ROCOIL 'WALL-MOUNTED' ROGOWSKI COIL CURRENT MEASURING SYSTEM WITH 1A OUTPUT CURRENT DRIVERS

FEATURES

- Three-channel Integrator enclosed in a steel cabinet.
- Can measure up to hundreds of kA.
- Input and output protection against surges.
- Current output to directly replace a 1A current transformer.
- Sensitivity can be specified by the user.
- Sensing coils can be replaced without the need for re-calibration.
- Excellent low-frequency response.
- Flexible Rogowski coils can be fitted without 'breaking' the conductor
- Withstands very large overloads for an indefinite time.
- Can be configured for dual inputs i.e. the output is the sum of the currents in two conductors.

1. COIL SENSORS (Rogowski Coils)

The integrator can be used with either Flexible or Rigid coils.

1.1 Flexible Coils (types 1000, 1100, 1200): Flexible Rogowski coils can be used for measuring electric current in large or awkwardly-shaped conductors, where space round the conductor is limited and for the measurement of very large currents (100's of kA).

Flexible coils are suitable for measurements requiring an accuracy of about 1%.

The coil is fitted by wrapping it round the conductor to be measured and bringing the ends together. The ends are fitted with a locating system to ensure that they are aligned correctly. The locating system can be either a 'push-together' type or a 'screw-together' type. Screw-together is more suitable for permanent installations

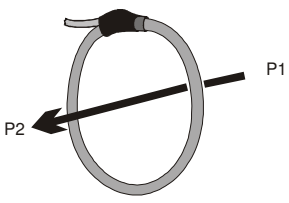
Electrical connection to the coil is at one end only. The other end is ‘free’ to be threaded round awkwardly-shaped conductors or conductors in confined spaces.

It is not necessary to mount the coil so that it is circular nor is it necessary to have the conductor exactly in the centre of the loop. Off-centre operation does not normally introduce errors of more than I - 2%. If the coil is long enough it can be wrapped more than once round the conductor provided the ends are brought together correctly. The output is proportional to the number of wraps.

It may be necessary to build a framework to support the coil round the conductor. The design of the framework will depend on the conductor configuration. Rocoil do not supply mounting frames

1.2 Rigid Coils (type 2100): Rigid Rogowski coils have a greater accuracy and stability than flexible coils and excellent rejection of interference caused by external magnetic fields. They are more suitable for low current and low frequency operation than flexible coils.

1.3 Phasing: If several coils are being used they should be mounted in the same sense (i.e. with all the output leads coming off clockwise or all anti-clockwise) and the outputs will then be in phase. To conform with the labelling of Current Transformers the figure shows the relationship between the P1 and P2 terminals and the direction of the output lead. This relationship applies to Type 1000 series flexible coils and Type 2100 series rigid coils. It does not apply to Type 4000 series coils which have overlapping ends. For these P1 and P2 are reversed.



1.4 Insulation: Unless otherwise specified it should NOT be assumed that the coils are insulated against high voltages. Additional insulation should be used with conductors carrying dangerous voltages.

1.5 Coil Connections: The coils are connected to the integrator by a 5mm 'twinax' cable which is normally permanently attached to the coil. The cable length can be at least 100m if required. The connector is either a Lemo connector or ferrules for a screw connector. With Rogowski Coils there is no risk of high voltages being developed if the input becomes open-circuited. The direct output from a flexible coil round a conductor carrying 100kA at 50Hz is only 6.5V.

1.6 Interchangeable Coils: Flexible Type 1000 series coils, which are normally used with this integrator, can be configured to be interchangeable. The advantage is that coils and integrators using the same interchangeable system can be freely exchanged without the need for re-calibration. This is useful if the coil becomes damaged or there is a need to change it for a coil of different length. The interchangeable system which is most commonly used with this integrator is the Rocoil 2500R system.

2. INTEGRATOR

2.1 Integrator Description: The integrator converts the output from the coil to a current which can be used to directly replace a 1A current transformer with a burden up to at least 3Ω including reactive loads (3VA). The overall sensitivity of the system is specified by the user to give the ratio of input and output currents subject to a maximum output current of about 1.8A peak (1.2A rms).

2.2 Enclosure: The integrator is housed in a steel enclosure with dimensions typically 300 x 400 x 120mm with a 50mm heat sink on the top edge of the box (see figure). Access for coil inputs, outputs and mains supply are via cable glands at the bottom. Output connections and mains supply input are by screw connectors inside the enclosure. The circuitry contains components that can generate a considerable amount of heat. To ensure efficient heat sinking the enclosure should be mounted with the heat sink at the top.

NOTE: CONTINUOUS OPERATION AT NEAR RATED CURRENT WILL CAUSE THE HEAT SINK TO BECOME HOT (ABOUT 40°C ABOVE AMBIENT)

2.3 Power supply: The instrument is driven from an AC mains supply switchable between 230V and 115V. A linear power supply is used rather than a switch-mode type to minimise circuit noise. The supply incorporates a mains input filter. The unit should work with a mains voltage down to 15% lower than rated. Mains supply connections are by screw connectors inside the enclosure. There is a 2A fuse on the right-hand main board which serves all three integrators.

2.4 Coil Connections: Coils are connected to the integrator using either Lemo connectors or screw connectors. For dual-input systems the input is always with screw connectors.

2.5 Output Connections: Output connections are via screw connectors at the bottom of the enclosure. S2 is the common connection. The other connection is either S1(3VA) or S1(2.5VA). Output S1(2.5VA) has a resistor in series with the output. This should be used when the burden is very low (<0.5Ω) to prevent the integrator output from becoming unstable.

2.6 Isolation: Each channel has its own power supply and the outputs from the integrators are left 'floating' and independent of each other. This is to ensure that there are no problems if the current loop driven by the integrator output is earthed somewhere.

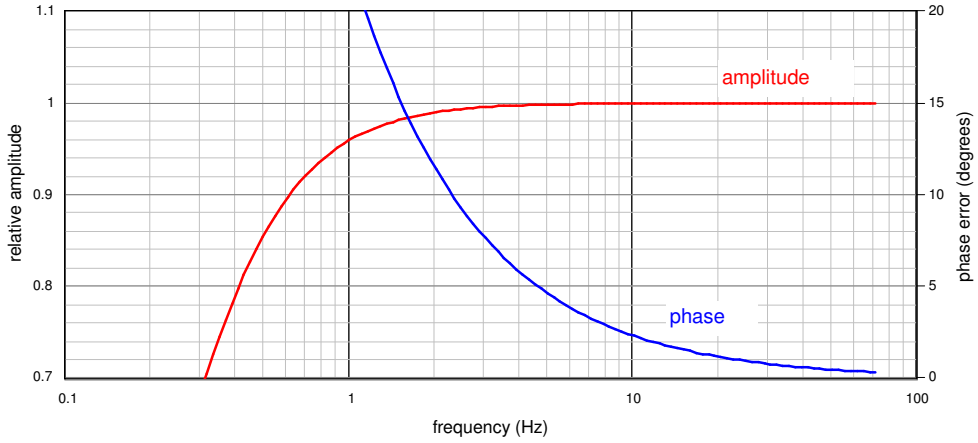
2.7 Accuracy: For flexible coils accuracy is about ±1%.

Effect of Temperature on Accuracy: The output is affected by both the temperature of the coil and the temperature of the integrator. These are specified separately because the coil and the integrator may be used in different environments

The temperature coefficient due to the coil depends on the type of coil used and other factors and it is impossible to give an accurate general figure for this. A typical value is -0.01% /°C. A typical temperature coefficient for an integrator is less than ±0.01%/°C.

2.8 Frequency Response*:* Stated accuracy applies in the range 20Hz to 5kHz
Low frequency -3dB point: Typically less than 1Hz. This can be extended to lower frequencies If required, for example, for transient measurements.

The figure shows typical amplitude and phase response curves.



2.9 DC Offset and Noise: With no current flowing through the coils the output current has no significant noise component at mains frequency. There is a DC offset current of up to 4mA.

2.10 Protection: The integrator inputs incorporate Gas Discharge Tubes (GDT) to protect the input circuitry from transient voltages caused by a fast current edge applied to the Rogowski coil. The output circuitry uses Transzorb suppressors and diodes to protect against surges induced in the output leads.

2.11 Overloads: Very large overloads will not damage the integrator. The output circuitry has current limiting to ensure that the output current cannot exceed about 1.8A peak no matter what the input.

2.12 Low Resistance Burden: The current drivers will operate into a burden of up to 3Ω. For a very low resistance burden, less than 0.5Ω, the output may become unstable. There is a second output labelled 2.5VA for use with low-resistance burdens. This adds a resistance of 0.47Ω in series with the output.

2.13 Dual Inputs: The integrator can be configured for dual coil inputs. This means that two coils can be connected to each input to give the sum of the currents in two conductors. This is the 'algebraic sum' i.e the sum of the waveforms. If only one input of a dual-input system is used the other input can be left open-circuit. If a dual-input system is required this should be specified on the purchase order.

2.14 Physical: The integrator is enclosed in a robust steel enclosure, suitable for wall-mounting (Rittal EB1556)

Dimensions: 475 x 300 x 120mm including glands and heat sink .
Weight: 9.4kg

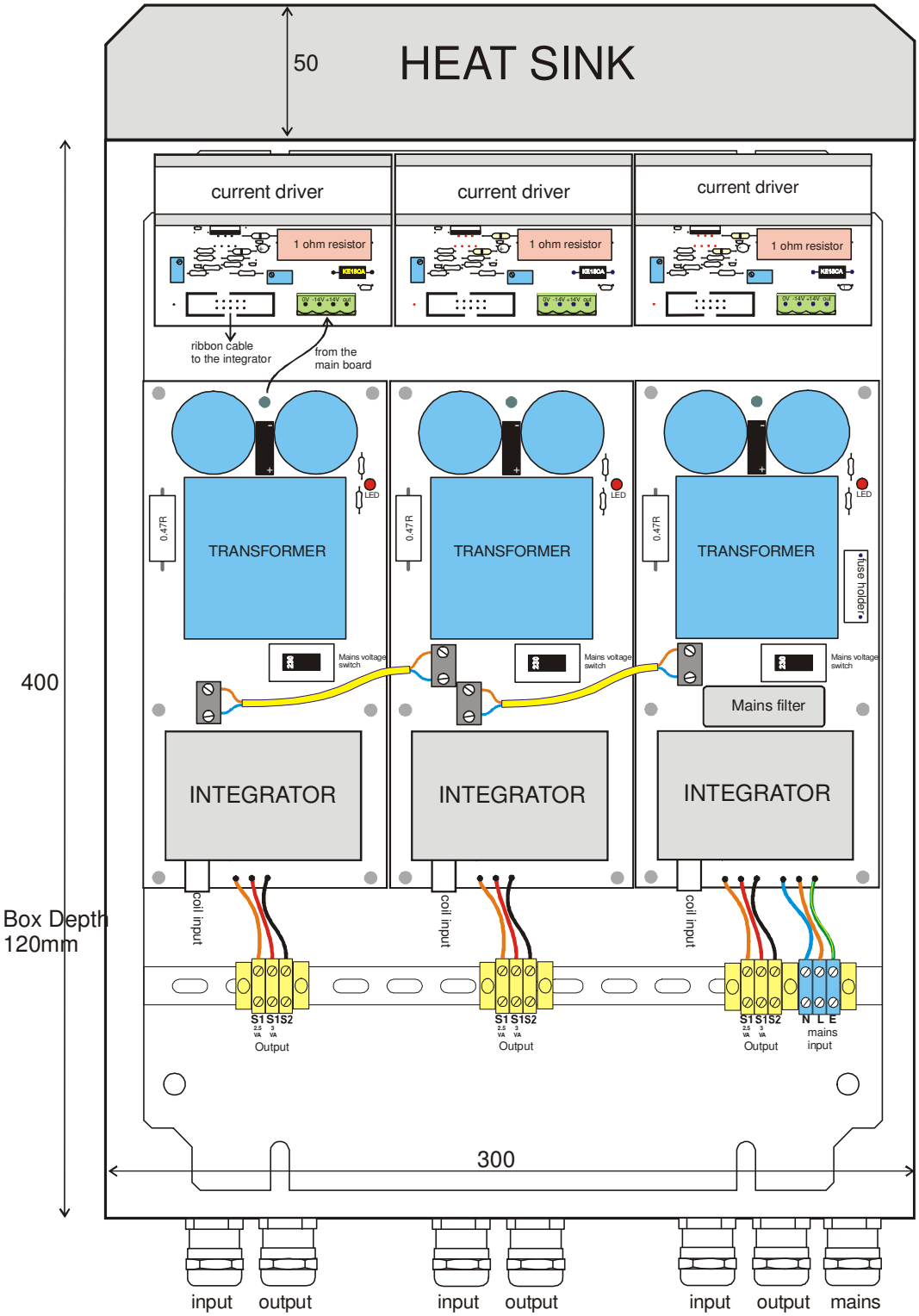
Ordering Information: Unless otherwise specified it will be assumed that the requirement is for an interchangeable system using the 2500R standard.

Integrator:

1) Sensitivity: Current for 1A output: There are no 'standard' values each integrator is designed and built to the required sensitivity.
2) Single input or dual input (see section 2.3)

Coil: It is not necessary to specify a current value for the coil. The same coil can be used to measure any current.

1) Length of coil: NOTE: The coil length is the length needed to go round the conductor not the conductor diameter. The coil does not have to be a tight fit.
2) Length of the output cable.



REV		DRN/ DATE	Title	Integrator enclosure		
A			oneampbx.cdr	SHEET 1 OF 1	SCALE	COPYRIGHT © ROCOIL Ltd.
			CLIENT	DRAWN BY DW 10/4/14	Rocoil PRECISION ROGOWSKI COILS	