

Using Murrelektronik MICO Modules to Create Low Voltage Limited Energy Circuits in Industrial Control Panels according to UL508A.

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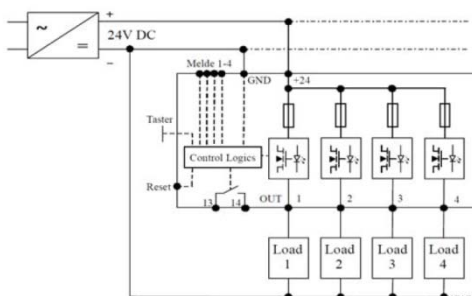
Sources:

- UL508A: UL Standard for Safety for Industrial Control Panels
- UL508: UL Standard for Safety for Industrial Control Equipment
- UL2367: UL Standard for Safety for Solid State Overcurrent Protectors

1. General Information

Murrelektronik's MICO modules are multichannel, electronic control switches for monitoring the current in secondary control circuits (Control Circuits-Isolated Secondary /24 VDC) that are powered by switch mode power supply units. The modules are optimized for the use on the load side of switch mode power supply units and offer a selective short-circuit and overload protection for each load channel used. If there is a failure in one of the connected load circuits/loads, the effected channel is electronically switched off according to the power-down characteristics, when the selected current load is exceeded. This ensures that the other loads connected to the power supply can function without any problem. Additionally to the electronic current monitoring, each load channel is equipped with a fuse (fuse acc. to UL248-14, also referred to in Supplement SA1 of UL508A).

Circuit diagram:



2. Approvals for the USA

Murrelektronik's MICO modules have the following approvals:

- UL: Category QVRQ2, File E321289 – Special-purpose Solid-state Overcurrent Protectors – Component acc. to UL2367
- UL: Category NMTR, File E200364 – Power Circuit and Motor-mounted Apparatus acc. to UL508
- CSA: Class 3211-87, File 080128_0_000 Industrial Control Equipment - Miscellaneous Apparatus - Certified to US Standards acc. to UL508

3. Using MICO Modules to design a 24VDC secondary control circuit with limited energy (Low-Voltage Limited Energy Circuits) in Industrial Control Panels according to UL508A

Most of the Industrial Control Panels that are intended for use in the USA are designed and evaluated according to UL508A. Consequently, all components listed in the attachment have to be selected according to the UL508A standard. This means, almost all components must have product specific UL approvals that are suitable for the corresponding application.

However, UL508A also offers some possibilities to design the supply of certain control circuits in a way that the requirements regarding the components and/or equipment are low (no UL approval required).

The following description explains how to create a Low-Voltage Limited Energy Circuit, in compliance with UL508A, using a 4 A MICO module (for example MICO Basic 8.4, MICO Basic 4.4, MICO 4.4 etc., UL File E321289) in connection with a switch mode power supply unit (for example Evolution 40-3x360-520/24: Output 24VDC SELV - UL File E222272).

3.1 What is a Low-Voltage Limited Energy Circuit?

Definition from UL508A, section 2.32: *LOW-VOLTAGE LIMITED ENERGY CIRCUIT – A control circuit involving a peak open-circuit potential of not more than 42.4 volts (dc or peak) supplied by a primary battery or by an isolated secondary circuit, and where the current capacity is limited by an overcurrent device, such as a fuse, or by the inherent capacity of the secondary transformer or power supply, or a combination of a secondary winding and an impedance.*

3.2 What are the advantages of a Low-Voltage Limited Energy Circuit compared to "normal" control circuits?

Different from "normal" control circuits, components/equipment that is used in L-V L E Circuits according to UL508A do not have to be additionally evaluated for the UL approval of control

cabinets. This means, it is not necessary to list the components in the "Procedure described" for the control cabinet.

Extract from UL508A, section 43.2

Secondary side requirements

43.2.1 Components and wiring located entirely within the low-voltage limited energy circuit are not required to be investigated.

43.2.2 Internal wiring shall comply with the separation of circuits requirements of 29.5 and, where routed with conductors of other circuits, shall comply with 38.1.

43.2.3 Field wiring terminals of a low-voltage limited energy circuit shall comply with 37.3.1.

Extract from UL508A, section SA3

Other Components

SA3.1 Electrical components, other than those covered by Section SA1, Listed Components and Section SA2, Recognized Components, shall be evaluated by the UL representative in accordance with the requirements in Appendix B or shall be described in the manufacturer's Procedure.

Exception: Electrical components having all electrical connections made to a low-voltage limited energy source, as described in Section 43, Low-Voltage Limited Energy Circuits, or a Class 2 source are able to be used within a panel without compliance with SA3.1.

3.4 How to Create a Low-Voltage Limited Energy Circuit Using MICO modules?

When creating a L-V L E Circuit, the following requirements have to be met:

Extract from UL508A, section 43

Low-Voltage Limited Energy Circuits

43.1 Component requirements

43.1.1 A low-voltage limited energy circuit shall comply with 43.1.2 and 43.1.3 and shall be supplied from one of the following isolated secondary sources:

...

b) A power supply that complies with 42.2 (e.g. power supply UL approved acc. to UL 60950-1);

c) An isolated secondary source that complies with 42.3 (e.g. power supply UL LISTED acc. to UL 508);

...

43.1.2 A low-voltage limited energy circuit shall have a maximum open-circuit secondary voltage of 30 Vac rms (42.4 Vdc or peak).

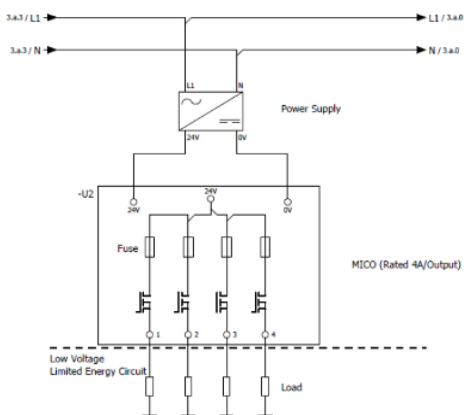
43.1.3 A low-voltage limited energy circuit shall have an overcurrent protection sized in accordance with Table 43.1.

Table 43.1
Overcurrent protection for a low-voltage limited energy circuit
Table 43.1 effective April 25, 2003

Open-circuit secondary voltage, volts (peak)	Maximum overcurrent device, amperes
0 – 20	5
20.1 – 42.4	$100/V^2$

² Where "V" is equal to the peak or dc open-circuit secondary voltage.

Based on the above mentioned requirements, you can design an L-V L E Circuit according to UL508A with the following units:



1. Power Supply: e.g. Evolution 40-3x360-520/24: Output Rating 24VDC SELV - UL LISTED in File E222272. (Meets the requirements 43.1.1 and 43.1.2 from UL508A)

2. MICO Basic 8.4, MICO Basic 4.4, MICO 4.4 etc. (rated current 4A per Output - Approved as Special-Purpose Solid-State Overcurrent Protector UL File E321289 (meets the requirements 43.1.3 from UL508A).

The individual 4A outputs/output channels of the MICO modules would provide the L-V L E Circuit.

4. Conclusion

Considering the above mentioned requirements, Murrelektronik's MICO modules help to create Low-Voltage Limited Energy Circuits that facilitate the installation of additional equipment in UL control cabinets.

Please also note: White Paper MICO (Industrial Control Panels)