## Plug-in Signal Conditioners K-UNIT

## WATT TRANSDUCER

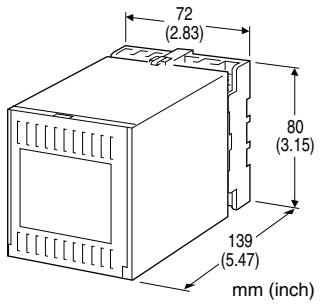
(with pulse output)

**Functions & Features**

• Providing a DC output signal and pulse totalizer signal in proportion to AC active power
• Convenient pulse unit output (Wh×10$^{n}$)
• Measuring bidirectional power flow
• DC output containing little ripple is ideal for computer input
• "Time division multiplication" method accepts distorted waveforms
• High-density mounting

**Typical Applications**

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




## MODEL: KUWT–[1][2][3][4]–[5][6]

## ORDERING INFORMATION

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

**How To Determine Pulse Unit**

[example]
3-phase / 3-wire, VT 3300 / 110 V, CT 250 / 5 A,
calibration range 750 W
• **From Pulse Unit** 10 [kWh/pulse]
10 [kWh/pulse] ÷ ((3300 ÷ 110) × (250 ÷ 5)) = 6.666 × $10^{-3}$ [kWh/pulse]
= 6.666 [Wh/pulse]
• **From Pulse Rate** 150 [pulse/kWh]
1 ÷ 150 [pulse/kWh]
= 6.666 × $10^{-3}$ [kWh/pulse]
= 6.666 [Wh/pulse]
• **From Frequency** 0.03125 Hz (at 100 %)
750 [W] ÷ (0.03125 [Hz] × 3600 [sec.]) = 6.666 [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] DC 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.)
**J**: 0 – 5 mA DC (Load resistance 2400 Ω 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] AUXILIARY POWER SUPPLY

**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**
**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 M-System's 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 auxiliary power
**Computation**: Time division multiplication
**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
• **Voltage Input**
**Operational range**: 0 – 120 % of rating
**Overload capacity**: 150 % of rating for 10 sec., 120 % continuous
• **Current Input**
**Operational range**: 0 – 120 % of rating
**Overload capacity**: 1000 % of rating for 3 sec., 200 % 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.
[example]
3-phase / 3-wire, measuring wattage 750 kW,
VT 3300 / 110 V, CT 250 / 5 A
$(750 \times 10^3\ [W]) \div ((3300 \div 110) \times (250 \div 5)) = 0 – 500\ [W]$

■ **INPUT RANGE**

• **3-phase / 3-wire**

| INPUT | | AVAILABLE RANGE | BURDEN (VA) | |
|---|---|---|---|---|
| | STD.RANGE | | VOLT. | CURR. |
| 110V/1A | ±200 W | ±100 – ±240 W | 0.2 /phase | 0.1/ph |
| 110V/5A | ±1000 W | ±500 – ±1200 W | | 0.5/ph |
| 220V/1A | ±400 W | ±200 – ±480 W | 0.4 /phase | 0.1/ph |
| 220V/5A | ±2000 W | ±1000 – ±2400 W | | 0.5/ph |

• **Single-phase / 2-wire**

| INPUT | | AVAILABLE RANGE | BURDEN (VA) | |
|---|---|---|---|---|
| | STD.RANGE | | VOLT. | CURR. |
| 110V/1A | ±100 W | ±50 – ±120 W | 0.2 | 0.1 |
| 110V/5A | ±500 W | ±250 – ±600 W | | 0.5 |
| 220V/1A | ±200 W | ±100 – ±240 W | 0.4 | 0.1 |
| 220V/5A | ±1000 W | ±500 – ±1200 W | | 0.5 |

• **Single-phase / 3-wire**

| INPUT | | AVAILABLE RANGE | BURDEN (VA) | |
|---|---|---|---|---|
| | STD.RANGE | | VOLT. | CURR. |
| 200V/1A | ±200 W | ±100 – ±240 W | 0.2 /phase | 0.1/ph |
| 200V/5A | ±1000 W | ±500 – ±1200 W | | 0.5/ph |

## OUTPUT SPECIFICATIONS

■ **DC OUTPUT**
• **DC Current**: 0 – 20 mA DC and ± 1 mA
**Minimum span**: 1 mA
**Offset**: Max. 1.5 times span
**Load resistance**: Output drive 12 V max.
• **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
**ON duration**: 0.025 sec. min.
0.150 sec. min. when the maximum frequency is less than 1 Hz, with the S5 rotary switch set to other than 0.
• **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

• **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.

VT Ratio × CT Ratio × Calibration Range [kW] ÷ (2.777 Hz × 3600 [sec.] × 10 × Pulse Unit [kWh/pulse])

$= 0.XXXX \times 10^{-x}$

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

a1 thr. a4: integer, 1 though 9

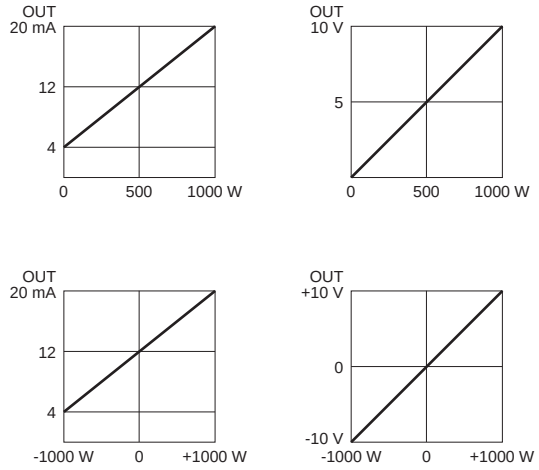
a5: integer, 0 through 6

[example] VT 3300 / 110 V, CT 250 / 5 A, Pulse Unit 10 [kWh/pulse], Clibration Range 1000 [W]

3300 ÷ 110 × 250 ÷ 5 × 1 [kW] ÷ (2.777 Hz × 3600 [sec.] × 10 × 10 [kWh/pulse]) = $0.1500 \times 10^{-2}$

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

■ **OPERATION DIAGRAM (example)**




## INSTALLATION

**Auxiliary power supply**

•**AC**: Operational voltage range: rating -15/+10 %, 50/60 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**: -10 to +55°C (14 to 131°F)

**Operating humidity**: 30 to 85 %RH (non-condensing)

**Mounting**: Surface or DIN rail

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

## PERFORMANCE in percentage of span

**Accuracy**: ±0.5 % (at 23°C ±10°C or 73.4°F ±18°F, 45 – 65 Hz)

**Response time**: ≤ 2 sec. (0 – 100 % ±1 %)

**Ripple**: 0.5 %p-p max.(The output ripple may increase when there is great difference between the frequencies of input signal and power supply)

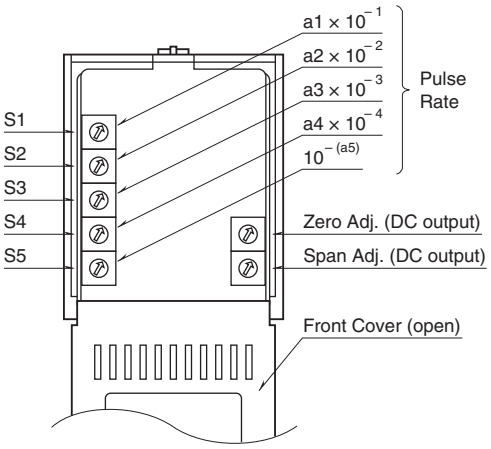
**Line voltage effect**: ±0.1 % over voltage range

**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)

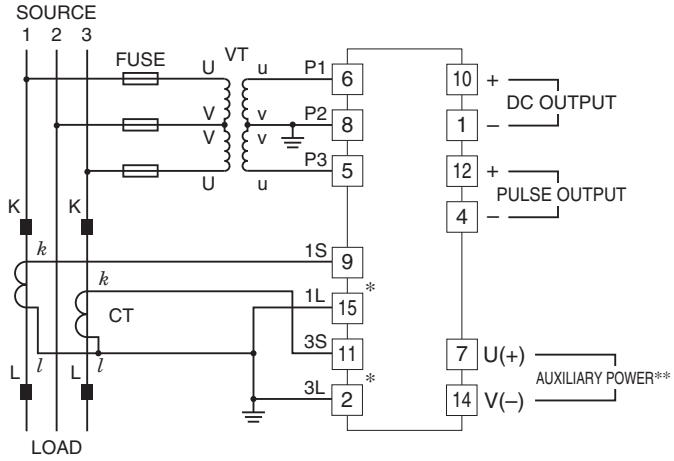
**Impulse withstand voltage**: 1.2 / 50 µsec., ±5 kV
(input to output or ground)

## EXTERNAL VIEW

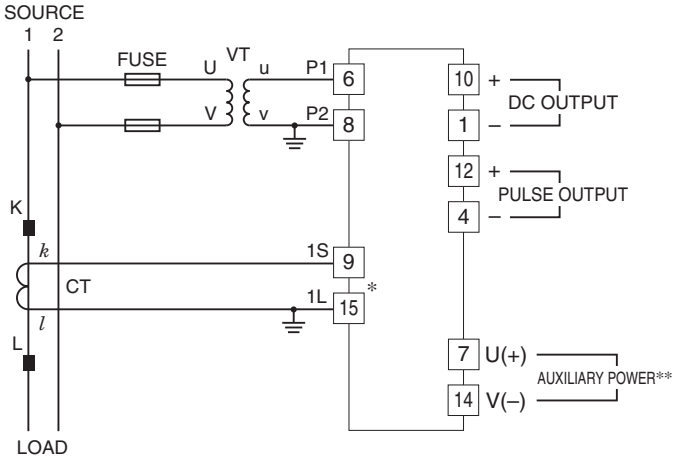



## CONNECTION DIAGRAM

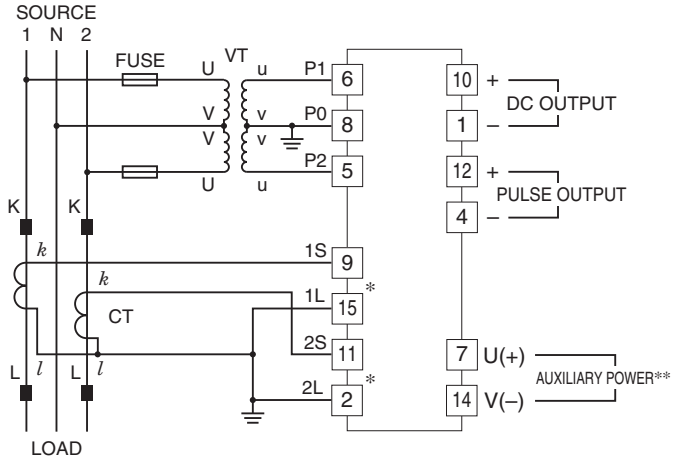
■ **3-PHASE/3-WIRE**




■ **SINGLE-PHASE/2-WIRE**

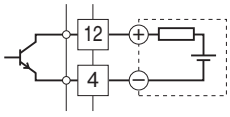



■ **SINGLE-PHASE/3-WIRE**



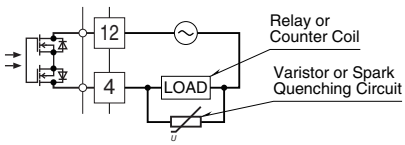

**Pulse Output Connection Examples**

■ **Open Collector**

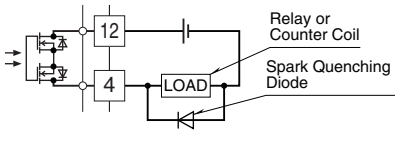



■ **Power Photo MOSFET Relay**

• **AC Powered**

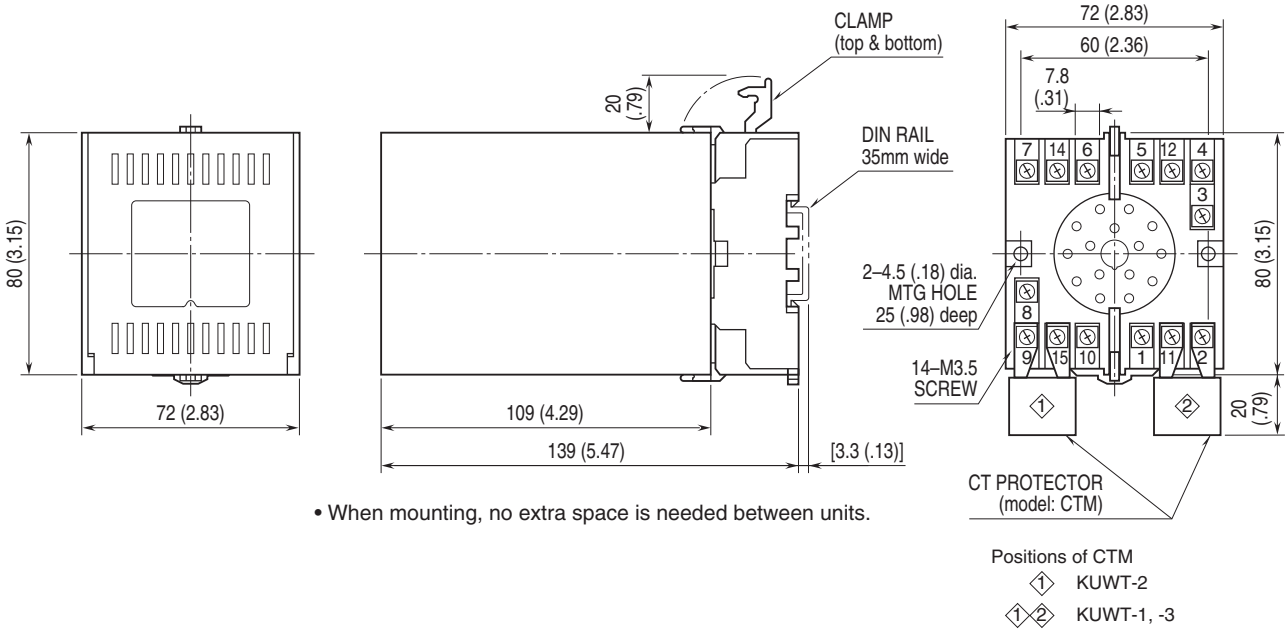



• **DC Powered**




*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 within the range of auxiliary power supply of the unit specified in the data sheet/instruction manual.

## EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm (inch)




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

⚠ Specifications are subject to change without notice.