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**Design specification for instrument system lightning surge
protection in petrochemical industry
(English Translation)**

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1 Scope

This Specification specifies the design rules for lightning protection engineering of instrument systems.

This Specification is applicable to the lightning protection design of instrument systems for explosive environments and non-explosive environments in new construction, expansion and reconstruction projects of petrochemical and coal-based fuel and chemical product plants.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB 50057-2010, Code for design protection of structures against lightning

GB/T 18802.21, Low-voltage surge protective devices -- Part 21. Surge protective devices connected to telecommunications and signaling networks -- Performance requirements and testing methods

3.1 Terms

For the purposes of this document, the following terms and definitions apply.

3.1.1

air-termination system

Metal objects and metal structures used to directly receive or withstand lightning strikes, such as. lightning rods (formerly known as lightning rods), lightning strips (wires), lightning nets, etc.

3.1.5

bonding

Connect equipment, instruments, earthing busbars, etc. that need to be earthed with earthing wires and bonding conductors to form a earthing system.

3.1.6

bonding conductor

A conductor that is used to connect various equipment that need to be earthed, various bonding bars, etc., to form a earthing system.

3.1.11

lightning electromagnetic induction

The phenomenon that the lightning current generates an electromagnetic field in the surrounding space and the conductor in this electromagnetic field generates an induced electromotive force.

3.1.12

electromagnetic shielding

A barrier to the protected target with materials that can reduce the passage of electromagnetic fields.

3.1.13

lightning surge

The pulse-shaped current and voltage generated by lightning electromagnetic induction and conducted along a circuit or conductor. It is also called lightning surging.

3.1.14

equipotential bonding

Use conductors to conductively connect various metal components, metal facilities, metal pipes, metal equipment, etc., so that the potential of each object is approximately equal.

3.1.27

safety extra-low voltage

The voltage that electrical insulation and isolation from other power systems, voltage does not exceed the limit. $\leq$ AC 50V, or $\leq$ DC 120V, exposed conductive parts are not earthed, in compliance with GB/T 16895.21-2020/IEC 60364-4-41.2017 on safety extra-low voltage specified voltage.

3.2 Abbreviations

The following abbreviations apply to this Specification.

4 General

4.1

The design of lightning protection projects shall determine the appropriate protection scope and adopt appropriate protection plans based on the specific conditions of the protection targets, so as to reduce the risk of lightning strikes to a tolerable level,

4.2

Lightning surge protection engineering for instrumentation shall adopt the following methods at the same time.

4.3 The protective earthing, working earthing, intrinsic safety earthing, shielding

earthing, anti-static earthing, and surge protective device earthing of the instrument shall finally be connected to the electrical earth termination system. The earth resistance shall comply with the earth resistance of the electrical earth termination system.

5.1 The implementation of lightning surge protection engineering for instrumentation

shall be determined based on one of the conditions of 5.2 to 5.6.

Abbreviation Full English name

5.4 When the regulatory authorities or owners assess that the possible economic losses

caused by lightning strikes are greater than the tolerable economic losses, or the expected risks of lightning strikes are greater than the tolerable risks, lightning surge protection engineering for instrumentation shall be implemented.

5.5 When the number of lightning strikes with lightning current intensity above 130kA

has occurred in the factory area ≥ 2 times/year, it is appropriate to implement lightning surge protection engineering for instrumentation.

5.6 Departments with corresponding management or supervision rights may implement lightning surge protection engineering for instrumentation in accordance with regulations without evaluation.

6.1 Instrumentation earthing system in control room

6.1.1

The instrument earthing system in the control room shall adopt a mesh-structured earthing system, which can be used in various buildings and rooms equipped with instruments.

6.1.5

For single-row cabinets or single-row consoles, a single bonding bar shall be used.

6.1.6

The bonding bar of the mesh structure shall be made of copper or hot-dip galvanized flat steel welded with a cross-sectional area of $\geq 40 \text{ mm} \times 4 \text{ mm}$ (width $\times$ thickness). There shall be no wire connections between bonding bar materials.

6.1.7

The bonding bar of the mesh structure shall be installed on the bottom support of the cabinet or other brackets. The height shall be close to the bottom of the cabinet, see

Appendix A. The bonding bar shall be installed using non-insulating brackets and other materials.

6.1.12

The earth wire (PE wire) from the power supply system shall be connected to the bonding bar of the instrument distribution cabinet. Multi-stranded copper core wires with a cross-sectional area of $\geq 16 \text{ mm}^2$ shall be connected to the mesh structure bonding bar by crimping.