THE EXPERIMENTAL DYNAMIC IDENTIFICATION OF THE HYDRAULIC SERVOMECHANISMS

MATHEMATICAL MODEL:

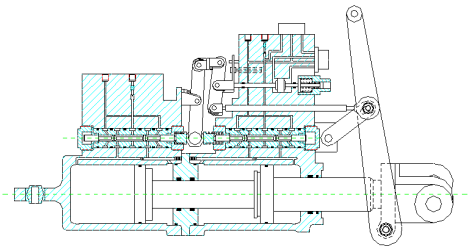
TRANSFER FUNCTION $G(s)=\frac{K}{1+s\cdot T}e^{-s\tau}$ $\quad G(s)=\frac{K\cdot\omega_0{}^2}{s^2+2\xi\cdot\omega_0\cdot s+\omega_0{}^2}$

MOTION EQUATION $T\frac{dy(t)}{dt}+y(t)=K\cdot u(t-\tau)$ $\quad \frac{d^2y(t)}{dt^2}+2\cdot\xi\cdot\omega_0\cdot\frac{dy(t)}{dt}+\omega_0{}^2\cdot y(t)=K\cdot\omega_0{}^2\cdot u(t)$

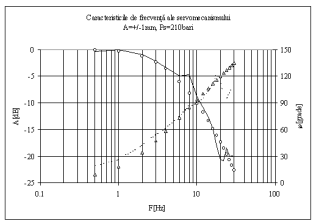
ANALITICAL SOLUTION $y(t)=K\left(1-e^{-\frac{t-\tau}{T}}\right)\cdot u(t-\tau)$ $\quad y(t)=K\cdot\left[1-\frac{1}{\sqrt{1-\xi^2}}e^{-\xi\cdot\omega_0\cdot t}\cdot\sin\left(\omega_0\cdot\sqrt{1-\xi^2}\cdot t+\varphi\right)\right]$

EXPERIMENTAL RESULTS

$\xi=\frac{-\ln M}{\sqrt{\pi^2+(\ln M)^2}}$ $\quad \omega_0=\frac{2\cdot\pi}{T\cdot\sqrt{1-\xi^2}}$ $\quad \varphi=a\cos\xi$

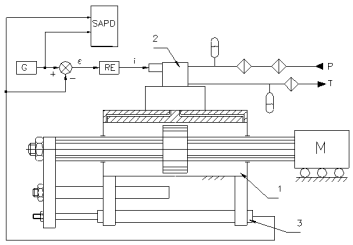


Hydraulic servo mechanism

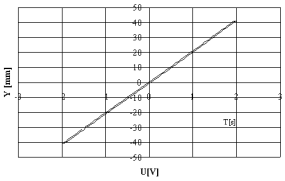


Frequency characteristics of a hydraulic servo mechanism;
(- measured values; o-values of identification model)

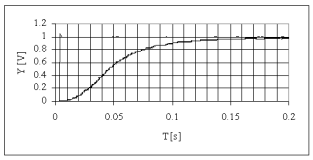
The transfer function of the identified servo mechanism $H(s)=\frac{3428}{s^2+170{,}9\cdot s+3403}$



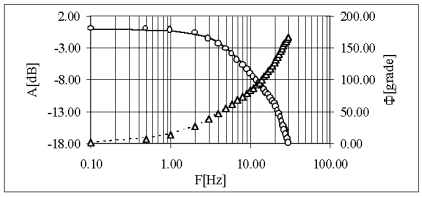
Electrohydaulic servo mechanism



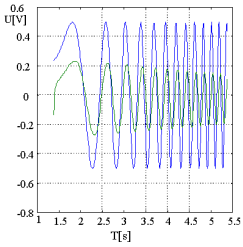
Steady state characteristic of electrohydraulic servo mechanism



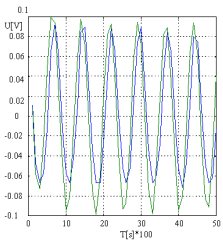
Step input response of the electrohydraulic servo mechanism; T=0.055



Frequency characteristics of the electrohydraulic servo mechanism;
(- measured values; o-values of identification model)



Input and output signals of the servomechanism
(linear variable frequency)



The servomechanism and ARX model output

Identified transfer function of the electrohydraulic model $H(s)=\frac{868100}{s^3\quad s^2}$

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