Technical Data Sheet

# *Theta 20A / 20V*

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File No. E471457




*Theta 20A / 20V* is used to measure and convert AC Voltage or Current input into a load independent DC current or voltage output signal.

## Special Features

- **True RMS** measurement
- Available in Single or Dual output type
- Onsite selectable output type (DC current / DC voltage)
- Accuracy class 0.2 (IEC/ EN 60 688)
- Seven Segment LCD Display
- RS-485(Modbus) Communication
- Output Response Time < 400 msec

## Application

*Theta 20A/20V* The is used to measure and convert AC Voltage or Current input into a load independent DC current or voltage output signal Output signal generated is proportional to the root mean square value of the input Current or Voltage.

## Product Features

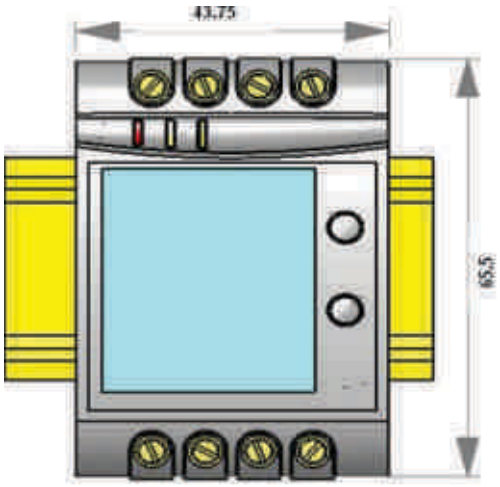
| | |
|---|---|
| **Measuring Input** | AC Voltage/ Current input signal , sine wave or distorted wave form. |
| **Analog Output (Single or dual)** | Isolated analog output which can be set onsite to either voltage or current output. |
| **Accuracy** | Output signal accuracy **class 0.2** as per International Standard **IEC/EN 60 688**. |
| **Programmable Input / Output** | The Transducer can be programmed onsite using front key & display or through programming port (COM) or through RS-485. |

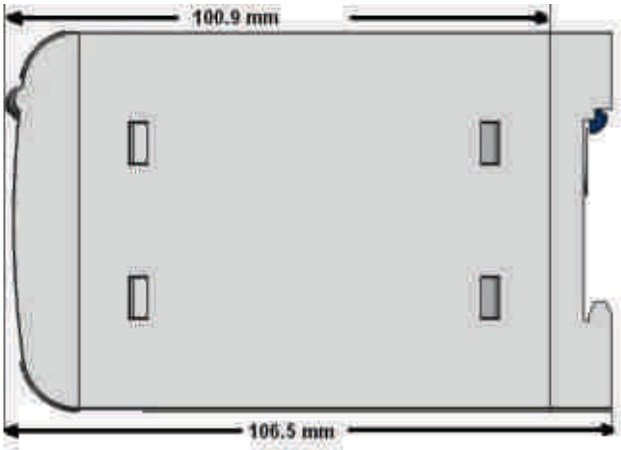
| | |
|---|---|
| **LED Indication** | LED indication for power on and output type. (Current output : Red LED, Voltage output : Green LED) |
| **Display Module** | Optional 7 segment LCD display with backlit & keypad. For displaying measured parameters & onsite configuration of Input/output. |
| **RS485 Communication (Optional)** | Optional RS485 communication is available. For reading measured parameters & onsite configuration of input/output. |

## Symbols and their meanings

| | |
|---|---|
| **X** | Input AC Voltage / AC Current |
| **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 |

## Dimensions




## Technical Specifications

| Reference conditions for Accuracy | |
|---|---|
| Pre-conditioning | 30 min acc. to IEC / EN 60 688 |
| Input Variable | Rated Voltage / Rated Current |
| Input waveform | Sinusoidal, Form Factor 1.1107 |
| Input signal frequency | 50 or 60Hz |
| Auxiliary supply voltage | At nominal range |
| Output Load | Rn = 7.5 V / Y2 ± 1%<br>With DC current output signal<br>Rn = Y2 / 1 mA ± 1%<br>With DC voltage output signal |
| Miscellaneous | Acc. to IEC / EN 60 688 |

# Technical Specifications

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

| | |
|---|---|
| Reference Value | Output end Value Y2 (Voltage or Current) |
| Basic Accuracy | 0.2 * 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 $C=1$

## Installation Data

| | |
|---|---|
| Mechanical Housing | Lexan 940 (polycarbonate) Flammability Class V-0 acc. To UL 94, self extinguishing, non dripping, free of halogen |
| Mounting position | Rail mounting / wall mounting |
| Weight | Approx. 0.4kg |

## Auxiliary Power Supply

| | |
|---|---|
| AC/DC Auxiliary Supply | 60V… 300 VAC-DC ± 5% or 24... 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 |

## Current Transducer (Theta 20A)

| | |
|---|---|
| Nominal input Current $I_N$ (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 at IN |
| Overload Capacity | 1.2 * $I_N$ continuously,<br>10* $I_N$ for 3 second, repeated<br>5 times at 5 minute intervals.<br>50* $I_N$ for 1 second, repeated<br>1 time at 1 hour interval(max 250 A). |
| No need of external potentiometer. User can set full scale output for desired input with the help of programmable CT secondary. | |

## Additional Error

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

## Measuring Input X

**Voltage Transducer** (Theta 20**V**)

| | |
|---|---|
| Nominal input Voltage UN (AC RMS) (PT Secondary range) | 57V ≤ UN ≤ 500 V |
| PT Primary range | 57V to 400 kV |
| Nominal Frequency $F_N$ | 45.....66 Hz |
| Nominal input Voltage burden | < 0.6 VA at UN |
| Overload Capacity | 1.2 * $U_N$ continuously,<br>2* $U_N$ for 1 second, repeated<br>10 times at 10 minute intervals<br>(Maximum 300V with power supply powered from measuring input). |
| No need of external potentiometer. User can set full scale output for desired input with the help of programmable PT secondary. | |

## 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) | 0…20mA / 4…20mA / 0…1mA OR 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<br>≤ 100 mA with voltage output |
| Voltage limit under R=∞ | < 1.25 * Y2 with voltage output<br>≤ 30 V with current output |
| Residual Ripple in Output signal | ≤ 1% pk-pk |
| Response Time | 400 msec |

## 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 EN 55 011 | Electromagnetic compatibility. |

# Technical Specifications

| Safety | |
|---|---|
| Protection Class | II (Protection Isolated, EN 61 010) |
| 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 61 010-1)<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. |

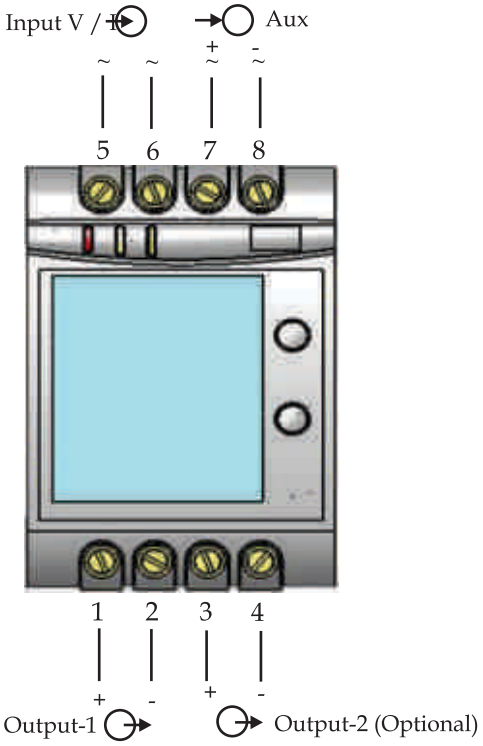
| Connection Terminal | |
|---|---|
| Connection Element | Conventional Screw type terminal with indirect wire pressure |
| Permissible cross section of the connection lead | ≤ 4.0 $mm^2$ single wire or<br>2 x 2.5 $mm^2$ fine wire |

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

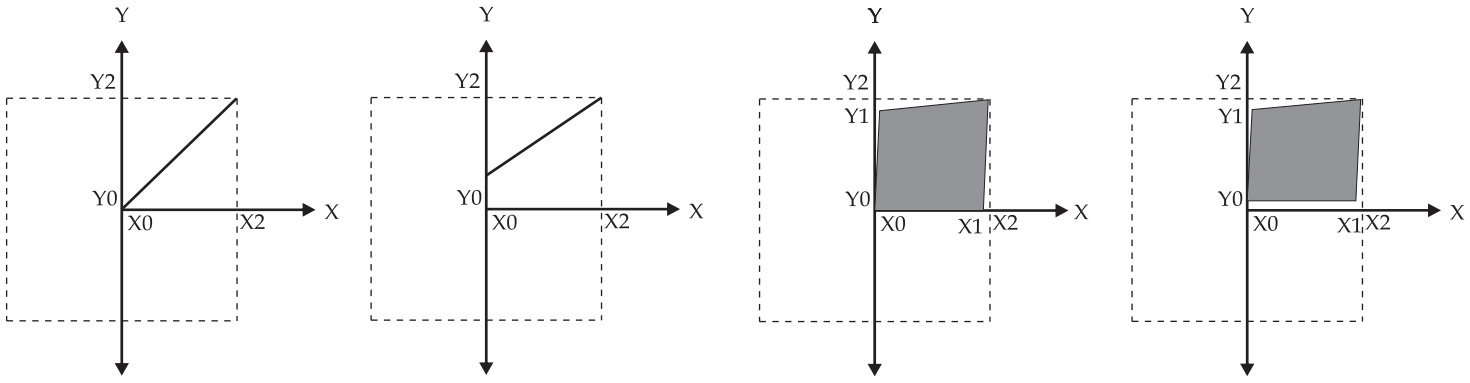
| Environmental | |
|---|---|
| Nominal range of use | 0 to 45°C |
| Storage temperature | -40 to 70 °C |
| Relative humidity of annual mean | ≤ 75% |
| Altitude | 2000m max |

# Electrical Connections

| Connection | Terminal details | |
|---|---|---|
| Measuring input | ~<br>~ | 5<br>6 |
| Auxilliary Power supply | ~ , +<br>~ , - | 7<br>8 |
| Measuring output - 1 | +<br>- | 1<br>2 |
| Measuring output - 2 | +<br>- | 3<br>4 |




## Output Characteristics




X0 = Start value of input

X1 = Elbow value of input

X2 = End value of input

Y0 = Start value of output

Y1 = Elbow value of output

Y2 = End value of output

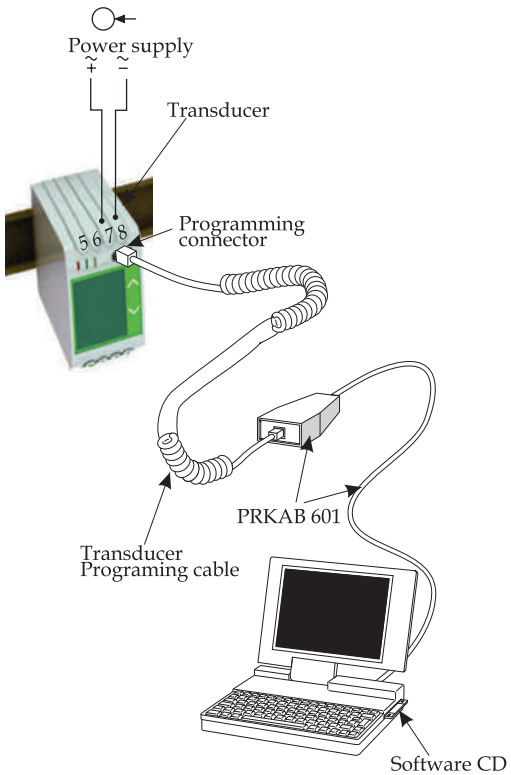
**Note:** End value(Y2) of output cannot be changed onsite.

# Technical Specifications

| 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/P2 LED | Output2 voltage selection<br>Output2 Current selection | Green LED continuous ON<br>Red LED continuous ON |

# 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,Password,communication parameter,Output Type & simulation mode can be programmed).<br>3) Programming Via Programming port available at front of Transducers using optional PRKAB601 Adapter. |
| **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 ⟷ Transducer.<br>The power supply must be applied to Transducer before it can be programmed.<br><br>The Configuration software is supplied on a CD. The programming cable PRKAB601 adjusts the signal level and provides the electrical insulati on between the Transducers |
| **Configuring Rish Con Transducer** | To Configure the transducer<br>Input / output one of the three programming methods can be adapted along with mechanical switch setting<br>(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. |

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

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

# Ordering Information Standard Version

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Product Code | TT20- | X | XX | X | X | X | X | X | 00000 |
| Product Type | THETA 20A | I | | | | | | |
| | THETA 20V | V | | | | | | |
| Input Range | Prog. 1…5A 1-5A | | 74 | | | | | |
| | Prog. 57…500V 57-500V | | 8E | | | | | |
| Power Supply | 60-300U | | | H | | | | |
| | 24-60U | | | F | | | | |
| Output | 1 O/P 1O | | | | 1 | | | |
| | 2 O/P 2O | | | | 2 | | | |
| Display Module | With Display | | | | | D | | |
| | Without Display WD | | | | | Z | | |
| RS485 Module | With RS-485 | | | | | | R | |
| | Without RS-485 | | | | | | Z | |
| Prog. Cable | With PRKAB 601 PRK | | | | | | | C |
| | Without PRKAB 601 | | | | | | | Z |

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