

THE *ELECTROLEVEL* AS AN ACCELEROMETER

When an *ELECTROLEVEL* sensor is accelerated in a direction normal to its measuring axis in the horizontal plane, the resultant of this acceleration and the acceleration due to gravity determine the position of the bubble and hence the output produced by the electronic signal conditioning unit

The effective angle measured is
 $\theta_{\text{eff}} = \arctan(-\text{acceleration} / g)$

which for small accelerations reduces to
 $\theta_{\text{eff}} = -\text{acceleration} / g$ (in radians)

The dynamic response to the *ELECTROLEVEL* is equivalent to a simple pendulum of a given natural frequency and damping factor. (see Table)

The frequency response characteristic extends from zero (steady state) to a few Hertz.



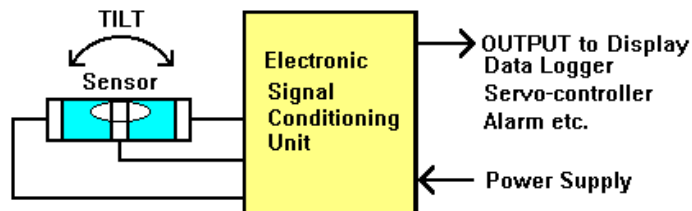
How an *ELECTROLEVEL* senses acceleration

Parameter	<i>ELECTROLEVEL</i> Vial Type A	<i>ELECTROLEVEL</i> Vial Type C
Pendulum Equiv. Length	305mm	38mm
Undamped natural frequency.	1 Hz	2-5 Hz
Damping factor @ 20 °C	0.6	0.9
Linear acceleration range	$\pm 0.01g$	$\pm 0.1g$
Discrimination	0.00001g	0.0001g

The mechanical properties of the *ELECTROLEVEL* -

- high resolution,
- resistance to shock (up to 500g repetitive shocks) and high frequency vibrations,
- true dc response,

make it an attractive alternative to piezo-electric sensors and strain gauge type sensors for measurements in the low frequency range.



ELECTROLEVEL Schematic System

Typically a set of *ELECTROLEVEL* equipment consists of a Sensing Head and Electronic Signal Conditioning Unit which may be separated by a distance of up to 100 metres.

A variety of Sensing heads and Signal Conditioning Units cater for most applications. Special designs can also be supplied.

The equipment can be calibrated in units to suit the applications, e.g. milli 'g' units

TYPICAL APPLICATIONS

SWAY MEASUREMENT

The measurement of sway in tall structures is one of the applications of the **ELECTROLEVEL** in its role as an accelerometer.

The relationship between acceleration of the structure to the measured wind loading conditions can be used to determine the dynamic characteristic of the structure and foundations.

Theoretical design parameters can be compared with empirical data.

VEHICLE ACCELERATION MEASUREMENT

There are a number of applications for the use of the **ELECTROLEVEL** as an accelerometer in connection with the testing of road and rail vehicles.

The following measurements may be made:

- Retardation due to braking, windage,
- Friction
- Drawbar Pull
- Duration of gear changes/braking sequences
- Lateral forces due to track superelevation errors.

The **ELECTROLEVEL** may also be used as a sensor in a servo control loop for automatic braking etc.

Tilt Measurements' Engineers are available for discussion of any possible applications and have many years' experience in the design of systems for customers from a diverse range of industries.

All information herein is believed to be correct but no liability is accepted by Tilt Measurement Limited for any application in respect of fitness of purpose, infringement of intellectual property rights, or consequential loss or damage howsoever caused.

TILT MEASUREMENT LIMITED
HORIZON HOUSE LONDON ROAD BALDOCK HERTS.. SG76NG U.K.
TELEPHONE - 44-(0) 1462-894566 FAX - 44-(0) 1462-895990
e-mail sales@tilt-measurement.com www.tilt-measurement.com
Ó **TILT** Measurement Limited 2000