

Intertech•Rail

B-Relay AREMA Compliance Review

IntertechRail Relays

Aug. 3rd, 2017

Overview

This compliance review conducted by IntertechRail is intended to confirm that our relays adhere to the suggested regulations laid out by the AREMA manual.

Methodology

This review covers section 6.2.1 in the AREMA manual “Recommended Design Criteria for Tractive-Armature Direct-Current Neutral Relay (Plug-In Type)” and any other applicable AREMA sections that are referenced in 6.2.1. Each sub-section is briefly outlined in the spreadsheet on the next page and reviewed in an effort to assess full compliance.

Field Experience

Our relays have been approved by Class 1, transits and many other railways when it comes to manufacturing process and practices. Overall, these B-Relays have been produced for almost 20 years and thousands are currently in service. Throughout these years, the manufacturing practices and inspection processes have only become more thorough as regulations and expectations in the railroad industry have increased.

Conclusion

Our relays comply wherever applicable with the AREMA manual. Expertise and repetition have been essential to this process and these relays continue to be a reliable substitute for buying from the original manufacturer without overpaying or sacrificing quality.

Compliance Matrix for Relays

C. Design

	Specific Requirement	Compliance	
1	Relay provided with registering means so it cannot be plugged into where it wont function properly	1	Complies
2	All moving parts enclosed in a case that meets NEMA 2 requirements for dirt and moisture	2	Complies
3	All nuts and screws secured and locked	3	Complies
4	Contact elements must be secured or designed that they wont lose adj during shipping	4	Complies
5	Cores and armature supports mounted correctly	5	Complies
6	Parts mounted on base plate meet NEMA 2 to prevent dust from entering enclosure of moving parts	6	Complies
7	Relay shall be sealed so no adjustments can be made without breaking seal	7	Complies

D. Armature Supports

Shall conform to Manual Part 6.5.1 Sections C-1, C-6, and C-11 through C-14

C-1	Trunnions are hard-drawn bronze or nickel-silver of nominal 18% nickel. Cylindrical, not less than 1/16 inches in dia. And 3/32 inches long	C-1	Not applicable
C-6	Armature bearing should be a different material than the trunnion, either hard brass, hand-drawn bronze, or nickel-silver of 18% nickel.	C-6	Complies
C-11	Armature bearing shall be of the manufacturer's standart trunnion, rocker bearing or hinged spring type	C-11	Complies
C-12	Armature of the rocker bearing or hinged spring type shall be held in place in such a manner as to permit free movement through its normal stroke but prevent other movement	C-12	Complies
C-13	Trunnions and bearings shall fit rigidly so they cannot exert pressure on the armature	C-13	Complies
C-14	The end play in the armature shall be no less than 0.010 and not more than 0.020	C-14	Complies

E. Air Gap

1	Minimum air gap shall be 0.010 inches. Should be provided by stop pins or pins approx. 1/8 inch diameter. Shall conform to 6.5.1 section C-17	1	Complies
C-17	Stop pins shall be metallurgically and mechanically compatable with mating surface for their intended use	C-17	Complies
2	Non-adjustable safety stop pins will be provided. Protruding no less than .008 inches from the face of the armature or core heads	2	Complies
3	For relays having special operating time. Air gap shall be no less than 0.004 inches	3	Complies
4	For these special relays, non-adjustable safety stop pins will be provided, protruding no less than 0.003 inches from the face of the armature/core heads	4	Complies

F. Magnetic Structure

1	Shall be silicone steel, having silicon content between 2.25 and 4.5%	1	Complies
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G. Coil Insulation

Shall conform to Manual Part 1.4.1, Sections D-1 through D-8

D-1	Coils wound with insulated wire to withstand between -40°F (-40°C) and +185°F (+85°C)	D-1	Complies
D-2	Insulating material shall be chemically neutral	D-2	Complies
D-3	Coils external to housing of moving parts shall be impregnated with insulating compound conforming to Manual Part 15.2.1	D-3	Complies
D-4	Coils adjacent to moving parts, armature air gaps or contacts shall be treated with insulating varnish conforming to 15.2.2	D-4	Complies
D-5	Material used for encapsulation shall be compatable with the other material used in the equipment	D-5	Complies
D-6	Encapsulated windings shall have the terminals or leads sealed to prevent entrance of moisture	D-6	Complies
D-7	Coils will be insulated to withstand the insulation test provided in section E. Lamp receptacle shall withstand one minute of an insulation test of 800 volts AC	D-7	Complies
D-8	Each coil shall be plainly and permanently marked showing the manufacturer's reference and nominal resistance on a tag of nonconductive material	D-8	Complies

H. Contacts

Contacts shall conform to manual part 6.5.1, sections F-1 through F-9, F-12, F-13 and F-22

Compliance Matrix for Relays

F-1	Contact elements shall be so secured that they will not shift nor become loose in shipment or service	F-1	Complies
F-2	Material used in affixing contact elements shall not cause corrosion	F-2	Complies
F-3	Metal support of the non-fusible contact element shall not come within 1/16 inches of the contact surface	F-3	Complies
F-4	Contacts of the silver impregnated carbon to silver type shall be designated that they cannot be mechanically locked or fused by lightning or by abnormal flow of current in service	F-4	Complies
F-5	For front contacts of the silver impregnated carbon to silver type, the resistance of the contacts measured with 1 ampere through contacts should not in 100,000 operations (when operating 10 times per minute) average more than 0.18 ohm per contact when the relay is energized at working current and when not breaking current or when breaking noninductive tungsten lamp load of 4 amperes ac or dc not exceeding 30 volts. The contact resistance shall be determined by taking at least 20 readings on each contact of the relay at intervals of 5,000 operations during the test. The average of all readings should be considered the contact resistance. The initial cleaned contact resistance measured with 1 ampere through contacts shall not exceed 0.09 ohm per contact when relay is energized at working current. Each contact should be designed to carry a 4 amperes non-inductive load continuously.	F-5	Complies
F-6	Finger contacts for the silver impregnated carbon to silver combination shall be formed so that either a flat or curved surface comes in contact with the carbon element	F-6	Complies
F-7	For contacts of the silver impregnated type, the initial contact resistance measured with 1 amp through the contacts shall not exceed 0.03 ohm per contact. Each contact should carry a 4 amp non-conductive load continuously	F-7	Complies
F-8	Contact fingers shall be made of such material and so proportioned that they will not flex appreciably under operating conditions	F-8	Complies
F-9	The minimum front contact opening shall be 0.050 inches and with front contacts closed the minimum back opening should be 0.020 inches	F-9	Complies
F-12	Contacts of the silver to silver type shall be designed to open and close a non-inductive tungsten lamp load of 4 amperes ac or dc per contact at not exceeding 30 volts for 500,000 operations without the average resistance per contact exceeding 0.05 ohm. The contact resistance shall be determined by taking not less than 20 readings at intervals of 5000 operations during the test. The initial cleaned contact resistance measured with 1 ampere through contacts shall not exceed 0.03 ohm. All resistance measurements shall be taken with relay energized at "working current". Each contact shall be designed to carry a 4 amperes non-inductive load continuously.	F12	Complies
F-13	Contacts in normal operation shall align squarely with fixed contacts and make positive low resistance contact	F-13	Complies
F-22	Silver-impregnated carbon to silver-impregnated carbon front contacts shall have an initial cleaned contact resistance measured with 1 ampere through contacts of not more than 0.20 ohm when the relay is energized at its working current. Silver-impregnated carbon to silver-impregnated carbon back contacts shall have an initial cleaned contact resistance measured with 1 ampere through contacts of not more than 0.40 ohm when the relay is de-energized.	F-22	Complies

J. Environmental requirements

Shall conform to Manual Part 11.5.1 Class C, and Manual Part 1.4.1, section E-3 to E-5

E-3	A surface leakage distance of not less than 1/4 inch shall be provided between any exposed metallic part of the apparatus carrying current and any other metallic part	E-3	Complies
E-4	Separate windings, which are insulated from each other, shall conform to Manual Part 11.5.1	E-4	Complies
E-5	Windings shall be checked for shorts by approved methods	E-5	Complies
Class-C	Wayside Signal Enclosure - Basic shelter from rain and snow is provided	C	Complies

K. Operating Characteristics

1	Operating characteristics of relays of the rocker bearing type shall be as shown in the following table:	1	Complies
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Compliance Matrix for Relays

No. of front and back dependent contacts	2	4	6	8	10	12
Inch-ounce torque in direction of drop-away with contact pressure (minimum)	25	45	65	95	110	125
Inch-ounce torque in direction of drop-away without contact pressure	9	12	15	25	30	35
Inch-ounce torque in direction of drop-away, dead weight only (minimum)	6	6	6	12	12	12
Ohms resistance	4	4	4	4	4	4
Minimum drop-away amperes without contact pressure	.017	.018	.019	.020	.022	.027
Minimum drop-away amperes with contact pressure	.040	.042	.052	.057	.065	.076
Maximum pick-up and working amperes with contact pressure	.065	.070	.085	.095	.112	.135

2 Operating characteristics of relays of the trunnion and hinged spring type shall be shown in the following table	2	Complies
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No. of front and back dependent contacts	4	8
Inch-ounce torque in direction of drop-away with contact pressure (minimum)	36	61
Inch-ounce torque in direction of drop-away without contact pressure (minimum)	16	21
Inch-ounce torque in direction of drop-away, dead weight only (minimum)	11	11
Ohms resistance (nominal)	4	4
Minimum drop-away amperes without contact pressure	.020	.020
Minimum drop-away amperes with contact pressure	.046	.046
Maximum pick-up and working amperes with contact pressure	.123	.123

L. Finish

Finish shall conform to Manual Part 6.5.1, Section I

I-1	Metal parts shall be protected against corrosion with nickel plating, or the equivalent, except where the parts used are inherently resistant to corrosion or where such protection will interfere with proper operation of the relay. Zinc or cadmium shall not be used within enclosure or on any current carrying parts	I-1	Complies
I-2	Material used for protection against corrosion shall neither melt or flake under ordinary conditions between -40°F (-40°C) and +185°F (+85°C)	I-2	Complies

M. Identification

Identification shall conform to Manual Part 6.5.1, Sections J-1, J-2, J-3a, J-3b, J-3c, J-3d, J-3h, J-4a, J-4c, J-4m, J-4n

J-1	Enclosure containing the moving parts of the relay shall be sealed	J-1	Complies
J-2	Magnet coils and resistors shall be plainly marked	J-2	Complies
J-3	Relays shall have an attached plate with the following info	J-3	Complies
J-3a	Manufacturer's Name	J-3a	Complies
J-3b	Manufacturer's drawing or other reference number	J-3b	Complies
J-3c	Resistance	J-3c	Complies
J-3d	Serial Number	J-3d	Complies
J-3h	Type	J-3h	Complies
J-4	The enclosure shall contain a test label in a location where it cannot interfere with the operation of the relay and shall be visible in the normal operating position.	J-4	Complies
J-4a	Serial Number	J-4a	Complies
J-4c	Minimum dropaway, maximum pick up, and working current	J-4c	Complies
J-4m	Date tested	J-4m	Complies
J-4n	Identification of tester	J-4n	Complies