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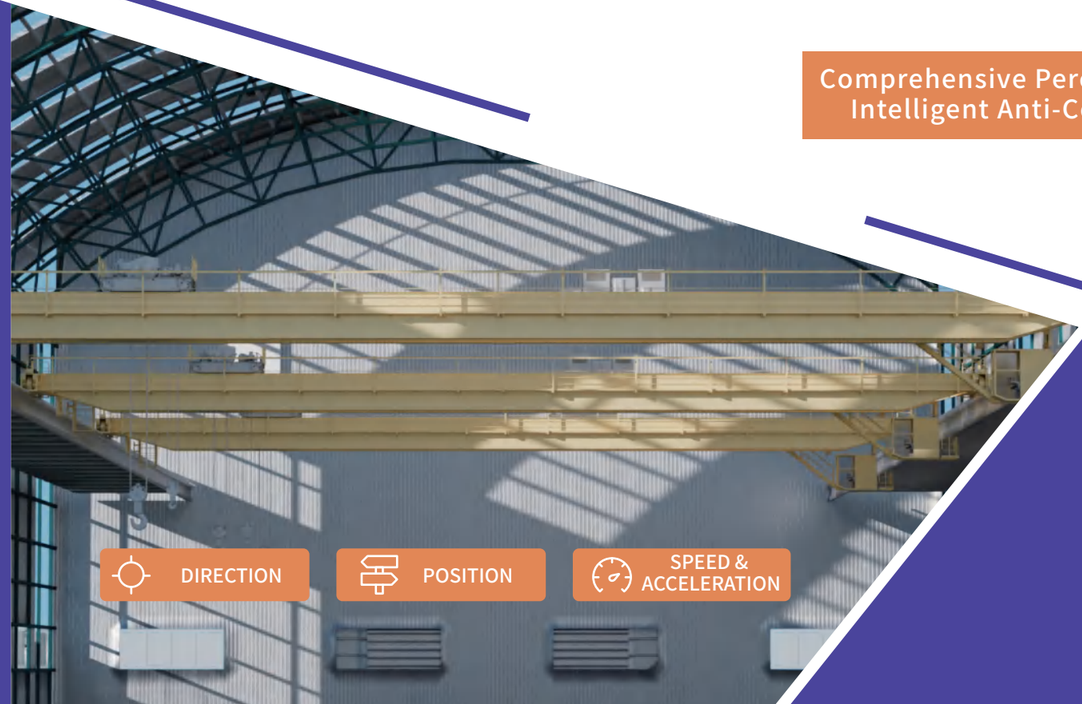
# CRANE DRIVING ASSISTANT SYSTEM

Comprehensive Perception
Intelligent Anti-Collision



## It's an empirical versus artificial intelligence battle

Mr. Luo is currently accompanying his daughter during her driving practice sessions. Despite recently obtaining her driver's license, she drives with great caution, often applying the brakes prematurely when encountering pedestrians or other vehicles on the road. Consequently, their journey to the wet market takes twice as long.

Mr. Luo is a hothead. Look, he was saying again today: "That car is going fast, you can hit the brakes later". He said it and then regretted it, after all, it's all about experience.

These days, his daughter picked up a new car and her driving skills have improved a lot. Mr. Luo sat in the passenger seat and found that the car had become intelligent enough to automatically avoid people and cars. It suddenly dawned on him, and his heart did not feel good.

"Is he better than me?" Mr. Luo asked.

# CONTENTS

# 01 Traditional Anti-Collision vs Intelligent Anti-Collision

## Traditional Anti-Collision System

Most crane systems rely on a fixed safety distance to achieve anti-collision.

### What is the “best” safety distance?

Short safety distance → collision at high speed


- Approaching at low speed, cranes stop just in time.
- Approaching at high speed, insufficient braking distance causes collision.

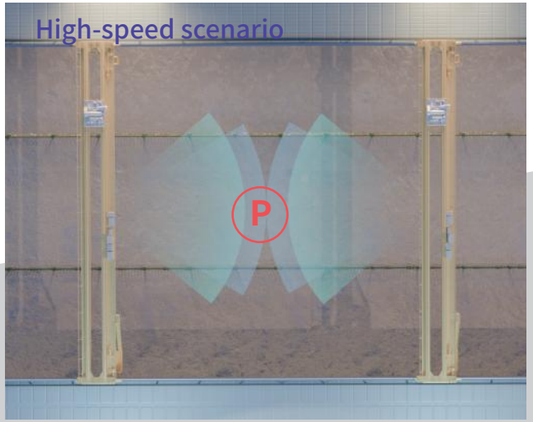
Long safety distance → low efficiency at low speed


- Approaching at high speed, cranes stop just in time.
- Approaching at low speed, premature braking distance reduces efficiency.

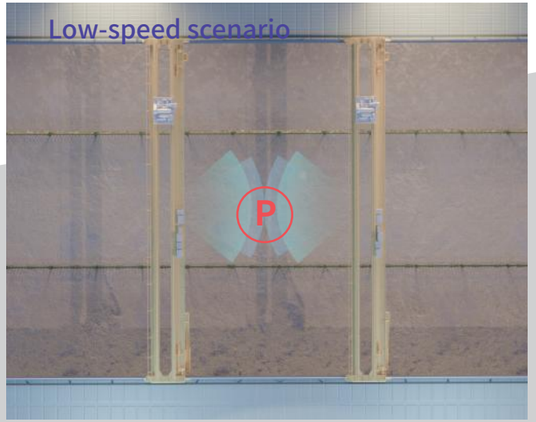
## Intelligent Anti-Collision System

Comprehensive perception of position, direction and speed enables automatic safety-distance adjustment, maximizing both safety and efficiency.

**The safety distance dynamically adapts based on position, direction, speed, and acceleration.**




When two cranes approach at high speed, early braking will be applied to prevent collisions.




When two cranes approach at low speed, late braking will be applied to maintain normal operation.

## 02 System Architecture

### Gantry Anchor

**Radio transceiver for gantry position coordinates**

Transmits and receives radio signals to create coordinate points for measuring crane position.

### Gantry Tag

**Real-time gantry position & motion status tracking**

Obtains real-time positional data and motion status of all gantry mechanisms.

### Trolley Anchor

**Radio transceiver for trolley position coordinates**

Transmits and receives radio signals to create coordinate points for measuring trolley position.

### Trolley Tag

**Real-time trolley position & motion monitoring**

Obtains real-time positional data and motion status of all trolley mechanisms.

### Smart Panel

**Adaptive safety distance calculation** based on position, velocity, direction and braking performance.

**Integrated audio/visual alarms**

Displays distances and movement directions of left & right neighboring cranes with integrated audio/visual warnings.

Adopts a separate-channel design, effectively isolating signals and eliminating interference.

## 03 Technical Specification

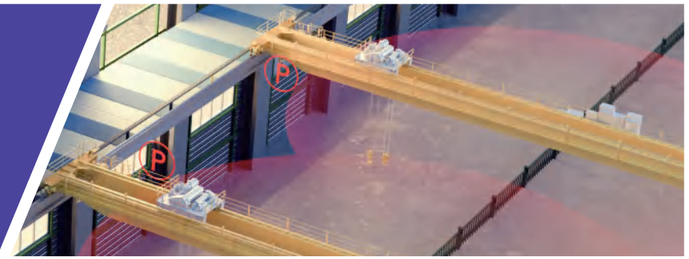
| Item | Gantry Anchor | Gantry Tag | Smart Panel | Trolley Anchor | Trolley Tag |
|---|---|---|---|---|---|
| Light-colored model | CDAS-20-1 | CDAS-20-2 | CDAS-20-3 | CDAS-20-4 | CDAS-20-5 |
| Dark-colored model | CDAS-20-1-5 | CDAS-20-2-5 | Shared with light-colored model | CDAS-20-4-5 | CDAS-20-5-5 |
| Dimensions & weight | 253*172*52mm 1006g | 253*172*52mm 1006g | 276*188*50mm 1000g | 253*172*52mm 1006g | 253*172*52mm 1006g |
| Power supply & consumption | 24V/1A, ⩽3W | 24V/1A, ⩽3W | 24V/1A, ⩽3W | 24V/1A, ⩽3W | 24V/1A, ⩽3W |
| Network interface protocol | TCP | TCP | Modbus TCP/UDP | TCP | TCP |
| Serial port | RS485*1 | RS485*1 | RS485*2 | RS485*1 | RS485*1 |
| Bluetooth | 5.1 | 5.1 | — | 5.1 | 5.1 |
| Operating temperature | -40°C~+65°C | -40°C~+65°C | -40°C~+65°C | -40°C~+65°C | -40°C~+65°C |
| Protection level | IP67 | IP67 | IP54 | IP67 | IP67 |

Note: The Smart Panel package includes one additional 5-port switch by default.

# 04 Application Scenarios

## Same-span Anti-collision

Intelligent Anti-Collision System (CDAS-20) continuously detects the position, direction, and speed of each crane, alarms operators and brakes cranes to prevent collision.



## Regional Safety Boundary (Area Anti-Collision)

Intelligent Anti-Collision System collects and outputs crane positions to the PLC, which enables flexible safety boundaries configuration via program or HMI. When a crane nears a boundary or another crane, the intelligent system outputs alarms to operators and braking signals to cranes.

## More Extended Applications

## Multi-level Anti-collision

Intelligent Anti-Collision System monitors real-time positions of overhead cranes across multiple levels, while high-precision positioning technology to track hook and load heights. All position and height data is transmitted via a wireless bridge to the control box, where advanced algorithms analyze collision risks, and instantly issue alarms and brake cranes, ensuring precise 3D anti-collision.


## Unmanned material handling in bulk warehouses

The key to achieving autonomous crane control is precise real-time position tracking. Intelligent Anti-Collision Control System provides position data with up to 10cm accuracy for both crane gantry and trolley, supporting Modbus TCP and UDP protocols. The system enables unmanned Bulk-material handling and anti-collision cranes, accelerating industrial digitalization.

# 05 Case Study

Same-span Anti-collision


## Project Background

In Steel smelting plant, three 200t cranes handle molten metal on 180m span. Preventing crane collisions is crucial to ensuring safe, reliable operations.

## Solution

Intelligent Anti-Collision System (CDAS-20) continuously monitors real-time position and movement of cranes. When the crane is approaching others or side walls, the Smart Panel alarms operator, brakes crane and outputs position data to the security system, ensuring safe production.

Multi-level Anti-collision

## Project Background

In Steel smelting plant Scrap Yard, Two 70t+70t dual trolley overhead cranes on upper rail and one 25t magnet crane on lower rail, are working simultaneously in the same space. Not only considering the same rail cranes anti-collosion, what's more important is multi-level cranes anti-collision protection.

## Solution

Intelligent anti-collision system tracks upper and lower cranes position in real time, and obtains hook-height data from high-precision encoders. All data are sent via wireless bridge to the PLC and the smart panel which executes collision-avoidance algorithms, issues alarm and brakes crane.


Regional Safety Boundary (Area Anti-Collision)


## Project Background

In continuous casting steel plant, dense pipes and beams under the crane rails demand both crane-to-crane and hook-to-obstacle protection.

## Solution

Intelligent anti-collision system tracks real-time positions of all cranes, enabling cranes anti-collision and collision prevention between hooks and obstacles by programing obstacle coordinates into PLC.

Unmanned bulk material handling by Cranes

## Project Background

Mineral Processing Plant requires four cranes anti-collision to ensure safe production and enable unmanned operations with position data.

## Solution

Intelligent anti-collision system collects real-time position data of crane gantry and trolley, while supporting standard Modbus protocol. PLC retrieves this real-time data to enable automatic grab-and-lift operations under application logic.

## 06 Product Features

### 01 Industrial Durability

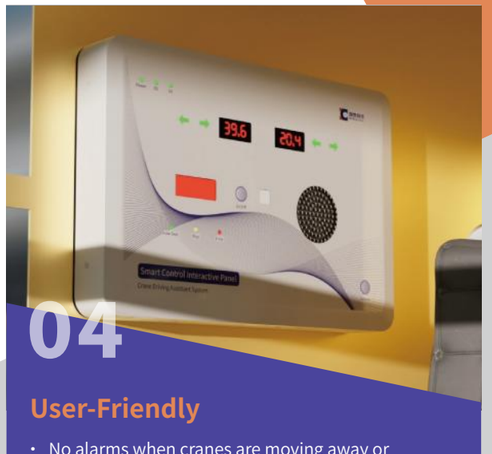
- -40°C to 65°C temperature resistance
- IP67 dustproof and waterproof
- Self-developed filtering algorithm ensures providing stable position data output

### 02 Easy installation and Maintenance

- Clamp-on installation
- No calibration/cleaning required
- Self-diagnostic ability


### 03 Low cost multifunctional

- No additional equipment is required for side wall anti-collision
- Auto-detects sway control on/off and adjusts braking distance
- Interoperable, outputs precise positioning data to smart systems
- Distance or speed mode selectable




### 04 User-Friendly

- No alarms when cranes are moving away or stationary
- Auto-restarts within a set time after shutdown for close-range work
- Position logging during power loss with continuous anti-collision functionality

# 07 Selection Guide

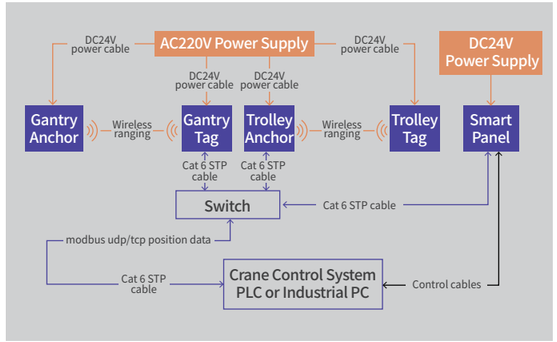
01 ---- 02 ---- 03

### Rail Length
Capable for anti-collision cranes within 1000-meter rail.

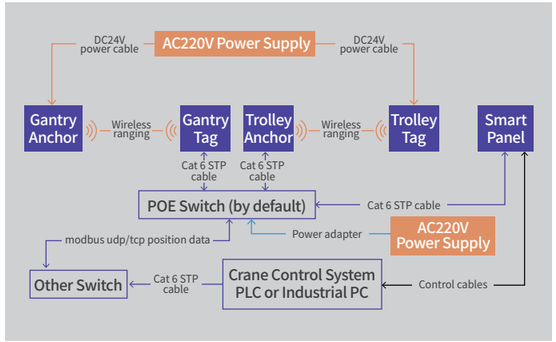
### Crane Quantity
Up to 6 overhead or gantry cranes on each rail

### Applicable functions
Crane gantry anti-collision/positioning
Crane gantry & trolley anti-collision/positioning

## Equipment Wiring

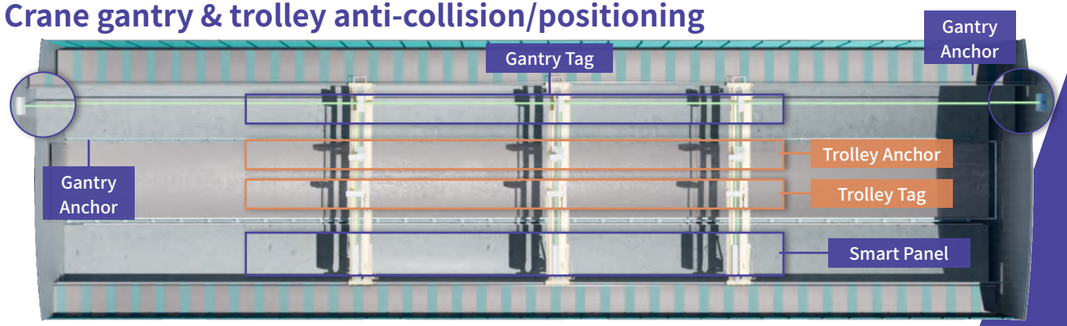



Adapter Power Supply




POE Power Supply

## Crane gantry & trolley anti-collision/positioning




| Crane quantity on each rail | Gantry Anchor | Gantry Tag | Smart Panel |
|---|---|---|---|
| 1 | 2 | 1 | 1 |
| 2 | 2 | 2 | 2 |
| 3 | 2 | 3 | 3 |
| 4 | 2 | 4 | 4 |
| 5 | 2 | 5 | 5 |
| 6 | 2 | 6 | 6 |

| Trolley quantity on each crane | Trolley Anchor | Trolley Tag |
|---|---|---|
| 1 | 1 | 1 |
| 2 | 2 | 2 |
| 4 | 4 | 4 |

Note: Each span requires two Gantry Anchors to achieve anti-collision for all cranes on that span. This system only provides trolley position information; trolley anti-collision needs to be integrated with a PLC or industrial PC.

For example, three cranes(1#, 2#, 3#) on the same span requires crane gantry & trolley anti-collision/positioning, 1 trolley on 1# crane, 2 trolleys on 2# crane, 4 trolleys on 3# crane, the selection is as following:

| Crane # | Trolley quantity | Gantry Anchor | Gantry Tag | Smart Panel | Trolley Anchor | Trolley Tag |
|---|---|---|---|---|---|---|
| 1# | 1 | 2 | 1 | 1 | 1 | 1 |
| 2# | 2 | | 1 | 1 | 2 | 2 |
| 3# | 4 | | 1 | 1 | 4 | 4 |
| Total | 7 | 2 | 3 | 3 | 7 | 7 |