MSSPPS01-ABS

TRUCK TIRES
BRAKE SYSTEMS WITH ABS
EDUCATIONAL BENCH

INSTRUCTION

https://autoedu.lt/

https://bads.lt/

https://automotivetrainingequipment.com/

2024Kaunas Lithuania

CONTENTS

1. WORK SAFETY

General safety requirements

Attention:

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

The educational equipment may 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.

It is forbidden to disconnect the power cords of the electrical elements of the educational equipment. Careless or repeated disconnection of these wires leads to connection failures and loss of contacts. The desired electrical measurements can be made in specially designed banana connectors installed in the training equipment. Banana type connectors are resistant to multiple connections.

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.);
- Air supply lines are intact and tight;
- There are no foreign bodies in the equipment components;
- Undamaged electrical wires;
- Neat power cord;
- 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:

- The noise emitted by the equipment is typical for such a work process (there are no extraneous sounds);
- The equipment did not start to leak air;
- The smell of smoldering, burning things is not smelled;
- 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 training equipment, of the ongoing processes, to carry out fault simulations, and to diagnose. Various laboratory tasks can be performed using the educational equipment. 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, training and learning of the construction and structure, operating principle, settings and adjustments of the truck and semi-trailer (trailer) pneumatic brake system with ABS system.

2.2. Parameters of educational equipment

Truck io stand

Length	1610 mm;
Width	500 mm;
Height	1820 mm;
Weight about	137 kg;
Power source	~ 230 V household electrical network

Trailer stand

Length	1360 mm;
Width	500 mm;
Height	1820 mm;
Weight about	83 kg;
The power source	is connected to the truck stand

2.3. Transport and storage conditions

The training equipment is mounted on a dedicated stand, frame, platform or chassis. When transporting the equipment, it is forbidden to turn it over or lay it down. 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.

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. Equipment must be covered with protective equipment if it is kept in a place that is exposed to direct sunlight.

Unused educational equipment is stored completely switched off. The emergency stop button is deactivated. The training stands are turned off with the control key and by disconnecting the power supply.

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 constantly monitor the absence of air leakage from the units of the training equipment.

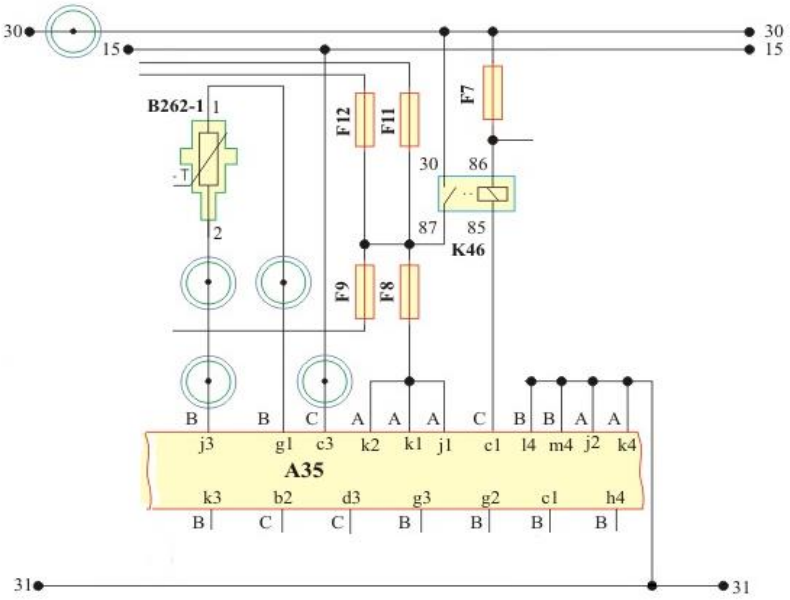
It is necessary to control and ensure that all the components belonging to the educational equipment are present.

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 parts of suitable quality and meeting the technical specification.

2.5. Symbols and markings

The training equipment uses automotive symbols for marking electrical diagrams and components. The figure below shows an example of marking components in an electrical diagram.



Example of wiring diagram and component labeling.

Designation of car electrical diagrams:

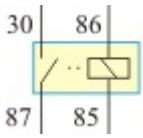
Black line connecting cables;

wires connected together;

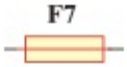
30 the cable marked with a number is such a cable of the electric circuit that has a constant voltage of +12 (24) V from the battery;

15 the wire marked with a number is the wire of the electrical circuit in which +12 (24) V direct voltage is activated with the help of the ignition key;

31 the wire marked with a number is the wire of the electric circuit that is connected to the car body and the negative terminal of the battery (ground ⏚);

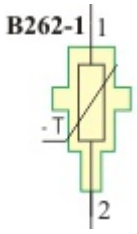


4-pin relay . The numbers 86 and 85 represent the contact numbers on the relay through which the relay electromagnet connecting contacts 30 and 87 is controlled. The numbers 30 and 87 indicate contact numbers through which a current of 30 A (or more) can be transmitted;



Fuse . Fuse marking symbol. In the schematic it is fuse F7.

A35 car system (assembly) control unit (computer) (eg: engine control unit, airbag control unit, brake ABS control unit or other). The letters A, B, C denote the connector used to connect the wires of the electrical installation to the control computer. Symbols g1, c3, k2, b2, d3 denote the contact of the control unit connector.



B262-1 temperature sensor 1. Numbers 1, 2 are the pin numbers of the temperature sensor.

A 4 (2) mm banana plug is installed in the training equipment and connected to that cable. connector (socket) for connecting measuring equipment or a jumper.

Two banana connectors (sockets) are installed on the cable for connecting a jumper. A jumper pulled out of the connectors breaks the circuit of this wire. Electric current cannot flow. The bench wiring diagram doesn't show this wire break because real cars don't have banana plugs. These connectors are installed in the electrical circuit of the training equipment, making it possible to perform measurements and simulate faults.

Shortener. Connector with 2 banana-type 4 (2) mm contacts (plugs) at the bottom and one banana-type 4 (2) mm contact (socket) at the top. All three contacts inside the jumper are connected together.

Attention:

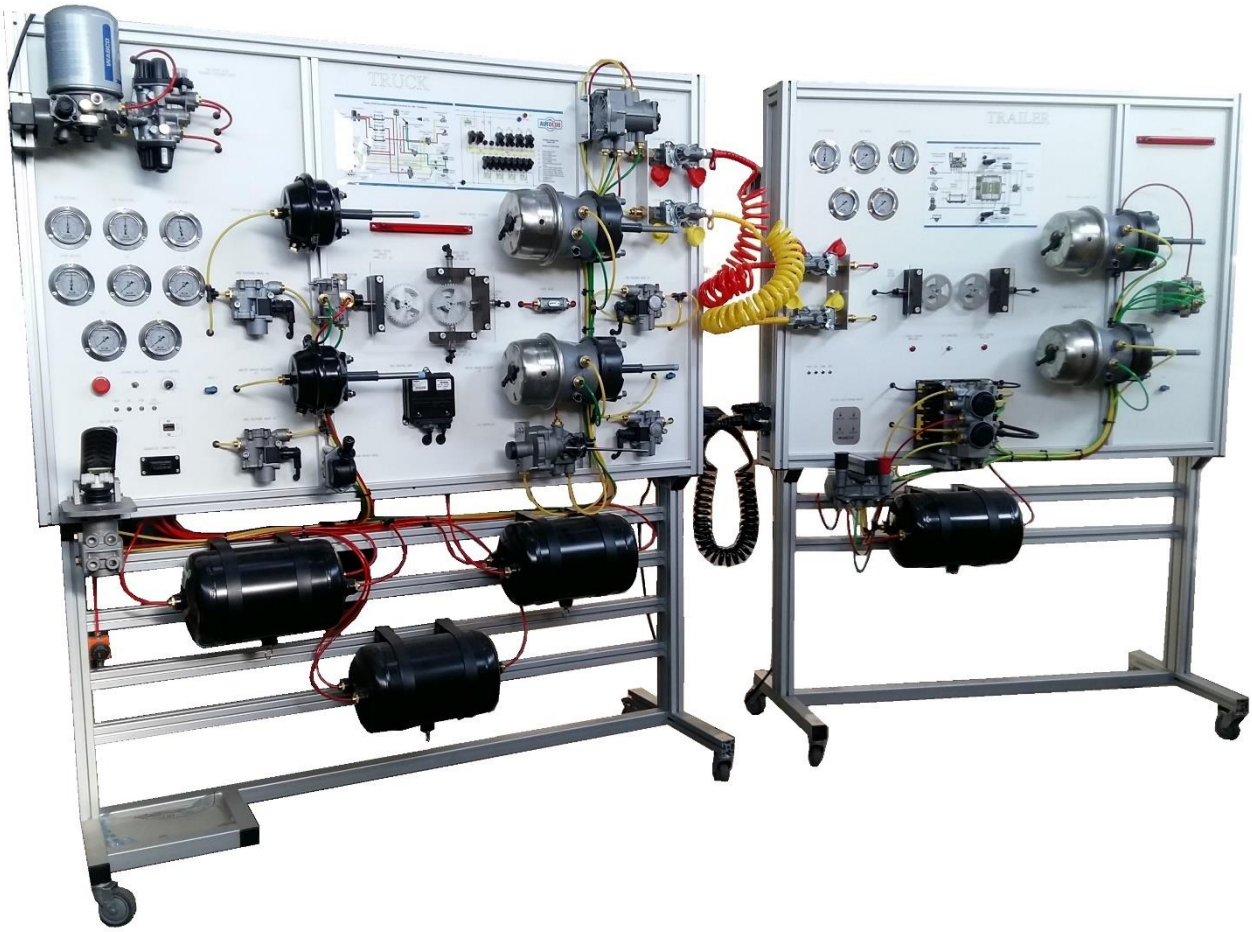
It is recommended to connect measuring cables with 4 (2) mm banana-type contacts (plugs) to the training equipment when performing various measurements of electrical parameters.

2.6. Equipment preparation and use

1. Place the stand in a level, well-lit and freely accessible place.

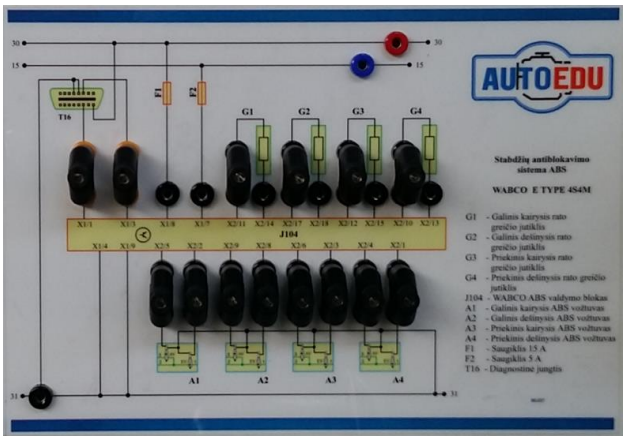
2. Lock the stand transport wheels.

3. Check that all the components of the stand are present and that they are installed correctly. Check that the stand is not visually damaged or broken anywhere. Are protections installed on rotating, heating and other elements that may pose a risk to human health. More detailed information in the section "Occupational safety →Before working with the training equipment, check that:".

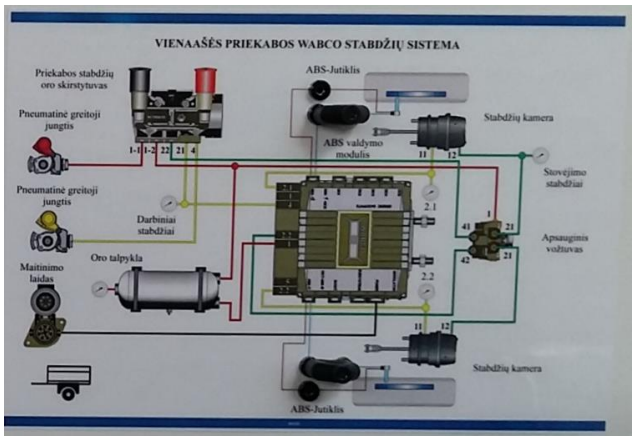


4. Check the fuses.

5. Check that all the jumpers are included in the wiring diagram and that they are correctly placed in their places.



Truck



P trailer

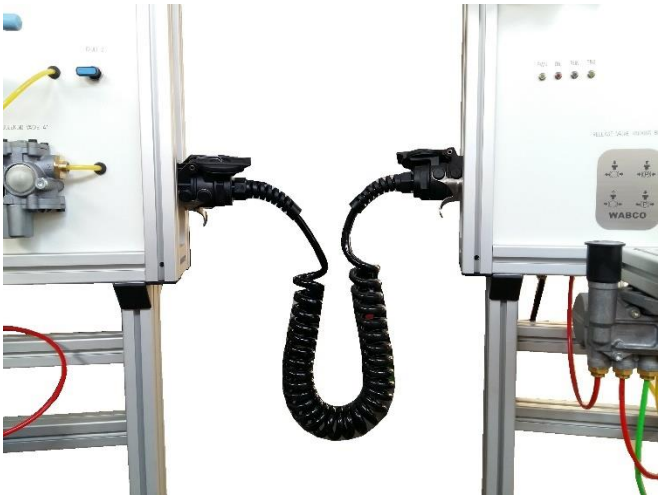
6. Check the tightness of the pneumatic lines.

7. Set the wheel speed control potentiometer knob to the extreme left position.

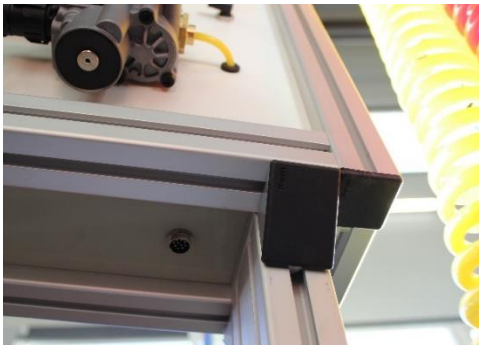
8. Connect the bench parts together (truck with trailer).

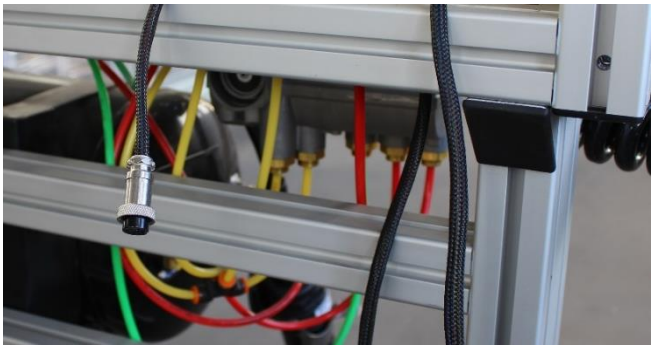
   a) Connect the air supply lines together.

   b) Connect the electrical circuit together.



c) Connect the additional cable required for proper system operation. (this wire is only required for bench work, but in a real truck-semi-trailer combination, this wire does not exist).





9. Connect the stand to the compressor.

Wait for the air tanks to fill.

10. Connect the stand to the household electrical network ~ 230 V 50 Hz.

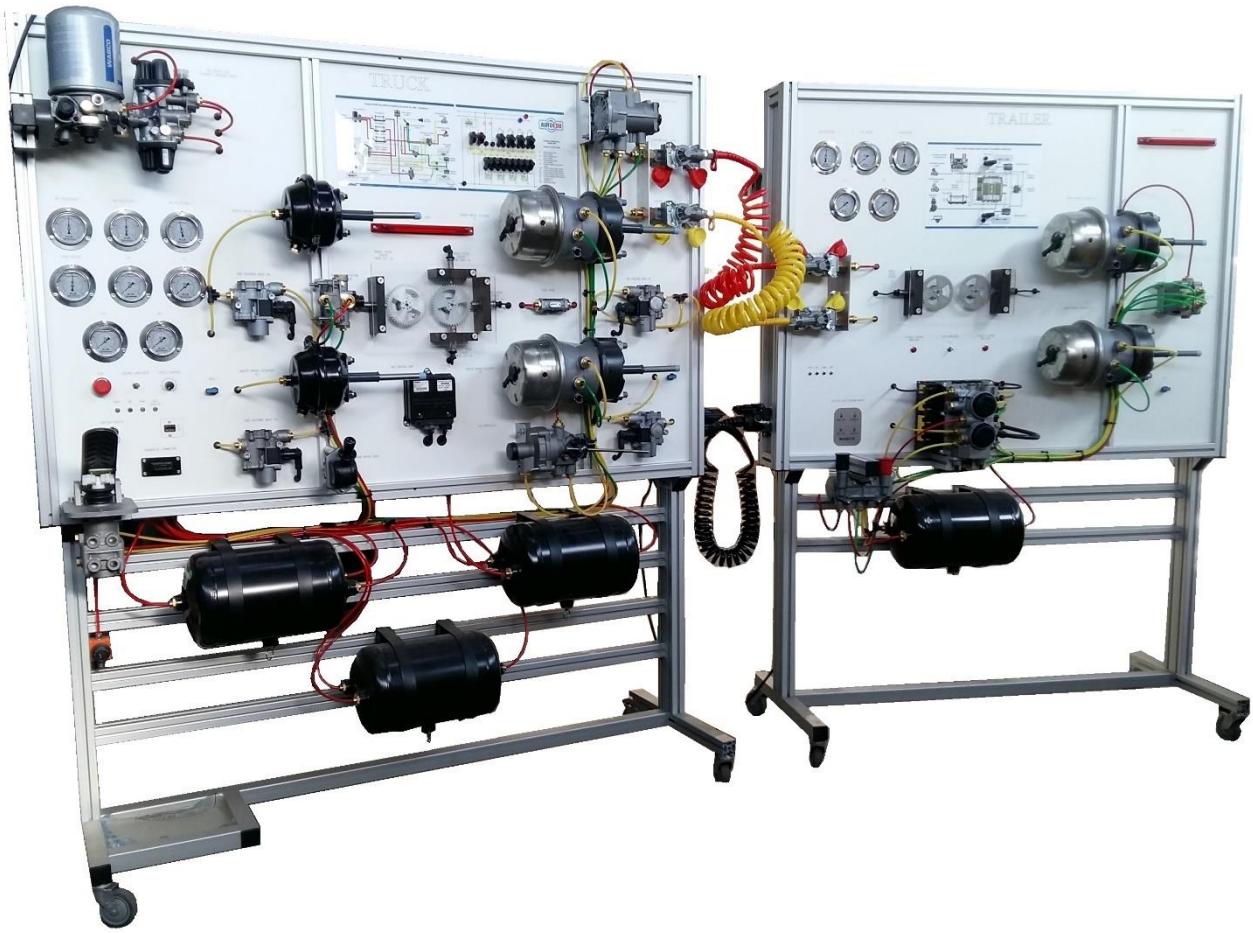
11. Unlock the bench's emergency stop key by turning its part in the direction of the arrow. When you turn part of the key in the direction of the arrow, the key bounces.

The PWR indicator lights up. The stand is ready for use.

3. EDUCATIONAL EQUIPMENT

3.1. General overview of educational equipment

Educational - the demonstration stand is intended for demonstration and learning of the operation of the pneumatic brake system of the truck and trailer. With this stand, it is possible to monitor various operating parameters of the brake system, perform measurements, simulate failures, and monitor parameter changes. On the stand, it is possible to simulate different driving speeds, a decrease in the rotation speed of the braked wheels, a change in air pressure, and mechanical and electrical system failures.



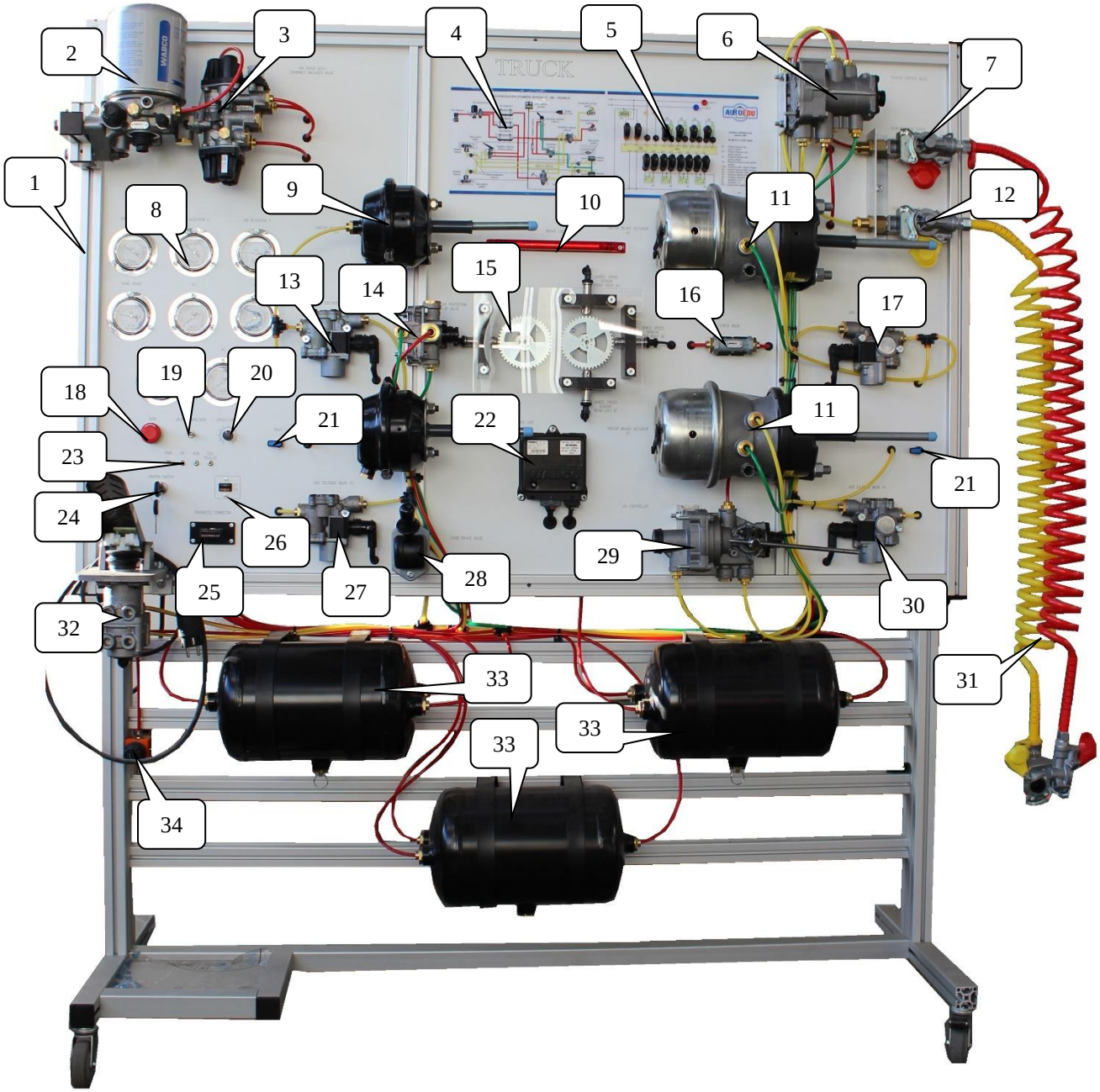
Truck and trailer pneumatic brake system educational demonstration stand

IMPORTANT

The stand is based on the truck Scania G - series MY 2003 (2003-2015) (It can also be identified as series P (2003-2013), series R (2003-2013)).

Trailer: Wabco T-EBS CD

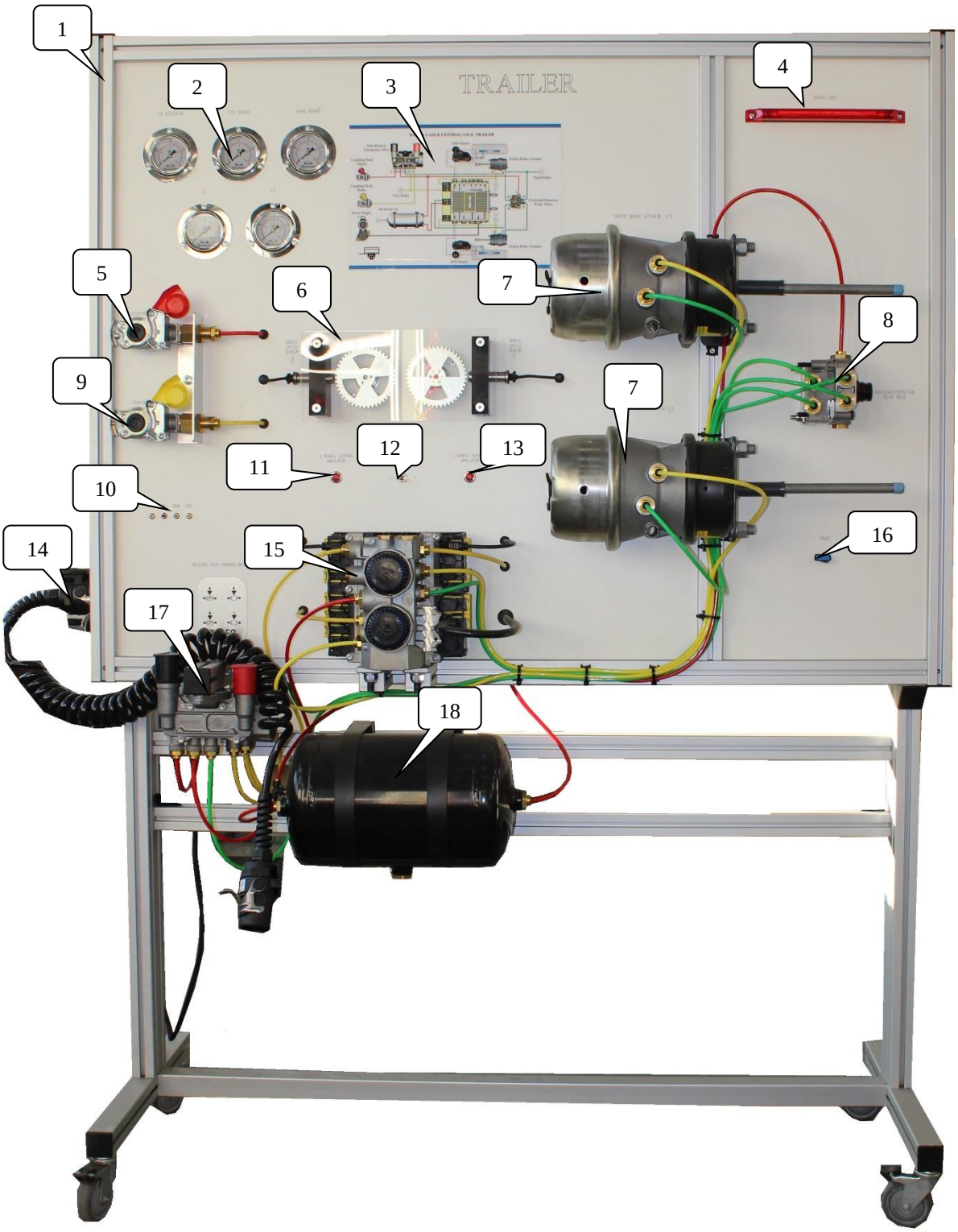
Components of the training-demonstration stand



Truck pneumatic brake system components

1	Stand frame
2	Air dryer
3	Safety valves
4	Pneumatic diagram
5	Electric scheme
6	Trailer brake system control valve
7	Air supply for trailer bus connection
8	Manometers
9	Front axle wheel brake chambers
10	Brake light
11	Rear axle wheel brake chambers with spring accumulators
12	Trailer brake control bus connector

13 ABS solenoid valve
14 Safety valves
15 Wheel rotation speed sensors
16 One-way valve
17 ABS solenoid valve
18 STOP emergency stop key
19 Wheel rotation speed simulation switch
20 Wheel speed change potentiometer
21 Failure simulation faucet
22 ABS control unit
23 Stand status indicator
24 Activation key
25 OBD diagnostic connector
26 Fuses
27 ABS solenoid valve
28 Parking brake control valve
29 Brake force regulator against load
30 ABS solenoid valve
31 Flexible ducts for air supply trailer
32 Service brake tap
33 Air tank
34 Compressor coupling and pressure regulator



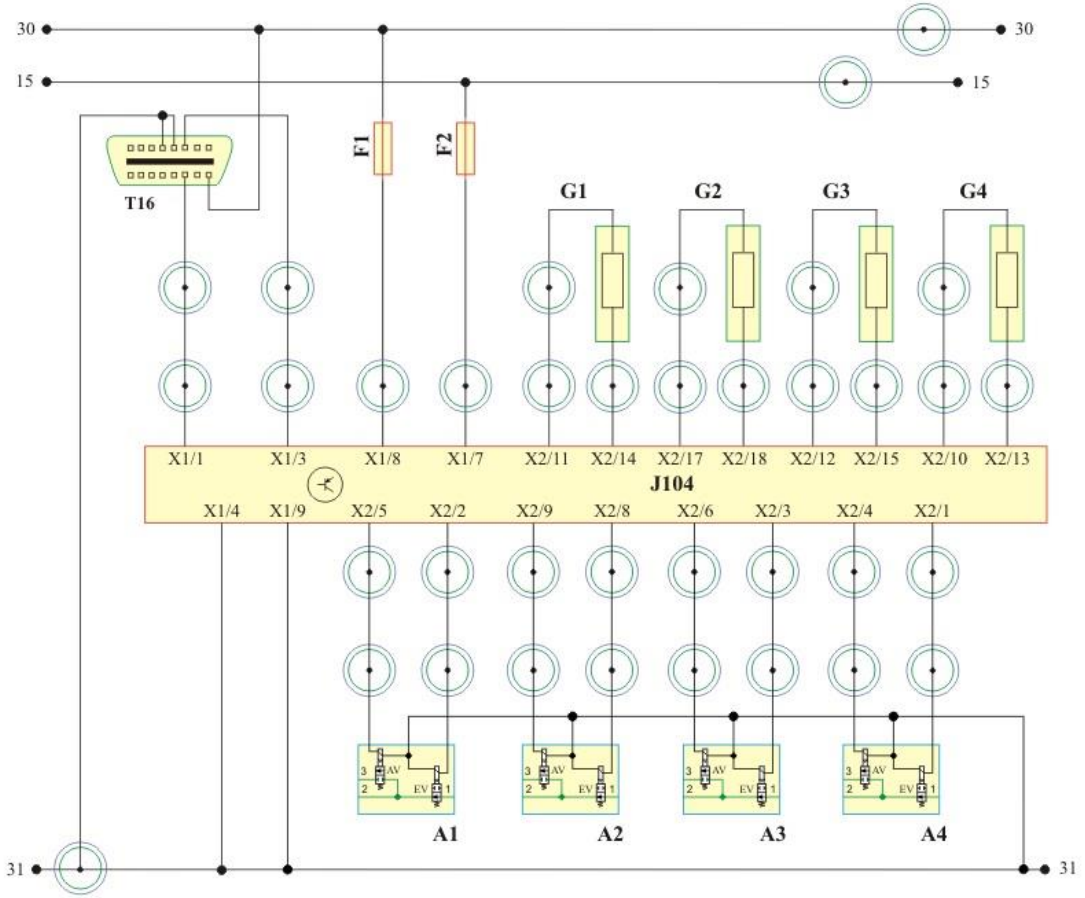
Trailer pneumatic brake system components

1 Stand frame
2 Manometers
3 Trailer brake electric - pneumatic scheme
4 Brake light
5 Air supply for trailer bus connection
6 Wheel rotation speed sensors
7 Trailer wheel brake cameras with spring accumulators

8 Safety valves
9 Trailer brake control bus connector
10 Stand status indicator
11 Wheel rotation speed simulation switch
12 Wheel rotation speed simulation switch
13 Wheel rotation speed simulation switch
14 Connecting cable
15 Trailer brake control unit
16 Failure simulation faucet
17 Trailer brake air distributor
18 Air tank

3.2. Electric scheme

All elements are presented in the electrical diagram: sensors, execution components, data transmission lines, diagnostic connection. According to this scheme, it is possible to see the connection circuits of the elements, the numbers of the connection contacts, the numbers of the components, the installation locations of the jumpers . When the jumper is removed from the electrical circuit, the control unit interprets this as a system failure.



Truck ABS brake system wiring diagram

3.3. A legend

G1 - Rear left wheel speed sensor
G2 - Rear right wheel speed sensor
G3 - Front left wheel speed sensor
G4 - Front right wheel speed sensor
J104 - WABCO ABS control unit
A1 - Rear Left ABS Valve
A2 - Rear Right ABS Valve
A3 - Front left ABS valve
A4 - Front right ABS valve
F1 - Fuse 15 A
F2 – Fuse 5 A
T16 – Diagnostic connector

4 . D ORB WITH TRAINING EQUIPMENT

The stand is designed and manufactured by maximally replicating the brake system of a truck and a trailer with ABS. Unlike a real truck, the stand must be connected to an external compressor. Air supplied from the compressor fills the truck and trailer brake air reservoirs. In order for the stand to work properly, it must be connected to the household electrical network. Electricity is used to power brake control units and other electrical components. The rotation of the truck and trailer wheels is simulated by the rotation of toothed discs, according to the teeth of which the speed sensors measure the rotation speed. Simulating the action of locking the wheels of a truck or trailer during braking, the rotation speed of one or more discs is reduced. Then the ABS brake system starts working, the sound of air being released through the pneumatic valves is heard.

It is possible to measure the electrical signals of the connected elements in the contacts of the electrical circuit using measuring tools . When the jumper is removed from the electrical circuit, an interruption (fault) of the electrical circuit is simulated. This affects the work of the bench components. A failure is detected in the ABS system control unit. A suitable medium for diagnostic studies.

Using system scanners (computer diagnostics) it is possible to see the real working parameters of the ABS system by connecting to the OBD II connector, to carry out diagnostics, scanning and erasing of malfunction errors. Diagnostic options depend on the system scanner model and software version used.

The stands of the training truck and trailer are equipped with valves, which, when opened, simulate a failure of the pneumatic system. The system becomes leaky when the valves are opened.

Switches are provided to simulate the locking of the braked wheels of a braked truck and trailer. Switches with fixed positions enable:

- simulating one (switch switched to the left) or three (switch switched to the right) wheel rotation speed reduction (wheel locking) in a truck.
- in the trailer, simulation of wheel rotation speed decrease (wheel locking) of sensor d (switch is activated to the left side) or c (switch is activated to the right side).

When the switch is in the middle position, the different wheels of the truck or trailer rotate at the same speed.

The trailer is equipped with non-locking switches for simulating a decrease in the speed of rotation of the wheels.

Fault codes

With the help of computer diagnostics, recorded fault codes or messages can be found in the memory of the brake ABS system control unit. These codes or messages are stored in the memory when a sensor, actuator, wire break, contacts are missing, or a jumper is removed from the electrical circuit.

Any fault codes or messages can be erased from the engine control unit's memory using computerized diagnostic equipment. Often, fault codes are recorded in the memory after disconnecting the cable when the ignition is on, when the signals of the speed sensors do not match, due to voltage fluctuations, etc. This is typical of random errors. If the fault codes cannot be deleted, or if these codes reappear immediately after deletion, the physical cause of the fault must be sought and eliminated. Only after physically eliminating the fault will it be possible to erase the fault error code from the memory of the control unit.

Pulling a connector out of an electrical connector circuit can simulate a fault and give trainee listeners a chance to identify the fault.

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 liquids 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

CONTACTS

Auto EDU, UAB

Ateits pl. 30 G, Kaunas,
LT – 52163, Lithuania

Phone: +370 – 37 337842
Fax: +370 – 37 337842

Email: info@autoedu.lt

www.automotivetrainingequipment.com