

Proposal for C37.20 series Control Wiring

6.3.4.2 Control wiring insulation test

A 60 Hz test voltage shall be applied after all circuit grounds have been disconnected. Either 1500 V for 1 min or 1800 V for 1 s may be utilized. All wires shall be tested either individually or in groups. At the option of the manufacturer, switchgear mounted devices that have been individually tested may be disconnected during the test.

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- Standard allows for checking all wires in a group or individually.
 - This test checks for insulation failures to ground *ONLY!*
 - Does not check for insulation failures between wires.
- Many relays and devices used today can not withstand the dielectric test values required by our standards, thus must be disconnected before this test can be run.

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- The rationale for this request are listed below:
 - Many if not most of the switchgear sold today requires third party labeling (UL,CSA etc.). This in turn requires listed and/or label components and materials.
 - Materials currently used in the insulation of the wires are not prone to dielectric breakdown.
 - Construction methods and materials used in modern switchgear better protect the wiring.
 - Manufacturing data indicates few if any failures are now occurring when this test is performed.
 - Lifting then replacing the wires to do the insulation test causes many wiring errors and additional shop floor time.
 - Standards allow design test to verify other varying aspects of the product; therefore, wiring should be treated similarly.
 - Momentary, BIL, short-circuit, etc.

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Control Wiring

- **6.3.4.2 Control wiring insulation test**

The insulation of listed control wiring can be verified through either a 60 Hz hi-potential test voltage or by a control sequence test that checks proper connection of all internal wiring. The control sequence test will be carried out at the maximum operating voltages of the connected devices in the control circuit. The 60 Hz hi-potential test shall be applied after all circuit grounds have been disconnected. Either 1500 V for 1 min or 1800 V for 1 s may be utilized. All wires shall be tested either individually or in groups. At the option of the manufacturer, switchgear mounted devices that have been individually tested may be disconnected during the test.

Unlisted control wiring must be given a hi-potential test. During this test the unlisted wire may be isolated and tested separately from portions of the control circuit utilizing listed wire.

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- **6.3.4.2 Control wiring insulation test**
- A 60 Hz test voltage shall be applied after all circuit grounds have been disconnected. Either 1500 V for 1 min or 1800 V for 1 s may be utilized. All wires shall be tested either individually or in groups. At the option of the manufacturer, switchgear mounted devices that have been individually tested may be disconnected during the test. *Also, switchgear mounted devices that can not withstand the test voltage should be disconnected during the test.*
- *All wiring used must be UL listed for 600V service.*
- *The voltage levels of this test are not mandatory if either of the conditions of 1 or 2 (below) can be demonstrated and met. In such cases, full functionality test at the maximum operating voltages of the devices will demonstrate conformance to the insulation requirement.*

• *Continued*

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1) Construction and test requirements:

a) Design tests have been done on similar or more onerous designs.

b) All the construction requirements of Clause 7.3 plus the following construction enhancements are also incorporated.

i) Wire is routed in a plastic wire-way with a minimum flammability rating of V1, or the wire is resting on a flat painted surface on which the paint has been tested to withstand a voltage of 2500Vac and wiring is not allowed to come into contact with hardware.

ii) All hinge wiring is protected from abrasion by a flexible sleeve (metal, plastic or fabric) .

2) Devices are connected to the wiring which prohibit the voltage from reaching values above the operating voltage of the control devices.