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

GB/T 10827.4-2023

**Industrial trucks - Safety requirements and verification - Part 4:
Driverless industrial trucks and their systems**

工业车辆 安全要求和验证 第4部分：无人驾驶工业车辆及其系统

(English Translation)

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1 Scope

This document specifies the safety requirements and verification methods for driverless industrial vehicles and their systems:

Unmanned industrial vehicles (vehicles in ISO 5053-1) are also called "automatic guided vehicles", "autonomous mobile robots", "robots" and "automatic guided vehicles":

"Guiding trolley", "tunnel tractor", "guiding vehicle", etc:

This document also contains the following requirements for driverless industrial vehicles:

---Automatic mode that requires the operator to take action to start or enable automatic operations;

---The ability to transport one or more occupants (to be considered neither driver nor operator);

---Additional manual mode that allows the operator to manually operate the vehicle;

---Maintenance mode that allows manual operation of vehicle functions for maintenance reasons:

This document does not apply to vehicles guided by purely mechanical means (tracks, guides, etc:) and remotely controlled vehicles: These vehicles are not considered for driverless industrial vehicles:

In this document, an unmanned industrial vehicle is a motorized industrial vehicle designed to operate automatically: Autonomous vehicle systems include Control system, guidance device and power system, the control system may be part of the vehicle and/or separate from it: This document does not cover power source requirements:

The conditions in the work area have an important impact on the safe operation of unmanned industrial vehicles (hereinafter referred to as "vehicles"): To eliminate related risks the preparation of the work area is detailed in Appendix A:

This document covers the use of relevant machinery under the manufacturer's intended use and misuse under foreseeable conditions, except for the following situations, as shown in the appendix all major hazards, hazardous states or hazardous events during the vehicle life cycle listed in B (5:4 in GB/T 15706-2012):

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text: Among them, the dated quotations for undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document:

3 Terms and definitions

The following terms and definitions as defined in GB/T 6104.1-2018 and GB/T 15706-2012 apply to this document:

4 Security requirements and/or protection/risk reduction measures

4.1

General requirements

4.1.1

General requirements Vehicles shall comply with the safety requirements and/or protective measures of this chapter:

In addition, for non-major hazards not covered in this document, vehicle design should be carried out according to the principles specified in GB/T 15706-2012:

The vehicle operating area shall comply with the requirements of Appendix A:

4.1.2

Normal climatic conditions the following normal climate conditions should be met:

- Average ambient temperature under continuous operating conditions: 25°C;
- The highest ambient temperature in a short period of time (not more than 1h): 40°C;
- Minimum ambient temperature when using the vehicle under normal indoor conditions: 5°C;
- Minimum ambient temperature when using the vehicle under normal outdoor conditions: -20°C;
- Altitude: no more than:2000m:

4.1.3

Electrical requirements the vehicle electrical system shall comply with the requirements of Table 1:

4.1.4

Energy storage components Components that store energy and may cause a hazard during removal or disassembly (e.g. hydraulic accumulators, capacitors or spring brakes) (location), measures should be taken to release its energy before moving or dismantling:

4.1.5

Side or angle

There should be no dangerous sharp edges or corners in the following areas:

- a) The normal operating position of the occupant;
- b) The operator's operating position;
- c) Access channels for daily inspections:

4.1.6

Protective devices the technical principles of protective devices should comply with the provisions of GB/T 15706-2012: Protective devices should comply with GB/T 8196-2018 Regulation:

The safety distance should comply with the provisions of GB/T 23821-2009: In addition, the safe distance to prevent touching the protective structure should comply with High-risk requirements in Table 2 of GB/T 23821-2009: In addition, the minimum height of continuous fixed enclosed structures shall be 2:1m:

4.1.7

Protective interlocking device Interlocking devices related to protective devices should comply with the regulations of GB/T 18831-2017:

4.1.8

Two-hand control device the two-hand control device should comply with the regulations of GB/T 19671-2022:

4.1.9

Transmission components Transmission components within human reach (such as drive shafts, couplings and belt drives) should be protected by fixed guards:

4.1.10

Electrosensitive protective equipment Electrosensitive protective equipment (ESPE) shall comply with the provisions of IEC 61496-2:2013 and IEC 61496-3:2018:

4.1.11

Pressure sensitive protection device the pressure-sensitive protection device should comply with Sample 5 or Sample 6 specified in Table 2 of GB/T 17454.2-2017 and GB/T 17454.3-2017 (Applies to shapes and sizes only):

4.1.12

Hydraulic system Hydraulic systems and their components should comply with ISO 4413:2010:

4.1.13

Pneumatic system Pneumatic systems and their components should comply with the regulations of GB/T 7932-2017:

4.1.14

Avoid automatic restarts the vehicle should be designed so that it is not allowed to restart automatically after any of the following actions:

- a) Emergency stop device;
- b) Short-stroke contact anti-collision device, see 4.8:2:1e);
- c) 4:9:3 Describe the situations in which the operator operates manually (such as seats, tillers, handles, foot pedals);
- d) Manual control instructions (such as throttle, steering wheel, joystick), see 4.9:3:1c);
- e) Non-contact stopping function specified in footnote c of Table A:1:

After the vehicle is powered off, it is not allowed to restart automatically:

4.1.15

Foot protection Measures should be taken to prevent injuries to the feet of persons standing near the vehicle:

Measures that can be taken include:

- a) Provide additional stopping distance margin for feet in accordance with ESPE manufacturer parameters;
- b) For people wearing safety shoes, reduce the frame gap to no more than 40mm to prevent feet from being trapped under the frame;
- c) The foot spacing under the chassis should be in accordance with the provisions of Figure 5 of GB/T 10827.1-2014 to prevent feet from contacting the driving wheel and balance wheel: