Electric solutions for port cranes

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Maritime cranes

Presentation outline

01 Liebherr – a family business

02 E-Drive for mobile harbour cranes

03 Zero emission mobile harbour crane

04 Purely electric portal crane LPS 420 E

01 Liebherr – a family business

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Group overview (2022)

1949

Founded by Hans Liebherr in Kirchdorf an der Iller, Germany

13 Product segments

Parent company
Liebherr-International AG based in Bulle, Switzerland

Liebherr is a family-run technology company

51,321

Employees

40

Production sites

12,589

Turnover in € mio

>140

Companies

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A 100% independent family business

From left to right: Jan Liebherr, Stéfanie Wohlfarth, Sophie Albrecht, Philipp Liebherr, Patricia Rüf, Johanna Platt, Isolde Liebherr and Willi Liebherr

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02 E-Drive for mobile harbour cranes

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Advantages of an electric drive

- Port cranes fitted with electric main drive delivers **many benefits:**
  - ZERO CO_2 emissions
  - Lower operational costs
    (Depending on local fuel vs electricity prices)
  - Reduced maintenance
  - No fuel and lubrication
  - Substantial reduction of engine noise

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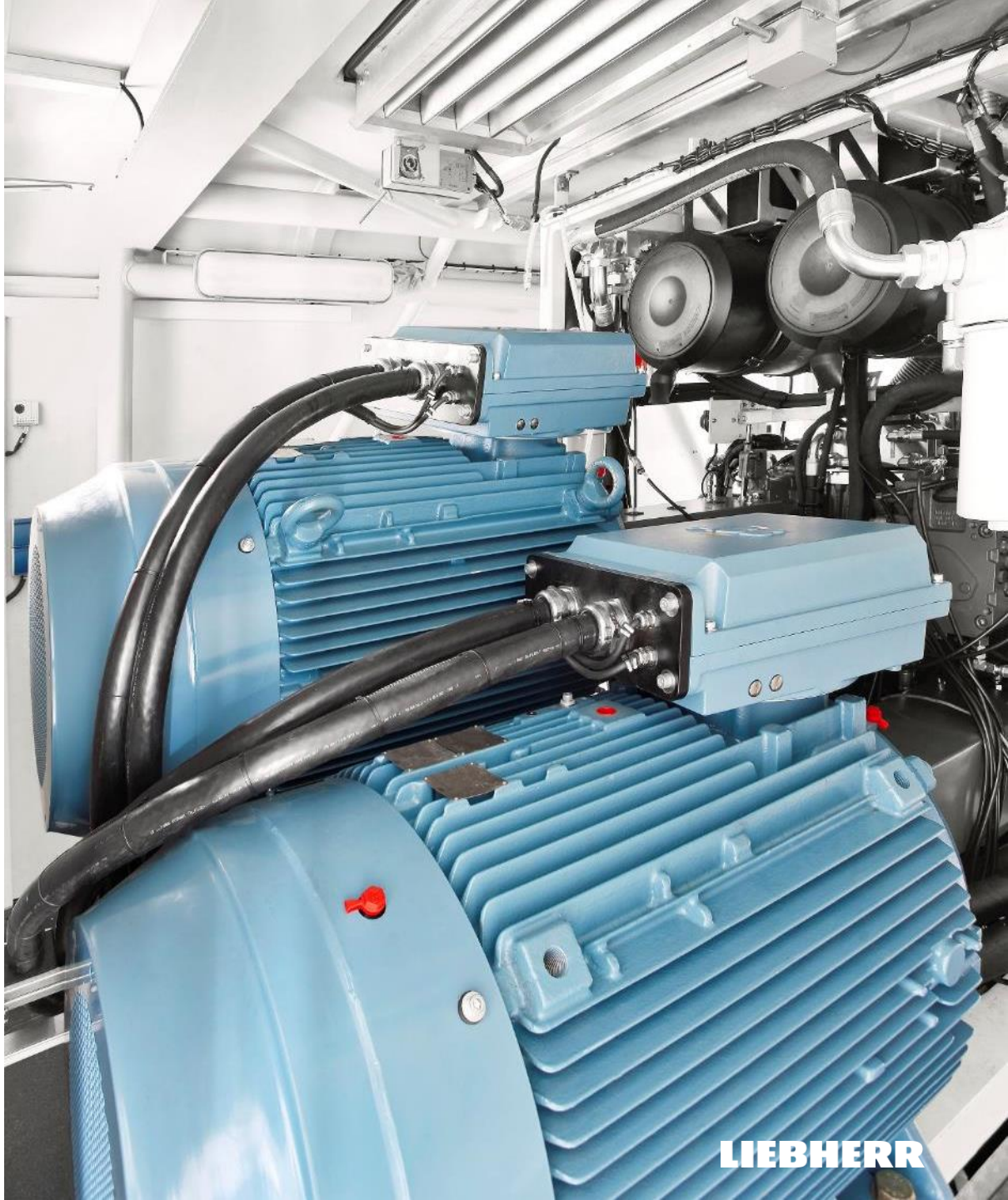
Advantages of an electric drive

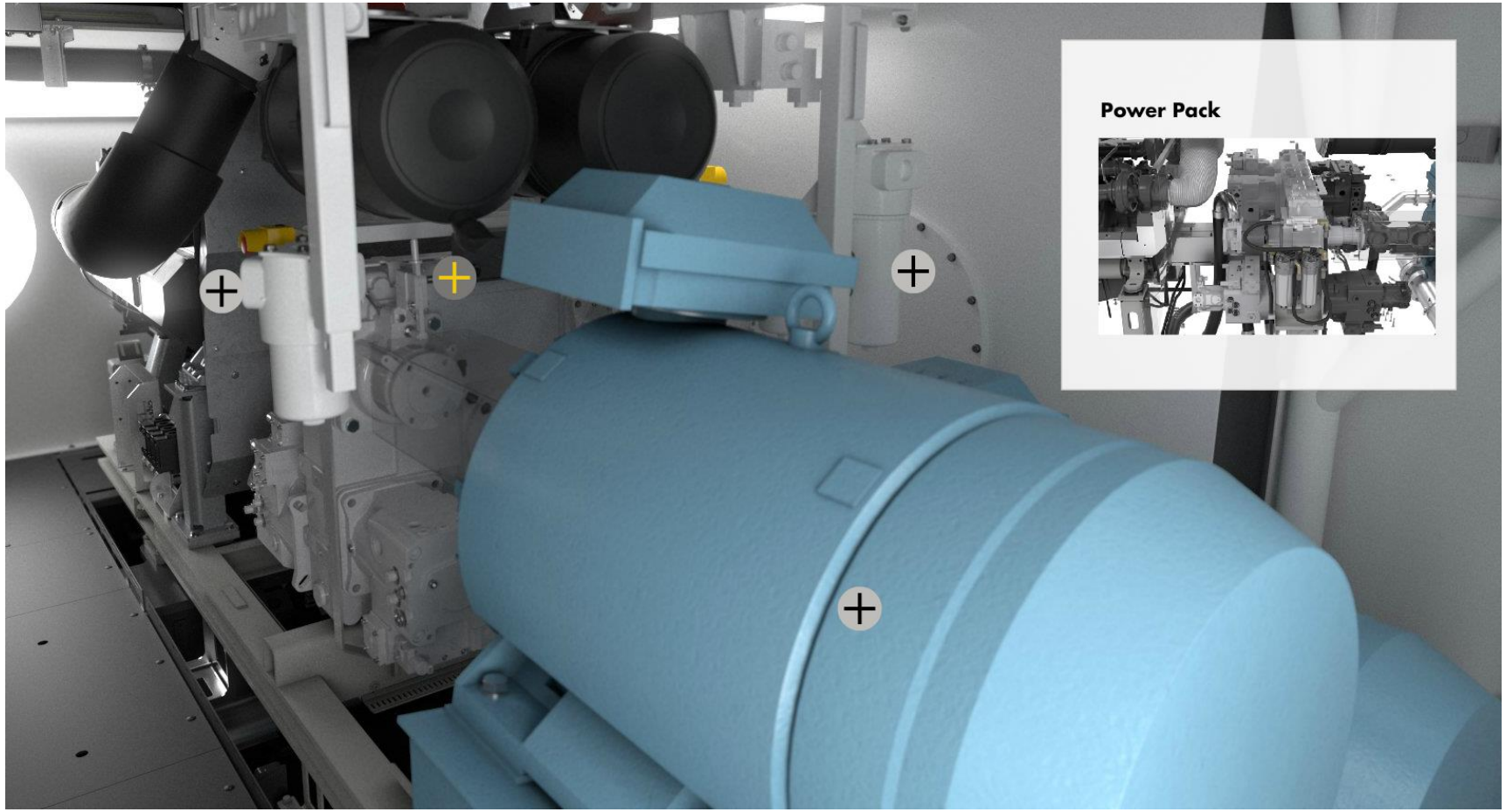
— An auxiliary external generator can also be plugged in to provide further backup if required

The electric main drive for LHM

- The two E-drive motors are installed internally within the cranes engine room and are therefore **protected from the elements**
- The electric drive consists of **two squirrel cage induction motors** for driving the crane hydraulics
- Engine characteristics:
  - Powerful
  - Reliable
  - High speeds
- Suitable for operation with power supply from 400V – 20kV and 50/60 Hz



Hybrid drive solution



- **Hybrid drive** (electric & diesel) also possible
  - A mechanical clutch allows for quick switching between electric and diesel operation.

Electric drive in high demand

— Liebherr has been using **an all-electric or hybrid drive concept** consisting of a diesel engine and an electric motor **for over 20 years** for its mobile harbour cranes

— In the 2021-2022 sales years, the demand for Liebherr mobile harbour cranes with an e-drive has **increased strongly**

— Compared to 2019, the number of units equipped with an electric motor has even **doubled**

Representive solution 1

— High Voltage cable drum in the middle of the undercarriage with a cable trench on the quay

Representive solution 2

— Low Voltage cable drum at the back side of the undercarriage with a cable trench on the quay

Representive solution 3

— High voltage cable drum at the back side of the undercarriage with lose installation of the cable on the quay

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Representive solution 4

— High voltage cable drum at the back side of the undercarriage with a cable car connected to the undercarriage

— Cable will be laid In a cable trench and covered with Panzerbelt

03 Zero emission mobile harbour crane

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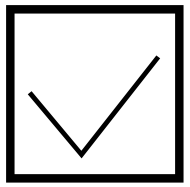
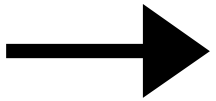
Zero emission LHM traveling by battery

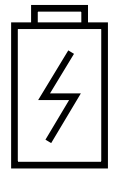
Emission free crane travelling via battery



Emergency operation possible



Up to 2 km travelling distance



10 years battery lifetime

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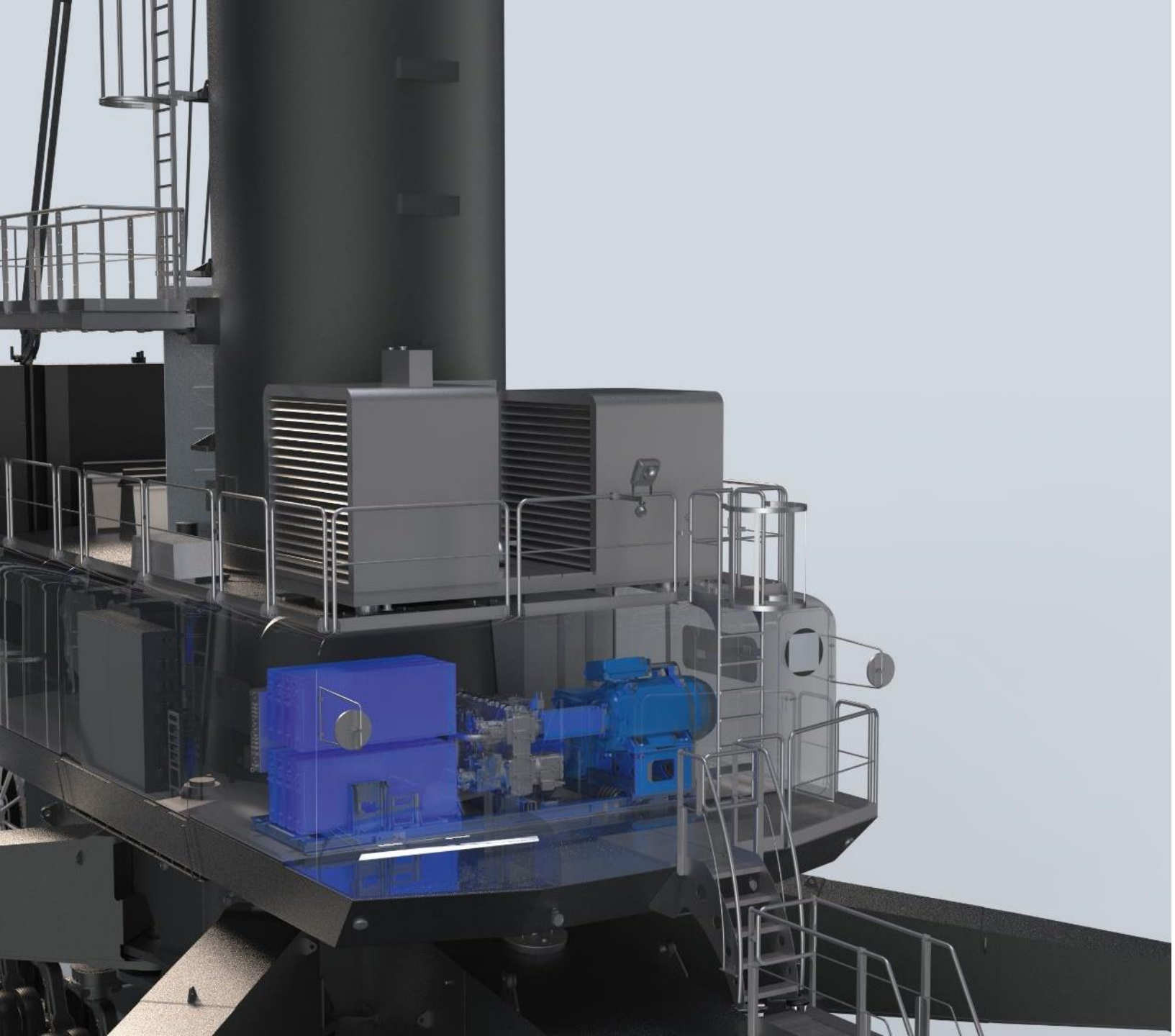

Unplugged LHM

— Up to **2 km travelling distance** with 260 kWh capacity

— Fully recharged battery within 10 to 12 hours

— Up to **10 years** battery lifetime

— Emergency operation possible

Zero emission traveling for grid connected cranes

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04 Purely electric portal crane LPS 420E

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Purely electrical

First 100% electrical driven port crane in the Liebherr MHC product range

All crane movements electrical driven:

- **Luffing**
- **Hoisting**
- **Slewing**
- **Driving**

Pure performance

Hook operation:

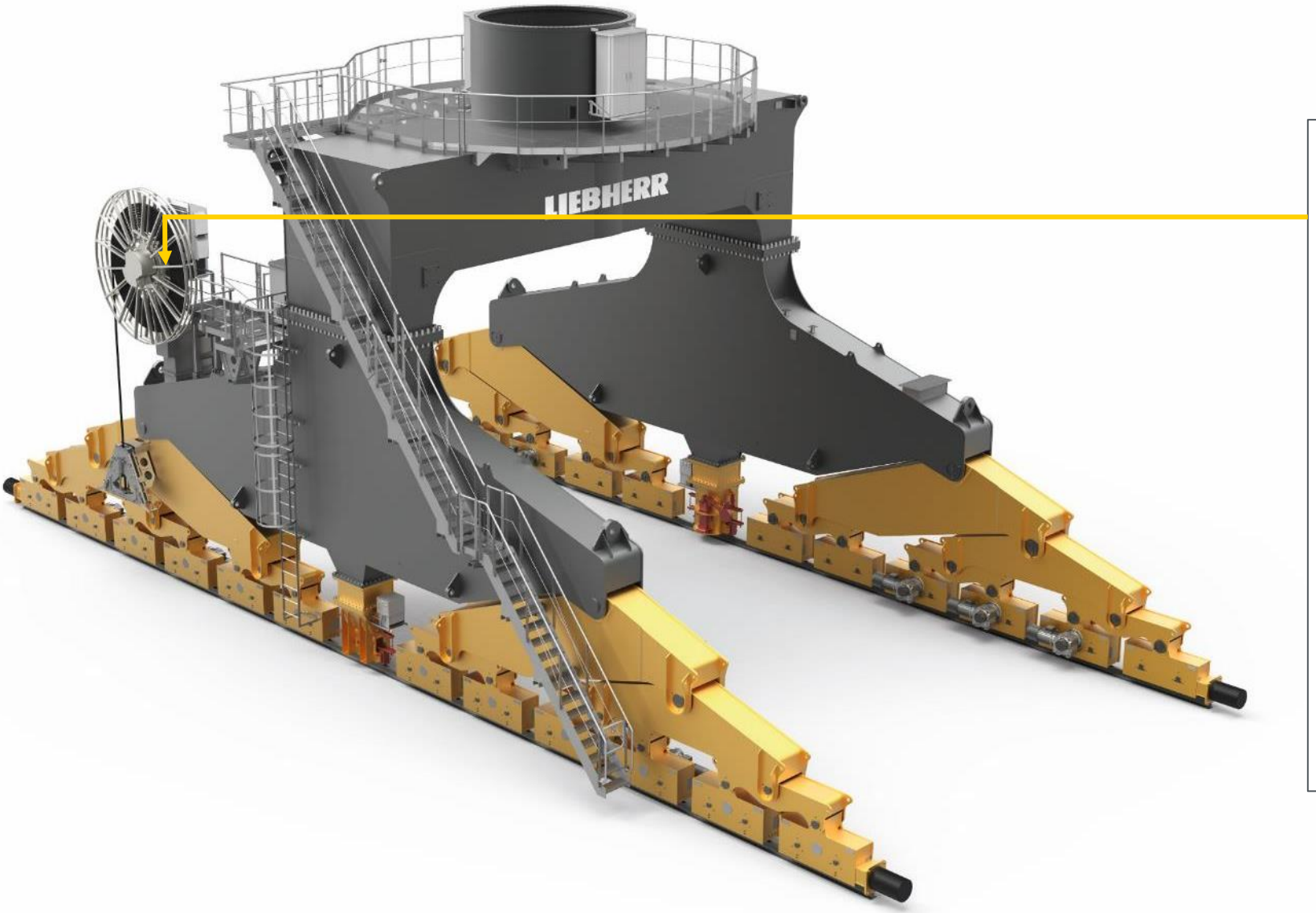
—124 tonnes

Bulk operation:

—Up to 1200 tonnes per hour

Container operation:

—Up to 30 cycles per hour

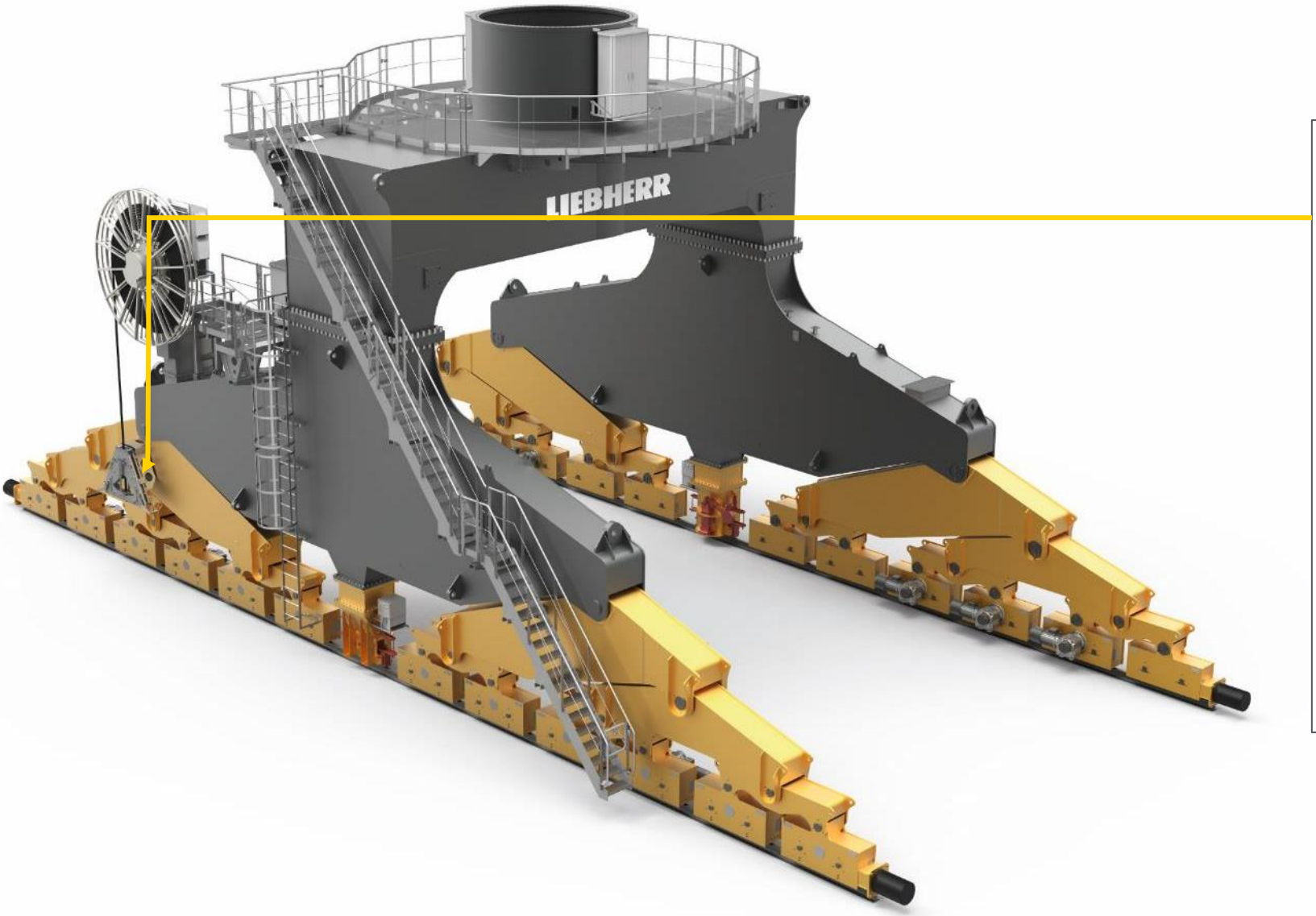


Main power supply incl. cable reel

— Optimised for low-voltage (380 V – 460 V)

— Optional high-voltage supply via additional transformer

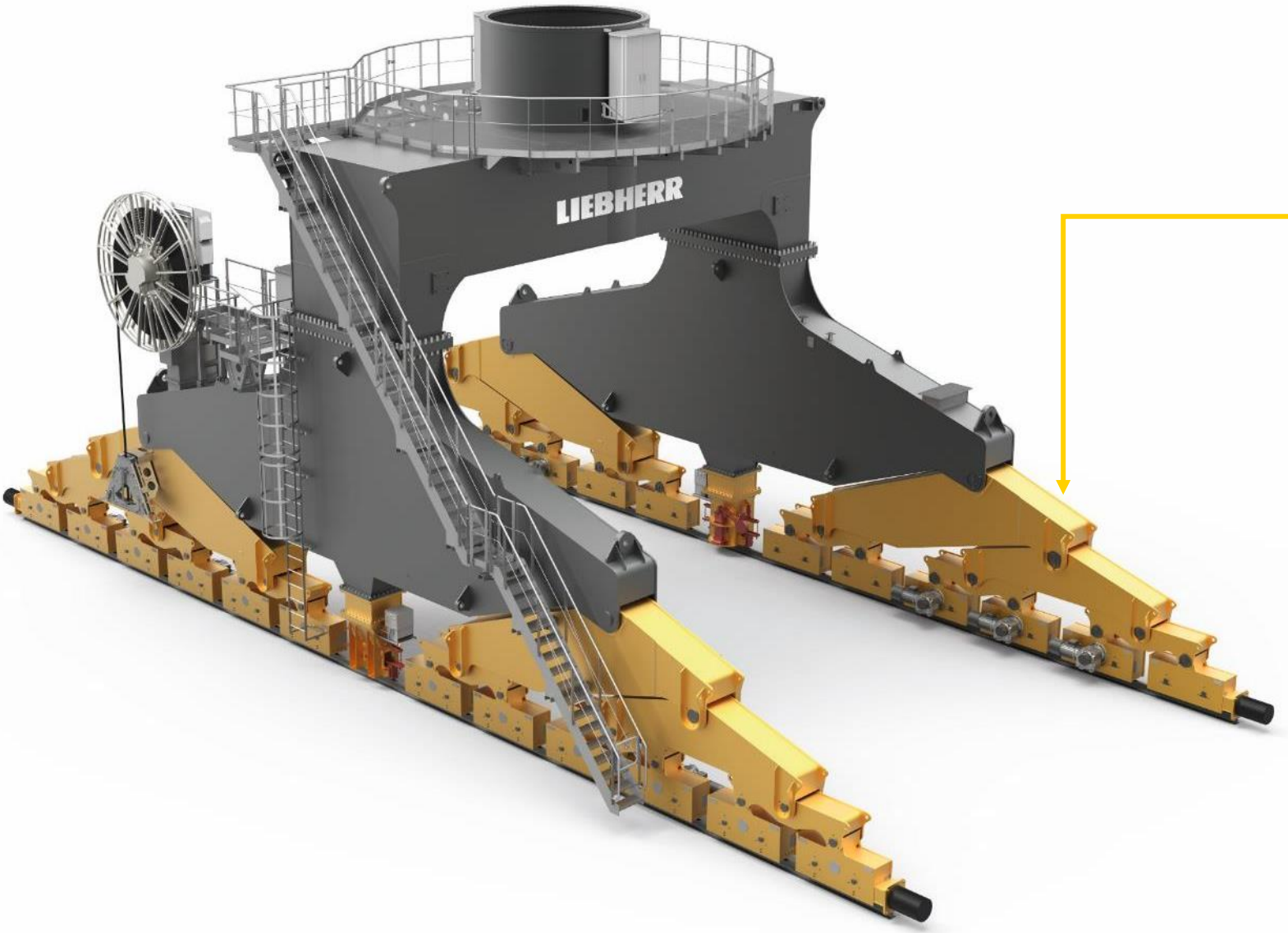
— Simultaneous operation of driving, slewing, luffing



Cable reel incl. deviation funnel

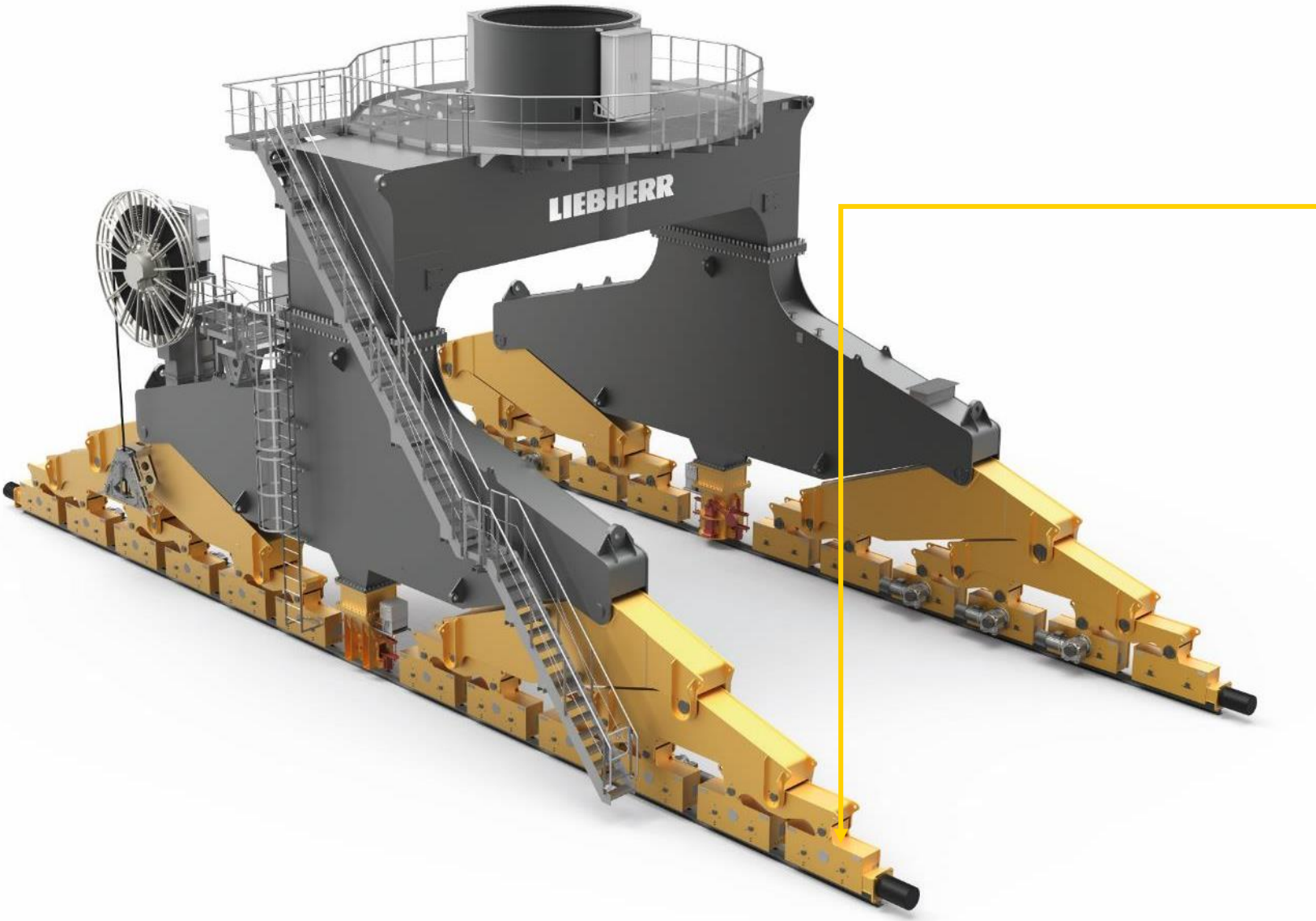
— Traveling distance low voltage ~70m (max.)

— Traveling distance high voltage
– standard 150 m
– max. 300 m



Bogie system

- Bogie driven with 9.5 kW gear asynchronous motor
- Variable number of driven boogies possible (8-12)
- Wheel load 30 t – 50 t
- Buffer, optical anti-collision sensors and parking device



Parking and safety devices

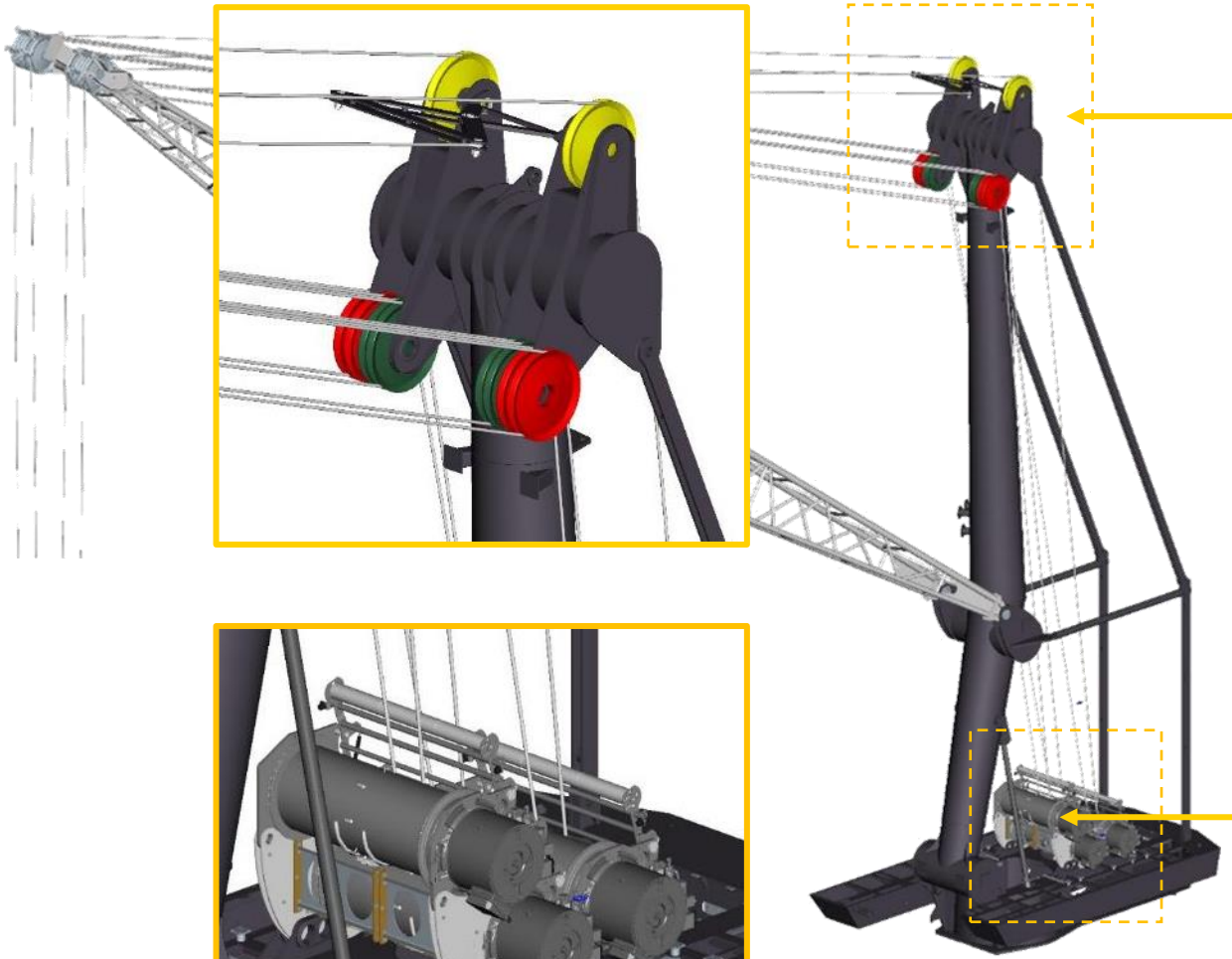
— Storm anchor

— Take up wedge

— Buffer and optical anti- collision sensors

— Cameras to ensure safety traveling (optional)

New Luffing System



Reeving Plan

- 2-Rope Double Reeving
- Mechanical rope length compensation
- Same ropes & sheaves as 4-Rope Hoisting System
- Boom lay down up to 12,5m gantry height possible

Winch

- Same single layer winch as 4-Rope Hoisting System
- Elastic suspension for less vibration

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Main drives components

Hoisting and luffing winches

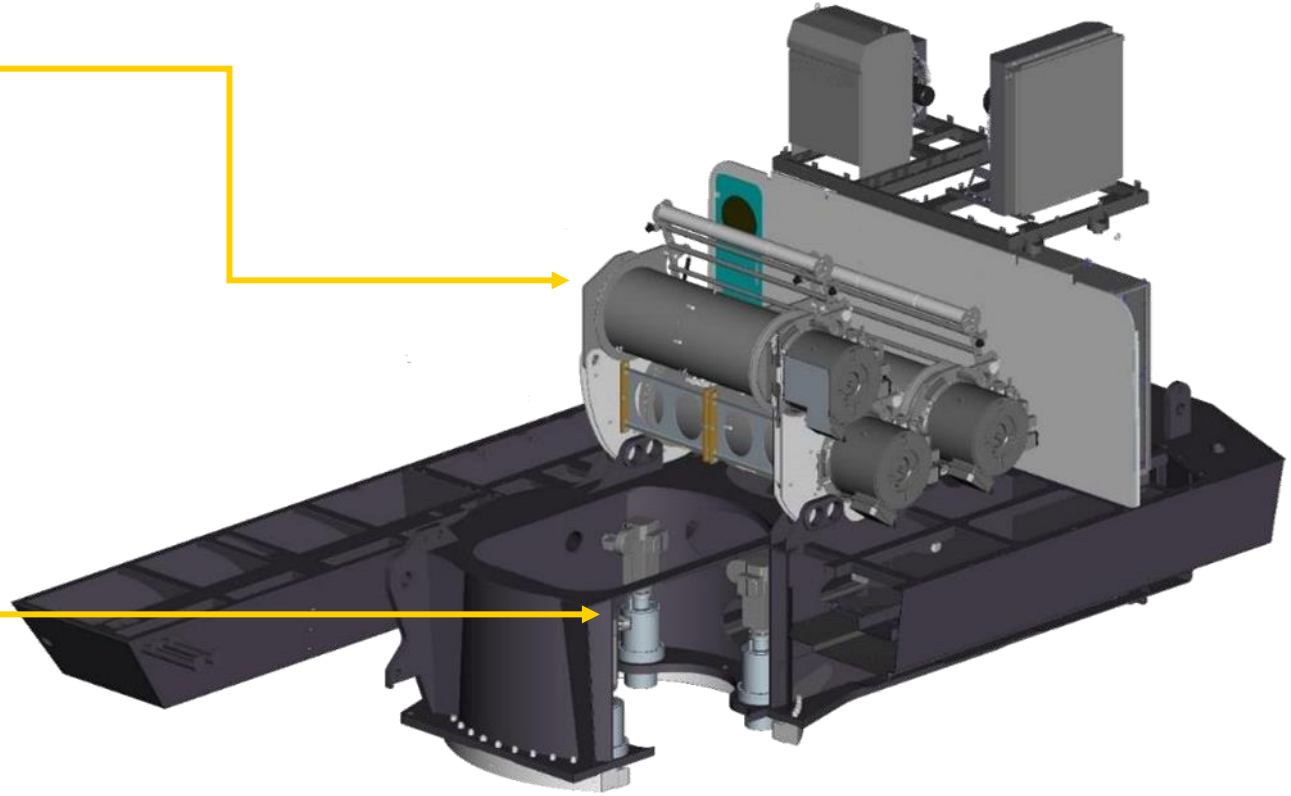
— Water-cooled permanent magnetic field synchronous motors

— Integrated holding brake – hydraulic

Slewing drive

— 3 x air-cooled asynchronous motors

— Integrated holding brake – hydraulic



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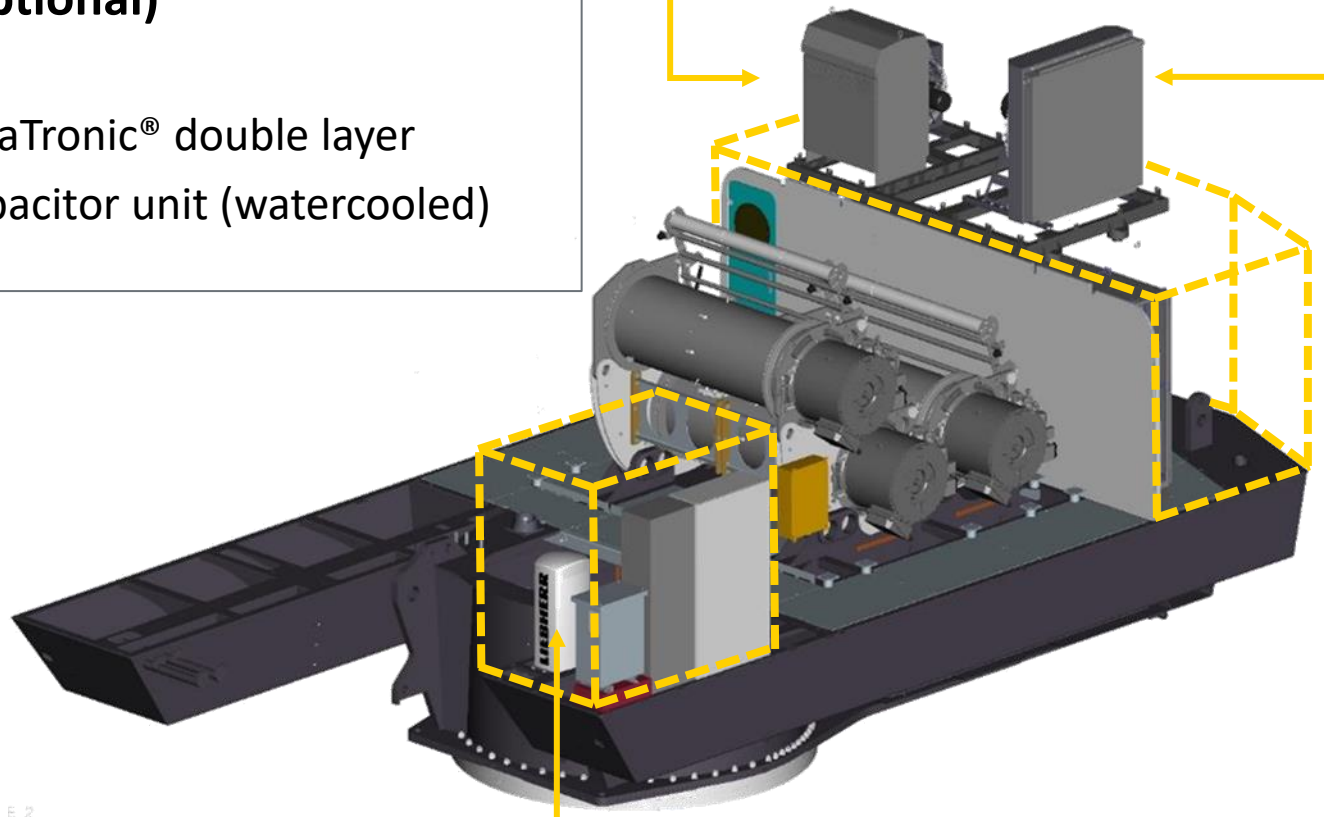
Electric drive components

Energy storage system (optional)

LiCaTronic® double layer capacitor unit (watercooled)



Cooling units & brake resistor

Separate heat exchangers for winch drives and power electronics

Power electronics compartment

LiCaTronic® Frequency Converter modules (same as LH150)

Switch cabinet build by COT Biberach

Control electronics compartment

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Liebherr frequency converter

- Proven technology (Liebherr STS cranes and Material Handler)
- High power density
- Ensured availability

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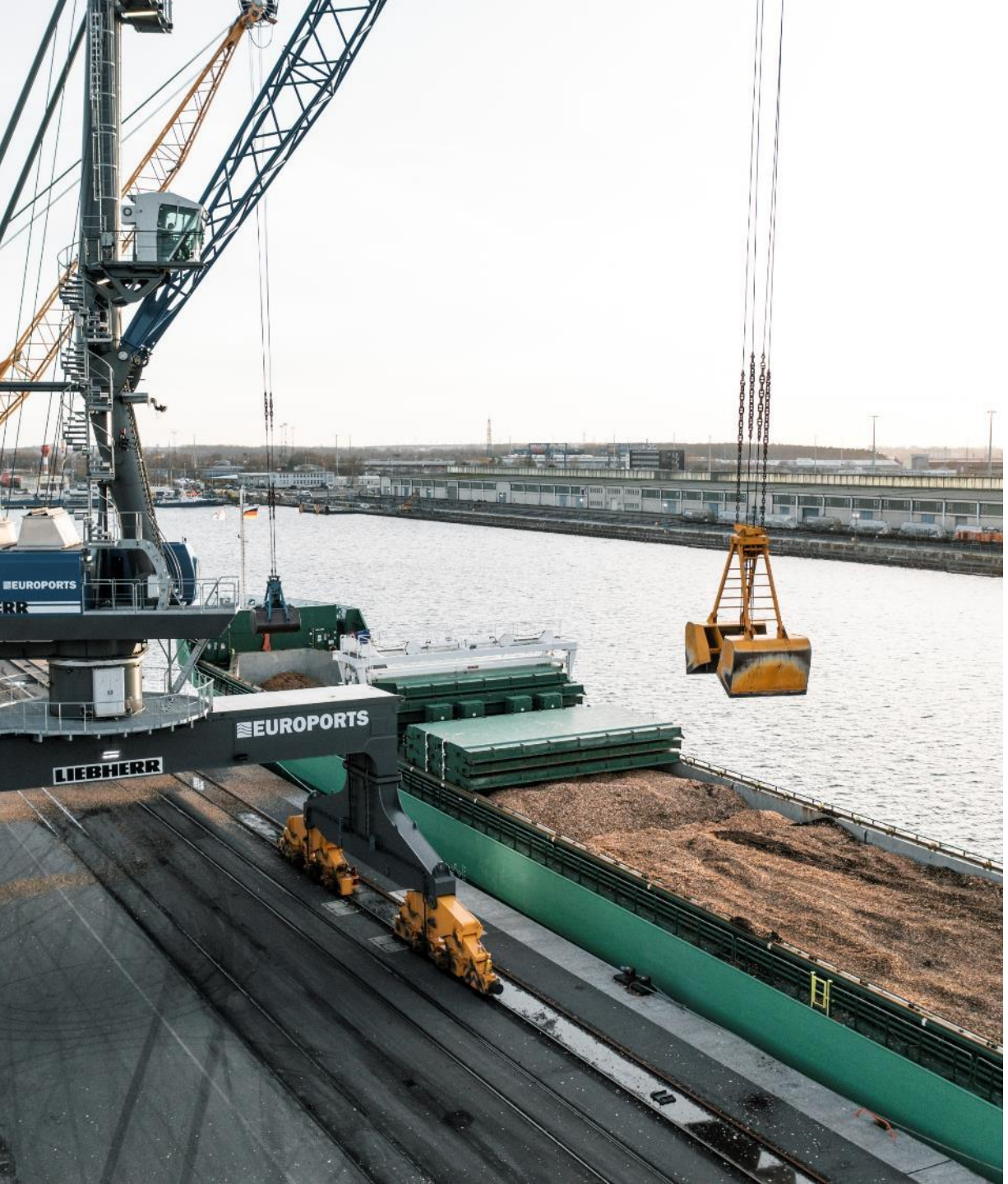

Technical specifications

Hoisting power	**2x190 kW (50 m / min @ 40 t)**
Max. SWL (Hook)	**124 t**
Max. SWL (Grab)	**90 t / 75 t**
Turnover bulk Classification bulk	**1200 t / h** **A8**
Turnover container Classification container	**30 cycles / h** **A7**
Max. hoisting speed	**100 m / min**
Working temprature	**-30°C - +50°C**

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LPS 420 E in Europe

— Euroports Germany expands bulk cargo capacity at the Rostock Overseas Port with the all-electric LPS 420 E portal crane

— Delivery mid of 2022

"We want to further strengthen the handling performance at our bulk terminal. In the coming year, we are not only investing in a new crane
to be even more efficient,
but we also want to make our contribution to sustainability."

Karsten Lentz
Managing Director of the Euroports Germany Group

Thank you.

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