

# ENCARDIO RITE



## VIBRATING WIRE TEMPERATURE METER

### MODEL ETT-10V

#### INTRODUCTION

The Encardio-rite model ETT-10V vibrating wire temperature meter is used for the measurement of internal temperature in concrete structures or water. It has a resolution of better than 0.1°C. The vibrating wire temperature meter is designed on the principle that dissimilar metals have different linear coefficient of expansion with temperature variation. The vibrating wire temperature meter basically consists of a magnetic, high tensile strength stretched wire, the two ends of which are fixed to any dissimilar metal in a manner that any change in temperature directly affects the tension in the wire and thus its natural frequency of vibration. The dissimilar metal, in the case of the Encardio-rite temperature meter, is aluminium. As the temperature signal is converted into frequency, the same read-out unit as is used for other vibrating wire sensors can also be used for monitoring temperature also.

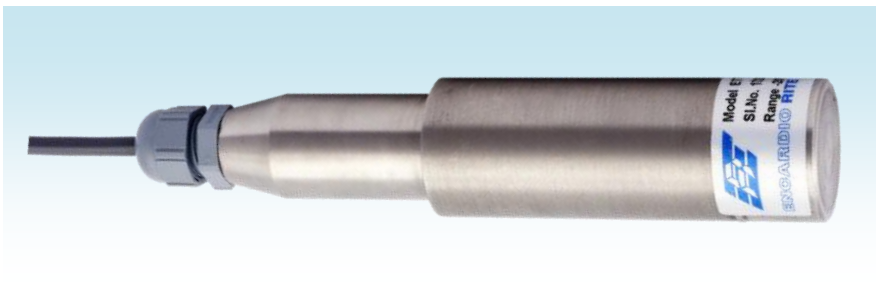
#### OPERATING PRINCIPLE

The change in temperature is sensed by the specially built Encardio-rite vibrating wire sensor and is converted to an electrical signal which is transmitted as a frequency to the read-out unit. The frequency, which is proportional to the temperature and in turn to the tension 'σ' in the wire, can be determined as follows:

$$f = [\sigma g / \rho]^{1/2} / 2l \text{ Hz}$$

where:

σ	=	tension of wire
g	=	acceleration due to gravity
ρ	=	density of wire
l	=	length of wire

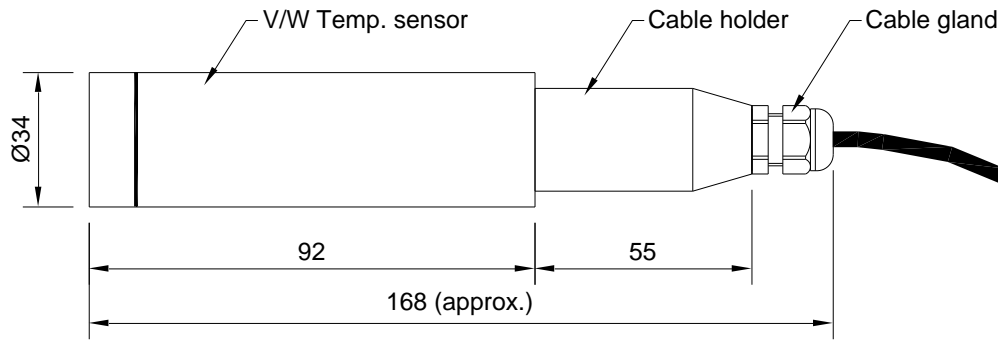


#### FEATURES

- ♦ Rugged, waterproof and of stainless steel construction for high reliability.
- ♦ Excellent linearity and hysteresis.
- ♦ Vibrating wire technology assures long term stability, quick and easy readout.
- ♦ Sensor hermetically sealed by electron beam welding with a vacuum of around 1/1000 Torr inside it
- ♦ Weather proof enclosure conforming to IP 68.
- ♦ Low cost, extremely reliable sensor.
- ♦ Suitable for remote reading, scanning and data logging.

#### APPLICATIONS

- ♦ For verifying design assumptions that will promote safer and economical design and construction.
- ♦ Temperature rise during process of curing concrete.
- ♦ Rock temperatures near liquid gas storage tanks and ground freezing operations.
- ♦ Water temperatures in reservoirs and bore holes.
- ♦ Interpretation of temperature related stress and volume changes in dams.
- ♦ Study of temperature effect on other installed instruments.



## TEMPERATURE IN CONCRETE DAM

Excepting for the procedure adopted during construction, the greatest single factor in causing stress in mass concrete is due to the temperature change. For analyzing the development of thermal stress and for control of artificial cooling, it is therefore necessary to monitor the temperature variation of concrete during construction. For this, the temperature should be accurately measured at many points in the structure, in the water and in the air. Sufficient number of sensors should be embedded to get a correct picture of temperature distribution at various points in the structure. In a large concrete dam, a typical scheme would be to place a temperature probe every 15 - 20 m along the cross-section and every 10 m along the elevation. For smaller dams, the spacing may be reduced.

Temperature probe placed in the upstream face of a dam, evaluates the reservoir temperature as it varies throughout the year. This is much easier than dropping a thermometer in the reservoir every now and then to take observations. During operation of a concrete dam, diurnal and seasonal changes in the environment, play havoc as far as development of thermal stresses in the structure is concerned. The effect is more pronounced on the downstream side. A few temperature sensors should be placed near and in the downstream face of the concrete dam to evaluate the rapid daily and weekly fluctuation in temperature.

## SPECIFICATIONS

<b>Transducer type</b>	<b>Vibrating wire</b>
<b>Model</b>	ETT-10V
<b>Service</b>	Embedment in concrete
<b>Accuracy</b>	± 0.5 % fs normal ± 0.1 % fs optional
<b>Range</b>	-20 to 80°C
<b>Coil resistance</b>	120-150 Ohm
<b>Insulation resistance</b>	> 500 M Ohm at 12 V
<b>Humidity</b>	0-100 % RH
<b>Vibration limit</b>	2 g, 50 - 500 Hz
<b>Read out</b>	Portable readout unit
<b>Enclosure</b>	Stainless steel. Hermetically sealed by electron beam welding to IP-68.
<b>Over voltage/ lightning protection</b>	Provided with bipolar plasma surge arrester to protect against over-voltage/lightning strikes.

\* All specifications are subject to change without prior notice.

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