TEXMATE Smart Process Measurement & Control Since 1976

# POWER TRANSDUCERS


ABS DIN Rail Mount Case

Screw Mount Metal Case

**HIGH ACCURACY**

**LEGENDARY RELIABILITY**

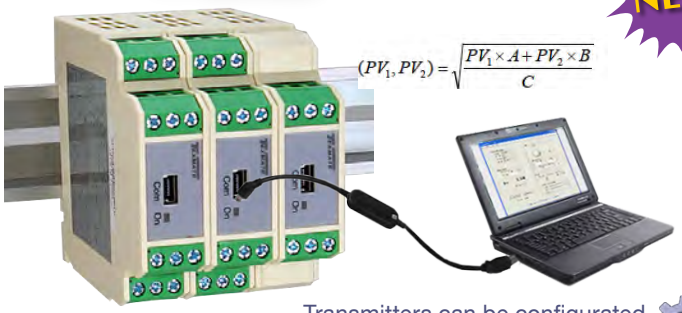
**FAST DELIVERY**

**FRIENDLY APPLICATION SUPPORT**

# Texmate DIN Rail Mount Transmitters

## TT SERIES

NEW



$$(PV_1, PV_2) = \sqrt{\frac{PV_1 \times A + PV_2 \times B}{C}}$$

Transmitters can be configurated using TT Configurator software without connecting to a power source.

**TT-1S1M** Single Channel input and Single 4-20mA output

**TTM-2S2MM** Dual same signal Inputs; Single 4-20mA output and Single 4-20mA output with Math Function

**TTM-2S2MC** Dual same signal Inputs; Single 4-20mA output with math function & Single RS-485 output

**TT-2D2MM** Dual Inputs; Dual 4-20mA output

**TT-2D2MC** Dual Inputs; Single 4-20mA & Single RS-485 output

| Model# | Input signal | Maximum Range | Accu- |
|---|---|---|---|
| TT-1S1M TTM-2S2MM TTM-2S2MC TT-2D2MM TT-2D2MC | Thermocouple J | -50 to 1000°C (-58 to 1832°F) | ±1°C |
| | Thermocouple K | -50 to 1370°C (-58 to 2498°F) | ±1°C |
| | Thermocouple T | -270 to 400°C (-454 to 752°F) | ±1°C |
| | Thermocouple E | -50 to 700°C (-58 to 1292°F) | ±1°C |
| | Thermocouple B | 0 to 1750°C (32 to 3182°F) | ±2°C * |
| | Thermocouple R | -50 to 1750°C (-58 to 3182°F) | ±2°C |
| | Thermocouple S | -50 to 1750°C (-58 to 3182°F) | ±2°C |
| | Thermocouple N | -50 to 1300°C (-58 to 2372°F) | ±2°C |
| | Thermocouple C | -50 to 1800°C (-58 to 3272°F) | ±2°C |
| | Pt100 | -200 to 600°C (-328 to | ±0.2°C |
| | MV | -60mV to 60mV | |
| | Voltage | -10 to 10Vdc | ±1mV |
| | Current | 0 to 24mAdc | ±10µA |

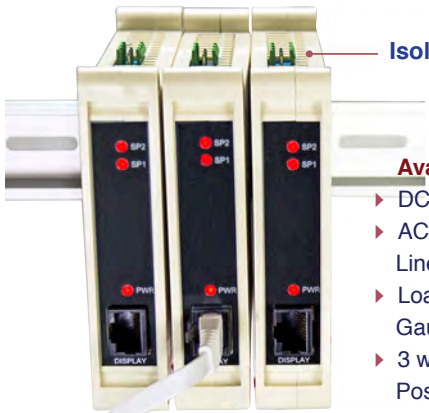
*Accuracy is not guaranteed between 0 and 400°C (0 and 752°F) for type B, R and S.

**Output signal** : DC 4/0~20mA or DC 0~10V
**Output resolution** : 0.6uA.
**Output response time** : <200mS.
**Communication : Modbus** RS-485 RTU protocol, 4800~38400 bps
**Power supply** : 18~36 Vdc, internal protection against polarity inversion

## LEOPARD TL SERIES

- Active, isolated analog output. (No need of external 24V to power output)
- Plug n Play. Order unit setup to your exact requirements.
- Dual 9A Form C relays with NO and NC connections available.
- 24 VDC Excitation to power 4-20 mA loops and selectable 5 or 10 VDC to power Strain gauge, and Pressure / Load cell.
- Auto sensing AC/DC power supply 85-265 VAC / 95-370 VDC or optional 18-36 VAC / 9-60 VDC.
- Remote programmer may be used as a remote display.

**Leopard Transmitter**

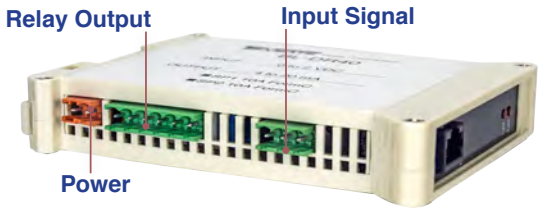


**Isolated Analog Output**

**Available Inputs:**

- DC - Volts, Amps, mV, mA
- AC - Volts, Amps, mV, mA, Line Frequency
- Load Cell, Pressure, Strain Gauge
- 3 wire Potentiometer - Position, Resistance
- Temperature - Thermocouple, RTD Pt-100
- Proximity switch - RPM or Frequency


**Remote Display Programmer**



# Contents

# AC CURRENT TRANSDUCER

SCREW MOUNT METAL CASE A

ABS DIN RAIL MOUNT CASE C

## MODELS OFFERED

**TA-1:** 1 Phase, Average sensing Amps

**TA-1T:** 1 Phase, True rms sensing Amps

ABS DIN RAIL MOUNT CASE D

SCREW MOUNT METAL CASE B

**TA-3:** 3 Phase, Average sensing Amps

**TA-3T:** 3 Phase, True rms sensing Amps

- True RMS sensing is recommended for input signals with distortion.
- Direct connect to the transducer for inputs ≤ 5A AC.
- Connect using a current Transformer (C.T.) for inputs greater than 5A AC.

## FEATURES

- **High accuracy ±0.2% of Rated Output (R.O.)**
- **Super high accuracy ±0.1% of Rated Output (R.O.) available as a special order.***
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277)**
- **Many input and output signal combinations**

## GENERAL SPECIFICATIONS

| | |
|---|---|
| **Accuracy** | ± 0.2% R.O. Standard for 10 to 100% of rated output |
| | ± 0.1% R.O. (Special Option) |
| **Temp. coefficient** | ≤100ppm/°C of span |
| | ≤60ppm/°C for ambient temperature of 25°C ±10°C |
| **Temp. range** | Storage temperature range -20°C to 60°C (-4°F to 140°F) |
| | Operating temperature range 0°C to 50°C (32°F to 122°F) |
| **Humidity range** | Up to 95% RH non condensing |
| **Isolation** | Between Input/Output/Power/Case |
| **Dielectric test** | DIN-IEC 688 |
| | 2K Vrms/1 min, Between terminal to terminal |
| | 2.8K Vrms/1 min, Between terminal to case |
| **Surge test** | DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 $\mu$s) |
| **Insulation Resistance** | Greater than 100 M Ω at 500V DC |
| **Housing material** | ABS Resin(94V-0) or metal |
| **Mounting** | Screw mount on metal case or Plastic case DIN Rail 35mm |
| **Auxiliary Power** | AC 115/230V ± 15%, 50/60Hz, 3VA |
| | DC 24V ± 20%(optional) |
| | 125V DC ± 20%(optional) |

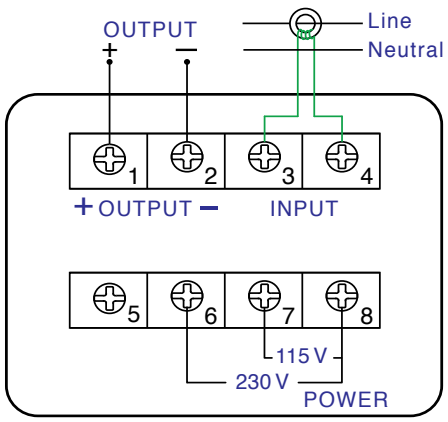
## INPUT SPECIFICATIONS

**AC Input** ..... 0 to 5A AC, 0 to 1A AC or custom input
**Frequency**..... 45Hz to 65Hz or 400Hz
**Burden** ..... ≤0.2VA
**Response Sensitivity** ..... ≤0.5% of measuring range to maximum input range
**Input Overload Capacity** ..... 3 times the rated input current continuously.
10 times the rated current for 10 seconds.
50 times the rated input current for 1 second.
80 times the rated input current for 0.5 second.

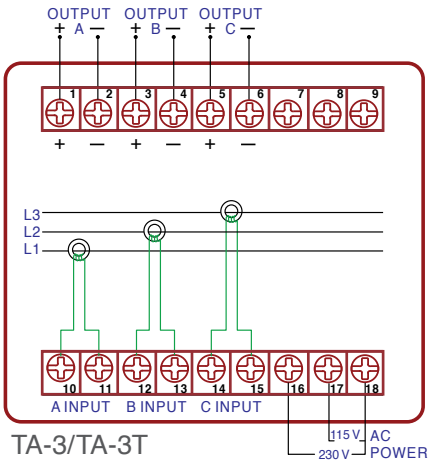
## OUTPUT SPECIFICATIONS

**Output Variables** ..... DC mA or DC Volts
**Ripple**..... < 0.5% of rated output. Peak to Peak (maximum)
**Response Time**..... < 400 milliseconds to go from 0 to 99% of output
**Zero Adjustment**..... ± 5% of rated output (minimum)
**Span Adjustment**..... ± 10% of rated output (minimum)
**Load Resistance**..... 10K Ω maximum for 0 to 1mA output
500 Ω maximum for 4 to 20mA output
500 Ω minimum for 0 to 10V output

## CONNECTION DIAGRAM




TA-1/TA-1T




TA-3/TA-3T

| Base Model | |
|---|---|
| TA-1 | 1 Phase, Avg sensing Amps |
| TA-1T | 1 Phase, TRMS sensing Amps |
| TA-3 | 3 Phase, Avg sensing Amps |
| TA-3T | 3 Phase, TRMS sensing Amps |

| Accuracy | |
|---|---|
| RO1 | ±0.2% |
| RO3 | ±0.1% |

| Input Signal | |
|---|---|
| SA1 | 0 to 5 A AC |
| SA2 | 0 to 1 A AC |
| SAY | Custom Input |

| Input Frequency | |
|---|---|
| HZ1 | 45Hz to 65Hz |
| HZ4 | 400Hz |

| Output Signal | |
|---|---|
| OA1 | 0 to 1 mA DC |
| OA2 | 4 to 20mA DC |
| OA3 | 0 to 10 V DC |
| OAY | Custom Output |

| Auxiliary Power | |
|---|---|
| P0 | Single Powered 0-1 mA Output Only |
| P1 | 115/230V AC ±15% |
| P2 | 24V DC ±15% |
| P3 | 125V DC ±15% |
| PY | Custom Power ±15% |

| Case | |
|---|---|
| CM | Metal |
| CP | Plastic |

# AC VOLTAGE TRANSDUCERS







## MODELS OFFERED

**TV-1:** 1 Phase, Average sensing

**TV-1T:** 1 Phase, True rms sensing

**TV-3:** 3 Phase, Average sensing

**TV-3T:** 3 Phase, True rms sensing

- True RMS sensing is recommended for input signals with distortion.
- Direct connect to the transducer for inputs ≤ 600V AC.
- Connect using a Potential Transformer (P.T.) for inputs > 600V AC.

## FEATURES

- **High accuracy ±0.2% of Rated Output (R.O.)**
- **Super high accuracy ±0.1% of Rated Output (R.O.) available as a special order.***
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277)**
- **Many input and output signal combinations**

## GENERAL SPECIFICATIONS

| | |
|---|---|
| **Accuracy** | ± 0.2% R.O. Standard for 10 to 100% of rated output |
| | ± 0.1% R.O. (Special Option) |
| **Temp. coefficient** | ≤100ppm/°C of span |
| | ≤60ppm/°C for ambient temperature of 25°C ±10°C |
| **Temp. range** | Storage temperature range -20°C to 60°C (-4°F to 140°F) |
| | Operating temperature range 0°C to 50°C (32°F to 122°F) |
| **Humidity range** | Up to 95% RH non condensing |
| **Isolation** | Between Input/Output/Power/Case |
| **Dielectric test** | DIN-IEC 688 |
| | 2K Vrms/1 min, Between terminal to terminal |
| | 2.8K Vrms/1 min, Between terminal to case |
| **Surge test** | DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 $\mu$s) |
| **Insulation Resistance** | Greater than 100 M Ω at 500V DC |
| **Housing material** | ABS Resin(94V-0) or metal |
| **Mounting** | Screw mount on metal case or Plastic case DIN Rail 35mm |
| **Auxiliary Power** | AC 115/230V ± 15%, 50/60Hz, 3VA |
| | DC 24V ± 20%(optional) |
| | 125V DC ± 20%(optional) |

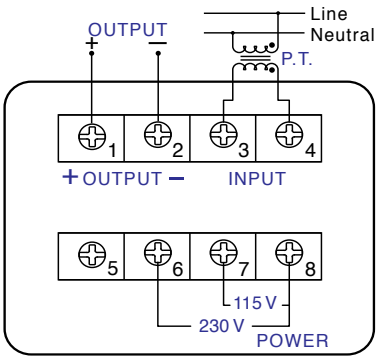
## INPUT SPECIFICATIONS

**AC Input**..... 0 to 150V AC, 0 to 300V AC, 0 to 600V AC or custom input
**Frequency** ..... 45Hz to 65Hz or 400Hz
**Burden**..... ≤0.1VA
**Response Sensitivity**..... ≤0.5% of measuring range to mazimum input range
**Input Overload Capacity**.... 1.25 times the rated input voltage continuously.
2 times the rated voltage for 10 seconds.
4 times the rated input voltage for 5 seconds.
Or 600V AC rms continuous.(absolute maximum)

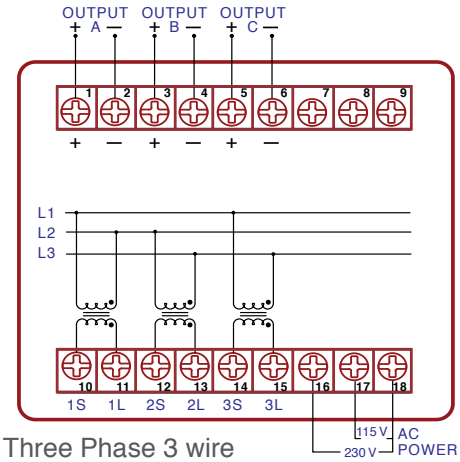
## OUTPUT SPECIFICATIONS

**Output Variables**..... DC mA or DC Volts
**Ripple**..... < 0.5% of rated output. Peak to Peak (maximum)
**Response Time**..... < 400 milliseconds to go from 0 to 99% of output
**Zero Adjustment**..... ± 5% of rated output minimum
**Span Adjustment**..... ± 10% of rated output minimum
**Load Resistance**..... 10K Ω maximum for 0 to 1mA output
500 Ω maximum for 4 to 20mA output
500 Ω minimum for 0 to 10V output

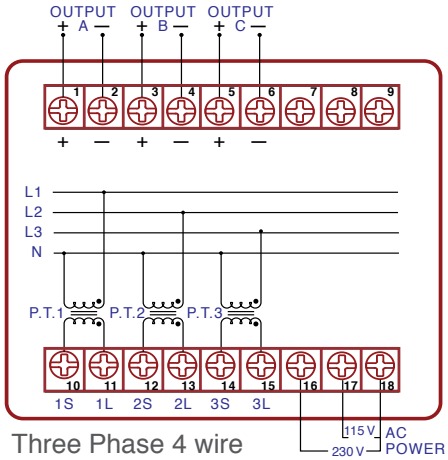
## CONNECTION DIAGRAM




TV-1/TV-1T




Three Phase 3 wire




Three Phase 4 wire

| Base Model | Accuracy | Input Signal | Input Frequency | Output Signal | Auxiliary Power | Case |
|---|---|---|---|---|---|---|
| TV-1 1 Phase, Avg sensing Volts | RO1 ±0.2% | SV1 0 to 150V AC | HZ1 45Hz to 65Hz | OV1 0 to 1 mA DC | P0 Single Powered | CM Metal |
| TV-1T 1 Phase, TRMS sensing Volts | RO3 ±0.1% | SV2 0 to 300V AC | HZ4 400Hz | OV2 4 to 20mA DC | P1 115/230V AC ±15% | CP Plastic |
| TV-3 3 Phase, Avg sensing Volts | | SV3 0 to 600V AC | | OV3 0 to 10 V DC | P2 24V DC ±15% | |
| TV-3T 3 Phase, TRMS sensing Volts | | SVY Custom Input | | OVY Custom Output | P3 125V DC ±15% | |
| | | | | | PY Custom Power ±15% | |

ABS DIN RAIL MOUNT CASE D

SCREW MOUNT METAL CASE B

## MODELS OFFERED

**TW-12:** Single Phase, 2 Wire – 1 Element

**TW-13:** Single Phase, 3 Wire – 2 Element

**TW-33:** 3 Phase, 3 Wire – 2 Element

**TW-34:** 3 Phase, 4 Wire – 3 Element

- Accurate measurement of the active power Watts for balanced or unbalanced loads.
- The output signals are isolated load independent DC mA or DC Volts, representing the measured value of the active power Watts.

## FEATURES

- **Uses Time Division Multiplication (TDM) for precision measurement of even distorted signals.**
- **High accuracy ±0.2% of Rated Output (R.O.)**
- **Super high accuracy ±0.1% of Rated Output (R.O.) available as a special order.***
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277) or screw mounting.**
- **Many input and output signal combinations**

## GENERAL SPECIFICATIONS

| | |
|---|---|
| **Accuracy** | ± 0.2% R.O. Standard for 10 to 100% of rated output |
| | ± 0.1% R.O. (Special Option) |
| **Temp. coefficient** | ≤100ppm/°C of span |
| | ≤60ppm/°C for ambient temperature of 25°C ±10°C |
| **Temp. range** | Storage temperature range -20°C to 60°C (-4°F to 140°F) |
| | Operating temperature range 0°C to 50°C (32°F to 122°F) |
| **Humidity range** | Up to 95% RH non condensing |
| **Isolation** | Between Input/Output/Power/Case |
| **Dielectric test** | DIN-IEC 688 |
| | 2K Vrms/1 min, Between terminal to terminal |
| | 2.8K Vrms/1 min, Between terminal to case |
| **Surge test** | DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 $\mu$s) |
| **Insulation Resistance** | Greater than 100 M Ω at 500V DC |
| **Housing material** | ABS Resin(94V-0) or metal |
| **Mounting** | Screw mount on metal case or Plastic case DIN Rail 35mm |
| **Auxiliary Power** | AC 115/230V ± 15%, 50/60Hz, 3VA |
| | DC 24V ± 20%(optional) |
| | 125V DC ± 20%(optional) |

## INPUT SPECIFICATIONS

| | |
|---|---|
| **AC Input** | 120V/5A AC, 240V/5A AC for 1ø/2 wire, 240V/120V, 5A AC for 1ø/ 3 Wire<br>120V/5A AC, 240V/5A AC for 3ø/3 Wire & 3ø / 4 Wire<br>custom input (600V max /10A AC max) |
| **Frequency** | 60Hz ±3Hz, 50Hz ±3Hz, 400Hz ±3Hz |
| **Burden** | ≤0.2VA per current circuit, ≤0.1VA per voltage circuit. |
| **Response Sensitivity** | ≤0.5% of measuring range to maximum input range |
| **Input Voltage** | 600V AC rms continuous (absolute maximum) |
| **Overload Capacity** | 1.25 times the rated input Voltage continuously.<br>2 times the rated input Voltage for 10 secs.<br>4 times the rated input Voltage for 5 secs. |
| **Input Current** | 3 times the rated input current continuously. |
| **Overload Capacity** | 10 times the rated input current for 10 secs.<br>50 times the rated input current for 1 sec.<br>80 times the rated input current for 0.5 secs |

## OUTPUT SPECIFICATIONS

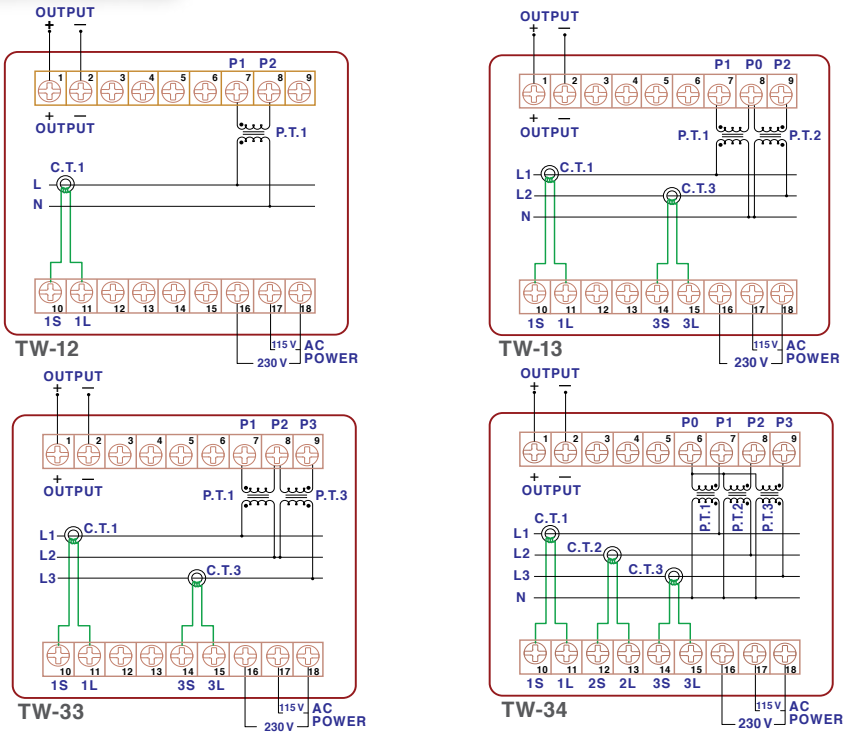
| | |
|---|---|
| **Output Variables** | DC mA or DC Volts |
| **Ripple** | < 0.5% of rated output. Peak to Peak (maximum) |
| **Response Time** | < 400 milliseconds to go from 0 to 99% of output |
| **Zero Adjustment** | ± 5% of rated output (minimum) |
| **Span Adjustment** | ± 10% of rated output (minimum) |
| **Load Resistance** | 10 kΩ maximum for 0 to 1mA output<br>500 Ω maximum for 4 to 20mA output<br>500 Ω minimum for 0 to 10V output |

**Maximum Input range value = (CT Ratio) X (PT Ratio) X (Nominal Watts)**

If CT = 200A:5A PT is 3300V:110V Nominal Watts = 500

then CT Ratio = 40 then PT Ratio = 30 and Maximum input range value = 40 x 30 x 500 = 600KW

## CONNECTION DIAGRAM




| Base Model | Accuracy | Input Signal | Input Frequency | Output Signal | Auxiliary Power | Case |
|---|---|---|---|---|---|---|
| TW-12 1 Phase, 1P/2W, 1E, Watts | RO1 ±0.2% | SW1 120V/5A AC | HZ6 60Hz | OW1 0 to 1 mA DC | P0 Single Powered | CM Metal |
| TW-13 1 Phase, 1P/3W, 2E, Watts | RO3 ±0.1% | SW2 240V/5A AC | HZ5 50Hz | OW2 4 to 20mA DC | P1 115/230V AC ±15% | CP Plastic |
| TW-33 3 Phase, 3P/3W, 2E, Watts | | SWY Custom Input, MAX 10A | HZ4 400Hz | OW3 0 to 10 V DC | P2 24V DC ±15% | |
| TW-34 3 Phase, 3P/4W, 3E, Watts | | | | OWY Custom Output | P3 125V DC ±15% | |
| | | | | | PY Custom Power ±15% | |


ABS DIN RAIL MOUNT CASE D


SCREW MOUNT METAL CASE B

## MODELS OFFERED

**TQ-12:** Single Phase, 2 Wire – 1 Element

**TQ-13:** Single Phase, 3 Wire – 2 Element

**TQ-33:** 3 Phase, 3 Wire – 2 Element

**TQ-34:** 3 Phase, 4 Wire – 3 Element

- Accurate measurement of the active power Watts for balanced or unbalanced loads.
- The output signals are isolated load independent DC mA or DC Volts, representing the measured value of the active power Watts.

## FEATURES

- **Uses Time Division Multiplication (TDM) for precision measurement of even distorted signals.**
- **High accuracy ±0.2% of Rated Output (R.O.)**
- **Super high accuracy ±0.1% of Rated Output (R.O.) available as a special order.***
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277) or screw mounting.**
- **Many input and output signal combinations**

## GENERAL SPECIFICATIONS

| | |
|---|---|
| **Accuracy** | ± 0.2% R.O. Standard for 10 to 100% of rated output |
| | ± 0.1% R.O. (Special Option) |
| **Temp. coefficient** | ≤100ppm/°C of span |
| | ≤60ppm/°C for ambient temperature of 25°C ±10°C |
| **Temp. range** | Storage temperature range -20°C to 60°C (-4°F to 140°F) |
| | Operating temperature range 0°C to 50°C (32°F to 122°F) |
| **Humidity range** | Up to 95% RH non condensing |
| **Isolation** | Between Input/Output/Power/Case |
| **Dielectric test** | DIN-IEC 688 |
| | 2K Vrms/1 min, Between terminal to terminal |
| | 2.8K Vrms/1 min, Between terminal to case |
| **Surge test** | DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 μs) |
| **Insulation Resistance** | Greater than 100 M Ω at 500V DC |
| **Housing material** | ABS Resin(94V-0) or metal |
| **Mounting** | Screw mount on metal case or Plastic case DIN Rail 35mm |
| **Auxiliary Power** | AC 115/230V ± 15%, 50/60Hz, 3VA |
| | DC 24V ± 20%(optional) |
| | 125V DC ± 20%(optional) |

## INPUT SPECIFICATIONS

| | |
|---|---|
| **AC Input** | 120V/5A AC, 240V/5A AC for 1ø/2 wire, 240V/120V, 5A AC for 1ø/ 3 Wire<br>120V/5A AC, 240V/5A AC for 3ø/3 Wire & 3ø / 4 Wire<br>custom input (600V max /10A AC max) |
| **Frequency** | 60Hz ±3Hz, 50Hz ±3Hz, 400Hz ±3Hz |
| **Burden** | ≤0.2VA per current circuit, ≤0.1VA per voltage circuit. |
| **Response Sensitivity** | ≤0.5% of measuring range to maximum input range |
| **Input Voltage** | 600V AC rms continuous (absolute maximum) |
| **Overload Capacity** | 1.25 times the rated input Voltage continuously.<br>2 times the rated input Voltage for 10 secs.<br>4 times the rated input Voltage for 5 secs. |
| **Input Current** | 3 times the rated input current continuously. |
| **Overload Capacity** | 10 times the rated input current for 10 secs.<br>50 times the rated input current for 1 sec.<br>80 times the rated input current for 0.5 secs |

## OUTPUT SPECIFICATIONS

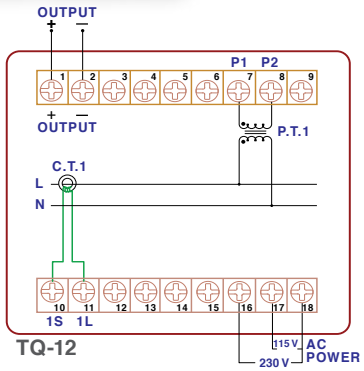
| | |
|---|---|
| **Output Variables** | DC mA or DC Volts |
| **Ripple** | < 0.5% of rated output. Peak to Peak (maximum) |
| **Response Time** | < 400 milliseconds to go from 0 to 99% of output |
| **Zero Adjustment** | ± 5% of rated output (minimum) |
| **Span Adjustment** | ± 10% of rated output (minimum) |
| **Load Resistance** | 10 kΩ maximum for 0 to 1mA output<br>500 Ω maximum for 4 to 20mA output<br>500 Ω minimum for 0 to 10V output |

**Maximum Input range value = (CT Ratio) X (PT Ratio) X (Nominal VARs)**

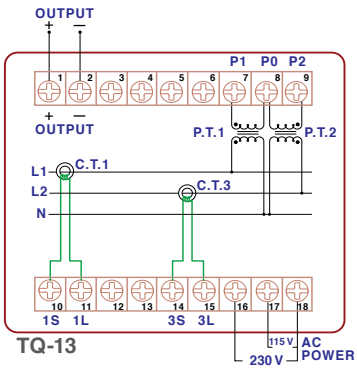
If CT = 200A:5A PT is 3300V:110V Nominal VARs = 500

CT Ratio = 40 PT Ratio = 30 and Maximum input range value = 40 x 30 x 500 = 600KVAR

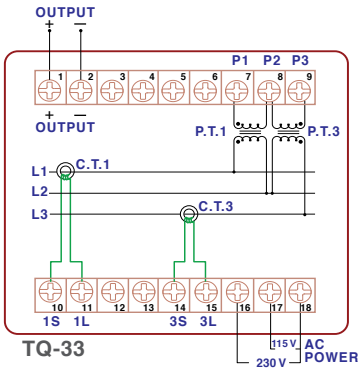
## CONNECTION DIAGRAM



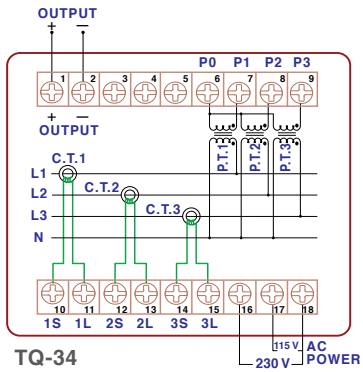

TQ-12




TQ-13




TQ-33




TQ-34

Case: CM Metal | CP Plastic

Input/Output Relationship: LG LAG = + Polarity | LD LEAD= + Polarity

Auxiliary Power: P0 Single Powered | P1 115/230V AC ±15% | P2 24V DC ±15% | P3 125V DC ±15% | PY Custom Power ±15%

Output Signal: OQ4 ±1 mA DC | OQ5 12 ± 8mA DC | OQ6 ±10 V DC | OQY Custom Output

Input Frequency: HZ6 60Hz | HZ5 50Hz | HZ4 400Hz

Input Signal: SW1 120V/5A AC | SW2 240V/5A AC | SWY Custom Input

Accuracy: RO1 ±0.2% | RO3 ±0.1%

Base Model: TQ-12 1 Phase, 1P/2W, 1E, VARs | TQ-13 1 Phase, 1P/3W, 2E, VARs | TQ-33 3 Phase, 3P/3W, 2E, VARs | TQ-34 3 Phase, 3P/4W, 3E, VARs


ABS DIN RAIL MOUNT CASE D


SCREW MOUNT METAL CASE B

## MODELS OFFERED

**TWQ-12:** 1 Phase, 2 Wire – 1 Element
**TWQ-13:** 1 Phase, 3 Wire – 2 Element
**TWQ-33:** 3 Phase, 3 Wire – 2 Element
**TWQ-34:** 3 Phase, 4 Wire – 3 Element

- Accurate measurement of the active power and reactive power (Watts and VARs) of a single/ three phase system with balanced or unbalanced loads.
- The output signals are isolated load independent DC mA or DC Volts, representing the measured value of the active and reactive power (Watts and VARs).

## FEATURES

- **Uses Time Division Multiplication (TDM) for precision measurement of even distorted signals.**
- **High accuracy ±0.2% of Rated Output (R.O.)**
- **Super high accuracy ±0.1% of Rated Output (R.O.) available as a special order.***
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277) or screw mounting.**
- **Many input and output signal combinations**

## GENERAL SPECIFICATIONS

| | |
|---|---|
| **Accuracy** | ± 0.2% R.O. Standard for 10 to 100% of rated output<br>± 0.1% R.O. (Special Option) |
| **Temp. coefficient** | ≤100ppm/°C of span<br>≤60ppm/°C for ambient temperature of 25°C ±10°C |
| **Temp. range** | Storage temperature range -20°C to 60°C (-4°F to 140°F)<br>Operating temperature range 0°C to 50°C (32°F to 122°F) |
| **Humidity range** | Up to 95% RH non condensing |
| **Isolation** | Between Input/Output/Power/Case |
| **Dielectric test** | DIN-IEC 688<br>2K Vrms/1 min, Between terminal to terminal<br>2.8K Vrms/1 min, Between terminal to case |
| **Surge test** | DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 μs) |
| **Insulation Resistance** | Greater than 100 M Ω at 500V DC |
| **Housing material** | ABS Resin(94V-0) or metal |
| **Mounting** | Screw mount on metal case or Plastic case DIN Rail 35mm |
| **Auxiliary Power** | AC 115/230V ± 15%, 50/60Hz, 3VA<br>DC 24V ± 20%(optional), 125V DC ± 20%(optional) |

## INPUT SPECIFICATIONS

| | |
|---|---|
| **AC Input** | 120V/5A AC, 240V/5A AC for 1ø/2 wire, 240V/120V, 5A AC for 1ø/ 3 Wire<br>120V/5A AC, 240V/5A AC for 3ø/3 Wire & 3ø / 4 Wire<br>custom input (600V max /10A AC max) |
| **Frequency** | 60Hz ±3Hz, 50Hz ±3Hz, 400Hz ±3Hz |
| **Burden** | ≤0.2VA per current circuit, ≤0.1VA per voltage circuit. |
| **Response Sensitivity** | ≤0.5% of measuring range to maximum input range |
| **Input Voltage** | 600V AC rms continuous (absolute maximum) |
| **Overload Capacity** | 1.25 times the rated input Voltage continuously.<br>2 times the rated input Voltage for 10 secs. 4 times the rated input Voltage for 5 secs. |
| **Input Current** | 3 times the rated input current continuously. 10 times the rated input current for 10 secs. |
| **Overload Capacity** | 50 times the rated input current for 1 sec. 80 times the rated input current for 0.5 secs |

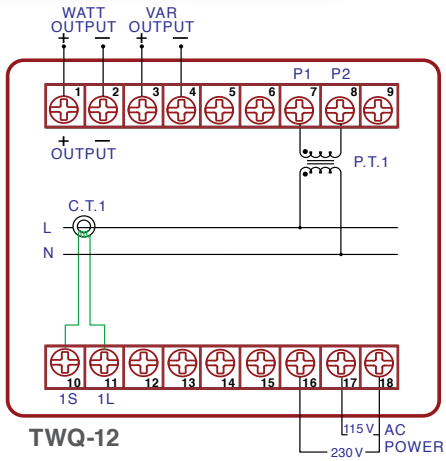
## OUTPUT SPECIFICATIONS

**Output Variables** ..... DC mA or DC Volts
**Ripple** ..... < 0.5% of rated output. Peak to Peak (maximum)
**Response Time** ..... < 400 milliseconds to go from 0 to 99% of output
**Zero Adjustment** ..... ± 5% of rated output (minimum)
**Span Adjustment** ..... ± 10% of rated output (minimum)
**Load Resistance** ..... 10 kΩ maximum for 0 to 1mA output
500 Ω maximum for 4 to 20mA output
500 Ω minimum for 0 to 10V output

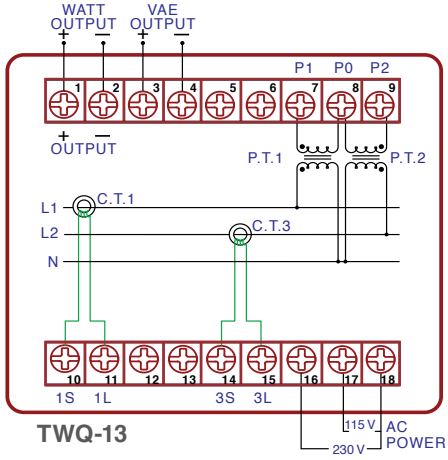
To calculate the actual Watts and VARs Maximum Input range value, the CT and PT ratios have to be factored in
**Maximum input Range for Watts = (CT Ratio) X (PT Ratio) X (Nominal Watts)**
**Maximum Input range value for VARs = (CT Ratio) X (PT Ratio) X (Nominal VARs)**

For example:
If CT = 200A:5A PT is 3300V:110V Nominal Watts = 1000 Nominal VARs = 1000
then CT Ratio = 40 then PT Ratio = 30 and
Maximum input range value for Watts = 40 x 30 x 1000 = 1200KWatts
Maximum input range value for VARs = 40 x 30 x 1000 = 1200KVARs

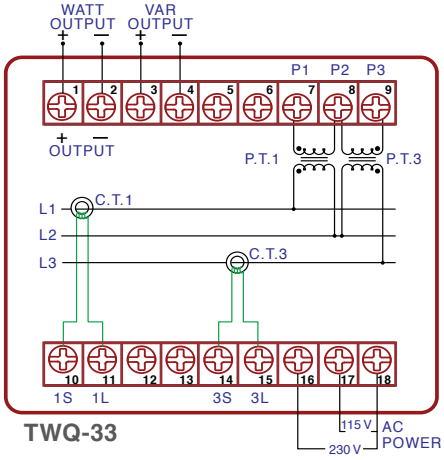
## CONNECTION DIAGRAM



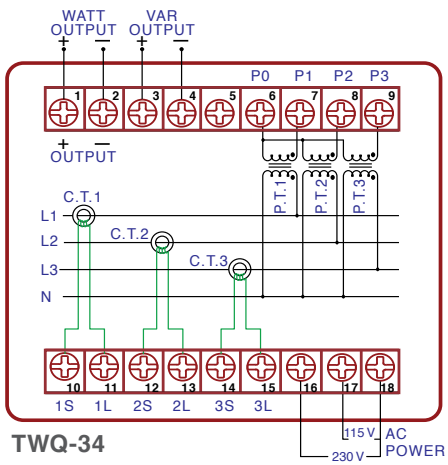
TWQ-12



TWQ-13



TWQ-33



TWQ-34

| Base Model | Accuracy | Input Signal | Input Frequency | Output Signal | Auxiliary Power | Input/Output Relationship | Case |
|---|---|---|---|---|---|---|---|
| TWQ-12 1 Phase, 1P/2W, 1E, Watt + VARs | RO1 ±0.2% | SW1 120V/5A AC | HZ6 60Hz | OWV1 Watts 0 to 1 mA DC VARs ±1mA DC | P0 Single Powered 0 +/- 1mA Output Only | LG LAG = + Polarity | CM Metal |
| TWQ-13 1 Phase, 1P/3W, 2E, Watt + VARs | RO3 ±0.1% | SW2 240V/5A AC | HZ5 50Hz | OWV2 Watts 4 to 20mA DC VARs 12 ± 8mA DC | P1 115/230V AC ±15% | LD LEAD= + Polarity | CP Plastic |
| TWQ-33 3 Phase, 3P/3W, 2E, Watt + VARs | | SWY Custom Input | HZ4 400Hz | OWV5 Watts 12 ± 8mA DC VARs 12 ± 8mA DC | P2 24V DC ±15% | | |
| TWQ-34 3 Phase, 3P/4W, 3E, Watt + VARs | | | | OWV6 Watts 0 to 10V DC VARs ±10V DC | P3 125V DC ±15% | | |
| | | | | | PY Custom Power ±15% | | |


ABS DIN RAIL MOUNT CASE D


SCREW MOUNT METAL CASE B

## MODELS OFFERED

**TWH-12:** 1 Phase, 2 Wire – 1 Element
**TWH-13:** 1 Phase, 3 Wire – 2 Element
**TWH-33:** 3 Phase, 3 Wire – 2 Element
**TWH-34:** 3 Phase, 4 Wire – 3 Element

- Accurate measurement of the active energy (Watt Hours) of a single phase system with balanced or unbalanced loads.
- The output signals are isolated load independent pulses, representing the measured value of the active energy (WattHours, forward and reverse).

## FEATURES

- **Uses Time Division Multiplication (TDM) for precision measurement of even distorted signals.**
- **High accuracy ±0.2% of Rated Output (R.O.)**
- **Super high accuracy ±0.1% of Rated Output (R.O.) available as a special order.***
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277) or screw mounting.**
- **Many input and output signal combinations.**

## GENERAL SPECIFICATIONS

| | |
|---|---|
| **Accuracy** | ± 0.2% R.O. Standard for 10 to 100% of rated output<br>± 0.1% R.O. (Special Option) |
| **Temp. coefficient** | ≤100ppm/°C of span<br>≤60ppm/°C for ambient temperature of 25°C ±10°C |
| **Temp. range** | Storage temperature range -20°C to 60°C (-4°F to 140°F)<br>Operating temperature range 0°C to 50°C (32°F to 122°F) |
| **Humidity range** | Up to 95% RH non condensing |
| **Isolation** | Between Input/Output/Power/Case |
| **Dielectric test** | DIN-IEC 688<br>2K Vrms/1 min, Between terminal to terminal<br>2.8K Vrms/1 min, Between terminal to case |
| **Surge test** | DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 μs) |
| **Insulation Resistance** | Greater than 100 M Ω at 500V DC |
| **Housing material** | ABS Resin(94V-0) or metal |
| **Mounting** | Screw mount on metal case or Plastic case DIN Rail 35mm |
| **Auxiliary Power** | AC 115/230V ± 15%, 50/60Hz, 3VA<br>DC 24V ± 20%(optional), 125V DC ± 20%(optional) |

## INPUT SPECIFICATIONS

| | |
|---|---|
| **AC Input** | 120V/5A AC, 240V/5A AC for 1ø/2 wire, 240V/120V, 5A AC for 1ø/ 3 Wire<br>120V/5A AC, 240V/5A AC for 3ø/3 Wire & 3ø / 4 Wire<br>custom input (600V max /10A AC max) |
| **Frequency** | 60Hz ±3Hz, 50Hz ±3Hz, 400Hz ±3Hz |
| **Burden** | ≤0.2VA per current circuit, ≤0.1VA per voltage circuit. |
| **Response Sensitivity** | ≤0.5% of measuring range to maximum input range |
| **Input Voltage** | 600V AC rms continuous (absolute maximum) |
| **Overload Capacity** | 1.25 times the rated input Voltage continuously.<br>2 times the rated input Voltage for 10 secs. 4 times the rated input Voltage for 5 secs. |
| **Input Current** | 3 times the rated input current continuously. 10 times the rated input current for 10 secs. |
| **Overload Capacity** | 50 times the rated input current for 1 sec. 80 times the rated input current for 0.5 secs |

## OUTPUT SPECIFICATIONS

**Output Variables**..... Pulses
**Ripple**..... < 0.5% of rated output. Peak to Peak (maximum)
**Response Time**..... < 400 milliseconds to go from 0 to 99% of output
**Zero Adjustment**..... ± 5% of rated output (minimum)
**Span Adjustment**..... ± 10% of rated output (minimum)

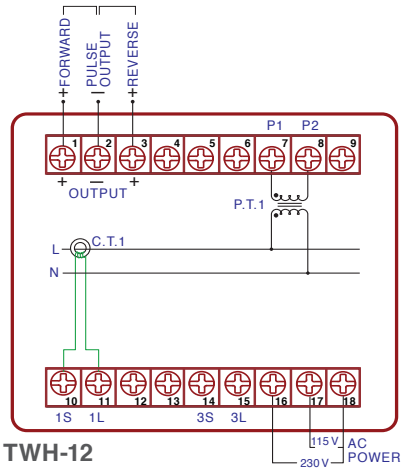
To calculate the actual WattHours for each output pulse, the CT and PT ratios have to be factored in

$$\text{WattHours per Output Pulse} = \frac{\text{(CT Ratio) X (PT Ratio)}}{\text{Nominal Pulses /WattHour}}$$

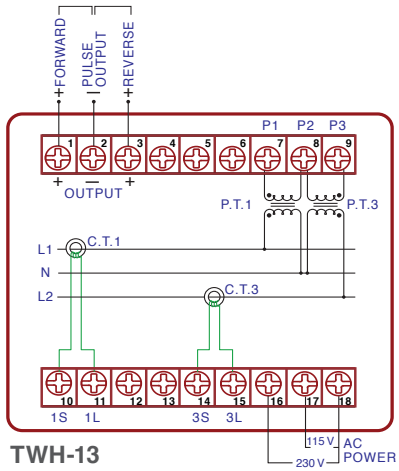
Calculation example: For Single phase 2 wire, TWH-12
If CT = 200A:5A then CT Ratio = 40 PT is 3300V:110V then PT Ratio = 30

If 1 pulse per WattHour is selected, the output will actually be 1 pulse per 1200 WattHours
If 10 pulse per WattHour is selected, the output will actually be 1 pulse per 120 WattHours
If 100 pulse per WattHour is selected, the output will actually be 1 pulse per 12 WattHours

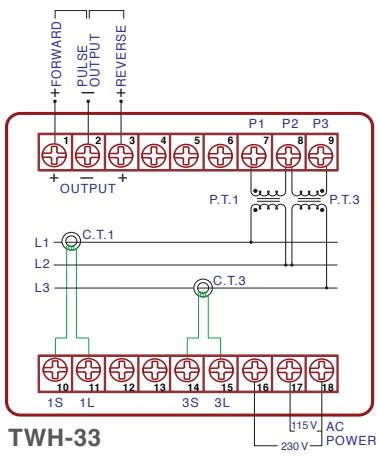
## CONNECTION DIAGRAM



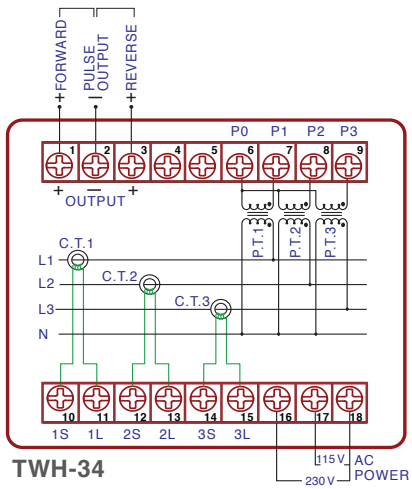

TWH-12




TWH-13




TWH-33




TWH-34

| Base Model | Accuracy | Input Signal | Input Frequency | Output Signal | Auxiliary Power | Pulse per WattHour | Case |
|---|---|---|---|---|---|---|---|
| TWH-12 1 Phase, 1P/2W, 1E, Watthours | RO1 ±0.2% | SW1 120V/5A AC | HZ6 60Hz | OR1 Reed Relay. Forward only | P1 115/230 VAC ±15% | PU1 1 pulse per WH | CM Metal |
| TWH-13 1 Phase, 1P/3W, 2E, Watthours | RO3 ±0.1% | SW2 240V/5A AC | HZ5 50Hz | OR2 Reed Relay. Forward + Reverse | P2 24 VDC ±15% | PU2 10 Pulses Per WH | CP Plastic |
| TWH-33 3 Phase, 3P/3W, 2E, Watthours | | SWY Custom Input | HZ4 400Hz | OC1 Open Collector. Forward only | P3 125 VDC ±15% | PU3 100 pulses per WH | |
| TWH-34 3 Phase, 3P/4W, 3E, Watthours | | | | OC2 Open Collector. Forward + Reverse | PY Custom Power ±15% | PU4 1 pulse per 1000WH | |

(Z670)

ABS DIN RAIL MOUNT CASE D

SCREW MOUNT METAL CASE B

## MODELS OFFERED

**TWWH-12 base model** 1 Phase, 2 Wire – 1 Element
**TWWH-13 base model** 1 Phase, 3 Wire – 2 Element
**TWWH-33 base model** 3 Phase, 3 Wire – 2 Element
**TWWH-34 base model** 3 Phase, 4 Wire – 3 Element

- Accurate measurement of the active energy (WattHours) of a three phase system with balanced or unbalanced loads.
- The output signals are isolated load independent pulses, representing the measured value of the active energy (WattHours, forward and reverse) and DC mA or DC V for the active power (Watts).

## FEATURES

- **Uses Time Division Multiplication (TDM) for precision measurement of even distorted signals.**
- **High accuracy ±0.2% of Rated Output (R.O.)**
- **Super high accuracy ±0.1% of Rated Output (R.O.) available as a special order.***
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277) or screw mounting.**
- **Many input and output signal combinations.**

## GENERAL SPECIFICATIONS

| | |
|---|---|
| **Accuracy** | ± 0.2% R.O. Standard for 10 to 100% of rated output |
| | ± 0.1% R.O. (Special Option) |
| **Temp. coefficient** | ≤100ppm/°C of span |
| | ≤60ppm/°C for ambient temperature of 25°C ±10°C |
| **Temp. range** | Storage temperature range -20°C to 60°C (-4°F to 140°F) |
| | Operating temperature range 0°C to 50°C (32°F to 122°F) |
| **Humidity range** | Up to 95% RH non condensing |
| **Isolation** | Between Input/Output/Power/Case |
| **Dielectric test** | DIN-IEC 688 |
| | 2K Vrms/1 min, Between terminal to terminal |
| | 2.8K Vrms/1 min, Between terminal to case |
| **Surge test** | DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 $\mu$s) |
| **Insulation Resistance** | Greater than 100 M Ω at 500V DC |
| **Housing material** | ABS Resin(94V-0) or metal |
| **Mounting** | Screw mount on metal case or Plastic case on DIN Rail 35mm |
| **Auxiliary Power** | AC 115/230V ± 15%, 50/60Hz, 3VA |
| | DC 24V ± 20%(optional) |
| | 125V DC ± 20%(optional) |

## INPUT SPECIFICATIONS

| | |
|---|---|
| **AC Input** | 120V/5A AC, 240V/5A AC. Custom input (600V max /10A AC max) |
| **Frequency** | 60Hz ±3Hz, 50Hz ±3Hz, 400Hz ±3Hz |
| **Burden** | ≤0.2VA per current circuit, ≤0.1VA per voltage circuit. |
| **Response Sensitivity** | ≤0.5% of measuring range to maximum input range |
| **Input Voltage** | 600V AC rms continuous (absolute maximum) |
| **Overload Capacity** | 1.25 times the rated input Voltage continuously. |
| | 2 times the rated input Voltage for 10 secs. |
| | 4 times the rated input Voltage for 5 secs. |
| **Input Current** | 3 times the rated input current continuously. |
| **Overload Capacity** | 10 times the rated input current for 10 secs. |
| | 50 times the rated input current for 1 sec. |
| | 80 times the rated input current for 0.5 secs |

## OUTPUT SPECIFICATIONS

**Output Variables**..... Pulses (WattHours) and DC mA or DC V (Watts)
**Ripple**..... < 0.5% of rated output. Peak to Peak (maximum)
**Response Time**..... < 400 milliseconds to go from 0 to 99% of output
**Zero Adjustment**..... ± 5% of rated output (minimum)
**Span Adjustment**..... ± 10% of rated output (minimum)

To calculate the actual WattHours and Watts for each output pulse, the CT and PT ratios have to be factored in

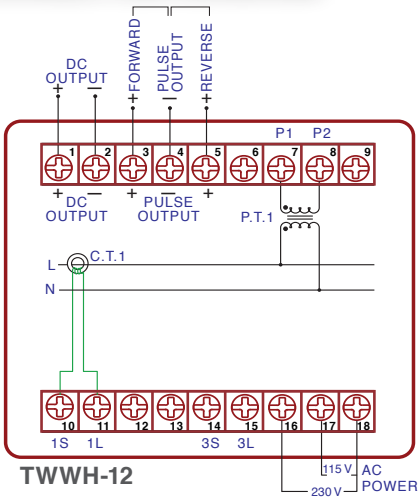
$$\text{Watts} = (\text{CT Ratio}) \times (\text{PT Ratio}) \times \text{Nominal Watts}$$

$$\text{WattHours per Output Pulse} = \frac{(\text{CT Ratio}) \times (\text{PT Ratio})}{\text{Nominal Pulses /WattHour}}$$

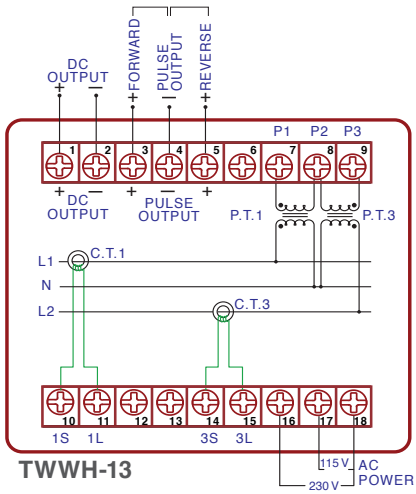
Calculation example: For Single phase 2 wire, TWWH-12
If CT = 200A:5A then CT Ratio = 40 PT is 3300V:110V then PT Ratio = 30
Watts = 30 x 40 x 500 = 600kW

If 1 pulse per WattHour is selected, the output will actually be 1 pulse per 1200 WattHours
If 10 pulse per WattHour is selected, the output will actually be 1 pulse per 120 WattHours
If 100 pulse per WattHour is selected, the output will actually be 1 pulse per 12 WattHours

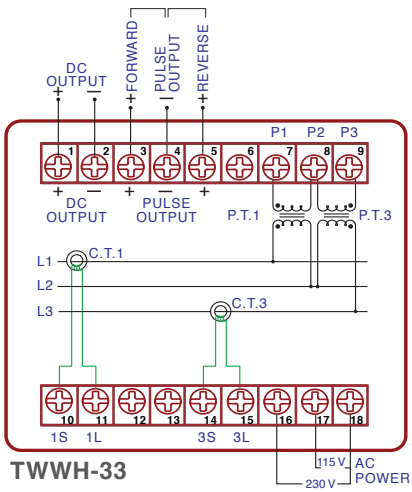
## CONNECTION DIAGRAM



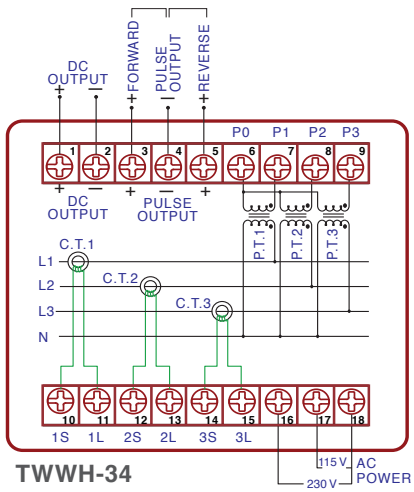

TWWH-12




TWWH-13




TWWH-33




TWWH-34

| Base Model | Accuracy | Input Signal | Frequency | Output Signal | Auxiliary Power | Pulse per WattHour | Case |
|---|---|---|---|---|---|---|---|
| TWWH-12 1 Phase, 1P/2W, 1E, Watts+Watthours | RO1 ±0.2% | SW1 120V/5A AC | HZ6 60Hz | OWR1 Watts 0 to 1 mA DC WHr Reed Relay. Forward only | P1 115/230 VAC ±15% | PU1 1 pulse/WH | CM Metal |
| TWWH-13 1 Phase, 1P/3W, 2E, Watts+Watthours | RO3 ±0.1% | SW2 240V/5A AC | HZ5 50Hz | OWR2 Watts 4 to 20 mA DC WHr Reed Relay. Forward and Reverse | P2 24 VDC ±15% | PU2 10 Pulses/WH | CP Plastic |
| TWWH-33 3 Phase, 3P/3W, 2E, Watts+Watthours | | SWY Custom Input | HZ4 400Hz | OWC1 Watts 0 to 1 mA DC WHr Open Collector. Forward only | P3 125 VDC ±15% | PU3 100 pulses/WH | |
| TWWH-34 3 Phase, 3P/4W, 3E, Watts+Watthours | | | | OWC2 Watts 4 to 20 mA DC WHr Open Collector. Forward + Reverse | PY Custom Power ±15% | PU4 1 pulse/1000WH | |

ABS DIN RAIL MOUNT CASE D

SCREW MOUNT METAL CASE B

## MODELS OFFERED

**TQH-12:** 1 Phase, 2 Wire – 1 Element
**TQH-13:** 1 Phase, 3 Wire – 2 Element
**TQH-33:** 3 Phase, 3 Wire – 2 Element
**TQH-34:** 3 Phase, 4 Wire – 3 Element

- Accurate measurement of the reactive energy (VAR Hours) of a single phase system with balanced or unbalanced loads.
- The output signals are isolated load independent DC mA or DC Volts, representing the measured value of the active energy (WattHours, forward and reverse).

## FEATURES

- **Uses Time Division Multiplication (TDM) for precision measurement of even distorted signals.**
- **High accuracy ±0.2% of Rated Output (R.O.)**
- **Super high accuracy ±0.1% of Rated Output (R.O.) available as a special order.***
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277) or screw mounting.**
- **Many input and output signal combinations.**

## GENERAL SPECIFICATIONS

| | |
|---|---|
| **Accuracy** | ± 0.2% R.O. Standard for 10 to 100% of rated output |
| | ± 0.1% R.O. (Special Option) |
| **Temp. coefficient** | ≤100ppm/°C of span |
| | ≤60ppm/°C for ambient temperature of 25°C ±10°C |
| **Temp. range** | Storage temperature range -20°C to 60°C (-4°F to 140°F) |
| | Operating temperature range 0°C to 50°C (32°F to 122°F) |
| **Humidity range** | Up to 95% RH non condensing |
| **Isolation** | Between Input/Output/Power/Case |
| **Dielectric test** | DIN-IEC 688 |
| | 2K Vrms/1 min, Between terminal to terminal |
| | 2.8K Vrms/1 min, Between terminal to case |
| **Surge test** | DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 $\mu$s) |
| **Insulation Resistance** | Greater than 100 M Ω at 500V DC |
| **Housing material** | ABS Resin(94V-0) or metal |
| **Mounting** | Screw mount on metal case or Plastic case on DIN Rail 35mm |
| **Auxiliary Power** | AC 115/230V ± 15%, 50/60Hz, 3VA |
| | DC 24V ± 20%(optional) |
| | 125V DC ± 20%(optional) |

## INPUT SPECIFICATIONS

| | |
|---|---|
| **AC Input** | 120V/5A AC, 240V/5A AC. Custom input (600V max /10A AC max) |
| **Frequency** | 60Hz ±3Hz, 50Hz ±3Hz, 400Hz ±3Hz |
| **Burden** | ≤0.2VA per current circuit, ≤0.1VA per voltage circuit. |
| **Response Sensitivity** | ≤0.5% of measuring range to maximum input range |
| **Input Voltage** | 600V AC rms continuous (absolute maximum) |
| **Overload Capacity** | 1.25 times the rated input Voltage continuously. |
| | 2 times the rated input Voltage for 10 secs. |
| | 4 times the rated input Voltage for 5 secs. |
| **Input Current** | 3 times the rated input current continuously. |
| **Overload Capacity** | 10 times the rated input current for 10 secs. |
| | 50 times the rated input current for 1 sec. |
| | 80 times the rated input current for 0.5 secs |

## OUTPUT SPECIFICATIONS

**Output Variables**..... Pulses
**Ripple**..... < 0.5% of rated output. Peak to Peak (maximum)
**Response Time**..... < 400 milliseconds to go from 0 to 99% of output
**Zero Adjustment**..... ± 5% of rated output (minimum)
**Span Adjustment**..... ± 10% of rated output (minimum)

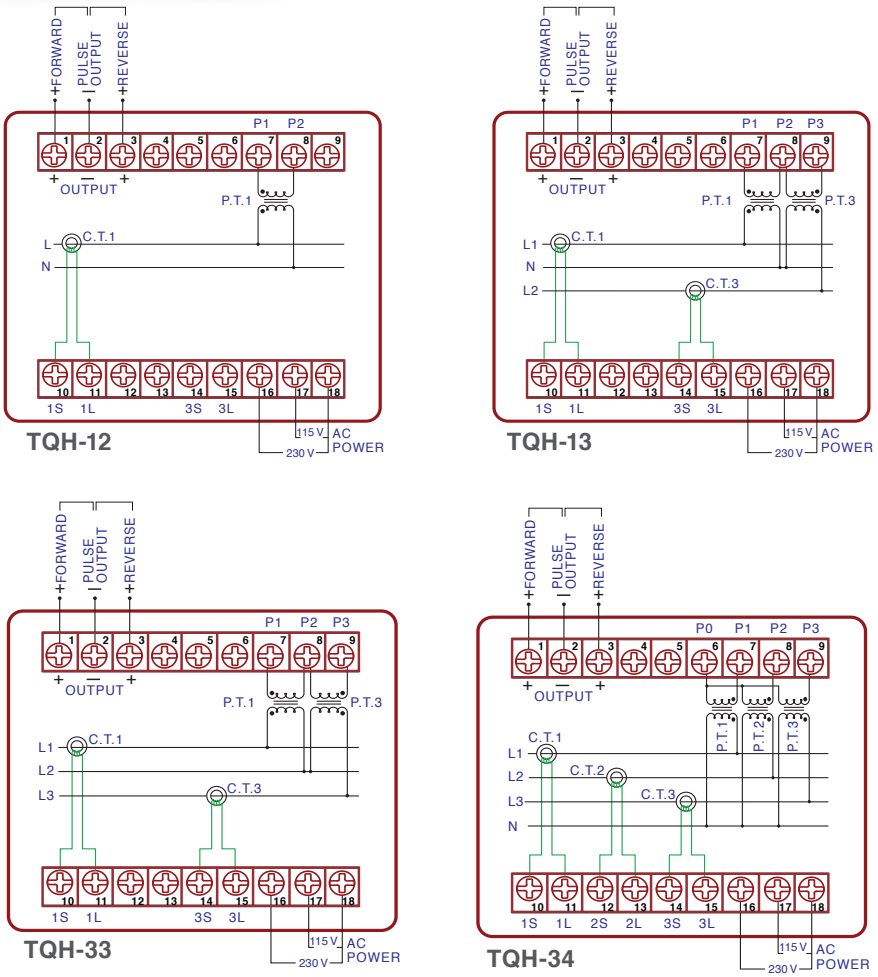
To calculate the actual VARHours for each output pulse, the CT and PT ratios have to be factored in

$$\text{VARHours per Output Pulse} = \frac{\text{(CT Ratio) X (PT Ratio)}}{\text{Nominal Pulses /VARHour}}$$

Calculation example: For Single phase 2 wire, TQH-12
If CT = 200A:5A then CT Ratio = 40 PT is 3300V:110V then PT Ratio = 30

If 1 pulse per VARHour is selected, the output will actually be 1 pulse per 1200 WARHours
If 10 pulse per VARHour is selected, the output will actually be 1 pulse per 120 VARHours
If 100 pulse per VARHour is selected, the output will actually be 1 pulse per 12 VARHours

## CONNECTION DIAGRAM




| Base Model | Accuracy | Input Signal | Input Frequency | Output Signal | Auxiliary Power | Pulse per VARHour | Case |
|---|---|---|---|---|---|---|---|
| | RO2 ±0.25% | SW1 120V/5A AC | HZ6 60Hz | OR1 Reed Relay. Forward only | P1 115/230 VAC ±15% | PU5 1 pulse per VARH | CM Metal |
| | RO3 ±0.1% | SW2 240V/5A AC | HZ5 50Hz | OR2 Reed Relay. Forward + Reverse | P2 24 VDC ±15% | PU6 10 Pulses Per VARH | CP Plastic |
| TQH-12 1 Phase, 1P/2W, 1E, VARhours | | SWY Custom Input | HZ4 400Hz | OC1 Open Collector. Forward only | P3 125 VDC ±15% | PU7 100 pulses per VARH | |
| TQH-13 1 Phase, 1P/3W, 2E, VARhours | | | | OC2 Open Collector. Forward + Reverse | PY Custom Power ±15% | PU8 1 pulse per 1000VARH | |
| TQH-33 3 Phase, 3P/3W, 2E, VARhours | | | | | | | |
| TQH-34 3 Phase, 3P/4W, 3E, VARhours | | | | | | | |

ABS DIN RAIL MOUNT CASE D

SCREW MOUNT METAL CASE B

## MODELS OFFERED

**TQQH-12:** 1 Phase, 2 Wire – 1 Element
**TQQH-13:** 1 Phase, 3 Wire – 2 Element
**TQQH-33:** 3 Phase, 3 Wire – 2 Element
**TQQH-34:** 3 Phase, 4 Wire – 3 Element

- Accurate measurement of the reactive power and reactive energy (VARs and VARHours) of a three phase system with balanced or unbalanced loads.
- The output signals are isolated load independent pulses, representing the measured value of the reactive energy (VARHours, forward and reverse) and DC mA or DC mV for the reactive power (VAR).

## FEATURES

- **Uses Time Division Multiplication (TDM) for precision measurement of even distorted signals.**
- **High accuracy ±0.2% of Rated Output (R.O.)**
- **Super high accuracy ±0.1% of Rated Output (R.O.) available as a special order.***
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277) or screw mounting.**
- **Many input and output signal combinations.**

## GENERAL SPECIFICATIONS

| | |
|---|---|
| **Accuracy** | ± 0.2% R.O. Standard for 10 to 100% of rated output |
| | ± 0.1% R.O. (Special Option) |
| **Temp. coefficient** | ≤100ppm/°C of span |
| | ≤60ppm/°C for ambient temperature of 25°C ±10°C |
| **Temp. range** | Storage temperature range -20°C to 60°C (-4°F to 140°F) |
| | Operating temperature range 0°C to 50°C (32°F to 122°F) |
| **Humidity range** | Up to 95% RH non condensing |
| **Isolation** | Between Input/Output/Power/Case |
| **Dielectric test** | DIN-IEC 688 |
| | 2K Vrms/1 min, Between terminal to terminal |
| | 2.8K Vrms/1 min, Between terminal to case |
| **Surge test** | DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 $\mu$s) |
| **Insulation Resistance** | Greater than 100 M Ω at 500V DC |
| **Housing material** | ABS Resin(94V-0) or metal |
| **Mounting** | Screw mount on metal case or Plastic case on DIN Rail 35mm |
| **Auxiliary Power** | AC 115/230V ± 15%, 50/60Hz, 3VA |
| | DC 24V ± 20%(optional) |
| | 125V DC ± 20%(optional) |

## INPUT SPECIFICATIONS

| | |
|---|---|
| **AC Input** | 120V/5A AC, 240V/5A AC. Custom input (600V max /10A AC max) |
| **Frequency** | 60Hz ±3Hz, 50Hz ±3Hz, 400Hz ±3Hz |
| **Burden** | ≤0.2VA per current circuit, ≤0.1VA per voltage circuit. |
| **Response Sensitivity** | ≤0.5% of measuring range to maximum input range |
| **Input Voltage** | 600V AC rms continuous (absolute maximum) |
| **Overload Capacity** | 1.25 times the rated input Voltage continuously. |
| | 2 times the rated input Voltage for 10 secs. |
| | 4 times the rated input Voltage for 5 secs. |
| **Input Current** | 3 times the rated input current continuously. |
| **Overload Capacity** | 10 times the rated input current for 10 secs. |
| | 50 times the rated input current for 1 sec. |
| | 80 times the rated input current for 0.5 secs |

## OUTPUT SPECIFICATIONS

**Output Variables**..... Pulses (VARHours) and DC mA or DC V (VARs)
**Ripple**..... < 0.5% of rated output. Peak to Peak (maximum)
**Response Time**..... < 400 milliseconds to go from 0 to 99% of output
**Zero Adjustment**..... ± 5% of rated output (minimum)
**Span Adjustment**..... ± 10% of rated output (minimum)

To calculate the actual VARHours and VARs for each output pulse, the CT and PT ratios have to be factored in

**VARs = (CT Ratio) X (PT Ratio) x Nominal Watts**

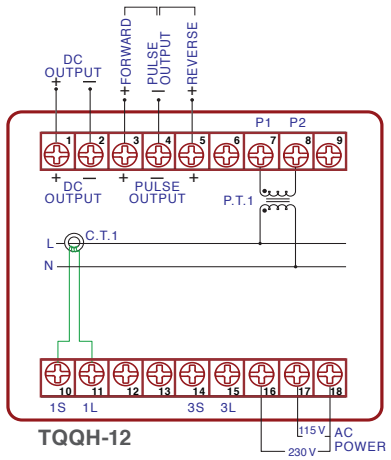
$$\text{VARHours per Output Pulse} = \frac{\text{(CT Ratio) X (PT Ratio)}}{\text{Nominal Pulses /VARHour}}$$

Calculation example: For Single phase 2 wire, TQQH-12
If CT = 200A:5A then CT Ratio = 40 PT is 3300V:110V then PT Ratio = 30

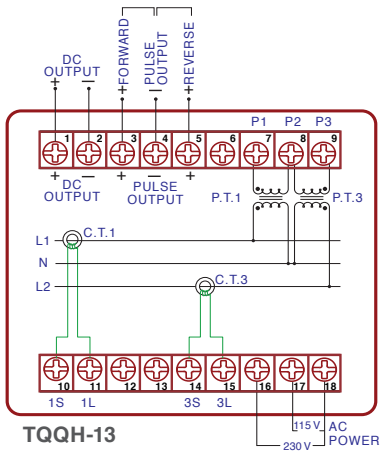
VARs = 30 x 40 x 500 = 600kVAR

If 1 pulse per VARHour is selected, the output will actually be 1 pulse per 1200 VARHours
If 10 pulse per VARHour is selected, the output will actually be 1 pulse per 120 VARHours
If 100 pulse per VARHour is selected, the output will actually be 1 pulse per 12 VARHours

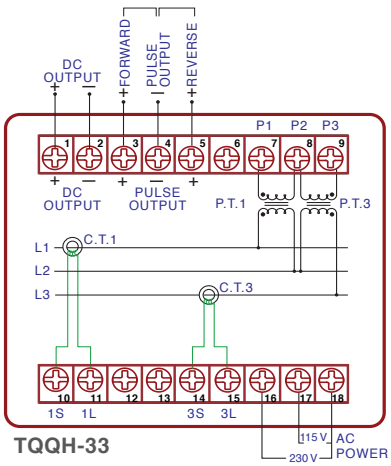
## CONNECTION DIAGRAM



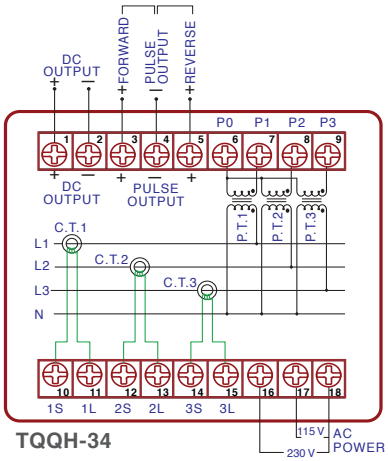
TQQH-12



TQQH-13



TQQH-33



TQQH-34

| Base Model | | Accuracy | | Input Signal | | Input Frequency | | Output Signal | | Auxiliary Power | | Pulse per VARHour | | Case | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TQQH-12 | 1 Phase, 1P/2W, 1E, VAR+VARhours | RO2 | ±0.25% | SW1 | 120V/5A AC | HZ6 | 60Hz | OQR4 | VARs ±1 mA DC<br>VARHr Reed Relay. Forward only | P1 | 115/230 VAC ±15% | PU5 | 1 pulse per VARH | CM | Metal |
| TQQH-13 | 1 Phase, 1P/3W, 2E, VAR+VARhours | RO3 | ±0.1% | SW2 | 240V/5A AC | HZ5 | 50Hz | OQR5 | VARs 12±8mA DC<br>VARHr Reed Relay. Forward and Reverse | P2 | 24 VDC ±15% | PU6 | 10 Pulses Per VARH | CP | Plastic |
| TQQH-33 | 3 Phase, 3P/3W, 2E, VAR+VARhours | | | SWY | Custom Input | HZ4 | 400Hz | OQC4 | VARs ±1 mA DC<br>VARHr Open Collector. Forward only | P3 | 125 VDC ±15% | PU7 | 100 pulses per VARH | | |
| TQQH-34 | 3 Phase, 3P/4W, 3E, VARs+VARhours | | | | | | | OQC5 | VARs 12 ± 8mA DC<br>VARHr Open Collector. Forward + Reverse | PY | Custom Power ±15% | PU8 | 1 pulse per 1000VARH | | |

# AC Power Factor TRANSDUCERS

ABS DIN RAIL MOUNT CASE D

SCREW MOUNT METAL CASE B

## MODELS OFFERED

**TPF-12:** 1 Phase, 2 Wire – 1 Element
**TPF-33:** 3 Phase, 3 Wire – 2 Element
**TPF-34:** 3 Phase, 4 Wire – 3 Element

- Accurate measurement of the Power Factor (Cos ϕ) of a three phase system with balanced or unbalanced loads.
- The output signals are isolated load independent DC mA or DC V, representing the measured value of the Power Factor (Cos ϕ).

## FEATURES

- **Uses Time Division Multiplication (TDM) for precision measurement of even distorted signals.**
- **High accuracy ±0.5% of Rated Output (R.O.).**
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277) or screw mounting.**
- **Many input and output signal combinations.**

## GENERAL SPECIFICATIONS

**Accuracy** ..... ± 0.2% R.O. Standard for 10 to 100% of rated output
± 0.1% R.O. (Special Option)
**Temp. coefficient** ..... ≤100ppm/°C of span
≤60ppm/°C for ambient temperature of 25°C ±10°C
**Temp. range** ..... Storage temperature range -20°C to 60°C (-4°F to 140°F)
Operating temperature range 0°C to 50°C (32°F to 122°F)
**Humidity range** ..... Up to 95% RH non condensing
**Isolation** ..... Between Input/Output/Power/Case
**Dielectric test** ..... DIN-IEC 688
2K Vrms/1 min, Between terminal to terminal
2.8K Vrms/1 min, Between terminal to case
**Surge test** ..... DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 μs)
**Insulation Resistance** ..... Greater than 100 M Ω at 500V DC
**Housing material** ..... ABS Resin(94V-0) or metal
**Mounting** ..... Screw mount on metal case or Plastic case on DIN Rail 35mm
**Auxiliary Power** ..... AC 115/230V ± 15%, 50/60Hz, 3VA
DC 24V ± 20%(optional) 125V DC ± 20%(optional)

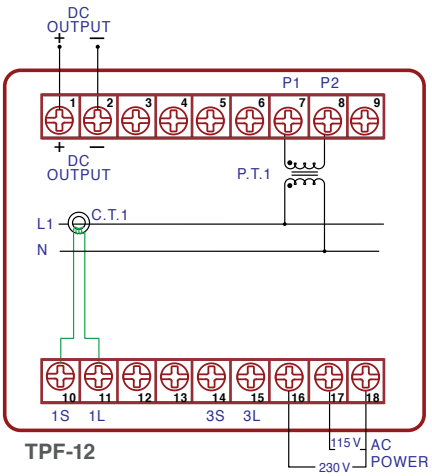
## INPUT SPECIFICATIONS

**Measuring Range** ..... Power Factor
Lead (capacitive) 0.5 …. 1 …. Lag (Inductive) 0.5
**AC Voltage Input** ..... 30 to 600V
**AC Current Input** ..... 0 to 5A AC
**Frequency** ..... 60Hz ±3Hz, 50Hz ±3Hz, 400Hz ±3Hz
**Burden** ..... ≤0.2VA per current circuit, ≤0.1VA per voltage circuit.
**Response Sensitivity** ..... ≤0.5% of measuring range to maximum input range
**Input Voltage** ..... 600V AC rms continuous (absolute maximum)
**Overload Capacity** 1.25 times the rated input Voltage continuously.
2 times the rated input Voltage for 10 secs.
4 times the rated input Voltage for 5 secs.
**Input Current** ..... 3 times the rated input current continuously.
**Overload Capacity** 10 times the rated input current for 10 secs.
50 times the rated input current for 1 sec.
80 times the rated input current for 0.5 secs

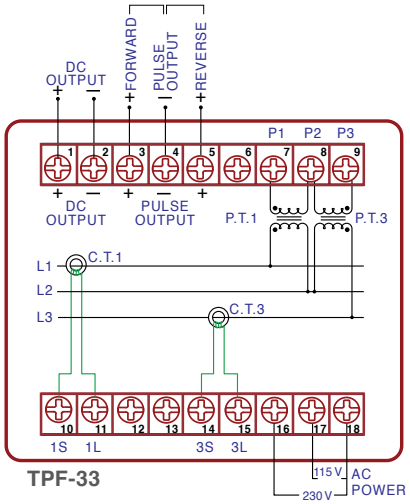
## OUTPUT SPECIFICATIONS

**Output Variables**..... DCmA or DCV (Power Factor. Cos ϕ)
**Ripple**..... < 0.5% of rated output. Peak to Peak (maximum)
**Response Time**..... < 400 milliseconds to go from 0 to 99% of output
**Zero Adjustment**..... ± 5% of rated output (minimum)
**Span Adjustment**..... ± 10% of rated output (minimum)

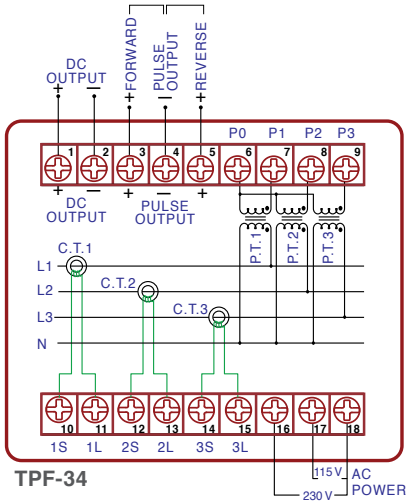
## CONNECTION DIAGRAM




TPF-12




TPF-33




TPF-34

| Base Model | |
|---|---|
| TPF-12 | 1 Phase, 1P/2W, 1E, Power Factor |
| TPF-33 | 3 Phase, 3P/3W, 2E, Power Factor |
| TPF-34 | 3 Phase, 3P/4W, 3E, Power Factor |

| Accuracy | |
|---|---|
| RO6 | ±0.5% |
| RO5 | ±0.3% |

| Input Signal | |
|---|---|
| SW1 | 120V/5A AC |
| SW2 | 240V/5A AC |
| SWY | Custom Input |

| Input Frequency | |
|---|---|
| HZ6 | 60Hz |
| HZ5 | 50Hz |
| HZ4 | 400Hz |

| Output Signal | |
|---|---|
| OPF1 | ±1 mA DC, 0-1-0 PF |
| OPF2 | 4 to 20mA DC 0-1-0 PF |
| OPFA | ±1 mA DC, 0.5 - 1 - 0.5 PF |
| OPFB | 4 to 20mA DC 0.5 - 1 - 0.5 PF |

| Auxiliary Power | |
|---|---|
| P0 | Single Powered |
| P1 | 115/230V AC ±15% |
| P2 | 24V DC ±15% |
| P3 | 125V DC ±15% |
| PY | Custom Power ±15% |

| Input/Output Relationship | |
|---|---|
| LG | LAG = + Polarity |
| LD | LEAD= +Polarity |

| Case | |
|---|---|
| CM | Metal |
| CP | Plastic |


ABS DIN RAIL MOUNT CASE D


SCREW MOUNT METAL CASE B

## MODELS OFFERED

**TF-1:** Frequency

- Accurate measurement of the Frequency of a single or three phase system with balanced or unbalanced loads.
- The output signals are isolated load independent DC mA or DC V, representing the measured value of the Frequency.

## FEATURES

- **High accuracy ±0.05% of Rated Output (R.O.).**
- **Frequency range from 45 Hz to 10KHz.**
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277) or screw mounting.**
- **Many input and output signal combinations.**

## GENERAL SPECIFICATIONS

**Accuracy** ..... ± 0.2% R.O. Standard for 10 to 100% of rated output
± 0.1% R.O. (Special Option)

**Temp. coefficient**..... ≤100ppm/ºC of span
≤60ppm/ºC for ambient temperature of 25ºC ±10ºC

**Temp. range** ..... Storage temperature range -20ºC to 60ºC (-4ºF to 140ºF)
Operating temperature range 0ºC to 50ºC (32ºF to 122ºF)

**Humidity range** ..... Up to 95% RH non condensing

**Isolation**..... Between Input/Output/Power/Case

**Dielectric test**..... DIN-IEC 688
2K Vrms/1 min, Between terminal to terminal
2.8K Vrms/1 min, Between terminal to case

**Surge test**..... DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 $\mu$s)

**Insulation Resistance** ..... Greater than 100 M Ω at 500V DC

**Housing material** ..... ABS Resin(94V-0) or metal

**Mounting** ..... Screw mount on metal case or Plastic case on DIN Rail 35mm

**Auxiliary Power**..... AC 115/230V ± 15%, 50/60Hz, 3VA
DC 24V ± 20%(optional) 125V DC ± 20%(optional)

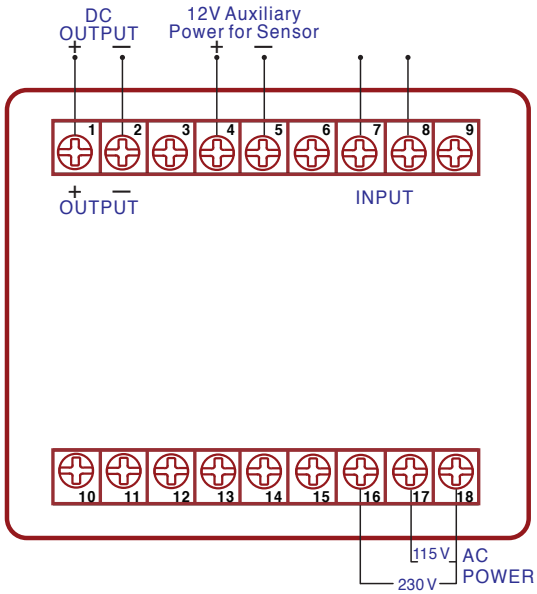
## INPUT SPECIFICATIONS

**AC Voltage Input range.....** 2V to 200V AC or 30 to 600V AC
**Frequency .....** 60Hz ±3Hz, 50Hz ±3Hz, 400Hz ±3Hz
**Burden.....** ≤0.2VA per current circuit, ≤0.1VA per voltage circuit.
**Response Sensitivity.....** ≤0.5% of measuring range to maximum input range
**Input Voltage.....** 600V AC rms continuous (absolute maximum)
**Overload Capacity** 1.25 times the rated input Voltage continuously.
2 times the rated input Voltage for 10 secs.
4 times the rated input Voltage for 5 secs.

## OUTPUT SPECIFICATIONS

**Output Variables.....** DCmA or DCV
**Ripple.....** < 0.5% of rated output. Peak to Peak (maximum)
**Response Time.....** < 400 milliseconds to go from 0 to 99% of output
**Zero Adjustment.....** ± 5% of rated output (minimum)
**Span Adjustment.....** ± 10% of rated output (minimum)
**Load Resistance.....** 10 kΩ maximum for 0 to 1mA output
500 Ω maximum for 4 to 20mA output
500 Ω minimum for 0 to 10V output

## CONNECTION DIAGRAM




| Base Model | | Accuracy | | Input Signal | | Input Frequency | | Output Signal | | Auxiliary Power | | Case | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TF-1 | 1 Phase, 1P/2W, Frequency | RO7 | ±0.1% | SF1 | 80V to 600V AC | HZ2 | 45Hz to 55Hz | OHZ1 | 0 to 1 mA DC | P1 | 115/230 VAC ±15% | CM | Metal |
| | | RO4 | ±0.05% | SF2 | 2V to 30V AC/DC | HZ3 | 55Hz to 65Hz | OHZ2 | 4 to 20mA DC | P2 | 24 VDC ±15% | CP | Plastic |
| | | | | | | HZ1 | 45Hz to 65Hz | OHZ4 | 0±1mA DC | P3 | 125 VDC ±15% | | |
| | | | | | | HZY | Custom input Fq range | OHZY | Custom Output | PY | Custom Power ±15% | | |

# DC Volts or mA TRANSMITTER ISOLATOR


## MODELS OFFERED

**TD-1:** DC Volts or mA

- The DC to DC Isolation Transmitter can receive various DC Voltage or Current signals and can output desired voltage or current signals isolated from each other

## FEATURES

- **High accuracy ±0.2% of Rated Output (R.O.)**
- **High immunity to external noise.**
- **Quick and easy mounting to 35mm DIN Rail (DIN46277)**
- **Many input and output signal combinations**

## GENERAL SPECIFICATIONS

| | |
|---|---|
| **Accuracy** | ± 0.1% R.O. |
| **Temp. coefficient** | ≤100ppm/ºC of span |
| | ≤60ppm/ºC for ambient temperature of 25ºC ±10ºC |
| **Temp. range** | Storage temperature range -20ºC to 60ºC (-4ºF to 140ºF) |
| | Operating temperature range 0ºC to 50ºC (32ºF to 122ºF) |
| **Humidity range** | Up to 95% RH non condensing |
| **Isolation** | Between Input/Output/Power/Case |
| **Dielectric test** | DIN-IEC 688 |
| | 2K Vrms/1 min, Between terminal to terminal |
| | 2.8K Vrms/1 min, Between terminal to case |
| **Surge test** | DIN-IEC 255-4, ANSI C37 90a/1974 5KV(1.2x50 μs) |
| **Insulation Resistance** | Greater than 100 M Ω at 500V DC |
| **Housing material** | ABS Resin(94V-0) or metal |
| **Mounting** | Screw mount on metal case or Plastic case on DIN Rail 35mm |
| **Auxiliary Power** | AC 115/230V ± 15%, 50/60Hz, 3VA |
| | DC 24V ± 20%(optional) |
| | 125V DC ± 20%(optional) |

## INPUT SPECIFICATIONS

**DC Voltage** ..... 0 to 600V

**DC Current** ..... for current input can be obtained from shunt

## OUTPUT SPECIFICATIONS

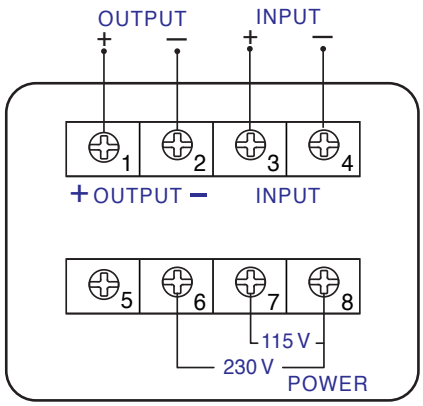
**Output Variables**..... DC Voltage (0~10V)
DC Current (0~20mA)

**Response Time**..... < 400 milliseconds to go from 0 to 99% of output

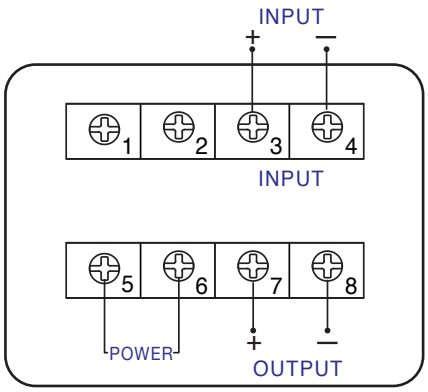
**Zero Adjustment**..... ± 5% of rated output (minimum)

**Span Adjustment**..... ± 10% of rated output (minimum)

## CONNECTION DIAGRAM




Metal Case




Plastic Din Rail

| Base Model | |
|---|---|
| TD-1 | DC Volts or mA |

| Accuracy | |
|---|---|
| RO7 | ±0.1% |

| Input Signal | |
|---|---|
| SD1 | 0 to 1mA DC |
| SD2 | 4 to 20mA DC |
| SD3 | 0 to 1V DC |
| SD4 | 0 to 10V DC |
| SDY | Custom Input (600V max) |

| Output Signal | |
|---|---|
| OD1 | 0 to 1mA DC |
| OD2 | 4 to 20mA DC |
| OD3 | 0 to 10VDC |
| ODY | Custom Output |

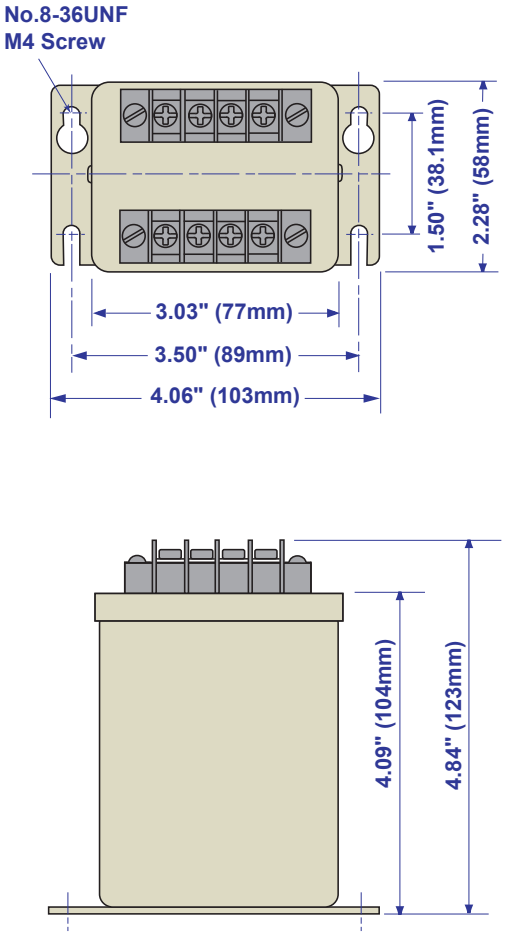
| Auxiliary Power | |
|---|---|
| P1 | 115/230 VAC ±15% |
| P2 | 24 VDC ±15% |
| P3 | 125 VDC ±15% |
| PY | Custom Power ±15% |

| Case | |
|---|---|
| CM | Metal |
| CP | Plastic |

## CASE DIMENSIONS

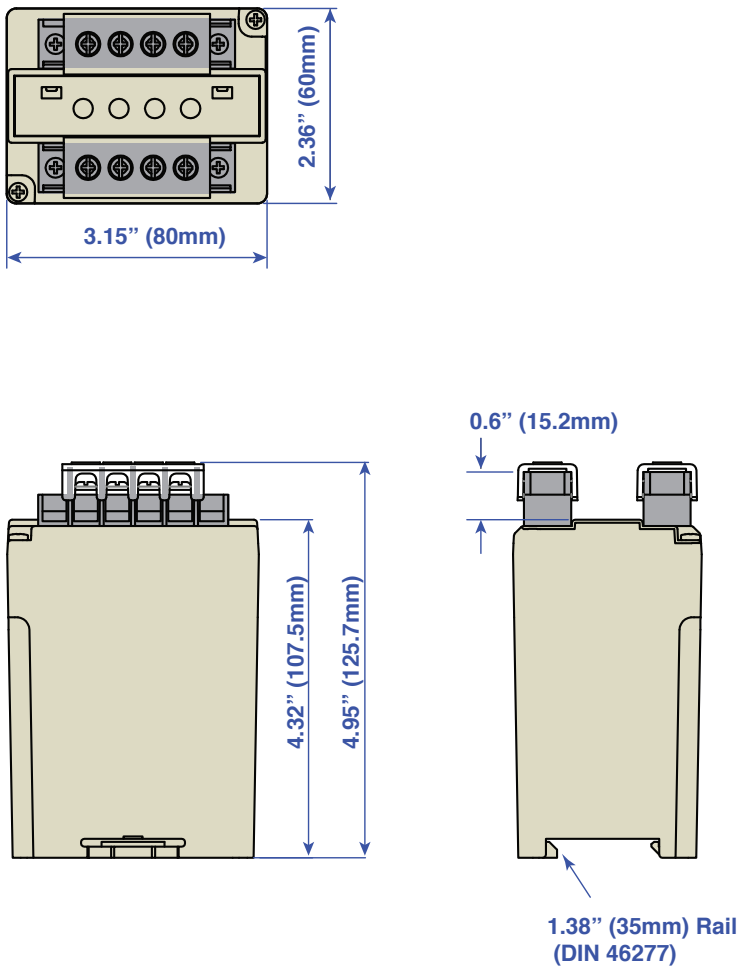
### Case A

**Metal Case, Screw Mounting**




### Case C

**Fire Retardant, ABS Case**
**DIN Rail Mounting**

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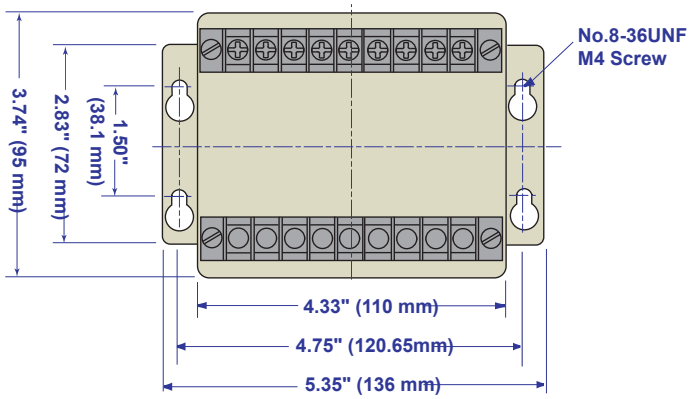
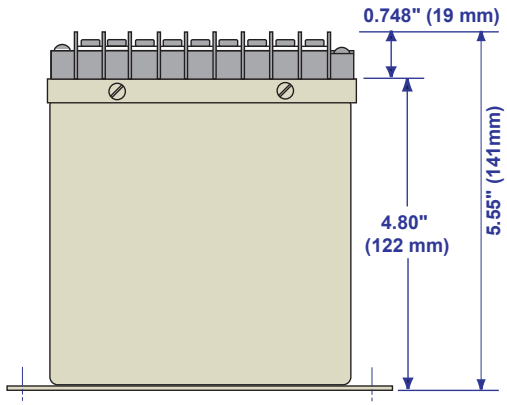
## CASE DIMENSIONS

## Case B

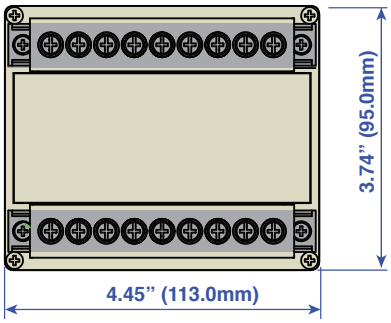
**Metal Case, Screw Mounting**

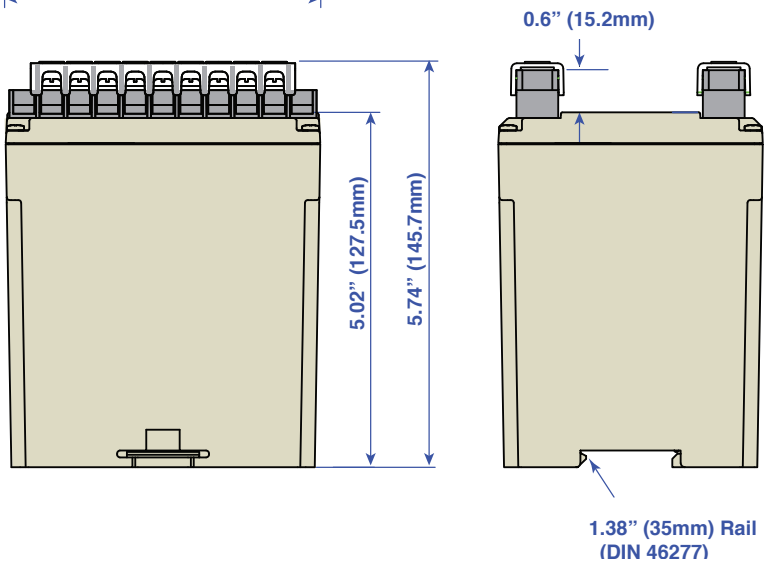



## Case D

**Fire Retardant, ABS Case**
**DIN Rail Mounting**

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