AFM-8A High Performance Power Analyzer

Description

AFM-8A multifunction power analyzer provides high-accuracy measurement and is designed for single phase and three phase application. It includes 4 Digital inputs, 4 Relay outputs, and a RS-485 Modbus RTU Communication port. The user can choose one more communication port, and 2 Analog outputs for output expansion.

It provides measure voltage and current of the 2~63 harmonic, and it shows CO_2 emissions, which is suitable for power monitoring, management and analyze power quality. It has TOU (time-of-use) function and 4MB Flash memory capacity, allowing users to record data for a long time. It also has a software line adjustment function to reduce the on-site line adjustment work.

It has the functions of waveform capture and recording, power record, and event record, which can be used for multifunction power analyzer.

Applications

- Voltage swell and sag detection record
- Power abnormal event record
- Waveform capture and recording
- Analysis of energy quality
- Support AFC System

Ordering Information

AFM-8A — A Input Range | V Input Range — I/O Type — Option1 — Option2 — AUX.Power

CODE	Input Range
A1	0~1A
A5	0~5A
A15	0~1A or 5A
MV	0~333mV
RC	0~333mV Rogowski coil
V6	20~400V L-N 35~690V L-L

CODE	I/O Type
D4	4xDI 4xRO
D8	8xDI

CODE	AO Type
N	NONE
A2	2xAO

CODE	Comm. Output
N	NONE
R	RS-485 Modbus RTU
E	Ethernet Modbus TCP

CODE	Power Supply
ADH	AC 85~264V DC 100~300V
ADL	AC/DC 20~56V

Meter Guide

Measurement items and functions		Data refresh rate 20Hz(50mS)
Voltage	Total and per phase L-L and L-N	●
Current	Total and per phase and neutral	●
Active Power	Four quadrants/per phase and active power total	●
Reactive Power	Four quadrants/per phase and reactive power total	●
Apparent Power	Total and per phase	●
Power Factor	Total and per phase	●
Frequency	Frequency	●
Active Energy	Import / Export / Total / Net	
Reactive Energy	Import / Export / Total / Net	
Apparent Energy	Total	
THD/Voltage	Total and per phase	
THD/Current	Total and per phase	
Individual Harmonic	Current and voltage 2nd~63rd Individual harmonics	
Phase Angle	Current and voltage	
Unbalance	Current and voltage	
Waveform Capture	Current and voltage per phase	
Demand	Current, active, reactive, apparent power	
Max. Demand Value	Current, active, reactive, apparent power and time stamp	
Max/Min Values	Parameter values and time stamp	

Measurement items and functions		Data refresh rate 20Hz(50mS)
Power Record	Swells voltage, Sags voltage and Over Current include time and setting	
Event Recording	Record the following parameter alarm events: frequency, phase voltage, line voltage, current, active/reactive/apparent power, power factor, voltage/current unbalance, voltage THD, current THD, power demand, current demand, voltage swell/sag, current swell	
Data Logging	The following parameters can be set to logging: frequency, phase voltage, line voltage, current, active/reactive/apparent power, power factor, active/reactive/apparent energy, voltage/current unbalance, load type, current and voltage phase angle, voltage THD max/min values, current THD max/min values, power demand max/min values, current demand max/min values, AO present values	
First Port of Comm.	RS-485 Modbus RTU	
Second Port of Comm.	RS-485 Modbus RTU or Ethernet Modbus TCP (Optional)	
Digital Input	DI1 DI2 DI3 DI4	
	DI5 DI6 DI7 DI8 (Optional)	
Pulse Output	PO1 PO2	
Relay Output	RO1 RO2 RO3 RO4 (Optional)	
Analog Output	AO1 AO2	
Digital Input/ Output Expansion	DIO1 DIO2 (Optional)	
Time of Use	4 time zones, 8 periods, 4 tariff	
Date and Time	Year, Month, Day, Hour, Minute, Second	
Run hour	Operating hours, Running hours	
CO_2 Emission	Total CO_2 weight of energy	

◎ Optional features

Accuracy & Resolutions

Parameter	Accuracy	Resolution	Measurement Range
Voltage	0.1%	0.1V	20~400V L-N / 35~690V L-L
Current	0.1%	0.001A	1%~120% CT rating current
Neutral Current	0.5%	0.001A	1%~120% CT rating current
Active Power	0.2%	1W	-999,999,999~999,999,999W
Reactive Power	0.5%	1Var	-999,999,999~999,999,999Var
Apparent Power	0.5%	1VA	0~999,999,999VA
Power Factor	0.5%	0.001	-0.020~+1.000~0.020
Frequency	0.01Hz	0.01Hz	45.00~65.00Hz
Active Energy	0.2%	0.1kWh	0~99,999,999.9kWh
Reactive Energy	0.5%	0.1kVarh	0~99,999,999.9kVarh
Apparent Energy	0.5%	0.1kVAh	0~99,999,999.9kVAh
THD	1.0%	0.1%	0~100.0%
Individual Harmonic	1.0%	0.1%	0~100.0%
Unbalance	0.5%	0.1%	0~300.0%

Technical Specification

Electrical Characteristics

Measurement: True RMS measurement
Sampling: 256 point/Cycle
Display refresh rate: 0.25s
Power system: 1P2W, 1P3W, 3P3W, (1, 2, 3CT) ;
3P4W(1, 3CT) Balance/Unbalance
Input range: Voltage: 20~400VLN ; 35~690VLL
PT Primary ratio: 100~1,200,000V
PT Secondary ratio: 50~600V
Current: 5A / 1A / 333mV
CT Primary ratio: 1~9999A
CT Secondary ratio: 0~5A / 0~1A / 333mV
Overload capacity: Voltage: 2x rated continuous ; 2500V / 1s
Current: 2x rated continuous ; 20x rated / 1s
Input burden: Voltage:<0.2VA ; Current:<0.1VA

Power Quality

THD: Total harmonic distortion for voltage and current
Individual harmonic: 2nd~63rd individual harmonics for voltage and current
Unbalance: 3-phase voltage and current
Swell/Sag detection: It can detect swell/sag from voltage and current per phase, so as to alert for power quality events, and trigger waveforms capture
Waveform and record: The waveform can be captured manually, DI trigger or sag/swell event, and the captured waveform can be directly obtained from the instrument through the communication address

Relay Output(RO)

Relay capacity: 4 channels SPST(1a), 5A / 250Vac, 5A / 30Vdc
Relay mode: Hi / Lo / Hi.Hold / Lo.Hold / DO
Active delay time: 0~599.9s can be set
Alarm set points: Up to 56 parameters of power and demand for alarm

Analog Output(AO)(Optional)

Output channel: 2 channels
Signal output: Voltage: 0~5V / 1~5V / 0~10V
Current: 0~20mA / 4~20mA / 0~10mA
Output capacity: Voltage: ≧ 1000Ω ; Current: ≤ 530Ω
Accuracy: ≤± 0.1% of F.S.; 16 bits DA converter
Ripple rate: ≤± 0.1% of F.S.
Response time: ≤200mS.(output: 10~90%)
Set points: Up to 29 parameters of power

Digital Input (DI)

Input capacity: 4 or 8 channels DI input, mechanical contact or open collector input are available
Function mode: Can be set to DI / Demand reset / Max. Demand reset / Energy reset / Max. and Min. reset / Relay reset / Screen backlight / Waveform

	capture enable / Manual TOU start
Debouncing time:	0~99 (x5mS) programable

Pulse Output (PO)

Output capacity:	2 open collector(O.C.), 30Vdc, 30mA(max)
Output frequency:	40Hz (max)
Pulse divider:	1~9999 (1 Pulse= 0.1kWh, if set 100, 1Pulse= 10.0kWh)
Pulse width:	0~5000mS, 0 is duty cycle 50%
Energy assign:	Import active energy / Export active energy / Import reactive energy / Export reactive energy / Test pulse
Test pulse:	3200 Pulse/1kWh, Duty cycle 50%

Digital Output / Input Expansion(DIO)(Via 2nd RS-485)

Expansion groups:	2 groups (2 RS-485 address)
Protocol:	Modbus RTU
Mode setting:	16xDI / 16xDO / 8xDI + 8xDO
Features:	Same function as relay output (RO) and digital input (DI) of meter
Polling time:	Can be set 10~3000x10mS

Demand

Calculation method:	Block / Sliding
Period:	1~60 min

TOU (Time of Use)

4 time zones:	1~4 zones per year
8 periods:	Each time zone can set 1~8 periods The sharp, peak, valley and normal tariff can be specified for each period
Parameters of TOU:	Cumulative value of import and export active energy, import and export reactive energy, total apparent energy for each tariff of previous and current day, and previous and current month; and maxinum current and power demand of each tariff for current month
Holiday setting:	The date and timetable of holiday for five years can be set individually or set on the same holiday for five years

Enhanced TOU

Calculation:	By hour, day, month, custom period, DI trigger and trigger by communication
Custom period:	Up to 4 periods
Records capacity:	12 records for month, 31 records for day, 72 records for hour, 144 records for custom period, 8 records for DI trigger, 8 records for communication trigger
Tariff:	Same as TOU define
Parameters of TOU:	Cumulative value of import and export active energy, import and export reactive energy, total apparent energy, and maxinum current and power demand of each tariff for per calculation period

Data Log

Waveform capture:	Each phase of voltage and current sampling are 64 points per cycle and continues record 16 cycles
Swell and sag:	It can record voltage sag/swell and current swell events, including the time of occurrence, the voltage phase or current phase that occurred, and the current measurement value
Log setting:	The specified parameters can be recorded according to the set interval time, the interval time can be set from 1 to 32767, and the interval time unit can be set as day, hour, minute, second
Event recording:	The event and time when an exception occurs can be recorded
Memory storage:	4MB Flash ROM

Rapid Data Refresh

Data capture:	From RS-485 or Ethernet
Refresh rate:	20Hz(50mS)
Parameters:	Phase voltage, line voltage, current, active/ reactive/apparent power, power factor, frequency, voltage THD, current THD

RS-485 Communication (2nd RS-485 is optional)

Port:	2 ports, which can fill the requirements of on-site HMI and central monitoring; the second port of RS-485 by expansion DIO module is available as a master.
Protocol:	Modbus RTU mode
Address:	1~247
Baud rate:	1200/2400/4800/9600/19200/38400/57600/ 115200 bps
Parity:	None / Even / Odd
Data bits:	8 bits
Stop bit:	1 or 2
Distance:	1200M max

Ethernet (Optional)

Interface:	10M/100M BASE-TX, RJ45 connector
Protocol:	Modbus TCP

Environmental Conditions

Operating Temp:	0~60℃
Humidity rating:	5~95%RH, Non-condensing
Temp. coefficient:	≤100 PPM/℃
Storage Temp:	-10~70℃

Degree of protection: Front panel: IEC 529 (IP50) ; Housing: IP20
Operating altitude(maximum): 2000m above sea-level

Power Supply

Range:	ADH: AC 85~264V, 50/60Hz; DC 100~300V ADL: AC/DC 20~56V
Power consumption:	AC:≤15VA @ 230V / DC:≤5W

Mechanical Characteristics

Dimensions:	96mm(W)x96mm(H)x98mm(L)
Panel cutout:	91.5mm(W)X91.5mm(H)
Material:	ABS, Black (with fire-retardant)
Mounting:	Panel mounting
Wire terminal:	PA 66 (UL 94V-0) Voltage input: AWG: 22~12 / 0.5~2.5mm^2 Screw Torque Value: M2.5 / 5.202kgf.cm(Max) Current input: AWG: 22~12 / 0.5~4.0mm^2 Screw Torque Value: M4 / 12.24kgf.cm(Max) Other input: AWG:22~16 / 0.5~1.5mm^2 Screw Torque Value:M2 / 2.04kgf.cm(Max)
Weight:	≤600g

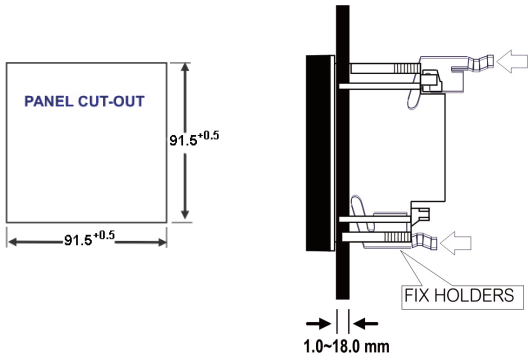
Safety

Isolation:	AC 2.5KV,50/60Hz,for 1 min, between Power / Input / Output / Case
Insulation resistance:	≥100MΩ @ 500Vdc
EMC:	EN 61326-1:2013
	EN 55011 Class B
	EN 61000-3-2:2014
	EN 61000-3-3:2013
	EN 61326-2-6:2013
	IEC 61000-4-2:2008
	IEC 61000-4-3:2006+A1:2007+A2:2010
	IEC 61000-4-4:2012
	IEC 61000-4-5:2014
	IEC 61000-4-6:2013/COR1:2015
	IEC 61000-4-8:2009
	IEC 61000-4-11:2004
LVD:	EN 61010-1:2010
FCC:	FCC part 15 subpart B Class B

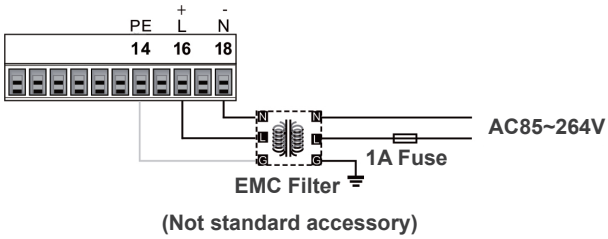
Accuracy of Standard

Active energy:	Class 0.2S (IEC62053-22:2003)
Reactive energy:	Class 1.0 (IEC62053-24:2003)

Installation



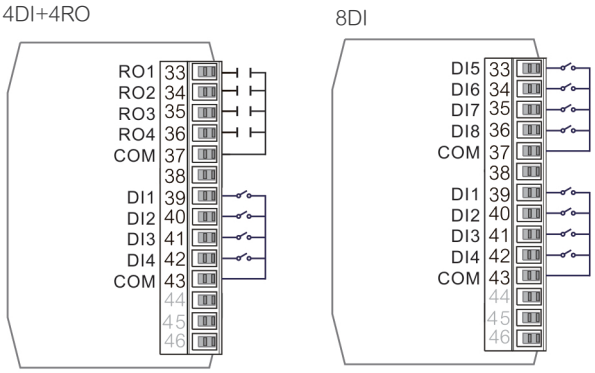
Power Connection



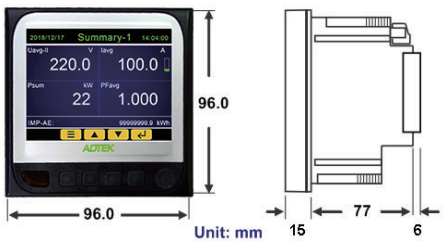
Front Panel

Display:	3.5" TFT color LCD, 70.0(W)x52.5(H)mm
Refresh rate:	0.5 Sec
Operation key:	The keys function as icons show on display

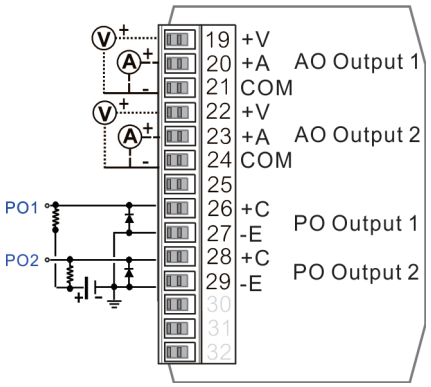
Relay Output (RO)/ External Control Input (ECI)



Dimensions

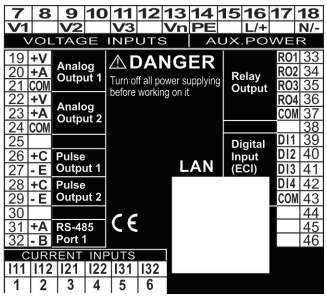


Analog Output(AO) / Pulse Output (PO)

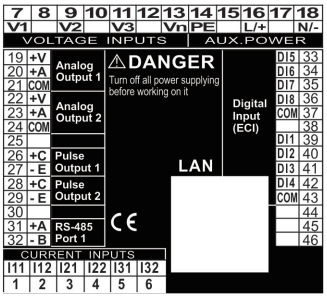


Pin Assignment

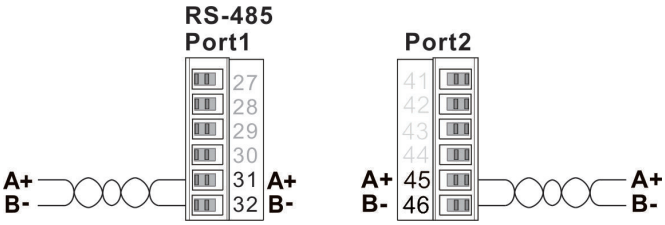
4DI+4RO



8DI

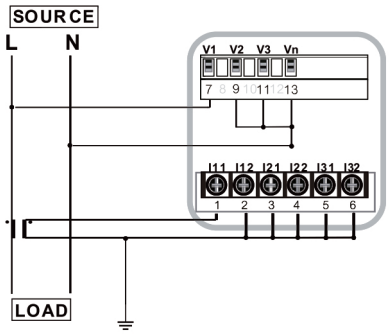
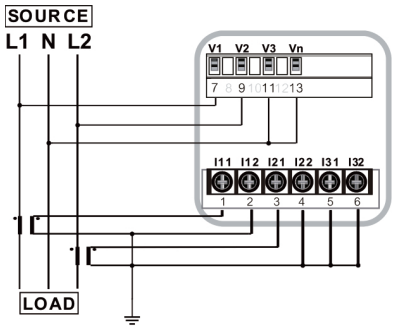
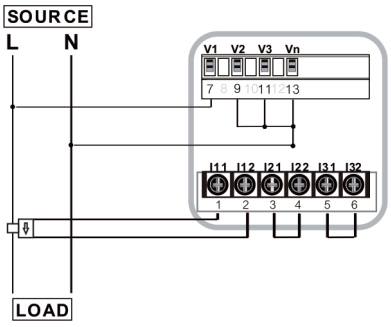
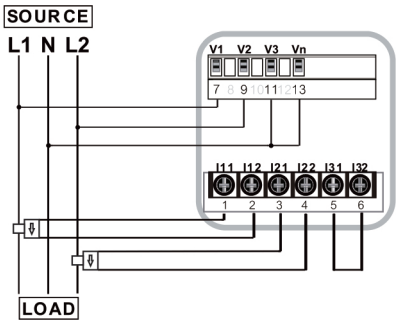


RS-485 Communication Port



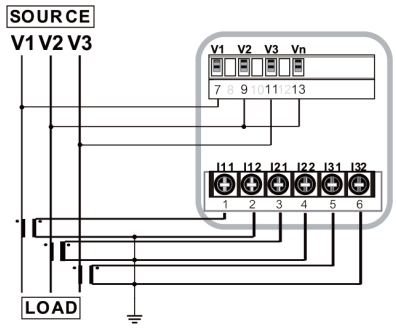
Voltage and Current Connection

CT secondary side distinguishes 1A/5A and 333mV. The mV of CT signal needs to be wired independently, and cannot be grounded or connected together with each other.

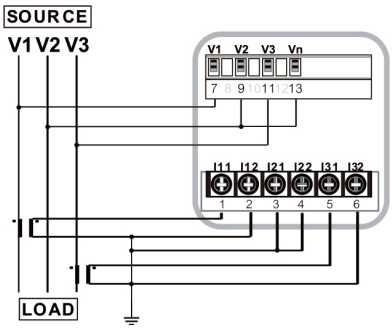
1P2W(1A/5A)	1P3W(1A/5A)
	
1P2W(333mV)	**1P3W(333mV)**
	

3P3W w/o PT

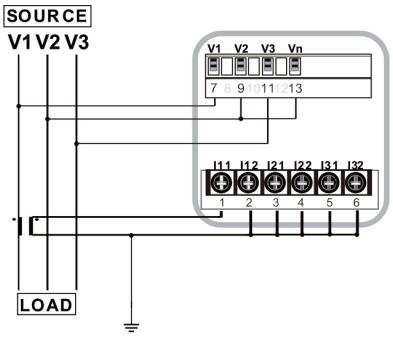
3CT(1A/5A)



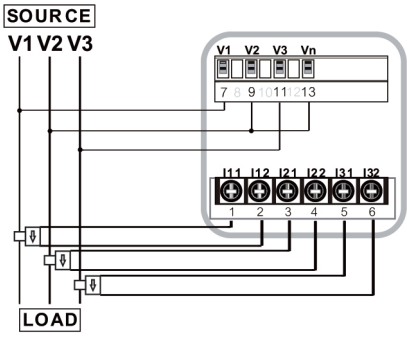
2CT(1A/5A)



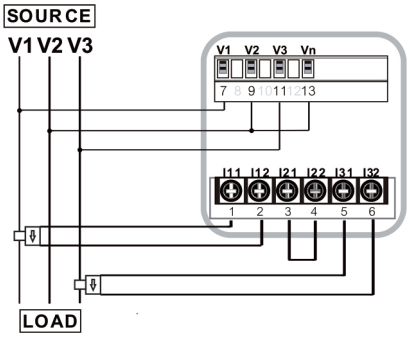
1CT(1A/5A)



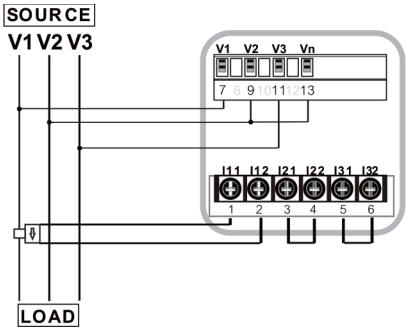
3CT(333mV)



2CT(333mV)

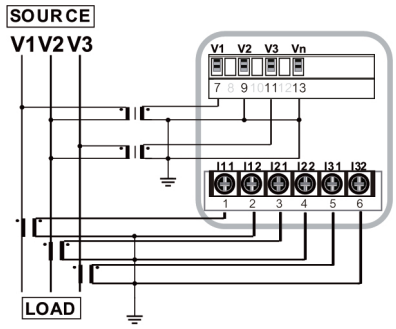


1CT(333mV)

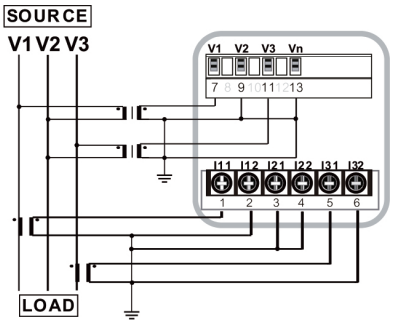


3P3W 2PT

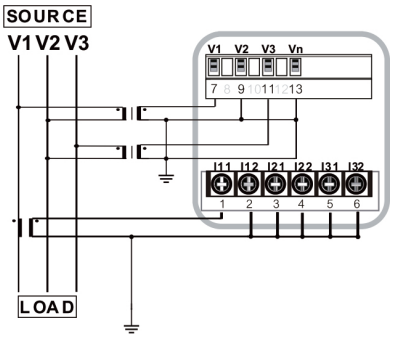
3CT(1A/5A)



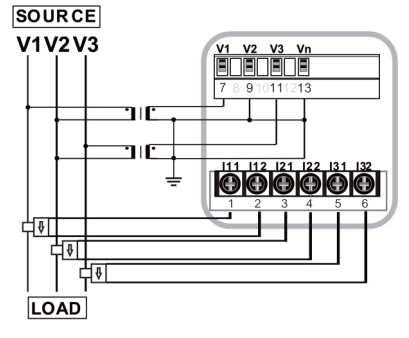
2CT(1A/5A)



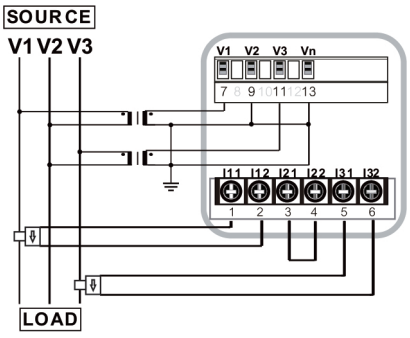
1CT(1A/5A)



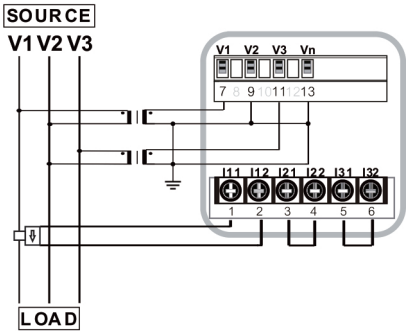
3CT(333mV)



2CT(333mV)

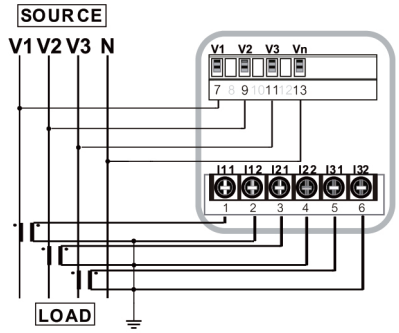


1CT(333mV)

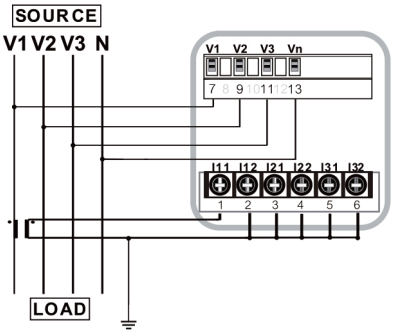


3P4W w/o PT

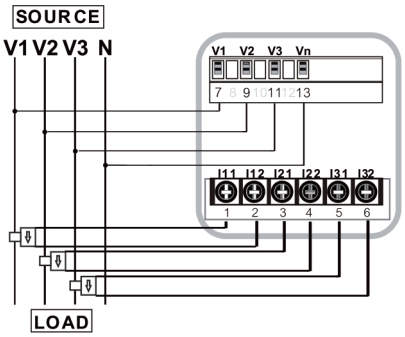
3CT(1A/5A)



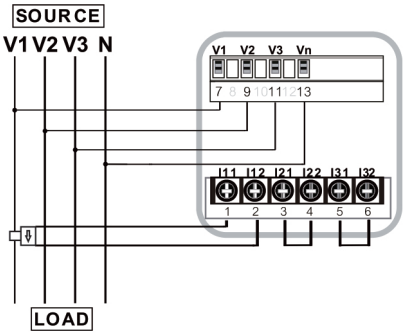
1CT(1A/5A)



3CT(333mV)

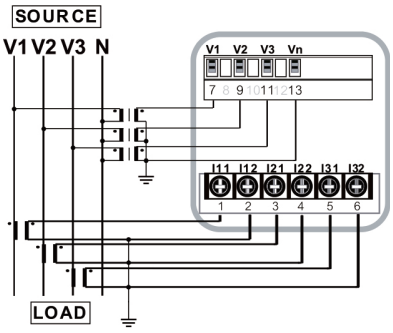


1CT(333mV)

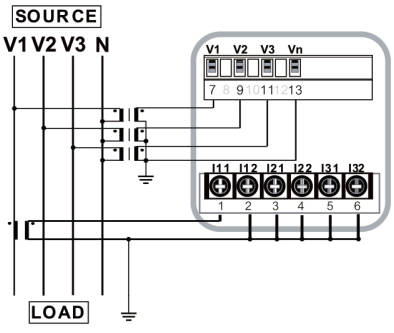


3P4W 3PT

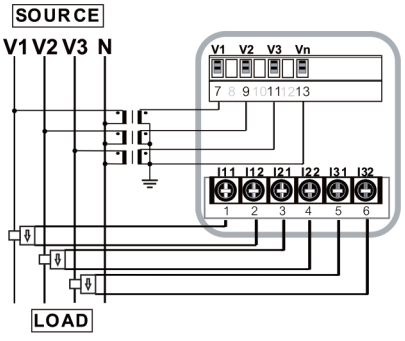
3CT(1A/5A)



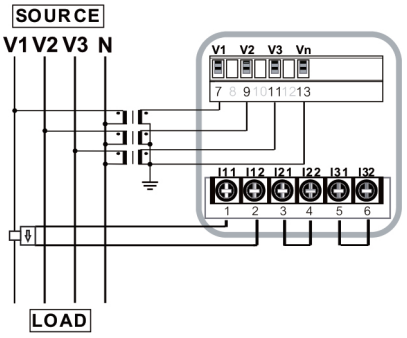
1CT(1A/5A)



3CT(333mV)



1CT(333mV)



Split Core CT Ordering Information

US – CTV — Hole — Primary Current — **2**

CODE	Diameter(mm)	CODE	Rated Current
10	Φ10	005	5A
16	Φ16	060	60A
		100	100A
		150	150A
24	Φ24	200	200A
35	Φ35	300	300A
		400	400A
		600	600A
50	Φ50	800	800A

(The output line of mV on the secondary side of the CT needs to be wired independently, and cannot be connected together or grounded for protection purposes.)

Type	Current of primary (A)	Voltage of secondary (mV)	Accuracy %F.S.	Weight
US-CTV-10-005	5A	333	1.0	60g
US-CTV-16-060	60A	333	0.5	100g
US-CTV-16-100	100A	333	0.5	100g
US-CTV-16-150	150A	333	0.5	100g
US-CTV-24-200	200A	333	0.5	205g
US-CTV-35-300	300A	333	0.5	375g
US-CTV-35-400	400A	333	0.5	375g
US-CTV-35-600	600A	333	0.5	375g
US-CTV-50-800	800A	333	0.5	655g