# Honeywell

# SXB35 & SXB36 Networked Power Meters (Modbus® RTU)

## APPLICATION

The SXB35 and SXB36 three-phase power transducers monitor energy parameters from aggregate kW (real power) and kWh (consumption) to power factor per phase. Integration of electronics lowers hardware and installation costs. The sensors automatically detect phase reversal, so CT load orientation is not a concern. The CTs and meters are calibrated as a set, so it is necessary to color-match the CTs and voltage leads when installing. These devices monitor up to 63 loads at a time on a single RS-485 drop.

With two platforms to choose from (SXB35 Energy Only or SXB36 Enhanced Data Stream), the applications for these devices are diverse, including aggregate billing, tenant submetering, energy management, performance contracting, demand limiting and cooling plant optimization. The 1% total system accuracy conforms to ANSIC12.1 metering standards.

## SPECIFICATIONS

**Input Voltage:** 208 to 480 VAC

**Number of Phases Monitored:** 1 or 3

**Frequency:** 50/60 Hz

**Maximum Primary Current:**
100/300/400/800/1600/2400 A continuous per phase

**CT Case Isolation:** 600 VAC

**Internal Isolation:** 2000 VAC rms

**Operating Temperature Range:**
0 to +60 ºC (+32 to +122 ºF) (<95% RH, non-condensing)

**Storage Temperature Range:**
-40 to +70 ºC (-40 to +158 ºF)

**Accuracy:**
+/- 1% of reading from 10% to 100% of the rated current (accuracy specified with conductors centered in the CT window)

**Output Type:** RS-485, 2-wire plus common

**Baud Rate:** 9600

**Protocol:** Modbus RTU

# ⚠ WARNING

**HAZARD OF ELECTRIC SHOCK, OR ARC FLASH**
Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.
This equipment must only be installe3d and serviced by qualified electrical personnel.
Read, understand and follow the instructions before installing this product.
Turn off all power supplying equipment before working on or inside the equipment.
Use a properly rated voltage sensing device to confirm power is off. DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION.
**Failure to follow these instructions will result in death or serious injury.**

# ⚠ CAUTION

**This product is not intended for life or safety applications.**
**Do not install this product in hazardous or classified locations.**
**The installer is responsible for conformance to all applicable codes.**
**Mount this product inside a suitable fire and electrical enclosure.**

# INSTALLATION

# ⚠ CAUTION

**For use in a pollution degree 2 or better environment only. A Pollution Degree 2 environment must control conductive pollution and the possibility of condensation or high humidity. Consideration must be given to the enclosure, the correct use of ventilation, thermal properties of the equipment and the relationship with the environment.**

## Quick Install

# ⚠ WARNING

**Disconnect and lock out power before installation.**

1. Set the address switches located on the bottom of the CT.
2. Connect the voltage leads to the source to be monitored.
3. Snap the CT onto the conductor (observe color matching).
4. Connect the Modbus wires (observe polarity).

**Table 1. SXB36 Modbus enhanced data stream meters.***

| Model | Max. Amps | CT Size |
|---|---:|---|
| SXB36-100 | 100 | Small |
| SXB36-300 | 300 | Small |
| SXB36-400 | 400 | Medium |
| SXB36-800-3 | 800 | Medium |
| SXB36-800-4 | 800 | Large |
| SXB36-1600 | 1600 | Large |
| SXB36-2400 | 2400 | Large |

\*   SXB36 models work with SXBC-1 LON nodes.

**Table 2. SXB35 Modbus basic energy meters.***

| Model | Max. Amps | CT Size |
|---|---|---|
| SXB35-100 | 100 | Small |
| SXB35-300 | 300 | Small |
| SXB35-400 | 400 | Medium |
| SXB35-800-3 | 800 | Medium |
| SXB35-800-4 | 800 | Large |
| SXB35-1600 | 1600 | Large |
| SXB35-2400 | 2400 | Large |

*  SXB35 models work with SXBC-5 LON nodes.
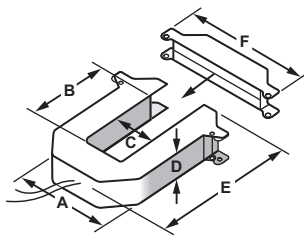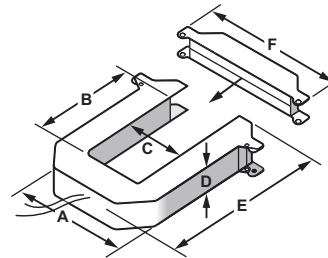


**SMALL
100/300 AMP**

A = 3-51/64 (96)
B = 1-13/64 (30)
C = 1-19/64 (31)
D = 1-13/64 (30)
E = 4 (100)
F = 4-51/64 (121)

M29198

**Fig. 1. Dimensions of small CT.**
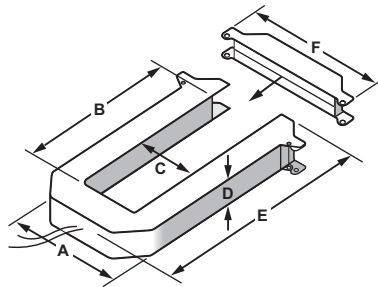


**MEDIUM
400/800 AMP**

A = 4-29/32 (125)
B = 2-29/32 (73)
C = 2-1/2 (62)
D = 1-13/64 (30)
E = 5-13/64 (132)
F = 5-29/32 (151)

M29199

**Fig. 2. Dimensions of medium CT.**



**LARGE
800/1600/2400 AMP**

A = 4-29/32 (125)
B = 5-1/2 (139)
C = 2-1/2 (62)
D = 1-13/64 (30)
E = 7-29/32 (201)
F = 6 (151)

M29200
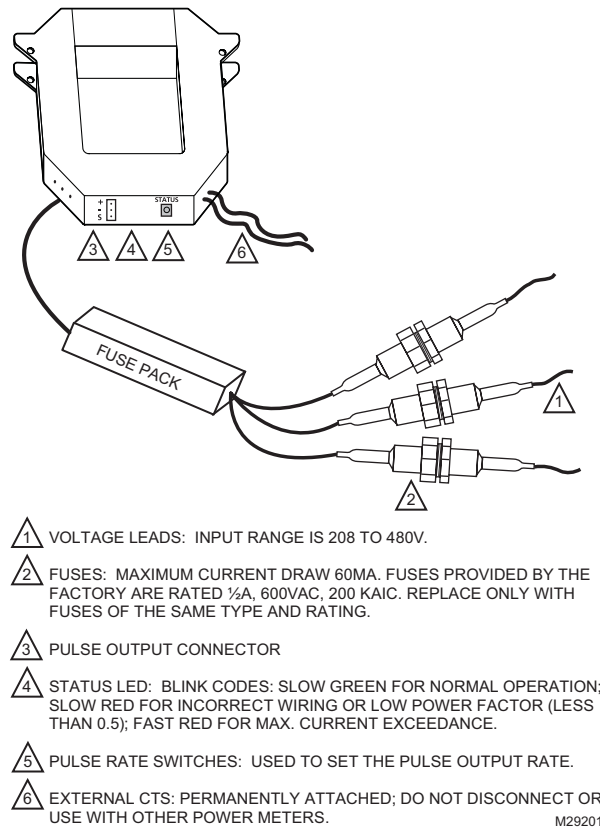
**Fig. 3. Dimensions of large CT.**

## Product Diagram



1. VOLTAGE LEADS: INPUT RANGE IS 208 TO 480V.

2. FUSES: MAXIMUM CURRENT DRAW 60MA. FUSES PROVIDED BY THE FACTORY ARE RATED ½A, 600VAC, 200 KAIC. REPLACE ONLY WITH FUSES OF THE SAME TYPE AND RATING.

3. PULSE OUTPUT CONNECTOR

4. STATUS LED: BLINK CODES: SLOW GREEN FOR NORMAL OPERATION; SLOW RED FOR INCORRECT WIRING OR LOW POWER FACTOR (LESS THAN 0.5); FAST RED FOR MAX. CURRENT EXCEEDANCE.

5. PULSE RATE SWITCHES: USED TO SET THE PULSE OUTPUT RATE.

6. EXTERNAL CTS: PERMANENTLY ATTACHED; DO NOT DISCONNECT OR USE WITH OTHER POWER METERS.

M29201

**Fig. 4. Diagram of product components.**

## Installation Details

## ⚠ CAUTION

**Connecting H8000 Series meters to the load side of a variable frequency drive will permanently damage the electronics. Connect only to the line side of a VFD.**

## ⚠ WARNING

**Disconnect and lock out power before installation.**

1.  Choose a unique address and set the switches for that address as shown in the Address Selection Switches section. Only addresses 1 to 63 can be used.
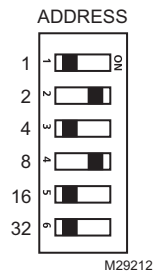


**Fig. 5. Setting address on the meter.**

2.  Connect the voltage leads to the phase conductors, at a location that is not normally turned off. Connect voltage leads on the Line side of the conductor to ensure constant power to the meter. For a 3-phase system, connect the red lead to phase A, black to phase B, and yellow to phase C. See the Wiring section on the following page.
3.  Snap the CT onto the conductor. Connect CTs to the correspondingly colored voltage lead. If the application can exceed 20 times the rated CT current, use wire ties to secure the I-bar to the CT housing. This CT automatically detects phase reversal, so CT load orientation is not important.
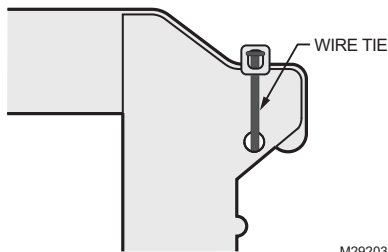


**Fig. 6. Use wire ties to secure the I-bar to the CT housing.**

4.  Remove the terminal block and attach the RS-485 wires. Observe (+), (-), and Shield polarity. Insulate any exposed wiring.
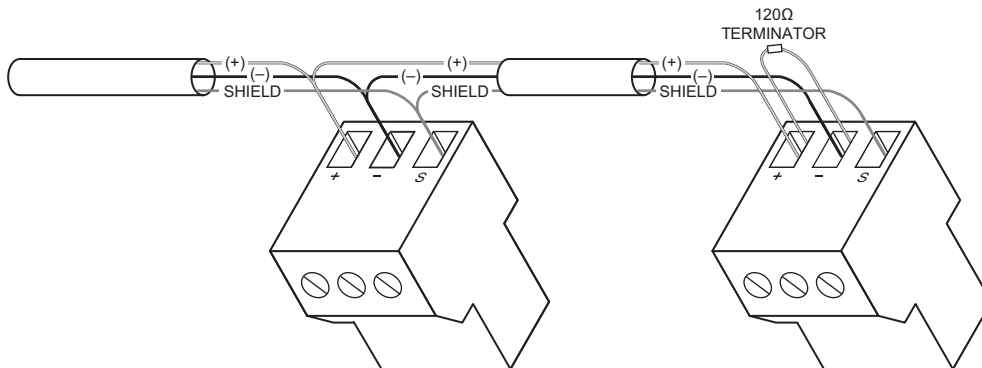


**Fig. 7. Shield any exposed wiring.**

5.  For information regarding software setup, see the Modbus protocol specifications available at www.veris.com/Modbus/.
6.  Check power reading (these calculations are approximations only).
    Expected power:
    kW = Volts x Amps x 1.732 x PF / 1000
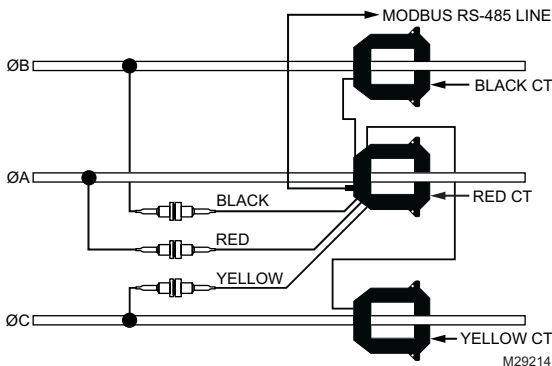    kW = Horsepower x 0.746

# WIRING



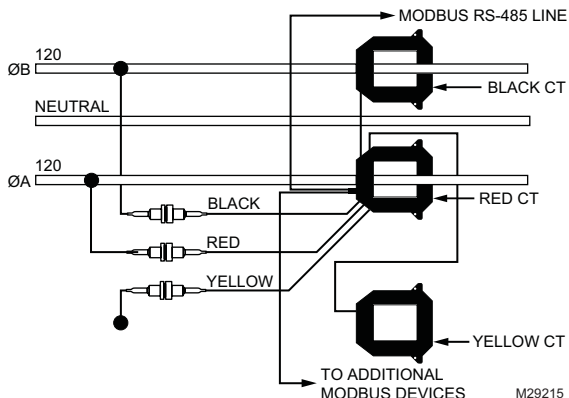**Fig. 8. Typical 208/480 VAC 3Ø, 3- or 4-wire installation.**



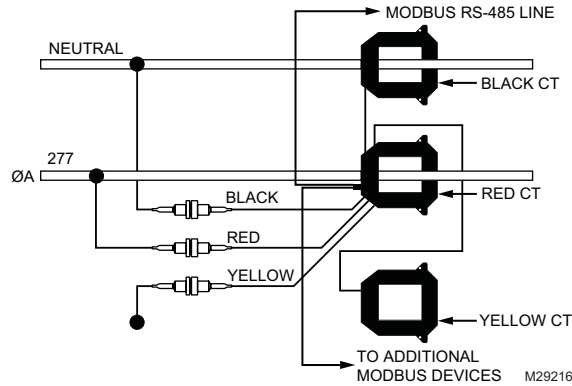**Fig. 9. Typical 240/120 VAC 1Ø, 3-wire installation.**

**Fig. 10. Typical 277 VAC 1Ø, 2-wire installation.**

NOTES:
1. DO NOT GROUND THE SHIELD INSIDE THE ELECTRICAL PANEL. All Modbus wires, including the shield, should be insulated to prevent accidental contact with high voltage conductors.
2. The Modbus cable should be mechanically secured where it enters the electrical panel.
3. All Modbus devices should be connected together in a daisy-chain fashion. The first and last devices in the chain should have a 120 Ohm terminating resistor between (+) and (-).
4. The Modbus cable should be shielded twisted pair wire BELDEN 1120A or similar.

# ⚠ WARNING

**After wiring, remove all scraps of wire or foil shield from the electrical panel. This could be DANGEROUS if wire scraps come into contact with high voltage wires!**

## Output

SXB35:

    kWh, consumption
    Reset kWh
    kW, demand

SXB36:

    kWh, consumption
    kW, demand
    VAR, reactive power
    VA, apparent power
    Power factor
    Average demand
    Minimum demand
    Maximum demand
    Voltage, line-to-line
    Voltage, line-to-neutral
    Amps, average current
    kW, demand ØA
    kW, demand ØB
    kW, demand ØC
    Power factor ØA
    Power factor ØB
    Power factor ØC
    Voltage, ØA to ØB
    Voltage, ØB to ØC
    Voltage, ØAto ØC
    Voltage, ØA to Neutral
    Voltage, ØB to Neutral
    Voltage, ØC to Neutral
    Amps, Current ØA
    Amps, Current ØB
    Amps, Current ØC

## Address Selection Switches

Each Modbus device must have a unique address. These switches must be set to assign a unique address before the device is connected to the Modbus RS-485 line. If an address is selected which conflicts with another device, both devices will be unable to communicate.
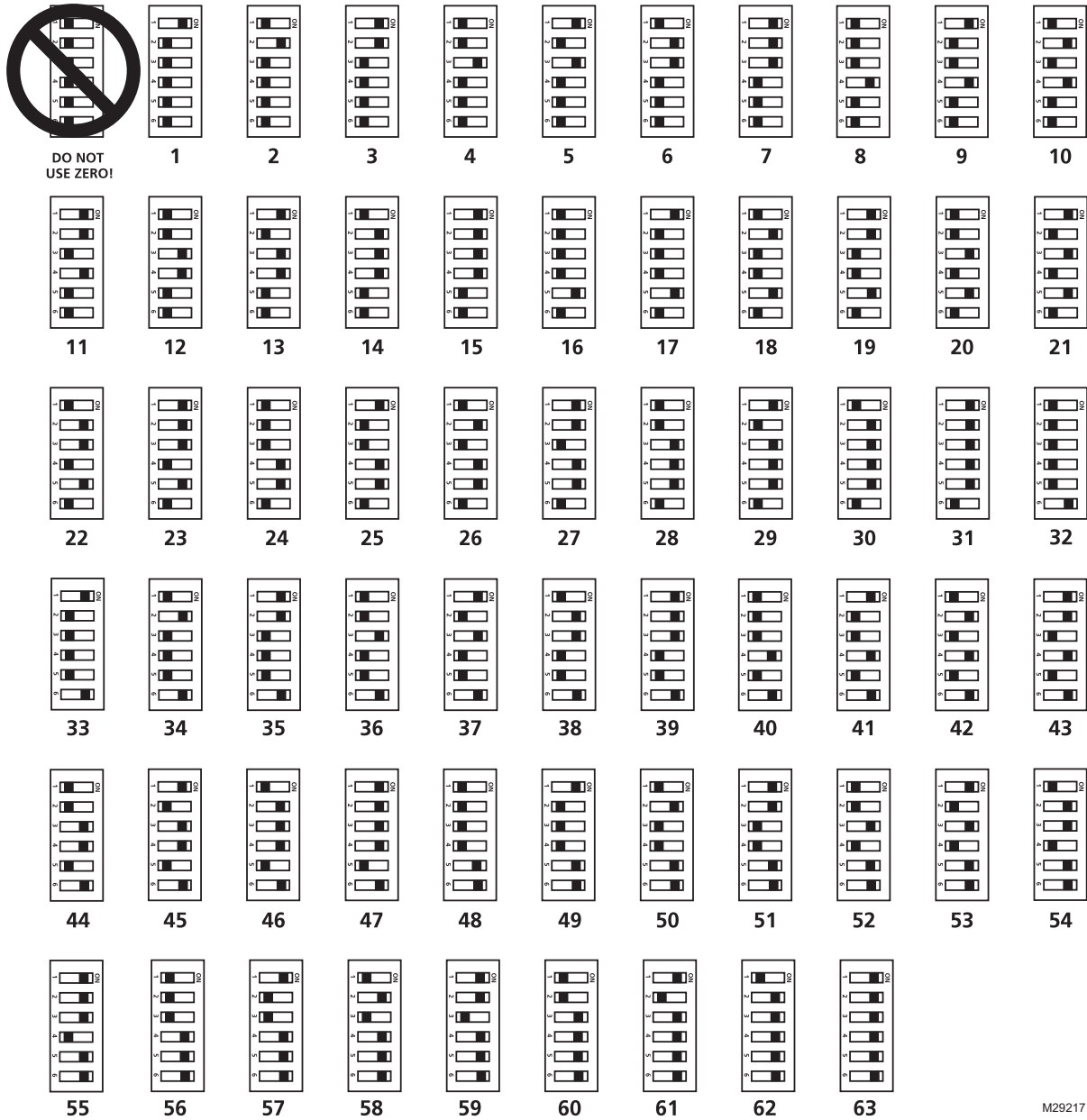


**Fig. 11. Address selection switches.**

62-0309—01

## Modbus Register Addressing

This table lists the addressed assigned to each data point. Registers are read MostSignificant Byte (MSB) first. 32 bit floating point values are encoded per IEEE Standard 754. For floating point format variables, each data point appears twice because two 16-bit addresses are required to hold a 32-bit float value. The 16 bit Most Significant Word (MSW) is in the lower address of the register pair, while the least Significant Word (LSW) is in the upper address.

Modbus RTU function codes supported: 3=read holding registers; 6=preset single register; 17=report Slave I.D

**Table 3. Quick Reference of the Most Common Data Points.**

| Modbus Addr | Typical Offset | Units | Description | INTEGER: multiplier required | FLOAT: UPPER 16 bits | FLOAT: LOWER 16 bits |
|---|---|---|---|---|---|---|
| 40001 | 0 | KWH | Energy Consumption, LSW | X | | |
| 40002 | 1 | KWH | Energy Consumption, MSW | X | | |
| 40003 | 2 | KW | Demand (power) | X | | |
| | | | | | | |
| 40257 | --- | KWH | Energy Consumption | | X | |
| 40258 | | KWH | Energy Consumption | | | X |
| 40259 | 0 | KWH | Energy Consumption (same 40257) | | X | |
| 40260 | | KWH | Energy Consumption (same 40258) | | | X |
| 40261 | 2 | KW | Demand (power) | | X | |
| 40262 | | KW | Demand (power) | | | X |

**Table 4. Complete Listing of Data Points.**

| Modbus Addr | Typical Offset | Units | Description | INTEGER: multiplier required | FLOAT: UPPER 16 bits | FLOAT: LOWER 16 bits |
|---|---|---|---|---|---|---|
| 40001 | 0 | KWH | Energy Consumption, LSW | X | | |
| 40002 | 1 | KWH | Energy Consumption, MSW | X | | |
| 40003 | 2 | KW | Demand (power) | X | | |
| 40004 | 3 | VAR | Reactive Power | X | | |
| 40005 | 4 | VA | Apparent Power | X | | |
| 40006 | 5 | --- | Power Factor | X | | |
| 40007 | 6 | VOLTS | Voltage, line to line | X | | |
| 40008 | 7 | VOLTS | Voltage, line to neutral | X | | |
| 40009 | 8 | AMPS | Current | X | | |
| 40010 | 9 | KW | Demand (power), phase A | X | | |
| 40011 | 10 | KW | Demand (power), phase B | X | | |
| 40012 | 11 | KW | Demand (power), phase C | X | | |
| 40013 | 12 | --- | Power Factor, phase A | X | | |
| 40014 | 13 | --- | Power Factor, phase B | X | | |
| 40015 | 14 | --- | Power Factor, phase C | X | | |
| 40016 | 15 | VOLTS | Voltage, phase A-B | X | | |
| 40017 | 16 | VOLTS | Voltage, phase B-C | X | | |
| 40018 | 17 | VOLTS | Voltage, phase A-C | X | | |
| 40019 | 18 | VOLTS | Voltage, phase A-N | X | | |
| 40020 | 19 | VOLTS | Voltage, phase B-N | X | | |
| 40021 | 20 | VOLTS | Voltage, phase C-N | X | | |
| 40022 | 21 | AMPS | Current, phase A | X | | |

**Table 4. Complete Listing of Data Points. (Continued)**

| Modbus Addr | Typical Offset | Units | Description | INTEGER: multiplier required | FLOAT: UPPER 16 bits | FLOAT: LOWER 16 bits |
|---|---|---|---|---|---|---|
| 40023 | 22 | AMPS | Current, phase B | X | | |
| 40024 | 23 | AMPS | Current, phase C | X | | |
| 40025 | 24 | KW | Average Demand | X | | |
| 40026 | 25 | KW | Minimum Demand | X | | |
| 40027 | 26 | KW | Maximum Demand | X | | |
| | | | | | | |
| 40257 | --- | KWH | Energy Consumption | | X | |
| 40258 | | KWH | Energy Consumption | | | X |
| 40259 | 0 | KWH | Energy Consumption (same 40257) | | X | |
| 40260 | | KWH | Energy Consumption (same 40258) | | | X |
| 40261 | 2 | KW | Demand (power) | | X | |
| 40262 | | KW | Demand (power) | | | X |
| 40263 | 4 | VAR | Reactive Power | | X | |
| 40264 | | VAR | Reactive Power | | | X |
| 40265 | 6 | VA | Apparent Power | | X | |
| 40266 | | VA | Apparent Power | | | X |
| 40267 | 8 | --- | Power Factor | | X | |
| 40268 | | --- | Power Factor | | | X |
| 40269 | 10 | VOLTS | Voltage, line to line | | X | |
| 40270 | | VOLTS | Voltage, line to line | | | X |
| 40271 | 12 | VOLTS | Voltage, line to neutral | | X | |
| 40272 | | VOLTS | Voltage, line to neutral | | | X |
| 40273 | 14 | AMPS | Current | | X | |
| 40274 | | AMPS | Current | | | X |
| 40275 | 16 | KW | Demand (power), phase A | | X | |
| 40276 | | KW | Demand (power), phase A | | | X |
| 40277 | 18 | KW | Demand (power), phase B | | X | |
| 40278 | | KW | Demand (power), phase B | | | X |
| 40279 | 20 | KW | Demand (power), phase C | | X | |
| 40280 | | KW | Demand (power), phase C | | | X |
| 40281 | 22 | --- | Power Factor, phase A | | X | |
| 40282 | | --- | Power Factor, phase A | | | X |
| 40283 | 24 | --- | Power Factor, phase B | | X | |
| 40284 | | --- | Power Factor, phase B | | | X |
| 40285 | 26 | --- | Power Factor, phase C | | X | |
| 40286 | | --- | Power Factor, phase C | | | X |
| 40287 | 28 | VOLTS | Voltage, phase A-B | | X | |
| 40288 | | VOLTS | Voltage, phase A-B | | | X |
| 40289 | 30 | VOLTS | Voltage, phase B-C | | X | |
| 40290 | | VOLTS | Voltage, phase B-C | | | X |
| 40291 | 32 | VOLTS | Voltage, phase A-C | | X | |
| 40292 | | VOLTS | Voltage, phase A-C | | | X |
| 40293 | 34 | VOLTS | Voltage, phase A-N | | X | |
| 40294 | | VOLTS | Voltage, phase A-N | | | X |

**Table 4. Complete Listing of Data Points. (Continued)**

| Modbus Addr | Typical Offset | Units | Description | INTEGER: multiplier required | FLOAT: UPPER 16 bits | FLOAT: LOWER 16 bits |
|---|---|---|---|---|---|---|
| 40295 | 36 | VOLTS | Voltage, phase B-N | | X | |
| 40296 | | VOLTS | Voltage, phase B-N | | | X |
| 40297 | 38 | VOLTS | Voltage, phase C-N | | X | |
| 40298 | | VOLTS | Voltage, phase C-N | | | X |
| 40299 | 40 | AMPS | Current, phase A | | X | |
| 40300 | | AMPS | Current, phase A | | | X |
| 40301 | 42 | AMPS | Current, phase B | | X | |
| 40302 | | AMPS | Current, phase B | | | X |
| 40303 | 44 | AMPS | Current, phase C | | X | |
| 40304 | | AMPS | Current, phase C | | | X |
| 40305 | 46 | KW | Average Demand | | X | |
| 40306 | | KW | Average Demand | | | X |
| 40307 | 48 | KW | Minimum Demand | | X | |
| 40308 | | KW | Minimum Demand | | | X |
| 40309 | 50 | KW | Maximum Demand | | X | |
| 40310 | | KW | Maximum Demand | | | X |

NOTES:

Modbus addresses in the 4xxxx format follow the Modicon protocol specification for point addressing. The actual address sent is the value shown, minus 40001. In other words, the leading "4" is omitted, and the remaining 4-digit number is decremented so that point 40001 is requested with a value of zero in the actual Modbus communication. Some Modbus implementations require point addresses to be specified beginning at zero or 40000, instead of 40001. Programming code may also require addresses which correspond to actual values transmitted, so a value of zero is used to request data beginning at modbus address 40001.

In many applications, a single Modbus command is used to read all of the data available from the meter. For integers, the beginning address is 40001 (or zero in the actual Modbus command), and for floats the first address used would typically be 40259 (or 258 in the actual Modbus command). Although the first float appears at address 40257, it is not necessary to read this value because it is a duplicate copy of the kWh value (required by the product firmware). When a block of data is read, the "typical offset" values index to the data within the block.

"Multiplier required" indicates that a multiplication is required to properly scale the integer value. See Using Integer Data Types section.

## Using Integer Data Types

Unlike the floating-point data type, the integer data type can only represent whole numbers between zero and 65535. To convert a data point value into the number it represents, the value must be multiplied by a constant, as indicated in the table below.

Please note: some data points require different multipliers for each amperage range, while others, e.g. volts and power factor, use the same multiplier regardless of the amperage range of the product. The latter are indicated by single row values.

**Table 5. Data Point Value Multipliers.**

| Addr | Units | 100A | 300/400A | 800A | 1600A | 2400A |
|---|---|---|---|---|---|---|
| 40001 | kWh | 7.81E-03 | 0.03125 | 0.0625 | 0.125 | 0.25 |
| 40002 | kWh | 512 | 2048 | 4096 | 8192 | 16384 |
| 40003 | kW | 0.004 | 0.016 | 0.032 | 0.064 | 0.128 |
| 40004 | VAR | 0.004 | 0.016 | 0.032 | 0.064 | 0.128 |
| 40005 | VAR | 0.004 | 0.016 | 0.032 | 0.064 | 0.128 |
| 40006 | --- | 3.0518E-5 | | | | |

**Table 5. Data Point Value Multipliers. (Continued)**

| Addr | Units | 100A | 300/400A | 800A | 1600A | 2400A |
|------|-------|------|----------|------|-------|-------|
| 40007 | VOLTS | 0.03125 | | | | |
| 40008 | VOLTS | 0.015625 | | | | |
| 40009 | AMPS | 3.906E-03 | 0.015625 | 0.03125 | 0.0625 | 0.1250 |
| 40010 | kW | 0.001 | 0.004 | 0.008 | 0.016 | 0.032 |
| 40011 | kW | 0.001 | 0.004 | 0.008 | 0.016 | 0.032 |
| 40012 | kW | 0.001 | 0.004 | 0.008 | 0.016 | 0.032 |
| 40013 | --- | 3.0518E-5 | | | | |
| 40014 | --- | 3.0518E-5 | | | | |
| 40015 | --- | 3.0518E-5 | | | | |
| 40016 | VOLTS | 0.03125 | | | | |
| 40017 | VOLTS | 0.03125 | | | | |
| 40018 | VOLTS | 0.03125 | | | | |
| 40019 | VOLTS | 0.015625 | | | | |
| 40020 | VOLTS | 0.015625 | | | | |
| 40021 | VOLTS | 0.015625 | | | | |
| 40022 | AMPS | 3.906E-03 | 0.015625 | 0.03125 | 0.0625 | 0.1250 |
| 40023 | AMPS | 3.906E-03 | 0.015625 | 0.03125 | 0.0625 | 0.1250 |
| 40024 | AMPS | 3.906E-03 | 0.015625 | 0.03125 | 0.0625 | 0.1250 |
| 40025 | kW | 0.004 | 0.016 | 0.032 | 0.064 | 0.128 |
| 40026 | kW | 0.004 | 0.016 | 0.032 | 0.064 | 0.128 |
| 40027 | kW | 0.004 | 0.016 | 0.032 | 0.064 | 0.128 |

As an alternative to Table , it can be convenient to invert the values for use as divisors, where the integer value returned by the meter is divided by a number from the table below. In most cases, the divisors are a more compact number. For these values, see Table .

**Table 6. Data Point Value Divisors.**

| Addr | Units | 100A | 300/400A | 800A | 1600A | 2400A |
|------|-------|------|----------|------|-------|-------|
| 40001 | kWh | 128 | 32 | 16 | 8 | 4 |
| 40002 | kWh | 1.9531E-3 | 4.8828E-4 | 2.4414E-4 | 1.2207E-4 | 6.1035E-5 |
| 40003 | kW | 250 | 62.5 | 31.25 | 15.625 | 7.8125 |
| 40004 | VAR | 250 | 62.5 | 31.25 | 15.625 | 7.8125 |
| 40005 | VAR | 250 | 62.5 | 31.25 | 15.625 | 7.8125 |
| 40006 | --- | 32768 | | | | |
| 40007 | VOLTS | 32 | | | | |
| 40008 | VOLTS | 64 | | | | |
| 40009 | AMPS | 256 | 64 | 32 | 16 | 8 |
| 40010 | kW | 1000 | 250 | 125 | 62.5 | 31.25 |
| 40011 | kW | 1000 | 250 | 125 | 62.5 | 31.25 |
| 40012 | kW | 1000 | 250 | 125 | 62.5 | 31.25 |
| 40013 | --- | 32768 | | | | |
| 40014 | --- | 32768 | | | | |
| 40015 | --- | 32768 | | | | |
| 40016 | VOLTS | 32 | | | | |
| 40017 | VOLTS | 32 | | | | |
| 40018 | VOLTS | 32 | | | | |

**Table 6. Data Point Value Divisors. (Continued)**

| Addr | Units | 100A | 300/400A | 800A | 1600A | 2400A |
|------|-------|------|----------|------|-------|-------|
| 40019 | VOLTS | 64 | | | | |
| 40020 | VOLTS | 64 | | | | |
| 40021 | VOLTS | 64 | | | | |
| 40022 | AMPS | 256 | 64 | 32 | 16 | 8 |
| 40023 | AMPS | 256 | 64 | 32 | 16 | 8 |
| 40024 | AMPS | 256 | 64 | 32 | 16 | 8 |
| 40025 | kW | 250 | 62.5 | 31.25 | 15.625 | 7.8125 |
| 40026 | kW | 250 | 62.5 | 31.25 | 15.625 | 7.8125 |
| 40027 | kW | 250 | 62.5 | 31.25 | 15.625 | 7.8125 |

# TROUBLESHOOTING

| Problem | Solution |
|---------|----------|
| Status LED does not blink | Check fuses and voltage connections. Status LED should blink regardless of CTs, Modbus connections, and DIP switch setting. |
| Power meter interferes with another device on the Modbus | Set DIP sw itches to a different Modbus address not in use. |
| Readings seem highly inaccurate. | • Check that each CT is installed on the conductor with the corresponding color voltage input lead attached. In most cases, incorrect wiring will cause the STATUS LED to blink RED (slowly). However, a power factor lower than 0.5 could cause the LED to blink this way, even if the unit is installed properly.<br>• It does not matter which side of the CT faces towards the load.<br>• If current is below 7% of full scale maximum for the CT, use a smaller CT or wrap each wire through the CT multiple times<br>• Check current with an amp-clamp.<br>Expected power:<br>kW = Volts x Amps x 1.732 x PF / 1000<br>kW = Horsepower x 0.746<br>PF is usually 0.7 to 0.95, depending on the load. |
| Meter goes offline when load is switched off. | Voltage leads must be connected on the Line side of the conductor. The power meter cannot communicate on the Modbus without voltage. |
| Status LED blinks red. | • If the LED blinks quickly (i.e., about 5 blinks in two seconds), then the use a CT with a higher amp rating.<br>• If the LED blinks slowly (i.e., about 1 blink in two seconds) the CTs are not installed on the correct conductors, or the power factor is less than 0.5. The meter can accurately measure these low PFs, but few loads operate normally at such a low power factor. |

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