

Fakulta strojní VŠB – TUO

Katedra automatizační techniky a řízení

**Prostředky automatického řízení**  
**2023**  
(Podklady pro poznámky)

doc. Ing. Jaromír Škuta, Ph.D.

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Katedra automatizační techniky a řízení

**Přednáška č. 4**  
**Řídicí systémy na bázi PLC, IPC, uP, ...**  
**(ot. č. 1, 4, 17).**

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Katedra automatizační techniky a řízení

**Co se dovíte?**

- Regulóstory
- Řídicí systémy
  - PLC
  - IPC
  - uP
- Vnitřní struktura řídicích systémů
- Vnitřní struktura I/O karet
- Rozhraní řídicích systémů.
- Vlastnosti řídicích systémů.

• ...  
• (Ot. č. 8, 9, 12, 15, 16).

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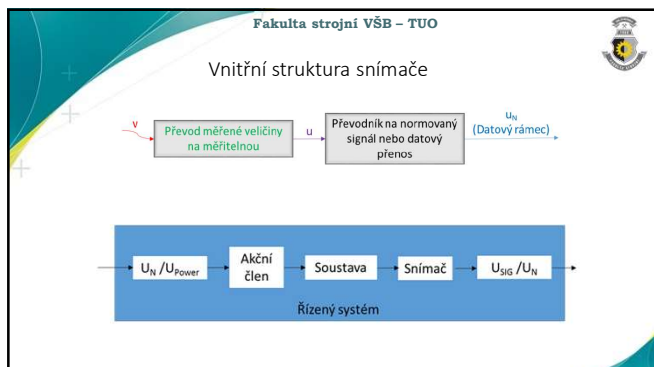
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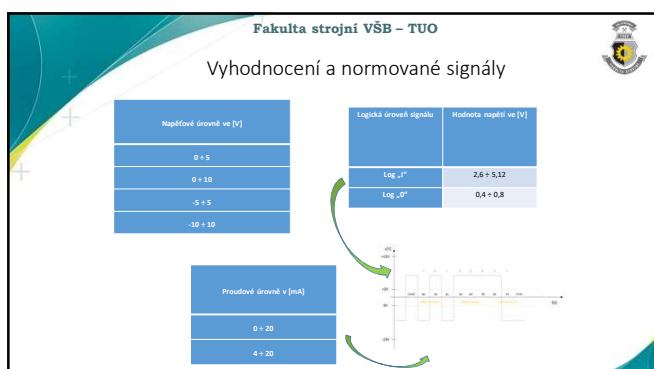
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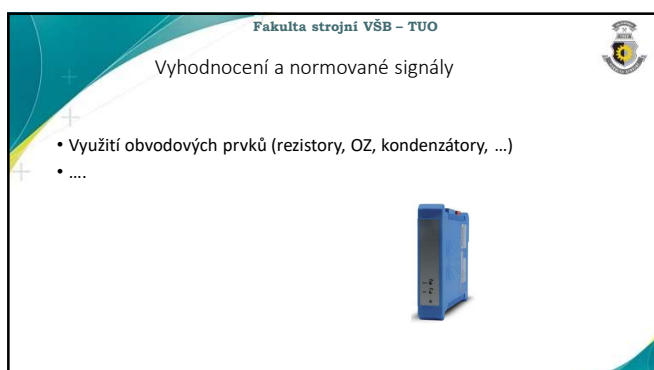
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### Vyhodnocení a normované signály

- Pasivní obvodové prvky



**Voltage Comparator**

$$V_{out} = \begin{cases} V_{ref} & \text{if } V_{in} > V_{ref} \\ 0 & \text{if } V_{in} < V_{ref} \end{cases}$$

**Non-inverting Amplifier**

$$V_{out} = \left(1 + \frac{R_2}{R_1}\right) V_{in}$$

**Inverting Amplifier**

$$V_{out} = -\frac{R_2}{R_1} V_{in}$$

**Voltage Divider**

$$V_{out} = V_{in} \frac{R_2}{R_1 + R_2}$$

**Summing Inverting Amplifier**

$$V_{out} = -\left(\frac{R_f}{R_1} V_{in1} + \frac{R_f}{R_2} V_{in2} + \dots\right)$$

**Operational Amplifier**

$$V_{out} = \frac{V_{in}}{A_{OL}}$$

**Comparator Amplifier**

$$V_{out} = \begin{cases} V_{sat} & \text{if } V_{in} > 0 \\ -V_{sat} & \text{if } V_{in} < 0 \end{cases}$$

**Integrator Amplifier**

$$V_{out} = -\frac{1}{RC} \int V_{in} dt$$

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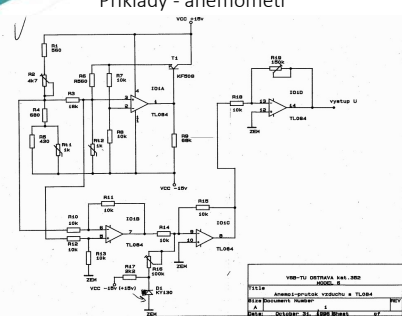
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### Příklady - anemometr



VSD-7U (REV. 04.11.2002)  
 1114 Anemometr - VŠB TUO \* TL084 \*  
 1114 (Rev. 04.11.2002)  
 1114 (Rev. 04.11.2002)

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### Vyhodnocení a normované signály

- Datový přenos formou protokolu popis rámce příklad

Command 2B	Virtual step 4B	Weight 5B	Direction 5B	Checksum 2B
Command 2B	Number of steps processed 8B	Direction 5B	Motor status 2B	Checksum 2B

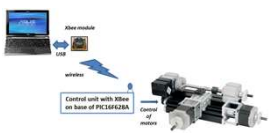
Set the coordinate origin

Current position: 0.000000

Required position: 0.000000

Speed of moving (mm/min): 0.000000

Stop



Control unit with XBox on base of PIC16F628A

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HUM SOFTWARE

### MF 624

multipunction I/O card for PCI bus



**Specifications**

**Analog Input:**  
Channels: 8 single ended channels  
A/D converter: 16-bit simultaneous sampling  
Conversion time: 1.5 μs (typical)  
Resolution: 12 bit  
Input range: 0 to 5 V  
Input impedance: 100 kΩ  
Input range: software, linear, external

**Analog Output:**  
Channels: 8 channels, 16-bit  
Output range: 0 to 5 V  
Output current: 20 mA per channel  
Settling time: 1 μs (typical)  
Digital I/O: 1 TTL compatible  
Input level: 5 V TTL compatible  
Output level: 5 V TTL compatible

**Filter/Converter:**  
Filter: 4  
Number of channels: 256  
Resolution: 12-bit, 20 ns  
Clock: PCLK, master pulse generation

**Extender Register:**  
Input/Output: 4 single ended or differential  
Input impedance: 10 kΩ  
Input frequency: max 2.5 MHz  
Polarity: CMOS

**General:**  
Power consumption: 500 mA @ 5 V  
Dimensions: 160 x 100 x 20 mm  
Operating temperature: 0 to 70 °C  
IO Connector: PCI 32-bit (not PCI)  
Interface: PCI, 32-bit 3V

**Driver Support:**  
16-bit/20-bit DACs  
12 and 16-bit C programming

**Applications:**

**Introduction:**  
MF 624 is a multipunction I/O card offering most of the functions required in process control or measurement applications. MF 624 offers A/D converters, D/A converters, digital input, digital output, quadrature analog input, analog outputs, PZM, pulse and frequency measurement. The card contains eight 16-bit A/D and eight 16-bit D/A converters. It also contains eight 16-bit analog output channels, eight digital inputs and eight digital outputs. Five modules accept both differential bus receivers and four transmitters. Executive and compare are 16-bit wide. MF 624 has 32-bit architecture for maximum performance. Analog inputs and outputs offer bipolar ranges ±1 V which suits most measurement and control applications. The card is designed for standard data acquisition and control applications and optimized for use with the Real Time Toolkit for MultiLAB. Because of the small size and low power consumption, MF 624 can be used not only in the desktop computers but also in portable computers and embedded with docking station.

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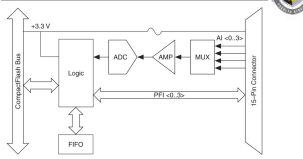
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### Popis systému I/O



- Vnitřní sběrnice
- Integrované moduly (brány, převodníky, multiplexy, ...)
- Logické pole
- Zásobníky
- ...

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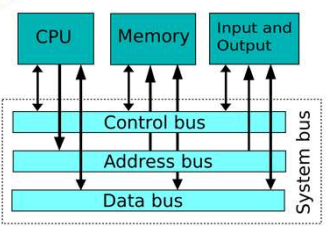
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Programming CS&P



Address	Read	Write
BA00000000	INTXSR	INTXSR
BA00000010	CPMPC	CPMPC

Table 7: BLX800 Memory Map

Address	Read	Write
BA00010000	ARBDATA - A/D data	ANCTRL - A/D control
BA00010040	ARBDATA - A/D data extender	
BA00010080	ARBDATA - A/D data extender	
BA000100C0	ARBDATA - A/D data extender	
BA00010100	ARBDATA - A/D data extender	
BA00010140	ARBDATA - A/D data extender	
BA00010180	ARBDATA - A/D data extender	
BA000101C0	ARBDATA - A/D data extender	
BA00010200	BDSN - digital input	DORSY - digital output
BA00010240	ADSTART - A/D 15th trigger	DIA0 - DIA 8 data
BA00010280		DIA1 - DIA 1 data
BA000102C0		DIA2 - DIA 2 data
BA00010300		DIA3 - DIA 3 data
BA00010340		DIA4 - DIA 4 data
BA00010380		DIA5 - DIA 5 data
BA000103C0		DIA6 - DIA 6 data
BA00010400		DIA7 - DIA 7 data

Table 8: BLX800 Memory Map

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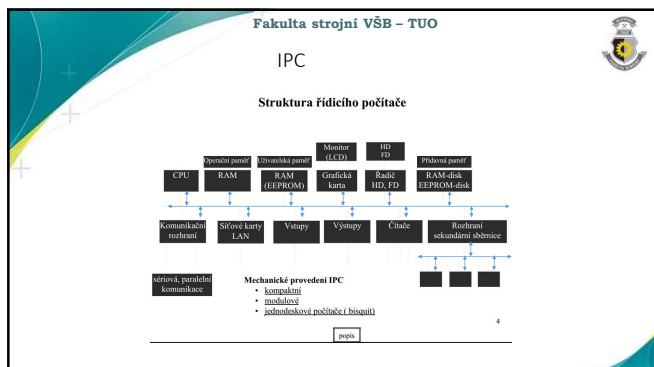
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- Fakulta strojní VŠB – TUO
- Desatero průmyslových počítačů
- Robustnost –
  - Prachuvzdornost –
  - Nárazuvzdornost –
  - Voděodolnost –
  - Teplotní odolnost –

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Fakulta strojní VŠB – TUO

Desatero průmyslových počítačů

- Spolehlivost –
- Účelovost –
- Kompaktnost –
- Časová garance –
- Funkčnost –

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Fakulta strojní VŠB – TUO

Katedra automatizační techniky a řízení

Co bylo obsahem přednášky

- Regulátory
- Řídicí systémy
  - PLC
  - IPC
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- Vnitřní struktura řídicích systémů
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• ...

• (Ot. č. 8, 9, 12, 15, 16).

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Katedra automatizační techniky a řízení

Děkuji za pozornost ...

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