RT 710
Hydraulic servo system

Description

- **complete model of a hydraulic servo control loop**
- **position control with adjustable load conditions**
- **hydraulic cylinder with directly mounted control valve**
- **vibration-damped mounting**
- **electronic servo amplifier**
- **GUNT software including oscilloscope and frequency generator**

Servo systems are closed-loop control systems. In many industrial applications it is often required to convert small mechanical motions into a different motions with increased force. Hydraulic systems are particularly suitable for applications where large actuation forces are required. The RT 710 unit allows the operation of a hydraulic servo system to be investigated in detail. A carriage with a mass of 50kg is moved by a hydraulic cylinder. Additional springs and an adjustable hydraulic damper permit static and dynamic loads to be simulated. The displacement of the carriage is established using a potentiometric position sensor and compared against the reference variable. The control deviation is processed in a separate servo amplifier.

Depending on the direction of the deviation, a control valve is activated in forward or reverse direction, which in turn produces a corresponding movement of the hydraulic cylinder and the carriage.

All variables can also be tapped as voltage signals. The GUNT software contains among other features an oscilloscope, a frequency generator and a voltmeter. In dynamic processes, for example, the displacement signal can be represented on the oscilloscope. Via the software, the reference variable can also be applied to the system in the form of a voltage. This implies that, with the frequency generator, dynamic tests can be performed and the frequency response recorded.

The trainer is a mobile unit. Measuring devices can be housed in the built-under cabinet unit.

Learning objectives/experiments

- familiarisation with the mode of operation of a hydraulic position control loop with adjustable load conditions
- reading and understanding circuit diagrams
- replacing springs and adjusting the damper
- influence of load and system pressure on control accuracy
- influence of the amplifier constants on the stability of the closed control loop
- recording the frequency response

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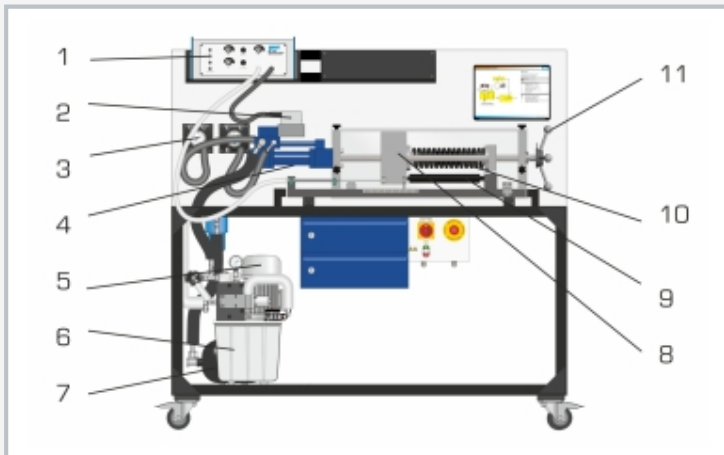
1 servo amplifier, 2 cylinder pressure manometer, 3 hydraulic cylinder with control valve, 4 switch box, 5 pump and oil tank, 6 carriage, 7 damper, 8 hand wheel for spring pre-tension, 9 springs
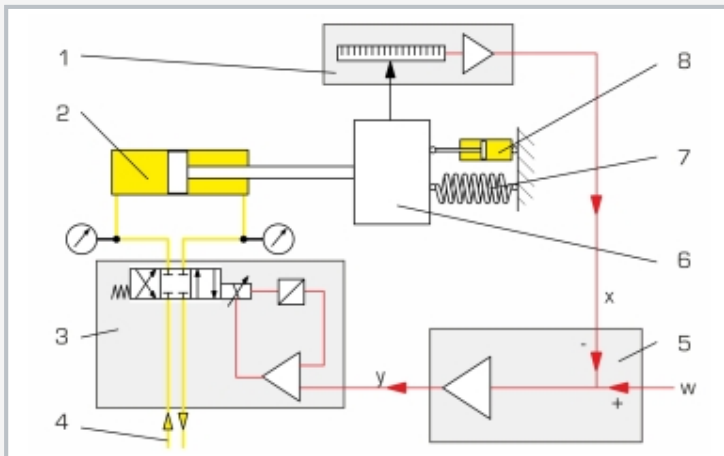
process schematic: 1 position sensor, 2 hydraulic cylinder, 3 control valve, 4 pressurised oil supply, 5 servo amplifier, 6 carriage, 7 spring, 8 damper; w reference value (setpoint), x controlled variable (actual value), y manipulated variable (manipulated value), yellow hydraulic oil
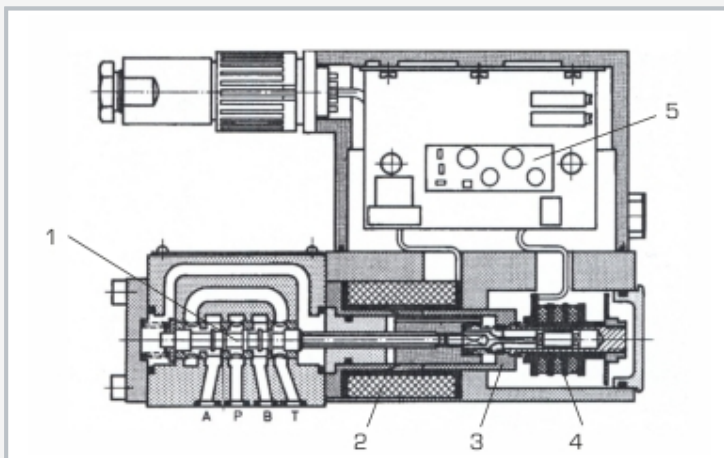
Control valve with position control capability: 1 control spool, 2 coil, 3 anchor, 4 displacement sensor, 5 control electronics

Specification

[1] self-contained training system of a complete hydraulic position control loop with adjustable loading conditions
[2] oil circuit with hydraulic unit, hydraulic accumulator, 2 manometers, control valve and hydraulic cylinder to move a weighted carriage
[3] operation of the electromagnetic control valve for position control by servo amplifier
[4] servo amplifier with adjustable gain
[5] all control variables available as voltage signals
[6] potentiometric displacement sensor
[7] adjustable load conditions on carriage using 2 springs with hand wheel and adjustable damping
[8] low-friction ball bearing-mounted carriage
[9] mobile steel profile trolley with built-under unit
[10] GUNT software for data acquisition via USB under Windows 10

Technical data

Hydraulic unit
- power output: 1,1kW
- flow rate: 4,3L/min
- head: 1500m
- tank capacity: 10L

Hydraulic accumulator capacity: 2L
Accumulator charging valve: max. 40L/min
Hydraulic cylinder
- piston diameter: d=40mm
- stroke: 150mm
- mass moved: 50kg

Control valve NG6
- nominal flow rate: 24L/min
- activation: ±10V

Potentiometric position sensor
- measuring range: 150mm
- output: 0 ...10V

400V, 50Hz, 3 phases; 400V, 60Hz, 3 phases
230V, 60Hz, 3 phases; UL/CSA optional
LxWxH: 1680x670x1600mm; Weight: approx. 420kg

Required for operation

PC with Windows

Scope of delivery

1 trainer
1 GUNT software + USB cable
1 set of accessories
1 set of instructional material

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