Theta 30P power transducer is a compact, multi-function panel mount power quality monitor, which measures, calculates and displays major electrical parameters of three phase power system

## Special Features

True RMS measurement

Fully on-site programmable input voltage range & input current range

On-site Configurable as Active / Reactive / Apparent Power Transducer / Phase Angle / Power Factor

On-site selectable output type (DC current / DC voltage)

Single or Dual output

Accuracy Class 0.2 ( IEC / EN 60688) for Power

Accuracy Class 0.5 ( IEC / EN 60688) for Phase Angle / Power Factor

Seven Segment LCD Display

RS-485 (Modbus) Communication

## Application

The Transducer is used to measure and convert  active, reactive, apparent power, Phase angle & Power Factor of a Single phase or three-phase AC system with balanced or unbalanced load into a proportional load independent DC current or voltage output signal.

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## Features

| | | | | |
|---|---|---|---|---|
| Measuring Input | AC Voltage / Current signal, sine wave or distorted wave form. | LED Indication | LED indication for power on and output type. (Current output : Red LED, Voltage output : Green LED) |
| Analog Output (Single or dual) | Isolated analog output which can be set onsite to either voltage or current output | Display Module (Optional) | Optional 7 segment LCD display with backlit & keypad. For displaying measured parameters & onsite configuration of Input / Output |
| Accuracy | Output signal accuracy class 0.2 as per International Standard IEC/EN 60 688. | Rs485 Communication (Optional) | Optional RS485 communication is available. For reading measured parameters & onsite configuration of Input / Output. |
| Programmable Input / Output | The Transducer can be programmed onsite using front key & display or through programming port (COM) or through RS-485. | | |

## Technical Specifications

**Accuracy ( Acc. to IEC / EN 60688)**

| Reference Value | Output end Value Y2 (Voltage or Current) |
|---|---|
| Basic Accuracy for Power Transducer | $0.2 * C$ |
| Basic Accuracy for Phase Angle & Power Factor Transducer | $0.5 * C$ |
| Factor C (The highest value applies if calculated C is less than 1, then C=1 applies) | |

Linear characteristics

$$C = \frac{1 - \frac{Y0}{Y2}}{1 - \frac{X0}{X2}} \text{ or } C = 1$$

Bent characteristics

For $X0 \leq X \leq X1$ $\quad C = \frac{Y1 - Y0}{X1 - X0} \cdot \frac{X2}{Y2}$ or C=1

For $X1 \leq X \leq X2$ $\quad C = \frac{1 - \frac{Y1}{Y2}}{1 - \frac{X1}{X2}}$ or C=1

## Symbols and their meanings

| | |
|---|---|
| X | Input Active / Reactive / Phase Angle / Power Factor |
| X0 | Start value of input |
| X1 | Elbow value of input |
| X2 | End value of input |
| Y | Output DC Voltage / DC Current |
| Y0 | Start value of output DC Voltage / DC Current |
| Y1 | Elbow value of output DC Voltage / DC Current |
| Y2 | End value of output DC Voltage / DC Current |
| RN | Rated value of output burden |
| FN | Nominal Frequency |

**Reference conditions for Accuracy**
Power factor

| Ambient temperature | 23°C +/- 1°C |
|---|---|
| Pre-conditioning | 30 min acc. to IEC / EN 60688 |
| Input Variable | Voltage Rated / Current Rated |
| Input waveform | Sinusoidal, Form Factor 1.1107 |
| Input signal frequency | 50 or 60Hz |
| Active / reactive factor | Cos Φ =1 resp. Sin Φ = 1 |
| Phase Angle & Power Factor Transducer Reference Value for Phase Angle = 90° resp. For Power Factor = 0.5 | |

**Reference conditions for Accuracy**

| Output Load | Rn = 7.5 V / Y2 ± 1% | With DC current output signal |
|---|---|---|
| | Rn = Y2 / 1 mA ± 1% | With DC voltage output signal |
| Miscellaneous | Acc. to IEC / EN 60688 | |

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## Technical Specifications

### Nominal Voltage Input (U$_N$)

| | |
|---|---|
| Nominal input Voltage (PT Secondary range) AC RM5 | 100V ≤ UN ≤ 500 VL-L |
| PT Primary range | 100V to 692 kVL-L |
| Nominal Frequency FN | 25.....60 Hz |
| Nominal input Voltage burden | < 0.6 VA per phase at UN |
| Overload Capacity | 1.2 * UN continuously, 2* UN for 1 second, repeated 10 times at 10 minutes intervals (UN maximum 300V with power supply powered from measuring input) |

### Nominal Current Input (I$_N$)

| | |
|---|---|
| Nominal input Current IN (AC RMS) (CT Secondary range) | 1 A ≤ IN ≤ 5 A |
| CT Primary range | 1 A to 9999 A |
| Nominal Frequency FN | 45.....66 Hz |
| Nominal input Current burden | < 0.2 VA per phase at IN |
| Overload Capacity | 1.2 * IN continuously, 10* IN for 3 seconds, repeated 5 times at 5 minutes intervals. 50* IN for 1 second, repeated 1 time at 1 hour interval (max 250 A). |

### Auxiliary Power Supply

| | |
|---|---|
| AC/DC Auxiliary Supply | 60V . . . 300 VAC-DC ± 5% or 24V . . . 60 VAC-DC ± 10% |
| AC Auxiliary supply frequency range | 40 to 65 Hz |
| Auxiliary supply consumption | |
| 60V...300 VAC-DC | ≤ 8VA for Single output ≤ 10VA for Dual output |
| 24V...60 VAC-DC | ≤ 5 VA for Single output ≤ 6 VA for Dual output |

### Measured Parameter ⊕→

| |
|---|
| Active Power / Reactive Powew / Apparent Power / Phase Angle / Power Factor |

### Additional Error

| | |
|---|---|
| Temperature influence | ± 0.2% /10°C |

### Phase Angle & Power Factor measurinf tange

| |
|---|
| Minimum span 20° to Maximum Span 360° |

### Allowed mesuring range & values X2 (callibration factor Xc)

| | |
|---|---|
| With single phase AC active / reactive / apparent power | $0.30 \leq (X2 / \text{Rated Power}) \leq 1.3 \cdot UN / \sqrt{3} \cdot IN$ |
| With three phase AC active / reactive / apparent power | $0.30 \leq (X2 / \text{Rated Power}) \leq 1.3 \cdot \sqrt{3} \cdot UN \cdot IN$ |
| For single phase Rated Power = $UN / \sqrt{3} \cdot IN$ | |
| For three phase Rated Power = $\sqrt{3} \cdot UN \cdot IN$ | |

### Measuring Output Y( Single or Optional Dual) ↻→

| | |
|---|---|
| Output type | Load independent DC Voltage or DC Current (Onsite selectable through DIP switches & programming.) |
| Load independent DC output (Y) | Unipolar 0…20mA / 4…20mA OR 0…10V |
| | Bipolar -20mA...0... +20mA OR -10V...0…+10V |
| Output burden with DC current output Signal | 0 ≤ R ≤ 15V/Y2 |
| Output burden with DC voltage output Signal | Y2 / (2 mA) ≤ R ≤ ∞ |
| Current limit under overload R=0 | ≤ 1.25 * Y2 with current output ≤ 100 mA with voltage output |
| Voltage limit under R=∞ | < 1.25 * Y2 with voltage output ≤ 30 V with current output |
| Residual Ripple in Output signal | ≤ 1% pk-pk |
| Response Time | <750 msec |

### Influence of Variations

| | |
|---|---|
| As per IEC / EN 60688 standard. Output stability | < 30min |

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### Technical Specifications

## Network Type Supported by Power Transducer

| |
|---|
| Single phase / <br> 3 phase 3 wire unbalanced / 3 phase 4 wire unbalanced / <br> 3 phase 3 wire balanced     / 3 phase 4 wire balanced |

## Network Type Supported by Power Factor  & Phase Angle

| |
|---|
| Single phase / (U12 I1) 3 phase balanced  load / <br> (U13 I1) 3 phase balanced  load / <br> (U23 I1) 3 phase balanced  load / <br> 3 phase 3 wire balanced  / 3 phase 4 wire balanced |

## Safety

| | |
|---|---|
| Protection Class | II (Protection Isolated, EN 61010) |
| Protection | IP 40, housing according to EN 60 529 <br> IP 20 ,terminal according to EN 60 529 |
| Pollution degree | 2 |
| Installation Category | III |
| Insulation Voltage | 1min. ( EN 61010-1) <br> 7700VDC, Input versus outer surface <br> 5200VDC, Input versus all other circuits <br> 5200VDC, Auxiliary supply versus outer surface and output <br> 690VDC,   Output versus output versus each other versus outer surface. |

## Installation Data

| | |
|---|---|
| Mechanical Housing | Lexan 940 (polycarbonate) <br> Flammability Class V-o acc to <br> UL 94, self extinguishing, <br> non dripping, free of halogen <br> with indirect wire pressure |
| Mounting position | Rail mounting / Wall mounting |
| Weight | Approx, 0.4 kg |

## Connection Terminal

| | |
|---|---|
| Connection Element | Conventional Screw type terminal <br> with indirect wire pressure |
| Mounting position | Rail mounting / Wall mounting |
| Weight | Approx, 0.4 kg |
| Permissible cross section of the connection lead | $\leq 4.0$ mm$^2$ single wire or <br> 2 x 2.5 mm$^2$ fine wire |

## LED Indication

| | | |
|---|---|---|
| ON LED | Aux.supply healthy condition | Green LED continuous ON |
| O/P1 LED | Output1 voltage selection <br> Output1 Current selection | Green LED continuous ON <br> Red LED continuous ON |
| O/P1 LED | Output2 voltage selection <br> Output2 Current selection | Green LED continuous ON <br> Red LED continuous ON |

## Ambient tests

| | |
|---|---|
| EN 60 068-2-6 | Vibration |
| Acceleration | ± 2 g |
| Frequency range | 10....150...10Hz, rate of frequency sweep: 1 octave/minute |
| Number of cycles | 10, in each of the three axes |
| EN 60 068-2-7 | Shock |
| Acceleration | 3 x 50g <br> 3 shocks in each direction |
| EN 60 068-2-1/-2/-3 | Cold, Dry, Damp heat |
| IEC 61000-4-2/-3/-4/-5/-6 <br> EN 55 011 | Electromagnetic compatibility |

## Environmental

| | |
|---|---|
| Operating  temperature | 0°C ...  23°C ... 45°C <br> (usage group II) |
| Storage temperature | -40°C to 70°C |
| Relative humidity of annual mean | ≤ 75% |
| Altitude | 2000m max |

## Electrical Connections

| Connection | Terminal details | |
|---|---|---|
| Measuring  Voltage <br> EN 55-011 | UL1 <br> UL2 <br> UL3 <br> N | 2 <br> 5 <br> 8 <br> 11 |
| Auxilliary Power supply | ~,+ <br> ~,- | 13 <br> 14 |
| Measuring output - 1 | + <br> - | 15 <br> 16 |
| Measuring Current Input | I1 <br> I1" <br> I2 <br> I2" <br> I3 <br> I2" | 1 <br> 3 <br> 4 <br> 6 <br> 7 <br> 9 |
| Measuring output - 2 | + <br> - | 17 <br> 18 |

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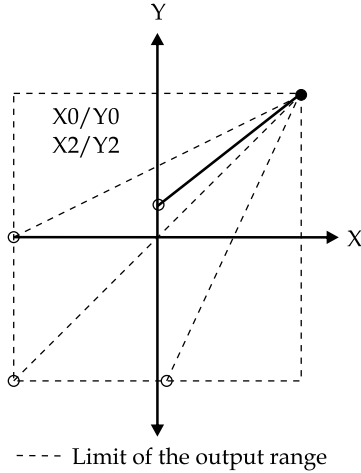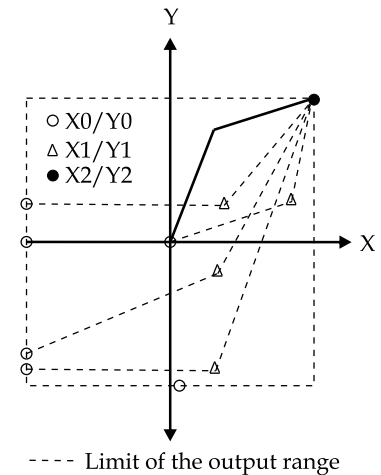Page 4 (8)

## Output Characteristics

Example of setting with Linear Characteristics
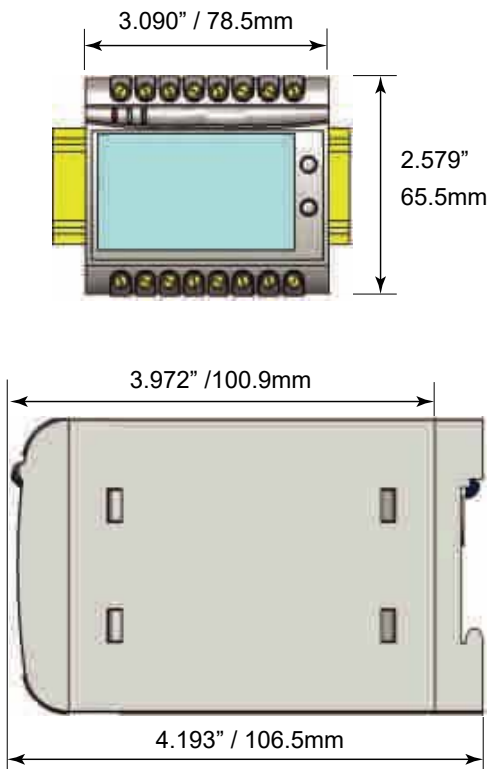


X0 = Start value of input

Y0 = Start value of output

X1 = Elbow value of input

Y1 = Elbow value of output

X2 = End value of input

Y2 = End value of output

Note: End value(Y2) of output

cannot be changed onsite

Example of setting with bent Characteristics



- - - - Limit of the output range

## Dimensions



3.090" / 78.5mm

2.579"
65.5mm

3.972" /100.9mm

4.193" / 106.5mm

## Technical Details

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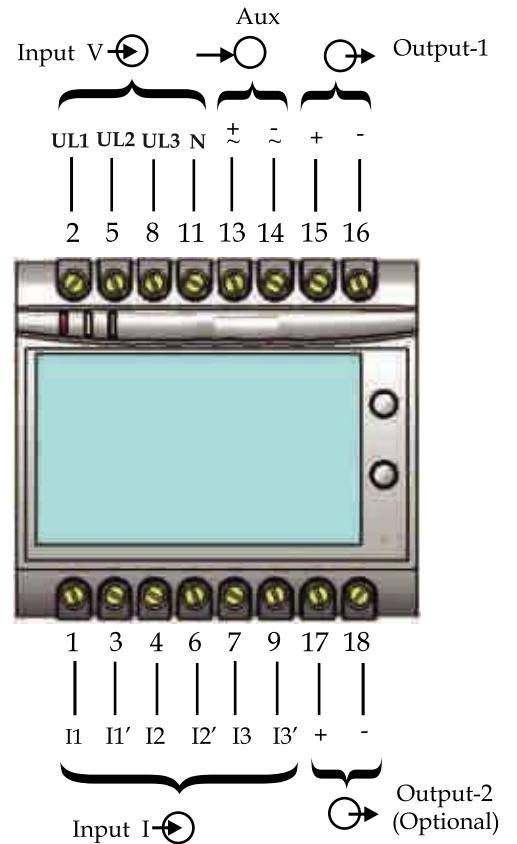
### Electrical Networks

| | |
|---|---|
| **3 Phase 4 Wire Unbalanced Load** |  |
| **3 Phase 3 Wire Unbalanced Load** |  |
| **3 Phase 4 Wire Balanced Load** |  |
| **3 Phase 3 Wire Balanced Load** |  |
| **1 Phase 2 Wire** |  |
| **U12 I1 3 Phase Balanced Load** |  |
| **U13 I1 3 Phase Balanced Load** |  |
| **U23 I1 3 Phase Balanced Load** |  |

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## Programming

| Programming of transducer can be done in three ways | 1) Programming Via Front LCD & two keys.<br>2) Programming Via optional RS-485(MODBUS) communication port. (Device address, PT Ratio, CT Ratio, Transducer type, Password, communication parameter, Output Type & simulation mode can be programmed).<br>3) Programming Via Programming port using optional PR-KAB is available |
|---|---|
| Programming Via Programming port (COM) | A PC with RS 232 C interface along with the programming cable PRKAB 601 and the configuration software are required to program the transducer. |

| The connections between | PC ⟷ PRKAB 601 ⟷ Theta 30P Transducer<br>The power supply must be applied to Transducer befor it can be programmed.<br><br>The Configuration software is supplied on a CD. The programming cable PRKAB 601 adjusts the signal level and provides the electrical insulation between the Transducers. |
|---|---|
| Configuring Rish Con Transducer | To Configure the Transducer Input / Output one of the tree programming methods can be adapted along with mechanical switch setting (DIP switch setting on PCB). |
| DIP Switch Setting for OUTPUT | Type of output (current or voltage signal) has to be set by DIP switch<br>For programming of DIP switch the user needs to open the transducer housing & set the DIP switch located on PCB to the desired output type Voltage or Current.<br>Output range changing is not possible with DIP switch setting<br><br>Reder below for DIP switch setting. |



Power supply

Transducer

Programming connector

Transducer Programing cable

PRKAB 601

Software CD
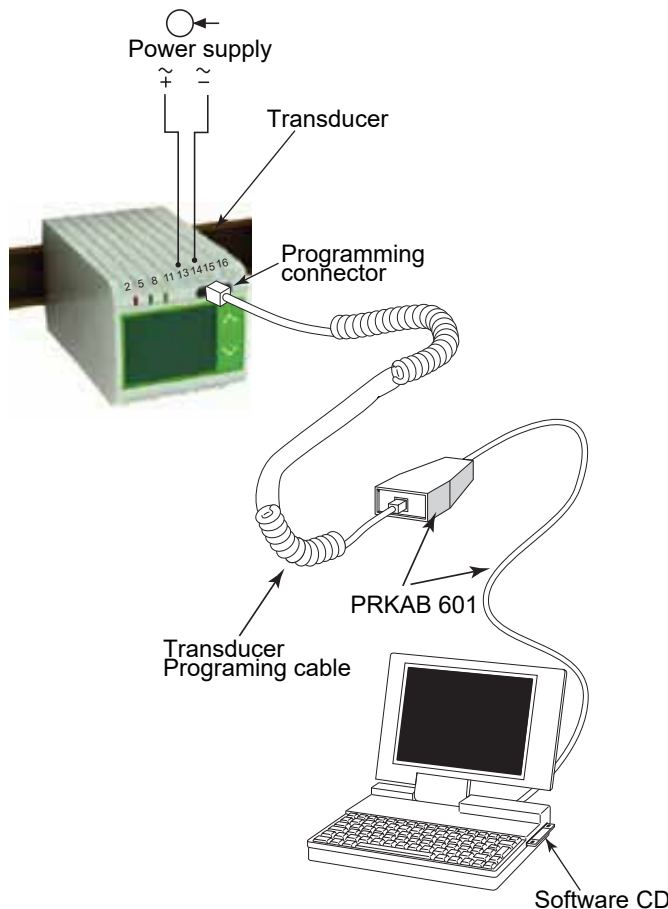
**The four pole DIP switch is located on the PCB in the Transducer**

| DIP Switch Setting | Type of Output Signal |
|---|---|
| ON ▮▮▮▮ 1234 | load-independent current |
| ON ▮▮▮▮ 1234 | load-independent voltage |

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## Ordering Information

| Product Code | TT30- | | X | X | XX | XX | X | X | X | X | X | 00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Product Type | Active Power Active | P | | | | | | | | | | |
| | Peactive Power Peactive | Q | | | | | | | | | | |
| | Apparent Power Apparent | S | | | | | | | | | | |
| System Type | 1P2W | | 1 | | | | | | | | | |
| | 3WUB | | 2 | | | | | | | | | |
| | 4WUB | | 3 | | | | | | | | | |
| | 4WB | | 4 | | | | | | | | | |
| | 3WB | | 5 | | | | | | | | | |
| | 3WB-U12 | | 6 | | | | | | | | | |
| | 3WB-U13 | | 7 | | | | | | | | | |
| | 3WB-U23 | | 8 | | | | | | | | | |
| Input Range | 100-500V | | | | 8F | | | | | | | |
| Input Current | 1/5A | | | | | 75 | | | | | | |
| Power Supply | 60-300U | | | | | | H | | | | | |
| | 24-60U | | | | | | F | | | | | |
| Output | 1O / P 10 | | | | | | | 1 | | | | |
| | 2O / P 20 | | | | | | | 2 | | | | |
| Display Module | With Display | | | | | | | | D | | | |
| | Without Display WD | | | | | | | | Z | | | |
| RS485 Module | With RS-485 485 | | | | | | | | | R | | |
| | Without RS-485 | | | | | | | | | Z | | |
| Prog. Cable | With PRKAB 601 PRK | | | | | | | | | | C | |
| | Without PRKAB 601 | | | | | | | | | | Z | |