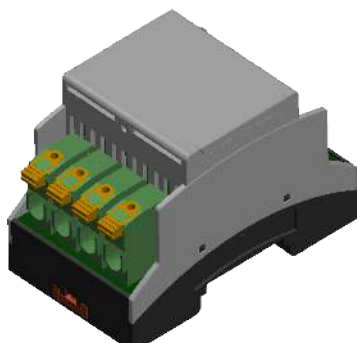


# Entube QE

Three Phase plus Neutral  
Voltage Sensor



## OVERVIEW

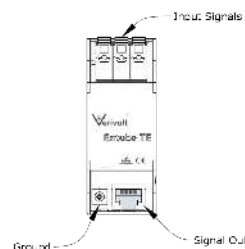
The Entube-QE series is designed for high quality three-phase plus Neutral measurements in a very compact form factor without need for power supplies. This series covers the ranges of  $\pm 100V$ ,  $\pm 200V$ ,  $\pm 300V$ ,  $\pm 400V$ ,  $\pm 500V$ ,  $\pm 750V$  and  $\pm 1000V$ , with up to 85kHz bandwidth and 0.2% accuracy. The Entube-QE sensor operates as a differential divider network with an anti-aliasing filter on its output. It generates a  $\pm 5V$  or  $\pm 10V$  scaled down version of the line-to-line or line-to-neutral voltage on its input terminals. Depending on the software configuration, the sensor outputs phase-to-phase voltages for Delta configuration, or phase-to-neutral for Wye configurations. This signal can then be processed by most computer based measurement platforms. One Entube-QE replaces 4 differential sensors, and only requires one cable for all four signals. This allows for very high channel densities, while delivering high performance for a low cost.

## SPECIFICATION

| Entube TE  | 100V           | 200V         | 300V           | 400V          | 500V          | 750V           | 1000V         |
|--|----------------|--------------|----------------|---------------|---------------|----------------|---------------|
| <b>Bandwidth (-3dB point)</b>                        | 85kHz          |              | 50kHz          |               |               | 25kHz          |               |
| <b>Integrated sensor noise (Referenced to input)</b> | < 30 $\mu V$   | < 60 $\mu V$ | < 100 $\mu V$  | < 130 $\mu V$ | < 170 $\mu V$ | < 220 $\mu V$  | < 290 $\mu V$ |
| <b>Gain (Using 10V standard output voltage)</b>      | 10             | 20           | 30             | 40            | 50            | 75             | 100           |
| <b>Input Impedance</b>                               | > 1 M $\Omega$ |              | > 2 M $\Omega$ |               |               | > 3 M $\Omega$ |               |
| <b>Line Output Impedance</b>                         | 50k $\Omega$   | 25k $\Omega$ | 33k $\Omega$   | 25k $\Omega$  | 20k $\Omega$  | 20k $\Omega$   | 15k $\Omega$  |

## HARDWARE DESCRIPTION

The Entube-TE is a differential voltage down-converter designed for 3-phase systems. It outputs all line-to-line and line-to-ground signal pairs. Delta or Wye measurements can be made depending on the input configuration of the digitizer being used (NRSE or Differential).



Signal Layout

The four inputs (3 phases + neutral) connect to the sensor via a Spring-cage, while the conditioned signals from the sensor come out on a standard Ethernet jack. The Entube-QE can be mounted anywhere between the signal source and the data acquisition system. A female-screw on the low voltage side of the sensor allows for DIN rail mounting, and serves as a safety ground.

A standard Ethernet cable is used to carry the conditioned signals from the sensor. The orange, brown and blue pairs carry phase voltages; the green connects to ground and DAQ reference. To avoid limiting the signal bandwidth and to eliminate cross-talk between pairs, a shielded STP Ethernet cable with a maximum length of 100m (330') should be used. This will keep good resolution beyond the 10th harmonic on a typical 60Hz system

### Electrical

Accuracy (percentage of reading)  $\pm 0.2\%$   
( $\pm 0.1\%$  Typical)

### Gain (Using 10V standard output voltage)

Max total phase shift at 60Hz < 0.05°

Common mode rejection  $\pm 2000V$

Withstanding differential mode surge voltage  $\pm 1000V$

### Mechanical

Mounting Type DIN Rail

Connectivity (Connector for power in and signal out to/from the sensor) RJ45 Ethernet jack

Outer Dimensions 1.4" x 1.4" x 4.5"

Weight 198 g (7.0 oz)

### Integrated sensor noise (Referenced to input)

Input-Output non-linearity < 250 ppm

Output voltage  $\pm 10V$ ,  $\pm 5V$

Gain temperature drift  $\pm 50$  ppm/°C

### Differential input dynamic range

Common mode rejection 52 dB

Power Supply Voltage None

Output type Single-ended signal

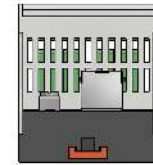
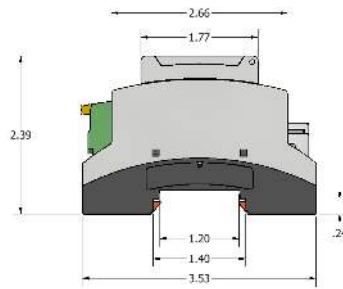
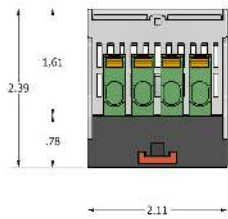
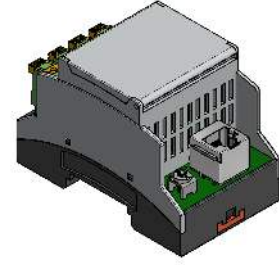
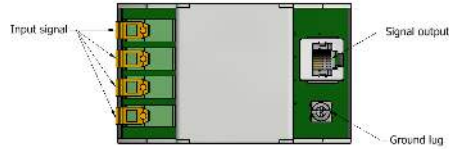
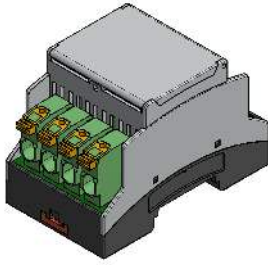
Output Offset Voltage <  $\pm 10\mu V$   
(on  $\pm 10V$  signal)

### Environmental

Operating temperature - 25 to 70 °C

Storage temperature - 40 to 80 °C

# MERCHICAL DIMENSIONS

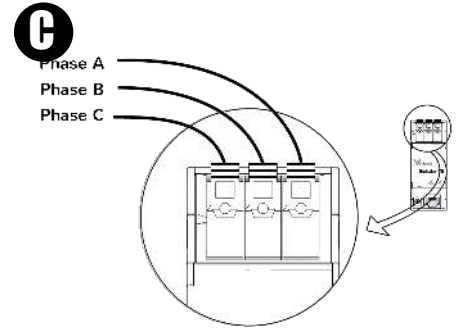
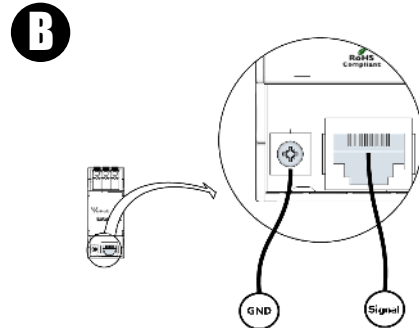
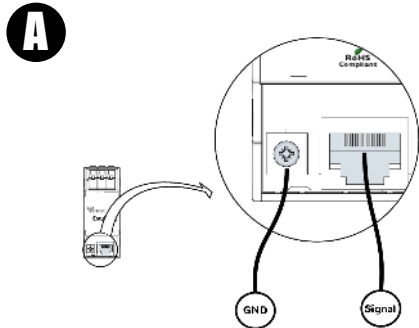


# HARDWARE CONFIGURATION

**A.** Safely connect Data Acquisition ground to ground of sensor.

**B.** Securely connect one end of a RJ45 to the output terminals, and the other end to the inputs of your break-out board or data acquisition unit

**C.** Securely connect wire between the source of measurement and an available Entube TE's input screw terminal.



## Standards and Certifications

- CE



## DANGER

THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE. This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.