Raychem CIRCUIT PROTECTION
A DIVISION OF tyco ELECTRONICS

Safety Considerations: Power Fault Protection

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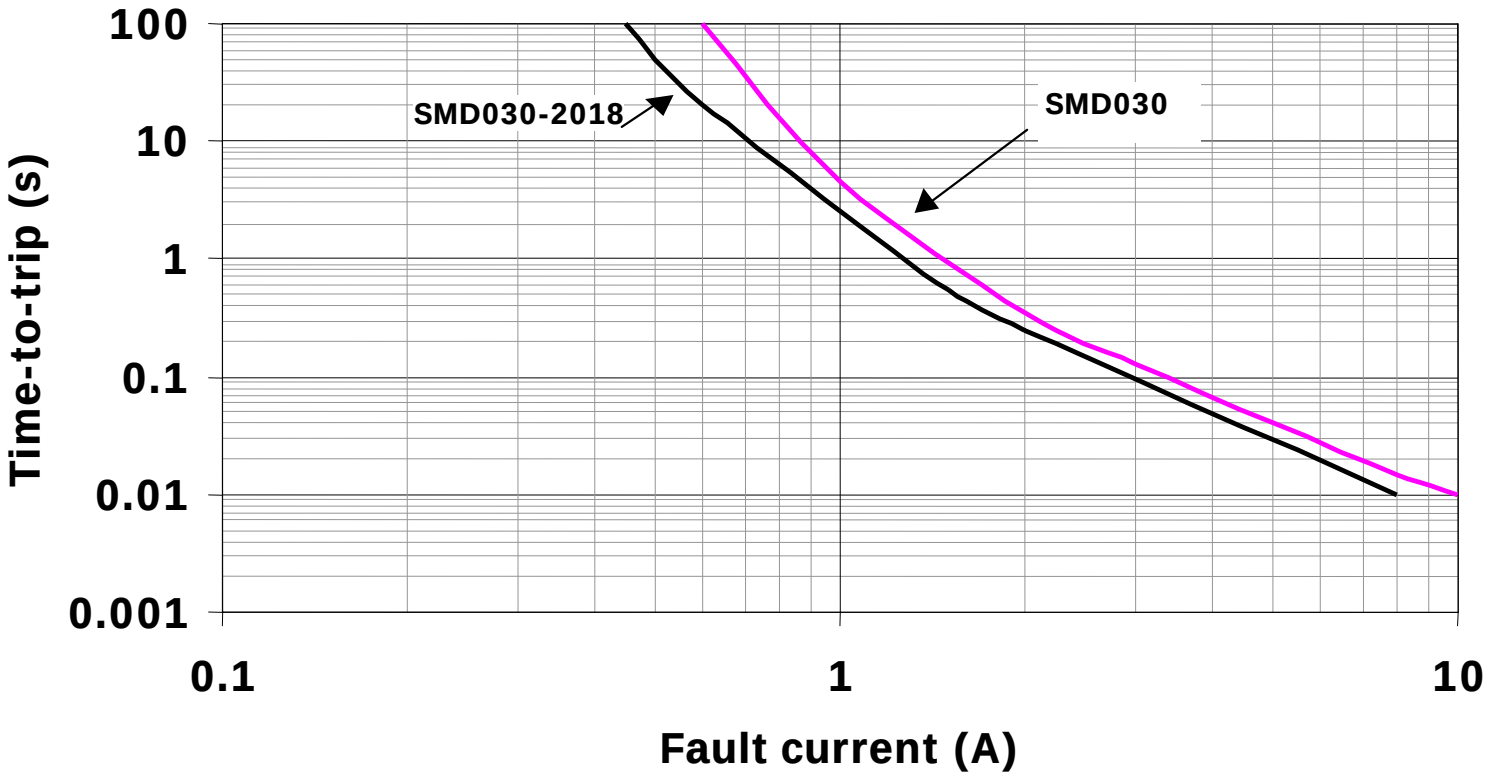
Potential Safety Hazards for Power via MDI

- Cable short circuits
  - Partial shorts - connections between few of 8 wires
  - Full shorts - connections between all 8 wires
- Power supply failures
- False detection supplies power to
  - Unpowered DTE
  - Bob Smith terminations
  - Appliances with low input impedance
- Misuse

WW Safety Standards: UL60950, IEC 60950

- **Section 2.5 Limited power sources**
  - **Inherently limited power supply**
    - **Output current is limited to 150/Voc after 60s**
      - **e.g. a 50V supply must limit output to 3A in 60s**
    - **Apparent power is limited to 100VA max after 60s**
    - **Limiting may be either inherent in power supply or by impedance**
  - **Not inherently limited power supply**
    - **Output current is limited to 1000/Voc after 60s**
      - **e.g. a 50V supply must limit output to 20A in 60s**
    - **Apparent power is limited to 250VA max after 60s**
    - **Requires overcurrent protection device rated at 100/Voc**
      - **e.g. a 50V supply requires 2A protection device**
        - **Circuit must break within 120s at 210% of current**

Overcurrent Protection Using PPTC Devices

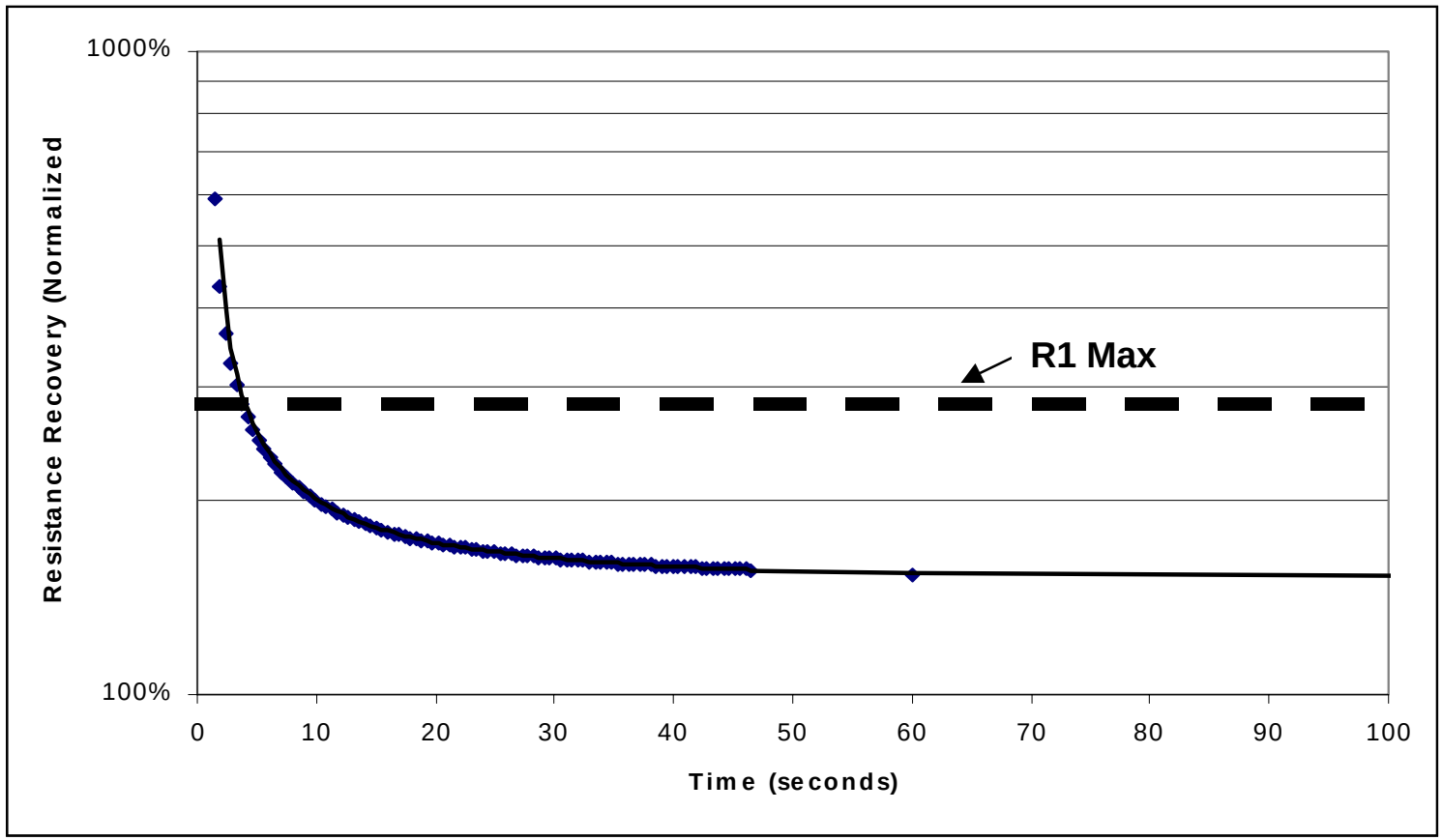


Polymeric PTC devices provide one method of compliance with UL/IEC/NEC product safety requirements

Universal Serial Bus 2.0 Specification

- **Section 7.2.1.2.1 Over-current protection**
  - **The host and all self-powered hubs must implement overcurrent protection for safety reasons…The over-current limiting mechanism must be resettable without user mechanical intervention. Polymeric PTCs and solid-state switches are examples of methods, which can be used for over-current limiting.**

Typical PPTC Recovery After Fault Condition



- PolySwitch devices will hold rated current when their resistance is at or below the Maximum Resistance (R1 Max) specification
- R1 Max is defined one hour post trip

Recommended Safety Requirements for Power Via MDI

- The power source to each loop must be independently current limited to a maximum rated output level in compliance with Section 2.5 of UL60950 and Section 2.5 of IEC 60950.

- Upon removal of a fault condition, all protection circuitry for the loop power feed must recover automatically without any operator intervention. Polymeric PTCs and solid-state switches are examples of methods which can be used for overcurrent protection.

Helps Fulfill Power via MDI Objective #3

- **Not cause damage and interoperate with compliant RJ-45 MDI Ethernet devices, including:**
  - **switch-to-switch connections (both supplying power)**
  - **cross-over cables**
  - **common mode termination implementations**
  - **shorted conductors, pairs or loop-back plug**

Meets Customer Requirements

- Interoperable with legacy equipment
- Low total cost of ownership
- High reliability
- Provides compliance with UL/CSA, IEC, NEC product safety requirements