Dual Zone Resistance Monitor

A Light-Weight, Compact System for Single or Dual Measurements

Portable DC Electrical Resistance Monitoring Electronics in an Ultra-Compact Format

Simple to Use Software with On-Board Data Storage

Controlled Wirelessly via Laptop, Tablet or Smartphone

Rowan Technologies' has been supplying DC electrical resistance monitoring systems to industrial clients and research establishments since the early 1990s. Our new Dual Zone Resistance Monitors are compact and highly portable instruments designed to measure and log changes in electrical resistance of plant components on-site, or of laboratory samples.

They can be used for periodic monitoring of items of plant that might be subject to corrosion or erosion, or where crack propagation might be of concern, for example at a pipe weld.

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Measurement Principles

Thinning of metal due to corrosion and erosion, or propagating cracks, can all increase the measured electrical resistance values. Metal resistance can also be heavily temperature-dependent and so accounting for temperature variations may also be an important consideration.

During resistance measurements, current passes through the metal between two current electrodes. Separate electrodes measure the resulting voltage drop. For industrial applications, voltage and current electrodes are usually welded to the item of plant under investigation or, alternatively, they may be firmly clamped against the electrically-conductive metal surface for the duration of the measurement cycle.

Measurement Techniques

The effect of metal temperature can be taken into account using two methods:

**Method 1:** During the measurement cycle, measure and store the true metal temperature using the monitor. Compensation for any temperature variations is straightforward once the metal resistance versus temperature relationship is established.

The photo shows Rowan Technologies’ bespoke thermal sensors welded to a boiler membrane wall, together with a current electrode.

**Method 2:** Use a resistance ratio technique:

Measure two areas (or zones): one across the defect (e.g. crack) and the other across an area with no defect (the reference area).

Assuming both areas experience the same metal temperature, then the ratio of resistances will eliminate the effect of any temperature changes between measurement intervals. Thus temperature measurement and compensation is not required.
Communications and Data Acquisition

The instrument has an on-board micro-computer that’s configured as a wireless hot-spot. Readily-available virtual networking software (e.g. RealVNC) is used via a laptop, tablet or smart phone to communicate with the instrument.

Once communication is established and the software loaded, the user is presented with a single easy-to-use logging screen. The user can then choose to:

- Create new data files or add to existing ones.
- Measure a single area, two individual areas or perform a resistance ratio measurement.
- Save the measured values to file or repeat the measurements.
- Display previously-stored data.
- Wirelessly transfer data to the controlling device (laptop, tablet or phone).

When the operator saves the latest measurements, they are stored as raw data (e.g. current, voltage, temperature) together with calculated resistance and associated time stamps.

The graph window, as shown above, displays all the resistance values from the chosen data file, together with the latest set of measurements. This allows the user to immediately see the history of the acquired data within the data file. Raw data can also be viewed using the on-board spreadsheet programme.

Data is stored in .csv format and so, once it is wirelessly transferred to the controlling device, it can be readily viewed and analysed in applications such as MSExcel.

Interpreting changes in resistance, in relation to changes in the surface under investigation (i.e. corrosion/erosion or cracking), is more straight-forward for some applications than for others. We will be happy to discuss any applications you have in mind.
Features, Applications and Benefits

- On-line or off-line monitoring: corrosion, erosion or crack propagation.
- The actual plant itself is monitored - no need for insert probes and entry ports.
- Electrodes and sensors are welded, clamped or otherwise secured to external surfaces.
- Rowan Technologies can supply electrodes and bespoke thermal sensors.
- Applications include pipes, storage vessels and membrane walls.
- Suited to non-hazardous areas: use in hazardous areas under a ‘hot work’ permit.
- Compact and easily-portable instrumentation.
- A cost-effective method of monitoring multiple locations.
- Suited to high temperature plant and remote locations: the instruments are developed for use in a wide range of ambient temperatures.
- Can be applied to thick or thin walls/membranes (<1mm to >50mm).
- Use in a laboratory with either an external battery or bench supply.

Further Features and Specifications

- Designed for up to two measurement areas.
- Software configurable for resistance ratio measurements.
- Up to 12 amps DC current applied during resistance measurement cycle.
- Voltage drop measurement input: up to 9mV.
- Logs up to four temperatures (optional): type K input, ~500 deg. C maximum.
- 18-bit A-D signal conversion.
- Configurable sample size.
- Multiple sample averaging (ratio measurement cycle).
- Operates from an external 24V DC battery or mains power source.
- Wireless communications via laptop, tablet or smart phone.
- On-board data storage and wireless data transfer.
- Optional wired Ethernet communication.