PCB Mounted Current Style Voltage Transformer

The **TV31** Series of PCB mounted current style voltage transformers are designed for applications where the primary AC signal must be transformed accurately into a lower secondary AC signal appropriate for micro-processor based circuit designs. Essentially a 1:1 primary to secondary ratio, these printed circuit board (PCB) mounted transformers are designed for harsh operating environments. They feature a fully sealed enclosure (epoxy resin), high dielectric insulation in a compact package.

A **TV31** Series is essentially a mA current transformer with a 1:1 ratio. A limiting resistor in series with the primary winding is a requirement. The small physical dimensions are designed specifically for integration into products which require exceptionally accurate signal transformation with low phase shift while exposed to harsh environmental operating conditions.

Features:

- Permalloy magnetic core.
- Printed circuit board mounted (PIH).

Specifications:

- Operating frequency: 50 to 400Hz
- Dielectric resistance: 1,000 M ohm @ 500 Vdc
- Isolation Voltage: 2500Vrms for 1 minute.
- Surge Withstand Voltage: 5,000V (1.2/50μs standard shock wave).
- Operating temperature: -40ºC to +85ºC
- Construction:
  - Epoxy encapsulated.
  - Case material: ABS or PBT resin.
- **RoHS** compliant.

Performance:

- Accuracy Class: 0.1, 0.2(IEC 60044-1)
- Linearity Class: : 0.1, 0.2

  (IEC 60044-1)

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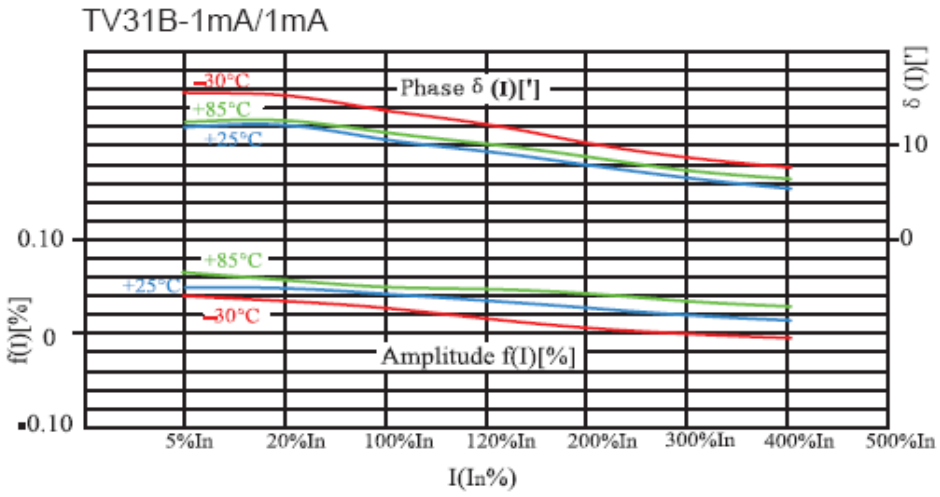
Models:

Model	Rated Input/Output	Accuracy/ Linearity	Secondary Burden
TV31B	1mA/ 1mA 2mA/2mA	0.1, 0.2	≤ 500 ohms
TV31D	2mA/ 2mA	0.1, 0.2	≤ 150 ohms
TV31E	2mA/ 2mA	0.1, 0.2	≤ 150 ohms
TV31F	2mA/ 2mA	0.1, 0.2	≤ 200 ohms
TV33	3mA/ 0.75mA	0.1, 0.2	≤ 1000 ohms

Typical Performance – TV31B-1mA/ 1mA:



Dimensions:

Model	Length (mm/")	Width (mm/")	Height (mm/")
TV31B	19.0/ 0.748	17.0/ 0.669	18.3/ 0.720
TV31D	19.5/ 0.768	10.5/ 0.413	18.0/ 0.709
TV31E	22.0/ 0.866	12.0/ 0.472	19.0/ 0.748
TV31F	18.8/ 0.740	16.2/ 0.638	13.3/ 0.524
TV33	28.0/ 1.102	28.0/ 1.102	20.0/ 0.787

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Application Method

The **TV31** current style voltage transformer is in fact a 1:1 current transformer. An input voltage cannot be directly applied to the primary winding. A limiting resistor – **R'** – must be used in series with the primary input winding.

The transformation of the input voltage signal is at the milli-ampere (mA) electric current level (the recommended operating condition is 2mA/2mA).

For example: When the input voltage is 1,000V full scale, **R'** should sized to be 500k ohms, thus limiting the **TV31** primary current to 2mA full scale.

The secondary current output, at the mA level, is suitable for input directly into an I/V switching circuit (Diagram 1) for transformation into a voltage signal. The mutual inductor design operates at a near zero load condition, thus providing a wide dynamic range, high precision and good linearity.

Diagram 2 shows the direct parallel sampling method. This method does not use the I/V switching circuit, but obtains the voltage signal through a resistance – **R –** across the secondary output. The resistance **R** is generally smaller than 200 ohms, otherwise the higher resistance will cause the mutual inductor to appear saturated and the output wave shape will have distortions.

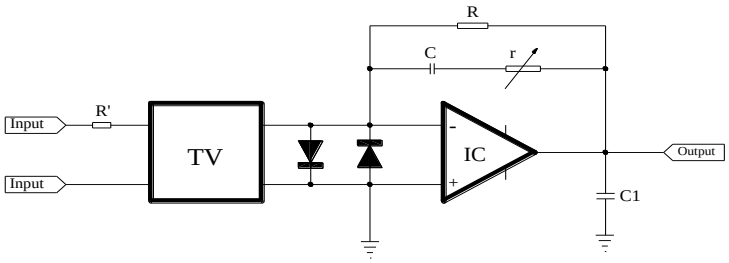

Diagram 1

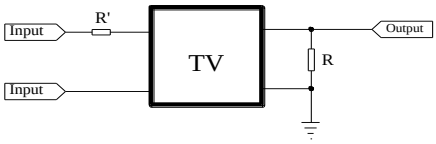

Diagram 2

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Application Example:

An example of an electric circuit design which uses the TV31B-02 is as follows. In this example the input voltage is 100V and the output voltage is 5V.

The circuit design that is similar to Diagram 1 would be:

Assume that the TV31B-02 electric current/ voltage phase shift shall not exceed Φ_c = 8'

Establish the limiting resistor **R'** value assuming a primary rated current of 2mA:

R' = 100V/2mA-0.13K Ω (where 0.13K Ω is the TV31B-02 start-up resistance)

R' = 49.91K Ω , Select R' = 50K Ω (1/4W).

Feedback resistance **R** = Vo/Ii=5V/2mA=2.5K Ω, compensating capacitance **C** and compensating resistance **r**: If **C** is selected to be 0.022 μF, then

$$r = 143 \times \sqrt{15R/\Phi_c - 1} = 143 \times \sqrt{15 \times 2.5/8 - 1} = 275\text{K}\Omega$$

In summary, in this example:

Assuming: Primary Full Scale Rated Voltage = 100 VAC,
Secondary Output = 0 to 5 VAC

Component Values**:** **R'** = 50 KΩ
R = 2.5 KΩ
C = 0.022 μF
r' = 275. KΩ

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