Fakulta strojní VŠB – TUO

Department of Control Systems and Instrumentation

Automatic Control Devices
2023

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Lecture No. 1
Overview of the principles of sensors and sensors, methods of evaluation, static, dynamic properties (follow-up to the subjects Automation technology, Measurement and sensor technology). (Question 2, 3, 4, 5, 6, 7).

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What do you find out?

- An overview of the principles of sensors and sensors
  - Position
  - Distance
  - Temperature
  - Vibration
  - Force
  - ....
- Ways of evaluation
- Static properties
- Dynamic properties
- ... .

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Prerequisite knowledge

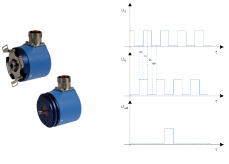- **In the subjects Automation technology in the bachelor's study** -

- **In the subject Measurement and sensor technology in the master's study** -

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Criterion I

- for measuring electrical quantities,
- …

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Criterion I

This is one of the basic criteria used by the designer when designing measuring and control systems.

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Criterion II

- Capacitive
…. .

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Criterion II

Not all methods of evaluation may be suitable for measuring in the conditions of technology.

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Criterion III

- Active
- …

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Criterion III

The essence of this criterion is whether the given sensor **needs an external source for its operation or uses energy from the technology (from the measured quantity) for its operation.**

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Criterion IV

- Continuous
- ...

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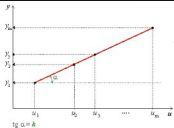Department of Control Systems and Instrumentation

Criterion IV

Values from sensors can be **continuous** when the output (measured) **quantity is continuous in level**

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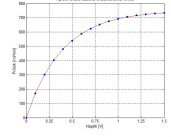
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Static properties

- **Static characteristic**

- **Class of accuracy**

- **Sensitivity**

- **Scale range of the measuring instrument**

- **Measuring range**

- **...**

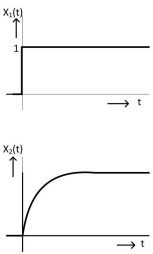$$\sigma_{TP} = \frac{|\Delta_m|}{X_R}100\%$$

Δ_m

X_R

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Dynamic properties
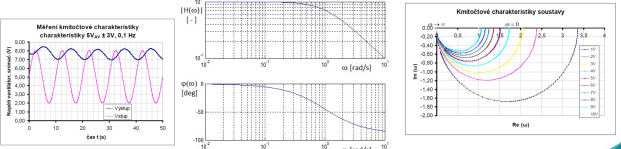
- **Step respons**

$X_1(t)$

$X_2(t)$

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Dynamic properties

- **Frequency characteristic**

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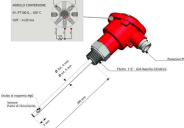Department of Control Systems and Instrumentation

Requirements

- Principle of sensor
  - measurement of dimensions, length, presence of objects, position, level height of liquids and loose materials
  - measurement of flows and pressures of gases, liquids and bulk materials
  - temperature and heat measure
  - measuring speed, shaft speed, weight, forces, torques and vibrations
  - …

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Example sensor question

- **Principle**

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What methods do you know of evaluating measured quantities?
How do we connect the V-meter to the circuit, what is its internal resistance?
How do we connect an A-meter to a circuit, what is its internal resistance?

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Example sensor question

- Principle of ...
- **Evaluation of**

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Example sensor question

- Principle of ...
- **Evaluation of**

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Example sensor question

- Principle of ...
- **Evaluation of**

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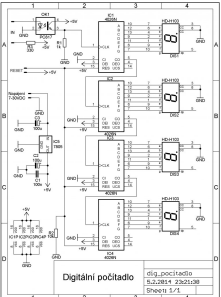Department of Control Systems and Instrumentation

Example sensor question

- **Decadal counter for 4 orders**

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Example sensor question

- Principle of ...
- Evaluation of ...
- **Mathematical dependence**

$$\Delta R = f(\Delta t)$$
$$\Delta U \approx \Delta R$$

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Example sensor question

- Principle of ...
- Evaluation of ...
- Mathematical
- **Static characteristic**

R[Ω]

t[°C]

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Example sensor question

- Principle of ...
- Evaluation of ...
- Mathematical
- Static characteristic
- **Sampling**

Kvantovaný a vzorkovaný signál

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Example sensor question

- Principle of ...
- Evaluation of ...
- Mathematical
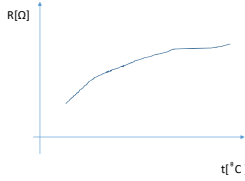- Static characteristic
- Sampling
- **Practical applications**

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What was the content of the lecture

- An overview of the principles of sensors and sensors
  - Position
  - Distance
  - Temperature
  - Vibration
  - Force
  - ....
- Ways of evaluation
- Static properties
- Dynamic properties
- ... .

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Thank you for your attention …

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