# UNIVERSITY of MISSOURI

#### **RESEARCH REACTOR CENTER**

July 27, 2015

U.S. Nuclear Regulatory Commission ATTN: Document Control Desk Mail Station P1-37 Washington, DC 20555-0001

REFERENCE: Docket No. 50-186 University of Missouri-Columbia Research Reactor Amended Facility License R-103

SUBJECT: Written communication as required by University of Missouri Research Reactor Technical Specification 6.1.h(2) regarding a deviation from Technical Specifications 3.2.a

The attached document provides the University of Missouri-Columbia Research Reactor (MURR) Licensee Event Report (LER) for an event that occurred on June 29, 2015, that resulted in a deviation from MURR Technical Specification 3.2.a.

If you have any questions regarding this report, please contact John L. Fruits, the facility Reactor Manager, at (573) 882-5319.

Sincerely,

FOR RALPH DURCH

Ralph A. Butler, P.E. Director

RAB:jlb

Enclosure

Signed hefore meg 7/27/15 Margee P-Stout

MARGEE P. STOUT My Commission Expires March 24, 2016 Montgomery County Commission #12511436

1513 Research Park Drive Columbia, MO 65211 Phone: 573-882-4211 Fax: 573-882-6360 Web: www.murr.missouri.edu Fighting Cancer with Tomorrow's Technology



## <u>Licensee Event Report No. 15-02 – June 29, 2015</u> <u>University of Missouri Research Reactor</u>

# **Introduction**

On June 29, 2015, with the reactor operating at 10 MW in the automatic control mode, the control room operator initiated a manual rod run-in to shut down the reactor as part of performing compliance procedure CP-10, "Rod Drop Times." Immediately after the rod run-in was initiated, the control room operator noted that shim control blade 'A' was not driving in the inward direction. The reactor was immediately shut down by placing Master Control Switch 1S1 in the "Test" position in accordance with reactor emergency procedure REP-8, "Control Rod Drive Mechanism Failure or Stuck Rod." Operation of Master Control Switch 1S1 removes the holding current from the four control rod drive mechanism (CRDM) electromagnets, thus allowing all of the control blades to drop to their fully inserted positions without inward movement of the CRDMs. All immediate actions of REP-8 were completed. Failure of the CRDM to move control blade 'A' in the inward direction resulted in a deviation from Technical Specification (TS) 3.2.a, which states, "*All control blades, including the regulating blade, shall be operable during reactor operation.*"

## **Description of the Rod Control System**

The reactivity of the reactor is controlled by five neutron absorbing control blades. Each control blade is attached to a CRDM by means of a support and guide extension (offset mechanism). Four of the control blades, referred to as the shim blades, are used for coarse adjustments to the neutron density of the reactor core. The fifth control blade is a regulating blade. The low reactivity worth of this blade allows for very fine adjustments in the neutron density in order to maintain the reactor at the desired power level. The nominal speed of the shim blades is one inch per minute in the outward direction and two inches per minute in the inward direction. Nominal speed of the regulating blade is 40 inches per minute in both the inward and outward directions. The speed of the control blades cannot be adjusted without physically altering the system. The four shim blades are actuated by electro mechanical CRDMs that position, hold, and scram each shim blade. Each CRDM consists of a 0.02-HP, 115-volt, one-amp, singlephase, 60-cycle motor connected to a lead screw assembly through a reduction gearbox and overload clutch. The reactivity worth and speed of travel for the control blades are sufficient to allow complete control of the reactor system from a shutdown condition to full power operation. The insertion rate of the control blades is adequate to ensure prompt shutdown of the reactor in the event a scram signal is received.

Control blade movements, interlocks and bypasses, and control modes are managed by the Rod Control System. The Rod Control System is a relay and switch logic system used to prohibit accidental or incorrect operation which could result in an unsafe condition. During normal operation, Master Control Switch 1S1 allows the shim blades to be withdrawn or inserted manually by a three-position ("In-Normal-Out") switch (1S4) located on the reactor control console. The switch is spring return to the mid-position ("Normal") when released. A five-position ("A-B-C-D-Gang") selector switch (1S3) enables the reactor operator to select the shim blades individually or as a group. 115 VAC power is supplied to the CRDM motor windings through motor relays (see Attachment 1); K1 for shim control blade insertion and K2 for shim control blade withdrawal.

# **Detailed Event Description**

On June 29, 2015, at 02:00 with the reactor operating at 10 MW in the automatic control mode, the control room operator initiated a manual rod run-in as part of performing compliance procedure CP-10, "Rod Drop Times." Immediately after the rod run-in was initiated, the control room operator noted that shim control blade 'A' was not driving in the inward direction. The reactor was immediately shut down by placing Master Control Switch 1S1 in the 'Test' position in accordance with reactor emergency procedure REP-8, "Control Rod Drive Mechanism Failure or Stuck Rod." Operation of Master Control Switch 1S1 removed the holding current from the four CRDM electromagnets, thus allowing all of the control blades to drop to their fully inserted positions without inward movement of the CRDMs. All control blades were verified to be fully inserted. All immediate actions of REP-8 were completed. Failure of the CRDM to move shim control blade 'A' in the inward direction resulted in a deviation from TS 3.2.a, which states, "All control blades, including the regulating blade, shall be operable during reactor operation."

After the reactor was secured, the CRDM was removed for inspection. Troubleshooting efforts revealed an intermitted failure of CRDM 'A' motor relay K1. Relay contacts 6 and 10 would intermittently not make sufficient contact to allow current flow with the relay coil energized; thus preventing the motor inward direction windings from being energized.

# <u>Safety Analysis</u>

The basis for TS 3.2.a is to ensure that the normal method of reactivity control is used during reactor operation. When operating the reactor at 10 MW in the automatic control mode, the control blades are routinely shimmed in the outward direction as a result of poison buildup and fuel depletion. Shimming of a control blade in the in-ward direction after initial reactor startup is not a routine occurrence and therefore it is difficult to postulate at what time the failure occurred and how long the reactor may have been in operation with the failed relay. A review of the

Nuclear Instrumentation (NI) power level strip-chart recorders indicated conditions consistent with steady-state operation for the entire week. While the ability of inward movement of control blade 'A' may have been unavailable sometime during this period, at no time was the ability to scram the reactor, either through automatic initiation or manually by the control room operator, affected by this failure. CRDM motor relays K1 and K2 are not a part of the Reactor Safety System.

# **Corrective Actions**

When the control room operator discovered that CRDM 'A' would not move the shim control blade in the inward direction, he immediately initiated a reactor scram by placing Master Control Switch 1S1 in the "Test" position and completed the immediate actions of reactor emergency procedure REP-8, "Control Rod Drive Mechanism Failure or Stuck Rod," to ensure the reactor was in a safe shutdown condition. All four shim control blades were verified to be fully inserted.

Troubleshooting efforts identified the failure of CRDM motor inward relay K1. The relay was bench tested to identify the single component intermittent failure of contacts 6 and 10. A visual inspection of the relay internals also revealed some discoloration on contacts 8 and 12, which can be associated with a high resistance connection (Attachment 1). This type of relay, Magnecraft 782HXDXH21-120A, has been used at MURR for many years and has proven very reliable in the past. However, a similar event occurred on April 23, 2014 (see LER 14-02, letter dated May 16, 2014). As a result of that event, all Magnecraft relays of that lot number were removed from service and a new lot of relays were installed. At that time the relay manufacturer (Schneider Electric) was contacted and MURR was assured that the failure was an isolated instance and not an identified deficiency. Because this June 29<sup>th</sup> occurrence is a similar repeat failure, the Magnecraft relay has been replaced with an equivalent relay from a different manufacturer (Allen Bradley) (Attachment 2). In addition to replacing the failed relay, all Magnecraft relays have been removed from the remaining CRDMs and replaced with Allen Bradley relays.

MURR electronic maintenance procedure EMP-12, "Drive Mechanism," was completed on CRDM 'A.' Additional post maintenance testing included bench testing to ensure correct operation of the CRDM relay contacts, monitoring CRDM run current and speed over the full length of travel, and performing multiple cycles of the CRDM motor relay to ensure proper operation.

Additionally, this event was entered into the MURR Corrective Action Program as CAP entry No. 15-0057 and any additional information or corrective actions will be considered and documented.

Licensee Event Report U.S. Nuclear Regulatory Commission July 27, 2015

If there are any questions regarding this Licensee Event Report, please contact me at (573) 882-5319. I declare under penalty of perjury that the foregoing is true and correct.

Director

Sincerely,

John L. Fruits Reactor Manager ENDORSEMENT: Reviewed and Approved,

FOR IZALIUM BUIZER Ralph A. Butler, P.E.

xc: Reactor Advisory Committee
 Reactor Safety Subcommittee
 Dr. Garnett S. Stokes, Provost
 Dr. Henry C Foley, Senior Vice Chancellor for Research
 Mr. Geoffrey Wertz., U.S. NRC
 Mr. Johnny Eads, U.S. NRC

Attachments:

- 1. Control Rod Drive Mechanism Motor Relay K1
- 2. 700-HC Miniature Ice Cube Relay

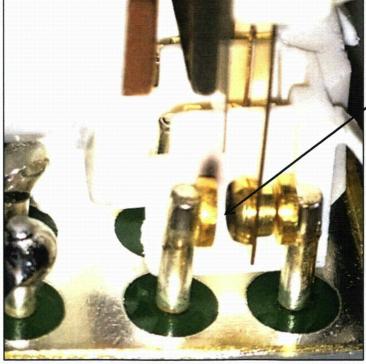
Jegred before My 1/27/15 Mon and - How t

SARY PUS NOTARY SEAL OF MIST MARGEE P. STOUT My Commission Expires March 24, 2016 Montgomery County Commission #12511436

# ATTACHMENT 1

# Magnecraft 782H Hermetic Ice Cube Relay





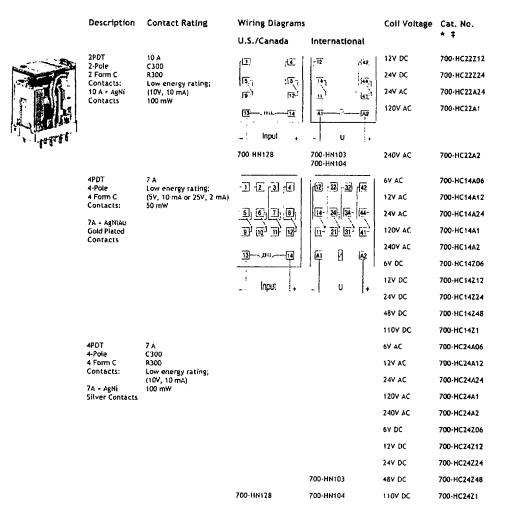
Relay Contacts
 6-10

Control Rod Drive Mechanism Motor Relay K1

### **Bulletin 700-HC Miniature Ice Cube Relay**

#### **Product Selection**

#### Bulletin 700-HC Miniature Square Base with Blade Terminals



+ LED Option: Add suffix (-4) to the selected Bulletin 700-HC Relay Cat. No. except for the 240V AC units, add (-4L).

# Push-to-Test and LED Option: Add suffix (-3-4) to the selected Bulletin 700-HC Relay Cat. No., except for the 240V AC units, add (-3-4L).

Copyright © 2015 Rockwell Automation, Inc. All Rights Reserved

#### Cat. No. 700-HC...

# ATTACHMENT 2

<form><tr< th=""><th>Cat. No. 700-1</th><th>HC</th><th></th><th></th><th></th><th>ATTACIN</th><th></th><th></th><th></th></tr<></form>	Cat. No. 700-1	HC				ATTACIN				
<table-container>Parameter in the serie in th</table-container>	Electrical Rati	ings								
<table-container>Career of the construction of the constructin of the construction of the cons</table-container>	Pilot Duty Rating ‡			NEMA C300,	R300					
nearn				7 A and 10 A						
n infinfinfinfinfinfinf1200013.413.417.015.415.417.020000200002000020.320.313.413.41200002000020000020.320.320.312000010.010.010.020.020.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.012000010.010.010.010.010.0120000010.010.010.010.010.0120000010.010.010.010.010.01200000010.01	Rated Insulation	Voltage	(U,)	250V IEC - 300V UL/CSA						
Image: state s	Contacts Indu		inductive	700-НС_4 Нр 700-НС22 Нр						
interm				►][◄	<) <b> </b> ►		►][◄	<b>∢</b> ][►		
			120V AC	15 A	1.5 A	1/8	15 A	1.5 A	1/3	
in the set is the set of t			240V AC	7.5 A	0.75 A	1/3	7.5 A	0.75 A	3/4	
				7 A, 277V AC			10 A, 277Y AC			
	Resistive			7 A, 30Y DC 10 A, 24V DC						
Aligned Notice at SATH     Disc At Nominal Votage at SATH     Disc At Nominal Votage at SATH       Bailer     547     547       Sath Sath Sath Sath Sath Sath Sath Sath	Min. Low Energy Permissible Load									
Bit is the state of the stat	Permissible Coll Voltage Variation			Pickup:	80110% of Nominal Vo	bitage at 50 Hz	Must Dropout Voltage:	201 of Nominal Vo	oltage at AC	
No         No         No         No           Control         1,0         1,0         1,0           Control         1,0         1,0         1,0         1,0           Control         1,0				80110% of Nominal Voltage at 60 Hz 10			10% of Nominal Ve	05 of Nominal Voltage at DC		
Ang         Ang         Solution         Solution           Solution         Solution         Solution					80110% of Nominal Ve	stage at DC				
General Section         Section         1.34         1.144           In C Call         1.40         1.144           Nam. Allow 12 Call         50 - 00 (0.000)         1.04 (0.000)           Nam. Allow 12 Call         50 - 00 (0.000)         1.04 (0.000)           Detective Vertice         Vertice         Vertice           Detective Vertice         0000         1.000 (0.000)           Call Allow 12 Call         0000 (0.000)         1.000 (0.000)           Call Allow 12 Call         0000 (0.000)         1.000 (0.000)           Call Allow 12 Call         0000 (0.000)         1.000 (0.000)           Call Allow 12 Call         Vertice Vertice Vertice         Vertice Ve				50 Hz			60 Hz			
10%     0.6     1.0%     1.1%       0 C JL     0.9 V MC       0 of W MC     0.9 v W OC       Dejspecification // Extrementation // Extr			Inrush	2.2 VA			1.6 VA			
<table-container>               initial state in the state in th</table-container>			Sealed	1.3 VA			1.1 VA			
<table-container>bailed<td colspace<="" td=""><td colspan="3">DC Coils</td><td colspan="6">1.0 <del>W</del></td></td></table-container>	<td colspan="3">DC Coils</td> <td colspan="6">1.0 <del>W</del></td>	DC Coils			1.0 <del>W</del>					
Beinstein Seinstein Schlere Seinstein Schlere Seinstein Schlere Seinstein Schlere	Max. Allowable Leakage			20% of VA (AC)						
Electrical     Paie-to-Pio     200V       Objective Withstand Context and Context				10× of W (DC	Ξ)					
Pathon         Pathon         Selection           Calcular         Good         Good           Calcular         Good         Good           Calcular         Josodoninum         Good           Calcular         Josodoninum         Josodoninum           Calcular         Josodoninum         Josodoninum           Calcular         Josodoninum         Josodoninum           Mechanical Life Good         Josodoninum         Josodoninum           Calcular         Selection         Selection           Selection         Selection	Design Specific	ation/1	est Requirem	ents						
Voltage         constant         constant           Exect-left (fyet)         >         000 minima           Mechanical         >         000 minima           Mechanical         >         010 diarded Terminal Sockets)           Mechanical (fyet)         >         010 diarded Terminal Sockets)           Mechanical (fyet)         >         010 diarded Terminal Sockets)           Mechanical (fyet)         >         010 diarded Terminal Sockets)           Sockets (fyet)         >         0100 diarded Terminal Sockets)           Sockets (fyet)         >         0100 diarded Terminal Sockets)										
Content to         0000V           Central Life (Cycles)         100 000 minimum           Mechanical            Uggee of Protection (Open Type) ECX         P 20 (Guarded Terminal Sockets)           Mechanical Life Cycles:         20 x 10s (ACX 50 x 10s (DC)           Switching Frequency Operations         1800/HR           Operating Time (ms)         Max. Pick           Maximum Operating Rate         See Product Selection           Operating Time (ms)         Max. Pick           Propout         8 cycles/s           Environmental            Temperature         9 cycles/s           Inded Hijp Delectric Material         5 cycles/s           Attitude         10 cycles/s           Inded Hijp Delectric Material         coperating Time (ms)           Attitude         5 cycles/s           Environmental         -           Inded Hijp Delectric Material         coperating Time (ms)           Attitude         5 cycles/s           - Temperature         0000 m r6560 ft;           Insulating Material         -           Contact Material         -           Contact Material         -           Contact Material         -           Contack Material <t< td=""><td colspan="2" rowspan="2">Voltage Contact Coil</td><td></td><td colspan="7"></td></t<>	Voltage Contact Coil									
AccharicalP 2 Guarda Terminal Sockets)Regen 07 Product Sockets)P 2 Guarda Terminal Sockets)Accharical Life CycleS 2 Guarda Terminal Sockets)Recharical Life CycleS 2 No (AC 100 N 00 (C)Victinia Frequency WS 00/HRCol VatageNo Product SelectionCol VatageNo Product SelectionOperating Time (m)Mar.NetResource SocketsS 2 SocketsResource SocketsS 2 SocketsProperation (m)S 2 SocketsResource SocketsS 2 SocketsProperation (m)S 2 SocketsResource SocketsSocketsResource SocketsSocketsResource SocketsSocketsSocketsS 2 SochetsSocketsS 2										
Aggree of Protection         b2 of durind Terminal Sockets)           Mechanical Life Cycles         > 0x 10 a (AC 30 x 10 a (AC 30		ycles}		100 000 minir	າພາກ					
(ijen Type) IEC 529Mechanikal Life Cycles0 x 106 (AC) 50 x 106 (DC)Switching Frequency Der Stop800/HROperating Time (m) by Der StopMax. PickuMax. Picku0Operating Time (m) by Der StopMax. PickuOperating Time (m) by Der StopMax. PickuDer Stop0Adxinum Operating Ret0Properation0Stop0Coll Coll Coll Coll Coll Coll Coll Coll										
skinking Frequency >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	(Open Type) IEC 529									
Coli Voltages       See Product Selection         Operating Time (ms)       Max.         Max.       Dopout         Dopout       Storage         Operating Material       Storage         Storage       Storage         Storage       Storage         Objecting Material       Voltages/Coll         Insulating Material       Voltages/Coll         Colact Material       Voltages/Coll         Terminal Markings on Sockets       Storage         Storage       Storage         Altifude       Tensparent Dust Cover         Contact Material       Stir 100-HC12)         Terminal Markings on Sockets       No-HND3, -HNI26, -HNI04         Sockets       Oo-HNI03, -HNI26, -INI04         Sockets       Col-HNI03, -HNI26, -INI04         Childer MINT//NRMT7/), CE Marked, LI CoverIffed										
Operating Time (ms)         Max. Pickup         10           Max: bropout         3           Aximum Operating Rate         6 sycles/s           Environmental         5 sycles/s           Temperature         0 perating         -055 ° C           (-22131 °F)         (-22131 °F)           (-22131 °F)         (-22131 °F)           Attitude         -55455 °C           (-22135 °F)         (-22135 °F)           Attitude         -55455 °C           (-21185 °F)         (-21185 °F)           Attitude         -55456 °C           (-21185 °F)         (-21185 °F)           Contact Material         -5141870 ODOO ·GOO ·GOO ·GOO ·GOO ·GOO ·GOO ·GOO										
Max, Dropout       3         Maximum Operating Rate       \$ cycles/s         Environmental       \$ cycles/s         Environmental       -055 °C         Temperature       0perating         Storage       5585 °C         c52131 °F)       -055 °C         c42131 °F)       -055 °C         c42131 °F)       -055 °C         c42131 °F)       -055 °C         c52455 °F)       -055 °C         c52455 °F)       -055 °C         c100 m (6560 ft)       -0560 m (560 ft)         Insulating Material       V       Molded High Dielectric Material         Contact Material       Transparent Dust Cover       Molded High Dielectric Material         Contact Material       In accordance with EN50 0005       In accordance with EN50 0005         Sockets       -00HIN13HIN164INI04       -1E14843Guide NRNT2/NRNT8)CULus Listed when used with Bulletin 700-HIN13HIN164, andHIN124E14843E14843E1484	-									
Image:	Ma									
Environmental Temperature Operating 3055 °C (-22131 °F) (-22131 °F) (-22131 °F) (-22131 °F) (-21185 °F) (-1185 °F) (-1				,						
Temperature         Operating         -30455 °C           -22131 °F)         -22131 °F)           Storage         -55485 °C           -67185 °F)         -67185 °F)           Altivude         2000 m (6560 ft)           Insulating Material         Volde High Dielectric Material           Enclosure         Transparent Dust Cover           Contact Material         Shi (700-HC2)           Schets         Naider Histo Dobos           Terminal Markings on Soc         Naider Histo Dobos           Sockets         Yo HN101, HN128, HN104           Certifications         Subschet/Elle No. E14843, Guide NRNTZ/NRNT8), CULsus Listed when used with Bulletin 700-HN103, HIN104, and -HIN128 sockets IFIE No. E14844	Maximum Operat	ing Rate	!	8 cycles/s						
i       i         Storage       i         i       i	Environmental									
Storage         55885 °C           (-5+85 °F)         (-5+85 °F)           Altiwde         0000 m (6560 ft)           Insulating Material         Molde High Dielectric Material           Faclosure         Transparent Dust Cover           Contact Material         Spil (700-HC2)           Terminal Markings on Socket         In accordance with EMSD 0005           Sockets         00-HIN03HIN104HIN104.0-LIN104.0-LIN105.0-LIN10	Storage		Operating	-30•55 °C						
insulating Material     co0 m (6560 ft)       Insulating Material     Molded High Dielectric Material       Enclosure     Transparent Dust Cover       Contact Material     AgNi (200-HC2) AgNi - 5 µm All (700-HC1)       Terminat Markings on Socket     In accordance with EN50 0005       Sockets     700-HN103, -HN104, -HN104       Certifications     Cilluus Recognized (File No. E14843, Guide NRNT2/NRNT8), culluus Listed when used with Bulletin 700-HN103, -HN104, and -HN128 sockets (File No. E14843)				(-22+131 *)	F)					
Altiwde     2000 m (6560 ft)       Insulating Material     Molded High Dielectric Material       Enclosure     Transparent Dust Cover       Contact Material     àgNi (700-HC2) AgNi - 5 µm All (700-HC1)       Terminal Markings on Socket     In accordance with ENSD 0005       Sockets     700-HN103 - HN128, -IIN104       Certifications     kluus Recognized (File No. E J4843, Guide NRNT2/NRNT8), cUlus Listed when used with Bulletin 700-HN103, -HN104, and -HN128 sockets (File No. E J4843)			Storage	·55+85 °C						
Insulating Material     Molded High Dielectric Material       Enclosure     Transparent Dust Cover       Contact Material     AgNi (700-HC2) AgNi - 5 µm All (700-HC1)       Terminal Markings on Socket     In accordance with ENSD 0005       Sockets     700-HN103, -HN128, -HN104       Certifications     ClRus Recognized (File No. £14843, Guide NRNT2/NRNT8), CULus Listed when used with Bulletin 700-HN103, -HN104, and -HN128 sockets (File No. £14844)										
Enclosure       Transparent Dust Cover         Contact Material       AgNi (700-HC2) AgNi - 5 µm All (700-HC1)         Terminal Markings on Socket       In accordance with EN50 0005         Sockets       700-HN103, -HN104, -HN104         Certifications       cURus Recognized (File No. E14843, Guide NRNT2/NRNT8), cULus Listed when used with Bulletin 700-HN103, -HN104, and -HN128 sockets (File No. E1484										
Contact Material       AgNi (700-HC2) AgNi (700-HC2) AgNi (700-HC1)         Terminal Markings on Socket       In accordance with EN50 0005         Sockets       700-HN103, -HN128, -HN104         Certifications       CURus Recognized (File No. E14843, Guide NRNT2/NRNT8), cULus Listed when used with Bulletin 700-HN103, -HN104, and -HN128 sockets (File No. E1484 Guide NRNT/NRNT7), CE Marked, LR Certified										
Agtli = 5 µm All (700-HC1)         Terminal Markings on Socket       In accordance with EN5D 0005         Sockets       700-HN103, -HN128, -HN104         Certifications       CURus Recognized (File No. E14843, Guide NRNT2/NRNT8), CULus Listed when used with Bulletin 700-HN103, -HN104, and -HN128 sockets (File No. E1484										
Sockets 700-HN103, -HN128, -HN104 Certifications cURus Recognized (File No. E14843, Guide NRNT2/NRNT8), cULus Listed when used with Bulletin 700-HN103, -HN104, and -HN128 sockets (File No. E1484 Guide NRNT/NRNT7), CE Marked, LR Certified	Contact Material	l		Agtii + 5 jum All (700-HC1)						
Certifications CURus Recognized (File No. E14843, Guide NRNT2/NRNT8), CULus Listed when used with Bulletin 700-HN103, -HN104, and -HN128 sockets (File No. E1484 Guide NRNT/NRNT7), CE Marked, LR Certificd		gs on Soc	:ket							
Guide NRNT/NRNT7), CE Marked, LR Certified										
Standards UL 508, CSA 22.2 No. 14, EN 61810-1	Certifications						us Listed when used with Bulletin 700-H	IN103, •HN104, and •HN12	18 sockets (File No. E14843,	
	Standards			UL 508. CSA	22.2 No. 14, EN 61810-1					

See Performance Data.

‡ NEMA Rating Chart is in publication 700-5G003\*