GE
Grid Solutions

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System Controls & Switchgears

CAEM 33 MK II

Second Rotor Earth Fault Relay

Challenge

The field circuit of the generator, comprising the field winding of the generator and the armature of the exciter together with any associated field circuit breaker if it exists, is an isolated D.C. circuit, which is not normally earthed. If an Earth fault occurs, there will be no steady state fault current and the need for action will not be evident.

Danger arises if a second earth fault occurs at a separate point in the field system, to cause the high field current to be diverted, in part at least from the intervening turns.

Solution

The only way to find out the first and the actual second rotor earth fault is, with the help of VAEM and CAEM schemes, along with a null detector. Null detector is adjusted to zero position with the help of potentiometers provided in the circuit.

In this scheme the first rotor earth fault is detected by VAEM and then the VAEM becomes out from the circuit. Null detector is again adjusted to the zero position. CAEM makes a bridge circuit between the faulted portion. Occurrance of the second rotor earth fault disturbs the balancing of the bridge and gives trip command to the machine.

Application

A single Earth Fault (E/F) detected in the D.C. field circuit of a machine requires the machine to be taken out of service at the first opportunity. This is because, if allowed to run with an Earth fault on the 'rotor', a subsequent second earth fault can cause severe damage to the machine.

However, a relay which can detect such a second E/F and trip out the machine can make it possible to run even with a single E/F, without any such risks, thus helping to preserve the generation risks, thus helping to preserve the generation capacity. CAEM 33 has been designed for the above application.

Customer Benefits

- Proven solution for second rotor Earth fault
- High sensitivity
- Reliable
- Helps to preserve the generation capacity

Principle of Operation

The working principle of CAEM 33 Mk II is different from Mark I. CAEM 33 has three auxillary units.

Unit A senses the DC leakage current and unit C is a hand reset contact follower relay / contact multiplication of Unit A as shown in Figure1. Unit B is monitoring the AC auxiliary supply. Whenever the auxillary supply fails, this relay will reset and initiate the alarm through the N/C contact. The relay has a step down transformer with two secondary windings.

The auxillary supply is connected to the primary of the transformer through relay case terminal 7&8. One of the secondary winding voltages is rectified and connected to coil of Unit B and coil of Unit C through unit A contact. Another secondary winding voltage is rectified and regulated by zener diode. The unit A coil has two windings.

The regulated DC voltage is connected to one of the windings of unit A. The DC leakage current flows through the relay terminal no. 9&10 and is connected to the other winding of the unit A through a bridge rectifier. The unit A is calibrated to pickup when DC current of 1 mA or higher flows through the terminal no. 9&10.

Without AC auxiliary supply, unit A relay will not operate even if the leakage current is more than 1 mA.

Figure 2 shows the combined scheme of VAEM and CAEM for first and second rotor earth fault respectively.

Operating Time

The relay operating time at 5 times.
Pick-up is between 40, 60 ms.

Operation Indicators

The shield must be perfectly free to drop when the contacts are about to touch or just before they touch, but never after. This enables that the contacts do not close without the operation indicator being displayed Adjustment is make by bending the spring catch, which locates in a notch in the armature.

Contacts

Two pairs of normally open self reset contacts and one pair of normally closed self reset contacts for the failure alarm.

Technical Data

a)	Field circuit voltage	250 V,450 V,650 V and 850 V
b)	Burden	Less than 3.5 VA at 230 V under normal condition. During operation the burden increases to approximately 15 VA (Maximum)
c)	Auxiliary voltage	Single phase 230/240 V, 50 Hz
d)	Operating time	40-60 ms at 5 times pick-up
e)	Relay setting	Fixed pick-up setting of 1 mA
f)	Contacts	1 No. for trip 1 No.for AC failure alarm All above contacts are potential free
g)	Case	1D vertical drawout

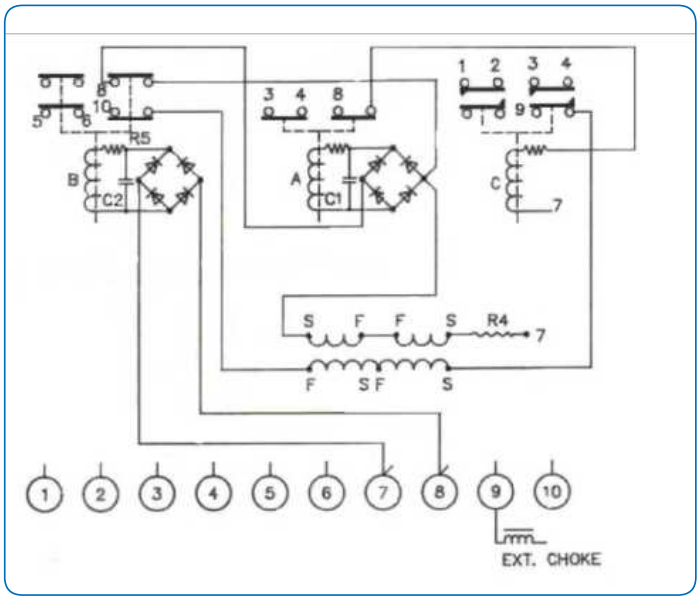

Figure 1: Functional Overview

Contact Ratings

	Make and carry continously	Make and carry for 0.5 second	Break
AC	1250 VA with maxima of 5 A and 660 V	7500 VA with maxima of 30 A and 660 V	1250 VA with maxima of 5 A and 660 V
DC	1250 W with maxima of 5 A and 660 V	7500 W with maxima of 30 Amps and 660 V	100 W (resisitive) 50 W(inductive) with maxima of 5 A and 660 V

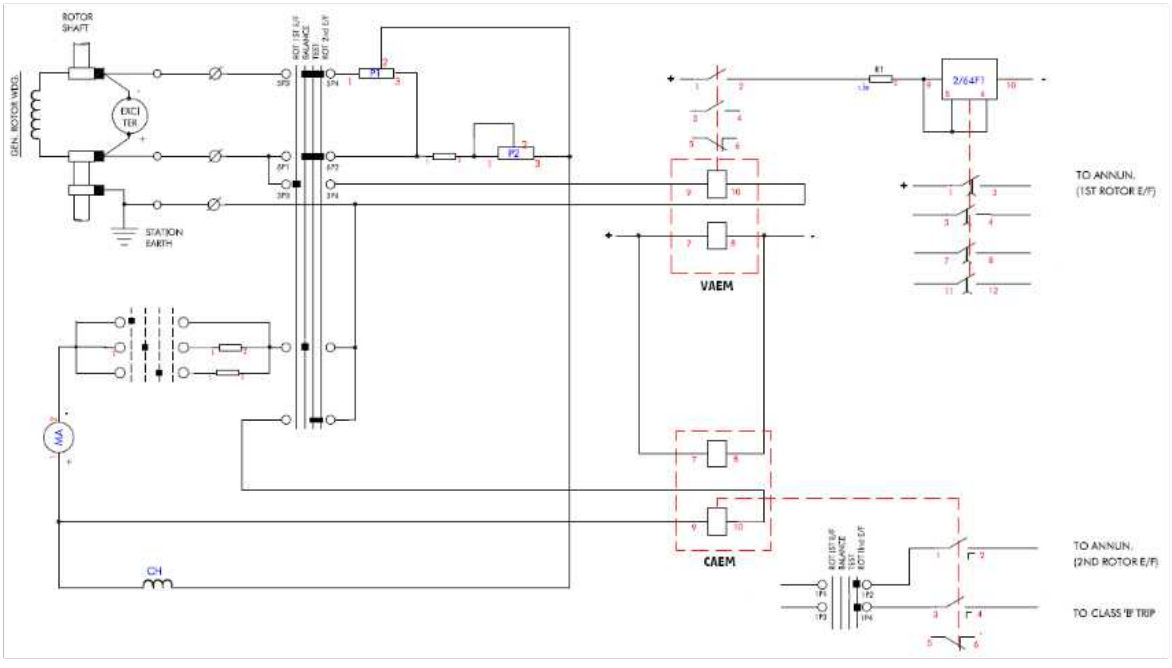

Figure 2: combined scheme of VAEM and CAEM for first and second rotor earth fault Protection

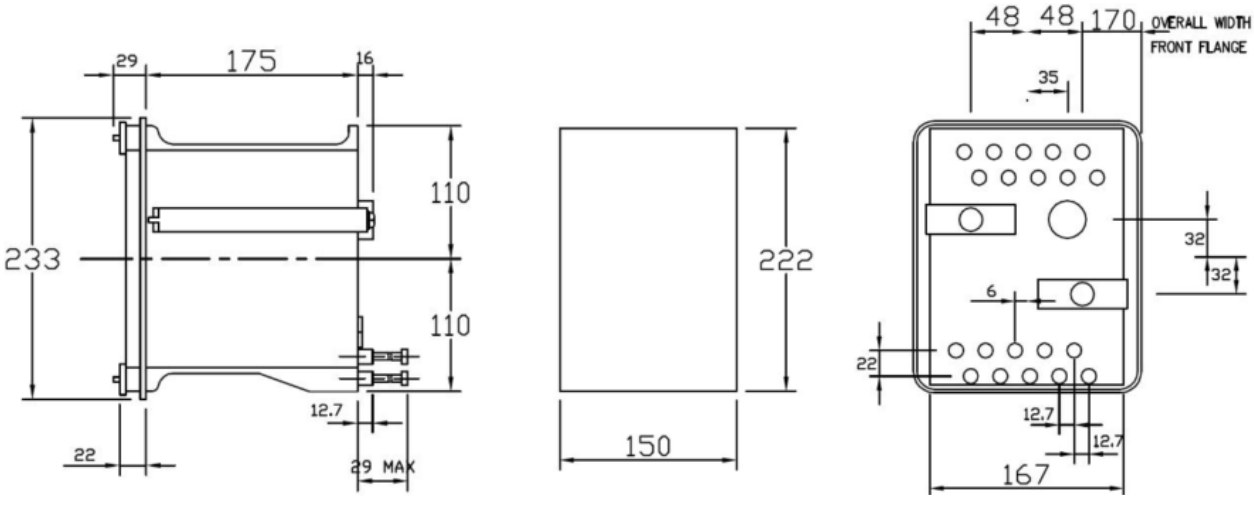

Figure 3: Case and Panel cut-out dimensions for case 1D (all dimensions in mm)

Information required with order

Field circuit Voltage:

For more information please contact
GE
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Worldwide Contact Center

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