

The harmonization of UL 508 with IEC 60947 will result in a gradual transition to a new series of UL standards for Switchgear and Controlgear, UL 60497. Some existing users of the UL 508 standard wonder what are the most appropriate wiring methods. The standard provides many different options to accommodate a range of construction requirements. This Wire Wisdom addresses the existing options and outlines the changes for the new standards.

FIELD WIRING – POWER CIRCUITS

Wiring between the branch circuit supply and the control panel should be done in accordance with the local electrical code, which is usually some variation of the NEC (National Electrical Code). However, UL 508 clearly allows the use of portable cord for cabinets that are portable or mobile with the use of a hand truck or forklift, where there are no other provisions for conduit or permanent connection to the building. The type of cord permitted is a hard service or junior hard service cord such as an SO or SJO (or other similar variation) that terminates in a listed attachment plug. For more information on listed and recognized components, see UL.com.

FIELD WIRING – CONTROL CIRCUITS

Field wiring types are once again determined by the local authority having jurisdiction, usually referencing the NEC, and again there is a provision for connection of field control wiring using cords. Unique to control circuits are the number of different types, ratings, styles and configurations of connectors that may be used to facilitate connection to the enclosure for quick disconnection or environmental sealing.

WIRING WITHIN THE PANEL – POWER CIRCUITS

There are two primary things to consider regarding wiring within the panel: what type of wiring to use, and how to apply it. The current and new standards address the types of wire permitted. To generalize, they are UL Listed thermoplastic or thermoset insulated building wire types, UL recognized wires, machine tool wires,^[1] and welding cable.

Generally speaking, users prefer more flexible wires such as MTW or welding cable for power circuits as they are easier to route and facilitate improved cable management inside the cabinet. Routing, fastening, terminating, splicing, and sizing requirements are all detailed in the standards. One specific requirement is that power conductors shall not be smaller than 14 AWG.

WIRING WITHIN THE PANEL – CONTROL CIRCUITS

Control wiring can be any of the wiring methods allowed for power circuits within the panel with the addition of power-limited circuit cable such as Type PLTC, CL2, or CL3 and communication cable such as types CM, CMR or CMP.^[2] Control circuits are unique in that many controls now use industrial networking cabling technology. Because of this, it is important that the cabling within the panel maintains the signal integrity. In such cases, it is generally necessary to use specialty cabling between the cabinet entrance point and the end device.

Most of the cables needed for this task are available with a PLTC or CM rating. Because of the sheer volume of control wiring that may be present, thin walled, flexible AWM (appliance wiring material) is often used. It is inexpensive, easy to terminate, available in a wide range of colors and can be custom ordered with many different identification methods.

Also unique to the control circuits are the types of modular connectors used on the cabinets. There are thousands of varieties that range from low-cost simple to install and use to very expensive, highly engineered solutions for the most severe conditions and demanding communication requirements. Some applications use preassembled cords for Ethernet, DeviceNet, Profibus or a myriad of other networks. While there are new products being developed every day, the industry is also pushing hard to standardize on basic formats such as the M-8 and M-12.^[3]

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HARMONIZING WITH IEC

The industry has been asking for harmonization between the UL 508 standards for Industrial Control Equipment and the IEC 60947 series of standards for Low Voltage Switchgear and Controlgear.^[4] This harmonization effort has taken place by UL, and the resulting new standards are UL 60947-1 Low Voltage Switchgear and Controlgear – Part 1, which addresses general rules for the series of standards.

The other standards within the series address circuit breakers, contactors and motor-starters, control circuit devices and switching elements, terminal blocks, protective conductor terminal blocks, safety requirements for fuse terminal blocks, and ancillary equipment.

There are many differences between the 508 and 60947 standards, but the most significant difference consists of specific practices used more so than the type of wires being used. Circuit classifications and separation requirements remain, but spacing, lengths, and even insulation thickness requirements vary. Most wire, cable and connectors used will not be affected by a change in the standard unless it happens to be built to a minimally compliant specification. In those cases, it may be wise to sit down with a copy of the new harmonized standard and plan your migration path.

^[1] Special installation requirements are to be followed for flexing or Class K machine tool wires.

^[2] For more information on these wire types refer to UL 13 and UL 444 respectively.

^[3] For more information on the M-8 and M-12 formats see IEC 60947-5-2 and IEC 61076-2-104 and -2-101 respectively.

^[4] www.ul.com/global/eng/pages/offerings/industries/powerandcontrols/industrialcontrolpanel/transition/

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For more information on the wire, cable or standards mentioned in this Wire Wisdom, please contact your local Anixter representative.

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