PERFORMANCE OF WORKING DRAWINGS OF DETAILS IN DRAWING LESSONS

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Abstract: This article provides an in-depth analysis of the process of performing working drawings of details that play an important role in the construction of mechanical engineering, mechanisms and devices. It extensively covers the issues of graphic representation of structural forms, projection system, dimensioning, determination of tolerances and surface quality, compliance with technical requirements and connection with production technology. The essence, structure, functional significance and quality criteria of the working drawing are scientifically studied, the advantages of modern CAD systems are emphasized. Keywords: working drawing, detail, construction, projection, drawing, geometric shape, dimensioning, tolerances, surface quality, technical requirements, production technology.

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Introduction. Creating working drawings of details is a fundamental and crucial process in mechanical engineering, metalworking, electrical engineering and many other industries. A working drawing is an official document that contains the shape, dimensions, material and technical requirements of the detail. With the deepening of industrial development, the requirements for drawing standards, projection accuracy, and dimensional accuracy have increased. Even the smallest detail in each mechanism must be manufactured on time and with high quality. If the working drawing is incorrect, the number of errors in production increases sharply. Therefore, creating a detailed drawing is considered not only a graphic task, but also a scientifically based constructive process. A working drawing is a guide for the manufacturer, which contains the necessary markings, tolerances, surface quality and technical requirements for the shape, dimensions, processing sequence of the part. The task of the drawing is to ensure that the image obtained from the part is clear without any additional explanations. The production workshop carries out preparation, cutting, drilling, grinding and assembly based on this drawing. The three-projection orthogonal projection system is the main one when depicting parts. Front, top and side views of the part are drawn. The criteria for selecting images are as follows: the projection that maximally reveals the main shape and structural elements is chosen as the main view, unnecessary views are avoided, only images that provide the necessary information are used, sections are used to determine the internal structure, half-views and half-sections are used in symmetrical parts. Projection is based on the physical principle: the incidence of light rays on a plane. All dimensions in the drawing are kept to scale and the principle of geometric invariance is observed. Dimensioning must strictly comply with GOST and Uz DSt standards. Dimensions must define the shape in the drawing, be non-repetitive and unambiguous. Types of dimensions: linear dimensions, angular dimensions, diameter and radius, taper and slope, positional dimensions. Dimensions are given in millimeters and are indicated above the lines placed. Tolerances are the maximum and minimum allowable dimensions of a part, which ensure that the parts work together. A small difference in the assembly of a machine can lead to a malfunction of the mechanism. Tolerances ensure functional reliability, standardize manufacturing accuracy, and guarantee mechanical compatibility between assembled parts. The marking system is implemented by symbols such as: IT level, H7, g6. Each symbol indicates the deviation standards from the average value of

the size. Surface quality is the degree of microgeometric irregularities of the surface of the part. It affects the friction, lubrication efficiency, and energy loss of the part. The following surfaces are described using symbols: Ra 0.8 - polished surfaces, Ra 3.2 - milled surfaces, Ra 12.5 - rough-machined surfaces. Surface quality affects the choice of technological processes, for example, grinding, milling, roughing. The working drawing indicates the material: steel, aluminum alloys, bronze, plastic. Technical requirements: heat treatment, hardness level, dimensional accuracy, special coatings, welding and assembly conditions. This allows the drawing to be used not only as a graphic image, but also as a full-fledged technological document. CAD systems such as AutoCAD, SolidWorks, CATIA, Siemens NX increase the quality of drawings, reduce errors and save time. Advantages: automatic projection, accurate dimensioning, creation of a 3D model and obtaining a drawing from it, checking tolerances, material calculations. At the same time, CAD systems require traditional drawing skills. Different types of details are shown separately in working drawings: complex-shaped, symmetrical, conductive, twisted and axially symmetrical details. In complex-shaped details, local sections and surface details are often used, which helps to clearly show the internal structure. In symmetrical details, half-sections and axial centerlines are used. For curved or bent parts, the bending radius and angle of inclination must be clearly defined. Each type of part is indicated by special symbols that facilitate the manufacturing process. The working drawings also indicate the sequence of the technological process: first cutting and drilling, then grinding and surface treatment, and finally assembly and coating. To reduce production errors, 3D models are created in CAD systems, all projections of which are automatically obtained and accurate dimensions are set. In this way, the drawing is used as a complete guide for the manufacturing process. If the quality criteria of the working drawing are met, the parts can be manufactured with 100% accuracy. A high-quality drawing must be complete and easy to read, the dimensions must be correct, unique, all projections must match, the technical requirements must be clearly written, comply with the production technology, and tolerances and surface quality must be indicated. At the same time, there is an opportunity to reduce technological errors and save time in the process of manufacturing parts. Conclusion: The execution of a working drawing of parts is a complex and scientifically based process, which is not only a graphic expression, but also a technological document and a constructive solution. The reliability and efficiency of each mechanism depends on the correct execution of the drawing. Modern CAD systems facilitate this process, but knowledge of classical drawing skills is always necessary. Working drawings, as the main and decisive stage of production, ensure the quality of parts, the efficiency of the mechanism and the safety of production.

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