



SOLIDSTATE CONTROLS

Quality Assurance

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U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Attention: Document Control Desk
Subject: Notification of Potential Defect - 10CFR Part 21

Product: Omron Timer Relay, part number H3CR-A-AC100-240/DC100125

Ametek Solidstate Controls is submitting the following Report of a Potential Defect in accordance with the requirements of 10CFR21. This notification is applicable to equipment with the following model number prefixes:

- 55-CCXXXX-XX
- 85-CCXXXX-XX
- 85-VCXXXX-XX

The attached document provides details on the potential problem, cause and effect, and actions required. Also provided below is a list of specific equipment affected by this issue. Please contact us at the phone number or email provided above if there are any questions.

Sincerely,

Ethan Salsbury
Quality Director
Ametek Solidstate Controls



COMPONENT DESCRIPTION:

AMETEK Part Number 07-740108-00, K306 relay, used in the float/equalize circuit of AMETEK Battery Chargers. The relay is a solid-state timer manufactured by Omron with manufacturer part number H3CR-A-AC100-240/DC100125.

PROBLEM YOU COULD SEE:

AMETEK was notified of a condition of a nonconforming K306 relay that led to failures of battery chargers.

AEP DC Cook reported a single failure of a K306 Float/Equalize timer relay in a controlled environment where the relay failed to transfer from float to equalize and caused the DC output to fail. Transferring the battery charger to equalize mode is always a manual operation and the float/equalize function is typically used after an outage or a discharge test in order to bring the batteries back to full charge. Before performing a discharge test, the charger should be put in equalize mode.

AMETEK was not able to evaluate this specific instance of failure, but it was determined the circuit does not meet the minimum contact current rating. As a result, the operation of the relay may be unreliable and the charger may experience a loss of output when equalize is initiated, failing to charge the batteries. The failed relay was installed in 2017 and was original to the equipment.

Extent of Condition

Equipment with this relay installed is listed in Appendix A of this report.

CAUSE:

High contact resistance on the K306 normally open contacts in series with the Equalize control potentiometer caused the DC output voltage to decrease. Cycling the AC input breaker off and on will restart the charger and return the charger to float. To get the charger to equalize, the float potentiometer can be increased to the equalize voltage.

The relay manufacturer specifies the minimum relay contact current rating of 10mA at 5VDC. In the float/equalize circuit, the current applied is approximately 0.6mA to 0.7mA at 15VDC. The relay contact may not make contact consistently as the minimum current contact rating is not met when installed in the circuit. Any potential oxidation built up on the contacts would further reduce the relay's ability to transfer correctly. Based on previous aging analyses, the lifetime of the relay exceeds 300 years. However, this does not account for oxidation and aging that may limit reliable operation.

In the instance of failure reported, replacing the K306 relay allowed the battery charger to transfer between float and equalize correctly.

EFFECT ON SYSTEM PERFORMANCE:

If the charger fails to transfer between float and equalize, the equalize light may turn on, the charger output will fail, voltage will drop below float voltage or to 0, and there will be no charging capabilities. An alarm will indicate Low DC voltage in the event the charger does not transfer between float and equalize. The charger will restart after the AC input breaker is cycled Off and On. The relay should be replaced if the charger output is lost. Other alarm(s) may be included with the design:



- Battery Discharge Alarm
- Low Current Alarm

The battery will charge with float voltage, but will take longer than with equalize voltage (~8-24 hours after charging current stabilizes)

The safety impact is a loss of battery charger output after an event where the float/equalize button is utilized and does not retransfer to equalize for charging. If the charger fails to transfer and the output is lost prior to a safety event, the battery may not be at full capacity for a shutdown. Each utility will need to evaluate the application of the battery charger and the battery it is charging.

ACTION REQUIRED:

This relay is integrated into the design of all AMETEK battery chargers. AMETEK has not experienced a significant number of failures relative to the quantities installed over the past 30 years and is not aware of widespread failures of this part. There have not been any trends in warranty or internal failures of this component. The incidents reported by AEP were the first on file that occurred early in the component's life. Typical failures of the K306 relay occur after many years in operation beyond the recommended replacement schedule of 10 years.

AMETEK is still seeking a direct replacement alternative to be used in the circuit with a higher minimum contact current rating. As an alternative enhancement to the reliability of the K306 relay, a reed relay board is being designed to increase the circuit current to meet the minimum contact current rating.

Estimated completion of the reed relay board is early 2022. This will include options for retrofitting to existing equipment along with the necessary seismic justification and replacement schedules.

The timer relay is currently on a 10-year preventative maintenance schedule. In the interim, affected utilities should consider replacing relays at 2-year intervals to avoid any disruption of operation. Routine operation should prolong the lifetime of the relay by reducing the oxidation buildup on the contacts. The relay can be cycled on a quarterly basis to extend this replacement to 5 years. The replacement and cycling time periods are based on conservative estimates of oxidation and the operation history of these relays.

The K306 relay should be tested annually to determine if any oxidation is impacting performance. AMETEK will update the operation manual to instruct users to transfer from float to equalize every outage, at minimum. Additionally, spare components should be available as a backup if a failure during transferring to equalize occurs.

AMETEK SOLIDSTATE CONTROLS CORRECTIVE ACTION:

AMETEK Solidstate Controls will work with you to arrange replacements and spare parts for your application as needed. Please contact our Client Services group at 1-800-222-9079 or 1-614-846-7500, extension 1.



Appendix A

Customer	Job Number	Model
ALABAMA POWER COMPANY	96000039	85-VC0075-32
		85-VC0075-35
	C94324	85-CC0250-01
		85-CC6000-29
ARKANSAS NUCLEAR ONE	C60185	
	C65853	85-CC4000-51
ATOMIC ENERGY OF CANADA	C72921	85-CC4000-67
		85-CC1500-77
CONSTELLATION ENERGY	94000960	85-CC3500-09
		85-CC5000-71
	C86206	85-CC0500-71
		85-CC0500-72
		85-CC3000-135
CONSUMER'S POWER, PALISADES	C64245	85-CC3000-136
		85-CC2000-71
DOMINION - KEWAUNEE	C101778	85-CC1500-96
DOMINION ENERGY	96000166	85-CC4000-104
	96000088	
	96000126	
	96000149	85-CC2500-46
DOMINION INC.		85-CC2500-47
		85-CC2500-48
		85-CC2500-48
DUKE ENERGY	96000070	85-CC3000-148
	C69374	85-CC0500-36
	C80148	85-CC5000-68
	C92133	85-CC3000-140
DUKE POWER CO	C55043	85-CC0750-12
	C55043	85-CC3000-64
	C62608	85-CC4000-87
EM TEST (SWITZERLAND) GMBH	96000084	85-CC0200-24
ENGINE SYSTEMS	C102106	55-CC0500-13
ERGYTECH INC.	C73423	85-CC6000-27
		85-CC6000-28
EXELON	96000151	85-CC3000-150
	96000169	85-CC2000-126
EXELON GENERATION CO	C78494	85-CC2000-100
		85-CC2000-102
		85-CC2000-99
		85-CC2000-101
	C80146	85-CC2000-103



Customer	Job Number	Model
FIRST ENERGY	C102800	85-CC2000-104
		85-CC6000-31
		85-CC6000-33
		85-CC6000-32
		85-CC6000-34
FORMOSA NEXTECH CO	96000095	85-CC3000-149
FRAMATOME TECHNOLOGIES	C72400	85-CC5000-72
		85-CC0500-40
GEORGIA POWER	C102225	85-CC0500-41
		85-CC4000-99
	C97060	85-CC4000-102
		85-CC3000-142
		85-CC2000-115
	C97060	85-CC2000-116
		85-CC4000-96
		96000083
	96000051	85-CC1000-64
	C97060	85-CC4000-97
INDIANA MICHIGAN POWER CO	96000079	85-CC0250-03
		85-CC0250-04
		85-CC0250-05
		85-CC2000-61
MILLSTONE NUCLEAR POWER STATION	C61578	85-CC2000-61
NIAGARA MOHAWK	40814	85-CC5000-03
NPP KRSKO	96000092	55-CC3000-18
PROGRESS ENERGY	C98245	85-CC3000-146
TVA	96000164	85-CC0200-25
TVA WATTS BAR	C98266	85-CC2000-118
		85-CC2000-123
		85-CC1500-97
ULYSSES - TAIWAN POWER	C101985	85-CC1500-97
ULYSSES SYSTEM DEVELOPMENT	C72472	85-CC1500-76