Competence Matrix 'Electrical Engineering/Electronics'

Based on the results of the VQTS II project. For further information see www.vocationalqualification.net; **VQTS II Competence Matrix 'Electronics/Electrical Engineering' Overlapping Italy, Netherland and Germany**

Competence Areas (core work tasks)	**Steps of Competence Development**			
1. Preparing, planning, mounting and installing electrical and/or electronic systems for buildings and industrial applications	He/She can prepare and carry out simple electrical and electronic installations (e.g. cables, electrical outlets, connection and distribution systems, modular electronic components, computer components) as well as carry out and check the necessary wirings and mountings.	He/She can plan, prepare and connect electrical and modular electronic installations. (e.g. energy supply in private and business premises, incl. lighting; alternating and three-phase current; electronic systems as units, wireless LAN, multimedia systems). He/She can advice the costumer and select the best implementation according to customer specifications.	He/She can plan complex electrical and/or electronically networked installations (e.g. systems of energy distribution, building management systems / KNX, regulation and monitoring systems, building access systems, RFID-systems etc.) and fully wire them. He/She can configure, service and diagnose the functionality of the installation according to customer requirements and for this purpose can use computer-assisted tools.	
2. Inspecting, maintaining and servicing electrical and/or electronic systems and machinery	He/She can carry out basic and scheduled maintenance tasks, inspections and checks at electrical and/or electronic equipment according to maintenance schedules and predefined instructions (e.g. checking voltage tolerances, changing wearing parts in industrial plants, switching and control systems, electrical machinery, computer systems). He/She can use the measuring and testing tools necessary for it.	He/She can carry out and document preventative maintenance and alignment tasks at electrical and/or electronic industrial appliances and systems according to established methods of the quality assurance (e.g. continuous monitoring of a CNC machine tool).	He/She can analyse and determine availability and condition of electrical and/or electronic systems. He/She can analyse influencing factors on reliability and performance of electrical/electronic systems and find causes of malfunctions (e.g. leakage current analysis, power factor correction, EMC analysis).	He/She can develop and document maintenance and inspection methods for electrical/electronic systems based on production and service process analysis as well as on quality management and customer requirements. He/She is able to develop related maintenance, inspection and quality assurance plans (e.g. optimizing MTBF of a production line, planning reserve power supply).
3. Setting up, putting into operation and adjusting electrical and/or electronic systems	He/She can set up, adjust and put into operation electrical and/or electronic systems (e.g. allocating frequency channels for a TV set, basic settings of a frequency converter or a thermo relay for a motor) following customer requirements and instructions from the technical documentation.	He/She can obtain and set system test parameters for set up and operation of electrical and electronic systems and select and carry out test procedures for installation and adjustment (e.g. adjusting interfaces in multimedia system, sensitivity setting of alarm equipment, elevator control unit).	He/She can select, set up and adjust electrical and/or electronic systems and their control including accompanying sensors and actuators according to requirement analysis (e.g. energy supply systems, drive systems, electrical machinery, radio relay systems).	
4. Designing, modifying and adapting wirings and circuit boards for electrical and/or electronic systems including their interfaces	He/She can modify, plan and build up simple electrical/electronic circuits according to standards and guidelines (e.g. wiring for rooms, connection diagram of basic motor circuits, simple operational amplifier applications, small programmable control units).	He/She can modify, plan and build up standard electrical/electronic appliances according to customer requirements and official regulations (e.g. fire-warning devices, layouts for electrical/electronic wirings with the help of CAD programmes, energy supply in private and business premises).	He/She can design, build up and improve electrical/electronic applications and its interfaces together with experts working in interdisciplinary teams according to emc standards and confirming test (e.g. electronic control circuits and equipment, microcontroller applications, PLC and related software).	He/She can design, build up and configure devices and facilities, units for process control systems including related programming and considering complex system requirements (e.g. controlled drive systems, process monitoring, automated production line, real time microcontroller applications for car control, GSM data transmission for monitoring and remote control).

5. Developing custom designed electrical and/or electronic projects	He/She can develop and propose solutions for simple electrical/electronic system based on customer requirements (e.g. lighting installations, power supply unit, basic automation and control systems).	He/She can design electrical/electronic systems (e.g. PLC program for industrial applications, microcontroller application, ensuring expansion capability) and provide the necessary documentation (operational, maintenance, safety instructions, function, integration and acceptance tests)	He/She can develop technical solutions for electrical and/or electronic systems and applications (e.g. microcontroller board for heating and air condition, RFID access system, new production line...) and provide appropriate documentation and customer training.	
6. Supervising and supporting work and business processes including quality management	He/She can check process steps in the production with suitable process tools (e.g. PPS, ERP, MRP) and carry out quality controls.	He/She can evaluate results of the process monitoring with software tools and determine quality assurance actions (work, production and time schedules).	He/She can develop controlling methods in the production (PPS, MRP, ERP) and process planning/control and supervision (CAP) and implement these with the help of software supported systems.	
7. Installing, configuring modifying and testing of application software for setup and operation of electrical and/or electronic systems	He/She can install programmes for hardware and software environments and carry out simple configuration tasks as well as updates (e.g. starter software, graphical programming for measurement and automation).	He/She can select hardware and software for production systems following the business requirements and test programmes.	He/She can integrate hardware and software into existing system environments and use simulation and diagnostic programs (e.g. implement and adapt a driver for a CAD/CAM interface).	He/She can combine hardware and software to networked system environments and carry out network specific checks of all signals and adapt by means of software (e.g. OPC-Server, process control system).
8. Diagnosing and repairing of electrical/electronic systems and equipment	He/She can carry out standardized test procedures and diagnostic methods using wiring diagrams and test tools and carry out simple repairs at electrical/electronic systems (e.g. power measurement, level measurement).	He/She can use testing and diagnostic tools as well as expert systems for the fault diagnosis at electrical/electronic systems up to the component level and carry out the necessary repairs (e.g. software control test, spectrum analyzer).	He/She can select and use diagnostic methods for complex electrical/electronic systems and carry out preventative measures for the avoidance of disturbances and malfunctions in arrangement with customers (e.g. detection of bit error rate, overvoltage protection analyse).	He/She can carry out system analyses (FMEA, FTA etc.) of electrical /electronic systems, determine error types and develop suitable diagnosis and repair methods

First part of VET (first year or first and second year of VET)

Second part of VET (second year or second and third year of VET)