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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 3836.32-2021

**Explosive atmospheres - Part 32: Intrinsically safe systems with
electronically controlled spark duration limitation**

爆炸性环境 第32部分：电子控制火花时限本质安全系统

(English Translation)

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1 Scope

This document specifies the structure, test, installation and Technical requirements for maintenance.

This document applies to intrinsically safe Power-i devices used in explosive environments and intrinsically safe circuits that enter explosive environments Related equipment connected and the connecting wires and cables between them.

This document applies to electrical equipment of IIB, IIA, I and III classes with a voltage not greater than 40Vd.c. and a safety factor of 1.5; it also applies to Class IIC "ic" equipment with a safety factor of 1.0 and Class IIC "ib" equipment with a voltage not greater than 32Vd.c. and a safety factor of 1.5.

This explosion-proof type is suitable for electrical equipment where the circuit itself cannot ignite the surrounding explosive environment.

This document is applicable to intrinsically safe equipment and systems that use electronically controlled spark time limits to provide high-power power while maintaining a safe level.

This document is also applicable to electrical appliances that are located outside hazardous locations or are protected by other types of explosion protection listed in GB/T 3836 (all parts).

Equipment or electrical equipment components, in which the intrinsic safety of circuits located in an explosive environment depends on the safety of such electrical equipment or electrical equipment components.

Design and structure. Circuits located in hazardous locations are evaluated in accordance with this document.

This document does not apply to "ia" level circuits and software controlled circuits.

This document is a supplement to GB/T 3836.1, GB/T 3836.4, GB/T 3836.15, GB/T 3836.16, GB/T 3836.18 and Revise.

2 Normative references

The content of the following documents constitutes an indispensable clause of this document through normative references in the text. Among them, dated quotations Only the version corresponding to the date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to This document.

GB/T 3836.1 Explosive environment Part 1: General requirements (GB/T 3836.1-2021, IEC 60079-0:2017, MOD)

GB/T 3836.4 Explosive atmosphere Part 4: Equipment protected by intrinsically safe "i"
(GB/T 3836.4-2021, IEC 60079-11:2006, MOD)

GB/T 3836.15 Explosive atmosphere Part 15: Design, selection and installation of electrical
devices (GB/T 3836.15-2017, IEC 60079-14:2007, MOD)

GB/T 3836.16 Explosive atmosphere Part 16: Inspection and maintenance of electrical
installations (GB/T 3836.16-2017, IEC 60079-17:2007, IDT)

GB/T 3836.18 Explosive Atmosphere Part 18: Intrinsically Safe Electrical System (GB/T
3836.18-2017, IEC 60079-25:2010, MOD)

3 Terms and definitions

The following terms and definitions defined in GB/T 3836.1 and GB/T 3836.4 apply to this document.

3.1 Power-i

It is a way to achieve intrinsic safety by limiting the voltage and current, while providing protection through the electronic control of the spark time limit.

5.1 General

Power-i should be regarded as an overall system, so the following requirements apply to all Power-i devices.

a) Under static or transient conditions (such as soft start), neither the Power-i cable nor the Power-i device should cause the spark pulse detection to fail. Therefore, Power-i requires overall consideration of the system;

b) All Power-i devices and Power-i cables should be evaluated and tested in accordance with Appendix C;

c) All Power-i devices should be classified according to 5.7;

d) In addition to complying with the relevant requirements of GB/T 3836.1, GB/T 3836.4 and GB/T 3836.18, the Power-i device should also meet the relevant requirements of GB/T 3836.1, GB/T 3836.4 and GB/T 3836.18.

Relevant requirements of other standards (for example, GB/T 3836.3, GB/T 3836.9 when applicable);

e) When temperature effects and component tolerances will affect the time and sensitivity of the safety performance of the Power-i device, they should be considered;

f) When conducting all the tests specified in this document, the safety functions (such as timing and sensitivity) of the Power-i device should be the most unfavorable. The fault is

applied to the device.

5.2 Power-i power supply

Each Power-i system only allows one active Power-i power supply. Power-i power supply should be placed in the Power-i connection line (trunk) One end.

The Power-i power supply should be able to detect closing sparks (sparks that occur when the current changes di/dt caused by a short circuit) and open circuit sparks (The spark that occurs when the current changes $-di/dt$ caused by the open circuit), and when the spark pulse appears, the power supply output should be able to be quickly shut off.

Figure 3 shows the core components of the Power-i power supply, with front-level safety-related voltage limiting and current limiting devices.

In various operating modes, including the transition phase from the traditional intrinsic safety mode to the Power-i mode, if it exceeds The intrinsic safety parameters specified in GB/T 3836.4 and GB/T 3836.18, Power-i power supply should ensure that the current change $\pm di/dt$ detection will not Invalidate.

Note: In the constant current mode, the current change di/dt may be suppressed, so no spark can be detected in this mode. Power-i power supply should meet the following relevant safety requirements.

- a) The output current $I_{o-source}$ and output voltage $U_{o-source}$ of the Power-i power supply limited by the voltage-limiting and current-limiting device shall meet the requirements of Table 1 and Table 2. Require.
- b) The Power-i power supply should be able to detect the dynamic change of the output current $I_{o\pm di/dt}$ specified in C.3.2. And the power supply should be from Power-i The mode is switched to shutdown mode.
- c) In shutdown mode, the output current $I_{shutdown}$ value may not be 0, but it should not exceed GB/T 3836.4 or GB/T 3836.18 When the corresponding safety factor is applied, the allowable current I_{o-GB} is 50%. which is. $I_{shutdown} \leq 0.5 I_{o-GB}$
- d) Within 20 μs of the spark information detected by the Power-i power supply, the output current of the Power-i power supply should be equal to or less than the value of I_{o-GB} 75%, that is, within the first 20 μs of transition to shutdown mode, the transient output current $I_{shutdown-20\mu s}$ is allowed to not exceed 75% of the I_{o-GB} value (See Figure C.5).
- e) The value of the transient output overshoot voltage $U_{overshoot-40\mu s}$ exceeding the rated output voltage $U_{o-source}$ within the maximum 40 μs in the shutdown mode should not be large At 6V. which is. $U_{overshoot-40\mu s} \leq U_{o-source} + 6V$
- f) Power-i power supply shall meet the requirements of C.3.2 test procedure.
- g) The following Power-i power supply components (see Figure 3) are safety-related