

Digital Servo Training System

581535 (8063-00)

FESTO

LabVolt Series

Datasheet



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General Description

The Digital Servo Training System consists of a compact trainer designed to familiarize students with the fundamentals of digital servo motion control. The training system features a single-axis belt-driven positioning system, a digital servo controller, and powerful software tools.

Motor control can be achieved in several ways: by using the included hardware controller, LABVIEW or MATLAB/SIMULINK, or an optional analog controller.

Open-source firmware and software controls are provided to allow the user to create his own control strategies by modifying the existing ones or by developing new ones. This open architecture also facilitates the addition of mechanical options to the system.

Features & Benefits

- Compact system that can be used on a table or bench
- Servo controller and linear axis
- Position and speed control, friction break, belt tensioning and backslash, dual encoders, transferable inertia load
- Safe and robust
- High-speed communication through a USB connection
- Easy connection to mechanical devices
- Observation and control can be performed simultaneously
- Motor control can be achieved using LABVIEW, MATLAB/SIMULINK, or controllers
 - Includes a CD-ROM containing data for the servo controller as well as various applications built with LABVIEW and MATLAB/SIMULINK
- State-of-the-art 32-bit microcontroller coupled to a power amplifier
- Straps can be easily disengaged from the motor shaft to study the motor
- Comprehensive curriculum
- Estimated program duration: 40 hours

List of Equipment

Qty	Description	Model number
1	Digital Servo Motor Control (Student Manual) _____	580535 (86197-00)
1	Digital Servo Motor Control (Instructor Guide) _____	580536 (86197-10)
1	Servo Controller _____	581443 (9035-00)
1	Linear Axis _____	581463 (9323-00)

List of Manuals

Description	Manual number
Digital Servo Motor Control (Workbook) _____	580535 (86197-00)
Digital Servo Motor Control (Workbook (Instructor)) _____	580536 (86197-10)

Table of Contents of the Manual(s)

Digital Servo Motor Control (Workbook) (580535 (86197-00))

- 1 Equipment and Software Familiarization
- 2 Open Loop Servo Motor Static Characteristics
- 3 Open Loop Servo Motor Transient Characteristics
- 4 Servo Closed Loop Speed Control – Steady State Characteristics

- 5 Servo Closed Loop Speed Control – Transient Characteristics and Disturbances
- 6 Motor Shaft Angular Position Control
- 7 Linear Position Sensing
- 8 Linear Position Control
- 9 Following Error in a Linear Position Control System

System Specifications

Parameter	Value
Computer Requirements	A currently available personal computer with USB 2.0 ports, running under one of the following operating systems: Windows® 7 or Windows® 8.
Physical Characteristics	
Intended Location	On a table able to support the weight of the equipment
Dimensions (H x W x D)	184 x 1600 x 349 mm (7.2 x 63 x 13.7 in)
Net Weight	TBE

Equipment Description

Servo Controller 581443 (9035-00)



The Servo Controller incorporates a state-of-the-art 32-bit microcontroller coupled to a power amplifier specially designed for brushed and brushless dc motor control. The Servo Controller connects to a host computer via a USB connection and is fully configurable for various types of open- and closed-loop control applications. The controller allows three methods of control:

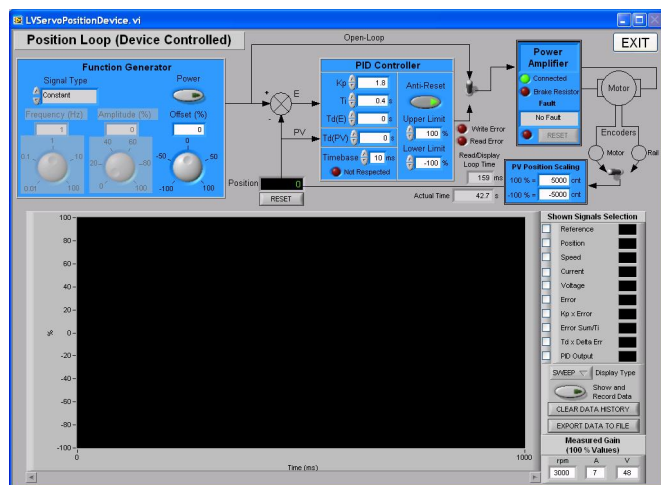
- Direct control from the 32-bit microcontroller
- PC-based control using LABVIEW or MATLAB/SIMULINK
- Using an optional analog controller

The control algorithm can be performed either by the microcontroller to ensure fast response and smooth closed-loop control or by a computer. The connections to mechanical devices

are made easy using two quick-connect cables: one for motor control and one for feedbacks (single or dual).

The controller also comprises four analog inputs and four analog outputs for monitoring and/or control. A DMA controller insures that observation and control can be performed simultaneously.

The Servo Controller is equipped with a built-in 48 V dc power supply to provide power to the training system and a six-IGBT bridge to power the external motor. A CD-ROM containing various applications and data for the Servo Controller is also included. The LABVIEW runtime application allows speed and position (open- or closed-loop) control using either the hardware controller (Device mode) or LABVIEW (Host mode) for the control algorithms. This application allows basic servo control and data acquisition on the Servo Controller.

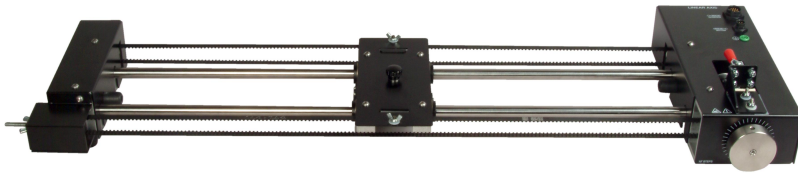


Open-source LABVIEW and MATLAB/SIMULINK application files, as well as the controller firmware, are also available on this CD-ROM. Resource files will be updated and/or added as new applications, control strategies, and mechanical options are developed. These files are also available free of charge at www.labvolt.com in the Downloads section of this system.

Specifications

Parameter	Value
Power Requirements	
Voltage	88-264 V ac
Frequency	47-63 Hz
Current	5 A
Microcontroller Type	
Type	STM32 ARM-based 32 bit MCU
Operating Frequency	72 MHz
Memory	20 kbytes RAM, 64 kbytes Flash ROM
A/D Converters (2)	12-bits, 1 μ s settling time
Digital to Analog Converters	12 bits, 8.5 μ s settling time
Connections	USB 1.1 or 2.0 and JTAG directly to microcontroller
Built-In Power Supply	
Voltage	48 V
Current	6.7 A
Power Amplifier	
Type	6 IGBT bridge
Bridge Maximum Voltage	48 V
IGBT Maximum Current	9 A
Analog Outputs (4)	\pm 10 V
Accessories	
	1 m quick-connect motor cable (1)
	1 m quick-connect feedback cable (1)
	2 m power cord (1)
	2 m USB interconnection cable (1)
	1.5 m ground lead (1)
	Resource CD-ROM (1)
Personal Computer Requirements	A currently available personal computer with USB 2.0 ports, running under one of the following operating systems: Windows [®] 7 or Windows [®] 8.
Physical Characteristics	
Dimensions (H x W x D)	184 x 267 x 175 mm (7.25 x 10.50 x 6.88 in)
Net Weight	4.1 kg (9 lb)

Linear Axis 581463 (9323-00)



The Linear Axis positioning system includes a brushed dc servo motor (an optional brushless dc servo motor is available), a belt mechanism, and two optical encoders (one on the motor and the other on the travel cart).

Various dynamic variables can be modified: friction, loading, and backlash. An inertia wheel can be mounted directly on the motor shaft or

used as a load on the travel cart. Backlash experiments can be performed by loosening the main strap and implementing control using either the motor encoder or the travel cart encoder. The travel cart straps can be easily disengaged from the motor shaft when students need to experiment only with the motor.

Specifications

Parameter	Value
Motor	
Power Output	128 W
Nominal Voltage	60 V dc
Current at Continuous Stall Torque	4.14 A dc
Nominal Speed	3400 r/min
Encoder (Motor)	
Type	Incremental
Resolution	1000 lines (4000 counts)
Encoder (Travel Cart)	
Type	Incremental
Resolution	360 lines (1800 counts)
Inertia Wheel	
Moment of Inertia	0.0002563 kg·m ² (0.876 lb·in ²)
Friction Brake Pad Material	
	Felt
Cart Travel Distance	
	654 mm (25.75 in)
Physical Characteristics	
Dimensions (H x W x D)	165 x 1054 x 349 mm (6.50 x 41.50 x 13.75 in)
11.8 kg (26 lb)	11.8 kg (26 lb)

Reflecting the commitment of Festo Didactic to high quality standards in product, design, development, production, installation, and service, our manufacturing and distribution facility has received the ISO 9001 certification.

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