

## Plug-in Signal Conditioners M-UNIT

### WATT TRANSDUCER

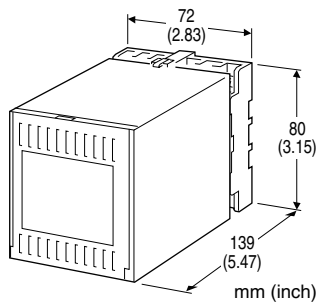
(with pulse output)

#### Functions & Features

- Providing a DC output signal and pulse totalizer signal in proportion to AC active power
- Convenient pulse unit output (Wh×10<sup>n</sup>)
- Measuring bidirectional power flow
- DC output containing little ripple is ideal for computer input
- "Time division multiplication" method accepts distorted waveforms
- Isolation up to 2000 V AC
- High-density mounting

#### Typical Applications

- Centralized monitoring and control of power management system in a manufacturing facility or building
- SCR - Silicon Controlled Rectifier



## MODEL: MUWT-[1][2][3][4]-[5][6]

### ORDERING INFORMATION

- Code number: MUWT-[1][2][3][4]-[5][6]
- Specify a code from below for each of [1] through [6].  
(e.g. MUWT-11A4-C/Q)
- Specify the specification for option code /Q  
(e.g. /C01/S01)
- Calibration range (e.g. -750 - +750 W)
- VT ratio, CT ratio (e.g. VT 3300 V / 110 V, CT 250 A / 5 A)
- Special output range (For codes Z & 0)
- Pulse output (e.g. 6.666 Wh/pulse)

#### How To Determine Pulse Unit ....

##### [example]

3-phase / 3-wire, VT 3300 V / 110 V, CT 250A / 5 A, calibration range 750 W

- **From Pulse Unit** 10 [kWh/pulse]
- $$10 \text{ [kWh/pulse]} \div ((3300 \div 110) \times (250 \div 5))$$
- $$= 6.666 \times 10^{-3} \text{ [kWh/pulse]}$$
- $$= 6.666 \text{ [Wh/pulse]}$$

- **From Pulse Rate** 150 [pulse/kWh]
- $$1 \div 150 = 6.666 \times 10^{-3} \text{ [kWh/pulse]}$$
- $$= 6.666 \text{ [Wh/pulse]}$$
- At primary side
- $$150 \text{ [pulse/kWh]} \div ((3300 \div 110) \times (250 \div 5))$$
- $$= 0.1 \text{ [pulse/kWh]}$$
- **From Frequency** 0.03125 Hz (at 100 %)
- $$750 \text{ [W]} \div (0.03125 \text{ [Hz]} \times 3600 \text{ [s]}) = 6.666 \text{ [Wh/pulse]}$$

### [1] CONFIGURATION

- 1: 3-phase / 3-wire
- 2: Single-phase / 2-wire
- 3: Single-phase / 3-wire

### [2] INPUT (unbalanced load)

- 1: 110 V / 5 A AC
  - 2: 110 V / 1 A AC
  - 3: 220 V / 1 A AC
  - 4: 220 V / 5 A AC
- A: 100 V / 200 V / 1 A AC (single-phase / 3-wire)
- B: 100 V / 200 V / 5 A AC (single-phase / 3-wire)

### [3] OUTPUT

Current

- A: 4 - 20 mA DC (Load resistance 600 Ω max.)
- B: 2 - 10 mA DC (Load resistance 1200 Ω max.)
- C: 1 - 5 mA DC (Load resistance 2400 Ω max.)
- D: 0 - 20 mA DC (Load resistance 600 Ω max.)
- E: 0 - 16 mA DC (Load resistance 750 Ω max.)
- F: 0 - 10 mA DC (Load resistance 1200 Ω max.)
- G: 0 - 1 mA DC (Load resistance 12 kΩ max.)
- GW: -1 - +1 mA DC (Load resistance 10 kΩ max.)
- Z: Specify current (See OUTPUT SPECIFICATIONS)

Voltage

- 1: 0 - 10 mV DC (Load resistance 10 kΩ min.)
- 2: 0 - 100 mV DC (Load resistance 100 kΩ min.)
- 3: 0 - 1 V DC (Load resistance 1000 Ω min.)
- 4: 0 - 10 V DC (Load resistance 10 kΩ min.)
- 5: 0 - 5 V DC (Load resistance 5000 Ω min.)
- 6: 1 - 5 V DC (Load resistance 5000 Ω min.)
- 1W: -10 - +10 mV DC (Load resistance 10 kΩ min.)
- 2W: -100 - +100 mV DC (Load resistance 100 kΩ min.)
- 3W: -1 - +1 V DC (Load resistance 1000 Ω min.)
- 4W: -10 - +10 V DC (Load resistance 10 kΩ min.)
- 5W: -5 - +5 V DC (Load resistance 5000 Ω min.)
- 0: Specify voltage (See OUTPUT SPECIFICATIONS)

### [4] PULSE OUTPUT

- 2: Open collector
- 3: Relay contact (mercury relay)

Suffix code 3 has been discontinued. Select code 4 instead.

4: Power photo MOSFET relay

## [5] POWER INPUT

AC Power

B: 100 V AC

C: 110 V AC

D: 115 V AC

F: 120 V AC

G: 200 V AC

H: 220 V AC

J: 240 V AC

DC Power

S: 12 V DC

R: 24 V DC

V: 48 V DC

P: 110 V DC

## [6] OPTIONS

blank: none

/Q: With options (specify the specification)

### SPECIFICATIONS OF OPTION: Q (multiple selections)

COATING (For the detail, refer to our web site.)

/C01: Silicone coating

/C02: Polyurethane coating

/C03: Rubber coating

TERMINAL SCREW MATERIAL

/S01: Stainless steel

### GENERAL SPECIFICATIONS

**Construction:** Plug-in

**Connection:** M3.5 screw terminals

**Screw terminal:** Chromated steel (standard) or stainless steel

**Housing material:** Flame-resistant resin (black)

**Isolation:** Voltage input to current input to DC output to pulse output to power

**Overrange output:** Approx. -10 - +120 % at 1 - 5 V

**Zero adjustment(DC output):** -5 to + 5 % (front)

**Span adjustment(DC output):** 95 to + 105 % (front)

### INPUT SPECIFICATIONS

**Frequency:** 50 or 60 Hz

• **Current Input**

**Operational range:** 0 - 120 % of rating

**Overload capacity:** 1000 % of rating for 3 sec., 200 % for 10 sec., 120% continuous

• **Voltage Input**

**Operational range:** 0 - 120 % of rating

**Overload capacity:** 150 % of rating for 10 sec., 120 % continuous

### ■ How To Determine Wattage Range

Calibration Range [W] = Measuring Wattage ÷ ((VT Ratio) × (CT Ratio))

Check that the required calibration range is within the available range in the table. Specify this range when ordering.

[example]

3-phase / 3-wire, measuring wattage 750 kW,

VT 3300/110 V, CT 250/5 A

$750 \times 10^3 [W] \div ((3300 \div 110) \times (250 \div 5)) = 0 - 500 [W]$

#### • 3-phase / 3-wire

VOLTAGE INPUT	BURDEN	CURRENT INPUT		STD RANGE	AVAILABLE RANGE
			BURDEN		
110V	0.2VA×2	1A	0.1VA×2	±200W	±100W - ±240W
		5A	0.5VA×2	±1000W	±500W - ±1200W
220V	0.4VA×2	1A	0.1VA×2	±400W	±200W - ±480W
		5A	0.5VA×2	±2000W	±1000W - ±2400W

#### • Single-phase / 2-wire

VOLTAGE INPUT	BURDEN	CURRENT INPUT		STD RANGE	AVAILABLE RANGE
			BURDEN		
110V	0.2VA	1A	0.1VA	±100W	±50W - ±120W
		5A	0.5VA	±500W	±250W - ±600W
220V	0.4VA	1A	0.1VA	±200W	±100W - ±240W
		5A	0.5VA	±1000W	±500W - ±1200W

#### • Single-phase / 3-wire

VOLTAGE INPUT	BURDEN	CURRENT INPUT		STD RANGE	AVAILABLE RANGE
			BURDEN		
100/ 200V *1	0.2VA×2	1A	0.1VA×2	±200W	±100W - ±240W
		5A	0.5VA×2	±1000W	±500W - ±1200W

100/200V: 100V = phase voltage

200V = line voltage except the grounding.

### OUTPUT SPECIFICATIONS

#### ■ DC Output

• **DC Current:** 0 - 20 mA DC and ±1 mA

**Minimum span:** 1 mA

**Offset:** ≤ 1.5 times span

**Load resistance:** Output drive 12 V max.; 10 V for [±] output

■ **DC Voltage:** -10 - +12 V DC

**Minimum span:** 5 mV

**Offset:** Max. 1.5 times span

**Load resistance:** Output drive 1 mA max. at ≥ 0.5 V

■ **Pulse output:** Frequency output proportional to the input; 0 - 2.777 Hz typical; 0 Hz at 0 W (cutout at approx. 0.5 - 1.0 %); max. 27.77 Hz at 100 % input

#### • Power Photo MOSFET Relay

**Rating:** 120 V AC/DC @ 100 mA (resistive load)

**Max. ON resistance:** 10 Ω

• **Open Collector**

**Rating:** 35 V DC @ 100 mA

**ON voltage:** ≤ 1 V at 100 mA

**ON duration:** 25 msec. min., 0.5 sec. max.

(at 0 - 2.777 Hz)

• **Pulse Unit:** refers to how much electrical energy (kWh) consumption at the primary of the VT and CT corresponds to the single output pulse per hour from the transducer.

• **How to Set Pulse Unit:** The switches S1 through S5, VT and CT ratios, and the transducer's calibration input range all determine the relative value of one pulse, i.e. the number of kWh per pulse.

$$\begin{aligned} & (\text{VT Ratio} \times \text{CT Ratio} \times \text{Calibration Range [kW]}) \\ & \div (2.777 \text{ [Hz]} \times 3600 \text{ [sec.]} \times 10 \times \text{Pulse Unit [kWh/pulse]}) \\ & = 0.XXXX \times 10^{-x} \end{aligned}$$

$$= 0. [a1] [a2] [a3] [a4] \times 10^{-[a5]}$$

a1 thr. a4: integer, 1 through 9

a5: integer, 0 through 6

[example] VT 3300 V / 110 V, CT 250 A / 5 A, Pulse Unit 10

[kWh/pulse], Calibration Range 1000 [W]

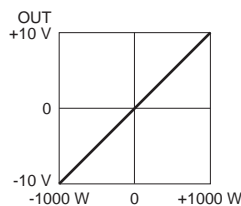
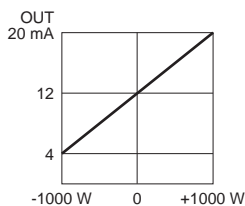
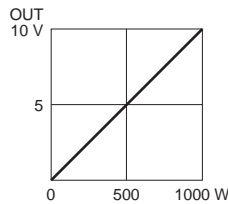
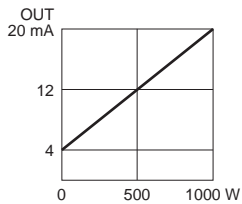
$$((3300 \div 110) \times (250 \div 5) \times 1 \text{ [kW]})$$

$$\div (2.777 \text{ Hz} \times 3600 \text{ [sec.]} \times 10 \times 10 \text{ [kWh/pulse]})$$

$$= 0.1500 \times 10^{-2}$$

S1 = 1, S2 = 5, S3 = 0, S4 = 0, S5 = 2

## ■ OPERATION DIAGRAM (example)



## INSTALLATION

### Power input

- **AC:** Operational voltage range: rating ±10 %, 50/60 ±2 Hz, approx. 2 VA
- **DC:** Operational voltage range: rating ±10 %, or 85 - 150 V for 110 V rating, ripple 10 %p-p max., approx. 2 W (18 mA at 110 V)

**Operating temperature:** -5 to +60°C (23 to 140°F)

**Operating humidity:** 30 to 90 %RH (non-condensing)

**Mounting:** Surface or DIN rail

**Weight:** 550 g (1.21 lb)

## PERFORMANCE in percentage of span

**Accuracy:** ±0.5 %

**Temp. coefficient:** ±0.05 %/°C (±0.03 %/°F)

**Response time:** ≤ 1 sec. (0 - 90 %)

**Ripple:** 0.5 %p-p max. (50/60 Hz)

The output ripple may increase when there is great difference between the frequencies of input signal and power supply.

**Line voltage effect:** ±0.1 % over voltage range

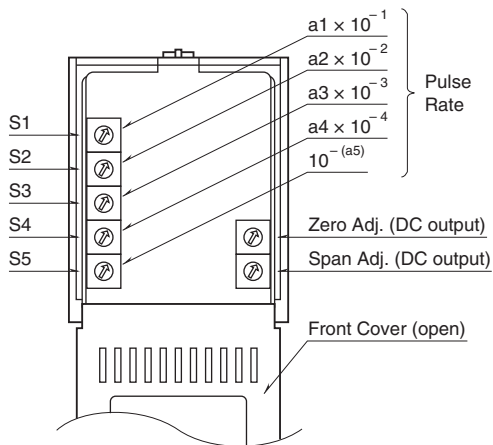
**Insulation resistance:** ≥ 100 MΩ with 500 V DC

**Dielectric strength:** 2000 V AC @ 1 minute

(voltage input to current input to DC output to power to ground)

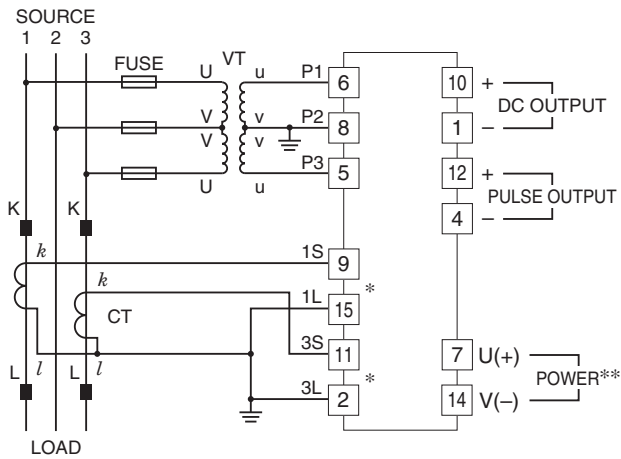
1000 V AC @ 1 minute (pulse output to voltage input or current input or DC output or power or ground)

## EXTERNAL VIEW



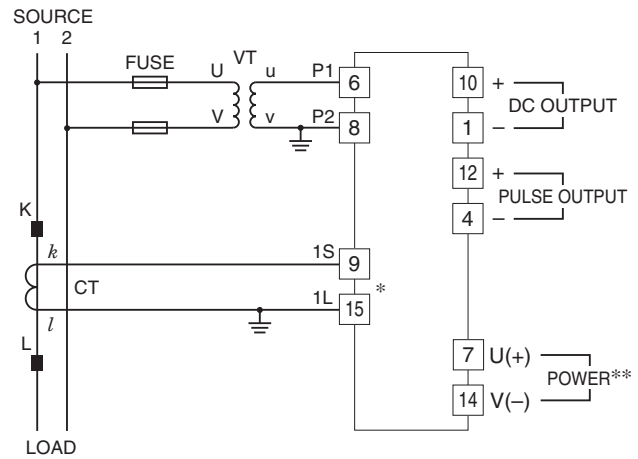
## CONNECTION DIAGRAM

### 3-PHASE/3-WIRE



\* CT Protector (model: CTM) attached to these terminals.

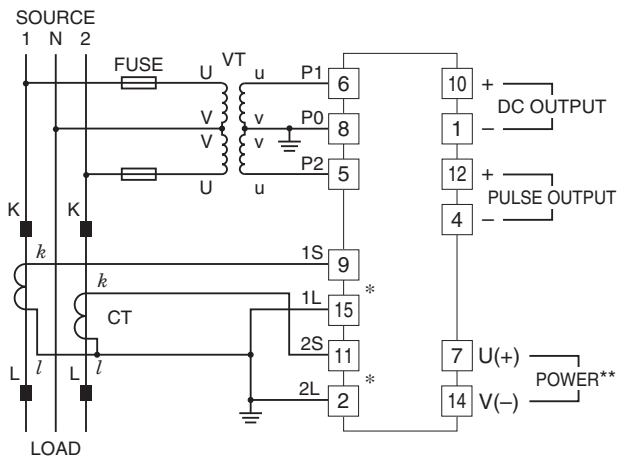
### SINGLE-PHASE/2-WIRE



\* CT Protector (model: CTM) attached to these terminals.

\*\*The transducer can be powered from the input voltage when the voltage is sufficiently stable and meets other supply voltage requirements.

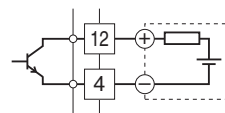
### SINGLE-PHASE/3-WIRE



\* CT Protector (model: CTM) attached to these terminals.

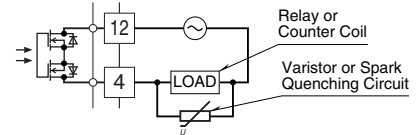
### Pulse Output Connection Examples

#### Open Collector

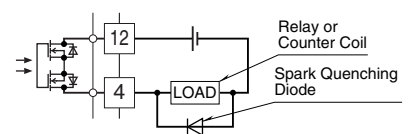


#### Power Photo MOSFET Relay

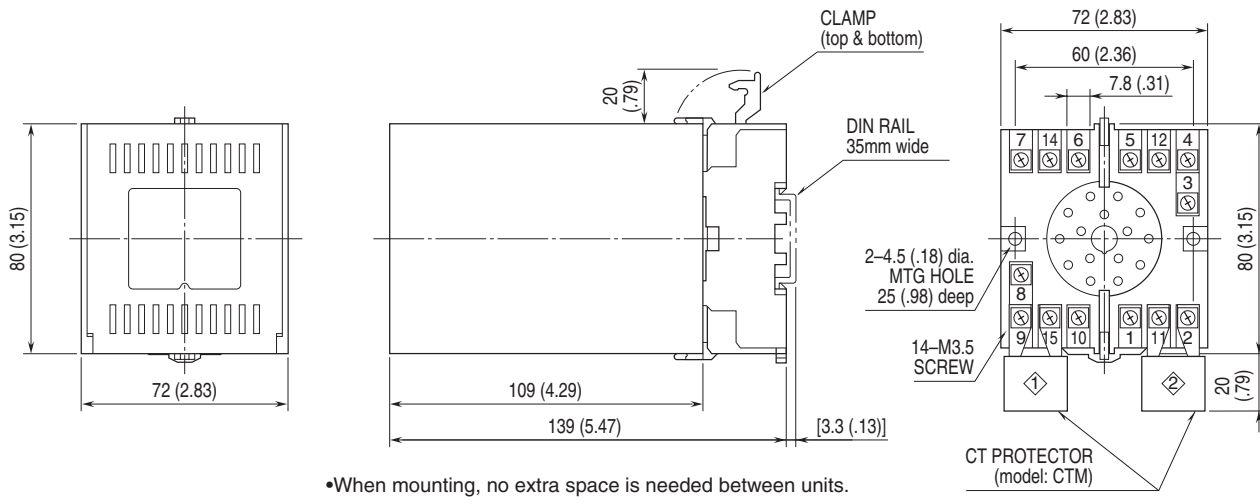
##### AC Powered



##### DC Powered



## EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm [inch]



•When mounting, no extra space is needed between units.

Positions of CTM  
 ① MUWT-2  
 ①② MUWT-1, 3



Specifications are subject to change without notice.