

## 1.0 PURPOSE

- 1.1. This test procedure is used to determine whether a component complies with the dielectric test requirements of ACRI2001 "Criteria for the Evaluation and Test of Intrinsically Safe Apparatus and Associated Apparatus", Section 10.7.
- 1.2. To provide a person knowledgeable in the appropriate technical field with a written procedure that will assure consistent repeatable test data and results independent of the person conducting the test.

## 2.0 SCOPE

This Standard Test Procedure (STP) applies to components submitted for test as an isolating component for use in intrinsically safe apparatus and associated apparatus evaluated, approved, or certified per 30 CFR Parts 18, 19, 22, 23, and 27.

## 3.0 REFERENCES

- 3.1. ACRI2001 "Criteria for the Evaluation and Test of Intrinsically Safe Apparatus and Associated Apparatus"
- 3.2. 30 CFR Part 18 "Electric Motor-Driven Mine Equipment and Accessories"
- 3.3. 30 CFR Part 19 "Electric Cap Lamps"
- 3.4. 30 CFR Part 22 "Portable Methane Detectors"
- 3.5. 30 CFR Part 23 "Telephones and Signaling Devices"
- 3.6. 30 CFR Part 27 "Methane-Monitoring Systems"

## 4.0 DEFINITIONS

- 4.1. **IS Side** - The side of the component connected to the intrinsically safe circuit of the associated apparatus.
- 4.2. **Non-IS Side** - The side of the component connected to the non-intrinsically safe circuit of the associated apparatus.
- 4.3. **Representative Sample** - A sample that is verified to comply with the documentation and specifications and is considered typical of the design.

## 5.0 TEST EQUIPMENT

- 5.1. A withstand/insulation tester (Kikusui Model 8850 or equivalent) with a cutoff current of  $5\text{mA} \pm 5\%$ . The test voltage shall be an ac voltage of a substantially sinusoidal waveform at a frequency between 48 Hz and 62 Hz or a dc voltage with no more than a 3 percent peak to peak ripple.
- 5.2. A stopwatch if the withstand/insulation tester does not have a built-in timer.

## 6.0 TEST SAMPLES

- 6.1. Three (3) representative samples of each type relay.
- 6.2. Three (3) representative samples of each type capacitor.
- 6.3. At least a three (3) foot representative sample of each type of cable or conductor.

## 7.0 PROCEDURES

- 7.1. Conduct the test at an ambient temperature of  $25 \pm 10^\circ\text{C}$ .
- 7.2. Set the withstand/insulation tester breakdown or cutoff current to 5 milliamperes, if equipped.
- 7.3. For relays, connect all leads (pins) on the Non-IS side together, and connect all leads (pins) on the IS side together.
- 7.4. For cables or conductors, the insulation of each different type shall be tightly wrapped with metal foil along at least 30 inches of the sample, and each type tested once.



**WARNING: HIGH VOLTAGE!  
DO NOT CONTACT LIVE CONDUCTORS.  
TEST COMPONENT IN A SUITABLE ENCLOSURE.  
COMPONENT UNDER TEST MAY BURST INTO FRAGMENTS OR  
FLAME DURING THE TEST.**

- 7.5. With no sample connected, set the withstand/insulation tester voltage according to the following chart.

Type of Component	Test Voltage (ACrms)	Test Voltage (DC)	Where applied
Relay	$4U_1$ or 2500, whichever is greater	$5.66 U_1$ or 3536, whichever is greater	Between IS and Non-IS terminals
Capacitor	$2U_2 + 1000$	$2.83 U_2 + 1414$	Between input and output leads
Cable or insulated conductor isolating part of an IS circuit or separate IS circuits	$2U_3$ or 500, whichever is greater	$2.83 U_3$ or 707, whichever is greater	Between metal foil and conductor
Cable or insulated conductor isolating Non-IS and IS circuits	$2U_4 + 1000$ or 1500, whichever is greater	$2.83U_4 + 1414$ or 2121, whichever is greater	Between metal foil and conductor

Where:  $U_1$  is the highest nominal operating voltage of the device,

$U_2$  is the voltage across the two capacitors (voltage is applied to a single capacitor),

$U_3$  is the normal working voltage of the intrinsically safe circuit,  
and

$U_4$  is the sum of the rms values of the voltages of the intrinsically safe circuit and the non-intrinsically safe circuit.

- 7.6. Connect the withstand/insulation tester leads to the application points of the sample given in the chart.
- 7.7. Increase the voltage steadily to the desired value in a period not less than 10 seconds and then maintained for at least 60 seconds.
- 7.8. Record the test voltage, time the voltage was applied, and whether or not the device under test passed the dielectric strength test.

## 8.0 TEST DATA

- 8.1. For relays and capacitors, the manufacturer and manufacturer's model or part number of the device under test.
- 8.2. For relays, a description or schematic diagram identifying the IS and Non-IS terminals and describing how the relay was connected in the test circuit.
- 8.3. For relays and capacitors, manufacturer's specified minimum dielectric withstand voltage between the input and output, and the internal creepage and clearance distances, if specified.
- 8.4. For cables or conductors, the manufacturer and part number, the voltage rating, and the radial thickness of insulation.
- 8.5. Test voltage.
- 8.6. Length of time the voltage was applied.
- 8.7. Test Results: Pass or Fail.
- 8.8. Test equipment used during testing. This should include: manufacturer, model number, serial number or other unique identification number, and calibration due date for each piece of equipment.

## 9.0 PASS/FAIL CRITERIA

The insulation or dielectric shall conduct no more than 5mA + 5% at the prescribed voltage as indicated by the test equipment.

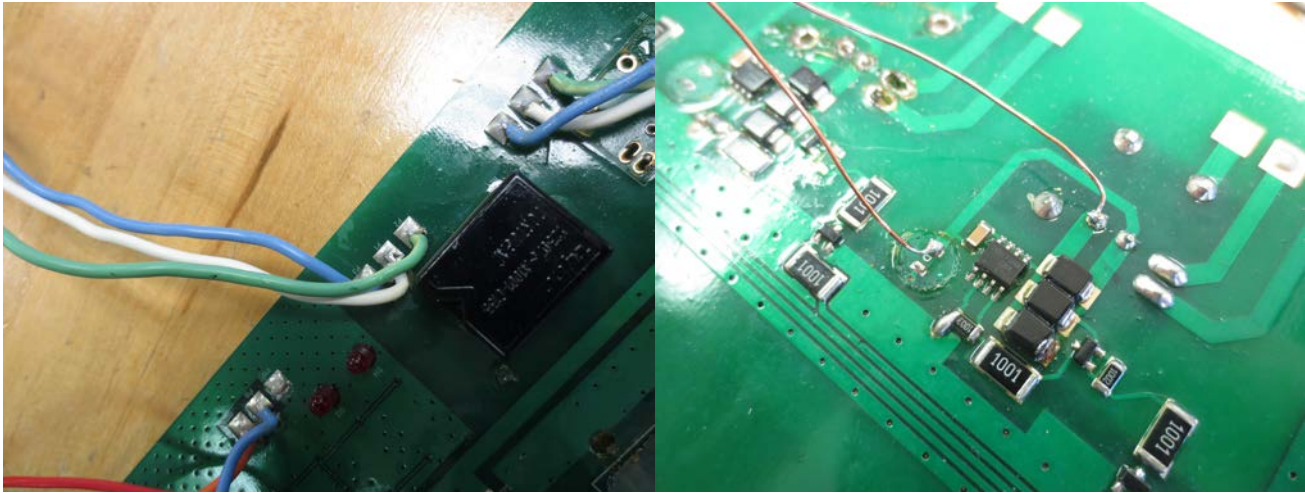
## Appendix 1 - Example Populated Test Sheet



Data Sheet No.	2
Inv. No.	IA-12345
Test Sheet No.	X
PAR No.	123456
Company	XYZ Company
Tester	A.B.C.
ASTP No.	ASTP2234
Results	PASS
Date	8/25/2014

Subject: Dielectric strength test per ACRI2001, Section 8.10 (relays).

Device Tested: Device Inc. part number ABC12 relay mounted on XYZ Company power supply PCB. Test conducted between the intrinsically safe (IS) coil (two 24AWG copper wires soldered to PCB on both ends of coil soldered together) and non-IS contacts (blue, white, and green wires soldered together) as shown in the photographs below.



Sample No.	Test Voltage	Time	Pass/Fail
1	2500 V	1 minute	Pass
2	2500 V	1 minute	Pass
3	2500 V	1 minute	Pass

Ambient Temperature: 20 C°

DUT Manufacturer's Specified Withstand Rating: 3000 V

DUT Manufacturer's Specified Internal/External Creepage/Clearance Distances:

external minimum creepage/clearance = 10 mm, internal = not specified on manufacturer's data sheet

Test Equipment: Kikusui Model 8850, MSHA ID# 137133 (cal. Due date 10/31/14); Omega Model 650, MSHA ID# 137074 (cal. due date 10/31/14)

Comments:

## Appendix 2 - Example Blank Test Sheet



Data Sheet No. 2  
Inv. No. \_\_\_\_\_  
Test Sheet No. \_\_\_\_\_  
PAR No. \_\_\_\_\_  
Company \_\_\_\_\_  
Tester \_\_\_\_\_  
ASTP No. ASTP2234  
Results \_\_\_\_\_  
Date \_\_\_\_\_

Subject: Dielectric strength test per ACRI2001, Section 7.4 (conductors), Section 8.5 (capacitors), or Section 8.10 (relays).

Device Tested:

Sample No.	Test Voltage	Time	Pass/Fail
1			
2			
3			

Ambient Temperature:

DUT Manufacturer's Specified Withstand Rating:

DUT Manufacturer's Specified Internal/External Creepage/Clearance Distances:

Test Equipment:

Comments: