

RT 700 Training System: Fundamentals of Hydraulics



Technical Description

RT 700 is a fully equipped training system with all necessary components and aids to conduct a comprehensive training course in the fundamentals of hydraulic controls. The didactic structure of the course is based on the long-established BIBB concept of training in hydraulic drive engineering.

The central element of the unit is the large assembly panel. Here, two different circuits can be easily constructed using items from the kit of modern standard industrial components and connecting hoses. A special quick-clamping system ensures all components are securely attached. The component connections face outward to allow easy interconnection by means of quick-couplers. An oil drip tray is positioned beneath the full width of the assembly panel. The sturdy mobile base unit houses the hydraulic unit and the electrical switch box. There is generous space for all the system components to be accommodated in drawers and cabinets.

The well-structured instructional material sets out the fundamentals and provides a step-by-step guide through the experiments.

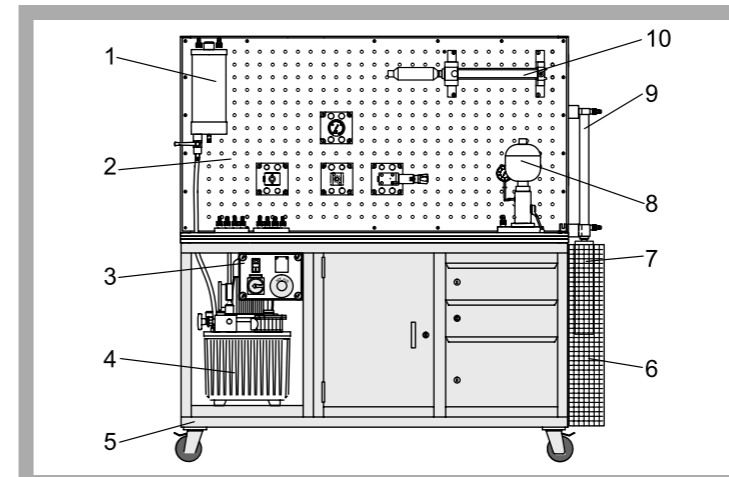
Learning Objectives / Experiments

- Comprehensive experimental introduction to the fundamentals of hydraulic drive and control engineering
- familiarisation with terms and symbols
 - representation of hydraulic circuits
 - drive unit
 - multi-way valves and drives
 - shut-off and flow control valves
 - pressure valves and pressure switches
 - hydraulic accumulators
 - application circuits
 - commissioning and maintenance

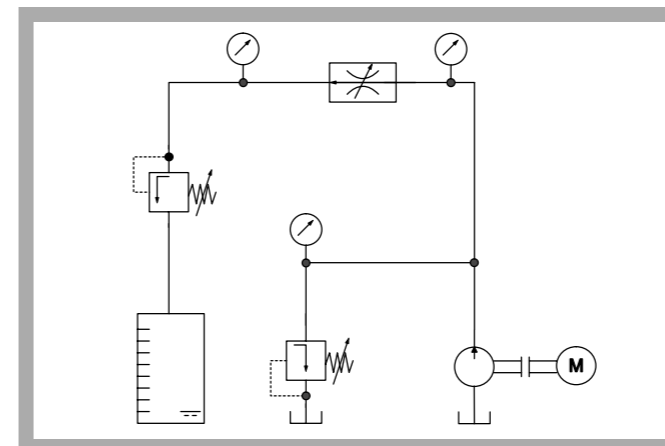
- * Complete training system providing an experimental introduction to the fundamentals of hydraulics
- * Experimental scope and configuration based on the tried and proven concept course developed by the Bundesinstitut für Berufsbildung (BIBB; Federal Institute for Vocational Training)
- * Large-format metal assembly panel for quick and safe component mounting
- * Solid base construction with oil drip tray, hydraulic unit and component storage system

G.U.N.T Gerätebau GmbH, Hanskampring 15-17, D-22885 Barsbüttel, Phone +49 (40) 67 08 54-0, Fax +49 (40) 67 08 54-42, E-mail sales@gunt.de, Web http://www.gunt.de
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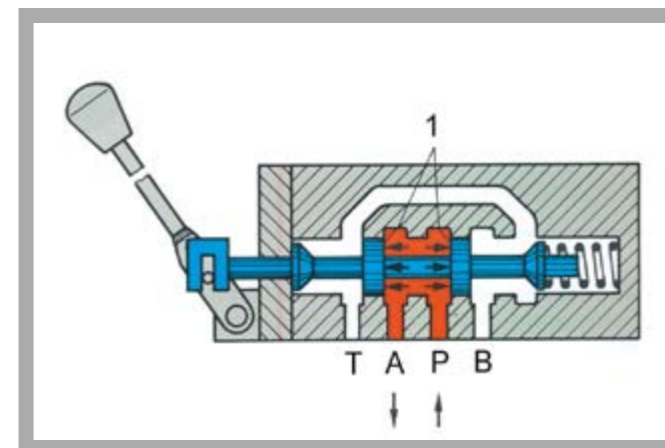
RT 700 Training System: Fundamentals of Hydraulics



1 measuring tank, 2 assembly panel, 3 switch box, 4 drive unit with gear pump, 5 mobile built-under unit, 6 guard grille, 7 weight, 8 diaphragm accumulator, 9 loaded cylinder, 10 differential cylinder



Circuit diagram of experimental setup for 2-way flow control valve



Sectional drawing of a 4/2-way valve: 1 control piston, force-equalised

Specification

- [1] training system providing an introduction to the fundamentals of hydraulic control engineering, BIBB concept
- [2] perforated metal panel for quick component fixing
- [3] oil drip tray
- [4] standard industrial hydraulic components
- [5] various multi-way valves, pressure limiting, check, restrictor, flow control and non-return valves
- [6] hydraulic motor
- [7] diaphragm accumulator
- [8] weighted piston with guard
- [9] pressure hoses with self-closing quick-couplers
- [10] drive unit with gear pump

Technical Data

Assembly panel, LxH: 1420x700mm
 Drive unit
 - with gear pump
 - working pressure: 100bar
 - flow rate: 4cm³ per revolution
 - power output: 1,5kW
 - speed: 1500min⁻¹
 Oil tank capacity: 25L
 Measuring tank: 3L, transparent
 Diaphragm accumulator
 - 1L, opening pressure: 140bar
 Pressure hoses, type 1SN DN 6, max. 225bar
 Emergency-off button

Dimensions and Weight

LxWxH: 1700x740x1700mm
 Weight: approx. 350kg

Required for Operation

230V, 60Hz, 3 phases or 400V, 50/60Hz, 3 phases

Scope of Delivery

1 training system, complete
 1 set of instructional material

Order Details

080.70000 RT 700 Training System:
 Fundamentals of Hydraulics

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RT 770 Training System: Pneumatics, Electro-Pneumatics and PLC

The station includes the following components:

- 1x single-acting cylinder
- 2x double-acting cylinder with end position damping
- 2x double-acting cylinder with end position damping and 2 limit switches (NO contacts)
- 2x maintenance unit
- 2x 8-way distributor block with manual slider valve
- 2x 3/2-way valve with push-button, locked at rest position
- 1x 3/2-way valve with mushroom-type button, locked at rest position
- 1x 3/2-way valve with push-button, open at rest position
- 2x 3/2-way valve with tipping roller lever, locked at rest position
- 4x 3/2-way valve with roller lever, locked at rest position
- 1x 3/2-way valve, pressurised on one side
- 1x 3/2 delay valve, locked at rest position
- 1x 5/2-way valve with hand lever, locked at rest position
- 3x 5/2-way valve dual-pressurised
- 1x 5/3-way valve with spring-centred mid position, all connections locked
- 2x one-way restrictor, adjustable
- 1x quick-vent valve with sound absorber
- 2x changeover valve (OR)
- 5x dual pressure valve (AND)
- 1x 3/2-way valve with pressure sequence actuator (pressure input valve)
- 1x pressure reducing valve with drain
- 1x device for pulling load
- 1x sequencer for 4 steps
- 3x manometer, 0...10bar

Components for electro-pneumatic experiments:

- 1x 3/2-way solenoid valve with spring return, locked at rest position
- 3x 5/2-way solenoid valve with spring return, locked at rest position
- 3x 5/2-way solenoid valve, impulse
- 3x relay board, 4 changeover contacts
- 2x electric limit switch (roller touch contact, can be used as NC contact and NO contact)
- 1x proximity switch, inductive (NO contact)
- 1x proximity switch, capacitive, with LED (NO contact)
- 1x proximity switch, optical, with LED (NO contact)
- 2x signal board (1x touch contact, locking, 2x touch contact, non-locking)
- 1x pressure switch
- 1x signalling unit and distributor

- 1x PLC with programming software

- 1x power supply unit, 24VDC
- 20x T-piece, flash connection
- 1x pneumatic hose 4/2mm, PA/colourless, 25m roll
- 1x hose cutter
- 20x laboratory cable, 1000mm, red
- 20x laboratory cable, 1000mm, black
- 20x laboratory cable, 500mm, red
- 20x laboratory cable, 500mm, black

RT 700 Training System: Fundamentals of Hydraulics

The kit includes the following components:

- 1x hydraulic accumulator
- 2x pressure limiting valve, directly controlled, pressure range: 4...160bar
- 1x adjustable restrictor valve
- 1x double-acting cylinder, stroke 250mm
- 1x double-acting cylinder, stroke 400mm, weight 19,5kg
- 1x measuring tank
- 4x manometer 0...160bar
- 1x gear motor
- 3x check valve
- 1x 2/2-way valve, locked at rest position
- 1x 2/2-way valve with jockey roller
- 1x 3/2-way valve, locked at rest position
- 1x 4/2-way valve, hand-operated, continuous at rest
- 1x 4/3-way valve with latch lock, hand-operated
- 1x 4/3-way valve mid position P and T connected, hand-operated
- 1x non-return valve, hydraulic releasing
- 2x non-return valve
- 2x one-way restrictor, adjustable
- 1x 2-way flow control valve
- 1x 3-way pressure reducing valve
- 1x accumulator filling device
- 1x pressure limiting valve, pre-controlled
- 2x metering valve pre-controlled

- 1x hose set
- 1x resistance line NG6, screw fitting
- 1x resistance line NG6, elbowed
- 1x resistance line NG4, elbowed
- 1x guard grille
- 2x screwdriver
- 1x single-end wrench, size 9 (DIN 894)
- 2x Allen key, size 4, 6

RT 710 Hydraulic Servo System



- * 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

Technical Description

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.

The well-structured instructional material sets out the fundamentals and provides a step-by-step guide through the experiments.

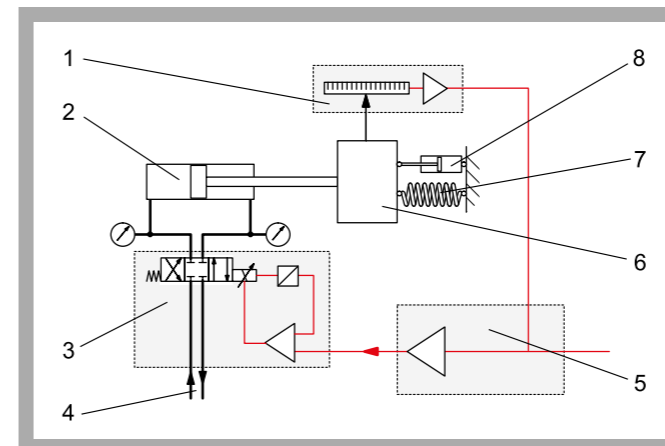
Learning Objectives / Experiments

- 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

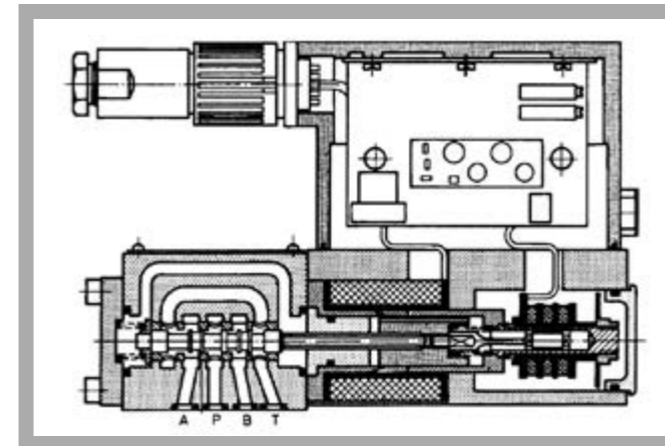
RT 710 Hydraulic Servo System



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



Control valve with position control capability

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 two 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 via USB under Windows Vista or Windows 7

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

Dimensions and Weight

- LxWxH: 1680x670x1600mm
- Weight: approx. 420kg

Required for Operation

- Hydraulics: 400V, 50Hz, 3 phase
- Servo amplifier: 230V, 50Hz, 1 phase

Scope of Delivery

- 1 hydraulic servo system, complete
- 1 GUNT software CD + USB cable
- 1 set of accessories
- 1 set of instructional material

Order Details

080.71000 RT 710 Hydraulic Servo System