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Mon-Mo-Po1.01-08 [7]: Quench Protection of Multi-coil Low Temperature Superconducting Systems

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Quench protection is critical for superconducting systems, especially those containing enough energy to damage the system during quench. We propose a new quench protection approach for multi-coil low temperature superconducting (LTS) systems that minimizes the number of protection components that must be activated during quench. In this approach, the electrically (and probably also inductively) coupled coils are electrically connected in these possible ways: all in parallel; several parallel-connected groups, with each group consisting of several series connected coils; several series-connected groups, with each group consisting of several coils in parallel. If one of the parallel-connected coils or groups quenches, current in this coil or group decreases while current in the other parallel-connected coils or groups tries to increase to keep total current flow in the circuit the same, and this tendency will be affected by the nature of the inductive coupling among the coils. If during this event the non-quenching parallel coils or groups remain superconducting (i.e., their current is below critical current and there are no mechanical or thermal events that may cause these coils to quench), then the quench is limited to only the quenched coil or group. In some cases, the equipment may continue operation after quench, although at a somewhat reduced capacity. The proposed approach is potentially more advantageous for superconducting systems that consist of many similar coils with relatively weak inductive coupling.

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