

# Application Note

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**Frictionless taut-band meters for high shock environments**

## Overview

Metering industry is dominated by jewel pivot meters since the early use in D'Arsonval galvanometers. Such instruments have a low life in high vibration and shock conditions. The D'Arsonval design has since been perfected by many afterwards and it still continues till today, but a major innovation in 1950's with the introduction of the Taut band meters showed promising rigidity in high shock and vibrations environments improving the meter life drastically.

## Problem Statement

The Jewel pivot movement require constant repair as there is friction causing contact between the jewel and pivot of the meter. Many manufactures have substituted the sahpire jewel by low cost ceramic and glass material which reduces the meter life even further (though Rishabh still continues to use sapphire jewel in its analog panel meters).

For the best repeatability and precise reading the friction between the jewel and pivot must be a low as possible. Additionally with the perfected design over the years, the jewel pivot meters perform well under normal condition but at times fail to preform well under high shock environment such as a railway carriage or a ship.

Though manufactures have designed movements where the torque on the pivot and the weight of the pivot with movement is the greater than the friction forces on the jewel a true friction less movement is only achieved in a **Taut-band design**.



*Gold Series taut band analog meters*

## Solution

The Taut Band Instrument work on the same primary principle as the D'Arsonval movement ie the movable coil and fixed magnet but the primary difference between the two design is the method of mounting the movable coil.

In a Taut band design the jewel and pivot are eliminated, thus eliminating the induced friction. The movement is built to be held by a thin band of special alloy. The alloys band is joint to the moving element and U shaped spring that are required to keep the band tension for movement. The current is supplied via the taut band to the moving coil which also provides the torque for the deflection. This friction less design with reduced weight and operating torque provides critical damping, with highly accurate and precise meter reading.

Manufacturing a taut band meters is critical process thus reliable and experience manufactures should be preferred.



*Taut band movement*



*Jewel Pivot movement*

## **Benefits of Gold Series Taut Band Switchboard Meters**

- Model is available in 110mm square size 250° to measure all electrical quantities
- All switchboard instruments in the series features rugged, friction free and shock resistant taut-band suspension element
- Taut Band suspension – eliminate friction and protects against shock
- Platform scale – No shadow on scale and is readable even from wide angles
- Easy to read linear scale and wide angle deflection
- Provide terminal protection cover for safety
- Meets all the requirements of ANSI-C39.1 (1981)
- Parallax error free platform dials
- Non-flammable plastic case
- Panel mounting is by four integral studs

### **Type of input Ranges Model**

- DC Voltmeter: 1V – 600V
- DC Ammeter 300 $\mu$ A – 30A
- AC RMS Voltmeter 50V – 600 V
- AC Average Voltmeter 3V – 600 V
- AC RMS Ammeter 1A – 30A
- AC Average Ammeter 300 $\mu$ A – 500mA
- Frequency Meter 45 – 450 Hz
- Watt meter 1/5A, 110-440 V (1P 2W, 1P 3W, 3P 3W & 3P 4W)
- Power Factor Meter 1/5A, 120-480 V (3P 3W & 3P 4W)



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