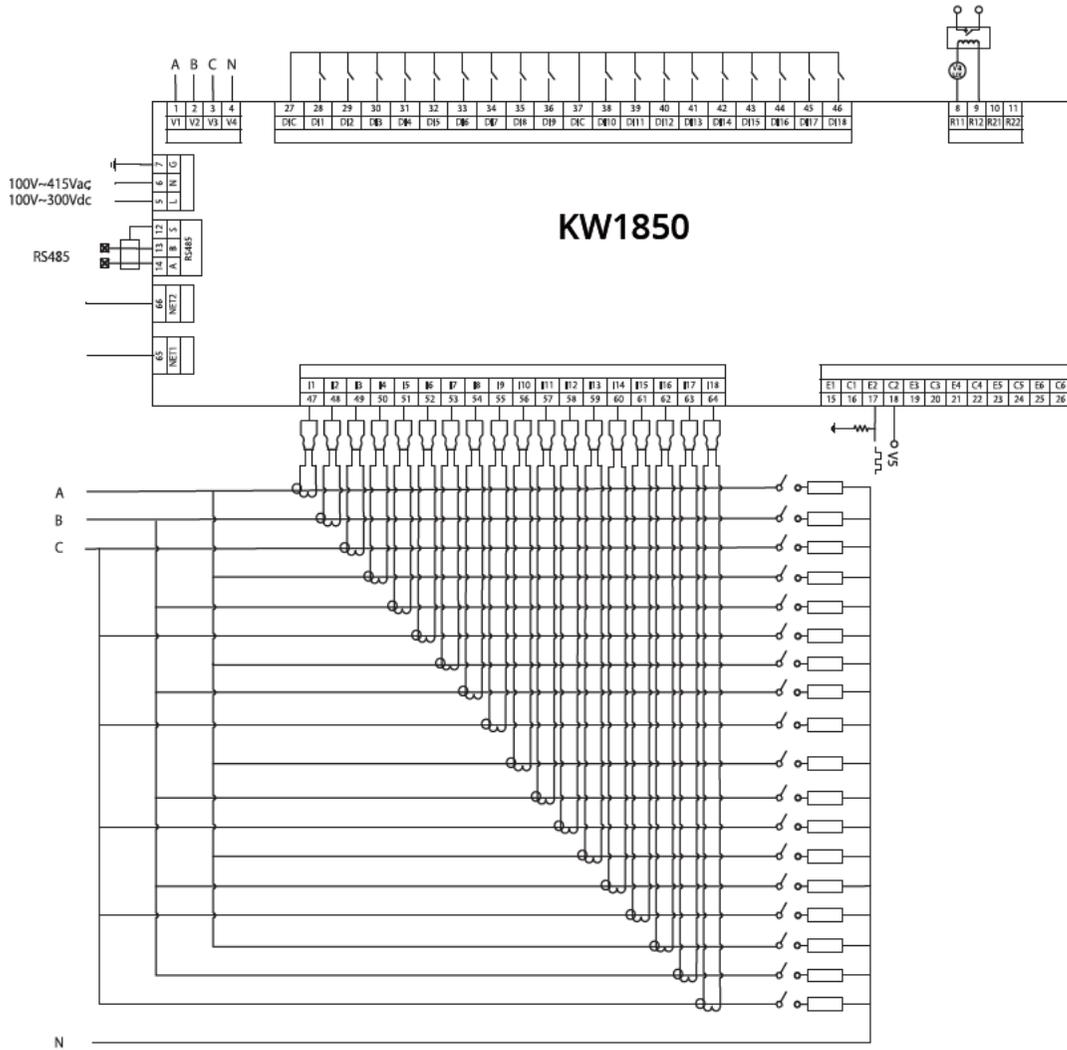
V_n is the voltage reference point of N2-KW1850, a low resistance to V_n connection contributes to a better measurement accuracy. V_n connection is related to the system wiring. Please refer to "Wiring Methods" for details.

Wiring Methods

N2-KW1850 wiring methods can be selected in system parameter settings. Inline defaults to 3-phase 4-line(3LN), load wiring can be set to single-phase (1LN), three-phase four-wire (3LN), single-phase three-wire (2LN).

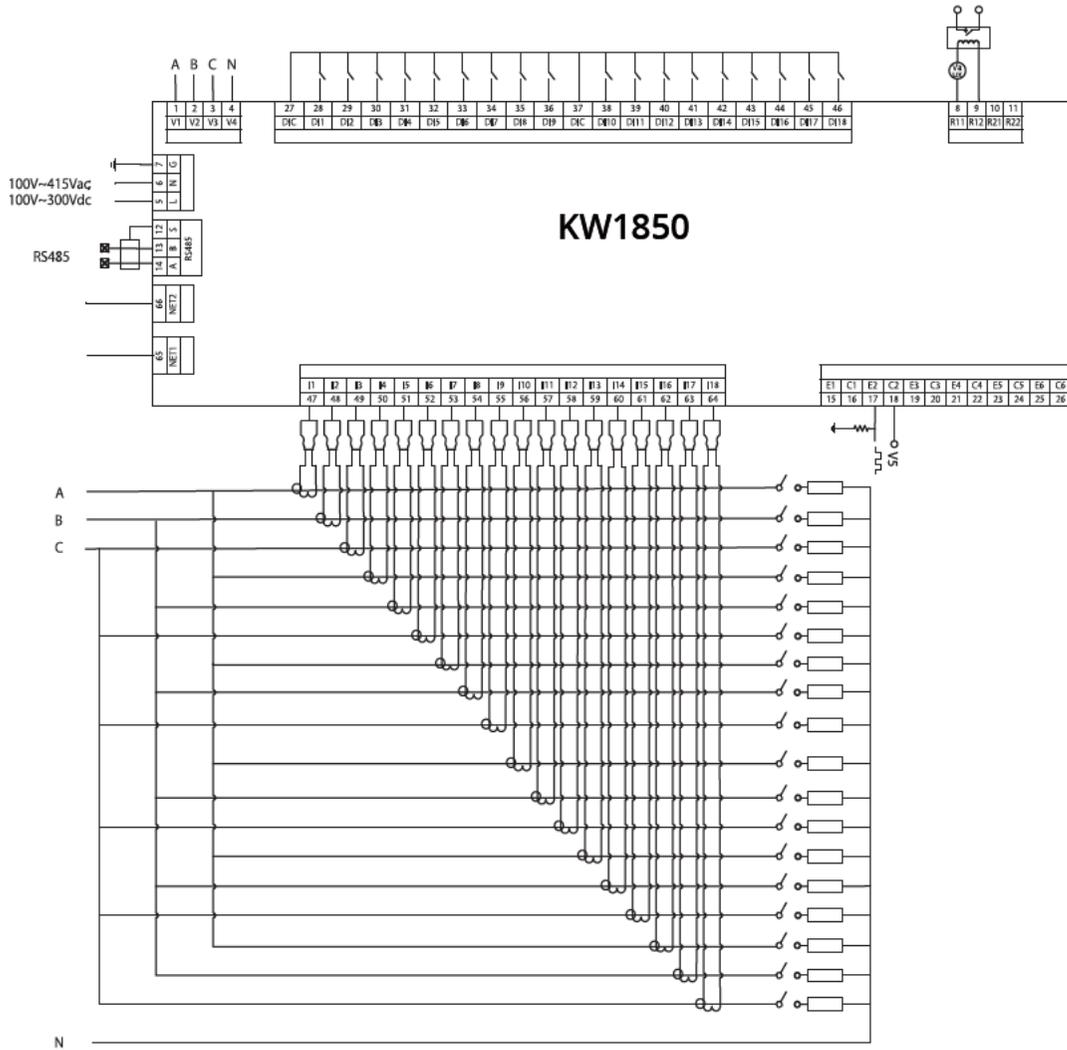
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1. Single Phase (1LN)



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2. Three Phase 4 Wire (3LN)

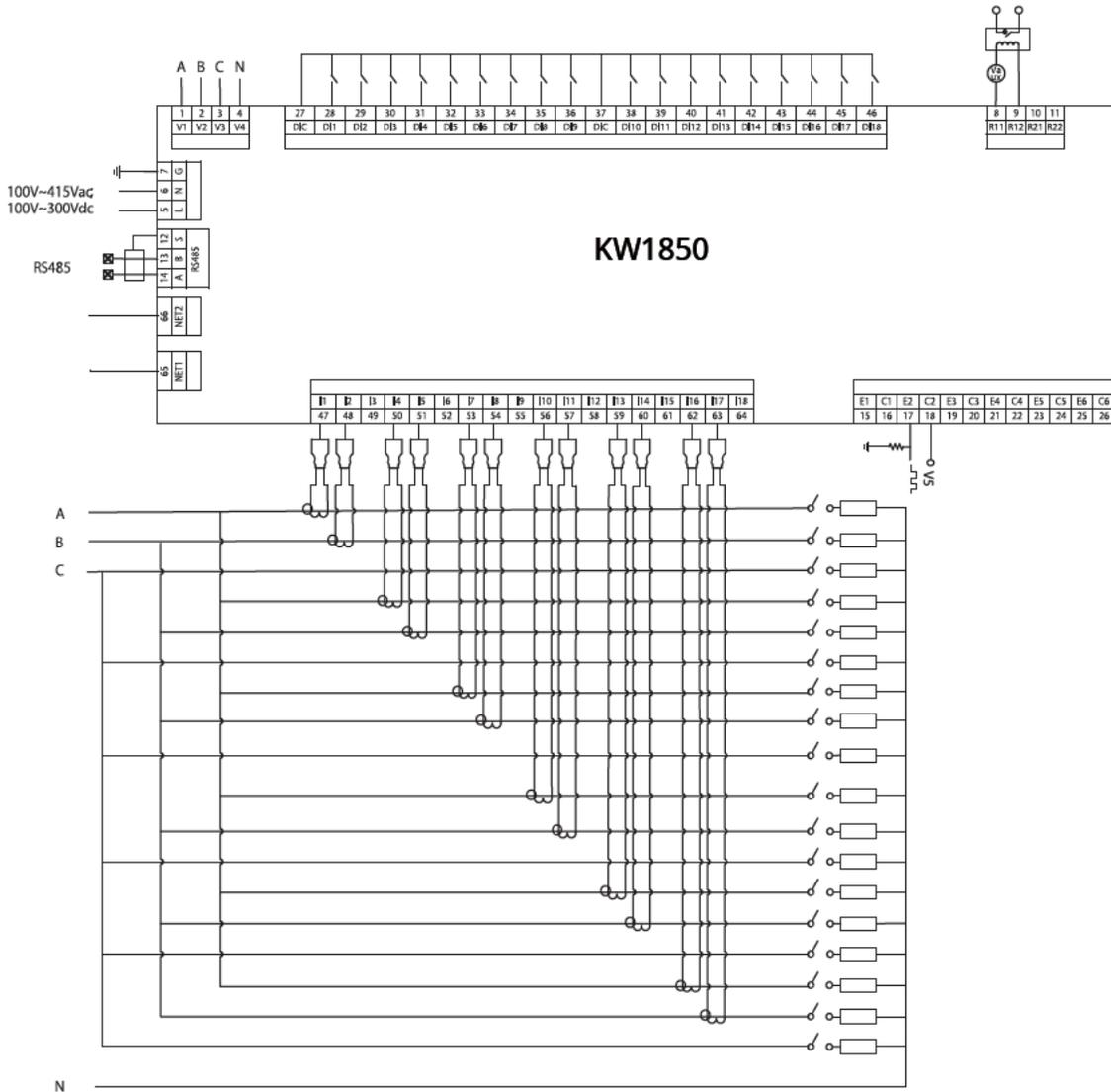


Phase 4 Wire

	Three Phase Circuit 1	Three Phase Circuit 2	Three Phase Circuit 3	Three Phase Circuit 4	Three Phase Circuit 5	Three Phase Circuit 6
Phase C	I3	I6	I9	I12	I15	I18
Phase B	I2	I5	I8	I11	I14	I17
Phase A	I1	I4	I7	I10	I13	I16

#N2-KW1850 Series - 8/23/23

3. Single Phase 3 Wire (2LN)

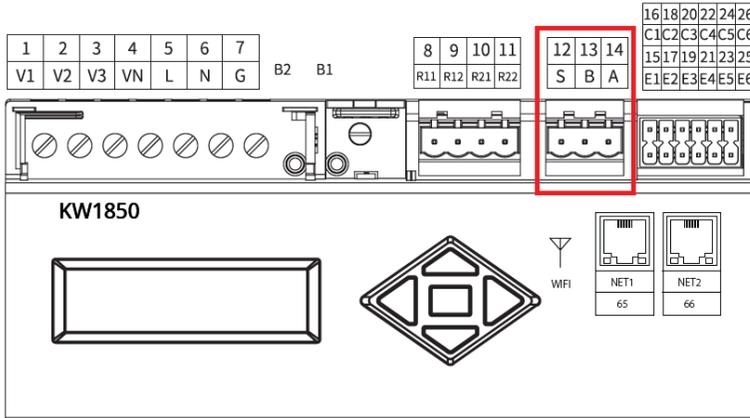


Single Phase Three Wire (2 Hot Phases - 1 Neutral)

Circuit	Phase A	Phase B
Single Phase Three Wire Circuit 6	16	17
Single Phase Three Wire Circuit 5	13	14
Single Phase Three Wire Circuit 4	10	11
Single Phase Three Wire Circuit 3	7	8
Single Phase Three Wire Circuit 2	4	5
Single Phase Three Wire Circuit 1	1	2

Communication Port

N2-KW1850 communication utilizes RS485 port, via Modbus-RTU protocol. The wiring terminals are A, B, S (14, 13, 12), where A is positive, B is negative, and S is the shield terminal. The maximum distance of shielded twisted pair cable is 1200 m.



N2-KW1850 Smart Metering System

If the master device does not have RS485 but RS232 port, a RS232/485 converter can be utilized. Typical RS485 network topologies include line, circle and star (wye).

In order to improve communication quality, please pay attention to:

1. High-quality shielded twisted pair cable is very important, AWG22 (0.6mm²) or lower is recommended. Two cables should be different colors.
2. Pay attention to "single point earthing". It means there is only one point of the shielding connected to ground in a single communication link.
3. Every A (+) should be connected to A(+), B(-) to B(-), or it will influence the network, even damage the communication interface.
4. "T" type connection topology should be avoided. This means no new branches except from the starting point.
5. Keep communication cables away as much as possible from sources of electrical noise. When several devices are connected (daisy chain) to the same long communication line, an anti-signal reflecting resistor (typical value 1200-3000Ω, 0.25W) is often used at the end of the circuit (the last meter of the chain) if the communication quality is distorted.
6. Use RS232/RS485 or USB/RS485 converter with optical isolated output and surge protection.

Appendix – Symbols Key

 Warning	Potential for death, serious injury, or permanent damage to a system.
 Caution	Potential for injury, damage to a system, or system failure.
 Tip	Useful information not related to injury or system damage.