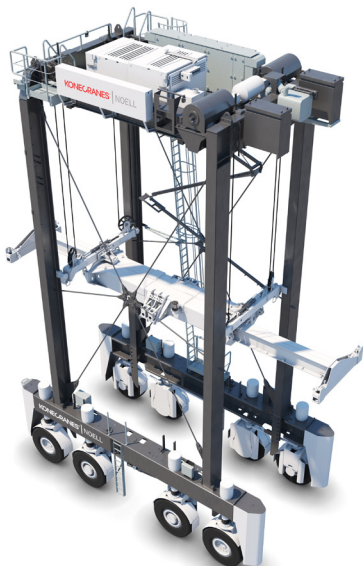


CUSTOMER TRAINING COURSE PROGRAMME

TECHNICAL TRAINING



PREFACE**PLEASE CONTACT US.**

In this brochure, you will find details of the courses available within the Konecranes Port Solutions customer training course programme.

Should you have any further questions about this customer training course programme or if you want to order one of our training courses, please do not hesitate to contact us.

**Deborah Schriegel-Bendik**

Training

Forststrasse 16

40597 Düsseldorf, Germany

Direct +49 211 7102-3792

Mobile +49 162 25 96 648

deborah.schriegel@konecranes.com

PREFACE

MAKING SKILLS WORK –

DEVELOP YOUR STAFF THROUGH OUR TRAINING COURSES

Making skills work – true to this motto we support you with high quality training course programme to exploit the full potential of your Konecranes Port Solutions products and to boost your productivity.

We offer you a comprehensive range of training courses that qualify your staff in the safe and efficient operation and maintenance of Konecranes Port Solutions products and their components. You benefit from our many years of experience. We continuously develop our training courses on the basis of intensive customer interaction and local expertise. With practical work carried out on the products, we ensure that your staff acquires the relevant know-how. We document the trainee's successful completion of the course with our training course certificates, which are recognised by the industry.

The most important highlights

- Modular, practice-oriented training course programme
- German-educated technical training instructors
- Operator training instructors with more than 20 years experience
- State-of-the-art equipment used in our training courses
- Comprehensive training course documentation for each course
- Training courses held at our training centres in
 - Düsseldorf (Germany)
 - Würzburg/Hamburg (Germany)
 - Odessa (Ukraine)
- Training courses held on site at your port
- Recognised Konecranes Port Solutions training course certificate



PREFACE

TRAINING CENTRE IN DÜSSELDORF, GERMANY



Highlights:

- Highly qualified, experienced training instructors
- State-of-the-art training workplaces equipped with Notebook and PLC controlled belt model
- Technology simulator to represent the overall crane control system
- Comprehensive training course documentation for each course
- Recognised Konecranes Port Solutions training course certificate

SIMULATOR TRAINING COURSE IN DÜSSELDORF, GERMANY



Highlights:

- Highly qualified, experienced training instructors
- State-of-the-art simulator featuring many operating scenarios that are adapted to Konecranes® Gottwald mobile harbour cranes and excellent physics simulation
- Recognised Konecranes Port Solutions crane operator licence in EC card format and official training course certificate

PREFACE

ON-SITE TRAINING COURSE AT CUSTOMER'S SITE



Highlights:

- Highly qualified, experienced training instructors
- Training course in customer's own environment with realistic conditions and following the relevant on-site procedures
- Training directly with customer's product
- Flexible training course structure switching between theory and practice
- Recognised Konecranes Port Solutions training course certificate



PREFACE

CONTENTS**1 Mobile harbour crane**

1.1	Technical training 1	9
1.2	Technical training 2	11
1.3	Troubleshooting training (on site & hands-on)	13

2 Automated guided vehicle

2.1	Technical Training 1	15
2.2	Technical Training 2	17
2.3	Battery training (BT)	19
2.4	Battery exchange station (BES)	20

3 Straddle & sprinter carriers

3.1	Technical Training 1	22
3.2	Technical Training 2	24

4 Rubber tyred gantry crane (RTG) and Rail Mounted Gantry Crane (RMG)

4.1	Technical training 1	26
4.2	Technical training 2	27

5 Product-independent training courses

5.1	SIMATIC S7 basic training	28
-----	-------------------------------------	----

MOBILE HARBOUR CRANE**1****MOBILE HARBOUR CRANE****Targets**

- Acquiring and improving the necessary skills
- Practical implementation of skills gained in classroom training
- Improved productivity through minimum downtimes and well-trained staff

Concept:**Technical Training 1 & 2****SIMATIC S7
basic training****Troubleshooting training
(on-site)**

**Safe handling and improved
container performance**

Target groups

- Maintenance staff and service technicians
- Maintenance staff and service technicians
- Experienced service technicians



making
skills
work

MOBILE HARBOUR CRANE

1.1 TECHNICAL TRAINING 1

Number of participants:

- Min. 3 and max. 8 participants

Duration:

- 5 days

Location:

- Training Center Düsseldorf, Germany
- On site

In this course, fundamental knowledge about Konecranes® Gottwald cranes is conveyed to the trainees. Trainees will first learn about the general set-up of their crane and become familiar with the product documentation. To be able to perform the maintenance work and fault diagnosis, trainees are introduced to the fundamentals of the electrics and hydraulics of their Konecranes® Gottwald products. The training also includes learning to read the circuit diagrams and hydraulic drawings. Trainees also receive instruction on the functions and settings of drive units and assemblies such as the hoists, slewing and luffing gear units as well as the brakes, steering and stabilisers.

“Technical training 1” is designed for electricians and mechanics involved in work or maintenance work on mechanical, hydraulic or electrical components of a Konecranes® Gottwald product.

Seminar contents:

- Mobile harbour cranes
 - G HxK/HxK general diagrams
 - G HxK/HxK superstructure/chassis/etc.
- Documentation
 - Training manual
 - Operating and maintenance manuals
 - Spare parts catalogue (CD ROM)
- Electrics
 - Designation systems for control systems and auxiliary units
 - Function modules, function designations etc.
 - Circuit diagrams
- Hydraulics
 - Introduction to hydraulics
 - Illustration of hydraulic symbols
 - Hydraulic circuit diagrams

Continued on next page

MOBILE HARBOUR CRANE

Continued from “Technical training 1” course programme

- Crane components
 - Superstructure and tower set-up
 - Hoist function and set-up
 - Slewing gear function and set-up
 - Luffing gear function and set-up

 - Chassis set-up
 - Travel gear function and set-up
 - Steering function and set-up
 - Brake function and set-up
 - Stabiliser function and set-up
- } for G HMK/HMK



MOBILE HARBOUR CRANE**1.2 TECHNICAL TRAINING 2****Number of participants:**

- Min. 3 and max. 8 participants

Duration:

- 5 days

Location:

- Training Center Düsseldorf, Germany
- On site

The trainees are taught knowledge relevant to the correction of faults on Konecranes® Gottwald cranes. After fundamental explanations of the way the control system, consisting of hardware and software components, is made up, key aspects of the bus systems are examined in detail. Additional insights into programming and the programming language used make subsequent troubleshooting that much easier. Participants will become familiar with one of the tried and tested aids for diagnosing faults – the Visumatic® control and visualisation system. Hands-on training enables the trainees to learn practical fault diagnosis skills and remedies.

Technical Training 2 is designed for electricians involved in more complex maintenance work or tougher troubleshooting.

Seminar contents:

- Programmable logic controller (PLC)
- PLC on mobile harbour cranes
 - Industrial PC/hardware/software/ethernet
 - Controller S7 300/S7 400 set-up/displays
- PROFIBUS DP
 - PROFIBUS DP components and interface
 - S7 hardware configuration
- ET 200S
 - IM 151 interface module set-up and displays
 - ET 200S input and output modules
- ASI bus
 - Set-up/function
 - Master and slave module set-up/function
- CAN bus (G HxK only)
 - Set-up/function
 - Master and slave module set-up/function

Continued on next page

MOBILE HARBOUR CRANE

Continued from "Technical training 2" course programme

- STEP 7 programming environment
 - Organisation blocks (OB)
 - Function blocks (FB)
 - Function (FC)
 - Data blocks (DB)
- Programming languages
 - Statement list (STL)
 - Function block diagram (FBD)
 - Ladder diagram (LAD)
- Online functions
 - Main window
 - Menu and toolbar
 - Object organiser
 - Variable table (VAT)
- User program
 - Set-up and structure
 - Signal tracking
 - Functions

MOBILE HARBOUR CRANE**1.3 TROUBLESHOOTING TRAINING (ON SITE & HANDS-ON)****Number of participants:**

- Min. 3 and max. 4 participants

Duration:

- 5 days

Location:

- On site

Requirements:

- Mobile harbour crane must be available

The trainees are taught knowledge relevant to the correction of faults on Konecranes® Gottwald cranes. After fundamental explanations of the way the control system, consisting of hardware and software components, is made up, key aspects of the bus systems are examined in detail. Additional insights into programming and the programming language used make subsequent troubleshooting that much easier. Participants will become familiar with one of the tried and tested aids for diagnosing faults – the Visumatic® control and visualisation system. Hands-on training enables the trainees to learn practical fault diagnosis skills and remedies.

The troubleshooting training is designed for electricians involved in more complex maintenance work or tougher troubleshooting.

Seminar contents:

- Electrics
 - Fault finding with Visumatic®
 - Fault finding with electrical booklet and multimeter
- Hydraulics
 - Fault finding with Visumatic® and hydraulic diagram
- Programmable logic controller (PLC)
 - Introduction into the user program
 - Fault finding with SIMATIC Manager
 - Error logging
 - Error recovery
- PROFIBUS DP
 - Reviewing connections at components and interfaces
- ET 200S
 - Evaluating status LEDs
 - Checking input and output modules

Continued on next page

MOBILE HARBOUR CRANE

Continued from “Troubleshooting training (on site & hands-on)” course programme

- ASI bus
 - Evaluating status LEDs
 - Replacing faulty components
 - Readdressing connected slaves
 - Displaying digital and analogue values
- Online functions
 - Diagnosing online status of the crane
 - Displaying variables in VAT
 - Comparing online/offline user program
 - Downloading user program
 - Signal tracking



AUTOMATED GUIDED VEHICLE**2 AUTOMATED GUIDED VEHICLE****2.1 TECHNICAL TRAINING 1****Number of participants:**

- Min. 3 and max. 6 participants

Duration:

- 2 days

Location:

- On site

Requirements:

- AGV must be available

In this course, fundamental knowledge about Konecranes® Gottwald cranes is conveyed to the trainees. Trainees will first learn about the general set-up of their crane and become familiar with the product documentation. To be able to perform the maintenance work and fault diagnosis, trainees are introduced to the fundamentals of the electrics and hydraulics of their Konecranes® Gottwald products. The training also includes learning to read the circuit diagrams and hydraulic drawings.

Technical training 1 is designed for electricians and mechanics involved in work or maintenance work on mechanical, hydraulic or electric components of an AGV.

Seminar contents:

- Automated guided vehicle (AGV)
 - General view of the components
 - Technical data
 - Safety instructions
- Documentation
 - Training manual
 - Operating and maintenance manuals
 - Spare parts catalogue (CD ROM)
- Electrics
 - Designation systems for control systems and auxiliary units
 - Function modules, function designations etc.
 - Circuit diagrams
- Hydraulics
 - Introduction to hydraulics
 - Illustration of hydraulic symbols
 - Hydraulic circuit diagrams

Continued on next page

AUTOMATED GUIDED VEHICLE

Continued from “Technical Training 1” course programme

- Vehicle components
 - Control system
 - Sensors
 - Chassis set-up
 - Travel gear function and set-up
 - Steering function and set-up
 - Brake function and set-up



AUTOMATED GUIDED VEHICLE**2.2 TECHNICAL TRAINING 2****Number of participants:**

- Min. 3 and max. 6 participants

Duration:

- 2 days

Location:

- On site

Requirements:

- AGV must be available

The trainees are taught knowledge relevant to the diagnosis and correction of faults on Konecranes® Gottwald cranes. After fundamental explanations of the way the control system, consisting of hardware and software components, is made up, key aspects of the bus systems are examined in detail. Additional insights into programming and the programming language used make subsequent troubleshooting that much easier. Hands-on training enables the trainees to learn practical fault diagnosis skills and remedies.

Technical Training 2 is designed for electricians involved in more complex maintenance work or tougher troubleshooting.

Seminar contents:

- Fundamentals of programmable logic controller (PLC)
- PLC on automated guided vehicles (AGV)
 - User program
 - Software update
 - Troubleshooting
- CAN bus
 - CAN bus components and interface
- Signal routes
- Introductions to TEAMS, FMDS, BMS, FCS
- Inverters
 - Basics
 - Manufacturer's documentation
 - Parameter update
 - Firmware update

Continued on next page

AUTOMATED GUIDED VEHICLE

Continued from “Technical Training 2” course programme

- IO Box
- Lütze LOCC Box Net
- Service display
 - Troubleshooting
 - Advanced user
 - Software update
- Sensors used on the AGV
- WLAN access point



AUTOMATED GUIDED VEHICLE

2.3

BATTERY TRAINING (BT)

Number of participants:

- Min. 3 and max. 6 participants

Duration:

- 0.5 days

Location:

- On site

Requirements:

- Battery exchange station and maintenance point must be available



In this course, fundamental knowledge about the AGV battery is conveyed to the trainees. Trainees will first learn about the general set-up of the battery and become familiar with the product documentation, so that they are able to perform maintenance work. Hands-on training enables the trainees to experience important maintenance steps on the product.

The battery training is designed for electricians involved in work or maintenance work on electric components or involved in troubleshooting.

Seminar contents:

- Safety
 - Electrical hazards
 - Safe handling of batteries
- Documentation
 - Training manual
 - Operating and maintenance manuals
- Batteries
 - Set-up
 - Changing manually
 - Maintenance
 - Water refill
 - Measuring acid density
 - Measuring cell voltage
 - Function of Wire-IQ
- Battery charger
 - Functions
 - Status lamps
- Battery exchange station
 - Automatic mode for battery maintenance

AUTOMATED GUIDED VEHICLE

2.4 BATTERY EXCHANGE STATION (BES)

Number of participants:

- Min. 3 and max. 6 participants

Duration:

- 1 day

Location:

- On site

Requirements:

- Battery AGV and battery exchange station must be available

In this course, fundamental knowledge about the AGV battery exchange station is conveyed to the trainees. Trainees will first learn about the general set-up of the battery exchange station and become familiar with the product documentation, so that they are able to perform maintenance work. Hands-on training enables the trainees to learn important fault diagnosis skills and remedies.

The battery exchange station training is designed for electricians involved in work or maintenance work on electric components or involved in troubleshooting.

Seminar contents:

- Safety
 - Electrical hazards
 - Safe handling of batteries
- Documentation
 - Training manual
 - Operating and maintenance manuals
- Batteries
 - Set-up and technical information
- Battery charger
 - Functions
 - Status lamps
 - Fault messages
- FMDS and BMS
 - Set-up
 - Operation
 - Fault messages
- BESC
 - Set-up
 - Troubleshooting

Continued on next page

AUTOMATED GUIDED VEHICLE

Continued from “Battery exchange station (BES)” course programme

- Function and set-up of the Battery exchange station
 - Automatic mode
 - Manual operation
 - Maintenance calibration
 - Fault messages
 - Troubleshooting



STRADDLE & SPRINTER CARRIERS**3 STRADDLE & SPRINTER CARRIERS****3.1 TECHNICAL TRAINING 1****Number of participants:**

- Min. 3 and max. 8 participants

Duration:

- 5 days

Location:

- Würzburg, Germany
- On site

Requirements:

- For on-site training a straddle carrier and/or a sprinter carrier must be available

In this course, fundamental knowledge about straddle carriers and sprinter carriers is conveyed to the trainees. Trainees will first learn about the general set-up of the straddle carrier and sprinter carrier and become familiar with the product documentation. To be able to perform the maintenance work and fault diagnosis, trainees are introduced to the fundamentals of the electrics and hydraulics. The training also includes learning to read the circuit diagrams and hydraulic drawings.

Technical Training 1 is designed for electricians and mechanics involved in work or maintenance work on mechanical, hydraulic or electric components of straddle carriers & sprinter carriers.

Seminar contents:

- Straddle carrier & sprinter carrier
 - Inspection of the main components
 - Explanation and location of the safety features
 - Introduction to the operational controls
- Documentation
 - Training manual
 - Operating and maintenance manual
 - Spare parts catalogue (CD ROM)
- Electrics
 - Designation systems for control systems and auxiliary units
 - Function modules, function designations etc.
 - Circuit diagrams
 - Basic description of individual electric systems

Continued on next page

STRADDLE & SPRINTER CARRIERS

Continued from "Technical Training 1 for Noell NSC E" course programme

- Hydraulics
 - Introduction to hydraulics
 - Illustration to hydraulic symbols
 - Hydraulic circuit diagrams
 - Basic description of individual hydraulic systems
- PLC system
 - Description and function of the CAN bus
 - Basic description of the PLC system
 - PLC software update with a USB memory stick
- Generator
 - Basic description of the generator
- Generator/frequency inverters
 - Basic description of the inverters
 - Diagnostics using the frequency inverter/CAN fault list
 - Basic description of the emergency recovery procedure
- Diesel engine
 - Overview of the main diesel engine components
- Straddle carrier & sprinter carrier maintenance
 - Maintenance schedule



STRADDLE & SPRINTER CARRIERS**3.2****TECHNICAL TRAINING 2****Number of participants:**

- Min. 3 and max. 8 participants

Duration:

- 3 days

Location:

- Würzburg, Germany
- On site

Requirements:

- For on-site training a straddle carrier and/or a sprinter carrier must be available

The trainees are taught knowledge relevant to the diagnosis and correction of faults on the straddle carrier and sprinter carrier. After fundamental explanations of the way the control system, consisting of hardware and software components, is made up, key aspects of the bus systems are examined in detail. Additional insights into programming and the programming language used make subsequent troubleshooting that much easier. Hands-on training enables the trainees to learn practical fault diagnosis skills and remedies.

Technical Training 2 is designed for electricians involved in more complex maintenance work or tougher troubleshooting.

Seminar contents:

- Straddle carrier & sprinter carrier
 - Explanation and location of the safety features
- Electrics
 - Overview of the electrical system
 - Electrical components (e.g. absolute encoder, keyboard etc.)
 - Description and function of the individual electric systems
 - Hoist
 - Drive system
 - Troubleshooting the electrical system
- PLC system
 - Description and function of the CAN bus
 - Working with PCanView to diagnose the CAN bus
 - Working with CoDeSys (monitoring the program and creating HEX files)
 - Working with WinFlash (downloading HEX files to ESX controller)
 - Working with the Mvision software to set up and program the display
 - PLC software update with a USB memory stick
 - PLC data upload with a USB memory stick

Continued on next page

STRADDLE & SPRINTER CARRIERS

Continued from "Technical Training 2 for Noell NSC E" course programme

- Describing and changing important PLC parameters
- Troubleshooting the PLC system
- Generator
 - Description and function of the generator
 - Troubleshooting the generator
- Frequency inverters
 - Description and function of the inverters
 - Diagnostics using the frequency inverter/CAN fault list
 - Downloading and changing parameters
 - Troubleshooting the frequency inverter
 - Description and function of the emergency recovery procedure
- Hydraulics
 - Steering system
 - Diagnostic software (only for electrical steering system)
 - Brake system
 - Spreader
 - Troubleshooting the hydraulic systems
- Diesel engine
 - Diagnostics for the diesel engine



RUBBER TYRED GANTRY CRANE (RTG) AND RAIL MOUNTED GANTRY CRANE (RMG)

4 RUBBER TYRED GANTRY CRANE (RTG) AND RAIL MOUNTED GANTRY CRANE (RMG)

4.1 TECHNICAL TRAINING 1

Number of participants:

- Min. 3 and max. 8 participants

Duration:

- 3 days

Location:

- Onsite
- Odessa



In this course, fundamental knowledge about RTG/RMG cranes is conveyed to the trainees. Trainees will first learn about the general set-up of their crane and become familiar with the product documentation. To be able to perform the maintenance work and fault diagnosis, trainees are introduced to the fundamentals of the electrics and hydraulics of their Konecranes products. The training also includes learning to read the circuit diagrams and hydraulic drawings. Trainees also receive instruction on the functions and settings of drive units and assemblies.

“Technical training 1” is designed for electricians and mechanics involved in work or maintenance work on mechanical, hydraulic or electrical components of a Konecranes product.

Seminar contents:

- RTG/RMG
 - General diagrams
- Documentation
 - Training manual
 - Operating and maintenance manuals
 - Spare parts catalogue (CD ROM)
- Electrics
 - Designation systems for control systems and auxiliary units
 - Function modules, function designations etc.
 - Circuit diagrams
- Crane components

RUBBER TYRED GANTRY CRANE (RTG) AND RAIL MOUNTED GANTRY CRANE (RMG)**4.2 TECHNICAL TRAINING 2****Number of participants:**

- Min. 3 and max. 8 participants

Duration:

- 3 days

Location:

- Onsite
- Odessa

The trainees are taught knowledge relevant to the correction of faults on Konecranes products. After fundamental explanations of the way the control system, consisting of hardware and software components, is made up, key aspects of the bus systems are examined in detail. Additional insights into programming and the programming language used make subsequent troubleshooting that much easier. Participants will become familiar with one of the tried and tested aids for diagnosing faults – the CMS. Hands-on training enables the trainees to learn practical fault diagnosis skills and remedies.

Technical Training 2 is designed for electricians involved in more complex maintenance work or tougher troubleshooting.

Seminar contents:

- Programmable logic controller (PLC)
- PLC on RTG/RMG
- Bus Systems
- Signal routes
- STEP 7 programming environment
 - Organisation blocks (OB)
 - Function blocks (FB)
 - Function (FC)
 - Data blocks (DB)
- Programming languages
 - Statement list (STL)
 - Function block diagram (FBD)
 - Ladder diagram (LAD)
- Online functions
 - Main window
 - Menu and toolbar
 - Object organiser
 - Variable table (VAT)

PRODUCT-INDEPENDENT TRAINING COURSES**5 PRODUCT-INDEPENDENT TRAINING COURSES****5.1 SIMATIC S7 BASIC TRAINING****Number of participants:**

- Min. 3 and max. 6 participants

Duration:

- 5 days

Location:

- Training Center Düsseldorf, Germany

Trainees are taught the relevant knowledge about Siemens S7 PLC Systems, the hardware set-up and the programming languages. The participants work with the belt model and can start to develop their own programming solutions. Hands-on training enables the trainees to learn practical fault diagnosis skills and remedies.

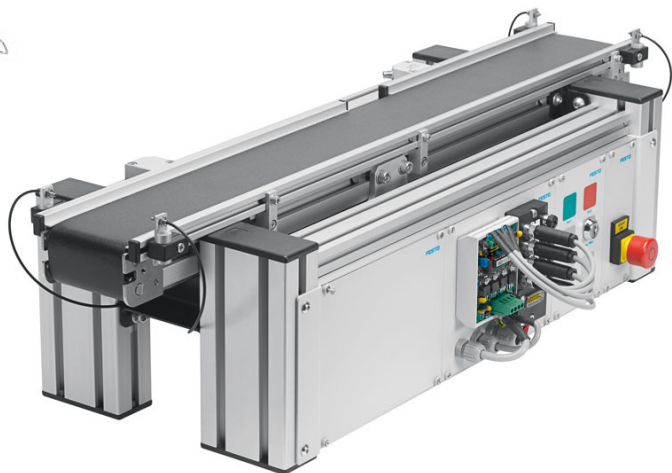
Seminar contents:

- Belt model
 - (hands-on)
- Programmable logic controller (PLC)
 - Fundamentals of programmable logic controller (PLC)
 - Memory areas
 - Program cycle
 - Block types
 - Data types
 - Addressing
- Programming the PLC
 - Programming languages
 - Statement list (STL)
 - Function block diagram (FBD)
 - Ladder diagram (LAD)
 - Digital and analogue instructions
- PLC hardware
 - Central device S7 300/S7 400 (CPU)
 - Decentralised periphery (ET 200 station)
 - Hardware configuration
 - PROFIBUS connection

PRODUCT-INDEPENDENT TRAINING COURSES

Continued from “SIMATIC S7 basic training” course programme

- SIMATIC manager
 - General set-up
 - User interface and operation
 - Applications
 - Creating logic blocks
 - Multiple instances in the variable declaration
 - Entering and editing addresses and parameters
 - Editing FBD and STL elements
 - Establishing online connections
 - Download/upload
 - Deleting on the programmable controller
 - Compressing the user memory
 - Managing multilingual texts
- Simulation tool
 - SIMATIC S/-PLCSIM



Notes

[illegible]


PRODUCT-INDEPENDENT TRAINING COURSES

Notes

[illegible]



Konecranes is a world-leading group of Lifting Businesses™, serving a broad range of customers, including manufacturing and process industries, shipyards, ports and terminals. Konecranes provides productivity enhancing lifting solutions as well as services for lifting equipment of all makes. The Group has 18,000 employees at 600 locations in 50 countries. Konecranes is listed on Nasdaq Helsinki (symbol: KCR).

© 2019 Konecranes. All rights reserved. 'Konecranes', 'Lifting Businesses' and  are either registered trademarks or trademarks of Konecranes.



konecranes.com