HG

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Design code of instrument grounding

仪表系统接地设计规范

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Design code of instrument grounding

1 General

1.0.1 This standard is formulated in order to unify the technical requirements for instrument system grounding design in the chemical industry, promote the standardization of instrument system grounding design, and achieve the goals of technological advancement, economic rationality, safety, and applicability.

1.0.2 This standard is applicable to the design of grounding systems for instrument and automatic control system engineering in the chemical industry.

1.0.3 In addition to complying with the requirements of this standard, the design of the instrument grounding system shall also comply with the relevant current national standards.

2 Terms

2.0.1 safety grounding

Grounding for the protection of instruments and personal safety, which is also called safe grounding.

2.0.2 working grounding

Grounding required for the normal operation of instrument and control systems.

2.0.3 shielding grounding

Grounding is adopted to avoid electromagnetic field interference on instruments and signals.

2.0.4 intrinsically safe grounding

Grounding required for proper operation of intrinsically safe instruments.

2.0.5 equipotential bonding

The connection by which the individual conductors are connected and equal to earth's potential.

2.0.6 connecting resistance

The sum of the resistance of the conductors and connection points from the grounding terminal of instruments and equipment to the grounding electrode.

2.0.7 grounding resistance

The sum of the grounding electrode's resistance to ground and the connecting resistance is called grounding resistance.

2.0.8 grounding system

The general term for bonding wires, bonding bars, bonding trunk wires, bonding terminal bars, and earthing electrodes.

3 Grounding categories

3.1 Safety grounding

3.1.1 The metal casing of electrical instruments and the normally non-energized metal parts of automatic control equipment may carry dangerous voltage due to various reasons (such as insulation damage). The safety grounding shall be implemented for the following electrical instruments and automatic control equipment:

1 Instrument panels, instrument consoles, instrument cabinets, instrument frames and instrument boxes;

2 Instrument control system cabinet and operating station;

3 Computer system cabinets and operating consoles;

4 Power supply panels, power supply boxes, electrical instrument casings, cable trays, protective tubes, junction boxes and armor layer of armored cable.

3.1.2 When the metal casings of small low-voltage electrical appliances such as buttons, signal lights, and relays installed on metal dials in non-explosion-proof situations have good electrical contact with the metal dial frame that has safety grounding, separate safety grounding may not be required.

3.1.3 For field instruments, transmitters and local switches with a power supply lower than 36 V, safety grounding is not required unless there are special needs.

3.1.4 Automatic control equipment that has safety grounding can be considered to have electrostatic grounding. When using an anti-static raised floor in the control room, electrostatic grounding shall be done. Electrostatic grounding shall share the grounding system with safety grounding.

3.2 Working grounding

3.2.1 Working grounding shall include signal loop grounding and shielding grounding.

3.2.2 The signal loop grounding shall meet the following requirements:

1 In electronic equipment such as automation systems and computers, non-isolated signals need to establish a unified signal reference point, and the signal loop shall be grounded (usually the negative pole of the DC power supply).

2 Isolated signals do not need to be grounded. Isolation shall be that each input (output) signal is insulated from other input (output) signal circuits, insulated from the ground, and the power supply is independent and isolated from each other.

3.2.3 Shielding grounding shall meet the following requirements:

1 For components in the instrument system used to reduce electromagnetic interference, such as cable shields, drain wires, and shielding grounding terminals on the instrument, shielding grounding shall all be implemented.

2 The spare core of ordinary multi-core cables without shielding laid aerially outdoors shall be grounded.

3 If the shielding layer of the shielded cable is grounded, the spare core does not need to be grounded.

4 The spare core of a multi-core cable that wears a protective tube does not need to be grounded.

3.3 Intrinsically safe grounding

3.3.1 For components of intrinsically safe instruments that need to be grounded for safety functions, the intrinsically safe grounding shall be implemented according to the requirements of the instrument manufacturer.

3.3.2 The bus bar of the Zener safety barrier shall be connected to the common terminal of the DC power supply, and the bus bar (or guide rail) of the Zener safety barrier shall be intrinsically safe grounded.

3.3.3 The isolation safety barrier does not need to be grounded.

6 Grounding system bonding requirements

6.1 Bonding specifications

6.1.1 The conductors of the grounding system shall be multi-stranded copper core insulated wires or cables.

6.1.2 The cross-section of the grounding system connecting wire should be selected according to the type of bonding and the following values:

Bonding wire: 1 mm^2~2.5 mm^2; grounding branch trunk wire: 4 mm^2~16 mm^2; bonding trunk wire: 10 mm^2~25 mm^2; grounding main line: 16 mm^2~50 mm^2.

6.2 Bonding bar and bonding terminal bar specifications

6.2.1 The bonding bar should be made of 25 mm×6 mm copper strips, or it can be formed by the combination of connecting terminals.

6.2.2 The bonding terminal bar and main grounding plate should be made of copper plates. The thickness of the copper plate shall not be less than 6 mm, and the length and width dimensions shall be determined as needed.

6.3 Requirements for bonding structure

6.3.1 All bonding wires shall be well insulated before being connected to the bonding bar; all grounding branch trunk wires shall be well insulated before being connected to the bonding terminal bar; all bonding trunk wires shall be well insulated before being connected to the main grounding plate.

6.3.2 The bonding bar (bus bar), bonding terminal bar, and main grounding plate shall be fixed with insulating brackets.

6.3.3 Various connections of the grounding system shall ensure good electrical conductivity. For connections BETWEEN bonding wires, grounding branch trunk wires, bonding trunk wires, grounding main lines AND bonding bars and bonding terminal bars, copper lugs and zinc-coated steel bolts shall be used; in addition, use anti-loosening and anti-slip pieces shall be used to ensure a secure and reliable connection. Or welding is used.

The connection parts of the grounding main line and the grounding electrode shall be treated by hot-dip galvanizing or hot tinning, respectively.

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