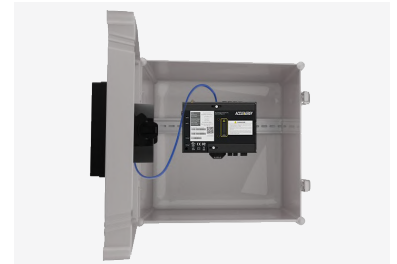


# Acuvim 3

Advanced Power Quality Meter  
Datasheet

ACCUENERGY



## DESCRIPTION

Acuvim 3 is the ultimate power quality and revenue grade energy meter fully compliant to IEC 61000-4-30 Class A standard and third-party certified by NMI. Designed with an industry-leading ANSI C12.20 Class 0.1/IEC 62053-2 Class 0.1S measurement accuracy and able to precisely detect power quality anomalies in critical distributed energy systems. Reports, data, analysis and control are easily accessible anywhere when using the optional 7-inch colour touch screen remote display unit or web interface.

## FEATURES

- + ANSI C12.20/IEC 62053-22 Class 0.1 accuracy for revenue metering
- + IEC 61000-4-30 Class A compliant power quality monitor
- + IEC 61000-4-15 compliant flicker measurement for voltage fluctuations
- + Waveform capture detection up to 512 sample per cycle and stored in COMTRADE data format
- + Frequency deviation triggers high speed data log-based events with pre/post event recording of active power and frequency
- + EN50160/IEEE519 compliant power quality report
- + IEEE C37.118 compliant synchrophasor measurement and data transfer
- + Time synchronization with IRIG-B, NTP, SNTP and PTP
- + Multi-protocol communications: IEC 61850, EtherNet/IP, Modbus-RTU, Modbus-TCP/IP, BACnet-IP, BACnet MS/TP, DNP3 TCP, SNMP, and IPv6/Ipv4
- + Dual Ethernet port, RS485, Wi-Fi (2.4GHz), IRIG-B, 4 digital I/O, and USB-C interface
- + 32 GB Data logger and data post: Up to 15 configurable dataloggers with user-selectable logging interval and parameters
- + Time of Use (TOU) support with 8 tariff rates and up to 12 historic billing periods
- + Optional 7-inch HMI touch screen colour remote display unit
- + 5A/1A, 333mV or RCT (Rogowski) current sensing input
- + DIN rail mount or panel mount installation

## KEY FEATURES

### Power Quality Analysis

IEC 61000-4-30 Class-A compliant metering:

- + Voltage/Current RMS measurement updated at half-cycle, with IEC 61557-12 Class 0.1 accuracy
- + Frequency 40Hz to 70Hz, 1mHz accuracy exceeds IEC 61557-12 Class 0.02 requirements
- + IEC 61000-4-15 Class F1 flicker voltage fluctuation measurement updated at 10-minute/2-hour intervals
- + Voltage/Current Harmonics up to 127<sup>th</sup>

PQ event monitoring:

- + Examines half-cycle voltage RMS and current RMS to detect sags, swell, or unbalance events
- + Analyze transient voltage at a rate of 32,000 samples per second
- + Detect voltage interruption based on threshold and hysteresis triggers

Waveform capture and fast logging:

- + Sample up to 60 cycles before and up to 300 cycles after PQ events
- + High resolution waveform sampling rate up to 512 samples per cycle for voltage and current
- + DI triggered waveform
- + 10-second extended waveform capture
- + Capture waveform events in COMTRADE file formats and posted to remote server via HTTP/FTP
- + Fast log waveform capture for half-cycle voltage and current RMS. Stored in a CSV file for post transfer to remote server
- + Configure alarms to automatically send waveform capture event-based emails

IEC 61000-4-30 PQ compliant measurements and logging reports:

- + EN 50160 power quality logging report for voltage RMS, unbalance, THD, harmonics, interruption, dip, and swell
- + IEEE 519 pass/fail report for voltage and current harmonics distortion
- + ITIC/CBEMA and SEMI curves analysis for power tolerance restrictions and IT infrastructure

### Revenue Grade Power & Energy Metering

High precision resolution:

- + Active energy: IEC 62053-22 Class 0.1S/ANSI C12.20 Class 0.1
- + Reactive energy exceeds IEC 62053-24 Class 0.5S
- + Active power: IEC 61557-12 Class 0.1
- + Power factor exceeds IEC61557-12 Class 0.5

Measurements:

- + Monitor real-time parameters for current, voltage, active power, reactive power, power factor, frequency, load nature
- + Bidirectional energy: import/export/net/total
- + Full four quadrant recording and analysis of energy flow for each phase and system energy

Time of Use (TOU) metering:

- + Up to 8 tariff rates
- + Rate structure assignment at 30 minutes interval
- + Record TOU net active energy, net reactive energy, apparent energy, and their maximum values for configured billing period
- + Record for current and 12 previous billing periods

### Synchrophasor Measurement

IEEE C37.118 compliant for high-speed precision measurements and data transfer:

- + Synchronized phasor
  - + IRIG-B time synchronization in millisecond level precision
  - + Magnitude / angle size for both voltage / current phasors
  - + Individual voltage and current channel and polyphase positive sequence convention
  - + Frequency and rate of change of frequency (ROCOF) detection against islanding
- + Configurable reporting data frame rates
  - + 50Hz: 10, 25, 50 frames/second
  - + 60Hz: 10, 12, 15, 20, 30, 60 frames/second
- + Communication protocol
  - + Producer (server) of synchrophasor data
  - + TCP/IP Ethernet-based network with broadcast/multicast data transmission support
  - + UPD data frame transmission using spontaneous or commanded communication modes

## APPLICATIONS

- |  |   |  |   |
|--|---|--|---|
| + SCADA  | + Power Distribution                        | + Industrial Automation                      | + Power Quality   |
| + UPS Systems  | + Critical infrastructure                   | + Manufacturing Facilities                   | + Telecommunications                                      |
| + Transportation Monitoring                            | + Power Distribution Substations            | + University and Clinical Laboratories       | + Power Distribution Units and Data Center Infrastructure |
| + Auxiliary Frequency Response Services and Incentives | + DER - Microgrids and Virtual Power Plants | + Healthcare Facilities EPSS Testing Systems |   |

## SPECIFICATIONS

Metering				
PARAMETERS	ACCURACY	RESOLUTION	RANGE	UPDATE RATE
Voltage	0.1%	0.001V	VLN :10V~400V VLL:17.3V~690V	½ Cycle 200ms (10/12 Cycle)
Current	0.1%	0.001A	1A:10mA~2A 5A:50mA~10A 333mV:3mV~400mV Rogowski Coil:3mV~400mV	½ Cycle 200ms (10/12 Cycle)
Power	0.1%	1W	-999999.999MW~999999.999MW	½ Cycle 200ms (10/12 Cycle)
Reactive Power	0.1%	1var	-999999.999Mvar~999999.999Mvar	½ Cycle 200ms (10/12 Cycle)
Apparent Power	0.1%	1VA	0~999999.999MVA	½ Cycle 200ms (10/12 Cycle)
Power Demand	0.1%	1W	-999999.999MW~999999.999MW	½ Cycle 200ms (10/12 Cycle)
Reactive Power Demand	0.1%	1var	-999999.999Mvar~999999.999Mvar	½ Cycle 200ms (10/12 Cycle)
Apparent Power Demand	0.1%	1VA	0~999999.999MVA	½ Cycle 200ms (10/12 Cycle)
Power Factor	0.1%	0.001	-1.000~1.000	
Frequency	0.001%	0.001Hz	40.000Hz~70.000Hz	½ Cycle 200ms (10/12 Cycle) 10s
Energy	0.1%	0.001Wh	0~999999.999MWh	½ Cycle 200ms (10/12 Cycle)
Reactive Energy	0.1%	0.001varh	0~999999.999Mvarh	½ Cycle 200ms (10/12 Cycle)
Apparent Energy	0.1%	0.001VAh	0~999999.999MVAh	½ Cycle 200ms (10/12 Cycle)
Harmonics	0.15%	0.001%		200ms (10/12 Cycle)
Phase Angle		0.001°	0.000°~359.999°	½ Cycle 200ms (10/12 Cycle)
Unbalance Factor	0.15%	0.001%	0.000%~100.000%	200ms (10/12 Cycle)
Running Time		1 minute		
Flicker	5%			Short Term (10 min) Long Term (2 hour)

## Input

### CURRENT INPUTS (EACH CHANNEL)

Nominal Current Options	① 5A, ② 1A, ③ 333mV, ④ Rogowski Coil
Metering Range	① 0-10A, ② 0-2A, ③ 0-400mV, ④ 0-400mV
Pickup Current	① 0.5mA, ② 0.5mA, ③ 0.25mV, ④ 0.25mV
Withstand	20Arms Continuous, 50Arms @10sec/hr, 500Arms @1sec/hr
Burden	0.05VA (Typical) @ 5A RMS
Accuracy	0.1% at Reading

### VOLTAGE INPUTS (EACH CHANNEL)

Nominal Full Scale	400Vac L-N, 690Vac L-L (+20%)
Withstand	1500Vac Continuous 2500Vac, 50/60Hz for 1 Minute
Input Impedance	2MΩ per Phase
Metering Frequency	40Hz~70Hz
Pickup Voltage	5Vac
Accuracy	0.1% at Reading

### POWER ACCURACY

Active Power	Class 0.1 (According to IEC61557-12)
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### FREQUENCY ACCURACY

Frequency	Class 0.02 (According to IEC61557-12)
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### ENERGY ACCURACY

Active	Class 0.1s (According to IEC 62053-22) Class 0.1 (According to ANSI C12.20)
Reactive	Class 0.5s (According to IEC 62053-24)

### HARMONIC RESOLUTION

Metered Value	127 <sup>th</sup> Harmonic
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## SPECIFICATIONS

### I/O Options

#### DIGITAL INPUT

Input Type	Dry
Input Resistance	100kΩ
Input Voltage Range	20~160 Vac/dc
Input Current (Max)	2mA
Start Voltage	15V
Stop Voltage	5V
Pulse Frequency (Max)	100Hz, 50% Duty Ratio (5ms ON and 5ms OFF)
SOE Resolution	2ms

#### DIGITAL OUTPUT (DO)

Voltage Range	0~250Vac/dc
Load Current	100mA (Max)
Output Frequency	25Hz, 50% Duty Ratio (20ms ON, 20ms OFF)
Isolation Voltage	2500Vac

#### RELAY OUTPUT (RO)

Switching Voltage (Max)	250Vac, 30Vdc
Load Current	5A (R), 2A (L)
Set Time	10ms (Max)
Contact Resistance	30mΩ (Max)
Isolation Voltage	2500Vac

#### ANALOG OUTPUT (AO)

Output Range	0~5V, 0~20mA 1~5V, 4~20mA Optional
Accuracy	0.50%
Temperature Drift	50ppm/°C Typical
Isolation Voltage	500Vdc
Open Circuit Voltage	15V

#### ANALOG OUTPUT (AI)

Input Range	0~5V, 0~20mA 1~5V, 4~20mA Optional
Accuracy	0.20%
Temperature Drift	50ppm/°C Typical
Isolation Voltage	500Vdc

#### POWER SUPPLY FOR DI (24 VDC)

Output Voltage	24Vdc
Output Current	42mA
Load (Max)	21DIs

### Mechanical Characteristics

IP Degree of Protection	IP54: Panel mount and touchscreen display, front. IP30: Panel mount rear, DIN rail mount, I/O modules.
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### Communications

Serial Port Protocols	Modbus-RTU 9600~115200 bps
WEB SERVER	HTTP/HTTPS
TIME SYNCHRONIZATION	NTP, SNTP, IRIG-B, PTP
ETHERNET	IPv4, IPv6, DHCP, DNS MODBUS-TCP/IP DNP 3.0 Over IP Level 2 IEC 61850 1st and 2nd Edition PMU (C37.118) SNMP V2C and V3 BACnet-IP HTTP/HTTPS Webserver file download HTTP/HTTPS, FTP, sFTP, SMTP Email data post, EtherNet/IP
WI-FI	(802.11 b/g/n 2.4GHz/5GHz)

### Control Power

Universal	AC or DC
<b>AC/DC CONTROL POWER</b>	
Operating Range	AC(P1):100~415Vac, 50/60Hz; 100~300Vdc DC(P2):20 to 60V DC±10%
Burden	15W, 25VA
Frequency	50/60Hz
Withstand	3250Vac, 50/60Hz for 1 minute Installation Category III (Distribution)

### LOW VOLTAGE DC CONTROL POWER (OPTIONAL)

Operating Range	20~60Vdc
Burden	5W

### Operating Environment

Operating Temperature	-25°C to 70°C -13°F to 158°F
Storage Temperature	-40°C to 70°C -40°F to 158°F
Relative Humidity	5% to 95% Non-Condensing
Altitude	<3000m
Pollution Degree	2
Location/Mounting	Indoor use only

### Standard Compliance & Certifications

Measurement Standard	IEC 62053-22; ANSI C12.20; IEC61557-12
Power Quality	Class A (According to IEC 61000-4-30)
Main Signaling	Class A (According to IEC 61000-4-30)
Flicker	IEC 61000-4-15 F1
Environmental Standard	IEC 60068-2, CE, RoHS
Safety Standard	IEC/UL 61010-1:2010, IEC/UL 61010—2-030:2010, Overvoltage Category III, Measurement Category III
EMC Standard	IEC 61000-4/-2-3-4-5-6-8-11-12-16-18, CISPR 32, Class B, IEC 62052-11, IEC 61326-1, IEC 61000-6-5
Outlines Standard	DIN 43700, ANSI C39.1
Protocol Conformance	IEC 61850 2 <sup>nd</sup> Edition BTL Listed for B-SA

## FUNCTION LIST

REAL TIME MEASURING	Parameters
Phase Voltage	V_A, V_B, V_C, VLN_AVG
Line Voltage	V_AB, V_BC, V_CA, VLL_AVG
Current	I_A, I_B, I_C, I_N, I_AVG
Power	P_A, P_B, P_C, P_SYS
Reactive Power	Q_A, Q_B, Q_C, Q_SYS
Apparent Power	S_A, S_B, S_C, S_SYS
Power Factor	PF_A, PF_B, PF_C, PF
Frequency	F
Load Features	L/C/R
Four Quadrant Powers	Four Quadrant Powers
<b>FUNDAMENTAL</b>	
Phase Voltage	V_A, V_B, V_C, VLN_AVG
Line Voltage	V_AB, V_BC, V_CA, VLL_AVG
Current	I_A, I_B, I_C, I_AVG, I_SYS
Line Current	I_AB, I_BC, I_CA, ILL_AVG
Power	P_A, P_B, P_C, P_SYS
Reactive Power	Q_A, Q_B, Q_C, Q_SYS
Apparent Power	S_A, S_B, S_C, S_SYS
Power Factor	PF_A, PF_B, PF_C, PF
<b>MAX/MIN</b>	
Frequency	F_Max, F_Min
Phase Voltage	Va_Max, Va_Min, Vb_Max, Vb_Min, Vc_Max, Vc_Min, Vln_AVG_Max, Vln_AVG_Min,
Line Voltage	Vab_Max, Vab_Min, Vbc_Max, Vbc_Min, Vca_Max, Vca_Min, Vll_AVG_Max, Vll_AVG_Min,
Current	Ia_Max, Ia_Min, Ib_Max, Ib_Min, Ic_Max, Ic_Min, I_AVG_Max, I_AVG_Min,
Power	Pa_Max, Pa_Min, Pb_Max, Pb_Min, Pc_Max, Pc_Min ,Psys_Max,Psys_Min
Reactive Power	Qa_Max, Qa_Min, Qb_Max, Qb_Min, Qc_Max, Qc_Min ,Qsys_Max, Qsys_Min
Apparent Power	Sa_Max, Sa_Min, Sb_Max, Sb_Min, Sc_Max, Sc_Min ,Ssys_Max,Ssys_Min
Power Factor	PFa_Lead_Max, PFb_Lag_Max, PFc_Lead_Max, PFsys_Lag_Max, PFa_Lead_Min, PFb_Lag_Min, PFc_Lead_Min, PFsys_Lag_Min, PFa_Lag_Max, PFb_Lag_Max, PFc_Lag_Max, PFsys_Lag_Max, PFa_Lag_Min, PFb_Lag_Min, PFc_Lag_Min, PFsys_Lag_Min,
Unbalance	Max Voltage Unbalance, Min Voltage Unbalance, Max Current Unbalance, Min Current Unbalance,
<b>ENERGY</b>	
Active Energy	Ep_imp, Ep_exp, Ep_total, Ep_net , Epa_imp, Epa_exp, Epb_imp, Epb_exp, Epc_imp, Epc_exp, Ep_q1, Ep_q2, Ep_q3, Ep_q4, Epa_q1, Epa_q2, Epa_q3, Epa_q4, Epb_q1, Epb_q2, Epb_q3, Epb_q4, Epc_q1, Epc_q2, Epc_q3, Epc_q4
Reactive Energy	Eq_imp, Eq_exp, Eq_total, Eq_net, Eqa_imp, Eqa_exp, Eqb_imp, Eqb_exp, Eqc_imp, Eqc_exp, Eq_q1, Eq_q2, Eq_q3, Eq_q4, Eqa_q1, Eqa_q2, Eqa_q3, Eqa_q4, Eqb_q1, Eqb_q2, Eqb_q3, Eqb_q4, Eqc_q1, Eqc_q2, Eqc_q3, Eqc_q4
Apparent Energy	Es_imp, Es_exp, Es_total, Es_net, Esa, Esb, Esc, Es_q1, Es_q2, Es_q3, Es_q4, Esa_q1, Esa_q2, Esa_q3, Esa_q4, Esb_q1, Esb_q2, Esb_q3, Esb_q4, Esc_q1, Esc_q2, Esc_q3, Esc_q4

## FUNCTION LIST

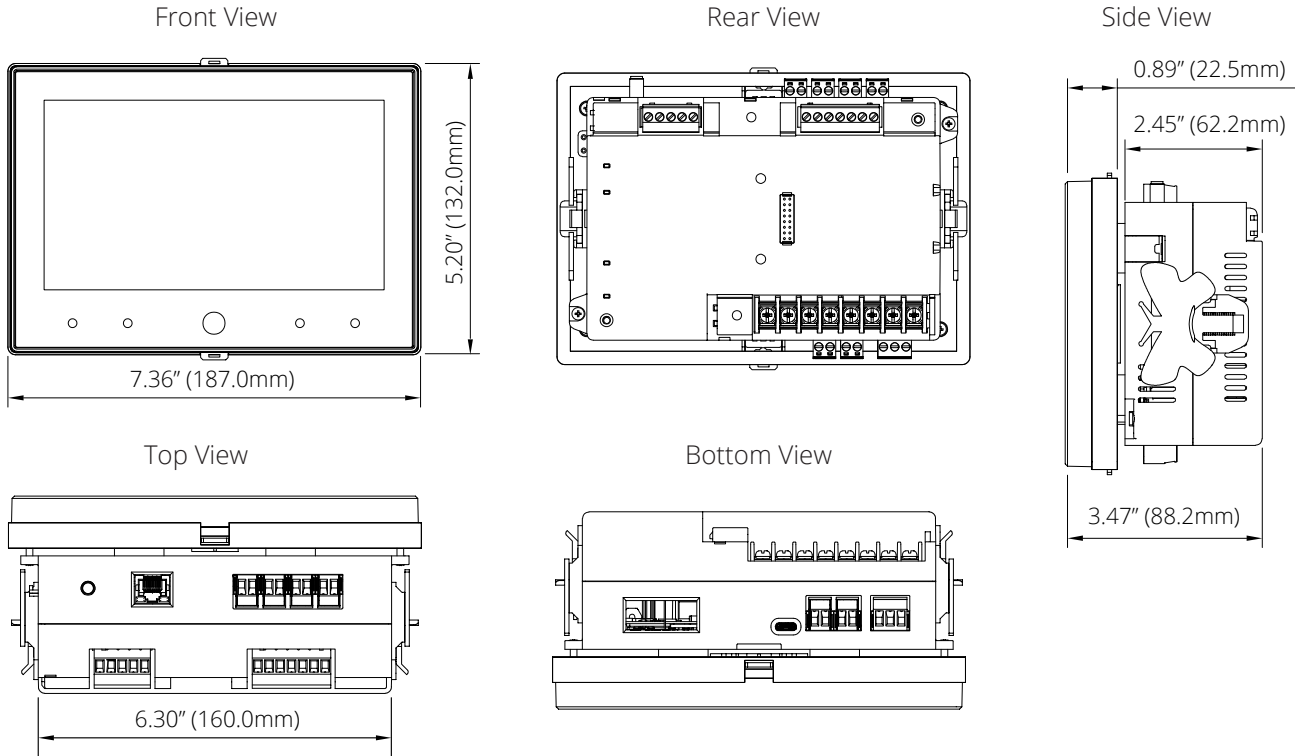
<b>DEMAND</b>	
Current Demand	Dmd_IA, Dmd_IB, Dmd_IC, Dmd_IN Dmd_IA_Max, Dmd_IB_Max, Dmd_IC_Max, Dmd_IN_Max
Power Demand	Dmd_Psum, Dmd_Qsum, Dmd_Ssum Dmd_Pa, Dmd_Qa, Dmd_Sa Dmd_Pb, Dmd_Qb, Dmd_Sb Dmd_Pc, Dmd_Qc, Dmd_Sc Dmd_Psys_Max, Dmd_Qsys_Max, Dmd_Ssys_Max Dmd_Pa_max, Dmd_Qa_max, Dmd_Sa_max Dmd_Pb_max, Dmd_Qb_max, Dmd_Sb_max Dmd_Pc_max, Dmd_Qc_max, Dmd_Sc_max
<b>HOURL</b>	
Device Run Time	Hours, Minutes
<b>POWER QUALITY</b>	
Voltage THD	THD_Va, THD_Vb, THD_Vc
Current THD	THD_Ia, THD_Ib, THD_Ic
Current TDD	TDD_Ia, TDD_Ib, TDD_Ic
Individual Harmonics	Harmonics 2 <sup>nd</sup> to 127 <sup>th</sup> (50Hz or 60Hz) Inter-harmonics
Voltage Crest Factor	Crest Factor
Current K Factor	K Factor
Voltage Flicker	Flicker_a, Flicker_b, Flicker_c (10 minutes and 2 hours)
<b>SEQUENCE</b>	
Voltage/Current Sequence	Positive Sequence, Negative Sequence, Zero Sequence
Voltage Unbalance	U_unbl
Current Unbalance	I_unbl
Aggregation	VLN, VLL, I, P, Q, S, Harmonics, Interharmonics, unbalance parameters (150/180-cycle, 10Minutes, and 2 hours)
<b>PHASE ANGLES</b>	
Voltage/Current Phase Angles	Voltage Phase Angle, Current Phase Angle
<b>STATISTICS</b>	
MAX with Time Stamp MIN with Time Stamp	Each Phase of V & I Total of P, Q, S, PF & F Demand of I1, I2, I3, IN, P, Q, & S Each Phase THD of V & I Unbalance Factor of V & I
<b>ALARM</b>	
Over/Under Limit Alarm	V, I, P, Q, S, PF, V_THD & I_THD Each Phase and Total/Average Unbalance Factor of V & I Load Type Analog and Digital Input of Each Channel Demand of I1, I2, I3, P, Q & S Reverse Phase Sequence
<b>WAVEFORM CAPTURE</b>	
Voltage and Current Waveform	Voltage Sag, Voltage Dip, Voltage Swell, Voltage Interruption, Unbalance Voltage, Transient Voltage, Current Sag, Current Swell, Unbalance Current, Manual Trigger
<b>POWER QUALITY EVENT LOGGING</b>	
Power Quality Event with Time Stamp	Voltage Sag, Voltage Dip, Voltage Swell, Voltage Interruption, Unbalance Voltage, Transient Voltage, Current Sag, Current Swell, Unbalance Current, Manual Trigger
<b>DATA LOGGING</b>	
Up to 15 Data Logger	

## FUNCTION LIST

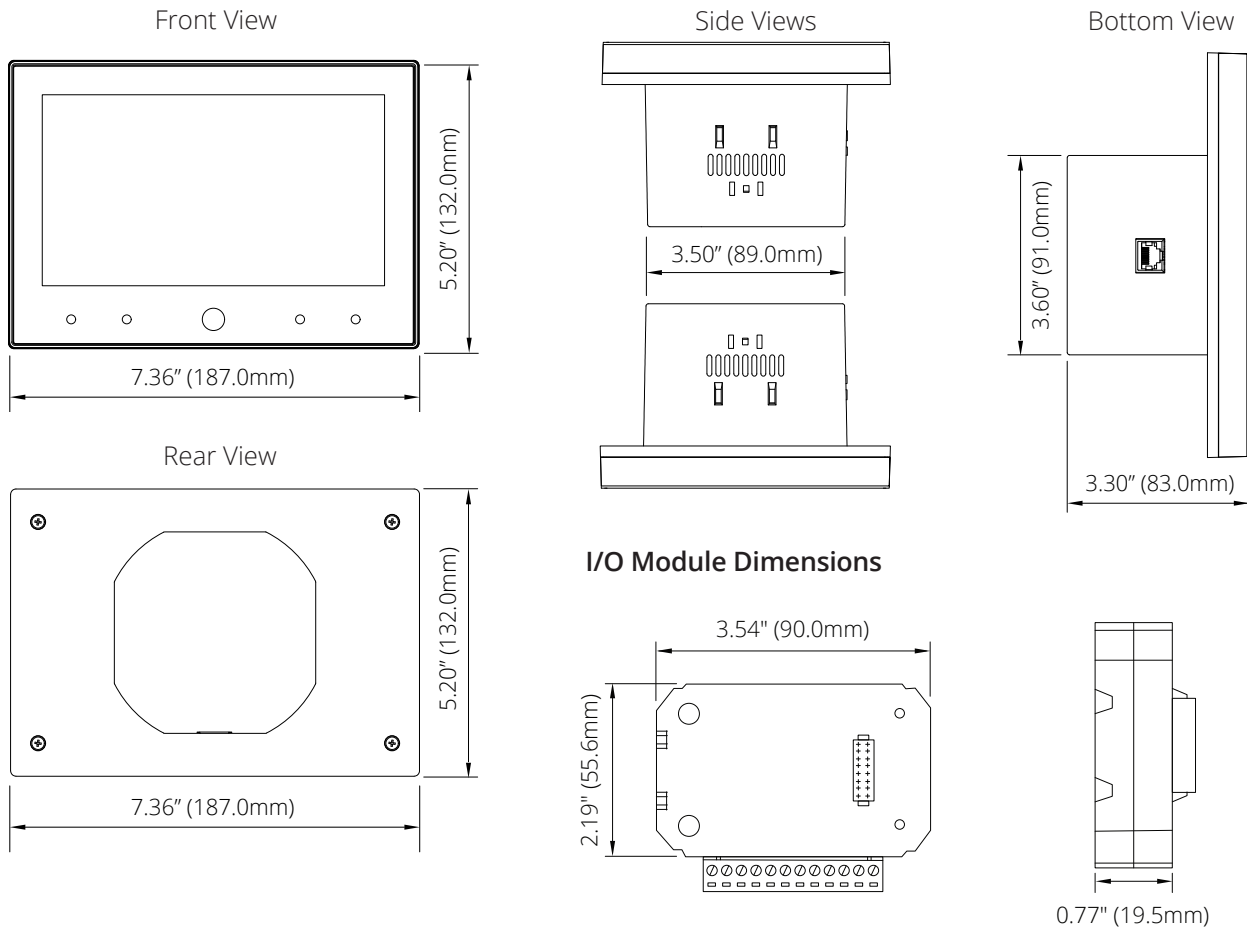
<b>TIME OF USE</b>	
Energy/Max Demand	Ep_net,Eq_net,Es, Net_Pdemand_Max, Net_Qdemand_Max, S_demand_Max,
<b>INPUT AND OUTPUT</b>	
Digital Input (DI)	4 Digital Input
Digital Output (DO)	1 Digital Output
<b>I/O MODULE (EXTENSION)</b>	
Switch Status (DI)	Digital Input
Power Supply for DI	24V DC
Relay Output (RO)	NO, Form A
Digital Output (DO)	Photo-MOS
Pulse Output (PO)	By Using DO
Analog Input (AI)	0 (4) – 20mA, 0 (1) – 5V
Analog Output (AO)	0 (4) – 20mA, 0 (1) – 5V
<b>COMMUNICATION</b>	
Ethernet Ports	2 Ports(100BASE-TX): RJ45 connector, CAT5/5e/6/6a cable.
Wi-Fi	1 Ports (802.11 b/g/n 2.4GHz/5GHz)
RS485	1 Ports: Baud rates of 9600 to 115200, pluggable screw terminal connector
USB	1 Port
IRIG-B	1 Port
<b>DISPLAY MODULE (OPTIONAL)</b>	
LCD	7" touchscreen color LCD

## DIMENSIONS

### Acuvim 3 Dimensions



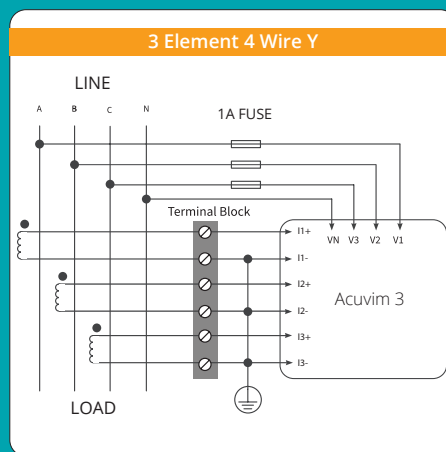
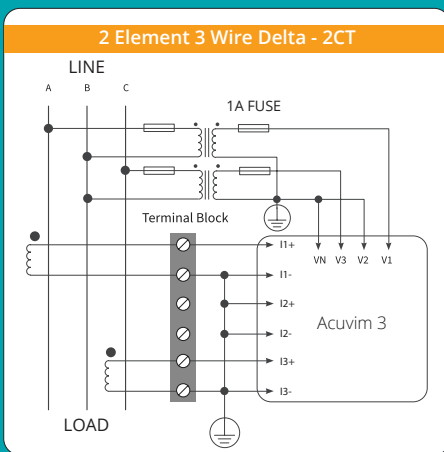
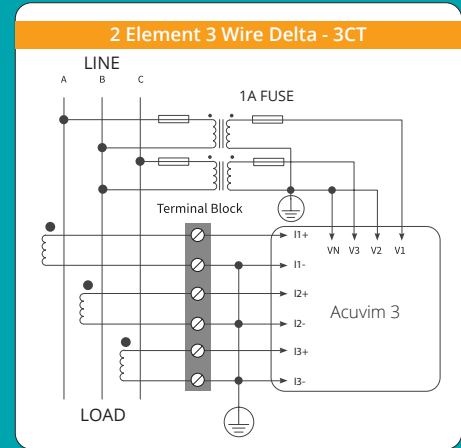
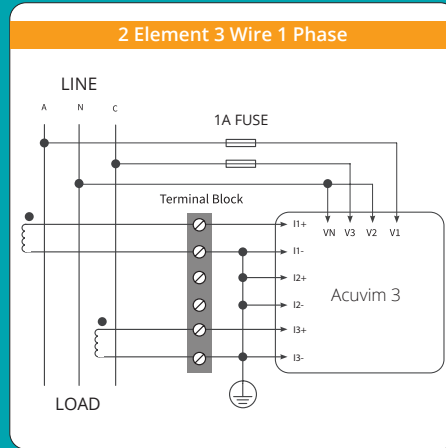
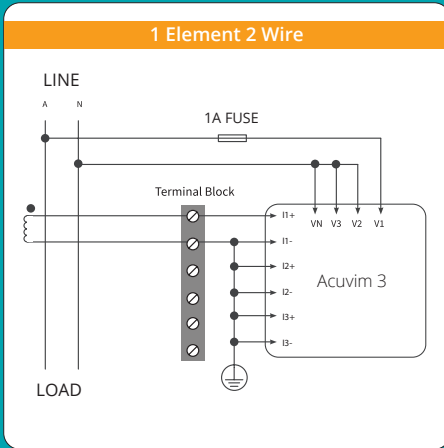
### Acuvim 3 Remote Display Dimensions



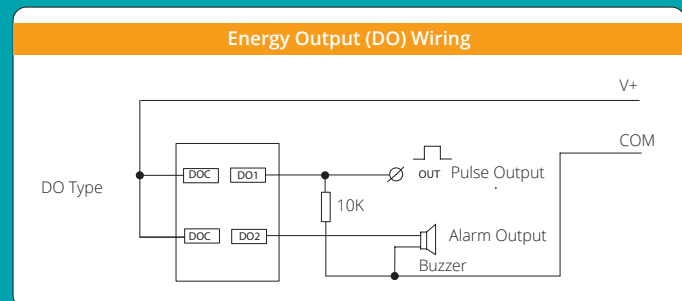
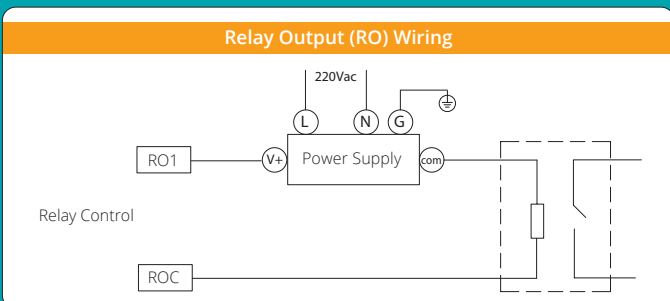
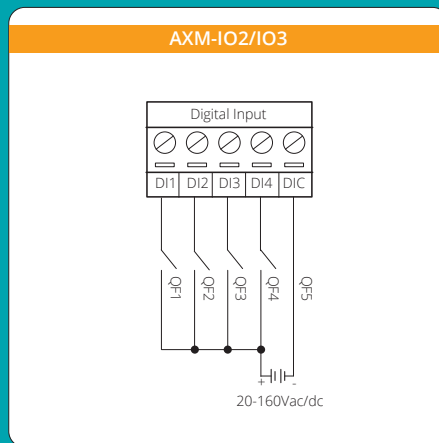
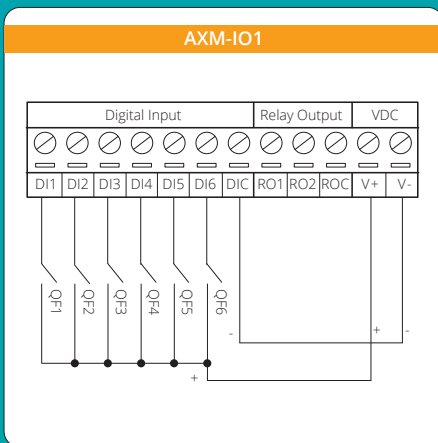


# WIRING DIAGRAMS

## Typical Wiring With 5A/1A CTs

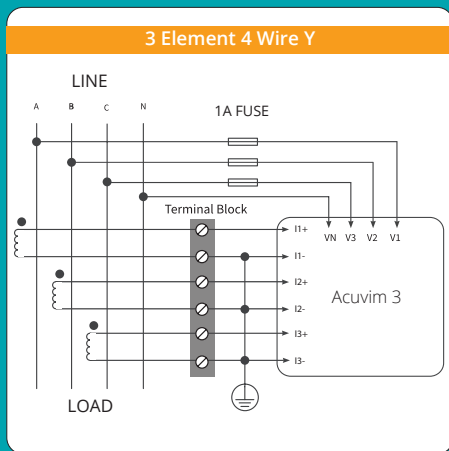
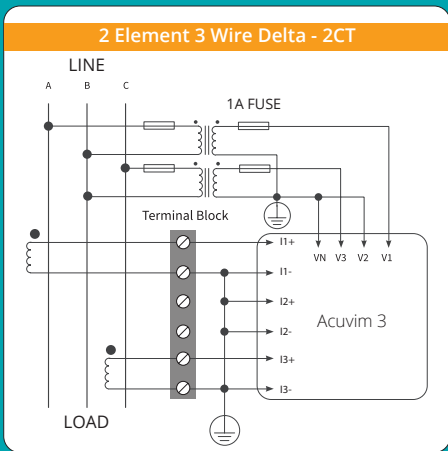
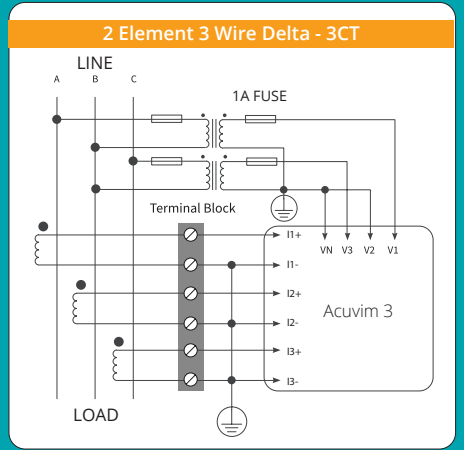
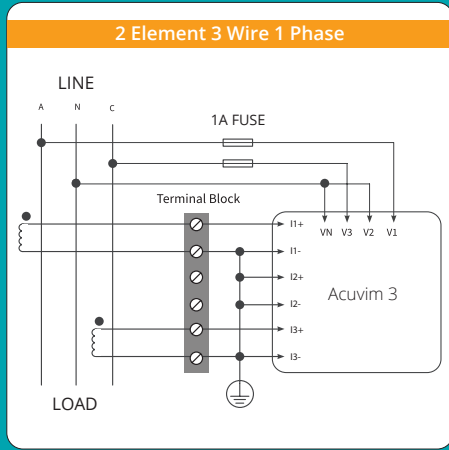
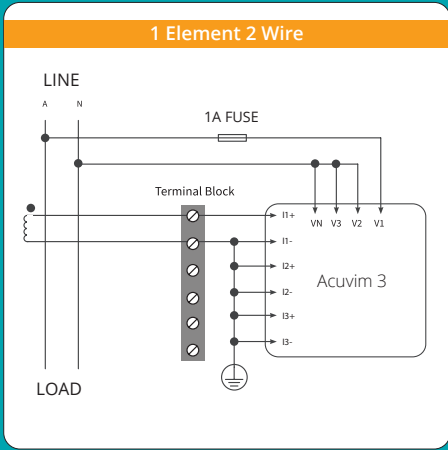


## I/O Module Wiring



# WIRING DIAGRAMS

## Typical Wiring RCT/mV Current Input



## ORDERING INFORMATION

+ Meter Model	- Mounting Option	- Current Input	- Power Supply	- Measurement Canada Application
<b>Acuvim 3:</b> Advanced Power Quality Meter	D: Panel Mount with LCD Display	<b>5A:</b> 5A/1A <i>(Input Field Selectable)</i>	<b>P1:</b> 100~415Vac, 50/60Hz, 100~300Vdc	<b>MC:</b> Measurement Canada Applications
	M: DIN rail mount without LCD	<b>mV:</b> 333mV and Rogowski Coil <i>(Input Field Selectable)</i>	<b>P2:</b> 20~60Vdc	<b>Blank:</b> For other application
Ordering Example:	Acuvim-3-M-5A-P1			
	Acuvim-3-D-mV-P2-MC			

+ I/O Module (Optional)	- Logic Module	- Input/Output Type
AXM-IO1	1	
	2	
Ordering Example:	AXM-IO1-1	
AXM-IO2	1	A: 4~20mA
AXM-IO3	2	B: 0~20mA
		C: 1~5V
Note:		D: 0~5V
Ordering Example:	AXM-IO3-1B	

+ Accessories (Optional)	
Acuvim 3 LCD Display	ACUVIM-3-DISP
Acuvim 3 Remote LCD Display	ACUVIM-3-REM-DISP

1. Refer to the I/O Module table.
2. Acuvim 3 support up to 3 external I/O modules.
3. No more than 2 of the same I/O modules may be attached to the meter (e.g. two AXM-IO2). The same two I/O modules must have a different logic number.



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