Crane subsystems

Hoisting units
Several hoisting drums can be driven by a single hoisting unit, while several drives can also operate a hoisting drum. The hoisting drum is secured by a mechanical brake. Types of control:

– Synchronization control
– Master/follower
– Positioning
– Hoist limiting
– Load monitoring

Travelling gear
The travelling gear consists of one or two system can sides, driven synchronously to prevent different levels of wheel wear. Types of control:

– Synchronization control
– Master/follower
– Speed-controlled positioning
– Travel limit

Swing
For the crane swing, tower torsion is critical. Types of control:

– Speed-controlled positioning

ABB has developed a comprehensive range of fully integrated crane technology solutions including AC and DC drives, controls and safety engineering. We offer a unique capability for customers to meet all their crane automation requirements from a single, high quality manufacturer.

This also comes with the complete global technical, application and service support provided by our skilled and experienced engineers who understand the particular demands and challenges of the crane industry.

The ABB crane portfolio is further enhanced by specific solutions, such as remote monitoring and predefined application control programs for towers, along with engineering and software development support.

How ABB can help you

Application solutions
– Crane regulation programs
– Test programs
– Indoor sensorless anti-sway control

Productivity
– Energy efficient drives and motors
– High availability
– Load speed control

Easy to use
– Commissioning assistant
– Cranes system check
– Continuous engineering tool
– Ready-made control

Services
– Remote access
– Service metering
– Global life cycle support
– Global availability of spare parts
Crane subsystems

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Several hoisting drums can be driven by a single hoisting unit, while several drives can also operate a hoisting drum. The hoisting drum is secured by a mechanical brake.

Types of control:
- Synchronization control
- Master/follower
- Hoist limiting
- Positioning
- Load monitoring

Traveling gear
The traveling gear consists of one or two system sides with two or three gears to provide different levels of wheel wear and tear. Types of control:
- Synchronization control
- Master/follower
- Speed-controlled positioning
- Travel limit

Traveling trolley
The traveling trolley has to meet the same demands as the traveling gear, if it consists of one drive system per side.

Types of control:
- Synchronization control
- Speed-controlled positioning
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Swing
For the crane swing, tower torsion is critical.

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The ABB crane portfolio is further enhanced by specific solutions, such as crane monitoring and predefined application control programs for cranes, along with engineering and software development support.

How ABB can help you

Application solutions
- Crane regulation programs
- Torque memory
- Brake control and monitoring
- Indoor sensorless anti-sway control

Productivity
- Energy efficient drives and motors
- Load speed control

Easy to use
- Commissioning assistant
- Crane system check
- Continuous engineering tool
- Ready-made input macros

Service
- Remote access
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Automation application solutions

Cranes

ABB drive and control technology | Crane automation solutions
Cranes

Crane subsystems
- Hoisting units
- Travelling gear
- Trolley travel
- Swing

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The positioning function determines the current position of the load with the aid of shaft encoders and scaling parameters. The swing function is responsible for the speed of the hoisting unit. This speed is determined by the rotor speed and the load mass. The accuracy of the load's final positioning is a function of the load mass, the drive motor and encoder resolution.

### Lifting magnets

It is common for cranes to lift magnetic materials with a lifting magnet. The program enables the lifting magnet to control the load weight. The weight is calculated by the program based on the magnetic properties and lifting force of the lifting magnet.

### Security functions

#### Speed adjustment

The integrated speed controller in ABB drives enables precise control of motor speed. It is designed to meet the requirements of crane applications where the load is suspended from the motor's field weakening range. If a load is suspended, the maximum speed is reduced automatically. This minimizes crane operating time and increases productivity.

#### Direct torque control (DTC)

Direct torque control (DTC) provides high-torque performance at near constant speed. It operates over the entire speed range without oscillations. The DTC control system offers high levels of flexibility at competitive costs and can be synchronized with other drive systems.

#### Master controller and synchronization

A master controller is essential for crane automation applications. Using a master controller, a system can be created that has a single control system for the entire crane. This control system is responsible for all movements of the crane, such as hoisting, lowering, and swiveling.

#### Fan coil safety

The safety function at the crane drive ensures dynamic braking in case of emergency. The Safety-SPS AC500-S PLC facilitates state of the art crane automation solutions with PROFIsafe via PROFINET. The AC500-XC (eXtreme Conditions) series extends the control options to applications in a hostile environment.

#### Brake control

Brake control integrates the mechanical brake function with non-powerful brake systems. The brake control is responsible for applying the braking force to the load and releasing the brake when the load is not stopped. It is designed to be used in combination with the mechanical brake function to ensure safe operation of the crane.

#### Area safeguards and anti-collision

Area safeguards and anti-collision functions are used to ensure safe operation of the crane. These functions can be integrated with the mechanical brake function to ensure safe operation of the crane.

### Braking options

####再生利用

Regenerative braking options help to save energy throughout crane operation. ABB supplies the control system complete with functional regeneration options. This enables energy-efficient operation of the crane.

### Crane automation solutions

ABB offers a complete range of display and operating devices. As the world market leader for speed-controlled drives, ABB provides drive systems and motors across the broad spectrum of applications. ABB supplies the control system complete with functional regeneration options. This enables energy-efficient operation of the crane.
The positioning function determines the current position of the load in the final position. A “quick-stop” function can be used to ensure that the load comes to rest in a defined location before the electromagnets separate. Force sensors and anti-collision systems can be used to detect excess forces and prevent potential cable sagging, which can arise in high winds, causing a hazard.

## Power measurement
The powering function determines the current position of the final load. It also includes the calculation of the required drive power. The calculation is based on the required drive power and the actual load, ensuring precise control of the drive and motor.

## False magnets
False magnets are used in the crane regulation program. The false magnet is closed, which opens a contact in the crane regulation program, triggering the crane to brake. This function prevents potential cable sagging, which can arise in high winds, causing a hazard.

## Service monitoring
The crane regulation program offers higher levels of operational reliability and more precise regulation of lower motor speeds with high torque bands.

## Types of control

### Direct Torque Control
Direct torque control (DTC) is a safety function that allows the crane to operate with a higher level of speed and torque regulation. It is used in critical applications where precise control is necessary, such as in high wind conditions.

### Master Follower and synchronization
In a master/follower (MF) system, the crane moves in unison with another crane, ensuring precise regulation of motor speeds and torque. This function is particularly useful in situations where multiple cranes are operating in close proximity.

### Parallel safety
The crane regulation program offers higher levels of operational reliability and more precise regulation of lower motor speeds with high torque bands.

## Products

### ABB crane automation technology
ABB offers a complete range of display and operating devices. As the world market leader for speed-controlled drives, ABB provides drive systems and motors across the broad range of operational technology requirements. The ABB drive and control technology offers a complete range of tools and functions for basic configuration, monitoring, commissioning, and diagnostics.

### Crane automation solutions
ABB offers solutions for crane automation, including crane system check, direct torque control, master follower, and synchronization. These solutions are designed to meet the requirements of automation processes with PROFIsafe via PROFINET. The Safety-SPS AC500-S PLC offers a flexible platform for more complex requirements through its comprehensive selection of trigonometric functions and structured text programming according to SIL 3/PL.

### Energy efficiency
ABB’s highly efficient IE2 and IE3 motors and speed-regulated drives help to achieve energy savings. The Energy Efficiency module ensures that the load is operated at its most efficient level, reducing energy consumption.

### Control and safety technology
The ABB drive and control technology offers a complete range of tools and functions for basic configuration, monitoring, commissioning, and diagnostics. The Safety-SPS AC500-S PLC offers a flexible platform for more complex requirements through its comprehensive selection of trigonometric functions and structured text programming according to SIL 3/PL.

### Decentralized security solutions with PROFIsafe via PROFINET
The ABB drive and control technology offers a complete range of tools and functions for basic configuration, monitoring, commissioning, and diagnostics. The Safety-SPS AC500-S PLC offers a flexible platform for more complex requirements through its comprehensive selection of trigonometric functions and structured text programming according to SIL 3/PL.

### Load handling
Load handling is an important aspect of crane automation. ABB offers solutions for load handling, including master follower and synchronization. These solutions are designed to meet the requirements of automation processes with PROFIsafe via PROFINET. The Safety-SPS AC500-S PLC offers a flexible platform for more complex requirements through its comprehensive selection of trigonometric functions and structured text programming according to SIL 3/PL.

### Area safeguards and anti-collision
Area safeguards and anti-collision systems can be used to detect excess forces and prevent potential cable sagging, which can arise in high winds, causing a hazard.

### Service monitoring
The crane regulation program offers higher levels of operational reliability and more precise regulation of lower motor speeds with high torque bands.
Position measurement
The positioning function determines the current position of the load with the aid of shaft encoders and scaling parameters. The crane regulation program can then use this information in additional operations such as setting software end limit values.

Load speed regulation optimizes the speed of the hoisting unit to match the load weight. With no load, the drive works well into the motor’s field weakening range. If a load is suspended, the maximum speed is reduced automatically. This both minimizes crane operating time and increases productivity.

Brake control
Brake control integrates the motor brake with the crane control for maximum safety. The brake control is designed to be used in all crane positions, and can be activated at any time. The brake controller ensures the stability and safety of the crane operation.

Performance optimization
The crane system check comprises electric and mechanical inspections. To ensure the safe and smooth operation of the crane system, the drive performs a thorough inspection of the system before the brake is opened. In addition, the drives can be integrated within the brake control circuit to monitor and control the braking status signals to further increase safety when starting or stopping.

Security functions
The program includes programmable means of operating time and mechanical brake usage for servicing purposes.

Faults and error messages
The feedback from the motor shaft. Through DTC, the crane regulation program offers higher levels of reliability and more precise regulation of lower motor speeds with high torque levels.

Master follower anti-synchronization
In a master follower application, the slave system receives the master control via digital or analog inputs, and the motor speed is set by the master. All the shaft encoders and parameters are taken into consideration. This ensures that the drive and motor can generate the necessary torque and that the mechanical brake does not slip before the drive opens the brake.

Safety technology
The Safety-SPS AC500-S PLC facilitates state-of-the-art decentralized security solutions with PROFIsafe via PROFINET. The new range of the PLC models, EclipseX, is designed to offer state-of-the-art functions and is used in demanding applications and, thanks to its modular design, it is cost-effective. The FlexPak-SPS controlled with the R890iA is the ideal choice for future applications. The modular PROFIsafe PLC is ideal for both typical solutions and integrated solutions with high safety requirements through its comprehensive selection of trigonometric functions and structured text programming according to SIL 3/PL.

Operating technology
ABB offers a complete range of display and operating devices developed to meet the requirements of automation processes. The range of HMIs (human machine interfaces) extends from simple operating panels to intelligent, programmable CP600 operating terminals with color TFT or touch screen displays.
Position measurement

The positioning function determines the current position of the load with the aid of shaft encoders and scaling parameters. Service monitoring

The program includes programmable monitoring of operating time and mechanical brake usage for servicing purposes.

Load speed regulation optimizes the speed of the hoisting unit to match the load weight. With no load, the drive works well.

Lifting magnets

The piece by piece placing of steel sheets from a stack that was previously placed.

Trend functions

Using ABB drives, the speed critical zones is limited to prevent potential cable sagging, which can arise in high winds, causing a hazard at the hoisting drum.

Direct Torque Control

Direct torque control (DTC) technology facilitates the precise regulation of speed and torque. The inverter monitors feedback from the encoder shaft. Through DTC, the inverter regulation offers higher levels of sensitivity and more precise regulation of linear motor speeds with high torque levels.

Master/Slave and synchronization

In a master/slave application, the slave system is a replica of the master system. By default, the master drum is powered by a separate motor and the load in the final position. A “quick-stop” function can be activated in emergency.

Functional safety

The Safety-SPS AC500-S PLC facilitates state of the art decentralized security solutions with PROFIsafe via PROFINET. The Safety SPS AC500-S PLC offers flexible solutions for most complex crane automation and security applications. The Safety SPS AC500-S PLC’s SIL 3 compliance and comprehensive selection of function libraries that provide modules for key functions such as safety.

Energy efficiency

ABB’s highly robust DIL and DE and DEP motors and drives (DE with low power regulation typically) help to save energy throughout a crane operation.

Operating technology

ABB offers a complete range of displays and operating devices, including advanced safety devices. The range of drives and motors across the broad power range serves the needs of all crane applications. For the highest levels of data transparency and efficiency, the range of drives and motors is used in demanding applications and, thanks to their programmability, they are readily adapted to crane applications. ABB’s SPS AC500-S PLC’s SIL 3 compliance and comprehensive selection of function libraries, which are both exceptionally reliable and energy efficient.

Control and safety technology

The SPS AC500-S PLC family is perfectly suitable for each crane application due to the spectrum of its performance, functionality, prompts and outputs, standard field buses, field networks and networks. Standardization of engineering tools and software also makes commissioning easier. The high performance Kollmorgen KPS drives, for example, offer a wide range of power levels and availability in a system, which allows control and parameter management to be performed via PROFINET or PROFINET. The AC500-XC (eXtreme Conditions) series extends the control options to applications in a hostile environment.
**Crane subsystems**

**Hoisting units**
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Types of control:
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**Travelling gear**
The travelling gear consists of one or two systems on each side, driven synchronously to prevent different levels of wheel wear and tear. Types of control:
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- Travel limit

**Trolley travel**
The travelling trolley has to meet the same demands as the travelling gear. If it consists of one drive system per side.

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**Swing**
For the crane swing, tower torsion is critical.

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Complete automation solutions from one company

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