AUTOEDU
Automotive technical education equipment

MSMPI01

ENGINE CONTROL SYSTEM MOTRONIC M 3.8.X (MPI)

https://autoedu.lt/

https://bads.lt/

https://automotivetrainingequipment.com/

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CONTENTS

1. SAFETY REQUIREMENTS

Attention:

Before using the training board, take a look at the user manual.

Training equipment may only be used for the training purposes specified in the instructions.

The staff conducting the training (lecturer, teacher, instructor and others) must be familiar with the instructions for the training equipment, know the methods and principles of use, settings, control of the equipment, be able to switch off (stop) the training equipment in an emergency.

The training staff (lecturer, teacher, instructor and others) acquaint those working and learning with the training equipment with the work safety requirements.

It is forbidden to work with educational equipment for children, unqualified staff.

It is forbidden to work with training equipment for persons under the influence of alcohol or other psychotropic substances.

It is forbidden for people who do not have the appropriate qualifications to open the electrical input boxes, connect or change anything there.

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

Do not ignore the information on possible dangers provided by the warning signs on the training equipment. Beware of the hazards indicated on the warning signs.

The training equipment must be switched off completely during cleaning work.

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

It is forbidden to clean the electronic components of the training equipment with damp cloths.

The equipment must be completely switched off during maintenance and repair work on the training equipment.

It is forbidden to disconnect the power cords of the electrical elements of the training equipment. Careless or repeated disconnection of these wires will result in damage to the connectors and loss of contact. The desired electrical measurements can be performed at specially designed and installed banana-type connectors in the training equipment. Banana type connectors are resistant to multiple joints.

Before working with training equipment, check that:

- Equipment is not mechanically damaged, broken;
- All protective shields are assembled;
- All heated, rotating parts (e.g., heating plugs, pulleys, gears, etc.) are covered;
- All components (e.g., wires, jumpers, fuses, handles, etc.) are available;
- Sufficient technical fluids (e.g., brake fluid, oil, coolant, etc.);
- Liquids do not leak through the joints;
- The equipment components are free of foreign bodies;
- Undamaged power cords;
- Neat power supplies (battery or stand power supply);
- Power supplies are properly connected (e.g., battery terminals are screwed on, polarity is not mixed, proper power supply is used according to local electrical installation standards);
- The training equipment is properly constructed and locked (e.g., the equipment is placed on a sufficiently solid base, the transport wheels are locked);
- During operation, the equipment will not pose any danger to those working with it and the surrounding staff;
- There are other factors not specified in the instructions that may endanger the health of personnel working with the equipment and others.

Observe during work with the equipment:

- The removal of exhaust gases from the auditorium by equipment with internal combustion engines occurs smoothly;
- The noise emitted by the equipment is characteristic of such a work process (no extraneous sounds);
- No leakage of liquids from the equipment;
- Odour of glowing, burning objects;
- Power supplies are working properly;
- There are no factors or processes other than those specified in the instructions that could endanger the health of personnel working with the equipment or other persons.

2. GENERAL INFORMATION

2.1. Purpose of training equipment

Teaching equipment 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 analysis of various car sensors and actuators. It is possible to perform various measurements on the training equipment, parameters. A variety of laboratory tasks can be performed using the training equipment. The equipment is designed and manufactured in order to provide learners with the clearest and most convenient information about the automotive sensors and actuators.

The training equipment is designed for demonstrating, training and learning the design and structure, principle of operation, settings and adjustments of the Otto engine fuel supply system Motronic M 3.8.X.

2.2. Training equipment parameters

Length	1360 mm;
Width	500 mm;
Height	1820 mm;
Weight	~ 70 kg;
Power supply	+ 12 V Battery

2.3. Transport and storage conditions

Training equipment is installed in a dedicated box. Do not overturn or lay the equipment during transport. During transport, the equipment must be protected from falling, tipping, shocks, humidity, temperature, vibration.

Put the training equipment only on a suitable, solid base (table, cupboard).

Export or import procedures must take into account the legislation in force 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 by protective equipment if it is stored in a place exposed to direct sunlight.

Unused training equipment is kept completely switched off. The training stands are switched off with the control key and by disconnecting the 12 V battery.

2.4. Preparation and use of equipment

The training equipment is maintained as conventional mechanical, hydraulic, pneumatic, electrical machines and systems. Training equipment requires minimal maintenance and service.

Constant monitoring of fluid leakage from the nodes of the training equipment should be carried out.

It is necessary to control and ensure that all complete parts belonging to the training equipment are present.

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

The 12V battery charge must be regularly checked and monitored. A strong discharge of the battery of the batteries (voltage less than 10.5 V) is not allowed. It is forbidden to store a discharged battery for more than 10 days (in a lead-acid battery, irreversible sulfation processes can begin, which leads to the failure of the battery).

When performing maintenance and maintenance of training equipment, it is mandatory to use only technical fluids of suitable quality and complying with the technical specification (motor, transmission oil, coolant, brake fluid, etc.), quality filters and other spare and complete parts.

2.5. Power supply

The battery of batteries with a voltage of 12 V must comply with the technical conditions of the training equipment: arrangement of the battery terminals, capacity (Ah), starting current (A), size (length (mm), width (mm), height (mm)).

When working with educational equipment, the power source of which is a 12 V battery, disconnect the battery charger. The charger can emit electromagnetic noise affecting the operation of the training equipment and can be fixed by sensitive measuring instruments (oscillograph).

Attention:

When connecting a 12V battery to the bench, the control key and all other users must be turned off. First, the contact (terminal) of the "+" battery is connected and tightened. Then the "-" battery contact (terminal) is connected and tightened.

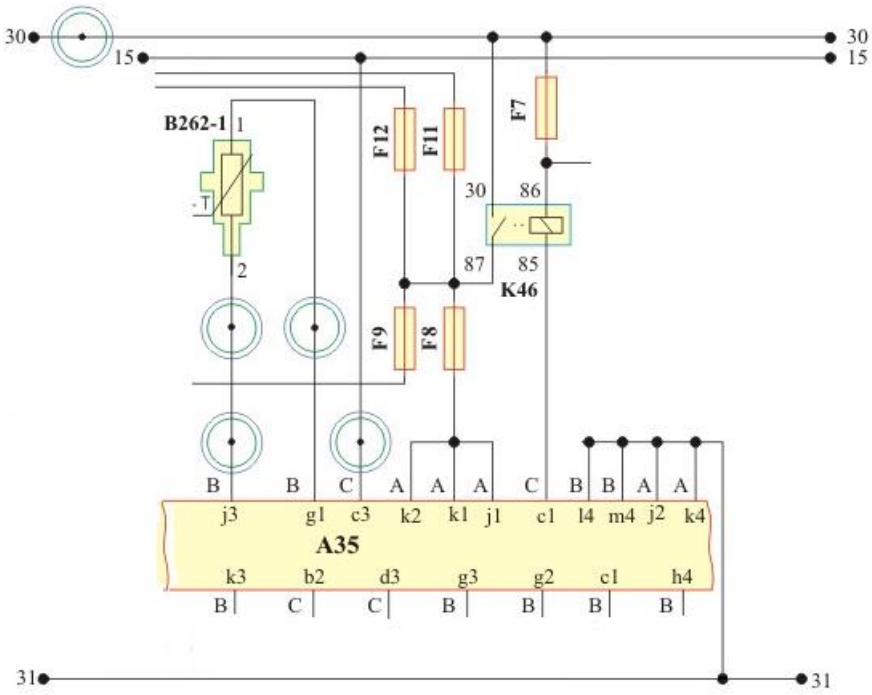
When disconnecting the 12 V battery from the bench, the stand must be turned off. First, the "-" battery contact is released and disconnected, later the "+" battery contact is released and disconnected.

Attention:

Do not mix the wires to the polarity of the connection of the 12 V battery. On the battery of the batteries, on the wire connections are marked "+" (positive) and "-" (negative) contacts (terminals). The contact of the wire is marked with a "+" (positive) sign (the color of the wire insulation is red) is connected to the battery contact marked with the "+" (positive) mark. The contact of the wire is marked with a "-" (negative) sign (the color of the wire insulation is black) is connected to the battery contact marked with the "-" (negative) mark.

2.5. Symbols and markings

Automotive symbols for marking wiring diagrams and components are used in the training equipment. The figure below shows an example of component marking in a wiring diagram.



Example of wiring diagram and component marking.

Marking of wiring diagrams:

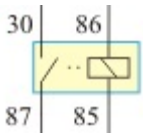
Black line connecting wires;

the wires are connected to each other;

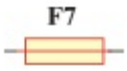
30 a numbered wire is an electrical circuit having a constant voltage of +12 V from a battery;

15 the numbered wire is an electrical circuit in which a +12 V DC voltage is turned on by the ignition key;

31 is the electrical circuit connected to the car body and the negative terminal of the battery (ground ⏚);

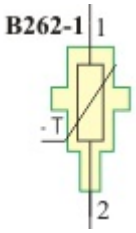


4-pin relay. Numbers 86 and 85 denote the contact numbers on the relay through which the relay electromagnet connecting contacts 30 and 87 is controlled. Numbers 30 and 87 denote contact numbers through which a current of 30 A (or greater) may be transmitted;



Fuse. Fuse marking symbol. In the circuit it is an F7 fuse.

A35 vehicle system (unit) control unit (computer) (e.g., engine control unit, airbag control unit, brake ABS control unit or other). The letters A, B, C denote the connection used to connect the electrical wiring to the control computer. The symbols g1, c3, k2, b2, d3 denote the contact of the control unit connector.



B262-1 Temperature Sensor 1. Numbers 1, 2 temperature sensors contact numbers.

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

Two banana connectors (sockets) are mounted on the cable for connecting the jumper. A jumper removed from the connectors breaks the circuit of this wire. Electric current cannot flow. The wiring diagram of the stand does not show this disconnection of the cord, because in real cars banana connectors are not installed. These connections are installed in the electrical circuit of the training equipment, enabling measurements to be made and faults to be simulated.

Jumper. Connector with 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 to each other.

Attention:

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

2.7. Preparation and use of equipment

General information about the educational equipment produced by the enterprise.

When preparing training equipment for work, it must be properly placed and fixed. Equipment that does not have its own chassis or stand is placed on a suitable table, cabinet. The furniture must

withstand the load on the training equipment. The equipment has its own stand or chassis, is placed on a flat and solid floor. The transport wheels of the equipment are blocked by fixing the brakes.

Attention:

Before working with training equipment, a charged 12 V battery or a household 12 V power supply is connected.

The technical condition of the equipment, the fastening of protective shields, the assembly and other things are checked. More detailed information on the requirements for safe work in the section Safety requirements → “Before working with training equipment, check that:” and ” Observe during work with the equipment:”.

The position of the emergency shutdown switch is checked. If the training equipment has been braked in an emergency way, the emergency shutdown switch remains embossed and the equipment does not start. When unblocking the emergency stop switch, it pops up when its upper part is turned in the direction of clockwise rotation (the upper part moves to the right).

Emergency stop switch

If there is a need to use an emergency stop switch, it is pressed with your finger or palm. You don't need to spin anything.

Educational equipment is activated with a switch, a starting key (depends on the type and assembly of training equipment).

Activation of training equipment

In educational equipment with a car dashboard, the full indication of the operation of the equipment is reflected in the panel. Other equipment has an indication of light, in which the LED PWR indicates that the equipment is connected to the power supply, ON - the ignition is turned on, RUN - the equipment is started and working.

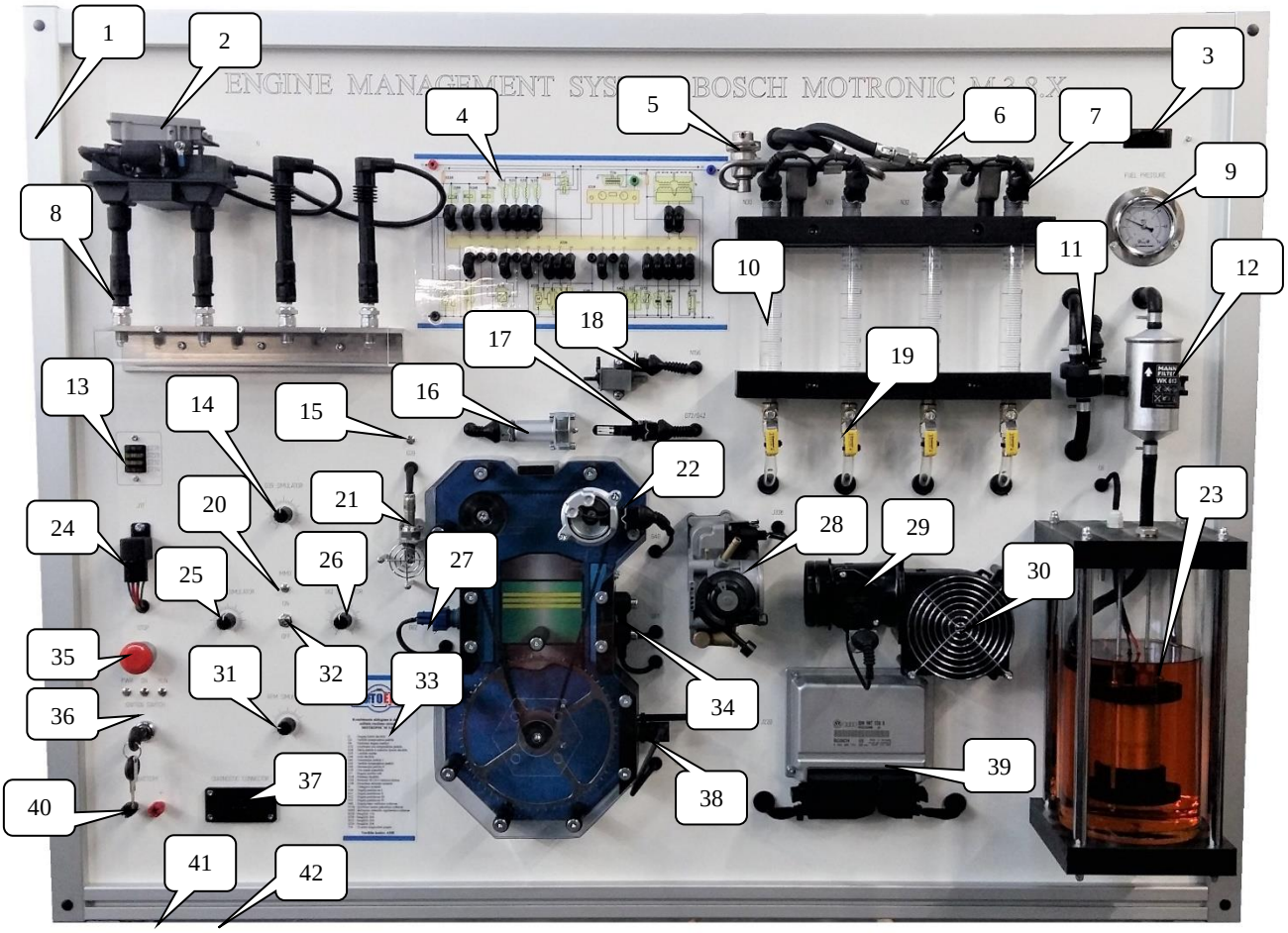
The equipment with the car starts key is controlled in the same way as a regular car.

Equipment with another type of ignition key, controlled in the same way as a regular car. In the middle position, the training equipment is turned off. In the first fixed position, turning the key to the right side activates the ignition. Turning the key further to the right (position without fixation) activates the starter. Turning the key to the left side from the middle position has a fixed position, but does not perform any function.

3. TRAINING EQUIPMENT

3.1. General overview of training equipment

A general view and structure of the training equipment is given in the illustrations below.



Training equipment

1 Frame
2 Ignition module (N)
3
4 Wiring diagram
5 Fuel pressure regulating valve
6 Fuel rail
7 Fuel injector (N30, N31, N32, N33)
8 Spark plug
9 Fuel pressure gauge
10 Fuel level flask
11 Purge control valve (N80)
12 Fuel filter
13 Fuses (S228, S229, S232, S234)
14 Lambda simulator (G39)
15 Lambda simulator LED
16 Camshaft adjustment solenoid valve (N205)
17 Intake air temperature sender (G72)

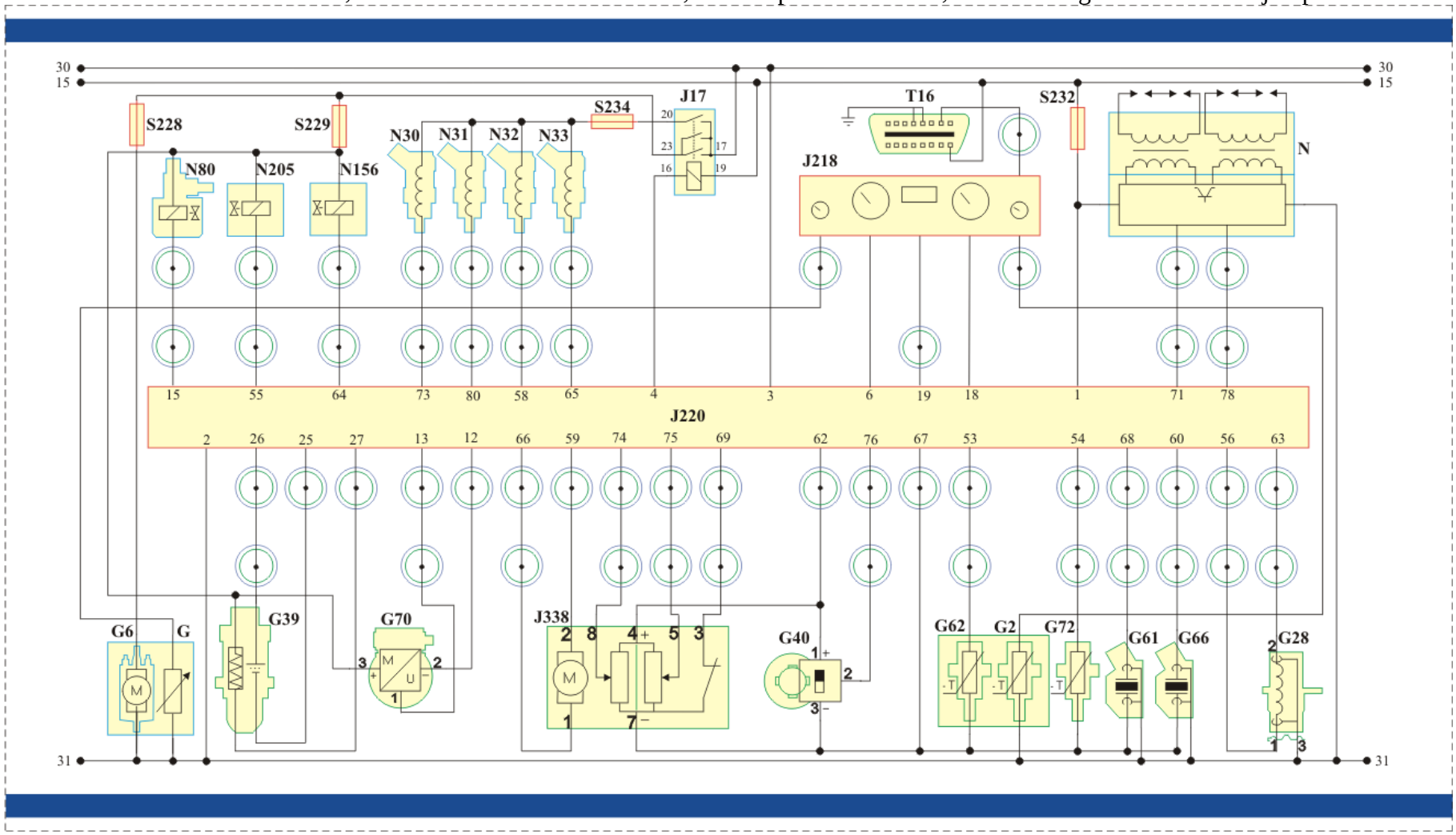
18 Variable tract intake manifold valve (N156)
19 Tap
20 Immobilizer LED
21 Oxygen sensor (G39)
22 Hall generator (G40)
23 Electric fuel pump (G6)
24 Fuel pump relay (J17)
25 Air flow regulator
26 Coolant temperature regulator (G62)
27 Coolant temperature sensor (G62)
28 Throttle valve control part (J338)
29 Air mass meter (G70)
30 Blower
31 Engine speed regulator
32 Immobilizer
33 Legend
34 Knock sensor (G61, G66)
35 Emergency STOP switch
36 Ignition key and indicators
37 Diagnostic connector (T16)
38 Engine speed / ref. mark sensor (G28)
39 Control unit Motronic M.3.8.X (J220)
40 12 V power supply contacts
41 Power supply cord
42 Fuse

IMPORTANT

The stand is made on the basis of a gasoline car Volkswagen Passat. When using computer diagnostics, the following data are indicated when identifying the car: make – Volkswagen, model – Passat (3B2, 3B5), year of production – 12/1996 – 01/2001, engine displacement – 1.8 litter, engine power – 92 kW, engine power – 92 kW, 125 Hp at 5800 min^{-1}, torque 173 Nm at 3950 min^{-1}, idle speed 760 – 960 min^{-1}, engine code ADR.

3.2. Wiring diagram

The wiring diagram contains all the elements: sensors, actuator components, data transmission lines, diagnostic connection. This diagram shows the connection circuits of the elements, the connection contact numbers, the component numbers, the mounting locations of the jumpers.



Wiring diagram

3.2. Legend

G - Fuel level sender
G2 - Coolant temperature sender
G6 - Electric fuel pump
G28 - Engine speed / ref. Mark sensor
G39 - Oxygen sensor
G40 - Hall generator
G61 - Knock sensor I
G62 - Coolant temperature sensor
G66 - Knock sensor II
G70 - Air mass meter
G72 - Intake-air temperature sender
J17 - Fuel pump relay
J218 - Instrument cluster
J220 - Control unit Motronic M3.8.X
J338 - Throttle – valve control part
N - Ignition module
N30 - Fuel injector I
N31 - Fuel injector II
N32 - Fuel injector II
N33 - Fuel injector VI
N80 - Purge control valve
N156 - Variable-track intake-manifold valve
N205 - Camshaft adjustment solenoid valve
S228 - Fuse 15 A
S229 - Fuse 20 A
S232 - Fuse 20 A
S234 - Fuse 10 A
T16 - 16 – pin Diagnostic link connector

4. WORK WITH TRAINING EQUIPMENT

The stand is constructed and manufactured with maximum repetition of the process of real engine operation. The values of the individual elements (Lambda sensor, coolant temperature, air mass meter) are determined manually using the available potentiometers. When setting engine operating values that do not correspond to reality, the bench may not work correctly, or a malfunction, an error message may be recorded in the memory of the engine control unit.

In the contacts of the electrical diagram, it is possible to measure the voltages of the elements connected there with the help of measuring instruments, to monitor the forms of signals, frequencies. After removing the jumper from the electrical circuit, the breakage of the electrical circuit is simulated. This affects the work of the components of the stand. A malfunction is recorded in the engine control unit. Suitable medium for diagnostic studies.

Laboratory work can also be done with the training stand. Measure various electrical parameters, the amount of fuel pumped out of the injectors, pressures, air masses, monitor the work of spark plugs, etc.

Using system scanners (computer diagnostics), it is possible to log in to the OBD II connector to see the real parameters of the engine operation, to carry out diagnostics, scanning and deleting fault errors, to perform the activation functions of various elements. Diagnostic capabilities will depend on the model of the system scanner used and the software version.

Activation functions of execution items

With the help of computer diagnostics, it is possible to carry out the activation of the execution items. After activating the component (it starts to work), it is possible to check the performance of this component: we see visually, hear, observe a change in the parameters of other components.

Options for activating elements depend on the available diagnostic manufacturer and version.

Fault codes

With the help of computer diagnostics, the recorded trouble codes or messages can be found in the memory of the engine control unit. These codes or messages are recorded in memory in the event of a breakdown of the sensor, the execution element, the breakage of the wire, the disappearance of contacts, the removal of the jumper from the electrical circuit.

All fault codes or messages using computer diagnostics can be deleted from the memory of the engine control unit. Often, fault codes are recorded in memory after disconnecting the wire when the ignition is turned on, without mismatching the signals of the speed sensors, due to voltage fluctuations, etc. This is typical for random errors. If the fault codes cannot be deleted, or these codes immediately appear again after deletion, you need to look for the physical cause of the malfunction and eliminate it. Only with the physical elimination of the malfunction, it will be possible to delete the fault error code from the memory of the control unit.

When a jumper is pulled out of the electrical connection circuit, the malfunction is simulated.

The educational - demonstration stand works by imitating some parameters of the real operation of the engine. The revolutions of the engine crankshaft, the mass of the supplied air, the temperature of the coolant, the oxygen content in the gases is simulated by determining these indicators manually. Imitating the real parameters of the engine operation on the stand can be carried out using the data presented in various databases.

5. WARRANTY CONDITIONS

Our products meet modern technical standards. We guarantee that our product is perfectly constructed and manufactured. They operate reliably if used correctly and in accordance with the provided maintenance rules.

Educational training board is used for educational purposes and can be used only with the components and operating fluids that are fitted on the board.

The guarantee of ____ months is provided for the educational training board. The guarantee begins to run from the sale date of the stand.

In order to warrant the setting of the appropriate date of sale, we ask the buyer to save the relevant contract documents: purchase check, invoice, transfer-acceptance act, warranty card with a product name filled correctly and clearly, number, date of sale, store stamp, signature and the signature of the seller.

The warranty is not applied:

- The User did not comply with the conditions of use, transportation and storage;
- Used inadequate operational fluids, or their quantities were too small;
- Non-original parts are used;
- An unsuitable source of energy was used;
- When connecting the power source, polarity was mixed;
- The design of the equipment has been changed;
- The equipment is damaged during transportation, or improper storage;
- The equipment suffered as a result of illegal actions of individuals (vandalism, hooliganism, theft);
- During the work, the instructions for safe work were not followed;
- Malfunctions of household electrical networks, voltage fluctuations;
- Aggressive chemical cleaning agents were used to clean the equipment;
- Any damage or loss of equipment has occurred, defined as force *majeure*;
- Educational equipment is broken or otherwise damaged;
- When foreign bodies are caught in the training equipment;
- By fusion of equipment with liquids of any origin;
- Using equipment that is not complete.

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

The terms of the warranty do not include the costs associated with the dismantling and transportation of the product to an authorized warranty service company. In addition, it does not cover the cost of consulting, switching on and regulating work. If the elements necessary for the repair of equipment need to be ordered from the supplier, the repair work can be extended.

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 enterprises. Replaced parts become the property of the service point.

Upon completion of warranty repairs, the warranty is not extended, but is valid until the specified term. The manufacturer reserves the right to change the appearance, design and structure

of the product. The service center has the right to suspend the warranty if the stand was used for other purposes.

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

The Customer is obliged to cover all expenses incurred by the technicians when they come to the Customer (transport, accommodation, etc.) to carry out warranty maintenance works for educational equipment, when the warranty period of the equipment has not yet expired, but at least one case has been identified, due to which the warranty for educational equipment is cancelled.

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

When applying for a warranty, the client must have all the documents for the purchase of educational equipment: purchase receipt, invoice, acceptance - transfer act.

Attention:

In the event of a breakdown of the educational equipment, the "Warranty maintenance coupon" is filled. The completed document is sent to the manufacturer of educational equipment.

Warranty maintenance coupon

Name of training equipment	_____
Product number	
Date of sale	
Training equipment owner	_____
Trading partner / representative	_____

Description of work performed

Data	Description of the fault and its elimination process	Technician / Signature
	_____ _____ _____ _____ _____	
	_____ _____ _____ _____ _____	
	_____ _____ _____ _____ _____	
	_____ _____ _____ _____ _____	
	_____ _____ _____ _____ _____	

NOTES

ANEX

We recommend that you carry out maintenance and service in accordance with the requirements of the official technical information of the engine manufacturer.

This bench uses calibration fluid instead of gasoline.

Shell V-Oil 1412

Special dilution oil for V-Oil 1404

Shell V-Oil 1412 is a spezial dilution oil for viscosity adjustment of Shell V-Oil 1404.

Application

Shell V-Oil 1412 is developed for the viscosity adjustment of Shell V-Oil 1404.

Properties

Shell V-Oil 1412 contains the same performance additives as Shell V-OIL 1404. This means there is no dilution effect in terms of additives while using this product.

Typical Physical Characteristics

Shell V-Oil 1412			
Density at 15°C	kg/m³	DIN 51757	818
Flashpoint COC	°C	DIN ISO 2592	92
Pourpoint	°C	DIN ISO 3016	-27
Kinematic viscosity		DIN 51562	
at 40°C	mm²/s		1,85
at 20°C	mm²/s		2,8
Boiling range		DIN 51751	
Initial boiling point	°C		220
Final boiling point	°C		360
Oxidation	Residue mg/100ml	ASTM D 2274	0,4

These charcteristics are typical of current production. Whilst future production will conform to Shell`s specification, variations in these characteristics may occur.

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