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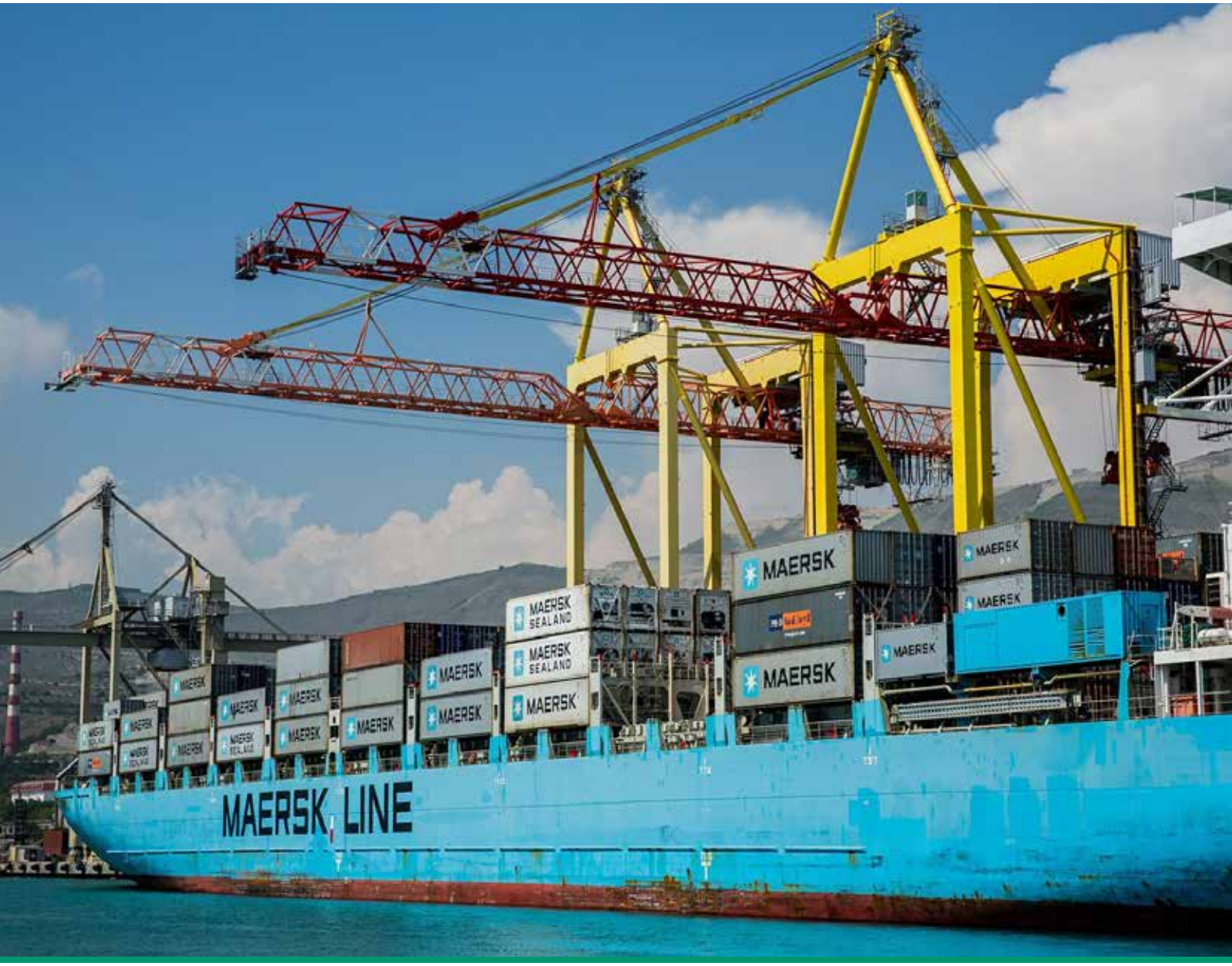
POSITION AND ANGLE CONTROL SYSTEM, INVERTED PENDULUM

Applied Automatic Control Technology

1st Edition

APPLIED AUTOMATIC CONTROL TECHNOLOGY – POSITION AND ANGLE CONTROL SYSTEM, INVERTED PENDULUM

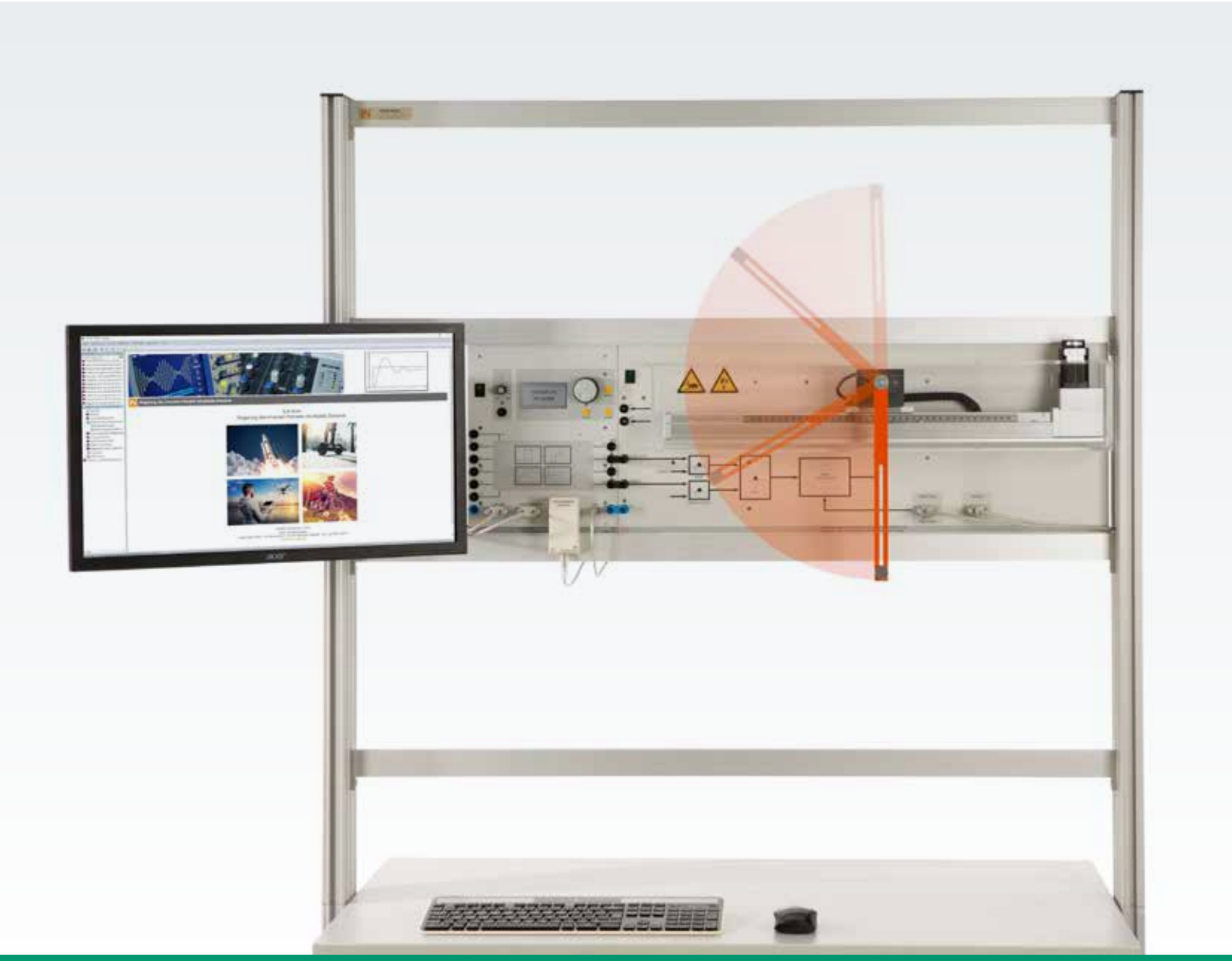


The ever increasing degree of automation affecting processes in all areas of industry necessitates a variety of control strategies and algorithms. The training system on positioning and angular controlled systems contains a broad spectrum of training material designed for the vivid and engaging teaching of everything from classic automatic positioning control with standard controllers all the way to model-based multivariable control in state space. A unique challenge is posed by oscillating and balancing a pendulum rod (inverted pendulum) that is pivot-mounted on a carriage that is subject to purely horizontal acceleration. The principle can also be applied to the automatic control of the Segway PT.

Training contents

- Automatic positioning control of an integral-action controlled system
- Automatic angular control with standard controllers
- Control engineering system analysis
- Automatic control of an inverted pendulum with standard controllers
- Developing models for simulation in Matlab Simulink
- Developing a model-based control system
- Automatic state-space control of an inverted pendulum as multivariable system
- Automatic system control for pendulum oscillation
- Implementation for Segway application
- Implementation for container bridge

Art. no. CO3620-2G



Technical data

- Linear axis with belt drive and recirculating ball bearing guide
- Travel distance of up to 400 mm
- High-performance hybrid stepping motor with power up to 100W
- Maximum speed of 0.5 m/s
- Acceleration rates of up to 10 m/s2
- Integrated speed and current control
- Position detection using a high-resolution incremental encoder with 4000 pulses per revolution
- Angular position detection using a high-resolution incremental encoder with 16000 pulses per revolution via a CAN interface
- Pendulum rod with a moveable centre of gravity
- Toggle switch for automatic initiation of a reference run (homing)
- Selection of the setpoint speed via an analog signal ±10 V
- Position switch outputs for use with primary control

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Ref. no.: K-I0-1195-GB
Applied automatic control - Inverted pendulum

12/19-GB (Printed in Germany)
Subject to technical amendments.