

OUTLINE CURRICULUM

for vocational education and training in the occupation of

Motor vehicle mechatronics technician

(Culture and Education Ministers Conference Resolution of 16 May 2003)

Part I: Preliminary remarks

This outline curriculum, relating to occupational tuition at a vocational school, is the subject of a resolution by the Permanent Conference of the Culture and Education Ministers and Senators of the Federal States (KMK).

The outline curriculum has been coordinated with the corresponding training regulations of the Federal Government (enacted by the Federal Ministry of Economics and Labour or other specialist ministry having responsibility for the process, in agreement with the Federal Ministry of Education and Research. This process of coordination is governed by an agreement concluded between the Federal Government and the federal states on 30 May 1972 (the “joint minutes”). The underlying principle of the outline curriculum, which describes minimum requirements, is to build on the basis of the lower secondary school leaving certificate.

In the case of occupations allocated to a specific occupational field, the outline curriculum is divided into occupational field related basic training and specialist continuation training.

The training regulations and the outline curriculum regulate the aims and content of the vocational education and training and form the basis of final qualification in a regulated occupation, also leading, in conjunction with tuition in further subjects, to qualification from a vocational school. This process fulfils the basic requirements for qualified employment, as well as opening up access to school-based and vocational further and continuing training courses.

The outline curriculum does not make any methodological stipulations in respect of tuition itself. If independence and responsibility of thought are to form an overarching aim of the training which is delivered, it is better they form an integral part of the teaching methods deployed. In principle, any methodological approach can help achieve this goal. Particularly suitable are methods which directly promote professional action competence, and these need to be afforded due consideration in the lesson planning process.

The federal states either adopt the outline curriculum directly or implement it in the form of their own schemes of work. If the latter option is followed, care is taken that the coordination of subject and time allocation which has been worked out between the outline curriculum and the respective training regulations is adhered to.

Part II: Training remit of vocational schools

Within the dual system of vocational education and training, vocational schools and companies providing training fulfil a joint remit.

Vocational schools are independent learning venues, working together as an equal partner with other vocational education and training stakeholders. Their task is to deliver vocational and general learning content to their pupils whilst paying particular attention to the requirements of vocational education and training.

Vocational schools aim to extend the general schooling their pupils have already received by providing basic and specialist vocational training. They aim to provide their pupils with a sense of environmental responsibility, enabling them to play their part in organising the world of work and society as a whole, as well as equipping them to fulfil occupation related tasks. They act in accordance with the regulations contained within federal state school law governing this form of school. A further particular focus of occupational tuition is the vocational regulatory framework enacted in a unified way at national level and applying to every individual state regulated occupation:

- The outline curriculum of the Permanent Conference of the Culture and Education Ministers and Senators of the Federal States (KMK)
- Federal Government training regulations relating to in-company training.

According to the outline agreement on vocational schools (KMK resolution of 15 March 1991), the aims of vocational schools are to

- “deliver professional action competence which combines specialist skills with general human and social abilities;
- develop occupational flexibility to meet the changing requirements in the world of work and society as a whole, including in terms of the ever closer European ties;
- encourage participation in further and continuing vocational education and training;
- support the ability and readiness of individuals to act in a responsible way in terms of organising their own lives and taking part in public life.”

To achieve these aims, vocational schools need to

- gear teaching towards pedagogical principles specific to these tasks, laying emphasis on a professional action oriented approach;
- deliver occupational field related and cross-occupational field qualifications whilst according due consideration to necessary vocational specialisation;
- guarantee differentiated and flexible training provision, in order to be able to meet the demands posed by different abilities and talents and fulfil the requirements of both the world of work and society as a whole;
- provide an extensive range of support for the disabled and disadvantaged and promote the interests of these groups as far as possible;

- draw attention to the threats to the environment and danger of accidents associated with both occupational and private life and demonstrate ways of avoiding or diminishing the risk of such occurrences.

In addition to this, vocational schools need to address key contemporary problems, both within general teaching and within vocationally related tuition, insofar as the latter is possible. These issues include

- work and unemployment
- peaceful co-existence between individuals, peoples and cultures on a worldwide basis, whilst retaining cultural identity
- sustaining the natural basis of life and
- guaranteeing human rights.

The aims listed relate to the development of professional action competence. This is defined within this context as the willingness and ability of an individual person to behave appropriately, thoughtfully and in an individually and socially responsible manner in social, occupational and private situations.

Professional action competence covers the dimensions of expert competence, personal competence and social competence.

Expert competence refers to the willingness and ability to use specialist knowledge and proficiency as a basis to solve tasks in a target oriented way, appropriately, methodically and independently and to be able to evaluate the results.

Personal competence refers to the willingness and ability of an individual person to clarify, think through and evaluate the opportunities for development, the demands and the restrictions which arise within the family, at work and in public life, develop his or her talents, make life plans and to develop further. Personal competence embraces such personal characteristics as independence, well-developed critical faculties, reliability and a sense of responsibility and duty. It also includes in particular the development of well-considered systems of values and the adherence to such values which defines the individual.

Social competence refers to the willingness and ability to experience and organise social relationships, identify and understand affection and tensions and to deal and communicate with others in a rational and responsible manner. It also includes in particular the development of social responsibility and solidarity.

Methodical and learning competence are created from balanced development within these three dimensions.

Competence refers to learning outcomes in terms of the individual and his or her capability to act on his or her own responsibility in private, occupational and social situations. Qualification, on the other hand, is defined as learning outcomes in terms of applicability, meaning from the point of view of the demand for them in private, occupational and social situations (cf. German Educational Council, Recommendations of the educational commission on the reorganisation of upper secondary education).

Part III: Didactic principles

The aims of vocational education and training require teaching to be geared towards pedagogical principles specific to the tasks of vocational schools, laying emphasis on a professional action oriented approach and equipping young people for independent planning, realisation and evaluation of work related tasks within the scope of their occupational activities.

Learning at vocational schools fundamentally takes place within the context of specific occupational action and also includes a wide range of theoretical operations, including understanding the actions of others. This learning is primarily associated with reflecting the constituent parts of action (action plan, process, results). Applying this theoretical base to occupational work creates the necessary learning conditions for learning at and outside the workplace. As far as the outline curriculum is concerned, this means that the description of aims and selection of content needs to be presented in an occupation related way.

A pragmatic approach to the structuring of professional action competence oriented tuition based on theoretical and didactic findings embraces the following terms of reference:

- Situations which are significant for the exercise of an occupation (learning for action) constitute didactic reference points.
- Learning outcomes are determined by actions, carried out by the individual person wherever possible or understood in theory (learning through action).
- Actions need to be planned, carried out, monitored, corrected if necessary and finally evaluated by the learners themselves wherever possible.
- Actions should promote holistic understanding of the realities of working life, including technical, safety, economic, legal, ecological and social aspects.
- Actions need to be integrated into the experiences of learners and be reflected in terms of their social effects.
- Actions should also include social processes such as conflict of interest management or conflict management.

Professional action oriented tuition is a didactic concept combining specialist and action related systematic structures and can be carried out by means of a variety of teaching methods.

Teaching provision at vocational schools is aimed at young people and adults who differ in terms of their levels of previous education, their cultural background and their experiences within the companies providing training. Vocational schools can only fulfil their training remit by taking these differences into account and providing students – whether these be disadvantaged or especially gifted – with the individual support they require.

Part IV: Occupation related preliminary remarks

The present outline curriculum for vocational education and training in the occupation of motor vehicle mechatronics technician has been coordinated with the Ordinance for vocational education and training in the occupation of motor vehicle mechatronics technician of ... (Federal Law Gazette I, p. ...).

The outline curricula relating to the regulated occupations of automobile mechanic (KMK Resolution of 7 January 1987), motor vehicle electrician (KMK Resolution of 30 May 1989) and motor vehicle mechanic (KMK Resolution of 30 May 1989) are superseded by the present outline curriculum.

The “Elements of vocational school tuition in the area of economics and sociology for technical regulated occupations” (KMK Resolution of 18 May 1984) forms the basis for the major teaching material in the examination area of economics and sociology.

The present outline curriculum had the following aims in terms of school-based learning:

Specific occupational and workshop-based actions are the starting point for vocational school learning. The following statements of objectives will, therefore, describe actions in virtually every learning field which should be planned, carried out and evaluated by the learners themselves in the form of actual and concrete occupationally specific work actions within the context of complete work and business processes.

The work processes described in the statements of objectives should be carried out by learners as complete actions and in a team wherever possible.

Changes to business processes in the occupation in question have brought about an increased level of contact between company employees and clients and external customers, as well as turning the employees themselves into internal customers within the system of cooperation between the various departments of a company. This customer orientation represents new challenges for the technical employees of companies in particular. As far as the learning fields relating to basic training are concerned, the outline curriculum therefore contains 40 planned hours for the extension of future employees’ communication skills, there being 20 hours in learning field 1 and 10 hours in learning fields 2 and 3 respectively. The aspects of communication, customer orientation and quality assurance form a particular focus of learning. These should be accorded equal consideration in subsequent learning fields. They are, however, only expressly mentioned when specific aspects of the occupational action field going beyond their general importance need to be taken into account.

Aims and content relating to 40 teaching hours have been integrated into the learning fields for the delivery of basic foreign language elements.

Mathematical and scientific content need to be delivered in an integrative way within the learning fields.

The starting point for the structuring of learning situations in terms of the didactic and methodological approach within individual learning fields should be the working process within the occupational action field. This is reflected in the statements of objective within the individual learning fields, contents thus being described in terms of work planning, work process determining, specialist and company specific or social aspects.

Contents forming an intrinsic part of every work process are only mentioned in learning field 1. These should, however, be accorded due consideration in all further learning fields of basic and specialist training. This applies to the following contents:

- Work planning
- Manufacturers' documentation
- Technical information, communications and documentation systems
- Procedures and devices for measuring and testing
- National and international norm, regulations and rules
- Health and safety at work and prevention of accidents
- Quality management¹⁾
- Foreign language terms
- Environmental protection, disposal and recycling
- Communication with employees and customers
- Chairing discussions and making presentations

In the specialist phase, the following contents are only stated in learning field 5:

- Workshop information systems
- Diagnostic systems
- Customer orientation

Although they retain their validity in respect of subsequent learning fields, they are only mentioned when particular aspects need to be addressed.

The specialist contents relating to the individual learning fields are exclusively stated in general terms and are not listed in a differentiated form. This procedure pursues three main aims:

- Delivery of work process oriented skills should be at the centre of vocational school training.
- The school itself should determine the structure of the learning fields in terms of actual content insofar as this is logistically possible.
- The catalogue of contents should remain open for further technical developments.

This puts more organisational tasks within the remit of the individual schools and imposes a greater level of didactic responsibility on them.

The division of the outline curriculum into the main areas of private motor vehicle technology, commercial motor vehicle technology, vehicle communication technology and motorcycle technology does not begin until the 3rd year of training, as planned in the training regulations. If there are sufficient numbers of students to allow tuition in these areas at an earlier stage, with the agreement of the companies providing training, these particular requirements can be addressed during the 2nd year of training by making appropriate differentiation in learning fields five to eight.

1) In the first year of training, students should learn to monitor and improve the quality of their work on an ongoing basis. In the following years, this process of self-assessment represents a starting point for adopting a holistic view of quality within the scope of quality management.

As far as in-company training is concerned, there is a close objective correlation between the outline curriculum and the training regulations. It is recommended that both plans should form the basis for organising exemplary learning situations.

The aims and contents of the outline curriculum relevant to the interim examination or to Part 1 of the final examination are coordinated via cooperation between training venues involving the vocational schools, the company or extra company training partners and the regional examination boards. Learning fields one to six form the basis of this process.

Part V: Learning fields

Overview of learning fields for the regulated occupation of motor vehicle mechatronics technician					
Learning fields		Suggested time allocation			
		No.	1st year	2nd year	3rd year
1	Maintenance and care of vehicles or systems	100			
2	Disassemble, repair and assemble technical vehicle subassemblies or systems	80			
3	Test and repair electrical and electronic systems	80			
4	Test and repair open loop and closed loop control systems	60			
5	Test and repair energy supply and starting systems		80		
6	Test and repair engine mechanics		60		
7	Diagnose and repair engine management systems		100		
8	Conduct service and repair work on exhaust systems		40		
Private motor vehicle technology specialist area					
9P	Maintain power transmission systems			60	
10P	Maintain chassis and brake systems			80	
11P	Retrofit and put additional systems into service			60	
12P	Test and repair networked systems			80	
13P	Diagnose and repair body work, comfort and safety systems				80
14P	Conduct service and repair work for a statutory inspection				60

Commercial motor vehicle specialist area					
9N	Maintain power transmission systems			60	
10N	Maintain chassis and brake systems			80	
11N	Retrofit and put additional systems into service			60	
12N	Test and repair networked systems			80	
13N	Test and repair electro pneumatic and electro hydraulic systems				80
14N	Conduct service and repair work for a statutory inspection				60
Vehicle communication technology specialist area					
9F	Test and repair power transmission systems			40	
10F	Test and repair chassis and brake systems			60	
11F	Retrofit and put additional systems into service			80	
12F	Test and repair networked systems			100	
13F	Test and repair comfort and safety systems				60
14F	Test, repair and retrofit wireless signal transmission systems				80
Motor cycle technology specialist area					
9M	Maintain power transmission systems			60	
10M	Maintain chassis and brake systems			80	
11M	Retrofit and put additional systems into service			60	
12M	Test and repair electronic systems			80	
13M	Test and repair systems relevant to safe driving of vehicle				100
14M	Advise customers in the selection of accessories				40
	Total (1020 hours overall)	320	280	280	140

Learning field 1: Maintenance and care of vehicles or systems

1st training year

Suggested time allocation: 100 hours

Statement of objectives:

Students carry out care and maintenance work to retain functionality or value of vehicles or on systems typical to the occupation.

They identify customer expectations in respect of order processing and react to customer wishes. They conduct discussions with line managers, employees and suppliers and pay due regard to the importance of customer care. They demonstrate a positive personal attitude towards their work in the workshop and accept responsibility for the business process.

The students analyse functional units of the vehicles or systems typical to the occupation and describe the functions of subsystems. They deploy procedures relating to the analysis and exemplification of the interrelation of functions.

They use service plans and repair guides, obtain technical documentation and deploy data processing means to procure information and documentation. They implement the rules, norms and procedures forming the basis of the service. They ensure communication with upstream and downstream functional areas.

Within the scope of the service work, they develop awareness of safety and quality and apply regulations relating to health and safety at work and protection of the environment in a secure way.

They document maintenance work carried out and provide information in respect of the nature and scope of this work.

Contents:

Work planning

Manufacturers' documentation

Service concepts and extent of service provision

Repair guides and service plans

Block diagrams, diagrams and functional schemes

Technical systems and subsystems

Technical information, communications and documentation systems

Procedures and devices for measuring and testing

Tools, company resources, auxiliary materials

Spare part and material requisitioning lists

Vehicle registration and road traffic regulations

Health and safety at work and prevention of accidents

Disposal and recycling

Quality of work

Conducting discussions and communication rules

Verbal and non-verbal communication

Conflict avoidance strategies

Learning field 2: Disassemble, repair and assemble technical vehicle subassemblies or systems

1st training year
Suggested time allocation: 80 hours

Statement of objectives:

Students plan the disassembly, repair and assembly of one or several subassemblies of a vehicle or a piece of equipment typical to the occupation and carry out these processes. They use company information systems for the planning, realisation and checking of the work processes, making particular use of digital data storage media. They pay due regard to statutory regulations and manufacturers' instructions and deploy technical means of communication.

Students deploy tools, machines, working materials, company resources and auxiliary materials in accordance with their functions. When disassembling, they test the components and elements to determine if they may be reused or recycled.

When creating detachable connections, in particular screw connections, they pay due regard to technical data and assembly instructions. When dealing with the repair of components, subassemblies, systems and equipment, they carry out the necessary work in respect of reshaping or separating semi-finished products, paying particular attention to drilling work such as producing screw threads or repair work. They deploy testing devices to determine lengths, diameters and threads.

Students check, evaluate, document and present their work results.

They communicate with employees, line managers and customers.

Contents:

Disassembly, repair and assembly plans

Vehicles, vehicle specific components, subassemblies and systems

Machines, assembly tools and working materials

Drill holes and threads

Devices and procedures for testing and measuring areas, lengths and threads

Screws and screw connections

Starting torques

Protection against corrosion

Liability law

Learning field 3: Test and repair electrical and electronic systems

1st training year

Suggested time allocation: 80 hours

Statement of objectives:

Students use the jobs at hand and error descriptions to plan the testing and repair of electric or electronic systems in vehicles or in systems specific to the occupation.

They use conventional and electronic information systems to obtain information. They use circuit diagrams and other technical electrical engineering or electronic documentation to analyse the principle circuits of electrical components.

Students carry out troubleshooting procedures on vehicles or on systems specific to the occupation and repair electrical and electronic systems. They select the necessary testing and measuring devices. They use tables and formulas to measure and determine electrical values and evaluate the readings and signals.

They use accident prevention regulations to avoid risk when dealing with electrical current.

Students document their work results and evaluate these against values already calculated and those provided by manufacturers. They present their work results with due regard to basic rules of communication.

Contents:

Circuit diagrams

Electrical and electronic components, subassemblies and systems

Electrical and electronic circuits, basic parameters and signals

Electrical measuring and testing devices

Installation instructions

Contact unit/switching device symbols, terminal designations

Wires and wire connections

Regulations for the testing of electrical/electronic systems

Health and safety and prevention of accidents when dealing with electrical components

Learning field 4: Test and repair open loop and closed loop control systems

1st training year

Suggested time allocation: 60 hours

Statement of objectives:

Students use the jobs at hand and error descriptions to plan the testing and repair of vehicle specific open loop and closed loop control systems.

They use manufacturer specific information systems to obtain necessary information and make use of the knowledge of employees and line managers.

They differentiate between open loop and closed loop control systems and allocate vehicle typical subassemblies and components to hydraulic, pneumatic or electrical/electronic systems.

They analyse functional relationships and use basic testing and measuring procedures to investigate signal, material and energy flows.

They use regulations and codes for systematic troubleshooting and develop problem-solving strategies.

Students disassemble and assemble open loop and closed loop technical components and check the functionality of the system as a whole by using testing and measuring procedures. They document their testing and measuring results and evaluate these against values already calculated and those provided by manufacturers. They narrow down errors and deviations in a systematic way and resolve these.

Whilst carrying out the job at hand, the students pay due regard to norms and guidelines relating to assuring product quality. When dealing with hydraulic, pneumatic or electrical/electronic systems they use health and safety and environmental protection regulations.

Contents:

Repair guides, functional schemes, troubleshooting plans

Control system, control circuit

Technical values of open loop and closed loop control systems

Sensors, actuators, input processing output principle

Principle circuits of open loop and closed loop control systems

Symbols, logical connections

Health and safety and prevention of accidents when working with high pressures

Disposal of company resources

Learning field 5: Test and repair energy supply and starting systems

2nd training year

Suggested time allocation: 80 hours

Statement of objectives:

Students plan diagnostic, maintenance and repair work to energy supply and starting systems and comply with manufacturers' instructions and regulations in respect of prevention of accidents whilst conducting these.

They use circuit diagrams to find out about types of circuits and use manufacturers' information to obtain information about nominal data and functional controls of the functional units. They analyse the function and interaction of components and subassemblies and investigate the influence potential errors may have on the functionality of the system. When testing the equipment, they use test procedures and devices which have been approved by the manufacturer. They carry out an error diagnosis and document the test results, using them as a basis to select new, spare or replacement parts with the assistance of workshop information systems.

The students advise customers in the selection of starter batteries and explain the professional way to carry out auxiliary starting.

Contents:

Workshop information systems
Diagnostic systems
Circuit diagrams
Inspection and maintenance regulations
Batteries
Starters, generators, starter generators
Energy management
New power supply systems
Alternative energy storage
Fuel cells
Economic and customer oriented calculations

Learning field 6: Test and repair engine mechanics

2nd training year

Suggested time allocation: 60 hours

Statement of objectives:

Students plan the testing and repair of engine subassemblies and carry these out.

They analyse and describe the function and the interaction of the components and subassemblies investigate the influence potential errors may have on the functionality of the system. They identify the components and subassemblies present in the engine and use customer information, visual inspection and error symptoms as the basis for planning diagnosis and repair. They use manufacturers' instructions and further technical documentation in this process. They use company information systems to plan, conduct and check jobs at hand.

As far as carrying out repairs is concerned, the students use the tools, machines, company resources and auxiliary materials which are prescribed and follow health and safety and environmental protection regulations. They test the engine mechanics components and subassemblies to ascertain if they may be reused.

The students document, check and evaluate their work results.

Contents:

Engine types

Engine subassemblies

Disassembly and assembly regulations

Assembly tools, special tools

Engine lubrication

Engine cooling

Engine control systems

Diagrams

Company resources and auxiliary materials

Disposal of engine oils and coolants

Learning field 7: Diagnose and repair engine management systems

2nd training year

Suggested time allocation: 100 hours

Statement of objectives:

Students carry out diagnostic and repair work in the area of engine management.

They use electronic information systems and vehicle specific documentation to identify the engine management system and conduct a system analysis. They use customer information, visual inspection and the results of their own diagnosis the basis for planning repair. They pay due regard to the effects of malfunctions on the engine subsystems, the combustion process and the composition of exhaust gases.

They deploy troubleshooting methods and troubleshooting strategies in a structured troubleshooting approach and pay due regard to manufacturer specific diagnostic concepts. They use data processing to obtain information, for error analysis, error resolution and documentation. They document, check and evaluate work carried out and inform the customer of the nature and extent of this work.

They implement the rules, norms and procedures forming the basis of the service and develop awareness of safety and quality.

They work economically and ecologically in a problem oriented way and follow health and safety and environmental protection regulations.

Contents:

Combustion procedure

Emission of harmful substances

Reducing pollutants

Block diagrams, circuit diagrams, diagrams, functional schemes

Signal, material and energy flow

Diagnostic, testing and measuring procedures

Sensors and actuators

Open loop and closed loop control

systems Subsystems engine management

Subassemblies and systems relating to mixture preparation / combustion and diesel engine

Adaptive systems

Interfaces to other systems

Fuels

Learning field 8: Conduct service and repair work on exhaust systems

2nd training year
Suggested time allocation: 40 hours

Statement of objectives:

Students prepare the vehicle for a planned service and create the stipulated test and inspection conditions. They conduct specialist interviews to specify and carry out the customer order. They use technical information systems to identify the vehicle and record manufacturer and customer data. They plan the stages of the work and carry out the service paying due regard to statutory regulations and manufacturers' instructions. They evaluate the test results and document the service carried out in accordance with regulations.

The students use systematic troubleshooting strategies, diagnose faulty components, plan the necessary stages of work and carry out repair work on exhaust and related systems. They document the work carried out and check the work before returning the vehicle.

Contents:

Vehicle specific data
Classifying pollutants
Statutory test and investigation procedures for exhaust systems
Test and inspection devices
Exhaust related systems
Exhaust fumes and the environment
Noise emission
Noise damping
Quality assurance
Service and customer satisfaction

Private motor vehicle technology specialist area

Learning field 9P: Maintain power transmission systems

3rd training year

Suggested time allocation: 60 hours

Statement of objectives:

Students carry out maintenance, diagnostic and repair work to vehicle power transmission systems.

They identify the existing power transmission systems within the vehicle and use customer information and error symptoms as the basis for planning the diagnosis and repair. They analyse the functions and interaction of the subassemblies and investigate the influence potential errors may have on the functionality of the system. They test the mechanical and hydraulic components of power transmission systems and decide if they may be reused. They calculate and measure mechanical values using tables and formulas and evaluate the readings.

They interpret the results of their own diagnosis of electronically controlled power transmission systems and use digital information technology to plan the diagnosis and repair of defective components. They pay due regard to networking with other electronic systems and analyse the exchange of data and the associated effects.

The students inform customers about causes of error and work which has been carried out. They provide advice about necessary maintenance and repair work and carry this out.

Contents:

Maintenance, test and assembly plans

Tools, company resources and auxiliary materials

Power transmission systems

Circuit diagrams

Open loop and closed loop control

Disposal of engine oils

Learning field 10P: Maintain chassis and brake systems

3rd training year

Suggested time allocation: 80 hours

Statement of objectives:

Students carry out maintenance, diagnostic and repair work to chassis and brake systems. They identify the existing chassis and brake systems within the vehicle and analyse their function and interaction with other systems.

They use diagnostic routines to narrow down and determine errors in chassis and brake systems. They investigate the influence potential errors may have on vehicle handling and on wear and tear to the chassis and brake systems. They evaluate the results of their own diagnosis of electronic chassis and brake control systems and pay due regard to functional interrelation with other systems.

They identify and document repair requirements. They use error symptoms, customer information and the results of their own diagnosis to plan testing and repairs and carry these out. They use manufacturer specific quality standards to exchange components. They pay due regard to safety and legal aspects when conducting the work and using spare parts. They calculate and measure mechanical values using tables and formulas and evaluate the readings.

They document the work results, explain the work carried out to the customer when returning the vehicle, providing information about the cause of errors.

They advise the customer on possible changes to the chassis system and the effect of these on vehicle handling.

Contents:

Maintenance, test and assembly plans

Statutory regulations

Brake systems

Chassis systems

Chassis geometry

Networking of systems

Health and safety

Liability law

Learning field 11P: Retrofit and put additional systems into service

3rd training year

Suggested time allocation: 60 hours

Statement of objectives:

Students install additional units and additional systems in accordance with the manufacturers' instructions and put these into service.

They test whether the installation or mounting of the additional equipment or accessory requested by the customer is permissible and feasible in terms of the specific vehicle. They advise customers in the selection process and provide information about the assembly costs and costs of installing or mounting of the devices or accessory. They use manufacturer specific information to draw up order lists.

The students obtain information about installation regulations and what is necessary in terms of assembly and adaptation. They stipulate the place, location and order of installation.

In order to accommodate the additional equipment, they make decisions in respect of the disassembly and relocation of existing subassemblies and components within the vehicle. They use regulations approved by the manufacturer to adapt the additional units to the existing systems within the vehicle. They put the additional units into service and deploy specific testing procedures and devices when testing functionality. They document the test results and store or dispose of parts no longer required.

They instruct customers in the operation of the additional units/systems and provide information on statutory registration regulations.

Contents:

Statutory regulations

Installation instructions

Tools, company resources and auxiliary materials

Additional systems/additional units

Procedures for putting in service

Company and customer cost accounting

Learning field 12P: Test and repair networked systems

3rd training year

Suggested time allocation: 80 hours

Statement of objectives:

Students carry out diagnostic and repair work to networked electronic systems within vehicles.

They use electronic information systems to identify vehicles and their technical equipment and obtain information as to possible malfunctions when receiving the vehicle by means of information from the customer and error symptoms.

They interpret the results of their own diagnosis and use technical information systems to gain a greater understanding of the way in which networked vehicle systems work. They pay due regard to the interlinking of control devices from various systems, analyse exchange of data and reciprocal dependencies and document their findings.

In order to plan and carry out their work, they use diagnostic devices usually to be found in the workshop, select testing devices in a system related way and pay due regard to the limitations of such devices. They further integrate their own problem solving strategies or alternatives into the diagnostic process. They document the readings, signals and error reports, analyse, evaluate and present results with regard to narrowing down cause of error and determining appropriate repair strategies and measures.

They monitor individual components and make decisions in respect of necessary repair measures. They code control devices, adapt software and test data communication lines, paying due regard to statutory and manufacturer related regulations. They make the defective components available for professional disposal or evaluation of damage on the part of the manufacturer. They check the functionality of the repaired systems and evaluate work carried out in accordance with economic and ecological aspects. When returning the vehicle, they inform the customer as to the work conducted.

Contents:

Circuit diagrams, functional and networking plans

Test instructions and conditions

Diagnostic computer

Control devices in networked systems

Conventional and BUS technology data transmission

Topology of networks and buses

System interfaces

Own diagnosis

Servo component diagnosis

Updates

Disposal of electronic devices

Guarantees and guarantee process

Learning field 13P: Diagnose and repair body work, comfort and safety systems

4th training year

Suggested time allocation: 80 hours

Statement of objectives:

Students carry out diagnostic and repair work to bodywork, comfort and safety systems, paying due regard to the order and the information supplied by the customer.

They analyse the relevant systems, identify the current equipment and system status and use manufacturer specific concepts and company information systems to test functionality.

They code the relevant systems in accordance with manufacturer instructions and customer wishes and instruct as to operation.

They pay due regard to existing systems networks and act in accordance with special safety regulations.

The students check, document and evaluate work carried out and provide the customer with information as to the nature and extent of the work.

Contents:

Assembly and maintenance circuit diagrams

Body work systems

Comfort systems

Statutory regulations

Safety systems

Safety regulations

Dealing with pyrotechnic systems

Learning field 14P: Conduct service and repair work for a statutory inspection

4th training year

Suggested time allocation: 60 hours

Statement of objectives:

Students plan service work within the context of stipulated statutory inspections and carry out this work.

In order to process the order, they identify the vehicles using manufacturer specific information systems. They ascertain the relevant vehicle conditions, document this and conduct an actual versus estimate comparison.

The students apply the rules, norms and regulations in respect of carrying out this service.

They create the test and inspection conditions stipulated for statutory inspections, monitor the functionality of the vehicle subsystems and draw up reports on the test and inspection procedures.

They analyse, document and evaluate the data thus obtained. Deficiencies identified relating to road traffic and operational safety are repaired before commencement of the test procedure with the agreement of the customer.

Subsequent to the statutory inspection, the students inform the customer as to the condition of the vehicle and in respect of the nature and extent of repair measures which may be necessary.

They carry out the service work in accordance with the principles of health and safety and environmental protection and measures relating to quality assurance.

Contents:

Vehicle specific data

Statutory regulations

Check lists

Test and inspection procedures

Inspection report

Driving and operational safety

Liability law

Service provision

Quality management via company organisation and employee qualification

Customer expectations, customer satisfaction

Customer advice

Commercial motor vehicle specialist area

Learning field 9N: Maintain power transmission systems

3rd training year

Suggested time allocation: 60 hours

Statement of objectives:

Students carry out maintenance, diagnostic and repair work to vehicle power transmission systems in commercial motor vehicles.

They identify the existing power transmission systems within the vehicle and use customer information and error symptoms as the basis for planning the diagnosis and repair. They analyse the functions and interaction of the subassemblies and investigate the influence potential errors may have on the functionality of the system. They test the mechanical and hydraulic components of power transmission systems and decide if they may be reused. They calculate and measure mechanical values using tables and formulas and evaluate the readings.

They interpret the results of their own diagnosis of electronically controlled power transmission systems and use digital information technology to plan the diagnosis and repair of defective components. They pay due regard to networking with other electronic systems and analyse the exchange of data and the associated effects.

The students inform customers about causes of error and work which has been carried out. They provide advice about necessary maintenance and repair work and carry this out.

Contents:

Maintenance, test and assembly plans

Tools, company resources and auxiliary materials

Power transmission systems

Circuit diagrams

Open loop and closed loop control

Disposal of engine oils

Dealing with heavy loads

Learning field 10N: Maintain chassis and brake systems

3rd training year

Suggested time allocation: 80 hours

Statement of objectives:

Students carry out maintenance, diagnostic and repair work to chassis and brake systems. They identify the existing chassis and brake systems within the commercial motor vehicle and analyse their function and interaction with other systems.

They use diagnostic routines to narrow down and determine errors in chassis and brake systems. They investigate the influence potential errors may have on vehicle handling and on wear and tear to the chassis and brake systems. They evaluate the results of their own diagnosis of electronic chassis and brake control systems and pay due regard to functional interrelation with other systems.

They identify and document repair requirements. They use error symptoms, customer information and the results of their own diagnosis to plan testing and repairs and carry these out. They use manufacturer specific quality standards to exchange components. They pay due regard to safety and legal aspects when conducting the work and using spare parts. They calculate and measure mechanical values using tables and formulas and evaluate the readings.

They document the work results, explain the work carried out to the customer when returning the vehicle, providing information about the cause of errors.

They advise the customer on possible changes to the chassis system and the effect of these on vehicle handling.

Contents:

Maintenance, test and assembly plans

Statutory regulations

Brake systems

Chassis systems

Chassis geometry

Networking of systems

Health and safety

Liability law

Learning field 11N: Retrofit and put additional systems into service

3rd training year

Suggested time allocation: 60 hours

Statement of objectives:

Students install additional units and additional systems in accordance with the manufacturers' instructions and put these into service.

They test whether the installation or mounting of the additional equipment or accessory requested by the customer is permissible and feasible in terms of the specific vehicle. They advise customers in the selection process and provide information about the assembly costs and costs of installing or mounting of the devices or accessory. They use manufacturer specific information to draw up order lists.

The students obtain information about installation regulations and what is necessary in terms of assembly and adaptation. They stipulate the place, location and order of installation.

In order to accommodate the additional equipment, they make decisions in respect of the disassembly and relocation of existing subassemblies and components within the vehicle. They use regulations approved by the manufacturer to adapt the additional units to the existing systems within the vehicle. When carrying out the fitting or re-fitting work, they use the necessary thermal separation and joining procedures. They use regulations approved by the manufacturer to adapt the additional units to the existing systems within the vehicle. They put the additional units into service and deploy specific testing procedures and devices when testing functionality. They document the test results and store or dispose of parts no longer required.

They instruct customers in the operation of the additional units/systems and provide information on safety and statutory registration regulations.

Contents:

Manufacturer technical information

Statutory regulations

Installation instructions

Tools, company resources and auxiliary materials

Additional systems/additional units

Thermal separation and joining procedures

Dealing with hoists

Procedures for putting in service

Company and customer cost accounting

Learning field 12N: Test and repair networked systems

3rd training year

Suggested time allocation: 80 hours

Statement of objectives:

Students carry out diagnostic and repair work to networked electronic systems within commercial motor vehicles.

They use electronic information systems to identify vehicles and their technical equipment and obtain information as to possible malfunctions when receiving the vehicle by means of information from the customer and error symptoms.

They interpret the results of their own diagnosis and use technical documentation to gain a greater understanding of the way in which networked vehicle systems work. They pay due regard to the interlinking of control devices from various systems, analyse exchange of data and reciprocal dependencies and document their findings.

In order to plan and carry out their work, they use diagnostic devices usually to be found in the workshop, select testing devices in a system related way and pay due regard to the limitations of such devices. They deploy additional problem solving strategies where necessary.

They document the readings, signals and error reports, analyse, evaluate and present results with regard to narrowing down cause of error and stipulating appropriate repair strategies.

They monitor individual components and make decisions in respect of necessary repair measures. They code control devices, adapt software and test data communication lines, paying due regard to statutory and manufacturer related regulations. They make the defective components available for professional disposal or evaluation of damage on the part of the manufacturer. They check the functionality of the repaired systems. When returning the vehicle, they inform the customer as to the work conducted.

Contents:

Circuit diagrams, functional and networking plans

Test instructions and conditions

Diagnostic computer

Control devices in networked systems

Conventional and BUS technology data transmission

Topology of networks and buses

System interfaces

Own diagnosis

Servo component diagnosis

Updates

Disposal of electronic devices

Guarantees and guarantee process

Learning field 13N: Test and repair electro pneumatic and electro hydraulic systems

4th training year

Suggested time allocation: 80 hours

Statement of objectives:

Students deploy diagnostic routines to narrow down and determine errors in electro pneumatic and electro hydraulic systems in commercial motor vehicles. They relate the interfaces of the individual systems and their data transmission devices to other vehicle systems when checking systems functionality and making error diagnoses.

They identify and document repair requirements. They use error symptoms, customer information and the diagnostic results to plan repairs and conduct these repairs. They pay due regard to manufacturer specific quality standards in respect of exchange of parts which have been subject to wear and tear or which are defective. They carry out work and use spare parts in accordance with safety, statutory and manufacturer specific aspects.

They document the work results and explain work carried out to the customer when returning the vehicle.

Contents:

Service and maintenance plans

Driver information systems

Statutory regulations

Electro hydraulic and electro pneumatic circuit diagrams

Electro hydraulic and electro pneumatic systems

Documentation relating to operational safety

Liability law

Health and safety

Learning field 14N: Conduct service and repair work for a statutory inspection

4th training year

Suggested time allocation: 60 hours

Statement of objectives:

Students carry out service work and testing and repair work within the context of stipulated statutory inspections.

In order to process the order, they identify the commercial motor vehicles using manufacturer specific information systems, obtain the vehicle data necessary for the inspection and plan the stages of the work.

They use diagnostic systems specific to the commercial motor vehicle to identify the statutorily required testing and measuring values and record the results in accordance with regulations.

They carry out technical calculations to obtain greater understanding of the systems. Deficiencies identified relating to road traffic and operational safety are repaired before commencement of the test procedure with the agreement of the customer. Subsequent to the statutory inspection, the students inform the customer as to the condition of the vehicle and in respect of the nature and extent of repair measures which may be necessary.

They carry out the service work in accordance with the principles of health and safety and environmental protection and measures relating to quality assurance.

Contents:

Vehicle specific data

Statutory regulations

Check lists

Test and inspection procedures

Inspection report

Driving and operational safety

Liability law

Service provision

Quality management via company organisation and employee qualification

Customer expectations, customer satisfaction

Customer advice

Vehicle communication technology specialist area

Learning field 9F: Test and repair power transmission systems

3rd training year

Suggested time allocation: 40 hours

Statement of objectives:

Students carry out diagnostic and repair work to vehicle power transmission systems.

They identify the existing power transmission systems within the vehicle and analyse the function and interaction of the subassemblies. They use customer information, error symptoms, results of their own diagnoses and manufacturer specific documentation to plan troubleshooting and repair of electronically controlled vehicle power transmission systems and carry this work out. They pay due regard to networking with other electronic systems and analyse the exchange of data and the associated effects.

The students inform customers about causes of error and work which has been carried out

Contents:

Circuit diagrams

Power transmission systems

Open loop and closed loop control

Tools, company resources and auxiliary materials

Disposal of engine oils

Learning field 10F: Test and repair chassis and brake systems

3rd training year
Suggested time allocation: 60 hours

Statement of objectives:

Students carry out diagnostic, adjustment and repair work to chassis and brake systems.

They use customer information in respect of error symptoms and identify the existing chassis and brake systems within the vehicle.

They use evaluations of their own diagnoses to narrow down and determine errors and use diagnostic routines. They pay due regard to functional interaction with other systems. They identify repair requirements and plan the implementation of repairs. They use manufacturer specific quality standards in respect of exchanging components. They pay due regard to safety, legal and manufacturer specific aspects when conducting the work and using spare parts.

They document the work results, explain the work carried out to the customer when returning the vehicle, providing information about the cause of errors.

Contents:

Inspection plans

Statutory regulations

Brake systems

Chassis systems

Networking of systems

Health and safety

Liability law

Learning field 11F: Retrofit and put additional systems into service

3rd training year

Suggested time allocation: 80 hours

Statement of objectives:

Students install additional units and additional systems in accordance with the manufacturers' instructions and put these into service.

They test whether the installation or mounting of the additional equipment or accessory requested by the customer is permissible and feasible in terms of the specific vehicle. They advise customers in the selection process and provide information about the assembly costs and costs of installing or mounting of the devices or accessory. They use manufacturer specific information to draw up order lists.

The students obtain information about installation regulations and what is necessary in terms of assembly and adaptation. They stipulate the place, location and order of installation.

In order to accommodate the additional equipment, they make decisions in respect of the disassembly and relocation of existing subassemblies and components within the vehicle. They use regulations approved by the manufacturer to adapt the additional units to the existing systems within the vehicle and update the software of control devices. They put the additional units into service and deploy specific testing procedures and devices when testing functionality. They document the test results and store or dispose of parts no longer required. They instruct customers in the operation of the additional systems.

Contents:

Statutory regulations

Installation instructions

Circuit diagrams

Tools, company resources and auxiliary materials

Additional systems/additional units

Procedures for putting in service

Company and customer cost accounting

Learning field 12F: Test and repair networked systems

3rd training year

Suggested time allocation: 100 hours

Statement of objectives:

Students diagnose errors within data transmission systems in the vehicle and carry out repairs. They use customer information, functional checks and information systems and deploy appropriate diagnostic strategies. They use vehicle specific documentation to identify vehicles and their equipment. They obtain for themselves the necessary information to understand the system. They analyse, describe and document functional inter-relationships.

They use circuit, connection, functional and network plans to develop troubleshooting strategies, which they present in concrete terms in the form of work plans. In respect of troubleshooting, they deploy diagnostic devices, select testing devices in a system related way and document the signals, readings, error reports and messages. They analyse and evaluate these for the purposes of stipulating appropriate repair measures. They use digital and print media to present their results.

They exchange defective components, identify and update software status, code control devices and repair data communication lines in accordance with manufacturers' instructions. They make the defective components available for professional disposal or evaluation of damage on the part of the manufacturer. They check the functionality of the repaired systems and evaluate the work carried out in accordance with economic and ecological aspects.

Contents:

Circuit diagrams, functional and networking plans

Expert systems

Diagnostic computer

System analysis

System limitations

System interfaces

Topology of networked systems

Data communication lines

Transmission of information

Data protocols

Updates

Electromagnetic compatibility

Guarantees and guarantee process

Disposal of electronic devices

Learning field 13F: Test and repair comfort and safety systems

4th training year

Suggested time allocation: 60 hours

Statement of objectives:

Students diagnose errors in comfort and safety systems and repair these.

They use electronic information systems and vehicle specific documentation to identify vehicles and their equipment. They use customer information, visual inspection, error symptoms and the results of their own diagnoses to formulate the job at hand in respect of troubleshooting and repair work.

They use workshop information systems to obtain information about the system, draw up work plans and stipulate diagnostic strategies. They document their work planning and diagnostic strategies and present these.

The students deploy electronic measuring, testing and diagnostic devices for the purposes of localising malfunctions and failure of system elements, paying due regard to health and safety regulations. They draw up reports of measuring and testing results and evaluate these for the purpose of determining appropriate repair measures.

They plan repair work and carry this out paying due regard to the manufacturers' instructions. They take effects on other systems into account.

They document their work results and evaluate these in relation to health and safety and quality assurance.

Contents:

Statutory regulations

Safety regulations

Circuit diagrams

Special tools

Networked safety systems

Own diagnosis

Dealing with pyrotechnic systems

Learning field 14F: Test, repair and retrofit wireless signal transmission systems

4th training year

Suggested time allocation: 80 hours

Statement of objectives:

The students diagnose malfunctions in wireless signal transmission systems and repair these. For the purposes of narrowing down the error, they use information received from customers in order to identify side effects relating to error symptoms. They deploy system and situation related strategies in the troubleshooting process.

They select technical documentation and testing devices, deploy these and draw up test reports. They use manufacturer specific documentation to plan repairs and carry these out.

They identify the software status of control devices and adapt this.

The students plan the necessary stages of work for retrofitting systems and their peripheral devices. They pay due regard to manufacturers' instructions in respect of selection of place of installation, take potential interaction with other vehicle systems into account and act in accordance with statutory regulations. On completion of assembly and adaptation, they monitor the functional and operational safety of the retrofitted systems and record and evaluate the changes made to the vehicle.

They document, present and evaluate their work results.

When returning the vehicle, they inform the customer of the work carried out and provide information in respect of safety regulations and regulations relating to use.

Contents:

Installation regulations

System software

Multimedia

Receiving and communication systems

Aerial systems

Electromagnetic compatibility

Statutory regulations relating to use

Motorcycle technology specialist area

Learning field 9M: Maintain power transmission systems

3rd training year

Suggested time allocation: 60 hours

Statement of objectives:

Students carry out maintenance, diagnostic and repair work to vehicle power transmission systems in motorcycles.

They identify the existing power transmission systems within the vehicle and use customer information and error symptoms as the basis for planning the diagnosis and repair. They pay due regard to necessary maintenance work.

They analyse the functions and interaction of the subassemblies and investigate the influence potential errors may have on the functionality of the system. They test the mechanical and hydraulic components of power transmission systems and decide if they may be reused. They calculate and measure mechanical values using tables and formulas and evaluate the readings.

They pay due regard to interaction with further systems.

The students document their work, inform customers about causes of error and work which has been carried out, provide advice about necessary maintenance and repair work and carry this out.

Contents:

Maintenance, test and assembly plans

Tools, company resources and auxiliary materials

Power transmission systems

Circuit diagrams

Open loop and closed loop control

Disposal of engine oils

Learning field 10M: Maintain chassis and brake systems

3rd training year

Suggested time allocation: 80 hours

Statement of objectives:

Students carry out maintenance, diagnostic and repair work to chassis and brake systems. They identify the existing chassis and brake systems within the motor cycle and analyse their function and interaction with other systems.

They use diagnostic routines to narrow down and determine errors in chassis and brake systems. They investigate the influence potential errors may have on vehicle handling and on wear and tear to the chassis and brake systems. They evaluate the results of their own diagnosis of electronic chassis and brake control systems and pay due regard to functional interrelation with other systems.

They identify and document repair requirements. They use error symptoms, customer information and the results of their own diagnosis to plan testing and repairs and carry these out. They use manufacturer specific quality standards to exchange components. They pay due regard to safety and legal aspects when conducting the work and using spare parts. They calculate and measure mechanical values using tables and formulas and evaluate the readings.

They document the work results, explain the work carried out to the customer when returning the vehicle, providing information about the cause of errors.

They advise the customer on possible changes to the chassis system and the effect of these on vehicle handling.

Contents:

Vehicle registration regulations

Statutory regulations

Wheels, tyres

Chassis systems

Chassis geometry

Brake systems

Maintenance, test and assembly plans

Liability law

Health and safety

Advising customers

Learning field 11M: Retrofit and put additional systems into service

3rd training year

Suggested time allocation: 60 hours

Statement of objectives:

Students install additional units and additional systems in accordance with the manufacturers' instructions and put these into service.

They test whether the installation or mounting of the additional equipment or accessory requested by the customer is permissible and feasible in terms of the specific vehicle. They advise customers in the selection process and provide information about the assembly costs and costs of installing or mounting of the devices or accessory. They use manufacturer specific information to draw up order lists.

The students obtain information about installation regulations and what is necessary in terms of assembly and adaptation. They stipulate the place, location and order of installation.

In order to accommodate the additional equipment, they make decisions in respect of the disassembly and relocation of existing subassemblies and components within the motorcycle. They use regulations approved by the manufacturer to adapt the additional units to the existing systems within the motorcycle. They put the additional units into service and deploy specific testing procedures and devices when testing functionality. They document the test results and store or dispose of parts no longer required.

They instruct customers in the operation of the additional units/systems and provide information on statutory registration regulations.

Contents:

Statutory regulations

Installation instructions

Tools, company resources and auxiliary materials

Additional systems/additional units

Procedures for putting in service

Company and customer cost accounting

Learning field 12M: Test and repair electronic systems

3rd training year

Suggested time allocation: 80 hours

Statement of objectives:

The students diagnose errors in electronic systems on the motorcycle and carry out repairs.

They use customer information, functional checks and information systems and deploy diagnostic strategies.

They use circuit diagrams and connection and functional plans to develop troubleshooting strategies, deploy testing, measuring and diagnostic systems and produce reports on signals, readings and the results of their own diagnosis. They analyse and evaluate the reports, using them to narrow down the error and determine appropriate repair measures. They identify and update and adapt software status and code control devices. They use manufacturers' instructions to repair the systems, including the data lines, and check functionality.

When returning the vehicle, they explain the work carried out to the customer.

Contents:

Circuit plans, functional plans

Expert systems

Conventional and BUS technology data transmission

System interfaces

Servo component diagnosis

Own diagnosis

Updates

Electromagnetic compatibility

Disposal of electronic devices

Guarantees and guarantee process

Liability law

Learning field 13M: Test and repair systems relevant to safe driving of vehicle

4th training year

Suggested time allocation: 100 hours

Statement of objectives:

Students diagnose motorcycles in terms of aspects relating to safe driving and vehicle registration regulations and repair them.

They identify the status of equipment and system status and plan repair work in accordance with customer information paying due regard to technical, manufacturer specific and statutory regulations. They use diagnostic concepts and information systems to analyse and eliminate errors. They analyse and describe the functions and interaction of the subsystems and their effect on the system as a whole.

When carrying out repair and adjustment work, they make use of manufacturer specific tools, machines and devices and company resources and auxiliary materials.

Components are tested to see if they may be reused. They document, check and evaluate the test and repair work.

They prepare the vehicle for stipulated statutory inspections and inform customers of vehicle registration regulations.

When returning the vehicle, they explain work carried out to the customer and provide information as to conspicuous features of the vehicle.

Contents:

Manufacturer clearances

Systems relevant to safe driving of vehicle

Driving dynamics

Driving stability

Maintenance regulations

Disassembly and assembly regulations

Economic and customer oriented calculations

Learning field 14M: Advise customers in the selection of accessories

4th training year

Suggested time allocation: 40 hours

Statement of objectives:

Students advise customers in the selection of motorcycle accessories, clothing and equipment and the care of these.

They examine customer wishes in terms of technical, statutory and economic feasibility and provide the customer with information in respect of the purpose and safety aspects of clothing, equipment and accessories. They provide information on the possibility of re-fitting and retrofitting accessories and additional parts and on the associated effects of this on the handling of the vehicle. They calculate the cost of retrofitting and fitting and give information about original or generic equipment products.

The students plan re-fitting and retrofitting and formulate the order.

Contents:

Advice and sales

Fashion and technical trends

Clothing and equipment catalogues

Safety equipment

Accessories and retro-fitting catalogues

Statutory regulations and clearances Retro-fit parts and subassemblies

Maintenance and care

Guarantee