



Association Wiap International

Education for every one , Ausbildung für alle



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Module description for the profession Polypractician

The profession includes some positions from the previous teaching programs from the machinist, mechanic and electrician. However, more adapted to the today's modern technologies.

Our modules have been set with a 10-it distance. The free places are for more intermediate modules in other advanced professional courses. This 10-it should remain distances.

The whole project was prepared for 4 languages. Thus, the educational program in different countries with the same system is executable.

The module assembly is aware mixed as the occupation of Polypractician.

MODULE 10 SAFETY AT WORK

Security in 2013 has a much higher priority than 30 years ago. The module is adapted to today's standards. Wear safety glasses why? Where? Wear safety shoes why?

- 10.1 work safety
- 10.1.1 safety Signs
- 10.1.1.1 safety Signs
- 10.1.1.2 prohibition Signs
- 10.1.1.3 warning Signs
- 10.1.1.4 emergency sign

- 10.1.2 accident causing

- 10.1.3 safety precautions
- 10.1.3.1 dangers must be eliminated
- 10.1.3.2 danger areas must be screened and referred
- 10.1.3.3 danger must be prevented

Reference Textbook: F.K.M. From page 82 to page 83

- 10.2 Wi_8_f_120_safety_roules
- 10.3 Wi_8_f_120_a Safety Wiap
- 10.4 Wi_8_f_120_a_safety_rules_en_vn_r2_gerry_letter - security rule in the electrical, mechanical and other works.

MODULE 20 FILES, SAWS, CHISELLING, MARKING, SCRAPING AND DRILLING

Very important for the daily life of a Polypractitioner: all types of crafts from the module 20

20.0 EP_C2_P3_P_25r1_Manuelle_Fertigung - Tools for Needlework (hammer, screwdriver, pliers, wrench, vise, sawing). Their application. Scribing, graining, license plate. work rule

20.0.1 EP_C2_P3_P25_r1_Module10_tools for hand work (hammer, screwdriver, pliers, wrench, vise, sawing). Their application. Scribing, graining, license plate. work rule

- 20.1 Files
 - 20.1.1 Files Slash
 - 20.1.2 filing forms
 - 20.1.3 filing work
 - 20.1.4 filing machines

- 20.2 saws
 - 20.2.1 sawing by hand
 - 20.2.2 cutting free of the saw blade
 - 20.2.3 sawing machines
 - 20.2.3.1 sawing bracket
 - 20.2.3.2 band sawing machines
 - 20.2.3.3 sawing machines

- 20.3 Chiseling
 - 20.3.1 form of chisel

- 20.4 scribing
 - 20.4.1 preparatory work for scribing
 - 20.4.2 Tools for scribing

- 20.5 scraping
 - 20.5.1 scraping tools
 - 20.5.2 basic shape of the scraper blade
 - 20.5.3 scraping a flat surface
 - 20.5.4 bedding-in of sliding bearing

- 20.6 drilling
 - 20.6.1 drilling and tension size
 - 20.6.2 spiral drill
 - 20.6.3 grinding of spiral drill
 - 20.6.4 Materials for twist drills
 - 20.6.5 tool wearing
 - 20.6.6 tool selection and drilling problem-
 - 20.6.7 Further drilling and drilling tools

Reference Textbook: F.K.M. 47 Edition page 196, 211,2 14, 217

F.K.M From page 122 to page 128

MODULE 30 MEASURE METRIC INCH, NONIUS, MICROMETER, WATERLEVEL

The handling of measuring instruments, temperature effects, cleanliness and discipline with the measuring tools.

Very important in order to be well acquainted. A vernier reading to 0.02 mm accuracy. Why has a micrometer a plastic or wooden handle? What temperature should have a good measurement space? At a level which represents an accuracy of 0.05 mm? And much more.

Described in the training documents EP C1 P1_P50 and P51_P67

30.1 EP_C1_P1_P50_r2_Messen - Fundamentals of metrology. Lengths test equipment (scale) Calipers. Micrometer. Height gauge. Gauges. Teachings). Shape and position check (Area and angle test. Tilt test. Cone test. Thread test).

30.2 EP_C1_P51_67_r2_Messen - shape and position test - surface inspection. Tolerances and fits. Elektropraktiker book: From page 51 to page 67

MODULE 40 CONVENTION MILLING, CNC MILLING

Milling is a professional component of Polypractician. For cubic machining milling is the machining. Today there are alternatives such as: water jet cutting, laser cutting, EDM.

This topic is also covered in the module.

- 40.1 Milling
- 40.1.1 sizes chipping
Cutting speed V_c , feed rate f , feed speed V_f , chip thickness h ,
Depth of cut a_e , cutting volume Q
- 40.1.2 milling tools
- 40.1.2.1 cutting materials for milling tools
Carbide (VHM) cermet, carbide, nitride and oxide ceramics, diamond,
boron nitride
- 40.1.2.2 tool wear
- 40.1.2.3 wear problems
Plate fracture, flank wear,
Built-up edge, comb cracks
- 40.1.3 mill holders
- 40.1.3.1 climbing cone (SK), hollow taper shank (HSK), slip-mill arbors,
Warning shrink fit chucks, shrink fit chuck power, hydro-rotating chuck, chuck
collet System
- 40.1.4 milling
Face and shoulder milling, form milling, plunge milling, helical interpolation
- 40.1.4.1 conventional milling and climb milling
Circumference cut milling, peripheral milling in synchronism
- 40.1.5 plan and square shoulder milling
- 40.1.5.1 tool selection
Choice of cutter and cutting boards, selection of milling division,
Choice of cutter recording (page 159), choice of insert geometry
- 40.1.5.2 choice of face and shoulder milling
Plan, milling, shoulder milling cutter, milling cutter with coarse pitch, close pitch cutter

- 40.1.5.3 choice of the cutter diameter
- 40.1.5.4 Choosing the position of the plan or angular milling cutter, carbide
- 40.1.5.5 Choosing the averages during milling
- 40.1.5.6 Index able inserts for finish milling

- 40.6 Measures for optimizing and troubleshooting
- 40.6.1 measures at milling problems (Table 1)

- 40.7 High Speed Cutting (HSC-milling)
- 40.7.1 applications of HSC milling
- 40.7.2 High-speed milling as an alternative to eroding
- 40.7.3 High - speed milling machine

- 40.8 Universal Milling Machines
- 40.8.1 Control and Programming
Manually controlled milling machines, CNC milling path control
Specifications, Universal clamping table, NC rotary table, tool changer
- 40.8.1.2 Bed milling machine (Fig. 4)

- 40.9 laser processing
Laser machining on a milling machine
- 40.9.1 Laser Processing
- 40.9.2 Scope. Advantages of laser processing with respect to the die-sinking EDM.

- 40.10 Programming of NC milling machines
- 40.10.1 tool change and correction
- 40.10.2 Programming the Finishing stocks Asses
- 40.10.3 tangential approach of the contour
- 40.10.4 machining cycles
- 40.10.5 Example program for the NC milling
- 40.10.6 program simulation

- 40.11 programming method

Reference textbook: Technical qualification metal Europa Verlag (FKM) 56 edition
From page 154 to page 170, from page 546 to page 552

MODULE 50 CONVENTION TURNING, CNC TURNING

The teaching has its own engineering. Turning is a very important part. Knowing the manipulations of a lathe including all functions properly, needs some good at knowledge.

- 50.1 TURN
- 50.1.1 rotation method
- 50.1.2 movements and voltage magnitudes
- 50.1.3 cutting geometry for turning tools

- 50.1.4 chip formation in turning
- 50.4.1.1 chip types
- 50.4.1.2 chip shapes
- 50.4.1.3 chip breakers and chip shape diagram

- 50.1.5 wear and tool life
 - 50.1.5.1 cause the wear
 - 50.1.5.2 WEAR

- 50.1.6 Turning Tools
 - 50.1.6.1 Selection of the holder and index able inserts
 - 50.1.6.2 shape and size of envy plates
 - 50.1.6.3 Fixing of the index able inserts
 - 50.1.6.4 Identification of inserts

- 50.1.7 Choice of cutting data when turning
 - 50.1.7.1 average speed and speed
 - 50.1.7.2 feed
 - 50.1.7.3 Depth of cut

- 50.1.8 forces and power when turning
- 50.1.9 Threading
- 50.1.10 Internal machining and outdoor recess turning

- 50.1.11 hard turning
 - 50.1.11.1 advantages of hard turning
 - 50.1.11.2 machining operation
 - 50.1.11.3 tool selection and cutting data

- 50.1.12 tool and work piece clamping systems
 - 50.1.12.1 clamping and turning tools
 - 50.1.12.2 work piece clamping
 - 50.1.12.3 collets
 - 50.1.12.4 clamping head
 - 50.1.12.5 more clamping options

- 50.1.13 lathes
 - 50.1.13.1 main groups
 - 50.1.13.2 universal lathes
 - 50.1.13.3 CNC lathes
 - 50.1.13.4 construction stages of lathes

- 50.1.14 functional units of a CNC machine tool
 - 50.1.14.1 drive units
 - 50.1.14.2 energy transfer units
 - 50.1.14.3 work units
 - 50.1.14.4 Supports and support units
 - 50.1.14.5 measurement and process control units
 - 50.1.14.6 units for environmental protection, waste management and occupational safety

- 50.1.15 Programming NC lathes
 - 50.1.15.1 tool call and contours
 - 50.1.15.2 tool nose radius compensation SRK
 - 50.1.15.3 machining cycles
 - 50.1.15.4 Contour

- 50.1.15.5 turning of grooves
- 50.1.15.6 Example program for a three-part

Reference Textbook: F.K.M. from page 134 to page 153 from page 360 to page 361
from page 538 to page 545

MODUL 60 GRINDING

- 60.0 grinding
- 60.1 abrasives
 - 60.1.1 Abrasives
 - 60.1.2 wear on the abrasive grain
 - 60.1.3 grain types
 - 60.1.4 grain
 - 60.1.5 bond the abrasive grains
 - 60.1.6 hardness of abrasive
 - 60.1.7 structure (structure)
 - 60.1.8 balancing
 - 60.1.9 dressing
- 60.2 Safety in grinding
- 60.3 Influences on the grinding result
 - 60.3.1 machining size, during grinding
 - 60.3.2 grinding heat and cooling lubrication
- 60.4 grinding process
 - 60.4.1 Designation of the grinding process
 - 60.4.2 Surface Grinding
 - 60.4.3 reciprocating grinding and creep feed grinding
 - 60.4.4 Surface and profile grinding machines
 - 60.4.5 work plan of the plan and fluting
 - 60.4.6 Cylindrical grinding
 - 60.4.7 Cylindrical Grinders
 - 60.4.8 CNC cylindrical grinding machines
 - 60.4.9 Work planning cylindrical grinding

Reference Textbook: F.K.M. from page 171 to page 182

MODULE 70 FORMING: BENDING AND SHEARING

A machine tool without plates cannot. All new machines, as well as in maintenance, now need more and more metal covers. This also by the increased safety. Therefore, a high value is placed on the handling of sheet metal working machines for sheet metal working in our profession.

- 70.0 forming
- 70.1 behavior of the materials during forming
 - 70.1.1 Required properties of the materials
 - 70.1.2 cold and hot forming
- 70.2 Forming
- 70.3 Bending Forming

- 70.3.1 defining the extended length
- 70.3.2 bending radius
- 70.4 Cut
- 70.4.1 Shearing
- 70.4.2 Cutting with scissors
- 70.4.2.1 Hand Shears
- 70.4.2.1 shearing machines
- 70.4.3 cutting with cutting tool
- 70.4.3.1 cutting force
- 70.4.3.2 sheet needs
- 70.4.3.2 cutting gap
- 70.4.4 shear cutting tools
- 70.4.4.1 Classification according to the type of guidance
- 70.4.4.2 Classification according to the production process

Reference Textbook: F.K.M. Page 92 to page 95
Page 103 to page 107

MODULE 80 WELDING

Welding, electric welding, MIG / MAG, oxyfuel, brazing.

The new machine is based in Europe, in recent years, often at the welded structures. A welding machine bed needs a good knowledge. It must be observed delay problems. There are to use the right kinds of steel and welding means. There are many different types of bevels. Our apprentices are so thoroughly familiarized.

- 80.0 welding
- 80.1 Classification of welding processes
- 80.2 Design of weld
- 80.2.1 welded joints and weld types
- 80.2.2 designations in welds
- 80.2.3 Welding positions
- 80.3 arc welding
- 80.3.1 manual arc welding
- 80.3.2 Working technique of manual arc welding
- 80.4 inert gas welding
- 80.4.1 Gas metal arc welding (GMAW)
- 80.4.2 AC TIG welding
- 80.4.3 Working technique of TIG welding
- 80.4.4 tungsten plasma welding
- 80.5 Gas fusion welding
- 80.5.1 Working technique of gas welding
- 80.6 beam welding
- 80.6.1 Laser welding
- 80.6.2 Electron beam welding
- 80.7 forge welding

- 80.7.1 Resistance butt welding
- 80.7.2 Friction Welding (FR)

- 80.8 use of welding processes

- 80.9 Testing of welded joints

Reference Textbook: F.K.M. From page 217 to page 229

MODULE 90 METAL RELAX WITH VIBRATION

Until a few years ago, Europe had many foundries and thus also in annealing. Due to the large flexibility that can be better lived by welded constructions; many foundries have been closed in recent years. This means that the furnaces have been greatly reduced. The alternative, vibrate instead annealing, is an environmentally conscious and cost-reducing alternative. Bring the engineering school in operation many advantages. Therefore, Heard in the teaching program.

Described in the training documents Wi_8_f_

- 90.1 Wi_8_f_1_19_j82a_r6_Info_Stresselief - Metal relax with vibration.
Instructions. Description of the process flow.
- 90.1.1 Wi_8_f_1_19_j82a_r6_Info_Stresselief - Metal relax with vibration.
Instructions. Description of the process flow (pdf)
- 90.2 Wi_f_19_j203_a_Metallentsp.mit Vibr_de – specification

MODULE 100 COATED-SURFACE TECHNOLOGY

Spraying and painting is one of the oldest and still most frequently applied rust protection method in mechanical engineering and machine maintenance. Since it must be treated in our teaching much against rust, this department is an important part of school teaching activities. The most important and most complex work is always preparing.

- 100.1 coating
- 100.1.1 surface treatments
- 100.1.1.2 Coating with paints and plastics
- 100.1.1.3 Phosphate and chromatin
- 100.1.2 lacquering and plastic coating

- 100.3 coating with metals
- 100.3.3 coatings with special properties

Reference Textbook: F.K.M. from page 230 to page 233

MODULE 110 MATERIAL SCIENCE - HEAT TREATMENT OF STEELS

Hardening, material science

There are hardening. There are tool steel. There is steel having a hardening temperature of 800 degrees, another steel grade 950. Our apprentices need to know what is what and how something is done. Our training program is being tested in practice. Primarily for machine maintenance. It is hardened, annealed, tempered and carburized.

- 110.0 Heat treatment of steel
- 110.1 types of microstructure of ferrous materials

- 110.2 Iron-carbon phase diagram
- 110.3 microstructure and crystal lattice during heating
- 110.4 glow
 - 110.4.1 annealing
 - 110.4.2 glow stress
 - 110.4.3 recrystallization annealing
 - 110.4.4 Annealing
 - 110.4.5 normalizing
 - 110.4.6 diffusion annealing
 - 110.4.7 Glühfehler
- 110.5 hardening
 - 110.5.1 Internal processes upon curing
 - 110.5.2 keeping and heating to hardening temperature
 - 110.5.3 quenching
 - 110.5.4 start
 - 110.5.5 quenching
 - 110.5.6 hardening depth
 - 110.5.7 distortion due to hardening and hardening cracks
 - 110.5.8 influence of alloying elements
 - 110.5.9 steps in hardening of tool steels

- 110.6 tempering
 - 110.6.1 Compensation diagram
 - 110.6.2 Internal processes during quenching and tempering
 - 110.6.3 heat treatment of quenched and tempered steels

- 110.7 hardening of the edge zone
 - 110.7.1 Surface hardening
 - 110.7.2 hardening
 - 110.7.3 Heat treatment of hardened steels
 - 110.7.4 nitriding (nitriding)

Reference Textbook: F.K.M. From page 277 to page 288

MODULE 120 MANUAL DIAGRAMS AND COMPUTER DRAWINGS, CAD

Structure, hand drawings and computer drawings, CAD

Hand signal of 3 pages. CAD drawing with a simple standard program is the basic concept of our teaching program. Who can do that, can later everything.

Described in the training documents Wi_8_f_

- 120.1 Technical Drawings
- 120.1.1 sketches
- 120.1.2 part drawings
- 120.1.3 Group and general arrangement drawings
- 120.1.4 exploded views
- 120.1.5 BOMs

Reference textbook F.K.M. page 555

MODULE 130 LEARNING FIELDS, SPECIAL CONSTRUCTION, OWN CONSTRUCTIONS

Special designs , in-house developments

There is no way around the fact that each machine tool maintenance , or engineering requires flexible thinking . It requires self- initiative employees. What can be learned ? Only when the boys themselves must do something (may have) . They should think for themselves , to create something yourself. These apprentices need a basic idea. The rest they make themselves. Good , accurate work. Something that the apprentice can be proud of himself. Therefore, this module also has a high valuation component.

- 130.1 Selected Key project: Keyring
- 130.2 clamping device for round work pieces
- 130.3 drill press for hand drill
- 130.4 Maintaining a pillar drill
- 130.5 bevel gear
- 130.6 programming and Customize on numerically controlled machine tools
- 130.7 feed drive of a CNC milling machine
- 130.8 Monitoring of product and process quality (water balance)
- 130.9 Customize individual parts of machine tools
- 130.10 Planning and commissioning of control systems engineering
- 130.11 Repair of technical systems
- 130.12 Maintenance of technical systems
- 130.13 Ensure the operability of automated systems

Reference Textbook: F.K.M. From page 582 to page 599

MODULE 140 HANDLING OF HAND MACHINES, SCRAPING , DRILL, MAGNETIC DRILL , ANGLE , JIGSAW

Dealing with portable machines cannot be learned at school. A few basic concepts such as the plug is pulled out when it is manipulated on the machines, is a given. However, it should also be handled in daily use such.

The shaving machine has a stroke adjustment of short stroke and long stroke , or even a speed control. For what is what ? The scraping angle like ? The handling of a magnetic drill, which should be secured while in the horizontal. And much more. You learn in practice and not at the school. This module contains the practical as well as theoretical piece of information.

Described in the training documents Wi_8_f_19_o_a1 to a7 scrape

- 140.1 Wi_8_f_19_o_a1_qrev4c_scrap_P1_7_xe3 - scraping with machine. Filing as a scraper. Shaving machine. scrape accessories
- 140.2 Wi_8_f_19_o_a2x_qrev2_scraping02x - Cockroaches
- 140.3 Wi_8_f_19_o_a3_qrev1a_scraping03_x - Files as a scraper
- 140.4 Wi_8_f_19_o_a4_qrev2_scrapingSchabmaschine04_x - shaving machine
- 140.5 Wi_8_f_19_o_a5_qrev2_scraping_equipment01_x - Schabzubehör 01
- 140.6 Wi_8_f_19_o_a6_qrev2_scraping_equipment02_x - Schabzubehör 02
- 140.7 Wi_8_f_19_o_a7_qrev2_scraping_equipment03_x - Schabzubehör 03
- 140.8 Wi_8_f_drilling and magnetic drilling machine - drilling. Instructions.
- 140.9 Wi_8_f_wi8f Jigsaw Blades - Jigsaw. Description. Instructions.

MODULE 150 APPLICATION TUPTARA, HELI COIL, LOC TITE, SEALANT, SILICONE, TOOLS

Many textbooks do not use brand names, because it is handled country-based. We want to call Tubtara as a sheet metal threaded inserts or Helicoil thread inserts as well as schools. Actually, everything that makes life easier in mechanical engineering: show, test and handle. Which adhesive is for what? Thread lock fixed, detachable again and as well as a rule preparation is completed.

Described in the training documents Wi_8_f_

- 150.1 Wi_8_f_1_19_q1_Verbindungstechnik_Loctite - using the Connection Technology Lucite German
- 150.1.1 Wi_8_f_1_19_q1_Verbindungstechnik_Loctite.en - using the Connection Technology Loctite English
- 150.1.2 Wi_8_f_1_19_q1_Verbindungstechnik_Loctite.pt - using the Connection Technology Loctite Portuguese
- 150.1.3 Wi_8_f_1_19_q1_Verbindungstechnik_Loctite.vn - using the Connection Technology Loctite Vietnamese
- 150.2 Wi_8_f_19_i30_qrev6_de_enpvnx_Helicoil_old - Helicoil / threaded insert (old)
- 150.3 Wi_8_f_19_i30_r7_de_Helic_old - Helicoil / threaded insert (old)
- 150.4.1 Wi_8_f_19_i32_r1_Helic_new - Helicoil / threaded insert new 1/4
- 150.4.2 Wi_8_f_19_i33_r1_Helic_new - Helicoil / threaded insert new 2/4
- 150.4.3 Wi_8_f_19_i34_r1_Helic_new - Helicoil / threaded insert new 3/4
- 150.4.4 Wi_8_f_19_i35_r1_Helic_new - Helicoil / threaded insert new 4/4

- 150.5 Wi_8_f_19_q_b1_silikon02_r3 - silicone. Use assembly Instructions
- 150.6 Wi_8_f_51_d2_qrev3_de_en_p_vn_handtool_zangen - hand tools. Pliers
- 150.6.1 Wi_8_f_51_d3_qrev4_de_en_vn_p_handtools_schluessel - hand tools.
key
- 150.7 Wi_8_f_19_j40_r1_Helcoil_Photoreportage

MODULE 160 TOOLS, GRINDERS, DRILLS, SCREW DRIVER, REPAIR PRODUCTION

Manual dexterity is important to think also some information. Like a screwdriver is ground. Or that a drill can be sanded with 8 degree angle

Described in the training documents wi_8_f

- 160.1 Wi_8_f_19_0_c1_r4_Bohren - drilling by hand and magnetic drill.
Instructions.

MODULE 170 LOADS MACHINERY TRANSPORT, AND CRANE LIFT TRUCK DRIVING, FOCUS

In mechanical engineering, lifting loads is an important co-ingredient. How heavy is the item that needs to be raised? Oversized cables are better than undersized! This has to be anchored in the minds of apprentices. That is, security, thinking ahead, no accidents. Can lift and transport loads be very dangerous. If eye bolts are used, the load angle should be observed. Heaviness is a point that should always be observed. Our apprentices are trained with the module. If a suspended load falls over, can damage the transport by the impact a higher load. So know how to lift loads is very important.

Described in the training documents Wi_8_f_19-

- 170.1 Wi_8_f_19_r_1h_r1_Transport08_Hebepressen
- 170.2 Wi_8_f_19_r_2a_r2_Transport20_Ringschrauben
- 170.3 Wi_8_f_19_r_1a_Transport01_Gefahren Notes

- 170.4 Wi_8_f_19_r_1b_Transport02_allg1
- 170.4.1 Wi_8_f_19_r_1c_Transport03_allg2
- 170.4.2 Wi_8_f_19_r_1d_r1_Transport04_abheben
- 170.4.3 Wi_8_f_19_r_1d_r1_Transport04_abheben.de.en
- 170.4.4 Wi_8_f_19_r_1d_r2_Transport04_abheben
- 170.4.5 Wi_8_f_19_r_1d_r2_Transport04_abheben.de.en

- 170.4.6. Wi_8_f_19_r_1d_r2_Transport04_abheben.de.vi
- 170.4.7 Wi_8_f_19_r_1d_Transport04_abheben
- 170.5 Wi_8_f_19_r_1e_Transport05_montage
- 170.6 Wi_8_f_19_r_1f_Transport06_Stapler
- 170.7 Wi_8_f_19_r_1g_r1_Transport07_Panzerrollen
- 170.1 Wi_8_f_19_r_1g_Transport07_Palettswagen

MODULE 180 ELECTRICAL ENGINEERING, ELECTRICAL CONTROLS

Electrical installation, Cabinets, wiring, cabling machines assemble electrical cabinets. The material divided. Knowing that, etc usually 300 mm are to be installed above ground, no components with possible flood The electrical cabinet cooling, no outside air to take cool, why? Because of the dirt / dust, along with the

humidity, much can destroy in an electric oven. The components must vary by manufacturer, have a distance to the wall. Therefore, never throw away the instructions of the manufacturer, but first study. Which cable cross-sections should be when, where used? For what are the drag chain cables available? Why can not use cheap cable? In the machinery industry is often worked with oil. This makes the cable hard and brittle. This should always be observed. And much more is called in the module.

180.1	Electrical Engineering
180.1.1	The electrical circuit
180.1.2	The electrical voltage
180.1.3	The electric current
180.1.2	current direction
180.1.2.1	effects of electric current
180.1.2.2	Measuring current and voltage
180.1.3	The electrical resistance
180.1.3.1	The Ohm "s law
180.1.3.2	Resistivity
180.1.3.3	conductor resistance
180.2	connection of resistors
180.2.1	series circuit of resistors
180.2.1.1	current
180.2.1.2	total voltage
180.2.1.3	total resistance
180.2.2	parallel connection of resistors
180.2.2.1	total current
180.2.2.2	total resistance
180.3	Types of current
180.3.1	DC
180.3.2	AC
180.3.3	three-phase AC
180.4	Electrical power and electrical work
180.4.1	Electrical power at DC and AC induction open or three-phase
180.4.2	Electrical power for AC and three-phase current with inductive and capacitive shares
180.4.3	Electrical Work
180.5	over current protection devices
180.5.1	fuses
180.5.2	circuit breaker
180.5.3	motor protection switch
180.6	error on electrical equipment and protective measures
180.6.1	effects of the electric current in the human body
180.6.2	electrical faults
180.6.3	protection measures
180.6.4	of protection for electrical equipment
180.6.5	Protection classes of electrical equipment
180.6.6	Instructions for the use of electrical appliances
180.7	Electrical control
180.7.1	structure

- 180.7.2 Electrical Switchgear
- 180.7.2.1 components electrical contact controls
- 180.7.2.2 Time-dependent electromagnetic switch
- 180.7.3 Electrical contact control
- 180.7.4 Wiring with terminal strips

Reference Textbook: F.K.M. Page 507 to page 510
Page 569 to page 581

MODULE 190 INSTALLATION, ELECTRICAL MEASUREMENTS SCHEMA READ

Often machines are transported far. Terminals, cable connection points etc in electrical cabinets can be changed by the shock. Therefore, there are several points that need to learn an apprentice so that he can in the professional world with open and attentive eyes. Read scheme, regardless of manufacturer, is not easy. There are various types, various standards, various countries. A large part is described in the module. Described in the training documents Wi_8_f_

- 190.1 EP_C4_P158_209_r2_Elektrofertigung - cable channels, clamps, installation of Conductor. Electrical Measuring Instruments. Digital Meters. Universal measuring instruments.

Elektropraktiker book: From page 158 to page 209

MODULE 200 PLC PROGRAMMING, CNC CONTROLS, STARTUPS

PLC programming , CNC controllers , commissioning . In maintenance and as a mechanical engineer apprenticeship very quickly recognizes that many different manufacturers of PLC controllers , CNC controllers, etc. , are on the market partly for decades. This module will show a variety overview. Will show why some PLC devices have an interface RS 232 and what it is at all. Where was it used? Where it is still used ? What does the future hold? In many machines are CNC controls and PLC integrated in one unit . Even just the CNC technology is something special again . How axes are set ? How is an acceleration adjusted ? What is a KV factor ? And much more. This module gives the trainee the opportunity to carry out tasks that cannot be done in-house in many companies. Where ever had a control manufacturers are coming up , which will now be our apprentice already have the basic knowledge .

- 200.6 Programmable Controllers
- 200.6.1 Programmable logic controller as a small controller (logic module)
- 200.6.2 Programmable logic controller as a modular automation system
- 200.6.2.1 construction of a modular PLC
- 200.6.2.1.1 input module: signal module SM / DE
- 200.6.2.1.2 central unit with program memory: CPU
- 200.6.2.1.3 output module: Signal Module DA
- 200.6.2.2 operation of a modular PLC
- 200.6.2.3 General Programming a PLC
- 200.6.2.3.1 programming the PLC
- 200.6.2.3.2 wiring a PLC
- 200.6.2.3.2 basic operations of the PLC
- 200.6.2.3.3 signal inversion
- 200.6.2.3.3 memory functions

- 200.6.2.3.4 time functions
- 200.6.2.4 sequence controllers in the PLC
- 200.7 CNC
- 200.7.1 features an NC-controlled machine
- 200.7.1.1 drives
- 200.7.1.2 measuring systems
- 200.7.1.3 structure and responsibilities of the CNC control
- 200.7.1.4 advantages of manufacturing with CNC-controlled machine tool
- 200.7.2 coordinates, zero and reference points
- 200.7.2.1 coordinate system
- 200.7.2.2 coordinates for lathes
- 200.7.2.3 Zero points and reference points
- 200.7.3 control types, corrections
- 200.7.3.1 types of control
- 200.7.3.2 tool measurement and tool offsets
- 200.8 commissioning
- 200.8.1 installation of machinery and plant
- 200.8.1.1 transport
- 200.8.1.2 incoming inspection and cleaning
- 200.8.1.3 installation
- 200.8.1.4 aligning
- 200.8.2 operation of machinery or equipment
- 200.8.2.1 Electrical components
- 200.8.2.2 Pneumatic and electro-pneumatic components
- 200.8.2.3 Hydraulic Assemblies
- 200.8.2.4 Mechanical Assemblies
- 200.8.2.5 fault diagnosis during commissioning
- 200.8.3 purchase of machinery and equipment

Reference Textbook: F.K.M. Page 511 to page 522

Page 523 to page 531

Page 353 to page 357

Module 200 PLC programming, CNC controls, startups

- 200.9.1 Wi_8_f_32_a1 commissioning Quick Guide Sinumerik System 800_Wiap
- 200.9.2 Wi_8_f_32_a4 machines up Datasheet
- 200.9.3 Wi_8_f_39_a1_M a CNC machine key
- 200.9.4 Wi_8_f_34_a1 M / G Key
- 200.9.5 Wi_8_f_30_b1 program safety rules
- 200.9.6 Wi_8_f_38_a_ conversion program Sinumerik 810/802
- 200.9.7 Wi_8_f_30_b1_Programm_SafetyRoul - safety program. rule
- 200.9.8 Wi_8_f_32_a1_802 instructions IBS 39_e1_ShortManua_Rev42 - Auxiliary guide to Sinumerik
- 200.9.9 Wi_8_f_32_a4_Spindle_Axis_Setting_up_Rev02_Sample_Sin802 - Spindle Axis . setting
- 200.9.10 Wi_8_f_34_a1__Rev02 - _M_G_Key_engl_port_germ - machine programming
- 200.9.11 Wi_8_f_38_a_Rev00_Conversion_Zyklen_Umwandlung_Revision - thread of Sinumerik . Cycles. Conversion .
- 200.9.12 Wi_8_f_39_a1_r1b_M_Schlüssel_DM2V - List of key DM2 V. Your application

MODULE 210 PNEUMATIC

Read Pneumatic diagram and handling

In mechanical engineering is almost little without pneumatic or hydraulic. Therefore, these two modules are to learn very conscientiously for our trainees. Make intensive test, so it is understandable why a cylinder in the rest position can be moved, or cannot be moved? What can be used for thread when hydraulic? Many such details are described in the module, the most out of practice.

- 210.0 Pneumatic controls
- 210.1 assemblies of pneumatic systems

- 210.2 component of the pneumatic
- 210.2.1 compressed air system
- 210.2.1.1 pressure units and types of printing
- 210.2.1.2 begetter compressed air
- 210.2.1.3 distribution and preparation of compressed air
- 210.2.2 Pneumatic working element
- 210.2.2.1 Air Cylinder
- 210.2.2.2 piston forces on cylinders
- 210.2.2.3 Air Motors
- 210.2.2.4 example of the application of pneumatic working elements

- 210.3 valves
- 210.3 .1 Valves
- 210.3.2 check valves
- 210.3.3 flow control valves
- 210.3.4 Pressure Valves

- 210.4 properties of the pneumatic

Reference Textbook: F.K.M. From page 479 to page 487

Module 210 Pneumatic

- 211.1 Wi_8_f_ scheme LIST

MODULE 220 HYDRAULIC

Read hydraulic diagram and handling

Here is the same text applies as in module 210 What is a tank return for a valve? How is called the supply line? The many different schema characters are trained from data sheets.

- 220.0 Hydraulic control
- 220.1 component
- 220.1.1 hydraulic fluids

- 220.1.2 hydraulic pump
- 220 1.2.1 Gear Pump
- 220.1.2.2 vane pumps
- 220.1.2.3 piston pumps

- 220.1.3 work item
- 220.1.3.1 hydraulic cylinder
- 220.1.3.2 hydraulic cylinder
- 220.1.3.3 hydraulic accumulator

- 220.1.4 valves
- 220.1.4.1 Valves
- 220.1.4.2 check valves
- 220.1.4.3 pressure valves
- 220.1.4.4 flow control valves
- 220.1.4.5 proportional valves

- 220.1.5 hydraulic lines
- 220.1.5.1 pipes and pipe fittings
- 220.1.5.2 Quick Couplings
- 220.1.5.3 Hose Assemblies

- 220.2 Electro hydraulic control
- 220.2.1 Electro hydraulic control of a drilling unit

Reference Textbook: F.K.M. From page 496 to page 505

Module 220 Hydraulic

- 220.3 Wi_8_f_19_db3_r2b_HydrI_Symbol 220.3 (1) - Hydraulic symbols: currents, pumps, Compressor, motors, valves, cylinders

MODULE 230 STANDARD PARTS, TAPER LOOK BELT, SEALS

The whole machine tool industry has changed a lot over 30 years ago. Many have opted for standard goods. Formerly a thread M7x 1 was often of a machine builder selected. Only that no other screws could be bought. However, today Taper look, V-belt types, timing belt etc. standard goods. What facilitates the mechanical engineering. The costs easier. Many such details are described in the module, the most out of practice.

Described in the training documents Wi_8_f_

- 230.1 Wi_8_f_19_e14_r2_86_c_Simp_repres_seals - Presentation and representation gaskets . Shaft seals. Piston rods. Profile sealing rings . Gasket sets. Labyrinth seals.
- 230.2 Wi_8_f_19_n20_qrev3_V_Belt_normal - V-belts. grooves
- 230.2.1 Wi_8_f_19_n21_qrev3_V_Belt_small (3) - Spacesaver
- 230.2.2 Wi_8_f_19_n25_qrev4a_V_belt - V-belts. Conversion table.
- 230.2.3 Wi_8_f_V_belt - Standard V-belt drive APSO 10 / Z , 13 / A , 17 / B , 22 / C ; Standard V-belt drive APSO SPZ , SPA, SPB , SPC
- 230.3 Wi_8_f_19_n30_r1_Zahnriemen - XL pitch 1/5 " (5.080 mm) , L pitch 3/ 8" (9.525 mm) , H dividing 1/2 " (12.7 mm) , XH division 7/8" (22.225 mm) , pitch XL, L , H, XH
- 230.3.1 Wi_8_f_19_n40_qrev1_Zahnriemen - Timing Belt MXL 025 , 037 ; timing belt L 050 , 075 , 100 , timing belt 075 , H , 100 , 150 , 200
- 230.4 Wi_8_f_19_n41_qrev1_Zahnriemenraeder - timing pulleys MXL 025 , 037 ; Timing pulleys L 050 , L075 , L100 , timing pulleys H075 , 100 , 150 , 200

MODULE 240 MECHANICAL ASSEMBLY, SPINDLE, STORAGE, SPLIP PINS

To talk to and exchange machine tool spindle bearings, is not so simple. The majority of the spindles are dismantled forward. A good mechanic can without the hammer. So often thinking before acting the right way. Depending on whether there still gears are included , or a belt drive, each type requires a knowledge. There are spindles with interference fit . It should always be taken to ensure that documentation is available so that a bearing assembly can be assessed before manipulation. Conical pinning is an engineering method that is necessary if machines are to be built , which operate in the mm range 0:01 . Vorreiben with the machine reamer , then rub with the hand reamer . The reamer will never turn back. The pins at collision prone areas not to be , that is always pulling . Only use for alignment. Many such references are included in the module.

Described in the training documents Wi_8_f_

- 240.1 Wi_8_f_19_p10_qrev1_Montage01 - mounting instructions.

- 240.2 StiftenZieherKFKOK_Box_rev02_c - sketch pin puller
- 240.2.1 StiftenZieherKFKOK_rev03_c - sketch pin puller
- 240.3 Wi_8_f_19_e1_Rev01_SpindleBearing70erFam - spindle bearing 70 Fam
General Info. Spindle replacement instructions.
- 240.4 Wi_8_f_19_e3_Rev00_SpindleBearingNN - Sketch spindle bearings NN
- 240.5 Wi_8_f_19_e5_Rev00_SpindleBearingTimken - Spindle bearings Timken .
General Info. construction
- 240.6 Wi_8_f_19_e5a_Rev00_SpindleBearing_Gamet - Gamet spindle bearings .
application Advantages

- 204.7 Wi_8_f_19_e8_SauberkeitLagermontage - bearing assembly. Instructions.
Cleaning before assembly

- 240.8 Wi_8_f_19_p2_qrev4a_konisch_Verstiften - conical pinning . use
in mechanical engineering. Statement. German
- 240.8.1 Wi_8_f_19_p2_qrev4a_konisch_Verstiften.de.en - conical pinning .
Use in engineering. Statement. English
- 240.8.2 Wi_8_f_19_p2_qrev4a_konisch_Verstiften.de.en2 - conical pinning .
Use in engineering. Statement. English
- 240.8.3 Wi_8_f_19_p2_qrev4a_konisch_Verstiften.de.pt - conical pinning .
Use in engineering. Statement. Portuguese
- 240.8.4 Wi_8_f_19_p2_qrev4a_konisch_Verstiften.de.vi - conical pinning .
Use in engineering. Statement. Vietnamese
- 240.8.5 Wi_8_f_19_p2_qrev4a_konisch_Verstiften_tl - conical pinning .
Use in engineering. Statement. German
- 240.8.6 Wi_8_f_19_p2_qrev4a_konisch_Verstiften_tl_en - conical pinning .
Use in engineering. Statement. English
- 240.8.7 Wi_8_f_19_p2_qrev4a_konisch_Verstiften_tl_envnpt conical pinning .
Use in engineering. Statement. Portuguese
- 240.8.8 Wi_8_f_19_p2_qrev4a_konisch_Verstiften_tl_envn - conical pinning .
Use in engineering. Statement. Vietnamese

MODULE 250 TOOL MACHINE MAINTENANCE / SERVICE

How important is the maintenance today, showing mainly the aircraft industry. A maintenance plan, where everything is done preventively, is much better than if nothing is done until something is defective. We

have the yellow box system, in which a net maintenance plan is included. The maintenance people must enter and sign any application on a machine in it. And early inspection often prevents damage that can cost a lot of money. Our system has monthly visual inspection. All annual inspection and every year a geometry control. It is exercising. Fill out papers and records and sign and date. Preventive maintenance should be deficiencies detected early. Then there is no machine downtime more, which endanger the production. The life of a machine is tripled.

- 250.1 Maintenance
- 250.1.1 function test
- 250.1.2 Documentation and logging

- 250.2 inspection
- 250.2.1 initial inspection
- 250.2.2 Inspection Rule
- 250.2.3 special inspections
- 250.2.4 Inspection measures
- 250.2.4.1 create an inspection plan
- 250.2.4.2 Preparatory measures
- 250.2.4.3 implementation
- 250.2.4.4 evaluation
- 250.2.4.5 derivation
- 250.2.5 adhesion
- 250.2.6 abrasion
- 250.2.7 disruption
- 250.2.8 Tribochemical reaction

- 250.3 repair
- 250.3.1 Example of a repair
- 250.3.2 steps

Reference Textbook: F.K.M. Page 445 to page 451

Here , of course, comes our Yellow speaker system to do so. Which is a key of all

- 250.4 Preventive Maintenance Wi_8_f_82_a_r1_2013_2014
- 250.5 Wi_8_f_80_a3_Rev06b_Maintenance Report_on_Machines
- 250.6 Wi_8_f_82_a_qrev19f_Pend Preventiv_2012_2013_r4 - Plan of preventive Maintenance of the machines
- 250.7 Wi_8_f_82_e1_r1_machinetool_handling_info_eng.de.vi - Handling of Tools (Vietnamese)
- 250.8 Wi_8_f_84_a_Rev05b_V_Visual Controll_Work_Lathe
- 250.8.1 Wi_8_f_84_a_Rev05b_V_Visual Controll_Work_Universal
- 250.9 Wi_8_f_85_a_arev1a_l_Report_Lathe_2013_qrev3 - Report on the Lathe Maintenance
- 250.10 Wi_8_f_86_a_G_Geometrie_Work_Konv_Lathe_r1 - geometry test report
- 250.10.1 Wi_8_f_86_a_G_Geometrie_Work_Lathe_CNC_r7_13_07_2012_hp - geometry test report

MODULE 260 OLD DOCUMENTATION, TO STUDY OBTAIN REPLACEMENT PARTS

Any good mechanic or electrician will usually work! Not studying papers. Our apprentices are trained from the beginning but so intense here that they are also able to search in old documents and also something to find. Part number are found; hence the contact with machine manufacturers, if it becomes necessary, can be selected. This module contains valuable information.

Described in the training documents Wi_8_f_

- 260.1 Wi_8_f_17_b1_r3_Elekt_Symbol - Electrical symbols with the images
- 260.2 Wi_8_f_17_z1_r3b_Schemazeichnen_Schulunterlagen_Lösung -
Scheme characters.
- 206.3 lines , schema and switching elements. Supports, relays,
Equipment . Measuring instruments. Batteries. Resistors . Coils. Capacitors.
- 260.4 Wi_8_f_17_a3_r2_EI_Normengine - Information on standard foot motors
- 260.5 Wi_8_f_17_C_ElektroMotor_SternInfo_Rev00 - information about star
electric motor
- 260.6 Wi_8_f_17_d1_r2_cable_Lapp_5574116 - cable. Schematic representation .
- 260.7 Wi_8_f_17_d3_r1_cable_Lapp_Schleppenkettenfähig - Lappkabel . Construction.
Specifications .
- 260.7.1 Wi_8_f_17_d4_r1_cable_Lapp_Schleppenkettenfähig_geschirmt - Lappkabel .
Shielded . Constructions. Specifications .
- 260.8 Wi_8_f_17_a5_B5_und_B14_Flansch_metric - Motorflansch . Sizes (metric).
- 260.8.1 Wi_8_f_17_a6_B5_und_B14_Flansch_inches - Motorflansch . Sizes (inch) .
- 260.9 Wi_8_f_8_a1_SketSunil01_m1 - Sketch types of lines. icon from the
Diameter and radius
- 260.9.1 Wi_8_f_8_a2_SketSunil02_m1 - Sketch baseline. Reference line. Kube
- 260.9.2 Wi_8_f_8_a3_SketSunil03_m1 - Sketch
- 260.9.3 Wi_8_f_8_a4_SketSunil04_m1 – Sketch

MODULE 270 WAREHOUSE MANAGEMENT, ORGANIZE, CATEGORIZE DOCUMENTING

An inventory management is important for the maintenance, as well as for production. It should not, when a screw is needed each time to be driven 50 kilometers. This module contains a lot of important information and standards. A normal screw means DIN 912 Hexagon socket countersunk screw is called a DIN 933 There are screws quality 8.8 and a 12.9. For what is what used? Many other examples of templates are included in this module.

Described in the training documents Wi_8_f_

- 270.1 Wi_8_f_27_x1_BoltStore_Vietnam_Revision01 - Store List bolts
- 270.2 Wi_8_f_135_a1_Schraubenlager_VN_r1 - bearing screws
- 270.3 Wi_8_f_135_b1_storeelist_measuring_tool_r1_A24 - Store List Tools
- 270.4 Wi_8_f_135_c1_computer_r1 Store List Pc / laptop / printer
- 270.5 Wi_8_f_135_d1_storeelist_Steel_r2 - Store List steel
- 270.6 Wi_8_f_135_e1_storeelist_inventar_Scrap_Material_r1 - Store List scrap material
- 270.7 Wi_8_f_135_f1_storeelist-messwerkzeug_r4 - Store List Measurement Tools

MODULE 280 WORK PREPARATION, WORK PLANS, BOUGHT, DOCUMENTATION, COMPUTER APPLICATION, FIND IN INTERNET, EXCELL, WORD

The skills of an apprentice even touch this subject, that he did not have to say with any activity in a company, I do not know!

Described in the training documents Wi_8_f_

- 280.1 Wi_8_f_r2_anleitung_word
- 280.2 Wi_8_f_8c5_r0_webside_handling

MODULE 290 FILLING SYSTEM

Over the last 30 years, the computer has replaced all paper folders majority. What was formerly stored in many folders, is now in the computer. It can be bought today for all programs. But it changed in 30 years, so much so that often a program manufacturer suddenly no longer exists. Then, when no overview exists where as a program producer has stored the data, as it can often happen that much needs to be re-started from the beginning. And these are often very many hours, days, months, and mostly everything is never found. So old times with books and folders were safer than today, the computer world. Precisely for this reason the module is important for the apprentice. A filing system that decades can contain data.

Described in the training documents

- 290.1 Wi_8_f_8_e1 description, storage data on web users
- 290.2 Wi_8_f_8_c1 filing drawings

MODULE 300 GENERAL EDUCATION, BASIC KNOWLEDGE

The knowledge base for many professions.

Described in the training documents Wi_8_f_

- 300.1 Wi_8_f_1_6_a2_r15e_mousmape.xls various technical information and formulas
- 300.2 Wi_8_f_1_6_a3_qrev2_b_Formel_Help_Sheet7.xls = Formulas
- 300.3 Wi_8_f_1_3_b6_qrev13a_Schnittmeter = meter cut calculations
- 300.4 Wi_8_f_19_b3_re_Toleranz_m1_USPapier tolerances
- 300.5 Wi_8_f_1_7_c12_qrev3a_angle_Calc_Tangens_help12 = angular Help
- 300.5.1 Wi_8_f_1_7_c10_qrev3a_Calc_Pythagoras_help10 = Pythagoras Calculate
- 300.5.2 Wi_8_f_1_7_c11_qrev3a_angle_Calc_Sinus_help11 = angle, sine
- 300.6 Wi_8_f_51_a1_r1_de_en_pox_vn_Basic1 = language exercises
- 300.6.1 Wi_8_f_51_a3_r1_de_en_vn_pox_Basic03 = language exercises
- 300.6.2 Wi_8_f_51_a4_r1_english_Basic04_de_en_pt_vn = language exercises
- 300.7 Wi_8_f_51_c10_r1_de_en_Px_vn_schweissen01 = welding info
- 300.8 Wi_8_f_51_d2_qrev3a_de_en_p_vn_handtool_zangen = Hand Tools Pliers
- 300.8.1 Wi_8_f_51_d4_qrev4_de_en_vn_p_handtool4 = hand tool (wire brush, file brush etc.)
- 300.8.2 Wi_8_f_51_d3_qrev4_de_en_vn_p_handtools_schluessel = hand tool, key
- 300.9 Wi_8_f_51_f1_r1_Englisch_Module_Vorschlag - Description of the modules "English"
- 300.9.1 Wi_8_f51_f2_r1_Englische_Grammatik - rule and examples of English grammar

300.10 Wi_8_r1_Kopf and Footer - description, such as headers and footer is made

MODULE 400 FINAL EXAMS, REPETITIONS, PRIVATE TUTORING

Throughout the training, the apprentice is tested with testing. He gets various documents. Everything is recorded. The points come from the work during the training period and the tests.

- 400.1 Wi_8_f_45_d1a_r4a_Qualification_Vietnam_A.xls = Information A Students. Test scores, absences, points
- 400.1.2 Information Wi_8_f_45_d1b_r2_Qualification_Vientam_B_letter.xls = B Students. Test scores, absences, points
- 400.2 Wi_8_f_45_e1_qrev4c_Test_XY01_Leveltest_Letter.xls = basic mathematics test
- 400.2.1 Wi_8_f_45_e2_qrev5_Test_XY_02_Prozenttest_letter - Test percent calculation
- 400.2.2 Wi_8_f_45_e3_qrev01_Test_XY_03a_iw_hp_ - test weight , RPM calculation
- 400.2.3 Wi_8_f_45_e4_Rev04_Test_XY04 - Test Diameterberechnung
- 400.2.4 Wi_8_f_45_e5_Rev01_Thread_Diverses_XY_05_hp - Test threaded calculation
- 400.2.5 Wi_8_f_45_e6_qrev02_Test_XY_06_hp_ - test weight pressure , friction calculation
- 400.2.6 Wi_8_f_45_e7_Rev00_Test_XY_07_hp_Welding_rev02_eng - test welding
- 400.2.7 Wi_8_f_45_e8_Rev01_Test_XY_08_CNC_ProgrammTest - Test Maschinenprogrammieren
- 400.2.8 Wi_8_f_45_e9_Rev01b_Test_XY_09_iw_us_o - Test sine, cosine, tangent , RPM, friction calculation
- 400.2.9 Wi_8_f_45_e11_r3_Test_XY_11_Mousmape_hp_Test thermal expansion , specific Weight , cylinders, screws, threaded
- 400.2.10 Wi_8_f_45_e12_qrev01_Test_XY_12_Mousmape2_hp_empty
- 400.2.11 Wi_8_f_45_e13xx_Test_XY13_RPM - Test calculation of RPM (engine speed)
- 400.2.13 Wi_8_f_45_e20_TestXY20_MachBuilderTest = Test Machine pictures
- 400.2.14 Wi_8_f_45_e50_Rev02_Test_XY50_english_test_iw = English Test 1 part
- 400.2.15 Wi_8_f_45_e50_Rev02_Test_XY50_english_test_iw - test English 2 part
- 400.2.16 Wi_8_f_45_e200_Rotationstest_XY200_Sample_xx = Test rotation calculation (sample)
- 400.2.17 Wi_8_f_45_e201_Rotationstest_XY201_r4 = Test rotation calculation. Fairs. Electrical
- 400.2.18 Wi_8_f_45_e203_Rotationstest_XY203_r4 = Test rotation calculation. Cleaning . Machine testing . papers

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