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Comparative study of professional competences required for typical professions of electrician and automotive technician based on examples in Germany, Poland and Portugal

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Chapter 1

Comparative analysis of typical jobs for the profession of electrician and automotive technician in Germany, Poland and Portugal and indication of the common and differentiating elements between Partner countries.

The comparative analysis deals with a comparison of worksites created in companies (that employ electricians and automotive technicians) in Poland, Germany and Portugal. The analysis is based on research conducted by international team in Partner countries - Poland, Portugal and Germany with the use of standardized tools.

The research has involved 60 entrepreneurs from each Partner country. Research tools included survey questionnaires (100% of tested population) and, additionally, in-depth interview with the entrepreneur (10% of tested population).

The consistency and differences in opinions of employers were analyzed for the description included in national reports developed by national research teams.

In accordance with the methodology, the national reports include point 1.3.Typical worksites for the profession of electrician and automotive technician.

1.1. Electrician

1.1.1. Polish Report

In accordance with the Polish Report containing the results of field research, the electricians are employed:

- in 93% of the companies undergoing the tests; the entrepreneurships employing the electricians hire them for typical profession - electrician,
- in case of 43% of tested companies, employees having such profession are employed for the profession of maintenance technician of devices and electrical equipment (10%), installation electrician, low voltage, medium voltage and high voltage network installation electrician, control cabinet installation electrician (3% each).

It shall be noted that respondents had a chance to choose more than one answer.

1.1.2. German Report

In accordance with the German Report containing the results of field research, the electricians are employed in companies:

- of which 30% are conducting productive activity (factory infrastructure),
- of which 23% are conducting tertiary activity (workshops),
- of which 15% are conducting maintenance activity (offices),
- of which 13% are conducting installation-executive activity at building sites (open-air areas),
- of which 19% are other places requiring professional competences (e.g. storehouses, surveillance, management personnel).

The sources of creation of worksites are: craftsmanship, plants, and service stations.

1.1.3. Portuguese Report

In accordance with the Portuguese Report containing the results of field research, the electricians are employed in companies:

- of which 26% are conducting productive activity (factory infrastructure),
- of which 45% are conducting tertiary and installation-executive activity at building sites (workshops, open-air areas),
- of which 29% are conducting commercial activity (offices).

1.1.4. Common elements of typical worksites for the profession of electrician

While analyzing the results of national research, it can be indicated that employees for the profession of electrician are employed for the professions requiring the professional competences of a given line of work:

- electricians of electrical/electrical power engineering installations and devices (job at building sites),
- maintenance operator of electrical/electrical power engineering installations and devices (job at production companies, offices),
- service of electrical/electrical power engineering devices (workshops, maintenance services),

– seller (trading companies).

The electricians are also employed as non-working personnel.

The structure of answers is different for each of the National Reports. While analyzing the source of the answer (types of companies) regarding the typical worksites, it can be concluded that different structure of tested companies influences the structure of the answer.

1.1.5. Differentiating elements (specific/various) for the typical worksites for the profession of electrician.

On German market the profession of electrician functions in separate professional categories regarding the directly electrical competences (power industry, building technologies) and so called low-voltage areas (information and telecommunication technologies, automation and control technologies, mechatronics). The above mentioned matter was agreed with during the stage of methodology development for the O5 result. That is why, for the German Report, the work environment has such a significant impact on a result of the answers regarding the worksites for the profession of electrician.

The specificity of German Report is therefore a clear classification of typical worksites for the profession of electrician as for the comprehension of Polish and Portuguese report and typical worksites for 'low-voltage' electricians (information and telecommunication technologies, automation and control technologies). The above mentioned range of worksites corresponds to a large extent to Polish profession of mechatronics engineer, computer scientist and electronics engineer.

Table 1. The structure of tested companies

Nature of the company	Poland %	Portugal %	Germany %
Production activity	7	26	30
Trade	13	29	0
Tertiary activity	57	45	23

Nature of the company	Poland %	Portugal %	Germany %
Production-tertiary	13		0
Tertiary-trade	4		13
Tertiary-administrative	3		15
Other	0	0	19

Table 2. The structure of typical worksites for the profession of electrician:

Worksites	Poland %	Portugal %	Germany %
Electrician	93	78	73
Maintenance operator of devices and equipment	43	55	0
Installation electrician	20	18	0
Seller	0	2	0
Executive position	0	0	0
Information-ICT, control automation, industrial electronics, mechatronics	0	0	27

1.2. Automotive technician

1.2.1. Polish Report

In accordance with the Polish Report containing the results of field research, the automotive technicians are employed:

- in 90% of the companies undergoing the tests, the entrepreneurships employing the automotive technicians hire them for typical profession - automotive technician,
- in case of 50% of tested companies, the entrepreneurships employing automotive technicians hire them for typical profession - diagnostician,
- in case of 13% of tested companies, employees having such profession are employed for the profession of foreman, leader and electromechanical engineer of automotive vehicles.

It shall be noted that respondents had a chance to choose more than one answer.

1.2.2. German Report

In accordance with the German Report containing the results of field research, the electricians are employed in companies:

- in 27% of tested companies, the entrepreneurships employing automotive technicians hire them for a typical profession - automotive technician,
- in 29% of tested companies, the entrepreneurships employing automotive technicians hire them for a typical profession - technician-diagnostician,
- in 27% of tested companies, the entrepreneurships employing automotive technicians hire them for a typical profession – automotive electromechanical engineer,
- in 16% of tested companies, the entrepreneurships employing automotive technicians hire them for other profession.

The sources of creation of worksites are: workshops/services, car showrooms, storages/wholesalers. It is also possible to work at car assistance, at car fleet workshops, motor vehicle diagnostic stations or at car manufacturers.

1.2.3. Portuguese Report

In accordance with the Portuguese Report containing the results of field research, the automotive technicians are employed in companies:

- in 27% of tested companies, the entrepreneurships employing automotive technicians hire them for a typical profession - automotive technician,
- in 29% of tested companies, the entrepreneurships employing automotive technicians hire them for a typical profession - technician-diagnostician,
- in 27% of tested companies, the entrepreneurships employing automotive technicians hire them for a typical profession – automotive electromechanical engineer,
- in 16% of tested companies, the entrepreneurships employing automotive technicians hire them for other profession.

The sources of creation of worksites are: workshops/services, car showrooms, storages/wholesalers.

1.2.4. Common elements of typical worksites for the profession of automotive technician

While analyzing the results of national research, it can be indicated that employees for the profession of automotive technician are employed for the professions requiring the professional competences of a given line of work:

- opened services of car maintenance (workshops/services,
- closed services of car maintenance (service stations for car fleets),
- Diagnostic services (workshops/services, motor vehicle diagnostic stations),

Automotive technicians are also employed as non-working personnel (foreman/foreworker/leader).

1.2.5. Differentiating elements (specific/various) for the typical worksites for the profession of electrician

On German market the professions of automotive technician, technician-diagnostician, automotive electromechanical engineer and chassis constructor are recognized as typical professions for car industry line of business in Germany and that is why they are classified in such way. Similar as for the profession of electrician, the work environment has a significant impact on a result of an answer. In case of Poland the most basic workplaces are workshops ensuring a wide range of services (mechanical and body repairs) connected with a large contribution of cars used on a tested market. In case of Germany and Portugal, they are more strictly set on diagnostics and services through replacement of faulty/failed parts.

Table 3. The structure of tested companies

Nature of the company	Poland %	Portugal %	Germany %
Production		23	3
tertiary	47	43	36
Tertiary-trade	43		23
Production-tertiary	7		27
Production -tertiary- trade	3		11
			0
Trade		20	0
Other (administrative)	0	13	0

Table 4. The structure of typical worksites for the profession of automotive technician

Worksite	Poland %	Portugal %	Germany %
Automotive technician	90		27
Technician-diagnostician	50		29

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Worksite	Poland %	Portugal %	Germany %
Automotive electromechanical engineer	3		27
Foreman/foreworker/leader	10		
Assembler at production line	0		
Other	0		16

Chapter 2

Comparative analysis of actions performed at typical jobs for the profession of electrician and automotive technician – comparison of performed actions in Germany, Poland and Portugal and indication of the common and differentiating elements between Partner countries

In all three of the partner countries a set of tasks that are typical for the professions of automotive technicians and electricians were presented to employers who were then asked to grade them. In the following a comparison of the answers in Poland, Portugal and Germany will be given.

2.1. Car Mechanics

Without taking a closer look at the very details of the results for each country, general patterns can be identified.

With regards to Poland, it can be stated that seven out of eight professional tasks (*Z1, Z2, Z4, Z5, Z6, Z7, Z8*) are estimated as *very important* by the great majority of employers. Only Z3 ("*interpretation of results and assessment of the vehicle's technical condition*") is ranked lower and labelled as *important* which still means that the task appears to be crucial to Polish employers. Nonetheless, there can still be found differences when considering the importance indicator. The most important tasks are Z2 (*taking measurements and diagnostic tests of motor vehicle and locating defects*) and Z6 (*replacement of damaged assemblies and components in a vehicle*) (both 4,5) followed closely by Z3 (*interpreting the results and evaluation of the technical condition of motor vehicle*) and Z5 (*dismantling, verification and matching spare parts for replacement of the motor vehicle*) (both 4,4). Again close to that are Z4 (*adjusting the scope and methods of the repair of motor vehicles*), Z7 *(replacing the damaged assemblies and components of motor vehicle*) and Z8 (*assessing the quality of repair and its valuation/estimated cost*) (all 4,1). The least important task is Z1 (*accepting and preparing motor vehicles or diagnostics*) (3,9).

As for Portugal the attitude of employers is a lot different. Most of them judge almost all of the tasks (Z1, Z2, Z3, Z5, Z6, Z8) as *relevant*. It is interesting that there are only two typical tasks in the list that are of real importance. *Z4* ("*adjusting the scope and methods of the repair of motor vehicle*") is of higher relevance to most employers who grade it *important*. Following the importance indicators the most important task that car mechanics should be able to perform is Z4 (4,0) which is followed by Z7 (*maintenance of assemblies and*

components of motor vehicle) (3,8). Next come Z2 (*taking measurements and diagnostic tests of motor vehicle and locating defects)* and Z3 (3,7) and after that Z6 (*replacing the damaged assemblies and components of motor vehicle)* (3,65). Z5 (*dismantling, verification and matching spare parts for replacement of the motor vehicle)* is ranked fifth (3,47) and the least important tasks are Z8 (*assessing the quality of repair and its valuation/estimated cost*) (3,25) and Z1 (*accepting and preparing motor vehicle for diagnostics)* (3,2).

The most important tasks to be performed in Germany are Z5 (*dismantling, verification and matching spare parts for replacement of the motor vehicle*) (4,4), Z7 (*maintenance of assemblies and components of motor vehicle)* (4,3) and Z2 (*taking measurements and diagnostic tests of motor vehicle and locating defects)* together with Z6 (*replacing the damaged assemblies and components of motor vehicle)* (both 4,2), These tasks are followed by Z3 (*interpreting the results and evaluation of the technical condition of motor vehicle)* (3,9) and Z4 (*adjusting the scope and methods of the repair of motor vehicle)* as well as Z8 (*assessing the quality of repair and its valuation/estimated cost)* (both 3,1). According to German employers the least important task is Z1 (*accepting and preparing motor vehicle for diagnostics)* (3,0).

In order to give an overview of the individual estimations in each of the three countries this table shows the importance indicators of the tasks Z1-Z8 for each country so that comparisons can be made quite easily.

Table 5.

No.	LIST OF PROFESSIONAL TASKS	POLAND (PL)	PORTUGAL (PT)	GERMANY (DE)
Z1	Accepting and preparing motor vehicles or diagnostics	3,9	3,2	3,0
Z2	Taking measurements and diagnostic tests of motor vehicle and locating defects	4,5	3,7	4,2
Z3	Interpreting the results and evaluation of the technical condition of motor vehicle	4,4	3,7	3,9
Z4	Adjusting the scope and methods of the repair of motor vehicles	4,1	4,0	3,1
Z5	Dismantling, verification and matching spare parts for replacement of the motor vehicle	4,4	3,5	4,4

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No.	LIST OF PROFESSIONAL TASKS	POLAND (PL)	PORTUGAL (PT)	GERMANY (DE)
Z6	Replacing the damaged assemblies and components of motor vehicle	4,5	3,7	4,2
Z7	Maintenance of assemblies and components of motor vehicles	4,1	3,8	4,3
Z8	Assessing the quality of repair and its valuation/estimated cost	4,1	3,3	3,0

2.2. Electricians

Polish employers who were asked to grade typical professional tasks of electricians in Poland regard Z2 (*implementation and running of electrical installations on the basis of technical documentation)* and Z3 (*assessing the technical condition of machinery, equipment and electrical systems after installation on the basis of measurements)* (both 4,4) as most important, followed by Z5 (*monitoring and verification of the fire protection measurements on the basis of technical documentation)* (4,3) and Z4 (*mounting of control systems, regulation and protection of machinery and electrical equipment on the basis of technical documentation)* (4,2). Z1 (*assembling and running of the machinery and electrical equipment on the basis of technical documentation*) is given an importance indicator of 3,9. The least important task to be performed is Z6 (*current maintenance)* (0,2). The lowest ranking results from the fact that Z6 is a task that was added to the list by only one of the Polish interviewees who regarded it as *very important* . In no other country employers added further tasks which they considered to be missing in the given list.

Portuguese employers do not rate any of the tasks *important* or *very important*. One should be aware of the fact that interviewees probably were allowed to double-rate single tasks because according to the results there were sometimes up to 65 approvals for a single point of the scale. This is why importance indicators are in general lower compared to the other countries. It is interesting that the whole list of tasks is primarily regarded as *relevant* and that none of the interviewees took their chance to add further tasks which they consider to be *important* or *very important*. Nonetheless, one can say that Z3 (*assessing the technical condition of machinery, equipment and electrical systems after installation on the basis of measurements)* (3,65) is the most important task for Portuguese employers followed by Z2 (*implementation and running of electrical installations on the basis of technical documentation)* and Z5 (*monitoring and verification of the fire protection measurements on the basis of technical documentation)* (both 3,4). The least important tasks are Z1 (*assembling and running of the machinery and electrical equipment on the basis of technical documentation)* (3,19) and Z4 (*mounting of control systems, regulation and protection of machinery and electrical equipment on the basis of technical documentation)* (3,07).

The answers of German employers appear to be highly uniform as well. Four out of five tasks are regarded as *important* whereas only one is ranked *very important*. Again, none of the interviewees added any further task. When looking at the importance indicators it can be seen that Z1 (*assembling and running of the machinery and electrical equipment on the basis of technical documentation)* and Z2 (*implementation and running of electrical installations on the basis of technical documentation)* are most important (both 4,4), followed by Z4 (*mounting of control systems, regulation and protection of machinery and electrical equipment on the basis of technical documentation)* (4,0). Both Z3 (*assessing the technical condition of machinery, equipment and electrical systems after installation on the basis of measurements)* and Z5 (*monitoring and verification of the fire protection measurements on the basis of technical documentation)* receive an indicator of 3,9.

In order to give an overview of the individual estimations in each of the three countries this table shows the importance indicators of the tasks Z1-Z8 for each country so that comparisons can be made quite easily.

Table 6.

No.	LIST OF PROFESSIONAL TASKS	POLAND (PL)	PORTUGAL (PT)	GERMANY (DE)
Z1	Assembling and running of the machinery and electrical equipment on the basis of technical documentation	3,9	3,2	4,4
Z2	Implementation and running of electrical installations on the basis of technical documentation	4,4	3,4	4,4
Z3	Assessing the technical condition of machinery, equipment and electrical systems after installation on the basis of measurements	4,4	3,7	3,9
Z4	Mounting of control systems, regulation and protection of machinery and electrical equipment on the basis of technical documentation	4,2	3,1	4,0
Z5	Monitoring and verification of the fire protection measurements on the basis of technical documentation	4,3	3,4	3,9

Chapter 3

Comparative analysis of the professional competences (knowledge, skills, social competence) anticipated by employers at typical jobs for the profession of electrician and automotive technician – comparison of the anticipated professional competences in Germany, Poland and Portugal and indication of the common and differentiating elements between Partner countries

Comparative analysis of the competence requirements of entrepreneurs from Poland, Germany and Portugal for the professions of electrician and motor vehicle mechanic was carried out on the basis of research conducted in the working environment, in relation to real jobs, where electricians and motor vehicle mechanics are employed. The study was conducted using a survey method with the use of diagnostic questionnaires standardized for all countries, for each profession separately. They included i.a. proposals for professional (knowledge and skills), personal and social competences, and the key competences for the above professions.

Consistency and differences in opinions of employers were analyzed in terms of importance indicator value. The rounded indicator values equal to or greater than 3.5 indicate the importance of the competences for performing professional tasks in the above professions.

The advisors/the project team from Handwerkskammer Erfurt recognized knowledge pertaining to competences as key for the vocational training of electricians and motor vehicle mechanics in Germany. Due to the fact that all elements of knowledge were classified as key, they were excluded from the study. For the same reason the K1 competence was also not surveyed among German employers.

That is why for comparative analyses it was assumed that K1 knowledge and skills, K2 knowledge for the profession of electrician and K1 and K2 knowledge for the profession of motor vehicle mechanic receive the importance indicator of "5" in German studies.

3.1 Comparative analysis of professional competences for the profession of electrician

Table 7. Degree of professional competencies in the profession of an electrician according to the opinion of employers

No.	List of professional competencies	Poland	Germany	Portugal
		Importance indicator		
K1	Installation and maintenance of electrical machinery and equipment	3.9	5.0	4.1
K2	Installation and maintenance of electrical systems	4.5	4.5	4.0

Source: Own study

Polish, German and Portuguese employers consider both professional competences in terms of installation and maintenance of electrical installations and electrical machinery and equipment to be very important (tab. 1). Because only one respondent in the survey proposed complementing the competences with assembly and installation of low voltage devices, the proposal was not taken into account.

Table 8. Degree of importance of knowledge that an electrician should have in respect of the installation and maintenance of electrical machinery and devices according to the opinion of employers

No.	Knowledge	Poland	Germany	Portugal
		Importance indicator		
1.	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.	**4.5**	**5.0**	**3.8**
2.	Electrical machinery and devices (types, characteristics, classification).	**3.6**	**5.0**	**4.2**
3.	The structure of electrical machinery (mechanical and electromagnetic).	**3.1**	**5.0**	**3.8**
4.	Technical documentation of the devices (block diagrams and guide drawings)	**4.0**	**5.0**	**3.5**
5.	The basics of electrical engineering and electronics.	**3.4**	**5.0**	**3.8**
6.	Standards and regulations for the installation of electrical machinery and equipment.	**3.4**	**5.0**	**3.9**
7.	Principles of installation and maintenance of electrical machinery/equipment	**3.8**	**5.0**	**3.6**
8.	Principles and methods of performance of electrical and mechanical connections	**4.5**	**5.0**	**3.1**
9.	Measurement instruments and methods	**3.9**	**5.0**	**4.2**
10.	Methods of locating and principles of removal of defects in the machinery and equipment	**3.6**	**5.0**	**3.7**
11.	Principles and methods of maintenance of machinery and equipment	**3.3**	**5.0**	**3.3**
12.	The basics of entrepreneurship	**2.6**	**5.0**	**2.2**
13.	Principles of starting and conducting an economic activity	**2.4**	**5.0**	**1.8**

Note: The color blue represents knowledge of minor importance - the importance indicator is equal to, greater than 3.5.
Source: Own study

Consistency of opinions

Employers from Poland, Germany and Portugal rated knowledge no. 1, 2, 4, 7, 9, 10 as important (tab. 2) in terms of installation and maintenance of electrical machinery and equipment.

Differences in the opinions of employers

According to Polish and Portuguese employers, the knowledge of the principles and methods of maintenance of machines and equipment is also of minor importance.
In the opinion of Polish employers knowledge no. 3, 5, 6, and in the opinion of the Portuguese employers - knowledge no. 8 received the lowest importance indicator values, which indicates that in the opinion of employers they are of minor importance.
Knowledge in the field of basics of entrepreneurship and the principles of starting and running a business, in the opinion of Polish and Portuguese employers (tab. 1), is of minor importance from the point of view of the performed professional tasks (an importance indicator of: 2.6, 2.2 and 2.4, 1.8 accordingly).

Table 9. Degree of importance of skills that an electrician should have in respect of the installation and maintenance of electrical machinery and devices according to the opinion of employers

No.	Skills	Poland	Germany	Portugal
		Importance indicator		
1.	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.	**4.5**	**5.0**	**3.8**
2.	Classify the electrical machinery and devices, specify their technical parameters.	**3.5**	**5.0**	**2.6**
3.	Differentiate between the parameters of elements and components of electrical equipment and determine their functions.	**3.7**	**5.0**	**3.9**
4.	Recognize the electrical machinery and devices and their elements, determine their purpose.	**3.7**	**5.0**	**3.8**
5.	Differentiate between structural elements used in electrical machinery and devices.	**3.2**	**5.0**	**3.6**
6.	Read and make drawings and diagrams of electrical machinery and devices	**4.1**	**5.0**	**3.5**

No.	Skills	Poland	Germany	Portugal
		Importance indicator		
7.	Mount systems of power supply, control, adjustment and protection of electrical machinery and devices based on the documentation.	**4.3**	**5.0**	3.2
8.	Select tools for installation of electrical machinery and devices.	**3.9**	**5.0**	3.4
9.	Perform mechanical installation of electrical and electric components.	**3.8**	**5.0**	**3.6**
10.	Check the compliance of the performed work with the documentation.	**4.0**	**5.0**	2.9
11.	Take measurements of parameters of electrical machinery and equipment.	**3.8**	**5.0**	**3.9**
12.	Locate typical damage of electrical machinery and equipment.	**3.7**	**5.0**	**4.1**
13.	Plan the sequence of actions performed during the disassembly and installation of electrical machinery and devices.	**4.0**	**5.0**	2.7
14.	Perform the replacement of worn or damaged elements and components of electrical machinery and devices.	**3.6**	**5.0**	**4.0**
15.	Perform the replacement of damaged control and protection elements of electrical machinery and equipment.	**3.8**	**5.0**	**3.6**
16	Check the correctness of the performed installation based on the documentation.	**4.1**	**5.0**	3.4
17.	Perform inspections and maintenance of electrical machinery and equipment.	**3.5**	**5.0**	3.0
18.	Check the operation of electrical machinery and equipment after installation and maintenance.	**3.7**	**5.0**	**3.5**
19.	Establish and conduct an economic activity in the electrical industry.	2.1	**5.0**	2.9

Note: The color blue represents skills of minor importance - the importance indicator is equal to, greater than 3.5.
Source: Own study

Consistency of opinions

Polish, German and Portuguese employers recognized nine (out of 19) skills in the field of installation and maintenance of machinery and electrical devices to be very important, important or significant (indicator equal to/greater than 3.5). These are skills no. 1, 3, 4, 6, 9, 11, 12, 14, 15, 18 (tab. 3).

Differences in the opinions of employers

German employers assessed the skills in the field of installation and maintenance of machinery and electrical devices as very important (an importance indicator of 5.0).

Polish employers consider electrician's skills pertaining to distinguishing construction materials used in machinery and electrical devices to be of minor importance (an importance indicator of 3.2). In the opinion of Portuguese employers, minor important skills are skills no. 2, 7, 8, 10, 13, 16, 17, 19 (tab. 3), which received an importance indicator of 2.6 to 3.4. Skills pertaining to setting up and running a business (importance indicator of 2.1 for Poland and 2.9 for Portugal), as well as knowledge from this field, received low value of the indicator. Differences of opinion arise from the fact that employers look through the prism of competences of their own employees rather than vocational school graduates/employees who can run their own business.

Table 10. Degree of importance of knowledge that an electrician should have in respect of the installation and maintenance of electrical systems according to the opinion of employers

No.	Knowledge	Poland	Germany	Portugal
		Importance indicator		
1.	Rules and regulations for occupational health and safety, fire protection, environment protection and the ergonomics during the performance of electrical installations.	**4.5**	**5.0**	**3.7**
2.	Principles and methods of releasing persons that were electrocuted from voltage and rescuing them.	**4.4**	**5.0**	**3.9**
3.	Standards and regulations governing the execution of electrical systems	**3.5**	**5.0**	**3.9**
4.	Construction and types of electrical systems	**3.9**	**5.0**	**3.9**
5.	Symbols used in technical documentations for electrical systems	**4.1**	**5.0**	**3.3**
6.	Accessories, tools and methods used during the execution of electrical systems	**4.3**	**5.0**	**4.0**
7.	Principles and methods of construction and operation of electrical systems	**4.2**	**5.0**	**3.6**
8.	Principles and methods of performance of electrical and mechanical systems connections	**4.4**	**5.0**	**3.8**
9.	Methods of locating and removing defects in the electrical system	**3.6**	**5.0**	**3.3**

No.	Knowledge	Poland	Germany	Portugal
		Importance indicator		
10.	Operation of devices, electric power systems and grids with voltage not exceeding 1kV	**3.5**	**5.0**	**3.6**
11.	Principles and methods of repairing power tools and electrical machinery in respect of the replacement of power cables with damaged insulation and the replacement of brushes in commutators	**3.3**	**5.0**	**3.4**
12.	Principles and methods of replacing bearings in power tools and induction motors, sharpening drills and cutters, other locksmith works	**2.7**	**5.0**	**2.8**

Note: The color blue represents knowledge of minor importance - the importance indicator is equal to, greater than 3.5.
Source: Own study

Consistency of opinions

Polish, German and Portuguese employers unanimously assess the importance of electricians' knowledge in the field of assembly and maintenance of electrical installations. Eight (out of 12) skills reached an importance indicator of 3.5 to 5.0 (tab. 4).

Differences in the opinions of employers

Knowledge of minor importance, according to Portuguese employers, pertains to the symbols used in the technical specifications for electrical installations (an importance indicator of 3.3) and methods of locating and removing faults in electrical installations (3.3).
Both Portuguese and Polish employers gave a low rating to the knowledge of the principles and methods of repair of power tools and electric machines in terms of replacement of power cables with damaged insulation and replacement of brushes in commutator motors (respectively: 3.4 and 3.3) and the principles and methods of replacing bearings in power tools and induction motors, sharpening drills and cutters, other locksmith works (respectively: 2.8 and 2.7). Whereas the German employers rated this knowledge as important to perform the installation and maintenance of electrical installations.

Table 11. Degree of importance of skills that an electrician should have in respect of the installation and maintenance of electrical systems according to the opinion of employers

No.	Skills	Poland	Germany	Portugal
		Importance indicator		
1.	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.	**4.6**	**4.4**	**3.1**
2.	Release persons that were electrocuted from voltage and rescue them.	**4.4**	**4.4**	**2.9**
3.	Adhere to the applicable standards and regulations in the performance of electrical systems	**3.9**	**4.4**	**3.3**
4.	Identify the type o electrical systems and characterize their structure	**4.1**	**3.9**	**3.6**
5.	Use the technical documentation of electrical systems	**4.3**	**4.3**	**3.6**
6.	Choose cables, accessories, tools and methods relevant to the performance and repair of various types of electrical systems	**4.4**	**4.1**	**3.0**
7.	Perform temporary connections	**3.8**	**4.4**	**2.6**
8.	Perform temporary systems	**3.8**	**4.4**	**2.9**
9.	Perform and repair internal electrical systems	**4.2**	**4.2**	**3.7**
10.	Perform and repair external electrical systems: teletechnical, signaling, protection of property and lightning protection	**3.8**	**3.5**	**3.9**
11.	Perform cable connections or overhead connections of buildings	**4.1**	**3.9**	**3.1**
12.	Perform connections of electrical and mechanical systems (bolted, clamp and soldered)	**4.0**	**4**	**3.2**
13.	Check the correctness of operation of internal and external electrical systems	**4.0**	**4.1**	**3.3**
14.	Locate and remove defects in internal and external electrical systems	**3.8**	**4.2**	**4.0**
15.	Operate devices, electric power systems and grids with voltage not exceeding 1kV	**3.7**	**3.9**	**3.6**
16.	Use simple operation and maintenance documentation of electrical machinery and devices	**4.0**	**4.3**	**3.4**
17.	Repair power tools and electrical machinery, replace power supply cables with damages insulation, replace brushes in commutators.	**3.2**	**3.8**	**3.5**
18.	Replace bearings in power tools and induction motors, sharpen drills and cutters, other locksmith works	**2.7**	**3.5**	**2.8**

Note: The color blue represents skills of minor importance - the importance indicator is equal to, greater than 3.5.

Source: Own study

Consistency of opinions

Consistent opinions of employers from Poland, Germany and Portugal pertain to six skills (out of 18). Skills no. 4, 5, 9, 10, 14, 15 were considered to be very important for the performance of assembly and maintenance of electrical installations (tab. 5).

Polish and German employers have converging opinions regarding sixteen skills (out of 18). They consider skills 1-16 (tab. 5) to be important for the performance of assembly and maintenance of electrical installations.

Differences in the opinions of employers

According to Polish and Portuguese employers, skills of minor importance are:

- replacing bearings in power tools and induction motors, sharpening drills and cutters, other locksmith works (skill 18 - respectively: 2.7 and 2.78).

In addition, Portuguese employers recognized skills no. 1-3, 6-8, 11-13, 16 (tab. 5) as of minor significance for the performance of assembly and maintenance of electrical installations (an importance factor of 2.88 to 3.38).

Whereas Polish employers assessed the skills involving repairing power tools and electric machines, replacement of power cords with damaged insulation, replacement of brushes in commutator motors as insignificant (an indicator of 3.2).

3.2. Comparative analysis of personal and social competencies for the profession of electrician

Table 12. The degree of importance of personal and social competencies relevant to the profession of electrician, according to opinions of employers

No.	Competencies personal and social	Poland	Germany	Portugal
		Importance indicator		
1.	He/she bears responsibility for the execution of tasks	**4.5**	**3.6**	**3.6**
2.	He/she is creative and consistent in the execution of tasks	**3.4**	**3.8**	**3.1**
3.	He/she respects the professional confidentiality	**3.8**	**3.9**	**2.9**
4.	He/she has the ability to assess his/her actions and actions of their team and take responsibility for their consequences	**4.1**	**3.6**	**3.8**
5.	He/she works partially on his/her own and takes on a cooperation in the organized conditions	**4.2**	**3.9**	**3.4**
6.	He/she recognizes his/her own educational needs, updates their knowledge and improves professional skills	**3.6**	**3.8**	**4.2**
7.	He/she can cope with stress	**3.4**	**3.8**	**2.8**
8.	He/she can negotiate the terms of arrangements	**2.7**		**1.8**

Note: The color blue represents personal and social competences of minor importance - the importance indicator is equal to, greater than 3.5.
Source: Own study

Consistency of opinions

Employers from Poland, Germany and Portugal gave a hight rating to the personal and social competences (tab. 6) pertaining to responsibility for the performance of tasks (an importance indicator of: 4.5, 3.6, 3.6 respectively), evaluation of their own and their team's activities and taking responsibility for their consequences (an importance indicator of: 4.1, 3.6, 3.8 respectively), recognition of their own educational needs, updating their knowledge and perfecting professional skills (an importance indicator of: 3.6, 3.8, 4.2 respectively).

Converging opinions are also presented by both Polish and German employers when it comes to the need for the employees to have the following personal and social competences:

- maintenance of professional secrecy (an importance indicator of: 3.8 and 3.9 respectively)

- performing work partly independently and taking up co-operation in organized conditions (an importance indicator of: 4.2 and 3.9 respectively).

Differences in the opinions of employers

Personal and social competencies regarding creativity, consistency in the execution of tasks (importance indicator of 3.4 and 3.1), coping with stress (3.4 and 2.8) and negotiating terms of arrangements (2.7 and 1.8), were considered minor or redundant by Polish and Portuguese employers (table 6).

Portuguese employers gave a low rating also to competences in the field of maintenance of professional secrecy (an importance indicator of 2.9) and performing work partly independently and taking up co-operation in organized conditions (an importance indicator of 3.4).

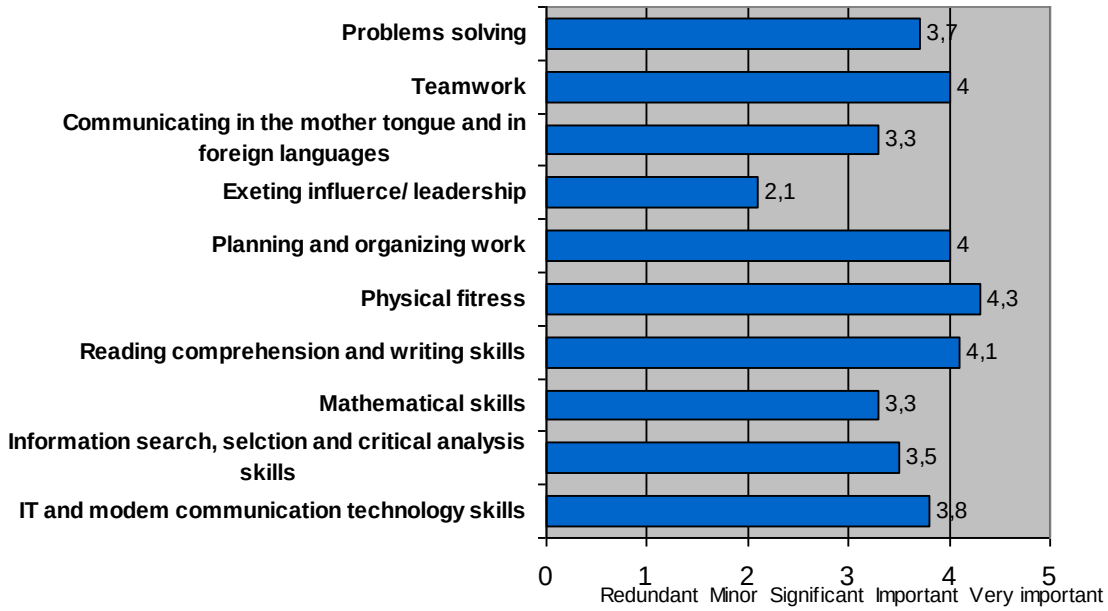
3.3. Comparative analysis of key competences for the profession of electrician

Table 13. The degree of importance of key competencies relevant to the profession of electrician, according to opinions of employers

No.	Key competences	Poland	Germany	Portugal
		Importance indicator		
1.	Problems solving	**3.7**	**4**	**3.9**
2.	Teamwork	**4.0**	**3.8**	**3.2**
3.	Communicating in the mother tongue and in foreign languages	**3.3**	**3.5**	**2.7**
4.	Exerting influence/leadership	**2.1**	**2.8**	**2.7**
5.	Planning and organizing work	**4.0**	**3.7**	**3.1**
6.	Physical fitness	**4.3**	**3.8**	**3.4**
7.	Reading comprehension and writing skills	**4.1**	**3.4**	**3.3**
8.	Mathematical skills	**3.3**	**3.7**	**4.0**
9.	Information search, selection and critical analysis skills	**3.5**	**3.6**	**2.7**
10.	IT and modern communication technology skills	**3.8**	**3.4**	**2.1**

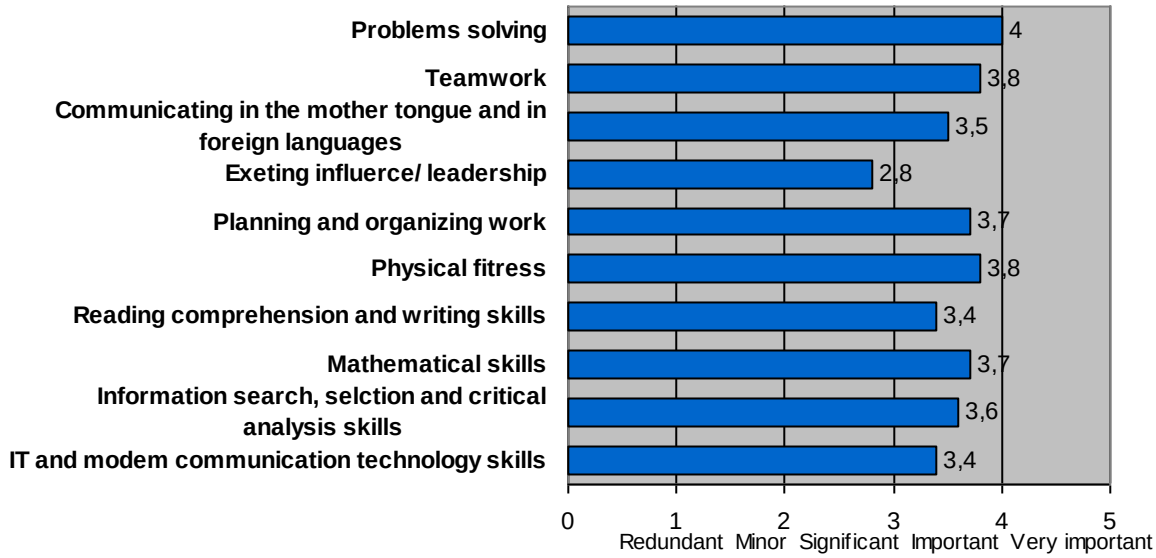
Source: Own study

Graph 1. Key competencies profile for the profession of an electrician - Poland



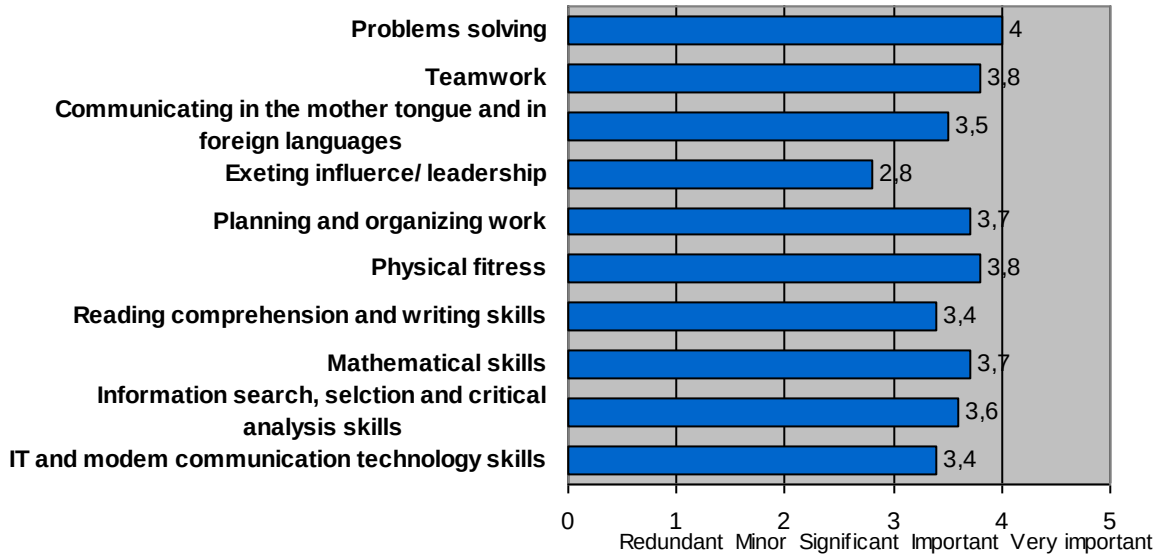
Source: Own study

Graph 2. Key competencies profile for the profession of an electrician - Germany



Source: Own study

Graph 3. Key competencies profile for the profession of an electrician - Portugal



Source: Own study

3.4. Comparative analysis of professional competences for the profession of motor vehicle mechanic

Table 14. Degree of professional competencies in the profession of vehicle mechanic according to the opinion of employers

No.	List of professional competencies	Poland	Germany	Portugal
		Importance indicator		
K1	Fault diagnosis in a vehicle	4.6	4.3	4.0
K2	Repair of components and assemblies of motor vehicles	4.6	4.3	4.0

Source: Own study

Polish, German and Portuguese employers considered both professional competences of the motor vehicle mechanic as important for the performance of professional tasks (tab. 8). Single respondents proposed in addition the following competences: handling specialized diagnostics systems.

Table 15. The degree of importance of knowledge that a motor vehicle mechanic should have in the diagnosis of failures of a motor vehicle according to the opinion of employers

No.	Knowledge	Poland	Germany	Portugal
		Importance indicator		
1.	Rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection in the diagnosis of components and assemblies of motor vehicles.	**4.3**	**5.0**	**3.5**
2.	Diagnostic and repair documentation	**4.2**	**5.0**	**4.1**
3.	Classification and identification of motor vehicles	**3.9**	**5.0**	**2.9**
4.	Construction and principles of operation of components and assemblies of motor vehicles of various types	**4.3**	**5.0**	**3.7**
5.	Basics of technical drafting	**3.4**	**5.0**	**2.2**
6.	The basics of electrical engineering and electronics	**3.7**	**5.0**	**2.9**
7.	Tools and measuring instruments to perform motor vehicles diagnostics	**4.1**	**5.0**	**3.6**

No.	Knowledge	Poland	Germany	Portugal
		Importance indicator		
8.	Methods of performing the diagnosis of motor vehicles	**4.0**	**5.0**	**4.3**
9.	Types of measurements and diagnostic testing of motor vehicles	**4.0**	**5.0**	**3.7**
10.	Principles of interpretation of the results of diagnostic tests	**4.1**	**5.0**	**3.6**
11.	Computer programs for the diagnosis of components and assemblies of motor vehicles	**4.0**	**5.0**	**3.2**
12.	Road traffic regulations and driving techniques	**2.8**	**5.0**	**2.1**
13.	The Basics of an economic activity in the automotive industry	**2.8**	**5.0**	**2.5**

Note: The color blue represents knowledge of minor importance - the importance indicator is equal to, greater than 3.5.
Source: Own study

Consistency of opinions

All employers agree that knowledge no. 1, 2, 4, 7 – 10 (tab. 9) is important for diagnosing faults in a motor vehicle. Furthermore, Polish and German employers agree in rating of knowledge no. 1, 3, 6, 11 (tab. 9).

Differences in the opinions of employers

According to Polish and Portuguese employers, knowledge no. 5, 12, 13 is of minor importance.

According to Portuguese employers, of minor significance for the performance of professional tasks is the knowledge pertaining to classification and identification of motor vehicles (an importance indicator of 2.9) and the knowledge of computer programs for the diagnosis of components and assemblies of motor vehicles (an importance indicator of 3.2).

Table 16. The degree of importance of skills that a vehicle mechanic should have in the diagnosis of failures of a motor vehicle according to the opinion of employers

No.	Skills	Poland	Germany	Portugal
		Importance indicator		
1.	Compliance with rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection in the diagnosis of components and assemblies of motor vehicles	**4.4**	**4.4**	2.5
2.	Preparation of a service order of a motor vehicle to be diagnosed	**3.5**	**4.2**	**3.3**
3.	Classification of motor vehicles	**3.6**	**4.3**	**3.7**
4.	Characterizing the structure of motor vehicles and explaining the operation of components and assemblies of these vehicles	**4.1**	**4.1**	**3.5**
5.	Observation of the standards concerning a technical drawing, machine parts, construction materials and consumables	**3.8**	**4.2**	**2.7**
6.	Identification of elements and electrical and electronic systems	**4.1**	**4.3**	**3.2**
7.	Application of tools and measuring instruments to perform motor vehicles diagnostics	**4.1**	**4.5**	**3.7**
8.	Selection of methods and determination of the scope of the diagnosis of components and assemblies of vehicles	**4.1**	**4.1**	**3.6**
9.	Performance of the diagnosis of motor vehicles with the use of measuring instruments (motors, system of chassis, vehicle body, tires)	**4.4**	**4.5**	**3.5**
10.	Interpretation of the results of the diagnostic testing of motor vehicles	**4.3**	**4.4**	3.4
11.	Use of computer programs for the diagnosis of motor vehicles	**4.1**	**4.5**	3.1
12.	Use of road traffic regulations and vehicle drivers	2.9	**4.3**	2.4
13.	Establishing and conducting an economic activity	2.7	**4.3**	2.5

Note: The color blue represents skills of minor importance - the importance indicator is equal to, greater than 3.5.
Source: Own study

Consistency of opinions

Converging opinions of employers pertain to the importance of skills no. 3, 4, 7, 8, 9 (tab. 10) in terms of diagnosis of failures in motor vehicles,

Employers from Poland and Germany considered skills no. 1, 2, 5, 6, 10, 11 (tab. 10) to be significant.

Differences in the opinions of employers

In the opinion of Polish and Portuguese employers, of minor significance are the skills pertaining to the application of road traffic regulations and driving techniques, and establishing and conducting an economic activity.

Only Portuguese employers considered skills no. 1, 2, 5, 6, 10, 11 to be of minor importance for diagnosis of failures in motor vehicles (importance indicators from 2.4 to 3.4).

Table 17. The degree of importance of knowledge that a motor vehicle mechanic should have in the repair of components and assemblies of motor vehicles according to the opinion of employers

No.	Knowledge	Poland	Germany	Portugal
		Importance indicator		
1.	Rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection in the repair of components and assemblies of motor vehicles.	**4.1**	**5.0**	**4.0**
2.	Catalogs and manuals for operation of motor vehicles	**3.8**	**5.0**	**3.8**
3.	Basics of technical drafting	**3.5**	**5.0**	**3.5**
4.	Construction and principle of operation of motor vehicles (drive system, brake system, steering system, bearing elements and wheel-axle assemblies of motor vehicles, wheels and tires, bodies of motor vehicles)	**4.5**	**5.0**	**2.8**
5.	Basic knowledge of engines	**4.3**	**5.0**	**4.2**
6.	The technology of repair of motor vehicles	**4.3**	**5.0**	**3.8**
7.	Principles and scope of performance of the maintenance of passenger vehicles	**4.1**	**5.0**	**3.0**
8.	Price list of repair of components and assemblies of motor vehicles.	**2.9**	**5.0**	**2.8**

Note: The color blue represents knowledge of minor importance - the importance indicator is equal to, greater than 3.5.
Source: Own study

Consistency of opinions

All employers named knowledge 1, 2, 3, 5, 6 (tab. 11) as important in terms of repair of components and assemblies of motor vehicles. Furthermore, Polish and German employers considered as significant the knowledge pertaining to construction and principle of operation of motor vehicles (an importance indicator of: 4.5 and 5.0 respectively) and the principles and scope of performance of the maintenance of motor vehicles (an importance indicator of: 4.1 and 5.0 respectively).

Differences in the opinions of employers

Portuguese employers considered knowledge no. 4 and 7 (tab. 11) to be of minor significance. Knowledge pertaining to the prices of repair of components and assemblies of motor vehicles was rated by Polish and Portuguese employers as of minor significance (an importance indicator of: 2.9 and 2.8 respectively).

Table 18. The degree of importance of skills that a motor vehicle mechanic should have in the repair of components and assemblies of motor vehicles according to the opinion of employers

No.	Skills	Poland	Germany	Portugal
		Importance indicator		
1.	Observing rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection in the repair of components and assemblies of motor vehicles	**4.1**	**4.4**	**3.4**
2.	Using the technical documentation of machinery and devices	**4.0**	**4.3**	**2.5**
3.	Using the technical drawing during assembly and installation works	**3.7**	**4.3**	**3.1**
4.	Locating damaged components and assemblies of passenger vehicles	**4.6**	**4.5**	**3.6**
5.	Selecting the methods of repair for motor vehicles	**4.4**	**4.4**	**3.7**
6.	Disassembling components and assemblies of motor vehicles	**4.2**	**4.4**	**3.2**
7.	Choosing components or assemblies of motor vehicles or their substitutes for replacement	**4.1**	**4.5**	**3.8**

No.	Skills	Poland	Germany	Portugal
		Importance indicator		
8.	Replacing damaged components and assemblies of motor vehicles using workshop tools and equipment	**4.4**	**4.3**	**3.5**
9.	Choosing consumable materials	**4.0**	**3.5**	**2.4**
10.	Controlling the quality of repair of motor vehicles	**4.2**	**4**	**3.9**
11.	Performing periodic technical maintenance of motor vehicles	**4.1**	**4.3**	**3.6**
12.	Assessing the quality of performed repair and determining its costs	**3.6**	**3.8**	**3.1**
13.	Preparing a cost estimate of repair	**2.9**	**3.5**	**3.8**

Note: The color blue represents skills of minor importance - the importance indicator is equal to, greater than 3.5.
Source: Own study

Consistency of opinions

Skills no. 4, 5, 7, 8, 10, 11 (tab. 12) are important to employers employing motor vehicle mechanics. Of equal importance to employers from Poland and Germany are skills no. 1, 2, 3, 6, 9, 12. In turn, employers from Germany and Portugal found the skill of drawing up a cost estimate of repairs as important as well (an importance indicator of 3.5 and 3.8 respectively).

Differences in the opinions of employers

Polish employers found drawing up a cost estimate for repairs to be a skill of minor significance for a vehicle car mechanic (an importance indicator of 2.9).
Employers from Portugal rated skills no. 1, 2, 3, 6, 9 and 12 as of minor significance for the performance of professional tasks (tab. 12).

3.5. Comparative analysis of personal and social competencies for the profession of motor vehicle mechanic

Table 19. The degree of importance of personal and social competencies relevant to the profession of motor vehicle mechanic, according to opinions of employers

No.	Competencies personal and social	Poland	Germany	Portugal
		Importance indicator		
1.	He/she is responsible for the execution of tasks related to the diagnosis and repair of motor vehicles	**4.4**	**3.9**	**3.4**
2.	He/she is creative and consistent in the execution of tasks	**4.0**	**3.9**	**3.3**
3.	He/she respects the professional confidentiality	**3.8**	**4.2**	**3.9**
4.	He/she can assess his/her actions and actions of their team and take responsibility for their consequences in the repair of motor vehicles	**4.1**	**3.9**	**3.9**
5.	He/she works partially on his/her own and takes on a cooperation in the organized conditions	**4.2**	**4.1**	**3.6**
6.	He/she recognizes his/her own educational needs, updates their knowledge and improves professional skills	**3.9**	**4.2**	**3.7**
7.	He/she can cope with stress	**3.9**	**4**	**2.7**

Note: The color blue represents personal and social competences of minor importance - the importance indicator is equal to, greater than 3.5.
Source: Own study

Consistency of opinions

Employers identified personal and social competences no. 3, 4, 5, 6 (tab. 13) to be of importance for employing an employee. Competences no. 1, 2, 7 are also important for the profession of motor vehicle mechanic from Poland and Germany.

Differences in the opinions of employers

In the opinion of employers from Portugal, competences no. 1, 2, 7 are of minor significance for the performance of professional skills of a motor vehicle mechanic.

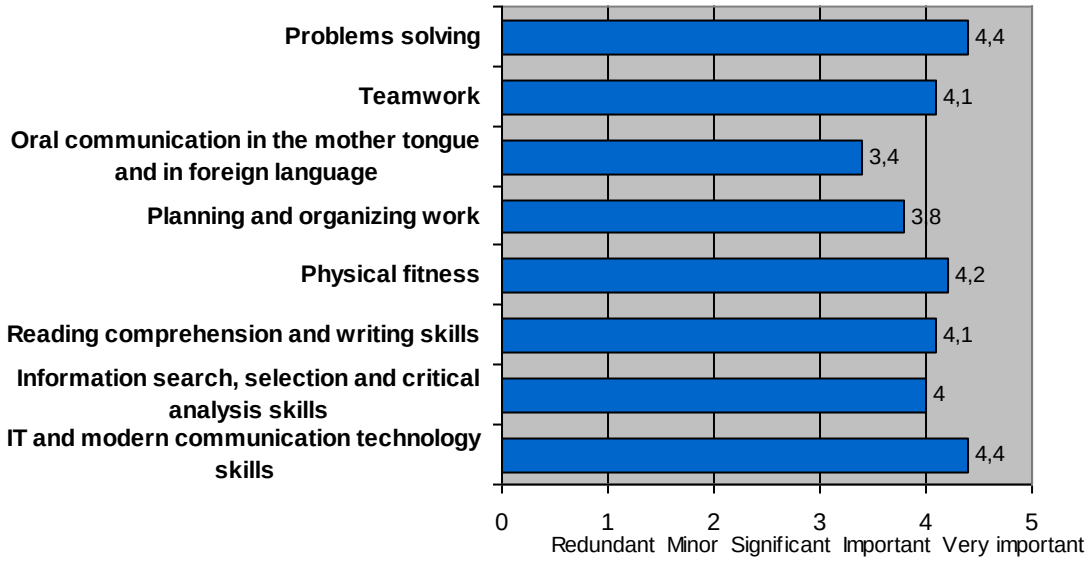
3.6. Comparative analysis of key competences for the profession of motor vehicle mechanic

Table 20. The degree of importance of key competencies relevant to the profession of motor vehicle mechanic, according to opinions of employers

No.	Key competences	Poland	Germany	Portugal
		Importance indicator		
1.	Problems solving	**4.4**	**3.9**	**3.6**
2.	Teamwork	**4.1**	**4.1**	**3.8**
3.	Oral communication in the mother tongue and in foreign language	**3.4**	**3.7**	**3.4**
4.	Planning and organizing work	**3.8**	**3.9**	**3.5**
5.	Physical fitness	**4.2**	**3.9**	**3.6**
6.	Reading comprehension and writing skills	**4.1**	**3.5**	**2.8**
7.	Information search, selection and critical analysis skills	**4.0**	**3.8**	**3.0**
8.	IT and modern communication technology skills	**4.4**	**4.1**	**3.2**

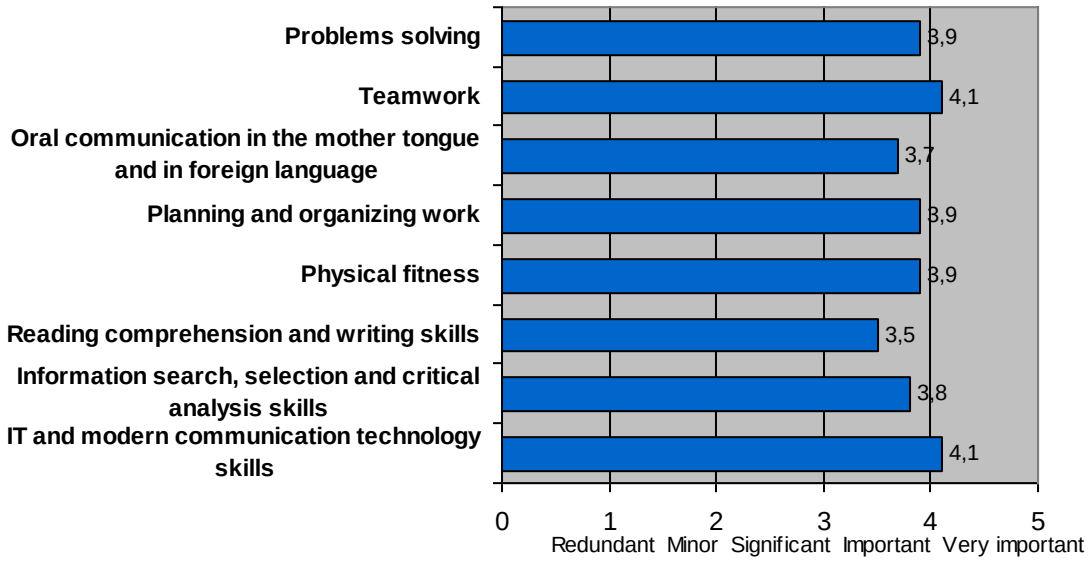
Source: Own study

Graph 4. The profile of competencies that are key for the profession of a motor vehicle mechanic - Poland



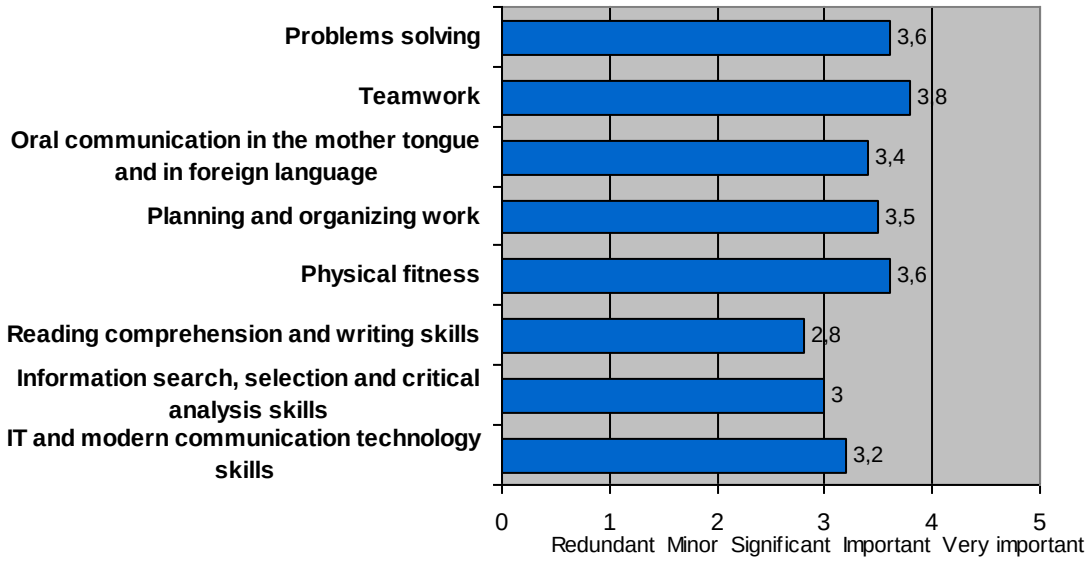
Source: Own study

Graph 5. The profile of competencies that are key for the profession of a motor vehicle mechanic - Germany



Source: Own study

Graph 6. The profile of competencies that are key for the profession of a motor vehicle mechanic - Portugal



Source: Own study

3.7. Summary

The comparative study of professional, personal and social, as well as key competences was performed on the basis of studies performed among representatives of employers employing electricians and motor vehicle mechanics in Poland, Germany and Portugal. The analysis showed both convergence in the opinions of employers, as well as differences in the assessment of the significance of the competences of workers employed for typical jobs in the above professions.

The consistency/divergence of the opinions on the professional competences expected by employers from each partner country stems from their experience in hiring employees, company size, varying degrees of industry specialization, demand for the product/service or innovation of the company. These depend on the specificity of the local, regional or national labor market and the degree of technological development in a given country.

Divergences in the employers' expectations can also stem from the differing manners of description of professional competences each of these countries utilizes.

The comparative analysis gives a general idea of the significance of the professional competences in the analyzed professions, expected by employers in individual countries. It may serve as the basis for further studies of the demand among employers for employees with particular competences.

Chapter 4

Comparative analysis of case studies within the scope of employer opinions regarding the competences of graduates seeking for a job in companies in Germany, Poland, Portugal

Table 22.

PORTUGAL (PT)	POLAND (PL)	GERMANY (DE)
The employers hire electricians and electro technicians from all around Portugal. They give them the chance and opportunity to grow and develop by allowing them to travel and visit branches and offices in other European countries. Some companies are run by a women which for Portuguese standards is something new. They cooperate with schools, institutions and associations which place the stagers there. Manager and owner of the company underlined the fact that students who have stages in the company lack practical knowledge. One director stated that the students need more practice at school or outside it so that is why she is so open to place the stagers in her own company. She sees and understands the needs and desires of students to develop. Similarly to other companies, the owner told us that the biggest problem he is facing nowadays with his employees is the lack of motivation. According to him, majority of well-qualified employees are leaving Portugal to work in foreign countries within their fields of study. He also told us that through international contact	**Some companies** employ workers who are valued for their technical skills and such personal competencies as responsibility, creativity, consistency in the execution of tasks, as well as key competencies: physical fitness, skills of using modern information and communication technologies. The current knowledge and technical skills are acquired and improved by employees in trainings funded entirely by the employer. The company does not recruit new employees. The number of employees is optimal. Graduates of vocational schools of motor engineering seeking work do not meet the expectations of the employer, according to the charge-hand being interviewed, most of all due to the lack of technical knowledge and commitment to the work. The company does not cooperate with vocational schools of motor engineering in organizing and conducting internships and apprenticeships. Other companies participate in vocational education by hiring students from the vocational for internships and apprenticeships.	As a result it can be said that the adaptions which – thanks to the project manager – could be made, contributed a lot to the success of this study and hence to the conclusions that could be drawn. Adaptions were necessary in order to receive reliable data. Of course professional competencies of the two differing professions cannot be compared. But instead, comparing results with the other participating countries will surely bring to light a number of interesting facts. When looking at *key competencies* it is rather interesting that *leadership skills* are ranked lowest both for car mechanics and electricians. This could result from the fact that general requirements stipulate further training for managers such as business administrator (German *Fachwirt*), master craftsman (German *Meister*) or management expert (German *Betriebswirt*). German professionals are not supposed to be involved in leadership without gaining any further qualifications. Another interesting aspect is the highly different perception of

PORTUGAL (PT)	POLAND (PL)	GERMANY (DE)
he is trying to invest in the employees by allowing them to participate in workshops, show initiative by coming up and realising their own ideas. The enterprises we interviewed cooperate with graduates of vocational courses performed by local schools. The owners and managers told us that first, by offering the stages to the schools and the students he has the chance to create and bring up his future employees. Car mechanic workshops do not have any problems to employ the students who underwent a training course in the profession of a car mechanic. The interviewees pointed out the problem of the fact that students and graduates have too much theoretical knowledge and not enough practical skills. The schools are lacking spaces to prepare the students from the practical side for the future profession and when the graduates enter the company, although, they are very compassionate, they have problems with adjusting to the system of work, they lack the knowledge on proper tools and they need to be properly trained in order to perform the job properly.	There is a natural rotation of workers in the company. In consideration of the above, the work positions are supplemented with new workers. However, these are not graduates from vocational schools, as every worker needs to assure continuity of services and sales with their work, so they need to have professional experience allowing to take up vocational activities immediately after being employed. When hiring, apart from experience, the company requires full professional competences associated with the work position. Social skills in the scope of responsibility for the entrusted tasks and team work skills are also expected. One director gives a positive rating of the professional competences gained as part of vocational education. Not all students have sufficient professional skills associated with the universality of the services provided by the company, and the scope of practical vocational education (apprenticeship) is not sufficient to form them properly. There is also a deficiency in social skills in terms of involvement in work pursuant to the company's needs and a lack of	*modern information and communication technologies* of interviewees from the two different professions. Referring to car mechanics *modern information and communication technologies* are regarded as highly relevant whereas electricians are apparently not supposed to fulfil these to such an extent. One more remarkable feature refers to the general estimation of items regardless of categories. Only very few interviewees rated single items as *not important* (=2) or unnecessary (=1). This means that fortunately the survey meets German conditions quite well which of course has to be ascribed to the adaptions.

PORTUGAL (PT)	POLAND (PL)	GERMANY (DE)
	care for the entrusted tools and order in the work place. A graduate's willingness to learn and involvement in works associated with getting acquainted with specific solutions in the company is of great importance when hiring them.	

Chapter 5

Summary and list of common and differentiating elements between Partner countries

The comparative analysis of educational effects in Poland with regard to the expectations of employers in Germany and Portugal was conducted in the German Federal States based on the interviews with 30 employers of automotive industry companies and 33 of electrical industry companies, whereas in Poland, respectively, 30 and 31. The persons, who were interviewed, answered the questions from the scope of common workplaces or worksites as well as from the scope of typical work actions. Additionally, the interviewees answered the questions regarding the requirements on professional competences, knowledge and skills, personal and social competences and key competences.

The educational effects applicable for the qualification distinguished for the profession of automotive technician in Poland i.e. Diagnostics and maintenance of parts and assemblies of automotive vehicles defined for research needs as professional competences expected by German and Portuguese employers and presented as: Diagnostics of automotive vehicle faults and Repair of parts and assemblies of automotive vehicle gained a 4.3 grade from the assessment of German employers' expectations with the use of five-point scale, from unnecessary (=1) to key (=5), meaning that this is very important and a 4.03 grade from employees employed in Portuguese companies. German interviewees mentioned also other professional competences as important. These are: use of diagnostic systems, specialized localization of faults, good knowledge of the use of various diagnostic systems and welding education, what analogically we can find in Polish educational system in the following activities, learned and performed by the students or employees: use of computer programs for diagnostics of automotive vehicles, localization of faulty parts and assemblies of automotive vehicles based on measurements and results of diagnostic research and selection of methods and defining the range of automotive vehicle repairs. Regarding the acceptance level of knowledge graded as key within all elements in case of Germany and skills connected with Diagnostics of automotive vehicle faults as key skills, i.e. having the best grade - 4.5, were provided by German instructors and entrepreneurs: tools and measurement devices required for performance of automotive vehicle diagnostics - which are also acknowledged as the most significant factor in Portuguese companies - and types of measurements and diagnostic tests of automotive vehicles as well as computer programs for the diagnosis of components and assemblies of automotive vehicles. Very important skills required by German entrepreneurs

and having grades 4.4 and 4.3 are: regulations regarding the safety, fire protection, environment protection and ergonomics within the scope of diagnostics of automotive vehicle components as well as rules of interpreting the diagnostic test results, classification and identification of automotive vehicles, basics of electrical engineering and electronics and basics of entrepreneurship in car industry. The educational effects of Polish educational institutions, preparing for M.18 qualification for the profession of automotive technician , analogous with knowledge and skills expected by German and Portuguese employers and related to Diagnostics of automotive vehicle faults, are: use of tools and measurement devices for the performance of diagnostics of automotive vehicles, performance of measurements and diagnostic research of automotive vehicles and interpretation of its results, use of computer programs for diagnostics of automotive vehicles, selection of methods and definition of scope of diagnostics for parts and assemblies of automotive vehicles. In second place, in terms of importance, German and Portuguese entrepreneurs require from their future Polish employees the following qualifications, which can be achieved by them in Polish schools, practical training centers, continuing education centers or other educational institutions: taking automotive vehicles for the diagnostics and drawing up the documentation of this acceptance, preparation of the automotive vehicle for the diagnostics, characterizing the structure of automotive vehicles and explaining the rules of operation of the components and assemblies of these vehicles as well as definition of components and assemblies of the automotive vehicle. The educational effects common for all professions existing in Polish educational system, i.e. related to the health and safety protection, gained the grade 4.4 among German interviewees, while Portuguese instructors has assigned a lower grade to them – 3.49. However, both grades were ranked second when taking into consideration the importance in terms of the level of knowledge and skills regarding the Fault diagnosis of automotive vehicle, similar to the basics of entrepreneurship in car industry and analogically to establishing and conducting an economic activity. The road traffic rules and car driving techniques considered by German interviewees as very important and with smaller level of importance among Portuguese interviewees, define the skills forming a basis for education i.e. for the profession of automotive technician in Poland, as well as skills of using the terms from electrical engineering and electronics.

In terms of competences linked with the category Repairs of parts and assemblies of automotive vehicles during the research of the importance it was demonstrated that the greatest attention was focused in Portuguese companies on basic knowledge about engines, structure and operation of automotive vehicles (drive system, braking system, steering system, bearings and propulsion elements of automotive vehicles, wheels and tires, automotive vehicle body) and on price list of services related to repair of parts and assemblies of automotive vehicles. When taking into consideration the skills, according to the interviewees the most significant from them are: choosing components or assemblies of automotive vehicles or their substitutes for replacements and preparing a cost estimate of repair, while choosing consumable materials is non-significant. Similarly the highest grade among German entrepreneurs, instructors and employees was obtained by skills of locating damaged components and assemblies of automotive vehicles and choosing components or assemblies of automotive vehicles or their substitutes for replacements together with the elements regarding compliance with the regulations of safety and environment protection. All of these skills comply with the following educational effects relevant for the qualification distincted for the profession of automotive technician in Polish educational system: locating damaged components and assemblies of automotive vehicles based on measurements and results of diagnostic testing, estimating the costs of repair of automotive vehicles, selection of method and definition of the scope of repair of automotive vehicle, disassembly and verification of components and assemblies of automotive vehicles, choosing components or assemblies of automotive vehicles or their substitutes for replacements.

In terms of personal and social competences, German and Portuguese interviewees are very consentaneous. The most significant selected competences with grade 4.1-4.2 in Germany and 3.9 in Portugal are: respecting professional confidentiality, recognition of learning needs, updating and improving the knowledge and professional skills, responsible evaluation of team actions together with consequences. The personal and social competences created and developed in Polish educational institutions and corresponding to competences existing in German and Portuguese educational system are: respecting professional confidentiality, updating the knowledge and improving professional competences, cooperation within the team and being responsible for the performed actions.

The above mentioned teamwork defined for the needs of research as a teamwork characterizing a Polish student and the future employee is considered in German and Portuguese companies and entrepreneurships as a key competence. When taking into consideration other highest graded key competences, there is a consistency among the interviewees from Germany and Portugal. All of the employees mentioned: the ability to use modern information and communication technologies, problem solving, planning and organizing work and motor efficiency. The future Polish employee must be creative and consistent in the implementation of tasks, shall use modern computer programs supporting the performance of the given tasks and shall predict the effects of the performed actions. The school has a task to prepare the student to communicate in the mother language and in foreign languages. This key competence received a 3.7 grade according to the German entrepreneurs and employees and 3.4 grade according to the Portuguese employees.

The educational effects corresponding to the distincted qualification for the profession of electrician in Poland, i.e. E.7. Installation and maintenance of machinery and electrical equipment and E.8. Installation and maintenance of electrical installations, defined for the research needs as professional competences predicted by Portuguese and German employees and presented as: Installation and maintenance of machinery and electrical equipment (within the German educational system there is no such competence for the profession of electronics engineer with energy and construction technologies specialization) and Installation and maintenance of electrical installations have obtained grades within the evaluation process of Portuguese entrepreneurs' expectations in the following order: 4.07 and 3.97 from 5-point scale (from unnecessary (=1) to key (=5)), which means that they are very important and grade 4.5 indicating the level between very important and key (applies to competence: Installation and maintenance of electrical installations) from employees hired for German companies.

Regarding the knowledge acceptance level from the scope of installation and maintenance of machinery and electrical equipment, the most significant, in case of Portugal, are devices and measurement methods and knowledge about the machinery and electrical equipment (the elements linked with knowledge are considered in Germany as having the greatest

significance, that is why the interviewees in the research focused only on evaluation of the professional competences with reference to abilities and skills).

The most important requirements required by Portuguese entrepreneurships and having the grades of 4.15, 4.06 and 3.9 are respectively: Locating typical damages of machinery and electrical equipment, performing the replacement of used and damaged parts and components of machinery and electrical equipment and distinguishing the differences between the parameters of elements and assemblies of machinery and electrical equipment and defining their functions. The educational effects in Polish educational institutions preparing for the E.7 qualifications for the profession of electrician, convergent with the knowledge and skills expected by the employers from Portugal and related to the Installation and maintenance of machinery and electrical equipment are: Locating typical damages of machinery and electrical damages, differentiating the parameters of elements and assemblies of machinery and electrical devices, defining the functions of elements and assemblies used in machinery and electrical devices, replacement of used or damaged elements and assemblies of machinery and electrical devices. In accordance with the survey performed among the employees from Portuguese companies within the area of Installation and maintenance of electrical installations we can see that there is a growth in level of importance of knowledge about the equipment, tools and methods used for electrical installations. The future employee hired in Portuguese entrepreneurship must have a very good knowledge about the structure and types of electrical installations, rules and methods of conduct in case of electrocution as well as standards and regulations regarding the fitting of electrical installations. Polish schools and educational institutions, implementing the core curriculum for the profession of electrician, prepare the syllabus, based on which the set of educational effects representing a framework for education within this profession is created. The educational effects common for the employees within the scope of electrical engineering-electronics area, which includes the profession of electrician, fulfilling the expectations of Portuguese employers and considered as the most important by them, the following correspond to them within the Polish educational system: selection of methods and devices for measurement of parameters of electrical and electronic systems, selection of tools and measurement devices and performance of tasks from the scope of mechanical installation of electrical and electronic

elements and devices as well as works within the scope of manual treatment; whereas the educational effects corresponding to the qualification of Installation and maintenance of electrical installations: differentiating the wires used in electrical installations, recognition of installation equipment, recognition of light sources and fixtures, definition of technical parameters of electrical installations and installation equipment, verification of conformity of the assembly of electrical installation with the wiring diagram. After finishing the vocational education, the graduates of Polish schools and educational institutions are prepared within the scope of Occupational health and safety defined as educational effects common for all professions. That is why they could easily fulfill the expectations within the scope of these professional competences, not only of Portuguese but also of German entrepreneurships. Interviewees from German companies and work places placed the highest grades – on the same level – following 5 professional competences within the area of Installation and technical maintenance of electrical installations corresponding to the Polish educational effects within the area of Occupational health and safety: organizing the worksite in accordance with the regulations regarding safety, fire protection, environment protection and ergonomics during the performance of actions on electrical installations, methods of releasing and rescuing the people in case of electrocution. Compliance with the standards and regulations regarding the fitting of electrical installations as a fourth mentioned skill has an identical equivalent in Polish educational system, when taking into consideration the educational effects common for the professions within the scope of electrical engineering-electronics area. On the other hand, the professional competences, highly graded by German interviewees and defined as performance of temporary connections and performing temporary installations, do not exist directly in Polish educational system as educational effects for the profession of electrician. Very important skills, required by German entrepreneurs and having 4.3 and 4.2 grades, are: Use of technical documentation of electrical installations, use of basic technical documentation of machinery and electrical equipment; production and assembly of indoor electrical installations and locating and repairing faults in internal and external electrical installations. The following educational effects in Polish educational system, common for the professions within the scope of electrical engineering-electronics area, correspond to the skills regarding the technical documentation: use of technical

documentation, illustrated part catalogues and maintenance manuals and compliance with the standards within such scope, whereas for the rest correspond the educational effects relevant to the E.8 qualification (Installation and maintenance of electrical installations) distincted from the profession of electrician, i.e. the recognition of typical damages of electrical installations, selection of tools for the installation and removal of electrical installation elements, performance of replacement of damaged wires and assemblies of electrical installations.

The most significant personal and social competences recognized by Portuguese pollers are: He/she recognizes his/her own learning needs, updates his/her knowledge and improves his/her professional skills; He/she can evaluate his/her actions and the actions of his/her team and takes responsibility for the consequences and He/she feels responsible for the performed tasks. On the other hand the most important competences for German entrepreneurs and employees are: He/she respects professional confidentiality and He/she works well both on his/her own and within a group. In second place the interviewees from Germany provided 3 elements of social and personal competences that gained the same importance grade. These are: he/she is creative and consistent in the implementation of tasks, he/she recognizes his/her own learning needs, updates his/her knowledge and improves his/her professional skills and he/she deals well with stress. Personal and social competences formed and developed within Polish educational institutions and corresponding to competences existing in German and Portuguese educational system are: creativity and consequences within the performance of tasks, propensity to change, respecting professional confidentiality, updating the knowledge and improving the professional skills, teamwork, taking responsibility for the performed actions and dealing well with the stress.

When taking into consideration the highest graded key competences, there is a huge concurrence of acceptance level between the interviewees from Germany and Portugal. The key competence with the highest importance indicator – key competence graded 4.0 among German entrepreneurs and employees is problem solving, furthermore teamwork, motor efficiency with 3.8 grade, as well as planning and organizing work and mathematic skills that obtained 3.7 mark. The highest mark – 4.01, was granted by interviewees from Portuguese entrepreneurships and companies to mathematic skills. Problem solving was considered in

Germany as the most important, while in Portugal it was placed second with 3.92 grade. The motoric efficiency, teamwork and planning and organizing work obtained grades: 3.45, 3.18 and 3.11 respectively. The future Polish employee has to be creative and consistent in the implementation of tasks. The educational effects common for all professions, educational effects for the professions within the frameworks of electrical engineering-electronics and the educational effects proper for the qualifications distinguished for the profession of electrician, on which the Polish school is placing the greatest effort, are based on problem solving, planning and organizing work, as well within a team. During the first year of education in syllabus for the profession of electrician the students are prepared for gaining common knowledge, participating in theoretical activities, learning mathematic skills needed for future practical education. During the subsequent years of education together with the growth of number of practical education subjects there can be seen a gradual increase of students' motor efficiencies, which are verified within the practical part of the exam confirming the professional qualifications.

The following comparative analysis of educational effects in Poland performed with reference to the expectations of employers from Germany and Portugal demonstrates a very huge consistency between the expectations of employers and the effects of formal education obtained by the graduates for the profession of electrician and automotive technician. Research testing in German and Portuguese entrepreneurships, oriented on measurement of the acceptance level of professional tasks, professional competences, knowledge and skills, personal and social competences and key competences was used for this analysis. Almost in each case, all of these elements existing within the research, including all of the competences, knowledge and skills verified in our partner countries, have their analogous equivalents within the educational effects common for all professions, educational effects common for the professions within the frameworks of electrical engineering-electronics and mechanical/mining-metallurgical area as well as the educational effects appropriate for the qualifications distinguished for the profession of electrician and automotive technician existing in Polish educational system.

The differences between importance grades of professional competences, knowledge and skills, personal and social competences and key competences for the profession of

electrician i.a.w. the opinions of employers from Germany, Portugal and Poland can be interpreted as the following: In comparison to employers from Germany and Portugal, he lowest grade of knowledge within the scope of installation and maintenance of machinery and electrical devices in accordance with the opinion of Polish employers applies to type, characteristics and structure of machinery and electrical devices. This is due to slightly bigger significance of professional competences related to installation and maintenance of electrical installations for Polish entrepreneurs. The electrical industry branch is currently one of the most developing areas of technology that also requires specialized technical staff. More often we may hear about intelligent installations and electrical systems. On the other hand, Portuguese entrepreneurs digress from the importance assessment of German and Polish partners within the knowledge area regarding the rules and methods of making electrical and mechanical connections. The explanation of such behavior of interviewees from Portuguese companies is that the instructors employed in entrepreneurships and companies conduct a training regarding this subject by themselves with regard to the newest standards and regulations. Analogically, you may explain the importance grade of skills that an electrician shall require within the scope of installation and maintenance of machinery and electrical devices. Classification of machinery and electrical devices, definition of their technical parameters, verification of conformity of performed works with the documentation and planning the schedule of activities during the process of removal and installation of machinery and electrical devices shall lie within the competence of people responsible for training and preparing a new employee for a job in Portugal.

The level of knowledge on symbols used in technical documentation regarding electrical installations also differs within the assessment of Portuguese employer. According to his opinion it is sufficient for the future employee to supplement his knowledge regarding his worksite during proper training. In the opinion of Portuguese employers, the most divergent importance grade that shall be obtained by the electrician within the scope of installation and maintenance of electrical installations is a grade regarding the performance of temporary connections. This educational effect does not exist in Polish educational system, although Polish entrepreneurs evaluate its usefulness much higher. From this you may draw conclusions that due to performance transiency such competence does not have such high

priority. The least graded key competence by Portuguese interviewees, in comparison to partners from Germany and Poland, is the ability to use modern information and telecommunication technologies. This is connected with greater adhesion to traditional work methods, in cases where this is unnecessary.

Longer way of introducing new technologies and a fear related to their costs is taking place in this case.

While analyzing the knowledge that shall be obtained by automotive technician within the scope of fault diagnostics of automotive vehicles, we end up with a conclusion that low degrees of importance among Portuguese entrepreneurs and mostly diverging from German and Polish partners within the areas of: classification and identification of automotive vehicles, basics of technical drawing and basics of electrical engineering and electronics, are caused by putting greater emphasis within this scope on mechanical elements than on electrical elements. As long as it is understandable that lower importance attachment to classification and identification of various types of automotive vehicles accessible on the market, very low rank of basics of technical drawings, thanks to which the schematics and full documentation required for fault diagnostics is created, is incomprehensible. Contrary to German employers, Portuguese and Polish employers given high grades to the knowledge about the traffic rules and driving techniques that shall not at all constitute an employment criterion. Similar as in case of the profession of electrician, knowledge about the basics of entrepreneurship and business activity from electrical or car industry branch does not have such a significance for interviewees from Portugal or Poland as for the German partner. The knowledge from this scope seems to have a low significance on this stage of professional activity. Analogous situation can be observed when taking into consideration the importance level of skills that shall be obtained by automotive technician within the scope of fault diagnostics of automotive vehicles. The use of traffic rules and driving techniques and undertaking and conducting business activity are, according to the opinion of Portuguese and Polish employers, the skills determinative of the employment. Significantly lower importance level from the scope of compliance with occupational health and safety rules, fire protection, ergonomics, environment protection within the scope of diagnostics of parts and assemblies of automotive vehicles and compliance with standards regarding the technical drawing, parts

of machines, structural and operational materials can be explained by the case that instructors employed in Portugal entrepreneurships and companies perform trainings by themselves on this subject in accordance with the newest standards and regulations. We come to an analogous conclusion while analyzing the importance of knowledge that shall be obtained by Portuguese automotive technician within the scope of repair of parts and assemblies of automotive vehicles within the structural area and operational rules of automotive vehicles (drive system, braking system, steering system, bearing and driving elements of automotive vehicles, wheels and tires, bodies of automotive vehicles). The price list for services regarding the repair of parts and assemblies of automotive vehicles as an element of knowledge for the profession of automotive technician gained a very low grade among Portuguese and Polish entrepreneurs. The reason for such state of affairs can be that at car industry plants such activities are performed by other service workers. The low importance level of skills among Portuguese interviewees within the scope of repair of parts and assemblies of automotive vehicles within the area of use of technical documentation of machinery and devices and selection of operational materials can also indicate that other company employees can be involved in performance of these actions. When it comes to personal and social competences, in comparison to German and Polish entrepreneurs the least amount of attention is paid by Portuguese entrepreneurs to the stress phenomenon. It can indicate that greater care is introduced to work efficiency and effectivity of the employee. The lowest graded key competences by Portuguese interviewees in comparison to German and Polish partners are skills regarding the use of modern information and communication, what was already explained based on the example of the profession of electrician, the ability of comprehension reading and writing and the ability of searching, selecting and critical analysis of information. It shall be assumed that the mentioned skills are treated as supporting the key competences.