

# CLUTCH WITH DIAPHRAGM SPRING

## INSTRUCTION

https://autoedu.lt/

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## 1. WORK SAFETY

#### **General safety requirements**

## Attention:

Familiarize yourself with the instruction manual of the training equipment before starting any work on the equipment.

## Attention:

Do not touch moving parts if there is a rotating clutch.

The educational equipment can only be used for the educational purposes specified in the instructions.

Training personnel (teacher, teacher, instructor and others) must be familiar with the instruction of the training equipment, know the methods and principles of using the equipment, settings, management, and be able to turn off (stop) the training equipment in an emergency.

The personnel conducting the training (teacher, teacher, instructor and others) acquaints those working and learning with the educational equipment with the work safety requirements s.

It is forbidden for children and unqualified personnel to work with the educational equipment.

Persons under the influence of alcohol or other psychotropic substances are prohibited from working with the training equipment.

It is prohibited to improve, modify or otherwise change the design of the educational equipment without the written consent of the manufacturer.

Do not ignore the warning signs on the training equipment about potential hazards. Beware of the hazards indicated in the warning signs.

When cleaning educational equipment, it must be completely switched off.

It is forbidden to wash educational equipment with running water or any chemical cleaning agents.

It is forbidden to clean the electronic components of the educational equipment with wet cloths.

When performing maintenance and repair work on educational equipment, the equipment must be completely switched off.

#### Before working with the training equipment, check that:

- The equipment is mechanically undamaged, unbroken;
- All protective shields are assembled;

- All hot, rotating parts (such as heating candles, pulleys, gears, etc.) are covered;
- There are all the components (e.g. wires, jumpers, fuses, knobs, etc.);
- Sufficient technical fluids (eg brake fluid, oil, coolant, etc.);
- Liquids do not seep through joints;
- There are no foreign bodies in the equipment components;
- Undamaged electrical wires;
- Neat power sources (battery or bench power unit);
- Are the power sources properly connected (e.g. the battery terminals of the batteries are screwed, the polarity is not mixed, the correct power source is used according to the local electrical network installation standards);
- Using training equipment with internal combustion engines ensures the removal of combustibles from the audience;
- The training equipment is properly placed and locked (e.g. the equipment is placed on a sufficiently solid base, the transport wheels are locked);
- During operation, the equipment will not cause any danger to the personnel working with it and the surrounding personnel;
- There are other factors not provided for in the instruction that may cause health hazards to the personnel working with the equipment and other persons.

When working with the equipment, observe whether:

- Equipment with internal combustion engines removes fuel from the audience smoothly;
- The noise emitted by the equipment is typical for such a work process (there are no extraneous sounds);
- The equipment did not start leaking liquids;
- The amount of technical fluids is sufficient;
- The smell of smoldering, burning things is not smelled;
- Power supplies are working properly;
- Any other factors or processes not provided for in the instruction that may cause health hazards to personnel working with the equipment or other persons do not take place.

## 2. GENERAL INFORMATION

#### 2.1. Purpose of educational equipment

Educational equipment is intended for educational activities. It is a visual tool for explaining and demonstrating the structure and operation of various automotive parts, assemblies, structures, systems. The equipment is used as a teaching and learning tool for monitoring and analyzing work processes of various car systems. It is possible to carry out various measurements of the parameters of the system installed in the educational equipment, of the ongoing processes, to carry out fault simulations, and to diagnose. The equipment is prepared and manufactured in order to provide students with information about the structure of the unit, the system composition and the principle of operation as clearly and comfortably as possible.

The educational equipment is intended for demonstration, teaching and learning of clutch construction and structure, operating principle, settings and adjustments.

#### 2.2. Parameters of educational equipment

Length	250 mm;
Width	200 mm;
Height	200 mm;
Weight about	10 kg (depends on the configuration);

#### 2.3. Transport and storage conditions

The training equipment is mounted on a dedicated stand, frame, platform or chassis. During transportation, it is mandatory to protect the equipment from falling, overturning, shocks, moisture, temperature effects, and vibrations.

Training equipment with its own chassis must be equipped with locked transport wheels during training and storage (as well as during transportation). It is allowed to unlock the castors only when moving the educational equipment to another place.

Educational equipment that does not have its own stand or chassis must be placed on a suitable, solid base (table, cabinet).

When carrying out export or import procedures, it is mandatory to take into account the legal acts between the countries. Import-export procedures and various taxes apply to various technical fluids, oils, batteries, tires and more.

Training equipment must be stored in a room with a minimum ambient temperature of at least +10 °C. Relative humidity not more than 60%.

Training equipment must not be exposed to direct sunlight. The equipment must be covered with protective equipment if it is stored in an area exposed to direct sunlight.

#### 2.4. Maintenance and service

Training equipment is maintained as normal mechanical, hydraulic, pneumatic, electrical machines and systems. Educational equipment requires minimal maintenance and service.

It is necessary to control and ensure that all the components belonging to the educational equipment are present.

Damaged, broken parts, blown fuses, damaged connecting wires and other parts are replaced with new ones.

When performing technical maintenance and servicing of educational equipment, it is mandatory to use only technical fluids of suitable quality and meeting the technical specifications (engine, transmission oil, coolant, brake fluid, etc.), high-quality filters and other spare and complete parts.

#### 2.5. Equipment preparation and use

General information about the educational equipment produced by the company.

When preparing training equipment for work, it must be properly positioned and secured. Equipment that does not have its own chassis or stand is placed on a suitable table or cabinet. The furniture must withstand the load of the educational equipment. Equipment with its own stand or chassis is placed on a flat and solid floor. The transport wheels of the equipment are locked by locking the brakes.

The technical condition of the equipment, fastening of protective shields, equipment and other details are checked. More detailed information on safe work requirements in the section "Occupational safety  $\rightarrow$ Before working with training equipment, check that:".

Educational equipment is made for the study and demonstration of details, assemblies, systems, structure, construction and operation of engines. The cuts made in the equipment allow to see the structure more clearly, to understand the principles of operation. The systems installed in the training equipment are fully functional.

## 3. EDUCATIONAL EQUIPMENT

## General overview of educational equipment

The general view and structure of the training equipment is presented in the illustration below.



General view of the clutch training layout

- 1. flywheel
- 2. clutch plate
- 3. Clutch cover
- 4. Diaphragm spring
- 5. Clutch release handle
- 6. Twist handle
- 7. Frame

#### 4. CLUTCH PRINCIPLE OF OPERATION

Clutch – is a friction coupling that transmits torque by frictional forces. The clutch is designed to disconnect the transmission from the running engine for a short time and then smoothly connect them. Thanks to the clutch, the running engine is smoothly connected to the transmission, which allows the car to move slowly from a standstill. The clutch dampens rotational oscillations and protects the transmission from breaking when high torque is transmitted. Then the clutch slips. In cars, cut-out clutches are installed between the engine and the transmission. The clutch consists of:

- clutch disc with friction linings;
- pressure disc, pressure spring (cylindrical or diaphragm), clutch cover;
- trip bearing.

A clutch is considered engaged when it transmits torque from the engine to the transmission. The clutch is disengaged when the clutch pedal is depressed, no torque is transmitted to the gearbox.

Friction clutches transmit engine torque to the transmission by friction, compressed clutch discs. This is why these clutches are also called disc clutches. Friction clutches, depending on various characteristics, are divided into:

- according to the type of friction wet (operating in oil) and dry;
- according to the activation mechanism permanently and non-permanently activated;
- according to the type of pressure mechanism mechanical, hydraulic, electromagnetic.

Clutches have the following requirements:

- 1. It must transmit the torque developed by the engine to the transmission.
- 2. Must turn on and off smoothly.
- 3. Must protect the transmission from dynamic loads.
- 4. Must turn off completely.
- 5. The moment of inertia of the clutch must be as small as possible.
- 6. Must radiate heat well from rubbing surfaces.
- 7. Must be easy to manage.

Multi-disc clutches engage most smoothly. Additional means are used to improve the smoothness of engagement of single-disc and double-disc clutches: friction linings made of special materials, elastic discs, etc. The torque transmitted by automotive clutches is the frictional torque between the compressed drive and driven discs.

Diaphragm spring clutches are used in cars and trucks. The pressure disc is not pressed by cylindrical springs, but by diaphragm springs. Such a spring is often called a Belleville or membrane spring. The spring is in the shape of a truncated cone. It is stamped from spring steel sheets. Eighteen radial spring leaves are not only elastic elements of the spring, but also actuation arms. If the central part of the spring is pressed, the outer part of the spring bends in the opposite direction.

For Dylant clutch friction linings, the initial compression force of the cylindrical compression springs decreases little by little, so the disc compression force also decreases - the clutch begins to slip. After installing the diaphragm spring, the pressure of the spring almost does not change as the linings wear, so the clutch does not slip.

A clutch with a diaphragm spring is smaller, lighter, simpler in design, and more reliable than a clutch with cylindrical springs.

A big advantage of the diaphragm spring is that its characteristic is non-linear. When compressed, the force of such a spring increases only up to a certain critical value and then begins

to decrease, while the force of cylindrical springs is always proportional to the degree of compression.

There are no built-in parts on the periphery of the clutch, so it is much easier to balance, and if the rotation frequency is high, there is no centrifugal force that could reduce the pressure force of the discs. The drive disc of such a clutch is subjected to a uniform load in any operating mode.



Clutch with diaphragm spring

Distinctive design elements of a clutch with a diaphragm spring are two integral assembly units (assemblies). One of them consists of a pressure disc, a diaphragm spring and a cover, the second - a drive disc with a damper of rotational oscillations. The clutch is disengaged by a sliding clutch with a ball bearing.

The pressure disc is connected to the hood with steel plates. Due to the elastic pressure of the plates, the disk can move in the longitudinal direction, that is, towards the flywheel (when the clutch is engaged) or away from the flywheel (when the clutch is disengaged). When the clutch pedal is depressed, the release bearing bends the leaves of the diaphragm spring in the direction of the flywheel. The spring bends to the opposite side, resting on the support ring on the side of the flywheel, riveted to the cover. Its outer edge moves away from the flywheel and stops pressing the disc (the clutch is disengaged).

## **5**. WARRANTY CONDITIONS

Educational equipment is a complex engineering product that meets the high standards of modern technology. The equipment is made of high quality, using modern materials and technologies.

Educational equipment is granted 13 months. warranty, unless otherwise stipulated in the sales contract. The guarantee starts counting from the day the invoice is issued.

The warranty for educational equipment is canceled if:

- Non-original parts are used;
- Low-quality fuel is used;
- The wrong power source is used;
- When connecting the power source, the polarity was mixed;
- Technical fluids of the wrong quality are used and/or there are not enough of them;
- The design of the equipment has been changed;
- Equipment damaged during transportation or improper storage;
- The equipment was damaged due to illegal actions of individuals (vandalism, hooliganism, theft);
- Safe work instructions were not followed during work;
- Failures of household electrical networks, voltage fluctuations;
- Aggressive chemical cleaning agents were used to clean the equipment;
- Any equipment damage or loss occurred, defined as a case of Force Majeure ;
- Educational equipment is broken or otherwise damaged;
- If foreign objects or liquid get into the educational equipment;
- Using incomplete equipment.

The warranty does not apply to equipment wearing parts, fuses, operating fluids, fuel, seals, filters, liners, belts, bearings, etc.

Warranty repairs are carried out at technical service companies authorized by the manufacturer. Defective equipment units are repaired or replaced with new ones free of charge during the warranty period. The decision on the replacement or repair of parts is made by technicians of authorized companies. Replaced parts become the property of the service point.

After warranty repair, the warranty period is not extended and remains valid until the end of the scheduled period.

The costs related to the disassembly, disassembly, packaging and transportation of the equipment to the authorized warranty service company are not reimbursed to the Customer.

The Customer must cover all expenses incurred by technicians coming to the Customer (transportation, accommodation, etc.) to carry out warranty maintenance work on the educational equipment, when the warranty period of the equipment has not yet expired, but at least one case has been identified that voids the warranty for the educational equipment.

The manufacturer reserves the right to change the design, appearance and equipment of the training equipment.

The warranty conditions are valid only when the educational equipment is used according to the purpose specified in the instructions and in compliance with all work safety instructions.

When applying for a guarantee, the customer must have all the documents for the purchase of the educational equipment: purchase receipt, invoice - receipt, acceptance - transfer deed.

## Attention:

If the educational equipment breaks down, a "Warranty maintenance voucher" is filled out. The completed document is sent to the manufacturer of the educational equipment.

## Warranty service voucher

Name of educational equipment	
Product number	
Date of sale	
Owner of educational equipment	
Trade partner/representative	

## Description of performed works

Date	Description of the failure and its elimination process	Technician / Signature
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FOR NOTES



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