

CEDM High Temperature Gripper Coils

Background

Westinghouse has developed replacement Combustion Engineering (CE) Control Element Drive Mechanism (CEDM) High Temperature (HT) Upper and Lower Gripper Coils that have much higher temperature capability than the original CEDM gripper coil design.

CE CEDM coils from the standard CE design have been in use for more than 40 years with a respectable operating history. However, the upper gripper coil, which is normally energized continuously in order to hold the control rod at the full out position, is under particular stress. As a result, the CE CEDM Upper Gripper Coil may fail after several years of service. Its failure is accelerated by excessively high voltage or exposure to temperatures above its design value.

The Westinghouse Control Rod Drive Mechanism (CRDM) coil design has also been in use for more than 40 years and has a nearly perfect operating history, including no reported temperature-related failures. This performance is due to the more robust design of Westinghouse CRDM Upper and Lower Gripper Coils, as well as the materials used to construct them.

Description

The new CEDM HT Upper and Lower Gripper Coils incorporate those time-proven materials used in the CRDM coil design and repackage them into drop-in replacements for the CEDM standard gripper coils. The result is gripper coils with exceptional performance characteristics.

Parameter	HT Gripper Coil	STD Gripper Coil
Number of Turns	830 + 0 / -10	830 ± 10
Wire Gauge	#15 AWG	#15 AWG
Resistance (Ω)	5.45 ± 0.20 @ 77°F	5.40 ± 0.20 @ 70°F
Inductance After Winding (mH)	117 - 129 @ 1 V, 1000 Hz	127 - 133 @ 1 V, 1000 Hz
Insulation Resistance @ 500 VDC (Ω)	1,000 Meg Ohm	10 Meg Ohm
Weight (lbs.)	58.5	59.5

The CEDM HT Upper and Lower Gripper Coils are superior to the existing CEDM coils with:

- Fiberglass filament insulation instead of varnish for much higher temperature resistance between coil wires
- Fiberglass epoxy high-temperature bobbin to support the coil winding
- Lead wires that are potted in the nipple to eliminate fretting wear
- Each coil fully potted in its coil housing and supplied as one assembly
- Coil housing for the upper gripper coil with double the surface area for enhanced heat transfer to the external cooling air



CEDM HT Upper Gripper Coil

The CEDM HT gripper coils are form, fit and functional replacements for the standard CEDM gripper coils with the same:

- Number of turns of wire
- Wire gage diameter
- Electrical resistance
- Electrical inductance
- Weight
- Operating characteristics
- Mounting mechanism

Benefits

The CEDM HT Upper and Lower Gripper Coils provide additional temperature margin: They are rated for 500°F for 60 years versus the standard coil which is rated at 350°F for 40 years.

The HT gripper coils also require less effort to replace than failed standard coils since they arrive factory-assembled and tested in the new housing.

Deliverables

The CEDM HT Gripper Upper and Lower Gripper Coils are drop-in replacements for 4-coil stacks.

Modified spacer rings are utilized in 5-coil stacks for the upper gripper coil only.

The CEDM HT Upper and Lower Gripper Coils are also available for installation into new replacement coil stacks.

Experience

Westinghouse is the original equipment manufacturer for the CE CEDM and the Westinghouse CRDM and has applied more than 40 years of knowledge to the enhanced (patent pending) CEDM High Temperature Upper and Lower Gripper Coil designs.



CEDM HT Upper and Lower Gripper Coils in a Coil Stack (5 coil-stack)