*Title of the project: „Recognition of vocational qualifications for the transfer needs on European job market”*

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# THE MODEL OF RECOGNITION OF VOCATIONAL QUALIFICATIONS IN THE PROFESSIONS OF AN ELECTRICIAN AND A CAR MECHANIC FOR THE PURPOSES OF THEIR TRANSFER ON THE EUROPEAN JOB MARKET IN GERMANY, POLAND AND PORTUGAL

## - final version

## Table of contents

# 1. Introduction

The aim of the development of the Model is to provide easier recognition of professional qualifications which are expected on job markets in Poland, Germany and Portugal for the professions of an electrician and a car mechanic.

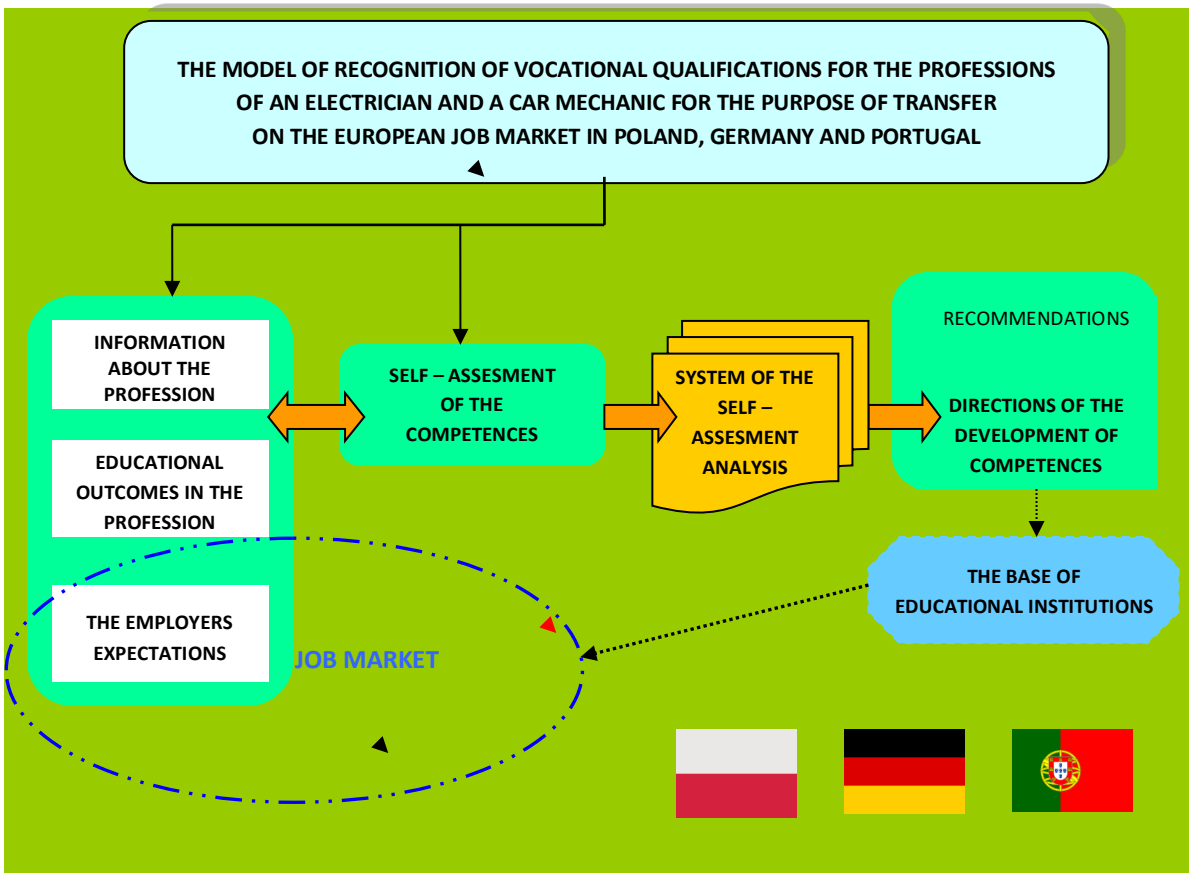
Target groups of the Model are:

- graduates of formal education in the profession/ professions,
- employers,
- representatives of educational institutions,
- representatives of labor market.

The content of the elements of the Model were developed for each profession separately.

## 2. Content of the Model

**Fig 1. The Model of recognition of vocational qualifications for the professions of an electrician and a car mechanic for the purpose of transfer on the European job market in Poland, Germany and Portugal represented graphically**




*Source: Partners' own elaboration*

## 2.1 Content of the Model fort he profession of a car mechanic

**Name of the profession:** a car mechanic

**Code of the profession:** 723103

**Qualification level:** M. 18

**Description of the profession:**

A car mechanic is a person who is engaged in operation, maintenance and repair of motor vehicles used for road transport. These vehicles include: passenger cars, buses, lorries, motorcycles, agricultural tractors together with non- motorized vehicles which are trailers and semi- trailers.

Learning objectives for the profession of a car mechanic

A car mechanic should be prepared to perform the following professional tasks:

1. Use motor vehicles;
2. Diagnose motor vehicles;
3. Repair motor vehicles.

Synthetic description of the profession of a car mechanic

A car mechanic performs maintenance and repairs engines, assemblies and mechanical systems of motor vehicles, lorries, buses, motorcycles and other motor vehicles using diagnostic tools as well as locksmith and assembling tools.

Professional tasks of a car mechanic

1. Acceptance of vehicles to repair and preparation of protocols.
2. Checking the operation of the vehicle and its components using the diagnostic equipment.
3. Setting and removing defects of vehicle systems.
4. Changing working fluids in a vehicle.
5. Checking the wheel positioning of a vehicle.
6. Controlling and setting the lights of the vehicle.

7. Performing works of disassembly, repairing and adjustment of assemblies for the components of the vehicle, including the engine, gearbox, clutch, brake, steering, suspension and more.
8. Washing and cleaning parts and components.
9. Coping and matching non-standard parts.
10. Checking the quality of the service and repairing work by means of driving and using diagnostic equipment.
11. Organizing, operating and maintaining the workplace with the principles of occupational health and safety, fire protection and environmental protection.
12. Execution of cost and repair settlement.

**Documents confirming formal qualification in the profession:**

The person who has passed examination confirming vocational qualification/ qualifications in the profession receives a certificate or diploma confirming vocational qualifications.

The certificate is received by a person who has passed the vocational examination in one qualification.

*Regulation of the Minister of National Education dated February 24, 2012 amending the Regulation on the conditions and manner of assessing, classifying and promoting students and course participants as well as conducting tests and examinations in public schools (Journal of Laws of 2012, item 262)*

The diploma is received by a person who has passed the vocational examination in all qualifications necessary for the profession and has a level of education required for the occupation. For a car mechanic there is only one qualification which was isolated and it can be obtained after a 3- year vocational school or on qualifying vocational courses.

**Table 1. Qualifications in the profession of a car mechanic**

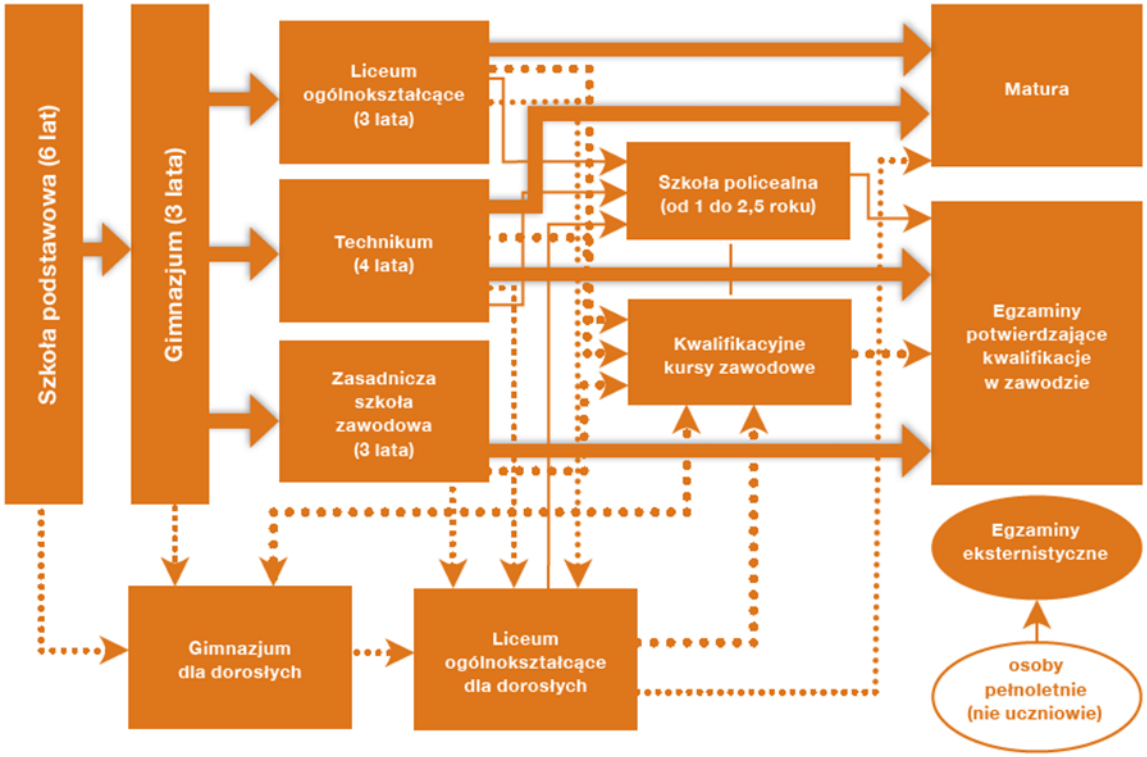
| Number of qualification (sequence) in the profession | Qualification symbol from the curriculum | Name of the qualification |
|---|---|---|
| K1 | M. 18. | Diagnosis and repair of subassemblies and assemblies of automotive vehicles |

*Source: own study on the basis of the Regulation of the Minister of National Education dated December 23, 2011 on the classification of professions for vocational education (Journal of Laws of 2012, item 7, later amended)*

The certificate confirming professional qualifications

The certificate which confirms professional qualifications is received by a person who has passed the vocational examination in the profession (the person has received at least 50% of the points in the written part and at least 75% of the points in practical part of the exam).

**Fig. 2 Structure of Polish system of vocational education**




*Source: Vocational and continuing training handbook, National Center to Support Vocational and Lifelong Education, Warsaw 2013, p. 8*

**Database of qualifications and educational outcomes for the profession obtained in the formal system of vocational education:**

Qualifications in the profession of a car mechanic may be obtained by:

- Passing professional examination in M. 18. qualification Diagnosis and repair of subassemblies and assemblies of automotive vehicles conducted by the Regional Examination Board,
- Graduating vocational school.

The documents that confirm obtaining the qualifications in the profession of a car mechanic are vocational school leaving certificate and a diploma confirming professional qualifications for a car mechanic.

The above documents are issued by vocational school to the graduates of a car mechanic course of education.

**Learning outcomes common to all professions**

(BHP) Health and Safety Occupation Rules

Pupil:

1) distinguishes concepts related with health and safety occupation rules , fire protection, environmental protection and ergonomics;
2) distinguishes tasks and powers of institutions and services operating in the field of labor protection and environmental protection in Poland;
3) defines the rights and responsibilities of the employee and the employer's in area of safety and health working conditions;
4) predicts threat to human health and life, property and the environment associated with the performance of professional tasks;
5) identifies the threats associated with the presents of harmful factors in the work place;
6) determines the effects of harmful factors on the human body;
7) organizes the workplace according to applicable ergonomics rules , health and safety regulations , fire protection and environmental protection;
8) exerts the individual and collective protection issues during performing professional tasks;

9) fallows the principles of safety and health at work and apply the rules of law related with fire and environmental protection;
10) provides first aid to the injured in accidents at work , as well as in emergency health and life threats.

(PDG). Making and business activities

Pupil:

1) uses concepts from the area of a functioning market economy;
2) exerts the labor law , law regulations related with using protection of personal data in the area of tax law and copyright law;
3) exerts the law relating with running a business ;
4) distinguishes enterprises and institutions occurring in the industry and the connections between them;
5) analyzes the activities carried out by companies in the industry;
6) initiates common ventures with different companies in the same industry;
7) prepares the documentation necessary for starting and running a business;
8) conducts correspondence related with business conducting;
9) operates office devices and uses computer programs to support economic activity;
10) plans and takes the marketing activities of the business;
11) optimizes the costs and revenues of the business.

(JOZ). Foreign language professionally oriented

Pupil:

1) uses the resource of language (vocabulary, grammar, spelling and phonetics), enabling implementation of professional tasks;
2) interprets statements regarding the performance of typical professional activities slowly and clearly articulated in standard dialect;
3) analyzes and interprets short texts written on performing common professional activities;
4) formulates a brief and understandable expression and written texts for communicating in the workplace;
5) uses foreign language sources of information.

(KPS). Personal and social competence

Pupil:

1) respects the principles of culture and ethics;
2) is creative and consistent in the implementation of tasks;
3) provides for the consequences of actions taken;
4) is opened to change;
5) is able to cope with stress;
6) updates the knowledge and improves professional skills;
7) respects professional confidentiality;
8) can be held responsible for their actions;
9) is able to negotiate the terms of agreements;
10) works as a part of team.

**The effects of training in the profession of car mechanic** *(developed on the basis of the Curriculum for the profession of car mechanic, 723,103 of the structure of this type of school: basic vocational school, type of program: linear, KOWEZiU, Warsaw 2012)*

**I. Common aims in teaching process between occupations which are the foundation of education in a profession or group of professions**

PKZ (Ea) Skills which are foundation for education in the professions of: telecommunications equipment installer, mechatronics fitter, electronics fitter, electrical engineer of motor vehicles, electrical engineer, electrician, telecommunications technician, ICT technician, electronics technician, avionics technician, mechatronics technician, electrical technician , electronics and medical informatics technician, car mechanic, automotive technician, automatic rail traffic control technician, technician for automatic control of rail traffic, electrical power engineering technician of rail transport, motorcycle mechanic, refrigeration and air conditioning technician, technician of lifting equipment

Pupil:

1) uses the basic issues in the field of electrical engineering and electronics;
2) describes the phenomena associated with DC and AC;
3) interprets the physical quantities associated with AC;
4) sets characteristics of sine waves of the type $y = A \sin(\omega t + \varphi)$;

5) applies the law to the electrical calculation and estimation of the size of electrical circuits
6) and electronic circuits;
7) recognizes parts as well as electrical and electronics systems;
8) draws schematic and installation diagrams of electrical and electronic systems;
9) distinguishes parameters of components of electrical and electronic systems;
10) uses a technical drawing of the mounting and installation work;
11) selects tools and measuring instruments and performs work in the field of the mechanical components and electronic equipment;
12) performs work in the field of manual processing;
13) describes the functions of components and electrical and electronic systems on the basis of technical documentation;
14) takes the connection components and electrical and electronic based on circuit diagrams and assembly;
15) 14)selects the methods and instruments for measuring parameters of electronic circuits and electronic equipment;
16) takes measurements of electrical components, electrical and electronic systems;
17) presents the results of measurements and calculations in the form of tables and graphs;
18) uses the technical documentation, catalogs and manuals, and adheres to the standards in this regard;
19) uses computer programs supporting the execution of tasks.

PKZ (Ma) skills which are foundation for vocational education: mechanic-operator of vehicles and agricultural machinery, watchmaker, optician mechanic, mechanic precision mechanic, industrial automation and precision equipment mechanic, mechanic-fitter of machinery and equipment, car mechanic, operator of locksmith machines and tools , blacksmith, fitter hulls, car tinsmith, tinsmith, painter, techniques, optician, mechanic engineering, mechanic ship, techniques shipbuilding techniques vehicles, techniques of agricultural mechanization, mechanic, fitter mechatronics, electrical engineer vehicle technician mechatronics technician of road transport, techniques, energetics, modeler foundry techniques , drilling technician underground mining techniques borehole mining, techniques, surface mining, techniques, processing

of solid minerals, techniques caster, techniques metallurgist operator foundry machines and equipment, the operator of machines and equipment metallurgical operator of machines and equipment for processing plastic, the operator of machines and equipment for plastics processing, goldsmith-jeweler, motorcycle mechanic, refrigeration and air conditioning technician, technician of lifting equipment

Pupil:

1) respects the principles of drawing a technical drawing machine;
2) draws sketches of machine parts;
3) prepares technical drawings using computer technology;
4) distinguishes parts of machinery and equipment;
5) distinguishes types of connections;
6) respects the principles of tolerance and fits;
7) distinguishes construction materials and supplies;
8) distinguishes means of internal transport;
9) selects the modes of transport and storage of materials;
10) recognizes the types of corrosion and determine the methods of protection against corrosion;
11) distinguishes the techniques and methods of producing machine parts and equipment;
12) distinguishes machines, devices and tools for hand and machine;
13) distinguishes measuring instruments used during manual processing and machine;
14) takes measurements in a workshop;
15) distinguishes the methods of quality control of performed work;
16) defines the structure and respects the principles of operation of machinery and equipment;
17) uses the technical documentation of machines and equipment and complies with the standards
18) for technical drawing, machine parts, construction materials and consumables;
19) uses computer programs supporting the execution of tasks.

PKZ (M.g) Skills constituting the foundation of education in the professions: car mechanic, automotive technician, automotive electrical engineer, mechanic-operator vehicles and agricultural machinery, agricultural mechanization techniques

Pupil:

1) performs control and maintenance operations of vehicles;
2) applies the provisions of the law on road traffic and vehicle drivers;
3) respects the principles of driving;
4) performs activities related to the conduct and operation of the motor vehicle to the extent
5) necessary to obtain a driving license category B.

## II. Learning outcomes relevant to qualifications in car mechanic profession

### M.18. Diagnosis and repair of subassemblies and assemblies of automotive vehicles

1. Diagnose components and assemblies of motor vehicles

Pupil:

1) adopts a motor vehicle diagnostic and prepares documentation of acceptance;
2) prepares a motor vehicle diagnostics;
3) characterizes the construction of motor vehicles and explains the principles of components and assembly of these vehicles;
4) defines the components and assemblies of a motor vehicle;
5) uses the tools and measuring instruments to perform diagnostics of vehicles;
6) selects the method and the extent of diagnostic components and assemblies of motor vehicles;
7) uses computer programs for the diagnosis of motor vehicles;
8) takes measurements and diagnostic tests vehicles and interpret their results;
9) evaluates the technical condition of vehicles.

2. Repair teams and components of motor vehicles

Pupil:

1) locates the damaged assemblies and components of vehicles on the basis of measurements and results of diagnostic tests;
2) assesses the cost of repairs of motor vehicles;
3) selects the method and determines the scope of the repairing a motor vehicle;
4) takes disassembly of assemblies and sub-assemblies of vehicles;
5) carries out the verification of assemblies and sub-assemblies of vehicles;
6) selects the assemblies or subassemblies of motor vehicles or their substitutes to replace;
7) replaces defective assemblies and components of vehicles using the equipment and workshop
8) tools;
9) performs assembly of subassemblies and assemblies of motor vehicles;
10) performs maintenance assemblies and sub-assemblies of vehicles;
11) explains the rules for the operation of motor vehicles and selects consumables;
12) carry out trials after repairing of motor vehicles;
13) assess the quality of repairing and determines its cost.

**Professional competencies expected by employers in Germany and Portugal and identified through research**

**Table 2. Professional competencies in the profession of a car mechanic**

| Qualifications in profession of a car mechanic in Poland | Professional competencies | Portugal | Germany |
|---|---|---|---|
| Diagnosis and repair of subassemblies and assemblies of automotive vehicles | Fault diagnosis of the vehicle | 4,0 | 4,3 |
| | Repairing parts and assemblies of motor vehicle | 4,0 | 4,3 |

*Source: own study*

**Table 3. Fault diagnosis of the vehicle**

| Skills | Portugal | Germany |
|---|---|---|
| Obey the safety regulations, fire regulations, environmental protection and ergonomics within diagnosis of components of motor vehicles | 2,5 | 4,4 |
| Prepare orders of service concerning diagnosis of a motor vehicle | 3,3 | 4,2 |
| Classify motor vehicles | 3,7 | 4,3 |
| Characterize the construction of motor vehicles and explain the principles of components and assemblies of such vehicles | 3,5 | 4,1 |
| Obey the standards for technical drawing, machine parts, construction materials and supplies | 2,7 | 4,2 |
| Identify electrical and electronic elements and systems | 3,2 | 4,3 |
| Use tools and measuring instruments to perform motor vehicle diagnostics | 3,7 | 4,5 |
| Choose the method and define the scope of diagnostic components and combinations of motor vehicles | 3,6 | 4,1 |
| Perform diagnostics of motor vehicles using measuring devices (engines, chassis, bodywork, tires) | 3,5 | 4,5 |
| Interpret the results of diagnostic tests of motor vehicles | 3,4 | 4,4 |
| Use computer programs used for the diagnosis of motor vehicles | 3,1 | 4,5 |
| Follow traffic rules | 2,4 | 4,3 |
| Establishing and running his/her own business | 2,5 | 4,3 |

*Source: own study*

**Table 4. Repairing components and assemblies of motor vehicles**

| Skills | Portugal | Germany |
|---|---|---|
| Obey the safety regulations, fire regulations, environmental protection and ergonomics within the repair of parts and assemblies of motor vehicles | 3,4 | 4,4 |
| Use the technical documentation of machines and equipment | 2,5 | 4,3 |
| Use the technical drawing of the mounting and installation work | 3,1 | 4,3 |
| Locate damaged assemblies and subassemblies of cars | 3,6 | 4,5 |
| Choose the methods of repairing motor vehicles | 3,7 | 4,4 |
| Disassemble the assemblies and components of motor vehicles | 3,2 | 4,4 |
| Select assemblies, subassemblies or their substitutes which are necessary to be replaced | 3,8 | 4,5 |
| Replace damaged assemblies and components of vehicles using the equipment and workshop tools | 3,5 | 4,3 |
| Choose supplies | 2,4 | 3,5 |
| Control the quality of vehicle repair | 3,9 | 4,0 |
| Perform periodic maintenance of vehicles | 3,6 | 4,3 |
| Assess the quality of repair and determine its cost | 3,1 | 3,8 |
| Prepare estimated cost of repair | 3,8 | 3,5 |

*Source: own study*

**Expected social and key competences identified through research**

**Table 5. Personal and social competences**

| Personal and social competences | Portugal | Germany |
|---|---|---|
| He/she feels responsible for the performed tasks connected with car diagnosis and repair | 3,4 | 3,9 |
| He/she is creative and consistent in the implementation of tasks | 3,3 | 3,9 |
| He/she respects professional confidentiality | 3,9 | 4,2 |
| He/she can evaluate his/her actions and the actions of his/her team and takes responsibility for the consequences (within the car diagnosis and repair) | 3,9 | 3,9 |
| He/she works well both on his/her own and within a group | 3,6 | 4,1 |
| He/she recognizes his/her own learning needs, updates his/her knowledge and improves his/her professional skills | 3,7 | 4,2 |
| He/she deals well with stress | 2,7 | 4,0 |

*Source: own study*

**Table 6. Key competences**

| Key competences | Portugal | Germany |
|---|---|---|
| Problem solving | 3,6 | 3,9 |
| Teamwork | 3,8 | 4,1 |
| Communication in the mother tongue and in foreign languages | 3,4 | 3,7 |
| Planning and organizing work | 3,5 | 3,9 |
| Motor efficiency | 3,6 | 3,9 |
| The ability of comprehensive reading and writing | 2,8 | 3,5 |
| The ability to search, filter and critical analysis of information | 3,0 | 3,8 |
| The ability to use modern information and communication technologies | 3,2 | 4,1 |

*Source: own study*

**Typical workplaces in the profession in Germany**

Small to middle size garages and production sites are common locations when working as a car mechanic (passenger cars). Businesses hiring professionals in this field are usually garages, car showrooms, spare parts stores or wholesale distributors. Working for roadside assistances, in garages owned by hauliers or inspection bodies is also possible. In addition car mechanics can work for automobile manufacturers and supply industries as well as for local public transport companies or logistics enterprises with large fleets.

**Typical workplaces in the profession in Portugal**

Imperio Centro Auto, is a company placed in Braga. The company employs 25 people. They specialize in three different services:

1) Repair of all types of vehicles,
2) Tyres (exchange and repair),
3) Sales departments of used cars.

H.M.Motor is a company dedicated to the commercialization of used vehicles as new vehicles. It started its activity in 2000 gaining an extensive experience in the automotive sector by its management and employees, and successively extended its operation with new customers and friends. H.M.Motors sells the best brands with all necessary guarantees, thus providing quality services and satisfaction to their customers at the time of sale, delivery and after the sales service. They employ around 20 people.

## 2.2 Content oft he Model in the profession of an electrician

**Name of the profession:** an electrician

**Code of the profession:** 741103

**Qualifications level:** E. 7. and E. 8.

**Description of the profession:**

An electrician is a person who works on installation, designs installations and electrical networks. An electrician can deal with the repairing and maintaining of household appliances and electro-mechanics in cars.

Learning objectives in the profession of an electrician

The education curriculum in the profession of an electrician includes the following learning objectives:

1) installing and commissioning of machinery and electrical equipment on the basis of technical documentation;
2) performing and commissioning of electrical installations on the basis of documentation;
3) evaluation of the technical condition of machines, appliances and electrical installations after assembly on the basis of measurements;
4) installing control systems, regulation of machine guarding and electrical equipment on the basis of technical documentation;
5) installing and checking the operation of fire protection on the basis of technical documentation.

Electrician's job involves the great responsibility for the safety of people who are using energy grid or devices supervised by him . Therefore, an electrician should be able to, both, concentrate and divide his attention. Technical skills (especially mathematical) and creative thinking are also very significant.

Synthetic description of a profession of an electrician

An electrician assembles and installs components as well as electrical equipment; diagnoses the condition of the electrical installations, appliances and electrical machines, locates damages and repairs them, selects securities and performs work in power stations and electrical networks in mining, metallurgical, waters transport and railway station industry

plants, in utilities, in companies manufacturing and exploiting machinery and electrical equipment, in service workshops and design offices.

Professional tasks of an electrician

1. Testing and controlling devices in the process of production and operation.
2. Choosing, using, installing and servicing machinery and electrical equipment and controlling control and measurement apparatus.
3. Installing, using and handling electricity systems.
4. Using effective protection of electrical equipment against short circuits, overload and overvoltage.
5. Diagnosing the state of components, systems and electrical equipment.
6. Matching, installing and testing of fire protection.
7. Abiding health and safety rules of electrical equipment and electrical measurements.
8. Planning and controlling the power grids.
9. Participation in the work of project teams.
10. Using computer technology.

**Description of formal documents confirming obtained qualifications in the profession**

A person who has passed the examination confirming the qualification/qualifications in the profession, shall receive a certificate or diploma confirming the professional qualifications.

A certificate shall be received by a person who has passed the professional examination within the scope of one qualification.

*Regulation of the Minister of National Education dated February 24, 2012 amending the Regulation on the conditions and manner of assessing, classifying and promoting students and course participants as well as conducting tests and examinations in public schools (Journal of Laws dated March 12, 2012, item 262*

A diploma shall be received by a person who has passed the professional examination within the scope of all qualifications required for the particular profession and who has a level of education required for the particular profession.

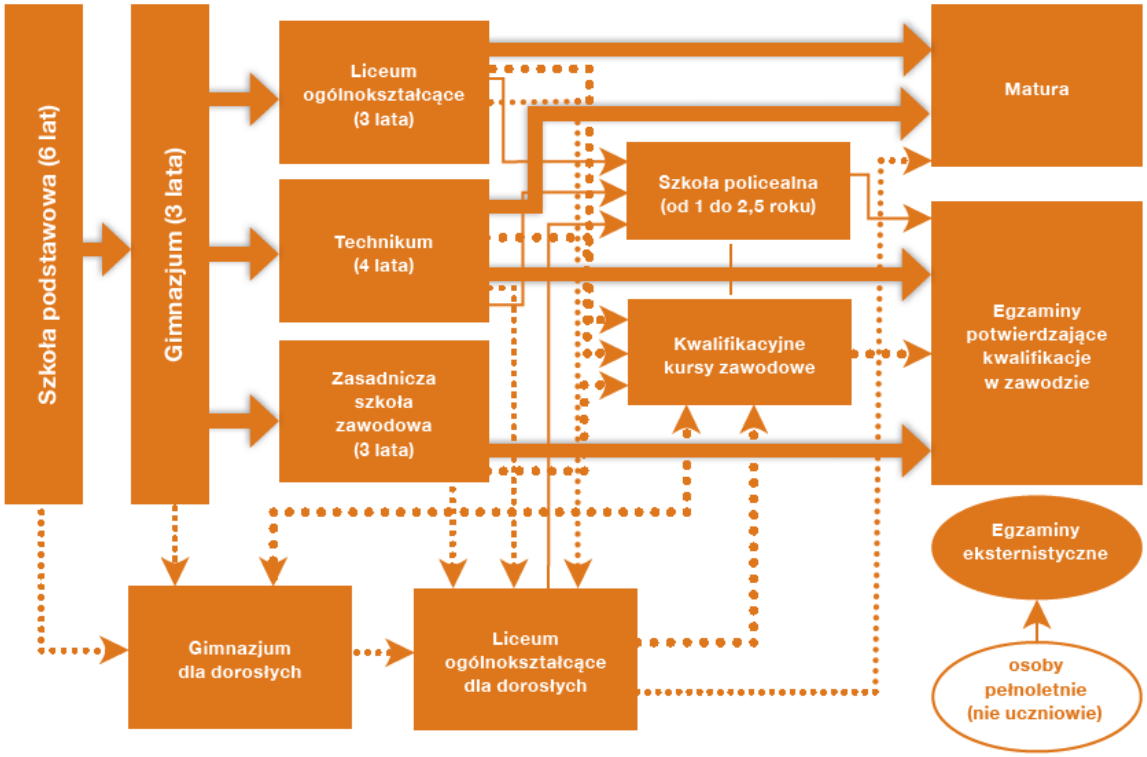
In the profession of an electrician two qualifications are separated (table 7), which may be attained by educating at 3-year vocational school or during vocational qualifying courses.

**Table 7: Qualifications separated for the profession of an electrician**

| Number of qualification (order) in profession | Symbol of qualification from core curriculum | Name of qualification |
|---|---|---|
| K1 | E. 7 | Installation and maintenance of electric plant and machinery |
| K2 | E. 8 | Installation and maintenance of electrical systems |

*Source: Own study based on the regulation of the Minister of National Education dated December 23, 2011 on classification of professions of vocational education (Journal of Laws of 2012, item 7, as amended)*

**Fig. 3. Structure of Polish system of vocational educati**




*Source: Vocational and continuing training handbook, National Center to Support Vocational and Lifelong Education, Warsaw 2013, p. 8*

**Base of qualifications and educational outcomes for the profession obtained in the formal system of vocational education:**

Qualifications in the profession of an electrician may be obtained by:

- passing professional examination in E. 7 qualification Installation and maintenance of electric plant and machinery conducted by the Regional Examination Board,
- passing professional examination in E. 8 qualification Installation and maintenance of electrical systems
- graduating vocational school.

The documents that confirm obtaining the qualifications in the profession of an electrician are vocational school leaving certificate and a diploma confirming professional qualifications for an electrician.

The above documents are issued by vocational school to the graduates of an electrician course of education.

**Learning outcomes common to all professions**

(BHP) Health and Safety Occupation Rules

Pupil:

1) distinguishes concepts related with health and safety occupation rules , fire protection, environmental protection and ergonomics;
2) distinguishes tasks and powers of institutions and services operating in the field of labor protection and environmental protection in Poland;
3) defines the rights and responsibilities of the employee and the employer's in area of safety and health working conditions;
4) predicts threat to human health and life, property and the environment associated with the performance of professional tasks;
5) identifies the threats associated with the presents of harmful factors in the work place;
6) determines the effects of harmful factors on the human body;
7) organizes the workplace according to applicable ergonomics rules , health and safety regulations , fire protection and environmental protection;
8) exerts the individual and collective protection issues during performing professional tasks;

9) fallows the principles of safety and health at work and apply the rules of law related with fire and environmental protection;
10) provides first aid to the injured in accidents at work , as well as in emergency health and life threats.

(PDG). Making and business activities

Pupil:

1) uses concepts from the area of a functioning market economy;
2) exerts the labor law , law regulations related with using protection of personal data in the area of tax law and copyright law;
3) exerts the law relating with running a business ;
4) distinguishes enterprises and institutions occurring in the industry and the connections between them;
5) analyzes the activities carried out by companies in the industry;
6) initiates common ventures with different companies in the same industry;
7) prepares the documentation necessary for starting and running a business;
8) conducts correspondence related with business conducting;
9) operates office devices and uses computer programs to support economic activity;
10) plans and takes the marketing activities of the business;
11) optimizes the costs and revenues of the business.

(JOZ). Foreign language professionally oriented

Pupil:

1) uses the resource of language (vocabulary, grammar, spelling and phonetics), enabling implementation of professional tasks;
2) interprets statements regarding the performance of typical professional activities slowly and clearly articulated in standard dialect;
3) analyzes and interprets short texts written on performing common professional activities;
4) formulates a brief and understandable expression and written texts for communicating in the workplace;
5) uses foreign language sources of information.

(KPS). Personal and social competence

Pupil:

1) respects the principles of culture and ethics;
2) is creative and consistent in the implementation of tasks;
3) provides for the consequences of actions taken;
4) is opened to change;
5) is able to cope with stress;
6) updates the knowledge and improves professional skills;
7) respects professional confidentiality;
8) can be held responsible for their actions;
9) is able to negotiate the terms of agreements;
10) works as a part of team.

Learning outcomes in the profession of an electrician *(developed on the basis of the Curriculum for electrician by profession, 741,103 of the structure of this type of school: basic vocational school, type of program: linear, KOWEZiU, Warsaw 2012)*

**I. Educational effects common to all occupations and learning outcomes the common to professions within the electro-electronic area constituting the foundation for training in a profession or group of professions**

PKZ (Ea) Skills which are a foundation for education in the professions: telecommunications equipment fitter, mechatronics fitter, electronics fitter, electrical engineer of vehicles, electrical engineer, electrician, telecommunications technician, ICT technician, electronics technician, avionics technician, mechatronics technician, electrical technician, electricity, electronics and medical informatics technician, car mechanic, electrical power engineering techniques of rail transport, motorcycle mechanic, refrigeration and air conditioning techniques, techniques of lifting equipment

Pupil:

1) uses the concepts in the field of electrical engineering and electronics;
2) describes the phenomena associated with DC and AC;
3) interprets the physical quantities associated with AC;
4) sets the characteristics of sine waves of the type $y = A \sin(\omega t + \varphi)$;

5) exerts the law to the electrical calculation and estimation of the size of electrical circuits and electronic circuits;
6) recognizes the parts and electrical and electronic systems;
7) draws schematic diagrams and assembly diagrams of electrical and electronic systems;
8) distinguishes between parameters of electrical and electronic components and systems;
9) uses a technical drawing of the mounting and installation work;
10) selects tools and measuring instruments and performs work in the field of the mechanical components and electrical and electronic equipment;
11) performs work in the field of manual processing;
12) describes the functions of components and electrical and electronic systems on the basis of technical documentation;
13) is able to connect components and electrical and electronic systems on the basis of circuit and assembly diagrams;
14) selects the methods and instruments for measuring parameters of electronic circuits and electronic equipment;
15) takes measurements of electrical components, electrical and electronic systems;
16) presents the results of measurements and calculations in the form of tables and graphs;
17) uses the technical documentation, catalogs and manuals, and adheres to the standards in this regard;
18) uses computer programs supporting the execution of tasks.

## II. Learning outcomes proper to distinguished qualifications in the profession of an electrician

### *E.7. Installation and maintenance of machinery and electrical equipment*

1. Installation of machinery and electrical equipment

Pupil:

1) classifies machines and electrical equipment according to specific criteria;
2) defines the technical parameters of machinery and electrical equipment;
3) distinguishes parameters of the elements and components of machinery and electrical equipment;
4) recognizes the machinery and electrical equipment and their components;
5) distinguishes structural materials used in machines and electrical equipment;
6) recognizes the power supplies, control and protection of machinery and electrical equipment and components;
7) recognizes wires and cables;
8) determines the destiny of machinery and electrical equipment;
9) defines the functions of the parts and components used in machinery and electrical equipment;
10) reads and prepares drawings and diagrams of machinery and electrical equipment;
11) selects tools for installation of machinery and electrical equipment;
12) delivers mechanical assembly of electrical and electronic components;
13) mounted power, control, regulation and protection supplies of machinery and electrical equipment on the basis of the documentation;
14) checks the conformity of the work with the documentation;
15) takes measurements of machinery and electrical equipment parameters.

2. Maintenance of machinery and electrical equipment

Pupil:

1) recognizes the parts of machinery and electrical equipment;
2) locates the typical damage of machinery and electrical equipment;
3) respects the principles of maintenance of machinery and electrical equipment;
4) plans sequence of actions during removal and installation of machinery and electrical equipment;
5) takes measurements of voltage, winding resistance and insulation resistance;

6) performs replacement of worn or damaged parts and components of machinery and electrical equipment;
7) delivers the replacement of defective parts of control systems and protection of machinery and electrical equipment;
8) checks the correctness of installation in control systems and protection of machinery and electrical equipment on the basis of the documentation;
9) carry out inspection and maintenance of electrical machinery and equipment;
10) checks the operation of machines and electrical equipment after assembly and maintenance.

**E.8. Installation and maintenance of electrical installations**

1. Electrical installations

Pupil:

1) distinguishes between the wires used in electrical installations;
2) recognizes installation equipment;
3) recognizes light sources and luminaires;
4) defines the technical specifications of electrical and equipment installations;
5) respects the rules for the operation of electrical installations in residential and industrial areas;
6) prepares assembly diagram of the installation;
7) traces the routing of wires and position of installation equipment on the basis of the scheme;
8) selects the tools to perform various types of electrical installations;
9) makes connections between the electrical components of the circuit and assembly diagrams;
10) checks compliance of the installation with the diagram;
11) takes the measurements of parameters of installation and protection in accordance with the instructions;
12) checks the operation of the electrical system after the installation.

2. Maintenance of electrical installations

Pupil:

1) respects the principles and defines the scope of maintenance of electrical installations;
2) recognizes typical damage to electrical installations;
3) selects spare parts of components of electrical installation on the basis of catalog data;
4) selects tools for assembly and disassembly of electrical components;
5) selects meters for measuring electrical parameters;
6) verifies the continuity of the phase and protective conductors;
7) takes measurements of parameters of electrical installations;
8) takes replacement on damaged cables and components of electrical installations;
9) checks the operation of fire protection;
10) performs maintenance of electrical installations according to the documentation.

**Professional competencies expected by employers in Germany and Portugal and identified through research**

**Table 8. Professional competences in the profession of an electrician**

| Qualifications in the profession of an electrician in Poland | Professional competences | Portugal | Germany |
|---|---|---|---|
| Installation and maintenance of machinery and electrical equipment | Installation and maintenance of machinery and electrical equipment | 4,1 | 5,0 |
| Installation and maintenance of electrical installations | Installation and maintenance of electrical installations | 4,0 | 4,5 |

*Source: own study*

**Table 9. Installation and maintenance of electrical installations**

| Skills | Portugal | Germany |
|---|---|---|
| Organize the workplace in line with the rules and regulations for occupational health and safety, fire protection, environment protection and the ergonomics during the performance of electrical installation. | 3,1 | 4,4 |
| Release persons that were electrocuted from voltage and rescue them. | 2,9 | 4,4 |
| Adhere to the applicable standards and regulations in the performance of electrical systems | 3,3 | 4,4 |
| Identify the type of electrical systems and characterize their structure | 3,6 | 3,9 |
| Use the technical documentation of electrical systems | 3,6 | 4,3 |
| Choose cables, accessories, tools and methods relevant to the performance and repair of various types of electrical systems | 3,0 | 4,1 |
| Perform temporary connections | 2,6 | 4,4 |
| Perform temporary systems | 2,9 | 4,4 |
| Perform and repair internal electrical systems | 3,7 | 4,2 |
| Perform and repair external electrical systems: tele-technical, signaling, protection of property and lightning protection | 3,9 | 3,5 |
| Perform cable connections or overhead connections of buildings | 3,1 | 3,9 |
| Perform connections of electrical and mechanical systems (bolted, clamp and soldered) | 3,2 | 4,0 |
| Check the correctness of operation of internal and external electrical systems | 3,3 | 4,1 |
| Locate and remove defects in internal and external electrical systems | 4,0 | 4,2 |
| Operate devices, electric power systems and grids with voltage not exceeding 1 kV | 3,6 | 3,9 |
| Use simple operation and maintenance documentation of electrical machinery and devices | 3,4 | 4,3 |
| Repair power tools and electrical machinery, replace power supply cables with damages insulation, replace brushes in commutators. | 3,5 | 3,8 |
| Replace bearings in power tools and induction motors, sharpen drills and cutters, other locksmith works | 2,8 | 3,5 |

*Source: own study*

**Table 10. Installation and maintenance of machinery and electrical equipment**

| Skills | Portugal | Germany |
|---|---|---|
| Organize the workplace in line with the rules and regulations for occupational health and safety, fire protection, environment protection and the ergonomics during the installation and maintenance of electrical machinery and devices. | 3,8 | 5,0 |
| Classify the electrical machinery and devices, specify their technical parameters. | 2,6 | 5,0 |
| Differentiate between the parameters of elements and components of electrical equipment and determine their functions. | 3,9 | 5,0 |
| Recognize the electrical machinery and devices and their elements, determine their purpose. | 3,8 | 5,0 |
| Differentiate between structural elements used in electrical machinery and devices. | 3,6 | 5,0 |
| Read and make drawings and diagrams of electrical machinery and devices | 3,5 | 5,0 |
| Mount systems of power supply, control, adjustment and protection of electrical machinery and devices based on the documentation. | 3,2 | 5,0 |
| Select tools for installation of electrical machinery and devices. | 3,4 | 5,0 |
| Perform mechanical installation of electrical and electric components | 3,6 | 5,0 |
| Check the compliance of the performed work with the documentation. | 2,9 | 5,0 |
| Take measurements of parameters of electrical machinery and equipment. | 3,9 | 5,0 |
| Locate typical damage of electrical machinery and equipment. | 4,1 | 5,0 |
| Plan the sequence of actions performed during the disassembly and installation of electrical machinery and devices. | 2,7 | 5,0 |
| Perform the replacement of worn or damaged elements and components of electrical machinery and devices. | 4,0 | 5,0 |
| Perform the replacement of damaged control and protection elements of electrical machinery and equipment. | 3,6 | 5,0 |
| Check the correctness of the performed installation based on the documentation. | 3,4 | 5,0 |
| Perform inspections and maintenance of electrical machinery and equipment. | 3,0 | 5,0 |
| Check the operation of electrical machinery and equipment after installation and maintenance. | 3,5 | 5,0 |
| Establish and conduct an economic activity in the electrical industry. | 2,9 | 5,0 |

*Source: own study*

## Expected social and key competences identified through research

### Table 11. Personal and social competences

| Personal and social competences | Portugal | German |
|---|---|---|
| He/she bears responsibility for the execution of tasks | 3,6 | 3,6 |
| He/she is creative and consistent in the implementation of tasks | 3,1 | 3,8 |
| He/she respects professional confidentiality | 2,9 | 3,9 |
| He/she can evaluate his/her actions and the actions of his/her team and takes responsibility for the consequences | 3,8 | 3,6 |
| He/she works partially on his/her own and takes on a cooperation in the organized conditions | 3,4 | 3,9 |
| He/she recognizes his/her own learning needs, updates his/her knowledge and improves his/her professional skills | 4,2 | 3,8 |
| He/she can cope with stress | 2,8 | 3,8 |
| He/she can negotiate the terms of arrangements | | 1,8 |

*Source: own study*

### Table 12. Key competences

| Key competences | Portugal | Germany |
|---|---|---|
| Problems solving | 3,9 | 4,0 |
| Teamwork | 3,2 | 3,8 |
| Communicating in the mother tongue and in foreign languages | 2,7 | 3,5 |
| Exerting influence/leadership | 2,7 | 2,8 |
| Planning and organizing work | 3,1 | 3,7 |
| Physical fitness | 3,4 | 3,8 |
| The ability of comprehensive reading and writing | 3,3 | 3,4 |
| Mathematical skills | 4,0 | 3,7 |
| The ability to search, filter and critical analysis of information | 2,7 | 3,6 |
| The ability to use modern information and communication technologies | 2,1 | 3,4 |

*Source: own study*

**Typical workplaces in Germany**

Typical workplaces for electricians are factory buildings, workshops, offices and outdoor areas. The majority of the companies that hire specialists with appropriate qualifications are a part of crafts of electrical equipment and sometimes are a part of property sector (e. g. the management, cleaning and supervising services). The rest are repair shops, car showrooms, spare parts warehouse and distribution services.

**Typical workplaces in Portugal**

Electrocelos is a company which was brought to life 30 years ago. From a small workshop it gradually evolved and changed into an enterprise which employs almost 50 people. Electrocelos emerged based on a long experience in the marketing, designing and manufacturing components for automation of doors, windows and shutters, as well as on the research of the current needs of the European market, where reliability and competitiveness have to be combined. It differs from other companies by being competitive and by offering quick aftermarket response. The area of automation was the last area which was created by Grupo André, but quickly became the biggest of them all. Electrocelos S.A. sells and installs automated systems. The company was able to create a network of resellers and installers throughout Europe. They have designed automation solutions where an easy installation was taken into consideration, long life of the product and its low maintenance, both for private and industry sectors for various applications, featuring automatic products designed to meet all needs. As the company is growing fast they have their own department devoted to electrical parts. They are constantly looking for new solutions in that field. Their workshops are well designed and they undergo constant changes as the answer to the needs of the market.

Ferreirolux, is a company which appeared on the market in Barcelos around 20 years ago. It specializes in the production of lamps of different kind. The company managed to develop in recent years and it opened another branch in Lijo. They have different departments, from production line through the electrical service to the sales department. Ferreirolux considers itself as a small sized company which employs 23 people. Ferreirolux is a company which offers full service to its customers. They introduced a 24h emergency service of an electrician. The clients can count on the company 7 days a week.

## 3. The results of Model testing

In the project "Recognition of vocational qualifications for the purpose of transfer on the European job market" methodology has been adopted to develop the test version of the Model that allows to develop tools that make it possible to compare and transfer qualifications in the professions of an electrician and a car mechanic on the European job market in Germany, Poland and Portugal.

The main aim of developing the Model- its test version, is to prepare tools that will make it possible to compare and transfer qualifications in the professions of an electrician and car mechanic on the European job market in Germany, Poland and Portugal that will make it possible to test and evaluate the obtained results and usability of the Model. The results of the test phase will be the basis for the development of the final version of the Model. The created Model is intended to be opened to its development in the implementation of other professions in the future. It has undergone testing in individual countries by:

- Four experts- two specialists in vocational training from each profession
- Target groups- five representatives of employers, five representatives of vocational schools, five graduates of each profession

Each interview scenario included an explanation of the aim of the meeting and the basic rules of the inquiry. The participants were given information about the project and the purpose of the interview. They were also made familiar with the test version of the Model which allows recognition of vocational qualifications in the professions of an electrician and a car mechanic for the purpose of transfer on the European job market in Germany, Poland and Portugal. They were informed that their answers are anonymous and their personal details will be used only to verify the authenticity of the inquiry and will not be published outside the summaries.

The first group (one woman and four men- one person aged between 26 and 40, the rest was 41 and over) which was interviewed, were the experts- teachers who are specialists in their professions – two of each, and one mutual specialist who is a teacher in both professions (an electrician and a car mechanic). The teachers, after getting familiar with the information about the Model of recognition of vocational qualifications in occupations of an electrician and car mechanic for the purpose of transfer on the European job market in Germany, Poland and

Portugal (its test version), had no objections concerning the content of the Model, elements of the Model: information about the profession, the effects of vocational education, as well as the employers' expectations, while in the area of self-assessment of competences they noted the lack of information about grades and the way they were achieved. They suggested expanding the model with the module that will make it possible to write down not only the self- assessment results but also formal results of vocational training (grades from chosen subjects from the vocational school leaving certificate as well as results in the percentages from the qualification examinations in the professions). In the part entitled: Recommendations – directions of competence development, the surveyed experts have noticed the need to divide information into cumulative, general and more detailed, referring to specific skills. To the question: Is the Database of educational institutions, as an element of the Model that will supplement information about available lifelong learning institutions, necessary to the users of the Model, they responded positively and they indicated the names and addresses of the institutions in which vocational schools' graduates would be able to bridge skills gap. The experts also suggested developing the Model with the module that will enable the employers to advertise the vacancies with the necessity to indicate expected competencies and skills that they could choose from a list and analogically developing the Model with another module for the graduates that will enable them to place there their offers. They also suggested adding the statistical module that will present the ranking of the most important competences for the employers.

In conclusion, the experts, who were the representatives of educational institutions, have recommended a test version of the Model of recognition of vocational qualifications in occupations of an electrician and a car mechanic for the purpose of transfer on the European job market in Germany, Poland and Portugal, after it is completed and modified in accordance with the aforementioned proposals.

The second group of people (three women and two men- one person aged between 26 and 40 and the rest 41 and over) who took part in the inquiry, were the representatives of educational institutions from vocational schools in Ostrołęka. The principals and heads of practical training departments, after watching a multimedia presentation, agreed with the content of the Model, especially if it comes to the information useful to the particular groups of users. The respondents paid attention to the fact that all the elements of the model should also be

translated and available in the languages of all the partners taking part in this project. In the element titled: Employers' expectations, the representatives of educational institutions suggested that the results (validity indicators) should be presented graphically, in the form of graphs in order to determine the level of convergence and divergence with the employers' expectations of professional competences (knowledge and skills), personal, social and key competences for the professions of an electrician and a car mechanic. Referring to the Model in part : Recommendations- directions of competence development, the principals and the heads of practical training departments, that were interviewed, emphasize the simple and technical way of providing information to graduates of vocational training. At the end of the inquiry, the representatives of the vocational schools in Ostrołęka have jointly recommended the test version of the Model of recognition of vocational qualifications in occupations of an electrician and a car mechanic for the purpose of transfer on the European job market in Germany, Poland and Portugal after adding the possibility of self- actualization of the Base of educational institutions by the training institutions with detailed data concerning their offer.

The third group consisted of four men, one aged 26-40 and the others 41 and over. They also took part in the inquiry and they were the employers' representatives. They recommended the test version of the Model of recognition of vocational qualifications in occupations of an electrician and a car mechanic for the purpose of transfer on the European job market in Germany, Poland and Portugal after its modification and the development of the Model with a module that will enable the employers to put their job advertisements with the necessity to indicate expected competencies and skills that they could choose from a list and analogically developing the model with another module for the graduates that will enable them to place there their offers. The same solution was proposed by the experts- the teachers of the professions.

The fourth group (six men- five of them in age group 26-40 and one – 41 and over), that was interviewed, were the graduates of vocational education in the professions of an electrician and a car mechanic. After watching a multimedia presentation they all agreed on a content of the Model and the elements of the Model. They accepted the test version of the Model of recognition of vocational qualifications in occupations of an electrician and a car mechanic for the purpose of transfer on the European job market in Germany, Poland and Portugal

without any changes. They only pointed out that the model could be developed in a way so that it is possible to enter formal results of vocational training.

After the research of the test version of the Model of recognition of vocational qualifications in occupations of an electrician and car mechanic for the purpose of transfer on the European job market in Germany, Poland and Portugal with the individual questionnaires that were addressed to the target groups, which consisted of the representatives of vocational education (teachers and executives), graduates and the employers, it emerges that the Model is comprehensible and well- judged and the analysis of the collected opinions and conclusions made by the experts and the representatives of target groups that were tested as well the following proposals were reported:

- Developing the Model with a module that will enable the employers to put their job advertisements with the necessity to indicate expected competencies and skills that they could choose from a list
- Developing the Model with a module for the graduates that will enable them to place there their offers
- Developing the Model with a module that will enable to write down the formal results of the vocational education together with the self- assessment
- Developing the Model with a statistical module that will present the ranking of the most important competences expected by the employers
- In the element: Employers' expectations – presentation of the results also in a graphical way, e.g. in a form of graphs
- The possibility of updating the offer by the training institutions from the base of educational institutions
- Availability of this model in all the languages of the countries participating in the project

Conclusions of these analyzes will be used to improve the test version of the Model, so that in a final version the model is user- friendly and its substantive content will make it possible to expand it further and achieve the assumed goals by the potential users.

# 4. Summary and tips for constructing the ICT tool

The result of the research which was done within the project "Recognition of vocational qualifications for the purpose of transfer on the European job market", Erasmus +, implemented by institutions from Poland, Germany and Portugal will be the Platform supporting the development of human resources, as well as processes of creating and updating descriptions of professional competences for creating and improving the quality of programming in two professions of an electrician and a car mechanic. Works on the research focused on comparative study: of formal systems of vocational education, identification of learning outcomes common and different in partner countries, unified model of recognition of professional competences for all partner countries. the results of the comparative study of formal systems of vocational education (conducted by schools, craft or other educational institutions) in Poland, Germany and Portugal in the professions of an electrician and a car mechanic showed similarities and differences which can be achieved in learning outcomes. The ICT tool should include a knowledge base about the professions of an electrician and a car mechanic (separately for each profession) i.e. information about the profession, description of vocational education outcomes, employers' expectations, information about educational institutions.

Information about compliance or discrepancies in professional competence of graduates/ employees or the applicants for employment in the above mentioned professions in comparison to the Polish, German and Portuguese employers expectations, recommendations for further career development may be acquired after carrying out the self-assessment of professional competence. The available base of search engines of educational institutions will facilitate the proper selection of training topics according to the place of residence or professional work in which new skills may be acquired or one can be assessed at competent institutions certifying competences and obtain a document that proofs qualifications.

The ICT tool for recognition and validation of vocational qualifications will facilitate the transfer of professional qualifications on the European labor market and will extend the possibility of cooperation of educational institutions with employers.

## Source materials


1. Own study based on the Regulation of the Minister of National Education dated December 23, 2011 on the classification of professions for vocational education (Journal of Laws of 2012, item 7, as amended)
2. Handbook of vocational and life- long education. The National Center to Support Vocational and Life- long Education, Warsaw 2013, p. 8
3. A comparative study of national systems of formal vocational training in line with European and national qualifications frameworks
4. A database of descriptions of qualifications and learning outcomes for the professions of an electrician and a car mechanic
5. A comparative study of vocational education systems in the professions of an electrician and a car mechanic in formal education, identification of learning outcomes and defining common and differentiating learning outcomes for partner countries
6. A report- The required professional competences in the typical workplaces in the professions of an electrician and a car mechanic (Poland, Germany and Portugal)
7. A comparative study of required professional competences in the typical workplaces in the professions of an electrician and a car mechanic on the basis of Poland, Germany and Portugal
8. A comparative study of the expected learning outcomes in formal education in the professions of an electrician and a car mechanic with the expectations of employers on the labor markets in Poland, Germany and Portugal.
9. The model of the recognition of vocational qualifications in the professions of an electrician and car mechanic for the purposes of their transfer on the European job market in Germany, Poland and Portugal- test version