EKM METERING INC.

EKM-Omnimeter HV v.5 Spec Sheet

Technical Specifications:

- Nominal Voltage Ranges:
  120V to 600V, 2-wire, Single-phase, One Line & Neutral
  120V to 600V, 3-wire, Single-phase, 2 Lines & Neutral
  120V to 600V, 3-wire, 3-phase, 3 Lines, No Neutral
  120V to 600V, 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. Tamper Detection Class 1.
- The equipment is protected throughout by double insulation as indicated by this symbol:
- Accuracy Class 0.5
- Rated Frequency: 50Hz/60Hz
- Red LED on right of LCD screen flashes 800x/kWh. 1 flash = 1.25Wh.
- Green LEDs on right of LCD screen indicate voltage/current direction
- Red RS485 LED blinks every time the meter successfully read remotely
- Red Out LEDs indicate the state (on/off) of the 12V output relays
- Optional tray for one 18650 lithium ion battery – backup so meter will continue to count pulses and communicate if the AC voltage is lost.

Safety Precautions:

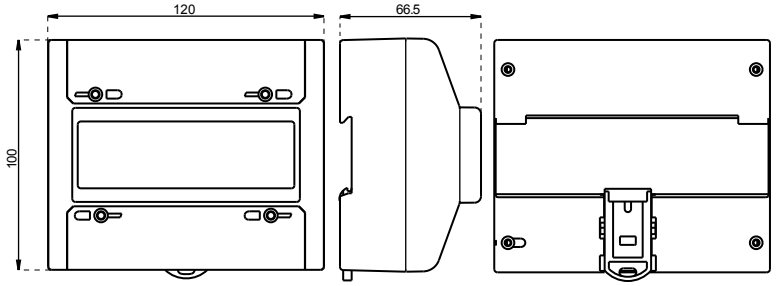
- Meter should be installed by a qualified electrician.
- Turn off all power supplying the equipment before preforming any wiring. Use a properly rated volt meter to confirm power is off.
- Use of this device inconsistent with this manual can cause permanent damage to the unit and/or serious harm to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

Tools/Materials List:

- Volt meter
- Small standard screwdriver
- Wire stripper
- DIN-Rail
- 16-22 AWG stranded copper wire
- Inline fuse holder with maximum 1Amp fuse (recommended)
- Enclosure (with appropriately rated conduit and fittings) is required if meter will be installed outdoors. We recommend our EKM-172711 Watertight Enclosure for use with this meter model. This meter is not compatible with the EKM-IENC Indoor Enclosure.

For All Systems:

1. Disconnect or switch power off before attempting to install, connect, disconnect or service the meter or the external current transformers (CTs). ALL POWER MUST BE DISCONNECTED!
2. Mount the meter using 35mm DIN Rail in a protected indoor location. If installing outdoors, a watertight enclosure is required.
3. IMPORTANT: Distinguish and then identify the Neutral and the Line(s) ('hot' wire(s), usually black or red). Label the Neutral and the hot wires.
4. Tightening torque of terminals:
   All terminals: 4.4 in-lb. (0.5 Nm)



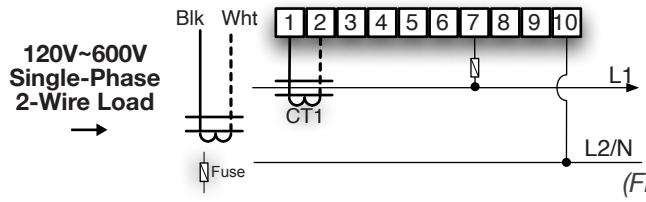
Load current	Power factor COSθ	Basic error %	
		Class 0.5	Class 1
0.05Ib	1.0	±1.0	±1.5
0.1Ib~Imax	1.0	±0.5	±1.0
0.1Ib	0.5(L)	±1.0	±1.5
	0.8(C)	±1.0	±1.5
0.2Ib~Imax	0.5(L)	±0.5	±1.0
	0.8(C)	±0.5	±1.0

EKM Omnimeter accuracy class 0.5%

(Fig 1)

Single Phase, 2-Wire:

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. The buttons should be fully out. 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 mounted to the DIN Rail or enclosure and all wiring is completed, with terminal block covers installed, power can be turned back on.
8. Meter will then begin cycling through meter values. For details go to: *https://documents.ekmmetering.com/EKM_Metering_LCD_Display_Value_Reading.pdf*
9. A video of an Omnimeter installation can be found here: *http://www.youtube.com/watch?v=ky9sgr1LTMk*

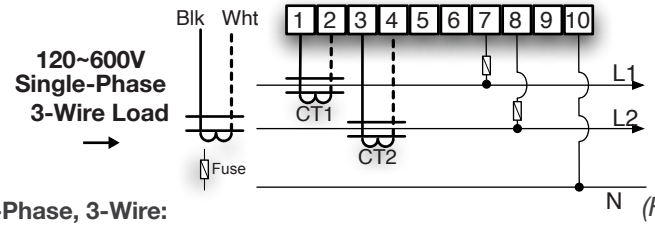


(Fig 2)

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.

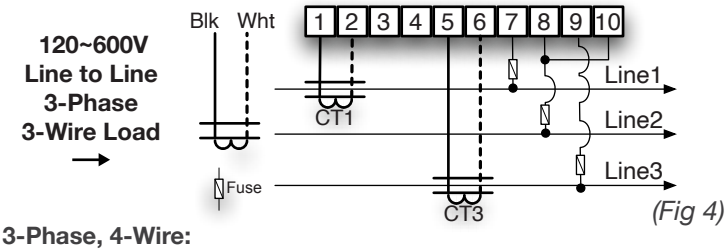
5. Black wire from CT1 connects to Port 1 on the Omnimeter. White wire from CT1 connects to Port 2. *(Fig3)*
6. Black wire from CT2 connects to Port 3. White wire from CT2 connects to Port 4. *(Fig 3)*
7. With split core CTs, close the CT around the wire to be measured and press firmly until you feel and hear it click to indicate full closure. The buttons should be fully out. 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 mounted to the DIN Rail or enclosure and all wiring is completed, with terminal block covers installed, power can be turned back on.
13. Meter will then begin cycling through meter values. For details go to: *https://documents.ekmmetering.com/EKM_Metering_LCD_Display_Value_Reading.pdf*
14. A video of an Omnimeter installation can be found here: *http://www.youtube.com/watch?v=ky9sgr1LTMk*



(Fig 3)

3-Phase, 3-Wire:

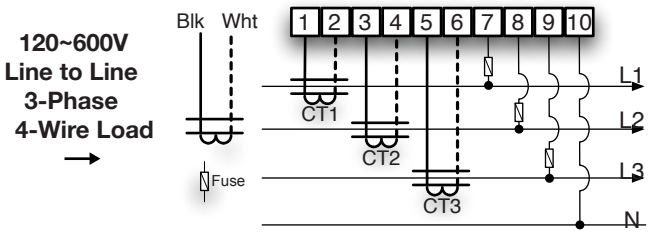
1. Label L1, L2 and L3. (Arbitrarily assign labels.)
2. You will be using 2 CTs for this install. Label them CT1 and CT3.
3. Fit CT1 around L1. Make sure the arrow is facing towards the load.
4. Fit CT3 around L3.
5. Black wire from CT1 connects to Port 1 on the Omnimeter. White wire from CT1 connects 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.
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. Be sure to add a jumper to Port 10. *(Fig 4)* L3 tap connects to Port 9.
10. Once the meter is properly mounted to the DIN Rail or enclosure and all wiring is completed, with terminal block covers installed, power can be turned back on.
11. Meter will then begin cycling through meter values. For details go to: *https://documents.ekmmetering.com/EKM_Metering_LCD_Display_Value_Reading.pdf*
12. A video of a Omnimeter installation can be found here: *http://www.youtube.com/watch?v=DeKiZddR0K8*



(Fig 4)

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 mounted to the DIN Rail or enclosure and all wiring is completed, with terminal block covers installed, power can be turned back on.
13. Meter will then begin cycling through meter values. For details go to: *http://documents.ekmmetering.com/EKM_Metering_LCD_Display_Value_Reading.pdf*
14. A video of a Omnimeter installation can be found here: *http://www.youtube.com/watch?v=DeKiZddR0K8*



(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 8)* 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 8)* 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 HV v.5 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 HV v.5. 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 8)

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 HV v.5 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 HV v.5 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.5 is now set 1:1. So for every 1 pulse sent to the Omnimeter v.5 from a pulse output device, the Omnimeter will increment 1. This ratio can be changed using the EKM Dash software. (Fig 8)

Relay Control:

The Omnimeter HV v.5 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. The state of the relays is indicated by red LEDs on the face of the meter. 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 8)

LEDs:

The green LEDs on the right of LCD screen indicate voltage/current direction. If the green LEDs are lit in any way, then the meter is either receiving voltage on those lines, or the meter is being powered by the optional 18650 battery. If one of the green LEDs is powered and is solid green that means that the meter is receiving voltage and forward current on that line. If one of the green LEDs is blinking on/off every ~1 second then the meter is not receiving any current on that line, so either the current transformer is not installed, or it is not connected properly, or there is currently no load on that line. If one of the green LEDs is blinking on/off slowly every ~2 seconds then the meter is receiving reverse current on that line, so the current is either running to the grid (from a solar PV system for example) or the CT is installed backwards on that line. If all of the green LEDs are blinking on/off rapidly every ~0.5 seconds then the meter is being powered by the backup 18650 battery and there is not AC voltage on any of the 3 lines.

The red LED on right of LCD screen flashes 800 times per kWh. 1 flash = 1.25Wh. The red RS485 LED blinks every time the meter successfully read remotely. The red Out LEDs indicate the state (on/off) of the 12V output relays.

Battery Option:

The meter has a tray for an optional 3.2–4.2VDC 18650 lithium ion battery. This backup ensures that the meter will remain powered in the event of of a power outage where the AC voltage is lost. This means that pulses will continue to be counted, the relays will still operate, and the meter will still communicate over RS-485. There is also a port on the meter (23) where a larger external 3.2–4.2VDC battery can be connected to increase the time that the Omnimeter will remain powered with a battery alone.

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 up to 42 data points. 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.

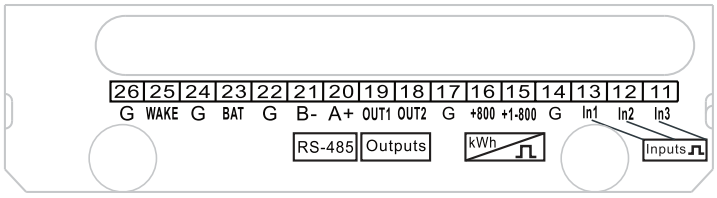
#	LCD Display Data	#	LCD Display Data	#	LCD Display Data
01	Total kWh	15	CosΘ L3	29	Pulse Count 1
02	Reverse kWh	16	T1 kWh (Time of Use 1)	30	Pulse Count 2
03	Volts L1 (Line 1)	17	T2 kWh	31	Pulse Count 3
04	Volts L2	18	T3 kWh	32	kWh on L1 (Line 1)
05	Volts L3	19	T4 kWh	33	Reverse kWh on L1
06	Amps L1	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)

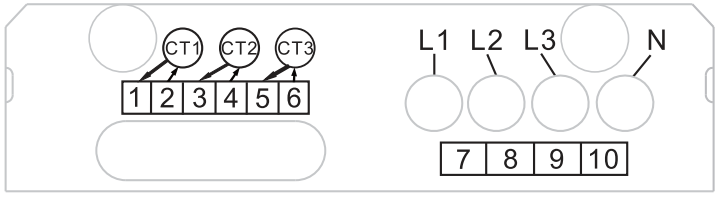
Transport and Handling:
The meter should be handled with care, as there are precision components inside that could break and/or cause faulty readings should the meter become damaged. The process of transportation, handling, and installation should be done according to the transportation and storage rule of GB/T15464-1995. Keep the meter in the original packaging when stored. The storage temperature range should be 0–40ºC. 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.

Terminal Block Layout:



(Fig 8)



(Fig 9)