

**TITLE: On-Board Machine Short-Circuit Protection****MSHA Mine Safety and Health Administration, Approval & Certification Center**

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**1.0 PURPOSE**

Short circuit protection for on-board machine cables is covered under Title 30 Code of Federal Regulations (30 CFR), Part 18.36 (a) (2). This section simply requires that cables between machine components have short circuit protection. This policy presents a method to calculate acceptable short circuit protection for machine cables.

**2.0 SCOPE**

This policy applies to all equipment submitted for approval, extension of approval, RAMP, or field modification under 30 CFR, Part 18.

**3.0 REFERENCE**

30 CFR, Part 18.36(a) (2)

**4.0 DEFINITIONS**

- 4.1. Control Cable – cable used for control circuits and for connections between instrument transformer secondaries, instruments, meters, relays, and similar equipment.
- 4.2. Maximum Available Current – the current available at a three-phase bolted fault for ac circuits or a line to line bolted fault for dc circuits. For battery powered equipment, this is the current available when the battery is at 100% charge.
- 4.3. Maximum Current without Insulation Damage – the current a cable can carry, in the time required for the short circuit protection device to trip, without exceeding its short-circuit temperature rating or damaging the cable insulation.
- 4.4. Minimum Available Current – the current available at a line to line arcing fault. For battery powered equipment, this is the current available when the battery has been discharged to 80% of rated capacity.

**5.0 POLICY**

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- 5.1. Short-circuit protection for on-board machine cables shall be set at no more than 70% of the minimum available short-circuit current when the voltage on the cable is 1000 volts or less.
- 5.2. Short-circuit protection for on-board machine cables shall be set at no more than 75% of the minimum available short-circuit current when the voltage on the cable is greater than 1000 volts.
- 5.3. The maximum available current shall be less than or equal to the maximum current the cable can withstand without insulation damage. The maximum available current shall be less than or equal to the interrupting capacity of the short-circuit protective device.
- 5.4. Control cables shall be protected by devices rated at no more than the control cable's ampacity or 70% of the minimum available short circuit current whichever is less.
- 5.5 All cables must be provided with short circuit protection, even if the circuit will limit the current in the cable to less than the ampacity of the cable. The short-circuit protection must be determined with the current limiting components bypassed.
- 5.6 The clearing time of the short-circuit protective device must be less than the time required to cause cable damage by any short-circuit or 10 seconds whichever is less.

The Approval and Certification Center's short circuit calculation program (scwin3.exe) is available to calculate these currents. The help file (scwin3.hlp) for this program includes the formulas and parameters used to make the calculations. The latest versions of these files are on the MSHA website ([www.msha.gov](http://www.msha.gov)).