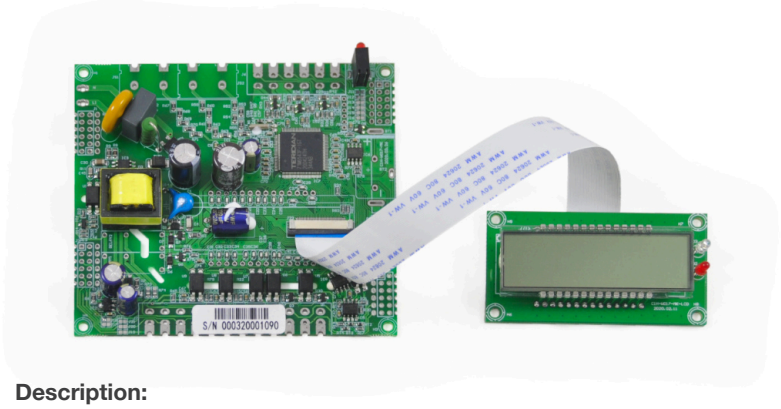
# EKM METERING INC.

## EKM-Omnimeter Stack v.4 Spec Sheet



**Description:**
The Omnimeter Stack v.4 is based on our Omnimeter Pulse v.4 meters but it is designed to be customizable for use with a case, or without a case for embedded applications, such as in electric vehicle chargers or HVAC units.

**Options:**
- LCD Screen:
  - Installed with ribbon cable connector
  - Soldered on to the PCB
  - No LCD screen
- Terminal Blocks:
  - All installed (affixed)
  - All installed (pluggable)
  - Some installed
  - None (castellated PCB connections provided)
- Stacking Connectors:
  - All installed
  - None
- Stacking Enclosure:
  - Included
  - Not included
- Data Protocol:
  - EKM protocol (EKM Push compatible)
  - Modbus
- kWh Resolution:
  - 1, 0.1, 0.01 (standard)
  - 0.0001 (California EV Charging)
- Current Transformers:
  - 26.6mA output, with secondary wire leads
  - 26.6mA output, solder on

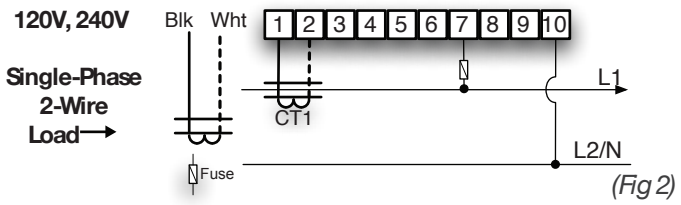
**Technical Specifications:**
- Nominal Voltage Ranges:
  - 120V to 415V, 2-wire, Single-phase, One Line & Neutral
  - 120V to 415V, 2-wire, Single-phase, Two Hot Lines
  - 120V to 480V, 3-wire, Single-phase, 2 Lines & Neutral
  - 120V to 415V, 3-wire, 3-phase, 3 Lines, No Neutral
  - 120V to 480V, 4-wire, 3-phase, 3 Lines and Neutral
- Range of allowable environmental conditions: Pollution Degree 2, Measurement Category III, Altitude rating 2000 meters max. Maximum Temperature Range: -30 Deg. C to 70 Deg. C. Relative humidity should be ≤85%. Tamper Detection Class 1.
- Accuracy Class 0.5
- Rated Frequency: 50Hz/60Hz
- Red LED on the meter face flashes 800 times/kWh. 1 flash = 1.25Wh.

**Safety Precautions:**
- Meter should be installed by a qualified electrician or technician.
- Turn off all power supplying the equipment before preforming an installation. Use a properly rated volt meter to confirm power is off.
- Use of this device that is inconsistent with this manual can cause permanent damage to the unit and/or serious harm to the operator.

| Load current | Power factor COSθ | Basic error % | |
|---|---|---|---|
| | | Class 0.5 | Class 1 |
| 0.05Ib | 1.0 | ±1.0 | ±1.5 |
| 0.1Ib~Imax | 1.0 | ±0.5 | ±1.0 |
| 0.1Ib | 0.5(L) | ±1.0 | ±1.5 |
| | 0.8(C) | ±1.0 | ±1.5 |
| 0.2Ib~Imax | 0.5(L) | ±0.5 | ±1.0 |
| | 0.8(C) | ±0.5 | ±1.0 |

EKM Omnimeter accuracy class 0.5% *(Fig 1)*

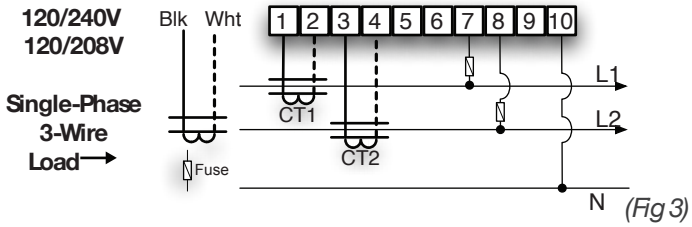
**120V, 2-Wire, Single Phase:**
1. Label Line 1 as L1.
2. Fit CT1 around L1. Make sure the arrow is facing towards the load (in the direction of flow). *(Fig 2)*
3. Black CT wire connects to Port 1 on the Omnimeter. White CT wire connects to Port 2. *(Fig 2)*
4. With split core CTs, close the CT around the wire to be measured and press firmly until you feel and hear it click to indicate full closure. Use a zip tie to ensure the CTs remain securely closed.
5. To power the meter and get a voltage reference: Use a maximum 1.0 Amp inline fuse on L1. Connect one fuse holder pigtail to the breaker, lug or an appropriate line-tap device, and connect the other pigtail to 16-22 AWG stranded copper wire for connection to the meter.
6. L1 connects to Port 7 on the Omnimeter, Neutral to Port 10. *(Fig 2)*
7. Once the meter is properly installed and all wiring is completed, the power can be turned back on.
8. If an LCD screen is connected, the meter will then begin cycling through meter values. See Fig 7.



*(Fig 2)*

**120/240V, 120/208V, Single Phase, 3-Wire:**
1. Label L1 and L2. (Arbitrarily assign labels.)
2. You will be using 2 CTs for this install. Label them CT1 and CT2.
3. Fit CT1 around L1. Make sure the arrow is facing towards the load (in the direction of flow).
4. Fit CT2 around L2.

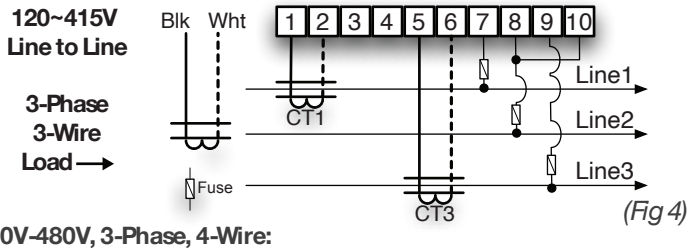
5. Black wire from CT1 connects to Port 1 on the Omnimeter. White wire from CT1 connects to Port 2. *(Fig3)*
6. Black wire from CT2 connects to Port 3. White wire from CT2 connects to Port 4. *(Fig 3)*
7. With split core CTs, close the CT around the wire to be measured and press firmly until you feel and hear it click to indicate full closure. Use a zip tie to ensure the CTs remain securely closed.
8. To power the meter and get a voltage reference: Use a maximum 1 Amp inline fuse on L1 and L2. Connect one fuse holder pigtail to the breaker, lug or an appropriate line-tap device, connect the other pigtail to 16-22 AWG stranded copper wire.
9. Tap into L1 at the breaker panel, with small stranded copper wire. This L1 tap connects to Port 7 on the Omnimeter. *(Fig 3)*
10. Tap into L2 at the breaker panel with small stranded copper wire. This L2 tap connects to Port 8 on the Omnimeter. *(Fig 3)*
11. Neutral connects to Port 10.
12. Once the meter is properly installed and all wiring is completed, the power can be turned back on.
13. If an LCD screen is connected, the meter will then begin cycling through meter values. See Fig 7.



*(Fig 3)*

**120V-415V, 3-Phase, 3-Wire:**

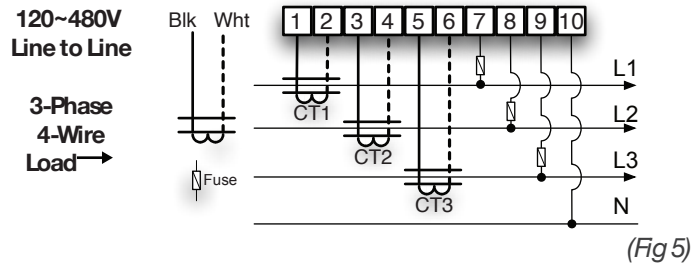
1. Label L1, L2 and L3. (Arbitrarily assign labels.)
2. You will be using 2 CTs for this install. Label them CT1 and CT3.
3. Fit CT1 around L1. Make sure the arrow is facing towards the load.
4. Fit CT3 around L3.
5. Black wire from CT1 connects to Port 1 on the Omnimeter. White wire from CT1 connects to Port 2. *(Fig 4)*
6. Black wire from CT3 connects to Port 5 on the Omnimeter. White wire from CT3 connects to Port 6. *(Fig 4)*
7. With split core CTs, close the CT around the wire to be measured and press firmly until you feel and hear it click to indicate full closure. The buttons should be fully out. Use a zip tie to ensure the CTs remain securely closed.
8. To protect the meter, use a maximum 1.0 Amp inline fuse on each line. Connect one fuse holder pigtail to the breaker, lug or an appropriate line-tap device, and connect the other pigtail to 16-22 AWG stranded copper wire for connection to the meter.
9. To power the meter and get a voltage reference:
   Tap into L1 at the breaker panel. Connect one fuse holder pigtail to the breaker, lug or an appropriate line-tap device, and connect the other pigtail to16-22 AWG stranded copper wire for connection to the meter. This L1 tap connects to Port 7 on the Omnimeter. Tap into L2 and L3 and repeat the connection process. L2 tap connects to Port 8. Add a jumper to Port 10. *(Fig 4)* L3 tap connects to Port 9.
10. Once the meter is properly installed and all wiring is completed, the power can be turned back on.
11. If an LCD screen is connected, the meter will then begin cycling through meter values. See Fig 7.



*(Fig 4)*

**120V-480V, 3-Phase, 4-Wire:**

1. Label L1, L2 and L3. (Arbitrarily assign labels.)
2. You will be using 3 CTs for this install. Label them CT1, CT2 and CT3.
3. Fit CT1 around L1. Make sure the arrow is facing towards the load (in the direction of flow).
4. Fit CT2 around L2.
5. Fit CT3 around L3.
6. Black wire from CT1 connects to Port 1 on the Omnimeter. White wire from CT1 connects to Port 2. *(Fig 5)*
7. Black wire from CT2 connects to Port 3 on the Omnimeter. White wire from CT2 connects to Port 4. *(Fig 5)*
8. Black wire from CT3 connects to Port 5 on the Omnimeter. White wire from CT3 connects to Port 6. *(Fig 5)*
9. With split core CTs, close the CT around the wire to be measured and press firmly until you feel and hear it click to indicate full closure. The buttons should be fully out. Use a zip tie to ensure the CTs remain securely closed.
10. Use a max 1.0 Amp inline fuse on each line to protect the meter.
11. To power the meter and get a voltage reference: Tap into L1 at the breaker panel. Connect one fuse holder pigtail to the breaker, lug or an appropriate line-tap device, and connect the other pigtail to 16-22 AWG stranded copper wire for connection to the meter. L1 connects to Port 7. Tap into L2 and L3 and repeat the connection process. L2 connects to Port 8. L3 connects to Port 9. Neutral connects to Port 10. *(Fig 5)*
12. Once the meter is properly installed and all wiring is completed, the power can be turned back on.
13. If an LCD screen is connected, the meter will then begin cycling through meter values. See Fig 7.



*(Fig 5)*

**RS-485 and Pulse Output:**

- Terminal 20 (A) connects to RS-485+ or T+ on the RS-485 network. Terminal 21 (B) connects to RS-485- or T-. *(Fig 9)* Terminal 22 (G) is used for the RS-485 network (signal) ground if needed. Observe proper RS-485 network topology. Twisted pair wiring is recommended. Shielded twisted pair may be beneficial in electrically noisy environments or for very long runs. RS-485 supports up to 256 devices on up to 4000 feet wire. Terminating resistors may be helpful.
- Terminals 15 and 16 are for pulse output. *(Fig 9)* Pulse rate: 800 Impulse/kWh. Polarity sensitive. Maximum 27VDC, 27mA.
- Red LED on the meter face flashes 800 times/kWh. 1 flash = 1.25Wh.

**Pulse Output:**

Like all of our meters, the Omnimeter Pulse v.4 has a Pulse Output. The Pulse Output 1 pulses at a rate of 800 pulses per kilowatt hour when set to 200 amp current transformers. This is the same rate that the red LED flashes on the meter face – 800 times/kWh. It also has a Settable Pulse Output (S02). The Programmable Pulse output can be set in software to pulse anywhere from 1 pulse per kWh to 800 pulses per kWh (limits are dependent on CT ratio). These are unpowered electronic dry contact pulses that can be counted by standard electronic pulse counters. Pulse counters can be located up to 200 feet away from the Omnimeter Pulse v.4. Connect Pulse Counter to port 16 and port 14 (ground) for the Fixed Pulse Output (this pulses as the same rate as the red pulse output LED on the face of the meter) or port 15 and port 14 (ground) for the Settable Pulse Output. Pulse Width 90ms, Polarity Sensitive, max 27VDC, max 27mA. *(Fig 10)*

| CT Ratio | Impulse Constant | Settable impulse constant range |
|---|---|---|
| 100/26.6 | 1600 | 1600, 800, 400, 320, 200, 160, 100, 80, 64, 50, 40, 32, 25, 20, 16, 10, 8, 5, 4, 2, 1 |
| 200/26.6 | 800 | 800, 400, 200, 160, 100, 80, 50, 40, 32, 25, 20, 16, 10, 8, 5, 4, 2, 1 |
| 400/26.6 | 400 | 400, 200, 100, 80, 50, 40, 25, 20, 16, 10, 8, 5, 4, 2, 1 |
| 800/26.6 | 200 | 200, 100, 50, 40, 25, 20, 10, 8, 5, 4, 2, 1 |
| 1000/26.6 | 160 | 160, 80, 40, 32, 20, 16, 10, 8, 5, 4, 2, 1 |
| 2000/26.6 | 80 | 80, 40, 20, 16, 10, 8, 5, 4, 2, 1 |
| 4000/26.6 | 40 | 40, 20, 10, 8, 5, 4, 2, 1 |
| 5000/26.6 | 32 | 32, 16, 8, 4, 2, 1 |

*(Fig 6)*

**Pulse Input:**

The Omnimeter Pulse v.4 can also count the pulses from up to 3 different pulse output devices. These could be pulses from our Pulse Output Water and Gas Meters or from any other unpowered dry contact pulse output device. Pulse Input ratios can be set in software from 1 to 9999 pulses per increment. The state of the 3 Inputs can also be polled in software, the Omnimeter Pulse v.4 will return a High or Low state for each pin in real-time (use this for sensing switch states, open or closed doors, etc). Connect Pulse Generator or Switching Sensor to each of the 3 Pulse Inputs. Connect all grounds to port 14 and each of up to 3 Pulse Generators to ports 11, 12, or 13. By default, the pulse input ratio of the Omnimeter v.4 is now set 1:1. So for every 1 pulse sent to the Omnimeter v.4 from a pulse output device, the Omnimeter will increment 1. This ratio can be changed using the EKM Dash software. (Fig 9)

**Relay Control:**

The Omnimeter Pulse v.4 comes with 2 controllable relay outputs. These can be controlled via software. You can set the outputs to be high or low to drive an external relay. The outputs are both 50 mA at 12 volts DC. Control lights, motors, etc by controlling relays. The Relay Control Outputs can also be set to go on or off from 1 to 9999 seconds. The realtime state of the outputs can also be polled via software, such as our EKM Dash. The outputs can also be used to power an external device (Wireless 485Bee Module, sensors, etc). Connect 12VDC (50mA max) relays, LED indicators, or buzzers to port 17 (ground) and port 19 for Output1 or port 17 (ground) and port 18 for Output2. (Fig 9)

**Working Principle:**

When the meter is working, the energy consumed by the user is transformed into voltage and current signals, which are sampled by sample circuits. A pulse signal is then produced by a specialized IC. The Pulse signal is directly proportional to power consumption. The MCU records and stores the corresponding energy use. The LCD screen displays the energy use. Recorded information and data can be transferred using the RS485 interface.

**Data:**

The LCD display shows 42 pieces of data. Every five seconds the LCD screen will display a new piece of data. The meter also provides max demand(kW) data and the demand period can be set to one of three intervals: 15minutes, 30 minutes, or 60 minutes. The max demand can be reset to zero in software over RS485. The meter has four time-of-use tariffs (T1, T2, T3, T4) to calculate the power during different time periods, and it can set up to four time periods per day, and specify the number of the tariff for that period (from T1 to T4). The meter time can be set using the RS485 interface. By design the main kWh registers 01 and 02 cannot be reset, though registers 39 and 40 can be reset. See Fig 6 below for a list of all 42 data values.

**Transport and Handling:**

The meter should be handled with care, as there are precision components inside that could break and/or cause faulty readings should the meter become damaged. The process of transportation, handling, and installation should be done according to the transportation and storage rule of GB/T15464-1995. Keep the meter in the original packaging when stored. The storage temperature range should be 0–40°C. The relative humidity should be ≤85%. There should be no toxic chemicals present and no corrosive substances or gases in the air. The meters should be stacked on a platform no more than ten units high.

**Warranty:**

Within two years from the date of sale, and on the condition that the user abide by the specifications and installation instructions listed here, and the sealing is kept completely intact. If the meter does not correspond with the rule of the enterprise standard, the meter shall be repaired free or replaced.

Data:

The LCD display shows 42 pieces of data. Every five seconds the LCD screen will display a new piece of data. The meter also provides max demand (kW) data and the demand period can be set to one of three intervals: 15minutes, 30 minutes, or 60 minutes. The max demand can be reset to zero in software over RS485. The meter has four time-of-use tariffs (T1, T2, T3, T4) to calculate the power during different time periods, and it can set up to four time periods per day, and specify the number of the tariff for that period (from T1 to T4). The meter time can be set using the RS-485 interface. By design the main kWh registers 01 and 02 cannot be reset, though registers 39, 40, 43, 44, and 45 can be reset. See Figs 7 and 8 below for a list of all LCD values.

| # | LCD Display Data | # | LCD Display Data | # | LCD Display Data |
|---|---|---|---|---|---|
| 01 | Total kWh | 15 | CosΘ L3 | 29 | Pulse Count 1 |
| 02 | Reverse kWh | 16 | T1 kWh (Time of Use 1) | 30 | Pulse Count 2 |
| 03 | Volts L1 (Line 1) | 17 | T2 kWh | 31 | Pulse Count 3 |
| 04 | Volts L2 | 18 | T3 kWh | 32 | kWh on L1 (Line 1) |
| 05 | Volts L3 | 19 | T4 kWh | 33 | Reverse kWh on L1 |
| 06 | Amps L1 | 20 | Reverse T1 kWh | 34 | kWh on L2 |
| 07 | Amps L2 | 21 | Reverse T2 kWh | 35 | Reverse kWh on L2 |
| 08 | Amps L3 | 22 | Reverse T3 kWh | 36 | kWh on L3 |
| 09 | Watts L1 | 23 | Reverse T4 kWh | 37 | Reverse kWh on L3 |
| 10 | Watts L2 | 24 | VARs L1 (Reactive) | 38 | Total KVARh (Reactive Total kWh) |
| 11 | Watts L3 | 25 | VARs L2 | 39 | Resettable kWh |
| 12 | Watts Total | 26 | VARs L3 | 40 | Resettable Reverse kWh |
| 13 | CosΘ L1 (Power Factor) | 27 | VARs Total | 41 | 3 Inputs High/Low |
| 14 | CosΘ L2 | 28 | Frequency (Hz) | 42 | Maximum Demand |

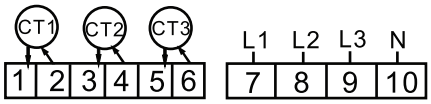
*(Fig 7)*

For serial numbers above 300005860:

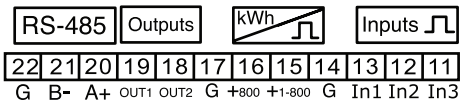
| # | LCD Display Data | | |
|---|---|---|---|
| 43 | Resettable Pulse Count 1 | | |
| 44 | Resettable Pulse Count 2 | | |
| 45 | Resettable Pulse Count 3 | | |
| 46 | Modbus Address | | |
| 47 | CT Ratio | | |
| 51 | Forward kWh | | |

*(Fig 8)*

**Terminal Layout:**




*(Fig 9)*




*(Fig 10)*