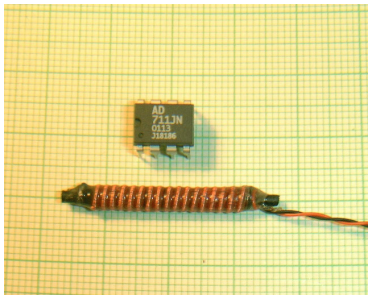
Rocoil® TUBE COILS



FEATURES

- Easily adaptable to different situations.
- Well-suited for bespoke designs.
- Available in a wide range of diameters as specified by the user.
- Coil winding is screened to minimise 'noise'.
- Can be used to measure at frequencies from less than 1Hz to more than 100kHz
- Accuracy 1%.
- Good rejection of external magnetic fields.
- Rugged construction.
- Compact construction

INTRODUCTION

The Rocoil® Tube coils are made by wrapping a length of flexible coil on to a tube. Wrapping a coil this way enables us to optimise the performance of the coil with respect to output and to pick-up from external conductors. Tube coils can be provided in a wide range of shapes and sizes and are well-suited for bespoke designs.

With a suitable electronic integrator these coils can be used to measure currents with a resolution as low as 5mA and high currents of greater than 1MA. They provide complete isolation from the circuit being measured and have no effect on the current being measured even for very low-impedance circuits.

INSTALLATION: The coil is threaded on to the conductor to be measured. For best accuracy it is recommended to mount the coil so that it is centred on the conductor and the axis of the tube is parallel to the conductor. Tube coils cannot be built as a 'split' version. Electrical connection to the coil is through a cable attached to the coil.

It is not recommended that coils are installed or removed from conductors that can carry dangerous voltages whilst they are live.

CALIBRATION: The coil calibration is defined by its mutual inductance. Coils that are supplied without integrators are individually calibrated to give their mutual inductance and the calibration values can be supplied to the user. Coils supplied with integrators are calibrated with the integrator as a pair.

CONNECTIONS: The coils are connected to the integrator by a 'twinax' cable (twisted pair with overall screen) which is permanently attached to the coil. The cable normally fitted is sheathed in a single layer of PVC but UL/CSA rated cable can be used or a special double-insulated cable with polyurethane sheath. The standard cable length is 2m but the length can be 100m or more if required.

INSULATION:

Because of the wide range of possible coil configurations we cannot give a general specification for the coil insulation. Insulation requirements are normally discussed with the user. If the coil is positioned at the centre of a long tube this can help to meet the requirement for high-voltage tracking distances.

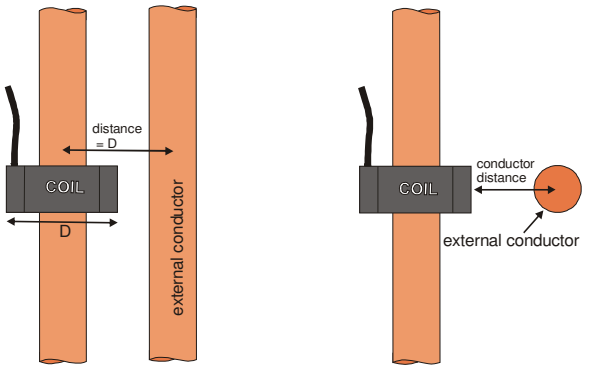
Coils should not be installed on uninsulated conductors when they are live.

TEMPERATURE RATING: Coils have been tested at ambient temperatures up to 60°C. However prolonged use at high temperatures should be avoided if possible. At high temperatures some of the materials used in the construction will soften and it may be necessary to provide additional support for the coil.

The output of the coil is affected by temperature due to the change in resistance of the winding. The temperature coefficient depends on the size of the coil but a typical value for a coil connected to an integrator is about -0.02%/°C.

INFLUENCE OF EXTERNAL MAGNETIC FIELDS: The coils are wrapped carefully round the tube and the ends are aligned to ensure minimum pick-up from external conductors.

The pick-up from an external conductor is used as a quality check and all coils are tested. The coil is usually placed a distance of one diameter away from the conductor as shown in the figure. The coil is rotated to find the maximum pick-up. Pick-up is expressed as the ratio between the voltage induced by an external conductor to the voltage that would be obtained if the same conductor were threading the coil. The pick-up ratio depends on the distance of the external conductor and its orientation.



Parallel conductor: This is a common configuration for example three phase conductors in the same enclosure. Under these conditions the pick-up ratio is less than 1%. The pick-up ratio reduces for larger values of distance and is roughly proportional to 1/(distance).

Perpendicular conductor: For a conductor distance > 50mm the pick-up ratio is usually less than 1%. The pick-up ratio is less for larger values of conductor distance and is roughly proportional to 1/(distance).

INFLUENCE OF CONDUCTOR POSITION: If the conductor is moved from the central position by a distance equal to 0.5 x the coil radius the output will change by less than 1%.

PHASING: If two coils are being used for current summing they should be mounted in the same sense (i.e. with both the output leads coming off in the same direction) and the outputs will then add. If the coils are mounted in the opposite sense the outputs will subtract.

FREQUENCY: The low-frequency performance is determined by the design of the integrator. With a suitable integrator these can be used to measure at frequencies well below 1Hz (-3dB). The upper frequency limit depends on the coil type and the length of the output lead. As an indication, a coil + integrator should be linear with frequency up to about 100 kHz.

OPEN-CIRCUIT OUTPUT LEADS: The direct output from the coil is very low, typically less than 100mV for 1000A at 50 Hz. There is no danger if the output leads are left open-circuit even when a current is flowing through the coil.