



## NRNT.E150950 Switches, Industrial Control

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### Switches, Industrial Control

#### Guide Information

**HONEYWELL CO LTD**

E150950

CHON AN PLANT

56 CHAAM-DONG

CHONAN-SHI

CHUNGNAM 330-200, KOREA

**Limit switches**, Cat. No. SZL-WL may be followed by letters A thru E, may be followed by letters A thru N, P or R, may be followed by E or L, may be followed by LE or L3 ; Cat. No. SZL-VL may be followed by A, may be followed by letters A-H, may be followed by W, may be followed by LE, L1, L2 or L3 .

**LOOK FOR LISTING MARK ON PRODUCT**

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The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Listed and covered under UL's Follow-Up Service. Always look for the Mark on the product.



## NRNT.GuideInfo Switches, Industrial Control

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### [Industrial Control Equipment] Switches, Industrial Control

#### Guide Information

This listing cover the following products:

Magnetically operated switches

Manually operated switches

Meter switches

Photoelectric switches

Solid state switches

Switches rated in horsepower and with or without pilot duty ratings for use in control circuits are listed under "Motor Controllers."

Open type switches are listed for use as parts of equipment where the acceptability of the combination has been determined by Underwriters Laboratories Inc. or where open type switches may be employed.

Switches have been tested to determine their acceptability for continuous operation at their marked rated load.

The basic standard used to investigate products in this category is UL508, "Electric Industrial Control Equipment" .

The Listing Mark of Underwriters Laboratories Inc. on the product is the only method provided by UL to identify products manufactured under its Listing and Follow-Up Service. The Listing Mark for these products includes the UL symbol (as illustrated in the Introduction of this Directory) together with the word "LISTED," a control number, and the product name "Industrial Control Equipment" (or "Ind. Cont. Eq." ).

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## NIMX.GuideInfo Industrial Control Equipment

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### Industrial Control Equipment

#### Guide Information for Electrical Equipment for Use in Ordinary Locations

The listing covers the following products:

Industrial Control Panels

Motor Control Centers

Motor Controllers

Miscellaneous Apparatus

Programmable Controllers

Industrial Control Switches

Enclosed industrial control equipment identified with an enclosure type designation is intended for use as indicated in the guide information at the front of this directory (AALZ).

Industrial Control Equipment, is for use with copper conductors unless marked to indicate which terminals are suitable for use with aluminum conductors. Such marking is independent of any marking on terminal connectors and is on a wiring diagram or other readily visible location.

Industrial Control Equipment, for which accessory kits are available for the field or distributor modification of the basic product or which may be assembled in many forms from separate components are marked to indicate the suitable accessories or separate components which may be used.

Control Panels

If the sealed rating of the operating coil circuit of a magnetically operated industrial control device exceeds 125 volt-amperes, the coil circuit rating is marked on the device.

Overload relays or industrial control equipment incorporating overload relays are identified as to their maximum tripping time at 600 per cent of the overload relay current element trip rating. The designations "Class 10, Class 20, and Class 30" are used to identify the maximum tripping times, with the Class number indicating the maximum tripping time in seconds. Overload relays with maximum tripping times of 10 or 30 seconds are marked Class 10 or Class 30 respectively. Overload

relays with a maximum tripping time of 20 seconds may be marked Class 20. Overload relays with tripping times in excess of 30 seconds are marked with their maximum tripping times. All unmarked overload relays have a maximum tripping time of 20 seconds.

There are open, across-the-line starters intended for bolt on mounting to panelboards and dead front switchboards and are so restricted by the Listing Mark. They are provided with a cover or door and the remaining portions of the enclosure are provided by the panel or switchboard enclosure.

Some industrial control equipment is suitable for use as service equipment and may be so marked. Such marking is part of the Listing Mark or is an integral part of other required markings.

Some of the equipment listed in this category has also been investigated for use aboard marine vessels over 65 ft. in length as covered by the Electrical Engineering Regulations of the United States Coast Guard, Subchapter J, CG-259, (46CFR Parts 110-113).

The Electrical Engineering Regulations of the United States Coast Guard classify marine type equipment as "Non-Watertight," "Drip-proof," or "Watertight."

Some industrial control equipment incorporates neutrals factory bonded to the frame or enclosure. Such units are marked "Suitable Only For Use As Service Equipment."

Open type across-the-line starters designed only for use in panelboards or dead front switchboards employ Listing Marks with the product identity "INDUSTRIAL CONTROL EQUIPMENT FOR USE IN PANELBOARDS AND DEAD FRONT SWITCHBOARDS" or "IND. CONT. EQ. FOR USE IN PANELBOARDS AND DEAD FRONT SWITCHBOARDS."

For other than industrial control panels, and unless indicated otherwise in the general information for the following subcategories, enclosed type product Listing Marks contain the product identity "INDUSTRIAL CONTROL EQUIPMENT" or the abbreviation "IND. CONT. EQ." on the enclosure, or the product identity "INDUSTRIAL CONTROL EQUIPMENT ENCLOSED" on the mechanism mounted within the enclosure. In either case, the Listing Mark indicates that the overall product with its enclosure is Listed.

Enclosures for use with open type products employ Listing Marks with the product identification "Enclosure For Industrial Control Equipment" or "Enclosure For Ind. Cont. Eq." and are marked to specify the Listed open type products to be installed within. Look for a Listing Mark on both the enclosure and the open mechanism.

For industrial control panels, one of the following product identities appears on the Listing Mark: "Open Industrial Control Panel" , "Industrial Control Panel Enclosure" , "Enclosed Industrial Control Panel" .

The "Enclosed Industrial Control Panel" Listing Mark covers both the enclosure and the panel provided with it. Open panels employ the "Open Industrial Control Panel" Listing Mark. The "Industrial Control Panel Enclosure" Listing Mark covers only the enclosure; the compatibility of the enclosure and the installed equipment and associated wiring has not been investigated unless an "Enclosed Industrial Control Panel" Listing Mark is also present.

The Listing Mark of Underwriters Laboratories Inc. on the product is the only method provided by UL to identify products manufactured under its Listing and Follow-Up Service. The Listing Mark for these products includes the UL symbol (as illustrated in the Introduction of this Directory) together with the word "LISTED," a control number, and one of the following product names as appropriate: "Industrial Control Equipment" (or "Ind. Cont. Eq." ); "Marine Industrial Control Equipment For Use Only On Vessels Over 65 Feet" .



## **AALZ.GuideInfo** **Electrical Equipment for Use in Ordinary Locations**

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### **Electrical Equipment for Use in Ordinary Locations**

#### **I. GENERAL**

This directory includes electrical equipment intended for use in ordinary locations as defined in NFPA 70, "National Electrical Code" (NEC). Electrical equipment for installation in hazardous (classified) locations, as defined in the NEC, is covered in UL's Hazardous Locations Equipment Directory. Electrical equipment for use in hazardous locations may also be used in ordinary locations.

#### **II. RELATED PRODUCTS**

Products and equipment intended for use in Canada are covered in UL's Products Certified for Canada Directory.

Products and equipment certified in accordance with international and regional standards are covered in UL's Products Certified in Accordance with International and Regional Standards Directory.

Equipment intended for fire protection purposes, including fire suppression equipment, fire alarm equipment, and fire services equipment is covered in UL's Fire Protection Equipment Directory.

Some ordinary location electrical equipment is provided with special features concerning its use in fire resistive assemblies. Such equipment (e.g., recessed fixtures or outlet boxes) is also Classified for fire resistance as noted in the general Guide Information for the individual product category and is covered in UL's Fire Resistance Directory.

Equipment used for the storing, containing, conveying, dispensing, regulating or use of flammable and combustible liquids and gases, and controls and detectors for the equipment in this directory are covered in UL's Flammable and Combustible Liquids and Gases Equipment Directory.

Equipment used in heating, cooling, refrigerating, ventilating and cooking applications, as well as accessories associated with such equipment are covered in UL's Heating, Cooling, Ventilating and Cooking Equipment Directory.

Equipment for use aboard marine vessels or in a marine environment is covered in UL's Marine Products Directory.

Plumbing system appliances, fixtures, fittings and piping are covered in UL's Plumbing and Associated Products Directory.

### III. EVALUATION REQUIREMENTS AND STANDARDS

Electrical equipment for use in ordinary locations has been evaluated with reference to risks to life and property and for potential conformity to the installation and use provisions of the NEC.

Some products are certified for uses not within the scope of the NEC. Such products are evaluated for the specifications or the use conditions indicated in the general Guide Information for each product category.

The standards used to investigate products are identified in the general Guide Information for each product category. There may not always be a published standard for evaluating a product to determine its acceptability for Listing or Classification. If no applicable standard is available, UL will exercise its judgment in the selection of applicable requirements from related standards and other sources to develop the requirements to cover uses and conditions for which specific requirements did not previously exist.

Products, equipment and construction materials certified by UL in accordance with international or regional standards only (e.g., products Classified to an IEC or ISO Standard) are intended for distribution, installation and use in areas of the world where the specified standards have been adopted and are in effect as national or regional standards.

The general Guide Information for each product category describes the limitations relative to the products covered, such as current, voltage and horsepower limits, markings, special descriptions and installation provisions.

### IV. INSTALLATION REQUIREMENTS

Ordinary locations as defined in the NEC include:

**Damp Location** — Partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, barns, and cold-storage warehouses.

**Dry Location** — A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction.

**Wet Location** — Installations underground or in concrete slabs or masonry in direct contact with the earth, and locations subject to saturation with water or other liquids, such as vehicle washing areas, and locations exposed to weather and unprotected.

**Outdoor Use** — In general, individual appliances and equipment have been investigated only for use indoors, in dry locations. An exception is where outdoor use is specifically permitted by the Article of the NEC concerned with the product installation. See also the general Guide Information for the product category or included in the individual Listing. In some cases the title (e.g., Snow Movers, Swimming Pool Fixtures) indicates the conditions for which the product has been investigated.

Cord and plug-connected appliances obviously intended for outdoor use, such as gardening appliances, are not intended for use in the rain, and should be stored indoors when not in use.

#### Enclosure Types

Section 110.11 of the NEC specifies that equipment shall be identified for use in certain operating

environments. Section 300.6 provides guidance regarding protection against corrosion and Table 430.91 provides the basis for selecting motor controller enclosure types for use in specific locations. To assist inspection authorities, UL requires type designations on power distribution and control equipment enclosures such as cabinets and cutout boxes, enclosed panelboards or switchboards, meter sockets, enclosed circuit breakers or switches, industrial control and other equipment. The following table summarizes the intended uses of the various type enclosures for other than hazardous locations:

<b>Enclosure Type Number</b>	<b>Provides a Degree of Protection Against the Following Environmental Conditions*</b>
1	Indoor use.
2	Indoor use, limited amounts of falling water.
3R	Outdoor use, undamaged by the formation of ice on the enclosure.**
3	Same as 3R plus windblown dust.
3S	Same as 3R plus windblown dust, external mechanisms remain operable while ice laden.
4	Outdoor use, splashing water, windblown dust, hose-directed water, undamaged by the formation of ice on the enclosure.**
4X	Same as 4 plus resists corrosion.
5	Indoor use to provide a degree of protection against settling airborne dust, falling dirt, and dripping noncorrosive liquids.
6	Same as 3R plus entry of water during temporary submersion at a limited depth.
6P	Same as 3R plus entry of water during prolonged submersion at a limited depth.
12, 12K	Indoor use, dust, dripping noncorrosive liquids.
13	Indoor use, dust, spraying water, oil and noncorrosive coolants.

\*All type enclosures provide a degree of protection against ordinary corrosion and against accidental contact with the enclosed equipment when doors of covers are closed and in place. All type enclosures provide protection against a limited amount of falling dirt.

\*\*All outdoor type enclosures provide a degree of protection against rain, snow and sleet. Outdoor enclosures are also suitable for use indoors if they meet the environmental conditions present.

An enclosure that complies with the requirements for more than one type of enclosure may be marked with multiple designations.

Enclosures marked with a type may also be marked as follows:

A Type 1 enclosure may be marked "Indoor Use Only."

A Type 3, 3S, 4, 4X, 6 or 6P enclosure may be marked "Raintight."

A Type 3R enclosure may be marked "Rainproof."

A Type 4, 4X, 6 or 6P enclosure may be marked "Watertight."

A Type 4X or 6P enclosure may be marked "Corrosion Resistant."

A Type 2, 5, 12, 12K or 13 enclosure may be marked "Driptight."

A Type 3, 3S, 5, 12K, or 13 enclosure may be marked "Dusttight."

For equipment designated "Raintight," testing designed to simulate exposure to a beating rain will not result in entrance of water. For equipment designated "Rainproof," testing designed to simulate exposure to a beating rain will not interfere with the operation of the apparatus or result in wetting of live parts and wiring within the enclosure. "Watertight" equipment is so constructed that water does not enter the enclosure when subjected to a stream of water. "Corrosion resistant" equipment is so constructed that it provides degree of protection against exposure to corrosive agents such as salt spray.

"Driptight" equipment is so constructed that falling moisture or dirt does not enter the enclosure. "Dusttight" equipment is so constructed that circulating or airborne dust does not enter the enclosure.

### **Sizes and Ratings**

The scope of product sizes and ratings appearing in the general Guide Information for some product categories is intended to indicate the current range of Listed products, however, it is not necessarily indicative of limitations for those Listed products.

Marked ratings of utilization equipment include ampere, wattage or volt-ampere ratings. Motor-operated utilization equipment may also be marked with a horsepower rating. The actual marked ratings (other than the horsepower rating) and other markings or instructions, if any, are to be used to select branch circuit conductors, branch circuit overcurrent protection, control devices and disconnecting means.

The ampere or wattage marking on power-consuming equipment is valid only when the equipment is supplied at its marked rated voltage. In general, the current input to heating appliances or resistance heating equipment will increase in direct proportion to an increase in the supply voltage, while the current input to an induction motor supplying a constant load will increase approximately in direct proportion to a decrease in the supply voltage. These increases in current can cause overcurrent protection devices to open even when these devices are properly selected on the basis of nameplate ratings.

### **Appliance and Utilization Equipment Terminations**

Except as noted in the general Guide Information for some product categories, most terminals, unless marked otherwise, are for use only with copper wire. If aluminum or copper-clad aluminum wire can be used, marking to indicate this fact is provided. Such marking is required to be independent of any marking on terminal connectors, such as on a wiring diagram or other visible location. The marking may be in an abbreviated form, such as "AL-CU."

Except as noted in the general Guide Information for some product categories, the termination provisions are based on the use of 60°C insulated conductors in circuits rated 100 A or less, and the use of 75°C insulated conductors in higher rated circuits as specified in Table 310.16 of the NEC. If the termination provisions on equipment are based on the use of other conductors, the equipment is either marked with both the size and temperature rating of the conductors to be used or with only the



temperature rating of the conductors to be used. If the equipment is only marked for use with conductors having a higher (75°C or 90°C) temperature rating (wire size not specified), the 60°C ampacities (for circuits rated 100 A or less) and 75°C ampacities (for circuits rated over 100 A) should be used to determine wire size. Conductors having a temperature rating higher than specified may be used, though not required, if the size of the conductors is determined on the basis of the 60°C ampacity (circuits rated 100 A or less) or 75°C ampacity (circuits rated over 100 A).

### **Distribution and Control Equipment Terminations**

Most terminals are suitable for use only with copper wire. Where aluminum or copper-clad aluminum wire can or shall be used (some crimp terminals may be Listed only for aluminum wire), there is marking to indicate this. Such marking is required to be independent of any marking on terminal connectors, such as on a wiring diagram or other visible location. The marking may be in an abbreviated form, such as "AL-CU."

Except as noted in the following paragraphs or in the general Guide Information for some product categories, the termination provisions are based on the use of 60°C ampacities for wire size Nos. 14-1 AWG, and 75°C ampacities for wire size Nos. 1/0 AWG and larger, as specified in Table 310.16 of the NEC.

Some distribution and control equipment is marked to indicate the required temperature rating of each field-installed conductor. If the equipment, normally intended for connection by wire sizes within the range 14-1 AWG, is marked "75C" or "60/75C," it is intended that 75°C insulated wire may be used at full 75°C ampacity. Where the connection is made to a circuit breaker or switch within the equipment, such a circuit breaker or switch must also be marked for the temperature rating of the conductor.

A 75°C conductor temperature marking on a circuit breaker or switch normally intended for wire sizes 14-1 AWG does not in itself indicate that 75°C insulated wire can be used unless 1) the circuit breaker or switch is used by itself, such as in a separate enclosure, or 2) the equipment in which the circuit breaker or switch is installed is also so marked.

A 75°C or 90°C temperature marking on a terminal (e.g., AL7, CU7AL, AL7CU or AL9, CU9AL, AL9CU) does not in itself indicate that 75°C or 90°C insulated wire can be used unless the equipment in which the terminals are installed is marked for 75°C or 90°C.

Higher temperature rated conductors than specified may be used if the size is based on the above statements.

**Copper-clad Aluminum Conductors** — Copper-clad aluminum conductors are subject to the ampacity requirements applicable to aluminum conductors.

**Copper Pigtail Leads** — Copper pigtail leads may be used with aluminum or copper-clad aluminum supply wires in dry locations if 1) the splicing devices are Listed for use in joining copper to aluminum, 2) there is sufficient wiring space, and 3) the means provided for connecting the wiring system are acceptable for the wire size used.

**Wiring Devices** — Supply terminals of 15 A and 20 A switches and receptacles not marked "CO/ALR" are for use with copper and copper-clad aluminum conductors only. Terminals marked "CO/ALR" are for use with aluminum, copper and copper-clad aluminum conductors.

Screwless pressure terminal connectors of the conductor push-in type are for use only with copper and copper-clad aluminum conductors, both solid and stranded, unless otherwise limited by marking.

Terminals of switches and receptacles rated 30 A and above not marked "AL/CU" are for use with copper conductors only. Terminals of switches rated 30 A and above marked "AL/CU" are for use with aluminum, copper and copper-clad aluminum conductors.

**Wire Connectors** — Combinations of dissimilar conductors in terminal or splicing connectors are acceptable only in dry locations and when the connectors are identified as suitable for such intermixing. See also the information under Wire Connectors and Soldering Lugs (ZMVV).

**Terminals** — Product terminals, including wire connectors and terminal screws, are acceptable for connection of only one conductor, unless there is marking or a wiring diagram indicating the number of conductors which may be connected.

**Tightening Torque** — Some equipment may be marked to show a tightening torque for wire connectors intended for use with field wiring.

**Supply Cords** — When flexible supply cords or cord sets are replaced on utilization equipment and appliances, the replacement should be of the same type, AWG size, voltage rating and temperature rating as originally used.

## V. INSTRUCTIONS AND PRODUCT MARKINGS

The products covered in this directory are intended to be installed in accordance with the installation instructions provided with the product. It is critical that the cautionary statements and installation and operating instructions on the product and in accompanying literature be followed.

## VI. FIELD MODIFICATIONS

The UL Mark applies to the product as it is originally manufactured when shipped from the factory. Authorized use of the UL Mark is the manufacturer's declaration that the product was originally manufactured in accordance with the applicable requirements. UL does not know what the effect of a modification may have on the safety of the product or the continued validity of the UL certification mark unless the field modifications have been specifically investigated by UL. Unless UL investigates a modified product, UL cannot indicate whether such changes "void" the UL Mark, or that the product continues to meet UL's safety requirements.

The only exception for a field modification authorized by UL is when the product has specific replacement markings. For example, a switchboard may have specific grounding kits added in the field. The switchboard is marked with a list of specific kit numbers that have been evaluated for use in that particular switchboard. Only grounding kits that are included on the product have been evaluated for use in that product.

## VII. MARINE EQUIPMENT

Certain equipment has been specifically investigated and certified for use aboard marine vessels. Such equipment has been evaluated in accordance with the applicable requirements of UL, the United States Coast Guard, the American Boat and Yacht Council Inc. and the National Fire Protection Association. For additional information, see the general Guide Information for the specific product category. Equipment bearing UL's Marine Mark is suitable for use only with stranded copper wire.



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