

CRANIUM

Reliable Crane Automation





Contents

Cranium	4
The All-in-One Solution for Your Crane	5
Cranium for STS Cranes	6
Cranium for Intermodal Cranes	8
Cranium for Industrial Cranes	10
Cranium for Rotary Cranes	12
Assistance and Automation Systems	14
Modules	22
References	24
Your Contacts	26
Talk to us about your project	27



Cranium

Efficient. Secure. Sustainable.



The All-in-One Solution for Your Crane

Cranium is the all-in-one solution for automating crane systems and is developed for **maximum efficiency, safety, and durability.**

The modular system combines cutting-edge sensor technology, powerful control engineering, and smart software.

Whether it's a **port, intermodal terminal, or industrial plant**, Cranium adapts flexibly to your needs and makes sure your cranes work perfectly today and in the future.

- ▶ **Everything under one roof** – from planning to commissioning
- ▶ **Easy to integrate** – seamless connection to existing systems
- ▶ **Modular expandability** – functions can be added at any time
- ▶ **Durable and reliable** – robust hardware with long-term availability
- ▶ **Field-tested** – proven technology in various applications

Cranium for STS Cranes

Increased TEU per Hour Same Crew

Every minute counts in terminal operations. Crane downtime means **lost handling capacity, rising costs, and dissatisfied shipping companies.**

Cranium makes your STS cranes **faster, more precise, and safer**—without the need for additional manpower. With intelligent real-time detection, assistance and automatic functions, and a robust

safety architecture, you can **increase throughput** and **gain predictability** for your handling processes.

The result: **more TEU per hour, shorter ship layovers,** and a terminal that stays ahead of the competition. With Cranium, you are investing in efficiency, safety, and future viability.

Four Reasons Why Your Terminal Benefits

Predictable Processes

Intelligent assistance technology reduces disruptions and **ensures reliability** in daily handling.

More Throughput per Crane

Move **more TEU per hour** – without additional staff or higher operating costs.

Competitive Advantage

Shorter berth times make your terminal **more attractive to shipping lines** and secure long-term volume.

Higher Safety

Your team works in a **safer environment.** Containers and infrastructure are **protected from damage.**



What Cranium Does for Your STS Cranes

- ✓ **Real-time Environment Recognition:** Detection of containers, vehicles, people, and hatch covers
- ✓ **Dynamic Collision Avoidance:** Reliably avoids collisions with other cranes and structures
- ✓ **Soft Landing:** Controlled lowering to protect materials and loads
- ✓ **Automated Target Approach:** The crane independently and precisely approaches defined targets such as lashing platforms
- ✓ **Seamless Integration:** Smooth connection to TOS, FCMS, OCR, SACS, and other systems

Cranium for Intermodal Cranes

Higher LU Capacity per Day Plannable Processes

In intermodal transport, reliability is key. Any congestion on the truck lane or delay in rail handling **threatens punctuality** and **reduces your required throughput**.

Cranium supports your cranes with intelligent real-time detection, automated assistance functions, and a robust safety architecture. This way, you handle **more**

loading units (LUs) per day and ensure a **stable, plannable process** for rail, road, and inland shipping.

The result: **greater daily capacity, smoother processes**, and an intermodal terminal that stays **ahead of the competition**.

Four Reasons Why Your Terminal Benefits

More Capacity per Day

Move **more LUs** with the same team. Your **handling performance increases** without additional staff.

Operational Safety

Your team works in a **protected environment** while you can operate precisely with LUs and infrastructure.

Plannable Workflows

Intelligent assistance technologies ensure more **stable processes** and **on-time trains**.

Customer Attractiveness

Reliable handling makes your terminal a **preferred partner for operators and freight forwarders**.



What Cranium Does for Your Intermodal Cranes

- ✓ **Real-time Environment Recognition:** Detection of obstacles, containers, vehicles, and people
- ✓ **Soft Landing:** Controlled placement for material and load protection
- ✓ **Obstacle Detection and Collision Avoidance:** Reliable protection in mixed traffic environments
- ✓ **Handling Safety:** Unintended lifting of trailers or trains automatically stops the hoist
- ✓ **Automatic Braking:** Slows down the lowering process in tight spaces to prevent collisions

Cranium for Industrial Cranes

Precise Crane Movements Shorter Throughput Times

In manufacturing, the precision of every single step determines efficiency and productivity. Inaccurate or error-prone crane movements **prolong processes, cause delays, and lead to damage.**

With Cranium, you control your industrial cranes more precisely and reliably. Automated assistance functions, intelligent real-time recognition, and a robust safety

architecture ensure that every load is correctly placed the first time.

This **reduces cycle times, standardizes your workflows, and increases the performance** of your entire production line.

Four Reasons Your Material Flow Benefits

Shorter Cycle Times

A stable material flow keeps your **production pace consistent** and **increases output per shift.**

Fewer Damages

Workpieces, tools, and infrastructure are protected, **reducing rework and repair costs.**

Higher Process Reliability

Accurate positioning reduces corrective movements and **prevents delays.**

Increased Operational Safety

Collision prevention, load monitoring, and precise positioning **protect employees, parts, and infrastructure.**



What Cranium Does for Your Industrial Cranes

- ✓ **Optimized Load Movement:** Precise lifting and movement of components, machines, or materials
- ✓ **Skew Detection and Sway Damping:** Dangerous skewing is reliably prevented
- ✓ **Automatic Pathfinding:** Predefined targets are automatically and safely approached
- ✓ **Custom Area Control:** Crane movements can be flexibly restricted
- ✓ **Low-Wear Track Control:** Reduces material wear and extends the life of your system

Cranium for Rotary Cranes

More Tons per Hour Shorter Laying Times

When handling bulk goods, every ton counts – whether gravel, coal, ore, scrap, or grain. Any downtime **increases berth time** and **drives up costs**.

Cranium supports your slewing cranes with intelligent real-time detection, automated assistance functions, and a robust safety architecture. This allows you to **move more tons per hour, reduce downtime**, and

ensure smooth operation even under the most demanding conditions.

The result: **higher handling performance, lower cost per ton**, and a port operation that stays **ahead in the competition**.

Four Reasons Your Rotary Cranes Perform Better

Higher Throughput

More tons per hour. Your handling capacity increases without additional personnel.

Plannable Workflows

Precise assistance functions stabilize processes and **shorten the dwell time** of ships and trains.

Robust and Future-Proof

Less wear, lower cost per ton, and a system that keeps your rotary cranes ready for the future.

Increased Operational Safety

Collision prevention and load monitoring **safeguard crew, infrastructure, and cargo**.



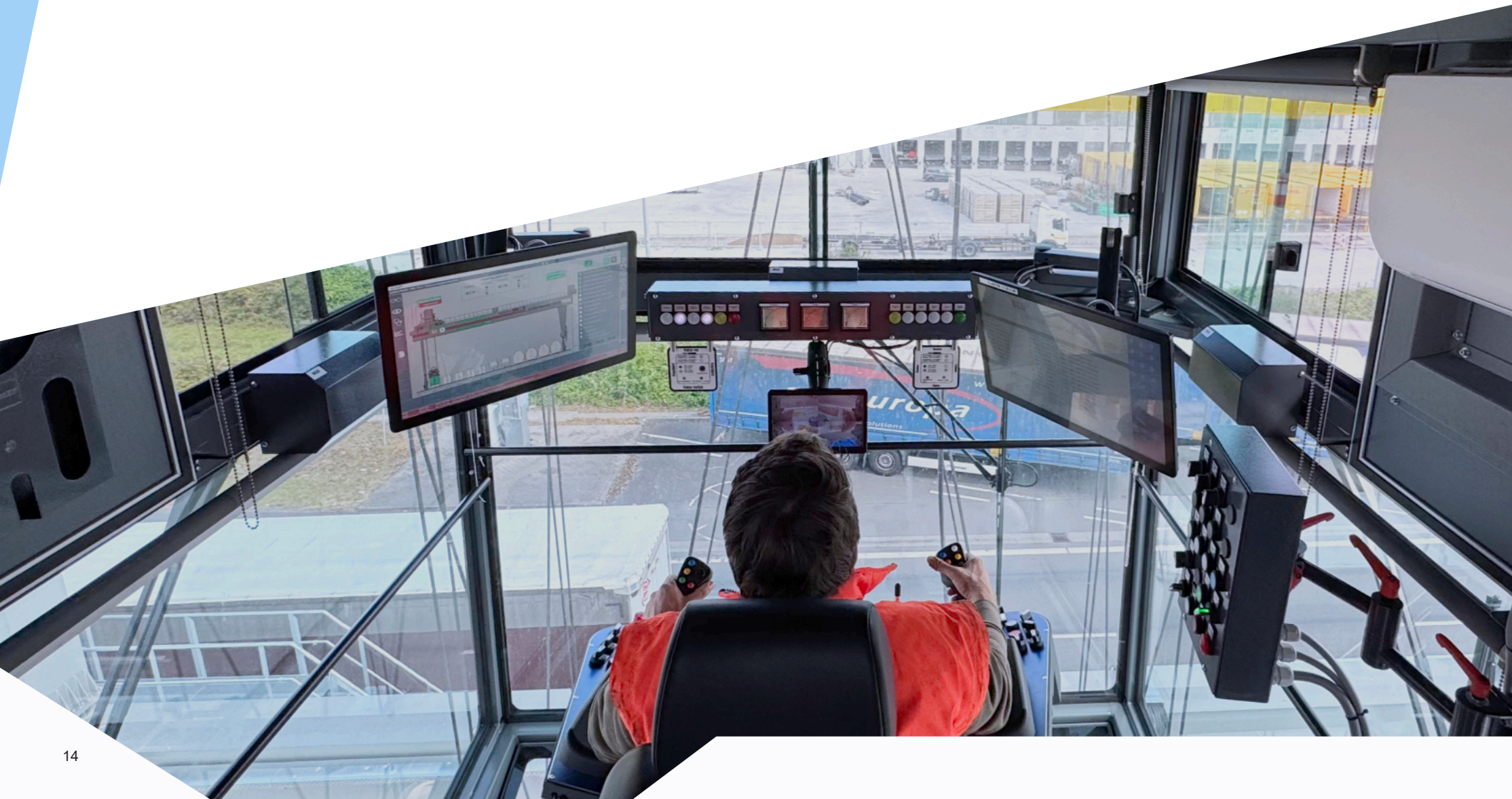
What Cranium Does for Your Rotary Cranes

- ✓ **Sway Damping:** Automatically reduces load pendulum for stable crane movements
- ✓ **Precise Positioning:** The grab can be automatically positioned above the hopper from any location
- ✓ **Cartesian Control:** Travel paths result from overlapping movements for precise control
- ✓ **Fixed Hoist Position:** The control system maintains a defined height regardless of boom position
- ✓ **Zones and Obstacles:** Restricted zones and speed limits are flexibly configurable



Assistance and Automation Systems

Proven Modules Optimally Combined



Crane Track Monitoring

Cranium's crane runway monitoring system reliably detects potential **obstacles in the area of rails and running gear** before dangerous situations or operational failures occur.

Ideal for **STS, intermodal, and industrial cranes** where safety and availability are top priorities.

Your New Functions

- ✓ Continuous monitoring of the entire crane track area for obstacles
- ✓ Immediate alerts when objects are detected
- ✓ Robust sensors for use in port and industrial environments
- ✓ Seamless integration into existing safety and assistance systems
- ✓ Configurable warning and shutdown logic
- ✓ For environments where ultrasonic or radar sensors are limited

Use These Modules for Crane Track Monitoring



Tip: For sway-damped braking when an obstacle is detected, we recommend adding the Bridge Crane module.





Load Collision Prevention and Soft Landing

Cranium's Load Collision Prevention System (LCPS) and Soft Landing reliably protects against **accidental collisions** and ensures **controlled, safe load and spreader placement**.

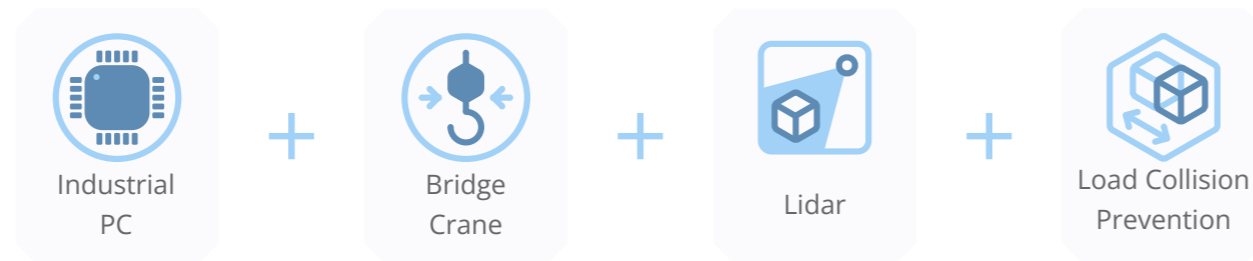
The system is also expandable to cover complete **crane collision prevention**.

Ideal for **STS, intermodal, and industrial cranes** where safety, material protection, and process stability are critical.

Your New Functions

- ✔ Detects obstacles and stops the crane automatically
- ✔ Controlled, slower landing speeds protect loads and infrastructure
- ✔ Individually configurable depending on load type and application area
- ✔ Seamless integration into existing systems
- ✔ Clearly distinguishes between environment and crane components
- ✔ High-resolution scanning (15 Hz with ~2 million points per second)

Use These Modules for Load Collision Prevention



Anti-Sway (Pendulum Damping)

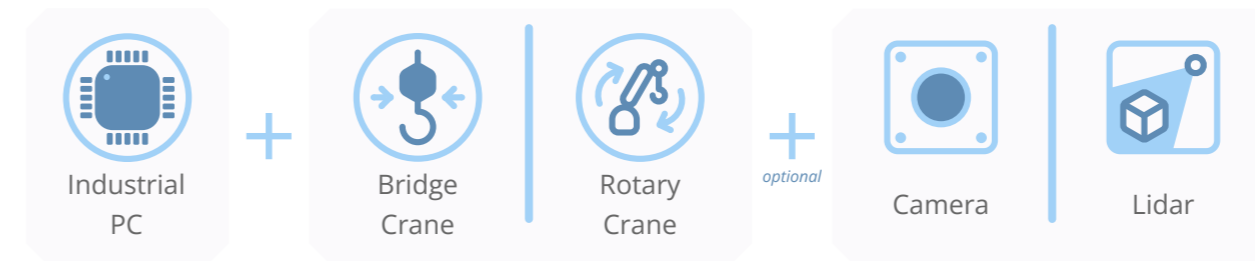
Cranium's pendulum damping automatically reduces **undesired oscillations of the load** and **ensures controlled, safe motion** – even when lifting and moving very heavy loads.

Ideal for **STS, intermodal, and industrial cranes** where precision and safety are essential.

Your New Functions

- ✔ Continuous suppression of load sway
- ✔ Active compensation via crane control
- ✔ Customizable control parameters for different load types
- ✔ Seamless integration into existing safety and assistance systems
- ✔ Support for all axes
- ✔ Skew detection / prevention

Use These Modules for Anti-Sway





Process Monitoring

Cranium's process monitoring captures and stores **operating data in real-time** using an integrated time-series database.

Via a **web-based dashboard**, you maintain complete visibility over all relevant operations and conditions – transparent, reliable, and ready for immediate analysis.

Your New Functions

- ✓ Real-time data acquisition for all crane and process signals
- ✓ Time-series logging for any desired time periods
- ✓ Web-based dashboard for monitoring and analysis
- ✓ Visualization and analysis of load movements and states
- ✓ Export function for views, settings, and data
- ✓ External API access to the database

Use These Modules for Process Monitoring



Anti-Train/Truck-Lifting (ATL)

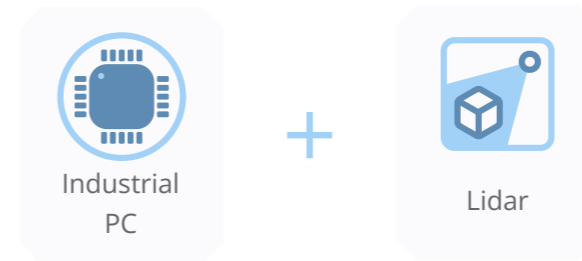
Cranium's ATL system reliably prevents **unintended lifting of carriages or trucks** in the event of a dangerous **load coupling**.

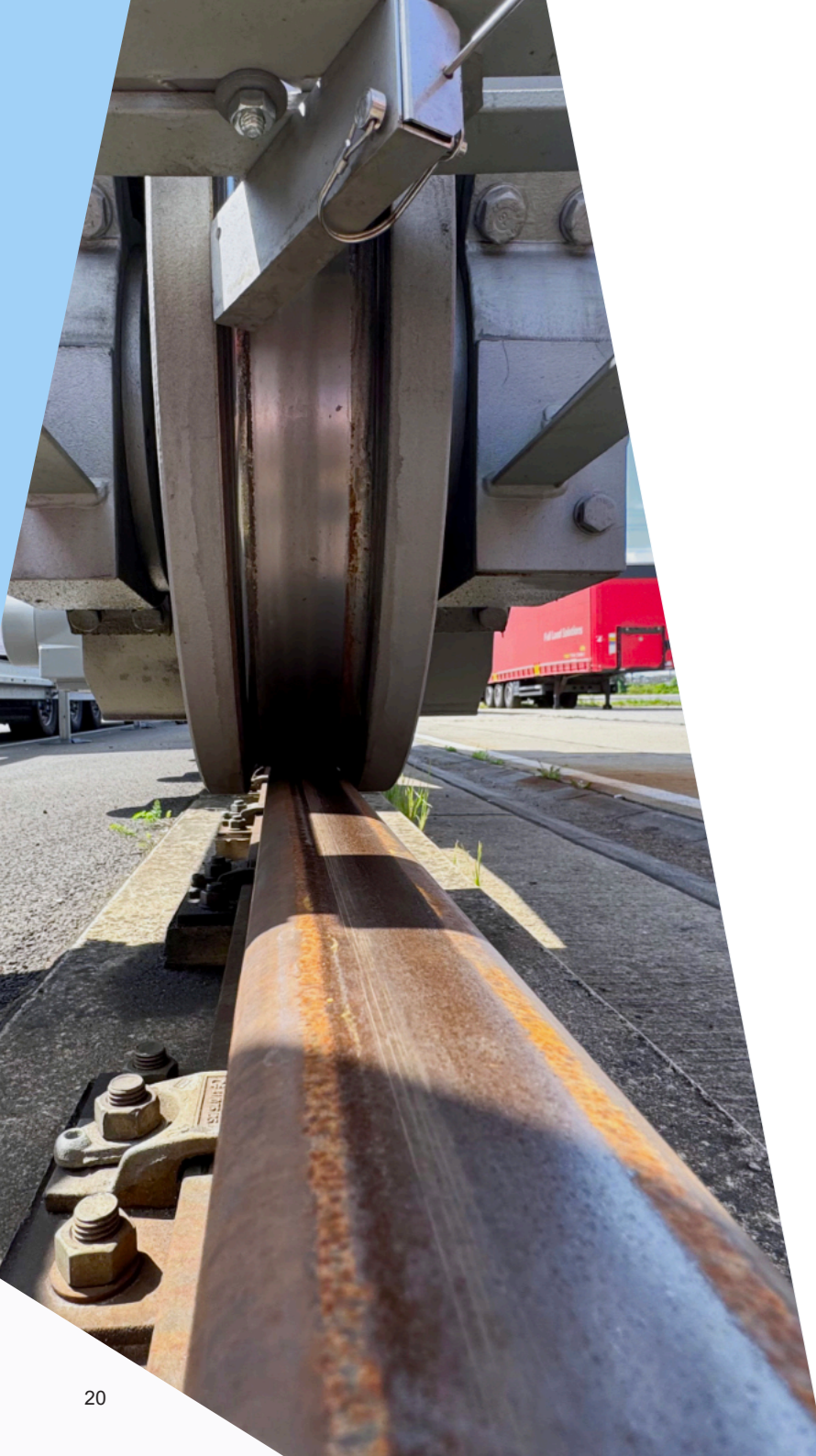
Sensors and control detect critical situations in real-time and **stop the lifting process** before any damage can occur.

Your New Functions

- ✓ Detection of unwanted lifting of vehicles with coupled loads
- ✓ Auto-stop of the hoist in case of critical load events
- ✓ Easy to implement into existing crane control systems
- ✓ Configurable thresholds depending on terminal requirements
- ✓ Seamless integration into safety and assistance systems
- ✓ Redundant evaluation via load-measuring pins and lidar sensors (PLD-capable)

Use These Modules for ATL





Track and Synchronization Control

Cranium's track and synchronization control continuously monitors the crane running gears and automatically compensates for deviations.

This module **minimizes wear on wheel flanges and rails** through continuous

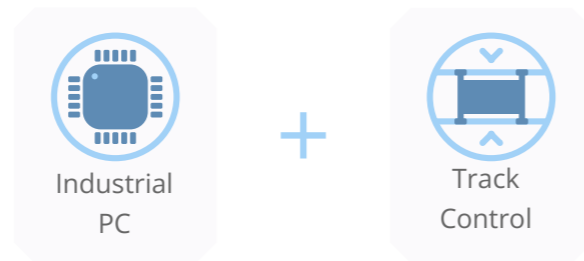
centering of running wheels – ideal for bridge cranes.

Additionally, it can **synchronize both gantry sides** and is **PLd-suitable** via multiple sensor channels.

Your New Functions

- ✔ Constant track alignment monitoring
- ✔ Automatically corrects deviation between gantry sides
- ✔ Minimizes structural stress
- ✔ Synchronization for smooth crane movements
- ✔ Configurable control parameters for different crane types
- ✔ Centered wheels reduce wear on flanges and rails

Use These Modules for Track and Synchronization Control



Gateway

Cranium's gateway **connects your crane to modern IT systems** and expands your automation capabilities. Data is captured and transmitted in real-time for immediate use in

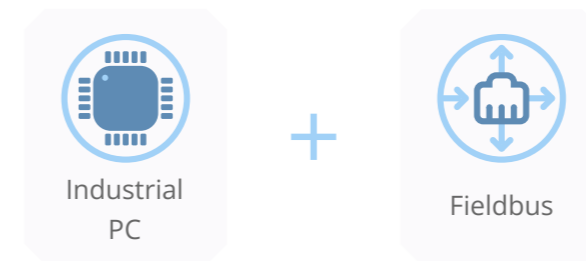
other systems.

If the built-in TCP connection for PLC communication is insufficient, this module supports **Profinet, Profibus, and CANopen**.

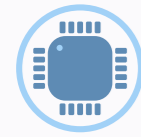
Your New Functions

- ✔ Integrated SoftPLC on the industrial PC
- ✔ Transparent view of all relevant process and operating data
- ✔ Integration with systems like control consoles, fleet monitoring, TOS, and OCR
- ✔ Supports Profinet, Profibus, and CANopen
- ✔ Future-proof interface for extensions and digital services
- ✔ Enables data conversions and custom mappings

Use These Modules for Gateway



Modules



Industrial PC

The core Cranium platform combines a Field-proven IPC with powerful software, including real-time crane monitoring and safe firmware upgrades. It is the required dependency for any other module.



Instrumentation

Functions for complex port scenarios. The "Crane Instrumentation System" (CIS) manages fail-safe load transfer with PLd in SC-automated portals and acts as gateway for OCR, TOS, and other interfaces.



Lidar

State-of-the-art 3D lidar technology supplements Cranium to achieve advanced automation functionality, such as load geometry measurement and dynamic obstacle avoidance.



Load Collision Prevention

With the lidar sensors, Cranium scans the area around the load. It uses the resulting environment maps to implement advanced 3D pattern matching to avoid dynamic obstacles.



Bridge Crane

The module for modern automation and advanced anti-sway of overhead cranes. It works out of the box but offers various parameters to fine-tune control behavior and trajectory.



Fieldbus

If the built-in TCP connection is insufficient for PLC communication due to specific project limitations, this module adds support for the Fieldbus protocols Profinet, Profibus, and CANopen.



Proximity Sensors

Real-time detection of approaching obstacles with modern directional lidar systems used as proximity sensors. For example, optimally suited for intermodal crane track monitoring.



Central Management App

The CMA is the ideal solution for terminals and owners that run multiple Cranium instances. It provides an intuitive web application for monitoring and controlling all operating Cranium systems.



Rotary Crane

This module extends Cranium to enable advanced automation for rotary cranes, including open- and closed-loop anti-sway. It also offers load control in intuitive Cartesian coordinates.



Camera

Cranium's standard solution to realize closed-loop feedback for anti-sway and automation algorithms is a robust industry camera used for diagonal pull detection and follow-me.



Areas and Obstacles

In addition to automatic paths already included in the base modules, this module offers comfortable possibilities and interfaces for defining and controlling static obstacles and velocity areas.



Remote Maintenance

For reliable remote maintenance, Cranium supports the integration of WireGuard as a VPN solution in combination with a compact and secure 5G router that easily fits in an electric cabinet.



Track Control

This extension for overhead and portal cranes minimizes wear on wheel flanges and rails by centering the running wheels on the rail. The module can also be used for synchronization of both crane sides.



Laser

The base module is ready to be extended with an infrared 2D laser to measure the load pendulum and geometry as an alternative to the camera, especially for outdoor applications.



Navigation

Based on defined and scanned obstacles, Cranium applies cutting-edge 3D pathfinding algorithms to find the optimal and safe trajectory to a reachable given target position in real-time.



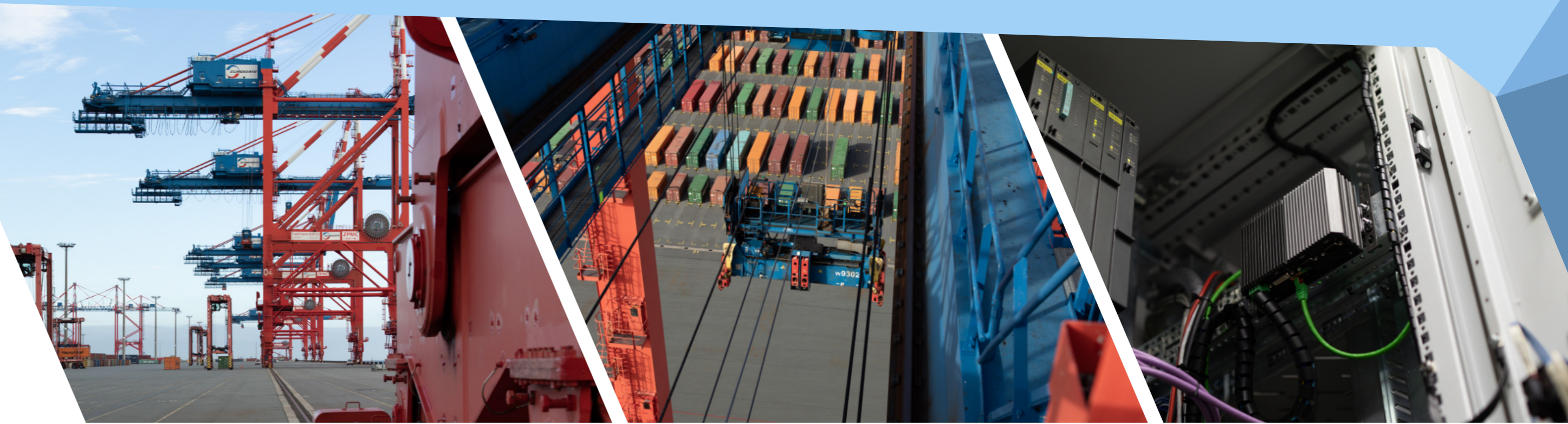
At the Jade-Weser Port Wilhelmshaven, **EUROGATE**, in cooperation with **APM Terminals**, implemented Cranium to ensure the operation of their STS container cranes

Highlights

- ▶ Certified emergency stop system (PLd) – designed for combined operation with autonomous straddle carriers
- ▶ Real-time monitoring of the work area for immediate detection of potential hazards

and to enable reliable interaction with fully automated straddle carriers.

- ▶ Seamless integration with existing terminal operation systems (TOS)
- ▶ Automatic positioning of lashing platforms (ALPA)



At the major freight transport hub in Cologne-Eifeltor, operated by **Deutsche Bahn**, Cranium is used in intermodal cranes from **DSD HILGERS** to improve safety, increase efficiency, and ensure smooth transfers between rail and

road.

The solution monitors the work area in real-time, detects obstacles reliably, and supports the crane operator with precise control – even under challenging time constraints.

Highlights

- ▶ Real-time environment detection for safe crane control
- ▶ Obstacle recognition for containers, vehicles, and people
- ▶ Controlled lowering of loads to protect material and infrastructure
- ▶ Crane rail monitoring with protection of the gantry and running gears



Scan the QR code to learn more about our projects. Or contact us, we will be happy to send you further references.

Your Contacts



Martin Kirst
Chief Executive Officer



Richard Herrmann
Head of Engineering



Uwe Ochs
Sales Account Manager

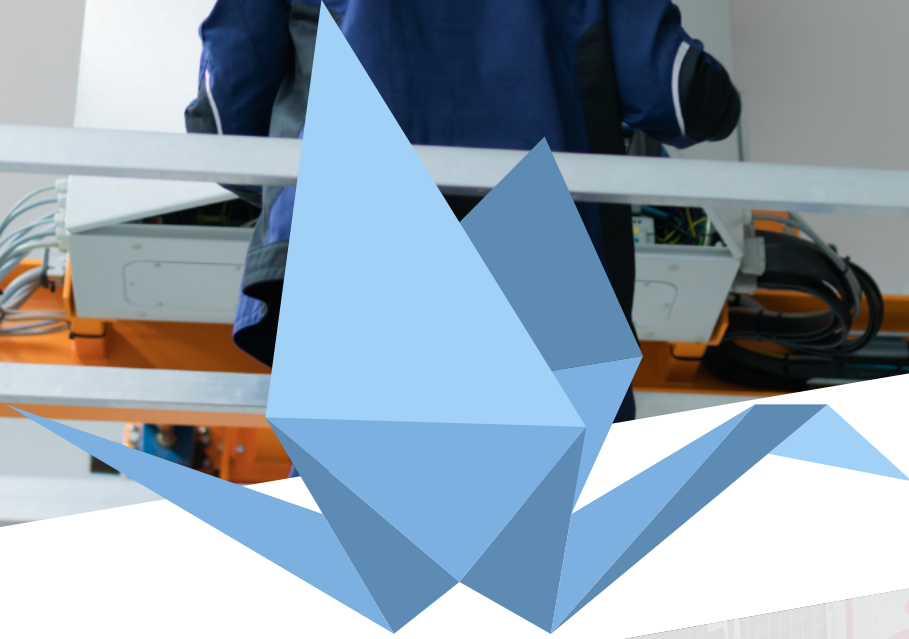
Talk to us about your project

Our team supports you from the initial idea to implementation of your automation solution. Whether you have specific questions about Cranium, need a custom quote, or want more references – we provide personal and professional consultation.



Polarith GmbH
Am Krökentor 1a
39104 Magdeburg
Deutschland

Phone: +49 391 74478204
Email: info@polarith.com
Web: polarith.com



 POLARITH

Efficient. Safe. Sustainable.



polarith.com/cranium