



伟隆港机

# JSD系列集装箱锁头智能解锁站

## SERIES JSD CONTAINER LOCK SMART TWISTLOCK STATION

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宁波伟隆港口机械有限公司  
NINGBO WEILONG PORT MACHINERY CO., LTD.

## 一、有关集装箱锁头

集装箱锁头承担着海运时对集装箱的安全连锁，是集装箱运输中确保安全的关键工具。据不完全统计，集装箱锁头的种类多达百余种。

### I. About the container lock

There are roughly 100 different types of twist locks used to secure stacked containers together during transportation. They play a crucially important role in ensuring the safety of vessels in global shipping.



集装箱常用锁头  
Commonly used locks for containers

## 二、码头解锁现状

因锁头类型众多，拆装锁工况复杂，目前全球各码头的集装箱锁头的拆装工序仍然依靠人工完成。

人工在岸桥底下或在人工锁岛内对集装箱的锁头进行拆装作业，存在以下问题：

- A. 人、机、车交互作业，安全隐患大；
- B. 全气候露天作业，工作环境恶劣，用工困难；
- C. 重复性连续作业，劳动强度大，易产生疲劳，存安全隐患；
- D. 随着自动化码头兴起，人工解锁已成为自动化作业瓶颈，亟待更新。

## II. Unlocking Status

Due to the numerous lock types and complex operational procedures, manual locking and unlocking are still the main operation mode in many large-scale ports, resulting in some safety hazard of lock workers working under a quay crane or in a lock station.

- A. The risk of cross-operation between machines, vehicles and workers.
- B. The Labor shortage due to the harsh working condition.
- C. The fatigue in the workplace due to the repetitive, continuous and intense operation.
- D. The bottleneck of a fully automated operation process in an automated port.



常规解锁工在吊具下作业，危险性大！  
Conventional unlocking works under the spreader, which is very dangerous!

### 三、智能解锁站面世

伟隆港机通过五年的技术研发，在2021年完成了第一套商业化运营的智能解锁站交付，实现了集装箱锁头拆装的自动化作业，解决了行业的痛点。



智能解锁站集成多项技术：

- A. 视觉智能定位
- B. AI智能识别
- C. 机器人技术
- D. 智能化编程控制技术
- E. 多功能组合夹具

### III. Intelligent unlocking station launched

Through five-year research and development, Weilong launched and delivered the first Smart Twistlock Station (STS) for commercial purpose in 2021. This pioneered solution helps the automated ports lock and unlock the containers automatically and partially solve the problem of labor which has been long regarded as a “hard nut to crack”.



Weilong Smart Twistlock Station (STS) integrates a number of technologies:

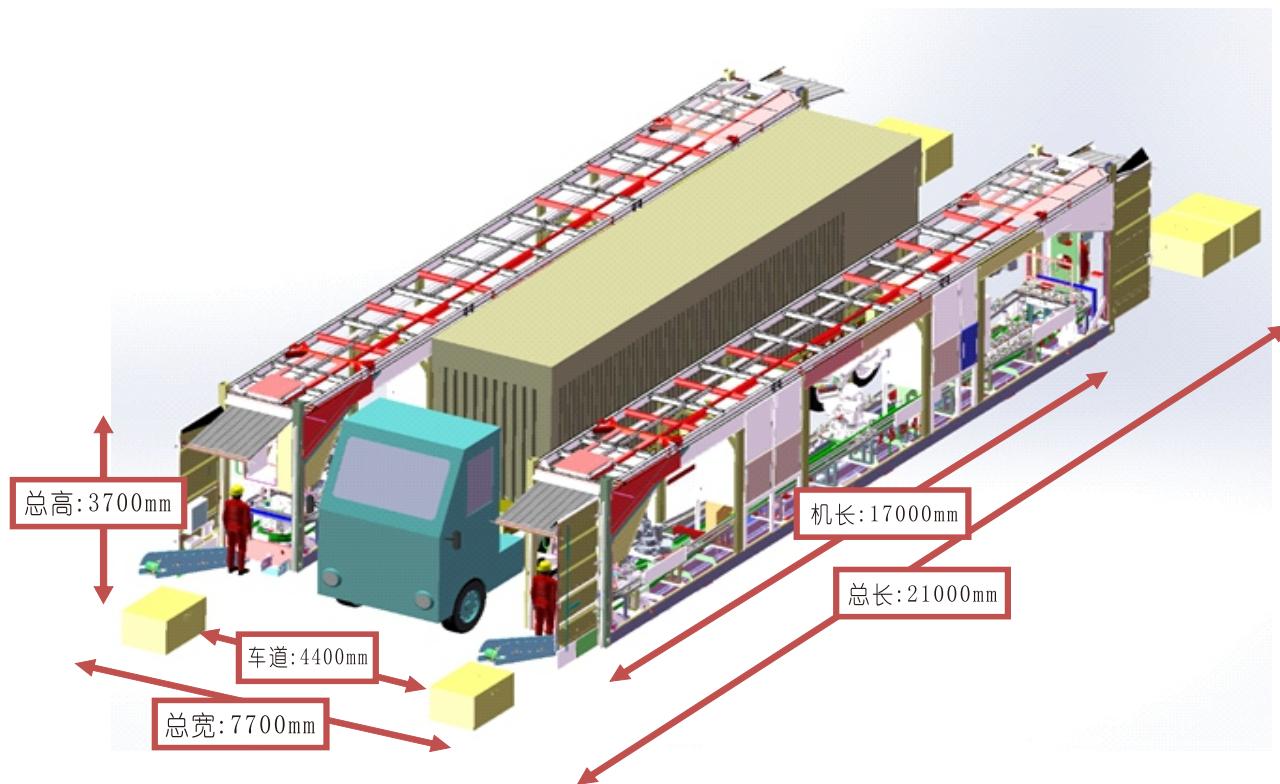
- A. Visual positioning
- B. AI intelligent identification
- C. Robotics
- D. Intelligent programming control technology
- E. Multi-functional fixture combination



## 四、智能解锁站主要技术参数

## IV. Main technical parameters

项目 Item	主要技术参数 Main technical parameter
适配船型 Ship type	箱量大于 3000 箱，单船锁头类型≤5 种 Container quantity more than 3000, lock type less than 5.
集装箱类型 Container type	单 20,双 20, 40, 45 英尺集装箱（超宽箱除外） Single 20,40,45 foot containers and double 20 foot containers (extra widecontainers excluded)
作业效率： Operational efficiency	单 20, 40 英尺箱(拆装 4 个)≤30S, 双 20 英尺箱(拆装 8 个)≤50S; Less than 30s for single 20,40 container, less than 50s for double 20 containers
工作电压/功率 Operating voltage/power	380VAC/50HZ/50KW
通讯接口 Communication interface	TCP/IP, 光纤接入 TCP/IP, Optical fiber
设计工作风速 Design wind speed	最大工作风速 20 米/秒， 最大非工作风速 55 米/秒 Maximum working wind speed 20 m/s, maximum noworking wind speed 55 m/s
适用环境温度 Applicable temperature	-20℃ ~50℃
相对湿度 Relative humidity	≤100%
气候条件 Climatic condition	雨：≤大雨 (24h 降雨量 25~50mm), 暴雨气候建议不进行作业 雾：允许雾气能见度范围：200m ≥能见度≥ 50m 雪：允许中、小雪气候作业 Rain:≤heavy rain (24h rainfall 25~50mm),no operation in heavy rain climate Fog: Allowed fog visibility range between 50m to 200m. Snow: Can operation in light and medium snow weather
适应工况 Adaptive condition	年作业 365 天，连续作业。 Annual operation 365 days, continuous operation.
作业车辆 Working vehicle	人工集卡，自动集卡，AGV 等      Manual truck, automatic truck, AGV, etc
操作人员 Operator	1 名      1 person



智能解锁站的场地布置  
Layout of Smart Twistlock Station

## 五、智能解锁站的技术创新

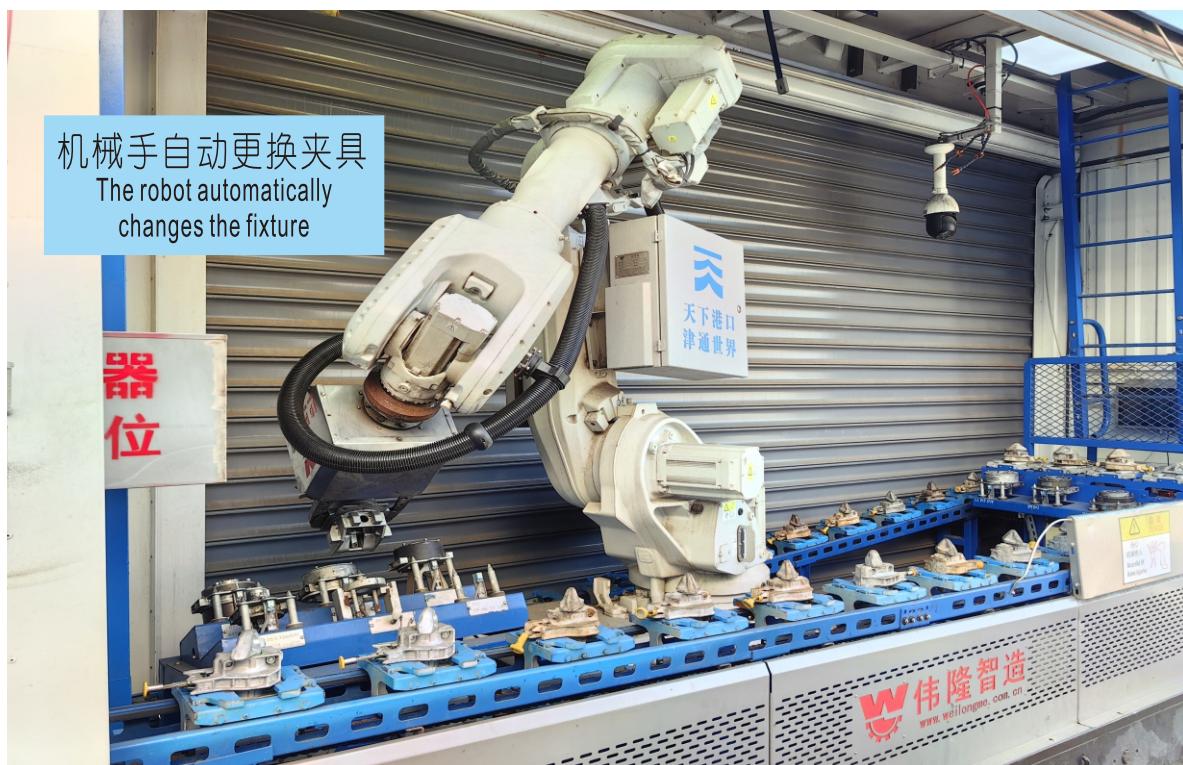
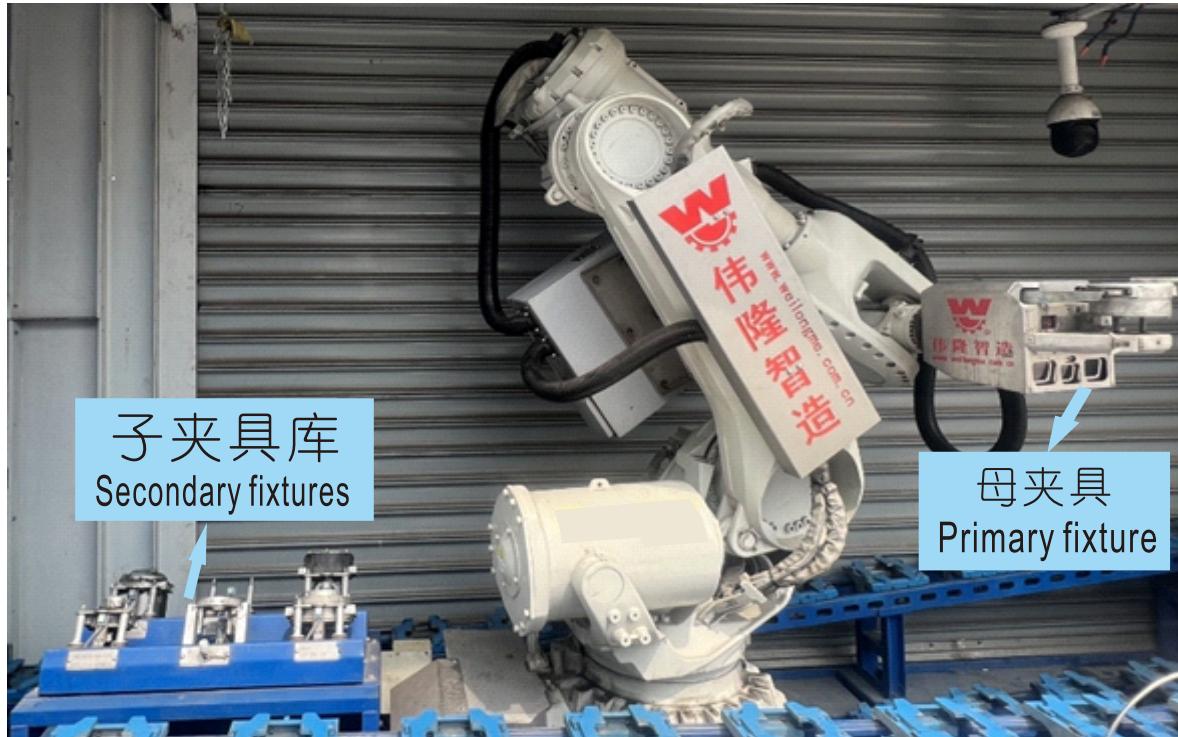
### A. 首创设计-多功能组合夹具

采用子母夹具结构，系统可根据来箱锁型的变换，指令机械手进行夹具自动更换组合，能适配多种锁头作业。

### V. Technical Innovation

#### A. Pioneered Design -- Fixture Collaboration

The primary fixture and secondary fixture work together collaboratively, providing optimal movement to handle the changes of different lock types.



## 智能解锁站的技术创新

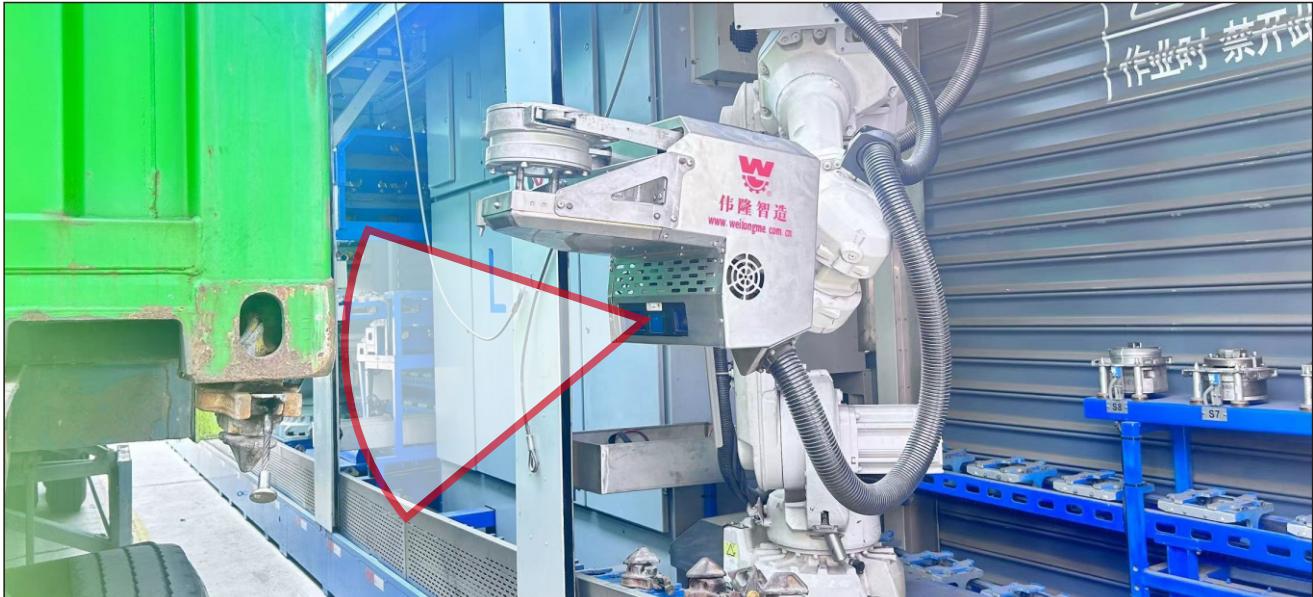
### B. 采用AI智能识别与定位

在全户外自然光环境下，采用智能相机对集装箱角件的快速、精准定位，引导机械手进行锁头拆装作业。

### Technical Innovation

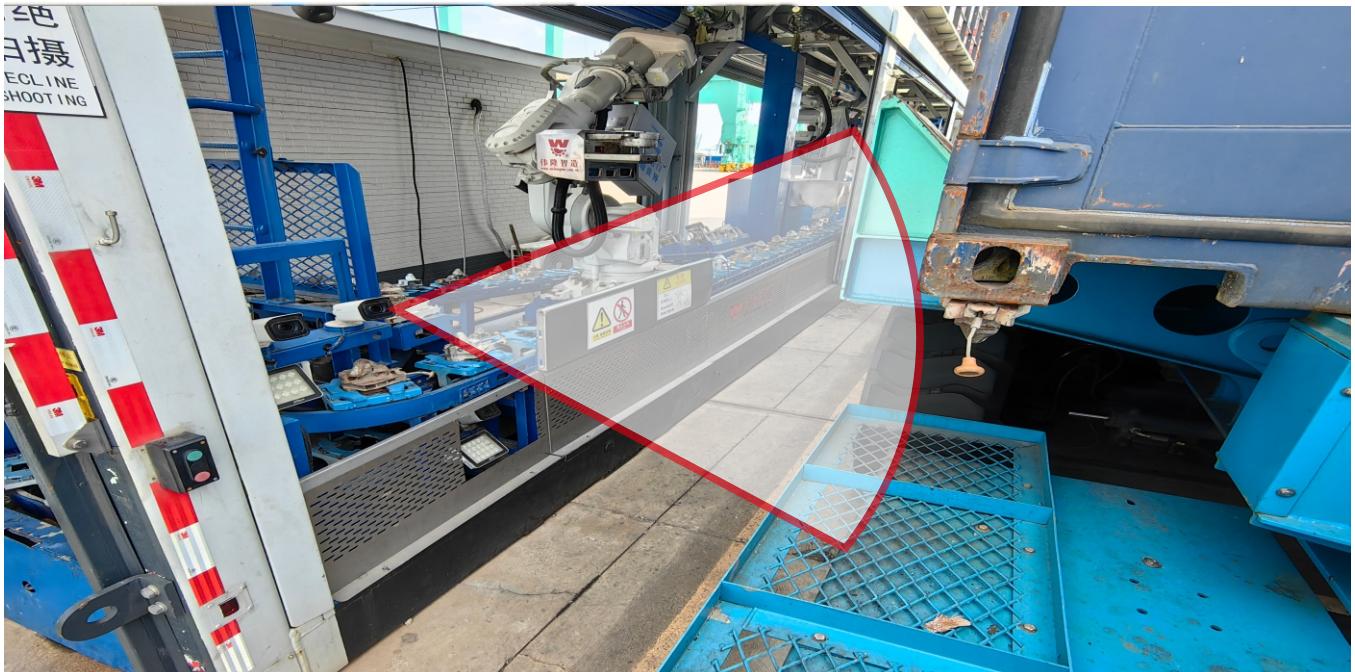
#### B. AI Identification & Positioning

In the case of outdoor condition with natural light, AI camera is able to find the 4 corner posts quickly and accurately and guide the robots to take the necessary actions.



集装箱进锁站时，AI智能识别系统自动对箱角所带的锁头进行不同类型精准识别。

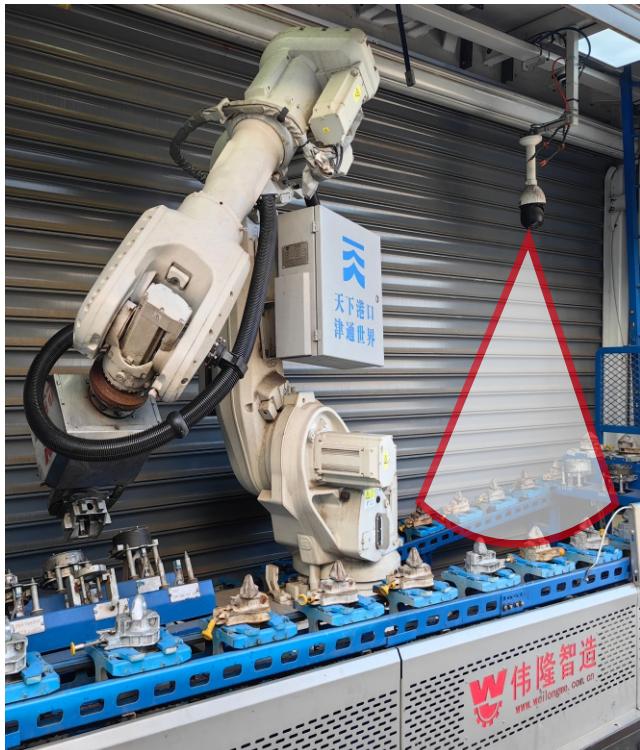
The lock types will be visually captured and identified by AI right the first time when the container enters the STS.



## 智能解锁站的技术创新

### C. 锁站智能管理系统

锁站智能识别系统对锁头输送链上的锁头进行实时检测、分析锁型，引导机器人进行锁头的抓取，实现锁头的智能管理运行。

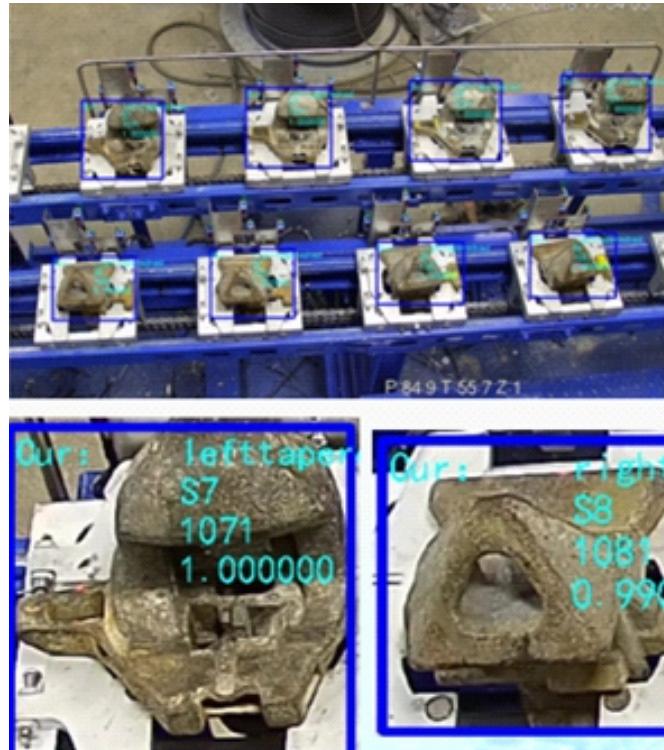


### D. 技术独创的双头机械手，为双箱解锁提高效率！

## Technical Innovation

### C. STS Intelligent Management System (IMS)

The management system analyzes and identifies the types of the twist locks transporting on the conveyor and guides the robot to grasp the target locks.



### D. The self-initiated two-sided fixtures improve the operating efficiency for 2×20' containers!.



## 智能解锁站的技术创新

### E. 锁头自动输送系统

锁头自动输送系统采用双层曲线环形结构，精确输送锁头到各个机械手抓取位，单体锁站可为装卸时循环存取锁头，一次存锁量400个。



### F. 锁头自动回收系统

装卸作业完毕后，由管理员向程序发送清锁指令，机械手会自动从锁头输送链上抓取锁头放入回收皮带机构中，皮带机自动运行将锁头运送至端部锁头框内，实现锁头的自动回收功能。

## Technical Innovation

### E. Locks Conveyor System

The two-layer and curved conveyors are designed and adapted in size according to the robot grasp position. Independent STS is able to restore up to 400 twistlocks.

### F. Twistlock Recycling System

The operator will send the “Clear Twistlocks” order to the recycling system and then robots will move the twistlocks from the conveyors to the basket placed on the end the STS.





伟隆港机

JSD系列集装箱锁头智能解锁站

Series JSD container lock smart twistlock station

## 智能解锁站的技术创新

### G. 智能化编程控制的锁站操作系统

智能化编程控制的锁站操作系统配备了HMI操作屏，使锁站操作管理可视化。能根据船舶装卸工艺，通过管理员对锁站操作系统设置装卸流程，并实现锁站自动作业。



### H. 不同工况的人机界面，使操作更便捷



## Technical Innovation

### G. Intelligent control system

The STS is equipped with an HMI touch screen that makes the system control and management visually and easily, ensuring the unmanned operation of STS according to the ship loading and unloading process.

JSD 集装箱智能解锁系统

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### H. User-friendly controlled HMI visually display the status of different working conditions.



## 六、智能解锁站的应用

## VI. Application of intelligent unlocking station

发明专利号 Patent Code: ZL 2020 1 1184339.3



天津第二集装箱自动化码头智能解锁站 (2021)  
TICT Smart Twistlock Station



宁波大榭招商集装箱码头智能解锁站 (2022)  
CMICT Smart Twistlock Station

欢迎用户来函咨询与交流，让我们的产品做得更好！

*Users are welcomed to consult us and give suggestions to make our products better!*



青岛前湾集装箱码头智能解锁站 (2023)  
QQCT Smart Twistlock Station

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