How Vahle ARTG Solution helps the Port to enhance the effeciency

VAHLE System & Project Business

VAHLE Company Film

VAHLE Chronicle

1912
Paul Vahle applies the first copperhead for a patent

Foundation of the VAHLE OHG

1926
Paul Vahle dies and his wife Helene manages the company

1932
Son Paul Werner Vahle takes over his father's business

1936
VAHLE has 30 employees

1956
Property is acquired at Westicker Strasse, Kamen

1962
Production start of KSL, enclosed conductor system

1966
VAHLE becomes Paul VAHLE GmbH & Co. KG

Josef Hötte joins VAHLE and will be a member of company management for almost 30 years

1998
Contactless Power Supply (CPS®) is developed

2001
The Shanghai 'Transrapid', equipped with VAHLE conductors, starts its high-speed service

2007
FABA product line conductor systems acquired

2012
One hundred year anniversary

2013
Foundation of the VAHLE DETO GmbH and expansion of the product portfolio by mobile controllers

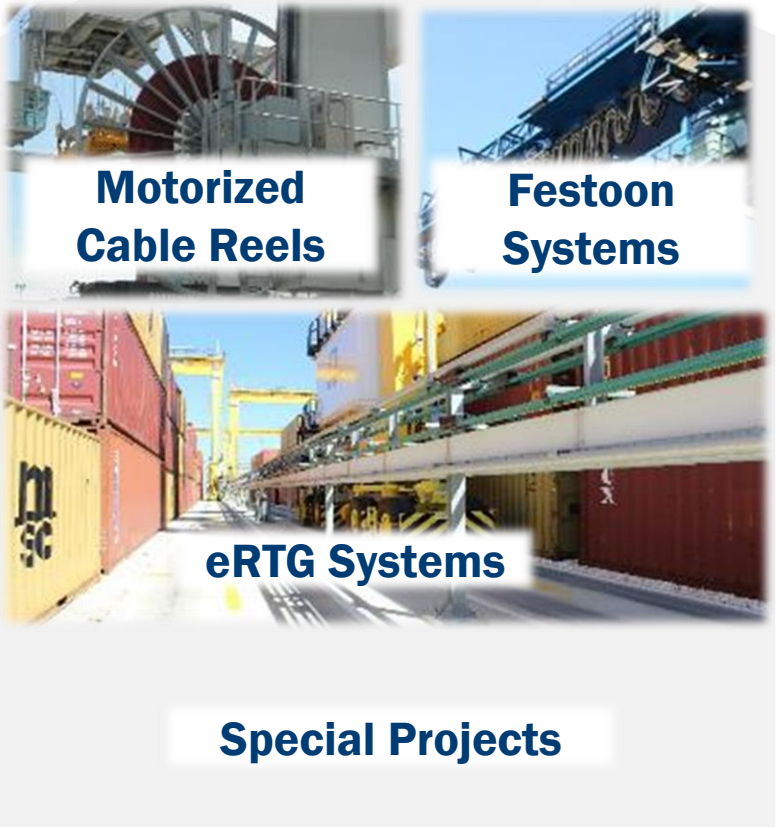
2015
The largest container port in the United Kingdom is electrified and automated by VAHLE

2017
Opening of the headquarters of VAHLE Automation GmbH in Schwoich, Austria

WHAT VAHLE DOES | VAHLE SYSTEMS

OVERVIEW MARKET SEGMENTS

PORT TECHNOLOGY
CONTAINER HANDLING



AMUSEMENT RIDES
ROLLER COASTER, ...

AUTOMATION
DATA, POSITIONING & CPS

AUTOMOTIVE
EMS, SKID, ...

CRANE TECHNOLOGY
OVERHEAD, PROCESS, ...

PEOPLE MOVER
TRAMS, TRAINS, ...

INTRALOGISTICS
WAREHOUSES, SORTER, ...

STEPS TO AUTOMATION

1.0 Electrification

Insulated conductor rails 1000 V, 1000 A with aluminium/ stainless steel

2.0 Positioning

precise position feedback with a contactless reading head

3.0 Data Communication

interference-free and safe for data & video up to 300 Mbit/s

4.0 - Automation

Combination of electrification, positioning and data

ARTG Solution– Electrification & Automation

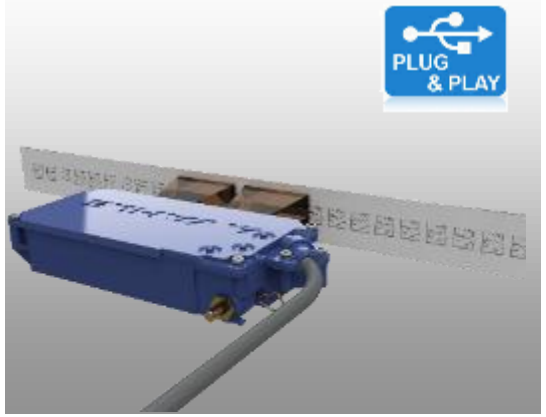
ARTG Solution

Electrification: flexible

- Electrification by **Conductor Rails**
- **Automated Power** Connection for block changes
- Automated **seamless switching**

Positioning: accurate

- **Absolute Positioning System** independent from external influences
- Position **accurancy** up to **± 1 mm**
- **PN / PB / Ethernet** Interfaces for Plug and Play Integration



Data Communication: safe

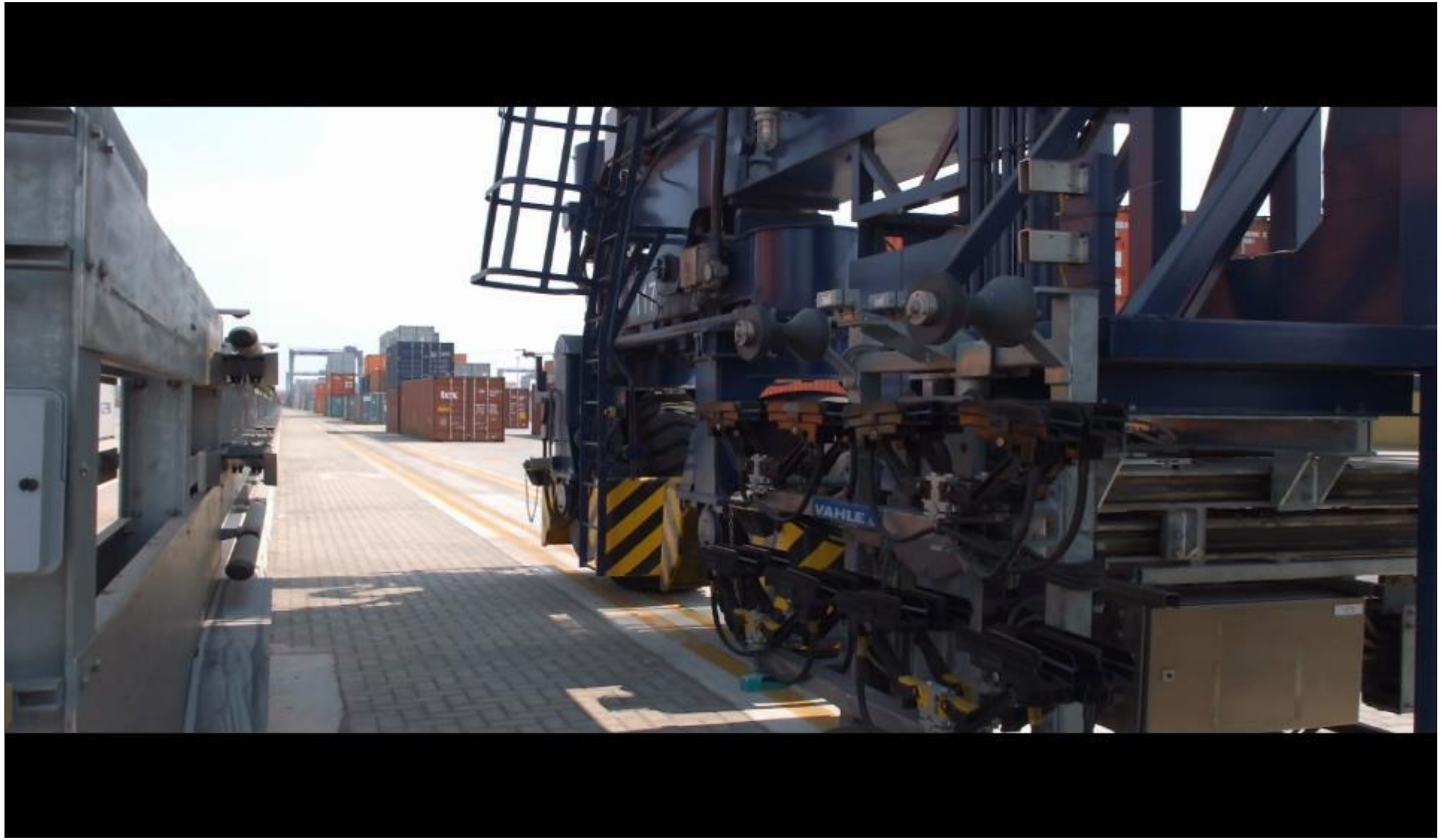
- **Highly shielded** data communication
- Up to 100**Mbit/s** gross rate
- **Low latency** times
- Interfaces **Ready for Automation** - Ethernet, Profinet & Profinet Safe

Control systems: smart

- **Autosteering**
- **Power measurement**
- **Remote Maintenance**
- **Energy optimization**

ARTG Solution– Electrification & Automation

ARTG Solution– quick drive in/out



ARTG Solution– Electrification & Automation

Overview Subsections



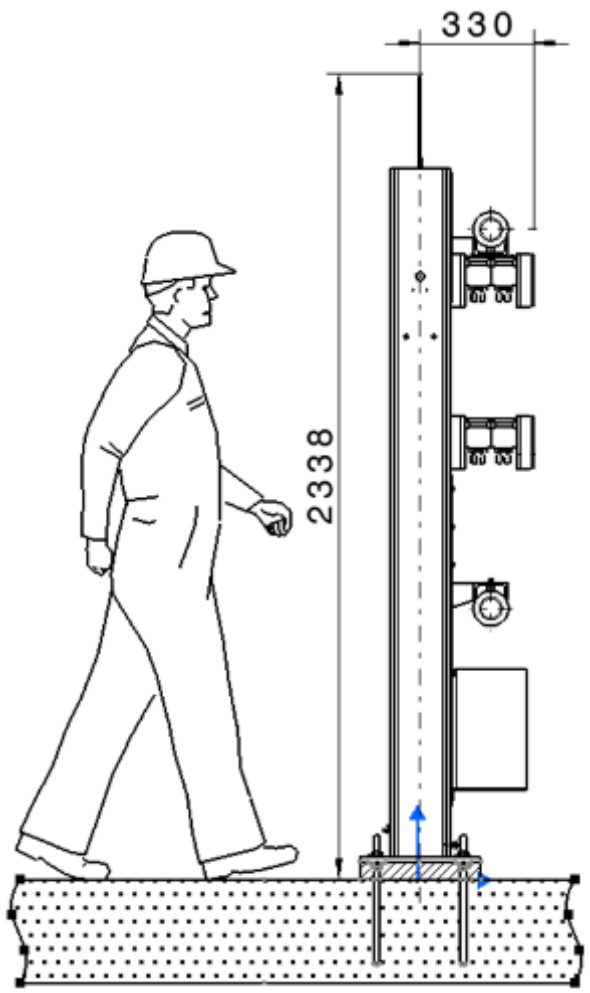

MOBILE PARTS
Existing or new RTG crane



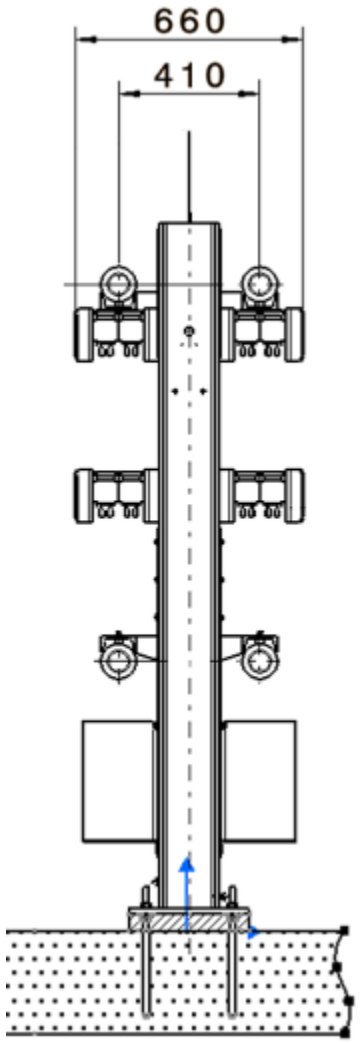

STATIONARY PARTS
Container Yard

ARTG Solution– Electrification & Automation

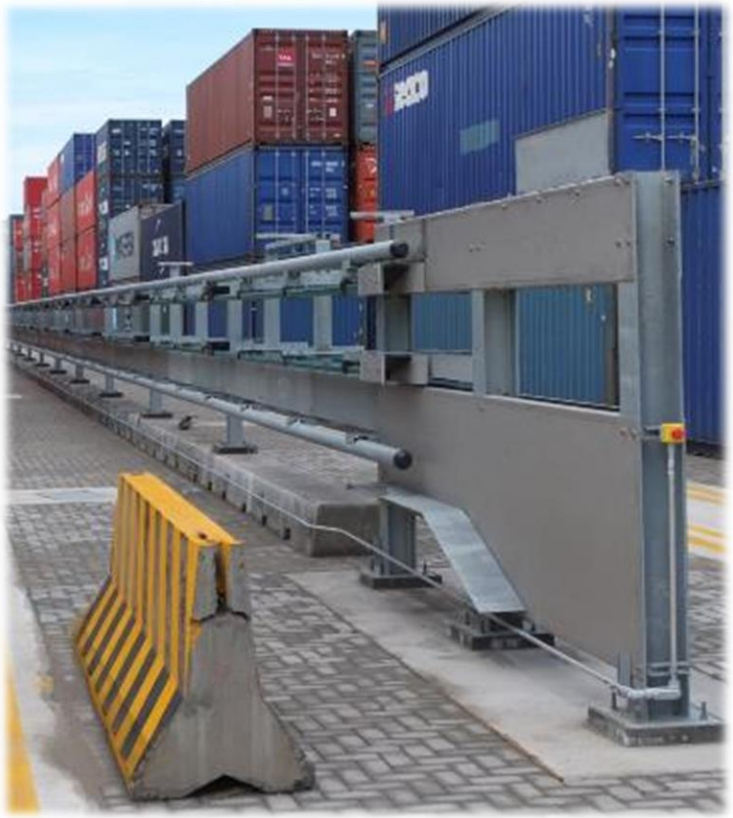
ARTG Solution– stationary side – steel support structure 2+2-System



LSS1250 Single



LSS1250 Double



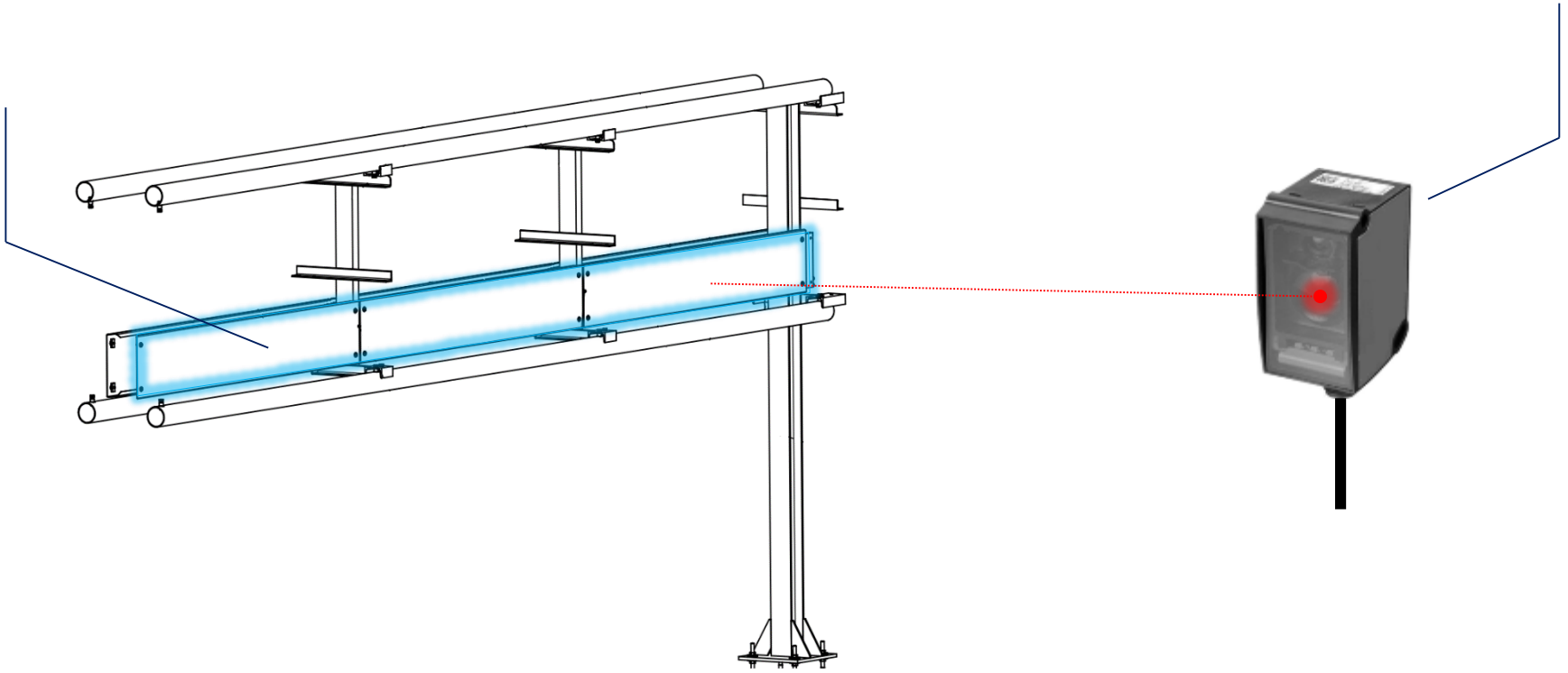
LSS1250 Back to Back Installation
@ HPH Lazaro Cardenas, Mexico

1D LASERSCANNER

Installed at the RTG crane

REFLECTION PLATE

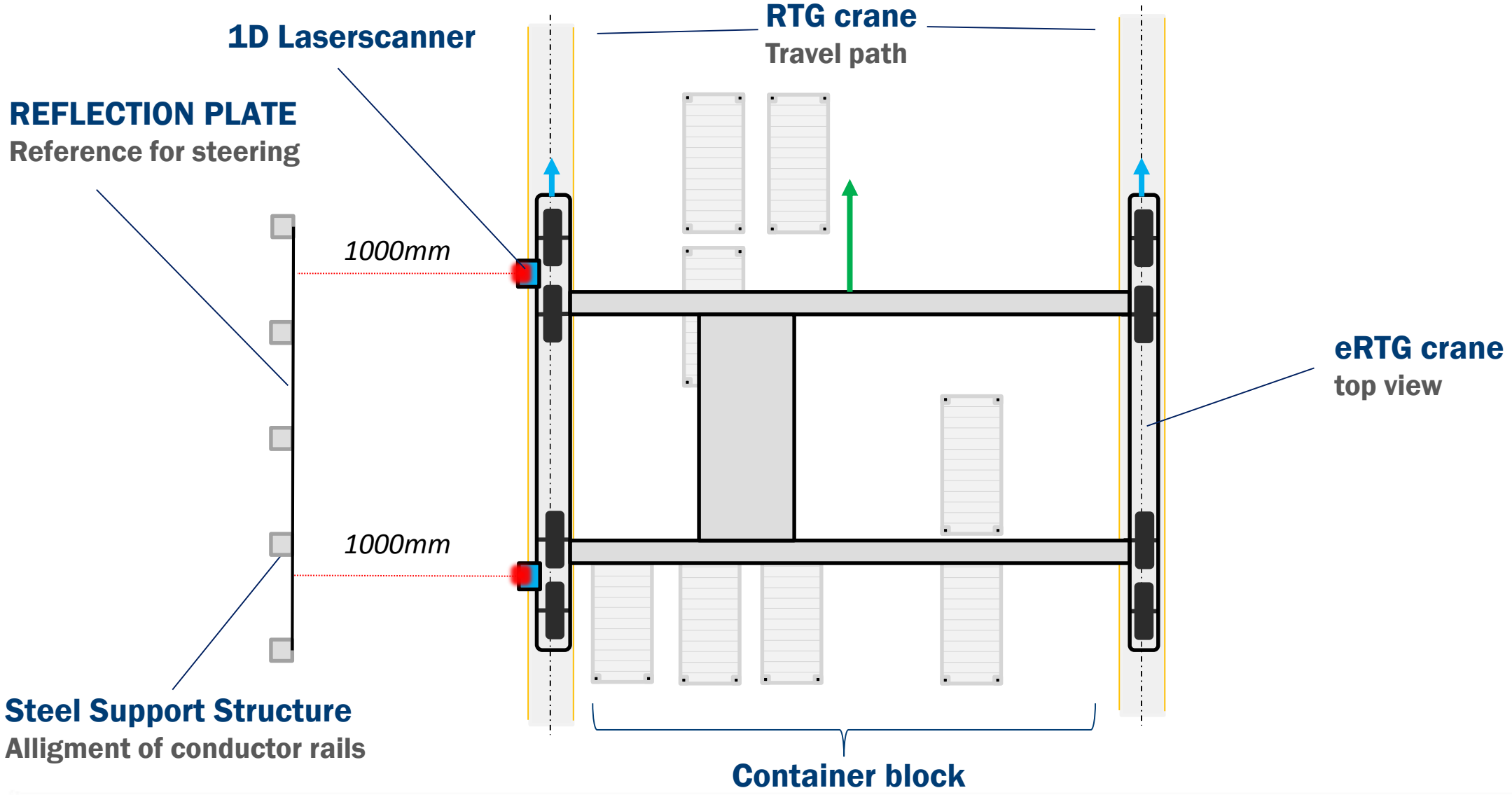
Reference for steering



Measurement Value: 839 mm

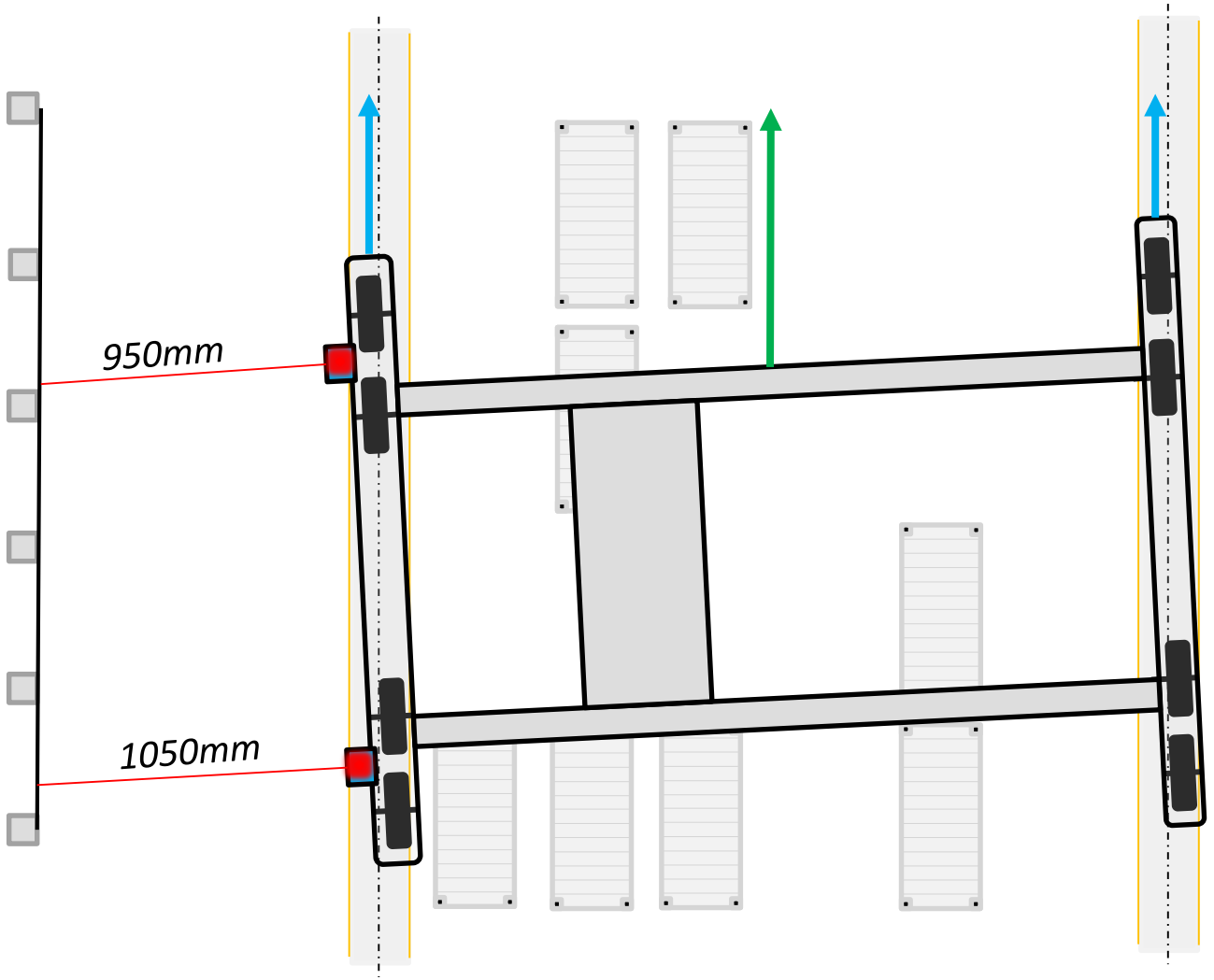
ARTG Solution– Electrification & Automation

eRTG Crane – Autosteering



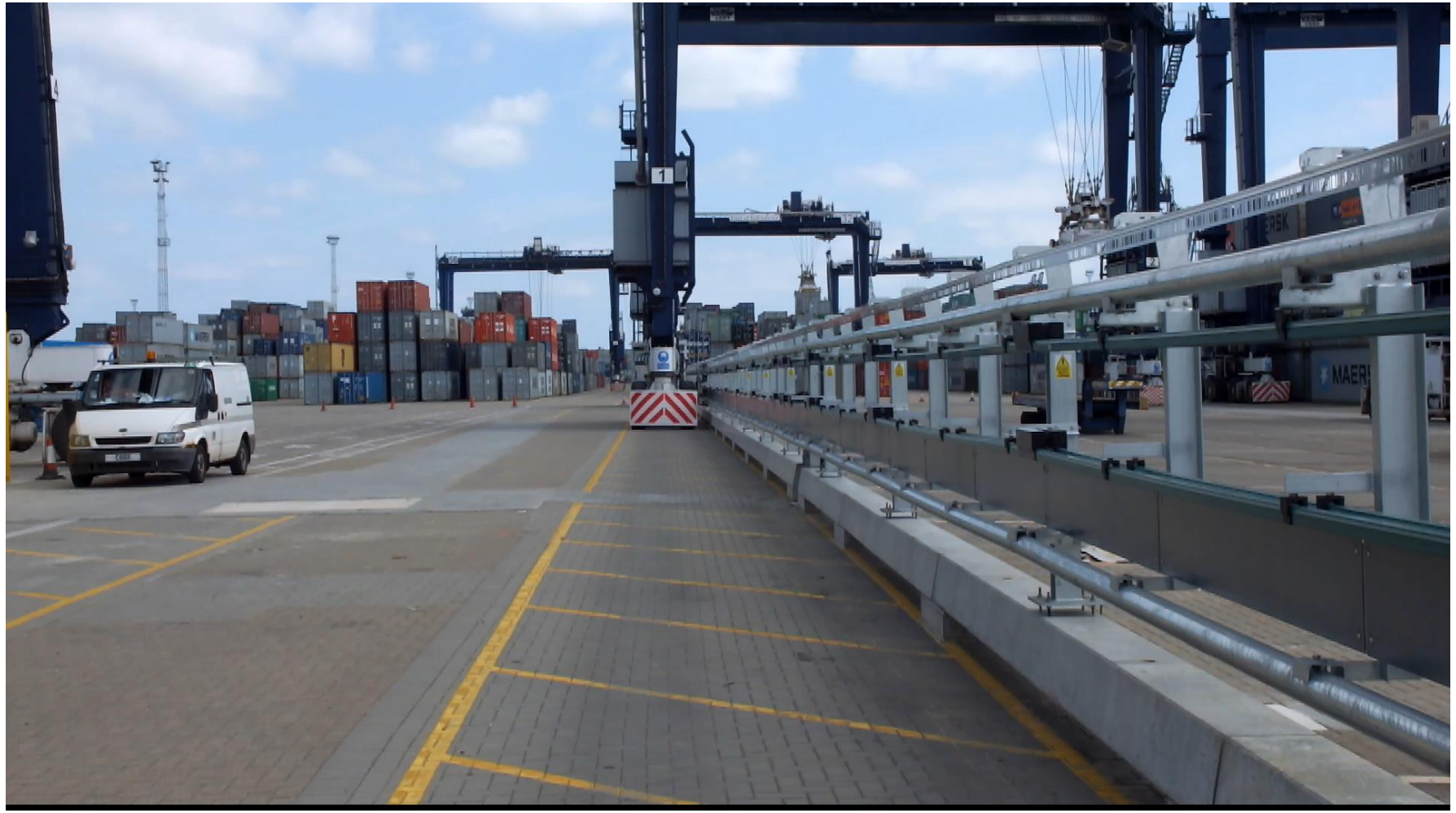
ARTG Solution– Electrification & Automation

eRTG Crane – Autosteering



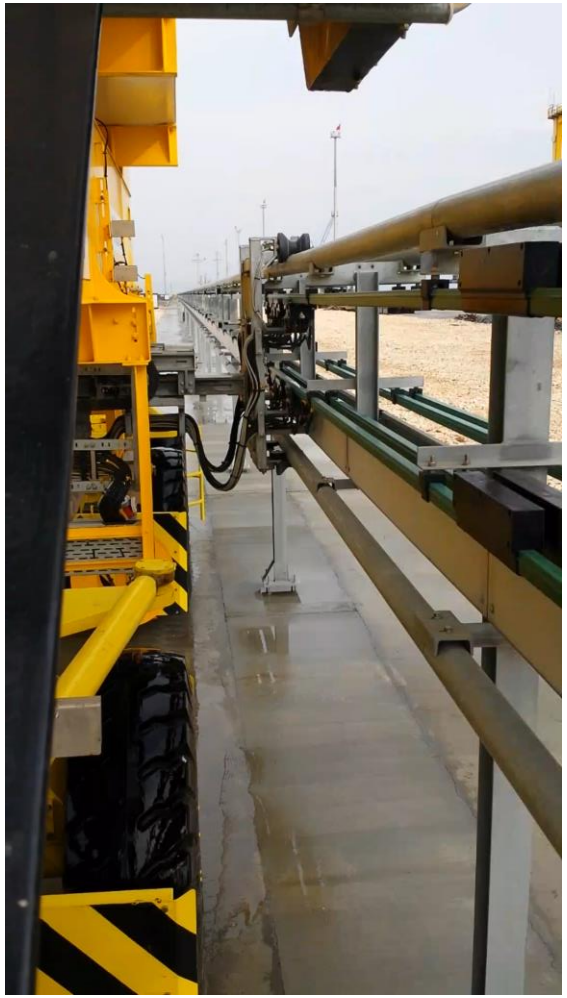
ARTG Solution– Electrification & Automation

eRTG Crane – Autosteering



Retrofitted ZPMC RTG crane

Siemens PLC: Autosteering with up to 160m/min

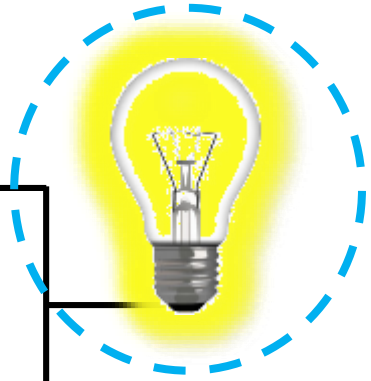


New Noell RTG crane

Siemens PLC: 160m/min

Consumer loads:

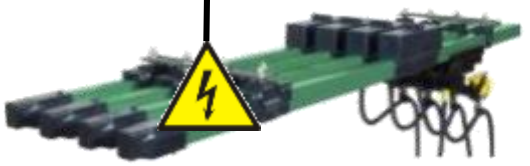
- Hoist
- Trolley
- Gantry
- Control System (PLC)



GENERATOR

Delay

CONDUCTOR RAIL

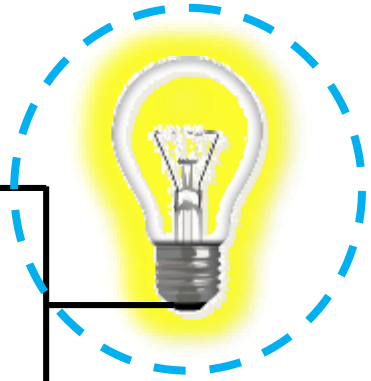


ARTG Solution– Electrification & Automation

eRTG Crane – Seamless switching / Synchronisation

Consumer loads:

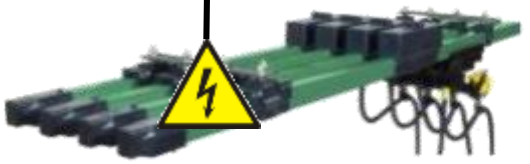
- Hoist
- Trolley
- Gantry
- Control System (PLC)



Synchronization unit

GENERATOR

CONDUCTOR RAIL

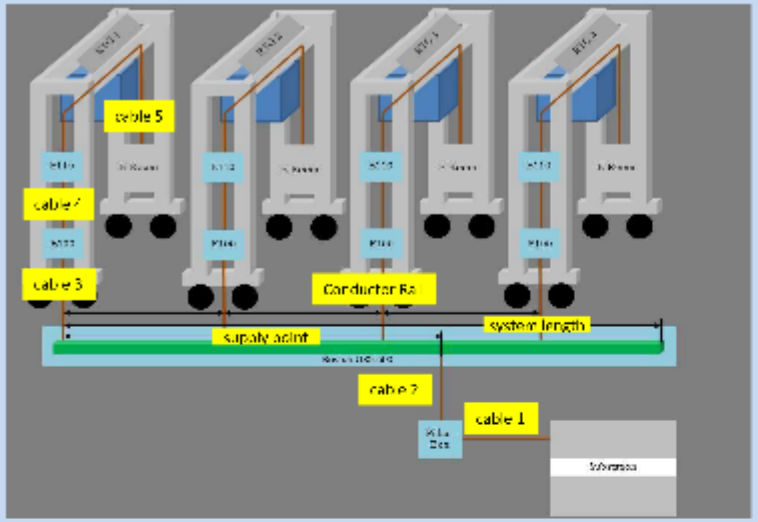


ARTG Solution– Electrification & Automation

4 cranes working simultaneously

ARTG Solution– Electrification & Automation

eRTG Crane – System Voltage Drop Calculation



3 RTG cranes are hoisting
1 RTG crane drives gantry

ProjectNo	-		Date	14.01.2015	
Customer	VSC Vendor				
Port	VSC Vendor		system length	375 m	
Country	Spain		supply point	168 m	
voltage sub.	24 kV	Frequency	50 Hz	cosφ	0,95
system voltage	500 V				
adjusted circuit breaker:		System fuse	1000 A	crane fuse (NH)	500 A

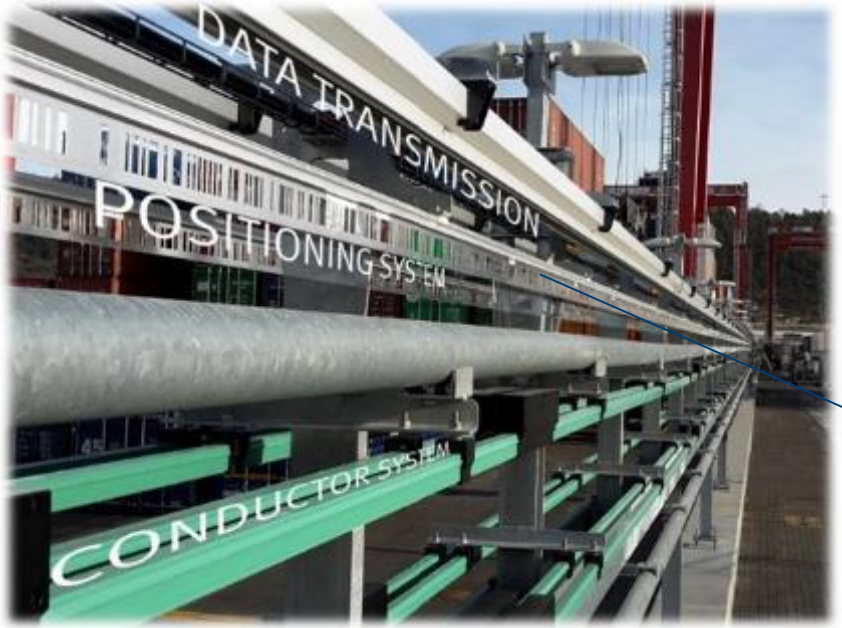
	hoist	trolley	Gantry	base load	RTG	total current
RTG 1	236,22 A	17,58 A		40,41 A	294,17 A	956,57 A
RTG 2	236,22 A			40,41 A	276,64 A	
RTG 3	236,22 A			40,41 A	276,64 A	
RTG 4		17,58 A	91,18 A	40,41 A	149,18 A	

	cable 1	cable 2	cable 3 arm	cable 4	cable 5	Conductor Rail
Cores per Phase	4 x 240 mm² per Phase	4 x 150 mm² per Phase	4 x 50 mm² per Phase	1 x 185 mm² per Phase	2 x 150 mm² per Phase	600 mm²
cabletype	4 x 240 mm² NYY 0,6/1kV	1 x 150 mm² H07RN-F 400/750V	2 x 50 mm² Draeseldt 1,8/3kV	1 x 185 mm² NSGAFÖU 1,8/3kV	1 x 150 mm² NSGAFÖU 1,8/3kV	600 mm² Busbar L 35-600AE
cable is fused with	1000,00 A	1000,00 A	500,00 A	500,00 A	500,00 A	1000,00 A
material of the wire	copper	copper	copper	copper	copper	Aluminium/Stainless-Steel
cable length	65,00 m	10,00 m	11,00 m	15,00 m	20,00 m	168,00 m
laying procedure	in earth	side by side in pierced cable tray	side by side in cable ladder	with distance in pierced cable tray	side by side in pierced cable tray	with distance
temperature	25 °C	35 °C	35 °C	35 °C	35 °C	35 °C
Max current-carrying capacity	1073,57 A	1121,36 A	1067,00 A	550,62 A	651,72 A	1000,00 A
current-carrying capacity is	right limited	ok	ok	right limited	ok	right limited
short-circuit current	27600,00 A	17250,00 A	5750,00 A	21275,00 A	17250,00 A	
Max Temp. isolator	70 °C	90 °C	80 °C	90 °C	80 °C	-
line voltage drop in V	3,49 V	0,90 V	0,72 V	1,18 V	0,94 V	35,20 V
line voltage drop in %	0,70 %	0,18 %	0,14 %	0,24 %	0,19 %	7,04 %

42,33 V	total voltage drop	8,47 %

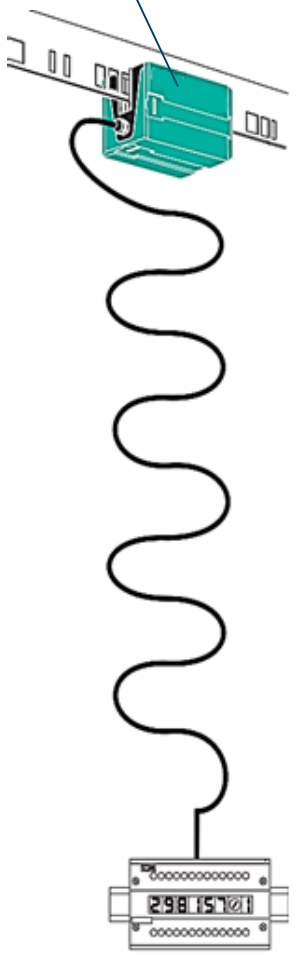
ARTG Solution– Electrification & Automation

eRTG Crane – Absolute Positioning



Reading head

Stainless steel code rail



Vahle WCS Positioning System

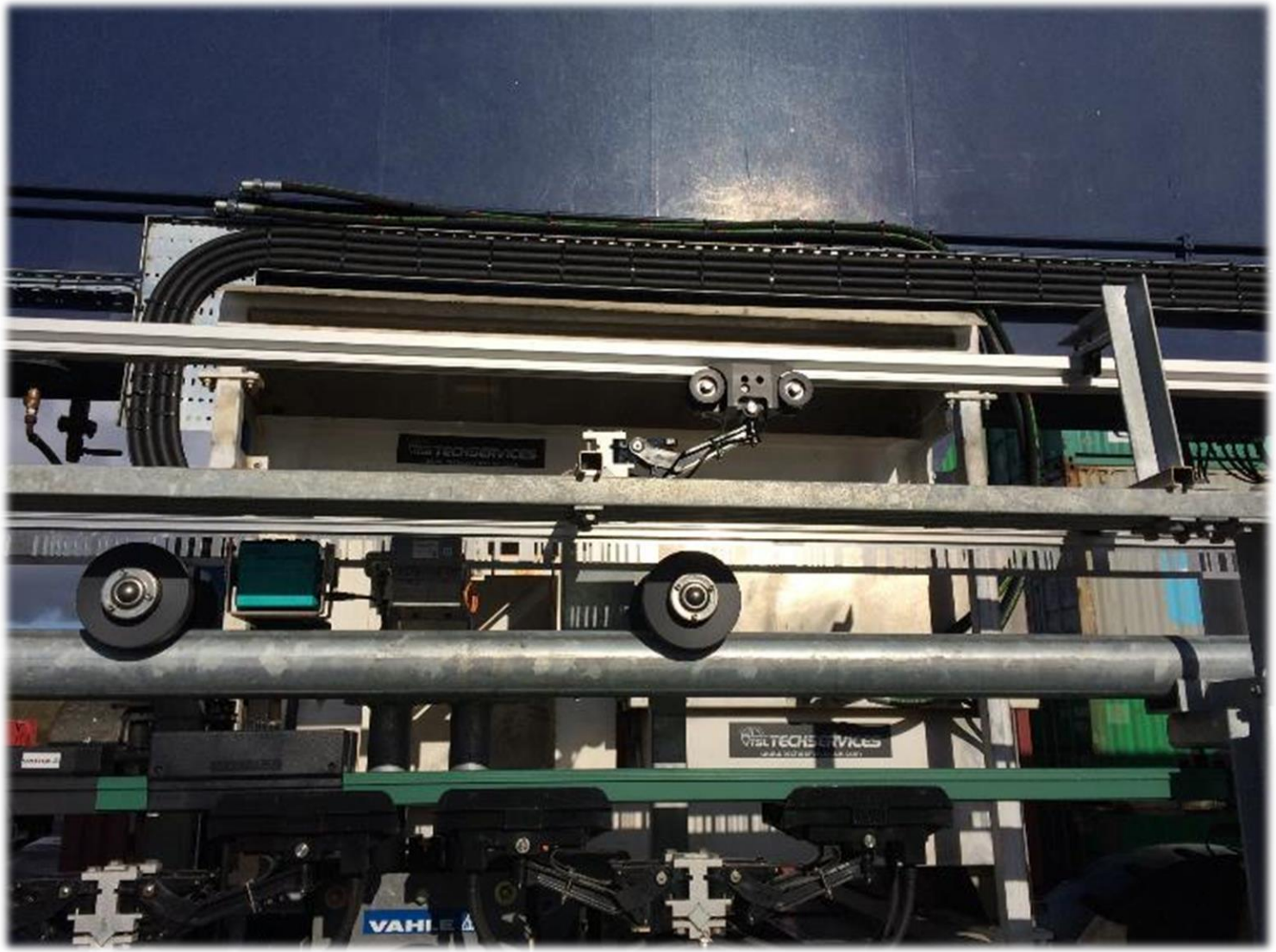
- Positioning System inside each block
- Staineless steel code rail not glued
- RTG Crane absolut position ± 0,8mm w/o use of GPS
- Interface to TOS system / Crane PLC with **Profibus/Profinet**
- Unsusceptible to external interference (GPS jamming)
- Reading head mounted on Current Collector Trolley
- Port application proven technology (e.g. Port of Oslo – Semi-Automation, Felixstowe, …)

ARTG Solution– Electrification & Automation

eRTG Crane – SMGX Data Communication - Test setup @ PFL

ARTG Solution– Electrification & Automation

eRTG Crane – SMGX Data Communication - Test setup @ PFL



ARTG Solution– Electrification & Automation

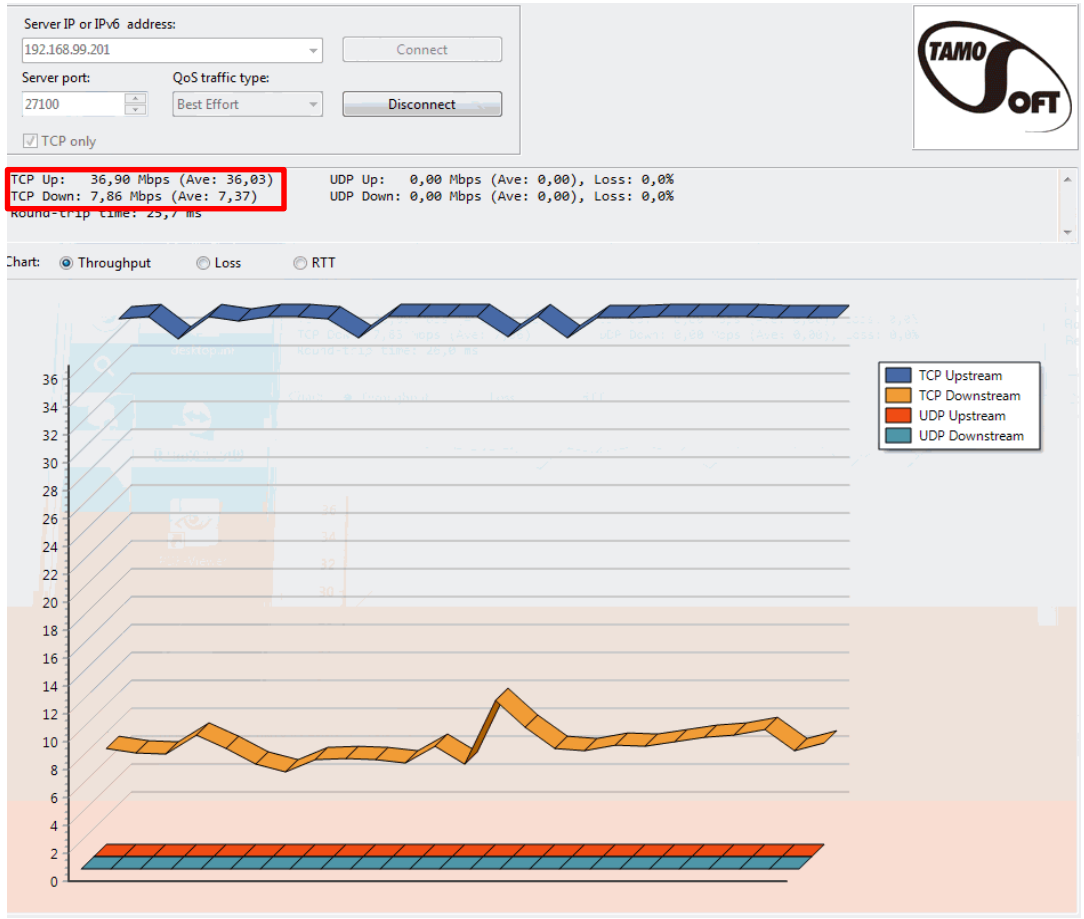
eRTG Crane – SMGX Data Communication - Test setup @ PFL

ARTG Solution– Electrification & Automation

eRTG Crane – SMGX Data Communication - Drive-in sequence

ARTG Solution– Electrification & Automation

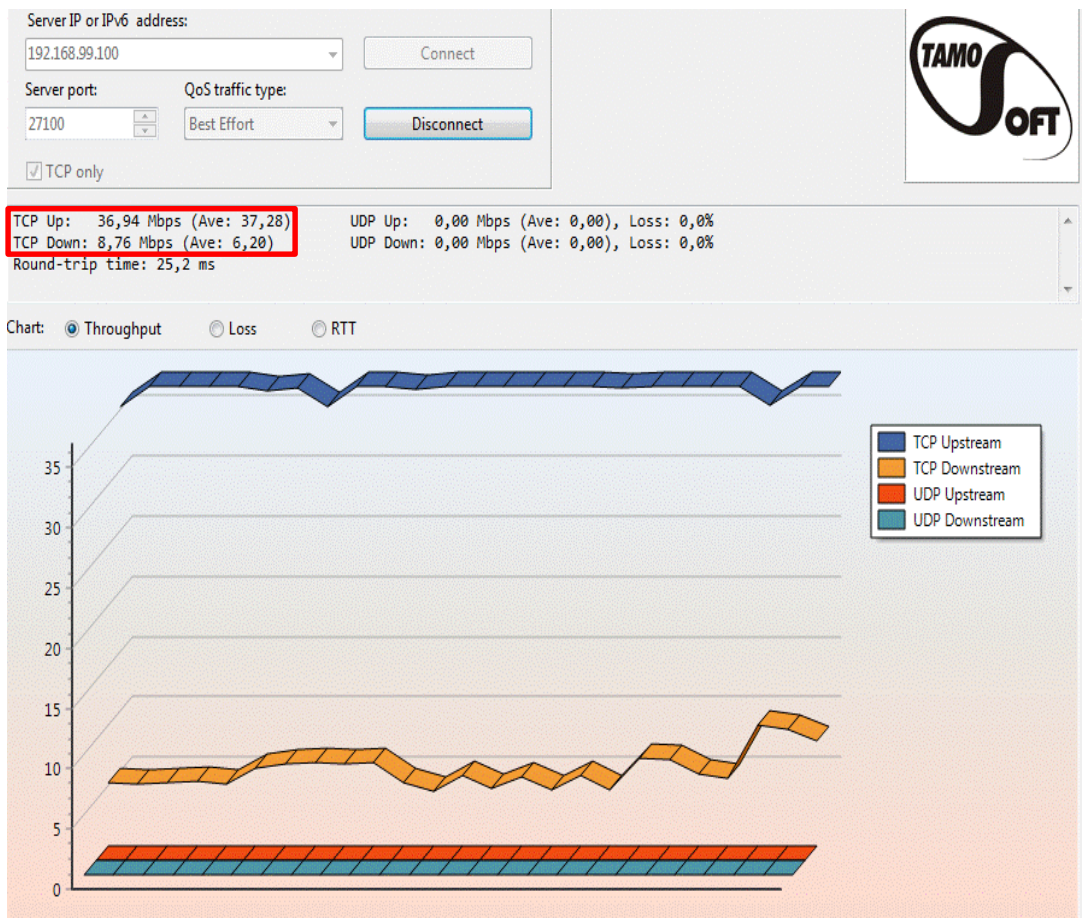
eRTG Crane – SMGX Data Communication - Bandwidth tests



Client #1

Average upstream: 36 Mbps

Average downstream: 7 Mbps



Client #2

Average upstream: 37 Mbps

Average downstream: 6 Mbps

ARTG Solution– Electrification & Automation

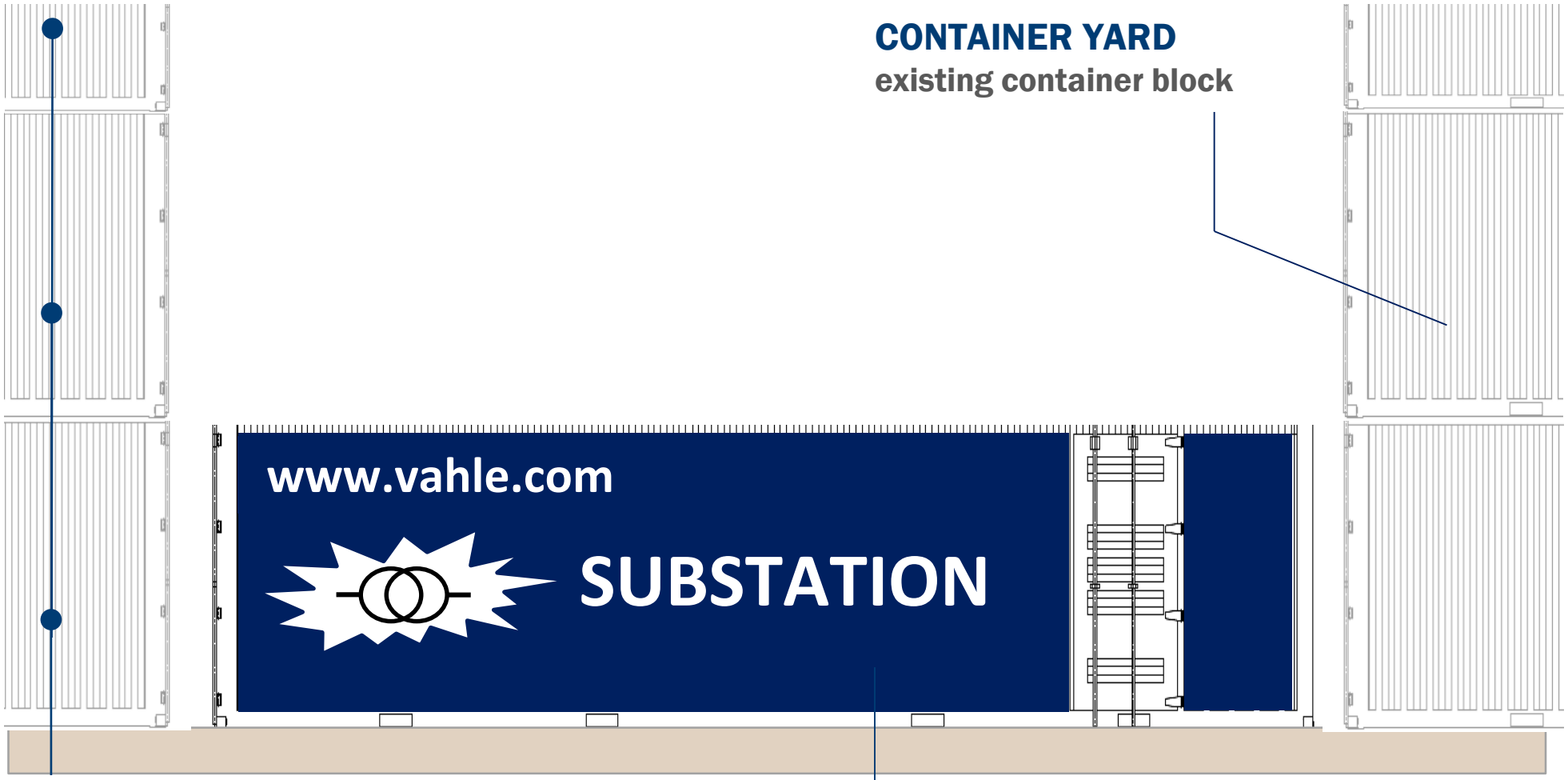
eRTG Crane – SMGX Data Communication - Live Video Images

ARTG Solution– Electrification & Automation

ARTG solution– Trimotion

ARTG Solution– Electrification & Automation

eRTG Crane – Substations



Easy to integrate in existing yard layout

Optional: HV / LV energy management

ARTG Solution– Electrification & Automation

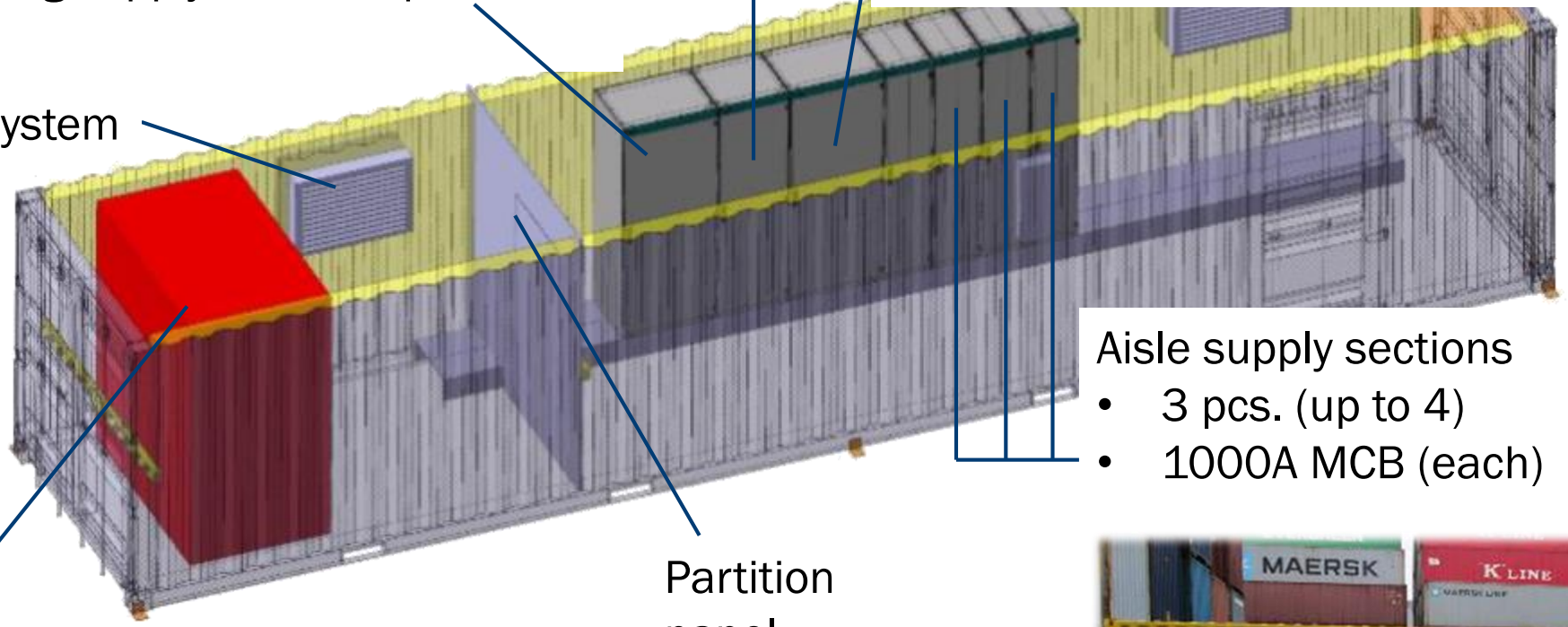
eRTG Crane – Substations - Detail

Illumination, AC, Ventilation panel

Power factor correction (400kvar)

Main incoming supply section up to 3200A

Ventilation system



Aisle supply sections

- 3 pcs. (up to 4)
- 1000A MCB (each)

Partition panel

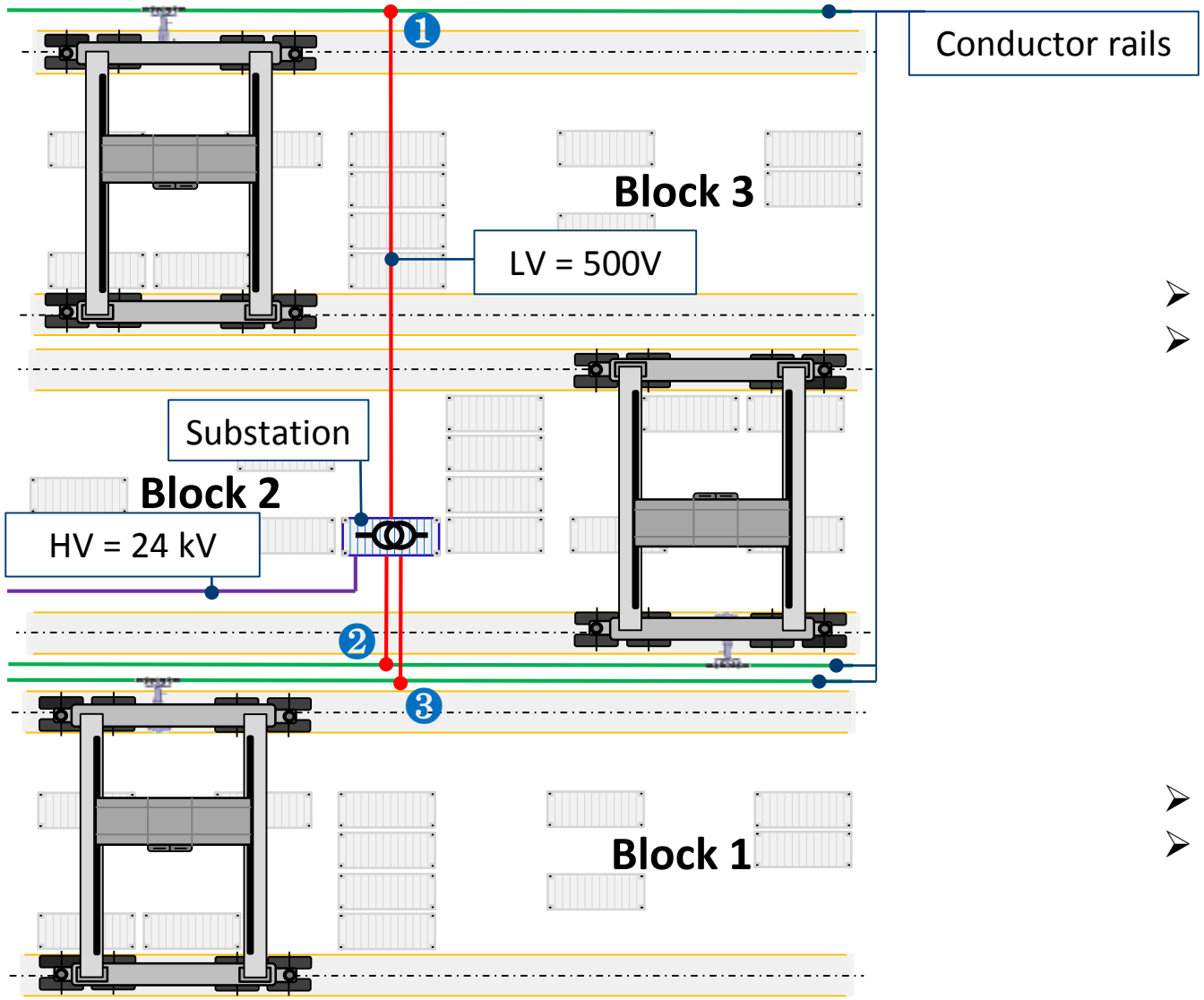
Resin transformer
24kV / 500V
Bi-directional - Eco Design

Complying with standards:

IEC/EN/VDE..100 ; DIN EN 50274
IEC 61641 ; IEC 61439 ; EN 45014

ARTG Solution– Electrification & Automation

eRTG Crane – Substation – LV & HV power link



Example:

- Center feeding of conductor rails
- Substation position optimized
  - Containerized Substation
  - Input Voltage: 24.000V AC 3phases
  - Short cable routes
  - 1000A MCB inside the substation per block
  - Low voltage release of MCB possible
  - Maximal 4 times 500V block feeding outputs
    - Used: 3 of 4
- Junction box next to conductor rails installed
- Each block independently disconnectable

Energy Storage Technology ($LiFePO_4$)

- $LiFePO_4$-batteries are ecological and most parts are recyclable
- Every single battery cell is monitored to ensure maximum avaliability and optimise the charging cycle
- Interface for online monitoring via internet
- Installation of the energy storage components in container or building
- 1 MW is equivalent to 40‘ ISO-Container

ARTG Solution– Electrification & Automation

Projects

Hong Kong, Modern Terminals Limited

- Electrification of 15.000 m & 104 RTGs
- Realisation in 2011-2012
- ARTG in 2018

GB – HPH UK – Port of Felixstowe

- Stationary: 49 Blocks
- Mobile: 48 RTGs
- Duration: 2015 - 2018

ARTG Solution– Electrification & Automation

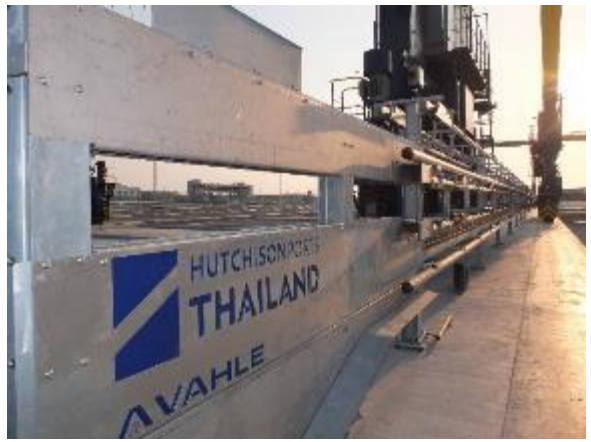
Projects

Norway – Port of Oslo

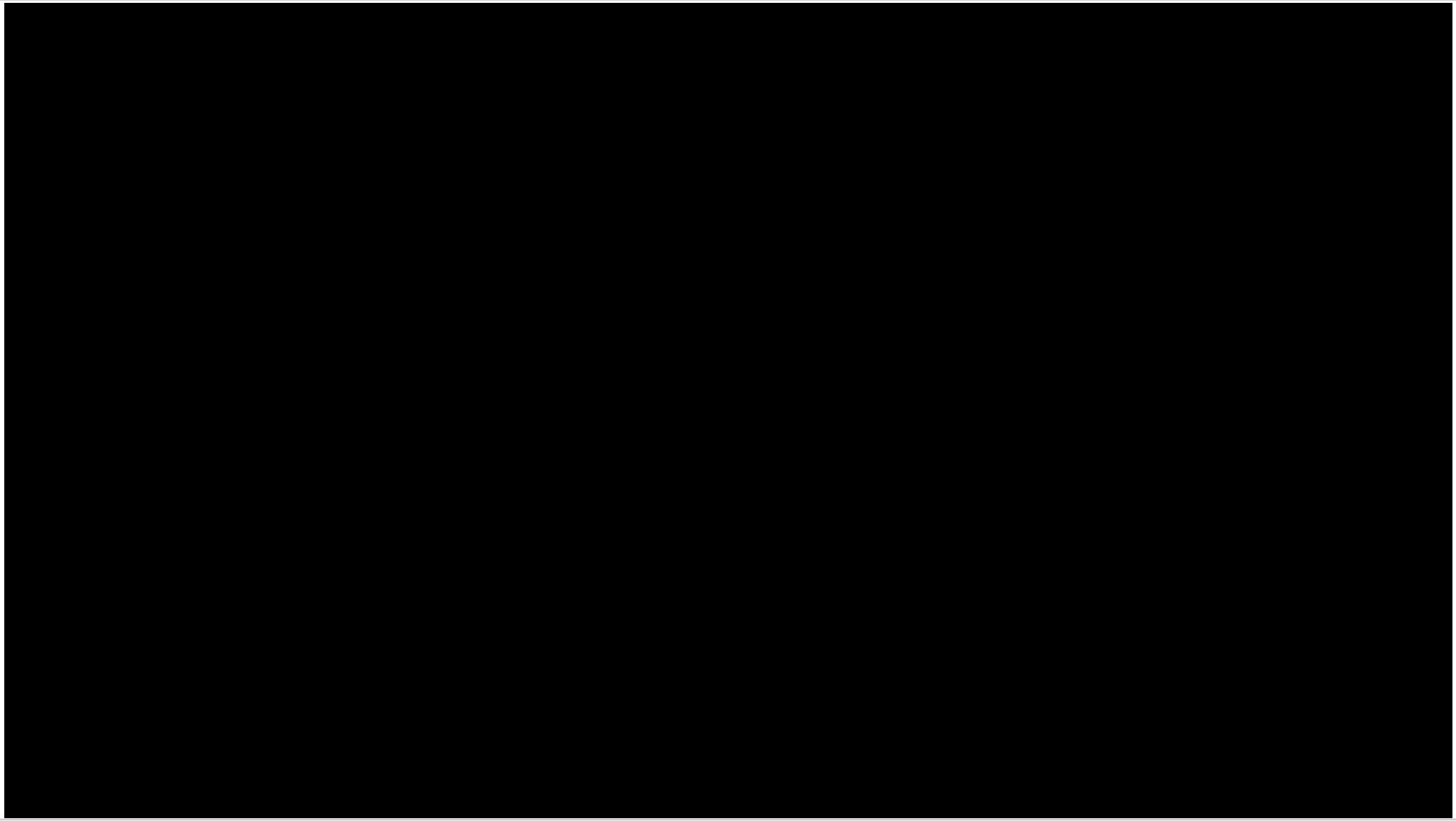
- Electrification of 4 Blocks & 2 RTGs in 2015
- Additional new testtrack (60m) with latest components of data transmission installed

Thailand – HPH HLTL – Port of Laem Chabang

- Stationary: 20 Blocks incl. Data transmission system
- Mobile: 20 RTGs
- Duration: 2017 - ongoing
- First Remote controlled RTGs for HPH Group



ARTG Reference video

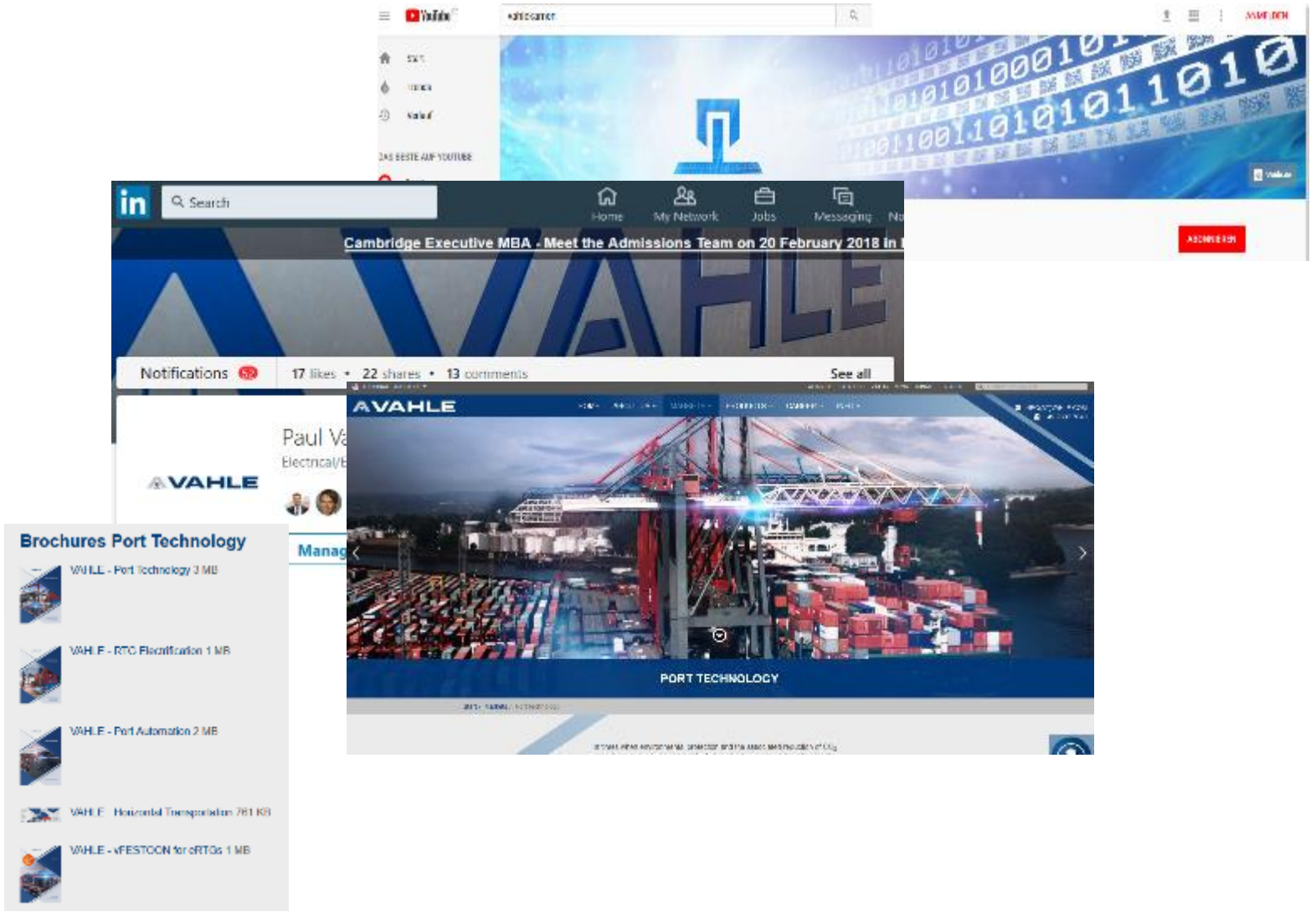


Projects references | Information | Contact details

Please follow on
- Youtube
- LinkedIn
- HomeSlide
- Brochures

Please contact us:

Jiang.xiaowei@vahle.com



AVAHLE
Business Unit Port Technology

THANK YOU FOR YOUR ATTENTION