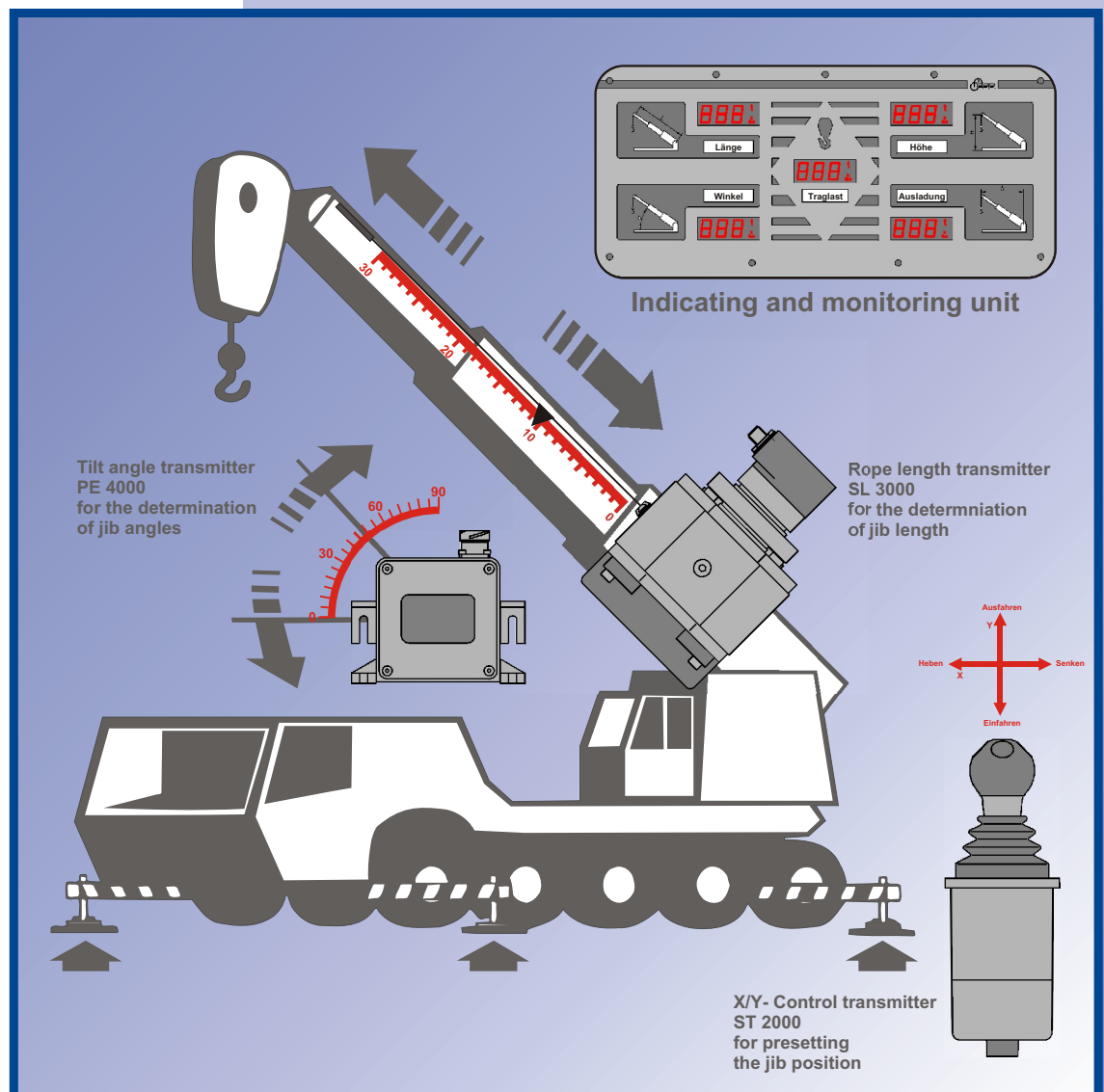


Systems of measurement for cranes and excavators



Demonstration panel

Systems of measurement for cranes and excavators; application example "telescopic crane"

Control and monitoring systems in this range of application make high demands on precision and reliability of all measuring components.

Important measuring data within the control system of a mobile crane for load moment limitation are for example angle and length signals of the telescope jib.

Measurement of that kind of data is carried out by means of **tilt angle and rope length transmitters**. From both signals, in the indicating and monitoring unit the values of jib overhang, hoisting height as well as the value of maximum load are calculated and displayed.

To demonstrate that kind of measuring problem the panel contains separate transducers for length and angular measurement.

For practical use in large-scale appliances for that kind of measuring purposes, mainly combination apparatuses are used, which contain in a fully enclosed casing the displacement and angle transducer as well as the collector ring for measuring cable signals.

To the available spectrum of measuring techniques of a mobile crane belong far more measuring components, as can be shown on the demonstration panel. This includes among other things transducer and indicating systems for determination and display of the

- **inclination of a trucks platform**
- **values of the pressures and lengths of supporting bars**
- **length of telescopic jib and the associated angle**
- **angular position of live ring and corresponding rotating speed**
- **hoisting rope length with associated uncoiling speed**
- **wind velocity and preset control value of control systems with electronic hand operated and pedal actuated control transmitters.**

... **Actual value determination of telescope jib length and telescope jib angle**

For determination of the jib length, only **transducers** are used, functioning on the basis of the **draw wire measuring principle**.

They contain in a robust aluminium case of degree of protection IP 65 a lightweight high precision measuring drum on which - by means of an extremely stable spring pull-back mechanism - one layer of a highly flexible steel rope is wound.

An outside the drum casing flange-mounted angular position encoder converts the number of drum revolutions, which is proportional to the measured length into an analogue or digital measuring signal.

Systems of that kind are capable of measuring straightforwardly lengths up to 60 m even under most extreme operating conditions.

On many types of cranes, so called **rope-length/angle transducers** are used. They contain a spring cable reel for the determination of the jib length and an optoelectronic tilt angle transmitter for the determination of the jib angle, integrated in a combined casing.

Tilt angle transmitters

are available as single axis and dual axis pendulum systems for the determination of the angular position of the telescope jib, of the tip of the level luffing jib and the determination of the tilt angle value of a bogie truck, for levelling purposes also as separate units.

*Further ratings are covered in following printed papers
"Rope Length Transmitters" and "Tilt Angle Transmitters".*

... **Set-point adjustment of telescope jib position**

Set-point adjustment of telescope jib position inside the lifting and slewing gear is carried out by means of x/y control transmitters.

They contain in each semi axis a robust inductive control system with a subsequent, in most cases redundant electronics for analogue control signal generation in form of a current or voltage variation, which is appropriate for hydraulic servo systems.

Further information referring to models, control handle modifications and characteristic curves of the signal are covered in the printed paper "X/Y Control Transmitters".

... **Indicating and monitoring unit**

The indicating and monitoring unit processes the signals of the telescope jib length and telescope jib angles.

The two signals are used to present on the frontal seven segment LED-display:

- **boom angle**
- **telescoped length**
- **hoisting height**
- **overhang and**
- **maximum load of the telescope jib.**

detailed data on request

Not shown are:

... **Live ring transmitter**

The live ring transmitter detects the angle and speed of swing of the telescope jib.

Inside a splash-proof aluminium case of protection degree IP 65, it contains a Gray-coded aperture disk with a resolution of 10 bits. The angular information is output via the built-in digital-to-analogue converter (DAC), as a current signal with sawtooth characteristic, 4 - 20 mA for 0 to 360°.

Referring to the speed of swing, the interpulse period of the outer sampling track of the Gray-coded aperture disk is evaluated by means of a microprocessor. The signal is output also as a 4 - 20 mA current signal with a resolution of 8 bits.

... **Rope drum transmitter**

The rope drum transmitter, integrated in a splash-proof aluminium case of protection degree IP 66 is to be coupled directly with the rope winch.

It contains a backlash compensated gear, to adapt the rope winch revolutions to the switching angle of the brake-before-make contacts of the cam-operated switch, which are used to limit the end point of the hoisting rope on the rope winch.

Speed and length of the hoisting rope are output via a built-in incremental transducer with transistor outputs having an offset of 90°.

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