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Author(s): CableTest Systems, Inc. http://www.cabletest.com

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CableTest Technical Bulletin

High Current Source Compliance Limits

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User-Programmable Values are Compliance Limits

CableTest's High Current Sources (HCS) have fully programmable current and voltage values representing the compliance limits for these entities.

The HCS regulates the voltage and the current in such a way that their magnitudes never exceed their corresponding compliance limits.

When performing measurements or energizations with the HCS, one of the current or voltage entities will be in compliance mode, having a magnitude equal to the user-programmed compliance value. The other entity will have a magnitude less than or equal to the user-programmed compliance value.

How to determine if the Voltage or Current is in Compliance Mode

To determine if the voltage or current are in compliance, we have to look at the actual user-programmed limits for these entities and the resistance of the device under test.

In all cases, Ohm's law can be used to determine the entity that will be in compliance. The two common variations of Ohm's law (V = IR) are listed below:

When the HCS is in current compliance mode, we use:

$$V[V] = R[\Omega] \cdot I[A] \qquad (1)$$

When the HCS is in voltage compliance mode, we use:

$$I[A] = \frac{V[V]}{R[\Omega]} \qquad (2)$$

The following examples demonstrate how to determine whether the current or the voltage will be in compliance mode.

Measuring 400Ω @ 1A/5V

First, let's assume that the current will be in compliance mode. If we plug R and I in equation (1) we get:

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$$V = 400\Omega \cdot 1A = 400V$$

$$400\text{V} > \text{V}_{max}$$

It is clear that if a current of 1A was used to measure a 400Ω resistor, the resulting voltage would be 400V. But this exceeds the 5V compliance limit, which means that this scenario is not possible.

This only leaves the possibility that the voltage is in compliance mode. Indeed, if we plug the voltage of 5V and the resistance of 400Ω in equation (2) we get:

$$I = \frac{5V}{400\Omega} = 0.0125A = 12.5mA$$

$$12.5\text{mA} < \text{I}_{max}$$

This measurement will be performed at a voltage of 5V and a current of 12.5mA!

Measuring 400Ω @ 1A/28V

Similarly to the example above we can see that the measurement will be in voltage compliance mode (since 400V > 28V) and the resulting current will be:

$$I = \frac{28V}{400\Omega} = 0.07A = 70mA$$

$$70\text{mA} < \text{I}_{max}$$

Measuring 10Ω @ 1A/5V

First, let's assume that the current will be in compliance mode. If we plug R and I in equation (1) we get:

$$V = 10\Omega \cdot 1A = 10V$$

$$10\text{V} > \text{V}_{max}$$

It is clear that if a current of 1A were used to measure a 10Ω resistor, the resulting voltage would be 10V. But this exceeds the 5V compliance limit, which means that this scenario is not possible.

This only leaves the possibility that the voltage is in compliance mode. Indeed, if we plug the voltage of 5V and the resistance of 10Ω in equation (2) we get:

$$I = \frac{5V}{10\Omega} = 0.5A = 500mA$$

$$500\text{mA} < \text{I}_{max}$$

This measurement will be performed at a voltage of 5V and a current of 500mA!

Measuring 10Ω @ 1A/15V

First, let's assume that the current will be in compliance mode. If we plug R and I in equation (1) we get:

$$V = 10\Omega \cdot 1A = 10V$$

$$10\text{V} < \text{V}_{max}$$

It is clear that if a current of 1A were used to measure a 10Ω resistor, the resulting voltage would be 10V. Our assumption proved to be true: the source is in current compliance mode.

If we are overly cautious and want to verify the other scenario, we can plug the voltage of 15V and the resistance of 10Ω in equation (2) we get:

$$I = \frac{15V}{10\Omega} = 1.5A$$

$$1.5\text{A} > \text{I}_{max}$$

The resulting current exceeds the 1A compliance limit. Therefore this scenario is false.

About CableTest Systems Inc.

CableTest Systems Inc. provides total cable testing solutions to a wide array of industries including aerospace, computers, medical, telecommunications, transportation and the military. Customers rely on CableTest's high voltage interconnect equipment to test their cables, wiring harnesses, power cords, and backplanes with speed, accuracy and reliability. You can learn more about CableTest Systems Inc. at www.CableTest.com.

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