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Electro-hydraulic Proportional and Servo Control System

Trainer,Double Pump,Low and Medium pressure

PN:0401060010

Electro-hydraulic Proportional and Servo Control System Trainer,Double Pump,Low and Medium pressure

Features

This electro-hydraulic proportional/servo control system trainer is a professional training platform for hydraulic circuit, hydraulic application, hydraulic drive ,electro-hydraulic servo system, electro-hydraulic proportional system,hydraulic pump, valve test and hydraulic curriculum design.It is especially suitable for students,scholars, experts, engineering and technical personnel in hydraulic discipline to build their own multi-unit integrated design experiments of hydraulic transmission, computer-aided testing system, programmable control system and computer control system with a variety of hydraulic components and programmable controller module.It can meet the teaching of the hydraulic disciplines for teaching and training of:

1. The composition of hydraulic transmission system.
2. The basic hydraulic circuit experiments
3. Various parts of a hydraulic transmission system observing,disassembly and assembly training.
4. PLC electrical control experiment:machine-electric-hydraulic integrated control experiments.
5. The performance test of hydraulic pump and valves.
6. The performance test of electro-hydraulic proportional valves and electro-hydraulic servo valves
7. Design experiments of computer-controlled electro-hydraulic proportional

position control system..

8. To understand the composition, working principle and calibration methods of electro-hydraulic servo position control system and the control characteristics of the electro-hydraulic proportional valve/servo valve

9. Experiments of the electro-hydraulic proportional hydraulic motor speed control

Electro-hydraulic Proportional and Servo Control System Trainer,Double Pump,Low and Medium pressure

Performance

1. The training panel is designed as T-slot and all hydraulic components use rapid joint which can inserted for easy operation.

2. The hydraulic components are industrial-grade with high reliability.High precision.The position control accuracy of proportional reversing valve can reach 0.1mm.

3. The hydraulic components are equipped with the oil transition plate mounted on the operating panel.Use quick-change retractable connector for circuit connection,easy and no leakage.

4. Hydraulic pressure source is used professional water-cooled or air cooled, and it can cut down the impact of high oil temperature to effect experimental accuracy.

5. The three-phase power supply module equips leakage protection.When earth leakage current exceeds 30mA,the power will cut off.The electric control use DC 24V with over-voltage protection.

6. This trainer has various sensors,including pressure sensor,pull and push force sensor,grating displacement sensor,displacement sensor,temperature sensor,flow sensor,speed sensor, to meet the needs of various experiments and tests.

7. The hydraulic unit use dual pump system to provide two different pressure and flow simultaneously to meet the requirements of different experiments.

8. It has various control modes>manual control,solenoid control,relay control,PLC control,microcomputer control.

9. The proportional/servo system test unit

This unit is an integrated structure composed by cylinders, modules,and

valves to complete servo / proportional system position, force control experiments. The action cylinder and load cylinder or cylinder stopper (pulleys, weights) are all installed on a channel pedestal, removable and interchangeable. Experimenters can simulate actual working conditions for experiments according to different load forms.

[Electro-hydraulic Proportional and Servo Control System Trainer, Double Pump, Low and Medium pressure](#)

[Typical Training Contents](#)

Part A Basic hydraulic Circuit Trainings(50 kinds of circuits)

1. Pressure Control Circuits

1.1 Pressure regulated circuit

1.1.1 Pressure regulating circuit by pressure relief valve/overflow valve

1.1.2 Balancing circuit(by pressure relief valve/overflow valve)

1.1.3 Pressure regulated circuit from remote port by pressure relief valve/overflow valve

1.1.4 Pressure regulated circuit by multi-stage pressure relief valve/overflow valve

1.2 Pressure reducing circuit

1.2.1 One-stage pressure reducing circuit

1.2.2 Two-stage pressure reducing circuit

1.3 Pressure relief circuit(Pressure-venting circuit)

1.3.1 Pressure relief circuit by two position two-way valve

1.3.2 Pressure relief circuit by three position four-way valve

1.3.3 Pressure relief circuit by pressure relief valve/overflow valve

1.4 Pressure holding circuit

1.4.1 Pressure holding circuit by pilot check valve

1.4.2 Pressure holding circuit by accumulator

1.5 Decompression circuit

1.5.1 Decompression circuit by sequence valve

1.5.2 Decompression circuit by throttle valve

2. Speed Control Circuits

2.1 Speed regulated circuit

2.1.1 Oil-inlet throttle speed regulated circuit

- 2.1.2 Oil-return throttle speed regulated circuit
- 2.1.3 By-pass throttle speed regulated circuit
- 2.1.4 Speed regulated circuit by speed regulated valve
- 2.1.5 Speed-reducing/Slow-speed circuit by solenoid valve and speed regulated valve
- 2.1.6 Secondary feed action circuit
- 2.1.7 Three feed action circuit
- 2.1.8 Differential action speed shift circuit
- 2.1.9 Differential connection fast-speed movement circuit
- 2.1.10 Differential pressure speed shift circuit
- 2.1.11 Differential circuit of two position three-way valve
- 2.1.12 Fast-speed movement circuit by accumulator

2.2 Synchronization circuit

- 2.2.1 Double/Twin cylinders synchronization action circuit
- 2.2.2 Synchronization circuit by throttle valve

3. Directional Control Circuits

3.1 Reversing circuit

- 3.1.1 Reversing circuit by reversing valve
- 3.1.2 Sequence action circuit by sequence valve
- 3.1.3 Balancing circuit by sequence valve
- 3.1.4 Sequence action circuit by pressure relay
- 3.1.5 Sequence action circuit by two position four-way valve, proximity switch

3.2 Lock circuit

- 3.2.1 Lock circuit by one-way valve
- 3.2.2 Lock circuit by pilot check valve
- 3.2.3 Lock circuit by reversing valve

Part B PLC control experiment: machine - electric - hydraulic integrated control experiment.

1. PLC programming instructions and ladder programming
2. Learn and use PLC programming software
3. Communication of PLC and computer
4. PLC application and optimization solutions in the hydraulic transmission system.

Part C The performance test of hydraulic pump and valves.

1. Hydraulic pump performance test

- 1.1 Hydraulic pump no-load performance test;
- 1.2 Efficiency characteristics of the hydraulic pump test
 - 1.2.1 mechanical efficiency
 - 1.2.2 volumetric efficiency
 - 1.2.3 overall efficiency

2. Static performance test of pressure relief valve/overflow valve

- 2.1 Pressure regulating range measurement
- 2.2 Pressure runout measurement
- 2.3 Pressure offset measurement
- 2.4 Pressure loss measurement
- 2.5 Unloading loss measurement
- 2.6 Opening and closing characteristics measurement

3. Dynamic performance test of pressure relief valve/overflow valve

- 3.1 Pressure step response characteristic curve measurement of pressure relief valve and the physical meaning and calculation methods for dynamic characteristics parameters of pressure relief valve.
 - 3.1.1 Steady-state pressure
 - 3.1.2 Test flow
 - 3.1.3 Unloading pressure
 - 3.1.4 Pressure amplitude
 - 3.1.5 Pressure overshoot
 - 3.1.6 Peak pressure
 - 3.1.7 Rise time
 - 3.1.8 Relief time
 - 3.1.9 Transition time

4. Static performance test of pressure reducing valve

- 4.1 Static characteristic parameters test of pressure reducing valve
 - 4.1.1 Pressure regulating range
 - 4.1.2 Pressure runout
 - 4.1.3 Pressure offset
- 4.2 Inlet and outlet characteristic curve test of pressure reducing valve
- 4.3 Outlet pressure-flow characteristic curve test of pressure reducing valve

5. Dynamic performance test of pressure reducing valve

5.1 Pressure step response characteristic curve measurement of pressure reducing valve

5.2 The physical meaning and calculation methods for dynamic characteristics parameters of pressure reducing valve.

5.2.1 Steady-state pressure

5.2.2 Test flow

5.2.3 Unloading pressure

5.2.4 Pressure amplitude

5.2.5 Pressure overshoot

5.2.6 Peak pressure

5.2.7 Rise time

5.2.8 Relief time

5.2.9 Transition time

6. Performance test of Oil-inlet throttle speed regulated circuit

6.1 To understand the principles and composition of oil-inlet throttle speed regulated circuit;

6.2 To learn characteristics and test methods of speed-load characteristics and power characteristics curve under variable load conditions;

6.3 To learn characteristics and test methods power curve under constant load conditions;

6.4 To analysis and compare the performance of throttle speed regulated under variable load and constant load.

7. Performance test of Oil-out/return throttle speed regulated circuit

7.1 To understand the principles and composition of oil-out/return throttle speed regulated circuit;

7.2 To learn characteristics and test methods of speed-load characteristics and power characteristics curve under variable load conditions;

7.3 To learn characteristics and test methods power curve under constant load conditions;

7.4 To analysis and compare the performance of throttle speed regulated under variable load and constant load.

8. Performance test of Oil-bypass throttle speed regulated circuit

8.1 To understand the principles and composition of oil-bypass throttle speed

regulated circuit;

8.2 To learn characteristics and test methods of speed-load characteristics and power characteristics curve under variable load conditions;

8.3 To learn characteristics and test methods power curve under constant load conditions;

8.4 To analysis and compare the performance of throttle speed regulated under variable load and constant load.

9.Characteristics test of the hydraulic cylinder

9.1 Minimum starting pressure test;

9.2 Load efficiency test of the hydraulic cylinder.

Part D Design experiment of computer-controlled proportional solenoid system/(electromagnetic proportional system) position control system

1. Performance test of proportional valve

1.1 Pressure characteristics of proportional relief valve

1.1.1 Pressure characteristic test device of proportional relief valve;

1.1.2 The physical meaning and test method of the input and output characteristics of proportional relief valve;

1.1.3 Pressure regulating characteristics and test method of proportional relief valve.

1.2 Dynamic characteristics experiment of the proportional relief valve

1.2.1 The dynamic characteristics test device of proportional relief valve

1.2.2 Pressure step response characteristic curve test method of proportional relief valve

1.2.3 The physical meaning and calculation methods for dynamic characteristics parameters of proportional relief valve.

1.3 Flow characteristics of proportional directional control solenoid valve

1.3.1 Flow characteristic test device of proportional directional control solenoid valve;

1.3.2 The physical meaning and test method of the input and output characteristics of proportional directional control solenoid valve;

1.3.3 Flow characteristics and test method of proportional directional control solenoid valve.

1.4 Dynamic performance test of proportional directional control solenoid valve

1.4.1 Dynamic characteristic test device of proportional directional control solenoid valve;

1.4.2 Flow step response characteristic curve test method of proportional directional control solenoid valve;

1.4.3 The physical meaning and calculation methods for dynamic characteristics and parameters of proportional directional control solenoid valve.

1.5 Flow characteristics of proportional speed regulating valve

1.5.1 Flow characteristic test device of proportional speed regulating valve;

1.5.2 The physical meaning and test method of the input and output characteristics of proportional speed regulating valve;

1.5.3 Flow characteristics and test method of proportional speed regulating valve.

1.6 Dynamic performance test of proportional speed regulating valve

1.6.1 Dynamic characteristic test device of proportional speed regulating valve;

1.6.2 Flow step response characteristic curve test method of proportional speed regulating valve;

1.6.3 The physical meaning and calculation methods for dynamic characteristics and parameters of proportional speed regulating valve.

2. Design and test experiments of proportional system

2.1 Performance experiment of electromagnetic proportional/(proportional solenoid)force control system (valve control cylinder)

2.1.1 The composition, working principle and correction methods of electromagnetic proportional/(proportional solenoid)force control system;

2.1.2 The role computer in electromagnetic proportional/(proportional solenoid)force control system;

2.1.3 the principle of dynamic analysis and time domain parameters test method

2.1.4 The impact of digital PID controller structure parameters on the dynamic performance of the system

2.2 Performance experiment of electromagnetic

proportional/(proportional solenoid)position control system (valve control cylinder)

2.2.1 The composition,working principle and correction methods of electromagnetic proportional/(proportional solenoid)position control system;

2.2.2 The role computer in electromagnetic proportional/(proportional solenoid)position control system;

2.2.3 The principle of dynamic analysis and time domain parameters test method

2.2.4 The impact of digital PID controller structure parameters on the dynamic performance of the system

2.3 Performance experiment of electromagnetic proportional/(proportional solenoid)speed control system (valve control motor)

2.3.1 The composition,working principle and correction methods of electromagnetic proportional/(proportional solenoid)speed control system;

2.3.2 The role computer in electromagnetic proportional/(proportional solenoid)speed control system;

2.3.3 the principle of dynamic analysis and time domain parameters test method

2.3.4 The impact of digital PID controller structure parameters on the dynamic performance of the system

Part E Performance test of servo valve (valve control cylinder)

1.Static characteristic experiment of servo reversing valve

1.1 The flow characteristics test device of servo reversing valve

1.2 The physical meaning and test method of the input and output characteristics of servo reversing valve;

1.3 Flow characteristics and test method of servo reversing valve;

1.4 The pressure gain characteristics test method of servo reversing valve

1.5 The frequency characteristics test method of servo reversing valve

2. Dynamic characteristic experiment of servo reversing valve

2.1 The dynamic characteristics test device of servo reversing valve

2.2 Flow step response characteristic curve test method of servo reversing valve;

2.3 The frequency response curve (Bode diagram) characteristics test method of servo reversing valve

2.4 The physical meaning and calculation methods for dynamic characteristics parameters of servo reversing valve

3. Performance test of servo reversing valve force control system(closed-loop control)

3.1 The composition,working principle and correction methods of servo reversing valve force control system;

3.2 The role computer in servo reversing valve force control system;

3.3 The principle of dynamic analysis and time domain parameters test method

3.4 The impact of digital PID controller structure parameters on the dynamic performance of the system

3.5 Closed loop force control system

4. Performance test of servo reversing valve position control system(closed-loop control)

4.1 The composition,working principle and correction methods of servo reversing valve position control system;

4.2 The role computer in servo reversing valve position control system;

4.3 The principle of dynamic analysis and time domain parameters test method

4.4 The impact of digital PID controller structure parameters on the dynamic performance of the system

4.5 Frequency characteristics analysis of the system

Part F The hydraulic circuit configuration screen demo and control experiment(optional).

It is including 20 kinds of typical hydraulic circuit demonstration and the action of the circuit in the experiments which can be controlled by PC.It use different colors to demonstrate the principle of the hydraulic circuit to make students learn and understand more intuitive in experiments and training.

1.Oil-inlet throttle speed regulating circuit

2.Oil-return throttle speed regulating circuit

3.By-pass throttle speed regulating circuit

4.Two-stage pressure regulated circuit

5.Two position and four-way reversing circuit

- 6.Three position four-way reversing valve circuit
- 7.Sequence action circuit by sequence valve
- 8.Sequence action circuit by pressure relay
- 9.Sequence action circuit by proximity switch
- 10.Differential circuit
- 11.Balancing circuit
- 12.Pressure holding circuit of pilot check valve
- 13.Decompression circuit by solenoid valve
- 14.Pressure holding circuit of isolation pressure fluctuation
- 15.Synchronization circuit by throttle valve
- 16.Fast and slow speed shift circuit
- 17.Speed shift circuit by throttle valve
- 18.Lock circuit by pilot check valve

Electro-hydraulic Proportional and Servo Control System Trainer,Double Pump,Low and Medium pressure

The Main Technical Parameters

Nos	Items	Specification	
1	Motor A	Rated power	2.2KW
		Rated speed	1440r/min
2	Motor B	Rated power	3.5KW
		Rated speed	1440r/min
3	Variable vane pump	Displacement	11.1ml/rev
		Maximum pressure	7Mpa
		Maximum flow	15L/min
		Motor speed	1440r/min
4	Quantitative vane pump	Rated Displacement	11ml/rev
		Maximum pressure	7Mpa
		Maximum flow	15 L/min
		Motor speed	1440r/min
5	Axial piston hydraulic motor	Rated pressure	31.5Mpa
		Displacement	5ml/rev
6	Hydraulic system working pressure	7Mpa	

Electro-hydraulic Proportional and Servo Control System Trainer,Double Pump,Low and Medium pressure Configuration List

Nos	Items	Specification	Qty	Marks
1	Motor	Rated output: 3.5 KW Speed: 1440 r / min	1	
2		Rated output: 2.2 KW Speed: 1440 r / min	1	
3	Variable vane pump		1	
4	Quantitative vane pump		1	
5	Axial piston hydraulic motor	Rated pressure: 31.5Mpa Displacement: 5ml / rev	1	
6	Throttle valve		1	
7	Pilot oriented pressure relief valve/overflow valve		2	
8	Circuit board		2	
9	Oil tank		1	
10	Shockproof pressure gauge	0-10MPa	2	
11	Pressure transmitter	10MPa	1	
12	Oil level gauge	150mm	1	
13	High pressure filter	Filtering accuracy: 5 μ m	1	
14	Magnetic filter	Filtering accuracy: 60 μ m	1	
15	Oil suction filter	Filtering accuracy: 20 μ m	1	
16	Air filter	Filtering accuracy:	1	

Nos	Items	Specification	Qty	Marks
		20 μm		
17	Hydraulic oil			None
18	Water cooler		1	
19	Ball valve		4	
20	Servo cylinder		1	
21	Hydraulic cylinder		2	
22	Three position and four-way solenoid directional/reversing valve		1	
23	Three position and four-way solenoid directional/reversing valve		1	
24	Two position and four-way solenoid directional/reversing valve		2	
25	Two position and three-way solenoid directional/reversing valve		1	
26	Three position and four-way manual directional/reversing valve		1	
27	Pilot oriented proportional relief valve		1	
28	Proportional amplifier		1	
29	Proportional solenoid reversing valve		1	
30	Proportional amplifier		1	
31	Proportional solenoid speed regulating valve		1	
32	Proportional amplifier		1	

Nos	Items	Specification	Qty	Marks
33	Electro-hydraulic servo valve		1	
34	Servo amplifier		1	
35	Pilot oriented pressure relief valve/overflow valve		1	
36	Direct-acting pressure relief valve		1	
37	Pilot oriented sequence valve		2	
38	Pilot oriented pressure reducing valve		2	
39	Throttle valve		2	
40	Two-way flow control valve		1	
41	Pilot check valve		2	
42	Tube-type one-way valve		2	
43	Pressure relay		1	
44	Accumulator		1	
45	Tee		1	
46	PLC		1	
47	PLC communication cable		1	
48	Pressure transmitter		4	
49	Flow sensor		1	
50	Tension and compression load cell(Built-in amplifier)		1	
51	Hall speed sensor	Size M10×1×35	1	
52	Flow digital display meter		1	
53	Rotationl speed digital display meter		1	
54	Grating displacement sensor		1	

Nos	Items	Specification	Qty	Marks
55	Displacement sensor		1	
56	Temperature controller		1	
57	Thermocouple	Measuring range -50 ~ 150 °C	1	
58	Proximity switch	NPN,DC24V	4	
59	Electrical control module		1	
60	Data universal interface board		1	
61	37-pin data communication cable(male)		1	
62	37-pin data communication cable(female)		1	
63	Data acquisition card		1	
64	Grating ruler		1	
65	Simulation control software		1	Optional
66	System acquisition and control software		1	Optional
67	PLC programming software		1	Optional
68	Acquisition card CD-ROM drive		1	
69	Experimental instructions		1	
70	Tee	M22×1.5	6	
71	Compression resistant hose	25Mpa	16	
72	Shockproof pressure gauge	0-10MPa	4	

Nos	Items	Specification	Qty	Marks
73	Precision pressure gauge		2	
74	Hydraulic modular valve block		16	
75	Load pulley		1	
76	Servo / proportional system test device		1	
77	Weights		4	
78	Adjustable wrench	10' '	1	
79	Adjustable wrench	12' '	1	
80	Open-end wrench	8-10'	1	
81	Open-end wrench	12-14'	1	
82	Open-end wrench	17-19'	1	
83	Inner ring plier		1	
84	Snap ring plier		1	
85	Phillips screwdriver		1	
86	Screwdriver		1	
87	Allen wrench		1	
88	Tool box		1	
89	Dust cover		1	
90	O-ring		8	
91	O-ring		10	
92	O-ring		10	
93	Signal light		2	
94	Button switch	24V	2	

Nos	Items	Specification	Qty	Marks
95	Pressure gauge		1	

*Products and configuration list described herein are subject to changes without notice.

*Optionals above is available for orders above 30 sets.