

Representation of the vocational education and training metal worker

1. Job profile
2. Vocational framework
3. Apprenticeship certification examination
4. Inter-company instruction for vocational training

1. Job profile

The metal worker works in companies of the manufacturing industry, e.g., to smiths, metal construction companies or locksmith's shops. He produces metal constructions for different ranges of application. E.g., gates, structural designs, superstructures as well as windows and doors. Also the installation of mechanical and electric locking systems belongs to his assignments. Main part of the metal worker is the preparation of the material after agreed subscriptions as well as the manufacture of the construction. Besides, various sweat processes are used for the material connection. Finished work pieces take a cleaning and passivate, e.g., by polish, varnish, seal, to enhance the appearance.

Duration of the vocational training: 3 years

2. Vocational framework

Contents of the vocational training:

Common skills, knowledge and abilities:

1. vocational training, labour legislation and collective bargaining law,
2. construction and organisation of the education company,
3. security and health protection at the work,
4. environment protection,
5. company, technical and customer-oriented communication,
6. planning and regulating of work routines; checking and assessing the results of working,
7. quality management,
8. proving and measure,
9. mating,
10. manual metal cutting and transforming,
11. machine treatment,
12. keeping in good condition and maintain operating resources,
13. welding, thermal separation,
14. manual and machine transforming of metal sheets and profiles,
15. electrical engineering,
16. treating and protecting of surfaces,
17. transporting units and assemblies,
18. dismantling and mounting of units and assemblies

Skills, knowledge and abilities in the field construction technology:

1. mounting and checking of hydraulic, pneumatic and electrotechnical units,
2. arrange workplaces in construction zones,

3. produce metal or steel constructions,
4. producing and fastening of units and construction elements in buildings,
5. mounting and dismantling of metal or steel constructions,
6. mounting, examining and adjusting of systems,
7. keep constructions of the metal or steel buildings in good condition;

3. Apprenticeship certification examination

The apprenticeship certification examination exists of 2 timewise separated parts. By the apprenticeship certification examination it is to be ascertained, whether the examinee has acquired the professional legal capacity. During the apprenticeship certification examination should be proved that the examinee owns the skills necessary for occupation, knowledge and abilities and controls, as well as that he or she is familiar with the essential teaching material taught in the vocational school lessons. The education order is to be laid. Besides, qualifications which were already an object of part 1 of the apprenticeship certification examination should be included in part 2 of the examination only, when it is necessary for the statement of the occupational ability.

With the inquiry of the whole result part 1 of the apprenticeship certification examination is weighted with 30 percent and part 2 of the examination with 70 percent.

Part 1

Part 1 of the apprenticeship certification examination should take place before the end of the second vocational training year. Part 1 of the examination applies to the skills attached performed for the first three education half-years, knowledge and abilities as well as on in the occupational school lessons to provided teaching material, as far as it is essential for the professional training.

Part 1 of the examination passes work order of the exam area. For this exam area the following default exists:

1. The examinee should prove, that he
 - a) apply manual and machine treatment technologies and formings, soluble and insoluble ones joining technologies,
 - b) consider the security and the health protection at the work,
 - c) make work schedules and test protocols and measuring protocols,
 - d) make use of technical plans, plan working steps, define work equipment, accomplish measurements as well as production sequences, in particular to consider the connection of technology, labour organisation, environment protection and economic efficiency and
 - e) explain specialised problems and their solutions, indicate for the working assignment the essential technical backgrounds as well as justify the approach by the realisation of their working assignment
2. To the examinations the following activities are to be laid:
Producing and checking a functioning work piece
3. The examinee should attend a working assignment which corresponds to a customer's order and lead a situative professional discussion referring on it which can exist of several discussion phases
4. The examination time is seven hours; within this time the professional discussion should be done during 15 minutes in total.

Part 2 in the field Construction technology

Part 2 of the apprenticeship certification examination applies to the attached performed skills, knowledge and abilities as well as on the teaching material provided in the occupational school lessons, as far as he is essential for the professional training.

Part 2 of the examination exists of the exam areas:

- (1) customer's order,
- (2) construction technology,
- (3) functional analysis and
- (4) economics and social studies.

(1) For the exam area customer's order the following default exists:

1. The examinee should prove, that he
 - a) can independently plan and move work routines and shared assignments aim-oriented considering more financially, more technically, of organizational and temporal default, material allot,
 - b) produces and mounts prefabricated pieces and productions as well as build up control-technical systems or can repair and start running;
2. To the examination area the following activities are to be laid:
 - a) makes to a metal or steel construction or from shares of it as well as construction documentation and
 - b) Mounting and commissionings or repairing a control-technical system including working planning and documentation
3. The examinee should prepare two working assignments which correspond to customer's orders and document as well as hold outgoing from one or both carried out working assignments one professional discussion; with the discussion the examinee should point out in particular, that he or she can accept customer's orders and, besides, recognise customer's problems and customer requests, can explain specialised customer problems and their solution;
4. The working assignment is to mark with number 2a with 50 percent, the working assignment with number 2b with 20 percent and the professional discussion with 30 percent;
5. The examination time amounts 16 hours; within this time the discussion has to be done in approx. 30 minutes.

(2) For the exam area construction technology the following default exists:

1. The examinee should prove, that he
 - a) considers the job safety and environment protection regulations,
 - b) plans the use of materials and auxiliary materials as well as tools and machines and to assign to the respective procedures,
 - c) makes problem analyses,
 - d) selects the components necessary for the production, tools and aids considering the technical rules,
 - e) plans arrangements having regard to the company procedures, evaluates and changes documents, does calculations as well as shows functional connections of a metal or steel construction and
 - f) analyse functional problems with tied up technical information, technological and mathematical circumstances, can evaluate and show suitable procedures of solutions
2. to the exam area the following activities are to be laid:

describe the production of a metal or steel construction construction under application of different manufacturing methods and the quality management;
3. the examinee has to do case-related assignments under aid of practise-customary bases in writing work and document the results in practise-customary form;

4. the exam time amounts two hours.

(3) For the exam area functional analysis the following default exists:

The examinee should prove, that he

- a) does problem analyses,
 - b) selects to the mounting, commissioning or maintenance necessary mechanical and electric one components, tools and aid considering from technical rules,
 - c) adapts mounting plans, plans working steps considering the job safety,
 - d) plans measures to the mounting, commissioning or maintenance taking into account company procedures, changes as well as explains functional connections of systems and
 - e) analyse functional problems with tied up technical of information, technological and mathematical circumstances analyse, can evaluate and show suitable procedures of solutions
2. to the exam area the following activities are to be laid:
describe the mounting, commissioning or maintenance and systematic containment of mistakes in a technical system after given requirements;
3. the examinee has to do case-related assignments under aid of practise-customary bases in writing work and document the results in practise-customary form
4. the exam time amounts two hours.

(4) For the exam area economics and social studies the following default exists:

1. The examinee should prove that he can show and assess general economic and social connections of the occupational world and professional life;
2. the examinee should work on case-related assignments in writing;
3. the exam time amounts one hour.

Weighting and passing regulation

The exam areas in the field Construction technology have to be weighted as follows:

1. exam area work order 30 percent,
2. exam area customer's order 35 percent,
3. exam area construction technology 12.5 percent,
4. exam area functional analysis 12.5 percent,
5. exam area economics and social studies 10 percent.

The apprenticeship certification examination in the field Construction technology is passed, if the performances

1. in the whole result of part 1 and part 2 with at least "enough",
2. in the result of part 2 of the apprenticeship certification examination with at least "enough",
3. in the exam area customer's order with at least "enough",
4. in at least two of the remaining exam areas of part 2 with at least "enough" and
5. in no exam area have been valued by part 2 with "insufficiently".

4. Inter-company instruction for vocational training

Course: Bases of the metal treatment

Course duration: 1 week, trainees of the 1st vocational training year

Course contents:

Examining and measuring (share = 20%)

- check evenness and roughness of work pieces
- check form exactness of work pieces
- examine surfaces for quality, attrition and damage
- measure lengths in particular with line graduations and caliper
- examine work pieces with square
- tear and granulate Relation lines, drilling middles and outlines in work pieces considering the material qualities and the following treatment

manual metal cutting and transforming (share = 50%)

- select tools considering the procedures and materials
- polish and deburr surfaces and forms in work pieces of iron and non-ferrous metals even, angular and parallel after general tolerance on measure
- distinguish metal sheets, pipes and profiles of iron, non-ferrous metals, plastics after scribing with the handsaw
- produce internal threads and external threads produce
- sharpen tools after intended purpose

Machine treatment (share = 30%)

- determine and adjust machine values of stationary machines, assign and apply coolant and lubricant
- adjust and strain work pieces and units considering the form and the material qualities
- select, adjust and strain tools considering the treatment procedures and the materials to be worked on
- produce drillings after general tolerance and situation tolerance by drilling in the full, drilling out and profile depressions as well as rubbing drillings up to the dimension exactness IT 7

Course: Treatment and transforming of metal sheets and profiles

Course duration: 1 week, trainees of the 1st vocational training year

Course contents:

Planning and operating work routines (share = 10%)

- chose and guarantee working steps and work routines according to functional, organizational, technical criteria
- material, tools and aids
- prepare workplace considering the work order
- control, assess and protocolling the results of working check
- introduce and present results of working

Manual and machine treatment and transforming of metal sheets and profiles (share = 70%)

- chose and guarantee working steps and work routines according to functional, organizational, technical criteria
- select, adjust and strain tools considering the treatment procedures and the materials to be worked on
- cut sheet metals and plastic pre-product with hand and hand alligator shears
- transform metal sheets, pipes and profiles of iron and non-ferrous metals
- cut and bend / transform metal sheets and profiles considering the material, the material surface, the work piece form and the connection mass

Dismantling and mounting of units and assemblies (share = 20%)

- make units or assemblies by mechanical mating
- check situation of units and assemblies, measure situation divergence
- examine units of surface state from the mating face and form tolerance as well as fix in appropriate position for mounting
- produce screw combinations considering the particles order and the torque and protect with protection elements
- dowel units form-conclusively and strength-conclusively considering the state of the mating face
- dismantle assemblies

Course: mating and transforming (metal active gas welding - MAG welding)

Course duration: 1 week, trainees from the 1st vocational training year

Course contents:

mating (share = 90%)

fix units and assemblies as well as mate metal sheets and profiles of steel up to a thickness from 5 mm by glaze welding in different sweat positions, including

- chose joint type considering the materials and the work pieces
- select sweat equipment, additives and auxiliary materials
- fix setting values
- prepare work pieces and joints for the welding
- prepare serviceability

Transform (share = 10%)

transform metal sheets, pipes and profiles of iron and non-ferrous metals

Course: mating and thermal separation (manual metal arc welding - MMA welding)

Course duration: 1 week, trainees from the 2nd vocational training year

Course contents:

metal sheets and profiles of steel separate thermally (share = 10%)

fix units and assemblies of steel, weld metal sheets and profiles in different positions with stick electrode (share = 80%)

including

- chose joint type considering the materials and the work pieces
- select sweat equipment, additives and auxiliary materials
- fix setting values
- prepare work pieces and joints
- prepare serviceability

examine weld joint, in particular on lack of fusion, welding penetration, skimming inclusions, joint superelevation and pores and posttreats as well as checks the form exactness of the work piece (share = 10%)

Course: gas-shielded welding

Course duration: 1 week, trainees from the 2nd vocational training year

Course contents:

mating

fix units and assemblies as well as mate metal sheets and profiles of iron and non-ferrous metals by glaze welding in different sweat positions, including chose joint type considering the materials and the work pieces

- select sweat equipment, additives and auxiliary materials
- fix setting values
- prepare work pieces and joints for the welding
- prepare serviceability

Course: tungsten inert gas welding - TIG welding

Course duration: 2 weeks, trainees from the 2nd vocational training year

Course contents:

- briefing: attend job safety and accident prevention with the TIG welding, know regulations and guidelines
- TIG welding apparatus and principle of the TIG welding, sweat sticks, protective gases, sweat electricity springs, avoid weld mistakes and get to know machine disturbances as well as risks of mistake in the basic material
- apply sweat caterpillars in PA, PF and PC position on metal, metal thickness 1 - 3 mm
- fillet welds in the corner kick weld in PB and PF position, metal thickness 1 - 3 mm
- butt weld in the dull push in PA position, metal thickness 1 - 3 mm
- butt weld in the dull push in PF position, metal thickness 1 - 3 mm
- fillet welds in the t-push in PB position, metal thickness 1 - 3 mm
- fillet welds in the t-push in PF position, metal thickness 1 - 3 mm
- fillet welds in the t-push in PD position, metal thickness 1 - 3 mm
- fillet welds in the lap joint in PB position, metal thickness 1 - 3 mm
- perform practical exercises

Assessment assignments:

- butt weld in the dull push in PA position: metal thickness 1 - 3 mm
- butt weld in the dull push in PF position: metal thickness 1 - 3 mm
- fillet weld in the t-push in PD position: metal thickness 1 - 3 mm
- filled weld in the lap joint in PB and PF position: metal thickness 1 - 3 mm
- technical instruction

Course: mating and adjusting (metal active gas welding – MAG welding)

Course duration: 1 week, trainees from the 2nd vocational training year

Course contents:

Sweat preparation, quality inspection (share = 5%)

planing sweat works

- sweat instructions (WPS) and apply sweat result plans
- plan effect from along- , across diminutions and corner diminutions and their effects on a whole unit
- checking weld joint concerning given quality criterions

mating (share = 90%)

fix units and assemblies as well as mate metal sheets and profiles of un-and low-alloyed steels mating by gas-shielded welding in different sweat positions, including chose joint type considering the materials and the work pieces

- select sweat equipment, additives and auxiliary materials
- fix setting values
- prepare work pieces and joints for the welding
- prepare serviceability

adjustice (share = 5%)

mechanical and thermal adjustice of sweat constructions

Course: Bases of the electrical engineering and preventive measures

Course duration: 1 week, trainees from the 2nd vocational training year

Course contents:

Electrotechnical bases (share = 10%)

- know electrotechnical basic dimensions tension, electricity, resistance and performance as well as those units
- know application and service of multimetre and Duspol
- implement tension measurement with the Duspol as well as tension and resistance measurements with multimetres

Electrotechnical and electronic construction elements (share = 20%)

examine function of electric construction elements and behaviour in easy switching circuits (small tension)

production from electric connections (share = 15%)

- know types of cables, marking, cross section and electricity charge
- work on different types of cables; produce connections and junctions with different cables and connecting systems

Protection against dangerous body streams (share = 15%)

- know meaning of German Institute for Standardization (DIN) VDE regulations
- know general requirements, protection from direct touching, protection from indirect touching
- know preventive measures in TN, TT and IT systems
- do measuring-technical exercises to preventive measures

Grounding, ground wire, potential balance (share = 10%)

know grounding constructions, operational grounding, ground wire concept, cross sections, potential balance grounding wire and markings (DIN VDE 0100, part 540)

Wire and cables protection(share = 5%)

- know electricity loading capacity, electrical overload and short circuit protection of wires and cables
- know protective organs

Functional test of electric constructions (share = 25%)

- know nameplates, machine markings and machine protection classes (DIN VDE 0710)
- distinguish three-phase alternating current motor from alternating current motor;
- know terminal block designations (VDE 0570 / DIN 42401)

Course: Mounting and checking of control-technical systems

Course duration: 1 week, trainees from the 2nd vocational training year

Course contents:

Mounting, examining and adjusting of systems / produce and mount mechanical equipment

mount, fix and examine systems with electric, pneumatic and hydraulic impulses and document functions, in particular examine in the interfaces more mechanically, pneumatic, hydraulic and electric assemblies, prepare serviceability

Mounting and checking of hydraulic, pneumatic and electrotechnical units

- mount, connect, supply with energy, examine and adjust electric, pneumatic and hydraulic units mount according to plans and regulations
- examine and adjust functions, limit and repair mistake considering the interfaces

Course: Treatment of light metal and high-grade steel

Course duration: 2 weeks, trainees from the 2nd vocational training year

Course contents:

mating (share = 5%)

connect metals and plastics by adherence

Machine treatment (share = 30%)

span and adjust profiles and units:

- produce cuttings produce in metal sheets and profiles from high-grade steel by boring, saws and milling
- punch and release metal sheets and profiles
- whet work pieces, in particular of aluminium and high-grade steel

production of metal or steel constructions (share = 50%)

- apply building regulations
- produce movable units from profiles of different materials, the matching fitting shares with and without devices
- produce solid to be installed units from profiles of different materials with and without devices

Fastening of units and construction elements to buildings (share = 15 %)

- check suitability of the subsurface for the connection
- fasten units by plugs and screws considering the building supervisory registration and the length expansion

Course: mount, adjust and examine locking and security systems

Course duration: 1 week, trainees from the 2nd vocational training year

Course contents:

Mount of mechanical equipment

examine function of the systems and produce considering

types of lock

norm measurement of locks

lock protections

locking system

metal mount of locks

door locks

Bibliography

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