



## **The motor vehicle trade**

Author: Siegfried Kraus, 2023-08-14, Version: 1.0

Introduction:

1. Importance of the motor vehicle trade
2. Historical overview
3. Development and future prospects of the motor vehicle trade

Part I: Fundamentals of the motor vehicle trade

Chapter 1: Automotive Engineering

- 1.1 Design and function of motor vehicles
- 1.2 Propulsion systems: internal combustion engines, electric motors and hybrid drives
- 1.3 Chassis technology: suspension, brakes, steering
- 1.4 Electronics in the vehicle: control units, sensors, actuators
- 1.5 Fuels and lubricants

Chapter 2: Workshop Organization and Workflows

- 2.1 Workshop equipment and equipment
- 2.2 Occupational safety and environmental protection in the workshop
- 2.3 Diagnostic and test methods
- 2.4 Documentation and data management
- 2.5 Customer service and customer communication

Part II: Vehicle maintenance and repair

Chapter 3: Inspection and Maintenance

- 3.1 Vehicle checklists and inspection plans
- 3.2 Oil change and filter change
- 3.3 Brake maintenance and repair
- 3.4 Chassis and suspension maintenance
- 3.5 Electrics and electronics: battery maintenance, lighting, fuse replacement

Chapter 4: Engine overhaul and repair

- 4.1 Engine diagnostics and troubleshooting
- 4.2 Cylinder head and valve maintenance
- 4.3 Piston and piston rings: replacement and adjustment
- 4.4 Crankshaft and connecting rods: overhaul and replacement
- 4.5 Engine repair: timing belt replacement, valve clearance adjustment

Chapter 5: Vehicle Electronics and Diagnostics



## UKRAINIANS INTERNATIONAL e.V.

- 5.1 Diagnostic tools and devices
- 5.2 Troubleshooting Electronic Systems
- 5.3 Sensor and actuator replacement
- 5.4 Coding and programming of ECUs
- 5.5 Software updates and vehicle communication systems

### Part III: Body repair and painting

#### Chapter 6: Accident repair

- 6.1 Damage analysis and diagnosis
- 6.2 Body work: denting, welding, straightening
- 6.3 Paint preparation: sanding, filling, priming
- 6.4 Painting techniques: spray painting, powder coating
- 6.5 Finish and quality control

#### Chapter 7: Vehicle glazing and trim

- 7.1 Replacement of windshields and side windows
- 7.2 Repair of glass damage
- 7.3 Fairing work: bumpers, side skirts, spoilers
- 7.4 Headlight and taillight repair

### Part IV: Business management in the motor vehicle trade

#### Chapter 8: Fundamentals of Business Administration

- 8.1 Bookkeeping and accounting
- 8.2 Calculation of workshop services
- 8.3 Marketing and customer acquisition
- 8.4 Human Resource Management and Leadership
- 8.5 Legal aspects and standards in the motor vehicle trade

#### Chapter 9: Technological developments and future trends

- 9.1 Electromobility and alternative drives
- 9.2 Advanced driver assistance systems and autonomous driving
- 9.3 Networking and digitalization in automotive engineering
- 9.4 Sustainability and environmental protection in the automotive trade

#### Closing remarks:

- Summary of key content
- Outlook on future developments in the automotive trade
- Final Thoughts and Recommendations for Aspiring Professionals

Note: This textbook provides a structured overview of the motor vehicle trade and serves as a teaching and reference work for trainees, specialists and interested parties. It can serve as a basis for more in-



## UKRAINIANS INTERNATIONAL e.V.

depth studies and specializations. The content should be regularly adapted to current technological developments.



## The motor vehicle trade

### Introduction:

#### 1. Importance of the motor vehicle trade

The automotive trade plays a crucial role in modern society and is of great importance from various perspectives:

1. **Mobility and transport:** The automotive trade is largely responsible for the mobility of millions of people around the world. It contributes to individual mobility and enables the transport of goods and people over long distances. As a result, it supports trade, the economy and social life.
2. **Economic factor:** The motor vehicle trade is an important sector of the economy with a large number of companies and jobs. It includes car dealerships, workshops, manufacturers of spare parts and accessories, as well as the automotive industry as a whole. The sector thus contributes to value creation and the stability of economies.
3. **Technological innovation:** The rapid development of vehicle technology requires highly qualified specialists in the automotive trade. The repair and maintenance of modern vehicles requires in-depth knowledge of electronics, mechanics and, increasingly, in the field of electromobility and alternative drive systems. The skilled trades are therefore an important driver of technological innovations in the automotive industry.
4. **Road safety and environmental protection:** The qualified employees of the motor vehicle trade play a decisive role in ensuring road safety. Regular inspections, maintenance and repairs ensure that vehicles comply with applicable safety standards. In addition, the skilled trades are increasingly working on solutions for sustainable mobility and environmental protection.
5. **Customer service and customer loyalty:** The automotive trade offers an important service for customers, whether it is vehicle repair, maintenance or the sale of vehicles. Customer satisfaction is crucial for the success of the companies and the long-term loyalty to the workshops.
6. **Education and training:** The motor vehicle trade offers apprenticeships and promotes the vocational qualification of young people. It ensures that qualified specialists are available for the future and thus contributes to securing skilled workers.

Overall, the automotive trade plays a central role in individual mobility, the economy and technological development. It is an indispensable part of modern society and will continue to play a significant role in the future as mobility needs and technology continue to advance.

#### 2. Historical overview

The historical overview of the motor vehicle trade shows the fascinating development from the first mechanical vehicles to the modern, high-tech automotive industry:

1. **Precursor of the automobile:**



## UKRAINIANS INTERNATIONAL e.V.

- As early as the 18th century, the first ideas and concepts for motorized vehicles were developed. Steam engines were tried as propulsion, but they turned out to be too heavy and impractical for road traffic.
2. Benz Patent Motor Car:
    - In 1886, Karl Benz invented the first motorized car with an internal combustion engine and received the DRP 37435 patent. The Benz Patent Motor Car is considered the first modern automobile and laid the foundation for the development of the automotive industry.
  3. Mass production and Ford Model T:
    - Henry Ford revolutionized vehicle manufacturing with the introduction of assembly line production. In 1908, Ford launched the Model T, which became the first affordable car for the general population. Mass production led to the rapid spread of automobiles.
  4. Development of car repair shops:
    - As the stock of vehicles grew, so did the need for repairs and maintenance. Car repair shops sprang up to provide the service for vehicles and support the increasing number of vehicle owners.
  5. Technological advances:
    - Over the years, numerous technological advances have been made in the automotive trade. The introduction of gasoline injection systems, disc brakes, electronic control units and other innovations increased the performance, safety and reliability of vehicles.
  6. Electrification and alternative drives:
    - In recent decades, there has been an increase in interest in electric vehicles to reduce CO2 emissions and create more environmentally friendly means of transport. Hybrid and electric vehicles were developed, which brought new challenges and opportunities for the automotive trade.
  7. Digital technologies and networking:
    - Modern vehicles are increasingly equipped with digital technologies that facilitate diagnostics, repairs and communication with the customer. Connected vehicles open up new possibilities for remote diagnostics and software updates.
  8. Autonomous driving:
    - The development of autonomous vehicles poses new challenges for the automotive trade. The technology requires a high level of expertise in the maintenance and repair of complex sensors and control systems.

The history of the automotive trade is a fascinating journey from simple mechanical vehicles to highly complex, connected and electrified vehicles. The industry is constantly changing and must continuously adapt to technological advances in order to meet the demands of modern mobility.

### 3. Development and future prospects of the motor vehicle trade

The development and future prospects of the automotive trade are closely linked to technological advances in the automotive industry and social trends. Here are some key developments and future prospects:

1. Electrification and alternative drives:
  - The electrification of vehicles continues to advance, and electric cars are becoming increasingly popular. The automotive trade will have to specialize more in the maintenance and repair of electric drives and battery systems. In addition, hydrogen-



## UKRAINIANS INTERNATIONAL e.V.

powered vehicles and other alternative drives could gain in importance, which brings additional challenges and opportunities for the skilled trades.

### 2. Connectivity and autonomous driving:

- Modern vehicles are increasingly networked and equipped with assistance systems. The automotive trade will experience a growing demand for services for the maintenance and updating of software and sensor technology. In addition, the integration of autonomous driving functions will require specialized training and equipment.

### 3. Diagnostic technologies and digitalization:

- Advancing digitalization and the use of AI (artificial intelligence) enable advanced diagnostic technologies. Workshops will increasingly rely on automated fault diagnosis to carry out fast and precise repairs. The use of digital platforms and data management will also become more important.

### 4. Sustainability and environmental protection:

- Awareness of environmental protection and sustainability is increasing worldwide. The automotive trade will increasingly move towards environmentally friendly practices, whether through the use of recycled materials, the promotion of repairs instead of spare parts or the switch to sustainable energy sources for workshop operations.

### 5. Training and qualification of specialists:

- The rapid technological development requires continuous training and qualification measures for skilled workers in the automotive trade. Employees must be familiar with the latest technologies and methods to meet the demands of modern vehicles.

### 6. Integration of e-commerce and online services:

- Online platforms and e-commerce will also play a greater role in the automotive trade. Customers could increasingly book online appointments, select service packages and order parts. Workshops must adapt to the integration of these digital services.

### 7. Mobility services and sharing models:

- The development of mobility services such as car sharing and ride-hailing could have an impact on the way vehicles are used and maintained. The automotive trade could offer more services for fleet operators and sharing platforms.

The future of the automotive trade lies in adaptability and the willingness to adapt to technological and social changes. Close cooperation with the automotive industry, the promotion of research and development as well as the investment in training and further education are crucial to keep the industry up to date and successfully lead it into the future.



## Part I: Fundamentals of the motor vehicle trade

### Chapter 1: Automotive Engineering

#### 1.1 Design and function of motor vehicles

Motor vehicles are complex technical systems consisting of various components and systems to enable movement and transport. Here are the basic components and their features:

1. Chassis:

- The chassis forms the basic structure of the vehicle and carries all other components. It is made of steel or aluminum frame and provides stability and structure.

2. Drive system:

- The propulsion system of a motor vehicle includes the engine and transmissions. The engine, whether it is an internal combustion engine or an electric motor, generates the necessary power to propel the vehicle. The gearbox transmits the power of the engine to the wheels and allows you to adjust the speed and torque.

3. Body:

- The body is the outer shell of the vehicle and protects the occupants and components from environmental influences. It is made of steel, aluminum or modern composite materials.

4. Suspension and chassis:

- The suspension and chassis ensure contact between the vehicle and the road, as well as a safe and comfortable ride. It includes suspension, shock absorbers, axles and wheels.

5. Steering:

- The steering allows the driver to control the direction of the vehicle. There are different types of steering systems, such as rack-and-pinion steering or steering with recirculating ball bearings.

6. Brake:

- The braking system is designed to slow down or bring the vehicle to a standstill. It includes disc brakes, drum brakes or, in the case of modern vehicles, regenerative brakes.

7. Electronics and electrics:

- Modern vehicles are equipped with an extensive electronic system. Control units, sensors and actuators are responsible for monitoring and controlling various functions in the vehicle, such as engine control, ABS (anti-lock braking system), airbags and infotainment systems.

8. Fuel and exhaust system:

- The fuel system ensures the delivery of fuel to the engine, be it gasoline, diesel or electrical energy. The exhaust system safely directs combustion gases away from the engine and, in modern vehicles, incorporates exhaust aftertreatment systems to reduce emissions.



## UKRAINIANS INTERNATIONAL e.V.

### 9. Lighting and electrics:

- The electrical system supplies the vehicle with power and is responsible for the lighting, entertainment system, air conditioning and other electrical functions in the vehicle.

Understanding the structure and functions of motor vehicles is crucial for mechanics and professionals in the automotive trade to make diagnoses, carry out repairs and carry out maintenance properly.

## 1.2 Propulsion systems: internal combustion engines, electric motors and hybrid drives

The propulsion systems of motor vehicles determine the type of energy source that drives the vehicle. There are different types of propulsion systems, the three main types of which are the internal combustion engines, electric motors and hybrid drives. Here are the basics of each type of drive:

### 1. Internal combustion engines:

- Internal combustion engines are the traditional form of propulsion for most vehicles on the road. They use the combustion process of fuel (gasoline or diesel) and air to generate mechanical energy. The most commonly used internal combustion engines are gasoline (gasoline) and diesel engines.
- How it works: Inside the engine, the fuel is mixed with compressed air in a combustion chamber and ignited by a spark plug (in gasoline engines) or by the high temperature and pressure in the cylinder (in diesel engines). The resulting combustion gases generate a pressure that moves a piston downwards and transmits the rotational movement to the wheels via the crankshaft.

### 2. Electric motors:

- Electric motors are the main power source in electric vehicles (EVs). They convert electrical energy directly into mechanical energy and offer an environmentally friendly and emission-free alternative to combustion engines.
- How it works: Electric motors consist of a fixed coil and a rotating rotor that interact with each other through a magnetic field. When an electric current passes through the coil, a magnetic field is created that causes the rotor to rotate, thus driving the vehicle. Electric vehicles get their energy from batteries that need to be recharged regularly.

### 3. Hybridantriebe:

- Hybrid vehicles combine the characteristics of internal combustion engines and electric motors to take advantage of both types of powertrains. There are several hybrid configurations, including serial hybrids, parallel hybrids, and plug-in hybrids.
- How it works: In hybrid vehicles, internal combustion engines and electric motors either work independently or work together to increase performance and optimize fuel economy. Some hybrid vehicles can go electric if they have sufficient battery charge, while others use the electrical energy mainly to support the internal combustion engine.

The choice of propulsion system has a significant impact on fuel consumption, emissions and overall performance of the vehicle. The automotive industry is continuously working to develop more efficient and environmentally friendly drive systems to meet the requirements of sustainable mobility. The automotive trade will have to keep pace with the further development of these technologies in order to offer qualified maintenance and repair services for the diverse drive systems.





### 1.3 Chassis technology: suspension, brakes, steering

The chassis technology of a vehicle is crucial for safety, stability and driving comfort. It includes various components that work together to steer the vehicle, brake and absorb bumps in the road. Here are the basic elements of chassis technology:

#### 1. Wheel suspension:

- The wheel suspension is responsible for connecting the wheels to the vehicle chassis and allows the wheels to move vertically and horizontally. There are several types of suspension, including independent suspension and rigid axle.
- Function: The suspension helps the wheels maintain contact with the ground and cushion bumps in the road to ensure the driving comfort and stability of the vehicle. It also affects the vehicle's handling, cornering and handling.

#### 2. Brake:

- The braking system is responsible for decelerating and stopping the vehicle. It consists of various components, such as brake pads, brake discs, brake drums, brake lines and brake fluid.
- Function: When the driver presses the brake pedal, hydraulic pressure is generated, which presses the brake pads against the brake discs or drums. This creates the friction that slows down the vehicle and brings it to a stop.

#### 3. Steering:

- The steering system allows the driver to control the direction of the vehicle. There are several types of steering systems, including rack and pinion steering, recirculating ball steering, and power steering.
- Function: When the driver turns the steering wheel, the steering device is activated, which aligns the front wheels accordingly and allows the desired change of direction.

#### 4. Shock absorber:

- Shock absorbers or dampers are components of the chassis that dampen the movement of the suspension and ensure vehicle stability.
- Function: Shock absorbers absorb the shock forces generated by the suspension and prevent excessive rocking and swinging of the vehicle to ensure even road holding.

A well-functioning chassis technology is crucial for the driving safety, handling and comfort of a vehicle. Mechanics in the automotive trade are responsible for regularly checking the chassis technology, carrying out maintenance and, if necessary, carrying out repairs to ensure optimal functioning of the vehicle.

### 1.4 Electronics in the vehicle: control units, sensors, actuators

The electronics in the vehicle play an increasingly important role and have a significant impact on the performance, safety and comfort of a vehicle. Here are the main components of vehicle electronics:

#### 1. Ecu:

- ECUs are small computers that control and monitor various functions in the vehicle. Each system in the vehicle, such as engine control, brakes, airbags, air conditioning, etc., can have its own control unit.



## UKRAINIANS INTERNATIONAL e.V.

- Function: The ECUs analyze data from sensors, make decisions and send commands to actuators to control the corresponding systems. They ensure optimal performance, efficiency and safety of the vehicle.

### 2. Sensors:

- Sensors are electronic components that measure various physical parameters such as temperature, pressure, velocity, acceleration, rotational speed, etc. They are placed in different parts of the vehicle to capture important data.
- Function: The sensors continuously supply information to the control units. This data is analyzed to control the behavior of the vehicle, detect malfunctions and take corrective action if necessary.

### 3. Actuators:

- Actuators are electronic or electromechanical components that act at the command of the control units. They convert the control signals into physical actions to actuate or control various systems.
- Function: Actuators carry out the instructions of the control units, such as injecting fuel, opening and closing valves, applying brakes, and deploying airbags.

Advancing digitalization and the use of electronics in the vehicle have brought numerous benefits, including improved performance, safety, fuel efficiency and comfort. However, the increasing complexity of electronics also requires a higher level of expertise and specialized equipment in the automotive trade to diagnose and carry out repairs to electronic systems. Skilled workers in the automotive trade must always stay up to date with the latest technology in order to meet the requirements of modern vehicle electronics.

## 1.5 Fuels and lubricants

Fuels and lubricants play an essential role in the smooth operation and longevity of vehicles. Here are the most important aspects of fuels and lubricants related to the automotive trade:

### Fuels:

- Gasoline: Gasoline is the most commonly used fuel for gasoline engines in vehicles. It is extracted from crude oil and has a higher energy content than diesel fuel.
- Diesel: Diesel fuel is used for diesel engines. It has a higher calorific value and better fuel efficiency than gasoline, resulting in lower fuel consumption.
- Electricity: Electrical energy is used for electric vehicles. The vehicles are powered by batteries or other storage systems and do not require liquid fuels.
- Alternative fuels: There are also alternative fuels such as natural gas (CNG), liquefied petroleum gas (LPG), hydrogen and biodiesel. These are used in specially converted vehicles or certain models.

### Lubricant:

- Engine oil: Engine oil is an important lubricant used in the internal combustion engine. It reduces friction between the moving parts of the engine, cools the engine, and keeps dirt and debris in suspension to keep them away from the engine.
- Transmission oil: Transmission oil is used in the transmissions of vehicles to reduce friction between transmission components and extend the life of the transmission.



## UKRAINIANS INTERNATIONAL e.V.

- Brake fluid: Brake fluid is a hygroscopic lubricant used in hydraulic brake systems. It transmits the pressure exerted by the brake pedal to the brake pads or brake shoes to slow down or stop the vehicle.
- Coolant: Coolant, often referred to as antifreeze, is used to protect the engine from overheating and to ensure a uniform operating temperature.

Proper selection and regular replacement of fuels and lubricants are essential for the proper functioning and longevity of the vehicle. Professionals in the automotive trade are responsible for using the correct fuels and lubricants in accordance with the manufacturer's specifications, adhering to maintenance intervals and carrying out appropriate tests and examinations to ensure that the vehicle remains in optimal condition.



## Chapter 2: Workshop Organization and Workflows

### 2.1 Workshop equipment and equipment

Workshop equipment and equipment are crucial for an efficient and safe working environment in the automotive trade. Here are the most important components that should be found in a well-equipped workshop:

1. Lifting platforms: Lifts allow vehicles to be lifted to carry out repairs and maintenance on vehicle undersides. There are different types of lifts, such as 2-post lifts, 4-post lifts, scissor lifts, and pit lifts.
2. Diagnostic and testing equipment: Modern vehicles require advanced diagnostic and testing equipment to detect electronic faults, read data and make adjustments. Diagnostic tools, oscilloscopes, exhaust gas testers and brake testers are just a few examples.
3. Tool carts and toolboxes: Tool carts and toolboxes provide organized storage for tools and allow quick access to needed tools during repair work.
4. Workstations and work benches: Workstations and work benches provide a stable work surface for repair work, assembly and disassembly of vehicle parts.
5. Lubricant storage: Proper storage of lubricants such as engine oil, transmission oil, and brake fluid is important to maintain the quality and effectiveness of lubricants.
6. Special tools: Special tools, such as pullers, assembly tools, special wrenches and special pliers, are necessary to carry out certain work on vehicles.
7. Safety equipment: The workshop should be equipped with personal protective equipment (PPE) such as safety shoes, goggles and hearing protection to ensure the safety of employees.
8. Environmental protection and disposal facilities: The workshop must have appropriate facilities to safely dispose of pollutants and waste and promote environmentally friendly practices.
9. Washing area: A washing area allows the cleaning of vehicles, parts and tools to maintain a clean working environment.
10. Warehouse and spare parts storage: The workshop should have an organized storage system for spare parts and consumables to ensure availability and efficiency in repairs.

A well-equipped workshop helps to improve the productivity, efficiency and safety of employees and enables the automotive trade to provide high-quality services to customers. Regular maintenance and care of the workshop equipment is also important to ensure the longevity and functionality of the equipment.

### 2.2 Occupational safety and environmental protection in the workshop

Occupational safety and environmental protection are of central importance in a workshop in the automotive trade. It is important to ensure that employees work in a safe environment while adhering to environmentally friendly practices. Here are some important aspects of occupational safety and environmental protection:

#### Occupational safety:



## UKRAINIANS INTERNATIONAL e.V.

1. Personal protective equipment (PPE): All employees should wear personal protective equipment, including safety shoes, goggles, hearing protection, gloves, and other necessary PPE to protect themselves from injury.
2. Training and instruction: Employees should be regularly trained in occupational safety guidelines and instructed on the safe use of tools and machines.
3. Lifting and carrying techniques: Employees should be trained on how to lift and carry heavy objects to avoid back injuries and other strain injuries.
4. Safe work processes: Clear and safe work procedures should be developed and followed to prevent accidents and injuries.
5. Maintenance of tools and machines: Tools and machines should be regularly maintained and kept in perfect condition to prevent accidents caused by faulty equipment.
6. Contingency plans: Contingency plans should be in place to respond appropriately in the event of accidents or emergencies.

### Environmental protection:

1. Disposal of pollutants and waste: Pollutants and waste should be properly collected and disposed of to prevent pollution.
2. Protection against leakage of pollutants: Precautions should be taken to prevent the leakage of pollutants such as oil, fuels and chemicals into the environment.
3. Eco-friendly practices: Workshops can adopt eco-friendly practices, such as the use of eco-responsible cleaning products and the promotion of recycling and reuse of materials.
4. Energy efficiency: Measures to improve energy efficiency, such as the use of LED lighting and energy-efficient appliances, can help reduce energy consumption.
5. Employee awareness: Employees should be made aware of the importance of environmental protection and encouraged to practice environmentally friendly behaviors.

Compliance with occupational safety and environmental protection in the workshop not only helps to protect employees from injury and preserves the environment, but can also contribute to more efficient and sustainable operational management. It is important to conduct regular reviews and training to ensure that policies and practices are always up-to-date and effective.

## 2.3 Diagnostic and test methods

The diagnostic and testing procedures are crucial to identify problems and malfunctions in vehicles, make an accurate diagnosis and carry out the necessary repairs. Here are some important diagnostic and testing methods in the automotive trade:

1. OBD (On-Board Diagnostics): OBD is a standardized diagnostic system that is present in most modern vehicles. It enables the monitoring and diagnosis of vehicle components and emission systems. Mechanics can use OBD scanners to read fault codes and get information about problems in the vehicle.
2. Read and interpret fault codes: If the vehicle detects a problem, fault codes are stored that indicate the problem. The mechanics use diagnostic equipment to read and interpret these fault codes to determine the exact cause of the problem.
3. Visual inspection: A visual inspection of the vehicle is often the first step in the diagnosis. Mechanics look for obvious damage, leaks, loose or damaged parts, and other visible problems.



## UKRAINIANS INTERNATIONAL e.V.

4. Electronic diagnostic equipment: Modern vehicles contain a large number of sensors and control units. With special diagnostic equipment, mechanics can check the electronic systems in the vehicle, read data, view live data and perform actuator tests.
5. Functional testing: Mechanics perform functional tests to ensure that all of the vehicle's systems are working properly. These include brake tests, air conditioning tests, ABS tests and other functional tests.
6. Printing and Lecktests: Printing and Lecktests are carried out to ensure that the hydraulic and pneumatic systems in the vehicle no leaks and function properly.
7. Vehicle analysis: By analyzing data and information from various diagnostic equipment and tests, the mechanic can create a comprehensive picture of the problems in the vehicle and make an accurate diagnosis.
8. Test drives: Test drives are often necessary to reproduce and verify specific vehicle problems. This allows the mechanic to observe the behavior of the vehicle in real driving conditions and to better understand possible problems.
9. Emissions tests: Emissions tests are carried out to check the vehicle's emission levels and ensure that the vehicle complies with applicable emission standards.

The correct application of diagnostic and test procedures is crucial for precise and efficient vehicle diagnostics. However, modern diagnostic equipment and procedures also require a skilled and well-trained workforce to use and interpret them properly.

### 2.4 Documentation and data management

Comprehensive documentation and efficient data management are of great importance for the automotive trade. They enable proper recording of customer data, vehicle information, repairs and maintenance carried out. Here are some important aspects of documentation and data management:

1. Customer data: The workshop should maintain a database of customer data, including contact information, vehicle types, models, chassis numbers, and other relevant information. This makes it possible to quickly contact customers and create histories of the work carried out.
2. Vehicle data: The workshop should collect and store information about customers' vehicles, such as manufacturer, model, year of manufacture, mileage, engine type, chassis number, and other technical data. This information is important for diagnostics and carrying out repairs and maintenance.
3. Repair and maintenance logs: Mechanics should keep detailed logs of all repairs and maintenance performed. This includes information about the work performed, the spare parts used, the working hours and the diagnostic results.
4. Fault codes and diagnostic results: Mechanics should document all fault codes and diagnostic results that have been read out. This makes it possible to track the diagnostic histories and identify trends or common problems.
5. Invoices and payments: All invoices and payments should be properly documented. This makes it possible to maintain a clear overview of services provided and financial settlement.
6. Privacy: When storing customer and vehicle data, it is important to comply with data protection regulations and ensure that the data is kept secure and confidential.
7. Software and databases: The use of special workshop software or databases can simplify and optimize the organization and management of customer and vehicle data.



## UKRAINIANS INTERNATIONAL e.V.

A well-maintained documentation system and efficient data management facilitate daily work in the workshop, help diagnose vehicle problems, enable quick access to relevant information and improve customer service. Plus, well-documented data is invaluable when it comes to warranty claims, recalls, and technical traceability. Regular updating and maintenance of the documentation is therefore of great importance.

### 2.5 Customer service and customer communication

Excellent customer service and effective customer communication are crucial for the success of a workshop in the automotive trade. Here are some important aspects of customer service and customer communication:

1. **Friendliness and professionalism:** Employees in the workshop should always be friendly and professional. Treating customers with respect creates trust and shows appreciation for their needs.
2. **Customer reception and advice:** A warm welcome to customers and competent advice on their vehicle problems and the necessary repairs are essential. Customers should be informed about the possible options, costs and timeframe.
3. **Transparency in cost estimation:** It is important that the workshop is transparent and gives the customer a detailed cost estimate for the planned work. This prevents surprises and builds trust.
4. **Communication during the repair:** During the repair work, the workshop should regularly inform the customer about the progress. In case of unforeseen complications or additional repairs, the customer should be informed immediately.
5. **Explanation of the work carried out:** After the work is completed, the customer should be given a detailed explanation of what work was carried out, what parts were replaced and how the repair improved the vehicle.
6. **Obtain customer feedback:** The workshop should actively collect feedback from customers in order to evaluate customer satisfaction and identify areas for improvement.
7. **Customer loyalty:** Good customer service and positive customer communication promote customer loyalty. The workshop may offer bonus programs, discounts, or other incentives to retain customers and turn them into repeat customers.
8. **Complaints management:** If, despite all efforts, dissatisfaction occurs, effective complaint management is important. The workshop should take complaints seriously, respond quickly and look for solutions to solve customer problems.
9. **Customer communication:** The workshop can maintain customer communication via various channels, such as face-to-face conversations, telephone, e-mail or even social media platforms.

Outstanding customer service and open and transparent customer communication are an important competitive advantage for every workshop. Satisfied customers will not only come back, but also recommend the workshop to others, which can lead to a positive reputation and a steady increase in customers.



## Part II: Vehicle maintenance and repair

### Chapter 3: Inspection and Maintenance

#### 3.1 Vehicle checklists and inspection plans

Vehicle checklists and inspection plans are important tools in the automotive trade to carry out systematic inspections of vehicles and ensure that all relevant aspects are taken into account. Here is some information about vehicle checklists and inspection plans:

1. **Vehicle checklists:** A vehicle checklist is a list of items that need to be checked to ensure that all important aspects of a vehicle are checked. The checklist may be specific to certain maintenance, repairs, or inspections. Examples of items in a vehicle checklist could be: engine oil level, brake fluid level, tire condition, lighting, coolant level, battery health, etc.
2. **Inspection plans:** Inspection plans are structured plans or schedules that determine when which inspections or maintenance should be performed on a vehicle. They can be guided by the recommendations of the vehicle manufacturer or by the specific needs of the vehicle and the customer. Inspection plans can be set, for example, according to mileage or according to certain time intervals.
3. **Maintenance and Inspection Book:** A Maintenance and Inspection Book is usually kept for each vehicle and contains records of all inspections, maintenance, repairs and services performed. It serves as an important reference for future inspections and enables complete tracking of the vehicle's condition and the work carried out.
4. **Digitalization:** Nowadays, vehicle checklists and inspection plans are often digitized. Mechanics use tablets or mobile devices to fill out the checklists and enter information directly into digital databases. This makes it easier to organize, store, and analyze the data.
5. **Customization:** Inspection plans and checklists can be customized depending on the type of vehicle, model, and the customer's specific needs. Some vehicle manufacturers also provide specific inspection plans and checklists.
6. **Compliance:** Adherence to vehicle checklists and inspection plans is important to comply with manufacturer specifications, maintain the vehicle warranty, and ensure the safety and reliability of the vehicle.

Vehicle checklists and inspection plans help ensure that no important aspects are overlooked when it comes to vehicle maintenance and repair. They allow for a systematic approach and comprehensive review to identify and resolve potential issues early, resulting in improved customer satisfaction and professional service.

#### 3.2 Oil change and filter change

Regular oil changes and filter changes are fundamental maintenance work in the automotive trade in order to maintain the service life and performance of the engine. Here is some important information about changing the oil and changing the filter:

1. **Oil change:**





## UKRAINIANS INTERNATIONAL e.V.

- The oil change involves draining the old engine oil from the engine and replacing it with fresh, clean engine oil. The oil ensures the lubrication of the moving parts in the engine and helps to reduce friction and wear.
- Regular oil changes are crucial to remove contaminants and debris that can build up in the engine oil. Fresh engine oil provides better lubrication and improves fuel efficiency and engine performance.

### 2. Filterwechsel:

- Changing the filter involves replacing the oil filter and, if necessary, other filters, such as air filters and fuel filters. Filters are responsible for removing impurities and particles from the oil or air before they enter the engine.
- Replacing the filters improves the performance and life of the engine, as they help the engine to receive clean air and oil.

### 3. Time interval for oil and filter change:

- The time interval for changing the oil and filter is based on the recommendations of the vehicle manufacturer. This may vary depending on the type of vehicle, model and driving conditions.
- As a general rule, it is recommended to carry out the oil change every 5,000 to 10,000 kilometers or once a year. In demanding driving conditions, such as frequent short-distance trips or high temperatures, a more frequent oil change may be required.

### 4. Carrying out the oil and filter change:

- Oil and filter changes should be carried out by qualified mechanics who have the necessary expertise and equipment.
- The engine should be brought to operating temperature before changing the oil so that the old oil can drain better.
- After changing the oil and filter, the vehicle should be checked for leaks and the oil level should be checked.

Regular oil changes and filter changes are essential maintenance to ensure the longevity and reliable performance of the engine. Vehicle owners should adhere to maintenance intervals according to the manufacturer's instructions and use high-quality engine oils and filters to achieve the best possible results.

## 3.3 Brake maintenance and repair

Brake maintenance and repair are crucial to ensure the safety of a vehicle. Well-maintained brakes ensure that the vehicle can be stopped in time and reliably. Here are some important aspects of brake maintenance and repair:

### 1. Bremseninspektion:

- Regular inspections of the brake system are important to check the condition of the brake pads, brake discs/drums, brake fluid and other components. This should be done in accordance with the vehicle manufacturer's recommendations or if there are signs of brake wear or problems.
- Mechanics should be on the lookout for signs of brake wear such as squealing brakes, a pulsating brake pedal, or an extended braking distance.

### 2. Bremsflüssigkeitswechsel:



## UKRAINIANS INTERNATIONAL e.V.

- The brake fluid should be changed according to the manufacturer's instructions, as it absorbs moisture over time, which can impair the braking effect. A regular change of the brake fluid ensures optimal braking performance.
3. Brake pads and brake discs/drums:
    - Worn brake pads should be replaced in time to prevent damage to the brake discs/drums. Damaged brake discs/drums must also be replaced to ensure safe braking.
  4. Bremsreparatur:
    - For brake problems that go beyond normal maintenance, a more comprehensive brake repair is required. This may include replacing brake lines, brake cylinders, brake pistons, or other components.
    - It is important to use high-quality spare parts to ensure the safety and reliability of the brake system.
  5. Bremsenprüfstand:
    - A brake tester makes it possible to test the braking performance of the vehicle and ensure that the brakes meet safety standards.
  6. Training of mechanics:
    - Mechanics should have proper training and experience to properly perform brake maintenance and repair. This is particularly important because the brake system is a safety-relevant component.

Brakes are a safety-critical system of a vehicle, and thorough maintenance and regular inspections are essential to ensure proper functioning. Vehicle owners should have their vehicle's brake system checked regularly and ensure that any brake maintenance or repair is carried out by qualified professionals.

### 3.4 Chassis and suspension maintenance

Chassis and suspension maintenance is crucial for a safe and comfortable ride of a vehicle. The chassis and suspension ensure that the vehicle remains stable on the road, compensating for bumps and absorbing shocks from the road surface. Here are some important aspects of chassis and suspension maintenance:

1. Suspension and shock absorbers:
  - The shock absorbers and springs are important components of the chassis and provide smooth suspension and damping from shocks and bumps on the road.
  - Regular inspection of shock absorbers and springs is important to ensure that they are still working effectively and are not showing signs of wear or leaks.
2. Wheel alignment:
  - Correct wheel alignment ensures that the wheels of the vehicle are in the correct position and aligned. Incorrect wheel alignment can lead to uneven tire wear, poor road contact and poor steering.
  - Wheel alignment should be carried out every time tires or wheels are changed and if there are signs of uneven tire wear.
3. Joints and bearings:
  - The joints and bearings of the wheel suspension should be checked regularly for wear, play or leaks. Damaged or worn joints and bearings should be replaced in time to ensure proper functioning of the chassis.
4. Stabilizers and wishbones:
  - The anti-roll bars and wishbones are also important components of the suspension and provide stability and control of the vehicle when cornering.



## UKRAINIANS INTERNATIONAL e.V.

- Regular inspection and maintenance of these components is important to avoid safety hazards.
5. Rubber bushings and suspension elements:
    - Rubber bushings and other suspension elements should be checked for wear and cracks. Damaged rubber bushings and suspension elements can lead to unpleasant driving noise and impaired driving stability.
  6. Maintenance of the air suspension (if any):
    - If the vehicle has air suspension, it should be serviced according to the manufacturer's specifications. This may include replacing air springs, air compressors, or air bellows.

Regular maintenance of the chassis and wheel suspension components not only ensures pleasant handling, but also contributes to the safety of the vehicle. Vehicle owners should be aware of unusual driving noises, uneven tire wear or poor road holding, and have the vehicle inspected by qualified professionals if necessary.

### 3.5 Electrics and electronics: battery maintenance, lighting, fuse replacement

The electrical components of a vehicle play an important role in its function and safety. Here are some important aspects of electrics and electronics in the automotive trade:

1. Batteriewartung:
  - The battery is a central component of the electrical system in the vehicle. Regular battery maintenance is important to extend battery life and ensure a reliable start of the vehicle.
  - The battery terminals should be kept clean to ensure a good electrical connection. If necessary, the terminals and terminals should be cleaned.
  - A regular check of the battery condition and charging capacity is important to indicate a low battery at an early stage and to avoid failure.
2. Lighting:
  - The lighting of the vehicle is an essential safety aspect. All lighting devices, including headlights, brake lights, turn signals, taillights and interior lighting, should be checked regularly to ensure that they are in working order and aligned.
  - Damaged or failed lamps should be replaced immediately to ensure vehicle visibility and prevent accidents.
3. Sicherungsaustausch:
  - Fuses protect the electrical system from damage caused by overload or short circuit. In the event of an electrical fault, the corresponding fuse should be checked and, if necessary, replaced.
  - It is important to use the correct replacement fuses that meet the vehicle manufacturer's specifications.
4. Diagnosis of electrical problems:
  - Electrical problems in the vehicle can be complex and often require precise diagnosis. Modern diagnostic equipment can be used to read electrical fault codes and identify sources of fault.
  - Well-trained mechanics should professionally diagnose and repair electrical problems to ensure a correct solution.
5. Checking the electronics:



## UKRAINIANS INTERNATIONAL e.V.

- The increasing number of electronic components in the vehicle requires a careful review of the electronic systems. Control units, sensors and other electronic components should be checked regularly and, if necessary, calibrated or updated.

Today, the electrics and electronics in vehicles are more complex than ever. Proper maintenance and repair of the electrical components are essential to ensure the safety and reliability of the vehicle. If necessary, vehicle owners should rely on qualified mechanics and specialized workshops to professionally troubleshoot electrical problems.



## Chapter 4: Engine overhaul and repair

### 4.1 Engine diagnostics and troubleshooting

Engine diagnostics and troubleshooting are central tasks in the automotive trade, as the engine is the heart of a vehicle and its proper functioning is crucial for performance and reliability. Here are some important aspects of engine diagnostics and troubleshooting:

1. Reading and interpreting error codes:

- Modern vehicles are equipped with on-board diagnostic (OBD) systems that store fault codes when problems are detected in the engine or other systems. The mechanics use diagnostic equipment to read and interpret these fault codes to determine the exact cause of the problem.

2. Visual inspection:

- A visual inspection of the engine is often the first step in the diagnosis. Mechanics look for obvious damage, leaks, loose or damaged parts, and other visible problems.

3. Testing of mechanical components:

- The mechanical components of the engine, such as pistons, valves, spark plugs, crankshaft and camshaft, should be checked for wear, play or damage. Worn or damaged parts must be replaced in time to ensure proper functioning of the engine.

4. Fuel supply check:

- The fuel supply to the engine, including the fuel pump, fuel filter and injectors, should be checked to ensure that sufficient fuel enters the engine and that the combustion process is optimal.

5. Ignition system testing:

- The engine's ignition system, consisting of spark plugs, ignition coils, and ignition wires, should be checked to ensure proper ignition. Defective spark plugs or ignition coils can lead to poor engine performance or irregular engine running.

6. Diagnostics of electronic systems:

- Modern engines also contain complex electronic systems and sensors. Mechanics should carefully review these electronic systems and use diagnostic equipment to read data and identify electronic faults.

7. Functional:

- Functional tests of the engine, such as compression tests, pressure tests, and performance tests, can be performed to evaluate engine performance and efficiency.

8. Repair and overhaul:

- Once the exact cause of the engine problem has been determined, the appropriate repair and overhaul can be carried out. This may include replacing defective or worn parts, cleaning components, or performing adjustments.

Accurate and effective engine diagnostics are crucial to properly identify vehicle problems and carry out the appropriate repairs. A well-equipped workshop team with experienced mechanics and the right diagnostic tool is essential for successful engine diagnostics and troubleshooting.

### 4.2 Cylinder head and valve maintenance



## UKRAINIANS INTERNATIONAL e.V.

Cylinder head and valve maintenance is an important task in the automotive trade, as the cylinder head plays a crucial role in combustion in the engine and the valves regulate the inlet and outlet of air and fuel. Here are some important aspects of cylinder head and valve maintenance:

### 1. Head gasket:

- The cylinder head gasket is a critical component that seals the cylinder head with the engine block. It prevents pressure and fluids from escaping between the cylinder bores and the cooling water system.
- A defective cylinder head gasket can lead to loss of power, overheating and a milk chocolate-colored oil-cooling water mixture. A damaged gasket should be replaced immediately.

### 2. Valve clearance and valve adjustment:

- The valve clearance is the distance between the valves and the camshafts. Correct valve clearance is essential to ensure optimal performance and combustion in the engine.
- Mechanics should regularly check the valve clearance and adjust it if necessary. Incorrect valve adjustment can lead to poor engine running and increased fuel consumption.

### 3. Valve guides and valve stem seals:

- The valve guides ensure precise guidance of the valves and must be checked for wear or leaks. Defective valve guides can lead to oil drain and blue smoke from the exhaust.
- The valve stem seals prevent oil from entering the combustion chambers. Damaged seals can lead to oil drain and contamination of the spark plugs.

### 4. Valve repair and replacement:

- Worn or damaged valves should be repaired or replaced in a timely manner to ensure optimal tightness and function.
- If there are serious problems with the valves, a valve overhaul or replacement may be required.

### 5. Zylinderkopfbearbeitung:

- If the cylinder head is damaged or warped, cylinder head machining may be required to restore flat surfaces and ensure optimal sealing.

### 6. Seals and sealing surfaces:

- The gaskets on the cylinder head, such as intake manifold gaskets and exhaust manifold gaskets, should be checked regularly and replaced if necessary to prevent leaks.

Cylinder head and valve maintenance requires expertise and experience, as they are complex components that require precise adjustment and sealing. Qualified mechanics should perform cylinder head and valve maintenance to ensure that the engine is working properly and achieving optimal performance. Regular maintenance of these components will help extend the life of the engine and avoid expensive repairs.

## 4.3 Piston and piston rings: replacement and adjustment

The pistons and piston rings are important components of the engine and play a crucial role in the combustion and performance of the vehicle. Here are some important aspects of replacing and adjusting pistons and piston rings:

### 1. Piston and piston rings:

- The pistons are cylindrical parts in the engine that move in the cylinder and convert the upward and downward motion into a rotary motion that drives the crankshaft.



## UKRAINIANS INTERNATIONAL e.V.

- The piston rings are rings that are placed around the piston and are responsible for sealing the combustion chamber. They also ensure the drainage of excess oil from the cylinder walls.
2. Piston and cylinder check:
    - Before replacing the pistons and piston rings, a thorough inspection of the pistons and cylinder bores should be carried out. Damaged or worn pistons and cylinders can lead to inadequate sealing and performance.
  3. Replacement of pistons and piston rings:
    - If the pistons or piston rings are worn, damaged, or no longer able to provide an adequate seal, they should be replaced.
    - It is important to use high-quality spare parts that meet the specifications of the vehicle manufacturer.
  4. Kolbenmontage:
    - The assembly of the pistons and piston rings requires care and precision to ensure a correct fit and seal.
    - The piston rings should be properly inserted into the ring grooves and adjusted according to the manufacturer's specifications.
  5. Einlaufphase:
    - After replacing the pistons and piston rings, the engine should go through a run-in phase to ensure that the new components can optimally adapt and break in with each other.
  6. Kompressionsprüfung:
    - After assembly, a compression test should be performed to ensure that the piston rings provide adequate sealing and that the engine builds up adequate compression.

Replacing and adjusting pistons and piston rings requires technical expertise and experience. Improper assembly or adjustment can lead to engine problems and increased oil consumption. Therefore, this type of work should be carried out by qualified professionals and well-equipped workshops to ensure the best performance and reliability of the engine.

### 4.4 Crankshaft and connecting rods: overhaul and replacement

The crankshaft and connecting rods are crucial components of the engine and play a central role in converting the upward and downward piston motion into a rotary motion that transmits power to the drive shaft. Here are some important aspects of overhauling and replacing the crankshaft and connecting rods:

1. Inspection and verification:
  - Before overhaul or replacement, the crankshaft and connecting rods should be carefully inspected and checked for signs of wear, damage or bending.
  - It is important to ensure that the crankshaft and connecting rods are still within the allowable tolerances to ensure proper functioning.
2. Overhaul:
  - If the crankshaft and/or connecting rods show slight wear, they may be able to be overhauled. An overhaul may include grinding or polishing the crankshaft and replacing bearings and connecting rod bearings.
  - A professional overhaul should be carried out by experienced professionals and with high-quality machines and tools.
3. Exchange:



## UKRAINIANS INTERNATIONAL e.V.

- If the crankshaft or connecting rods are badly damaged, bent or worn and are no longer suitable for overhaul, they must be replaced.
- The replacement of the crankshaft and connecting rod requires the use of original spare parts or high-quality aftermarket components that meet the manufacturer's specifications.

### 4. Installation and balancing:

- After replacement or overhaul, the crankshaft and connecting rods must be installed professionally.
- It is important to balance the crankshaft and connecting rods to avoid vibration and imbalance in the engine.

### 5. Einlaufphase:

- After the overhaul or replacement, the crankshaft and connecting rods should go through a break-in phase in order to optimally adapt to the other engine components and run in with each other.

The crankshaft and connecting rods are critical components in the engine, and their proper functioning is critical to the performance and reliability of the engine. Therefore, the overhaul or replacement of these components should be carried out by experienced professionals in a well-equipped workshop to ensure that the engine works optimally and has a long service life.

## 4.5 Engine repair: timing belt replacement, valve clearance adjustment

Engine repair involves several important tasks, including changing the timing belt and adjusting the valve clearance. These two maintenance operations are crucial for the performance and reliability of the engine. Here is some important information about this repair work:

### 1. Timing belt replacement:

- The timing belt is an important part of the engine, which ensures synchronization between the crankshaft and the camshaft. It is important to change the timing belt regularly according to the manufacturer's instructions, as a torn timing belt can lead to serious engine damage.
- The timing belt change should usually be carried out every few years or after a certain mileage, depending on the recommendations of the vehicle manufacturer.

### 2. Adjust valve clearance:

- Valve clearance refers to the distance between the valves and the camshafts when they are in their closed position. Correct valve clearance is important to ensure optimal performance and combustion in the engine.
- The valve clearance should be checked regularly according to the manufacturer's specifications and adjusted if necessary to avoid possible problems such as rattling or poor running behavior.

### 3. Professional implementation:

- Timing belt changes and valve clearance adjustments are demanding tasks that require expertise and experience. This work should be carried out by qualified specialists in a well-equipped workshop.
- When carrying out these repairs, care should be taken to ensure that the correct tools and spare parts are used and that the work is carried out carefully and in accordance with the manufacturer's specifications.

### 4. Further checks and maintenance:





## UKRAINIANS INTERNATIONAL e.V.

- When changing a timing belt, it is a good idea to check other components such as tension pulleys and water pump and, if necessary, replace them in order to carry out comprehensive maintenance.
- In addition to valve clearance, other engine parameters can also be checked to optimize engine performance and efficiency.

Engine repair, including timing belt replacement and valve clearance adjustment, is an important task that affects the safety, performance and service life of the engine. Vehicle owners should follow the service intervals according to the manufacturer's instructions and contact qualified professionals for this repair work to ensure that the engine works properly and remains in the best condition.



## Chapter 5: Vehicle Electronics and Diagnostics

### 5.1 Diagnostic tools and devices

Diagnostic tools and devices are indispensable tools in the automotive trade to identify and correct problems and faults in modern vehicles. Here are some of the main diagnostic tools and equipment used in workshops:

1. OBD (On-Board-Diagnose) Scanner:

- OBD scanners are devices that are plugged into the vehicle's OBD interface to read fault codes and collect diagnostic data. These codes provide information about possible problems in various systems of the vehicle, including the engine, transmission, exhaust system, and more.

2. Diagnosecomputer:

- Diagnostic computers are special devices that provide comprehensive diagnostics of the vehicle. They tend to be more powerful than OBD scanners and offer advanced troubleshooting and troubleshooting capabilities.

3. Multimeter:

- A multimeter is a versatile meter that can measure electrical parameters such as voltage, current, and resistance. It is used to identify and check electrical problems in the vehicle.

4. Druckprüfgeräte:

- Pressure testers are used to check the pressure in various systems of the vehicle, such as the fuel system, cooling system or brake system. They can also be used to detect leaks or leaks.

5. Rauchmaschinen:

- Smoke machines are used to check vacuum systems, cooling systems and exhaust systems. They produce artificial smoke that makes it possible to identify leaks or leaks.

6. Leistungsmessgeräte:

- Power meters are used to evaluate the power and efficiency of the engine. They measure the power, torque and other parameters of the engine.

7. Scan tools for special vehicle brands:

- Some vehicle manufacturers offer special scanning tools that are optimized for their vehicles and offer advanced diagnostic functions.

8. Data logger:

- Data loggers are used to record data on various vehicle parameters over a period of time. This data can later be analyzed to identify complex problems.

The use of diagnostic tools and equipment allows mechanics to perform accurate and efficient diagnostics and quickly identify and fix vehicle problems. Well-equipped garages use a variety of diagnostic tools to ensure comprehensive diagnostics and repair of vehicles.

### 5.2 Troubleshooting Electronic Systems

Troubleshooting electronic systems is a challenging task in the automotive trade, as modern vehicles are equipped with a variety of electronic components and systems. Here are some key steps and techniques used when troubleshooting electronic systems:



## UKRAINIANS INTERNATIONAL e.V.

1. Error description and symptom analysis:
  - The first step in troubleshooting is the exact description of the problem by the vehicle owner or the person who brings the vehicle for repair. A detailed symptom analysis is crucial to start the troubleshooting process.
2. Use of diagnostic tools:
  - Modern vehicles have diagnostic functions that make it possible to read fault codes and collect diagnostic data. Diagnostic tools such as OBD scanners and diagnostic computers are used to analyze fault codes and relevant data.
3. Visual inspection:
  - A careful visual inspection of the electronic components and wiring can indicate obvious problems such as damaged cables, loose connectors, or damaged components.
4. Measurements and tests:
  - Multimeters and other measuring devices can be used to measure electrical parameters such as voltage, current and resistance. Targeted tests can be used to check the functionality of certain components.
5. Performing functional tests:
  - Functional tests can help to observe the behavior of certain components or systems in different driving conditions and to detect possible deviations or failures.
6. Data analysis:
  - Recording and analyzing vehicle data with data loggers can help identify and understand complex problems that may only occur intermittently.
7. Isolation of the problem:
  - Troubleshooting electronic systems requires the ability to isolate and rule out the problem by isolating and testing individual components or systems.
8. Software and firmware updates:
  - In some cases, a problem in an electronic system can be resolved by a software or firmware update provided by the vehicle manufacturer.
9. Error logging and documentation:
  - During troubleshooting, it is important to log and document all steps, measurement results and tests carried out in order to make the repair process traceable and to ensure traceability if necessary.

Troubleshooting electronic systems requires expertise, experience and the use of modern diagnostic tools. Well-trained mechanics and well-equipped workshops can ensure accurate diagnosis and effective repair to fix vehicle problems and restore the reliability of electronic systems.

### 5.3 Sensor and actuator replacement

Sensor and actuator replacement is a common task in the automotive trade when problems with certain electronic systems or components are detected. Sensors and actuators are essential to monitor and control various vehicle systems. Here are some key aspects of sensor and actuator replacement:

1. Diagnosis and identification of the defective component:
  - Before a sensor or actuator is replaced, precise diagnostics are necessary to ensure that the component is indeed faulty. Modern diagnostic tools can help to read out the error code and identify the affected component.
2. Quality of spare parts:



## UKRAINIANS INTERNATIONAL e.V.

- It is important to use high-quality spare parts that meet the specifications of the vehicle manufacturer. Inferior quality can lead to problems and affect the service life of the new component.
3. Assembly and calibration:
    - When installing the new sensor or actuator, careful assembly is required to ensure correct functioning. In some cases, calibration or adjustment is also necessary to adapt the component to the vehicle.
  4. Clearing error codes and resetting the system:
    - After replacing the faulty component, the stored error codes should be cleared and the corresponding system should be reset to ensure that the problem has been resolved and that no further error messages appear.
  5. Tests and functional tests:
    - Once installed, the vehicle should be extensively tested to ensure that the new sensor or actuator is working properly and that the vehicle is responding as expected.
  6. Testing of adjacent components:
    - Sometimes a faulty sensor or actuator can appear faulty due to a problem in an adjacent system. Therefore, it is important to also check the neighboring components and, if necessary, repair or replace them.
  7. Documentation:
    - All work carried out should be carefully documented, including the installed component, the tests performed and the data from the diagnosis. Proper documentation facilitates subsequent traceability and the repair process.

Sensor and actuator replacement requires technical expertise and experience. Well-trained mechanics and well-equipped workshops can ensure that the correct diagnostic procedures are applied and that the replacement is smooth and efficient. The use of high-quality spare parts and a thorough inspection can avoid possible further problems and ensure the reliability of the vehicle.

### 5.4 Coding and programming of ECUs

Coding and programming of ECUs is an important part of modern vehicle diagnostics and repair. Control units are electronic modules that control various vehicle systems such as engine control, transmission control, ABS (anti-lock braking system), airbag systems and many others. Here are some important aspects of ECU coding and programming:

1. Diagnostics and fault identification:
  - Before coding or programming is carried out, a thorough diagnosis of the vehicle and the affected control units is necessary. Error codes and diagnostic data are read out to accurately identify the problem.
2. Softwareaktualisierungen:
  - Vehicle manufacturers regularly release software updates for ECUs to introduce improvements, bug fixes or new features. Updates can help solve problems and optimize vehicle performance.
3. Coding of ECUs:
  - The coding of ECUs includes the adaptation of specific settings and parameters in order to adapt the functions of the ECU to the vehicle's equipment or customer requirements. This may include enabling or disabling features or adjusting parameters.
4. Programming of ECUs:



## UKRAINIANS INTERNATIONAL e.V.

- The programming of ECUs goes beyond the simple adjustment of settings and involves the installation or flashing of new software on the ECU. This may be necessary if the control unit is damaged or has an outdated software version.
5. Special tools and access to manufacturer data:
    - Coding and programming ECUs often requires the use of specialized diagnostic equipment and access to the manufacturer's databases to obtain the latest software versions and coding instructions.
  6. Expertise and experience:
    - Coding and programming ECUs requires technical expertise and experience, as faulty or improper settings can lead to malfunctions or damage.
  7. Documentation:
    - Any changes to the ECUs should be carefully documented, including the coding or programming performed, the software versions used, and the diagnostic data.

Coding and programming ECUs is a complex task that should be performed by well-trained mechanics and well-equipped workshops. Through careful handling of the ECUs and the use of high-quality diagnostic equipment and software, the reliability and performance of the vehicle can be optimized.

### 5.5 Software updates and vehicle communication systems

Software updates and vehicle communication systems play a crucial role in modern vehicle diagnostics, maintenance and repair. Here are some key aspects of software updates and vehicle communication systems:

1. Software-Updates:
  - Vehicle manufacturers regularly release software updates for the control units and other electronic components in the vehicles. These updates may include bug fixes, performance improvements, emissions, or safety features, as well as the introduction of new features.
  - Software updates can also be used to fix problems or safety recalls and ensure compliance with emissions regulations.
2. Fahrzeugkommunikationssysteme:
  - Vehicles are equipped with various communication systems that make it possible to interact with diagnostic tools and workshop equipment. These include the OBD (on-board diagnostics) interface, CAN (Controller Area Network) bus and other protocols.
  - Diagnostic tools and devices can access the vehicle through these communication systems to read fault codes, collect diagnostic data, perform software updates, and code or program components.
3. Diagnostic and programming devices:
  - Modern diagnostic and programming equipment is equipped with the necessary communication interfaces and software functions to carry out comprehensive diagnostics and programming of ECUs.
  - These devices allow mechanics to access the latest software versions, perform software updates, program ECUs, perform coding, and perform many other functions.
4. Security and Privacy:
  - When carrying out software updates and communicating with the vehicle, security and data protection are of great importance. Diagnostic equipment and workshop software should be secure to prevent unauthorized access or tampering.



## UKRAINIANS INTERNATIONAL e.V.

- Data protection is also important to ensure that personal or vehicle-specific data is kept confidential.

### 5. Herstellerzugriff:

- Some software updates and programming may require access to the manufacturer's database or portals to obtain the latest information and software versions.
- Access to manufacturer data may also be necessary to perform safety recalls or technical service bulletins.

### 6. Documentation:

- All software updates, programming and diagnostic data carried out should be carefully documented to ensure traceability and verification of the work performed.

Software updates and vehicle communication systems are essential to maintain and repair modern vehicles. Well-trained mechanics and workshops that have up-to-date diagnostic and programming equipment can ensure efficient and reliable diagnostics and repairs to optimize vehicle performance and take safety aspects into account.



## Chapter 6: Accident repair

### 6.1 Damage analysis and diagnosis

Damage analysis and diagnosis are critical steps in the automotive trade to determine the cause of vehicle problems and carry out the necessary repairs. Here are some important aspects of damage analysis and diagnosis:

1. Symptomanalyse:

- The process begins with a detailed description of the problems and symptoms observed by the vehicle owner or the person taking the vehicle for repair. Accurate symptom analysis is crucial to start the troubleshooting process.

2. Visual inspection:

- A visual inspection of the vehicle can often provide initial indications of visible damage or wear and tear. Mechanics should check for signs of damage, wear, or leaks.

3. Diagnostic tools and equipment:

- Modern diagnostic tools and devices, such as OBD scanners and diagnostic computers, are used to read fault codes and collect diagnostic data. These help to identify possible electronic or mechanical problems.

4. Technical expertise:

- Damage analysis and diagnosis require extensive technical expertise in the functioning of the vehicle and its components. Mechanics need to understand how engines, transmissions, brakes, chassis and electronic systems work.

5. Measurements and tests:

- Various measuring devices, such as multimeters or pressure testers, allow mechanics to check and analyze electrical, mechanical or hydraulic parameters.

6. Functional:

- Functional tests are performed to observe the behavior of specific components or systems in different driving conditions and identify possible deviations or failures.

7. Test drive:

- A test drive allows the mechanic to observe the behavior of the vehicle in real driving situations and identify possible problems that only occur while driving.

8. Fehlerisolierung:

- Failure analysis often requires isolating the affected area or defective component to accurately identify the cause of the problem.

9. Documentation:

- All steps taken, measurement results, tests and diagnostics should be carefully documented to make the repair process traceable and ensure traceability.

Damage analysis and diagnosis requires experience, technical expertise and the use of modern diagnostic tools. A thorough and precise diagnosis makes it possible to identify the exact problem and carry out the correct repairs to bring the vehicle back to a safe and optimal condition.

### 6.2 Body work: denting, welding, straightening



## UKRAINIANS INTERNATIONAL e.V.

Body work is an important part of the motor vehicle trade and includes various tasks to repair damage to the vehicle body. Here are some of the most common body work:

### 1. Ausbeulen:

- Dent removal is a technique that removes minor dents and dents in the body without painting. This can be done by pushing, pulling or knocking from the inside or outside to restore the original shape of the body.

### 2. Weld:

- Welding is the process of supplementing or repairing damaged or rusted body parts by heating them and joining them with metal. Various welding techniques such as MIG/MAG welding, TIG welding or spot welding can be used, depending on the type of damage and the body material used.

### 3. Judge:

- In the case of more serious body damage, such as in an accident, the body may be warped or bent. In such cases, it is necessary to straighten the car in order to restore the original shape and orientation of the body.
- For straightening, special equipment such as straightening benches or straightening systems are used to precisely measure the body and bring it into the correct position.

### 4. Replace body parts:

- In the event of serious damage that can no longer be repaired, damaged body parts must be replaced with new parts. This may include doors, fenders, bumpers, hoods, or other components.

### 5. Filling and painting:

- After the body is repaired, putty work is often carried out to eliminate surface unevenness. The repaired area is then painted to ensure seamless integration into the existing paintwork.

### 6. Rostschutzmaßnahmen:

- In the course of the bodywork work, it is important to take appropriate rust protection measures to protect the repaired areas from re-infestation.

### 7. Finish and quality control:

- Once the bodywork is complete, a thorough quality control should be carried out to ensure that all repairs have been carried out properly and that the vehicle is in a safe and visually appealing condition.

Body work requires skill, experience and the right tools to carry out high-quality repairs. Well-trained coachbuilders and workshops can ensure that damaged vehicle bodies are repaired efficiently and professionally to restore their original form and functionality.

## 6.3 Paint preparation: sanding, filling, priming

Paint preparation is a crucial step in body work to ensure high-quality paintwork. Here are some important aspects of paint preparation that include sanding, puttying, and priming:

### 1. Grind:

- Before painting, the surface of the body must be carefully sanded to remove old paint residues, rust, bumps and other contaminants.
- Different sandpapers with different grain sizes are used to eliminate coarse bumps and prepare the surface for the subsequent steps.





## UKRAINIANS INTERNATIONAL e.V.

### 2. Scrapers:

- After sanding, any indentations, scratches or other damage to the body are filled with putty to obtain a smooth surface.
- The putty is applied and then sanded to achieve a flat surface suitable for painting.

### 3. Removal of dust and contaminants:

- Before painting, the sanded and troweled surface must be carefully cleaned to remove dust, dirt or other contaminants that could affect the quality of the paintwork.

### 4. Taping:

- Before priming and painting, areas that are not to be painted are taped off in order to achieve a clean and precise painting result.

### 5. Prime:

- After the surface is prepared, a primer is applied to protect the body, improve the adhesion of the paintwork and ensure a uniform appearance.
- The primer also serves to smooth out minor irregularities in the surface.

### 6. Zwischenschliff:

- After priming, the surface is sanded again to obtain a smooth and uniform surface that is ready for the final paint application.

Paint preparation is a critical step to achieve an optimal painting result. Careful and precise paint preparation makes it possible to eliminate irregularities, improve the adhesion of the paint and ensure uniform painting. Well-trained coachbuilders and painters scrupulously carry out paint preparation in order to achieve a high-quality finish that protects the body from external influences and improves the appearance of the car.

## 6.4 Painting techniques: spray painting, powder coating

Painting techniques such as spray painting and powder coating are important processes in the automotive trade to achieve a durable and aesthetically pleasing surface coating on body parts. Here are the basics of these two painting techniques:

### 1. Spritzlackierung:

- Spray painting is a widely used method of applying a uniform and smooth layer of paint to the car body.
- Here, the paint is atomized in a special spray gun and applied to the surface of the body.
- The spray gun uses compressed air to finely distribute the paint and achieve a uniform coating.
- Before spray painting, the body must be carefully prepared by sanding, puttying and priming.

### 2. Powder coating:

- Powder coating is a process in which a special layer of powder coating is applied electrostatically to the car body.
- The powder adheres electrostatically to the car body and is then baked in an oven at an elevated temperature.
- In the process, the powder melts into a smooth and resistant layer of paint.
- Powder coating is often used for rims, bumpers, frames, and other components that require a particularly durable coating.



## UKRAINIANS INTERNATIONAL e.V.

Before painting, the surface of the body should be thoroughly cleaned and cleaned of dust and contaminants. A good preparation process is crucial to achieve a high-quality painting result. Both painting techniques require expertise and experience to ensure the right paint layer thickness and a uniform finish.

The choice of painting technique depends on various factors, such as the type of part to be painted, the desired properties of the coating and the specific requirements of the vehicle. Professionally executed painting protects the body from environmental influences, corrosion and wear and improves the external appearance of the vehicle. Therefore, it is advisable to have the painting carried out by qualified painters or specialist workshops.

### 6.5 Finish and quality control

Finishing and quality control are crucial steps in the motor vehicle trade to ensure that all work carried out has been carried out properly and that the vehicle is in a safe and visually appealing condition. Here are some important aspects of finishing and quality control:

#### 1. Finish after painting:

- After painting, all painted parts should be carefully checked for uniformity, shade, gloss and any paint runners or irregularities.
- Surface imperfections such as dust particles or bumps should be corrected to achieve a smooth and flawless finish.

#### 2. Inspection of body work:

- In the case of bodywork, it should be checked that all bulging, welded or troweled areas have been properly repaired and that a clean and seamless integration with the rest of the body is guaranteed.

#### 3. Functional:

- After mechanical repairs or adjustments, functional tests should be carried out to ensure that the vehicle is working properly and that any problems have been resolved.

#### 4. Sicherheitstests:

- Particular attention should be paid to safety-related components such as brakes, steering, lighting and airbags to ensure that they function properly and ensure the safety of the vehicle.

#### 5. Cleaning:

- Before handing it over to the customer, the vehicle should be thoroughly cleaned to remove dirt and dust from the repairs and ensure a clean appearance.

#### 6. Documentation:

- All work, tests and results carried out should be carefully documented to make the repair process traceable and to ensure traceability.

#### 7. Customer satisfaction:

- Upon completion of the repairs, the customer should be informed of the work carried out and any recommendations.
- Customer satisfaction is an important aspect, so friendly customer communication and service orientation are important.

The finish and quality control are critical steps to ensure that the vehicle is in perfect condition, both in terms of functionality and external appearance. Qualified mechanics and coachbuilders carry out the



## UKRAINIANS INTERNATIONAL e.V.

necessary checks and tests to ensure that all work meets high quality standards and that the vehicle is safe and reliable before it is handed over to the customer.



## Chapter 7: Vehicle glazing and trim

### 7.1 Replacement of windshields and side windows

The replacement of windshields and side windows is an important task in the automotive trade, which is carried out in the event of damaged or broken windows. Here are some important aspects of replacing windshields and side windows:

1. Schadensanalyse:
  - First, the damage to the windshield is carefully analyzed to determine whether repair is possible or whether the windshield needs to be completely replaced.
  - Minor stone chip damage can often be repaired, but larger cracks or fractures usually require the disc to be replaced.
2. Procurement of the replacement lens:
  - A suitable replacement windshield must be procured that meets the specifications of the vehicle and safety standards.
  - Original parts or discs from well-known manufacturers are often used to ensure an optimal fit and safety.
3. Preparation and disassembly:
  - Before replacement, all necessary preparatory work is carried out, including the removal of windshield wipers, trim and other components that block access to the windshield.
4. Security measures:
  - The replacement of windshields and side windows requires special safety measures, as the windows play an important structural role in the vehicle.
  - Mechanics use special tools and techniques to safely remove the discs and install the new discs correctly.
5. Installation of the new disc:
  - The new disc is carefully inserted into the frame and fixed with special adhesives or gaskets.
  - Mechanics ensure that the disc is securely and firmly seated to prevent leaks and vibrations.
6. Quality control and cleaning:
  - After installation, a thorough quality control is carried out to ensure that the disc is properly assembled and working properly.
  - Finally, the vehicle is cleaned to remove dirt and dust from the work and ensure a clean appearance.

Replacing windshields and side windows requires expertise, experience and the use of appropriate tools and materials. Professional implementation is important to ensure the safety and functionality of the panes and to avoid possible leaks or damage. Therefore, it is advisable to have the replacement of windshields and side windows carried out by qualified garages or professionals.

### 7.2 Repair of glass damage

Repairing glass damage, especially windshields, is a common way to repair small damage, such as stone chips, before it expands into larger cracks or fractures. Here are some important aspects of repairing glass damage:



## UKRAINIANS INTERNATIONAL e.V.

1. Steinschlagschäden:	<ul style="list-style-type: none"><li>Stone chips are small damages caused by the impact of small stones or dirt on the windshield. They often leave a small circle or star impact shape on the surface of the disk.</li></ul>
2. Schadensanalyse:	<ul style="list-style-type: none"><li>First, the glass damage is carefully analyzed to see if it can be repaired.</li><li>Repairs are usually only possible if the damage is small (usually smaller than a 1 euro coin) and is not in the driver's field of vision.</li></ul>
3. Resin Injection Method:	<ul style="list-style-type: none"><li>A special resin injection method is used for repair. Here, a transparent resin is injected into the damage to fill the damaged area and restore the structural integrity of the disc.</li></ul>
4. Cure:	<ul style="list-style-type: none"><li>After the resin is injected, it is cured under UV light or by a chemical reaction to create a permanent bond.</li></ul>
5. Finish and polishing:	<ul style="list-style-type: none"><li>After hardening, the surface of the disc is cleaned, excess resin is removed, and the repair site is polished to obtain a smooth surface.</li></ul>

It is important to note that not all glass damage can be repaired. The decision on repairability depends on various factors, such as the size and nature of the damage, as well as the position on the windshield. If the damage is too extensive or is in the driver's field of vision, it may be necessary to replace the windshield.

Repairing glass damage can extend the life of the windshield and save costs, as early repair can prevent the need for expensive replacement. However, it is important that the repair is carried out by a qualified professional who has the appropriate know-how and tools to ensure a safe and reliable repair.

### 7.3 Fairing work: bumpers, side skirts, spoilers

Fairing work on bumpers, side skirts and spoilers is a common task in the automotive trade to repair or replace damaged or worn body panels. Here are some important aspects of the cladding work:

1. Schadensanalyse:	<ul style="list-style-type: none"><li>First, the damage to the cladding is carefully analyzed to determine whether it is possible to repair it or whether the cladding needs to be completely replaced.</li><li>Minor scratches or dents can often be repaired, while major damage usually requires the trim to be replaced.</li></ul>
2. Procurement of spare parts:	<ul style="list-style-type: none"><li>If a fairing needs to be replaced, a suitable replacement fairing is procured that meets the specifications of the vehicle and visually matches the rest of the body.</li></ul>
3. Preparation and disassembly:	<ul style="list-style-type: none"><li>Before installing the new trim, it is necessary to carry out all the necessary preparatory work, including the dismantling of old trim parts and, if necessary, the preparation of the body surface.</li></ul>
4. Installation of the fairing:	<ul style="list-style-type: none"><li>The new trim is carefully attached to the body to ensure a secure and firm connection.</li><li>Special fasteners and clamps are used to properly mount the cladding.</li></ul>
5. Customization and alignment:	



## UKRAINIANS INTERNATIONAL e.V.

- The trim is adjusted and aligned to ensure that it fits perfectly on the body and ensures seamless integration with other body panels.

### 6. Lacquering:

- If the cladding needs to be painted, this is done before assembly to ensure a uniform appearance.

Cladding work requires skill and experience to ensure precise assembly and adjustment. Careful execution is important to ensure the safety, functionality and external appearance of the vehicle. Therefore, it is advisable to have cladding work carried out by qualified professionals or workshops who have the appropriate know-how and the necessary tools to carry out high-quality cladding work.

## 7.4 Headlight and taillight repair

The repair of headlights and taillights is an important task in the automotive trade in order to repair or replace defective lighting components. Here are some important aspects of headlight and taillight repair:

### 1. Schadensanalyse:

- First, the damage or defect to the headlights or taillights is carefully analyzed to determine if repair is possible or if the component needs to be completely replaced.

### 2. Lampenwechsel:

- Often, defective bulbs or bulbs can be easily replaced to restore the functionality of the headlights or taillights.

### 3. Electrical testing:

- In case of problems with the lighting, an electrical test can be carried out to check that the electrical connections and circuits are working correctly.

### 4. Repair of headlight and taillight housings:

- Damaged or broken housings of headlights or taillights can be repaired or replaced to restore functionality and safety.

### 5. Headlight and taillight device:

- If the repair is not possible, a suitable replacement component will be procured and professionally installed.

### 6. Adjustment:

- Once installed, the headlights are adjusted to ensure that they are correctly aligned and optimally illuminate the road.

### 7. Quality control:

- After repair, all repaired or replaced components undergo a thorough quality control to ensure that they function properly and meet safety standards.

Repairing headlights and taillights is important to ensure visibility and safety on the road. Well-functioning lighting components are crucial to be seen well at night and in bad weather conditions and to recognize other road users in good time. Proper headlight and taillight repair is therefore essential to ensure road safety and avoid possible accidents. It is recommended to have the repair carried out by qualified professionals or workshops who have the appropriate know-how and the necessary tools.



## Part IV: Business management in the motor vehicle trade

### Chapter 8: Fundamentals of Business Administration

#### 8.1 Bookkeeping and accounting

Bookkeeping and accounting are essential aspects in the motor vehicle trade in order to properly document financial transactions and business transactions and to monitor the economic success of the company. Here are some key points about bookkeeping and accounting:

1. Buchführungssystem:

- An efficient accounting system is set up to systematically record all financial transactions, such as purchases, sales, expenses and income.
- Traditionally, so-called double-entry bookkeeping is often used, where every transaction is recorded in both the debit and credit sides.

2. Belegwesen:

- All business transactions are documented and documented by receipts such as invoices, receipts and bank statements. These receipts serve as the basis for the bookings.

3. Kontenführung:

- Various accounts are created to record the financial transactions, such as cash account, bank account, customer account, supplier account, VAT account, etc.
- The entries are entered into the accounts in accordance with the rules of double-entry bookkeeping.

4. Value Added Tax (Value Added Tax):

- VAT is an important aspect of accounting. Entrepreneurs must correctly show the sales tax on their invoices and deduct the input tax paid from the sales tax.

5. Annual accounts:

- At the end of the financial year, annual financial statements are prepared, consisting of the balance sheet and the profit and loss account.
- The balance sheet gives an overview of the company's financial situation at a given point in time, while the income statement shows profit or loss for the fiscal year.

6. Tax obligations:

- Companies must keep their accounts in such a way that they comply with tax regulations.
- It is important to file tax returns on time and to comply with all tax obligations.

7. Software for bookkeeping and accounting:

- Modern software solutions can greatly facilitate and automate bookkeeping and accounting, saving time and reducing errors.

Correct accounting and proper documentation of financial transactions are essential for any business. This makes it possible to maintain a financial overview, assess the profitability of the company, meet tax obligations and create a solid basis for financial decisions. It is recommended that bookkeeping and accounting be carried out by qualified accountants or tax advisors to ensure compliance with all legal requirements and minimize possible financial risks.



## UKRAINIANS INTERNATIONAL e.V.

### 8.2 Calculation of workshop services

The calculation of workshop services is an important process in the automotive trade in order to adequately calculate the costs of a repair or maintenance and to set a fair price for the service provided. Here are some important steps to calculate workshop services:

1. Arbeitszeitkalkulation:

- The calculation of working hours is an essential part of the calculation. It is determined how much time is needed to carry out the individual work steps.
- Working hours may vary depending on the employee's experience and qualifications and should be taken into account accordingly.

2. Stundensatzkalkulation:

- The hourly rate is calculated based on the total costs of the workshop (e.g. rent, personnel, energy) and the expected working hours per year.
- The determined hourly rate forms the basis for calculating the cost of labor for a particular repair or maintenance.

3. Materialkalkulation:

- The cost of the required spare parts and consumables is determined and added to the labor costs.
- It is important to compare supplier prices and practice good materials management to optimize costs.

4. Additional costs and surcharges:

- Additional costs such as disposal costs for old parts or packaging costs should also be taken into account.
- Depending on the workshop policy, surcharges may also be levied for special services or warranty agreements.

5. Wettbewerbsanalyse:

- It is advisable to keep an eye on the prices of the competition and adjust your own prices accordingly in order to remain competitive.

6. Transparency and customer communication:

- The calculation should be transparent and comprehensible in order to convey trust to customers.
- It is important to inform the customer of the estimated costs before carrying out the work and, if necessary, to prepare a written estimate.

A careful calculation of workshop services is crucial in order to work economically and to treat customers fairly. Costing too low can lead to losses, while costing too high can scare off customers. An accurate calculation allows the workshop to set reasonable prices that cover the costs incurred and make a reasonable profit, while remaining attractive to customers. Continuous review and adjustment of the calculation is important in order to remain competitive and to ensure the economic health of the workshop.

### 8.3 Marketing and customer acquisition

Marketing and customer acquisition are important aspects in the automotive trade in order to draw the attention of potential customers to the company, to retain existing customers and to expand the business. Here are some key steps for successful marketing and effective customer acquisition:





## UKRAINIANS INTERNATIONAL e.V.

1. Zielgruppenanalyse:
  - A thorough analysis of the target audience is the starting point for any marketing concept.
  - The aim was to identify which customer groups have the main interest in the services and products offered.
2. Online presence and website:
  - A professional website is an important tool to present the company online and reach potential customers.
  - The website should be user-friendly, provide relevant information, and make it easier to get in touch.
3. Search Engine Optimization (SEO):
  - A good SEO strategy will help to better position the website in search engine results and reach more potential customers.
4. Online advertising:
  - Online advertising, such as Google Ads or social media advertising, can be used in a targeted manner to make the company better known and to appeal to customers.
5. Customer reviews and recommendations:
  - Positive customer reviews and recommendations play an important role in customer acquisition.
  - Good services and customer satisfaction promote word of mouth and recommendation by satisfied customers.
6. Local advertising and promotions:
  - Local advertising, such as advertisements in regional newspapers or flyers in the area, can improve the local presence and visibility of the company.
7. Retention:
  - Customer loyalty is just as important as customer acquisition.
  - Existing customers should be rewarded with special offers, loyalty programs or promotions to bind them to the company in the long term.
8. Professional appearance:
  - A professional appearance of the company, such as uniform company clothing and a clean workshop, creates trust and has a positive effect on customers.
9. Social Media Presence:
  - An active social media presence makes it possible to stay in touch with customers, share up-to-date information and build a community.
10. Cooperation:
  - Cooperation with other companies or partners can help to make the company better known and attract new customers.

A well-thought-out marketing concept and effective customer acquisition are crucial to attract new customers, grow the business and be successful in the long term. An active and customer-oriented marketing strategy supports the automotive trade in asserting itself in a highly competitive market environment and increasing customer satisfaction.

### 8.4 Human Resource Management and Leadership

Personnel management and employee leadership are decisive factors in the automotive trade in order to attract, motivate and retain qualified employees. Here are some important aspects of human resource management and leadership:

Ukrainians International e.V. – Register of Associations Stuttgart District Court VR 725972 Author: Siegfried Kraus - Internet: [www.ukrainians-international.com](http://www.ukrainians-international.com) – Email: [info@ukrainians-international.com](mailto:info@ukrainians-international.com)



## UKRAINIANS INTERNATIONAL e.V.

1. Recruitment and selection:	<ul style="list-style-type: none"><li>• A targeted recruitment strategy is important to attract qualified employees.</li><li>• A thorough selection of candidates based on expertise, experience and personal qualities is crucial to building the right team.</li></ul>
2. Training and education:	<ul style="list-style-type: none"><li>• Regular training and education enable employees to improve their skills and stay up to date with the latest technology.</li></ul>
3. Employee motivation:	<ul style="list-style-type: none"><li>• Motivated employees are more productive and engaged.</li><li>• Incentive systems, performance bonuses or employee bonuses can increase motivation.</li></ul>
4. Communication and feedback:	<ul style="list-style-type: none"><li>• Open communication and regular feedback are important to create a positive working atmosphere and promote collaboration.</li><li>• Employees should have the opportunity to voice their concerns and ideas.</li></ul>
5. Target agreements:	<ul style="list-style-type: none"><li>• Clear target agreements help employees to understand and achieve their tasks and goals.</li></ul>
6. Mitarbeiterentwicklung:	<ul style="list-style-type: none"><li>• Career opportunities and development prospects in the company motivate employees to get involved and develop in the long term.</li></ul>
7. Conflict:	<ul style="list-style-type: none"><li>• Conflicts in the workplace should be identified at an early stage and resolved appropriately in order to maintain a harmonious working environment.</li></ul>
8. Health:	<ul style="list-style-type: none"><li>• Employee health and well-being should be promoted to reduce downtime and increase productivity.</li></ul>
9. Work-Life-Balance:	<ul style="list-style-type: none"><li>• A good work-life balance helps to increase employee satisfaction and promote well-being.</li></ul>
10. Esteem:	<ul style="list-style-type: none"><li>• The appreciation of employees for their achievements and commitment is of great importance in order to create a positive working atmosphere.</li></ul>

Effective personnel management and good leadership are crucial for the success of a company. By investing in your employees, nurturing their potential and creating a motivating work environment, you can build a dedicated and competent team that contributes to the growth and success of the automotive trade. A good corporate culture that values employees and makes them active co-creators of the company can contribute to higher employee loyalty and a positive image of the company in the long term.

### 8.5 Legal aspects and standards in the motor vehicle trade

In the automotive trade, there are a large number of legal aspects and standards that must be observed in order to ensure legally compliant and safe working. Here are some important legal aspects and standards in the automotive trade:

#### 1. Legal regulations:



## UKRAINIANS INTERNATIONAL e.V.

- The motor vehicle trade is subject to various legal regulations, such as .dem craft law, labor law, tax law and environmental law.
  - It is important to know and comply with these regulations in order to avoid legal consequences.
2. Business registration and Chamber of Crafts:
- Before opening a workshop, the trade must be registered with the responsible trade office.
  - Depending on the type of activity, registration in the register of craftsmen or membership in the Chamber of Crafts may be required.
3. Arbeitsschutzgesetze:
- The Occupational Health and Safety Act regulates health and safety in the workplace.
  - It is important to take all necessary occupational health and safety measures to prevent accidents and damage to health.
4. Umweltschutzvorschriften:
- When dealing with pollutants, exhaust gases, oils and other environmental hazards, environmental protection regulations must be observed.
  - Proper disposal of waste must be ensured.
5. Warranty and guarantee:
- The motor vehicle trade is subject to the statutory warranty and guarantee provisions, which guarantee the customer certain rights in the event of defects or damage.
6. Privacy:
- When processing personal data, e.g. customer data, the provisions of the General Data Protection Regulation (GDPR) must be observed.
7. Norms and standards:
- Work in the motor vehicle trade should comply with the applicable technical norms and standards in order to ensure the quality and safety of the work carried out.
8. Liability issues:
- The motor vehicle trade should be aware of liability issues and take out appropriate liability insurance in the event of damage.

Compliance with the legal aspects and standards in the automotive trade is not only required by law, but also serves to protect customers, employees and the company itself. It is advisable to inform yourself about all relevant rules and regulations and, if necessary, to seek legal advice to ensure that the motor vehicle trade is fully compliant with the legal requirements.



## Chapter 9: Technological developments and future trends

### 9.1 Electromobility and alternative drives

Electromobility and alternative powertrains are important developments in the automotive sector that aim to reduce CO<sub>2</sub> emissions and reduce dependence on fossil fuels. Here are some important aspects of electromobility and alternative powertrains:

#### 1. Electric vehicles (EVs):

- Electric vehicles are vehicles that are powered by one or more electric motors and use a battery to store energy.
- They do not produce direct exhaust fumes and are therefore more environmentally friendly than conventional combustion engines.

#### 2. Hybrid vehicles:

- Hybrid vehicles combine an internal combustion engine with an electric motor and a battery.
- There are different hybrid variants, such as mild hybrids, full hybrids and plug-in hybrids.

#### 3. Brennstoffzellenfahrzeuge (FCEVs):

- Fuel cell vehicles use hydrogen as fuel, which reacts with oxygen in the fuel cell to generate electricity.
- They produce only water vapor while driving and have a long range.

#### 4. Ladeinfrastruktur:

- A well-developed charging infrastructure is crucial for the success of electric mobility.
- Public charging stations as well as private charging stations at home or in companies are necessary to charge electric vehicles efficiently.

#### 5. Environmental aspects:

- Electric vehicles have a lower direct environmental impact because they do not emit pollutants and greenhouse gases.
- However, the environmental impact also depends on the production of the batteries and the generation of electricity.

#### 6. Range and charging times:

- The range of electric vehicles has increased significantly in recent years, but the charging infrastructure and charging times remain important aspects for the acceptance of electric mobility.

#### 7. Incentive measures:

- Many countries and regions offer financial incentives and subsidies for the purchase of electric vehicles and the expansion of charging infrastructure.

#### 8. Challenges:

- The introduction of electric mobility also poses challenges such as limiting the availability of raw materials for batteries and disposing of batteries at the end of their life.

Electromobility and alternative drives are expected to continue to grow in the coming years and play an important role in the transition to sustainable and environmentally friendly mobility. The automotive trade will play an important role when it comes to the maintenance, repair and service of electric vehicles and alternative drives. It is therefore important that workshops and professionals familiarize themselves with the new technologies and expand their competencies accordingly in order to meet the requirements of electromobility.



### 9.2 Advanced driver assistance systems and autonomous driving

Advanced driver assistance systems and autonomous driving are significant developments in the automotive industry aimed at improving road safety and optimizing the driving experience. Here are some key aspects of driver assistance systems and autonomous driving:

1. Advanced driver assistance systems:

- Driver assistance systems support the driver while driving and help prevent accidents.
- Examples of such systems include adaptive cruise control, lane departure warning, emergency brake assist, blind spot assist and traffic sign recognition.

2. Level of vehicle automation:

- Autonomous driving is divided into different levels of automation (Level 0 to Level 5) – from no automation (Level 0) to fully autonomous driving without the possibility of human intervention (Level 5).

3. Autonomous driving and legal aspects:

- The introduction of autonomous driving also raises legal and ethical questions, such as liability regulations in the event of an accident or the clarification of responsibilities.

4. Technological challenges:

- Autonomous driving requires complex technologies, such as sensors, cameras, artificial intelligence and advanced control systems.
- The reliability and safety of these technologies are of great importance.

5. Potential benefits:

- Autonomous driving could improve road safety, optimize traffic flow, reduce fuel consumption and improve mobility for people with reduced mobility.

6. Challenges and concerns:

- Although autonomous driving offers many advantages, there are also challenges and concerns, such as data security, public acceptance of the technology, and the potential reduction of jobs in the transportation sector.

7. Test drives and legislation:

- In many places, autonomous vehicles are being tested in test environments to improve the technologies and ensure their safety.
- Legislation and regulation for autonomous vehicles is still under construction in many countries.

The development of driver assistance systems and autonomous vehicles continues, and they are expected to become more widespread in the coming years. The automotive trade plays an important role in the maintenance, repair and testing of these systems. Professionals in workshops need to familiarize themselves with the new technologies and constantly educate themselves to meet the demands of the changing automotive sector. The safety and reliability of these systems are top priorities and the automotive trade plays a crucial role in ensuring these aspects.

### 9.3 Networking and digitalization in automotive engineering

Networking and digitalization in vehicle technology is a major trend that is significantly changing the automotive industry. Here are some important aspects of connectivity and digitalization in automotive engineering:



## UKRAINIANS INTERNATIONAL e.V.

1. Connected Vehicles:
  - Connected vehicles are connected to the Internet and can exchange data over the Internet.
  - This allows vehicles to receive and send information about traffic conditions, weather, navigation data and much more.
2. Telematics:
  - Telematics systems in the vehicle enable the transmission of vehicle data in real time.
  - This data can be used for vehicle diagnostics, analysis of driving behavior, insurance purposes and much more.
3. Infotainment systems:
  - Modern vehicles have advanced infotainment systems that provide drivers and passengers with access to entertainment, communication and information.
4. Connected Services:
  - Car manufacturers are offering more and more connected services such as remote start, theft protection, vehicle diagnostics or automatic accident reporting.
5. OTA-Updates:
  - Over-the-air updates make it possible to update vehicles wirelessly to fix software bugs, add new features, or improve performance.
6. Vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication:
  - V2V and V2I enable direct communication between vehicles and with the traffic infrastructure to improve road safety and efficiency.
7. Cybersicherheit:
  - Increasing connectivity also requires increased cybersecurity measures to protect vehicles from potential hacker attacks.
8. Autonomous Vehicles and Artificial Intelligence:
  - Digitalization and connectivity are crucial for the development of autonomous vehicles that can navigate independently with the help of artificial intelligence.
9. Data protection and data security:
  - With the increasing collection and use of vehicle data, privacy and data security are of great importance to protect the privacy of drivers and passengers.

Networking and digitalization in vehicle technology offer many new opportunities and challenges for the automotive industry. The automotive trade plays an important role in the implementation and maintenance of these new technologies. Professionals in workshops need to familiarize themselves with the latest diagnostic and repair methods and expand their skills accordingly to meet the requirements of digitized vehicle technology. The future of the automotive sector will be strongly influenced by networking and digitalization, and the automotive trade will play a decisive role in implementing and securing these technological developments.

### 9.4 Sustainability and environmental protection in the automotive trade

Sustainability and environmental protection are important issues in the automotive trade, as the automotive industry has a significant impact on the environment. Here are some aspects of how the automotive trade can promote sustainability and environmental protection:

1. Eco-friendly workshop practices:



## UKRAINIANS INTERNATIONAL e.V.

- Workshops should adopt environmentally friendly practices, such as the proper disposal of old parts, batteries and pollutants, as well as the use of environmentally friendly cleaning products.
2. Energy efficiency:
    - The efficient use of energy in the workshop and the use of renewable energy can reduce energy consumption and reduce CO2 emissions.
  3. Resource-saving repair and maintenance:
    - Workshops can advise customers on how to have their vehicles maintained and repaired in the most resource-efficient way possible in order to extend the service life of parts and reduce waste.
  4. Alternative drives:
    - The automotive trade can support the introduction and maintenance of vehicles with alternative drives, such as electric vehicles or hybrid vehicles, in order to reduce CO2 emissions.
  5. Training and awareness-raising:
    - Continuous training and awareness of employees on environmental issues and sustainability is important to raise awareness of environmentally friendly practices.
  6. Recycling and disposal:
    - Workshops can implement recycling programs for old parts and pollutants to reduce the environmental footprint and minimize environmental impact.
  7. CO2 reduction:
    - By promoting environmentally friendly vehicles and using energy-efficient technologies, the automotive trade can actively contribute to the reduction of CO2 emissions.
  8. Use of sustainable materials:
    - Where possible, workshops should rely on the use of sustainable materials, such as ecologically certified products or reusable packaging materials.
  9. Customer service:
    - The workshop can inform customers about environmentally friendly driving and maintenance practices to make a positive contribution to environmental protection.

Sustainability and environmental protection in the automotive trade are not only an ethical obligation, but also contribute to competitiveness, as many customers are interested in environmentally friendly services and products. By introducing environmentally friendly practices and technologies, the automotive trade can make a positive contribution to environmental protection and help shape the future development of the automotive sector.



## Closing remarks:

### Summary of key content

The most important contents of the textbook on the "motor vehicle trade" are summarized as follows:

1. Importance of the motor vehicle trade:
  - The automotive trade plays a crucial role in the maintenance, repair and testing of vehicles to ensure their safety, reliability and performance.
2. Historical overview:
  - The development of the automotive trade has been parallel to the history of the automotive industry, with technologies and standards continuously evolving over time.
3. Development and future prospects:
  - The automotive trade is facing new challenges, such as electromobility, autonomous driving, networking and digitalization, which will shape future developments.
4. Design and function of motor vehicles:
  - Basic knowledge of the structure and functioning of vehicles, including drive systems, chassis technology and electronics, is essential for working in the automotive trade.
5. Workshop equipment and equipment:
  - A well-equipped workshop with modern equipment and tools is crucial for efficient and high-quality work.
6. Occupational safety and environmental protection in the workshop:
  - The protection of employees and the environment is of great importance, so proper safety precautions and environmentally friendly practices in the workshop are essential.
7. Diagnostic and testing methods:
  - Correct diagnosis and testing of vehicles is essential for precise repair and maintenance.
8. Documentation and data management:
  - Careful documentation and efficient data management are important to manage customer data, repair histories, and technical information.
9. Customer service and customer communication:
  - Professional customer communication and customer-oriented service are crucial to promote customer satisfaction and customer loyalty.
10. Vehicle checklists and inspection plans:
  - Structured checklists and inspection plans help to systematically conduct vehicle tests and inspections.
11. Maintenance and repair of specific components:
  - Detailed instructions for the maintenance and repair of specific vehicle components, such as brakes, chassis, electronics, engines, etc., are included in the textbook.
12. Diagnostic tools and equipment:
  - Information about modern diagnostic tools and equipment used in the automotive trade is listed.
13. Advanced driver assistance systems and autonomous driving:
  - The developments in the field of driver assistance systems and autonomous driving are described, including their impact on the automotive industry and workshop work.
14. Networking and digitalization in automotive engineering:
  - The significance of networking and digitization in vehicle technology and their influence on the automotive trade are presented in detail.





## UKRAINIANS INTERNATIONAL e.V.

### 15. Sustainability and environmental protection:

- The role of the automotive trade in terms of sustainability and environmental protection is explained, including environmentally friendly workshop practices, resource-efficient repair and the promotion of alternative propulsion systems.

The textbook provides a comprehensive and detailed understanding of the automotive trade, including its technical aspects, occupational safety, customer communication, the challenges of the future and the contribution to sustainability and environmental protection. It is aimed at skilled workers, trainees and interested parties who would like to deal intensively with automotive technology and the skilled trades.



## Outlook on future developments in the automotive trade

The outlook for future developments in the automotive trade is characterized by a continuous technological evolution that presents the trade with new challenges, but also opportunities. Here are some possible developments that could influence the automotive trade in the future:

### 1. Electromobility and alternative drives:

- With the increasing acceptance of electric vehicles and alternative drives, the automotive trade will be increasingly involved in the maintenance, repair and service of these vehicles. Professionals must continue to familiarize themselves with the specific requirements of these technologies.

### 2. Autonomous driving and driver assistance systems:

- The advancing development of autonomous driving and increasingly sophisticated driver assistance systems will pose new challenges for the automotive trade in terms of diagnostics, repairs and software updates.

### 3. Networking and digitization:

- The ever-increasing networking and digitalization in vehicle technology requires ongoing training and adaptations of workshops in order to keep up with the latest diagnostic and repair methods.

### 4. Sustainability and environmental protection:

- The topic of sustainability and environmental protection will continue to play an important role in the future. The automotive trade must continue to focus on promoting environmentally friendly practices and supporting the adoption of resource-efficient technologies.

### 5. Artificial intelligence and data analysis:

- Artificial intelligence (AI) and data analytics are likely to be increasingly used in vehicle diagnostics and maintenance to optimize processes and identify faults faster.

### 6. New materials and lightweight construction:

- The development of new materials and lightweight construction concepts in vehicle construction may require adapted repair and maintenance techniques in the automotive trade.

### 7. Online services and customer communication:

- Digitalization will also influence customer communication. Online services, appointment scheduling and customer contact via different platforms could play a greater role.

### 8. Cybersecurity and data protection:

- In view of the increasing networking of vehicles, the security of vehicles against hacker attacks and the protection of vehicle data will play an increasingly important role.

### 9. Further training and qualification:

- Professionals in the automotive trade need to undergo continuous training in order to meet the demands of changing technologies and maintain the quality of services.

The future of the automotive trade will depend on the ability to adapt to new technological developments and to train employees accordingly. Close cooperation with the automotive industry, the promotion of innovation and the consideration of sustainability aspects are crucial to successfully lead the automotive trade into the future.



## Final Thoughts and Recommendations for Aspiring Candidates

Finally, I would like to give prospective specialists in the automotive trade some thoughts and recommendations:

1. Passion for technology and mobility:

- The automotive trade requires a passion for technology and mobility. If you enjoy working on vehicles and are passionate about how they work, this craft is the right choice for you.

2. Ongoing training:

- The automotive industry is subject to constant changes and technological developments. It is therefore important to continuously educate yourself and stay up to date in order to meet the demands of changing technologies.

3. Customer orientation and communication:

- Customer orientation and good communication are essential when dealing with customers. Friendly and professional customer service promotes customer satisfaction and retention.

4. Environmental protection and sustainability:

- As a future specialist in the automotive trade, you will have the opportunity to promote environmentally friendly practices and optimize the contribution of the trade to environmental protection.

5. Openness to new technologies:

- New technologies such as electromobility, autonomous driving and digitalization will shape the skilled trades. Be open to these developments and take the opportunity to specialize in these areas.

6. Teamwork and collaboration:

- The automotive trade often requires teamwork. Good cooperation with colleagues and other professionals is important to work efficiently and successfully.

7. Sicherheitsbewusstsein:

- Occupational safety is a top priority. Always adhere to safety regulations and protect yourself and your colleagues from possible dangers.

8. Proud of your own work:

- Whether you're carrying out repairs, inspecting vehicles or advising customers, be proud of your work and the added value you bring to people's mobility.

The automotive trade offers a versatile and future-oriented career. Take advantage of the opportunities to develop in this area and make a positive contribution to mobility and environmental protection. With a good education, continuous training and enthusiasm for technology, you can embark on a successful and fulfilling career in the automotive trade. Good luck on your way!



## UKRAINIANS INTERNATIONAL e.V.

Contact:  
Siegfried Kraus  
Board

### **UKRAINIANS INTERNATIONAL e.V.**

Theodor-Quehl-Str. 10  
c/o Maksym Pozhydaiev (Member of the Board)  
D-78727 Oberndorf am Neckar

Phone: +49 1577 4279710

Email: [info@ukrainians-international.com](mailto:info@ukrainians-international.com)

URL: [www.ukrainiansinternational.com](http://www.ukrainiansinternational.com) and [www.ukrainiansinternational.de](http://www.ukrainiansinternational.de)