VVM Digital Voltage Current Sensor Module 100V 200A with Watt hour, Ampere hour, Serial UART Communication, Over-Current Detection, MODBUS Compatible

Features:

- Hall Effect based non-invasive current measurement, no shunt resistor or wire break required, based on WCS1500 sensor, precision voltage measurement
- DC voltage range: 100V, DC current range: +/- 200A, AC current range: 150A True-RMS, Energy and Battery Capacity Measurement in Watt-hour and Ampere-hour/Coulomb Count
- Measured data can be fed to any micro-controller or Data Acquisition System, Data available on Serial port, Programmable Baud Rate, default is 9600, 16x2 I2C LCD Compatible
- Can be configured as MODBUS RTU slave by connecting it to a TTL to RS485 Converter, programmable Slave ID, default value is 1
- Current Measurement Sensitivity is 11mV/A, Voltage Measurement Sensitivity is 25mV/V
- Diameter 9.0mm conductor through hole
- Over current value can be easily set using potentiometer
- Current Measurement Electrical Isolation 4000V
- Bandwidth > 20kHz, nearly zero magnetic hysteresis
- Push button switch to toggle modes between DC Voltage Current, AC Current, Watt hour and Ampere hour, over-current values and calibration setting.
- Typical Applications include Test and Measurement Systems, Instrumentation and Control Systems, Motor Control, Power Systems, Solar Systems, Battery Chargers, state of charge estimation, Electric Vehicles, Load Detection, Over-Current Fault Detection, etc.

Description: VVM301 Voltage Current Sensor Module provides economical and precise voltage and current measurement solution for industrial and commercial applications. It allows system designers to monitor any current path without breaking or changing original system. Current flowing through the 9.0mm sensor slot will generate a magnetic field which is sensed and converted into a proportional voltage.

The system uses precision resistors for DC voltage measurement and WCS1500 Hall Effect Sensor for current measurement. The system is capable of measuring both DC and True-RMS AC Current.
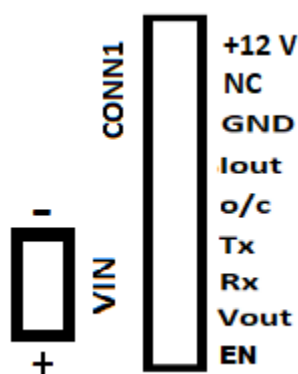
+12v : Power Supply 7 to 12 V max
NC: Not connected
GND : Supply Ground
Iout : Output Voltage proportional to current, 11mV/A
   Current = (Iout – 2.5) / 0.011
O/C : Over-Current Detection Digital Output, Low on Over-Current, High otherwise
Tx : Serial Data output
Rx : Serial Data input
Vout : Output Voltage proportional to input voltage, 25mV/V
EN : When used as MODBUS slave, connect this pin to DE and RE pins of TTL to RS485 Converter Module
VIN connector is for voltage measurement, ensure correct polarity

Operation: Connect +12v and GND pins on CONN1. Connect + and – pins of VIN connector to the voltage source to be measured, with correct polarity. Pass the cable (for measuring current) through the on-board white sensor. Current direction is indicated by the arrow on the sensor. Analog Data is available on Vout and Iout, Data is also available on Tx and Rx pins, default Baud Rate is 9600

Format of Serial Data on Tx pin is as shown:

C99.90D0V99.90D

where C : Current ,99.90 : Measured Current value
      D: D if DC, A if AC
      0 : 0 if No Over-Current Detect, 1 if Over-Current Detect
      V : Voltage, 99.90 : Measured Voltage, D : DC

Push button switch allows users to select between following modes available:

Mode 1: DC Voltage and Current	**Mode 2**: DC Current only
Mode 3: AC Current only	**Mode 4**: Over-current setting
Mode 5: DC Voltage, Current, Wh and Ah	**Mode 6**: Zero Current calibration

Mode 4: Over Current can be detected by adjusting the preset RV1 for desired value of current. Turn preset clockwise to increase over-current value and anti-clockwise to decrease it. On over current, o/c pin on CONN1 goes low and red LED glows

Mode 5: Serial Port outputs V, I, Wh and Ah values as follows:

C99.90D0V99.90DWh123.45DAh12.34D

Where C: Current, 99.90 : Measured Current, D: DC (can be used as a delimiter), 0 : 0 if No Over-Current Detect, 1 if Over-Current Detect, V : Voltage, 99.90 : Measured Voltage, Wh: Watt hours, 123.45: Watt hour reading, Ah: Ampere hours, 12.34: Ah reading
To save Wh and Ah values in device memory (to retain values after power off), send character **'S'** through the Serial Port. To reset Wh and Ah values to 0 in memory, send **'R'** through the Serial Port. Press push-button switch for one second and release to go from Mode 5 to Mode 6

Mode 6: Zero Current Calibration Mode allows the user to reset the current reading to zero when there is no current flowing through the sensor. Calibration may be required if there is error in measured value due to supply voltage variation, temperature variation, etc. To proceed with zero calibration, ensure no current flows through the sensor and long press the push-button in zero current calibration mode. To maintain accuracy, use a good quality power supply with minimum voltage drift.

Changing Baud rate: Default Baud rate is 9600. To change this value, send character **'B'** through the Serial Port. Following message will be displayed **"Enter new Baud, max 115200"**. Type the new value and press Enter. Restart the system. Following standard Baud Rates are permitted.
9600 / 19200 / 38400 / 57600 / 115200

MODBUS: The device can be configures as a Modbus slave. Default Slave ID is 1. To change this value, send character **'I'** through the Serial Port. Following message will be displayed **"Enter new Slave ID"**. Type the new value and press Enter. Restart the system. Only valid slave IDs from 1 to 247 are permitted.

Connect the device to a TTL to RS485 module as follows:

EN to both DE and RE, TX to DI, RX to RO, POWER and GND to both modules
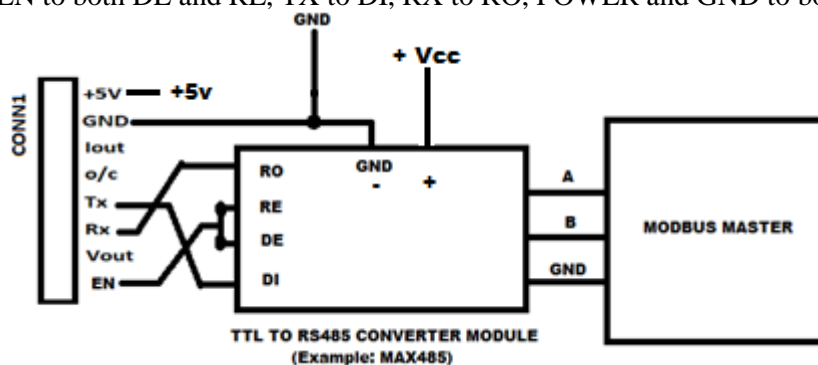
To enter Modbus slave mode, select **Mode 5,** via push-button switch. Press and hold the push button switch for atleast 10 seconds, and then release the button. Restart the system. Register format is as follows:

Modbus Register	Value	
40001	Voltage	
40002	Current	Watt hour = (Value in 40003) + (10000x(Value in 40004))
40003	Watt hour Low	
40004	Watt hour High	
40005	Ampere hour Low	Ampere hour = (Value in 40005) + (10000x(Value in 40006))
40006	Ampere hour High	

In Modbus slave Mode, regular Serial UART communication will not be available, because the data will be communicated via Modbus protocol.

To exit Modbus slave mode, Press and hold the push button switch for atleast 10 seconds in mode 5, and then release the button. Restart the system. Regular Serial UART Communication will be restored

NOTE
- This system can measure maximum 100V DC, hence it is not suitable for AC Mains Voltage measurement, but can be used for AC Mains Current measurement.
- As Hall Effect sensors are used, this system is less accurate for very low current values
- If Serial Port is not in use, connect **Rx** and **NC** pin together, to avoid random display error

Calibration Settings

I. **Zero Calibration Setting:** This setting is used when the system displays small values of current even when no current is flowing through the sensor. To remove this offset, toggle push-button switch till '***Set Current to Zero, Long press to Calibrate***' message appears on the Display/ Serial Port. Long press push-button till '***0 Calibration Done, Please Restart***' message appears. Restart the system.

II. **Current Calibration Setting (Optional):** To calibrate Current reading, toggle push button for Mode 2 where display shows only current reading or Serial Port displays only current reading. Press and hold the button till '***Calibrate Current***' message appears on the Display/Serial Port. Pass current through the sensor (atleast 10A). The display shows two current readings, old reading and new reading to be calibrated. Adjust potentiometer till the new reading is equal to the actual current flowing through the sensor. Long press and hold the push button till '***Calibration Done***' message appears on the Display/ Serial Port. Restart the system.

III. **Voltage Calibration Setting (Optional):** To calibrate Voltage reading, toggle push button for Mode 1 where Display shows both voltage and current reading or Serial Port displays both voltage and current reading. Press and hold the button till '***Calibrate Voltage***' message appears on the Display/Serial Port. Apply voltage to VIN connector (atleast 10V). The display shows two voltage readings, old reading and new reading to be calibrated. Adjust potentiometer till the new reading is equal to the actual voltage connected. Long press and hold the push button till '***Calibration Done***' message appears on the Display/ Serial Port. Restart the system.

Factory Default Calibration Setting: To restore factory settings, press and hold the push-button switch during power on, till '***Long Press for Default Calibration***' message appears on the Display/ Serial Port. Again press and hold the push-button switch till '***Default Calibration Done, Please Restart***' message appears on the Display/ Serial Port. Restart the system.

CURRENT DIRECTION

PUSH BUTTON

OVER CURRENT ADJUST POT.

MEASURE VOLTS

CONN. 1

VIN +

80

75

4mm

31

36