

RCTi rated current, output and overloads

Rated Current

The rated current for a given model of RCTi is selectable by a dual range switch.

For example the RCTi/6 has a rated current of either

x1 range 5,000 Arms
x2 range 10,000 Arms

Rated Output

For a given rated current the rated output of the RCTi is 5.0V rms ($\pm 7.07V$ pk).

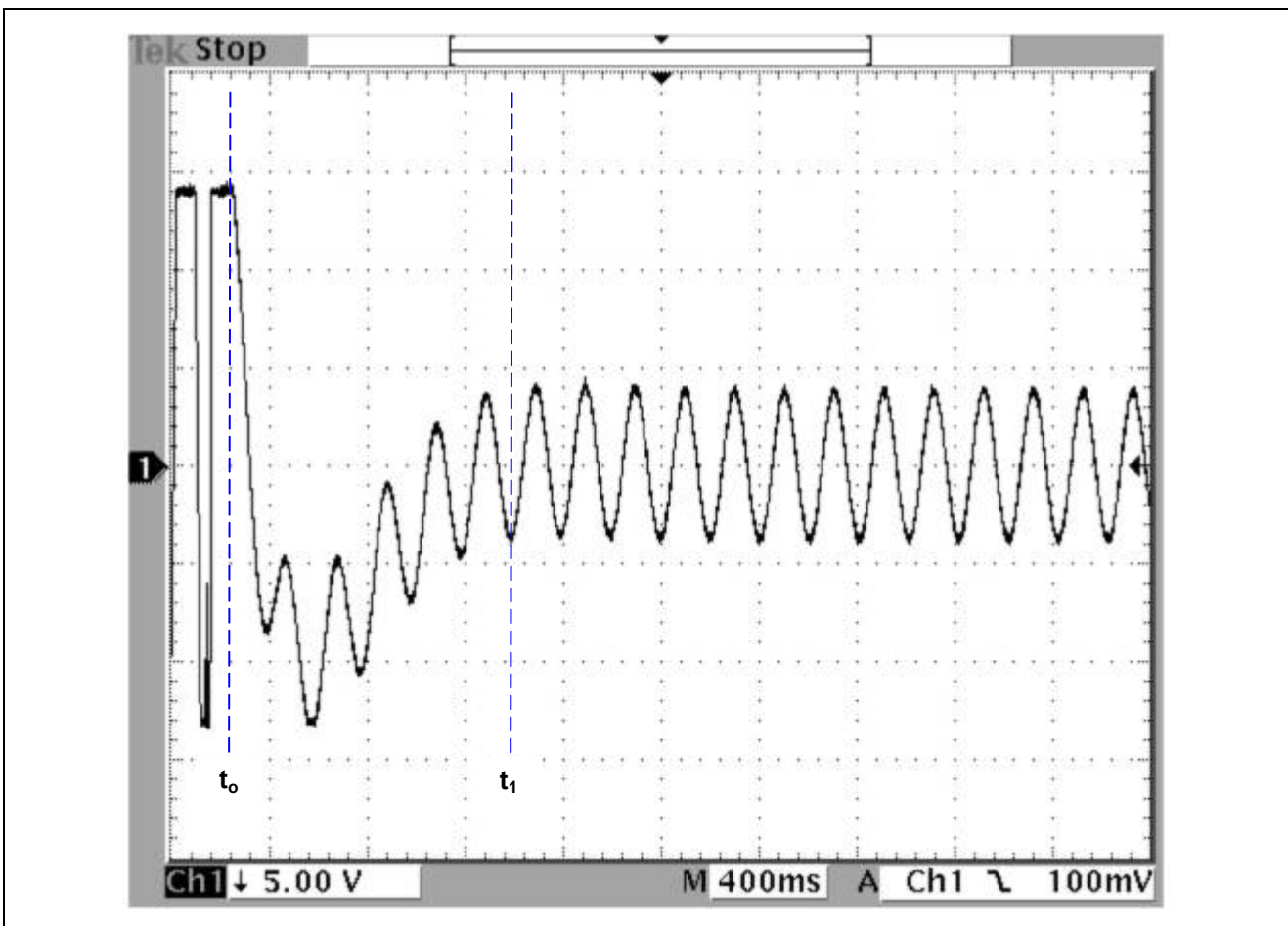
Output limit

The output limit for the RCTi is 150% x the rated current.

Exceeding the output limit will not damage the RCTi provided the absolute di/dt (rate of change of current) ratings are not exceeded. It will return to normal operation after the current surge has passed.

If the output limit is exceeded the electronic integrator will saturate and the measured waveform will be completely corrupted. (This is unlike an amplifier where the output will simply be 'clipped'.)

The RCTi will recover from integrator saturation in a time determined by the low frequency bandwidth. This is shown below. A 5Hz sinusoidal fault of current sufficient to saturate the integrator of the RCTi is measured. At time t_0 the fault current is instantaneously reduced to a value less than the output limit of the RCTi. At time t_1 the RCTi has recovered from saturation, the time to recovery is typically 1.2 secs



RCTi recovering from a fault current sufficient to saturate the electronic integrator

Peak di/dt (rate of change of current) rating

This is the maximum di/dt above which the transducer will fail to correctly measure the current. The values for the RCTi are listed below

Type	Range	Rated current (A)	Peak di/dt (kA/μs)
RCTi / 3	x1	500	2.0
	x2	1,000	4.0
RCTi / 4	x1	1,000	4.0
	x2	2,000	8.0
All other RCTi's	either range	-	10.0

Absolute maximum (peak) di/dt - 10.0 kA/μs

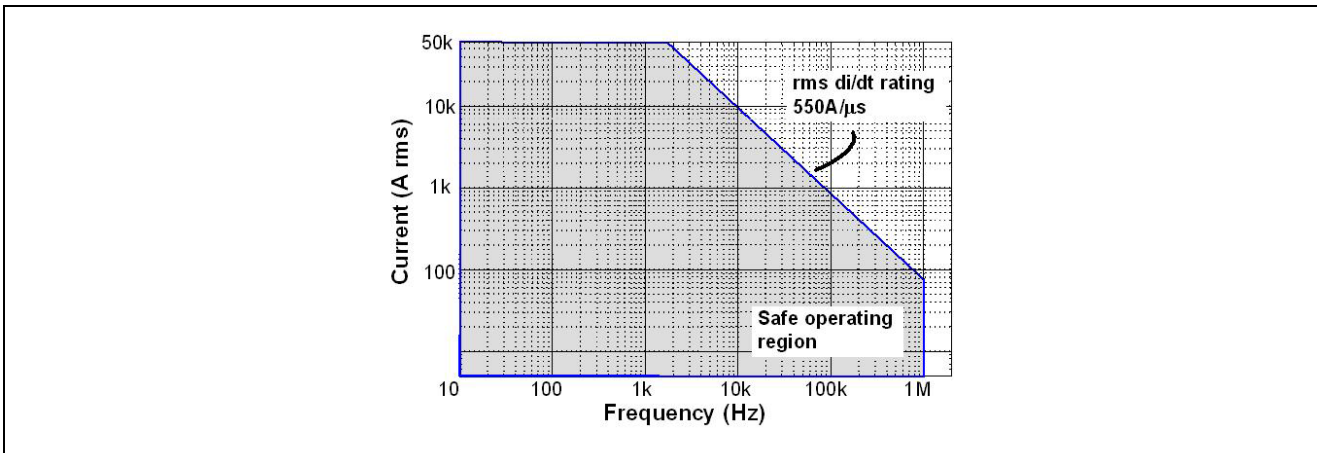
The transducer can be damaged by excessive di/dt due to the voltage generated in the coil.

The absolute maximum peak di/dt rating for all RCTi transducers is 10.0kA/μs which must not be exceeded.

Absolute maximum (rms) di/dt - 0.55 kA/μs

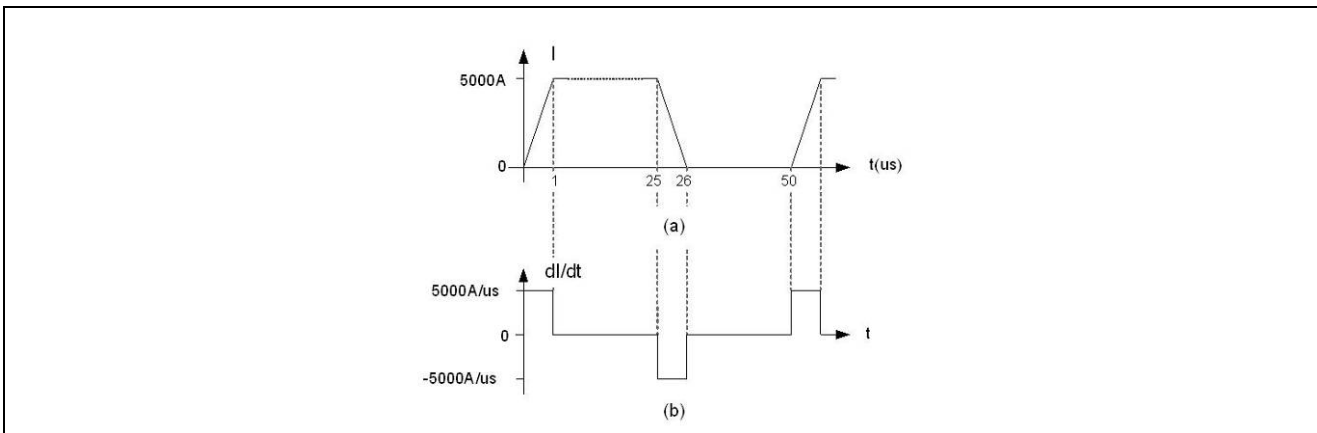
The RCTi can also be damaged by sufficiently high repetitive di/dt even though the peak di/dt rating is not exceeded. A damping resistor is used to provide correct termination of the Rogowski coil and cable to prevent reflections (seen as high frequency damped oscillations) appearing on the measured waveform. A high repetitive di/dt will cause excessive power to be dissipated in this resistor.

For **sinusoidal waveforms** provided your current/frequency product is in the safe operating region outlined below the RCTi will not be damaged.



Safe operating region given rms di/dt ratings

For **pulsed waveforms** an example of how to calculate the di/dt rms is shown below,



Consider the current waveform shown in Figure (a) with a repetition frequency of 20kHz. Figure (b) shows the corresponding di/dt waveform. The rms di/dt is given by $5000 \text{ A/μs} \times (1\text{μs}/25\text{μs})^{0.5} = 1 \text{ kA/μs rms}$.