

# Mechanical Drives Learning System (SI units)

## 46100-00

**FESTO**

**LabVolt Series**

Datasheet



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Festo Didactic  
en 120 V - 60 Hz  
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## General Description

### Gain precious time with a turnkey solution for teaching the fundamentals of industrial mechanics

The Mechanical drives learning system exposes students to the hardware, tools, measuring apparatus, and methods used by industrial mechanics to keep plants running. It covers the identification, installation, and troubleshooting of common machine elements, and is suitable for beginners in vocational schools, as well as industrial mechanics who need to refresh their basic skills.

Hardware is of industrial-grade, yet small and light enough to be handled by one student. Most of the hands-on exercises take place inside an ergonomic and safe workstation which is the foundation of the system.

The Mechanical drives learning system is divided into a Workstation package (required for all topics) and four levels. Each level consists of separate models that include hardware, tools, measuring apparatus, and instructor manuals. Optional topics and hardware are also offered.

### System of units (SI versions only)

The SI version of the system is designed with components and manuals that use the International System of Units, abbreviated SI (m, kg, etc.)

### Electrical network (SI versions only)

The SI version of the system is available for 120 V, 60 Hz and 230 V, 50/60 Hz electrical networks. The 230 V, 50/60 Hz version of the workstation is CE compliant.

### Languages for hardware and manuals (SI versions only)

The 120 V, 60 Hz system is available in English, Spanish and French. The 230 V, 50/60 Hz system is available in English, Spanish, French and German.

### Features & Benefits

- Safe and ergonomic workstation
- Small footprint
- Hundreds of possible setups with movable T-slotted extrusions
- Turnkey solution with necessary fasteners and tools
- Optional work bench available to store components from all levels

### List of Available Training Systems

Qty	Description	Model number
1	Mechanical Drives Learning System (SI units): Workstation Package _____	594775 (46100-00)
1	Mechanical Drives Training System, SI Units – Level 1 (add-on) _____	594777 (46100-10)
1	Mechanical Drives Training System, SI Units – Level 2 (add-on) _____	594778 (46100-20)
1	Mechanical Drives Training System, SI Units – Level 3 (add-on) _____	594780 (46100-30)
1	Mechanical Drives Training System, SI Units – Level 4 (add-on) _____	594781 (46100-40)

## Available Training Systems

### Mechanical Drives Learning System (SI units): Workstation Package 594775 (46100-00)



#### Gain precious time with a turnkey solution for teaching the fundamentals of industrial mechanics

This package includes the Workstation and components common to most experiments such as shafts, couplings, pillow block bearings, fasteners and tools. A three-phase motor, an adjustable-height motor mounting base and a Prony brake are also included.

Versatile and equipped with movable T-slotted extrusions, the Workstation is at the heart of the Mechanical Drives Learning system. Students use

it to quickly assemble a variety of mechanical drive set-ups. They can also test the set-ups with the included variable frequency drive and Prony brake to control the motor speed and load, creating various usage scenarios.

This ergonomic workstation is designed to minimize assembly time. Positioning the T-slotted extrusions and the main components, such as the motor and pillow block bearings, only requires a single tool and a couple of minutes, allowing students to focus their attention on the most relevant learning objectives.

Safety is maintained with an industrial-grade detection circuit that cuts power when the polycarbonate cover is opened. Trainees are asked to perform a lockout/tag out procedure on the main switch to prevent accidental activation of the motor while they are working. The cover can also be locked when closed to further improve safety during operation and allow instructors to control access to the components.

The Workstation is small enough to fit on most shop tables. Alternatively, an optional work bench is available with enough storage to accommodate most of the hardware of the entire Mechanical drives learning system.

### Features & Benefits

- Safe and ergonomic workstation
- Small footprint
- Hundreds of possible setups with movable T-slotted extrusions
- Turnkey solution with necessary fasteners and tools
- Optional work bench available to store components from all levels

### List of Equipment

Qty	Description	Model number
1	Workstation (SI Units) _____	593733 (46860-00)
1	Panel with shafts and couplings _____	593742 (46861-00)
1	Pillow block bearings panel _____	593746 (46862-00)
1	Workstation Accessories (SI units) _____	593750 (46863-00)



## List of Manuals

Description	Manual number
Introduction to Mechanical Drive Systems (Workbook (Instructor)) _____	593933 (52934-3C)
Mechanical Drives Training System (User Guide) _____	594994 (54435-EC)

## Table of Contents of the Manual(s)

### Introduction to Mechanical Drive Systems (Workbook (Instructor)) (593933 (52934-3C))

- 1 Introduction to Mechanical Drives
- 2 Familiarization with the Workstation
- 3 Safety
- 4 Pillow Block Bearings
- 5 Motor, Variable Frequency Drive, and Tachometer
- 6 Shaft Alignment and Couplings
- 7 Torque, Power, and Efficiency

### Mechanical Drives Training System (User Guide) (594994 (54435-EC))

- General Requirements for Operating the Equipment
- Introduction
- Safety Precautions
- Technical Data
- Unpacking, Transport, Disposal
- Installation and Maintenance
- Commissioning
- Risks for Service Personnel

### Mechanical Drives Training System, SI Units – Level 1 (add-on) 594777 (46100-10)



Properly aligned pulleys, sprockets, and gears as well as adjustment of belt tension, chain slack and gear backlash are essential in mechanical drives. The Level 1 package includes hardware and tools to master these skills.

Future industrial mechanics must be trained to master the fundamental skills related to the identification, installation, and maintenance of belt, chain, and gear drives to minimize vibration, maximize power transmission, and help ensure that components reach their expected service-life.

The manuals of the Level 1 package guide the students step-by-step during their learning process with several photos and illustrations. The pulleys, sprockets and gears are stored on a panel for quick identification and inventory control.

## List of Equipment

Qty	Description	Model number
1	Belt drives 1 _____	593759 (46866-00)
1	Chain drives 1 _____	593763 (46867-00)
1	Gear drives 1 _____	593767 (46868-00)

## List of Manuals

Description	Manual number
Belt Drives 1 (Workbook (Instructor)) _____	593952 (54332-3C)
Chain Drives 1 (Workbook (Instructor)) _____	593962 (54333-3C)
Gear Drives 1 (Workbook (Instructor)) _____	593972 (54334-3C)

## Mechanical Drives Training System, SI Units – Level 2 (add-on) 594778 (46100-20)



### Gain precious time with a turnkey solution for teaching the fundamentals of industrial mechanics

Building on the knowledge gained in Level 1, Level 2 provides students with more learning opportunities in installation procedures of hardware commonly used in a variety of belt drives, chain drives, and gear drives.

There are several types of belts, pulleys, chains, sprockets, and gears suited for specific applications. Industrial maintenance students need to be able to identify and install them according to specifications. A selection of the most common ones is included in Level 2, along with new hardware and tools to teach these skills.

The manuals of the Level 2 package guide the students step-by-step during their learning process with several photos and illustrations. The pulleys, sprockets and gears are stored on a panel for quick identification and inventory control.

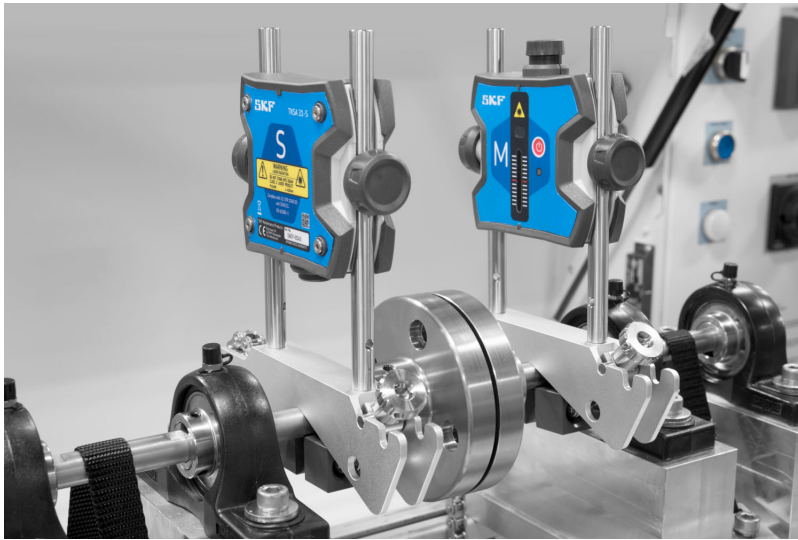
## List of Equipment

Qty	Description	Model number
1	Belt drives 2 _____	593778 (46873-00)
1	Chain drives 2 _____	593782 (46874-00)
1	Gear drives 2 _____	593786 (46875-00)
1	Level 2 Accessories (SI) _____	593790 (46876-00)

## List of Manuals

Description	Manual number
Belt Drives 2 (Workbook (Instructor)) _____	595217 (54977-3C)
Chain Drives 2 (Workbook (Instructor)) _____	595225 (54978-3C)
Gear Drives 2 (Workbook (Instructor)) _____	595233 (54979-3C)

## Mechanical Drives Training System, SI Units – Level 3 (add-on) 594780 (46100-30)



**Gain precious time with a turnkey solution for teaching the fundamentals of industrial mechanics**

Building on the knowledge gained in Level 1, Level 2 provides students with more learning opportunities in installation procedures of hardware commonly used in a variety of belt drives, chain drives, and gear drives.

There are several types of belts, pulleys, chains, sprockets, and gears suited for specific applications. Industrial maintenance students need to be able to identify and install them according to specifications. A selection

of the most common ones is included in Level 2, along with new hardware and tools to teach these skills.

The manuals of the Level 2 package guide the students step-by-step during their learning process with several photos and illustrations. The pulleys, sprockets and gears are stored on a panel for quick identification and inventory control.

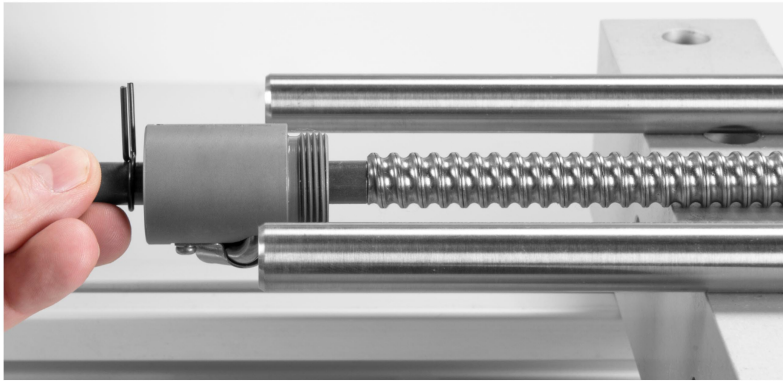
### List of Equipment

Qty	Description	Model number
1	Shaft Alignment and Couplings _____	593797 (46880-00)
1	Bearings and seals _____	593801 (46881-00)
1	Spare Parts for Bearings and Seals _____	593805 (46882-00)
1	Accessory level 3 _____	593809 (46883-00)

### List of Manuals

Description	Manual number
Shaft Alignment and Couplings (Workbook (Instructor)) _____	596133 (49138-3C)
Bearings and Seals (Workbook (Instructor)) _____	596141 (49348-3C)
Bearings and Seals (Workbook (Instructor)) _____	8121656 (49348-30)

## Mechanical Drives Training System, SI Units – Level 4 (add-on) 594781 (46100-40)



This package introduces clutches for various operating conditions along with their proper installation procedures. And the topic ball screws and linear bearings introduces the main components and proper assembly steps of a linear slide.

Several industrial applications, such as some conveyors, may require a load to be engaged/disengaged or braked while the motor keeps running. Other applications require the torque to be

limited to protect mechanical equipment from overload caused by shock loads or machine jamming. The topic Clutches and brakes introduces those aspects and presents clutches for various operating conditions along with their proper installation procedures.

In modern industry, ball screws and linear bearings are commonly used to transform rotational movement into linear movement, and vice versa. Typical applications include many types of machine tools, such as CNC mills and drills. The topic Ball screws and linear bearings introduces the main components and proper assembly steps of a linear slide. Essential concepts of maintenance and lubrication of linear bearings, ball screws, and ball nuts are also covered.

The manuals of the Level 4 package guide the students step-by-step during their learning process with several photos and illustrations. The main hardware is stored on panels for quick identification and inventory control.

### List of Equipment

Qty	Description	Model number
1	Clutches and Brakes _____	593820 (46888-00)
1	Ball screw drives and linear bearings _____	593824 (46889-00)
1	Electromagnetic Clutch-Brake Unit (SI) _____	593834 (46893-00)

### List of Manuals

Description	Manual number
Clutches and brakes (Workbook (Instructor)) _____	596149 (49349-3C)
Ball Screws and Linear Bearings (Workbook (Instructor)) _____	596157 (49350-3C)
Ball Screws and Linear Bearings (Workbook (Instructor)) _____	8121664 (49350-30)

## Equipment Description

### Workstation (SI Units) 593733 (46860-00)

Versatile and equipped with movable T-slotted extrusions, the Workstation is at the heart of the Mechanical Drives training system.

Learners use it to quickly assemble a variety of mechanical drive set-ups. They can also test the set-ups with the included variable frequency drive and prony brake to control the motor speed and load, creating various usage scenarios.

This ergonomic workstation is designed to minimize assembly time. Positioning the T-slotted extrusions and the main components, such as the motor and pillow block bearings, only requires a single tool and a couple of minutes, allowing students to focus their attention on the most relevant learning objectives.

Safety is maintained with an industrial-grade detection circuit that cuts power when the polycarbonate cover is opened. Trainees are asked to perform a lockout/tag out procedure on the main switch to prevent accidental activation of the motor while they are working. The cover can also be locked when closed to further improve safety during operation and allow instructors to control access to the components.

## List of Manuals

Description	Manual number
Introduction to Mechanical Drive Systems (Workbook (Instructor)) _____	593933 (52934-3C)
Mechanical Drives Training System (User Guide) _____	594994 (54435-EC)

## Table of Contents of the Manual(s)

### Introduction to Mechanical Drive Systems (Workbook (Instructor)) (593933 (52934-3C))

- 1 Introduction to Mechanical Drives
- 2 Familiarization with the Workstation
- 3 Safety
- 4 Pillow Block Bearings
- 5 Motor, Variable Frequency Drive, and Tachometer
- 6 Shaft Alignment and Couplings
- 7 Torque, Power, and Efficiency

### Mechanical Drives Training System (User Guide) (594994 (54435-EC))

- General Requirements for Operating the Equipment
- Introduction
- Safety Precautions
- Technical Data
- Unpacking, Transport, Disposal
- Installation and Maintenance
- Commissioning
- Risks for Service Personnel

## Panel with shafts and couplings 593742 (46861-00)



Mechanical drives use shafts to transmit power through a machine. Shafts can carry pulleys, sprockets, gears, and couplings to transmit rotary motion. Understanding how they are made, installed, and maintained are essential skills that future industrial mechanics must master.

The Couplings – Shafts Panel includes five stainless steel shafts of two different lengths with key seat and flat. These are required in most experiments. The popular rigid sleeve and flexible jaw couplings are provided to teach basic couplings and shafts alignment methods. All components are stored on a panel for identification and inventory control. The panel has handles for moving and positioning. One Shafts and Couplings Panel is required with each Workstation.

## Pillow block bearings panel 593746 (46862-00)

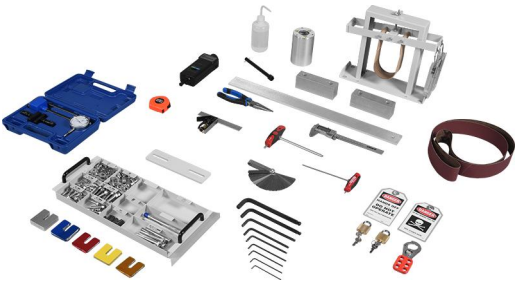


Pillow block bearings are an important part of mechanical drives and are used in virtually all industries. Understanding how they are made, installed, and maintained are essential skills that future industrial mechanics must master.

The Pillow Block Bearings panel includes ten housings with stainless steel rolling bearings that can be swiveled to compensate for slight shaft misalignment. A setscrew is provided to hold the inserted shaft in place.

The rolling bearing is pre-lubricated for life under normal operating conditions. For learning purposes, grease can be pushed-in through a nipple during re-lubrication using a grease gun. Pillow block bearings are required in most experiments and are stored on a panel for identification and inventory control. The panel has handles for moving and positioning. One Pillow Block Bearings Panel is required with each Workstation.

**Workstation Accessories (SI units)**  
**593750 (46863-00)**



The Mechanical drives training system is a turnkey solution. Instructors will find most fasteners, tools, and measuring apparatus required for the suggested experiments in the Workstation Accessories package.

Various lengths of cap screws with a single hexagonal socket drive size are supplied so that only one tool is required to fix components to the T-slotted extrusions, saving assembly time. A compartmented box is included to store, organize and quickly identify fasteners.

One Workstation accessories package is required with each Workstation.

**Belt drives 1**  
**593759 (46866-00)**



Aligned pulleys, properly tensioned belts, and careful handling and inspection of belts and pulleys are essential to minimize vibration, maximize power transmission, and meet the expected service-life of belt drives. Industrial mechanics must be trained to master the fundamental skills related to the installation and maintenance of belt drives.

The Belt drives 1 package includes all the hardware and tools to teach these skills. Pulleys with different pitch diameters, a pulley gauge, a belt, and a belt tension tester are available for students to experiment with proper installation and maintenance procedures. Pulleys are stored on a panel for identification and inventory control. The panel has handles for moving and positioning.

**Manual**

**Description**

**Manual  
number**

Belt Drives 1 (Workbook (Instructor)) \_\_\_\_\_ 593952 (54332-3C)

**Specifications**

Parameter	Value
<b>Pulleys</b>	
Pitch diameter	80 mm (3.15 in), 100 mm (3.94 in), 125 mm (4.92 in)
For Belt Type	A and B
<b>V-Belt</b>	
Designation	A38
<b>V-Belt and Pulley Gauges</b>	
Includes	8 gauges for grooves and 2 for belts
<b>Pen Belt Tension Tester</b>	
Maximum Tension	15.9 kg (35 lb)



Parameter	Value
<b>Panel</b>	
Quantity	1
Dimensions (H x W x D)	TBE
<b>Physical Characteristics</b>	
Total Net Weight	TBE

## Chain drives 1 593763 (46867-00)



Aligned sprockets, proper adjustment of chain slack, lubrication, and careful handling and inspection of chains and sprockets are essential to minimize vibration, maximize power transmission and meet the expected service-life of chain drives. Industrial mechanics must be trained to master the fundamental skills related to the installation and maintenance of chain drives.

The Chain Drives 1 package includes all the hardware and tools to teach these skills. Sprockets with varying numbers of teeth, chains, connecting links, a chain puller, and a chain breaker are available for students to experiment with proper installation and maintenance procedures. Sprockets are stored on a panel for identification and inventory control. The panel has handles for moving and positioning.



## Manual

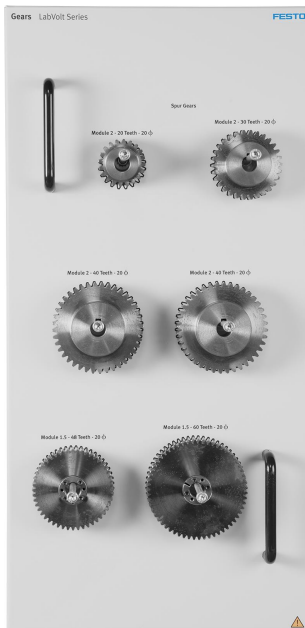
### Description

### Manual number

Chain Drives 1 (Workbook (Instructor)) \_\_\_\_\_ 593962 (54333-3C)



## Gear drives 1 593767 (46868-00)



Aligned gears, proper adjustment of backlash, lubrication, and careful handling and inspection of gears are essential to minimize vibration, maximize power transmission, and meet the expected service life of gear drives. Industrial mechanics must be trained to master the fundamental skills related to the installation and maintenance of gear drives.

The Gear Drives 1 package includes hardware to teach the fundamentals of gear drives. Spur gears with varying modules and numbers of teeth are available for students to experiment with proper installation and maintenance procedures. Gears are stored on a panel for identification and inventory control. The panel has handles for moving and positioning.

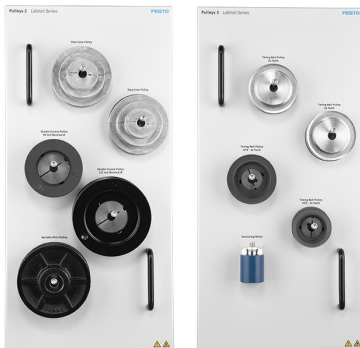
## Manual

### Description

### Manual number

Gear Drives 1 (Workbook (Instructor)) \_\_\_\_\_ 593972 (54334-3C)

## Belt drives 2 593778 (46873-00)



This package includes all the hardware to teach additional belt drives skills. Various types of common pulleys and belts shall be included for students to experiment with proper installation and maintenance procedures. Pulleys are stored on panels for identification and inventory control. Each panel has two handles for moving and positioning.



## Manual

### Description

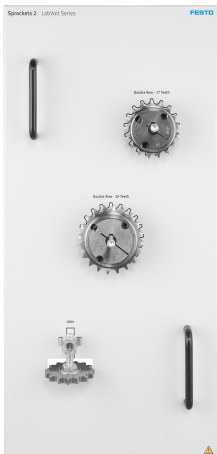
### Manual number

Belt Drives 2 (Workbook (Instructor)) \_\_\_\_\_ 595217 (54977-3C)

### Topic Coverage

- Wedge and cogged belts
- Multiple-belt drives
- Multiple-speed belt drives
- Variable-speed belt drives
- Synchronous belt drives
- High torque synchronous belt drives
- Pulley idlers

## Chain drives 2 593782 (46874-00)



This package includes all the hardware to teach additional chain drives skills. Double sprockets with varying number of teeth, a double chain, a chain tensioner, and double connecting links are available for students to experiment with proper installation and maintenance procedures. Sprockets are stored on a panel for identification and inventory control. The panel has two handles for moving and positioning.



## Manual

### Description

### Manual number

Chain Drives 2 (Workbook (Instructor)) \_\_\_\_\_ 595225 (54978-3C)

### Topic Coverage

- Multiple-Chain Drives
- Chain tensioners

## Gear drives 2 593786 (46875-00)



This package includes all the hardware and tools to teach additional gear drives skills. Spur gears with varying modules and numbers of teeth are available for students to experiment with proper installation and maintenance procedures. Gears are stored on a panel for identification and inventory control. The panel has two handles for moving and positioning.

## Manual

### Description

Gear Drives 2 (Workbook (Instructor)) \_\_\_\_\_ 595233 (54979-3C)

**Manual  
number**

### Topic Coverage

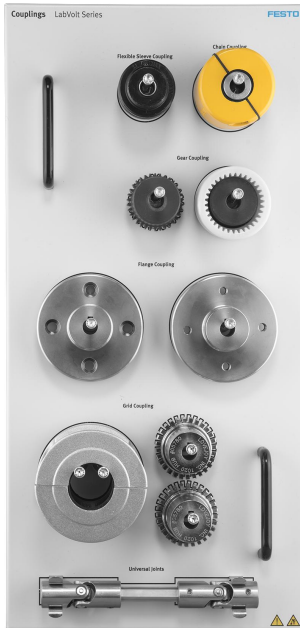
- Helical Gears
- Worms and Worm Gears
- Miter Gears
- Gearboxes

## Level 2 Accessories (SI) 593790 (46876-00)



Includes most fasteners, tools, and measuring apparatus required for the suggested experiments of level 2.

## Shaft Alignment and Couplings 593797 (46880-00)



A fundamental aspect of mechanical drives is the axial transmission of torque from a driving machine to a driven machine. A typical example is a motor connected to a pump. This is achieved by joining the shafts of each machine through a device called the coupling. A key requirement of any coupling is the alignment of the shafts.

The topic Shaft alignment and couplings introduces those aspects and presents couplings and shaft alignment methods suitable for various operating conditions. For couplings, the emphasis is put on selection, assembly and disassembly, while the portion that deals with shaft alignment methods demonstrates proper handling of the tools to take valid measurements and ensure a proper alignment. An add-on named Laser alignment of shafts is optionally available.

### Manual

#### Description

#### Manual number

Shaft Alignment and Couplings (Workbook (Instructor)) \_\_\_\_\_ 596133 (49138-3C)

## Bearings and seals 593801 (46881-00)



The topic Bearings and seals deals with the inner components of a machine. In the context of real applications such as a gearbox, a pump and a wheel hub, students learn industry-proven methods for installing and removing bearings and seals in housings and on shafts. Essential notions of bearings lubrication are also covered.

### List of Manuals

#### Description

#### Manual number

Bearings and Seals (Workbook (Instructor)) \_\_\_\_\_ 596141 (49348-3C)

Bearings and Seals (Workbook (Instructor)) \_\_\_\_\_ 8121656 (49348-30)

## Spare Parts for Bearings and Seals 593805 (46882-00)



This package includes replacement parts for the three applications described in the Bearings and Seals section. The following components are included:

Shaft keys, mechanical seal, roll of gasket material, O-rings, retaining rings, socket screws, shaft locknuts, lock washers, shims, adapter sleeves, V-ring seals, lip seals.

## Accessory level 3 593809 (46883-00)



This package includes most tools and measuring apparatus required for the suggested experiments of Shaft Alignment and Couplings, Laser Shaft Alignment (optional), and Bearings and Seals.

## Clutches and Brakes 593820 (46888-00)



This package includes hardware and tools to teach clutches and torque limiter installation and maintenance skills.

## Manual

### Description

### Manual number

Clutches and brakes (Workbook (Instructor)) \_\_\_\_\_ 596149 (49349-3C)

### Topic Coverage

- Freewheel clutches
- Torque limiters
- Electromagnetic clutches and brakes

## Ball screw drives and linear bearings 593824 (46889-00)



This package includes hardware and tools to teach ball screws and linear bearings installation and maintenance skills.

## List of Manuals

### Description

### Manual number

Ball Screws and Linear Bearings (Workbook (Instructor)) \_\_\_\_\_ 596157 (49350-3C)  
 Ball Screws and Linear Bearings (Workbook (Instructor)) \_\_\_\_\_ 8121664 (49350-30)

### Topic Coverage

- Linear bearings
- Ball nuts and ball screws
- Backlash
- Pitch, lead, start, and speed

## Electromagnetic Clutch-Brake Unit (SI) 593834 (46893-00)

This package consists of an electromagnetic clutch/brake unit which is required for some suggested experiments included in the Clutches and Brakes package manuals.

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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